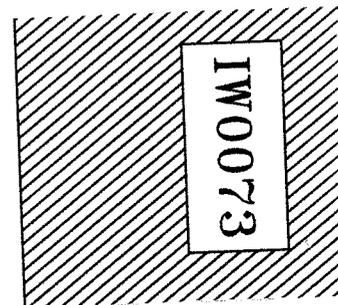


ANNUAL SUBSIDENCE MONITORING REPORT
EAST / TRAIL MOUNTAIN PROPERTIES
1995



PACIFICORP
TECHNICAL SERVICES REPORT
RODGER C. FRY

IW0073

CENTRAL ENGINEERING

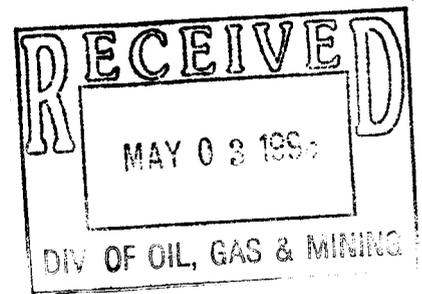
**ANNUAL SUBSIDENCE MONITORING REPORT
EAST/TRAIL MOUNTAIN PROPERTIES
1995**



MARCH 29, 1996

PACIFICORP
SUBSIDENCE MONITORING PROGRAM
ANNUAL REPORT FOR 1995

March 1996



Submitted to:

United States Department of the Interior
Office of Surface Mining
Minerals Management Service
Utah Division of Oil, Gas and Mining

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APPENDICES

Subsidence Map

Raw Data

Des-Bee-Dove Mines

Deer Creek Mine

Wilberg/Cottonwood Mine

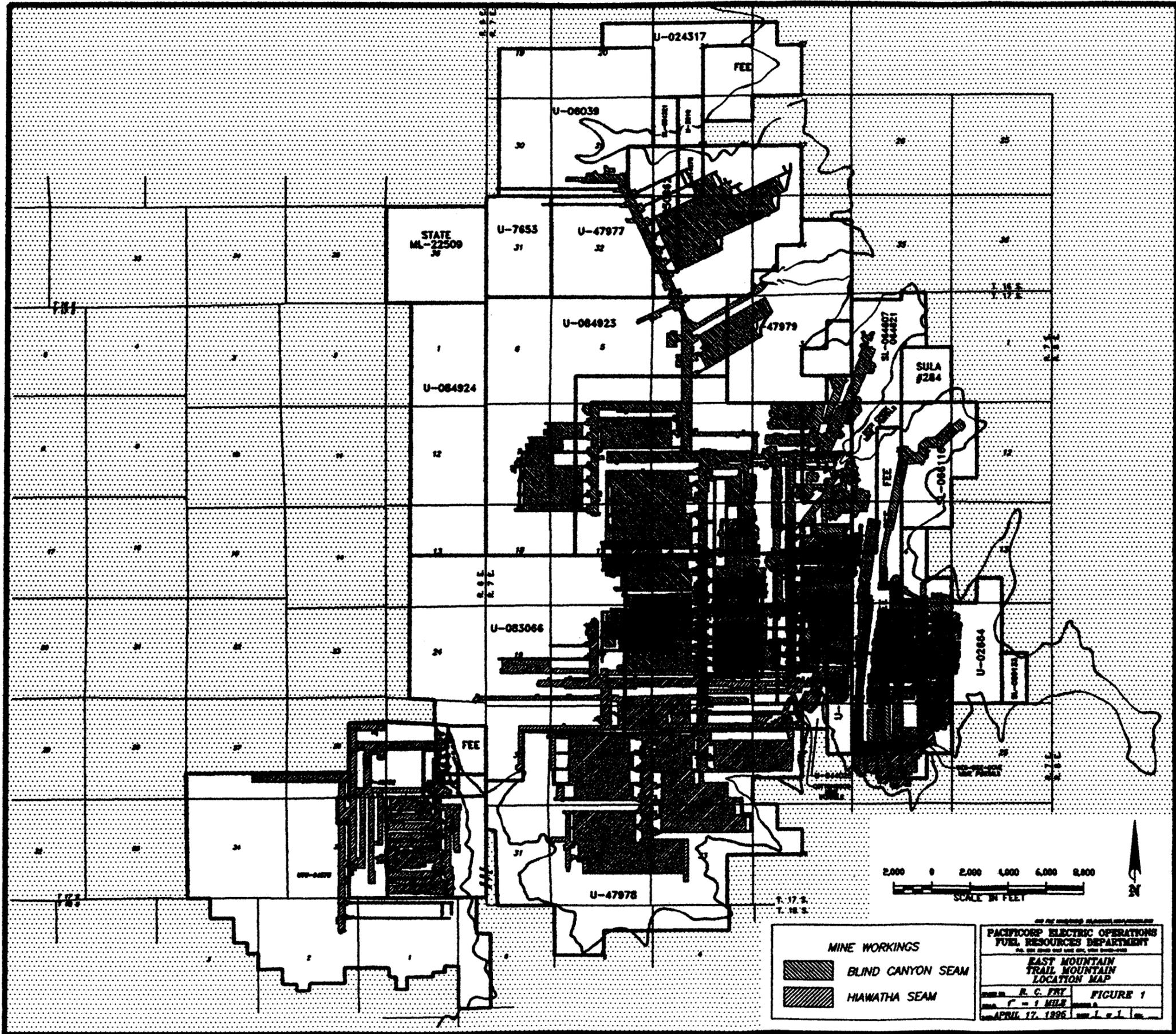
Spring Map with 5-Year Mine Plan Showing Subsidence

Cliff Stability Survey Targets

INTRODUCTION

PacifiCorp's East Mountain Subsidence Monitoring Study is an ongoing project designed to detect, observe, and report the effects of mining-induced subsidence above the Deer Creek, Wilberg/Cottonwood, Des-Bee-Dove and Trail Mountain Mines (see Figure 1). This, the fourteenth such annual report submitted, covers the period between August 31, 1994 and August 31, 1995.

The initial report submitted in 1982 details the monitoring methods used in the study; therefore, they are not discussed in depth here. Briefly, PacifiCorp uses aerial photogrammetric survey methods and annual helicopter reconnaissance flights to monitor subsidence. The aerial photogrammetry work is contracted to a mapping company. Contracts for the work are bid and awarded for a three year period. This is the third contractor that has been involved with the project. Between 1982 and 1987 the work was contracted through Intermountain Aerial Surveys. They established reading points on generally a 200 foot grid but adjusted the location of each point to be on easily reproducible locations. Between 1988 and 1990 the work was contracted to Maps Inc. Because of the type of equipment it was better for them to establish uniform grid points on 200 foot spacing. In 1991 the work was contracted to MapCon Mapping Consultants. The owners of this company were previously employed by Intermountain Aerial Surveys and felt that better results could be obtained by using the original grid established by Intermountain Aerial Surveys. Therefore, they reverted back to the original monitoring grid. A change in the method of reading the aerial photographs may result in some slight changes in measured subsidence in some areas. Also, it is crucial that accurate paneled control be surveyed and recorded on the photographs to



MINE WORKINGS

 BLIND CANYON SEAM

 HIAWATHA SEAM

PACIFICORP ELECTRIC OPERATIONS
 FUEL RESOURCES DEPARTMENT
 EAST MOUNTAIN
 TRAIL MOUNTAIN
 LOCATION MAP

BY: R. C. FRY
 SCALE: 1" = 1 MILE
 DATE: APRIL 17, 1995

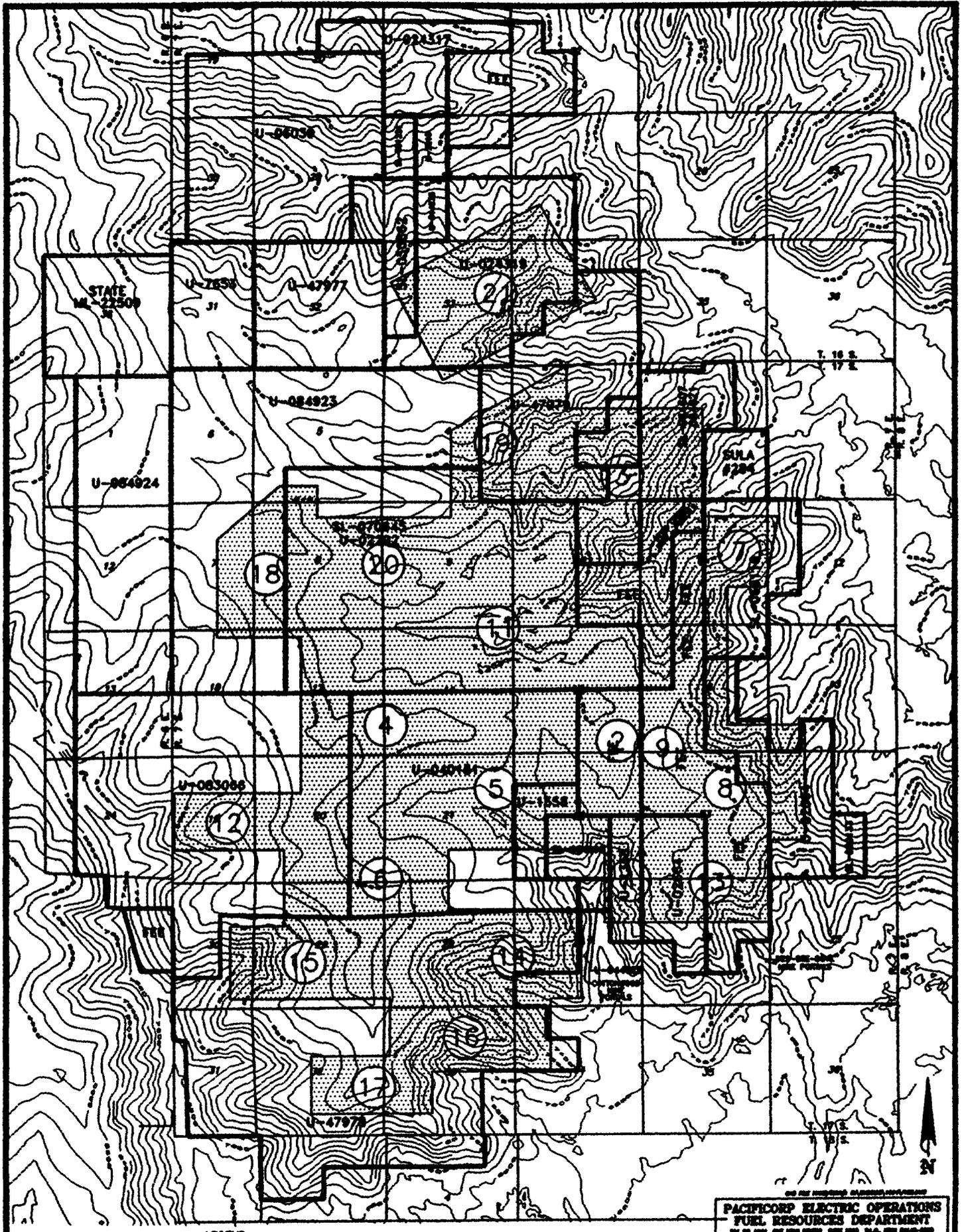
FIGURE 1

enable close subsidence readings. Between 1987 and 1990, some of the survey control in the more difficult to reach areas were not properly paneled and could not be identified on the photographs. It appears that this diminished the precision of the subsidence reading in some of the areas during those years. Using the aerial photographs derived from a flight conducted on September 15, 1995, elevations were measured at 12,927 different points. These elevations were then compared with the baseline survey elevations measured from the aerial photos collected in 1980, 1986, and 1987. The difference in elevation is the amount of subsidence that has occurred.

A map of all areas of subsidence is included in the appendix to this report. The raw data is included in the appendix of this report on a 3 ½ inch disk in an ASCII file called SUB95.TXT. The photography completed on September 15, 1995 were black and white and included all of the areas where longwall or room and pillar extraction has been completed. Prior to PacifiCorp's acquisition of the Trail Mountain Mine from ARCO Coal Co., they monitored subsidence using on the ground monumentation. Nowhere did the monitoring identify subsidence greater than a few tenths of feet. Since the acquisition of the property no longwall mining has occurred. When longwall mining does commence, we will read the elevations from that years photography.

Location

Figure 2 shows all areas above PacifiCorp's coal mines which have potential for mining-induced subsidence. New fractures were noticed in the field early in 1995 above recently extracted longwall panels in the Cottonwood Mine. These fractures will be discussed in detail latter in the report (see Area 4). A helicopter reconnaissance flight during 1995 revealed no new areas of visible surface disturbance. In areas where subsidence has been detected, data is shown in the form of contour maps and profiles. Both indicate elevation change from pre-mining



LEGEND



AREAS STUDIED FOR SUBSIDENCE
NUMBERS KEYED TO TEXT

PACIFICORP PERMIT BOUNDARY

DATE	REVISION	BY

PACIFICORP ELECTRIC OPERATIONS
 FUEL RESOURCES DEPARTMENT
 1994 SUBSIDENCE MONITORING
 AREAS STUDIED
 FOR SUBSIDENCE

DRAWN BY R. C. FRY	FIGURE 2
SCALE 1" = 1 MILE	
DATE JAN. 20, 1995	DRAWN BY J. J. J.

elevations. The profile figures present data for all years monitored with the exception of the 1990 data. The computer data files from that year were damaged rendering them unreadable. At this time it is felt that enough data exists from the other years and the task of regenerating that data is not warranted. In many areas of subsidence the angle-of-draw has been calculated and reported; however, in the majority of cases the angle should not be considered the actual final angle-of-draw due to several factors. For example, the zone of subsidence to date may be small and contained within the underlying mined area, suggesting that the subsidence has not yet reached its maximum extent. Also, many mined sections are surrounded by other older workings which influence the calculation. In a few areas where the mined-out workings are surrounded by burned coal, the failure of clinker beds promotes subsidence outside the mined area resulting in an angle-of-draw greater than might be expected.

Area 1

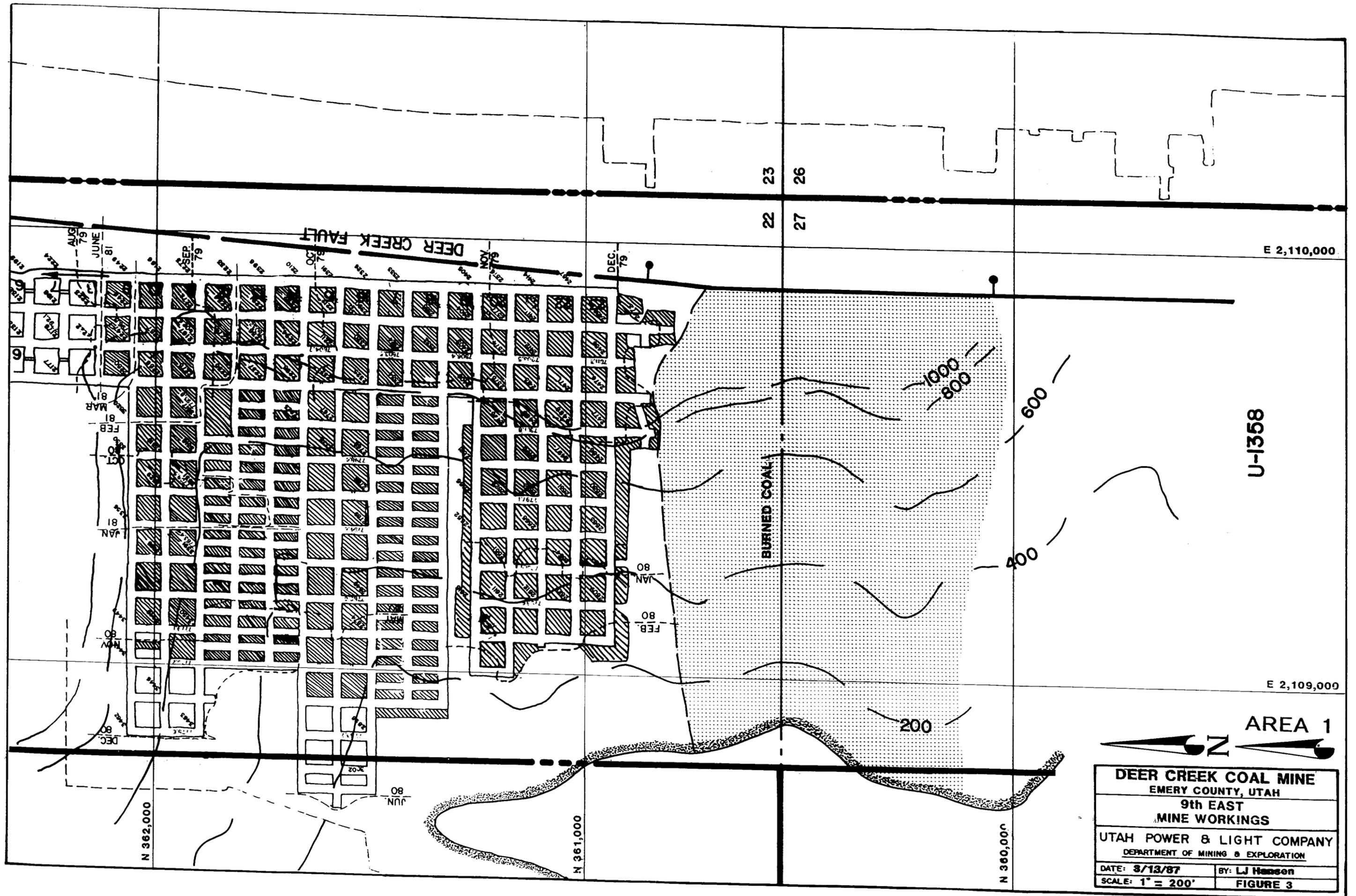
Deer Creek 9th East - Wilberg 1st Right

Subsidence in Area 1 was first documented in the 1981 Subsidence Monitoring Report submitted in 1982. The relationship of the subsidence to the underlying Deer Creek and Wilberg mine workings is shown in Figures 3, 4, and 5. Each map covers the same area, Figure 5 being a contour map of subsidence on the surface over the mine workings depicted in the other two figures. The most recent mining in this area occurred in the Wilberg 1st Right section in June 1984.

Figures 6 and 7 are north to south and west to east profiles showing the amount of subsidence in this area during the past eight years. The location of each line is shown on Figure 5. The area has seen little change since 1985 and appears to have totally stabilized. Maximum subsidence remains at about twenty-eight (28) feet. A detailed look from a helicopter revealed that the subsidence maximum is located on a steep slope, about 200 feet south of the southernmost mining, where a good-sized rotational slump has occurred. The workings here are also surrounded by burned coal. It is probable that the combination of steep slopes and crushing of clinker beds has allowed subsidence to occur well outside the area of mine workings. An inspection of the area from the ground indicates that many of the open fractures forming the graben-like structure have begun to heal and fill in with soil.

Calculation of the angle-of-draw is complicated because the workings are nearly surrounded by faults, burned coal, and other mine workings. Due to this complexity, angle-of-draw was not determined for Area 1.

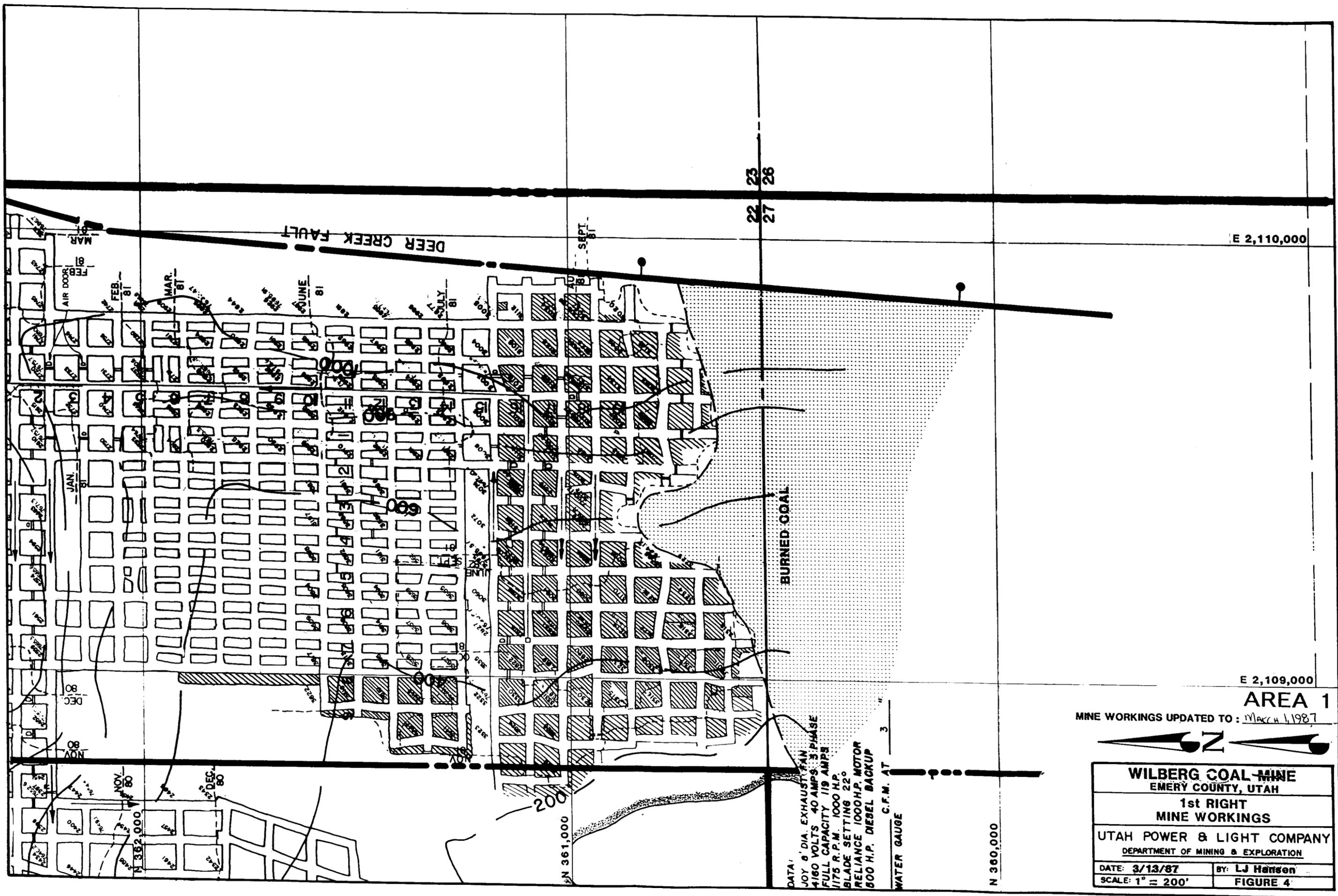
There are no springs, and no hydrologic impacts due to mining have been observed at this location.



U-1358

AREA 1

DEER CREEK COAL MINE	
EMERY COUNTY, UTAH	
9th EAST MINE WORKINGS	
UTAH POWER & LIGHT COMPANY	
DEPARTMENT OF MINING & EXPLORATION	
DATE: 3/13/87	BY: LJ Hansen
SCALE: 1" = 200'	FIGURE 3



E 2,110,000

E 2,109,000

AREA 1

MINE WORKINGS UPDATED TO: March 1, 1987



WILBERG COAL MINE EMERY COUNTY, UTAH	
1st RIGHT MINE WORKINGS	
UTAH POWER & LIGHT COMPANY DEPARTMENT OF MINING & EXPLORATION	
DATE: 3/13/87	BY: LJ Hansen
SCALE: 1" = 200'	FIGURE 4

DATA:
 JOY 6" DIA. EXHAUST FAN
 4160 VOLTS 40 AMPS 3 PHASE
 FULL CAPACITY 119 AMPS
 1175 R.P.M. 1000 H.P.
 BLADE SETTING 22°
 RELIANCE 1000 H.P. MOTOR
 800 H.P. DIESEL BACKUP

C.F.M. AT 3"
 WATER GAUGE

N 360,000

N 361,000

22 23
27 26

DEER CREEK FAULT

BURNED COAL

AIR DOOR

FEB 81

MAR 81

JUNE 81

JULY 81

SEPT 81

JAN 81

DEC 80

NOV 80

DEC 80

N 362,000

N 363,000

N 364,000

N 365,000

N 366,000

N 367,000

N 368,000

N 369,000

N 370,000

N 371,000

N 372,000

N 373,000

N 374,000

N 375,000

N 376,000

N 377,000

N 378,000

N 379,000

N 380,000

N 381,000

N 382,000

N 383,000

N 384,000

N 385,000

N 386,000

N 387,000

N 388,000

N 389,000

N 390,000

N 391,000

N 392,000

N 393,000

N 394,000

N 395,000

N 396,000

N 397,000

N 398,000

N 399,000

N 400,000

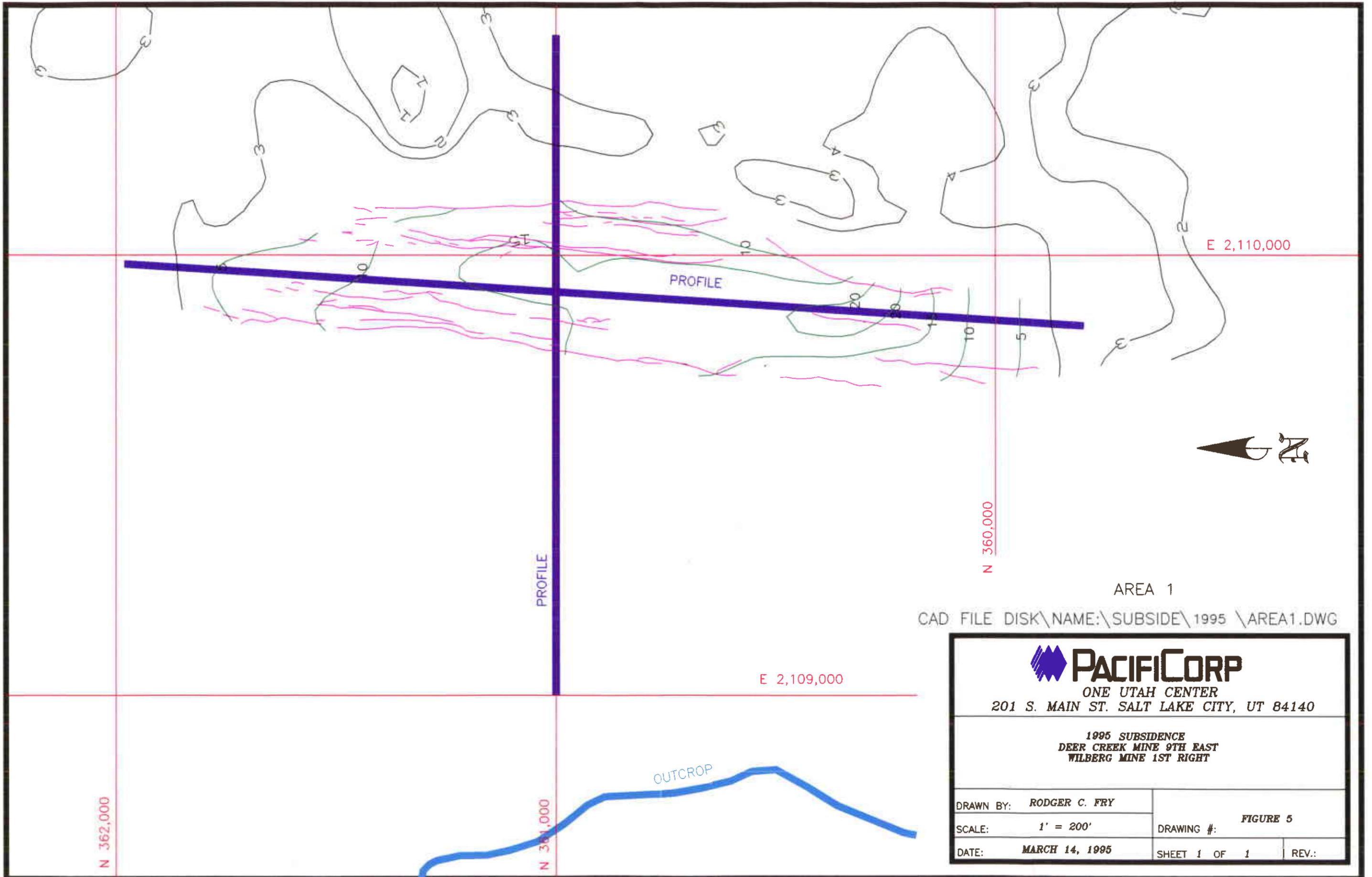
N 401,000

N 402,000

N 403,000

N 404,000

N 405,000



E 2,110,000

N 360,000

PROFILE

PROFILE



AREA 1

CAD FILE DISK\NAME:\SUBSIDE\1995 \AREA1.DWG

E 2,109,000

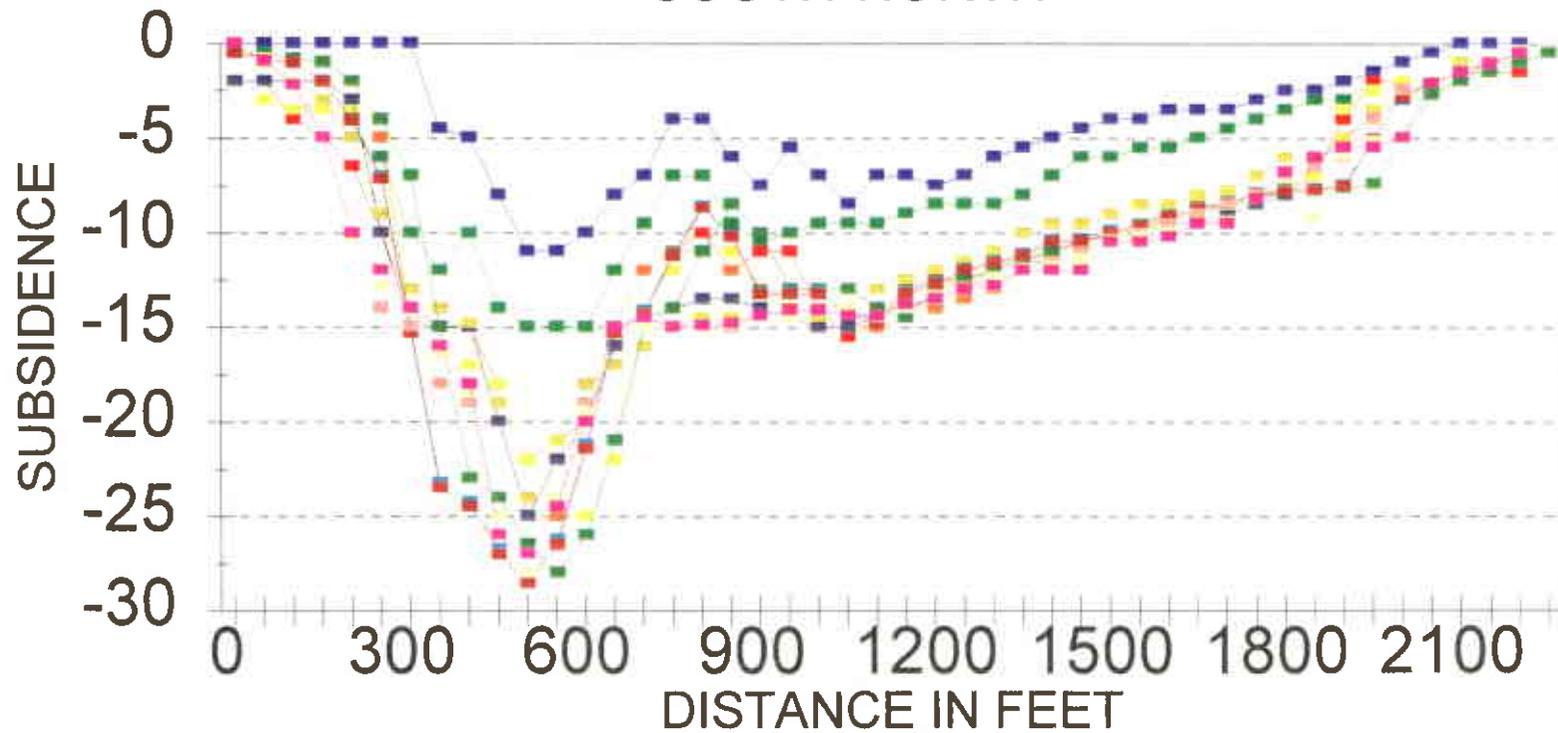
N 362,000

N 361,000

OUTCROP

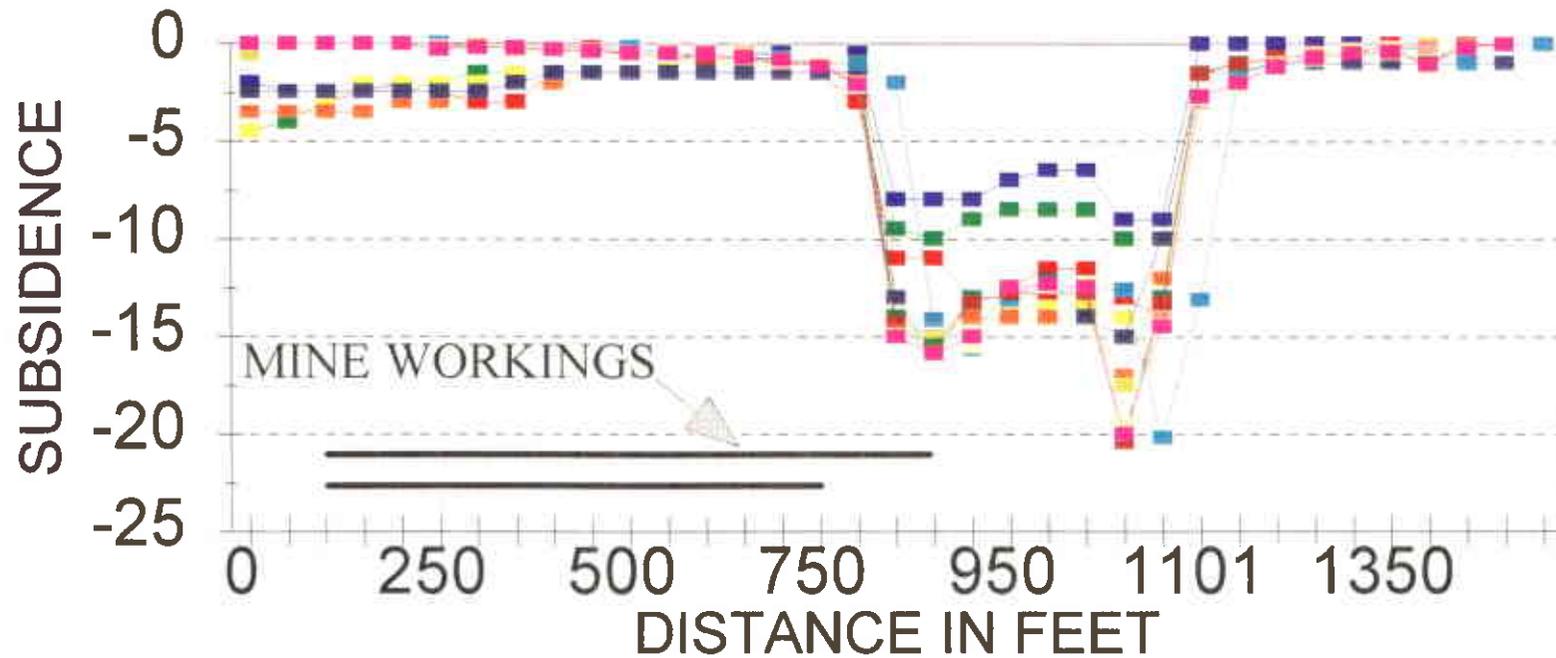
 PACIFICORP ONE UTAH CENTER 201 S. MAIN ST. SALT LAKE CITY, UT 84140			
1995 SUBSIDENCE DEER CREEK MINE 9TH EAST WILBERG MINE 1ST RIGHT			
DRAWN BY:	RODGER C. FRY	DRAWING #: FIGURE 5	
SCALE:	1' = 200'		
DATE:	MARCH 14, 1995	SHEET 1 OF 1	REV.:

FIGURE 6
AREA 1 SUBSIDENCE PROFILE
SOUTH-NORTH



- | | | | | |
|------|------|------|------|------|
| 1982 | 1983 | 1984 | 1985 | 1986 |
| 1987 | 1988 | 1989 | 1991 | 1992 |
| 1993 | 1994 | 1995 | | |

FIGURE 7
AREA 1 SUBSIDENCE PROFILE
 WEST-EAST



■ 1982	■ 1983	■ 1984	■ 1985	■ 1986
■ 1987	■ 1988	■ 1989	■ 1991	■ 1992
■ 1993	■ 1994	■ 1995		

Area 2

Deer Creek 5th, 6th, 7th, and 8th East Longwall Panels

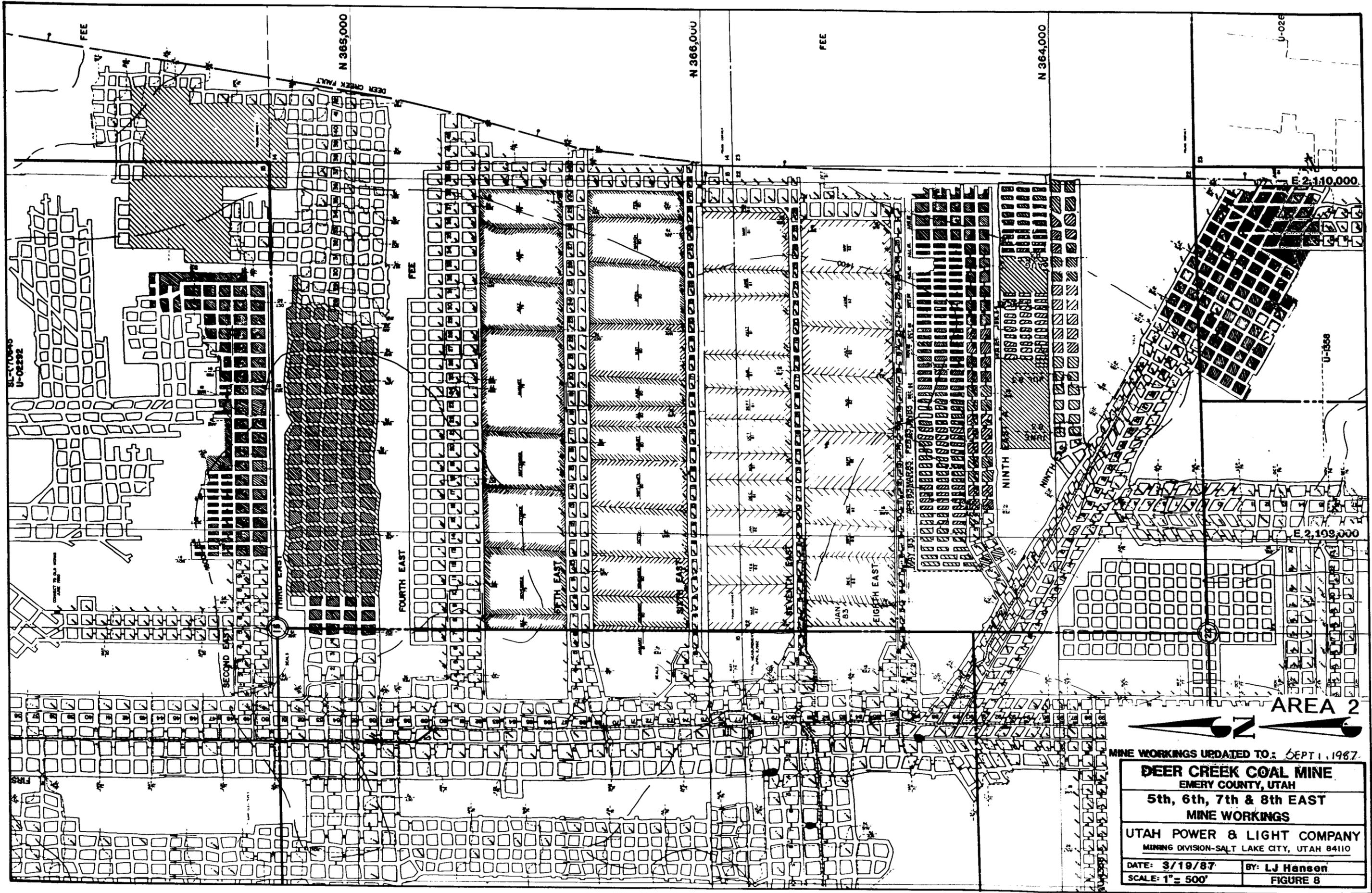
Wilberg 3rd through 13th Right Panels

Mining in the Deer Creek Mine in Area 2 was completed by February 1985. Coal extraction in the underlying Wilberg Mine 3rd and 4th Right panels was completed between September 1987 and the end of January 1988 (Figures 8 and 9).

Maximum subsidence in Area 2 has stabilized at 13 feet in one area above the center of the multiple seam mining area (Figure 10). The subsidence profiles (Figures 11 and 12) indicate that the subsidence has been stable for the past 4 years or more. Neither PacifiCorp nor other contracted personnel have detected any surface fissures or other visible disturbance in the area.

Angle-of-draw has been calculated where possible. On the eastern side of Area 2 the angle is influenced by the Deer Creek Fault and the adjacent Little Dove Mine workings across the fault; thus, no angle was calculated. On other sides it ranges from less than zero to 11 degrees.

No springs have been identified over the subsidence area but two springs, one-fourth to one-third mile to the west, show no effects from mining (see Hydrologic Monitoring Report, 1995).



AREA 2

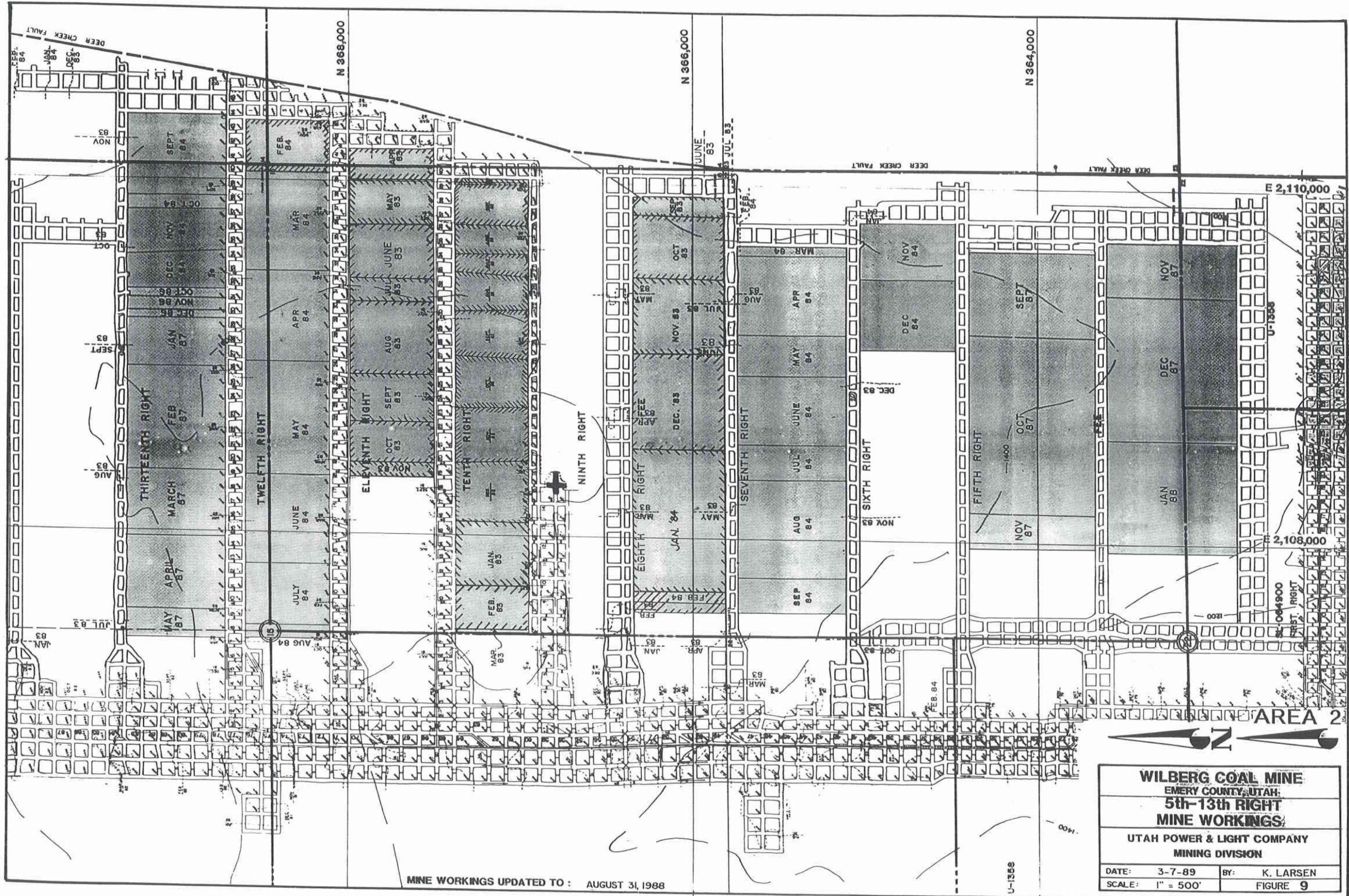


MINE WORKINGS UPDATED TO: SEPT. 1, 1987.

DEER CREEK COAL MINE
 EMERY COUNTY, UTAH
 5th, 6th, 7th & 8th EAST
 MINE WORKINGS

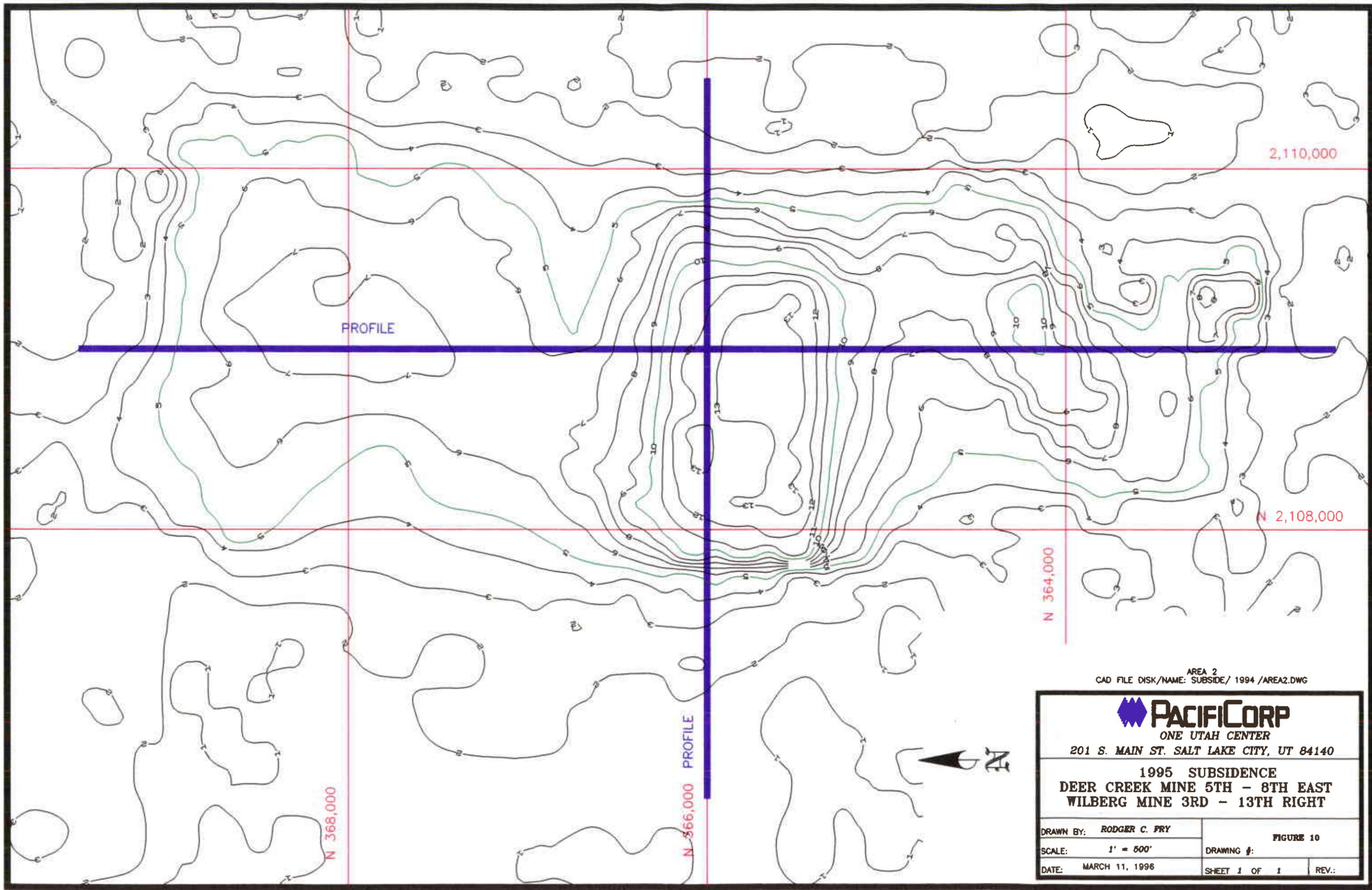
UTAH POWER & LIGHT COMPANY
 MINING DIVISION-SALT LAKE CITY, UTAH 84110

DATE: 3/19/87	BY: LJ Hansen
SCALE: 1" = 500'	FIGURE 8



MINE WORKINGS UPDATED TO : AUGUST 31, 1988

WILBERG COAL MINE	
EMERY COUNTY, UTAH	
5th-13th RIGHT	
MINE WORKINGS	
UTAH POWER & LIGHT COMPANY	
MINING DIVISION	
DATE: 3-7-89	BY: K. LARSEN
SCALE: 1" = 500'	FIGURE 9



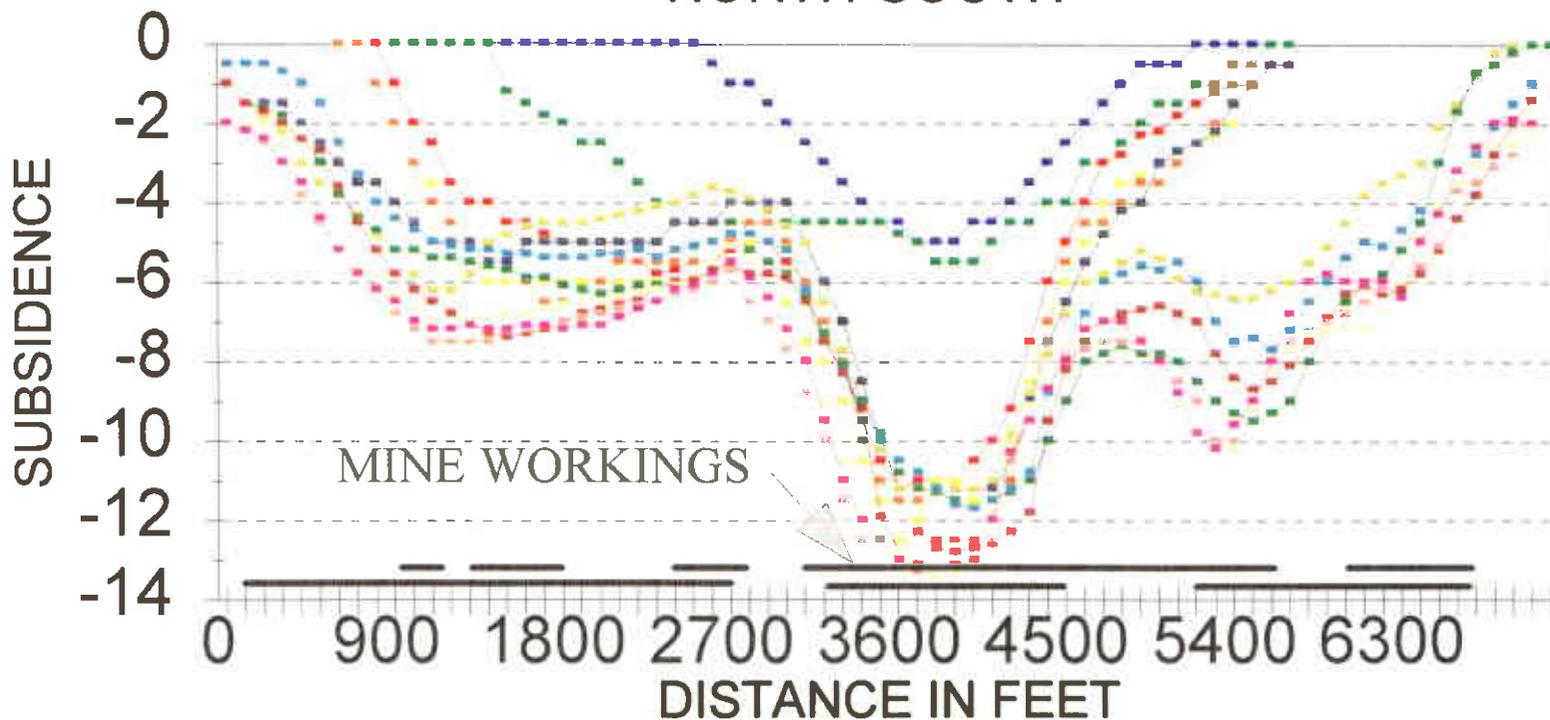
AREA 2
 CAD FILE DISK/NAME: SUBSIDE/ 1994 /AREA2.DWG

PACIFICORP
 ONE UTAH CENTER
 201 S. MAIN ST. SALT LAKE CITY, UT 84140

1995 SUBSIDENCE
 DEER CREEK MINE 5TH - 8TH EAST
 WILBERG MINE 3RD - 13TH RIGHT

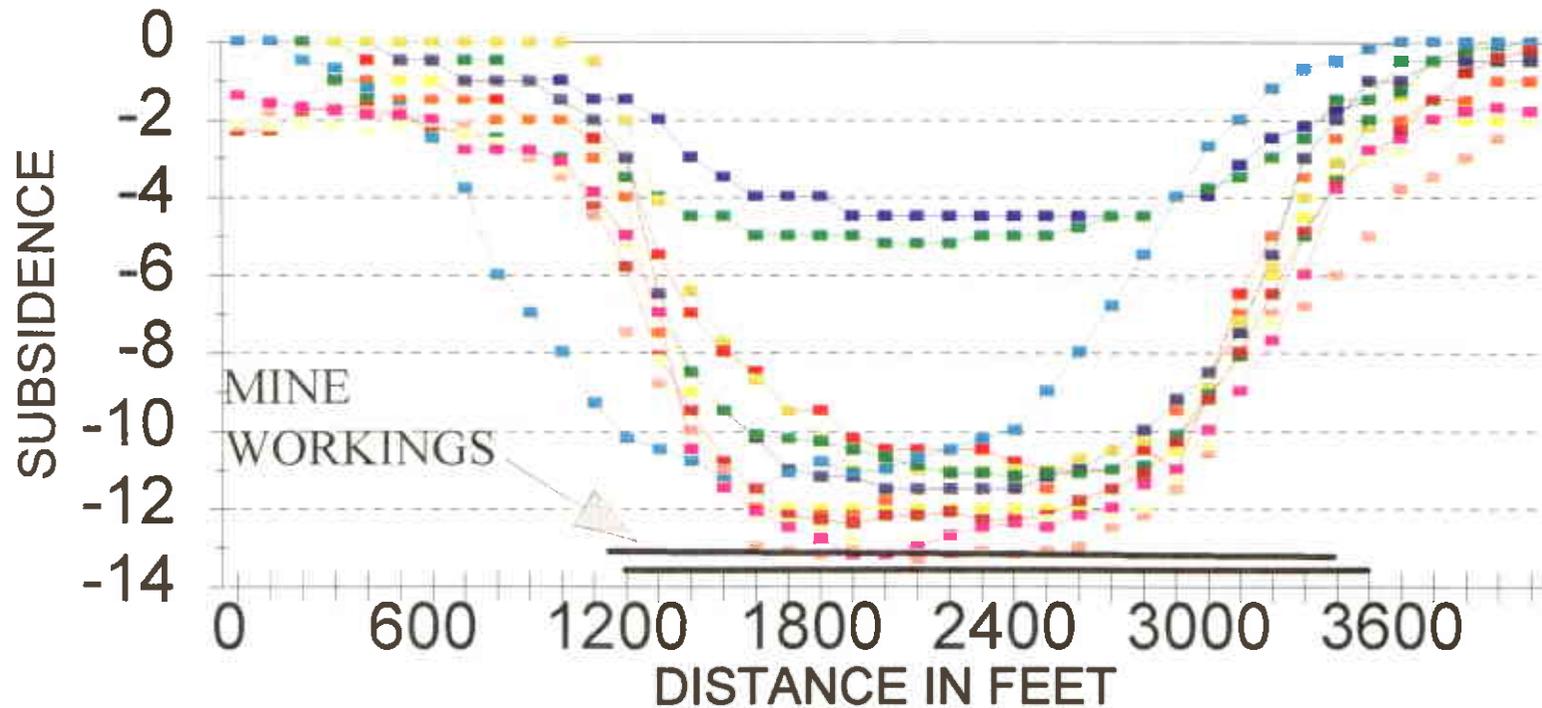
DRAWN BY: RODGER C. FRY	FIGURE 10	
SCALE: 1" = 500'	DRAWING #:	
DATE: MARCH 11, 1996	SHEET 1 OF 1	REV.:

FIGURE 11
AREA 2 SUBSIDENCE PROFILE
NORTH-SOUTH



1982	1983	1984	1985	1986
1987	1988	1989	1991	1992
1993	1994	1995		

FIGURE 12
AREA 2 SUBSIDENCE PROFILE
WEST-EAST



1982	1983	1984	1985	1986
1987	1988	1989	1991	1992
1993	1994	1995		

Area 3

Deer Creek 1st North Area

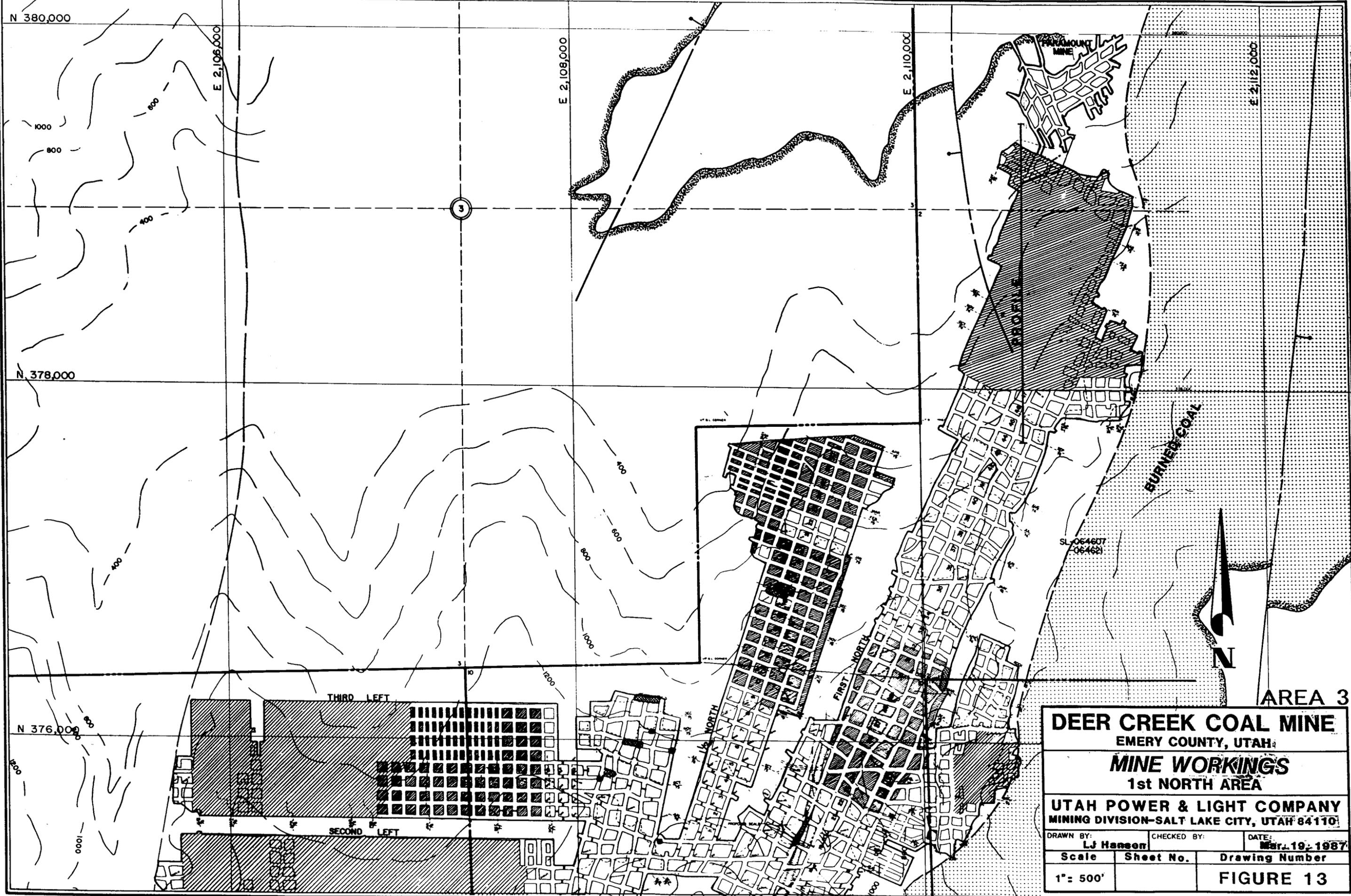
Most of the 1st North section of the Deer Creek Mine was abandoned and sealed in 1978 after being mined out. The southern portion is still open and may be used for access to a block of coal which lies to the west. Pillar extraction in the 3rd Left and 1-1/2 North sections was completed early in 1980 (Figure 13).

The subsidence above 1st North occurs on a narrow ridge capped by a highly fractured sandstone. The subsidence measured is depicted in Figure 13A. Figure 14 is a profile of total subsidence as it occurred along a line of points above the workings. The subsidence in area 3 has shown no significant change in the past 4 years.

A Helicopter survey in 1995 did not reveal any new surface cracks or new areas of cliff failure.

No angle-of-draw was determined due to the steep slopes, burned coal, and mode of subsidence.

The strata surrounding and above the 1st North workings are generally dry; therefore, mining has not adversely affected the groundwater.



AREA 3

DEER CREEK COAL MINE		
EMERY COUNTY, UTAH		
MINE WORKINGS		
1st NORTH AREA		
UTAH POWER & LIGHT COMPANY		
MINING DIVISION-SALT LAKE CITY, UTAH 84110		
DRAWN BY: Lj Hansen	CHECKED BY:	DATE: Mar. 19, 1987
Scale	Sheet No.	Drawing Number
1" = 500'		FIGURE 13

N 380,000

E 2,106,000

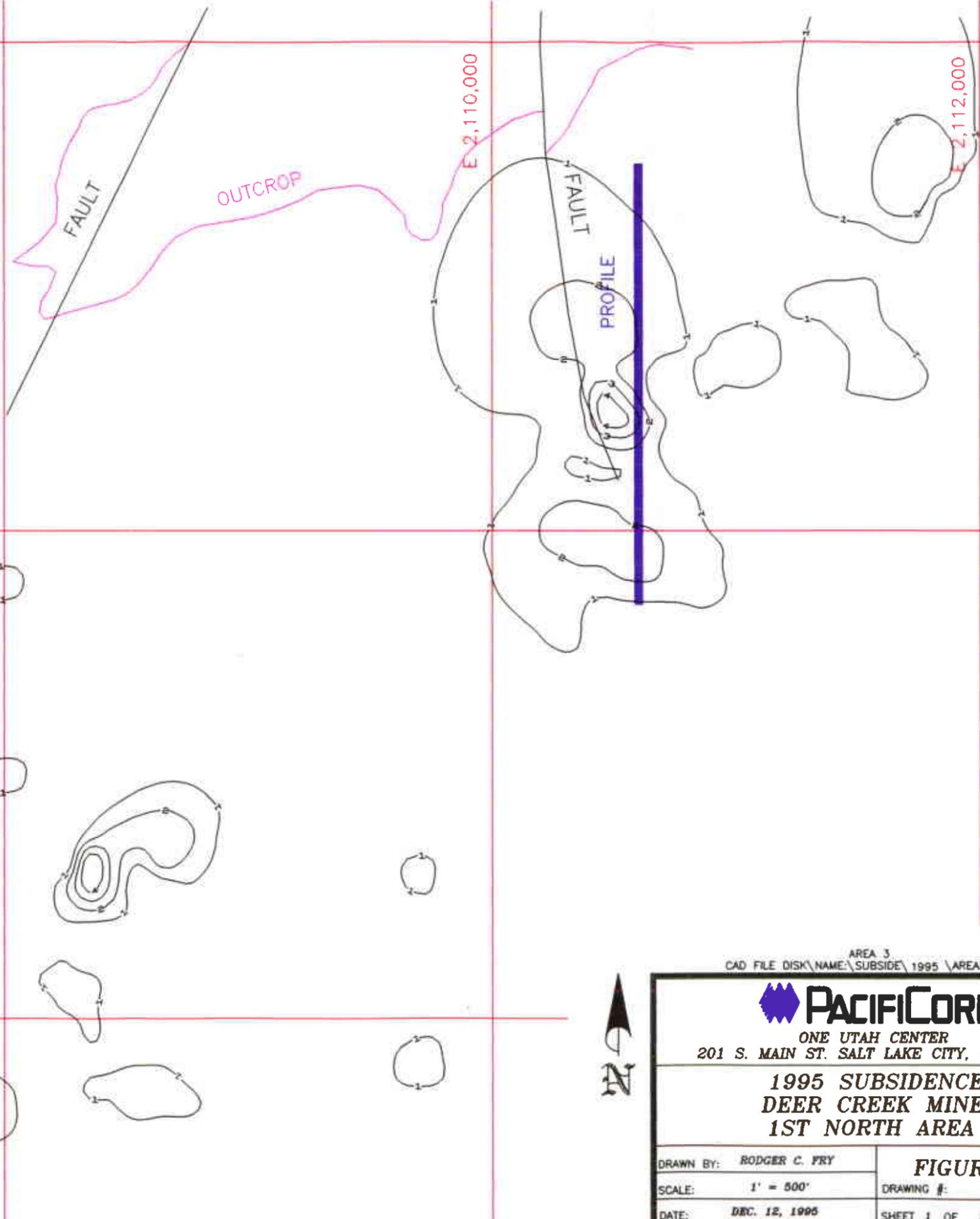
E 2,108,000

E 2,110,000

E 2,112,000

N 378,000

N 376,000



AREA 3
CAD FILE DISK\NAME\SUBSIDE\1995\AREA3.DWG



PACIFICORP

ONE UTAH CENTER
201 S. MAIN ST. SALT LAKE CITY, UT 84140

**1995 SUBSIDENCE
DEER CREEK MINE
1ST NORTH AREA**

DRAWN BY: RODGER C. FRY

FIGURE 13A

SCALE: 1" = 500'

DRAWING #:

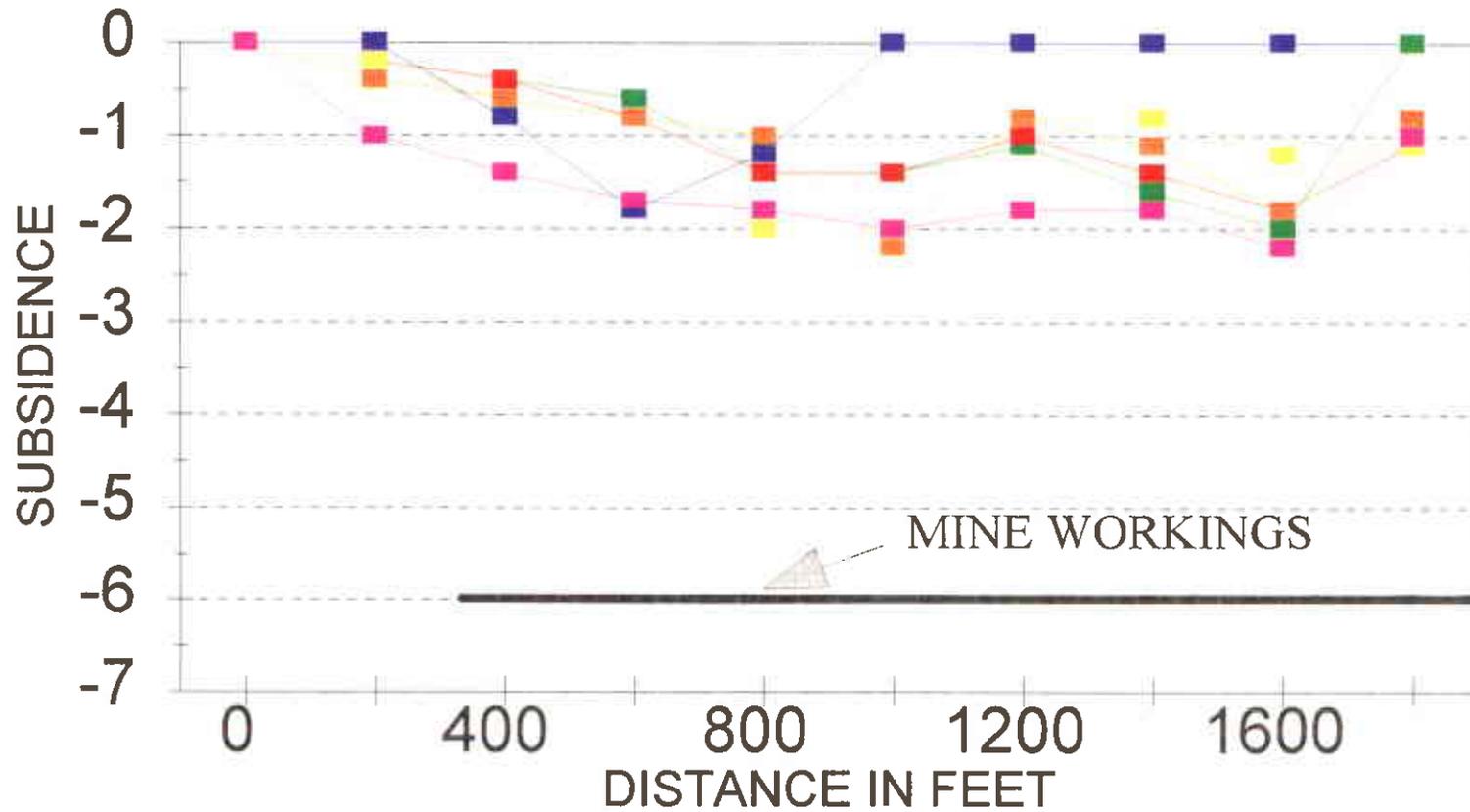
DATE: DEC. 12, 1995

SHEET 1 OF 1

REV.:

FIGURE 14

AREA 3 SUBSIDENCE PROFILE NORTH-SOUTH



Area 4

Deer Creek 2nd through 17th Right Longwall Panels

Subsidence in Area 4 was detected for the first time in 1984 by photogrammetric methods. Longwall mining commenced in the 2nd Right longwall panels in 1980 and by the end of August 1991 the 2nd through 17th Right panels had been completed (Figure 15). In the Cottonwood mine, Longwall mining began in September of 1992 in the 9th Left Panel off 2nd north and the 8th Left Panel was terminated early because of unacceptable coal quality in February 1993. Mining resumed in this area in the 5th Left Longwall Panel in August of 1994 and continued through August of 1995 when mining was active in the 2nd Left Longwall Panel (Figure 15A).

Maximum subsidence has increased dramatically in the last year from just over eight (8) feet to over thirteen (13) feet (Figure 16). The profiles, Figures 17 and 18 show some variability from year to year. This area is heavily vegetated and it is thought that this creates difficulties in obtaining consistent readings from year to year. Where the recent mining was active in the Cottonwood Mine, it is still easy to see the resultant renewed subsidence on the profiles.

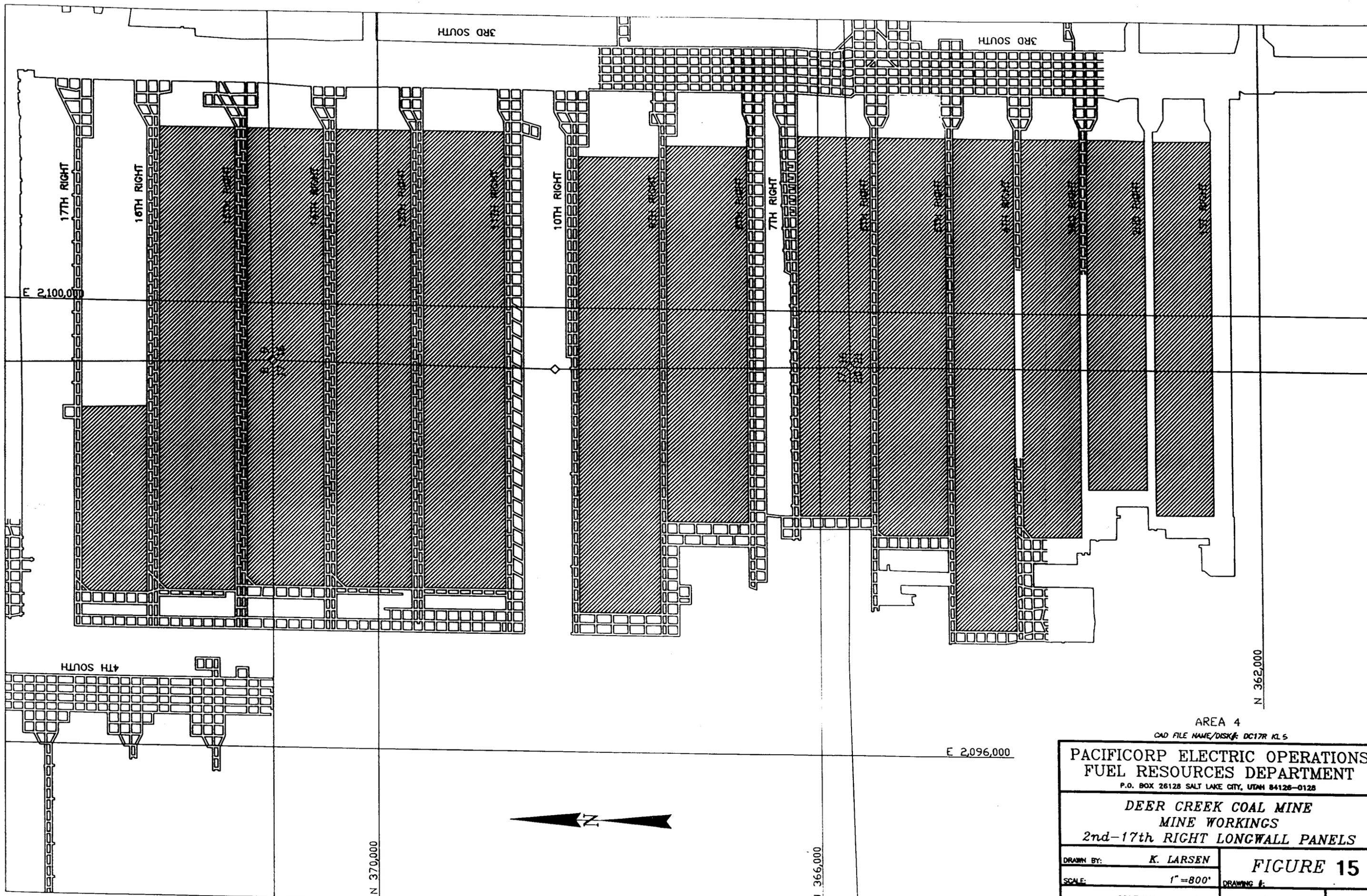
Surface fractures were identified in the field in late May of 1995. These fractures were located on Fee surface land and PacifiCorp filled in the fractures with a motor grader and reseeded the area. The location of the fractures are shown on figure 16.

The calculated angle-of-draw of the subsidence ranges from less than zero to 22 degrees. Because mining in this area will still be active until late 1995, it is expected that subsidence will continue to be experienced particularly in the southern part of the area.

Several springs are located on East Mountain above these longwall panels and the 2nd through 5th Left panels located directly to the east (see Area 5). Fluctuations in spring flow occur

from year to year but seem to be related to variations in precipitation rather than mining. Flows are generally low in dry years and higher in wetter years (see Hydrologic Monitoring Report, 1995 and the Appendices to this report).

The left fork of the Grimes Wash drainage crosses the middle of the subsidence area. Stream monitoring has revealed no changes attributable to mining. This stream has been called Perennial by the US Forest Service, but our data indicates that it is ephemeral.

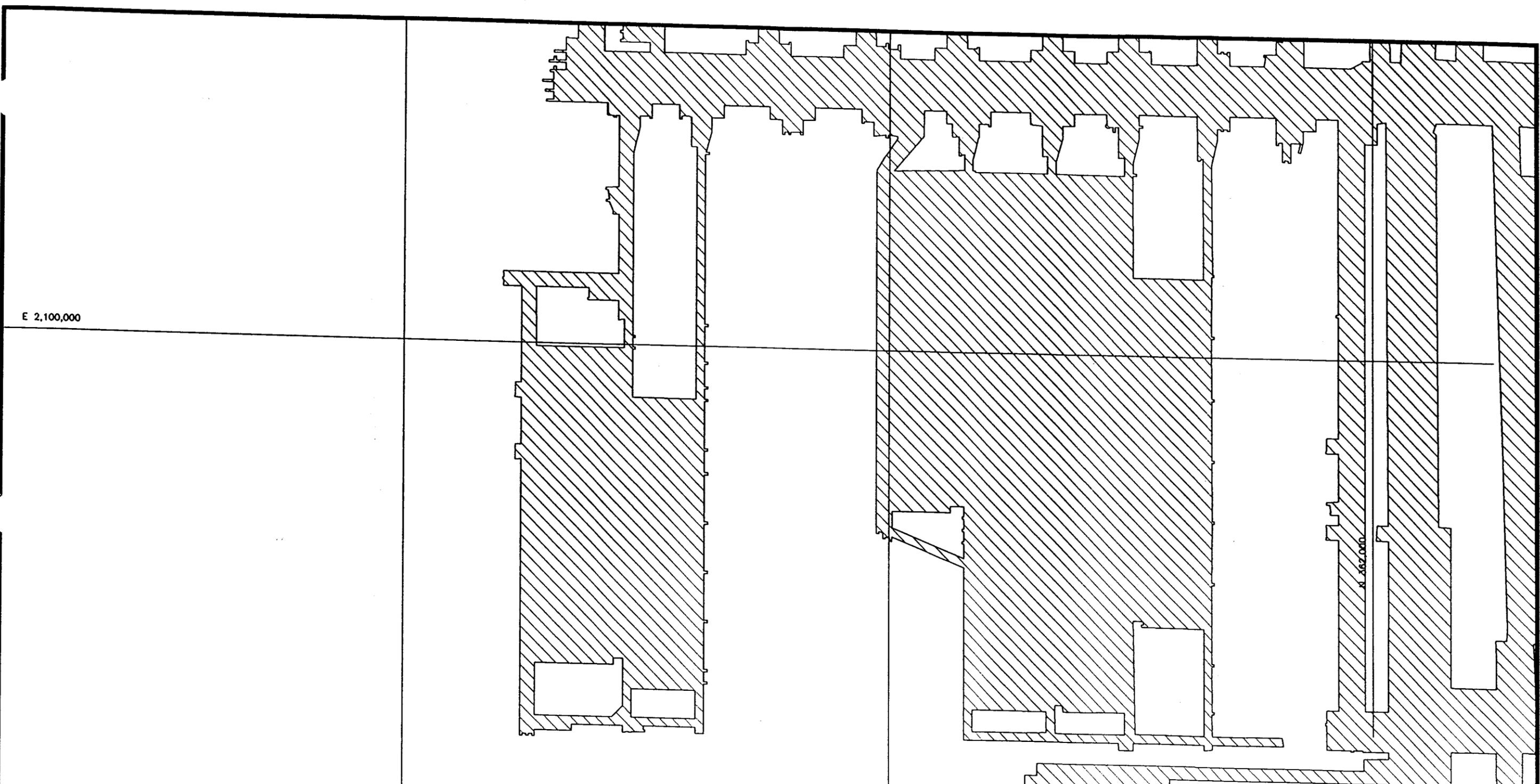


AREA 4
 CAD FILE NAME/DISK: DC17R KL 5

PACIFICORP ELECTRIC OPERATIONS
 FUEL RESOURCES DEPARTMENT
 P.O. BOX 26128 SALT LAKE CITY, UTAH 84126-0128

DEER CREEK COAL MINE
 MINE WORKINGS
 2nd-17th RIGHT LONGWALL PANELS

DRAWN BY:	K. LARSEN	FIGURE 15
SCALE:	1" = 800'	
DATE:	MARCH 19, 1991	
		DRAWING #:
		SHEET 1 of 1
		REV.



AREA 4
 CAD FILE DISK\NAME:\SUBSIDE\1994\AREA4BM.DWG



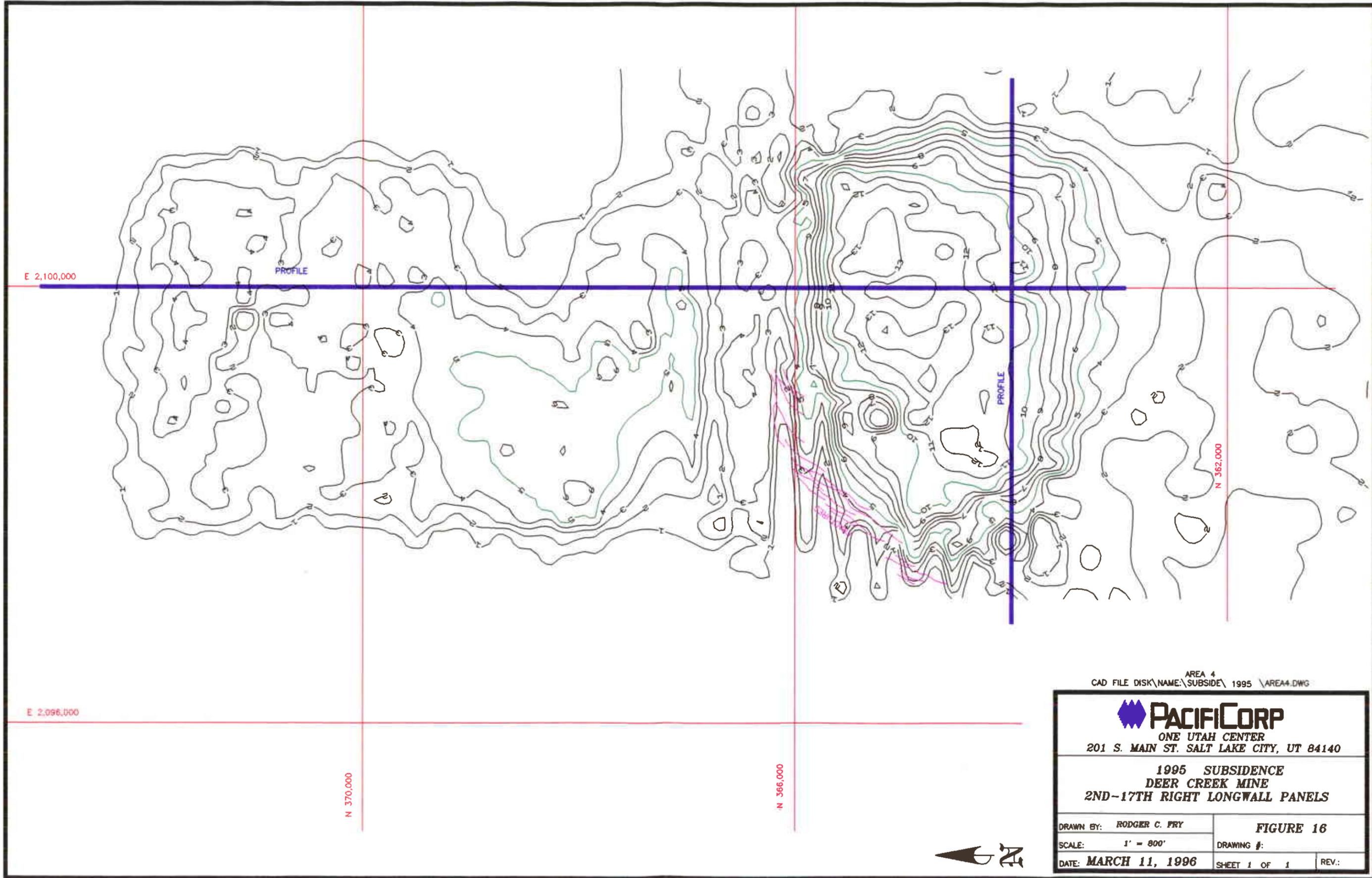
ONE UTAH CENTER
 201 S. MAIN ST. SALT LAKE CITY, UT 84140

COTTONWOOD COAL MINE
 MINE WORKINGS
 2ND-5TH LEFT & 8TH-9TH LEFT PANELS

DRAWN BY: RODGER C. FRY
 SCALE: 1" = 800'
 DATE: MARCH 31, 1995

FIGURE 15A
 DRAWING #:
 SHEET 1 OF 1
 REV.:





AREA 4
 CAD FILE DISK\NAME:\SUBSIDE\ 1995 \AREA4.DWG



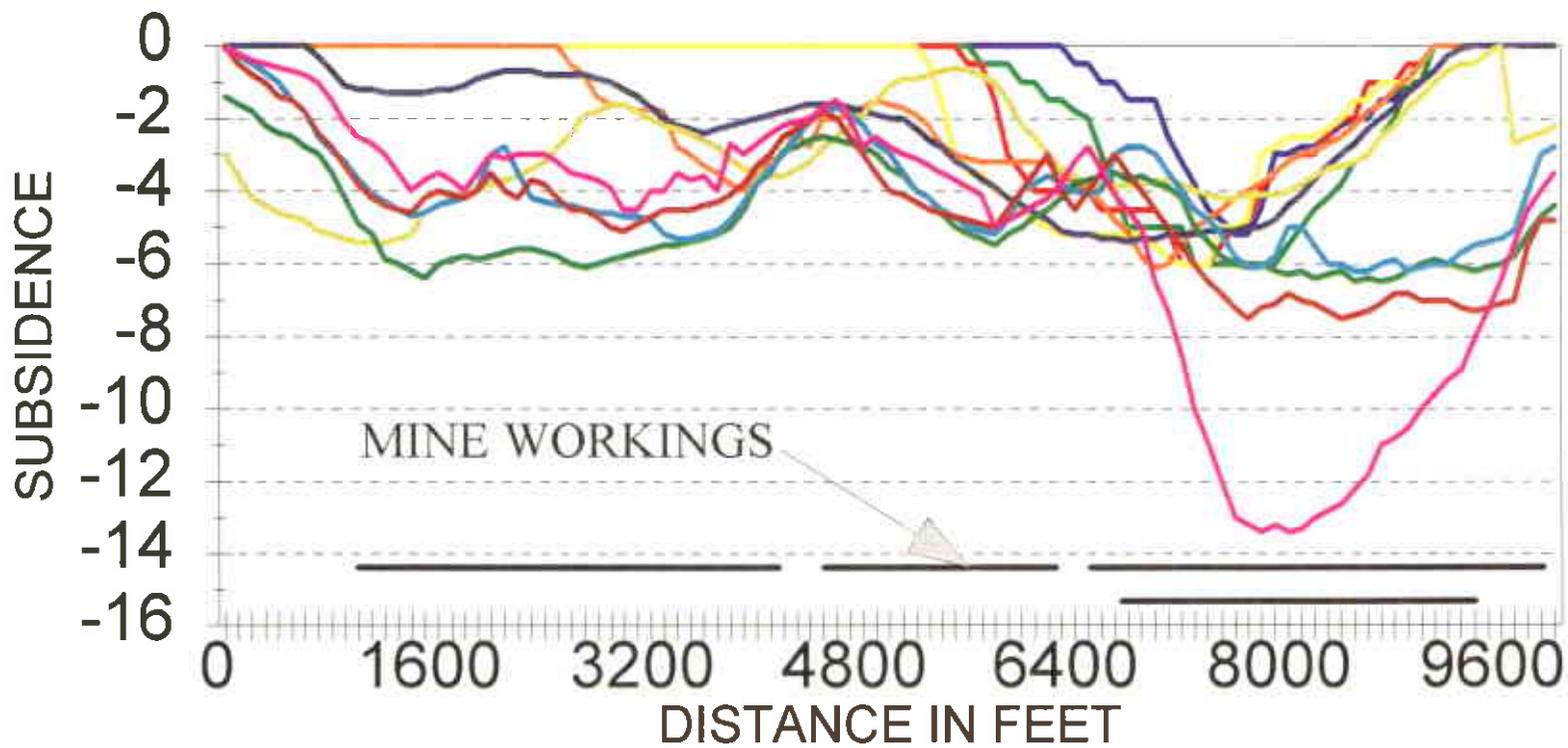
ONE UTAH CENTER
 201 S. MAIN ST. SALT LAKE CITY, UT 84140

**1995 SUBSIDENCE
 DEER CREEK MINE
 2ND-17TH RIGHT LONGWALL PANELS**

DRAWN BY: **RODGER C. FRY**
 SCALE: **1" = 800'**
 DATE: **MARCH 11, 1996**

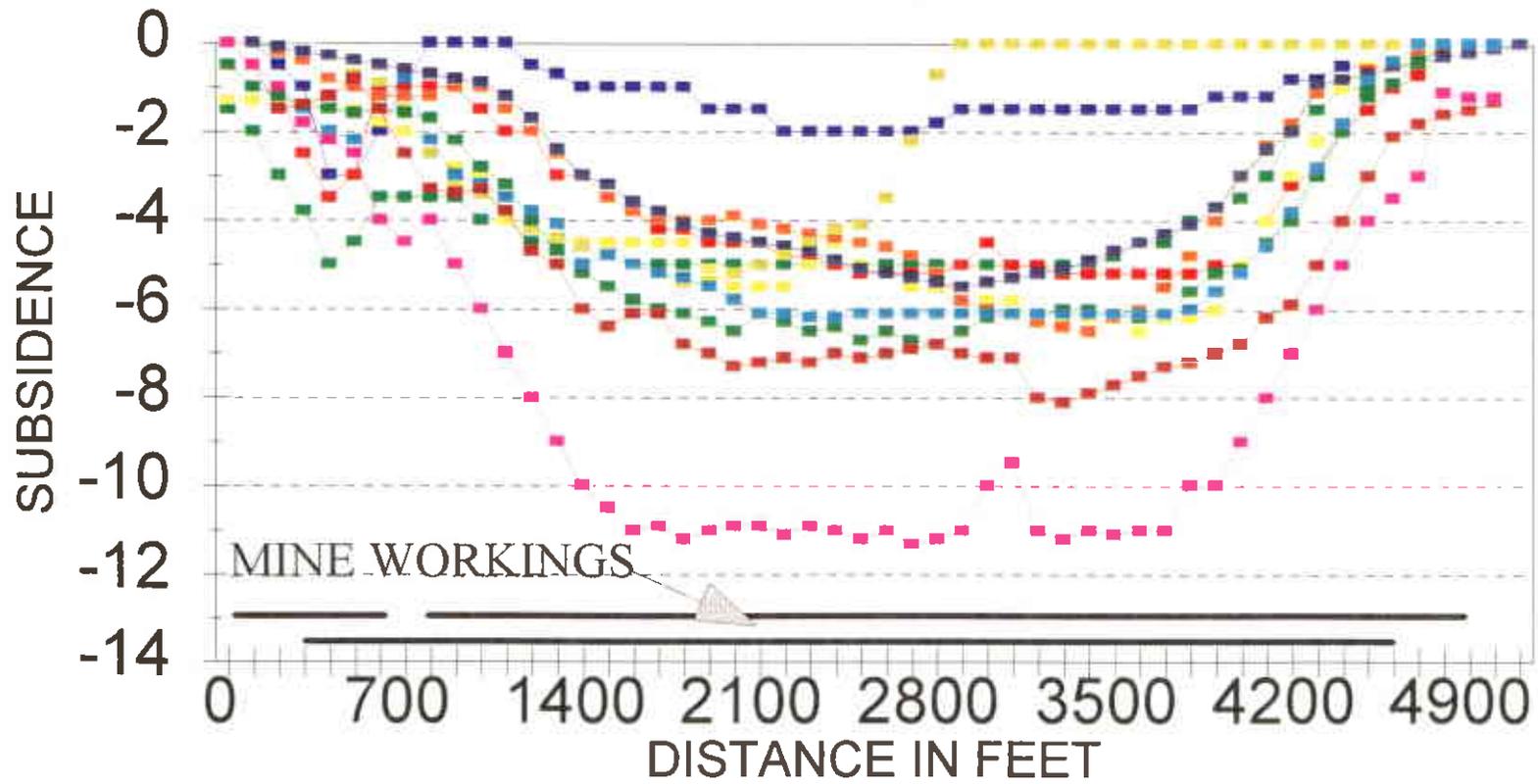
FIGURE 16
 DRAWING #:
 SHEET 1 OF 1
 REV.:

FIGURE 17
AREA 4 SUBSIDENCE PROFILE
NORTH-SOUTH



- | | | | | | |
|--------|--------|--------|--------|--------|--------|
| — 1984 | — 1985 | — 1986 | — 1987 | — 1988 | — 1989 |
| — 1991 | — 1992 | — 1993 | — 1994 | — 1995 | |

FIGURE 18
AREA 4 SUBSIDENCE PROFILE
WEST-EAST



1984	1985	1986	1987	1988	1989
1991	1992	1993	1994	1995	

Area 5

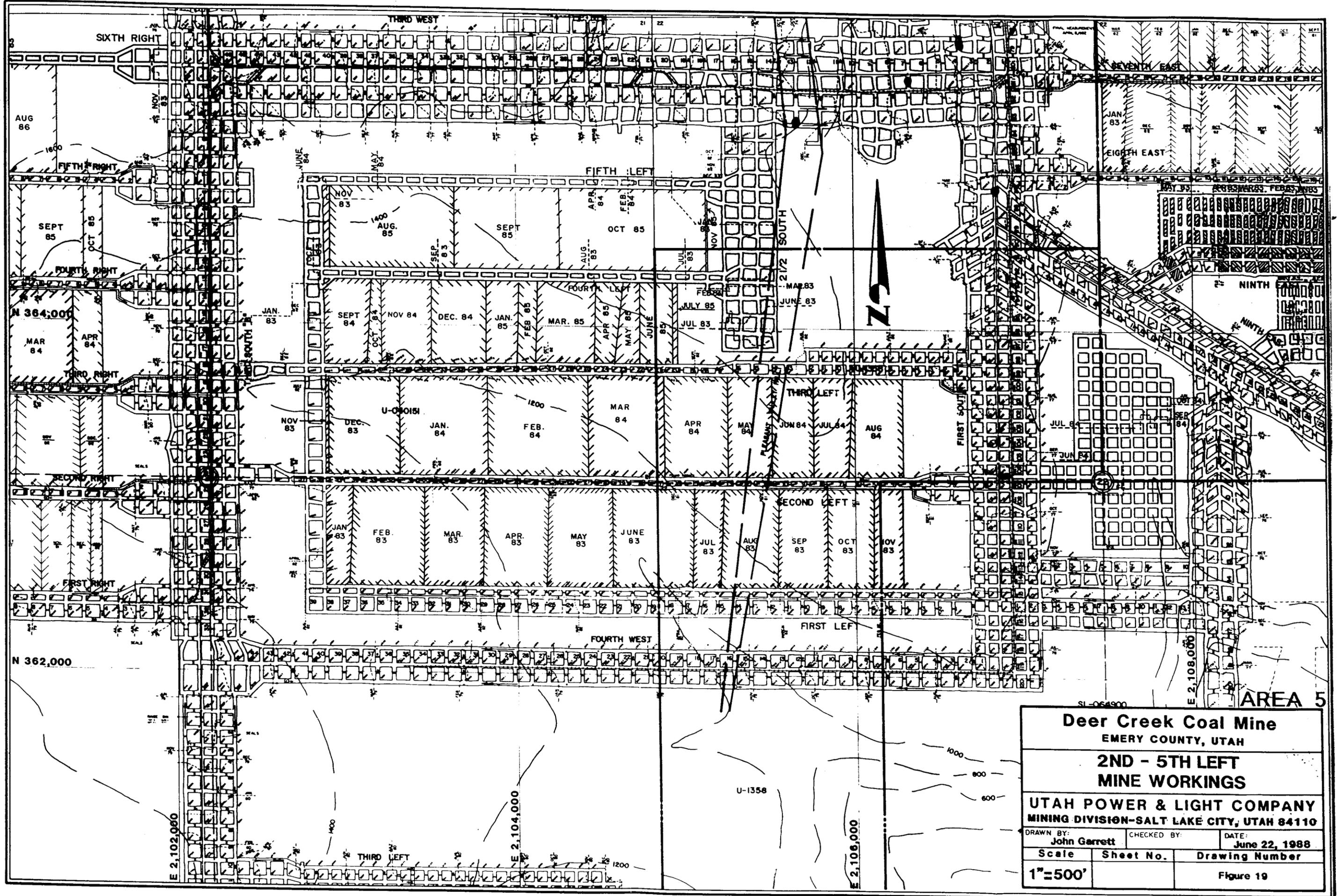
Deer Creek 2nd through 5th Left Longwall Panels

Photogrammetry revealed subsidence in Area 5 for the first time in 1984. Mining of the 2nd Left longwall panel in the Deer Creek Mine began in January 1983, and by October 1985 all four panels had been completed (Figure 19). In the Cottonwood Mine, longwall mining began in the 6th Right Longwall Panel in February 1993 and the last mining was completed in the 1st Right Longwall Panel in August 1994 completing all mining in this area (Figure 19A).

Maximum subsidence over the panels is slightly greater than twelve (12) feet where both seams have been mined (Figure 20). The maximum subsidence showed a substantial increase between 1993 and 1994 but showed no renewed increase between 1994 and 1995. No surface disturbance has been identified over the panels.

As mentioned in the previous section, none of the springs located above the workings show any adverse effects due to mining.

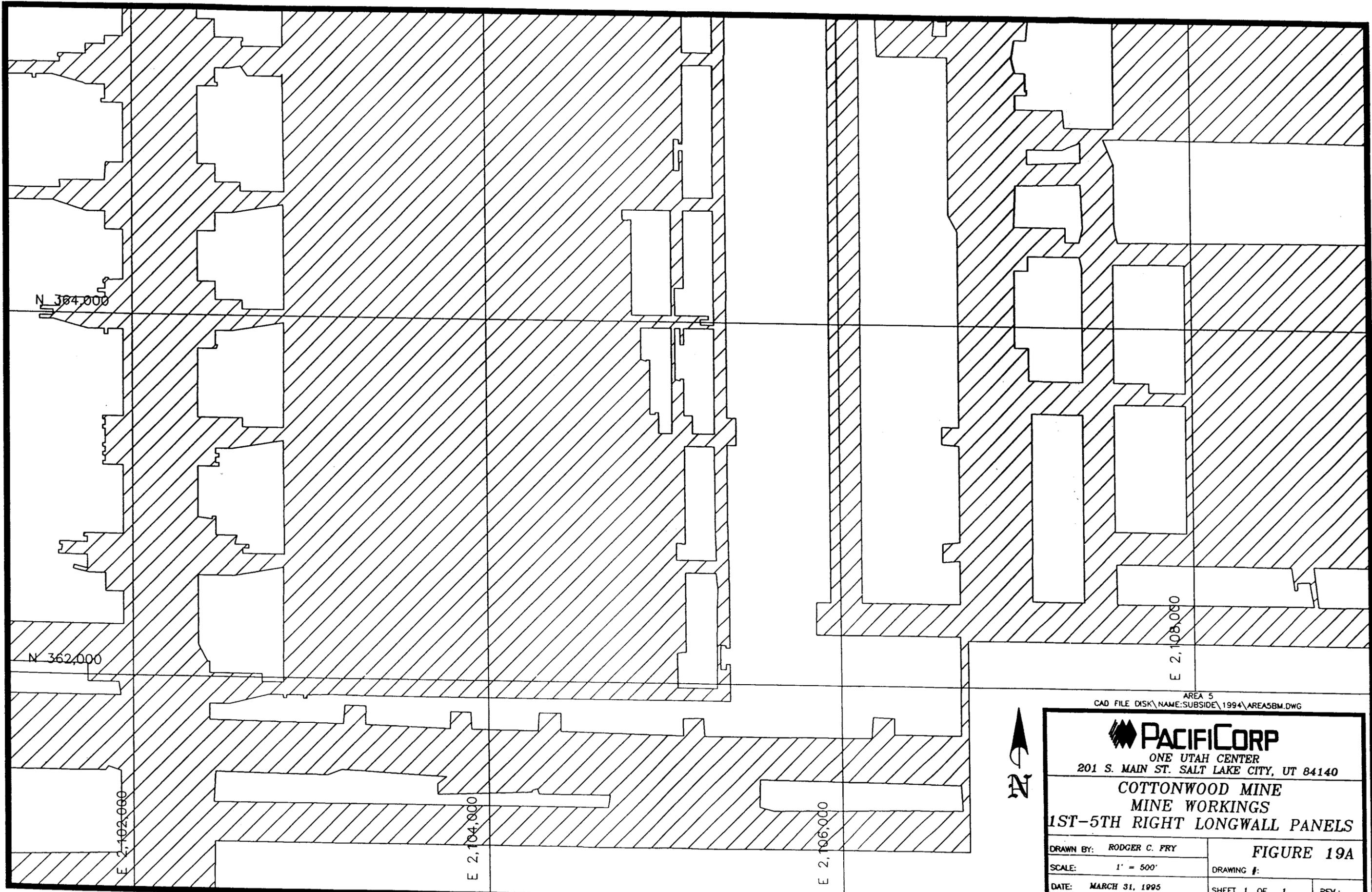
Measured angle-of-draw is between zero and 13 degrees.



SI-064900

AREA 5

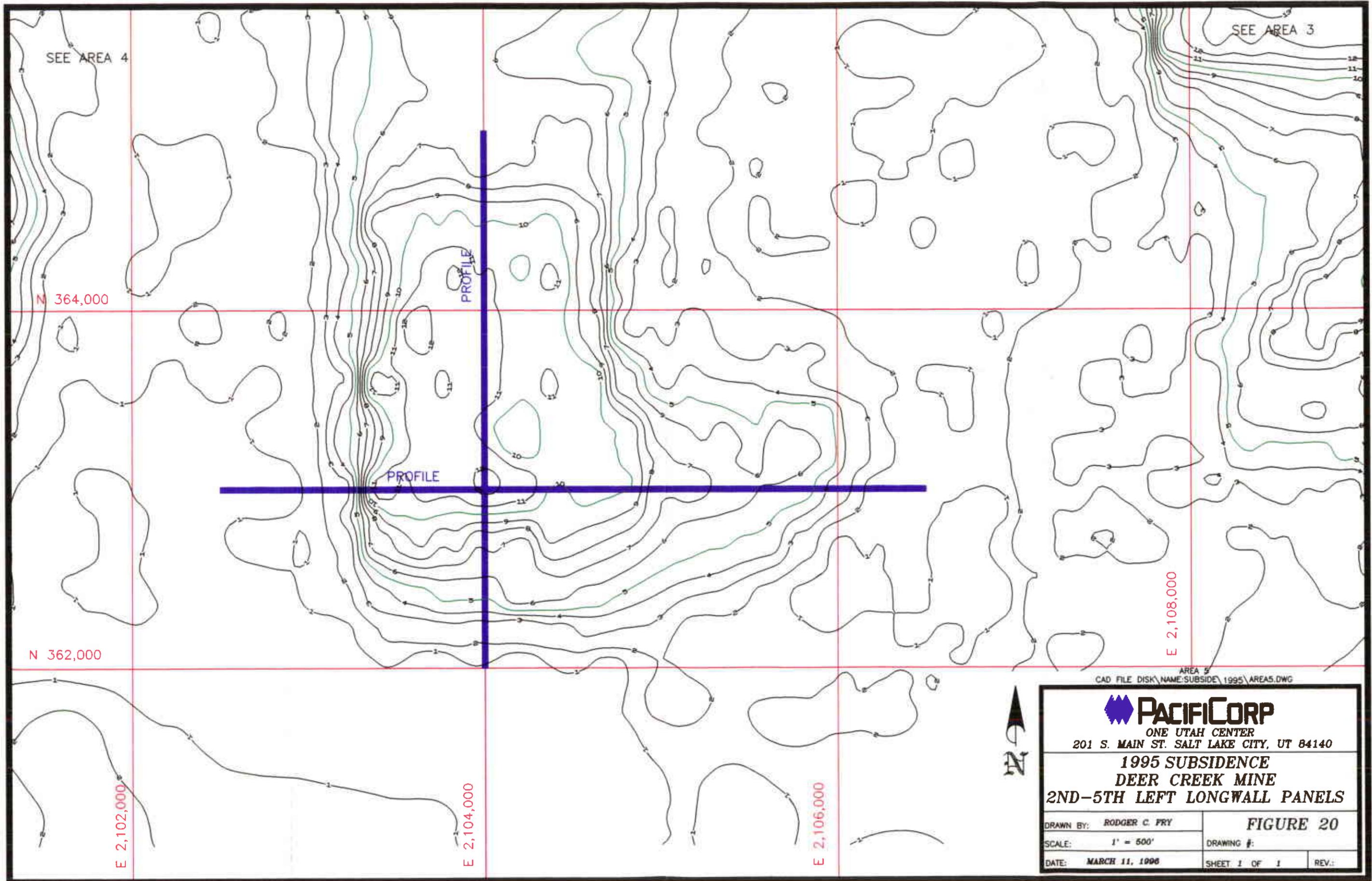
Deer Creek Coal Mine		
EMERY COUNTY, UTAH		
2ND - 5TH LEFT		
MINE WORKINGS		
UTAH POWER & LIGHT COMPANY		
MINING DIVISION-SALT LAKE CITY, UTAH 84110		
DRAWN BY: John Garrett	CHECKED BY:	DATE: June 22, 1988
Scale	Sheet No.	Drawing Number
1"=500'		Figure 19



AREA 5
 CAD FILE DISK\NAME:SUBSIDE\1994\AREA5BM.DWG

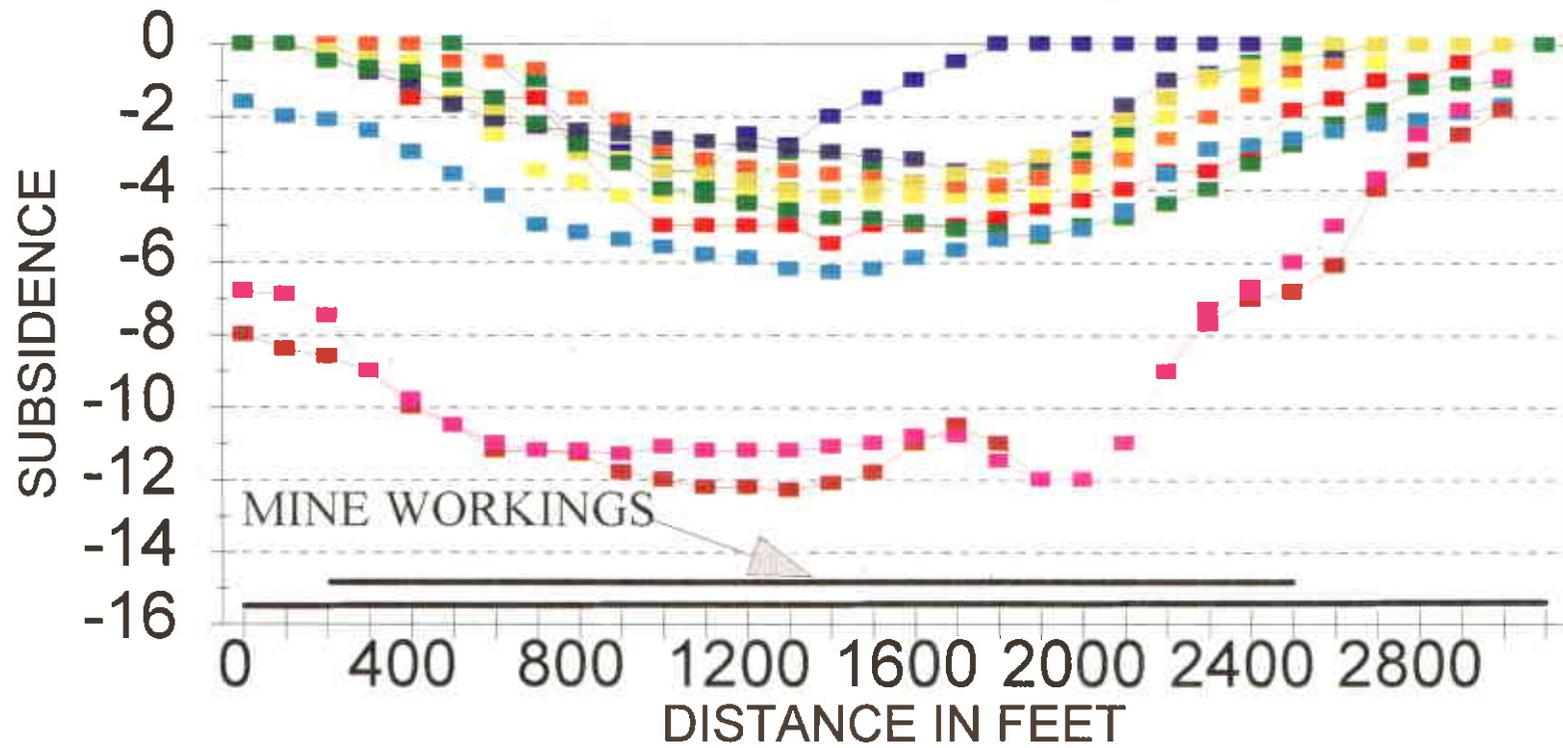


 PACIFICORP ONE UTAH CENTER 201 S. MAIN ST. SALT LAKE CITY, UT 84140	
COTTONWOOD MINE MINE WORKINGS 1ST-5TH RIGHT LONGWALL PANELS	
DRAWN BY: RODGER C. FRY	FIGURE 19A
SCALE: 1" = 500'	DRAWING #:
DATE: MARCH 31, 1995	SHEET 1 OF 1 REV.:



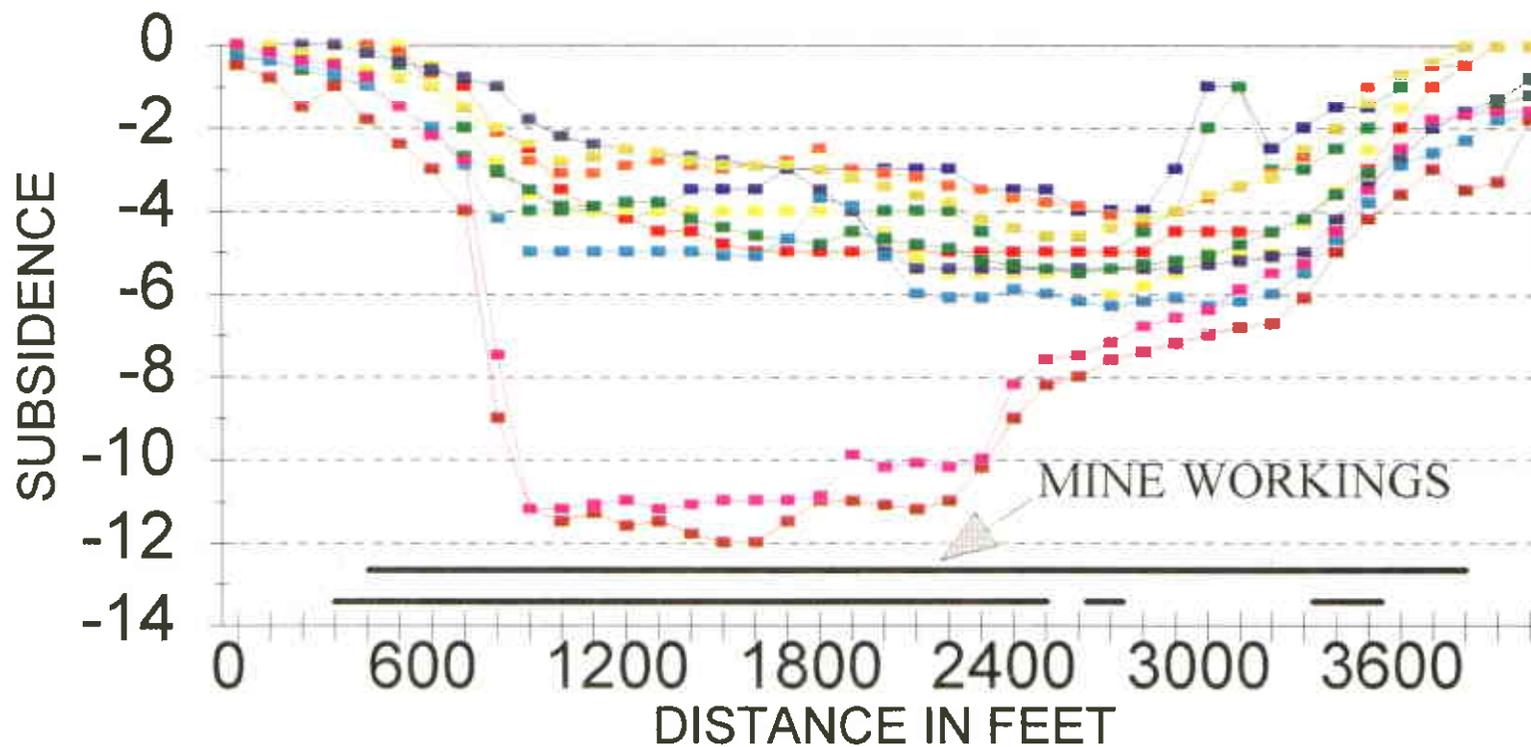
 PACIFICORP ONE UTAH CENTER 201 S. MAIN ST. SALT LAKE CITY, UT 84140		
1995 SUBSIDENCE DEER CREEK MINE 2ND-5TH LEFT LONGWALL PANELS		
DRAWN BY: RODGER C. FRY	FIGURE 20	
SCALE: 1" = 500'	DRAWING #:	
DATE: MARCH 11, 1996	SHEET 1 OF 1	REV.:

FIGURE 21
AREA 5 SUBSIDENCE PROFILE
 NORTH-SOUTH



- | | | | | | |
|------|------|------|------|------|------|
| 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
| 1991 | 1992 | 1993 | 1994 | 1995 | |

FIGURE 22
AREA 5 SUBSIDENCE PROFILE
WEST-EAST



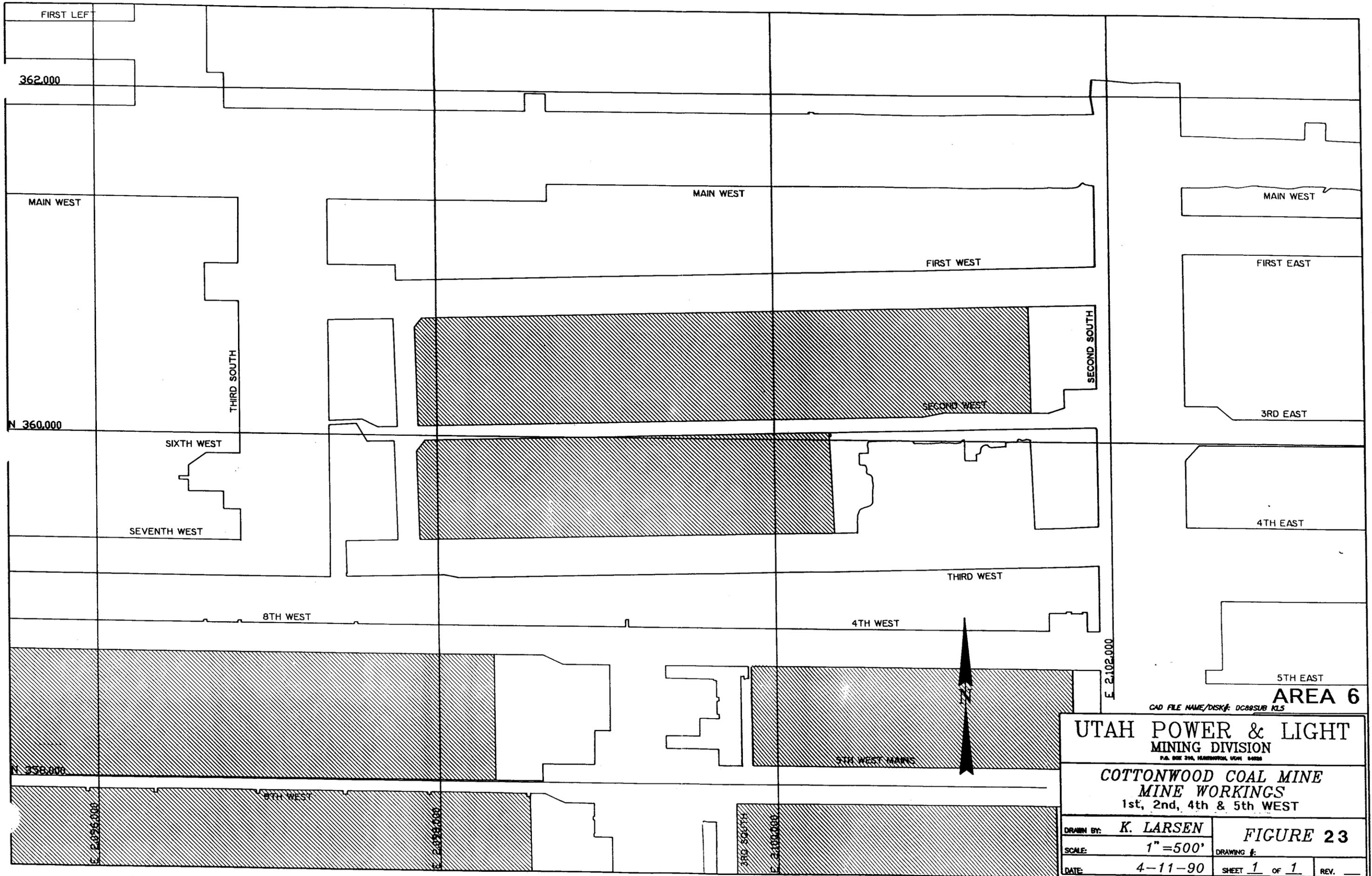
Area 6

Wilberg 1st and 2nd West Longwall Panels

Mining in the Wilberg 1st and 2nd West longwall panels was completed in June 1983 (Figure 23). This area of subsidence has now reached a maximum of five (5) feet over the Second West Longwall Panel (Figure 24). The subsidence in this area has been stable for the past four years. The subsidence profiles (Figures 25 and 26) show the change in subsidence since 1983.

Calculated angle-of-draw ranges from zero to 15 degrees where not influenced by other workings.

Four springs located just north of the area show no effect from the subsidence (see Hydrologic Monitoring Report, 1995).

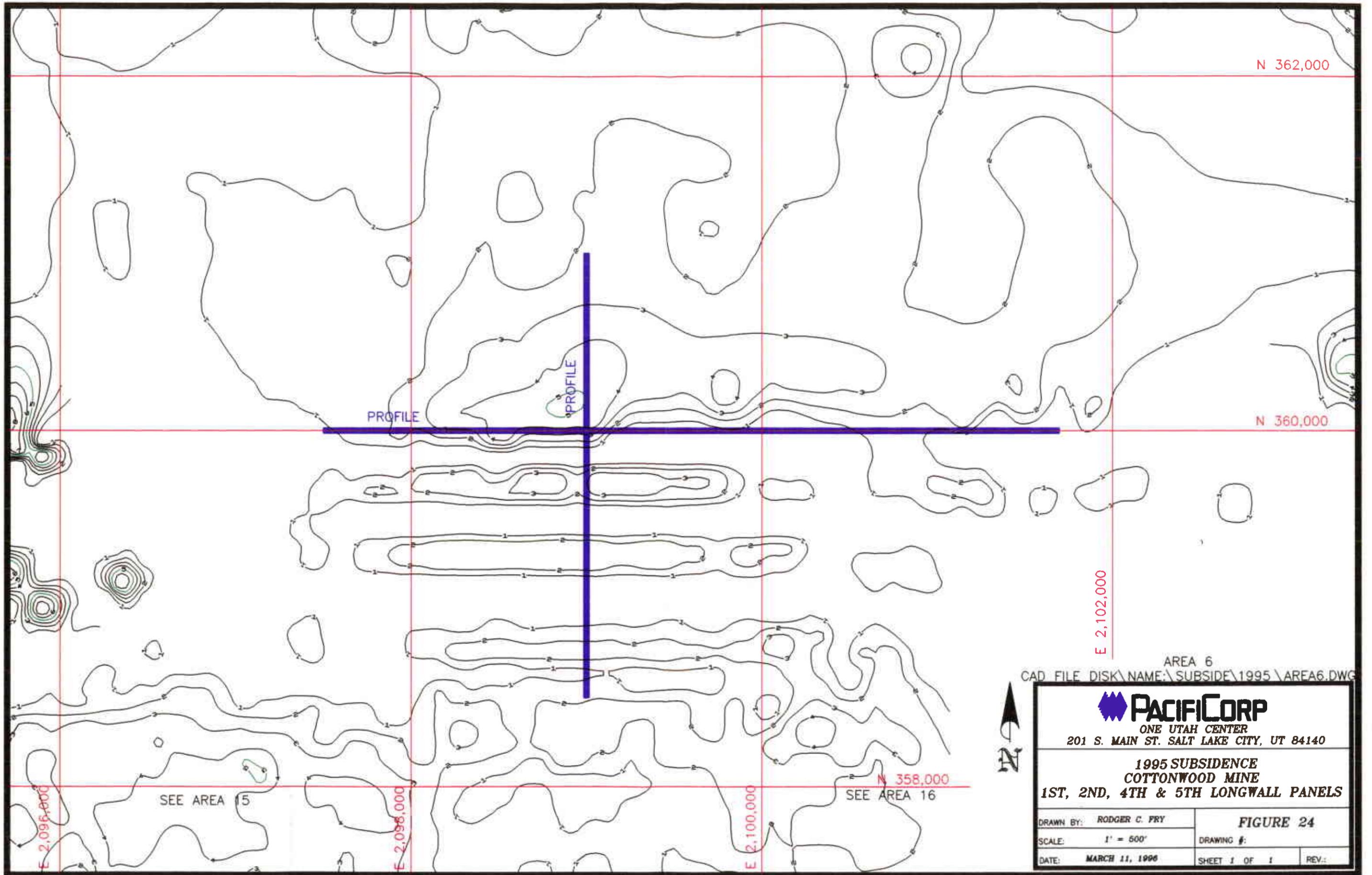


CAD FILE NAME/DISK#: DC88SUB KLS
AREA 6

UTAH POWER & LIGHT
 MINING DIVISION
P.O. BOX 210, HARRISVILLE, UTAH 84403

COTTONWOOD COAL MINE
 MINE WORKINGS
 1st, 2nd, 4th & 5th WEST

DRAWN BY: K. LARSEN	FIGURE 23
SCALE: 1" = 500'	DRAWING #:
DATE: 4-11-90	SHEET 1 of 1 REV.

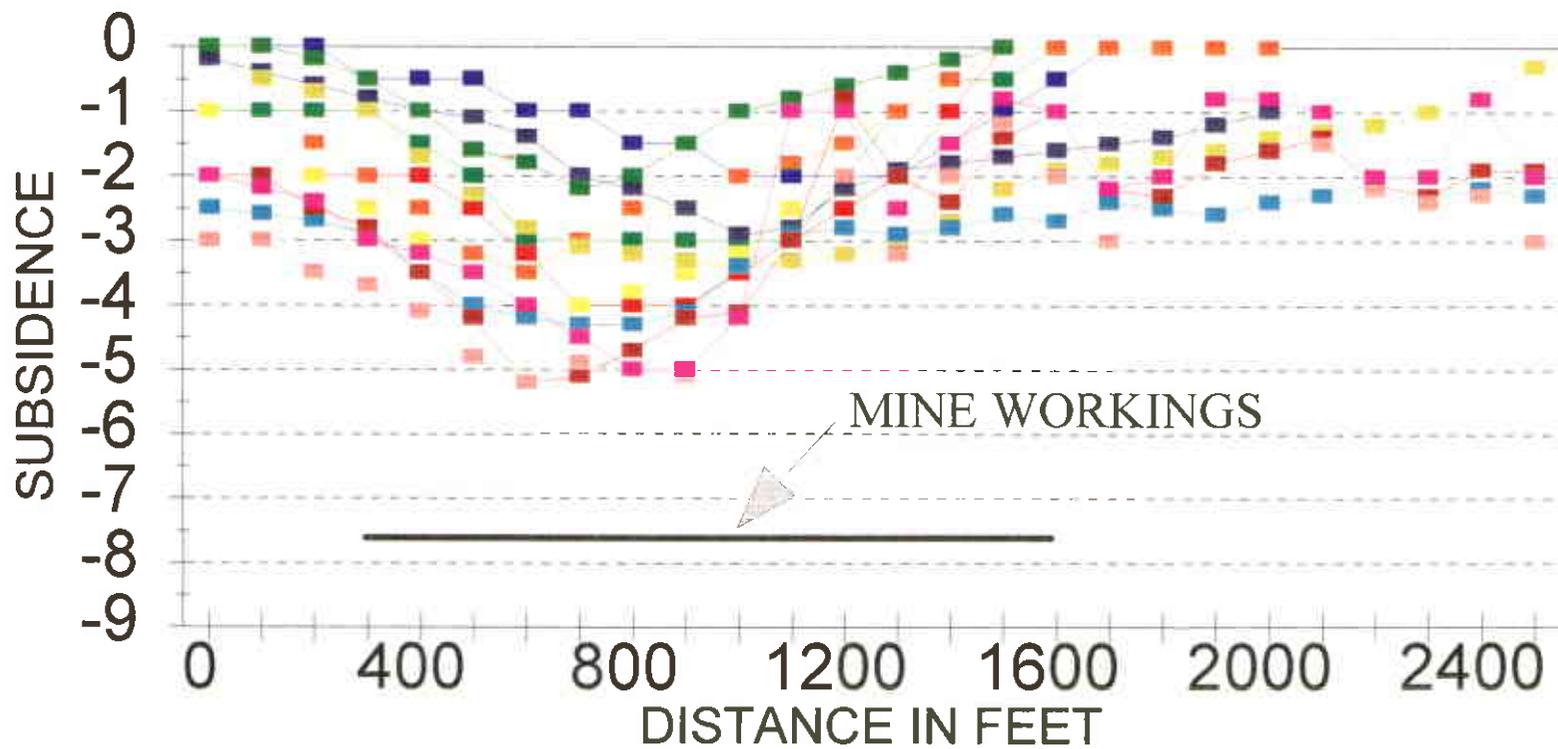


AREA 6
 CAD FILE DISK\NAME:\SUBSIDE\1995\AREA6.DWG



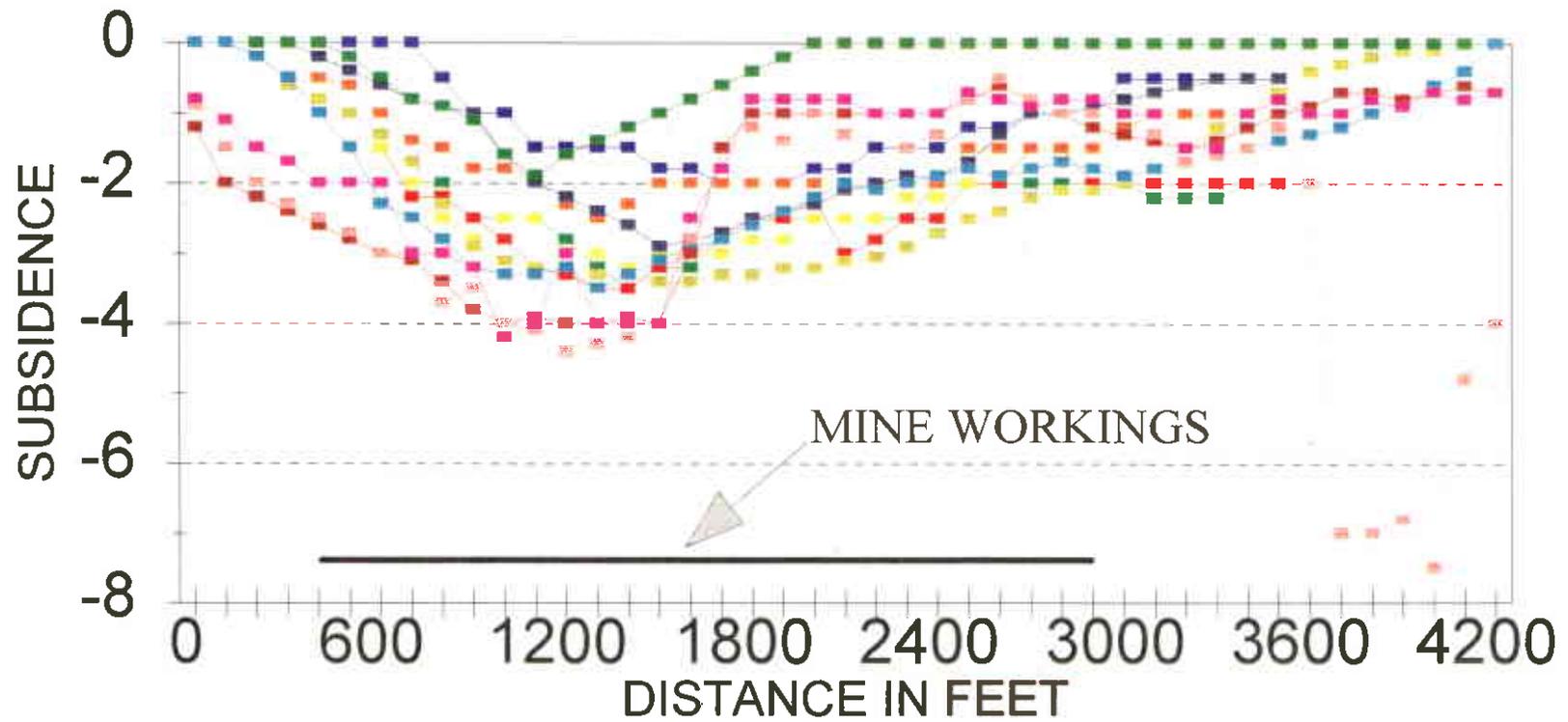
 PACIFICORP ONE UTAH CENTER 201 S. MAIN ST. SALT LAKE CITY, UT 84140		
1995 SUBSIDENCE COTTONWOOD MINE 1ST, 2ND, 4TH & 5TH LONGWALL PANELS		
DRAWN BY: RODGER C. PRY	FIGURE 24	
SCALE: 1" = 500'	DRAWING #:	
DATE: MARCH 11, 1996	SHEET 1 OF 1	REV.:

FIGURE 25
AREA 6 SUBSIDENCE PROFILE
 NORTH-SOUTH



■ 1983	■ 1984	■ 1985	■ 1986	■ 1987	■ 1988
■ 1989	■ 1991	■ 1992	■ 1993	■ 1994	■ 1995

FIGURE 26
AREA 6 SUBSIDENCE PROFILE
WEST-EAST



- | | | | | | |
|------|------|------|------|------|------|
| 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
| 1989 | 1991 | 1992 | 1993 | 1994 | 1995 |

Area 7

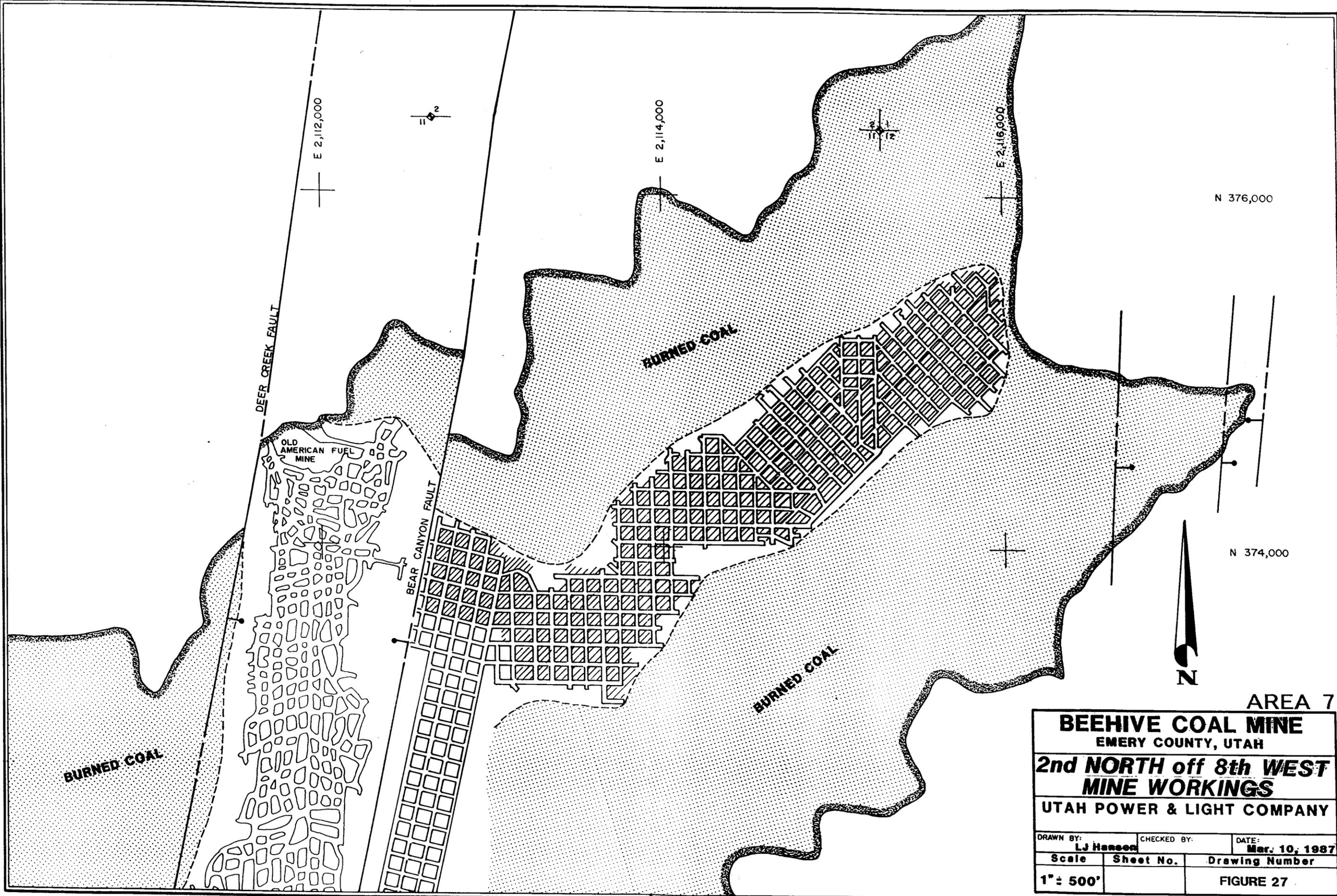
Beehive Mine 2nd North off 8th West

Pillar extraction mining in 2nd North was completed in 1983 and, as shown in Figures 27, 28, and 29, little additional subsidence has occurred over the workings since 1984. The workings are surrounded by burned coal.

Maximum subsidence is as much as six (6) feet. In examining the area by helicopter and aerial photography it is apparent that much of the elevation change measured was due to cliff failure and mass wasting on the steep slopes above the workings, where the rocks were highly fractured prior to mining. The profile, Figure 29, shows no measurable subsidence since 1991, this area is however, steep and rugged limiting the accuracy of the photogrammetric monitoring. Hence, the fluctuations in the reading are experienced from year to year.

It was not possible to get an accurate angle-of-draw because crushing of the surrounding clinker beds allowed subsidence to occur several thousand feet from the mine workings in some cases.

The subsidence has had no known influence on the hydrology in the area since they lack adequate recharge and are generally dry.



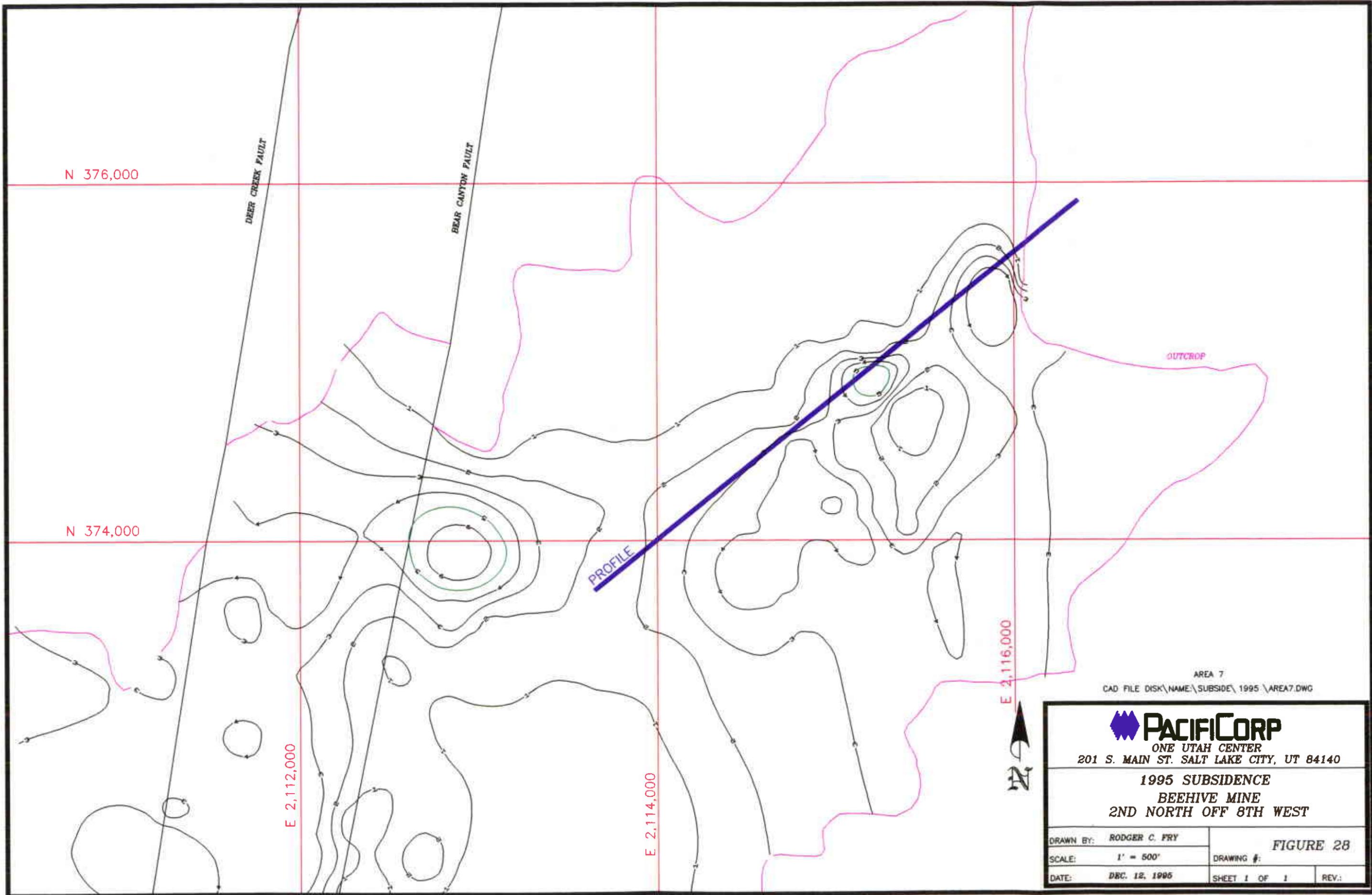
AREA 7

BEEHIVE COAL MINE
EMERY COUNTY, UTAH

2nd NORTH off 8th WEST
MINE WORKINGS

UTAH POWER & LIGHT COMPANY

DRAWN BY: LJ Hansen	CHECKED BY:	DATE: Mar. 10, 1987
Scale	Sheet No.	Drawing Number
1" = 500'		FIGURE 27

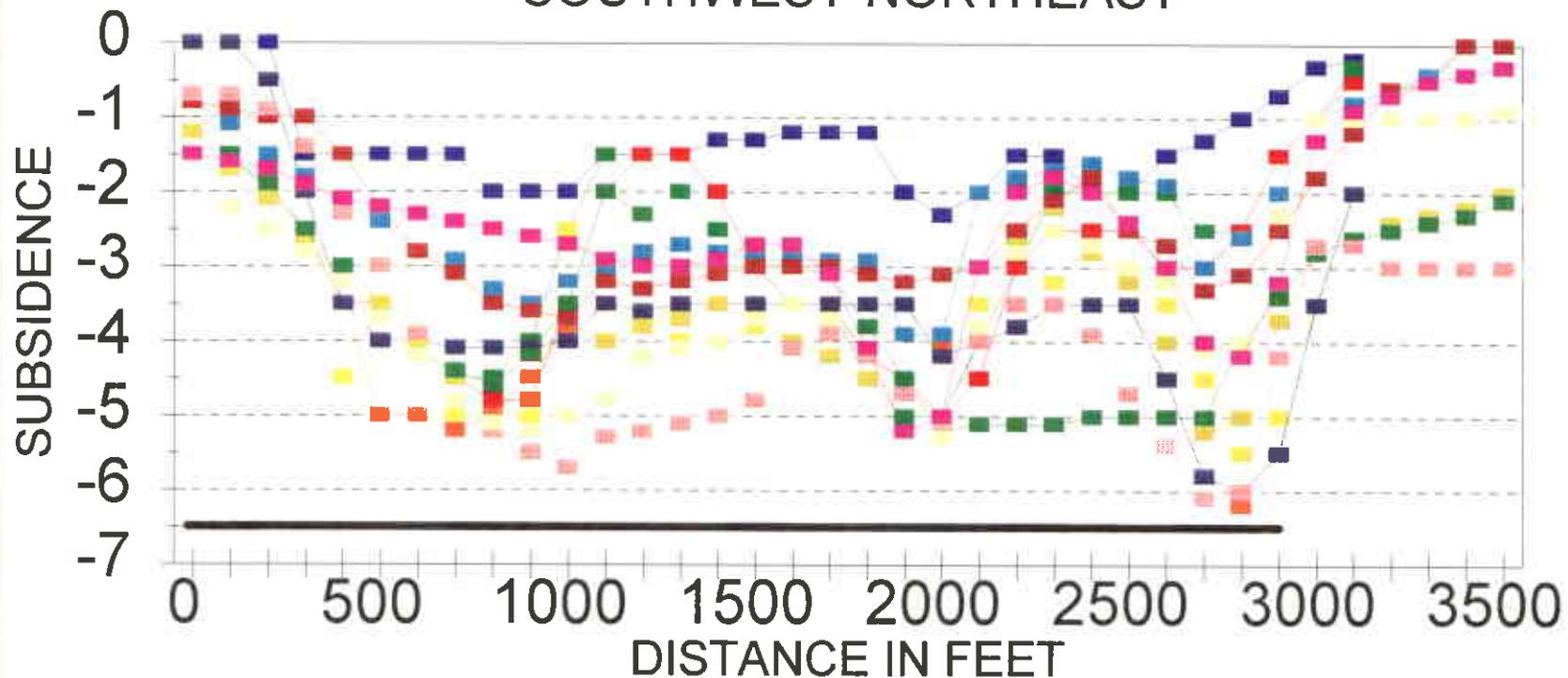


AREA 7
 CAD FILE DISK\NAME\SUBSIDE\1995\AREA7.DWG

 PACIFICORP ONE UTAH CENTER 201 S. MAIN ST. SALT LAKE CITY, UT 84140		
1995 SUBSIDENCE BEEHIVE MINE 2ND NORTH OFF 8TH WEST		
DRAWN BY: RODGER C. FRY	FIGURE 28	
SCALE: 1" = 500'	DRAWING #:	
DATE: DEC. 12, 1995	SHEET 1 OF 1	REV.:

FIGURE 29

AREA 7 SUBSIDENCE PROFILE SOUTHWEST-NORTHEAST



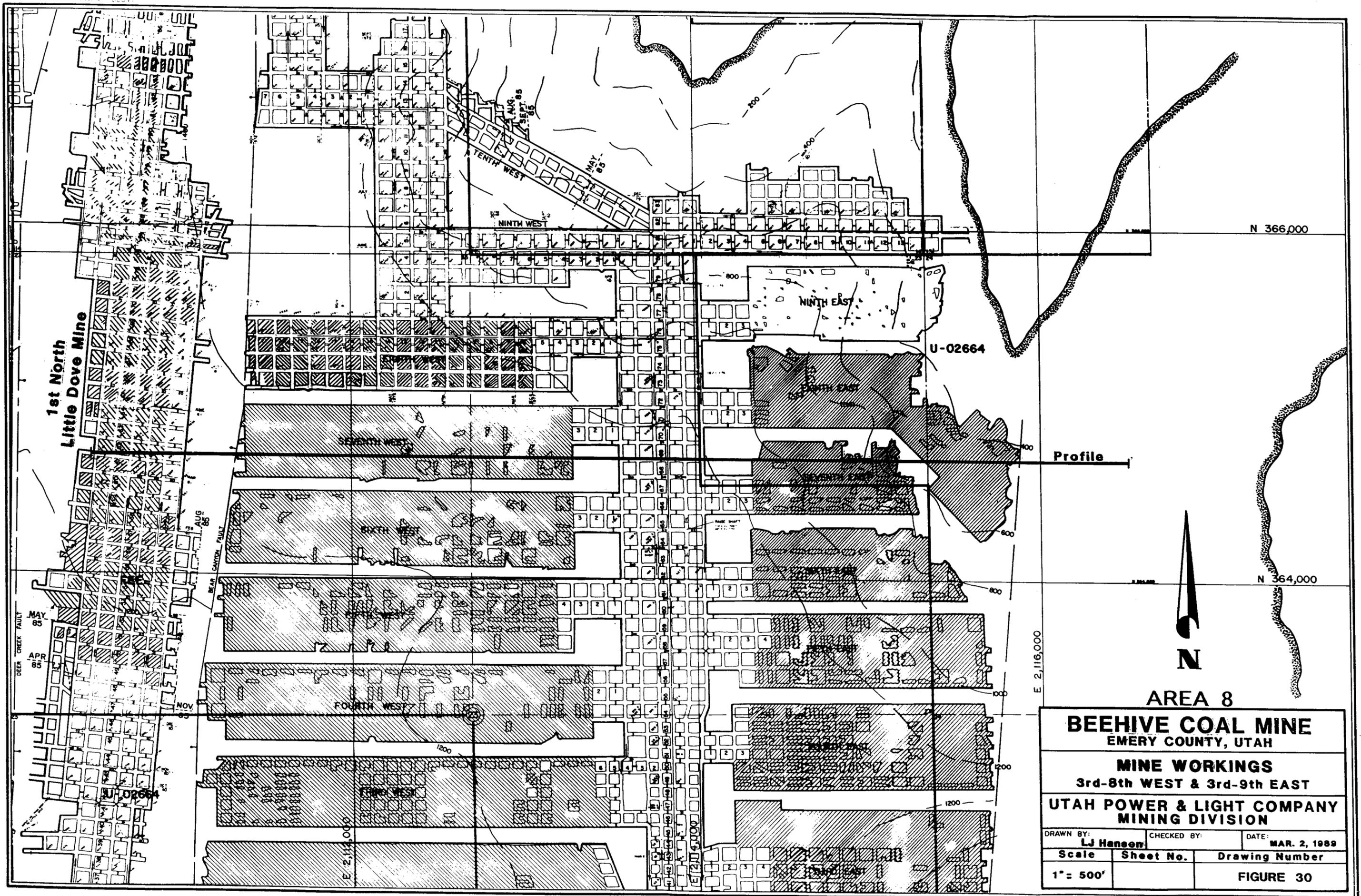
- | | | | | |
|------|------|------|----------|------|
| 1982 | 1983 | 1984 | 1985 | 1986 |
| 1987 | 1988 | 1989 | 1991 | 1992 |
| 1993 | 1994 | 1995 | WORKINGS | |

Area 8

Beehive 3rd Through 8th West and 3rd Through 9th East

Deseret 3rd Through 9th West and 1st Through 5th East

Some of the subsidence in Area 8 may have gone undetected because pillar extraction, and presumably subsidence, in part of the area was completed before the establishment of baseline survey data (Figures 30, 31, and 32). The west to east subsidence profile of the area depicted in Figure 33 indicates that subsidence up to slightly over six (6) feet has occurred. The profile also indicates that the subsidence has been stable since 1992. On the eastern side subsidence has remained at two feet or less for the last four years. Where not influenced by other workings, the angle-of-draw reached a maximum of 31 degrees on the eastern edge of the area.



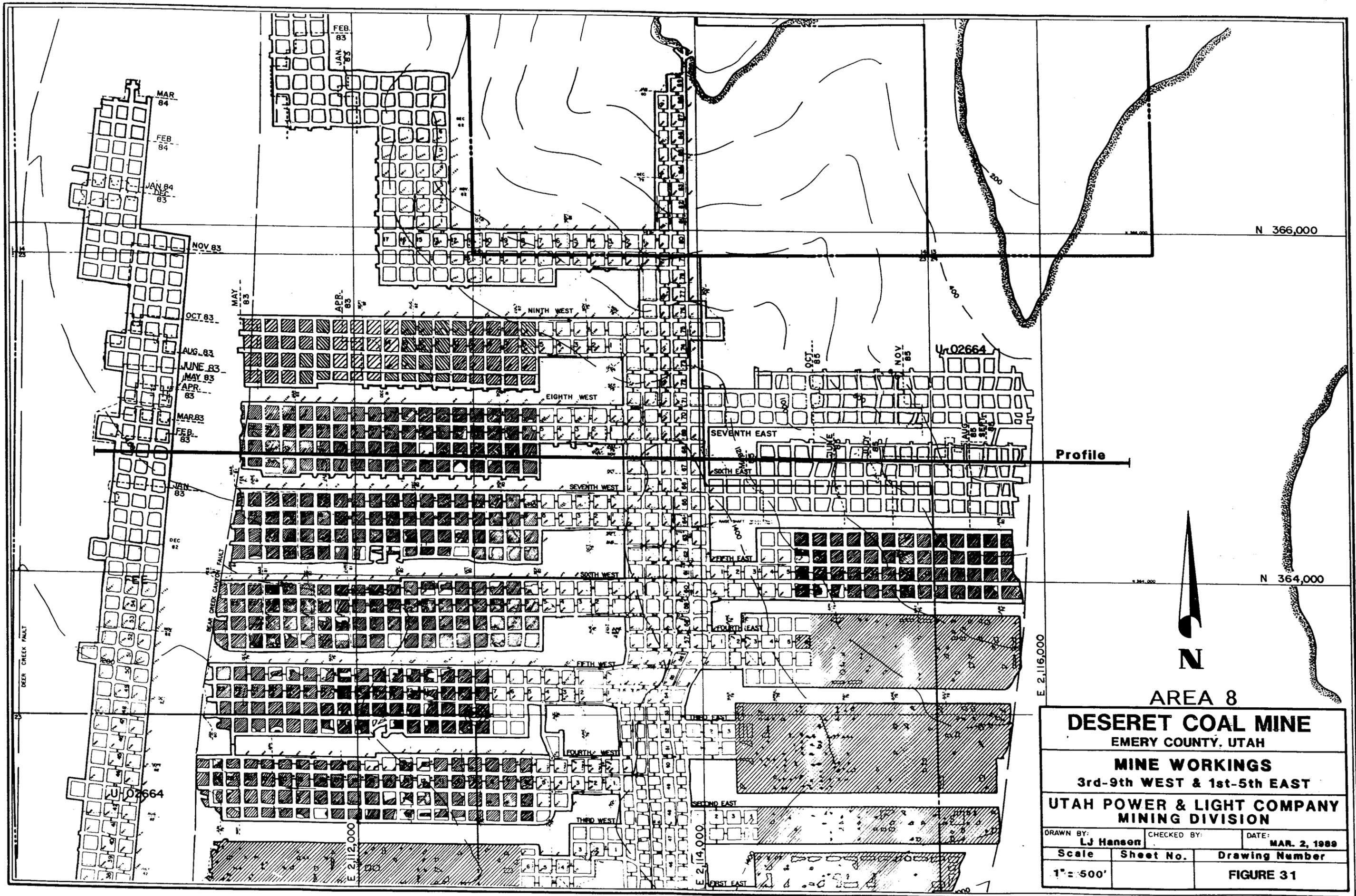
AREA 8

BEEHIVE COAL MINE
EMERY COUNTY, UTAH

MINE WORKINGS
3rd-8th WEST & 3rd-9th EAST

UTAH POWER & LIGHT COMPANY
MINING DIVISION

DRAWN BY: LJ Hanson	CHECKED BY:	DATE: MAR. 2, 1989
Scale 1" = 500'	Sheet No.	Drawing Number FIGURE 30



N 366,000

N 364,000

E 2,116,000

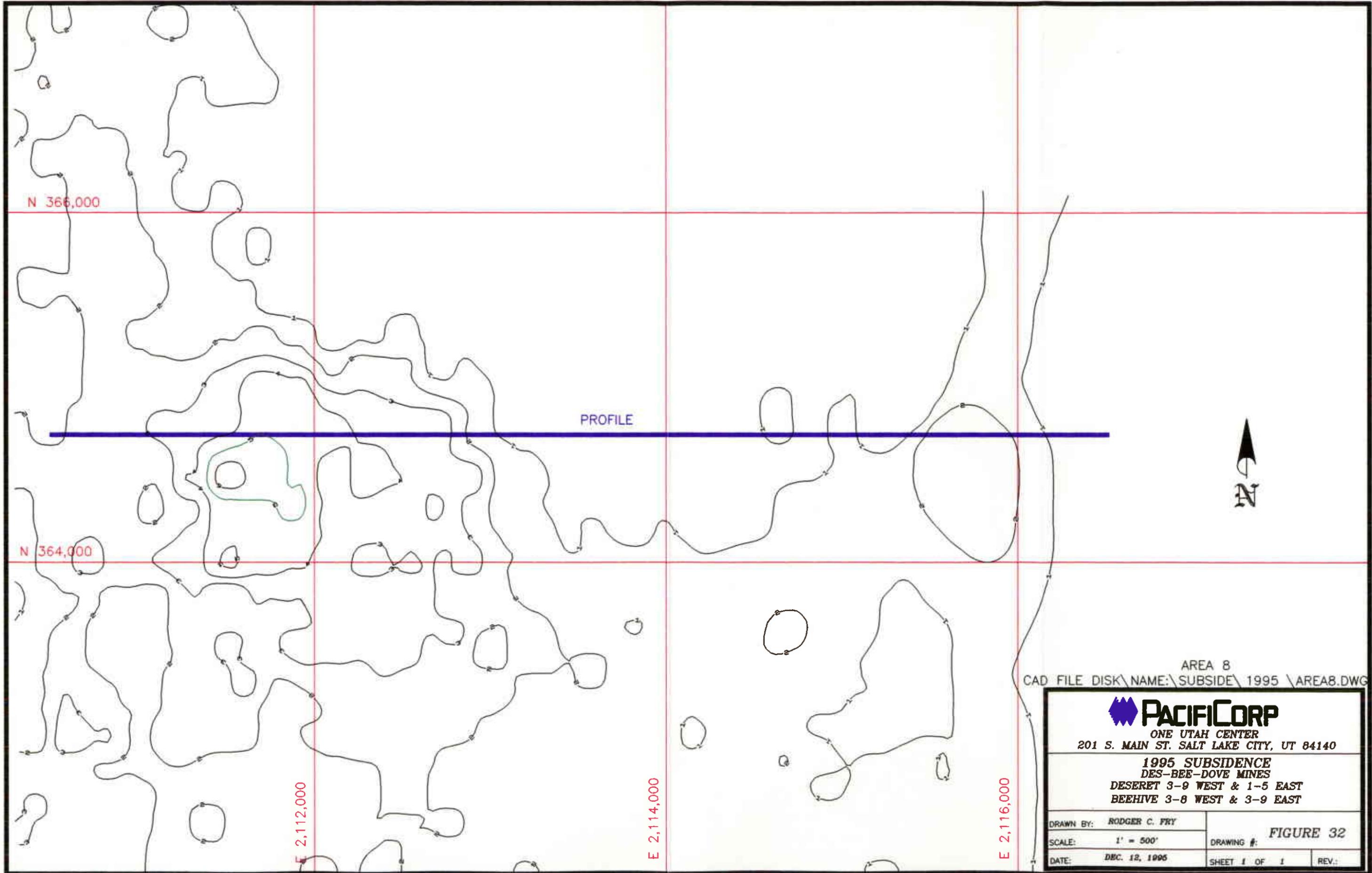
E 2,112,000

E 2,114,000



AREA 8

DESERET COAL MINE		
EMERY COUNTY, UTAH		
MINE WORKINGS		
3rd-9th WEST & 1st-5th EAST		
UTAH POWER & LIGHT COMPANY		
MINING DIVISION		
DRAWN BY: LJ Hanson	CHECKED BY:	DATE: MAR. 2, 1989
Scale 1" = 500'	Sheet No.	Drawing Number FIGURE 31



AREA 8
CAD FILE DISK\NAME:\SUBSIDE\1995\AREA8.DWG

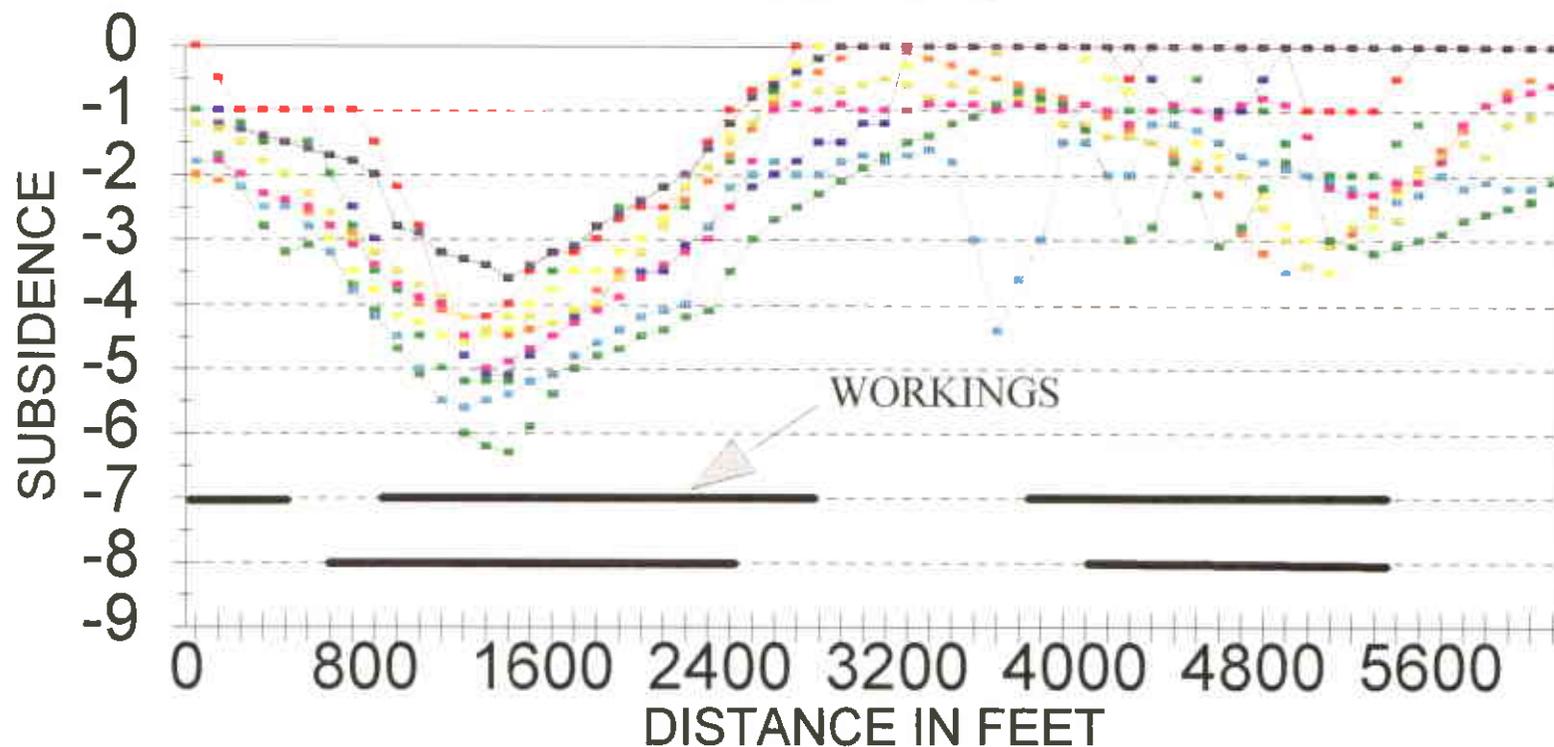


ONE UTAH CENTER
201 S. MAIN ST. SALT LAKE CITY, UT 84140

1995 SUBSIDENCE
DES-BEE-DOVE MINES
DESERET 3-9 WEST & 1-5 EAST
BEEHIVE 3-8 WEST & 3-9 EAST

DRAWN BY: RODGER C. FRY	FIGURE 32
SCALE: 1" = 500'	DRAWING #:
DATE: DEC. 12, 1995	SHEET 1 OF 1
	REV.:

FIGURE 33
AREA 8 SUBSIDENCE PROFILE
WEST- EAST



1985	1986	1987	1988	1989
1991	1992	1993	1994	1995

Areas 9 and 10

Little Dove 1st North and the old American Fuel Mine

The 1st North section of the Little Dove Mine and the American Fuel Mine workings are located in a graben formed by the Deer Creek and Bear Creek Canyon faults (see figures for Areas 7 and 8). In August 1982 the Little Dove workings, mining in a northerly direction, intersected the old workings of the American Fuel Mine about 1000 feet south of where available maps indicated they extend. Mining conditions in that area of Little Dove revealed that strata were highly stressed. In some cases pillars were crushed before they could be extracted. At that time pillar extraction mining was begun in 1st North and continued to the south with minor interruptions from 1982 through much of 1987.

To date the maximum observed subsidence over 1st North is about three to four feet, occurring over some of the most recently extracted pillars (see Subsidence Map in Appendix). No other notable subsidence has been detected over the remainder of 1st North.

Subsidence of over six (6) feet has been measured above the American Fuel Mine workings.

Any angle-of-draw calculation would be affected by both the surrounding mine workings and the faults on either side; therefore, no angle-of-draw was calculated for either the 1st North area of the Little Dove Mine or the old American Fuel Mine.

No fractures are known over the 1st North workings, but some cliff failure and fractures are probably present over the American Fuel Mine on the cliffs and steep slopes.

Mining has had no known effect on the hydrology of the areas.

Area 11

Deer Creek C and D North Longwall Panels

Cottonwood 11th Right Longwall Panel off 2 ½ North

Cottonwood 6th & 7th Right Longwall Panel off of 2nd North

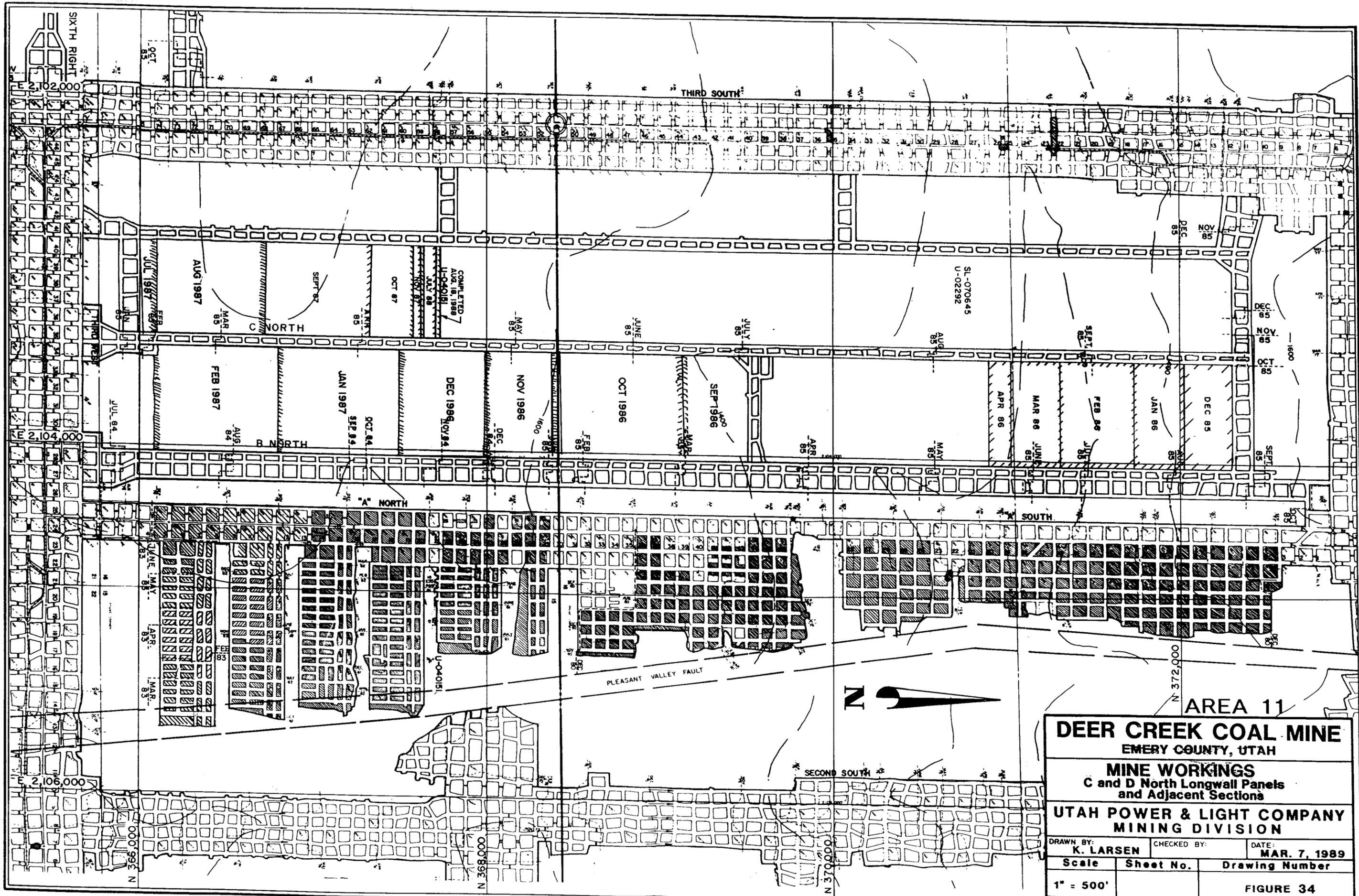
Longwall mining in the C North panel began in December 1984 and was terminated in April 1986 due to geologic complications. New setup entries were driven further south and mining resumed in September 1986; the panel was completed in March 1987. The D North longwall panel began production in July 1987, but after October 1987 production was limited due to poor coal quality. The panel was terminated in August 1988 at a length of 1750 feet. Pillar extraction mining in A North and A South was completed in June 1983 (Figure 34).

Mining in the 11th Right Panel in the Cottonwood Mine began In July of 1992 and was completed in September 1992 (Figure 35). The 10th Right Panel to the south was developed but couldn't be mined with longwall methods because of thin coal and poor coal quality. Mining began in the 7th Right Panel in February 1993 and by August 1993 mining in the 6th Right Panel had been completed.

Measurable subsidence to date has exceeded thirteen (13) feet in the area of multiple seam mining above the 6th and 7th Right Longwall Panels in the Cottonwood mine (Figures 36, 37, and 38). The maximum subsidence showed an increase of about two feet between 1993 and 1994 but showed a decrease of about one foot between 1994 and 1995. This recent decrease is near the detection limit of the method and may be just noise in the data.

Fractures were discovered at the western end of coal extraction above the 7th Right Longwall Panel. The fractures were first discovered on June 17, 1993. Mining of the longwall

panel was completed on May 12, 1993. An aerial reconnaissance of the area on May 18, 1993 revealed no surface fractures at that time. This places the occurrence of the fractures between May 18, 1993 and June 17, 1993. Burnt Tree Springs is located approximately 800 feet to the southeast of the fractures. Measurements of the spring discharge throughout the summer of 1993 and 1994 indicated that the fracturing has had no effect on the spring. The angle-of-draw measured ranges from less than zero to 28 degrees.



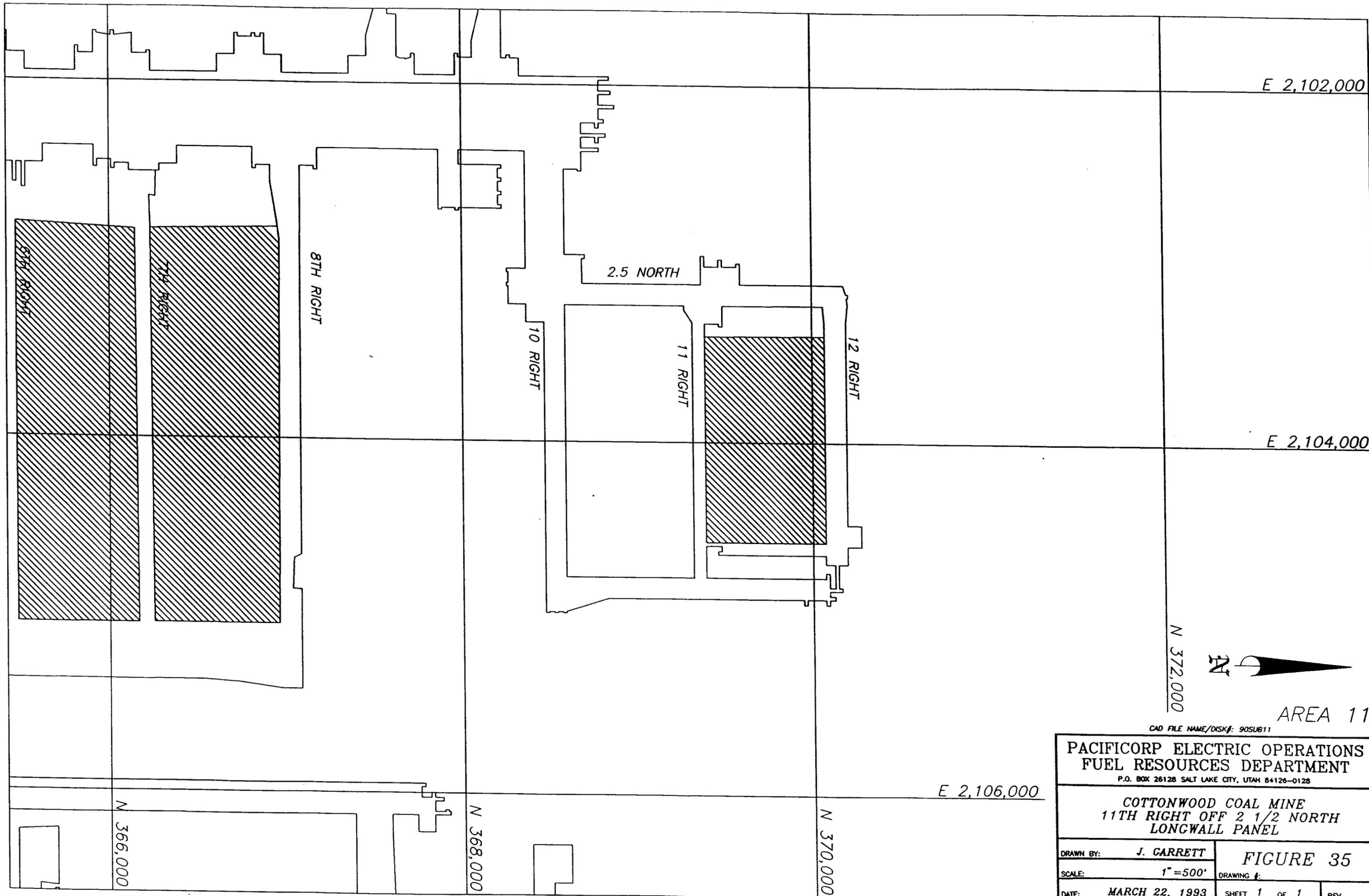
AREA 11

DEER CREEK COAL MINE
EMERY COUNTY, UTAH

MINE WORKINGS
C and D North Longwall Panels
and Adjacent Sections

UTAH POWER & LIGHT COMPANY
MINING DIVISION

DRAWN BY: K. LARSEN	CHECKED BY:	DATE: MAR. 7, 1989
Scale	Sheet No.	Drawing Number
1" = 500'		FIGURE 34



E 2,102,000

E 2,104,000

E 2,106,000

N 372,000



AREA 11

CAD FILE NAME/DISK#: 90SUB11

PACIFICORP ELECTRIC OPERATIONS
 FUEL RESOURCES DEPARTMENT
 P.O. BOX 26128 SALT LAKE CITY, UTAH 84126-0128

COTTONWOOD COAL MINE
 11TH RIGHT OFF 2 1/2 NORTH
 LONGWALL PANEL

DRAWN BY: J. GARRETT

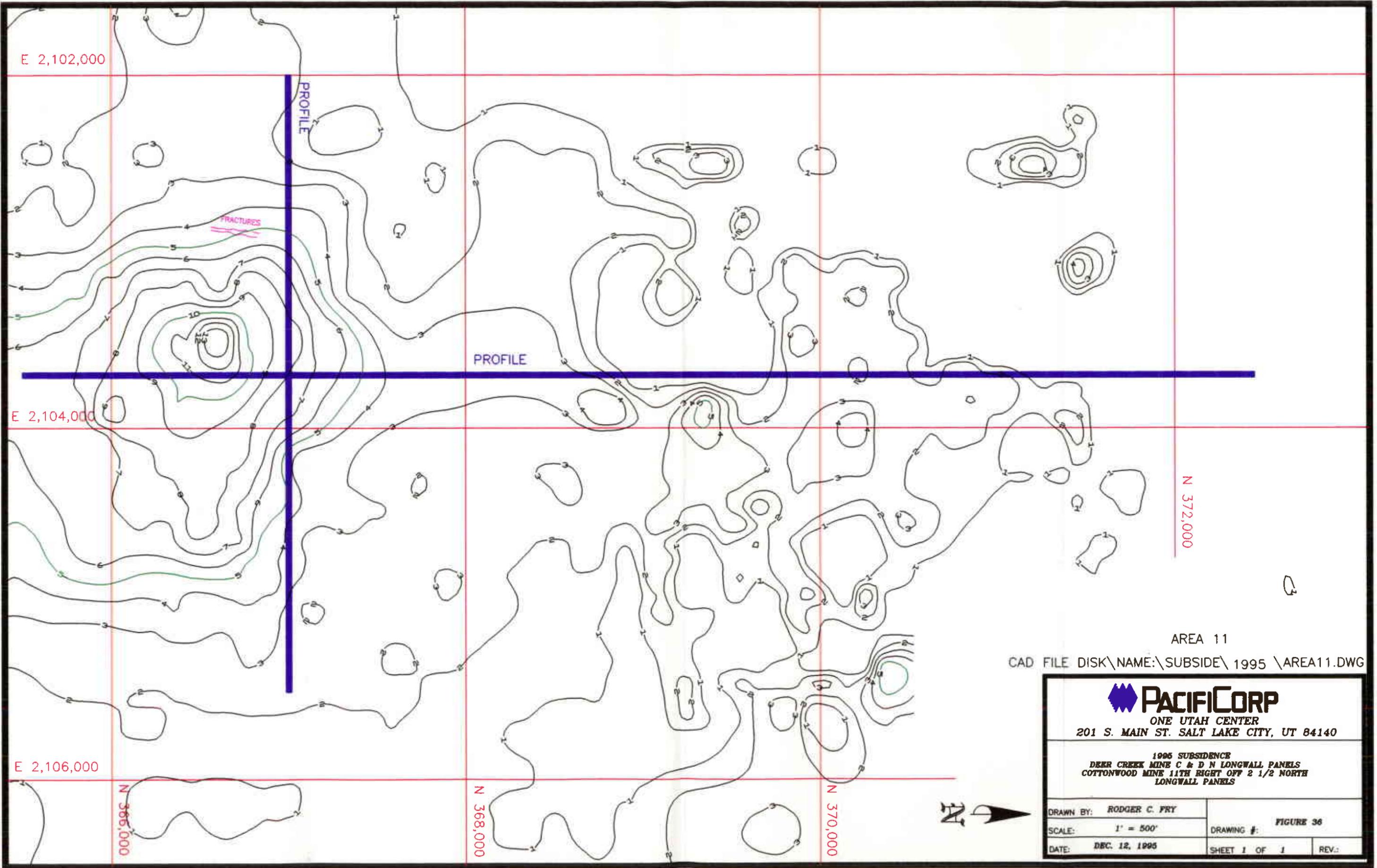
FIGURE 35

SCALE: 1" = 500'

DRAWING #:

DATE: MARCH 22, 1993

SHEET 1 OF 1 REV.



AREA 11

CAD FILE DISK\NAME:\SUBSIDE\ 1995 \AREA11.DWG

 PACIFICORP ONE UTAH CENTER 201 S. MAIN ST. SALT LAKE CITY, UT 84140		
1995 SUBSIDENCE DEER CREEK MINE C & D N LONGWALL PANELS COTTONWOOD MINE 11TH RIGHT OFF 2 1/2 NORTH LONGWALL PANELS		
DRAWN BY: RODGER C. FRY	FIGURE 36	
SCALE: 1" = 500'	DRAWING #:	
DATE: DEC. 12, 1995	SHEET 1 OF 1	REV.:

FIGURE 37

AREA 11 SUBSIDENCE PROFILE

NORTH-SOUTH

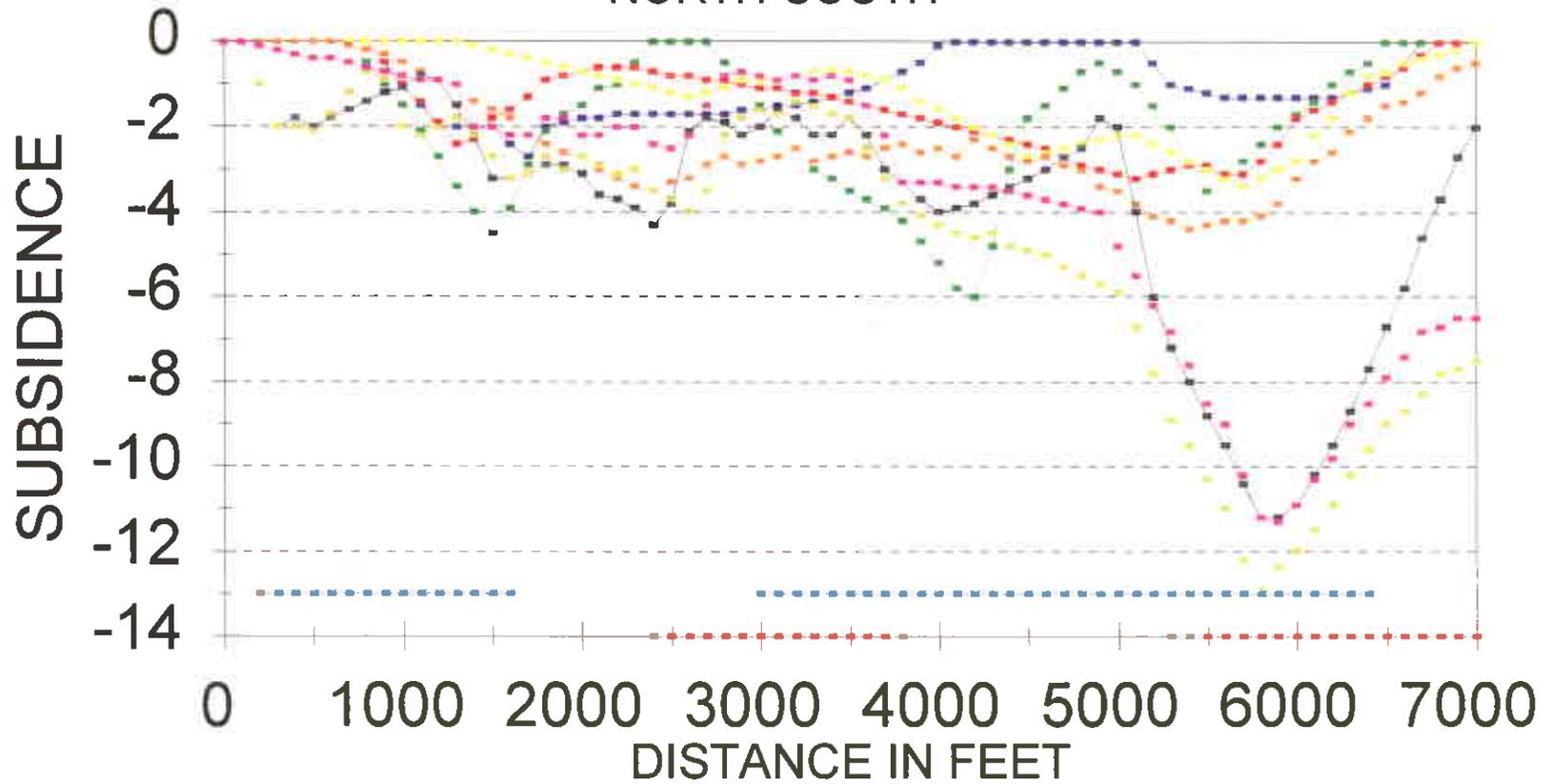
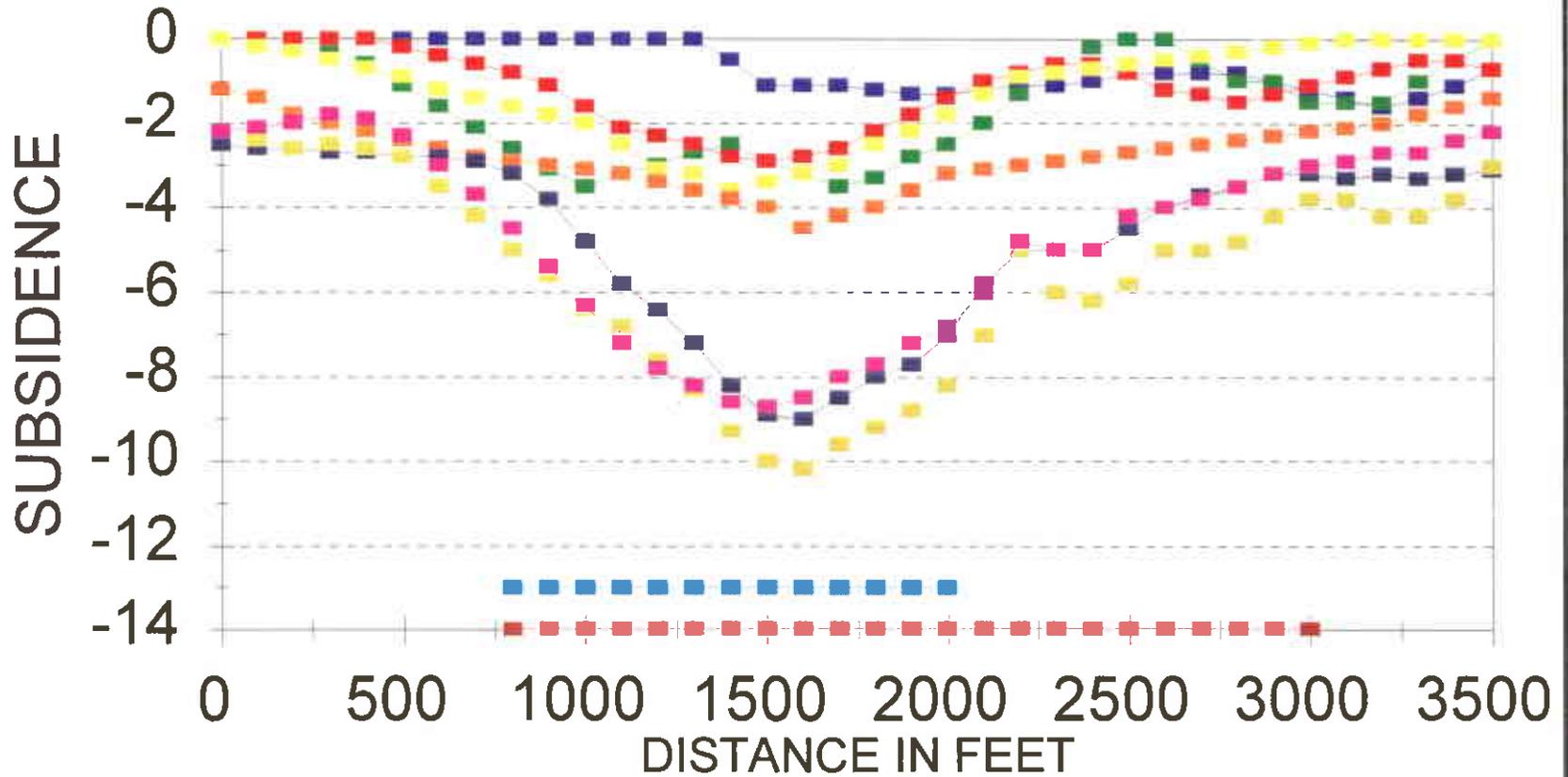


FIGURE 38
AREA 11 SUBSIDENCE PROFILE
WEST-EAST



1987	1988	1989	1991	1992
1993	1994	1995	DC	CW

Area 12

Wilberg 2nd Left Longwall Panel

The 2nd Left longwall panel is located in the western portion of the Wilberg Mine (Figure 2). A block of coal measuring 2300 feet by 530 feet was extracted during 1981 and 1982. To date no measurable subsidence has occurred and no visible surface disturbance has been observed. Overburden ranges from 1500 to 1900 feet over the panel. It is somewhat surprising that no movement has been detected since subsidence has been observed in other instances where smaller blocks of coal were extracted and overburden was of similar thickness.

One spring is located approximately 800 feet northeast of the extracted workings on the surface. It has not been affected by mining.

Area 13

Des-Bee-Dove Southern Areas

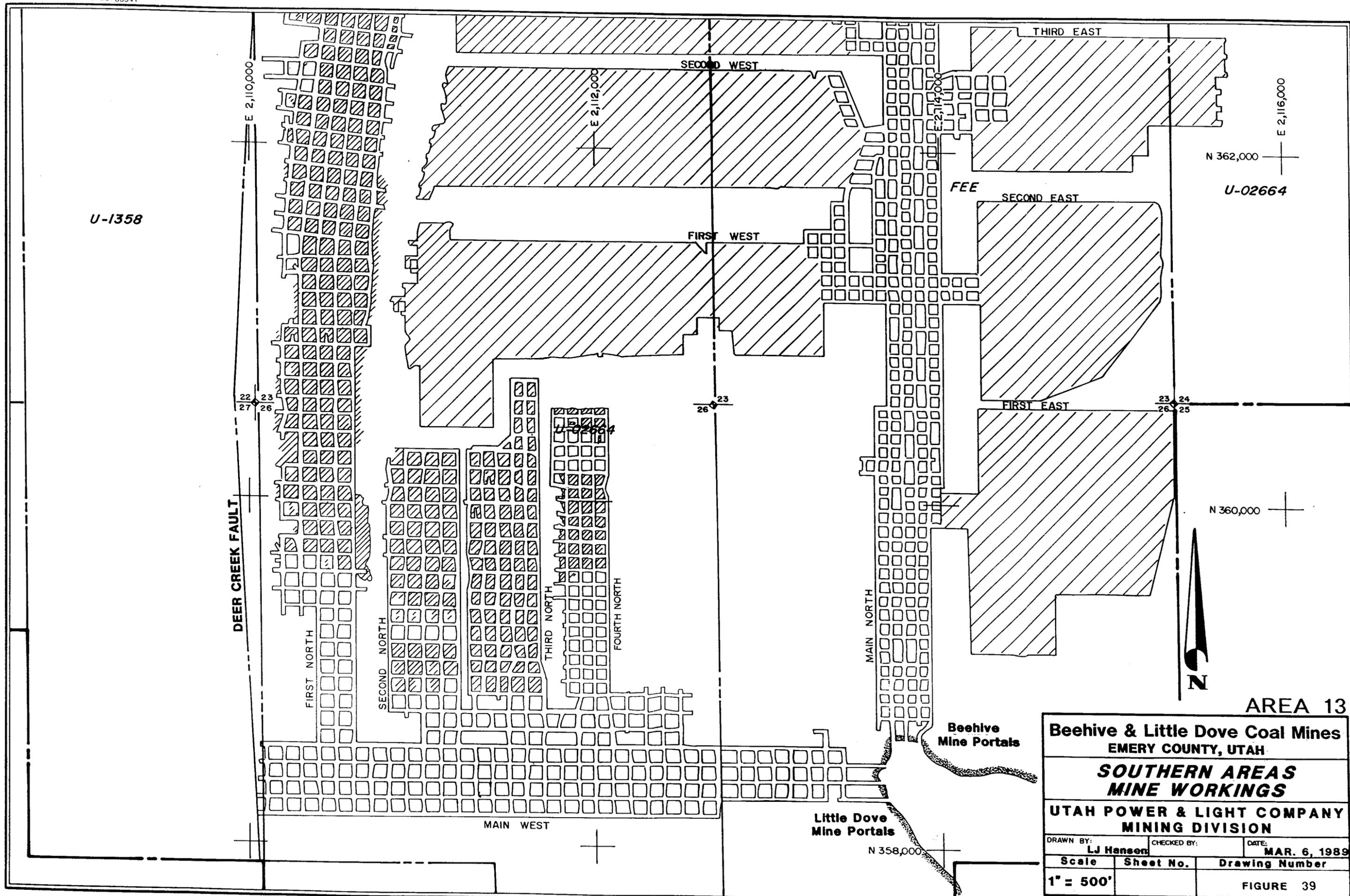
Area 13, covering the southern portions of the Deseret, Beehive, and Little Dove Mines, was first monitored for subsidence in 1986. Some of the sections were mined before baseline survey data were established; therefore, subsidence measured over these sections will likely not represent what actually occurred. The 4th North section in the Little Dove Mine was completed in February 1987 (Figures 39 and 40).

Maximum subsidence over the area as of August 1995 was about three (3) feet over some of the older working near the mine portals (Figures 41, 42, and 43). No change in subsidence has occurred in the past year.

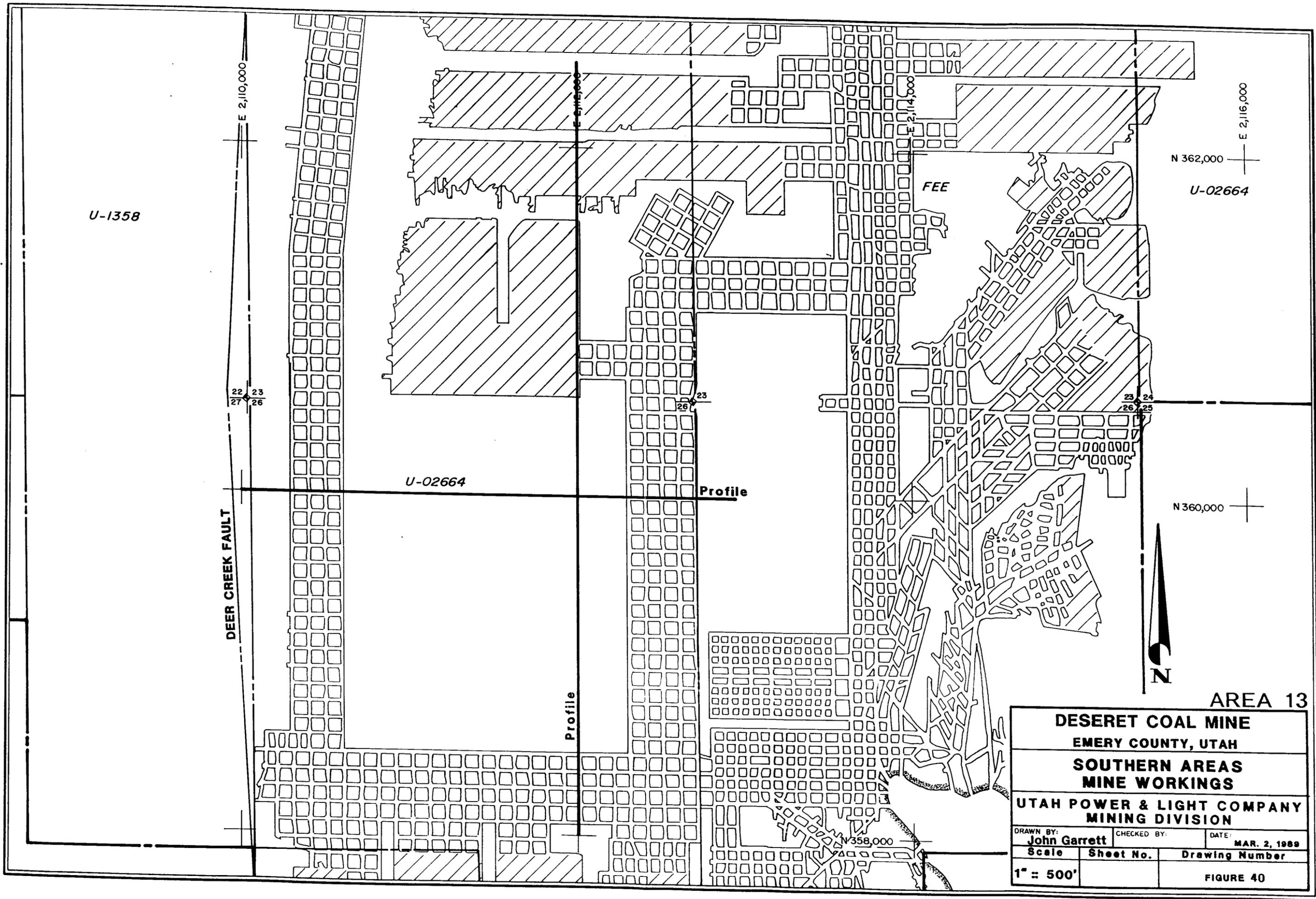
The subsidence profiles, figures 42 and 43 show subsidence yearly since 1986. These profiles show that the readings in 1993 and 1994 are somewhat lower than in 1995 or in previous years. This is most likely a problem with the aerial triangulation because a comparison of the survey monuments in the area show no change in that time period.

No visible surface disturbance of any kind has been found.

There are no known springs over the workings, and mining is not expected to have any effect on the hydrology of the area.



Beehive & Little Dove Coal Mines		
EMERY COUNTY, UTAH		
SOUTHERN AREAS		
MINE WORKINGS		
UTAH POWER & LIGHT COMPANY		
MINING DIVISION		
DRAWN BY: LJ Hansen	CHECKED BY:	DATE: MAR. 6, 1989
Scale	Sheet No.	Drawing Number
1" = 500'		FIGURE 39



U-1358

E 2,110,000

22 23
27 26

DEER CREEK FAULT

U-02664

Profile

Profile

23 24
26 25

FEE

N 358,000

N 362,000

U-02664

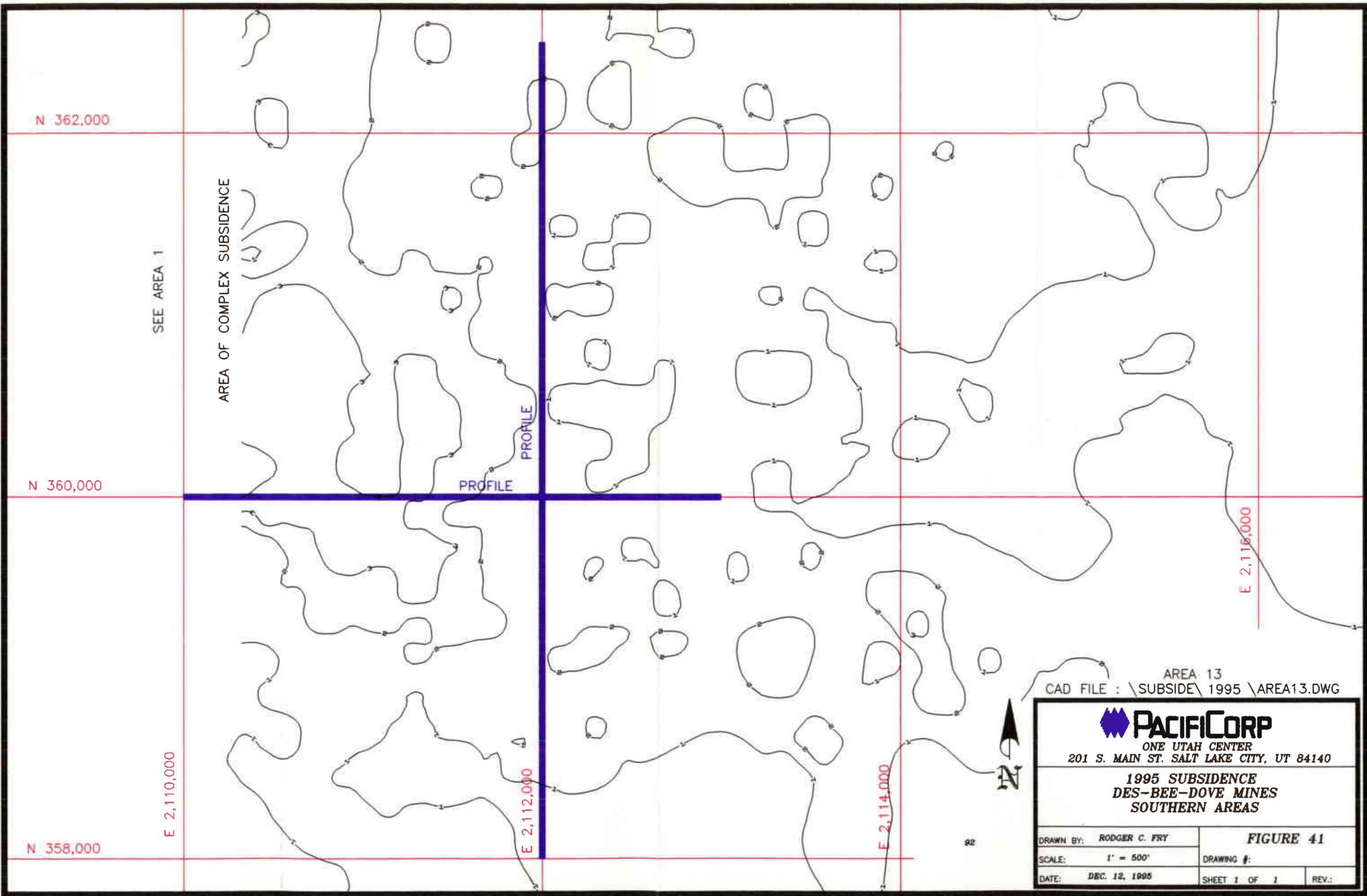
E 2,116,000

N 360,000



AREA 13

DESERET COAL MINE		
EMERY COUNTY, UTAH		
SOUTHERN AREAS		
MINE WORKINGS		
UTAH POWER & LIGHT COMPANY		
MINING DIVISION		
DRAWN BY: John Garrett	CHECKED BY:	DATE: MAR. 2, 1989
Scale 1" = 500'	Sheet No.	Drawing Number FIGURE 40



SEE AREA 1

AREA OF COMPLEX SUBSIDENCE

PROFILE
PROFILE

AREA 13

CAD FILE : \SUBSIDE\ 1995 \AREA13.DWG

PACIFICORP

ONE UTAH CENTER
201 S. MAIN ST. SALT LAKE CITY, UT 84140

1995 SUBSIDENCE
DES-BEE-DOVE MINES
SOUTHERN AREAS

DRAWN BY: RODGER C. FRY
SCALE: 1" = 500'
DATE: DEC. 12, 1995

FIGURE 41
DRAWING #:
SHEET 1 OF 1
REV.:

92

FIGURE 42

AREA 13 SUBSIDENCE PROFILE NORTH-SOUTH

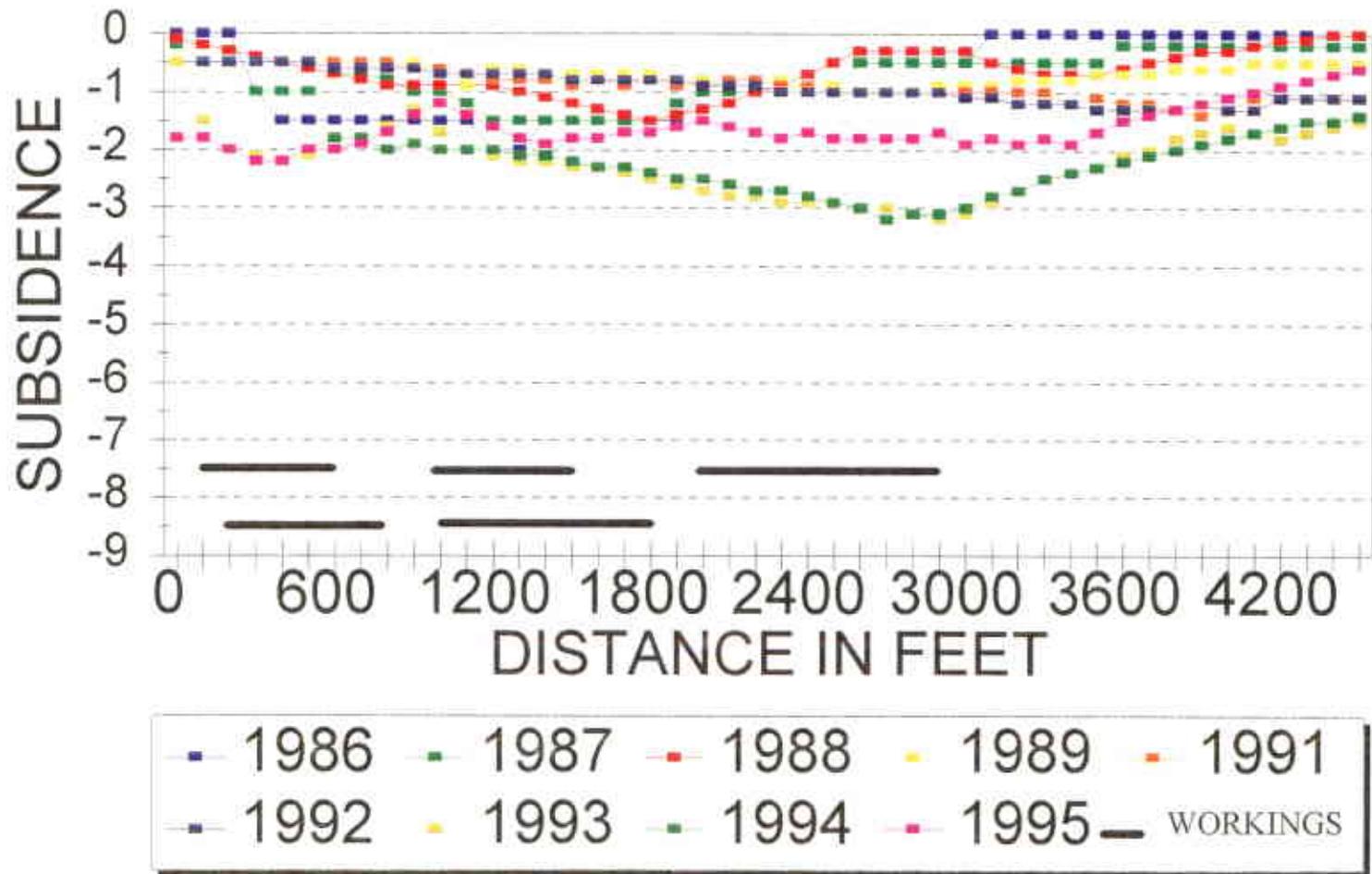
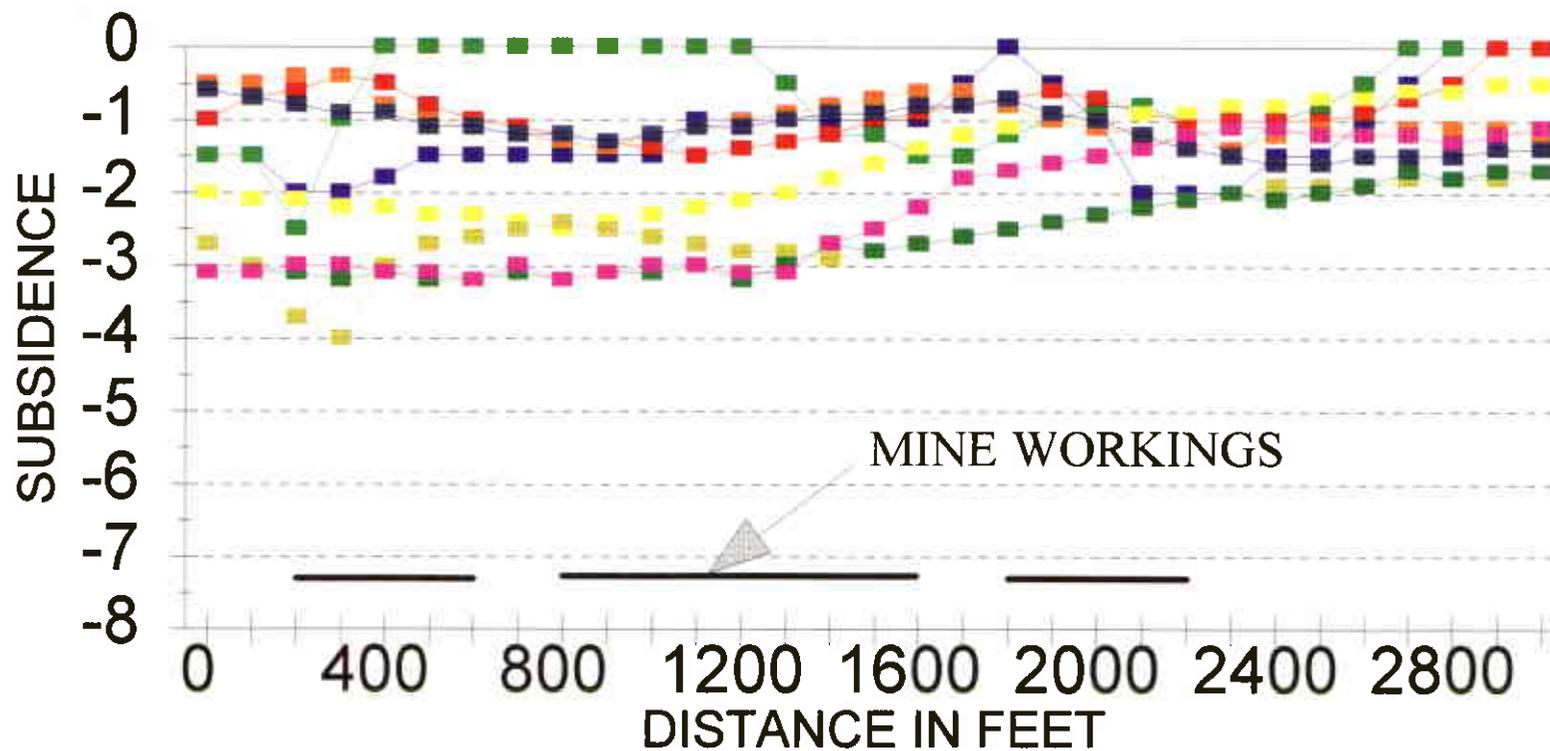


FIGURE 43
AREA 13 SUBSIDENCE PROFILE
WEST-EAST



- | | | | | |
|------|------|------|------|------|
| 1986 | 1987 | 1988 | 1989 | 1991 |
| 1992 | 1993 | 1994 | 1995 | |

Area 14

Cottonwood 6th and 7th East Longwall Panels

Subsidence in Area 14 was first monitored and detected in 1987. Mining began in the 6th East panel in September 1986 and continued until the panel was completed in March 1987. Mining in the 7th East panel began in April 1987, and the panel was finished in September 1987 (Figure 44).

Topography consists of very steep south facing slopes and cliffs with slopes covered by a few scattered pinon, juniper, mountain brush, and grasses. Overburden ranges from near 1400 feet to 200 feet.

The Castlegate Sandstone forms a 200-foot high escarpment along the north side of Newberry Canyon with numerous naturally occurring joints and fractures. Stress caused by removal of coal was transferred to the fractures resulting in brittle failure of the cliff face (spalling) in some places. Talus from the spalling has accumulated on the steep slopes below the cliffs on older natural talus slopes. The newer debris remains mostly above the coal outcrop level and reaches the canyon floor in only one location. Surface cracks have been observed and mapped along the ridge above the cliff. The cracks are discontinuous and extend for approximately 2,000 feet parallel to the northern edge of the 6th East longwall panel. A few cracks are also found directly on top of the Castlegate Sandstone escarpment. Maximum subsidence to date is over seven (7) feet above the western end of the 7th East Longwall Panel and five (5) feet over the eastern end of 6th East along the Pleasant Valley Fault (Figures 45, 46, and 47). Because this area has rugged and steep terrain, it is the most difficult to achieve consistent results using the photogrammetric monitoring. As can be seen on the subsidence map (Figure 45) and the profiles

(Figures 46 and 47) the subsidence appears to vary substantially from one location to another and change up and down in time. This is because the photogrammetric monitoring is difficult in this type of terrain. The profiles for the 1995 data show no area where the measured subsidence is greater than has been read in one or more previous year. Several survey targets were established in this area on the Castlegate cliff and have been surveyed since their emplacement in 1986. This monitoring shows no changes in the last three years. The data from these monitoring sites are located in the appendix to this report.

The angle-of-draw was not calculated to the west, south and east because of the steep slopes, burned coal, and other workings surrounding the 6th and 7th East panels. The angle of draw on the north side of the 6th East Panel is 25 degrees.

There are no springs in the vicinity of Area 14. The strata are generally dry; thus, mining is expected to have no adverse impact on the hydrology.

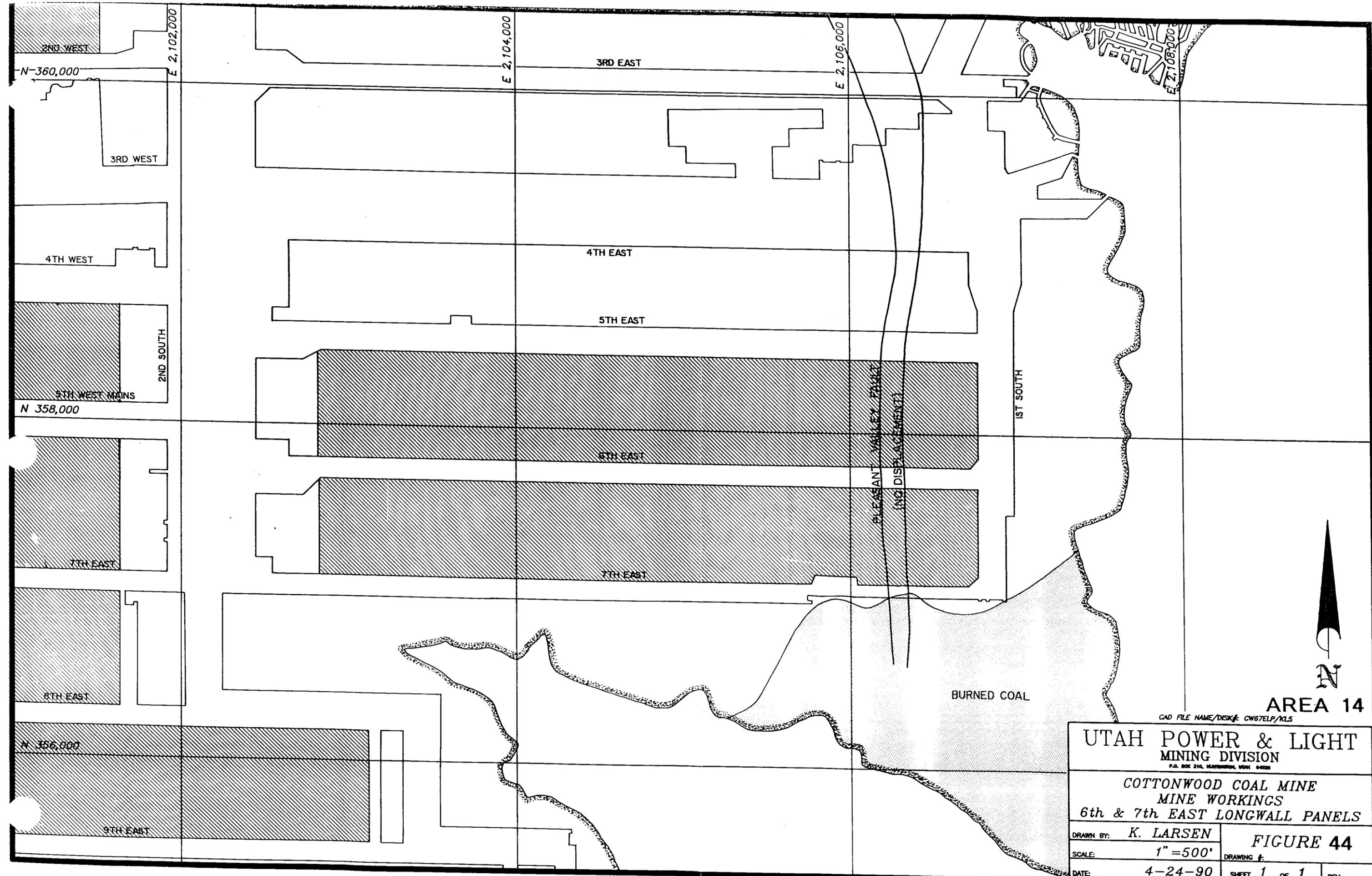
Wildlife in the area includes deer, elk, nesting golden eagles in spring and summer, wintering bald eagles, hares, rabbits, grouse, and other species. Grazing cattle can also be found along the ridge top in the summer months.

The major impacts associated with subsidence and resulting cliff failure, surface cracking, and talus deposition in Area 14 are 1) possible loss of golden eagle nests and/or nest sites, 2) disruption of grazing and hunting land use, and 3) loss of wildlife habitat.

Prior to longwall mining in the area an eagle monitoring plan was developed and implemented. It went into effect in February 1986 and is an ongoing program. The purpose of the plan is to collect data whereby the impacts of subsidence and cliff spalling upon eagle nesting can be assessed. The report entitled "Assessment of Mining Related Impacts in Newberry

Canyon" submitted to the Utah Division of Oil, Gas and Mining discusses all mining related impacts in Area 14 and includes the eagle monitoring plan as an appendix.

PacifiCorp will continue to monitor subsidence to assess the significance of related impacts in this area.



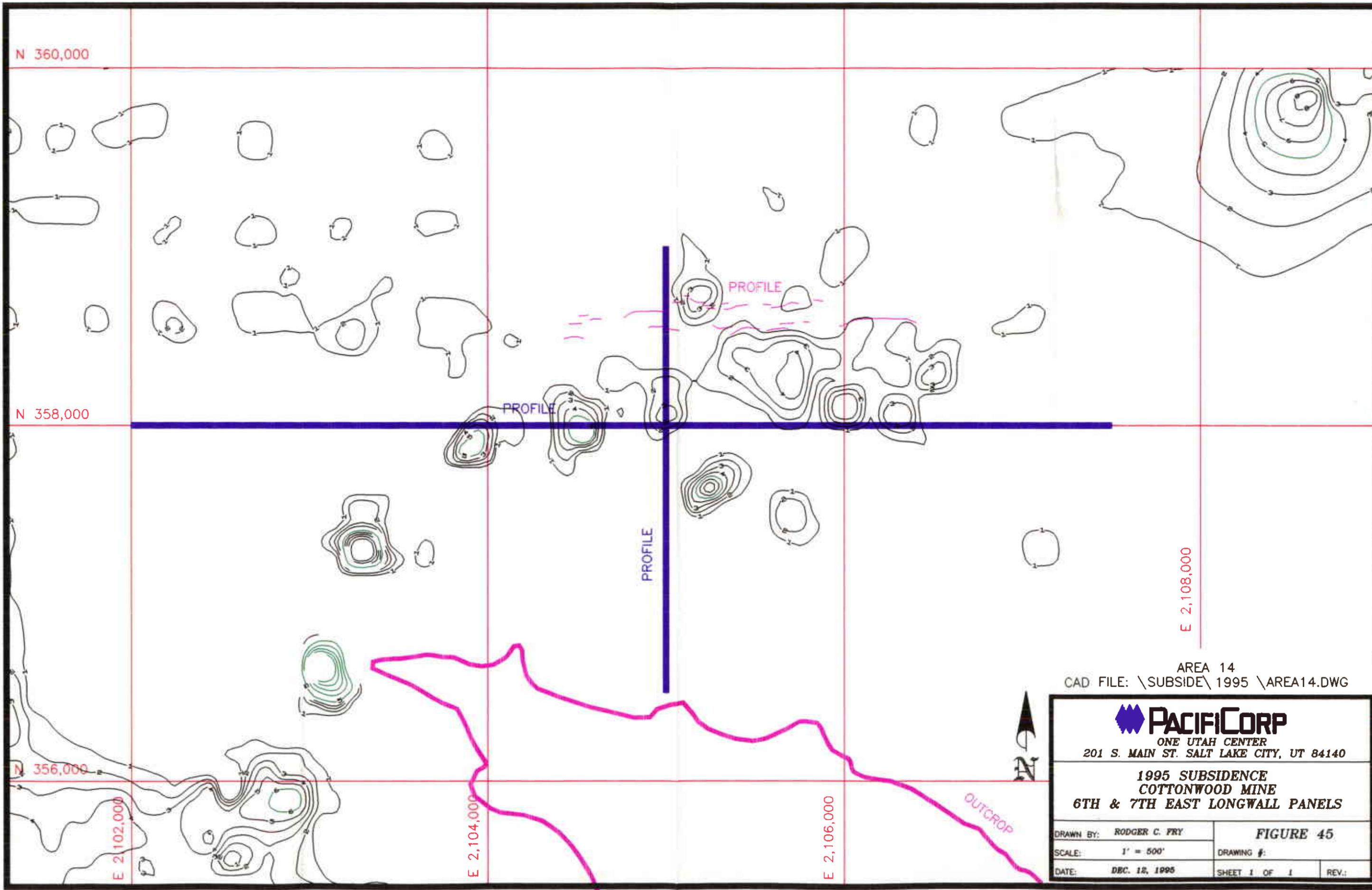
AREA 14

CAD FILE NAME/DISK#: CW67ELP/KLS

**UTAH POWER & LIGHT
MINING DIVISION**
P.O. BOX 310, HARTSVILLE, WYOMI 84038

**COTTONWOOD COAL MINE
MINE WORKINGS
6th & 7th EAST LONGWALL PANELS**

DRAWN BY:	K. LARSEN	FIGURE 44
SCALE:	1" = 500'	
DATE:	4-24-90	DRAWING #:
		SHEET 1 OF 1
		REV. _____



AREA 14
 CAD FILE: \SUBSIDE\1995\AREA14.DWG

PACIFICORP
 ONE UTAH CENTER
 201 S. MAIN ST. SALT LAKE CITY, UT 84140

**1995 SUBSIDENCE
 COTTONWOOD MINE
 6TH & 7TH EAST LONGWALL PANELS**

DRAWN BY: RODGER C. FRY	FIGURE 45
SCALE: 1" = 500'	DRAWING #:
DATE: DEC. 12, 1995	SHEET 1 OF 1
	REV.:



FIGURE 46
AREA 14 SUBSIDENCE PROFILE
NORTH-SOUTH

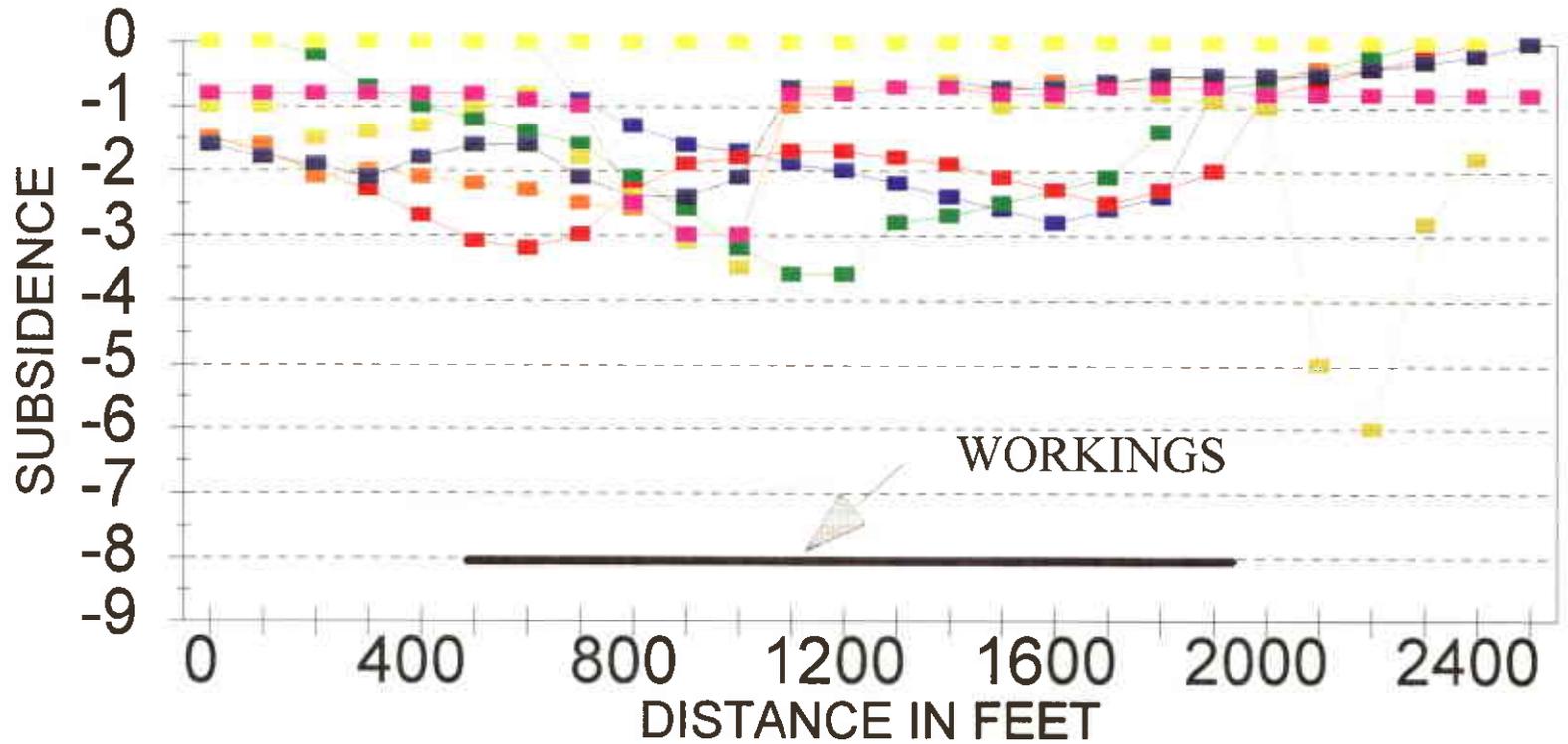
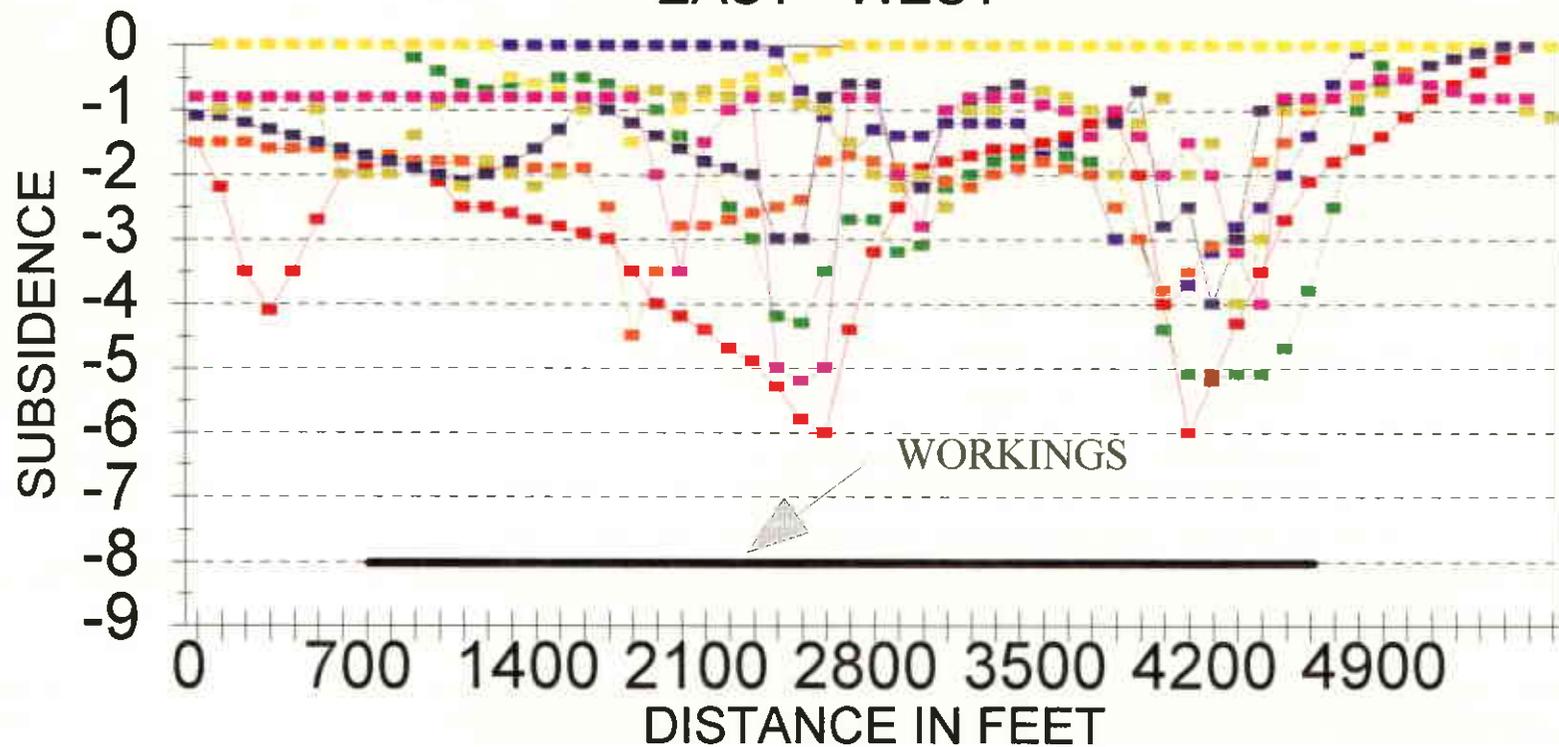


FIGURE 47
AREA 14 SUBSIDENCE PROFILE
EAST - WEST



Area 15

Cottonwood 9th and 12th West Longwall Panels

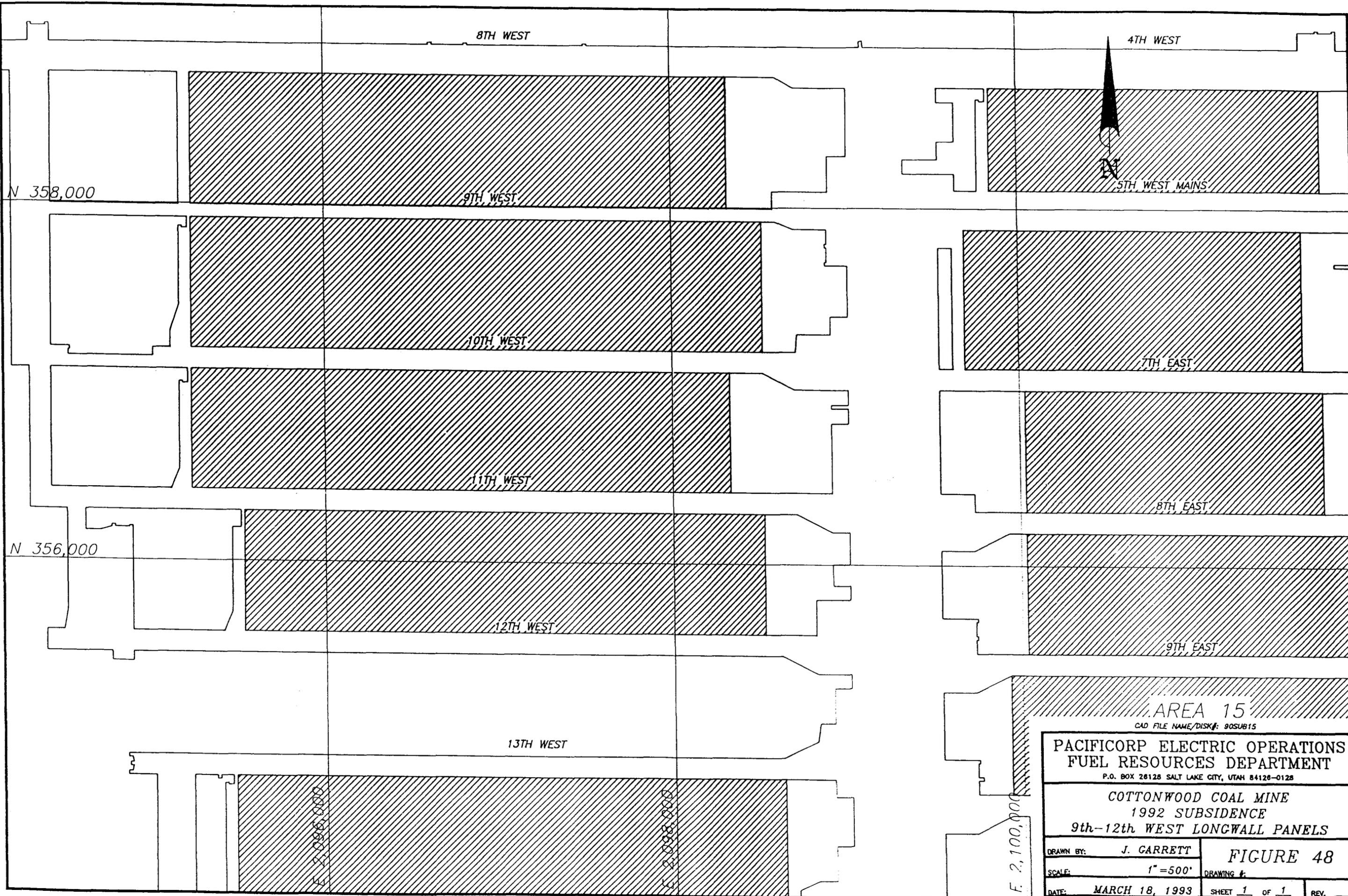
Subsidence in 9th and 10th West was first monitored and detected in 1988 when longwall extraction began there. The 9th through 12th West panels were all completed by fall of 1989 (Figure 48).

The surface above these panels is comprised mainly of steep to moderate slopes with a small flat area forming the top of East Mountain on the area's eastern edge. Overburden ranges from 800 feet to over 2000 feet.

Maximum measured subsidence to date is over five (5) feet above 11th West (Figures 49, 50, and 51). This area has experienced no additional subsidence in the past four years.

Calculated angle-of-draw is less than zero on the south and east and reaches 20 degrees on the west.

There are no known springs in the area.



8TH WEST

4TH WEST

N 358,000

9TH WEST

5TH WEST MAINS

10TH WEST

7TH EAST

11TH WEST

8TH EAST

N 356,000

12TH WEST

9TH EAST

13TH WEST

AREA 15

CAD FILE NAME/DISK#: 90SUB15

PACIFICORP ELECTRIC OPERATIONS
FUEL RESOURCES DEPARTMENT
P.O. BOX 28128 SALT LAKE CITY, UTAH 84128-0128

COTTONWOOD COAL MINE
1992 SUBSIDENCE
9th-12th WEST LONGWALL PANELS

DRAWN BY: J. GARRETT

FIGURE 48

SCALE: 1"=500'

DRAWING #:

DATE: MARCH 18, 1993

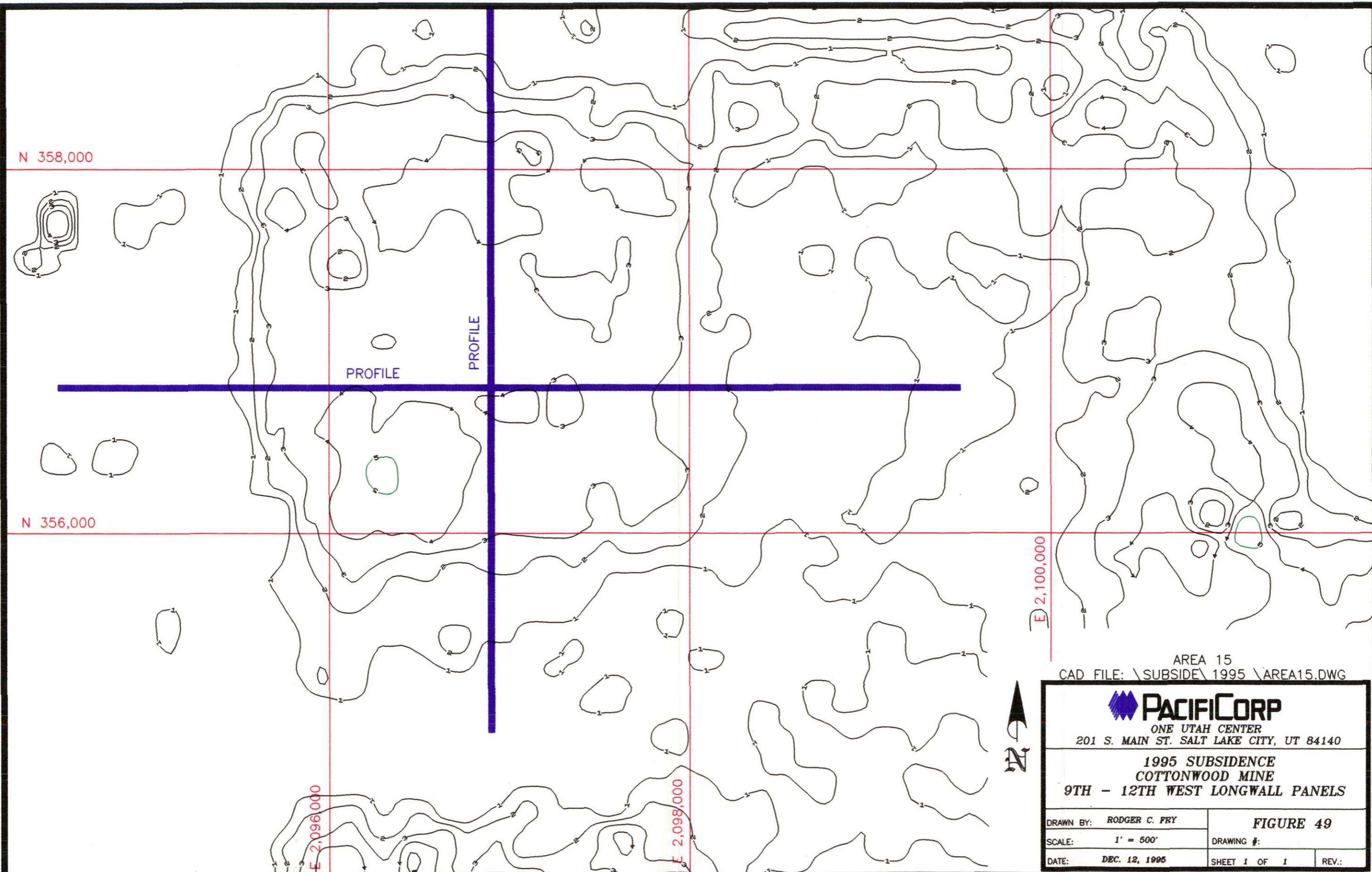
SHEET 1 OF 1

REV.

E 2,096,000

E 2,098,000

E 2,100,000



AREA 15
 CAD FILE: \SUBSIDE\1995\AREA15.DWG

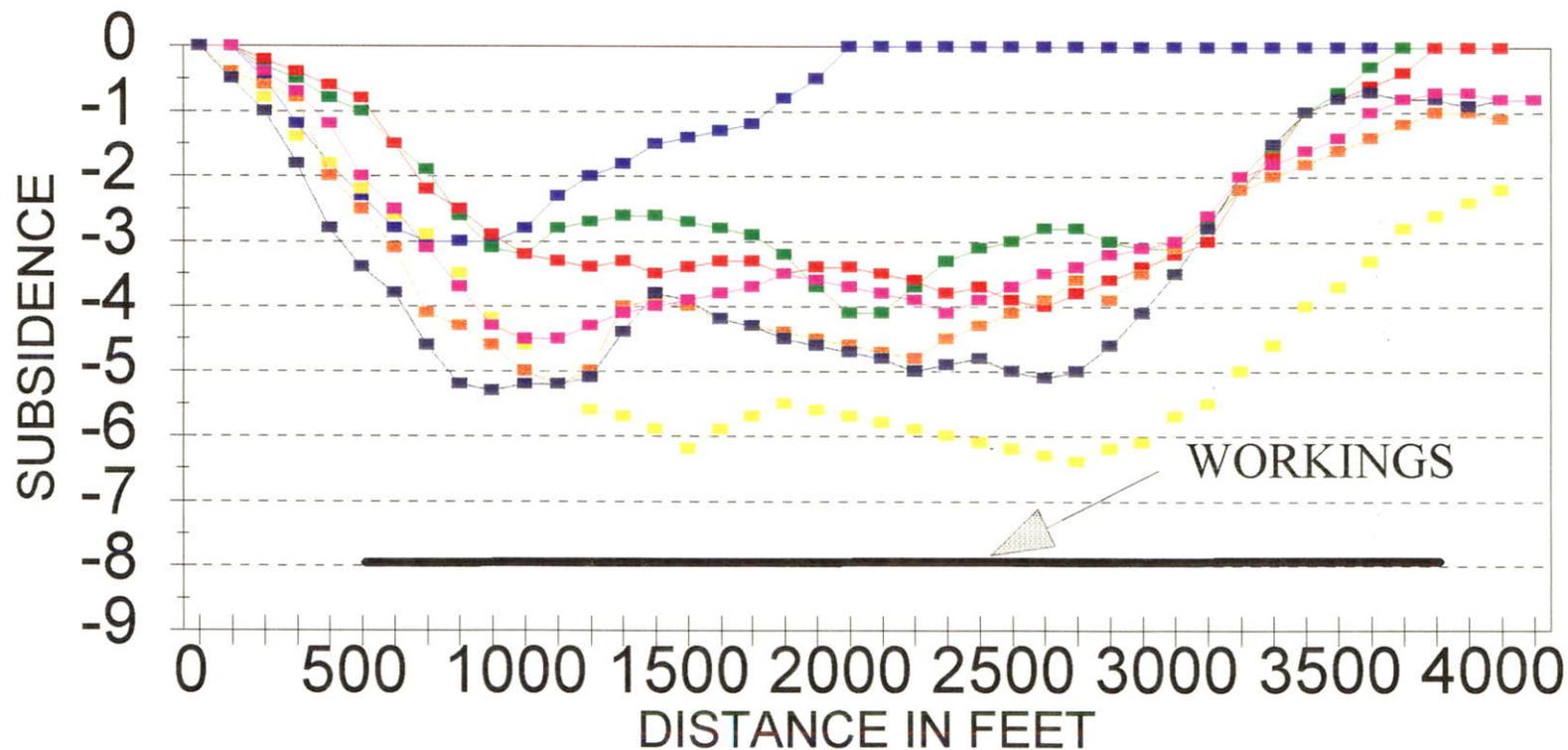


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**1995 SUBSIDENCE
 COTTONWOOD MINE
 9TH - 12TH WEST LONGWALL PANELS**

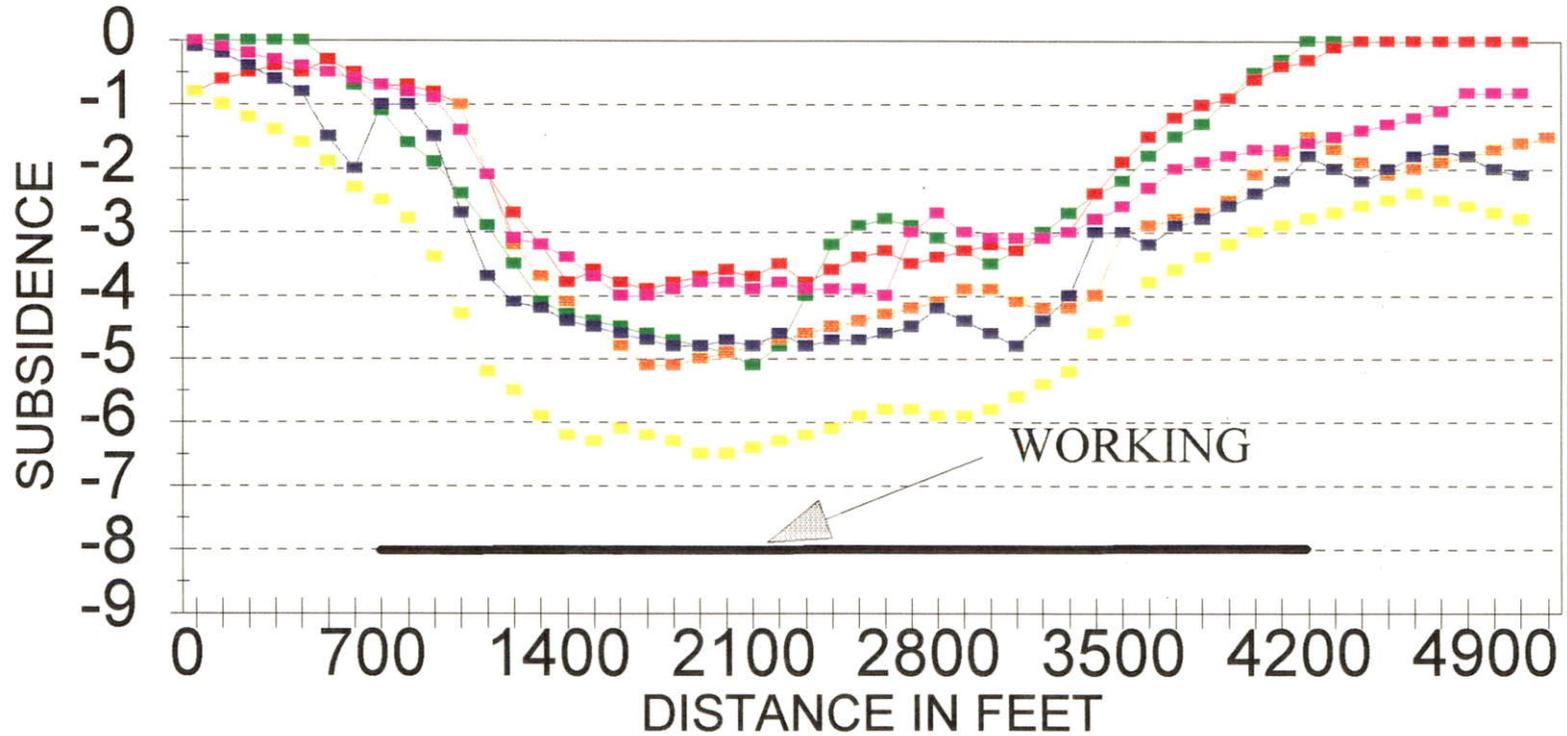
DRAWN BY: RODGER C. FRY	FIGURE 49	
SCALE: 1" = 500'	DRAWING #:	
DATE: DEC. 12, 1995	SHEET 1 OF 1	REV.:

FIGURE 50
AREA 15 SUBSIDENCE PROFILE
NORTH-SOUTH



1988	1989	1991	1992
1993	1994	1995	

FIGURE 51
AREA 15 SUBSIDENCE PROFILE
WEST-EAST



Area 16

Cottonwood 8th Through 11th East Longwall Panels

Mining in Area 16 began in the 8th East panel in June of 1989, and ended in the 8th East panel in May, 1992 (Figure 52).

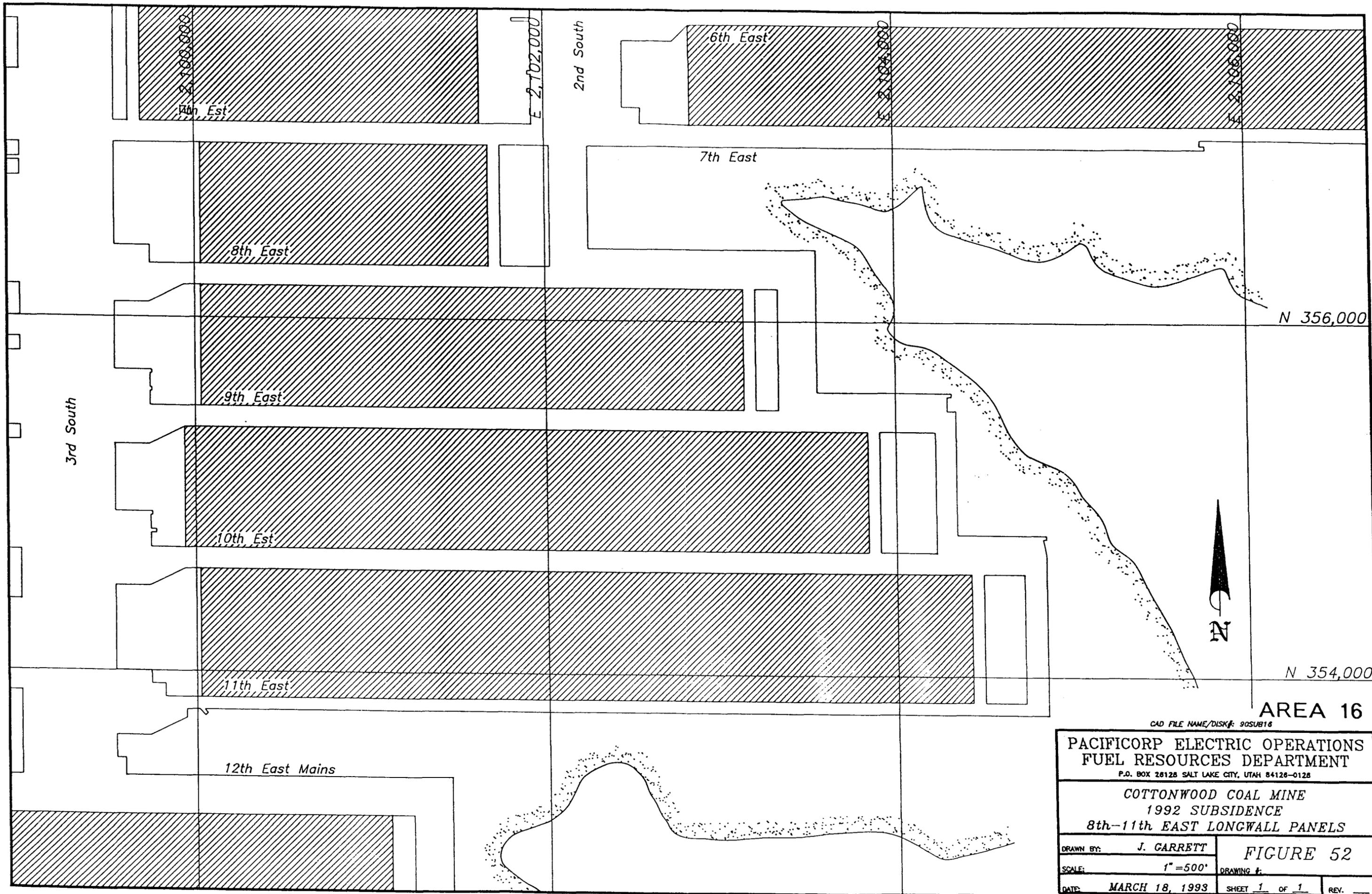
Topography in Area 16 is very similar to that of Area 14 with cliffs and very steep slopes covered by a few scattered pinon, juniper, mountain brush, and grasses. Overburden ranges from near 100 feet near outcrop to about 1800 feet.

As with Area 14 cliff spalling has occurred in places and the resulting talus has accumulated on the steep slopes below the cliffs. No surface cracks have been observed to date.

Maximum subsidence observed to date exceeds five (5) feet and occurs over the 11th East panel where the overburden is less than 600 feet (Figure 53, 54, and 55). Figure 53 shows several "bulls-eyes" in the area of the Castlegate cliff which are in very steep and rugged areas. The photogrammetric method is not reliable in these areas and it is not felt that the areas have subsided to the extent shown on figure 53. This is supported by the fact that subsidence survey targets placed along the cliff in 1986 have shown no movement in recent years (see appendix).

The angle-of-draw was not calculated because the steep slopes and other adjacent workings make accurate measurement difficult.

There are no known springs in the area. Strata on both the surface and in underground mine workings are typically very dry; therefore, mining is not expected to affect the hydrology.



AREA 16

CAD FILE NAME/DISK#: 90SUB16

**PACIFICORP ELECTRIC OPERATIONS
FUEL RESOURCES DEPARTMENT**
P.O. BOX 26128 SALT LAKE CITY, UTAH 84126-0128

**COTTONWOOD COAL MINE
1992 SUBSIDENCE
8th-11th EAST LONGWALL PANELS**

DRAWN BY: **J. GARRETT**

FIGURE 52

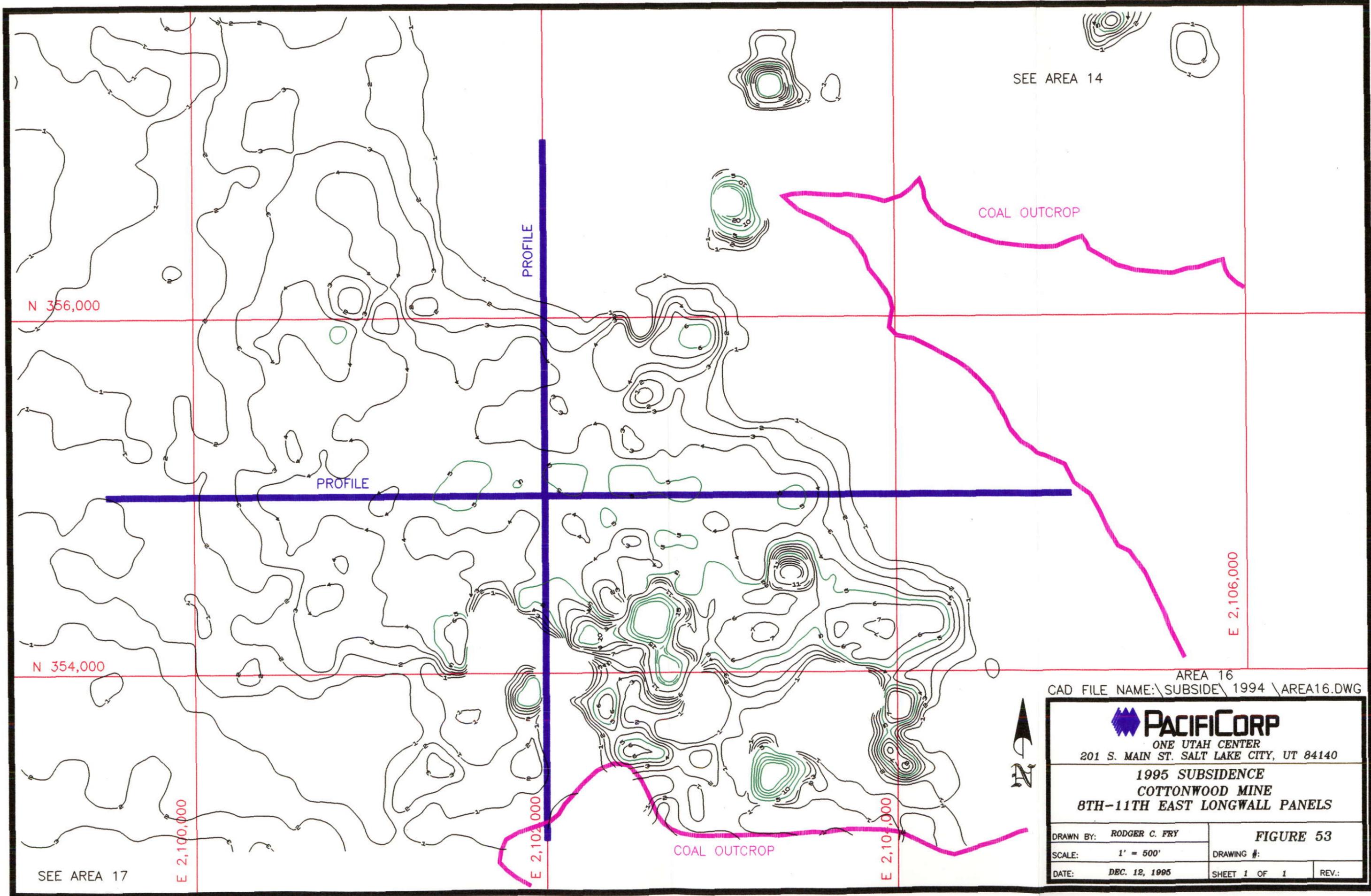
SCALE: **1" = 500'**

DRAWING #:

DATE: **MARCH 18, 1993**

SHEET **1** OF **1**

REV. _____



SEE AREA 14

COAL OUTCROP

PROFILE

PROFILE

N 356,000

N 354,000

E 2,106,000

E 2,100,000

E 2,102,000

E 2,104,000

COAL OUTCROP

SEE AREA 17



AREA 16
 CAD FILE NAME: \SUBSIDE\ 1994 \AREA16.DWG

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1995 SUBSIDENCE
 COTTONWOOD MINE
 8TH-11TH EAST LONGWALL PANELS

DRAWN BY: RODGER C. FRY		FIGURE 53	
SCALE: 1' = 500'		DRAWING #:	
DATE: DEC. 12, 1995	SHEET 1 OF 1	REV.:	

FIGURE 54

AREA 16 SUBSIDENCE PROFILE NORTH-SOUTH

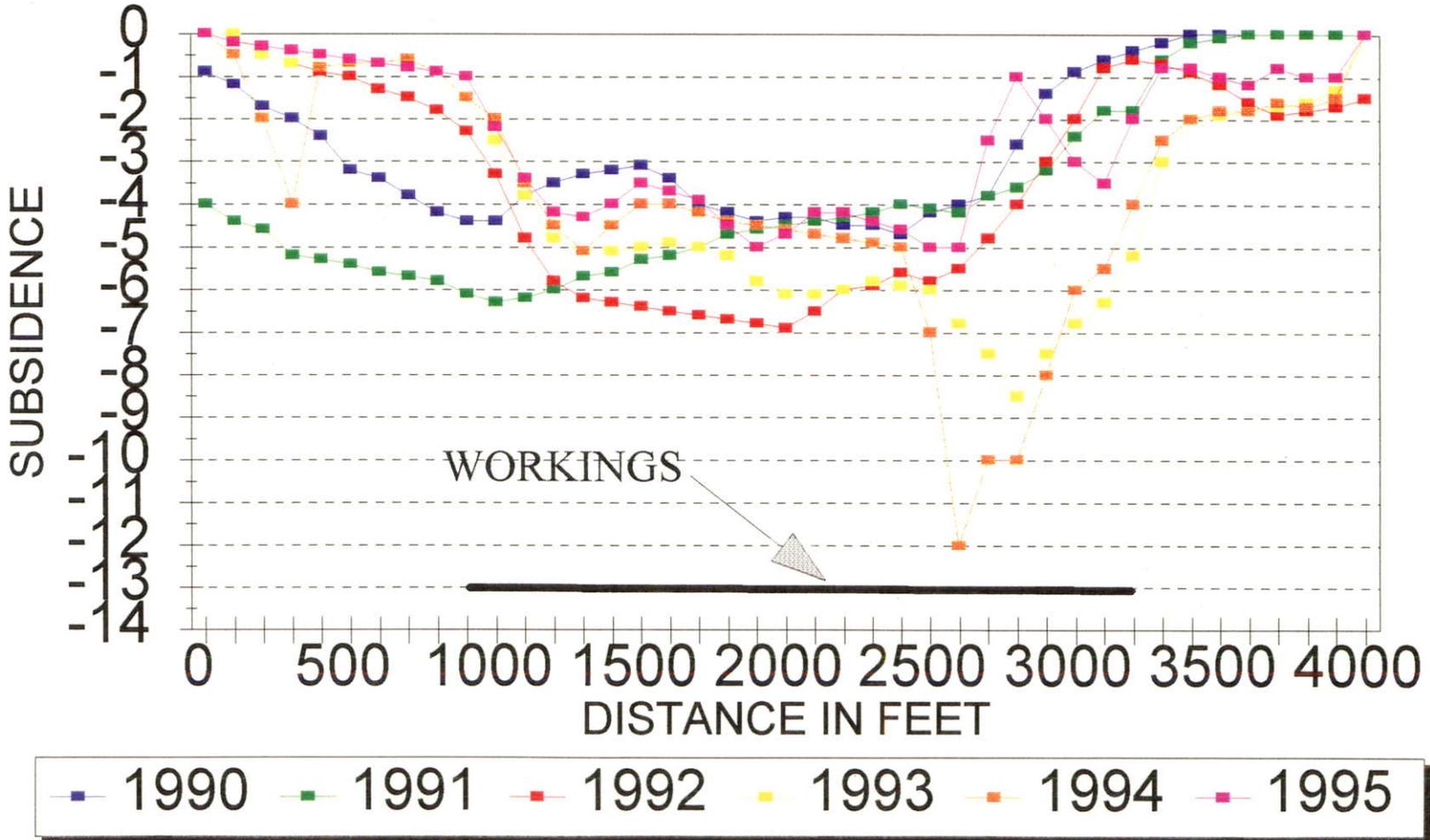
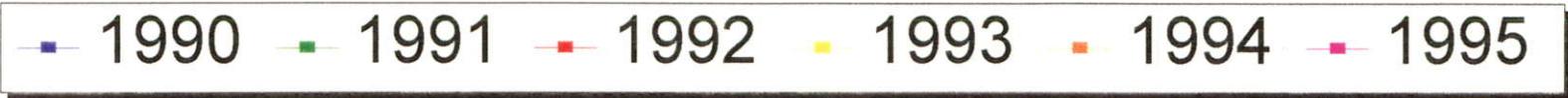
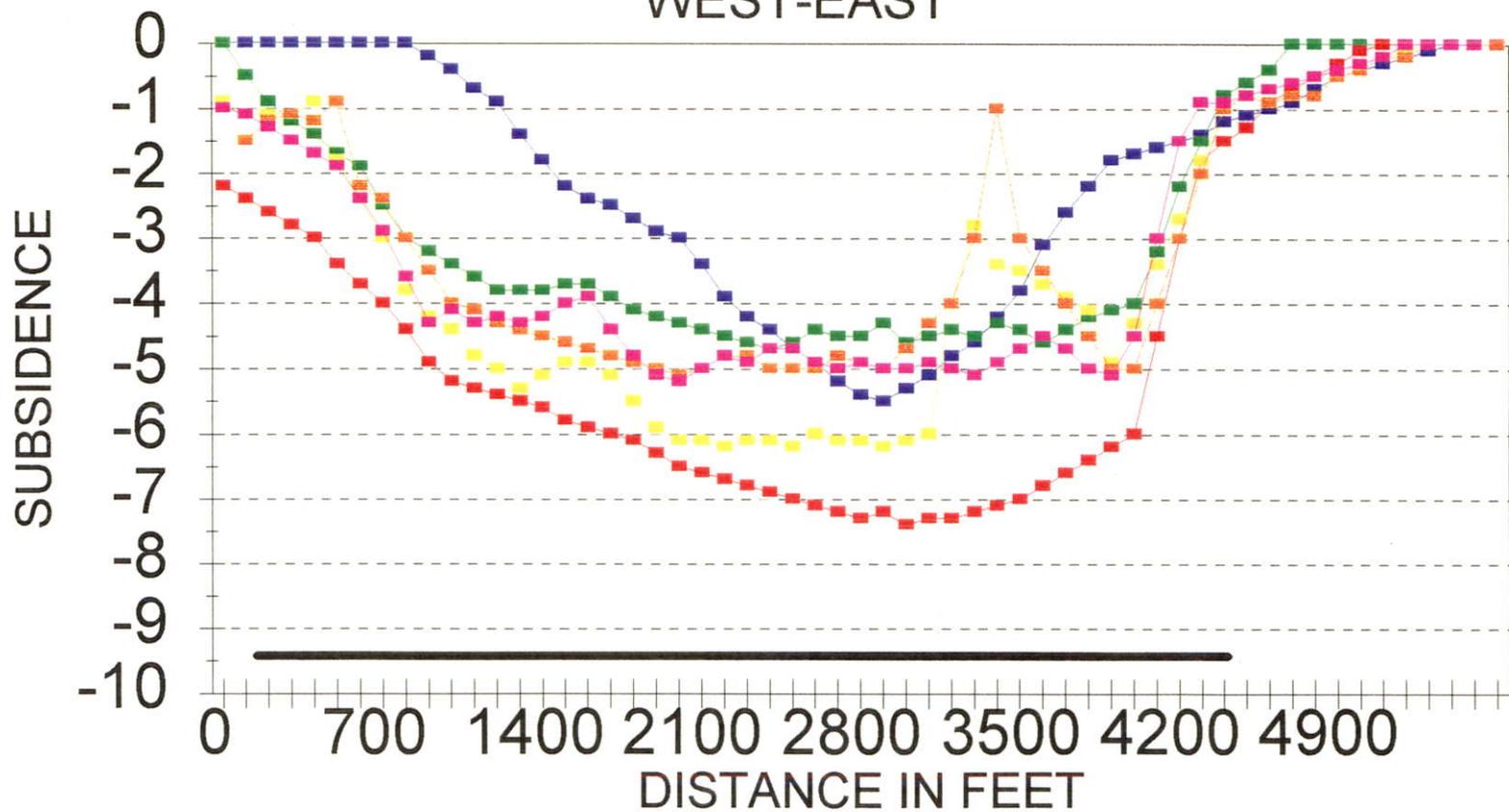


FIGURE 55
AREA 16 SUBSIDENCE PROFILE
WEST-EAST



Area 17

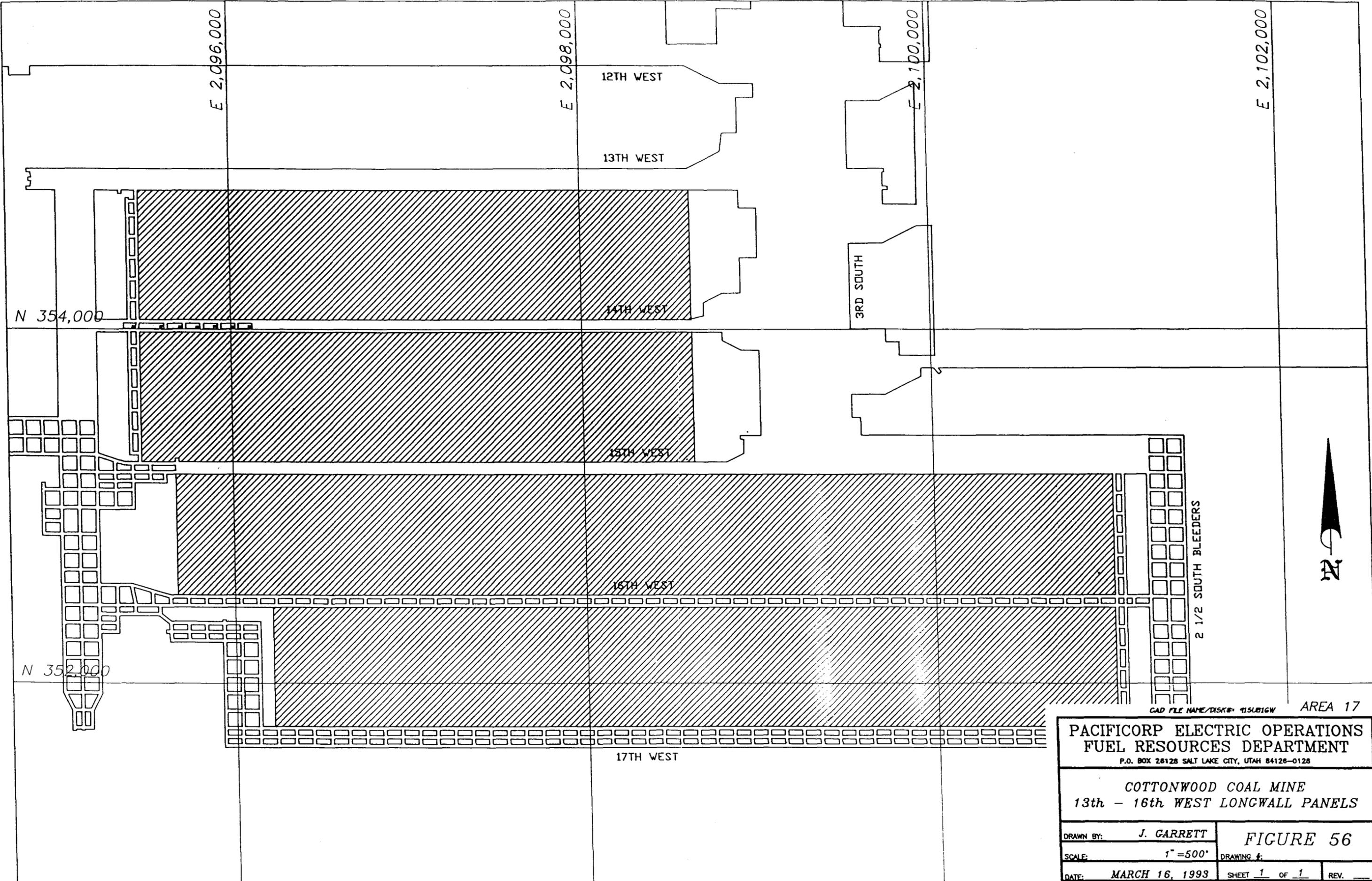
Cottonwood 13th Through 16th West Longwall Panels

Mining in the 16th West longwall panel began in October 1990 and the panel was completed in March 1991. Mining in the area was finished in March, 1992 with the completion of the 13th West longwall panel (figure 56). The topography over these longwall panels is characterized by steep slopes covered with conifer and aspen trees which extend up from the cliffs which surround the east, south and west sides of the panels. The panels are covered by overburden ranging from 800 feet at both the west and east end of the panels to over 1,800 feet in the center of the panels.

The measured subsidence exceeds six (6) feet in an area above the 16th west panel. The subsidence zone follows a narrow east-west trending trough centered above the two longer panels and then extends north above the 14th and 13th west longwall panels (figures 57, 58, and 59). No surface fractures have been observed in the area above these longwall panels. Subsidence in this area has been stable for over four years.

On the south side of the subsidence zone, the angle of draw is less than 10 degrees.

No springs are located above this area and the strata is not saturated. Therefore, it is not likely that this subsidence will have any effect on the hydrology of the area.

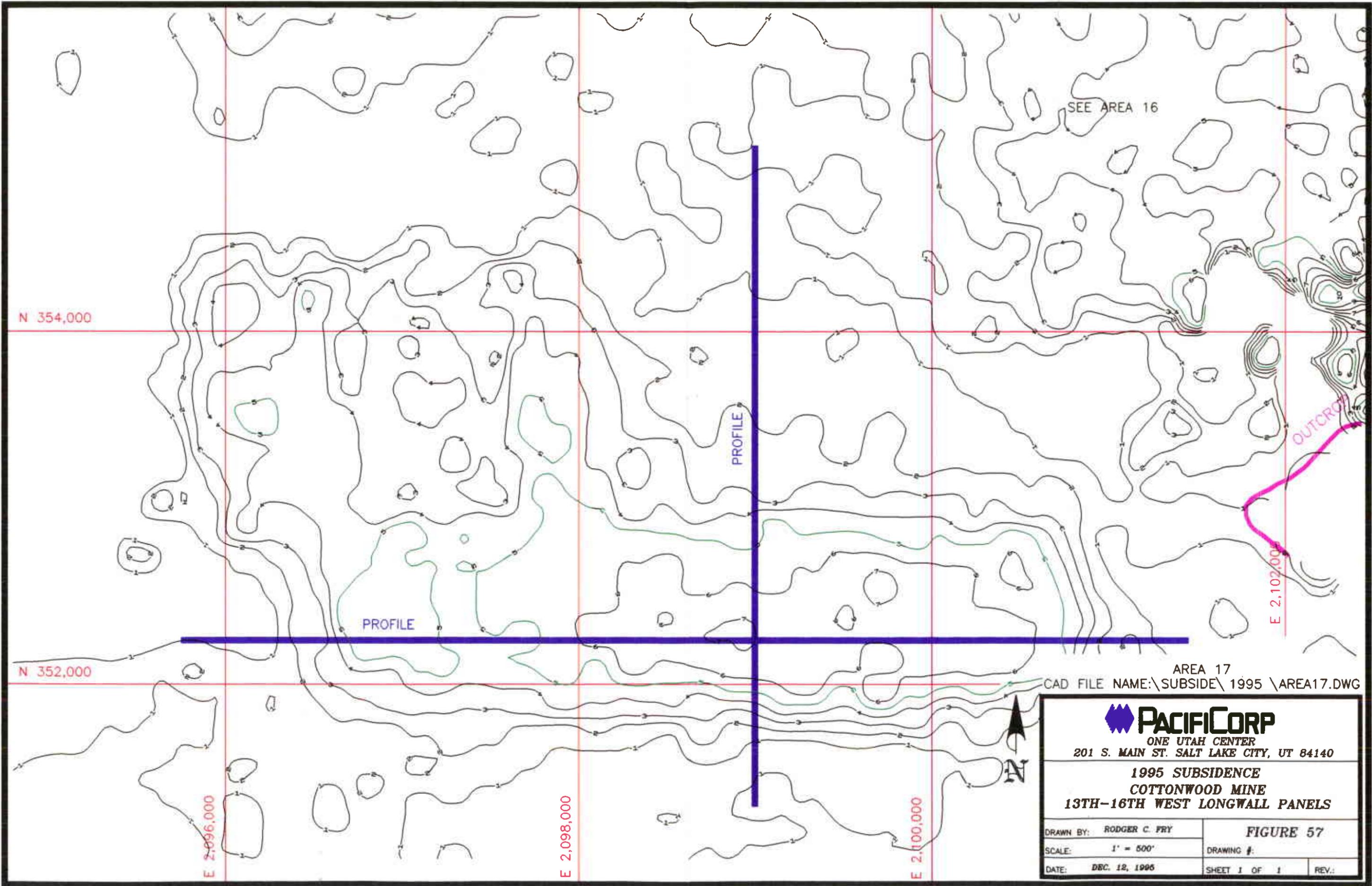


CAD FILE NAME/DISK# 115L01GW AREA 17

PACIFICORP ELECTRIC OPERATIONS
 FUEL RESOURCES DEPARTMENT
 P.O. BOX 26128 SALT LAKE CITY, UTAH 84126-0128

COTTONWOOD COAL MINE
 13th - 16th WEST LONGWALL PANELS

DRAWN BY:	J. GARRETT	DRAWING #:	FIGURE 56
SCALE:	1" = 500'		
DATE:	MARCH 16, 1993	SHEET 1 OF 1	REV. _____



AREA 17
 CAD FILE NAME:\SUBSIDE\1995\AREA17.DWG

 PACIFICORP ONE UTAH CENTER 201 S. MAIN ST. SALT LAKE CITY, UT 84140	
1995 SUBSIDENCE COTTONWOOD MINE 13TH-16TH WEST LONGWALL PANELS	
DRAWN BY: RODGER C. FRY SCALE: 1" = 500' DATE: DEC. 12, 1995	FIGURE 57 DRAWING #: SHEET 1 OF 1 REV.:

FIGURE 58

AREA 17 SUBSIDENCE PROFILE NORTH-SOUTH

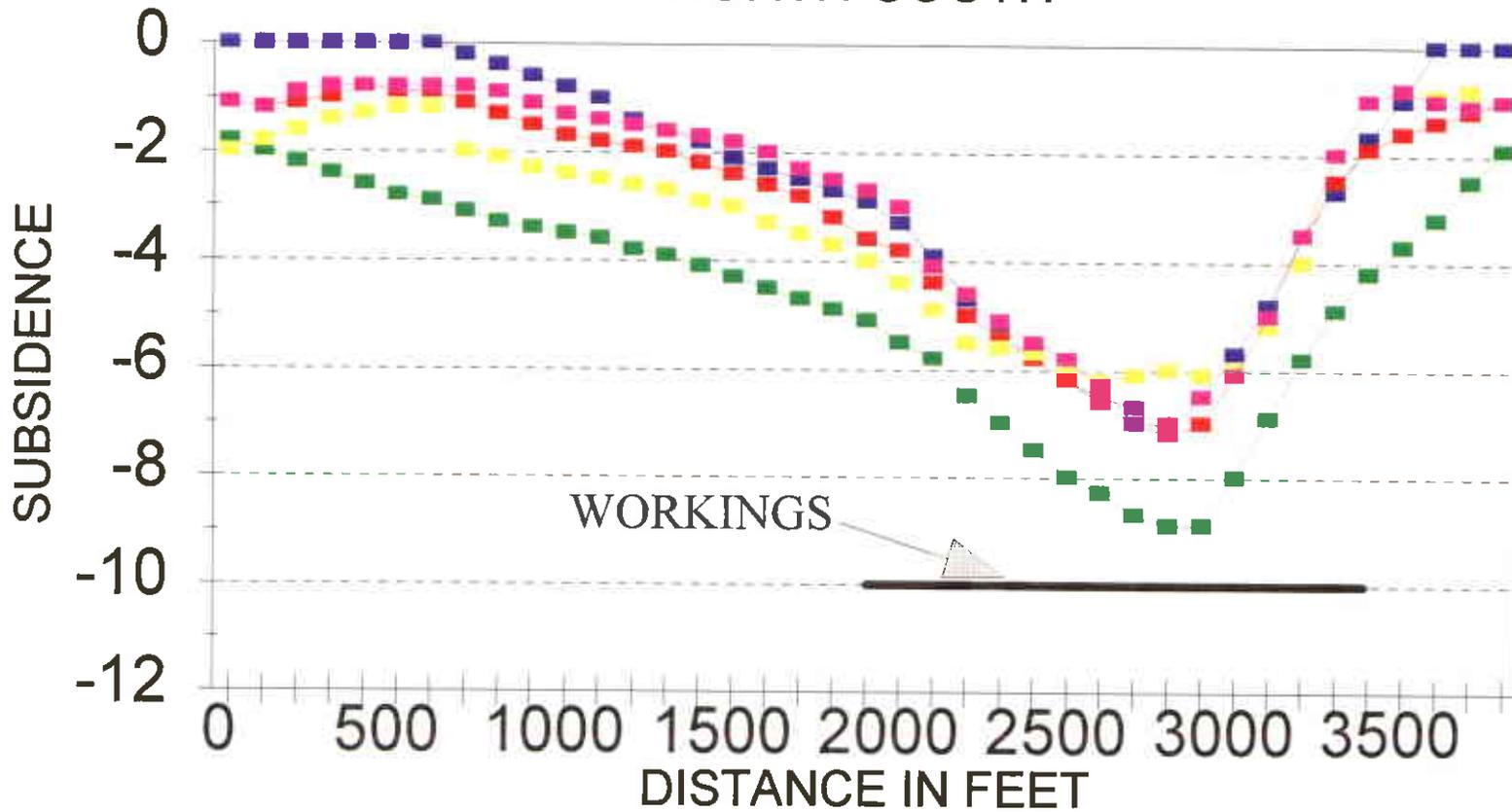
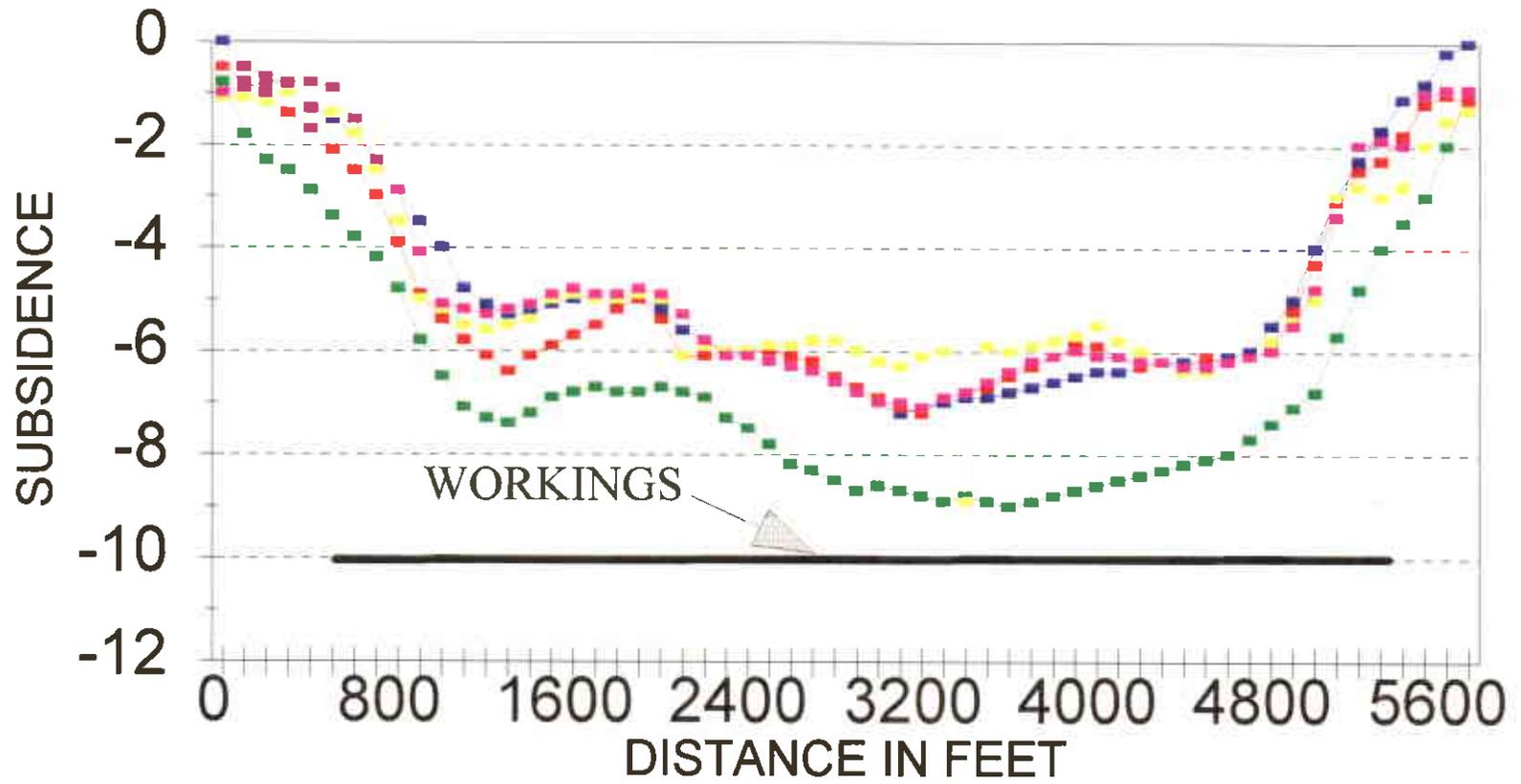


FIGURE 59

AREA 17 SUBSIDENCE PROFILE WEST-EAST



■ 1991 ■ 1992 ■ 1993 ■ 1994 ■ 1995