ENTERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION

UNIT NO. 3

BASEMAT MONITORING PROGRAM
REPORT NO. 4

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ENTERGY OPERATIONS, INC.
WATERFORD STEAM ELECTRIC STATION
UNIT NO. 3

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TABLE OF CONTENTS

ENTERGY OPERATIONS, INC.
WATERFORD STEAM ELECTRIC STATION
UNIT NO. 3

BASEMAT MONITORING PROGRAM
REPORT NO. 4

LIST OF TABLES

ENTERGY OPERATIONS, INC.
WATERFORD STEAM ELECTRIC STATION
UNIT NO. 3

BASEMAT MONITORING PROGRAM
REPORT NO. 4

LIST OF FIGURES

LIST OF FIGURES (CONTINUED)

LIST OF FIGURES (CONTINUED)

ENTERGY OPERATIONS, INC.
WATERFORD STEAM ELECTRIC STATION
UNIT NO. 3

BASEMAT MONITORING PROGRAM
REPORT NO. 4

1.0 PURPOSE

The Nuclear Plant Island Structure (NPIS) Common Foundation Basemat Monitoring Program required by Waterford 3 Technical Specification Section 6.8.4.e has been established to provide continuing assurance of basemat integrity and to ensure that conditions within the basemat do not change significantly. The monitoring program is being implemented according to Entergy Operations, Inc. Surveillance Procedures PE-5-033 and CE-2-100 (References 1 & 2). These reports have been prepared at approximately 18 month intervals since Waterford 3 has been in operation.

2.0 SCOPE

This report documents the results of the Nuclear Plant Island Structure (NPIS) Common Foundation Basemat Monitoring Program for the four areas specified in Technical Specification Section 6.8.4.e. The four areas are:

a. Basemat differential settlement

b. Groundwater chemistry

c. Seasonal variation in groundwater level

d. Crack surveillance

The Basemat Monitoring Special Report No. 3 (Reference 3), issued in June, 1990 covered the monitoring data collected through March, 1990. This report is an extension of the previous report and adds the surveillance data collected in May, 1990 through August, 1991.

3.0 CONCLUSION

The Basemat Monitoring Program has been active since Waterford 3 has been in operation. The results of the monitoring program are summarized below.

3.0 CONCLUSION (CONTINUED)

a. Basemat Differential Settlement - The calculated differential settlements for all eight sets of monitoring points are within the specified action limits of ±1.0 inch specified in References 1 and 4. The maximum differential during this reporting period was 0.492 inches (settlement), noted in February, 1991 for the east side.

b. Groundwater Chemistry - The maximum level of groundwater chloride content analyzed was for this reporting period. The level recorded was 56.10 ppm in May, 1991 for the west side, which was still substantially below the defined limit of 250 ppm specified in Reference 4.

c. Seasonal Variation in Groundwater Level - Groundwater level variation is small and is similar in the east and west wells. The overall variation is 3.45 feet for the east well and 4.81 feet for the west well.

d. Crack Surveillance - Fluctuation in crack width of the fifteen instrumented cracks over the surveillance period is below the prescribed action limit of 15 mils (0.015 inch) specified in References 1 and 4. The maximum increase in crack width measured for this period is 3.00 mils for Crack No. 12 for August, 1991. The crack width variation is cyclic without much fluctuation from its established baseline reading.

The data collected between May, 1990 and August, 1991 has satisfactorily been below the action limits requirements and no unusual behavior of the basemat has been detected. The continued integrity of the basemat has, therefore, been verified by the surveillance program.

4.0 BACKGROUND AND PROGRAM OVERVIEW

A surveillance program for the Nuclear Power Plant Island Structure (NPIS) Common Foundation Basemat has been in place since 1985 and was instituted to provide continuing assurance of basemat integrity and to ensure that conditions within the basemat do not change significantly.

The Basemat Surveillance Program is divided into four major areas:

a. Basemat elevation, which is the primary method of identifying the gross response of the basemat to loading, soil consolidation and environmental changes, and flexural variations within the basemat.

4.0 BACKGROUND AND PROGRAM OVERVIEW (CONTINUED)

b. Groundwater chemistry to detect any changes from the current absence of significant rebar corrosion potential within the basemat.

c. Groundwater level to detect any correlation of fluctuations in the groundwater level with measured basemat movements or measured changes in crack width.

d. Crack surveillance to provide an indication of changes in the state of strain at the top surface of the basemat.

The first Basemat Special Report was submitted for the data collected through December, 1986 as part of the surveillance program to the NRC via Reference 5 on January 5, 1987. The second Basemat Special Report documenting and evaluating the data collected through August, 1988 was submitted to the NRC via Reference 6 in September, 1988. The third Basemat Special Report evaluating the data through March, 1990 was submitted to the NRC via Reference 3 in June, 1990.

The analysis of the data collected demonstrated that for the four major areas of the Basemat Surveillance Program, there was no unusual behavior of the basemat. The reports verified that the basemat continued to perform as designed with all the data below the action limits requirements.

4.1 Surveillance Frequency

a. Basemat Elevation Survey

As described in Basemat Special Report No. 3 (Reference 3), Waterford 3 had successfully completed the quarterly surveys and had begun their semi-annual readings. Four consecutive surveillances have been performed with the first one in March, 1990 and the last one in August, 1991.

In accordance with Procedure PE-5-033, since no significant changes were observed and no adverse or unexplained data has been obtained, Waterford 3 will extend the interval to annually.

b. Groundwater Chemistry

Sampling and analysis of groundwater for chloride content is being performed quarterly.

4.1 Surveillance Frequency (Continued)

c. Seasonal Groundwater Levels

Groundwater level readings are being taken on a quarterly basis at the same time as the groundwater chemistry samples are taken.

d. Crack Surveillance

The crack width monitoring follows the same surveillance frequency stated in Section 4.1.a for the basemat elevation surveys. The semi-annual frequency has successfully been completed and the interval will be lengthened to annually.

5.0 RESULTS AND DISCUSSIONS

The surveillance data collected through August, 1991 for each element of the Basemat Monitoring Program is presented in the following subsections.

5.1 Survey Improvements

The existing offsite master benchmark used for all surveying done on the Waterford 3 site is located on a footing of the abandoned transmission tower located about one half mile east of the plant.

The long distance between the benchmark and the plant site makes it difficult to close the survey loop in one day within the allowable tolerances due to heavy vehicular traffic on adjacent Highway 18 and other factors such as wind and temperature. In an effort to improve the surveying procedure, two permanent benchmarks (SBM-A and SBM-B) with protective bumper guards were installed on the plant site located outside the protected area fence (see Figure 2).

Entergy Operations, Inc.'s intention was to use the new onsite permanent benchmarks instead of the offsite benchmark to perform the surveys. It was believed that the vicinity of the onsite benchmarks would give more control over the survey and eliminate possible error introduced due to the distance traversed.

The elevations of SBM-A and SBM-B were established in March, 1990 at 15.195 feet and 16.653 feet, respectively. Since March, 1990 the elevation of these benchmarks have been surveyed three times.

5.1 Survey Improvements (Continued)

Surveys were performed in August of 1990, in February of 1991, and in August of 1991. The average elevations of these benchmarks are 0.011 feet lower than the original established elevations.

In August, 1990 SBM-A was surveyed at 15.189 feet and SBM-B at 16.645 feet. Since these elevations were within the tolerance specified in Reference 1, $\pm$0.008 feet from the established elevation, they were not resurveyed. Furthermore, the loop closed within 0.001 feet, well within the allowable closure error of $\pm$0.01 feet stated in Reference 1.

On February 25, 1991 SBM-A was determined to be 15.180 feet with a closure error of 0.009 feet. SBM-B, which was based on SBM-A's reading, was surveyed at 16.641 feet. Since SBM-A's surveyed elevation was 0.015 feet lower than the established elevation of 15.195 feet, SBM-A was surveyed again on March 4, 1991. The second survey established the elevation at 15.188 feet. The average of the first and second survey for SBM-A elevation, 15.184 feet, was then used in determining the rest of the basemat monitoring points elevations.

On August 28, 1991 SBM-A was again determined to be 15.180 feet with a closure error of 0.009 feet. Once again, since the elevation was 0.015 feet lower than the established elevation, it was surveyed again on September 3, 1991 and determined to be 15.183 feet.

The average elevation of these two surveys, 15.182 feet, was used to adjust the remaining basemat monitoring elevations.

Subsequently, the onsite benchmarks' elevations will continue to be surveyed each surveillance interval using the offsite benchmark. As stated earlier, the current interval is annually and will be lengthened to every refueling outage after three consecutive satisfactory surveillances. This will satisfy one of the requirements of Reference 1, the old master benchmark shall be utilized at least once per 18 months to verify the elevations of SBM-A and SBM-B. This concurs with the NRC request stated in Reference 7 to utilize the master benchmark at specified intervals to verify the elevations of SBM-A and SBM-B.

5.2 Basemat Elevation Survey Results

Differential movements of eight points located at the east and west edges of the NPIS foundation mat relative to the two points located adjacent to the shield building are being monitored and compared with the action limit of ±1.0 inch. The baseline differentials for the eight sets of monitoring points were established in July, 1984 and recorded in Table 1. Listed in Table 2 are the differences between the eight sets of differentials settlements and their corresponding baseline differentials for the entire period of December, 1985 through August, 1991. These eight sets of settlement point differentials relative to their baselines are also pictorially represented in Figures 5, 6, 7, and 8.

The maximum difference between the calculated differential settlements for this period and their corresponding baseline differentials was 0.492 inch (settlement) which was noted in February, 1991 between monitoring points "E5" and "F". Since the differential settlements for this reporting period are within the action limits, less than ±1.0 inch, without any unusual behavior, the element of the surveillance program related to the basemat differential settlements during this period is acceptable.

No distinct trend has been identified among the differential settlements; however, the following observations have been concluded. The differential settlements between points E5-M9 and M11A-M10 are comparable with similar patterns and differential settlements. These points are mirror images with one set of points on the east side and the other on the west side. The set of points E5-M9 and M11A-M13 are also opposite each. The differential settlements of these points are not as cyclic as the points on the south and north sides of the mat. Their fluctuations are small.

The set of points on the southeast side of the mat, generally have a higher differential settlement than the set of points on the southwest side M11A-A and M11A-D. Differential settlements of M11A-A and M11A-D show similar patterns.

The results of the three surveys for this reporting period are represented as contour plots which depict the behavior of the foundation mat. The contours represent the settlements of the 37 monitoring points located on the surface of the basemat (see Figure 4) for this reporting period relative to their elevations in December, 1985. The contour plots for these three surveys are shown on Figures 9, 10 and 11.

5.2 Basemat Elevation Survey Results

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The set of points on the southeast side of the mat, E5-F, generally have a higher differential settlement than the set of points on the southwest side M11A-A and M11A-D. Differential settlements of M11A-A and M11A-D follow similar patterns.

The results of the three surveys for this reporting period are represented as contour plots which depict the flexural behavior of the foundation mat. The contour plots represent the settlements of the 37 monitoring points, located on the surface of the basemat (see Figure 1), for this reporting period relative to their elevation in December, 1985. The contour plots for these three surveys are shown on Figures 9, 10 and 11.

5.2 Basemat Elevation Survey Results (Continued)

The elevation variation for the 37 monitoring points with respect to the July, 1984 or December, 1985 reading are shown in Figures 12 through 30. The first available elevation reading is represented by the initial zero reading of the plot. A dotted line in the graph represents a lack of elevation reading for that period. Twenty-seven out of thirty-seven monitoring points are compared with the December, 1985 actual or derived readings and the rest of the ten points are compared with the July, 1984 readings.

A review of the contour plots and the graphs depicting elevation variations of the monitoring points reveals that the basemat settlement is cyclic with a slight overall gradual settlement. The west side of the plant appears to have settled slightly lower than the east side. The basemat elevation surveillance is considered satisfactory and acceptable since no unusual behavior in the contour configuration and elevation survey of the monitoring points has been observed.

5.3 Groundwater Chemistry

The chloride content of the groundwater has been analyzed in accordance with Entergy Operations Surveillance Procedure CE-2-100 (Reference 2). The groundwater chloride content values obtained from the start of the surveillance program through August, 1991 are listed in Table 3 and plotted on Figure 31.

The chloride content varied from 5.23 ppm to 48.0 ppm for the east well and from a low of 5.0 ppm to a high of 56.10 ppm for the west well. These ranges are based from the start of the program to August, 1991. These values are well below the action limit of maximum 250 ppm and are, therefore, acceptable.

5.4 Seasonal Groundwater Levels

The groundwater elevation in the two wells from the start of the program through August, 1991 are listed in Table 4 and plotted on Figure 32.

The seasonal variation of groundwater levels is usually similar between both wells. The overall variation is 3.45 feet for the east well and 4.81 feet for the west well.

In the past, the variation in groundwater elevation between the west and east well ranged from 0.00 feet to 0.30 feet.

5.4 Seasonal Groundwater Levels (Continued)

However, in May, 1991 the west well was 0.47 feet higher than the east well and in August, 1991 the west well was 0.90 feet lower than the east.

Also, the groundwater elevation in August, 1991 was the lowest recorded. The east well's elevation was 9.60 feet and the west well's elevation was 8.70 feet. Prior to that, the elevation varied from 10.70 to 13.05 feet for the east well and 10.97 to 13.51 feet for the west well.

5.5 Cracks Surveillance

The change in crack widths without temperature corrections for the fifteen instrumented cracks are listed in Table 5. Table 6 shows crack width variations after temperature correction is applied. The values given in the tables are cumulative variations in crack width with respect to the baseline reading which was established in August, 1986 for Crack Nos. 3, 5, 11 and 12 and May, 1987 for the remaining eleven cracks. Shown on Figure 4 are the locations of the fifteen cracks.

The crack width variation with respect to its base reading for each crack from start to August, 1991 is pictorially represented in Figures 33 through 40.

The results show that the maximum increase in crack width was 4.65 mils which was measured in March, 1988 for Crack No. 12 as reported in Special Report No. 2 (Reference 6). This variation has since been reduced to 3.00 mils as reported in the August, 1991 surveillance. The crack width variations for all the cracks, with the exception of Cracks 3 and 12, do not fluctuate more than 3.15 mils from their baseline readings. Other than the crack width measurement of -3.45 mils report for Crack 3, all other variations for this crack is less than or equal to 1.00 mils.

A crack width of -3.45 mils was measured in February, 1991 for Crack 3. However, comparing this data to the previous and later data for this crack, it appears that this is an erroneous reading. Neither this crack or any other cracks have a crack width variance this low.

The thermal reading for this crack is higher than the thermal readings for the adjacent cracks for this surveillance. It can be concluded that this erroneous reading is the contributing factor for the lower reading.

5.5 Cracks Surveillance

Since the crack width variations were below the action limit, 15 mils, the crack surveillance element of the monitoring program for this period was satisfactory and acceptable.

REFERENCES

1. Entergy Operations Surveillance Procedure, "NPIS Common Foundation Basemat Integrity Check," PE-5-033, Revision 4.

2. Entergy Operations Surveillance Procedure, "Chemistry Technical Specifications, Surveillance Performance Coordination," CE-2-100, Revision 6.

3. Entergy Operations, Inc. Report, "Waterford Steam Electric Station Unit No. 3, Basemat Monitoring Program Special Report No. 3," June, 1990.

4. LP&L report, "Waterford Steam Electric Station Unit No. 3, Basemat Summary Report," July, 1987.

5. LP&L Report, "Waterford Steam Electric Station Unit No. 3, Basemat Monitoring Program Special Report," December 30, 1986.

6. LP&L Report, "Waterford Steam Electric Station Unit No. 3, Basemat Monitoring Program Special Report No. 2," September, 1988.

7. NRC letter, D. L. Wigginton (USNRC) to LP&L, Summary of Meeting Held on April 18, 1990 with LP&L to Discuss the Settlement Monitoring, Basemat Crack Monitoring, and Groundwater Level Monitoring Programs, Docket No. 50-383 - May 23, 1990.

TABLE 1

ENTERGY OPERATIONS, INC.
WATERFORD STEAM ELECTRIC STATION
UNIT NO. 3

BASEMAT MONITORING PROGRAM
REPORT NO. 4

BASEMAT SETTLEMENT MONITORING
BASEMAT EDGE TO SHIELD BUILDING
BASELINE DIFFERENTIAL CALCULATION
(JULY, 1984)

Monitoring Points	Baseline Elevations (Ft)		Baseline Differential (Ft)
E5 - M9	(-35.284)-(-35.286)	=	+0.002
E5 - E13	(-35.284)-(-35.334)	=	+0.050
E5 - E14	(-35.284)-(-35.336)	=	+0.052
E5 - F	(-35.284)-(-35.438)	=	+0.154
M11A - M10	(-35.364)-(-35.440)	=	+0.076
M11A - M13	(-35.364)-(-35.288)	=	-0.076
M11A - A	(-35.364)-(-35.420)	=	+0.056
M11A - D	(-35.364)-(-35.606)	=	+0.242

NOTE: For location of Monitoring Points, see Figure 1.

TABLE 2

ENTERGY OPERATIONS, INC.
WATERFORD STEAM ELECTRIC STATION
UNIT NO. 3

BASEMAT MONITORING PROGRAM
REPORT NO. 4

SETTLEMENT POINTS DIFFERENTIAL RELATIVE
TO JULY, 1984 BASELINE (b)
(INCH)

(Action Limit) = ± 1.0 Inch)

MONITOR-ING POINTS (a)	DEC 85	JUL 86	DEC 86	JUN 87	SEP 87	DEC 87	MAR 88	AUG 88	NOV 88	FEB 89	MAY 89	AUG 89	MAR 90	AUG 90	FEB 91	AUG 91
E5-M9	0.156	0.180	0.192	0.168	0.168	0.348	0.324	0.132	0.336	0.336	0.276	0.264	0.360	0.216	0.420	0.264
E5-E13					0.120	0.276	0.324	0.114	0.252	0.192	0.288	0.300	0.288	0.216	0.300	0.240
E5-E14					0.096	0.300	0.324	0.091	0.192	0.156	0.264	0.288	0.240	0.168	0.228	0.216
E5-F	0.540	0.228	0.084	0.480	0.408	0.468	0.456	0.310	0.288	0.468	0.276	0.420	0.360	0.300	0.492	0.384
M11A-M10	0.228	0.168	0.288	0.084	0.216	0.312	0.348	0.215	0.408	0.300	0.264	0.252	0.324	0.180	0.408	0.336
M11A-M13	0.036	0.060	0.060	0.084	0.108	0.156	0.144	0.145	0.192	0.132	0.096	0.156	0.132	0.132	0.180	0.168
M11A-A	-0.024	-0.156	-0.024	0.036	0.420	0.036	0.420	0.102	0.096	-0.060	-0.024	0.036	-0.060	-0.060	0.240	0.312
M11A-D	-0.060	-0.120	-0.024	0.000	0.396	0.060	0.384	0.024	0.108	-0.024	-0.036	0.000	-0.024	-0.096	0.252	0.300

NOTES: (a) For location of monitoring points, see Figure 1.

(b) Differentials are calculated as "Baseline Differential" minus "Actual Differential."
Sign convention: A (+) differential indicates settlement, whereas, a (-) differential indicates heaving of the Basemat.

TABLE 3

ENTERGY OPERATIONS, INC.
WATERFORD STEAM ELECTRIC STATION
UNIT NO. 3

BASEMAT MONITORING PROGRAM
REPORT NO. 4

NUCLEAR PLANT ISLAND STRUCTURE
GROUNDWATER CHLORIDE CONTENT (ppm)

(Action Limit = 250 ppm)

DATE	LOCATION	
	EAST WELL	WEST WELL
08/29/84	22.00	17.50
11/29/84	35.00	28.50
03/04/85	37.00	25.00
06/13/85	35.00	22.00
09/21/85	23.00	14.40
11/25/85	46.00	18.00
03/06/86	35.00	16.00
06/02/86	33.00	15.00
09/05/86	33.00	20.00
11/20/86	31.00	20.00
02/26/87	38.00	15.00
06/09/87	48.00	7.80
09/03/87	22.00	5.00
12/14/87	36.00	7.70
03/15/88	22.50	24.80
06/14/88	29.80	10.10
08/15/88	21.00	6.10
11/17/88	17.00	4.8
02/20/89	21.00	5.60
05/15/89	15.90	5.20
08/15/89	12.70	5.00
11/14/89	43.20	15.00
02/23/90	19.50	16.70
05/16/90	15.50	14.50
08/29/90	32.59	16.42
11/16/90	49.10	18.20
02/18/91	21.70	11.30
05/31/91	5.23	56.10
08/28/91	19.90	6.70

NOTE: For location of wells, see Figure 2.

TABLE 4

ENTERGY OPERATIONS, INC.
WATERFORD STEAM ELECTRIC STATION
UNIT NO. 3

BASEMAT MONITORING PROGRAM
REPORT NO. 4

NUCLEAR PLANT ISLAND STRUCTURE
GROUNDWATER ELEVATION (FT.)

(No Action Limit)

DATE	LOCATION	
	EAST WELL	WEST WELL
06/13/85	11.50	11.50
09/21/85	10.70	10.97
11/25/85	11.65	11.52
03/06/86	11.57	11.70
06/02/86	11.67	11.80
09/05/86	11.75	11.91
11/20/86	11.90	12.11
02/26/87	12.00	12.01
06/09/87	12.05	12.35
09/03/87	11.90	12.11
12/14/87	11.36	11.18
03/15/88	12.00	12.16
06/14/88	11.92	12.13
08/18/88	12.23	12.26
11/17/88	11.65	11.81
02/20/89	11.60	11.61
05/15/89	12.15	12.02
08/15/89	12.15	12.39
11/14/89	12.10	11.85
02/23/90	12.90	13.00
05/16/90	12.23	12.21
08/29/90	11.45	11.55
11/16/90	11.45	11.36
02/18/91	13.05	12.86
05/31/91	13.04	13.51
08/28/91	9.60	8.70

NOTE: For location of wells, see Figure 2.

TABLE 5

ENTERGY OPERATIONS, INC.
WATERFORD STEAM ELECTRIC STATION
UNIT NO. 3

BASEMAT MONITORING PROGRAM
REPORT NO. 4

CRACK WIDTH MONITORING
CHANGE IN CRACK WIDTH IN MILS (0.001 IN.)

WITHOUT TEMPERATURE CORRECTION

CRACK NO.	NOV 86	FEB 87	MAY 87	SEPT 87	DEC 87	MAR 88	JUNE 88	AUG 88	NOV 88	FEB 89	MAY 89	AUG 89	MAR 90	AUG 90	FEB 91	AUG 91
1				0.45	1.40	1.85	0.90	0.50	0.45	1.30	-0.65	-1.30	-1.50	-1.30	-1.85	-3.60
2				0.15	1.00	1.70	0.40	0.25	0.90	1.05	-2.05	-1.90	-0.70	-0.75	-1.10	-0.50
3	-0.40	-0.20	-0.20	-0.20	-0.10	1.35	0.05	0.00	0.25	1.20	-2.50	-2.80	-1.75	-1.30	-3.15	-2.00
4				0.05	3.15	3.35	0.60	0.05	0.90	2.70	-1.25	-2.00	-0.20	-0.20	1.50	-1.75
5	-0.10	0.00	-0.50	-0.05	1.20	1.10	0.65	0.00	0.70	0.70	-1.60	0.30	-1.70	-2.05	-0.15	-2.50
6				-0.15	-0.50	0.15	-0.25	-0.45	-0.20	0.00	-2.85	-2.60	-2.30	-2.25	-2.30	-1.60
7				0.40	0.90	0.80	0.15	0.05	0.10	0.15	-2.35	-2.30	-1.55	-1.05	-1.65	-1.90
8				0.50	0.35	1.25	0.20	0.05	-0.20	0.20	-2.50	-2.55	-2.05	-2.25	-1.50	-2.25
9				0.45	0.15	0.25	0.80	0.35	0.45	1.10	-2.30	-2.25	-1.75	-2.05	-0.85	-1.85
10				0.65	0.75	2.00	0.65	0.30	0.85	1.20	-1.90	-1.85	-0.80	-1.25	-0.40	-1.70
11	-0.10	1.50	-0.60	0.35	0.70	1.65	0.55	0.35	0.80	1.05	-1.95	-1.85	-0.95	-1.80	-1.00	-0.05
12	1.30	3.50	0.70	0.10	1.30	3.95	2.30	1.25	1.15	5.35	0.50	-1.15	2.45	-1.45	4.65	1.90
13				0.20	1.10	3.40	-0.05	0.45	0.85	1.90	-1.75	-1.95	-0.75	-0.85	-0.45	-1.65
14				0.00	0.55	2.15	0.45	0.10	0.65	2.20	-1.70	-1.50	-1.40	-2.15	0.03	-2.00
15				0.80	0.95	1.65	0.40	0.90	1.05	1.45	-1.90	-1.75	-1.85	-1.75	-1.00	-1.65

TABLE 6

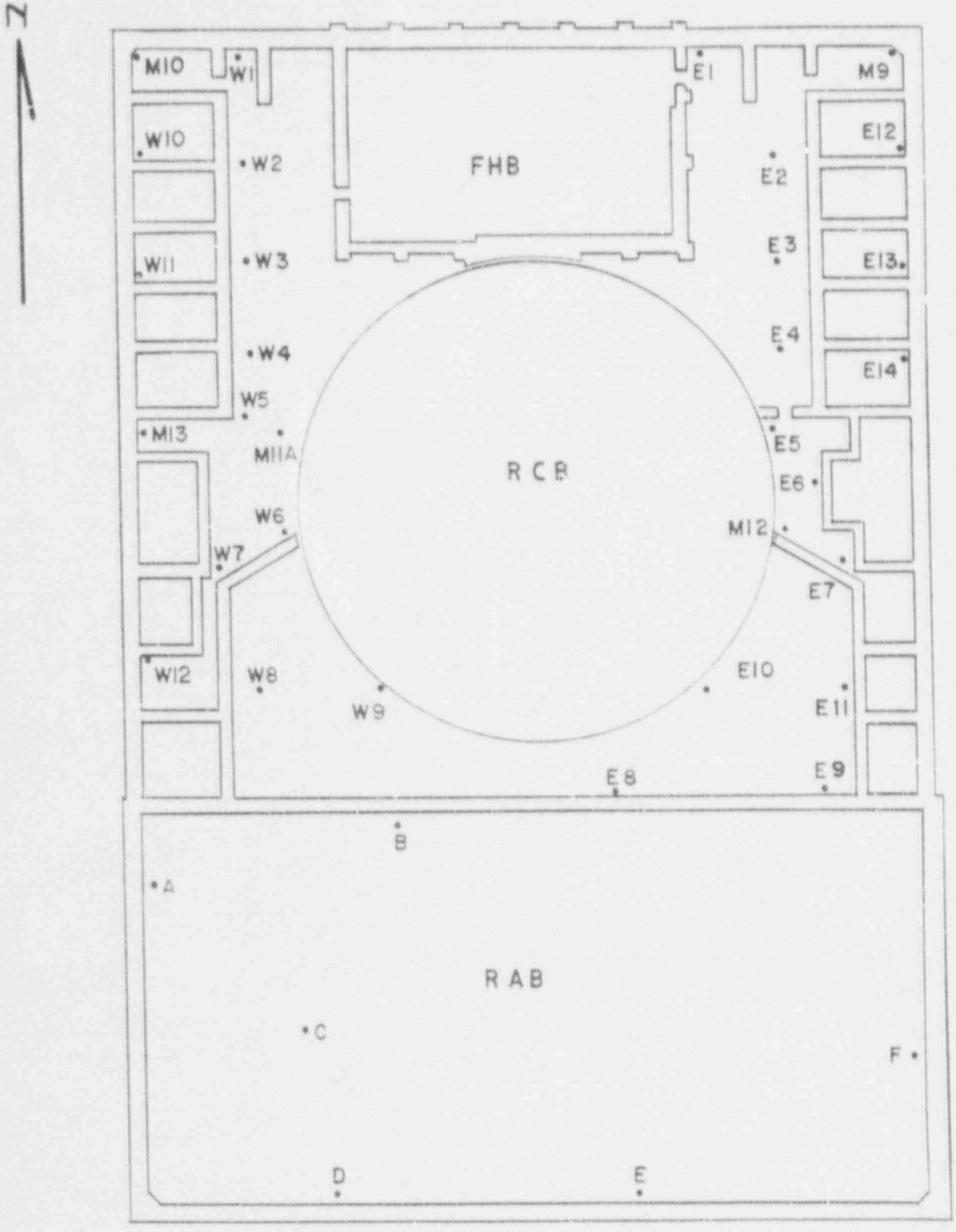
ENTERGY OPERATIONS, INC.
WATERFORD STEAM ELECTRIC STATION
UNIT NO. 3

BASEMAT MONITORING PROGRAM
REPORT NO. 4

CRACK WIDTH MONITORING
CHANGE IN CRACK WIDTH IN MILS (0.001 IN.)

WITH TEMPERATURE CORRECTION

CRACK NO.	NOV 86	FEB 87	MAY 87	SEPT 87	DEC 87	MAR 88	JUNE 88	AUG 88	NOV 88	FEB 89	MAY 89	AUG 89	MAR 90	AUG 90	FEB 91	AUG 91
1				-0.35	-0.20	0.45	0.20	0.10	-0.05	0.30	1.25	1.30	0.90	0.90	0.95	-1.20
2				-0.65	1.30	1.10	-0.90	-0.55	-0.10	0.65	-0.25	-1.10	1.10	1.05	1.80	0.40
3	-0.50	0.30	-0.30	-0.20	-0.40	1.05	0.15	0.20	0.45	0.50	0.20	0.10	0.45	0.60	-3.45	1.00
4				-0.55	2.35	3.15	-0.60	-0.65	0.30	2.00	0.25	-0.30	1.80	1.90	3.00	0.75
5	0.00	0.40	-0.50	-0.35	1.10	0.00	0.35	0.00	0.80	0.20	0.50	3.00	-0.30	-1.05	0.45	-1.50
6				-0.35	-0.70	-0.55	-0.65	-0.65	-0.60	-0.40	-0.55	-0.10	0.20	1.15	-1.00	-0.10
7				-0.30	0.50	0.20	-0.75	-0.55	-0.40	-0.95	-0.25	-0.80	0.55	1.15	0.55	-0.20
8				-0.20	-1.15	0.45	-0.90	-0.75	-1.60	-1.00	-1.00	-0.85	-0.45	-0.35	-0.40	-0.85
9				0.25	-0.15	-0.25	0.00	0.15	0.55	0.80	0.20	-0.05	0.55	0.55	1.05	0.55
10				0.75	0.25	1.40	1.15	0.40	0.35	0.20	0.00	0.15	0.50	0.35	0.70	-0.20
11	-0.50	0.10	-0.50	-0.35	0.50	0.05	1.95	-0.15	0.50	0.45	0.75	0.35	0.65	-0.60	0.10	2.35
12	1.20	3.70	1.00	0.10	1.90	4.65	2.80	1.55	1.05	4.45	-0.50	1.25	1.85	0.25	2.15	3.00
13				0.20	1.00	2.40	-0.15	0.15	0.75	2.50	0.45	0.25	1.05	0.95	2.35	1.65
14				-0.80	0.55	1.95	0.05	-0.90	-0.65	0.80	-0.10	-0.40	0.40	-1.45	1.80	-1.10
15				0.70	1.05	1.75	0.50	1.20	1.75	.35	1.30	1.55	1.45	1.15	2.10	1.95

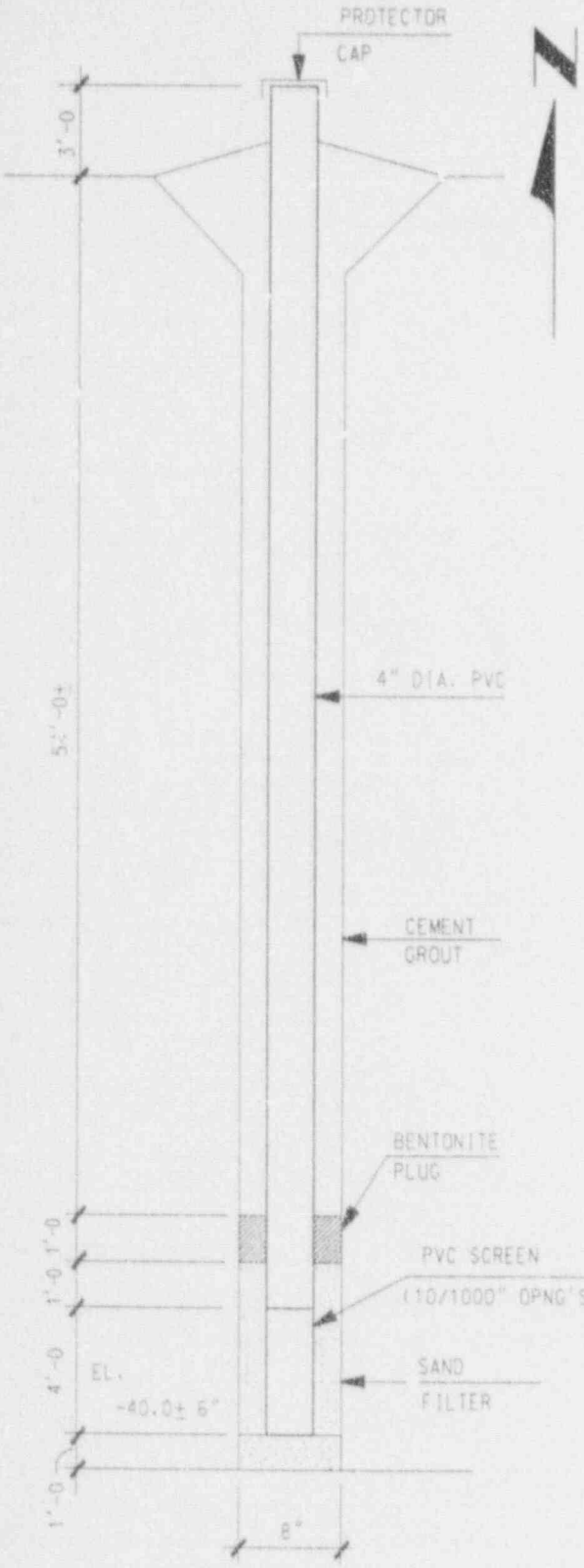


ENTERGY OPERATIONS

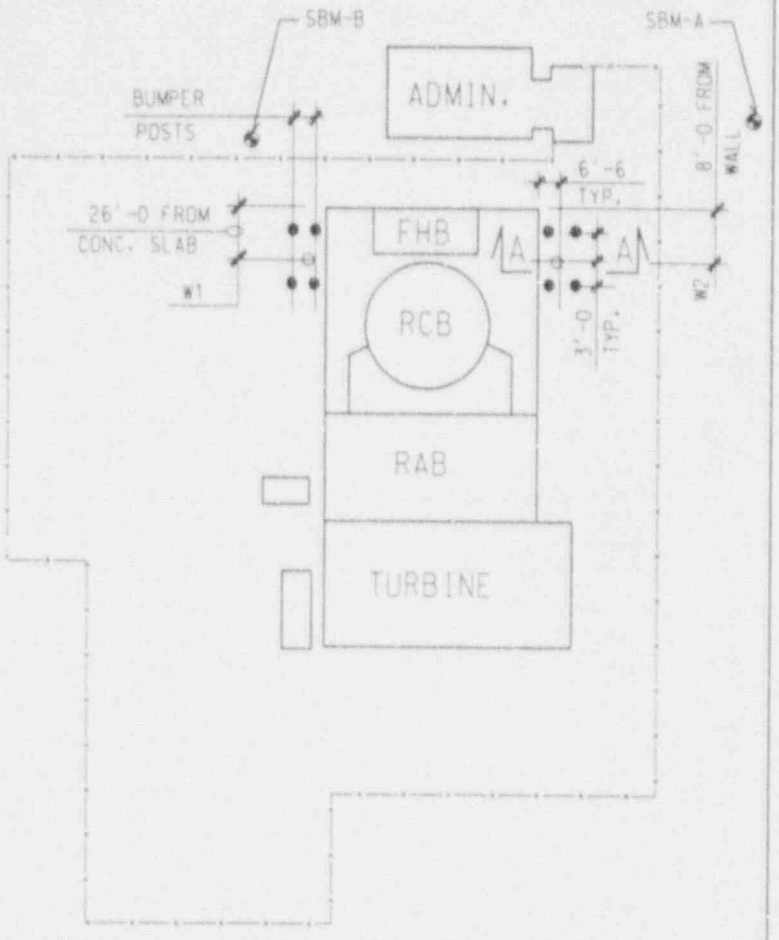
Waterford Steam Electric Station # 3

SETTLEMENT MONITORING POINTS

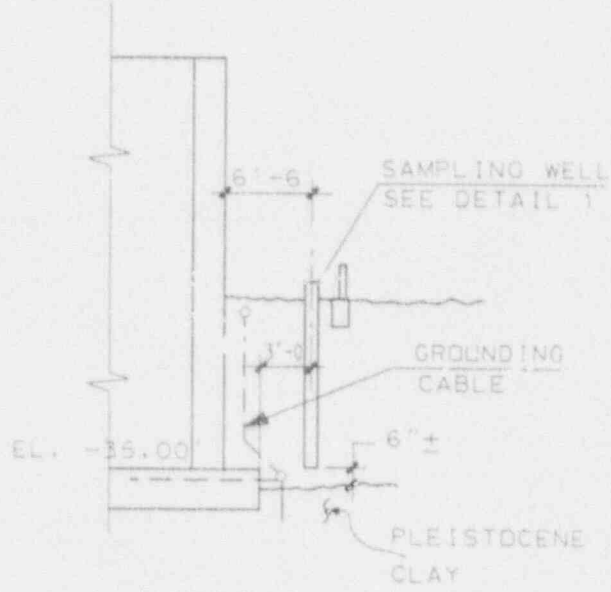
FIGURE 1



DETAIL 1



PLAN



SECTION A

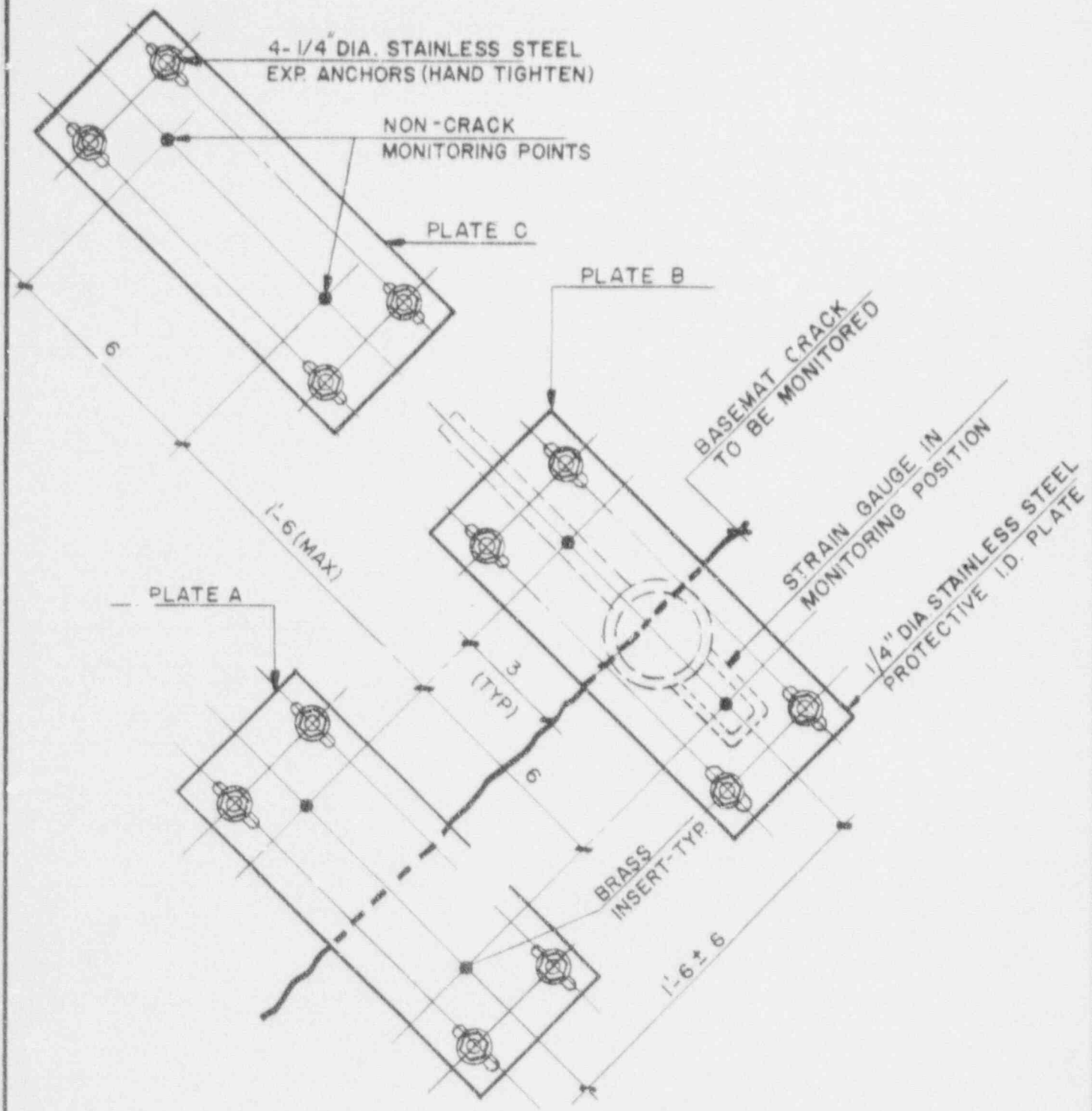
BENCH MARK	N-ft.	W-ft.	ELEVATION
SBM-A	4529.65	3451.87	15.195 ft.
SBM-B	4477.32	3997.30	16.653 ft.

ENTERGY OPERATIONS

Waterford Steam Electric Station Station #3

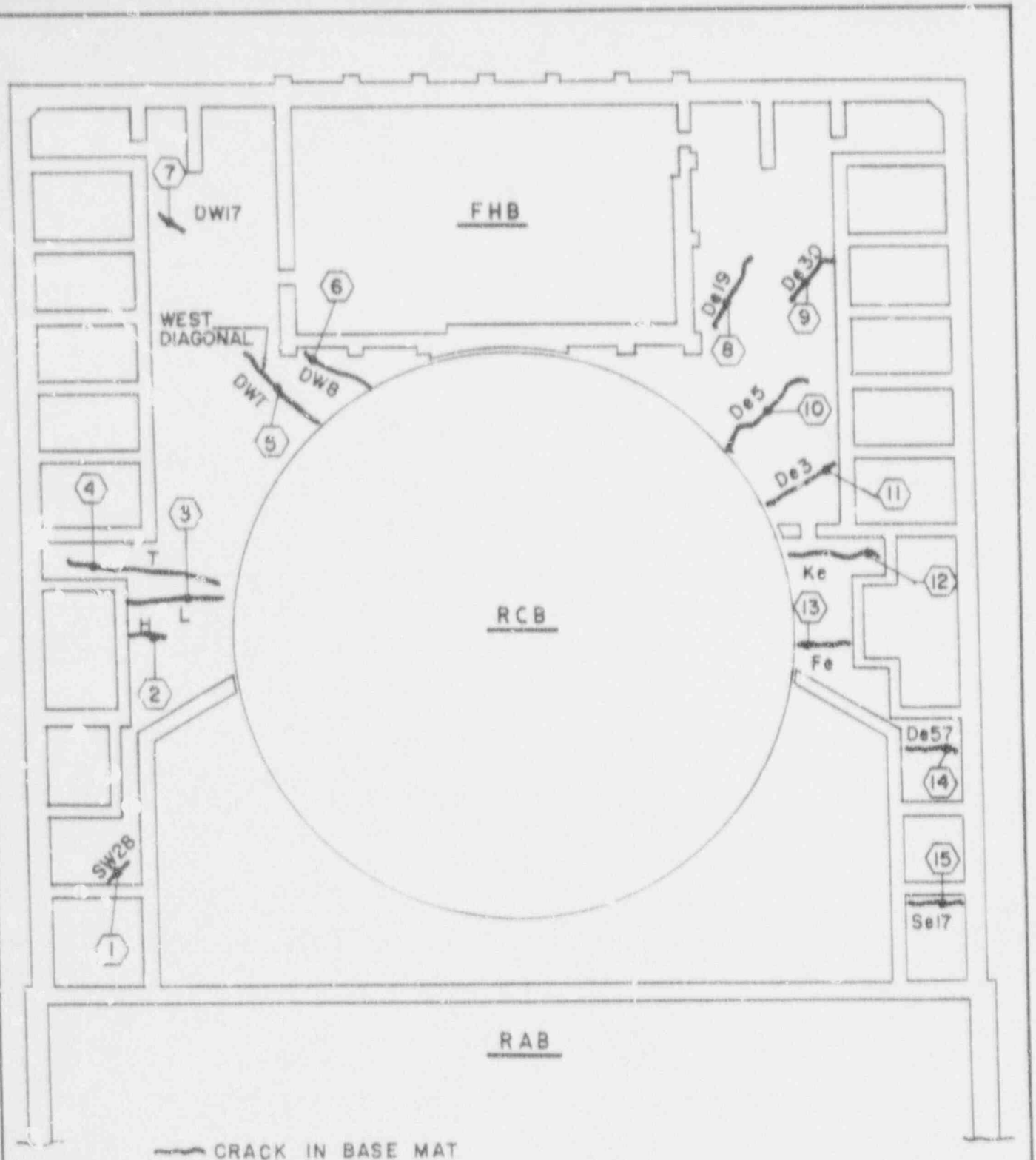
GROUNDWATER SAMPLING WELLS
& PERMANENT ONSITE BENCHMARKS

FIGURE 2



ENTERGY OPERATIONS
Waterford Steam Electric Station # 3

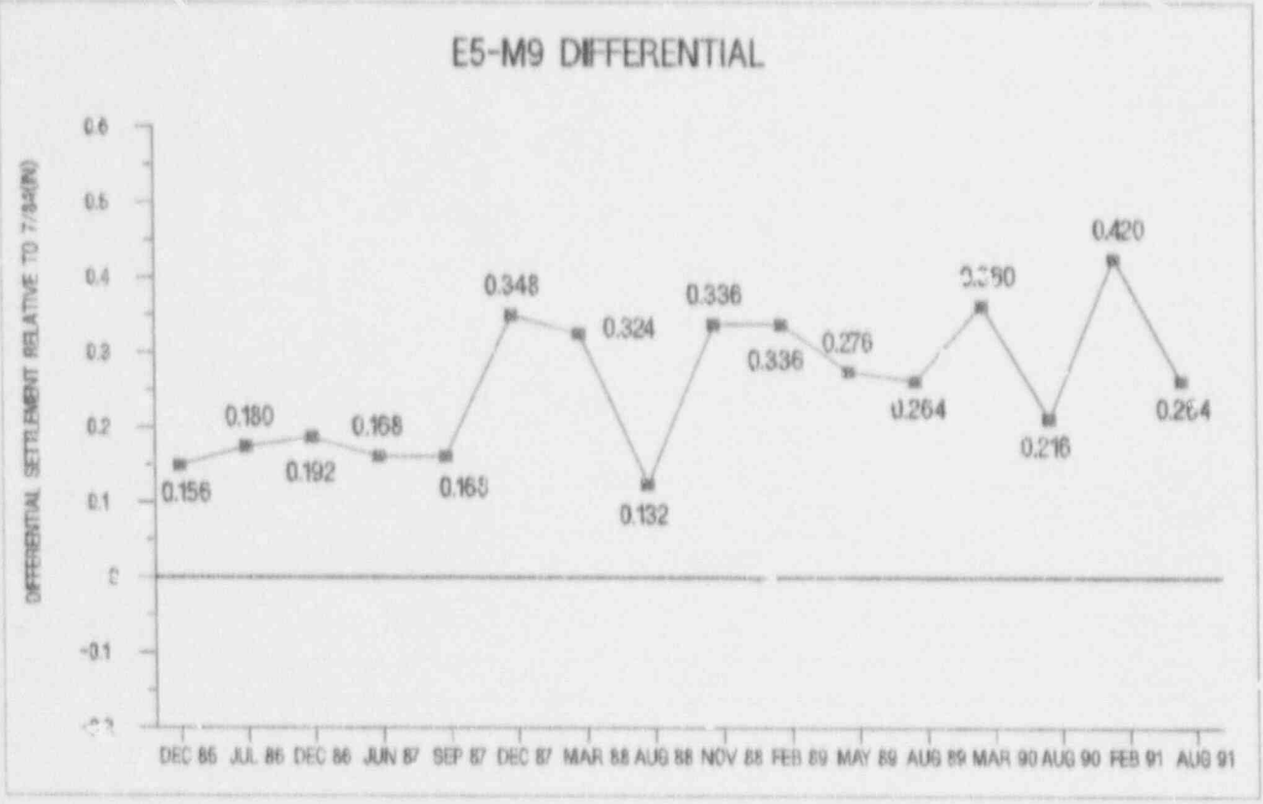
INSTRUMENTED ARRANGEMENT
AT CRACK WIDTH
MONITORING STATION
FIGURE 3

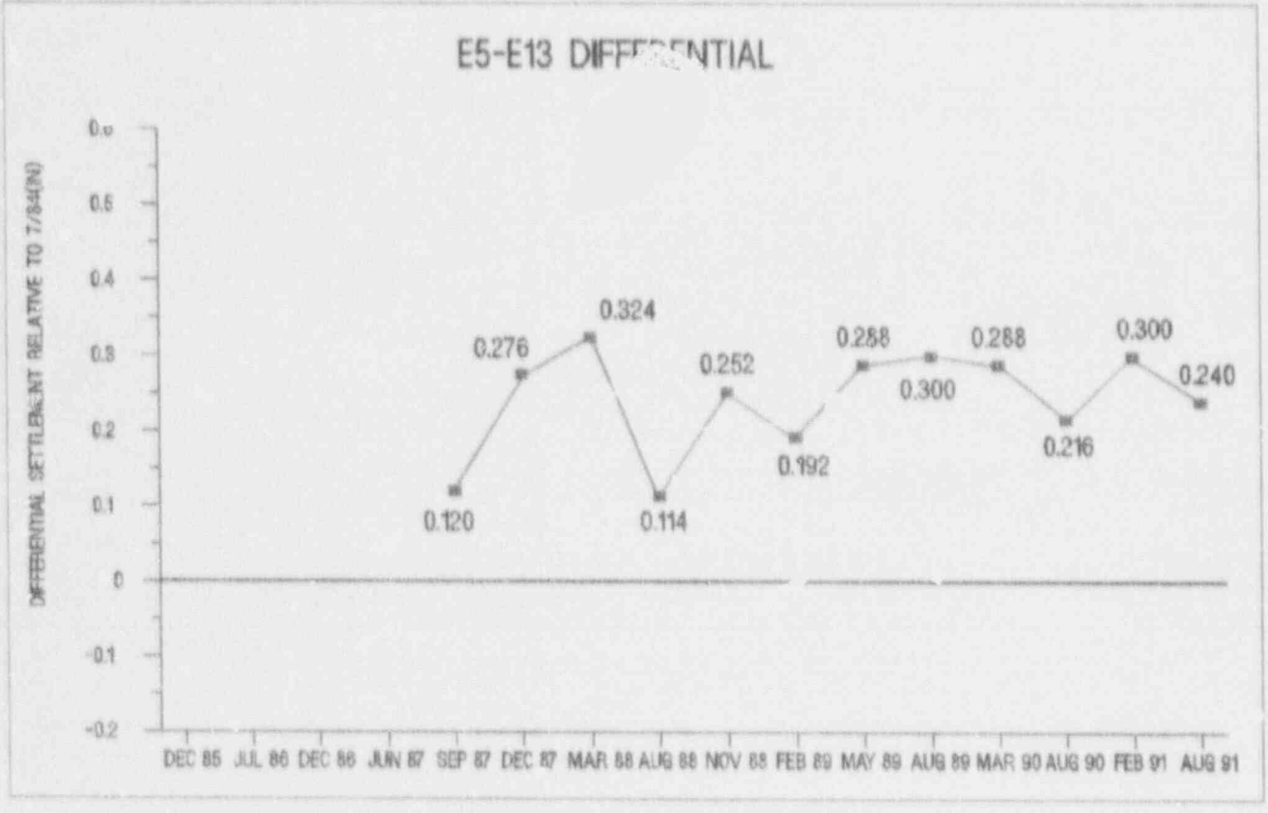


ENTERGY OPERATIONS
Waterford Steam Electric Station #3

CRACK WIDTH MONITORING STATIONS

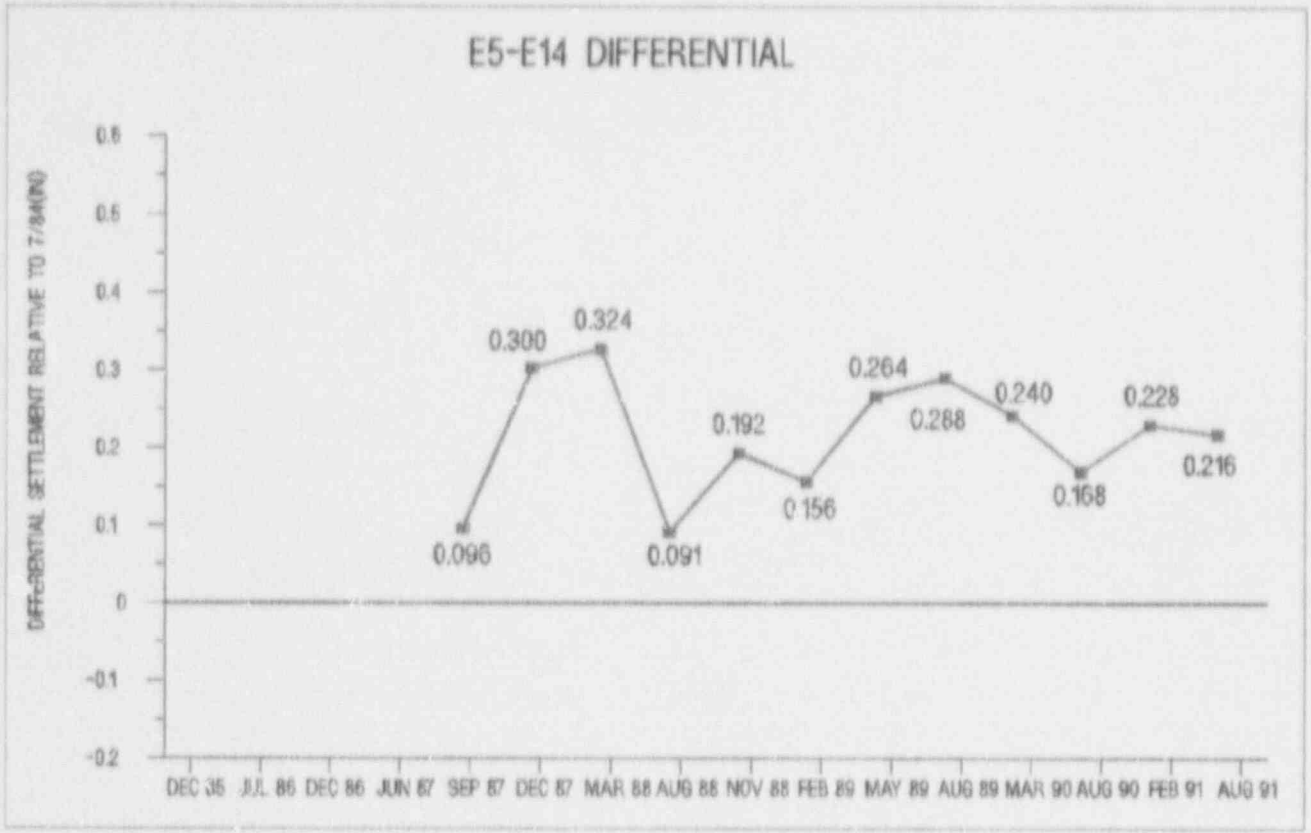
FIGURE 4

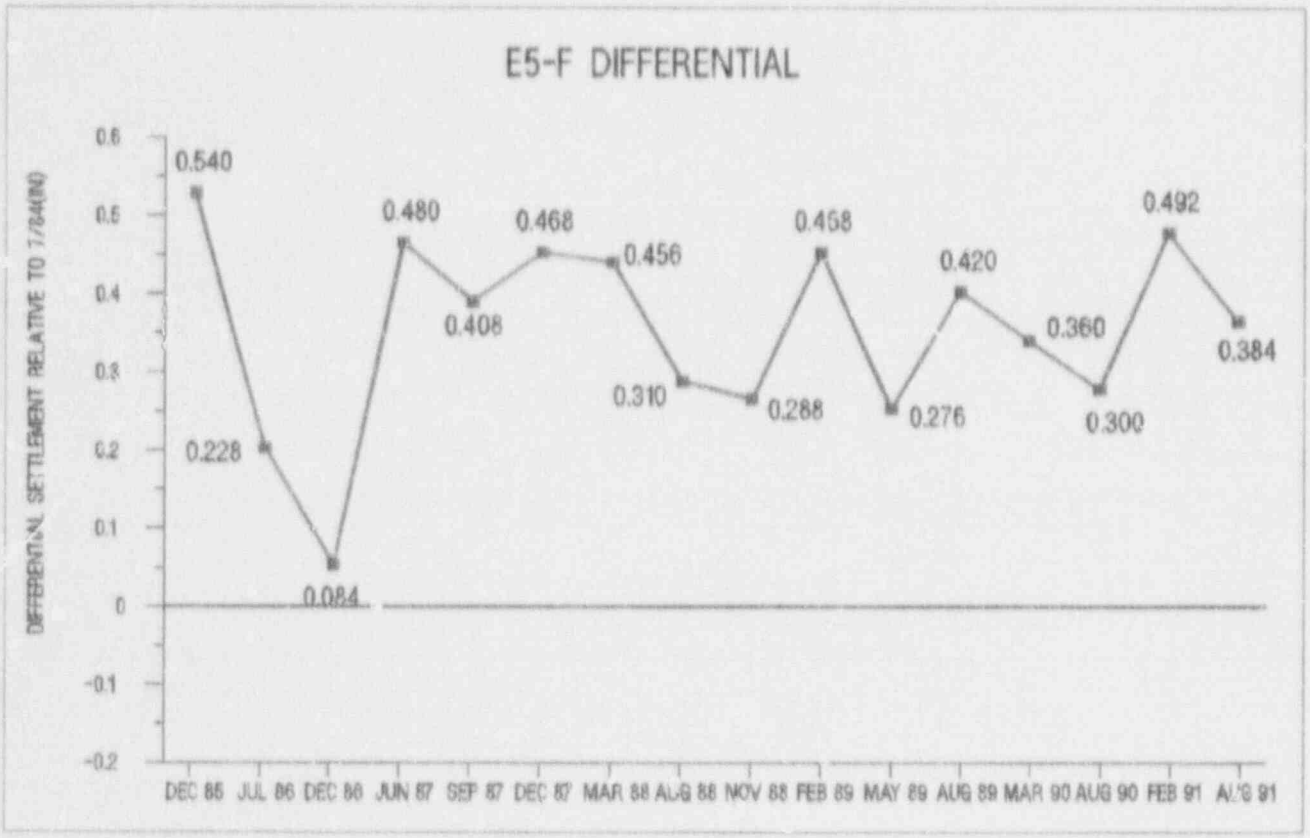




SETTLEMENT POINTS DIFFERENTIAL

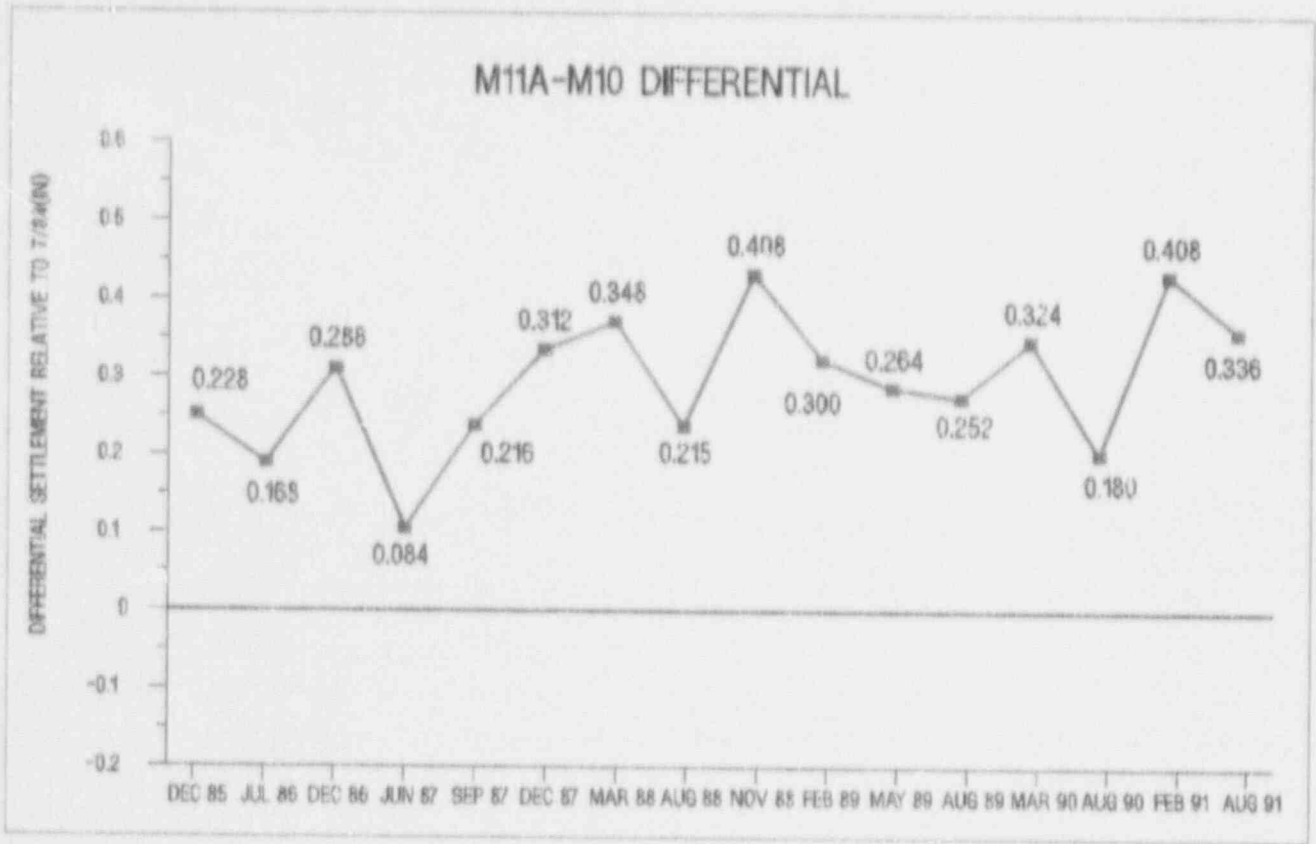
FIGURE 5

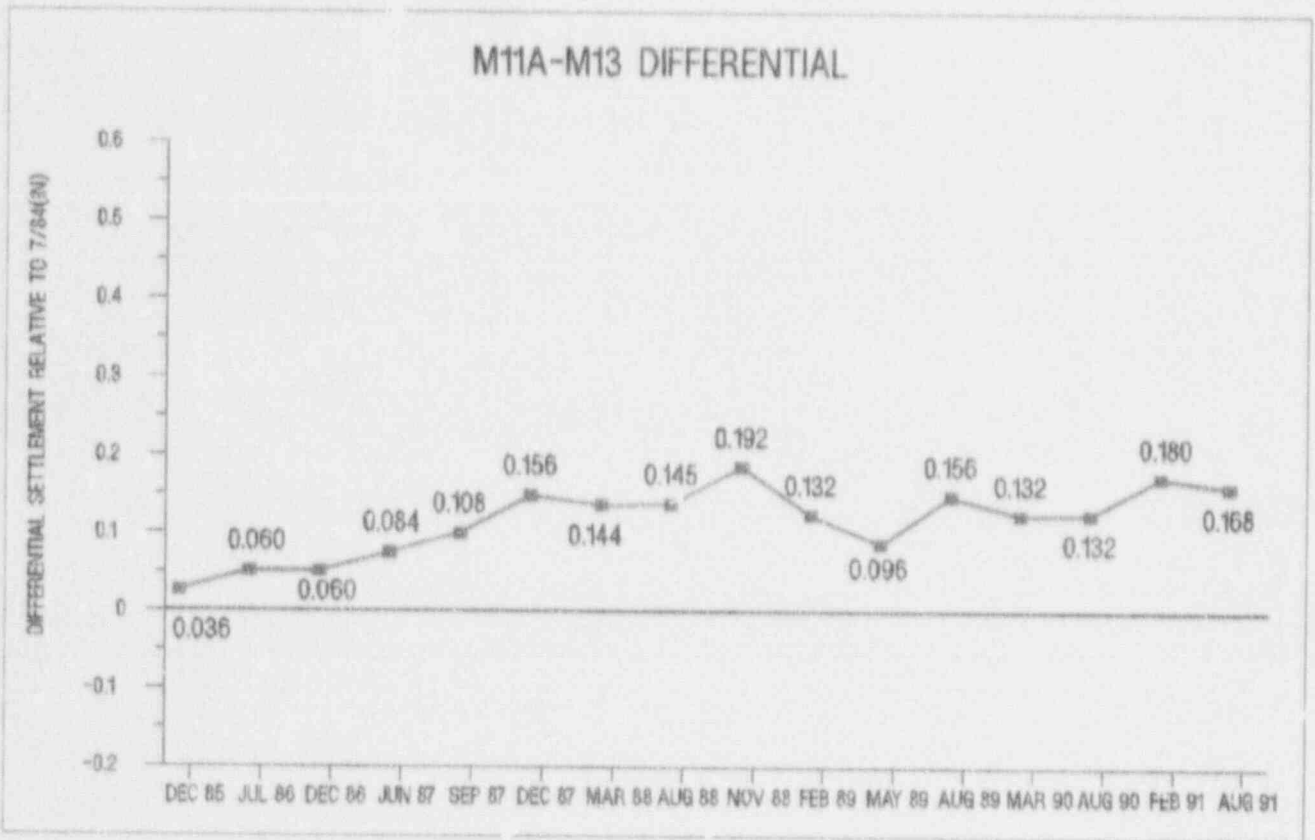




SETTLEMENT POINTS DIFFERENTIAL

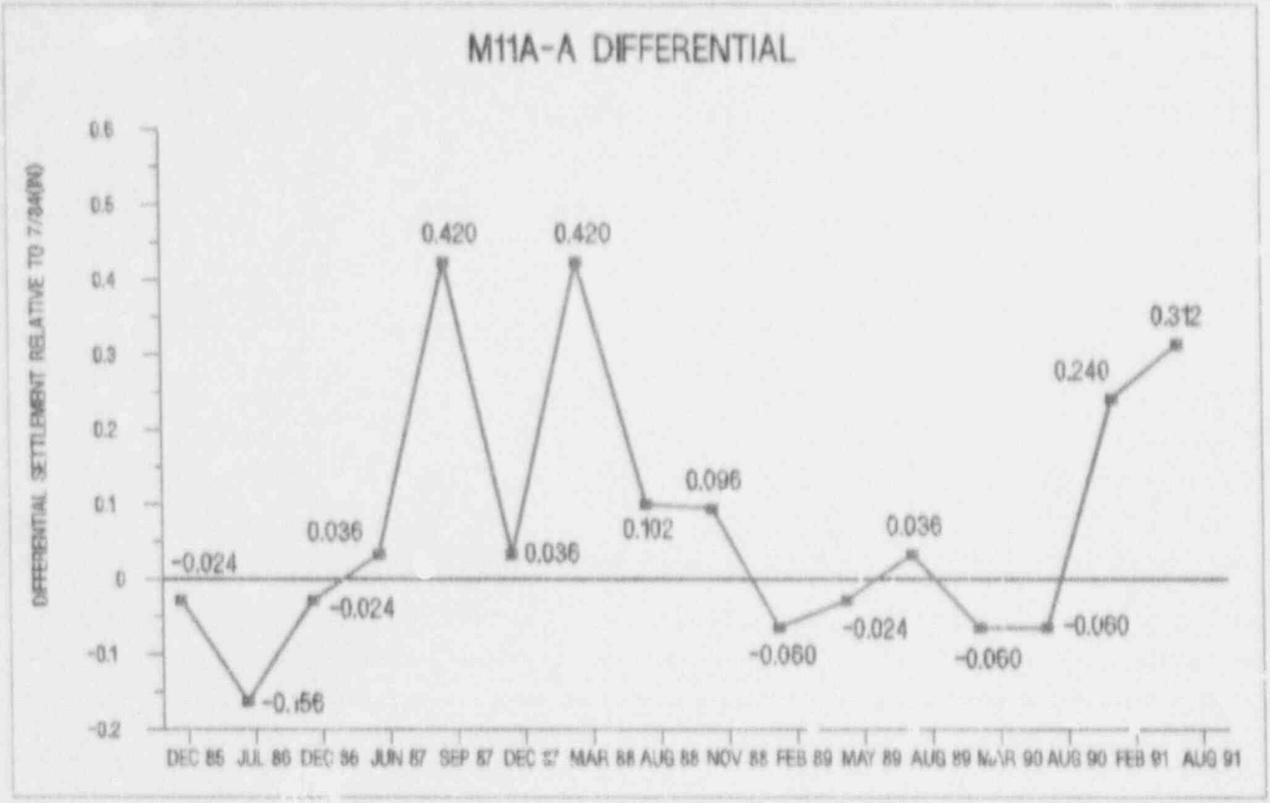
FIGURE 6

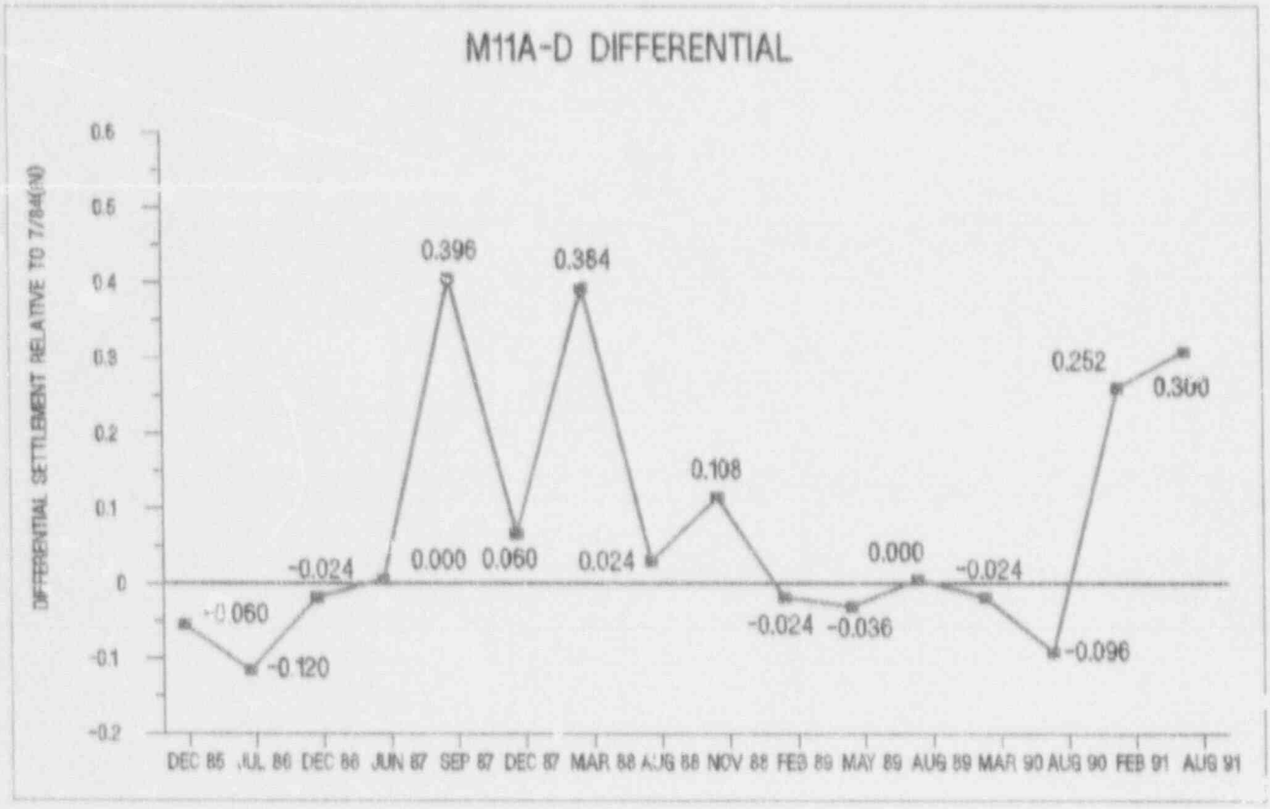




SETTLEMENT POINTS DIFFERENTIAL

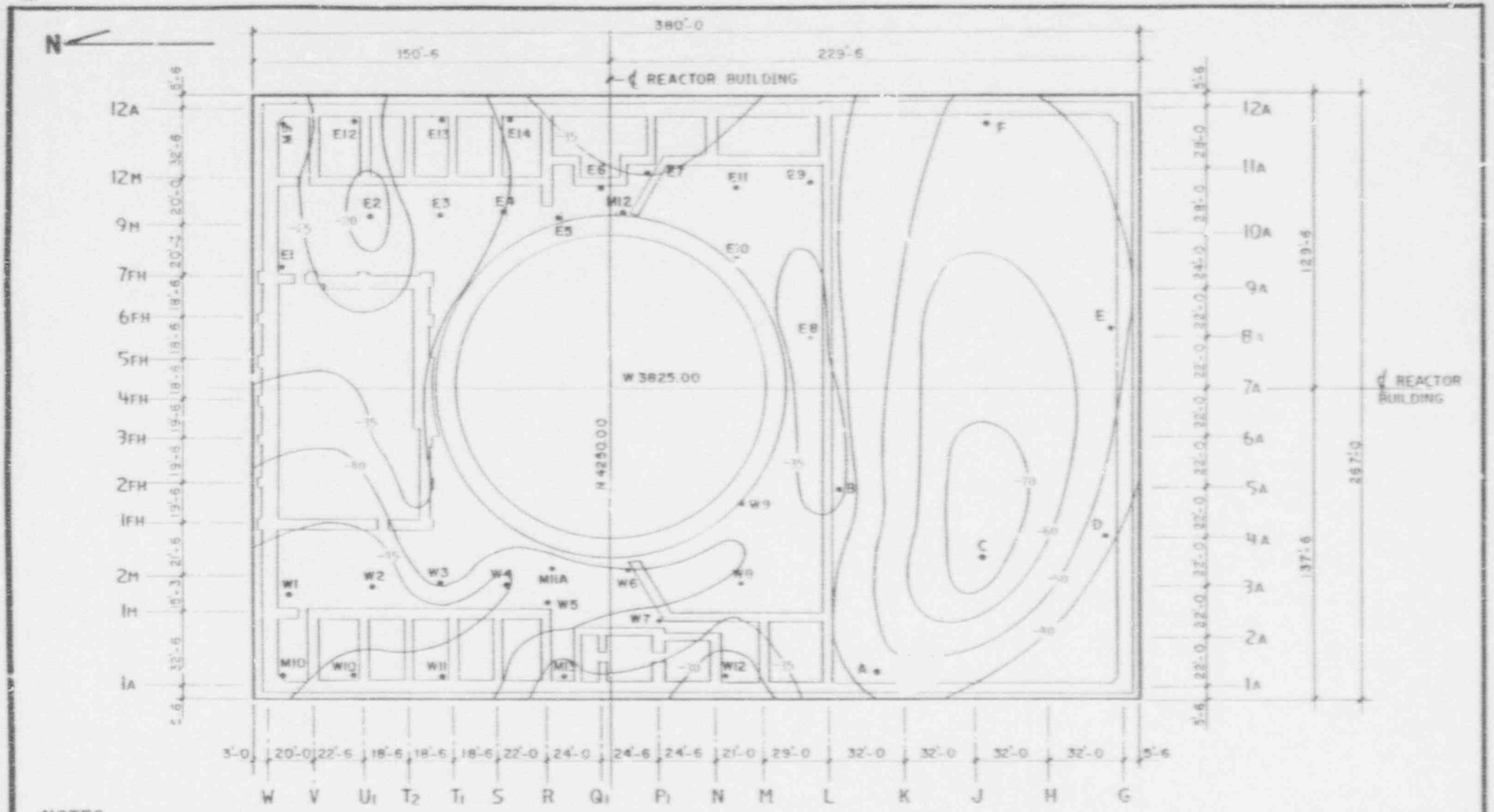
FIGURE 7





SETTLEMENT POINTS DIFFERENTIAL

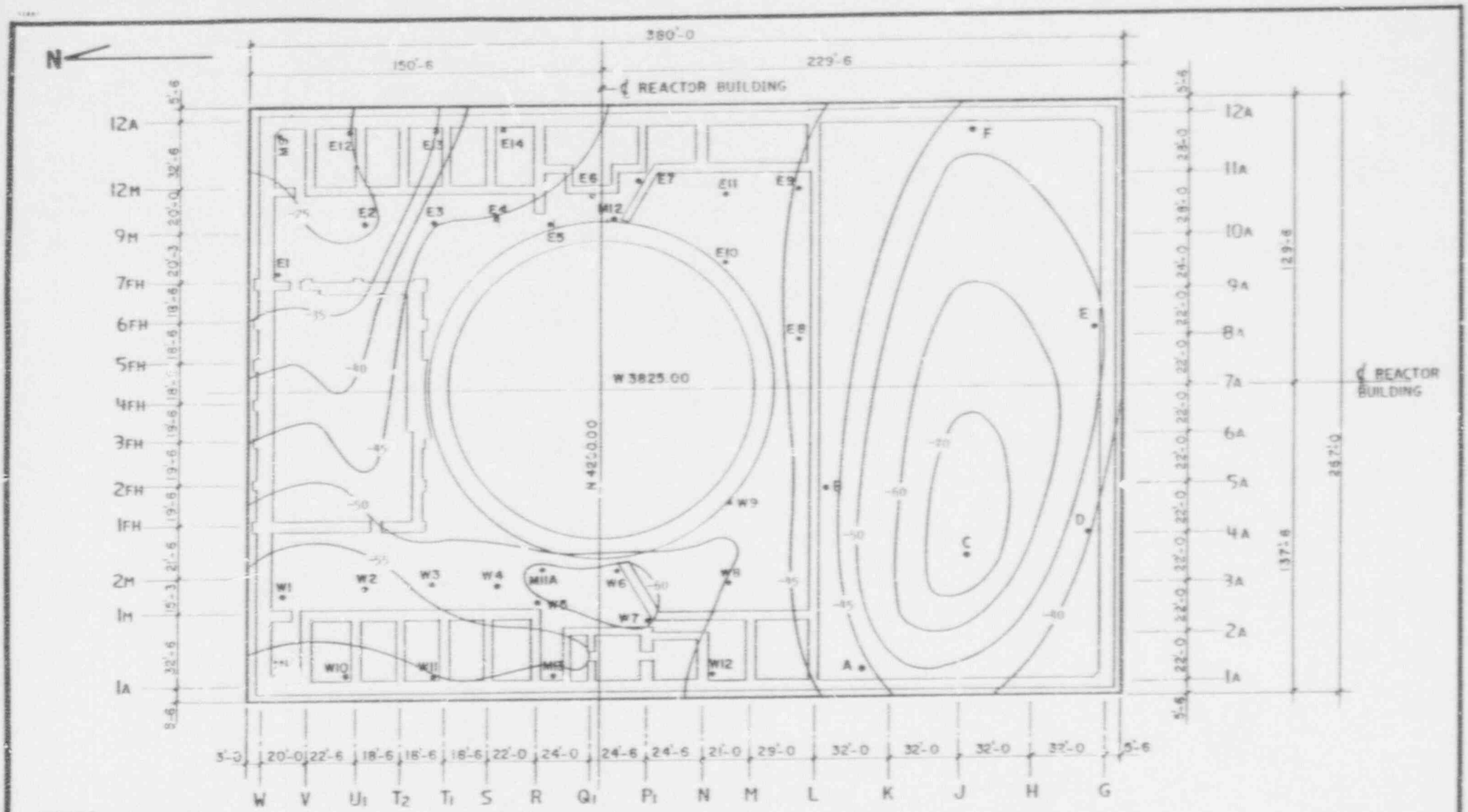
FIGURE 8



NOTES:
CONTOURS ARE IN 0.001 FT
(-) = DOWN
• = MONITORING POINT

BASEMAT ABSOLUTE SETTLEMENTS
PERIOD DEC. 1985 TO AUG. 1990
56 MONTHS

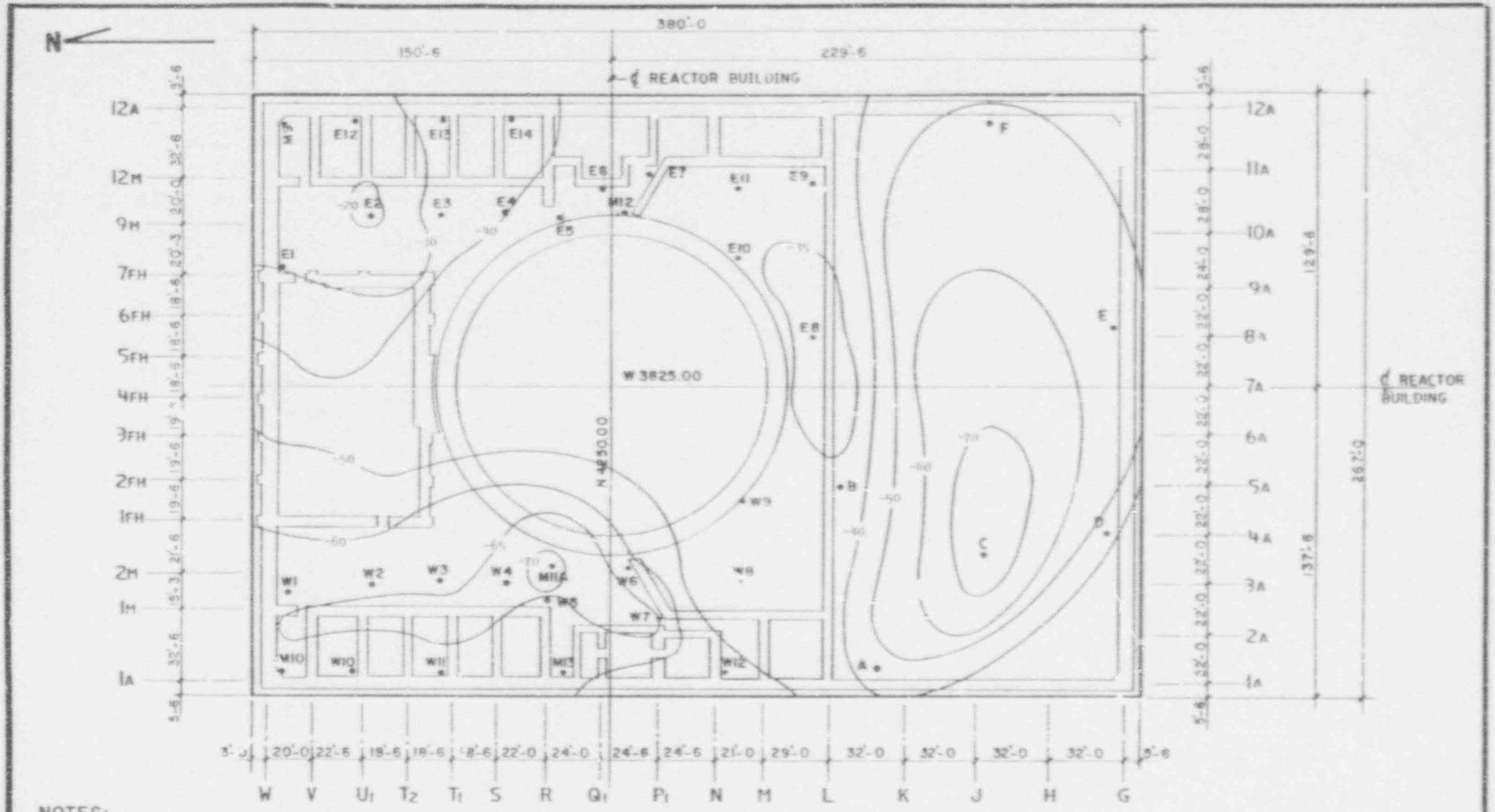
FIGURE 9



NOTES:
CONTOURS ARE IN 0.001 FT
(-) = DOWN
• = MONITORING POINT

BASEMAT ABSOLUTE SETTLEMENTS
PERIOD DEC. 1985 TO FEB. 1991
62 MONTHS

FIGURE 10

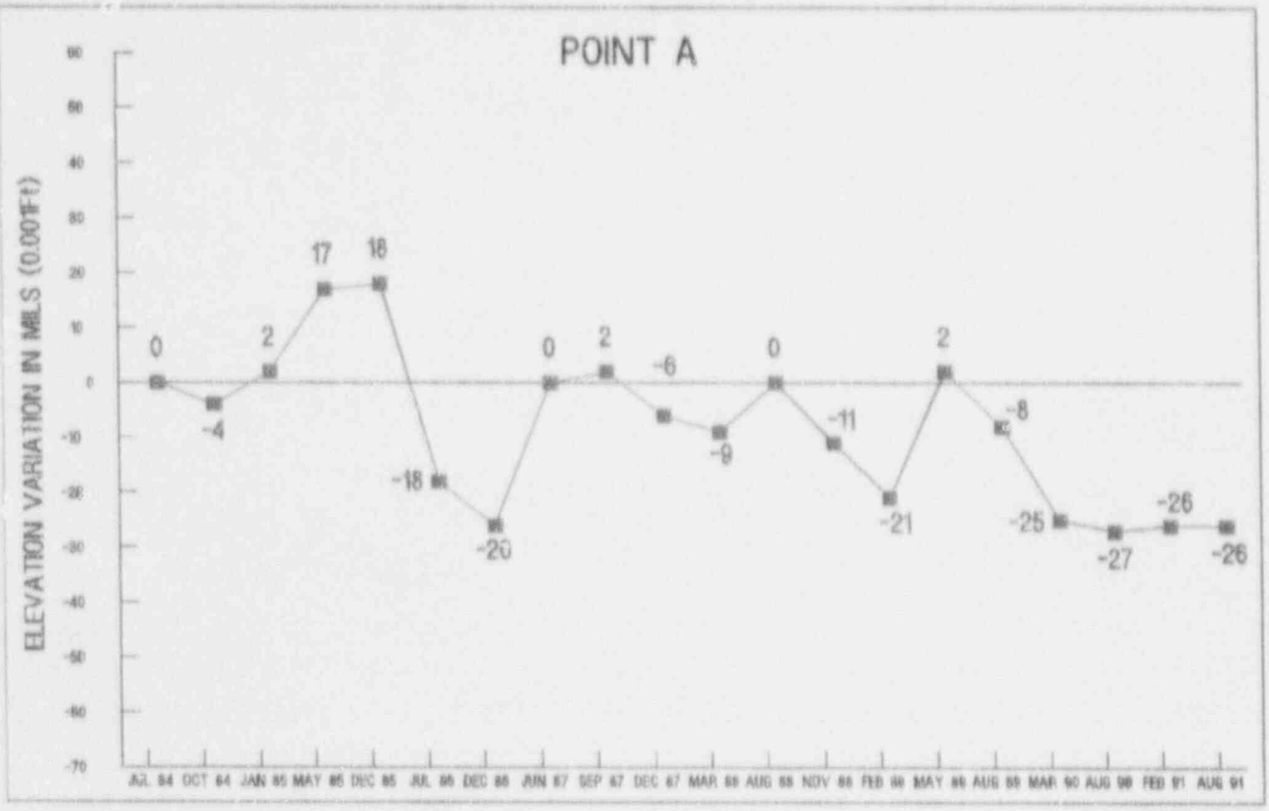


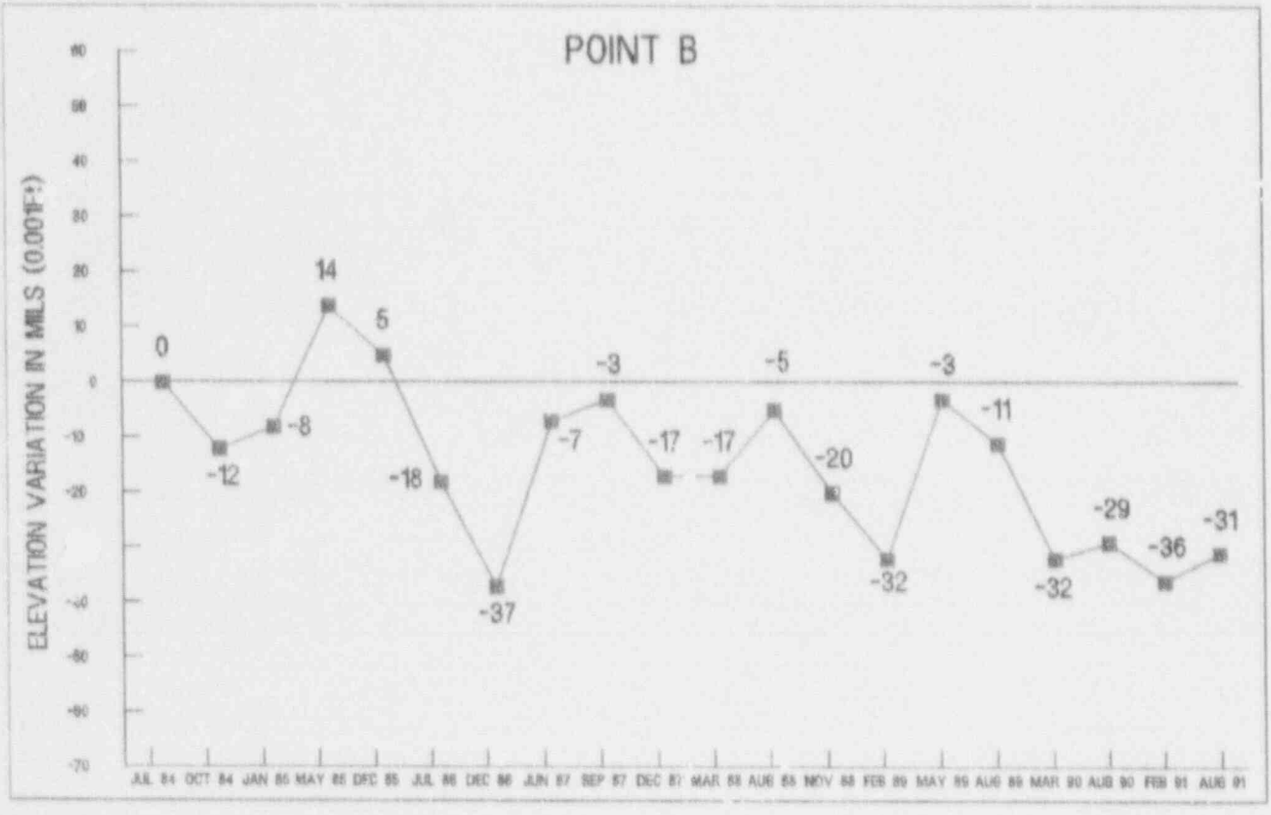
NOTES:
CONTOURS ARE IN 0.001 FT
(–) = DOWN
• = MONITORING POINT

BASEMAT ABSOLUTE SETTLEMENTS

PERIOD DEC. 1985 TO AUG. 1991
68 MONTHS

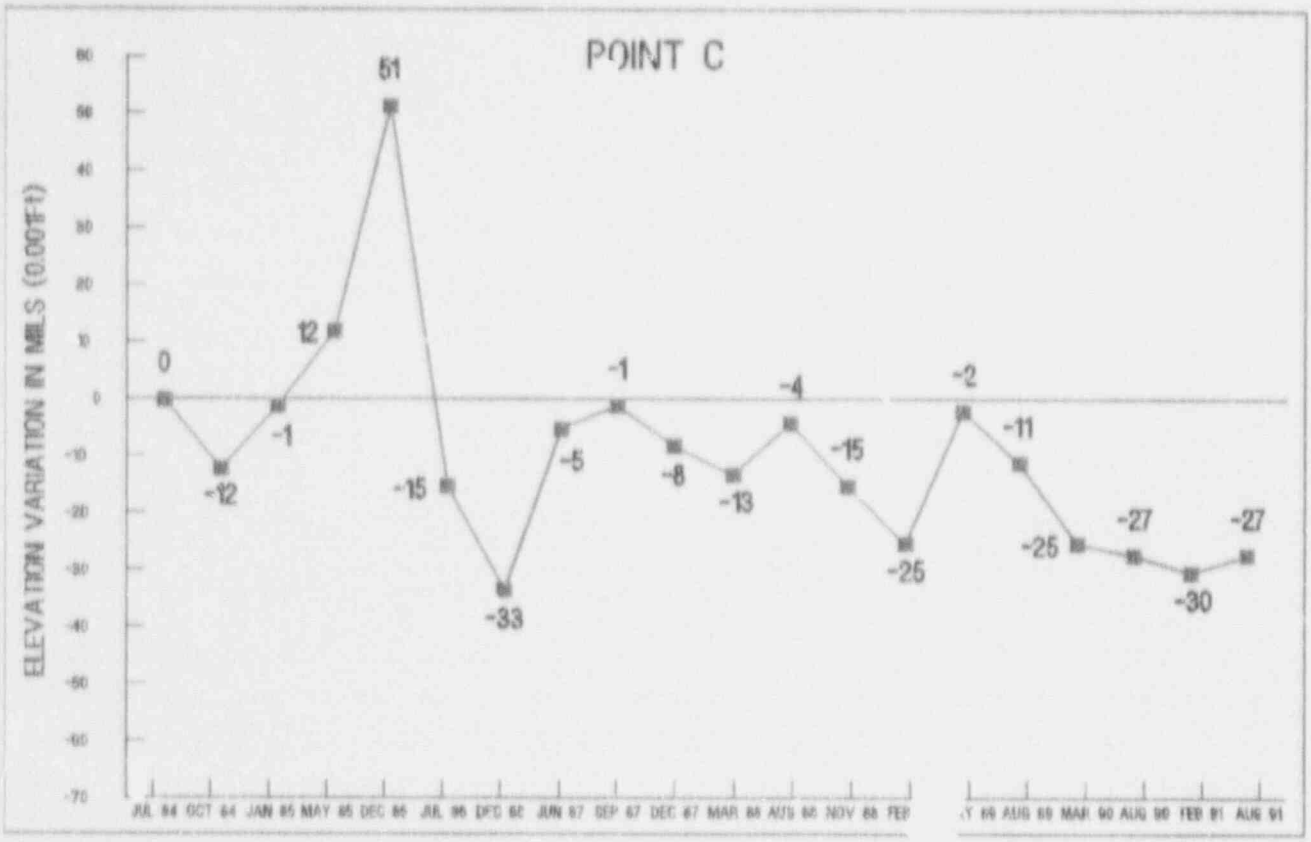
FIGURE 11

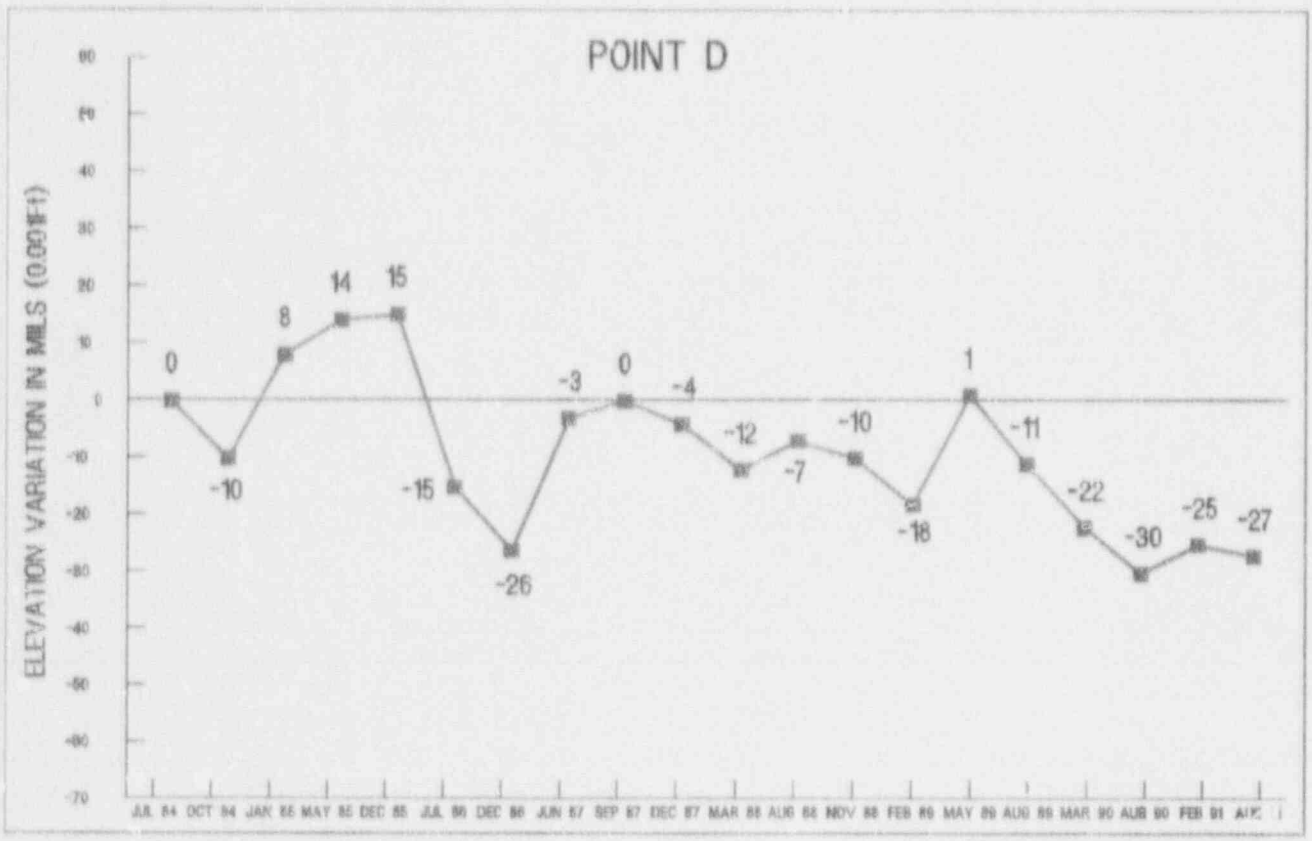




ELEVATION VARIATION OF MONITORING POINTS

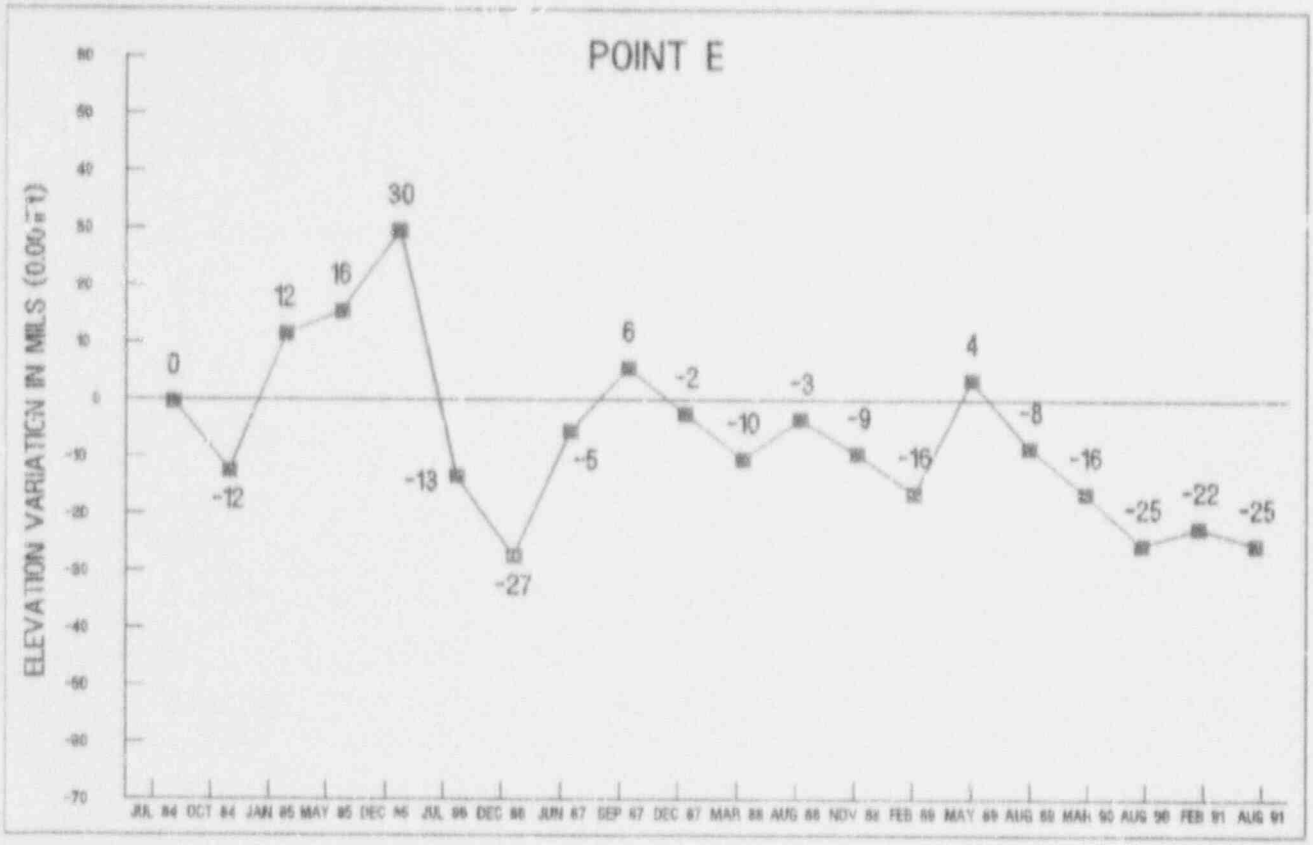
FIGURE 12

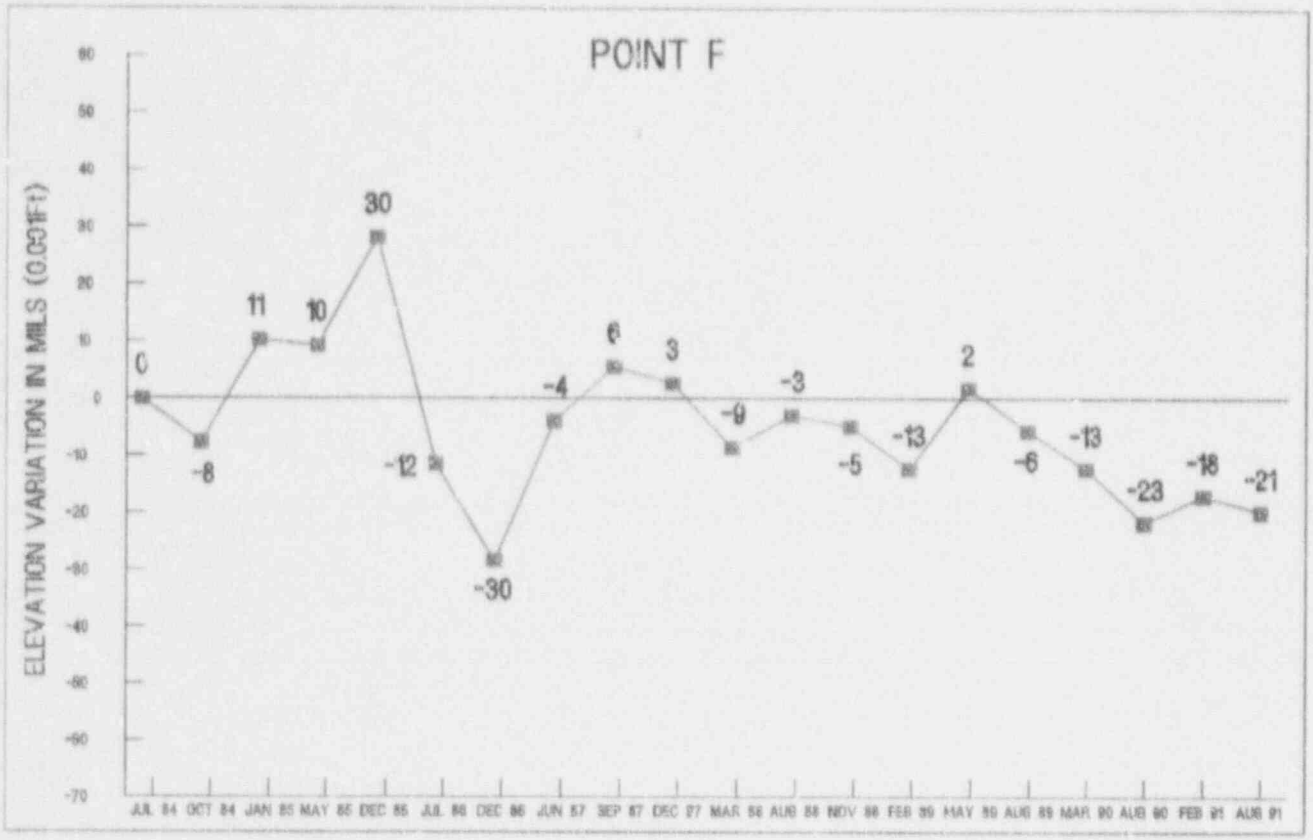




ELEVATION VARIATION OF MONITORING POINTS

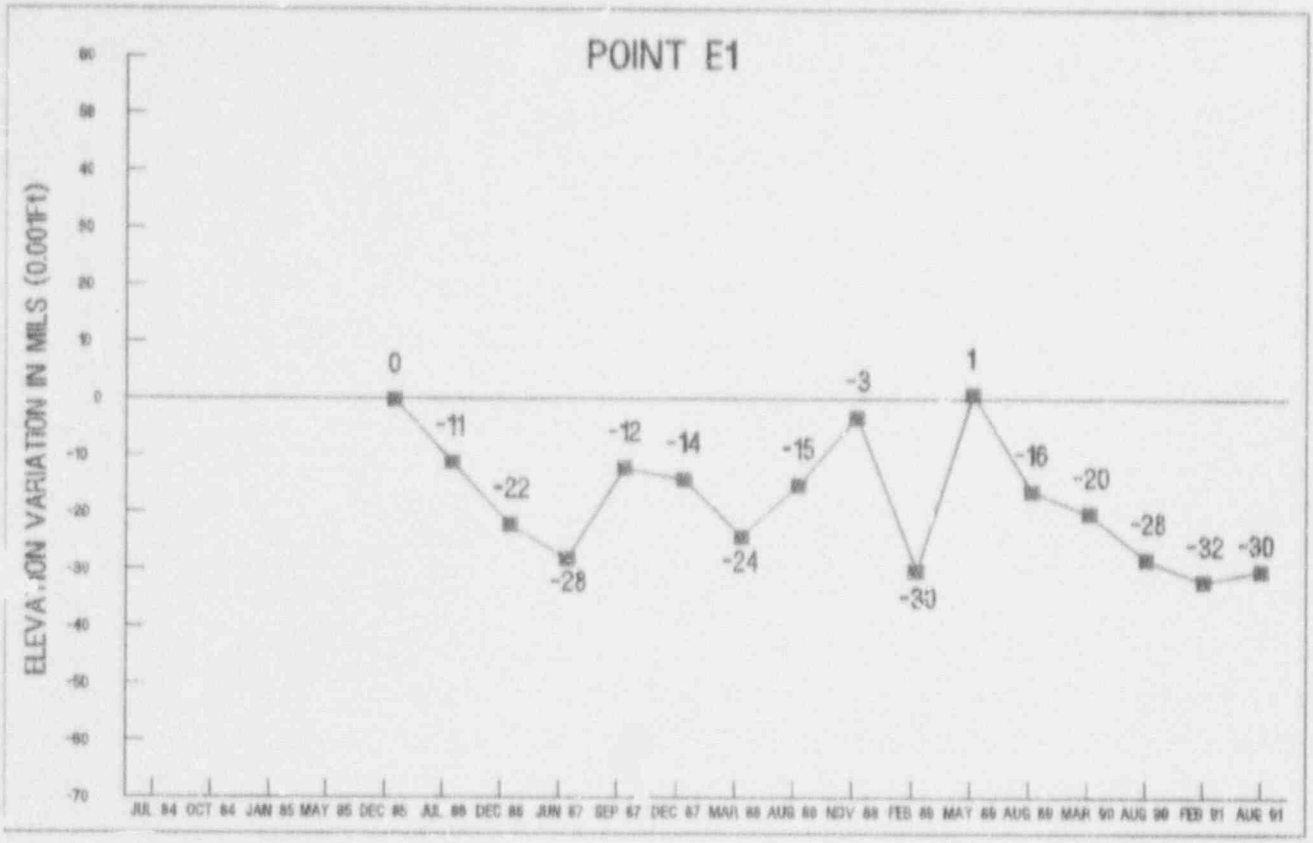
FIGURE 13

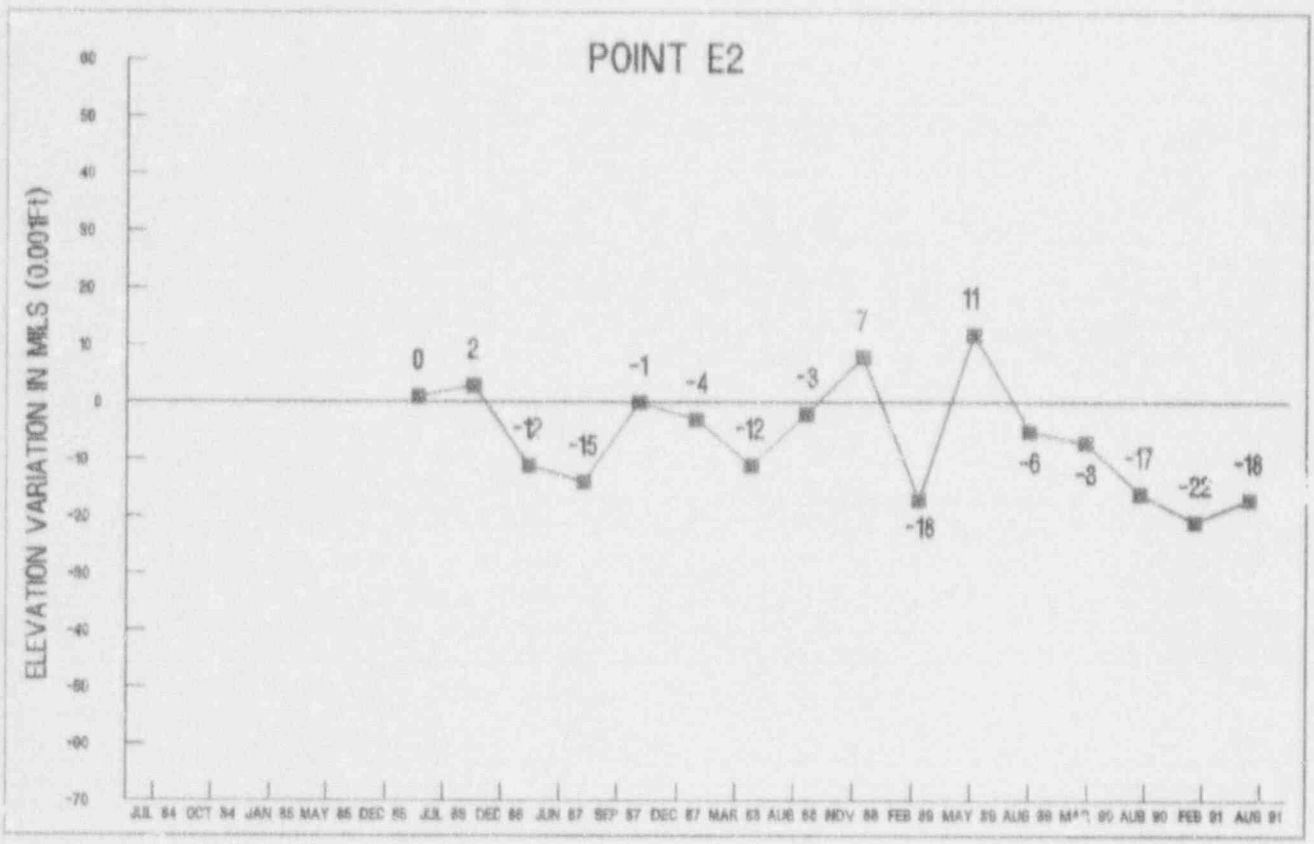




ELEVATION VARIATION OF MONITORING POINTS

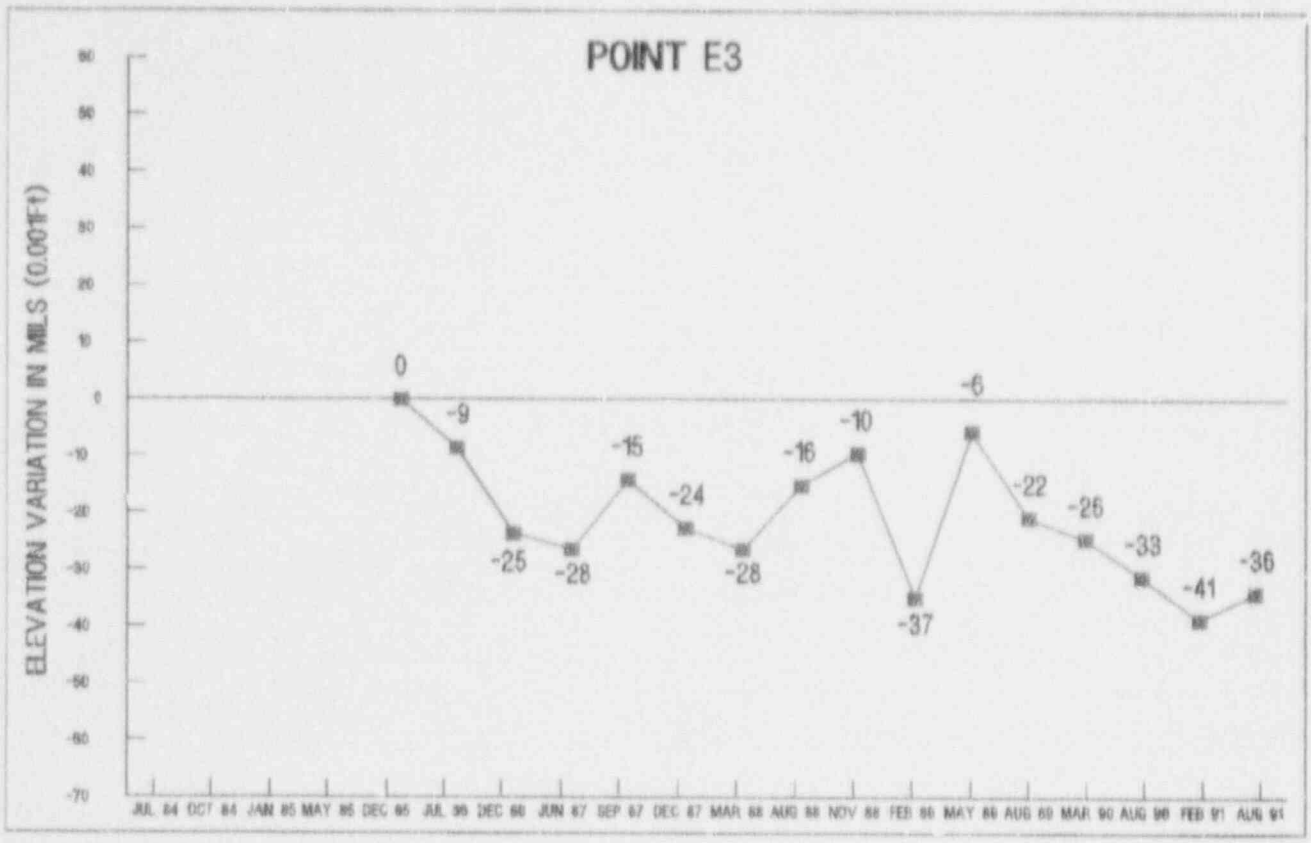
FIGURE 14

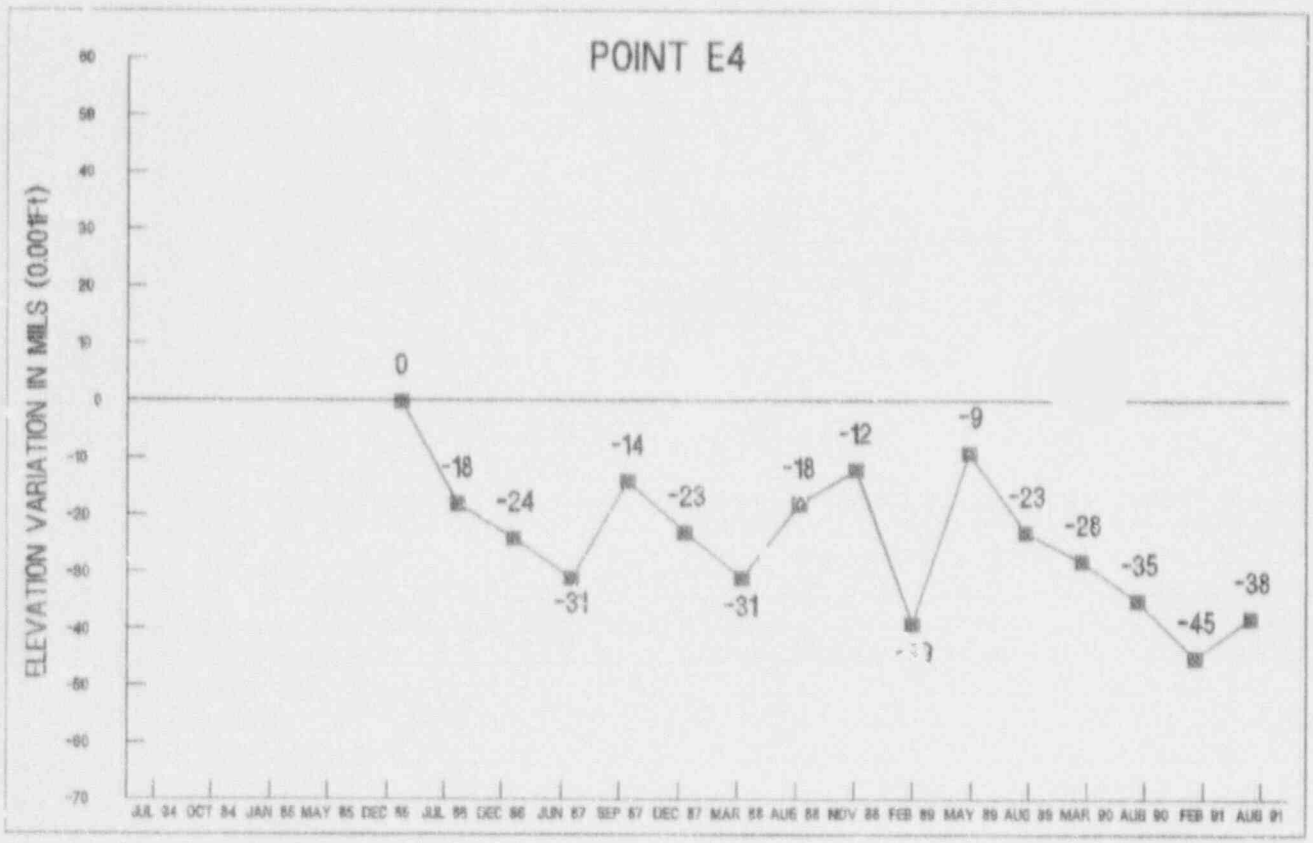




ELEVATION VARIATION OF MONITORING POINTS

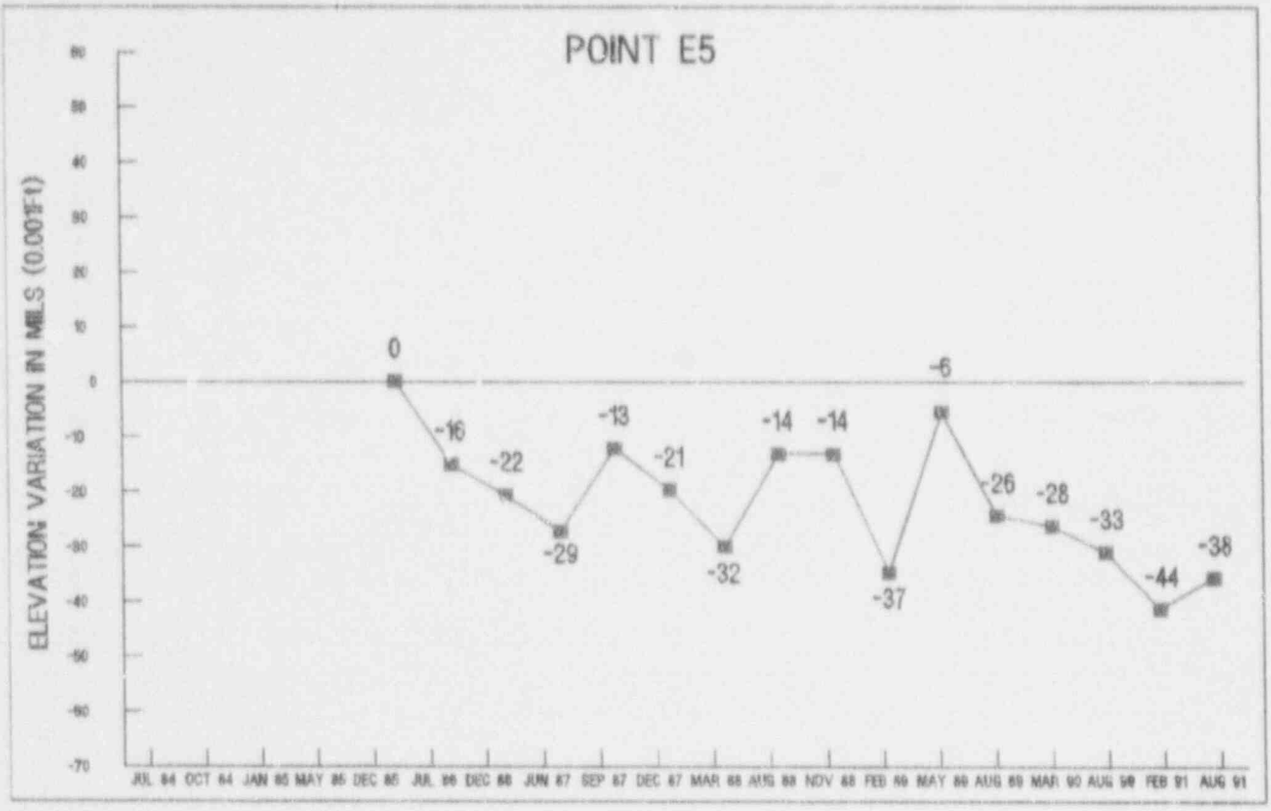
FIGURE 15

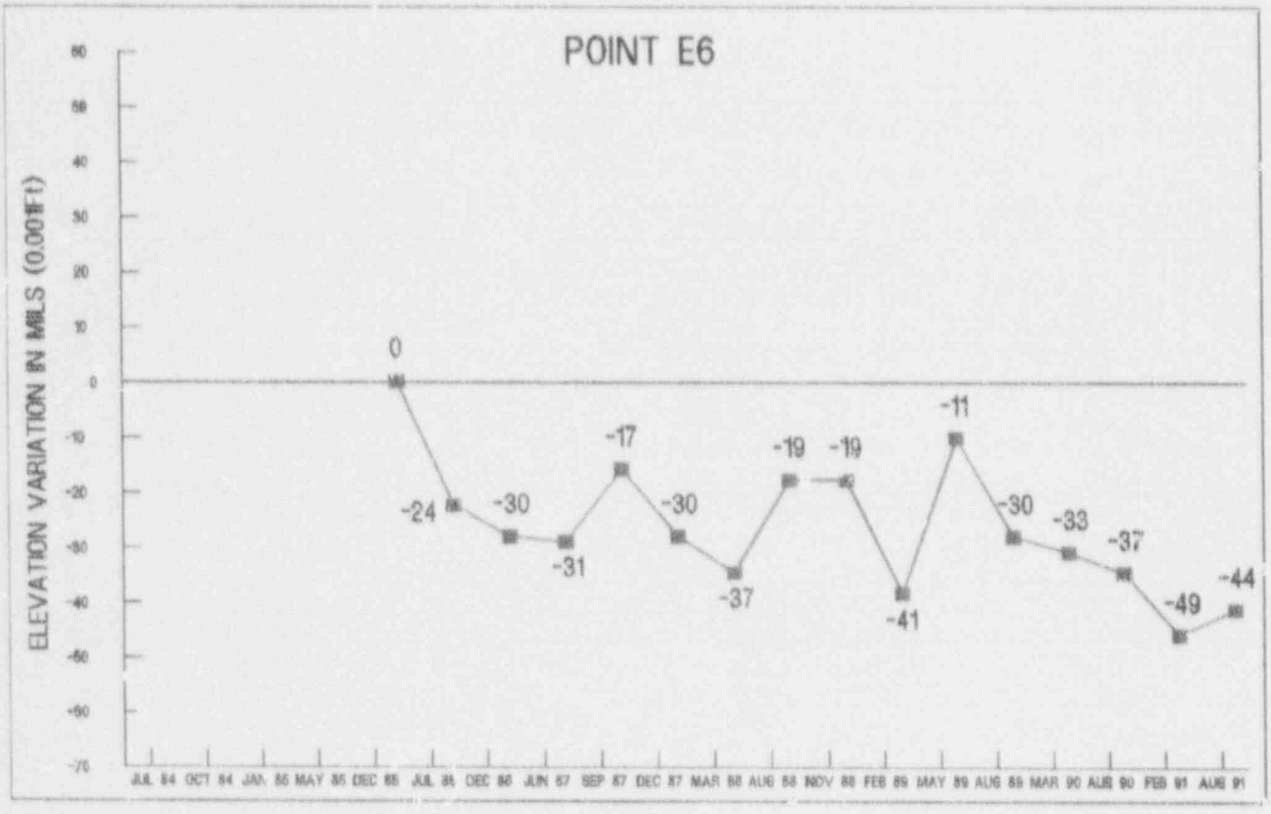




ELEVATION VARIATION OF MONITORING POINTS

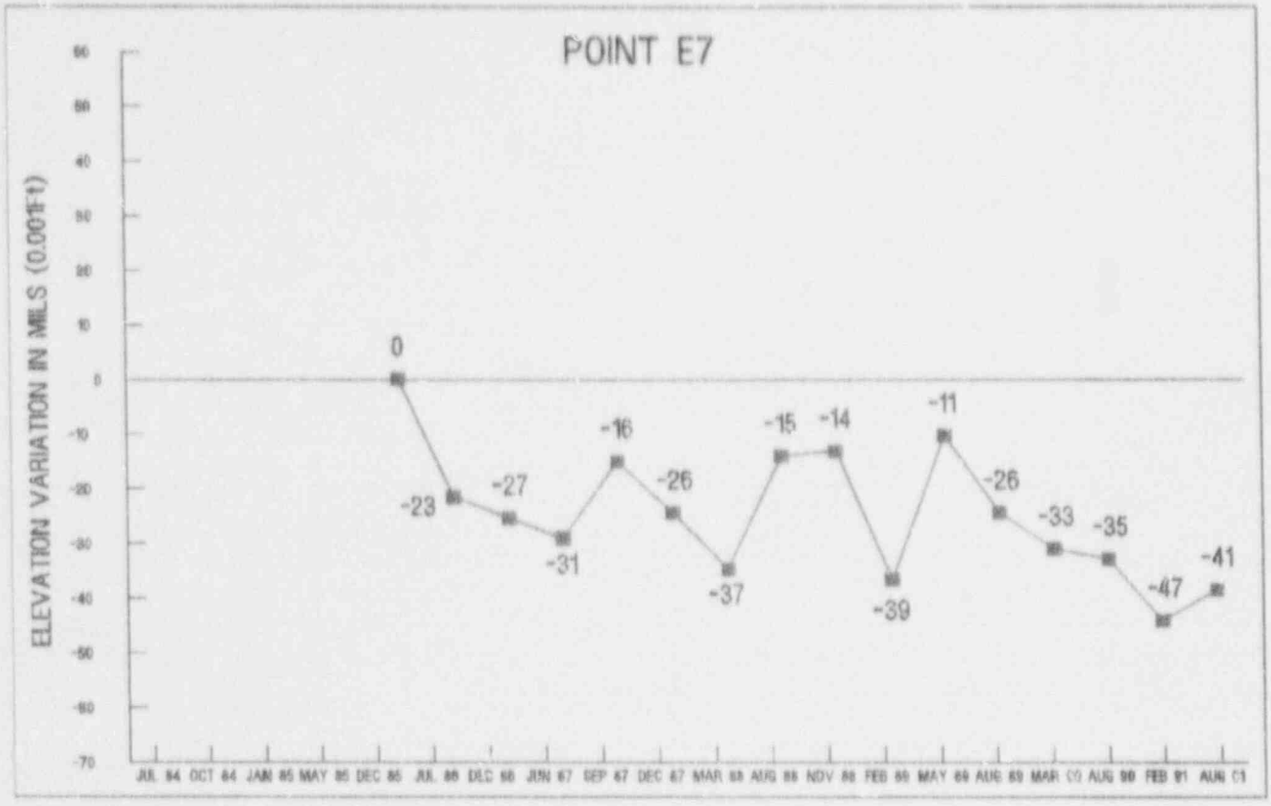
FIGURE 16

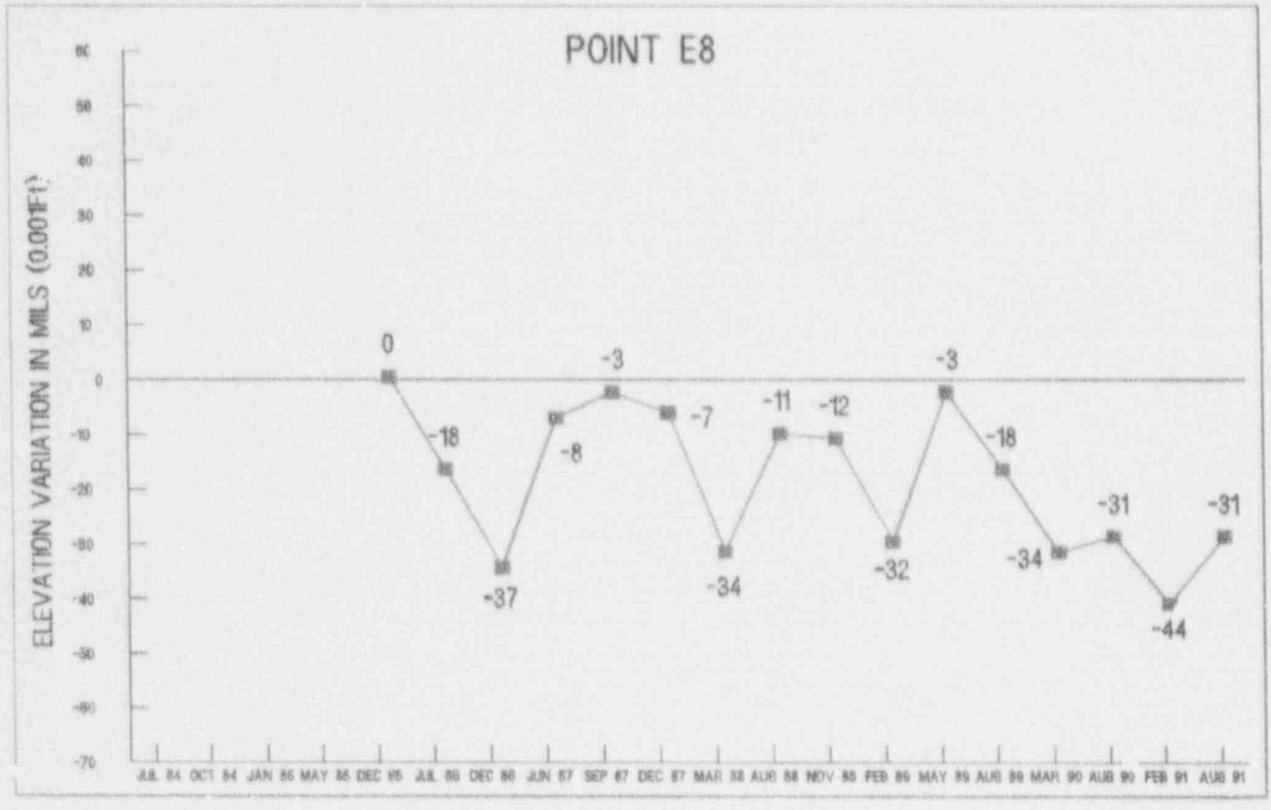




ELEVATION VARIATION OF MONITORING POINTS

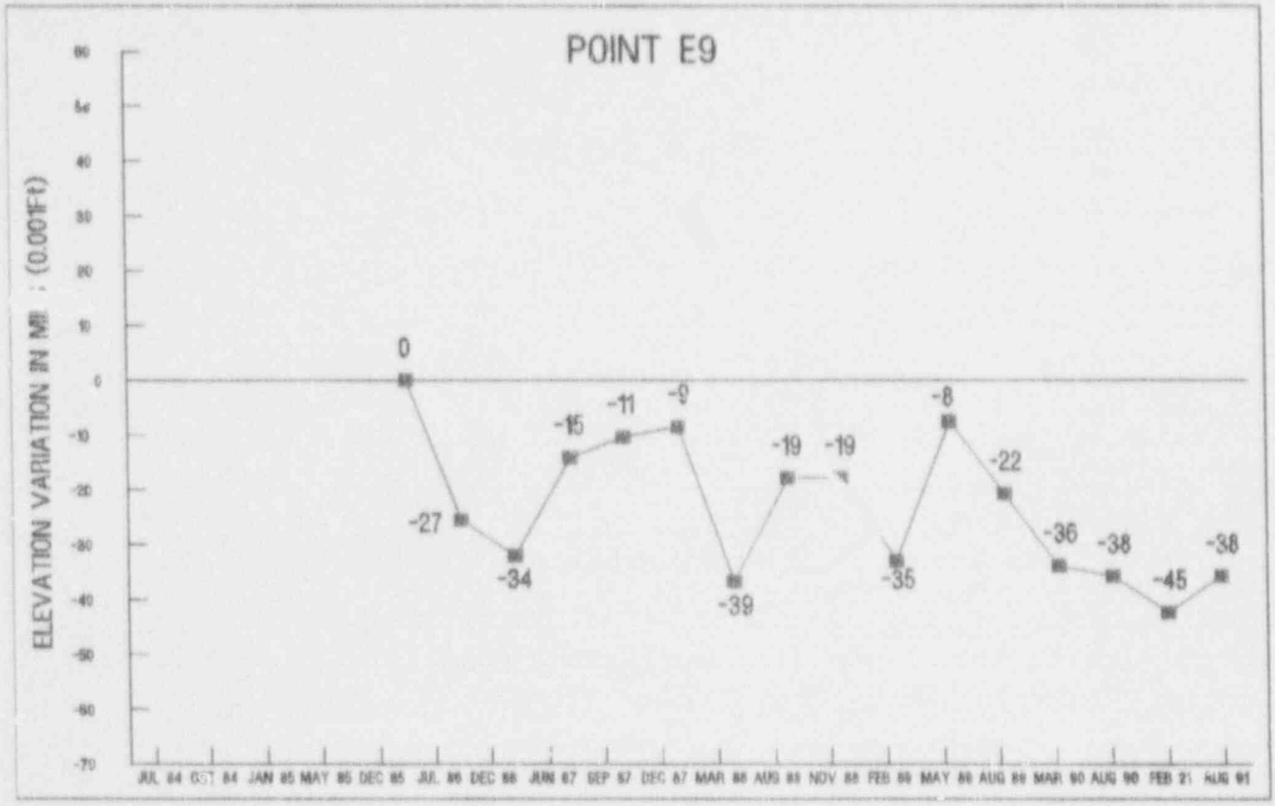
FIGURE 17

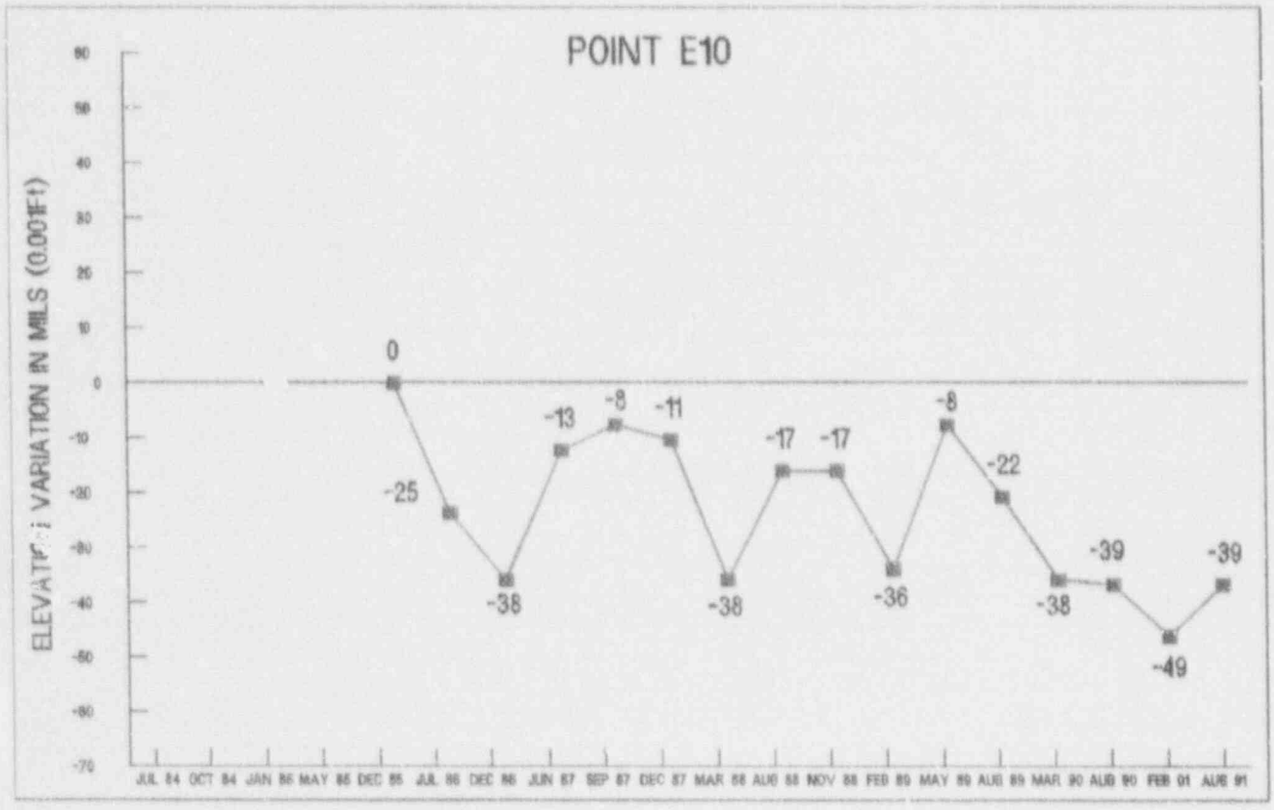




ELEVATION VARIATION OF MONITORING POINTS

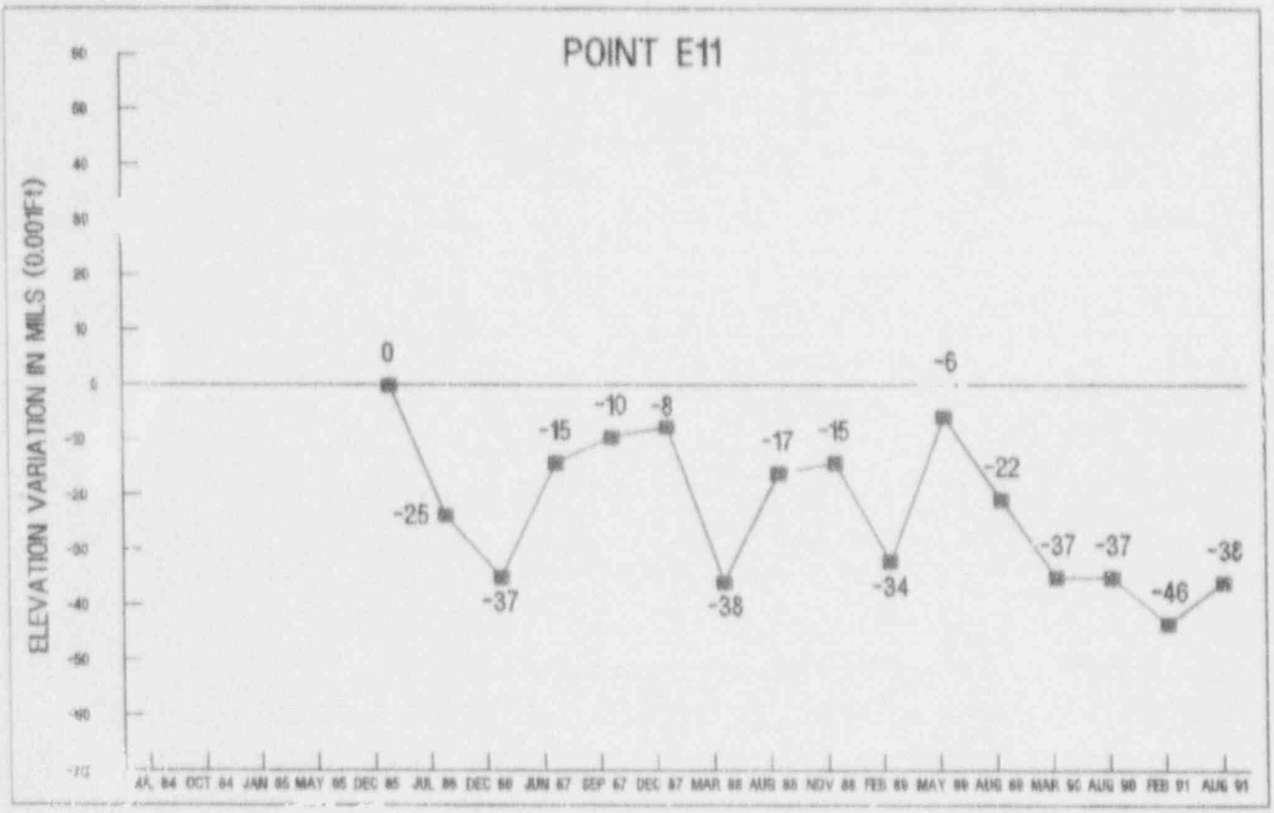
FIGURE 18

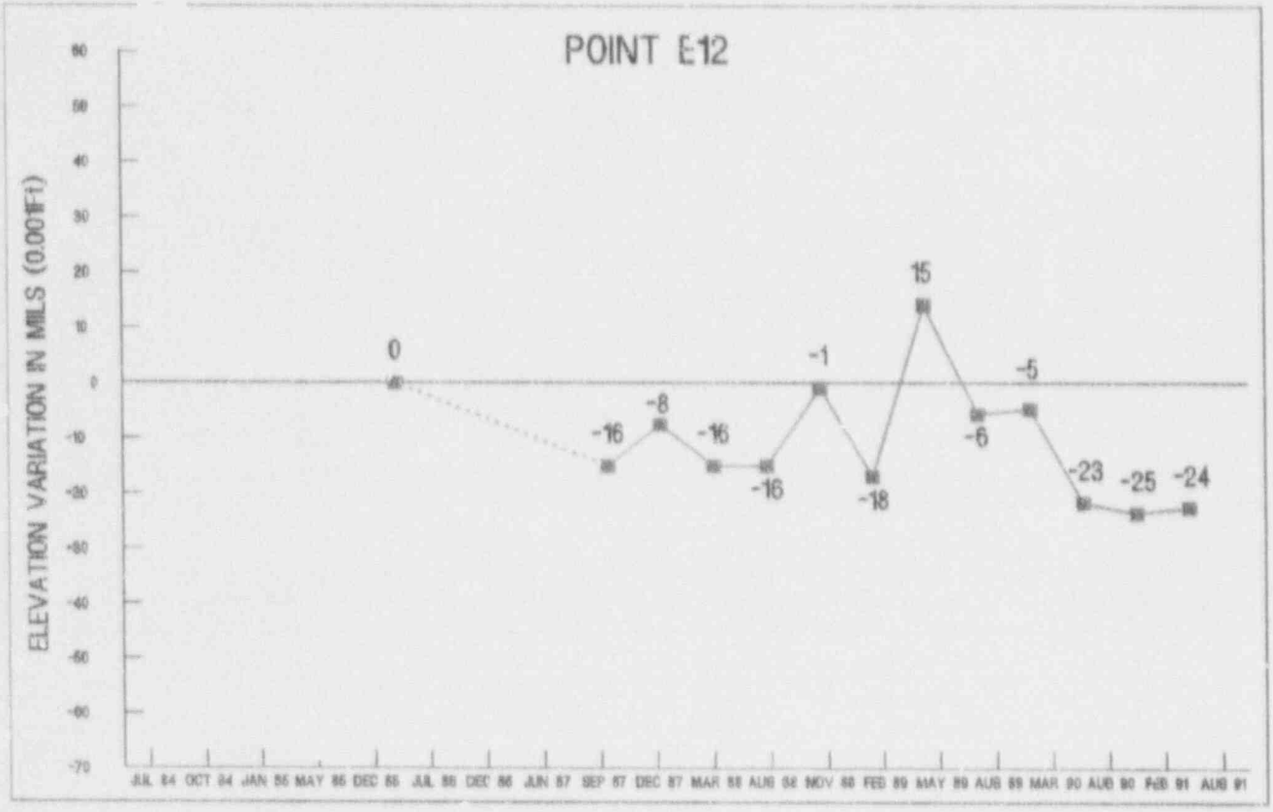




ELEVATION VARIATION OF MONITORING POINTS

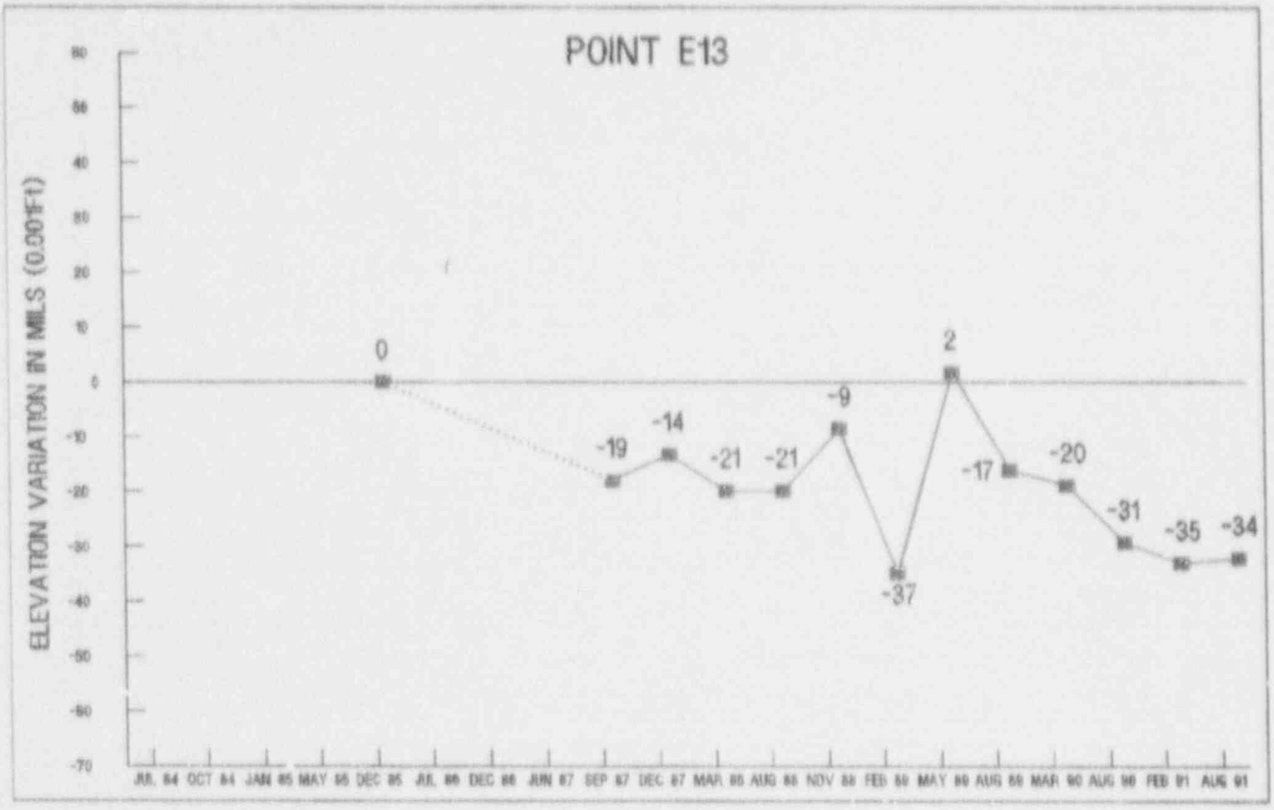
FIGURE 19

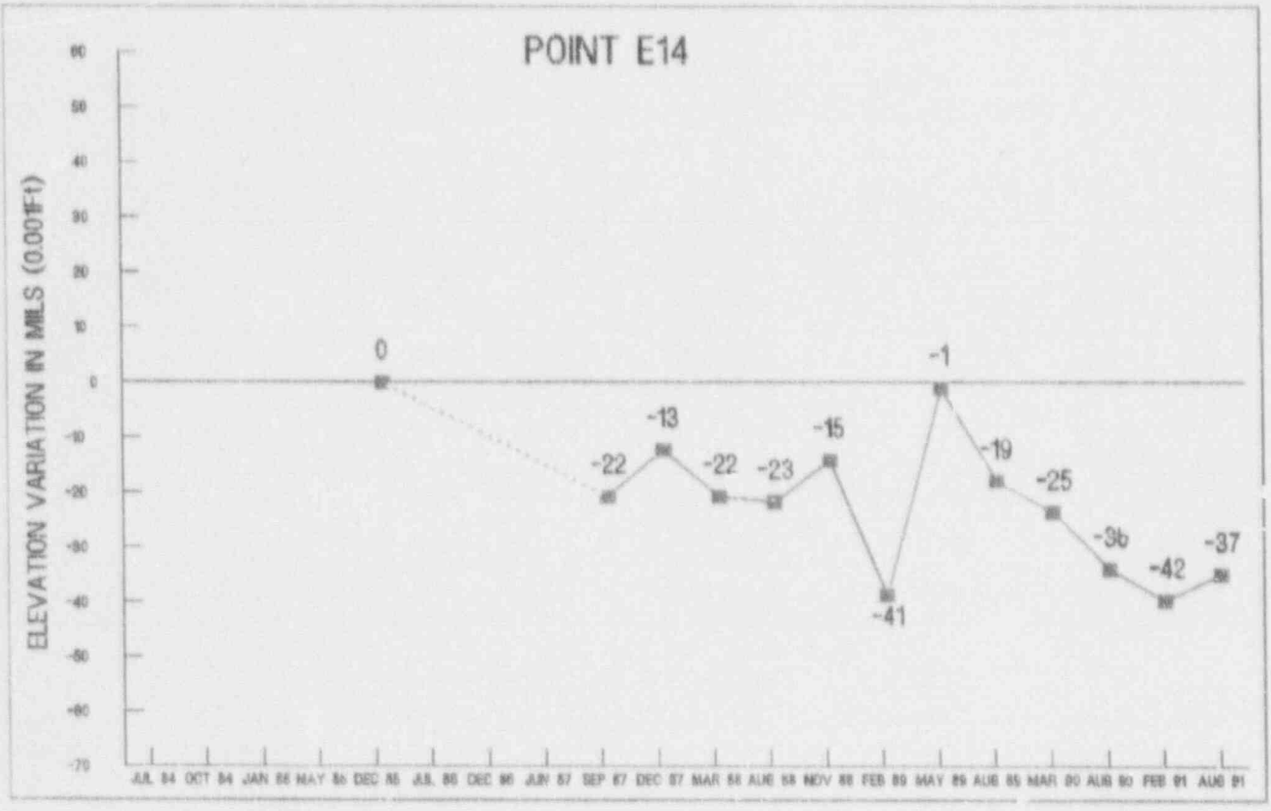




ELEVATION VARIATION OF MONITORING POINTS

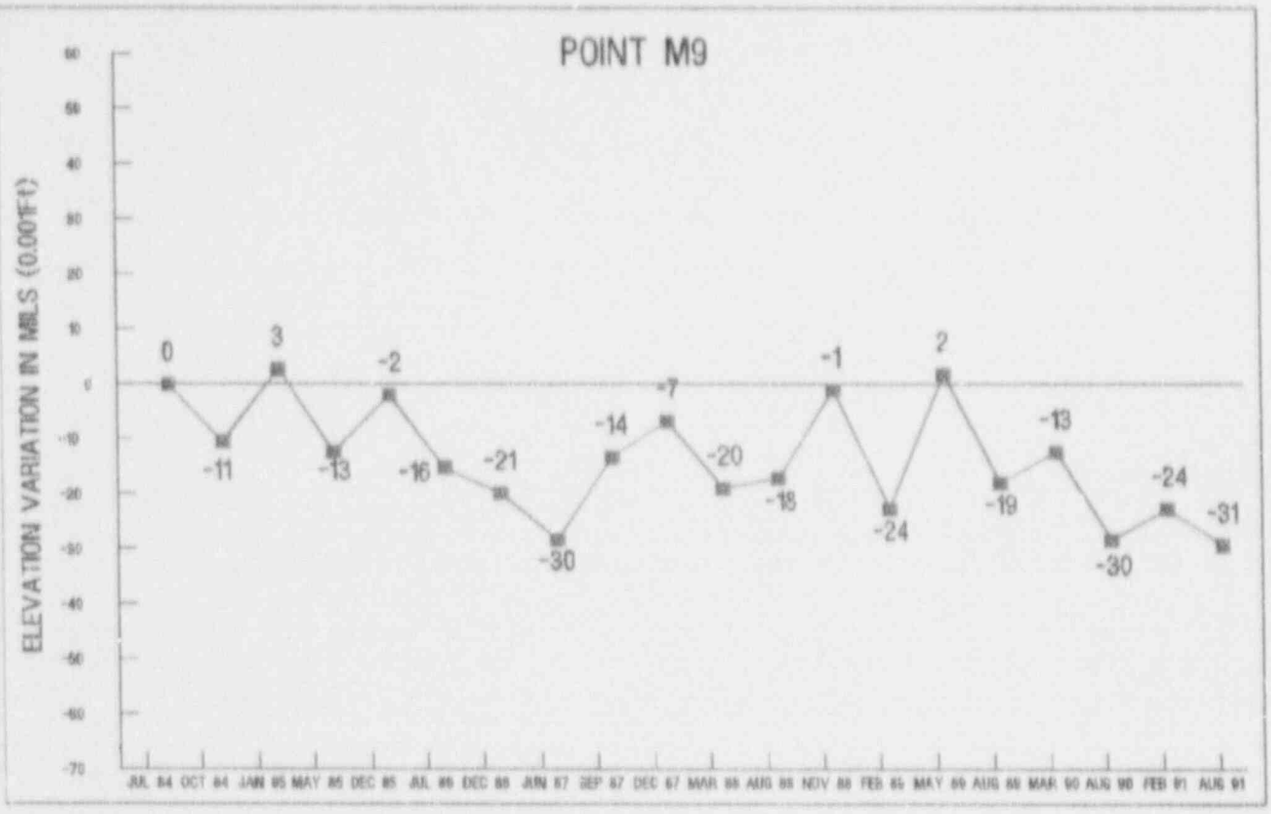
FIGURE 20

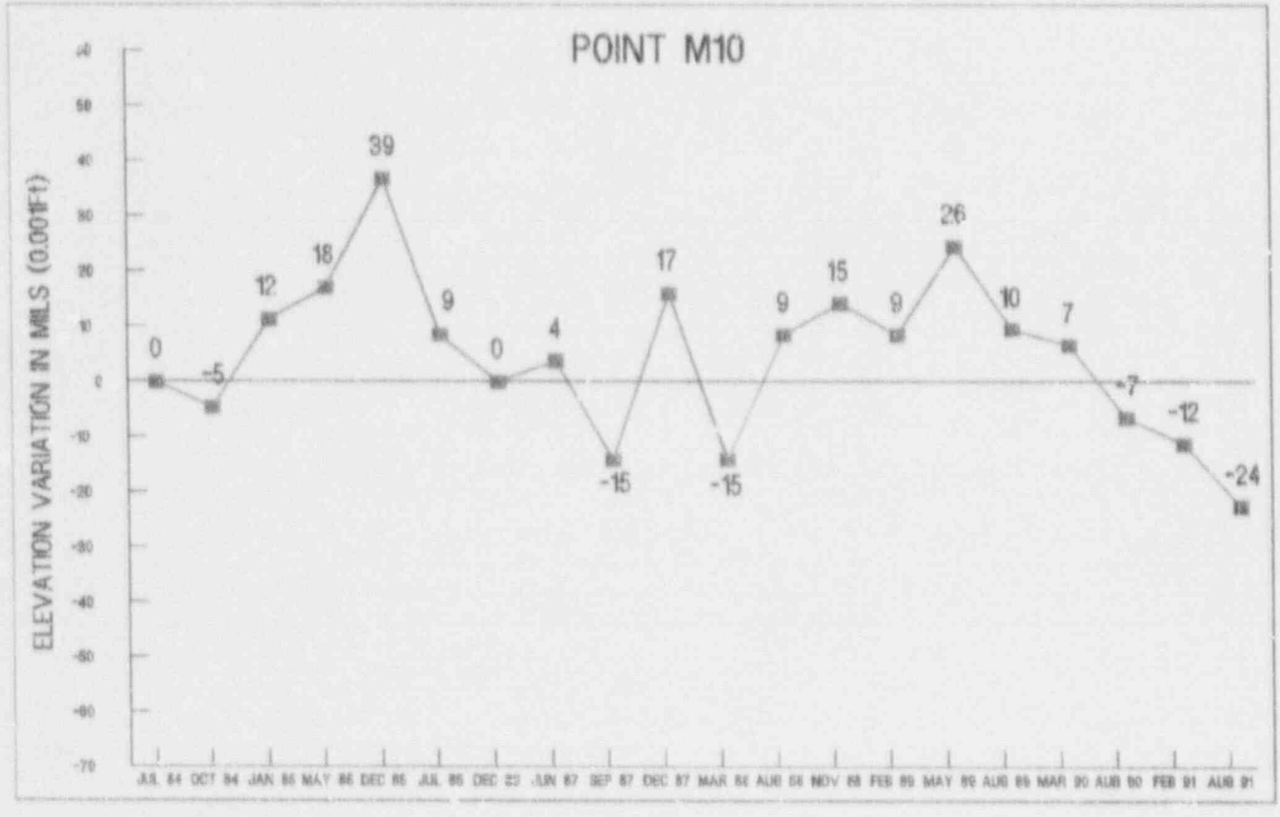




ELEVATION VARIATION OF MONITORING POINTS

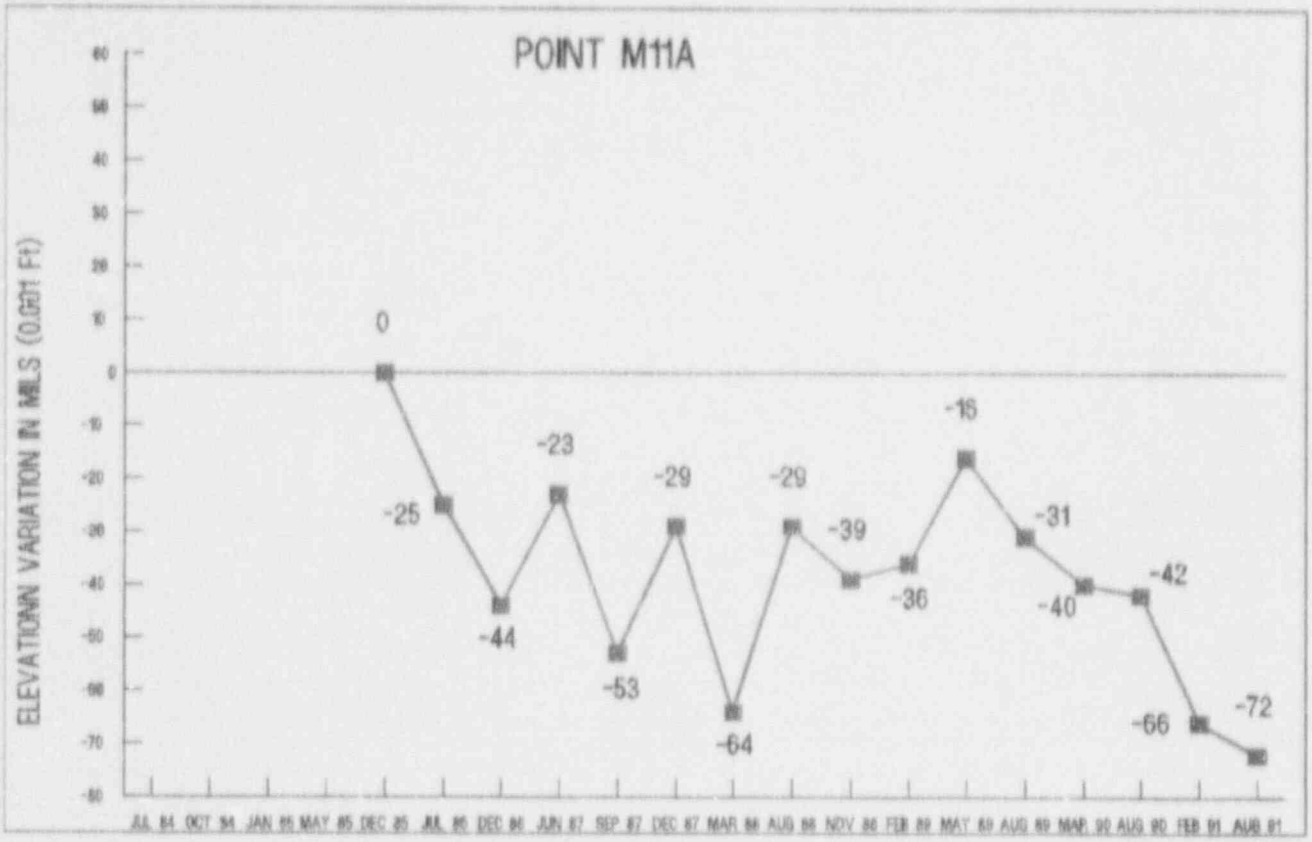
FIGURE 21

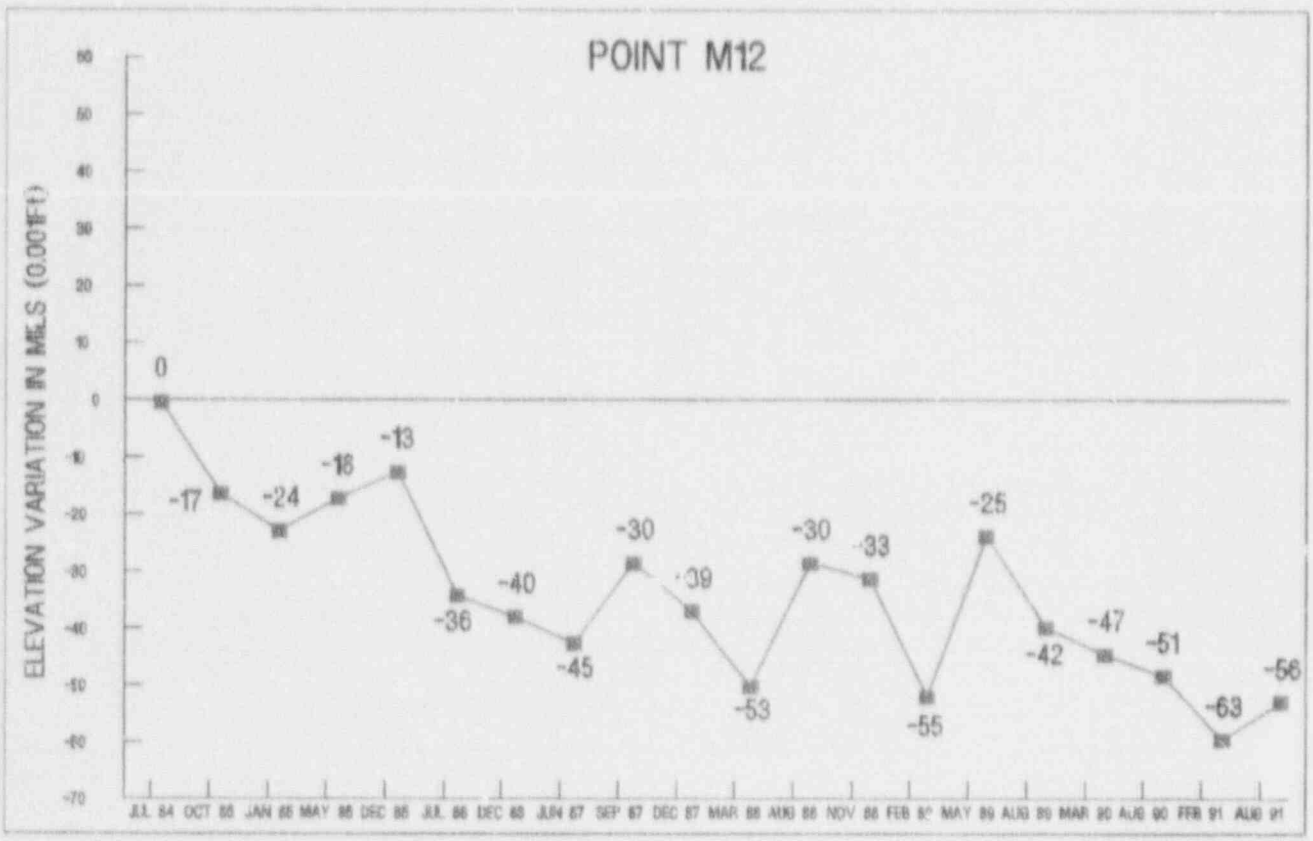




ELEVATION VARIATION OF MONITORING POINTS

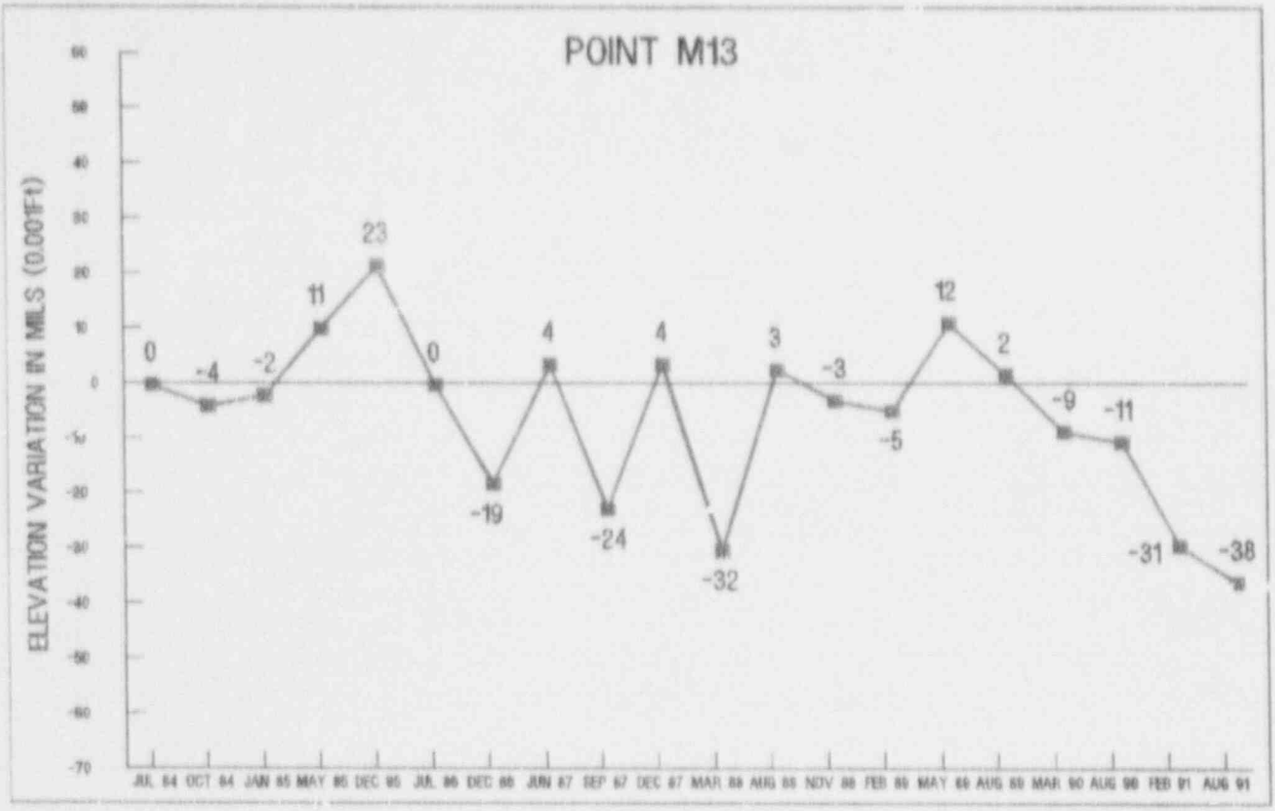
FIGURE 22

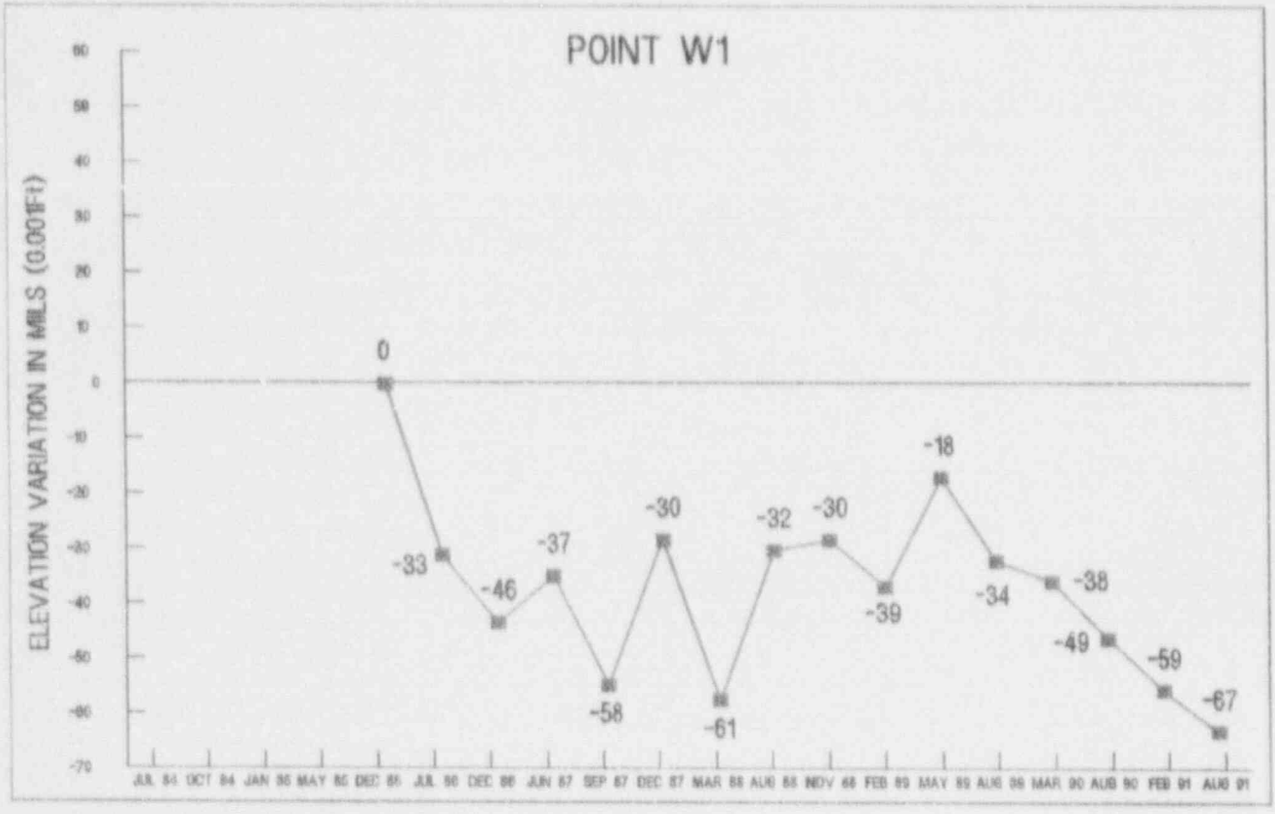




ELEVATION VARIATION OF MONITORING POINTS

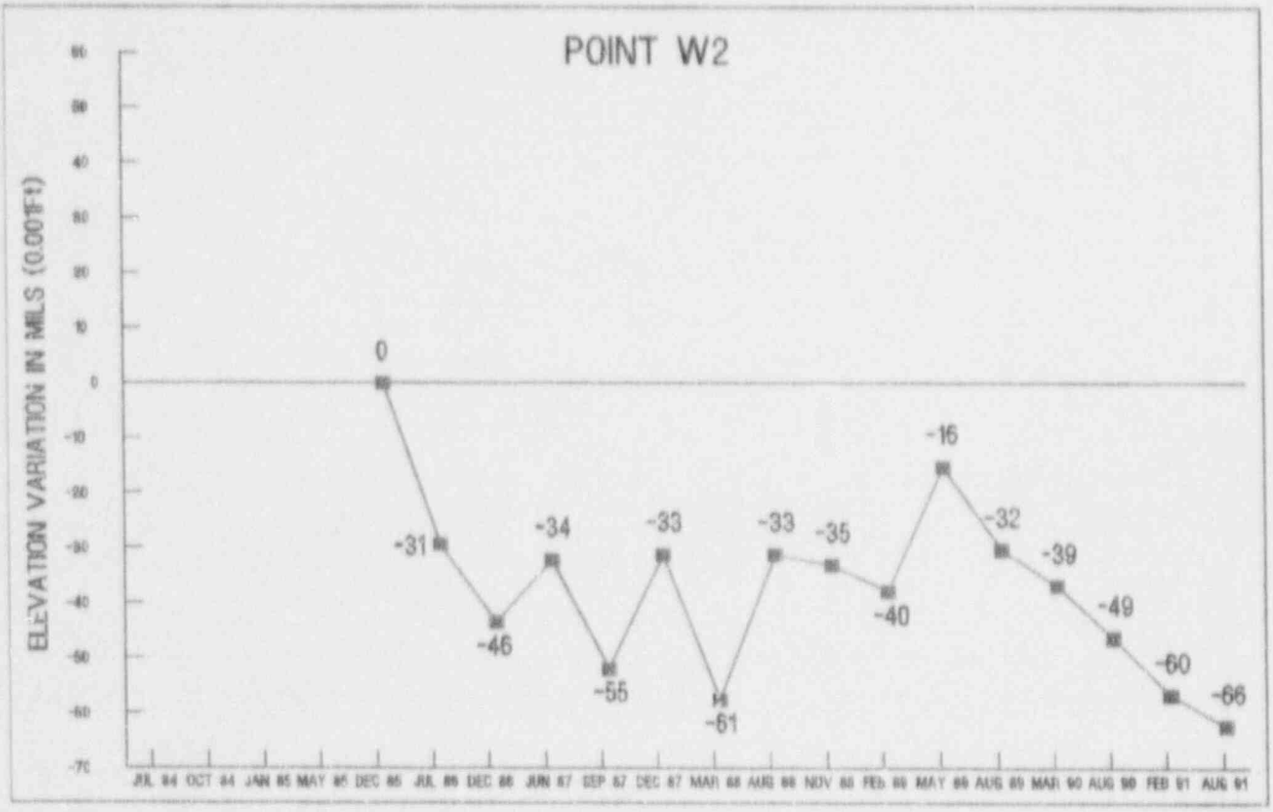
FIGURE 23

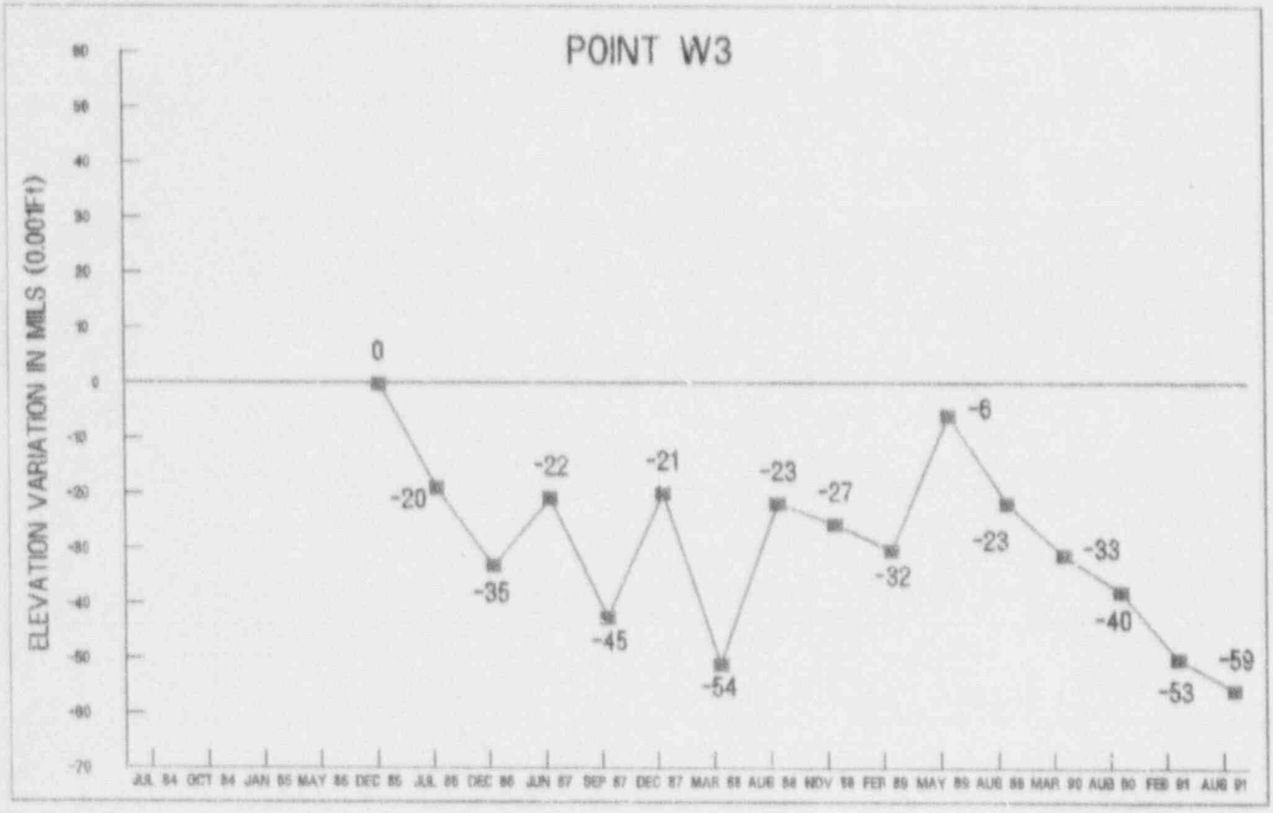




ELEVATION VARIATION OF MONITORING POINTS

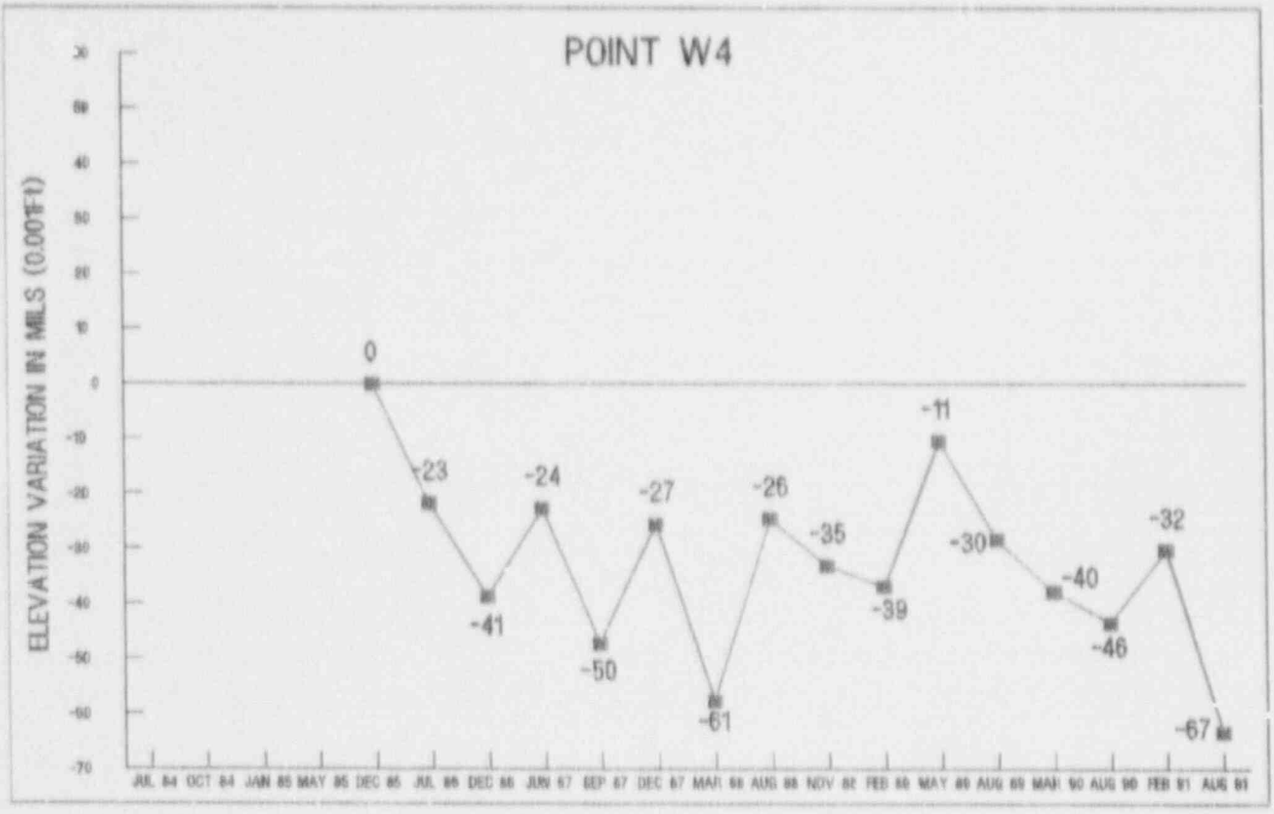
FIGURE 24

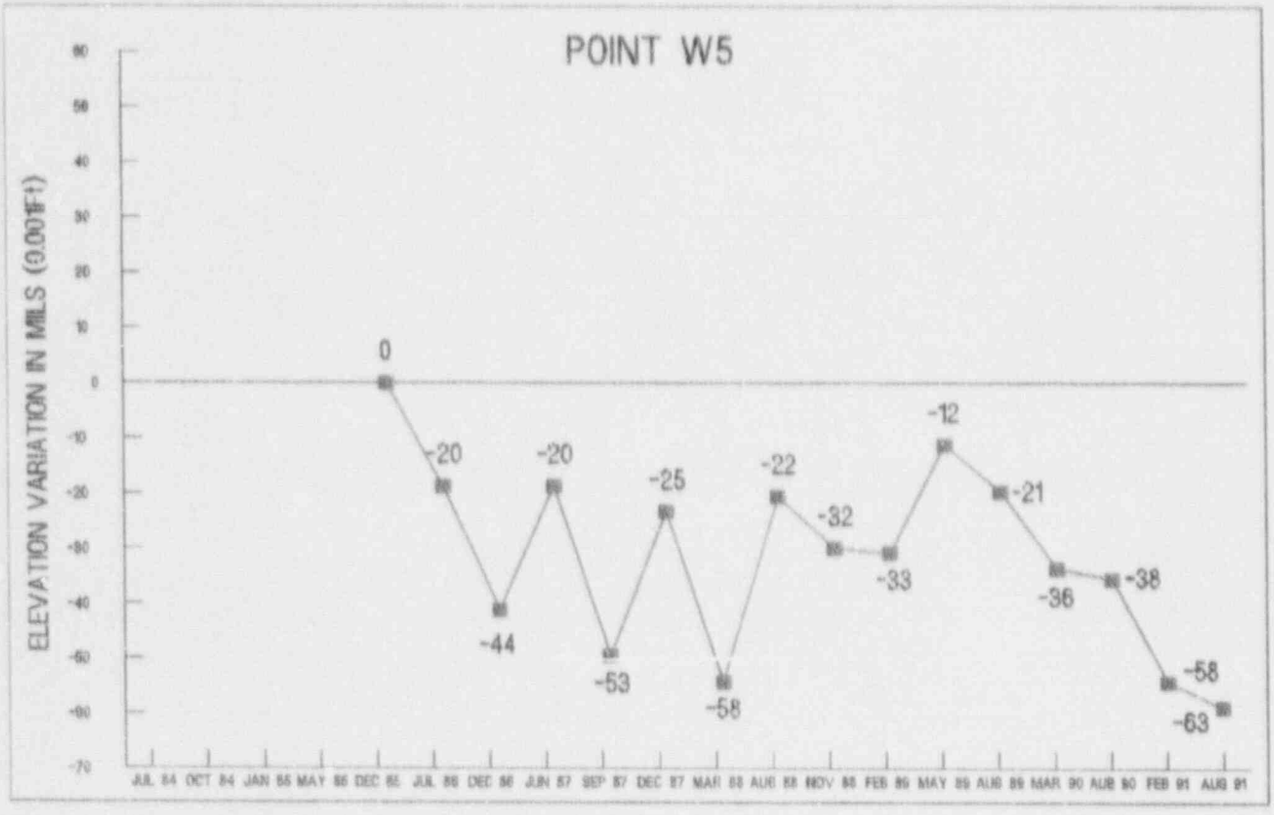




ELEVATION OF MONITORING POINTS

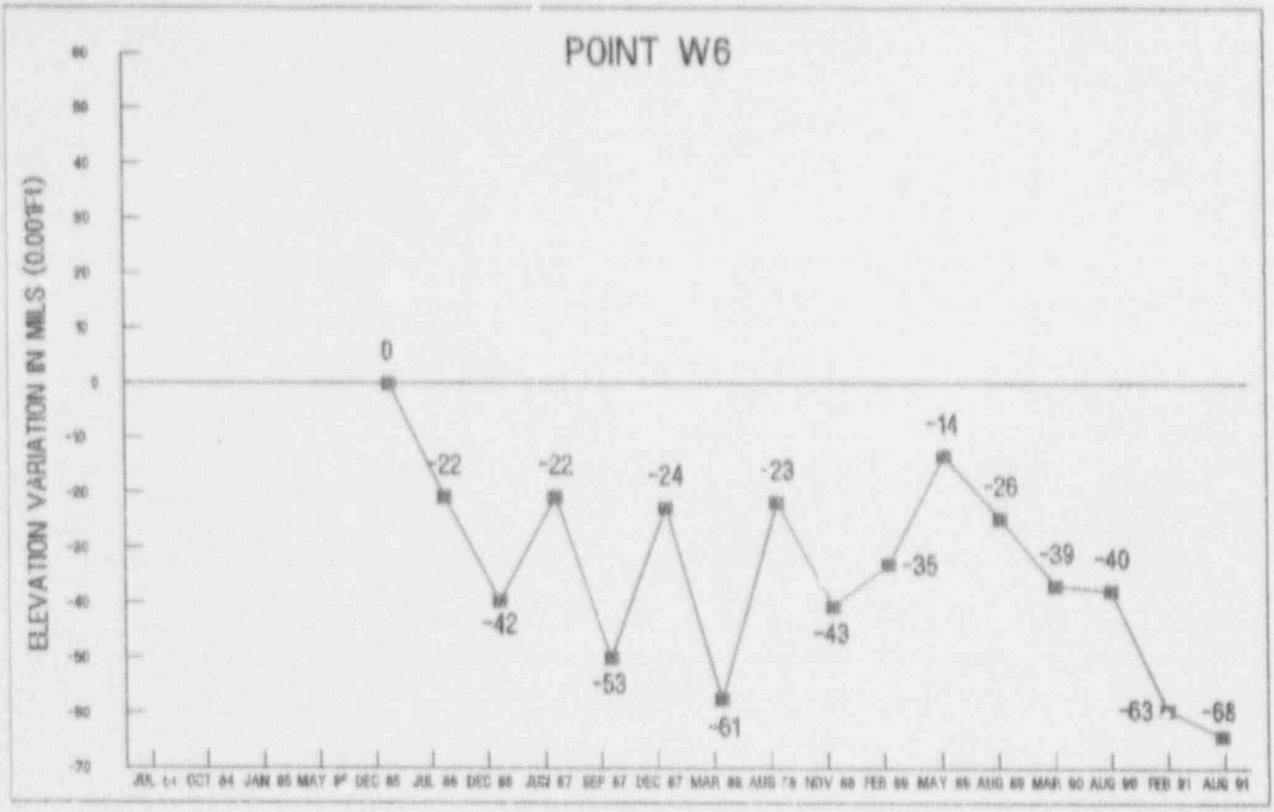
FIGURE 25

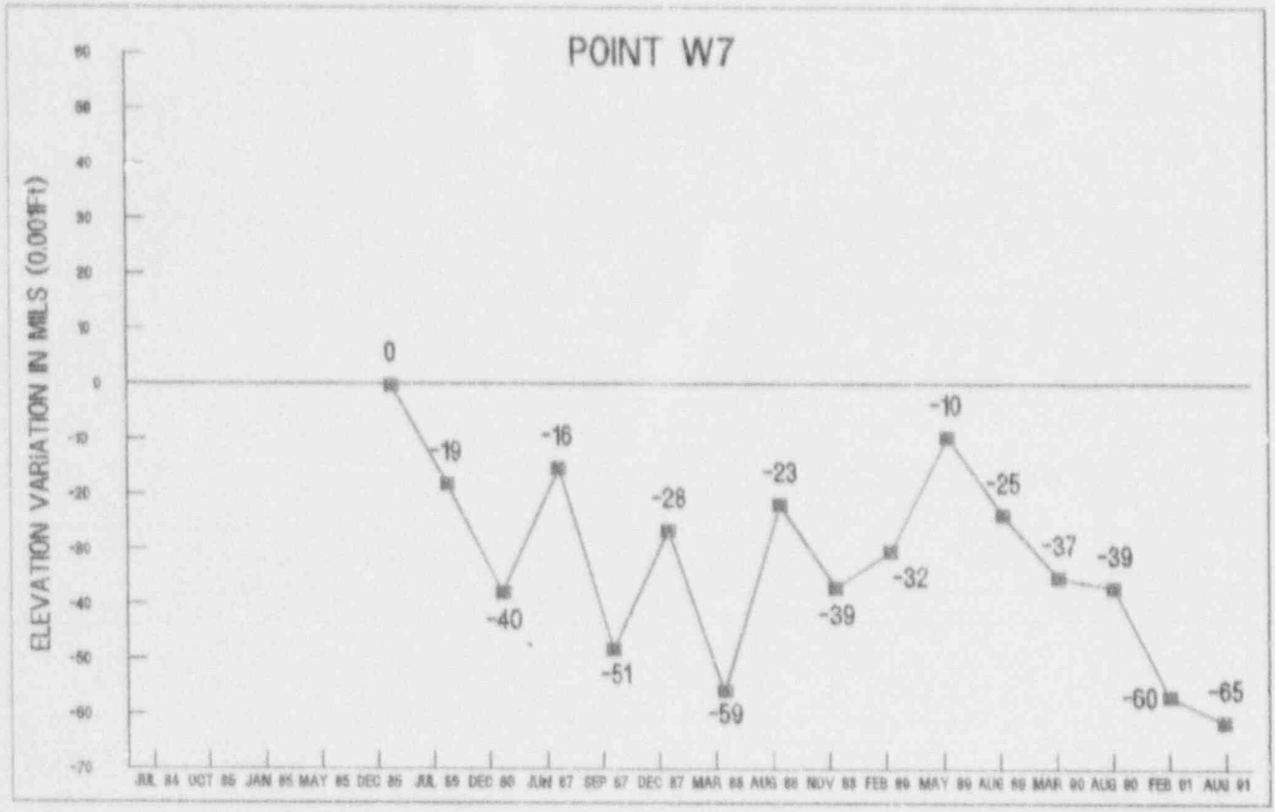




ELEVATION VARIATION OF MONITORING POINTS

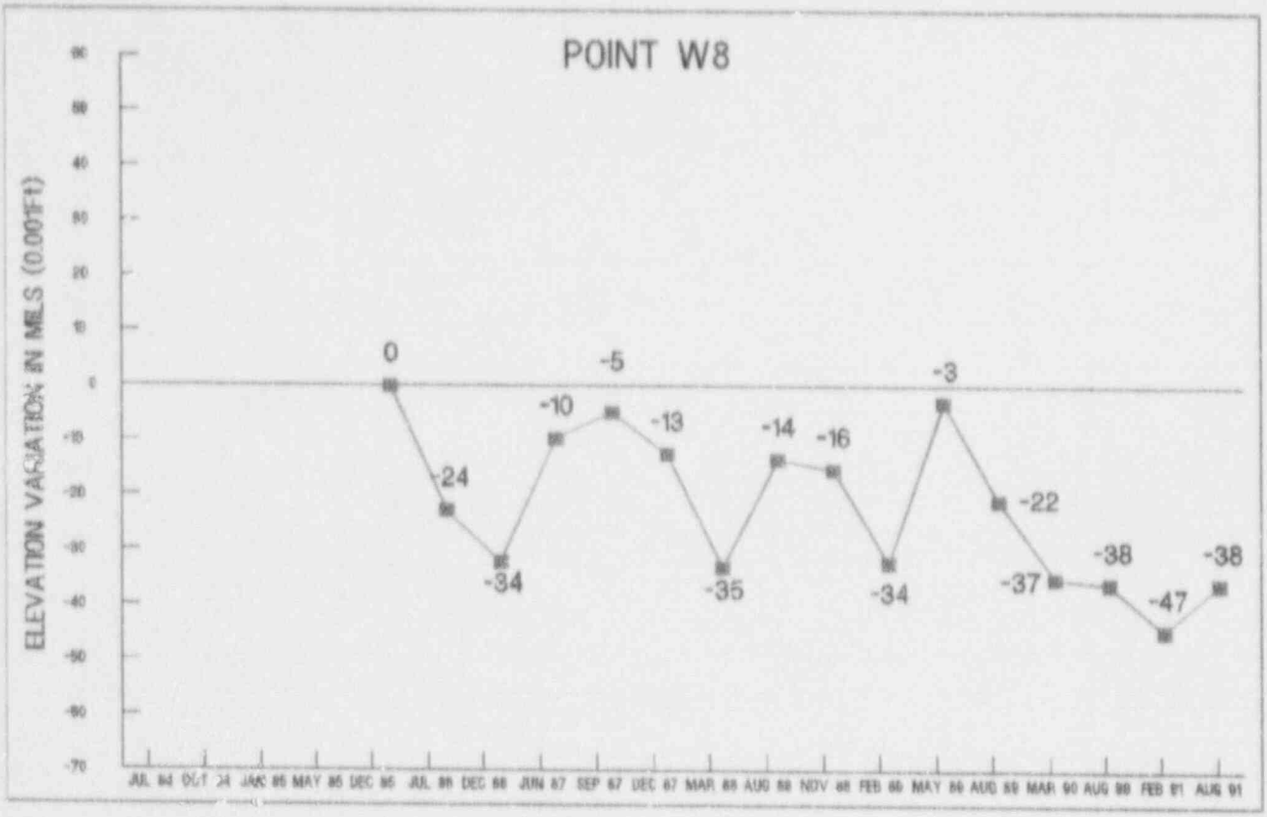
FIGURE 26

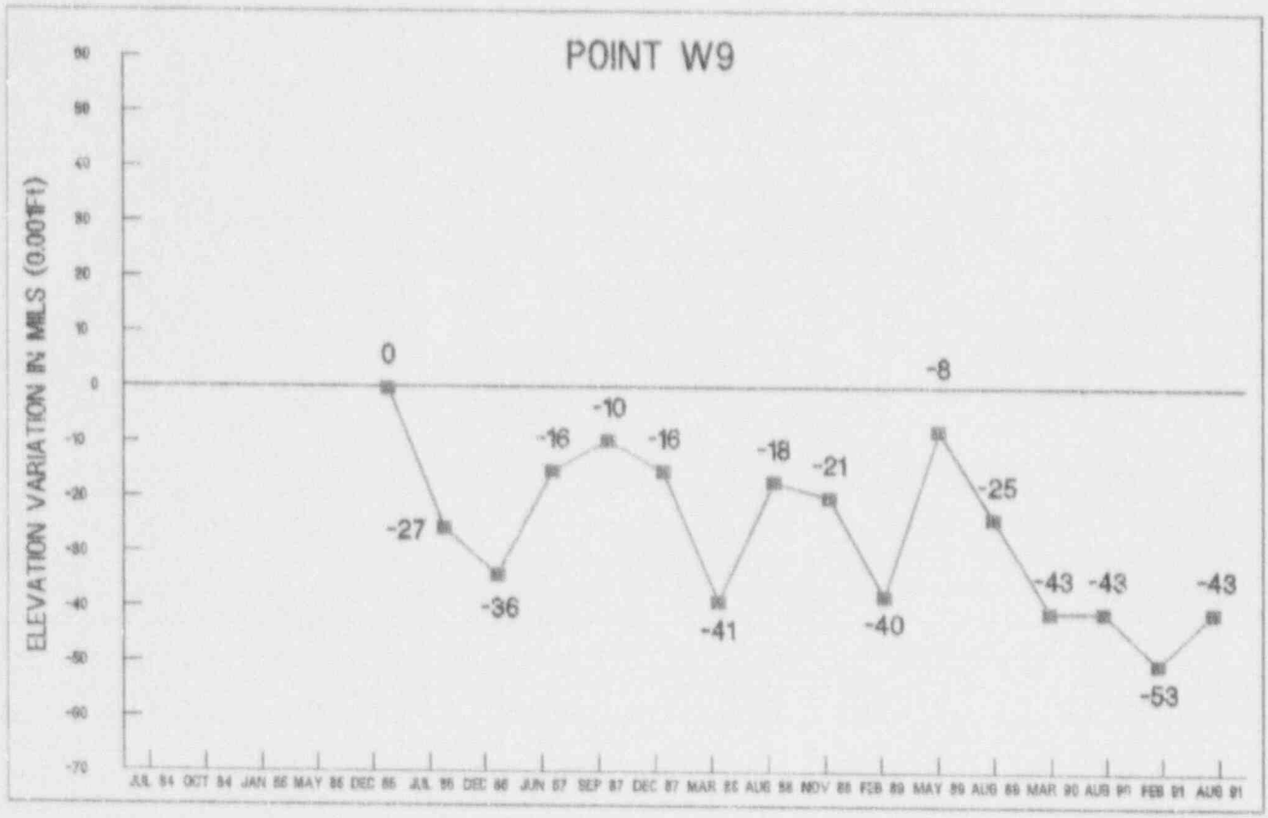




ELEVATION VARIATION OF MONITORING POINTS

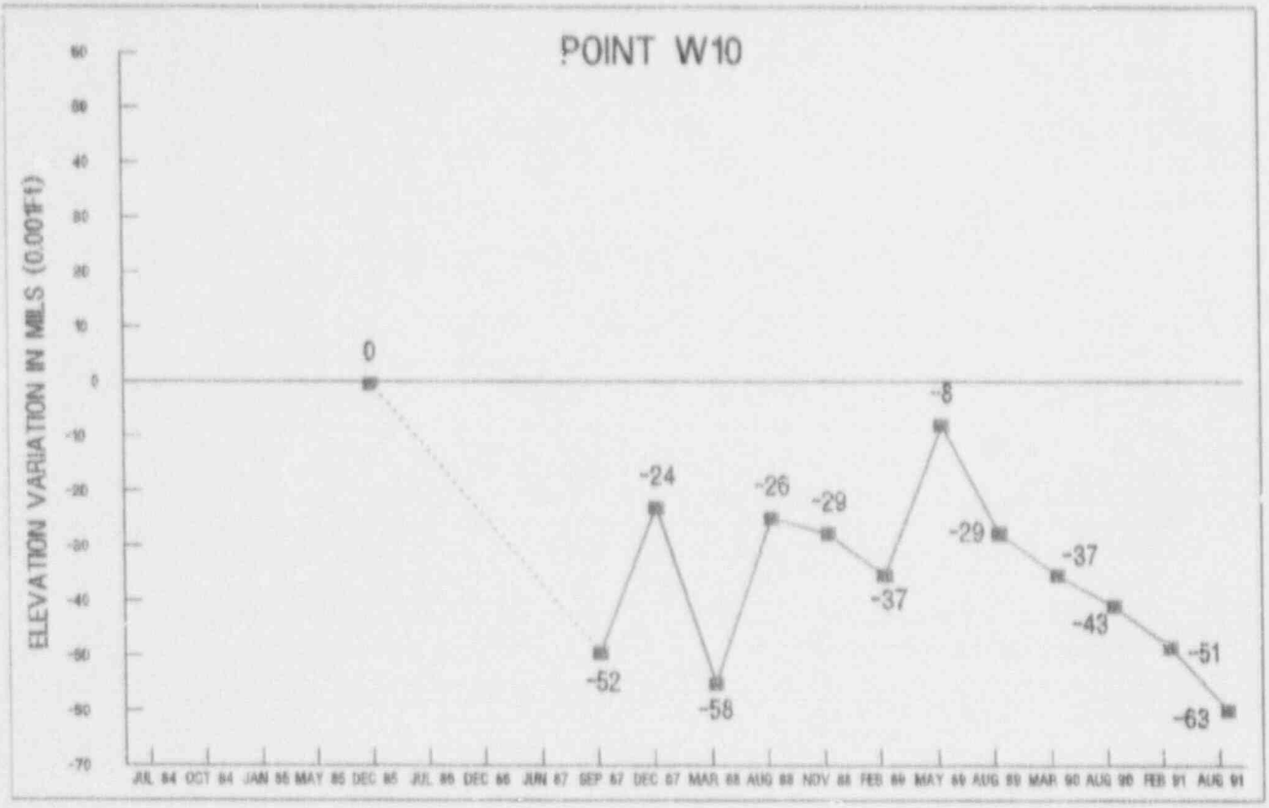
FIGURE 27

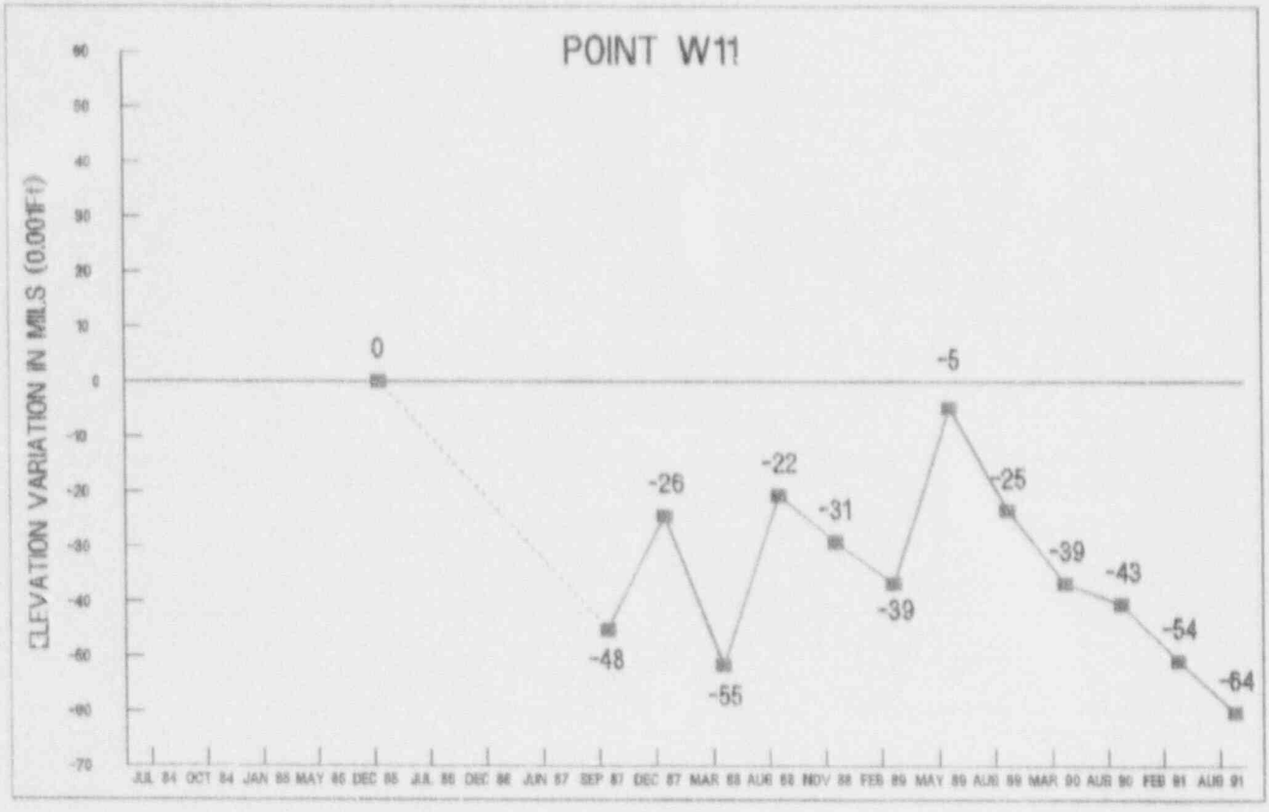




ELEVATION VARIATION OF MONITORING POINTS

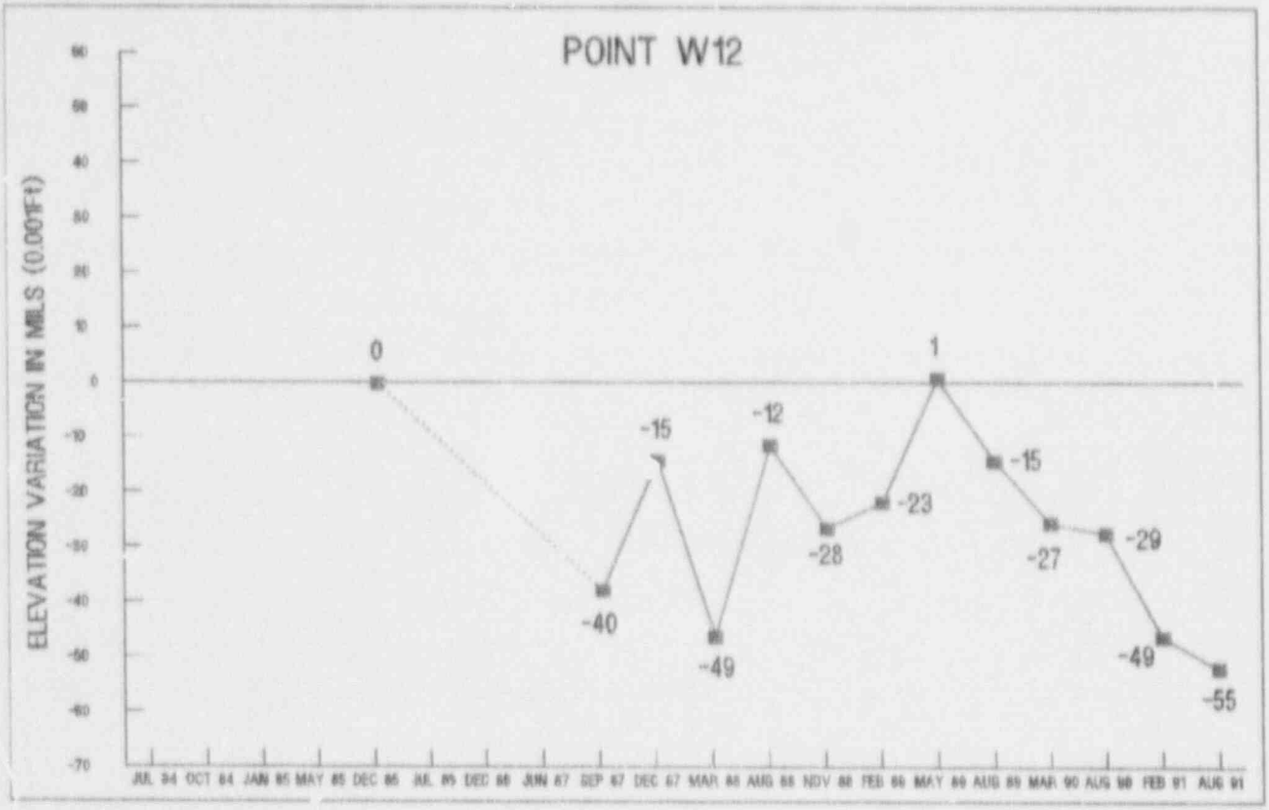
FIGURE 28





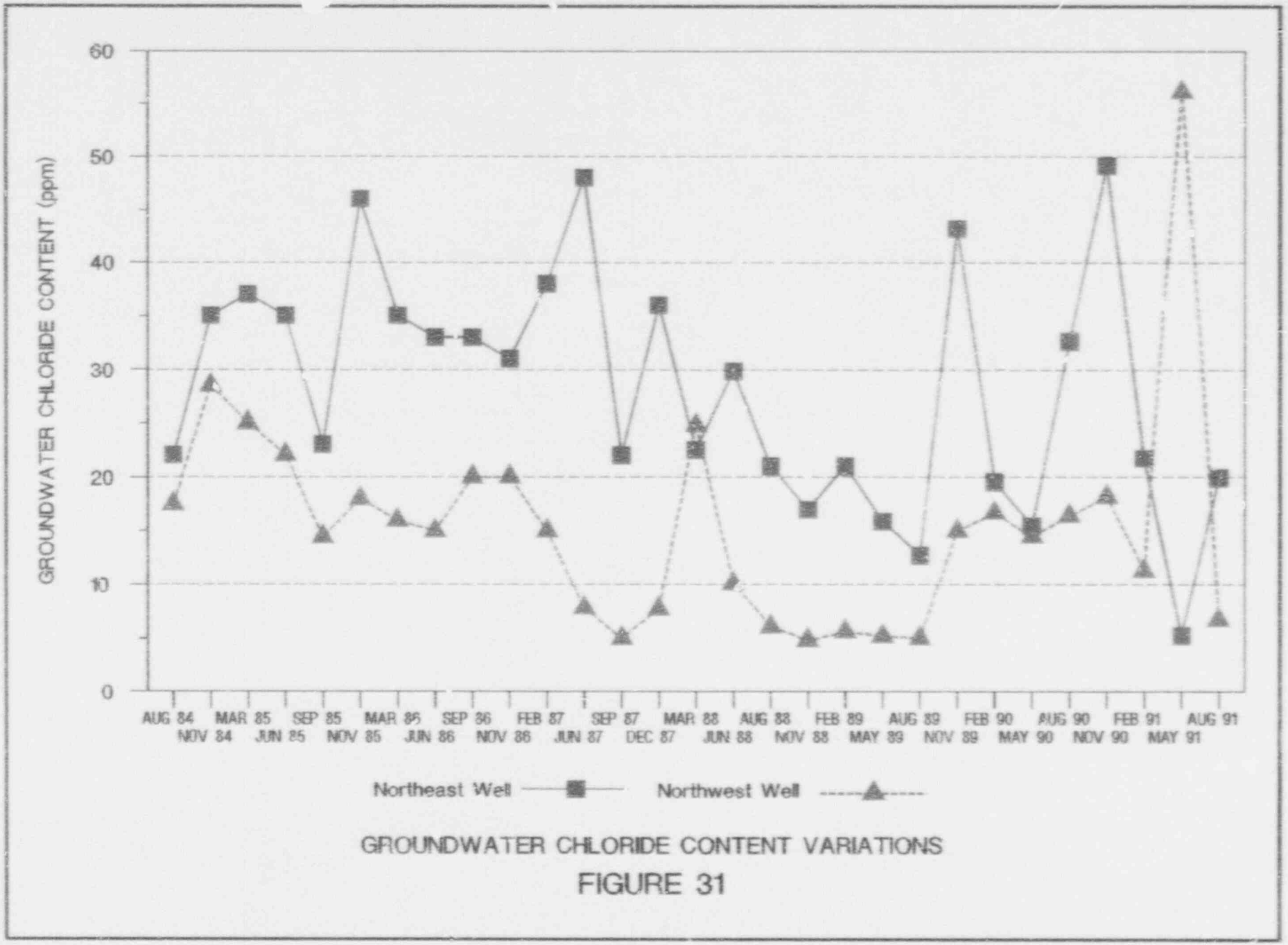
ELEVATION OF MONITORING POINTS

FIGURE 29



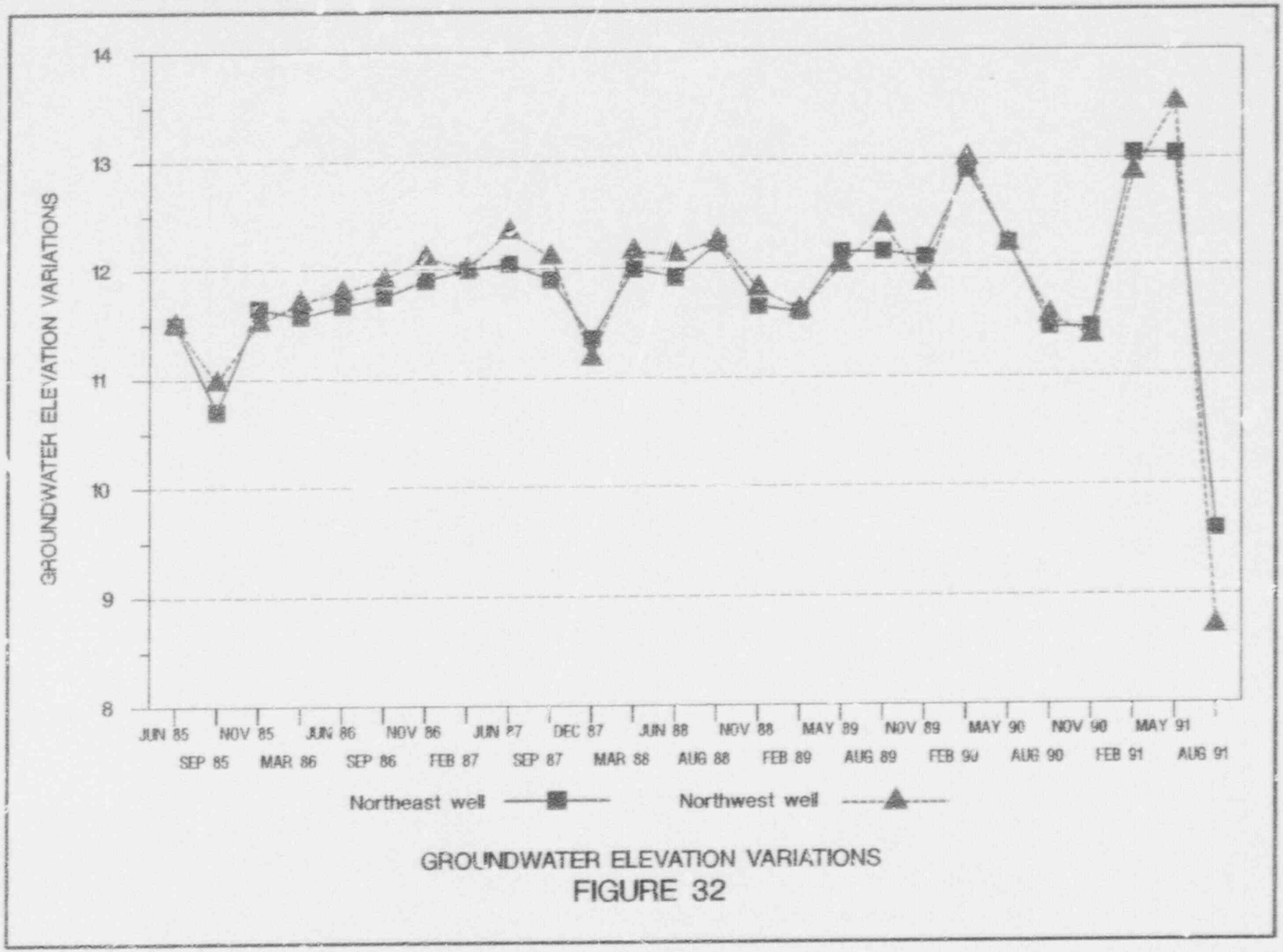
ELEVATION OF MONITORING POINTS

FIGURE 30



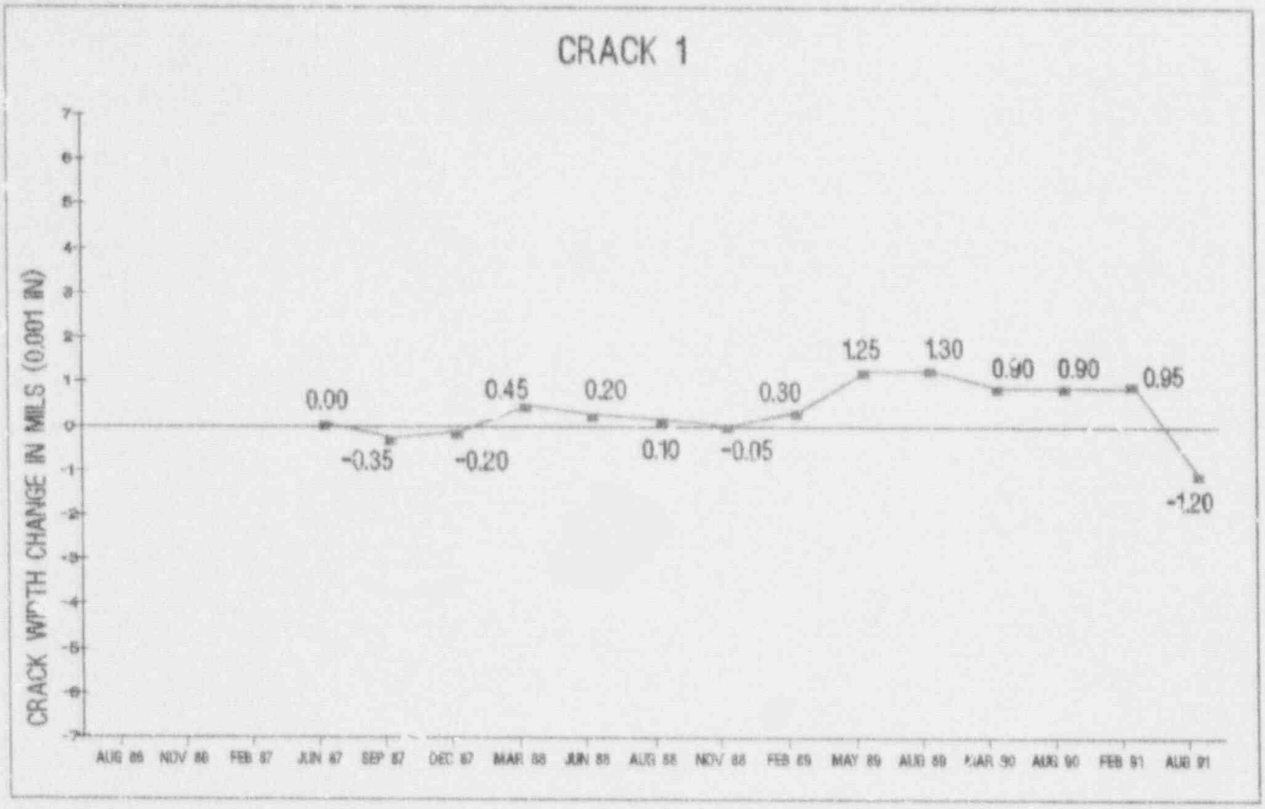
GROUNDWATER CHLORIDE CONTENT VARIATIONS

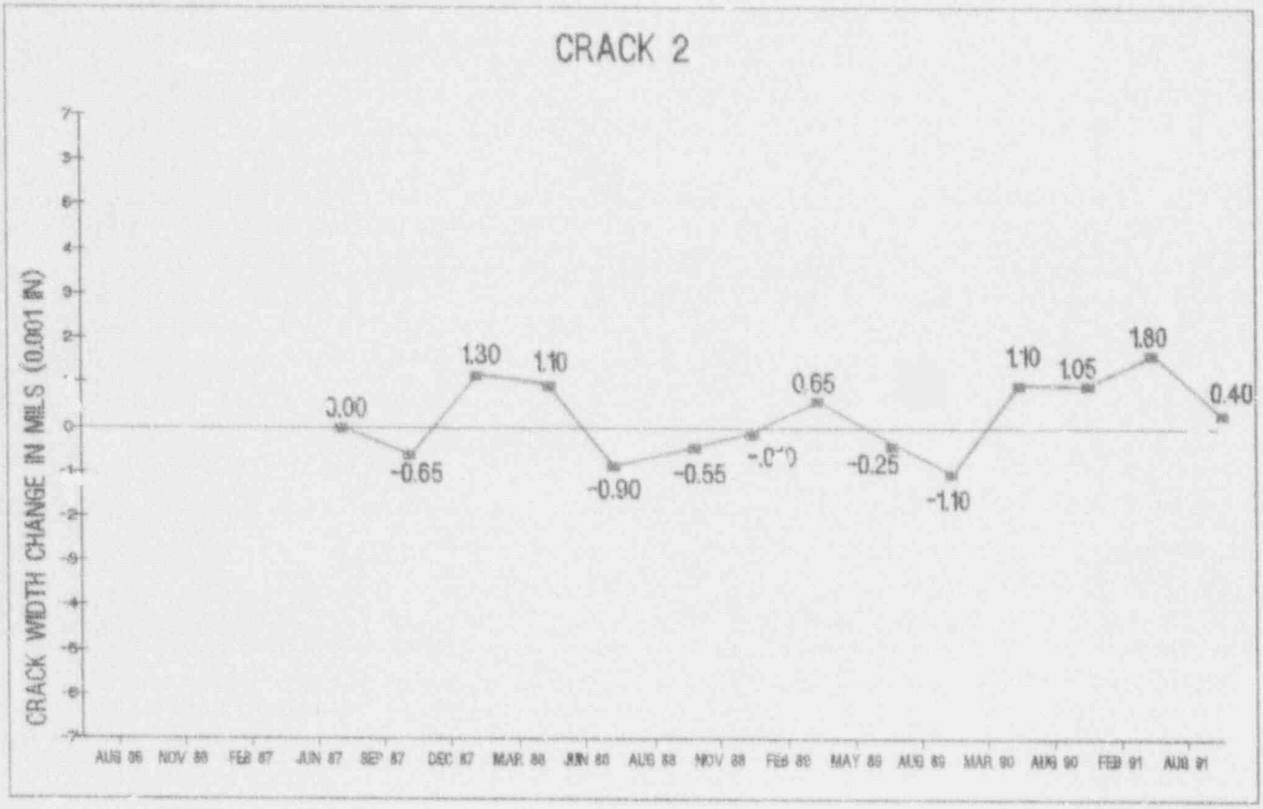
FIGURE 31



GROUNDWATER ELEVATION VARIATIONS

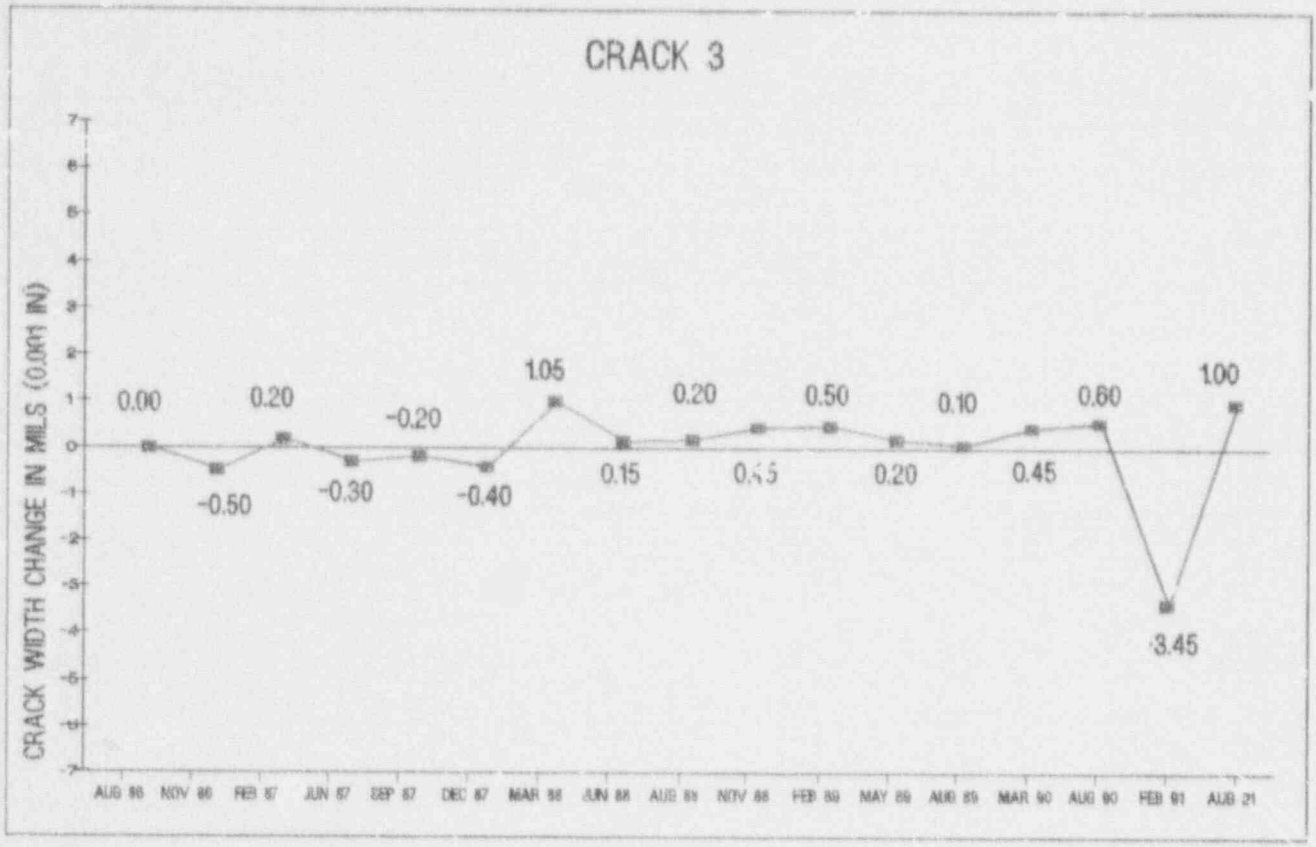
FIGURE 32

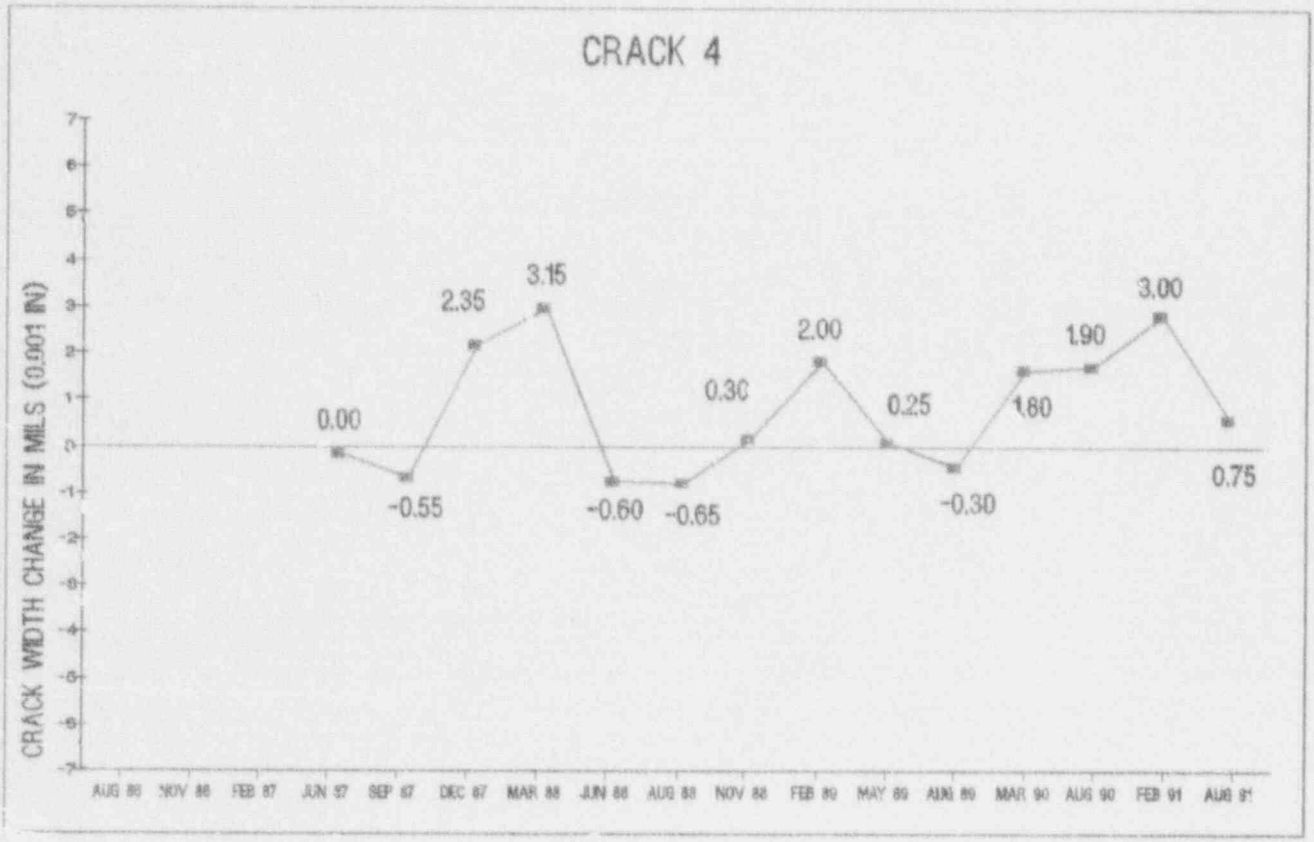




CRACK WIDTH VARIATIONS

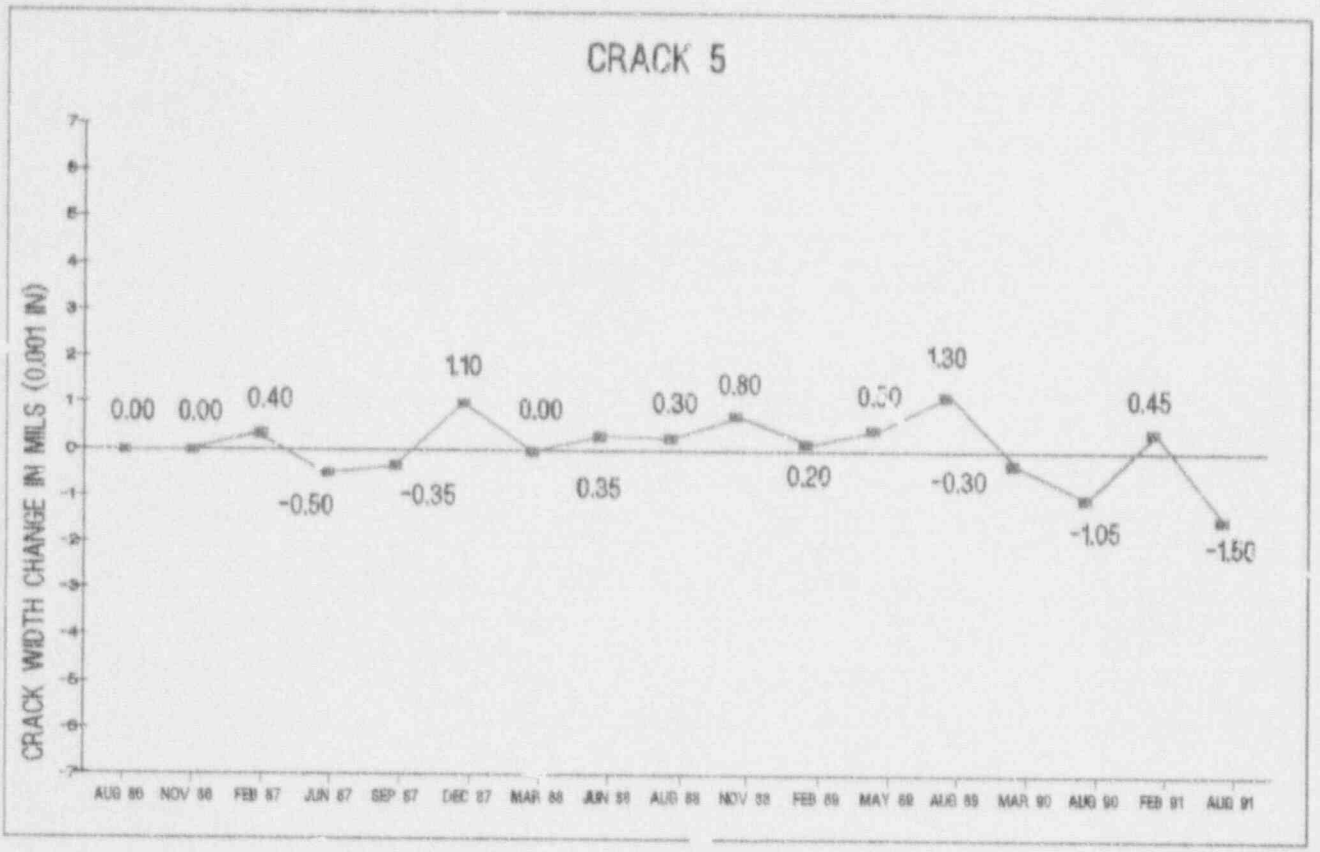
FIGURE 33

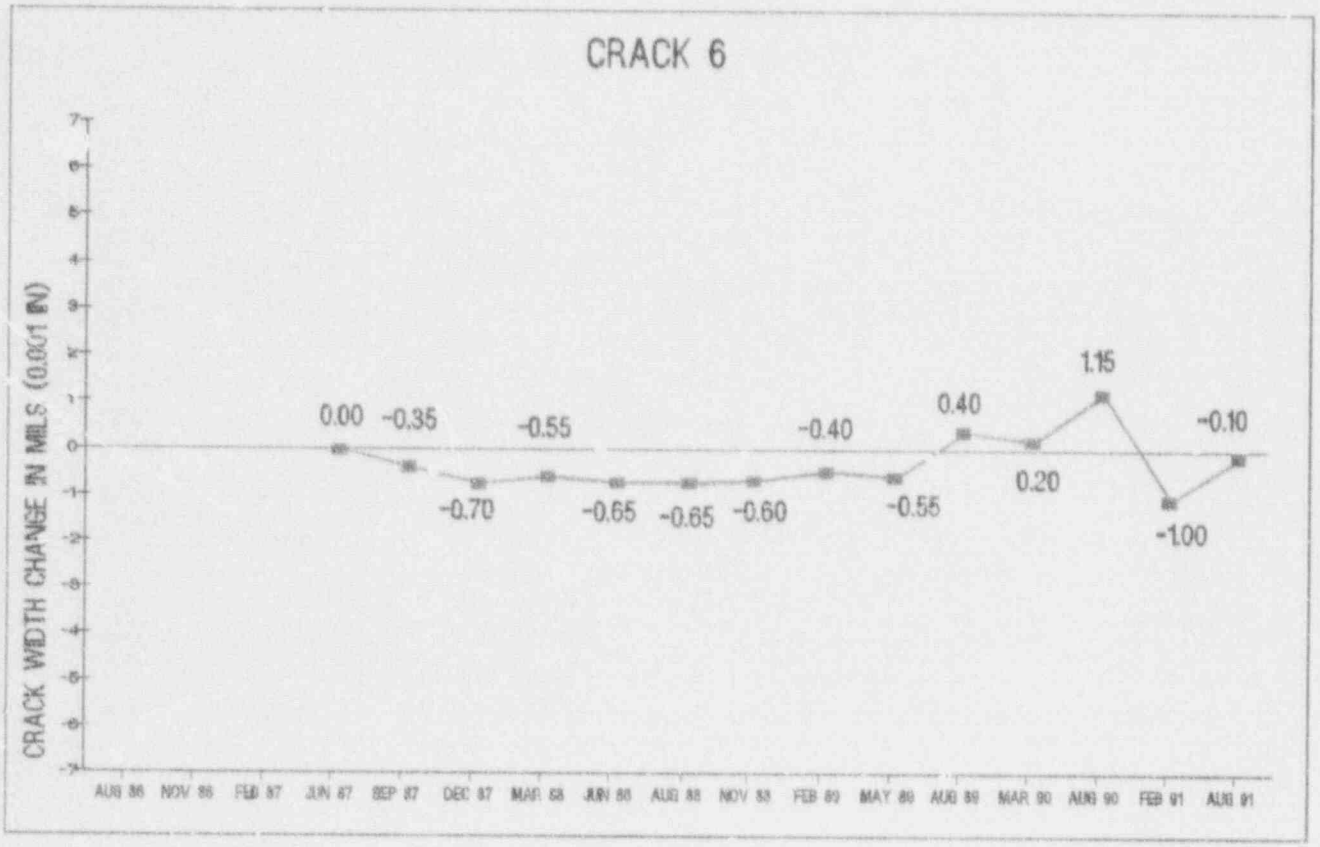




CRACK WIDTH VARIATIONS

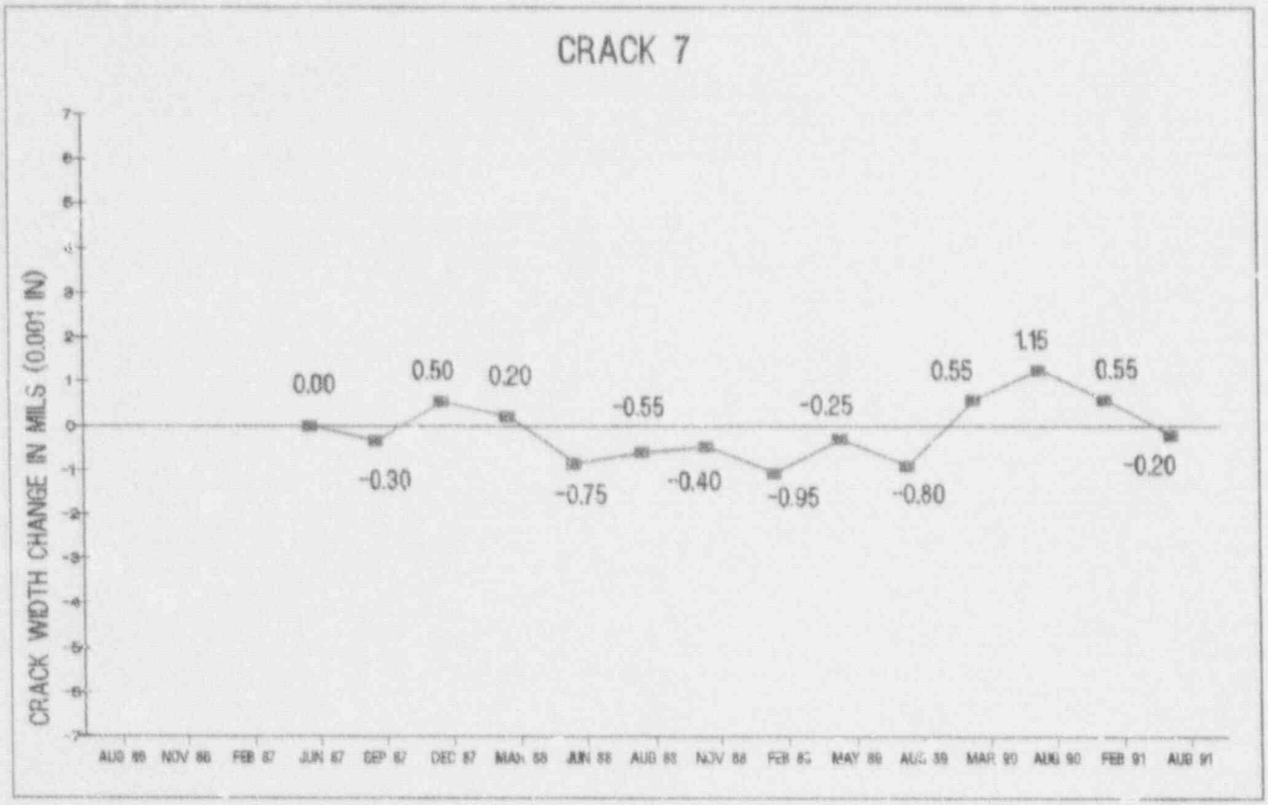
FIGURE 34

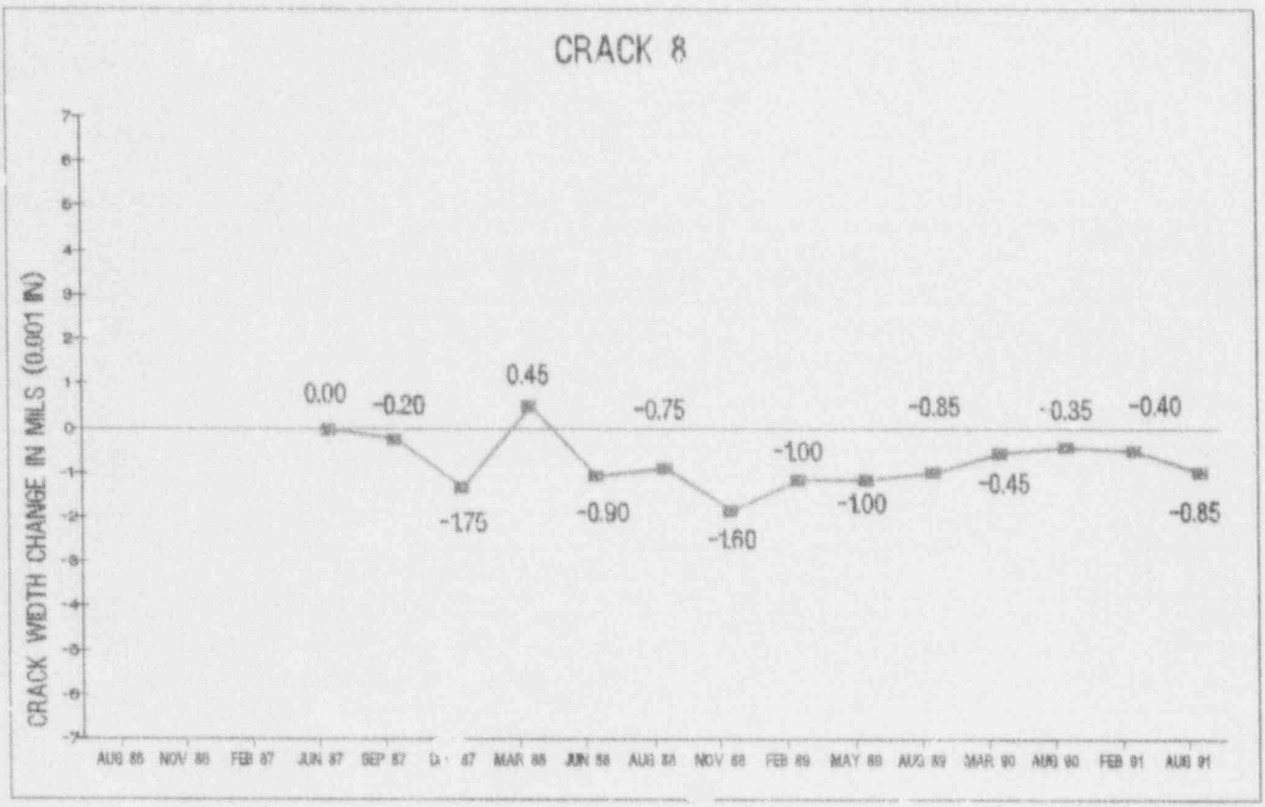




CRACK WIDTH VARIATIONS

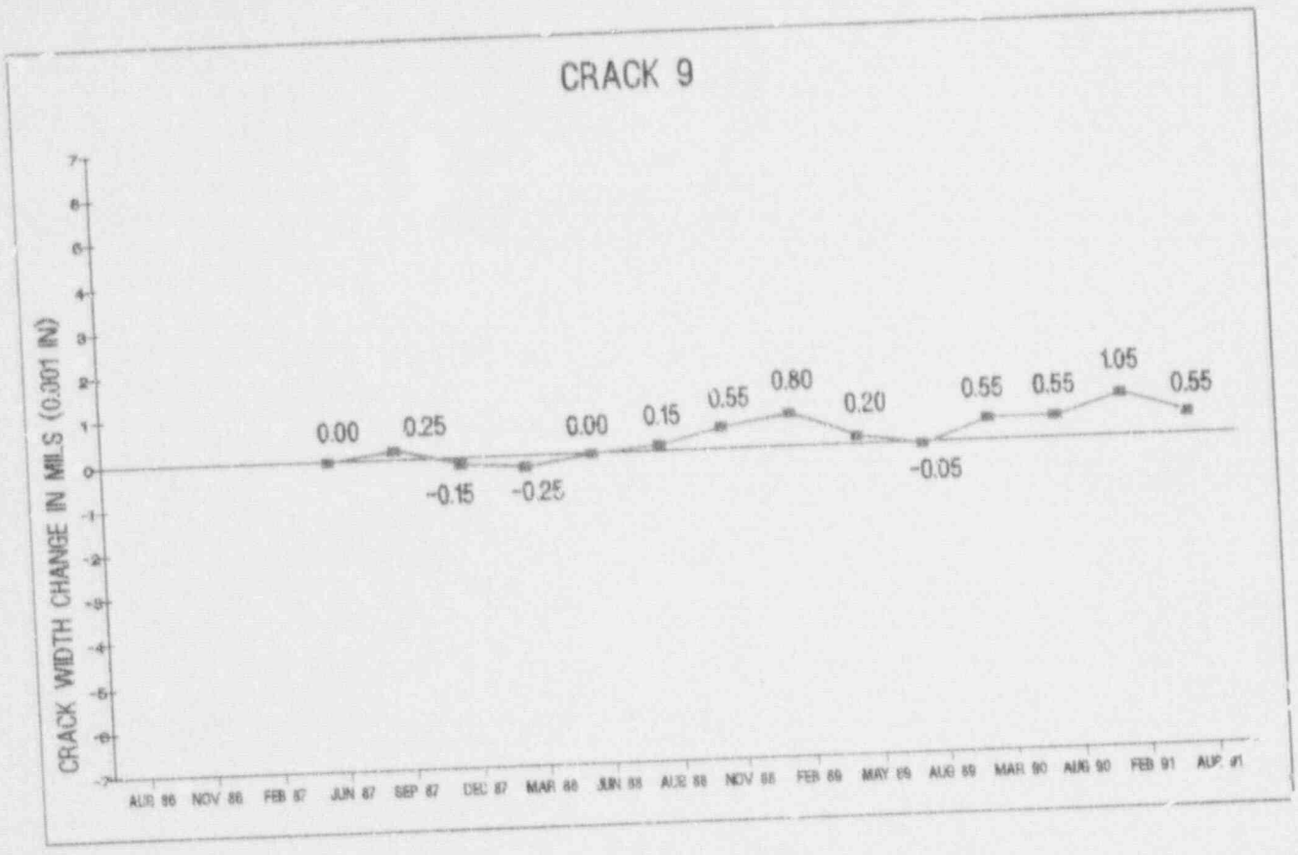
FIGURE 35

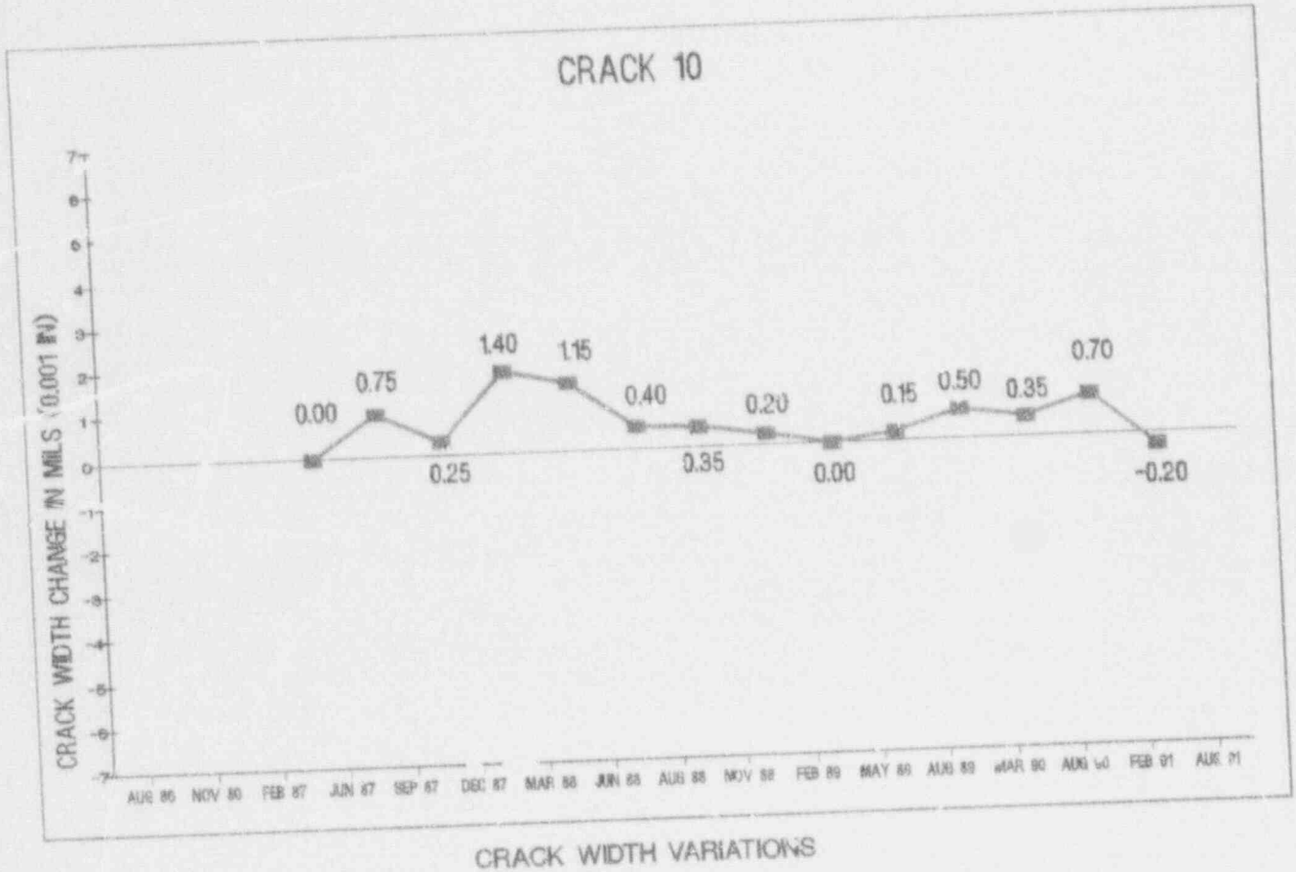




CRACK WIDTH VARIATIONS

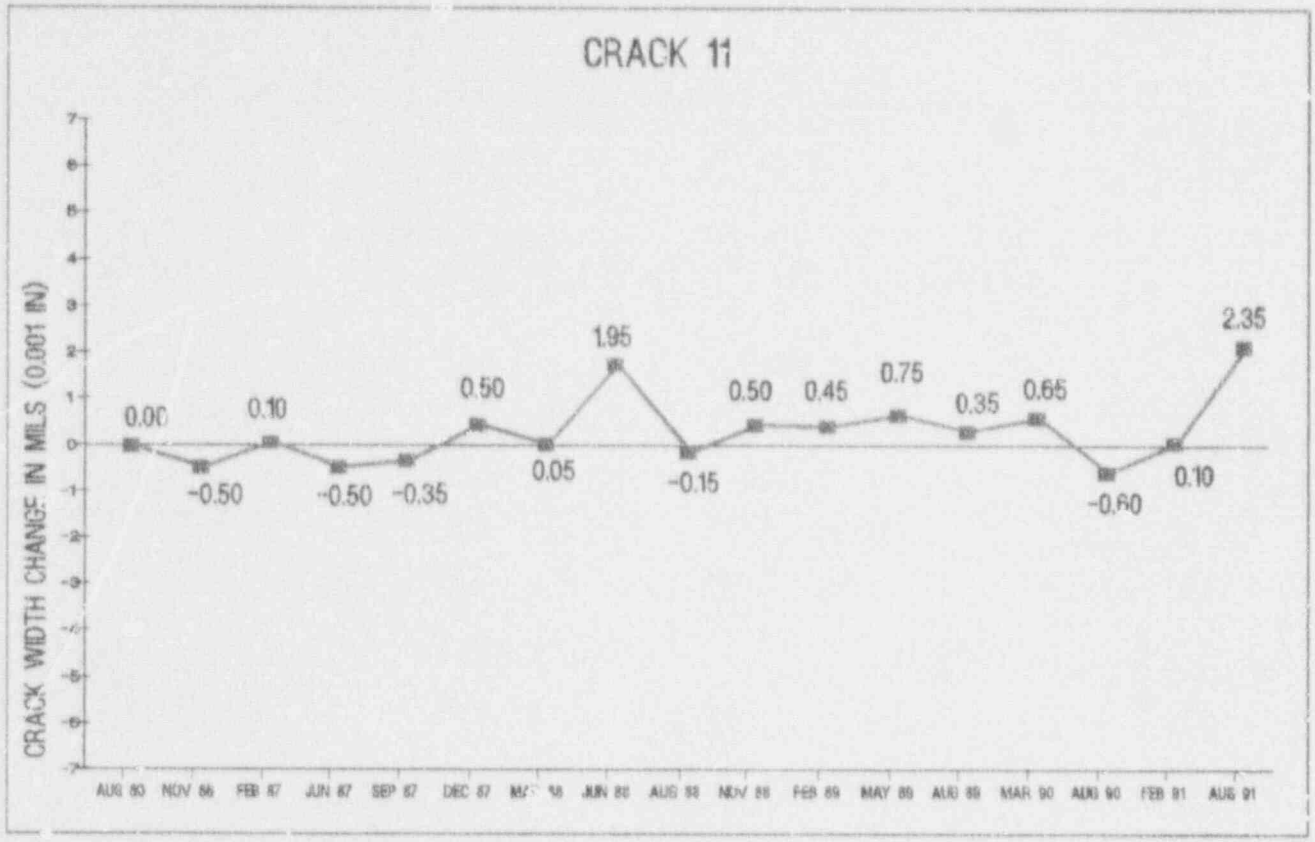
FIGURE 36

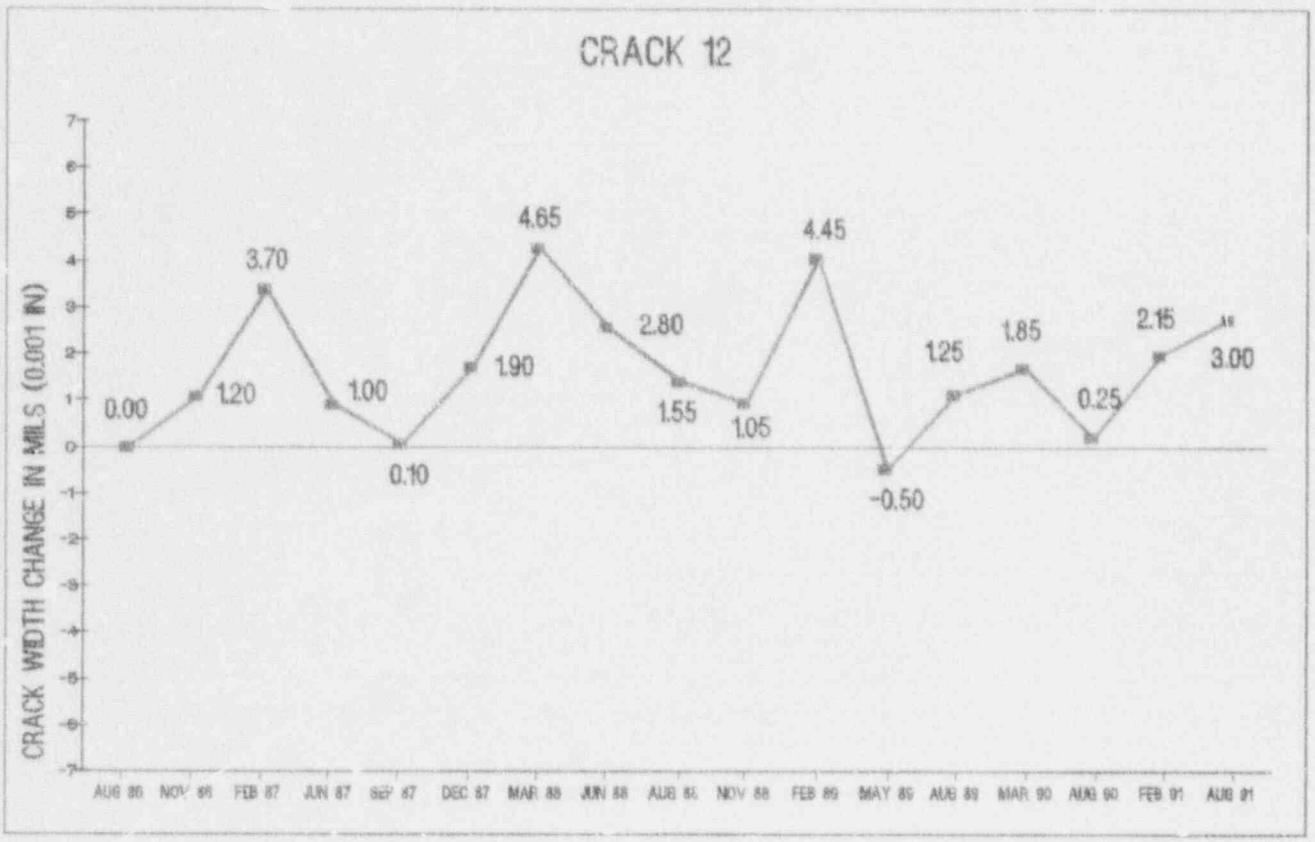




CRACK WIDTH VARIATIONS

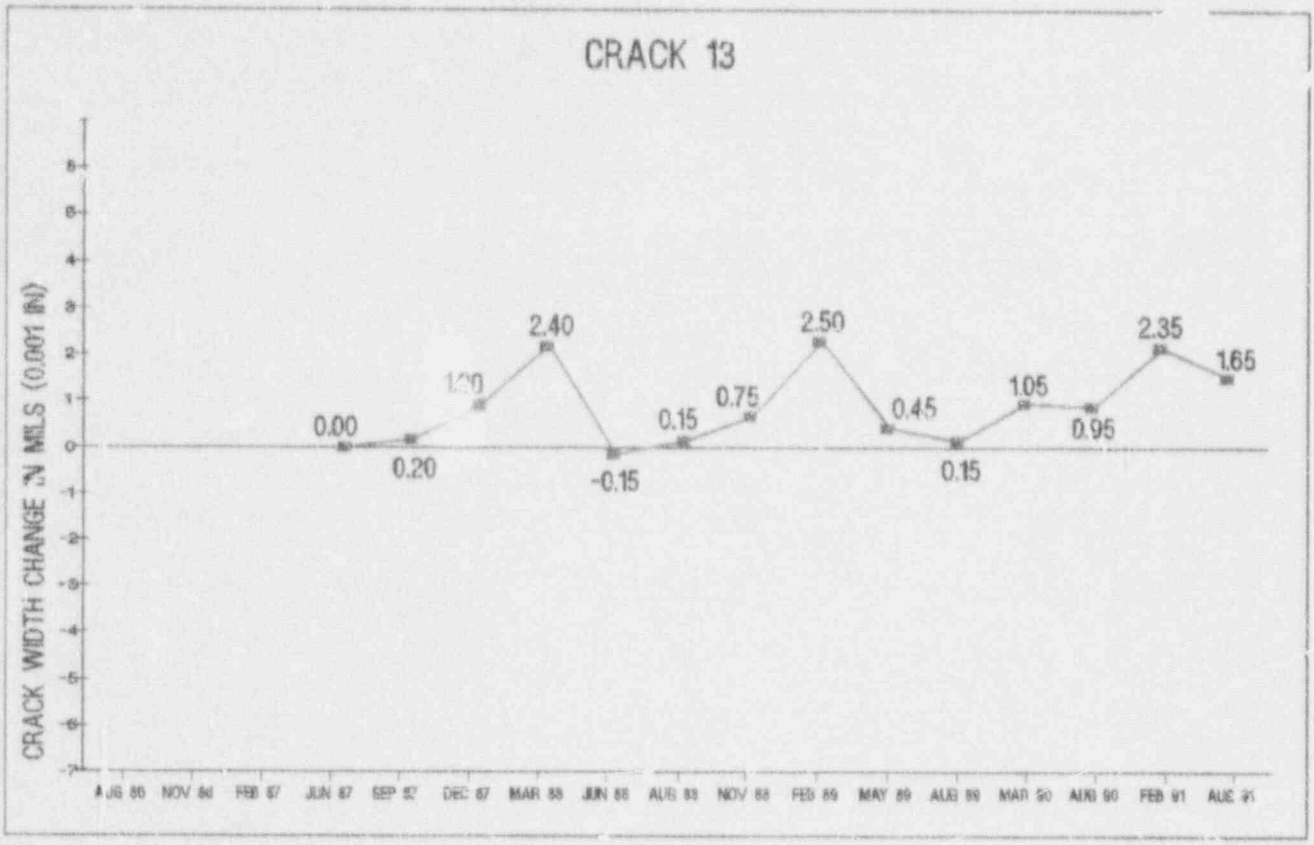
FIGURE 37

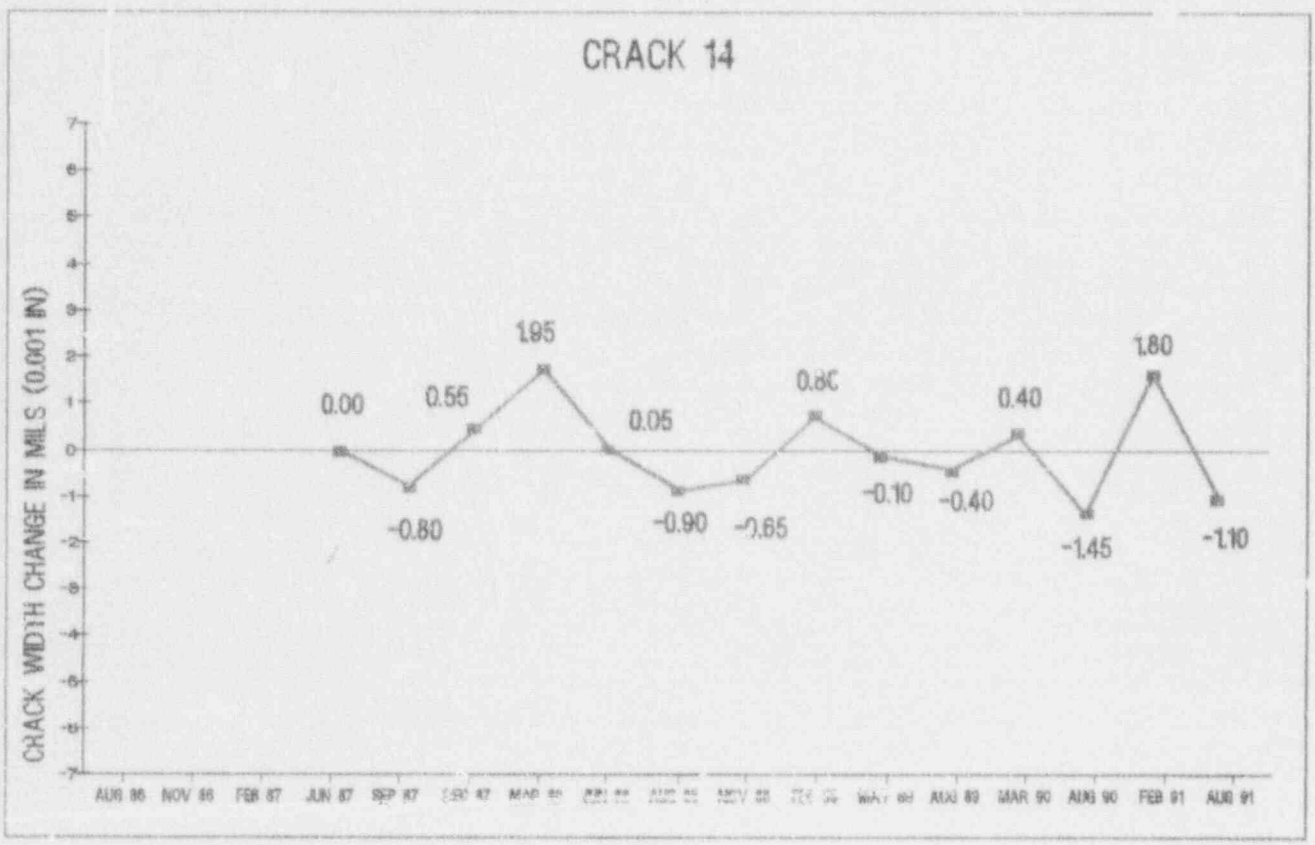




CRACK WIDTH VARIATIONS

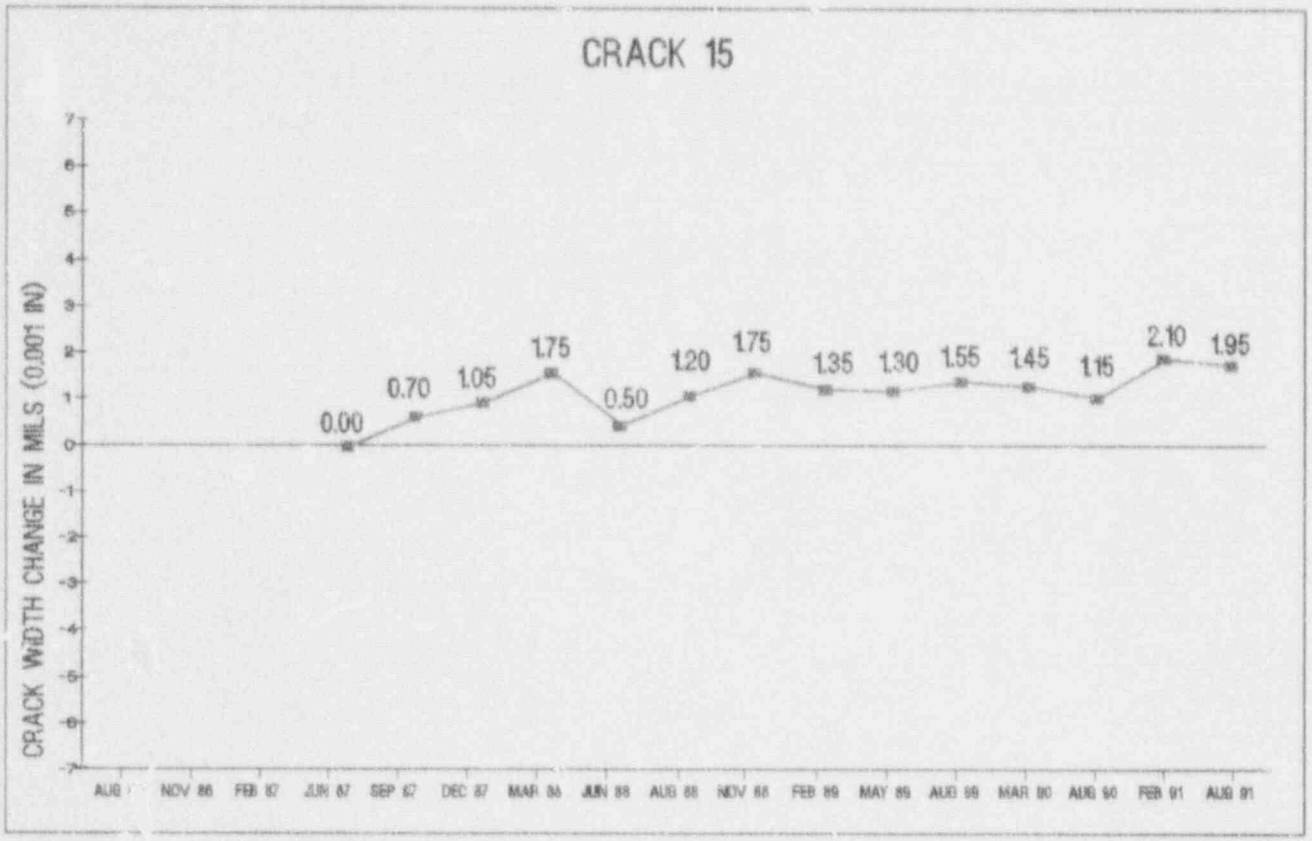
FIGURE 38





CRACK WIDTH VARIATIONS

FIGURE 39



CRACK WIDTH VARIATIONS

FIGURE 40