1988 ANNUAL REPORT
COTTER CORPORATION
CANON CITY MILL
Table of Contents


| | | Page Nos. |
|---|---|---|
| 1.0 | License Conditions 21.1, 29 and 30 - Water Quality Data | 1-1 to 1-137 |
| 2.0 | License Condition 22.5 - Alpha Survey of Equipment Leaving the Mill | 2-1 |
| 3.0 | Personnel Monitoring Surveys, Inspections and Audits | |
| 3.1 | License Condition 23.7 - Personnel Alpha Surveys | 3-1 to 3-12 |
| 3.2 | License Condition 23.8 - Alpha Surveys of Control Rooms, Etc. | 3-13 to 3-25 |
| 3.3 | License Conditions 23.9, 23.9.1, 23.9.2, Independent Audit | 3-26 |
| 4.0 | Bioassay Measurements | |
| 4.1 | License Condition 24.1.1.1 - Urinalysis | 4-1 to 4-12 |
| 4.2 | License Condition 24.2.1 through 24.4 - In Vivo | 4-13 |
| 5.0 | License Conditions 25.0 - Stack Effluent Data | 5-1 to 5-19 |
| 6.0 | Work Station and Employee Exposure Data | |
| 6.1 | Licenses Condition 26.1 and 26.2 - Work Station and Breathing Zone Data | 6-1 to 6-6 |
| 6.2 | License Condition 26.3 - Monthly Radon at Work Stations | 6-7 to 6-11 |
| 6.3 | License Condition 26.4 - Time Weighted Exposures | 6-12 |
| 7.0 | Environmental Monitoring Data | |
| 7.1.1 | License Condition 27 - Environmental TLD Monitoring | 7-1 to 7-5 |
| 7.1.2 | License Condition 27 - Radon-222 Monitoring | 7-6 to 7-10 |
| 7.1.3 | License Condition 27.1 - Environmental Air Particulates | 7-11 to 7-29 |



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1988 ANNUAL REPORT
COTTER CORPORATION
CANON CITY MILL
Table of Contents


| | | Page Nos. |
|---|---|---|
| 7.0 | Environmental Monitoring Data (cont) | |
| 7.2 | License Conditions 27.2 and 27.3 - Soils and Vegetation Data | 7-30 to 7-36 |
| 8.0 | License Condition 28.0 - Land Use Survey | 8-1 |
| 9.0 | Gamma Monitoring | |
| 9.1 | Gamma Survey | 9-1 to 9-6 |
| 9.2 | TLD Badges | 9-7 to 9-12 |
| 10.0 | Annual Reports | |
| 10.1 | License Condition 17.1 - Fugitive Dust Control Report | 10-1 |
| 10.2 | License Condition 19.3.5 - Pumpback Flow Records | 10-2 to 10-3 |
| 10.3 | License Condition 22.7 - Radiation Safety Training Report | 10-4 |
| 10.4 | Colorado Departmemt of Health Inspections | 10-5 |
| 11.0 | License Condition 36.0 MILDOS Assessment | 11-1 |

# 1.0 - WATER QUALITY MONITORING - ANNUAL REPORT

## LICENSE CONDITIONS 21.1, 29 AND 30

Cotter Corporation operated and maintained its water quality monitoring program in the vicinity of the Canon City mill site for the first four months of 1988. The purpose of this program was fourfold: 1) compliance with the requirements of License Conditions 21.1, 29 and 30; 2) compliance with the NRC Regulatory Guide 4.14; 3) maintenance of a sufficient data base for evaluation and appraisal of groundwater quality trends and 4) assessment of the effect of various remedial measures, including the transfer of the alkaline tailings which was completed in 1983.

Cotter Corporation has completed a comprehensive technical review, inventory and evaluation of past, present and future source terms which affect the ground and surface water systems and has presented the pertinent details of these analyses in sections 2, 3, 6, 9, 10 and 12 of "Application for Renewal of Radioactive Materials License No.369-01S" dated March 29, 1984, which was filed with the Colorado Department of Health, as well as in a variety of other documents available in the public domain

On November 17, 1981, June 30, 1983, and again in the March 29, 1984, Mill License Renewal Application, Cotter proposed to the Colorado Department of Health a revised ground and surface water monitoring system. A second proposal was filed with the Colorado Department of Health on January 14, 1985, and updated and resubmitted in September, 1985. The issues raised in these letters have been resolved by agreement between the Department

and Cotter, as described in Section 15 of the Remedial Action Plan (RAP) prepared as part of the settlement of the CERCLA lawsuit filed by the State in U. S. District Court in December, 1983. Cotter continues to attempt to collect all samples specified in the current license, but can not collect samples when it is physically or legally impossible to do so. This annual report presents graphs for essentially all monitoring locations as listed in License Condition 11.33. Upon entry of the CERCLA case consent decree by the Federal District Court, on April 4, 1988, Cotter implemented the water monitoring requirements specified in Section 15 of the RAP commencing in May, 1988. Beginning in June, 1989, Cotter will report water quality data collected in accordance with the RAP, as part of the RAP Annual Report. Water quality data will no longer be included in the Mill License Annual Report.

The two graphs plotted for each of these locations depict Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) concentrations as a function of time over the period from 1981 through 1987. Tables of annual average concentrations for each of these constituents have been previously presented for the period 1981 through 1987.

Since this report covers only January - April, 1988. For this period, averages have not been calculated since they would not reflect a valid comparison to previous annual averages.

Additionally, this annual report contains discussion of water quality at each location where sampling was conducted in accordance with the current mill license prior, to signing the consent decree. A complete computer printout of all water quality data accumulated since January, 1985, is provided separately.

Wells designated as 100 series are located offsite. Wells designated 300 series are onsite. Locations designated as the 500 series are surface water locations and are either onsite or offsite. Trench and underdrain locations designated as 700 series are considered onsite locations. Commencing in August, 1984, the Cotter laboratory reported Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) analyses utilizing revised Lower Limits of Detection (LLD's) of 0.005 mg/l. License Condition 30.5 specifies screening criteria of 0.3 mg/l for Molybdenum (Mo) and 0.08 mg/l for Natural Uranium ($^{Nat}U$).

OFFSITE LOCATIONS

Well #106 showed a slight downtrend for Natural Uranium ($^{Nat}U$). Radium-226 ($^{226}Ra$) averaged 0.5 pCi/l. No levels above License Condition 30.5 screening criteria were noted.

Well #111 had no levels above License Condition 30.5 screening criteria.

Well #114 had no exceedance of License Condition 30.5 screening criteria while concentrations remained stable.

Well #117 had relatively stable Natural Uranium ($^{Nat}U$) concentrations below License Condition 30.5 screening criteria; however, three (3) Molybdenum (Mo) analyses exceeded the License Condition 30.5 screening level.

Well #118 has not been sampled since January 11, 1982, because the owner's pump is inoperative.

Well #119 continues to demonstrate the cyclic dilution effect of the DeWeese Dye Ditch. Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) levels above the License Condition 30.5 screening criteria were encountered in 1988.

Well #120 has stabilized for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo). No values exceeded the License Condition 30.5 screening criteria.

Well #122 continued a downtrend for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo). Both constituents exceeded License Condition 30.5 screening criteria.

Well #123 was not sampled in 1988. The owner has refused access.

Well #124 was sampled once during this reporting period, and a continuing downtrend for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) is apparent. Molybdenum (Mo) exceeded the License Condition 30.5 screening criteria.

Well #129 had an apparent uptrend for Natural Uranium ($^{Nat}U$) and a stable concentrations for Molybdenum (Mo), with one (1) exceedance each of the License Condition 30.5 screening criteria for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo).

Well #135 had stable Natural Uranium ($^{Nat}U$) concentrations and one detectable Molybdenum (Mo) concentration. Levels were below the License Condition 30.5 screening criteria.

Well #136 was sampled once in March, 1981, and not sampled subsequently as it was not considered to be in the shallow groundwater flow regime flowing from the mill site

Well #137 showed generally stable concentrations with no levels encountered above the License Condition 30.5 screening criteria.

Well #138 showed all analysis above the License Condition 30.5 screening criteria with the DeWeese Dye Ditch dilution effect evident.

Well #139 has had essentially the same concentration profile for 1981-1988 as well #138. Levels exceeding the License Condition 30.5 screening criteria were noted.

Well #140 showed a cyclic dilution effect of the DeWeese Dye Ditch. Levels exceeded the License Condition 30.5 screening criteria.

Well #141, showed an uptrend for 1988 as compared to 1987 for Natural Uranium ($^{Nat}U$). Molybdenum (Mo) had stable concentrations. All concentrations were below the License Condition 30.5 screening criteria.

Well #142 has not been sampled since June 11, 1981, due to the owner's pump being inoperable.

Well #144 exhibited stable concentrations with Molybdenum (Mo) exceeding the License Condition 30.5 screening criterion on two (2) occasions.

Well #153 had no levels above License Condition 30.5 screening criteria.

In summary, during early 1988, offsite wells generally exhibited concentrations that would be predicted for winter to early spring samples.

ONSITE LOCATIONS

In 1987, well #303 showed stable Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) concentrations. In 1985, a steady rise in Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) occurred. This water is currently of a quality similar to trench location #703. Prior to 1985, the water quality in this well was diluted by pumping of the well, causing mixing with deeper water, which is of better quality. Concentrations have remained stable through April, 1988.

Well #312 continued on the upswing for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo).

Well #313 had stable concentrations for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo).

Well #314 had stable concentrations for Natural Uranium ($^{Nat}U$) concentrations and a continued uptrend for Molybdenum (Mo). Sulfate ($SO_4$) has shown a continued uptrend during the 1981-1988 monitoring program with a program high of 710 mg/l reached on March 9, 1988. Radium-226 ($^{226}Ra$) averaged 1.4 pCi/l.

Well #315 had stable Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) concentrations.

Well #316 had not been sampled since January 20, 1984, because it was blocked. In January, 1986, an attempt was made to clean out this well. This location was found to be filled with silt and mud and is not repairable.

Well #317 has not been sampled since March of 1986. This well was apparently damaged during the refurbishment of well #315 and is not repairable.

Well #324 continued a downtrend for Natural Uranium ($^{Nat}U$) while Molybdenum (Mo) had a slight uptrend. Continuation of the rise in water level was noted with a 0.50 foot rise from January to April, 1988.

Well #325 which showed a peaking for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) on November 1, 1987, with a program high for Total Dissolved Solids (TDS) on September 17, 1987, showed a drop to historical levels. Average Radium-226 ($^{226}Ra$) concentration was 0.5 pCi/l.

Well #326 has never been sampled as it did not produce water.

Well #327 samples were obtained commencing August 7, 1985. Stable concentrations for Natural Uranium ($^{Nat}U$) with an uptrend for Molybdenum (Mo) were indicated for 1988.

Well #328 showed stable concentrations for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo).

Well #329 showed stable concentrations for Natural Uranium ($^{Nat}U$) for 1988 while Molybdenum (Mo), which showed a steep rise to 2.1 mg/l on December 16, 1987, averaged 1.8 mg/l. Additionally, Sulfate ($SO_4$) peaked in February, 1988, to a 1981 - 1988 program high. Radium-226 ($^{226}Ra$) average concentration was 0.8 pCi/l.

Well #330 showed stable concentrations for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo).

Well #331, which had a slight rise for Natural Uranium ($^{Nat}U$) through 1987, then receded, had a continued strong downtrend for Molybdenum (Mo) was evident.

Well #333 has shown stable concentrations.

Well #334 has shown stable concentrations.

Well #335 has Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) at stable concentrations which are believed to be background levels. The water level, which had risen consistently since 1981 receded 1.5 feet by March, 1988.

Well #336 had stable Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) concentrations.

Well #337 had a downtrend for Natural Uranium ($^{Nat}U$) and a slight uptrend for Molybdenum (Mo) concentrations.

Well #338 had a slight uptrend for Natural Uranium ($^{Nat}U$) and an uptrend for Molybdenum (Mo).

Well #339 showed low levels of Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) in 1987; these levels are believed to be background concentrations.

Well #340 has exhibited concentrations very similar to well #333. Well #340 was constructed as a monitoring well for a pump test conducted on well #333.

Well #341, also a well adjacent to well #333, showed decreased concentrations possibly related to the continued pumping of well #333.

Well #342 was not sampled in 1987 until June 21, when a new means of access was found. The Natural Uranium ($^{Nat}U$) concentration are stable while Molybdenum (Mo) showed an uptrend.

Well #344 had stabilized for Natural Uranium ($^{Nat}U$) concentrations and Molybdenum (Mo) concentrations.

In summary, no significant conclusions can be drawn from the onsite wells for this monitoring period.

SURFACE LOCATIONS

The upgradient Arkansas River surface location #502 showed stable concentrations relative to river flow fluctuations, i.e., when river flow is low, concentrations are high.

The downgradient Arkansas River surface location #504 also showed stable concentrations relative to river flow fluctuations.

Surface location #505, the SCS Dam reservoir, exhibited a cyclic concentration trend related to reservoir water levels.

Surface location #519 has shown stable concentrations for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) concentrations in 1987.

Surface location #520 showed stable concentrations with no levels exceeding License Condition 30.5 screening criteria.

Surface location #526 showed stable concentrations below License Condition 30.5 screening criteria.

Surface location #528 was sampled during three runoff events during 1988.

Surface location #531 showed stable concentrations.

Surface location #555 has been sampled from 1985 through 1987. Stable concentrations exist well below the screening criteria established in the license with a peak for Molybdenum (Mo) in January, 1988, and for Natural Uranium ($^{Nat}U$) in March, 1988

In conclusion, surface water locations show no discernible trends in concentrations of mill-derived constituents.

TRENCH LOCATIONS

Trench location #701 shows a continued downtrend which started in January, 1983, for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo).

Trench location #703 showed essentially stable Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) concentrations in 1988 as compared to 1987.

Sample location #710, had an uptrend for Natural Uranium ($^{Nat}U$) and a downtrend for Molybdenum (Mo).

Location #711 has shown an uptrend for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo).

Sample location #712 showed a drop for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) in 1988 as compared to 1987.

Trench locations #714, #715 and #716, upgradient of the SCS reservoir, showed stable concentrations for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) which fluctuate based on ground water recharge due to precipitation.

In summary, Trench locations continued to show a downtrend for this reporting period.

FIGURE 1.1

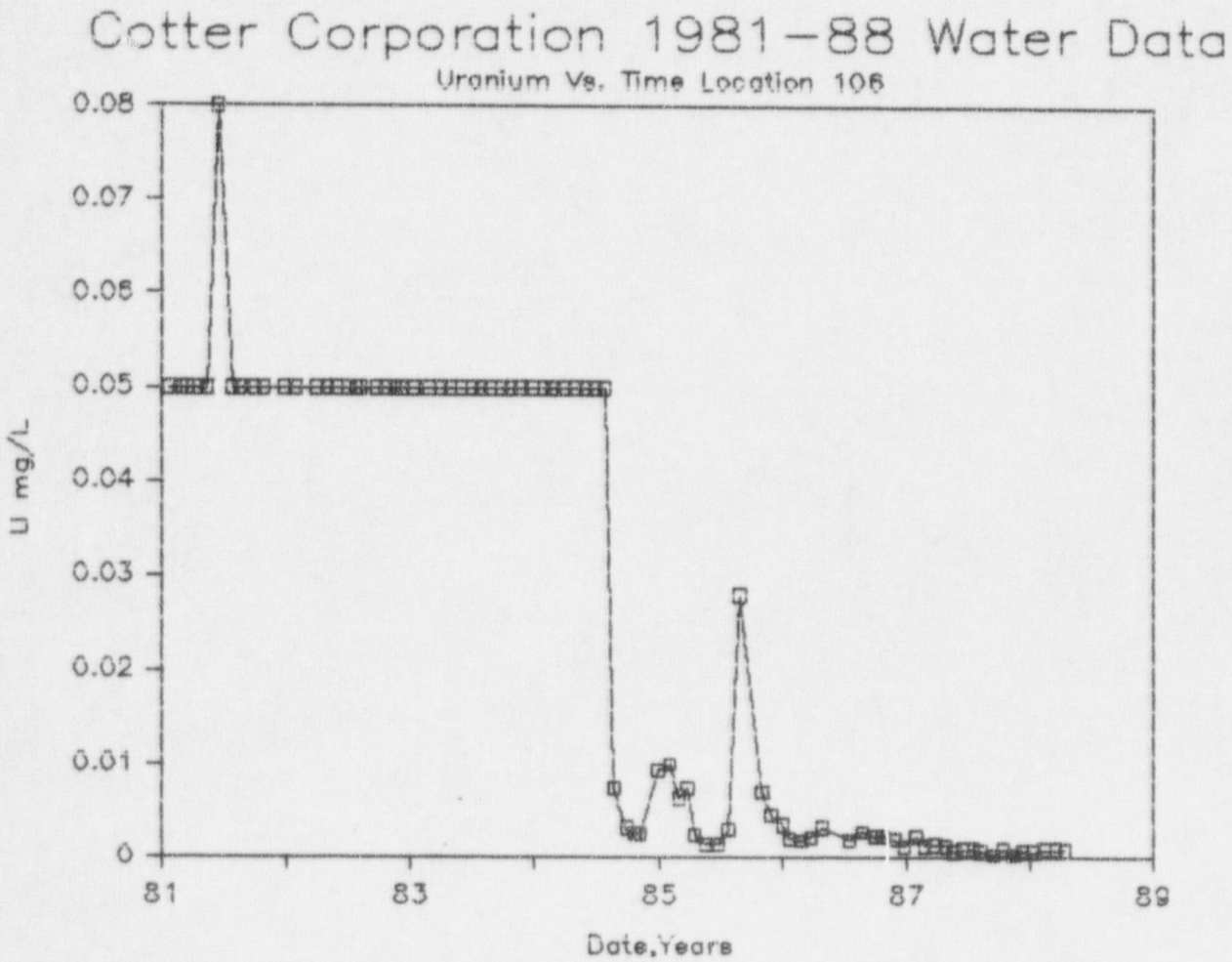

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 106
U mg/L
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.2

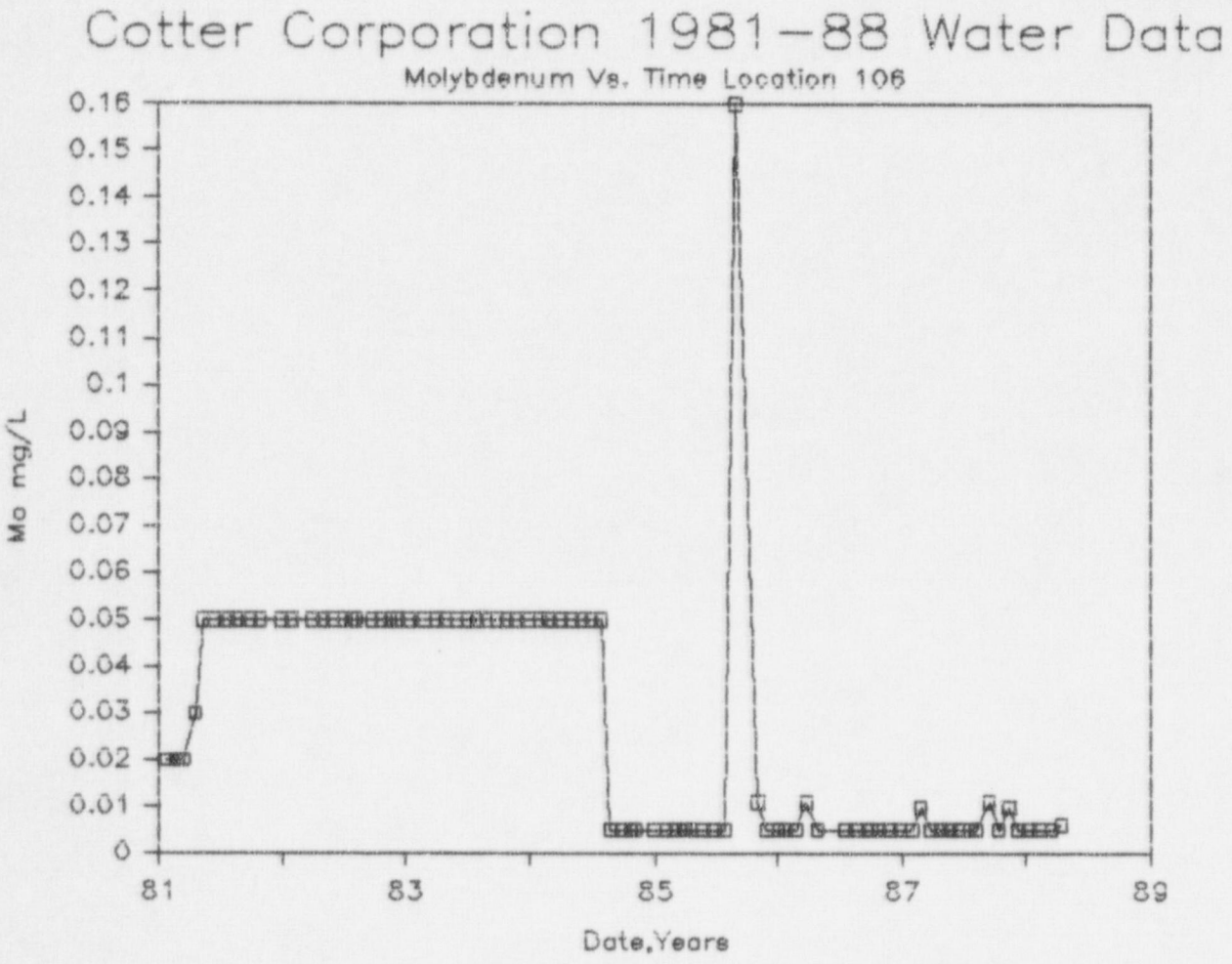

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 106
Mo mg/L
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.3

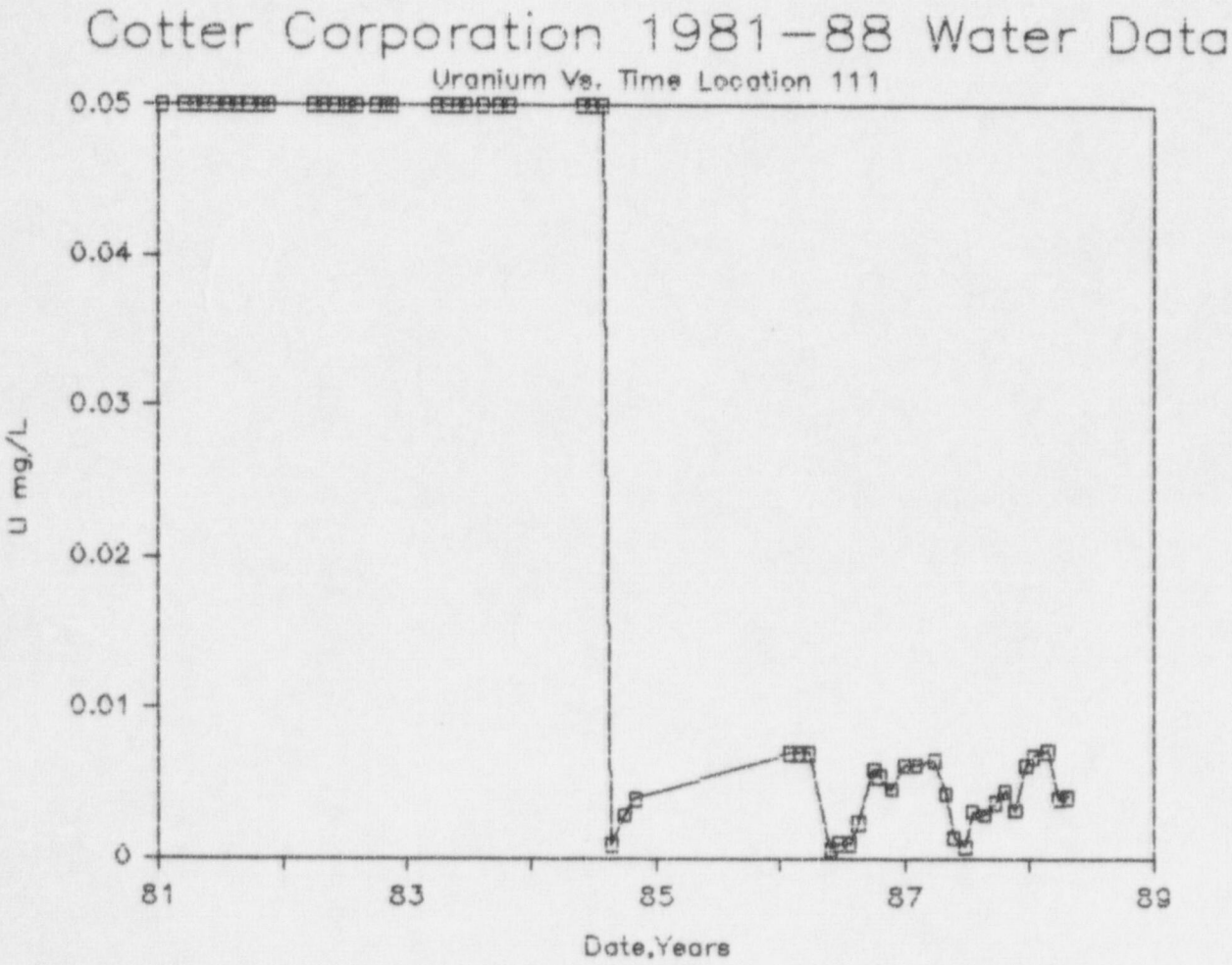

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 111
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.4

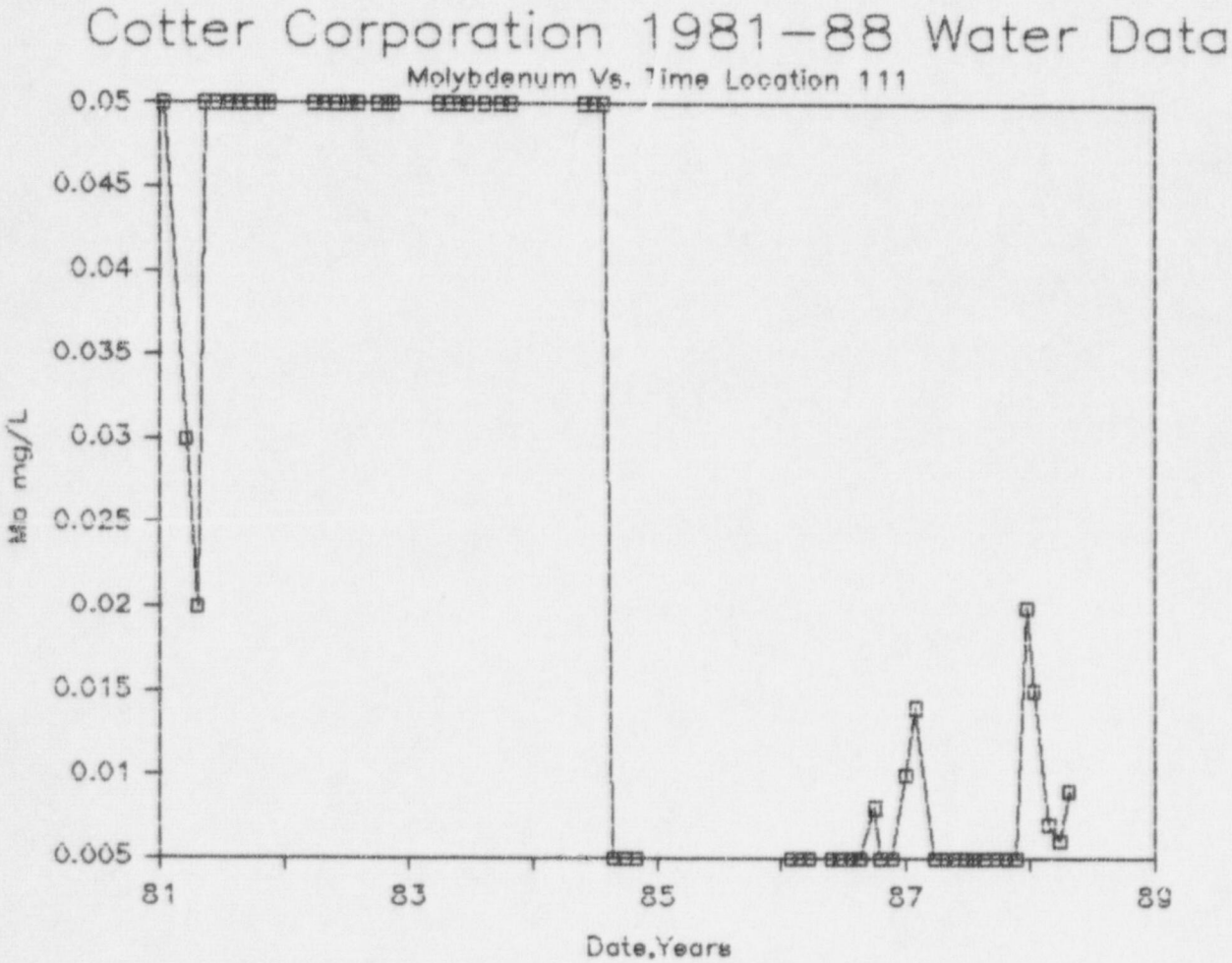

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 111
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
Mo mg/L
81
83
85
87
89
Date,Years

FIGURE 1.5

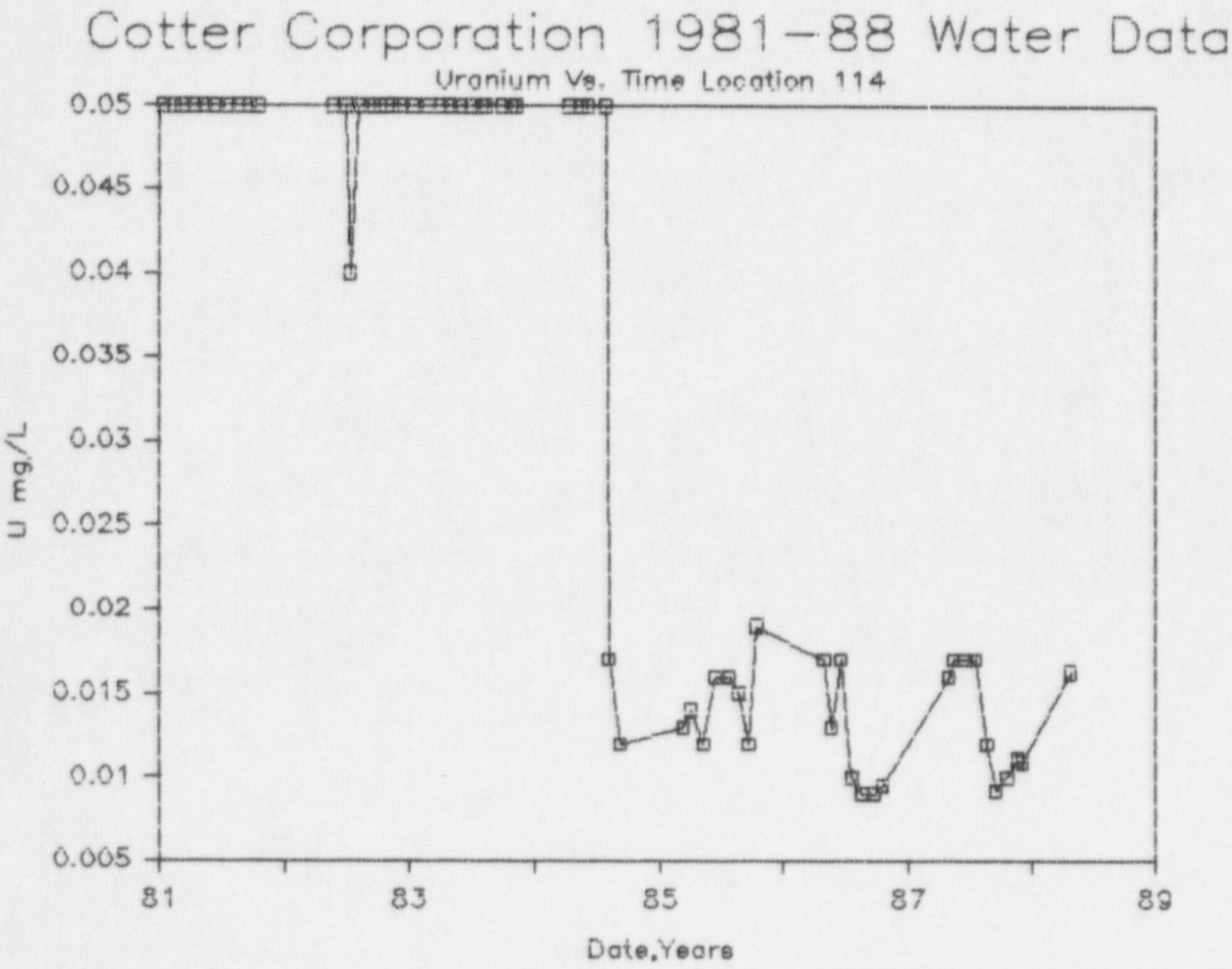

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 114
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.6

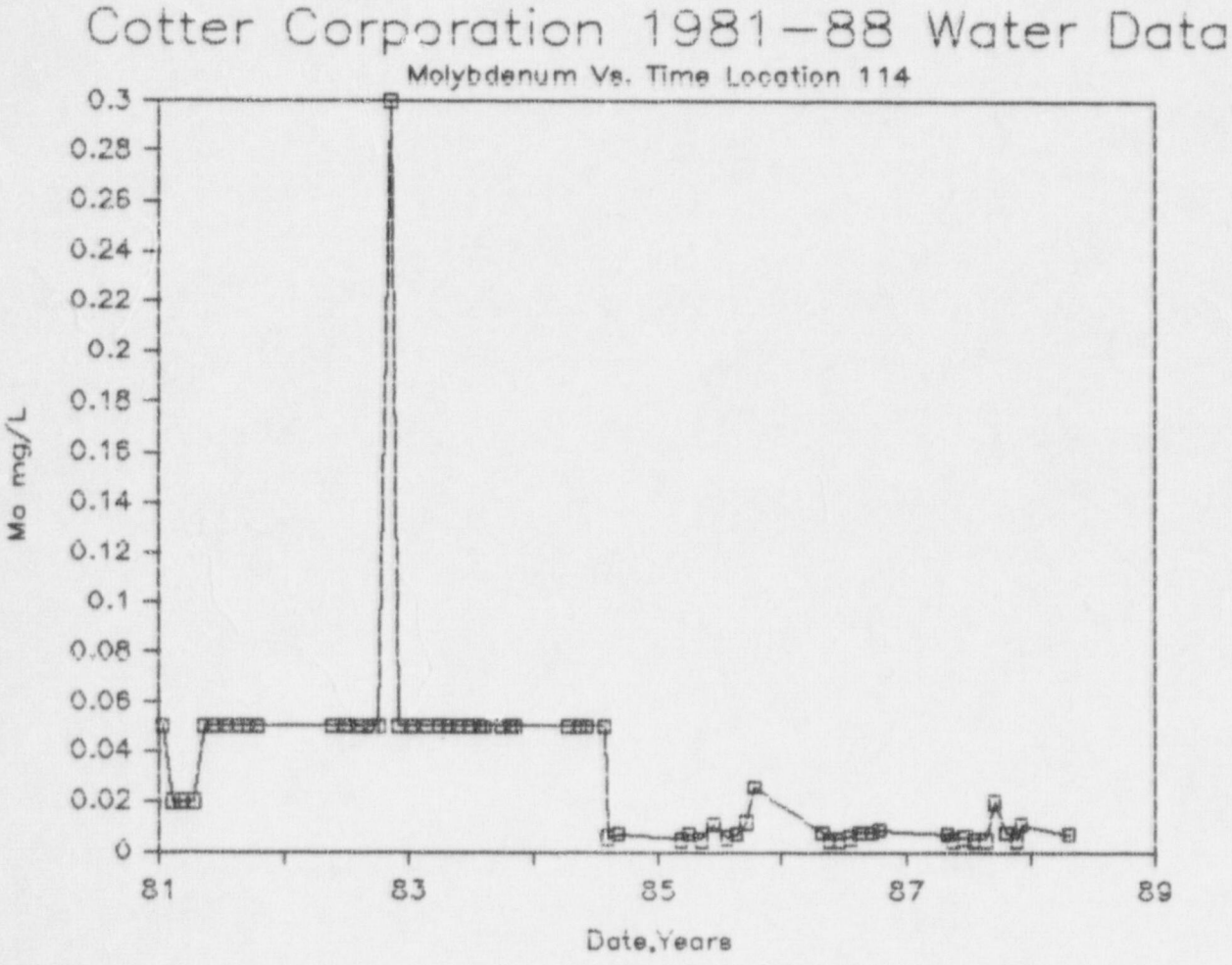

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 114
Mo mg/L
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
81
83
85
87
89
Date,Years

FIGURE 1.7

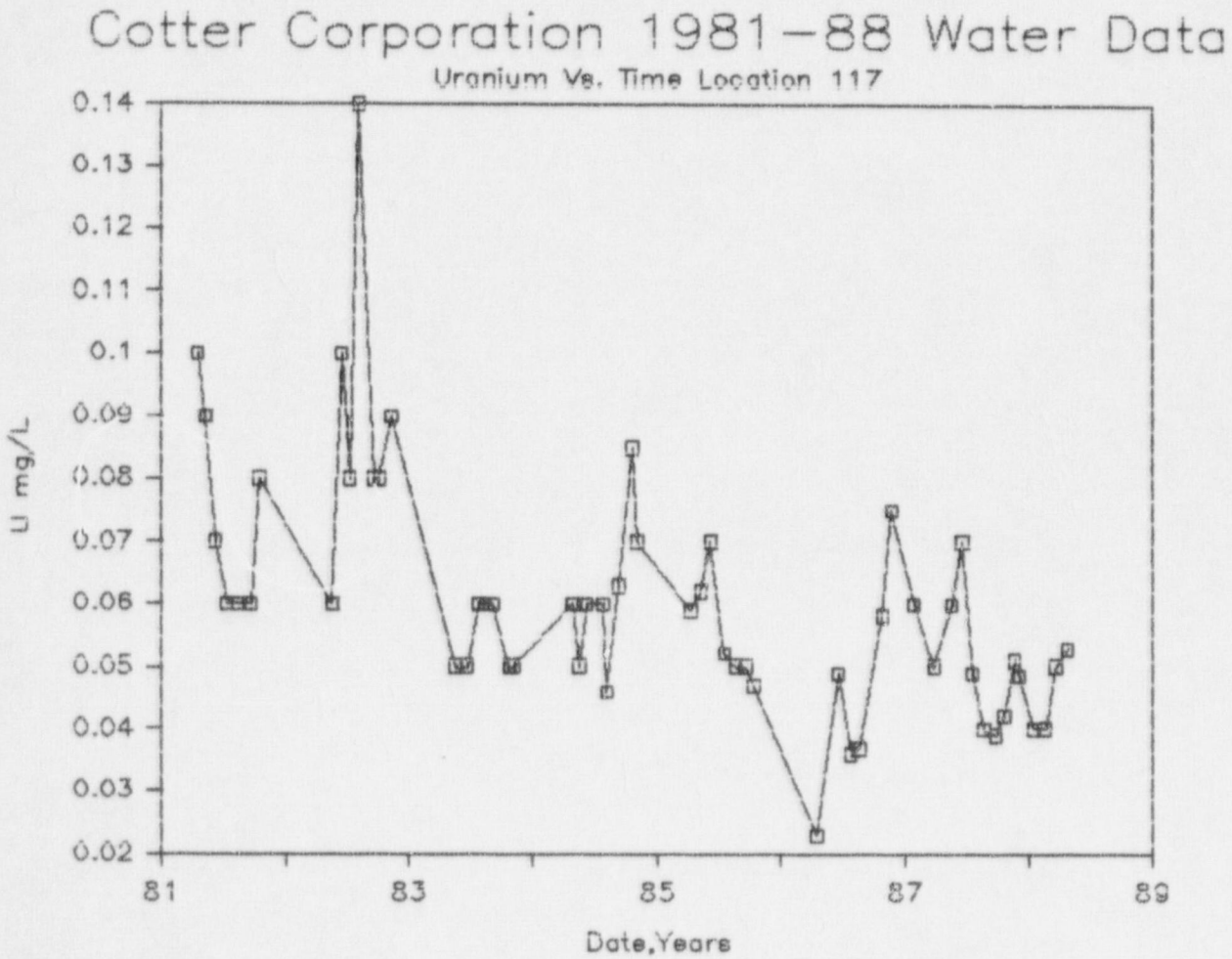

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 117
U mg/L
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
81
83
85
87
89
Date,Years

FIGURE 1.8

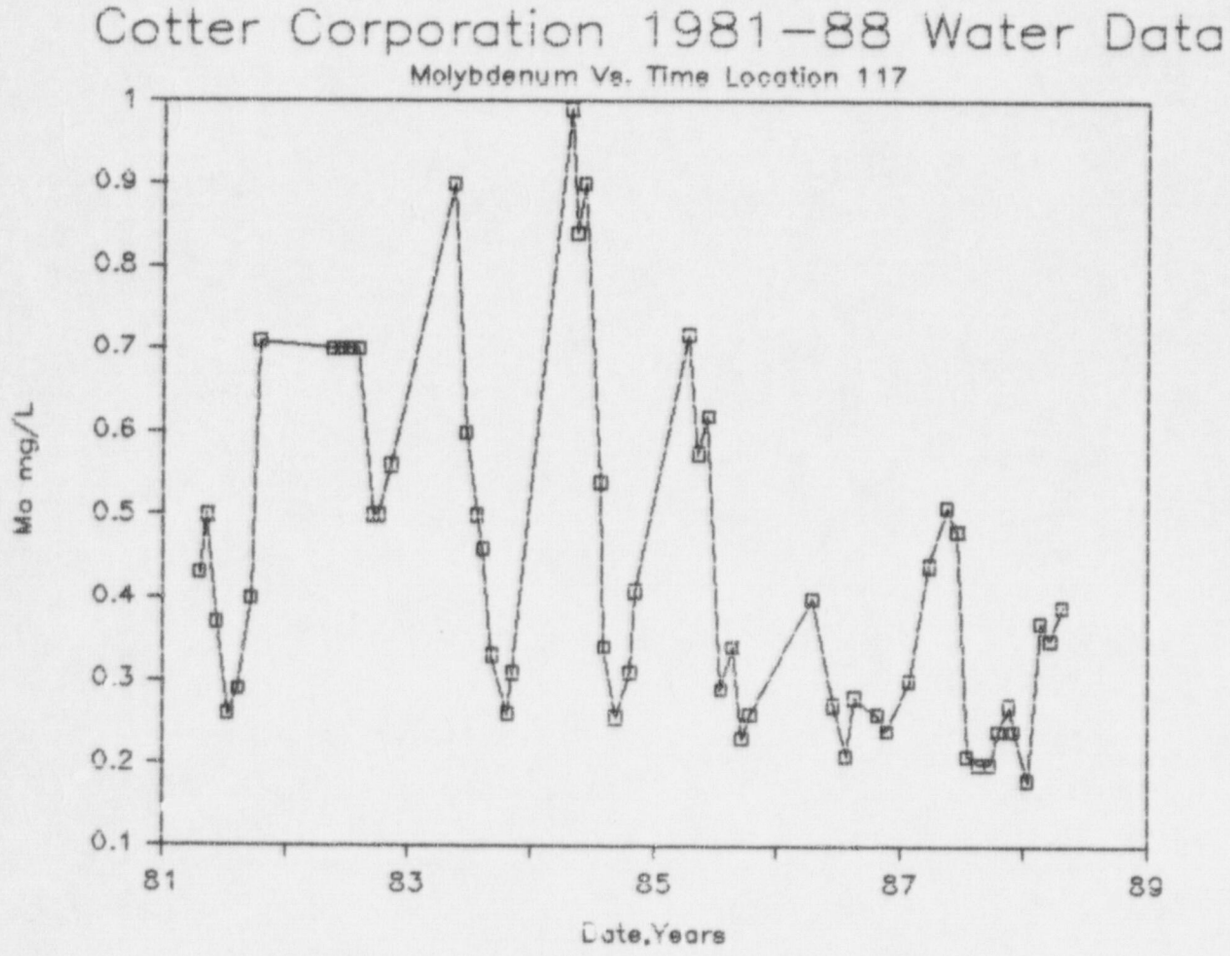

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 117
Mo mg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
81
83
85
87
89
Date,Years

FIGURE 1.9

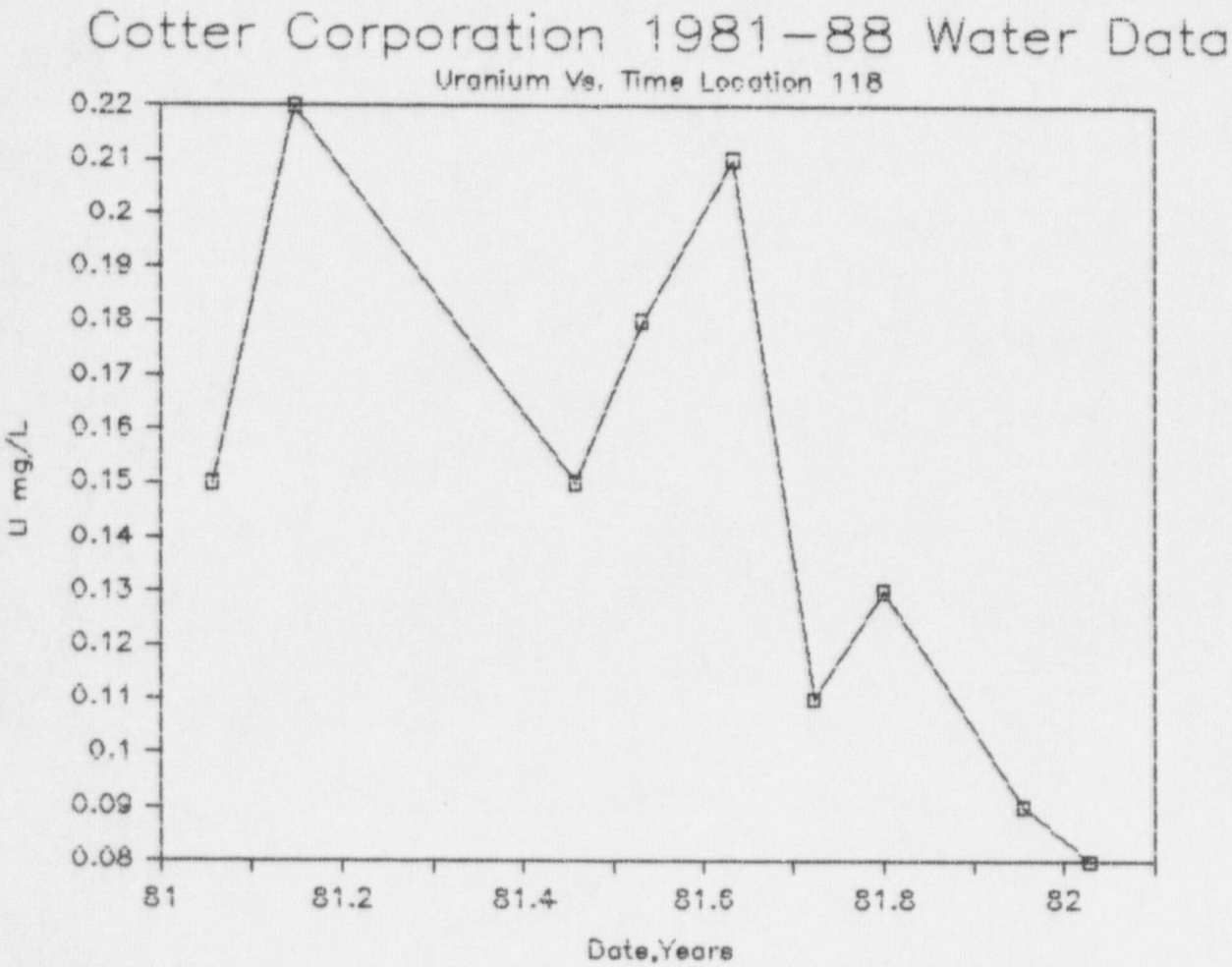

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 118
U mg/L
0.22
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
81
81.2
81.4
81.6
81.8
82
Date,Years

FIGURE 1.10

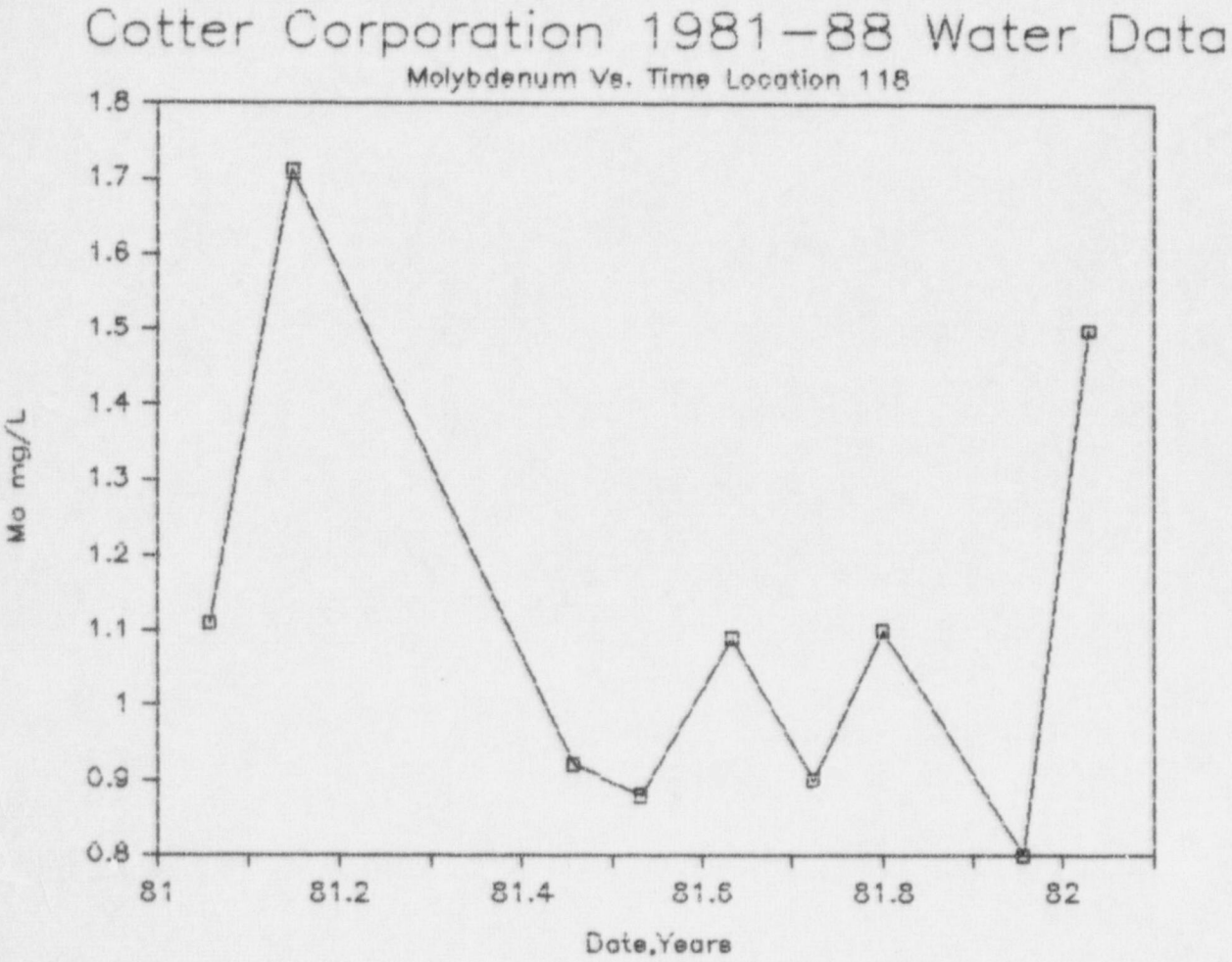

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 118
Mo mg/L
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
81
81.2
81.4
81.6
81.8
82
Date,Years

FIGURE 1.11

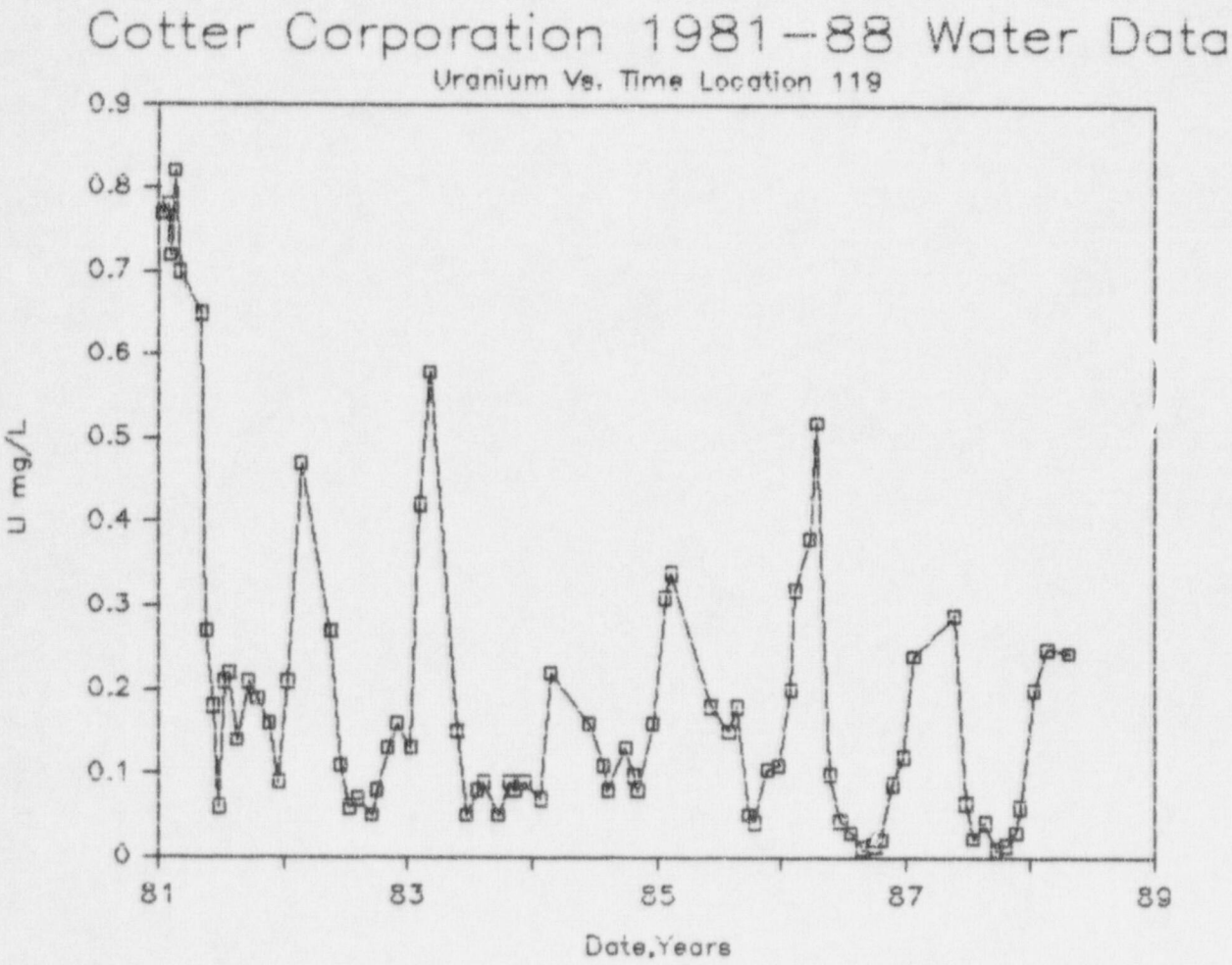

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 119
U mg/L
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
89
Date,Years

FIGURE 1.12

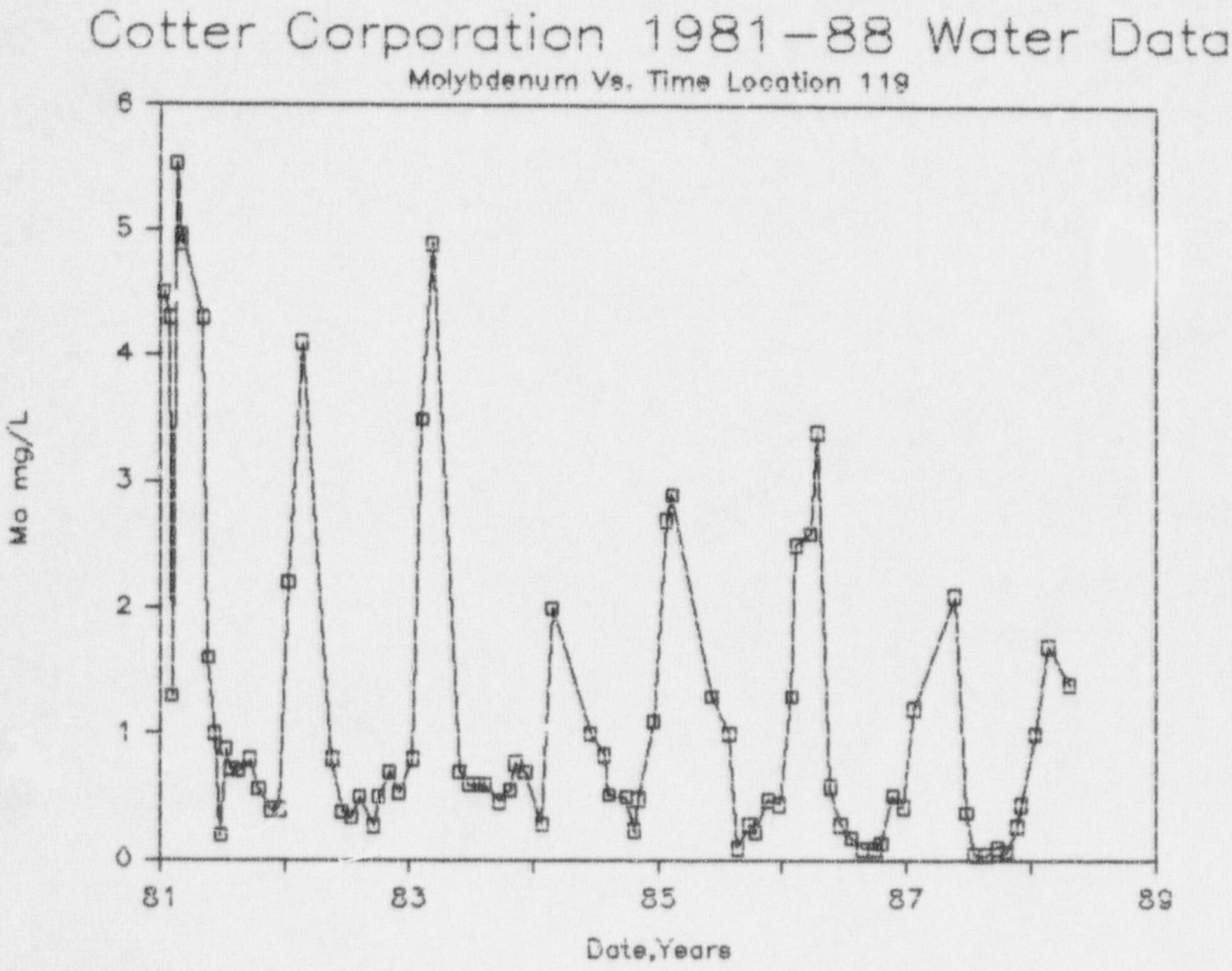

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 119
Mo mg/L
0
1
2
3
4
5
6
81
83
85
87
89
Date,Years

FIGURE 1.13

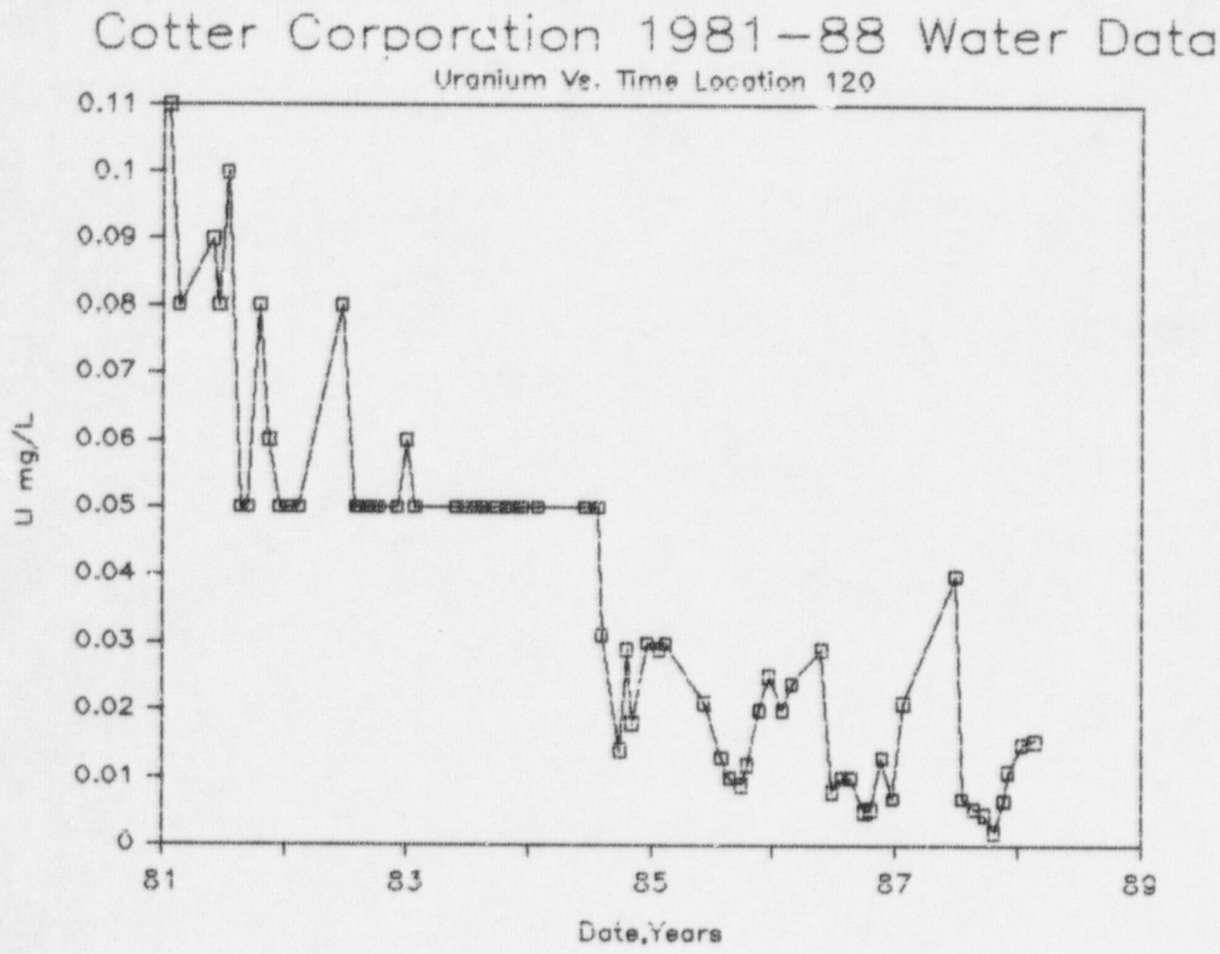

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 120
U mg/L
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.14

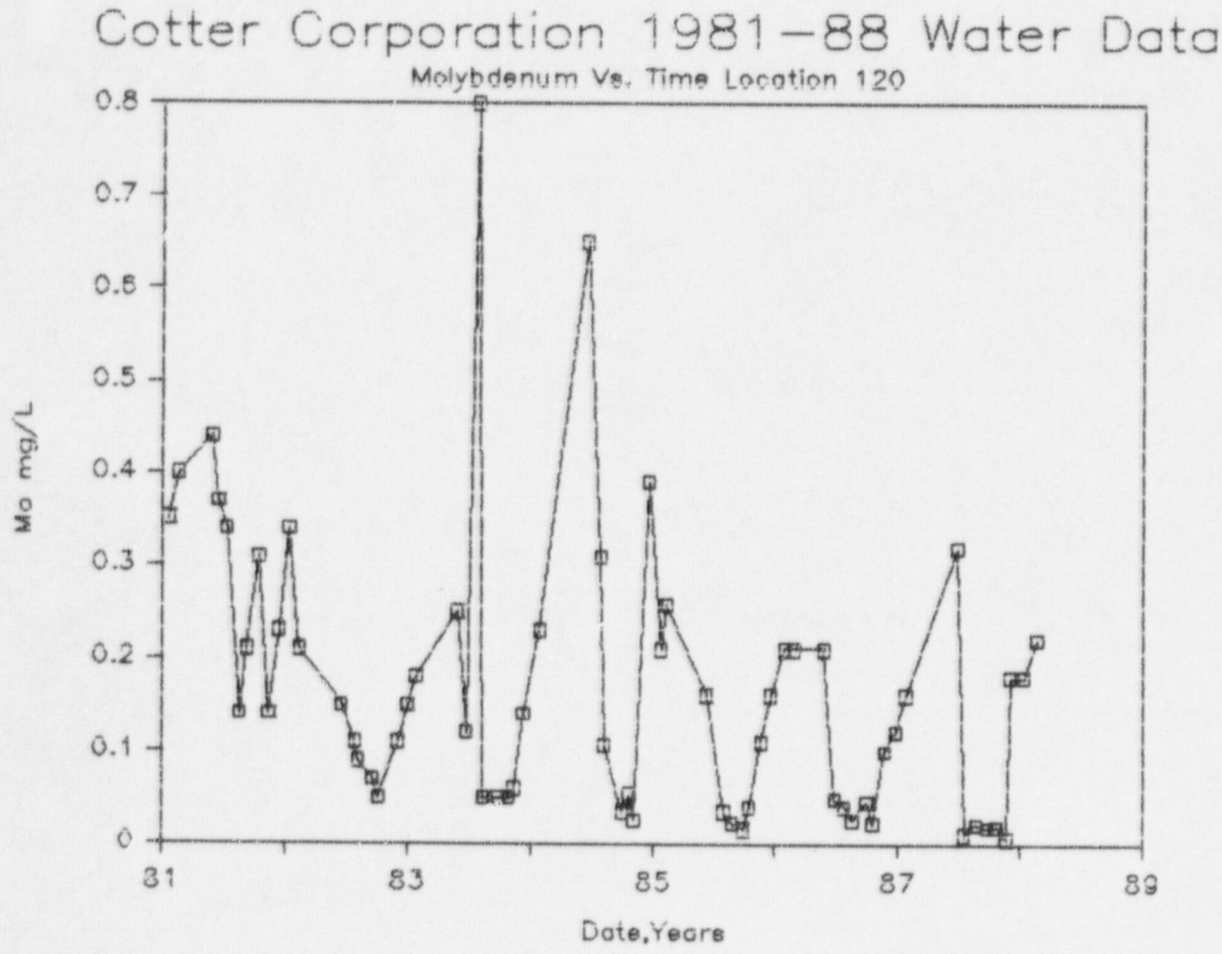

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 120
Mo mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
89
Date,Years

FIGURE 1.15

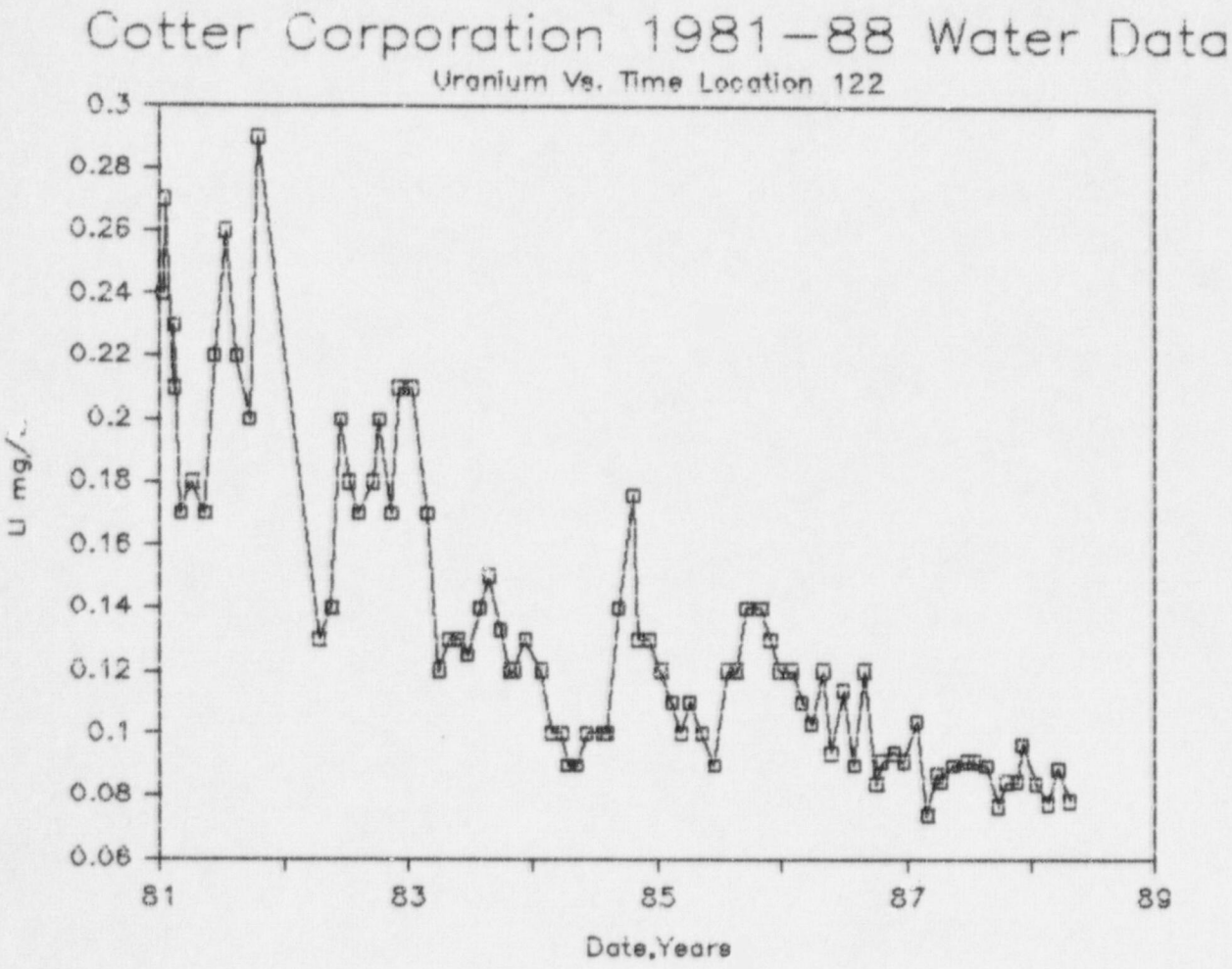

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 122
U mg/L
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
81
83
85
87
89
Date,Years

FIGURE 1.16

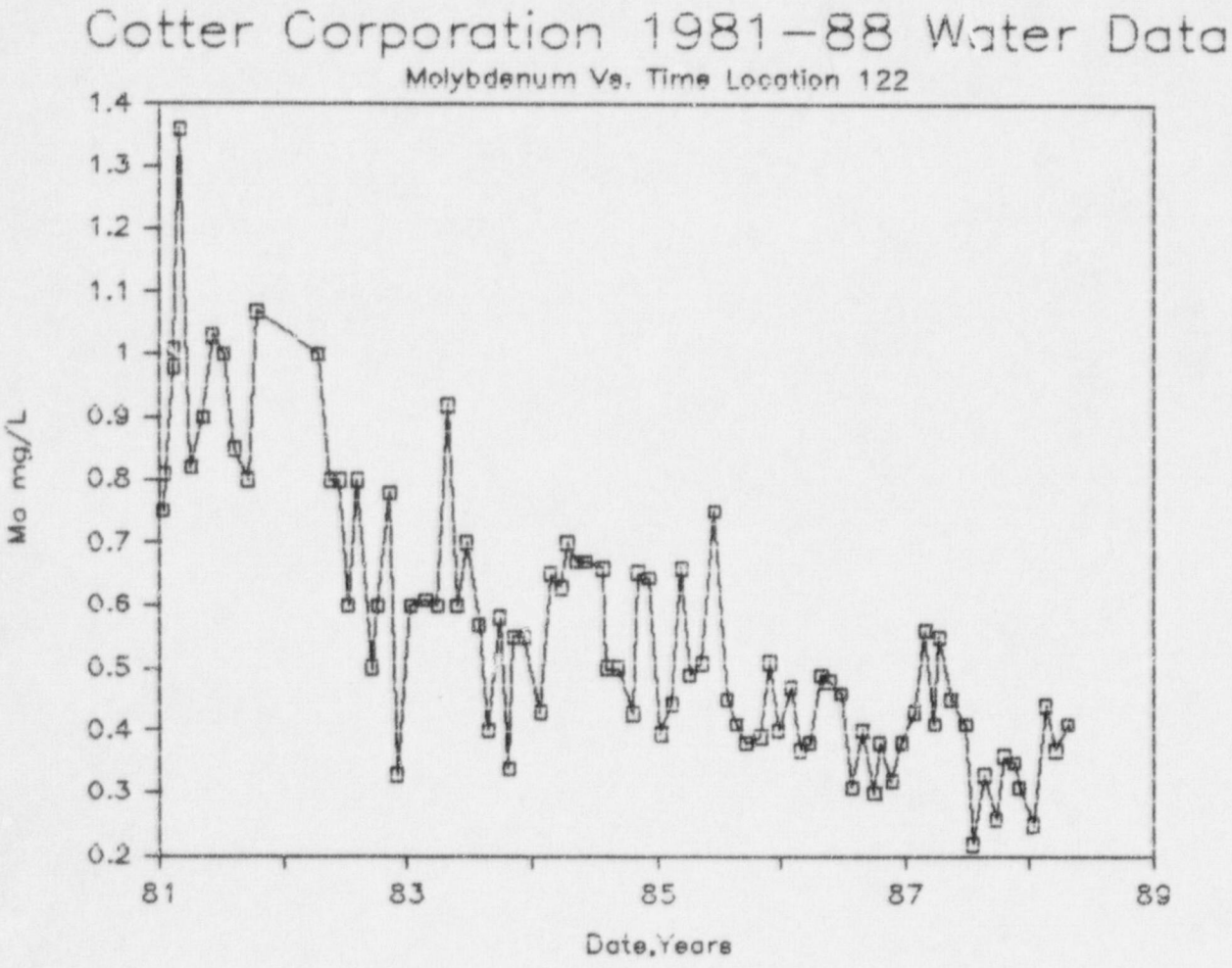

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 122
Mo mg/L
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
81
83
85
87
89
Date,Years

FIGURE 1.17

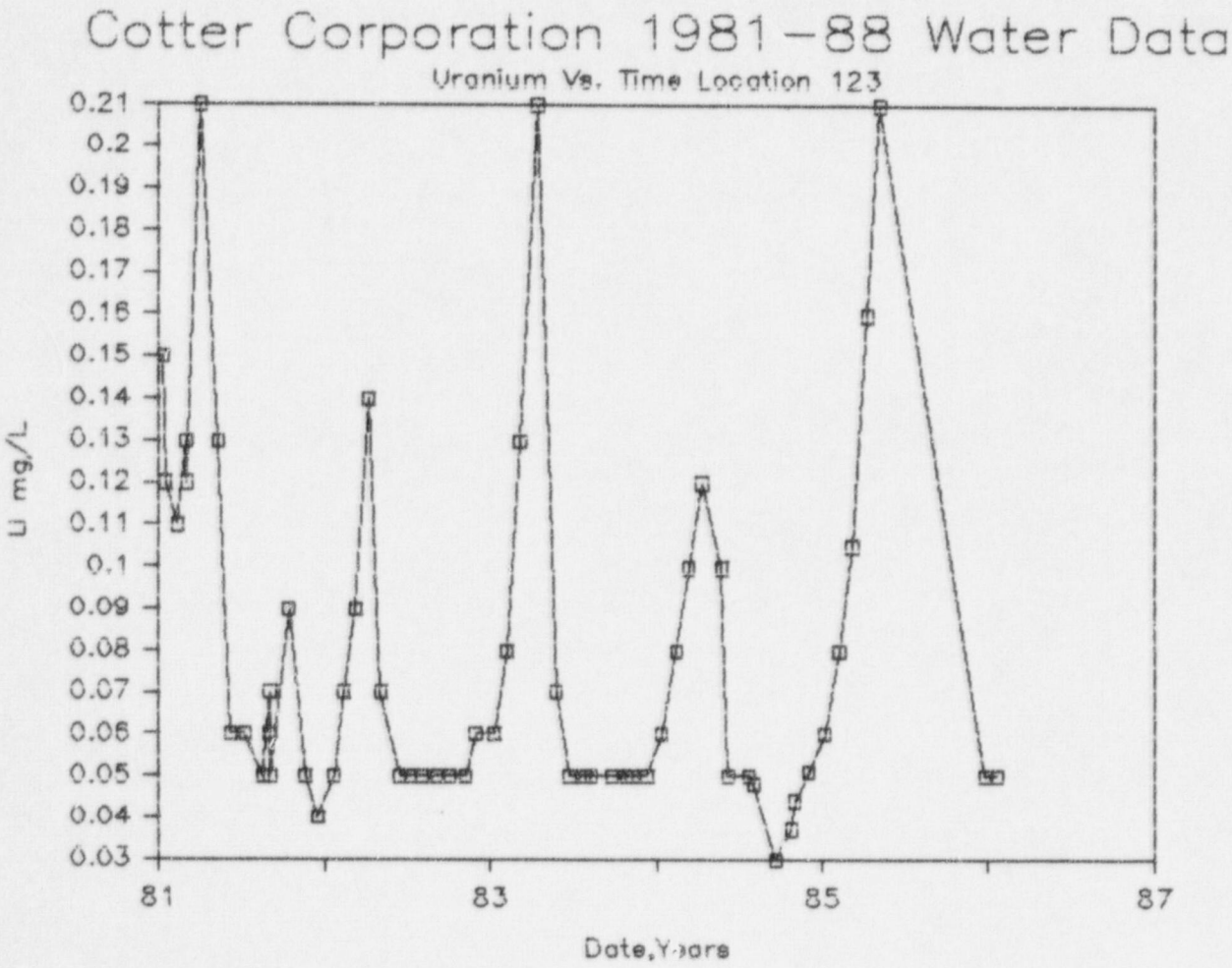

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 123
U mg/L
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
81
83
85
87
Date,Years

FIGURE 1.18

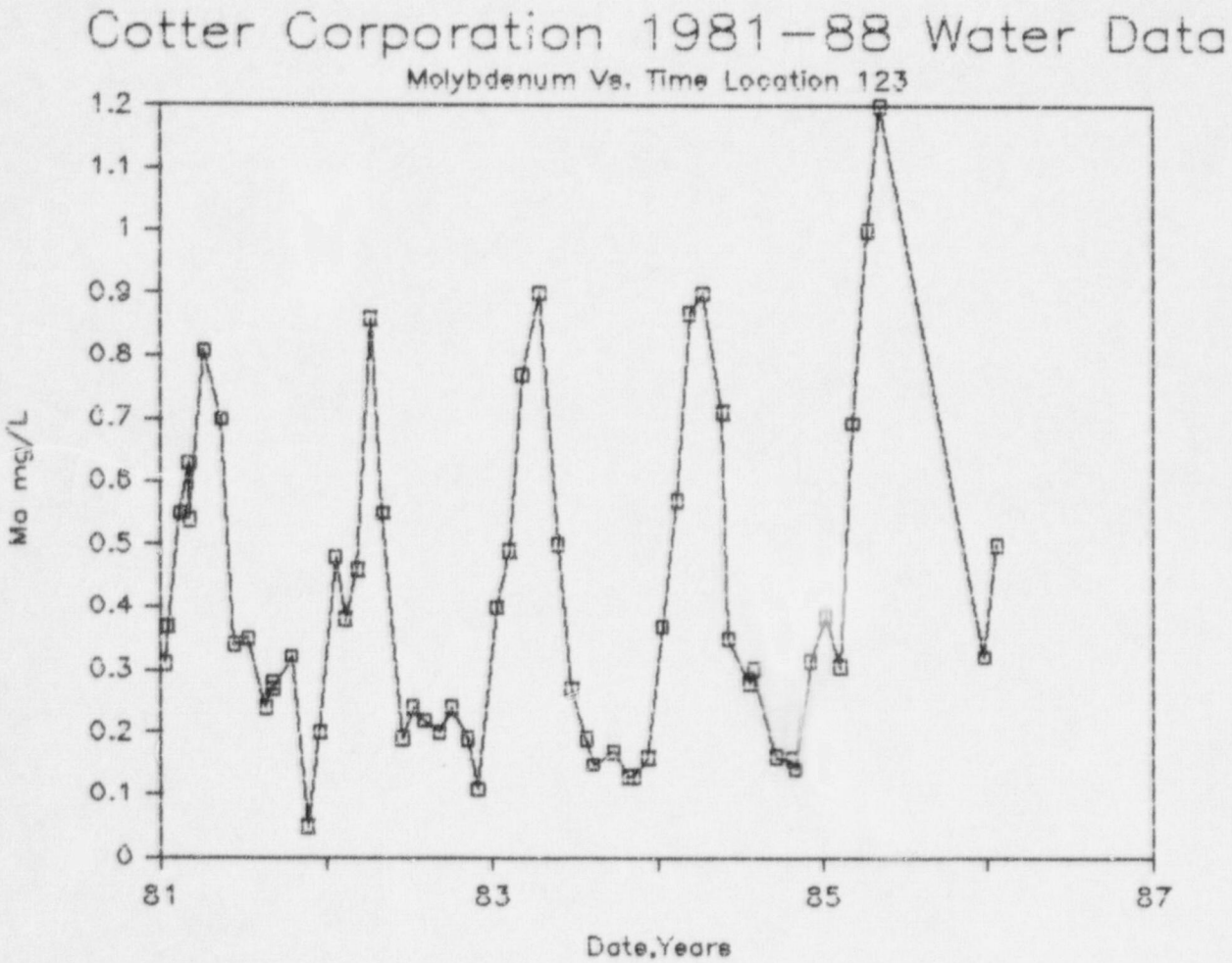

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 123
Mo mg/L
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.19

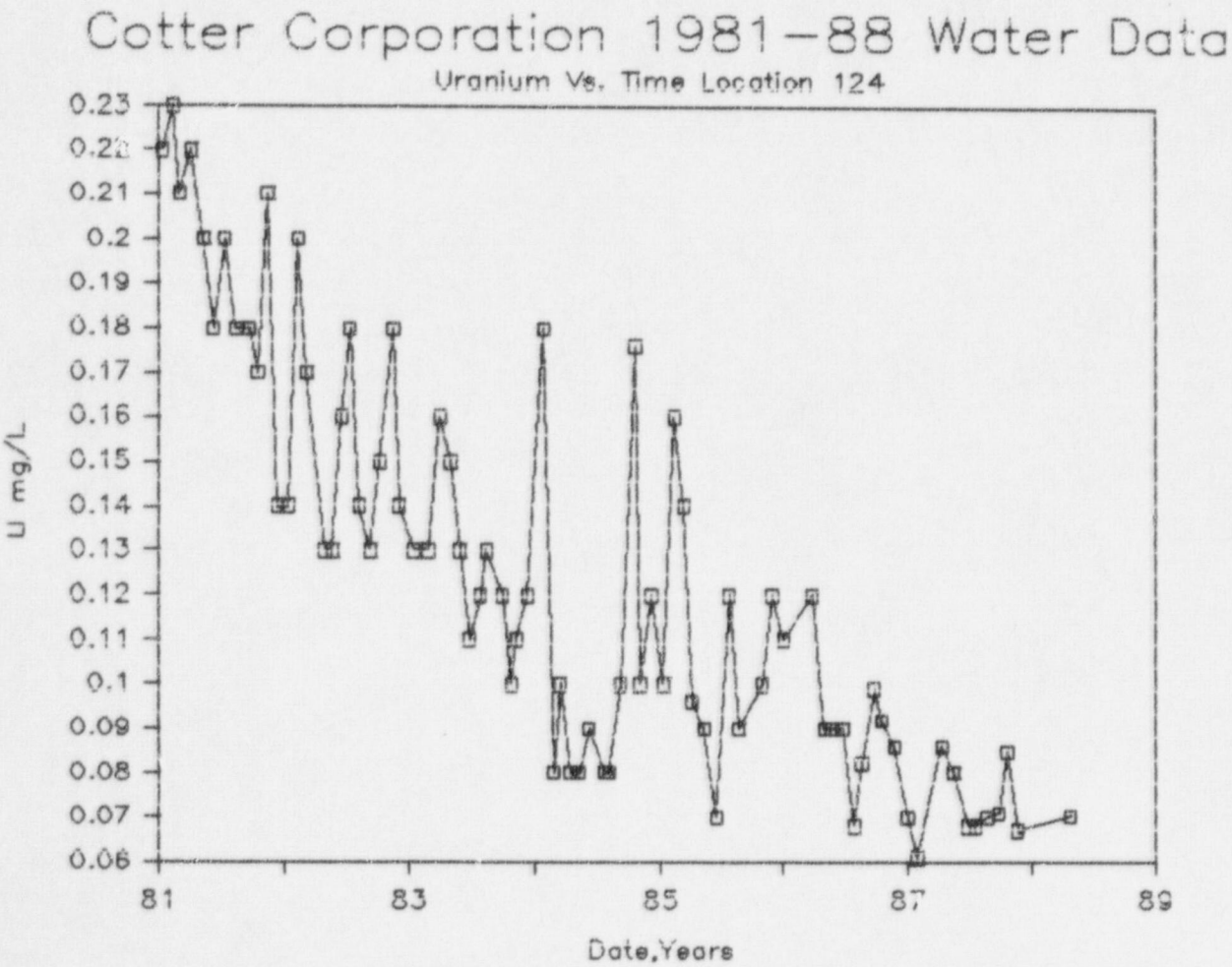

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 124
U mg/L
0.23
0.22
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
81
83
85
87
89
Date,Years

FIGURE 1.20

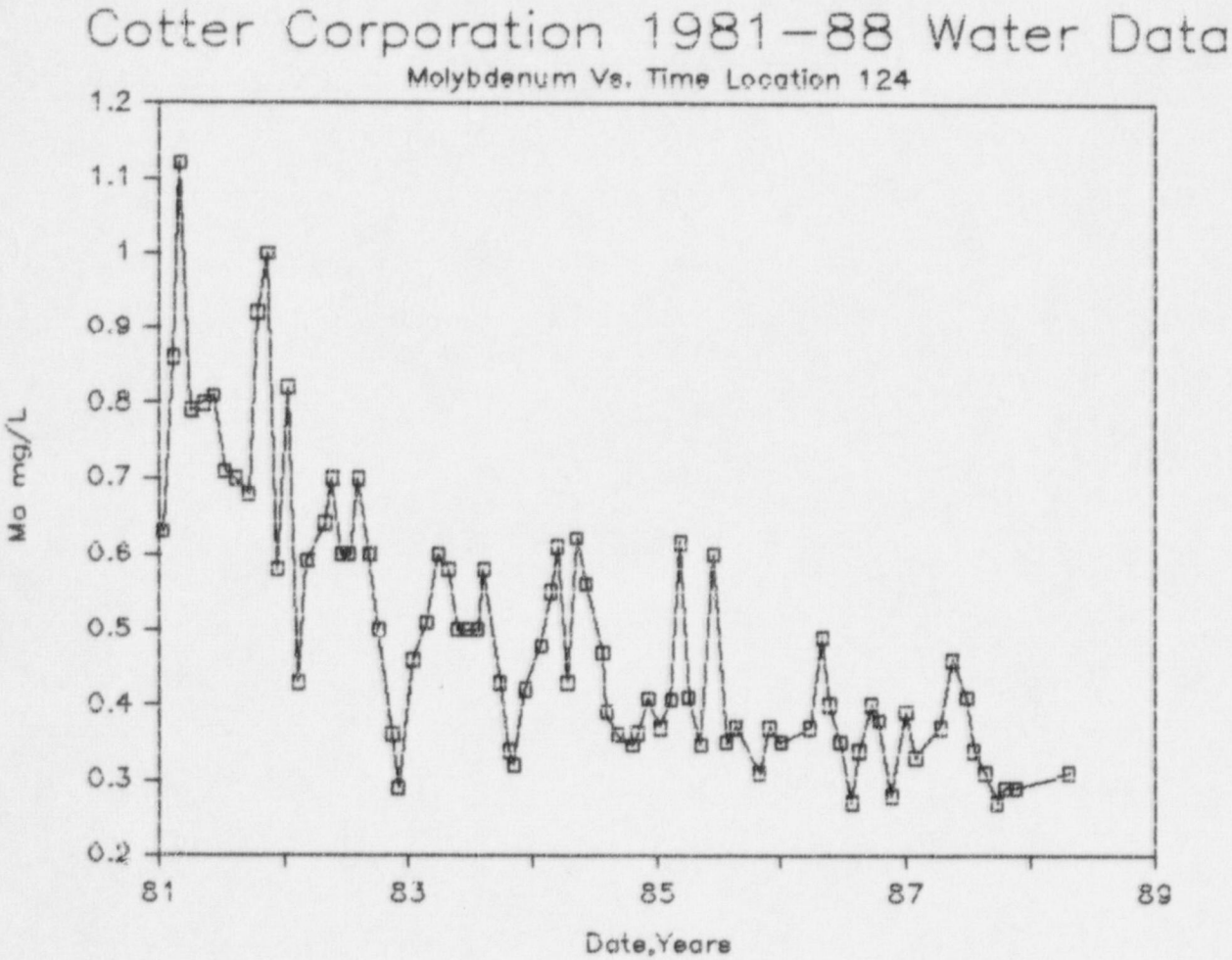

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 124
Mo mg/L
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
81
83
85
87
89
Date,Years

FIGURE 1.21

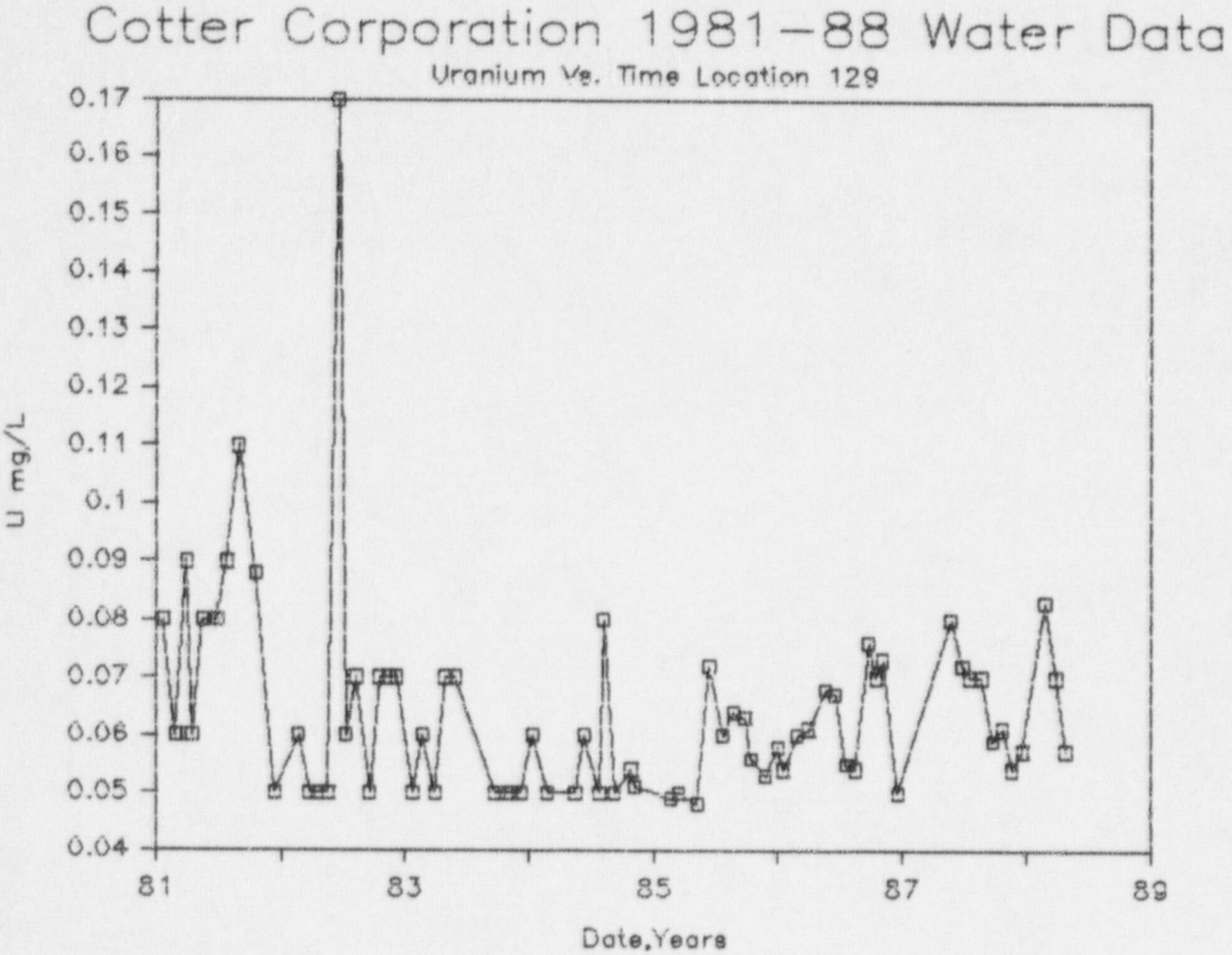

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 129
U mg/L
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
81
83
85
87
89
Date,Years

FIGURE 1.22

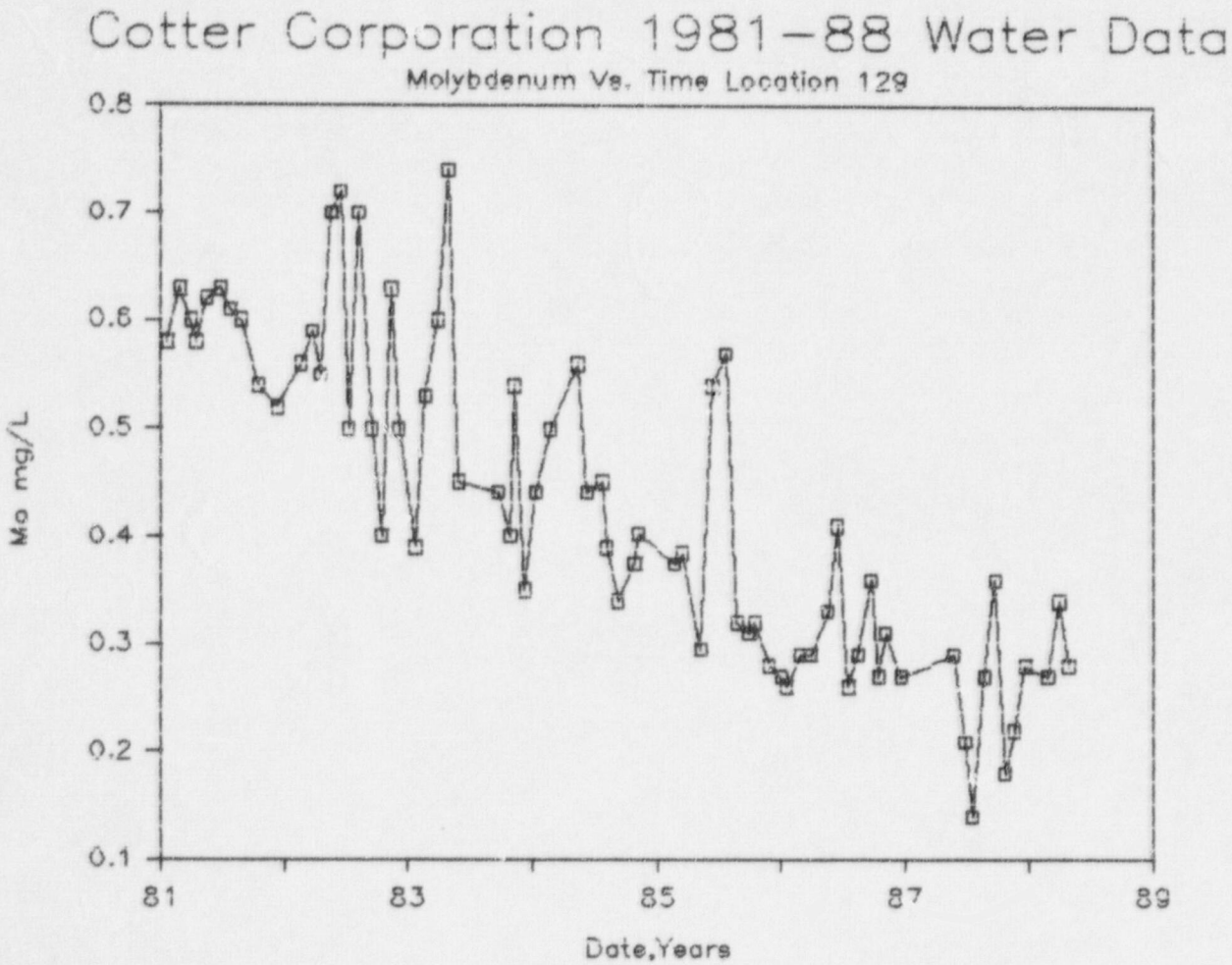

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 129
Mo mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
81
83
85
87
89
Date,Years

FIGURE 1.23

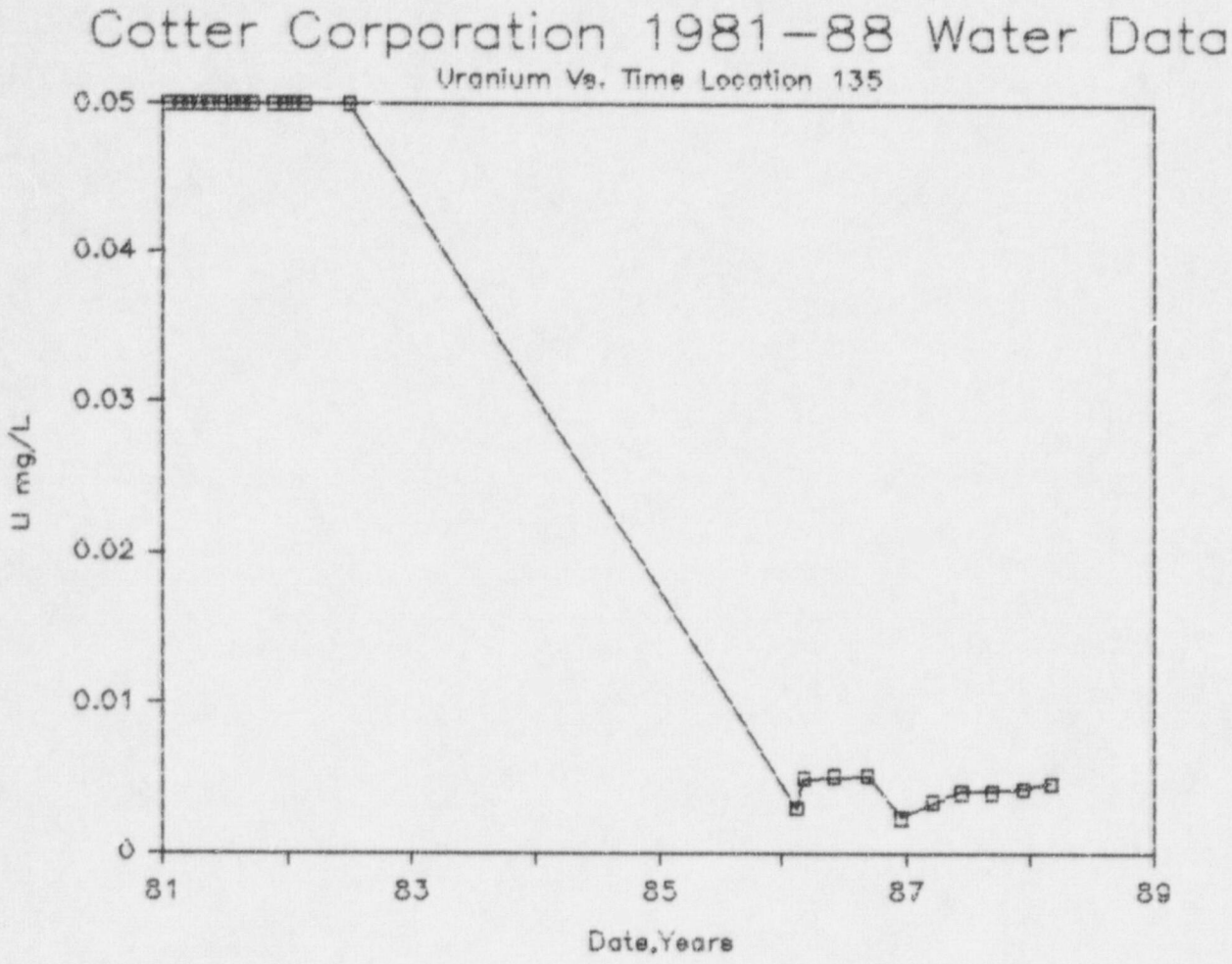

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 135
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.24

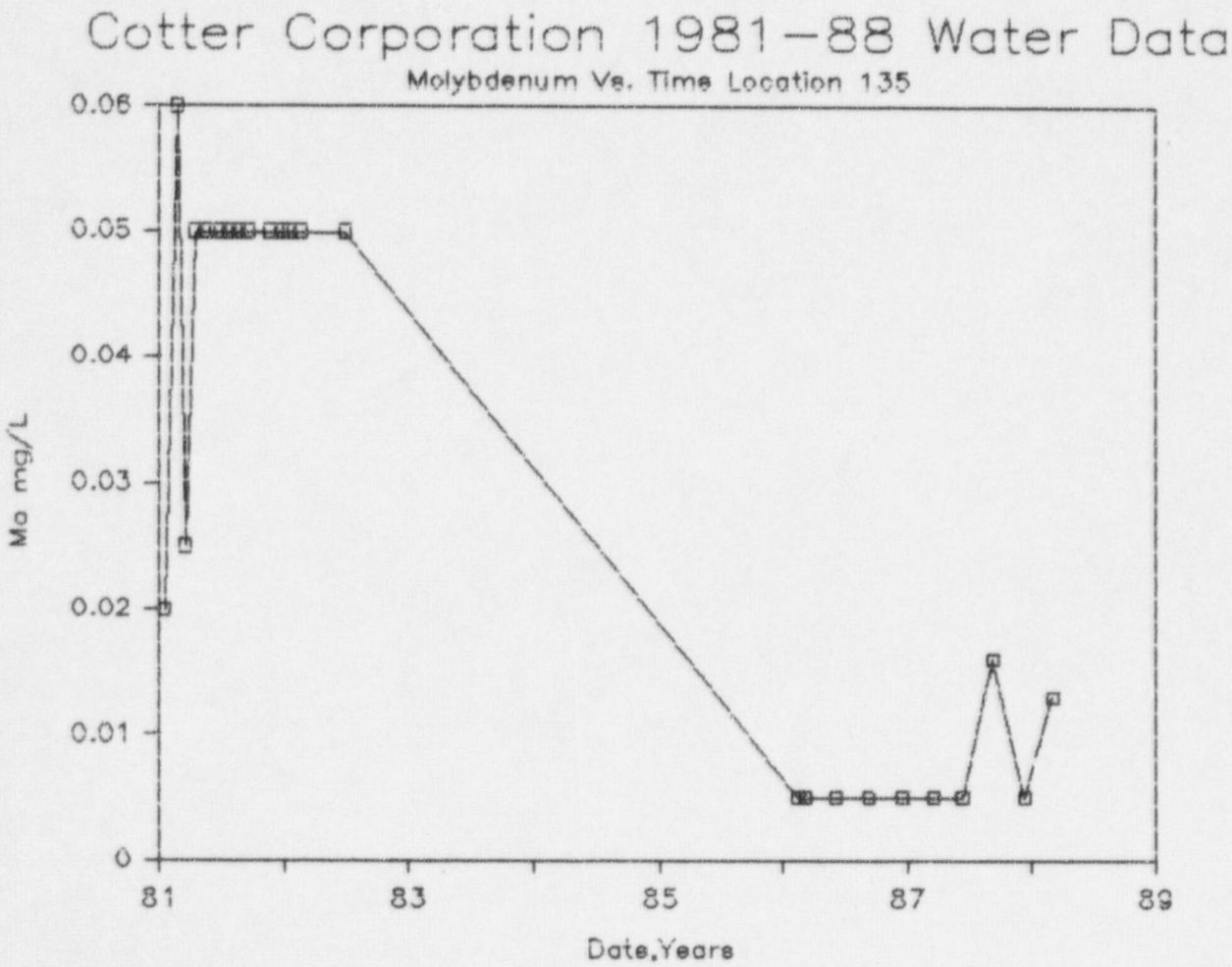

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 135
0.06
0.05
0.04
0.03
0.02
0.01
0
Mo mg/L
81
83
85
87
89
Date,Years

FIGURE 1.25

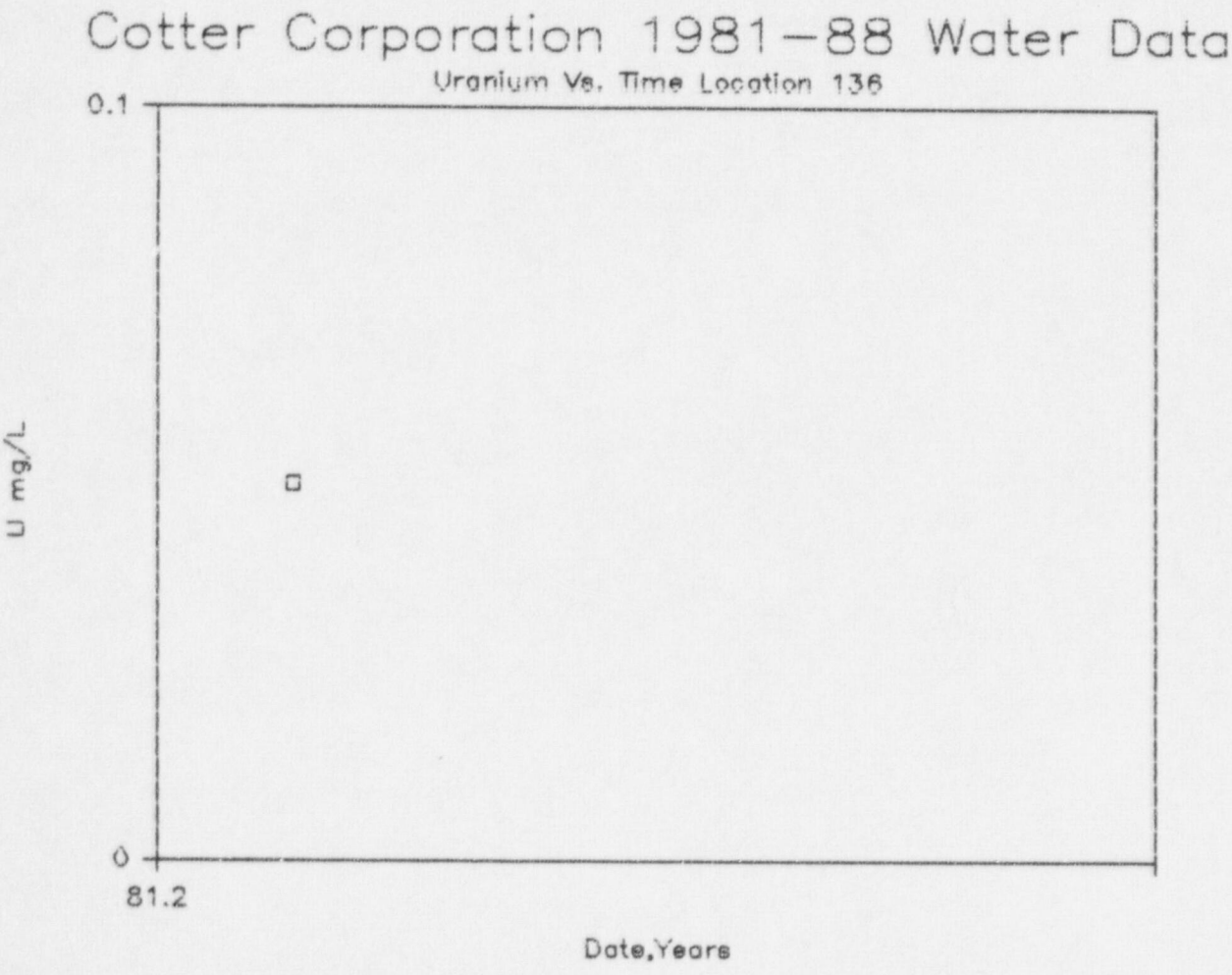

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 136
0.1
0
U mg/L
81.2
Date,Years

FIGURE 1.26

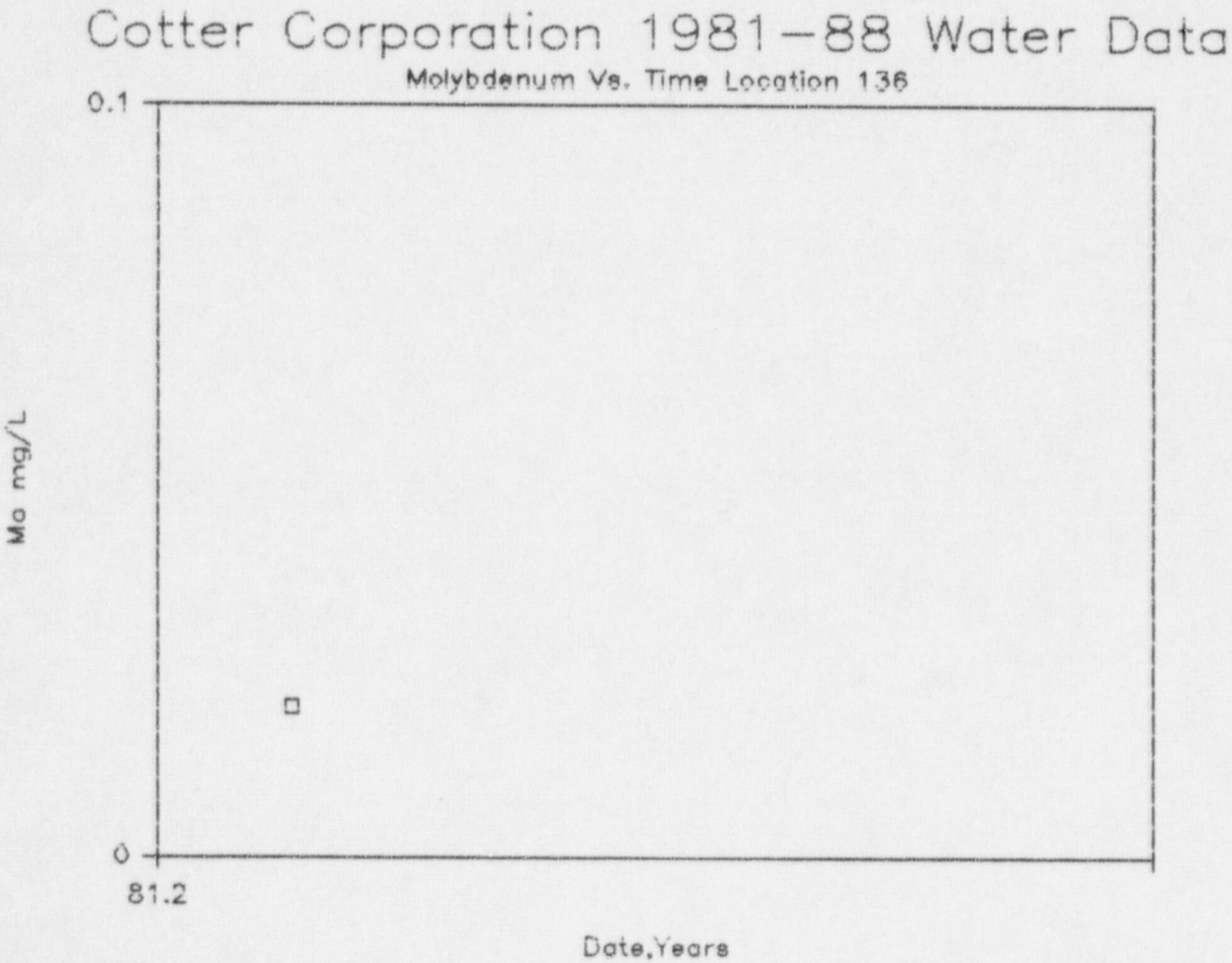

Cotter Corporation 1981-88 Water Data
Molybdenum Vs. Time Location 136
0.1
0
81.2
Mo mg/L
Date,Years

FIGURE 1.27

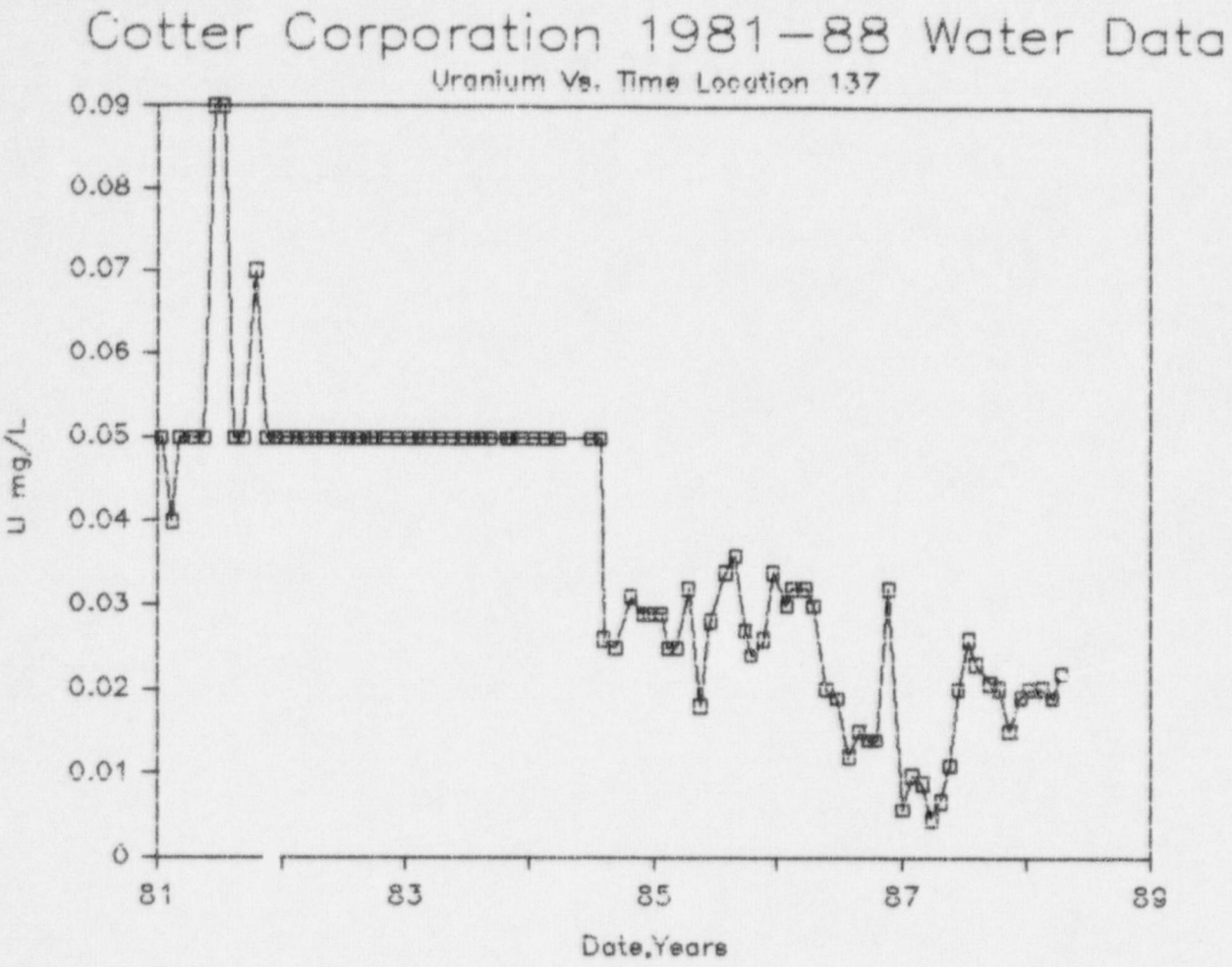

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 137
U mg/L
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.28

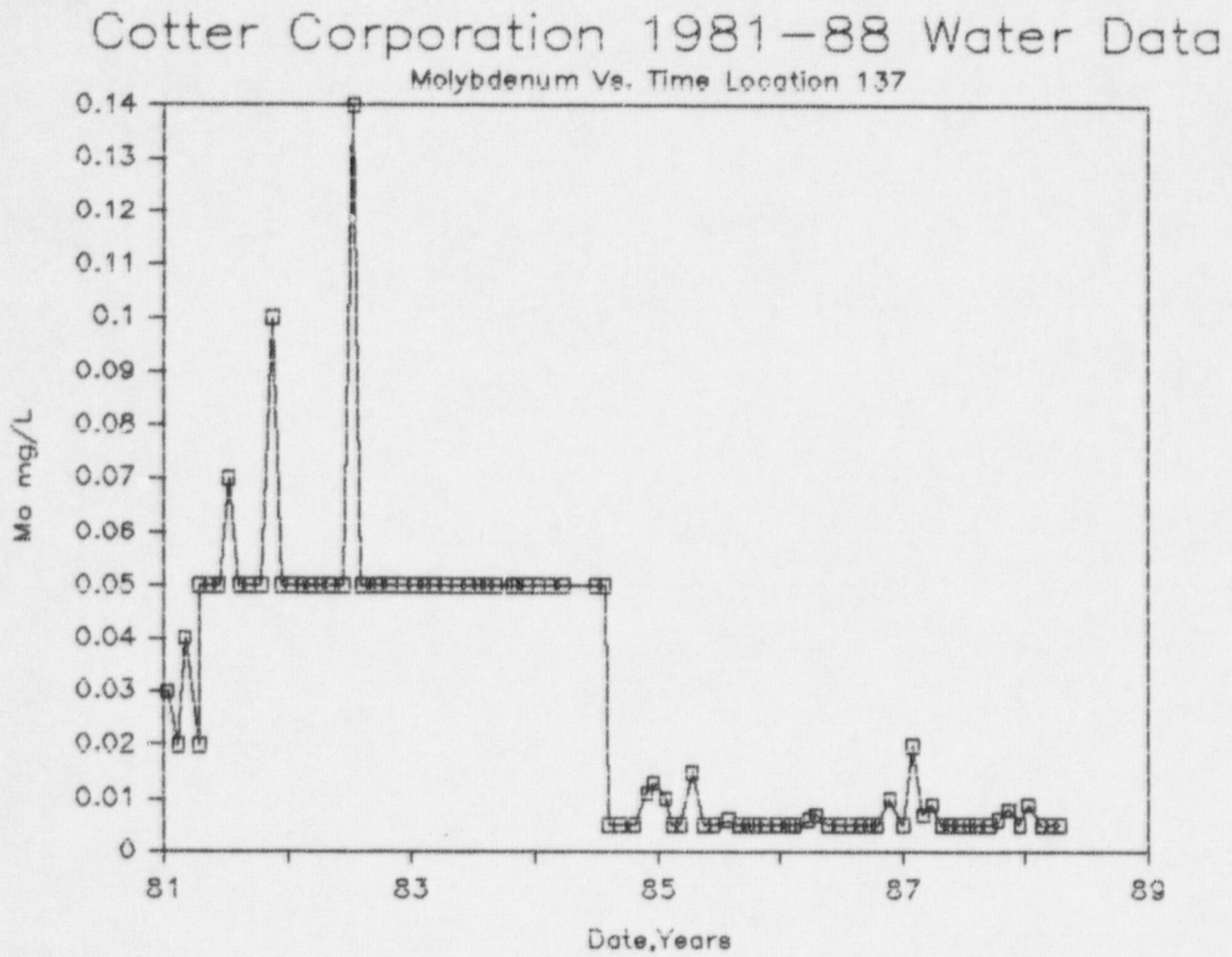

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 137
Mo mg/L
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.29

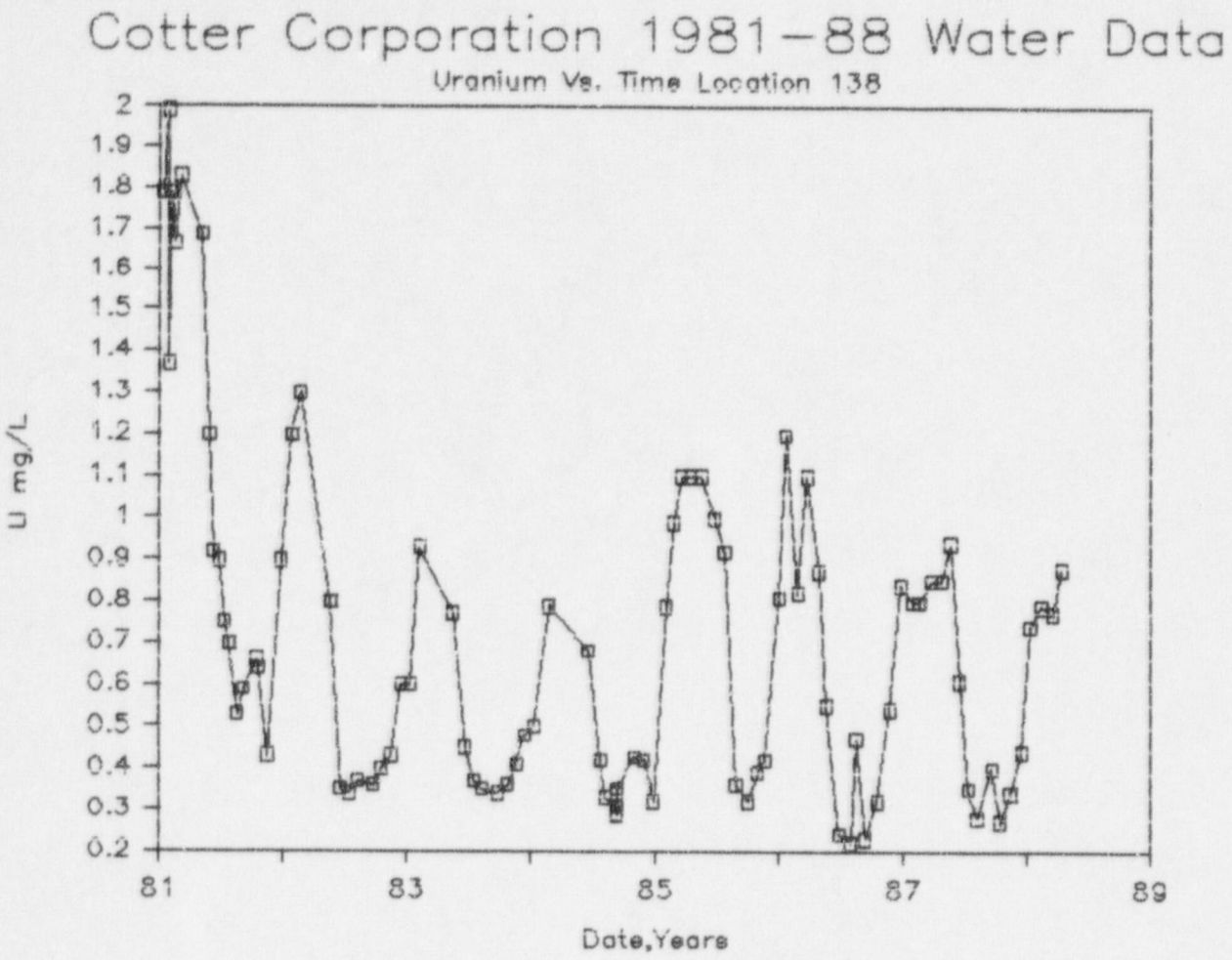

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 138
U mg/L
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
81
83
85
87
89
Date,Years

FIGURE 1.30

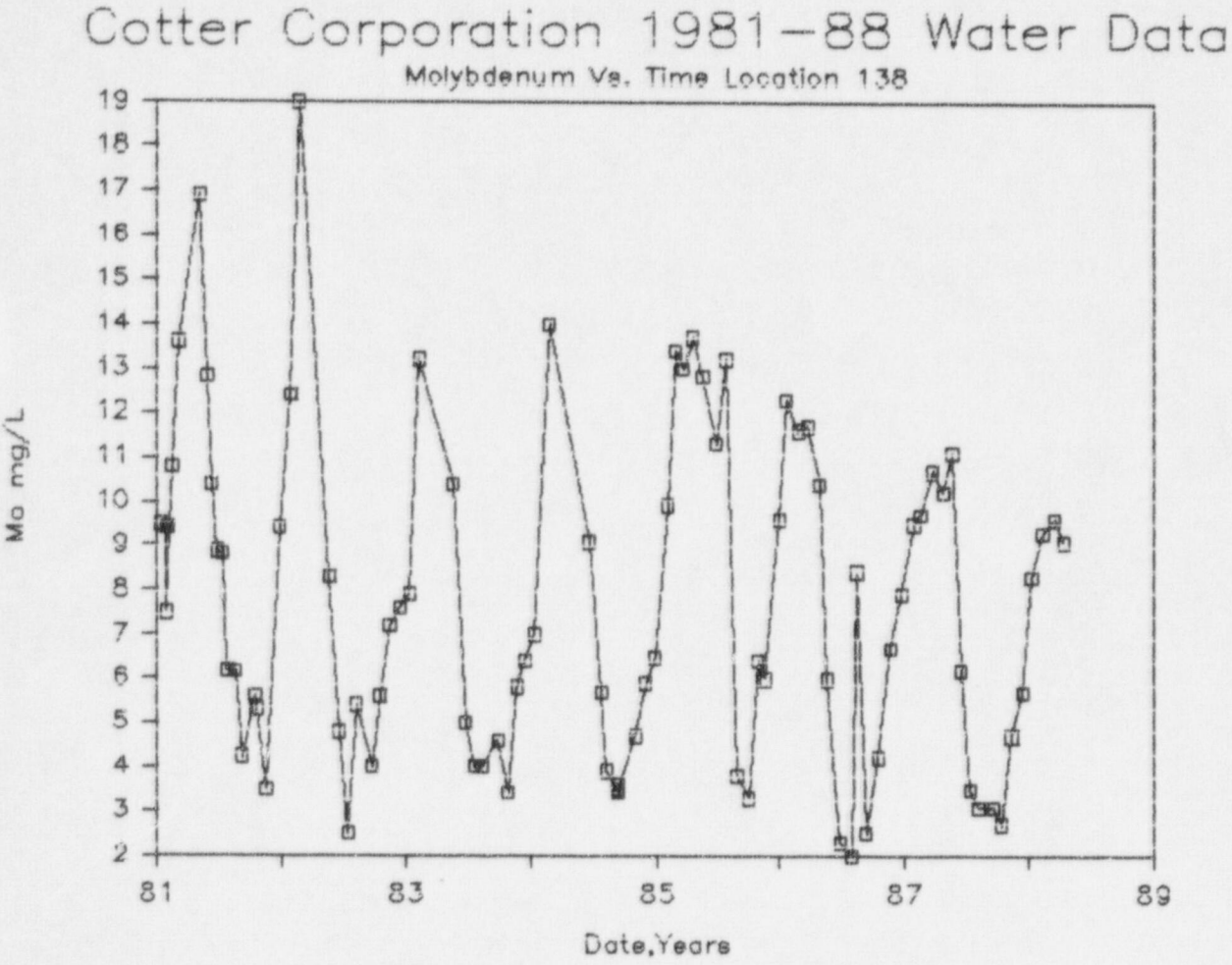

Cotter Corporation 1981-88 Water Data
Molybdenum Vs. Time Location 138
Mo mg/L
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
81
83
85
87
89
Date,Years

FIGURE 1.31

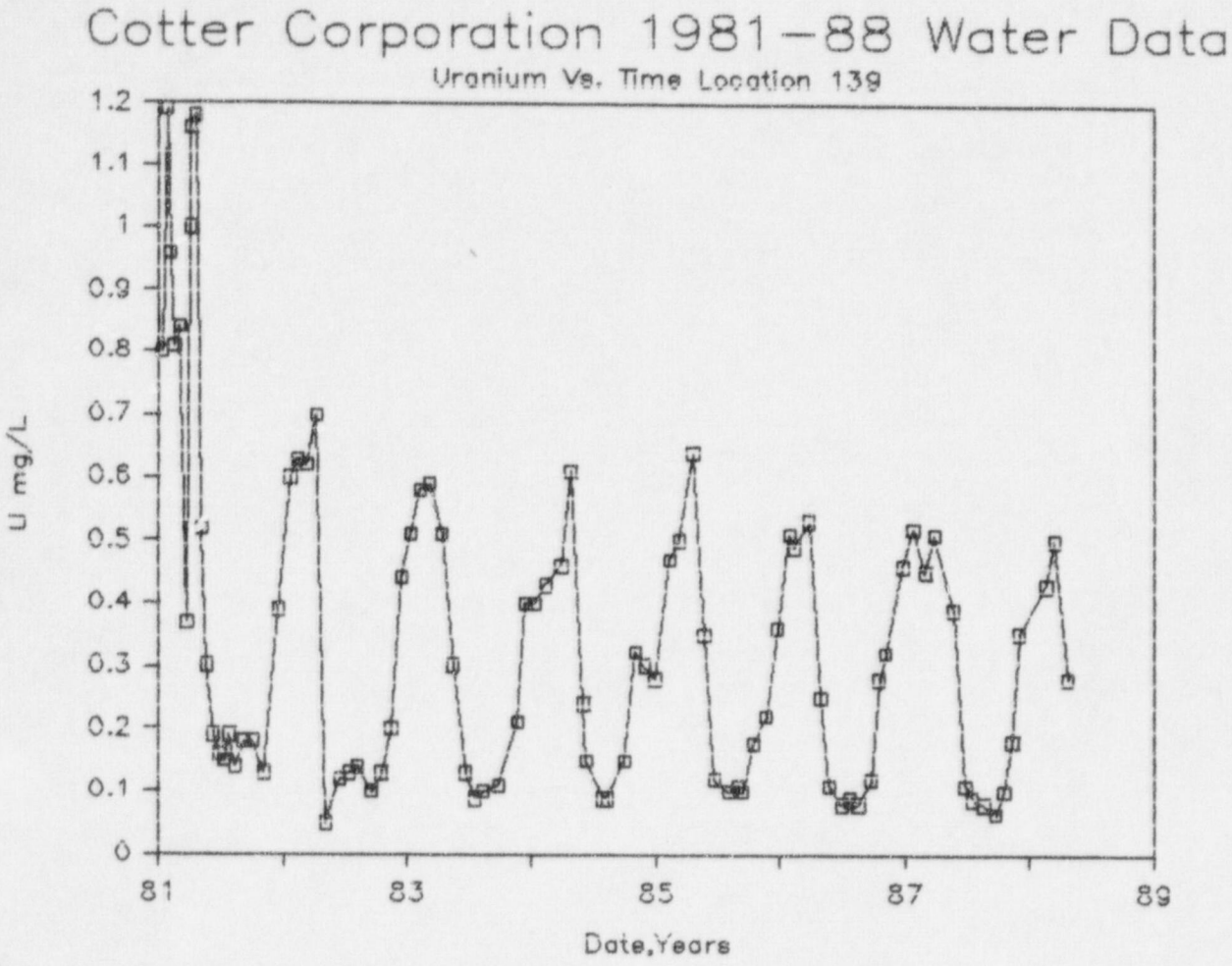

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 139
U mg/L
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
89
Date,Years

FIGURE 1.32

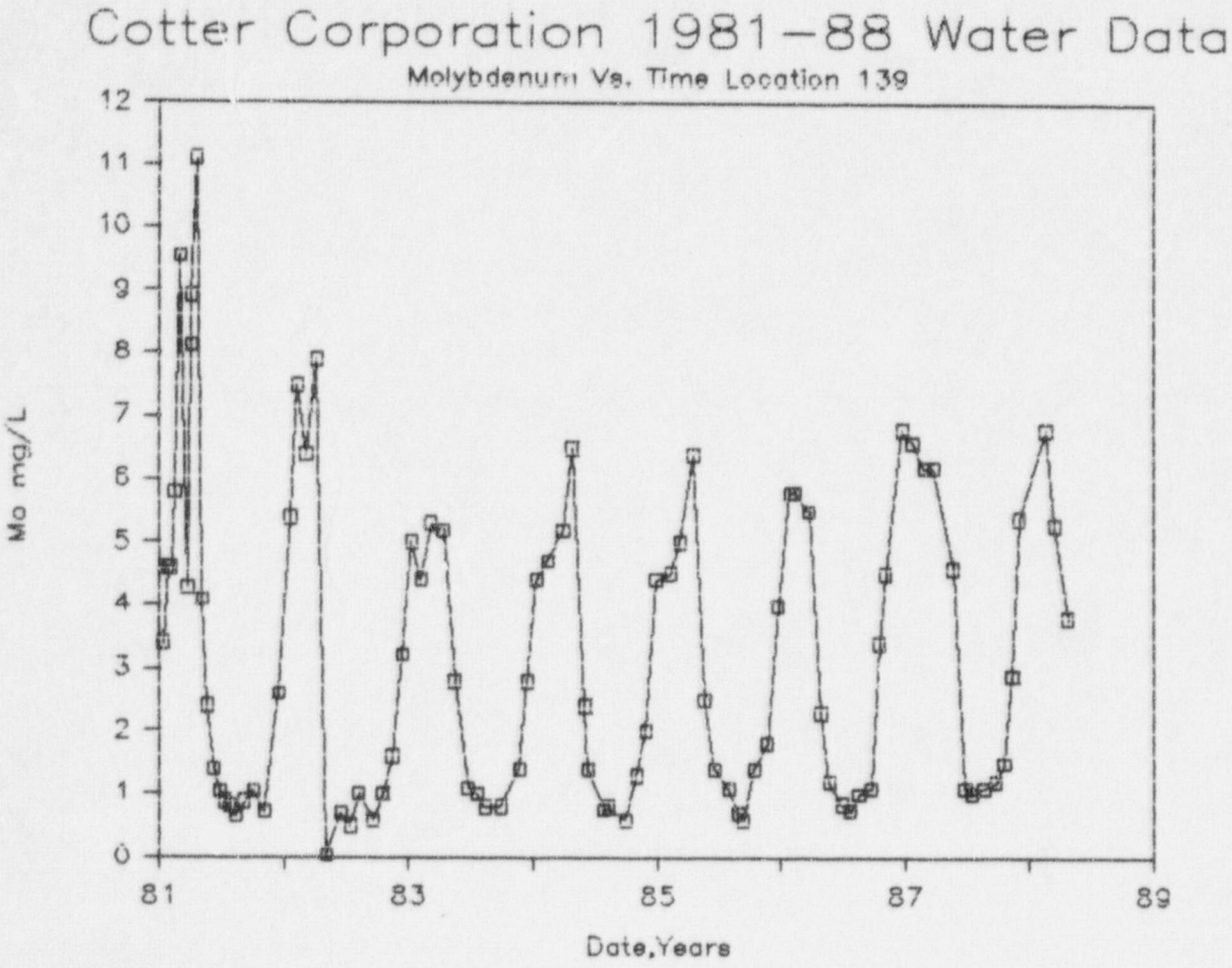

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 139
Mo mg/L
12
11
10
9
8
7
6
5
4
3
2
1
0
81
83
85
87
89
Date,Years

FIGURE 1.33

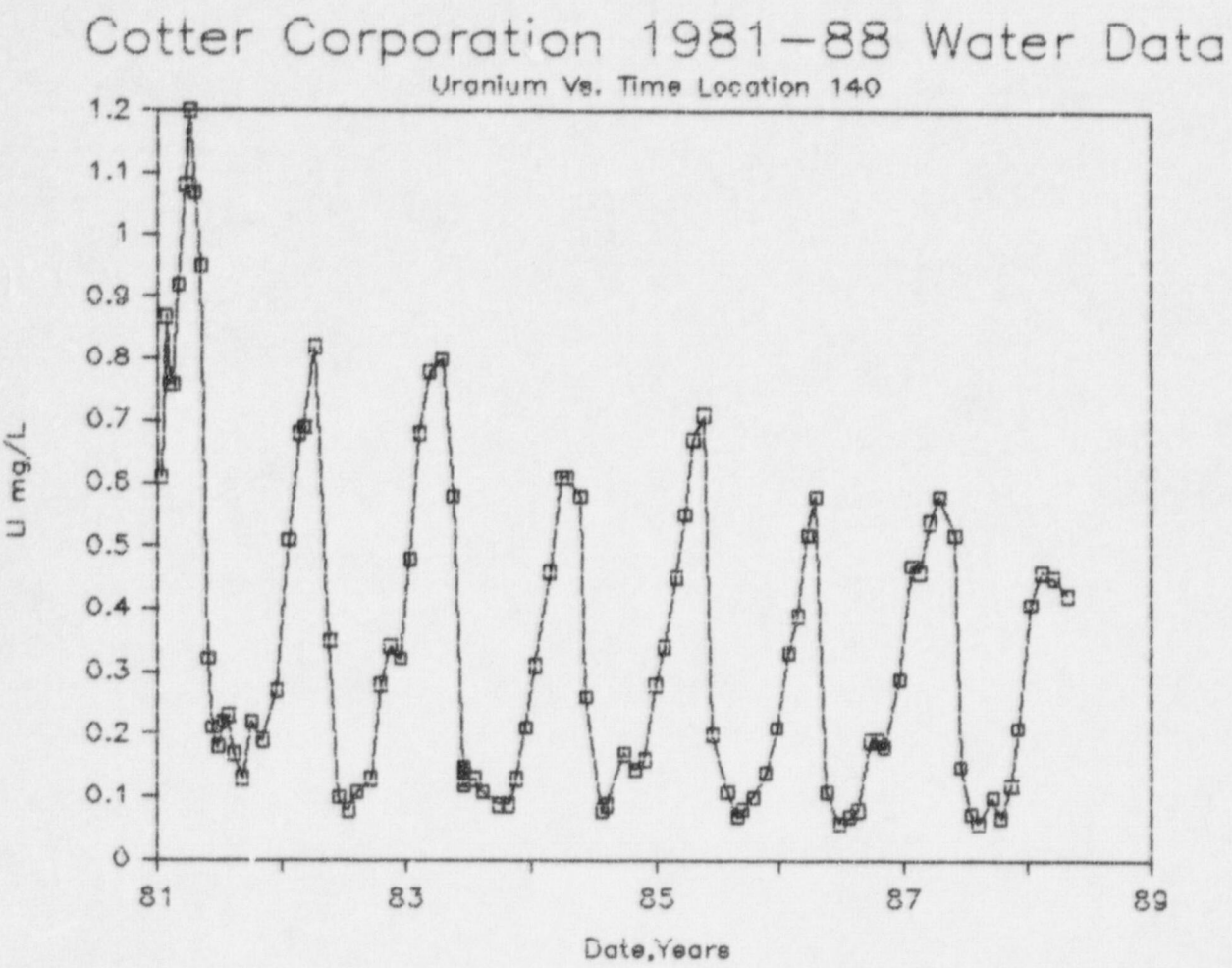

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 140
U mg/L
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
89
Date,Years

FIGURE 1.34

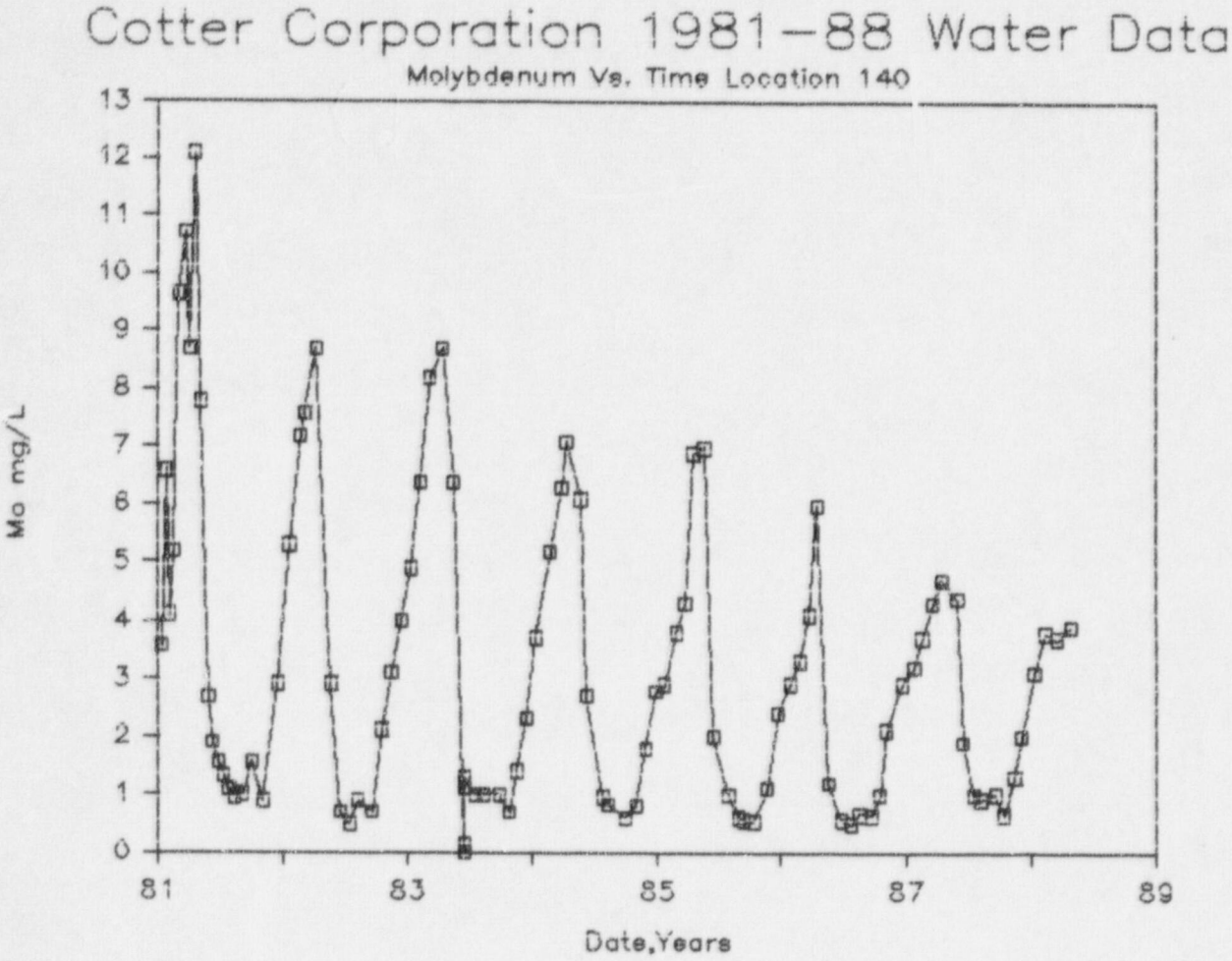

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 140
Mo mg/L
0
1
2
3
4
5
6
7
8
9
10
11
12
13
81
83
85
87
89
Date,Years

FIGURE 1.35

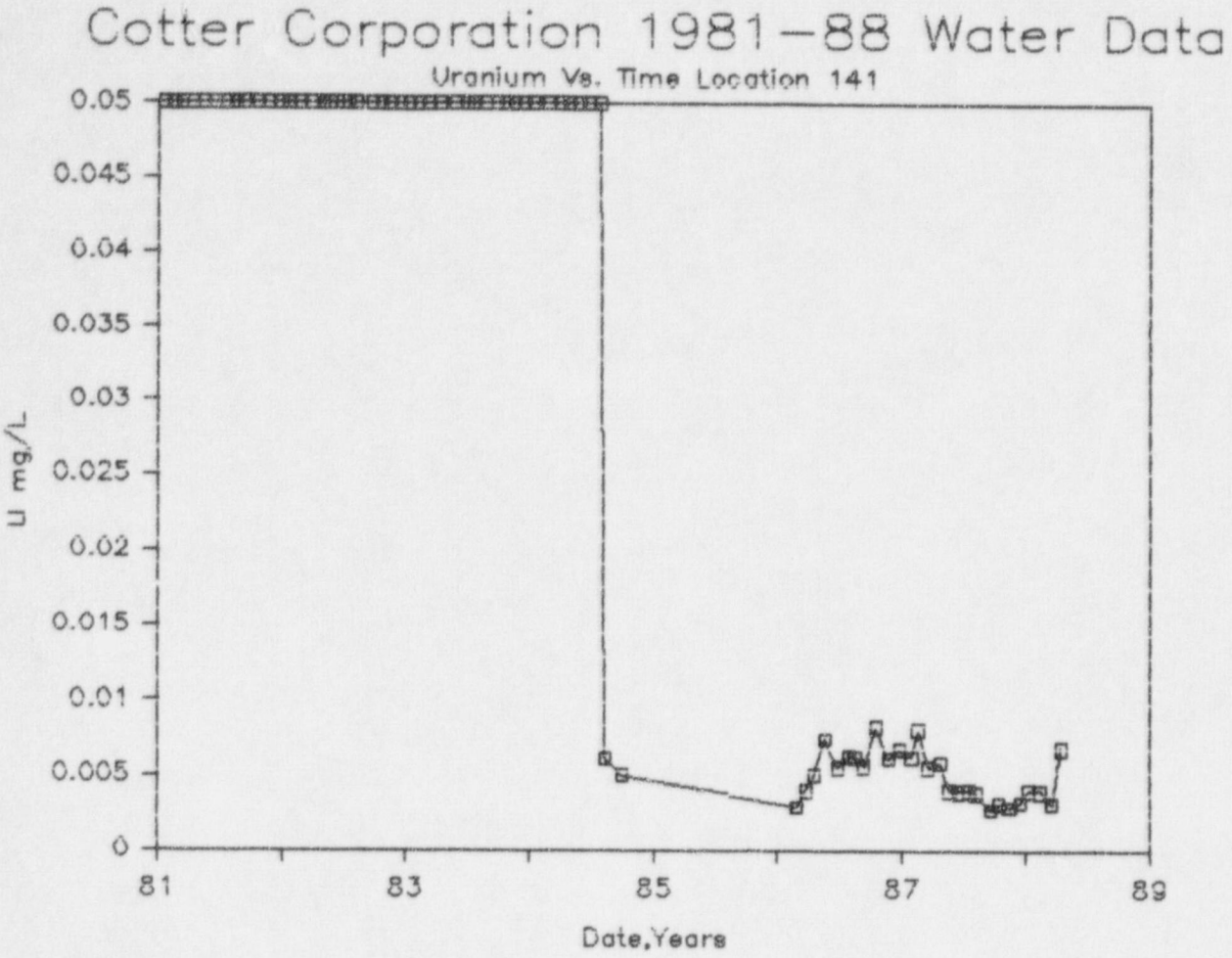

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 141
U mg/L
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
81
83
85
87
89
Date,Years

FIGURE 1.36

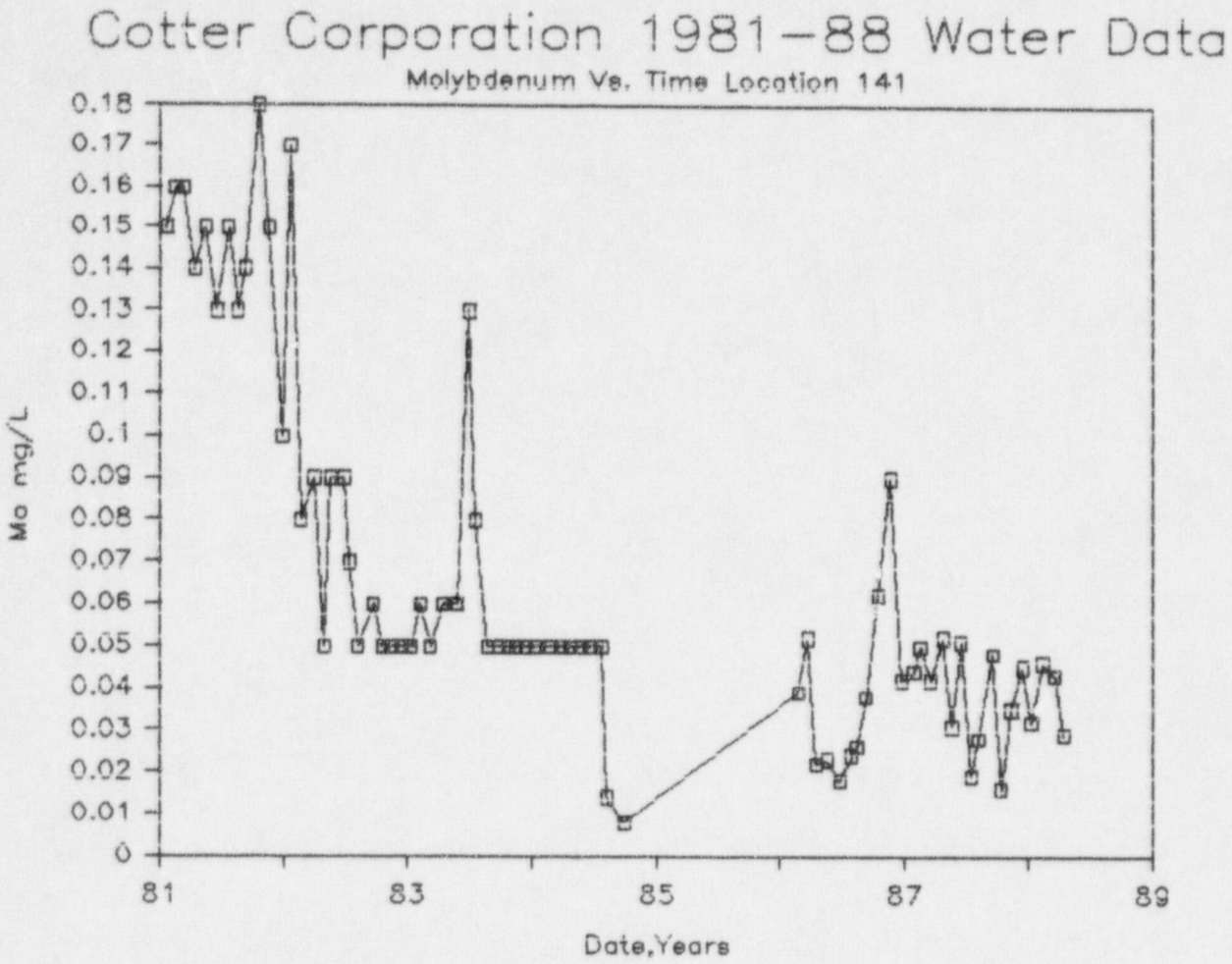

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 141
Mo mg/L
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.37

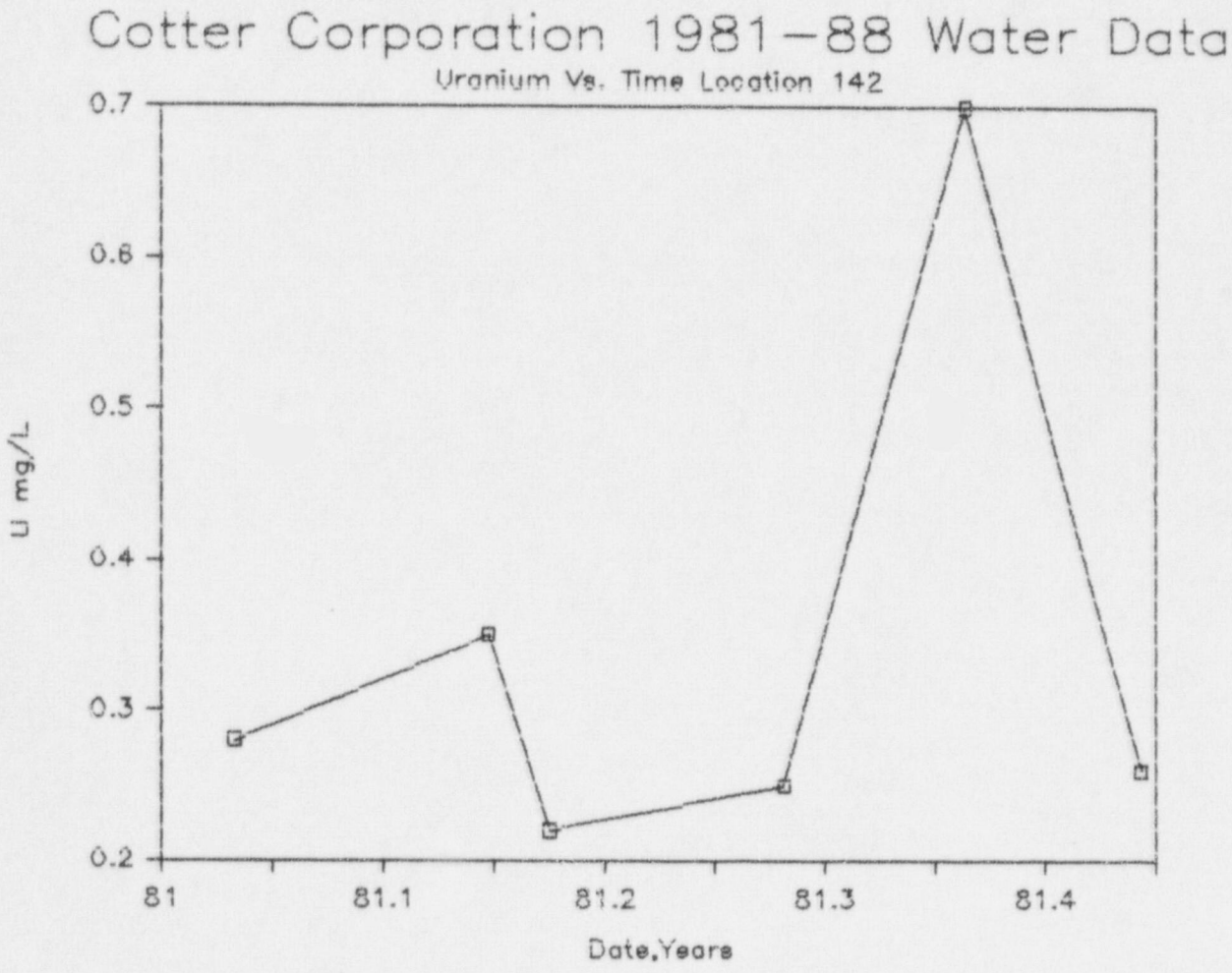

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 142
U mg/L
0.7
0.6
0.5
0.4
0.3
0.2
81
81.1
81.2
81.3
81.4
Date,Years

FIGURE 1.38

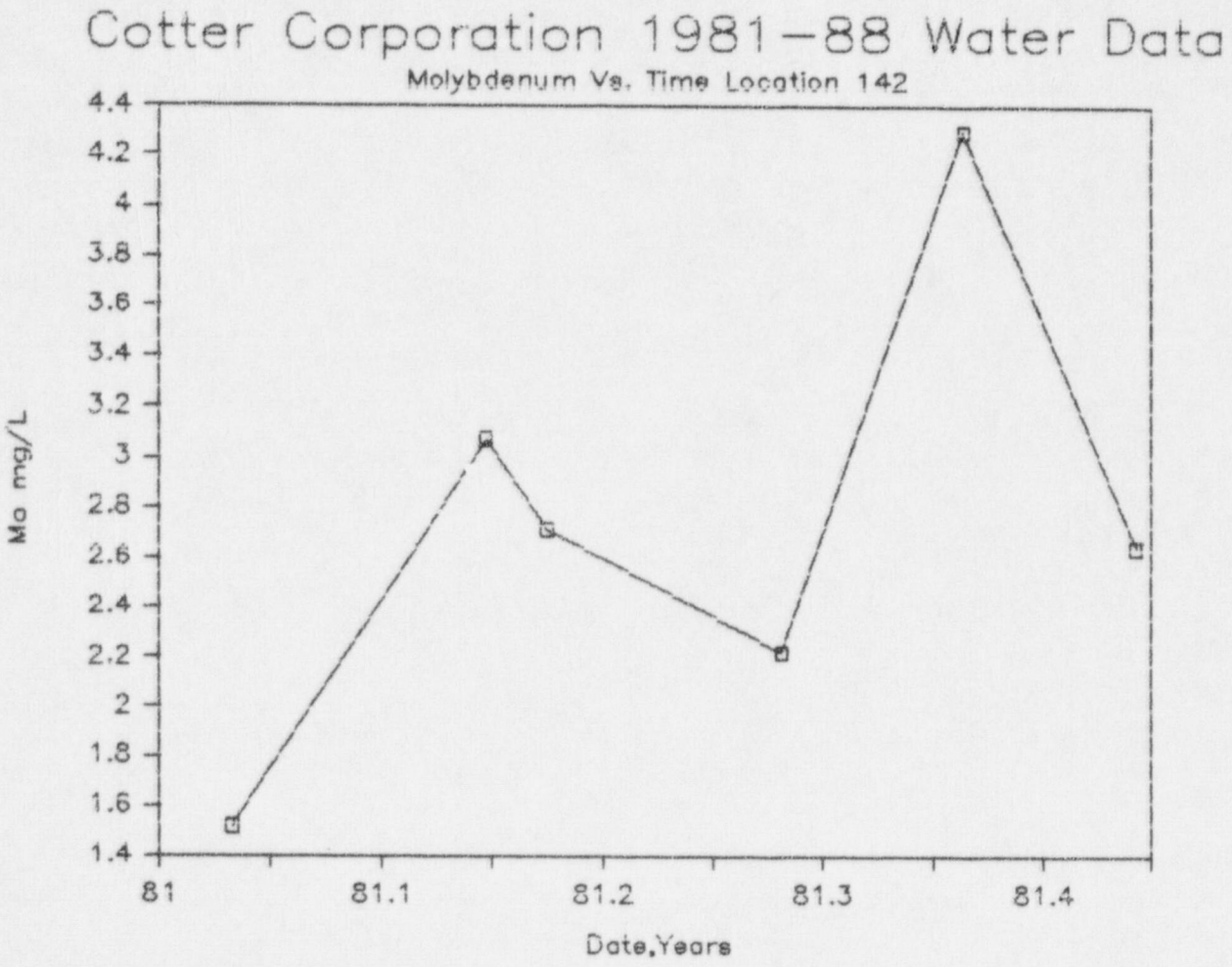

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 142
Mo mg/L
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
81
81.1
81.2
81.3
81.4
Date,Years

FIGURE 1.39

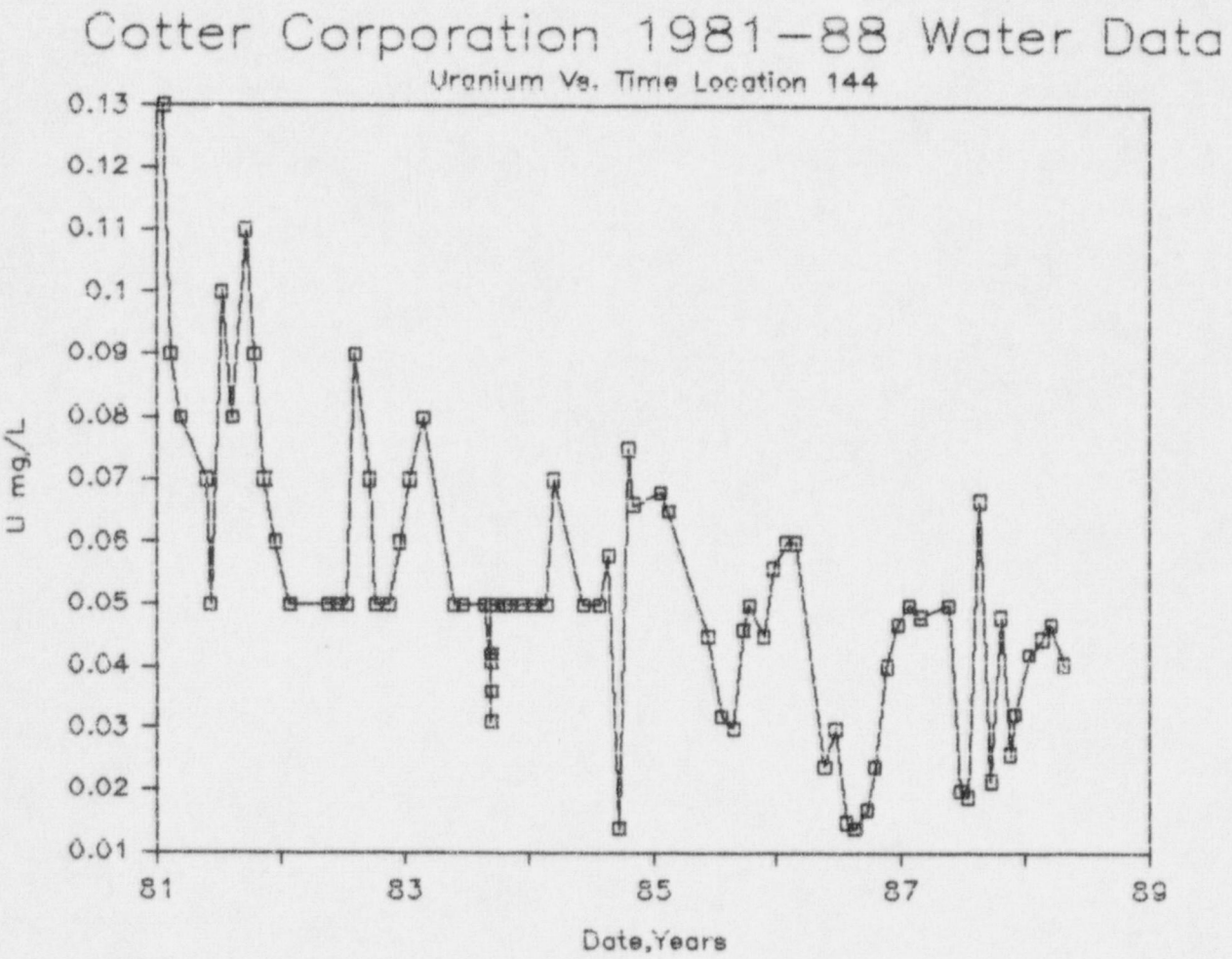

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 144
U mg/L
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
81
83
85
87
89
Date,Years

FIGURE 1.40

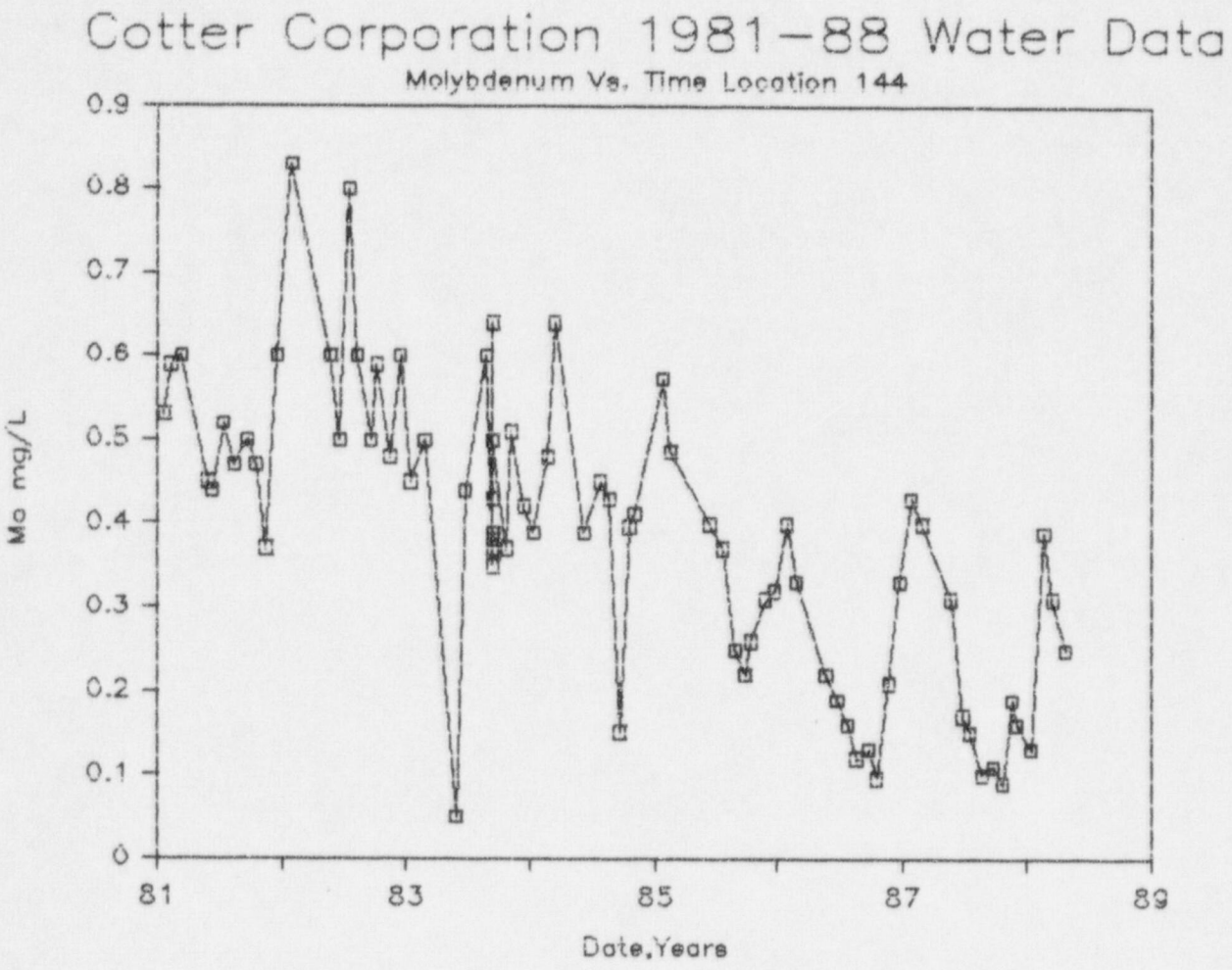

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 144
Mo mg/L
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
89
Date,Years

FIGURE 1.41

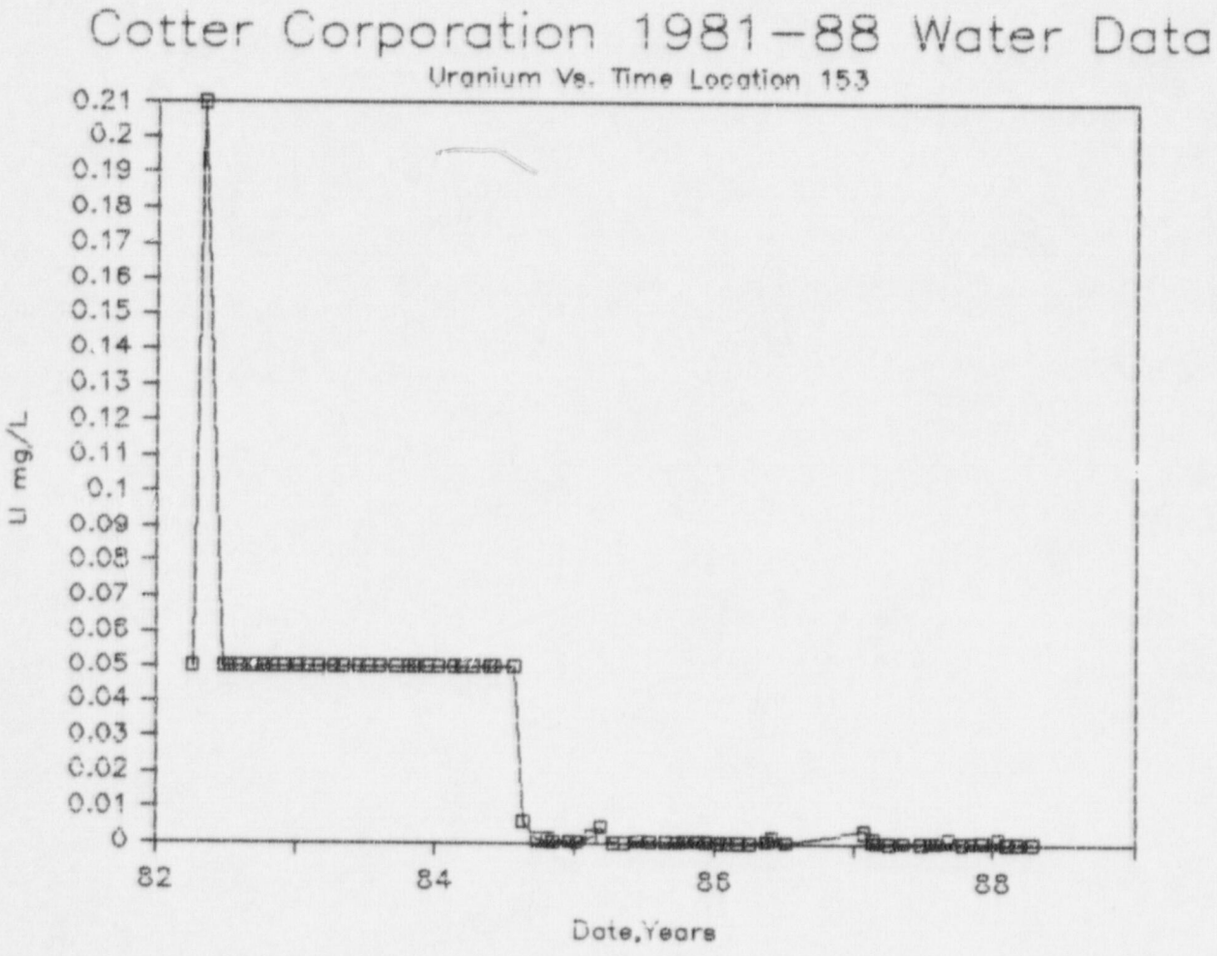

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 153
U mg/L
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
82
84
86
88
Date,Years

FIGURE 1.42

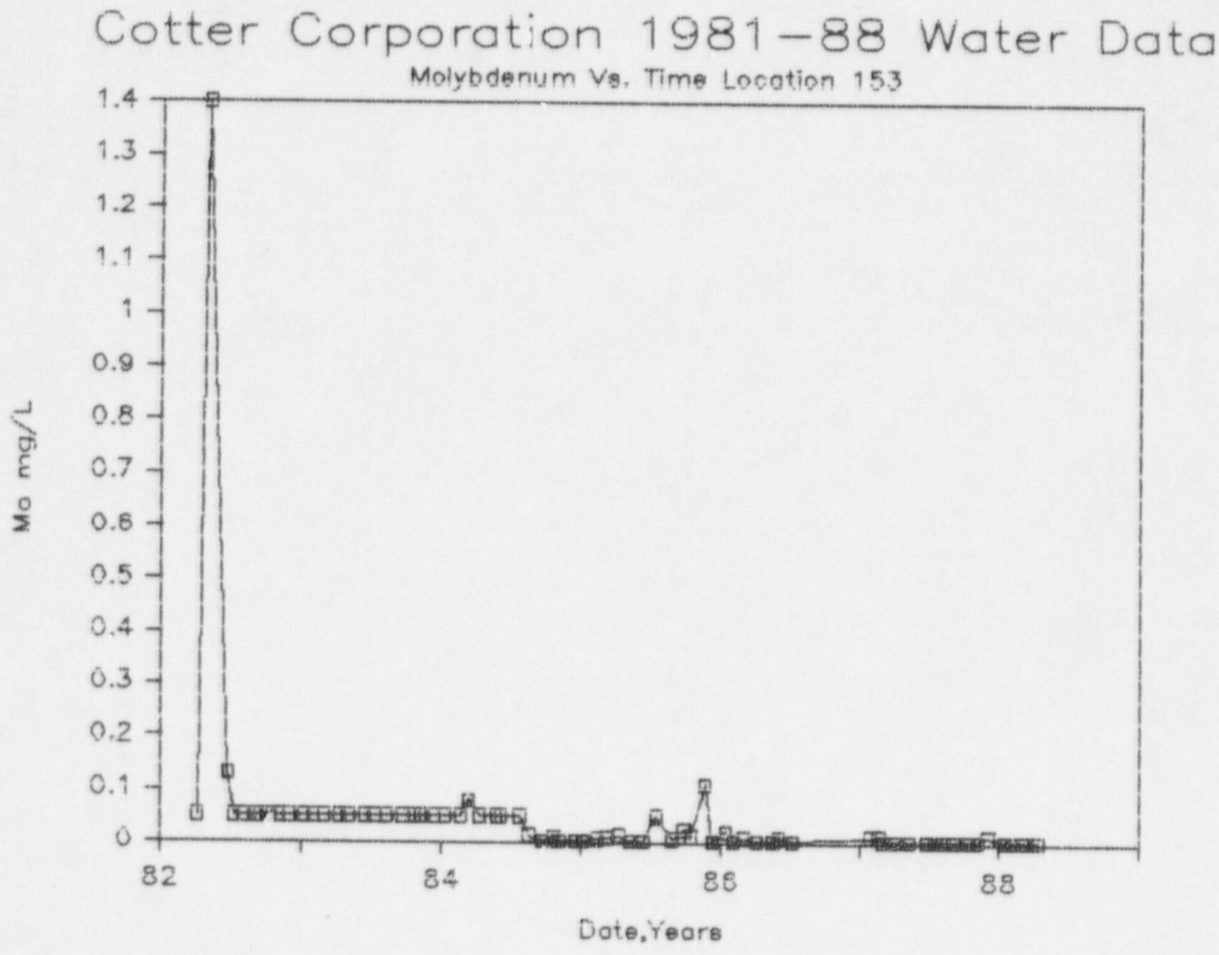

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 153
Mo mg/L
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
82
84
86
88
Date,Years

FIGURE 1.43

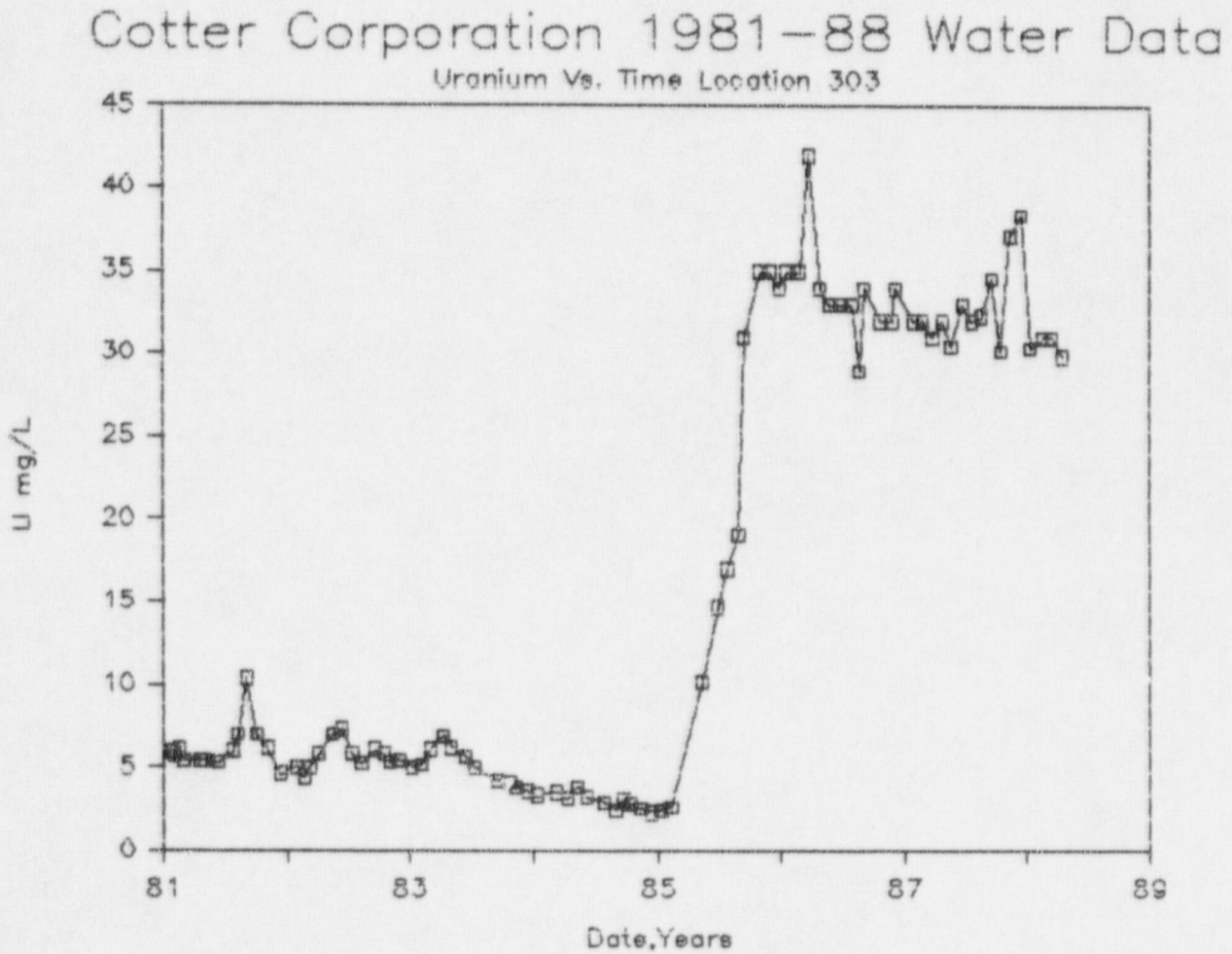

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 303
U mg/L
45
40
35
30
25
20
15
10
5
0
81
83
85
87
89
Date,Years

FIGURE 1.44

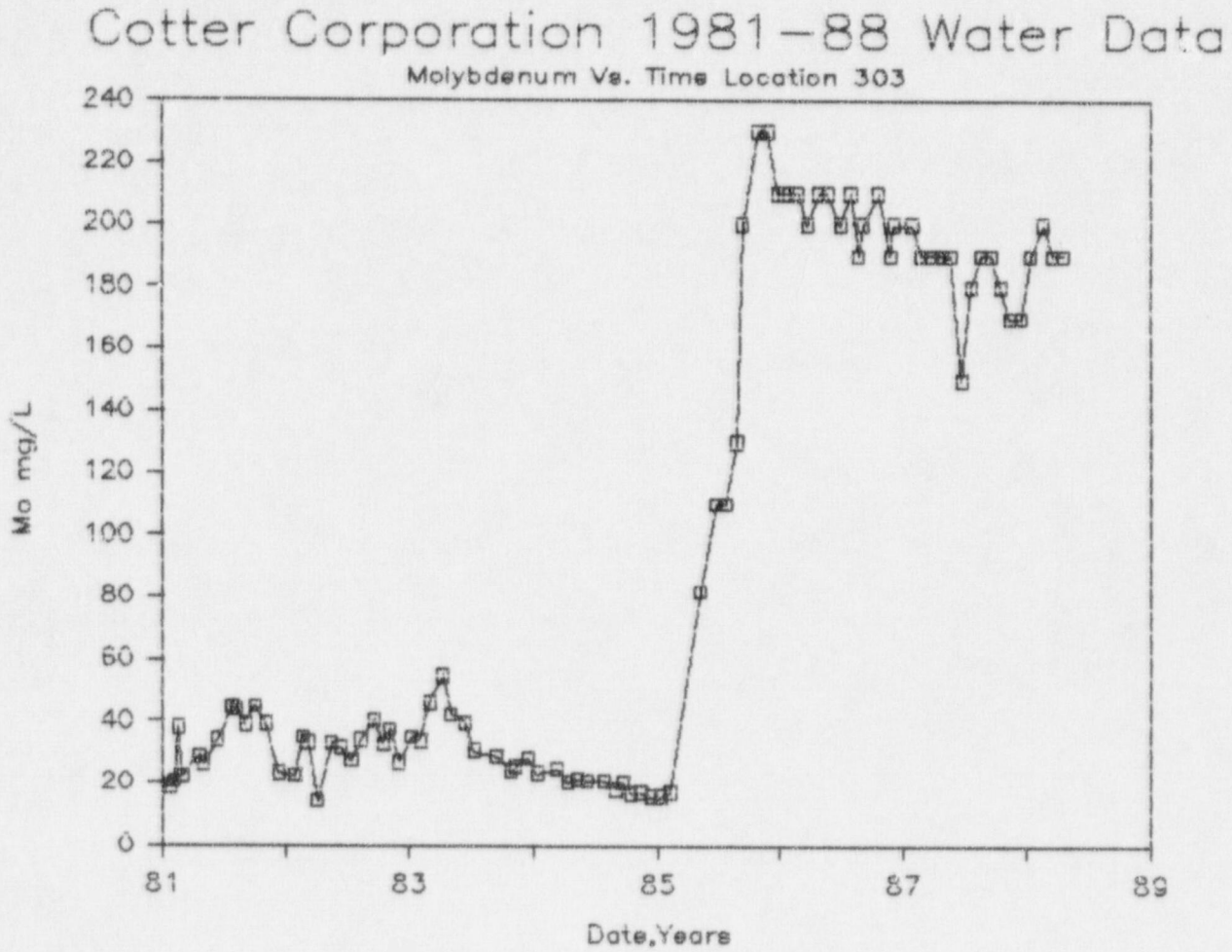

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 303
Mo mg/L
240
220
200
180
160
140
120
100
80
60
40
20
0
81
83
85
87
89
Date,Years

FIGURE 1.45

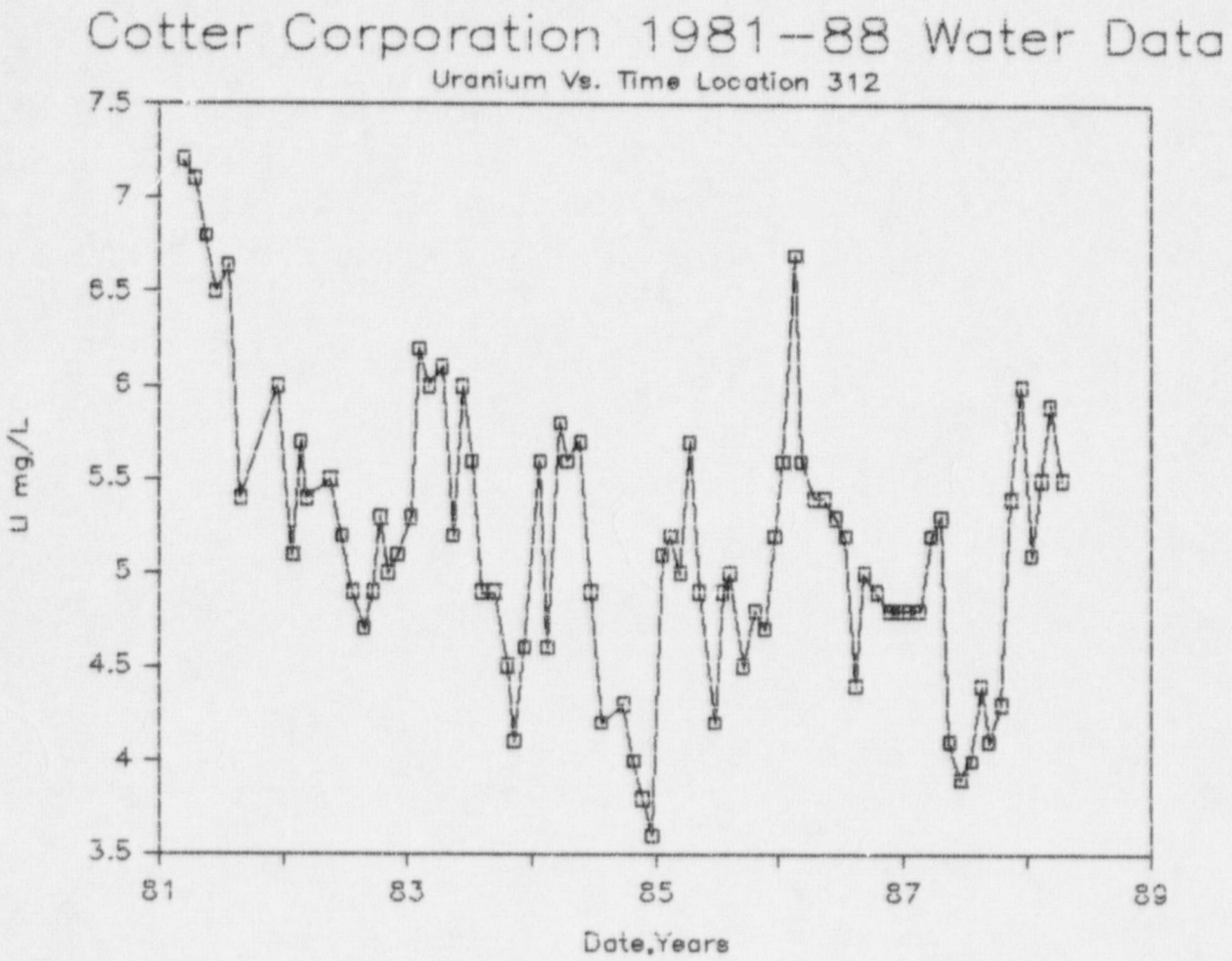

Cotter Corporation 1981--88 Water Data
Uranium Vs. Time Location 312
7.5
7
6.5
6
5.5
5
4.5
4
3.5
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.46

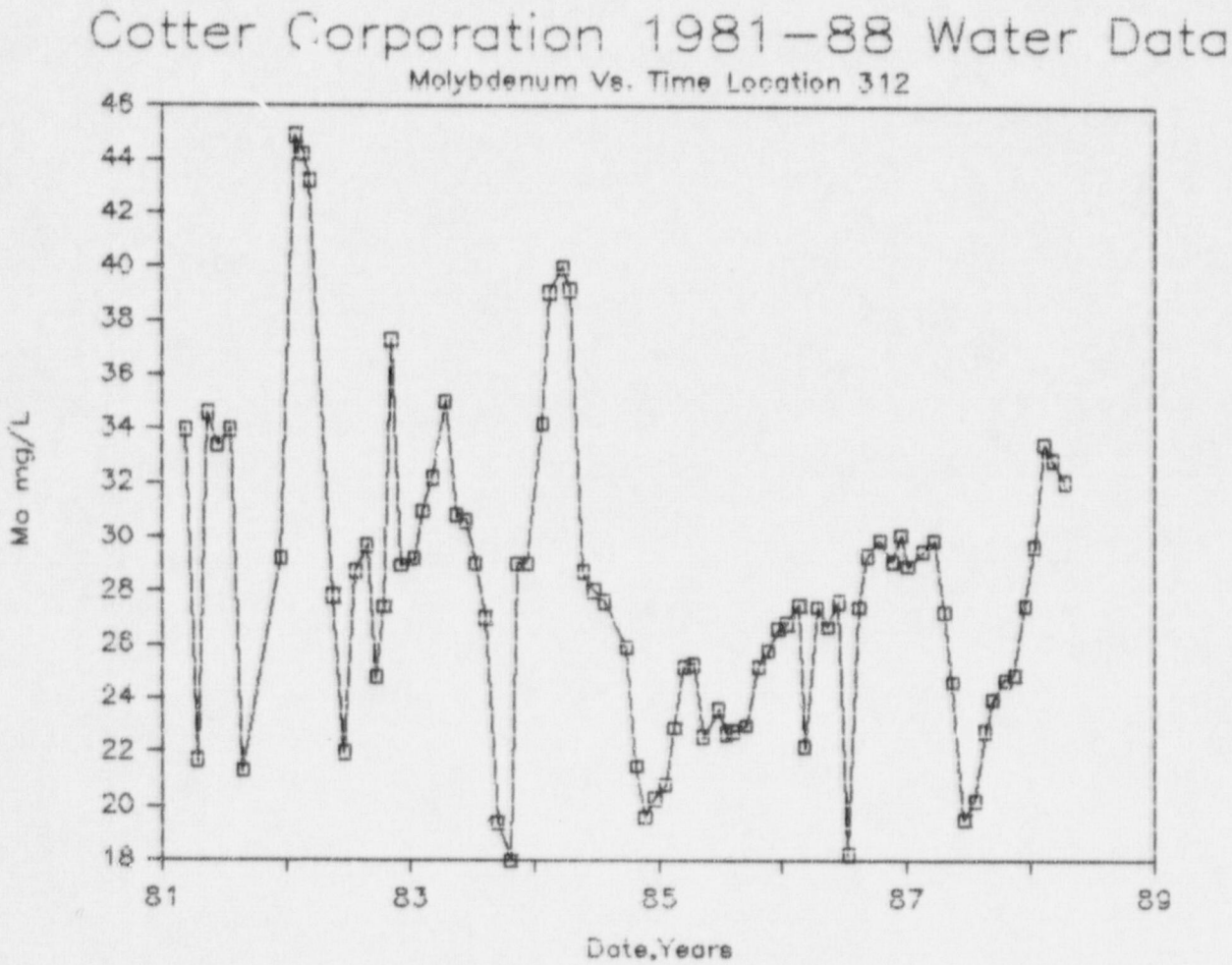

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 312
Mo mg/L
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
81
83
85
87
89
Date,Years

FIGURE 1.47

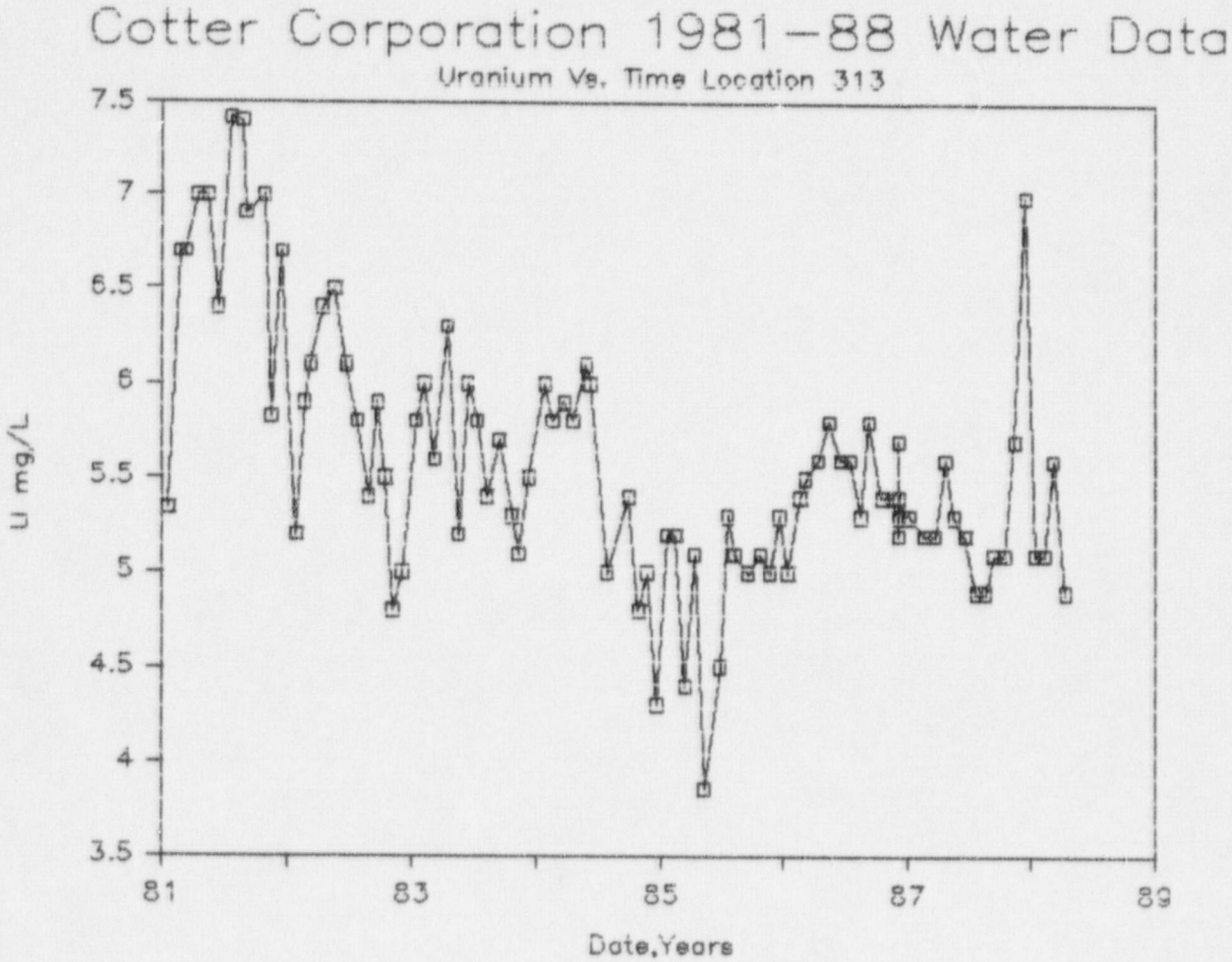

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 313
U mg/L
7.5
7
6.5
6
5.5
5
4.5
4
3.5
81
83
85
87
89
Date,Years

FIGURE 1.48

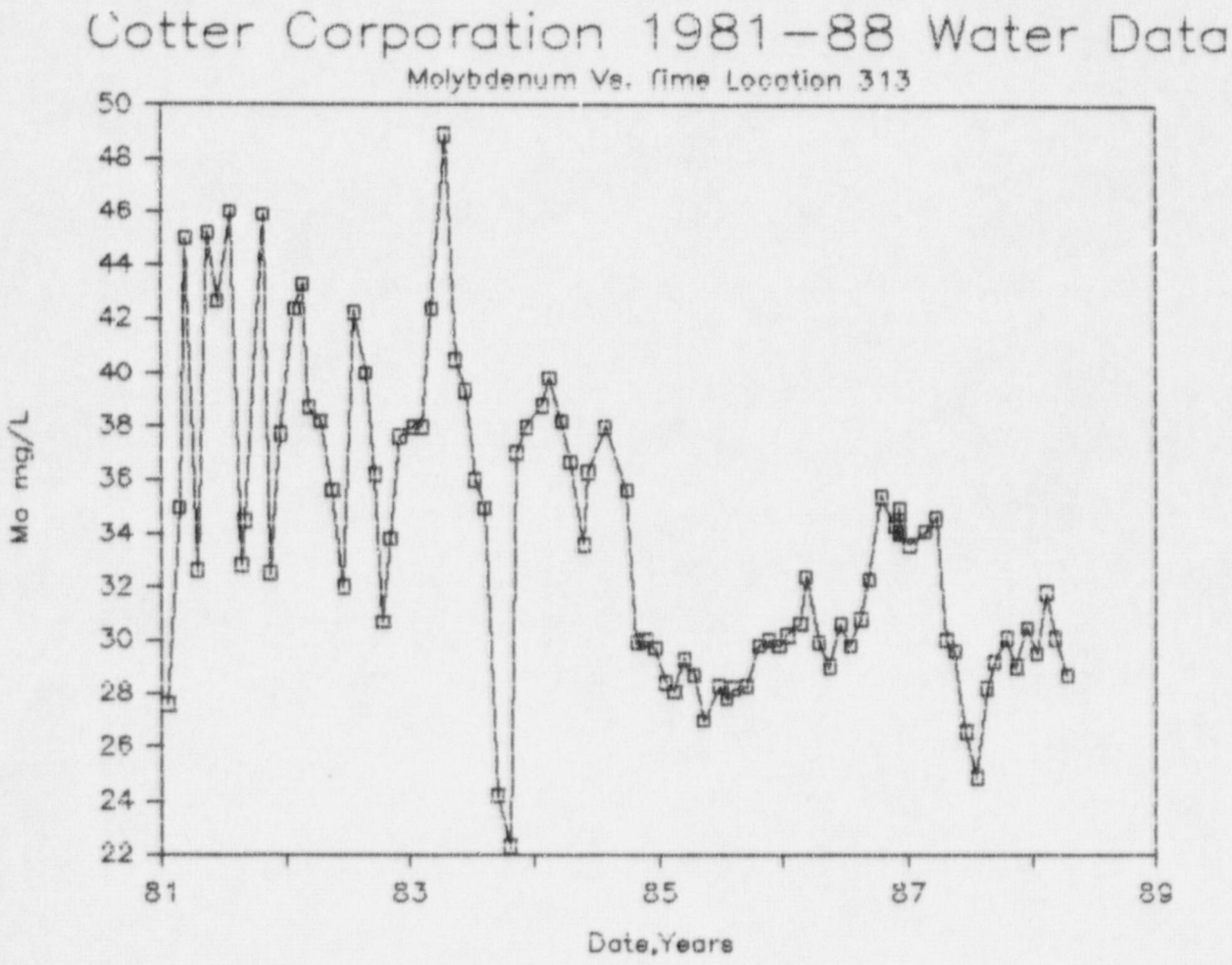

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 313
Mo mg/L
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
81
83
85
87
89
Date,Years

FIGURE 1.49

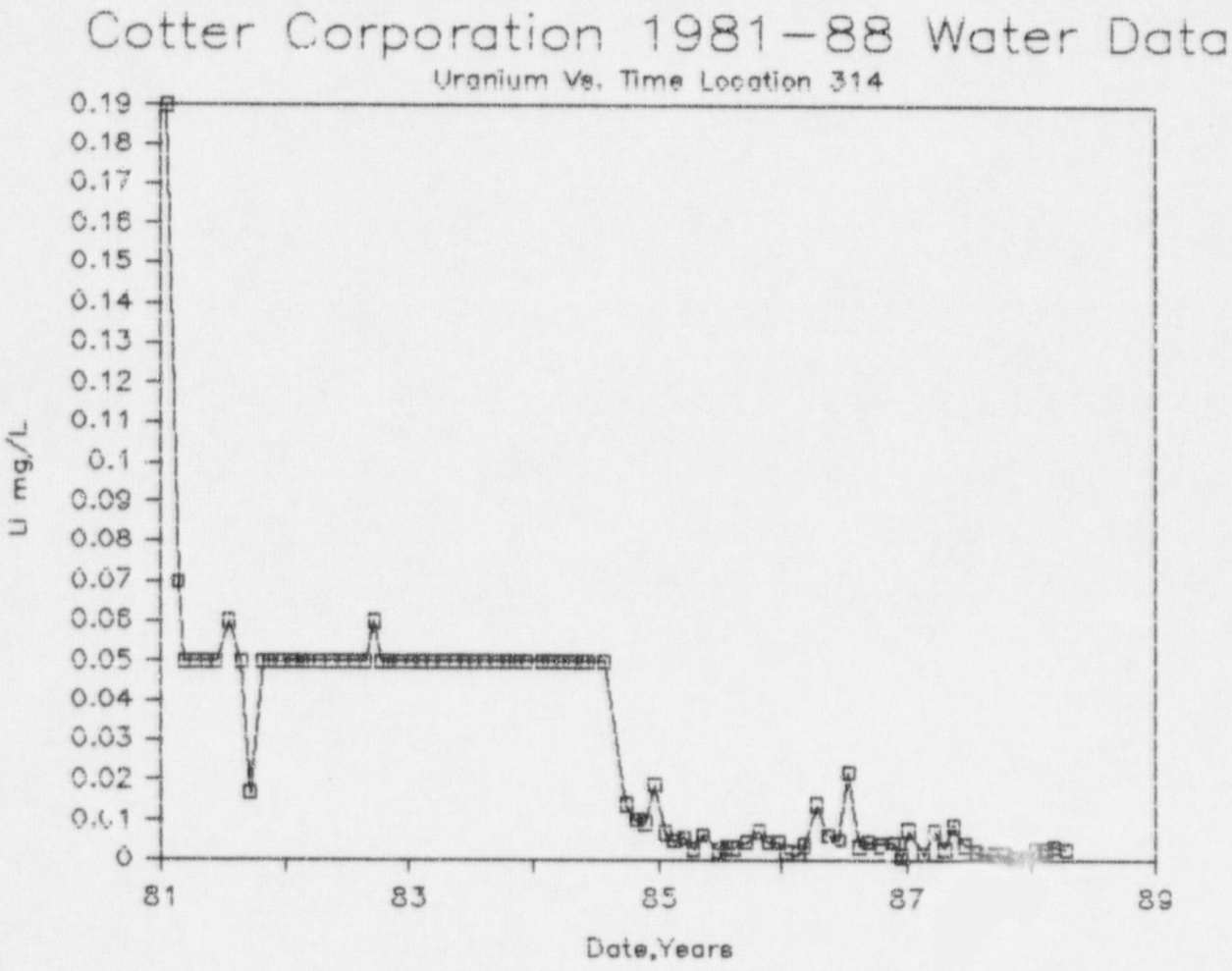

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 314
U mg/L
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.50

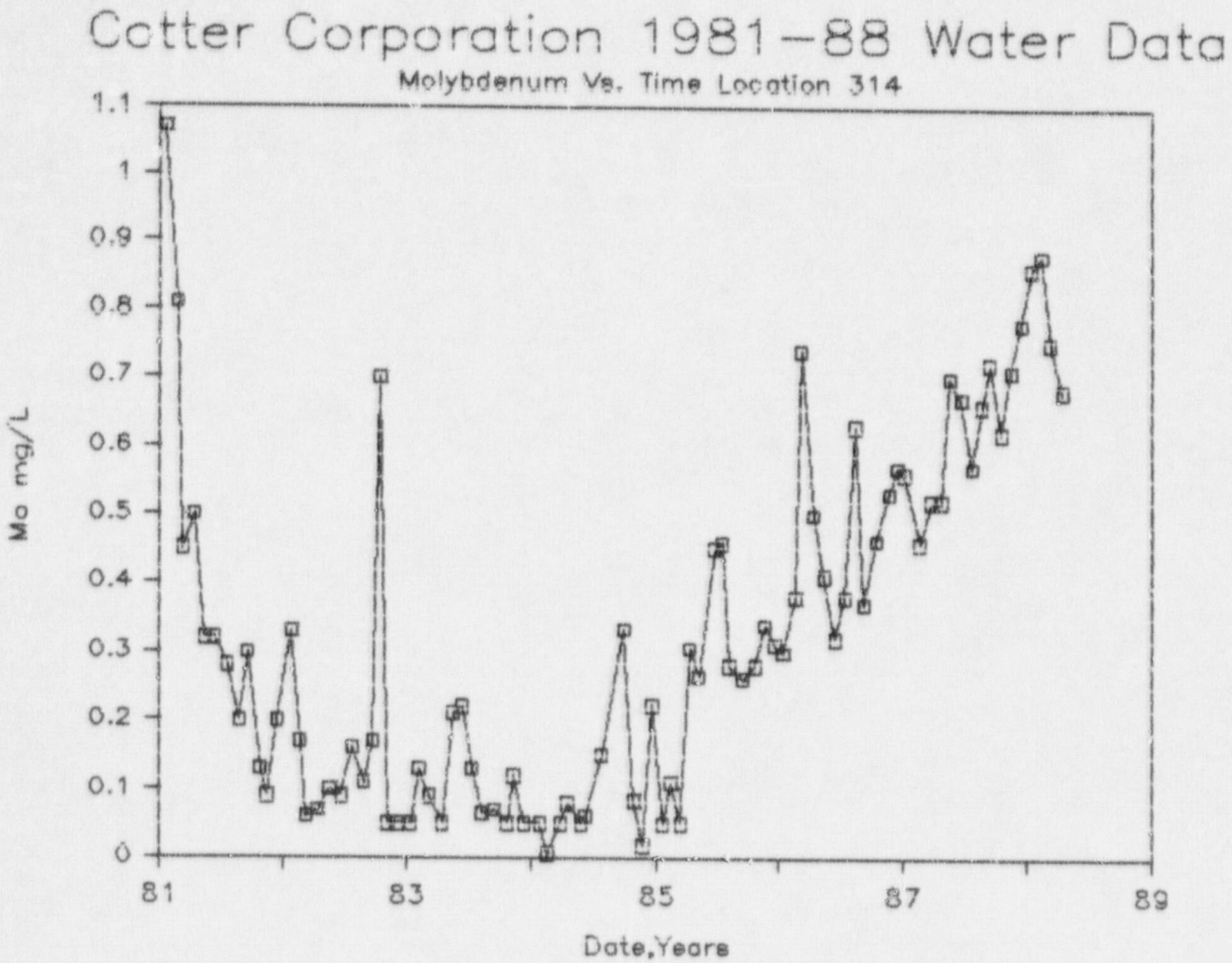

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 314
Mo mg/L
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
89
Date,Years

FIGURE 1.51

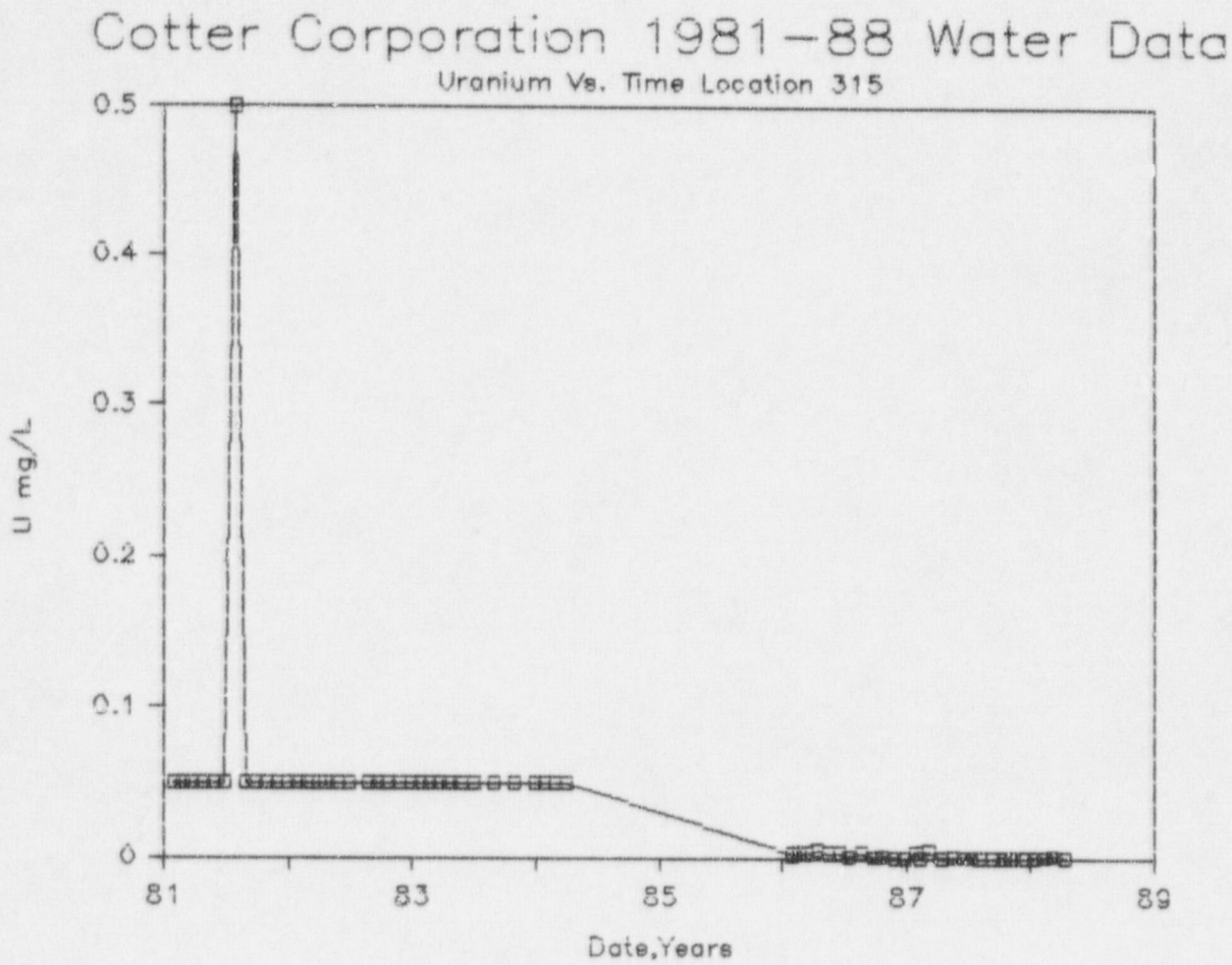

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 315
0.5
0.4
0.3
0.2
0.1
0
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.52

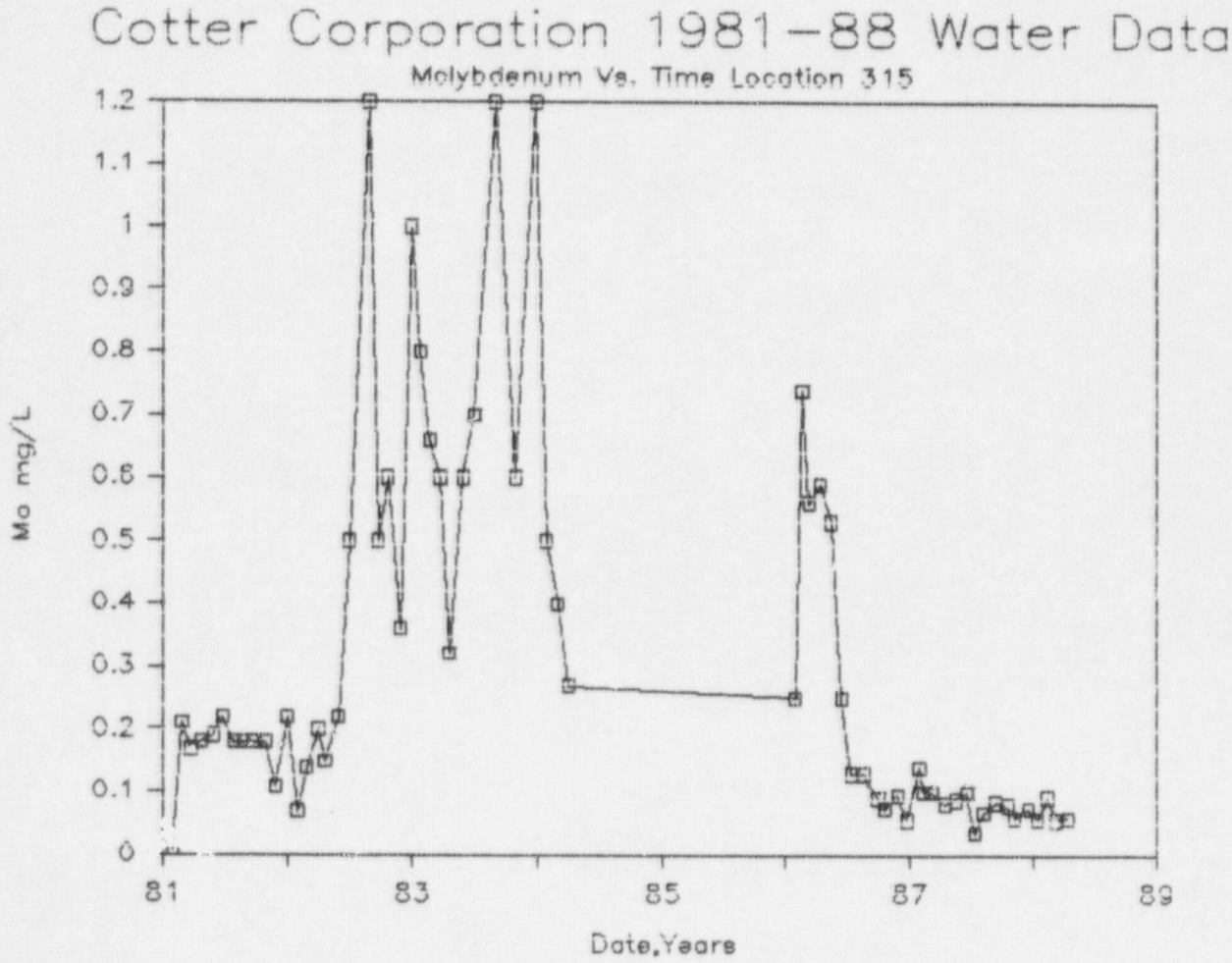

Cotter Corporation 1981-88 Water Data
Molybdenum Vs. Time Location 315
Mo mg/L
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
89
Date,Years

FIGURE 1.53

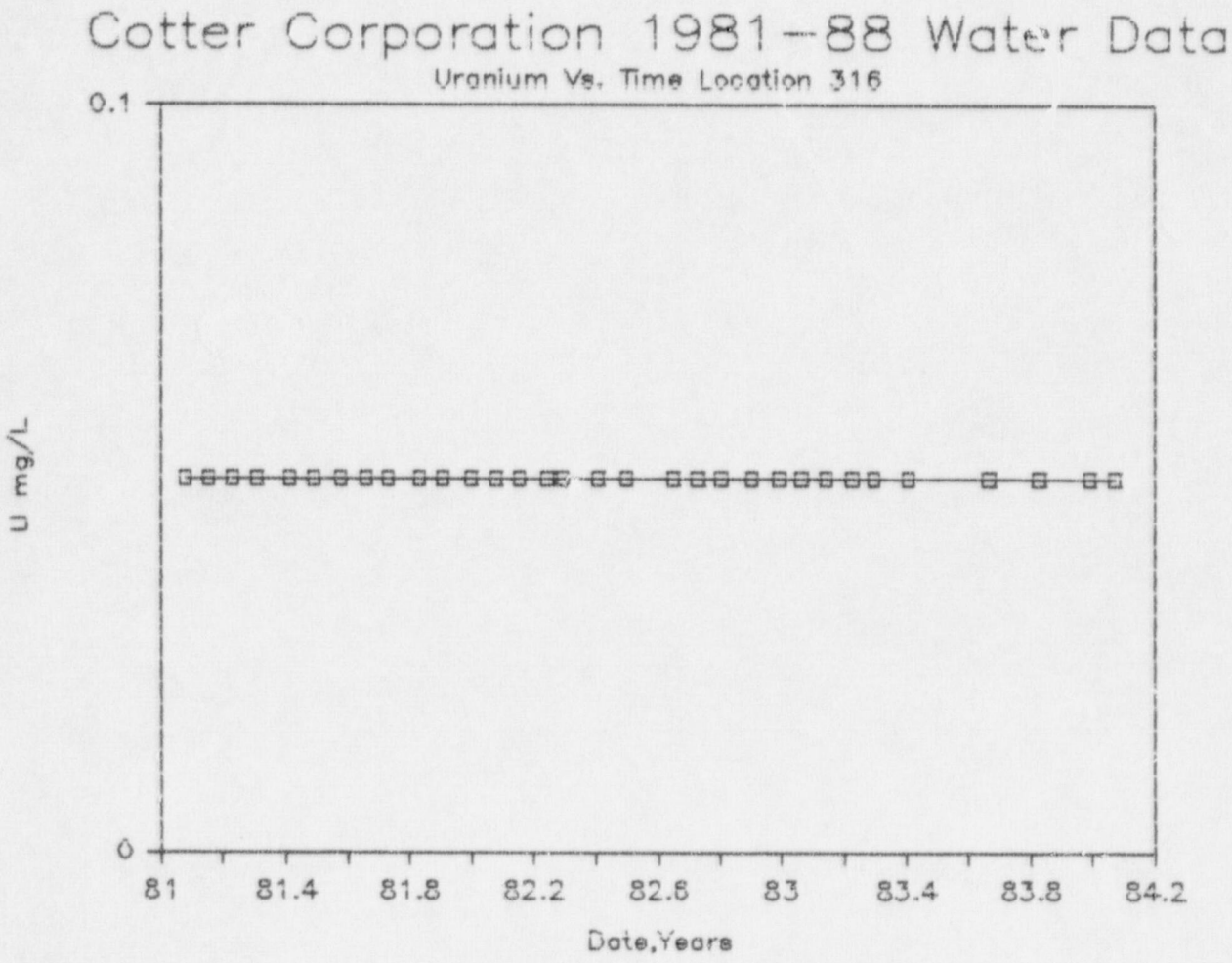

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 316
0.1
0
U mg/L
81
81.4
81.8
82.2
82.6
83
83.4
83.8
84.2
Date,Years

FIGURE 1.54

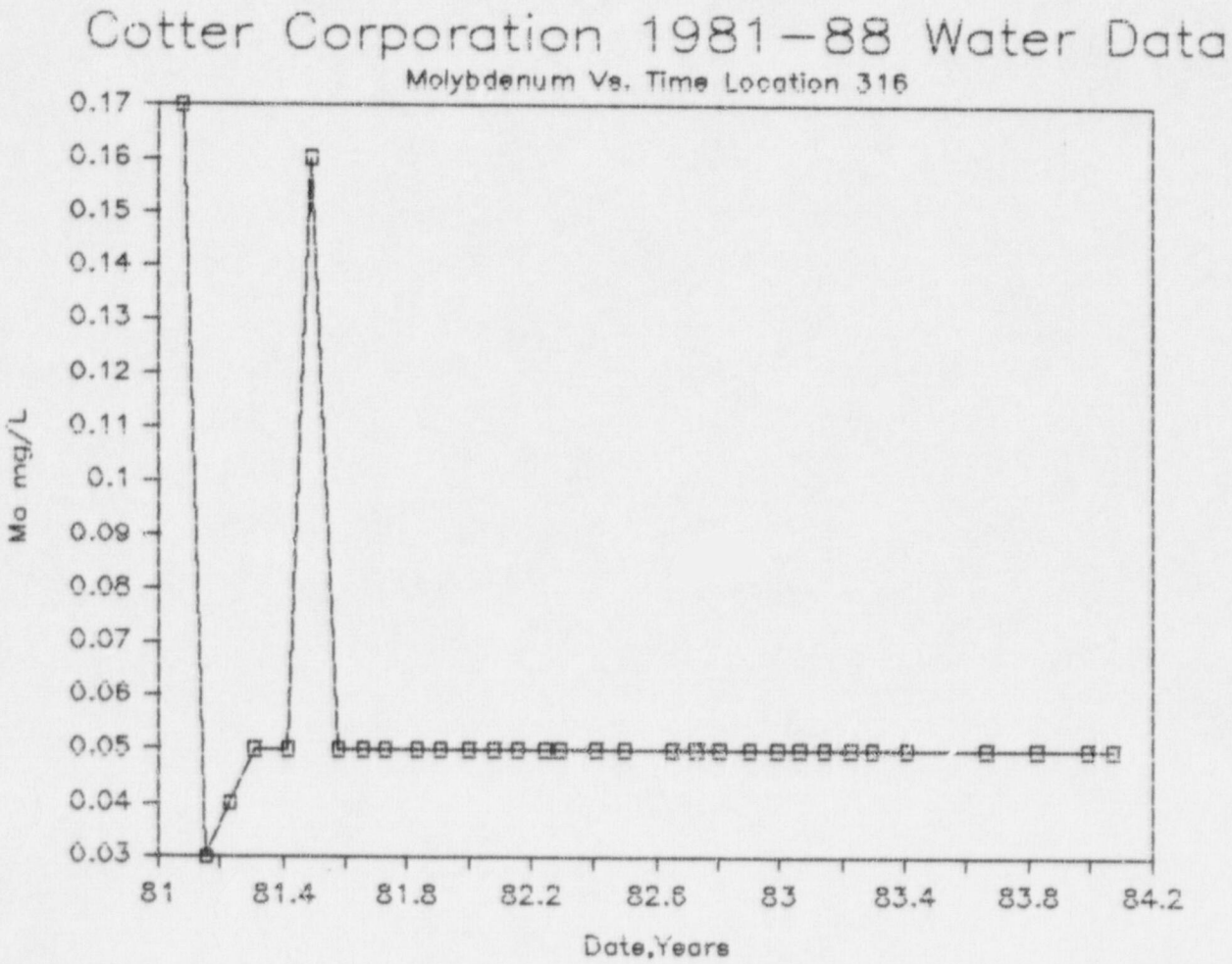

Cotter Corporation 1981-88 Water Data
Molybdenum Vs. Time Location 316
Mo mg/L
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
81
81.4
81.8
82.2
82.6
83
83.4
83.8
84.2
Date,Years

FIGURE 1.55

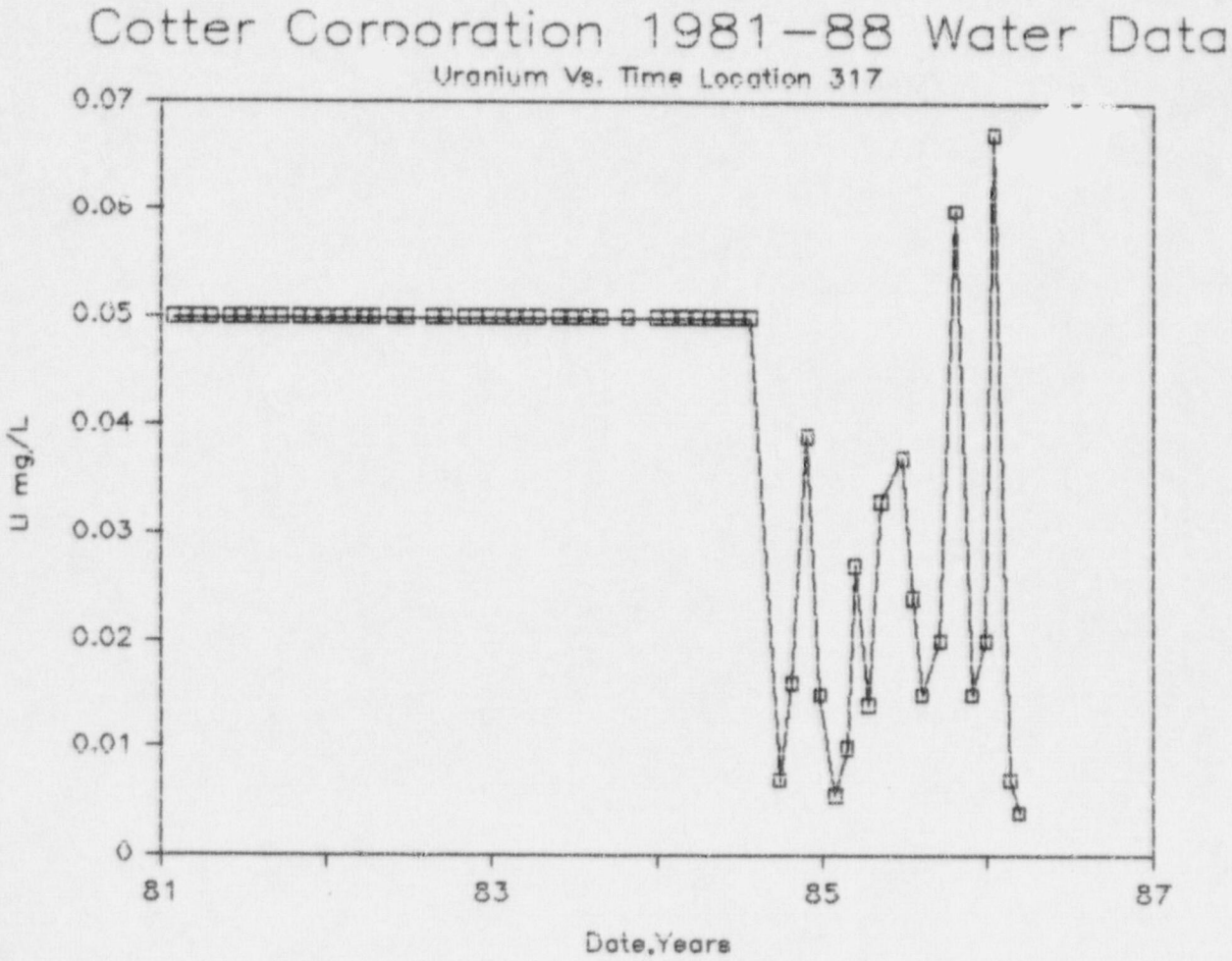

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 317
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
Date,Years

FIGURE 1.56

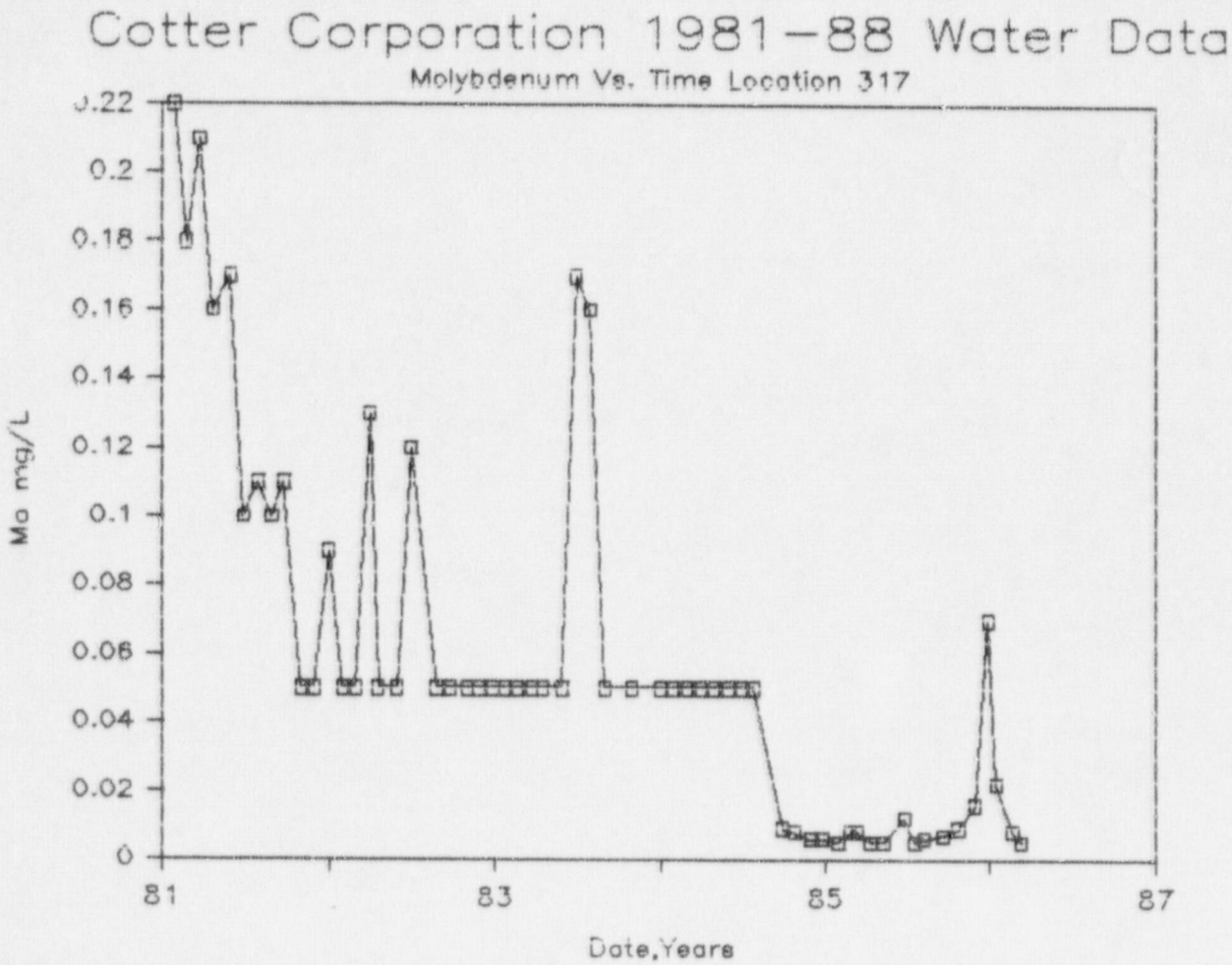

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 317
Mo mg/L
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
81
83
85
87
Date,Years

FIGURE 1.57

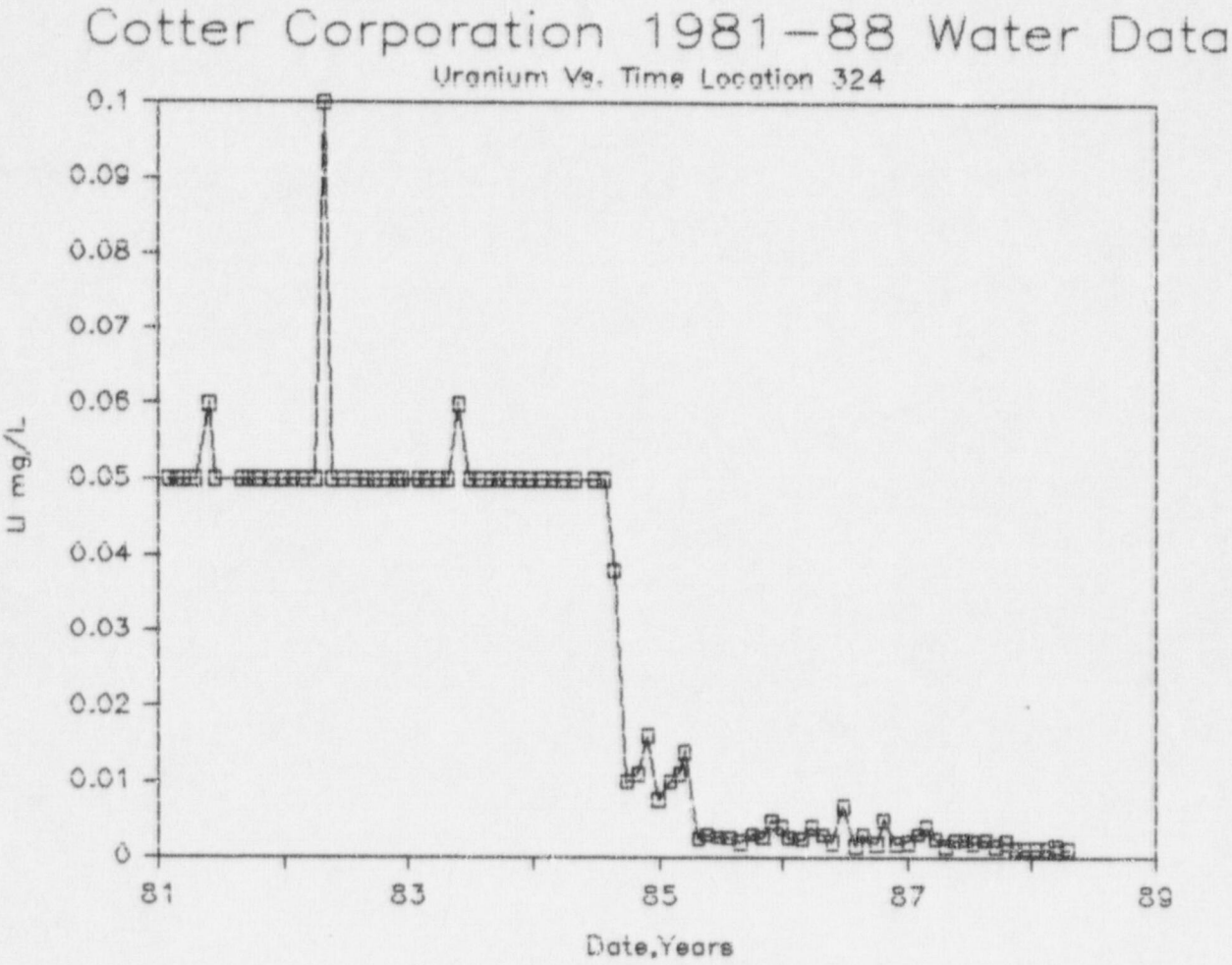

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 324
U mg/L
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.58

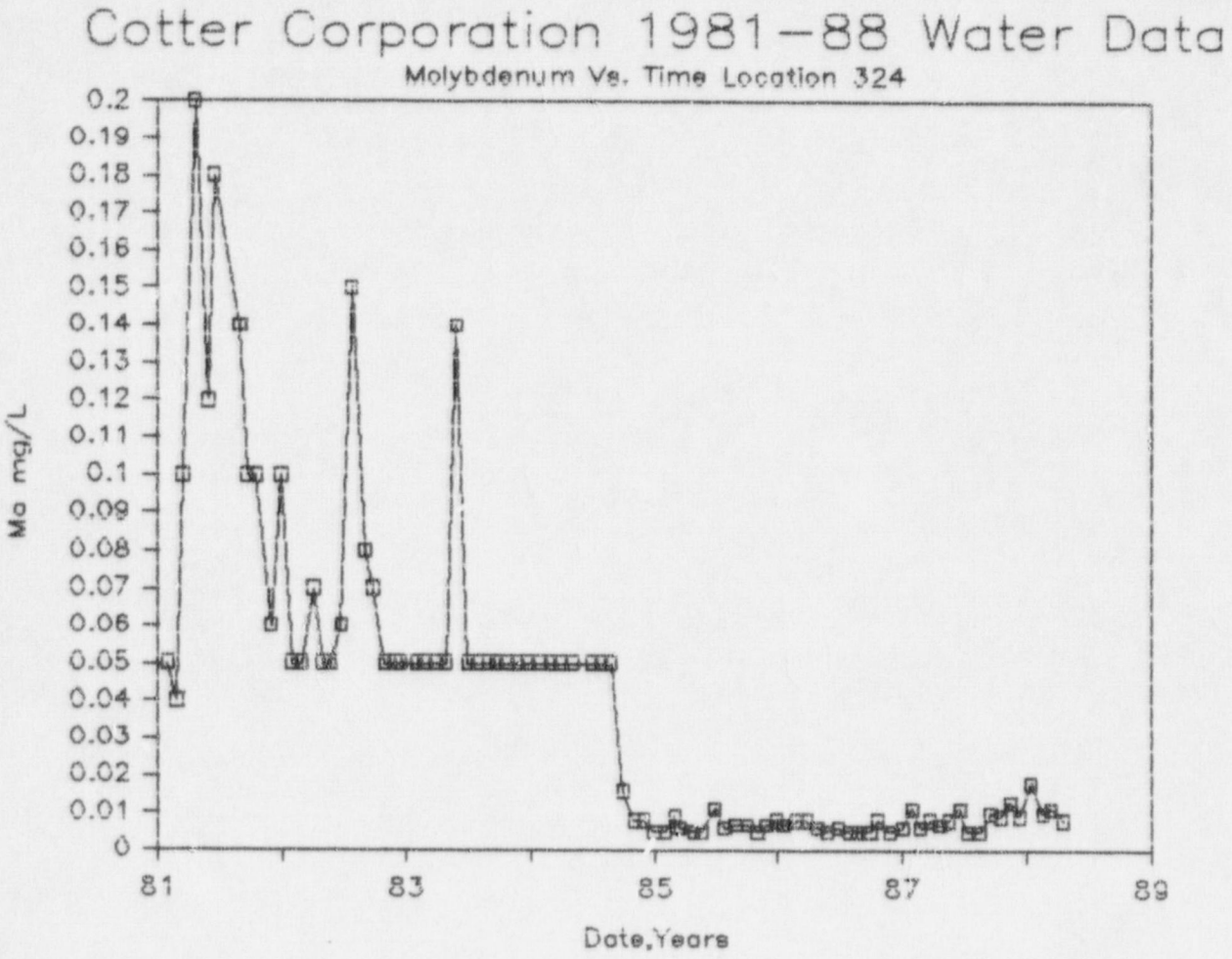

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 324
Mo mg/L
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.59

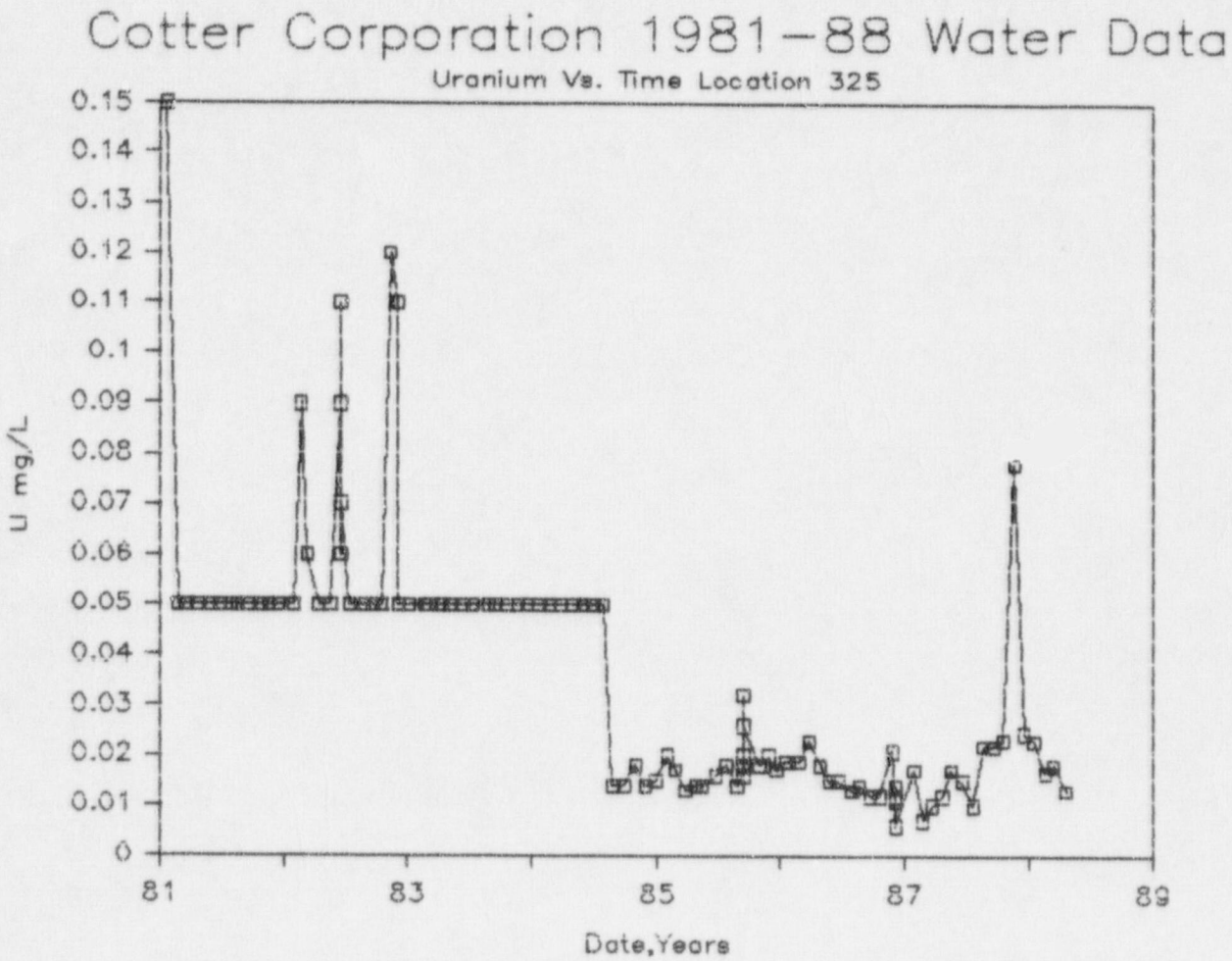

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 325
U mg/L
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.60

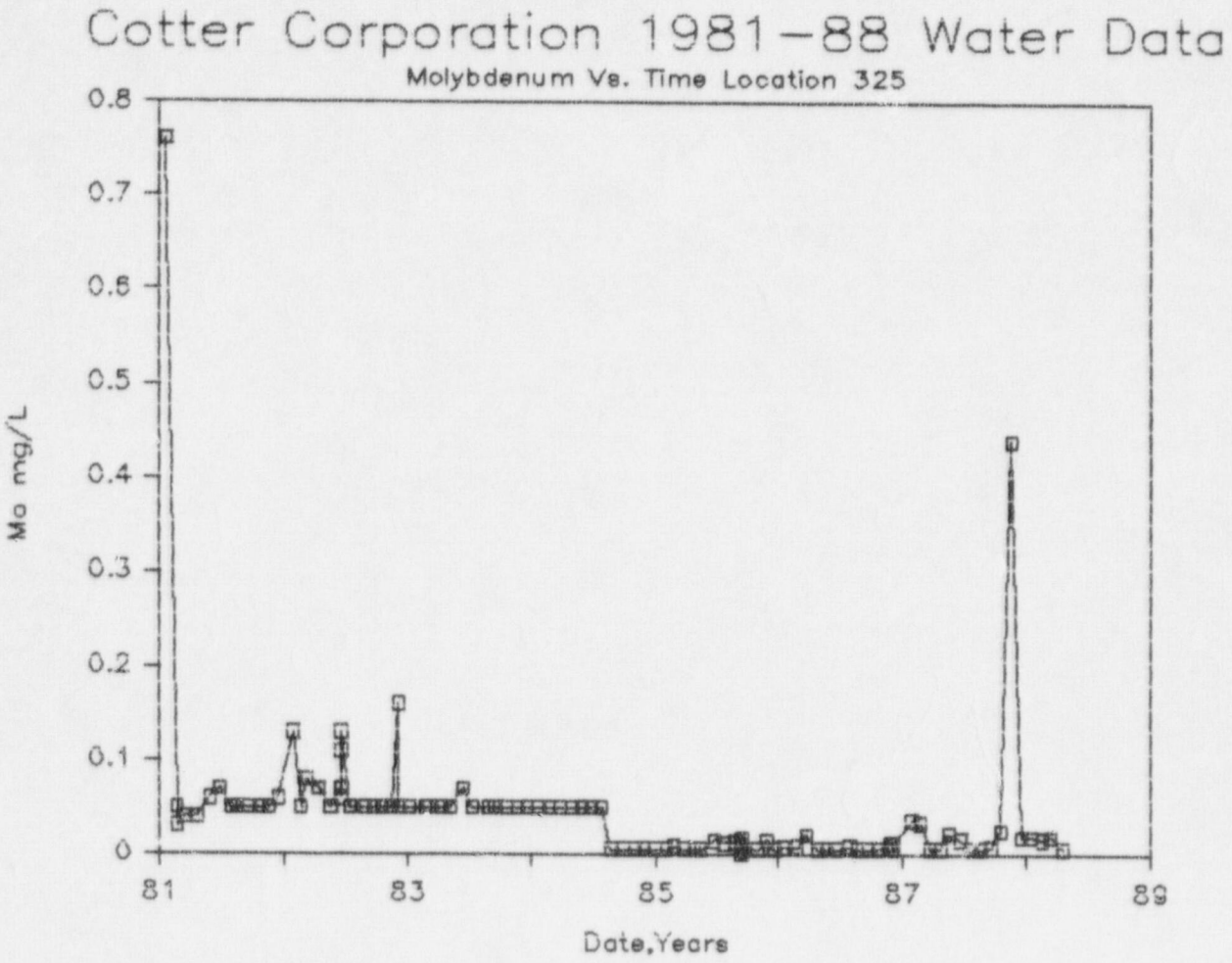

Cotter Corporation 1981-88 Water Data
Molybdenum Vs. Time Location 325
Mo mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
89
Date,Years

FIGURE 1.61

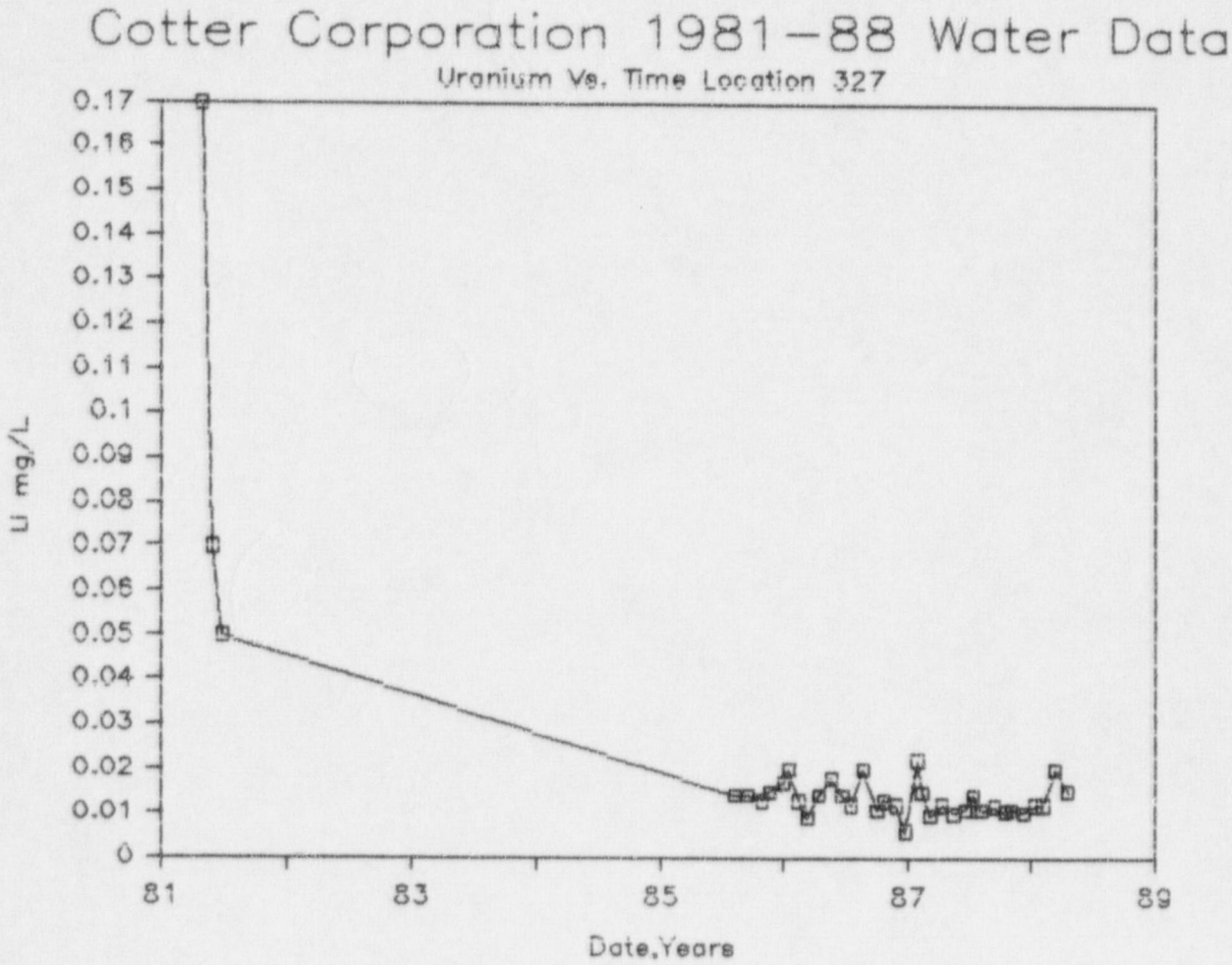

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 327
U mg/L
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.62

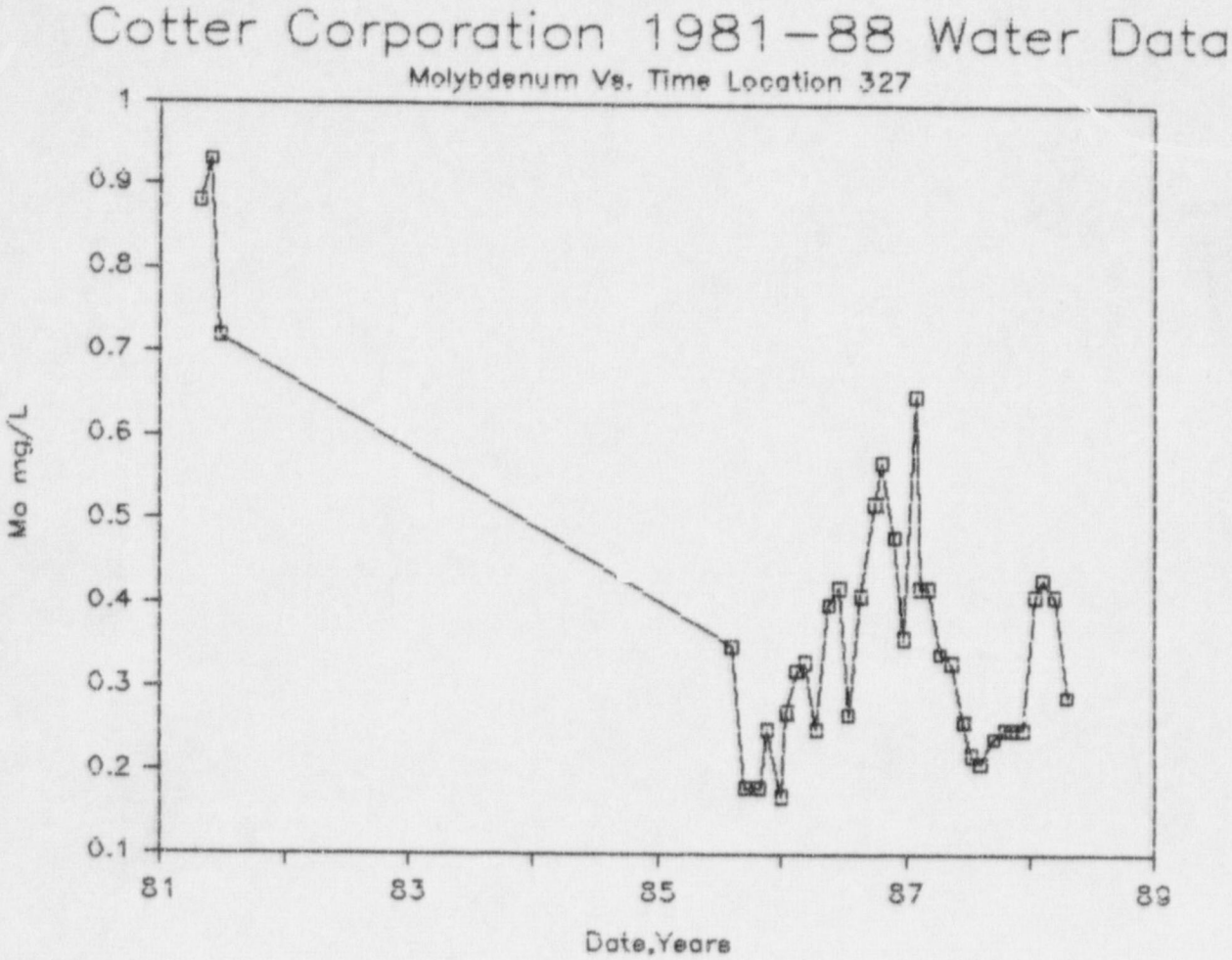

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 327
Mo mg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
81
83
85
87
89
Date,Years

FIGURE 1.63

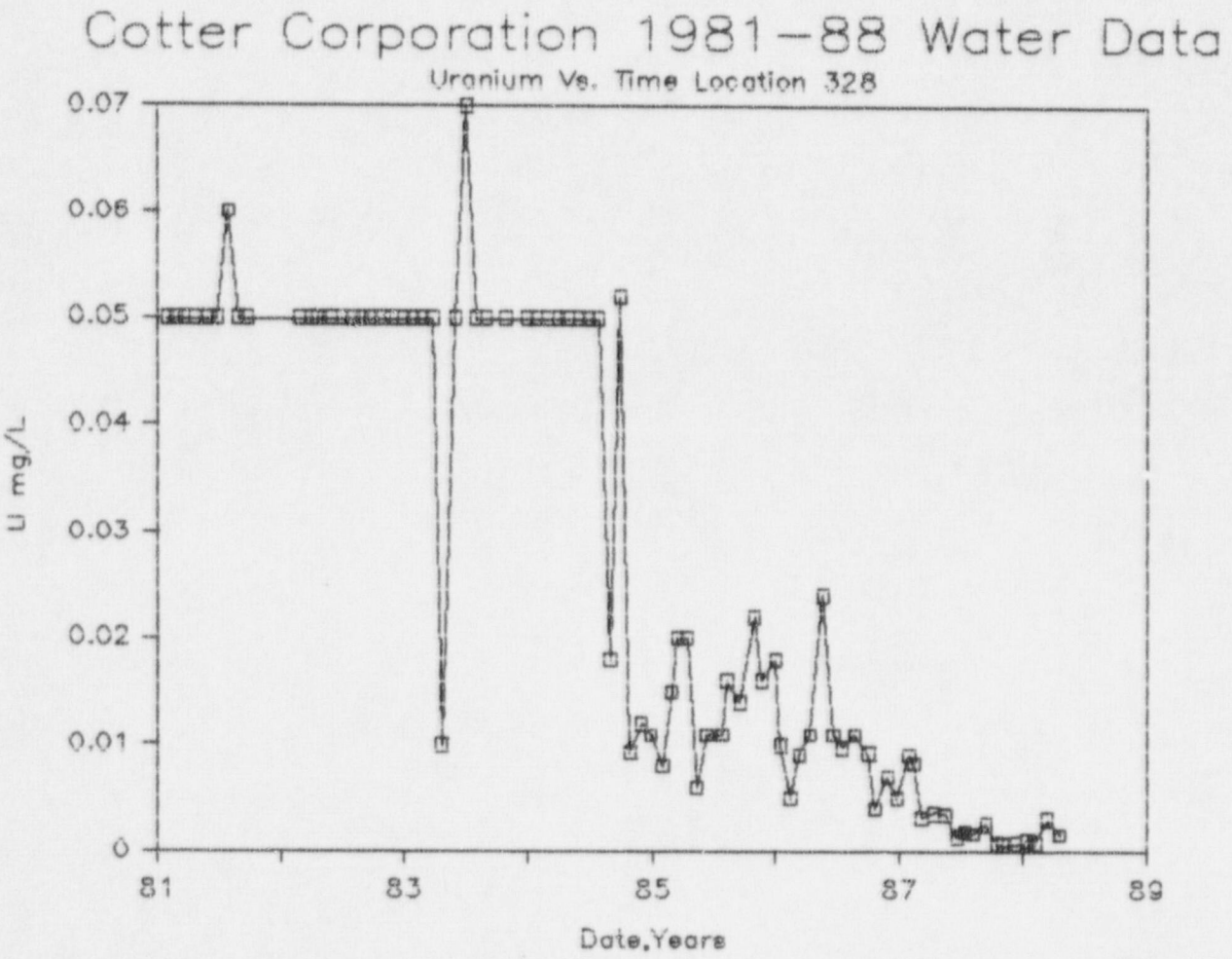

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 328
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.64

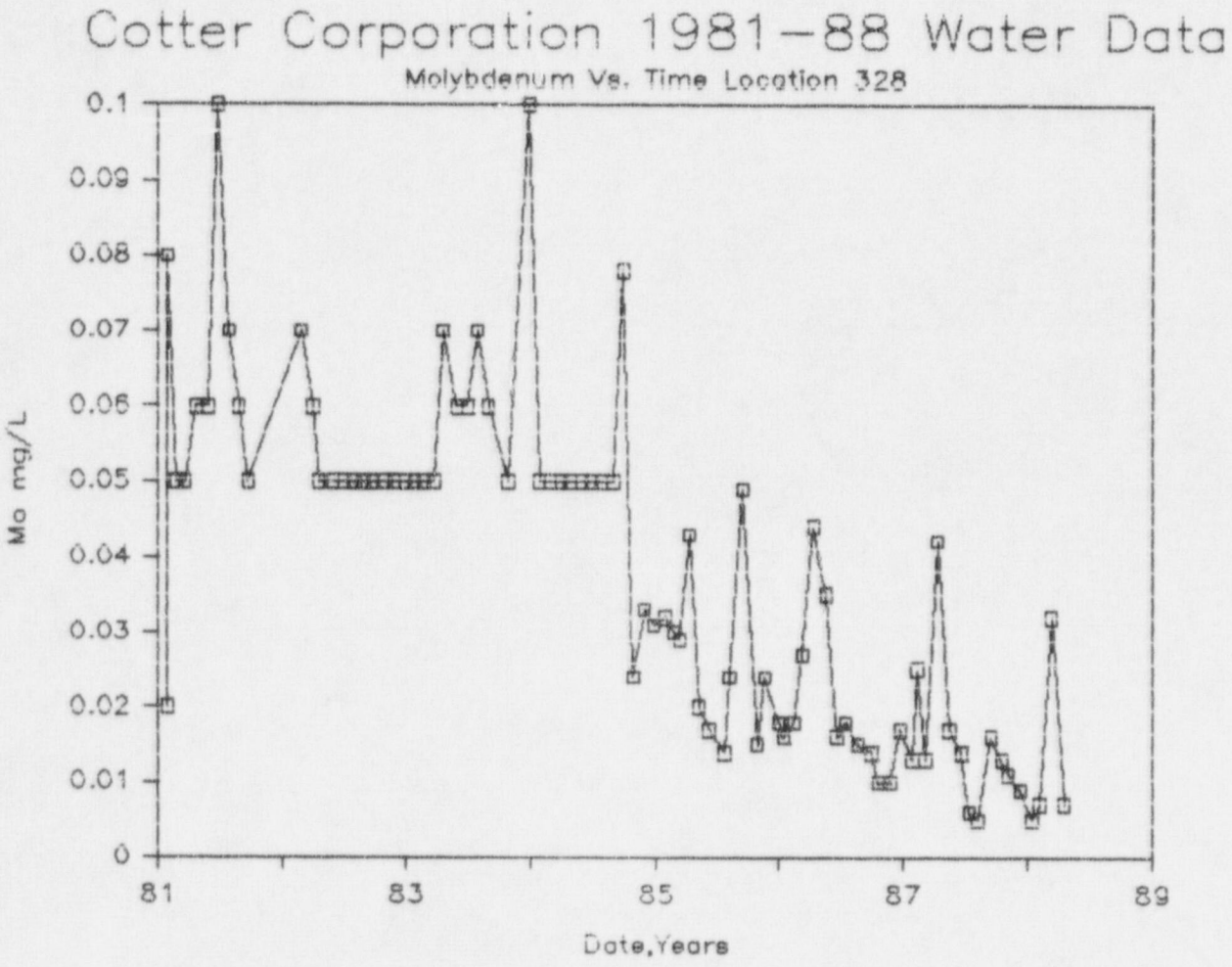

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 328
Mo mg/L
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.65

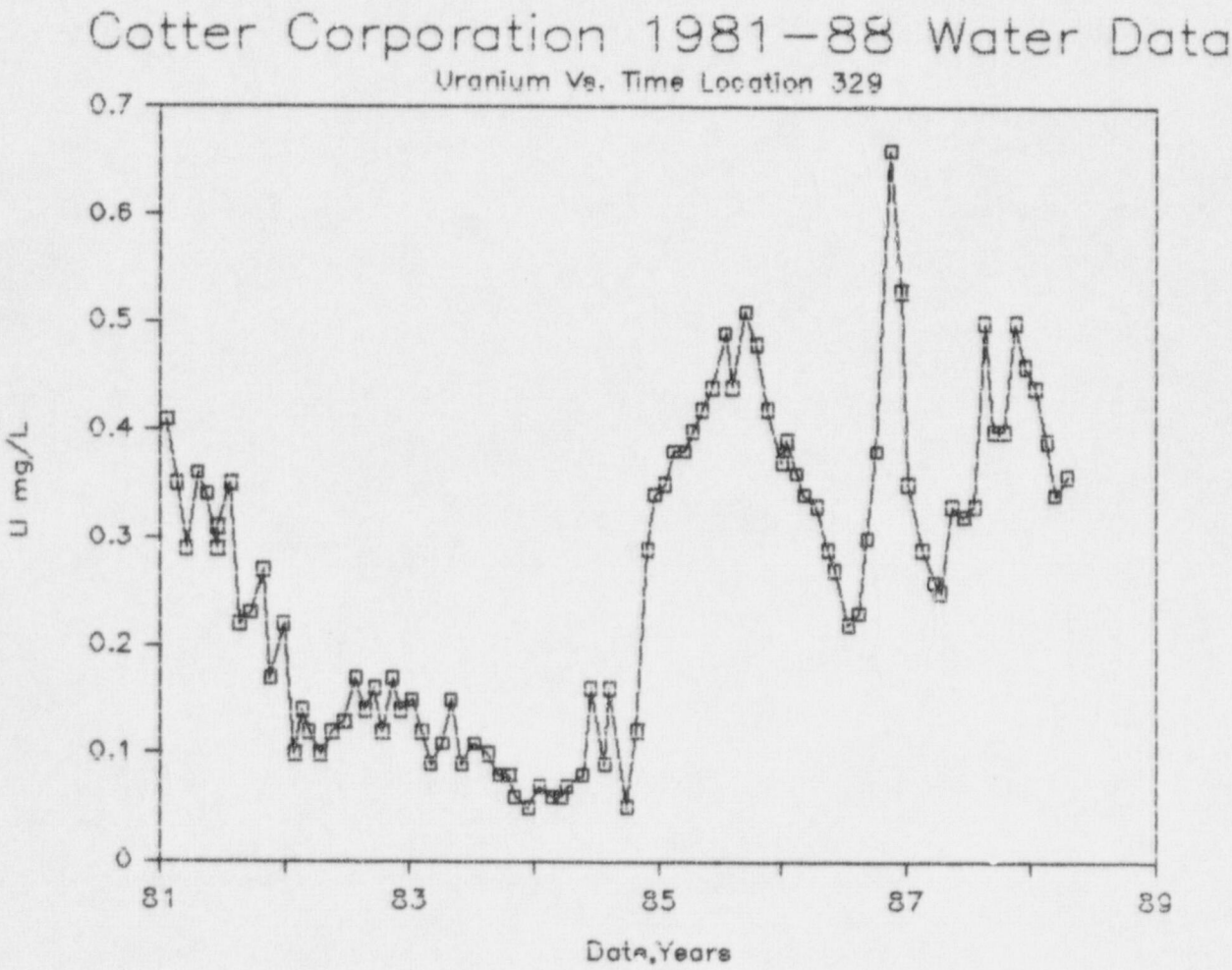

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 329
U mg/L
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
89
Data,Years

FIGURE 1.66

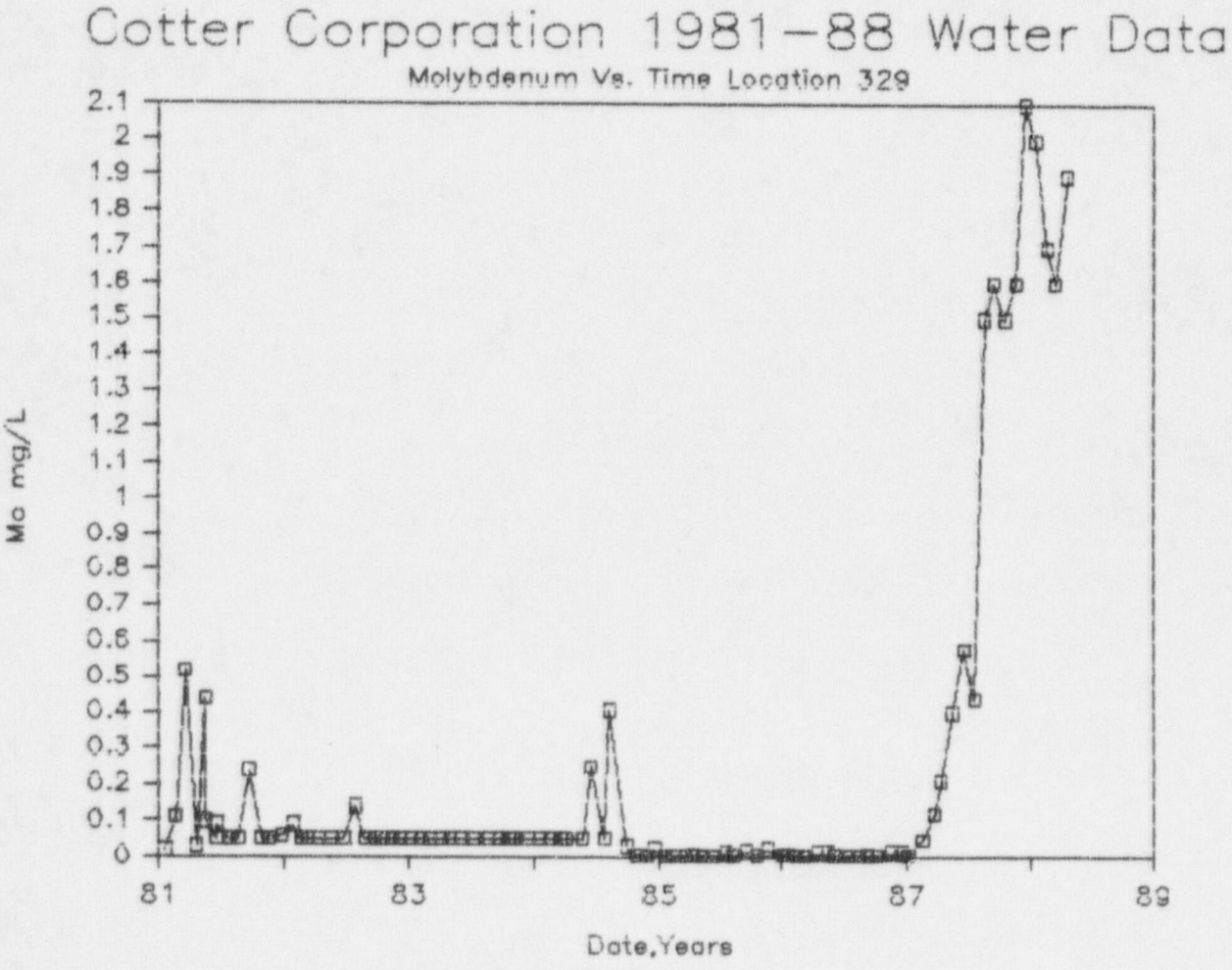

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 329
Mo mg/L
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
89
Date,Years

FIGURE 1.67

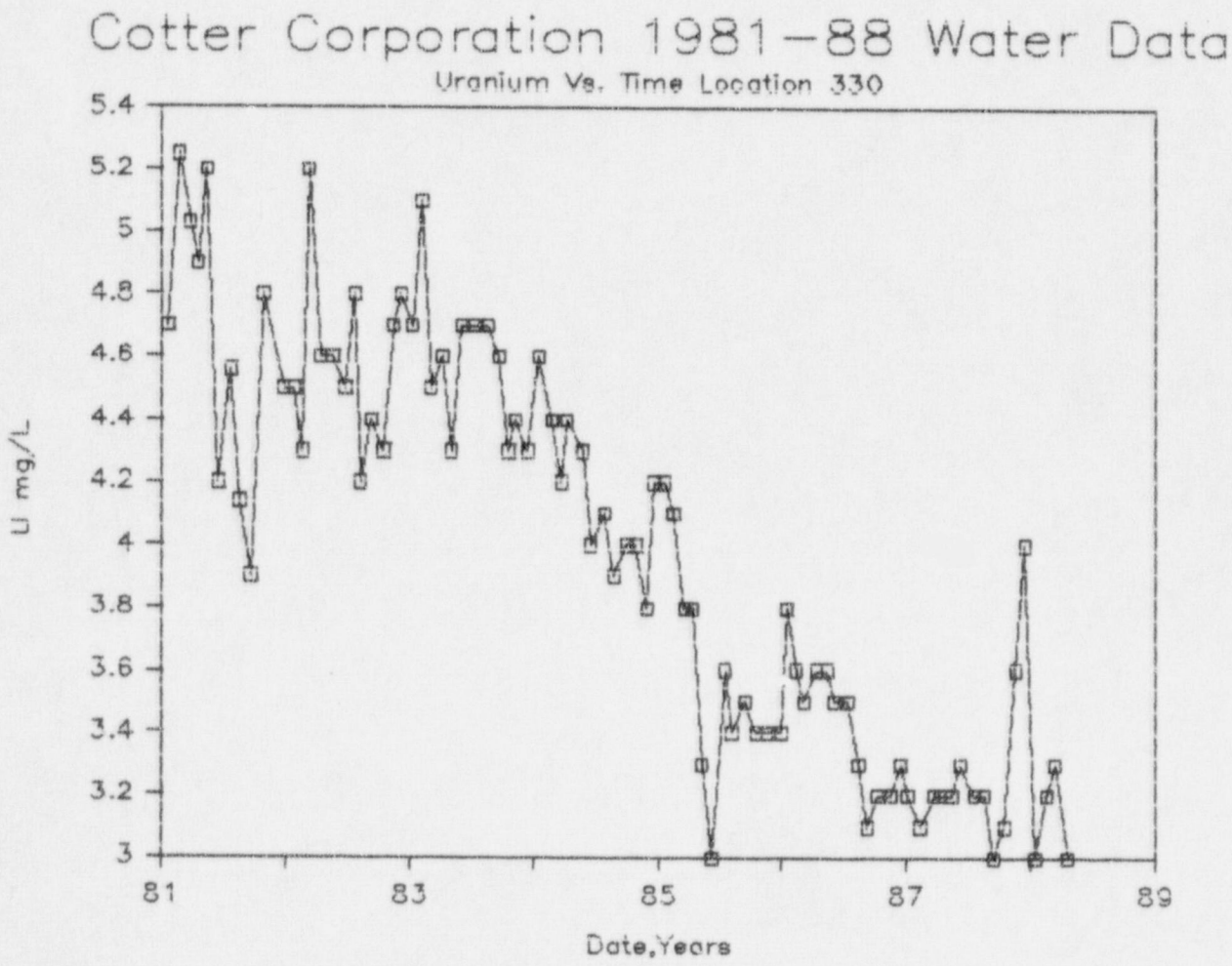

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 330
U mg/L
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
81
83
85
87
89
Date,Years

FIGURE 1.68

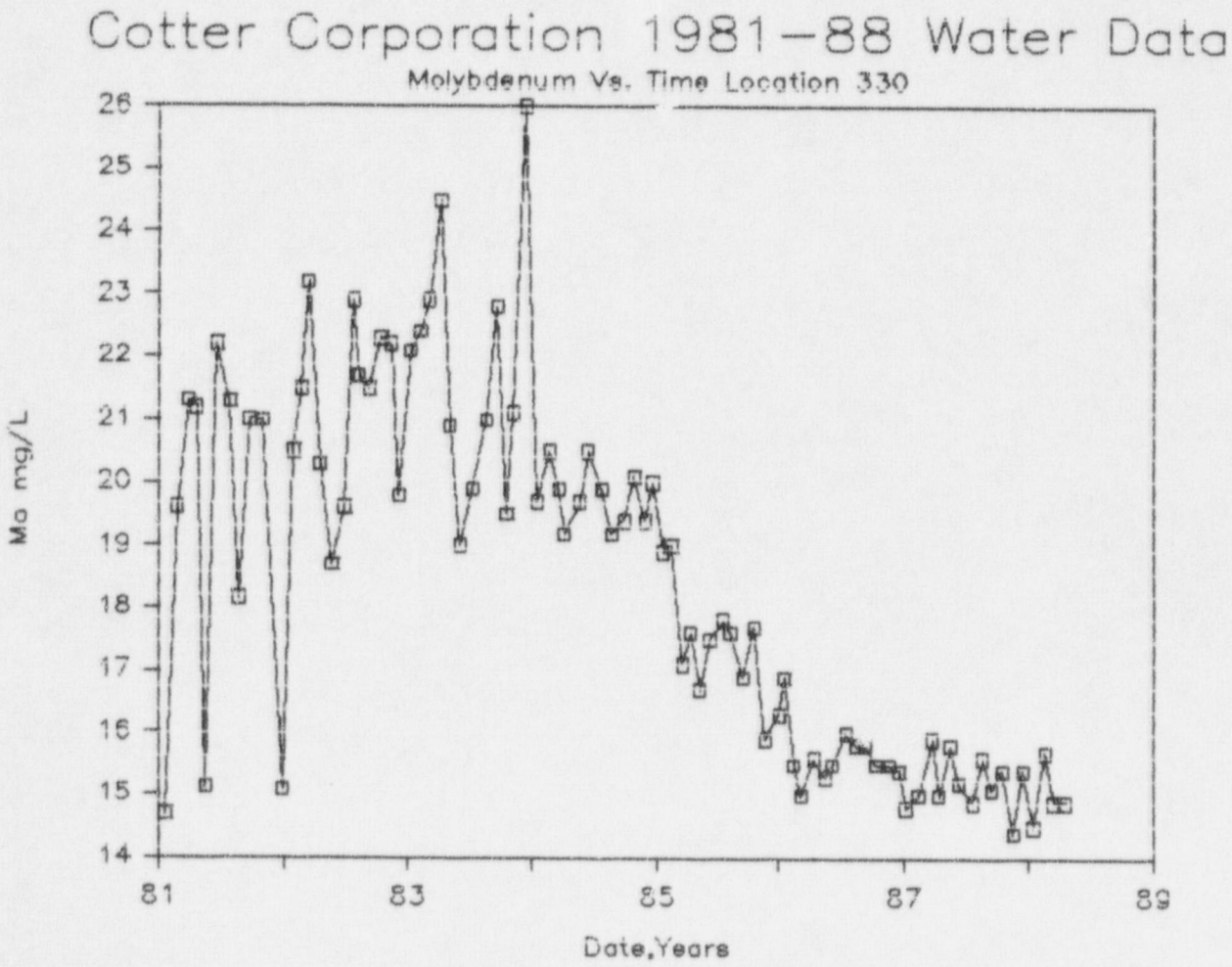

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 330
Mo mg/L
26
25
24
23
22
21
20
19
18
17
16
15
14
81
83
85
87
89
Date,Years

FIGURE 1.69

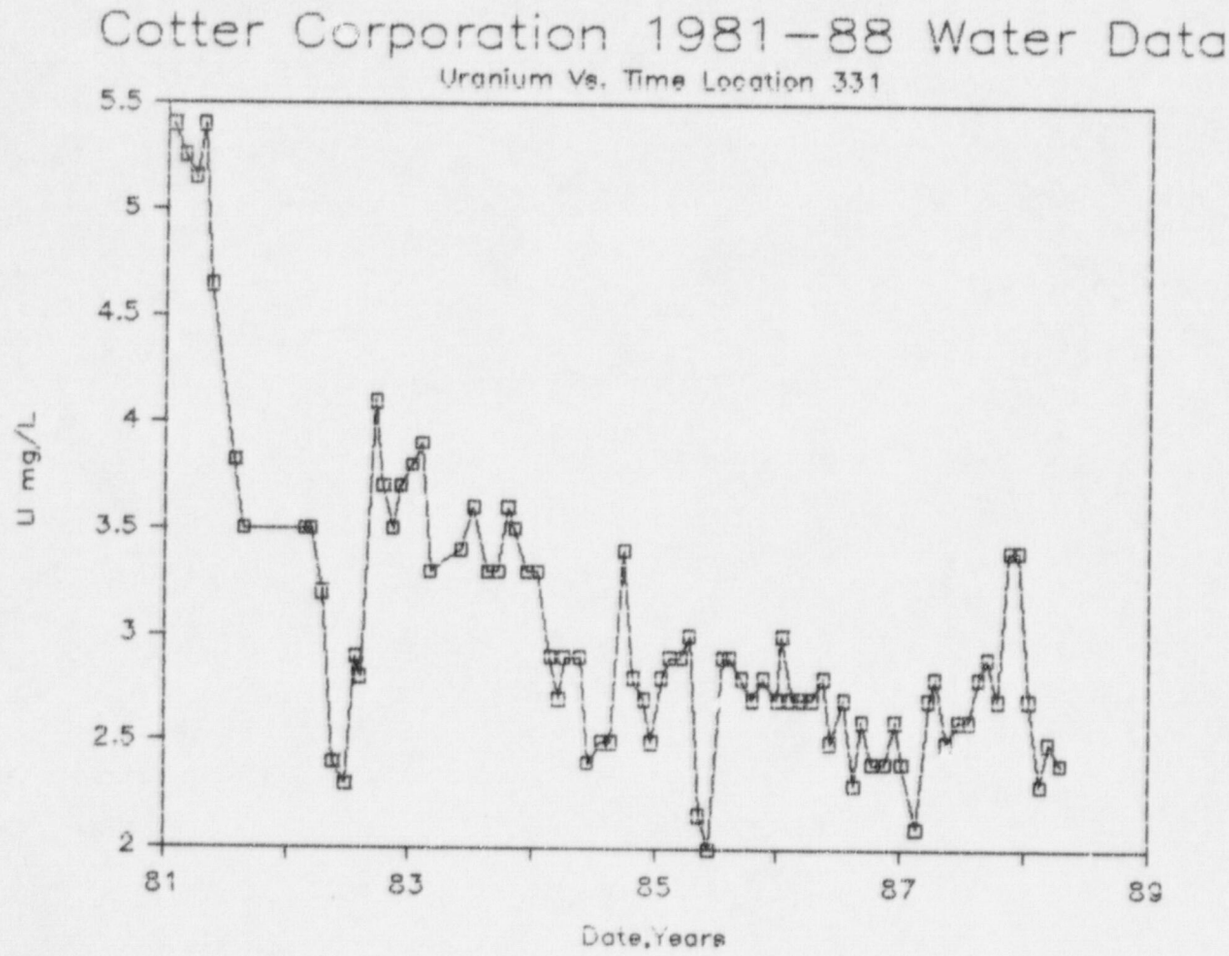

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 331
U mg/L
5.5
5
4.5
4
3.5
3
2.5
2
81
83
85
87
89
Date,Years

FIGURE 1.70

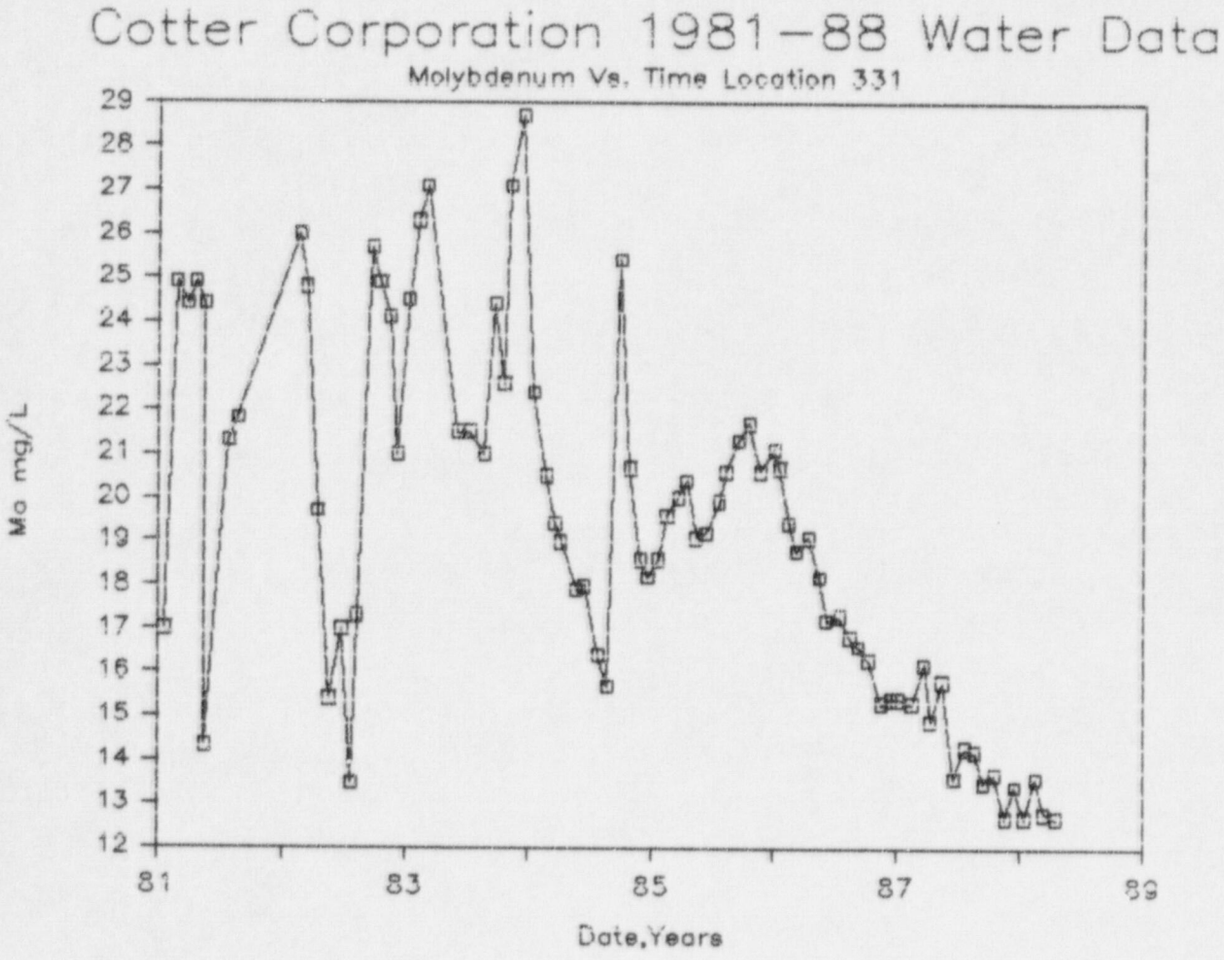

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 331
Mo mg/L
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
81
83
85
87
89
Date,Years

FIGURE 1.71

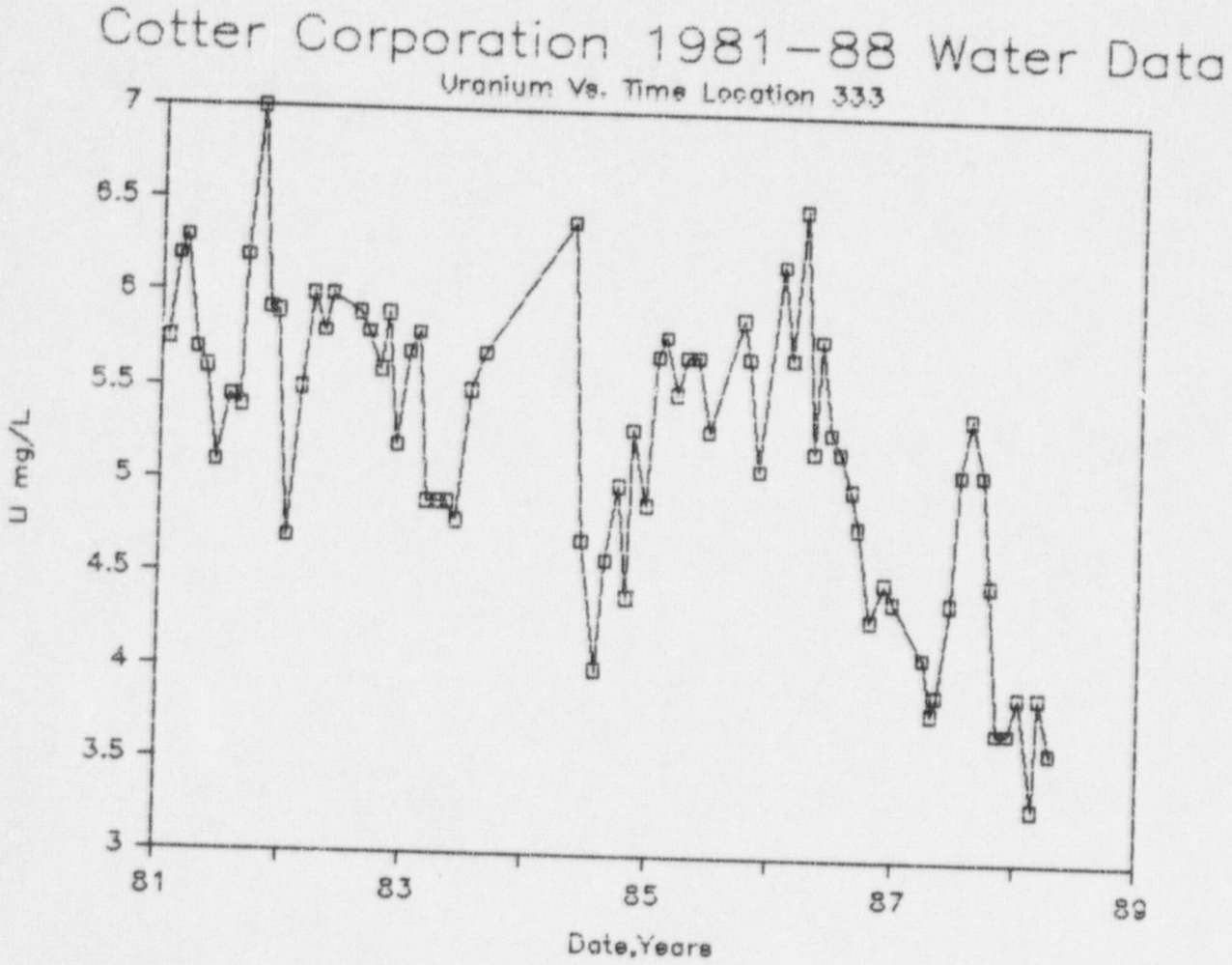

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 333
U mg/L
7
6.5
6
5.5
5
4.5
4
3.5
3
81
83
85
87
89
Date,Years

FIGURE 1.72

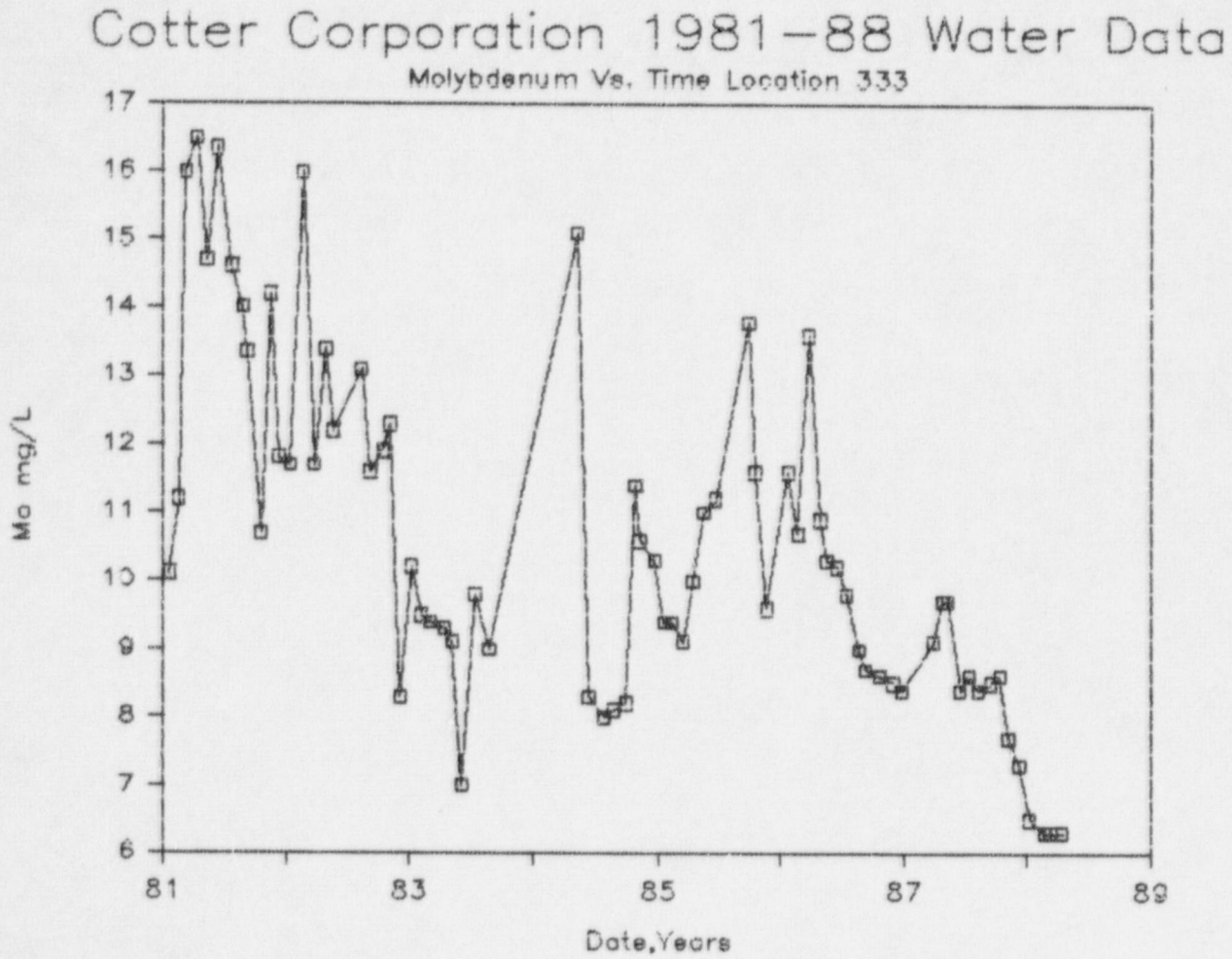

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 333
Mo mg/L
17
16
15
14
13
12
11
10
9
8
7
6
81
83
85
87
89
Date,Years

FIGURE 1.73

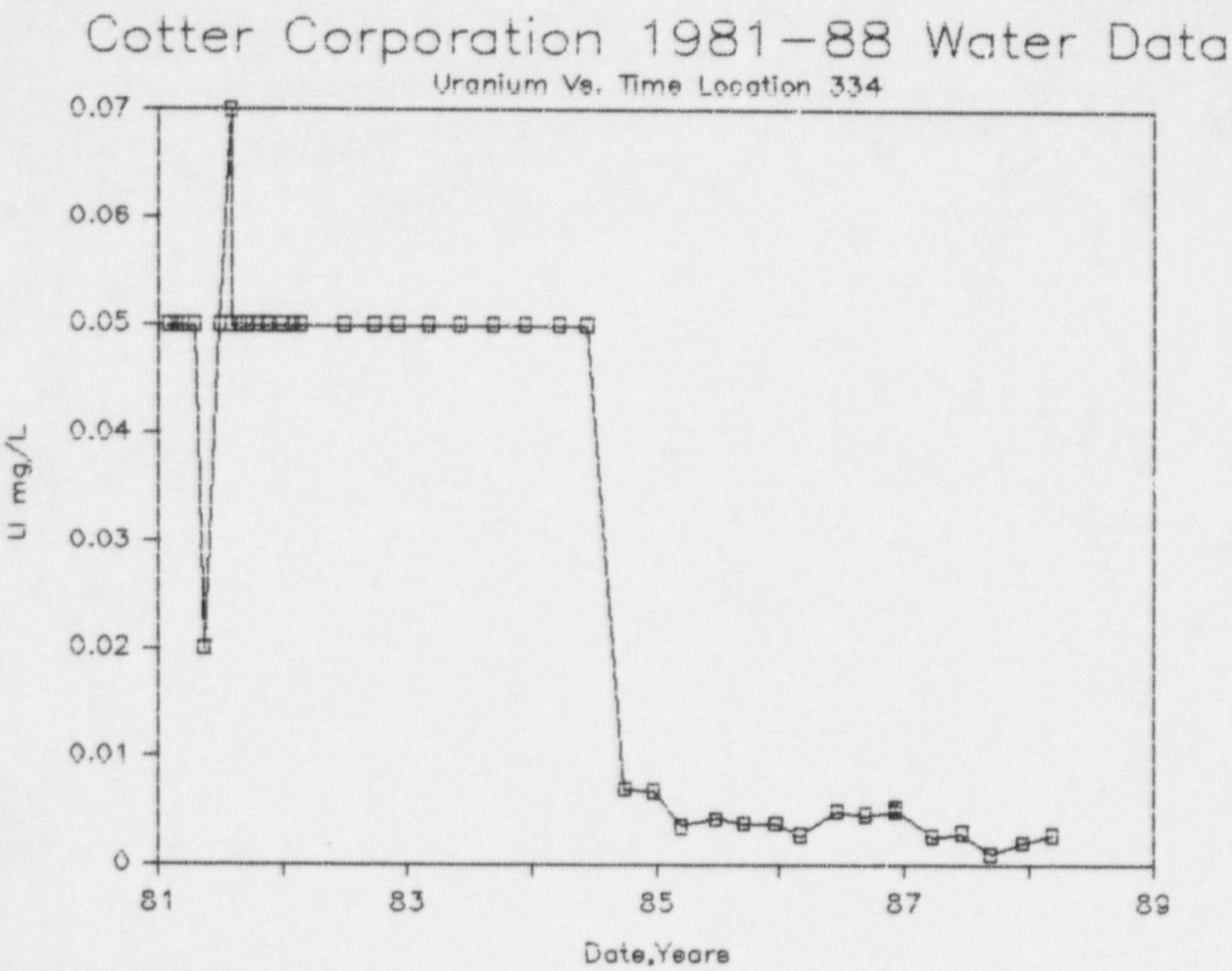

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 334
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.74

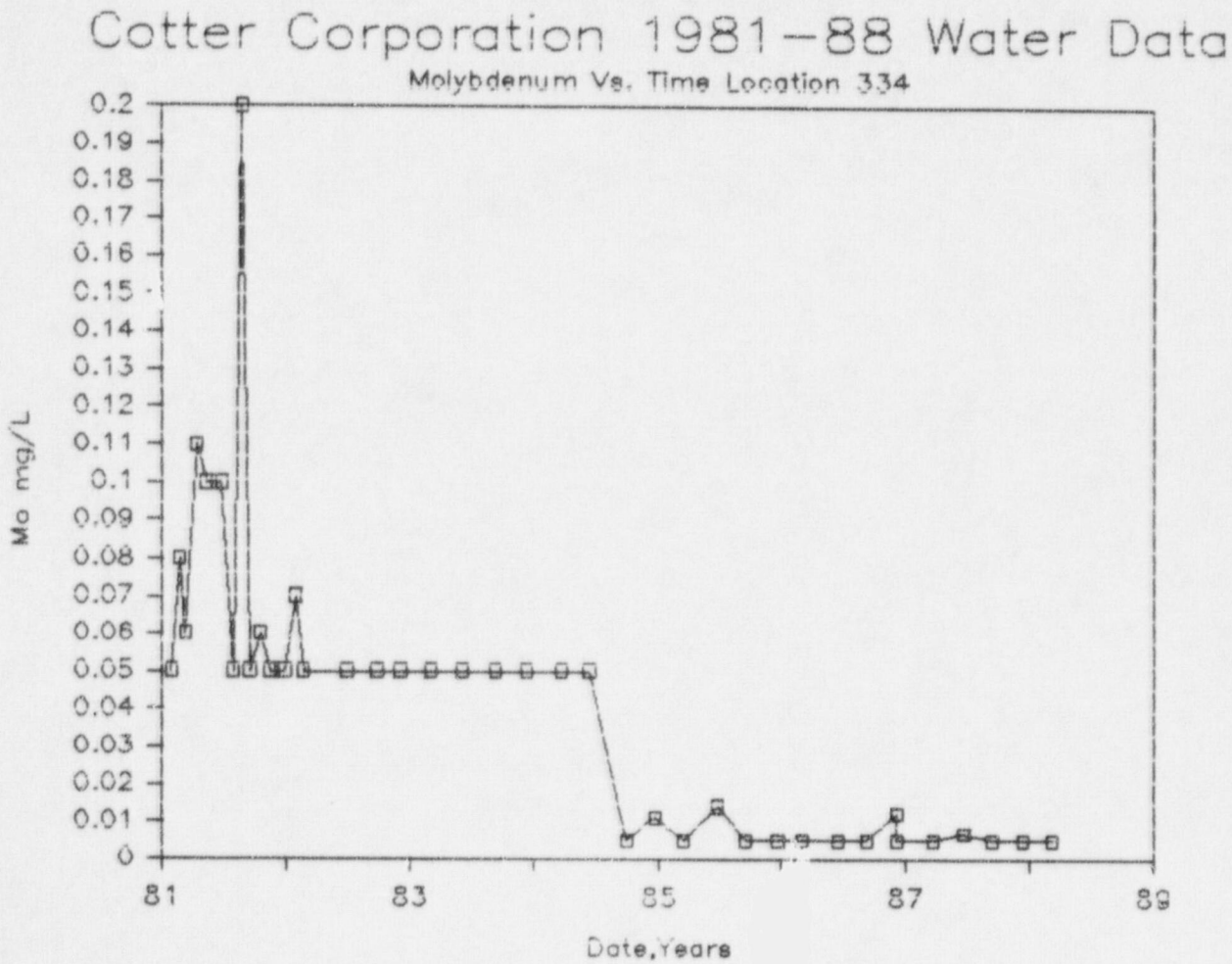

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 334
Mo mg/L
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.75

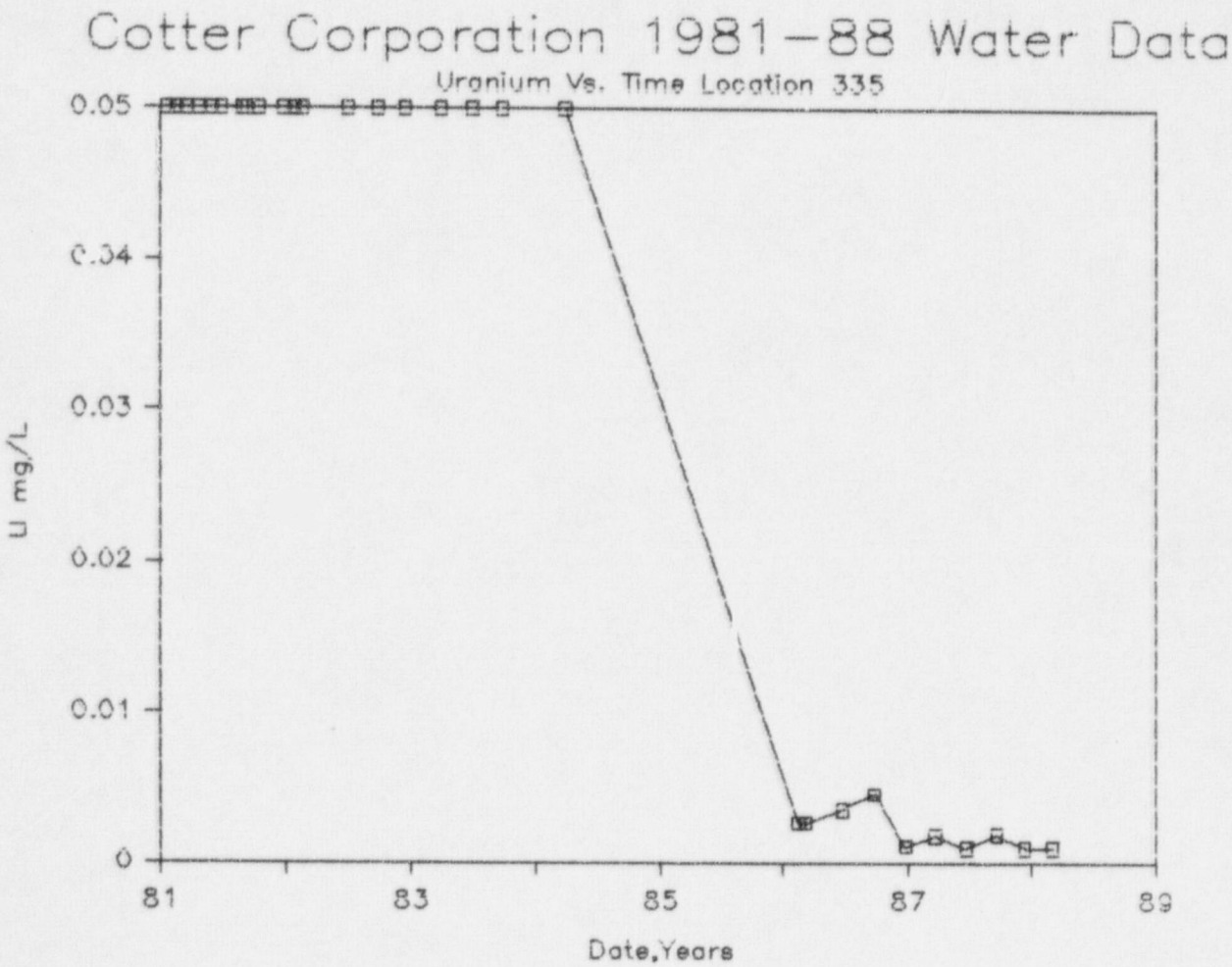

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 335
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.76

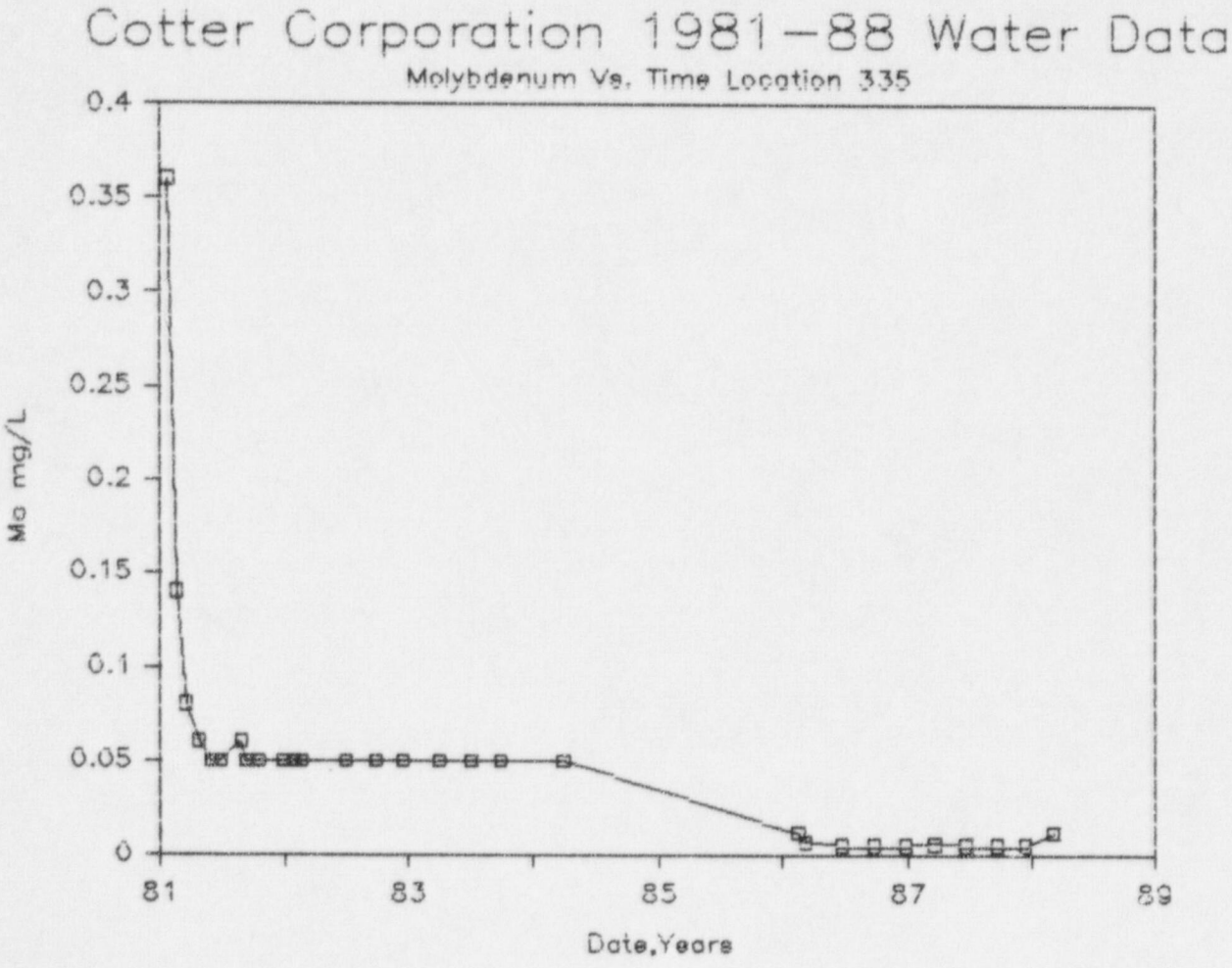

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 335
Mo mg/L
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
81
83
85
87
89
Date,Years

FIGURE 1.77

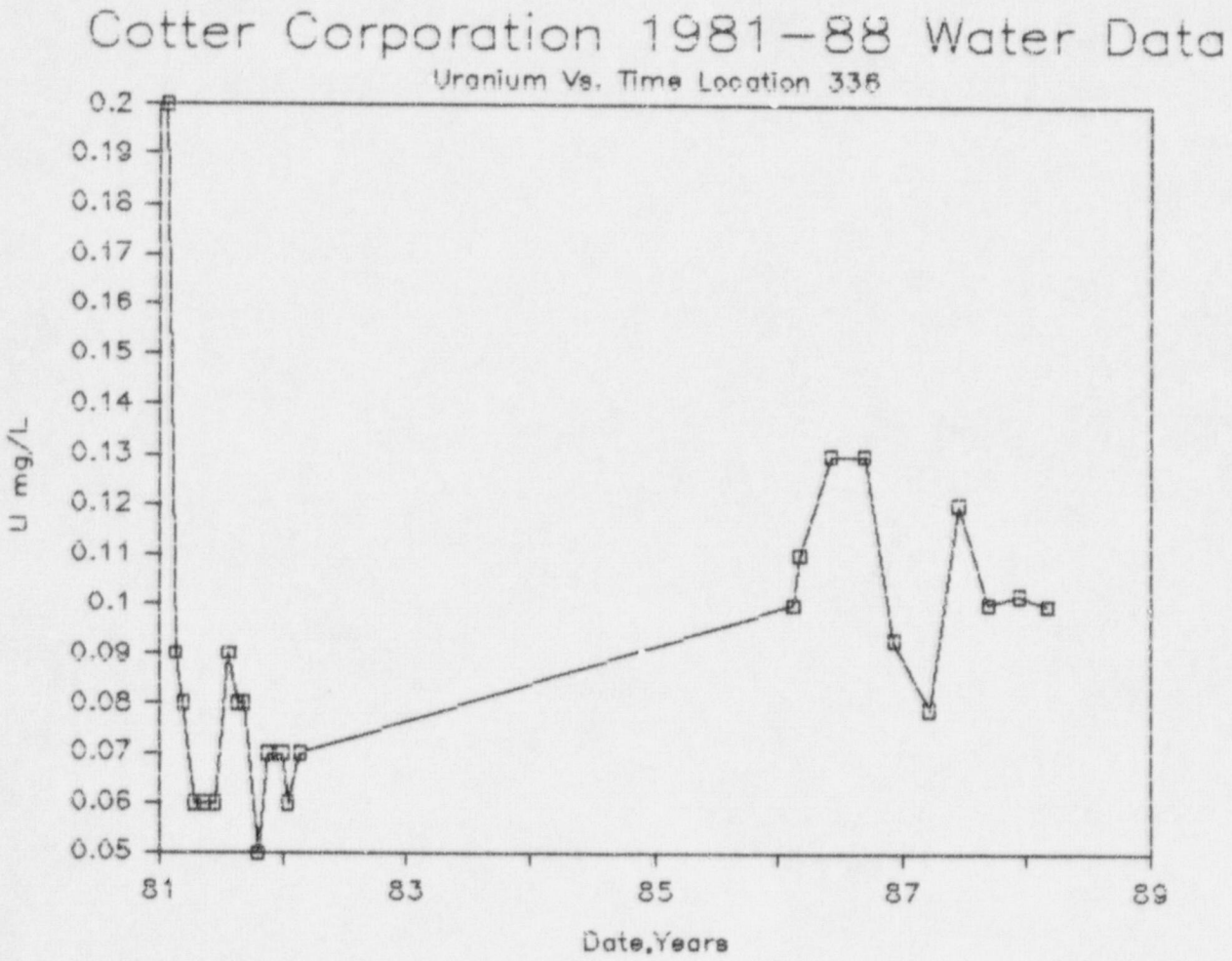

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 336
U mg/L
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
81
83
85
87
89
Date,Years

FIGURE 1.78

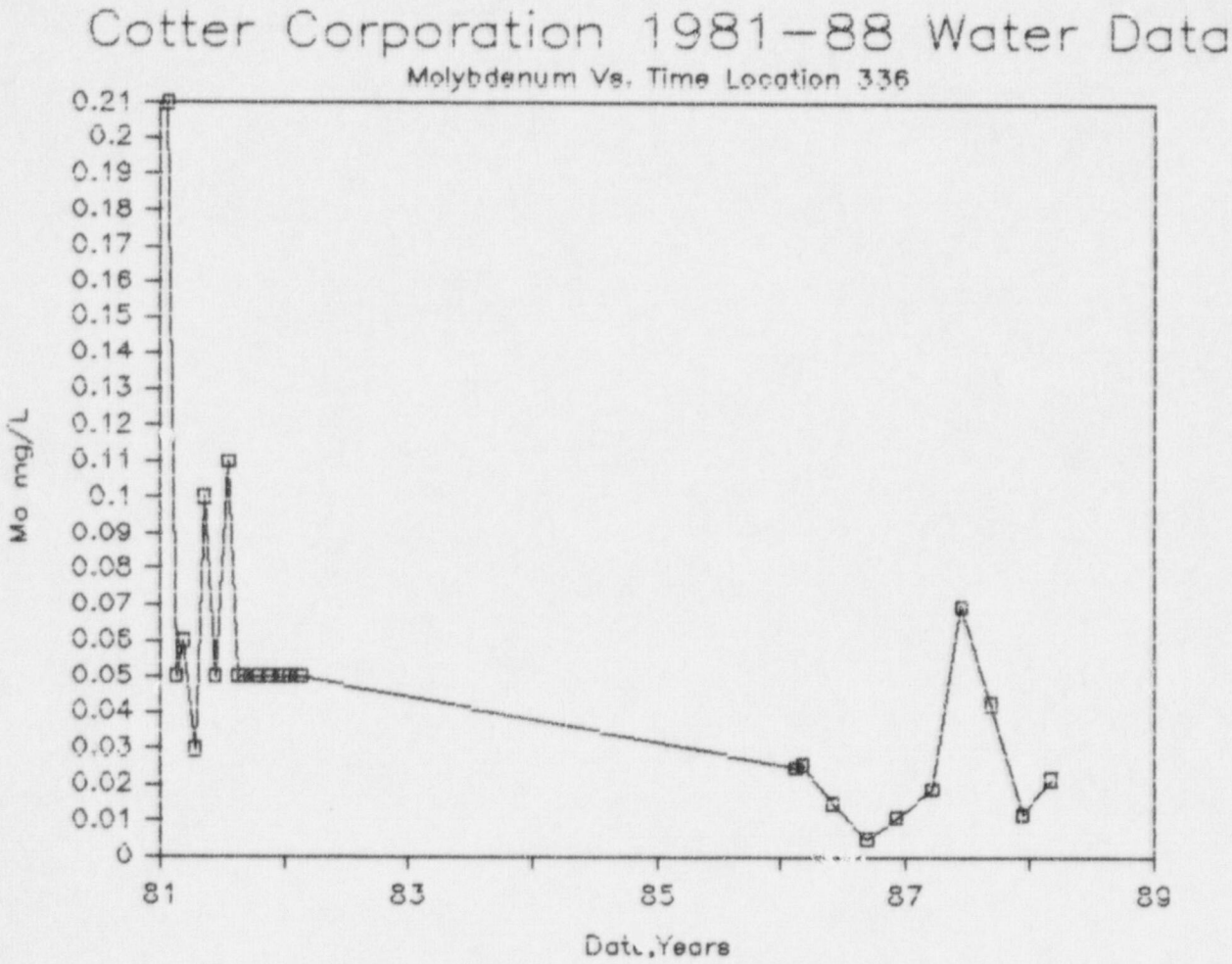

Cotter Corporation 1981-88 Water Data
Molybdenum Vs. Time Location 336
Mo mg/L
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.79

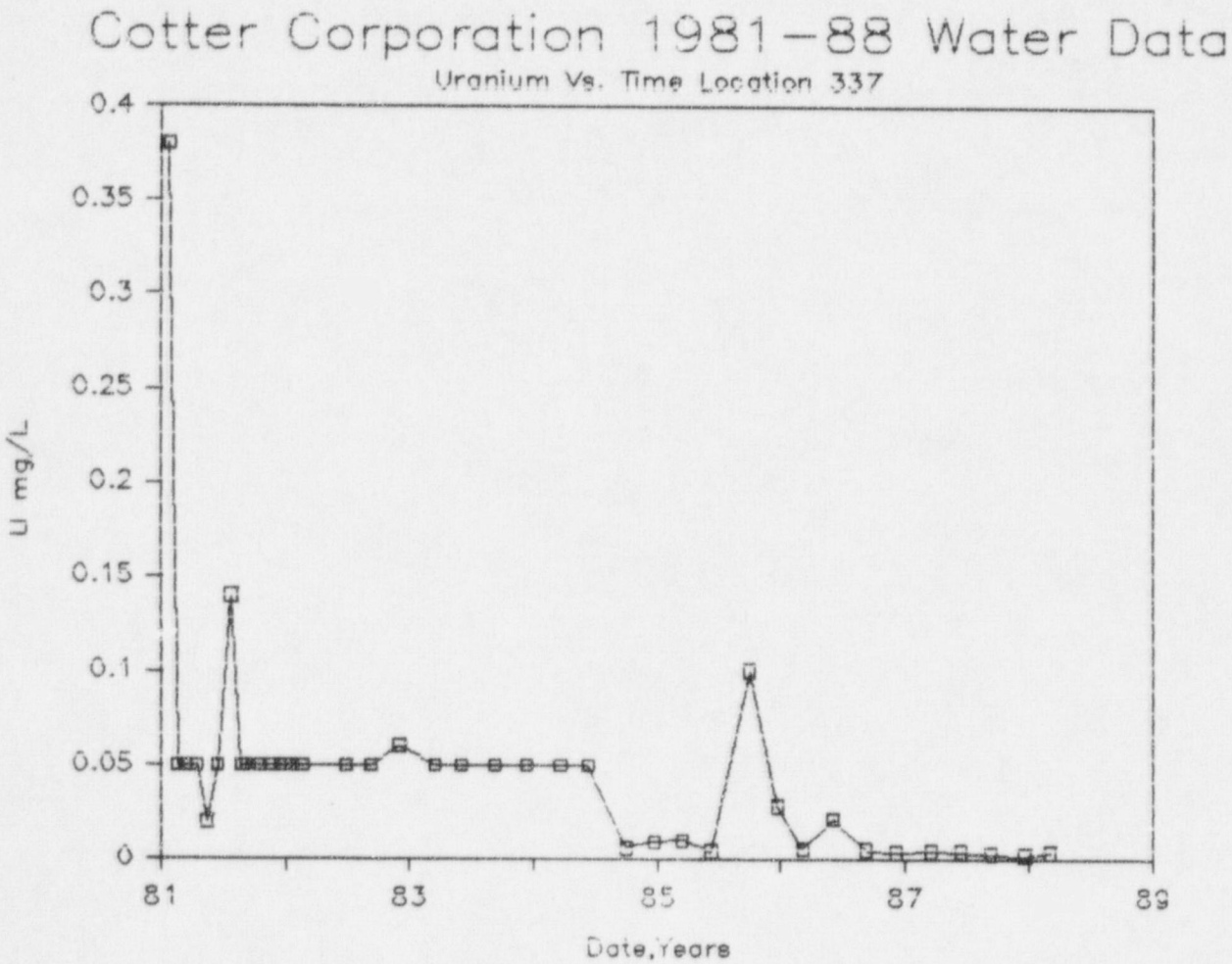

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 337
U mg/L
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
81
83
85
87
89
Date,Years

FIGURE 1.80

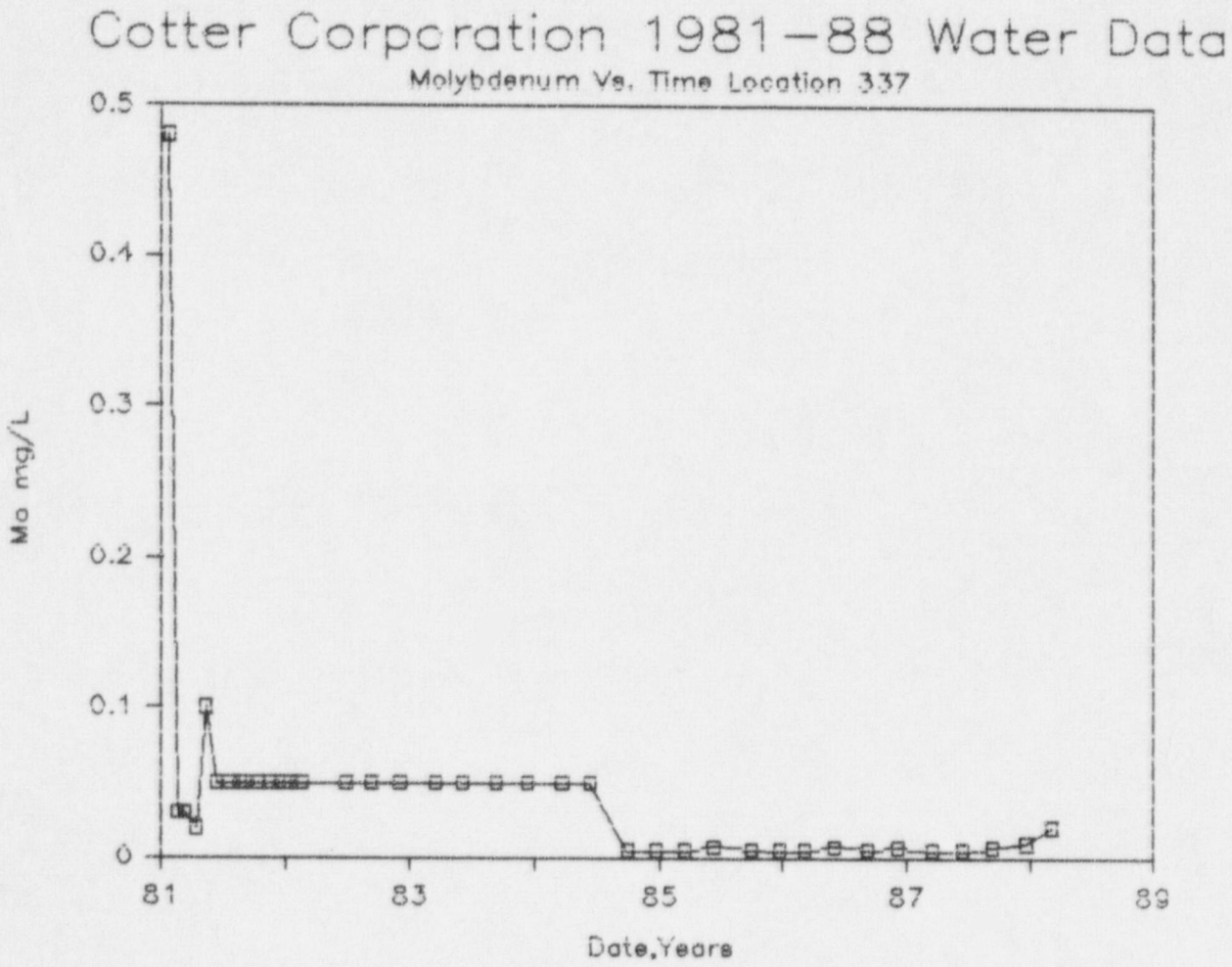

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 337
0.5
0.4
0.3
0.2
0.1
0
Mo mg/L
81
83
85
87
89
Date,Years

FIGURE 1.81

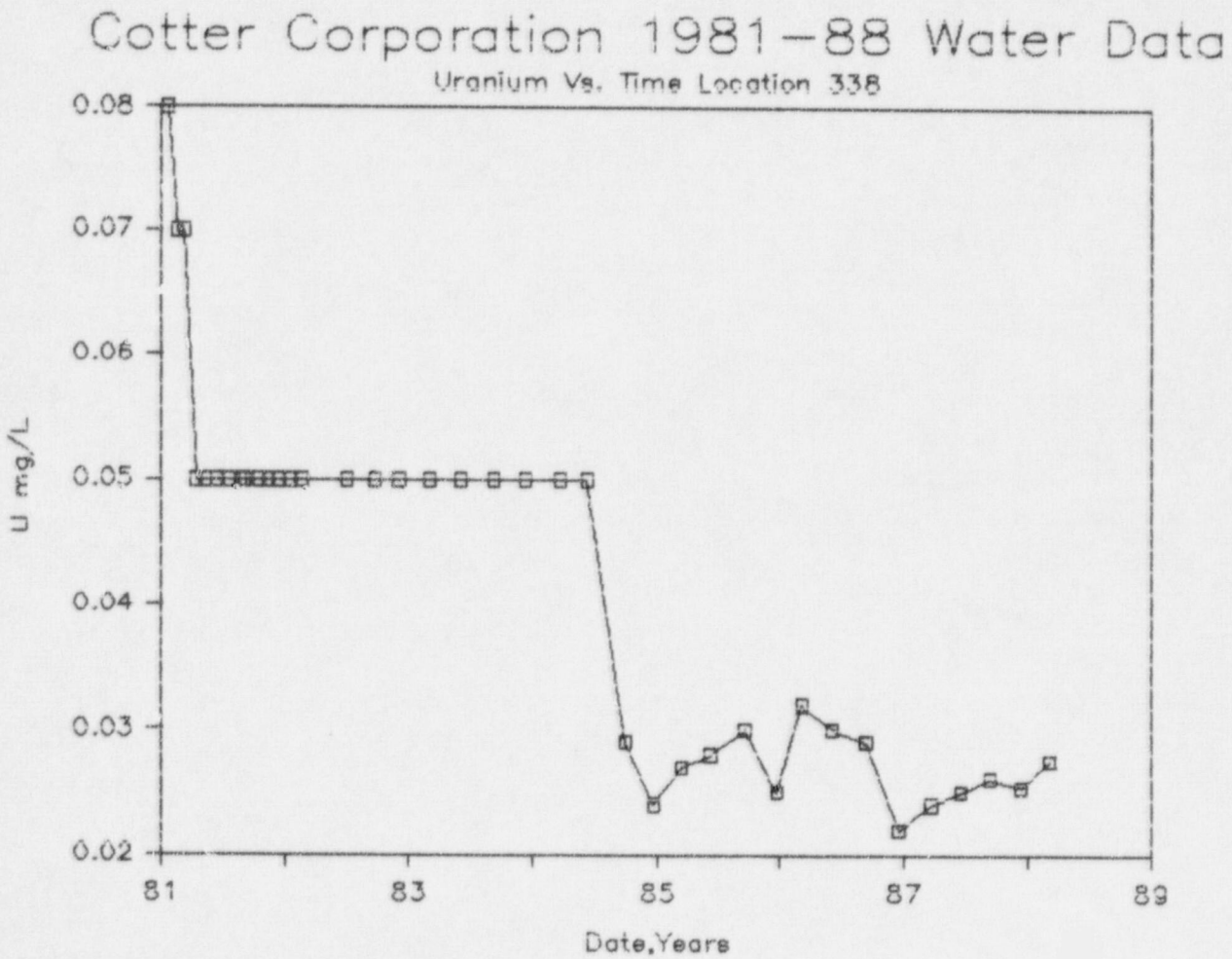

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 338
0.08
0.07
0.06
0.05
0.04
0.03
0.02
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.82

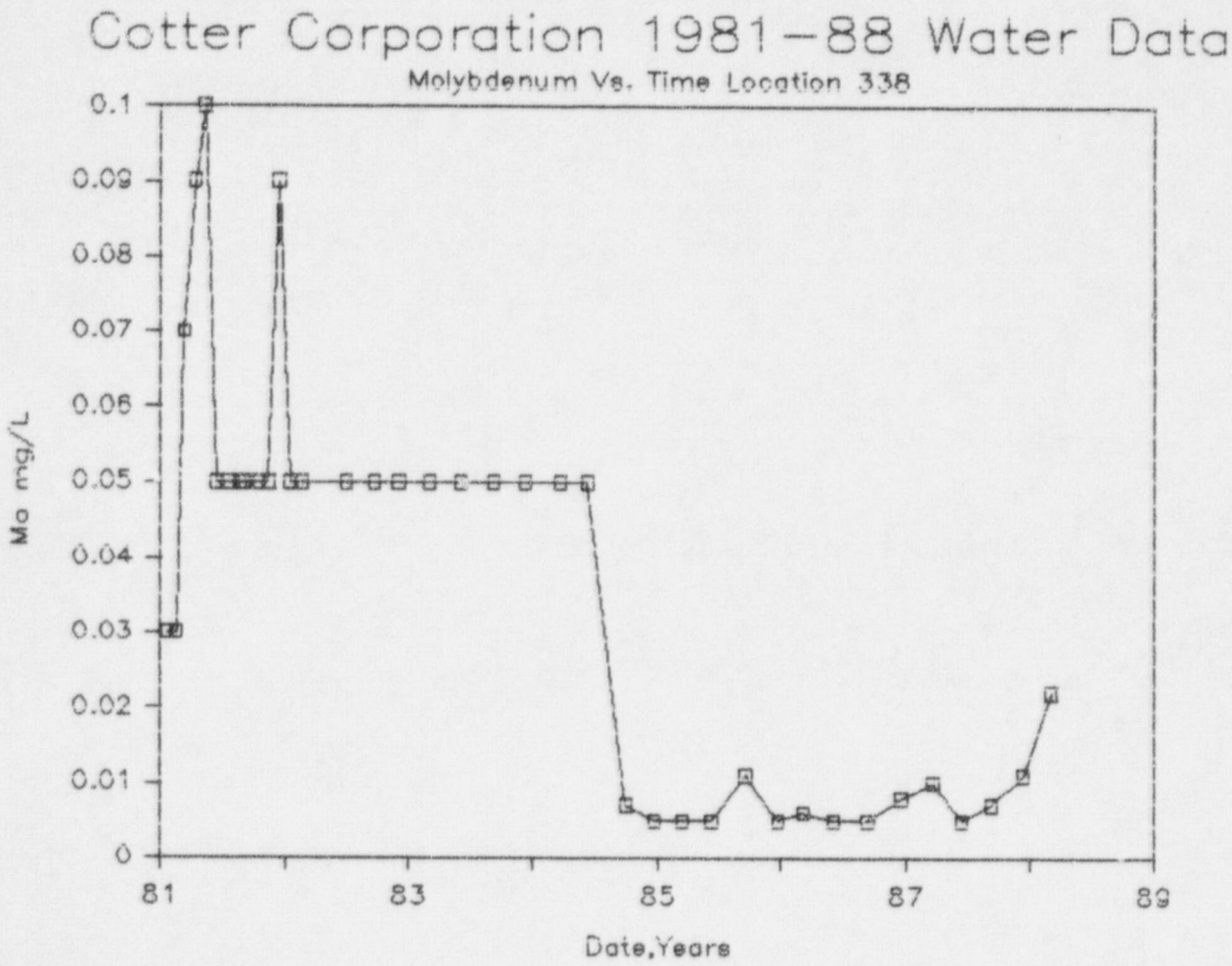

Cotter Corporation 1981-88 Water Data
Molybdenum Vs. Time Location 338
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Mo mg/L
81
83
85
87
89
Date,Years

FIGURE 1.83

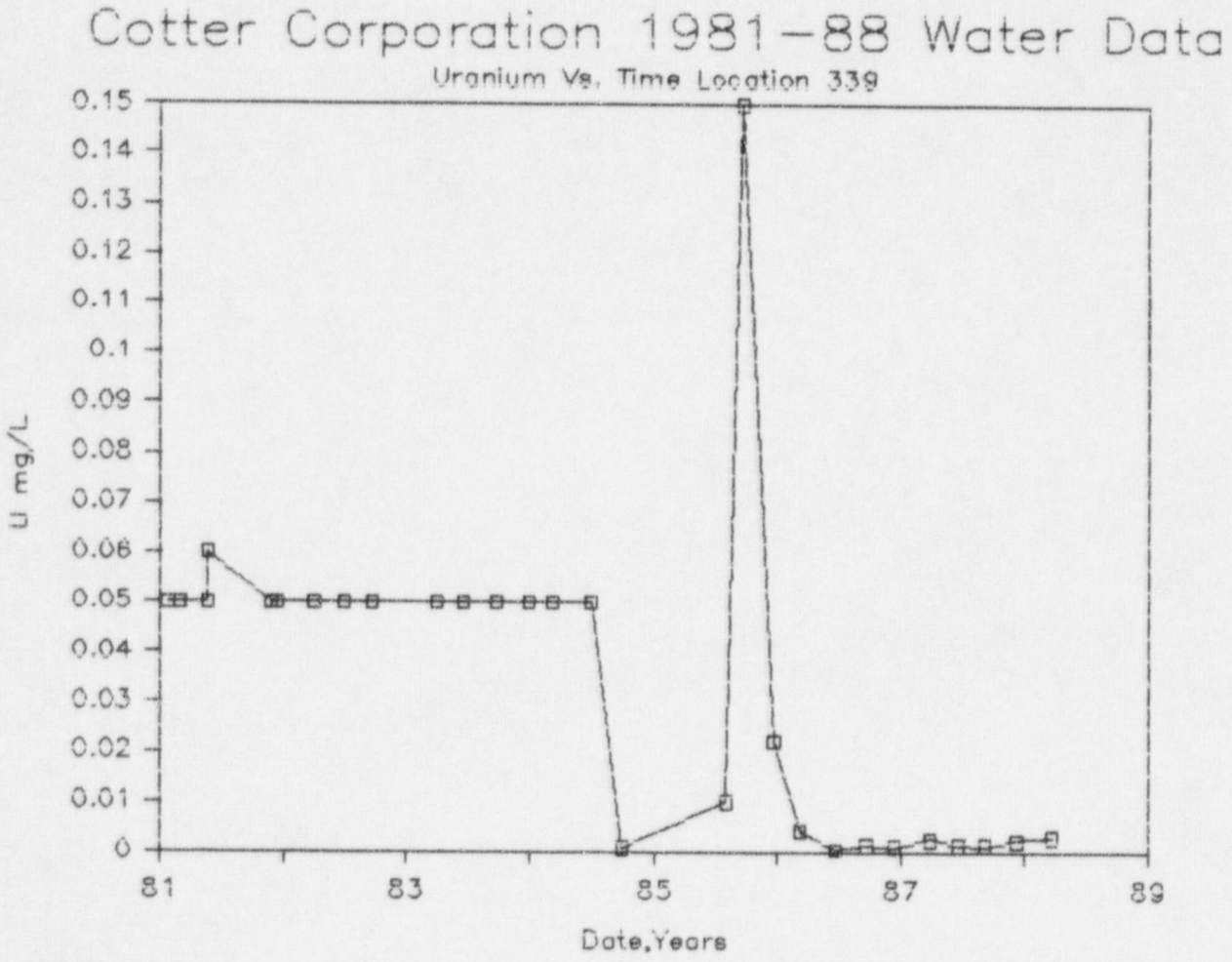

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 339
U mg/L
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.84

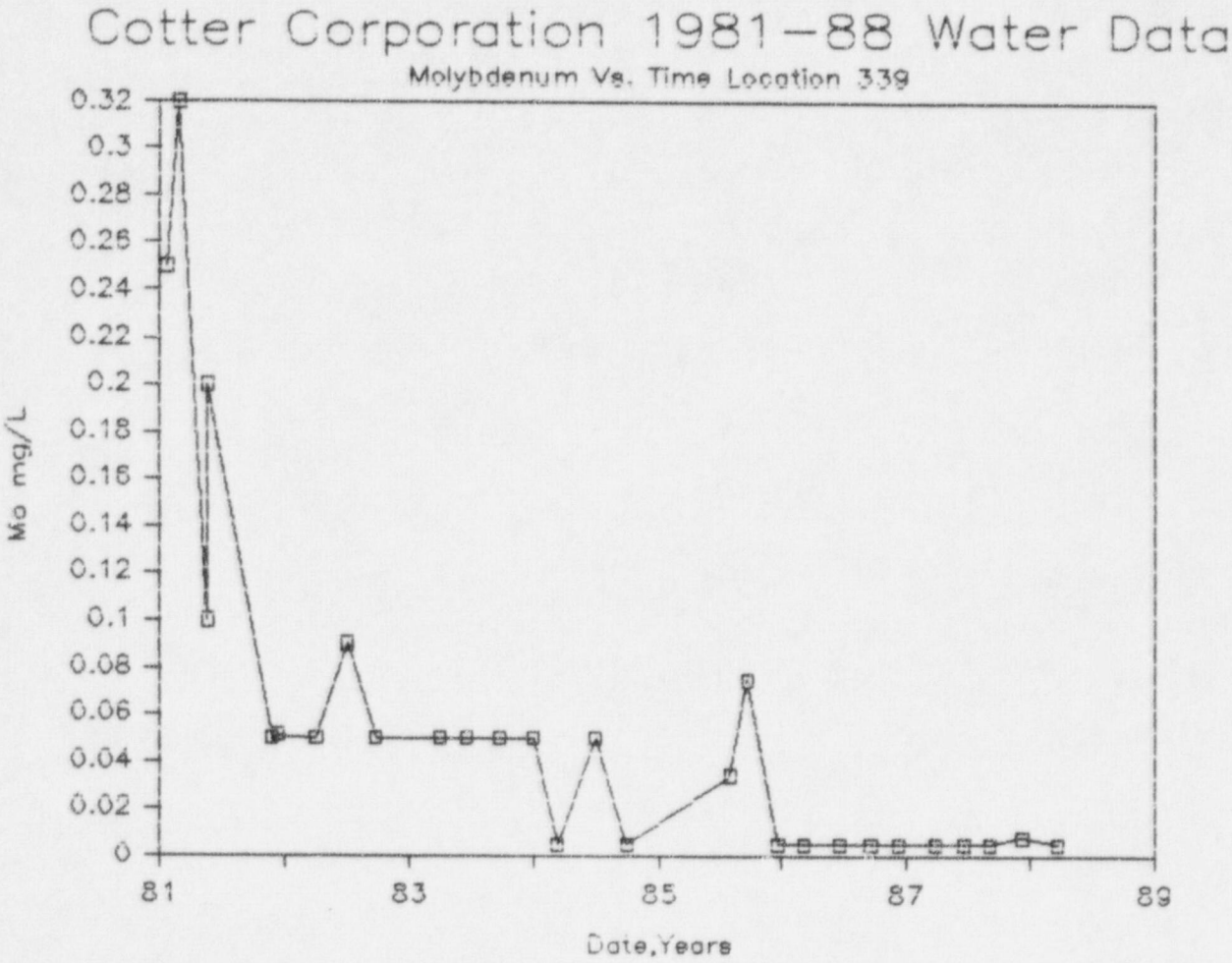

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 339
Mo mg/L
0.32
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
81
83
85
87
89
Date,Years

FIGURE 1.85

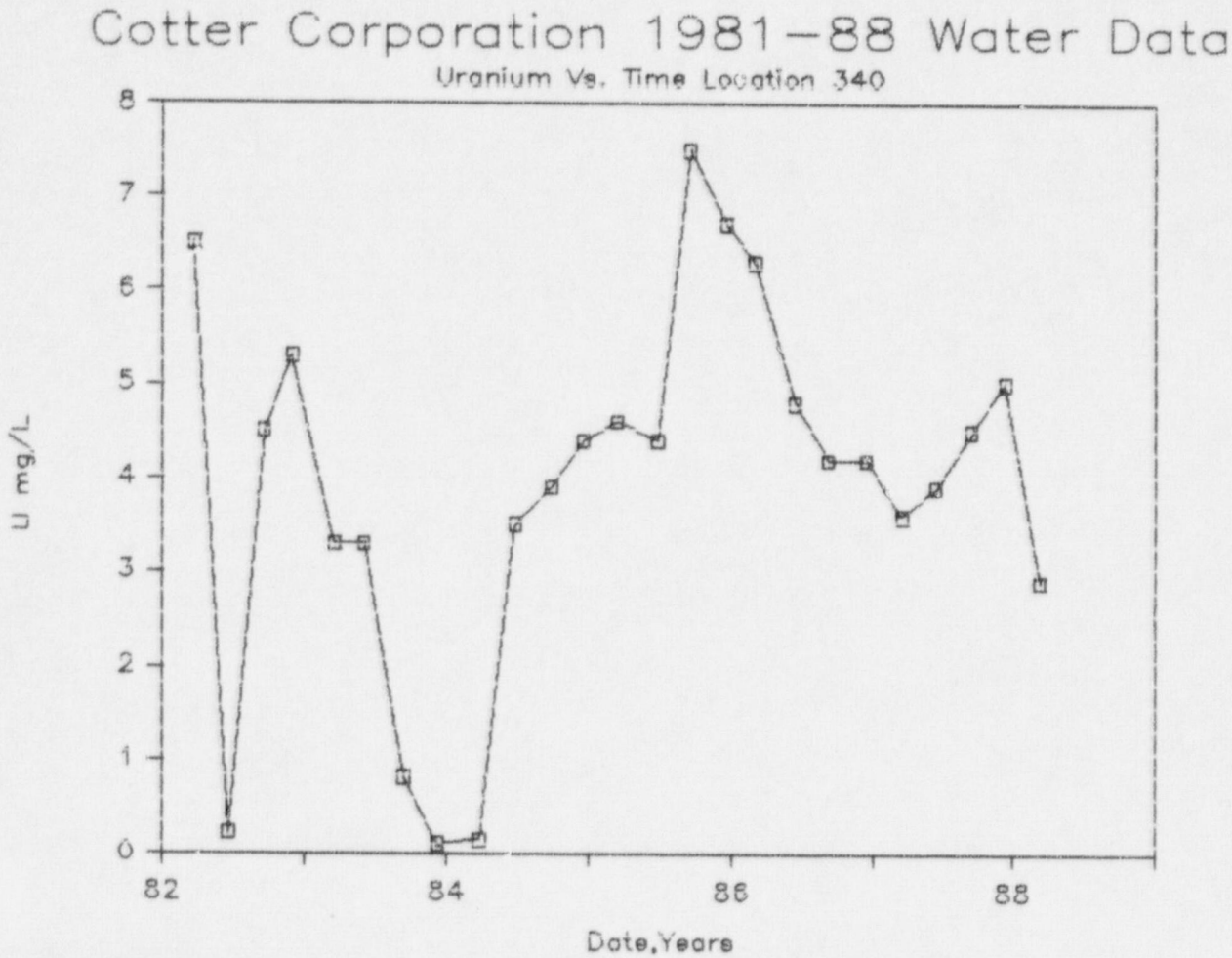

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 340
U mg/L
0
1
2
3
4
5
6
7
8
82
84
86
88
Date,Years

FIGURE 1.86

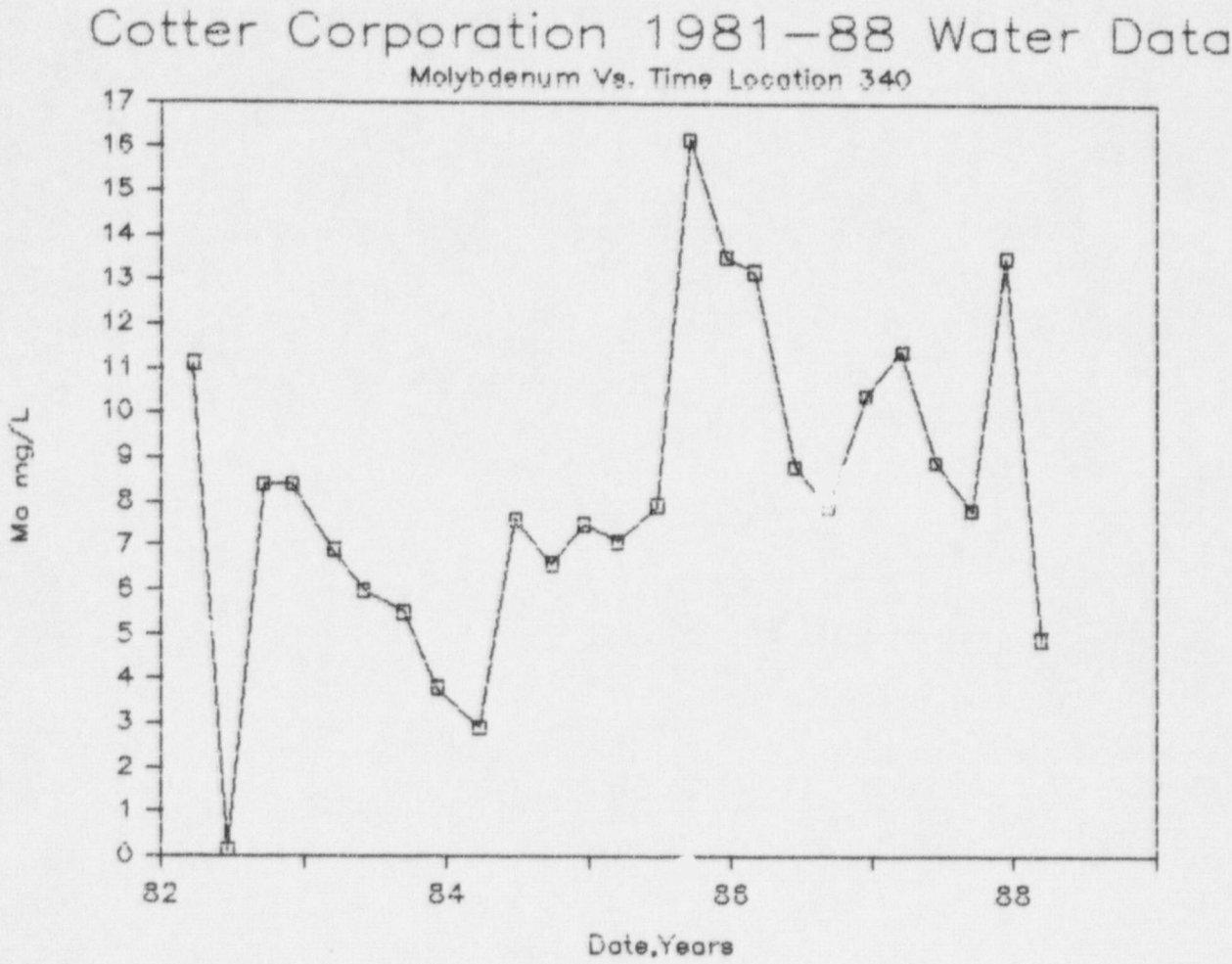

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 340
Mo mg/L
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
82
84
86
88
Date,Years

FIGURE 1.87

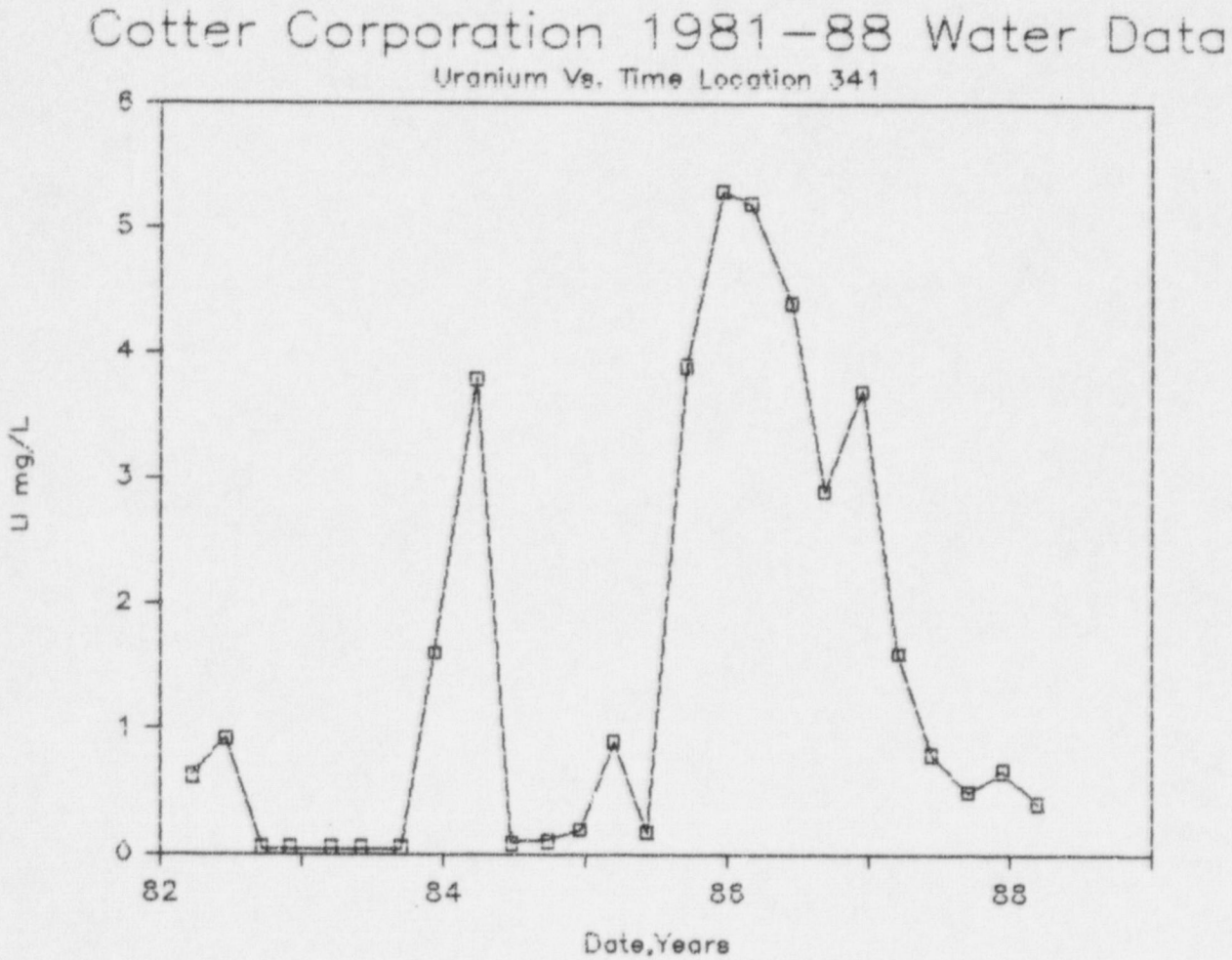

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 341
U mg/L
0
1
2
3
4
5
6
82
84
86
88
Date,Years

FIGURE 1.88

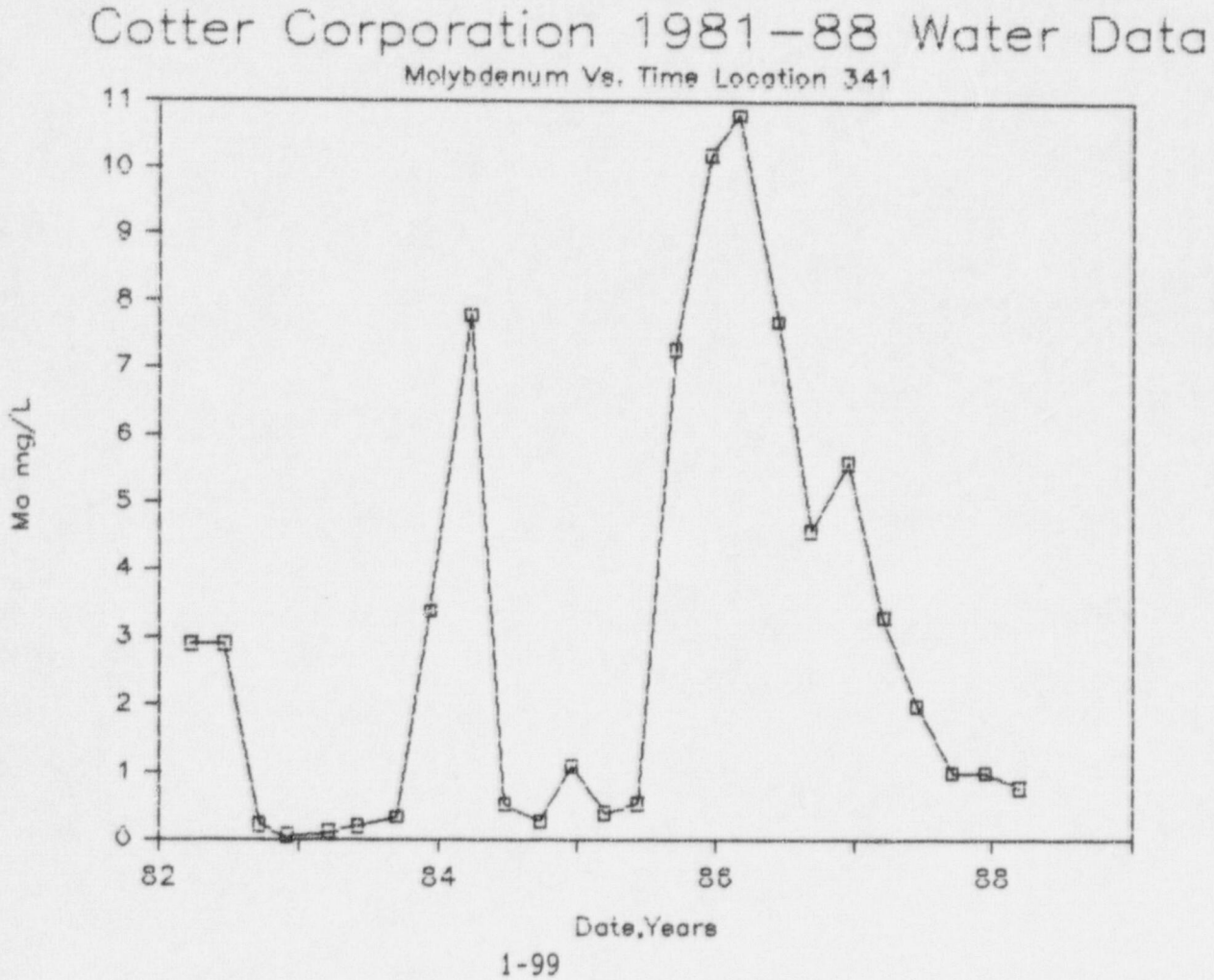

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 341
Mo mg/L
11
10
9
8
7
6
5
4
3
2
1
0
82
84
86
88
Date,Years

FIGURE 1.89

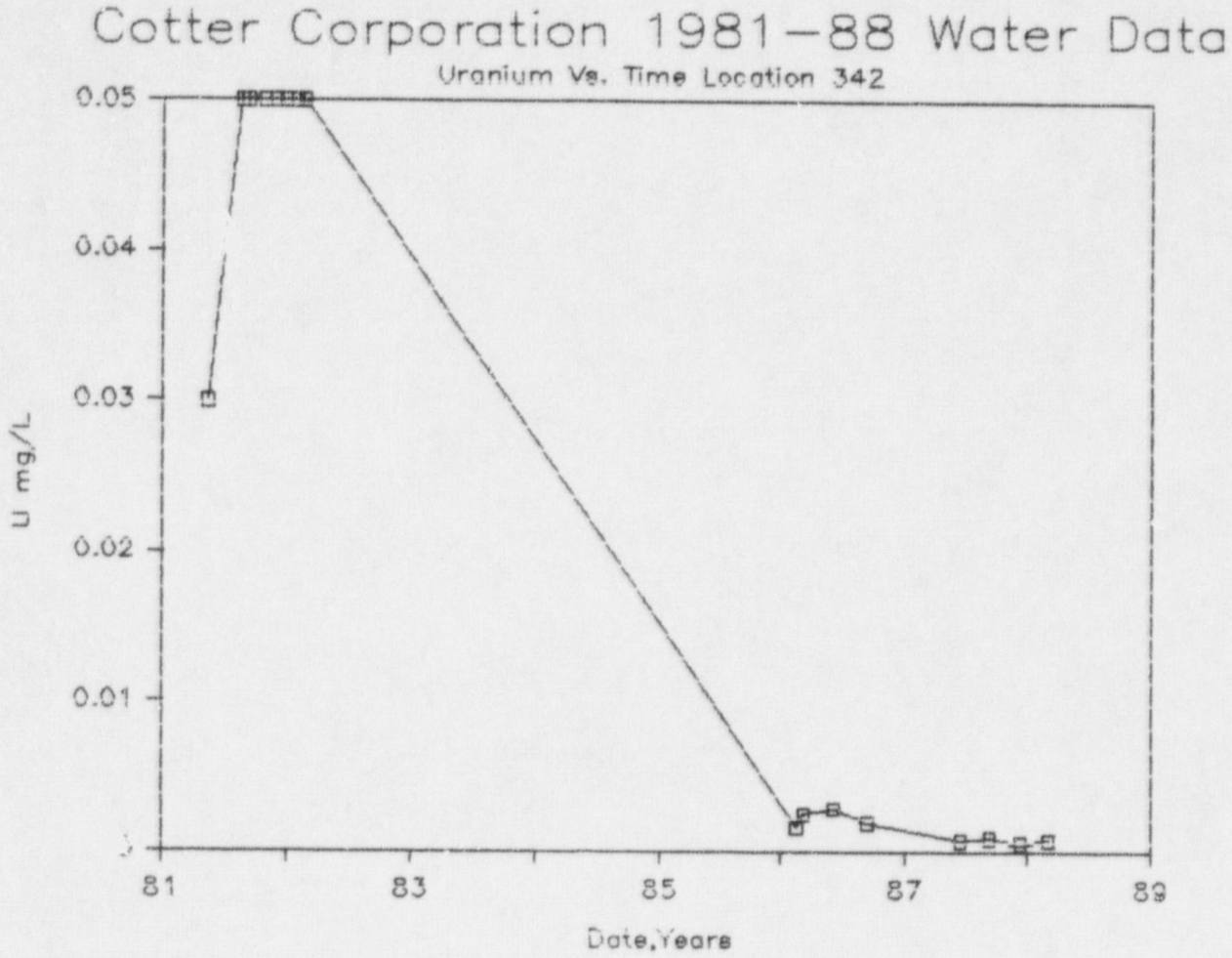

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 342
0.05
0.04
0.03
0.02
0.01
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.90

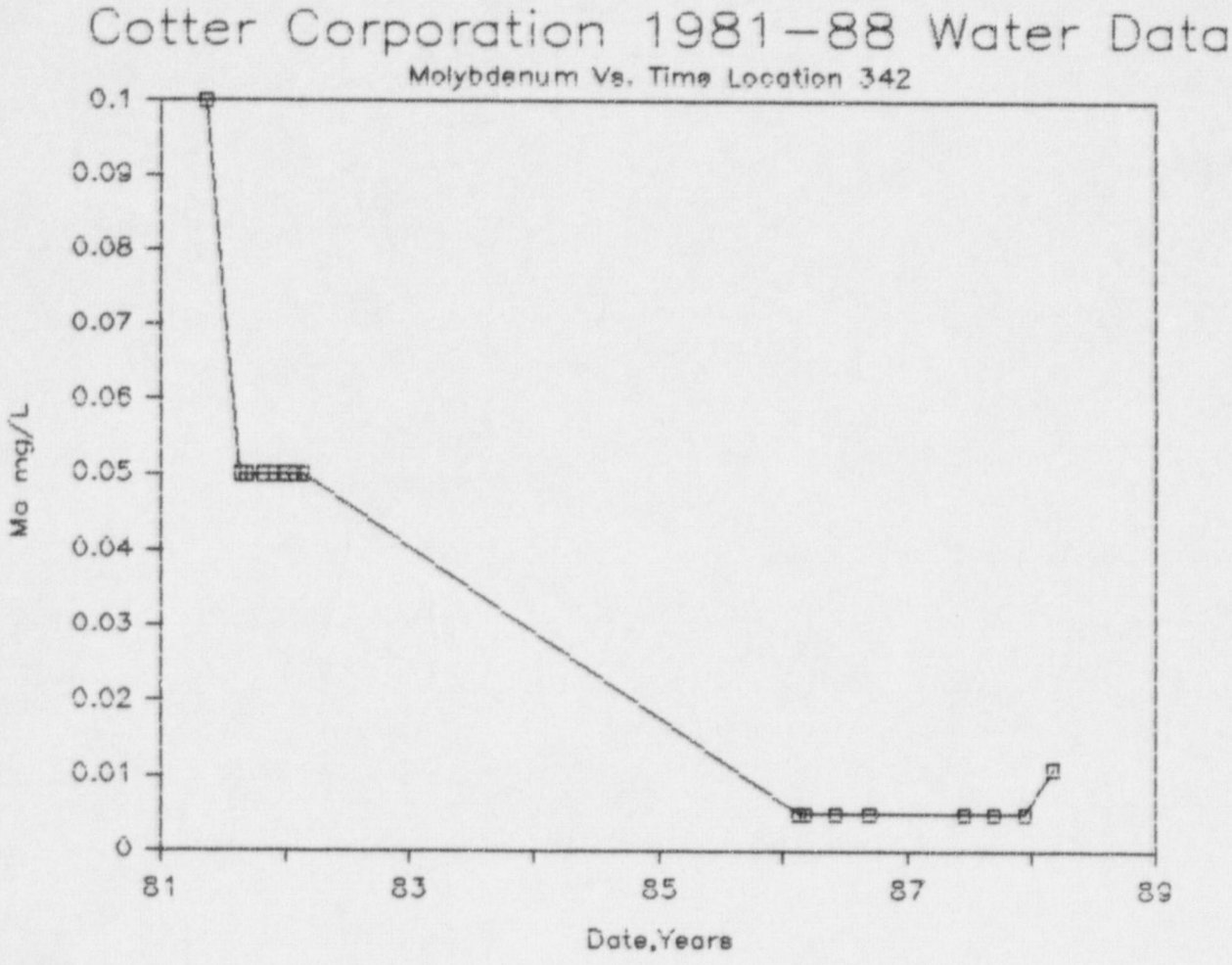

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 342
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Mo mg/L
81
83
85
87
89
Date,Years

FIGURE 1.91

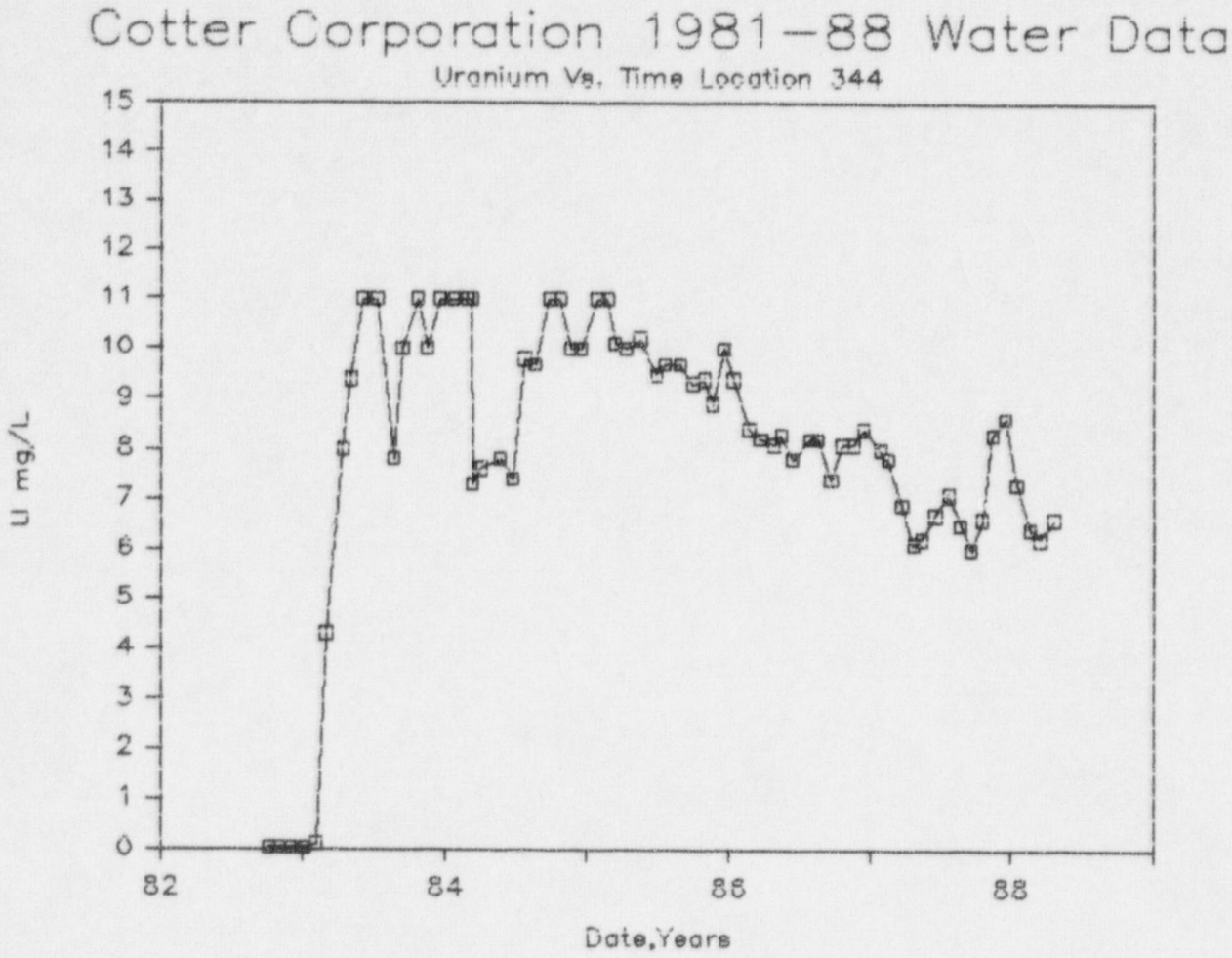

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 344
U mg/L
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
82
84
86
88
Date,Years

FIGURE 1.92

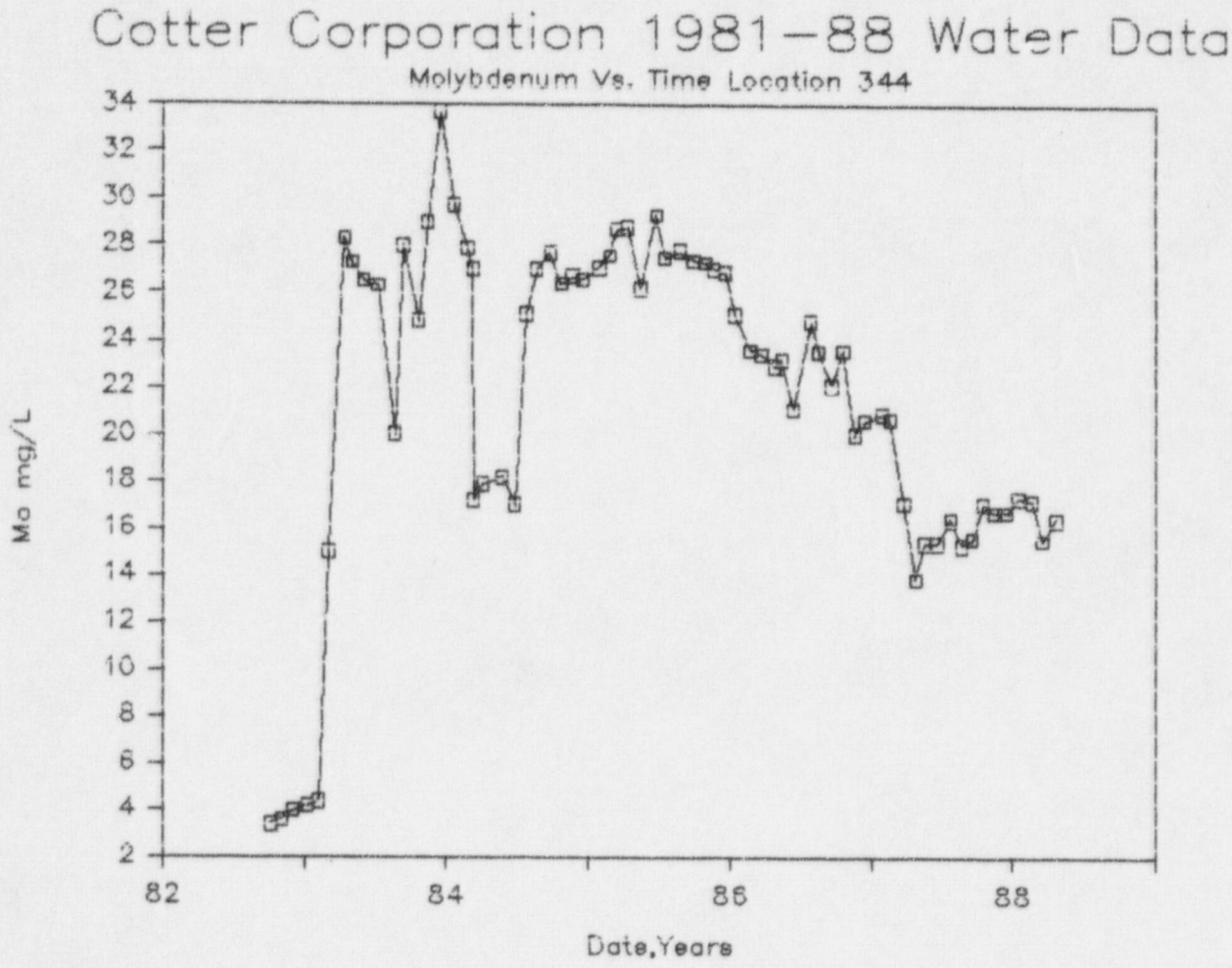

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 344
Mo mg/L
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
82
84
86
88
Date,Years

FIGURE 1.93

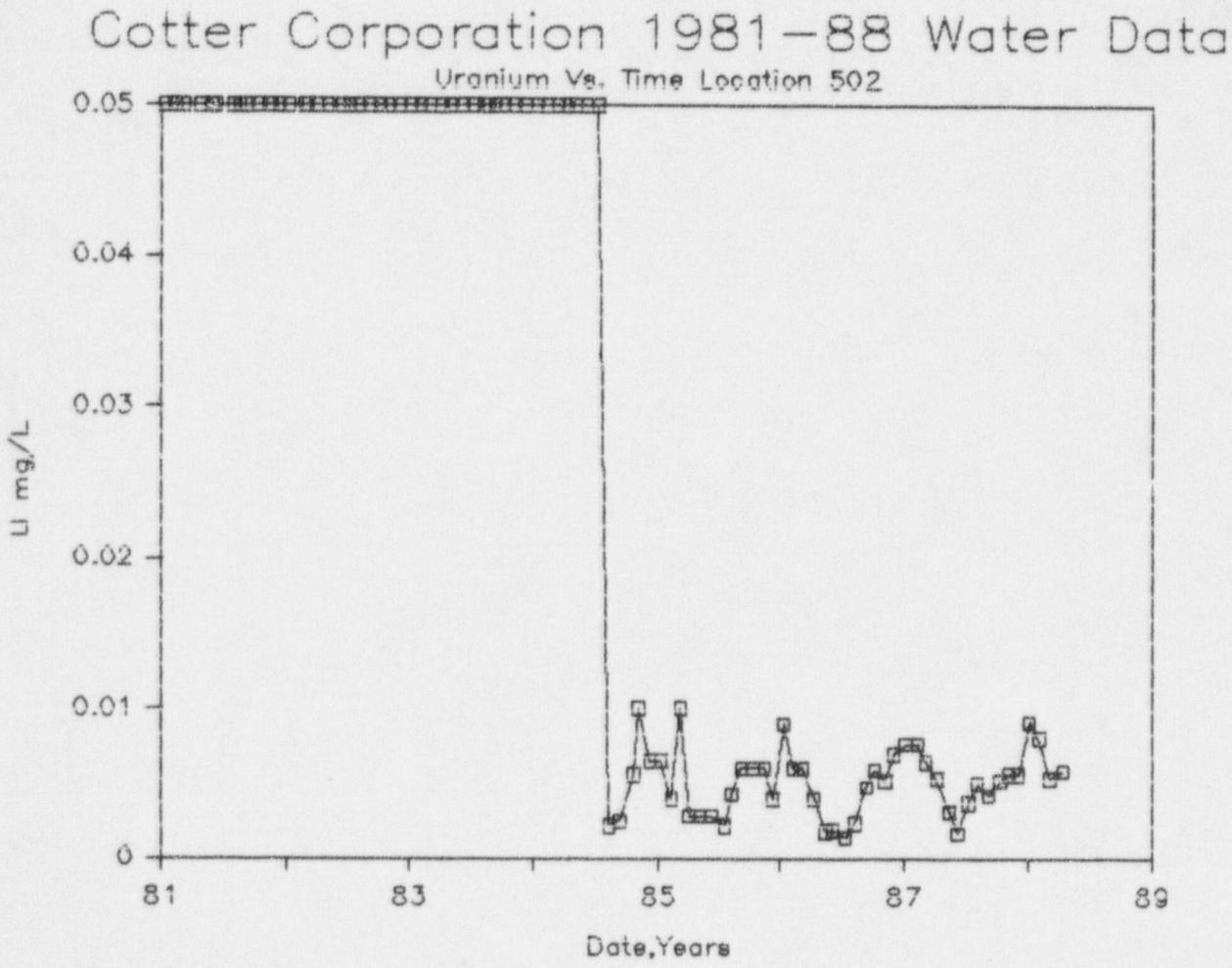

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 502
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.94

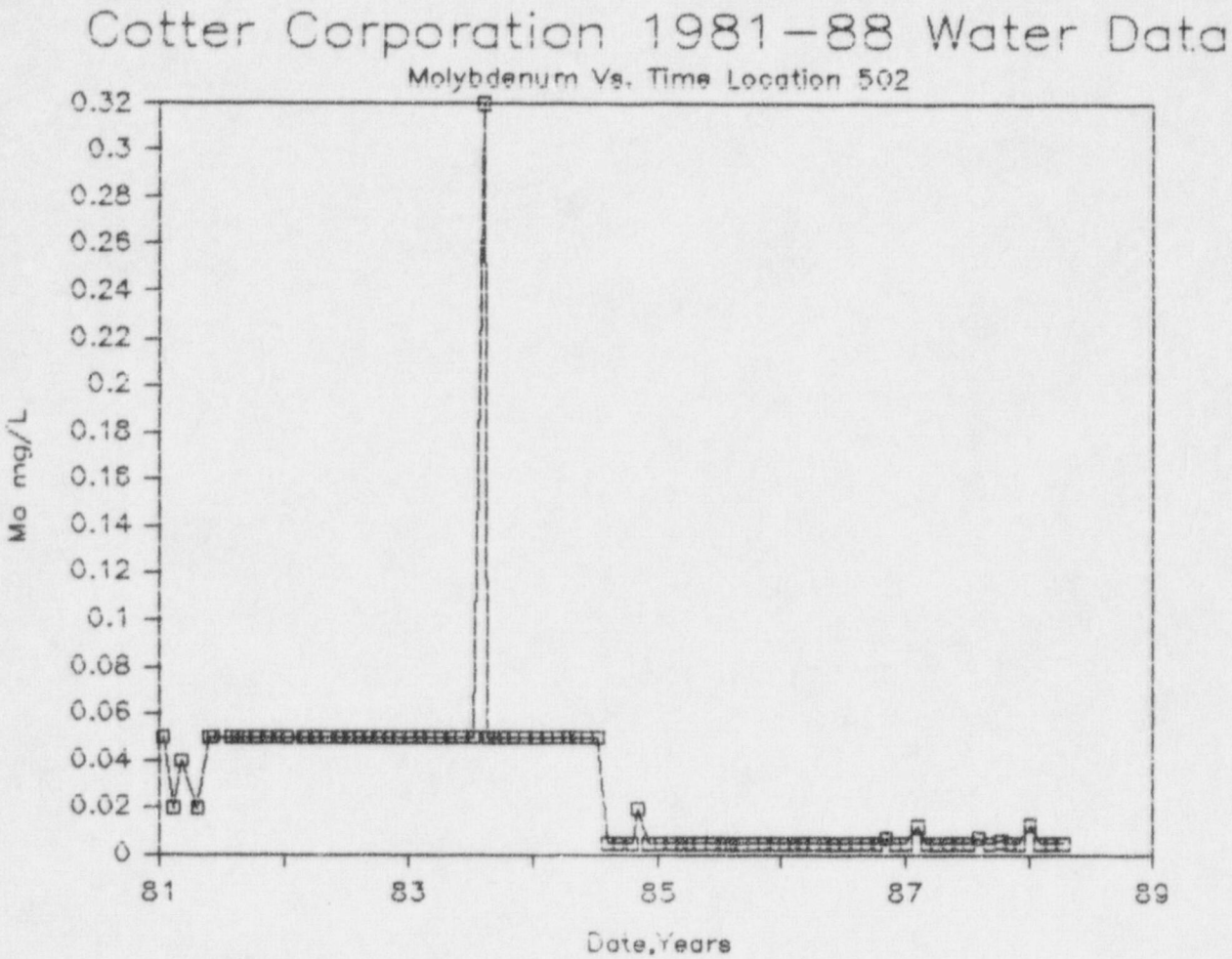

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 502
Mo mg/L
0.32
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
81
83
85
87
89
Date,Years

FIGURE 1.95

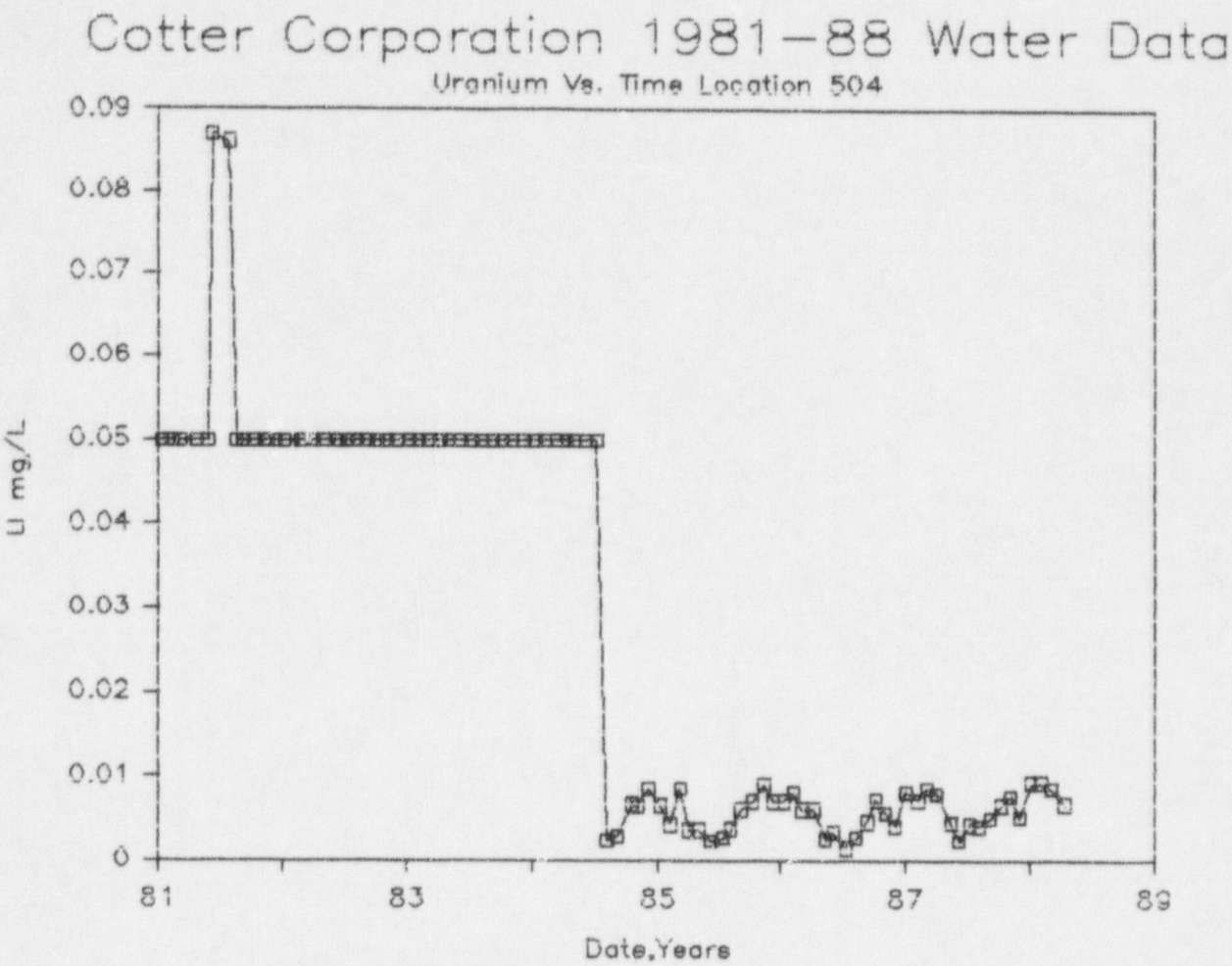

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 504
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.96

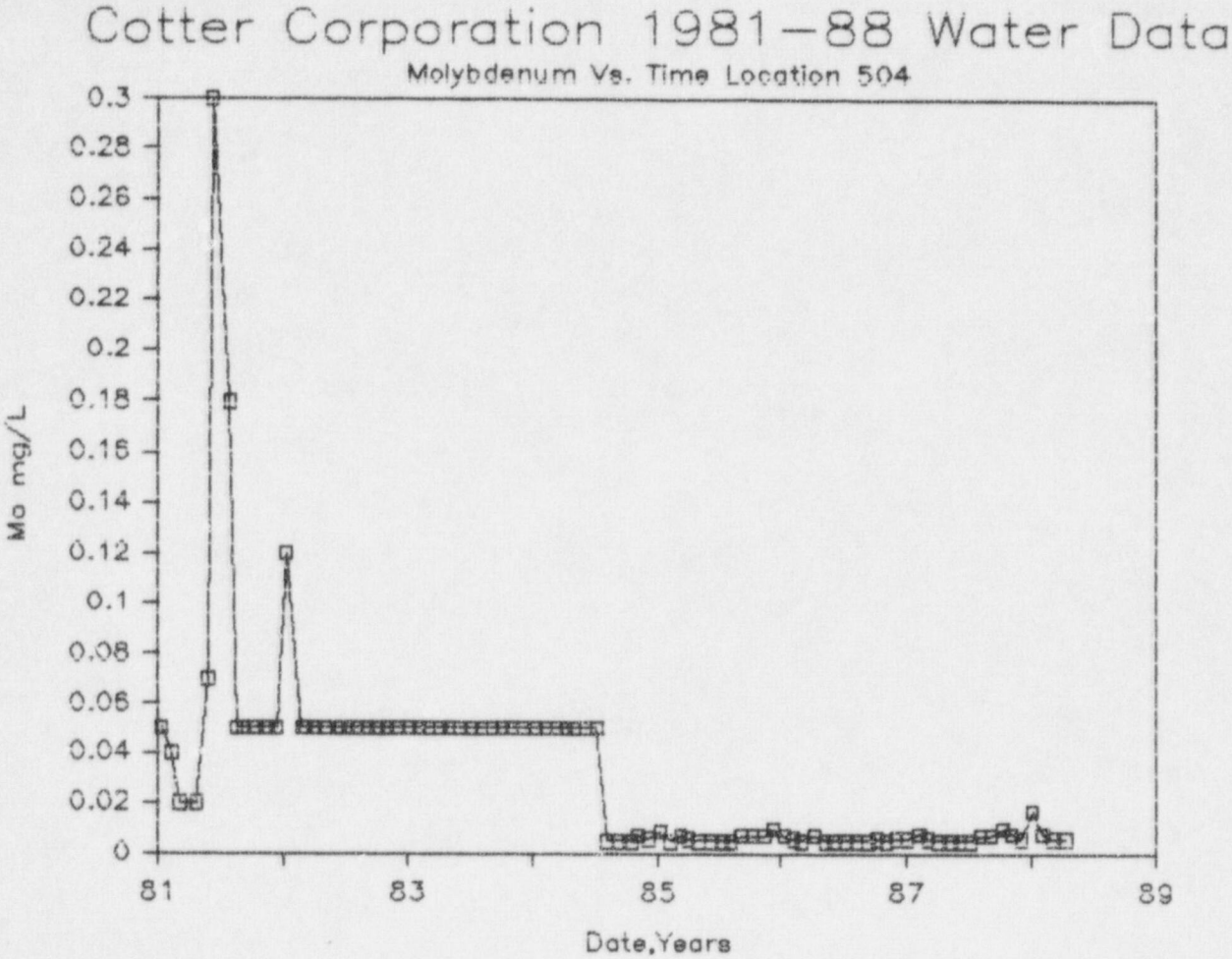

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 504
Mo mg/L
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
81
83
85
87
89
Date,Years

FIGURE 1.97

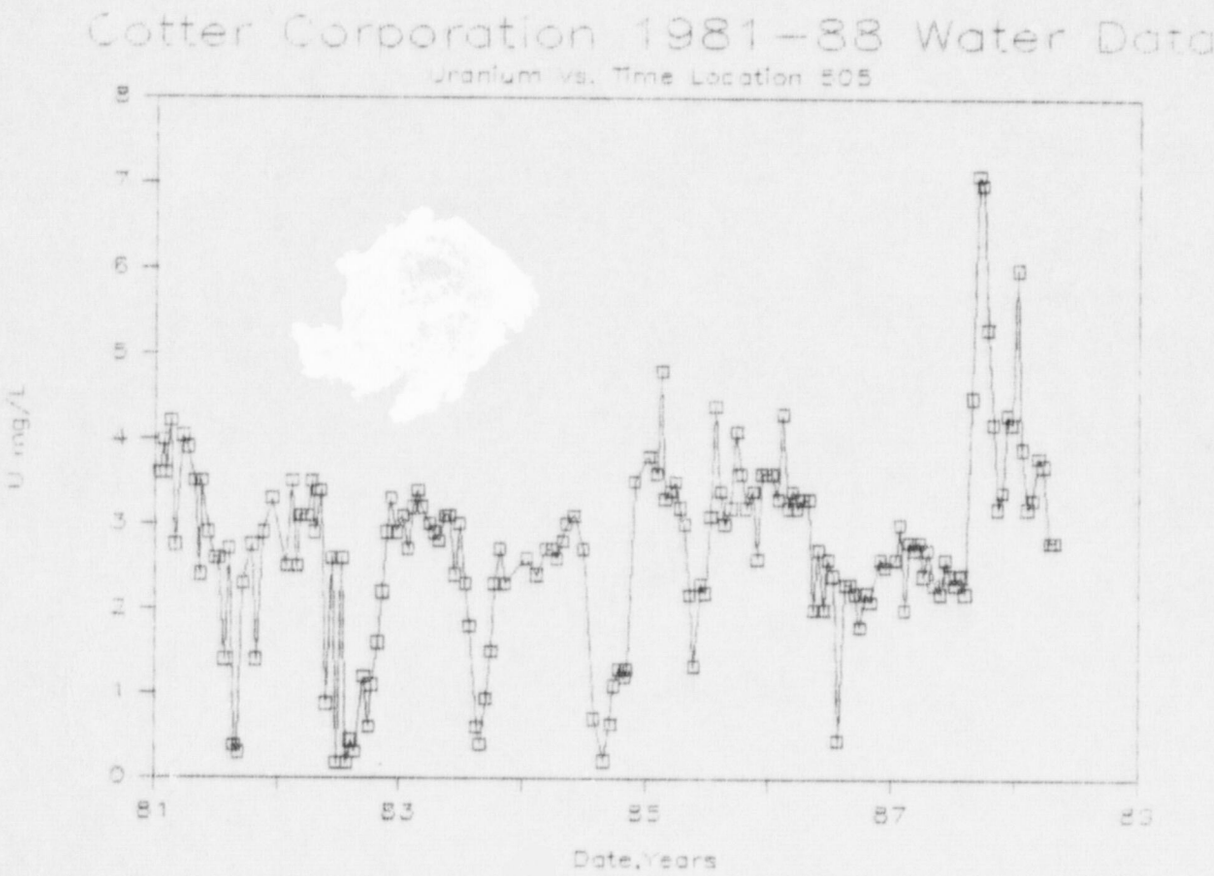

Cotter Corporation 1981-88 Water Data
Uranium vs. Time Location 505
U mg/L
0
1
2
3
4
5
6
7
8
81
83
85
87
89
Date, Years

FIGURE 1.98

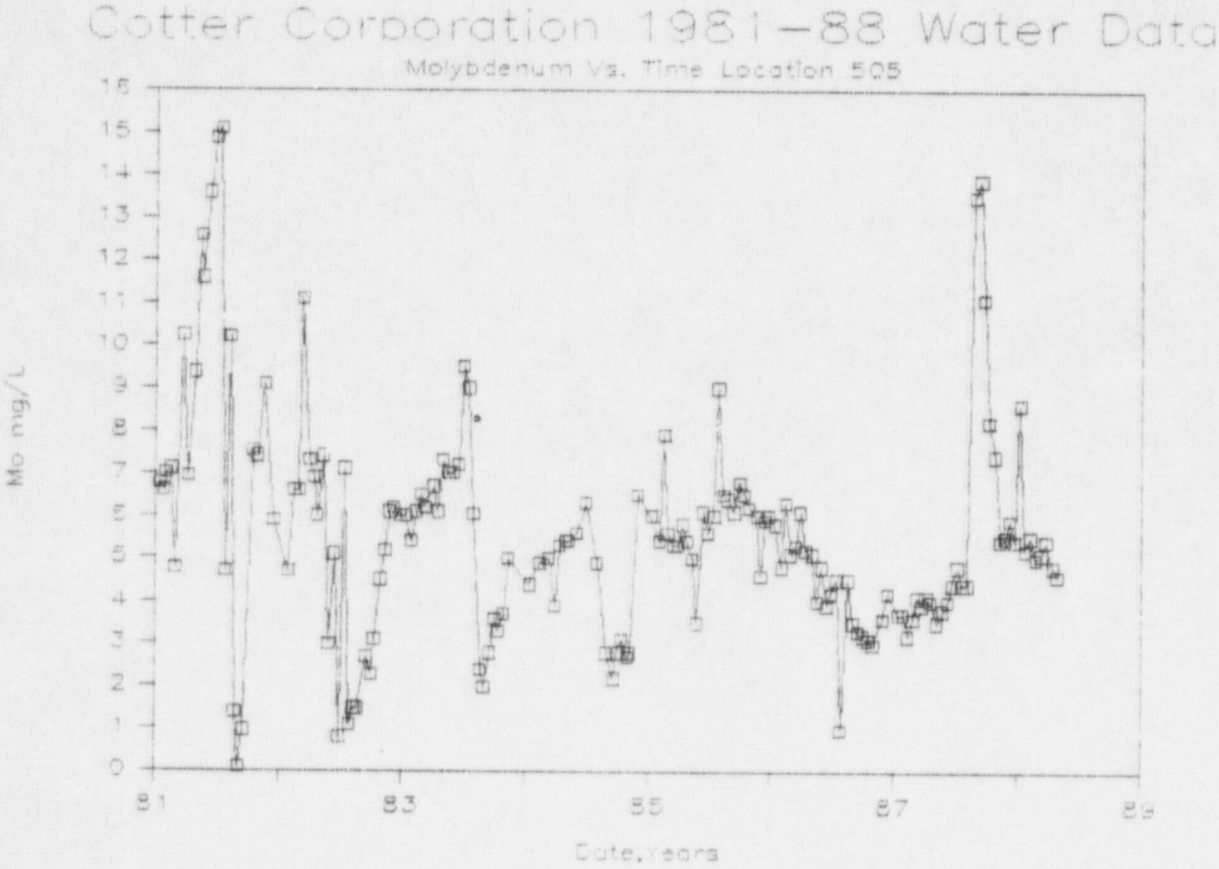

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 505
Mo mg/L
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
81
83
85
87
Date,Years

FIGURE 1.99

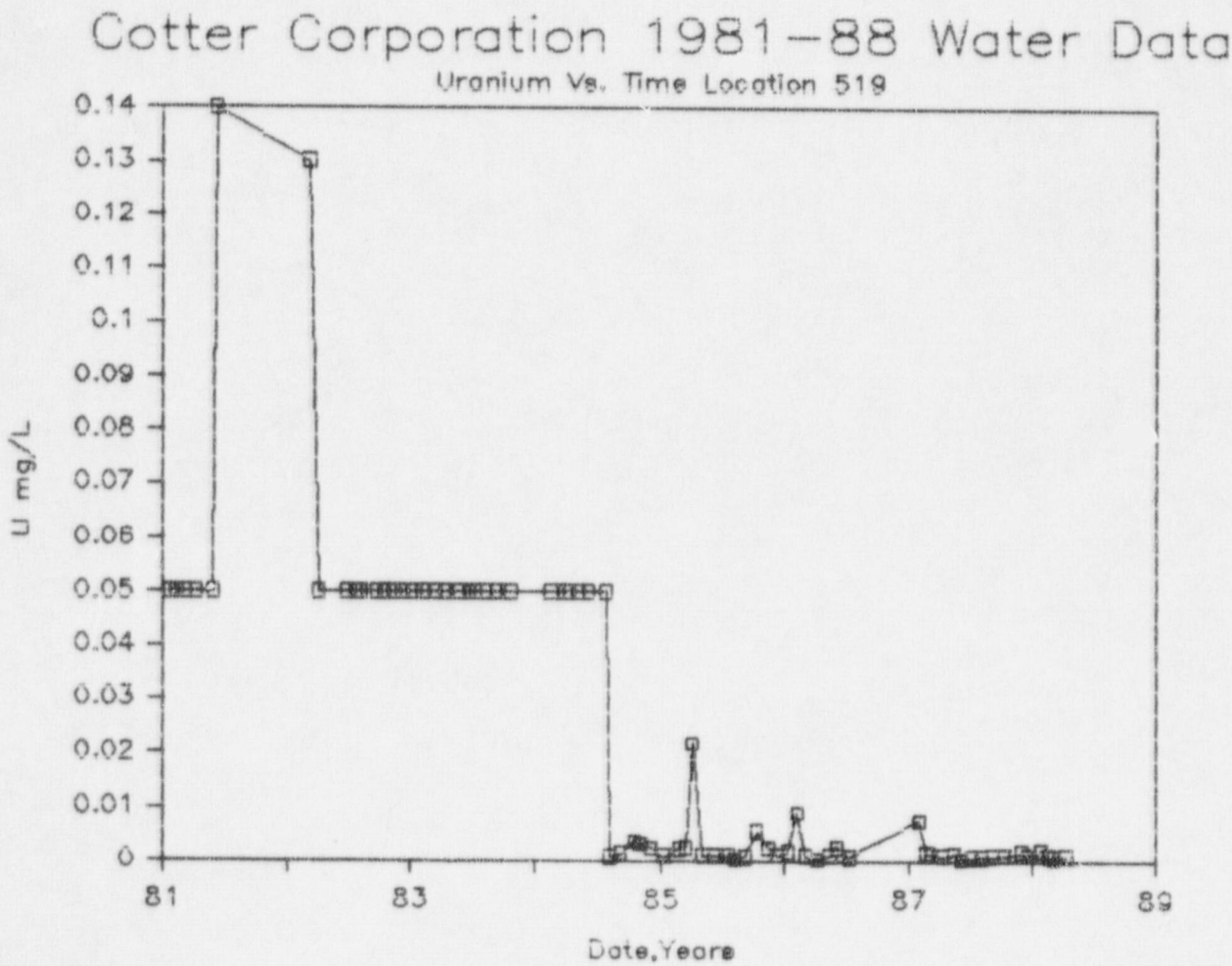

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 519
U mg/L
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.100

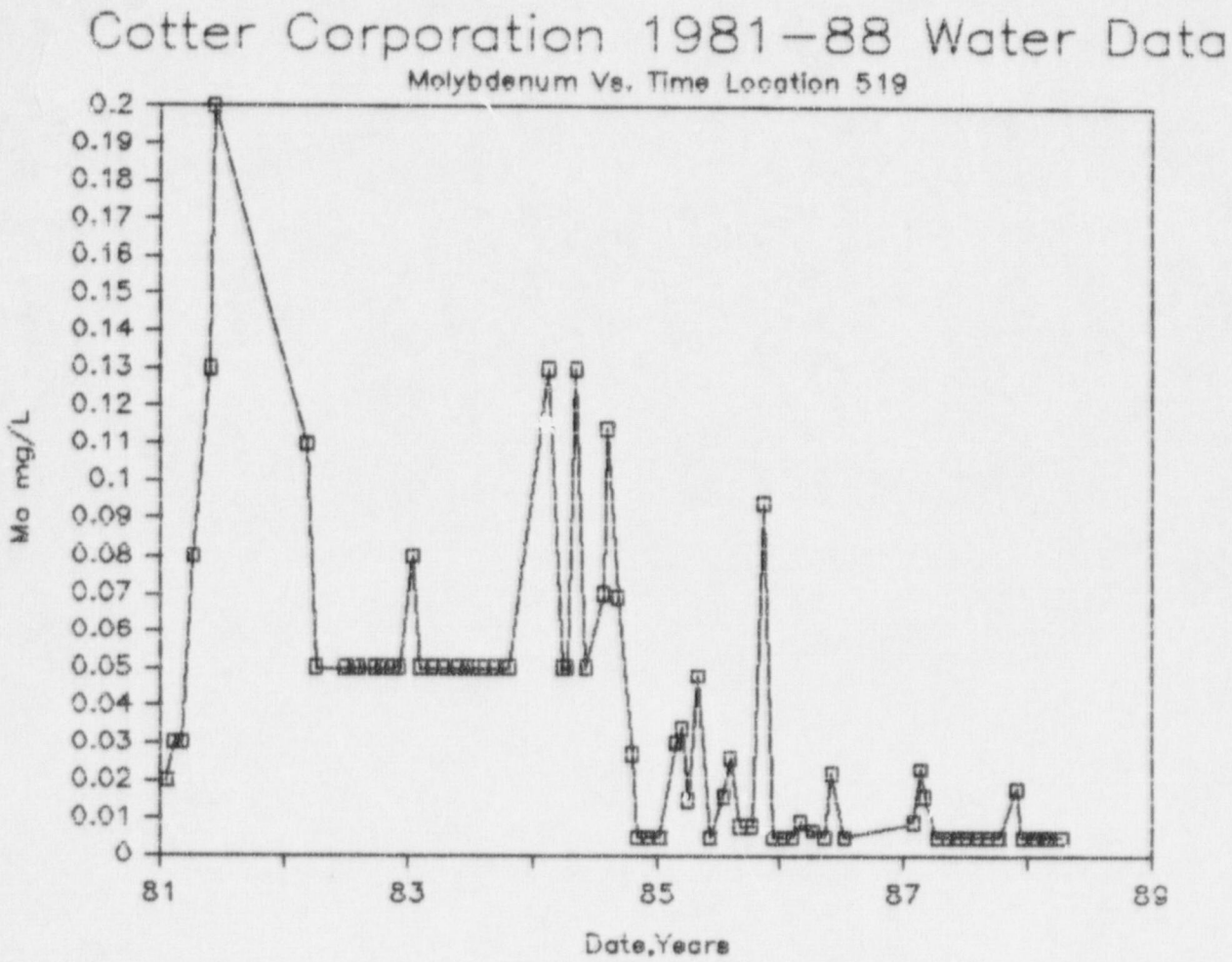

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 519
Mo mg/L
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.101

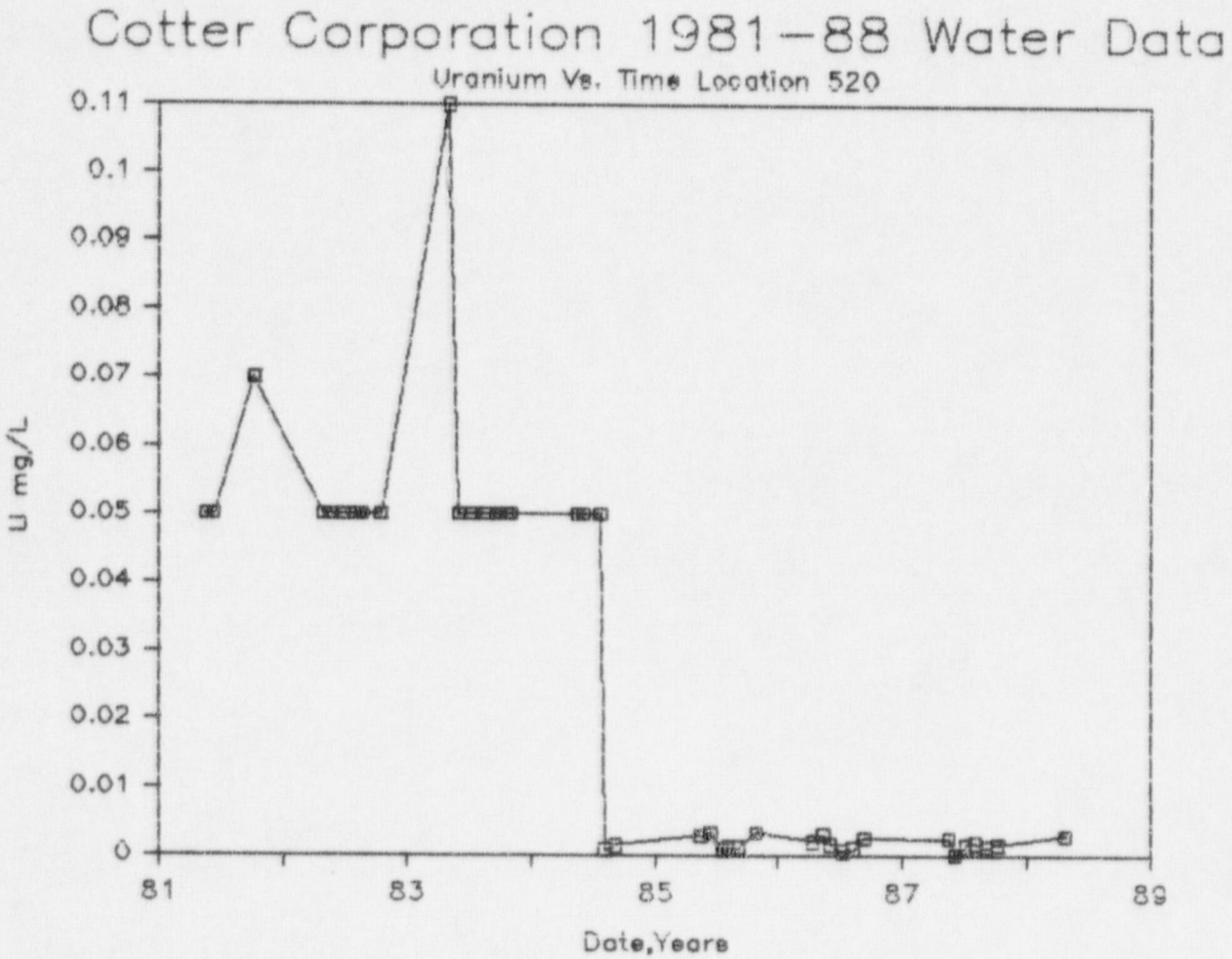

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 520
U mg/L
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.102

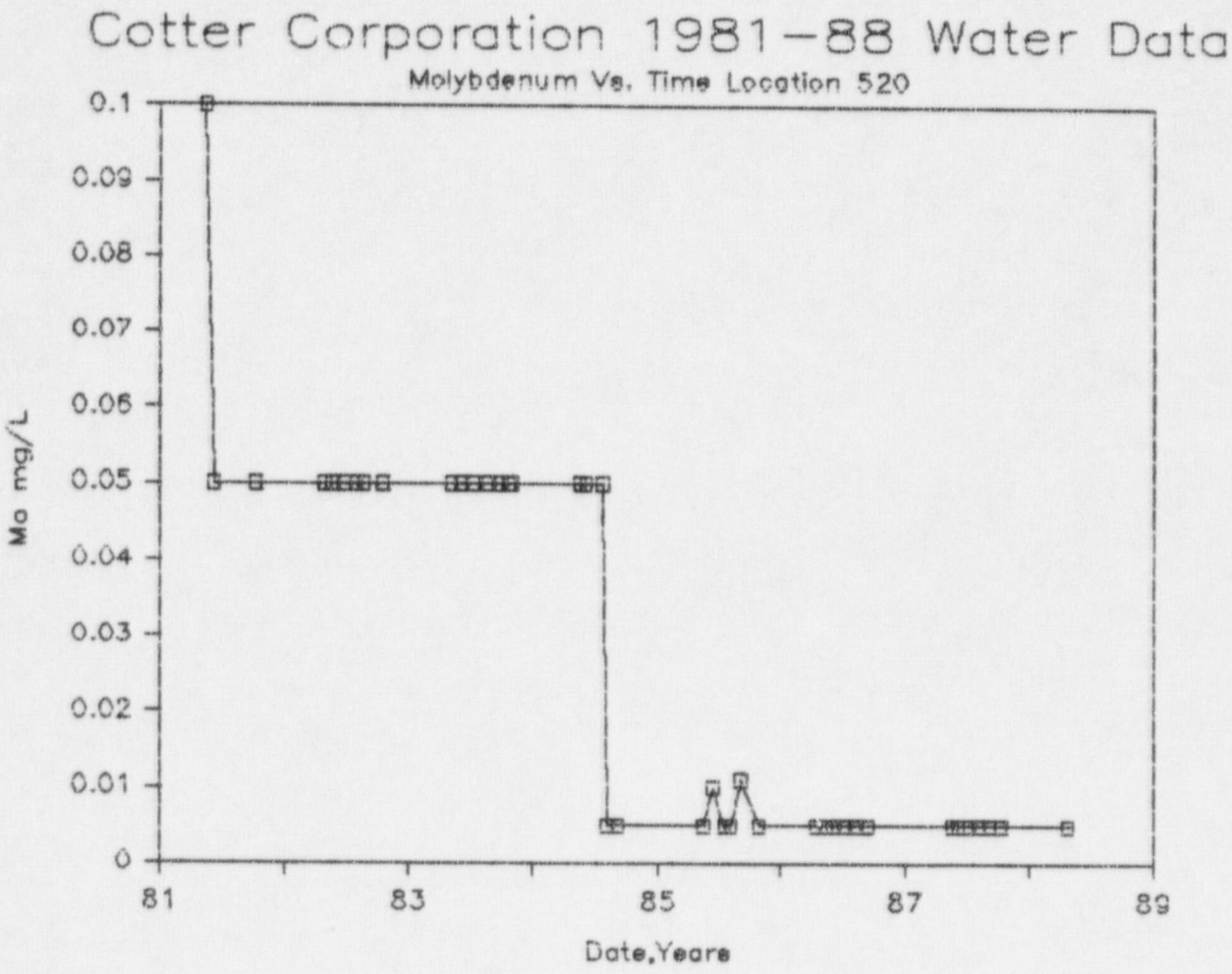

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 520
Mo mg/L
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
89
Date,Years

FIGURE 1.103

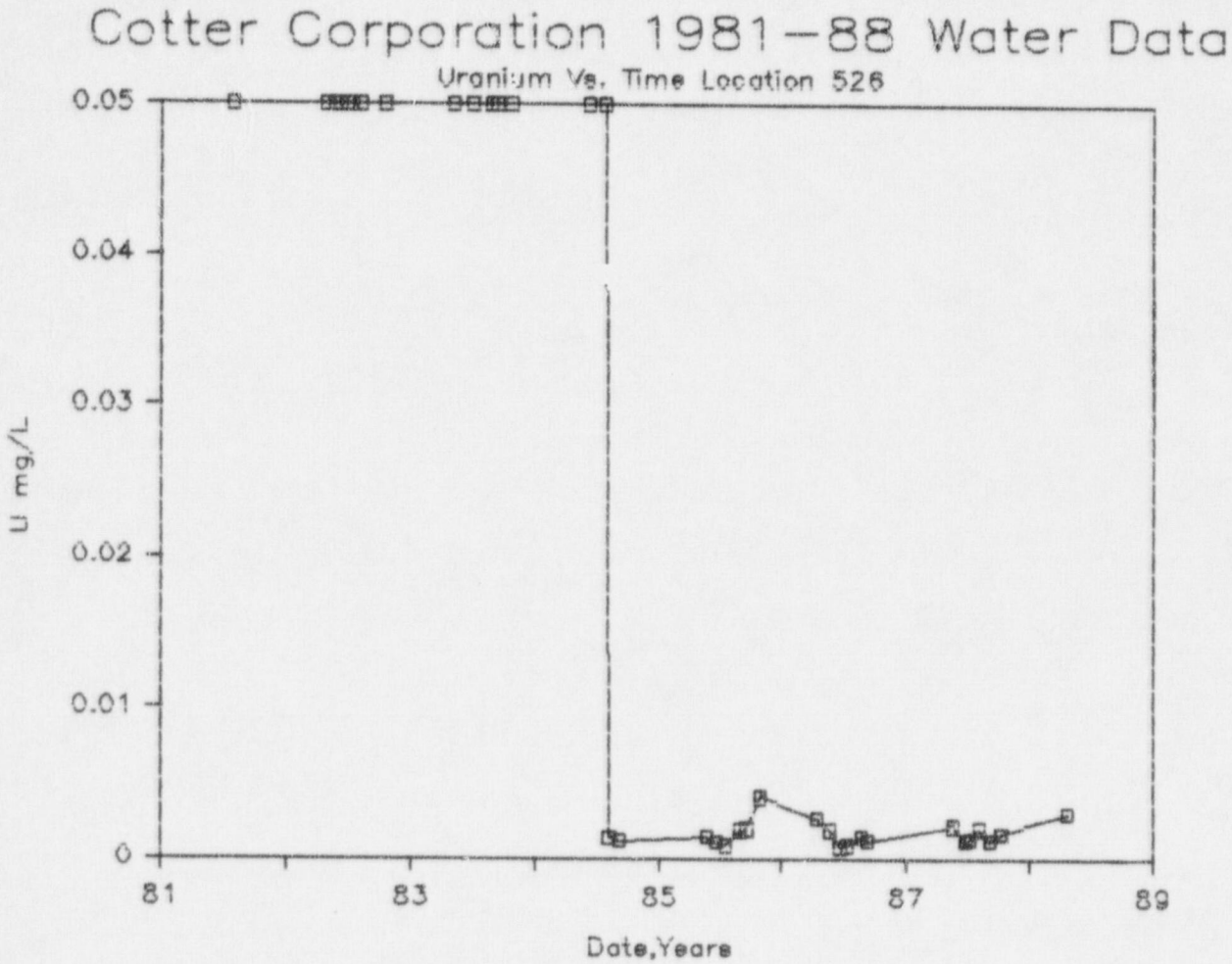

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 526
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.104

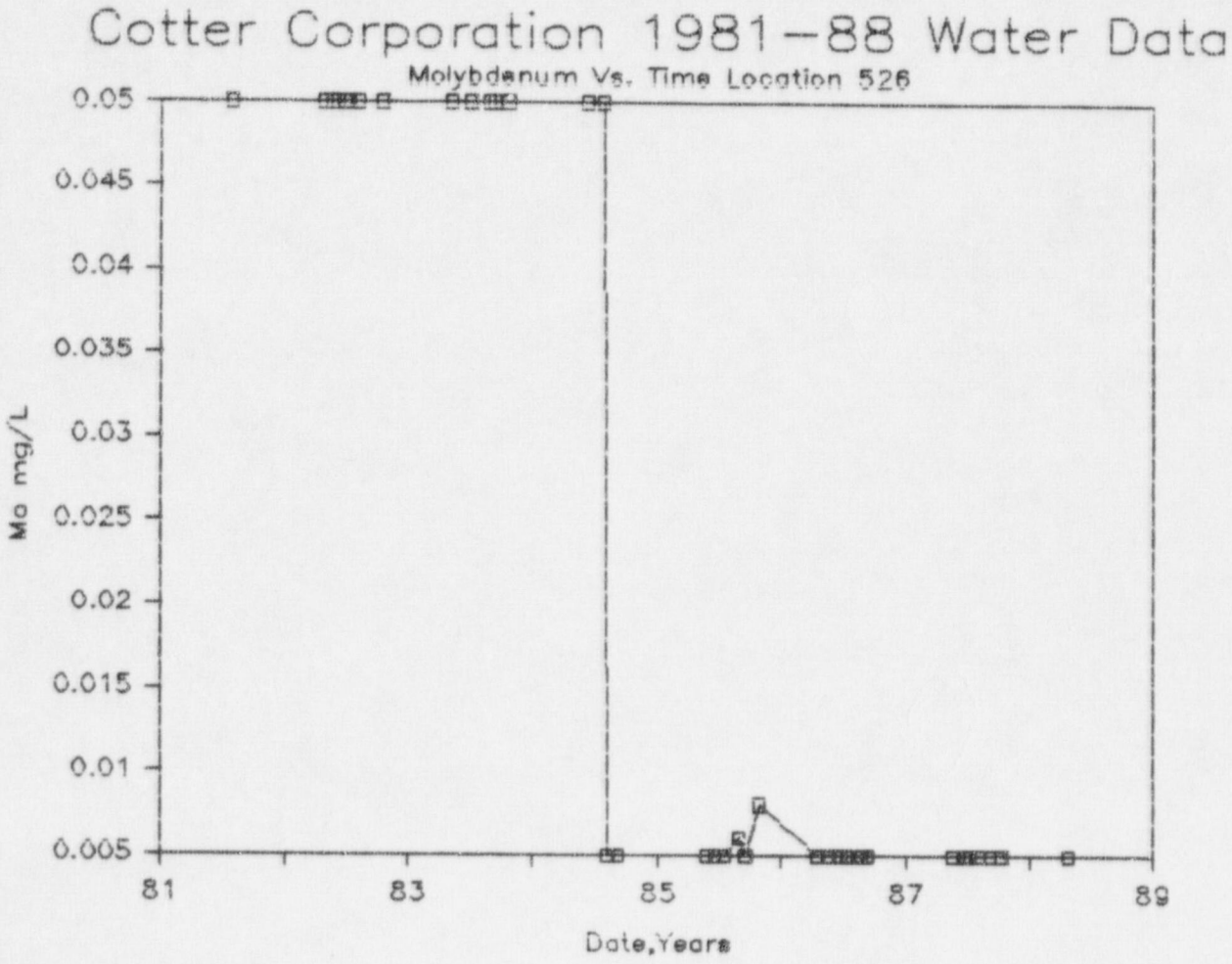

Cotter Corporation 1981-88 Water Data
Molybdenum Vs. Time Location 526
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
Mo mg/L
81
83
85
87
89
Date,Years

FIGURE 1.105

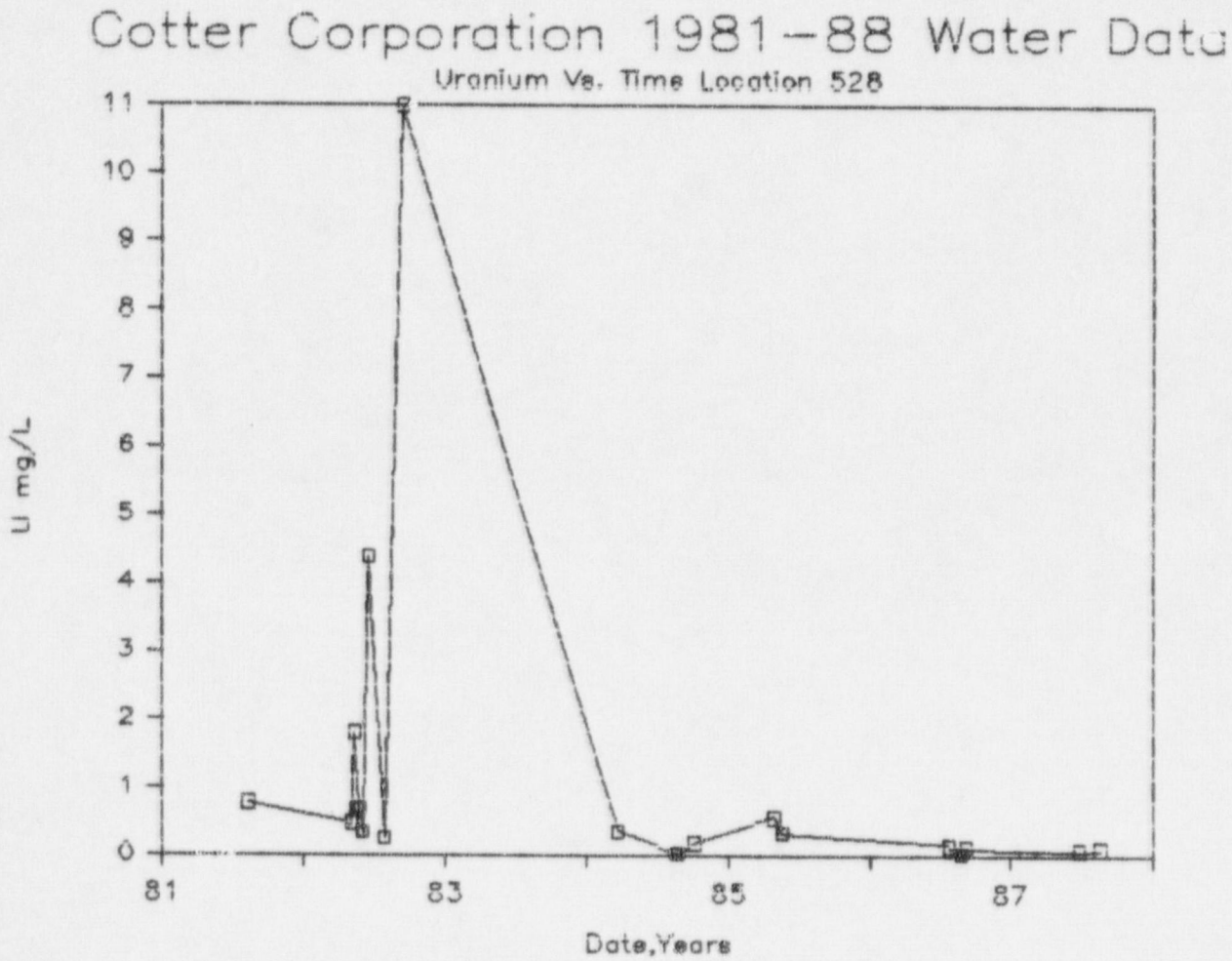

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 528
U mg/L
11
10
9
8
7
6
5
4
3
2
1
0
81
83
85
87
Date,Years

FIGURE 1.106

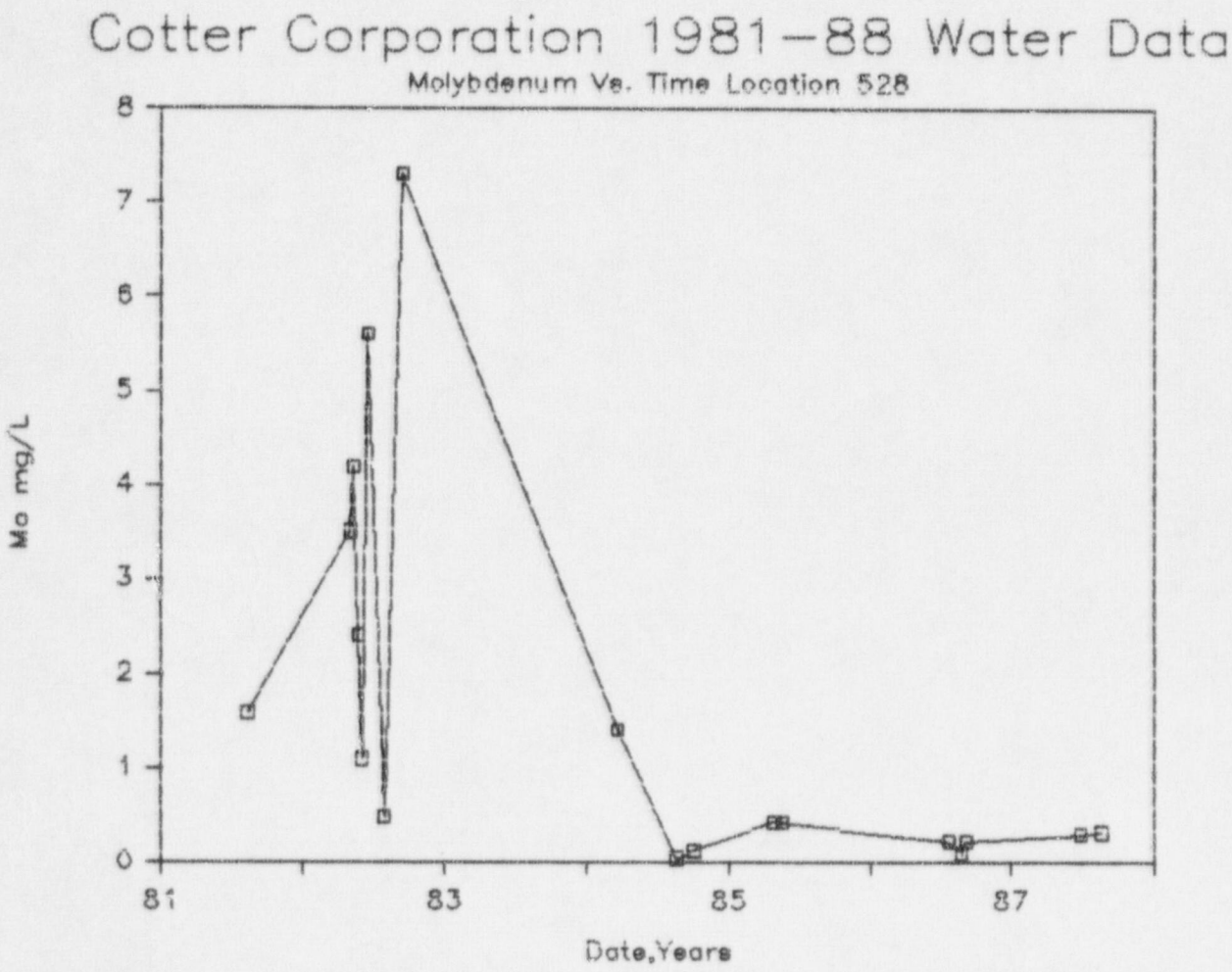

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 528
Mo mg/L
8
7
6
5
4
3
2
1
0
81
83
85
87
Date,Years

FIGURE 1.107

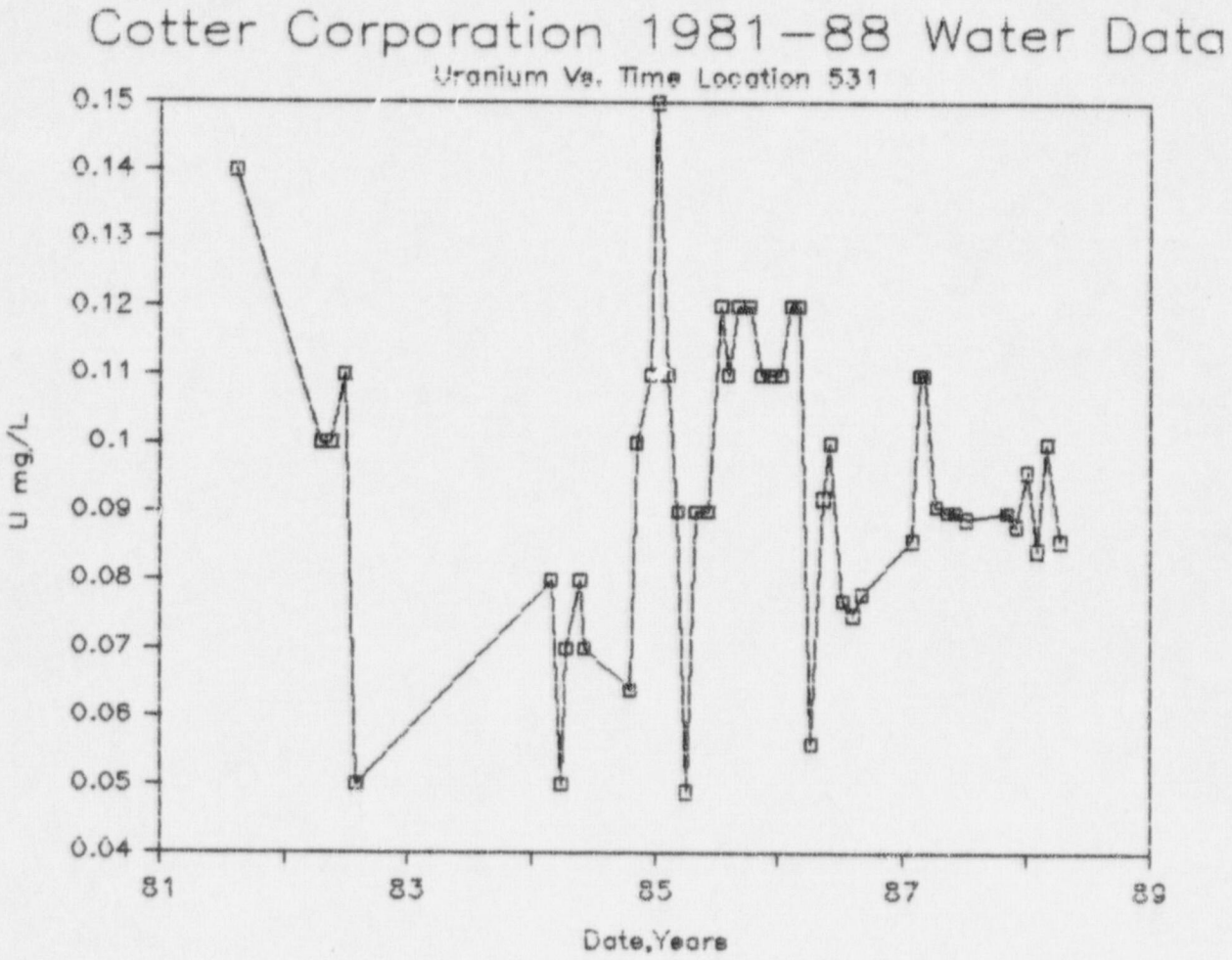

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 531
U mg/L
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
81
83
85
87
89
Date,Years

FIGURE 1.108

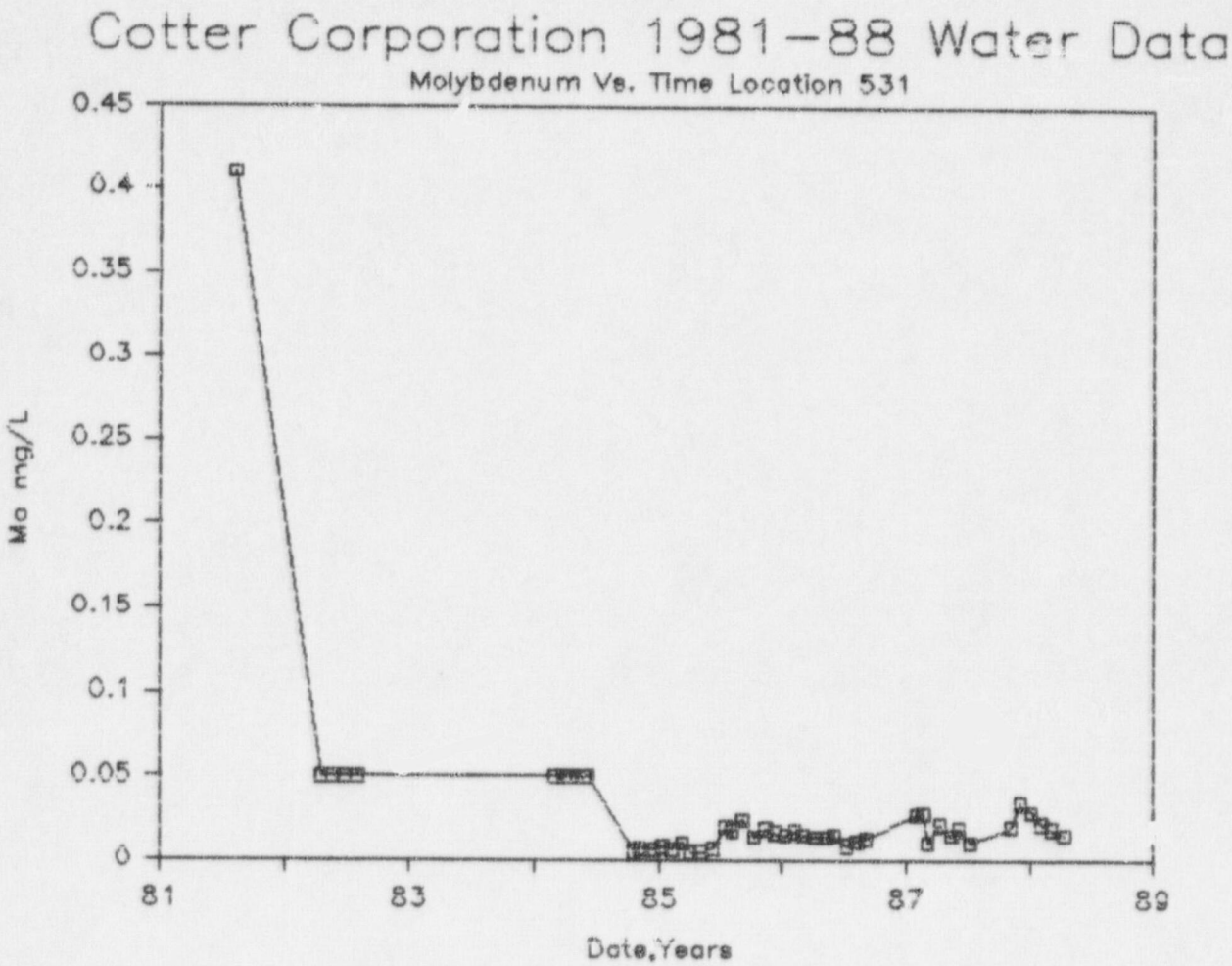

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 531
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Mo mg/L
81
83
85
87
89
Date,Years

FIGURE 1.109

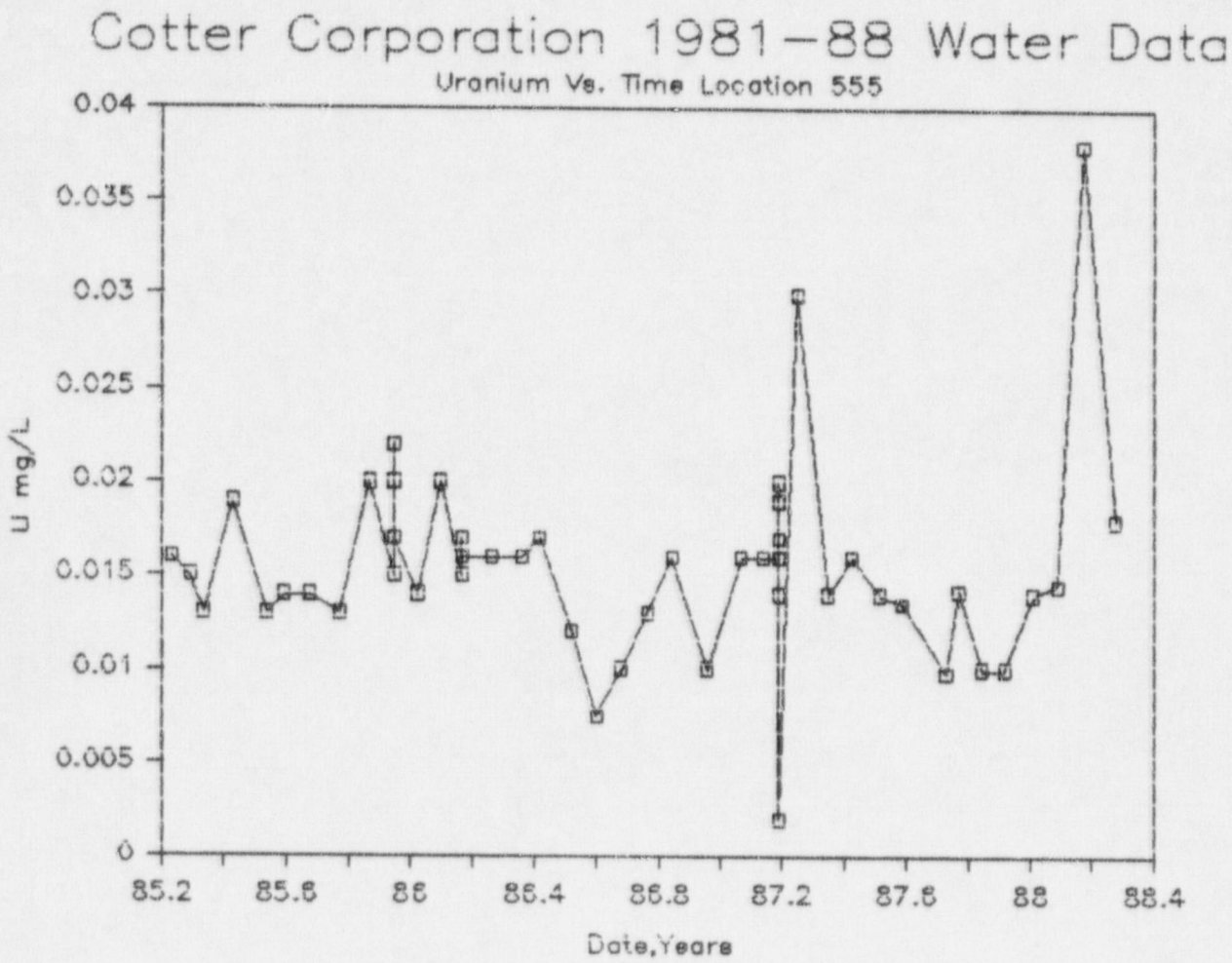

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 555
U mg/L
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
85.2
85.6
86
86.4
86.8
87.2
87.6
88
88.4
Date,Years

FIGURE 1.110

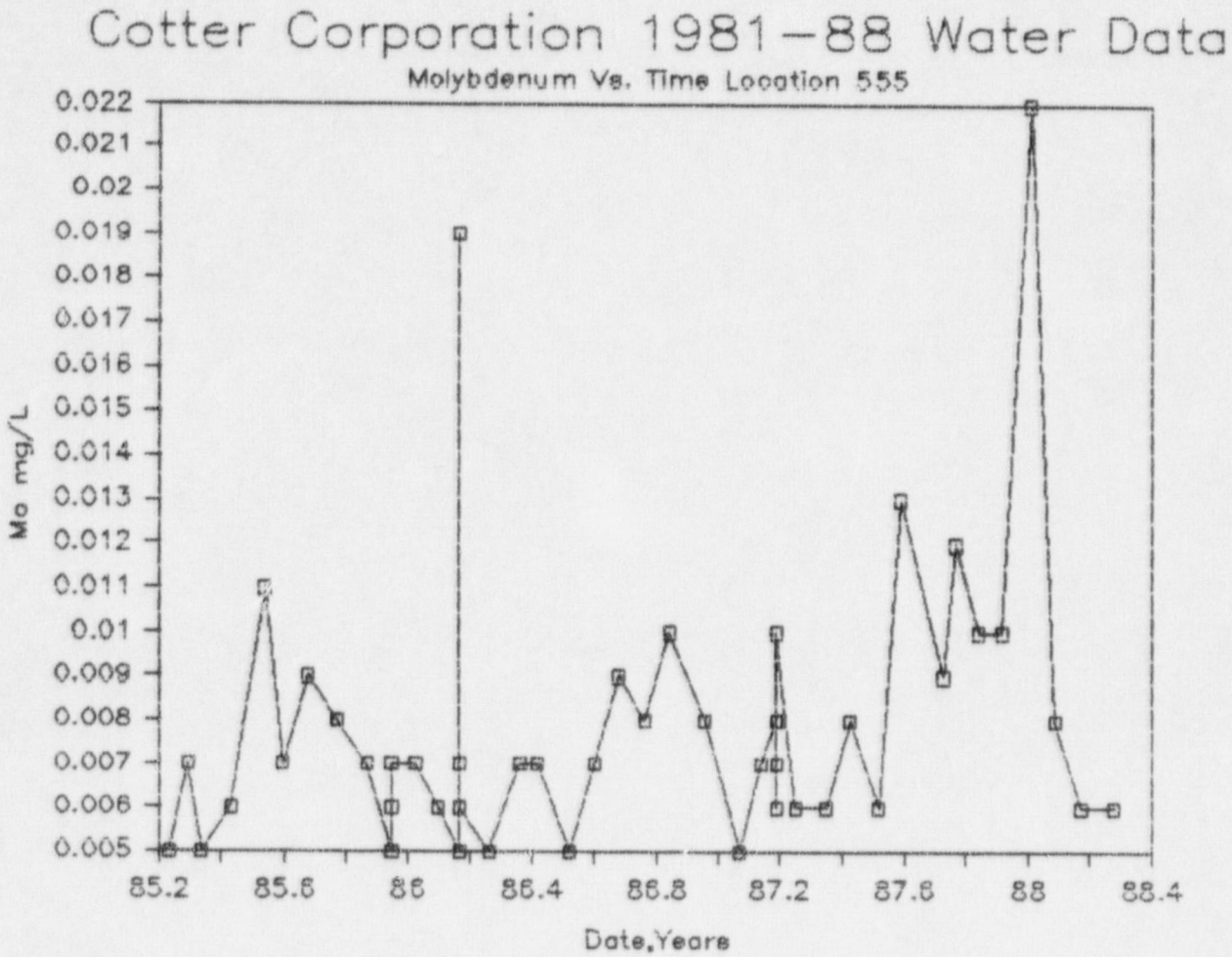

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 555
Mo mg/L
0.022
0.021
0.02
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
85.2
85.6
86
86.4
86.8
87.2
87.6
88
88.4
Date,Years

FIGURE 1.111

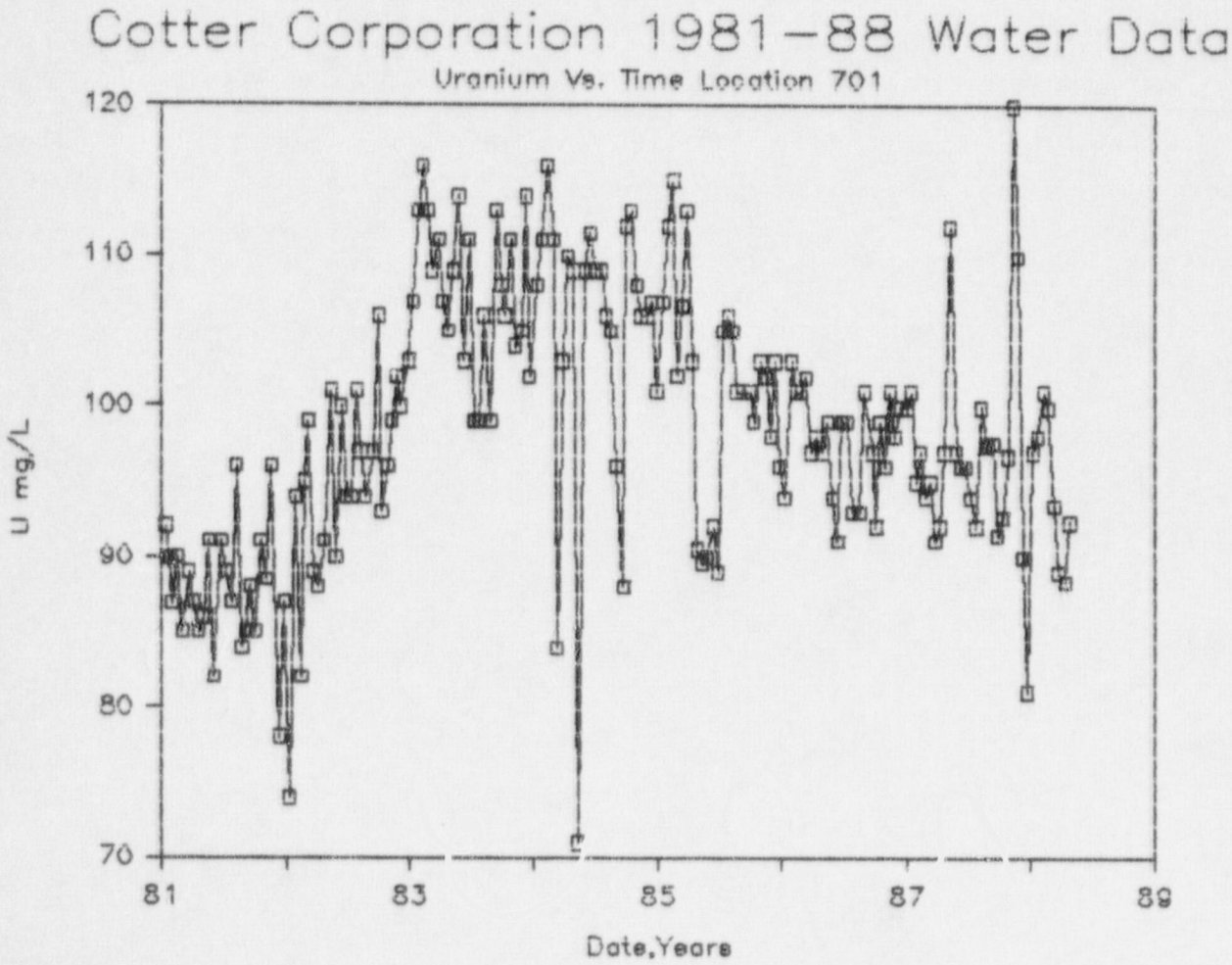

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 701
120
110
100
90
80
70
U mg/L
81
83
85
87
89
Date,Years

FIGURE 1.112

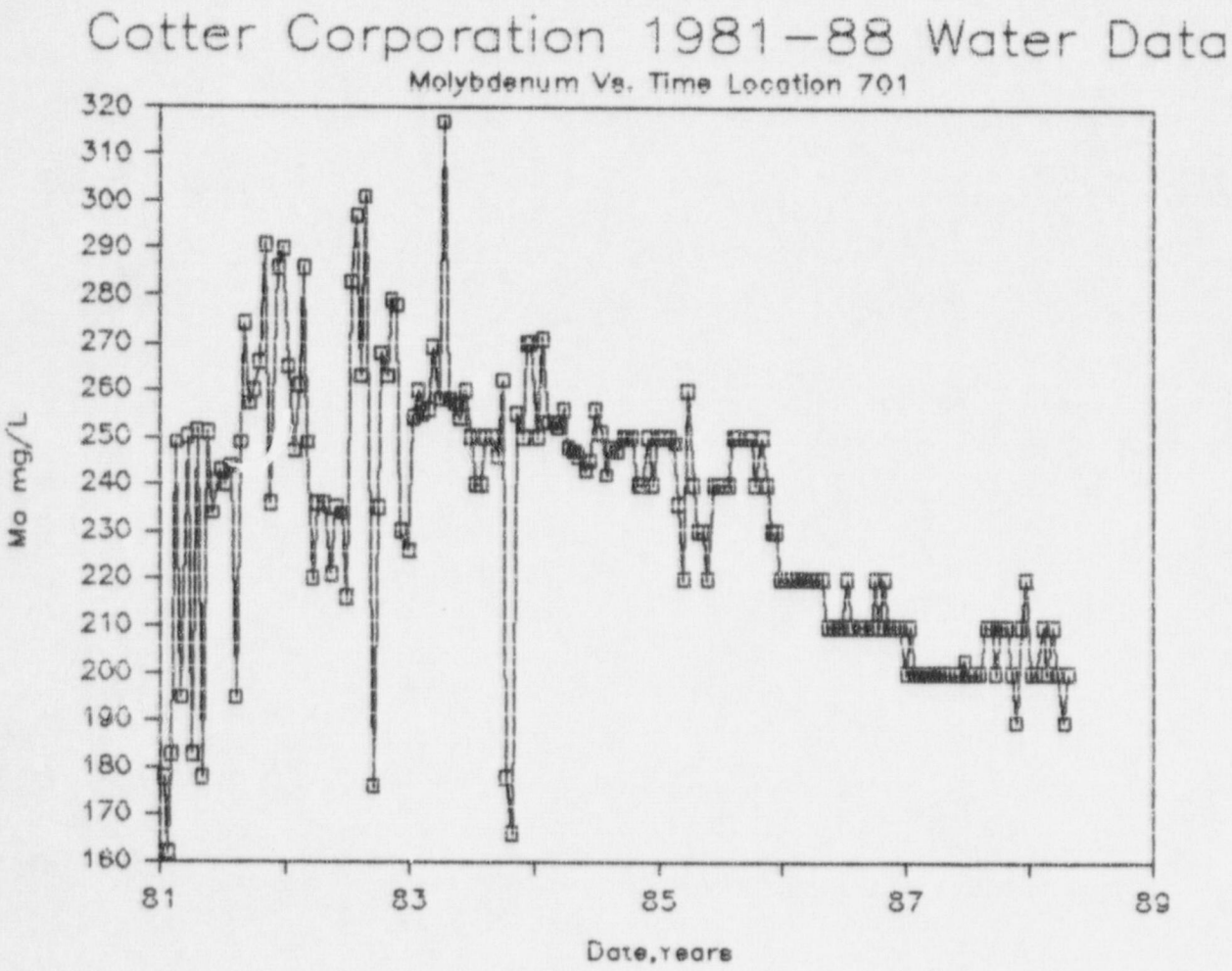

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 701
Mo mg/L
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
81
83
85
87
89
Date, Years

FIGURE 1.113

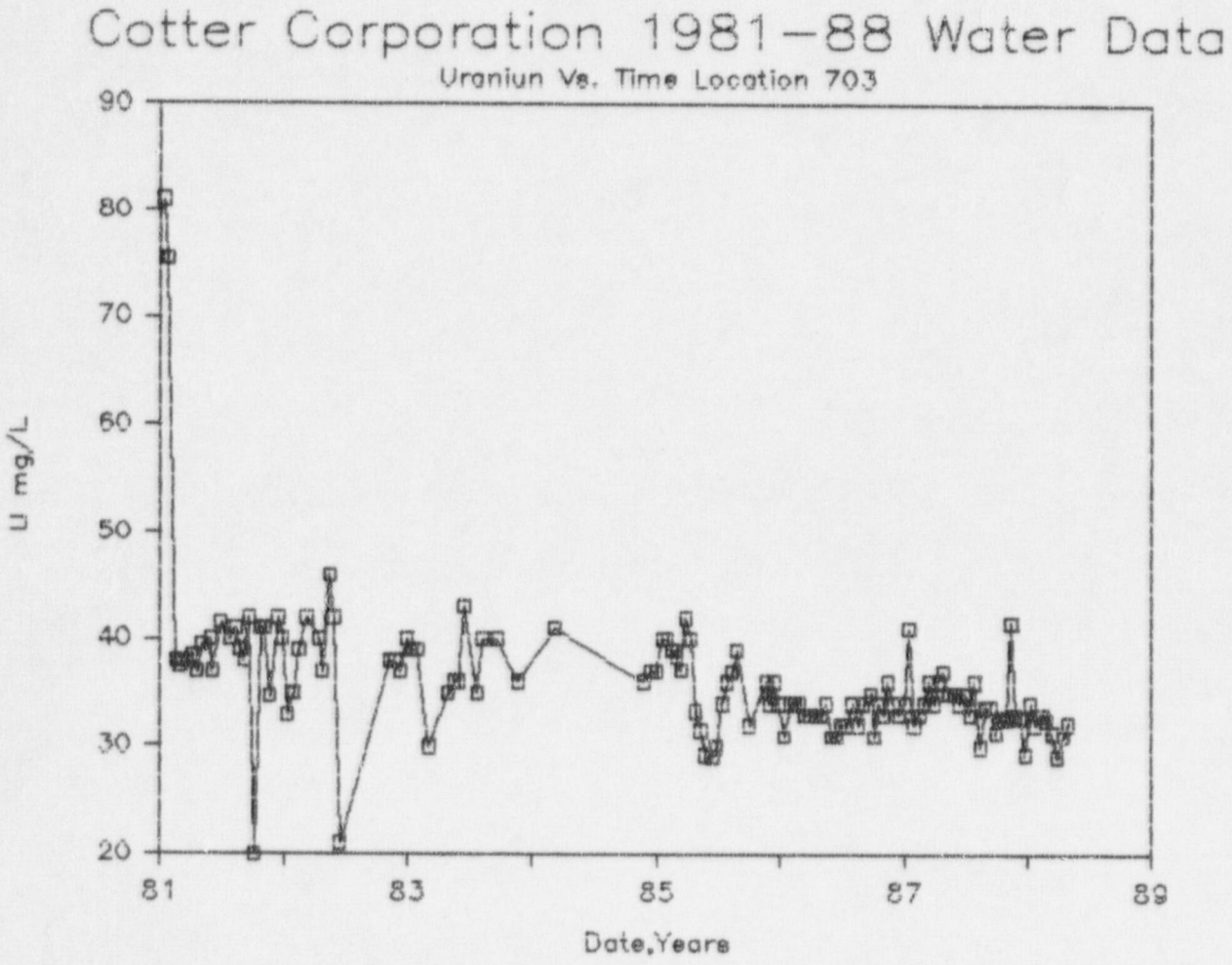

Cotter Corporation 1981-88 Water Data
Uraniun Vs. Time Location 703
U mg/L
90
80
70
60
50
40
30
20
81
83
85
87
89
Date,Years

FIGURE 1.114

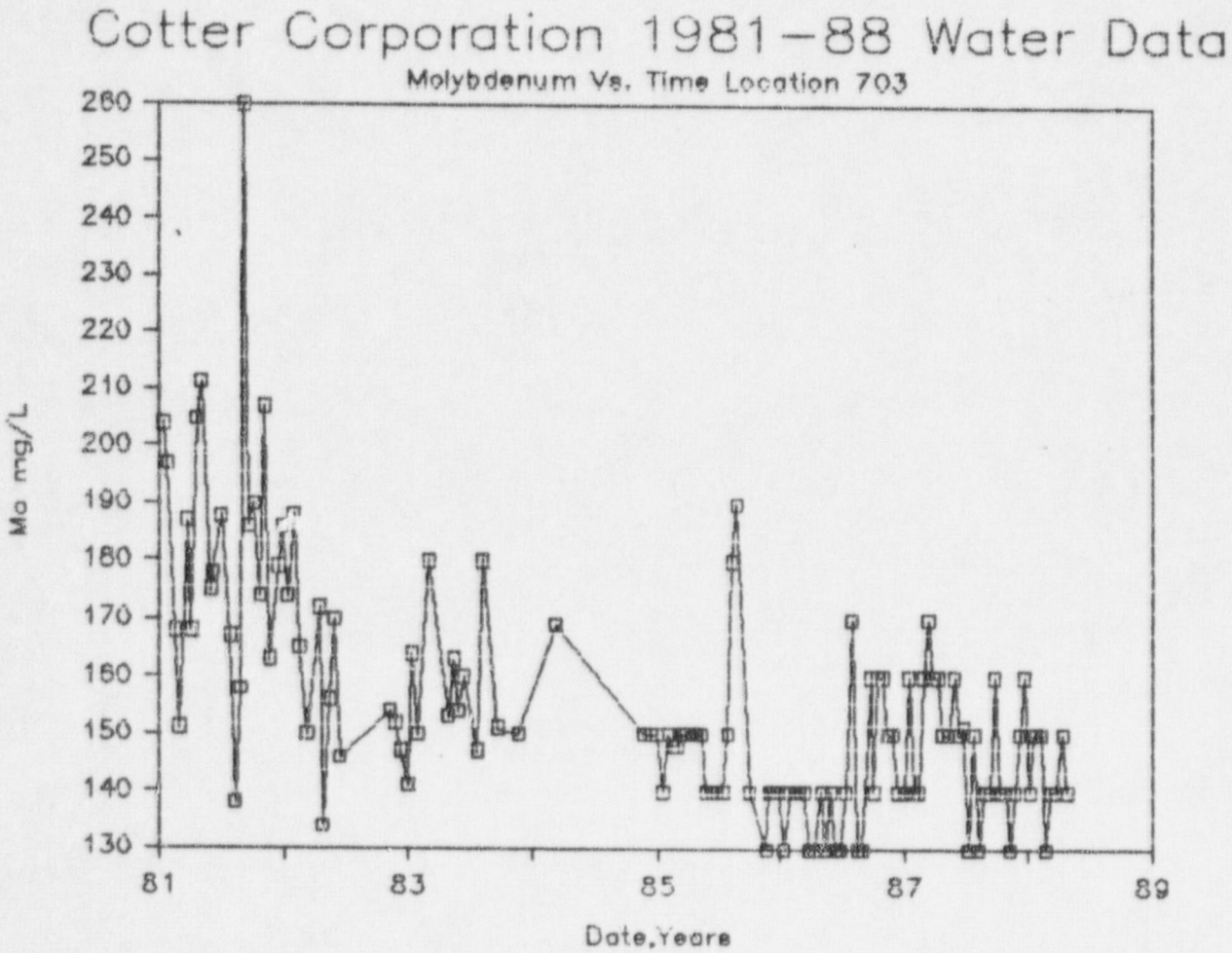

Cotter Corporation 1981-88 Water Data
Molybdenum Vs. Time Location 703
Mo mg/L
260
250
240
230
220
210
200
190
180
170
160
150
140
130
81
83
85
87
89
Date,Years

FIGURE 1.115

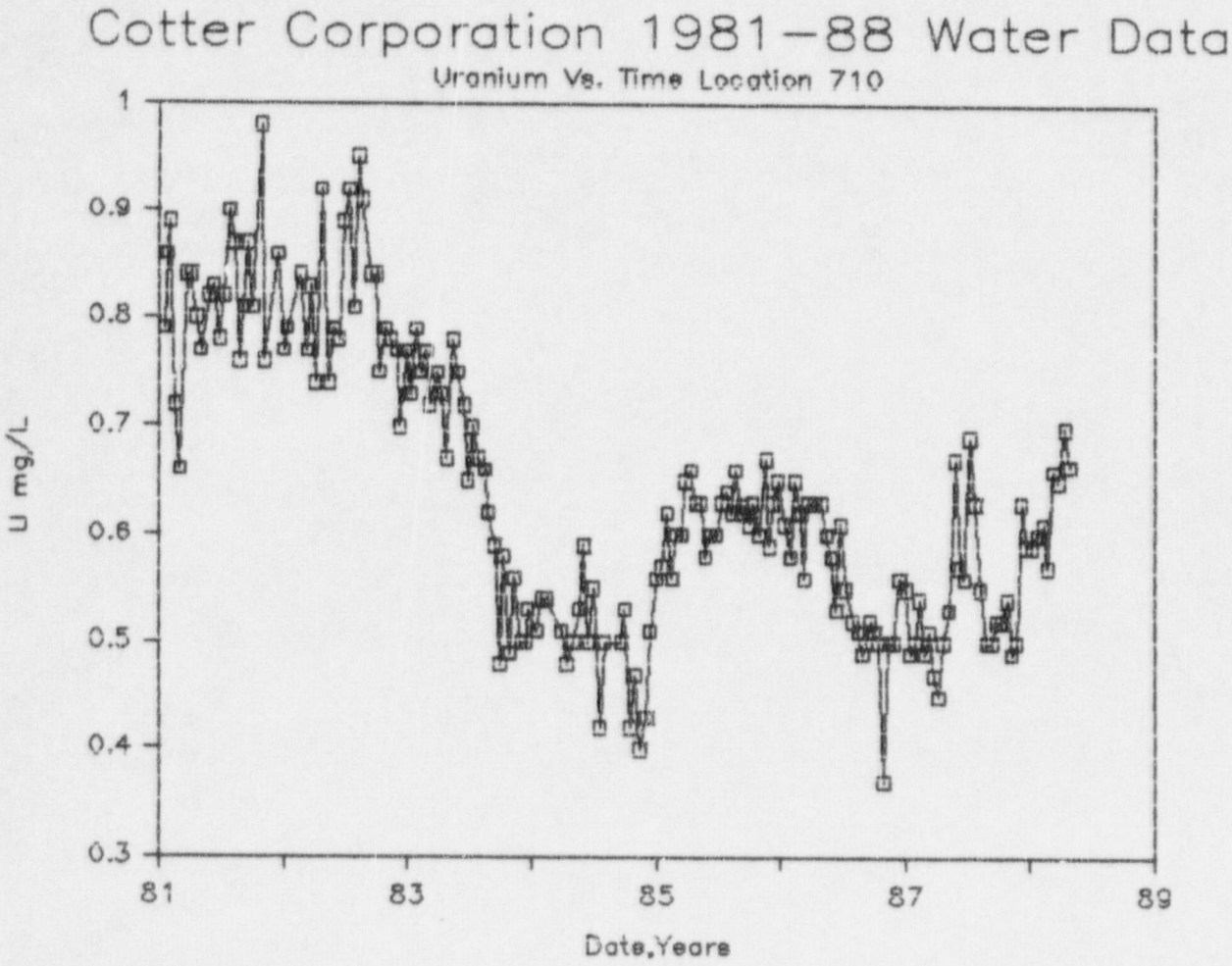

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 710
U mg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
81
83
85
87
89
Date,Years

FIGURE 1.116

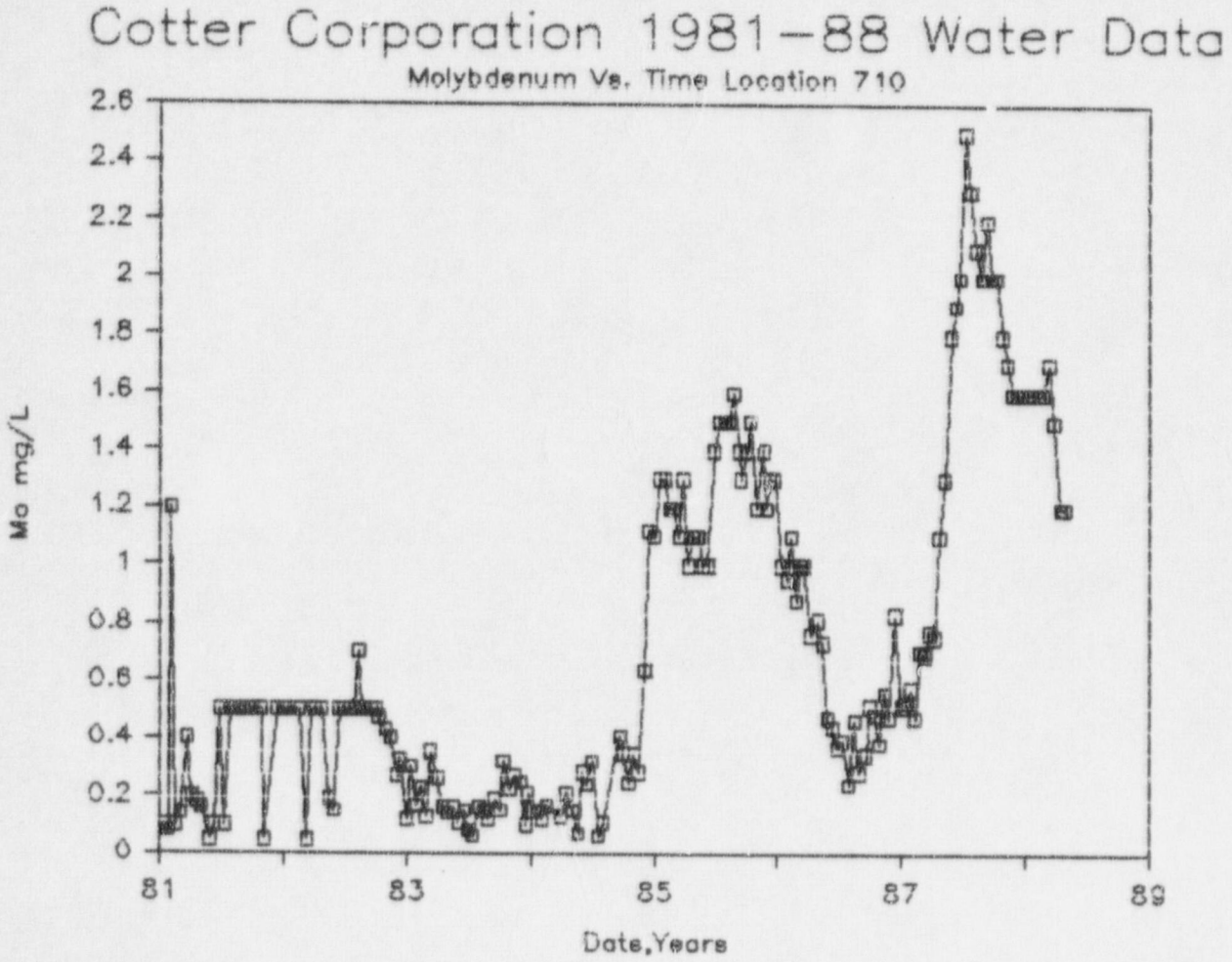

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 710
Mo mg/L
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
81
83
85
87
89
Date,Years

FIGURE 1.117

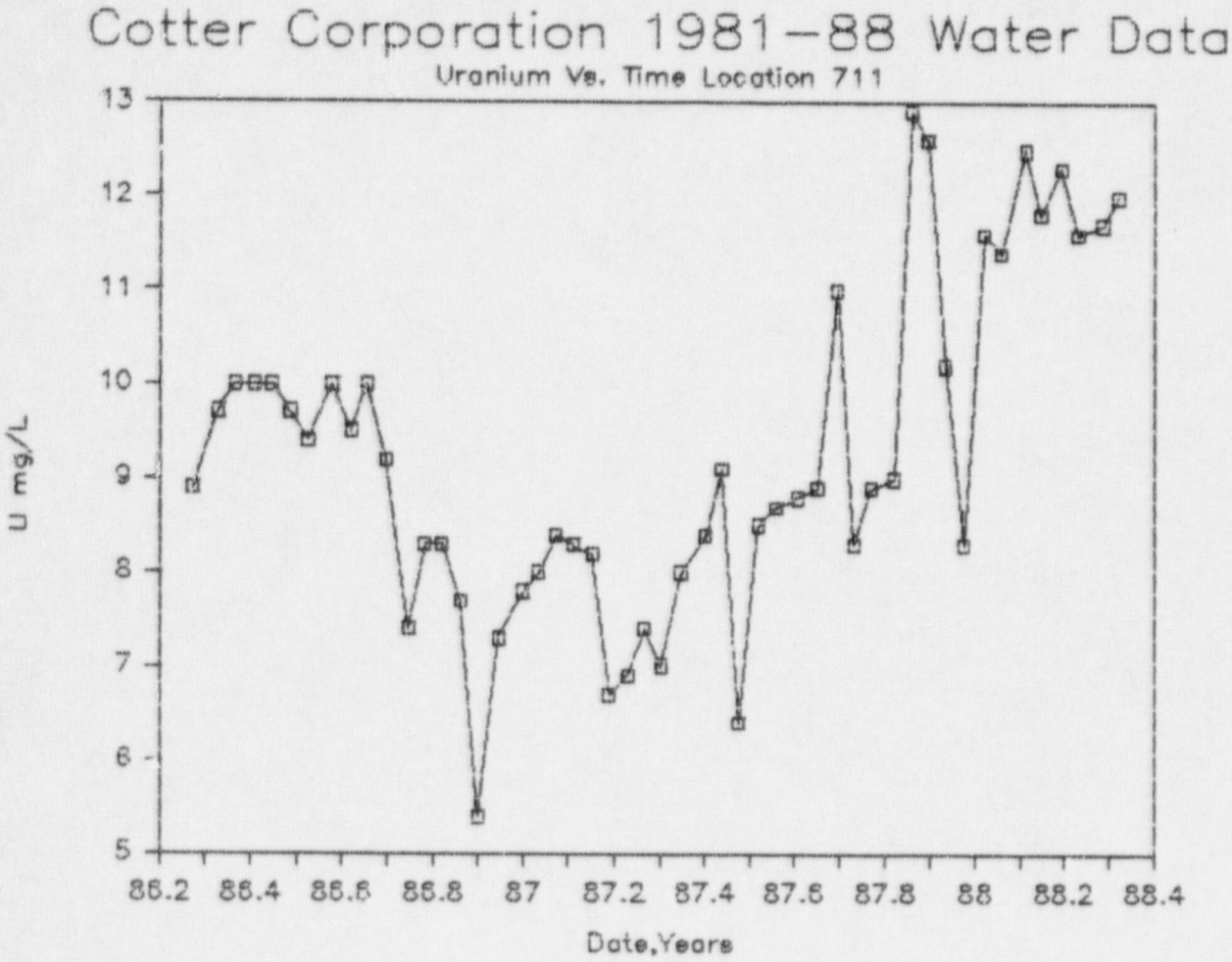

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 711
U mg/L
13
12
11
10
9
8
7
6
5
86.2
86.4
86.6
86.8
87
87.2
87.4
87.6
87.8
88
88.2
88.4
Date,Years

FIGURE 1.118

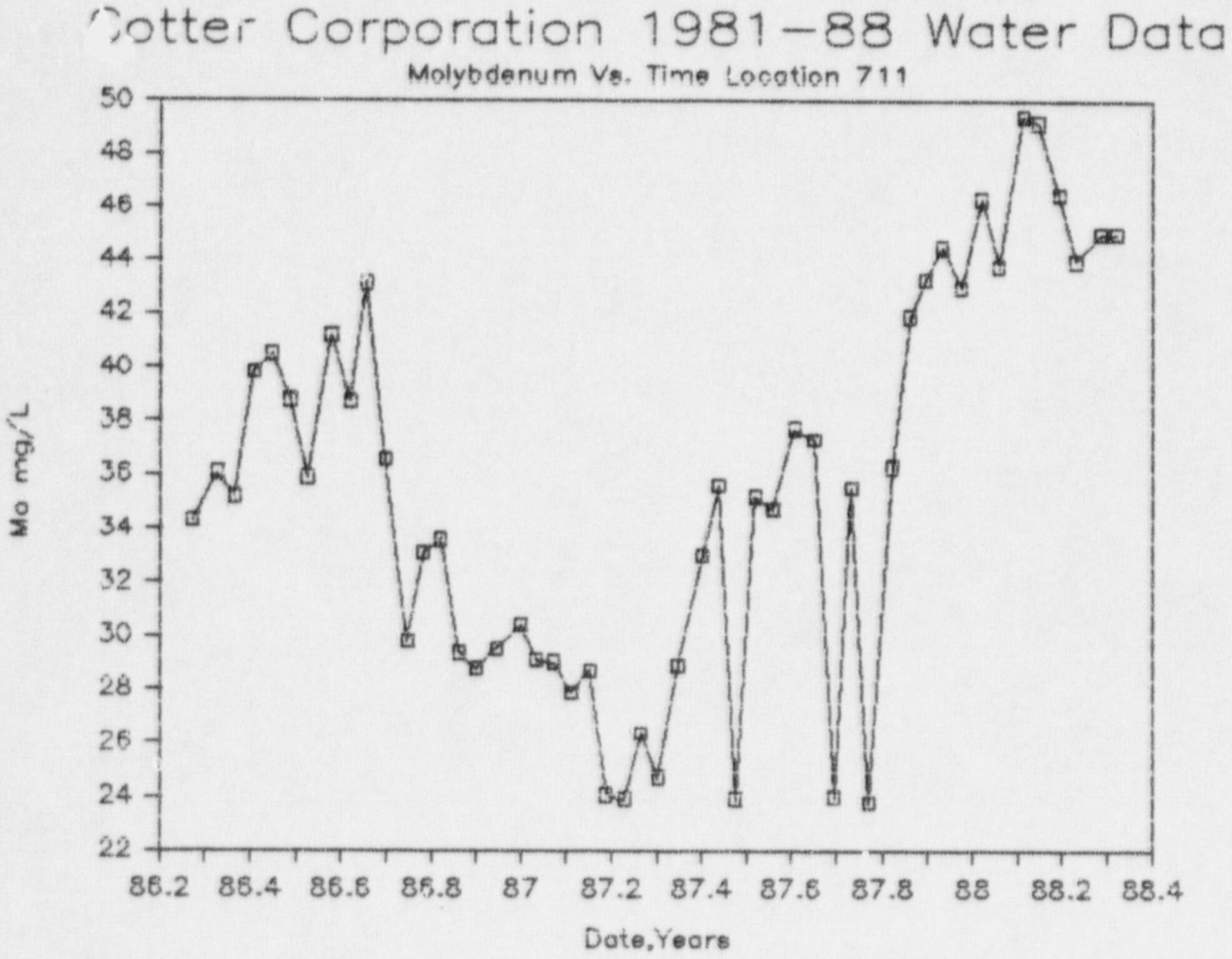

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 711
Mo mg/L
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
86.2
86.4
86.6
86.8
87
87.2
87.4
87.6
87.8
88
88.2
88.4
Date,Years

FIGURE 1.119

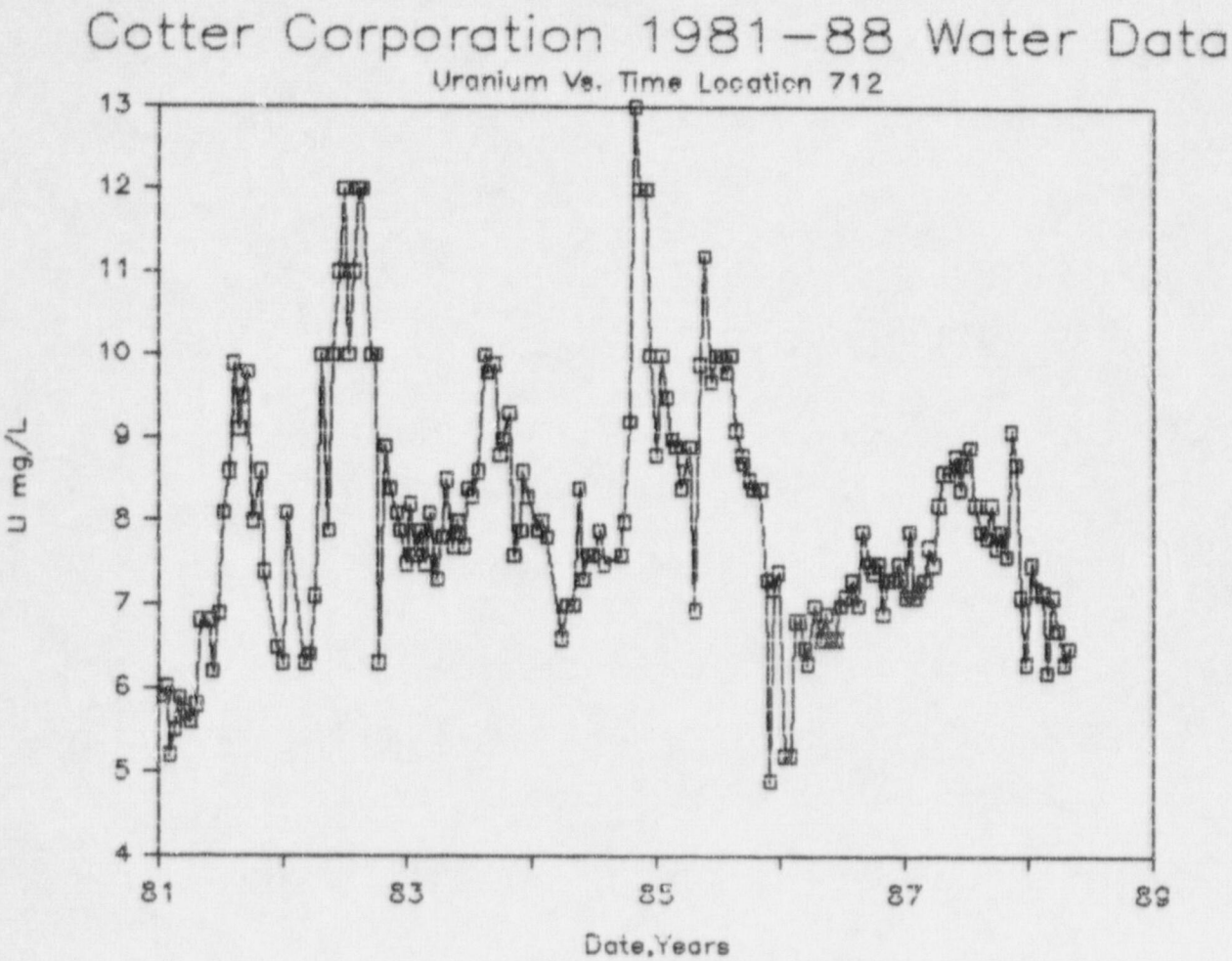

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 712
U mg/L
13
12
11
10
9
8
7
6
5
4
81
83
85
87
89
Date,Years

FIGURE 1.120

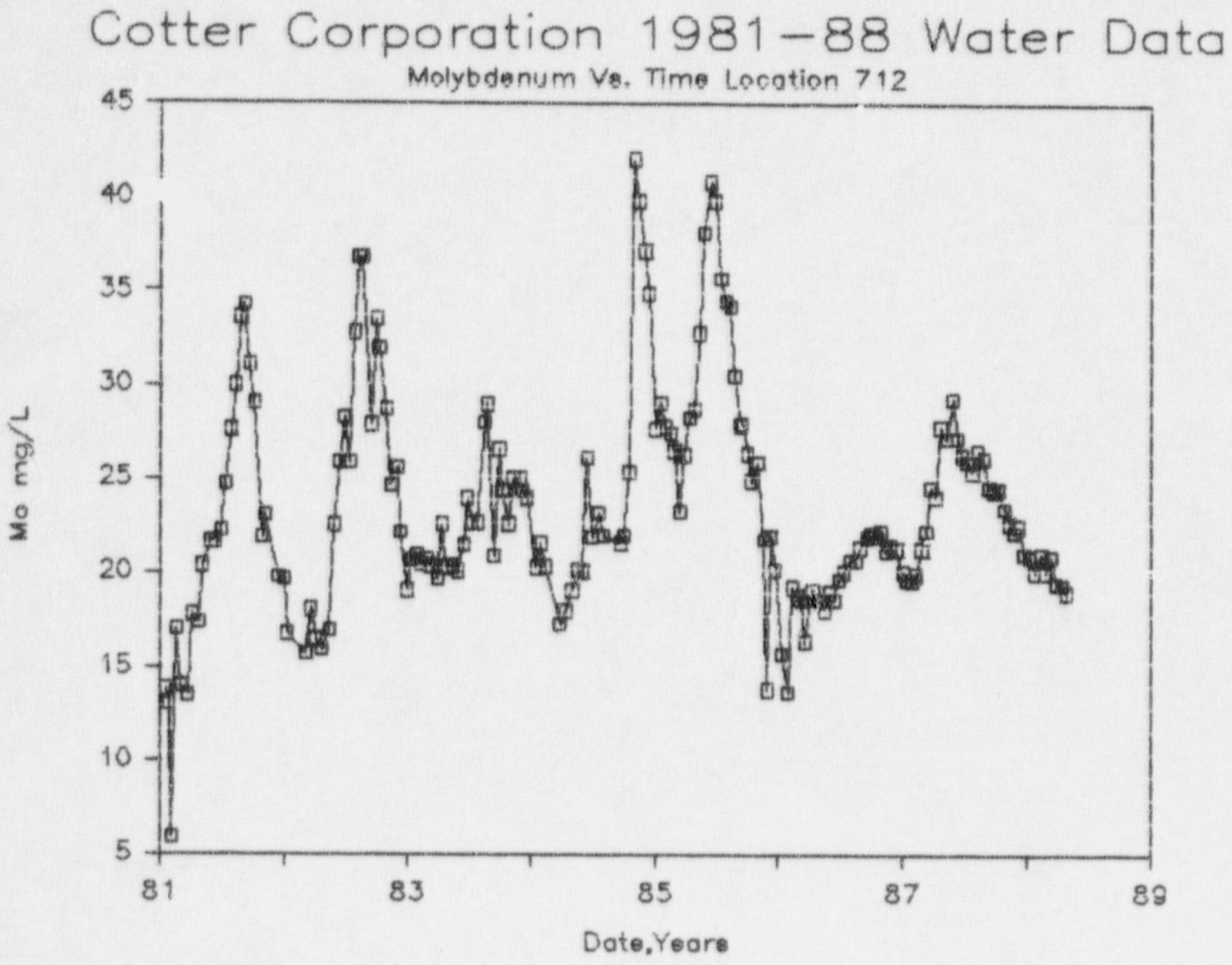

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 712
Mo mg/L
45
40
35
30
25
20
15
10
5
81
83
85
87
89
Date,Years

FIGURE 1.121

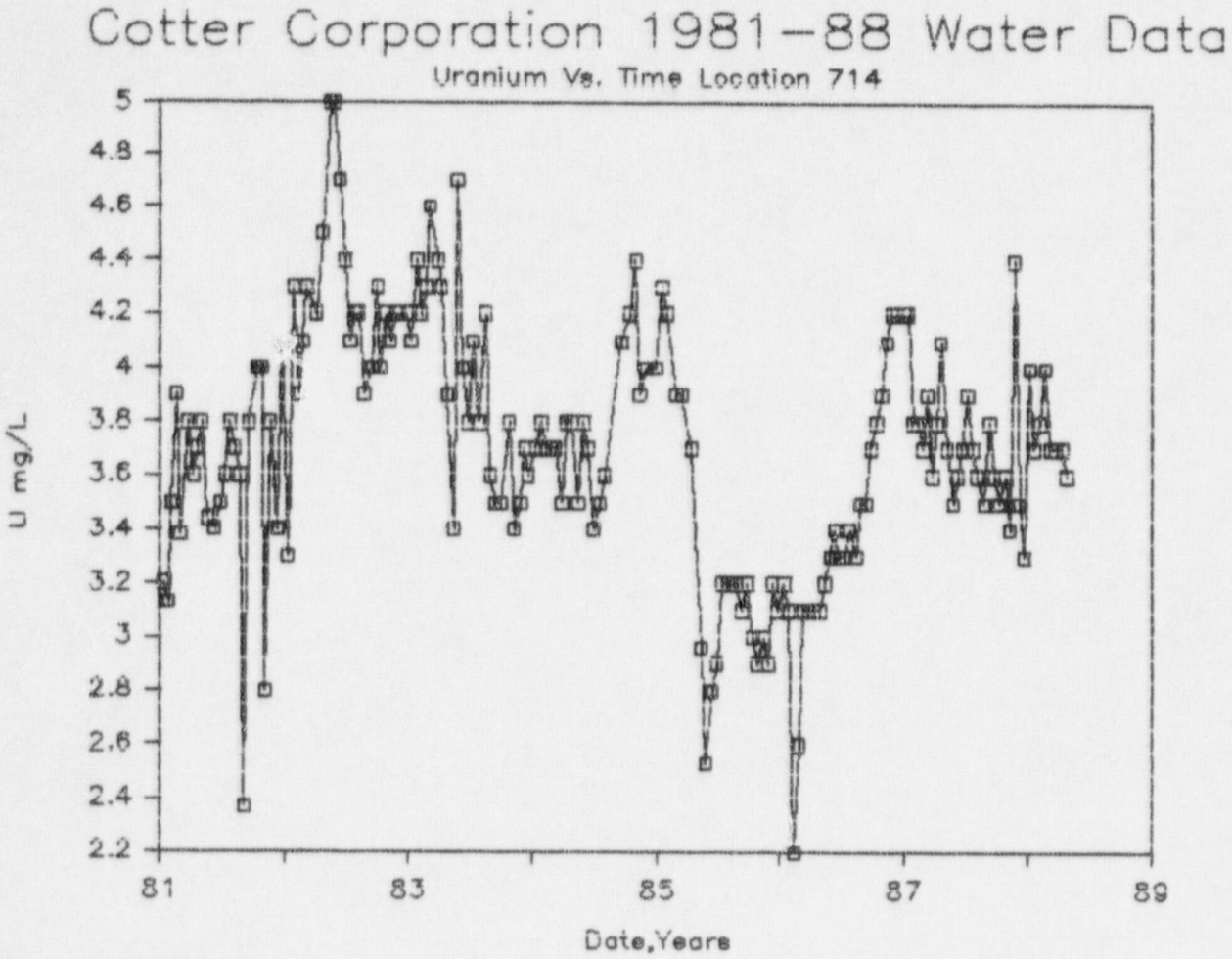

Cotter Corporation 1981-88 Water Data
Uranium Vs. Time Location 714
U mg/L
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
81
83
85
87
89
Date,Years

FIGURE 1.122

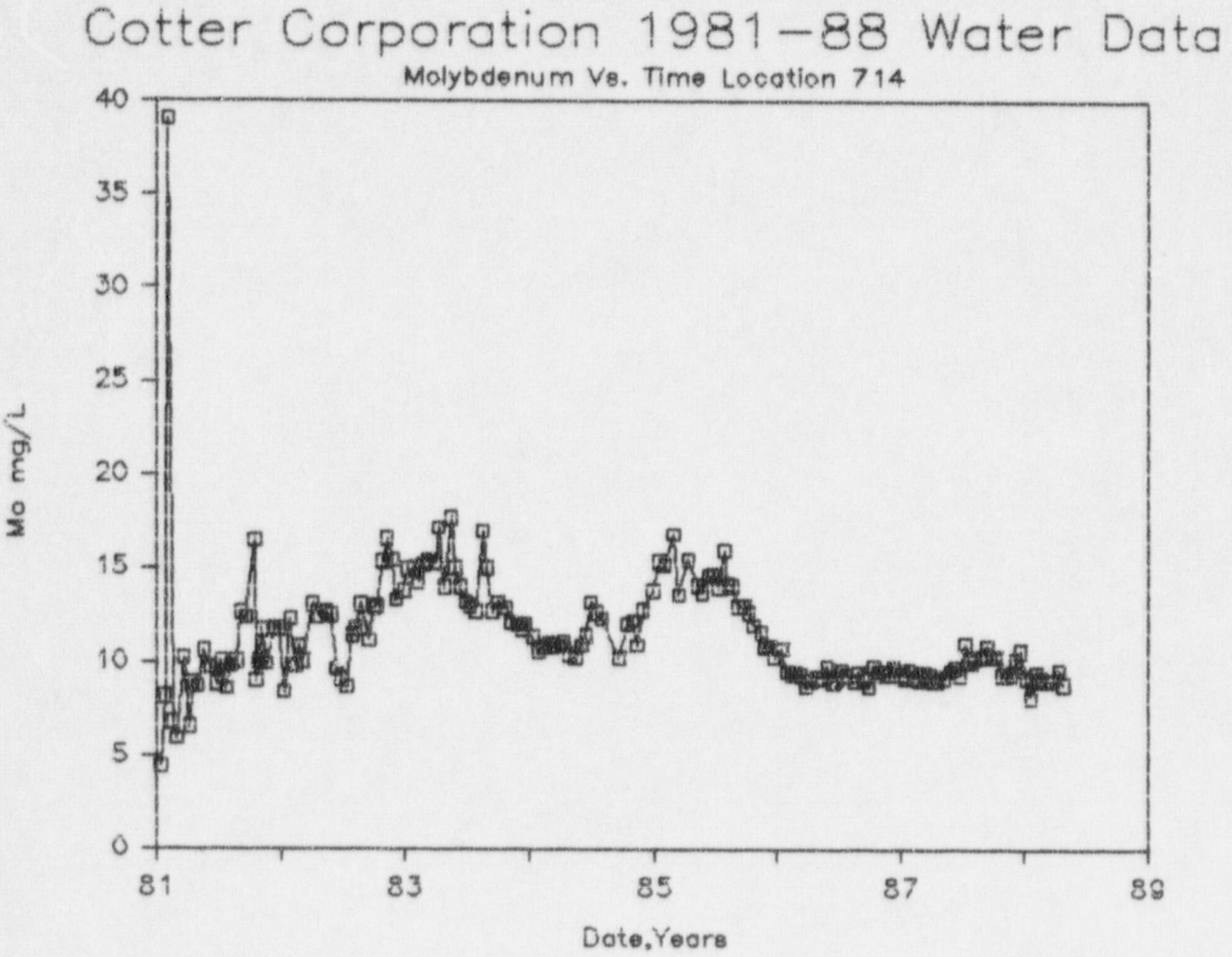

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 714
Mo mg/L
40
35
30
25
20
15
10
5
0
81
83
85
87
89
Date,Years

FIGURE 1.123

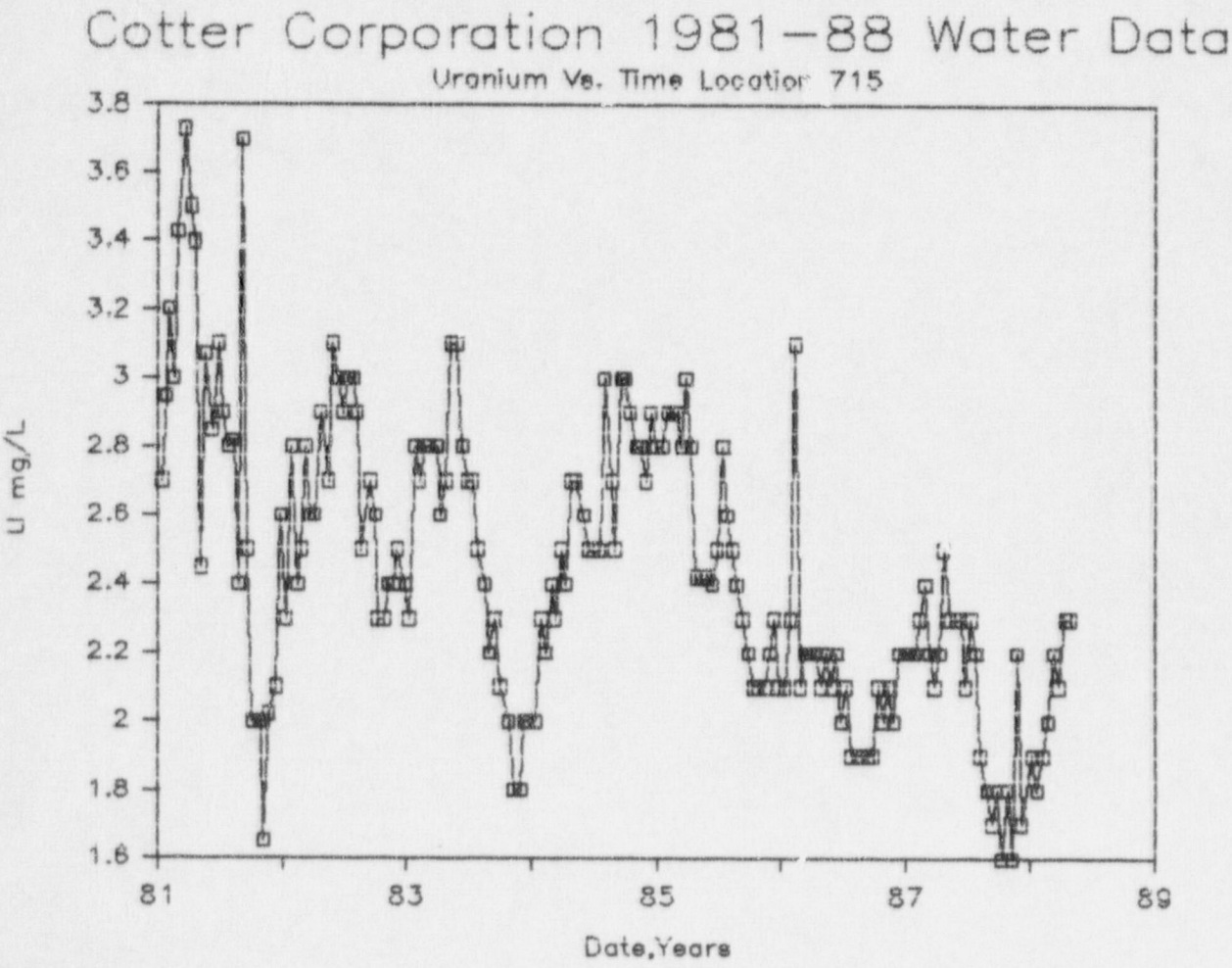

Cotter Corporation 1981–88 Water Data
Uranium Vs. Time Location 715
U mg/L
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
81
83
85
87
89
Date,Years

FIGURE 1.124

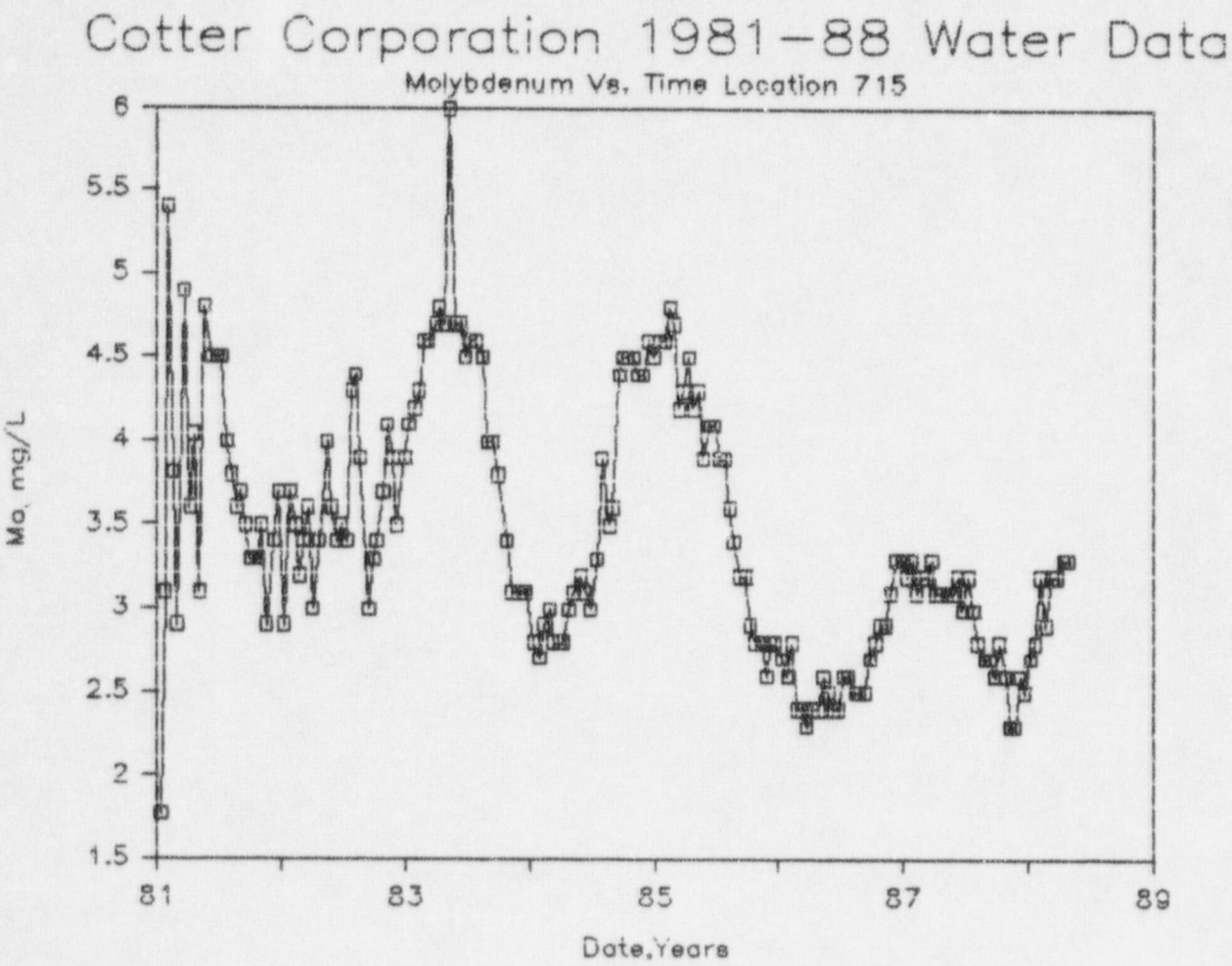

Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 715
Mo, mg/L
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
81
83
85
87
89
Date,Years

FIGURE 1.125

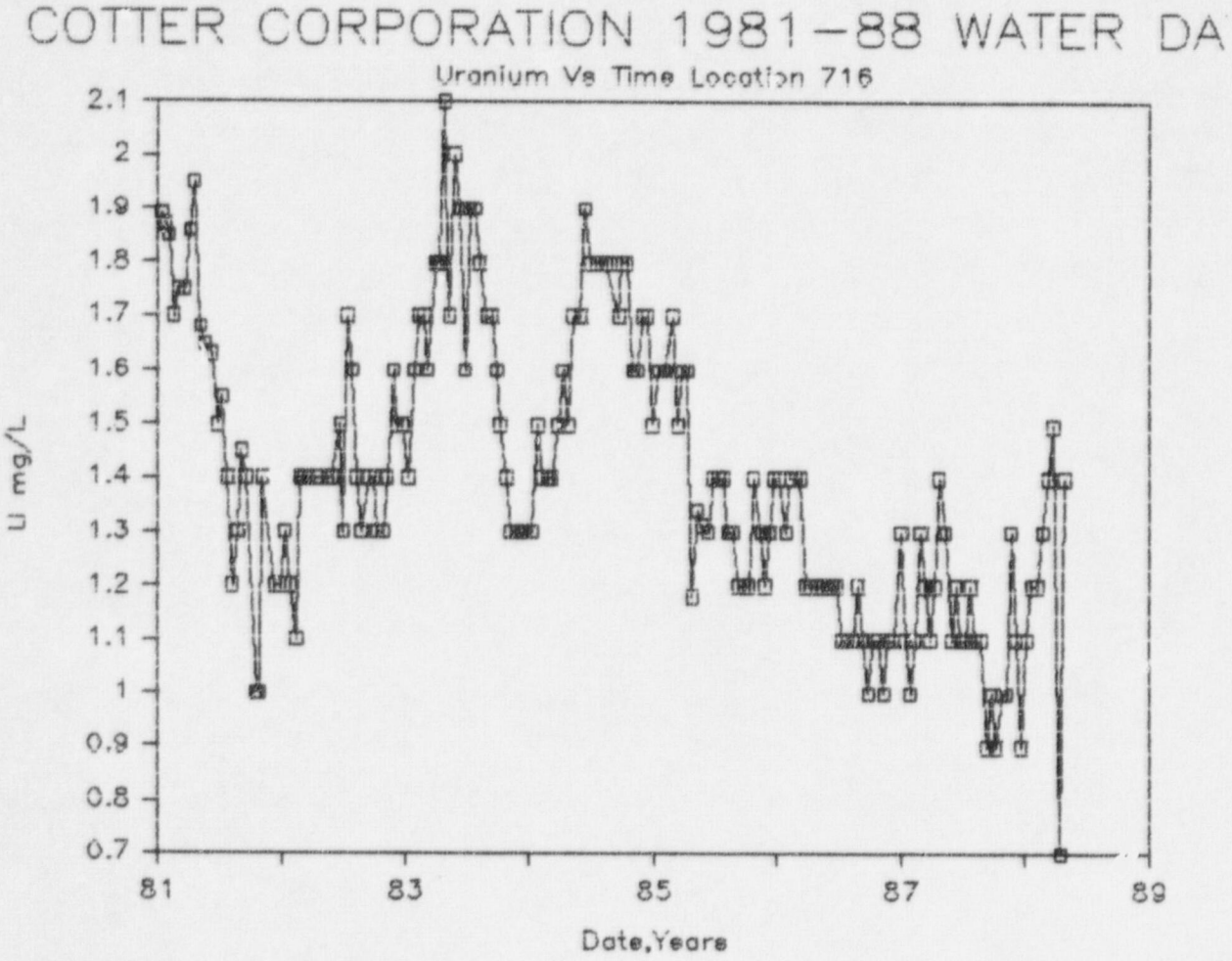
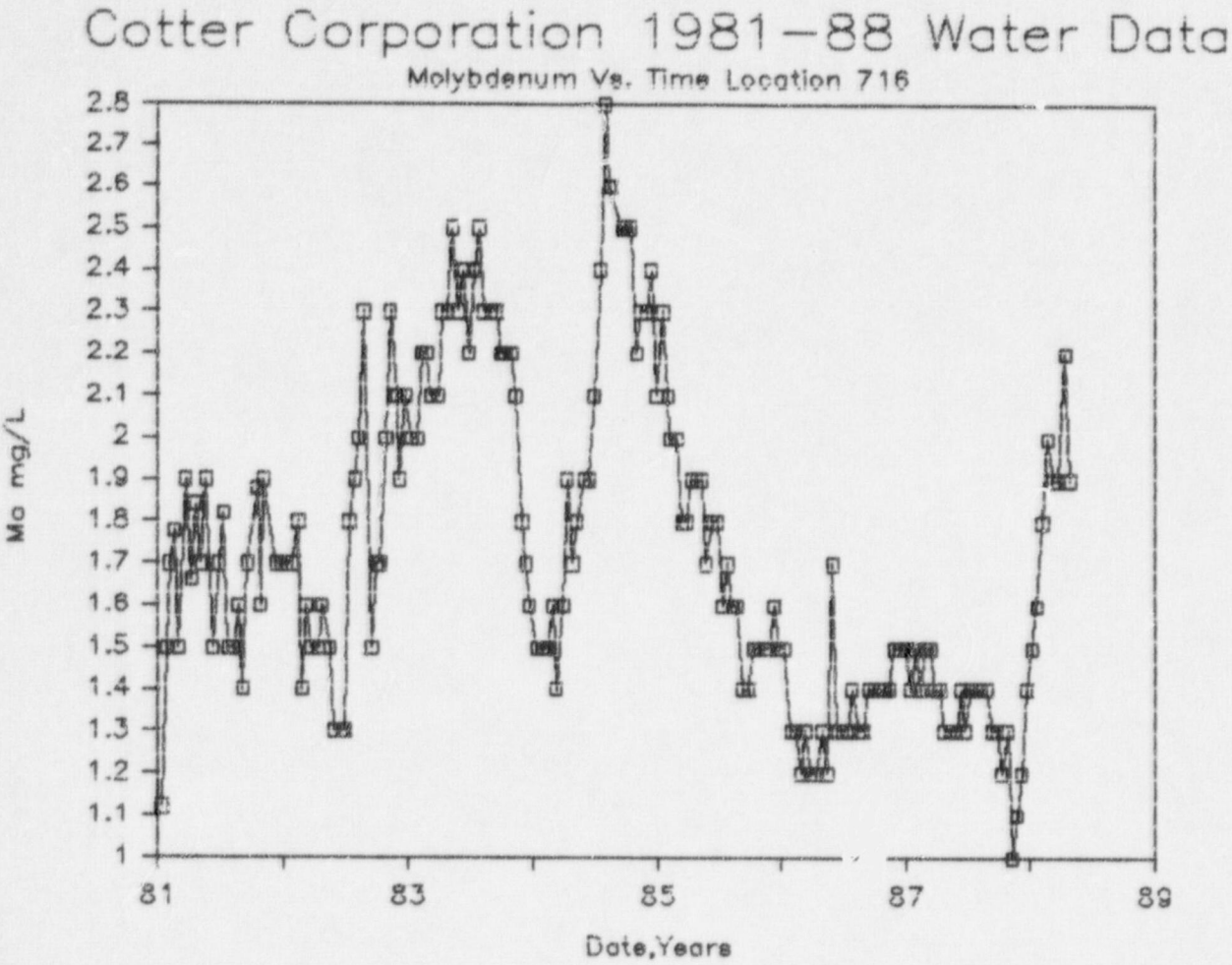

COTTER CORPORATION 1981-88 WATER DA
Uranium Vs Time Location 716
U mg/L
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
81
83
85
87
89
Date,Years

FIGURE 1.126


Cotter Corporation 1981–88 Water Data
Molybdenum Vs. Time Location 716
Mo mg/L
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
81
83
85
87
89
Date,Years

## 2.0 ALPHA MONITORING OF EQUIPMENT LEAVING THE MILL SITE - ANNUAL REPORT

LICENSE CONDITION 22.5

Cotter Corporation Radiation Safety personnel routinely conduct alpha monitoring surveys of equipment leaving the mill property (i.e., the restricted area). Orders were issued in 1980 specifying the maximum permissible limit for release (i.e. 1000 dpm/100cm$^2$) along with the procedure for security notification prior to equipment release. This information was cited in the 1980 annual report. A form is utilized for the release of equipment which documents the survey date, equipment description, maximum reading obtained and the signature of the surveyor. In 1988, 325 such surveys were conducted for equipment leaving the site.

In addition to the routine equipment surveys, alpha surveys were conducted on all contractor equipment that was used on site during the remedial action plan construction activities. Due to the detail required in these surveys, separate documentation was utilized for this purpose and the Company's security personnel were informed prior to the equipment leaving the site.

Cotter plans to continue the monitoring of equipment leaving the facility for alpha contamination in a continuing effort to control potential off-site contamination.

# 3.0 - PERSONNEL MONITORING SURVEYS, INSPECTIONS AND AUDITS - ANNUAL REPORT

## 3.1 - ALPHA CONTAMINATION SURVEYS (PERSONNEL)

LICENSE CONDITION 23.7 ALPHA CONTAMINATION SURVEYS

Personnel are monitored as required in connection with radiation work permits and spot surveys are conducted to monitor possible contamination of workers leaving the site.

A total of 459 spot surveys was performed in 1988. All surveys indicated contamination levels less than 1000 dpm/100cm$^2$. This represents a significant increase in spot surveys compared to previous years. This increase is due primarily to construction activities during the third and fourth quarters. During construction, it was required that approximately ten randomly selected construction employees be surveyed on a daily basis. Results of the spot surveys are presented in Table 3.1.

Cotter plans to continue the personnel alpha contamination survey program as required by license condition.

PROGRAM - LAB307
RUN DATE 02/28/89

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY (dpm/100cm**2) FOR 1988

| DATE | JOB DESCRIPTION | LEFT HAND | RIGHT HAND | LEFT FOOT | RIGHT FOOT |
|---|---|---|---|---|---|
| 03/29/88 | MAINTENANCE INSTRUME | 0 | 225 | 0 | 75 |
| 03/29/88 | MAINT ELECTRICIAN | 225 | 300 | 75 | 75 |
| 03/29/88 | LABORERS | 150 | 375 | 75 | 0 |
| 06/22/88 | SECURITY/SAFETY TECH | 0 | 0 | 83 | 166 |
| 06/23/88 | ANLYT NON SMPLE PREP | 0 | 0 | 525 | 700 |
| 06/23/88 | SECURITY/SAFETY TECH | 0 | 88 | 0 | 0 |
| 07/18/88 | GR. DIVIDE-SURVEYOR | 148 | 148 | 148 | 148 |
| 07/18/88 | GR. DIVIDE-SURVEYOR | 148 | 148 | 276 | 276 |
| 07/18/88 | GR. DIVIDE-SURVEYOR | 148 | 148 | 276 | 276 |
| 07/19/88 | GR. DIVIDE-SURVEYOR | 158 | 158 | 711 | 711 |
| 07/19/88 | GR. DIVIDE-SURVEYOR | 474 | 474 | 632 | 632 |
| 07/19/88 | GR. DIVIDE-SURVEYOR | 316 | 316 | 780 | 780 |
| 07/20/88 | GR. DIVIDE-SURVEYOR | 632 | 632 | NA | NA |
| 07/20/88 | GR. DIVIDE-SURVEYOR | 553 | 553 | NA | NA |
| 07/20/88 | GR. DIVIDE-SURVEYOR | 395 | 395 | NA | NA |
| 07/21/88 | NIELSONS-OPERATORS | 237 | 237 | 553 | 553 |
| 07/21/88 | NIELSONS-LABORERS | 316 | 316 | 474 | 474 |
| 07/22/88 | GR. DIVIDE-SURVEYOR | 316 | 316 | 553 | 553 |
| 07/22/88 | GR. DIVIDE-SURVEYOR | 237 | 237 | 474 | 474 |
| 07/22/88 | GR. DIVIDE-SURVEYOR | 395 | 395 | 474 | 474 |
| 07/22/88 | NIELSONS-PROJECT SUP | 375 | 375 | 355 | 355 |
| 07/22/88 | NIELSONS-OPERATORS | 632 | 632 | 237 | 237 |
| 07/22/88 | NIELSONS-LABORERS | 158 | 158 | 316 | 316 |
| 07/25/88 | GR. DIVIDE-SURVEYOR | 444 | 444 | 444 | 444 |
| 07/25/88 | GR. DIVIDE-SURVEYOR | 395 | 395 | 474 | 474 |
| 07/25/88 | GR. DIVIDE-SURVEYOR | 296 | 296 | 444 | 444 |
| 07/25/88 | NIELSONS-PROJECT ENG | 370 | 370 | 444 | 444 |
| 07/25/88 | NIELSONS-OPERATORS | 592 | 592 | 592 | 592 |
| 07/25/88 | NIELSONS-LABORERS | 670 | 670 | 518 | 518 |
| 07/26/88 | GR. DIVIDE-SURVEYOR | 148 | 148 | 814 | 814 |
| 07/26/88 | GR. DIVIDE-SURVEYOR | 888 | 888 | 740 | 740 |
| 07/26/88 | GR. DIVIDE-SURVEYOR | 444 | 444 | 740 | 740 |
| 07/26/88 | NIELSONS-LABORERS | 296 | 296 | 518 | 518 |
| 07/27/88 | GR. DIVIDE-SURVEYOR | 450 | 450 | 525 | 525 |
| 07/27/88 | CHEN & ASSO.-TESTERS | 150 | 150 | 300 | 300 |
| 07/27/88 | NIELSONS-FOREMEN | 562 | 562 | 675 | 675 |
| 07/27/88 | NIELSONS-WATER WAGON | 600 | 600 | 750 | 750 |
| 07/27/88 | NIELSONS-OPERATORS | 225 | 225 | 750 | 750 |
| 07/27/88 | NIELSONS-OPERATORS | 300 | 300 | 450 | 450 |
| 07/27/88 | NIELSONS-OPERATORS | 150 | 150 | 450 | 450 |
| 07/27/88 | NIELSONS-OPERATORS | 375 | 375 | 450 | 450 |
| 07/27/88 | NIELSONS-GR. CHECKER | 600 | 600 | 600 | 600 |
| 07/27/88 | GR. DIVIDE-SURVEYOR | 675 | 675 | 300 | 300 |
| 07/27/88 | GR. DIVIDE-SURVEYOR | 225 | 225 | 525 | 525 |
| 07/28/88 | MILL FMAN-RAP QA/QC | 60 | 60 | 80 | 55 |
| 07/28/88 | GR. DIVIDE-SURVEYOR | 256 | 256 | 384 | 384 |
| 07/28/88 | GR. DIVIDE-SURVEYOR | 256 | 256 | 384 | 384 |
| 07/28/88 | GR. DIVIDE-SURVEYOR | 512 | 512 | 384 | 384 |
| 07/28/88 | COLOG, INC. WELL LOG | 384 | 384 | 384 | 384 |
| 07/28/88 | NIELSONS-PROJECT SUP | 352 | 352 | 512 | 512 |
| 07/28/88 | NIELSONS-PROJECT ENG | 97 | 97 | 128 | 128 |
| 07/28/88 | NIELSONS-SPECIALISTS | 96 | 96 | 128 | 128 |
| 07/28/88 | NIELSONS-MECHANIC | 256 | 256 | 416 | 416 |
| 07/28/88 | NIELSONS-OPERATORS | 256 | 256 | 512 | 512 |

PROGRAM - LAB307
RUN DATE 02/28/89

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY (dpm/100cm**2) FOR 1988

| DATE | JOB DESCRIPTION | LEFT HAND | RIGHT HAND | LEFT FOOT | RIGHT FOOT |
|---|---|---|---|---|---|
| 07/28/88 | NIELSONS-OPERATORS | 512 | 512 | 384 | 384 |
| 07/28/88 | NIELSONS-OPERATORS | 128 | 128 | 128 | 128 |
| 07/28/88 | NIELSONS-LABORERS | 384 | 384 | 512 | 512 |
| 07/28/88 | NIELSONS-OILERS | 320 | 320 | 768 | 768 |
| 07/29/88 | NIELSONS-OPERATORS | 384 | 384 | 128 | 128 |
| 07/29/88 | NIELSONS-OPERATORS | 256 | 256 | 384 | 384 |
| 07/29/88 | NIELSONS-OPERATORS | 256 | 256 | 960 | 960 |
| 07/29/88 | NIELSONS-OPERATORS | 256 | 256 | 684 | 684 |
| 07/29/88 | NIELSONS-LABORERS | 256 | 256 | 448 | 448 |
| 08/01/88 | COLOG, INC. WELL LOG | 96 | 96 | 320 | 320 |
| 08/01/88 | NIELSONS-OPERATORS | 120 | 120 | 480 | 480 |
| 08/01/88 | NIELSONS-OPERATORS | 80 | 80 | 400 | 400 |
| 08/01/88 | NIELSONS-LABORERS | 0 | 0 | 160 | 160 |
| 08/02/88 | GR. DIVIDE-SURVEYOR | 74 | 74 | 37 | 37 |
| 08/02/88 | GR. DIVIDE-SURVEYOR | 37 | 37 | 37 | 37 |
| 08/02/88 | NIELSONS-WATER WAGON | 296 | 296 | 74 | 74 |
| 08/02/88 | NIELSONS-OPERATORS | 44 | 44 | 148 | 148 |
| 08/02/88 | NIELSONS-LABORERS | 22 | 22 | 29 | 29 |
| 08/02/88 | NIELSONS-LABORERS | 29 | 29 | 118 | 118 |
| 08/02/88 | GR. DIVIDE-SURVEYOR | 0 | 0 | 74 | 74 |
| 08/03/88 | YOUNG DRLG.-DRILLERS | 27 | 27 | 41 | 41 |
| 08/03/88 | COLOG, INC. WELL LOG | 137 | 137 | 150 | 150 |
| 08/03/88 | NIELSONS-OPERATORS | 274 | 274 | 150 | 150 |
| 08/03/88 | NIELSONS-OPERATORS | 41 | 41 | 123 | 123 |
| 08/03/88 | NIELSONS-LABORERS | 123 | 123 | 68 | 68 |
| 08/04/88 | RAP OS COORD HPR-CDH | 74 | 74 | 51 | 51 |
| 08/04/88 | RAP ONSC COOR-CDH | 88 | 88 | 44 | 44 |
| 08/04/88 | RAP CONSTRUCTION ACT | 29 | 29 | 59 | 59 |
| 08/04/88 | RAP OS COORD HPR-CDH | 148 | 148 | 148 | 148 |
| 08/04/88 | RAP ONSC COOR-CDH | 111 | 111 | 296 | 296 |
| 08/04/88 | YOUNG DRLG.-DRILLERS | 74 | 74 | 44 | 44 |
| 08/04/88 | COLOG, INC. WELL LOG | 20 | 20 | 118 | 118 |
| 08/04/88 | COLOG, INC. WELL LOG | 44 | 44 | 22 | 22 |
| 08/04/88 | NIELSONS-WATER WAGON | 29 | 29 | 133 | 133 |
| 08/04/88 | NIELSONS-OPERATORS | 0 | 0 | 29 | 29 |
| 08/04/88 | NIELSONS-OPERATORS | 37 | 37 | 162 | 162 |
| 08/04/88 | NIELSONS-OPERATORS | 44 | 44 | 138 | 138 |
| 08/04/88 | NIELSONS-LABORERS | 44 | 44 | 140 | 140 |
| 08/05/88 | GR. DIVIDE-SURVEYOR | 222 | 222 | 296 | 296 |
| 08/05/88 | GR. DIVIDE-SURVEYOR | 74 | 74 | 222 | 222 |
| 08/05/88 | GR. DIVIDE-SURVEYOR | 296 | 296 | 148 | 148 |
| 08/05/88 | NIELSONS-OPERATORS | 287 | 287 | 148 | 148 |
| 08/05/88 | NIELSONS-GR. CHECKER | 222 | 222 | 518 | 518 |
| 08/08/88 | YOUNG DRLG.-DRILLERS | 384 | 384 | 128 | 128 |
| 08/08/88 | NIELSONS-FOREMEN | 640 | 640 | 384 | 384 |
| 08/08/88 | NIELSONS-OPERATORS | 192 | 192 | 320 | 320 |
| 08/08/88 | NIELSONS-OPERATORS | 192 | 192 | 448 | 448 |
| 08/09/88 | NIELSONS-OPERATORS | 370 | 370 | 518 | 518 |
| 08/09/88 | NIELSONS-OPERATORS | 592 | 592 | 296 | 296 |
| 08/09/88 | GR. DIVIDE-SURVEYOR | 444 | 444 | 370 | 370 |
| 08/09/88 | GR. DIVIDE-SURVEYOR | 590 | 590 | 296 | 296 |
| 08/09/88 | GR. DIVIDE-SURVEYOR | 296 | 296 | 222 | 222 |
| 08/10/88 | GR. DIVIDE-SURVEYOR | 444 | 444 | 962 | 962 |
| 08/10/88 | NIELSONS-MECHANIC | 444 | 444 | 888 | 888 |

PROGRAM - LAB307
RUN DATE 02/28/89

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY (dpm/100cm**2) FOR 1988

| DATE | JOB DESCRIPTION | LEFT HAND | RIGHT HAND | LEFT FOOT | RIGHT FOOT |
|---|---|---|---|---|---|
| 08/10/88 | NIELSONS-OPERATORS | 370 | 370 | 444 | 444 |
| 08/10/88 | NIELSONS-OPERATORS | 370 | 370 | 592 | 592 |
| 08/10/88 | NIELSONS-OPERATORS | 592 | 592 | 740 | 740 |
| 08/11/88 | GR. DIVIDE-SURVEYOR | 222 | 222 | 296 | 296 |
| 08/11/88 | NIELSONS-OPERATORS | 592 | 592 | 222 | 222 |
| 08/11/88 | NIELSONS-OPERATORS | 222 | 222 | 148 | 148 |
| 08/11/88 | NIELSONS-OPERATORS | 148 | 148 | 222 | 222 |
| 08/11/88 | NIELSONS-LABORERS | 148 | 148 | 296 | 296 |
| 08/12/88 | RAP CONSTRUCTION ACT | 142 | 142 | 284 | 284 |
| 08/12/88 | GR. DIVIDE-SURVEYOR | 142 | 142 | 142 | 142 |
| 08/12/88 | GR. DIVIDE-SURVEYOR | 142 | 142 | 284 | 284 |
| 08/12/88 | GR. DIVIDE-SURVEYOR | 142 | 142 | 148 | 148 |
| 08/12/88 | NIELSONS-MECHANIC | 142 | 142 | 814 | 814 |
| 08/12/88 | NIELSONS-OPERATORS | 200 | 568 | 200 | 284 |
| 08/12/88 | NIELSONS-OPERATORS | 100 | 142 | 400 | 400 |
| 08/13/88 | NIELSONS-FOREMEN | 100 | 148 | 200 | 296 |
| 08/13/88 | NIELSONS-MECHANIC | 148 | 148 | 296 | 296 |
| 08/13/88 | NIELSONS-OPERATORS | 150 | 222 | 200 | 296 |
| 08/13/88 | NIELSONS-OPERATORS | 200 | 296 | 100 | 148 |
| 08/13/88 | NIELSONS-OPERATORS | 100 | 148 | 100 | 148 |
| 08/13/88 | NIELSONS-GR. CHECKER | 100 | 148 | 150 | 222 |
| 08/15/88 | YOUNG DRLG.-DRILLERS | 142 | 142 | 284 | 284 |
| 08/15/88 | GR. DIVIDE-SURVEYOR | 284 | 284 | 142 | 142 |
| 08/15/88 | HARDING-LAWSON | 142 | 142 | 142 | 142 |
| 08/15/88 | NIELSONS-OPERATORS | 600 | 852 | 500 | 710 |
| 08/15/88 | NIELSONS-LABORERS | 568 | 568 | 568 | 568 |
| 08/15/88 | NIELSONS-GR. CHECKER | 500 | 710 | 600 | 852 |
| 08/15/88 | NIELSONS-GR. CHECKER | 600 | 852 | 600 | 710 |
| 08/16/88 | YOUNG DRLG.-DRILLERS | 205 | 205 | 274 | 274 |
| 08/16/88 | YOUNG DRLG.-DRILLERS | 68 | 68 | 137 | 137 |
| 08/16/88 | NIELSONS-OPERATORS | 300 | 444 | 200 | 568 |
| 08/16/88 | NIELSONS-OPERATORS | 200 | 368 | 100 | 145 |
| 08/16/88 | NIELSONS-OPERATORS | 200 | 368 | 200 | 368 |
| 08/16/88 | YOUNG DRLG.-DRILLERS | 68 | 68 | 411 | 411 |
| 08/16/88 | GR. DIVIDE-SURVEYOR | 148 | 148 | 148 | 148 |
| 08/16/88 | NIELSONS-PROJECT SUP | 100 | 148 | 100 | 148 |
| 08/17/88 | NIELSONS-MECHANIC | 148 | 148 | 148 | 148 |
| 08/17/88 | NIELSONS-OPERATORS | 100 | 148 | 200 | 296 |
| 08/17/88 | NIELSONS-OPERATORS | 300 | 442 | 400 | 596 |
| 08/17/88 | NIELSONS-OPERATORS | 300 | 442 | 600 | 888 |
| 08/17/88 | NIELSONS-WATER WAGON | 400 | 592 | 300 | 442 |
| 08/17/88 | NIELSONS-OPERATORS | 100 | 148 | 200 | 296 |
| 08/17/88 | NIELSONS-OILERS | 296 | 296 | 148 | 148 |
| 08/18/88 | GR. DIVIDE-SURVEYOR | 350 | 350 | 240 | 240 |
| 08/18/88 | NIELSONS-OPERATORS | 100 | 162 | 100 | 162 |
| 08/18/88 | NIELSONS-OPERATORS | 100 | 162 | 200 | 324 |
| 08/18/88 | NIELSONS-OPERATORS | 100 | 162 | 400 | 648 |
| 08/18/88 | NIELSONS-OPERATORS | 100 | 162 | 100 | 162 |
| 08/18/88 | NIELSONS-OPERATORS | 100 | 162 | 200 | 324 |
| 08/18/88 | NIELSONS-OPERATORS | 400 | 640 | 300 | 480 |
| 08/18/88 | NIELSONS-OPERATORS | 100 | 162 | 200 | 324 |
| 08/18/88 | NIELSONS-GR. CHECKER | 100 | 162 | 190 | 162 |
| 08/18/88 | NIELSONS-GR. CHECKER | 300 | 324 | 600 | 648 |
| 08/19/88 | NIELSONS-MECHANIC | 222 | 222 | 296 | 296 |

PROGRAM - LAB307
RUN DATE 02/28/89

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY (dpm/100cm**2) FOR 1988

| DATE | JOB DESCRIPTION | LEFT HAND | RIGHT HAND | LEFT FOOT | RIGHT FOOT |
|---|---|---|---|---|---|
| 08/19/88 | NIELSONS-OPERATORS | 592 | 592 | 740 | 740 |
| 08/19/88 | NIELSONS-OPERATORS | 444 | 444 | 740 | 740 |
| 08/19/88 | NIELSONS-OPERATORS | 444 | 444 | 592 | 592 |
| 08/19/88 | NIELSONS-LABORERS | 740 | 740 | 740 | 740 |
| 08/19/88 | NIELSONS-GR. CHECKER | 444 | 444 | 740 | 740 |
| 08/22/88 | NIELSONS-OPERATORS | 333 | 333 | 444 | 444 |
| 08/22/88 | NIELSONS-OPERATORS | 629 | 629 | 148 | 148 |
| 08/22/88 | NIELSONS-OPERATORS | 296 | 296 | 111 | 111 |
| 08/22/88 | NIELSONS-OPERATORS | 74 | 74 | 74 | 74 |
| 08/22/88 | NIELSONS-OPERATORS | 444 | 444 | 259 | 259 |
| 08/22/88 | NIELSONS-OPERATORS | 259 | 259 | 296 | 296 |
| 08/22/88 | NIELSONS-OPERATORS | 222 | 222 | 148 | 148 |
| 08/23/88 | GR. DIVIDE-SURVEYOR | 222 | 222 | 592 | 592 |
| 08/23/88 | GR. DIVIDE-SURVEYOR | 296 | 296 | 444 | 444 |
| 08/23/88 | NIELSONS-MECHANIC | 222 | 222 | 740 | 740 |
| 08/23/88 | NIELSONS-OPERATORS | 148 | 148 | 259 | 259 |
| 08/23/88 | NIELSONS-OPERATORS | 296 | 296 | 444 | 444 |
| 08/24/88 | NIELSONS-WATER WAGON | 296 | 296 | 296 | 296 |
| 08/24/88 | NIELSONS-OPERATORS | 222 | 222 | 444 | 444 |
| 08/24/88 | NIELSONS-OPERATORS | 222 | 222 | 444 | 444 |
| 08/24/88 | NIELSONS-LABORERS | 222 | 222 | 296 | 296 |
| 08/24/88 | NIELSONS-GR. CHECKER | 444 | 444 | 444 | 444 |
| 08/24/88 | NIELSONS-GR. CHECKER | 222 | 222 | 296 | 296 |
| 08/25/88 | GR. DIVIDE-SURVEYOR | 400 | 400 | 712 | 712 |
| 08/25/88 | NIELSONS-OPERATORS | 548 | 548 | 685 | 685 |
| 08/25/88 | NIELSONS-OPERATORS | 411 | 411 | 650 | 650 |
| 08/25/88 | NIELSONS-OPERATORS | 548 | 548 | 822 | 822 |
| 08/25/88 | NIELSONS-LABORERS | 274 | 274 | 617 | 617 |
| 08/25/88 | GR. DIVIDE-SURVEYOR | 267 | 267 | 712 | 712 |
| 08/26/88 | NIELSONS-WATER WAGON | 83 | 83 | 153 | 153 |
| 08/26/88 | NIELSONS-OPERATORS | 121 | 121 | 140 | 140 |
| 08/26/88 | NIELSONS-OPERATORS | 128 | 128 | 204 | 204 |
| 08/26/88 | NIELSONS-GR. CHECKER | 96 | 96 | 179 | 179 |
| 08/26/88 | NIELSONS-GR. CHECKER | 108 | 108 | 153 | 153 |
| 08/27/88 | NIELSONS-OPERATORS | 66 | 66 | 79 | 79 |
| 08/27/88 | NIELSONS-OPERATORS | 0 | 0 | 79 | 79 |
| 08/27/88 | NIELSONS-OPERATORS | 0 | 0 | 33 | 33 |
| 08/29/88 | NIELSONS-LABORERS | 148 | 148 | 621 | 621 |
| 08/29/88 | NIELSONS-LABORERS | 592 | 592 | 148 | 148 |
| 08/29/88 | NIELSONS-OPERATORS | 592 | 592 | 266 | 266 |
| 08/29/88 | NIELSONS-OPERATORS | 140 | 140 | 310 | 310 |
| 08/29/88 | NIELSONS-OPERATORS | 592 | 592 | 370 | 370 |
| 08/30/88 | NIELSONS-SPECIALISTS | 890 | 890 | 959 | 959 |
| 08/30/88 | NIELSONS-MECHANIC | 342 | 342 | 548 | 548 |
| 08/30/88 | NIELSONS-WATER WAGON | 685 | 685 | 822 | 822 |
| 08/30/88 | NIELSONS-GR. CHECKER | 342 | 342 | 822 | 822 |
| 08/30/88 | NIELSONS-GR. CHECKER | 616 | 616 | 959 | 959 |
| 08/31/88 | NIELSONS-WATER WAGON | 205 | 205 | 616 | 616 |
| 08/31/88 | NIELSONS-OPERATORS | 479 | 479 | 342 | 342 |
| 08/31/88 | NIELSONS-LABORERS | 411 | 411 | 342 | 342 |
| 08/31/88 | NIELSONS-LABORERS | 239 | 239 | 342 | 342 |
| 09/01/88 | NIELSONS-OPERATORS | 666 | 666 | 296 | 296 |
| 09/01/88 | NIELSONS-OPERATORS | 222 | 222 | 518 | 518 |
| 09/01/88 | NIELSONS-OPERATORS | 370 | 370 | 740 | 740 |

PROGRAM - LAB307
RUN DATE 02/28/89

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY (dpm/100cm**2) FOR 1988

| DATE | JOB DESCRIPTION | LEFT HAND | RIGHT HAND | LEFT FOOT | RIGHT FOOT |
|---|---|---|---|---|---|
| 09/01/88 | NIELSONS-OPERATORS | 370 | 370 | 518 | 518 |
| 09/01/88 | NIELSONS-OPERATORS | 222 | 222 | 518 | 518 |
| 09/02/88 | NIELSONS-OPERATORS | 121 | 121 | 302 | 302 |
| 09/02/88 | NIELSONS-LABORERS | 180 | 180 | 363 | 363 |
| 09/02/88 | NIELSONS-LABORERS | 121 | 121 | 60 | 60 |
| 09/02/88 | NIELSONS-OPERATORS | 202 | 202 | 181 | 181 |
| 09/02/88 | NIELSONS-OPERATORS | 105 | 105 | 180 | 180 |
| 09/03/88 | NIELSONS-OPERATORS | 274 | 274 | 411 | 411 |
| 09/03/88 | NIELSONS-OPERATORS | 137 | 137 | 205 | 205 |
| 09/03/88 | NIELSONS-OPERATORS | 137 | 137 | 205 | 205 |
| 09/05/88 | NIELSONS-MECHANIC | NA | NA | NA | NA |
| 09/06/88 | GR. DIVIDE-SURVEYOR | 43 | 43 | 87 | 87 |
| 09/06/88 | NIELSONS-OPERATORS | 87 | 87 | 87 | 87 |
| 09/06/88 | NIELSONS-OPERATORS | 87 | 87 | 130 | 130 |
| 09/06/88 | NIELSONS-GR. CHECKER | 43 | 43 | 43 | 43 |
| 09/06/88 | NIELSONS-LABORER-WAT | 43 | 43 | 87 | 87 |
| 09/07/88 | NIELSONS-OPERATORS | 288 | 288 | 432 | 432 |
| 09/07/88 | NIELSONS-OPERATORS | 240 | 240 | 192 | 192 |
| 09/07/88 | GR. DIVIDE-SURVEYOR | 480 | 480 | 288 | 288 |
| 09/07/88 | NIELSONS-FOREMEN | 528 | 528 | 336 | 336 |
| 09/07/88 | NIELSONS-OPERATORS | 192 | 192 | 96 | 96 |
| 09/07/88 | NIELSONS-OPERATORS | 96 | 96 | 144 | 144 |
| 09/07/88 | NIELSONS-LABORERS | 144 | 144 | 192 | 192 |
| 09/08/88 | NIELSONS-MECHANIC | 80 | 80 | 560 | 560 |
| 09/08/88 | NIELSONS-GR. CHECKER | 160 | 160 | 400 | 400 |
| 09/08/88 | NIELSONS-OPERATORS | 320 | 320 | 240 | 240 |
| 09/08/88 | NIELSONS-OPERATORS | 640 | 640 | 320 | 320 |
| 09/08/88 | NIELSONS-OPERATORS | 560 | 560 | 640 | 640 |
| 09/08/88 | NIELSONS-LABORERS | 320 | 320 | 240 | 240 |
| 09/09/88 | GR. DIVIDE-SURVEYOR | 148 | 148 | 296 | 296 |
| 09/09/88 | NIELSONS-OPERATORS | 148 | 148 | 148 | 148 |
| 09/09/88 | NIELSONS-OPERATORS | 148 | 148 | 444 | 444 |
| 09/09/88 | NIELSONS-GR. CHECKER | 500 | 740 | 400 | 592 |
| 09/09/88 | NIELSONS-FOREMEN | 444 | 444 | 444 | 444 |
| 09/09/88 | NIELSONS-OPERATORS | 148 | 148 | 296 | 296 |
| 09/10/88 | GR. DIVIDE-SURVEYOR | 200 | 320 | 300 | 480 |
| 09/10/88 | NIELSONS-WATER WAGON | 250 | 415 | 300 | 480 |
| 09/10/88 | NIELSONS-OPERATORS | 400 | 640 | 300 | 480 |
| 09/10/88 | NIELSONS-OPERATORS | 200 | 320 | 300 | 480 |
| 09/10/88 | NIELSONS-WATER WAGON | 200 | 320 | 300 | 480 |
| 09/10/88 | NIELSONS-OPERATORS | 800 | 800 | 320 | 320 |
| 09/11/88 | NIELSONS-MECHANIC | 300 | 444 | 200 | 444 |
| 09/11/88 | NIELSONS-OPERATORS | 400 | 592 | 300 | 444 |
| 09/11/88 | NIELSONS-OILERS | 300 | 296 | 300 | 444 |
| 09/11/88 | NIELSONS-FOREMEN | 300 | 444 | 450 | 666 |
| 09/11/88 | NIELSONS-OPERATORS | 300 | 444 | 200 | 296 |
| 09/12/88 | NIELSONS-GR. CHECKER | 440 | 440 | 330 | 330 |
| 09/12/88 | GR. DIVIDE-SURVEYOR | 220 | 220 | 220 | 220 |
| 09/12/88 | NIELSONS-OPERATORS | 220 | 220 | 320 | 320 |
| 09/12/88 | NIELSONS-OPERATORS | 220 | 220 | 220 | 220 |
| 09/12/88 | NIELSONS-LABORERS | 220 | 220 | 220 | 220 |
| 09/12/88 | NIELSONS-LABORERS | 220 | 220 | 220 | 220 |
| 09/13/88 | GR. DIVIDE-SURVEYOR | 100 | 240 | 100 | 240 |
| 09/13/88 | NIELSONS-FOREMEN | 120 | 120 | 120 | 120 |

PROGRAM - LAB307
RUN DATE 02/28/89

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY (dpm/100cm**2) FOR 1988

| DATE | JOB DESCRIPTION | LEFT HAND | RIGHT HAND | LEFT FOOT | RIGHT FOOT |
|---|---|---|---|---|---|
| 09/13/88 | NIELSONS-MECHANIC | 50 | 120 | 100 | 240 |
| 09/13/88 | NIELSONS-OPERATORS | 120 | 120 | 120 | 120 |
| 09/13/88 | NIELSONS-OPERATORS | 100 | 240 | 50 | 120 |
| 09/13/88 | NIELSONS-OPERATORS | 200 | 480 | 100 | 240 |
| 09/14/88 | NIELSONS-OPERATORS | 100 | 214 | 100 | 214 |
| 09/14/88 | NIELSONS-OPERATORS | 100 | 214 | 100 | 214 |
| 09/14/88 | NIELSONS-OPERATORS | 50 | 107 | 50 | 107 |
| 09/14/88 | NIELSONS-OPERATORS | 50 | 107 | 100 | 214 |
| 09/14/88 | NIELSONS-OPERATORS | 150 | 321 | 100 | 214 |
| 09/15/88 | NIELSONS-WATER WAGON | 214 | 214 | 214 | 214 |
| 09/15/88 | NIELSONS-OPERATORS | 107 | 107 | 214 | 214 |
| 09/15/88 | NIELSONS-OPERATORS | 321 | 321 | 214 | 214 |
| 09/15/88 | NIELSONS-OPERATORS | 107 | 107 | 214 | 214 |
| 09/15/88 | GR. DIVIDE-SURVEYOR | 107 | 107 | 214 | 214 |
| 09/15/88 | NIELSONS-OPERATORS | 107 | 107 | 107 | 107 |
| 09/16/88 | GR. DIVIDE-SURVEYOR | 120 | 120 | 120 | 120 |
| 09/16/88 | NIELSONS-OPERATORS | 480 | 480 | 120 | 120 |
| 09/16/88 | NIELSONS-OPERATORS | 120 | 120 | 480 | 480 |
| 09/16/88 | NIELSONS-GR. CHECKER | 0 | 0 | 0 | 0 |
| 09/16/88 | GR. DIVIDE-SURVEYOR | 240 | 240 | 420 | 420 |
| 09/17/88 | NIELSONS-OPERATORS | 107 | 107 | 321 | 321 |
| 09/17/88 | NIELSONS-OPERATORS | 107 | 107 | 321 | 321 |
| 09/17/88 | NIELSONS-OPERATORS | 107 | 107 | 214 | 214 |
| 09/17/88 | NIELSONS-WATER WAGON | 214 | 214 | 321 | 321 |
| 09/17/88 | NIELSONS-OPERATORS | 321 | 321 | 50 | 50 |
| 09/17/88 | NIELSONS-LABORERS | 107 | 107 | 321 | 321 |
| 09/19/88 | GR. DIVIDE-SURVEYOR | 0 | 0 | 0 | 0 |
| 09/19/88 | NIELSONS-FOREMEN | 0 | 0 | 101 | 101 |
| 09/19/88 | NIELSONS-OPERATORS | 0 | 0 | 101 | 101 |
| 09/19/88 | NIELSONS-OPERATORS | 0 | 0 | 0 | 0 |
| 09/19/88 | NIELSONS-OPERATORS | 0 | 0 | 0 | 0 |
| 09/19/88 | NIELSONS-GR. CHECKER | 0 | 0 | 0 | 0 |
| 09/19/88 | GR. DIVIDE-SURVEYOR | 0 | 0 | 0 | 0 |
| 09/20/88 | NIELSONS-OPERATORS | 192 | 192 | 96 | 96 |
| 09/20/88 | NIELSONS-OPERATORS | 96 | 96 | 0 | 0 |
| 09/20/88 | NIELSONS-OPERATORS | 0 | 0 | 288 | 288 |
| 09/20/88 | NIELSONS-OPERATORS | 192 | 192 | 96 | 96 |
| 09/20/88 | NIELSONS-GR. CHECKER | 96 | 96 | 192 | 192 |
| 09/21/88 | GR. DIVIDE-SURVEYOR | 0 | 0 | 0 | 0 |
| 09/21/88 | NIELSONS-WATER WAGON | 0 | 0 | 192 | 192 |
| 09/21/88 | NIELSONS-OPERATORS | 0 | 0 | 192 | 192 |
| 09/21/88 | GR. DIVIDE-SURVEYOR | 192 | 192 | 192 | 192 |
| 09/21/88 | NIELSONS-OPERATORS | 0 | 0 | 0 | 0 |
| 09/21/88 | NIELSONS-OPERATORS | 0 | 0 | 0 | 0 |
| 09/21/88 | NIELSONS-OPERATORS | 0 | 0 | 288 | 288 |
| 09/22/88 | NIELSONS-LABORERS | 0 | 0 | 0 | 0 |
| 09/22/88 | NIELSONS-LABORERS | 0 | 0 | 0 | 0 |
| 09/22/88 | NIELSONS-LABORERS | 0 | 0 | 0 | 0 |
| 09/22/88 | NIELSONS-GR. CHECKER | 0 | 0 | 384 | 384 |
| 09/23/88 | NIELSONS-OPERATORS | 0 | 0 | 51 | 51 |
| 09/23/88 | NIELSONS-OPERATORS | 102 | 102 | 81 | 81 |
| 09/23/88 | NIELSONS-GR. CHECKER | 132 | 132 | 408 | 408 |
| 09/23/88 | NIELSONS-GR. CHECKER | 81 | 81 | 122 | 122 |
| 09/23/88 | NIELSONS-OPERATORS | 40 | 40 | 163 | 163 |

PROGRAM - LAB307
RUN DATE 02/28/89

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY (dpm/100cm**2) FOR 1988

| DATE | JOB DESCRIPTION | LEFT HAND | RIGHT HAND | LEFT FOOT | RIGHT FOOT |
|---|---|---|---|---|---|
| 09/24/88 | NIELSONS-OPERATORS | 360 | 360 | 50 | 50 |
| 09/24/88 | NIELSONS-LABORERS | 40 | 40 | 200 | 200 |
| 09/24/88 | NIELSONS-LABORERS | 0 | 0 | 100 | 100 |
| 09/24/88 | NIELSONS-OPERATORS | 0 | 0 | 0 | 0 |
| 09/24/88 | NIELSONS-LABORERS | 0 | 0 | 220 | 220 |
| 09/26/88 | NIELSONS-OPERATORS | 48 | 48 | 211 | 211 |
| 09/26/88 | NIELSONS-OPERATORS | 48 | 48 | 211 | 211 |
| 09/26/88 | NIELSONS-GR. CHECKER | 182 | 182 | 787 | 787 |
| 09/26/88 | NIELSONS-OPERATORS | 173 | 173 | 0 | 0 |
| 09/26/88 | NIELSONS-OPERATORS | 96 | 96 | 173 | 173 |
| 09/27/88 | NIELSONS-OPERATORS | 160 | 160 | 664 | 664 |
| 09/27/88 | NIELSONS-FOREMEN | 336 | 336 | 192 | 192 |
| 09/27/88 | NIELSONS-OPERATORS | 0 | 0 | 144 | 144 |
| 09/27/88 | NIELSONS-OPERATORS | 480 | 480 | 640 | 640 |
| 09/27/88 | NIELSONS-OPERATORS | 240 | 240 | 144 | 144 |
| 09/28/88 | NIELSONS-OPERATORS | 187 | 187 | 340 | 340 |
| 09/28/88 | NIELSONS-OPERATORS | 102 | 102 | 204 | 204 |
| 09/28/88 | NIELSONS-OPERATORS | 85 | 85 | 102 | 102 |
| 09/28/88 | NIELSONS-GR. CHECKER | 102 | 102 | 153 | 153 |
| 09/29/88 | GR. DIVIDE-SURVEYOR | 187 | 187 | 255 | 255 |
| 09/29/88 | GR. DIVIDE-SURVEYOR | 153 | 153 | 187 | 187 |
| 09/29/88 | NIELSONS-WATER WAGON | 187 | 187 | 510 | 510 |
| 09/29/88 | NIELSONS-OPERATORS | 34 | 34 | 153 | 153 |
| 09/29/88 | NIELSONS-LABORERS | 663 | 663 | 153 | 153 |
| 09/30/88 | NIELSONS-OPERATORS | 160 | 160 | 80 | 80 |
| 09/30/88 | NIELSONS-OPERATORS | 320 | 320 | 160 | 160 |
| 09/30/88 | NIELSONS-OPERATORS | 240 | 240 | 320 | 320 |
| 09/30/88 | NIELSONS-MECHANIC | NA | NA | NA | NA |
| 09/30/88 | NIELSONS-OPERATORS | 560 | 560 | 320 | 320 |
| 09/30/88 | NIELSONS-OPERATORS | 400 | 400 | 160 | 160 |
| 10/01/88 | NIELSONS-LABORERS | 160 | 160 | 160 | 160 |
| 10/01/88 | NIELSONS-LABORERS | 80 | 80 | 240 | 240 |
| 10/01/88 | NIELSONS-CARPENTER | 200 | 200 | 160 | 160 |
| 10/03/88 | NIELSONS-FOREMEN | 320 | 320 | 120 | 120 |
| 10/03/88 | NIELSONS-OPERATORS | 40 | 40 | 160 | 160 |
| 10/03/88 | NIELSONS-OPERATORS | 240 | 240 | 160 | 160 |
| 10/03/88 | NIELSONS-OILERS | 160 | 160 | 320 | 320 |
| 10/03/88 | NIELSONS-OPERATORS | 0 | 0 | 80 | 80 |
| 10/04/88 | NIELSONS-LABORERS | 40 | 40 | 20 | 200 |
| 10/04/88 | ENVIRONMENTAL LINERS | 400 | 400 | 40 | 40 |
| 10/04/88 | NIELSONS-LABORERS | 160 | 160 | 80 | 80 |
| 10/04/88 | NIELSONS-LABORERS | 80 | 80 | 240 | 240 |
| 10/04/88 | ENVIRONMENTAL LINERS | 160 | 160 | 40 | 40 |
| 10/04/88 | GR. DIVIDE-SURVEYOR | 160 | 160 | 160 | 160 |
| 10/04/88 | NIELSONS-OPERATORS | 40 | 40 | 120 | 120 |
| 10/04/88 | ENVIRONMENTAL LINERS | 40 | 40 | 80 | 80 |
| 10/04/88 | ENVIRONMENTAL LINERS | 40 | 40 | 120 | 120 |
| 10/05/88 | ENVIRONMENTAL LINERS | 250 | 250 | 200 | 200 |
| 10/05/88 | ENVIRONMENTAL LINERS | 500 | 500 | 250 | 250 |
| 10/05/88 | NIELSONS-MECHANIC | 600 | 600 | 750 | 750 |
| 10/05/88 | NIELSONS-OPERATORS | 200 | 200 | 100 | 100 |
| 10/05/88 | NIELSONS-GR. CHECKER | 100 | 100 | 150 | 150 |
| 10/05/88 | NIELSONS-LABORER-WAT | 400 | 400 | 400 | 400 |
| 10/05/88 | ENVIRONMENTAL LINERS | 200 | 200 | 200 | 200 |

PROGRAM - LAB307
RUN DATE 02/28/89

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY (dpm/100cm**2) FOR 1988

| DATE | JOB DESCRIPTION | LEFT HAND | RIGHT HAND | LEFT FOOT | RIGHT FOOT |
|---|---|---|---|---|---|
| 10/05/88 | ENVIRONMENTAL LINERS | 350 | 350 | 200 | 200 |
| 10/05/88 | NIELSONS-LABORERS | 500 | 500 | 0 | 0 |
| 10/06/88 | NIELSONS-FOREMEN | 280 | 280 | 360 | 360 |
| 10/06/88 | NIELSONS-OPERATORS | 360 | 360 | 80 | 80 |
| 10/06/88 | NIELSONS-OPERATORS | 400 | 400 | 240 | 240 |
| 10/06/88 | ENVIRONMENTAL LINERS | 400 | 400 | 80 | 80 |
| 10/06/88 | NIELSONS-OPERATORS | 80 | 80 | 240 | 240 |
| 10/06/88 | NIELSONS-OPERATORS | 400 | 400 | 160 | 160 |
| 10/06/88 | ENVIRONMENTAL LINERS | 400 | 400 | 40 | 40 |
| 10/06/88 | ENVIRONMENTAL LINERS | 640 | 640 | 80 | 80 |
| 10/06/88 | ENVIRONMENTAL LINERS | 240 | 240 | 120 | 120 |
| 10/07/88 | GR. DIVIDE-SURVEYOR | 0 | 0 | 192 | 192 |
| 10/07/88 | NIELSONS-FOREMEN | 384 | 384 | 0 | 0 |
| 10/07/88 | NIELSONS-OPERATORS | 384 | 384 | 384 | 384 |
| 10/07/88 | NIELSONS-OPERATORS | 0 | 0 | 192 | 192 |
| 10/07/88 | NIELSONS-OPERATORS | 192 | 192 | 192 | 192 |
| 10/07/88 | NIELSONS-OPERATORS | 292 | 192 | 192 | 192 |
| 10/07/88 | ENVIRONMENTAL LINERS | 192 | 192 | 384 | 384 |
| 10/07/88 | ENVIRONMENTAL LINERS | 192 | 192 | 384 | 384 |
| 10/08/88 | NIELSONS-OPERATORS | 320 | 320 | 160 | 160 |
| 10/08/88 | NIELSONS-OPERATORS | 320 | 320 | 0 | 0 |
| 10/08/88 | NIELSONS-OPERATORS | 160 | 160 | 160 | 160 |
| 10/08/88 | NIELSONS-OPERATORS | 160 | 160 | 480 | 480 |
| 10/08/88 | NIELSONS-LABORERS | 320 | 320 | 480 | 480 |
| 10/09/88 | NIELSONS-LABORERS | 170 | 170 | 0 | 0 |
| 10/09/88 | NIELSONS-LABORERS | 250 | 250 | 170 | 170 |
| 10/09/88 | TWO SISTERS CLEANING | 168 | 168 | 420 | 420 |
| 10/09/88 | NIELSONS-OPERATORS | 170 | 170 | 340 | 340 |
| 10/09/88 | NIELSONS-OPERATORS | 340 | 340 | 340 | 340 |
| 10/09/88 | NIELSONS-LABORERS | 170 | 170 | 170 | 170 |
| 10/10/88 | ENVIRONMENTAL LINERS | 510 | 510 | 170 | 170 |
| 10/10/88 | ENVIRONMENTAL LINERS | 170 | 170 | 170 | 170 |
| 10/10/88 | GR. DIVIDE-SURVEYOR | 340 | 340 | 255 | 255 |
| 10/10/88 | NIELSONS-FOREMEN | 510 | 510 | 170 | 170 |
| 10/10/88 | NIELSONS-OPERATORS | 340 | 340 | 255 | 255 |
| 10/10/88 | NIELSONS-OPERATORS | 170 | 170 | 170 | 170 |
| 10/10/88 | NIELSONS-LABORERS | 170 | 170 | 510 | 510 |
| 10/10/88 | NIELSONS-GR. CHECKER | 340 | 340 | 510 | 510 |
| 10/10/88 | NIELSONS-CARPENTER | 510 | 510 | 170 | 170 |
| 10/11/88 | NIELSONS-MECHANIC | 380 | 380 | 760 | 760 |
| 10/11/88 | NIELSONS-OPERATORS | 380 | 380 | 380 | 380 |
| 10/11/88 | ENVIRONMENTAL LINERS | 285 | 285 | 190 | 190 |
| 10/11/88 | ENVIRONMENTAL LINERS | 380 | 380 | 0 | 0 |
| 10/11/88 | ENVIRONMENTAL LINERS | 190 | 190 | 0 | 0 |
| 10/11/88 | NIELSONS-OPERATORS | 200 | 380 | 190 | 285 |
| 10/11/88 | NIELSONS-OPERATORS | 200 | 380 | 100 | 190 |
| 10/11/88 | NIELSONS-OPERATORS | 510 | 510 | 0 | 0 |
| 10/11/88 | NIELSONS-GR. CHECKER | 100 | 190 | 100 | 190 |
| 10/11/88 | ENVIRONMENTAL LINERS | 380 | 380 | 285 | 285 |
| 10/12/88 | ENVIRONMENTAL LINERS | 640 | 640 | 320 | 320 |
| 10/12/88 | ENVIRONMENTAL LINERS | 240 | 240 | 160 | 160 |
| 10/12/88 | NIELSONS-MECHANIC | 0 | 0 | 0 | 0 |
| 10/12/88 | NIELSONS-WATER WAGON | 160 | 160 | 640 | 640 |
| 10/12/88 | NIELSONS-LABORERS | 160 | 160 | 320 | 320 |

PROGRAM - LAB307
RUN DATE 02/28/89

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY (dpm/100cm**2) FOR 1988

| DATE | JOB DESCRIPTION | LEFT HAND | RIGHT HAND | LEFT FOOT | RIGHT FOOT |
|---|---|---|---|---|---|
| 10/12/88 | NIELSONS-LABORERS | 160 | 160 | 320 | 320 |
| 10/12/88 | ENVIRONMENTAL LINERS | 160 | 160 | 400 | 400 |
| 10/12/88 | ENVIRONMENTAL LINERS | 160 | 160 | 160 | 160 |
| 10/12/88 | NIELSONS-OILERS | 0 | 0 | 160 | 160 |
| 10/13/88 | NIELSONS-OPERATORS | 160 | 160 | 320 | 320 |
| 10/13/88 | NIELSONS-LABORERS | 320 | 320 | 160 | 160 |
| 10/13/88 | NIELSONS-OPERATORS | 160 | 160 | 160 | 160 |
| 10/14/88 | NIELSONS-OPERATORS | 161 | 161 | 161 | 161 |
| 10/14/88 | NIELSONS-OPERATORS | 0 | 0 | 161 | 161 |
| 10/14/88 | NIELSONS-OPERATORS | 0 | 0 | 161 | 161 |
| 10/14/88 | NIELSONS-GR. CHECKER | 161 | 161 | 161 | 161 |
| 10/14/88 | ENVIRONMENTAL LINERS | 161 | 161 | 0 | 0 |
| 10/14/88 | ENVIRONMENTAL LINERS | NA | NA | NA | NA |
| 10/14/88 | ENVIRONMENTAL LINERS | 161 | 161 | 161 | 161 |
| 10/14/88 | ENVIRONMENTAL LINERS | 483 | 483 | 0 | 0 |
| 10/14/88 | NIELSONS-FOREMEN | 0 | 0 | 0 | 0 |
| 10/14/88 | NIELSONS-OPERATORS | 0 | 0 | 322 | 322 |
| 10/14/88 | NIELSONS-OPERATORS | 0 | 0 | 0 | 0 |
| 10/14/88 | NIELSONS-OPERATORS | 0 | 0 | 0 | 0 |
| 10/15/88 | ENVIRONMENTAL LINERS | 161 | 161 | 161 | 161 |
| 10/15/88 | ENVIRONMENTAL LINERS | 161 | 161 | 322 | 322 |
| 10/15/88 | ENVIRONMENTAL LINERS | 161 | 161 | 322 | 322 |
| 10/15/88 | NIELSONS-LABORERS | 0 | 0 | 161 | 161 |
| 10/16/88 | NIELSONS-OPERATORS | 320 | 320 | 320 | 320 |
| 10/16/88 | NIELSONS-OPERATORS | 161 | 161 | 320 | 320 |
| 10/16/88 | NIELSONS-LABORERS | 161 | 161 | 161 | 161 |
| 10/16/88 | NIELSONS-GR. CHECKER | 0 | 0 | 320 | 320 |
| 10/17/88 | ENVIRONMENTAL LINERS | 151 | 151 | 151 | 151 |
| 10/17/88 | ENVIRONMENTAL LINERS | 302 | 302 | 151 | 151 |
| 10/17/88 | NIELSONS-OFFICE MGR. | 0 | 0 | 0 | 0 |
| 10/17/88 | NIELSONS-OPERATORS | 0 | 0 | 151 | 151 |
| 10/17/88 | NIELSONS-LABORERS | 227 | 227 | 0 | 0 |
| 10/18/88 | NIELSONS-OPERATORS | 320 | 320 | 320 | 320 |
| 10/18/88 | NIELSONS-OPERATORS | 160 | 160 | 160 | 160 |
| 10/18/88 | ENVIRONMENTAL LINERS | 160 | 160 | 320 | 320 |
| 10/18/88 | ENVIRONMENTAL LINERS | 0 | 0 | 160 | 160 |
| 10/19/88 | NIELSONS-OPERATORS | 0 | 0 | 320 | 320 |
| 10/19/88 | NIELSONS-OPERATORS | 0 | 0 | 0 | 0 |
| 10/19/88 | NIELSONS-FOREMEN | 88 | 88 | 160 | 160 |
| 10/19/88 | NIELSONS-MECHANIC | 88 | 88 | 480 | 480 |
| 10/19/88 | NIELSONS-OPERATORS | 160 | 160 | 0 | 0 |
| 10/20/88 | NIELSONS-OPERATORS | 160 | 160 | 320 | 320 |
| 10/20/88 | NIELSONS-LABORERS | 160 | 160 | 0 | 0 |
| 10/20/88 | NIELSONS-OPERATORS | 120 | 120 | 120 | 120 |
| 10/20/88 | NIELSONS-CARPENTER | 0 | 0 | 0 | 0 |
| 10/20/88 | ENVIRONMENTAL LINERS | 160 | 160 | 320 | 320 |
| 10/20/88 | ENVIRONMENTAL LINERS | 100 | 160 | 0 | 0 |
| 10/24/88 | NIELSONS-OPERATORS | 22 | 22 | 600 | 600 |
| 10/24/88 | NIELSONS-OPERATORS | 0 | 0 | 135 | 135 |
| 10/24/88 | NIELSONS-LABORERS | 135 | 135 | 75 | 75 |
| 10/24/88 | ENVIRONMENTAL LINERS | 450 | 450 | 315 | 315 |
| 10/24/88 | ENVIRONMENTAL LINERS | 675 | 675 | 150 | 150 |
| 10/24/88 | ENVIRONMENTAL LINERS | 637 | 637 | 150 | 150 |
| 10/26/88 | NIELSONS-OPERATORS | 160 | 160 | 192 | 192 |

PROGRAM - LAB307
RUN DATE 02/28/89

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY (dpm/100cm**2) FOR 1988

| DATE | JOB DESCRIPTION | LEFT HAND | RIGHT HAND | LEFT FOOT | RIGHT FOOT |
|---|---|---|---|---|---|
| 10/26/88 | NIELSONS-LABORERS | 0 | 0 | 144 | 144 |
| 10/26/88 | NIELSONS-LABORERS | 400 | 400 | 720 | 720 |
| 10/26/88 | ENVIRONMENTAL LINERS | 464 | 464 | 336 | 336 |
| 10/26/88 | ENVIRONMENTAL LINERS | 160 | 160 | 416 | 416 |
| 10/26/88 | NIELSONS-WATER WAGON | 144 | 144 | 320 | 320 |
| 10/26/88 | ENVIRONMENTAL LINERS | 360 | 360 | 480 | 480 |
| 10/27/88 | NIELSONS-LABORERS | 288 | 288 | 336 | 336 |
| 10/27/88 | NIELSONS-CARPENTER | 64 | 64 | 96 | 96 |
| 10/27/88 | NIELSONS-OPERATORS | 80 | 80 | 200 | 200 |
| 10/27/88 | NIELSONS-LABORERS | 800 | 800 | 240 | 240 |
| 10/28/88 | NIELSONS-LABORERS | 242 | 242 | 644 | 644 |
| 10/28/88 | NIELSONS-LABORERS | 805 | 805 | 483 | 480 |
| 10/28/88 | NIELSONS-OPERATORS | 120 | 120 | 201 | 201 |
| 10/28/88 | NIELSONS-OPERATORS | 161 | 161 | 281 | 281 |
| 10/28/88 | NIELSONS-OPERATORS | 161 | 161 | 322 | 322 |
| 10/29/88 | NIELSONS-LABORERS | 296 | 296 | 370 | 370 |
| 10/29/88 | NIELSONS-OPERATORS | 259 | 259 | 444 | 444 |
| 10/29/88 | NIELSONS-LABORERS | 74 | 74 | 222 | 222 |
| 10/30/88 | NIELSONS-FOREMEN | 640 | 640 | 240 | 240 |
| 10/30/88 | NIELSONS-MECHANIC | 160 | 160 | 400 | 400 |
| 10/30/88 | NIELSONS-LABORERS | 400 | 400 | 160 | 160 |
| 10/31/88 | NIELSONS-OPERATORS | 560 | 560 | 200 | 200 |
| 10/31/88 | NIELSONS-LABORERS | 200 | 200 | 400 | 400 |
| 10/31/88 | NIELSONS-WATER WAGON | 160 | 160 | 320 | 320 |
| 11/01/88 | NIELSONS-LABORERS | 563 | 563 | 402 | 402 |
| 11/01/88 | NIELSONS-LABORERS | 241 | 241 | 322 | 322 |
| 11/01/88 | NIELSONS-LABORERS | 483 | 483 | 161 | 161 |
| 11/02/88 | NIELSONS-LABORERS | 240 | 240 | 640 | 640 |
| 11/02/88 | NIELSONS-LABORERS | 240 | 240 | 160 | 160 |
| 11/02/88 | NIELSONS-OPERATORS | 160 | 160 | 80 | 80 |
| 11/03/88 | NIELSONS-LABORERS | 241 | 241 | 322 | 322 |
| 11/03/88 | NIELSONS-FOREMEN | 322 | 322 | 402 | 402 |
| 11/03/88 | NIELSONS-OPERATORS | 201 | 201 | 483 | 483 |
| 11/03/88 | NIELSONS-OPERATORS | 201 | 201 | 402 | 402 |
| 11/03/88 | NIELSONS-OPERATORS | 281 | 281 | 161 | 161 |
| 11/07/88 | NIELSONS-LABORERS | 200 | 320 | 200 | 322 |
| 11/07/88 | NIELSONS-LABORERS | 100 | 161 | 420 | 644 |
| 11/07/88 | NIELSONS-LABORERS | 200 | 320 | 100 | 161 |
| 11/08/88 | NIELSONS-LABORERS | 300 | 322 | 100 | 161 |
| 11/09/88 | NIELSONS-MECHANIC | 100 | 161 | 320 | 483 |
| 11/09/88 | NIELSONS-OILERS | 100 | 161 | 200 | 320 |
| 11/10/88 | NIELSONS-LABORERS | 100 | 161 | 200 | 322 |
| 11/10/88 | NIELSONS-LABORERS | 100 | 161 | 100 | 161 |
| 11/10/88 | NIELSONS-LABORERS | 100 | 161 | 300 | 483 |
| 11/10/88 | NIELSONS-LABORERS | 100 | 161 | 200 | 322 |
| 12/22/88 | ANLYT NON SMPLE PREP | 0 | 81 | 81 | 81 |
| 12/22/88 | PAYRL/PERS/ACCT PAY | 0 | 81 | 81 | 81 |
| 12/22/88 | U.S. WELDING-TRUCK D | 0 | 81 | 81 | 242 |
| 12/22/88 | MILL FMAN-RAP QA/QC | 16 | 161 | 81 | 161 |
| 12/22/88 | MAINTENANCE INSTRUME | 161 | 242 | 161 | 242 |
| 12/22/88 | PROD SUPERINTENDENT | 0 | 0 | 0 | 161 |
| 12/22/88 | MILL ACCOUNTANT | 0 | 0 | 81 | 0 |
| 12/22/88 | PL ENG-SUP CERCLA CO | 81 | 0 | 81 | 161 |
| 12/22/88 | SECURITY/SAFETY TECH | 0 | 0 | 161 | 161 |

PROGRAM - LAB307
RUN DATE 02/28/89

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY (dpm/100cm**2) FOR 1988

| DATE | JOB DESCRIPTION | LEFT HAND | RIGHT HAND | LEFT FOOT | RIGHT FOOT |
|---|---|---|---|---|---|
| 12/22/88 | SECURITY/SAFETY TECH | 0 | 81 | 81 | 242 |
| 12/22/88 | MAINT ELECTRICIAN | 0 | 242 | 81 | 81 |
| 12/22/88 | CH. MET./PERSNL. COO | 0 | 81 | 0 | 81 |
| 12/22/88 | ANLYT NON SMPLE PREP | 161 | 322 | 161 | 81 |

## 3.2 - ALPHA CONTAMINATION SURVEYS OF LUNCHROOMS, CONTROL ROOMS, CHANGE ROOMS, AND OFFICES - ANNUAL REPORT LICENSE CONDITION 23.8

Cotter Corporation performs weekly alpha monitoring surveys of lunchrooms, control rooms, change rooms and offices at the Canon City mill. Surveys conducted in 1988 have been summarized in Table 3.2 which indicates all the readings at each of the locations surveyed. Comparison of Table 3.2 to the table for 1987 (Table 3.3) indicates no change in the percentage of survey locations which had maximum monthly values in excess of 1000 dpm/100cm$^2$ (0.00% in 1988 and 0.00% in 1987).

Cotter will continue alpha contamination surveys of lunchrooms, control rooms, change rooms and offices in 1989 as required by License Condition 23.8.

PROGRAM - LAB120 C O T T E R C O R P O R A T I O N RUN DATE 01/11/89

ALPHA CONTAMINATION SURVEY FOR 1988 (ALPHA ACTIVITY(DPM/100 CM**2) TIME 08 46 58

(* DENOTES RESURVEY AFTER CLEANUP)

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MENS' LOCKER ROOM DOOR AT ENTRANCE | 14 | 17 | 14 | <7 | 18 | <7 | <7 | <7 | 15 | 6 | <6 | 17 |
| | 17 | 10 | 28 | 17 | <7 | 17 | 21 | 10 | 10 | 15 | 15 | 33 |
| | 8 | 22 | 38 | <8 | 14 | 19 | 8 | <6 | 10 | <6 | 11 | <6 |
| | 19 | 18 | 12 | 10 | <7 | <7 | <7 | <5 | 14 | 20 | 15 | 27 |
| | | | 12 | | 30 | | | 17 | | 8 | | |
| WOMENS' LOCKER ROOM DOOR AT ENTRANCE | <7 | 27 | 30 | 13 | 51 | 45 | 41 | <7 | 11 | 13 | 11 | 28 |
| | <8 | 21 | 12 | 14 | 23 | 55 | 14 | 16 | 10 | 19 | 13 | 15 |
| | 24 | 24 | 12 | 12 | 56 | 29 | 24 | <6 | 12 | 12 | 24 | 19 |
| | 26 | 16 | 20 | 15 | 34 | 51 | 25 | 15 | 8 | 13 | 48 | 29 |
| | | | 12 | | 32 | | | 21 | | 14 | | |
| MAIN OFFICE NORTH DOOR AT ENTRANCE | 22 | 22 | 9 | 18 | <7 | 11 | <7 | <7 | <6 | 8 | 9 | <7 |
| | 9 | 13 | <7 | 22 | 21 | 9 | 9 | <6 | <6 | 17 | <7 | 15 |
| | 16 | <8 | <8 | <8 | <7 | 14 | <7 | <6 | 12 | <5 | <7 | <6 |
| | <7 | 18 | <8 | <8 | <7 | <7 | <7 | <5 | 12 | 7 | 11 | 25 |
| | | | <8 | | <7 | | | <5 | | 8 | | |
| MAIN OFFICE EAST DOOR AT ENTRANCE | 25 | 19 | <6 | 11 | <7 | 14 | 18 | <7 | 23 | 11 | 9 | 11 |
| | 12 | 28 | <7 | <6 | <7 | 24 | 9 | 8 | 14 | 11 | 19 | 35 |
| | 14 | <8 | <8 | <8 | 9 | <6 | <7 | 8 | <6 | 8 | 13 | <6 |
| | 19 | 23 | <8 | <8 | 8 | <7 | <7 | <5 | 12 | 16 | <6 | 29 |
| | | | 17 | | <7 | | | 7 | | 19 | | |
| TRAILERHOUSE CHANGE HOUSE | | | | | 113 | 94 | 21 | 35 | 11 | 8 | 9 | |
| | | | | | | | 9 | 27 | 20 | 43 | 35 | |
| | | | | | | | 21 | 25 | 32 | 8 | | |
| | | | | | | | 53 | 9 | | 24 | | |
| | | | | | | | | 32 | | 23 | | |
| SECONDARY CRUSHER LUNCHROOM DOOR AT ENTRANCE | | | | | 119 | | | | | | | |
| LAB LUNCHROOM DOOR AT ENTRANCE | 14 | 17 | 12 | 11 | 14 | <7 | 15 | <7 | 9 | <6 | 18 | 11 |
| | 17 | 36 | 35 | 11 | 8 | 12 | <6 | <6 | 14 | 13 | <7 | 29 |
| | 19 | 17 | 9 | <8 | 9 | 14 | <7 | 8 | 16 | 10 | <7 | 8 |
| | 11 | 36 | 17 | 25 | 8 | 15 | <7 | <5 | <5 | <6 | <6 | 47 |
| | | | 12 | | <7 | | | <5 | | <6 | | |
| LAB LUNCHROOM TABLE | <7 | <8 | <6 | <7 | 8 | <7 | <7 | 15 | <5 | <6 | <6 | <7 |
| | <8 | 15 | <7 | <6 | <7 | 6 | <6 | 8 | 8 | <6 | <7 | 9 |
| | 16 | <8 | <8 | <8 | <7 | <6 | <7 | <6 | <6 | <6 | <7 | 8 |
| | 21 | <9 | 12 | <8 | <7 | <7 | <7 | <5 | <5 | <6 | <6 | <6 |
| | | | | | 11 | | | <5 | | <6 | | |
| ELECTRICIANS' LUNCHROOM DOOR AT ENTRANCE | 30 | 29 | 48 | 26 | 43 | 14 | 26 | 17 | 21 | 32 | 15 | 22 |
| | 25 | 10 | 15 | 39 | 48 | 22 | 64 | 29 | 14 | 13 | 8 | 24 |
| | 38 | 24 | 35 | 28 | 27 | 12 | 41 | 18 | 10 | 12 | 24 | 8 |
| | 45 | 36 | 30 | 35 | | 13 | 48 | 6 | 23 | 24 | 21 | 27 |
| | | | 12 | | | | | 17 | | 12 | | |
| ELECTRICIANS' LUNCHROOM TABLE | 40 | 22 | 9 | 16 | 8 | <7 | <7 | <7 | 21 | <6 | 15 | 8 |

PROGRAM - LAB120

COTTER CORPORATION

ALPHA CONTAMINATION SURVEY FOR 1988 (ALPHA ACTIVITY(DPM/100 CM**2)

(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 01/11/89
TIME 09:51:38

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 14 | 39 | 12 | 11 | <7 | <6 | 9 | <6 | 12 | 35 | <7 | 7 |
| | 38 | 19 | <8 | 12 | 14 | <6 | <7 | <6 | 7 | 19 | <7 | <6 |
| | 8 | 18 | 12 | <8 | <7 | <7 | <7 | <6 | 16 | <6 | 17 | <6 |
| | | | <8 | | <7 | | | 13 | | 19 | | |
| INSTRUMENT LUNCHROOM WEST DOOR AT ENTRANCE | | | | | | | | 72 | | | | |
| | | | | | | | | 32 | | | | |
| INSTRUMENT LUNCHROOM TABLE | | | | | | | | 33 | | | | |
| | | | | | | | | <5 | | | | |
| MET LAB LUNCHROOM TABLE | 22 | <8 | <6 | 11 | <7 | <7 | 8 | 10 | 37 | <6 | 15 | <7 |
| | <8 | <8 | <7 | 6 | 8 | <6 | <6 | <6 | <6 | <6 | <7 | <6 |
| | 22 | <8 | <8 | <8 | <7 | <6 | <7 | <6 | <5 | <6 | 13 | 8 |
| | 11 | <9 | <8 | <8 | <7 | <7 | <7 | <5 | 14 | <6 | <6 | 18 |
| | | | <8 | | <7 | | | 9 | | <6 | | |
| MET LAB WEST DOOR AT ENTRANCE | 20 | 24 | 84 | 26 | 28 | 24 | 31 | 17 | <6 | 21 | 26 | 28 |
| | 22 | 21 | 70 | 45 | 60 | 39 | 19 | 14 | 14 | 24 | 33 | 29 |
| | 27 | 54 | 17 | 23 | 43 | 35 | 11 | 25 | 18 | 14 | 15 | 28 |
| | 34 | 112 | 30 | 32 | 59 | 33 | 51 | 7 | 19 | 24 | 17 | 31 |
| | | | 45 | | 51 | | | 23 | | 30 | | |
| UV-SX CONTROL ROOM NORTH DOOR AT ENTRANCE | 35 | 47 | 55 | 47 | 46 | 56 | 39 | 54 | 43 | 38 | 21 | |
| | 43 | 49 | 15 | 34 | 34 | 57 | 66 | 39 | 30 | 41 | | |
| | 32 | 39 | 61 | 64 | 35 | 55 | 71 | 70 | 46 | | | |
| | 51 | 46 | 82 | 42 | 44 | 18 | 33 | 31 | 47 | | | |
| | | | 22 | | 40 | | | 42 | | | | |
| CCD CONTROL ROOM AT ENTRANCE | 68 | 101 | 63 | 47 | 21 | 19 | 77 | 62 | 45 | 38 | 32 | |
| | 50 | 47 | 38 | 78 | 67 | 49 | 54 | 85 | 43 | 26 | | |
| | 83 | 107 | 41 | 48 | 38 | 47 | 97 | 50 | 85 | | | |
| | 60 | 64 | 48 | 17 | 54 | 142 | 66 | 39 | 58 | | | |
| | | | 32 | | 37 | | | 63 | | | | |
| CCD CONTROL ROOM TABLE | 32 | 19 | 9 | 24 | 13 | 14 | 39 | 27 | 29 | 32 | 60 | |
| | 30 | 88 | 10 | 14 | 16 | 52 | 26 | 27 | 56 | 28 | | |
| | 75 | 37 | 15 | <8 | 30 | <6 | 44 | 16 | 20 | | | |
| | 19 | 56 | 15 | 15 | 24 | 15 | 10 | 23 | 27 | | | |
| | | | 30 | | 48 | | | 32 | | | | |
| GRIND-LEACH CONTROL ROOM WEST DOOR AT ENTRANCE | 42 | 24 | 42 | 34 | 21 | 27 | 58 | 134 | 68 | 64 | 78 | |
| | 24 | 65 | 48 | 37 | 21 | 72 | 94 | 91 | 87 | 84 | | |
| | 48 | 52 | 43 | 33 | 35 | 58 | 210 | 66 | 78 | | | |
| | 24 | 49 | 40 | 27 | 47 | 38 | 142 | 96 | 78 | | | |
| | | | 27 | | 32 | | | 75 | | | | |
| GRIND-LEACH CONTROL ROOM EAST DOOR AT ENTRANCE | 37 | 55 | 53 | 94 | 26 | 48 | 49 | 67 | 84 | 100 | 67 | |
| | 66 | 39 | 55 | 88 | 34 | 67 | 64 | 39 | 41 | 67 | | |
| | 27 | 39 | 64 | 84 | 80 | 37 | 84 | 41 | 61 | | | |
| | 53 | 71 | 66 | 52 | 52 | 46 | 104 | 60 | 56 | | | |
| | | | 65 | | 82 | | | 60 | | | | |

PROGRAM - LAB120

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY FOR 1988 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 01/11/89
TIME 09:53:32

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GRIND-LEACH CONTROL ROOM TABLE AT ENTRANCE | 19 | 14 | <6 | <7 | <7 | <7 | 21 | 57 | 27 | 81 | 13 | |
| | 25 | 41 | 10 | 11 | <7 | 12 | 24 | 10 | 30 | 17 | | |
| | 16 | 14 | 9 | <8 | <7 | 12 | <7 | 25 | 7 | | | |
| | 24 | 96 | 12 | <8 | 8 | <7 | 18 | 11 | 19 | | | |
| | | | <8 | | 131 | | | 11 | | | | |
| PRODUCT BUILDING CONTROL ROOM DOOR AT ENTRANCE | | | | | | 35 | | | | | | |
| PRODUCT BUILDING CONTROL ROOM TABLE | | | | | | 12 | | | | | | |
| SECONDARY CRUSHER LUNCHROOM TABLE | | | | | 36 | | | | | | | |
| MAINTENANCE TRAILER LUNCHROOM SOUTH ENTRANCE | | | | | | | | 58 | | | | |
| SHOP AREA TABLE TOPS | 37 | 35 | 68 | 76 | 76 | 77 | 15 | 14 | 9 | 117 | 22 | 13 |
| | 35 | 39 | 91 | 45 | 8 | 6* | 39 | 20 | 63 | 54 | 37 | 42 |
| | 22 | 64 | 28 | 43 | 43 | 482 | 87 | 27 | 68 | 26 | 77 | 17 |
| | 68 | 61 | 92 | 32 | 21 | <6 | 43 | 8 | 16 | 27 | *243 | 42 |
| | | | 60 | | 131 | 51 | | 34 | | 93 | 11 | |
| MAINTENANCE TRAILER LUNCHROOM TABLE | | | | | | | | 30 | | | | |
| RUBBER SHOP TABLE | | | | | | | | | 20 | | | |
| GUARD SHACK FLOOR | 27 | 12 | 19 | 13 | 31 | 24 | 8 | <7 | 7 | 19 | 11 | 8 |
| | 17 | 34 | 35 | 6 | <7 | 14 | 24 | <6 | 12 | 13 | 8 | 15 |
| | 8 | 17 | 12 | 10 | 14 | 14 | 24 | 14 | 14 | <6 | 17 | 10 |
| | 45 | 21 | 22 | 10 | 8 | 15 | 10 | <5 | 19 | 13 | 8 | 14 |
| | | | 22 | | 19 | | | 7 | | <6 | | |
| GUARD SHACK TABLE | <7 | <8 | <6 | <7 | <7 | <7 | 8 | <7 | 7 | <6 | <6 | <7 |
| | 17 | 26 | 15 | <6 | <7 | <6 | <6 | <6 | <6 | <6 | <7 | <6 |
| | 19 | 27 | <8 | <8 | <7 | <6 | 11 | 8 | <6 | <6 | <7 | 8 |
| | <7 | 16 | <8 | <8 | <7 | 10 | <7 | <5 | <5 | <6 | <6 | 9 |
| | | | <8 | | <7 | | | <5 | | <6 | | |
| RUBBER SHOP FLOOR | | | | | | | | | 25 | | | |
| SX TABLE | 30 | 14 | 9 | <7 | 11 | <7 | 13 | <7 | <6 | 36 | 8 | |
| | 30 | 28 | <7 | 14 | 10 | 14 | <6 | <6 | 19 | 15 | | |
| | 32 | 19 | 12 | <8 | <7 | <6 | <7 | 10 | 18 | | | |
| | 13 | 21 | <8 | 15 | 11 | <7 | 20 | <5 | 60 | | | |
| | | | <8 | | <7 | | | <5 | | | | |
| RADIATION SAFETY TECHNICIANS' FLOOR | 19 | 22 | 12 | 8 | <7 | 14 | 10 | 10 | 9 | 17 | 22 | 19 |
| | 17 | 81 | 23 | 17 | <7 | 17 | 14 | <6 | 14 | 17 | 19 | 31 |
| | 27 | 14 | 15 | 12 | 19 | 17 | 16 | <6 | 29 | 8 | 24 | 21 |
| | 13 | 41 | <8 | 12 | <7 | <7 | 13 | <5 | 21 | 20 | 13 | 12 |
| | | | <8 | | 35 | | | 11 | | 10 | | |

PROGRAM - LAB120

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY FOR 1988 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 01/11/89
TIME 09:55:40

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RADIATION SAFETY TECHNICIANS' TABLE | 19 | 14 | <6 | <7 | <7 | <7 | 8 | 17 | 13 | <6 | 9 | <7 |
| | 12 | 49 | 10 | 14 | <7 | <6 | <6 | <6 | 8 | <6 | <7 | <6 |
| | 19 | 9 | 9 | 10 | 11 | <6 | 16 | 8 | <6 | 12 | 8 | <6 |
| | 13 | 16 | <8 | <8 | <7 | <7 | 48 | 7 | <5 | <6 | 11 | 12 |
| | | | <8 | | 9 | | | <5 | | <6 | | |
| CRUSHER FOREMAN'S OFFICE ENTRANCE | 17 | 17 | | | | | 31 | | 17 | | | |
| | 14 | 31 | | | | | | | | | | |
| | 35 | <8 | | | | | | | | | | |
| | 21 | 41 | | | | | | | | | | |
| CRUSHER FOREMAN'S TABLE | 24 | <8 | | | | | 8 | | <6 | | | |
| | <8 | 28 | | | | | | | | | | |
| | 24 | 32 | | | | | | | | | | |
| | 24 | 16 | | | | | | | | | | |
| SAFETY TECHNICIANS' TABLE | 25 | 19 | <6 | <7 | <7 | <7 | 10 | <7 | <6 | <6 | <6 | 8 |
| | 12 | 15 | <7 | <6 | <7 | 12 | <6 | <6 | 8 | 7 | 8 | 7 |
| | 40 | 14 | 9 | <8 | <7 | <6 | <7 | <6 | <6 | 12 | <7 | <6 |
| | 37 | 10 | <8 | <8 | 8 | 10 | <7 | <5 | <5 | 7 | <6 | 7 |
| | | | <8 | | 9 | | | 11 | | <6 | | |
| CRUSHER/LABOR LUNCHROOM TRAILER FLOOR | <7 | | | | 10 | 47 | 33 | 32 | 9 | 11 | 40 | 15 |
| | <8 | | | | 13 | 61 | 19 | 10 | 19 | 37 | 13 | 24 |
| | 35 | | | | 24 | | 19 | 14 | 18 | <6 | 15 | 10 |
| | | | | | | | 25 | <5 | 23 | 27 | | 16 |
| | | | | | | | | 21 | | 23 | | |
| CRUSHER/LABOR LUNCHROOM TRAILER TABLE | 17 | | | | <7 | 115 | 18 | <7 | 13 | <6 | 9 | 8 |
| | <8 | | | | 8 | 10 | <6 | <6 | 8 | 17 | <7 | 13 |
| | 27 | | | | 56 | | <7 | <6 | <6 | 10 | <6 | <6 |
| | | | | | | | <7 | <5 | <5 | 7 | | 12 |
| | | | | | | | | <5 | | 8 | | |
| SALVAGE SHOP TABLE | 27 | 12 | 35 | 24 | 41 | 97 | 8 | 37 | | | | |
| | 17 | 36 | 86 | 32 | 26 | 75 | 129 | 81 | | | | |
| | 59 | 84 | 168 | 151 | 51 | 40 | 19 | | | | | |
| | 40 | 66 | 69 | 57 | 16 | 76 | 41 | | | | | |
| | | | 35 | | 40 | | | | | | | |
| SALVAGE SHOP FLOOR | 50 | 11 | 122 | 73 | 59 | 74 | 56 | 54 | | | | |
| | 35 | 49 | 138 | 60 | 52 | 65 | 54 | 20 | | | | |
| | 69 | 44 | 30 | 15 | 257 | 58 | 16 | | | | | |
| | 54 | 64 | 71 | 35 | 47 | 74 | 38 | | | | | |
| | | | 56 | | 61 | | | | | | | |
| WAREHOUSE TABLE | 22 | 29 | <8 | <8 | | | 8 | | <6 | <6 | 11 | |
| | 12 | 99 | | | | | | | | <6 | <7 | |
| | 14 | 9 | | | | | | | | <6 | | |
| | 21 | 61 | | | | | | | | <6 | | |
| WHSE SHIP/REC TABLE | 30 | 27 | 22 | 63 | 8 | <7 | 13 | 20 | 32 | 13 | 17 | |

PROGRAM - LAB12?

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY FOR 1988 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 01/11/89
TIME 09:57:10

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 24 | 47 | 30 | 22 | 13 | <6 | 11 | <6 | 12 | 13 | 13 | |
| | 27 | 24 | 9 | 12 | 26 | 13 | | | | 38 | 32 | |
| | 19 | 31 | 20 | 20 | | | | | | <6 | | |
| | | | 25 | | | | | | | | | |
| ELECTRICIAL FOREMAN'S TABLE | 22 | 55 | | | | 22 | 13 | 14 | 34 | 24 | 45 | |
| | 32 | 62 | | | | | | 20 | 27 | 12 | | |
| | 35 | 17 | | | | | | | | | | |
| | 24 | 56 | | | | | | | | | | |
| TRAILER OFFICE FLOOR | | | | | 189 | <7 | | | | | | |
| TRAILER OFFICE TABLE-WEST | 11 | <8 | <6 | <7 | <7 | 6 | <6 | <6 | <6 | <6 | <7 | <6 |
| | | 15 | <7 | <6 | <7 | <6 | <7 | <5 | <5 | | <6 | <6 |
| | | 9 | <8 | 10 | <7 | <7 | <7 | | | | | |
| | | <9 | <8 | <8 | <7 | | | | | | | |
| | | | <8 | | <7 | | | | | | | |
| TRAILER OFFICE TABLE-EAST | 16 | 27 | <6 | <7 | <7 | 6 | <6 | <6 | 16 | <6 | <7 | 49 |
| | | 10 | <7 | <6 | <7 | <6 | <7 | 7 | <5 | | <6 | 30 |
| | | 12 | <8 | 12 | <7 | <7 | <7 | | | | | |
| | | 11 | <8 | <8 | <7 | | | | | | | |
| | | | <8 | | <7 | | | | | | | |
| TRAILER OFFICE FLOOR AT ENTRANCE | | | | | | 127 | <7 | <7 | 7 | 6 | 9 | 8 |
| | | | | | | | <7 | <6 | 23 | 11 | 13 | |
| | | | | | | | | <5 | | <6 | | |
| | | | | | | | | | | 7 | | |
| CONSTRUCTION TRAILER LUNCH TABLE | | | | | | | 105 | 44 | 9 | <6 | 9 | |
| | | | | | | | 29 | <6 | <6 | <6 | 8 | |
| | | | | | | | 29 | 8 | <6 | <6 | <6 | |
| | | | | | | | 18 | 11 | 12 | 24 | | |
| | | | | | | | | <5 | | <6 | | |
| CONSTRUCTION TRAILER LUNCH FLOOR | | | | | | | 28 | 49 | 37 | 36 | 18 | |
| | | | | | | | 44 | 33 | 38 | 30 | 11 | |
| | | | | | | | 129 | 22 | 36 | 28 | 30 | |
| | | | | | | | 155 | 53 | 43 | 68 | | |
| | | | | | | | | 25 | | 41 | | |
| TRAILER HOUSE CHANGE HOUSE COUNTER | | | | | | | <7 | 17 | 11 | 23 | 18 | |
| | | | | | | | <6 | 31 | 16 | <6 | 19 | |
| | | | | | | | <7 | 8 | 10 | <6 | | |
| | | | | | | | 18 | <5 | <5 | 13 | | |
| | | | | | | | | <5 | | <6 | | |
| CONSTRUCTION TRAILER COUNTER | | | | | | | <7 | | | | | |
| | | | | | | | <6 | | | | | |
| | | | | | | | <7 | | | | | |
| CONSTRUCTION TRAILER COUNTER SOUTH | | | | | | | 18 | | | | | |

PROGRAM - LAB120

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY FOR 1988 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 01/11/89
TIME 09:58:29

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTRUCTION TRAILER DESK SOUTH END | | | | | | | <7 | <7 | <6 | <6 | <6 | <7 |
| | | | | | | | <7 | 12 | <6 | <6 | <7 | <6 |
| | | | | | | | | <6 | <6 | <6 | <7 | |
| | | | | | | | | <6 | <5 | <6 | 8 | |
| | | | | | | | | 7 | | <6 | | |
| MET LAB WORK AREA COUNTER | | | | | | | 13 | 10 | 19 | 23 | | |
| | | | | | | | 10 | 12 | | | | |
| | | | | | | | | 29 | | | | |
| ON-SITE COORD-CDH OFFICE TABLE | | | | | | | 21 | 19 | <6 | <6 | 8 | |
| | | | | | | | | | | <6 | <6 | |
| | | | | | | | | | | <6 | | |
| | | | | | | | | | | 11 | | |
| ON-SITE COORD CDH OFFICE ENTRANCE | | | | | | | 24 | 30 | 10 | 13 | 8 | |
| | | | | | | | | | | 22 | 15 | |
| | | | | | | | | | | <6 | | |
| | | | | | | | | | | <6 | | |
| CONSTRUCTION TRAILER DESK AT ENTRANCE | | | | | | | | | | <6 | <6 | |
| | | | | | | | | | | <6 | <7 | |
| | | | | | | | | | | <6 | | |
| | | | | | | | | | | <6 | | |
| CONSTRUCTION TRAILER TABLE NORTH END | | | | | | | <7 | <7 | 11 | <6 | 90 | <7 |
| | | | | | | | | <6 | 8 | <6 | <7 | 9 |
| | | | | | | | | <6 | <6 | 12 | <7 | |
| | | | | | | | | <6 | <5 | <6 | <6 | |
| | | | | | | | | <5 | | <6 | | |
| CONSTRUCTION TRAILER OUTSIDE RESTROOM | | | | | | | | 10 | <5 | | | <7 |
| | | | | | | | | 13 | | | | |
| SEC. IMP. RESTROOM | | | | | | | | 54 | | | | |
| CONSTRUCTION TRAILER AIR COND. SO. | | | | | | | | | 9 | | | |
| ELECTRIC SHOP AREA COUNTER | | | | | | | | | | | | 13 |

PROGRAM - LA8120

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY FOR 1987 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 02/04/88
TIME 10:19:36

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MENS' LOCKER ROOM DOOR AT ENTRANCE | <7 | 46 | 36 | 25 | 7 | 13 | 8 | <7 | 11 | 35 | 9 | 9 |
| | 25 | 15 | 21 | 24 | 15 | 11 | <7 | 8 | <6 | <9 | 11 | 29 |
| | <10 | <8 | 10 | 8 | <7 | <6 | 9 | 19 | 2 | 20 | <3 | 17 |
| | 17 | 33 | 8 | 12 | 18 | 44 | 13 | <8 | 24 | 15 | <3 | 18 |
| | | | | 28 | | 21 | | | | | | <3 |
| WOMENS' LOCKER ROOM DOOR AT ENTRANCE | 19 | 49 | 38 | 10 | <7 | <7 | 18 | 23 | <7 | 15 | 17 | 6 |
| | 20 | 37 | 11 | 21 | <8 | 21 | 10 | <7 | <8 | 14 | <3 | 34 |
| | 13 | 32 | 8 | <7 | <7 | 6 | 27 | <7 | 4 | <8 | <3 | 15 |
| | <9 | 13 | 45 | 9 | 10 | 11 | 13 | 10 | <7 | 33 | 6 | 10 |
| | | | | <7 | | 23 | | | | | | 12 |
| MAIN OFFICE NORTH DOOR AT ENTRANCE | <7 | 14 | 26 | 8 | <7 | 33 | <7 | 8 | <7 | 10 | <8 | 6 |
| | 53 | 20 | <7 | 26 | <8 | <7 | 10 | <7 | <8 | 21 | 6 | 11 |
| | <10 | <8 | <7 | <7 | 18 | 11 | 6 | 6 | 2 | 12 | 4 | <8 |
| | <9 | 38 | <7 | <6 | 15 | <7 | 16 | 15 | 11 | 20 | <3 | 13 |
| | | | | 13 | | <7 | | | | | | 7 |
| MAIN OFFICE EAST DOOR AT ENTRANCE | <7 | 26 | 16 | 28 | 12 | 28 | <7 | <7 | <7 | <8 | 15 | <3 |
| | <9 | 22 | <7 | <7 | <8 | <7 | <7 | <7 | <8 | 16 | <3 | 21 |
| | 15 | 17 | 10 | <7 | 15 | <6 | 19 | 6 | 7 | 10 | <3 | 20 |
| | 14 | 23 | <7 | 12 | 23 | 14 | <7 | 15 | 9 | <8 | <3 | 20 |
| | | | | 8 | | 11 | | | | | | 9 |
| SECONDARY CRUSHER LUNCHROOM DOOR AT ENTRANCE | 29 | 181 | 164 | | | | | | | | | |
| | 104 | 218 | 137 | | | | | | | | | |
| | 28 | 112 | 20 | | | | | | | | | |
| | 14 | 113 | | | | | | | | | | |
| LAB LUNCHROOM DOOR AT ENTRANCE | 16 | 11 | 21 | 15 | 10 | 8 | 11 | 11 | 10 | 17 | 30 | 16 |
| | 40 | 67 | 18 | 19 | <8 | 13 | 25 | 8 | <8 | <9 | <3 | 39 |
| | 20 | 27 | 10 | 8 | 10 | 14 | 6 | 8 | 9 | 20 | 80 | <8 |
| | 21 | 51 | 10 | 22 | 10 | 14 | 21 | 15 | 39 | 17 | 4 | <7 |
| | | | | 13 | | 18 | | | | | | 4 |
| LAB LUNCHROOM TABLE | <7 | <8 | 11 | <7 | <7 | <7 | 8 | 8 | <8 | <8 | <8 | 6 |
| | <9 | <7 | <7 | <7 | <8 | <7 | <7 | <7 | <8 | 11 | <3 | 16 |
| | <10 | <8 | <7 | <7 | <7 | 6 | <6 | 9 | <2 | <8 | <3 | 12 |
| | <9 | <7 | <7 | <6 | <7 | <7 | 11 | <8 | <7 | 22 | <3 | <7 |
| | | | | 10 | | <7 | | | | | | <3 |
| ELECTRICIANS' LUNCHROOM DOOR AT ENTRANCE | 22 | 124 | 78 | 83 | 43 | 13 | 56 | 48 | 78 | 56 | 28 | 14 |
| | 89 | 70 | 81 | 49 | 22 | 24 | 20 | 36 | 92 | 27 | 22 | 76 |
| | 73 | 95 | 23 | 50 | 35 | 47 | 39 | 29 | 26 | 25 | <3 | 41 |
| | 71 | 56 | 97 | 46 | 43 | 59 | 38 | 61 | 31 | 56 | 16 | 54 |
| | | | | 43 | | 34 | | | | | | 12 |
| ELECTRICIANS' LUNCHROOM TABLE | <7 | 39 | 31 | 23 | 12 | <7 | <7 | 13 | 73 | 10 | 15 | 4 |
| | 15 | 10 | 13 | <7 | <8 | <7 | <7 | 18 | <8 | 76 | 6 | 39 |
| | <10 | 15 | 15 | 33 | 13 | 19 | 14 | 24 | 9 | 17 | 32 | 12 |
| | <9 | 41 | 8 | <6 | <7 | 16 | <7 | 53 | 16 | 22 | <3 | 33 |

PROGRAM - LAB120

COTTER CORPORATION

ALPHA CONTAMINATION SURVEY FOR 1987 (ALPHA ACTIVITY(DPM/100 CM**2)

(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 02/04/88
TIME 10:21:31

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 13 | | 11 | | | | | | 26 |
| INSTRUMENT LUNCHROOM WEST DOOR AT ENTRANCE | 39 | 119 | | 75 | | | | | | | | |
| | 86 | | | | | | | | | | | |
| | 46 | | | | | | | | | | | |
| | 17 | | | | | | | | | | | |
| INSTRUMENT LUNCHROOM TABLE | 26 | 31 | | 20 | | | | | | | | |
| | 23 | | | | | | | | | | | |
| | 15 | | | | | | | | | | | |
| | <9 | | | | | | | | | | | |
| HET LAB LUNCHROOM TABLE | <7 | <8 | <7 | 20 | 10 | <7 | <7 | <7 | 13 | <8 | <8 | 9 |
| | 30 | 17 | <7 | <7 | <8 | <7 | <7 | <7 | 89 | 47 | <3 | 18 |
| | <10 | 10 | 15 | <7 | <7 | <6 | <6 | 6 | 95 | <8 | <3 | 10 |
| | <9 | 6 | <7 | 17 | <7 | 16 | 18 | <8 | 44 | 15 | <3 | <7 |
| | | | | <7 | | <7 | | | | | | 7 |
| HET LAB WEST DOOR AT ENTRANCE | 34 | 29 | 31 | 48 | 43 | 35 | 31 | 26 | 26 | 33 | 17 | 6 |
| | 46 | 47 | 36 | 31 | 35 | 59 | 53 | 61 | 38 | 19 | 18 | 66 |
| | 71 | 50 | 28 | 43 | 45 | 34 | 42 | 40 | 14 | 38 | 6 | 33 |
| | 26 | 46 | 18 | 60 | 28 | 36 | 28 | 58 | 26 | 12 | 4 | 10 |
| | | | | 152 | | 34 | | | | | | 16 |
| JU-JX CONTROL ROOM NORTH DOOR AT ENTRANCE | 8 | 104 | 151 | 86 | 68 | 69 | 31 | 63 | 70 | 63 | 41 | 19 |
| | 149 | 127 | 94 | 104 | 65 | 72 | 28 | 43 | 56 | 55 | 6 | 47 |
| | 53 | 90 | 43 | 90 | 78 | 77 | 44 | 64 | 38 | 56 | 23 | 67 |
| | 36 | 88 | 95 | 110 | 86 | 24 | 79 | 63 | 56 | 38 | 21 | 41 |
| | | | | 71 | | 94 | | | | | | 14 |
| CCD CONTROL ROOM AT ENTRANCE | 68 | 379 | 435 | 134 | 110 | 132 | 119 | 56 | 70 | 81 | 72 | 45 |
| | 154 | 327 | 313 | 203 | 87 | 80 | 106 | 36 | 92 | 86 | 13 | 108 |
| | 23 | 317 | 88 | 115 | 142 | 115 | 85 | 74 | 52 | 30 | 9 | 74 |
| | 36 | 238 | 326 | 199 | 103 | 94 | 81 | 33 | 96 | 85 | 31 | 59 |
| | | | | 243 | | 122 | | | | | | 26 |
| CCD CONTROL ROOM TABLE | 31 | 131 | 88 | 13 | 17 | 28 | 21 | 33 | 50 | 15 | 33 | 4 |
| | 23 | 122 | 16 | 29 | 17 | 21 | 13 | 8 | <8 | 34 | 4 | 29 |
| | 88 | 92 | 13 | 15 | 13 | 19 | 24 | 16 | 16 | 17 | 27 | <8 |
| | 56 | 88 | 48 | 22 | 123 | 14 | 31 | 33 | 56 | 41 | 19 | 38 |
| | | | | 8 | | 8 | | | | | | 12 |
| GRIND-LEACH CONTROL ROOM WEST DOOR AT ENTRANCE | 147 | 221 | 146 | 156 | 48 | 69 | 54 | 51 | 55 | 48 | 25 | 16 |
| | 20 | 172 | 68 | 92 | 118 | 62 | 60 | <7 | <8 | 24 | 13 | 55 |
| | 91 | 200 | 18 | 108 | 91 | 72 | 57 | 44 | 11 | 58 | 18 | 59 |
| | 44 | 193 | 132 | 115 | 73 | 46 | 74 | 33 | 74 | 67 | 19 | 48 |
| | | | | 122 | | 51 | | | | | | 4 |
| GRIND-LEACH CONTROL ROOM EAST DOOR AT ENTRANCE | 22 | 124 | 149 | 66 | 55 | 26 | 79 | 43 | 93 | 51 | 56 | 36 |
| | 30 | 95 | 76 | 46 | 90 | 92 | 71 | 23 | 82 | 52 | 8 | 71 |
| | 28 | 110 | 48 | 356 | 73 | 37 | 54 | 40 | 23 | 69 | 16 | 72 |
| | 51 | 76 | 63 | 67 | 28 | 49 | 71 | 32 | 74 | 38 | 19 | 87 |

PROGRAM - LA0120

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY FOR 1987 (ALPHA ACTIVITY(DPM 100 CM**2)
(* DENOTES SURVEY AFTER CLEANUP)

RUN DATE 02/04/88
TIME 10 25 11

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 48 | | 104 | | | | | | 26 |
| GRIND-LEACH CONTROL ROOM TABLE AT ENTRANCE | 12 | 66 | 129 | 35 | 153 | 13 | 44 | 13 | 20 | <7 | 20 | 6 |
| | 20 | 82 | 48 | 177 | 67 | 26 | <7 | <7 | 30 | 68 | 27 | 50 |
| | <10 | 35 | 46 | 57 | 23 | 11 | 32 | 19 | 4 | 20 | 13 | 25 |
| | 19 | 141 | 140 | 70 | 15 | 19 | 8 | 10 | 16 | 22 | 64 | 13 |
| | | | | 28 | | 31 | | | | | | 4 |
| PRODUCT BUILDING CONTROL ROOM DOOR AT ENTRANCE | 49 | | | | | | | | | | | |
| | 144 | | | | | | | | | | | |
| | 46 | | | | | | | | | | | |
| | 78 | | | | | | | | | | | |
| PRODUCT BUILDING CONTROL ROOM TABLE | 14 | | | | | | | | | | | |
| | 20 | | | | | | | | | | | |
| | 15 | | | | | | | | | | | |
| | < | | | | | | | | | | | |
| SECONDARY CRUSHER LUNCHROOM TABLE | 7 | 14 | 28 | | | | | | | | | |
| | 30 | 15 | 38 | | | | | | | | | |
| | 10 | 10 | 15 | | | | | | | | | |
| | <9 | 28 | | | | | | | | | | |
| MAINTENANCE TRAILER LUNCHROOM SOUTH ENTRANCE | 24 | 161 | 161 | | | | | | | | | |
| | 26 | 132 | | | | | | | | | | |
| | 18 | 92 | | | | | | | | | | |
| | 41 | 171 | | | | | | | | | | |
| SHOP AREA TABLE TOPS | 27 | 131 | 144 | 35 | 30 | 84 | 59 | 106 | 40 | 99 | 74 | 16 |
| | 104 | 192 | 144 | 74 | 37 | 97 | 66 | 89 | <8 | 26 | 11 | 29 |
| | 78 | 197 | 15 | 75 | 131 | 95 | 34 | 89 | 64 | 38 | 180 | 258 |
| | 36 | 28 | 107 | 131 | 35 | 177 | 48 | 22 | 21 | 41 | 14 | 72* |
| | | | | 112 | | 56 | | | | | | 28 |
| | | | | | | | | | | | | 34 |
| MAINTENANCE TRAILER LUNCHROOM TABLE | 17 | 69 | 38 | | | | | | | | | |
| | 20 | *42 | | | | | | | | | | |
| | <10 | 230 | | | | | | | | | | |
| | 19 | 32 | | | | | | | | | | |
| | | 23 | | | | | | | | | | |
| RUBBER SHOP TABLE | 14 | | | 18 | | | | | | | | |
| | 137 | | | | | | | | | | | |
| | 10 | | | | | | | | | | | |
| | <9 | | | | | | | | | | | |
| GUARD SHACK FLOOR | | 78 | 68 | 23 | <7 | <7 | 8 | 13 | 44 | 40 | <8 | 11 |
| | | | 36 | 26 | 22 | | 10 | 13 | 21 | 21 | 4 | 37 |
| | | | 15 | 15 | 15 | 11 | 6 | 44 | 11 | 20 | <3 | 17 |
| | | | 30 | 24 | 18 | 16 | 8 | <8 | 21 | 20 | 6 | 28 |
| | | | | 13 | | 107 | | | | | | 14 |

PROGRAM - LAB120

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY FOR 1987 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 02/04/88
TIME 10:24:31

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GUARD SHACK TABLE | | 13 | 7 | <7 | <7 | <7 | <7 | <7 | 13 | <8 | <8 | <3 |
| | | | 8 | <7 | <8 | <7 | <7 | <7 | 8 | 11 | <3 | 10 |
| | | | <7 | <7 | <7 | <6 | 6 | 62 | 4 | <8 | <3 | 10 |
| | | | <7 | <6 | <7 | <7 | <7 | <8 | <7 | <8 | <3 | <7 |
| | | | | <7 | | <7 | | | | | | <3 |
| RUBBER SHOP FLOOR | 9 | | | 53 | | | | | | 63 | | |
| | 48 | | | | | | | | | | | |
| | <10 | | | | | | | | | | | |
| | 29 | | | | | | | | | | | |
| SX TABLE | 12 | 56 | 31 | 28 | 7 | <7 | 16 | 18 | 32 | <8 | <8 | <3 |
| | 51 | 30 | 18 | <7 | <8 | <7 | 13 | <7 | <8 | 19 | <3 | 37 |
| | 15 | <8 | 15 | 8 | <7 | 9 | <6 | 14 | 16 | 35 | <3 | <8 |
| | 19 | 48 | 15 | <6 | 7 | 36 | 11 | <8 | 54 | 17 | 21 | 13 |
| | | | | 31 | | 21 | | | | | | <3 |
| RADIATION SAFETY TECHNICIANS' FLOOR | 17 | 11 | 16 | 15 | 25 | 36 | 21 | 11 | 8 | 30 | 12 | 6 |
| | 28 | 50 | 16 | 14 | 30 | 16 | 30 | <7 | 10 | 42 | <3 | 29 |
| | <10 | 30 | 20 | 30 | 25 | 27 | 24 | 49 | 4 | 20 | 6 | <3 |
| | 27 | 36 | 25 | 34 | 18 | 11 | 13 | <8 | 19 | <8 | 4 | 38 |
| | | | | 21 | | 8 | | | | | | 16 |
| RADIATION SAFETY TECHNICIANS' TABLE | 41 | 9 | 13 | 10 | 10 | <7 | 13 | <7 | 97 | 10 | <8 | <3 |
| | <9 | <7 | 11 | 9 | 10 | <7 | <7 | 8 | 10 | 14 | 4 | 28 |
| | 18 | <8 | 23 | <7 | 15 | 21 | 16 | 19 | 11 | 17 | <3 | 10 |
| | 21 | 18 | 13 | 17 | 25 | 24 | <7 | 12 | 16 | 22 | <3 | 10 |
| | | | | 16 | | 8 | | | | | | 12 |
| CRUSHER FOREMAN'S OFFICE ENTRANCE | | | | | | | | 18 | 13 | 34 | <3 | 6 |
| | | | | | | | | 48 | 21 | 28 | <3 | 66 |
| | | | | | | | | | 4 | 22 | 24 | 41 |
| | | | | | | | | | 26 | | | 7 |
| CRUSHER FOREMAN'S TABLE | | | | | | | | 8 | 13 | 21 | <3 | <3 |
| | | | | | | | | <6 | <8 | 22 | 16 | 11 |
| | | | | | | | | | 7 | <8 | 11 | 15 |
| | | | | | | | | | 34 | | | 19 |
| SAFETY TECHNICIANS' TABLE | <7 | <8 | <7 | 8 | <7 | <7 | 8 | <7 | <7 | <8 | <8 | 11 |
| | 10 | <7 | <7 | <7 | <8 | <7 | <7 | <7 | <8 | 19 | 4 | 39 |
| | 10 | 10 | 13 | <7 | <7 | 6 | 11 | <6 | 4 | <8 | 6 | <8 |
| | <9 | <7 | 20 | <6 | 7 | 9 | 8 | <8 | <7 | <8 | <3 | 28 |
| | | | | 13 | | 8 | | | | | | <3 |
| JIM CAIN'S DESK | | | | | | | | | | 11 | | |
| CRUSHER/LABOR LUNCHROOM TRAILER FLOOR | 39 | 39 | 68 | 25 | 35 | 18 | 26 | 31 | 13 | 20 | <8 | 4 |
| | 10 | 30 | 43 | 54 | 25 | 16 | 15 | 8 | 34 | 11 | <3 | 24 |
| | 10 | 45 | 23 | 50 | 13 | 14 | 27 | 6 | 16 | <8 | 11 | 12 |
| | 17 | 61 | 38 | 50 | 25 | 16 | 23 | 17 | 31 | <8 | 9 | 23 |
| | | | | 28 | | 11 | | | | | | 16 |

PROGRAM - LAB120

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY FOR 1987 (ALPHA ACTIVITY (DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 02/04/88
TIME 10:26:09

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUSHER/LABOR LUNCHROOM TRAILER TABLE | <7 | <3 | 13 | <7 | <7 | 3 | 11 | 16 | <7 | <8 | <8 | <3 |
| | 13 | <7 | 8 | <7 | 15 | <7 | 10 | <7 | 13 | 21 | <3 | <9 |
| | 13 | 17 | 13 | 15 | <7 | <6 | 11 | <6 | 19 | 17 | <3 | 20 |
| | <9 | 13 | 10 | <6 | 7 | <7 | <7 | <8 | 11 | <8 | 4 | 10 |
| | | | | <7 | | <7 | | | | | | <3 |
| SALVAGE SHOP TABLE | 35 | | | | | | | 48 | 163 | 129 | 41 | 21 |
| | | | | | | | | | 66 | 112 | 11 | 87 |
| | | | | | | | | | 26 | 48 | 13 | 28 |
| | | | | | | | | | 76 | 106 | 24 | 130 |
| | | | | | | | | | | | | 51 |
| SALVAGE SHOP FLOOR | | | | | | | | 33 | 73 | 102 | 38 | 23 |
| | | | | | | | | | 66 | 39 | 20 | 53 |
| | | | | | | | | | 16 | 22 | 32 | 98 |
| | | | | | | | | | 116 | 33 | 24 | 130 |
| | | | | | | | | | | | | 24 |
| MILL FOREMAN/SHIFTERS TABLE | 12 | 9 | 18 | 10 | 10 | 19 | <7 | 8 | 20 | 8 | <8 | 4 |
| | <9 | <7 | <7 | 34 | 12 | <6 | <6 | 7 | <8 | 63 | <3 | 50 |
| | 23 | 30 | 13 | <7 | 15 | 11 | | <8 | 19 | 15 | 18 | |
| | <9 | | <7 | 34 | 10 | <7 | | <8 | 21 | 20 | <3 | |
| | | | | <7 | | | | | | | | |
| WAREHOUSE TABLE | 61 | <8 | 10 | 11 | | | | 18 | 22 | 11 | <3 | 6 |
| | | | | | | | | | 18 | 10 | 9 | <9 |
| | | | | | | | | | <2 | 33 | 16 | 13 |
| | | | | | | | | | 24 | | | 7 |
| WHSE SHIP/REC TABLE | <7 | 16 | 23 | 43 | 7 | 13 | 8 | 8 | 35 | 28 | 25 | <3 |
| | <9 | 12 | 23 | 51 | 32 | 11 | 339 | <7 | 64 | 14 | <3 | 21 |
| | <9 | 50 | <7 | <7 | 43 | 14 | *71 | 70 | 23 | 10 | 4 | <8 |
| | | 31 | | 22 | 28 | 18 | 24 | 38 | <7 | 12 | 16 | <7 |
| | | | | 38 | | | 13 | | | | | <3 |
| ELECTRICIAL FOREMAN'S TABLE | | | | | | | | <7 | 15 | <9 | 11 | 6 |
| | | | | | | | | | 31 | 35 | 11 | 68 |
| | | | | | | | | | 19 | 51 | 14 | 46 |
| | | | | | | | | | 39 | | | 16 |
| SALVAGE SHOP WORK TABLE #1 | | | | | | | 60 | | | | | |
| SALVAGE SHOP WORK TABLE #2 | | | | | | | 148 | | | | | |
| SHIFTERS' FLOOR | | | | | | | | 10 | | | | |
| ANALYTICAL LAB EAST DOOR FLOOR AT ENT. | | | | | | | | <8 | | | | |
| TRAILER OFFICE FLOOR | | | | | | | | | | | | 17 |
| TRAILER OFFICE TABLE-WEST | | | | | | | | | | | | 12 |

PROGRAM - LA8129

COTTER CORPORATION

ALPHA CONTAMINATION SURVEY FOR 1987 (ALPHA ACTIVITY/DPM/100 CM**2)

(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE = 12/04/87

TIME 10:27:41

| AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TRAILER OFFICE TABLE-EAST | | | | | | | | | | | | <8 |

## 3.3 - INDEPENDENT AUDIT - ANNUAL REPORT

LICENSE CONDITIONS 23.9, 23.9.1, 23.9.2 AND 23.9.3

An independent radiation safety audit was conducted at the mill from May 2, 1988 to May 6, 1988, by E. R. Johnson and Associates. The findings of this audit were forwarded to the Colorado Department of Health on September 29, 1988, and appropriate remedial actions have been ongoing since the receipt of the final audit report.

## 4.0 - BIOASSAY MEASUREMENTS - ANNUAL REPORT

LICENSE CONDITION 24.0

Bioassay measurements by urinalysis methods were conducted at the mill in 1988. Analytical results and accompanying discussion are presented in Section 4.1. In vivo testing was not conducted in 1988 due to the shutdown of operations. Of the current employees, none met the criteria established for in vivo measurements which states in the Radiological Health and Safety Procedure 2-12 that "an annual in vivo lung scan will be made on all workers routinely involved in ore crushing and handling and in the calcining and handling of uranium concentrates or in maintenance of related equipment. Baseline in vivo measurements will be obtained for all non-clerical mill employees as soon as feasible after employment starts".

## 4.1 - URINALYSIS DATA

LICENSE CONDITION 24.1.1.1

Urinalysis measurements for uranium concentrations were performed for employees based on their assigned duties during this period. The analytical results for urine samples collected from mill personnel in 1988 are presented in Figure 4.5. Results for the outside contractor employees are not included in order to permit comparison with results of previous data from 1984 through 1987. These data are presented in Figures 4.1 through 4.4, respectively.

Inspection of the data presented in Figures 4.1 through 4.5 indicates a stabilization of results through 1986, a decrease in 1987 and no change in 1988 for uranium in urine concentrations of Cotter mill employees. The decrease and stabilization in 1987 and 1988 are attributed to the shutdown of milling operations. To further compare the results for each year from 1984 through 1988, Tables 4.1 and 4.2 were prepared to show the monthly average and yearly average of monthly concentrations of urinary uranium, the associated monthly standard deviations and yearly average monthly deviations for these years.

For the period beginning in 1984 through 1988, no sample has exceeded the second action level (29 ug/l Uranium).

Evaluation of the 1988 data with regard to the first action level (15 ug/l) shows no change from 1987. This is attributed to the shutdown of milling operations. Specifically, the percentages of urinalysis sample results in excess of 15 ug/l from 1984 through 1988 were 0.37%, 0.25%, 0.20%, 0.00%,and 0.00%, respectively.

A monthly distribution of urinalysis data as a function of job category is summarized for 1988 in Table 4.3. A total of 141 urinalyses was performed during 1988 including 12 rerun analyses performed to verify sample results.

Referring to Figure 4.5, it was determined that 100% of urine sample results for 1988 showed uranium concentrations of less than the analytical detection limit of 5 ug/l. Table 4.1 and Figure 4.5 represent results for the 120 urine samples collected. They do not include rerun (re-analysis) results.

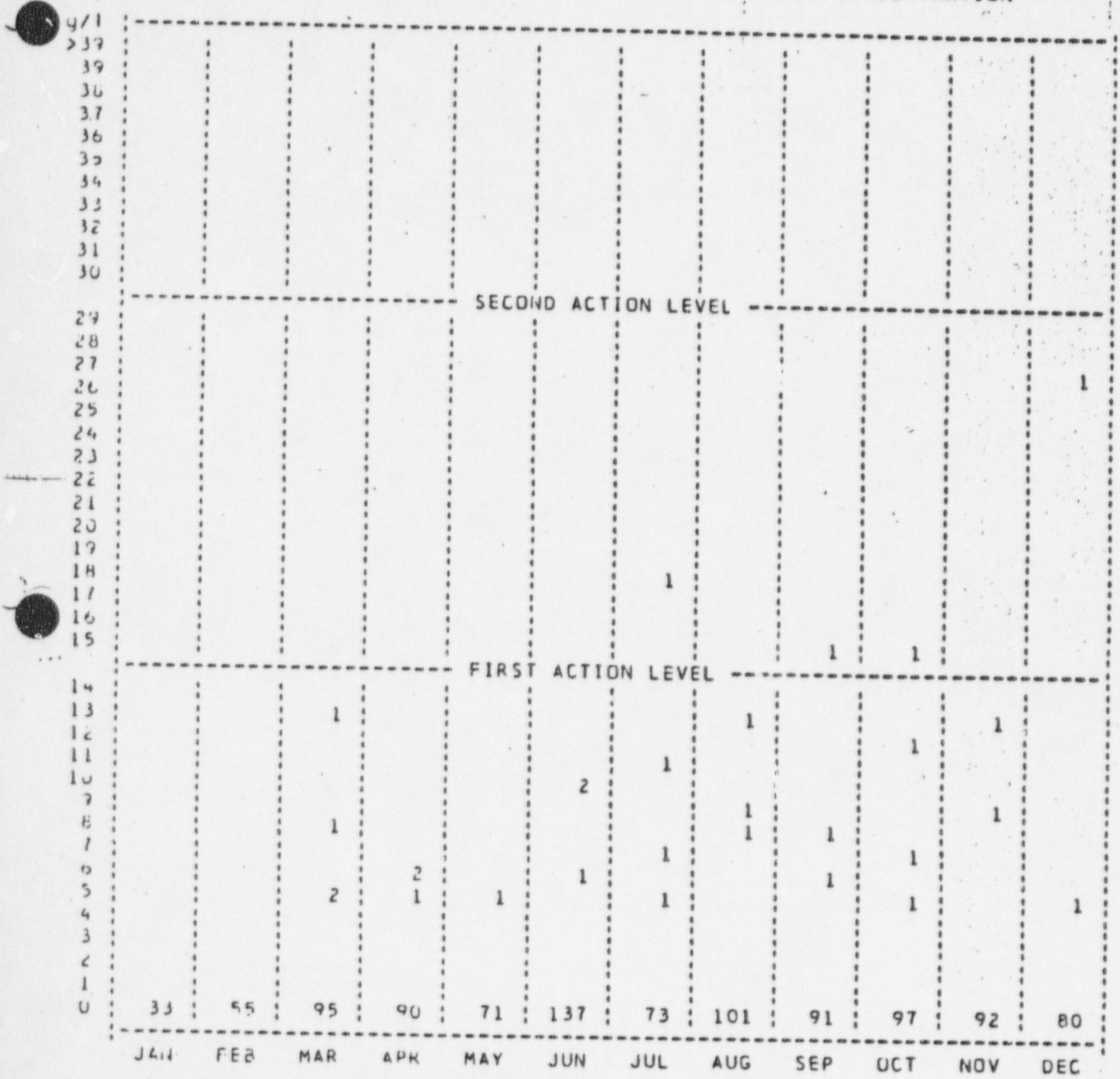
The urine sampling program continued in 1988 as modified in 1987.

In conclusion, the 1988 data for urinalysis indicate no change in concentrations compared to the 1987 data.

FIGURE 4.1

PROGRAM - LAB301 COTTER CORPORATION RUN DATE 02/25/85

1984 MONTHLY SAMPLE DISTRIBUTION OF URINARY URANIUM CONCENTRATION

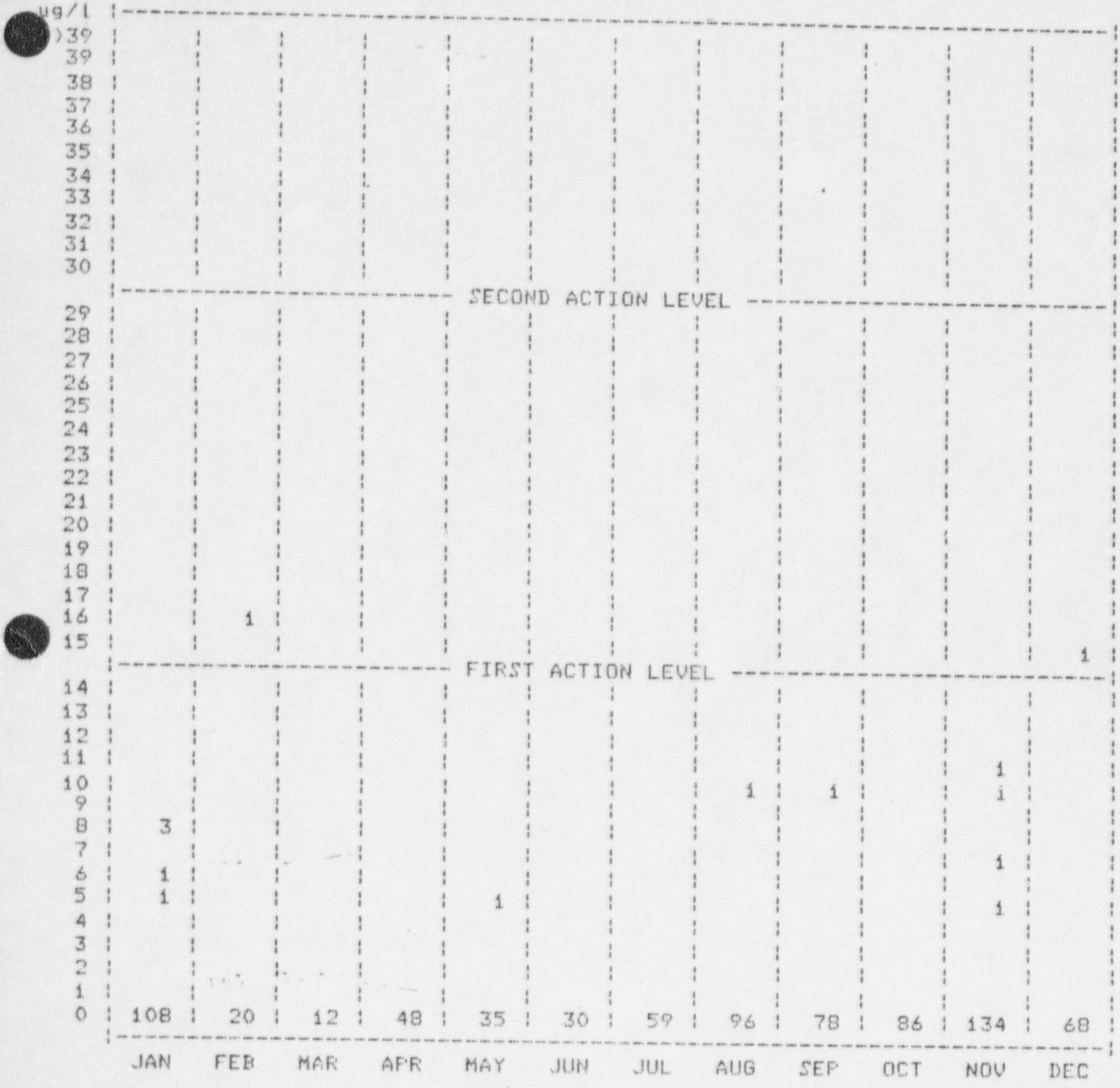



NOTE: VALUES <5 GRAPHED AS 0

FIGURE 4.2

PROGRAM - LAB301 C O T T E R C O R P O R A T I O N RUN DATE 01/23/86

1985 MONTHLY SAMPLE DISTRIBUTION OF URINARY URANIUM CONCENTRATION




NOTE; VALUES <5 GRAPHED AS 0

FIGURE 4.3

PROGRAM - LAB301 C O T T E R C O R P O R A T I O N RUN DATE 02/10/87

1986 MONTHLY SAMPLE DISTRIBUTION OF URINARY URANIUM CONCENTRATION

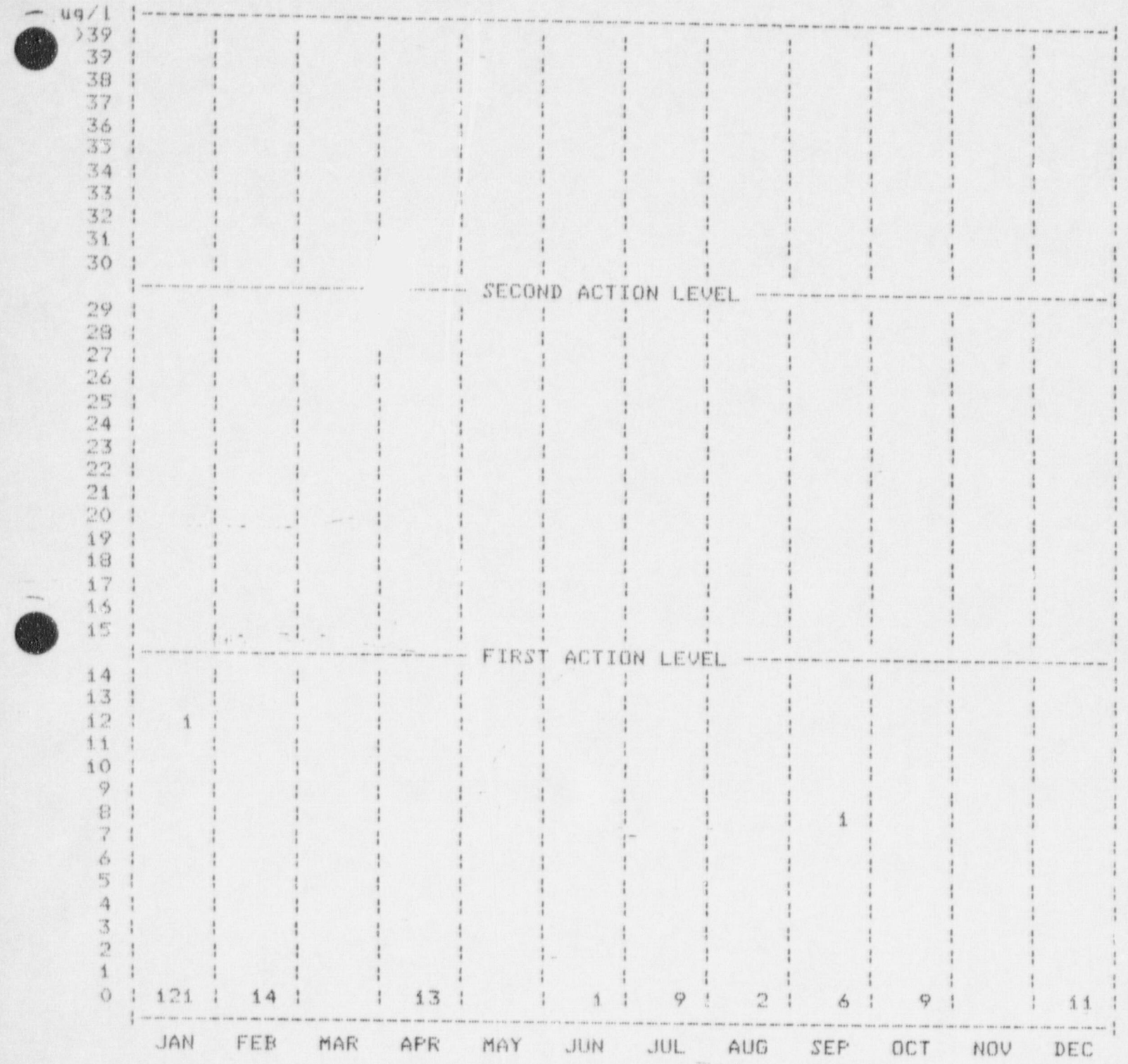
| ug/l | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| >39 | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| SECOND ACTION LEVEL | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | 2 | |
| 17 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| FIRST ACTION LEVEL | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 13 | | | | | | | | | | 1 | | |
| 12 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 9 | 1 | | | | | | | | | | | |
| 8 | | | | | 1 | | | 1 | | | 1 | |
| 7 | | | | | | | | | | | 1 | |
| 6 | | | | | | | 1 | | | 1 | | |
| 5 | | | | | | | 1 | 1 | | 1 | 2 | |
| 4 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | |
| 0 | 52 | 121 | 70 | 100 | 89 | 73 | 53 | 93 | 72 | 54 | 137 | 67 |

NOTE: VALUES <5 GRAPHED AS 0

FIGURE 4.4

PROGRAM - LAB301 C O T T E R C O R P O R A T I O N RUN DATE 02/05/88

1987 MONTHLY SAMPLE DISTRIBUTION OF URINARY URANIUM CONCENTRATION

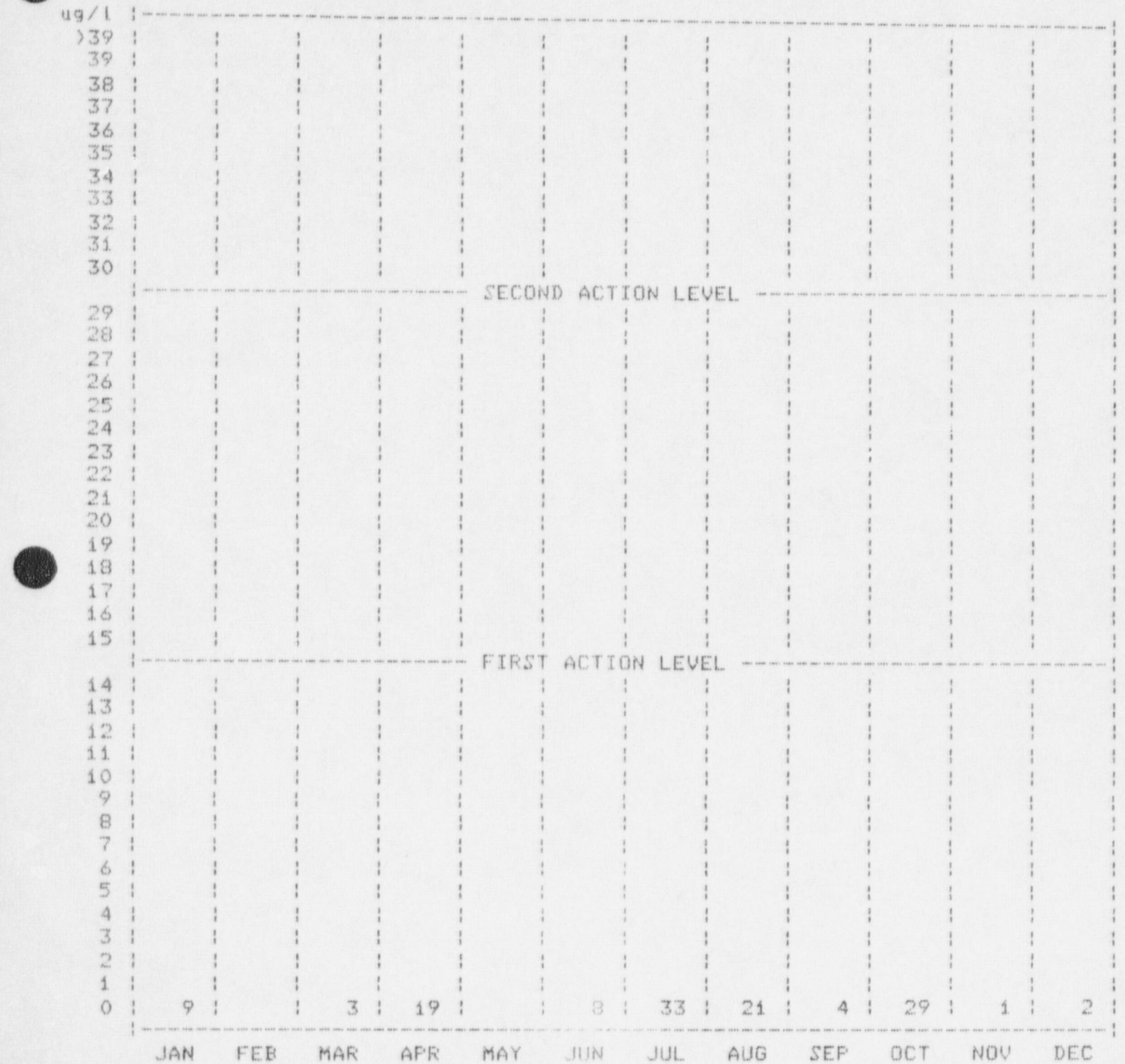



NOTE; VALUES <5 GRAPHED AS 0

FIGURE 4.5

PROGRAM - LAB301 C O T T E R C O R P O R A T I O N RUN DATE 02/28/89

1988 MONTHLY SAMPLE DISTRIBUTION OF URINARY URANIUM CONCENTRATION




NOTE; VALUES <5 GRAPHED AS 0

TABLE 4.1

URINARY URANIUM CONCENTRATIONS

ug/l

| MONTH | 1988 n | 1988 AVERAGE-X | 1988 DEVIATION-S | 1987 n | 1987 AVERAGE-X | 1987 DEVIATION-S | 1986 n | 1986 AVERAGE-X | 1986 DEVIATION-S | 1985 n | 1985 AVERAGE-X | 1985 DEVIATION-S | 1984 n | 1984 AVERAGE-X | 1984 DEVIATION-S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN. | 9 | 0.00 | 0.00 | 122 | 0.10 | 1.09 | 53 | 0.17 | 1.24 | 113 | 0.31 | 1.47 | 33 | 0.00 | 0.00 |
| FEB. | * | | | 14 | 0.00 | 0.00 | 121 | 0.00 | 0.00 | 21 | 0.76 | 3.49 | 55 | 0.00 | 0.00 |
| MAR. | 3 | 0.00 | 0.00 | 0 | - | - | 70 | 0.00 | 0.00 | 12 | 0.00 | 0.00 | 99 | 0.31 | 1.67 |
| APR. | 19 | 0.00 | 0.00 | 13 | 0.00 | 0.00 | 100 | 0.00 | 0.00 | 48 | 0.00 | 0.00 | 93 | 0.18 | 1.01 |
| MAY | * | | | 0 | - | - | 90 | 0.09 | 0.84 | 36 | 0.14 | 0.83 | 72 | 0.07 | 0.59 |
| JUNE | 8 | 0.00 | 0.00 | 0 | - | - | 73 | 0.00 | 0.00 | 30 | 0.00 | 0.00 | 140 | 0.19 | 1.29 |
| JULY | 33 | 0.00 | 0.00 | 9 | 0.00 | 0.00 | 55 | 0.20 | 1.04 | 59 | 0.00 | 0.00 | 77 | 0.53 | 2.56 |
| AUG. | 21 | 0.00 | 0.00 | 2 | 0.00 | 0.00 | 95 | 0.14 | 0.96 | 97 | 0.10 | 1.02 | 104 | 0.29 | 1.72 |
| SEPT. | 4 | 0.00 | 0.00 | 7 | 1.14 | 3.02 | 72 | 0.00 | 0.00 | 79 | 0.13 | 1.13 | 94 | 0.31 | 1.84 |
| OCT. | 29 | 0.00 | 0.00 | 9 | 0.00 | 0.00 | 57 | 0.46 | 2.08 | 86 | 0.00 | 0.00 | 101 | 0.39 | 2.07 |
| NOV. | 1 | 0.00 | 0.00 | 0 | - | - | 143 | 0.47 | 2.53 | 138 | 0.24 | 1.45 | 94 | 0.23 | 1.62 |
| DEC. | 2 | 0.00 | 0.00 | 11 | 0.00 | 0.00 | 67 | 0.00 | 0.00 | 69 | 0.22 | 181 | 82 | 0.39 | 3.03 |

TABLE 4.2

URINARY URANIUM CONCENTRATIONS

| | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|
| Average-X | 0.00 | 0.16 | 0.13 | 0.16 | 0.24 |
| Standard-S | 0.00 | 0.40 | 0.72 | 0.93 | 1.45 |

PROGRAM - LAB121

TABLE 4 Page 1 of 2

COTTER CORPORATION
URINALYSIS SUMMARY (ug/l) FOR 1988 (INCLUDES RERUNS)
NATURAL URANIUM

RUN DATE 1/16/89

| JOB DESCRIPTION | JAN | | | FEB | | | MAR | | | APR | | | MAY | | | JUN | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) |
| MILL FMAN-RAP QA/QC | | | | | | | | | | | | | | | | | | |
| MAINT FOREMAN | | | | | | | | | | 1 | | | | | | | | |
| MAINT INST MAN | | | | | | | | | | | | | | | | | | |
| MAINT ELECTRICIAN | | | | | | | | | | | | | | | | | | |
| MAINT AUTO MECH | | | | | | | | | | | | | | | | | | |
| CH. MET./PERSNL. COO | | | | | | | | | | 1 | | | | | | | | |
| ANLYT LAB SUPERVISOR | 1 | | | | | | | | | | | | | | | | | |
| ANLYT NON SMPLE PREP | 3 | | | | | | | | | | | | | | | | | |
| ANLYT SAMPLE PREP | | | | | | | 1 | | | 1 | | | | | | | | |
| JUNIOR METALURGIST | | | | | | | | | | | | | | | | | | |
| BKGD PRSN #1 | 2 | | | | | | 1 | | | 3 | | | | | | 1 | | |
| BKGD PRSN #2 | 1 | | | | | | 1 | | | 2 | | | | | | 1 | | |
| LABORERS | | | | | | | | | | | | | | | | 1 | | |
| PT ENG-SUP CERCLA CO | | | | | | | | | | 1 | | | | | | | | |
| ENV. COORD./RAD. SAF | | | | | | | | | | 1 | | | | | | | | |
| HEALTH & SAFETY SUPE | 1 | | | | | | | | | 1 | | | | | | | | |
| RAD SAFETY TECHS | 2 | | | | | | | | | 1 | | | | | | | | |
| SECURITY/SAFETY TECH | | | | | | | | | | 2 | | | | | | 5 | | |
| RAP CONSTRUCTION ACT | | | | | | | | | | | | | | | | | | |
| COTTER-OTHER LOCATIO | | | | | | | | | | 6 | | | | | | | | |
| RAP ONSC COOR-CDH | | | | | | | | | | | | | | | | | | |
| GR. DIVIDE-SURVEYOR | | | | | | | | | | | | | | | | | | |
| CHEN & ASSO.-TESTERS | | | | | | | | | | | | | | | | | | |
| NIELSONS-PROJECT SUP | | | | | | | | | | | | | | | | | | |
| NIELSONS-PROJECT ENG | | | | | | | | | | | | | | | | | | |
| NIELSONS-SPECIALISTS | | | | | | | | | | | | | | | | | | |
| NIELSONS-FOREMEN | | | | | | | | | | | | | | | | | | |
| NIELSONS-MECHANIC | | | | | | | | | | | | | | | | | | |
| NIELSONS-WATER WAGON | | | | | | | | | | | | | | | | | | |
| NIELSONS-OPERATORS | | | | | | | | | | | | | | | | | | |
| NIELSONS-LABORERS | | | | | | | | | | | | | | | | | | |
| NIELSONS-OILERS | | | | | | | | | | | | | | | | | | |
| NIELSONS-GR. CHECKER | | | | | | | | | | | | | | | | | | |
| NIELSONS-CARPENTER | | | | | | | | | | | | | | | | | | |
| ENVIRONMENTAL LINERS | | | | | | | | | | | | | | | | | | |
| TOTALS | 10 | | | | | | 3 | | | 20 | | | | | | 8 | | |

THIS REPORT INCLUDES COTTER & OUTSIDE CONTRACTOR PERSONNEL.

PROGRAM - LAB121

COTTER CORPORATION
URINALYSIS SUMMARY (ug/l) FOR 1988 (INCLUDES RERUNS)
NATURAL URANIUM

RUN DATE 1/16/89

| JOB DESCRIPTION | JUL | | | AUG | | | SEP | | | OCT | | | NOV | | | DEC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) |
| MILL FMAN-RAP QA/QC | 1 | | | | | | | | | | | | | | | | | |
| MAINT FOREMAN | 1 | | | | | | | | | | | | | | | | | |
| MAINT INST MAN | 1 | | | | | | | | | 1 | | | | | | | | |
| MAINT ELECTRICIAN | 1 | | | | | | | | | | | | | | | | | |
| MAINT AUTO MECH | 1 | | | | | | | | | 1 | | | | | | | | |
| CH. MET./PERSNL. COO | | | | | | | | | | 1 | | | | | | | | |
| ANLYT LAB SUPERVISOR | | | | 1 | | | | | | | | | | | | | | |
| ANLYT NON SMPLE PREP | | | | | | | | | | | | | | | | | | |
| ANLYT SAMPLE PREP | | | | | | | | | | | | | | | | | | |
| JUNIOR METALURGIST | 1 | | | | | | | | | | | | | | | | | |
| BKGD PRSN #1 | 3 | | | 1 | | | | | | 2 | | | | | | 2 | | |
| BKGD PRSN #2 | | | | | | | | | | 1 | | | | | | 1 | | |
| LABORERS | | | | | | | | | | 1 | | | | | | | | |
| PT ENG-SUP CERCLA CO | | | | 1 | | | | | | | | | | | | | | |
| ENV. COORD./RAD. SAF | | | | 1 | | | | | | | | | | | | | | |
| HEALTH & SAFETY SUPE | 1 | | | 1 | | | | | | 1 | | | | | | | | |
| RAD SAFETY TECHS | 1 | | | 1 | | | | | | 1 | | | | | | | | |
| SECURITY/SAFETY TECH | 1 | | | 1 | | | | | | | | | | | | | | |
| RAP CONSTRUCTION ACT | | | | 2 | | | | | | 1 | | | | | | | | |
| COTTER-OTHER LOCATIO | | | | | | | | | | | | | | | | | | |
| RAP ONSC CO JR-CDH | 1 | | | | | | | | | | | | | | | | | |
| GR. DIVIDE SURVEYOR | 5 | | | 2 | | | | | | | | | | | | | | |
| CHEN & ASSO.-TESTERS | | | | 1 | | | | | | | | | | | | | | |
| NIELSONS-PROJECT SUP | 1 | | | | | | | | | | | | | | | | | |
| NIELSONS-PROJECT ENG | 1 | | | | | | | | | | | | | | | | | |
| NIELSONS-SPECIALISTS | 1 | | | | | | | | | | | | | | | | | |
| NIELSONS-FOREMEN | 1 | | | 1 | | | | | | 1 | | | | | | | | |
| NIELSONS-MECHANIC | 1 | | | 1 | | | 1 | | | 1 | | | | | | | | |
| NIELSONS-WATER WAGON | | | | 1 | | | | | | | | | | | | | | |
| NIELSONS-OPERATORS | 7 | | | 7 | | | 2 | | | 2 | | | 1 | | | | | |
| NIELSONS-LABORERS | 4 | | | | | | 1 | | | 4 | | | | | | | | |
| NIELSONS-OILERS | 1 | | | | | | | | | | | | | | | | | |
| NIELSONS-GR. CHECKER | 1 | | | 1 | | | 1 | | | | | | | | | | | |
| NIELSONS-CARPENTER | | | | | | | 1 | | | | | | | | | | | |
| ENVIRONMENTAL LINERS | | | | | | | | | | 13 | | | | | | | | |
| TOTALS | 36 | | | 23 | | | 6 | | | 31 | | | 1 | | | 3 | | |

THIS REPORT INCLUDES COTTER & OUTSIDE CONTRACTOR PERSONNEL.

## 4.2 - IN VIVO TESTING - ANNUAL REPORT

LICENSE CONDITIONS 24.2.1 THROUGH 24.4

Baseline and annual in vivo tests are conducted for personnel at the Cotter milling facility. Specifically, baseline testing is conducted for all newly hired employees and annual testing is conducted for all employees routinely exposed to airborne yellowcake and/or ore dust, including maintenance personnel involved with work tasks in yellowcake and/or ore handling areas.

During 1988, no in vivo sample measurements were made because of the non-operating status of the mill. Personnel did not meet the minimum requirements for in vivo measurements. In vivo measurements will continue to be made as the need arises in accordance with license requirements.

All bioassay results are reviewed by Cotter's corporate medical advisor as required by License Condition 24.1.1.3.3.

5.0 - STACK EFFLUENT - ANNUAL REPORT

LICENSE CONDITION 25.0

Stack effluent samples were collected during operating periods for the laboratory baghouse in accordance with License Condition 25.0. All stack sampling is done utilizing the Anderson stack sampling system in accordance with EPA Method 5. The yellowcake dryer, secondary crusher and primary crusher were not operated in 1988. Sampling results are presented in Table 5.1.

In order to place stack concentrations and release rates into perspective on an annualized basis, time-weighted annual averages were calculated for the period 1979 - 1988 and are exhibited as Tables 5.2 through 5.6, and as Figures 5.1 through 5.10. Estimated operating hours are listed in Table 5.7.

LABORATORY BAGHOUSE STACK

The laboratory baghouse stack operated satisfactorily in 1988. Radionuclide concentrations exhibited a slight downturn, with the exception of Lead-210 ($^{210}Pb$), which exhibited a slight upturn. Sampling was done quarterly. Estimated annual releases were:

Natural Uranium ($^{Nat}U$) = 0.0125 mCi

Thorium-230 ($^{230}Th$) = 0.0025 mCi

Radium-226 ($^{226}Ra$) = 0.0021 mCi

PROGRAM - LAB117

LABORATORY STACK
COMPUTER REF# 0850

RUN DATE 89/03/03
TIME 10:40:40

| 1988 MNTH | SAMPLED VOL(ML) | VOLUMETRIC FLOW RATE (ML/SEC) | EST. OP HRS | U-NAT UCI/ML | U-NAT UCI/SEC | TH230 UCI/ML | TH230 UCI/SEC | RA226 UCI/ML | RA226 UCI/SEC | PB210 UCI/ML | PB210 UCI/SEC | PO210 UCI/ML | PO210 UCI/SEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 1.64E+06 | 3.57E+06 | 14.00 | 9.83E-12 | 3.51E-05 | 1.47E-12 | 5.23E-06 | 1.71E-12 | 6.11E-06 | 1.77E-12 | 6.33E-06 | 1.83E-12 | 6.54E-06 |
| FEB | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MAR | 1.64E+06 | 3.57E+06 | 12.00 | 9.83E-12 | 3.51E-05 | 1.47E-12 | 5.23E-06 | 1.71E-12 | 6.11E-06 | 1.77E-12 | 6.33E-06 | 1.83E-12 | 6.54E-06 |
| APR | 1.68E+06 | 3.51E+06 | 20.00 | 1.13E-11 | 3.98E-05 | 1.67E-12 | 5.86E-06 | 1.43E-12 | 5.03E-06 | 4.18E-13 | 1.47E-06 | 2.03E-12 | 7.12E-06 |
| MAY | 1.68E+06 | 3.51E+06 | 06.00 | 1.13E-11 | 3.98E-05 | 1.67E-12 | 5.86E-06 | 1.43E-12 | 5.03E-06 | 4.18E-13 | 1.47E-06 | 2.03E-12 | 7.12E-06 |
| JUN | 1.68E+06 | 3.51E+06 | 15.00 | 1.13E-11 | 3.98E-05 | 1.67E-12 | 5.86E-06 | 1.43E-12 | 5.03E-06 | 4.18E-13 | 1.47E-06 | 2.03E-12 | 7.12E-06 |
| JUL | 1.55E+06 | 3.24E+06 | 20.00 | 7.01E-13 | 2.27E-06 | 1.29E-13 | 4.19E-07 | 3.24E-13 | 1.05E-06 | 7.76E-13 | 2.51E-06 | 5.18E-13 | 1.68E-06 |
| AUG | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| SEP | 1.55E+06 | 3.24E+06 | 05.00 | 7.01E-13 | 2.27E-06 | 1.29E-13 | 4.19E-07 | 3.24E-13 | 1.05E-06 | 7.76E-13 | 2.51E-06 | 5.18E-13 | 1.68E-06 |
| OCT | 1.54E+06 | 3.34E+06 | 05.00 | 3.09E-12 | 1.03E-05 | 1.04E-12 | 3.48E-06 | 6.51E-13 | 2.17E-06 | 0.00E+00 | 0.00E+00 | 2.60E-13 | 8.70E-07 |
| NOV | 1.54E+06 | 3.34E+06 | 30.00 | 3.09E-12 | 1.03E-05 | 1.04E-12 | 3.48E-06 | 6.51E-13 | 2.17E-06 | 0.00E+00 | 0.00E+00 | 2.60E-13 | 8.70E-07 |
| DEC | 1.54E+06 | 3.34E+06 | 50.00 | 3.09E-12 | 1.03E-05 | 1.04E-12 | 3.48E-06 | 6.51E-13 | 2.17E-06 | 0.00E+00 | 0.00E+00 | 2.60E-13 | 8.70E-07 |
| AVERAGE JANUARY - JUNE | | | | 1.07E-11 | 3.80E-05 | 1.59E-12 | 5.62E-06 | 1.54E-12 | 3.08E-06 | | | | |
| MAXIMUM JANUARY - JUNE | | | | 1.13E-11 | 3.98E-05 | 1.67E-12 | 5.86E-06 | 1.71E-12 | 6.11E-06 | | | | |
| AVERAGE JULY - DECEMBER | | | | 2.54E-11 | 8.48E-06 | 8.33E-13 | 2.78E-06 | 5.77E-13 | 1.92E-06 | | | | |
| MAXIMUM JULY - DECEMBER | | | | 3.09E-12 | 1.03E-05 | 1.04E-12 | 3.48E-06 | 6.51E-13 | 2.17E-06 | | | | |

PROGRAM - LAB117

LABORATORY STACK
ESTIMATED MONTHLY RELEASE RATE

RUN DATE 89/03/03

| 1988 | NATU MCI | TH230 MCI | RA226 MCI |
|---|---|---|---|
| JAN | 1.77E-03 | 2.64E-04 | 3.08E-04 |
| FEB | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MAR | 1.51E-03 | 2.26E-04 | 2.64E-04 |
| APR | 2.87E-03 | 4.22E-04 | 3.62E-04 |
| MAY | 8.60E-04 | 1.27E-04 | 1.09E-04 |
| JUN | 2.15E-03 | 3.17E-04 | 2.71E-04 |
| JUL | 1.63E-04 | 3.02E-05 | 7.54E-05 |
| AUG | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| SEP | 4.08E-05 | 7.54E-06 | 1.88E-05 |
| OCT | 1.86E-04 | 6.26E-05 | 3.91E-05 |
| NOV | 1.11E-03 | 3.76E-04 | 2.35E-04 |
| DEC | 1.86E-03 | 6.26E-04 | 3.91E-04 |
| TOTAL JAN - JUNE | 9.16E-03 | 1.36E-03 | 1.31E-03 |
| TOTAL JULY - DEC | 3.36E-03 | 1.10E-03 | 7.60E-04 |
| TOTAL | 1.25E-02 | 2.46E-03 | 2.07E-03 |

*'D ITEMS ARE ESTIMATED MAXIMUM MONTHLY RELEASE

TABLE 5.2

STACK EFFLUENT
Natural Uranium ($^{Nat}U$)

| YEAR | AVERAGE ANNUAL CONCENTRATION (μCi/ml) | | | | AVERAGE ANNUAL RELEASE RATE (μCi/sec) | | | |
|---|---|---|---|---|---|---|---|---|
| | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER |
| 1979 | 2.19E-11 | 3.15E-12 | 7.98E-13 | 1.12E-12 | 2.15E-5 | 8.02E-6 | 3.06E-6 | 4.22E-6 |
| 1980 | 2.80E-10 | 5.71E-11 | 2.43E-12 | 2.39E-10 | 2.73E-4 | 9.31E-5 | 9.10E-6 | 9.37E-4 |
| 1981 | 3.43E-10 | 1.06E-11 | 9.38E-12 | 1.02E-11 | 2.77E-4 | 1.76E-5 | 2.89E-5 | 2.19E-5 |
| 1982 | 2.22E-10 | 1.02E-11 | 4.65E-12 | 4.00E-12 | 1.58E-4 | 2.19E-5 | 1.40E-5 | 1.42E-5 |
| 1983 | 1.96E-10 | 1.23E-11 | 8.56E-12 | 7.74E-12 | 1.26E-4 | 3.38E-5 | 2.63E-5 | 2.73E-5 |
| 1984 | 1.26E-9 | 1.36E-12 | 1.08E-11 | 1.12E-12 | 7.19E-4 | 3.67E-6 | 3.05E-5 | 3.65E-6 |
| 1985 | 1.62E-9 | 8.48E-12 | 2.00E-11 | - | 8.07E-4 | 3.06E-5 | 7.77E-5 | - |
| 1986 | 1.91E-9 | 5.98E-12 | 4.24E-12 | - | 8.83E-4 | 2.14E-5 | 1.64E-5 | - |
| 1987 | 1.77E-9* | 6.23E-12 | 2.49E-12** | - | 7.45E-4* | 2.13E-5 | 8.93E-6** | - |
| 1988 | - | 5.27E-12 | - | - | - | 2.11E-5 | - | - |

NOTE: Utilization of the Anderson Stack Sampling System (EPA Method 5) commenced for the Yellowcake Calciner Venturi Scrubber in June, 1984, for the Laboratory Baghouse in July, 1985 and for the Secondary Crusher Baghouse in the Third Quarter of 1985.

*January, 1987 only.

**First Quarter, 1987 only.

TABLE 5.3

STACK EFFLUENT

Thorium-230 ($^{230}Th$)

| YEAR | AVERAGE ANNUAL CONCENTRATION (µCi/ml) | | | | AVERAGE ANNUAL RELEASE RATE (µCi/sec) | | | |
|---|---|---|---|---|---|---|---|---|
| | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER |
| 1979 | 4.84E-13 | 2.80E-12 | 1.08E-12 | 1.48E-12 | 4.76E-7 | 7.11E-6 | 4.12E-6 | 5.55E-6 |
| 1980 | 3.77E-12 | 2.01E-11 | 1.44E-12 | 6.99E-11 | .76E-6 | 3.33E-5 | 5.46E-6 | 4.06E-5 |
| 1981 | 7.31E-12 | 3.76E-12 | 7.76E-13 | 4.57E-12 | 5.49E-6 | 6.02E-6 | 2.25E-6 | 1.01E-5 |
| 1982 | 7.32E-12 | 1.62E-12 | 8.54E-13 | 1.72E-12 | 4.56E-6 | 3.19E-6 | 2.74E-6 | 4.11E-6 |
| 1983 | 1.04E-10 | 2.29E-12 | 3.45E-12 | 4.47E-12 | 6.68E-5 | 6.08E-6 | 1.05E-6 | 1.58E-5 |
| 1984 | 2.21E-12 | 5.24E-13 | 4.64E-13 | 2.17E-13 | 1.51E-6 | 1.34E-6 | 1.40E-6 | 7.29E-7 |
| 1985 | 6.01E-12 | 4.69E-13 | 5.26E-13 | - | 2.89E-6 | 1.69E-6 | 2.07E-6 | - |
| 1986 | 2.25E-12 | 1.33E-12 | 1.93E-12 | - | 1.07E-6 | 4.84E-6 | 7.40E-6 | - |
| 1987 | 3.64E-13* | 1.58E-12 | 0.00** | - | 1.53E-7* | 5.34E-6 | 0.00** | - |
| 1988 | - | 1.11E-12 | - | - | - | 3.86E-6 | - | - |

*January, 1987 only.
** First Quarter, 1987 only.

TABLE 5.4
STACK EFFLUENT
Radium 226 ($^{226}Ra$)

| YEAR | AVERAGE ANNUAL CONCENTRATION (µCi/ml) | | | | AVERAGE ANNUAL RELEASE RATE (µCi/sec) | | | |
|---|---|---|---|---|---|---|---|---|
| | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER |
| 1979 | 3.50E-13 | 3.13E-12 | 6.15E-13 | 1.01E-11 | 3.46E-7 | 7.95E-6 | 2.36E-6 | 3.81E-5 |
| 1980 | 3.33E-12 | 2.71E-11 | 5.30E-12 | 1.16E-10 | 3.56E-6 | 3.78E-5 | 1.97E-5 | 4.70E-4 |
| 1981 | 1.91E-12 | 4.18E-12 | 2.90E-12 | 3.38E-12 | 1.46E-6 | 6.81E-6 | 8.66E-6 | 7.06E-6 |
| 1982 | 1.43E-12 | 1.40E-12 | 2.53E-12 | 8.77E-13 | 1.11E-6 | 3.03E-6 | 7.86E-6 | 2.67E-6 |
| 1983 | 1.08E-11 | 2.23E-12 | 4.30E-12 | 5.47E-12 | 6.34E-6 | 5.83E-6 | 1.32E-5 | 1.93E-5 |
| 1984 | 3.56E-12 | 5.70E-13 | 1.08E-12 | 1.07E-12 | 2.05E-6 | 1.46E-6 | 3.05E-6 | 3.03E-6 |
| 1985 | 5.11E-13 | 4.45E-13 | 1.09E-12 | - | 2.81E-7 | 1.60E-6 | 4.18E-6 | - |
| 1986 | 3.49E-13 | 6.23E-13 | 7.58E-13 | - | 1.69E-7 | 2.47E-6 | 2.96E-6 | - |
| 1987 | 3.64E-13* | 2.65E-12 | 6.89E-13** | - | 1.53E-7* | 9.04E-6 | 2.47E-6** | - |
| 1988 | - | 9.41E-13 | - | - | - | 2.36E-6 | - | - |

*January, 1987 only.
**First Quarter, 1987 only.

TABLE 5.5

STACK EFFLUENT
Lead-210 ($^{210}Pb$)

| YEAR | AVERAGE ANNUAL CONCENTRATION (µCi/ml) | | | | AVERAGE ANNUAL RELEASE RATE (µCi/sec) | | | |
|---|---|---|---|---|---|---|---|---|
| | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER |
| 1979 | 5.28E-12 | 8.66E-12 | 6.66E-12 | 5.54E-12 | 5.19E-6 | 2.20E-5 | 2.55E-5 | 2.08E-5 |
| 1980 | 0 | 1.75E-11 | 7.43E-13 | 2.08E-10 | 0 | 2.94E-5 | 2.64E-6 | 8.62E-4 |
| 1981 | 1.24E-11 | 6.09E-12 | 5.28E-12 | 8.21E-12 | 9.55E-6 | 1.18E-5 | 1.57E-5 | 1.89E-5 |
| 1982 | 1.81E-11 | 4.35E-12 | 5.25E-12 | 1.45E-12 | 1.26E-5 | 7.89E-6 | 1.71E-5 | 4.08E-6 |
| 1983 | 1.67E-11 | 3.37E-12 | 4.13E-12 | 1.59E-12 | 6.18E-6 | 8.39E-6 | 1.26E-5 | 5.61E-6 |
| 1984 | 4.21E-12 | 1.71E-12 | 1.27E-12 | 4.05E-13 | 2.44E-6 | 4.69E-6 | 3.59E-6 | 1.44E-6 |
| 1985 | 3.82E-12 | 1.16E-12 | 1.30E-12 | - | 1.40E-6 | 3.98E-6 | 4.95E-6 | - |
| 1986 | 1.52E-12 | 1.46E-12 | 8.16E-13 | - | 6.58E-7 | 5.22E-6 | 3.18E-6 | - |
| 1987 | 1.82E-12* | 1.88E-12 | 2.30E-13** | - | 2.56E-7* | 6.31E-6 | 8.25E-7** | - |
| 1988 | - | 4.66E-12 | - | - | - | 1.62E-6 | - | - |

*January, 1987 only.
**First Quarter 1987 only.

TABLE 5.6

STACK EFFLUENT
Polonium-210 ($^{210}Po$)

| YEAR | AVERAGE ANNUAL CONCENTRATION (µCi/ml) | | | | AVERAGE ANNUAL RELEASE RATE (µCi/sec) | | | |
|---|---|---|---|---|---|---|---|---|
| | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER |
| 1979 | - | - | - | - | - | - | - | - |
| 1980 | 0 | 2.53E-12 | 7.43E-13 | 2.08E-10 | 0 | 3.84E-6 | - | - |
| 1081 | 2.82E-12 | 6.20E-12 | 3.09E-12 | 3.73E-12 | 2.21E-6 | 1.01E-5 | 9.18E-6 | 8.21E-6 |
| 1982 | 4.82E-12 | 4.31E-12 | 2.11E-12 | 3.63E-12 | 3.23E-6 | 8.93E-6 | 6.89E-6 | 8.89E-6 |
| 1983 | 1.46E-12 | 1.39E-12 | 2.48E-12 | 3.53E-12 | 1.01E-6 | 3.71E-6 | 9.62E-6 | 1.24E-5 |
| 1984 | 3.50E-13 | 5.83E-13 | 1.24E-12 | 1.35E-13 | 2.05E-7 | 1.00E-6 | 3.46E-6 | 4.80E-7 |
| 1985 | 8.40E-13 | 3.77E-13 | 7.55E-13 | - | 3.71E-7 | 1.33E-6 | 2.90E-6 | - |
| 1986 | 6.94E-13 | 7.96E-13 | 7.33E-13 | - | 3.14E-7 | 2.90E-6 | 2.85E-6 | - |
| 1987 | 6.07E-13* | 3.11E-12 | 1.89E-12** | - | 2.56E-7* | 1.05E-5 | 6.80E-6** | - |
| 1988 | - | 9.37E-13 | - | - | - | 3.27E-6 | - | - |

*January, 1987.
**First Quarter, 1987 only.

TABLE 5.7

STACK EFFLUENT

ESTIMATED OPERATING HOURS

| YEAR | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER |
|---|---|---|---|---|
| 1979 | - | - | - | - |
| 1980 | 6720 | 1825.7 | 2080 | 1400 |
| 1981 | 4620 | 600.7 | 1790 | 860 |
| 1982 | 2100 | 467+ | 1015.8 | 251.2 |
| 1983 | 2310 | 505.5+ | 680.1 | 27.3 |
| 1984 | 2520 | 779 | 986.2 | 83.8 |
| 1985 | 1769 | 531.7 | 518.5 | - |
| 1986 | 2215.5 | 727 | 600.5 | - |
| 1987 | 420.15 | 236 | 45.2 | - |
| 1988 | - | 177 | - | - |

FIGURE 5.1

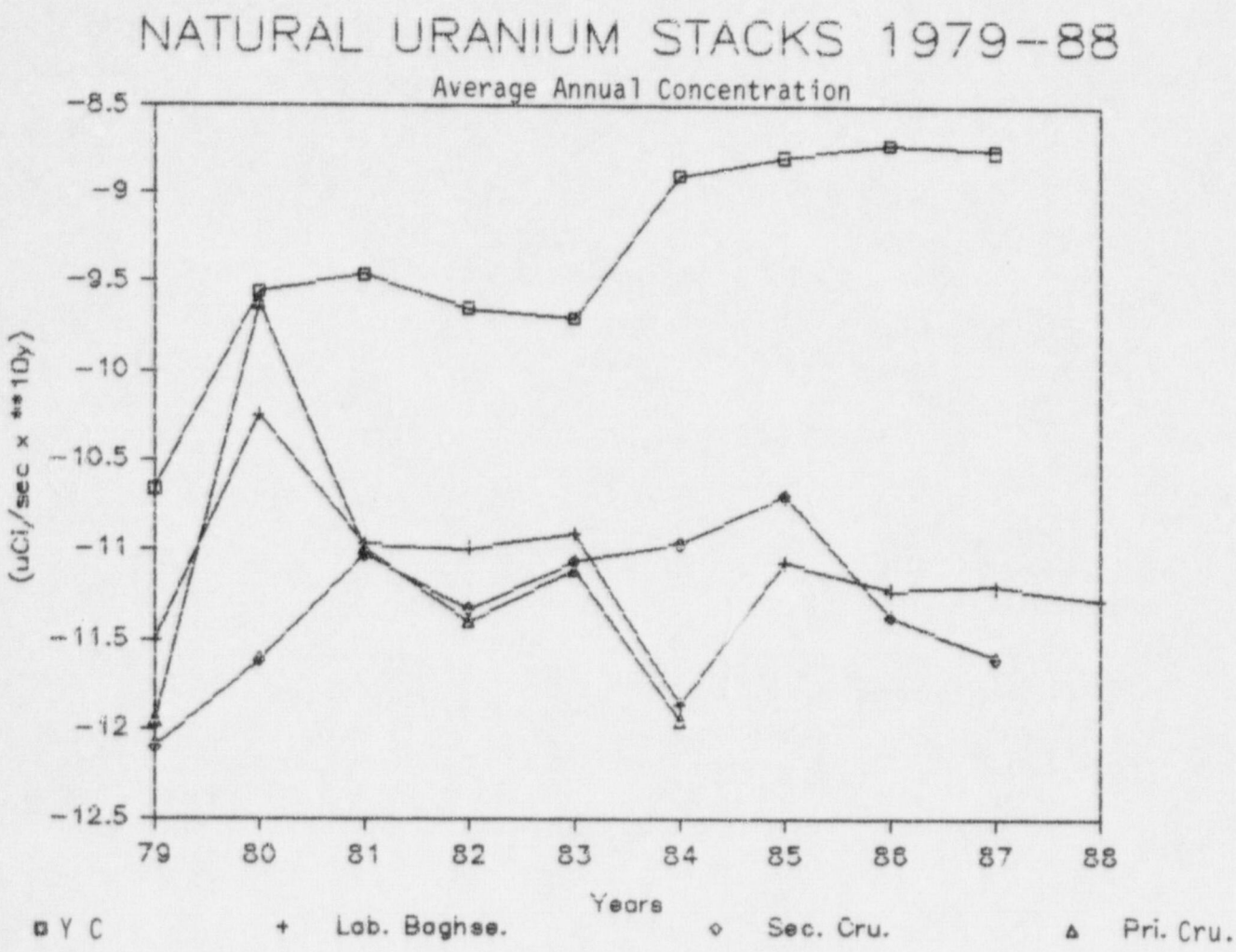

NATURAL URANIUM STACKS 1979--88
Average Annual Concentration
(uCi/sec x **10y)
-8.5
-9
-9.5
-10
-10.5
-11
-11.5
-12
-12.5
79
80
81
82
83
84
85
86
87
88
Years
Y C
Lab. Baghse.
Sec. Cru.
Pri. Cru.

FIGURE 5.2

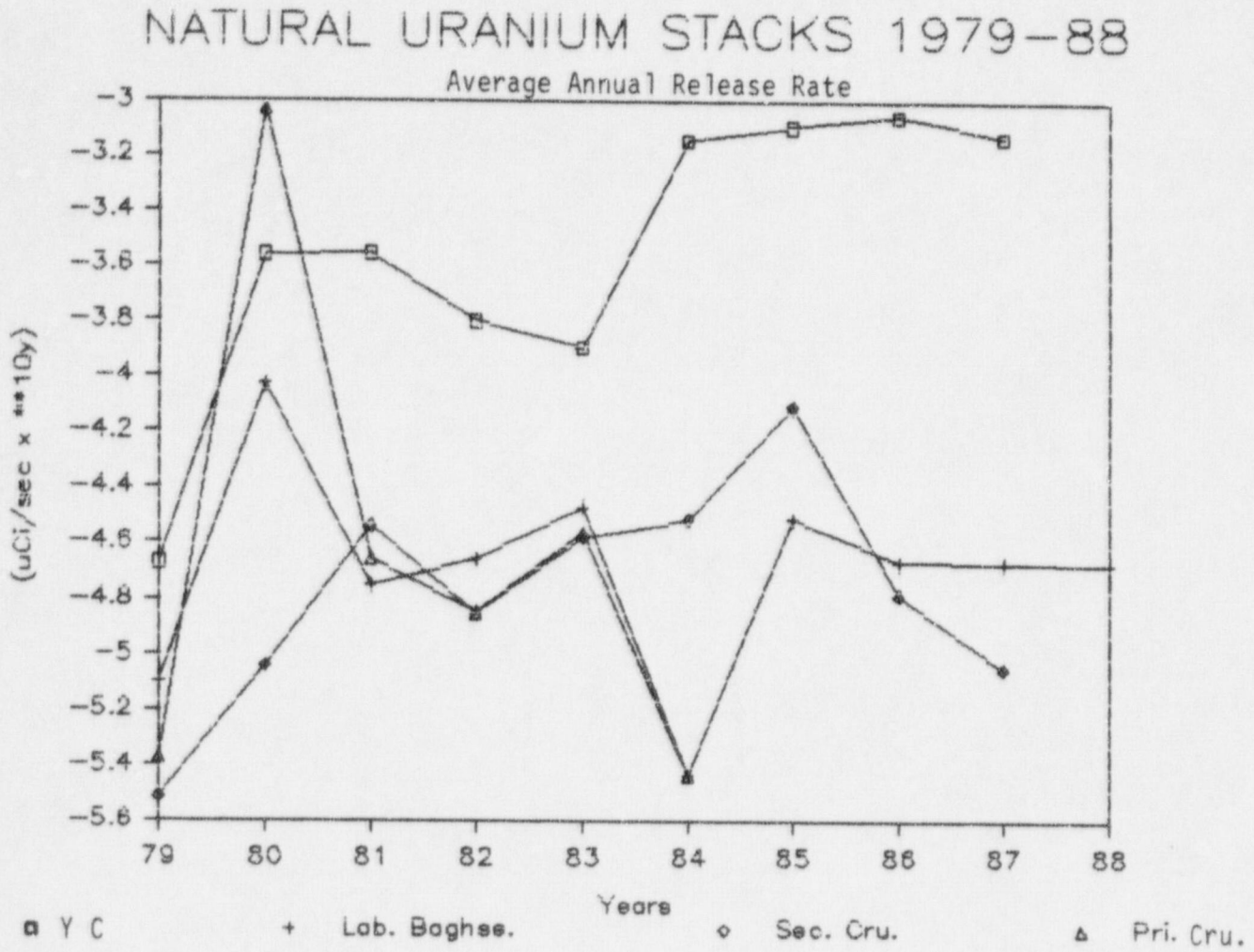

NATURAL URANIUM STACKS 1979-88
Average Annual Release Rate
(uCi/sec x **10y)
-3
-3.2
-3.4
-3.6
-3.8
-4
-4.2
-4.4
-4.6
-4.8
-5
-5.2
-5.4
-5.6
79
80
81
82
83
84
85
86
87
88
Years
Y C
Lab. Boghse.
Sec. Cru.
Pri. Cru.

FIGURE 5.3

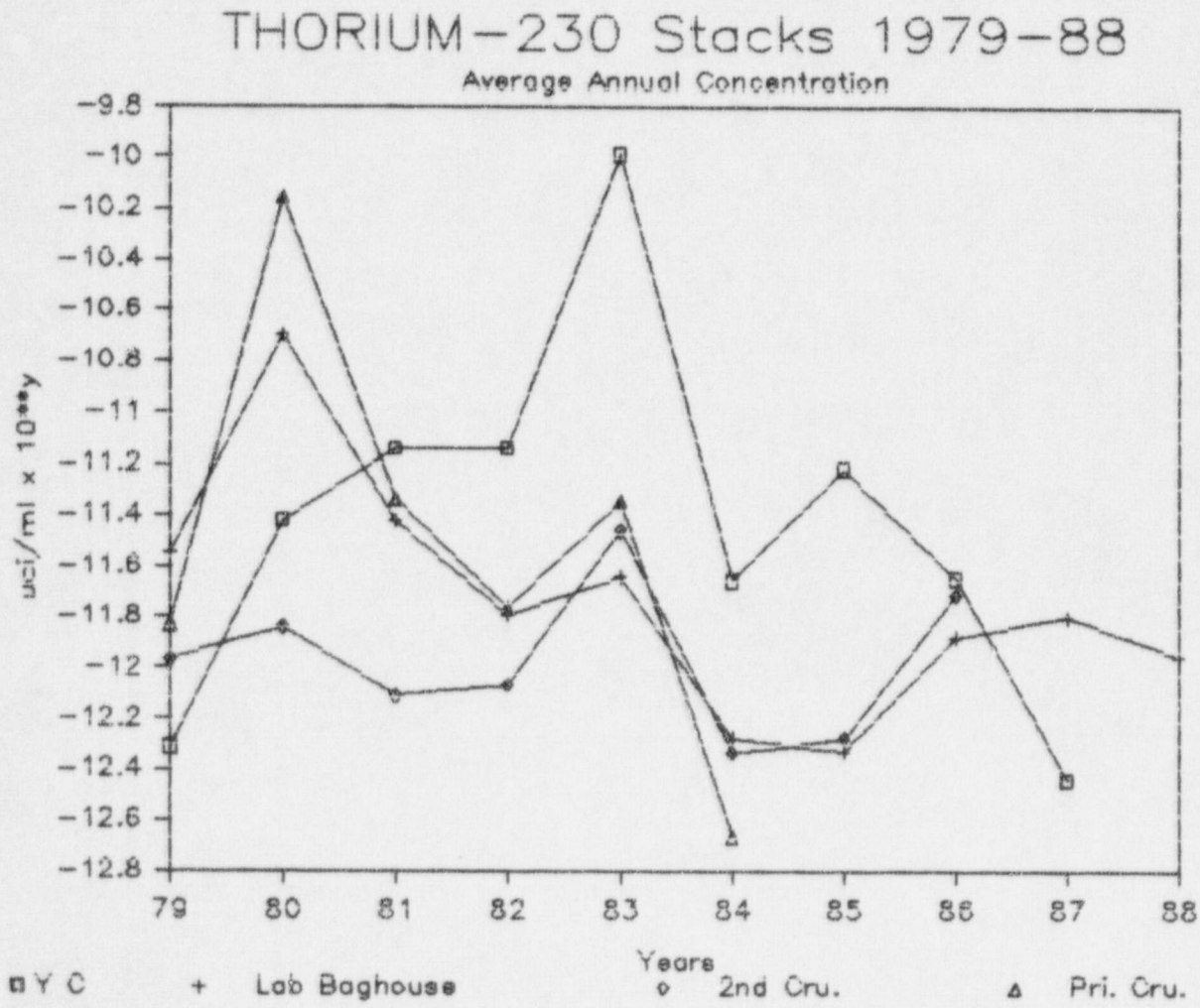

THORIUM-230 Stacks 1979-88
Average Annual Concentration
uci/ml x 10**y
-9.8
-10
-10.2
-10.4
-10.6
-10.8
-11
-11.2
-11.4
-11.6
-11.8
-12
-12.2
-12.4
-12.6
-12.8
79
80
81
82
83
84
85
86
87
88
Years
Y C
Lab Baghouse
2nd Cru.
Pri. Cru.

FIGURE 5.4

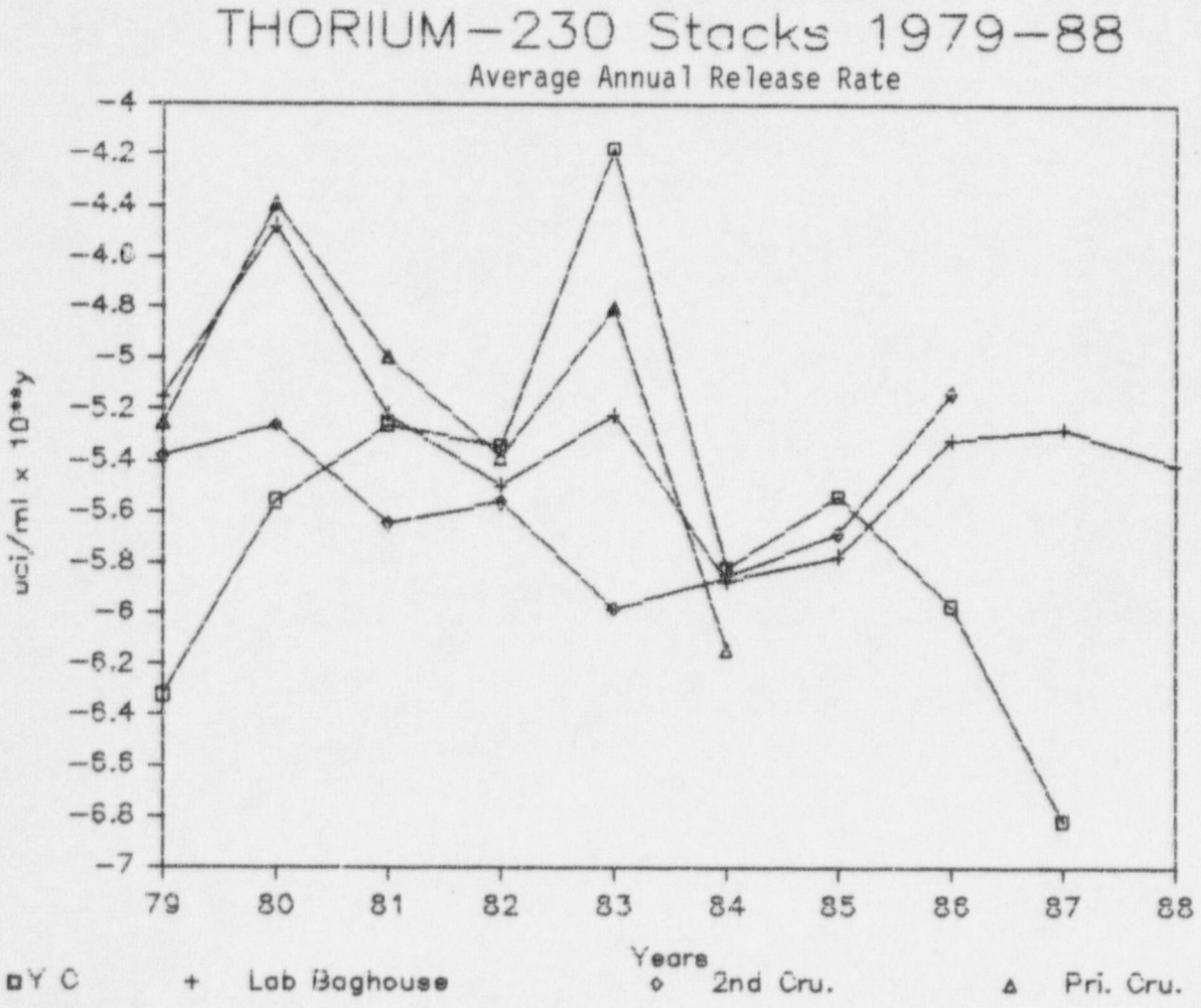

THORIUM-230 Stacks 1979-88
Average Annual Release Rate
uci/ml x 10**y
-4
-4.2
-4.4
-4.6
-4.8
-5
-5.2
-5.4
-5.6
-5.8
-6
-6.2
-6.4
-6.6
-6.8
-7
79
80
81
82
83
84
85
86
87
88
Years
Y C
Lab Baghouse
2nd Cru.
Pri. Cru.

FIGURE 5.5

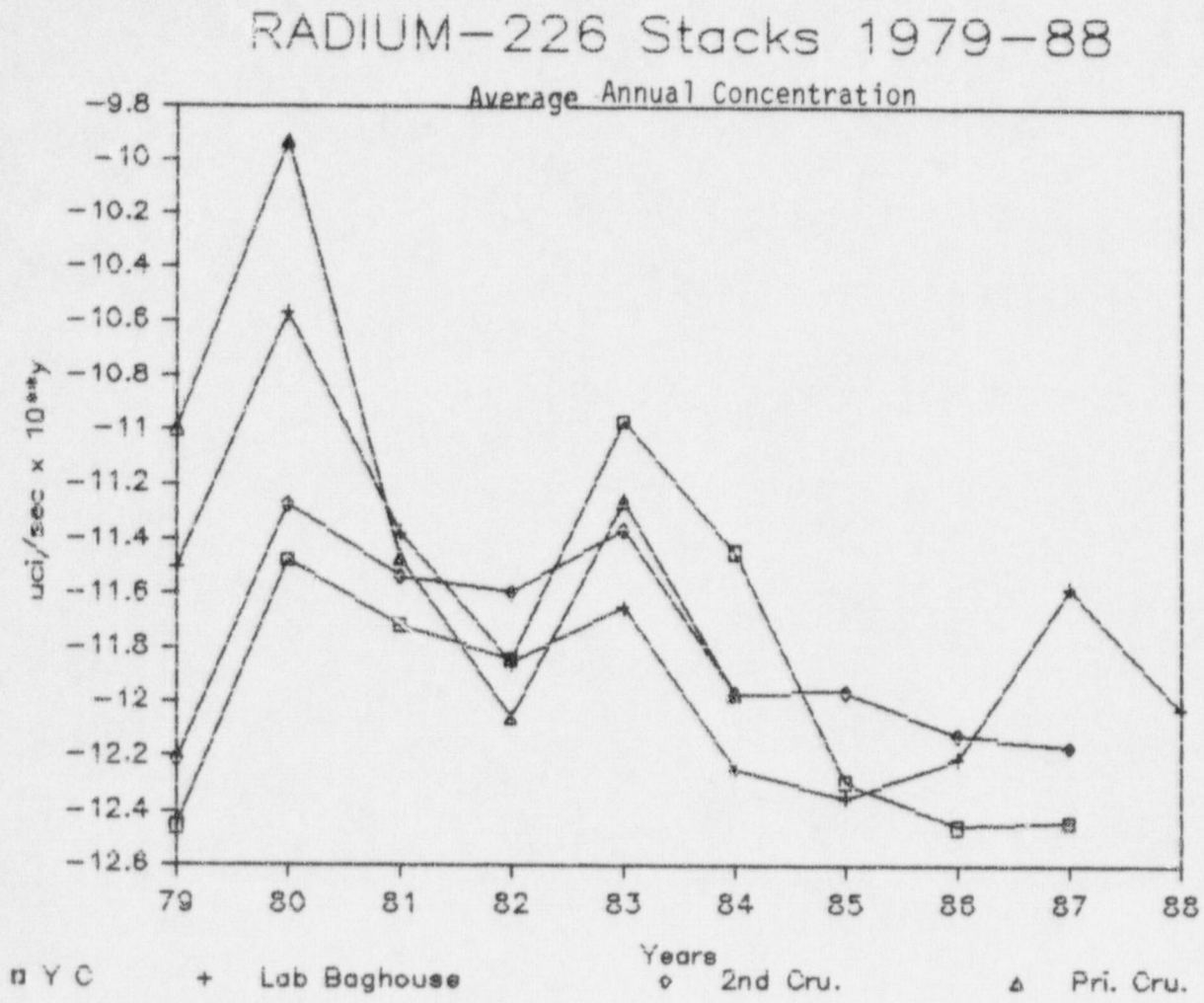

RADIUM-226 Stacks 1979-88
Average Annual Concentration
-9.8
-10
-10.2
-10.4
-10.6
-10.8
-11
-11.2
-11.4
-11.6
-11.8
-12
-12.2
-12.4
-12.6
uci/sec x 10**y
79
80
81
82
83
84
85
86
87
88
Years
Y C
Lab Baghouse
2nd Cru.
Pri. Cru.

FIGURE 5.6

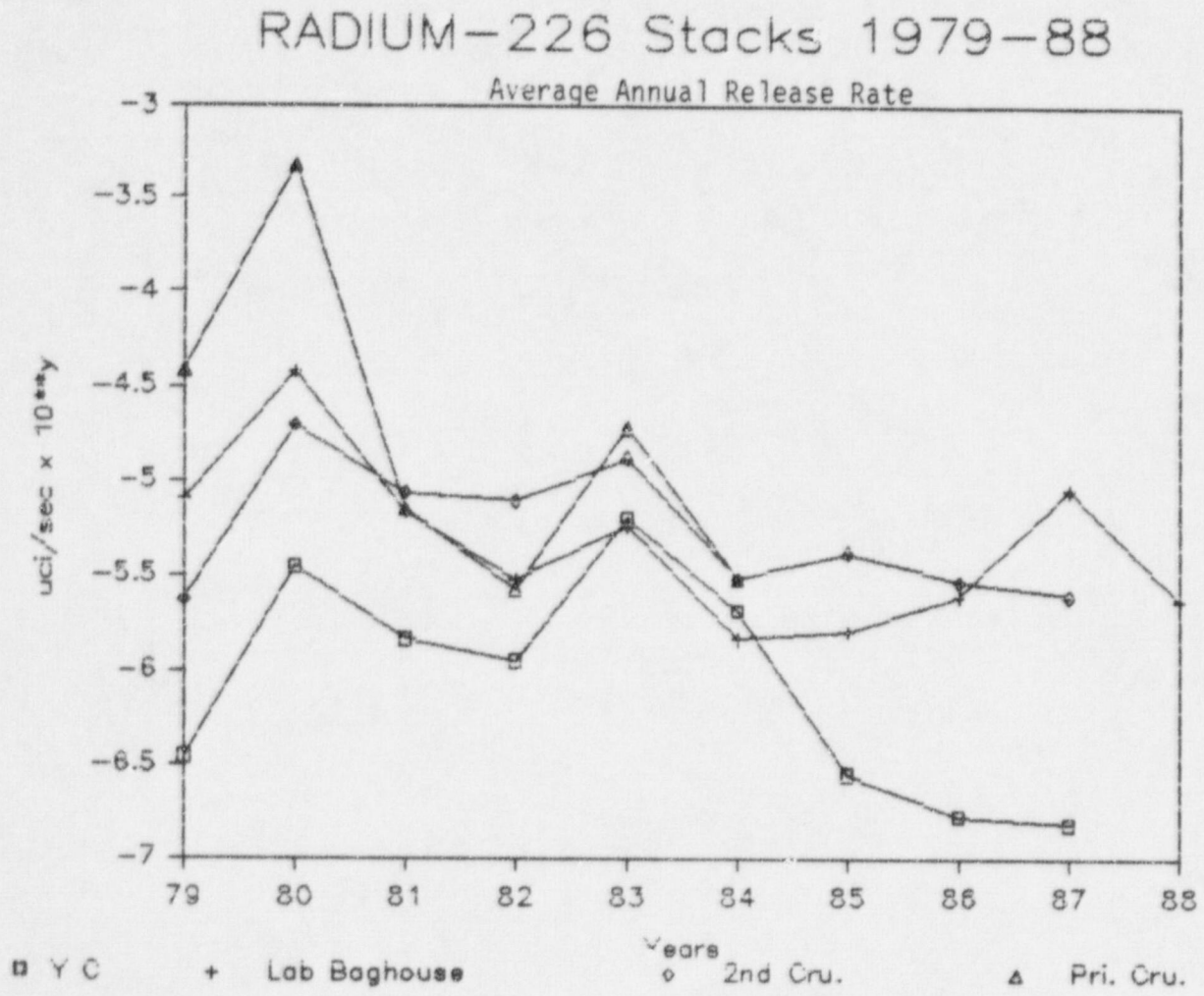

RADIUM-226 Stacks 1979-88
Average Annual Release Rate
uci/sec x 10**y
-3
-3.5
-4
-4.5
-5
-5.5
-6
-6.5
-7
79
80
81
82
83
84
85
86
87
88
Years
Y C
Lab Baghouse
2nd Cru.
Pri. Cru.

FIGURE 5.7

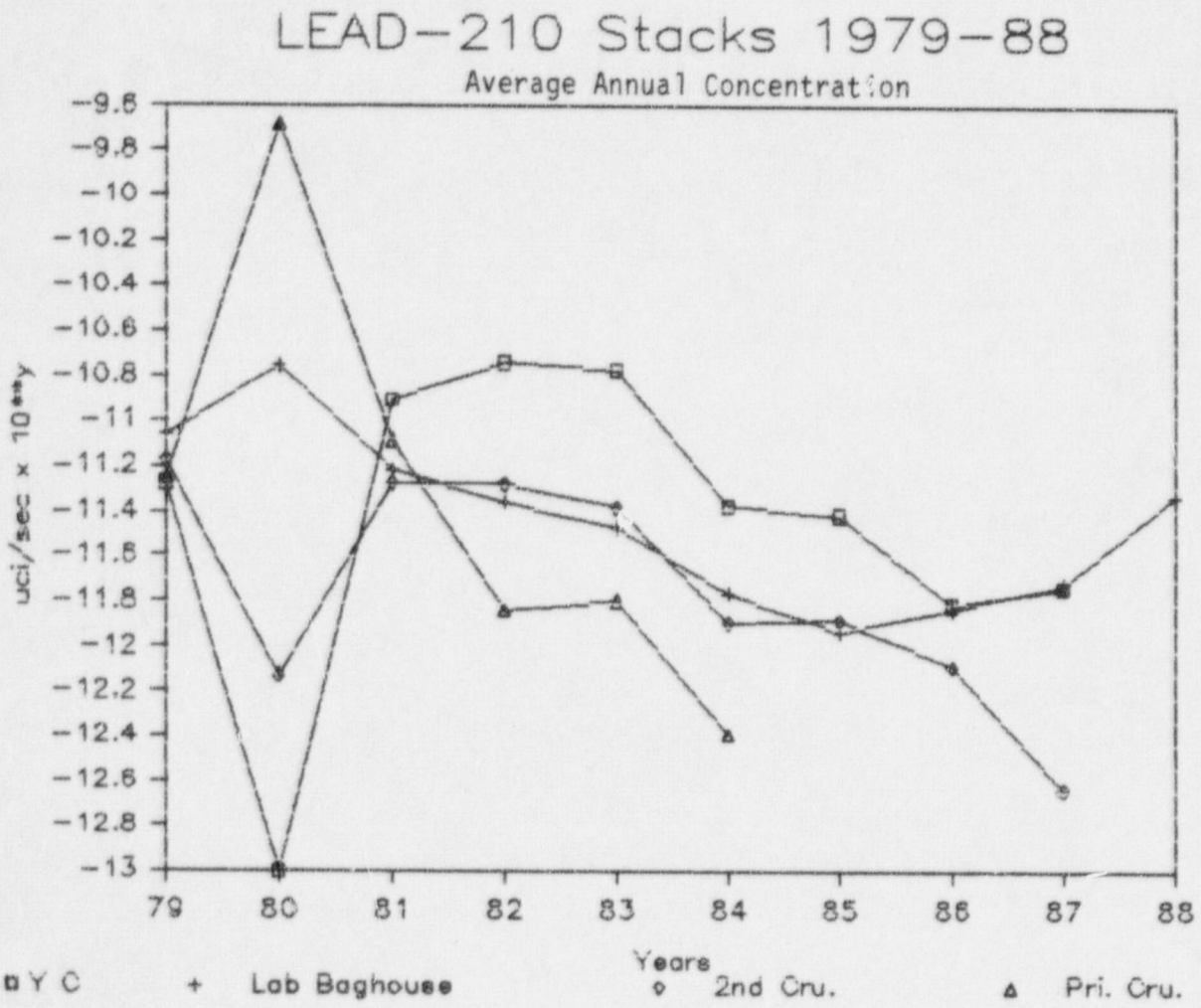

LEAD-210 Stacks 1979-88
Average Annual Concentration
uci/sec x 10**y
-9.6
-9.8
-10
-10.2
-10.4
-10.6
-10.8
-11
-11.2
-11.4
-11.6
-11.8
-12
-12.2
-12.4
-12.6
-12.8
-13
79
80
81
82
83
84
85
86
87
88
Years
Y C
Lab Baghouse
2nd Cru.
Pri. Cru.

FIGURE 5.8

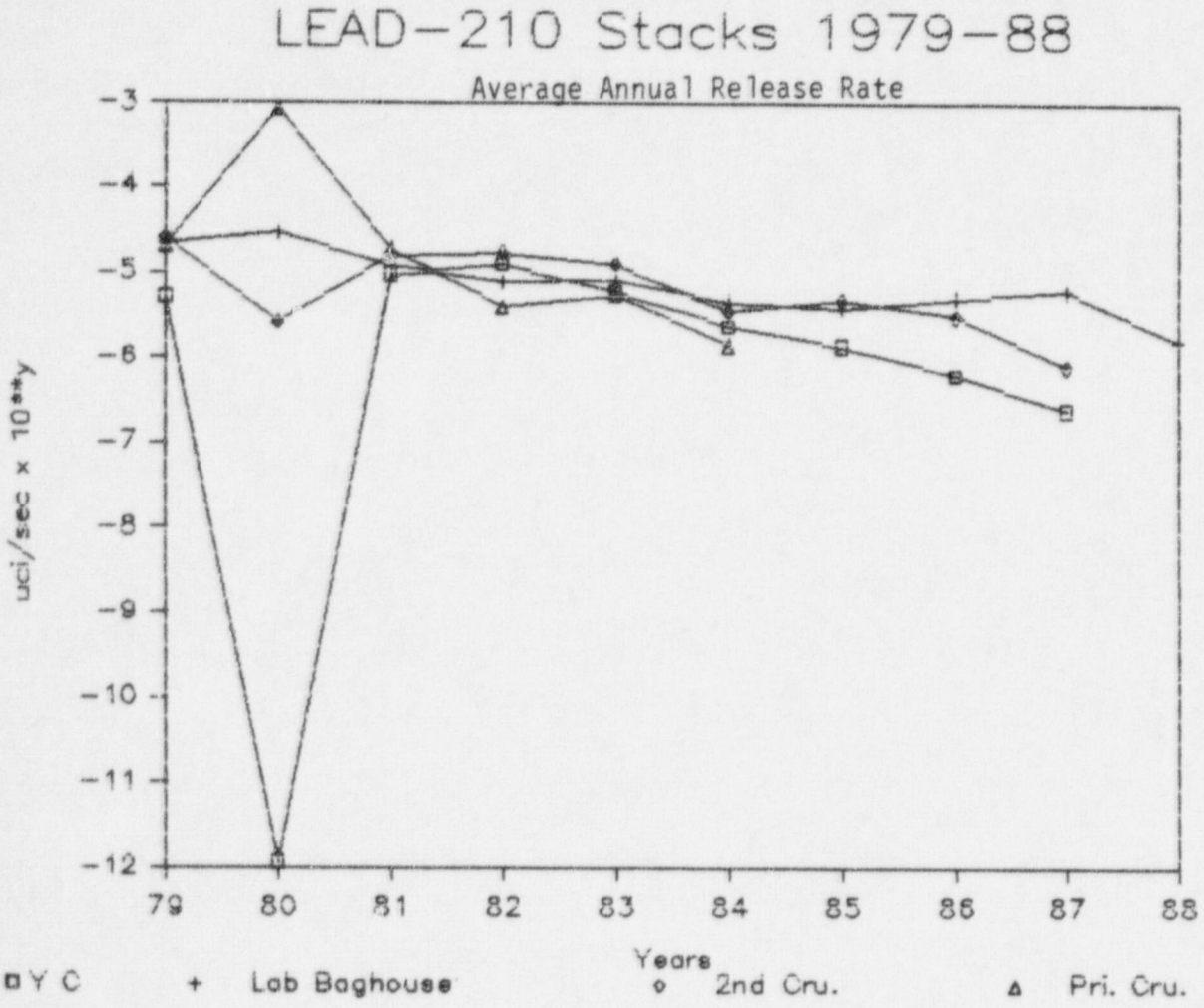

LEAD-210 Stacks 1979-88
Average Annual Release Rate
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
uci/sec x 10**y
79
80
81
82
83
84
85
86
87
88
Years
Y C
Lab Baghouse
2nd Cru.
Pri. Cru.

FIGURE 5.9

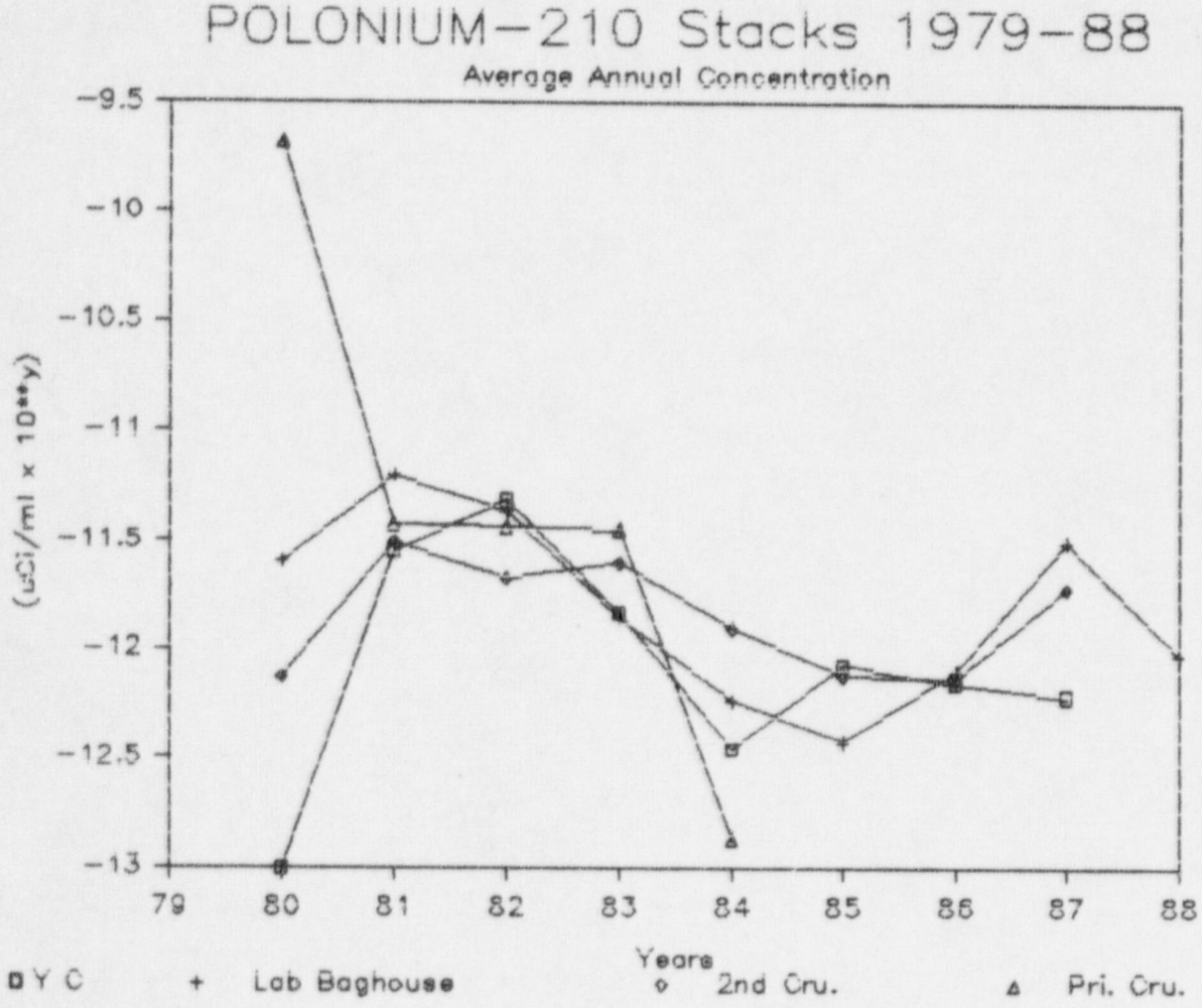
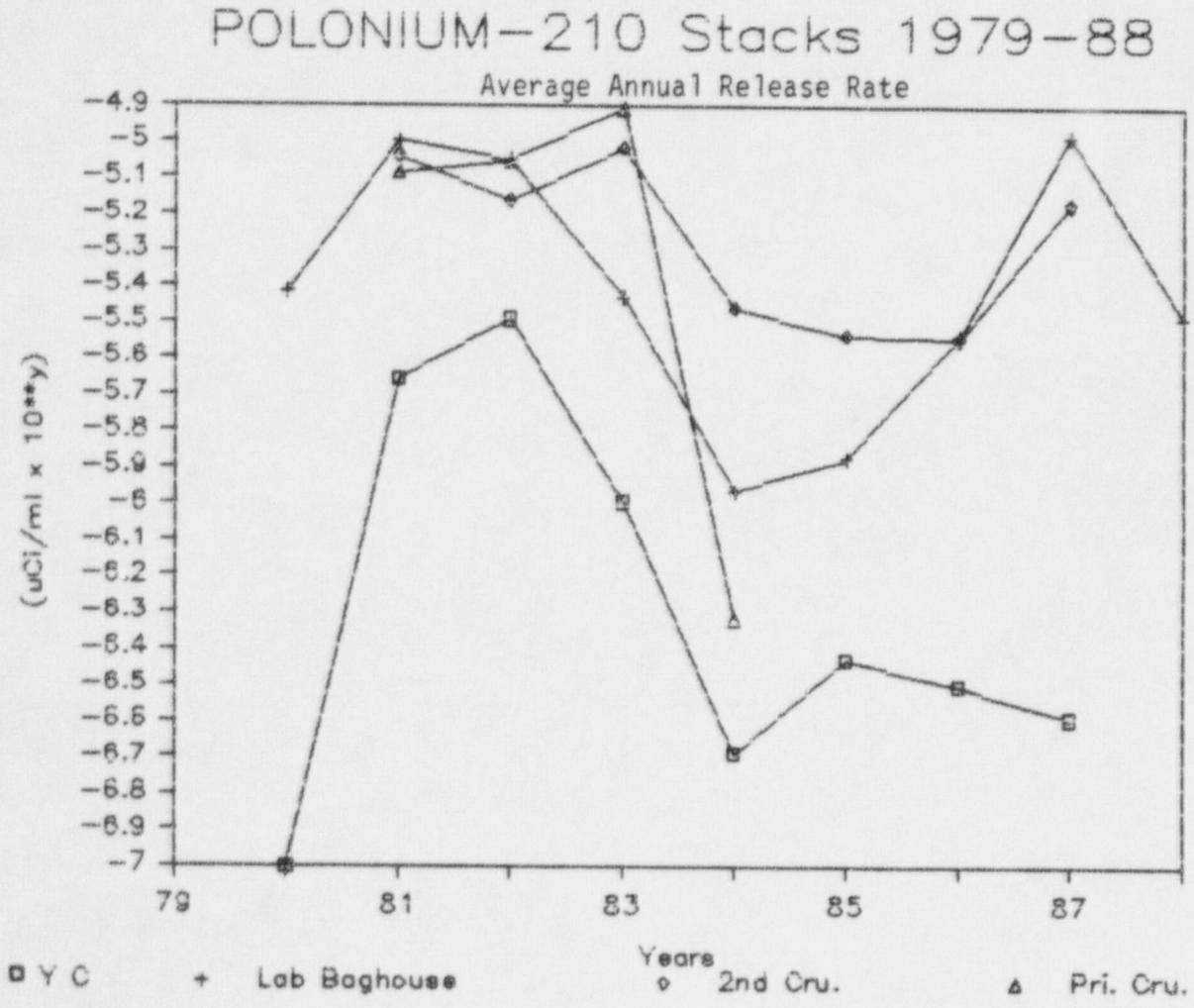

POLONIUM-210 Stacks 1979-88
Average Annual Concentration
-9.5
-10
-10.5
-11
-11.5
-12
-12.5
-13
(uCi/ml x 10**y)
79
80
81
82
83
84
85
86
87
88
Years
Y C
Lab Baghouse
2nd Cru.
Pri. Cru.

FIGURE 5.10


POLONIUM-210 Stacks 1979-88
Average Annual Release Rate
(uCi/ml x 10**y)
-4.9
-5
-5.1
-5.2
-5.3
-5.4
-5.5
-5.6
-5.7
-5.8
-5.9
-6
-6.1
-6.2
-6.3
-6.4
-6.5
-6.6
-6.7
-6.8
-6.9
-7
79
81
83
85
87
Years
Y C
Lab Baghouse
2nd Cru.
Pri. Cru.

6.0 - AIRBORNE RADIOACTIVITY CONCENTRATIONS - WORK STATION EMPLOYEE EXPOSURE - ANNUAL REPORT

6.1 - SAMPLING FOR RADIOACTIVE PARTICULATE AND WORKER BREATHING ZONE SAMPLING

LICENSE CONDITIONS 26.1 AND 26.2

Air samples are collected on a monthly or quarterly basis at locations based on the level of activity at that location and the procedural requirements to determine airborne Uranium concentrations. At a minimum, samples are collected on a quarterly basis within the constraints of the modified license requirements for mill shutdown status (Amendment #23).

A comparison of 1988 data to the data for the last two quarters of 1987 indicates that a reduction in airborne concentrations of approximately 20% has occurred. The average airborne concentration for 1988 was $4.42E^{-13}$ uCi/ml (0.88% of MPC) compared to the 1987 airborne concentration of $5.57E^{-13}$ uCi/ml (1.11% of MPC). The last two quarters for 1987 were used because during the first two quarters work was still being performed in the mill. This reduction in concentrations is attributed to the shutdown of operations and cleanup of the mill areas (Table 6.1).

Routine breathing zone samples are collected on a monthly basis for selected workers throughout the mill. A summary of these results is presented in Table 6.2.

6.0 - AIRBORNE RADIOACTIVITY CONCENTRATIONS - WORK STATION EMPLOYEE EXPOSURE - ANNUAL REPORT

6.1 - SAMPLING FOR RADIOACTIVE PARTICULATE AND WORKER BREATHING ZONE SAMPLING

LICENSE CONDITIONS 26.1 AND 26.2

Page 2

Breathing zone results for 1988, compared to the second half of 1987, indicates an overall reduction of Uranium concentrations in all categories This is attributed to the current non-operating status and the nature of the work being performed by miil personnel.

Cotter plans to continue work station and breathing zone air sample programs in 1989 and will modify monitoring should the operating status of the mill change.

PROGRAM - LAB032 GENERAL AIR SAMPLE (IN PLANT) FOR AIRBORNE PARTICULATES (MICROCURIES PER MILLILITER) FOR CALENDAR YEAR 1988 RUN DATE 2/02/89 TIME 9:00:38

| LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0126 | | 3.22E-13 | | | | 6.19E-13 | | | 6.98E-14 | | 2.03E-13 | |
| 0127 | | 3.34E-13 | | | | 1.22E-12 | | | 7.11E-13 | | 3.80E-13 | |
| 0128 | | 2.04E-13 | | | | 3.56E-13 | | | 1.70E-13 | | | 1.10E-12 |
| 0129 | | 2.26E-13 | | | | 5.52E-13 | | | 1.48E-13 | | | 5.64E-13 |
| 0130 | | 1.60E-13 | | | | 2.94E-13 | | | 5.42E-13 | | | 6.31E-13 |
| 0131 | | 3.77E-13 | | | | 1.96E-13 | | | 1.40E-13 | | | 2.26E-13 |
| 0132 | 7.12E-13 | | | 3.97E-13 | | | <8.21E-14 | | | 6.45E-13 | | |
| 0133 | 1.73E-12 | | | 5.16E-13 | | | <1.10E-13 | | | 1.38E-13 | | |
| 0134 | 7.17E-13 | | | 1.84E-13 | | | 3.76E-14 | | | 3.22E-13 | | |
| 0137 | 4.01E-13 | | | 2.96E-13 | | 3.02E-13 | 1.21E-13 | | | 1.47E-13 | | |
| 0138 | 4.17E-13 | | | 6.39E-13 | | | 4.92E-13 | | | 1.41E-13 | | |
| 0139 | 2.32E-13 | | | 2.46E-13 | | | 2.09E-13 | | | 1.99E-13 | | |
| 0140 | 5.13E-13 | | | 1.39E-13 | | | 9.40E-14 | | | 5.64E-14 | | |
| 0141 | 5.80E-13 | | | 1.14E-12 | | | 3.34E-13 | | | 2.61E-12 | | |
| 0142 | 6.7[illegible]E-13 | | | 6.25E-13 | | | 2.44E-13 | | | 2.26E-13 | | |
| 0143 | 4.17E-13 | | | 2.74E-13 | | | 9.31E-14 | | | 2.87E-13 | | |
| 0144 | 2.65E-13 | | | 2.76E-13 | | | <4.70E-14 | | | 1.54E-13 | | |
| 0145 | | 4.62E-13 | | | 1.78E-13 | | | 9.96E-14 | | 1.91E-13 | | |
| 0146 | | 9.92E-14 | | | 1.91E-13 | 2.76E-13 | | 7.22E-13 | | 1.41E-13 | | |
| 0147 | | 2.43E-13 | | | 6.41E-13 | | | 1.21E-13 | | 3.76E-13 | | |
| 0149 | | 2.10E-12 | | | 9.56E-13 | | | 1.37E-12 | | 6.27E-13 | | |
| 0152 | | 1.33E-12 | | | 8.66E-13 | | | 5.74E-13 | | 3.76E-13 | | |
| 0153 | | 6.99E-13 | | | 7.38E-13 | | | 9.76E-13 | | 1.53E-13 | | |
| 0154 | | 1.60E-12 | | | 5.8[illegible]-13 | | | 2.90E-13 | | 1.21E-13 | | |
| 0155 | | 1.08E-13 | | | | 6.39E-13 | | | 1.20E-12 | | | 3.22E-13 |
| 0157 | | | 2.51E-13 | 6.87E-13 | | 3.34E-13 | 1.93E-13 | | | | | 1.17E-13 |
| 0158 | | | 2.53E-12 | 3.74E-13 | | 7.79E-13 | 4.51E-13 | | | | | 4.35E-13 |
| 0159 | | | 1.42E-13 | 1.30E-12 | | 1.70E-12 | 7.05E-14 | | | | | 3.89E-13 |

PROGRAM - LAB032

GENERAL AIR SAMPLE (IN PLANT) FOR AIRBORNE PARTICULATES
(MICROCURIES PER MILLILETER) FOR CALENDAR YEAR 1988

RUN DATE 2/02/89
TIME 9:00:38

| LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0161 | | 2.38E-12 | | | 3.11E-13 | | | 1.70E-13 | | 2.87E-13 | | |
| 0162 | | 6.21E-14 | | | | 5.57E-13 | 2.05E-13 | 3.54E-13 | 4.05E-13 | 4.23E-13 | | 2.20E-13 |
| 0163 | 4.77E-13 | | | 5.16E-14 | | | (7.92E-14 | | | 5.31E-13 | | |
| 0165 | | 2.05E-13 | | | | 3.91E-13 | | | 2.05E-13 | | | 4.23E-13 |
| 0166 | | 8.79E-13 | | | | 2.54E-13 | | | 6.36E-14 | | | 1.13E-12 |
| 0168 | 1.39E-14 | | | | | 3.48E-14 | | | 1.82E-15 | | 1.71E-14 | |
| 0169 | | 1.08E-13 | | | | 2.39E-13 | | | 6.84E-14 | | 3.60E-13 | |
| 0181 | | 1.01E-12 | | 5.49E-13 | | | | 3.41E-13 | | 2.62E-13 | | |
| 0182 | | 5.64E-14 | 1.33E-13 | | | 9.78E-14 | | | | 1.80E-13 | | |
| 0183 | | 1.76E-13 | | | 4.51E-13 | | 1.29E-13 | | | 2.01E-13 | | |
| 0185 | | 3.28E-13 | | | | 9.21E-13 | | | 7.52E-13 | | 1.92E-13 | |
| 0186 | | 1.76E-13 | | | | 8.20E-13 | | 3.53E-13 | 8.27E-13 | 2.91E-13 | | |
| 0193 | | 8.69E-13 | | 8.48E-13 | | | | 4.51E-13 | | 5.77E-13 | | |
| 0203 | | | 1.71E-13 | 1.95E-13 | | 2.84E-13 | 1.17E-13 | | | | | 1.56E-13 |
| 0205 | 1.28E-12 | 3.79E-13<br>1.35E-13 | | | | | 3.42E-13 | 5.05E-13 | 4.55E-13 | 3.64E-13 | 5.04E-13 | |
| 0206 | 3.27E-13 | | | 4.77E-13 | | | (1.10E-13 | | | 2.82E-13 | | |
| 0208 | | 1.02E-13 | | | | 1.35E-13 | | | 3.01E-13 | | 1.01E-13 | |
| 0210 | 2.07E-13 | 3.58E-13 | 2.20E-13 | 2.00E-13 | 1.33E-13 | 1.17E-13 | 1.77E-13 | | | | | |
| 0211 | | | | | | | | | | 1.99E-13 | | |
| 0212 | | | | | | | | | | 2.46E-12 | | 4.51E-13 |
| 0300 | | | | | | | 9.54E-14<br>2.55E-14 | 7.01E-14<br>5.79E-14<br>5.01E-14<br>4.14E-14 | 1.99E-14<br>6.77E-14<br>2.26E-14<br>1.13E-13<br>7.52E-14 | 3.76E-14 | | |
| 0301 | | | | | | | 9.81E-14<br>9.21E-14 | | 4.07E-13 | | | |
| 0302 | | | | | | | (2.19E-14<br>1.43E-14<br>8.19E-15 | 7.15E-14<br>1.04E-14<br>1.81E-15<br>1.38E-14 | 2.74E-14<br>7.31E-15<br>1.05E-14<br>9.30E-15 | 6.99E-15<br>9.64E-15<br>1.23E-14<br>1.60E-14 | 6.18E-15 | 6.29E-15 |

PROGRAM - LAB032 GENERAL AIR SAMPLE (IN PLANT) FOR AIRBORNE PARTICULATES (MICROCURIES PER MILLILETER) FOR CALENDAR YEAR 1988 RUN DATE 2/02/89 TIME 9:00:38

| LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 1.02E-14 | | | | |
| 0303 | | | | | | | <2.51E-13 | | | | | |
| 0304 | | | | | | | 8.63E-14 | 8.37E-14 | 3.42E-14 | 9.40E-14 | | |
| | | | | | | | 9.65E-14 | 1.22E-13 | | | | |
| | | | | | | | | 4.10E-14 | | | | |
| | | | | | | | | 2.51E-14 | | | | |
| 0305 | | | | | | | 3.20E-13 | 1.75E-13 | 2.82E-13 | 4.70E-14 | | |
| | | | | | | | | 3.75E-13 | 5.64E-14 | | | |
| | | | | | | | | 7.71E-14 | | | | |
| | | | | | | | | 3.94E-14 | | | | |
| 0306 | | | | | | | 2.66E-13 | 1.85E-13 | | 6.27E-14 | | |
| | | | | | | | 3.91E-14 | 1.15E-13 | | 6.27E-14 | | |
| | | | | | | | | 5.47E-14 | | | | |
| | | | | | | | | 3.22E-14 | | | | |
| 0308 | | | | | | | | 9.78E-14 | 5.64E-14 | 1.37E-13 | | |
| | | | | | | | | 9.23E-14 | 4.70E-14 | 3.76E-14 | | |
| | | | | | | | | 8.78E-14 | 5.13E-14 | | | |
| | | | | | | | | 9.03E-14 | | | | |
| | | | | | | | | 7.52E-14 | | | | |
| | | | | | | | | 3.76E-14 | | | | |
| 0309 | | | | | | | | 7.52E-14 | 1.13E-13 | | | |
| | | | | | | | | | 6.84E-14 | | | |
| 0310 | | | | | | | | 8.60E-14 | 4.26E-13 | | | |
| | | | | | | | | <2.51E-14 | 1.88E-14 | | | |
| | | | | | | | | 1.03E-13 | 1.13E-13 | | | |
| | | | | | | | | 4.91E-14 | 6.27E-14 | | | |
| 0311 | | | | | | | | 7.33E-14 | 3.16E-13 | | | |
| | | | | | | | | 4.58E-14 | 3.76E-14 | | | |
| | | | | | | | | | 9.90E-14 | | | |
| | | | | | | | | | 7.52E-14 | | | |
| 0312 | | | | | | | | 3.29E-14 | 1.52E-13 | | | |
| | | | | | | | | 5.96E-14 | 8.96E-14 | | | |
| | | | | | | | | | 7.52E-14 | | | |
| 0313 | | | | | | | | 1.76E-13 | 9.03E-14 | | | |
| | | | | | | | | | 3.76E-14 | | | |
| | | | | | | | | | 3.76E-14 | | | |
| | | | | | | | | | 7.52E-14 | | | |
| 0314 | | | | | | | | | 3.76E-14 | 1.50E-13 | | |
| 0315 | | | | | | | | | 3.76E-14 | | | |
| | | | | | | | | | 7.52E-14 | | | |

RUN DATE 1/12/89
TIME 9:06:02

COTTER CORPORATION
BREATHING ZONE SUMMARY FOR CALENDER YEAR 1988
NATURAL URANIUM CONCENTRATION (uCi/ml)

PROGRAM - LAB037
PAGE 1

| CATEGORY | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *** MILL FMAN-RAP QA/QC *** | | | | | | | | | | | | |
| 0101 | | | | | 3.72E-13 | | 2.13E-13 | | | | | |
| *** LOADER OPERATOR *** | | | | | | | | | | | | |
| 0202 | | | | | | | | | | | | 2.60E-13 |
| *** MAINTENANCE - INSTRU *** | | | | | | | | | | | | |
| 0305 | | | | | | | | | 6.64E-13 | 6.41E-13 | | |
| *** MAINTENANCE - AUTO M *** | | | | | | | | | | | | |
| 0307 | | | | | | | | | | 2.81E-12 | | |
| *** MAINTENANCE - MECHAN *** | | | | | | | | | | | | |
| 0310 | | | | | | | | | | | 4.69E-13 | |
| *** CH. MET./PERSNL. COO *** | | | | | | | | | | | | |
| 0401 | | | | | 4.27E-13 | | | 1.65E-12 | | | | |
| *** ANALYTICAL LAB PERSO *** | | | | | | | | | | | | |
| 0404 | | 1.72E-12 | 3.52E-12 | | | 7.18E-13 | | | | | | |
| *** LABORERS *** | | | | | | | | | | | | |
| 0505 | | | | | 7.11E-13 | | (2.00E-13 | | | 2.20E-12 | | |
| *** SECURITY/SAF ECH *** | | | | | | | | | | | | |
| 0806 | | | | | | 4.47E-13 | | | | | | |
| | | | | | | 3.94E-12 | | | | | | |
| | | | | | | 4.95E-13 | | | | | | |
| *** RAP CONSTRUCTION ACT *** | | | | | | | | | | | | |
| 0901 | | | | | | | (2.42E-13 | | 2.35E-13 | | | 2.57E-13 |
| | | | | | | | (1.76E-13 | | | | | |
| | | | | | | | (2.89E-13 | | | | | |
| | | | | | | | 2.05E-13 | | | | | |

MPC = PRECIP-DRYER OPERATOR 1E-10 uCi/ml
RAP CONSTRUCTION ACTIVITIES 1E-10 uCi/ml
ALL OTHERS 5E-11 uCi/ml

6.2 - MONTHLY RADON DAUGHTER CONCENTRATIONS AT WORK STATIONS - ANNUAL REPORT

LICENSE CONDITION 26.3

Cotter Corporation collected air samples at selected process areas on a quarterly basis during 1988. These samples were taken to determine radon daughter concentrations.

Samples were collected at the following locations on a quarterly basis beginning in March, 1987:

RD-1 Primary Crusher (Middle level)

RD-2 Secondary Crusher (Lower level)

RD-3 Secondary Crusher (Upper level)

RD-4 Fine Ore Bins (Lower level)

RD-5 Fine Ore Bins (Upper level)

RD-6 New Sample Plant

RD-7 Met Lab

RD-8 Sample Preparation

RD-9 Grind-Leach Building

RD-10 Environmental Laboratory

RD-11 Sample Shed

In addition to these routine samples, two samples are collected on a quarterly basis as an ALARA function. These samples are used to evaluate radon daughter concentrations in non-routine sampling locations. (See Radiological Health and Safety Procedures 2-6.)

6.2 - MONTHLY RADON DAUGHTER CONCENTRATIONS AT WORK STATIONS - ANNUAL REPORT

LICENSE CONDITION 26.3

Page 2

Radon daughter sampling in 1988 consisted of a total of 103 samples, an increase of 7 over the number of samples taken in 1987, and included 29 samples taken in conjunction with Remedial Action Plan construction activities. The radon daughter concentration data presented in Table 6.3 show that three of the 103 samples collected exceeded 25% of MPC (0.083 WL). One of the these three samples exceeded MPC. The sample exceeding MPC was collected at the Top of the Fine Ore Bins after the mill was shut down. This area is entered only by Radiation Safety personnel for the purpose of obtaining samples and has been secured since September, 1987. The two samples exceeding 25% of MPC were also in the fine ore bin area. The elevated levels are caused by the residual ore in the bins and the shut down of the bin ventilation system.

The following is a summary of the radon daughter data for 1988 compared to 1987:

6.2 - MONTHLY RADON DAUGHTER CONCENTRATIONS AT WORK STATIONS -

ANNUAL REPORT

LICENSE CONDITION 26.3

Page 3

RADON DAUGHTER CONCENTRATION (WL) (% MPC)

| LOCATION | 1987 | 1988 |
|---|---|---|
| Secondary Crusher | 0.019 (5.7) | 0.017 ( 5.1) |
| Fine Ore Bins | 0.564 (169.2) | 0.086 (25.8)* |
| Sample Prep | 0.007 (2.1) | 0.006 ( 1.8) |
| Met Lab | 0.019 (5.7) | 0.008 ( 2.4) |
| Sample Plant | 0.005 (1.5) | 0.009 ( 2.7) |
| Grind-Leach | 0.046 (13.8) | 0.040 (12.0) |

*The average concentration at the Top of the Fine Ore Bins was 0.275 WL (82.6%). The average concentration at the Bottom of the Fine Ore Bins was 0.048 WL (14.4%).

Cotter plans to continue radon daughter sampling in 1989 as specified in mill license requirements.

PROGRAM - LAB112

COTTER CORPORATION
RADON DAUGHTER SAMPLE RESULTS YEAR TO DATE

RUN DATE 01/12/89
TIME 08:16:33

| LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRIMARY CRUSHER (MIDDLE LEVEL) | 0.007 | | | <.006 | | | <.004 | | | 0.005 | | |
| SAMPLE SHED | 0.003 | | | 0.008 | | | | | | <.004 | | |
| SECONDARY CRUSHER (UPPER LEVEL) | 0.006 | | | | | | | | | | | |
| SECONDARY CRUSHER (LOWER LEVEL) | <.004 | | | 0.044 | | 0.008 | 0.010 | | | 0.031 | | |
| FINE ORE BINS (UPPER LEVEL) | | | | | | 0.482 | | | | | | 0.068 |
| FINE ORE BINS (LOWER LEVEL) | 0.047 | | | 0.037 | 0.035 | | 0.149<br>0.156<br>0.032<br>0.006 | <.005 | | 0.006 | | <.004 |
| SOLVENT EXTRACTION BUILDING | | | | | | | 0.013 | | | | | 0.021 |
| SAMPLE PREPARATION | <.002 | | <.007 | <.011 | | <.004 | <.004 | | | 0.009 | | <.005 |
| MET. LAB | 0.016 | | | <.005 | | | | <.005 | | <.004 | | |
| MAINTENANCE SHOP | <.002 | | | | <.005 | | | | | 0.006 | | 0.005 |
| NEW SAMPLE PLANT | 0.005 | | | 0.017 | | | <.004 | | | 0.009 | | |
| CHANGE HOUSE | <.002 | | | | | | <.004 | | | | | 0.015 |
| PRODUCT BUILDING (BARREL STORAGE AREA) | | | | | | | | | | | | <.004 |
| ENVIRONMENTAL LABORATORY | <.002 | | | <.008 | | | | | | <.004 | | |
| GRIND LEACH BLDG. | 0.007 | | | 0.082 | 0.064<br>0.044 | 0.037 | | <.005 | | 0.043 | | 0.019<br>0.057 |
| LABOR LUNCHROOM | | | | | | | <.004 | 0.005 | | | | |
| MOISTURE SAMPLE DRYING ROOM | | | | | | | | | | 0.016 | | |
| CCD AREAS | | | | | | <.004 | | | | | | |
| RUBBER SHOP | | | | | | | | | | <.004 | | |
| WATER PUMP HOUSE | | | | <.005 | | | | | | | | |
| LIME BUILDING | | | | | 0.006 | | | | | | | |
| OLD MILL AREA WEST | | | | | | | <.002<br><.005 | | | | | |
| SECURITY STATION | | | | | | | | | | | | 0.021 |
| WAREHOUSE | | | | | | | | | | 0.023 | | 0.012 |

PROGRAM - LAB112

COTTER CORPORATION
RADON DAUGHTER SAMPLE RESULTS YEAR TO DATE

RUN DATE 01/12/89
TIME 08:18:45

| LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SCS DAM AREA #2 | | | | | | | | <.002<br>0.004 | | | | |
| SCS BARRIER AREA | | | | | | | 0.004 | 0.003<br><.004 | | <.004 | | |
| SECONDARY IMPOUNDMENT | <.003 | <.003 | <.001 | <.005 | 0.003 | <.005 | 0.005<br>0.002<br><.003<br>0.007 | <.001<br>0.013<br><.003 | <.002<br><.001 | 0.006<br><.004 | | 0.004 |
| WATER DISTRIBUTION POND | | | | | | | | 0.007 | | | | |
| OLD TAILINGS AREA | | | | | | | | <.003 | <.003 | 0.010 | | |
| CONSTRUCTION TRAILER | | | | | | | | | | <.004 | | |

MPC = 0.333 WL

## 6.3 - TIME WEIGHTED EXPOSURE STUDIES - ANNUAL REPORT LICENSE CONDITION 26.4

Due to the shutdown of the mill and subsequent layoff of mill personnel, a time study was not conducted in 1988.

7.1.1 - ENVIRONMENTAL TLD - ANNUAL REPORT

LICENSE CONDITION 27

Environmental Thermoluminescent Dosimeters are utilized at the following ten perimeter locations: at four fenceline boundaries (north, south, east and west), at three locations in the proposed area of the now defunct OroVerde development, at one Lincoln Park residence, at the Shadow Hills Golf Club and at one Canon City residence. In accordance with the terms of RAP Section 23, the air monitors at OroVerde #1, OroVerde #2, and the Shadow Hills Golf Club were taken out of service during the third quarter of 1988, while the north monitoring site was moved near the actual site boundary during the third quarter. Since the license requires that environmental TLD's be located with air monitors, environmental TLD locations were changed as well. Results of this monitoring are presented in Tables 7.1 and 7.2, and in Figures 7.1 and 7.2 and are indications of external radiation exposure.

Evaluation of these data indicates a narrow range of exposure rates. During 1987, both onsite and offsite locations had lower average values concurrent with the mill shutdown; however, 1988 showed a rise possibly attributable to RAP construction activities.

TABLE 7.1

PROGRAM - LAB304

COTTER CORPORATION
ENVIRONMENTAL TLD FOR 1988

RUN DATE 02/28/89

| LOCATION | EXPOSURE RATE (uR/hr) 1ST QTR | 2ND QTR | 3RD QTR | 4TH QTR |
|---|---|---|---|---|
| AS201 SHADOW HILLS GOLF COURSE | 11.6 | 10.5 | 10.5 | |
| AS202 E. QTR CORNER SECTION 16 | 17.2 | 13.5 | 15.2 | 14.0 |
| AS203 S. QTR CORNER SECTION 16 | 13.9 | 14.0 | 12.9 | 13.5 |
| AS206 N. QTR CORNER SECTION 16 | 10.6 | 16.5 | 10.6 | 15.7 |
| AS204 W. QTR CORNER SECTION 16 | 11.8 | 14.7 | 10.4 | 14.4 |
| CANON CITY | 9.1 | 10.1 | 7.9 | 10.2 |
| LINCOLN PARK | 11.9 | 11.4 | 11.1 | 11.9 |
| ORO VERDE #1 | 12.2 | 15.8 | 16.4 | 11.9 |
| ORO VERDE #2 | 11.5 | 11.1 | 11.9 | 11.9 |
| ORO VERDE #3 | 8.2 | 12.6 | 7.5 | 12.4 |

TABLE 7.2

ANNUAL AVERAGE GAMMA EXPOSURE RATE
ENVIRONMENTAL TLD (μR/hr)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 11.7 | 14.0 | 12.6 | 12.7 | | | | | 11.4 | 11.8 |
| 1980 | 11.6 | 13.4 | 11.7 | 12.9 | | | | | 11.4 | 10.4 |
| 1981 | 14.8 | 14.3 | 12.8 | 12.7 | | 15.4 | 11.6 | 12.3 | 12.3 | 10.6 |
| 1982 | 11.4 | 13.7 | 12.6 | 14.7 | 20.4 | 10.7 | 10.9 | 12.7 | 11.2 | 9.9 |
| 1983 | 12.2 | 13.6 | 12.6 | 14.2 | 15.6 | 10.6 | 11.4 | 12.0 | 11.6 | 10.6 |
| 1984 | 14.1 | 14.5 | 14.3 | 14.6 | 14.8 | 11.4 | 12.2 | 13.2 | 11.2 | 12.3 |
| 1985 | 12.6 | 14.3 | 13.5 | 14.5 | 14.8 | 10.4 | 11.3 | 12.3 | 11.2 | 10.5 |
| 1986 | 11.5 | 13.9 | 13.7 | 14.5 | 14.2 | 12.3 | 11.0 | 11.8 | 10.7 | 11.0 |
| 1987 | 12.1 | 12.9 | 12.5 | 12.6 | 12.6 | 12.3 | 9.5 | 10.4 | 9.7 | 9.6 |
| 1988 | 10.9 | 15.0 | 13.6 | 12.8 | 13.4 | 14.8 | 11.5 | 10.2 | 11.6 | 9.3 |

FIGURE 7.1

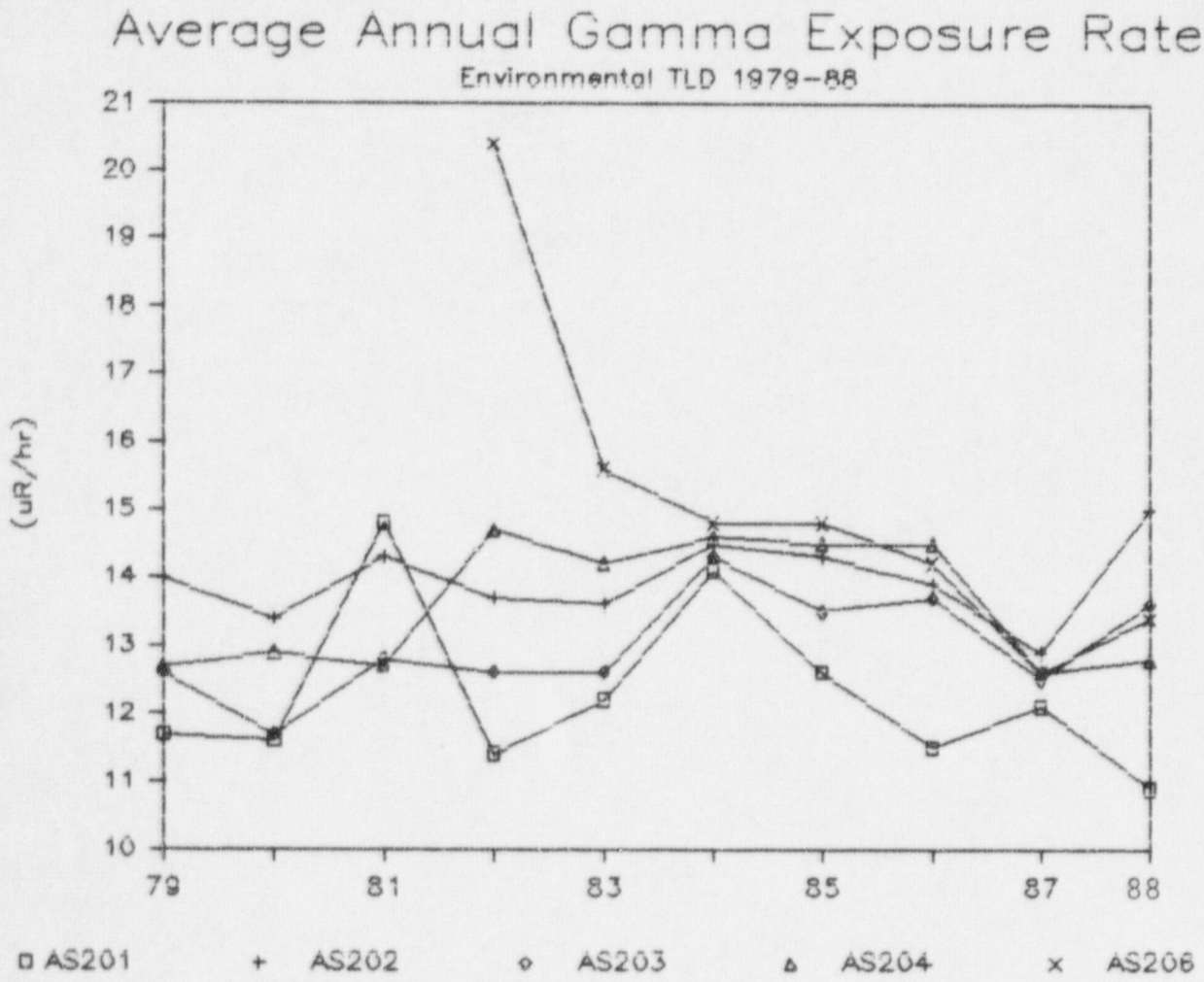
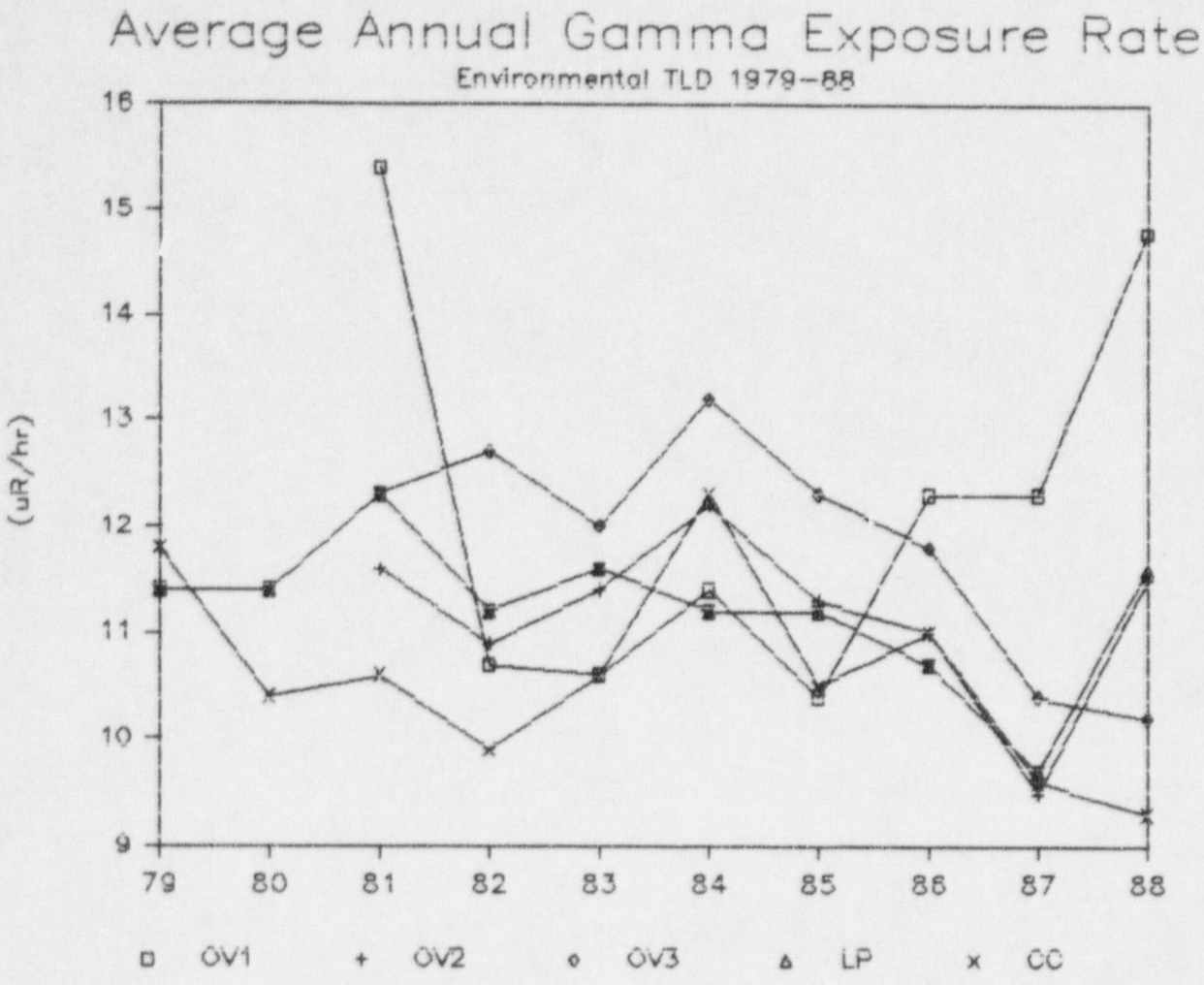

Average Annual Gamma Exposure Rate
Environmental TLD 1979-88
(uR/hr)
21
20
19
18
17
16
15
14
13
12
11
10
79
81
83
85
87
88
AS201
AS202
AS203
AS204
AS206

FIGURE 7.2


Average Annual Gamma Exposure Rate
Environmental TLD 1979–88
(uR/hr)
16
15
14
13
12
11
10
9
79
80
81
82
83
84
85
86
87
88
OV1
OV2
OV3
LP
CC

## 7.1.2 - RADON-222 - ANNUAL REPORT

LICENSE CONDITION 27

Environmental Radon-222 concentrations were measured at the same sampling locations described in Section 7.1.1 with the Track Etch (R) system utilizing Type M filters to subtract any Thoron contribution. Results for 1988 are summarized in Table 7.3 and Figures 7.3 and 7.4.

Please note that Cotter presented an analysis of the validity of the second quarter value for the Canon City location in a letter dated September 6, 1988, to the Department. Further evaluation of air particulate data indicated no anomalies; therefore, the annual average was calculated without this result.

Evaluation of these data with respect to previous data sets demonstrates a narrow range of analytical results.

# TABLE 7.3

PROGRAM - LAB315 | C O T T E R  C O R P O R A T I O N | RUN DATE 03/06/89

RADON-222 REPORT FOR 1988 | TIME 11:34:40

(pCi/m3)

| LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0800 SHADOW HILLS GOLF COURSE | | | 300 | | | 200 | | | 300 | | | |
| 0801 EAST QUARTER CORNER SECTION 16 | | | 500 | | | 400 | | | 700 | | | 500 |
| 0802 SOUTH QUARTER CORNER SECTION 16 | | | 1400 | | | 700 | | | 800 | | | 700 |
| 0803 NORTH QUARTER CORNER SECTION 16 | | | 1400 | | | 300 | | | 800 | | | 600 |
| 0804 WEST QUARTER CORNER SECTION 16 | | | 700 | | | 600 | | | 1200 | | | 1400 |
| 0805 CANON CITY | | | 1100 | | | 30700 | | | 300 | | | 1100 |
| 0806 LINCOLN PARK | | | 800 | | | 300 | | | 300 | | | 800 |
| 0809 ORO VERDE #1 | | | 600 | | | 400 | | | 500 | | | |
| 0810 ORO VERDE #2 | | | 400 | | | 100 | | | 7200 | | | |
| 0811 ORO VERDE #3 | | | 400 | | | 200 | | | 700 | | | 500 |

MPC = 3000 pCi/m3

TABLE 7.4

AVERAGE RADIONUCLIDE CONCENTRATIONS
ENVIPONMENTAL RADON-222
(μCi/ml)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 3.30E-10 | 4.20E-10 | 4.65E-10 | 7.85E-10 | | | | | | 7.07E-10 |
| 1980 | 3.50E-10 | 3.30E-10 | 2.50E-10 | 2.40E-10 | | | | | 2.93E-10 | 3.10E-10 |
| 1981 | 4.40E-10 *(6.13E-10) | 3.80E-10 (5.15E-10) | 3.78E-10 (5.88E-10) | 5.20E-10 (6.93E-10) | 9.70E-10 | 3.55E-10 | 2.94E-10 | 3.95E-10 | 2.60E-10 | 2.60E-10 |
| 1982 | 5.84E-10 *(7.15E-10) | 4.7E-10 (5.45E-10) | 5.79E-10 (7.23E-10) | 2.30E-9 (2.46E-9) | 1.09E-9 | 6.00E-10 | 3.30E-10 | 5.76E-10 | 1.04E-9 | 6.57E-10 |
| 1983 | 8.03E-10 | 9.16E-10 | 7.05E-10 | 8.75E-10 | 1.19E-9 | 3.65E-10 | 8.22E-10 | 6.48E-10 | 4.92E-10 | 4.19E-10 |
| 1984 | 8.20E-10 | 6.10E-10 | 7.20E-10 | 6.50E-10 | 8.50E-10 | 5.17E-10 | 3.06E-10 | 8.95E-10 | 5.44E-10 | 4.14E-10 |
| 1985 | 5.85E-10 | 6.60E-10 | 6.90E-10 | 8.20E-10 | 8.30E-10 | 4.70E-10 | 6.58E-10 | 5.72E-10 | 4.70E-10 | 5.60E-10 |
| 1986 | 2.25E-9 **(6.60E-10) | 1.94E-9 (7.50E-10) | 1.51E-9 (5.80E-10) | 1.44E-9 (7.80E-10) | 1.09E-9 (6.00E-10) | 1.67E-9 (5.95E-10) | 2.04E-9 (3.80E-10) | 1.05E-9 (3.70 E-10) | 1.37E-9 (6.90E-10) | 1.25E-9 (7.80E-10) |
| 1987 | 5.75E-10 | 7.75E-10 | 6.75E-10 | 8.00E-10 | 8.75E-10 | 4.75E-10 | 4.67E-10 | 4.75E-10 | 4.00E-10 | 7.75E-10 |
| 1988 | 2.67E-10 | 5.25E-10 | 9.00E-10 | 9.75E-10 | 7.75E-10 | 5.00E-10 | 2.50E-10 | 4.50E-10 | 5.50E-10 | 8.33E-10 |

*The figures in parentheses for the year 1981 and 1982 are the average utilizing the passive radon monitor results during the transition to new monitoring techniques.

**Average of second, third and fourth quarters only.

MPC = 3E-9

FIGURE 7.3

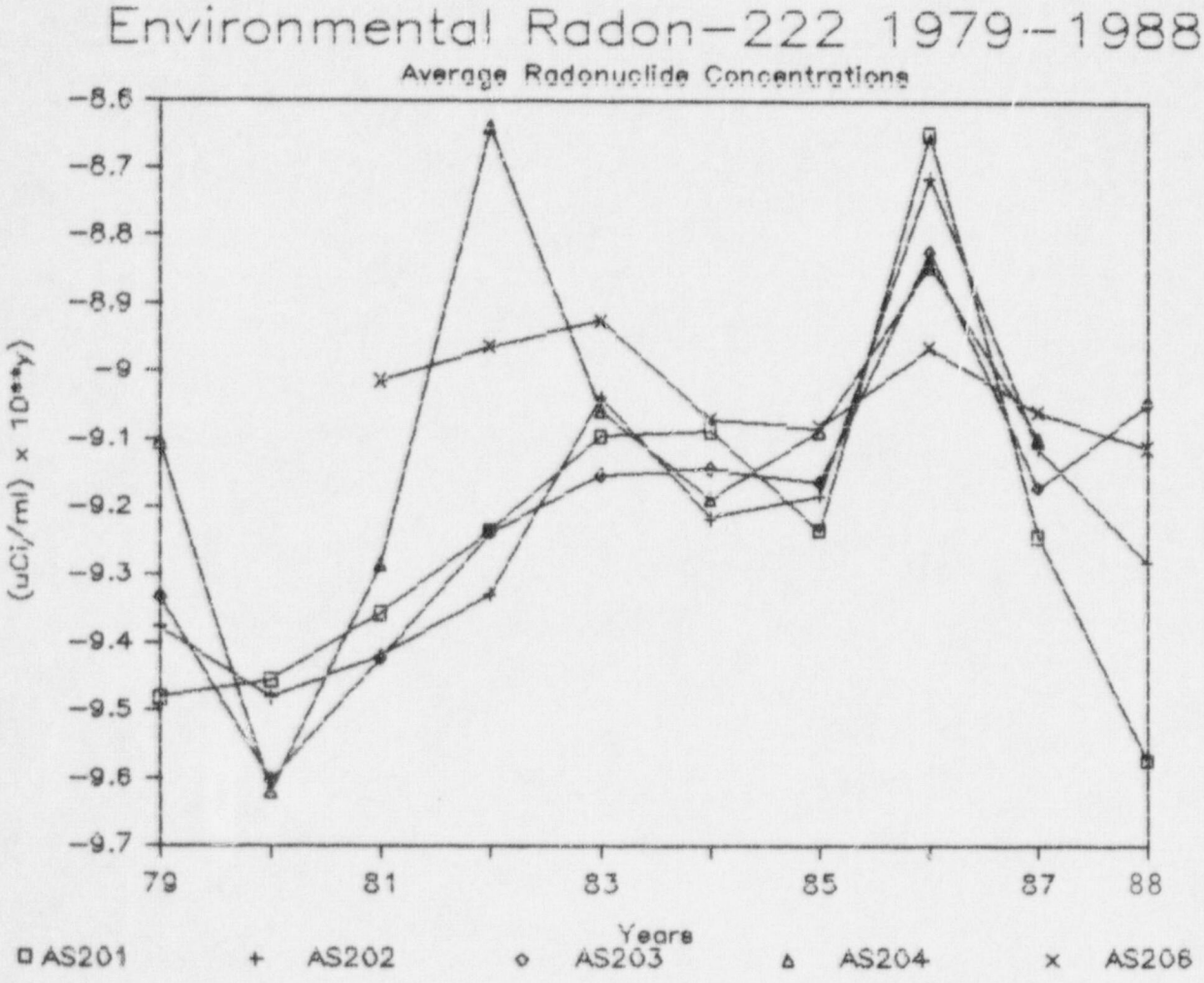
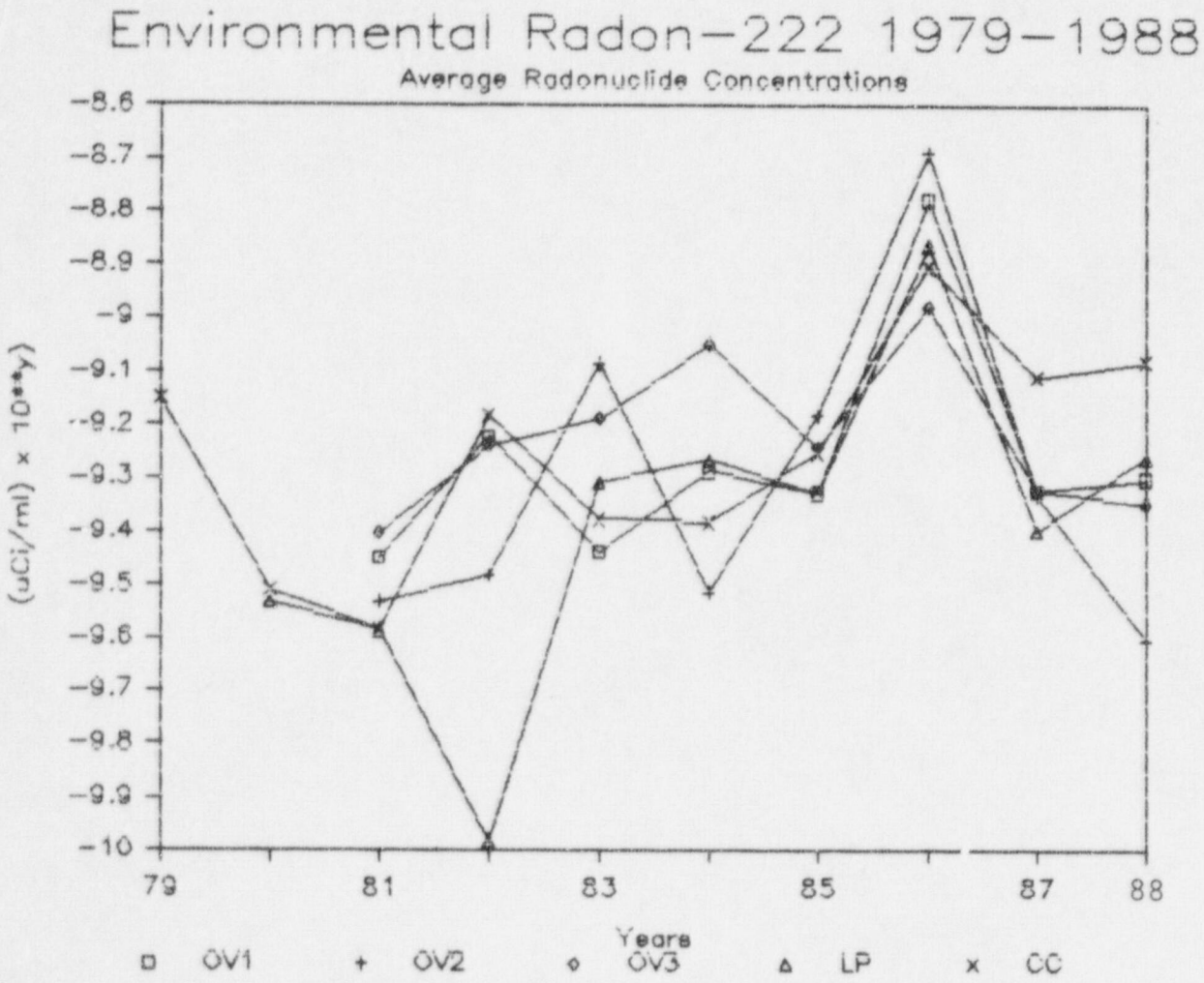

Environmental Radon-222 1979--1988
Average Radonuclide Concentrations
(uCi/ml) x 10**y)
-8.6
-8.7
-8.8
-8.9
-9
-9.1
-9.2
-9.3
-9.4
-9.5
-9.6
-9.7
79
81
83
85
87
88
Years
AS201
AS202
AS203
AS204
AS206

FIGURE 7.4


Environmental Radon–222 1979–1988
Average Radonuclide Concentrations
(uCi/ml) x 10**y)
-8.6
-8.7
-8.8
-8.9
-9
-9.1
-9.2
-9.3
-9.4
-9.5
-9.6
-9.7
-9.8
-9.9
-10
79
81
83
85
87
88
Years
OV1
OV2
OV3
LP
CC

## 7.1.3 - ENVIRONMENTAL AIR PARTICULATES - ANNUAL REPORT

## LICENSE CONDITION 27.1

Cotter Corporation operated continuous air particulate samplers at the following locations: at four boundaries (north, south, east and west), at three locations in the now defunct OroVerde development area, at one Lincoln Park residence, at the Shadow Hills Golf Course and at one Canon City residence. Pursuant to the requirements of RAP Section 23, the Shadow Hills Golf Club, OroVerde #1, and OroVerde #2 were discontinued during the third quarter of 1988, while the north sampler was moved north of the SCS Reservoir near the site boundary.

Evaluation and analysis of the annual averages indicates that Natural Uranium ($^{Nat}U$) concentrations were down at all locations, with the Shadow Hills, the north boundary, OroVerde #1, OroVerde #2, OroVerde #3, Lincoln Park, and Canon City at all time lows. Thorium-230 ($^{230}Th$) concentrations, on the other hand, were up at onsite locations and relatively low at offsite locations. This may be an indication of the RAP construction activities, onsite and the improved confinement and stabilization of tailings materials onsite since the tailings transfer operation in 1981 - 1983. Radium-226 ($^{226}Ra$) concentrations were up at onsite locations, with the exception of the north boundary, while offsite locations were at, or very near, all time lows. This distribution probably reflects aspects of the

scenarios for both Natural Uranium ($^{Nat}U$) and Thorium-230 ($^{230}Th$) with the additional fact that Thorium-230 ($^{230}Th$) concentrations in the tailings are in an approximate 2:1 ratio with Radium-226 ($^{226}Ra$) and environmental air concentrations are approximately in the same ratio. Lead-210 ($^{210}Pb$) and Polonium-210 ($^{210}Po$) averages were in the same range as previous annual averages. These concentrations probably reflect ambient Radon-222 levels.

Quarterly results for Natural Uranium ($^{Nat}U$), Thorium-230 ($^{230}Th$) and Radium-226 ($^{226}Ra$) onsite were generally low for the first quarter of 1988 with increasing or level concentrations later in the year. The north boundary concentration dropped sharply in the fourth quarter of 1988, concurrent with the relocation of the sampler.

OroVerde #3 annual averages for Natural Uranium ($^{Nat}U$), Thorium-230 ($^{230}Th$), and Radium-226 ($^{226}Ra$) are at all time lows.

PROGRAM - LAB039

COTTER CORPORATION GENERAL AIR SURVEY
UNRESTRICTED AREA

RUN DATE 89/03/06
TIME 10:02:17

| LOCATION | | 1ST QUARTER 1988 | 2ND QUARTER 1988 | 3RD QUARTER 1988 | 4TH QUARTER 1988 |
|---|---|---|---|---|---|
| | | Nat U (uCi/ml) MPC = 5E-12 | | | |
| *0800 | AS201 SHADOW HILLS GOLF COURSE | 2.14E-16 | 1.79E-16 | 8.71E-17 | 0.00E+00 |
| 0801 | AS202 EAST QUARTER CORNER SECTION 16 | 7.38E-16 | 1.03E-15 | 4.25E-16 | 5.00E-16 |
| 0802 | AS203 SOUTH QUARTER CORNER SECTION 16 | 4.46E-16 | 1.16E-15 | 4.91E-16 | 5.78E-16 |
| **0803 | AS206 NORTH QUARTER CORNER SECTION 16 | 3.29E-16 | 1.31E-15 | 5.02E-16 | 6.33E-17 |
| 0804 | AS204 WEST QUARTER CORNER SECTION 16 | 3.98E-16 | 8.70E-16 | 1.56E-15 | 7.85E-16 |
| 0805 | CANON CITY | 2.39E-16 | 1.53E-16 | 3.22E-16 | 8.50E-17 |
| 0806 | LINCOLN PARK | 2.20E-16 | 1.43E-16 | 2.84E-16 | 9.27E-17 |
| *0809 | ORO VERDE #1 | 2.55E-16 | 1.55E-16 | 4.15E-16 | 0.00E+00 |
| *0810 | ORO VERDE #2 | 2.13E-16 | 1.56E-16 | 1.75E-16 | 0.00E+00 |
| 0811 | ORO VERDE #3 | 2.01E-16 | 1.93E-16 | 2.65E-16 | 9.73E-17 |
| 0812 | QUALITY CONTROL-OFFICE | 5.24E-17 | 7.17E-17 | 4.42E-17 | 0.00E+00 |
| 0813 | QUALITY CONTROL-TRUCK | 6.99E-17 | 4.72E-17 | 1.77E-17 | 0.00E+00 |
| | | Th230 (uCi/ml) MPC = 3E-13 | | | |
| *0800 | AS201 SHADOW HILLS GOLF COURSE | 3.90E-16 | 6.69E-16 | 4.44E-16 | 0.00E+00 |
| 0801 | AS202 EAST QUARTER CORNER SECTION 16 | 2.50E-15 | 2.73E-15 | 1.24E-15 | 3.83E-15 |
| 0802 | AS203 SOUTH QUARTER CORNER SECTION 16 | 1.77E-15 | 4.80E-15 | 2.40E-15 | 5.08E-15 |
| **0803 | AS206 NORTH QUARTER CORNER SECTION 16 | 4.34E-16 | 7.09E-15 | 7.00E-16 | 9.36E-18 |
| 0804 | AS204 WEST QUARTER CORNER SECTION 16 | 6.46E-16 | 4.85E-15 | 9.77E-15 | 8.12E-15 |
| 0805 | CANON CITY | 3.53E-16 | 1.18E-16 | 1.69E-16 | 4.67E-17 |
| 0806 | LINCOLN PARK | 1.78E-16 | 1.27E-16 | 2.11E-16 | 4.66E-17 |
| * 0809 | ORO VERDE #1 | 2.30E-16 | 1.20E-16 | 5.87E-16 | 0.00E+00 |
| * 0810 | ORO VERDE #2 | 7.60E-17 | 9.55E-17 | 2.90E-16 | 0.00E+00 |
| 0811 | ORO VERDE #3 | 1.83E-16 | 1.49E-16 | 2.81E-16 | 6.76E-17 |
| 0812 | QUALITY CONTROL-OFFICE | 3.74E-17 | 0.00E+00 | 5.22E-18 | 0.00E+00 |
| 0813 | QUALITY CONTROL-TRUCK | 0.00E+00 | 9.75E-18 | 3.91E-18 | 2.67E-18 |
| | | Ra226 (uCi/ml) MPC = 2E-12 | | | |
| *0800 | AS201 SHADOW HILLS GOLF COURSE | 1.55E-16 | 4.04E-16 | 3.51E-16 | 0.00E+00 |
| 0801 | AS202 EAST QUARTER CORNER SECTION 16 | 5.74E-16 | 1.75E-15 | 7.21E-16 | 2.13E-15 |
| 0802 | AS203 SOUTH QUARTER CORNER SECTION 16 | 6.80E-16 | 2.31E-15 | 1.64E-15 | 3.58E-15 |
| **0803 | AS206 NORTH QUARTER CORNER SECTION 16 | 1.25E-16 | 8.11E-16 | 3.14E-16 | 1.90E-16 |
| 0804 | AS204 WEST QUARTER CORNER SECTION 16 | 3.10E-16 | 2.04E-15 | 4.01E-15 | 3.76E-15 |

*REMOVED FROM SERVICE DURING THE THIRD QUARTER OF 1988.
**MOVED NEAR THE ACTUAL SITE BOUNDARY DURING THE THIRD QUARTER OF 1988

PROGRAM - LAB039 COTTER CORPORATION GENERAL AIR SURVEY UNRESTRICTED AREA RUN DATE 89/03/06 TIME 10 03:52

| | LOCATION | 1ST QUARTER 1988 | 2ND QUARTER 1988 | 3RD QUARTER 1988 | 4TH QUARTER 1988 |
|---|---|---|---|---|---|
| 0805 | CANON CITY | 5.36E-17 | 9.66E-17 | 0.00E+00 | 5.22E-17 |
| 0806 | LINCOLN PARK | 8.46E-17 | 1.66E-16 | 9.22E-17 | 1.52E-16 |
| * 0809 | ORO VERDE #1 | 3.89E-17 | 1.00E-16 | 3.64E-16 | 0.00E+00 |
| * 0810 | ORO VERDE #2 | 5.24E-18 | 2.40E-16 | 1.81E-16 | 0.00E+00 |
| 0811 | ORO VERDE #3 | 2.07E-17 | 6.26E-17 | 1.16E-16 | 2.36E-16 |
| 0812 | QUALITY CONTROL-OFFICE | 2.58E-18 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 0813 | QUALITY CONTROL-TRUCK | 0.00E+00 | 0.00E+00 | 1.30E-18 | 6.93E-17 |

Pb210 (uCi/ml) MPC = 8E-12

| | | | | | |
|---|---|---|---|---|---|
| * 0800 | AS201 SHADOW HILLS GOLF COURSE | 1.98E-14 | 1.73E-14 | 1.62E-14 | 0.00E+00 |
| 0801 | AS202 EAST QUARTER CORNER SECTION 16 | 2.40E-14 | 1.90E-14 | 2.25E-14 | 2.04E-14 |
| ** 0802 | AS203 SOUTH QUARTER CORNER SECTION 16 | 2.56E-14 | 1.65E-14 | 2.00E-14 | 1.55E-14 |
| 0803 | AS206 NORTH QUARTER CORNER SECTION 16 | 2.36E-14 | 1.88E-14 | 1.95E-14 | 1.50E-14 |
| 0804 | AS204 WEST QUARTER CORNER SECTION 16 | 1.97E-14 | 1.88E-14 | 1.89E-14 | 2.67E-14 |
| 0805 | CANON CITY | 1.99E-14 | 1.88E-14 | 2.31E-14 | 2.27E-14 |
| 0806 | LINCOLN PARK | 1.99E-14 | 1.74E-14 | 2.24E-14 | 2.17E-14 |
| * 0809 | ORO VERDE #1 | 2.33E-14 | 1.87E-14 | 1.87E-14 | 0.00E+00 |
| * 0810 | ORO VERDE #2 | 1.90E-14 | 1.83E-14 | 1.48E-14 | 0.00E+00 |
| 0811 | ORO VERDE #3 | 1.74E-14 | 1.76E-14 | 1.86E-14 | 1.69E-14 |
| 0812 | QUALITY CONTROL-OFFICE | 1.06E-16 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 0813 | QUALITY CONTROL-TRUCK | 0.00E+00 | 0.00E+00 | 1.46E-16 | 2.39E-16 |

Po210 (uCi/ml) MPC = 7E-12

| | | | | | |
|---|---|---|---|---|---|
| * 0800 | AS201 SHADOW HILLS GOLF COURSE | 7.73E-15 | 6.57E-15 | 7.28E-15 | 0.00E+00 |
| 0801 | AS202 EAST QUARTER CORNER SECTION 16 | 9.62E-15 | 9.42E-15 | 7.70E-15 | 9.76E-15 |
| 0802 | AS203 SOUTH QUARTER CORNER SECTION 16 | 9.83E-15 | 8.32E-15 | 7.30E-15 | 7.98E-15 |
| 0803 | AS206 NORTH QUARTER CORNER SECTION 16 | 8.28E-15 | 7.76E-15 | 6.14E-15 | 7.07E-15 |
| ** 0804 | AS204 WEST QUARTER CORNER SECTION 16 | 7.06E-15 | 8.05E-15 | 8.83E-15 | 1.10E-14 |
| 0805 | CANON CITY | 7.97E-15 | 6.08E-15 | 5.96E-15 | 6.63E-15 |
| 0806 | LINCOLN PARK | 7.53E-15 | 6.59E-15 | 6.89E-15 | 7.52E-15 |
| * 0809 | ORO VERDE #1 | 8.88E-15 | 6.66E-15 | 8.44E-15 | 0.00E+00 |
| * 0810 | ORO VERDE #2 | 7.66E-15 | 5.54E-15 | 7.08E-15 | 0.00E+00 |
| 0811 | ORO VERDE #3 | 6.79E-15 | 6.31E-15 | 7.36E-15 | 6.29E-15 |
| 0812 | QUALITY CONTROL-OFFICE | 5.94E-17 | 0.00E+00 | 4.57E-17 | 5.46E-17 |
| 0813 | QUALITY CONTROL-TRUCK | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.16E-17 |

*REMOVED FROM SERVICE DURING THE THIRD QUARTER OF 1988.
**MOVED NEAR THE ACTUAL-SITE-BOUNDARY DURING THE THIRD QUARTER OF 1988.

# TABLE 7.6

AVERAGE RADIONUCLIDE CONCENTRATIONS
ENVIRONMENTAL AIR PARTICULATES
NATURAL URANIUM (μCi/ml)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979* | 2.47E-15 | 6.19E-15 | 1.50E-15 | 2.26E-15 | | | | | | 1.00E-15 |
| 1980 | 3.61E-15 | 3.71E-15 | 1.55E-15 | 2.82E-15 | | | | | 8.36E-16 | 1.40E-15 |
| 1981 | 3.49E-15 | 4.07E-15 | 1.54E-15 | 5.28E-15 | 8.30E-15 | 2.57E-15 | 1.29E-15 | 1.37E-15 | 1.03E-15 | 1.02E-15 |
| 1982 | 1.06E-15 | 2.31E-15 | 1.26E-15 | 2.48E-14 | 2.79E-15 | 6.19E-16 | 4.96E-16 | 5.96E-16 | 5.28E-16 | 4.79E-16 |
| 1983 | 1.51E-15 | 1.26E-15 | 1.43E-15 | 1.32E-15 | 1.63E-15 | 5.17E-16 | 2.34E-15 | 5.03E-16 | 4.77E-16 | 6.86E-16 |
| 1984 | 5.03E-16 | 5.50E-16 | 7.65E-16 | 8.36E-16 | 1.52E-15 | 3.22E-16 | 3.56E-16 | 4.01E-16 | 2.78E-16 | 3.27E-16 |
| 1985 | 1.08E-15 | 1.42E-15 | 1.22E-15 | 8.96E-16 | 1.92E-15 | 5.53E-16 | 6.36E-15 | 6.66E-16 | 4.56E-16 | 5.77E-16 |
| 1986 | 4.84E-16 | 6.71E-16 | 6.56E-16 | 4.05E-16 | 9.36E-16 | 3.07E-16 | 3.03E-16 | 4.84E-16 | 2.95E-16 | 2.93E-16 |
| 1987 | 7.19E-16 | 8.08E-16 | 1.03E-15 | 1.09E-15 | 1.05E-15 | 4.78E-16 | 4.84E-16 | 4.60E-16 | 4.66E-16 | 5.12E-16 |
| 1988 | 1.60E-16 | 6.73E-16 | 6.69E-16 | 9.03E-16 | 5.51E-16 | 2.75E-16 | 1.81E-16 | 1.89E-16 | 1.85E-16 | 1.95E-16 |

*4th Quarter only

# TABLE 7.7

AVERAGE RADIONUCLIDE CONCENTRATIONS
ENVIRONMENTAL AIR PARTICULATES
THORIUM-230 (µCi/ml)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979* | 2.20E-15 | 2.33E-15 | 1.05E-15 | 8.08E-15 | | | | | | 3.07E-16 |
| 1980 | 3.15E-16 | 2.50E-16 | 8.76E-16 | 2.81E-16 | | | | | 8.17E-17 | 1.30E-16 |
| 1981 | 9.95E-16 | 2.60E-15 | 3.50E-15 | 3.00E-14 | 6.93E-15 | 2.00E-16 | 6.55E-16 | 3.25E-16 | 1.42E-16 | 8.17E-17 |
| 1982 | 4.04E-15 | 2.12E-14 | 1.94E-14 | 8.95E-14 | 1.26E-14 | 1.40E-15 | 2.21E-15 | 3.15E-15 | 7.49E-16 | 9.13E-16 |
| 1983 | 1.74E-15 | 5.86E-15 | 9.79E-15 | 5.64E-15 | 8.26E-15 | 5.13E-16 | 6.86E-16 | 1.07E-15 | 3.74E-16 | 3.12E-16 |
| 1984 | 9.74E-16 | 1.64E-15 | 2.98E-15 | 3.82E-15 | 6.35E-15 | 4.45E-16 | 3.59E-16 | 2.89E-16 | 2.69E-16 | 2.00E-16 |
| 1985 | 8.62E-16 | 1.84E-15 | 2.15E-15 | 4.86E-15 | 3.73E-15 | 2.85E-16 | 3.45E-16 | 2.84E-16 | 2.60E-16 | 2.64E-16 |
| 1986 | 1.19E-15 | 3.70E-15 | 5.55E-15 | 3.13E-15 | 4.68E-15 | 3.09E-16 | 3.00E-16 | 2.41E-16 | 3.70E-16 | 3.08E-16 |
| 1987 | 6.72E-16 | 1.21E-15 | 1.25E-15 | 2.28E-15 | 1.08E-15 | 1.92E-16 | 1.21E-16 | 9.90E-17 | 2.06E-16 | 1.77E-16 |
| 1988 | 5.01E-16 | 2.58E-15 | 3.51E-15 | 5.85E-15 | 2.05E-15 | 2.34E-16 | 1.54E-16 | 1.70E-16 | 1.41E-16 | 1.72E-16 |

*4th Quarter Only

# TABLE 7.8

AVERAGE RADIONUCLIDE CONCENTRATIONS
ENVIRONMENTAL AIR PARTICULATES
RADIUM-226 (μCi/ml)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 * | 1.24E-15 | 1.55E-15 | 3.75E-16 | 7.89E-15 | | | | | | 3.07E-16 |
| 1980 | 2.53E-15 | 3.61E-15 | 7.81E-16 | 1.62E-15 | | | | | 2.78E-16 | 1.58E-15 |
| 1981 | 4.36E-15 | 4.19E-15 | 2.35E-15 | 2.94E-15 | 2.96E-15 | 6.23E-16 | 4.84E-16 | 6.30E-16 | 3.79E-16 | 4.59E-16 |
| 1982 | 1.35E-15 | 6.53E-15 | 6.92E-15 | 3.81E-15 | 3.39E-14 | 7.30E-16 | 9.15E-16 | 1.25E-15 | 6.07E-16 | 4.02E-16 |
| 1983 | 1.04E-15 | 2.00E-15 | 5.08E-15 | 4.95E-15 | 2.85E-15 | 2.76E-16 | 3.46E-16 | 5.30E-16 | 9.42E-17 | 1.76E-16 |
| 1984 | 5.63E-16 | 1.11E-15 | 1.84E-15 | 3.63E-15 | 2.20E-15 | 2.03E-16 | 1.89E-16 | 1.87E-16 | 1.18E-16 | 1.67E-16 |
| 1985 | 1.53E-15 | 9.63E-16 | 1.11E-15 | 1.78E-15 | 1.97E-15 | 1.57E-16 | 1.98E-16 | 1.89E-16 | 1.69E-16 | 1.88E-16 |
| 1986 | 9.39E-16 | 1.47E-15 | 1.98E-15 | 1.61E-15 | 2.60E-15 | 2.52E-16 | 1.99E-16 | 2.22E-16 | 1.43E-16 | 3.45E-16 |
| 1987 | 4.64E-16 | 5.91E-16 | 7.52E-16 | 1.19E-15 | 4.74E-16 | 1.47E-16 | 2.16E-16 | 1.89E-16 | 1.83E-16 | 1.15E-16 |
| 1988 | 3.03E-16 | 1.29E-15 | 2.05E-15 | 2.53E-15 | 3.60E-16 | 1.68E-16 | 1.42E-16 | 1.09E-16 | 1.24E-16 | 5.06E-17 |

*4th Quarter Only

# TABLE 7.9

AVERAGE RADIONUCLIDE CONCENTRATIONS
ENVIRONMENTAL AIR PARTICULATES
POLONIUM-210 (μCi/ml)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AC-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 * | 1.05E-14 | 1.19E-14 | 3.84E-14 | 1.03E-14 | | | | | | 6.48E-15 |
| 1980 | 9.42E-15 | 1.00E-14 | 9.64E-15 | 1.55E-14 | | | | | 8.07E-15 | 8.84E-15 |
| 1981 | 1.41E-14 | 1.29E-14 | 1.09E-14 | 3.53E-14 | 1.48E-14 | 8.27E-15 | 5.64E-15 | 9.45E-15 | 7.60E-15 | 6.77E-15 |
| 1982 | 1.63E-14 | 3.26E-14 | 3.26E-14 | 1.00E-13 | 2.48E-14 | 2.09E-14 | 1.60E-14 | 2.08E-14 | 1.54E-14 | 1.66E-14 |
| 1983 | 3.06E-15 | 6.76E-15 | 7.49E-15 | 4.79E-15 | 6.31E-15 | 4.06E-15 | 4.29E-15 | 4.38E-15 | 4.54E-15 | 3.86E-15 |
| 1984 | 6.85E-15 | 6.78E-15 | 6.74E-15 | 9.30E-15 | 8.96E-15 | 6.01E-15 | 5.99E-15 | 6.10E-15 | 5.11E-15 | 5.99E-15 |
| 1985 | 8.45E-15 | 9.28E-15 | 7.94E-15 | 8.11E-15 | 9.73E-15 | 9.25E-15 | 4.41E-15 | 9.31E-15 | 7.72E-15 | 9.35E-15 |
| 1986 | 7.11E-15 | 7.66E-15 | 6.85E-15 | 7.14E-15 | 6.95E-15 | 5.25E-15 | 3.04E-15 | 3.54E-15 | 4.66E-15 | 7.67E-15 |
| 1987 | 1.06E-14 | 1.08E-14 | 1.03E-14 | 1.39E-14 | 1.28E-14 | 1.05E-14 | 9.80E-15 | 8.30E-15 | 1.20E-14 | 1.07E-14 |
| 1988 | 7.19E-15 | 9.13E-15 | 8.36E-15 | 8.74E-15 | 7.31E-15 | 7.99E-15 | 6.76E-15 | 6.69E-15 | 7.13E-15 | 6.66E-15 |

*4th Quarter Only

# TABLE 7.10

AVERAGE RADIONUCLIDE CONCENTRATIONS
ENVIRONMENTAL AIR PARTICULATES
LEAD-210 (μCi/ml)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 * | 1.95E-14 | 2.11E-14 | 1.65E-14 | 2.08E-14 | | | | | | 2.30E-14 |
| 1980 | 1.94E-14 | 1.81E-14 | 1.69E-14 | 1.25E-14 | | | | | 1.86E-14 | 1.98E-14 |
| 1981 | 2.34E-14 | 2.01E-14 | 1.72E-14 | 4.71E-14 | 2.34E-14 | 1.82E-14 | 1.24E-14 | 2.11E-14 | 1.57E-14 | 1.70E-14 |
| 1982 | 3.24E-14 | 3.87E-14 | 4.35E-14 | 9.94E-14 | 4.07E-14 | 3.07E-14 | 2.69E-14 | 4.05E-14 | 2.50E-14 | 3.31E-14 |
| 1983 | 9.85E-15 | 1.70E-14 | 1.73E-14 | 1.82E-14 | 1.95E-14 | 2.21E-14 | 1.73E-14 | 1.44E-14 | 1.29E-14 | 1.79E-14 |
| 1984 | 1.46E-14 | 1.44E-14 | 1.46E-14 | 1.60E-14 | 1.43E-14 | 1.20E-14 | 1.35E-14 | 1.48E-14 | 1.26E-14 | 1.15E-14 |
| 1985 | 1.00E-14 | 9.12E-15 | 8.12E-15 | 8.80E-15 | 9.30E-15 | 1.09E-14 | 9.01E-15 | 9.90E-15 | 9.97E-15 | 1.14E-14 |
| 1986 | 1.19E-14 | 1.26E-14 | 1.19E-14 | 1.12E-14 | 1.22E-14 | 9.48E-15 | 5.76E-15 | 8.81E-15 | 1.07E-14 | 1.22E-14 |
| 1987 | 1.92E-14 | 1.95E-14 | 1.92E-14 | 2.22E-14 | 2.35E-14 | 2.04E-14 | 2.19E-14 | 1.43E-14 | 2.17E-14 | 2.01E-14 |
| 1988 | 1.78E-14 | 2.15E-14 | 1.94E-14 | 2.10E-14 | 1.93E-14 | 2.02E-14 | 1.67E-14 | 1.76E-14 | 2.04E-14 | 2.11E-14 |

*4th Quarter only

FIGURE 7.5

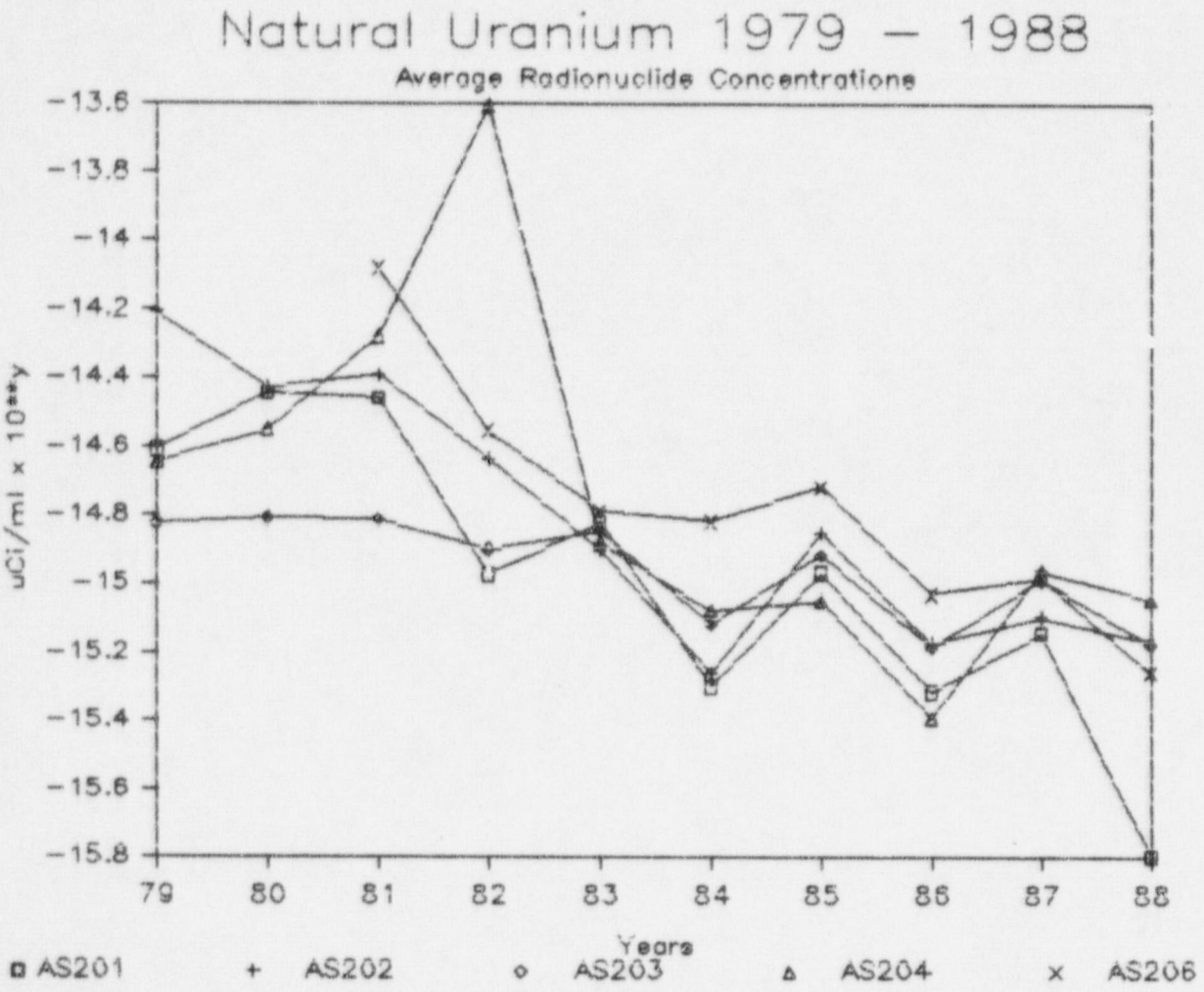

Natural Uranium 1979 – 1988
Average Radionuclide Concentrations
uCi/ml x 10**y
-13.6
-13.8
-14
-14.2
-14.4
-14.6
-14.8
-15
-15.2
-15.4
-15.6
-15.8
79
80
81
82
83
84
85
86
87
88
Years
AS201
AS202
AS203
AS204
AS206

FIGURE 7.6

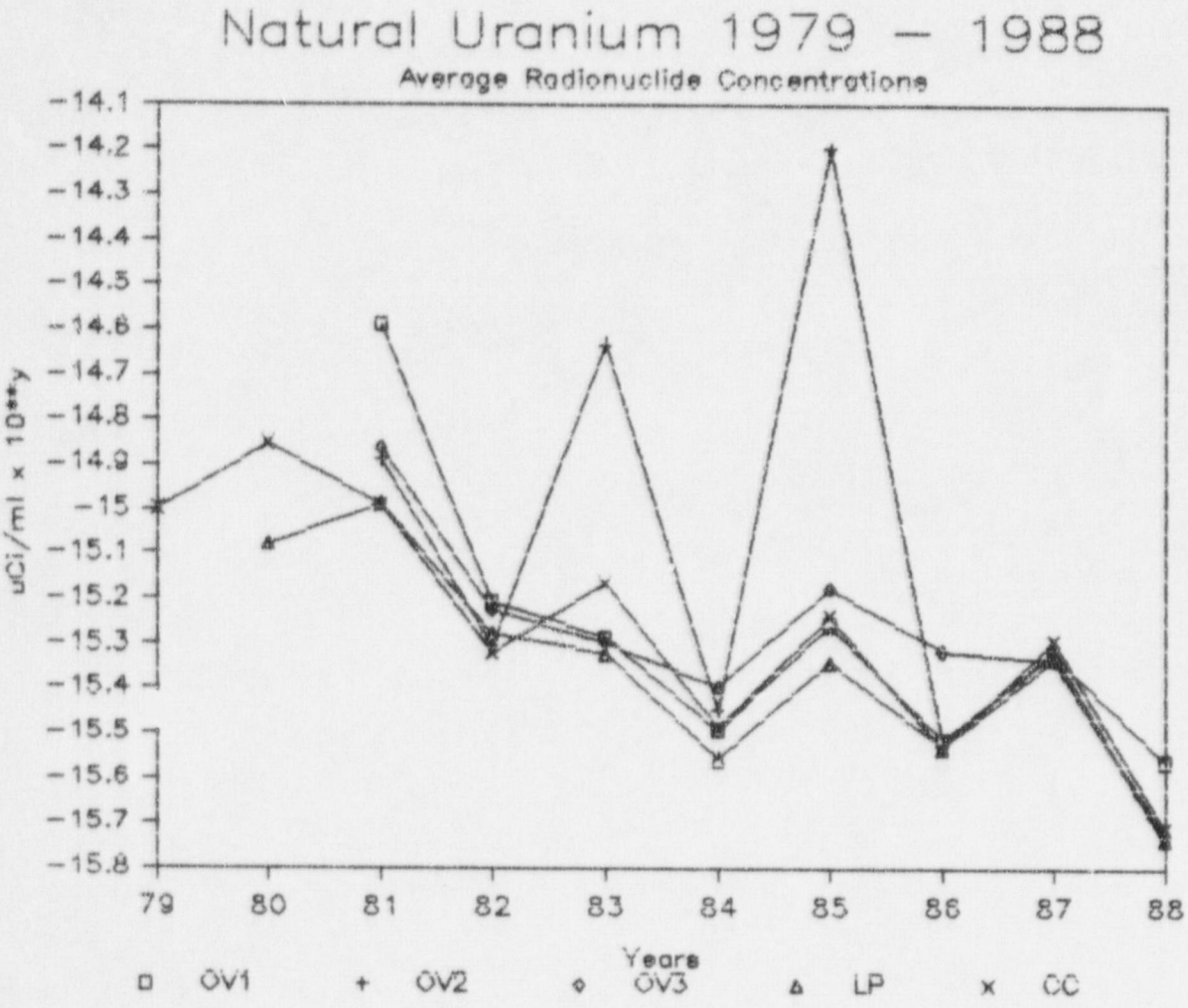

Natural Uranium 1979 – 1988
Average Radionuclide Concentrations
uCi/ml x 10**y
-14.1
-14.2
-14.3
-14.4
-14.5
-14.6
-14.7
-14.8
-14.9
-15
-15.1
-15.2
-15.3
-15.4
-15.5
-15.6
-15.7
-15.8
79
80
81
82
83
84
85
86
87
88
Years
OV1
OV2
OV3
LP
CC

FIGURE 7.7

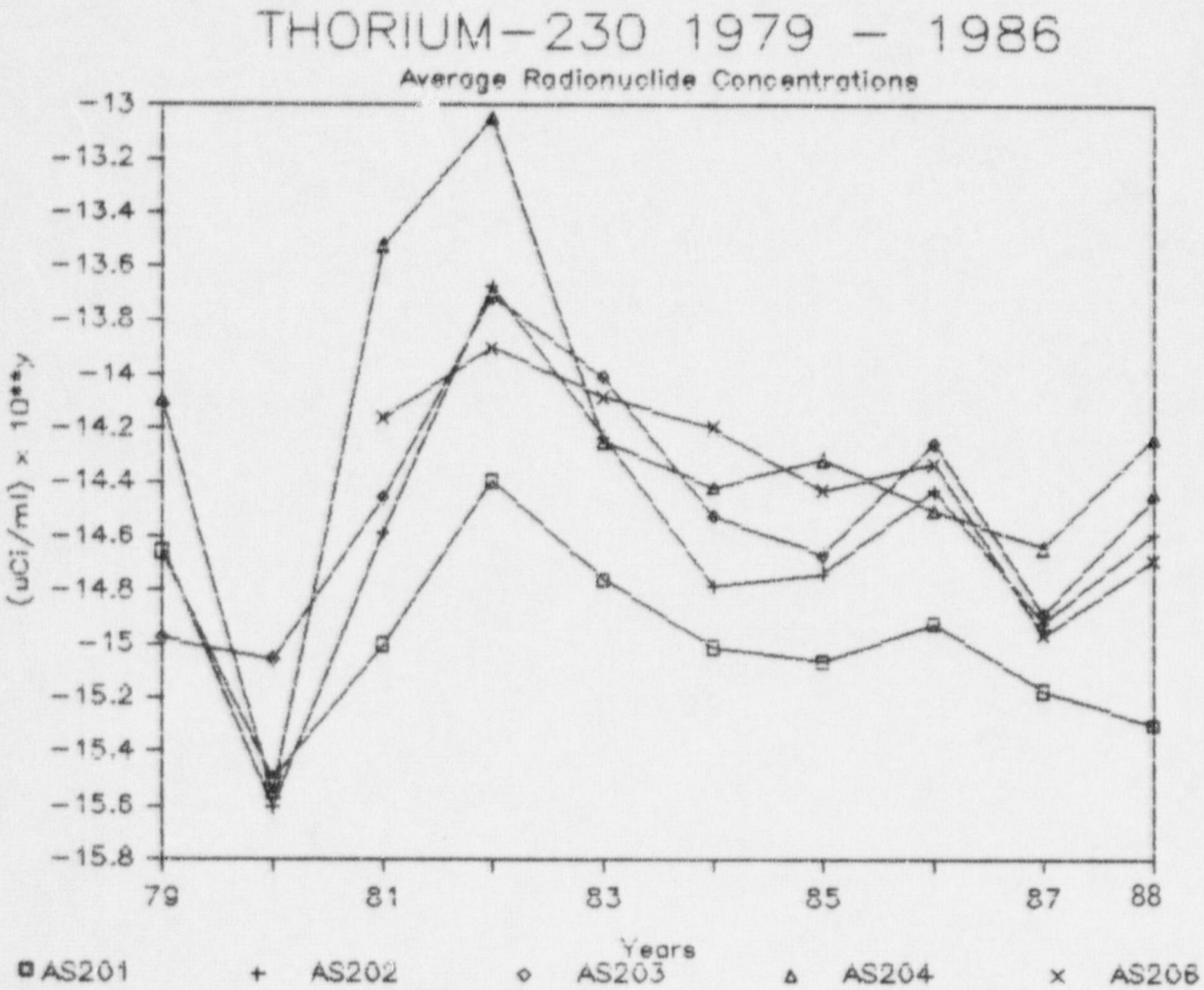

THORIUM-230 1979 - 1986
Average Radionuclide Concentrations
(uCi/ml) x 10**y
-13
-13.2
-13.4
-13.6
-13.8
-14
-14.2
-14.4
-14.6
-14.8
-15
-15.2
-15.4
-15.6
-15.8
79
81
83
85
87
88
Years
AS201
AS202
AS203
AS204
AS206

FIGURE 7.8

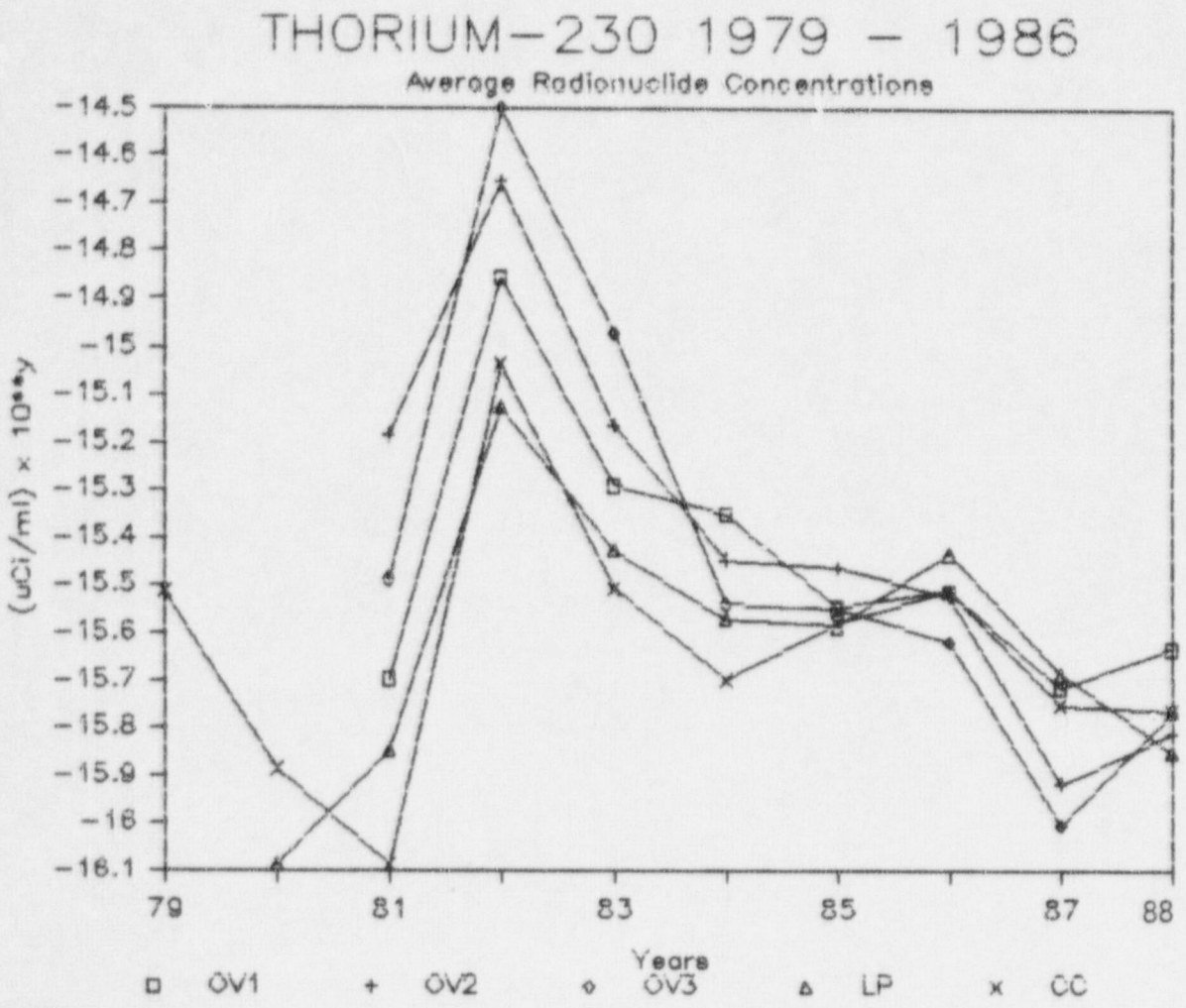

THORIUM-230 1979 - 1986
Average Radionuclide Concentrations
(uCi/ml) x 10**-9
-14.5
-14.6
-14.7
-14.8
-14.9
-15
-15.1
-15.2
-15.3
-15.4
-15.5
-15.6
-15.7
-15.8
-15.9
-16
-16.1
79
81
83
85
87
88
Years
OV1
OV2
OV3
LP
CC

FIGURE 7.9

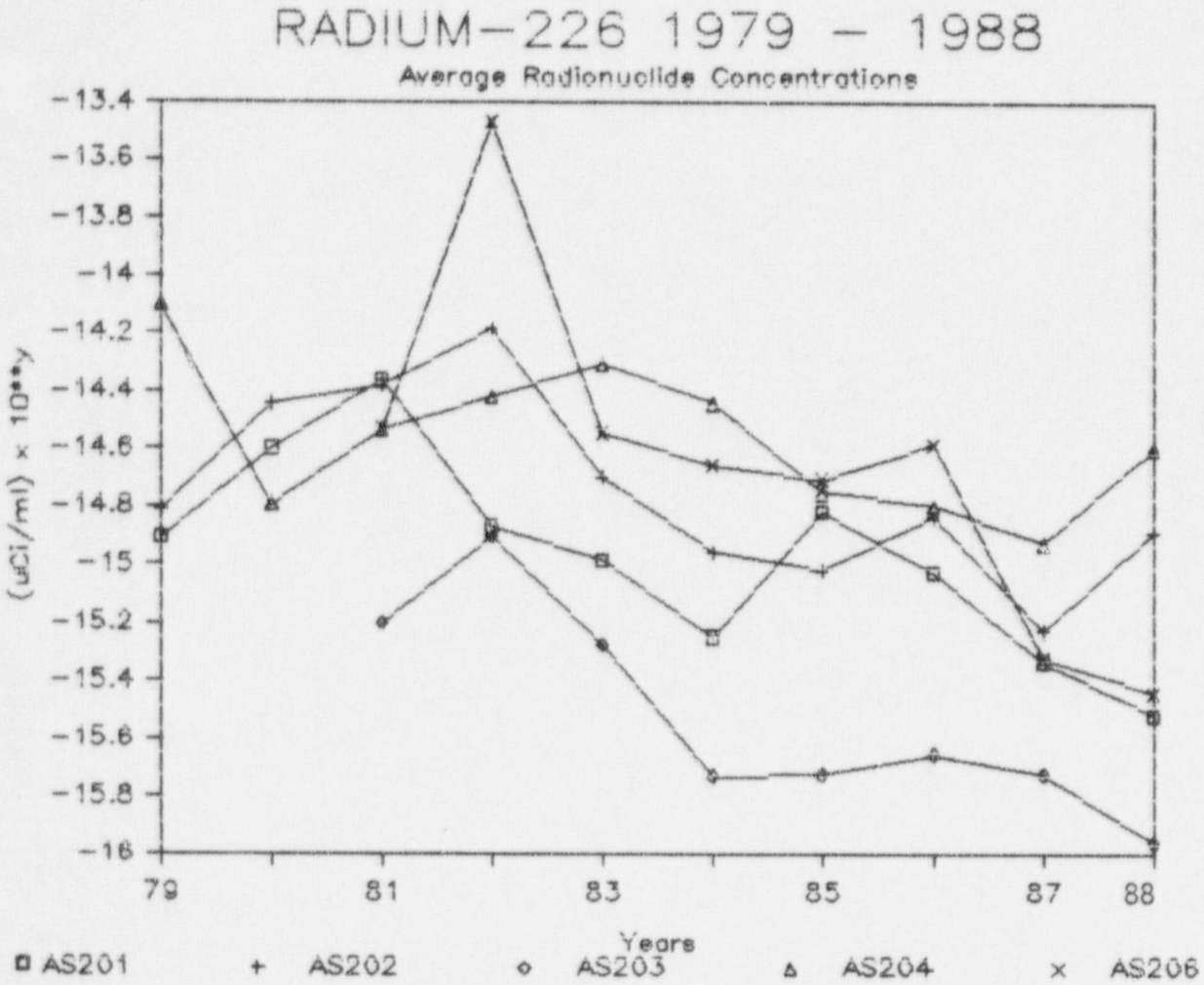

RADIUM-226 1979 - 1988
Average Radionuclide Concentrations
(uCi/ml) x 10**y
-13.4
-13.6
-13.8
-14
-14.2
-14.4
-14.6
-14.8
-15
-15.2
-15.4
-15.6
-15.8
-16
79
81
83
85
87
88
Years
AS201
AS202
AS203
AS204
AS206

FIGURE 7.10

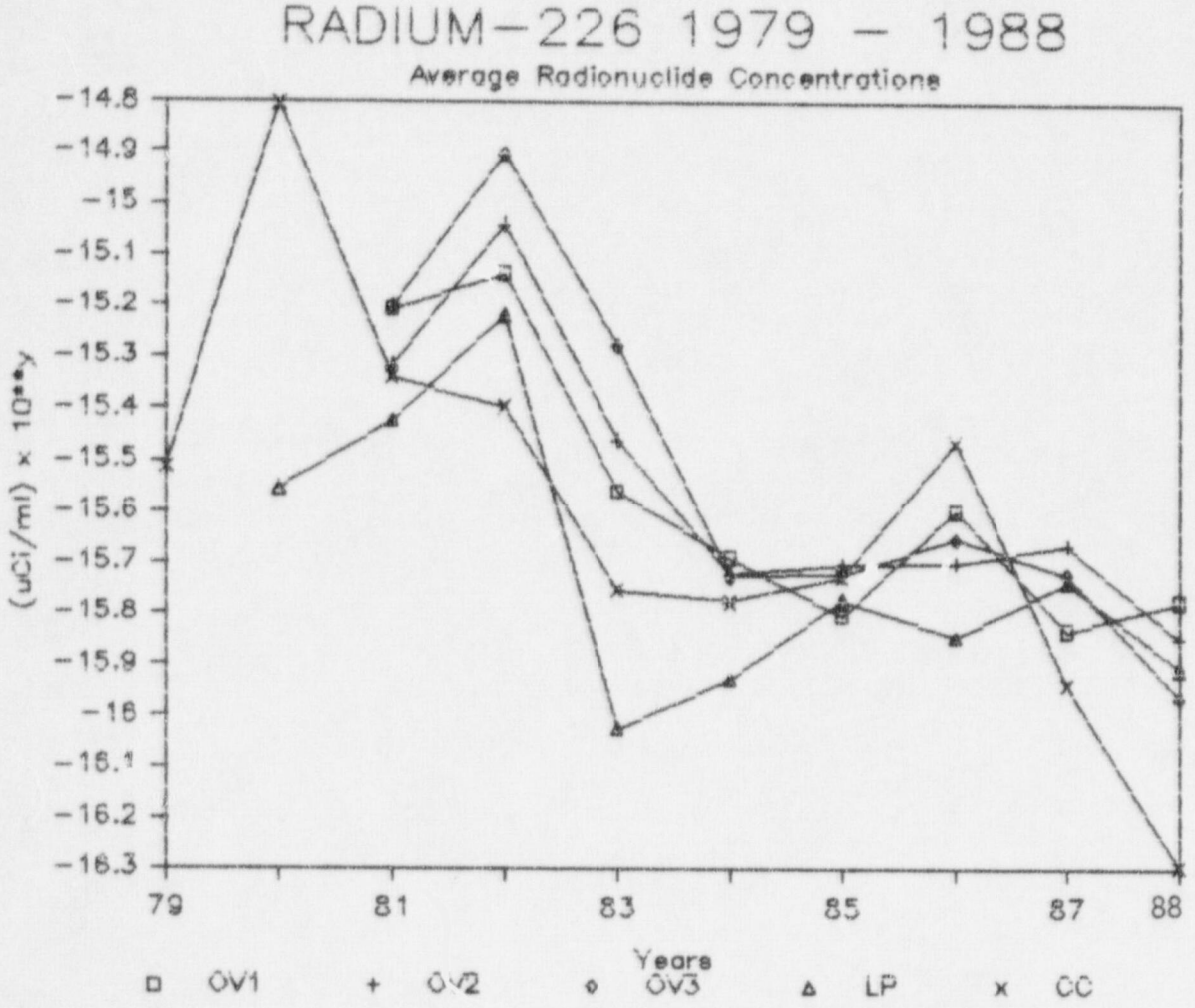

RADIUM-226 1979 - 1988
Average Radionuclide Concentrations
(uCi/ml) x 10**y
-14.8
-14.9
-15
-15.1
-15.2
-15.3
-15.4
-15.5
-15.6
-15.7
-15.8
-15.9
-16
-16.1
-16.2
-16.3
79
81
83
85
87
88
Years
OV1
OV2
OV3
LP
CC

FIGURE 7.11

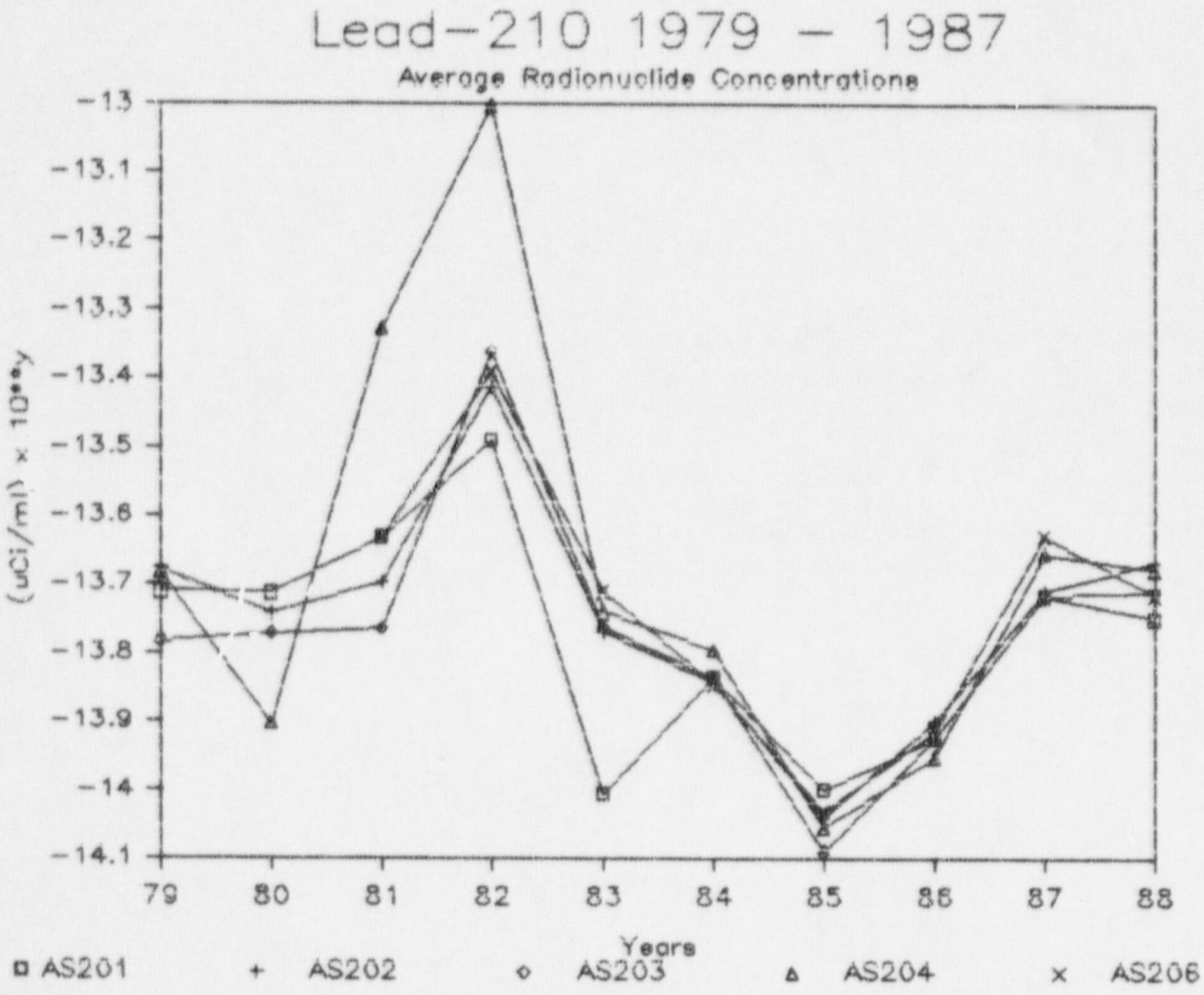

Lead-210 1979 - 1987
Average Radionuclide Concentrations
-13
-13.1
-13.2
-13.3
-13.4
-13.5
-13.6
-13.7
-13.8
-13.9
-14
-14.1
(uCi/ml) x 10**y
79
80
81
82
83
84
85
86
87
88
Years
AS201
AS202
AS203
AS204
AS206

FIGURE 7.12

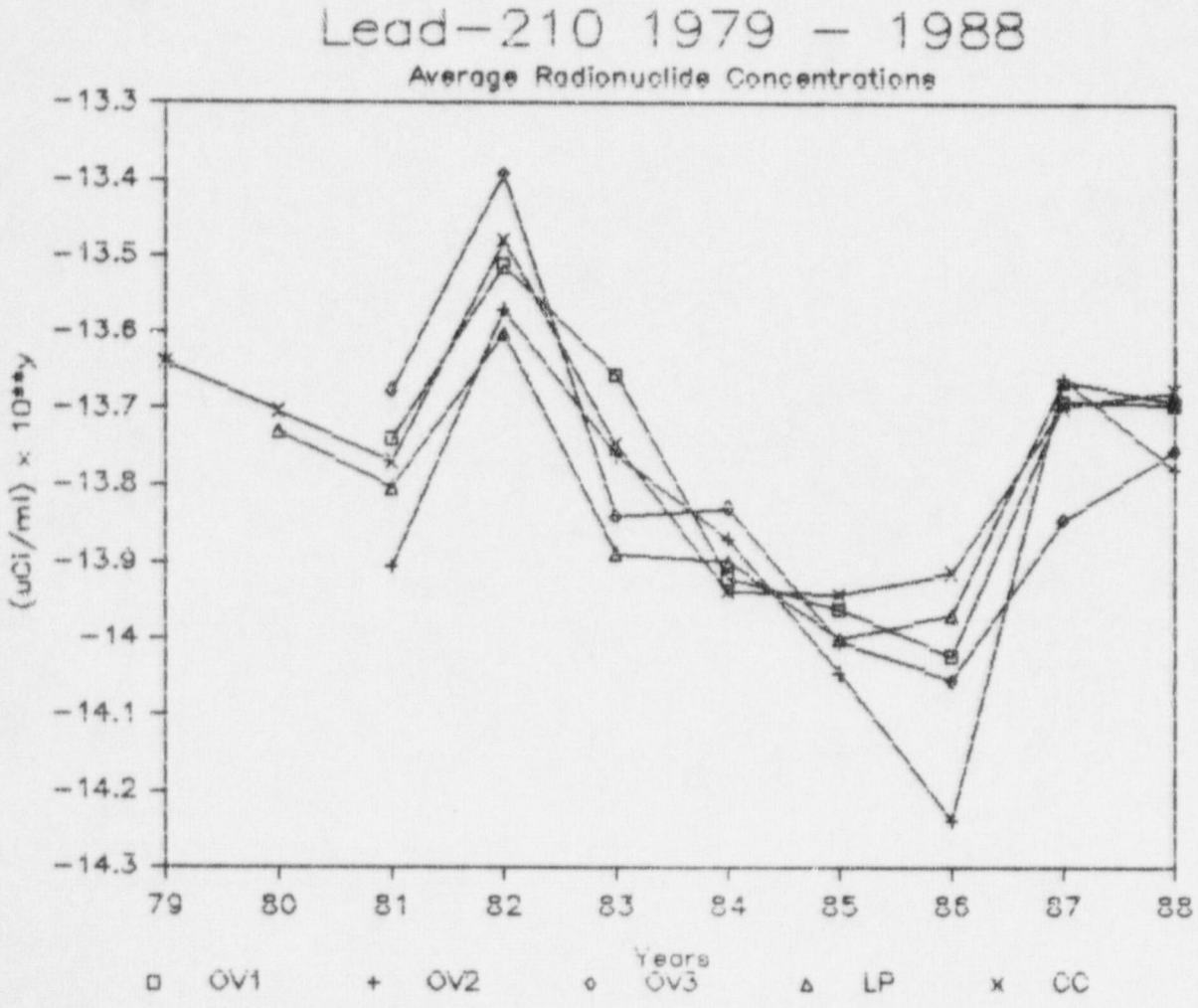

Lead-210 1979 - 1988
Average Radionuclide Concentrations
(uCi/ml) x 10**-9
-13.3
-13.4
-13.5
-13.6
-13.7
-13.8
-13.9
-14
-14.1
-14.2
-14.3
79
80
81
82
83
84
85
86
87
88
Years
OV1
OV2
OV3
LP
CC

FIGURE 7.13

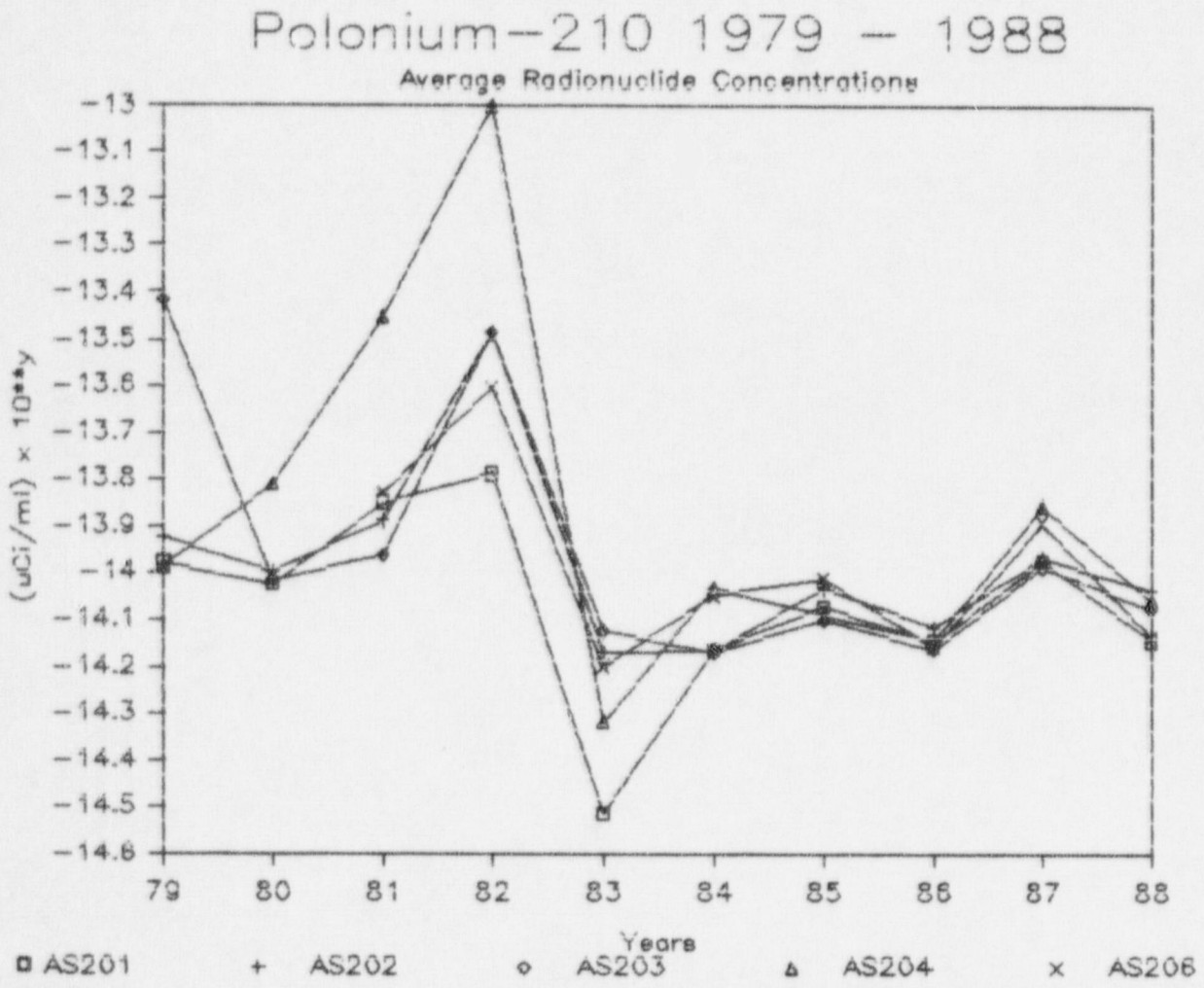
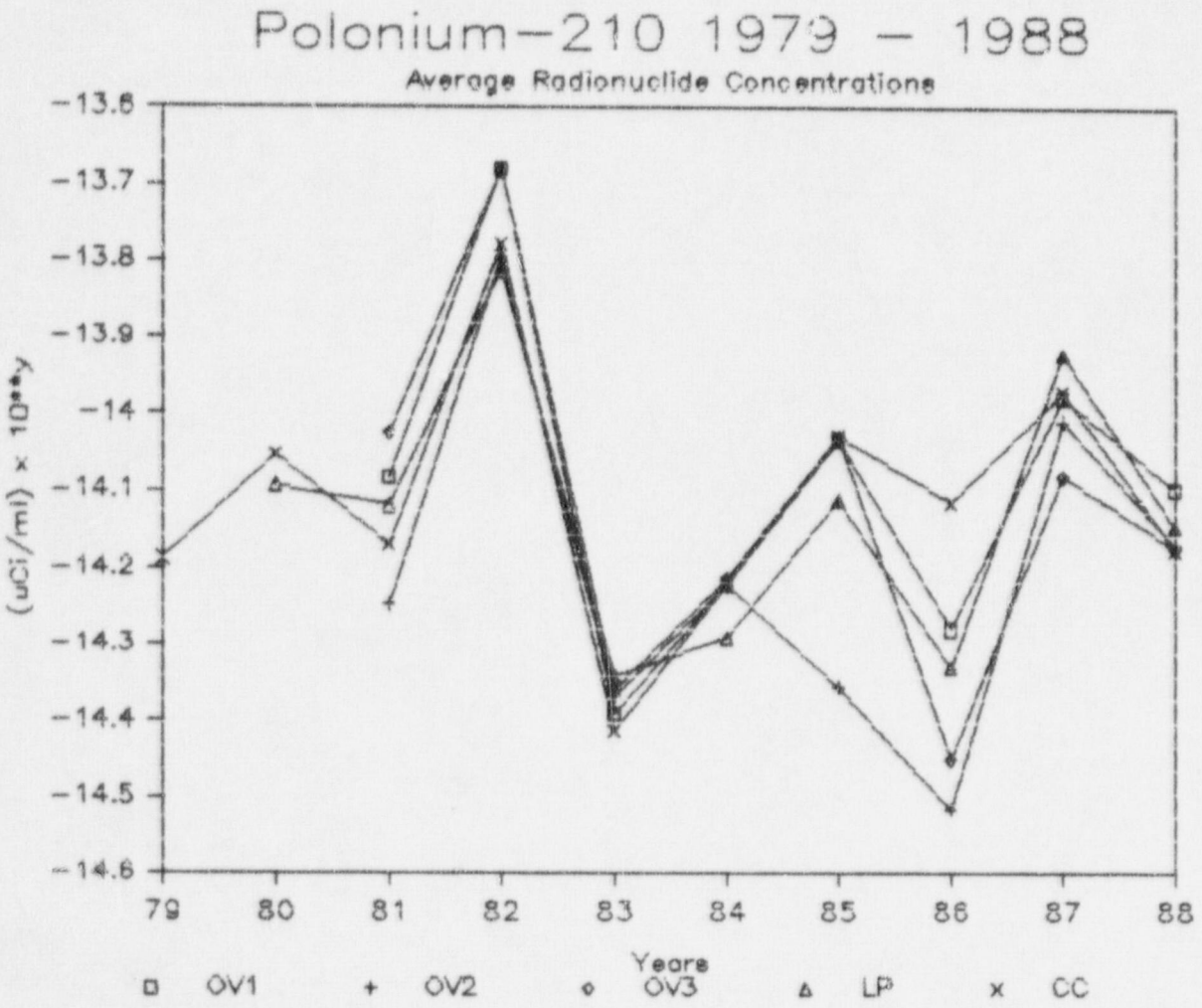

Polonium-210 1979 - 1988
Average Radionuclide Concentrations
(uCi/ml) x 10**y
-13
-13.1
-13.2
-13.3
-13.4
-13.5
-13.6
-13.7
-13.8
-13.9
-14
-14.1
-14.2
-14.3
-14.4
-14.5
-14.6
79
80
81
82
83
84
85
86
87
88
Years
AS201
AS202
AS203
AS204
AS206

FIGURE 7.14


Polonium-210 1979 - 1988
Average Radionuclide Concentrations
(uCi/ml) x 10**-y
-13.6
-13.7
-13.8
-13.9
-14
-14.1
-14.2
-14.3
-14.4
-14.5
-14.6
79
80
81
82
83
84
85
86
87
88
Years
OV1
OV2
OV3
LP
CC

## 7.2 - SOILS AND VEGETATION - ANNUAL REPORT
## LICENSE CONDITIONS 27.2 AND 27.3

Soil samples were collected at the ten air sample locations and analytical results are presented in Tables 7.11 and 7.12 for the period 1979 through 1988. The April, 1988, results are within the expected range as previously seen.

Vegetation samples were collected at the ten (10) air sample locations, as available, and the analytical results are presented in Tables 7.13 through 7.16 for the period 1979 through 1988. Additional radionuclide analysis were included to provide data for offsite dose assessment as required by the Department. Results similar to previous sampling years' results were obtained.

TABLE 7.11

NATURAL URANIUM IN SOILS
pCi/g DRY

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | | 6.43 | 3.39 | 3.18 | | | | | | |
| 1980 | 4.27 | 1.69 | 1.42 | 3.52 | | | | | 3.52 | 3.05 |
| 1980 | 5.75 | 7.3 | 4.3 | 14.5 | | | | | 4.30 | 7.80 |
| 1981 | 0.34 | 4.87 | 2.71 | 5.28 | | | | | 1.56 | 2.57 |
| 1982 | 0.55 | 1.09 | 0.22 | 1.09 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 1983 | 2.7 | 1.2 | 2.0 | 2.1 | 2.2 | 2.3 | 4.4 | 27 | 2.4 | 2.0 |
| 1983 | 3.7(20)* | 3.6 | 2.1 | 3.0 | 9.8(21)* | 1.4 | 2.0 | 1.8 | 1.9 | 6.6(4.2)* |
| 1984 | 2.0 | 4.1 | 2.9 | 2.6 | 2.8 | 2.7 | 2.1 | 2.3 | 1.7 | 2.5 |
| 1985 | 2.8 | 2.3 | 2.3 | 3.2 | 4.0 | 1.5 | 2.3 | 2.3 | 2.3 | 2.7 |
| 1986 | 3.0 | 5.7 | 3.2 | 5.0 | 6.3 | 3.5 | 3.2 | 3.3 | 5.6 | 3.7 |
| 1986 | 1.1 | 0.9 | 1.3 | 2.2 | 3.2 | 0.9 | 1.1 | 0.9 | 3.0 | 1.4 |
| 1987 | 1.61 | 1.45 | 1.93 | 1.0 | 5.85 | 2.04 | 1.6 | 1.43 | 0.71 | 4.29 |
| 1988 | 2.6 | 3.0 | 3.2 | 3.2 | 5.0 | 4.3 | 3.5 | 2.6 | 3.7 | 3.2 |

*Resampled January 24, 1984

# TABLE 7.12

RADIUM-226 IN SOILS
pCi/g DRY

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | | 13.3 | 1.90 | 2.40 | | | | | | |
| 1980 | 5.24 | 3.20 | 1.62 | 5.13 | | | | | 2.43 | 4.44 |
| 1980 | 4.22 | 6.86 | 2.35 | 4.11 | | | | | 1.36 | 3.60 |
| 1981 | 3.83 | 5.23 | 2.63 | 3.65 | | | | | 1.12 | 1.55 |
| 1982 | 6.04 | 3.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1983 | 2.1 | 2.2 | 2.5 | 2.1 | 4.7 | 1.7 | 1.3 | 0.8 | 1.6 | 1.0 |
| 1983 | 8.5(7.7)*(0.4)+ | 4.0 | 4.8 | 2.8 | 12(5.2)*(2.6)+ | 1.4 | 1.5 | 1.0 | 1.2 | 9.8(10)*(1.1)+ |
| 1984 | 1.5 | 7.3 | 2.2 | 2.0 | 3.2 | 1.1 | 1.6 | 1.6 | 2.0 | 1.0 |
| 1985 | 0.8 | 3.0 | 1.9 | 2.4 | 4.4 | 0.9 | 1.6 | 1.2 | 1.5 | 1.2 |
| 1986 | 1.3 | 3.3 | 1.2 | 4.6 | 6.8 | 0.8 | 1.1 | 1.4 | 1.7 | 1.8 |
| 1986 | 1.2 | 0.7 | 2.8 | 4.0 | 8.5 | 0.9 | 1.1 | 1.0 | 4.5 | 1.4 |
| 1987 | 0.8 | 0.5 | 0.5 | 1.1 | 2.2 | 0.9 | 1.0 | 0.8 | 0.8 | 2.3 |
| 1988 | 0.9 | 1.3 | 1.2 | 0.9 | 3.1 | 0.8 | 1.1 | 0.7 | 0.8 | 0.6 |

*Reanalysis January 24, 1984
+Resampled January 24, 1984

# TABLE 7.13

THORIUM-230 IN VEGETATION
pCi/g WET

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| June 1988 | | | | | | 0.011 | 0.016 | | 0.016 | 0.086 |
| July 1988 | 0.019 | 0.231 | 0.423 | 0.536 | 0.693 | | | 0.012 | | |
| Aug. 1988 | | 0.123 | 0.385 | 1.339 | 0.635 | | | 0.020 | 0.009 | 0.007 |
| Sept. 1988 | | 0.334 | 0.495 | 1.335 | 0.043 | | | 0.025 | 0.023 | 0.010 |

# TABLE 7.14

RADIUM-226 IN VEGETATION
pCi/g WET

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 0.01 | 12.76 | 2.92 | 0.41 | | | | | | |
| June 1980 | 1.10 | 0.074 | 0.045 | 0.091 | | | | | 0.073 | 0.018 |
| Aug. 1980 | 0.23 | 0.24 | 0.12 | 0.13 | | | | | 0.08 | 0.04 |
| Oct. 1980 | 0.67 | 0.76 | 0.171 | 0.133 | | | | | 0.029 | 0.02 |
| July 1981 | 0.678 | 0.753 | 0.511 | 2.40 | | | | | 0.602 | 0.056 |
| Aug. 1981 | 0.158 | 0.405 | 0.389 | 0.698 | | | | | 0.087 | 0.205 |
| Sept. 1981 | 0.765 | 0.308 | 0.619 | 1.726 | | | | | 0.027 | 0.027 |
| July 1982 | | 0.62 | 3.7 | 1.3 | | | 0.14 | 0.32 | 0.15 | 0.10 |
| Aug. 1982 | | 0.11 | 0.63 | 0.38 | | | 0.40 | 0.07 | 0.02 | 0.03 |
| Sept. 1982 | | 0.26 | 1.2 | 3.2 | | | 0.0 | 0.23 | 0.24 | 0.0 |
| July 1983 | 0.08 | 0.43 | 0.64 | 1.1 | | | 0.09 | 0.14 | 0.017 | 0.022 |
| Aug. 1983 | 0.062 | 0.31 | 0.97 | 1.1 | | | 0.007 | 0.076 | 0.015 | 0.009 |
| Sept. 1983 | 0.085 | 0.33 | 0.42 | 0.59 | | | 0.049 | 0.059 | 0.085 | 0.009 |
| July 1984 * | 0.14 | 3.3 | 1.4 | 1.3 | 1.5 | | 0.21 | 0.20 | 0.11 | 0.15 |
| Aug. 1984 * | 0.18 | 0.49 | 0.34 | 0.60 | 0.30 | | 0.12 | 0.35 | 0.02 | <0.01 |
| Sept. 1984* | 0.08 | 0.11 | 0.34 | 0.29 | 0.29 | | 0.06 | 0.04 | 0.04 | 0.04 |
| June 1985 | 0.02 | 0.02 | 0.11 | 0.16 | 0.22 | | 0.03 | 0.01 | 0.01 | <0.01 |
| July 1985 | 0.04 | 0.06 | 0.19 | 0.06 | 0.31 | | 0.03 | 0.04 | 0.02 | 0.01 |
| Aug. 1985 | 0.07 | 0.09 | 1.5 | 0.50 | 1.2 | | 0.03 | 0.07 | 0.00 | 0.01 |
| June 1986 | 0.06 | 0.40 | 0.54 | 0.26 | 0.18 | 0.05 | 0.06 | 0.03 | 0.00 | 0.00 |
| July 1986 | 0.07 | 0.92 | 0.90 | 0.38 | 0.24 | 0.04 | 0.07 | 0.05 | 0.01 | 0.00 |
| Aug. 1986 | 0.06 | 0.11 | 0.05 | 0.16 | 0.08 | 0.04 | 0.05 | 0.01 | 0.01 | 0.01 |
| July, 1987 | 0.042 | 0.14 | 0.19 | 0.079 | 0.21 | 0.031 | 0.05 | 0.016 | 0.021 | 0.013 |
| Aug. 1987 | 0.064 | 0.11 | 0.20 | 0.20 | 0.31 | 0.056 | 0.016 | 0.035 | 0.034 | 0.0061 |
| Sept.1987 | 0.057 | 0.094 | 0.16 | 0.14 | 1.20 | 0.053 | 0.020 | 0.018 | 0.027 | 0.013 |
| June 1988 | | | | | | 0.107 | 0.012 | | 0.007 | 0.004 |
| July 1988 | 0.052 | 0.115 | 0.220 | 0.176 | 0.176 | | | 0.015 | | |
| Aug. 1988 | | 0.116 | 0.268 | 0.551 | 0.278 | | | 0.022 | 0.009 | 0.004 |
| Sept. 1988 | | 0.337 | 0.260 | 0.541 | 0.039 | | | 0.026 | 0.024 | 0.008 |

*Previously reported as dry.

# TABLE 7.15

LEAD-210 IN VEGETATION
pCi/g WET

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| June 1988 | | | | | | 0.185 | 0.366 | | 0.062 | 0.081 |
| July 1988 | 0.029 | 0.420 | 0.641 | 0.582 | 0.823 | | | 0.866 | | |
| Aug. 1988 | | 0.241 | 0.752 | 0.385 | 0.710 | | | 0.594 | 0.121 | 0.070 |
| Sept. 1988 | | 0.529 | 1.16[a] | 0.348 | 0.973 | | | 0.933 | 0.335 | 0.277 |

TABLE 7.16

MOLYBDENUM IN VEGETATION
µg/g WET

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 6.02 | 29.84 | 14.57 | 164.7 | | | | | | |
| June 1980 | 2570.0 | 879.0 | 654.0 | 18074.0 | | | | | 41.0 | 19.0 |
| Aug. 1980 | 2.0 | 12.0 | 0.5 | 121.0 | | | | | 11.0 | 20.0 |
| Oct. 1980 | 9.9 | 27.4 | 6.0 | 75.0 | | | | | 1.5 | 0.5 |
| July 1981 | 9.12 | 10.71 | 13.77 | 228.0 | | | | | 3.06 | 0.75 |
| Aug. 1981 | 4.91 | 16.64 | 26.4 | 93.60 | | | | | <0.52 | 2.34 |
| Sept. 1981 | 2.9 | 31.82 | 19.72 | 135.20 | | | | | 0.39 | 1.37 |
| July 1982 | | 34.3 | 13.6 | 220.0 | | | 11.2 | 2.2 | 5.0 | 0.10 |
| Aug. 1982 | | 54.79 | 36.16 | 440.0 | | | 18.27 | 6.12 | 14.50 | 0.03 |
| Sept. 1982 | | 165.0 | 69.0 | 296.5 | | | 26.1 | 10.8 | 9.64 | 0.0 |
| July 1983 | 1.7 | 13.0 | 3.4 | 150.0 | | | 2.7 | 1.7 | 0.07 | 0.08 |
| Aug. 1983 | 0.13 | 5.0 | 5.0 | 25.0 | | | 2.1 | 0.8 | 0.13 | 0.13 |
| Sept. 1983 | 1.1 | 23.0 | 16.0 | 110.0 | | | 6.4 | 0.45 | 3.0 | 0.18 |
| July 1984 | 5.6 | 24.0 | 22.0 | 130.0 | 30.0 | | 1.6 | 0.16 | 0.82 | 0.76 |
| Aug. 1984 | 0.45 | 30.0 | 13.0 | 220.0 | 32.0 | | 3.4 | 17.0 | 0.86 | 1.4 |
| Sept. 1984 | 0.49 | 15.0 | 12.0 | 150.0 | 15.0 | | 5.5 | 4.7 | 0.43 | 0.26 |
| June 1985 | 5.2 | 5.0 | 4.5 | 4.2 | 0.96 | | 0.11 | 0.07 | 1.8 | 0.60 |
| July 1985 | 12 | 16 | 15 | 380 | 110 | | 6.0 | 4.0 | 1.6 | 0.90 |
| Aug. 1985 | 5.2 | 11 | 4.8 | 74 | 20 | | 4.4 | 2.1 | 0.10 | 2.2 |
| June 1986 | 7.50 | 5.30 | 9.50 | 16.0 | 18.0 | 0.68 | 3.0 | 2.0 | 3.50 | 26.0 |
| July 1986 | 3.80 | 34.0 | 30.0 | 600 | 9.40 | 0.28 | 1.40 | 0.90 | 0.76 | 2.80 |
| Aug. 1986 | 1.60 | 7.40 | 42.8 | 106 | 114 | 3.20 | 3.00 | 2.00 | 1.40 | 1.10 |
| July 1987 | 2.40 | 18.0 | 30.0 | 330 | 58.0 | <0.13 | 7.50 | 0.68 | 0.20 | 0.30 |
| Aug. 1987 | 2.9 | 16.0 | 17.0 | 270 | 53.0 | 0.10 | 3.3 | 1.1 | 0.70 | 0.36 |
| Sept. 1987 | 1.3 | 23.0 | 7.3 | 1.8 | 2.3 | <0.08 | 6.8 | 1.7 | 0.65 | 0.35 |
| June 1988 | | | | | | <1.0 | 1.7 | | <1.0 | <1.0 |
| July 1988 | 3.7 | 7.8 | 9.8 | 93.5 | 25.8 | | | 1.58 | | |
| Aug. 1988 | | 16.3 | 10.8 | 119.0 | 17.6 | | | 2.55 | <1.0 | <1.0 |
| Sept. 1988 | | 16.5 | 9.0 | 54.3 | 2.8 | | | 1.28 | 0.88 | 0.26 |

## 8.0 - SEMI-ANNUAL LAND USE STATUS REPORT - ANNUAL REPORT LICENSE CONDITION 28.1

During the six month period ending December 31, 1988, no significant change in land use status at, or adjacent to, the mill site has occurred.

9.0 - MONITORING DONE IN ACCORDANCE WITH COTTER ALARA POLICY - ANNUAL REPORT

9.1 - GAMMA MONITORING SURVEY (10 CFR 20)

Although not a regulatory requirement, Cotter Corporation performs gamma radiation surveys at 86 locations throughout the milling facility, pursuant to its ALARA policy. In addition to these surveys, periodic general surveys are conducted throughout the mill property; these surveys are not associated with specific survey locations. These surveys allow detection of any significant gamma levels that are not identified at routine survey points. Cotter Corporation performed gamma surveys on a quarterly basis. This change in frequency was due to the shutdown of the mill. The quarterly survey readings for 1988 were reviewed to determine any trending of the gamma radiation levels. The review indicated that the highest gamma reading recorded in 1988 was 1.40 mR/hr., at location RS-87 on the Top of the #1 leach tank in May, 1988. This reading was taken as a spot check in an attempt to locate the elevated readings in the leach area. Gamma levels in the leach area have been somewhat elevated since the mill shut down operations in 1987.

The annual average of gamma survey averages for 1988 was 0.141 mR/hr. which was slightly lower than readings obtained in 1987 (0.145 mR/hr.) but higher than readings obtained in 1985 (0.098 mR/hr). These averages are presented graphically in

Figure 9.1 and a breakdown of the survey averages are presented in Table 9.1. Readings have tended to increase in some areas and decrease in other areas in 1988. This may be attributed to the buildup of radon daughters, some of which are gamma emitters, within the idle circuit and the removal of radium from other portions. During normal operations, this buildup does not occur due to the constant circulation of liquids which keeps the system flushed out.

During 1987, elevated levels were shown in the CCD thickeners, primarily RS-41. In 1988, levels at RS-41 reduced to an average gamma level of 0.079 mR/hr. which is a reduction in levels by 94%. This can be attributed to a redissolution of gypsum from the tanks and concurrent removal of radium which had been co-precipitated with the gypsum. Should the leach tanks be placed back in operation, it is expected that the gamma levels will return to normal levels.

A summary of all gamma radiation levels recorded from quarterly surveys during 1988 is presented in Table 9.2.

TABLE 9.1

PROG-LAB311 RADIOMETRIC SURVEY (GAMMA) RUN DATE 02/28/89
FOR 1988 IN MR/HR

| | TOTAL | n | AVG-X | DEV-S |
|---|---|---|---|---|
| JAN | ** | | | |
| FEB | 10.970 | 77 | 0.142 | 0.117 |
| MAR | ** | | | |
| APR | ** | | | |
| MAY | 11.380 | 80 | 0.142 | 0.177 |
| JUN | ** | | | |
| JUL | 11.610 | 79 | 0.147 | 0.118 |
| AUG | ** | | | |
| SEP | ** | | | |
| OCT | 11.740 | 79 | 0.149 | 0.156 |
| NOV | ** | | | |
| DEC | 9.940 | 79 | 0.126 | 0.143 |

1988 AVERAGE-X 0.141
1988 AVERAGE-S 0.142

** NOTE: NO SAMPLES TAKEN FOR THE MONTH.

PROGRAM - LAB119

COTTER CORPORATION
RADIOMETRIC SURVEY (GAMMA) FOR 1988 (MR/HR)

RUN DATE 01/11/89
TIME 09:27:43

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RS1-SECONDARY CRUSHER (LEVEL 1) | | 0.160 | | | 0.150 | | 0.160 | | | 0.110 | | 0.120 |
| RS2-SECONDARY CRUSHER (LEVEL 2) | | 0.140 | | | 0.150 | | 0.160 | | | 0.153 | | 0.130 |
| RS3-SECONDARY CRUSHER (LEVEL 3) | | 0.200 | | | 0.140 | | 0.150 | | | 0.148 | | 0.140 |
| RS4-SECONDARY CRUSHER (LEVEL 4) | | | | | 0.070 | | | | | | | |
| RS6-FINE ORE BINS (WEST-WS #1 & #2) | | 0.180 | | | 0.130 | | 0.110 | | | 0.250 | | 0.170 |
| RS7-FINE ORE BINS (EAST-WS #1 & #2) | | 0.160 | | | 0.120 | | 0.100 | | | 0.220 | | 0.140 |
| RS8-FINE ORE BINS (EAST WS #2) | | 0.130 | | | 0.130 | | 0.130 | | | 0.095 | | 0.090 |
| RS9-FINE ORE BINS (SE SCHWARTZ) | | 0.130 | | | 0.120 | | 0.100 | | | 0.096 | | 0.090 |
| RS10-FINE ORE BINS (N CUSTOM) | | 0.080 | | | 0.150 | | 0.100 | | | 0.270 | | 0.140 |
| RS11-FINE ORE BINS (N.W. CUSTOM) | | 0.140 | | | 0.120 | | 0.120 | | | 0.097 | | 0.130 |
| RS12-FINE ORE BINS (S CUSTOM) | | 0.120 | | | 0.100 | | 0.130 | | | 0.098 | | 0.100 |
| RS13-GRIND AND LEACH (LOWER-EAST END MDL) | | 0.080 | | | 0.140 | | 0.140 | | | 0.045 | | 0.040 |
| RS14-GRIND AND LEACH (OUTSIDE STORAGE RM) | | 0.070 | | | 0.120 | | 0.120 | | | 0.105 | | 0.100 |
| RS15-GRIND AND LEACH (LOWER-UNDER BALL MILL) | | 0.100 | | | 0.170 | | 0.160 | | | 0.028 | | 0.250 |
| RS16-GRIND AND LEACH (LOWER-WEST #3 LEACH TANK) | | 0.600 | | | 0.700 | | 0.500 | | | 0.067 | | 0.550 |
| RS17-GRIND AND LEACH (LOWER-WEST #1 LEACH TANK) | | 0.140 | | | 0.200 | | 0.200 | | | 0.336 | | 0.250 |
| RS18-GRIND AND LEACH (LOWER-EAST END #1 A.C.) | | 0.400 | | | 0.180 | | 0.190 | | | 0.197 | | 0.170 |
| RS19-GRIND AND LEACH (LOWER-SOUTH REPULP TANK) | | 0.600 | | | 0.190 | | 0.160 | | | 0.240 | | 0.130 |
| RS20-GRIND AND LEACH (LOWER-WEST REPULP TANK) | | 0.500 | | | 0.500 | | 0.400 | | | 0.385 | | 0.300 |
| RS21-GRIND AND LEACH (LOWER-SOUTH #3 AUTOCLAVE) | | 0.080 | | | 0.060 | | 0.100 | | | 0.034 | | 0.050 |
| RS22-GRIND AND LEACH (LOWER-WEST END #1 A.C.) | | 0.060 | | | 0.080 | | 0.120 | | | 0.047 | | 0.060 |
| RS23-GRIND AND LEACH (LOWER-WEST END #2 A.C.) | | 0.100 | | | 0.090 | | 0.110 | | | 0.069 | | 0.090 |
| RS24-GRIND AND LEACH (LOWER WEST END #3 A.C.) | | 0.100 | | | 0.070 | | 0.090 | | | 0.071 | | 0.030 |
| RS25-GRIND AND LEACH (LOWER S.E. COMPRESSOR) | | 0.080 | | | 0.070 | | 0.100 | | | 0.086 | | 0.070 |
| RS26-GRIND AND LEACH (UPPER-E. ROD MILL FEED) | | 0.130 | | | 0.160 | | 0.160 | | | 0.219 | | 0.130 |
| RS27-GRIND AND LEACH (UPPER-E. ROD MILL) | | 0.100 | | | 0.130 | | 0.120 | | | 0.075 | | 0.130 |
| RS28-GRIND AND LEACH (UPPER-E. END BALL MILL) | | 0.180 | | | 0.110 | | 0.130 | | | 0.126 | | 0.080 |
| RS29-GRIND AND LEACH (UPPER-S. END BALL MILL) | | 0.200 | | | 0.100 | | 0.140 | | | 0.110 | | 0.130 |
| RS30-GRIND AND LEACH (UPPER-N. END BALL MILL) | | 0.200 | | | 0.120 | | 0.100 | | | 0.133 | | 0.160 |
| RS31-GRIND AND LEACH (UPPER-CONTROL ROOM) | | 0.120 | | | 0.080 | | 0.050 | | | 0.046 | | 0.030 |
| RS32-GRIND AND LEACH (UPPER-W. END BALL MILL) | | 0.400 | | | 0.600 | | 0.500 | | | 1.110 | | 0.650 |
| RS33-GRIND AND LEACH (UPPER-E. #1 & #2 A.C.) | | 0.200 | | | 0.110 | | 0.160 | | | 0.197 | | 0.150 |
| RS34-GRIND AND LEACH (UPPER-E. #2 & #3 A.C.) | | 0.180 | | | 0.140 | | 0.190 | | | 0.266 | | 0.180 |
| RS35-GRIND AND LEACH (UPPER-N.E. #3 A.C.) | | 0.400 | | | 0.300 | | 0.400 | | | 0.566 | | 0.350 |
| RS36-GRIND AND LEACH (UPPER-N. #3 LETDOWN) | | 0.180 | | | 0.190 | | 0.180 | | | 0.156 | | 0.120 |
| RS37-GRIND AND LEACH (UPPER-BETWEEN #2 & #3 LD) | | 0.140 | | | 0.130 | | 0.180 | | | 0.091 | | 0.110 |
| RS38-GRIND AND LEACH (UPPER BETWEEN #1 & #2 LD) | | 0.120 | | | 0.100 | | 0.170 | | | 0.009 | | 0.110 |
| RS39-CCD CATWALK #1 | | 0.080 | | | 0.070 | | 0.070 | | | 0.046 | | 0.050 |
| RS40-CCD CATWALK #9 | | 0.060 | | | 0.070 | | 0.130 | | | 0.047 | | 0.070 |
| RS41-CCD CATWALK #8 | | 0.080 | | | 0.080 | | 0.140 | | | 0.053 | | 0.040 |
| RS42-CCD CATWALK #7 | | 0.090 | | | 0.070 | | 0.080 | | | 0.046 | | 0.060 |
| RS43-CCD CATWALK #6 | | 0.060 | | | 0.060 | | 0.100 | | | 0.042 | | 0.020 |
| RS44-CCD CATWALK #5 | | 0.080 | | | 0.050 | | 0.090 | | | 0.038 | | 0.040 |
| RS45-CCD CATWALK #4 | | 0.040 | | | 0.060 | | 0.090 | | | 0.055 | | 0.060 |
| RS46-CCD CATWALK #2) | | 0.080 | | | 0.080 | | 0.110 | | | 0.056 | | 0.060 |
| RS47-CCD CONTROL ROOM | | 0.050 | | | 0.040 | | 0.060 | | | 0.027 | | 0.030 |
| RS48-CCD CATWALK #3 | | 0.060 | | | 0.090 | | 0.080 | | | 0.053 | | 0.070 |
| RS49-SX (UPPER U309-E. #4 EX SETTLER) | | 0.090 | | | 0.100 | | 0.090 | | | 0.152 | | 0.090 |
| RS50-SX (UPPER U308 E. #3 EX SETTLER) | | 0.120 | | | 0.130 | | 0.110 | | | 0.262 | | 0.160 |
| RS51-SX (UPPER U308 E. #2 EX SETTLER) | | 0.080 | | | 0.120 | | 0.140 | | | 0.118 | | 0.080 |
| RS52-SX (UPPER U308 N. #3 & #4 EX. SETTLERS) | | 0.100 | | | 0.090 | | 0.100 | | | 0.122 | | 0.060 |
| RS53-SX (UPPER U308 N. END #1 EX SETTLER) | | 0.100 | | | 0.080 | | 0.130 | | | 0.108 | | 0.100 |
| RS54-SX (UPPER U308 N. END LOADED ORE SURGE) | | 0.090 | | | 0.070 | | 0.120 | | | 0.059 | | 0.060 |
| RS55-SX (UPPER N. #4 ST SETTLER) | | 0.060 | | | 0.040 | | 0.090 | | | 0.352 | | 0.030 |

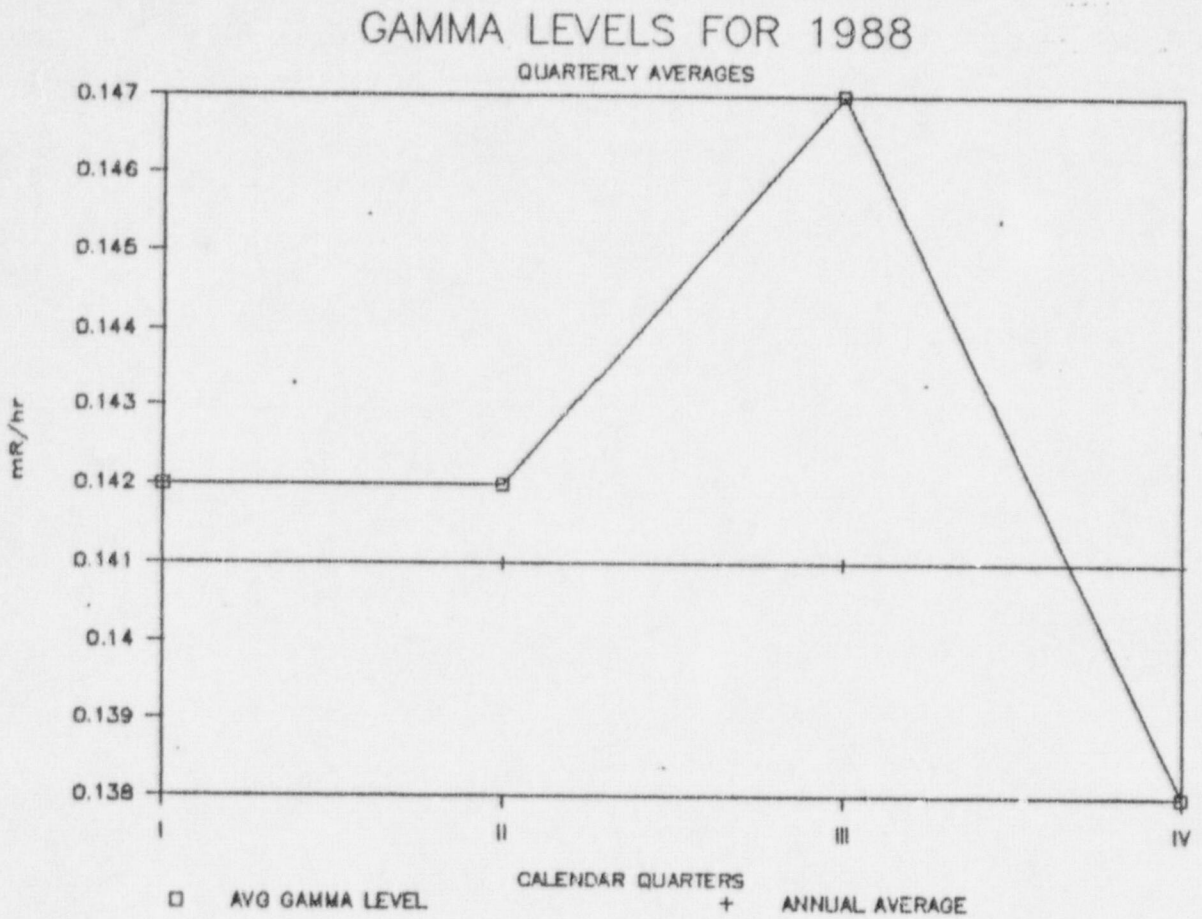
PROGRAM - LAB119

COTTER CORPORATION
RADIOMETRIC SURVEY (GAMMA) FOR 1988 (MR/HR)

RUN DATE 01/11/89
TIME 09:30:18

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RS56-SX (UPPER U308 N, #3 & #4 ST SETTLERS) | | 0.040 | | | 0.050 | | 0.100 | | | 0.042 | | 0.030 |
| RS57-SX (UPPER U308 N. #2 & #3 ST SETTLERS) | | 0.060 | | | 0.060 | | 0.130 | | | 0.433 | | 0.040 |
| RS58-SX (UPPER U308 N. #1 & #2 ST SETTLERS) | | 0.060 | | | 0.050 | | 0.130 | | | 0.048 | | 0.050 |
| RS59-SX (UPPER E. #1 ST SETTLER) | | 0.050 | | | 0.060 | | 0.090 | | | 0.053 | | 0.050 |
| RS60-SX CONTROL ROOM | | 0.070 | | | 0.030 | | 0.080 | | | 0.019 | | 0.020 |
| RS61-UV PRODUCT (LOWER E. BARREL MAINT.) | | 0.060 | | | 0.070 | | 0.090 | | | 0.295 | | 0.040 |
| RS62-PRODUCT (LOWER U308 CALCINER) | | 0.080 | | | 0.090 | | 0.100 | | | 0.130 | | 0.070 |
| RS64-UV PRODUCT MCC ROOM | | 0.050 | | | | | | | | 0.147 | | |
| RS67-LAB CRUSHING ROOM EAST | | 0.060 | | | 0.040 | | 0.050 | | | 0.040 | | 0.050 |
| RS68-LAB CRUSHING ROOM WEST | | 0.100 | | | 0.050 | | 0.060 | | | 0.022 | | 0.030 |
| RS69-BLENDING ROOM | | 0.110 | | | 0.120 | | 0.100 | | | 0.023 | | 0.020 |
| RS70-LAB FILTER ROOM | | 0.060 | | | 0.050 | | 0.080 | | | 0.033 | | 0.030 |
| RS71-LAB U30C PREP AREA | | 0.040 | | | 0.050 | | 0.060 | | | 0.017 | | |
| RS72-MET. LAB | | 0.060 | | | 0.070 | | 0.090 | | | 0.053 | | 0.050 |
| RS73-PRIMARY CRUSHER-TOP | | 0.200 | | | 0.170 | | 0.140 | | | 0.355 | | 0.170 |
| RS74-PRIMARY CRUSHER-MIDDLE | | 0.210 | | | 0.170 | | 0.180 | | | 0.247 | | 0.160 |
| RS75-PRIMARY CRUSHER-BOTTOM | | 0.190 | | | 0.180 | | 0.160 | | | 0.261 | | 0.160 |
| RS76-PRIMARY CRUSHER SHAMPLE SHED-TOP | | 0.200 | | | 0.200 | | 0.190 | | | 0.292 | | 0.170 |
| RS77-PRIMARY CRUSHER SAMPLE SHED-MIDDLE | | 0.140 | | | 0.190 | | 0.180 | | | 0.241 | | 0.200 |
| RS78-PRIMARY CRUSHER SAMPLE SHED-BOTTOM | | 0.200 | | | 0.170 | | 0.190 | | | 0.244 | | 0.200 |
| RS80-NEW SAMPLE PLANT -NORTH | | 0.400 | | | 0.140 | | 0.140 | | | 0.118 | | 0.180 |
| RS81-NEW SAMPLE PLANT SOUTH | | 0.110 | | | 0.160 | | 0.150 | | | 0.119 | | 0.170 |
| RS82-SOUTHEAST OF SX SAND FILTERS | | 0.080 | | | 0.060 | | 0.070 | | | 0.267 | | 0.060 |
| RS83-S.X. V205 SIDE | | 0.120 | | | 0.080 | | 0.110 | | | 0.097 | | 0.090 |
| RS86-SECURITY STATION | | | | | 0.050 | | 0.080 | | | 0.048 | | 0.050 |
| RS87-TOP #1 LEACH | | | | | 1.400 | | | | | | | |
| RS89-UPPER SIDE #3 LEACH | | | | | | | | | | | | 1.000 |
| RS95-NEW CRUSHER/LABOR LUNCHROOM | | | | | 0.100 | | 0.100 | | | 0.113 | | 0.060 |
| RS96 TOP LEVEL NORTH PRIMARY LEACH TANK | | | | | | | 0.900 | | | | | |
| DATA RECORDS COORDINATOR OFFICE | | | | | | | | | | | | 0.040 |

FIGURE 9.1-


GAMMA LEVELS FOR 1988
QUARTERLY AVERAGES
0.147
0.146
0.145
0.144
0.143
0.142
0.141
0.14
0.139
0.138
mR/hr
I
II
III
IV
CALENDAR QUARTERS
AVG GAMMA LEVEL
ANNUAL AVERAGE

## 9.2 - PERSONNEL DOSIMETRY (TLD) - ANNUAL REPORT

In addition to alpha contamination monitoring of specified personnel, all employees are required to wear Thermoluminescent Dosimeters at the mill in order to evaluate personnel exposures to Beta and Gamma radiation.

The data presented in Table 9.3 indicate a decrease in whole body exposures encountered by Cotter mill employees in 1988 from that experienced in 1987. This result is to be expected because the mill continued to be in a shutdown status through 1988. All exposures are well below the regulatory guidelines which specify a maximum permissible annual exposure of 5 rem.

Also, for the purpose of this report, an evaluation of total rem (man-rem) at the Cotter mill was prepared (Table 9.3). A comparison of 1987 and 1988 data was not performed because in 1987 the mill was completely shutdown for approximately nine months compared to 12 months in 1988. Because of this extended shutdown, man-rem exposures are significantly lower than in any other reported years and are expected to remain as such as long as the mill remains in a non-operational status. It should be noted that during RAP construction activities, man-rem and construction employees individual exposures were higher than those of Cotter personnel. This is due to the nature of the work being done and the area where the work was performed. These levels were below the regulatory guidelines. The apparent increase in exposures to Cotter personnel in the summary distributions (Table 9.3) is due to construction personnel exposures and not exposures to Cotter mill employees.

9.2 - PERSONNEL DOSIMETRY (TLD) - ANNUAL REPORT


In conclusion, TLD data indicate an overall decrease in whole body exposures at the Cotter mill. Moreover, all exposures were below guidelines specified within the regulatory framework (i.e. less than 10% of 5 rem.).

PROGRAM - LAB305 T L D TOTALS BY LOCATION FOR 1988 RUN DATE 02/02/89

| LOCATION | | TOTAL MREMS | TOTAL MAN REMS |
|---|---|---|---|
| 0101 | MILL FMAN-RAP QA/QC | 12.00 | 0.01200 |
| | CATEGORY 0100 TOTALS | 12.00 | 0.01200 |
| 0304 | MAINTENANCE FOREMAN | 4.00 | 0.00400 |
| 0305 | MAINTENANCE - INSTRU | 36.00 | 0.03600 |
| 0306 | MAINTENANCE - ELECTR | 42.00 | 0.04200 |
| 0307 | MAINTENANCE - AUTO M | 33.00 | 0.03300 |
| | CATEGORY 0300 TOTALS | 115.00 | 0.11500 |
| 0401 | CH. MET./PERSNL. COO | 0.00 | 0.00000 |
| 0402 | ANALYTICAL LAB SUPER | 6.00 | 0.00600 |
| 0403 | ANALYTICAL LAB (EXCL | 17.00 | 0.01700 |
| 0406 | JUNIOR METALURGIST | 20.00 | 0.02000 |
| | CATEGORY 0400 TOTALS | 43.00 | 0.04300 |
| 0505 | LABORERS | 30.00 | 0.03000 |
| | CATEGORY 0500 TOTALS | 30.00 | 0.03000 |
| 0601 | WAREHOUSE SUPERVISOR | 0.00 | 0.00000 |
| 0603 | SUPT. SUPP. SVCS. | 0.00 | 0.00000 |
| | CATEGORY 0600 TOTALS | 0.00 | 0.00000 |
| 0701 | MANAGER OF MILLING | 8.00 | 0.00800 |
| 0702 | PRODUCTION SUPERINTE | 3.00 | 0.00300 |
| 0703 | MILL ACCOUNTANT | 13.00 | 0.01300 |
| 0708 | PAYRL/PERS/ACCT PAY | 10.00 | 0.01000 |
| 0709 | PL ENG-SUP CERCLA CO | 0.00 | 0.00000 |
| | CATEGORY 0700 TOTALS | 34.00 | 0.03400 |
| 0801 | ENV. COORD./RAD. SAF | 2.00 | 0.00200 |
| 0802 | HEALTH & SAFETY SUPE | 20.00 | 0.02000 |

PROGRAM - LAB305 T L D TOTALS BY LOCATION FOR 1988 RUN DATE 02/02/89

| LOCATION | | TOTAL MREMS | TOTAL MAN REMS |
|---|---|---|---|
| 0803 | RADIATION SAFETY TEC | 9.00 | 0.00900 |
| 0804 | DATA RECORDS COORDIN | 0.00 | 0.00000 |
| 0806 | SECURITY/SAFETY TECH | 85.00 | 0.08500 |
| | CATEGORY 0800 TOTALS | 116.00 | 0.11600 |
| 0901 | RAP CONSTRUCTION ACT | 165.00 | 0.16500 |
| | CATEGORY 0900 TOTALS | 165.00 | 0.16500 |
| 9042 | RAP ONSC COOR-CDH | 15.00 | 0.01500 |
| 9043 | YOUNG DRLG.-DRILLERS | 59.00 | 0.05900 |
| 9044 | GR. DIVIDE-SURVEYOR | 81.00 | 0.08100 |
| 9061 | NIELSONS-PROJECT SUP | 0.00 | 0.00000 |
| 9062 | NIELSONS-PROJECT ENG | 0.00 | 0.00000 |
| 9063 | NIELSONS-OFFICE MGR. | 0.00 | 0.00000 |
| 9064 | NIELSONS-SPECIALISTS | 4.00 | 0.00400 |
| 9065 | NIELSONS-FOREMEN | 19.00 | 0.01900 |
| 9066 | NIELSONS-MECHANICS | 18.00 | 0.01800 |
| 9067 | NIELSONS-WATER WAGON | 18.00 | 0.01800 |
| 9068 | NIELSONS-OPERATORS | 102.00 | 0.10200 |
| 9069 | NIELSONS-LABORERS | 24.00 | 0.02400 |
| 9070 | NIELSONS-OILERS | 9.00 | 0.00900 |
| 9072 | NIELSONS-GR. CHECKER | 34.00 | 0.03400 |
| 9074 | NIELSONS-CARPENTER | 0.00 | 0.00000 |
| 9080 | ENVIRONMENTAL LINERS | 10.00 | 0.01000 |
| | CATEGORY 9000 TOTALS | 393.00 | 0.39300 |

PROGRAM - LAB305 T L D TOTALS BY LOCATION FOR 1988 RUN DATE 02/03/89

| LOCATION | TOTAL MREMS | TOTAL MAN REMS |
|---|---|---|

*** DISTRIBUTION OF EMPLOYEE TLD DATA FOR 1988 ***

| EXPOSURE RANGE IN mRem | NUMBER OF EXPOSURES* | PERCENT |
|---|---|---|
| EXPOSURES > 200 | 0 | 0.0 % |
| EXPOSURES <= 200 BUT >= 100 | 0 | 0.0 % |
| EXPOSURES < 100 | 85 | 35.4 % |
| EXPOSURES = 0 | 155 | 64.6 % |
| DISTRIBUTION TOTALS | 240 | 100.0 % |

*NUMBER OF EXPOSURES REFLECTS NUMBER OF TLD READINGS FOR THE PERIOD

PROGAM - LAB306 *** DISTRIBUTION OF EMPLOYEE TLD DATA FOR 1988 ***

| EXPOSURE RANGE IN mRem | NUMBER OF EMPLOYEES | PERCENT |
|---|---|---|
| EXPOSURES ) 200 | 0 | 0.0 % |
| EXPOSURES (= 200 BUT =) 100 | 0 | 0.0 % |
| EXPOSURES ( 100 | 66 | 61.1 % |
| EXPOSURES = 0 | 42 | 38.9 % |
| DISTRIBUTION TOTALS | 108 | 100.0 % |

10.1 - FUGITIVE DUST CONTROL - ANNUAL REPORT

LICENSE CONDITION 17.1

Cotter Corporation uses the following procedures for dust suppression on roadways: at the mill, roads are treated with water by waterspray truck as required to control fugitive particulate emissions; and, speed limits have been designated at 10 mph within the boundaries of the mill site and 25 mph from the main gate to the public road.

The use of Wendon has been implemented, with success on problem areas, and the secondary impoundment area is now under water persuant to the requirements of the RAP.

10.2 - PUMPBACK STATION FLOW RECORDS -ANNUAL REPORT

LICENSE CONDITION 19.3.5

Cotter has installed flowmeters at designated pumpback locations required by the Radioactive Materials License. Flow records are maintained at the Canon City mill office. During the tailings removal operation, Trench #2 (location 702) was excavated and no longer is in existence. The underdrain flow has been consistently below 2 gpm which shows no increase over previous years and is an indication of impoundment integrity.

Monthly Average Flows and Annual Totals are shown in Table 10-1.

# TABLE 10.1

PUMPBACK

Gallons per Minute

| 1988 | Jan. | Feb. | March | April | May | June | July | August | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cotter #1 | 13.5 | 13.64 | 13.79 | 13.73 | 13.84 | 13.83 | 12.63 | 13.22 | 13.63 | -- | -- | -- |
| Pond 1 Tr | 0.06 | 0.05 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.08 | 0.07 | 0.06 | 0.05 | 0.04 |
| Pond 3 Tr | 0.43 | 0.37 | 0.25 | 0.31 | 0.28 | 0.32 | 0.33 | 0.36 | 0.30 | 0.31 | 0.24 | 0.33 |
| Subdrain S | 1.89 | 1.73 | 1.58 | 1.45 | 1.32 | 1.24 | 1.22 | 1.25 | 1.37 | 1.40 | 1.27 | 1.17 |
| S5 Res Tr E | 3.48 | 3.26 | 3.02 | 2.67 | 3.50 | 3.33 | 2.15 | 3.89 | 4.44 | -- | -- | -- |
| S5 Res Tr W | 9.43 | 8.72 | 8.83 | 10.12 | 6.93 | 9.45 | 8.41 | 3.95 | 2.79 | -- | -- | -- |
| #11 Pumpback | 24.88 | 28.48 | 25.05 | 22.76 | 17.94 | 18.38 | 31.30 | 49.70 | 22.29 | -- | -- | -- |
| #12 Pumpback | 45.06 | 48.34 | 45.42 | 41.92 | 35.74 | 35.93 | 46.69 | 71.66 | 37.29 | 1.91 | 1.63 | -- |

| | Total Gallons Jan. 1 - Dec. 31 |
|---|---|
| Cotter #1 | 5,225,400 |
| Pond 1 Tr | 26,980 |
| Pond 3 Tr | 165,720 |
| Subdrain S | 726,000 |
| S5 Res Tr E | 1,279,400 |
| S5 Res Tr W | 2,949,000 |
| #11 Pumpback | 10,439,900 |
| #12 Pumpback | 17,794,000 |

10.3 - RADIATION SAFETY TRAINING - ANNUAL REPORT

LICENSE CONDITION 22.7

Radiation safety training is conducted at the mill to review radiation safety protection for employees. These training sessions are at least sixty minutes in duration and are provided as part of the new employee safety training course, as well as review sessions for personnel already employed at the mill. Training sessions are offered on a quarterly basis with the objective of annual retraining in radiation safety practices for all employees.

In 1988, a total of 22 radiation safety sessions were conducted with an attendance of 95 Cotter employees. Sessions were provided in all quarters of the calendar year and annual retraining of all employees was achieved. The number of sessions and total attendance was increased in comparison to the previous year's in an attempt to provide more training opportunities for personnel.

In addition, ten radiation safety training sessions were presented to outside contractor personnel. Attendance at these sessions totaled 80 individuals.

Cotter is committed to the practice of providing continuing education for Radiation Safety personnel to remain abreast of new techniques and procedures in radiation safety. Radiation safety training sessions for all mill personnel will continue through 1989, as specified.

## 10.4 - COLORADO DEPARTMENT OF HEALTH INSPECTION - ANNUAL REPORT

During the period January 1, 1988, through December 31, 1988, the Colorado Department of Health did not perform an inspection at the Canon City mill.

The Colorado Department of Health furnished Cotter with its findings from the 1987 inspection in a report dated March 29, 1988. Cotter responded to that report on April 19, 1988, and a meeting was held on April 28, 1988, to discuss several items covered in the inspection report.

All items contained in the inspection have been resolved with the except of 1) the urinalysis sample collection procedure, which is not relevant at this time due to the current status of the mill, and 2) the Yellowcake scrubber operation, which has become a part of the Remedial Action Plan and resolution of this matter is now in progress.

11.0 - SEMI-ANNUAL MILDOS REPORT - ANNUAL REPORT

LICENSE CONDITION 36.0

1. Compliance Assessment

There have been no significant changes in emission rates due to mill operations. Cotter has remained in compliance with 40 CFR 190, Sub-chapter F.

2. Environmental Monitoring and Assessment Progra (EMAP)

Cotter has continued the environmental monitoring program described in previous correspondence to the Division pursuant to License Condition 36.0

The March 29, 1984, license renewal application presents the results of analyses that show, for various scenarios, that the operation of the mill complies with 40 CFR 190. The mill has been shut down since January 30, 1987. Since the mill did not operate for the six month period ending December 31, 1988, compliance with 40 CFR 190 was achieved.

## 11.0 - SEMI-ANNUAL MILDOS REPORT - ANNUAL REPORT

LICENSE CONDITION 36.0

1. Compliance Assessment

There have been no significant changes in emission rates due to mill operations. Cotter has remained in compliance with 40 CFR 190, Sub-chapter F.

2. Environmental Monitoring and Assessment Program (EMAP)

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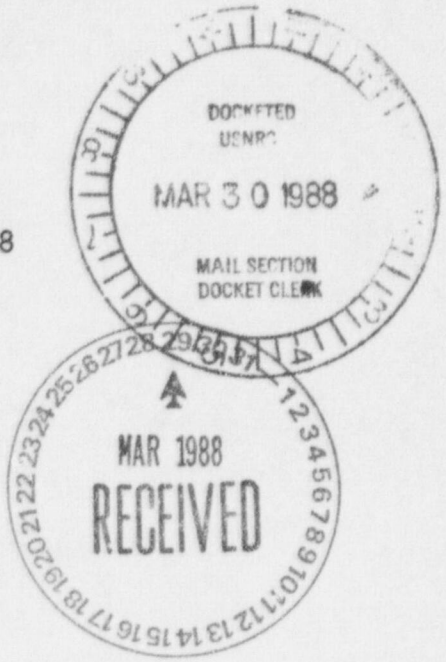
The March 29, 1984, license renewal application presents the results of analyses that show, for various scenarios, that the operation of the mill complies with 40 CFR 190. The mill has been shut down since January 30, 1987. Since the mill's operation during the six month period ending June 30, 1987, has been well within the bounds of the more extreme scenario, compliance with 40 CFR 190 has been demonstrated.

6000022020E

# Cotter Corporation
## General Office

303 980 1292
12596 WEST BAYAUD AVENUE, SUITE 350
LAKEWOOD, COLORADO 80228




March 28, 1988

Mr. Albert J. Hazle, Director
Radiation Control Division
Colorado Department of Health
4210 East 11th Avenue
Denver, Colorado 80220

Re: Radioactive Materials License No. Colo. 369-01S

Dear Mr. Hazle:

Pursuant to License Condition 31.2 of the above-captioned license, please find enclosed three (3) copies of the annual report.

Sections 8.1 and 11.0 of the annual report also contain information required by License Conditions 28.0 and 36.5, respectively.

A complete report of the water history for the period 1981 through 1987 is enclosed with this submittal.

If you have any questions or if you require additional information about the enclosed annual report, please contact me.

Sincerely,

J. P. McCluskey
Executive Vice President

JPM/th

Enclosures

cc: File No. 8610-10-3

OFFICIAL DOCKET COPY

88-0644

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1987 ANNUAL REPORT
COTTER CORPORATION
CANON CITY MILL
Table of Contents


| | | Page Nos. |
|---|---|---|
| 1.0 | License Conditions 21.1, 29 and 30 - Water Quality Data | 1-1 to 1-149 |
| 2.0 | License Condition 22.5 - Alpha Survey of Equipment Leaving the Mill | 2-1 |
| 3.0 | Personnel Monitoring Surveys, Inspections and Audits | |
| 3.1 | License Condition 23.7 - Personnel Alpha Surveys | 3-1 to 3-11 |
| 3.2 | License Condition 23.8 - Alpha Surveys of Control Rooms, Etc. | 3-12 to 3-24 |
| 3.3 | License Conditions 23.9, 23.9.1, 23.9.2, Independent Audit | 3-25 |
| 4.0 | Bioassay Measurements | |
| 4.1 | License Condition 24.1.1.1 - Urinalysis | 4-1 to 4-12 |
| 4.2 | License Condition 24.2.1 through 24.4 - In Vivo | 4-13 |
| 5.0 | License Conditions 25.0 - Stack Effluent Data | 5-1 to 5-24 |
| 6.0 | Work Station and Employee Exposure Data | |
| 6.1 | Licenses Condition 26.1 and 26.2 - Work Station and Breathing Zone Data | 6-1 to 6-11 |
| 6.2 | License Condition 26.3 - Monthly Radon at Work Stations | 6-12 to 6-16 |
| 6.3 | License Condition 26.4 - Time Weighted Exposures | 6-17 |
| 7.0 | Environmental Monitoring Data | |
| 7.1.1 | License Condition 27 - Environmental TLD Monitoring | 7-1 to 7-5 |
| 7.1.2 | License Condition 27 - Radon-222 Monitoring | 7-6 to 7-10 |
| 7.1.3 | License Condition 27.1 - Environmental Air Particulates | 7-11 to 7-28 |

1987 ANNUAL REPORT
COTTER CORPORATION
CANON CITY MILL
Table of Contents


| | | Page Nos. |
|---|---|---|
| 7.0 | Environmental Monitoring Data (cont) | |
| 7.2 | License Conditions 27.2 and 27.3 - Soils and Vegetation Data | 7-29 to 7-33 |
| 8.0 | License Condition 28.0 - Land Use Survey | 8-1 |
| 9.0 | Gamma Monitoring | |
| 9.1 | Gamma Survey | 9-1 to 9-6 |
| 9.2 | TLD Badges | 9-7 to 9-12 |
| 10.0 | Annual Reports | |
| 10.1 | License Condition 17.1 - Fugitive Dust Control Report | 10-1 |
| 10.2 | License Condition 19.3.5 - Pumpback Flow Records | 10-2 to 10-3 |
| 10.3 | License Condition 22.7 - Radiation Safety Training Report | 10-4 |
| 10.4 | Colorado Departmemt of Health Inspections | 10-5 |
| 11.0 | License Condition 36.0 MILDOS Assessment | 11-1 |

# 1.0 - WATER QUALITY MONITC 'NG - ANNUAL REPORT

## LICENSE CONDITIONS 21.1, 29 AND 30

Cotter Corporation operated and maintained its water quality monitoring program in the vicinity of the Canon City mill site during the calendar year 1987. The purpose of this program was fourfold: 1) compliance with the requirements of License Conditions 21.1, 29 and 30; 2) compliance with the NRC Regulatory Guide 4.14; 3) maintenance of a sufficient data base for evaluation and appraisal of groundwater quality trends and 4) assessment of the effect of various remedial measures, including the transfer of the alkaline tailings which was completed in 1983.

Cotter Corporation has completed a comprehensive technical review, inventory and evaluation of past, present and future source terms which affect the ground and surface water systems and has presented the pertinent details of these analyses in sections 2, 3, 6, 9, 10 and 12 of "Application for Renewal of Radioactive Materials License No.369-01S" dated March 29, 1984, which was filed with the Colorado Department of Health, as well as in a variety of other documents available in the public domain

On November 17, 1981, June 30, 1983, and again in the March 29, 1984, Mill License Renewal Application, Cotter proposed to the Colorado Department of Health a revised ground and surface

water monitoring system. A second proposal was filed with the Colorado Department of Health on January 14, 1985, and updated and resubmitted in September, 1985. The issues raised in these letters have been resolved by agreement between the Department and Cotter, as described in Section 15 of the Remedial Action Plan (RAP) prepared as part of the settlement of the CERCLA lawsuit filed by the State in U. S. District Court in December, 1983. Cotter continues to attempt to collect al' samples specified in the current license, but can not collect samples when it is physically or legally impossible to do so. This annual report presents graphs for essentially all monitoring locations as listed in License Condition 11.33. Upon entry of the CERCLA case consent decree by the Federal District Court, Cotter will implement the water monitoring requirements specified in Section 15 of the RAP.

The two graphs plotted for each of these locations depict Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) concentrations as a function of time over the period from 1981 through 1987. Tables 1.1 through 1.8 contain annual average concentrations for each of these constituents for the period 1981 through 1987.

Additionally, this annual report contains discussion of water quality at each location where sampling is required by the current mill license. A complete computer printout of all water quality data accumulated since January, 1981, is provided separately.

Wells designated as 100 series are located offsite. Wells designated 300 series are onsite. Locations designated as the 500 series are surface water locations and are either onsite or offsite. Trench and underdrain locations designated as 700 series are considered onsite locations. Commencing in August, 1984, the Cotter laboratory reported Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) analyses utilizing revised Lower Limits of Detection (LLD's) of 0.005 mg/l. License Condition 30.5 specifies screening criteria of 0.3 mg/l for Molybdenum (Mo) and 0.08 mg/l for Natural Uranium ($^{Nat}U$).

OFFSITE LOCATIONS

Well #106 showed a slight downtrend for Natural Uranium ($^{Nat}U$). Radium-226 ($^{226}Ra$) averaged 0.8 pCi/l. No levels above License Condition 30.5 screening criteria were noted.

Well #111 had no levels above License Condition 30.5 screening criteria. Molybdenum (Mo) had a post LLD change high of 0.020 mg/l on December 23, 1987.

Well #114 had 1981-1987 program highs for the following constituents in 1987:

| Constituent | Symbol | Date | Concentration |
|---|---|---|---|
| Total Dissolved Solids | TDS | April 28, 1987 | 580 |
| Chloride | Cl | April 28, 1987 | 15 |
| Calcium | Ca | May 13, 1987 | 160 |
| Potassium | K | June 16, 1987 | 100 |

Well #117 had relatively stable Natural Uranium ($^{Nat}U$) concentration below License Condition 30.5 screening criteria; however, three (3) Molybdenum (Mo) analyses exceeded the License Condition 30.5 screening level.

Well #118 has not been sampled since January 11, 1982, because the owner's pump is inoperative.

Well #119 continues to demonstrate the cyclic dilution effect of the DeWeese Dye Ditch. 1981-1987 program lows for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) were obtained on September 23, 1987, and October 22, 1987, respectively. A marked downtrend was observed in 1987 as evidenced by the annual averages. Also, Total Dissolved Solids (TDS) and Sulfate ($SO_4$) at 240 and 20 mg/l respectively, on July 17, 1987, were program lows. Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) levels above the License Condition 30.5 screening criteria were encountered in 1987.

Well #120 has continued a downtrend for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) although a peaking occurred on June 25, 1987. Also, peaking for Chloride (Cl), Sulfate ($SO_4$) and Total Dissolved Solids (TDS) occurred in June, 1987. A 1981-1987 program low for Natural Uranium ($^{Nat}U$) and for Molybdenum (Mo) was observed on October 22, 1987, and November 20, 1987, respectively. One (1) Molybdenum (Mo) value exceeded the License Condition 30.5 screening criterion.

Well #122 showed a downtrend for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo). Program lows for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) were encountered on September 24, 1987, and June 16, 1987, respectively. Both constituents exceeded License Condition 30.5 screening criteria.

Well #123 was not sampled in 1987. The owner has refused access.

Well #124 has exhibited a continuing downtrend for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) with program lows of 0.061 mg/l and 0.27 mg/l on January 28, 1987, and September 24, 1987, respectively; both constituents exceeded the License Condition 30.5 screening criteria.

Well #129 had stable Natural Uranium ($^{Nat}U$) concentrations and a continued downtrend for Molybdenum (Mo) with

one (1) exceedence each of the License Condition 30.5 screening criteria for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo). Since 1981, Molybdenum (Mo) concentrations have declined by approximately 60%.

Well #135 had stable Natural Uranium ($^{Nat}U$) concentrations and one detectable Molybdenum (Mo) concentration. Levels were below the License Condition 30.5 Screening Criteria.

Well #136 was sampled once in March, 1981, and not sampled subsequently as it was not considered to be in the groundwater flow regime of the affected area.

Well #137 showed generally stable concentrations with no levels encountered above the License Condition 30.5 screening criteria. A program low for Natural Uranium ($^{Nat}U$) was reported for March 26, 1987.

Well #138 had a lower average concentration for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) in 1987 than in previous years.

Well #139 has had essentially the same concentration profile for 1981-1987. A program low of 0.065 mg/l for Natural Uranium ($^{Nat}U$) was encountered on September 24, 1987. Levels exceeding the License Condition 30.5 screening criteria were noted.

Well #140 showed downward average concentrations concurrent with the cyclic dilution effect of the DeWeese Dye Ditch. Levels exceeded the License Condition 30.5 screening criteria.

Well #141, showed a downtrend for 1987 as compared to 1986 for Natural Uranium ($^{Nat}U$). All concentrations were below the License Condition 30.5 screening criteria.

Well #142 has not been sampled since June 11, 1981, due to the owner's pump being inoperable.

Well #144 exhibited stable concentrations with Molybdenum (Mo) exceeding the License Condition 30.5 screening criterion on three (3) occasions.

Well #153 had no levels above License Condition 30.5 screening criteria.

In summary, the most notable trends in offsite concentrations for the period 1981-1987 are the continuing downtrends in concentrations of mill-derived constituents in wells in Lincoln Park including #120, #124, #129 and #144. There are no noticeable trends in mill-derived constituents in wells which are not completed in the shallow ground water flow regime, including wells #106, #111, #114, #137, #141 and #153. No strong trends in Natural Uranium ($^{Nat}U$) or Molybdenum (Mo) are apparent in wells which are strongly affected by dilution from DeWeese Dye Ditch infiltration. These include #119, #123, #138, #139 and #140. However, some programs lows were reached in 1987 in some of these wells.

ONSITE LOCATIONS

In 1987, well #303 showed stable Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) concentrations. In 1985, a steady rise in Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) occurred. This water is currently of a quality similar to trench location #703. Prior to 1985, the water quality in this well was diluted by pumping of the well, causing mixing with deeper water, which is of better quality.

Well #312 showed a similar response for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) with a midyear low and a sharp rise at year's end.

Well #313 had a late year uptrend for Natural Uranium ($^{Nat}U$) while Molybdenum (Mo) exhibited a downtrend in 1987.

Well #314 had a slight downtrend for Natural Uranium ($^{Nat}U$) and a continued uptrend for Molybdenum (Mo). Total Dissolved Solids (TDS) has shown a general uptrend during the 1981-1987 monitoring program with a program high of 1310 mg/l reached on July 21, 1987. Radium-226 ($^{226}Ra$) averaged 1.3 pCi/l.

Well #315 Molybdenum (Mo) concentrations showed a sharp drop for 1987.

Well #316 had not been sampled since January 20, 1984, because it was blocked. In January, 1986, an attempt was made to

clean out this well. This location was found to be filled with silt and mud and is not repairable.

Well #317 has not been sampled since March of 1986. This well was apparently damaged during the refurbishment of well #315 and is not repairable.

Well #324 has shown stable concentrations. Continuation of the rise in water level was noted with a 0.50 foot rise from January to December, 1987.

Well #325 showed a peak for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) on November 1, 1987, while a program high for Total Dissolved Solids (TDS) was reached on September 17, 1987. A water level drop of four (4) fee ... noted in 1987. Average Radium-226 ($^{226}Ra$) concentration was 0.8 pCi/l.

Well #326 has never been sampled as it did not produce water.

Well #327 samples were obtained commencing August 7, 1985. Stable concentrations for Natural Uranium ($^{Nat}U$) with a downtrend for Molybdenum (Mo) were indicated for 1987.

Well #328 shows a continued downtrend in concentrations for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) with program lows for these constituents on November 15, 1987, and August 5, 1987, respectively.

Well #329 showed stable concentrations for Natural Uranium ($^{Nat}U$) for 1987 while Molybdenum (Mo) showed a steep rise to 2.1 mg/l on December 16, 1987. Additionally, Total Dissolved

Solids (TDS) Sulfate ($SO_4$), Sodium (Na), Magnesium (Mg) and Calcium (Ca) peaked in December, 1987, to 1981-1987 program highs. Radium-226 ($^{226}Ra$) average concentration was 1.3 pCi/l.

Well #330 showed a continued downtrend for Natural Uranium ($^{Nat}U$) with stabilized Molybdenum (Mo) concentrations.

Well #331 had a slight rise for Natural Uranium($^{Nat}U$) through 1987, with a continued strong downtrend for Molybdenum (Mo).

Well #333, which had a consistent downtrend since the middle of 1986 for Natural Uranium ($^{Nat}U$), peaked in August, 1987, and turned downward, while Molybdenum peaked in April, 1987, and trended downward.

Well #334 has shown stable concentrations.

Well #335 has Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) at stable concentrations which are believed to be background levels. The water level is 37.65 feet higher than when initially sampled in 1981.

Well #336 had stable Natural Uranium ($^{Nat}U$) concentrations, while the Molybdenum (Mo) average concentration was higher than 1986.

Well #337 had a downtrend for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) concentrations.

Well #338 has shown a downtrend for Natural Uranium ($^{Nat}U$) and a slight uptrend for Molybdenum (Mo).

Well #339 showed low levels of Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) in 1987; these levels are believed to be background concentrations.

Well #340 has exhibited concentrations very similar to well #333. Well #340 was constructed as a monitoring well for a pump test conducted on well #333.

Well #341, also a well adjacent to well #333, showed decreased concentrations possibly related to the continued pumping of well #333.

Well #342 was not sampled in 1987 until June 21, when a new means of access was found. The Natural Uranium ($^{Nat}U$) average concentration was lower for 1987 than for 1986.

Well #344 had a downtrend for Natural Uranium ($^{Nat}U$) through September, 1987, then showed a rise. Average Molybdenum (Mo) concentrations show a continuing downtrend.

In conclusion, onsite wells which are not completed in the shallow ground water system downgradient of the old ponds area exhibited unimpacted or very low Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) concentrations, and no significant or no discernible trends during the period 1981 - 1987. These wells include #316, #317, #324, #325, #334, #335, #337, #338, #339 and

#342. There are several wells which are downgradient of the old ponds area, but which are not completed in the shallow ground water system, including #329 and #336. The concentrations of Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) in these wells exhibit random variability, but no strong trends. However, Well #329 has shown a strong uptrend for Molybdenum (Mo) starting in early 1987 which was preceded by a 1985 upturn for Natural Uranium ($^{Nat}U$). Well #329 is probably on the fringe of the ground water pathway. A third group of wells onsite exhibit concentrations which are primarily a function of the rate of pumping of water in pumpback wells. These include #303, which is near trench location #703, and wells #333, #340 and #341. The concentrations of these wells are more indicative of the rate of pumping in these localized areas than of the performance of the remedial action program.

Wells in the shallow groundwater flow system which are exhibiting no uniform response to the removal of the old tailings and the operation of the pumpback system include #312, #313, #314, #315 and #327. Wells #328, #330, #331 and #344 are showing consistent downtrends in response to the remedial action measures implemented at the site.

SURFACE LOCATIONS

The upgradient Arkansas River surface location #502 showed stable concentrations relative to river flow fluctuations, i.e., when river flow is low, concentrations are high.

The downgradient Arkansas River surface location #504 also showed stable concentrations relative to river flow fluctuations.

Surface location #505, the SCS Dam reservoir, exhibited a cyclic concentration trend related to reservoir water levels. Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) peaked to program highs in September, 1987. This probably reflects the hot, dry spell encountered earlier in the summer.

Surface location #519 has shown stable concentrations for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) concentrations in 1987.

Surface location #520 showed stable concentrations with no levels exceeding License Condition 30.5 screening criteria.

Surface location #526 showed stable concentrations below License Condition 30.5 screening criteria.

Surface location #528 was sampled during two runoff events during 1987. For the sample collected August 22, 1987, Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) slightly exceeded License Condition 30.5 screening criteria.

Surface location #531 showed a slight uptrend for 1987 versus 1986.

Surface location #555 has been sampled from 1985 through 1987 to assess the Sand Creek influx to the Arkansas River. Stable concentrations exist well below the screening criteria established in the license and below the ground water objectives specified in the Remedial Action Plan (RAP).

In conclusion, offsite surface water locations show no discernible trends in concentrations of mill-derived constituents. Location #505, the pond at the SCS reservoir, exhibited upward trending for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) concentrations in 1987 related to climatological conditions.

TRENCH LOCATIONS

Trench location #701 shows a continued downtrend which started in January, 1983, for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo).

Trench location #703 showed essentially stable Natural Uranium ($^{Nat}U$) concentrations with an uptrend for Molybdenum (Mo) in 1987 as compared to 1986.

Sample location #710, which had stable concentrations for Natural Uranium ($^{Nat}U$) and an uptrend for Molybdenum (Mo) also had a peaking to a program high of 2.2 mg/l for Molybdenum (Mo) in September, 1987.

Location #711 was sampled commencing in April, 1986, after reaming the impoundment subdrain pipe in an attempt to distinguish between subdrain and toedrain pipes. Stable concentrations have existed since that time.

Sample location #712 showed a rise for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) in 1987 as compared to 1986.

Trench locations #714, #715 and #716, upgradient of the SCS reservoir, showed stable concentrations for Natural Uranium ($^{Nat}U$) and Molybdenum (Mo) which fluctuate based on ground water recharge due to precipitation.

In conclusion, the most significant trend with respect to the trenches and drains is the downward trend at #701. Molybdenum (Mo) concentrations have declined by 15% since 1983 while Natural Uranium ($^{Nat}U$) concentrations have fallen 10%.

TABLE 1.1

OFFSITE AVERAGE CONCENTRATION - 1981 - 1987
U (mg/l)

| LOCATION | 1981 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|
| 106 | 0.05 | 0.05 | 0.03 | 0.007 | 0.002 | 0.0009 |
| 111 | 0.05 | 0.05 | 0.03 | - | 0.004 | 0.0039 |
| 114 | 0.05 | 0.05 | 0.04 | 0.015 | 0.012 | 0.0134 |
| 117 | 0.08 | 0.05 | 0.062 | 0.056 | 0.046 | 0.051 |
| 118 | 0.15 | 0.05 | - | - | - | - |
| 119 | 0.15 | - | 0.12 | 0.16 | 0.154 | 0.0861 |
| 120 | 0.07 | 0.16 | 0.03 | 0.02 | 0.013 | 0.0122 |
| 122 | 0.197 | 0.05 | 0.11 | 0.12 | 0.103 | 0.080 |
| 123 | 0.08 | 0.14 | 0.064 | 0.11 | 0.05 | - |
| 124 | 0.18 | 0.08 | 0.11 | 0.11 | 0.089 | 0.0729 |
| 129 | 0.07 | 0.13 | 0.06 | 0.06 | 0.063 | 0.0665 |
| 135 | 0.05 | 0.06 | - | - | 0.004 | 0.040 |
| 136 | 0.05 | - | - | - | - | - |
| 137 | 0.05 | - | 0.04 | 0.028 | 0.021 | 0.015 |
| 138 | 0.91 | 0.05 | 0.47 | 0.78 | 0.617 | 0.5775 |
| 139 | 0.44 | 0.50 | 0.29 | 0.29 | 0.277 | 0.2589 |
| 140 | 0.48 | 0.32 | 0.31 | 0.30 | 0.249 | 0.2795 |
| 141 | 0.05 | 0.35 | 0.04 | - | 0.0058 | 0.0044 |
| 142 | 0.34 | 0.05 | - | - | - | - |
| 144 | 0.07 | 0.06 | 0.05 | 0.06 | 0.033 | 0.0382 |
| 153 | 0.07 | 0.05 | 0.03 | 0.0011 | 0.0006 | 0.0008 |

TABLE 1.2

OFFSITE AVERAGE CONCENTRATION - 1981 - 1987
Mo (mg/l)

| LOCATION | 1981 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|
| 106 | 0.05 | 0.05 | 0.03 | 0.02 | 0.006 | 0.006 |
| 111 | 0.05 | 0.05 | 0.03 | - | 0.005 | 0.006 |
| 114 | 0.06 | 0.05 | 0.035 | 0.011 | 0.007 | 0.008 |
| 117 | 0.52 | 0.48 | 0.57 | 0.43 | 0.276 | 0.309 |
| 118 | 1.11 | - | - | - | - | 0.517 |
| 119 | 1.11 | 1.29 | 0.78 | 1.05 | 1.010 | 0.092 |
| 120 | 0.22 | 0.19 | 0.22 | 0.11 | 0.102 | - |
| 122 | 0.63 | 0.59 | 0.59 | 0.48 | 0.395 | 0.387 |
| 123 | 0.37 | 0.36 | 0.44 | 0.64 | 0.500 | - |
| 124 | 0.69 | 0.48 | 0.47 | 0.41 | 0.367 | 0.341 |
| 129 | 0.58 | 0.49 | 0.43 | 0.37 | 0.303 | 0.244 |
| 135 | 0.05 | - | - | - | 0.005 | 0.008 |
| 136 | 0.02 | - | - | - | - | - |
| 137 | 0.05 | 0.05 | 0.029 | 0.006 | 0.006 | 0.008 |
| 138 | 8.36 | 6.47 | 6.70 | 9.7 | 7.170 | 6.680 |
| 139 | 3.38 | 2.78 | 2.87 | 2.67 | 3.250 | 3.440 |
| 140 | 4.13 | 3.61 | 3.24 | 2.76 | 2.160 | 2.420 |
| 141 | 0.11 | 0.06 | 0.04 | - | 0.040 | 0.038 |
| 142 | 2.74 | - | - | - | - | - |
| 144 | 0.55 | 0.42 | 0.42 | 0.35 | 0.219 | 0.211 |
| 153 | 0.19 | 0.05 | 0.035 | 0.021 | 0.009 | 0.007 |

TABLE 1.3

ONSITE AVERAGE CONCENTRATIONS - 1081 - 1987
U (mg/l)

| LOCATIONS | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|
| | 5.94 | 5.06 | 2.98 | 18.43 | 33.86 | 32.9 | |
| 312 | 5.69 | 5.28 | 4.74 | 4.93 | 5.26 | 4.69 | |
| 313 | 6.20 | 5.64 | 5.46 | 4.92 | 5.48 | 5.38 | |
| 314 | 0.06 | 0.05 | 0.04 | 0.005 | 0.006 | 0.0032 | |
| 315 | 0.05 | 0.05 | 0.05 | - | 0.002 | 0.0014 | |
| 316 | 0.05 | 0.05 | 0.05 | - | - | - | |
| 317 | 0.05 | 0.05 | 0.039 | 0.018 | 0.026 | - | |
| 324 | 0.05 | 0.05 | 0.036 | 0.005 | 0.003 | 0.0021 | |
| 325 | 0.06 | 0.05 | 0.04 | 0.016 | 0.0147 | 0.0214 | |
| 327 | 0.10 | - | - | 0.015 | 0.014 | 0.0123 | |
| 328 | 0.05 | 0.05 | 0.038 | 0.015 | 0.0097 | 0.0031 | |
| 329 | 0.22 | 0.10 | 0.129 | 0.420 | 0.358 | 0.3658 | |
| 330 | 4.61 | 4.58 | 4.16 | 3.58 | 3.43 | 3.28 | |
| 331 | 3.86 | 3.50 | 2.79 | 2.71 | 2.62 | 2.74 | |
| 333 | 5.77 | 5.28 | 4.91 | 5.60 | 5.24 | 4.37 | |
| 334 | 0.05 | 0.05 | 0.028 | 0.0039 | 0.0043 | 0.0022 | |
| 335 | 0.05 | 0.05 | 0.05 | - | 0.003 | 0.0014 | |
| 336 | 0.08 | - | - | - | 0.113 | 0.10 | |
| 337 | 0.07 | 0.05 | 0.029 | 0.036 | 0.009 | 0.0032 | |
| 338 | 0.05 | 0.05 | 0.038 | 0.028 | 0.028 | 0.0251 | |
| 339 | 0.05 | 0.05 | 0.034 | 0.061 | 0.002 | 0.0019 | |
| 340 | 4.28 | 1.88 | 2.99 | 5.8 | 4.88 | 4.25 | |
| 341 | 0.71 | 0.44 | 1.05 | 2.57 | 4.05 | 0.89 | |
| 342 | 0.05 | - | - | - | 0.006 | 0.0007 | |
| 344 | 0.05 | 8.56 | 9.58 | 9.90 | 8.22 | 7.07 | |

TABLE 1.4

ONSITE AVERAGE CONCENTRATIONS - 1981 - 1987
Mo (mg/l)

| LOCATIONS | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|
| 303 | 31.8 | 35.3 | 20.0 | 133.0 | 203.0 | 182.5 | |
| 312 | 31.5 | 28.4 | 29.5 | 23.9 | 26.9 | 25.3 | |
| 313 | 37.8 | 36.6 | 35.1 | 28.6 | 31.6 | 30.0 | |
| 314 | 0.28 | 0.10 | 0.104 | 0.264 | 0.466 | 0.62 | |
| 315 | 0.30 | 0.74 | 0.390 | - | 0.291 | 0.085 | |
| 316 | 0.06 | 0.05 | 0.05 | - | - | - | |
| 317 | 0.10 | 0.07 | 0.034 | 0.013 | 0.012 | - | |
| 324 | 0.09 | 0.06 | 0.036 | 0.007 | 0.006 | 0.009 | |
| 325 | 0.09 | 0.05 | 0.03 | 0.012 | 0.0089 | 0.0515 | |
| 327 | 0.84 | - | - | 0.226 | 0.383 | 0.32 | |
| 328 | 0.06 | 0.06 | 0.047 | 0.026 | 0.020 | 0.015 | |
| 329 | 0.10 | 0.05 | 0.085 | 0.008 | 0.007 | 0.842 | |
| 330 | 20.2 | 21.8 | 19.8 | 17.4 | 15.65 | 15.2 | |
| 331 | 21.2 | 24.5 | 19.4 | 20.2 | 17.6 | 14.4 | |
| 333 | 13.0 | 9.0 | 10.0 | 10.6 | 10.03 | 8.6 | |
| 334 | 0.07 | 0.05 | 0.029 | 0.007 | 0.007 | 0.006 | |
| 335 | 0.08 | 0.05 | 0.05 | - | 0.007 | 0.005 | |
| 336 | 0.07 | - | - | - | 0.016 | 0.036 | |
| 337 | 0.07 | 0.05 | 0.03 | 0.006 | 0.007 | 0.007 | |
| 338 | 0.06 | 0.05 | 0.03 | 0.007 | 0.006 | 0.008 | |
| 339 | 0.12 | 0.05 | 0.02 | 0.038 | 0.005 | 0.0061 | |
| 340 | 9.27 | 5.55 | 6.15 | 11.2 | 10.1 | 10.4 | |
| 341 | 2.8 | 1.0 | 2.43 | 4.61 | 7.18 | 1.825 | |
| 342 | 0.05 | - | - | - | 0.005 | 0.005 | |
| 344 | 3.67 | 22.3 | 24.2 | 27.6 | 22.8 | 16.8 | |

TABLE 1.5

SURFACE LOCATIONS AVERAGE CONCETRATIONS - 1981 - 1987
U (mg/l)

| LOCATIONS | 1981 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|
| 502 | 0.05 | 0.05 | 0.03 | 0.005 | 0.005 | 0.0051 |
| 504 | 0.05 | 0.05 | 0.03 | 0.005 | 0.005 | 0.0059 |
| 505 | 2.47 | 2.40 | 2.03 | 3.24 | 2.63 | 3.36 |
| 519 | 0.06 | 0.05 | 0.028 | 0.003 | 0.002 | 0.0016 |
| 520 | 0.05 | 0.06 | 0.030 | 0.002 | 0.002 | 0.0014 |
| 526 | 0.05 | 0.05 | 0.026 | 0.002 | 0.001 | 0.0016 |
| 528 | 2.47 | - | 0.19 | 0.45 | 0.090 | 0.0795 |
| 531 | 0.11 | - | 0.078 | 0.106 | 0.092 | 0.0938 |
| 555 | - | - | - | 0.0152 | 0.0139 | 0.0152 |

TABLE 1.6

SURFACE LOCATIONS AVERAGE CONCENTRATIONS - 1981 - 1987
Mo (mg/l)

| LOCATIONS | 1981 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|
| 502 | 0.05 | 0.07 | 0.036 | 0.005 | 0.005 | 0.0058 |
| 504 | 0.07 | 0.05 | 0.032 | 0.007 | 0.006 | 0.0065 |
| 5 | 6.80 | 5.66 | 4.35 | 5.95 | 4.30 | 5.66 |
| 529 | 0.06 | 0.05 | 0.064 | 0.025 | 0.008 | 0.009 |
| 520 | 0.05 | 0.05 | 0.03 | 0.007 | 0.005 | 0.005 |
| 526 | 0.05 | 0.05 | 0.03 | 0.006 | 0.005 | 0.005 |
| 528 | .27 | - | 0.52 | 0.421 | 0.178 | 0.315 |
| 531 | 0.19 | - | 0.034 | 0.013 | 0.014 | 0.0204 |
| 555 | - | - | - | 0.007 | 0.0072 | 0.0083 |

TABLE 1.7

TRENCH LOCATIONS AVERAGE CONCENTRATIONS - 1981 - 1987
U (mg/l)

| LOCATIONS | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|
| 701 | 91.4 | 108 | 105 | 101 | 97.7 | 97.9 | |
| 703 | 40.3 | 37.2 | 37.75 | 35.6 | 33.2 | 34.2 | |
| 710 | 0.81 | 0.65 | 0.50 | 0.62 | 0.55 | 0.539 | |
| 711 | - | - | - | - | 8.8 | 8.70 | |
| 712 | 8.03 | 8.37 | 8.56 | 8.78 | 6.89 | 7.98 | |
| 714 | 3.89 | 3.95 | 3.79 | 3.26 | 3.41 | 3.72 | |
| 715 | 2.72 | 2.49 | 2.61 | 2.50 | 2.13 | 2.05 | |
| 716 | 1.45 | 1.64 | 1.63 | 1.38 | 1.19 | 1.11 | |

TABLE 1.8

TRENCH LOCATIONS AVERAGE CONCENTRATIONS - 1981 - 1987
Mo (mg/l)

| LOCATIONS | 1981<br>1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|
| 702 | 242 | 251 | 249 | 239 | 214 | 203 |
| 703 | 174 | 159 | 154.8 | 147.9 | 141.3 | 148.4 |
| 710 | 0.38 | 0.18 | 0.324 | 1.28 | 0.62 | 1.50 |
| 711 | - | - | - | - | 35.3 | 32.2 |
| 712 | 23 | 23 | 25 | 28.6 | 19.6 | 24.1 |
| 714 | 10.8 | 14.2 | 11.5 | 13.6 | 9.35 | 9.72 |
| 715 | 3.[illegible] | 4.23 | 3.55 | 3.76 | 2.65 | 2.92 |
| 716 | 1.[illegible] | 2.18 | 2.04 | 1.78 | 1.36 | 1.34 |

FIGURE 1.1

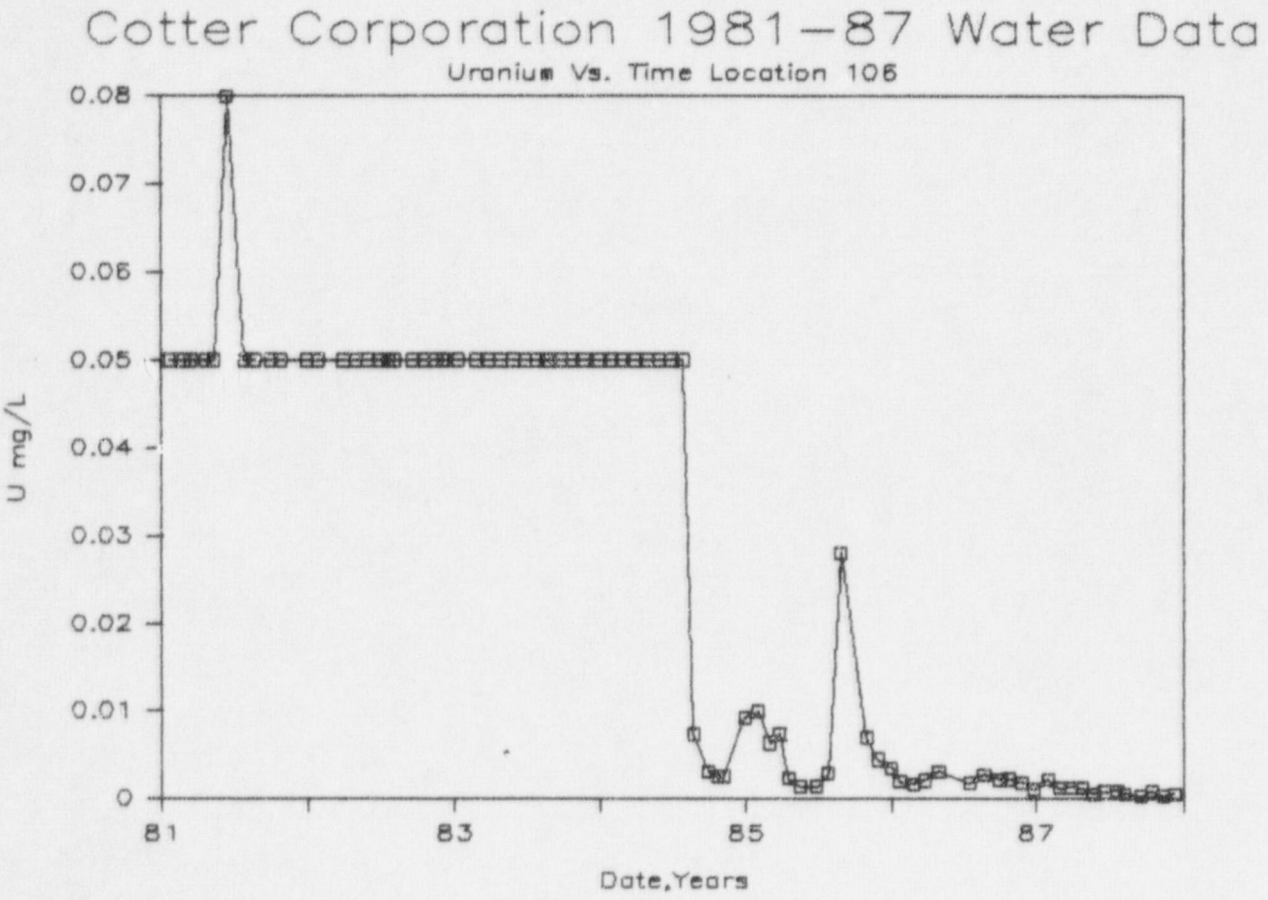

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 106
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
Date,Years

FIGURE 1.2

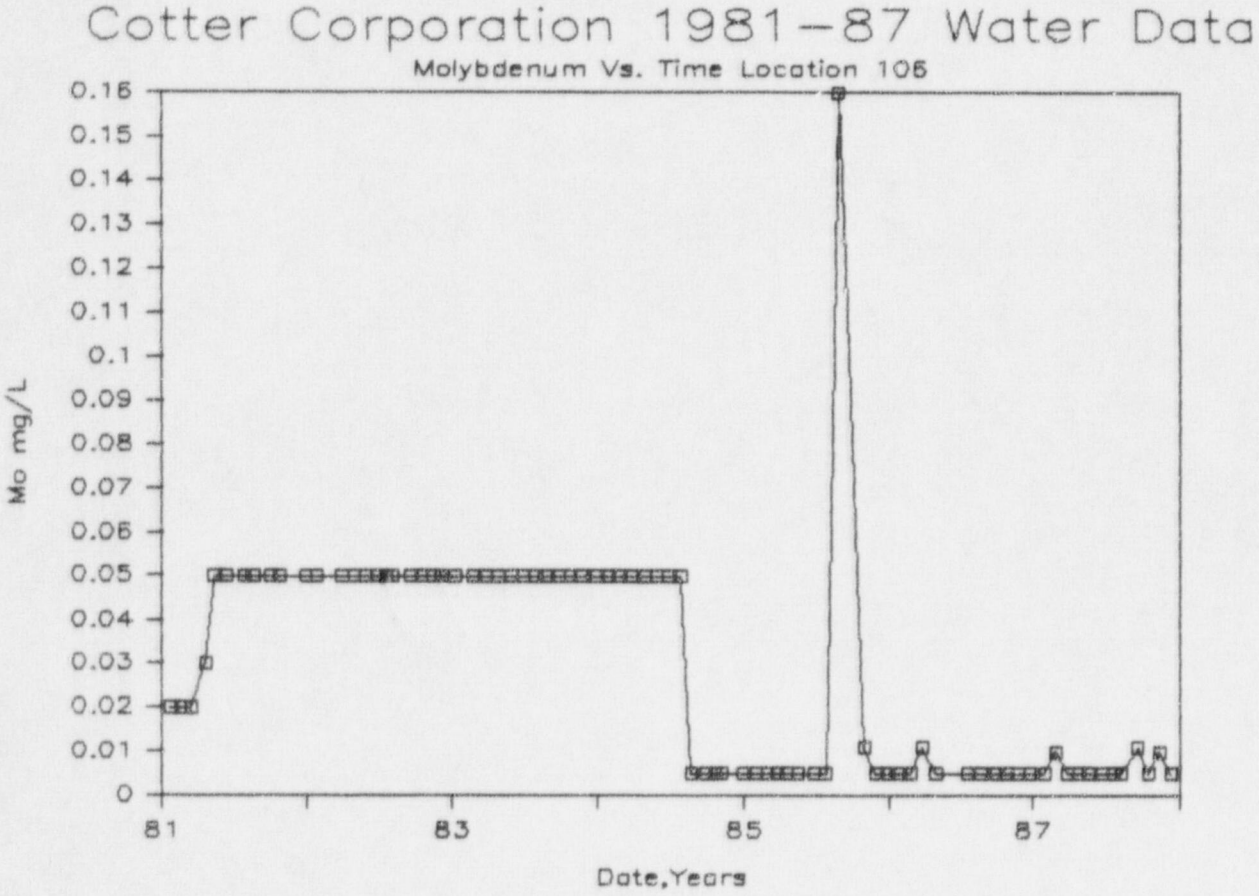

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 105
Mo mg/L
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.3

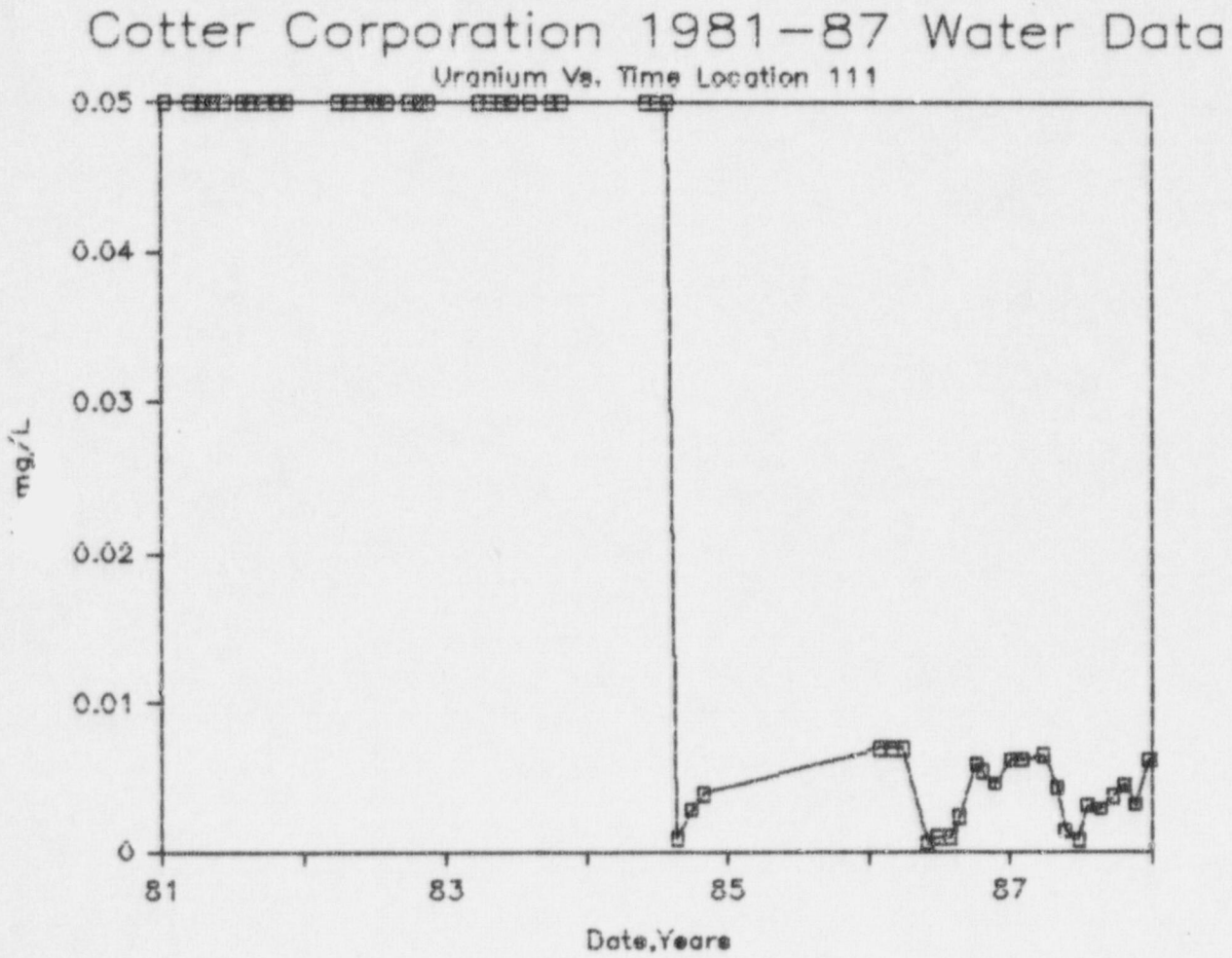

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 111
0.05
0.04
0.03
0.02
0.01
0
mg/L
81
83
85
87
Date,Years

FIGURE 1.4

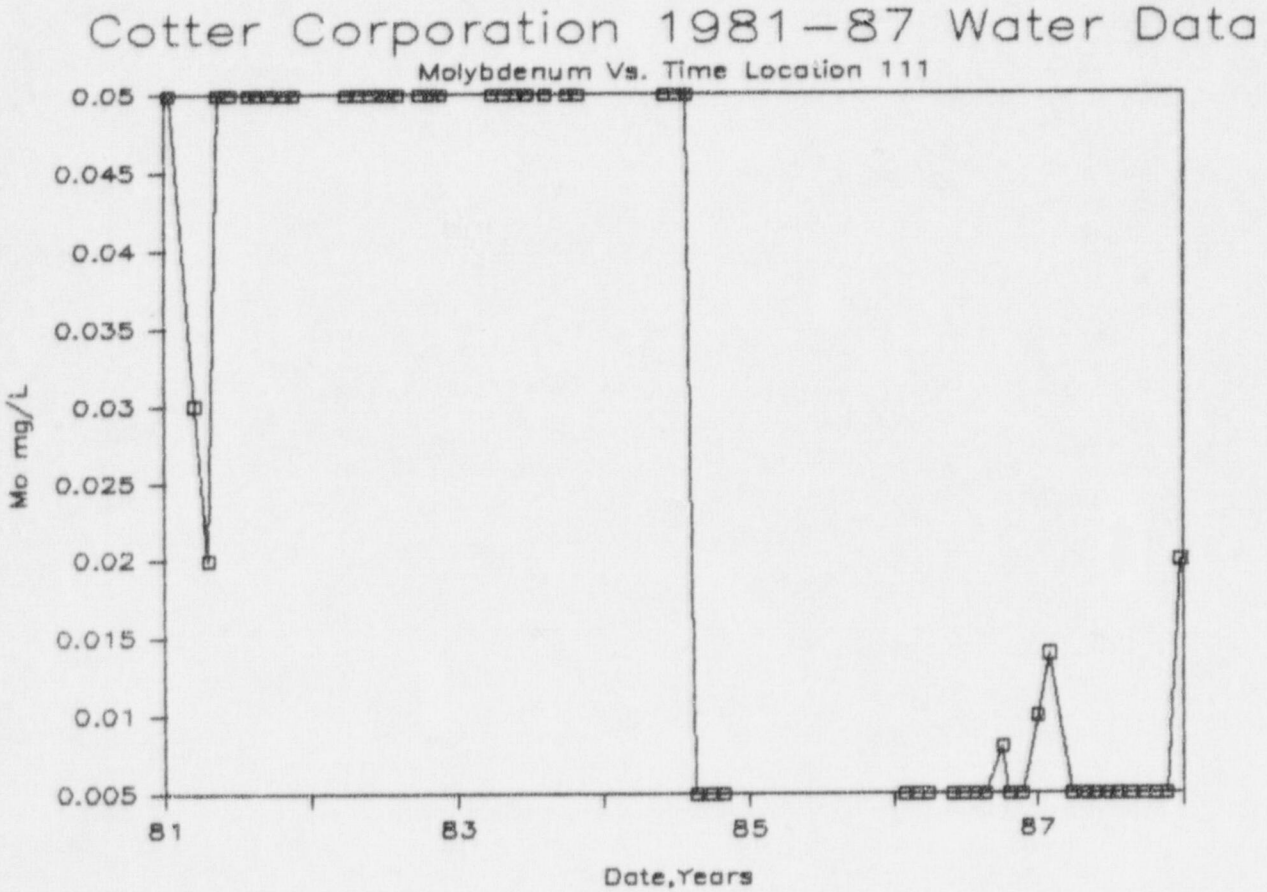

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 111
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
Mo mg/L
81
83
85
87
Date,Years

FIGURE 1.5

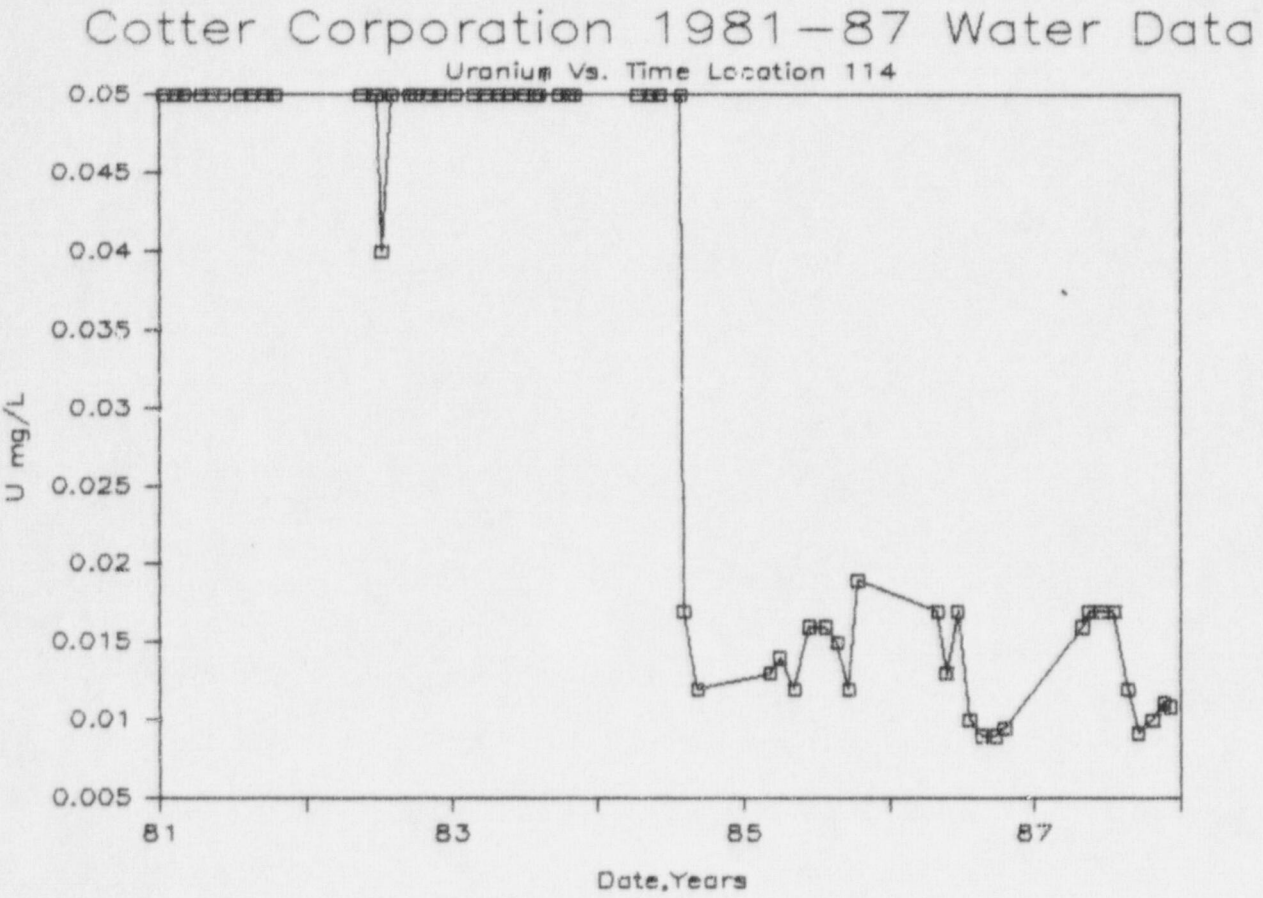

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 114
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
U mg/L
81
83
85
87
Date,Years

FIGURE 1.6

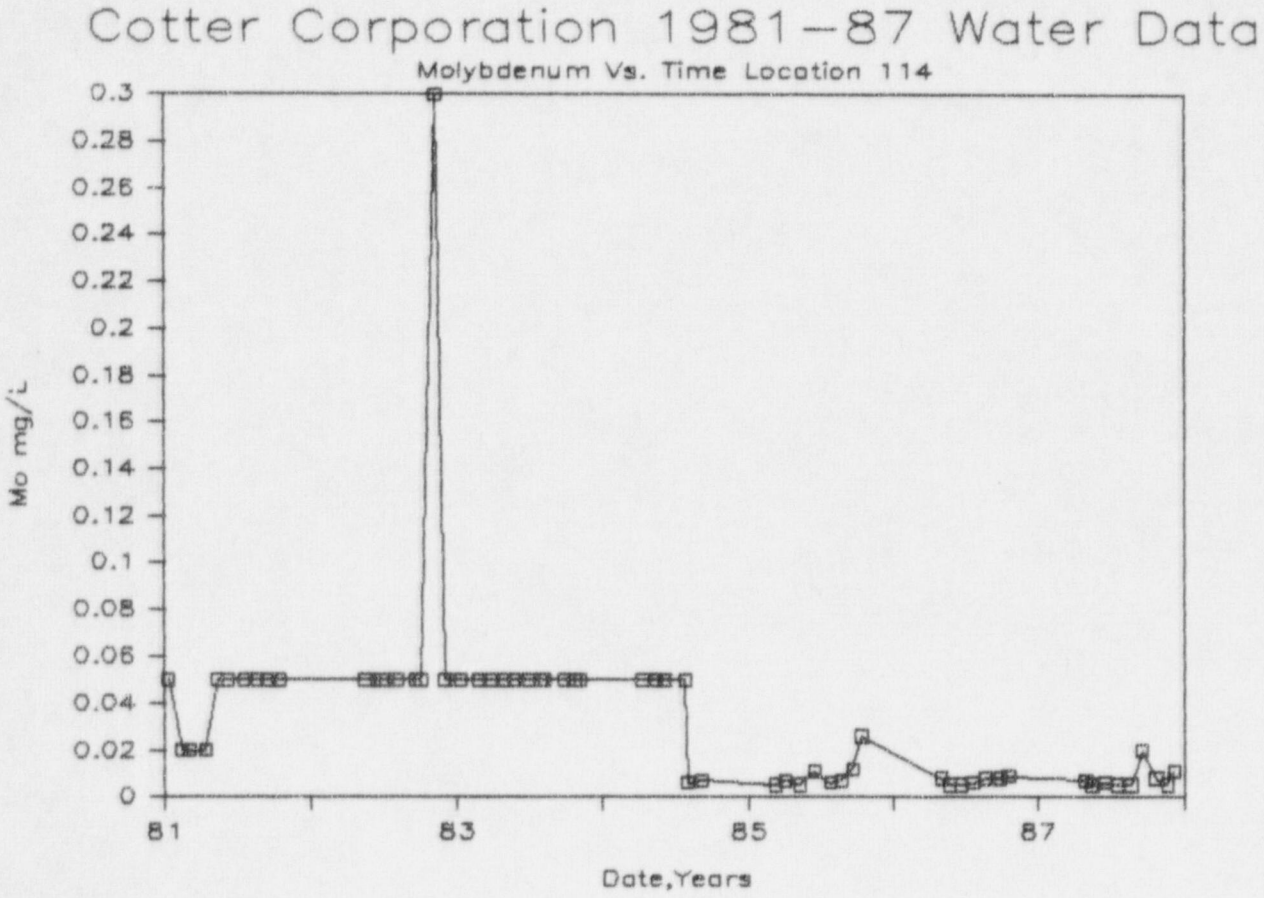

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 114
Mo mg/L
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
81
83
85
87
Date,Years

FIGURE 1.7

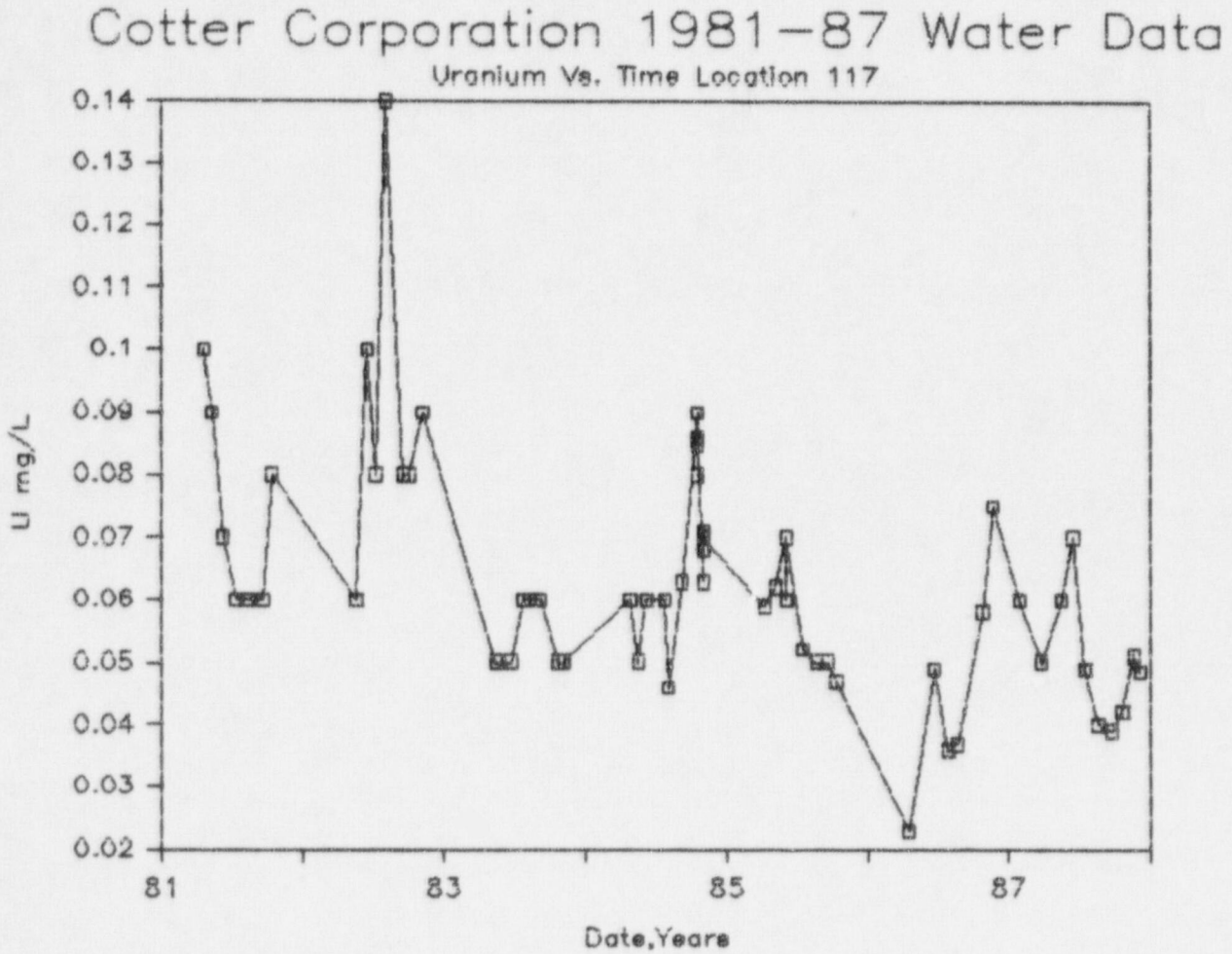

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 117
U mg/L
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
81
83
85
87
Date,Years

FIGURE 1.8

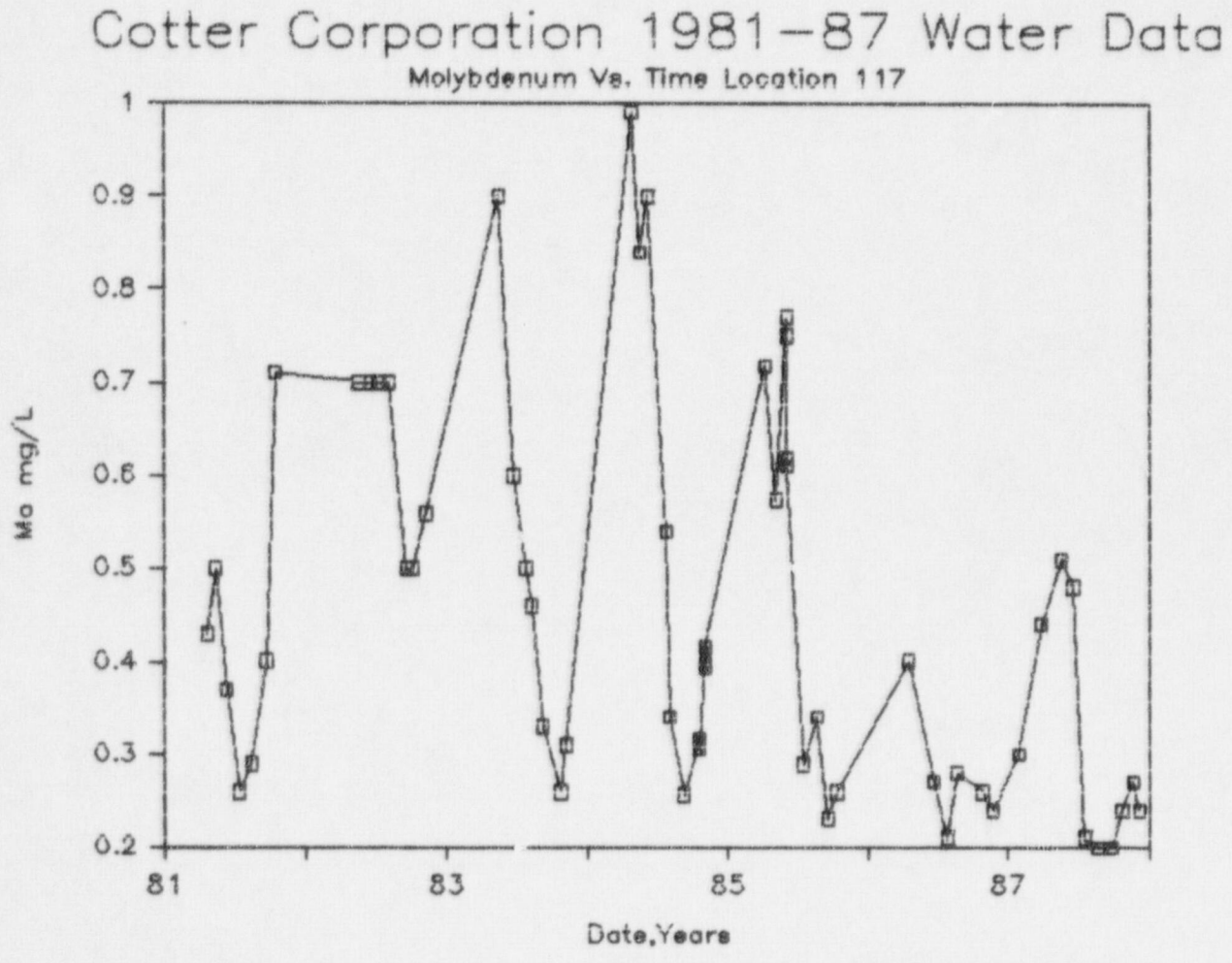

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 117
Mo mg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
81
83
85
87
Date,Years

FIGURE 1.9

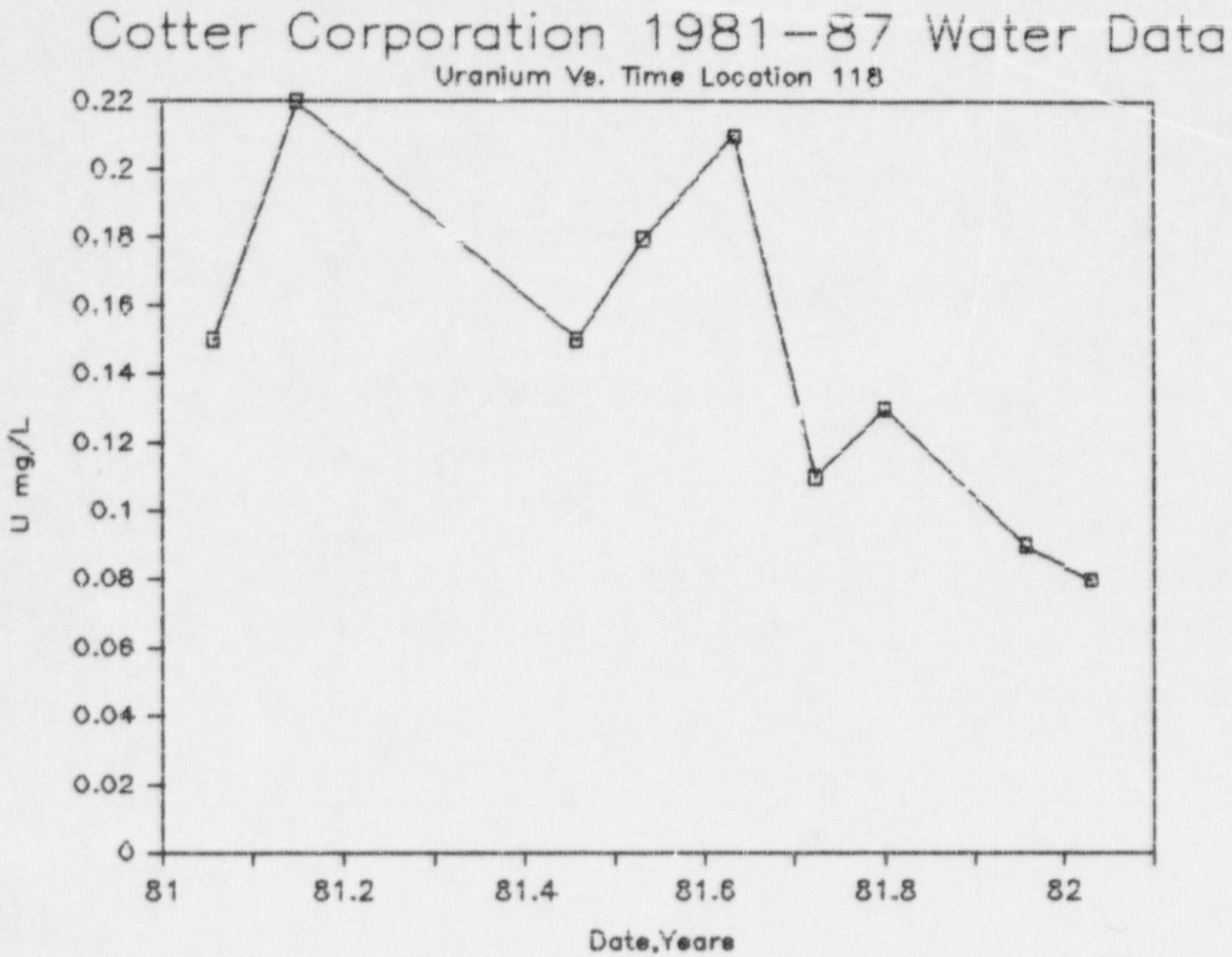

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 118
U mg/L
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
81
81.2
81.4
81.6
81.8
82
Date,Yeare

FIGURE 1.10

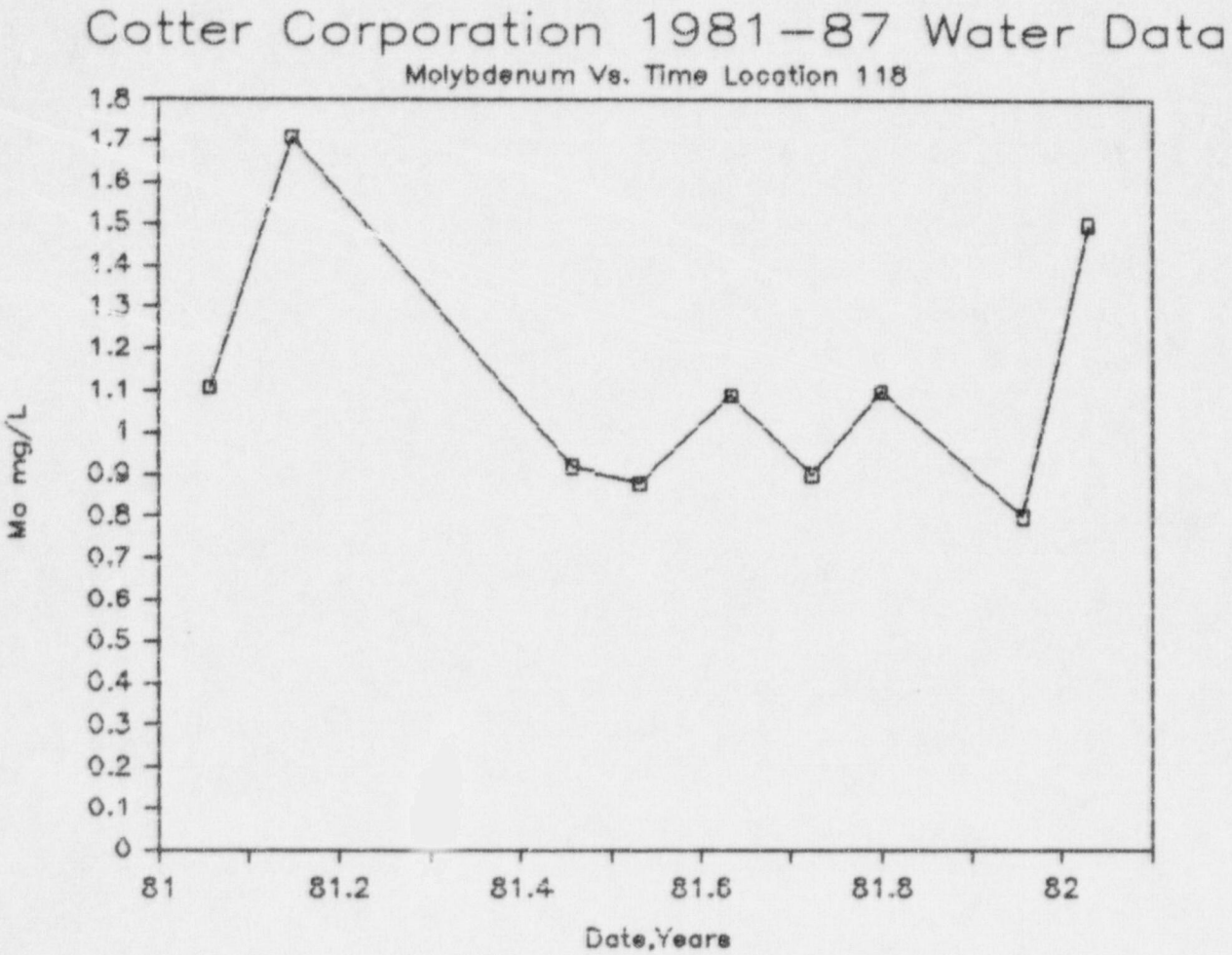

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 118
Mo mg/L
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
81.2
81.4
81.6
81.8
82
Date,Years

FIGURE 1.11

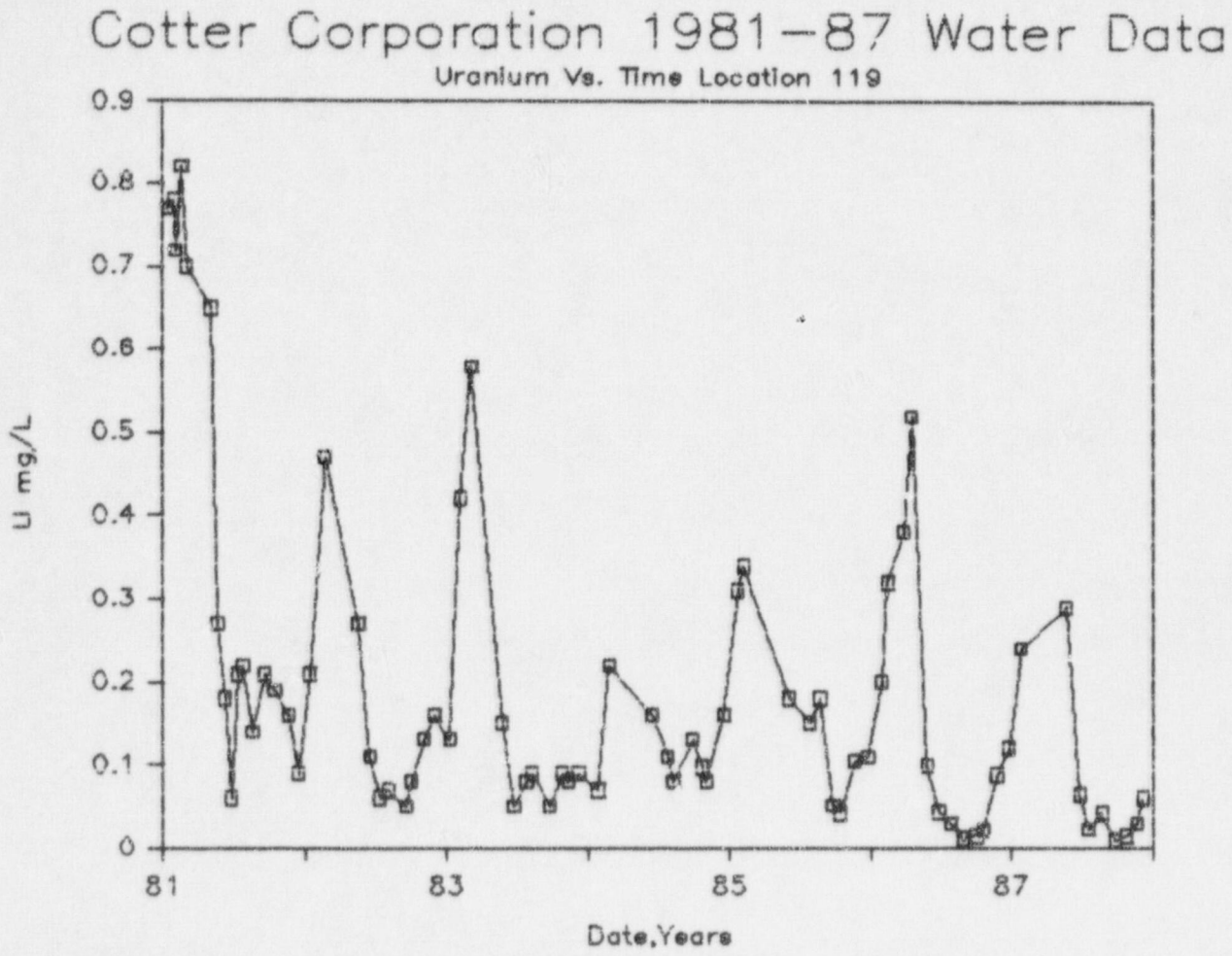

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 119
U mg/L
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.12

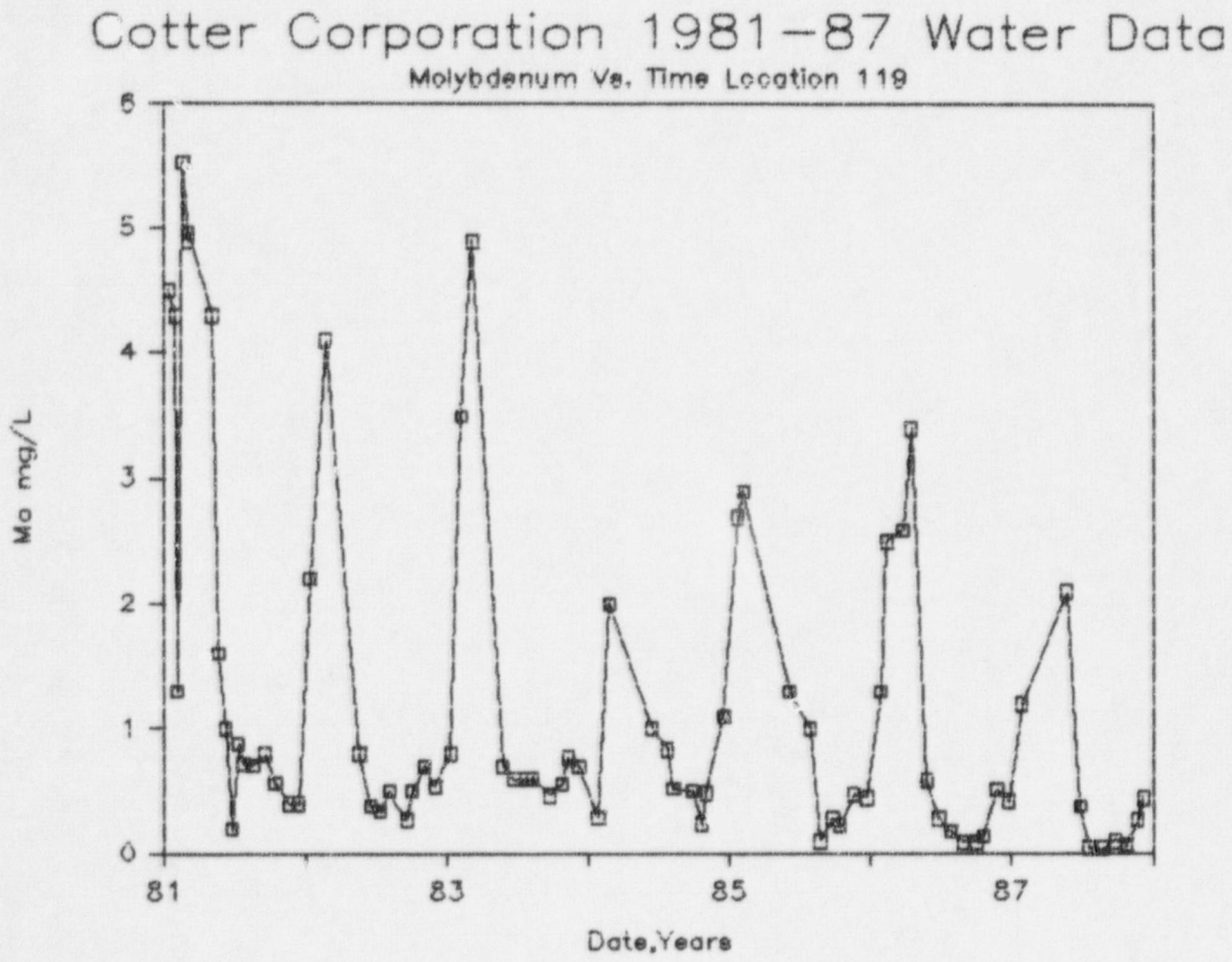

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 119
Mo mg/L
0
1
2
3
4
5
6
81
83
85
87
Date,Years

FIGURE 1.13

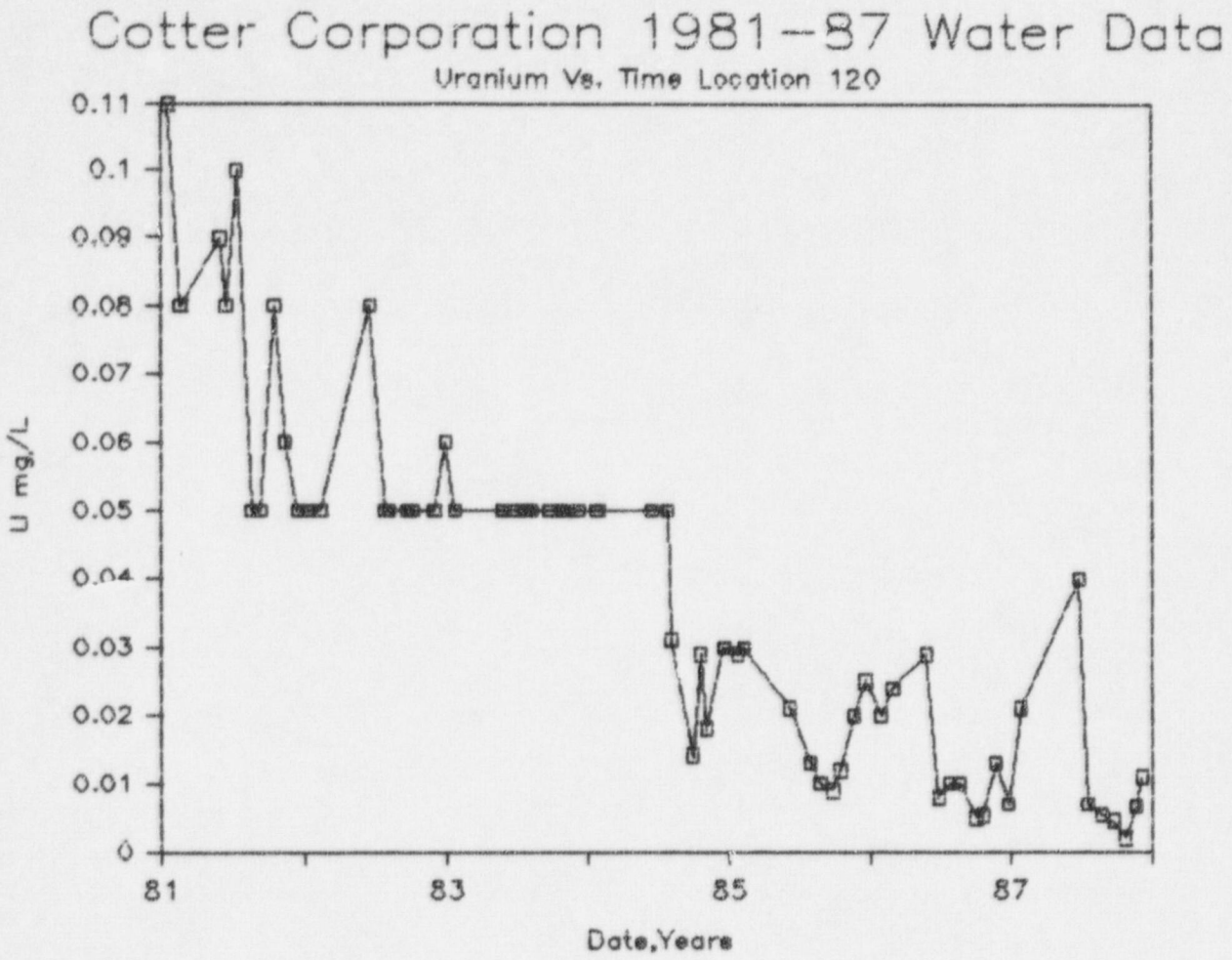

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 120
U mg/L
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.14

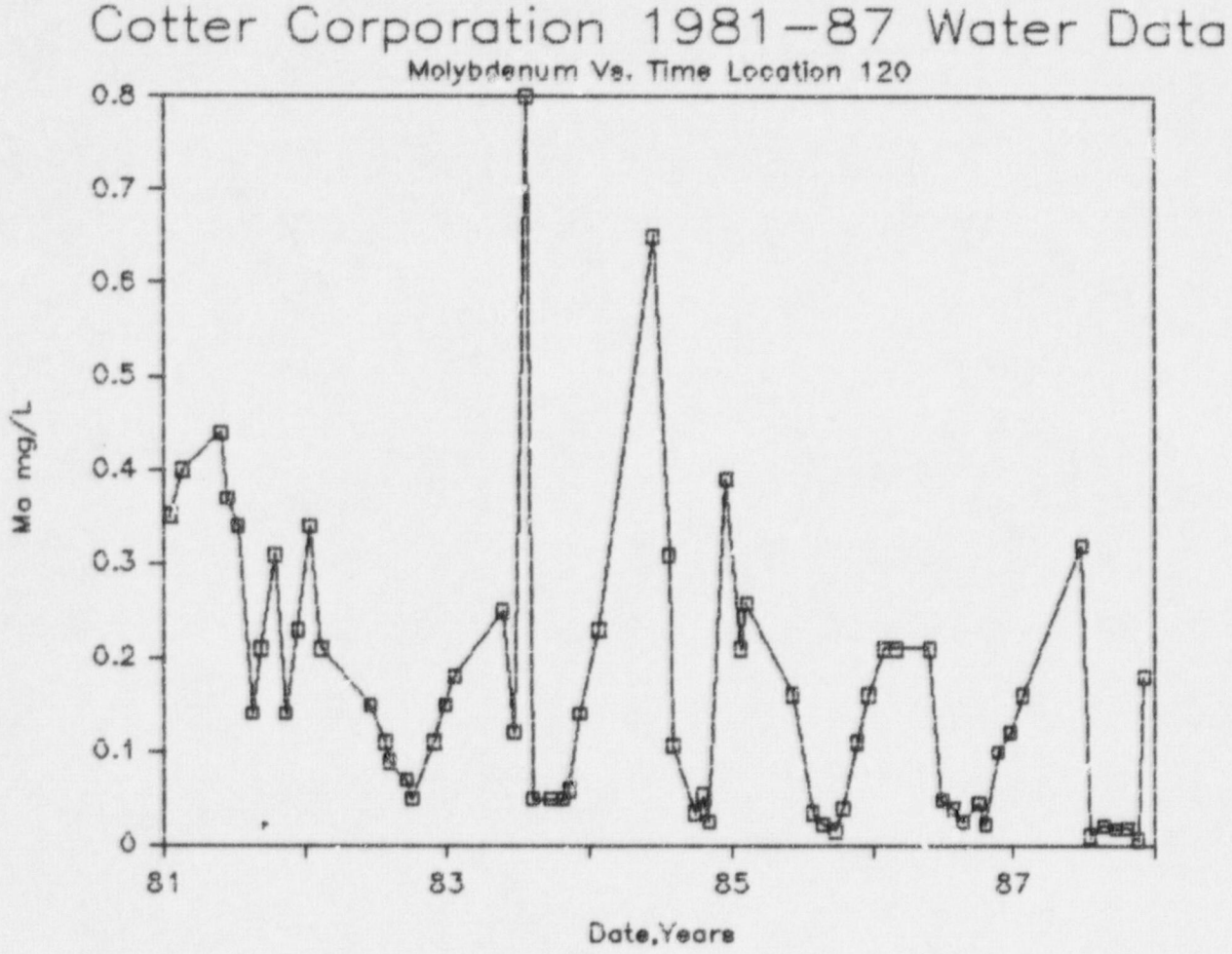

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 120
Mo mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.15

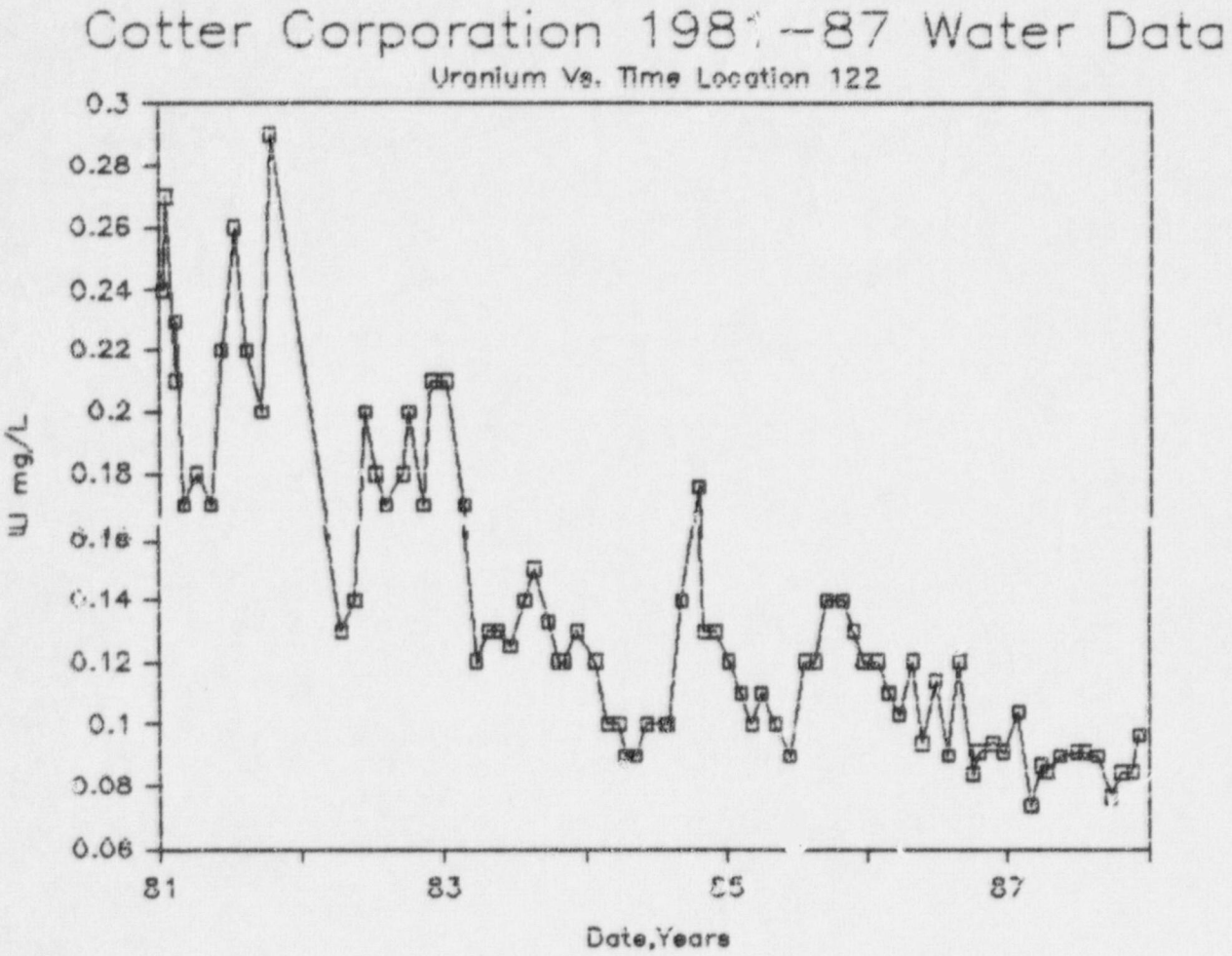

Cotter Corporation 198?-87 Water Data
Uranium Vs. Time Location 122
U mg/L
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
81
83
85
87
Date,Years

FIGURE 1.16

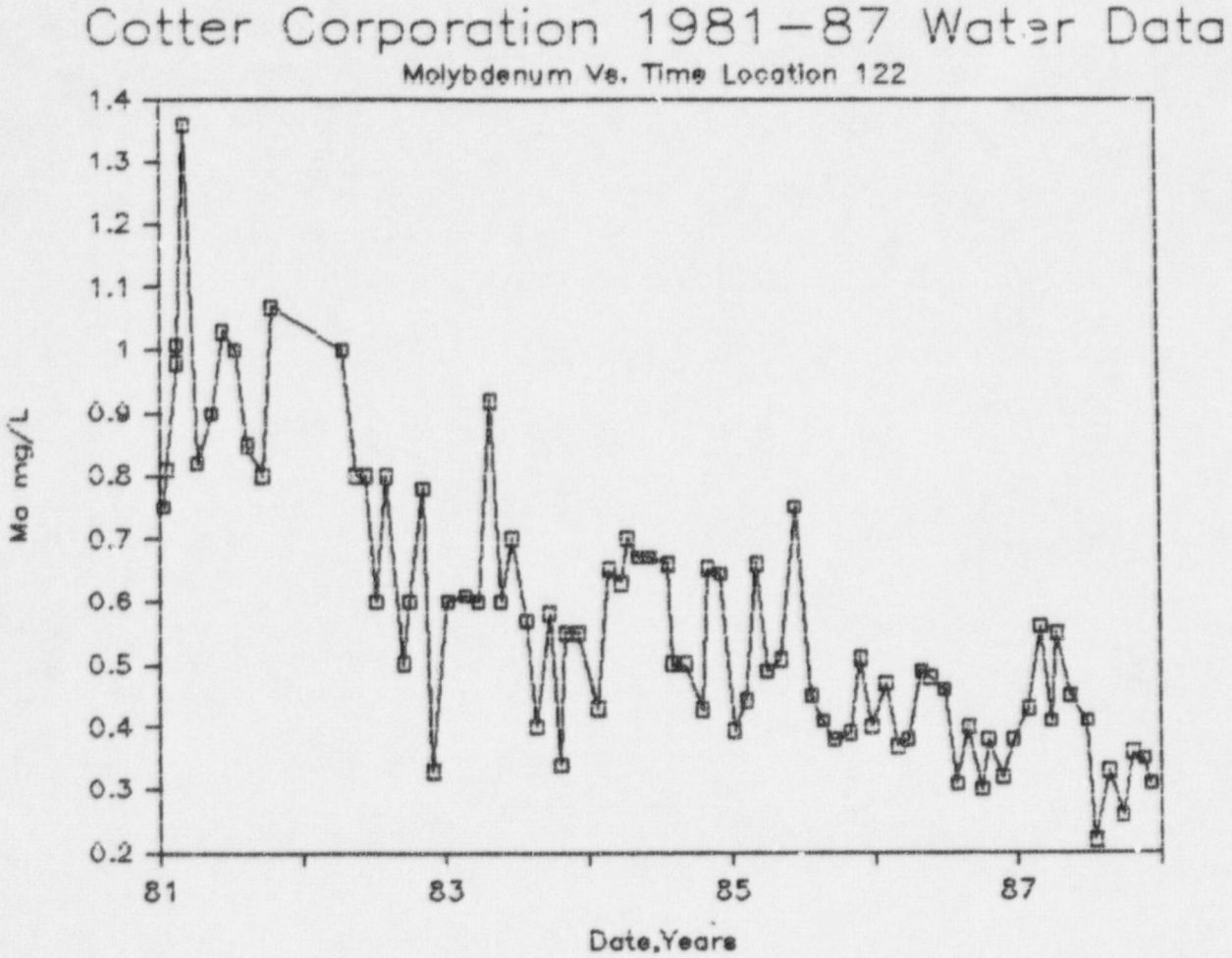

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 122
Mo mg/L
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
81
83
85
87
Date,Years

FIGURE 1.17

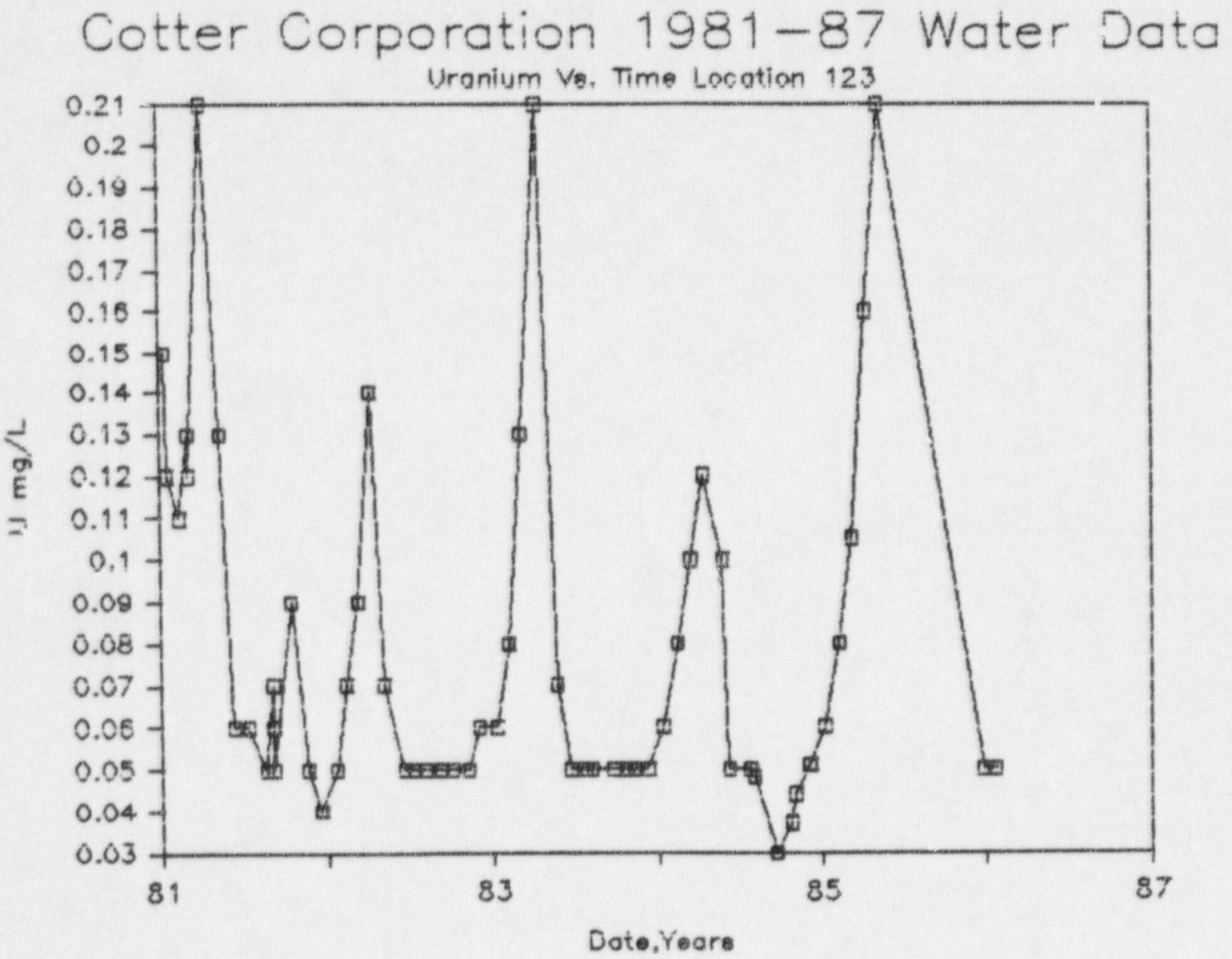

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 123
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
U mg/L
81
83
85
87
Date,Years

FIGURE 1.18

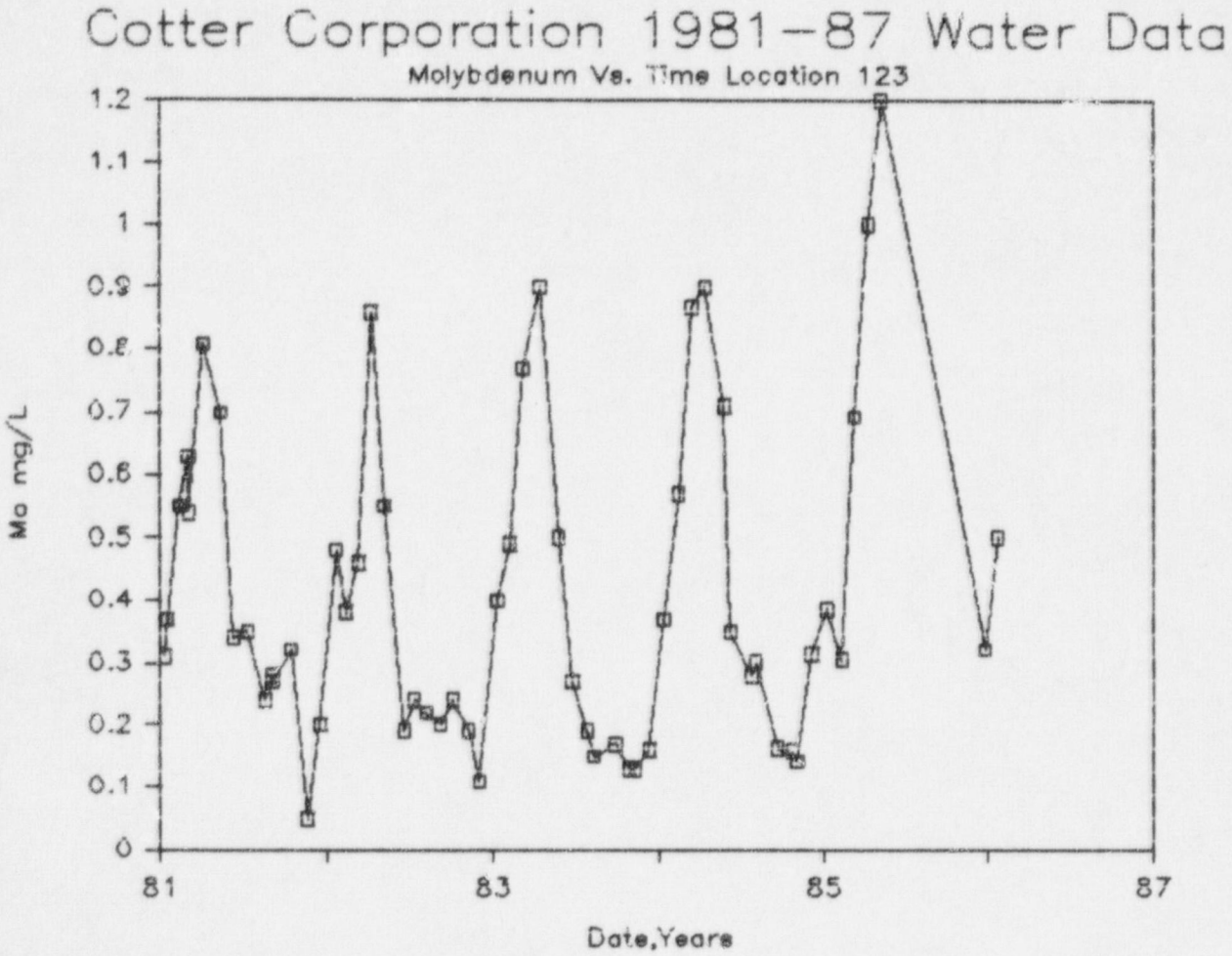

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 123
Mo mg/L
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.19

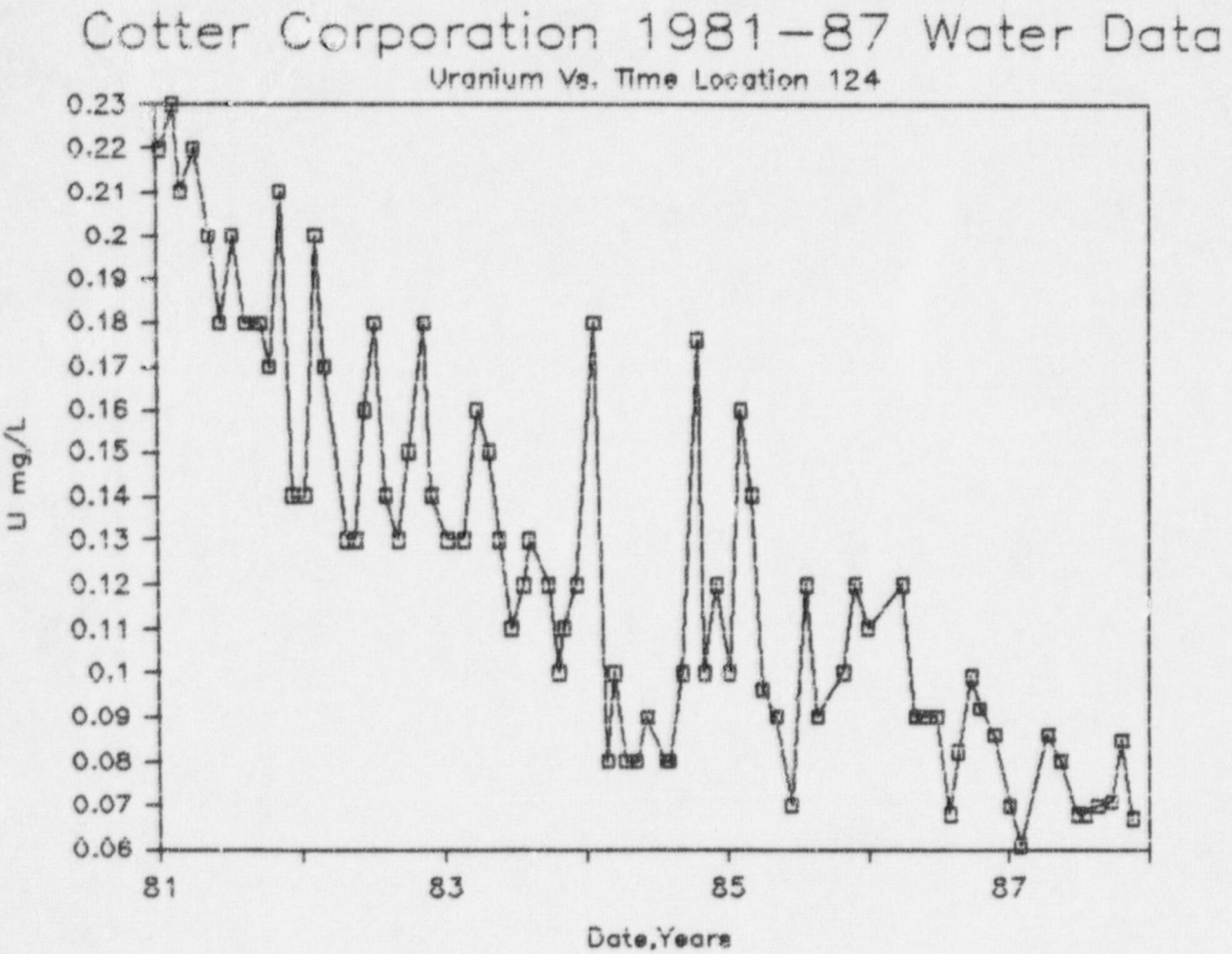

Cotter Corporation 1981—87 Water Data
Uranium Vs. Time Location 124
U mg/L
0.23
0.22
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
81
83
85
87
Date,Years

FIGURE 1.20

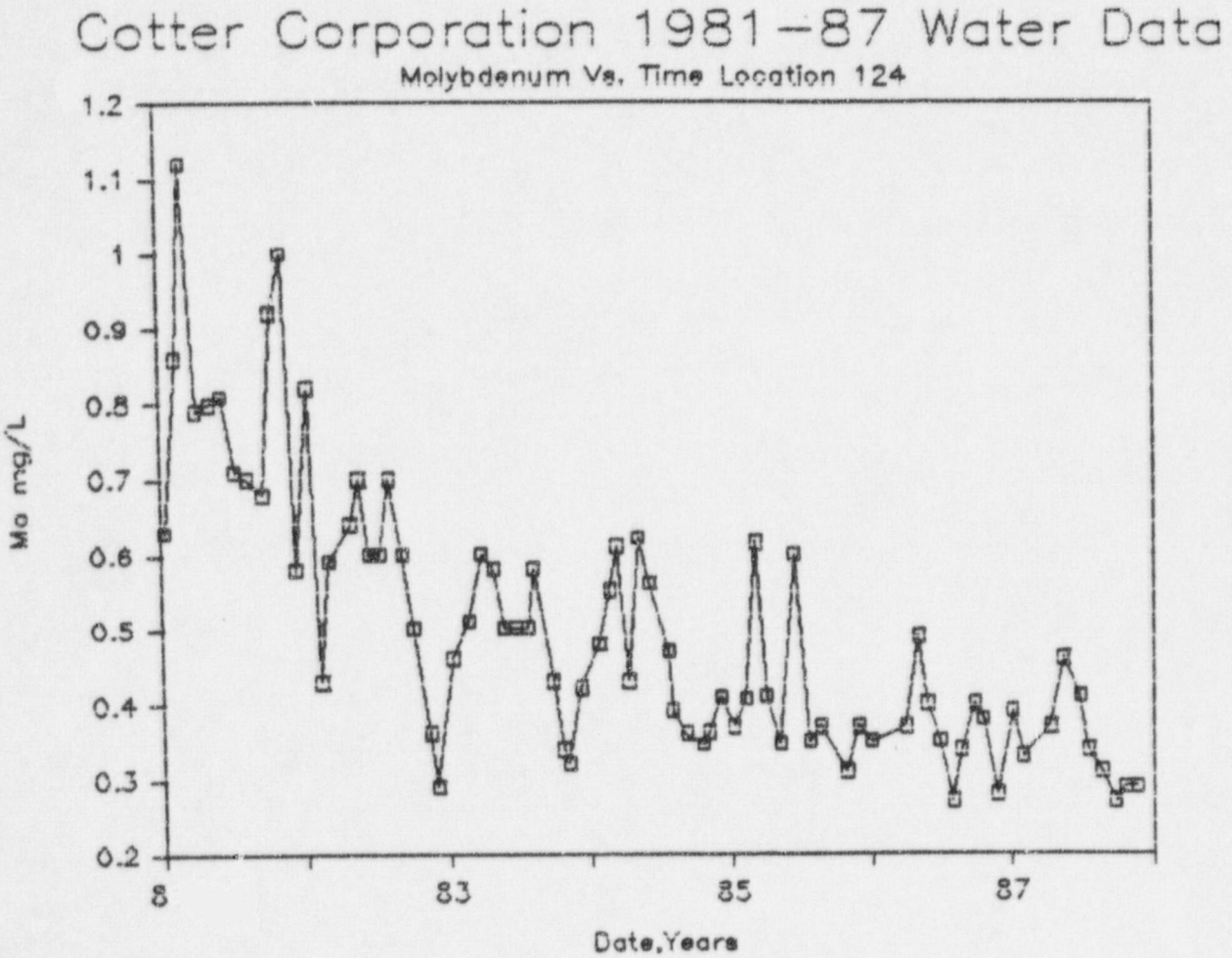

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 124
Mo mg/L
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
8
83
85
87
Date,Years

FIGURE 1.21

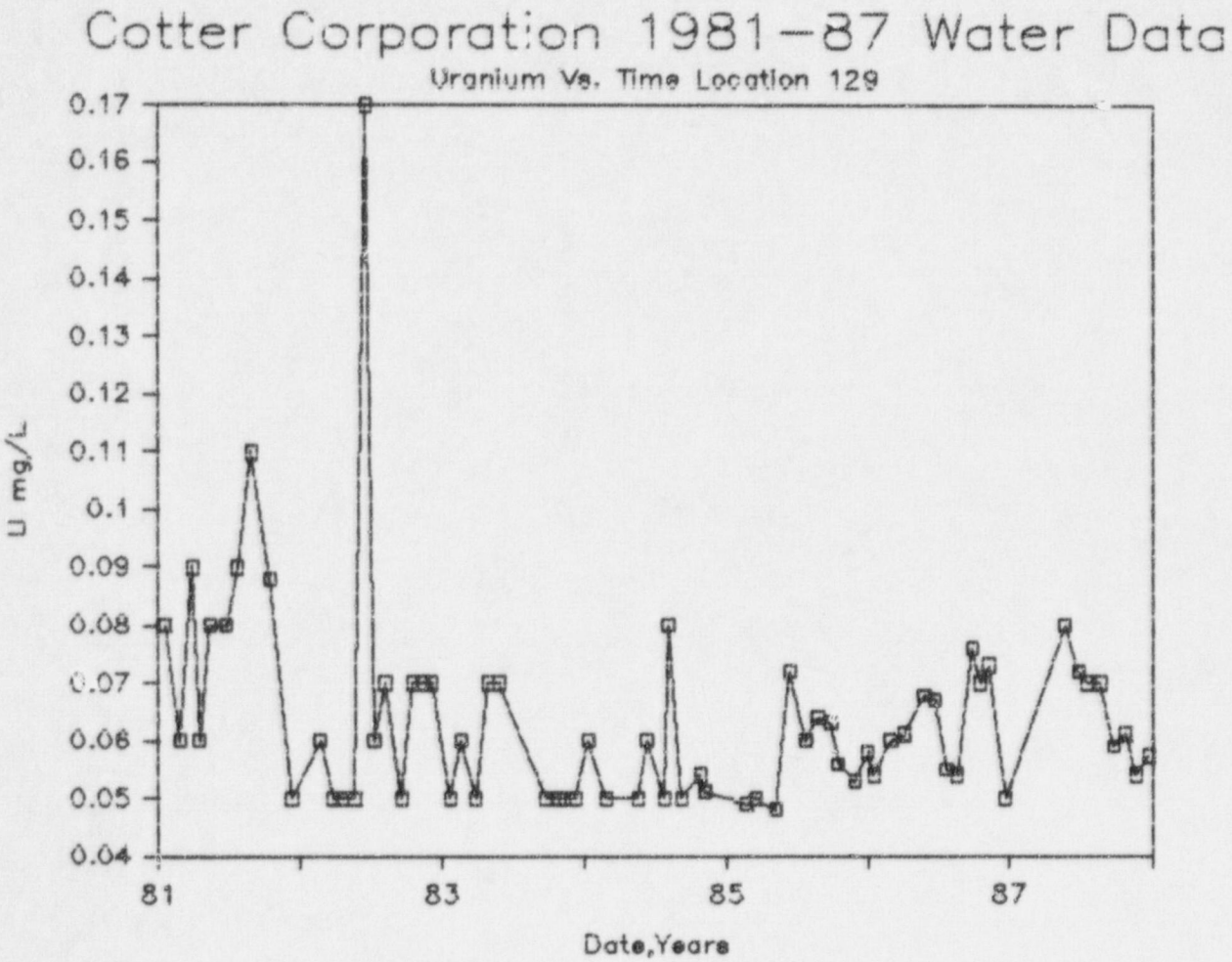

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 129
U mg/L
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
81
83
85
87
Date,Years

FIGURE 1.22

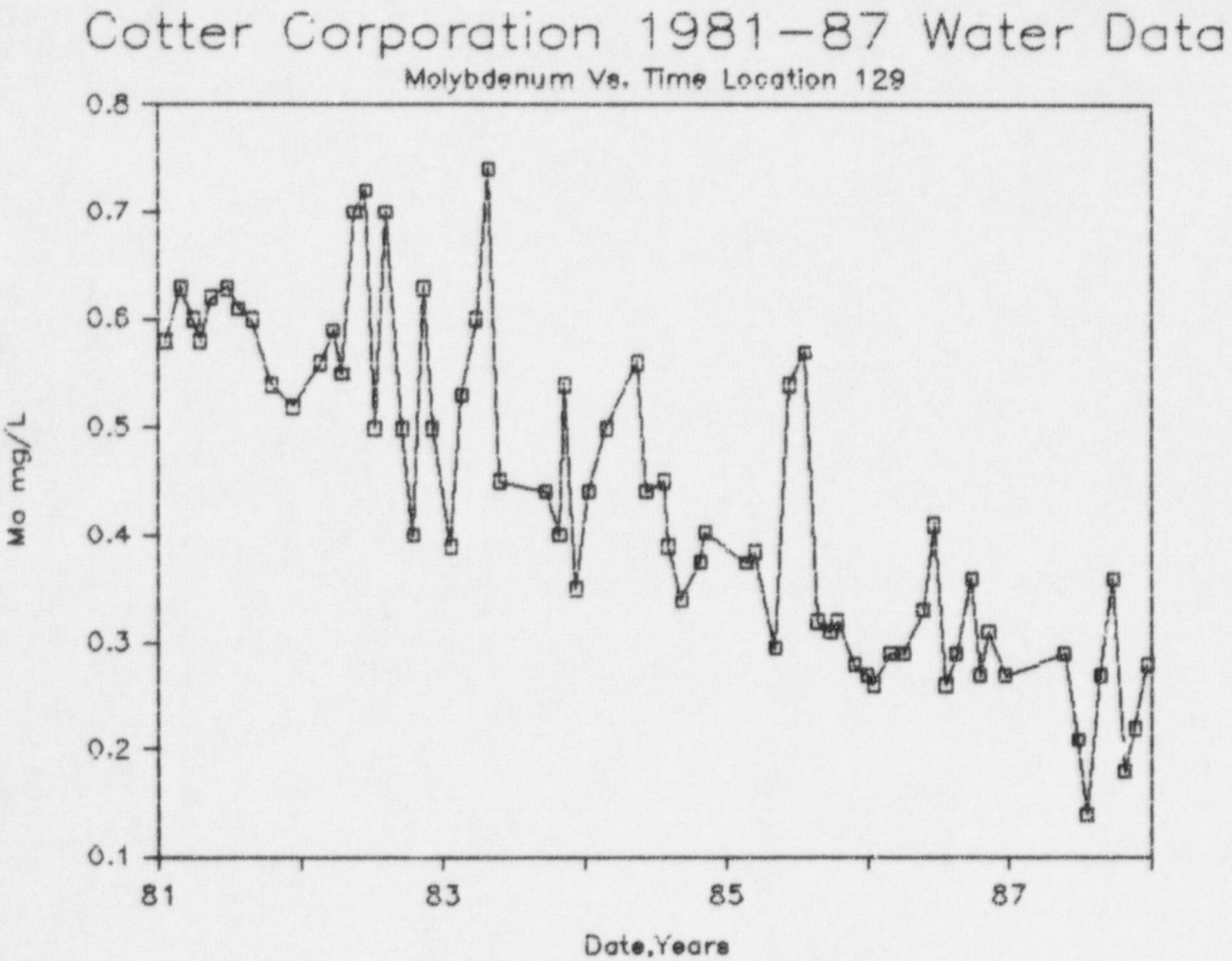

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 129
Mo mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
81
83
85
87
Date,Years

FIGURE 1.23

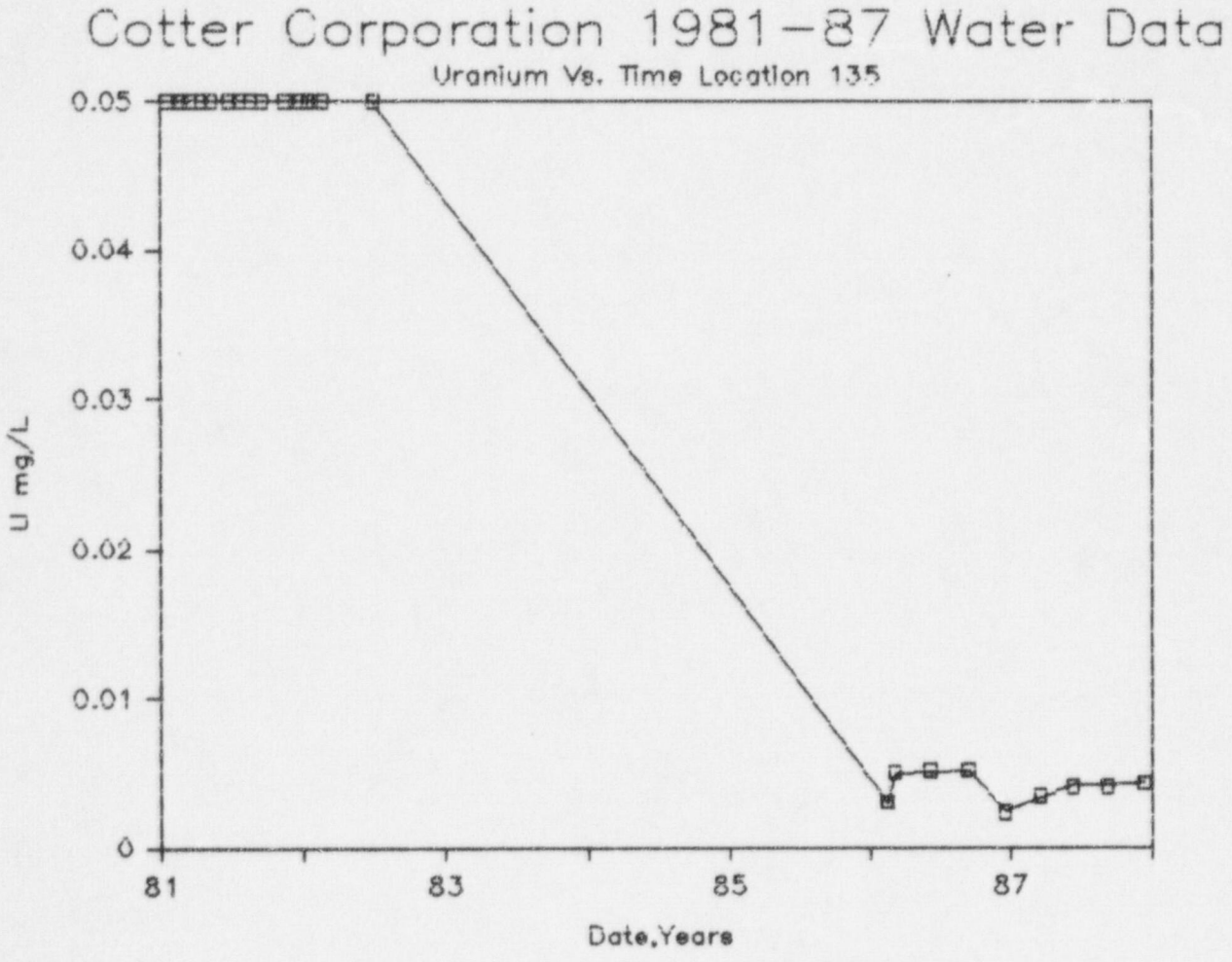

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 135
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
Date,Years

FIGURE 1.24

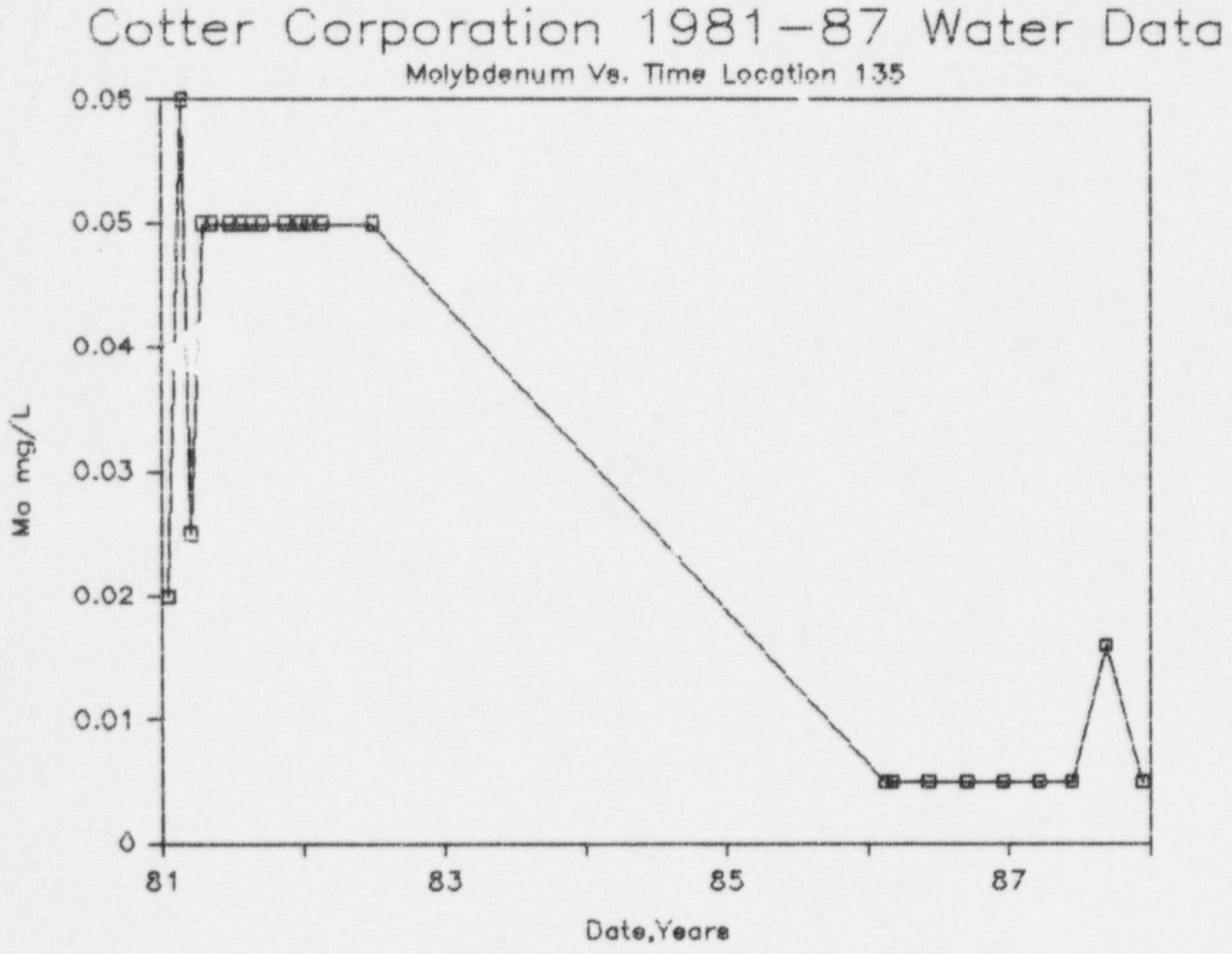

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 135
0.06
0.05
0.04
0.03
0.02
0.01
0
Mo mg/L
81
83
85
87
Date,Years

FIGURE 1.25

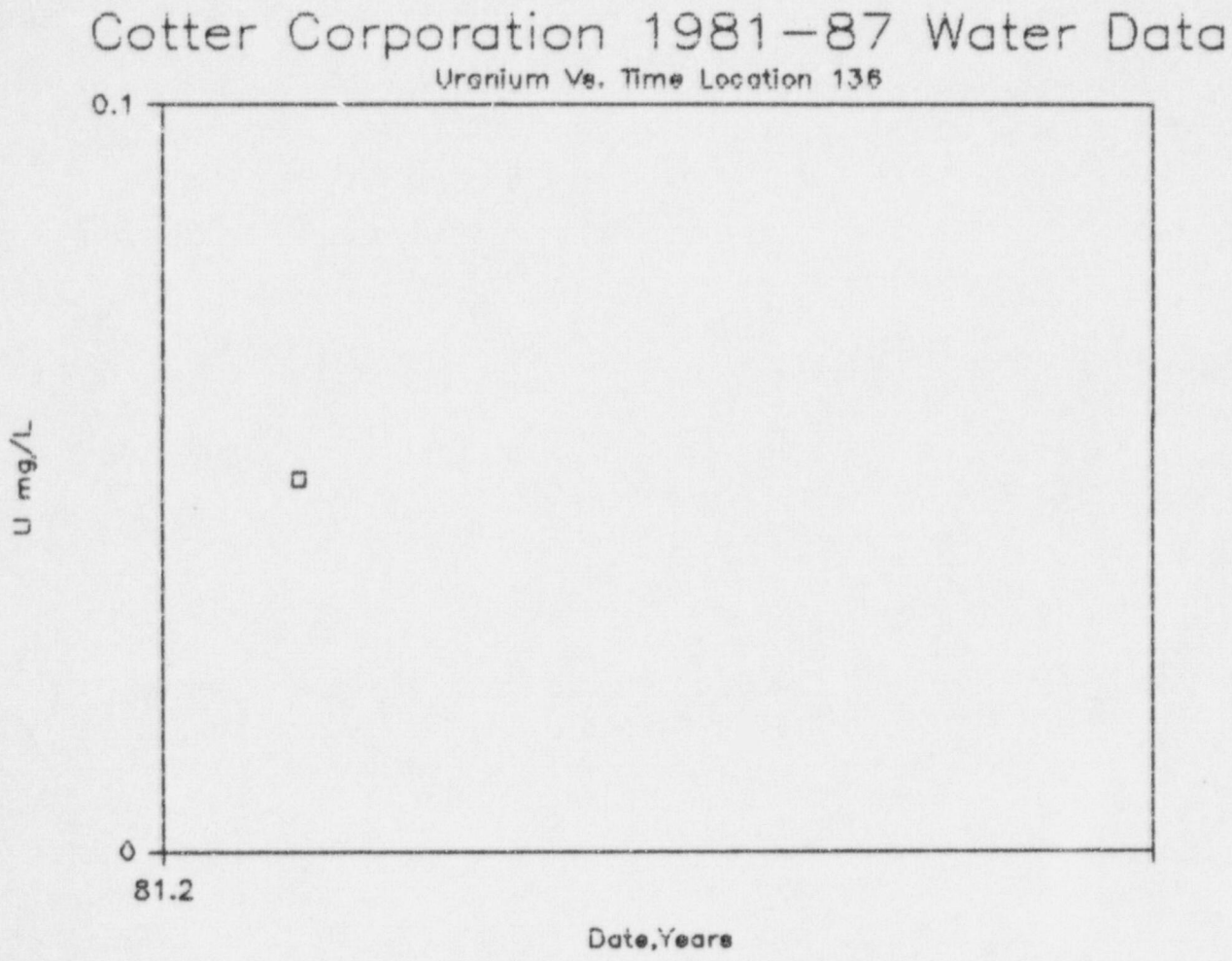

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 136
0.1
0
81.2
U mg/L
Date,Years

FIGURE 1.26

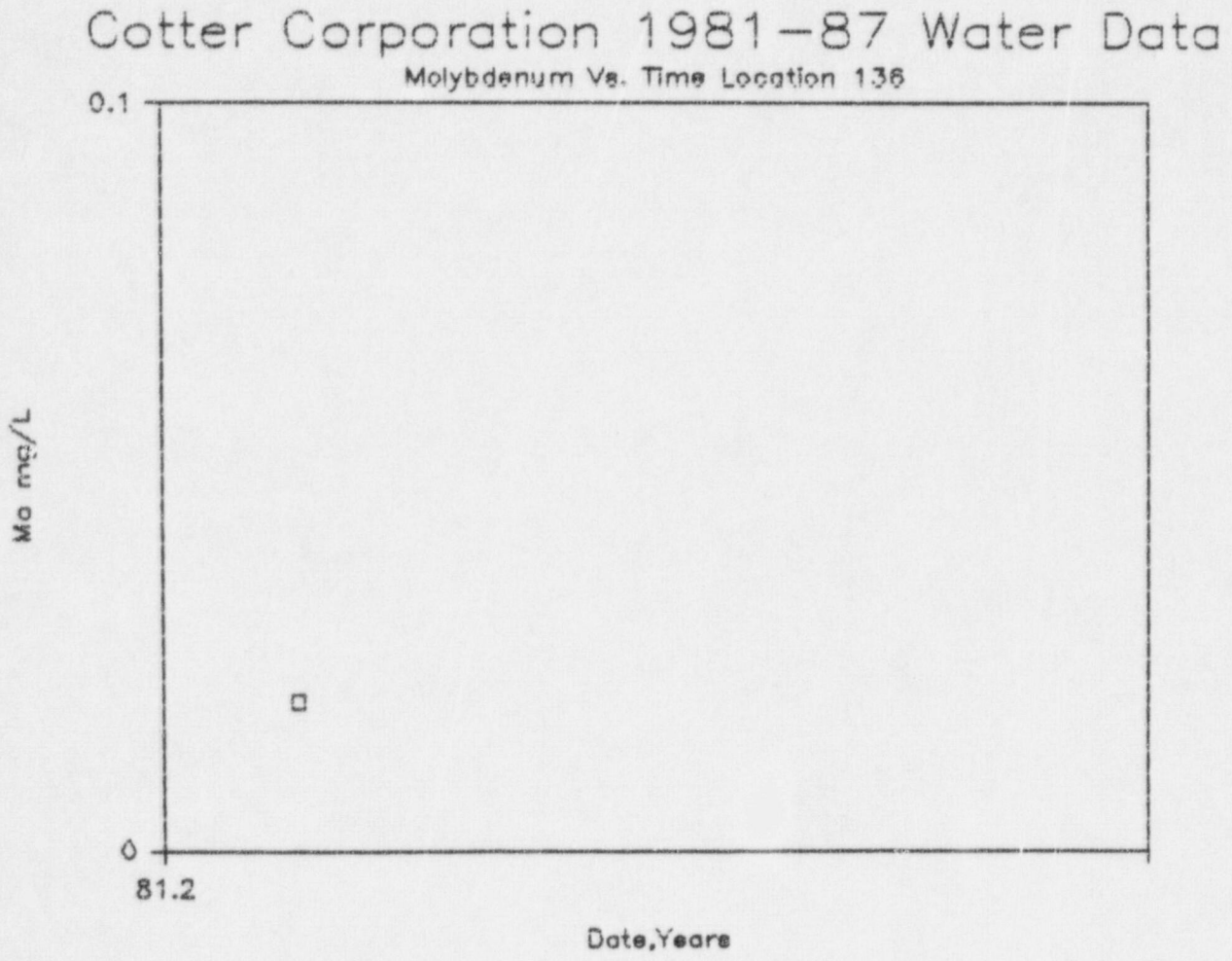

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 136
0.1
0
81.2
Mo mg/L
Date,Years

FIGURE 1.27

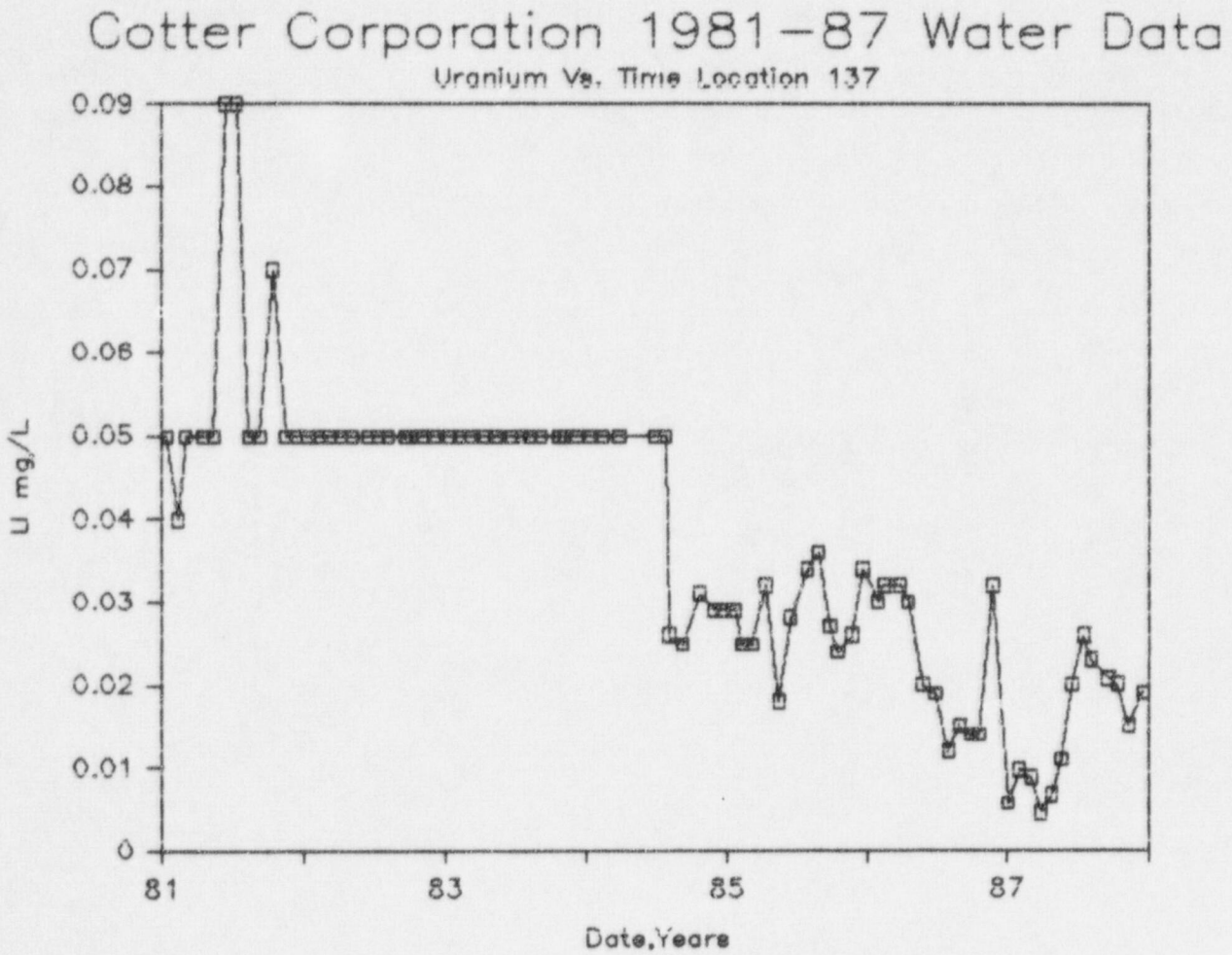

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 137
U mg/L
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.28

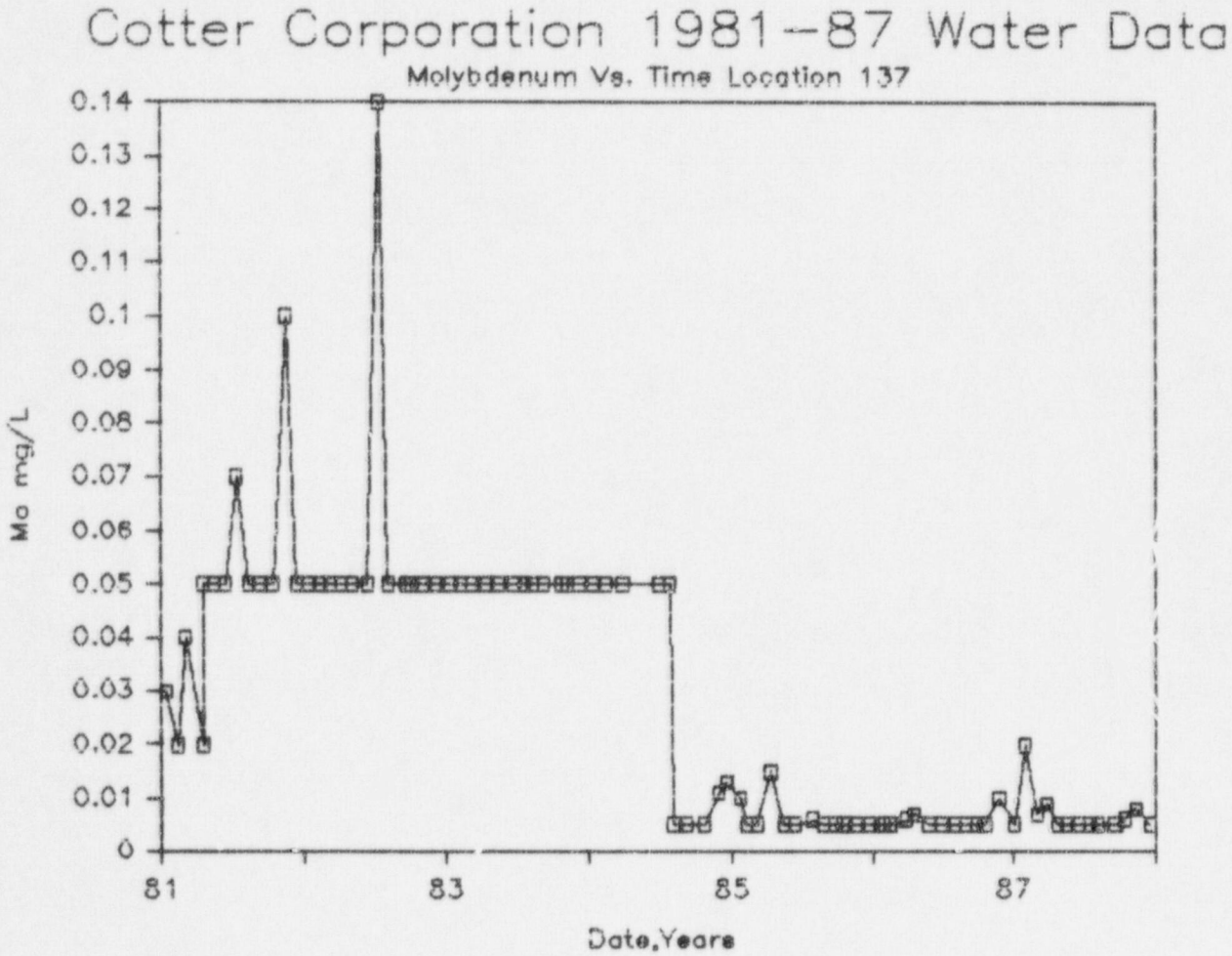

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 137
Mo mg/L
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.29

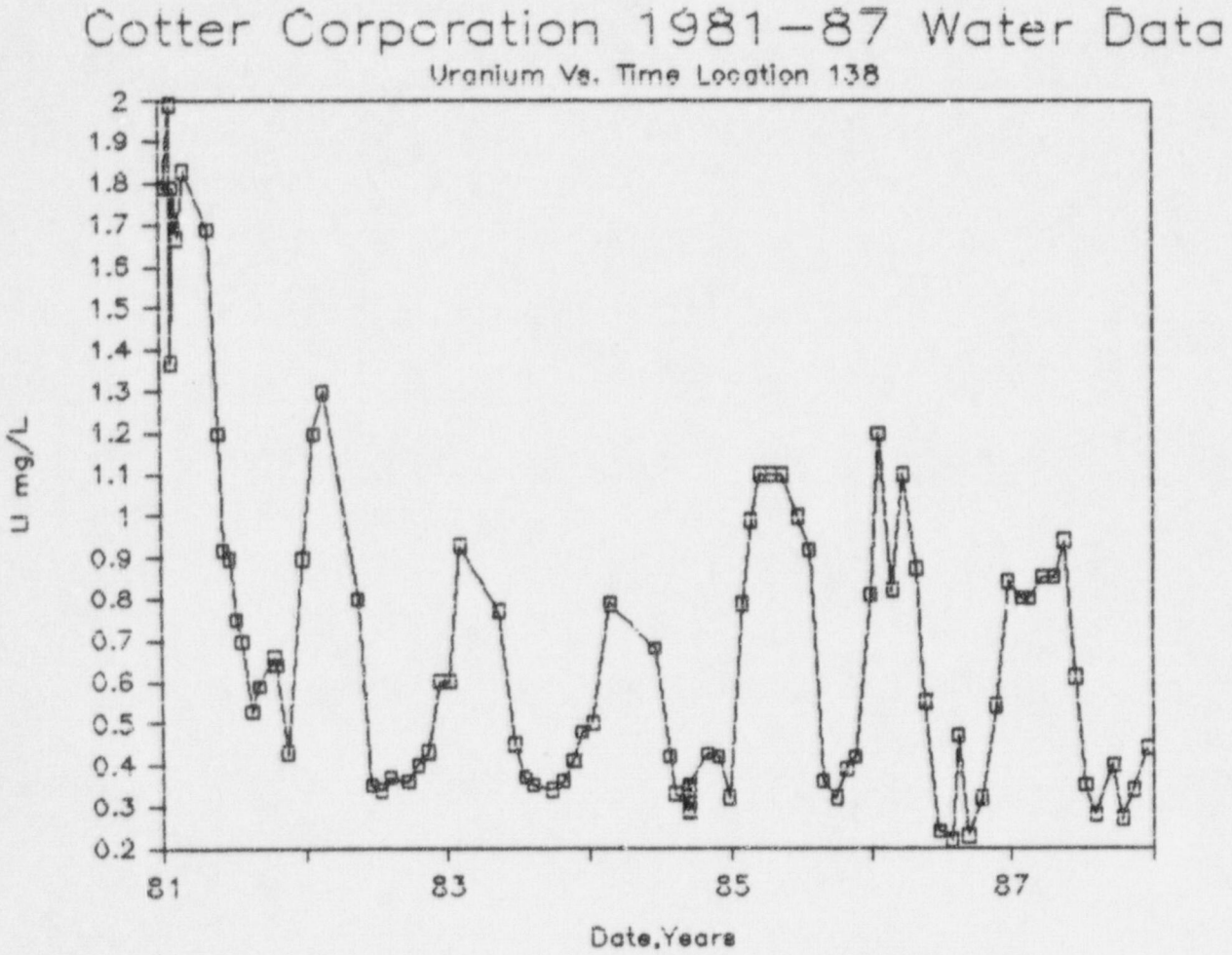

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 138
U mg/L
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
81
83
85
87
Date,Years

FIGURE 1.30

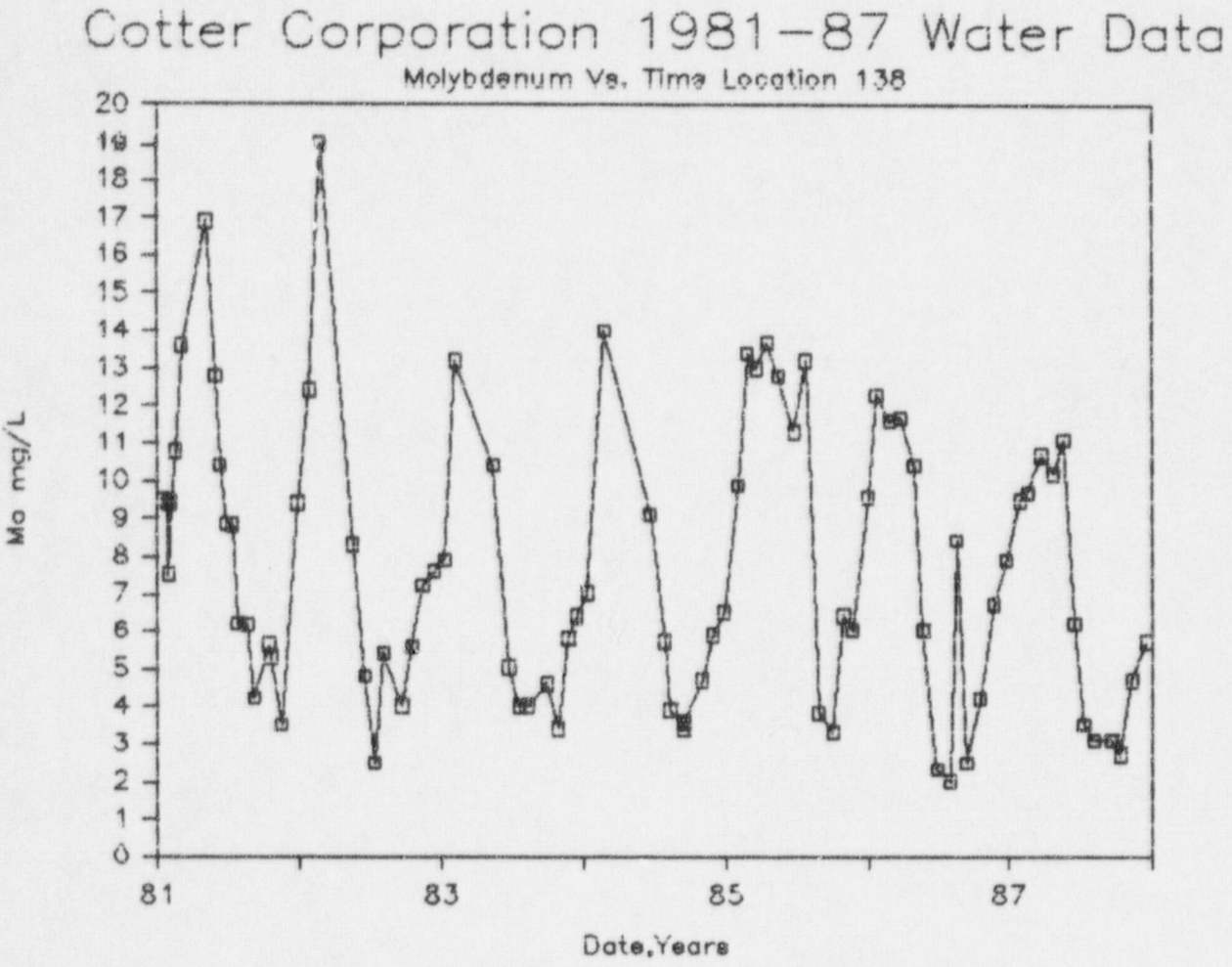

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 138
Mo mg/L
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
81
83
85
87
Date,Years

FIGURE 1.31

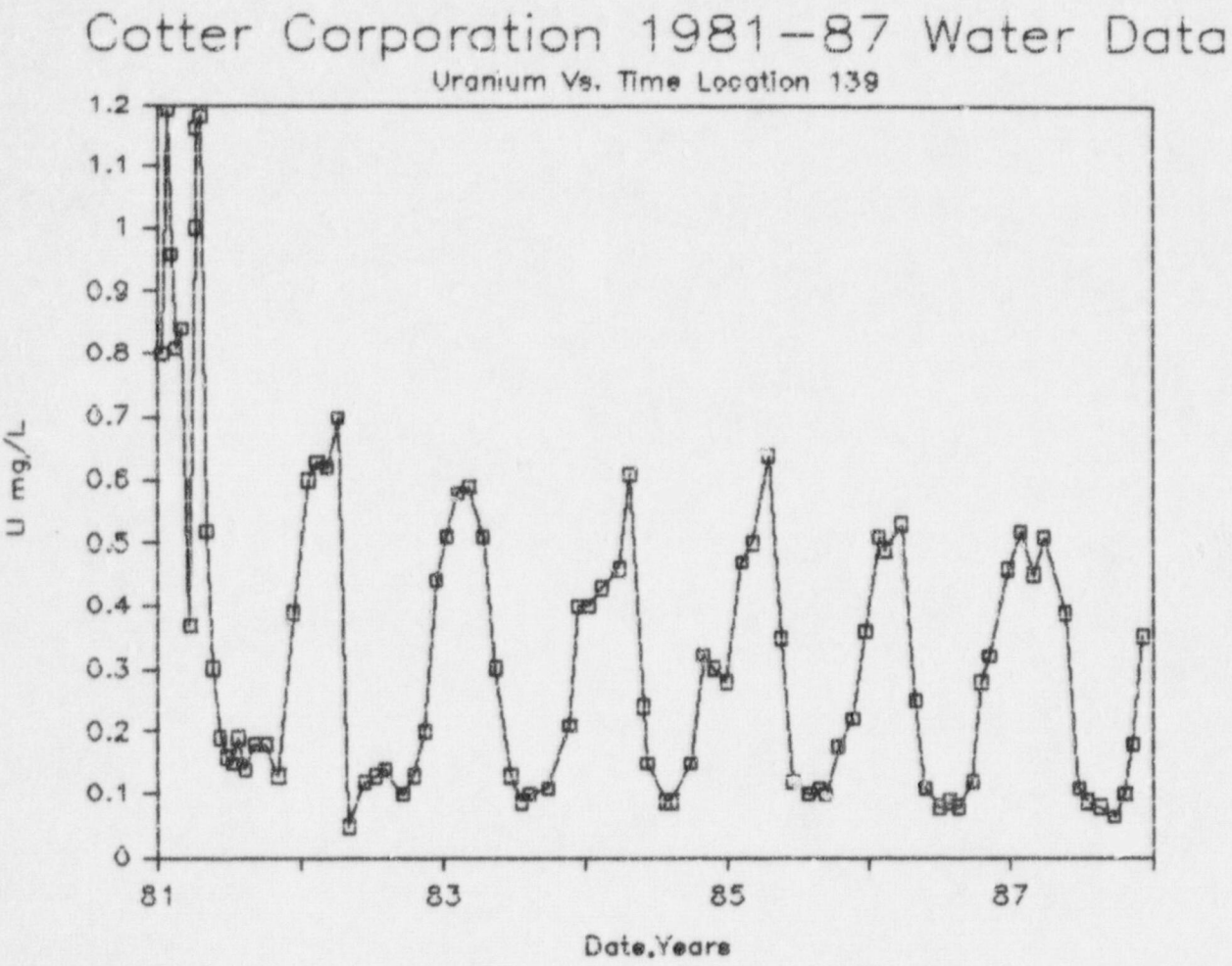

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 138
U mg/L
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.32

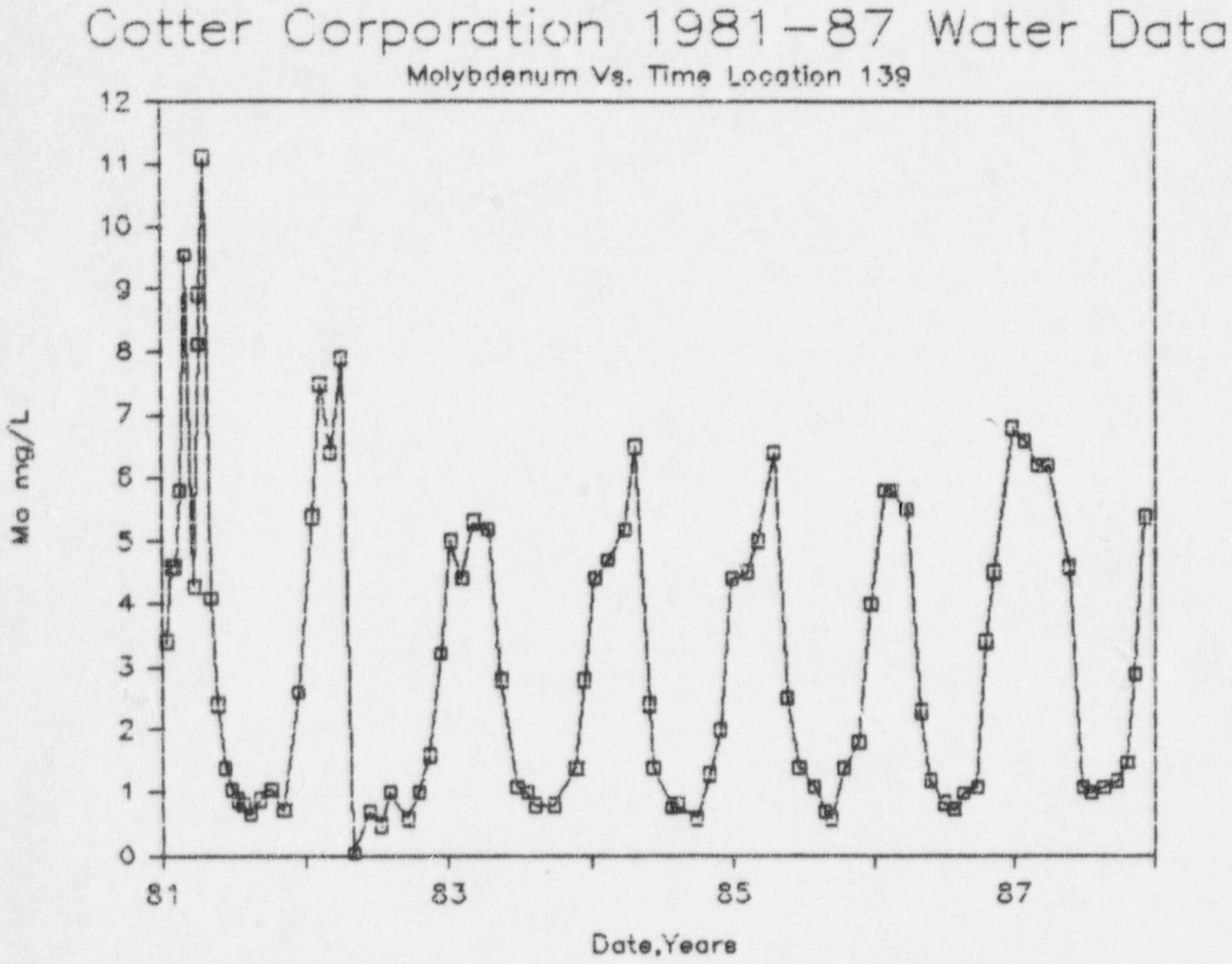

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 139
Mo mg/L
12
11
10
9
8
7
6
5
4
3
2
1
0
81
83
85
87
Date,Years

FIGURE 1.33

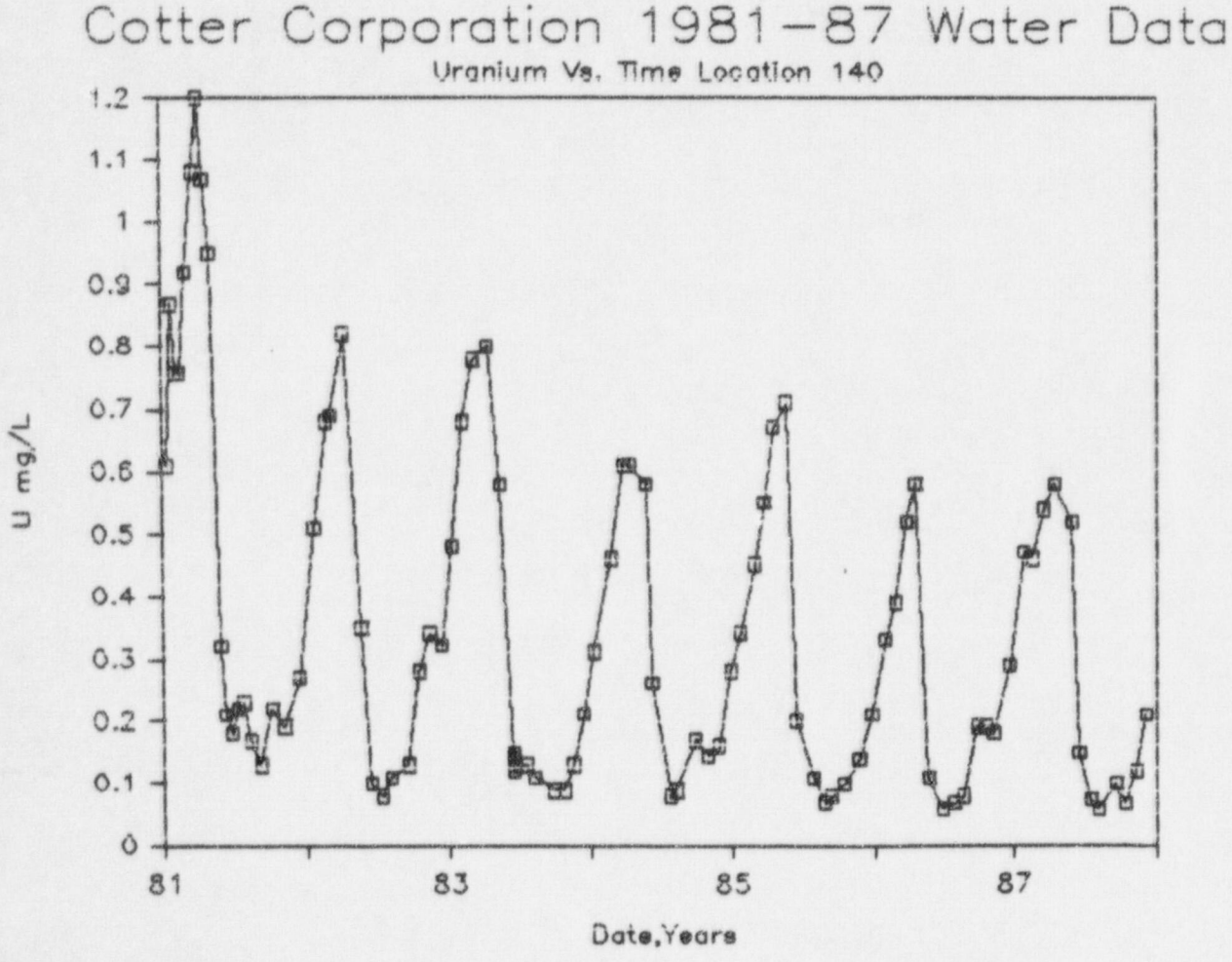

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 140
U mg/L
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.34

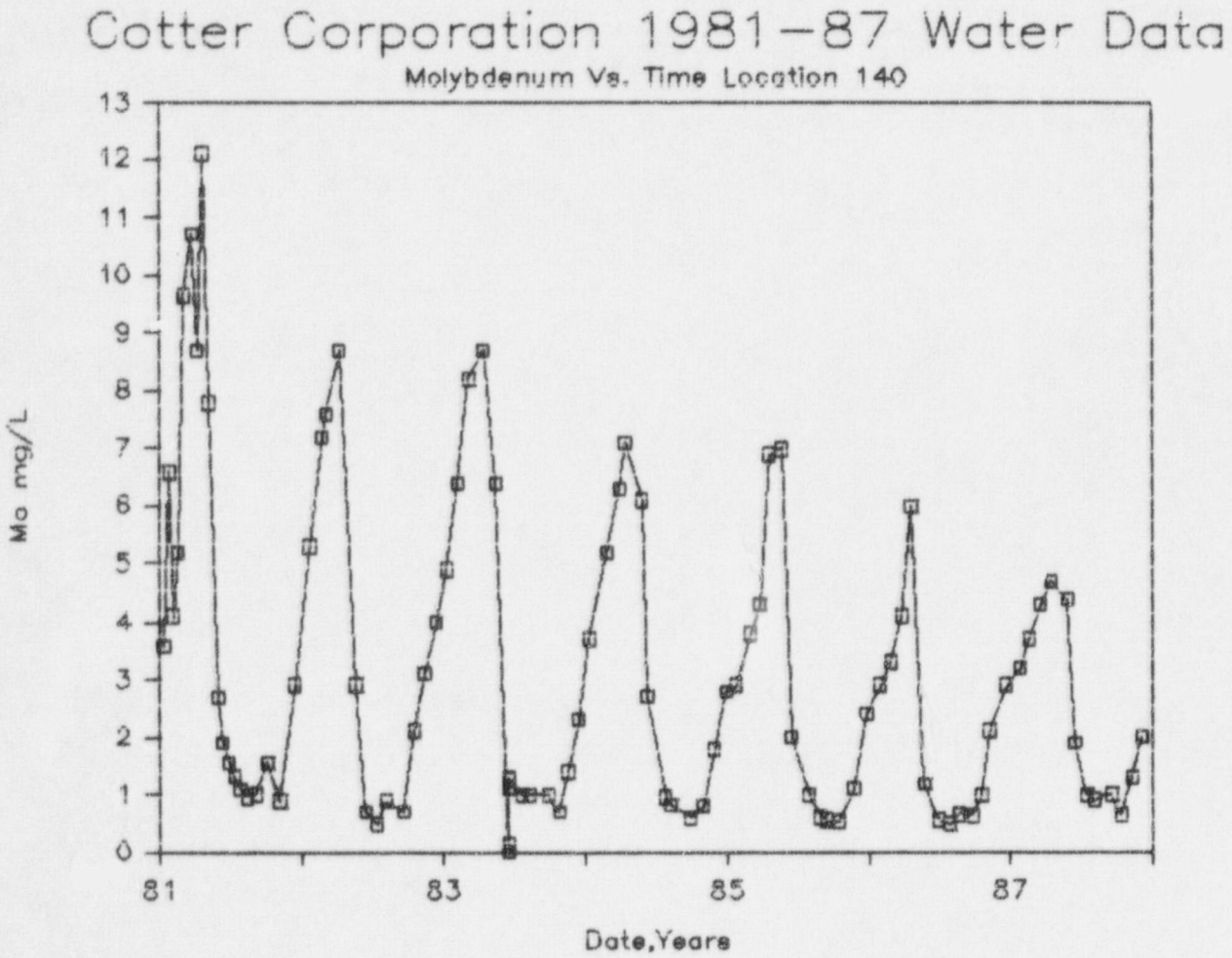

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 140
Mo mg/L
13
12
11
10
9
8
7
6
5
4
3
2
1
0
81
83
85
87
Date,Years

FIGURE 1.35

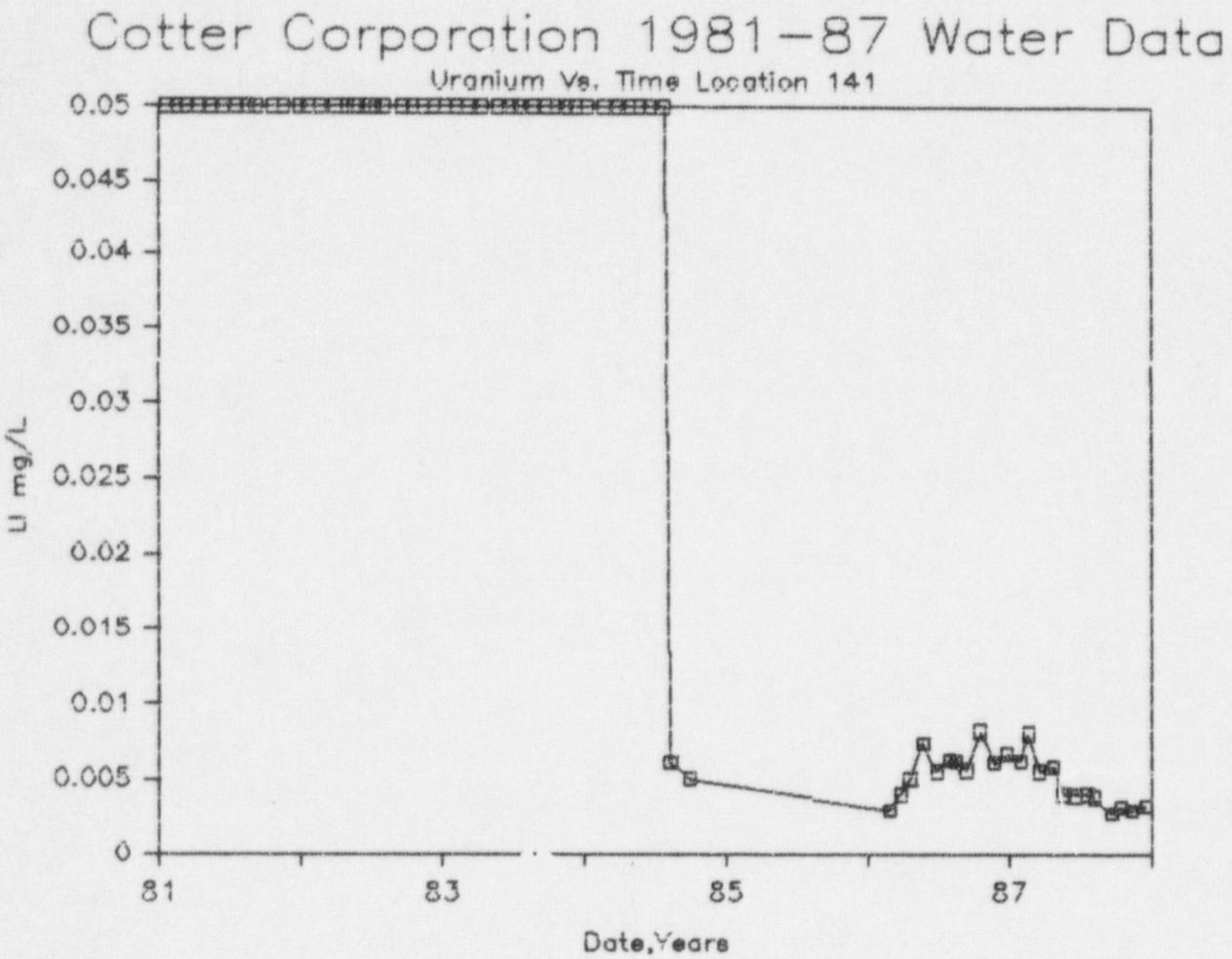

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 141
U mg/L
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
81
83
85
87
Date,Years

FIGURE 1.36

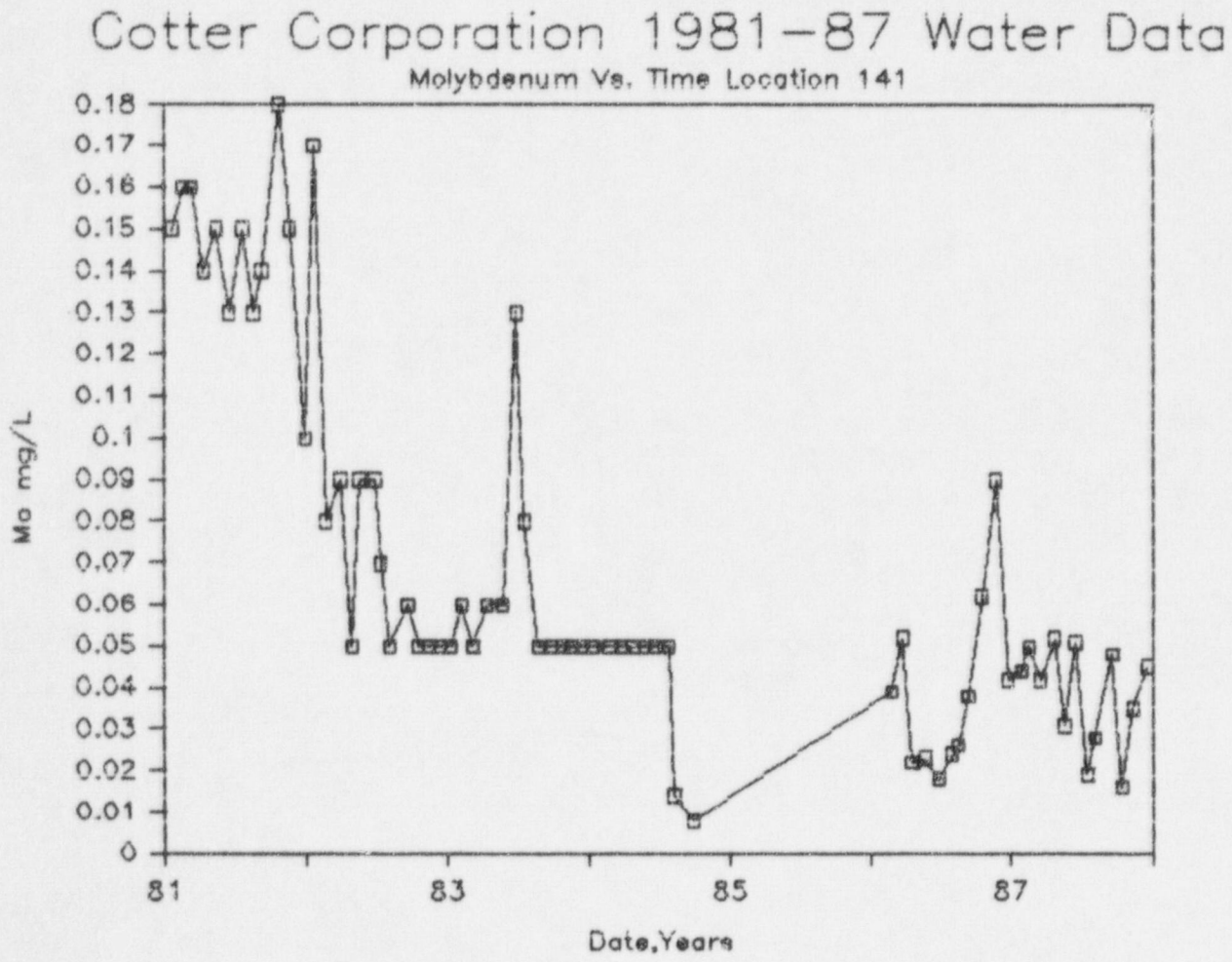

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 141
Mo mg/L
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.37

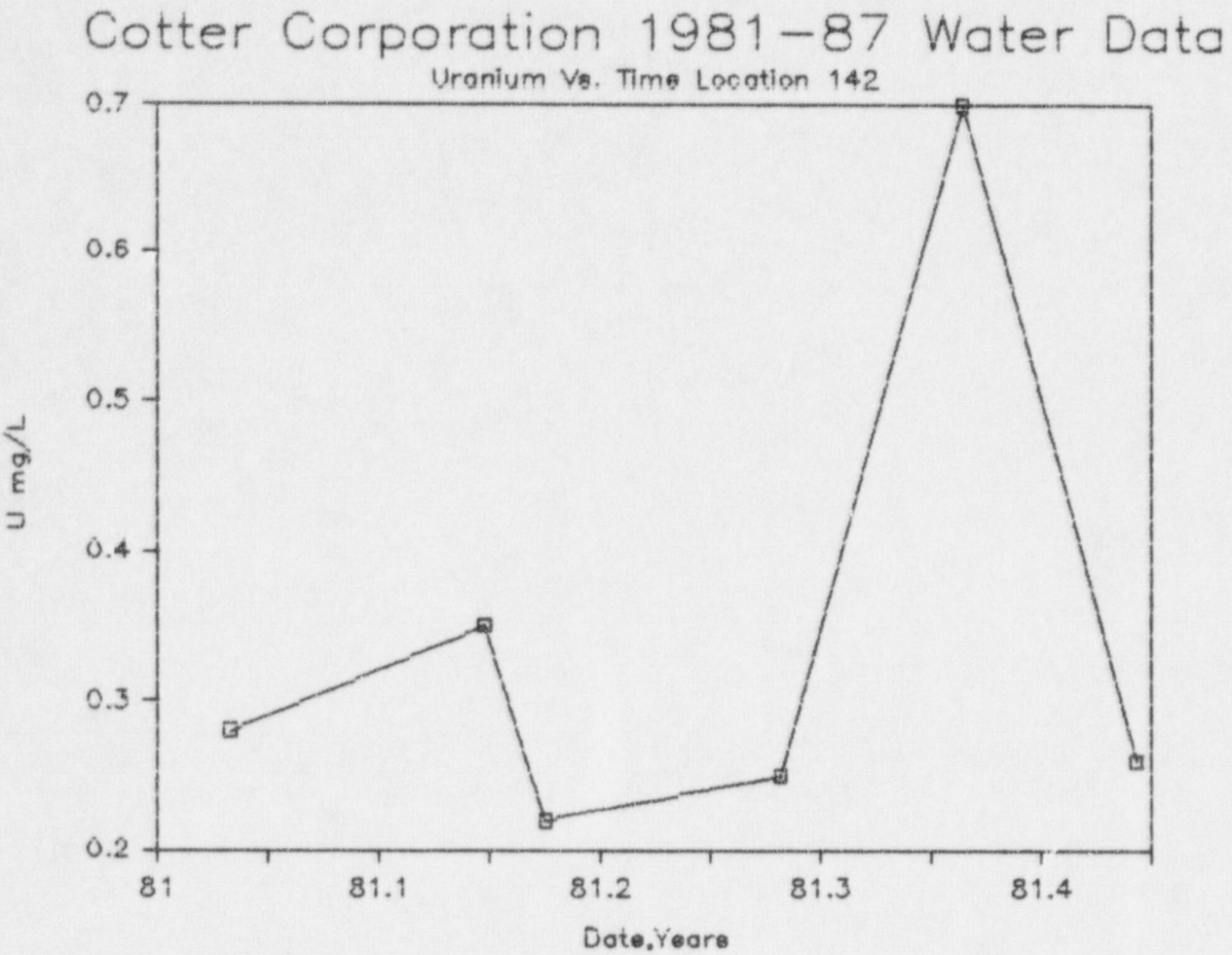

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 142
U mg/L
0.7
0.6
0.5
0.4
0.3
0.2
81
81.1
81.2
81.3
81.4
Date,Years

FIGURE 1.38

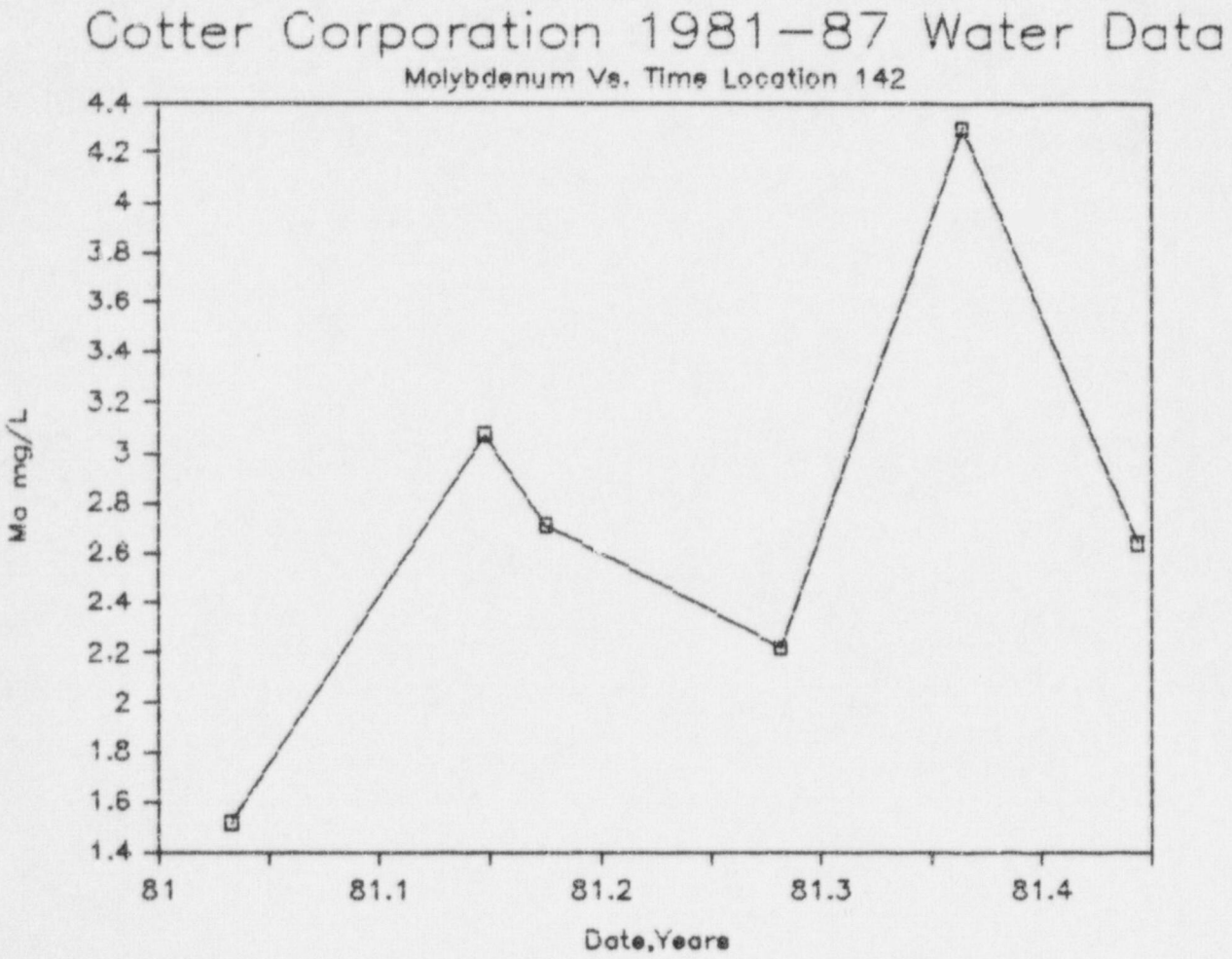

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 142
Mo mg/L
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
81
81.1
81.2
81.3
81.4
Date,Years

FIGURE 1.39

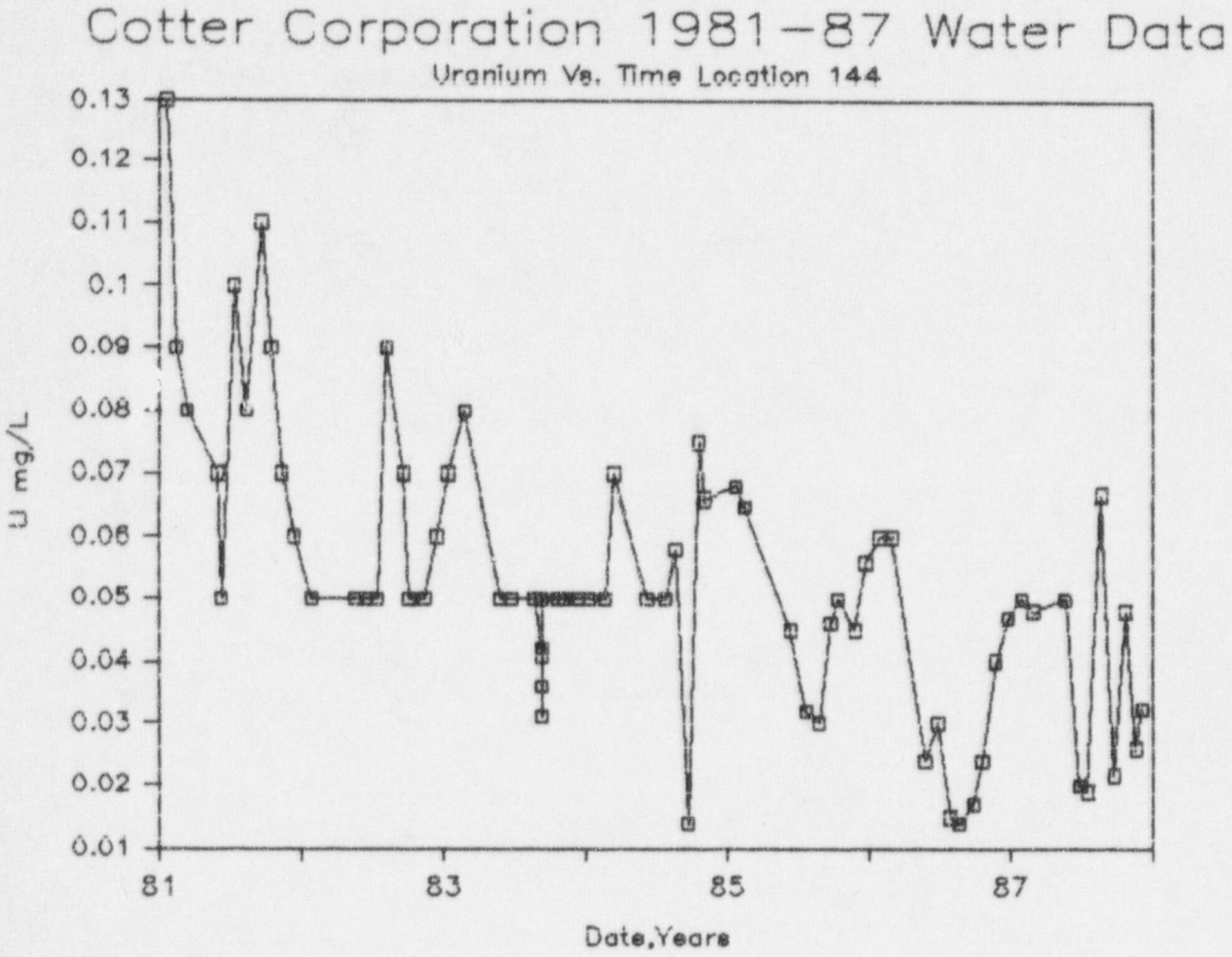

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 144
U mg/L
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
81
83
85
87
Date,Years

FIGURE 1.40

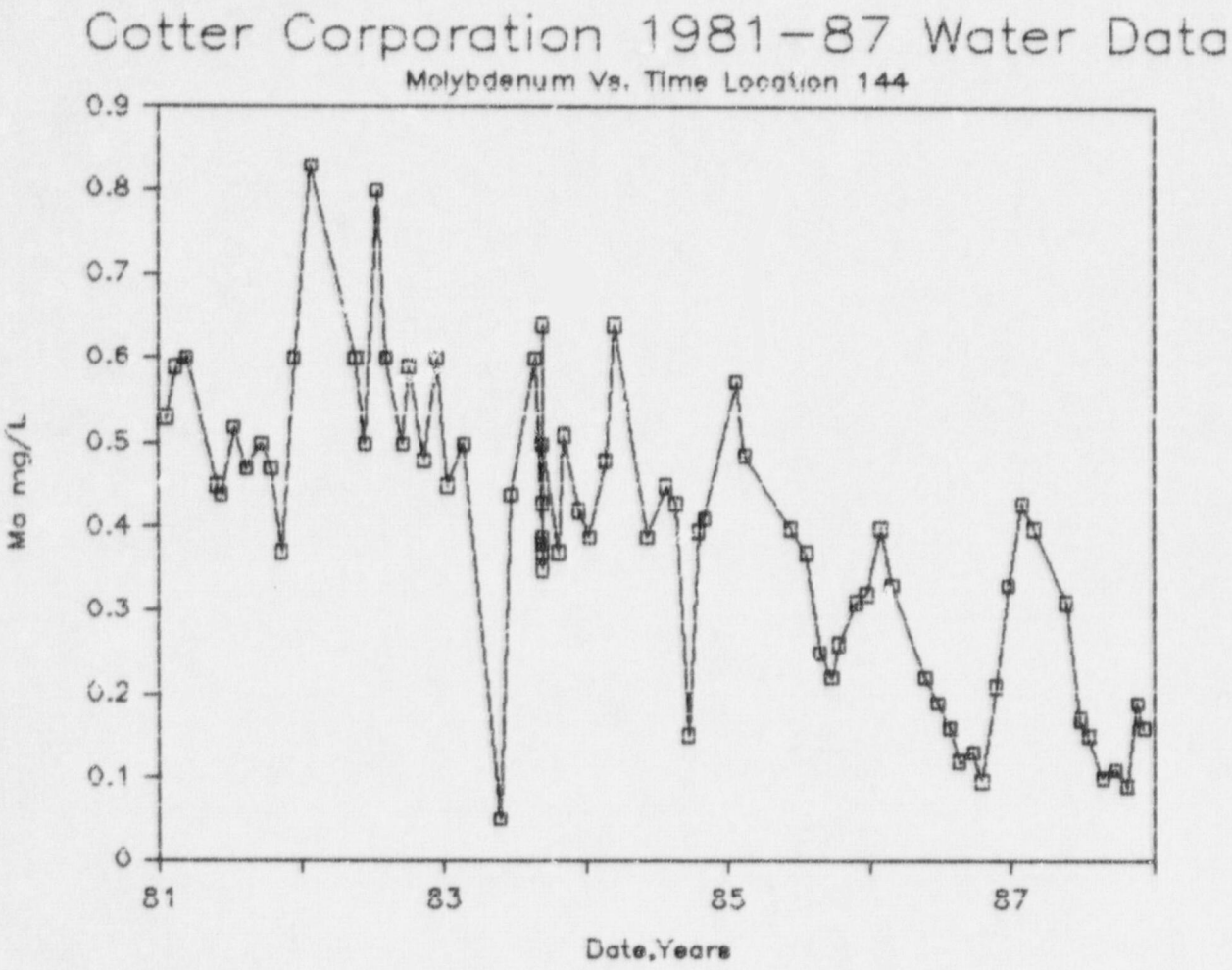

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 144
Mo mg/L
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.41

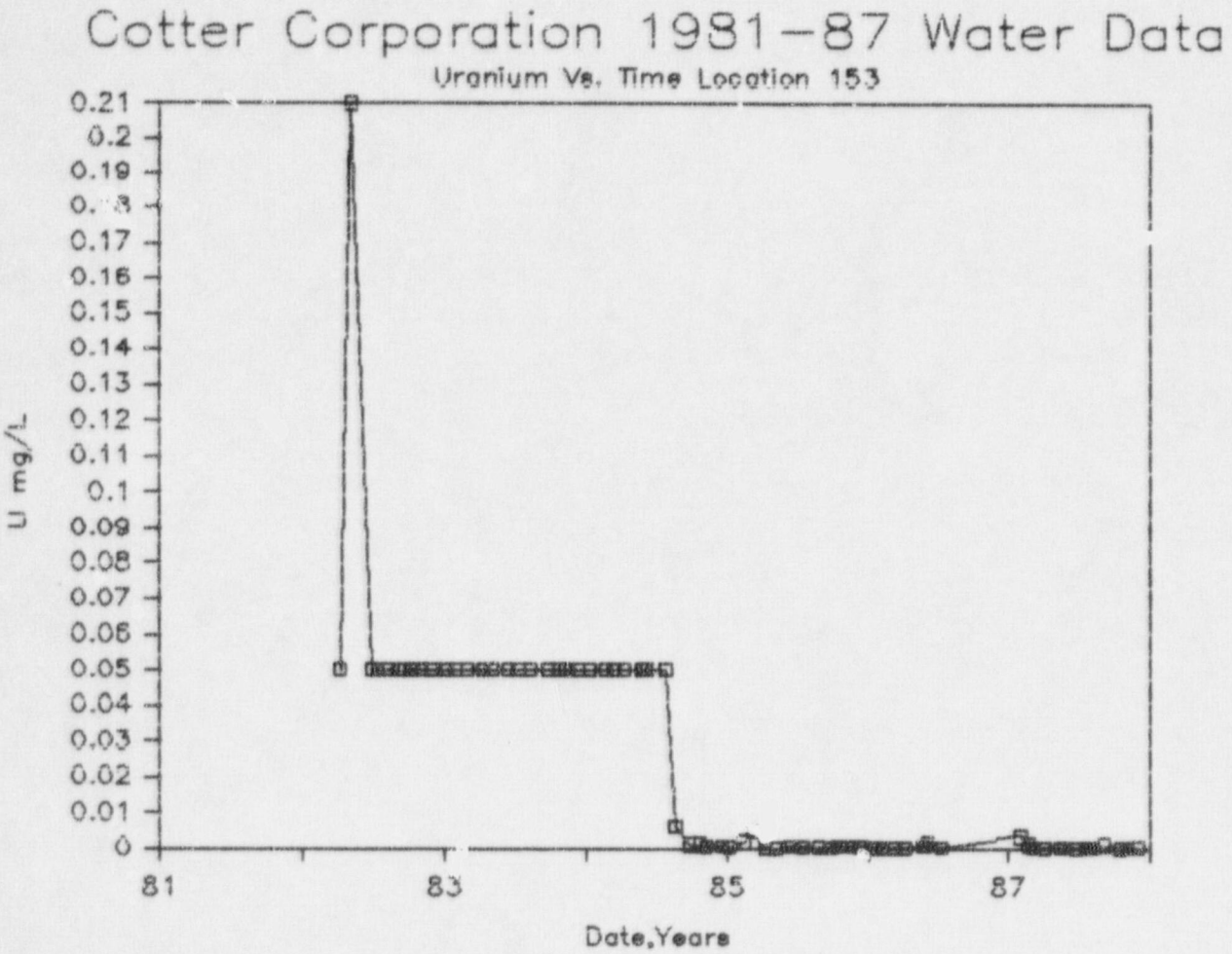

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 153
U mg/L
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.42

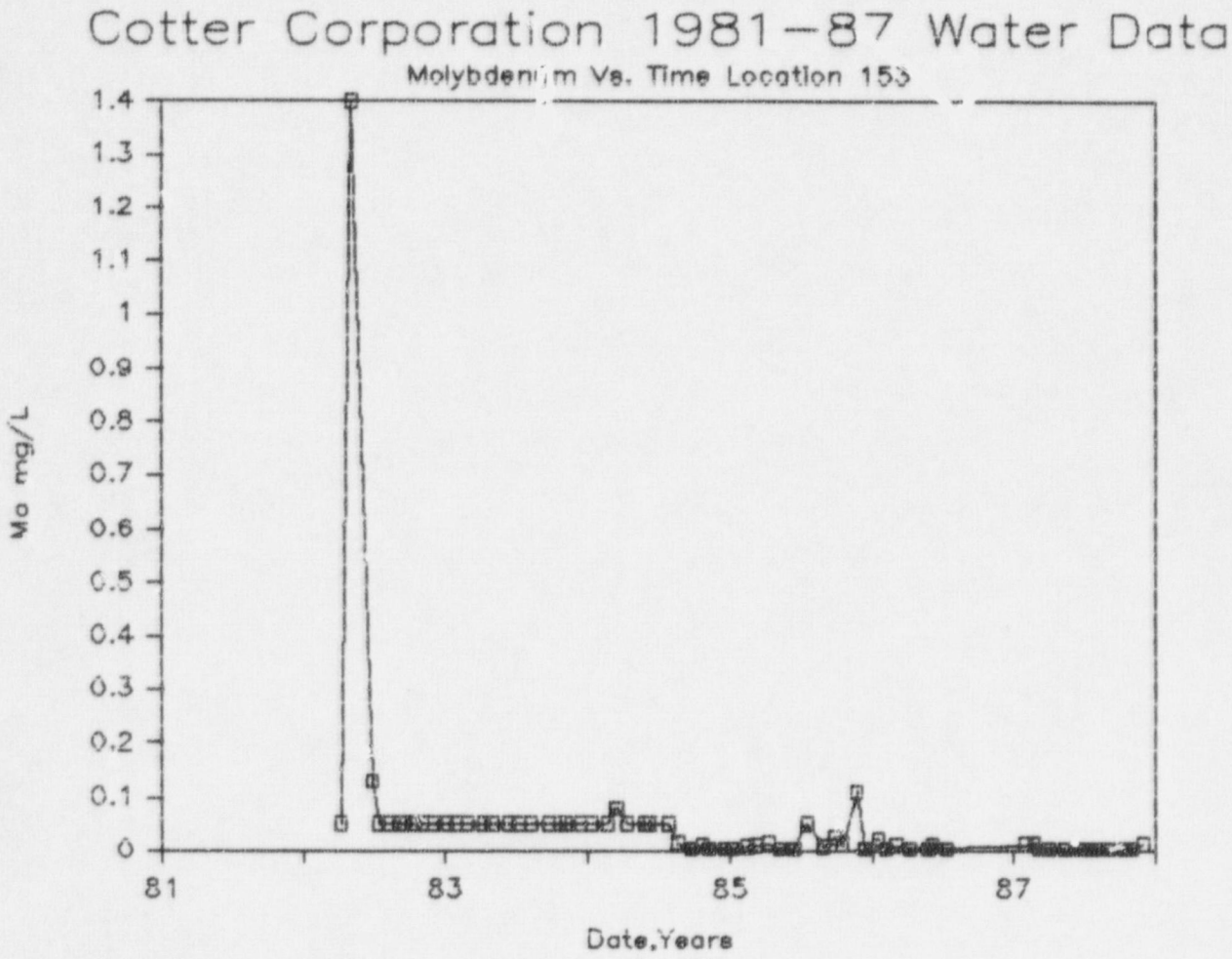

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 153
Mo mg/L
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.43

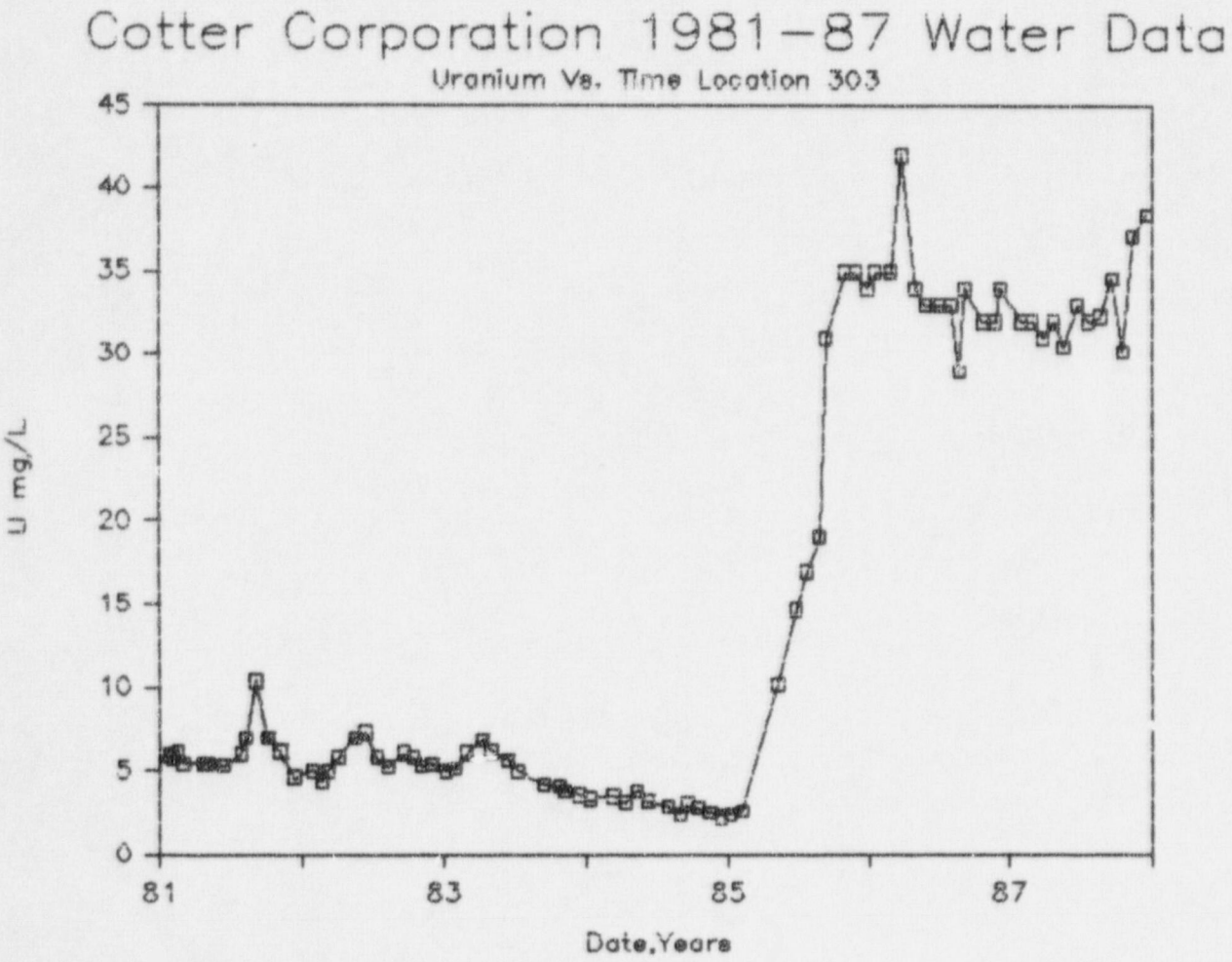

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 303
U mg/L
45
40
35
30
25
20
15
10
5
0
81
83
85
87
Date,Years

FIGURE 1.44

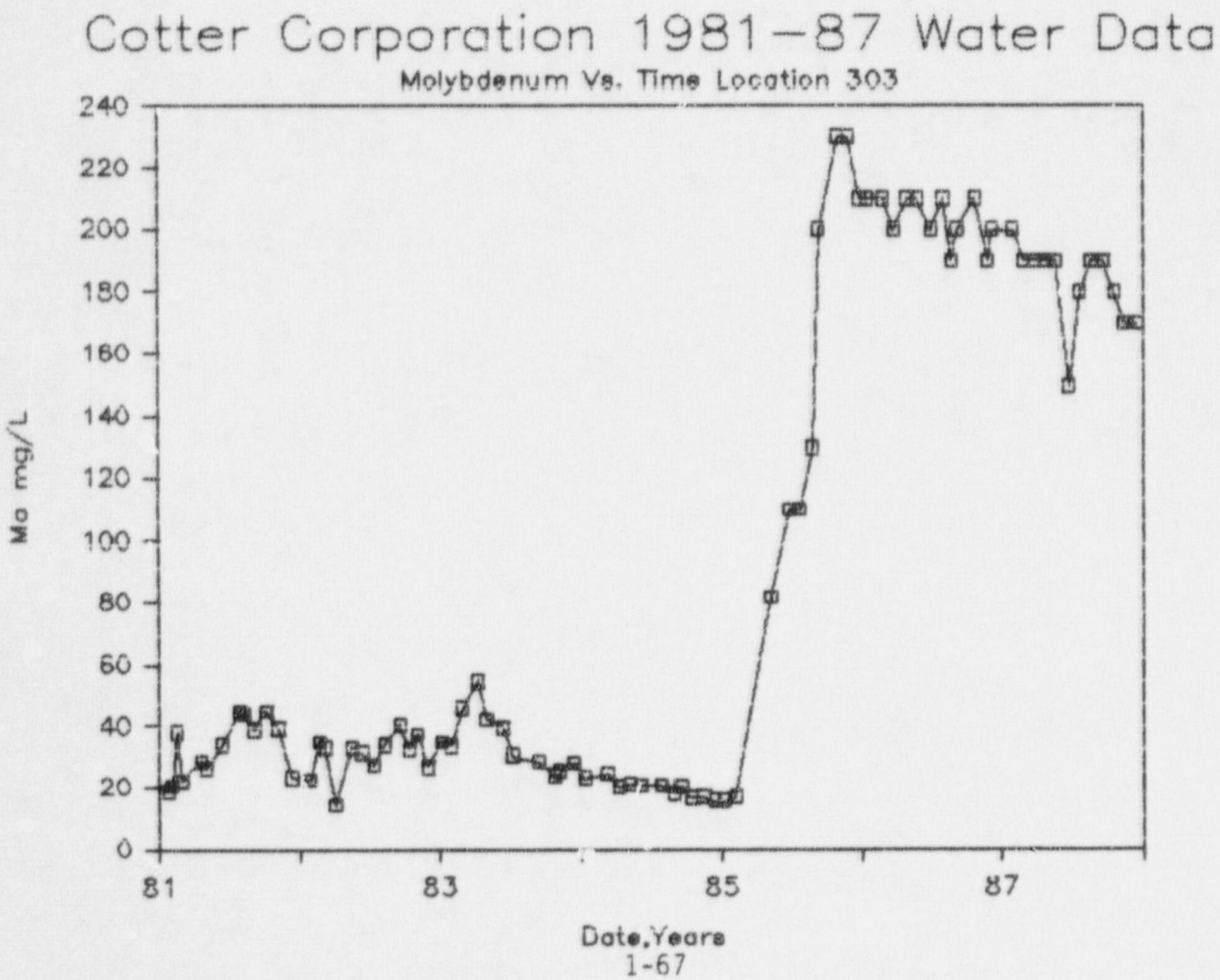

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 303
Mo mg/L
240
220
200
180
160
140
120
100
80
60
40
20
0
81
83
85
87
Date,Years
1-67

FIGURE 1.45

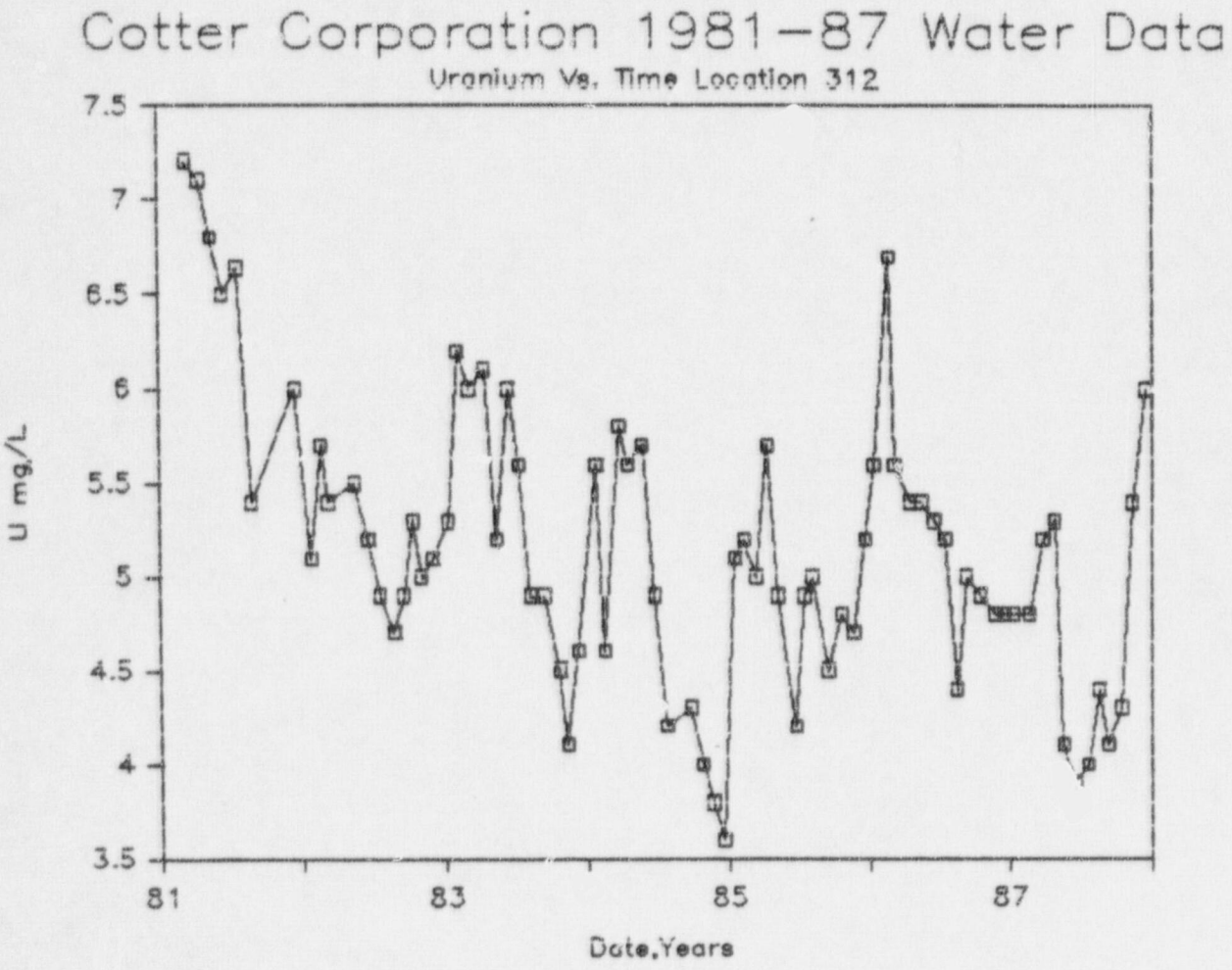

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 312
U mg/L
7.5
7
6.5
6
5.5
5
4.5
4
3.5
81
83
85
87
Date,Years

FIGURE 1.46

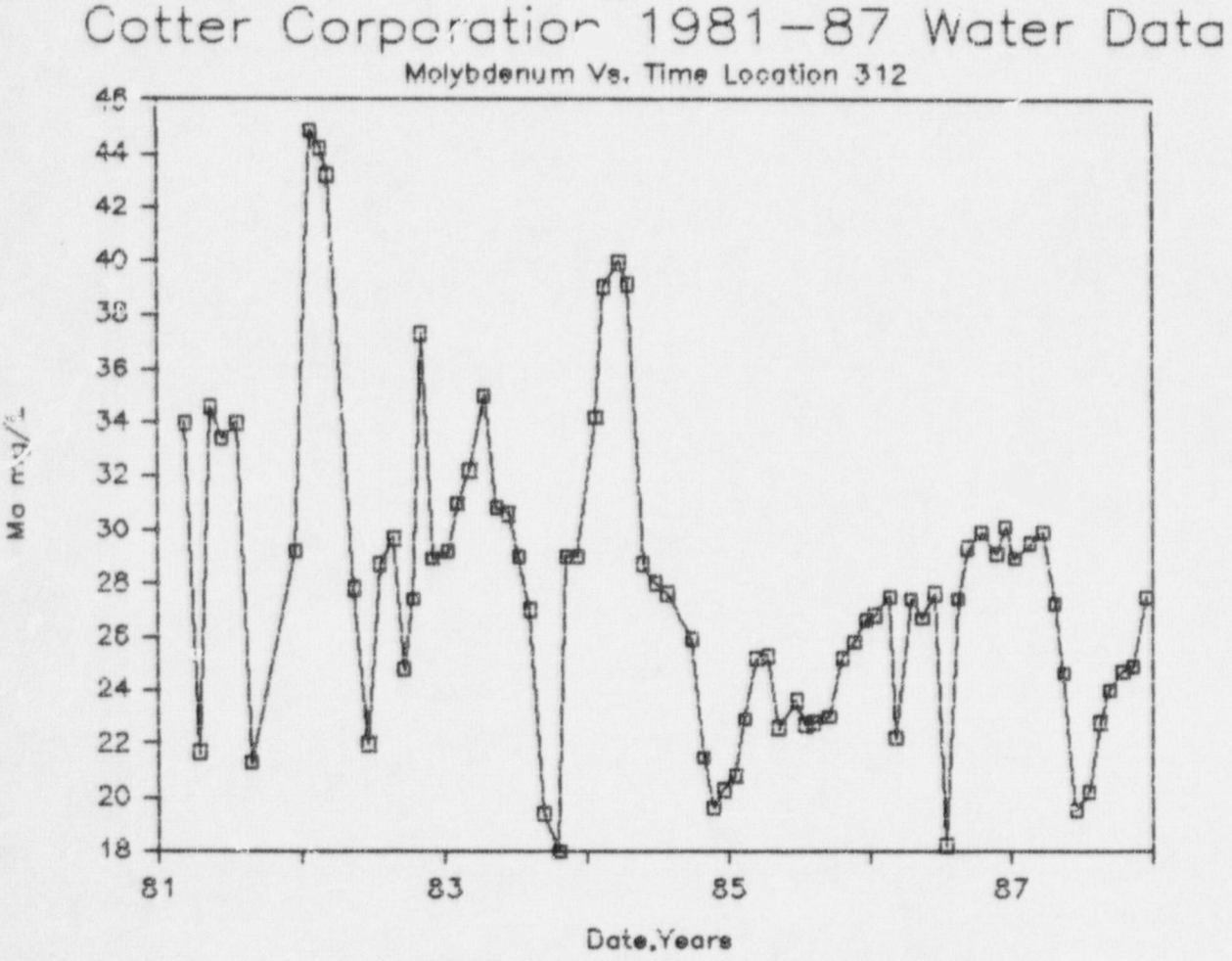

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 312
Mo mg/L
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
81
83
85
87
Date,Years

FIGURE 1.47

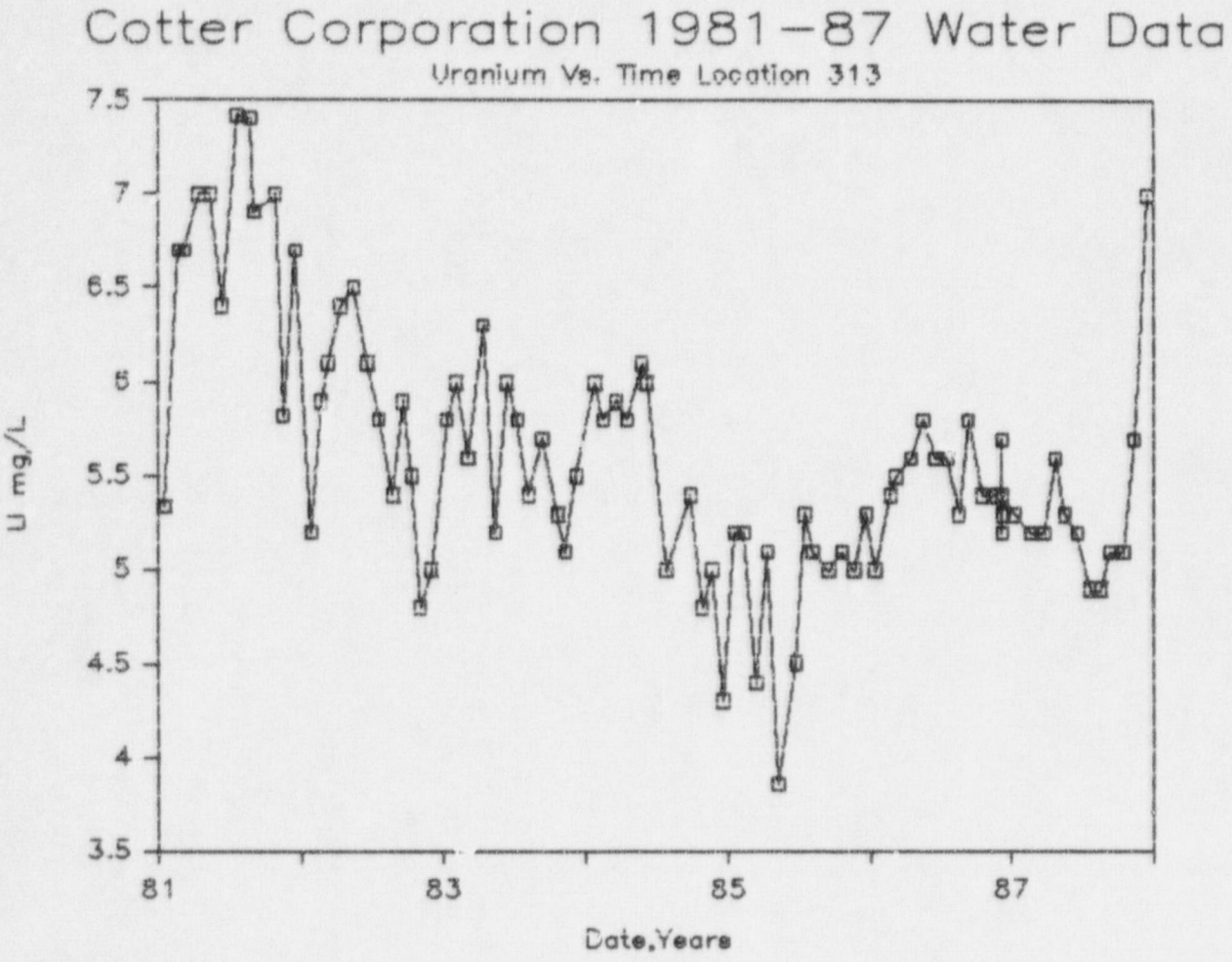

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 313
U mg/L
7.5
7
6.5
6
5.5
5
4.5
4
3.5
81
83
85
87
Date,Years

FIGURE 1.48

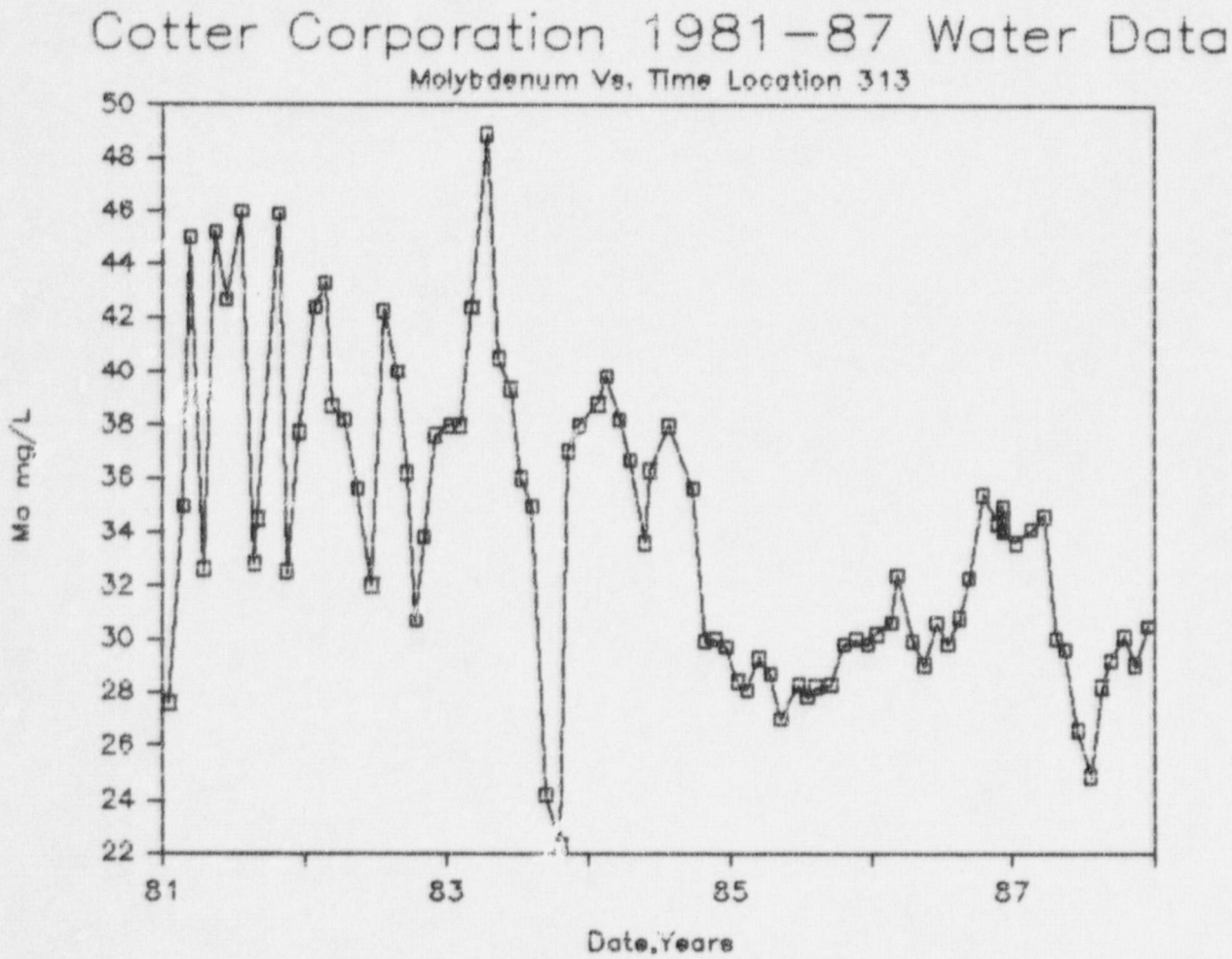

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 313
Mo mg/L
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
81
83
85
87
Date,Years

FIGURE 1.49

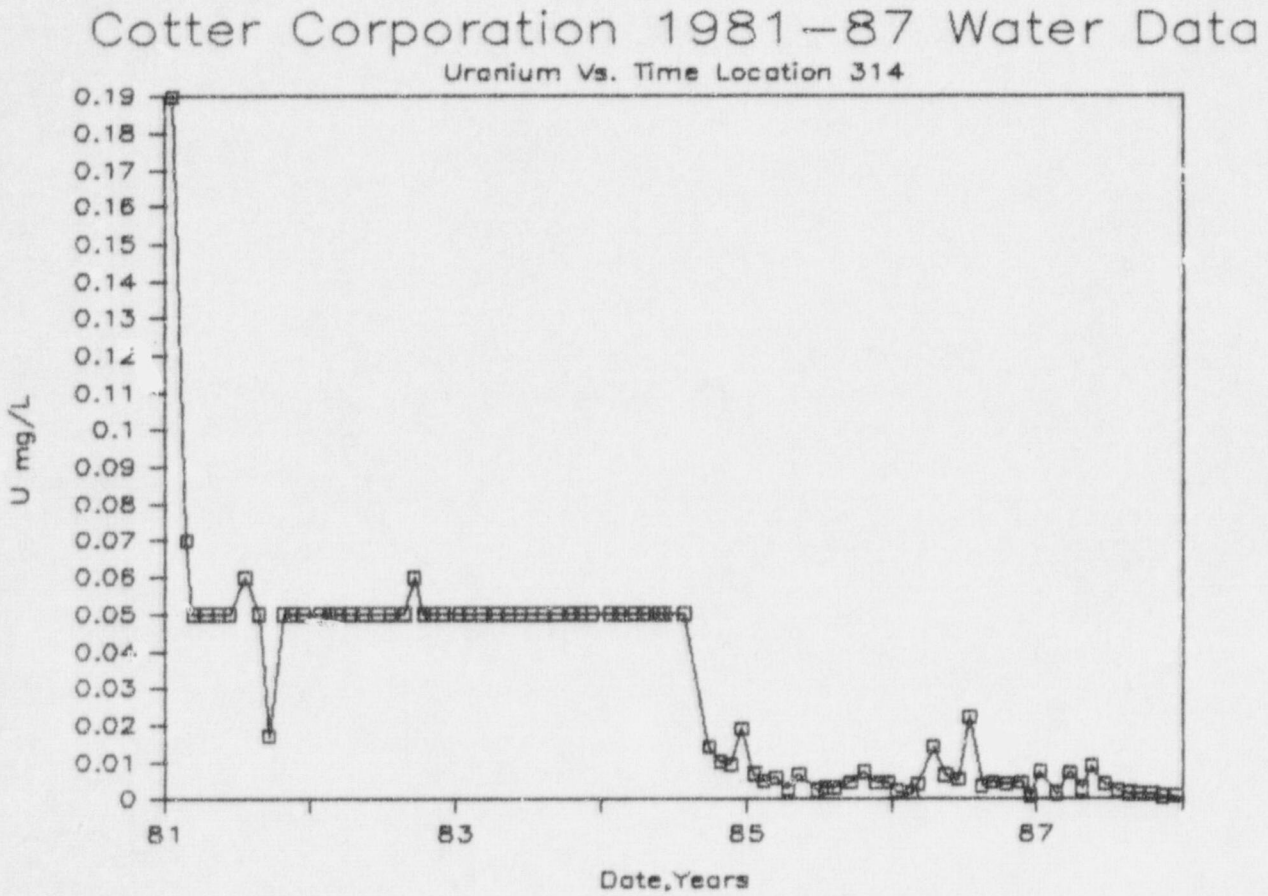

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 314
U mg/L
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date, Years

FIGURE 1.50

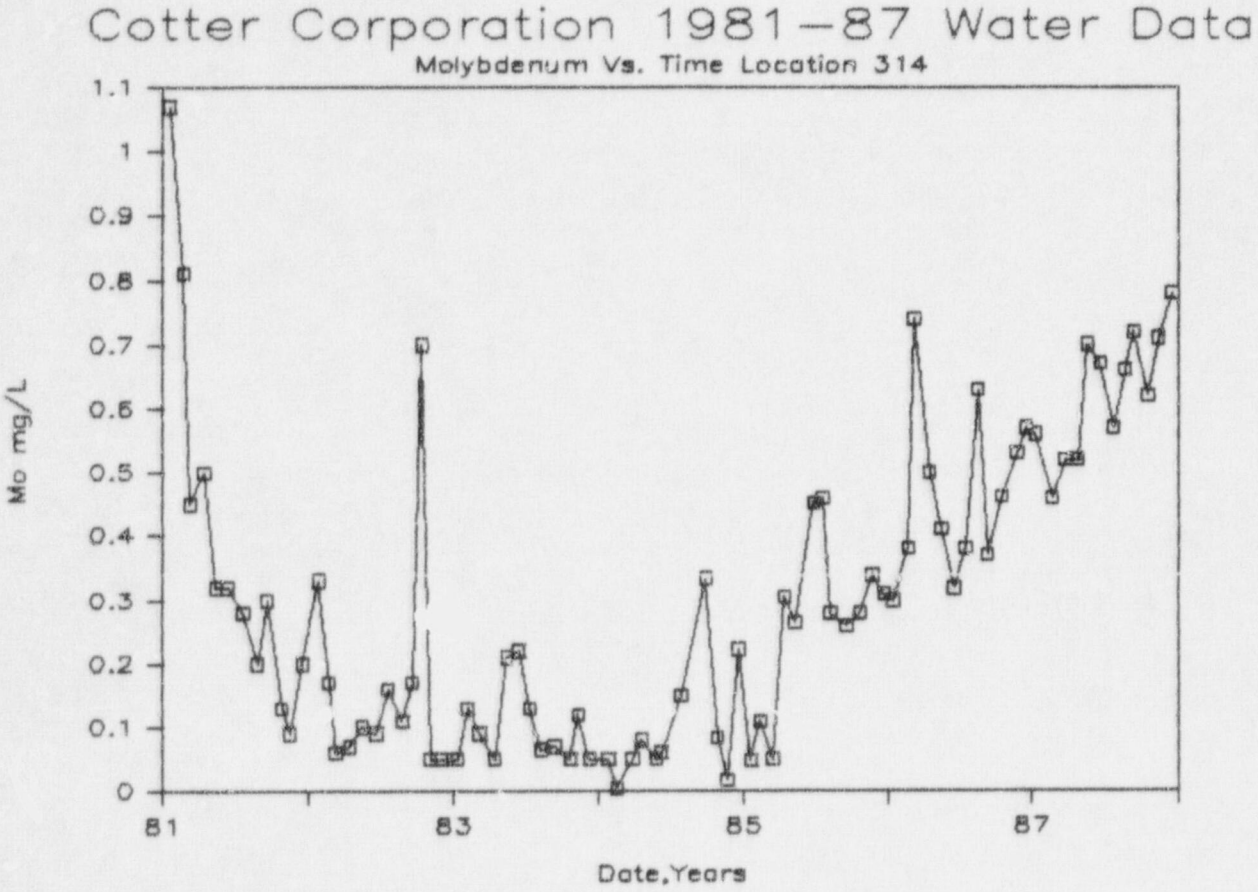

Cotter Corporation 1981—87 Water Data
Molybdenum Vs. Time Location 314
Mo mg/L
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.51

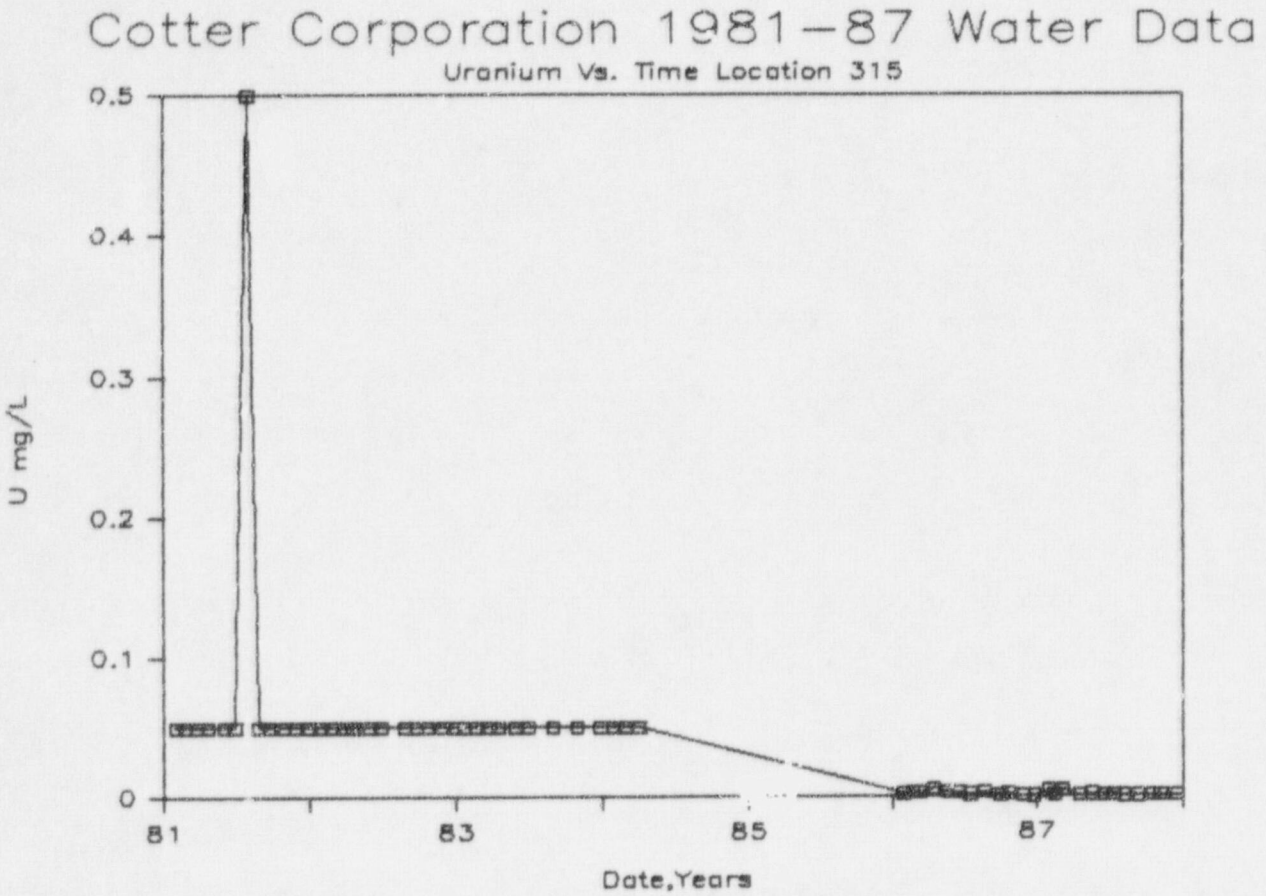

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 315
0.5
0.4
0.3
0.2
0.1
0
U mg/L
81
83
85
87
Date,Years

FIGURE 1.52

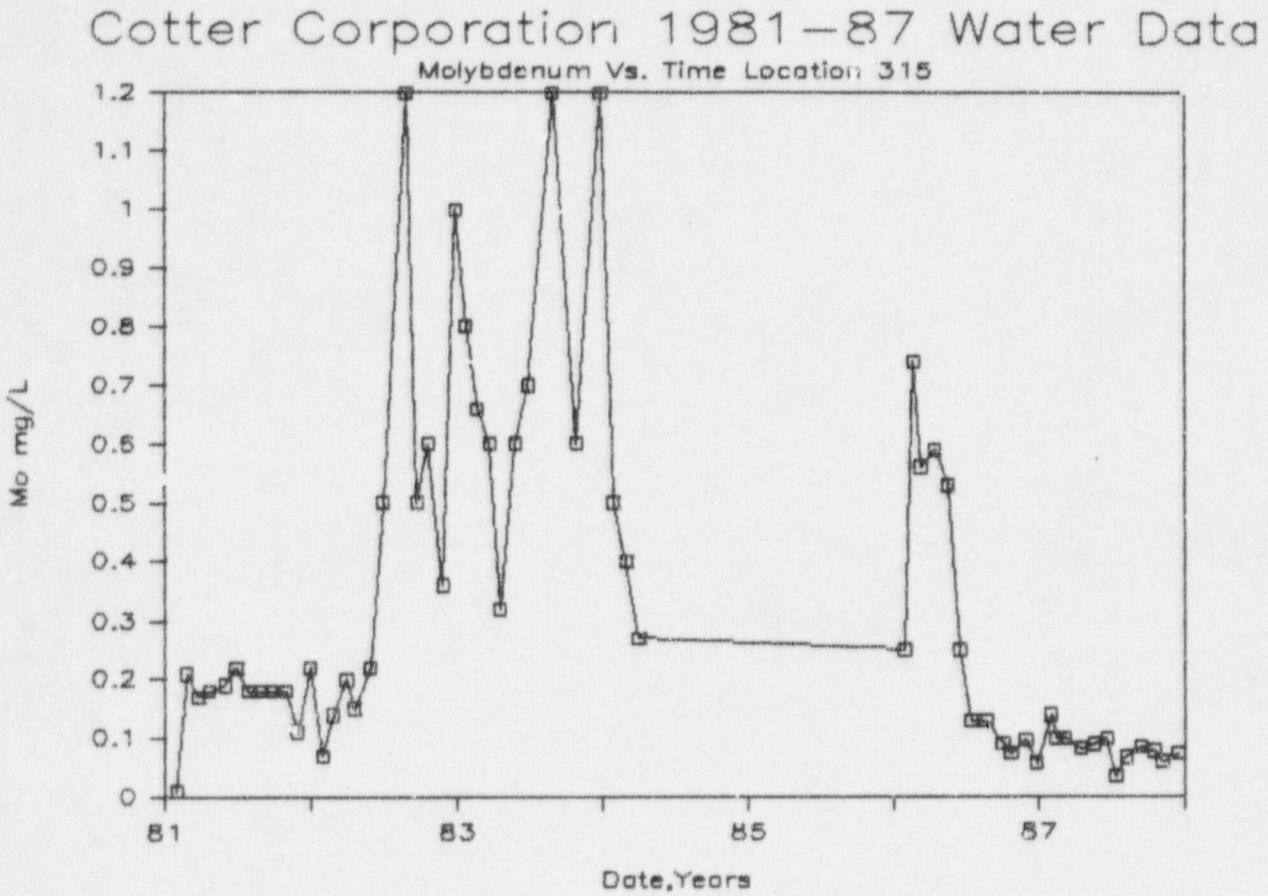
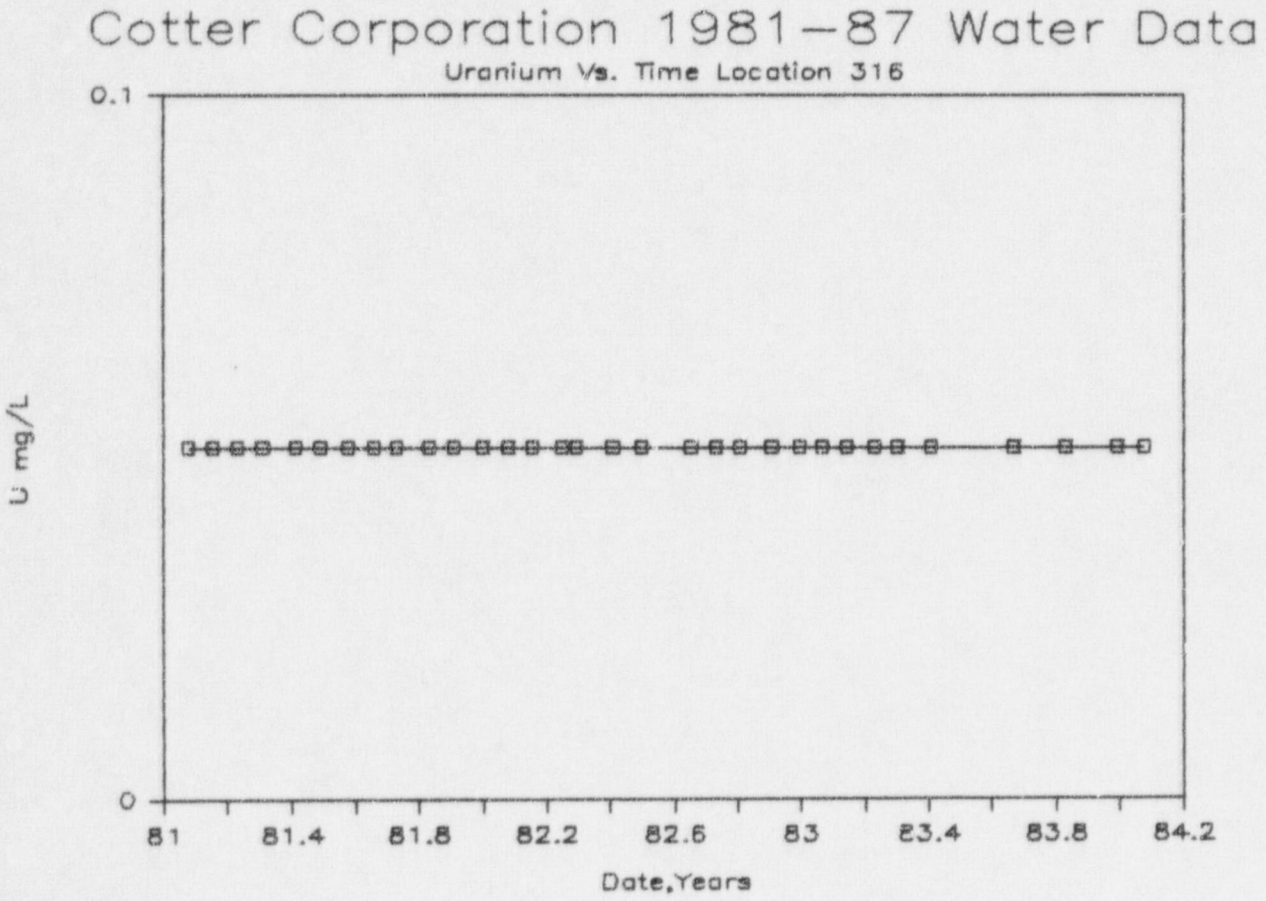
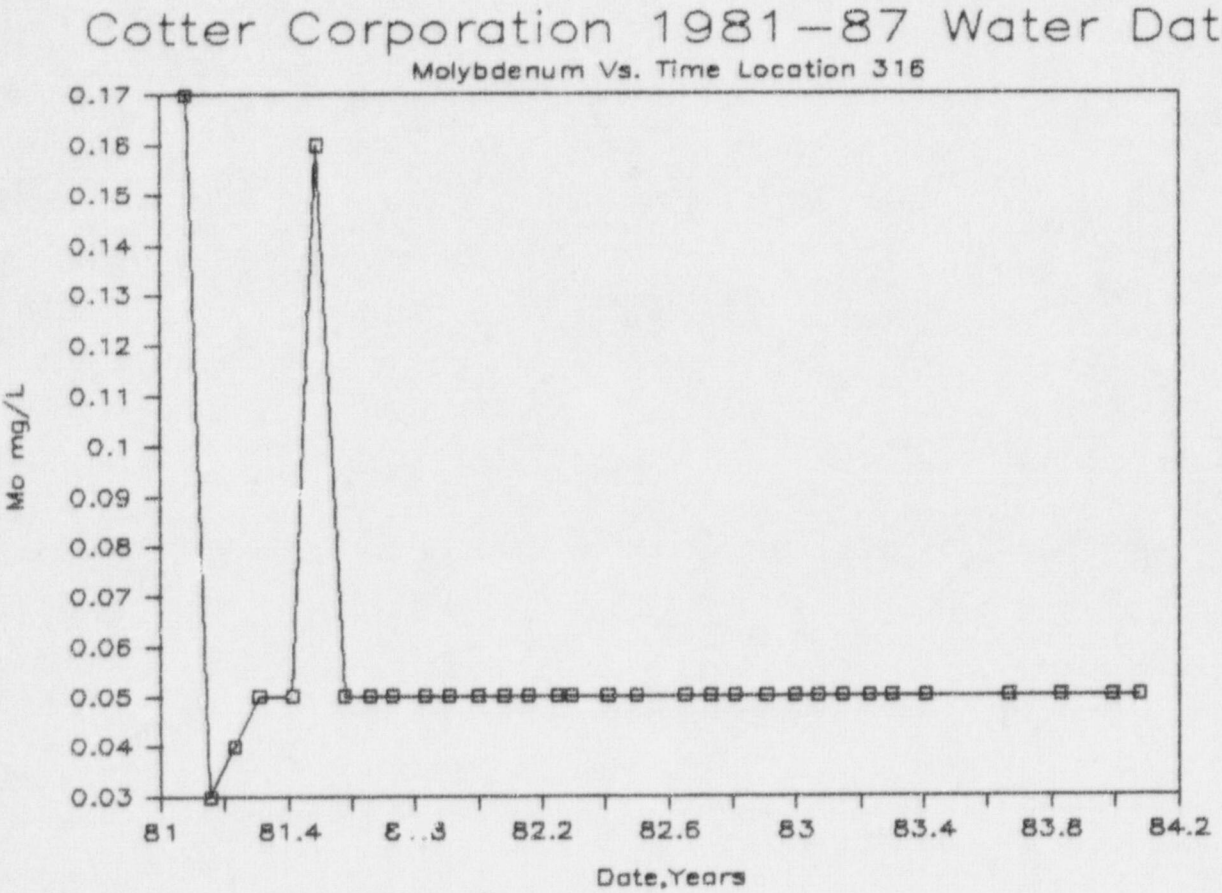

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 315
Mo mg/L
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.53




As noted in the text, this well has been irreparable since 1984.

FIGURE 1.54




As noted in the text, this well has been irreparable since 1984.

FIGURE 1.55

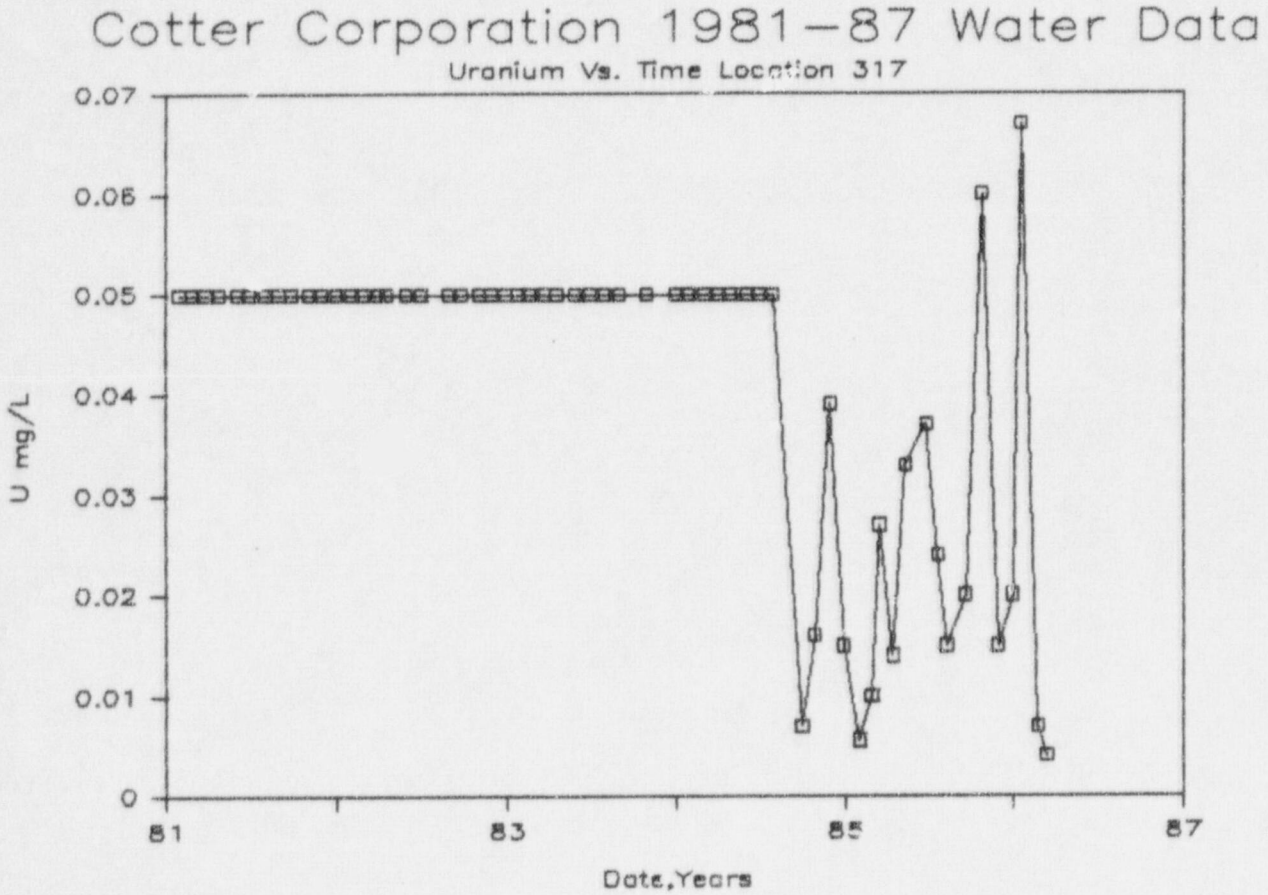

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 317
U mg/L
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.56

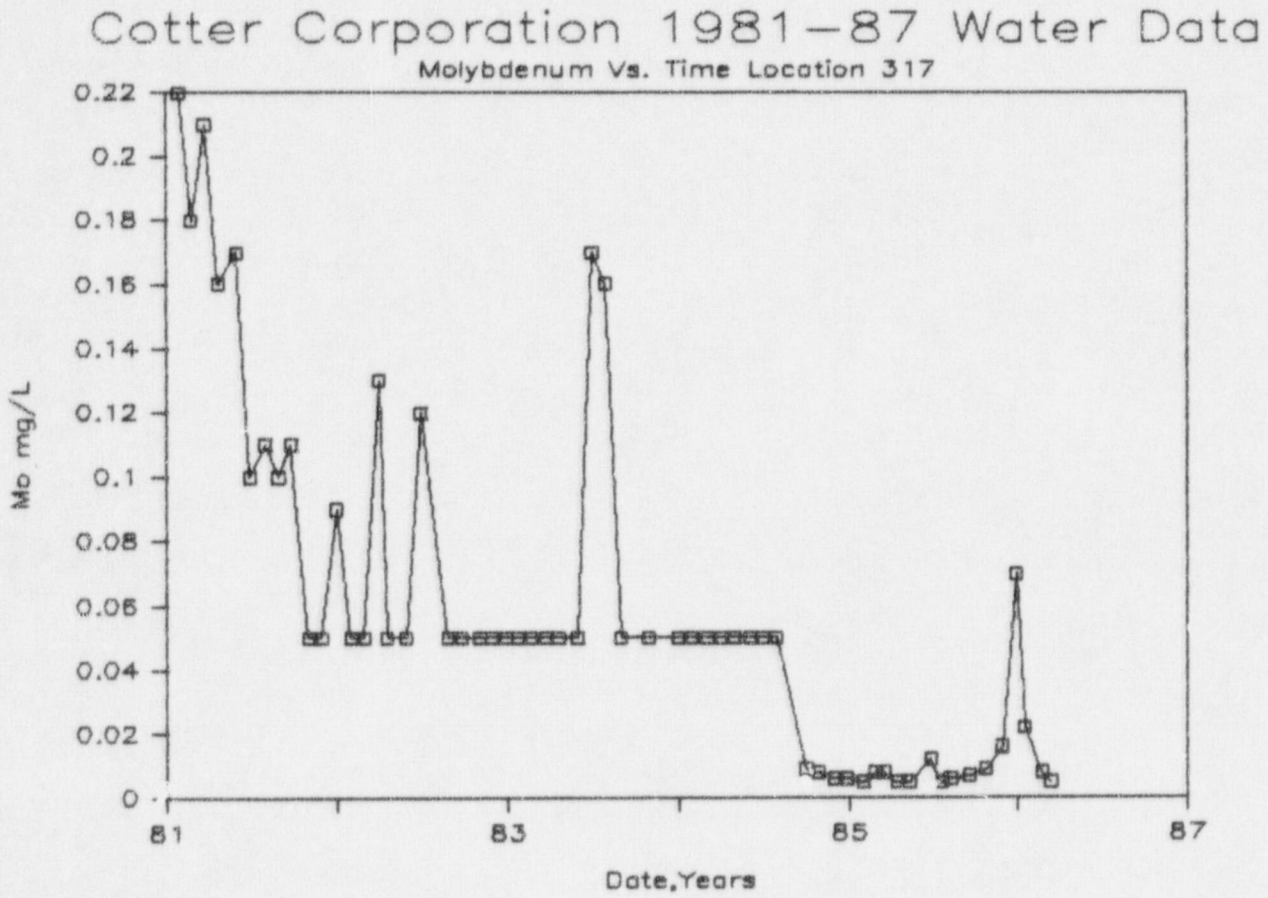

Cotter Corporation 1981—87 Water Data
Molybdenum Vs. Time Location 317
Mo mg/L
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
81
83
85
87
Date,Years

FIGURE 1.57

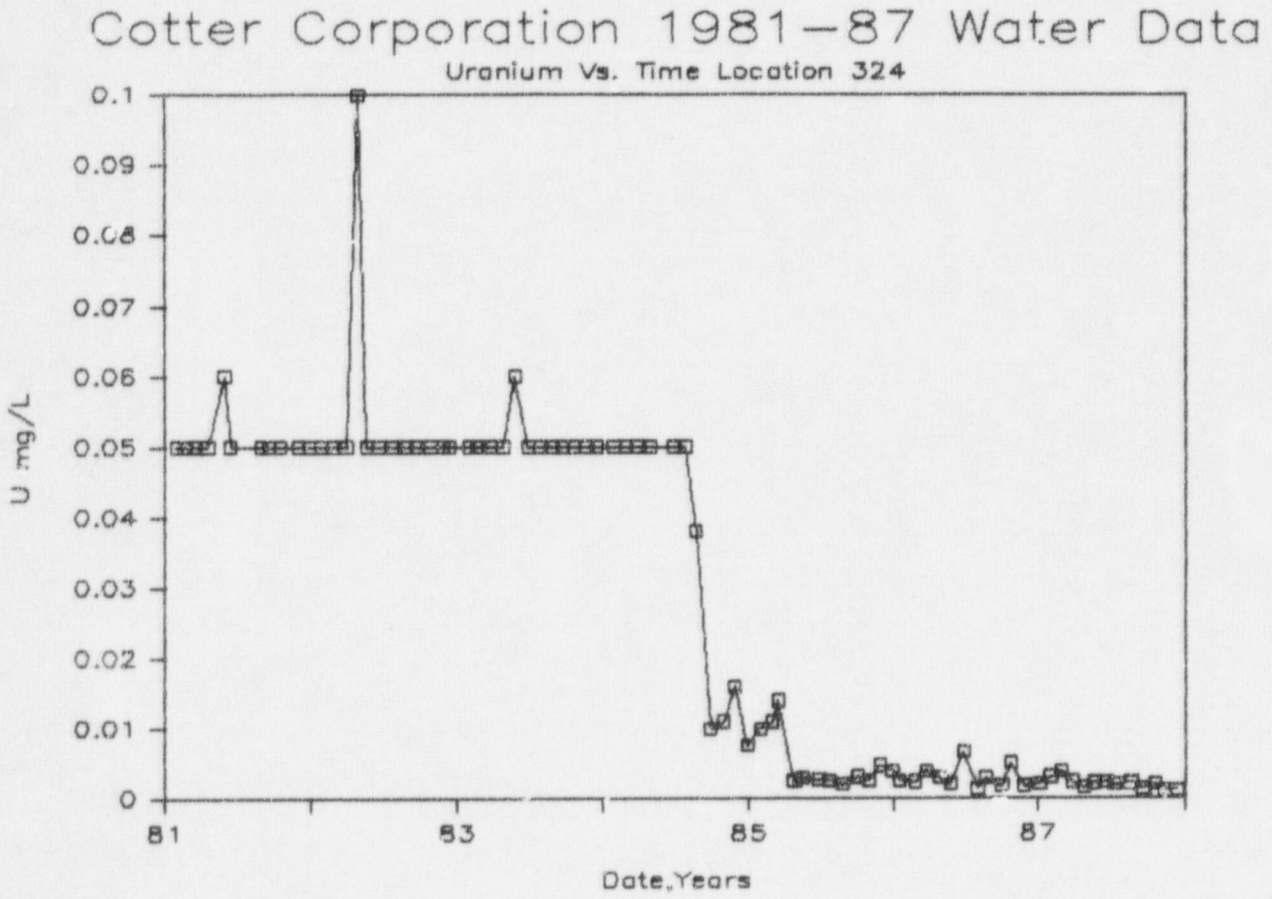

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 324
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.58

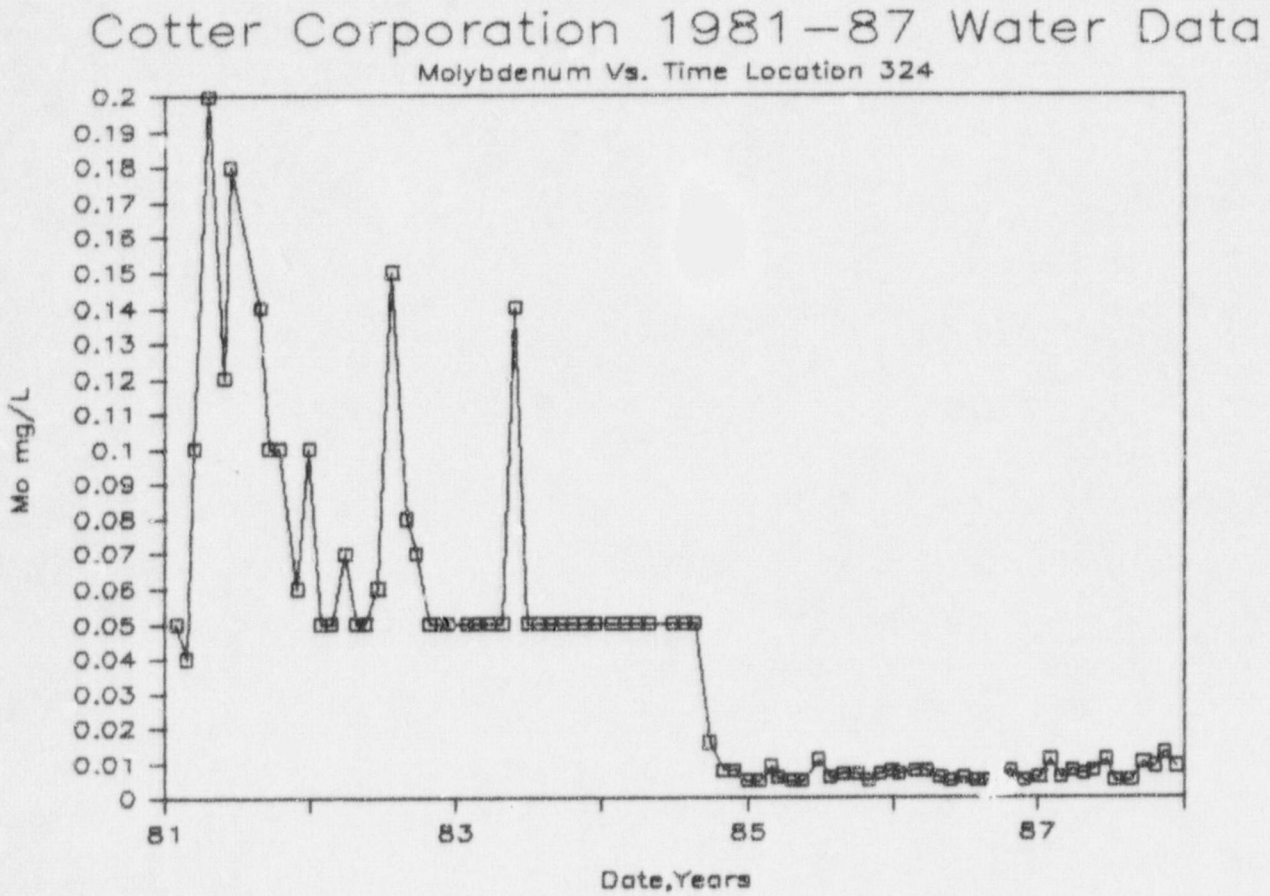

Cotter Corporation 1981—87 Water Data
Molybdenum Vs. Time Location 324
Mo mg/L
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.59

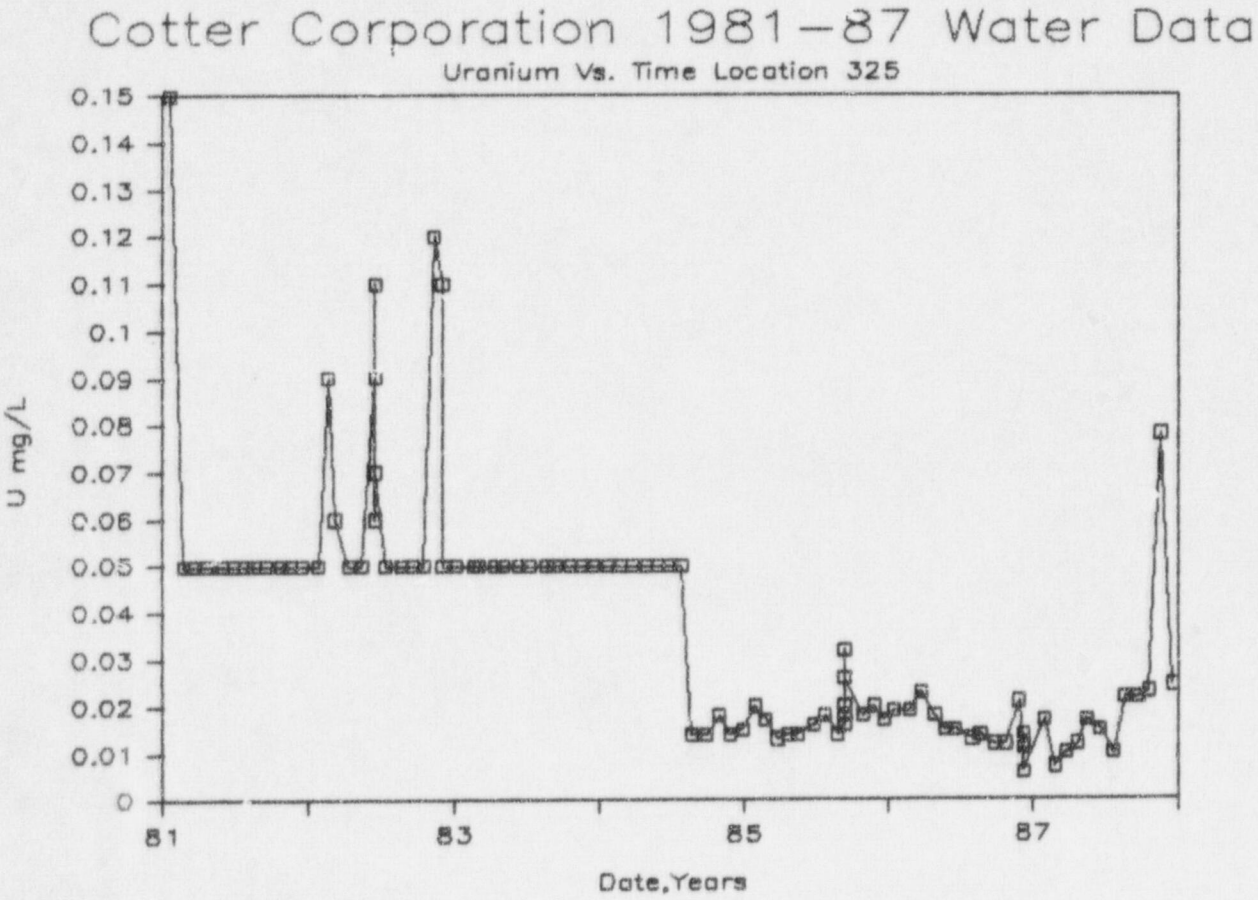

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 325
U mg/L
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.60

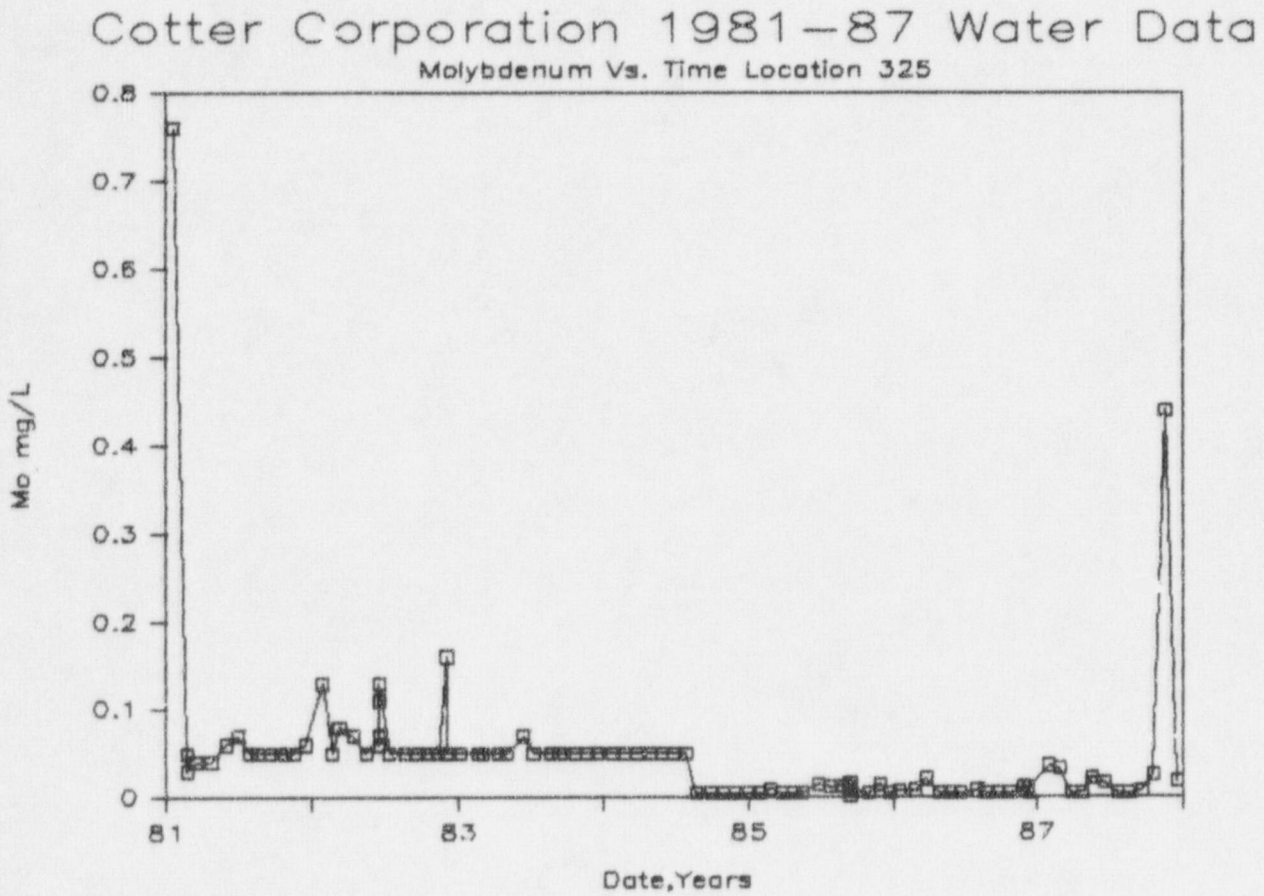

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 325
Mo mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.61

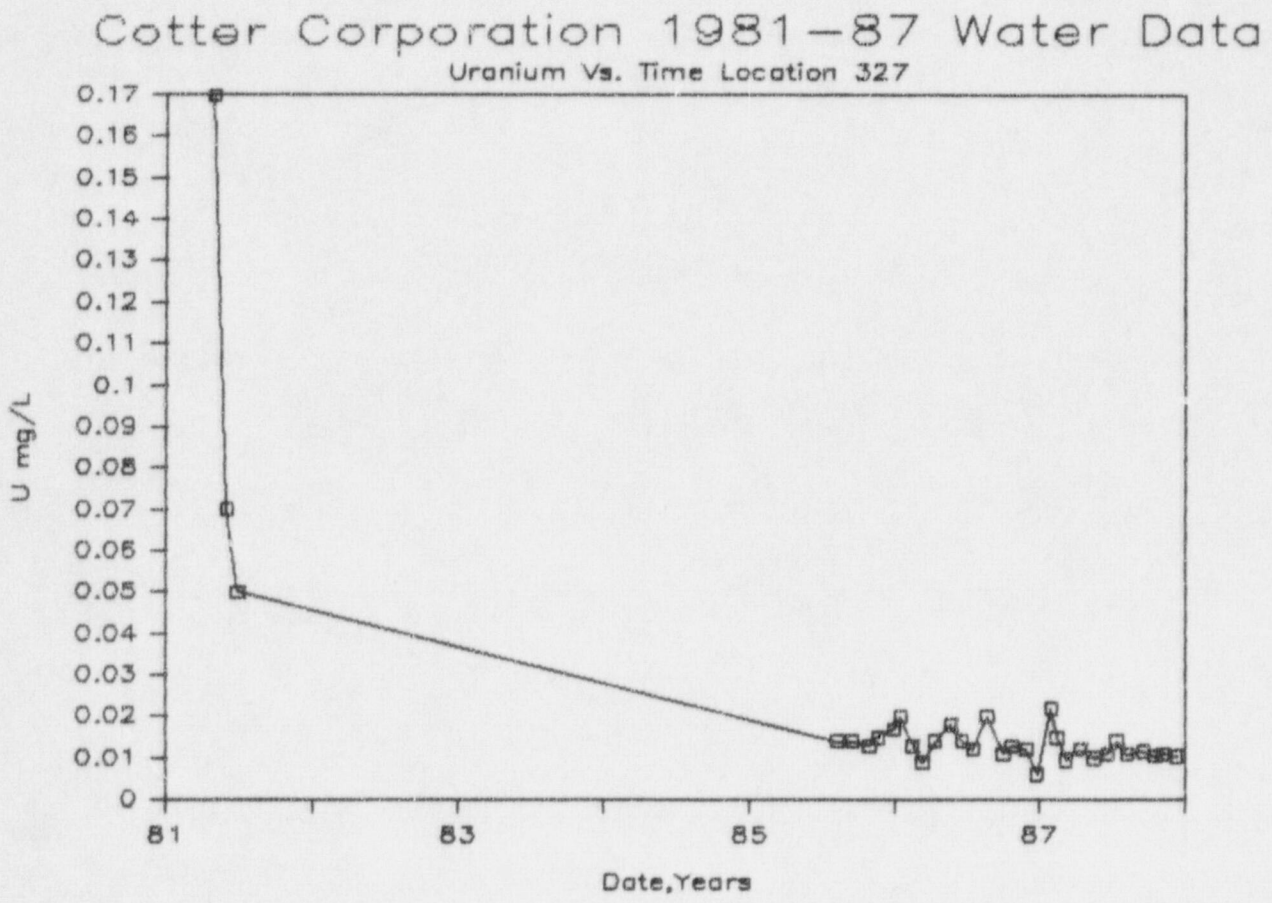

Cotter Corporation 1981—87 Water Data
Uranium Vs. Time Location 327
U mg/L
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.62

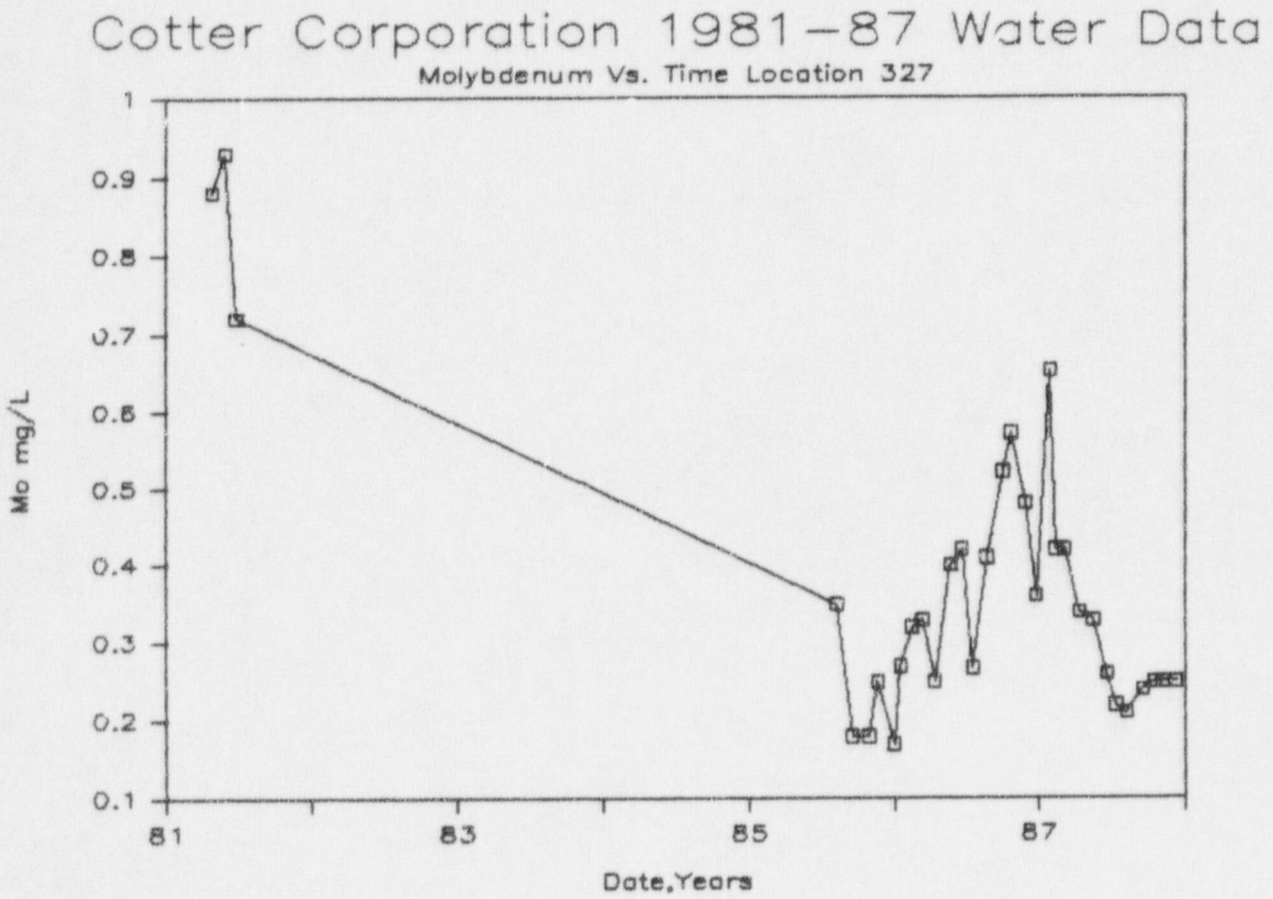

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 327
Mo mg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
81
83
85
87
Date,Years

FIGURE 1.63

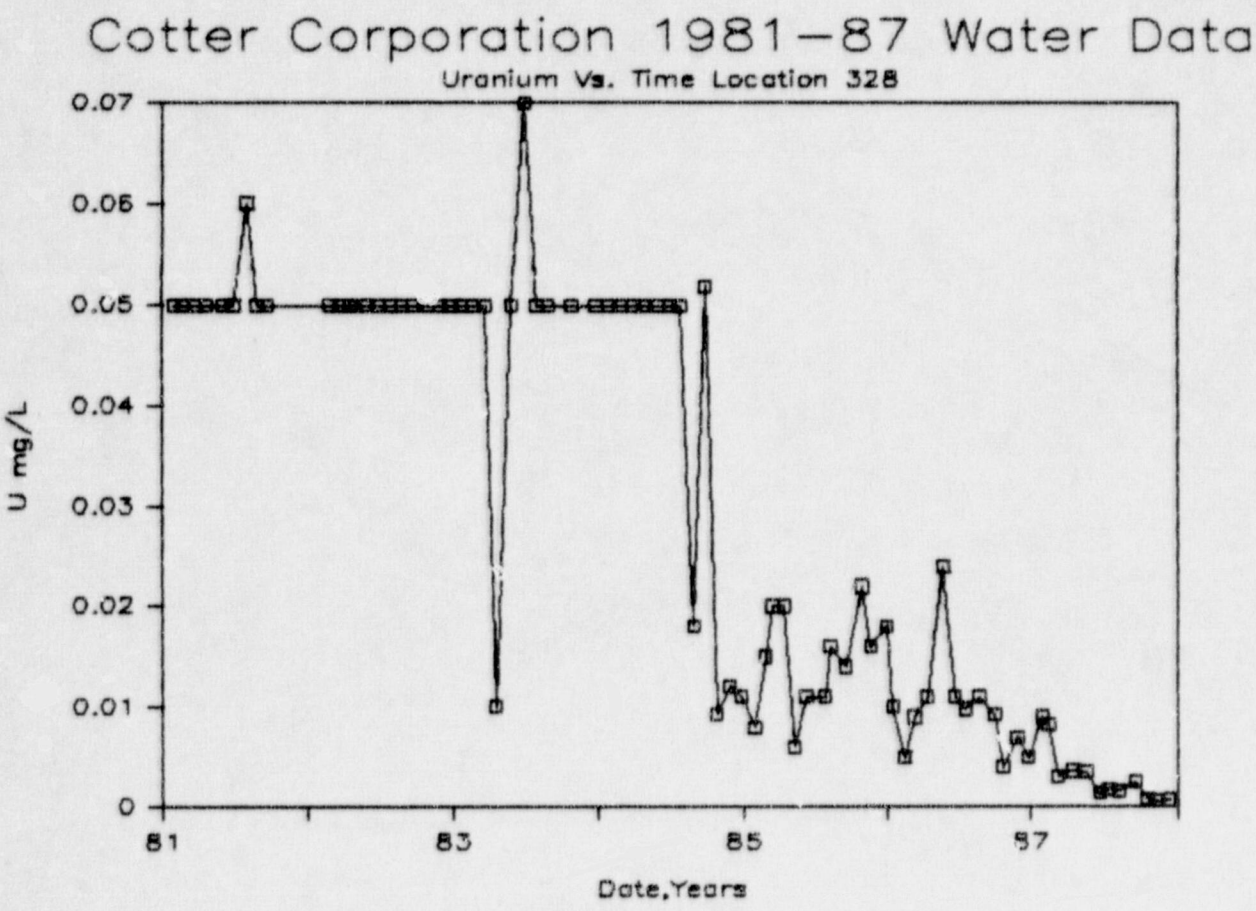

Cotter Corporation 1981—87 Water Data
Uranium Vs. Time Location 328
U mg/L
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.64

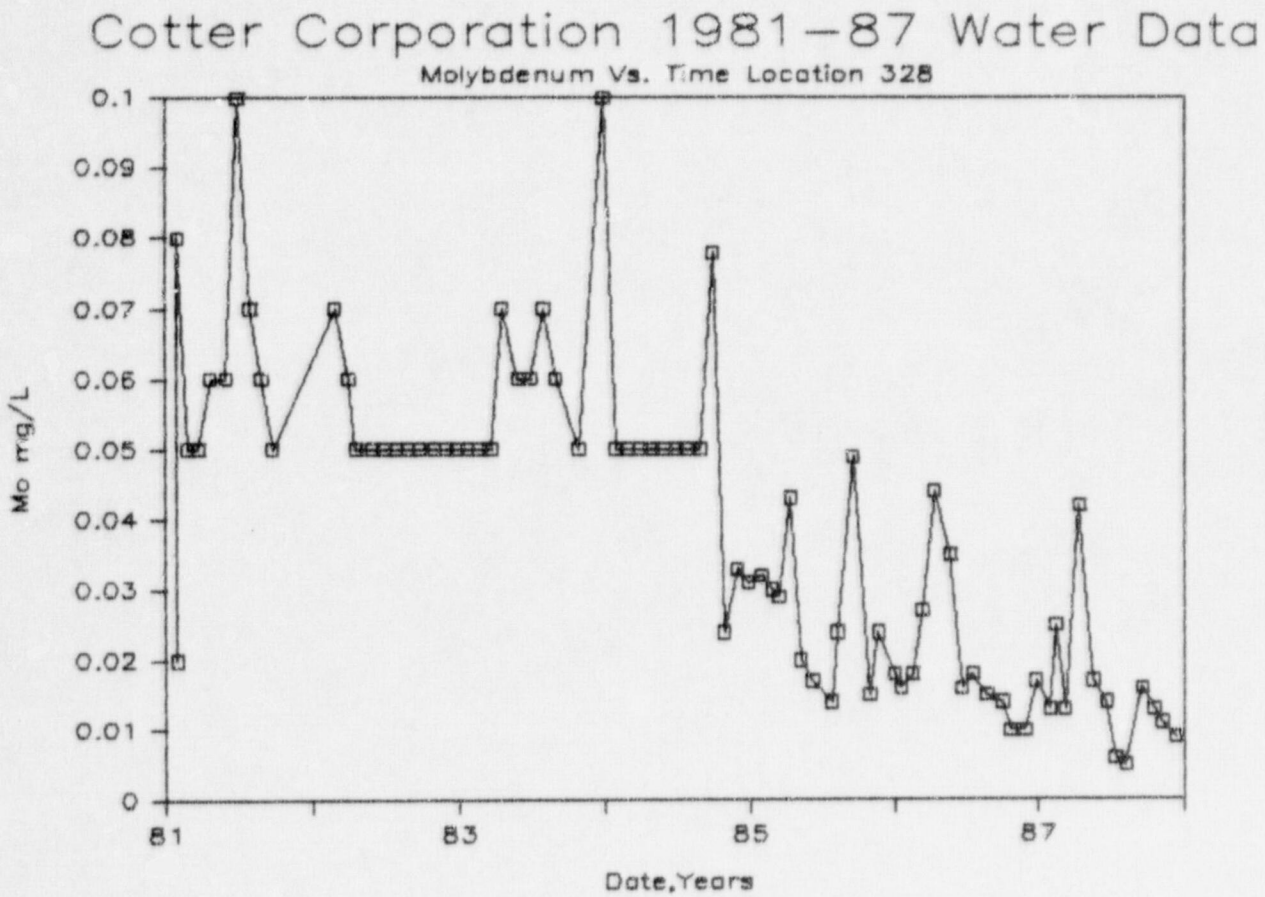

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 328
Mo mg/L
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.65

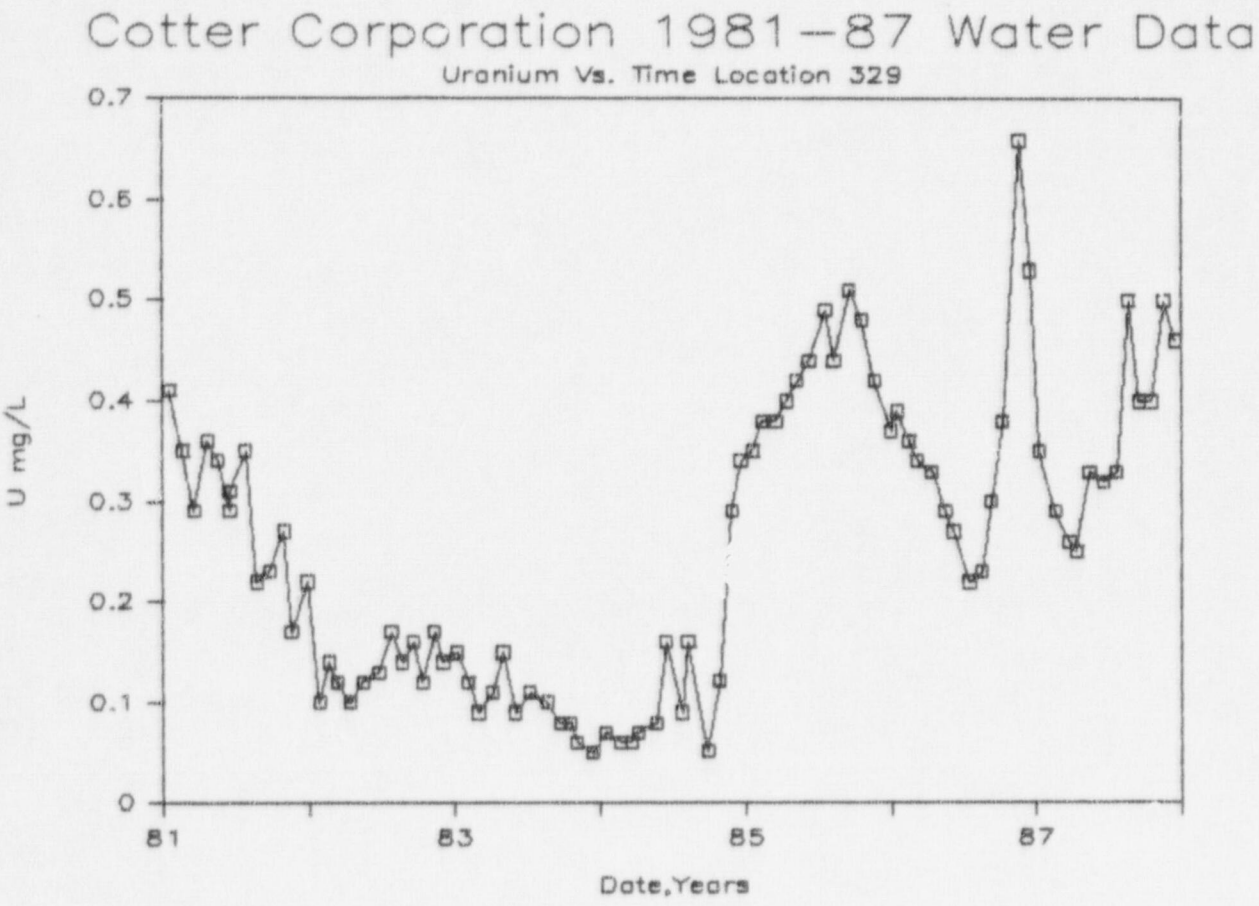

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 329
U mg/L
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.66

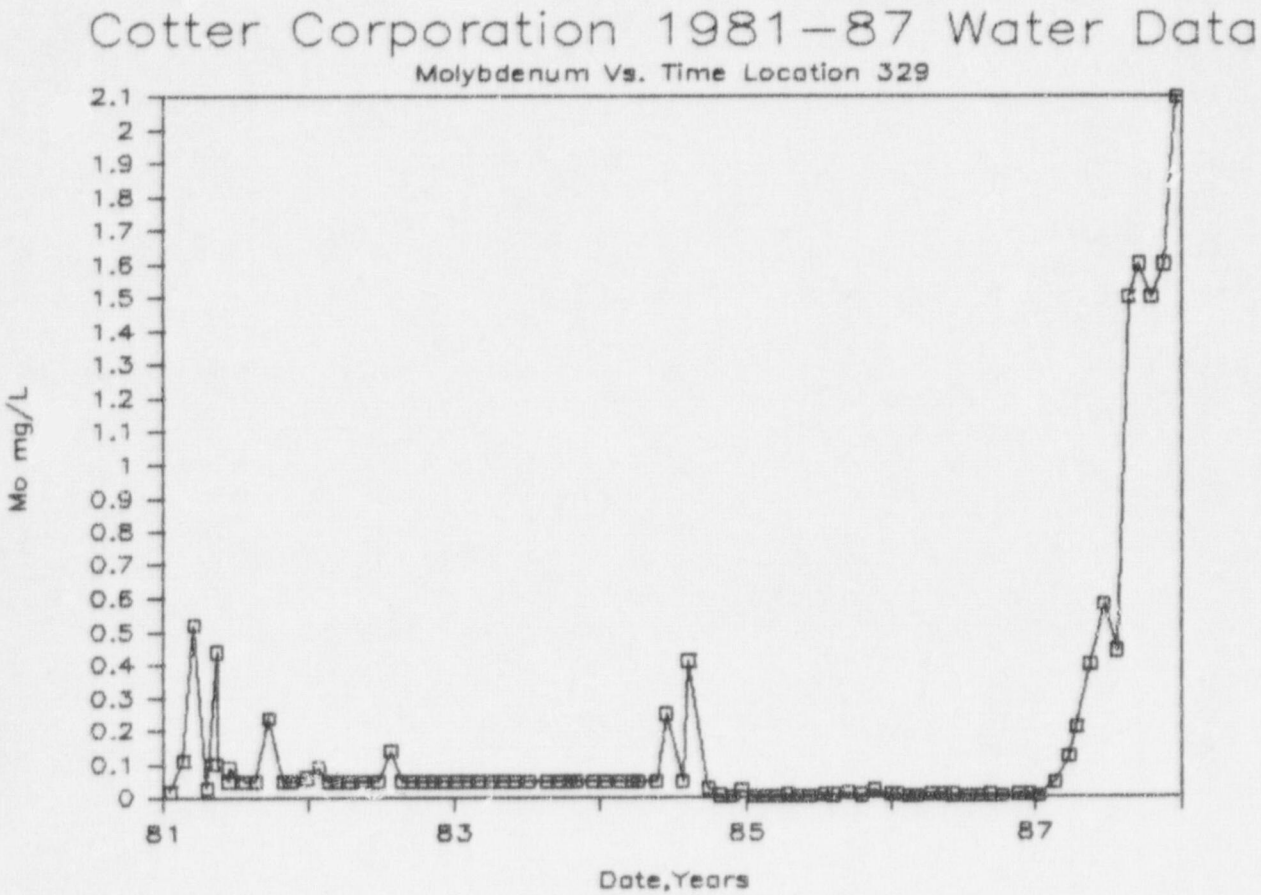

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 329
Mo mg/L
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
81
83
85
87
Date,Years

FIGURE 1.67

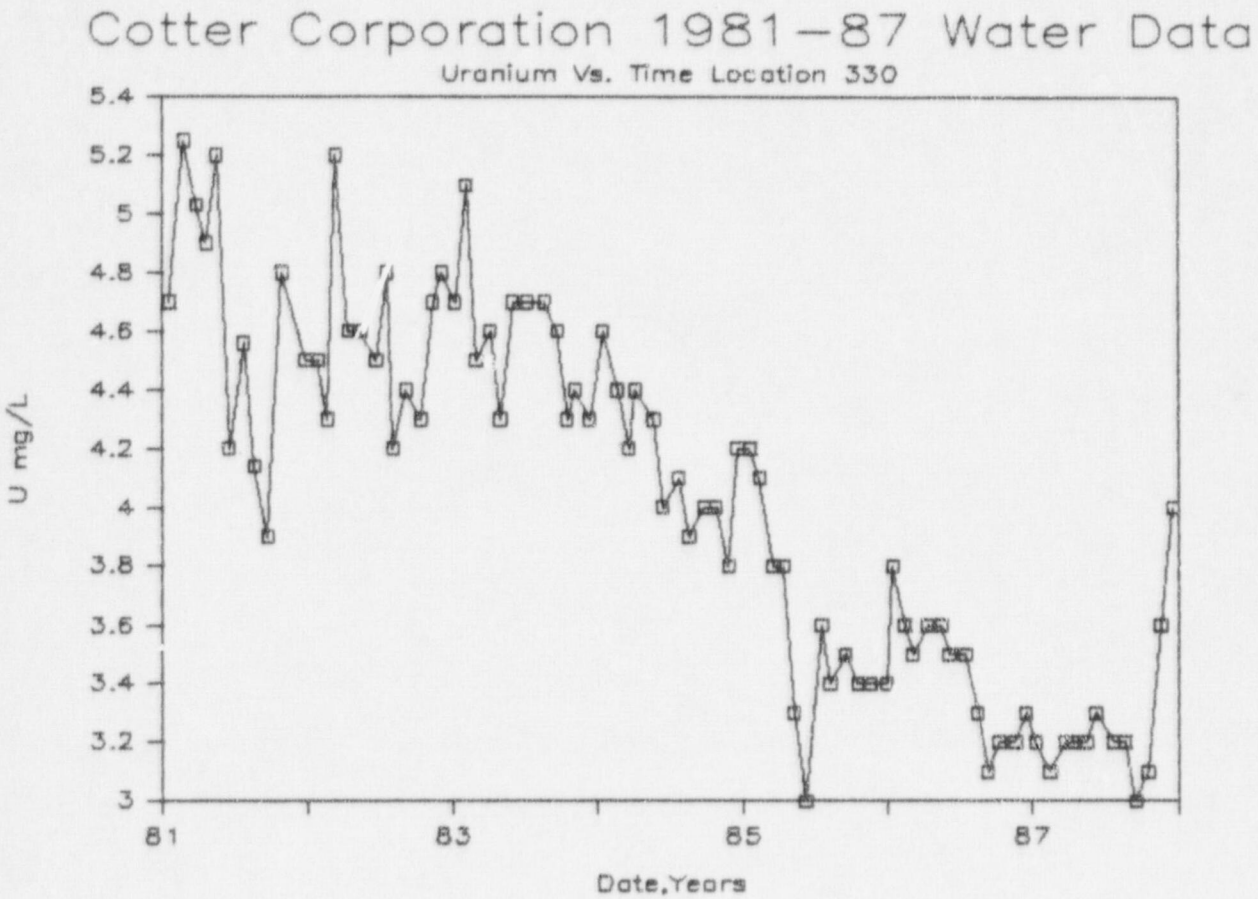

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 330
U mg/L
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
81
83
85
87
Date,Years

FIGURE 1.68

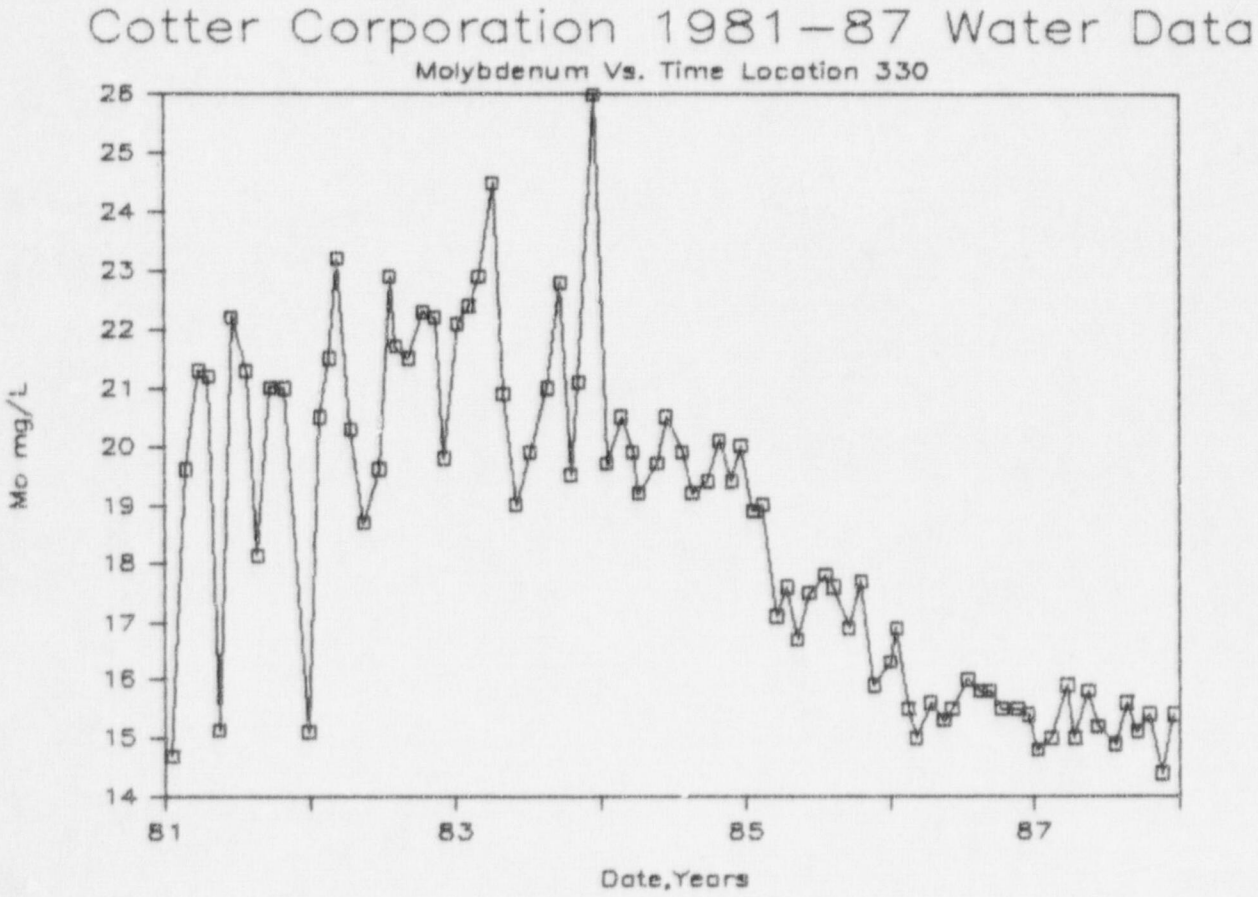

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 330
Mo mg/L
26
25
24
23
22
21
20
19
18
17
16
15
14
81
83
85
87
Date,Years

FIGURE 1.69

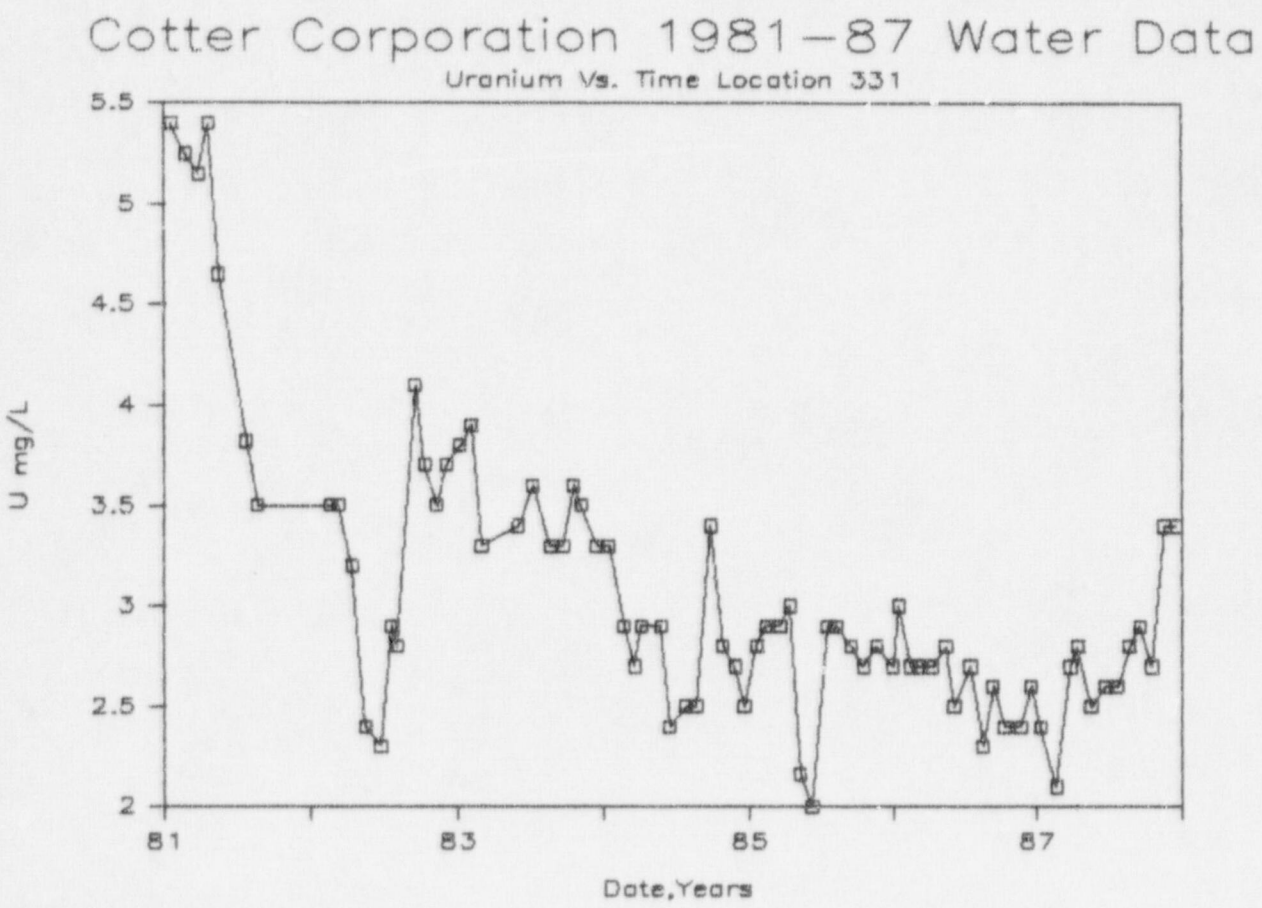

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 331
U mg/L
5.5
5
4.5
4
3.5
3
2.5
2
81
83
85
87
Date,Years

FIGURE 1.70

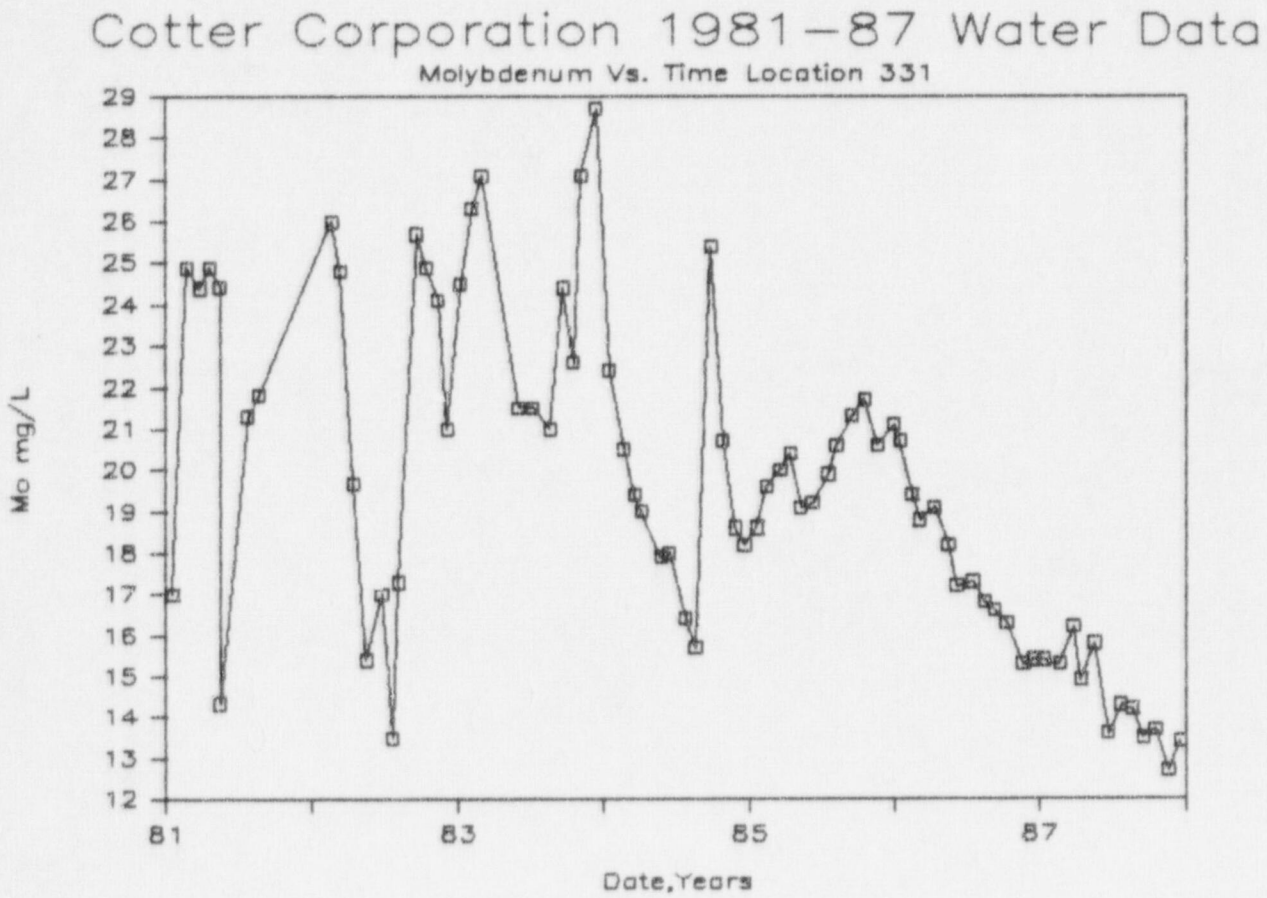

Cotter Corporation 1981—87 Water Data
Molybdenum Vs. Time Location 331
Mo mg/L
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
81
83
85
87
Date,Years

FIGURE 1.71

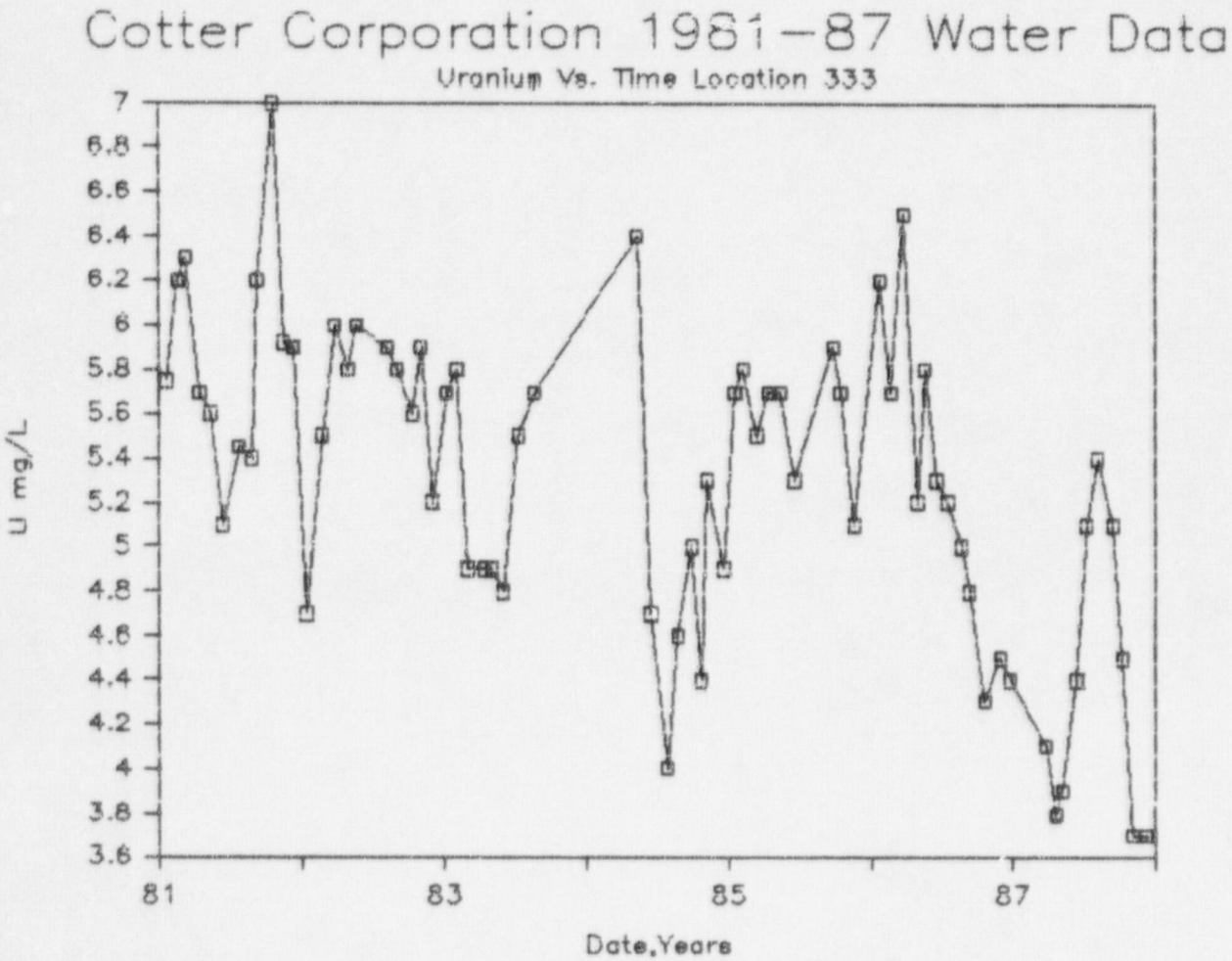

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 333
U mg/L
7
6.8
6.6
6.4
6.2
6
5.8
5.6
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
81
83
85
87
Date,Years

FIGURE 1.72

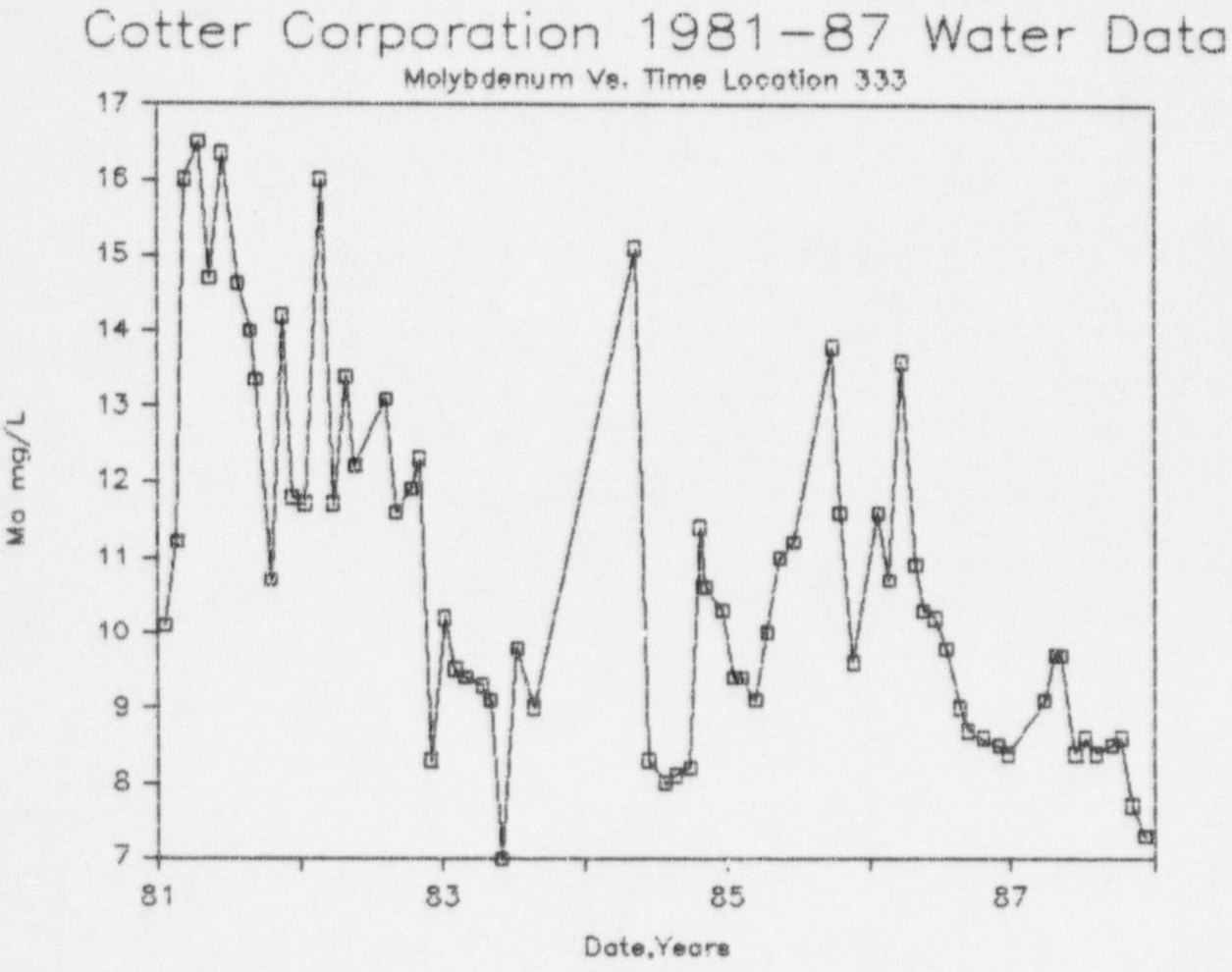

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 333
Mo mg/L
17
16
15
14
13
12
11
10
9
8
7
81
83
85
87
Date,Years

FIGURE 1.73

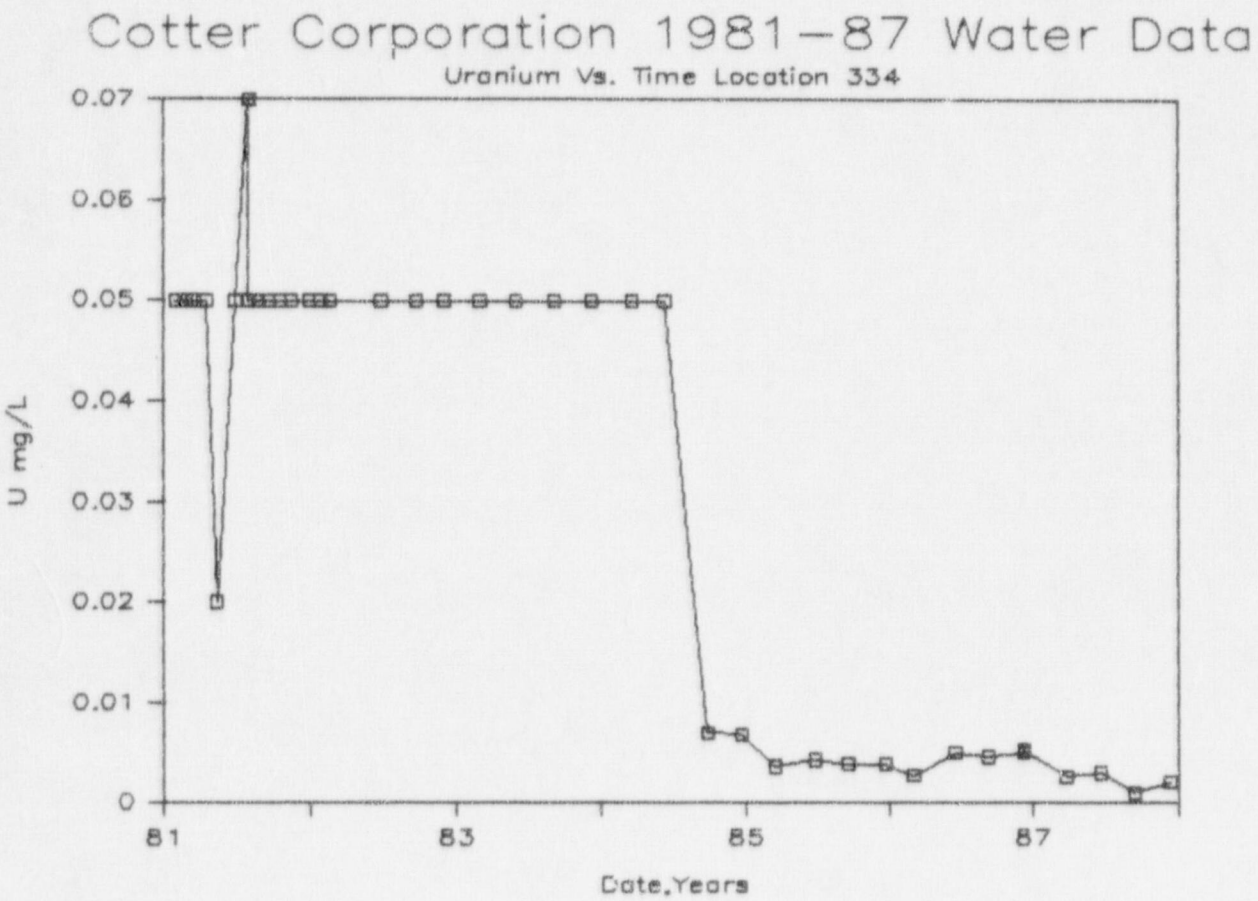

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 334
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
Date,Years

FIGURE 1.74

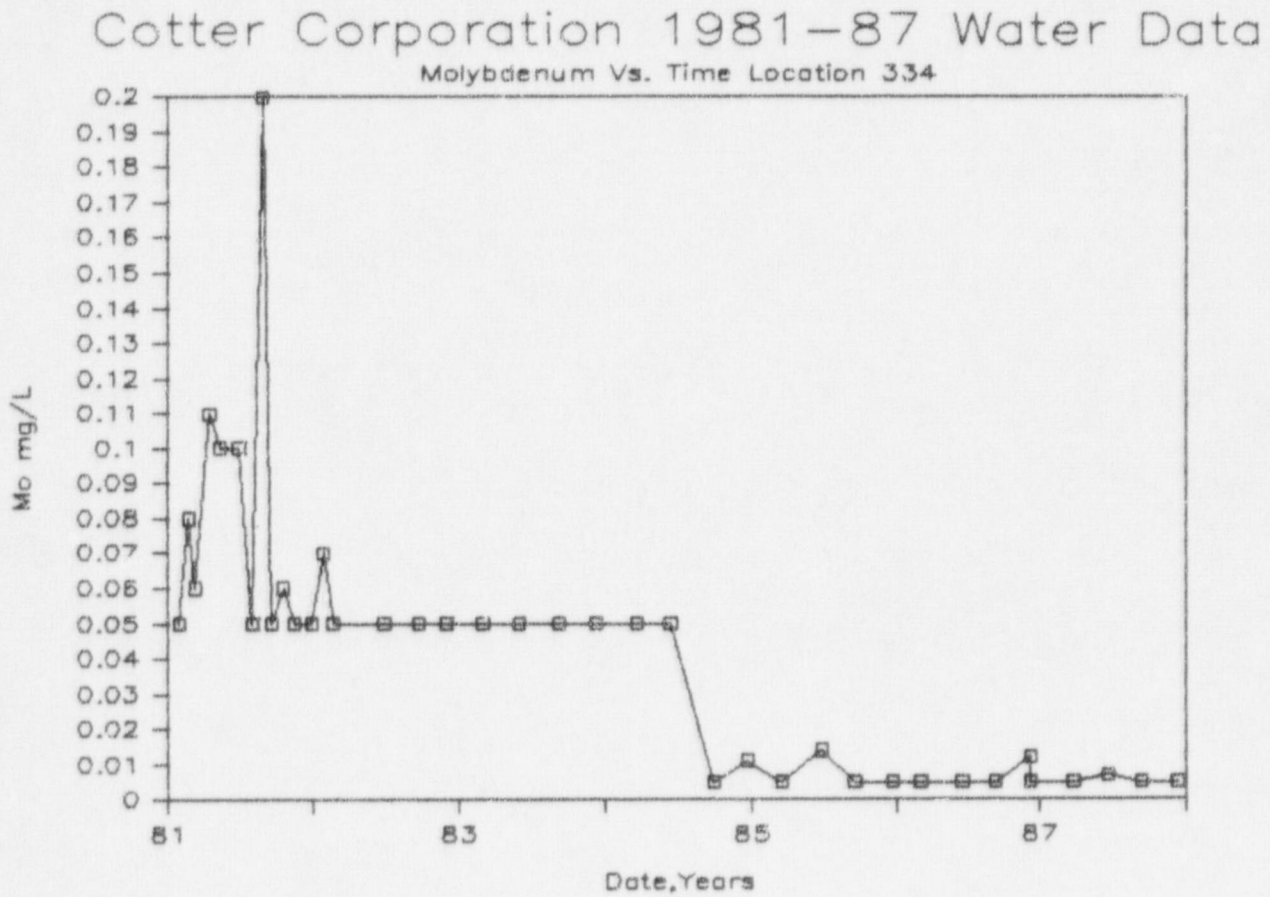

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 334
Mo mg/L
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.75

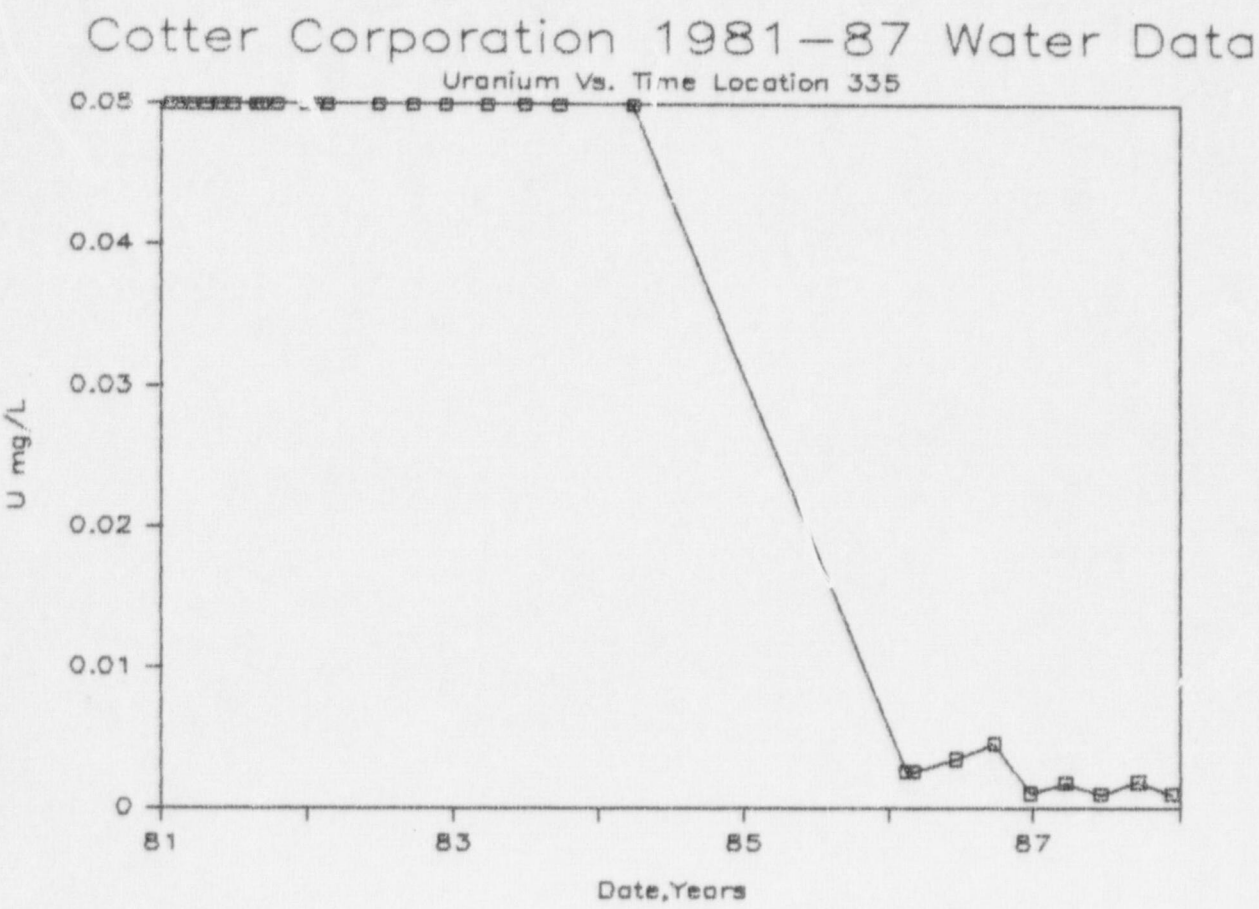

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 335
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
Date,Years

FIGURE 1.76

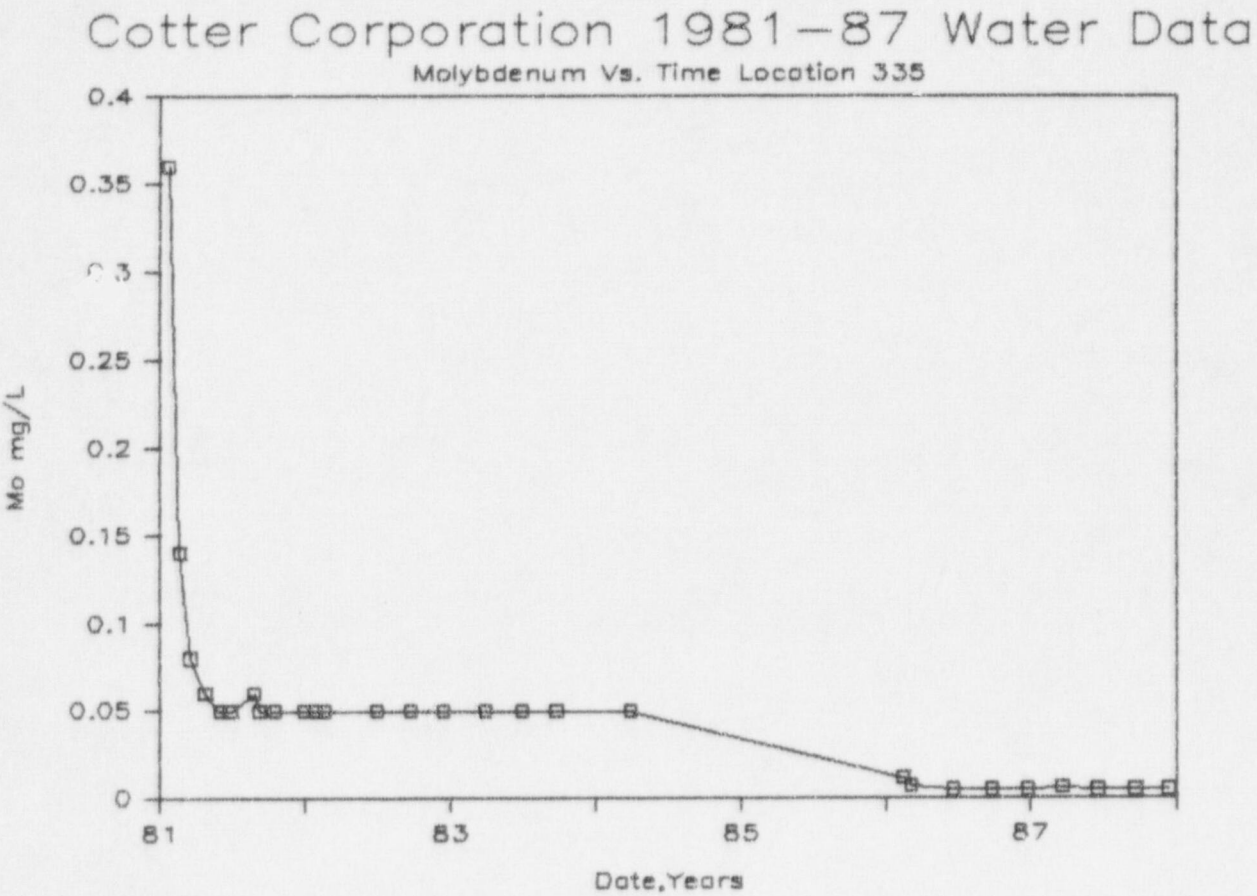

Cotter Corporation 1981—87 Water Data
Molybdenum Vs. Time Location 335
Mo mg/L
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
81
83
85
87
Date,Years

FIGURE 1.77

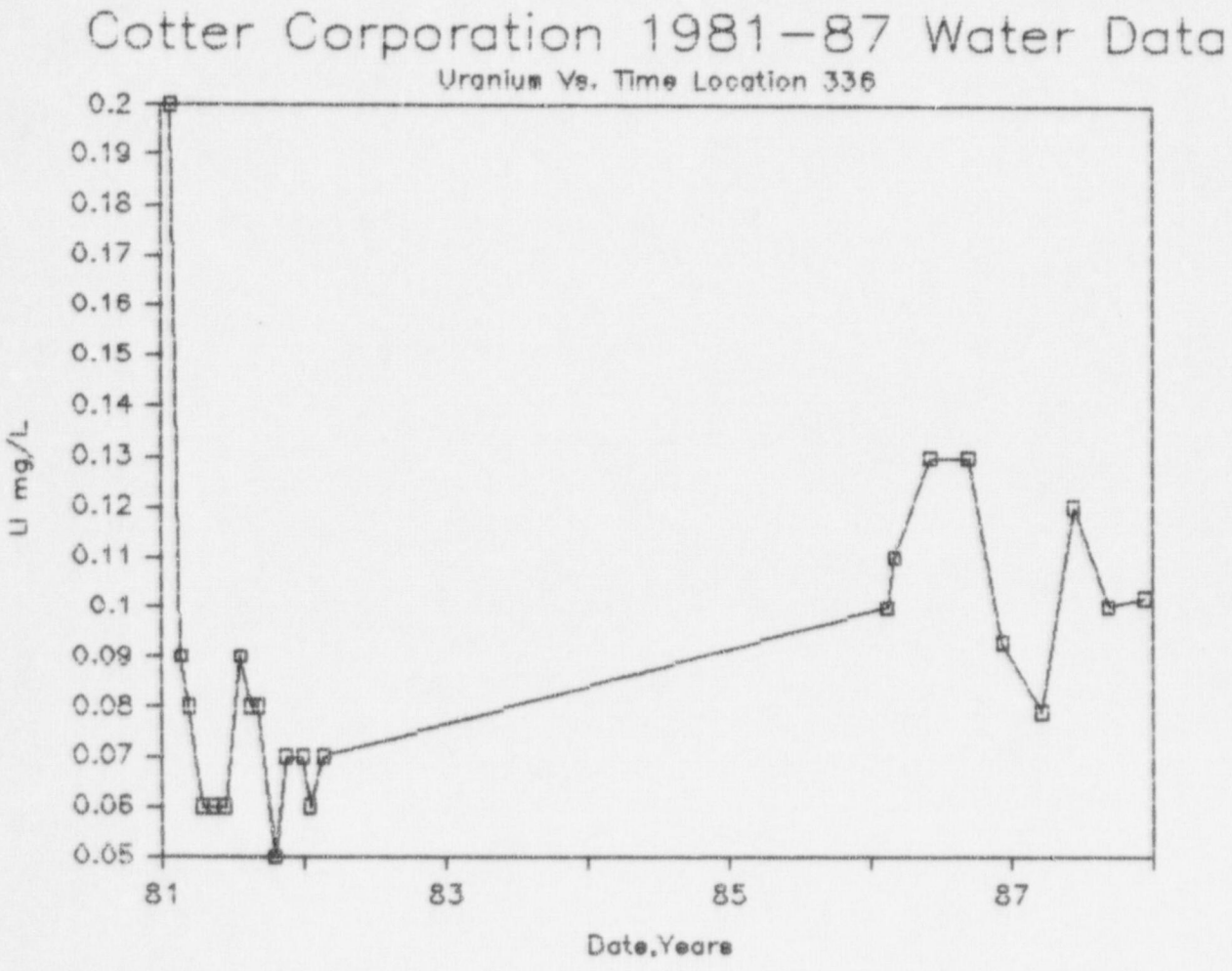

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 336
U mg/L
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
81
83
85
87
Date,Years

FIGURE 1.78

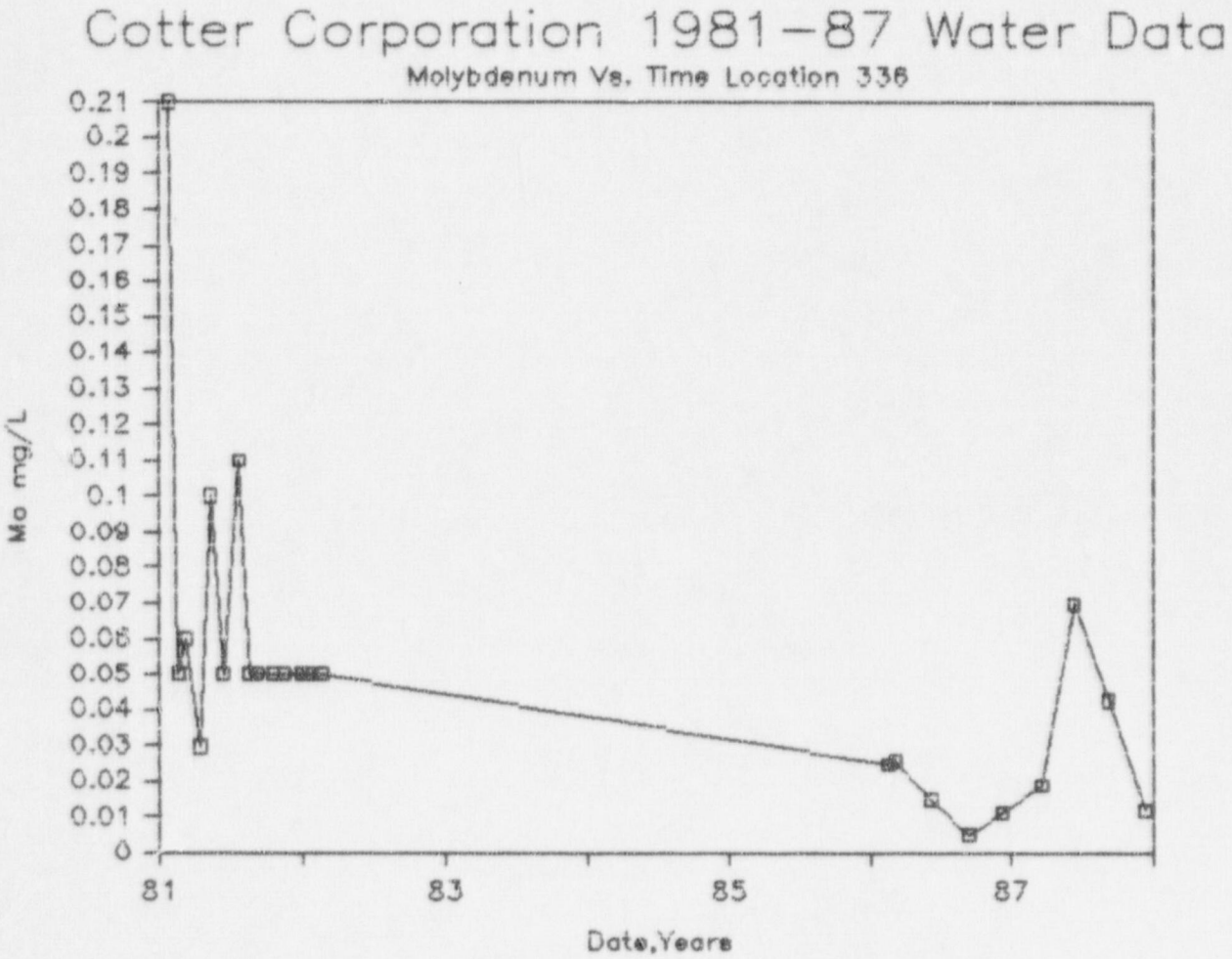

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 336
Mo mg/L
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.79

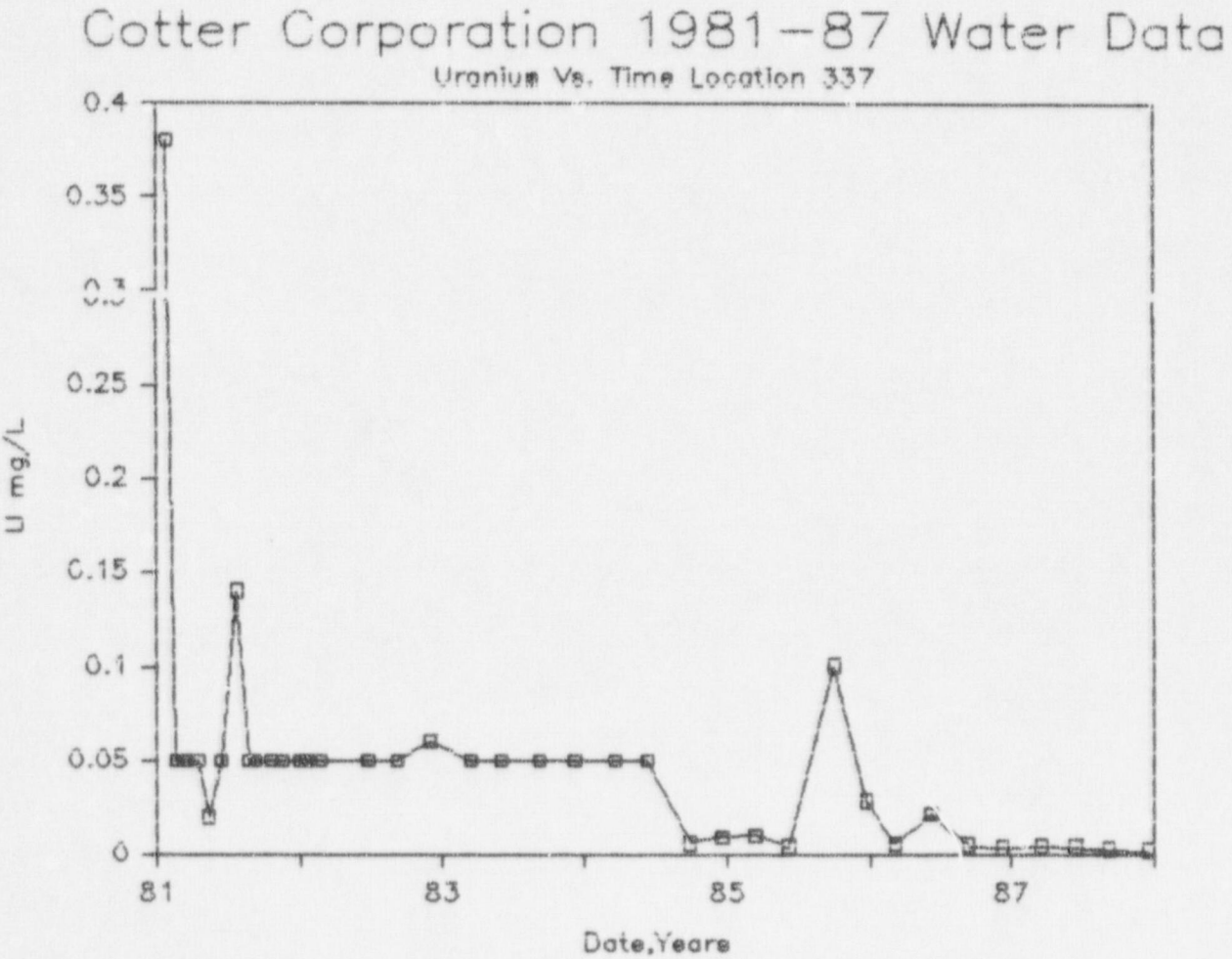

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 337
U mg/L
0.4
0.35
0.25
0.2
0.15
0.1
0.05
0
81
83
85
87
Date,Years

FIGURE 1.80

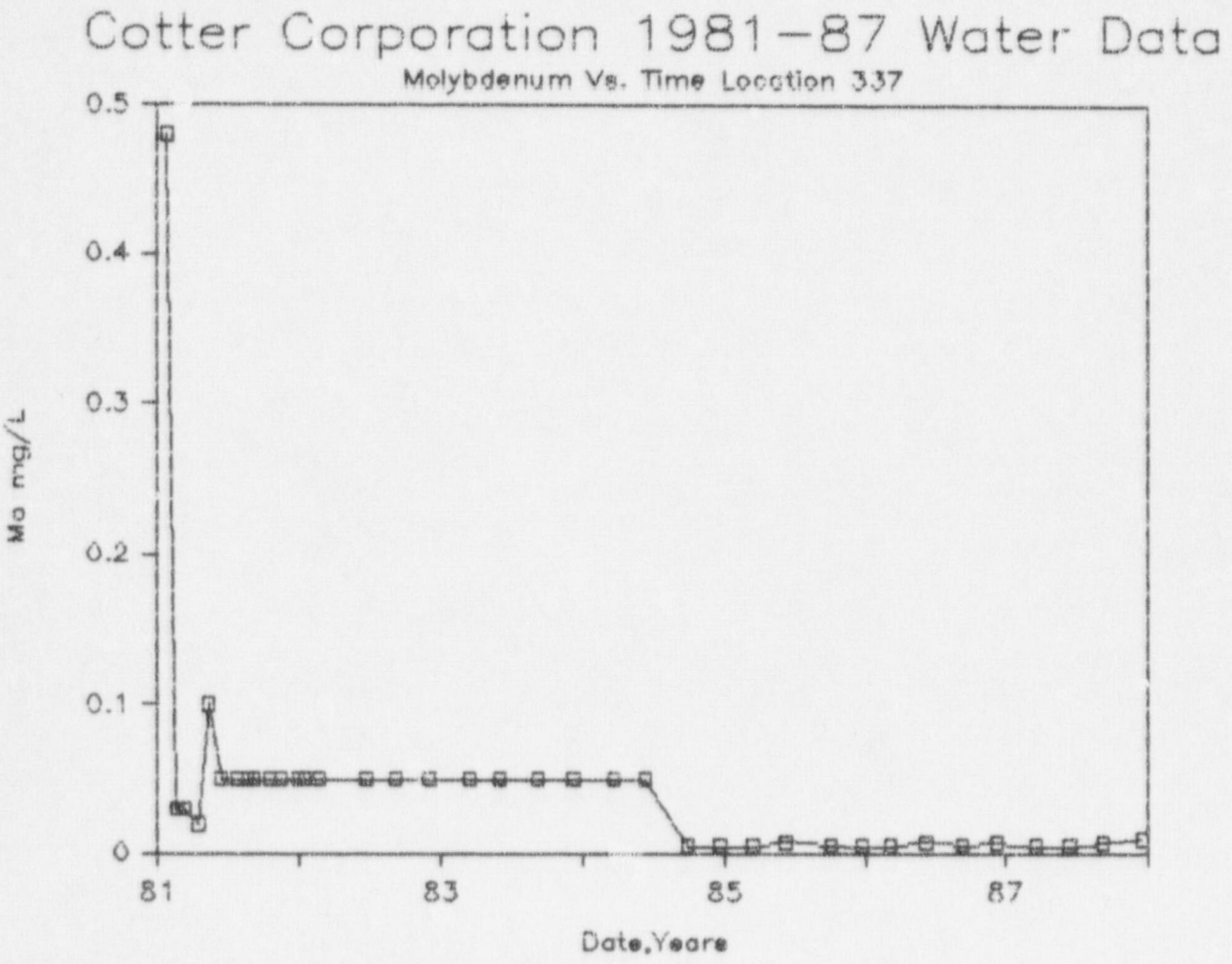

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 337
0.5
0.4
0.3
0.2
0.1
0
Mo mg/L
81
83
85
87
Date,Years

FIGURE 1.81

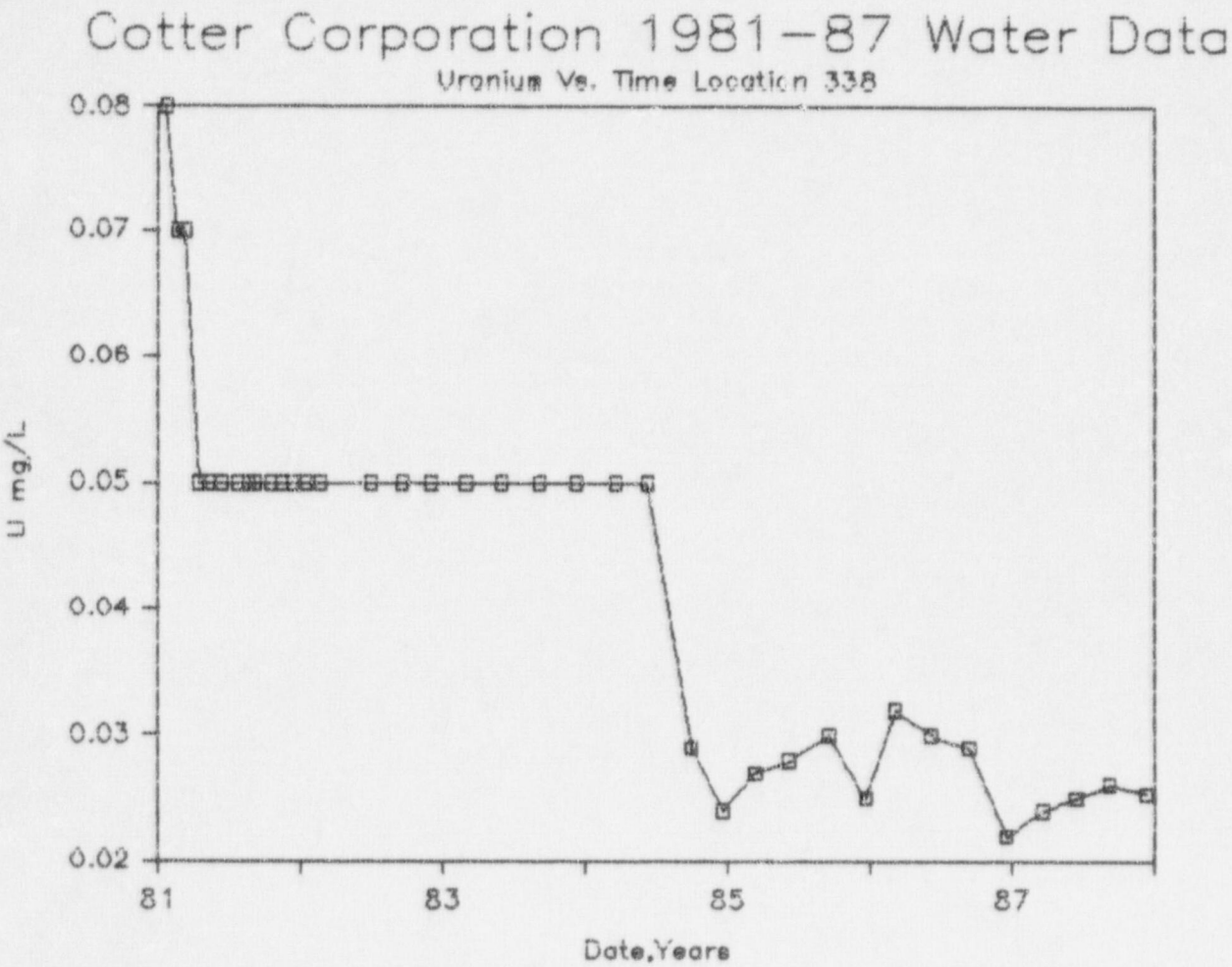

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 338
U mg/L
0.08
0.07
0.06
0.05
0.04
0.03
0.02
81
83
85
87
Date,Years

FIGURE 1.82

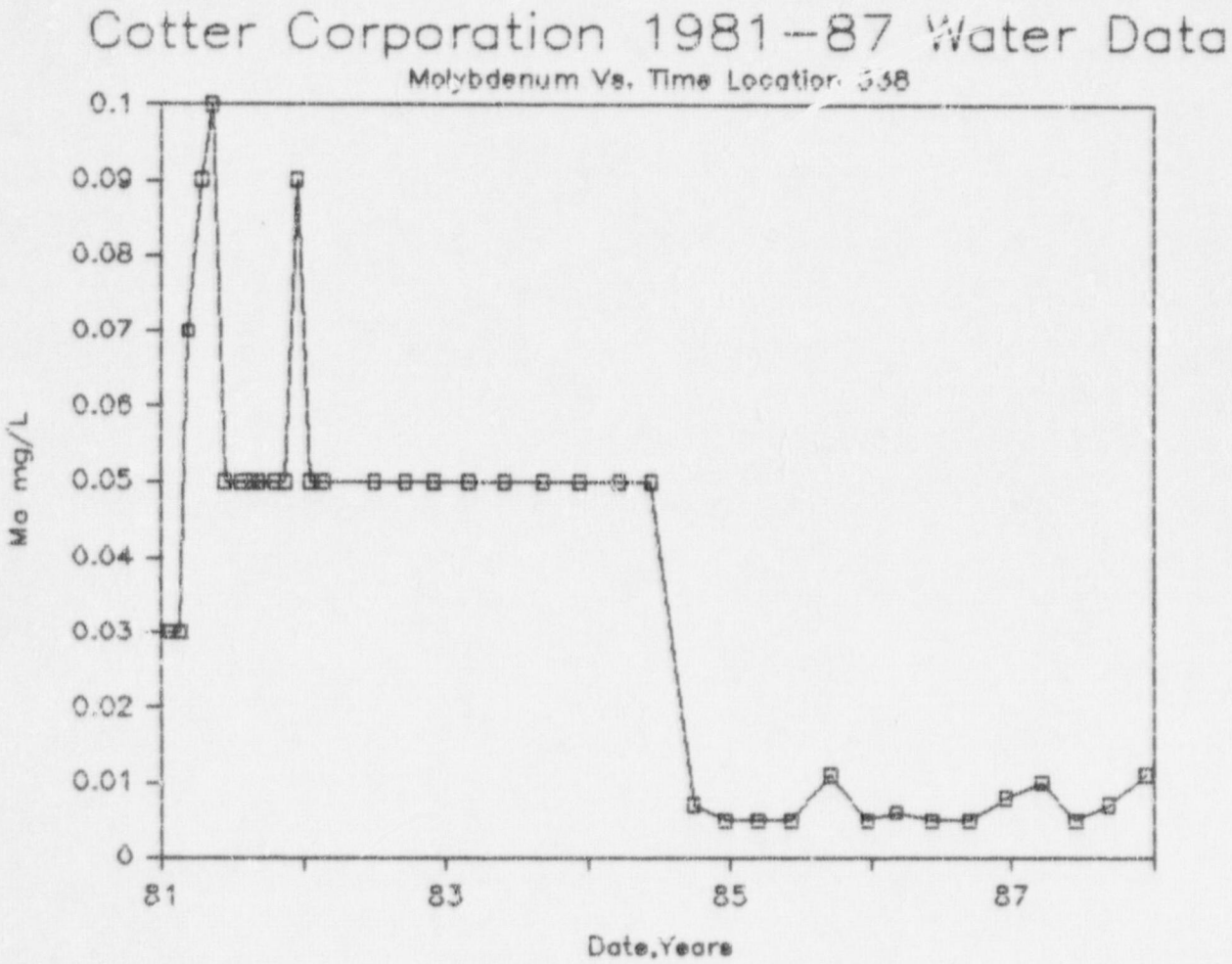

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 3.58
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Mo mg/L
81
83
85
87
Date,Years

FIGURE 1.83

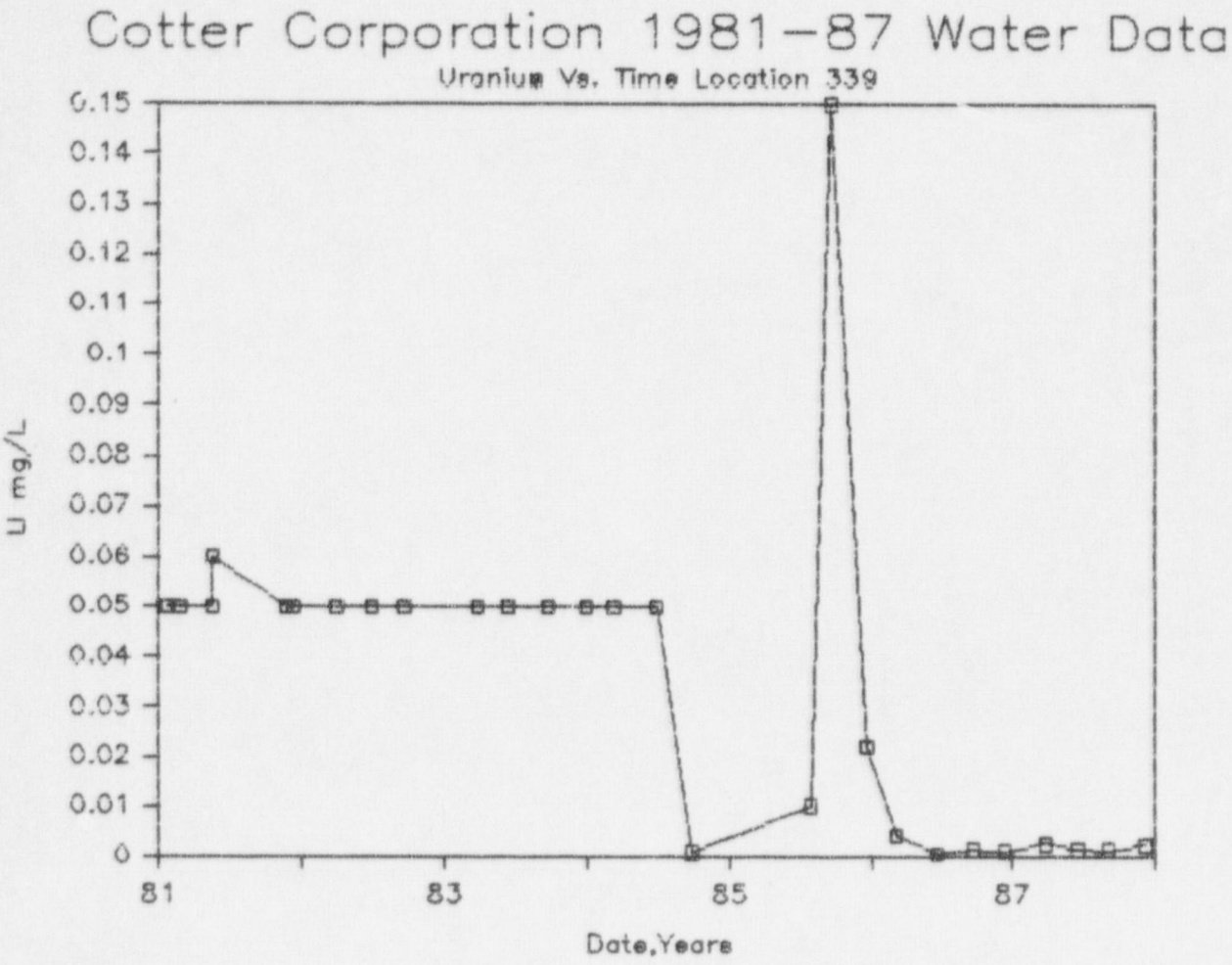

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 339
U mg/L
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.84

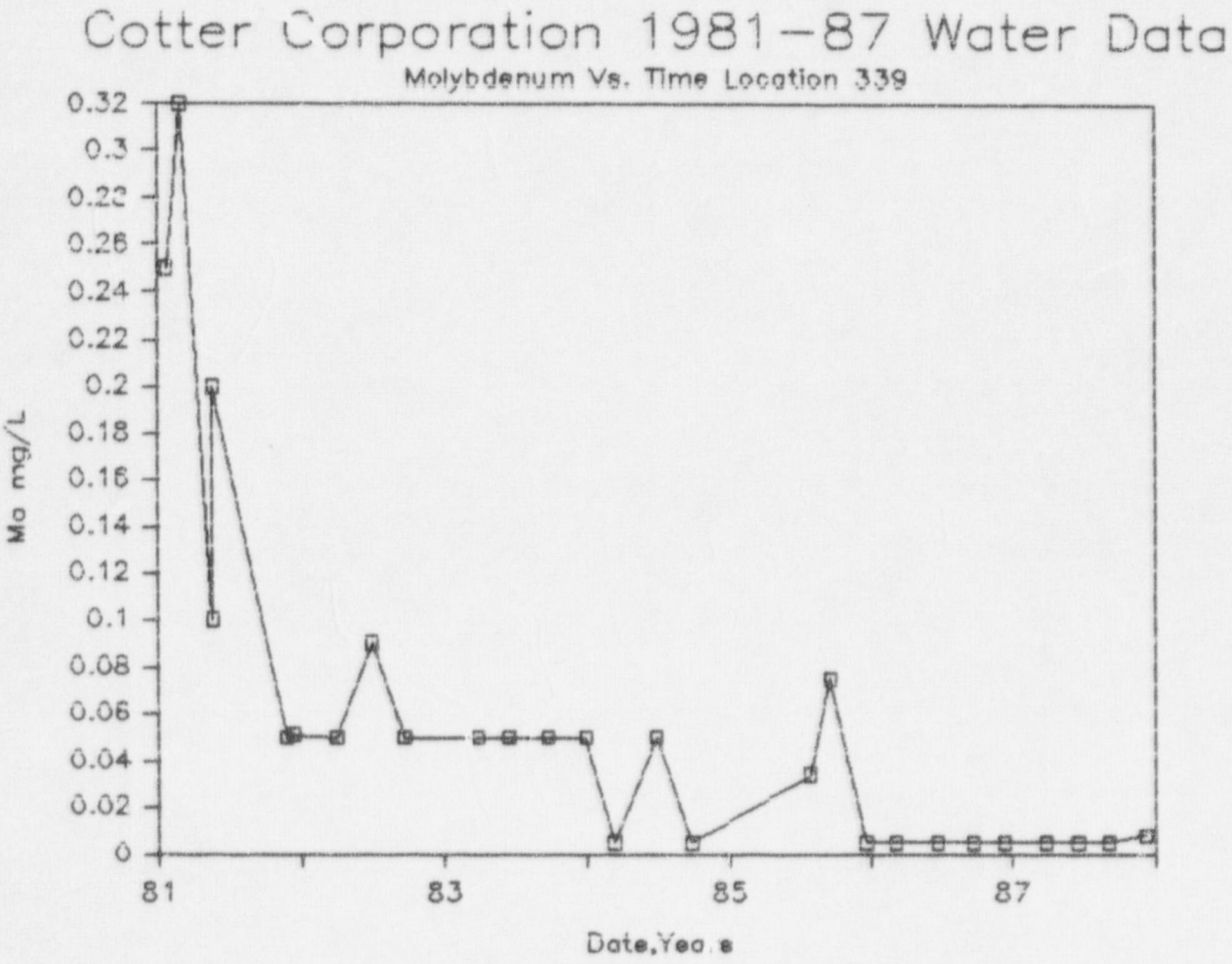

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 339
Mo mg/L
0.32
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
81
83
85
87
Date,Years

FIGURE 1.85

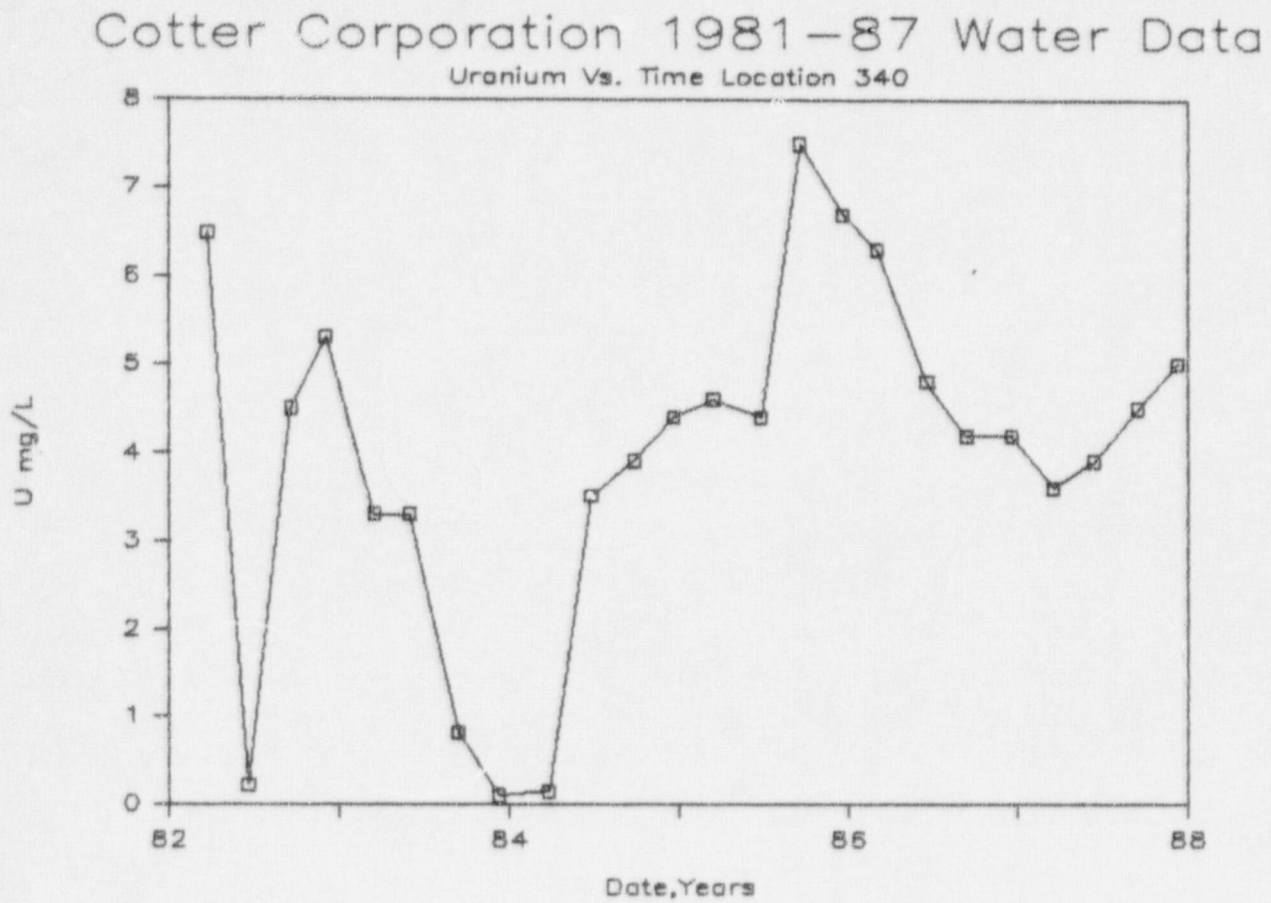

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 340
U mg/L
0
1
2
3
4
5
6
7
8
82
84
86
88
Date,Years

FIGURE 1.86

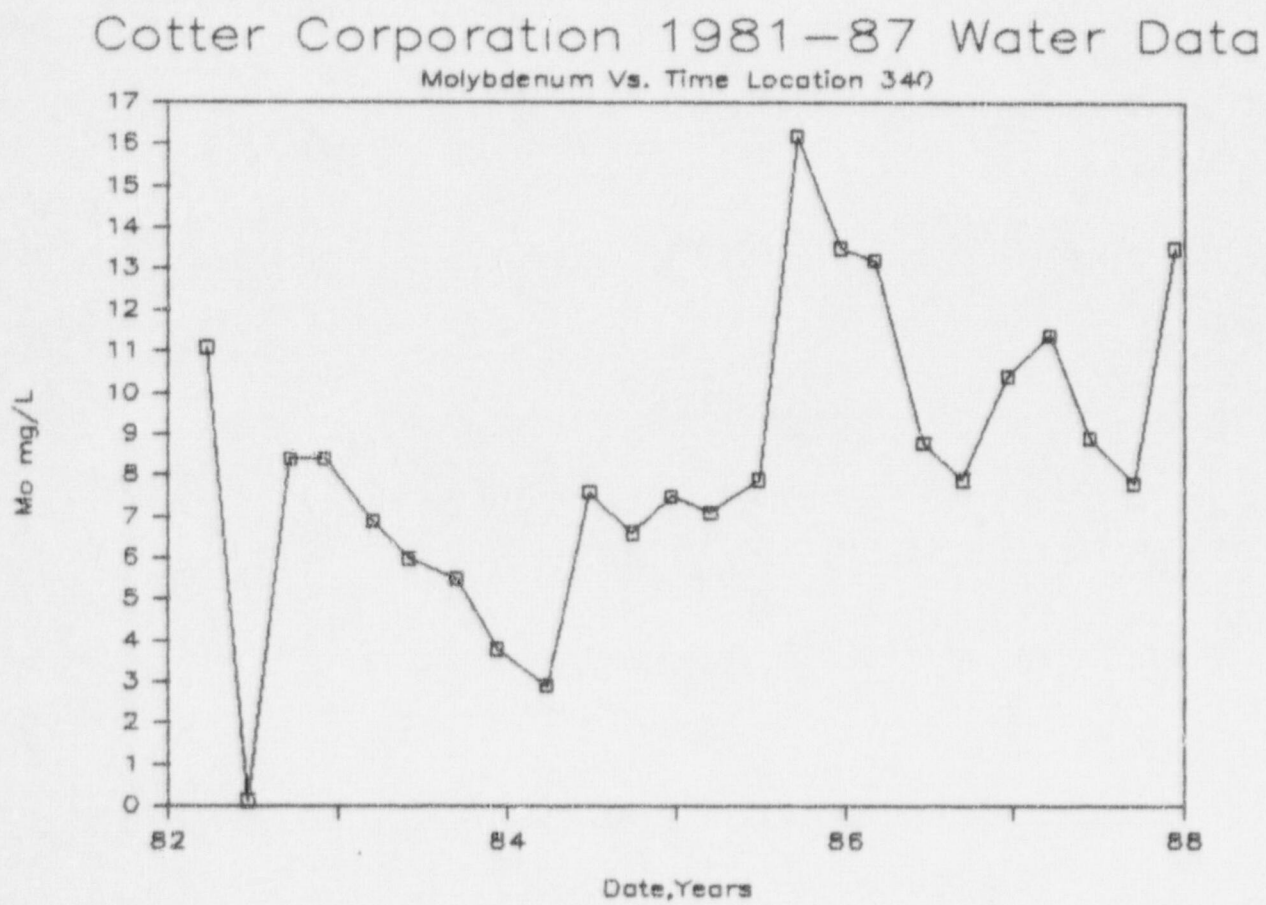

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 340
Mo mg/L
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
82
84
86
88
Date,Years

FIGURE 1.87

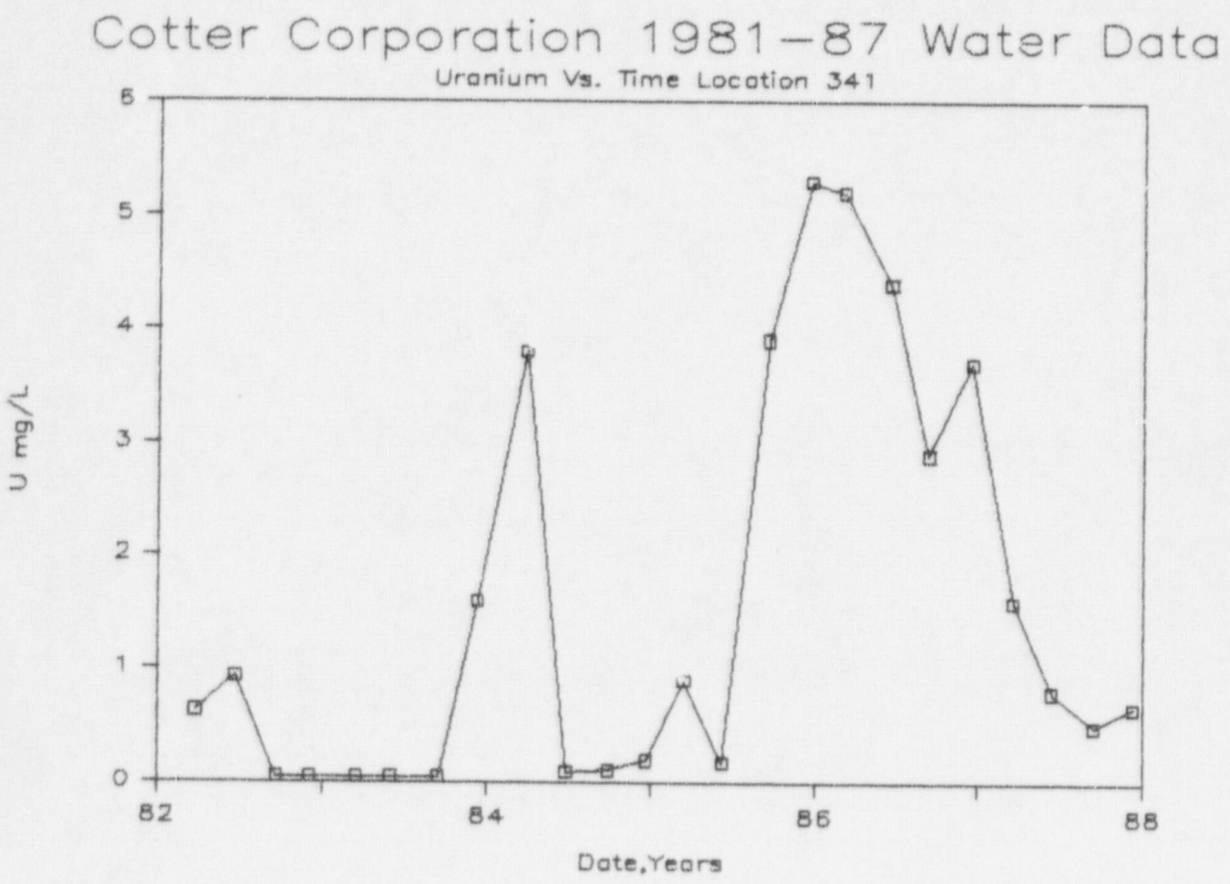

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 341
U mg/L
0
1
2
3
4
5
6
82
84
86
88
Date,Years

FIGURE 1.88

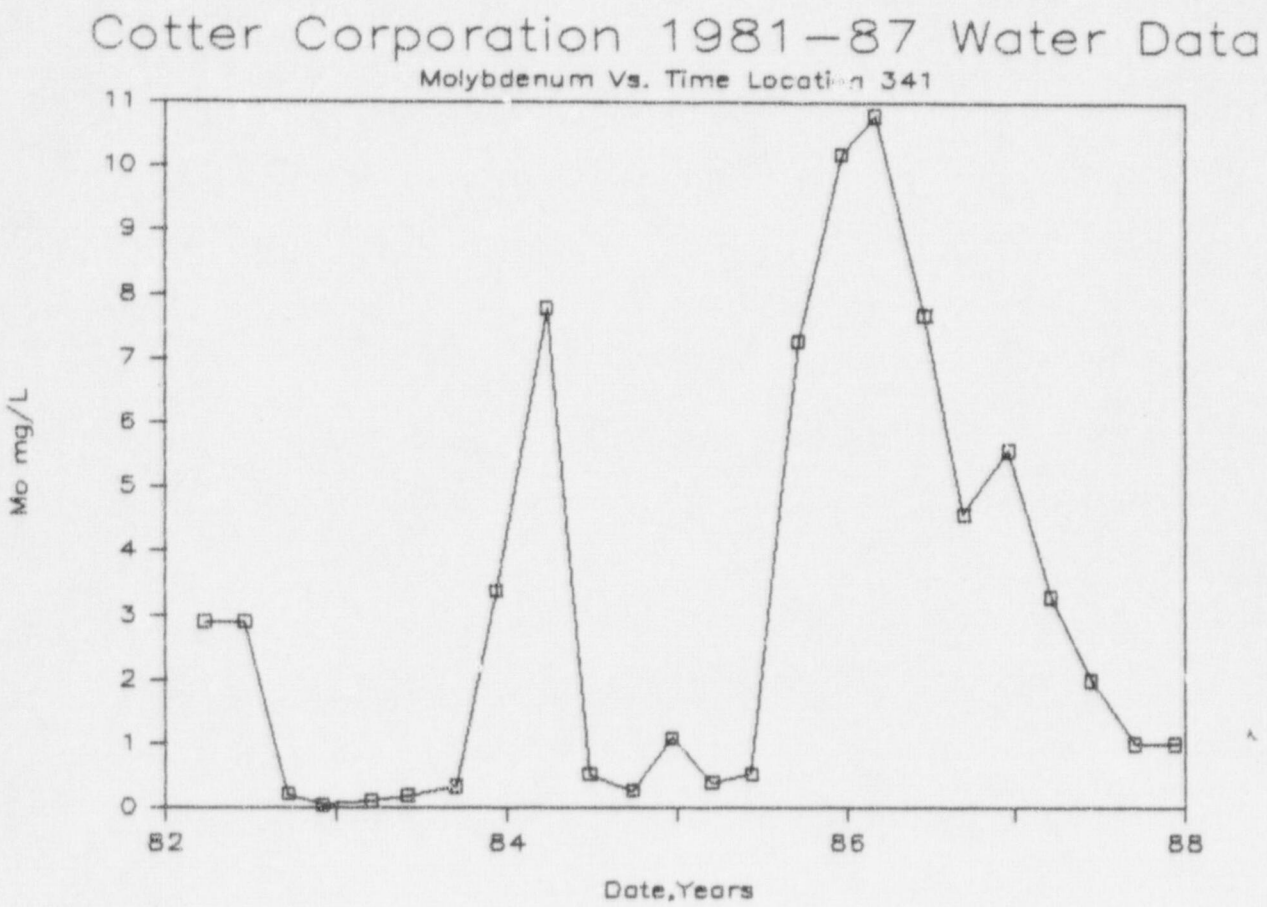

Cotter Corporation 1981—87 Water Data
Molybdenum Vs. Time Location 341
Mo mg/L
11
10
9
8
7
6
5
4
3
2
1
0
82
84
86
88
Date,Years

FIGURE 1.89

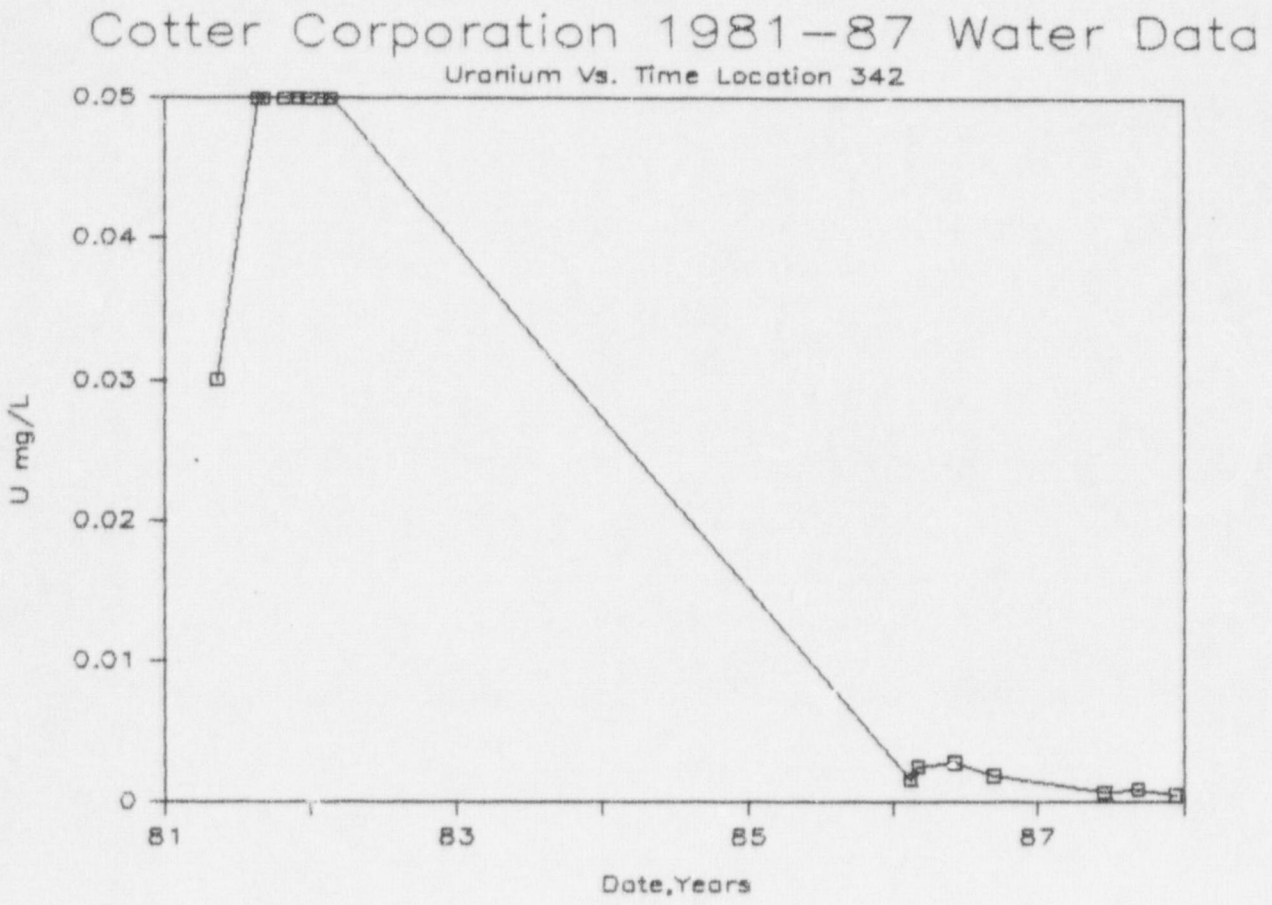

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 342
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
Date,Years

FIGURE 1.90

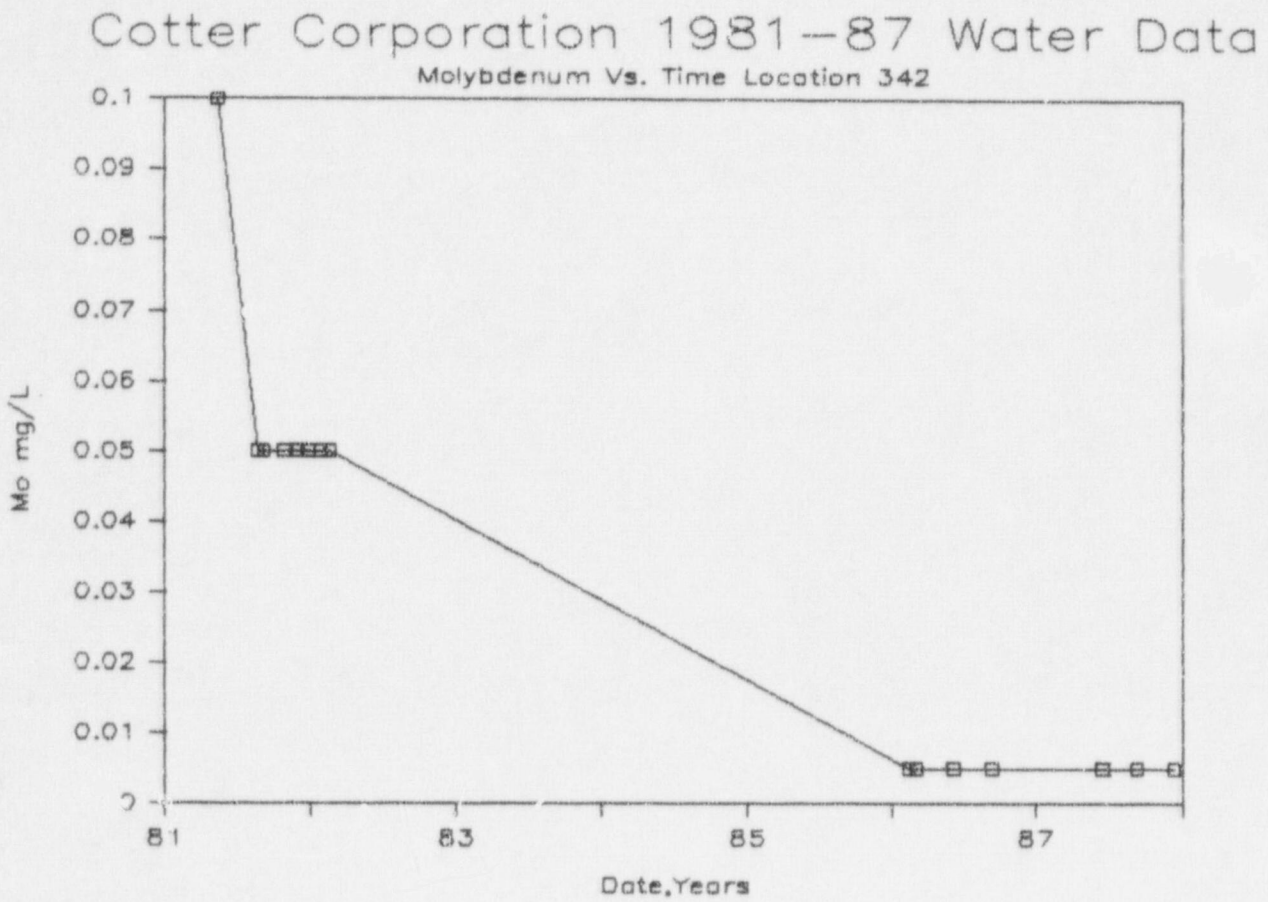

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 342
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Mo mg/L
81
83
85
87
Date,Years

FIGURE 1.91

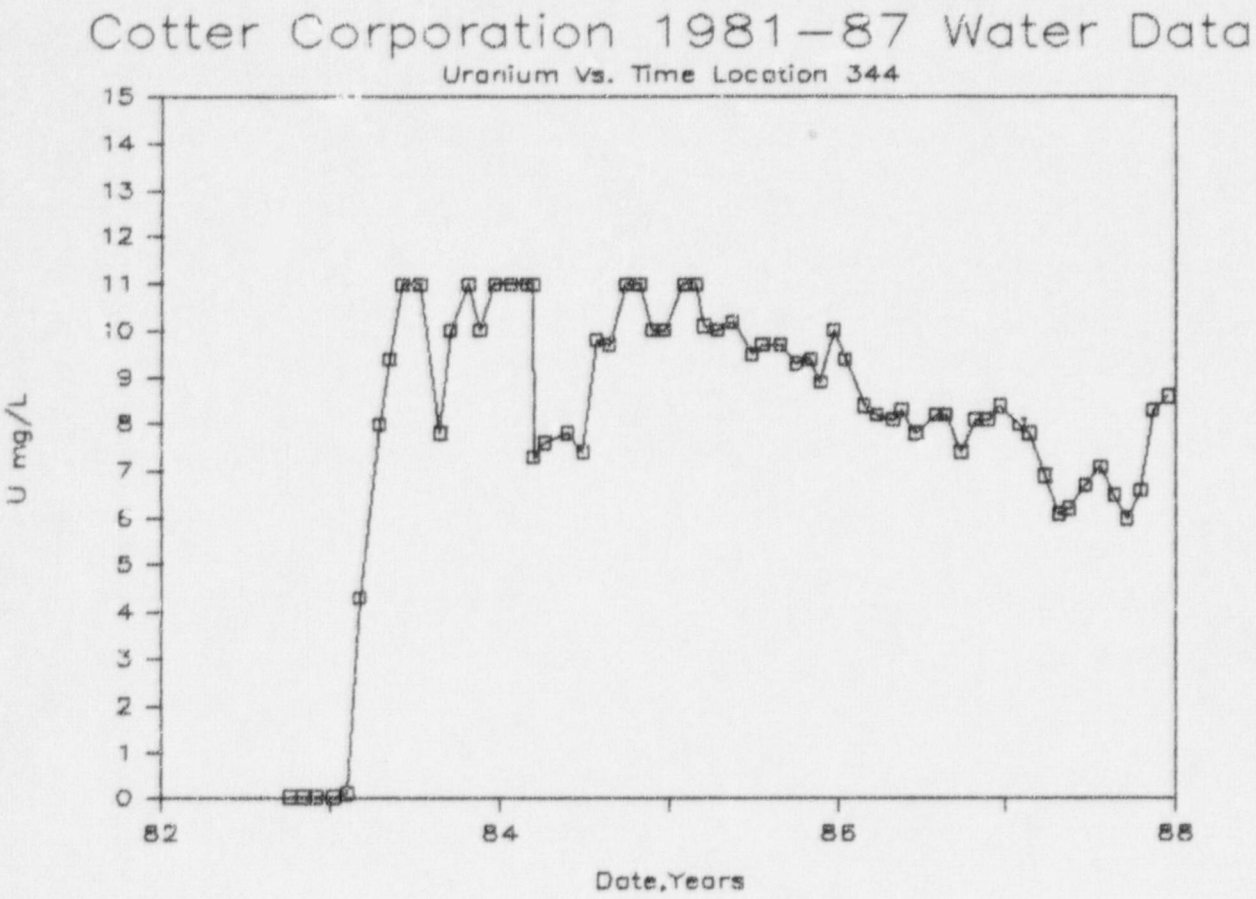

Cotter Corporation 1981—87 Water Data
Uranium Vs. Time Location 344
U mg/L
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
82
84
86
88
Date,Years

FIGURE 1.92

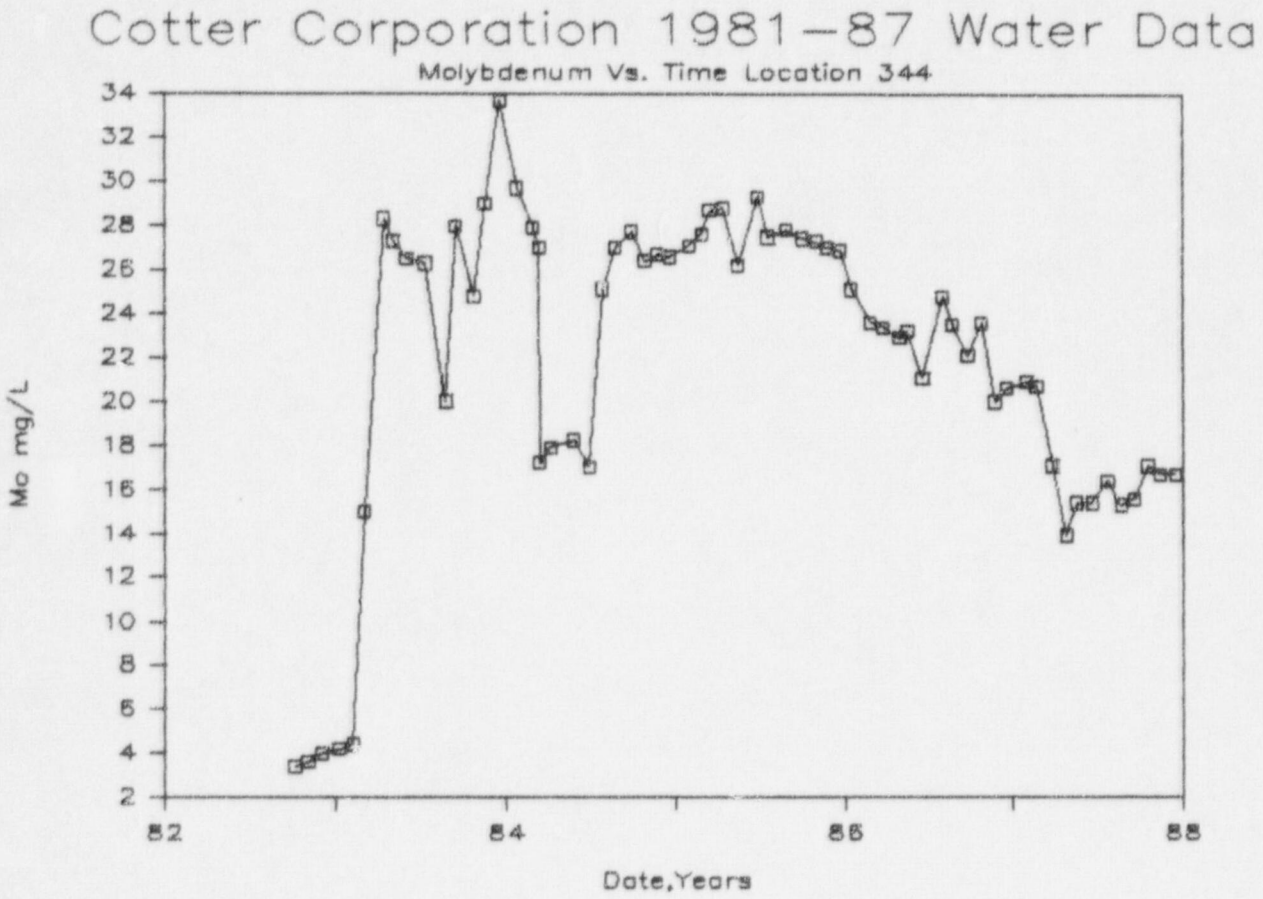

Cotter Corporation 1981—87 Water Data
Molybdenum Vs. Time Location 344
Mo mg/L
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
82
84
86
88
Date,Years

FIGURE 1.93

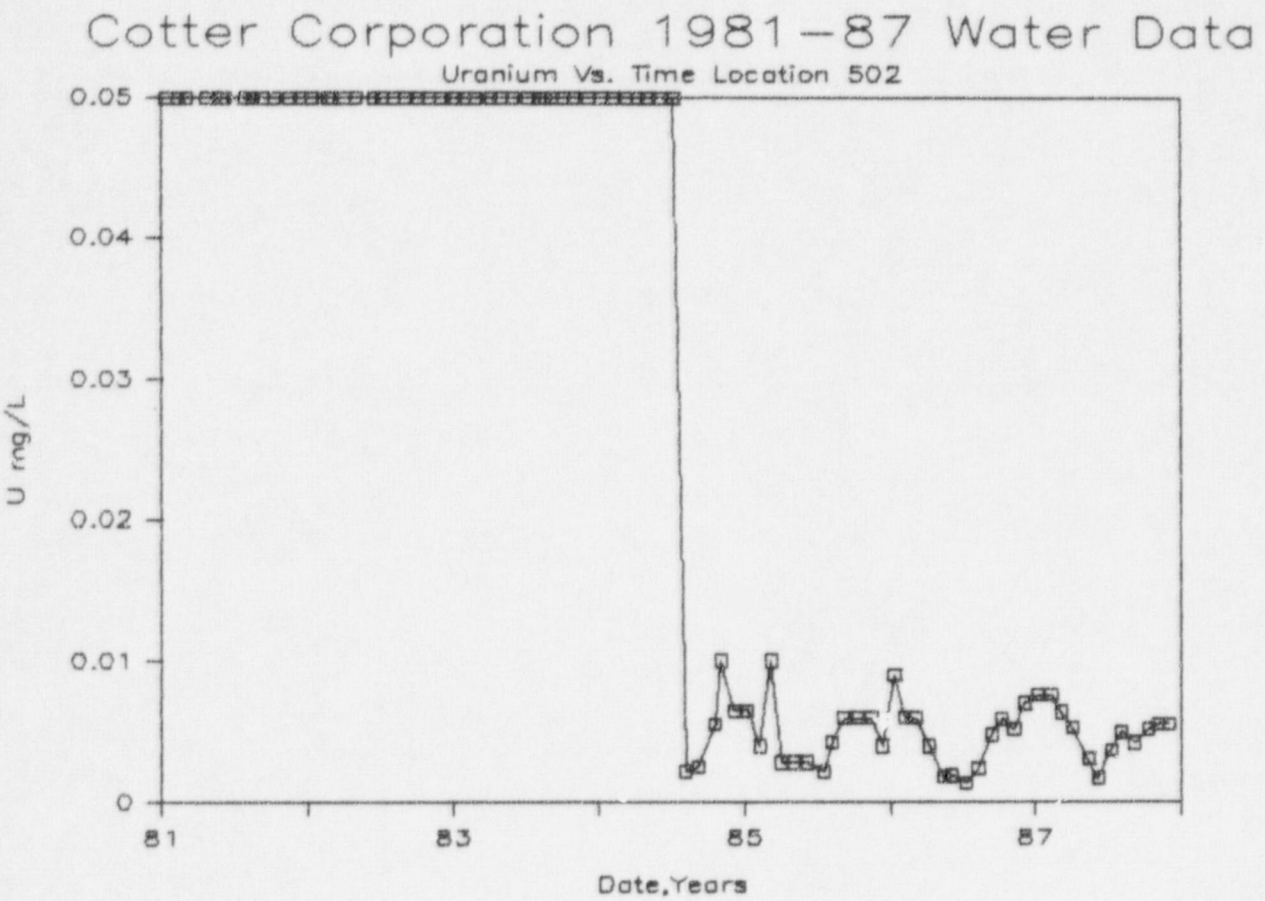
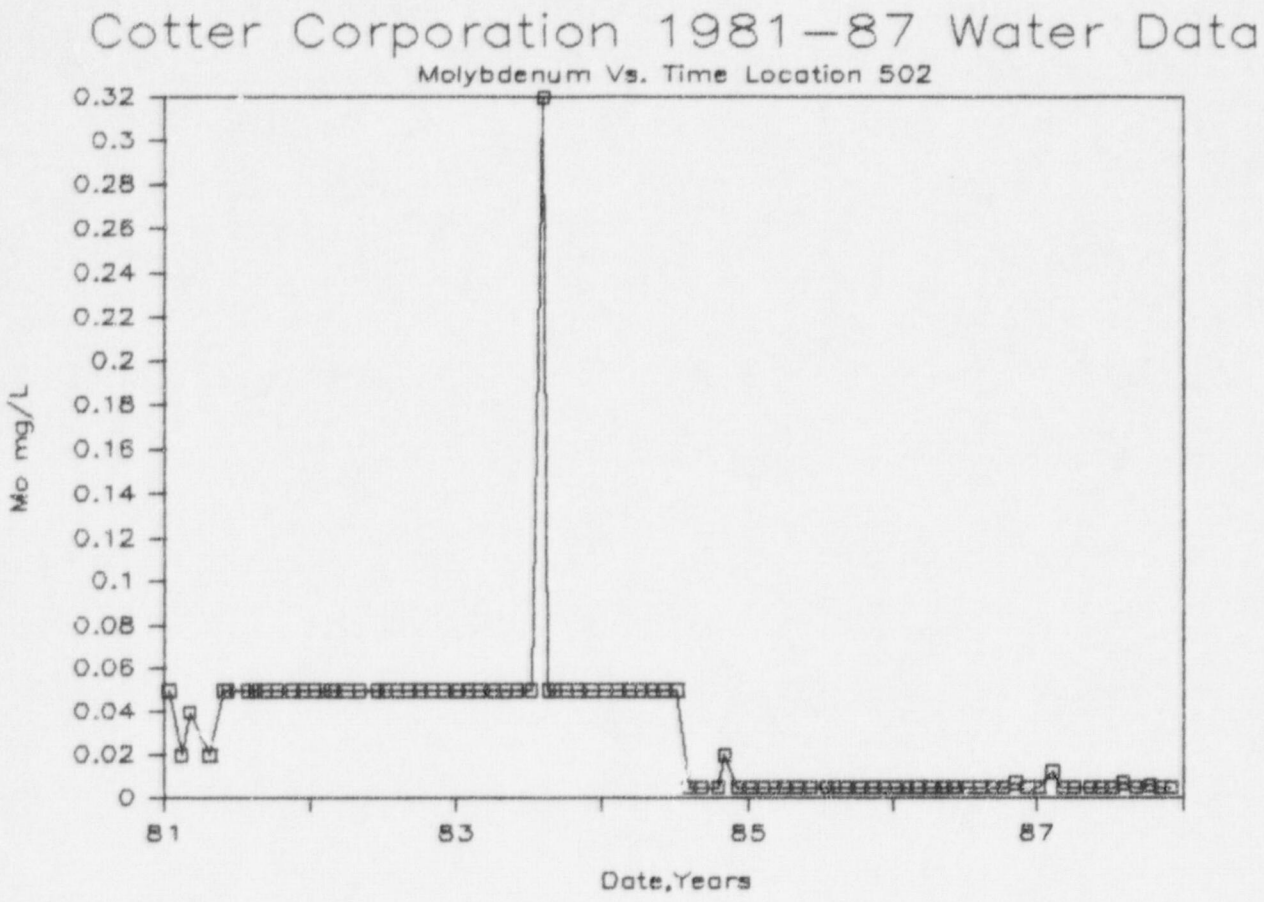
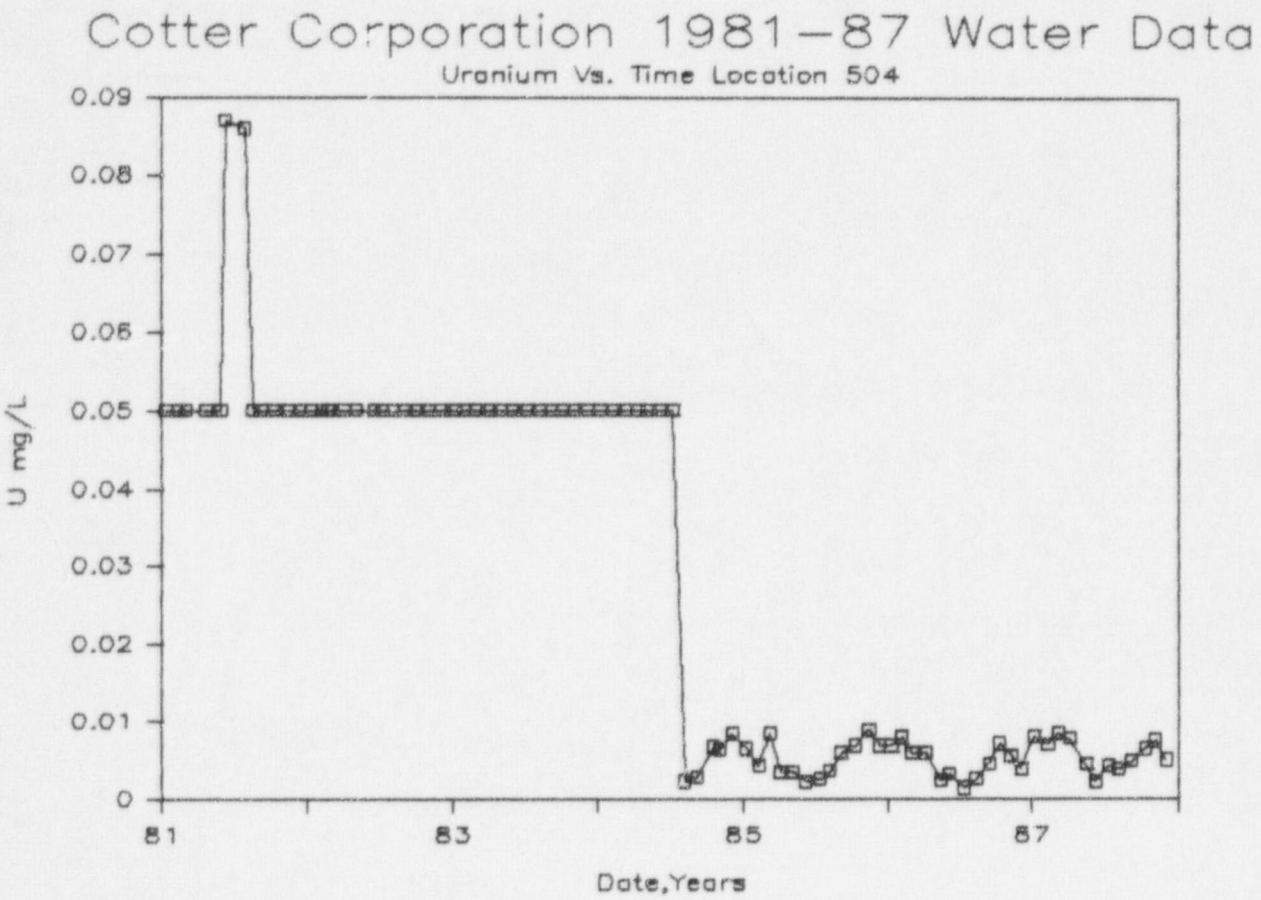

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 502
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
Date,Years

FIGURE 1.94


Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 502
Mo mg/L
0.32
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
81
83
85
87
Date,Years

FI[illegible].1.95



Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 504
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
Date,Years

FIGURE 1.96

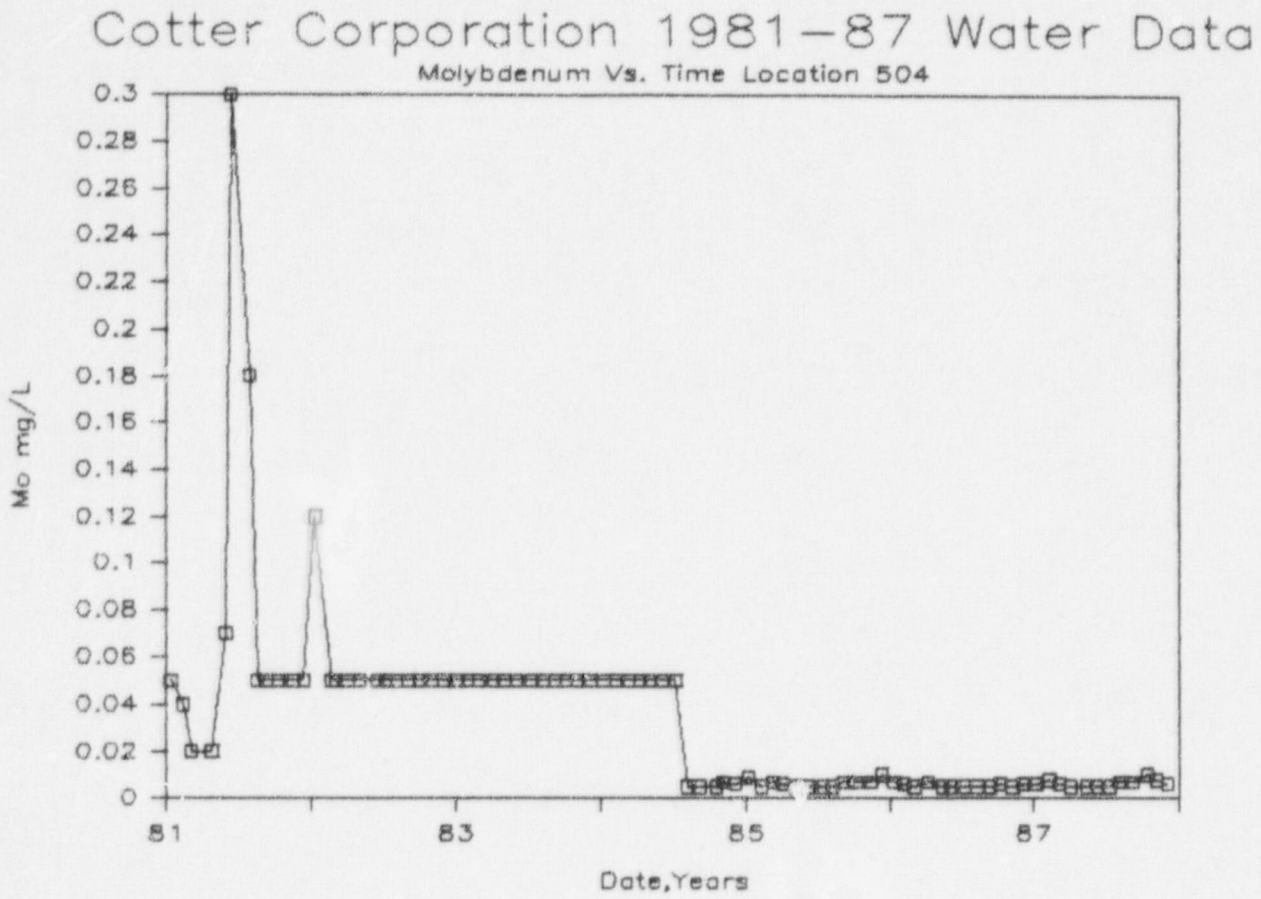

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 504
Mo mg/L
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
81
83
85
87
Date,Years

FIGURE 1.97

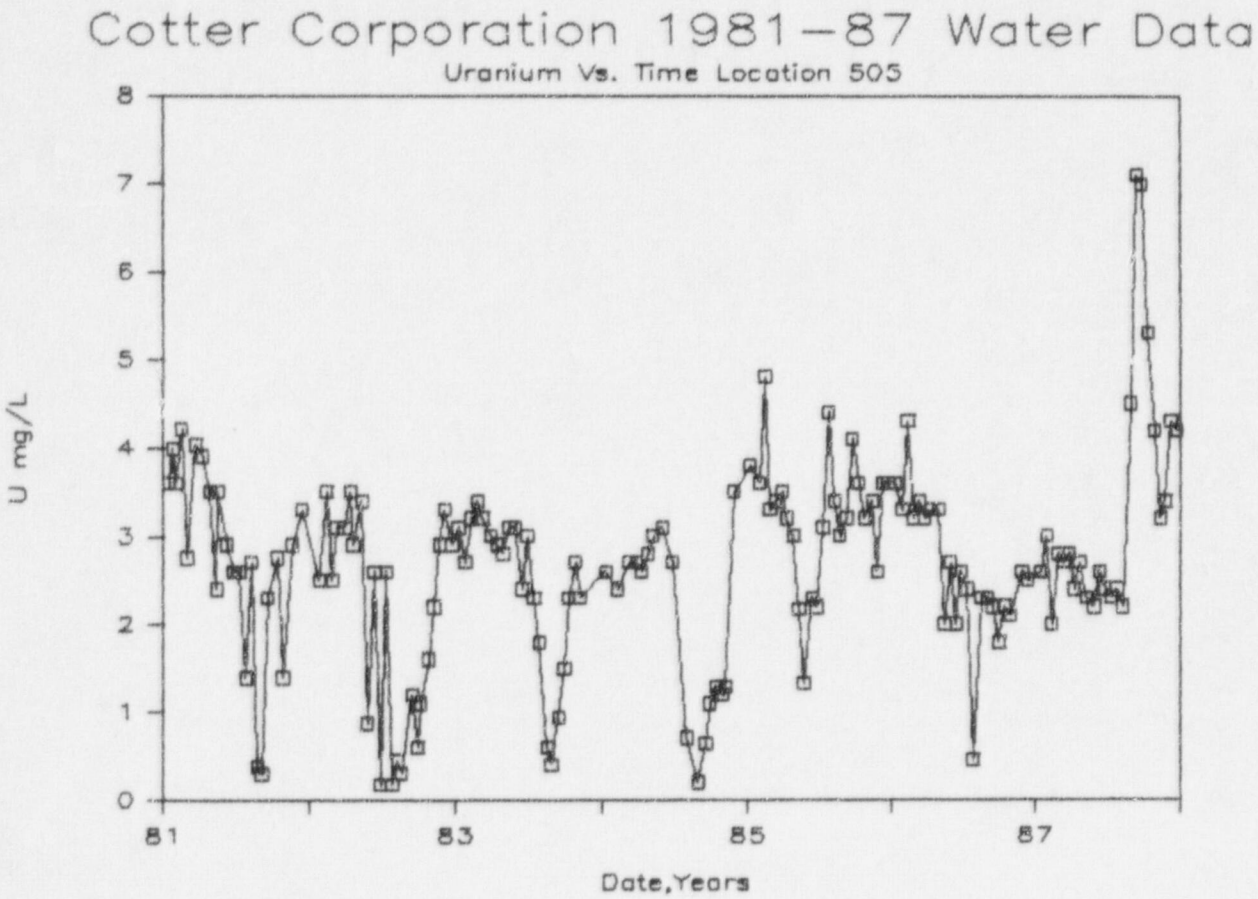

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 505
U mg/L
0
1
2
3
4
5
6
7
8
81
83
85
87
Date,Years

FIGURE 1.98

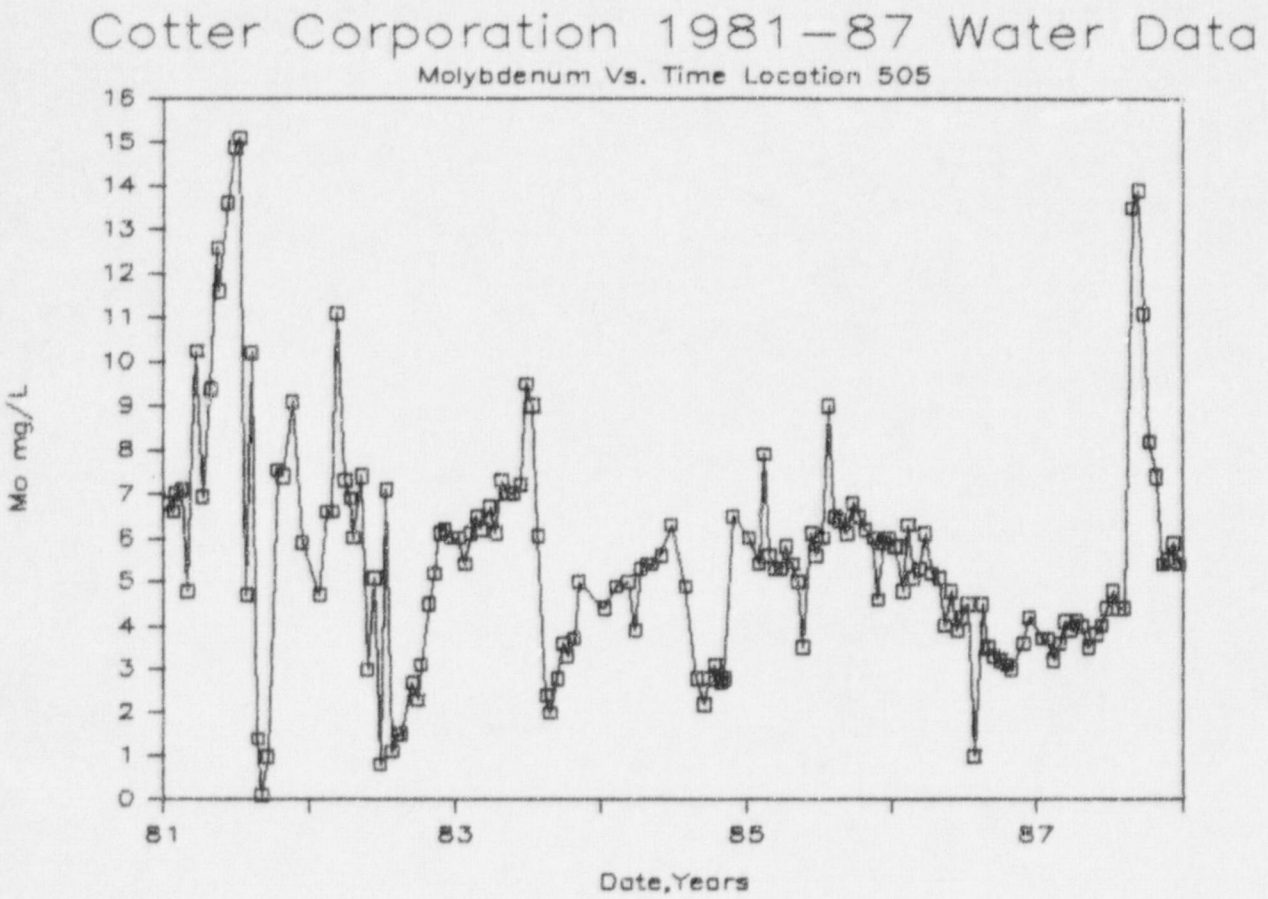

Cotter Corporation 1981—87 Water Data
Molybdenum Vs. Time Location 505
Mo mg/L
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
81
83
85
87
Date,Years

FIGURE 1.99

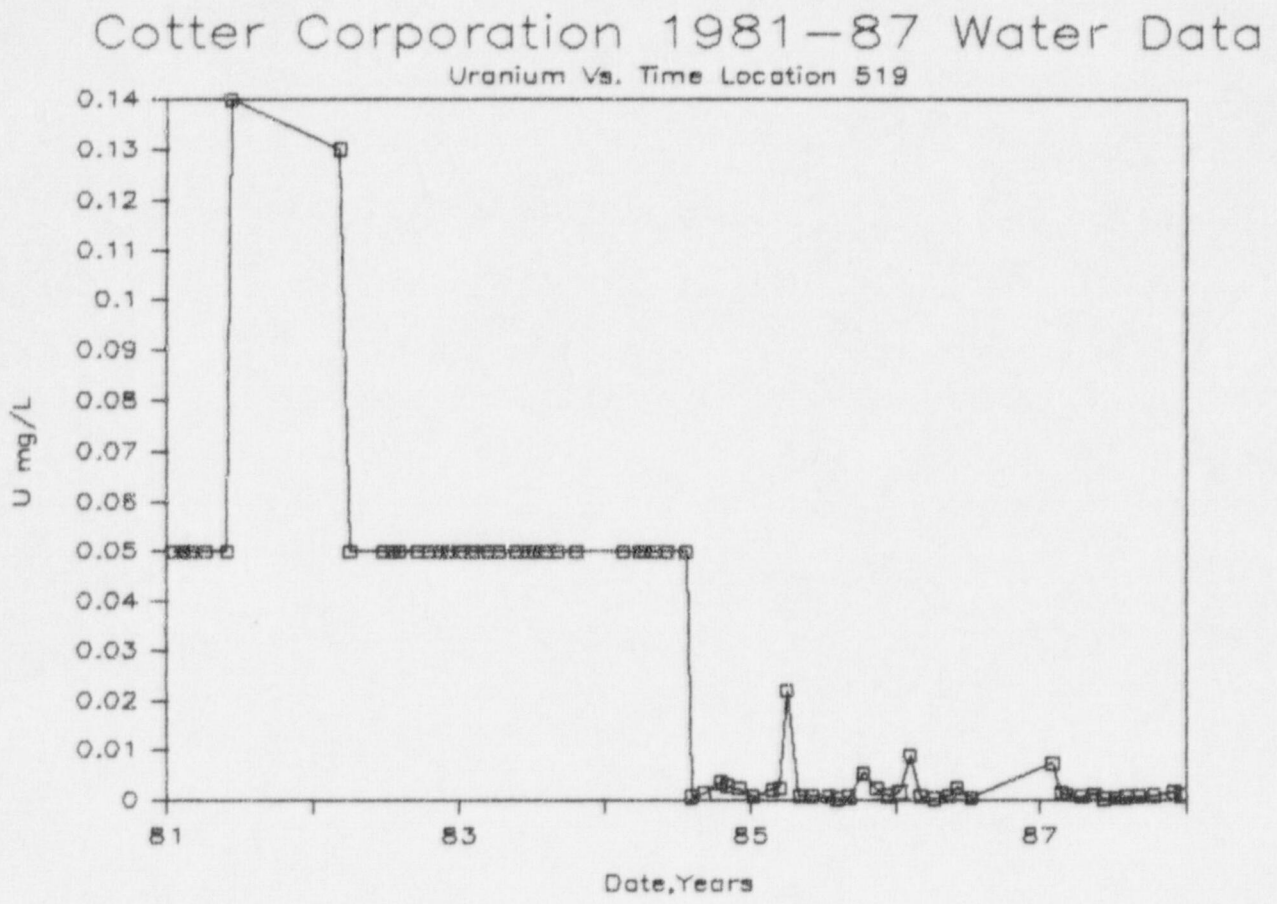

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 519
U mg/L
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.100

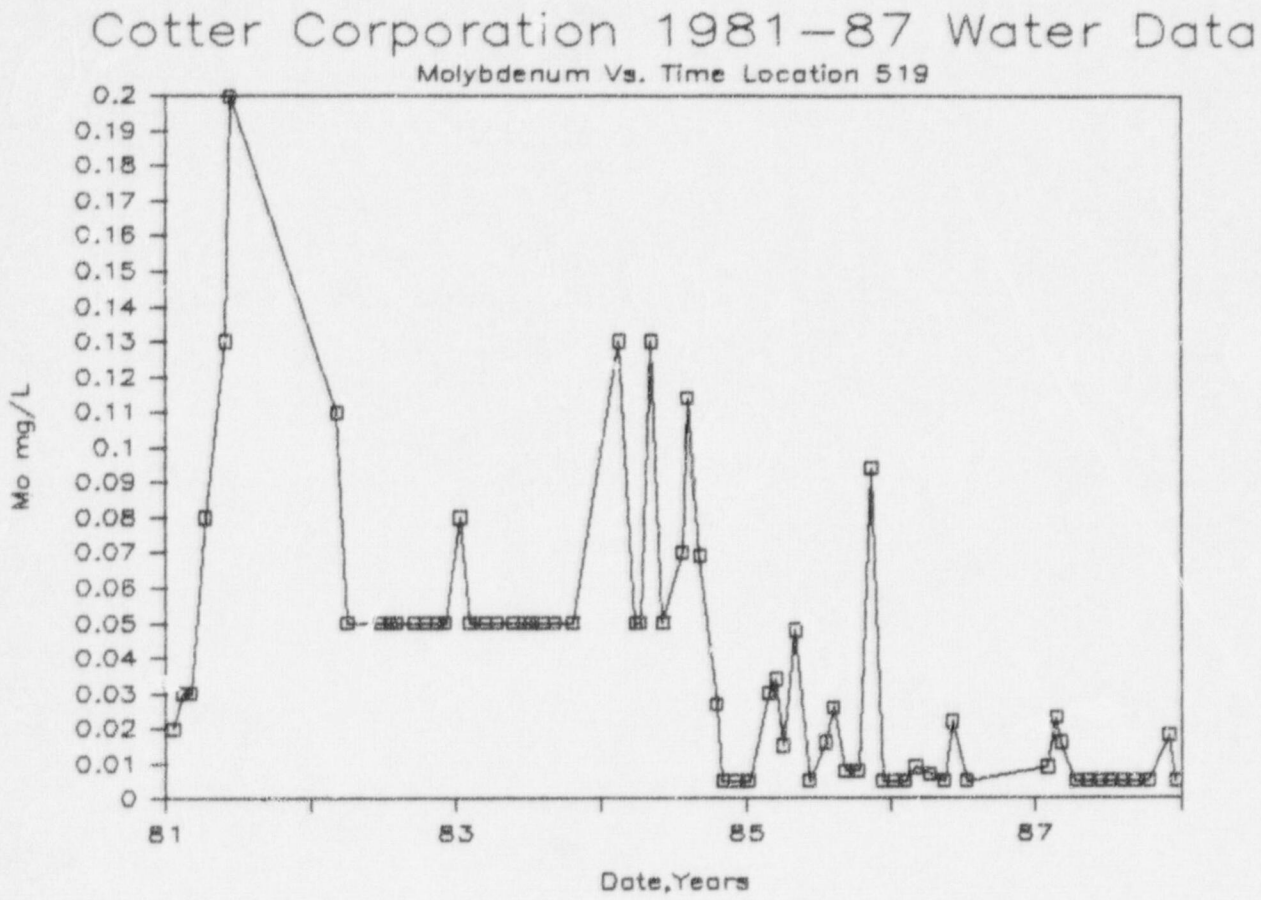

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 519
Mo mg/L
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.101

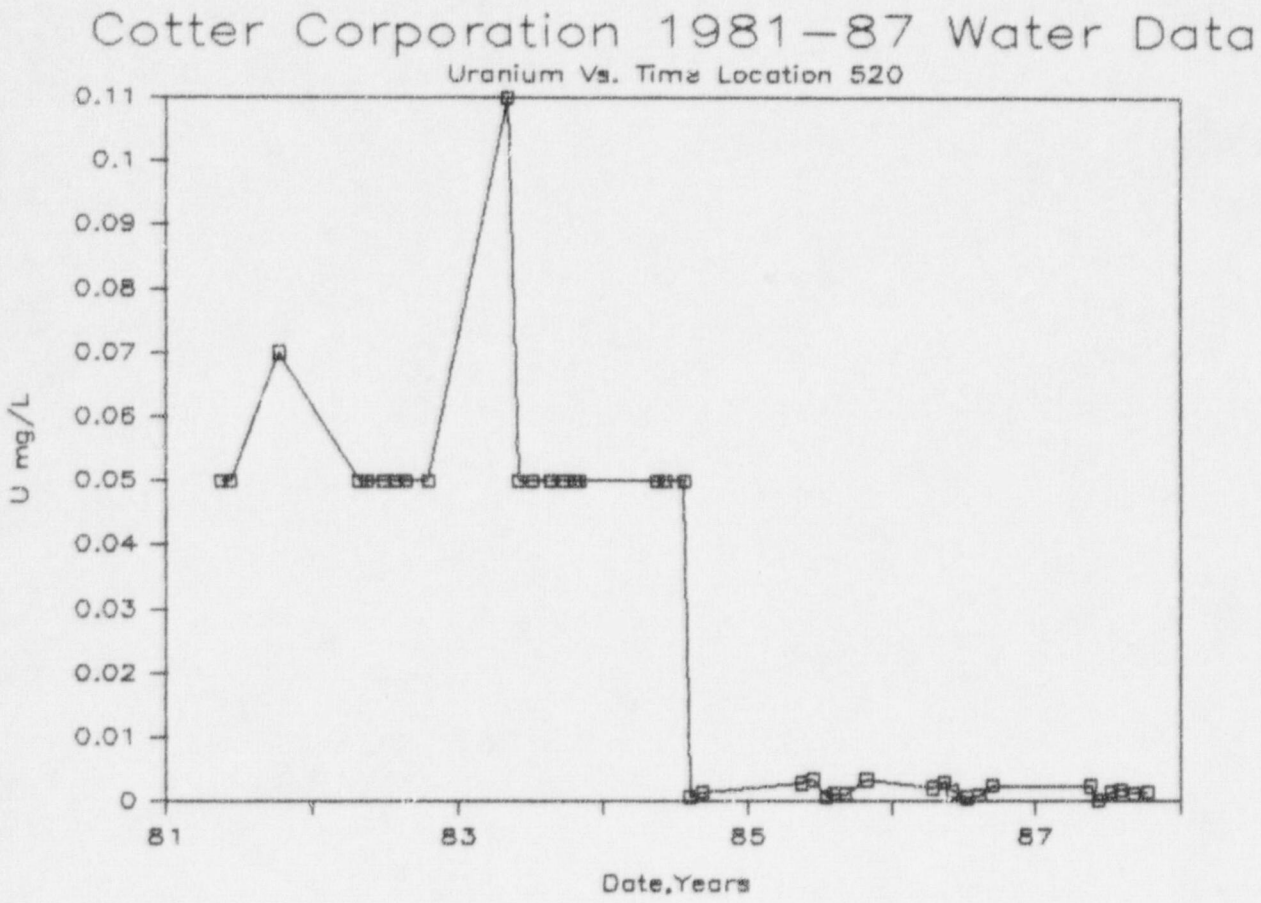

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 520
U mg/L
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.102

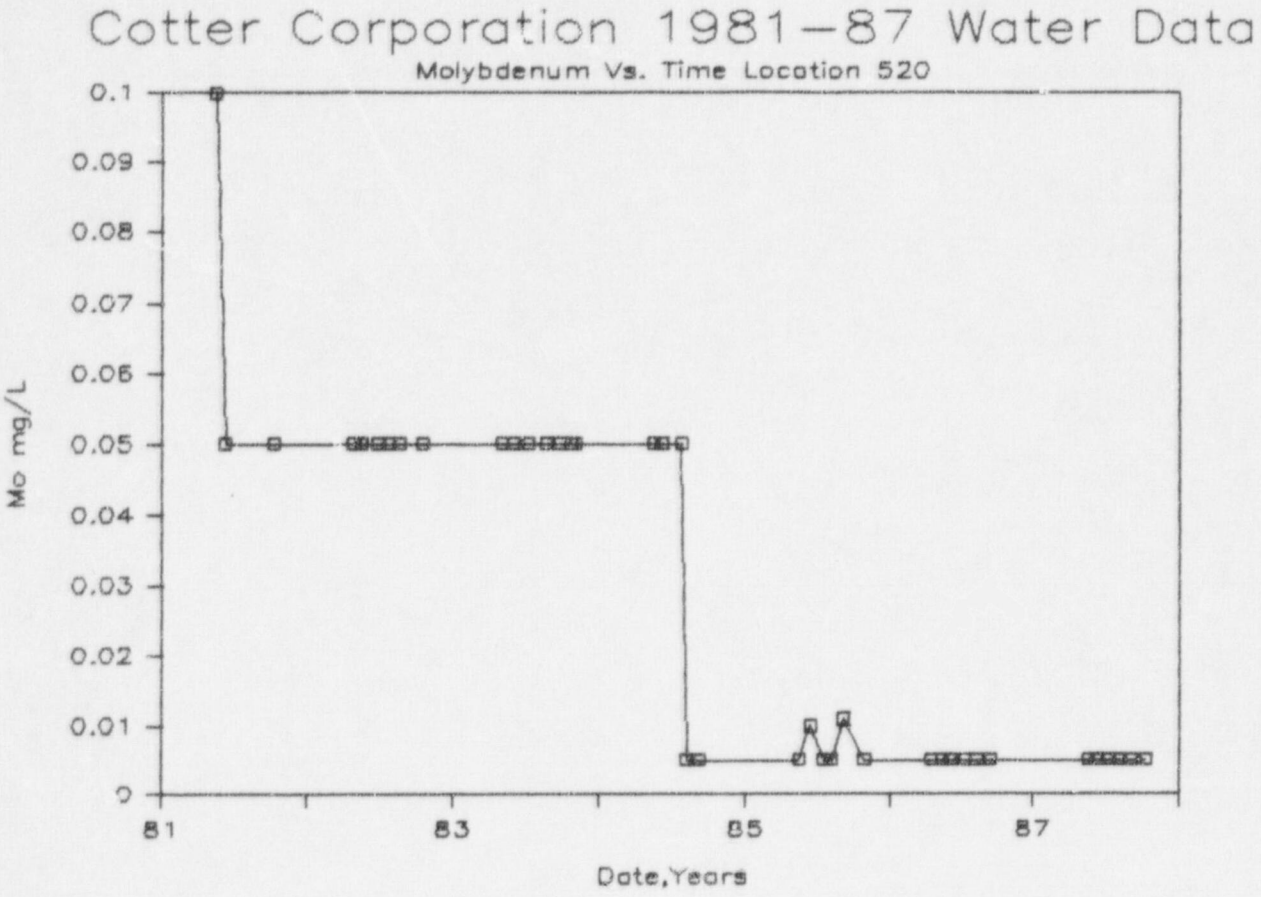

Cotter Corporation 1981—87 Water Data
Molybdenum Vs. Time Location 520
Mo mg/L
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
81
83
85
87
Date,Years

FIGURE 1.103

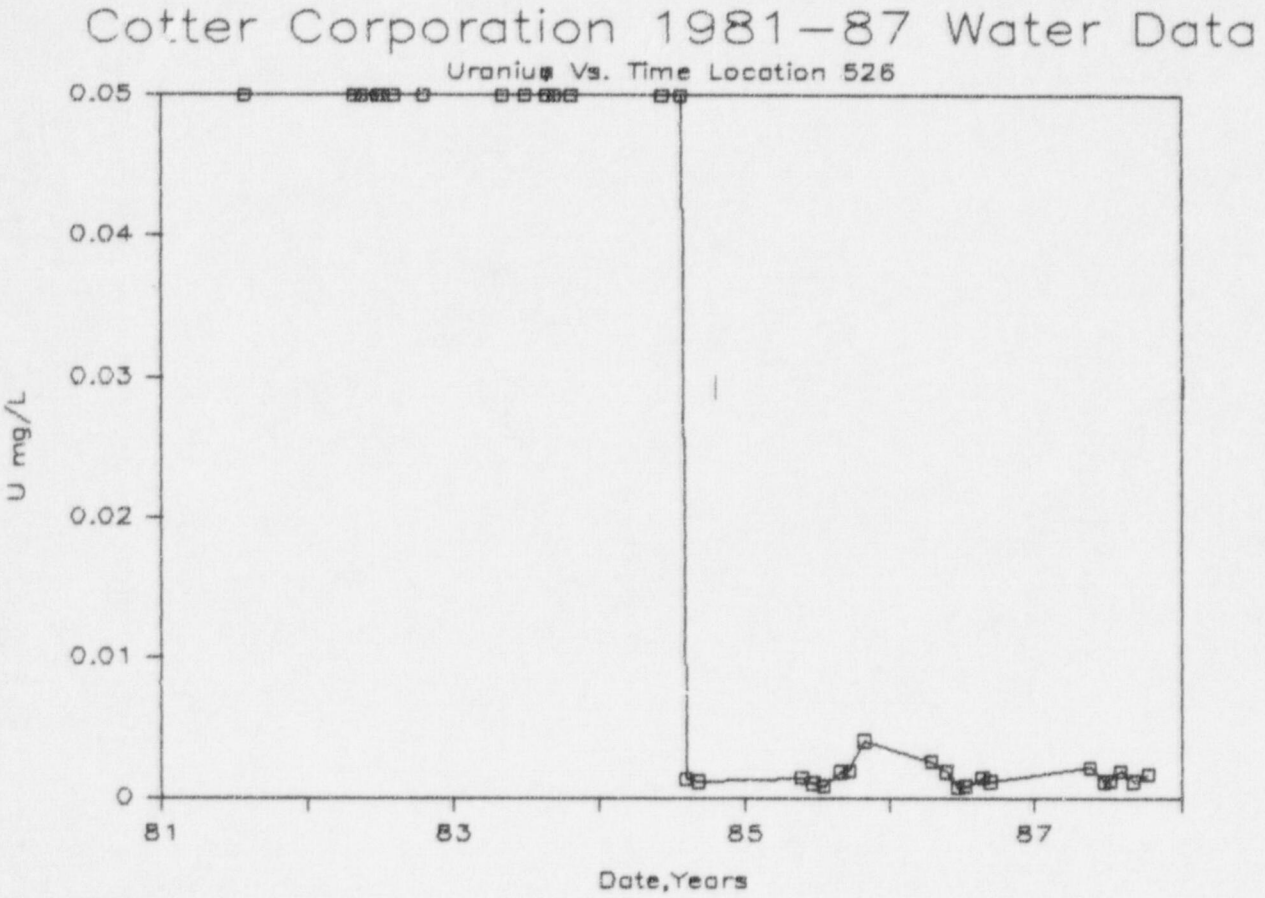

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 526
0.05
0.04
0.03
0.02
0.01
0
U mg/L
81
83
85
87
Date,Years

FIGURE 1.104

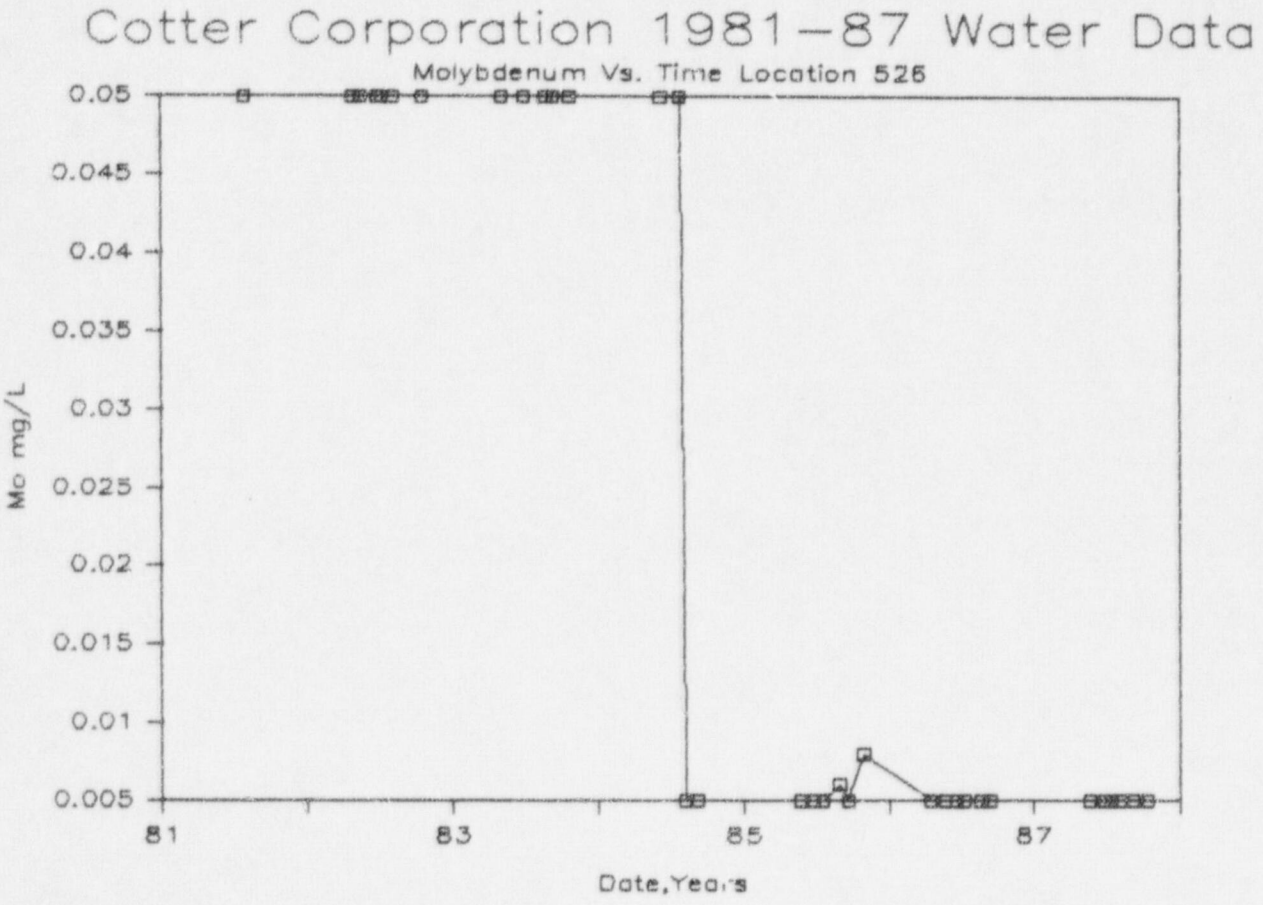

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 526
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
Mo mg/L
81
83
85
87
Date, Years

FIGURE 1.105

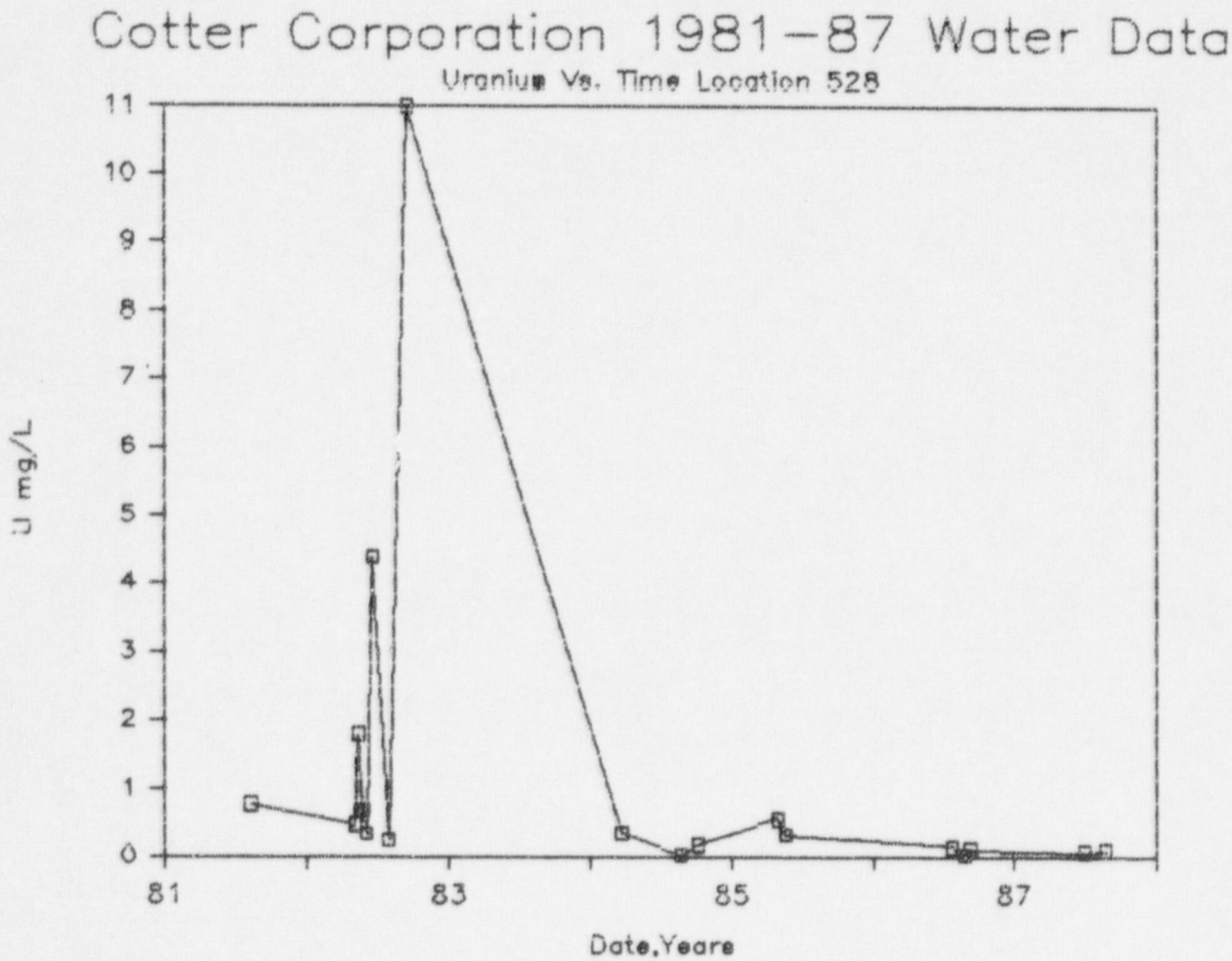

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 528
U mg/L
11
10
9
8
7
6
5
4
3
2
1
0
81
83
85
87
Date,Years

FIGURE 1.106

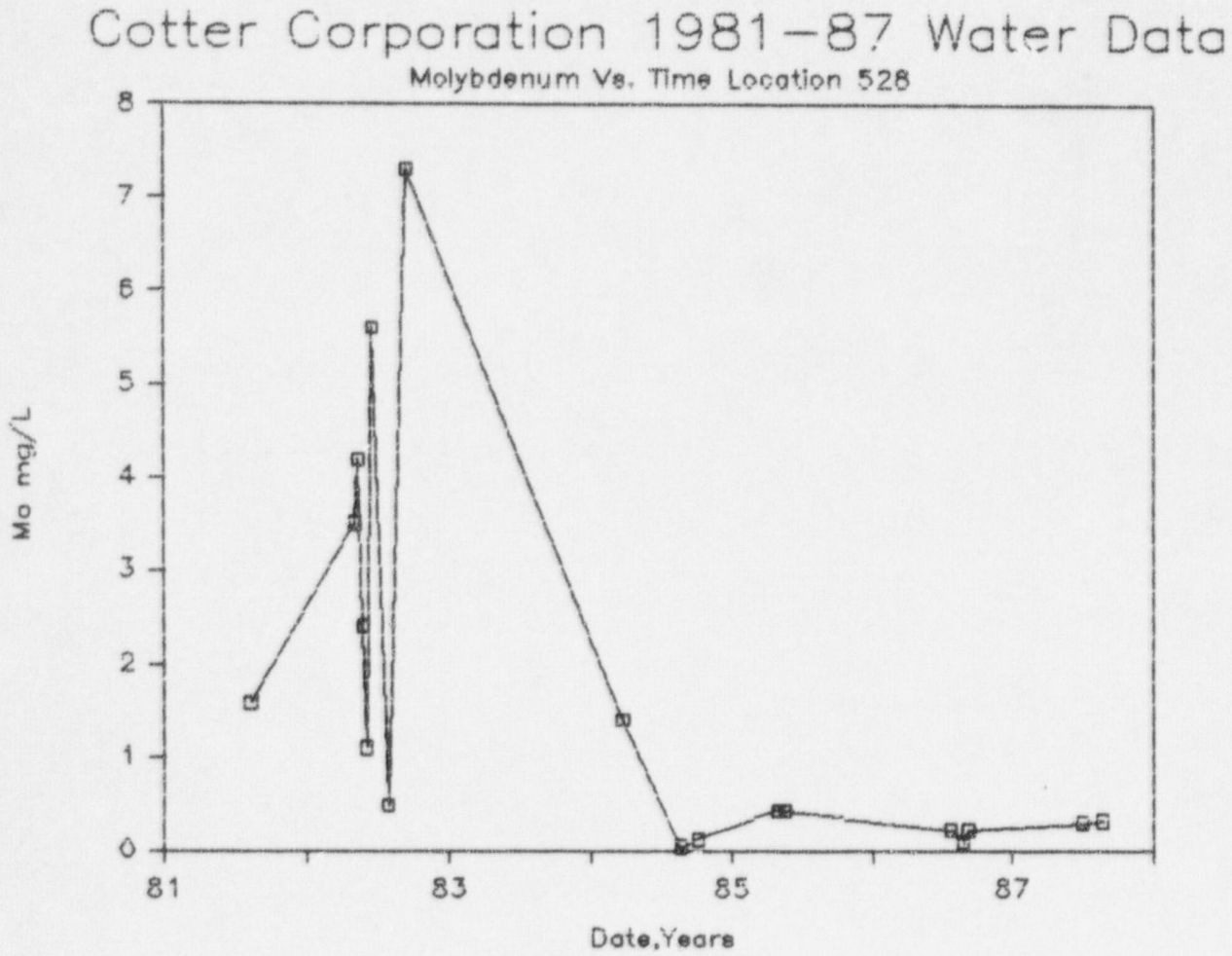

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 528
Mo mg/L
0
1
2
3
4
5
6
7
8
81
83
85
87
Date,Years

FIGURE 1.107

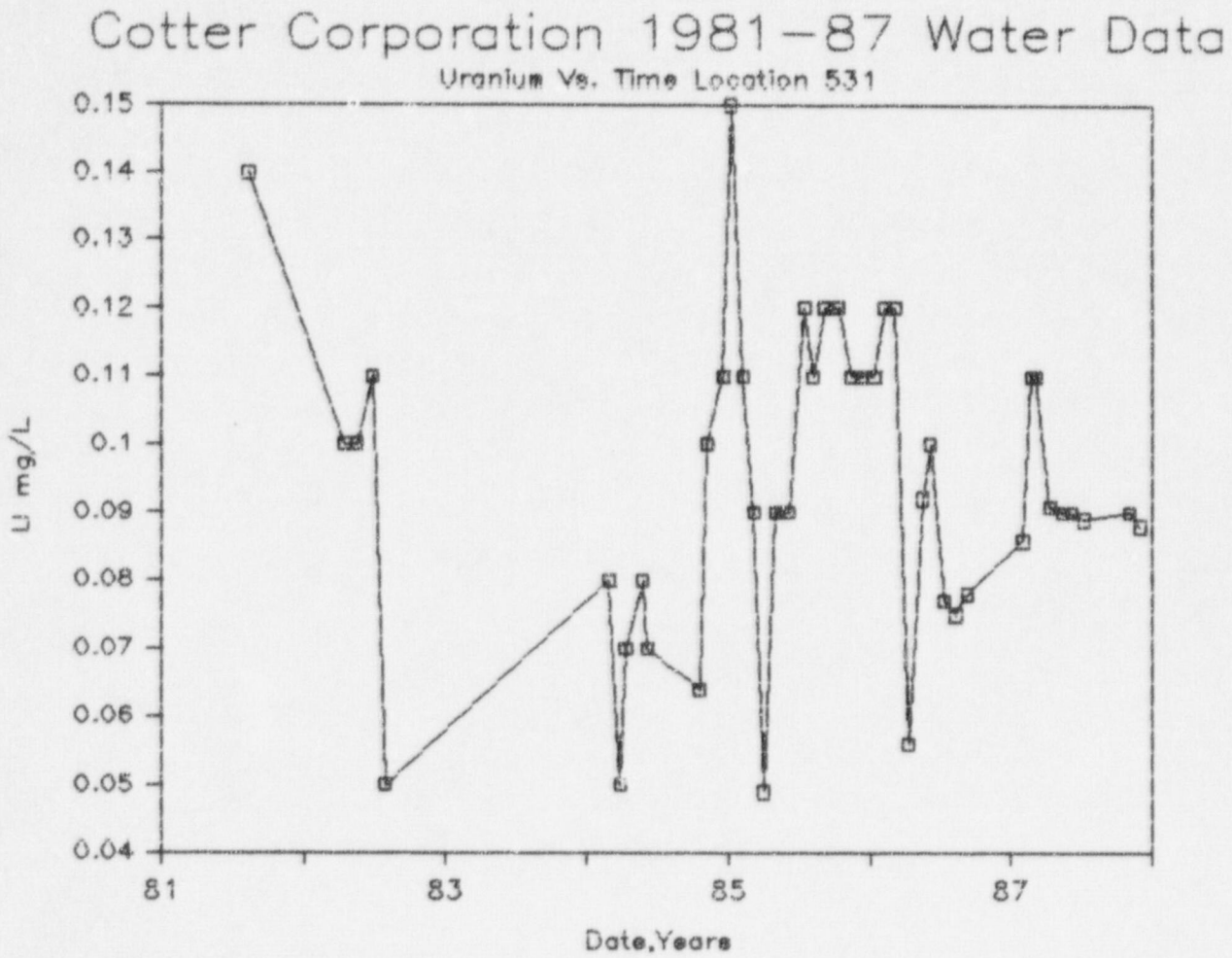

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 531
U mg/L
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
81
83
85
87
Date,Years

FIGURE 1.108

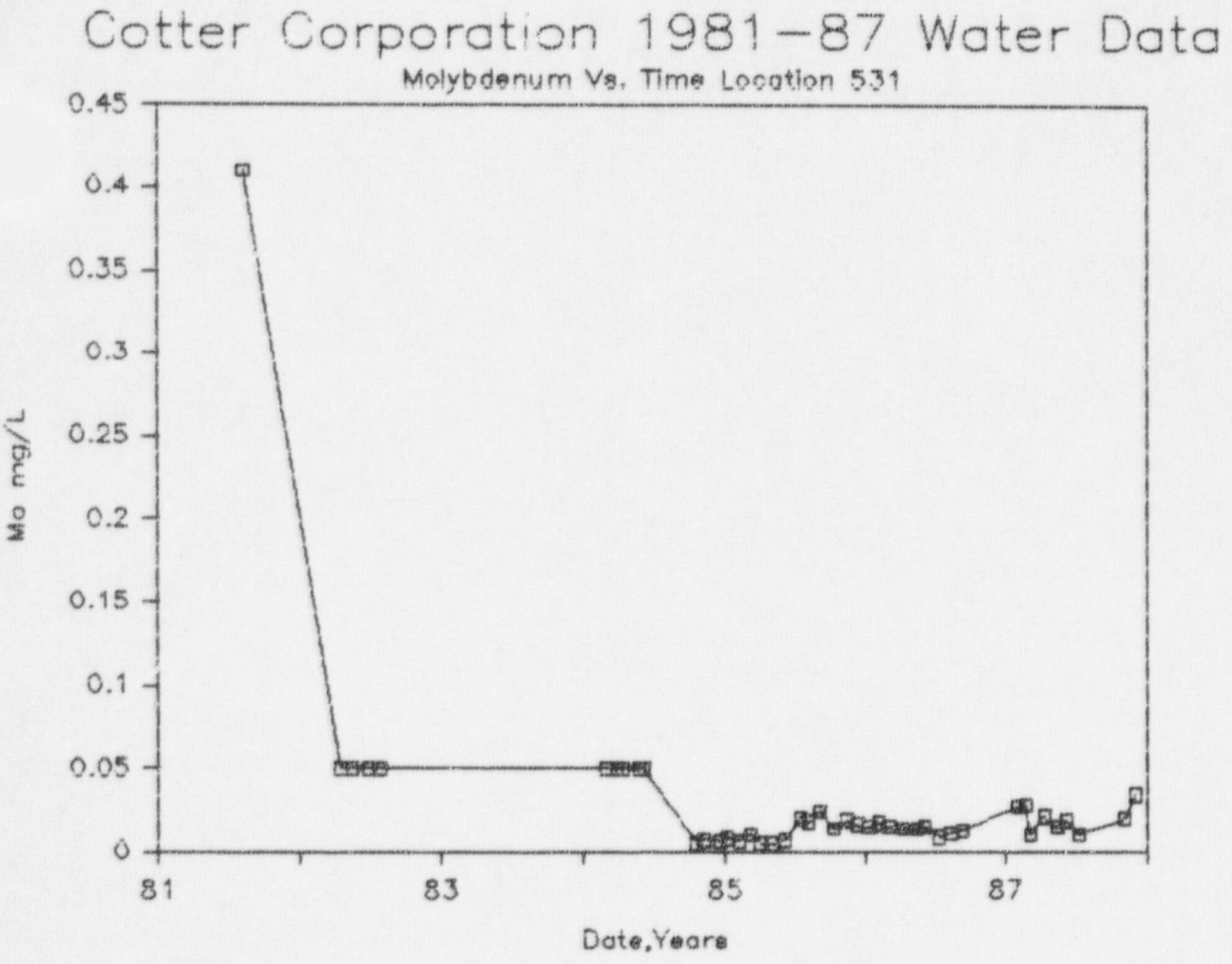

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 531
Mo mg/L
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
81
83
85
87
Date,Years

FIGURE 1.109

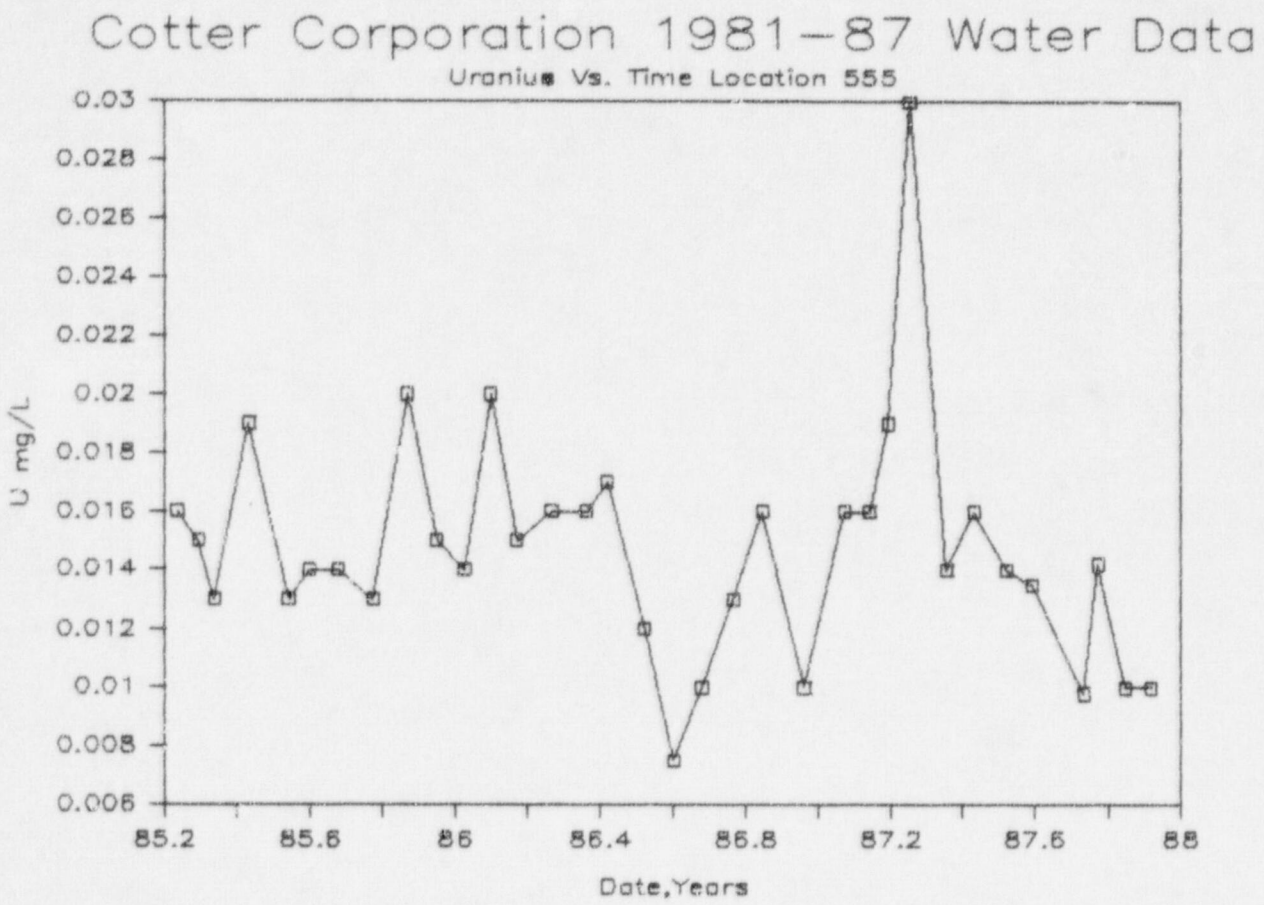

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 555
0.03
0.028
0.026
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
U mg/L
85.2
85.6
86
86.4
86.8
87.2
87.6
88
Date,Years

FIGURE 1.110

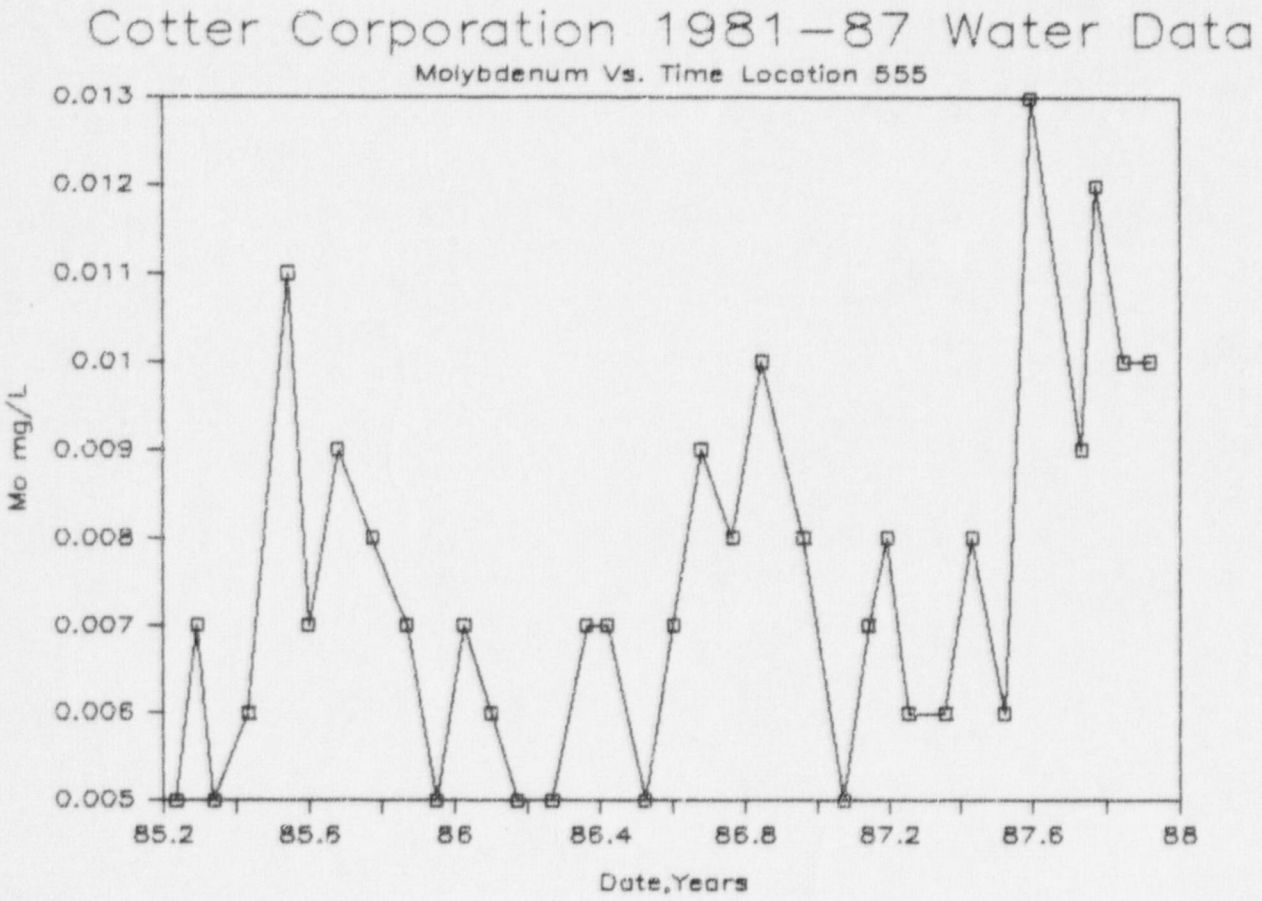

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 555
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
Mo mg/L
85.2
85.6
86
86.4
86.8
87.2
87.6
88
Date,Years

FIGURE 1.111

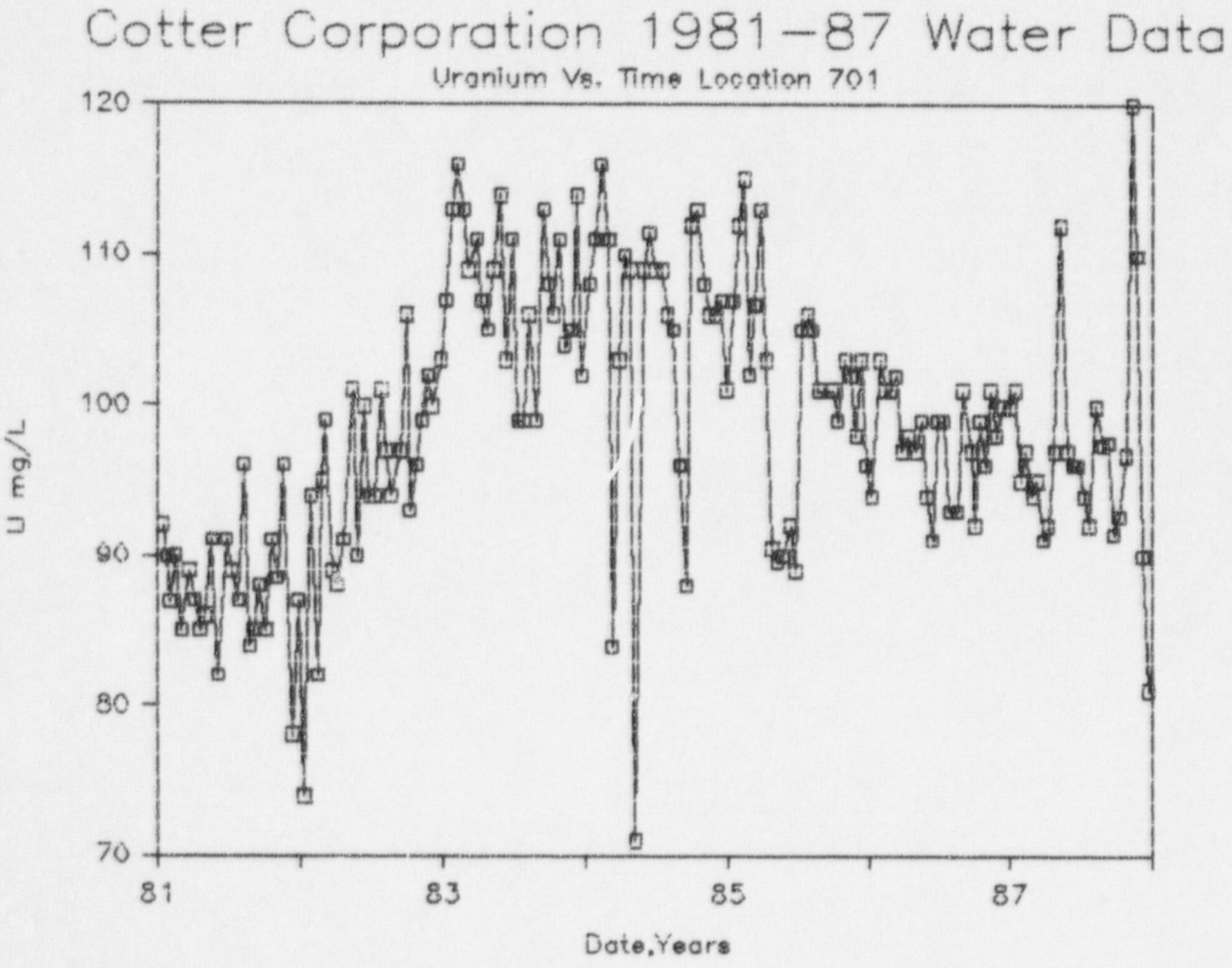

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 701
120
110
100
90
80
70
U mg/L
81
83
85
87
Date,Years

FIGURE 1.112

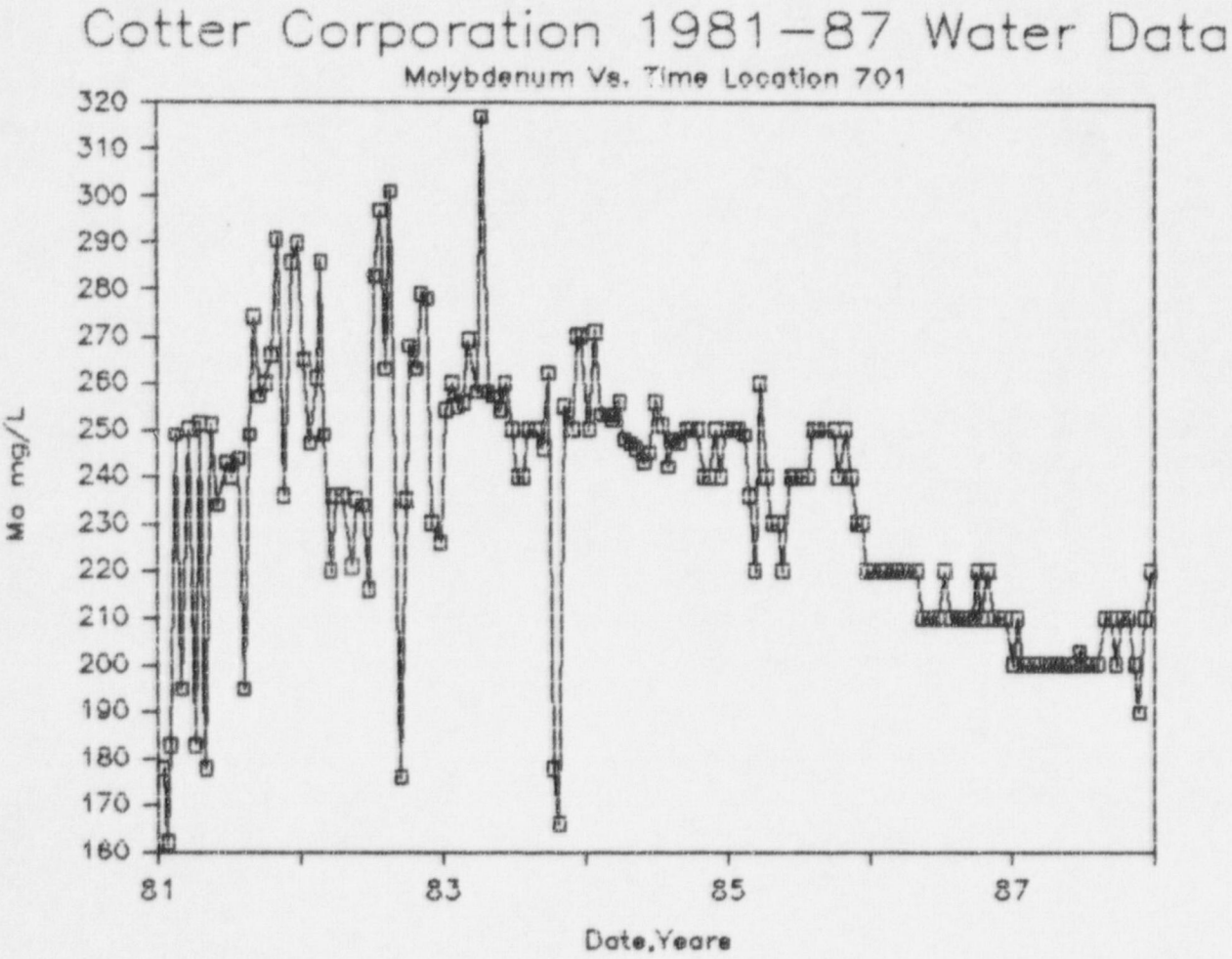

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 701
Mo mg/L
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
81
83
85
87
Date,Years

FIGURE 1.113

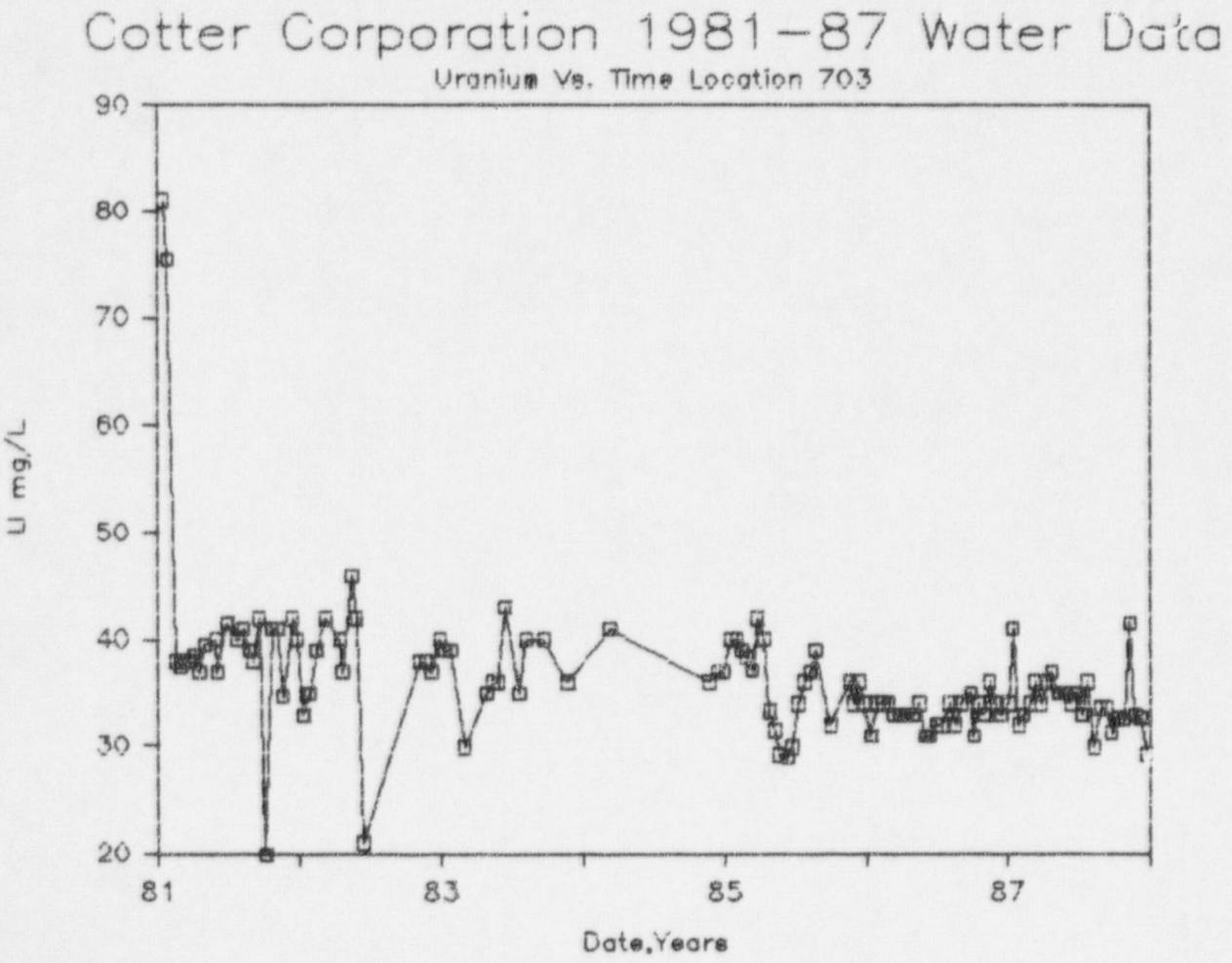

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 703
U mg/L
90
80
70
60
50
40
30
20
81
83
85
87
Date,Years

FIGURE 1.114

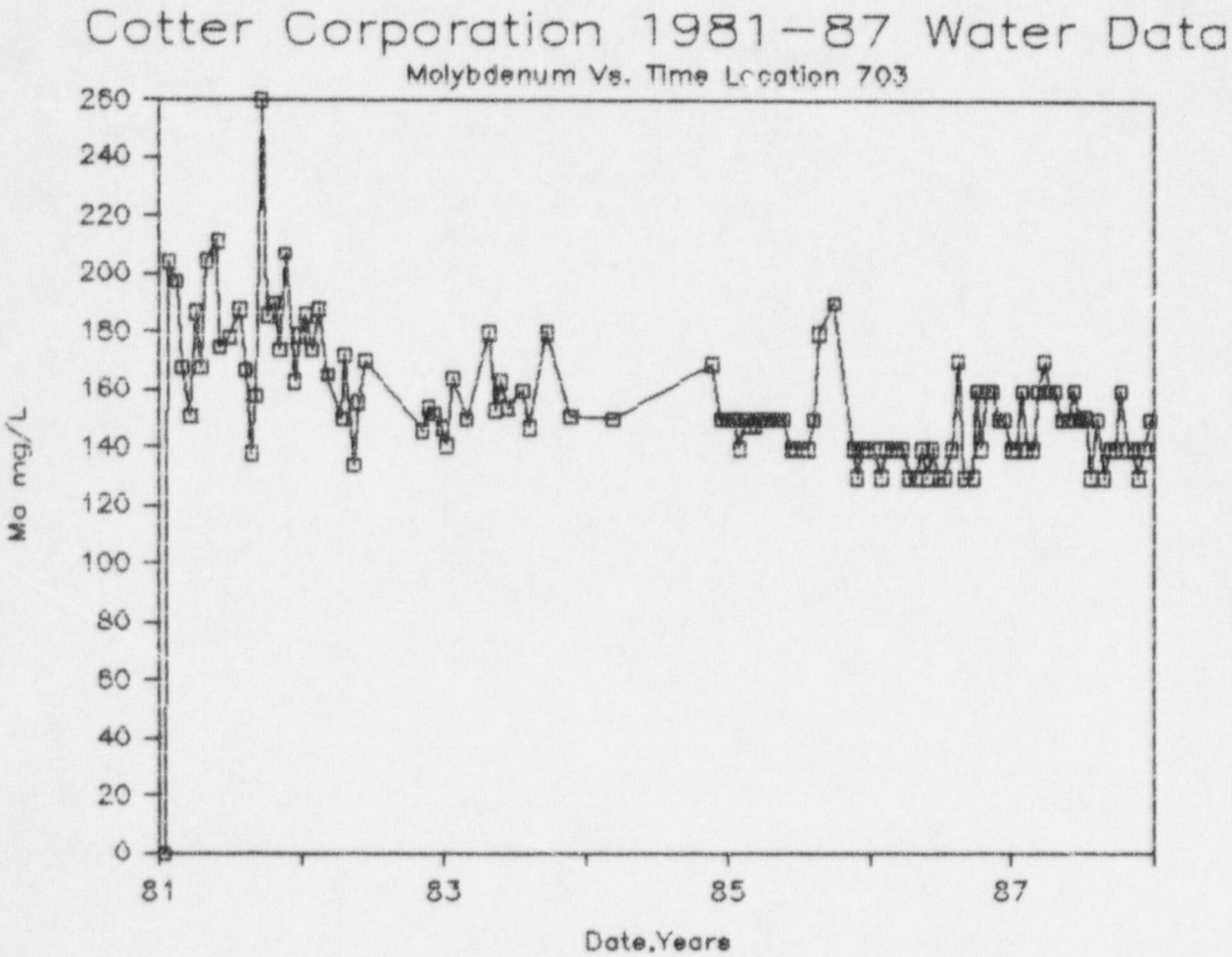

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 703
Mo mg/L
260
240
220
200
180
160
140
120
100
80
60
40
20
0
81
83
85
87
Date,Years

FIGURE 1.115

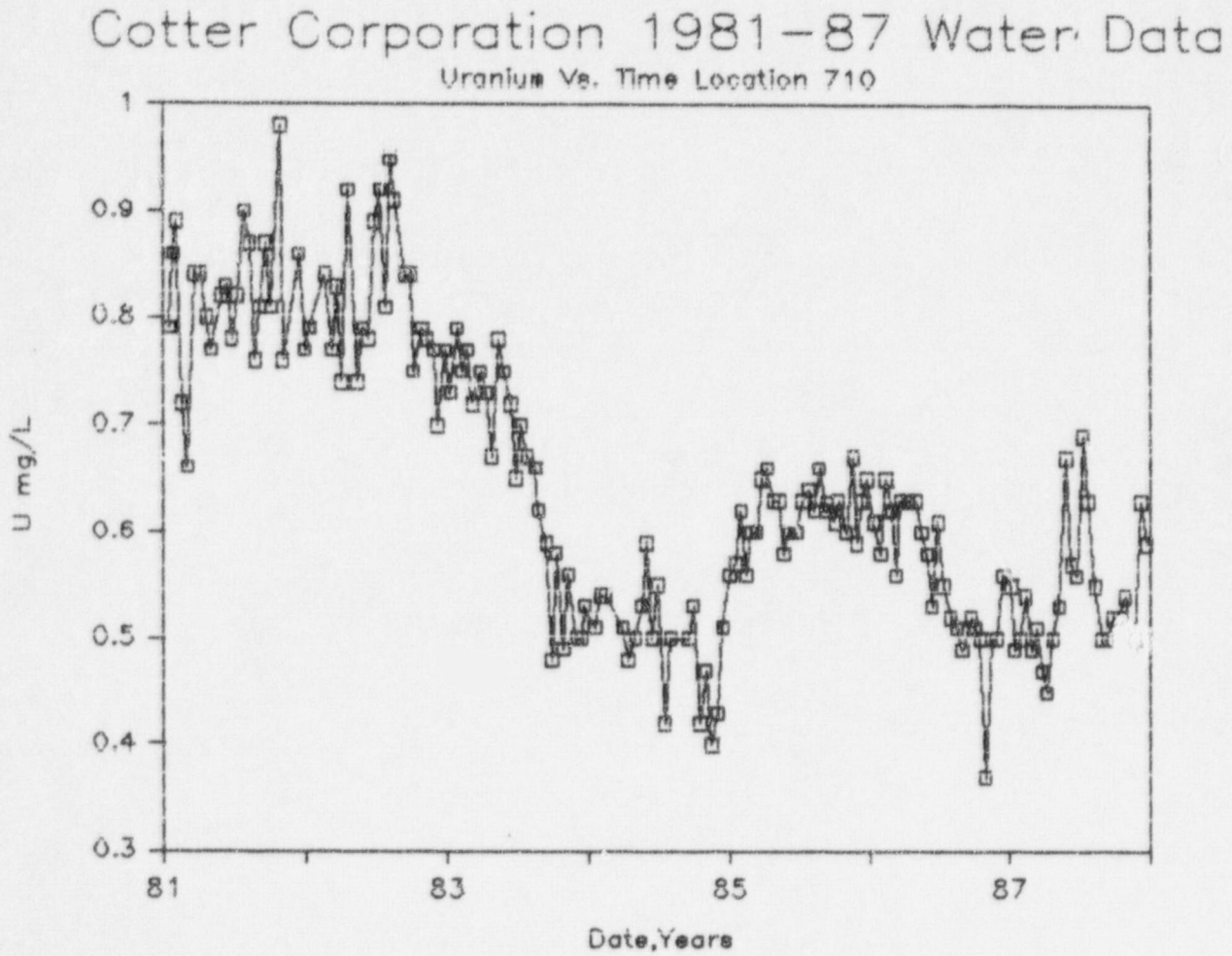

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 710
U mg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
81
83
85
87
Date,Years

FIGURE 1.116

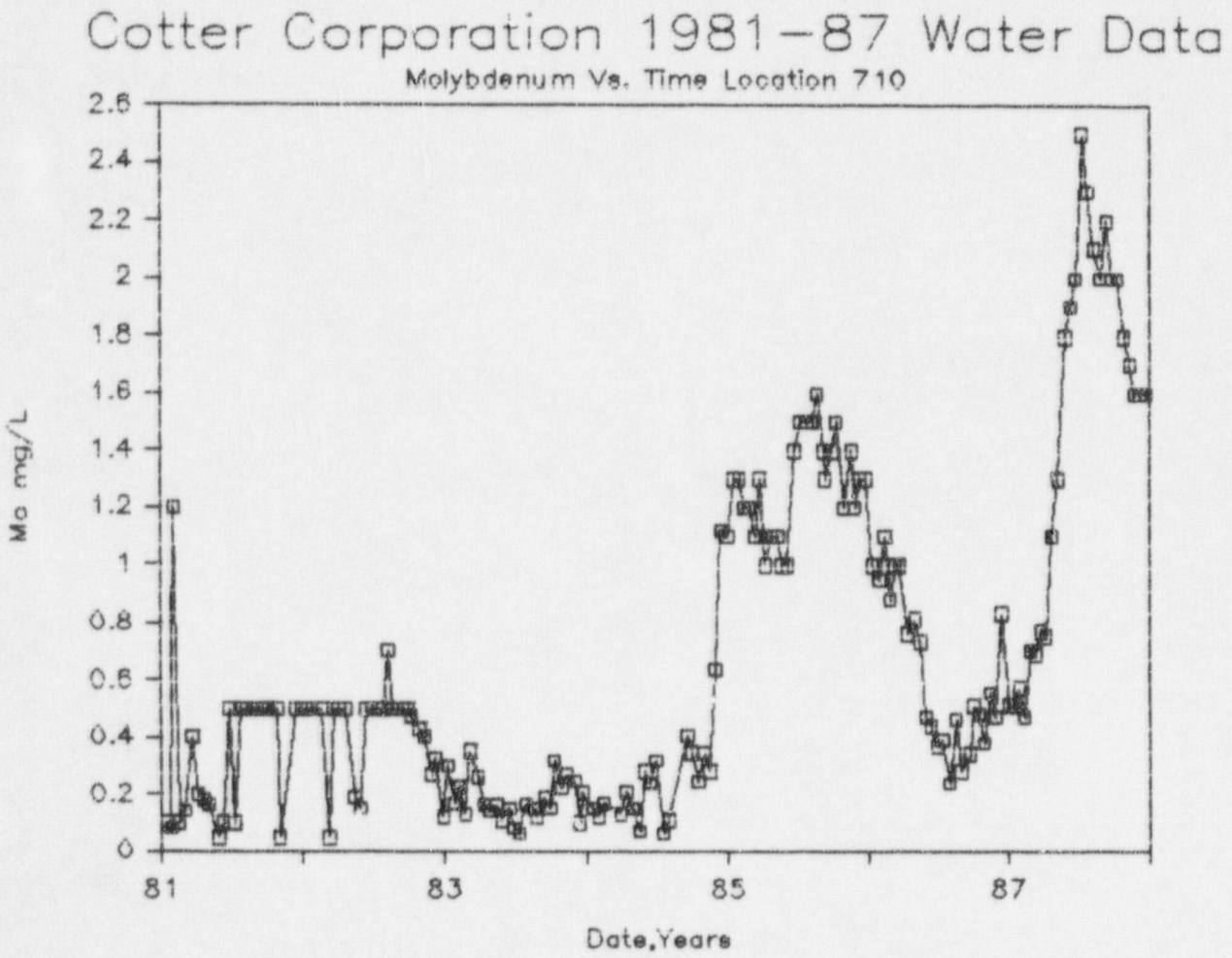

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 710
Mo mg/L
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
81
83
85
87
Date,Years

FIGURE 1.117

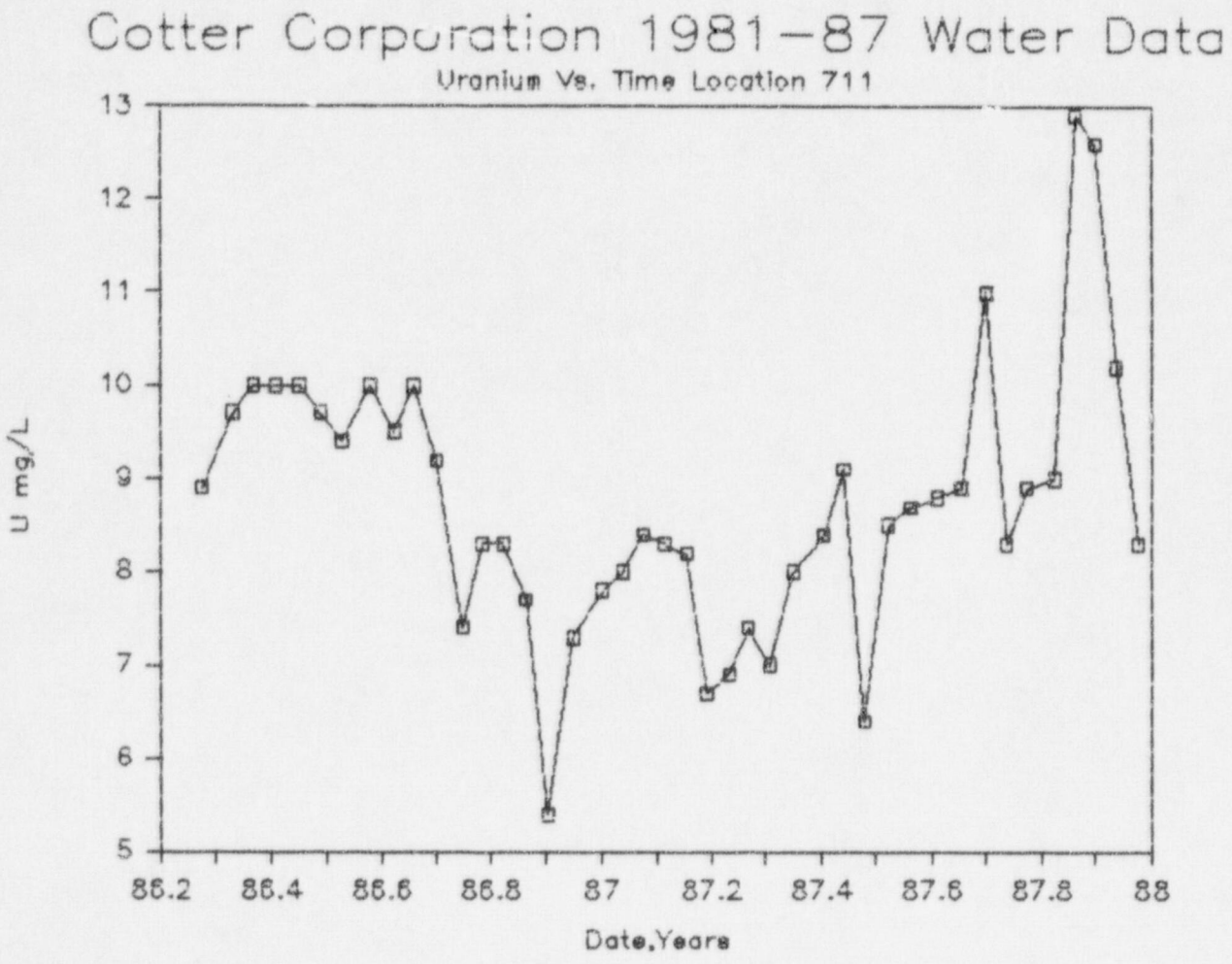

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 711
U mg/L
13
12
11
10
9
8
7
6
5
86.2
86.4
86.6
86.8
87
87.2
87.4
87.6
87.8
88
Date,Years

FIGURE 1.118

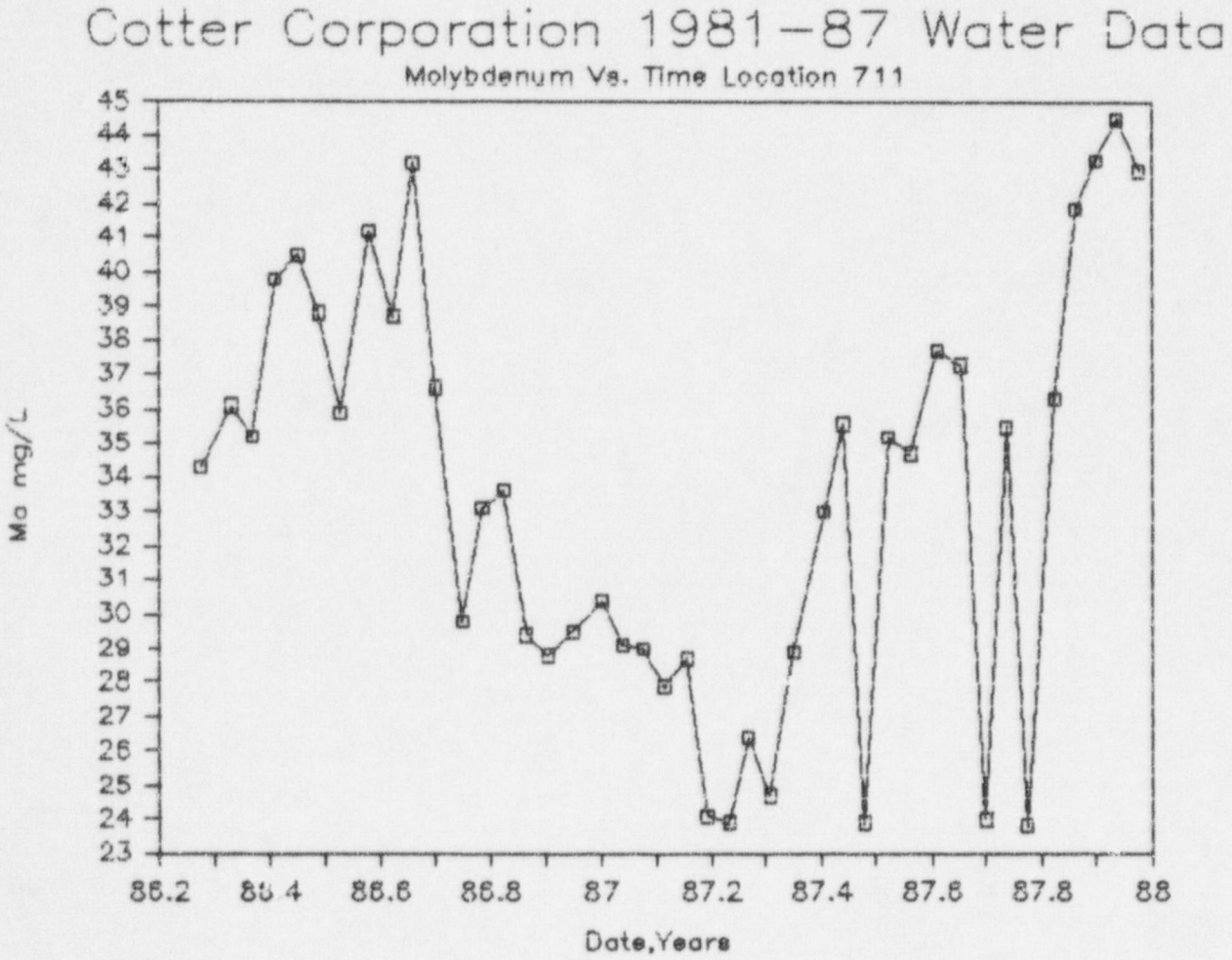

Cotter Corporation 1981-87 Water Data
Molybdenum Vs. Time Location 711
Mo mg/L
45
44
43
42
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
26
25
24
23
86.2
86.4
86.6
86.8
87
87.2
87.4
87.6
87.8
88
Date,Years

FIGURE 1.119

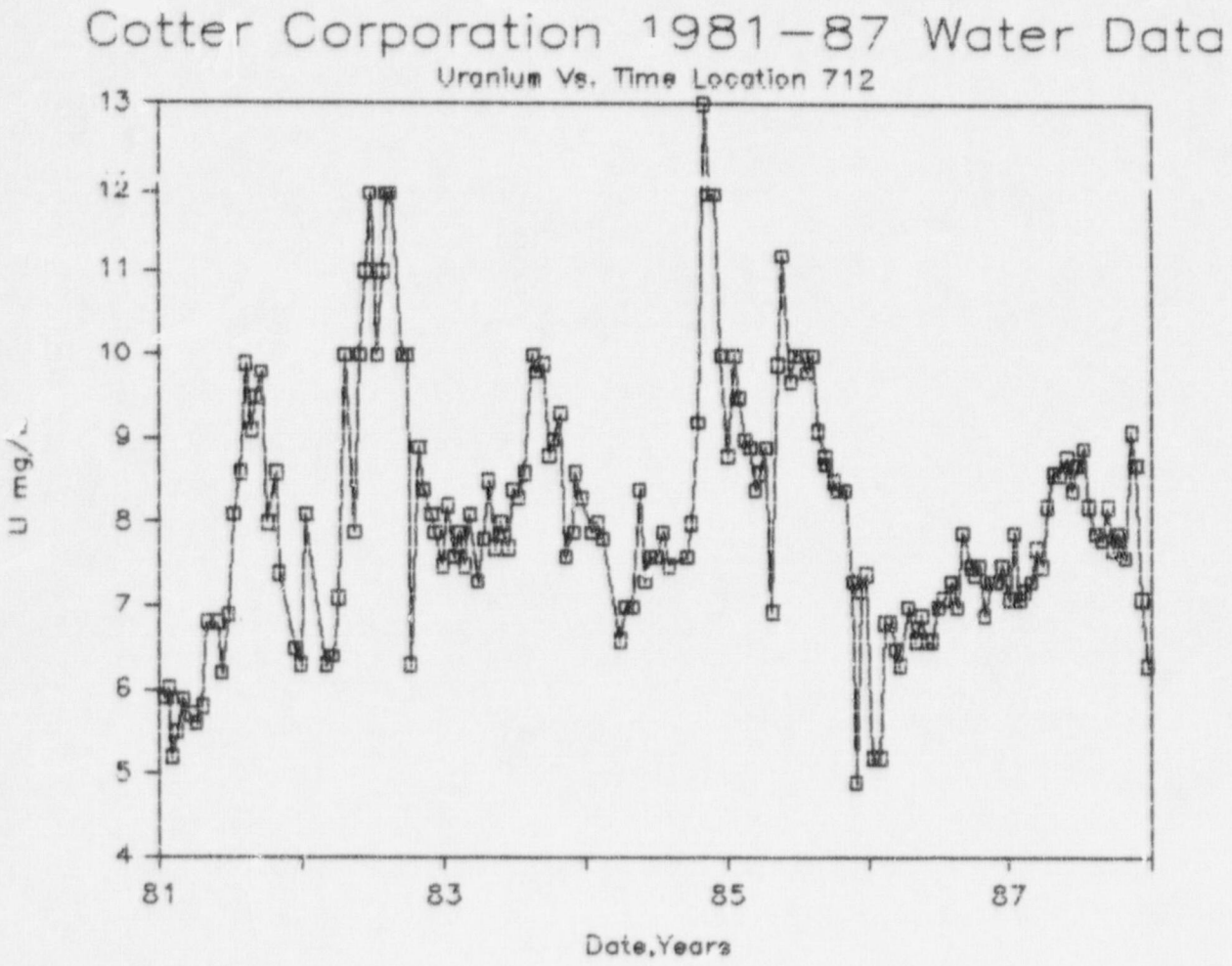

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 712
U mg/L
13
12
11
10
9
8
7
6
5
4
81
83
85
87
Date,Years

FIGURE 1.120

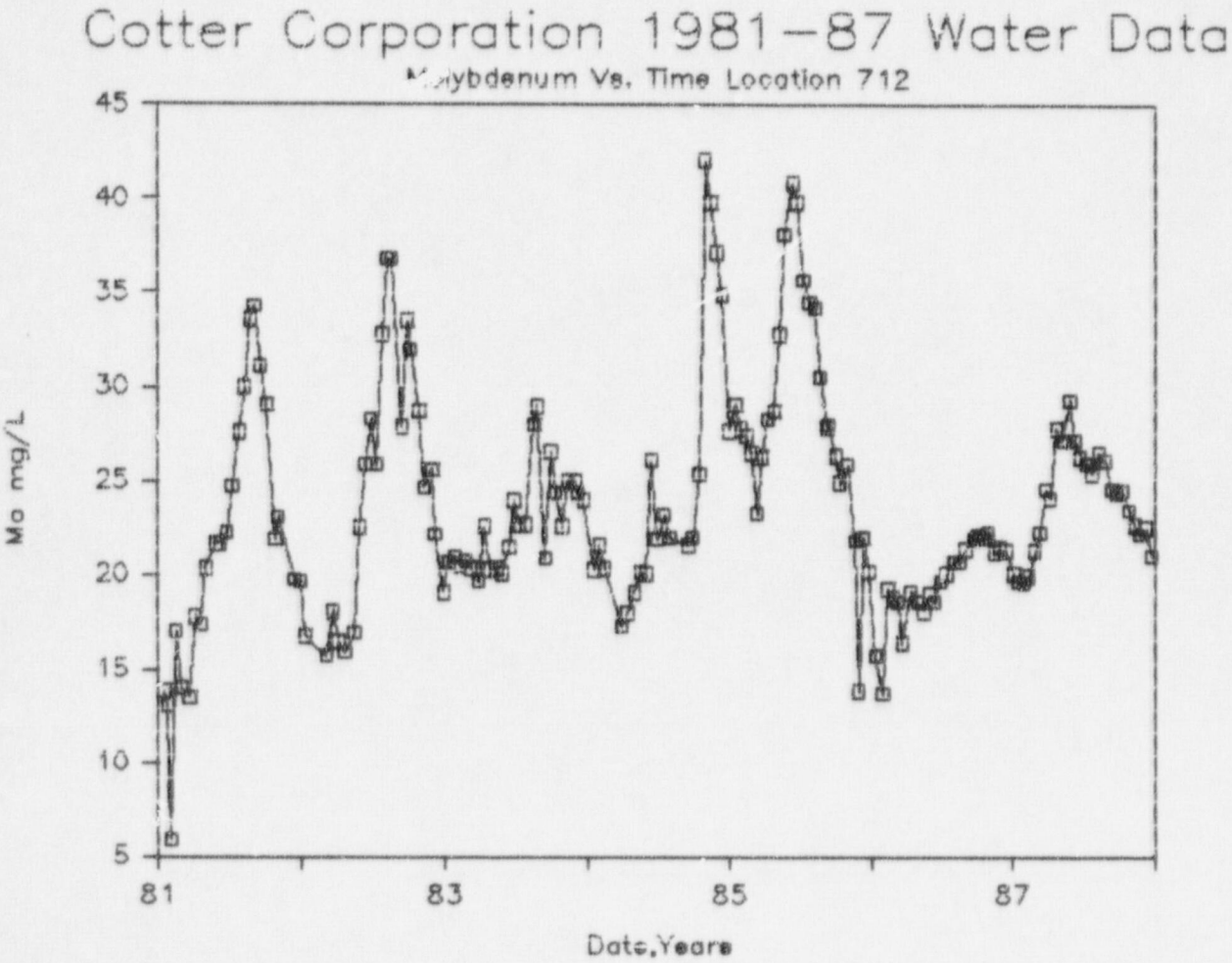

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 712
Mo mg/L
45
40
35
30
25
20
15
10
5
81
83
85
87
Date,Years

FIGURE 1.121

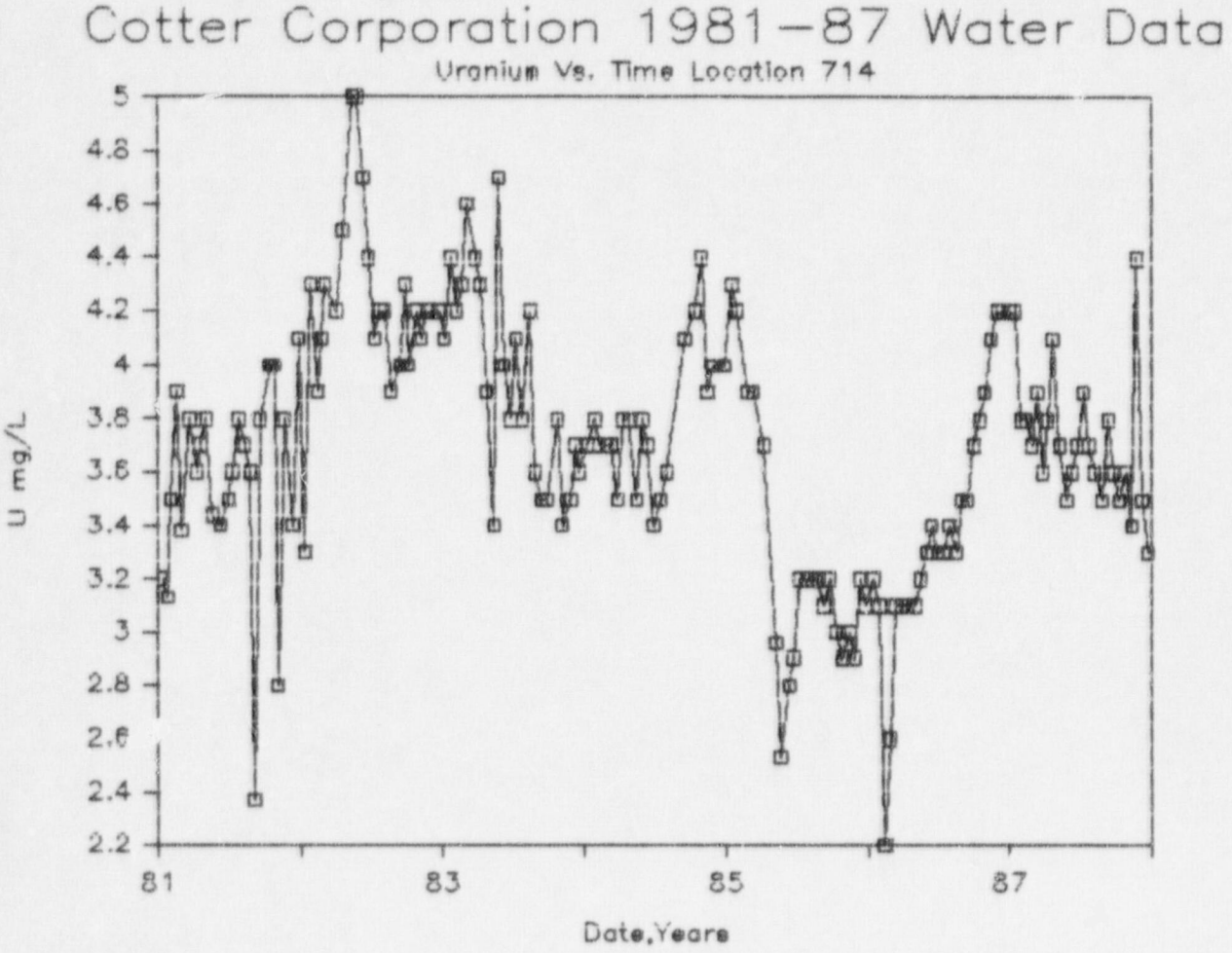

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 714
U mg/L
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
81
83
85
87
Date,Years

FIGURE 1.122

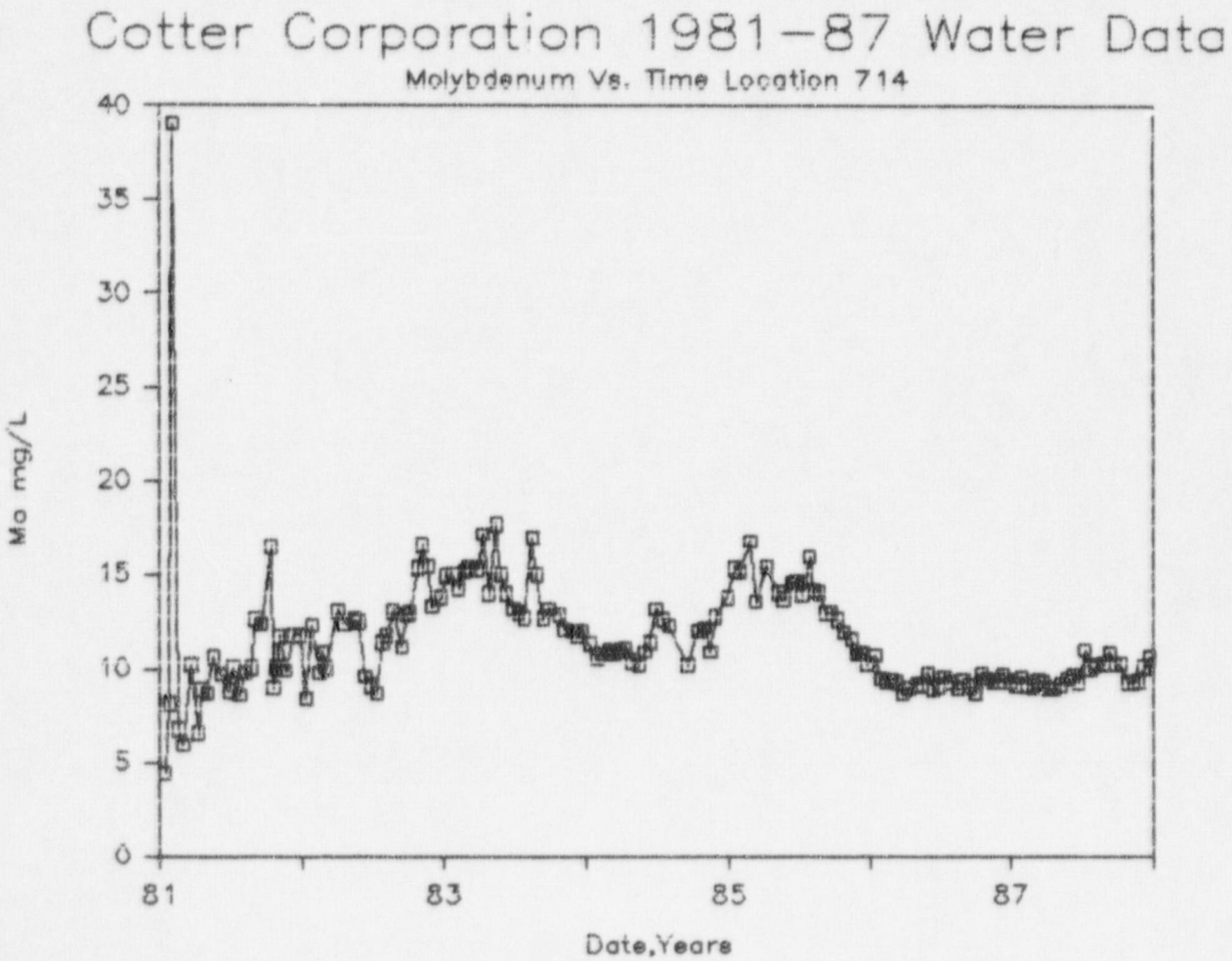

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 714
Mo mg/L
40
35
30
25
20
15
10
5
0
81
83
85
87
Date,Years

FIGURE 1.123

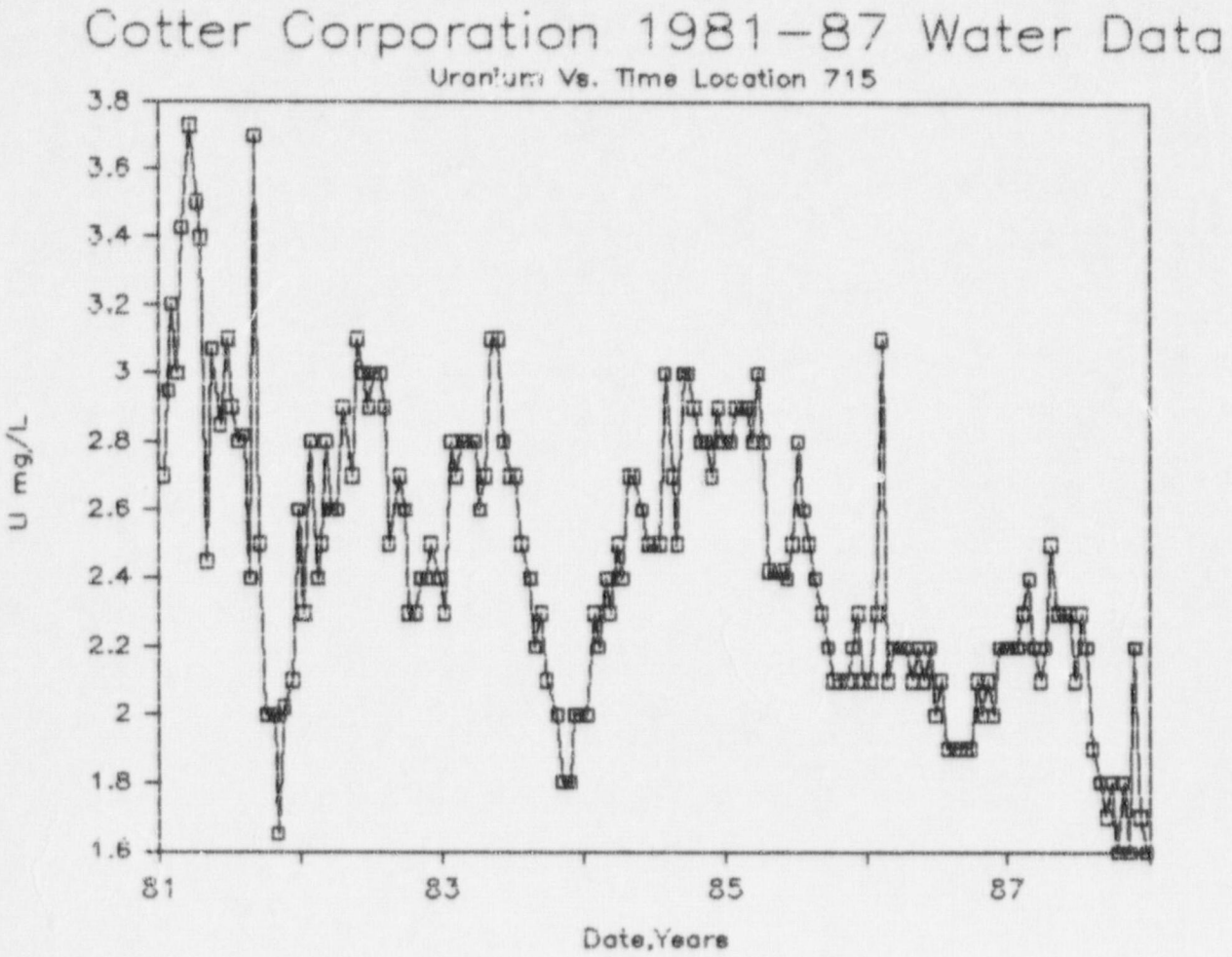

Cotter Corporation 1981–87 Water Data
Uranium Vs. Time Location 715
U mg/L
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
81
83
85
87
Date,Years

FIGURE 1.124

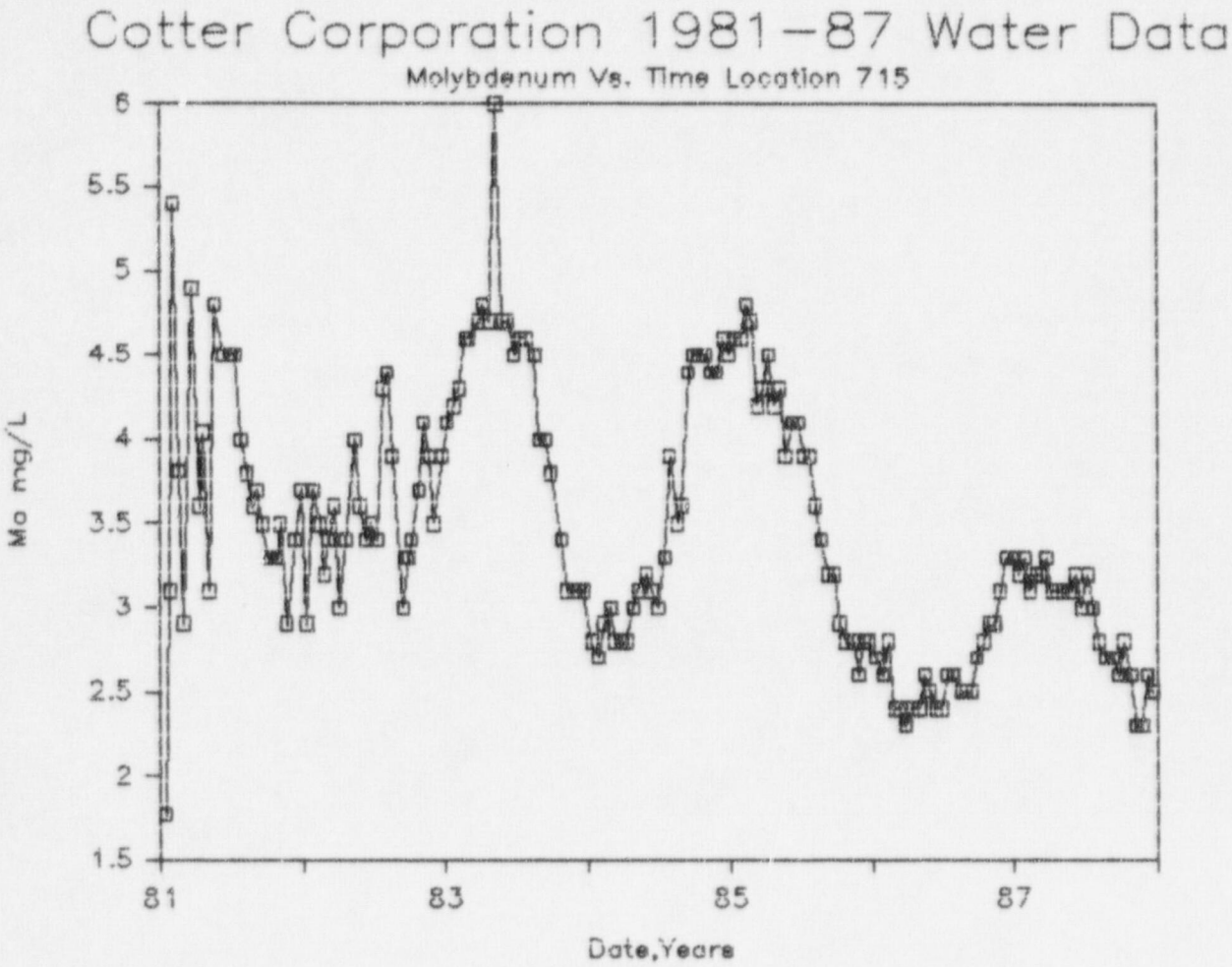

Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 715
Mo mg/L
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
81
83
85
87
Date,Years

FIGURE 1.125

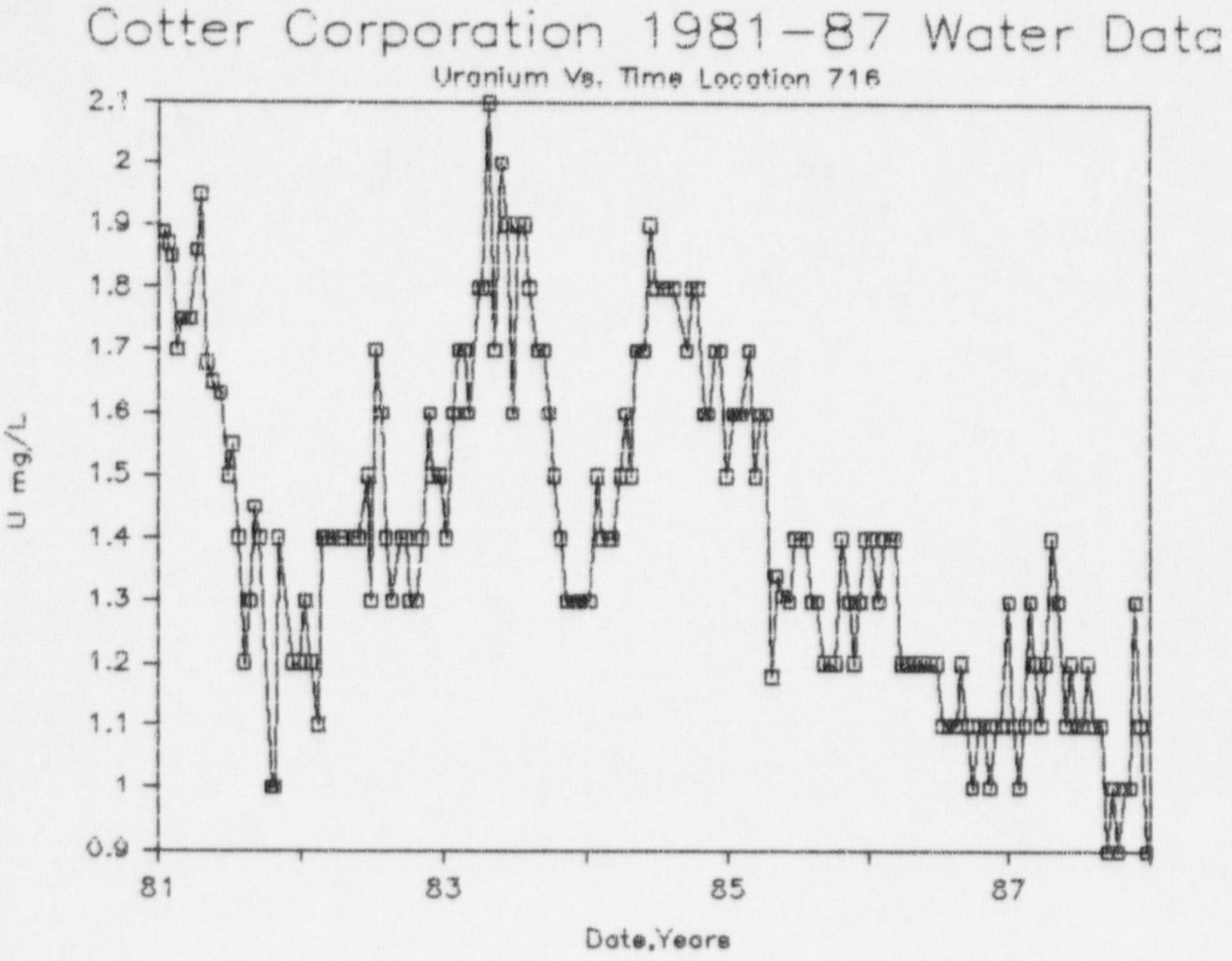
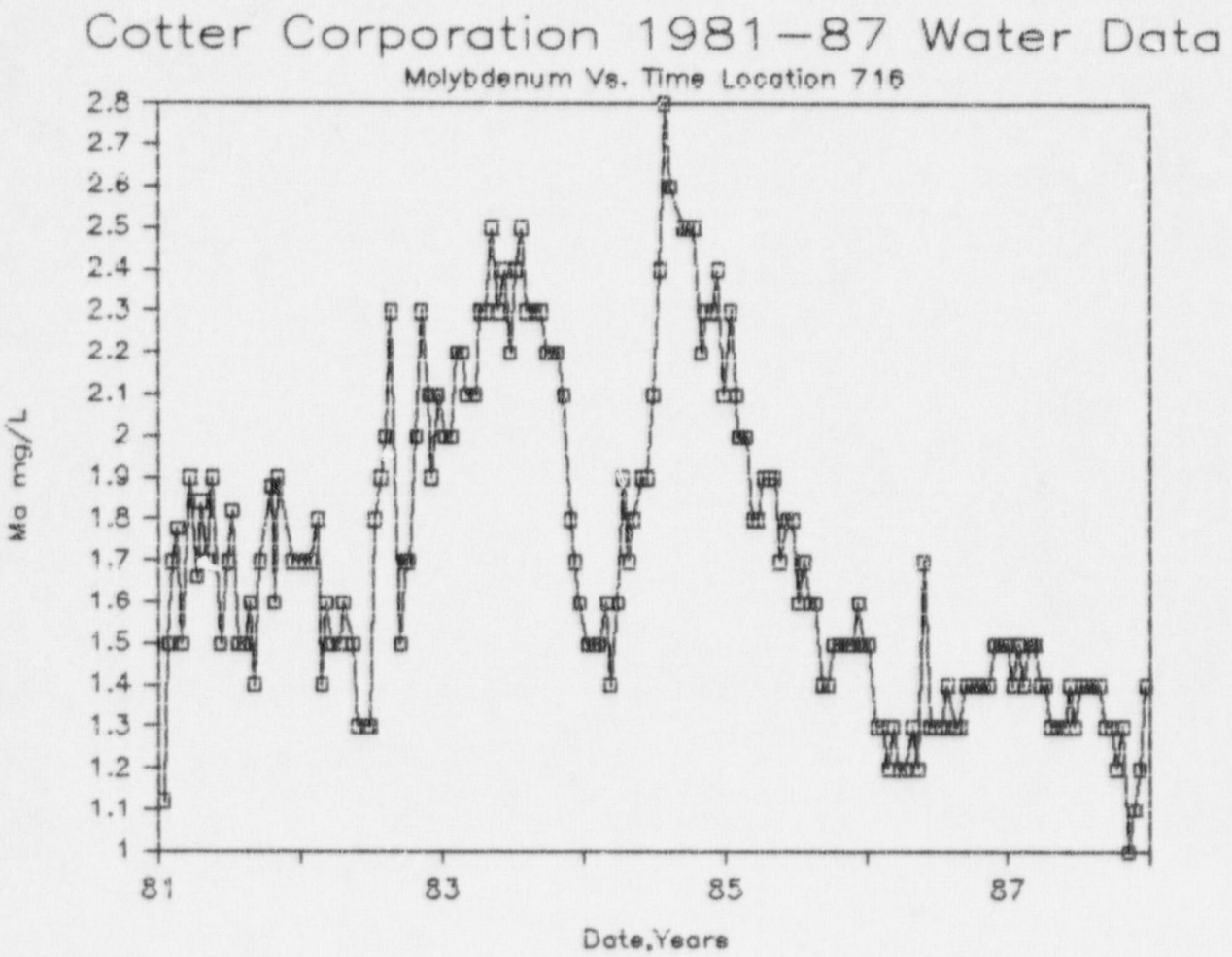

Cotter Corporation 1981-87 Water Data
Uranium Vs. Time Location 716
U mg/L
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
81
83
85
87
Date,Years

FIGURE 1.126


Cotter Corporation 1981–87 Water Data
Molybdenum Vs. Time Location 716
Mo mg/L
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
81
83
85
87
Date,Years

## 2.0 ALPHA MONITORING OF EQUIPMENT LEAVING THE MILL SITE - ANNUAL REPORT

LICENSE CONDITION 22.5

Cotter Corporation Radiation Safety personnel routinely conduct alpha monitoring surveys of equipment leaving the mill property (i.e., the restricted area). Orders were issued in 1980 specifying the maximum permissible limit for release (i.e. 1000 dpm/100cm$^2$) along with the procedure for security notification prior to equipment release. This information was cited in the 1980 annual report. A form is utilized for the release of equipment which documents the survey date, equipment description, maximum reading obtained and the signature of the surveyor. In 1987, 125 such surveys were conducted for equipment leaving the site.

In addition, spot check alpha surveys are performed for yellowcake shipments. This spot check involves monitoring several barrels in each shipment for alpha contamination. In 1987, the survey results for those shipments leaving the site demonstrated that none of the barrels released exceeded the permissible limit for release to the unrestricted area (i.e 1000 dpm/100cm$^2$).

Cotter plans to continue the monitoring of equipment leaving the facility for alpha contamination in a continuing effort to control potential off-site contamination.

## 3.0 - PERSONNEL MONITORING SURVEYS, INSPECTIONS AND AUDITS - ANNUAL REPORT

### 3.1 - ALPHA CONTAMINATION SURVEYS (PERSONNEL)

LICENSE CONDITION 23.7 ALPHA CONTAMINATION SURVEYS

Cotter routinely conducts alpha monitoring surveys on a per-shift basis of employees assigned to the yellowcake calcining/packaging areas. These surveys are performed by Safety Technicians who are present at the change house at the end of each shift. Results of the 1987 surveys conducted for employees assigned to this area of the mill are presented in Table 3.1. These summary sheets indicate contamination levels for both hands and shoes and whether or not the employee showered prior to the survey.

In addition to these routine surveys, maintenance personnel are monitored as required in connection with radiation work permits and spot surveys are conducted to monitor possible contamination of other workers leaving the site.

A total of 35 spot surveys was performed in 1987. All surveys indicated contamination levels less than 1000 dpm/100cm$^2$. Results of the spot surveys are presented in Table 3.2.

Cotter plans to continue the personnel alpha contamination survey program as required by license condition.

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY
($dpm/cm^2$)

Year 87

EMPLOYEE NAME #1 JOB DESCRIPTION

| DATE | HANDS | FOOT | | | Factor |
|---|---|---|---|---|---|
| Ludlum 1-23-87 | 320-160 | 896-320 | Showered | Meal | 1.60 |
| Ludlum 1-27-87 | 160-480 | 240-800 | Showered | Meal | |
| 1-28-87 | 400-480 | 240-480 | Showered | Spencer | |
| 1-29-87 | 577-495 | 747-165 | Showered | Spencer | |

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COTTER CORPORATION

ALPHA CONTAMINATION SURVEY
(dpm/cm$^2$)

Year 87

EMPLOYEE NAME #2 JOB DESCRIPTION Y.C. Operator

| DATE | L HANDS R | L FOOT R | | | |
|---|---|---|---|---|---|
| 1-7-87 | 174-348 | 522-348 | Showered | Neal | |
| 1-8-87 | 240-160 | 240-320 | Showered | Ortega | |
| 1-9-87 | 240-160 | 200-240 | Showered | Spurlock | |
| 1-10-87 | 400-240 | 240-240 | Showered | Spurlock | |
| 1-11-87 | 320-400 | 320-320 | Showered | Spurlock | |
| 1-12-87 | 480-240 | 560-640 | Showered | Ortega | |
| 1-13-87 | 261-478 | 478-522 | Showered | Neal | |
| Fberline 1-14-87 | 480-560 | 880 160 | Showered | Ortega | |
| 1-15-87 | 240-280 | 160-240 | Showered | Cotter | |
| Eberline 1-16-87 | 320-160 | 480-320 | Showered | Neal | 1,60 |
| 1-20-87 | 400-320 | 320-320 | Showered | Spurlock | |
| Eberline 1-21-87 | 320-480 | 240-400 | Showered | Neal | 1,60 |
| 1-22-87 | 320-240 | 160-280 | Showered | Spurlock | |
| Sullivan 1-23-87 | 320-480 | 80-240 | Showered | Neal | 1,60 |
| " 1-24-86 | 278-400 | 120-200 | Showered | Unreadable | 1,60 |
| Sullivan 1-27-86 | 480-320 | 80-160 | Showered | Neal | 1,60 |
| 1-30-87 | 320-480 | 240-160 | Showered | Unreadable | 1,60 |
| Sullivan 1-31-87 | 268-480 | 672-268 | Showered | Spurlock | |

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COTTER CORPORATION
ALPHA CONTAMINATION SURVEY
(dpm/cm$^2$)

Year 87

EMPLOYEE NAME #3 JOB DESCRIPTION Precip Operator

| DATE | L HANDS R | L FOOT R | | |
|---|---|---|---|---|
| 1-10-87 | 480-240 | 160-40 | Showered | Neal |

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ALPHA CONTAMINATION SURVEY
(dpm/cm$^2$)

Year 82

EMPLOYEE NAME # 4 JOB DESCRIPTION

| DATE | L HANDS R | L FOOT R | | |
|---|---|---|---|---|
| 1-27-87 | 240-480 | 160-320 | Showered | Neal |
| 1-30-87 | 330-495 | 330-247 | Showered | Neal |

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COTTER CORPORATION

ALPHA CONTAMINATION SURVEY
(dpm/cm$^2$)

Year 87

EMPLOYEE NAME #5

JOB DESCRIPTION U.C. Operator

| DATE | L HANDS R | L FOOT R | | | |
|---|---|---|---|---|---|
| 1-7-87 | 174-261 | 87-348 | Showered | Neal | |
| 1-8-87 | 480-280 | 320-384 | Showered | Usnick | 1.60 |
| 1-9-87 | 280-280 | 160-280 | Showered | Usnick | 1.60 |
| 1-11-87 | 480-320 | 240-280 | Showered | Usnick | 1.60 |
| 1-12-87 | 320-400 | 280-320 | Showered | Usnick | 1.60 |
| 1-13-87 | 576-336 | 576-480 | Showered | Usnick | 1.92 |
| 1-14-87 | 400-480 | 240-320 | Showered | Sayler | 1.60 |
| 1-15-87 | 400-280 | 480-400 | Showered | Sayler | 1.60 |
| 1-16-87 | 400-480 | 400-360 | Showered | Sayler | 1.60 |
| 1-19-87 | 160-320 | 240-440 | Showered | Usnick | 1.60 |
| 1-20-87 | 320-440 | 160-400 | Showered | Usnick | [illegible] |
| 1-21-87 | 560-320 | 360-240 | Showered | Usnick | 1.60 |
| 1-22-87 | 147-240 | 147-240 | Showered | Sayler | 1.60 |
| 1-23-87 | 480-160 | 320-320 | Showered | Ortega | 1.60 |
| 1-26-87 | 240-280 | 320-240 | Showered | Sayler | 1.60 |
| 1-27-87 | 240-400 | 400-280 | Showered | Usnick | 1.60 |
| 1-28-87 | 240-160 | 160-160 | Showered | Spencer | 1.60 |
| 1-31-87 | 96-384 | 384-672 | Showered | J Adams | (1.92) |

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COTTER CORPORATION

ALPHA CONTAMINATION SURVEY
(dpm/cm$^2$)

Year 87

#6

EMPLOYEE NAME _____ JOB DESCRIPTION _____

| DATE | L HANDS R | L FOOT R | Showered | Meal |
|---|---|---|---|---|
| 1-30-87 | 412-507 | 247-495 | Showered | Meal |

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COTTER CORPORATION

ALPHA CONTAMINATION SURVEY
($dpm/cm^2$)

Year 87

#7

EMPLOYEE NAME

JOB DESCRIPTION

| DATE | L HANDS R | L FOOT R | Showered | Meal |
|---|---|---|---|---|
| 1-30-87 | 747-495 | 412-577 | Showered | Meal |

RECEIVED:
COTTER CORP
Radiation Safety Dept.
Date: FEB 2 1987
Distribution:

Jan 2/12/87

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY
($dpm/cm^2$)

#8

Year 87

EMPLOYEE NAME _____ JOB DESCRIPTION Y.C. Operator

| | DATE | L HANDS R | L FOOT R | | | Factor |
|---|---|---|---|---|---|---|
| Berlina | 1-8-87 | 400 - 480 | 400 - 400 | Showered | D. Saylor | |
| " | 1-9-87 | 320 - 160 | 320 - 400 | Showered | D. Saylor | |
| " | 1-10-87 | 320-160 | 200-400 | Showered | Neal | 1.60 |
| Ludlum | 1-11-87 | 320-160 | 240-400 | Showered | Neal | 1.60 |
| Eberlin | 1-12-87 | 480-320 | 240-400 | Showered | Ortega | |
| " | 1-13-87 | 320-480 | 400-280 | Showered | Ortega | |
| Ludlum | 1-14-87 | 192-288 | 384-192 | Showered | Neal | 1.92 |
| Berlina | 1-15-87 | 160-320 | 160-320 | Showered | Neal | 1.60 |
| Ludlum | 1-16-87 | 514-367 | 220-147 | Showered | Ortega | |
| | 1-17-87 | 160-320 | 320-400 | Showered | Spencer | |
| | 1-19-87 | 320-240 | 280-320 | Showered | Saylor | |
| Berlina | 1-20-87 | 160-320 | 240-160 | Showered | Neal | 1.60 |
| | 1-21-87 | 160-360 | 560-280 | Showered | Hamide | 1.60 |
| Ludlum | 1-22-87 | 640-280 | 320-256 | Showered | Neal | 1.60 |
| Ludlum | 1-23-87 | 560-320 | 360-320 | Showered | Neal | 1.60 |
| Latham | 1-26-87 | 480-320 | 160-80 | Showered | Neal | 1.60 |
| Ludlum | 1-27-87 | 480-400 | 320-480 | Showered | Neal | 1.60 |
| Ludlum | 1-28-87 | 320-480 | 640-640 | Showered | Billingsley | 1.60 |
| Ludlum | 1-24-87 | 495-412.5 | 330-1480 | Showered | Billingsley | 1.65 |
| Latham | 1-30-87 | 355-310 | 246-325 | Showed | J. Ortega | 1.43 |

RECEIVED:
COTTER CORP.
Radiation Safety Dept.
Date: FEB 2 1987
Distribution: Jan 2-17-87

ENTERED FEB 1 / 1987



RSD-42

COTTER CORPORATION

ALPHA CONTAMINATION SURVEY
($dpm/cm^2$)

Year 87

#9

EMPLOYEE NAME _____ JOB DESCRIPTION Y.C. Operator

| DATE | L HANDS R | L FOOT R | Showered | | Factor |
|---|---|---|---|---|---|
| 1-12-87 | 320 - 720 | 160 - 160 | Showered | Citrus | |
| 1-13-87 | 560 - 400 | 80 - 320 | Showered | Citrus | |
| 1-14-87 | 576 - 384 | 288 - 192 | Showered | Neal | 1.92 |
| 1-15-87 | 320 - 300 | 560 - 320 | Showered | Neal | 1.60 |

Perline

RECEIVED
COTTER CORP.
Radiation Safety Dept.
Date: FEB 2 1987
Distribution:
2-17-87

TABLE 3.2

PROGRAM - LAB307
RUN DATE 02/05/88

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY (dpm/100cm**2) FOR 1987

| DATE | JOB DESCRIPTION | LEFT HAND | RIGHT HAND | LEFT FOOT | RIGHT FOOT |
|---|---|---|---|---|---|
| 03/30/87 | MAINTENANCE INSTRUME | 121 | 121 | 242 | 182 |
| 03/30/87 | MAINT ELECTRICIAN | 182 | 182 | 242 | 121 |
| 03/30/87 | HEALTH & SAFETY SUPE | 605 | 242 | 242 | 121 |
| 03/30/87 | SECURITY/SAFETY TECH | 61 | 121 | 182 | 242 |
| 04/29/87 | CDH-INSPECTORS | 591 | 296 | 296 | 197 |
| 04/29/87 | CDH-INSPECTORS | 296 | 493 | 394 | 690 |
| 06/26/87 | MAINT FOREMAN | 180 | 60 | 600 | 180 |
| 06/26/87 | SECURITY/SAFETY TECH | 60 | 120 | 120 | 120 |
| 06/26/87 | SECURITY/SAFETY TECH | 60 | 0 | 180 | 180 |
| 08/05/87 | OC-AMER EARTH-CAT.OP | 160 | 160 | 400 | 400 |
| 08/14/87 | OC-AMER EARTH-CAT.OP | 100 | 100 | 200 | 200 |
| 08/14/87 | OC-AMER EARTH-CAT.OP | 150 | 150 | 300 | 300 |
| 08/17/87 | OC-AMER EARTH-CAT.OP | 240 | 240 | 300 | 180 |
| 08/18/87 | OC-AMER EARTH-CAT.OP | 300 | 100 | 450 | 400 |
| 08/19/87 | OC-AMER EARTH-CAT.OP | 120 | 0 | 120 | 300 |
| 08/19/87 | OC-AMER EARTH-CAT.OP | 240 | 120 | 600 | 710 |
| 09/22/87 | SECURITY/SAFETY TECH | 57 | 57 | 339 | 170 |
| 09/22/87 | SECURITY/SAFETY TECH | 226 | 169 | 160 | 124 |
| 09/22/87 | ANLYT NON SMPLE PREP | 57 | 85 | 283 | 113 |
| 11/24/87 | OUTSIDE CONTRACTOR-U | 0 | 166 | 83 | 83 |
| 11/24/87 | MAINT SUPERINT | 0 | 0 | 249 | 166 |
| 11/24/87 | MAINT SUPERINT | 83 | 83 | 166 | 166 |
| 11/24/87 | SECURITY/SAFETY TECH | 0 | 0 | 166 | 166 |
| 11/24/87 | SECURITY/SAFETY TECH | 83 | 83 | 498 | 332 |
| 11/24/87 | LABORERS | 83 | 83 | 166 | 332 |
| 11/24/87 | ANLYT NON SMPLE PREP | 166 | 0 | 332 | 166 |
| 11/24/87 | ENV. COORD./RAD. SAF | 166 | 166 | 83 | 830 |
| 11/24/87 | CH. MET./PERSNL. COO | 0 | 166 | 166 | 166 |
| 11/24/87 | ANLYT LAB SUPERVISOR | 332 | 166 | 332 | 498 |
| 11/24/87 | MILL ACCOUNTANT | 166 | 166 | 0 | 166 |
| 11/24/87 | MILL ACCOUNTANT | 83 | 83 | 166 | 166 |
| 11/24/87 | MILL ACCOUNTANT | 166 | 0 | 83 | 83 |
| 11/24/87 | JUNIOR METALURGIST | 0 | 0 | 166 | 166 |
| 11/24/87 | SUPERINT SUPPORT SVC | 83 | 0 | 166 | 166 |
| 11/24/87 | SUPERINT SUPPORT SVC | 249 | 166 | 83 | 83 |

3.2 - ALPHA CONTAMINATION SURVEYS OF LUNCHROOMS, CONTROL ROOMS, CHANGE ROOMS, AND OFFICES - ANNUAL REPORT LICENSE CONDITION 23.8

Cotter Corporation performs weekly alpha monitoring surveys of lunchrooms, control rooms, change rooms and offices at the Canon City mill. Surveys conducted in 1987 have been summarized in Table 3.3 which indicates all the readings at each of the locations surveyed. Comparison of Table 3.3 to the table for 1986 (Table 3.4) indicates no change in the percentage of survey locations which had maximum monthly values in excess of 1000 dpm/100cm$^2$ (0.00% in 1986 and 0.00% in 1987).

Cotter will continue alpha contamination surveys of lunchrooms, control rooms, change rooms and offices in 1988 as required by License Condition 23.8.

PROGRAM - LA8120

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY FOR 1987 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 02/04/88
TIME 10:19:36

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MENS' LOCKER ROOM DOOR AT ENTRANCE | <7 | 46 | 36 | 25 | 7 | 13 | 8 | <7 | 11 | 35 | 9 | 9 |
| | 25 | 15 | 21 | 24 | 15 | 11 | <7 | 8 | <6 | <9 | 11 | 29 |
| | <10 | <8 | 10 | 8 | <7 | <6 | 9 | 19 | 2 | 20 | <3 | 17 |
| | 17 | 33 | 8 | 12 | 18 | 44 | 13 | <8 | 24 | 15 | <3 | 18 |
| | | | | 28 | | 21 | | | | | | <3 |
| WOMENS' LOCKER ROOM DOOR AT ENTRANCE | 19 | 49 | 38 | 10 | <7 | <7 | 18 | 23 | <7 | 15 | 17 | 6 |
| | 20 | 37 | 11 | 21 | <8 | 21 | 10 | <7 | <8 | 14 | <3 | 34 |
| | 13 | 32 | 8 | <7 | <7 | 6 | 27 | <7 | 4 | <8 | <3 | 15 |
| | <9 | 13 | 45 | 9 | 10 | 11 | 13 | 10 | <7 | 33 | 6 | 10 |
| | | | | <7 | | 23 | | | | | | 12 |
| MAIN OFFICE NORTH DOOR AT ENTRANCE | <7 | 14 | 26 | 8 | <7 | 33 | <7 | 8 | <7 | 10 | <8 | 6 |
| | 53 | 20 | <7 | 26 | <8 | <7 | 10 | <7 | <8 | 21 | 6 | 11 |
| | <10 | <8 | <7 | <7 | 18 | 11 | 6 | 6 | 2 | 12 | 4 | <8 |
| | <9 | 38 | <7 | <6 | 15 | <7 | 16 | 15 | 11 | 20 | <3 | 13 |
| | | | | 13 | | <7 | | | | | | 7 |
| MAIN OFFICE EAST DOOR AT ENTRANCE | <7 | 26 | 16 | 28 | 12 | 28 | <7 | <7 | <7 | <8 | 15 | <3 |
| | <9 | 22 | <7 | <7 | <8 | <7 | <7 | <7 | <8 | 16 | <3 | 21 |
| | 15 | 17 | 10 | <7 | 15 | <6 | 19 | 6 | 7 | 10 | <3 | 20 |
| | 14 | 23 | <7 | 12 | 23 | 14 | <7 | 15 | 9 | <8 | <3 | 20 |
| | | | | 8 | | 11 | | | | | | 9 |
| SECONDARY CRUSHER LUNCHROOM DOOR AT ENTRANCE | 29 | 181 | 164 | | | | | | | | | |
| | 104 | 218 | 137 | | | | | | | | | |
| | 28 | 112 | 20 | | | | | | | | | |
| | 14 | 113 | | | | | | | | | | |
| LAB LUNCHROOM DOOR AT ENTRANCE | 19 | 11 | 21 | 15 | 10 | 8 | 11 | 11 | 10 | 17 | 30 | 16 |
| | 40 | 67 | 18 | 19 | <8 | 13 | 25 | 8 | <8 | <9 | <3 | 39 |
| | 20 | 27 | 10 | 8 | 10 | 14 | 6 | 8 | 9 | 20 | 80 | <8 |
| | 21 | 51 | 10 | 22 | 10 | 14 | 21 | 15 | 39 | 17 | 4 | <7 |
| | | | | 13 | | 18 | | | | | | 4 |
| LAB LUNCHROOM TABLE | <7 | <8 | 11 | <7 | <7 | <7 | 8 | 8 | <8 | <8 | <8 | 6 |
| | <9 | <7 | <7 | <7 | <8 | <7 | <7 | <7 | <8 | 11 | <3 | 16 |
| | <10 | <8 | <7 | <7 | <7 | 6 | <6 | 9 | <2 | <8 | <3 | 12 |
| | <9 | <7 | <7 | <6 | <7 | <7 | 11 | <8 | <7 | 22 | <3 | <7 |
| | | | | 10 | | <7 | | | | | | <3 |
| ELECTRICIANS' LUNCHROOM DOOR AT ENTRANCE | 22 | 124 | 78 | 83 | 43 | 13 | 56 | 48 | 78 | 56 | 28 | 14 |
| | 89 | 70 | 81 | 49 | 22 | 24 | 20 | 36 | 92 | 27 | 22 | 76 |
| | 73 | 95 | 23 | 50 | 35 | 47 | 39 | 29 | 26 | 25 | <3 | 41 |
| | 71 | 56 | 97 | 46 | 43 | 59 | 38 | 61 | 31 | 56 | 16 | 54 |
| | | | | 43 | | 34 | | | | | | 12 |
| ELECTRICIANS' LUNCHROOM TABLE | <7 | 39 | 31 | 23 | 12 | <7 | <7 | 13 | 73 | 10 | 15 | 4 |
| | 15 | 10 | 13 | <7 | <8 | <7 | <7 | 18 | <8 | 76 | 6 | 39 |
| | <10 | 15 | 15 | 33 | 13 | 19 | 14 | 24 | 9 | 17 | 32 | 12 |
| | <9 | 41 | 8 | <6 | <7 | 16 | <7 | 53 | 16 | 22 | <3 | 33 |

PROGRAM - LAB120 COTTER CORPORATION RUN DATE 02/04/88
ALPHA CONTAMINATION SURVEY FOR 1987 (ALPHA ACTIVITY(DPM/100 CM**2) TIME 10:21:31
(* DENOTES RESURVEY AFTER CLEANUP)

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 13 | | 11 | | | | | | 26 |
| INSTRUMENT LUNCHROOM WEST DOOR AT ENTRANCE | 39 | 119 | | 75 | | | | | | | | |
| | 86 | | | | | | | | | | | |
| | 46 | | | | | | | | | | | |
| | 17 | | | | | | | | | | | |
| INSTRUMENT LUNCHROOM TABLE | 26 | 31 | | 20 | | | | | | | | |
| | 23 | | | | | | | | | | | |
| | 15 | | | | | | | | | | | |
| | <9 | | | | | | | | | | | |
| MET LAB LUNCHROOM TABLE | <7 | <8 | <7 | 20 | 10 | <7 | <7 | <7 | 13 | <8 | <8 | 9 |
| | 30 | 17 | <7 | <7 | <8 | <7 | <7 | <7 | 89 | 47 | <3 | 18 |
| | <10 | 10 | 15 | <7 | <7 | <6 | <6 | 6 | 95 | <8 | <3 | 10 |
| | <9 | 6 | <7 | 17 | <7 | 16 | 18 | <8 | 44 | 15 | <3 | <7 |
| | | | | <7 | | <7 | | | | | | 7 |
| MET LAB WEST DOOR AT ENTRANCE | 34 | 29 | 31 | 48 | 43 | 35 | 31 | 26 | 26 | 33 | 17 | 8 |
| | 46 | 47 | 36 | 31 | 35 | 59 | 53 | 61 | 38 | 19 | 18 | 66 |
| | 71 | 50 | 28 | 43 | 45 | 34 | 42 | 40 | 14 | 38 | 6 | 33 |
| | 26 | 43 | 18 | 60 | 28 | 36 | 28 | 58 | 26 | 12 | 4 | 10 |
| | | | | 152 | | 34 | | | | | | 16 |
| JV-1X CONTROL ROOM NORTH DOOR AT ENTRANCE | 8 | 104 | 151 | 86 | 68 | 69 | 31 | 63 | 70 | 63 | 41 | 19 |
| | 149 | 127 | 94 | 104 | 65 | 72 | 28 | 43 | 56 | 55 | 6 | 47 |
| | 53 | 90 | 43 | 90 | 78 | 77 | 44 | 64 | 38 | 56 | 23 | 67 |
| | 36 | 88 | 95 | 110 | 86 | 24 | 79 | 83 | 56 | 38 | 21 | 41 |
| | | | | 71 | | 94 | | | | | | 14 |
| CCD CONTROL ROOM AT ENTRANCE | 68 | 379 | 435 | 134 | 110 | 132 | 119 | 58 | 78 | 81 | 72 | 43 |
| | 154 | 327 | 313 | 203 | 87 | 80 | 106 | 36 | 92 | 86 | 13 | 108 |
| | 23 | 317 | 88 | 115 | 142 | 115 | 85 | 74 | 52 | 30 | 9 | 74 |
| | 36 | 238 | 326 | 199 | 103 | 94 | 81 | 33 | 96 | 85 | 31 | 59 |
| | | | | 243 | | 122 | | | | | | 26 |
| CCD CONTROL ROOM TABLE | 31 | 131 | 88 | 13 | 17 | 28 | 21 | 33 | 50 | 15 | 33 | 4 |
| | 23 | 122 | 16 | 29 | 17 | 21 | 13 | 8 | <8 | 34 | 4 | 29 |
| | 88 | 92 | 13 | 15 | 13 | 19 | 24 | 16 | 16 | 17 | 27 | <8 |
| | 56 | 88 | 48 | 22 | 123 | 14 | 31 | 33 | 56 | 41 | 19 | 38 |
| | | | | 8 | | 8 | | | | | | 12 |
| GRIND-LEACH CONTROL ROOM WEST DOOR AT ENTRANCE | 147 | 221 | 146 | 156 | 48 | 69 | 54 | 51 | 55 | 48 | 25 | 16 |
| | 20 | 172 | 68 | 92 | 118 | 62 | 60 | <7 | <8 | 24 | 13 | 55 |
| | 91 | 200 | 18 | 108 | 91 | 72 | 57 | 44 | 11 | 58 | 18 | 59 |
| | 44 | 193 | 132 | 115 | 73 | 46 | 74 | 33 | 74 | 67 | 19 | 48 |
| | | | | 122 | | 51 | | | | | | 4 |
| GRIND-LEACH CONTROL ROOM EAST DOOR AT ENTRANCE | 22 | 124 | 149 | 66 | 55 | 26 | 79 | 43 | 93 | 51 | 56 | 36 |
| | 30 | 95 | 76 | 46 | 90 | 92 | 71 | 23 | 82 | 52 | 8 | 71 |
| | 28 | 110 | 48 | 356 | 73 | 37 | 54 | 40 | 23 | 69 | 16 | 72 |
| | 51 | 76 | 63 | 67 | 28 | 49 | 71 | 32 | 74 | 38 | 19 | 87 |

PROGRAM - LAB120 COTTER CORPORATION RUN DATE 02/04/88
ALPHA CONTAMINATION SURVEY FOR 1987 (ALPHA ACTIVITY(DPM/100 CM**2) TIME 10:20:11
(* DENOTES RESURVEY AFTER CLEANUP)

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 48 | | 104 | | | | | | 26 |
| GRIND-LEACH CONTROL ROOM TABLE AT ENTRANCE | 12 | 66 | 129 | 35 | 153 | 13 | 44 | 13 | 20 | <7 | 20 | 6 |
| | 20 | 82 | 48 | 177 | 67 | 26 | <7 | <7 | 30 | 68 | 27 | 50 |
| | <10 | 35 | 46 | 57 | 23 | 11 | 32 | 19 | 4 | 20 | 13 | 25 |
| | 19 | 141 | 140 | 70 | 15 | 19 | 8 | 10 | 16 | 22 | 64 | 13 |
| | | | | 28 | | 31 | | | | | | 4 |
| PRODUCT BUILDING CONTROL ROOM DOOR AT ENTRANCE | 49 | | | | | | | | | | | |
| | 144 | | | | | | | | | | | |
| | 46 | | | | | | | | | | | |
| | 78 | | | | | | | | | | | |
| PRODUCT BUILDING CONTROL ROOM TABLE | 14 | | | | | | | | | | | |
| | 20 | | | | | | | | | | | |
| | 15 | | | | | | | | | | | |
| | < | | | | | | | | | | | |
| SECONDARY CRUSHER LUNCHROOM TABLE | 7 | 14 | 28 | | | | | | | | | |
| | 30 | 15 | 38 | | | | | | | | | |
| | 10 | 10 | 15 | | | | | | | | | |
| | <9 | 28 | | | | | | | | | | |
| MAINTENANCE TRAILER LUNCHROOM SOUTH ENTRANCE | 21 | 161 | 161 | | | | | | | | | |
| | 66 | 132 | | | | | | | | | | |
| | 18 | 92 | | | | | | | | | | |
| | 41 | 171 | | | | | | | | | | |
| SHOP AREA TABLE TOPS | 27 | 131 | 144 | 35 | 30 | 84 | 59 | 106 | 40 | 99 | 74 | 16 |
| | 104 | 192 | 144 | 74 | 37 | 97 | 66 | 89 | <8 | 26 | 11 | 29 |
| | 78 | 197 | 15 | 75 | 131 | 95 | 34 | 88 | 64 | 38 | 160 | 253 |
| | 36 | 28 | 107 | 131 | 35 | 177 | 48 | 22 | 21 | 41 | 14 | 72* |
| | | | | 112 | | 56 | | | | | | 28 |
| | | | | | | | | | | | | 34 |
| MAINTENANCE TRAILER LUNCHROOM TABLE | 17 | 69 | 38 | | | | | | | | | |
| | 20 | *42 | | | | | | | | | | |
| | <10 | 230 | | | | | | | | | | |
| | 19 | 32 | | | | | | | | | | |
| | | 23 | | | | | | | | | | |
| RUBBER SHOP TABLE | 14 | | | 18 | | | | | | | | |
| | 137 | | | | | | | | | | | |
| | 10 | | | | | | | | | | | |
| | <9 | | | | | | | | | | | |
| GUARD SHACK FLOOR | | 78 | 68 | 23 | <7 | <7 | 8 | 13 | 44 | 40 | <8 | 11 |
| | | | 36 | 26 | 22 | <7 | 10 | 13 | 21 | 21 | 4 | 37 |
| | | | 15 | 15 | 15 | 11 | 6 | 44 | 11 | 20 | <3 | 17 |
| | | | 30 | 24 | 18 | 16 | 8 | <8 | 21 | 20 | 6 | 28 |
| | | | | 13 | | 107 | | | | | | 14 |

PROGRAM - LAB120

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY FOR 1987 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RECURVEY AFTER CLEANUP)

RUN DATE 02/04/88
TIME 10:24:31

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GUARD SHACK TABLE | | 13 | 7 | <7 | <7 | <7 | <7 | <7 | 13 | <8 | <8 | <3 |
| | | | 8 | <7 | <8 | <7 | <7 | <7 | 8 | 11 | <3 | 16 |
| | | | <7 | <7 | <7 | <8 | 6 | 62 | 4 | <8 | <3 | 10 |
| | | | <7 | <6 | <7 | <7 | <7 | <8 | <7 | <8 | <3 | <7 |
| | | | | <7 | | <7 | | | | | | <3 |
| RUBBER SHOP FLOOR | 9 | | | 53 | | | | | | 63 | | |
| | 48 | | | | | | | | | | | |
| | <10 | | | | | | | | | | | |
| | 29 | | | | | | | | | | | |
| SX TABLE | 12 | 56 | 31 | 28 | 7 | <7 | 16 | 18 | 32 | <8 | <8 | <3 |
| | 51 | 30 | 18 | <7 | <8 | <7 | 13 | <7 | <8 | 19 | <3 | 37 |
| | 15 | <8 | 15 | 8 | <7 | 9 | <6 | 14 | 16 | 35 | <3 | <8 |
| | 19 | 48 | 15 | <6 | 7 | 36 | 11 | <8 | 54 | 17 | 21 | 13 |
| | | | | 31 | | 21 | | | | | | <3 |
| RADIATION SAFETY TECHNICIANS' FLOOR | 17 | 11 | 16 | 15 | 25 | 36 | 21 | 11 | 8 | 30 | 12 | 6 |
| | 28 | 50 | 16 | 14 | 30 | 16 | 30 | <7 | 10 | 42 | <3 | 29 |
| | <10 | 30 | 20 | 30 | 25 | 27 | 24 | 49 | 4 | 20 | 6 | <3 |
| | 27 | 36 | 25 | 34 | 18 | 11 | 13 | <8 | 19 | <8 | 4 | 38 |
| | | | | 21 | | 8 | | | | | | 16 |
| RADIATION SAFETY TECHNICIANS' TABLE | 41 | 9 | 13 | 10 | 10 | <7 | 13 | <7 | 97 | 10 | <8 | <3 |
| | <9 | <7 | 11 | 9 | 10 | <7 | <7 | 8 | 10 | 14 | 4 | 24 |
| | 18 | <8 | 23 | <7 | 15 | 24 | 16 | 19 | 11 | 17 | <3 | 10 |
| | 21 | 18 | 13 | 17 | 25 | 24 | <7 | 12 | 16 | 22 | <3 | 10 |
| | | | | 16 | | 8 | | | | | | 12 |
| CRUSHER FOREMAN'S OFFICE ENTRANCE | | | | | | | | 18 | 13 | 34 | <3 | 6 |
| | | | | | | | | 49 | 21 | 28 | <3 | 66 |
| | | | | | | | | | 4 | 22 | 24 | 41 |
| | | | | | | | | | 26 | | | 7 |
| CRUSHER FOREMAN'S TABLE | | | | | | | | 8 | 13 | 21 | <3 | <3 |
| | | | | | | | | <6 | <8 | 22 | 16 | 11 |
| | | | | | | | | | 7 | <8 | 11 | 15 |
| | | | | | | | | | 34 | | | 19 |
| SAFETY TECHNICIANS' TABLE | <7 | <8 | <7 | 8 | <7 | <7 | 8 | <7 | <7 | <8 | <8 | 11 |
| | 10 | <7 | <7 | <7 | <8 | <7 | <7 | <7 | <8 | 19 | 4 | 39 |
| | 10 | 10 | 13 | <7 | <7 | 6 | 11 | <6 | 4 | <8 | 6 | <8 |
| | <9 | <7 | 20 | <6 | 7 | 9 | 8 | <8 | <7 | <8 | <3 | 28 |
| | | | | 13 | | 8 | | | | | | <3 |
| JIM CAIN'S DESK | | | | | | | | | | 11 | | |
| CRUSHER/LABOR LUNCHROOM TRAILER FLOOR | 39 | 39 | 68 | 25 | 35 | 18 | 26 | 31 | 13 | 20 | <8 | 4 |
| | 10 | 30 | 43 | 54 | 25 | 16 | 15 | 8 | 34 | 11 | <3 | 24 |
| | 10 | 45 | 23 | 50 | 13 | 14 | 27 | 6 | 16 | <8 | 11 | 12 |
| | 17 | 61 | 38 | 50 | 25 | 16 | 23 | 17 | 31 | <8 | 9 | 23 |
| | | | | 28 | | 11 | | | | | | 16 |

PROGRAM - LAB120 COTTER CORPORATION RUN DATE 02/04/90
ALPHA CONTAMINATION SURVEY FOR 1987 (ALPHA ACTIVITY:DPM/100 CM**2) TIME 10:26:09
(* DENOTES RESURVEY AFTER CLEANUP)

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUSHER/LABOR LUNCHROOM TRAILER TABLE | <7 | <3 | 13 | <7 | <7 | 3 | 11 | 16 | <7 | <8 | <8 | <3 |
| | 13 | <7 | 8 | <7 | 15 | <7 | 10 | <7 | 13 | 21 | <3 | <9 |
| | 13 | 17 | 13 | 15 | <7 | <6 | 11 | <6 | 19 | 17 | <3 | 20 |
| | <9 | 13 | 10 | <6 | 7 | <7 | <7 | <8 | 11 | <8 | 4 | 10 |
| | | | | <7 | | <7 | | | | | | <3 |
| SALVAGE SHOP TABLE | 35 | | | | | | | 48 | 163 | 129 | 41 | 21 |
| | | | | | | | | | 66 | 112 | 11 | 87 |
| | | | | | | | | | 26 | 48 | 13 | 28 |
| | | | | | | | | | 76 | 106 | 24 | 130 |
| | | | | | | | | | | | | 51 |
| SALVAGE SHOP FLOOR | | | | | | | | 33 | 73 | 102 | 38 | 23 |
| | | | | | | | | | 66 | 39 | 20 | 53 |
| | | | | | | | | | 16 | 22 | 32 | 98 |
| | | | | | | | | | 116 | 33 | 24 | 130 |
| | | | | | | | | | | | | 24 |
| MILL FOREMAN/SHIFTERS TABLE | 12 | 9 | 18 | 10 | 10 | 19 | <7 | 8 | 20 | 8 | <8 | 4 |
| | <9 | <7 | <7 | 34 | 12 | <6 | <6 | 7 | <8 | 63 | <3 | 50 |
| | 23 | 30 | 13 | <7 | 15 | 11 | | <8 | 19 | 15 | 18 | |
| | <9 | | <7 | 34 | 10 | <7 | | <8 | 21 | 20 | <3 | |
| | | | | <7 | | | | | | | | |
| WAREHOUSE TABLE | 61 | <8 | 10 | 11 | | | | 18 | 22 | 11 | <3 | 6 |
| | | | | | | | | | 18 | 10 | 9 | <9 |
| | | | | | | | | | <2 | 33 | 16 | 13 |
| | | | | | | | | | 24 | | | 7 |
| WHSE SHIP/REC TABLE | <7 | 16 | 23 | 43 | 7 | 13 | 8 | 8 | 35 | 28 | 25 | <3 |
| | <9 | 12 | 23 | 51 | 32 | 11 | 339 | <7 | 64 | 14 | <3 | 21 |
| | <9 | 50 | <7 | <7 | 43 | 14 | *71 | 70 | 23 | 10 | 4 | <8 |
| | | 31 | | 22 | 28 | 18 | 24 | 38 | <7 | 12 | 16 | <7 |
| | | | | 38 | | | 13 | | | | | <3 |
| ELECTRICIAL FOREMAN'S TABLE | | | | | | | | <7 | 15 | <9 | 11 | 6 |
| | | | | | | | | | 31 | 35 | 11 | 68 |
| | | | | | | | | | 19 | 51 | 14 | 46 |
| | | | | | | | | | 39 | | | 16 |
| SALVAGE SHOP WORK TABLE #1 | | | | | | | 60 | | | | | |
| SALVAGE SHOP WORK TABLE #2 | | | | | | | 148 | | | | | |
| SHIFTERS' FLOOR | | | | | | | | 10 | | | | |
| ANALYTICAL LAB EAST DOOR FLOOR AT ENT. | | | | | | | | <8 | | | | |
| TRAILER OFFICE FLOOR | | | | | | | | | | | | 17 |
| TRAILER OFFICE TABLE-WEST | | | | | | | | | | | | 12 |

PROGRAM - LAB120

COTTER CORPORATION

ALPHA CONTAMINATION SURVEY FOR 1987 (ALPHA ACTIVITY/DPM/100 CM**2)

(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 02/04/88

TIME 10:27:41

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TRAILER OFFICE TABLE-EAST | | | | | | | | | | | | <8 |

PROGRAM - LAB120

COTTER CORPORATION

ALPHA CONTAMINATION SURVEY FOR 1986 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 02/05/87
TIME 08:23:46

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MENS' LOCKER ROOM DOOR AT ENTRANCE | 44 | 41 | 98 | 63 | 17 | 12 | 22 | 19 | 41 | 16 | 15 | 4 |
| | 51 | <3 | 68 | 22 | 10 | 14 | 48 | 15 | <9 | <7 | <7 | 11 |
| | 31 | 116 | 51 | 9 | 18 | <8 | <8 | 45 | 40 | <9 | 17 | 19 |
| | 16 | 21 | 20 | 9 | 24 | 30 | 44 | 35 | 7 | 23 | 17 | 25 |
| | 11 | | | | 20 | | | 12 | | <8 | | 43 |
| WOMENS' LOCKER ROOM DOOR AT ENTRANCE | 26 | 18 | 62 | 40 | 45 | 45 | 20 | 19 | 68 | 16 | 8 | 16 |
| | 18 | 28 | 55 | 20 | 41 | 35 | 27 | 40 | <9 | 12 | 15 | 31 |
| | 26 | 72 | 37 | 21 | 45 | 34 | 17 | 52 | 45 | <9 | 25 | 16 |
| | 28 | 19 | 36 | 23 | 37 | 20 | 27 | 42 | <7 | 25 | 159 | 12 |
| | 30 | | | | 17 | | | <8 | | <8 | | 51 |
| MAIN OFFICE NORTH DOOR AT ENTRANCE | 23 | 23 | 11 | <8 | 9 | <8 | <8 | <8 | 8 | 18 | 13 | <3 |
| | 23 | <3 | 22 | 10 | 10 | <8 | 22 | <7 | 12 | 25 | <7 | 16 |
| | 21 | 14 | 33 | <3 | 23 | <8 | 15 | 10 | 10 | <9 | 10 | <7 |
| | <3 | <9 | <8 | 6 | <8 | 10 | 27 | 30 | 12 | <9 | 27 | <9 |
| | <3 | | | | <8 | | | 12 | | 8 | | <8 |
| MAIN OFFICE EAST DOOR AT ENTRANCE | 16 | 21 | 14 | 22 | <8 | <8 | 12 | 9 | <6 | <8 | <8 | <3 |
| | <9 | <3 | 12 | 12 | 18 | <8 | 10 | 8 | <9 | 10 | <7 | 9 |
| | 13 | 11 | 56 | 4 | 15 | <8 | <8 | <8 | <7 | 15 | 7 | 21 |
| | <3 | 11 | 18 | 9 | 17 | <8 | <8 | <8 | <7 | <9 | <7 | <9 |
| | 13 | | | | <8 | | | <8 | | 11 | | <8 |
| CHANGEHOUSE IN TRAILER HOUSE | 168 | 171 | 149 | 150 | 76 | 124 | 199 | | | | | |
| | 146 | 73 | 139 | 121 | 216 | 145 | 168 | | | | | |
| | 100 | 121 | 148 | 87 | 76 | 170 | | | | | | |
| | 78 | 144 | 158 | 85 | 126 | 161 | | | | | | |
| | 44 | | | | 145 | | | | | | | |
| SECONDARY CRUSHER LUNCHROOM DOOR AT ENTRANCE | 61 | 135 | 124 | 115 | 110 | 134 | 125 | 62 | 93 | 99 | 41 | <3 |
| | 64 | 49 | 80 | 60 | 311 | 99 | 88 | 208 | 17 | 93 | 52 | 51 |
| | 82 | 52 | 110 | 49 | 279 | 117 | 95 | 210 | 95 | 30 | 57 | 54 |
| | 54 | 95 | 46 | 52 | 204 | 148 | 146 | 190 | 42 | 106 | 48 | 50 |
| | 37 | | | | 150 | | | 45 | | 39 | | 136 |
| LAB LUNCHROOM DOOR AT ENTRANCE | 26 | 23 | 19 | 20 | <8 | 17 | <8 | 37 | 18 | <8 | 25 | 4 |
| | 34 | 14 | 14 | 12 | 36 | 17 | 10 | 10 | <9 | 25 | 15 | 16 |
| | 16 | 11 | 23 | 6 | 12 | 17 | 10 | <8 | 25 | 10 | 22 | 39 |
| | 3 | 19 | 15 | <3 | 11 | 28 | 14 | 10 | 12 | 23 | 17 | 20 |
| | <3 | | | | 25 | | | <8 | | 8 | | 41 |
| LAB LUNCHROOM TABLE | <9 | 16 | <9 | <8 | <8 | <8 | <8 | <8 | 28 | 11 | 15 | <3 |
| | 11 | <3 | <8 | <8 | <8 | <8 | <8 | 8 | 10 | <7 | <7 | <9 |
| | <9 | <9 | <7 | <3 | <8 | <8 | <7 | <8 | 38 | <9 | 12 | <7 |
| | <3 | <9 | <8 | <3 | <8 | <8 | <8 | <8 | <7 | 13 | 17 | <9 |
| | <3 | | | | <8 | | | <8 | | <8 | | 11 |
| ELECTRICIANS' LUNCHROOM DOOR AT ENTRANCE | 49 | 66 | 88 | 71 | 61 | 88 | 61 | 17 | 99 | 61 | 43 | 81 |
| | 49 | 33 | 47 | 73 | 49 | 40 | 50 | 73 | 55 | 57 | 57 | 68 |
| | 64 | 75 | 56 | 37 | 73 | 37 | 57 | 213 | 118 | 123 | 12 | 31 |

PROGRAM - LAB120

COTTER CORPORATION

ALPHA CONTAMINATION SURVEY FOR 1986 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 02/05/87
TIME 08:25:46

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 37 | 93 | 125 | 104 | 60 | 110 | 92 | 52 | 83 | 65 | 76 | 69 |
| | 30 | | | | 38 | | | 15 | | 66 | | 108 |
| ELECTRICIANS' LUNCHROOM TABLE | 13 | 31 | 34 | 30 | 9 | 12 | <8 | 24 | 23 | 8 | 15 | 9 |
| | <9 | 9 | <8 | <8 | <8 | <8 | <8 | 13 | <9 | <7 | 10 | 21 |
| | 11 | <9 | <7 | 11 | <8 | <8 | 12 | 10 | 10 | 25 | 77 | 14 |
| | 30 | <9 | 36 | <3 | <8 | 33 | [illegible] | 15 | 10 | 20 | 25 | <9 |
| | <3 | | | | <8 | | | <8 | | 11 | | 11 |
| INSTRUMENT LUNCHROOM WEST DOOR AT ENTRANCE | 66 | 97 | 85 | 92 | 80 | 30 | 97 | 44 | 58 | 10 | 76 | 129 |
| | 39 | 54 | 83 | 623 | 67 | 38 | 35 | 59 | 25 | 37 | 65 | 133 |
| | 110 | 85 | 94 | 30 | 58 | 32 | 57 | 65 | 40 | 53 | 42 | 21 |
| | 52 | 121 | 107 | 61 | 50 | 66 | 58 | 32 | 68 | 35 | 48 | 37 |
| | 23 | | | | 55 | | | <8 | | 23 | | 101 |
| INSTRUMENT LUNCHROOM TABLE | 64 | 49 | 21 | 43 | 25 | 177 | 48 | 14 | 93 | 8 | 33 | 171 |
| | 39 | 42 | 108 | 185 | 18 | 158 | 317 | 60 | 60 | 27 | 30 | 19 |
| | 36 | 42 | 92 | 42 | 15 | 17 | *55 | <8 | 13 | 93 | 37 | 21 |
| | 71 | 123 | 18 | 63 | <8 | 138 | 32 | 17 | 10 | 33 | 7 | <9 |
| | 35 | | | | 10 | | 8 | <8 | | 36 | | 43 |
| MET LAB LUNCHROOM TABLE | <9 | <9 | <9 | <8 | <8 | <8 | <8 | <8 | 8 | 11 | 38 | 4 |
| | <9 | 6 | 14 | <8 | <8 | <8 | <8 | <8 | 27 | 10 | <7 | <8 |
| | 11 | <9 | 13 | <3 | <87 | <8 | <8 | <8 | <7 | <9 | 22 | <7 |
| | <3 | <9 | 13 | <3 | <8 | 10 | <7 | <8 | <7 | 23 | 15 | <9 |
| | <3 | | | | <8 | | | <8 | | 13 | | <8 |
| MET LAB WEST DOOR AT ENTRANCE | 77 | 44 | 195 | 61 | 9 | 42 | 76 | 79 | 51 | <8 | 23 | 14 |
| | 54 | 71 | 82 | 55 | 51 | 14 | 98 | 62 | 50 | 30 | 27 | 49 |
| | 57 | 77 | 66 | 30 | 76 | 45 | 97 | 62 | 53 | 43 | 45 | 11 |
| | 35 | 67 | 69 | 26 | 52 | 69 | 40 | 32 | 45 | 43 | 43 | 34 |
| | 33 | | | | 38 | | | 17 | | 34 | | 56 |
| UV-SX CONTROL ROOM NORTH DOOR AT ENTRANCE | 160 | 97 | 70 | 48 | 30 | 91 | 112 | 17 | 191 | 61 | 41 | 21 |
| | 115 | 76 | 96 | 60 | 38 | 142 | 310 | 100 | 115 | 32 | 15 | 19 |
| | 146 | 113 | 271 | 21 | 73 | 55 | 127 | 138 | 53 | 70 | 52 | 96 |
| | 75 | 57 | 89 | 23 | 22 | 166 | 114 | 125 | 70 | 83 | 119 | 52 |
| | 37 | | | | 27 | | | 57 | | 34 | | 203 |
| CCD CONTROL ROOM AT ENTRANCE | 254 | 740 | 322 | 56 | 12 | 53 | 56 | 34 | 56 | 18 | 51 | 239 |
| | 207 | 109 | 88 | 112 | 62 | 53 | 38 | 38 | 40 | 42 | 25 | 235 |
| | 317 | 408 | 43 | 30 | 94 | 119 | 50 | 82 | 118 | 153 | 25 | 77 |
| | 147 | 371 | 192 | 16 | 62 | 92 | 134 | 35 | 75 | 30 | 116 | 75 |
| | 171 | | | | 27 | | | 15 | | 34 | | 193 |
| CCD CONTROL ROOM TABLE | 66 | 188 | 75 | <8 | 11 | 22 | 35 | 14 | 11 | 8 | 30 | 156 |
| | 34 | 14 | 19 | 10 | <8 | 27 | 15 | 18 | <9 | <7 | 22 | 163 |
| | 29 | 24 | 15 | 32 | <8 | <8 | 20 | 17 | 15 | 48 | 20 | 54 |
| | 29 | 24 | 59 | 11 | 24 | 25 | 22 | 20 | 25 | 28 | 33 | 20 |
| | 11 | | | | 17 | | | <8 | | 23 | | 31 |
| GRIND-LEACH CONTROL ROOM WEST DOOR AT ENTRANCE | 84 | 318 | 123 | 363 | 14 | 114 | 8 | 117 | 129 | 41 | 18 | 94 |

PROGRAM - LAB120

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY FOR 1986 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 02/05/87
TIME 08:27:43

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 46 | 47 | 136 | 223 | 105 | 78 | 43 | 65 | 128 | 180 | 57 | 41 |
| | 87 | 121 | 38 | 30 | 71 | 162 | 145 | 85 | 113 | 83 | 168 | 64 |
| | 16 | 90 | 77 | 4 | 70 | 112 | 134 | 77 | 75 | 85 | 60 | 32 |
| | 13 | | | | 48 | | | 15 | | 39 | | 53 |
| GRIND-LEACH CONTROL ROOM EAST DOOR AT ENTRANCE | 66 | 99 | 368 | 263 | 20 | 37 | 30 | 37 | 36 | 81 | 23 | 21 |
| | 69 | 23 | 146 | 91 | 100 | 68 | 45 | 43 | 93 | 52 | 52 | 39 |
| | 62 | 47 | 63 | 47 | 81 | 70 | 110 | 50 | 83 | 63 | 130 | 31 |
| | 42 | 113 | 74 | 37 | 72 | 118 | 99 | 75 | 35 | 64 | 38 | 49 |
| | 13 | | | | 40 | | | 10 | | 21 | | 46 |
| GRIND-LEACH CONTROL ROOM TABLE AT ENTRANCE | 36 | <9 | 26 | 40 | <8 | <8 | <8 | <8 | 36 | 10 | 30 | 119 |
| | 16 | 9 | 65 | 25 | <8 | 14 | 30 | 28 | <9 | 10 | 27 | 26 |
| | <9 | <9 | 13 | 4 | 25 | 32 | 32 | <8 | 45 | <9 | 65 | 21 |
| | 11 | 14 | 23 | <3 | <8 | <8 | 17 | 10 | 20 | <9 | 33 | <9 |
| | 11 | | | | <8 | | | <8 | | 16 | | 33 |
| PRODUCT BUILDING CONTROL ROOM DOOR AT ENTRANCE | 186 | 90 | 85 | 163 | 48 | 137 | 120 | 82 | 111 | 28 | 197 | 201 |
| | 141 | 42 | 108 | 101 | 46 | 58 | 181 | 151 | 274 | 32 | 72 | 34 |
| | | 24 | 79 | 16 | 124 | 137 | 130 | 153 | 210 | 38 | 82 | 61 |
| | | | 100 | 54 | 85 | 135 | 96 | 173 | 42 | 65 | 70 | 37 |
| | | | | | 142 | | | 70 | | 21 | | 141 |
| PRODUCT BUILDING CONTROL ROOM TABLE | 21 | <3 | 19 | 15 | <8 | 14 | 28 | 64 | 41 | 41 | 25 | 38* |
| | 36 | <9 | 22 | 17 | 15 | 22 | 20 | 60 | 65 | 15 | 7 | 289 |
| | | 27 | 23 | 9 | 25 | 21 | 47 | 42 | 48 | 18 | 52 | 19 |
| | | | 31 | 23 | <8 | 48 | 23 | 65 | 57 | 25 | 43 | 26 |
| | | | | | 25 | | | 15 | | 18 | | <9 |
| | | | | | | | | | | | | 16 |
| SECONDARY CRUSHER LUNCHROOM TABLE | 11 | 28 | 47 | 22 | 9 | 14 | 33 | 12 | 18 | <8 | <8 | <3 |
| | 11 | 9 | 12 | 20 | 26 | 9 | 12 | <7 | 15 | 35 | 20 | <9 |
| | 13 | 27 | <8 | 9 | 18 | 45 | <7 | 20 | 8 | 15 | 10 | <7 |
| | 9 | <9 | 13 | 16 | 22 | 18 | <7 | <8 | 17 | <9 | 12 | <9 |
| | 30 | | | | 10 | | | <8 | | <8 | | <8 |
| MAINTENANCE TRAILER LUNCHROOM SOUTH ENTRANCE | 33 | 61 | 164 | 84 | 27 | 93 | 38 | 64 | 51 | 43 | 28 | 26 |
| | 39 | 38 | 22 | 60 | 72 | 55 | 55 | 60 | 17 | 17 | 12 | 198 |
| | 31 | 67 | 74 | 42 | 20 | 47 | 40 | 40 | 53 | 85 | 45 | 16 |
| | 71 | 121 | 141 | 13 | 39 | 41 | 23 | 47 | 22 | 38 | 27 | 44 |
| | 42 | | | | 48 | | | 62 | | 59 | | 63 |
| SHOP AREA TABLE TOPS | 173 | 107 | 70 | 97 | 74 | 60 | 230 | 54 | 447 | 33 | 38 | 79 |
| | 115 | 40 | 195 | 73 | 177 | 73 | *43 | 193 | 118 | 133 | 110 | 79 |
| | 174 | 113 | 152 | 130 | 68 | 109 | 259 | 198 | 163 | 98* | 22 | 74 |
| | 56 | 113 | 143 | 71 | 154 | 107 | *83 | 185 | 63 | 115 | 70 | 62 |
| | 171 | | | | 86 | | 17 | <8 | | 65 | | 66 |
| | | | | | | | 192 | | | 99 | | |
| MAINTENANCE TRAILER LUNCHROOM TABLE | 11 | <9 | 57 | 15 | <8 | <8 | 15 | 9 | 11 | <8 | 18 | <3 |
| | <9 | <3 | <8 | <8 | 13 | 9 | 15 | 15 | 10 | <7 | 10 | 49 |
| | 13 | <9 | 23 | 4 | 12 | <8 | 12 | 10 | 10 | 15 | 7 | <7 |

PROGRAM - LAB120

COTTER CORPORATION
ALPHA CONTAMINATION SURVEY FOR 1986 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 02/05/87
TIME 08:29:32

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | <3 | <9 | 25 | 11 | 14 | 23 | 10 | 10 | <7 | <9 | <7 | <9 |
| | <3 | | | | 10 | | | <8 | | 8 | | 11 |
| RUBBER SHOP TABLE | 84 | 66 | 136 | <8 | 14 | 9 | <8 | <8 | 26 | <8 | <8 | <3 |
| | 16 | <3 | 27 | 66 | <8 | <8 | <8 | 18 | <9 | 15 | 7 | 19 |
| | 23 | 11 | <7 | 11 | <8 | <8 | 22 | <8 | 18 | 20 | 22 | 9 |
| | 11 | <9 | 13 | 23 | <8 | 18 | <8 | <8 | <7 | 16 | | <9 |
| | 3 | | | | 15 | | | 12 | | <8 | | 11 |
| GUARD SHACK FLOOR | 90 | | | 23 | 63 | | | 15 | | | | |
| GUARD SHACK TABLE | <9 | | | <3 | <8 | | 15 | <7 | | | | |
| | | | | | | | | <8 | | | | |
| RUBBER SHOP FLOOR | 74 | 130 | 54 | 30 | 14 | 40 | 45 | <8 | 53 | 10 | 20 | 9 |
| | 100 | 35 | 78 | 203 | 51 | 48 | 33 | 52 | 27 | 15 | 27 | 56 |
| | 77 | 85 | 76 | 94 | 43 | 45 | 25 | 22 | 28 | 48 | 22 | <7 |
| | 106 | 88 | 84 | 23 | 44 | 33 | 37 | 27 | 27 | 15 | 28 | 12 |
| | 52 | | | | 30 | | | <8 | | <8 | | 73 |
| SX TABLE | 26 | 13 | 37 | 25 | <8 | 19 | 22 | <8 | 16 | <8 | <8 | 6 |
| | 72 | 11 | 8 | <8 | <8 | 22 | 58 | 15 | <9 | 35 | <7 | 21 |
| | 13 | 11 | 36 | 4 | <8 | 19 | 15 | <8 | 25 | 25 | 12 | 31 |
| | 11 | <9 | <8 | 56 | 24 | 10 | 12 | 17 | <7 | 15 | 25 | 20 |
| | 16 | | | | 25 | | | 20 | | 11 | | 18 |
| PRODUCT BUILDING CONTROL BOARD | | | | | | | | 93 | | | | |
| V205 SCHEMATIC BOARD | | | | | | | | 55 | | | | |
| RADIATION SAFETY TECHNICIANS' FLOOR | <3 | 26 | 26 | 17 | 36 | 40 | 27 | 34 | 8 | 16 | | 6 |
| | | 39 | 13 | 9 | 20 | 23 | 30 | 37 | 20 | | | 36 |
| | | 19 | | 9 | 37 | | 25 | 12 | 33 | | | 21 |
| | | | | | | | | | | | | 12 |
| | | | | | | | | | | | | 18 |
| RADIATION SAFETY TECHNICIANS' TABLE | <3 | <3 | 11 | 15 | <8 | <8 | <8 | <8 | 28 | 28 | | <3 |
| | | 11 | 13 | 6 | <8 | <8 | <7 | <8 | <9 | | | 41 |
| | | <9 | 23 | 6 | 9 | | 15 | <8 | <7 | | | 16 |
| | | | | | | | | | 8 | | | 15 |
| | | | | | | | | | | | | <8 |
| CRUSHER FOREMAN'S OFFICE ENTRANCE | | | | | | | | 20 | | | | |
| CRUSHER FOREMAN'S TABLE | <3 | | | 10 | | | | <8 | | | | |
| SAFETY TECHNICIANS' TABLE | <9 | <9 | <9 | <8 | <8 | <8 | | 10 | <9 | <8 | <8 | <3 |
| | <9 | <3 | <8 | <8 | <8 | <8 | | <8 | <7 | <7 | 17 | <8 |
| | <9 | <9 | <8 | <3 | <8 | <8 | | <8 | <7 | <9 | | 16 |
| | <3 | <9 | <8 | | | | | | | <9 | | <9 |
| | | | | | | | | | | <8 | | <8 |

PROGRAM - LAB120

C O T T E R  C O R P O R A T I O N
ALPHA CONTAMINATION SURVEY FOR 1986 (ALPHA ACTIVITY(DPM/100 CM**2)
(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 02/05/87
TIME 08 31 12

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SCALE HOUSE DESK | 11 | 11 | 18 | | | | 12 | 60 | | | | |
| CRUSHER/LABOR LUNCHROOM TRAILER FLOOR | 21 | 51 | 52 | 45 | 40 | 9 | 15 | 22 | 41 | 13 | 25 | 6 |
| | 26 | 11 | 32 | 22 | 33 | 12 | 42 | 27 | 17 | 30 | <7 | 14 |
| | 31 | 72 | 28 | 6 | 28 | <8 | 45 | 72 | 40 | <9 | 45 | 14 |
| | 18 | 42 | 13 | 6 | 37 | 25 | 57 | 57 | 15 | <9 | 30 | 27 |
| | 9 | | | | 20 | | | 30 | | <8 | | 38 |
| CRUSHER/LABOR LUNCHROOM TRAILER TABLE | <9 | 28 | <9 | <8 | <8 | <8 | <8 | <8 | 16 | <8 | <8 | <3 |
| | 11 | <3 | <8 | <8 | 10 | <8 | <8 | 32 | <9 | <7 | 7 | 9 |
| | 13 | <9 | <8 | <3 | <8 | <8 | 15 | 20 | <7 | <9 | <7 | <7 |
| | 9 | <9 | 10 | 4 | 24 | <8 | <8 | 10 | <7 | <9 | 20 | <9 |
| | <3 | | | | <8 | | | <8 | | <8 | | <8 |
| SALVAGE SHOP TABLE | | | | 10 | 23 | | 22 | <8 | 28 | 8 | 18 | <3 |
| | | | | | | | <8 | 13 | <9 | <7 | <7 | 19 |
| | | | | | | | | <8 | 33 | 18 | 12 | 28 |
| | | | | | | | | 10 | <7 | 13 | 17 | |
| | | | | | | | | <8 | | 8 | | |
| SALVAGE SHOP FLOOR | | | | | | | 62 | 45 | 86 | 41 | 36 | 31 |
| | | | | | | | | 70 | 30 | 40 | 42 | 46 |
| | | | | | | | | 30 | 158 | 33 | 42 | |
| | | | | | | | | <8 | 135 | 30 | 40 | |
| | | | | | | | | | | 36 | | |
| MILL FOREMAN/SHIFTERS TABLE | <3 | 18 | 19 | <8 | <8 | <8 | <8 | 9 | 21 | <8 | 18 | 169 |
| | 3 | 9 | 10 | <8 | <8 | <8 | <8 | 40 | [illegible] | 10 | <7 | 54 |
| | | 27 | | 4 | <8 | <8 | 27 | <8 | 40 | 20 | 10 | 9 |
| | | <9 | | 4 | <8 | <8 | | <8 | 12 | 18 | 17 | 15 |
| | | | | | | | | <8 | | 8 | | 23 |
| GRIND AND LEACH SHIFTERS TABKE | <9 | | <9 | | | | | | | | | |
| | <9 | | | | | | | | | | | |
| | <9 | | | | | | | | | | | |
| WAREHOUSE TABLE | 28 | <9 | <8 | | | | | <8 | | | | 18 |
| | | <9 | | | | | | | | | | |
| WHSE SHIP/REC TABLE | <9 | 13 | 44 | <8 | 10 | 24 | <8 | 17 | 8 | 13 | <8 | 46 |
| | 13 | <3 | <8 | 22 | 33 | 25 | 58 | 40 | 12 | 25 | 20 | 21 |
| | <9 | <9 | 13 | 4 | 27 | 40 | 22 | 32 | | 30 | 35 | 16 |
| | <3 | <9 | 23 | 42 | <8 | 36 | 30 | 20 | | <9 | 22 | 27 |
| | <3 | | | | | | | <8 | | 13 | | |
| MAINTENANCE FOREMAN'S OFFICE TABLE-WEST | | 61 | <8 | <3 | <8 | | <8 | <8 | | | | |
| | | 32 | 56 | | | | | | | | | |
| MAINTENANCE FOREMAN'S OFFICE TABLE-EAST | 13 | 36 | 9 | | 12 | 24 | 33 | <8 | 13 | | | |
| | | | 14 | | | | | | | | | |
| | | | <8 | | | | | | | | | |

TABLE 3.4 Page of 6

PROGRAM - LAB120

COTTER CORPORATION

ALPHA CONTAMINATION SURVEY FOR 1986 (ALPHA ACTIVITY(DPM/100 CM**2)

(* DENOTES RESURVEY AFTER CLEANUP)

RUN DATE 02/05/87
TIME 08:32:46

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE PREP COUNTER (NORTHWEST) | <3 | | | | | | | | | | | |
| CHANGE HOUSE MIDDLE OF NORTH BENCH | | | | | | | | | 18<br>10 | | | |
| ELECTRICIAL FOREMAN'S TABLE | 16 | 21<br>9 | | 43 | | | 133 | 53<br><8 | | | | |
| INSTRUMENT FOREMAN'S DESK | 106 | | 68 | 89 | | | | <8 | | | | |
| CAT PLANT DESK CONTROL ROOM | 16 | | | | | | | | | | | |
| CAT PLANT FLOOR | 16 | | | | | | | | | | | |
| MAINT. SHOP FLOOR | 575 | | | | | | | | | | | |
| WAREHOUSE FLOOR | | 30 | | 35 | | | | | | | | |
| CRUSHER/LABOR FOREMAN'S DESK | | <9 | | | | | <7 | | | | | |
| PLANT ENGINEER'S DESK | | | | | | | <7 | | | | | |
| MAINTENANCE SHOP COUNTERTOP-SOUTH | | | | | | | | | | 345<br>141 | | |
| MAINTENANCE SHOP COUNTERTOP-WEST | | | | | | | | | | 115 | | |

## 3.3 - INDEPENDENT AUDIT - ANNUAL REPORT

LICENSE CONDITIONS 23.9, 23.9.1, 23.9.2 AND 23.9.3

An independent radiation safety audit was conducted at the mill from April 22 to April 24, 1987, and May 11 and May 12, 1987, by E. R. Johnson and Associates. The findings of this audit were forwarded to the Colorado Department of Health on September 25, 1987, and appropriate remedial actions have been ongoing since the receipt of the final audit report.

# 4.0 - BIOASSAY MEASUREMENTS - ANNUAL REPORT

Bioassay measurements by urinalysis methods were conducted at the mill in 1987. Analytical results and accompanying discussion are presented in Section 4.1. In vivo testing was not conducted in 1987 due to the shutdown of operations and the layoff of personnel. Of the remaining employees, none met the criteria established for in vivo measurements which states in the Radiological Health and Safety Procedure 2-12 that "an annual in vivo lung scan will be made on all workers routinely involved in ore crushing and handling and in the calcining and handling of uranium concentrates or in maintenance of related equipment. Baseline in vivo measurements will be obtained for all non-clerical mill employees as soon as feasible after employment starts".

## 4.1 - URINALYSIS DATA

LICENSE CONDITION 24.1.1.1

Urinalysis measurements for uranium concentrations are performed for employees assigned to ore crushing, yellowcake calcining/packaging operations and for new employees' baseline sampling. In addition, maintenance personnel and other selected employees participated in the urinalysis program.

4.0 - BIOASSAY MEASUREMENTS - ANNUAL REPORT

4.1 - URINALYSIS DATA

LICENSE CONDITION 24.1.1.1

Page 2

The analytical results for urine samples collected from mill personnel in 1987 are presented in Figure 4.5. A result for the outside contractor, which indicates no anomalous exposure, was not included in order to compare results to previous data from 1983 through 1986. These data are presented in Figures 4.1 through 4.4, respectively.

Inspection of the data presented in Figures 4.1 through 4.5 indicates a stabilization of results through 1986 and a decrease in 1987 for uranium in urine concentrations of Cotter mill employees. The decrease in 1987 is directly attributed to the shutdown of operations. To further compare the results for each year from 1983 through 1987, Tables 4.1 and 4.2 were prepared to show the monthly average and yearly average of monthly concentrations of urinary uranium, the associated monthly standard deviations and yearly average monthly deviations for these years.

For the period beginning in 1983 through 1987, no sample has exceeded the second action level (29 ug/l Uranium).

4.0 - BIOASSAY MEASUREMENTS - ANNUAL REPORT

4.1 - URINALYSIS DATA

LICENSE CONDITION 24.1.1.1

Page 3

Evaluation of the 1987 data with regard to the first action level (15 ug/l) shows a decrease since 1986. This decrease is attributed to the shutdown of milling operations. Specifically, the percentages of urinalysis sample results in excess of 15 ug/l from 1983 through 1987 were 0.58%, 0.37%, 0.25%, 0.20% and 0.00%, respectively.

A monthly distribution of urinalysis data as a function of job category is summarized for 1987 in Table 4.3. A total of 203 urinalyses was performed during 1987 including 15 rerun analyses performed to verify sample results.

Referring to Figure 4.5, it was determined that 98.94% of urine sample results for 1987 showed uranium concentrations of less than the analytical detection limit of 5 ug/l. Table 4.1 and Figure 4.5 represent single results for the 187 urine samples collected. They do not include rerun (re-analysis) results.

The urine sampling program continued in 1987 as modified in 1983.

In conclusion, the 1987 data for urinalysis indicate a decrease in concentrations compared to the 1986 data.

FIGURE 4.1

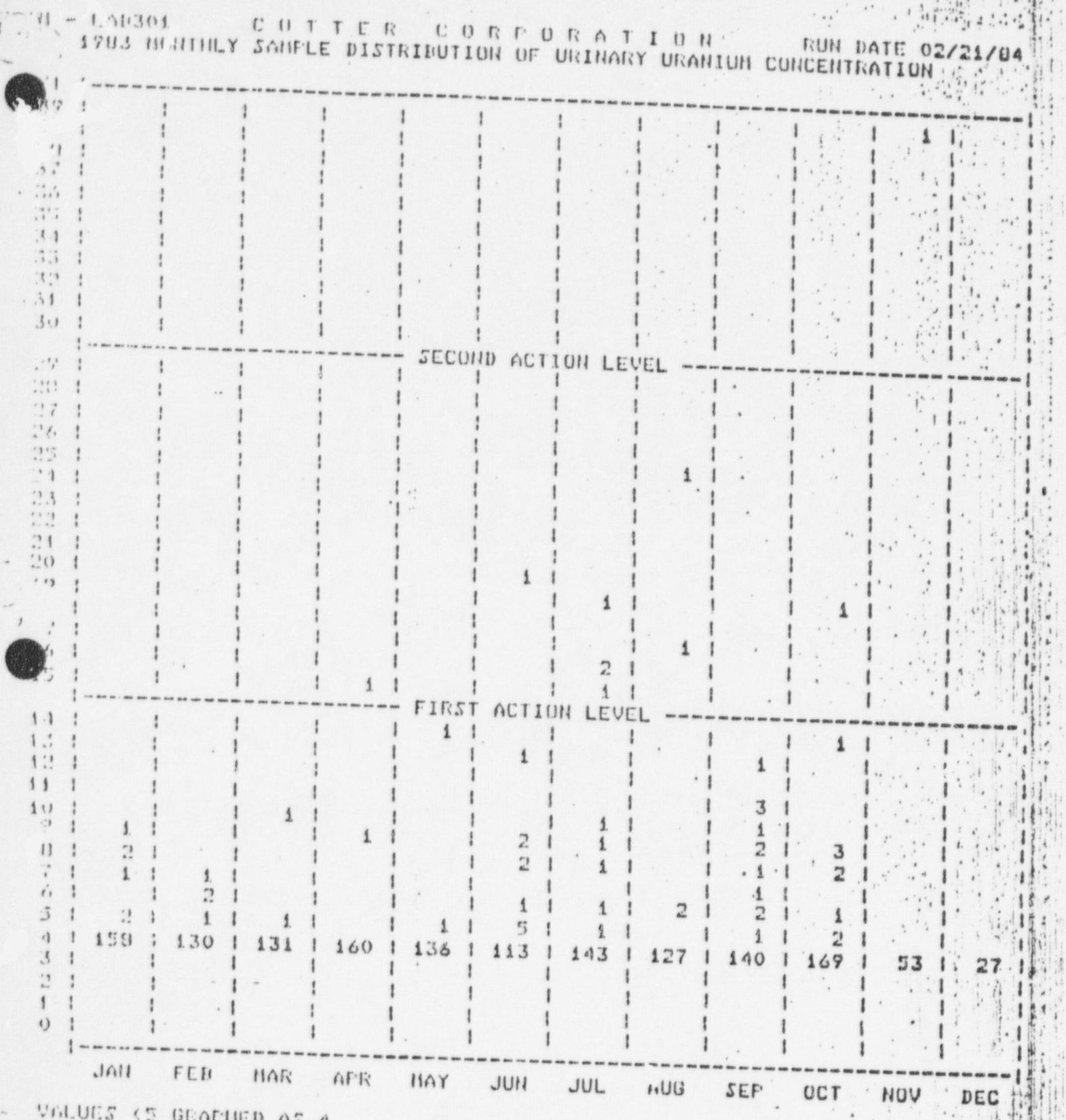
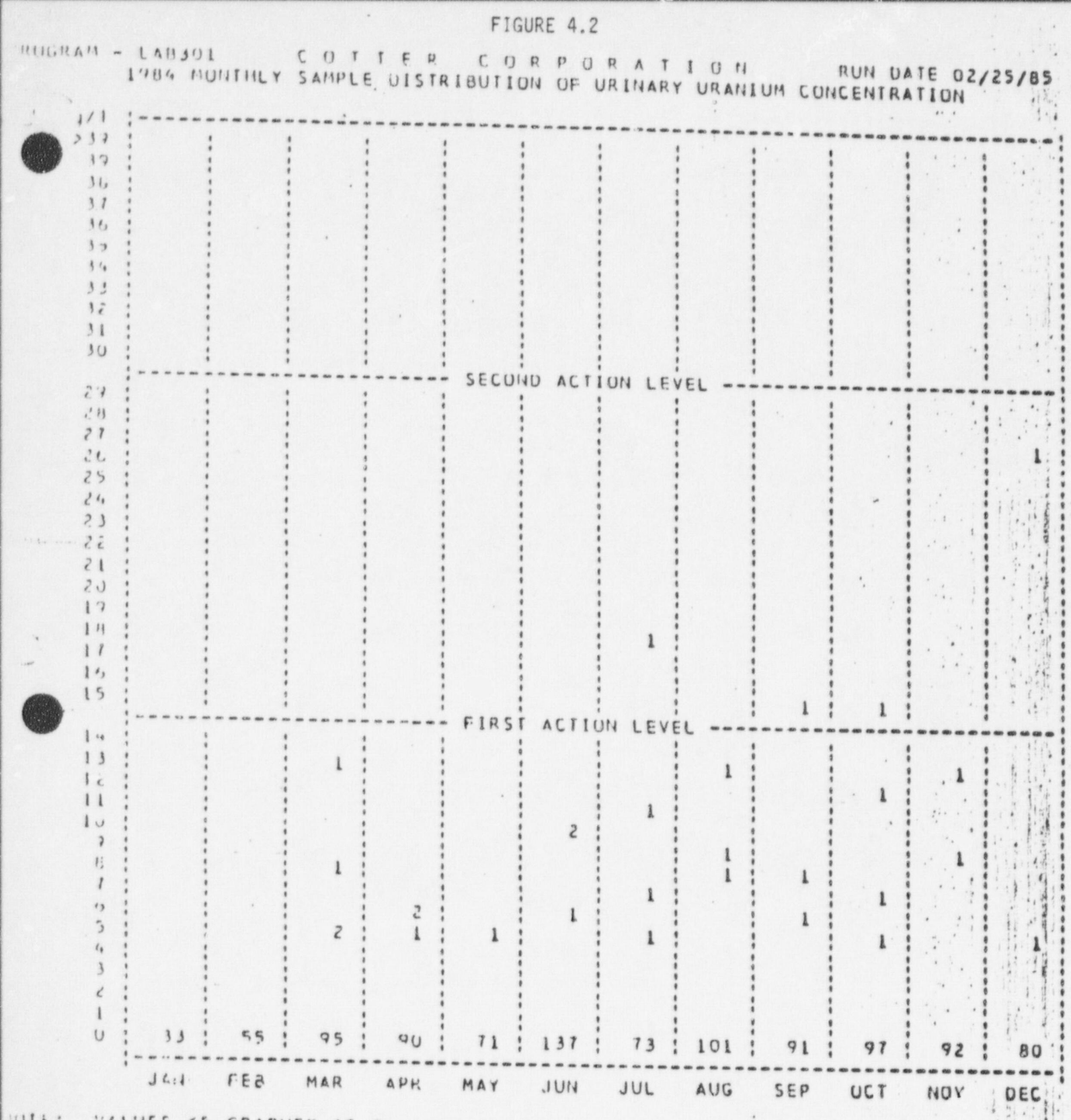

H - LA0301 COTTER CORPORATION RUN DATE 02/21/04
1983 MONTHLY SAMPLE DISTRIBUTION OF URINARY URANIUM CONCENTRATION
SECOND ACTION LEVEL
FIRST ACTION LEVEL
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
159 130 131 160 136 113 143 127 140 169 53 27
VALUES <5 GRAPHED AS 4

FIGURE 4.2

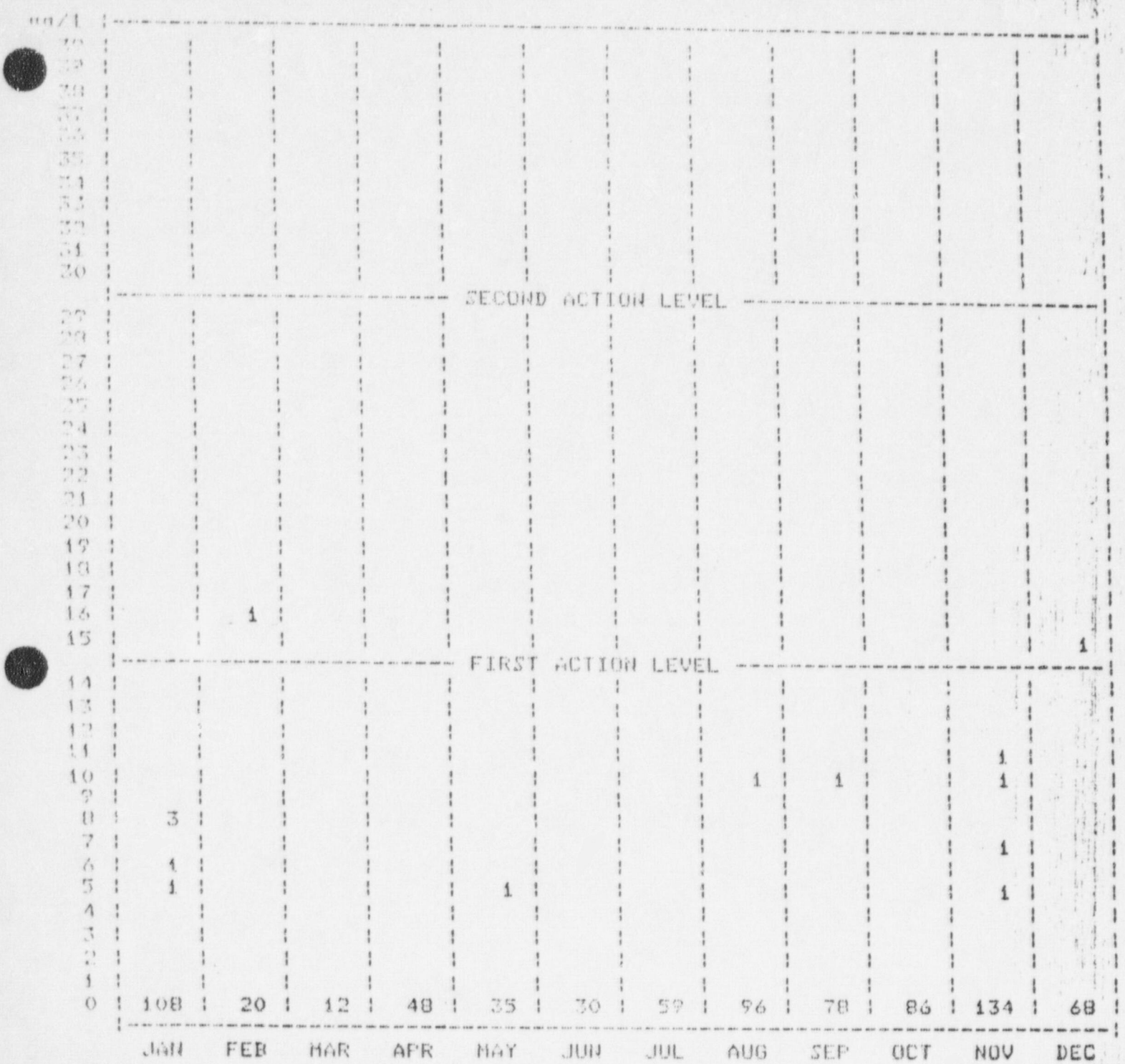



NOTE: VALUES <5 GRAPHED AS 0

FIGURE 4.3

[illegible] - LAN301 C O T T E R C O R P O R A T I O N RUN DATE 01/23/86

1985 MONTHLY SAMPLE DISTRIBUTION OF URINARY URANIUM CONCENTRATION



| ug/l | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 16 | | 1 | | | | | | | | | | |
| 15 | | | | | | | | | | | | 1 |
| 14 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | 1 | |
| 10 | | | | | | | | 1 | 1 | | 1 | |
| 9 | | | | | | | | | | | | |
| 8 | 3 | | | | | | | | | | | |
| 7 | | | | | | | | | | | 1 | |
| 6 | 1 | | | | | | | | | | | |
| 5 | 1 | | | | 1 | | | | | | 1 | |
| 4 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | |
| 0 | 108 | 20 | 12 | 48 | 35 | 30 | 59 | 96 | 78 | 86 | 134 | 68 |

SECOND ACTION LEVEL

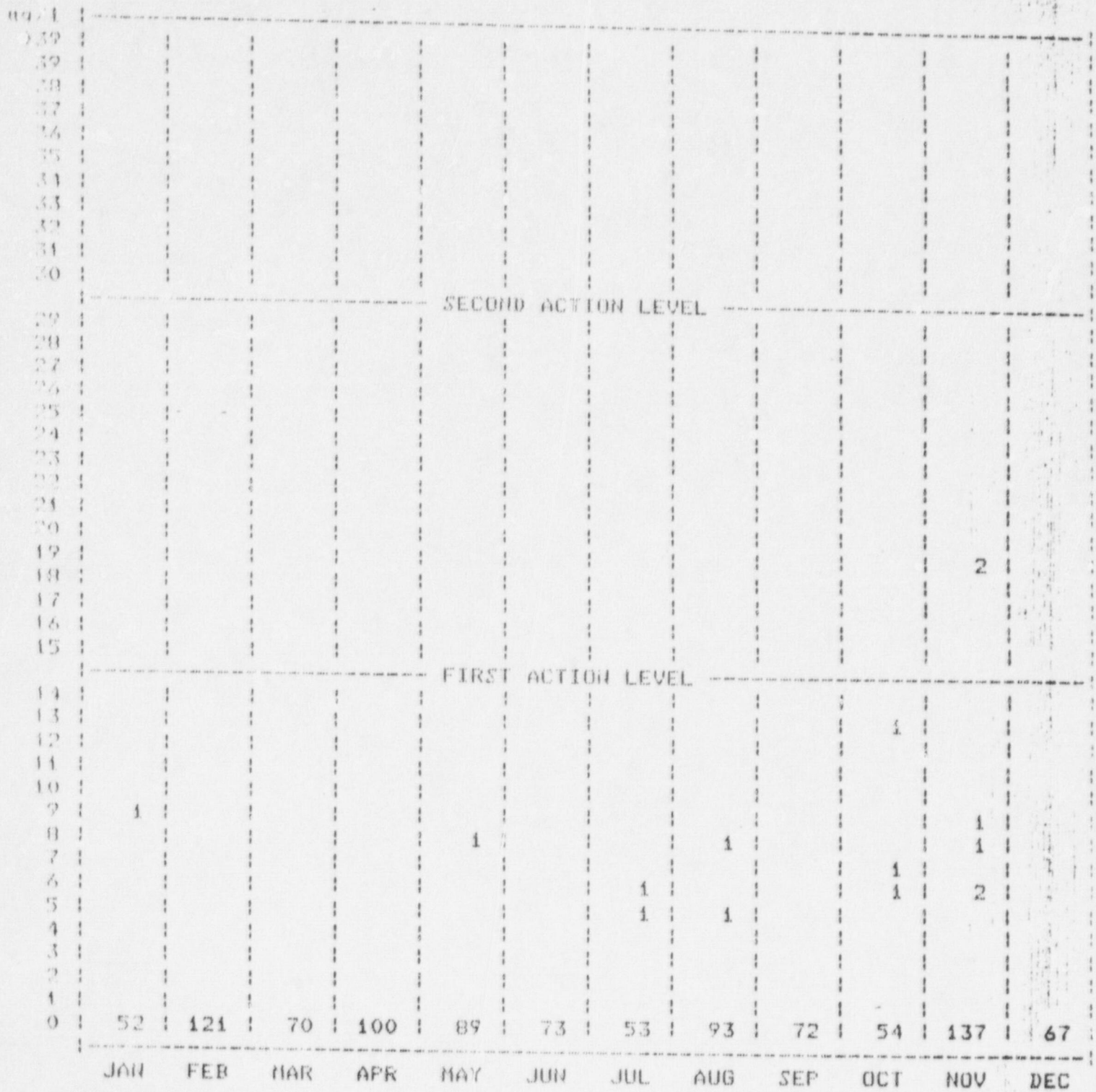
FIRST ACTION LEVEL

NOTE; VALUES <5 GRAPHED AS 0

FIGURE 4.4

[illegible] - LAB301 C O T T E R C O R P O R A T I O N RUN DATE 02/10/87

1986 MONTHLY SAMPLE DISTRIBUTION OF URINARY URANIUM CONCENTRATION

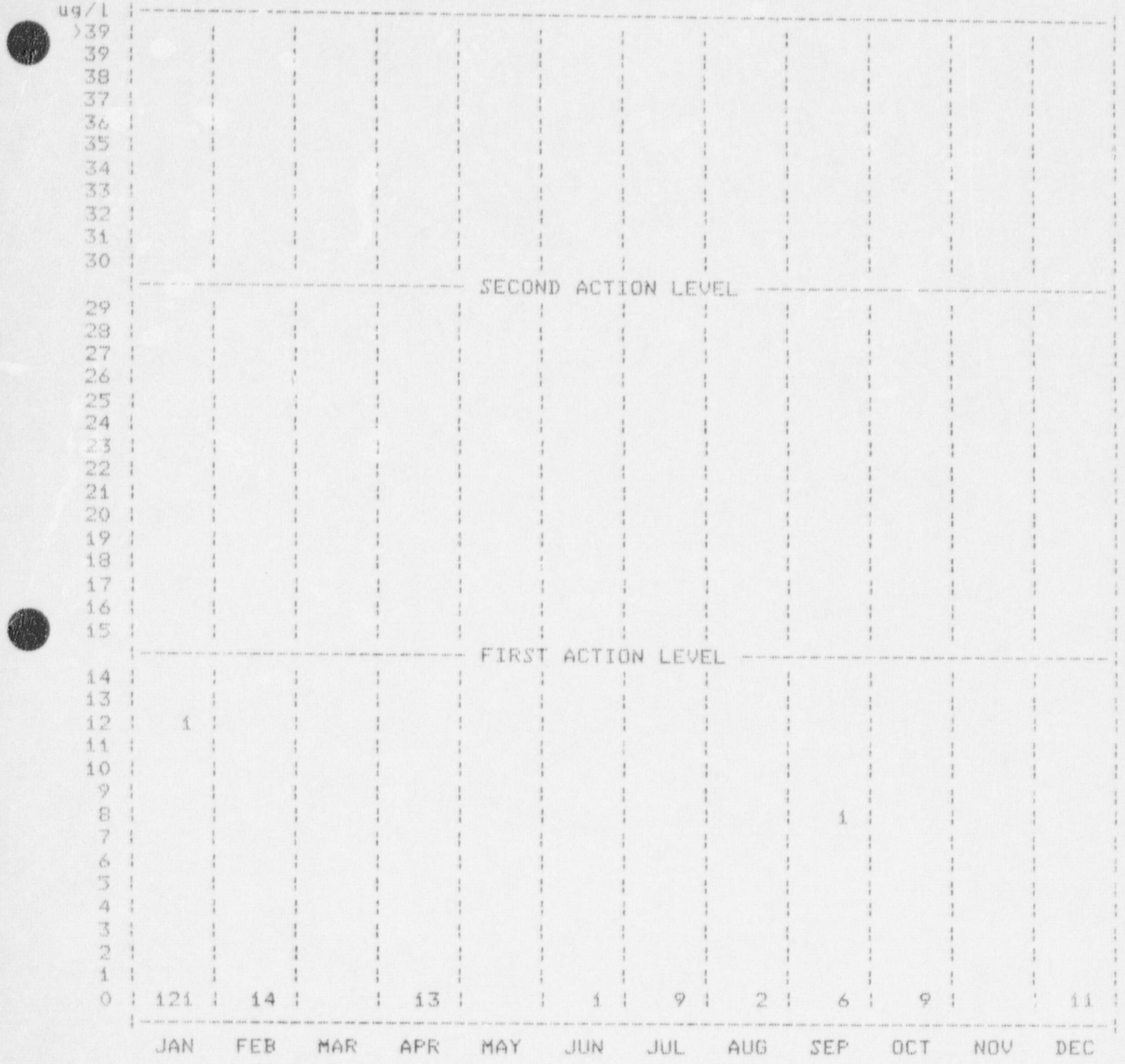



NOTE: VALUES <5 GRAPHED AS 0

FIGURE 4.5

PROGRAM - LAB301 C O T T E R C O R P O R A T I O N RUN DATE 02/05/88

1987 MONTHLY SAMPLE DISTRIBUTION OF URINARY URANIUM CONCENTRATION




NOTE: VALUES <5 GRAPHED AS 0

TABLE 4.1

URINARY URANIUM CONCENTRATIONS

ug/l

| MONTH | 1987 n | 1987 AVERAGE-X | 1987 DEVIATION-S | 1986 n | 1986 AVERAGE-X | 1986 DEVIATION-S | 1985 n | 1985 AVERAGE-X | 1985 DEVIATION-S | 1984 n | 1984 AVERAGE-X | 1984 DEVIATION-S | 1983 n | 1983 AVERAGE-X | 1983 DEVIATION-S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN. | 122 | 0.10 | 1.09 | 53 | 0.17 | 1.24 | 113 | 0.31 | 1.47 | 33 | 0.00 | 0.00 | 164 | 4.11 | 0.64 |
| FEB. | 14 | 0.00 | 0.00 | 121 | 0.00 | 0.00 | 21 | 0.76 | 3.49 | 55 | 0.00 | 0.00 | 134 | 4.06 | 0.36 |
| MAR. | 0 | - | - | 70 | 0.00 | 0.00 | 12 | 0.00 | 0.00 | 99 | 0.31 | 1.67 | 133 | 4.05 | 0.53 |
| APR. | 13 | 0.00 | 0.00 | 100 | 0.00 | 0.00 | 48 | 0.00 | 0.00 | 93 | 0.18 | 1.01 | 162 | 4.10 | 0.95 |
| MAY | 0 | - | - | 90 | 0.09 | 0.84 | 36 | 0.14 | 0.83 | 72 | 0.07 | 0.59 | 138 | 4.08 | 0.85 |
| JUNE | 0 | - | - | 73 | 0.00 | 0.00 | 30 | 0.00 | 0.00 | 140 | 0.19 | 1.29 | 125 | 4.40 | 1.81 |
| JULY | 9 | 0.00 | 0.00 | 55 | 0.20 | 1.04 | 59 | 0.00 | 0.00 | 77 | 0.53 | 2.56 | 152 | 4.45 | 2.13 |
| AUG. | 2 | 0.00 | 0.00 | 95 | 0.14 | 0.96 | 97 | 0.10 | 1.02 | 104 | 0.27 | 1.72 | 131 | 4.29 | 2.16 |
| SEPT. | 7 | 1.14 | 3.02 | 72 | 0.00 | 0.00 | 79 | 0.13 | 1.13 | 94 | 0.31 | 1.84 | 152 | 4.38 | 1.47 |
| OCT. | 9 | 0.00 | 0.00 | 57 | 0.46 | 2.08 | 86 | 0.00 | 0.00 | 101 | 0.39 | 2.07 | 179 | 4.29 | 1.54 |
| NOV. | 0 | - | - | 143 | 0.47 | 2.53 | 138 | 0.24 | 1.45 | 94 | 0.23 | 1.62 | 54 | 4.67 | 4.90 |
| [illegible] | 11 | 0.00 | 0.00 | 67 | 0.00 | 0.00 | 69 | 0.22 | 181 | 82 | 0.39 | 3.03 | 27 | 4.00 | 0.00 |

TABLE 4.2

URINARY URAIUM CONCENTRATIONS

| | 1987 | 1986 | 1985 | 1984 | 1983 |
|---|---|---|---|---|---|
| Average-X | 0.16 | 0.13 | 0.16 | 0.24 | 4.24 |
| Average-S | 0.40 | 0.72 | 0.93 | 1.45 | 1.45 |

PROGRAM - LAB121

COTTER CORPORATION
URINALYSIS SUMMARY (ug/l) FOR 1987 (INCLUDES RERUNS)

RUN DATE 2/04/88

| JOB DESCRIPTION | JAN | | | FEB | | | MAR | | | APR | | | MAY | | | JUN | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-14 | 15-29 | 30&> | 0-14 | 15-29 | 30&> | 0-14 | 15-29 | 30&> | 0-14 | 15-29 | 30&> | 0-14 | 15-29 | 30&> | 0-14 | 15-29 | 30&> |
| GNL MILL FOREMAN | | | | 1 | | | | | | | | | | | | | | |
| PRODUCT (YELLOWCAKE) | 9 | | | 4 | | | | | | | | | | | | | | |
| BALL MILL | 7 | | | | | | | | | | | | | | | | | |
| LEACH | 8 | | | | | | | | | | | | | | | | | |
| CCD | 1 | | | | | | | | | | | | | | | | | |
| SX | 13 | | | 1 | | | | | | | | | | | | | | |
| LIME PREP | 1 | | | | | | | | | | | | | | | | | |
| CRUSHER OPERATOR | 6 | | | | | | | | | | | | | | | | | |
| LOADER OPERATOR | 3 | | | | | | | | | | | | | | | | | |
| MAINTENANCE CLERK | 1 | | | | | | | | | | | | | | | | | |
| MAINT FOREMAN | | | | | | | | | | | | | | | | | | |
| MAINT INST MAN | 2 | | | | | | | | | 1 | | | | | | | | |
| MAINT ELECTRICIAN | 2 | | | | | | | | | 1 | | | | | | | | |
| MAINT AUTO MECH | 1 | | | | | | | | | 1 | | | | | | | | |
| MAINT OILER | 1 | | | | | | | | | | | | | | | | | |
| MAINT CARPENTER | 2 | | | | | | | | | | | | | | | | | |
| MAINT MECH | 31 | | | 2 | | | | | | | | | | | | | | |
| SPECIAL PROJECTS FOR | 2 | | | | | | | | | | | | | | | | | |
| MAINT UT MECH-RUBBER | 3 | | | | | | | | | | | | | | | | | |
| CH. MET./PERSNL. COO | | | | | | | | | | 1 | | | | | | | | |
| ANLYT NON SMPLE PREP | 2 | | | | | | | | | 1 | | | | | | | | |
| ANLYT SAMPLE PREP | 3 | | | | | | | | | | | | | | | | | |
| JUNIOR METALURGIST | | | | | | | | | | | | | | | | | | |
| QUALITY ASSURANCE CO | 1 | | | | | | | | | | | | | | | | | |
| BKGD PRSN #1 | 3 | | | 3 | | | | | | 2 | | | | | | 2 | | |
| BKGD PRSN #2 | 3 | | | 2 | | | | | | 2 | | | | | | | | |
| LABORERS | 13 | | | | | | | | | 1 | | | | | | | | |
| WAREHOUSE SUPERVISOR | | | | | | | | | | | | | | | | | | |
| WAREHOUSEMEN | 1 | | | 1 | | | | | | | | | | | | | | |
| PROD SUPERINTENDENT | | | | | | | | | | | | | | | | | | |
| RECEPTIONIST/TYPIST | 1 | | | | | | | | | | | | | | | | | |
| ENV. COORD./RAD. SAF | | | | | | | | | | | | | | | | | | |
| HEALTH & SAFETY SUPE | | | | | | | | | | 1 | | | | | | | | |
| RAD SAFETY TECHS | 6 | | | 1 | | | | | | 1 | | | | | | | | |
| SECURITY/SAFETY TECH | 4 | | | | | | | | | 1 | | | | | | | | |
| SUPERINT SUPPORT SVC | | | | | | | | | | | | | | | | | | |
| OC-AMER EARTH-CAT.OP | | | | | | | | | | | | | | | | | | |
| TOTALS | 130 | | | 15 | | | | | | 13 | | | | | | 2 | | |

PROGRAM - LAB121

COTTER CORPORATION
URINALYSIS SUMMARY (ug/l) FOR 1987 (INCLUDES REruns)

RUN DATE 2/04/88

| JOB DESCRIPTION | JUL | | | AUG | | | SEP | | | OCT | | | NOV | | | DEC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) | 0-14 | 15-29 | 30&) |
| GNL MILL FOREMAN | | | | | | | 1 | | | | | | | | | | | |
| PRODUCT (YELLOWCAKE) | | | | | | | | | | | | | | | | | | |
| BALL MILL | | | | | | | | | | | | | | | | | | |
| LEACH | | | | | | | | | | | | | | | | | | |
| CCD | | | | | | | | | | | | | | | | | | |
| SX | | | | | | | | | | | | | | | | | | |
| LIME PREP | | | | | | | | | | | | | | | | | | |
| CRUSHER OPERATOR | | | | | | | | | | | | | | | | | | |
| LOADER OPERATOR | | | | | | | | | | | | | | | | | | |
| MAINTENANCE CLERK | | | | | | | | | | | | | | | | | | |
| MAINT FOREMAN | | | | | | | | | | 1 | | | | | | | | |
| MAINT INST MAN | | | | | | | | | | | | | | | | 2 | | |
| MAINT ELECTRICIAN | | | | | | | | | | | | | | | | 2 | | |
| MAINT AUTO MECH | | | | | | | | | | | | | | | | 1 | | |
| MAINT OILER | | | | | | | | | | | | | | | | | | |
| MAINT CARPENTER | | | | | | | | | | | | | | | | | | |
| MAINT MECH | | | | | | | | | | | | | | | | | | |
| SPECIAL PROJECTS FOR | | | | | | | | | | | | | | | | | | |
| MAINT UT MECH-RUBBER | | | | | | | | | | | | | | | | | | |
| CH. MET./PERSNL. COO | | | | | | | | | | | | | | | | | | |
| ANLYT NON SMPLE PREP | 1 | | | | | | | | | | | | | | | | | |
| ANLYT SAMPLE PREP | | | | | | | | | | 1 | | | | | | | | |
| JUNIOR METALURGIST | | | | | | | 1 | | | | | | | | | | | |
| QUALITY ASSURANCE CO | | | | | | | | | | | | | | | | | | |
| BKGD PRSN #1 | 3 | | | | | | 2 | | | 2 | | | | | | 2 | | |
| BKGD PRSN #2 | 1 | | | | | | 1 | | | 1 | | | | | | 2 | | |
| LABORERS | | | | | | | | | | | | | | | | | | |
| WAREHOUSE SUPERVISOR | | | | | | | | | | 1 | | | | | | | | |
| WAREHOUSEMEN | | | | | | | | | | | | | | | | 2 | | |
| PROD SUPERINTENDENT | | | | | | | 1 | | | 1 | | | | | | | | |
| RECEPTIONIST/TYPIST | | | | | | | | | | | | | | | | | | |
| ENV. COORD./RAD. SAF | 1 | | | | | | | | | | | | | | | | | |
| HEALTH & SAFETY SUPE | 1 | | | | | | | | | 1 | | | | | | | | |
| RAD SAFETY TECHS | 1 | | | | | | | | | 2 | | | | | | | | |
| SECURITY/SAFETY TECH | 3 | | | | | | 2 | | | | | | | | | | | |
| SUPERINT SUPPORT SVC | | | | | | | | | | 1 | | | | | | | | |
| OC-AMER EARTH-CAT.OP | | | | 2 | | | | | | | | | | | | | | |
| TOTALS | 11 | | | 2 | | | 8 | | | 11 | | | | | | 11 | | |

## 4.2 - IN VIVO TESTING - ANNUAL REPORT

LICENSE CONDITIONS 24.2.1 THROUGH 24.4

Baseline and annual in vivo tests are conducted for personnel at the Cotter milling facility. Specifically, baseline testing is conducted for all newly hired employees and annual testing is conducted for all employees routinely exposed to airborne yellowcake and/or ore dust, including maintenance personnel involved with work tasks in yellowcake and/or ore handling areas.

During 1987, no in vivo sample measurements were made because of the mill shutdown and layoff of personnel. The remaining personnel did not meet the minimum requirements for in vivo measurements. In vivo measurements will continue to be made as the need arises in accordance with license requirements.

All bioassay results are reviewed by Cotter's corporate medical advisor as required by License Condition 24.1.1.3.3.

5.0 - STACK EFFLUENT - ANNUAL REPORT

LICENSE CONDITION 25.0

Stack effluent samples were collected during operating periods for the yellowcake dryer-venturi scrubber, the laboratory baghouse and the secondary crusher baghouse in accordance with License Condition 25.0. All stack sampling is done utilizing the Anderson stack sampling system in accordance with EPA Method 5. The primary crusher was not run in 1987. Sampling results are presented in Table 5.1.

In order to place stack concentrations and release rates into perspective on an annualized basis, time-weighted annual averages were calculated for the period 1979 - 1987 and are exhibited as Tables 5.2 through 5.6 and as Figures 5.1 through 5.10. Estimated operating hours are listed in Table 5.7.

YELLOWCAKE CALCINER-VENTURI SCRUBBER STACK

Due to the mill shutdown in January, 1987, only one yellowcake scrubber stack sample was collected. The concentrations encountered are consistent with the average annual ranges previously reported.

Estimated annual releases for 1987 were:

Natural Uranium ($^{Nat}U$) = 1.13 mCi

Thorium-230 ($^{230}Th$) = 0.0002 mCi

Radium-226 ($^{226}Ra$) = 0.0002 mCi

LABORATORY BAGHOUSE STACK

The laboratory baghouse stack operated satisfactorily in 1987. All radionuclide concentrations exhibited a slight upturn. Sampling was done quarterly. Estimated annual releases were:

Natural Uranium ($^{Nat}U$) = 0.0156 mCi

Thorium-230 ($^{230}Th$) = 0.023 mCi

Radium-226 ($^{226}Ra$) = 0.0057 mCi

SECONDARY CRUSHER BAGHOUSE STACK

The secondary crusher baghouse stack operated satisfactorily in 1987. It was operated only during the first quarter of 1987. All radionuclides except Polonium-210 ($^{210}Po$) showed a downtrend. Estimated annual releases were:

Natural Uranium ($^{Nat}U$) = 0.0015 mCi

Thorium-230 ($^{230}Th$) = 0.000 mCi

Radium-226 ($^{226}Ra$) = 0.0004 mCi

| 1987 MNTH | SAMPLED VOL(ML) | VOLUMETRIC FLOW RATE (ML/SEC) | EST. OP HRS | U-NAT UCI/ML | U-NAT UCI/SEC | TH230 UCI/ML | TH230 UCI/SEC | RA226 UCI/ML | RA226 UCI/SEC | PB210 UCI/ML | PB210 UCI/SEC | PO210 UCI/ML | PO210 UCI/SEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 1.59E+06 | 3.35E+06 | 65.00 | 1.26E-11 | 4.22E-05 | 1.57E-12 | 5.27E-06 | 5.28E-12 | 1.77E-05 | 2.89E-12 | 9.69E-06 | 3.46E-12 | 1.16E-05 |
| FEB | 1.73E+06 | 3.60E+06 | 06.00 | 2.47E-11 | 8.90E-05 | 3.24E-12 | 1.17E-05 | 1.17E-11 | 4.21E-05 | 5.39E-12 | 1.94E-05 | 7.30E-12 | 2.63E-05 |
| MAR | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| APR | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MAY | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| JUN | 1.61E+06 | 3.50E+06 | 20.00 | 9.23E-12 | 3.23E-05 | 3.16E-12 | 1.11E-05 | 2.73E-12 | 9.55E-06 | 3.35E-12 | 1.17E-05 | 4.40E-12 | 1.54E-05 |
| JUL | 1.67E+06 | 3.53E+06 | 30.00 | 3.29E-12 | 1.16E-05 | 1.14E-12 | 4.02E-06 | 6.00E-13 | 2.12E-06 | 7.80E-13 | 2.75E-06 | 2.76E-12 | 9.74E-06 |
| AUG | 1.00E+00 | 0.00E+00 | 16.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| SEP | 1.00E+00 | 0.00E+00 | 35.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| OCT | 1.46E+06 | 3.10E+06 | 24.00 | 8.18E-13 | 2.54E-06 | 1.51E-12 | 4.68E-06 | 1.85E-12 | 5.75E-06 | 1.44E-12 | 4.47E-06 | 2.40E-12 | 7.45E-06 |
| NOV | 1.00E+00 | 0.00E+00 | 16.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| DEC | 1.00E+00 | 0.00E+00 | 24.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| AVERAGE JANUARY - JUNE | | | | 7.76E-12 | 2.73E-05 | 1.33E-12 | 4.67E-06 | 3.28E-12 | 1.16E-05 | | | | |
| MAXIMUM JANUARY - JUNE | | | | 2.47E-11 | 8.90E-05 | 3.24E-12 | 1.17E-05 | 1.17E-11 | 4.21E-05 | | | | |
| AVERAGE JULY - DECEMBER | | | | 6.84E-13 | 2.36E-06 | 4.42E-13 | 1.45E-06 | 4.09E-13 | 1.31E-06 | | | | |
| MAXIMUM JULY - DECEMBER | | | | 3.29E-12 | 1.16E-05 | 1.51E-12 | 4.68E-06 | 1.85E-12 | 5.75E-06 | | | | |

PROGRAM - LAB117

LABORATORY STACK
ESTIMATED MONTHLY RELEASE RATE



| 1987 | NATU MCI | TH230 MCI | RA226 MCI |
|---|---|---|---|
| JAN | 9.88E-03 | 1.23E-03 | 4.14E-03 |
| FEB | 1.92E-03 | 2.52E-04 | 9.10E-04 |
| MAR | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| APR | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MAY | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| JUN | 2.33E-03 | 7.97E-04 | 6.88E-04 |
| JUL | 1.25E-03 | 4.34E-04 | 2.29E-04 |
| AUG | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| SEP | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| OCT | 2.19E-04 | 4.05E-04 | 4.97E-04 |
| NOV | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| DEC | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| TOTAL JAN - JUNE | 1.41E-02 | 2.28E-03 | 5.74E-03 |
| TOTAL JULY - DEC | 1.47E-03 | 9.39E-04 | 7.25E-04 |
| TOTAL | 1.56E-02 | 3.12E-03 | 6.47E-03 |

*'D ITEMS ARE ESTIMATED MAXIMUM MONTHLY RELEASE

PROGRAM - LAB117

YELLOWCAKE DRYER STACK
COMPUTER REF# 0851

RUN DATE 88/02/04
TIME 09:53:31

| 1987 MNTH | SAMPLED VOL(ML) | VOLUMETRIC FLOW RATE (ML/SEC) | EST. UP HRS | U-NAT UCI/ML | U-NAT UCI/SEC | TH230 UCI/ML | TH230 UCI/SEC | RA226 UCI/ML | RA226 UCI/SEC | PB210 UCI/ML | PB210 UCI/SEC | PO210 UCI/ML | PO210 UCI/SEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 8.24E+05 | 4.22E+05 | 420.15 | 1.77E-09 | 7.45E-04 | 3.64E-13 | 1.53E-07 | 3.64E-13 | 1.53E-07 | 1.82E-12 | 7.67E-07 | 6.07E-13 | 2.56E-07 |
| FEB | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MAR | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| APR | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MAY | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| JUN | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| JUL | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| AUG | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| SEP | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| OCT | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| NOV | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| DEC | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| AVERAGE JANUARY - JUNE | | | | 2.95E-10 | 1.24E-04 | 6.07E-14 | 2.56E-08 | 6.07E-14 | 2.56E-08 | | | | |
| MAXIMUM JANUARY - JUNE | | | | 1.77E-09 | 7.45E-04 | 3.64E-13 | 1.53E-07 | 3.64E-13 | 1.53E-07 | | | | |
| AVERAGE JULY - DECEMBER | | | | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | | | | |
| MAXIMUM JULY - DECEMBER | | | | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | | | | |

PROGRAM - LABTIT YELLOWCAKE DRYER STACK RUN DATE 08/02/94

ESTIMATED MONTHLY RELEASE RATE

| 1987 | NATU MCI | TH230 MCI | RA225 MCI |
|---|---|---|---|
| JAN | 1.13E+00 | 2.32E-04 | 2.32E-04 |
| FEB | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MAR | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| APR | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MAY | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| JUN | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| JUL | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| AUG | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| SEP | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| OCT | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| NOV | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| DEC | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| TOTAL JAN - JUNE | 1.13E+00 | 2.32E-04 | 2.32E-04 |
| TOTAL JULY - DEC | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| TOTAL | 1.13E+00 | 2.32E-04 | 2.32E-04 |

*'D ITEMS ARE ESTIMATED MAXIMUM MONTHLY RELEASE

PROGRAM - LA0117

SECONDARY CRUSHER STACK
COMPUTER REF: 0052

| 1987 MNTH | SAMPLED VOL(ML) | VOLUMETRIC FLOW RATE (ML/SEC) | EST. OP HRS | U-NAT UCI/ML | U-NAT UCI/SEC | TH230 UCI/ML | TH230 UCI/SEC | RA226 UCI/ML | RA226 UCI/SEC | PB210 UCI/ML | PB210 UCI/SEC | PO210 UCI/ML | PO210 UCI/SEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QTR1 | 1.74E+06 | 3.57E+06 | 45.20 | 2.49E-12 | 8.97E-06 | 0.00E+00 | 0.00E+00 | 6.8'E-11 | 2.47E-06 | 2.30E-13 | 8.25E-07 | 1.89E-12 | 6.80E-06 |
| QTR2 | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| QTR3 | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| QTR4 | 1.00E+00 | 0.00E+00 | 00.10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| AVERAGE JANUARY - JUNE | | | | 1.24E-12 | 4.47E-06 | 0.00E+00 | 0.00E+00 | 3.44E-13 | 1.24E-06 | | | | |
| MAXIMUM JANUARY - JUNE | | | | 2.49E-12 | 8.93E-06 | 0.00E+00 | 0.00E+00 | 6.89E-13 | 2.47E-06 | | | | |
| AVERAGE JULY - DECEMBER | | | | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | | | | |
| MAXIMUM JULY - DECEMBER | | | | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | | | | |

PROGRAM - LABELLE

SECONDARY CRUSHER STACK
ESTIMATED MONTHLY RELEASE RATE

PLN DATE 93/02/04

| 1987 | NATU MCI | TH230 MCI | RA226 MCI |
|---|---|---|---|
| QTR1 | 1.45E-03 | 0.00E+00 | 4.03E-04 |
| QTR2 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| QTR3 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| QTR4 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| TOTAL JAN - JUNE | 1.45E-03 | 0.00E+00 | 4.03E-04 |
| TOTAL JULY - DEC | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| TOTAL | 1.45E-03 | 0.00E+00 | 4.03E-04 |

*'D ITEMS ARE ESTIMATED MAXIMUM MONTHLY RELEASE

TABLE 5.2

STACK EFFLUENT
Natural Uranium ($^{Nat}U$)

| YEAR | AVERAGE ANNUAL CONCENTRATION (μCi/ml) | | | | AVERAGE ANNUAL RELEASE RATE (μCi/sec) | | | |
|---|---|---|---|---|---|---|---|---|
| | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER |
| 1979 | 2.19E-11 | 3.15E-12 | 7.98E-13 | 1.12E-12 | 2.15E-5 | 8.02E-6 | 3.06E-6 | 4.22E-6 |
| 1980 | 2.80E-10 | 5.71E-11 | 2.43E-12 | 2.39E-10 | 2.73E-4 | 9.31E-5 | 9.10E-6 | 9.37E-4 |
| 1981 | 3.43E-10 | 1.06E-11 | 9.33E-12 | 1.02E-11 | 2.77E-4 | 1.76E-5 | 2.89E-5 | 2.19E-5 |
| 1982 | 2.22E-10 | 1.02E-11 | 4.65E-12 | 4.00E-12 | 1.58E-4 | 2.19E-5 | 1.40E-5 | 1.42E-5 |
| 1983 | 1.96E-10 | 1.23E-11 | 8.56E-12 | 7.74E-12 | 1.26E-4 | 3.32E-5 | 2.63E-5 | 2.73E-5 |
| 1984 | 1.26E-9 | 1.36E-12 | 1.08E-11 | 1.12E-12 | 7.19E-4 | 3.67E-6 | 3.05E-5 | 3.65E-6 |
| 1985 | 1.62E-9 | 8.48E-12 | 2.00E-11 | - | 8.07E-4 | 3.06E-5 | 7.77E-5 | - |
| 1986 | 1.91E-9 | 5.98E-12 | 4.24E-12 | - | 8.83E-4 | 2.14E-5 | 1.64E-5 | - |
| 1987 | 1.77E-9* | 6.23E-12 | 2.49E-12** | - | 7.45E-4* | 2.13E-5 | 8.93E-6** | - |

NOTE: Utilization of the Anderson Stack Sampling System (EPA Method 5) commenced for the Yellowcake Calciner Venturi Scrubber in June, 1984, for the Laboratory Baghouse in July, 1985 and for the Secondary Crusher Baghouse in the Third Quarter of 1985.

*January, 1987 only.

**First Quarter, 1987 only.

TABLE 5.3

STACK EFFLUENT

Thorium-230 ($^{230}Th$)

| YEAR | AVERAGE ANNUAL CONCENTRATION (µCi/ml) | | | | AVERAGE ANNUAL RELEASE RATE (µCi/sec) | | | |
|---|---|---|---|---|---|---|---|---|
| | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER |
| 1979 | 4.84E-13 | 2.80E-12 | 1.08E-12 | 1.48E-12 | 4.76E-7 | 7.11E-6 | 4.12E-6 | 5.55E-6 |
| 1980 | 3.77E-12 | 2.01E-11 | 1.44E-12 | 6.99E-11 | 2.76E-6 | 3.33E-5 | 5.46E-6 | 4.06E-5 |
| 1981 | 7.31E-12 | 3.76E-12 | 5E-13 | 4.57E-12 | 5.49E-6 | 6.02E-6 | 2.25E-6 | 1.01E-5 |
| 1982 | 7.32E-12 | 1.62E-12 | | 1.72E-12 | 4.56E-6 | 3.19E-6 | 2.74E-6 | 4.11E-6 |
| 1983 | 1.04E-10 | 2.29E-12 | | .47E-12 | 6.68E-5 | 6.08E-6 | 1.05E-6 | 1.58E-5 |
| 1984 | 2.21E-12 | 5.24E-13 | | 2.17E-13 | 1.51E-6 | 1.34E-6 | 1.40E-6 | 7.29E-7 |
| 1985 | 6.01E-12 | 4.69E-13 | 5.20 | - | 2.89E-6 | 1.69E-6 | 2.07E-6 | - |
| 1986 | 2.25E-12 | 1.33E-12 | 1.93E-12 | - | 1.07E-6 | 4.84E-6 | 7.40E-6 | - |
| 1987 | 3.64E-13* | 1.58E-12 | 0.00** | - | 1.53E-7* | 5.34E-6 | 0.00** | - |

*January, 1987 only.
** First Quarter, 1987 only.

TABLE 5.4
STACK EFFLUENT
Radium 226 ($^{226}Ra$)

| YEAR | AVERAGE ANNUAL CONCENTRATION (μCi/ml) | | | | AVERAGE ANNUAL RELEASE RATE (μCi/sec) | | | |
|---|---|---|---|---|---|---|---|---|
| | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER |
| 1979 | 3.50E-13 | 3.13E-12 | 6.15E-13 | 1.01E-11 | 3.46E-7 | 7.95E-6 | 2.36E-6 | 7.81E-5 |
| 1980 | 3.33E-12 | 2.71E-11 | 5.30E-12 | 1.16E-10 | 3.56E-6 | 3.78E-5 | 1.97E-5 | 4.70E-4 |
| 1981 | 1.91E-12 | 4.18E-12 | 2.90E-12 | 3.38E-12 | 1.46E-6 | 6.81E-6 | 8.66E-6 | 7.06E-6 |
| 1982 | 1.43E-12 | 1.40E-12 | 2.53E-12 | 8.77E-13 | 1.11E-6 | 3.03E-6 | 7.86E-6 | 2.67E-6 |
| 1983 | 1.08E-11 | 2.23E-12 | 4.30E-12 | 5.47E-12 | 6.34E-6 | 5.83E-6 | 1.32E-5 | 1.93E-5 |
| 1984 | 3.56E-12 | 5.70E-13 | 1.08E-12 | 1.07E-12 | 2.05E-6 | 1.46E-6 | 3.05E-6 | 3.03E-6 |
| 1985 | 5.11E-13 | 4.45E-13 | 1.09E-12 | - | 2.81E-7 | 1.60E-6 | 4.18E-6 | - |
| 1986 | 3.49E-13 | 6.23E-13 | 7.58E-13 | - | 1.69E-7 | 2.47E-6 | 2.96E-6 | - |
| 1987 | 3.64E-13* | 2.65E-12 | 6.89E-13** | - | 1.53E-7* | 9.04E-6 | 2.67E-6** | - |

*January, 1987 only.
**First Quarter, 1987 only.

TABLE 5.6

STACK EFFLUENT

Lead-210 ($^{210}Pb$)

| YEAR | AVERAGE ANNUAL CONCENTRATION (µCi/ml) | | | | AVERAGE ANNUAL RELEASE RATE (µCi/sec) | | | |
|---|---|---|---|---|---|---|---|---|
| | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER |
| 1979 | 5.28E-12 | 8.66E-12 | 6.66E-12 | 5.64E-12 | 5.19E-6 | 2.20E-5 | 2.55E-5 | 2.08E-5 |
| 1980 | 0 | 1.75E-11 | 7.43E-13 | 2.08E-10 | 0 | 2.94E-5 | 2.64E-6 | 8.62E-4 |
| 1981 | 1.24E-11 | 6.09E-12 | 5.28E-12 | 8.21E-12 | 9.55E-6 | 1.18E-5 | 1.57E-5 | 1.89E-5 |
| 1982 | 1.81E-11 | 4.35E-12 | 5.25E-12 | 1.35E-12 | 1.26E-5 | 7.89E-6 | 1.71E-5 | 4.08E-6 |
| 1983 | 1.67E-11 | 3.37E-12 | 4.13E-12 | 1.59E-12 | 6.18E-6 | 8.39E-6 | 1.26E-5 | 5.61E-6 |
| 1984 | 4.21E-12 | 1.71E-12 | 1.27E-12 | 4.05E-13 | 2.44E-6 | 4.69E-6 | 3.59E-6 | 1.44E-6 |
| 1985 | 3.82E-12 | 1.16E-12 | 1.39E-12 | - | 1.40E-6 | 3.90E-6 | 4.95E-6 | - |
| 1986 | 1.52E-12 | 1.46E-12 | 8.16E-13 | - | 6.58E-7 | 5.22E-6 | 3.18E-6 | - |
| 1987 | 1.82E-12* | 1.88E-12 | 2.30E-13** | - | 2.56E-7* | 6.31E-6 | 8.25E-7** | - |

*January, 1987 only.
**First Quarter 1987 only.

TABLE 5.6

STACK EFFLUENT
Polonium-210 ($^{210}Po$)

| YEAR | AVERAGE ANNUAL CONCENTRATION (μCi/ml) | | | | AVERAGE ANNUAL RELEASE RATE (μCi/sec) | | | |
|---|---|---|---|---|---|---|---|---|
| | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER |
| 1979 | - | - | - | - | - | - | - | - |
| 1980 | 0 | 2.53E-12 | 7.43E-13 | 2.08E-10 | 0 | 3.84E-6 | - | - |
| 1081 | 2.82E-12 | 6.20E-12 | 3.09E-12 | 3.73E-12 | 2.21E-6 | 1.01E-5 | 9.18E-6 | 8.21E-6 |
| 1982 | 4.82E-12 | 4.31E-12 | 2.11E-12 | 3.63E-12 | 3.23E-6 | 8.93E-6 | 6.89E-6 | 8.89E-6 |
| 1983 | 1.46E-12 | 1.39E-12 | 2.48E-12 | 3.53E-12 | 1.01E-6 | 3.71E-6 | 9.62E-6 | 1.24E-5 |
| 1984 | 3.50E-13 | 5.83E-13 | 1.24E-12 | 1.35E-13 | 2.05E-7 | 1.00E-6 | 3.46E-6 | 4.30E-7 |
| 1985 | 8.40E-13 | 3.77E-13 | 7.55E-13 | - | 3.71E-7 | 1.33E-6 | 2.90E-6 | - |
| 1986 | 6.94E-13 | 7.96E-13 | 7.33E-13 | - | 3.14E-7 | 2.90E-6 | 2.85E-6 | - |
| 1987 | 6.07E-13* | 3.11E-12 | 1.89E-12** | - | 2.56E-7* | 1.05E-5 | 6.80E-6** | - |

*January, 1987.
**First Quarter, 1987 only.

TABLE 5.7

STACK EFFLUENT

ESTIMATED OPERATING HOURS

| YEAR | YELLOWCAKE CALCINER VENTURI SCRUBBER | LABORATORY BAGHOUSE | SECONDARY CRUSHER | PRIMARY CRUSHER |
|---|---|---|---|---|
| 1979 | - | - | - | - |
| 1980 | 6720 | 1825.7 | 2080 | 1400 |
| 1981 | 4620 | 600.7 | 1790 | 860 |
| 1982 | 2100 | 467+ | 1015.8 | 25 |
| 1983 | 2310 | 505.5+ | 680.1 | 27.3 |
| 1984 | 2520 | 779 | 986.2 | 83.8 |
| 1985 | 1769 | 531.7 | 518.5 | - |
| 1986 | 2215.5 | 727 | 600.5 | - |
| 1987 | 420.15 | 236 | 45.2 | - |

FIGURE 5.1

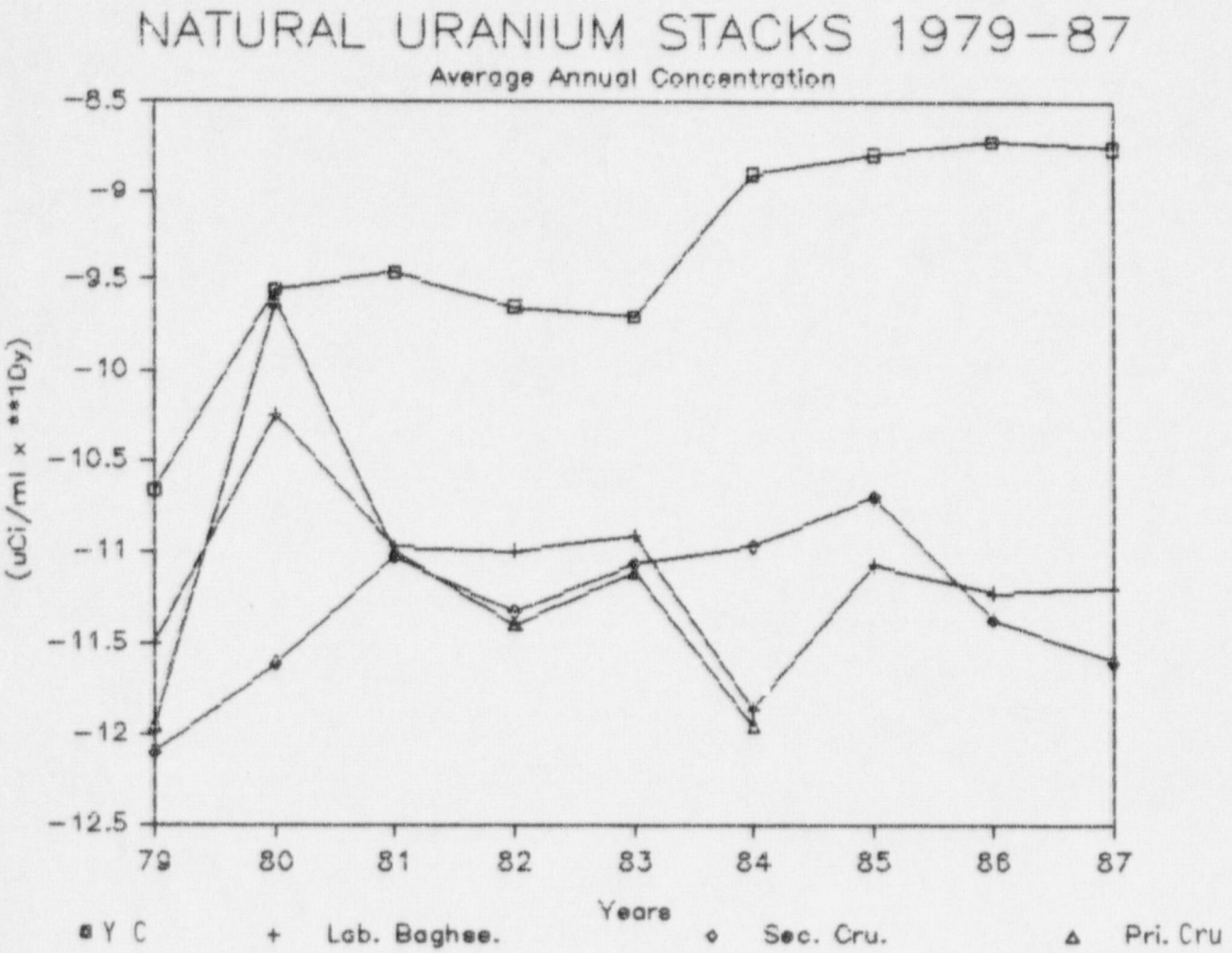

NATURAL URANIUM STACKS 1979-87
Average Annual Concentration
(uCi/ml x **10y)
-8.5
-9
-9.5
-10
-10.5
-11
-11.5
-12
-12.5
79
80
81
82
83
84
85
86
87
Years
Y C
Lab. Baghee.
Sec. Cru.
Pri. Cru

FIGURE 5.2

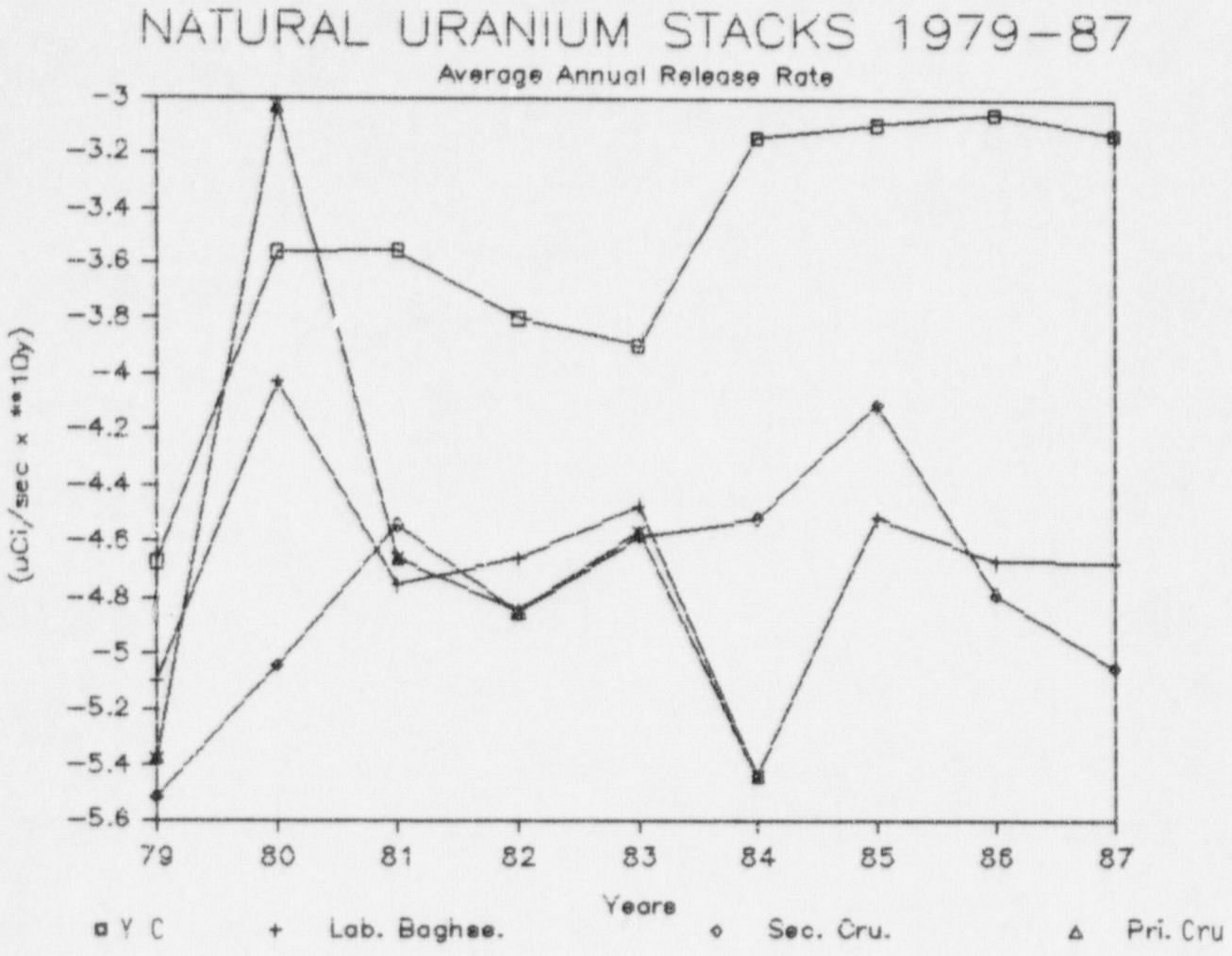
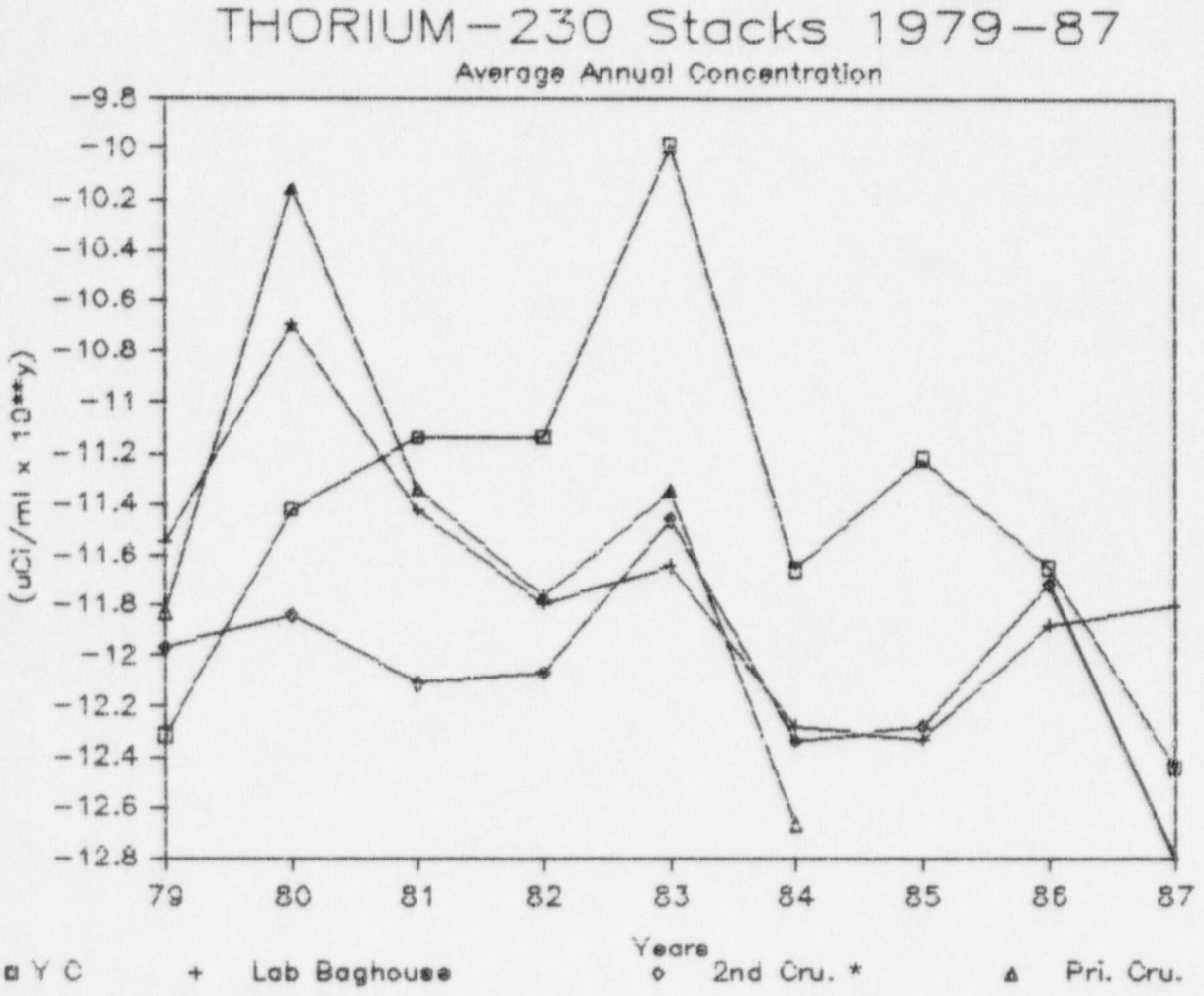
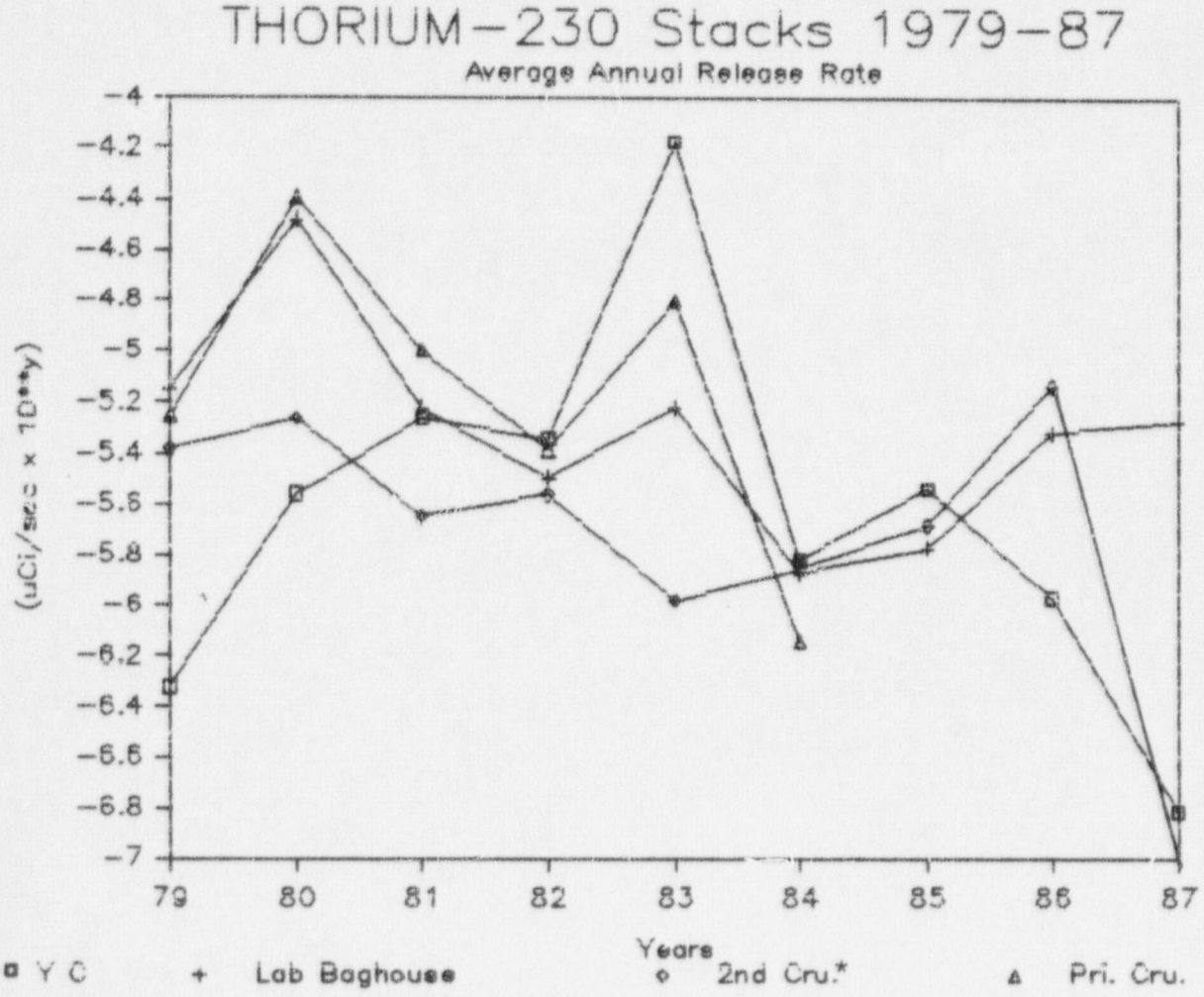

NATURAL URANIUM STACKS 1979-87
Average Annual Release Rate
(uCi/sec x **10y)
-3
-3.2
-3.4
-3.6
-3.8
-4
-4.2
-4.4
-4.6
-4.8
-5
-5.2
-5.4
-5.6
79
80
81
82
83
84
85
86
87
Years
Y C
Lab. Baghee.
Sec. Cru.
Pri. Cru

FIGURE 5.3




*0.00 for 1987 Secondary Crusher plotted as $10^{-12.8}$.

FIGURE 5.4




*0.00 for Secondary Crusher in 1987 plotted as $10^{-7}$.

FIGURE 5.5

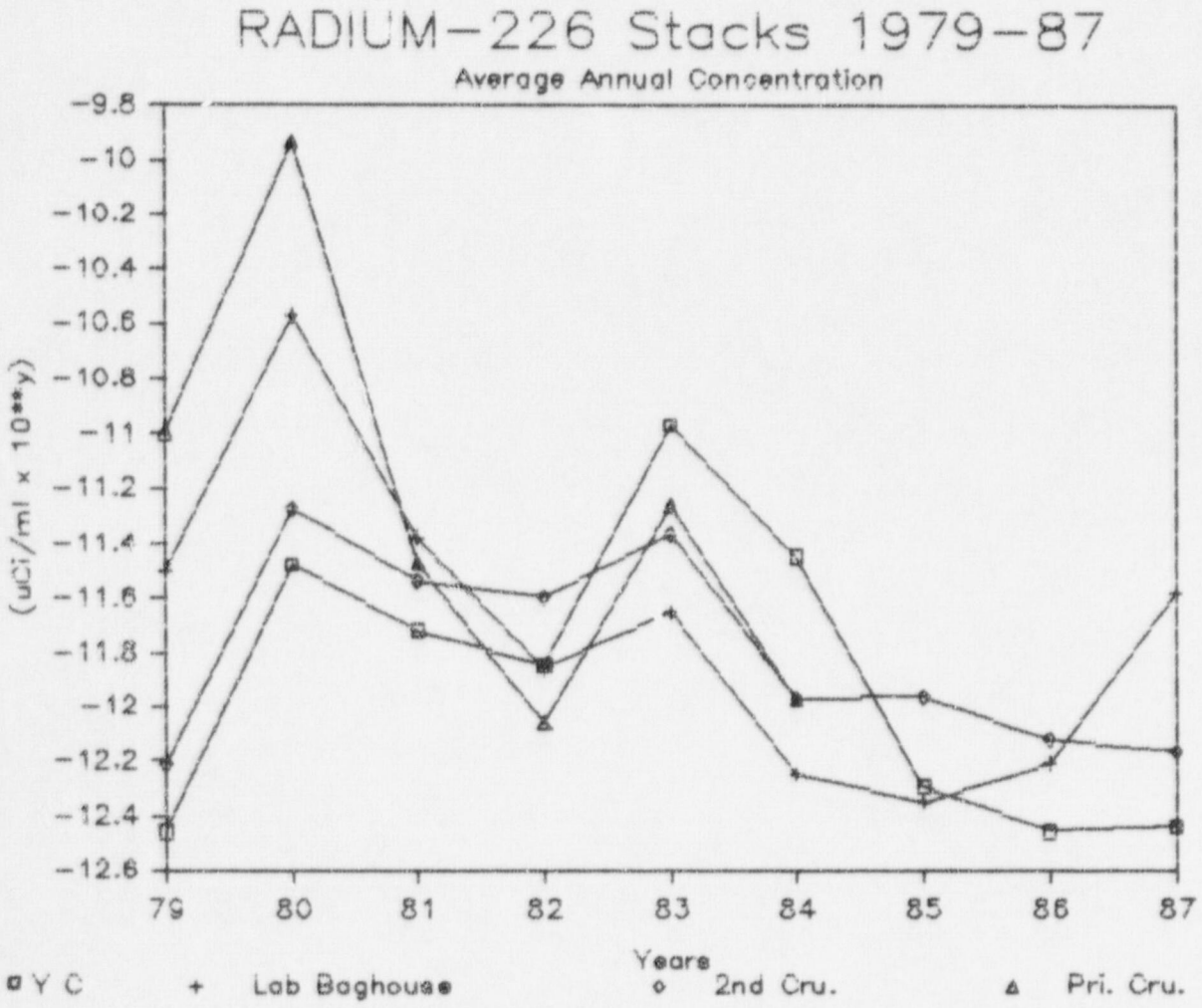

RADIUM-226 Stacks 1979-87
Average Annual Concentration
(uCi/ml x 10**y)
-9.8
-10
-10.2
-10.4
-10.6
-10.8
-11
-11.2
-11.4
-11.6
-11.8
-12
-12.2
-12.4
-12.6
79
80
81
82
83
84
85
86
87
Years
Y C
Lab Baghouse
2nd Cru.
Pri. Cru.

FIGURE 5.6

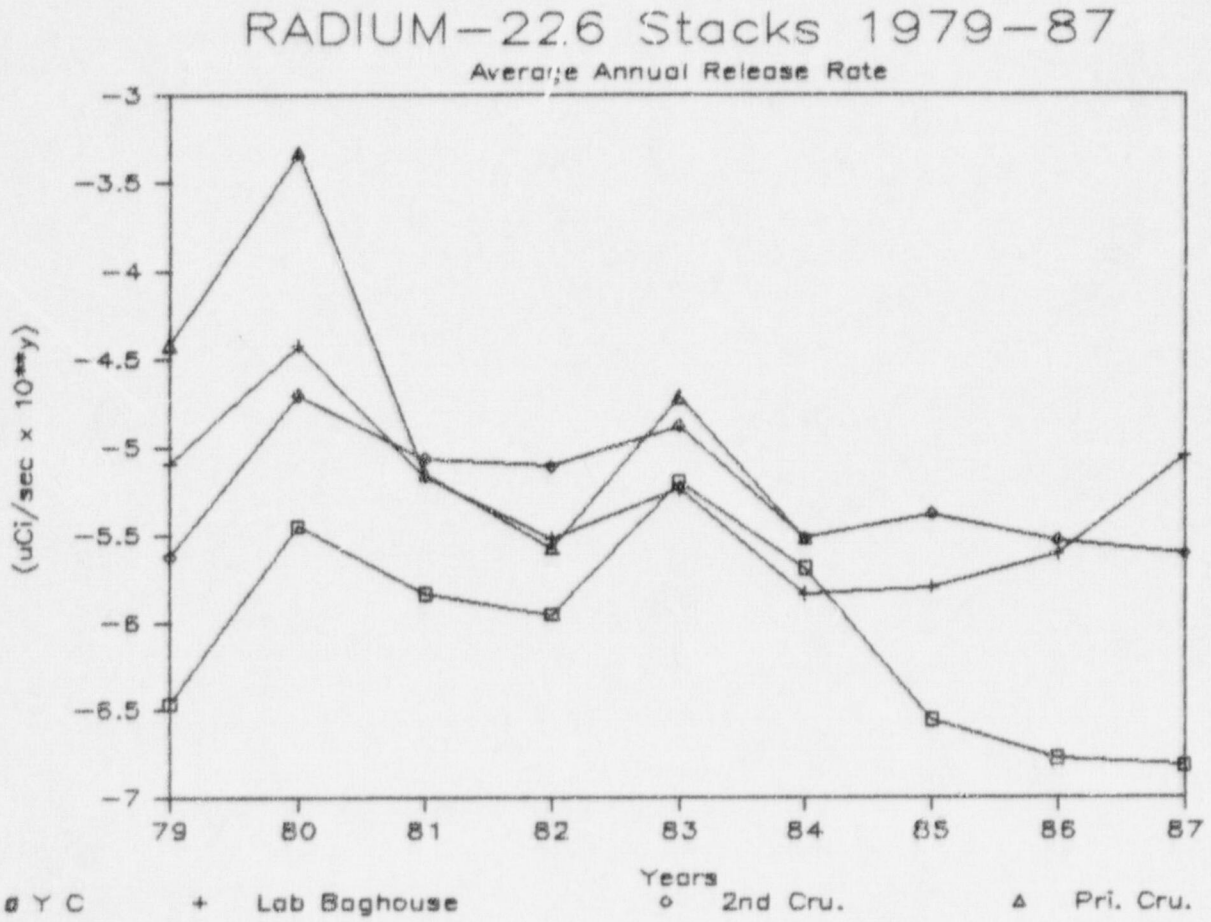
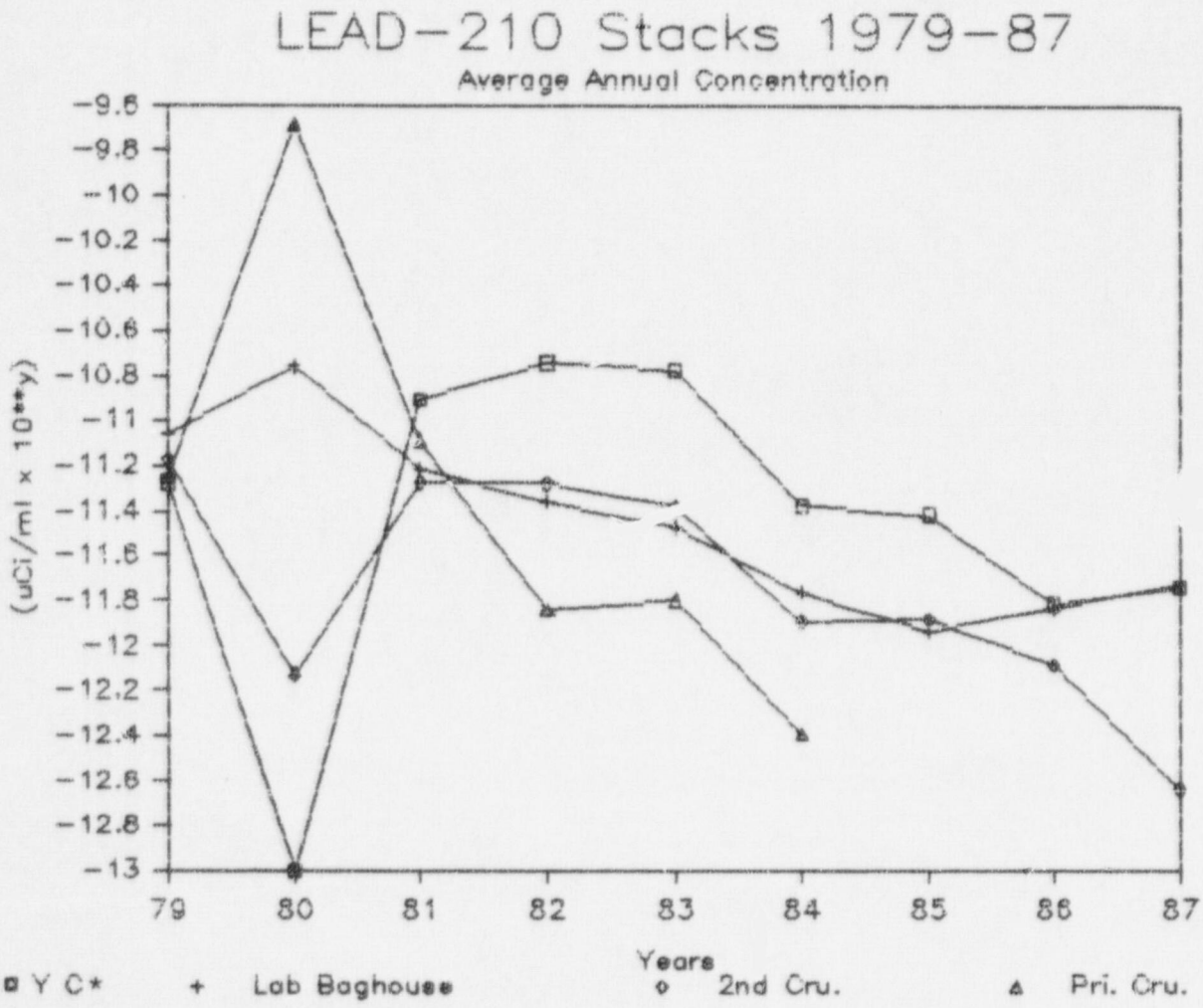
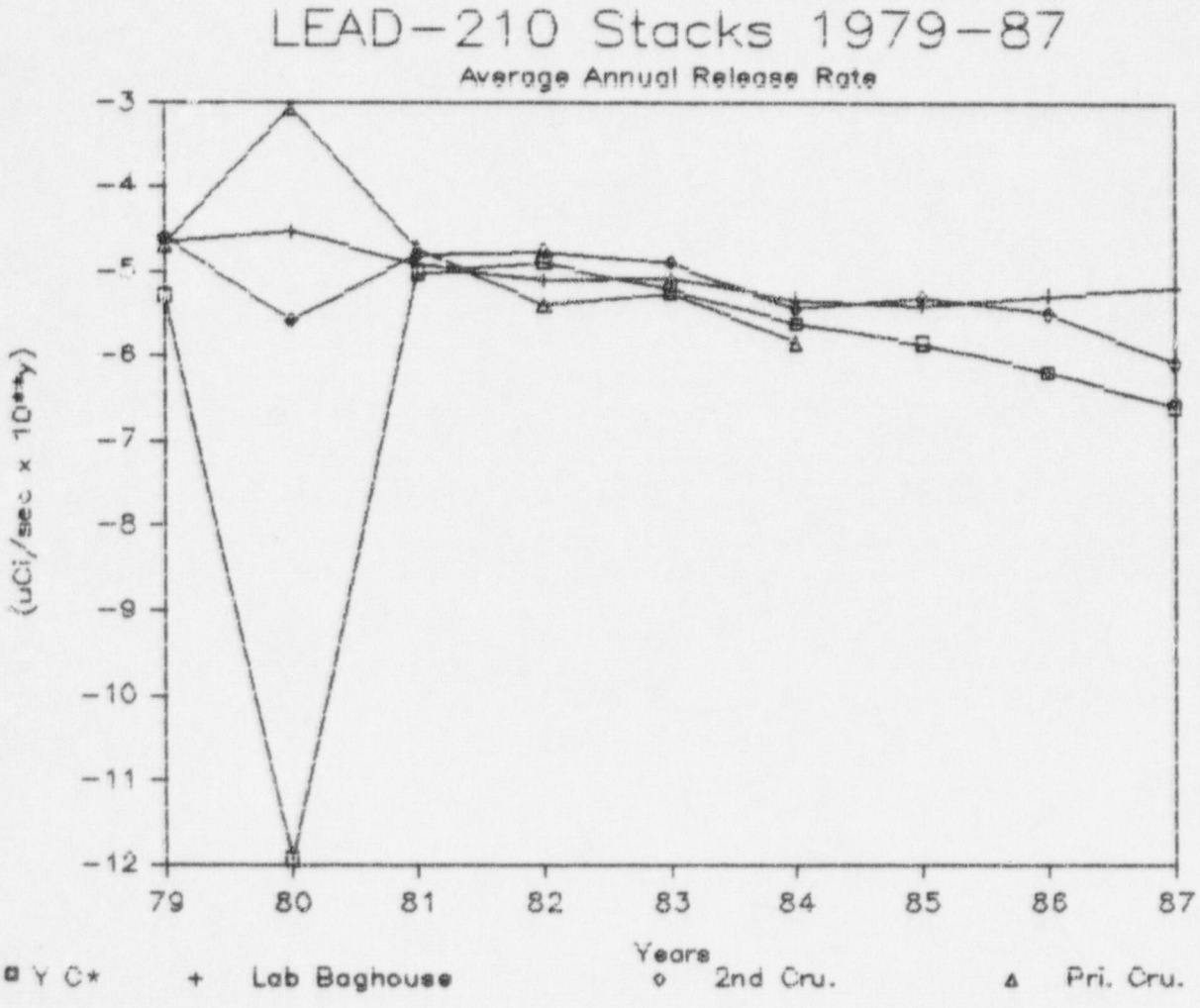

RADIUM-226 Stacks 1979-87
Average Annual Release Rate
(uCi/sec x 10**-y)
-3
-3.5
-4
-4.5
-5
-5.5
-6
-6.5
-7
79
80
81
82
83
84
85
86
87
Years
ø Y C
+ Lab Baghouse
o 2nd Cru.
Δ Pri. Cru.

FIGURE 5.7




*0.0 for 1980 Yellowcake stack plotted as $10^{-13}$.

FIGURE 5.8




*0.0 for 1980 Yellowcake stack plotted as $10^{-12}$.

FIGURE 5.9

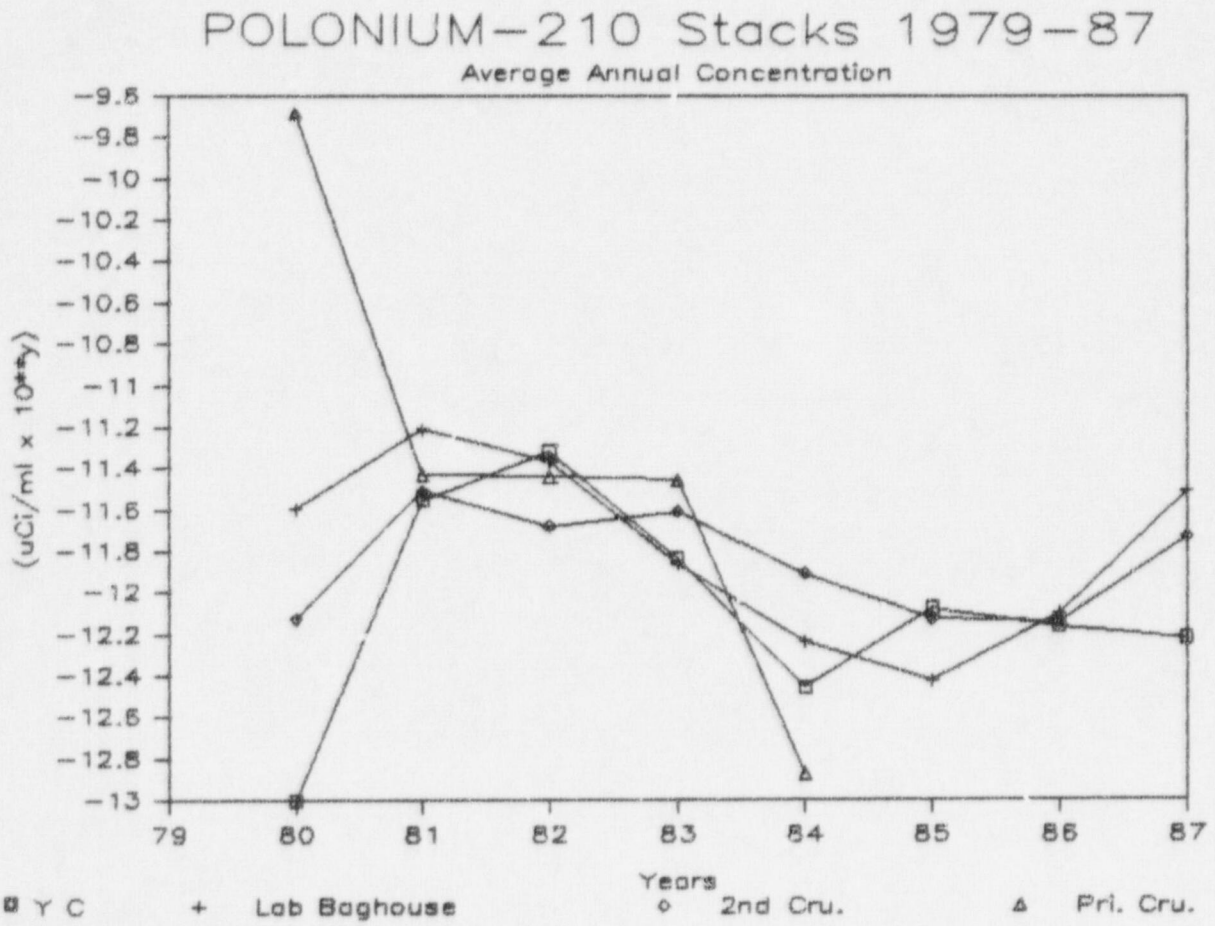
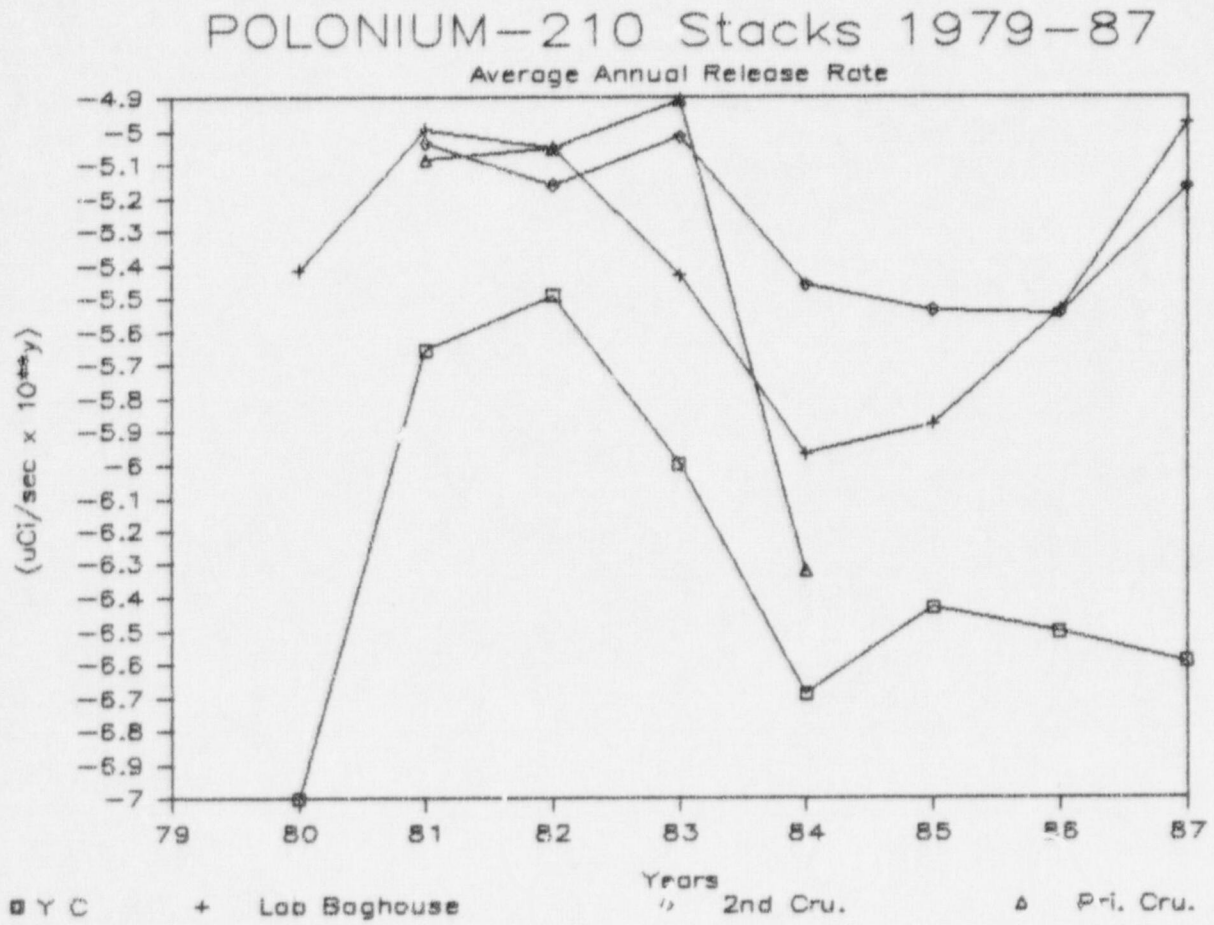

POLONIUM-210 Stacks 1979-87
Average Annual Concentration
(uCi/ml x 10**-y)
-9.6
-9.8
-10
-10.2
-10.4
-10.6
-10.8
-11
-11.2
-11.4
-11.6
-11.8
-12
-12.2
-12.4
-12.6
-12.8
-13
79
80
81
82
83
84
85
86
87
Years
Y C
Lab Baghouse
2nd Cru.
Pri. Cru.

FIGURE 5.10


POLONIUM-210 Stacks 1979-87
Average Annual Release Rate
(uCi/sec x 10**-7)
-4.9
-5
-5.1
-5.2
-5.3
-5.4
-5.5
-5.6
-5.7
-5.8
-5.9
-6
-6.1
-6.2
-6.3
-6.4
-6.5
-6.6
-6.7
-6.8
-6.9
-7
79
80
81
82
83
84
85
86
87
Years
Y C
Lab Baghouse
2nd Cru.
Pri. Cru.

6.0 - AIRBORNE RADIOACTIVITY CONCENTRATIONS - WORK STATION EMPLOYEE EXPOSURE - ANNUAL REPORT

6.1 - SAMPLING FOR RADIOACTIVE PARTICULATE AND WORKER BREATHING ZONE SAMPLING

LICENSE CONDITIONS 26.1 AND 26.2

Cotter collects air samples on a weekly basis at work stations within the yellowcake calcining/packaging area along with supplemental breathing zone samples to check the validity of the work station samples. Air samples also are collected on a monthly basis in other process and storage locations within the mill to determine airborne uranium concentrations. In February, due to the mill shutdown, air samples were collected in accordance with License Amendment #19; and in April, in accordance with License Amendment #23 which superseded #19. Air samples were collected from February through December on a quarterly basis within the constraints of Amendments #19 and #23.

The data representative of the calciner enclosure show that of the 19 samples collected, three (15.8%) exceeded MPC. A comparison to 1986 data is inappropriate since the mill only operated for two weeks in 1987. Samples collected within twenty-four hours of the incident that caused the elevated levels indicated a return to normal airborne concentration levels of <25% of MPC. Summary data for these locations and all other general air sample locations are presented in Tables 6.1 and 6.2.

The increased concentrations observed at sample locations in the calciner enclosure, as compared to sample results for December, 1986, reflect problems encountered with the calciner hammer mill and spillage when plugging in the hammer mill occurred. It should be noted that these problems occurred after the mill employees had been notified of their pending layoff and this notification may have contributed to these problems.

Evaluation of the data representative of the Bird Centrifuge Area (UV-35) indicates that one of the 13 samples collected exceeded MPC. A comparison to 1986 data is inappropriate since the mill operated for only two weeks in 1987.

Supplemental routine breathing zone samples are collected on a monthly basis for selected workers throughout the mill, including workers in the calcining/packaging area. A summary of these results is presented in Table 6.3.

Evaluation of the four breathing zone samples taken in the yellowcake product area shows that one sample (25%) exceeded MPC and the remaining three samples exceeded 25% of MPC. Breathing

zone sample results for the yellowcake product area reflect problems associated with the calciner hammer mill plugging. The two samples collected in April were associated with cleanup operations that involved the handling of yellowcake. A comparison of January breathing zone samples to area airborne particulate samples collected at the same time indicates a direct correlation of breathing zone to general air samples.

Breathing zone results for 1987 cannot be compared to those from 1986 because a majority of the 1987 samples were taken during the mill shut down.

Cotter plans to continue work station and breathing zone air sample programs as described in its letter to the Division dated February 24, 1987.

PROGRAM - LAB032

GENERAL AIR SAMPLE (IN PLANT) FOR AIRBORNE PARTICULATES
(MICROCURIES PER MILLILITER) FOR CALENDAR YEAR 1987

RUN DATE 2/04/88
TIME 9:21:29

| LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0126 | 7.87E-13 | 3.58E-13 | 2.36E-13 | | | 7.52E-13 | | | 1.44E-12 | | | 3.95E-13 |
| 0127 | 3.53E-13 | 1.78E-13 | 2.95E-13 | | | 4.27E-13 | | | 1.76E-12 | | | 4.41E-13 |
| 0128 | 9.96E-13 | 3.35E-12 | 4.97E-13 | | | 8.74E-13 | | | 1.42E-12 | | | 2.32E-13 |
| 0129 | 7.52E-13 | 4.40E-12 | 6.99E-13 | | | 5.47E-13 | | | 9.85E-13 | | | 9.14E-13 |
| 0130 | 8.74E-13 | 5.15E-13 | 6.77E-13 | | | 4.21E-13 | | | <1.82E-13 | | | 4.93E-13 |
| 0131 | 4.05E-12 | 4.57E-13 | 4.07E-13 | | | 1.83E-13 | | | 1.23E-12 | | | 5.92E-13 |
| 0132 | 3.77E-12 | 4.51E-13 | | <3.64E-13 | | | <3.22E-13 | | | 4.01E-13 | | |
| 0133 | 6.45E-12 | 6.94E-13 | | <2.01E-13 | | | <2.13E-13 | | | 1.07E-12 | | |
| 0134 | 8.46E-12 | 9.58E-13 | | 1.81E-13 | | | 1.88E-13 | | | 9.13E-13 | | |
| 0135 | 7.28E-12 | 4.57E-13 | | | | | | | | | | |
| 0136 | 2.96E-12 | 6.04E-13 | | 8.46E-13 | | | 2.09E-13 | | | | | |
| 0137 | 2.91E-12 | 6.69E-13 | | <3.32E-13 | | | 5.74E-13 | | | 4.58E-13 | | |
| 0138 | 2.48E-12 | 3.96E-13 | | 6.15E-13 | | | <1.03E-13 | | | 4.61E-13 | | |
| 0139 | 1.01E-12 | 8.41E-13 | | 6.19E-13 | | | 7.76E-13 | | | 3.25E-13 | | |
| 0140 | 2.12E-12 | 3.98E-13 | 2.12E-12 | 5.42E-13 | <2.40E-14 | <1.34E-13 | 2.01E-13 | | | 3.33E-13 | | |
| 0141 | 5.75E-13 | 2.48E-12 | | 7.72E-13 | | | <3.76E-13 | | | 5.19E-13 | | |
| 0142 | 1.63E-12 | 3.87E-12 | | 1.60E-12 | | | 1.98E-13 | | | 2.41E-13 | | |
| 0143 | 1.03E-12 | 3.01E-12 | | 3.69E-13 | | | 1.49E-13 | | | 1.48E-13 | | |
| 0144 | 1.35E-12 | 3.29E-12 | | 4.18E-13 | | | <1.03E-13 | | | 2.98E-13 | | |
| 0145 | 1.13E-12 | 5.42E-12 | | | 1.80E-13 | | | 1.00E-12 | 2.62E-13 | | 2.26E-13 | |
| 0146 | 2.12E-12 | 6.08E-12 | | | 3.53E-13 | | | 3.32E-13 | 3.71E-12 | | 2.20E-13 | |
| 0147 | 2.13E-12 | 2.26E-12 | | | 3.96E-13 | | | 7.52E-13 | 5.64E-13 | | 1.34E-13 | |
| 0148 | 2.78E-12 | | | | 2.06E-13 | | | | | | | |
| 0149 | 3.50E-12 | 2.13E-12 | | | 2.98E-13 | | | 5.10E-13 | | | 6.06E-13 | |
| 0151 | 3.61E-11<br>1.15E-11<br>1.32E-12<br>6.86E-09<br>2.26E-11 | 5.31E-12 | | | | | | | | | | |
| 0152 | 1.14E-11 | 1.36E-12 | | | 1.13E-12 | | | 6.35E-13 | | | 1.89E-13 | |

PROGRAM - LAB032

GENERAL AIR SAMPLE (IN PLANT) FOR AIRBORNE PARTICULATES
(MICROCURIES PER MILLILETER) FOR CALENDAR YEAR 1987

RUN DATE 2/04/88
TIME 9:21:29

| LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0153 | 1.33E-12 | 6.87E-13 | 1.24E-12 | | 1.82E-12 | | | 1.92E-12 | | | 5.57E-13 | |
| 0154 | 8.46E-13 | 9.74E-13 | 9.67E-13 | | 1.15E-12 | | | 2.48E-12 | | | 1.42E-12 | |
| 0155 | 1.59E-12 | 1.62E-12 | 1.28E-12 | | | <1.36E-13 | | | 9.93E-13 | | | 2.37E-13 |
| 0156 | 4.96E-12<br>1.18E-11<br>1.95E-12<br>8.78E-09<br>9.03E-12 | 7.22E-12 | | | | | | | | | | |
| 0157 | 7.21E-13 | 2.68E-13 | 1.15E-12 | <2.89E-13 | 2.26E-13 | 2.58E-13 | 4.75E-13<br>7.92E-13 | | 3.22E-13 | | | 5.64E-13 |
| 0158 | 3.96E-12 | 1.81E-13 | 5.45E-13 | <3.53E-13 | 2.71E-13 | 1.02E-12 | 6.71E-13<br>8.69E-13 | | 3.82E-13 | | | 2.26E-13 |
| 0159 | 7.52E-13 | 1.20E-13 | 2.32E-13 | <3.42E-13 | 3.68E-13 | 2.94E-13 | 2.17E-13 | | <1.10E-13 | | | 2.03E-13 |
| 0161 | 2.48E-12 | 4.23E-13 | | | 1.18E-12 | | | 4.57E-12 | | | 1.54E-13 | |
| 0162 | 7.24E-13 | 6.82E-13 | 7.96E-13 | <3.76E-13 | 4.18E-13 | 2.26E-13 | 2.97E-13 | | | | | 4.83E-13 |
| 0163 | 1.97E-12 | 7.52E-13 | 2.37E-12 | 8.10E-13 | 4.37E-13 | <2.75E-13 | 6.90E-13 | | | 2.28E-13 | | |
| 0165 | 1.78E-12 | 1.62E-12 | 4.23E-13 | 2.63E-12 | 6.02E-13 | 8.74E-13 | | | 7.19E-13 | | | 2.56E-13 |
| 0166 | 3.36E-13 | 6.83E-13 | 7.09E-13 | | | <3.64E-13 | | | 4.06E-13 | | | 5.78E-13 |
| 0168 | 9.58E-14 | 1.54E-14 | 4.74E-15 | | | 1.57E-14 | | | 1.10E-14 | | | 5.98E-15 |
| 0169 | 7.32E-13 | 6.15E-13 | 3.28E-13 | 4.51E-13 | 1.47E-12 | <1.10E-13 | 1.61E-13 | | | | | 1.67E-13 |
| 0170 | | | | 9.50E-13 | | | | | | | | |
| 0181 | 5.70E-12<br>1.17E-11<br>3.16E-12<br>6.46E-10<br>1.23E-11 | 3.22E-12<br>1.69E-12<br>5.96E-13<br>4.51E-12 | 5.85E-13 | | 1.48E-13 | | | 5.31E-13 | | | 9.33E-13 | |
| 0182 | 1.50E-12 | | | | | 2.10E-13 | | | | 1.27E-13 | | |
| 0183 | 1.30E-12 | 2.77E-12 | | | 3.76E-13 | | | 2.72E-12 | 2.65E-13 | | 5.10E-13 | |
| 0185 | 8.78E-13 | 1.09E-12 | 2.44E-13 | | | 8.74E-13 | | | 8.65E-13 | | | 3.88E-13 |
| 0186 | 9.74E-13 | 9.26E-13 | 1.72E-13 | | | 1.09E-12 | | | 4.60E-13 | | | 8.38E-13 |
| 0193 | 2.84E-12 | 1.32E-12 | | | 2.56E-13 | | | 3.53E-13 | | | 2.26E-13 | |
| 0203 | 3.82E-12 | 8.39E-13 | 7.08E-13 | 2.64E-13 | 5.94E-13 | <2.51E-13 | 1.68E-13 | | <1.11E-13 | | | 2.41E-13 |
| 0204 | 1.47E-11 | 9.48E-12 | | | 2.22E-13 | | | | | | | |

PROGRAM - LAB032

GENERAL AIR SAMPLE (IN PLANT) FOR AIRBORNE PARTICULATES
(MICROCURIES PER MILLILETER) FOR CALENDAR YEAR 1987

RUN DATE 2/04/88
TIME 9:21:29

| LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.48E-12 | | | | | | | | | | | |
| | 1.02E-12 | | | | | | | | | | | |
| | 5.20E-09 | | | | | | | | | | | |
| | 2.11E-11 | | | | | | | | | | | |
| 0205 | 7.18E-13 | 2.08E-12 | 5.40E-13 | <1.52E-13 | 1.09E-12 | <2.09E-13 | 3.66E-13 | 5.70E-13 | 3.16E-13 | 4.31E-13 | 1.35E-13 | 4.20E-13 |
| 0206 | 1.50E-12 | 1.34E-13 | 1.25E-12 | 9.96E-13 | 7.39E-13 | 4.34E-13 | 3.22E-13 | | | 4.00E-13 | | |
| 0208 | 8.18E-13 | 7.74E-13 | 5.64E-13 | <3.76E-13 | 9.87E-13 | <3.76E-13 | 3.56E-13 | | | | | 4.15E-13 |
| 0210 | 1.31E-12 | | | | 2.88E-12 | 5.64E-13 | 4.45E-13 | <1.71E-13 | 2.39E-12 | 4.11E-13 | 7.52E-14 | 1.63E-13 |
| 0211 | | | 3.88E-13 | | | | | | | | | |

PROGRAM - LAB309

COTTER CORPORATION
GENERAL AIR SAMPLES (SELECTED LOCATIONS) FOR 1987

RUN DATE 02/05/88

UU20-CALCINER ENCLOSURE CENTER LEVEL

| SAMPLE DATE | RESULTS uCi/ml |
|---|---|
| 01/07/87 | 3.61E-11 |
| 01/13/87 | 1.15E-11 |
| 01/23/87 | 1.32E-12 |
| 01/27/87 | 6.86E-09 |
| 01/28/87 | 2.26E- 1 |
| 02/04/87 | 5.31E-_2 |

PROGRAM - LAB309 COTTER CORPORATION RUN DATE 02/05/88
GENERAL AIR SAMPLES (SELECTED LOCATIONS) FOR 1987

UV25-CALCINER ENCLOSURE UPPER LEVEL

| SAMPLE DATE | RESULTS uCi/ml |
|---|---|
| 01/07/87 | 4.96E-12 |
| 01/13/87 | 1.18E-11 |
| 01/23/87 | 1.95E-12 |
| 01/27/87 | 8.78E-09 |
| 01/28/87 | 9.03E-12 |
| 02/04/87 | 7.22E-12 |

PROGRAM - LAB309 COTTER CORPORATION RUN DATE 02/05/88

GENERAL AIR SAMPLES (SELECTED LOCATIONS) FOR 1987

UV35-BIRD CENTRIFUGE AREA

| SAMPLE DATE | RESULTS uCi/ml |
|---|---|
| 01/07/87 | 5.70E-12 |
| 01/13/87 | 1.17E-11 |
| 01/23/87 | 3.16E-12 |
| 01/27/87 | 6.46E-10 |
| 01/28/87 | 1.23E-11 |
| 02/04/87 | 3.22E-12 |
| 02/12/87 | 1.69E-12 |
| 02/19/87 | 5.96E-13 |
| 02/25/37 | 4.51E-12 |
| 03/04/87 | 5.85E-13 |
| 05/04/87 | 1.48E-13 |
| 08/04/87 | 5.31E-13 |
| 11/02/87 | 9.33E-13 |

PROGRAM - LAB309 COTTER CORPORATION RUN DATE 02/05/88

GENERAL AIR SAMPLES (SELECTED LOCATIONS) FOR 1987

UV41 -YELLOWCAKE DRYER LOWER LEVEL

| SAMPLE DATE | RESULTS uCi/ml |
|---|---|
| 01/07/87 | 1.47E-11 |
| 01/12/87 | 2.48E-12 |
| 01/23/87 | 1.02E-12 |
| 01/27/87 | 5.20E-09 |
| 01/28/87 | 2.11E-11 |
| 02/04/87 | 9.48E-12 |
| 05/04/87 | 2.22E-13 |

RUN DATE 2/04/88
TIME 9:26:26

COTTER CORPORATION
BREATHING ZONE SUMMARY FOR CALENDER YEAR 1987
NATURAL URANIUM CONCENTRATION (uCi/ml)

PROGRAM - LAB037
PAGE 1

| CATEGORY | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *** GENERAL MILL FOREMAN *** | | | | | | | | | | | | |
| 0101 | | | 1.34E-13 | | | | | | | | | |
| *** PRODUCT (YELLOWCAKE) *** | | | | | | | | | | | | |
| 0103 | 1.96E-10 | | | 8.92E-11 | | | | | | | | |
| | 2.52E-11 | | | 7.81E-11 | | | | | | | | |
| *** BALL MILL *** | | | | | | | | | | | | |
| 0104 | 3.11E-12 | | | | | | | | | | | |
| *** CRUSHER OPERATOR *** | | | | | | | | | | | | |
| 0201 | 1.60E-12 | | | | | | | | | | | |
| *** LOADER OPERATOR *** | | | | | | | | | | | | |
| 0202 | 3.24E-12 | | | | | | | | | | | |
| *** TRUCK OPERATOR *** | | | | | | | | | | | | |
| 0203 | 1.27E-12 | | | | | | | | | | | |
| *** MAINTENANCE - MECHAN *** | | | | | | | | | | | | |
| 0310 | | | | | | | | 1.47E-12 | | | | |
| *** ANALYTICAL LAB PERSO *** | | | | | | | | | | | | |
| 0404 | | <3.49E-14 | | | | | 2.73E-12 | | 3.57E-12 | 9.17E-12 | | |
| *** LABORERS *** | | | | | | | | | | | | |
| 0505 | | | | | | <2.38E-12 | | | | | | |

MPC = PRECIP-DRYER OPERATOR 1E-10 uCi/ml
ALL OTHERS 5E-11 uCi/ml

6.2 - MONTHLY RADON DAUGHTER CONCENTRATIONS AT WORK STATIONS - ANNUAL REPORT

LICENSE CONDITION 26.3

Cotter Corporation collected air samples at selected process areas on a monthly basis for the first two months of the first quarter and on a quarterly basis for the remainder of the year. These samples were taken to determine radon daughter concentrations. The sampling frequency was reduced due to the shutdown of milling operations as approved by the Colorado Department of Health in License Amendments #19 and #23. License Amendment #23, issued on March 23, 1987, and superseded License Amendment #19. Sampling conducted in February was in accordance with Amendment #19; sampling in accordance with Amendment #23 began in April.

Samples were collected at the following locations on a monthly basis beginning in February, 1982:

RD-1 Primary Crusher (Middle level)

RD-2 Secondary Crusher (Lower level)

RD-3 Secondary Crusher (Upper level)

RD-4 Fine Ore Bins (Lower level)

RD-5 Fine Ore Bins (Upper level)

RD-6 New Sample Plant

RD-7 Met Lab

RD-8 Sample Preparation

RD-9 Grind-Leach Building

RD-10 Environmental Laboratory

RD-11 Sample Shed

In addition to these routine samples, two samples are collected on a quarterly basis as an ALARA philosophy function. These samples are used to evaluate radon daughter concentrations in nonroutine sampling locations. (See Radiological Health and Safety Procedures 2-6.)

Radon daughter sampling in 1987 consisted of a total of 96 samples, a decrease of 169 over the number of samples taken in 1986, and included 12 samples taken in the secondary impoundment area. The radon daughter concentration data presented in Table 6.4 show that nine of the 96 samples collected exceeded MPC (0.333WL). None of the remaining samples exceeded 25% of MPC. All nine samples exceeding MPC were collected at the Top of the Fine Ore Bins after the mill was shut down. This area is entered only by Radiation Safety personnel for the purpose of obtaining samples and has been secured since September, 1987. The elevated levels are caused by the residual ore in the bins and the shut down of the bin ventilation system.

6.2 - MONTHLY RADON DAUGHTER CONCENTRATIONS AT WORK STATIONS - ANNUAL REPORT

LICENSE CONDITION 26.3



The following is a summary of the radon daughter data for 1987 compared to 1986:

RADON DAUGHTER CONCENTRATION (WL) (% MPC)

| LOCATION | 1987 | 1986 |
|---|---|---|
| Secondary Crusher | 0.019 (5.7) | 0.015 (4.5) |
| Fine Ore Bins | 0.564 (169.2)* | 0.010 (3.0) |
| Sample Prep | 0.007 (2.1) | 0.007 (2.1) |
| Met Lab | 0.019 (5.7) | 0.017 (5.1) |
| Sample Plant | 0.005 (1.5) | 0.006 (1.8) |
| Grind-Leach | 0.046 (13.8) | 0.031 (9.3) |

*The average concentration at the Top of the Fine Ore Bins was 0.863 WL (258.9%). The average concentration at the Bottom of the Fine Ore Bins was 0.027WL (8.1%).

Cotter plans to continue radon daughter sampling in 1988 as specified in mill license requirements.

PROGRAM - LAB112

COTTER CORPORATION

1987 RADON DAUGHTER SAMPLE RESULTS YEAR TO DATE (Working Levels)

RUN DATE 02/04/88
TIME 09:44:59

| LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRIMARY CRUSHER (MIDDLE LEVEL) | <.003 | <.006 | | | <.005 | | <.005 | | | 0.007 | | |
| SAMPLE SHED | <.005 | 0.013 | | | <.005 | | <.005 | | | 0.008 | | |
| SECONDARY CRUSHER (UPPER LEVEL) | 0.029 | 0.014 | | | | | | | | | | |
| SECONDARY CRUSHER (LOWER LEVEL) | 0.012 | 0.010 | | 0.020 | | | 0.009 | | | 0.041 | | |
| FINE ORE BINS (UPPER LEVEL) | <.005 | 1.15<br>1.18<br>1.23<br>0.491 | | 1.29 | 0.656 | | 0.667<br>0.616 | 1.041 | | | | |
| FINE ORE BINS (LOWER LEVEL) | 0.008 | 0.008 | | 0.047 | | | 0.063 | | | <.011 | | |
| COUNTER CURRENT DECANTATION BUILDING | | | | | | | | | | <.004 | | |
| SOLVENT EXTRACTION BUILDING | | | | <.005 | | | | 0.011 | | | | |
| SAMPLE PREPARATION | 0.006 | <.008 | | 0.010 | | | <.005 | | | <.008 | | 0.010 |
| MET. LAB | 0.011 | 0.026 | | | 0.027 | | 0.014 | 0.034 | | 0.011 | | 0.012 |
| MAINTENANCE SHOP | | | | <.005 | | | | | | <.051 | | <.007 |
| NEW SAMPLE PLANT | <.004 | <.006 | | | <.006 | | 0.005 | | | <.J05 | | |
| CHANGE HOUSE | | | | | | | 0.018 | | | | | |
| PRODUCT BUILDING (BARREL STORAGE AREA) | | | | | | | 0.010 | | | | | |
| ENVIRONMENTAL LABORATORY | <.004 | <.008 | | <.005 | | | <.005 | | | <.005 | | |
| GRIND LEACH BLDG. | 0.043 | 0.068 | | 0.070 | 0.076 | | 0.017 | 0.032 | | 0.018 | 0.034 | 0.018 |
| REAGENT BUILDING | 0.008 | | | | | | | | | | | |
| LABOR LUNCHROOM | | <.007 | | | | | | | | | | |
| GRIND LEACH BLDG. WEST (UPPER LEVEL) | 0.065 | | | | | | | | | | | |
| GRIND LEACH BLDG. EAST (UPPER LEVEL) | 0.065 | | | | | | | | | | | |
| GRIND LEACH BLDG. CONTROL ROOM | | | | | | | | 0.050 | | | | |
| RUBBER SHOP | | | | | | | | | | 0.007 | | |
| ELECTRICIANS' LUNCHROOM | | | | | | | | | <.006 | | | |
| SALVAGE SHOP | | | | | | | | | 0.016 | | | |
| WAREHOUSE | 0.030 | | | | | | | 0.004 | | | | |

PROGRAM - LAB112

COTTER CORPORATION

1987 RADON DAUGHTER SAMPLE RESULTS YEAR TO DATE (Working Levels)

RUN DATE 02/04/88

TIME 09:48:56

| LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SCS DAM AREA #1 | | | | | | | <.003 | | | | | |
| SCS DAM AREA #2 | | | | | | | <.003 | | | | | |
| SECONDARY IMPOUNDMENT | <.003 | <.005 | <.003 | <.003 | <.002 | <.005 | <.005 | <.005 | <.001 | <.001 | <.001 | <.006 |

MPC = 0.333 WL

## 6.3 - TIME WEIGHTED EXPOSURE STUDIES - ANNUAL REPORT LICENSE CONDITION 26.4

Due to the shutdown of the mill and subsequent layoff of mill personnel, a time study was not conducted in 1987.

## 7.1.1 - ENVIRONMENTAL TLD - ANNUAL REPORT

LICENSE CONDITION 27

Environmental Thermoluminescent Dosimeters are utilized at the following ten perimeter locations: at four fenceline boundaries (north, south, east and west), at three locations in the proposed area of the now defunct OroVerde development, at one Lincoln Park residence, at the Shadow Hills Golf Club and at one Canon City residence. Results of this monitoring are presented in Tables 7.1 and 7.2, and in Figures 7.1 and 7.2 and are indications of external radiation exposure.

Evaluation of these data indicates a narrow range of exposure rates. Based on yearly average exposures rates, the locations showed a downtrend, except for Shadow Hills which exceeded the 1986 level and OroVerde #1 which was equal to the 1986 level.

TABLE 7.1

PROGRAM - LAB304

COTTER CORPORATION
ENVIRONMENTAL TLD FOR 1987

RUN DATE 02/05/88

| LOCATION | EXPOSURE RATE (uR/hr) 1ST QTR | 2ND QTR | 3RD QTR | 4TH QTR |
|---|---|---|---|---|
| AS201 SHADOW HILLS GOLF COURSE | 15.3 | 10.0 | 12.2 | 10.7 |
| AS202 E. QTR CORNER SECTION 16 | 13.0 | 11.8 | 14.3 | 12.4 |
| AS203 S. QTR CORNER SECTION 16 | 13.5 | 11.9 | 12.0 | 12.7 |
| AS206 N. QTR CORNER SECTION 16 | 12.5 | 14.2 | 10.7 | 12.8 |
| AS204 W. QTR CORNER SECTION 16 | 12.3 | 13.2 | 10.0 | 14.7 |
| CANON CITY | 10.4 | 10.0 | 7.9 | 10.0 |
| LINCOLN PARK | 10.0 | 9.1 | 8.8 | 10.7 |
| ORO VERDE #1 | 12.5 | 12.9 | 9.8 | 13.9 |
| ORO VERDE #2 | 9.3 | 10.0 | 7.9 | 10.7 |
| ORO VERDE #3 | 10.0 | 11.0 | 9.0 | 11.4 |

TABLE 7.2

ANNUAL AVERAGE GAMMA EXPOSURE RATE
ENVIRONMENTAL TLD (μR/hr)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 EAST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 11.7 | 14.0 | 12.6 | 12.7 | | | | | 11.4 | 11.3 |
| 1980 | 11.6 | 13.4 | 11.7 | 12.9 | | | | | 11.4 | 10.4 |
| 1981 | 14.8 | 14.3 | 12.8 | 12.7 | | 15.4 | 11.6 | 12.3 | 12.3 | 10.6 |
| 1982 | 11.4 | 13.7 | 12.6 | 14.7 | 20.4 | 10.7 | 10.9 | 12.7 | 11.2 | 9.9 |
| 1983 | 12.2 | 13.6 | 12.6 | 14.2 | 15.6 | 10.6 | 11.4 | 12.0 | 11.6 | 10.6 |
| 1984 | 14.1 | 14.5 | 14.3 | 14.6 | 14.8 | 11.4 | 12.2 | 13.2 | 11.2 | 12.3 |
| 1985 | 12.6 | 14.3 | 13.5 | 14.5 | 14.8 | 10.4 | 11.3 | 12.3 | 11.2 | 10.5 |
| 1986 | 11.5 | 13.9 | 13.7 | 14.5 | 14.2 | 12.3 | 11.0 | 11.8 | 10.7 | 11.0 |
| 1987 | 12.1 | 12.9 | 12.5 | 12.6 | 12.6 | 12.3 | 9.5 | 10.4 | 9.7 | 9.6 |

FIGURE 7.1

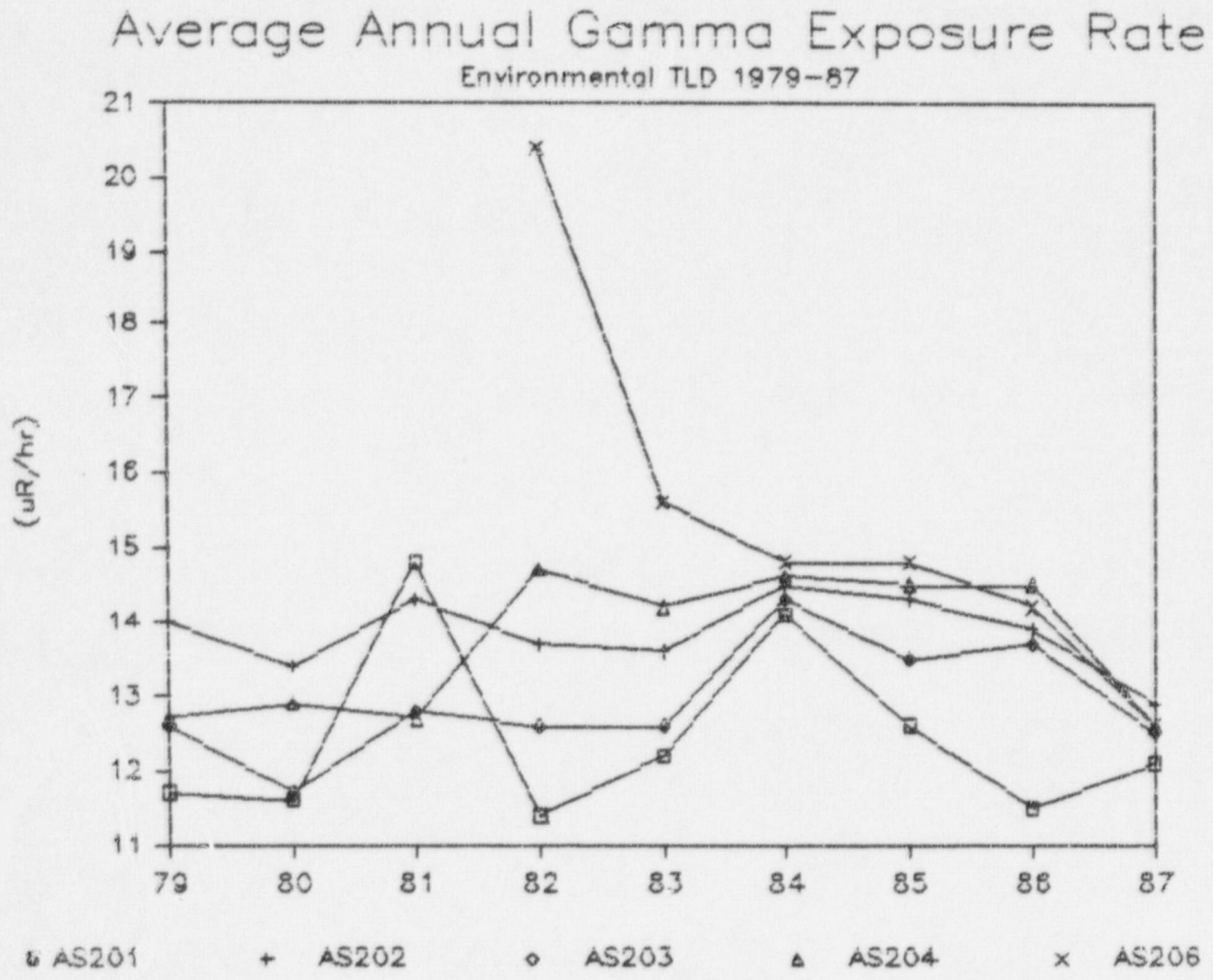
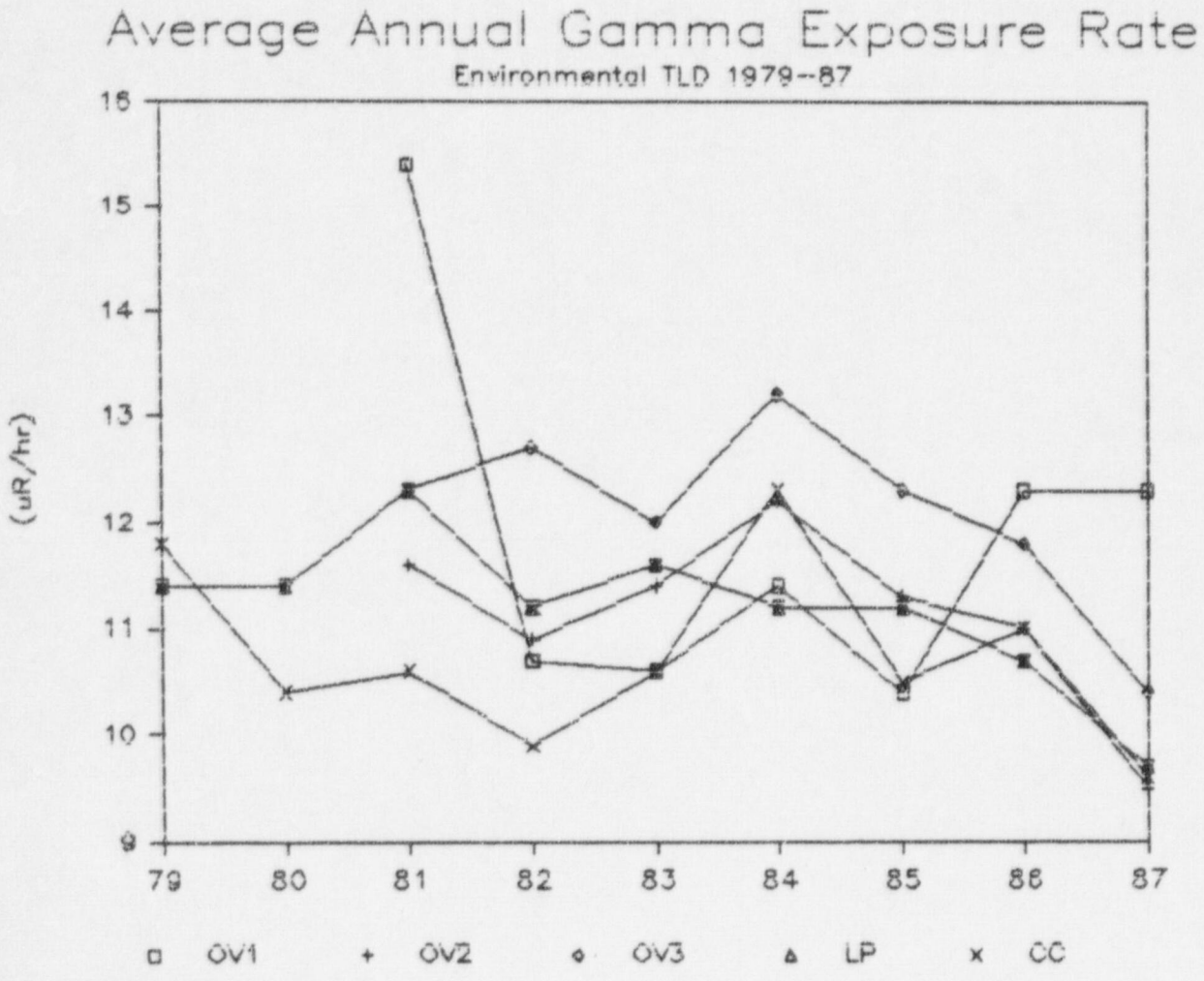

Average Annual Gamma Exposure Rate
Environmental TLD 1979-87
(uR/hr)
21
20
19
18
17
16
15
14
13
12
11
79
80
81
82
83
84
85
86
87
AS201
AS202
AS203
AS204
AS206

FIGURE 7.2


Average Annual Gamma Exposure Rate
Environmental TLD 1979--87
(uR/hr)
16
15
14
13
12
11
10
9
79
80
81
82
83
84
85
86
87
OV1
OV2
OV3
LP
CC

## 7.1.2 - RADON-222 - ANNUAL REPORT

### LICENSE CONDITION 27

Environmental Radon-222 concentrations were measured at the ten sampling locations described in Section 7.1.1 with the Track Etch (R) system utilizing Type M filters to subtract any Thoron contribution. Results for 1987 are summarized in Table 7.3 and Figures 7.3 and 7.4. Evaluation of these data with respect to previous data sets demonstrates a narrow range with boundary locations in one band, OroVerde locations in another band, and Canon City and Lincoln Park on either end of the spectrum.

TABLE 7

PROGRAM - LAB315 COTTER CORPORATION RUN DATE 02/05/88

RADON-222 REPORT FOR 1987 TIME 13:57:49

(pCi/m3)

| LOCATION | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0800 | SHADOW HILLS GOLF COURSE | | | 200 | | | 200 | | | 600 | | | 1300 |
| 0801 | EAST QUARTER CORNER SECTION 16 | | | 100 | | | 200 | | | 900 | | | 1900 |
| 0802 | SOUTH QUARTER CORNER SECTION 16 | | | 100 | | | 200 | | | 1000 | | | 1400 |
| 0803 | NORTH QUARTER CORNER SECTION 16 | | | 200 | | | 400 | | | 1200 | | | 1700 |
| 0804 | WEST QUARTER CORNER SECTION 16 | | | 200 | | | 400 | | | 1700 | | | 900 |
| 0805 | CANON CITY | | | 100 | | | 200 | | | 1300 | | | 1500 |
| 0806 | LINCOLN PARK | | | 100 | | | 300 | | | 800 | | | 400 |
| 0809 | ORO VERDE #1 | | | 400 | | | 100 | | | 600 | | | 800 |
| 081 | ORO VERDE #2 | | | 100 | | | 200 | | | | | | 1100 |
| 0811 | ORO VERDE #3 | | | 100 | | | 300 | | | 800 | | | 700 |

MPC = 3000 pCi/m3

TABLE 7.4

AVERAGE RADIONUCLIDE CONCENTRATIONS
ENVIRONMENTAL RADON-222
(μCi/ml)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 3.30E-10 | 4.20E-10 | 4.65E-10 | 7.85E-10 | | | | | | 7.07E-10 |
| 1980 | 3.50E-10 | 3.30E-10 | 2.50E-10 | 2.40E-10 | | | | | 2.93E-10 | 3.10E-10 |
| 1981 | 4.40E-10 *(6.13E-10) | 3.80E-10 (5.15E-10) | 3.78E-10 (5.88E-10) | 5.20E-10 (6.93E-10) | 9.70E-10 | 3.55E-10 | 2.94E-10 | 3.95E-10 | 2.60E-10 | 2.60E-10 |
| 1982 | 5.84E-10 *(7.15E-10) | 4.7E-10 (5.45E-10) | 5.79E-10 (7.23E-10) | 2.30E-9 (2.46E-9) | 1.09E-9 | 6.00E-10 | 3.30E-10 | 5.76E-10 | 1.04E-9 | 6.57E-10 |
| 1983 | 8.03E-10 | 9.16E-10 | 7.05E-10 | 8.75E-10 | 1.19E-9 | 3.65E-10 | 8.22E-10 | 6.48E-10 | 4.92E-10 | 4.19E-10 |
| 1984 | 8.20E-10 | 6.10E-10 | 7.20E-10 | 6.50E-10 | 6.50E-10 | 5.17E-10 | 3.36E-10 | 8.95E-10 | 5.44E-10 | 4.14E-10 |
| 1985 | 5.85E-10 | 6.60E-10 | 6.90E-10 | 8.20E-10 | 8.30E-10 | 4.70E-10 | 6.58E-10 | 5.72E-10 | 4.70E-10 | 5.60E-10 |
| 1986 | 2.25E-9 **(6.60E-10) | 1.94E-9 (7.50E-10) | 1.51E-9 (5.80E-10) | 1.44E-9 (7.80E-10) | 1.09E-9 (6.00E-10) | 1.67E-9 (5.95E-10) | 2.04E-9 (3.80E-10) | 1.05E-9 (3.70 E-10) | 1.37E-9 (6.90E-10) | 1.25E-9 (7.90E-10) |
| 1987 | 5.75E-10 | 7.75E-10 | 6.75E-10 | 8.00E-10 | 8.75E-10 | 4.75E-10 | 4.67E-10 | 4.75E-10 | 4.00E-10 | 7.75E-10 |

*The figures in parentheses for the year 1981 and 1982 are the average utilizing the passive radon monitor results during the transition to new monitoring techniques.

**Average of second, third and fourth quarters only.

MPC = 3E-9

FIGURE 7.3

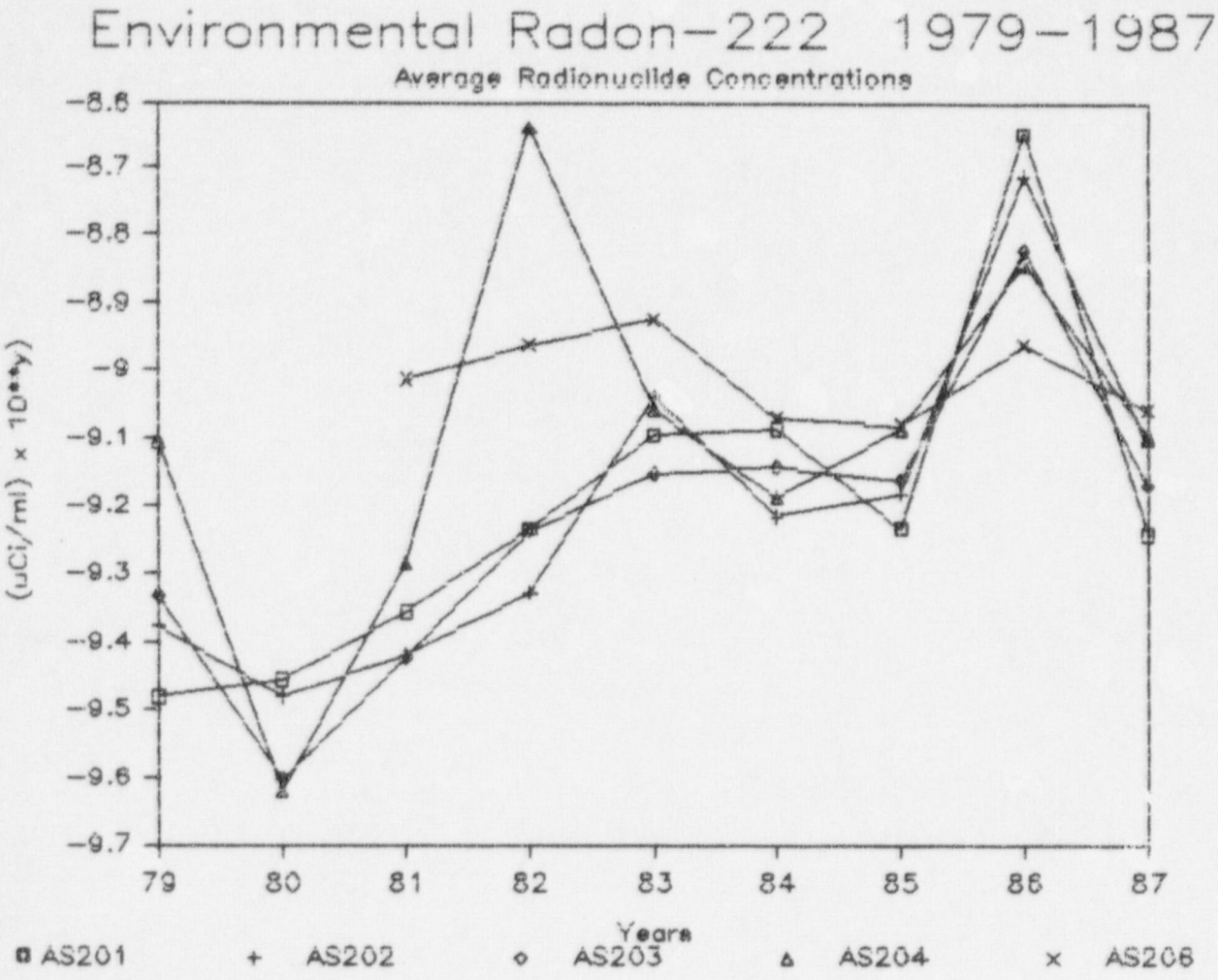
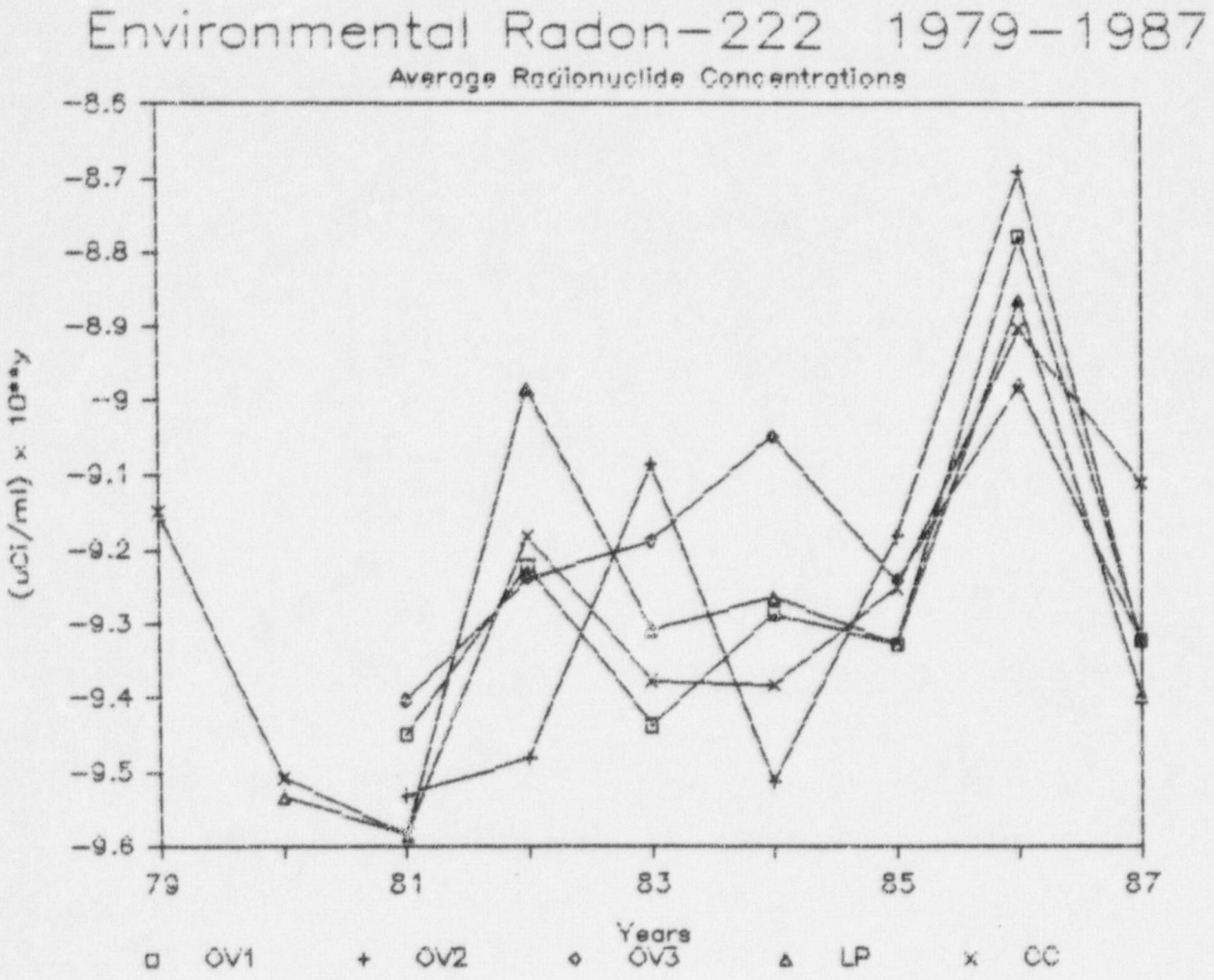

Environmental Radon-222 1979-1987
Average Radionuclide Concentrations
(uCi/ml) x 10**y)
-8.6
-8.7
-8.8
-8.9
-9
-9.1
-9.2
-9.3
-9.4
-9.5
-9.6
-9.7
79
80
81
82
83
84
85
86
87
Years
AS201
AS202
AS203
AS204
AS206

FIGURE 7.4


Environmental Radon-222 1979-1987
Average Radionuclide Concentrations
(uCi/ml) x 10**-9
-8.6
-8.7
-8.8
-8.9
-9
-9.1
-9.2
-9.3
-9.4
-9.5
-9.6
79
81
83
85
87
Years
OV1
OV2
OV3
LP
CC

## 7.1.3 - ENVIRONMENTAL AIR PARTICULATES - ANNUAL REPORT

LICENSE CONDITION 27.1

Cotter Corporation operated continuous air particulate samplers at the following locations: at four boundaries (north, south, east and west), at three locations in the now defunct OroVerde development area, at one Lincoln Park residence, at the Shadow Hills Golf Course and at one Canon City residence.

Evaluation and analysis of these data indicate that no standards have been exceeded for the period of record. For 1987, all locations, except OroVerde #3, showed higher Natural Uranium ($^{Nat}U$) than for 1986, all averages were higher for Lead-210 ($^{210}Pb$) and Polonium-210 ($^{210}Po$). Thorium-230 ($^{230}Th$) and Radium-226 ($^{226}Ra$) averages were lower except for Radium-226 ($^{226}Ra$) at OroVerde #2.

Examination of these data suggests that mill operations have very little effect on environmental air concentrations. It should be noted that the Cotter Laboratory conducted all analysis for 1987.

Natural Uranium ($^{Nat}U$) concentrations for the first quarter 1987 were uniformly high and dropped off at most locations for each successive quarter. No explanation for this phenomenon is evident.

PROGRAM - LAB039 COTTER CORPORATION GENERAL AIR SURVEY U.RESTRICTED AREA RUN DATE 88/02/23 TIME 10:14:07

| LOCATION | | 1ST QUARTER 1987 | 2ND QUARTER 1987 | 3RD QUARTER 1987 | 4TH QUARTER 1987 |
|---|---|---|---|---|---|
| | | Nat U (uCi/ml) MPC = 5E-12 | | | |
| 0800 | AS201 SHADOW HILLS GOLF COURSE | 1.53E-15 | 6.78E-16 | 3.99E-16 | 2.67E-16 |
| 0801 | AS202 EAST QUARTER CORNER SECTION 16 | 1.89E-15 | 4.70E-16 | 2.78E-16 | 5.93E-16 |
| 0802 | AS203 SOUTH QUARTER CORNER SECTION 16 | 2.21E-15 | 8.66E-16 | 2.45E-16 | 8.00E-16 |
| 0803 | AS206 NORTH QUARTER CORNER SECTION 16 | 2.51E-15 | 8.24E-16 | 3.51E-16 | 5.06E-16 |
| 0804 | AS204 WEST QUARTER CORNER SECTION 16 | 1.87E-15 | 1.27E-15 | 7.77E-16 | 4.60E-16 |
| 0805 | CANON CITY | 1.11E-15 | 6.51E-16 | 2.81E-16 | 5.73E-17 |
| 0806 | LINCOLN PARK | 8.85E-16 | 5.09E-16 | 9.65E-17 | 3.74E-16 |
| 0809 | ORO VERDE #1 | 1.49E-15 | 3.07E-16 | 9.44E-17 | 1.91E-17 |
| 0810 | ORO VERDE #2 | 1.45E-15 | 3.08E-16 | 1.38E-16 | 3.83E-17 |
| 0811 | ORO VERDE #3 | 1.14E-15 | 3.83E-16 | 1.63E-16 | 1.53E-16 |
| 0812 | QUALITY CONTROL-OFFICE | 1.18E-15 | 2.26E-16 | 1.11E-16 | 1.91E-17 |
| 0813 | QUALITY CONTROL-TRUCK | 8.97E-16 | 2.26E-16 | 5.99E-17 | 9.54E-17 |
| | | Th230 (uCi/ml) MPC = 3E-13 | | | |
| 0800 | AS201 SHADOW HILLS GOLF COURSE | 5.29E-16 | 5.66E-16 | 1.05E-15 | 5.44E-16 |
| 0801 | AS202 EAST QUARTER CORNER SECTION 16 | 1.55E-15 | 9.86E-16 | 5.07E-16 | 1.78E-15 |
| 0802 | AS203 SOUTH QUARTER CORNER SECTION 16 | 2.51E-15 | 6.94E-16 | 4.24E-16 | 1.54E-15 |
| 0803 | AS206 NORTH QUARTER CORNER SECTION 16 | 1.19E-15 | 1.45E-15 | 8.95E-16 | 7.74E-16 |
| 0804 | AS204 WEST QUARTER CORNER SECTION 16 | 8.71E-16 | 2.37E-15 | 3.73E-15 | 2.15E-15 |
| 0805 | CANON CITY | 2.47E-16 | 1.72E-16 | 1.71E-16 | 1.18E-16 |
| 0806 | LINCOLN PARK | 2.22E-16 | 2.83E-16 | 1.35E-16 | 1.83E-16 |
| 0809 | ORO VERDE #1 | 2.28E-16 | 1.70E-16 | 1.88E-16 | 1.23E-16 |
| 0810 | ORO VERDE #2 | 1.45E-16 | 1.54E-16 | 1.83E-16 | 0.00E+00 |
| 0811 | ORO VERDE #3 | 1.34E-16 | 0.00E+00 | 1.42E-16 | 1.20E-16 |
| 0812 | QUALITY CONTROL-OFFICE | 2.38E-16 | 0.00E+00 | 5.06E-18 | 1.03E-16 |
| 0813 | QUALITY CONTROL-TRUCK | 1.23E-16 | 1.21E-16 | 0.00E+00 | 0.00E+00 |
| | | Ra226 (uCi/ml) MPC = 2E-12 | | | |
| 0800 | AS201 SHADOW HILLS GOLF COURSE | 4.12E-16 | 8.17E-16 | 4.35E-16 | 1.93E-16 |
| 0801 | AS202 EAST QUARTER CORNER SECTION 16 | 7.81E-16 | 3.26E-16 | 3.01E-16 | 9.54E-16 |
| 0802 | AS203 SOUTH QUARTER CORNER SECTION 16 | 1.28E-15 | 5.03E-16 | 2.34E-16 | 1.03E-15 |
| 0803 | AS206 NORTH QUARTER CORNER SECTION 16 | 7.42E-16 | 4.54E-16 | 3.43E-16 | 3.55E-16 |
| 0804 | AS204 WEST QUARTER CORNER SECTION 16 | 4.81E-16 | 1.59E-15 | 1.69E-15 | 1.01E-15 |
| 0805 | CANON CITY | 2.03E-16 | 1.59E-16 | 8.30E-17 | 1.69E-17 |
| 0806 | LINCOLN PARK | 3.12E-16 | 2.13E-16 | 1.11E-16 | 9.55E-17 |
| 0809 | ORO VERDE #1 | 1.99E-16 | 1.32E-16 | 1.51E-16 | 1.07E-16 |
| 0810 | ORO VERDE #2 | 2.98E-16 | 2.04E-16 | 1.74E-16 | 5.95E-17 |

PROGRAM - LAB039 COTTER CORPORATION GENERAL AIR SURVEY UNRESTRICTED AREA RUN DATE 88/02/23 TIME 10 15 56

| LOCATION | | 1ST QUARTER 1987 | 2ND QUARTER 1987 | 3RD QUARTER 1987 | 4TH QUARTER 1987 |
|---|---|---|---|---|---|
| 0811 | ORO VERDE #3 | 2.57E-16 | 1.44E-16 | 1.67E-16 | 1.08E-16 |
| 0812 | QUALITY CONTROL-OFFICE | 2.87E-16 | 6.53E-17 | 1.16E-16 | 3.52E-17 |
| 0813 | QUALITY CONTROL-TRUCK | 1.89E-16 | 9.46E-17 | 1.81E-16 | 0.00E+00 |
| | | Pb210 (uCi/ml) MPC = 8E-12 | | | |
| 0800 | AS201 SHADOW HILLS GOLF COURSE | 2.02E-14 | 1.48E-14 | 1.82E-14 | 2.39E-14 |
| 0801 | AS202 EAST QUARTER CORNER SECTION 16 | 2.16E-14 | 1.92E-14 | 1.32E-14 | 2.41E-14 |
| 0802 | AS203 SOUTH QUARTER CORNER SECTION 16 | 2.38E-14 | 1.86E-14 | 1.11E-14 | 2.33E-14 |
| 0803 | AS206 NORTH QUARTER CORNER SECTION 16 | 2.29E-14 | 2.03E-14 | 2.33E-14 | 2.76E-14 |
| 0804 | AS204 WEST QUARTER CORNER SECTION 16 | 2.68E-14 | 2.10E-14 | 1.95E-14 | 2.16E-14 |
| 0805 | CANON CITY | 2.23E-14 | 1.69E-14 | 2.04E-14 | 2.08E-14 |
| 0806 | LINCOLN PARK | 1.93E-14 | 1.84E-14 | 2.20E-14 | 2.69E-14 |
| 0809 | ORO VERDE #1 | 1.56E-14 | 1.91E-14 | 1.10E-14 | 3.57E-14 |
| 0810 | ORO VERDE #2 | 2.30E-14 | 1.71E-14 | 2.39E-14 | 2.36E-14 |
| 0811 | ORO VERDE #3 | 1.57E-14 | 5.37E-15 | 1.59E-14 | 2.04E-14 |
| 0812 | QUALITY CONTROL-OFFICE | 4.51E-16 | 0.00E+00 | 2.16E-16 | 5.82E-16 |
| 0813 | QUALITY CONTROL-TRUCK | 3.10E-16 | 5.46E-17 | 7.46E-17 | 1.51E-16 |
| | | Po210 (uCi/ml) MPC = 7E-12 | | | |
| 0800 | AS201 SHADOW HILLS GOLF COURSE | 8.65E-15 | 1.28E-14 | 1.36E-14 | 7.41E-15 |
| 0801 | AS202 EAST QUARTER CORNER SECTION 16 | 9.34E-15 | 1.63E-14 | 8.82E-15 | 8.71E-15 |
| 0802 | AS203 SOUTH QUARTER CORNER SECTION 16 | 1.12E-14 | 1.55E-14 | 6.68E-15 | 7.75E-15 |
| 0803 | AS206 NORTH QUARTER CORNER SECTION 16 | 9.80E-15 | 1.67E-14 | 1.61E-14 | 8.63E-15 |
| 0804 | AS204 WEST QUARTER CORNER SECTION 16 | 1.16E-14 | 1.93E-14 | 1.65E-14 | 8.34E-15 |
| 0805 | CANON CITY | 8.72E-15 | 1.37E-14 | 1.36E-14 | 6.87E-15 |
| 0806 | LINCOLN PARK | 9.87E-15 | 1.49E-14 | 1.40E-14 | 9.10E-15 |
| 0809 | ORO VERDE #1 | 7.17E-15 | 1.70E-14 | 7.19E-15 | 1.06E-14 |
| 0810 | ORO VERDE #2 | 9.17E-15 | 1.46E-14 | 1.45E-14 | 7.85E-15 |
| 0811 | ORO VERDE #3 | 7.96E-15 | 3.61E-15 | 1.44E-14 | 7.22E-15 |
| 0812 | QUALITY CONTROL-OFFICE | 3.10E-16 | 4.13E-17 | 0.00E+00 | 5.64E-18 |
| 0813 | QUALITY CONTROL-TRUCK | 3.10E-16 | 2.13E-17 | 0.00E+00 | 0.00E+00 |

TABLE 7.6

AVERAGE RADIONUCLIDE CONCENTRATIONS
ENVIRONMENTAL AIR PARTICULATES
NATURAL URANIUM (μCi/ml)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979* | 2.47E-15 | 6.19E-15 | 1.50E-15 | 2.26E-15 | | | | | | 1.00E-15 |
| 1980 | 3.61E-15 | 3.71E-15 | 1.55E-15 | 2.82E-15 | | | | | 8.36E-16 | 1.40E-15 |
| 1981 | 3.49E-15 | 4.07E-15 | 1.54E-15 | 5.28E-15 | 8.30E-15 | 2.57E-15 | 1.29E-15 | 1.37E-15 | 1.03E-15 | 1.02E-15 |
| 1982 | 1.06E-15 | 2.31E-15 | 1.26E-15 | 2.48E-14 | 2.79E-15 | 6.19E-16 | 4.96E-16 | 5.96E-16 | 5.28E-16 | 4.79E-16 |
| 1983 | 1.51E-15 | 1.26E-15 | 1.43E-15 | 1.32E-15 | 1.63E-15 | 5.17E-16 | 2.34E-15 | 5.03E-16 | 4.77E-16 | 6.86E-16 |
| 1984 | 5.03E-16 | 5.50E-16 | 7.65E-16 | 8.36E-16 | 1.52E-15 | 3.22E-16 | 3.56E-16 | 4.01E-16 | 2.78E-16 | 3.27E-16 |
| 1985 | 1.08E-15 | 1.42E-15 | 1.22E-15 | 3.96E-16 | 1.92E-15 | 5.53E-16 | 6.36E-15 | 6.66E-16 | 4.56E-16 | 5.77E-16 |
| 1986 | 4.84E-16 | 6.71E-16 | 6.56E-16 | 4.05E-16 | 9.36E-16 | 3.07E-16 | 3.03E-16 | 4.84E-16 | 2.95E-16 | 2.93E-16 |
| 1987 | 7.19E-16 | 8.08E-16 | 1.03E-15 | 1.09E-15 | 1.05E-15 | 4.78E-16 | 4.84E-16 | 4.60E-16 | 4.66E-16 | 5.12E-16 |

*4th Quarter only

TABLE 7.7

AVERAGE RADIONUCLIDE CONCENTRATIONS
ENVIRONMENTAL AIR PARTICULATES
THORIUM-230 (μCi/ml)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979* | 2.20E-15 | 2.33E-15 | 1.05E-15 | 8.08E-15 | | | | | | 3.07E-16 |
| 1980 | 3.15E-16 | 2.50E-16 | 8.76E-16 | 2.81E-16 | | | | | 8.17E-17 | 1.30E-16 |
| 1981 | 9.95E-16 | 2.60E-15 | 3.50E-15 | 3.00E-14 | 6.93E-15 | 2.00E-16 | 6.55E-16 | 3.25E-16 | 1.42E-16 | 8.17E-17 |
| 1982 | 4.04E-15 | 2.12E-14 | 1.94E-14 | 8.95E-14 | 1.26E-14 | 1.40E-15 | 2.21E-15 | 3.16E-15 | 7.49E-16 | 9.13E-16 |
| 1983 | 1.74E-15 | 5.86E-15 | 9.79E-15 | 5.64E-15 | 8.26E-15 | 5.13E-16 | 6.86E-16 | 1.07E-15 | 3.74E-16 | 3.12E-16 |
| 1984 | 9.74E-16 | 1.64E-15 | 2.98E-15 | 3.82E-15 | 6.35E-15 | 4.45E-16 | 3.59E-16 | 2.89E-16 | 2.69E-16 | 2.00E-16 |
| 1985 | 8.62E-16 | 1.84E-15 | 2.15E-15 | 4.86E-15 | 3.73E-15 | 2.85E-16 | 3.45E-16 | 2.64E-16 | 2.60E-16 | 2.64E-16 |
| 1986 | 1.19E-15 | 3.70E-15 | 5.55E-15 | 3.13E-15 | 4.68E-15 | 3.09E-16 | 3.00E-16 | 2.41E-16 | 3.70E-16 | 3.08E-16 |
| 1987 | 6.72E-16 | 1.21E-15 | 1.29E-15 | 2.28E-15 | 1.08E-15 | 1.92E-16 | 1.21E-16 | 9.90E-17 | 2.06E-16 | 1.77E-16 |

*4th Quarter Only

TABLE 7.8

AVERAGE RADIONUCLIDE CONCENTRATIONS
ENVIRONMENTAL AIR PARTICULATES
RADIUM-226 (μCi/ml)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 * | 1.24E-15 | 1.55E-15 | 3.75E-16 | 7.09E-15 | | | | | | 3.07E-16 |
| 1980 | 2.53E-15 | 3.61E-15 | 7.81E-16 | 1.62E-15 | | | | | 2.78E-16 | 1.58E-15 |
| 1981 | 4.36E-15 | 4.19E-15 | 2.35E-15 | 2.94E-15 | 2.96E-15 | 6.23E-16 | 4.84E-16 | 6.30E-16 | 3.79E-16 | 4.59E-16 |
| 1982 | 1.35E-15 | 6.50E-15 | 6.92E-15 | 3.81E-15 | 3.39E-14 | 7.30E-16 | 9.15E-16 | 1.25E-15 | 6.07E-16 | 4.02E-16 |
| 1983 | 1.04E-15 | 2.00E-15 | 5.08E-15 | 4.95E-15 | 2.85E-1[illegible] | [illegible].76E-16 | 3.46E-16 | 5.30E-16 | 9.42E-17 | 1.76E-16 |
| 1984 | 5.63E-16 | 1.11E-15 | 1.84E-15 | 3.63E-15 | 2.20E-15 | 2.03E-16 | 1.89E-16 | 1.87E-16 | 1.18E-16 | 1.67E-16 |
| 1985 | 1.53E-15 | 9.63E-16 | 1.11E-15 | 1.78E-15 | 1.97E-15 | 1.5[illegible]E-16 | 1.98E-16 | 1.39E-16 | 1.6[illegible]E-16 | 1.88E-16 |
| 1986 | 9.39E-16 | 1.47E-15 | 1.98E-15 | 1.61E-15 | 2.60E-15 | 2.52E-16 | 1.99E-16 | 2.22E-16 | 1.43E-16 | 3.45E-16 |
| 1987 | 4.64E-16 | 5.91E-16 | 7.62E-16 | 1.19E-15 | 4.74E-16 | 1.47E-16 | 2.16E-16 | 1.89E-16 | 1.83E-16 | 1.15E-16 |

*4th Quarter Only

TABLE 7.9

AVERAGE RADIONUCLIDE CONCENTRATIONS
ENVIRONMENTAL AIR PARTICULATES
LEAD-210 (μCi/ml)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 * | 1.95E-14 | 2.11E-14 | 1.65E 14 | 2.08E-14 | | | | | | 2.30E-14 |
| 1980 | 1.94E-14 | 1.81E-14 | 1.69E-14 | 1.25E-14 | | | | | 1.86E-14 | 1.98E-14 |
| 1981 | 2.34E-14 | 2.01E-14 | 1.72E-14 | 4.71E-14 | 2.34E-14 | 1.82E-14 | 1.24E-14 | 2.11E-14 | 1.57E-14 | 1.70E-14 |
| 1982 | 3.24E-14 | 3.87E-14 | 4.35E-14 | 9.94E-14 | 4.07E-14 | 3.07E-14 | 2.69E-14 | 4.05E-14 | 2.50E-14 | 3.31E-14 |
| 1983 | 9.85E-15 | 1.70E-14 | 1.73E-14 | 1.82E-14 | 1.95E-14 | 2.21E-14 | 1.73E-14 | 1.44E-14 | 1.29E-14 | 1.79E-14 |
| 1984 | 1.46E-14 | 1.44E-14 | 1.46E-14 | 1.60E-14 | 1.43E-14 | 1.20E-14 | 1.35E-14 | 1.48E-14 | 1.26E-14 | 1.15E-14 |
| 1985 | 1.00E-14 | 9.12E-15 | 8.12E-15 | 8.80E-15 | 9.30E-15 | 1.09E-14 | 9.01E-15 | 9.30E-15 | 9.97E-15 | 1.14E-14 |
| 1986 | 1.19E-14 | 1.26E-14 | 1.19E-14 | 1.12E-14 | 1.22E-14 | 9.48E-15 | 5.76E-15 | 8.81E-15 | 1.07E-14 | 1.22E-14 |
| 1987 | 1.92E-14 | 1.95E-14 | 1.92E-14 | 2.22E-14 | 2.35E-14 | 2.04E-14 | 2.19E-14 | 1.43E-14 | 2.17E-14 | 2.01E-14 |

*4th Quarter Only

TABLE 7.10

AVERAGE RADIONUCLIDE CONCENTRATIONS
ENVIRONMENTAL AIR PARTICULATES
POLONIUM-210 (μCi/ml)

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 * | 1.05E-14 | 1.19E-14 | 3.84E-14 | 1.03E-14 | | | | | | 6.48E-15 |
| 1980 | 9.42E-15 | 1.00E-14 | 9.64E-15 | 1.55E-14 | | | | | 8.07E-15 | 8.84E-15 |
| 1981 | 1.41E-14 | 1.29E-14 | 1.09E-14 | 3.53E-14 | 1.48E-14 | 8.27E-15 | 5.64E-15 | 9.45E-15 | 7.60E-15 | 6.77E-15 |
| 1982 | 1.63E-14 | 3.26E-14 | 3.26E-14 | 1.00E-13 | 2.48E-14 | 2.09E-14 | 1.60E-14 | 2.08E-14 | 1.54E-14 | 1.66E-14 |
| 1983 | 3.06E-15 | 6.76E-15 | 7.49E-15 | 4.79E-15 | 6.31E-15 | 4.06E-15 | 4.29E-15 | 4.38E-15 | 4.54E-15 | 3.86E-15 |
| 1984 | 6.85E-15 | 6.78E-15 | 6.74E-15 | 9.30E-15 | 8.96E-15 | 6.01E-15 | 5.99E-15 | 6.10E-15 | 5.11E-15 | 5.99E-15 |
| 1985 | 8.45E-15 | 9.28E-15 | 7.94E-15 | 8.11E-15 | 9.73E-15 | 9.25E-15 | 4.41E-15 | 9.31E-15 | 7.72E-15 | 9.35E-15 |
| 1986 | 7.11E-15 | 7.66E-15 | 6.85E-15 | 7.14E-15 | 6.95E-15 | 5.25E-15 | 3.04E-15 | 3.54E-15 | 4.66E-15 | 7.67E-15 |
| 1987 | 1.06E-14 | 1.08E-14 | 1.03E-14 | 1.39E-14 | 1.28E-14 | 1.05E-14 | 9.30E-15 | 8.30E-15 | 1.20E-14 | 1.07E-14 |

*4th Quarter Only

FIGURE 7.5

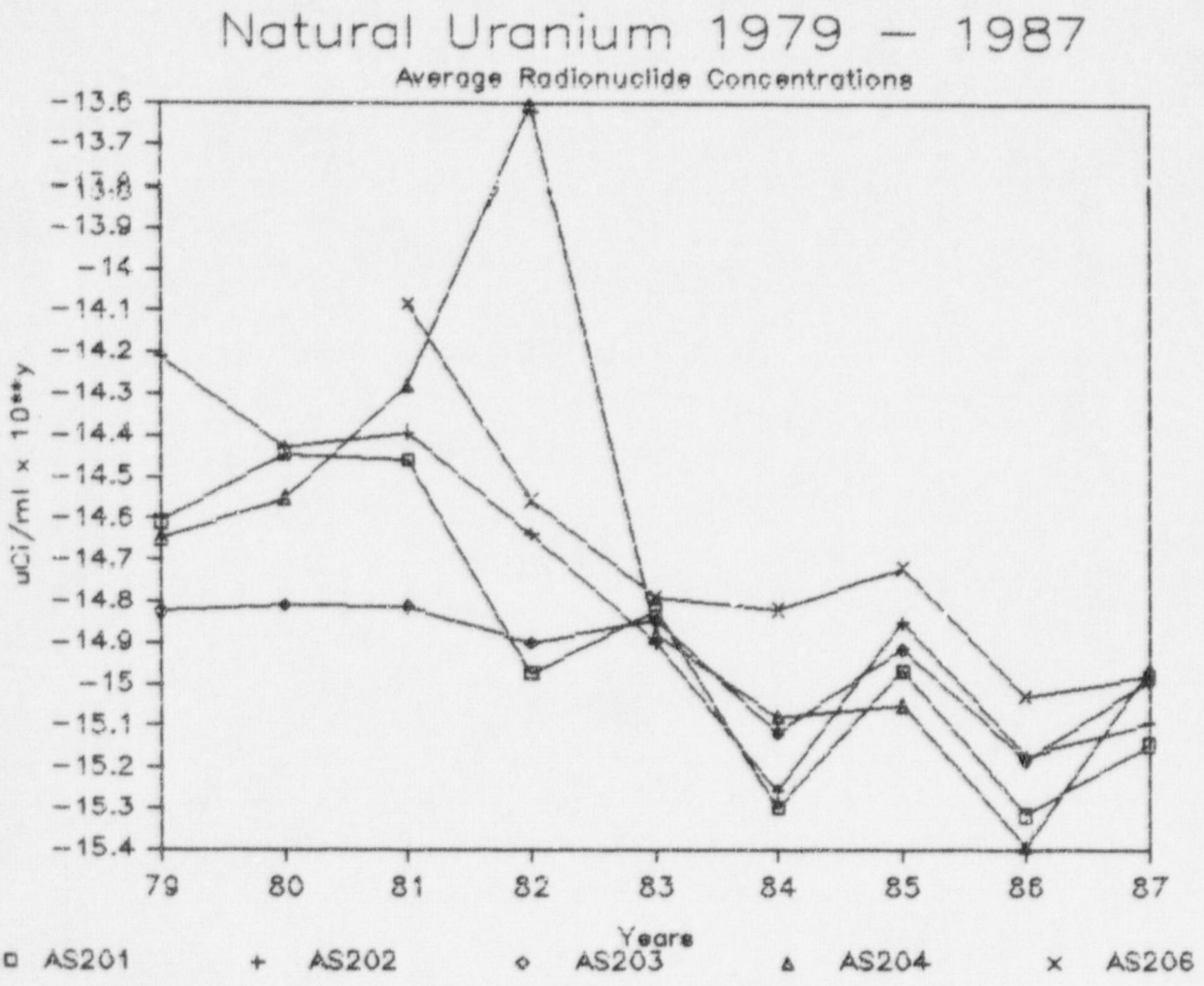

Natural Uranium 1979 – 1987
Average Radionuclide Concentrations
uCi/ml x 10**y
-13.6
-13.7
-13.8
-13.9
-14
-14.1
-14.2
-14.3
-14.4
-14.5
-14.6
-14.7
-14.8
-14.9
-15
-15.1
-15.2
-15.3
-15.4
79
80
81
82
83
84
85
86
87
Years
AS201
AS202
AS203
AS204
AS206

FIGURE 7.6

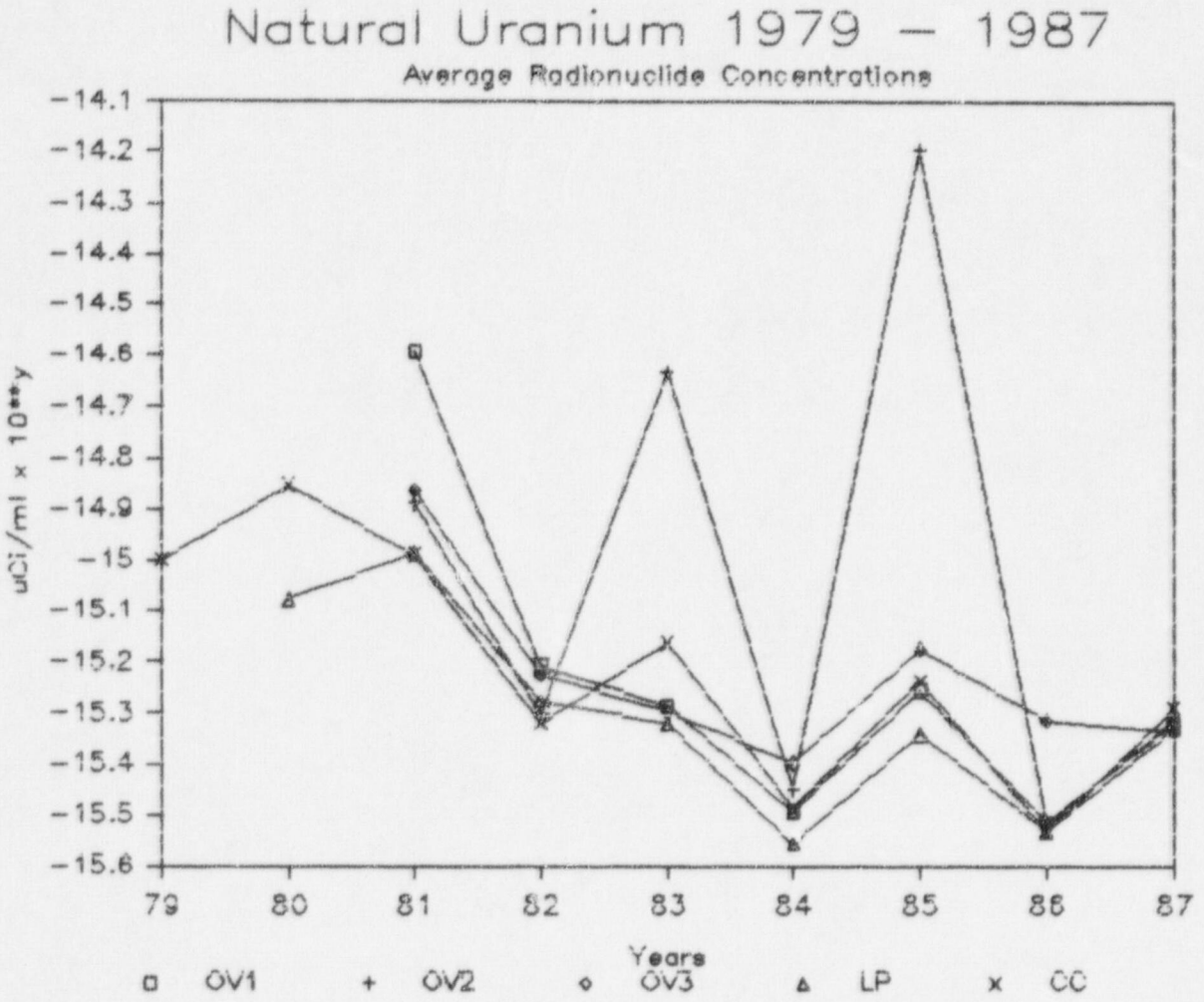

Natural Uranium 1979 – 1987
Average Radionuclide Concentrations
uCi/ml x 10**y
-14.1
-14.2
-14.3
-14.4
-14.5
-14.6
-14.7
-14.8
-14.9
-15
-15.1
-15.2
-15.3
-15.4
-15.5
-15.6
79
80
81
82
83
84
85
86
87
Years
OV1
OV2
OV3
LP
CC

FIGURE 7.7

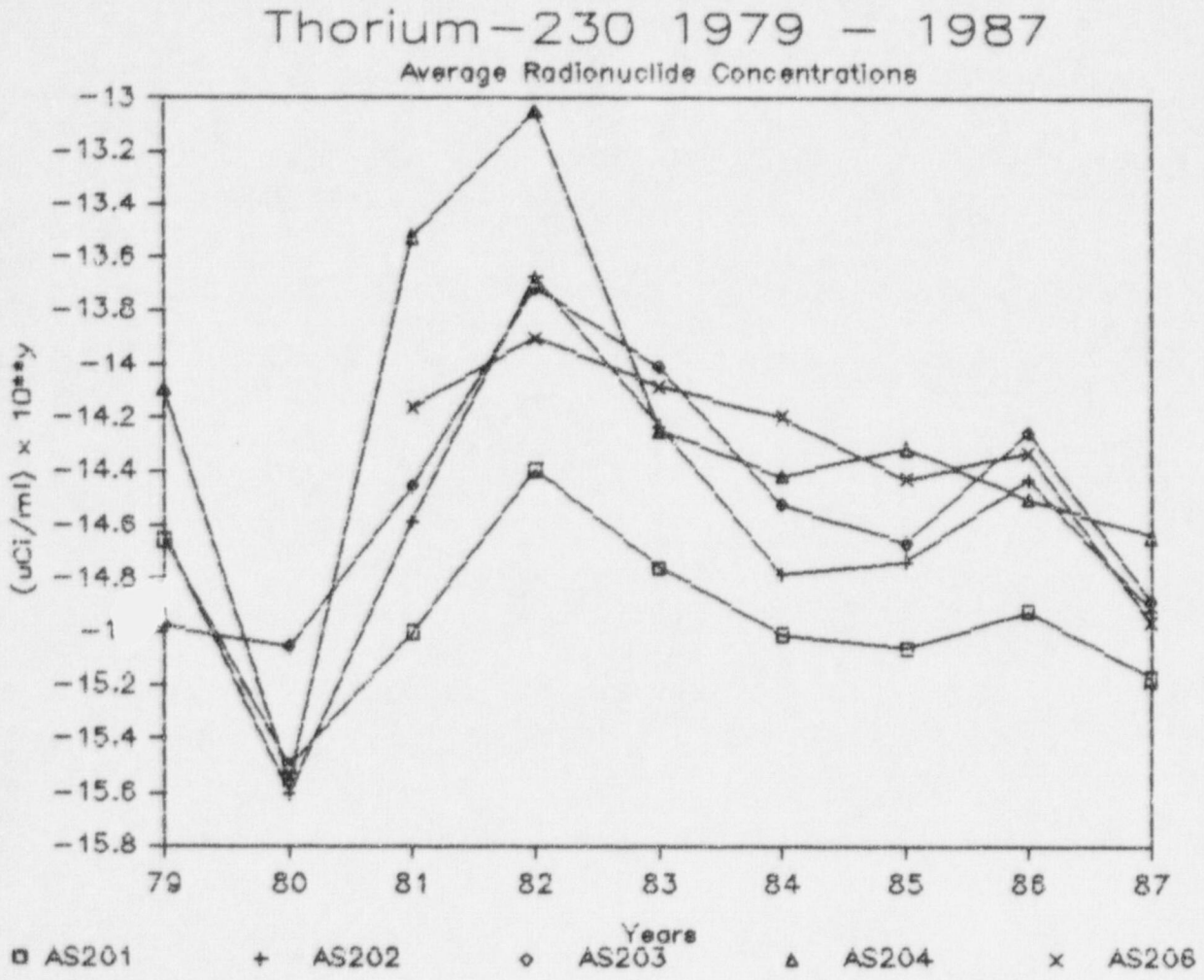

Thorium-230 1979 - 1987
Average Radionuclide Concentrations
(uCi/ml) x 10**y
-13
-13.2
-13.4
-13.6
-13.8
-14
-14.2
-14.4
-14.6
-14.8
-1
-15.2
-15.4
-15.6
-15.8
79
80
81
82
83
84
85
86
87
Years
AS201
AS202
AS203
AS204
AS206

FIGURE 7.8

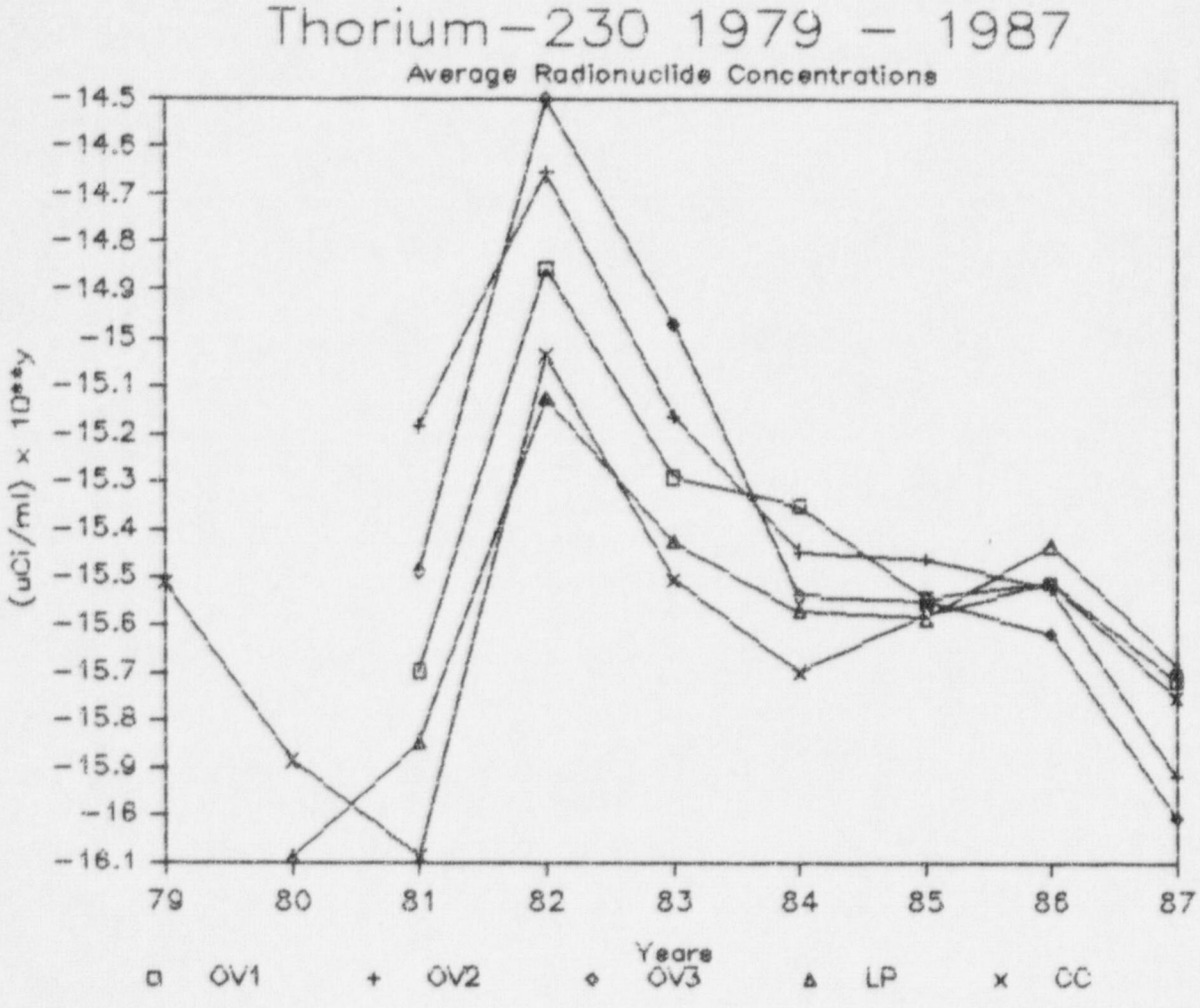

Thorium-230 1979 - 1987
Average Radionuclide Concentrations
(uCi/ml) x 10**y
-14.5
-14.6
-14.7
-14.8
-14.9
-15
-15.1
-15.2
-15.3
-15.4
-15.5
-15.6
-15.7
-15.8
-15.9
-16
-16.1
79
80
81
82
83
84
85
86
87
Years
OV1
OV2
OV3
LP
CC

FIGURE 7.9

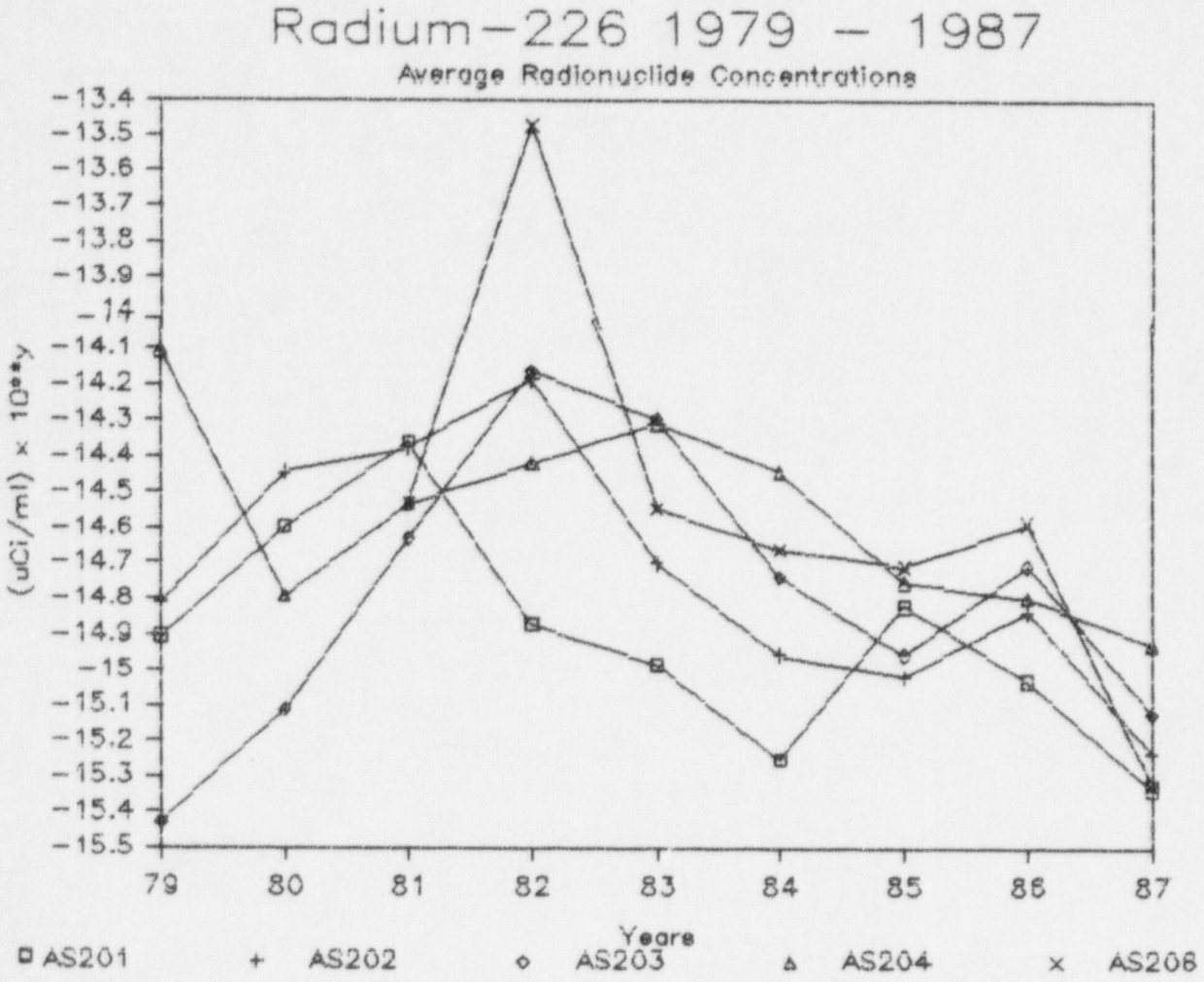

Radium-226 1979 - 1987
Average Radionuclide Concentrations
(uCi/ml) x 10**y
-13.4
-13.5
-13.6
-13.7
-13.8
-13.9
-14
-14.1
-14.2
-14.3
-14.4
-14.5
-14.6
-14.7
-14.8
-14.9
-15
-15.1
-15.2
-15.3
-15.4
-15.5
79
80
81
82
83
84
85
86
87
Years
AS201
AS202
AS203
AS204
AS206

FIGURE 7.10

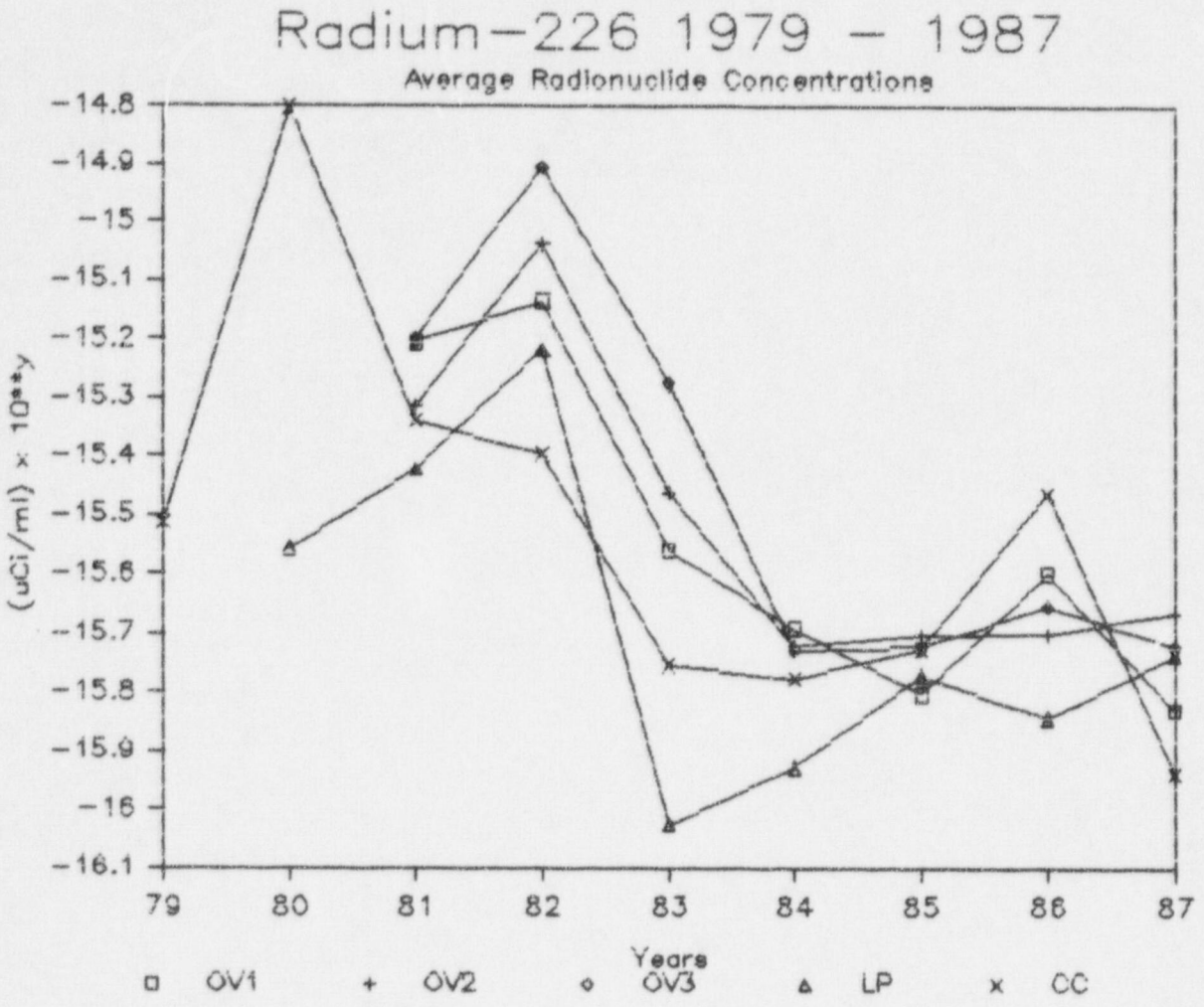

Radium-226 1979 - 1987
Average Radionuclide Concentrations
(uCi/ml) x 10**y
-14.8
-14.9
-15
-15.1
-15.2
-15.3
-15.4
-15.5
-15.6
-15.7
-15.8
-15.9
-16
-16.1
79
80
81
82
83
84
85
86
87
Years
OV1
OV2
OV3
LP
CC

FIGURE 7.11

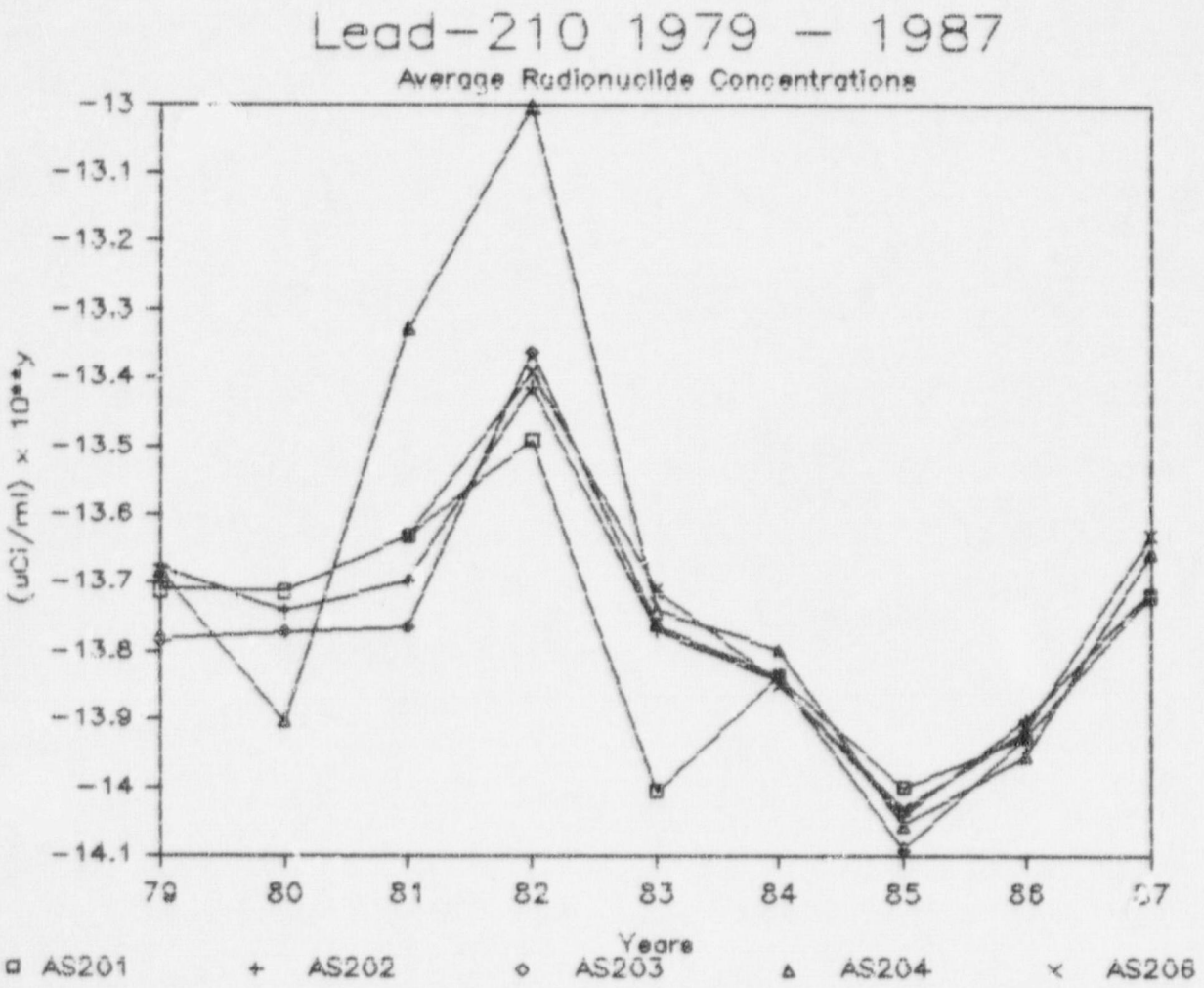

Lead-210 1979 - 1987
Average Radionuclide Concentrations
(uCi/ml) x 10**y
-13
-13.1
-13.2
-13.3
-13.4
-13.5
-13.6
-13.7
-13.8
-13.9
-14
-14.1
79
80
81
82
83
84
85
86
87
Years
AS201
AS202
AS203
AS204
AS206

FIGURE 7.12

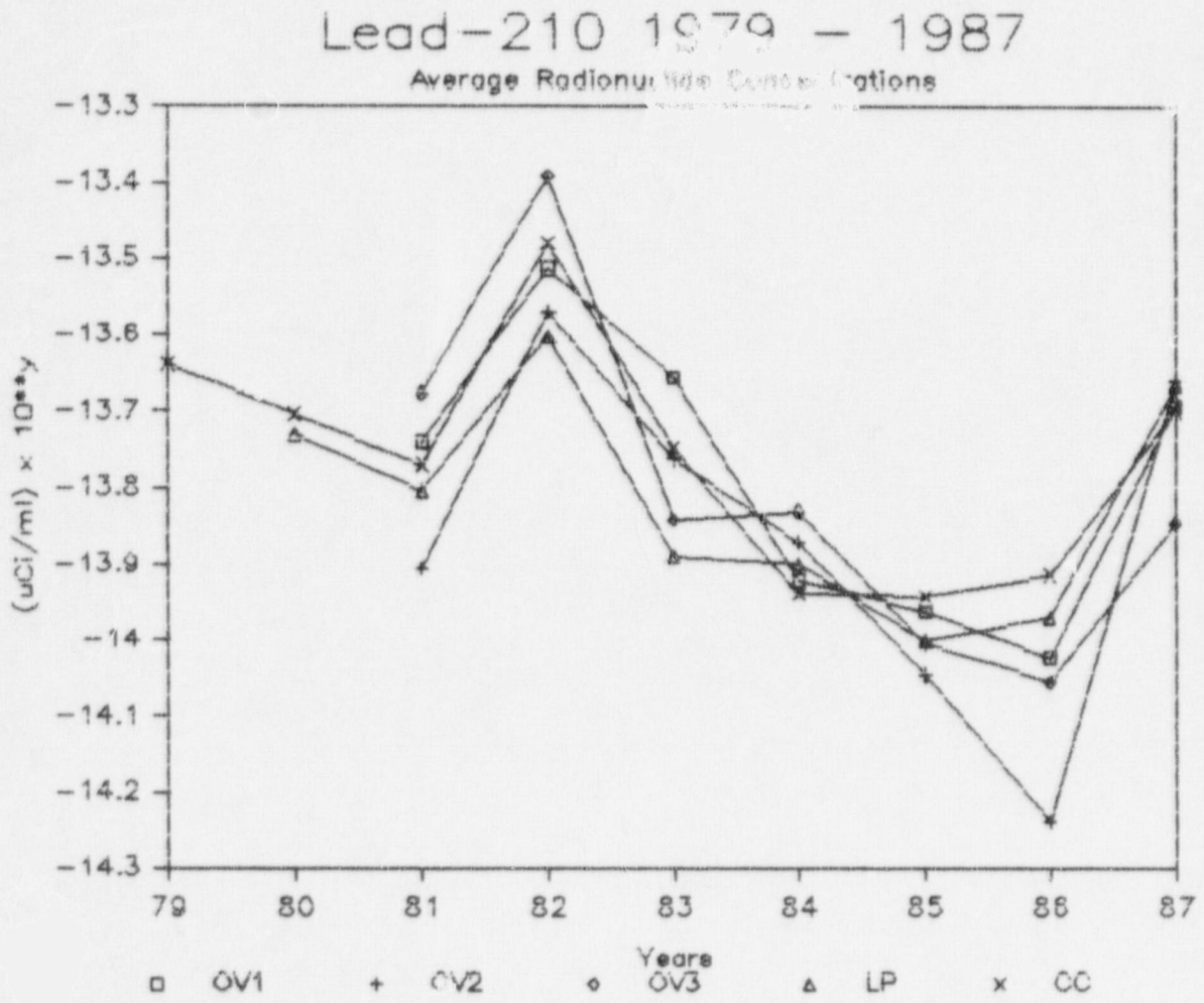

Lead-210 1979 - 1987
Average Radionuclide Concentrations
(uCi/ml) x 10**y
-13.3
-13.4
-13.5
-13.6
-13.7
-13.8
-13.9
-14
-14.1
-14.2
-14.3
79
80
81
82
83
84
85
86
87
Years
OV1
OV2
OV3
LP
CC

FIGURE 7.13

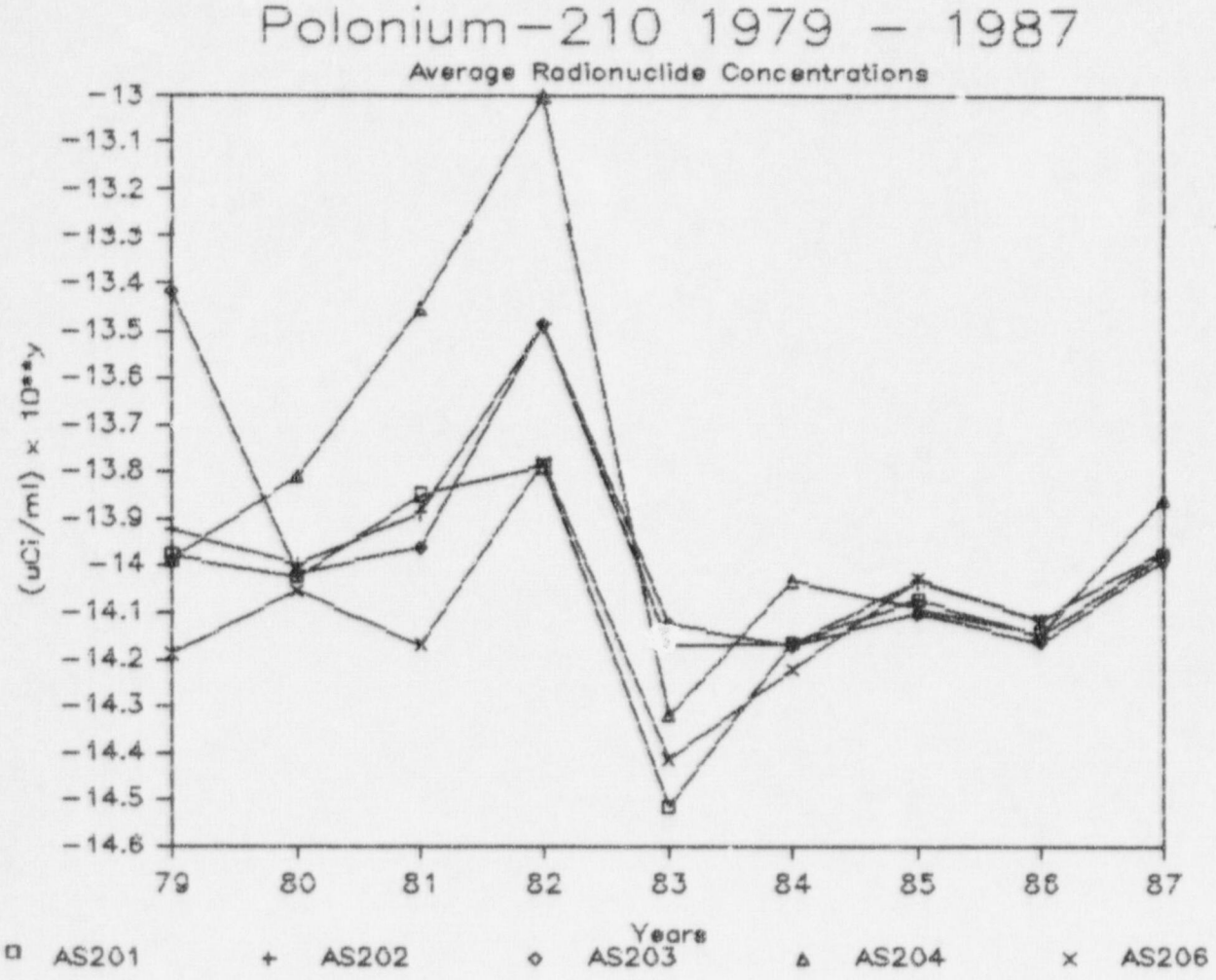
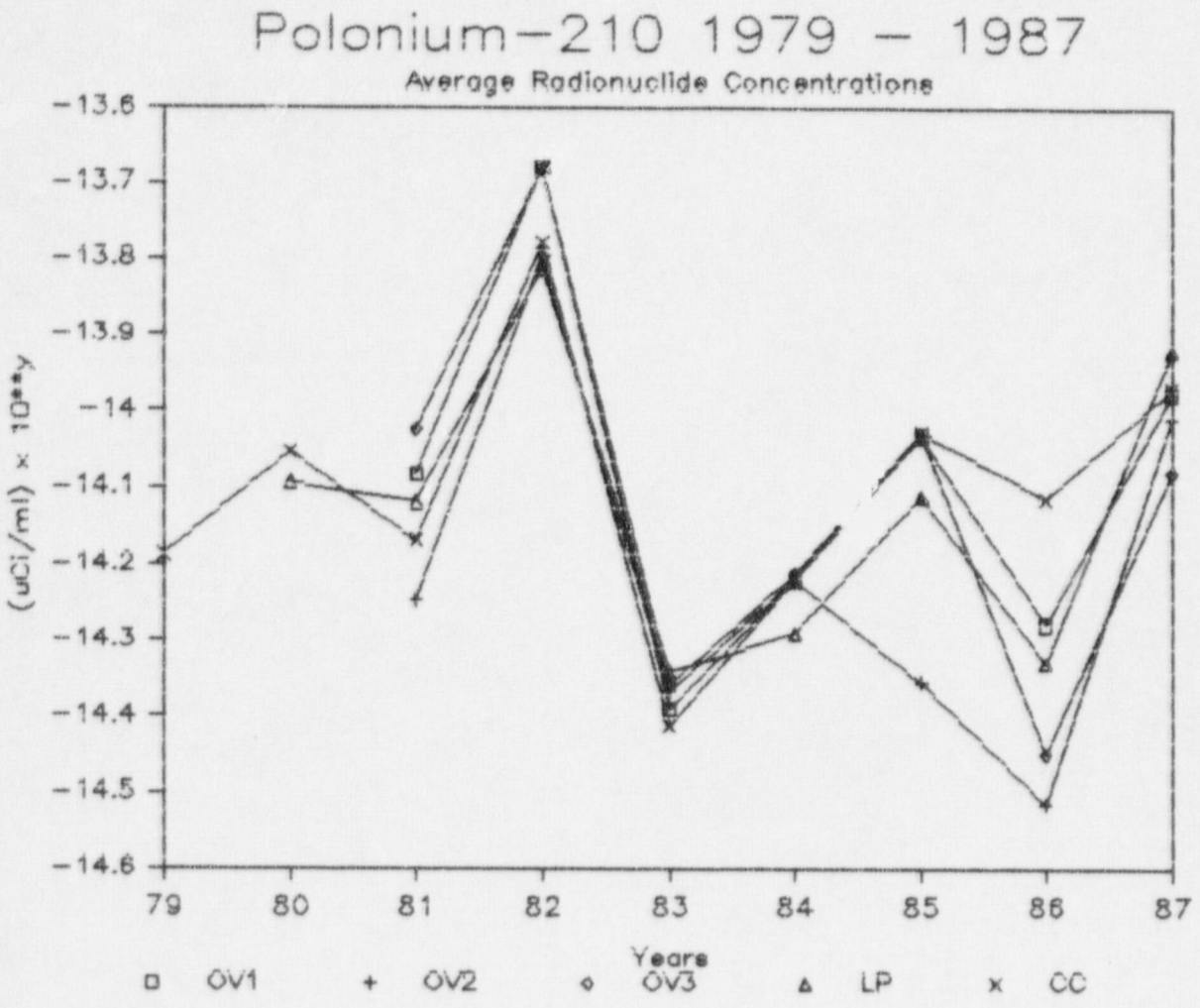

Polonium-210 1979 - 1987
Average Radionuclide Concentrations
(uCi/ml) x 10**-y
-13
-13.1
-13.2
-13.3
-13.4
-13.5
-13.6
-13.7
-13.8
-13.9
-14
-14.1
-14.2
-14.3
-14.4
-14.5
-14.6
79
80
81
82
83
84
85
86
87
Years
AS201
AS202
AS203
AS204
AS206

FIGURE 7.14


Polonium-210 1979 - 1987
Average Radionuclide Concentrations
(uCi/ml) x 10**y
-13.6
-13.7
-13.8
-13.9
-14
-14.1
-14.2
-14.3
-14.4
-14.5
-14.6
79
80
81
82
83
84
85
86
87
Years
OV1
OV2
OV3
LP
CC

## 7.2 - SOILS AND VEGETATION - ANNUAL REPORT

## LICENSE CONDITIONS 27.2 AND 27.3

Soil samples were collected at the ten air sample locations and analytical results are presented in Tables 7.11 and 7.12 for the period 1979 through 1987.

Vegetation samples were collected at the ten air sample locations, as available, and the analytical results are presented in Tables 7.13 and 7.14 for the period 1979 through 1987.

Results similar to previous sampling years' results were obtained.

Analytical results from individual sampling sets vary within the expected bounds of sampling techniques, analytical and geochemical variability; therefore, the 1987 sampling is considered similar to previous results.

TABLE 7.11

RADIUM-226 IN SOILS
pCi/g DRY

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | | 13.3 | 1.90 | 2.40 | | | | | | |
| 1980 | 5.24 | 7.20 | 1.62 | 5.13 | | | | | 2.43 | 4.44 |
| 1980 | 4.22 | 6.86 | 2.35 | 4.11 | | | | | 1. 6 | 3.60 |
| 1981 | 3.83 | 5.23 | 2.63 | 3.65 | | | | | 1.12 | 1.55 |
| 1982 | 6.04 | 3.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1983 | 2.1 | 2.2 | 2.5 | 2.1 | 4.7 | 1.7 | 1.3 | 0.8 | 1.6 | 1.0 |
| 1983 | 8.6(7.7)*(0.4)+ | 4.0 | 4.8 | 2.8 | 12(5.2)*(2.6)+ | 1.4 | 1.5 | 1.0 | 1.2 | 9.8(10)*(1.1)+ |
| 1984 | 1.5 | 7.3 | 2.2 | 2.0 | 3.2 | 1.1 | 1.6 | 1.6 | 2.0 | 1.0 |
| 1985 | 0.8 | 3.0 | 1.9 | 2.4 | 4.4 | 0.9 | 1.6 | 1.2 | 1.5 | 1.2 |
| 1986 | 1.3 | 3.3 | 1.2 | 4.6 | 6.8 | 0.8 | 1.1 | 1.4 | 1.7 | 1.8 |
| 1986 | 1.2 | 0.7 | 2.8 | 4.0 | 8.5 | 0.9 | 1.1 | 1.0 | 4.5 | 1.4 |
| 1987 | 0.8 | 0.5 | 0.5 | 1.1 | 2.2 | 0.9 | 1.0 | 0.8 | 0.8 | 2.3 |

*Reanalysis January 24, 1984
+Resampled January 24, 1984

TABLE 7.12

NATURAL URANIUM IN SOILS
pCi/g DRY

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | | 6.43 | 3.39 | 3.18 | | | | | | |
| 1980 | 4.27 | 1.69 | 1.42 | 2.52 | | | | | 3.52 | 3.09 |
| 1980 | 5.75 | 7.3 | 4.3 | 14.5 | | | | | 4.30 | 7.80 |
| 1981 | 0.34 | 4.87 | 2.71 | 5.28 | | | | | 1.56 | 2.57 |
| 1982 | 0.55 | 1.09 | 0.22 | 1.09 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 1983 | 2.7 | 1.2 | 2.0 | 2.1 | 2.2 | 2.3 | 4.4 | 27 | 2.4 | 2.0 |
| 1983 | 2.7/2.0* | 3.6 | 2.1 | 3.0 | 5.8/2.1* | 1.4 | 2.0 | 1.8 | 1.9 | 6.8/4.2* |
| 1984 | 2.0 | 4.1 | 2.9 | 2.6 | 2.8 | 2.7 | 2.1 | 2.3 | 1.7 | 2.5 |
| 1985 | 2.8 | 2.3 | 2.3 | 3.2 | 4.0 | 1.5 | 2.3 | 2.3 | 2.3 | 2.7 |
| 1986 | 3.0 | 5.7 | 3.2 | 5.0 | 6.3 | 3.5 | 3.2 | 3.3 | 5.6 | 3.7 |
| 1986 | 1.1 | 0.9 | 1.3 | 2.2 | 3.2 | 0.9 | 1.1 | 0.9 | 3.0 | 1.4 |
| 1987 | 1.61 | 1.45 | 1.93 | 1.0 | 5.85 | 2.04 | 1.6 | 1.43 | 0.71 | 4.29 |

*Resampled January 24, 1984

TABLE 7.13

RADIUM-226 IN VEGETATION
pCi/g WET

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 0.01 | 12.76 | 2.92 | 0.41 | | | | | | |
| June 1980 | 1.10 | 0.074 | 0.045 | 0.091 | | | | | 0.073 | 0.018 |
| Aug. 1980 | 0.23 | 0.24 | 0.12 | 0.13 | | | | | 0.08 | 0.04 |
| Oct. 1980 | 0.67 | 0.76 | 0.171 | 0.133 | | | | | 0.029 | 0.02 |
| July 1981 | 0.678 | 0.753 | 0.511 | 2.40 | | | | | 0.602 | 0.056 |
| Aug. 1981 | 0.158 | 0.405 | 0.389 | 0.698 | | | | | 0.087 | 0.205 |
| Sept. 1981 | 0.765 | 0.308 | 0.619 | 1.726 | | | | | 0.027 | 0.027 |
| July 1982 | | 0.62 | 3.7 | 1.3 | | | 0.14 | 0.32 | 0.15 | 0.10 |
| Aug. 1982 | | 0.11 | 0.63 | 0.38 | | | 0.40 | 0.07 | 0.02 | 0.03 |
| Sept. 1982 | | 0.26 | 1.2 | 3.2 | | | 0.0 | 0.23 | 0.24 | 0.0 |
| July 1983 | 0.08 | 0.43 | 0.64 | 1.1 | | | 0.09 | 0.14 | 0.017 | 0.022 |
| Aug. 1983 | 0.062 | 0.31 | 0.97 | 1.1 | | | 0.007 | 0.076 | 0.015 | 0.009 |
| Sept. 1983 | 0.085 | 0.33 | 0.42 | 0.59 | | | 0.049 | 0.059 | 0.085 | 0.009 |
| July 1984 * | 0.14 | 3.3 | 1.4 | 1.3 | 1.5 | | 0.21 | 0.20 | 0.11 | 0.15 |
| Aug. 1984 * | 0.18 | 0.49 | 0.34 | 0.60 | 0.30 | | 0.12 | 0.35 | 0.02 | <0.01 |
| Sept. 1984* | 0.08 | 0.11 | 0.34 | 0.29 | 0.29 | | 0.06 | 0.04 | 0.04 | 0.04 |
| June 1985 | 0.02 | 0.02 | 0.11 | 0.16 | 0.22 | | 0.03 | 0.01 | 0.01 | <0.01 |
| July 1985 | 0.04 | 0.06 | 0.19 | 0.06 | 0.31 | | 0.03 | 0.04 | 0.02 | 0.01 |
| Aug. 1985 | 0.07 | 0.09 | 1.5 | 0.50 | 1.2 | | 0.03 | 0.07 | 0.00 | 0.01 |
| June 1986 | 0.06 | 0.40 | 0.54 | 0.26 | 0.18 | 0.05 | 0.06 | 0.03 | 0.00 | 0.00 |
| July 1986 | 0.07 | 0.92 | 0.90 | 0.38 | 0.24 | 0.04 | 0.07 | 0.05 | 0.01 | 0.00 |
| Aug. 1986 | 0.06 | 0.11 | 0.05 | 0.16 | 0.08 | 0.04 | 0.05 | 0.01 | 0.01 | 0.01 |
| July, 1987 | 0.042 | 0.14 | 0.19 | 0.079 | 0.21 | 0.031 | 0.05 | 0.016 | 0.021 | 0.013 |
| Aug. 1987 | 0.064 | 0.11 | 0.20 | 0.20 | 0.31 | 0.056 | 0.016 | 0.035 | 0.034 | 0.0061 |
| Sept.1987 | 0.057 | 0.094 | 0.16 | 0.14 | 1.20 | 0.053 | 0.020 | 0.018 | 0.027 | 0.013 |

*Previously Reported as Dry

TABLE 7.14

MOLYBDENUM IN VEGETATION
µg/g WET

| YEAR | AS-201 SHADOW HILLS | AS-202 EAST BOUNDARY | AS-203 SOUTH BOUNDARY | AS-204 WEST BOUNDARY | AS-206 NORTH BOUNDARY | OROVERDE #1 | OROVERDE #2 | OROVERDE #3 | LINCOLN PARK | CANON CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 6.02 | 29.84 | 14.57 | 164.7 | | | | | | |
| June 1980 | 2570.0 | 879.0 | 654.0 | 18074.0 | | | | | 41.0 | 19.0 |
| Aug. 1980 | 2.0 | 12.0 | 0.5 | 121.0 | | | | | 11.0 | 20.0 |
| Oct. 1980 | 9.9 | 27.4 | 6.0 | 75.0 | | | | | 1.5 | 0.5 |
| July 1981 | 9.12 | 10.71 | 13.77 | 228.0 | | | | | 3.06 | 0.75 |
| Aug. 1981 | 4.91 | 16.64 | 26.4 | 93.60 | | | | | <0.52 | 2.34 |
| Sept. 1981 | 2.9 | 31.82 | 19.72 | 135.20 | | | | | 0.39 | 1.37 |
| July 1982 | | 34.2 | 13.6 | 220.0 | | | 11.2 | 2.2 | 5.0 | 0.10 |
| Aug. 1982 | | 54.79 | 36.16 | 440.0 | | | 18.27 | 6.12 | 14.50 | 0.03 |
| Sept. 1982 | | 165.0 | 69.0 | 296.5 | | | 26.1 | 10.8 | 9.64 | 0.0 |
| July 1983 | 1.7 | 13.0 | 3.4 | 150.0 | | | 2.7 | 1.7 | 0.07 | 0.08 |
| Aug. 1983 | 0.13 | 5.0 | 5.0 | 25.0 | | | 2.1 | 0.8 | 0.13 | 0.13 |
| Sept. 1983 | 1.1 | 23.0 | 16.0 | 110.0 | | | 6.4 | 0.45 | 3.0 | 0.18 |
| July 1984 | 5.6 | 24.0 | 22.0 | 130.0 | 30.0 | | 1.6 | 0.16 | 0.82 | 0.76 |
| Aug. 1984 | 0.45 | 30.0 | 13.0 | 220.0 | 32.0 | | 3.4 | 17.0 | 0.86 | 1.4 |
| Sept. 1984 | 0.49 | 15.0 | 12.0 | 150.0 | 15.0 | | 5.5 | 4.7 | 0.43 | 0.26 |
| June 1985 | 5.2 | 5.0 | 4.5 | 4.2 | 0.96 | | 0.11 | 0.07 | 1.8 | 0.60 |
| July 1985 | 12 | 16 | 15 | 380 | 110 | | 6.0 | 4.0 | 1.4 | 0.90 |
| Aug. 1985 | 5.2 | 11 | 4.8 | 74 | 20 | | 4.4 | 2.1 | 0.10 | 2.2 |
| June 1986 | 7.50 | 5.30 | 9.50 | 16.0 | 18.0 | 0.68 | 3.0 | 2.0 | 3.50 | 26.0 |
| July 1986 | 3.80 | 34.0 | 30.0 | 600 | 9.40 | 0.28 | 1.40 | 0.90 | 0.76 | 2.80 |
| Aug. 1986 | 1.60 | 7.40 | 42.8 | 106 | 114 | 3.20 | 3.00 | 2.00 | 1.40 | 1.10 |
| July 1987 | 2.40 | 18.0 | 30.0 | 330 | 58.0 | <0.13 | 7.50 | 0.68 | 0.20 | 0.30 |
| Aug. 1987 | 2.9 | 16.0 | 17.0 | 270 | 53.0 | 0.10 | 3.3 | 1.1 | 0.70 | 0.36 |
| Sept. 1987 | 1.3 | 23.0 | 7.3 | 1.8 | 2.3 | <0.08 | 6.8 | 1.7 | 0.65 | 0.35 |

## 8.0 - SEMI-ANNUAL LAND USE STATUS REPORT - ANNUAL REPORT LICENSE CONDITION 28.1

Since the last reporting period, little change has occurred in the land use status of the lands surrounding the mill. As reported previously, the proposed residential development of OroVerde (Northeast one-quarter of the Southeast one-quarter of Section 7, Township 19 South, Range 70 West) known as Canon Country, has been cancelled.

# 9.0 - MONITORING DONE IN ACCORDANCE WITH COTTER ALARA POLICY - ANNUAL REPORT

## 9.1 - GAMMA MONITORING SURVEY (10 CFR 20)

Although not a regulatory requirement, Cotter Corporation performs gamma radiation surveys at 86 locations throughout the milling facility, pursuant to its ALARA policy,. In addition to these surveys, periodic general surveys are conducted throughout the mill property; these surveys are not associated with specific survey locations. These surveys allow detection of any significant gamma levels that are not identified at routine survey points. As specified in Amendments #19 and #23, Cotter Corporation performed gamma surveys on a quarterly basis. This change in frequency was due to the shutdown of the mill. The quarterly survey readings for 1987 were reviewed to determine any trending of the gamma radiation levels. The review indicated that the highest gamma reading recorded in 1987 was 1.40 mR/hr., at location RS-41 on the catwalk of the #8 CCD thickener in July, 1987. Readings at RS-41 ranged from 0.70 to 1.40 mR/hr., with an average reading of 1.04 mR/hr. and a standard deviation of 0.26 mR/hr.

9.0 - MONITORING DONE IN ACCORDANCE WITH COTTER ALARA POLICY

ANNUAL REPORT

9.1 - GAMMA MONITORING SURVEY (10 CFR 20)

Page 2

The annual average of gamma survey averages for 1987 was 0.145 mR/hr. which was slightly lower than readings obtained in 1986 (0.151 mR/hr.) but higher than readings obtained in 1985 (0.098 mR/hr). These averages are presented graphically in Figure 9.1 and a breakdown of the survey averages are presented in Table 9.1. Overall readings in most areas have tended to increase during 1987. This may be attributed to the buildup of radon daughters, some of which are gamma emitters, within the idle circuit. During normal operations, this buildup does not occur due to the constant circulation of liquids which keep the system flushed out. Elevated levels at location RS-41 can be attributed to the co-precipitation of radium and gypsum which occurs in the #8 CCD Thickener, especially at the center well. Precipitation occurs due to the calcium and sulfate concentrations and pH conditions in this thickener. As gypsum builds up, the gamma levels rise and as the gypsum is redissolved, the gamma levels drop.

A summary of all gamma radiation levels recorded from quarterly surveys during 1987 is presented in Table 9.2.

TABLE 9.1

PROG-LAB311 RADIOMETRIC SURVEY (GAMMA) RUN DATE 02/05/88
FOR 1987 IN MR/HR

| | TOTAL | n | AVG-X | DEV-S |
|---|---|---|---|---|
| JAN | 9.480 | 83 | 0.114 | 0.123 |
| FEB | 8.560 | 81 | 0.106 | 0.112 |
| MAR | 0.000 | 0 | .000 | .000 |
| APR | 11.000 | 79 | 0.139 | 0.145 |
| MAY | 0.000 | 0 | .000 | .000 |
| JUN | 0.000 | 0 | .000 | .000 |
| JUL | 18.157 | 80 | 0.227 | 0.203 |
| AUG | 0.000 | 0 | .000 | .000 |
| SEP | 0.000 | 0 | .000 | .000 |
| OCT | 10.740 | 77 | 0.139 | 0.117 |
| NOV | 0.000 | 0 | .000 | .000 |
| DEC | 0.000 | 0 | .000 | .000 |

*** 1987 AVERAGE-X 0.145
*** 1987 AVERAGE-S 0.140

PROGRAM = LAD:19 — CUTTER CORPORATION — RUN DATE 12/14/88
RADIOMETRIC SURVEY (GAMMA) FOR 1987 (MR/HR) — TIME 10:00:05

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RS1-SECONDARY CRUSHER (LEVEL 1) | 0.090 | 0.090 | | 0.090 | | | 0.170 | | | 0.170 | | |
| RS2-SECONDARY CRUSHER (LEVEL 2) | 0.120 | 0.110 | | 0.130 | | | 0.230 | | | 0.190 | | |
| RS3-SECONDARY CRUSHER (LEVEL 3) | 0.150 | 0.120 | | 0.180 | | | 0.260 | | | 0.130 | | |
| RS4-SECONDARY CRUSHER (LEVEL 4) | 0.070 | 0.030 | | | | | | | | | | |
| RS5-FINE ORE BINS (TOP LEVEL) | 0.400 | 0.180 | | 0.200 | | | 0.370 | | | | | |
| RS6-FINE ORE BINS (WEST-WS #1 & #2) | 0.120 | 0.070 | | 0.120 | | | 0.280 | | | 0.110 | | |
| RS7-FINE ORE BINS (EAST-WS #1 & #2) | 0.110 | 0.100 | | 0.120 | | | 0.250 | | | 0.130 | | |
| RS8-FINE ORE BINS (EAST WS #2) | 0.110 | 0.070 | | 0.130 | | | 0.190 | | | 0.150 | | |
| RS9-FINE ORE BINS (SE SCHWARTZ) | 0.100 | 0.070 | | 0.100 | | | 0.230 | | | 0.140 | | |
| RS10-FINE ORE BINS (N CUSTOM) | 0.120 | 0.170 | | 0.140 | | | 0.180 | | | 0.150 | | |
| RS11-FINE ORE BINS (N.W. CUSTOM) | 0.090 | 0.080 | | 0.110 | | | 0.190 | | | 0.100 | | |
| RS12-FINE ORE BINS (S CUSTOM) | 0.090 | 0.080 | | 0.110 | | | 0.160 | | | 0.100 | | |
| RS13-GRIND AND LEACH (LOWER-EAST END MDL) | 0.080 | 0.070 | | 0.080 | | | 0.070 | | | 0.080 | | |
| RS14-GRIND AND LEACH (OUTSIDE STORAGE RM) | 0.070 | 0.090 | | 0.080 | | | 0.180 | | | 0.100 | | |
| RS15-GRIND AND LEACH (LOWER-UNDER BALL MILL) | 0.050 | 0.110 | | 0.080 | | | 0.320 | | | 0.140 | | |
| RS16-GRIND AND LEACH (LOWER-WEST #3 LEACH TANK) | 0.300 | 0.300 | | 0.500 | | | 0.900 | | | 0.700 | | |
| RS17-GRIND AND LEACH (LOWER-WEST #1 LEACH TANK) | 0.100 | 0.110 | | 0.130 | | | 0.440 | | | 0.170 | | |
| RS18-GRIND AND LEACH (LOWER-EAST END #1 A.C.) | 0.120 | 0.120 | | 0.160 | | | 0.410 | | | 0.200 | | |
| RS19-GRIND AND LEACH (LOWER-SOUTH REPULP TANK) | 0.140 | 0.140 | | 0.400 | | | 0.500 | | | 0.300 | | |
| RS20-GRIND AND LEACH (LOWER-WEST REPULP TANK) | 0.200 | 0.160 | | 0.500 | | | 0.500 | | | 0.300 | | |
| RS21-GRIND AND LEACH (LOWER-SOUTH #3 AUTOCLAVE) | 0.070 | 0.040 | | 0.070 | | | 0.070 | | | 0.050 | | |
| RS22-GRIND AND LEACH (LOWER-WEST END #1 A.C.) | 0.040 | 0.050 | | 0.080 | | | 0.080 | | | 0.060 | | |
| RS23-GRIND AND LEACH (LOWER-WEST END #2 A.C.) | 0.060 | 0.050 | | 0.090 | | | 0.120 | | | 0.090 | | |
| RS24-GRIND AND LEACH (LOWER WEST END #3 A.C.) | 0.070 | 0.060 | | 0.060 | | | 0.130 | | | 0.080 | | |
| RS25-GRIND AND LEACH (LOWER S.E. COMPRESSOR) | 0.070 | 0.090 | | 0.060 | | | 0.110 | | | 0.110 | | |
| RS26-GRIND AND LEACH (UPPER-E. ROD MILL FEED) | 0.070 | 0.100 | | 0.110 | | | 0.180 | | | 0.140 | | |
| RS27-GRIND AND LEACH (UPPER-E. ROD MILL) | 0.080 | 0.100 | | 0.110 | | | 0.130 | | | 0.080 | | |
| RS28-GRIND AND LEACH (UPPER-E. END BALL MILL) | 0.120 | 0.120 | | 0.100 | | | 0.170 | | | 0.110 | | |
| RS29-GRIND AND LEACH (UPPER-S. END BALL MILL) | 0.140 | 0.090 | | 0.090 | | | 0.170 | | | 0.130 | | |
| RS30-GRIND AND LEACH (UPPER-N. END BALL MILL) | 0.130 | 0.130 | | 0.160 | | | 0.220 | | | 0.160 | | |
| RS31-GRIND AND LEACH (UPPER-CONTROL ROOM) | 0.060 | 0.030 | | 0.100 | | | 0.070 | | | 0.100 | | |
| RS32-GRIND AND LEACH (UPPER-W. END BALL MILL) | 0.300 | 0.400 | | 0.500 | | | 0.800 | | | 0.500 | | |
| RS33-GRIND AND LEACH (UPPER-E. #1 & #2 A.C.) | 0.130 | 0.050 | | 0.080 | | | 0.720 | | | 0.150 | | |
| RS34-GRIND AND LEACH (UPPER-E. #2 & #3 A.C.) | 0.140 | 0.090 | | 0.130 | | | 0.240 | | | 0.170 | | |
| RS35-GRIND AND LEACH (UPPER-N.E. #3 A.C.) | 0.200 | 0.200 | | 0.400 | | | 0.490 | | | 0.300 | | |
| RS36-GRIND AND LEACH (UPPER-N. #3 LETDOWN) | 0.140 | 0.070 | | 0.140 | | | 0.220 | | | 0.100 | | |
| RS37-GRIND AND LEACH (UPPER-BETWEEN #2 & #3 LD) | 0.120 | 0.080 | | 0.120 | | | 0.140 | | | 0.090 | | |
| RS38-GRIND AND LEACH (UPPER BETWEEN #1 & #2 LD) | 0.110 | 0.100 | | 0.110 | | | 0.150 | | | 0.110 | | |
| RS39-CCD CATWALK #1 | 0.070 | 0.060 | | 0.090 | | | 0.100 | | | 0.080 | | |
| RS40-CCD CATWALK #9 | 0.060 | 0.080 | | 0.100 | | | 0.080 | | | 0.060 | | |
| RS41-CCD CATWALK #8 | 1.100 | 0.700 | | 1.100 | | | 1.400 | | | 0.700 | | |
| RS42-CCD CATWALK #7 | 0.120 | 0.090 | | 0.090 | | | 0.210 | | | 0.090 | | |
| RS43-CCD CATWALK #6 | 0.070 | 0.040 | | 0.060 | | | 0.110 | | | 0.060 | | |
| RS44-CCD CATWALK #5 | 0.070 | 0.050 | | 0.060 | | | 0.130 | | | 0.080 | | |
| RS45-CCD CATWALK #4 | 0.060 | 0.050 | | 0.070 | | | 0.130 | | | 0.070 | | |
| RS46-CCD CATWALK #2) | 0.100 | 0.070 | | 0.070 | | | 0.150 | | | 0.070 | | |
| RS47-CCD CONTROL ROOM | 0.070 | 0.050 | | 0.050 | | | 0.060 | | | 0.100 | | |
| RS48-CCD CATWALK #3 | 0.090 | 0.060 | | 0.080 | | | 0.160 | | | 0.070 | | |
| RS49-SX (UPPER U308-E. #4 EX SETTLER) | 0.080 | 0.070 | | 0.130 | | | 0.280 | | | 0.140 | | |
| RS50-SX (UPPER U308 E. #3 EX SETTLER) | 0.080 | 0.070 | | 0.090 | | | 0.260 | | | 0.160 | | |
| RS51-SX (UPPER U308 E. #2 EX SETTLER) | 0.060 | 0.090 | | 0.100 | | | 0.190 | | | 0.120 | | |
| RS52-SX (UPPER U308 N. #3 & #4 EX. SETTLERS) | 0.070 | 0.080 | | 0.150 | | | 0.200 | | | 0.090 | | |
| RS53-SX (UPPER U308 N. END #1 EX SETTLER) | 0.070 | 0.060 | | 0.100 | | | 0.180 | | | 0.100 | | |
| RS54-SX (UPPER U308 N. END LOADED ORE SURGE) | 0.070 | 0.050 | | 0.080 | | | 0.130 | | | 0.100 | | |

PROGRAM - LAB119

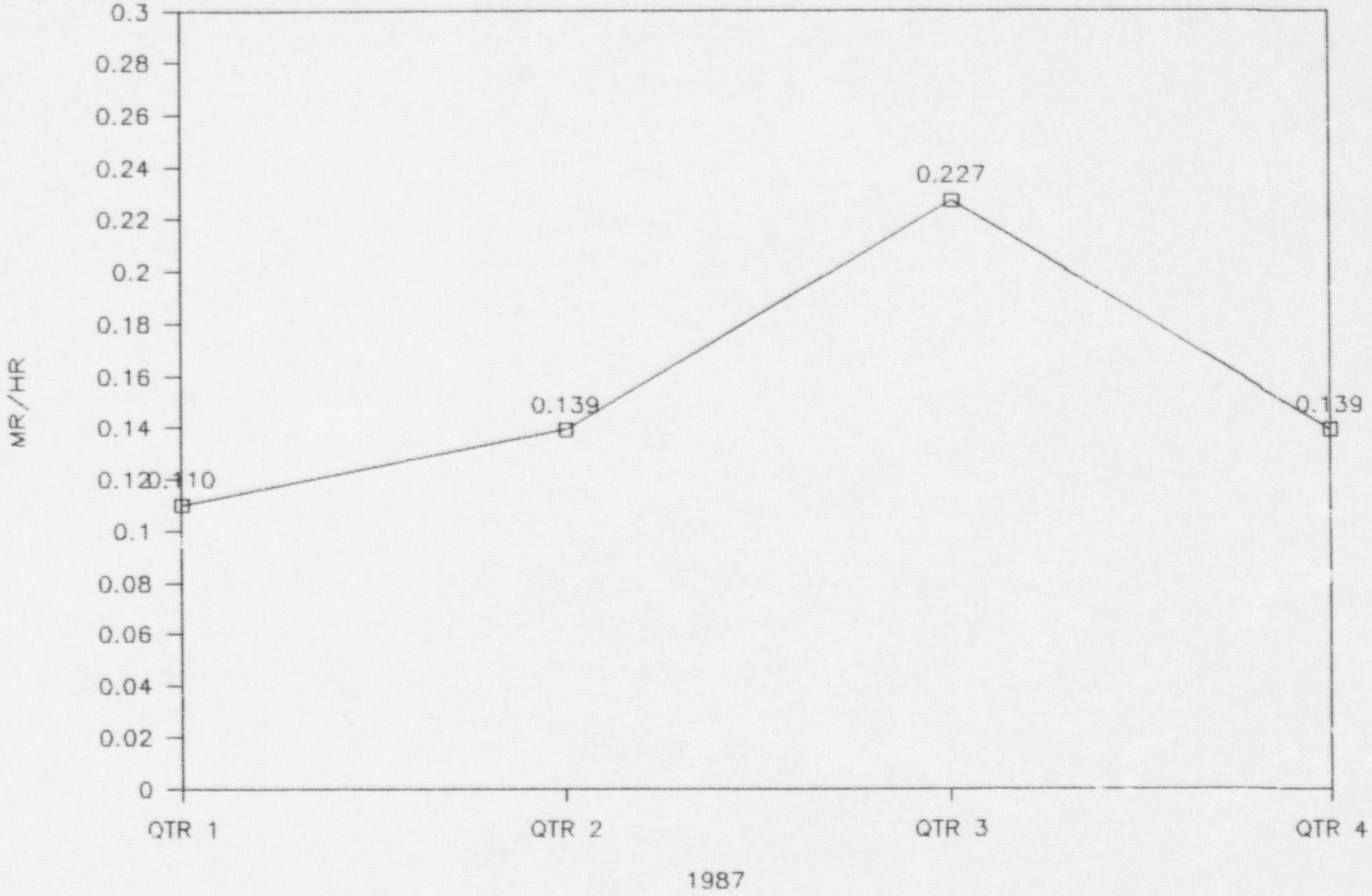
COTTER CORPORATION
RADIOMETRIC SURVEY (GAMMA) FOR 1987 (MR/HR)

RUN DATE 02/04/88
TIME 10:02:28

| NO. AND LOCATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RS55-SX (UPPER N. #4 ST SETTLER) | 0.030 | 0.030 | | 0.050 | | | 0.070 | | | 0.070 | | |
| RS56-SX (UPPER U308 N. #3 & #4 ST SETTLERS) | 0.040 | 0.040 | | 0.070 | | | 0.080 | | | 0.080 | | |
| RS57-SX (UPPER U308 N. #2 & #3 ST SETTLERS) | 0.050 | 0.030 | | 0.060 | | | 0.090 | | | 0.090 | | |
| RS58-SX (UPPER U308 N. #1 & #2 ST SETTLERS) | 0.050 | 0.040 | | 0.070 | | | 0.38 | | | 0.070 | | |
| RS59-SX (UPPER E. #1 ST SETTLER) | 0.090 | 0.020 | | 0.050 | | | 0.090 | | | 0.050 | | |
| RS60-SX CONTROL ROOM | 0.030 | 0.030 | | 0.040 | | | 0.032 | | | 0.020 | | |
| RS61-UV PRODUCT (LOWER E. BARREL MAINT.) | 0.160 | 0.400 | | 0.050 | | | 0.060 | | | 0.070 | | |
| RS62-PRODUCT (LOWER U308 CALCINER) | 0.110 | 0.190 | | 0.090 | | | 0.120 | | | 0.090 | | |
| RS63 UV PRODUCT BARREL ENC.(DECOMMISSIONED) | 0.140 | 0.200 | | | | | | | | | | |
| RS64-UV PRODUCT MCC ROOM | 0.080 | 0.090 | | 0.100 | | | 0.170 | | | | | |
| RS65-UV PRODUCT (MIDDLE U308 CALCINER) | 0.090 | | | | | | | | | | | |
| RS66-UV PRODUCT (UPPER U308 CALCINER) | 0.080 | | | | | | | | | | | |
| RS67-LAB CRUSHING ROOM EAST | 0.070 | 0.100 | | 0.130 | | | 0.100 | | | 0.130 | | |
| RS68-LAB CRUSHING ROOM WEST | 0.070 | 0.080 | | 0.090 | | | 0.130 | | | 0.080 | | |
| RS69-BLENDING ROOM | 0.060 | 0.060 | | 0.110 | | | 0.120 | | | 0.070 | | |
| RS70-LAB FILTER ROOM | 0.100 | 0.030 | | 0.140 | | | 0.170 | | | 0.070 | | |
| RS71-LAB U308 PREP AREA | 0.050 | 0.040 | | 0.020 | | | 0.035 | | | 0.040 | | |
| RS72-MET. LAB | 0.050 | 0.040 | | 0.080 | | | 0.130 | | | 0.060 | | |
| RS73-PRIMARY CRUSHER-TOP | 0.150 | 0.170 | | 0.180 | | | 0.500 | | | 0.200 | | |
| RS74-PRIMARY CRUSHER-MIDDLE | 0.140 | 0.150 | | 0.160 | | | 0.380 | | | 0.190 | | |
| RS75-PRIMARY CRUSHER-BOTTOM | 0.150 | 0.150 | | 0.180 | | | 0.400 | | | 0.180 | | |
| RS76-PRIMARY CRUSHER SHAMPLE SHED-TOP | 0.130 | 0.150 | | 0.190 | | | 0.420 | | | 0.190 | | |
| RS77-PRIMARY CRUSHER SAMPLE SHED-MIDDLE | 0.140 | 0.110 | | 0.180 | | | 0.410 | | | 0.200 | | |
| RS78-PRIMARY CRUSHER SAMPLE SHED-BOTTOM | 0.140 | 0.120 | | 0.200 | | | 0.300 | | | 0.170 | | |
| RS80-NEW SAMPLE PLANT -NORTH | 0.080 | 0.070 | | 0.150 | | | 0.210 | | | 0.130 | | |
| RS81-NEW SAMPLE PLANT SOUTH | 0.090 | 0.060 | | 0.130 | | | 0.190 | | | 0.300 | | |
| RS82-SOUTHEAST OF SX SAND FILTERS | 0.060 | 0.090 | | 0.060 | | | 0.100 | | | 0.070 | | |
| RS83-S.X. V205 SIDE | 0.040 | 0.030 | | 0.070 | | | 0.150 | | | 0.090 | | |
| RS86-SECURITY STATION | | | | | | | 0.110 | | | | | |
| RS95-NEW CRUSHER/LABOR LUNCHROOM | 0.090 | 0.050 | | 0.100 | | | 0.190 | | | 0.050 | | |

# RADIOMETRIC SURVEY (GAMMA)

AVERAGE FOR 1987 IN MR/HR



## 9.2 - PERSONNEL DOSIMETRY (TLD) - ANNUAL REPORT

In addition to alpha contamination monitoring of specified personnel, all employees are required to wear Thermoluminescent Dosimeters at the mill in order to evaluate personnel exposures to Beta and Gamma radiation.

The data presented in Table 9.3 indicate a decrease in whole body exposures encountered by Cotter mill employees in 1987 from that experienced in 1986. This result is to be expected because mill operations were discontinued in February, 1987, and the mill remained shutdown through the remainder of 1987. All exposures are well below the regulatory guidelines which specify a maximum permissible annual exposure of 5 rem.

Also, for the purpose of this report, an evaluation of total rem (man-rem) at the Cotter mill was prepared (Table 9.3). During 1987, as during 1985, the mill was in a shutdown status. A comparison of those two periods was not performed because in 1985 the mill was shutdown for 7.5 months compared to 11 months in 1987. Because of this extended shutdown, man-rem exposures are significantly lower than in any other reported years and are expected to remain as such as long as the mill is in a non-operational status.

9.2 - PERSONNEL DOSIMETRY (TLD) - ANNUAL REPORT


In conclusion, TLD data indicate an overall decrease in whole body exposures at the Cotter mill. Moreover, all exposures were below guidelines specified within the regulatory framework (i.e. less than 10% of 5 rem.).

| LOCATION | | TOTAL MREMS | TOTAL MAN REMS |
|---|---|---|---|
| 0101 | GNL MILL FOREMAN | 0.00 | 0.00000 |
| 0103 | PRODUCT (YELLOWCAKE) | 60.00 | 0.06000 |
| 0104 | BALL MILL | 0.00 | 0.00000 |
| 0105 | LEACH | 0.00 | 0.00000 |
| 0106 | CCD | 0.00 | 0.00000 |
| 0107 | SX | 0.00 | 0.00000 |
| | CATEGORY 0100 TOTALS | 60.00 | 0.06000 |
| 0201 | CRUSHER OPERATOR | 0.00 | 0.00000 |
| 0202 | LOADER OPERATOR | 0.00 | 0.00000 |
| | CATEGORY 0200 TOTALS | 0.00 | 0.00000 |
| 0301 | MAINT SUPERINT | 0.00 | 0.00000 |
| 0302 | MAINTENANCE CLERK | 0.00 | 0.00000 |
| 0304 | MAINT FOREMAN | 30.00 | 0.03000 |
| 0305 | MAINT INST MAN | 20.00 | 0.02000 |
| 0306 | MAINT ELECTRICIAN | 40.00 | 0.04000 |
| 0307 | MAINT AUTO MECH | 20.00 | 0.02000 |
| 0308 | MAINT OILER | 0.00 | 0.00000 |
| 0310 | MAINT MECH | 0.00 | 0.00000 |
| 0311 | SPECIAL PROJECTS FOR | 0.00 | 0.00000 |
| 0312 | MAINT UT MECH-RUBBER | 0.00 | 0.00000 |
| | CATEGORY 0300 TOTALS | 110.00 | 0.11000 |
| 0401 | CH. MET./PERSNL. COO | 10.00 | 0.01000 |
| 0402 | ANLYT LAB SUPERVISOR | 0.00 | 0.00000 |
| 0403 | ANLYT NON SMPLE PREP | 40.00 | 0.04000 |
| 0404 | ANLYT SAMPLE PREP | 0.00 | 0.00000 |
| 0406 | JUNIOR METALURGIST | 20.00 | 0.02000 |
| 0407 | QUALITY ASSURANCE CO | 0.00 | 0.00000 |
| | CATEGORY 0400 TOTALS | 70.00 | 0.07000 |

PROGRAM - LAB305 T L D TOTALS BY LOCATION FOR 1987 RUN DATE 02/16/88

| LOCATION | | TOTAL MREMS | TOTAL MAN REMS |
|---|---|---|---|
| 0505 | LABORERS | 30.00 | 0.03000 |
| | CATEGORY 0500 TOTALS | 30.00 | 0.03000 |
| 0601 | WAREHOUSE SUPERVISOR | 10.00 | 0.01000 |
| 0603 | SUPT. SUPP. SVCS | 0.00 | 0.00000 |
| | CATEGORY 0600 TOTALS | 10.00 | 0.01000 |
| 0701 | MGR OF MILLING | 10.00 | 0.01000 |
| 0702 | PROD SUPERINTENDENT | 0.00 | 0.00000 |
| 0703 | MILL ACCOUNTANT | 0.00 | 0.00000 |
| 0707 | RECEPTIONIST/TYPIST | 0.00 | 0.00000 |
| 0708 | PAYRL/PDERS/ACCT PAY | 10.00 | 0.01000 |
| 0709 | PLANT ENGINEER | 20.00 | 0.02000 |
| | CATEGORY 0700 TOTALS | 40.00 | 0.04000 |
| 0801 | ENV. COORD./RAD. SAF | 10.00 | 0.01000 |
| 0802 | HEALTH & SAFETY SUPE | 0.00 | 0.00000 |
| 0803 | RAD SAFETY TECHS | 40.00 | 0.04000 |
| 0804 | DATA RECORDS COORDIN | 20.00 | 0.02000 |
| 0806 | SECURITY/SAFETY TECHS | 140.00 | 0.14000 |
| | CATEGORY 0800 TOTALS | 210.00 | 0.21000 |

PROGRAM - LAB305 T L D TOTALS BY LOCATION FOR 1987 RUN DATE 02/16/88

| LOCATION | TOTAL MREMS | TOTAL MAN REMS |
|---|---|---|

*** DISTRIBUTION OF EMPLOYEE TLD DATA FOR 1987 ***

| EXPOSURE RANGE IN mRem | NUMBER OF EXPOSURES* | PERCENT |
|---|---|---|
| EXPOSURES > 200 | 0 | 0.0 % |
| EXPOSURES (= 200 BUT >= 100 | 0 | 0.0 % |
| EXPOSURES < 100 | 29 | 15.4 % |
| EXPOSURES = 0 | 159 | 84.6 % |
| DISTRIBUTION TOTALS | 188 | 100.0 % |

*NUMBER OF EXPOSURES REFLECTS NUMBER OF TLD READINGS FOR THE PERIOD

PROGAM [redacted]AB306 *** DISTRIBUTION OF EMPLOYEE TLD DATA FOR 1987 ***

| EXPOSURE RANGE IN mRem | NUMBER OF EMPLOYEES | PERCENT |
|---|---|---|
| EXPOSURES > 200 | 0 | 0.0 % |
| EXPOSURES (= 200 BUT => 100 | 0 | 0.0 % |
| EXPOSURES < 100 | 26 | 28.3 % |
| EXPOSURES = 0 | 66 | 71.7 % |
| DISTRIBUTION TOTALS | 92 | 100.0 % |

10.1 - FUGITIVE DUST CONTROL - ANNUAL REPORT

LICENSE CONDITION 17.1

Cotter Corporation uses the following procedures for dust suppression on roadways: at the mill, roads are treated with water by waterspray truck as required to control fugitive particulate emissions; and, speed limits have been designated at 10 mph within the boundaries of the mill site and 25 mph from the main gate to the public road.

Ensuring the effectiveness of dust suppression in the secondary tailings pond requires regularly scheduled furrowing of the tailings surface. Refurrowing of the Secondary Impoundment was completed in August, 1987.

## 10.2 - PUMPBACK STATION FLOW RECORDS -ANNUAL REPORT

LICENSE CONDITION 19.3.5

Cotter has installed flowmeters at designated pumpback locations required by the Radioactive Materials License. Flow records are maintained at the Canon City mill office. During the tailings removal operation, Trench #2 (location 702) was excavated and no longer is in existence. The underdrain flow has been consistently below 4 gpm which shows no increase over previous years and is an indication of impoundment integrity.

Monthly Average Flows and Annual Flows are shown in Table 10-1.

TABLE 10.1

PUMPBACK

Gallons per Minute

| 1967 | Jan. | Feb. | March | April | May | June | July | August | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cotter #1 | 1.25 | 1.07 | 4.16 | 4.44 | 8.30 | 12.3 | 13.0 | 12.6 | 12.2 | 13.3 | 13.6 | 13.5 |
| Pond 1 Tr | 0.07 | 0.07 | 0.08 | 0.11 | 0.14 | 0.14 | 0.15 | 0.15 | 0.14 | 0.12 | 0.10 | 0.07 |
| Pond 3 Tr | 0.36 | 0.42 | 0.39 | 0.45 | 0.49 | 0.56 | 0.56 | 0.54 | 0.62 | 0.55 | 0.49 | 0.42 |
| Subdrain S | 1.78 | 1.68 | 1.68 | 1.88 | 2.23 | 2.36 | 2.54 | 2.52 | 2.53 | 2.40 | 2.33 | 2.14 |
| S5 Res Tr E | 2.83 | 3.33 | 3.24 | 3.05 | 2.96 | 3.81 | 3.64 | 4.00 | 4.14 | 4.53 | 4.39 | 3.73 |
| S5 Res Tr W | 9.80 | 10.0 | 10.2 | 10.5 | 9.37 | 10.23 | 9.19 | 7.47 | 10.1 | 8.27 | 7.86 | 10.0 |
| #11 Pumpback | 40.6 | 40.8 | 39.3 | 37.2 | 31.4 | 22.2 | 18.6 | 17.8 | 27.6 | 31.3 | 38.6 | 34.7 |
| #12 Pumpback | 40.1 | 29.4 | 46.2 | 45.2 | 42.2 | 41.0 | 38.3 | 37.2 | 45.4 | 50.9 | 56.9 | 50.0 |

| | Total Gallons Jan. 1 - Dec. 31 |
|---|---|
| Cotter #1 | 4,765,700 |
| Pond 1 Tr | 59,090 |
| Pond 3 Tr | 252,090 |
| Subdrain S | 1,145,200 |
| S5 Res Tr E | 1,961,000 |
| S5 Res Tr W | 4,972,100 |
| #11 Pumpback | 16,545,500 |
| #12 Pumpback | 22,296,300 |

## 10.3 - RADIATION SAFETY TRAINING - ANNUAL REPORT

LICENSE CONDITION 22.7

Radiation safety training is conducted at the mill to review radiation safety protection for employees. These training sessions are at least sixty minutes in duration and are provided as part of the new employee safety training course, as well as review sessions for personnel already employed at the mill. Training sessions are offered on a quarterly basis with the objective of annual retraining in radiation safety practices for all employees.

In 1987, a total of 17 radiation safety sessions were conducted with an attendance of 104 Cotter employees. Sessions were provided in all quarters of the calender year and annual retraining of all employees was achieved. The number of sessions and total attendance was decreased in comparison to the previous year's training due to the mill shutdown.

In addition, one radiation safety training session was presented to outside contractor personnel.

Cotter is committed to the practice of providing continuing education for Radiation Safety personnel to remain abreast of new techniques and procedures in radiation safety. Radiation safety training sessions for all mill personnel will continue through 1988, as specified.

## 10.4 - COLORADO DEPARTMENT OF HEALTH INSPECTION - ANNUAL REPORT

The Colorado Department of Health conducted an inspection of the Canon City milling facility November 30, 1987 through December 3, 1987. No report on that inspection has been issued.