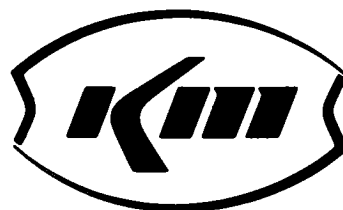


**KERR-McGEE CHEMICAL CORPORATION**

FOURTH QUARTER PERFORMANCE REPORT  
CHROMIUM MITIGATION PROGRAM  
KERR-McGEE CHEMICAL CORPORATION  
HENDERSON, NEVADA

DECEMBER 28, 1987



*Verne*  
*Tom of Jeff*  
*AA*



**KERR-McGEE CHEMICAL CORPORATION**

POST OFFICE BOX 55 • HENDERSON, NEVADA 89015

February 1, 1988

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ENVIRONMENTAL  
PROTECTION

Mr. Joe Livak  
State of Nevada  
Division of Environmental Protection  
201 South Fall Street  
Carson City, NV 89710

Dear Mr. Livak:

Enclosed please find the following items:

1. Two copies of the Fourth Quarter 1987 Performance Report for the Chromium Mitigation Program.
2. Appendix I for Consent Order documentation.
3. Appendix K for the Consent Order document.
4. Appendix J, also for the Consent Order document.

This should complete the appendices section and provide up-to-date information on the Chromium Mitigation Program.

Please contact Alan J. Gaddy at (702) 565-8901, should you have any questions.

Sincerely,

*P. S. Corbett*  
P. S. Corbett  
Plant Manager

PSC:j  
cc: AJGaddy

*Jeff -*  
*Review &*  
*File -*  
*Tom*

FOURTH QUARTER PERFORMANCE REPORT  
CHROMIUM MITIGATION PROGRAM  
KERR-McGEE CHEMICAL CORPORATION  
HENDERSON, NEVADA

DECEMBER 28, 1987

Prepared by:

Jeff Lux  
Hydrologist  
Engineering Services Division  
Kerr-McGee Corporation

KERR-McGEE CHEMICAL CORPORATION  
HENDERSON, NEVADA

FOURTH QUARTER PERFORMANCE REPORT  
CHROMIUM MITIGATION PROGRAM

INTRODUCTION

In compliance with the Consent Order for Cleanup of Chromium in Groundwater at the Henderson Facility, finalized September 9, 1986, Kerr-McGee Chemical Corporation prepared a performance report on November 18, 1987, for submission to the Nevada Department of Environmental Protection. This report stated that discharge of non-contact cooling water into the beta ditch, upgradient from the groundwater interceptor trench, was having an adverse effect on the groundwater intercept system. Based on this discovery, the discharge of water into the ditch was discontinued on November 13, 1987, and groundwater elevations were recorded approximately one month later. This report presents a summary of information collected to date on the facility groundwater interceptor system.

GROUNDWATER SURFACE CONFIGURATION

Figure 1 illustrates the consent order monitoring area, and shows the locations of groundwater recovery and monitor wells. Appendix A lists all groundwater elevations recorded since May 1987 in wells within the consent decree area. Water levels are recorded monthly and during semi-annual sampling events.

Figure 2 shows the potentiometric surface within this area on November 9, 1987, when the impact of infiltration from the beta ditch was greatest. From Appendix A it can be seen that the groundwater elevations were considerably higher than they had been in May, and had been steadily increasing. After discontinuing the discharge of water into the beta ditch, water levels began declining. Figure 3 shows the potentiometric surface based on groundwater elevations recorded December 16, 1987, approximately one month after discontinuing use of the beta ditch. By comparing Figure 2 with Figure 3, it is apparent that groundwater elevations are decreasing, although this decline in groundwater elevation has not yet been sufficient to significantly increase the control of groundwater flow.

In the row of wells nearest the beta ditch, groundwater elevations have declined from approximately 1 foot near the AP-5 pond to roughly 3 feet near the C-1 pond. Groundwater elevations in the interceptor line have decreased to a lesser extent. Kerr-McGee anticipates equal declines in



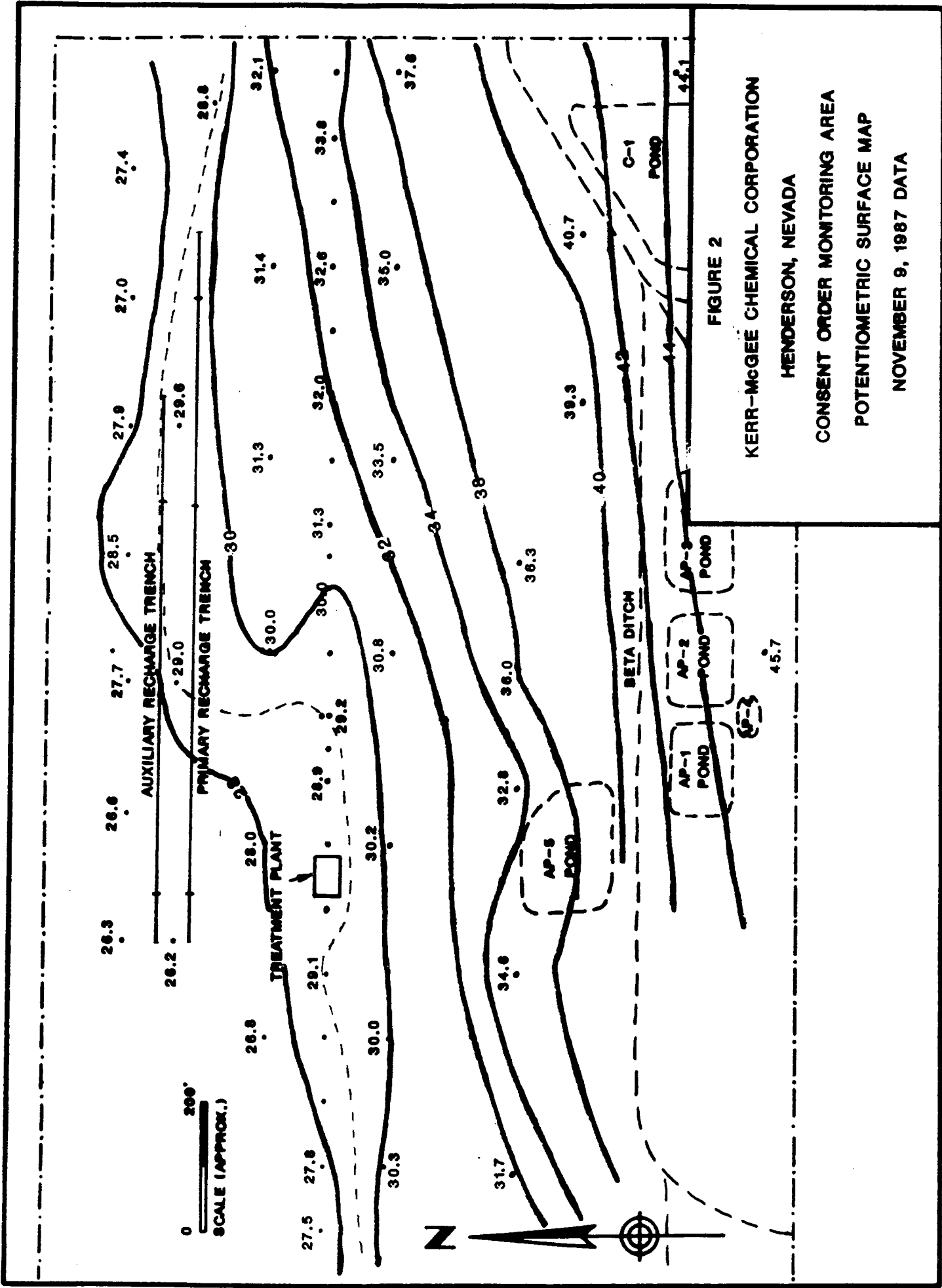
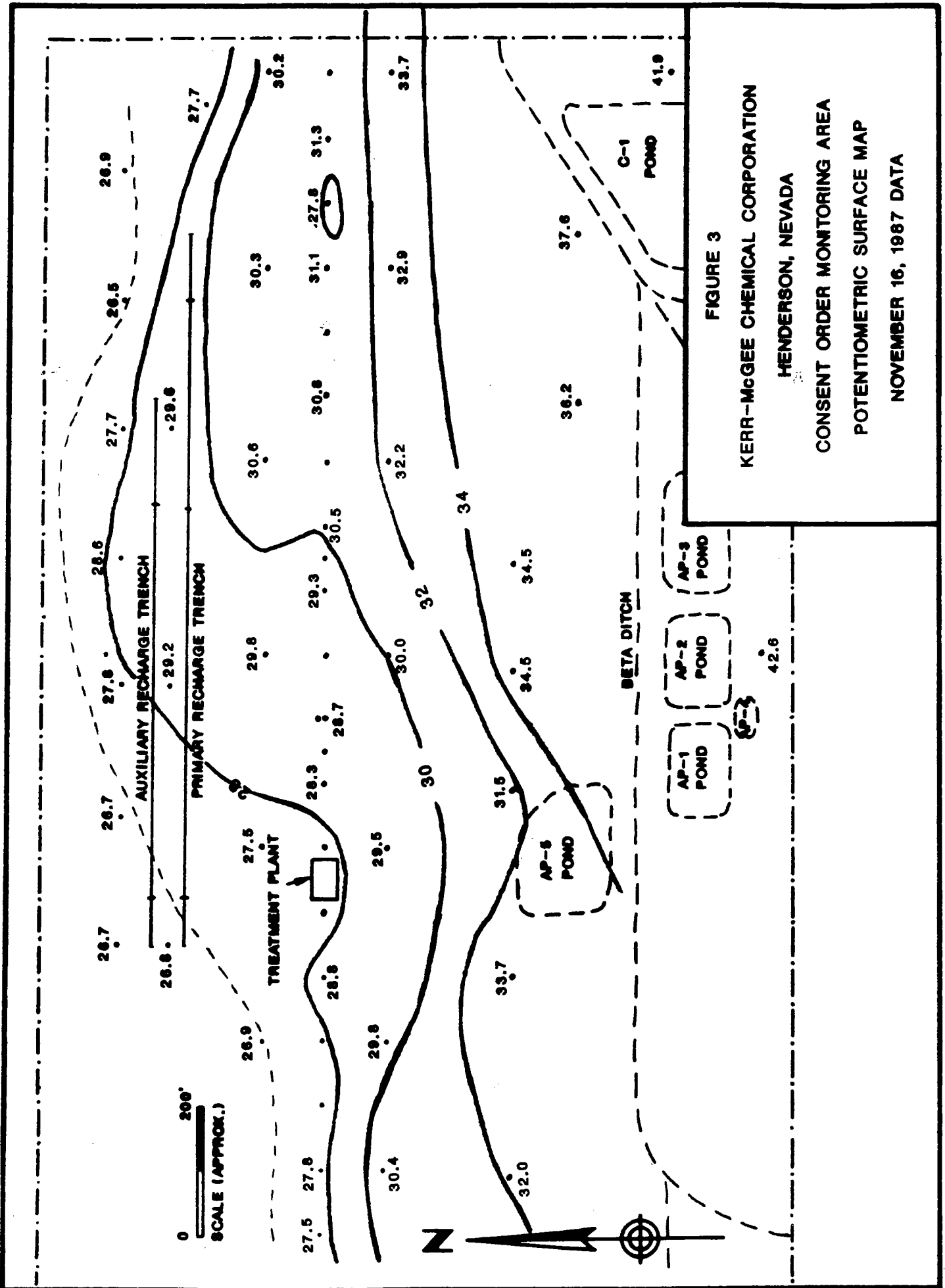


FIGURE 2

KERR-McGEE CHEMICAL CORPORATION  
 HENDERSON, NEVADA  
 CONSENT ORDER MONITORING AREA  
 POTENTIOMETRIC SURFACE MAP  
 NOVEMBER 9, 1987 DATA



**FIGURE 3**  
**KERR-McGEE CHEMICAL CORPORATION**  
**HENDERSON, NEVADA**  
**CONSENT ORDER MONITORING AREA**  
**POTENTIOMETRIC SURFACE MAP**  
**NOVEMBER 16, 1987 DATA**

groundwater elevations in the interceptor line, although they will occur later in time. It is believed that total reduction in groundwater elevations have not yet occurred, and that months are required before water levels upgradient from the interceptor system are restored to "static" conditions.

#### CONTINUOUS WATER LEVEL RECORDERS

Wells M-78 and M-80 are both equipped with continuous water level recorders. The November 13 through December 13, 1987 chart from well M-78 is attached as Figure 4. This chart illustrates the decline in water levels since discontinuance of discharge to the beta ditch on November 13, 1987. Water levels declined approximately 1.5 feet in that one month. Continuing declines are still being recorded.

#### PROJECTED PERFORMANCE OF THE INTERCEPTOR SYSTEM

Kerr-McGee maintains that, as groundwater elevations decline to the levels that were present before the effects of the beta ditch were felt, drawdown will increase in response to pumping of the recovery system. Kerr-McGee proposes to monitor the continuing decline in groundwater elevations, and to revise potentiometric surface maps on a monthly basis to monitor progress in groundwater interception. A report will be issued by March 14, 1988, detailing progress in the performance of the groundwater interceptor system.

#### IMPACT OF DISPOSAL SYSTEM ON WATER LEVELS

Appendix J, the Disposal System Contingency Plan, identifies certain wells that will be utilized in evaluating the impact of the recharge of treated water into the groundwater. In addition, also in Appendix J, Kerr-McGee identified certain wells that would be sampled and analyzed for chromium on a quarterly basis. Figure 5 illustrates the location of the Appendix J wells.

All of the wells installed prior to August 1987 have been sampled and analyzed for total chromium and hexavalent on a semi-annual basis. However, water levels for the Appendix J wells prior to December 1987 were only recorded when they were sampled for analysis. The water level data is therefore scattered over a six month period, and is not useful for impact determination. Beginning with the December data, water levels in these wells will be recorded simultaneously, so that meaningful records can be kept.

The consent order lists surface wetting as one indication that the disposal system is raising groundwater elevations. To date, no such wetting has occurred. Except in the immediate vicinity of the recharge trench, raising of water lev-



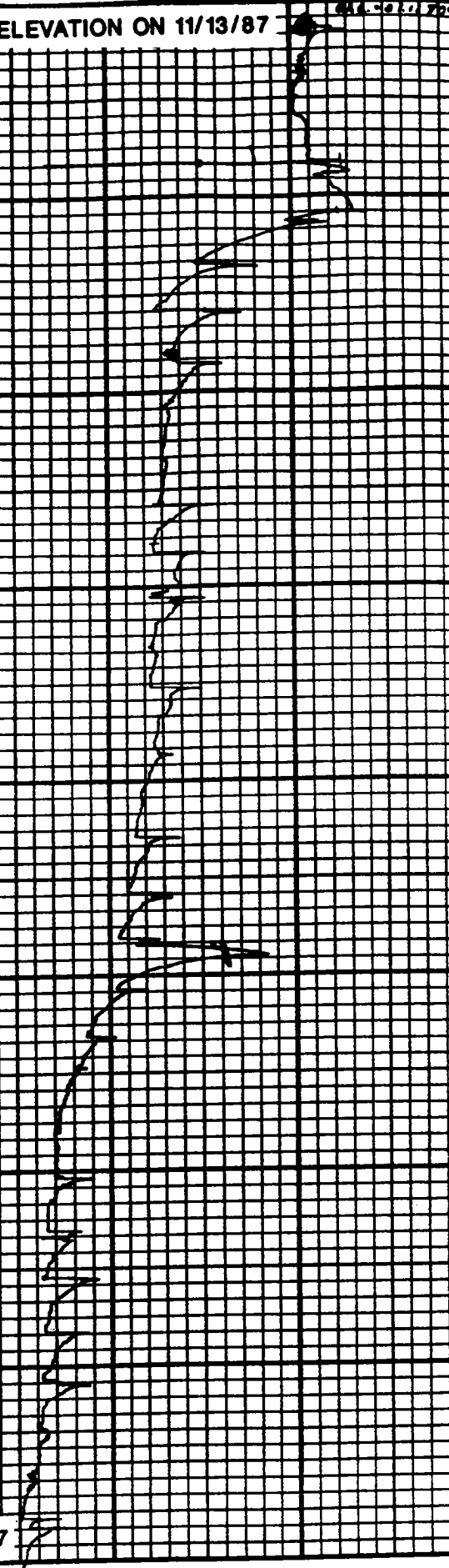
NOV 13 1987  
413/87  
413-413/87

ELEVATION ON 11/13/87

**FIGURE 4**  
**GROUNDWATER ELEVATION**  
**CONTINUOUS RECORDER CHART**  
**NOVEMBER 13, 1987 TO DECEMBER 13, 1987**  
**WELL #M-78**

1 FT.  
←ELEVATIONS→

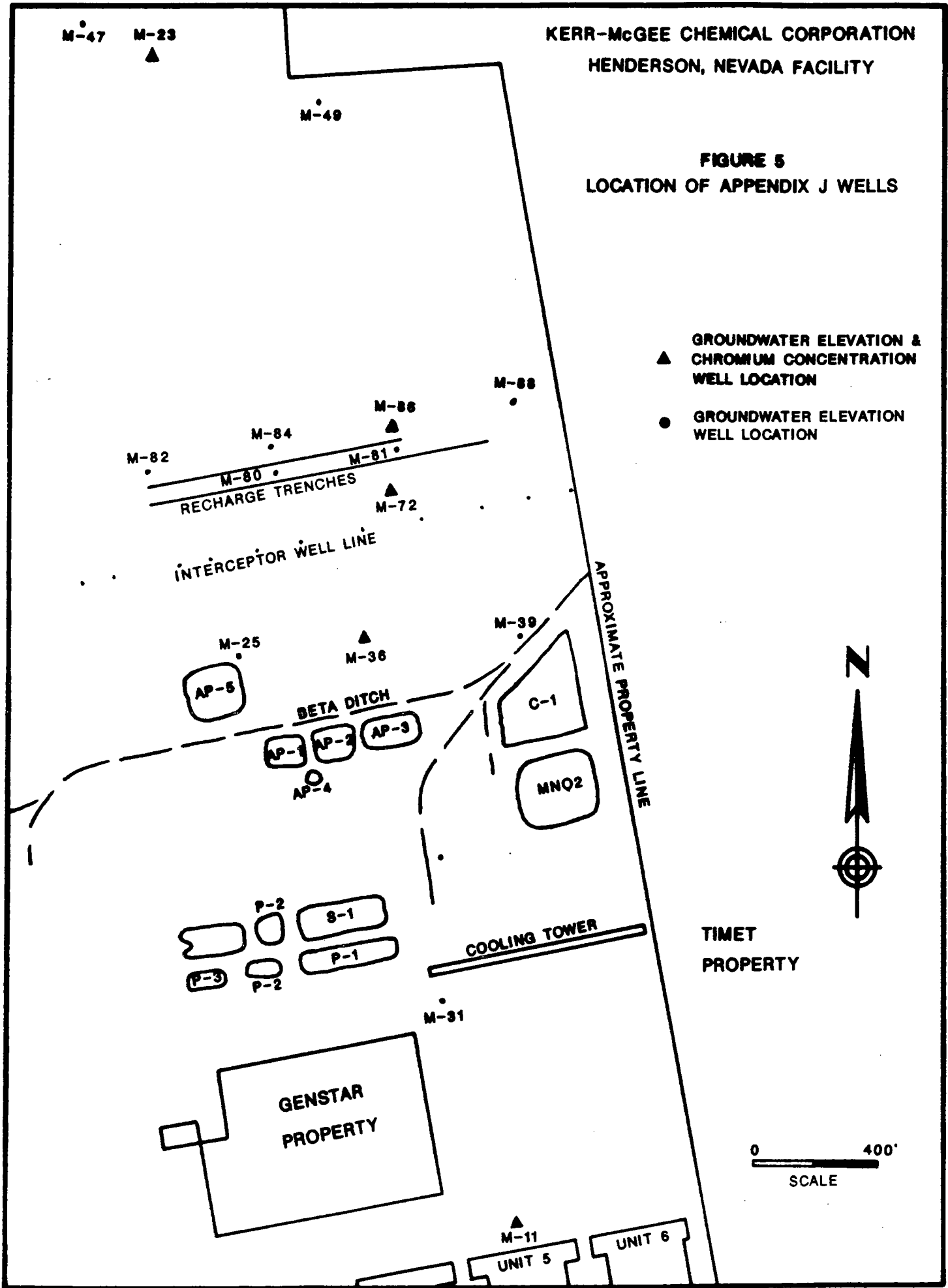
ELEVATION ON 12/13/87



KERR-McGEE CHEMICAL CORPORATION  
HENDERSON, NEVADA FACILITY

FIGURE 5  
LOCATION OF APPENDIX J WELLS

- ▲ GROUNDWATER ELEVATION & CHROMIUM CONCENTRATION WELL LOCATION
- GROUNDWATER ELEVATION WELL LOCATION



els downgradient from the trench is negligible.

#### CHROMIUM TREATMENT SYSTEM EFFECTIVENESS

Each week since initiation of the groundwater recovery system, the discharge from the water treatment plant has been sampled three times weekly. These samples have been composited and analyzed for total chromium and hexavalent chrome. Table 1 lists the relevant data for the period October 19, 1987, through December 31, 1987.

The consent order specifies the following limits on concentration of discharge water: Total Chromium 1.7 mg/l and Hexavalent Chromium 0.05 mg/l as a monthly average; Total Chromium 3.4 and Hexavalent Chromium 0.1 mg/l as a maximum single value on composite samples. Two consecutive monthly violations triggers implementation of the Treatment System Contingency Plan. Discharge testing began at system initiation; however, consecutive violations of discharge limits is not to begin until 60 days after system initiation, or November 14, 1987.

As can be seen from Table 1, difficulties were encountered during the first 60 days of treatment. Maintenance scheduling and capacity adjustment had to be coordinated, and it was late November when the system was operating efficiently. Since then, very few violations of the discharge limits have occurred; those resulted from unavoidable complications (blown fuse, end-of-year holidays, etc.). These complications have been corrected, and it is expected that future data will show efficient removal of the chromium from the feed water.

The effectiveness of the groundwater treatment system in reducing chromium levels throughout the plume will be determined by the levels of chromium in the Appendix J wells. The first set of analytical data obtained from these wells simultaneously comes from a January 22, 1988 sampling event. Hexavalent chromium levels in the five wells listed in Appendix J as chromium concentration wells are:

M-11	46.0	ppm
M-36	0.48	ppm
M-72	1.2	ppm
M-86	0.83	ppm
M-23	5.4	ppm

Hexavalent chromium levels will be monitored quarterly and graphically tracked to evaluate the impact of the treatment system on groundwater quality.

TABLE 1  
GROUNDWATER TREATMENT ANALYSIS  
CHROMIUM MITIGATION PROGRAM  
HENDERSON, NEVADA

WEEK OF	VOLUME TREATED (M gal.)	FEED CHROMIUM (mg/l)	END OF PIPE	
			TOTAL (mg/l)	HEXAVALENT (mg/l)
Oct. 19 - Oct. 25	1163	2.6	0.36	0.032
Oct. 26 - Nov. 1	1207	2.5	0.32	0.004
Nov. 2 - Nov. 8	1225	2.7	0.68	0.31
Nov. 9 - Nov. 15	1197	2.5	1.60	1.09
Nov. 16 - Nov. 22	1213	2.5	0.26	0.13
Nov. 23 - Nov. 29	1251	2.6	0.17	0.003
November Average		2.6	0.68	0.38
Nov. 30 - Dec. 6	1144	2.7	0.78	0.51
Dec. 7 - Dec. 13	1264	2.7	0.13	0.002
Dec. 14 - Dec. 20	1166	2.7	0.20	0.003
Dec. 21 - Dec. 31*	1848	2.5	0.54	0.31
December 1987 Average		2.7	0.41	0.21

\* Measurement taken over an 11 day period.

## PROPOSED FUTURE ACTION

Kerr-McGee Chemical Corporation is in the process of evaluating the effect of receding regional water levels in the interceptor area. Monthly water elevations will be recorded, and groundwater control development will be monitored. By the March 14, 1988 reporting time, the effect of the beta ditch infiltration should be essentially gone, and the true capability of the interceptor system should be apparent.

Discharge concentrations will continue to be monitored, and additional work is being scheduled to prevent exceeding discharge limits in the event of future equipment malfunctions. This includes purchase of an additional electrolytic cell, more spare parts, and scheduling of increased time for maintenance.

A report summarizing the effectiveness of these measures will be submitted March 14, 1988.

APPENDIX A  
GROUNDWATER ELEVATIONS

Appendix A

KERR-MCGEE CHEMICAL CORPORATION  
 HENDERSON, NEVADA FACILITY  
 GROUNDWATER ELEVATIONS

	M-11	M-14	M-15	M-17	M-18	M-19	M-22	M-25	M-27	M-34	M-36	M-37
TOC	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM
	1814.45	1759.43	1751.07	1772.18	1738.93	1768.52	1759.38	1757.25	1741.28	1776.10	1758.88	1759.58
MAY 1987			24.43	30.30	12.79	28.20	23.79	27.48	17.86		24.38	26.76
JUN 1987		27.96	23.77	28.50	12.13	26.99	21.90	26.24	17.86		24.38	26.76
JUL 1987		28.26	23.70	30.70	12.42	27.86	23.27	26.60	17.98		25.73	27.24
AUG 1987			24.40	30.90	12.80	28.22	24.28	27.61	17.89		23.47	26.15
9-14-87		28.55	23.23	27.60	10.65	25.18	20.50	25.69	17.89		23.47	26.15
10-19-87		28.02	22.36	27.60	11.00	20.37	20.37	24.66	14.41		22.73	25.33
10-29-87		27.90	22.15	26.93	10.93	24.94	20.66	24.72	14.35		22.95	25.26
11-09-87		27.71	21.84	26.47	10.17	24.41	20.10	24.50	14.00		22.61	25.03
12-16-87	44.84	1769.61	22.35	29.62	11.24	26.61	22.68	25.73	13.91	32.00	24.32	25.93

	M-38	M-39	M-46	M-47	M-49	M-53	M-54	M-55	M-56	M-57	M-58	M-59
TOC	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM
	1759.08	1760.22	1716.08	1715.04	1718.89	1752.34	1749.85	1750.15	1750.14	1753.12	1750.51	1744.16
MAY 1987			25.67	22.38	25.67	23.21	23.21	23.21	22.24	26.78	21.18	14.11
JUN 1987	24.90	1734.18	25.28	21.73	25.28	22.46	22.46	22.46	21.42	26.38	19.94	12.82
JUL 1987	26.12	1732.96	25.34	22.01	25.34	22.80	22.80	22.80	21.93	26.53	20.60	13.58
AUG 1987			25.45	22.02	25.45	22.65	22.65	22.65	21.56	26.62	19.65	12.40
9-14-87	24.04	1735.04	25.10	21.57	25.10	22.11	22.11	22.11	20.94	26.30	18.76	11.32
10-19-87	23.05	1736.03	25.00	21.30	25.00	21.66	21.66	21.66	20.49	26.00	18.81	12.01
10-29-87	23.35	1735.73	24.84	21.12	24.84	21.44	21.44	21.44	20.40	25.88	18.84	12.04
11-09-87	23.07	1736.01	24.56	20.80	24.56	21.22	21.22	21.22	20.13	25.67	18.52	11.53
12-16-87	24.63	1734.45	24.56	21.05	24.56	21.90	21.90	21.90	20.80	25.61	19.70	13.06

	M-38	M-39	M-46	M-47	M-49	M-53	M-54	M-55	M-56	M-57	M-58	M-59
TOC	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM
	1759.08	1760.22	1716.08	1715.04	1718.89	1752.34	1749.85	1750.15	1750.14	1753.12	1750.51	1744.16
MAY 1987			25.67	22.38	25.67	23.21	23.21	23.21	22.24	26.78	21.18	14.11
JUN 1987	24.90	1734.18	25.28	21.73	25.28	22.46	22.46	22.46	21.42	26.38	19.94	12.82
JUL 1987	26.12	1732.96	25.34	22.01	25.34	22.80	22.80	22.80	21.93	26.53	20.60	13.58
AUG 1987			25.45	22.02	25.45	22.65	22.65	22.65	21.56	26.62	19.65	12.40
9-14-87	24.04	1735.04	25.10	21.57	25.10	22.11	22.11	22.11	20.94	26.30	18.76	11.32
10-19-87	23.05	1736.03	25.00	21.30	25.00	21.66	21.66	21.66	20.49	26.00	18.81	12.01
10-29-87	23.35	1735.73	24.84	21.12	24.84	21.44	21.44	21.44	20.40	25.88	18.84	12.04
11-09-87	23.07	1736.01	24.56	20.80	24.56	21.22	21.22	21.22	20.13	25.67	18.52	11.53
12-16-87	24.63	1734.45	24.56	21.05	24.56	21.90	21.90	21.90	20.80	25.61	19.70	13.06

Appendix A

	M-60	M-61	M-62	M-63	M-64	M-65	M-66	M-67	M-68	M-69	M-70	M-71
TOC	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.
MAY 1987	21.60	1750.37	1746.37	1751.88	1751.7	1752.93	1753	1745.36	1748.15	1749.14	1747.31	1747.14
JUN 1987	20.5	1729.87	1729.57	1729.26	1729.34	1729.59	1729.59	1729.59	1729.59	1729.59	1729.59	1729.59
JUL 1987	21.06	1729.31	1729.60	1729.03	1728.82	1728.99	1728.99	1728.99	1728.99	1728.99	1728.99	1728.99
AUG 1987	20.57	1729.80	1729.30	1728.93	1729.05	1729.39	1729.39	1729.39	1729.39	1729.39	1729.39	1729.39
9-14-87	19.78	1730.59	1729.68	1729.36	1729.49	1730.01	1730.01	1730.01	1730.01	1730.01	1730.01	1730.01
10-19-87	19.36	1731.01	1729.96	1729.56	1729.86	1730.41	1730.41	1730.41	1730.41	1730.41	1730.41	1730.41
10-29-87	19.33	1731.04	1730.07	1729.71	1730.01	1730.48	1730.48	1730.48	1730.48	1730.48	1730.48	1730.48
11-09-87	19.08	1731.29	1730.34	1730.03	1730.19	1730.78	1730.78	1730.78	1730.78	1730.78	1730.78	1730.78
12-16-87	19.86	1730.51	1730.35	1729.75	1729.53	1729.95	1729.95	1729.95	1729.95	1729.95	1729.95	1729.95

	M-72	M-73	M-74	M-78	M-79	M-80	M-81	M-82	M-83	M-84	M-85	M-86
TOC	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.
MAY 1987	18.09	1727.75	1740.61	1743.84	1750.95	1744.27	1743.42	1741.84	1742.01	1740.51	1741.95	1741.98
JUN 1987	17.00	1728.84	1729.64	1729.64	1729.64	1729.64	1729.64	1729.64	1729.64	1729.64	1729.64	1729.64
JUL 1987	17.63	1728.21	1729.03	1729.03	1729.03	1729.03	1729.03	1729.03	1729.03	1729.03	1729.03	1729.03
AUG 1987	17.97	1727.87	1729.94	1729.94	1729.94	1729.94	1729.94	1729.94	1729.94	1729.94	1729.94	1729.94
9-14-87	15.98	1729.86	1730.97	1730.97	1730.97	1730.97	1730.97	1730.97	1730.97	1730.97	1730.97	1730.97
10-19-87	14.92	1730.92	1730.83	1731.13	1731.13	1731.13	1731.13	1731.13	1731.13	1731.13	1731.13	1731.13
10-29-87	14.90	1730.94	1730.84	1731.26	1731.26	1731.26	1731.26	1731.26	1731.26	1731.26	1731.26	1731.26
11-09-87	14.52	1731.32	1731.38	1731.38	1731.38	1731.38	1731.38	1731.38	1731.38	1731.38	1731.38	1731.38
12-16-87	15.29	1730.55	1730.27	1729.09	1726.82	1729.18	1729.55	1726.65	1726.68	1727.79	1728.60	1727.70

	M-60	M-61	M-62	M-63	M-64	M-65	M-66	M-67	M-68	M-69	M-70	M-71
TOC	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.	DTM	ELEV.
MAY 1987	18.09	1727.75	1740.61	1743.84	1750.95	1744.27	1743.42	1741.84	1742.01	1740.51	1741.95	1741.98
JUN 1987	17.00	1728.84	1729.64	1729.64	1729.64	1729.64	1729.64	1729.64	1729.64	1729.64	1729.64	1729.64
JUL 1987	17.63	1728.21	1729.03	1729.03	1729.03	1729.03	1729.03	1729.03	1729.03	1729.03	1729.03	1729.03
AUG 1987	17.97	1727.87	1729.94	1729.94	1729.94	1729.94	1729.94	1729.94	1729.94	1729.94	1729.94	1729.94
9-14-87	15.98	1729.86	1730.97	1730.97	1730.97	1730.97	1730.97	1730.97	1730.97	1730.97	1730.97	1730.97
10-19-87	14.92	1730.92	1730.83	1731.13	1731.13	1731.13	1731.13	1731.13	1731.13	1731.13	1731.13	1731.13
10-29-87	14.90	1730.94	1730.84	1731.26	1731.26	1731.26	1731.26	1731.26	1731.26	1731.26	1731.26	1731.26
11-09-87	14.52	1731.32	1731.38	1731.38	1731.38	1731.38	1731.38	1731.38	1731.38	1731.38	1731.38	1731.38
12-16-87	15.29	1730.55	1730.27	1729.09	1726.82	1729.18	1729.55	1726.65	1726.68	1727.79	1728.60	1727.70



Appendix A

M-87 M-88  
 1741.89 1738.73  
 DTW ELEV. DTW ELEV.

MAY 1987  
 JUN 1987  
 JUL 1987  
 AUG 1987  
 9-14-87 16.90 1724.99 12.28 1726.45  
 10-19-87 15.84 1726.05 12.10 1726.63  
 10-29-87 15.70 1726.19 12.02 1726.71  
 11-09-87 14.91 1726.96 11.38 1727.35  
 12-16-87 15.40 1726.49 11.82 1726.91

I-A I-B I-C I-D I-E I-F I-G I-H I-I I-J I-K  
 1751.38 1752.15 1752.14 1751.67 1752.67 1748.56 1751.06 1752.02 1744.5 1748.58 1744.51  
 DTW ELEV. DTW ELEV. DTW ELEV. DTW ELEV. DTW ELEV. DTW ELEV. DTW ELEV. DTW ELEV. DTW ELEV. DTW ELEV.

MAY 1987  
 JUN 1987 24.87 1726.51 25.14 23.59 23.62 20.90 23.45 23.17 14.91 18.71 13.39  
 JUL 1987 25.25 1726.13 25.10 24.12 23.62 21.44 22.00 21.53 13.38 16.80 11.41  
 AUG 1987 25.51 1725.87 25.54 24.38 24.22 21.52 23.01 22.62 14.53 18.64 12.70  
 9-14-87 25.06 1727.53 24.98 23.86 23.53 20.73 22.92 22.11 14.24 17.78 12.37  
 10-19-87 27.18 1725.41 26.73 24.58 36.80 22.99 23.63 24.90 15.35 20.51 17.15  
 10-29-87 27.01 1725.58 26.45 24.33 35.80 22.99 24.19 24.96 15.48 20.52 16.89  
 11-09-87  
 12-16-87 26.45 1726.14 26.49 25.55 45.58 23.17 24.59 27.10 17.63 21.75 19.92