



Department of Energy

**Ohio Field Office
Fernald Area Office**

P. O. Box 538705
Cincinnati, Ohio 45253-8705
(513) 648-3155

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OCT 19 2000

Mr. James A. Saric, Remedial Project Manager
U.S. Environmental Protection Agency
Region V, SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

DOE-0070-01

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Ms. Val Orr
Division of Drinking and Ground Waters - UIC Unit
P.O. Box 1049
1800 Watermark Drive
Columbus, Ohio 45316-1049

Dear Mr. Saric, Mr. Schneider, and Ms. Orr:

AUGUST 2000 RE-INJECTION OPERATING REPORT

This correspondence submits the Re-Injection Operation Report for the month of August 2000.

As specified in the Re-Injection Demonstration Test Plan, monthly re-injection operating reports are to be prepared and submitted to the U.S. Environmental Protection Agency (U.S. EPA), Ohio Environmental Protection Agency (OEPA) Office of Federal Facilities Oversight, and the OEPA Division of Drinking and Ground Waters - UIC Unit.

Mr. James A. Saric
Mr. Tom Schneider
Ms. Val Orr

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OCT 19 2000

If you have any questions regarding this submittal, please contact Robert Janke at (513) 648-3124.

Sincerely,



Johnny W. Reising
Fernald Remedial Action
Project Manager

Enclosure

cc: w/enclosure

R.J. Janke, OH/FEMP

G. Jablonowski, USPEA-V, SRF-5J

T. Schneider, OEPA-Dayton (three copies of enclosure)

F. Bell, ATSDR

F. Hodge, Tetra Tech

M. Schupe, HSI GeoTrans

R. Vandegrift, ODH

D. Brettschneider, Fluor Fernald, Inc./52-5

K. Broberg, Fluor Fernald, Inc./52-5

W. Hertel, Fluor Fernald, Inc./52-5

M. Jewett, Fluor Fernald, Inc./52-2

R. White, Fluor Fernald, Inc./52-5

AR Coordinator, Fluor Fernald, Inc./78

cc w/o enclosure:

N. Hallein, EM-31/CLOV

A. Tanner, OH/FEMP

D. Carr, Fluor Fernald, Inc./2

T. Hagen, Fluor Fernald, Inc./65-2

J. Harmon, Fluor Fernald, Inc./90

S. Hinnefeld, Fluor Fernald, Inc./31

M. Jewett, Fluor Fernald, Inc./52-2

U. Kumthekar, Fluor Fernald, Inc./64

T. Walsh, Fluor Fernald, Inc./65-2

ECDC, Fluor Fernald, Inc./52-7

**MONTHLY RE-INJECTION
OPERATING REPORT
AUGUST 2000**

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OVERVIEW

On September 2, 1999, DOE completed one year of active groundwater re-injection as part of a field-scale demonstration. A report detailing the demonstration was issued to the U.S. EPA and Ohio EPA on May 30, 2000. Based on the results of the demonstration, re-injection will continue at Fernald.

Re-Injection at Fernald is exempted under 40 CFR 300.400(e)(1) from requiring a permit, as it is a CERCLA action. Per Ohio EPA Guidelines (OEPA 1997) DOE will prepare monthly operating reports that include:

- I. An analysis of the injectate
- II. The volume and rate of re-injection
- III. A description of any well maintenance and rehabilitation procedures conducted.

Routine monitoring of the aquifer in the re-injection area is conducted for the Integrated Environmental Monitoring Program. Results of the Integrated Monitoring Program are reported quarterly and are available for viewing on the Fernald Website, www.fernald.gov.

DOE will submit the monthly re-injection operating reports to the U.S. EPA, Ohio EPA Office of Federal Facilities Oversight, and the Division of Ohio EPA Drinking and Ground Waters – Underground Injection Control Unit.

This report covers re-injection operations from August 1, 2000 to September 1, 2000.

ANALYSIS OF THE INJECTATE

Groundwater extracted from the Great Miami Aquifer is treated for uranium removal and is then re-injected into the Great Miami Aquifer. The groundwater is treated in the FEMP Advanced Waste Water Treatment (AWWT) Expansion Facility. The effluent from the AWWT Expansion Facility is sampled monthly for the parameters listed in Table 2.1 of the Re-Injection Demonstration Test Plan, Revision 0.

Monthly injectate grab sampling focuses on the final remediation level (FRL) constituents that have had an exceedance of their FRL in the region of the aquifer from which the groundwater is being pumped. The monthly injectate grab samples are sent to an off-site laboratory for analysis. In addition to the monthly grab sample, 24-hour composite samples are collected and analyzed for uranium. The 24-hour composite

sampler samples the combined effluent from the active treatment trains comprising the facility. The daily composite results are used by plant management for making process control decisions. They provide a daily evaluation of the quality of the water that is re-injected into the aquifer. Composite daily uranium results from the AWWT Expansion Facility effluent are shown in Figure 1.

The monthly grab sample was collected on August 8, 2000. Results are provided in Table 1. These results indicate that all the constituent concentrations are below their respective FRLs. The total uranium concentration measured in the grab sample was 1.25 $\mu\text{g/L}$. The FRL for uranium is 20 $\mu\text{g/L}$. The total uranium concentration of the 24-hour composite sample also collected on August 8, 2000 was 0.1 $\mu\text{g/L}$.

VOLUME AND RATE OF RE-INJECTION

Treated groundwater is being re-injected into the Great Miami Aquifer in five re-injection wells. The design re-injection set point for each of the re-injection wells is 200 gpm. The combined design re-injection rate for all five wells is 1000 gallons per minute. Figure 2 illustrates the location of the five re-injection wells. Re-Injection Well 8 is 8 inches in diameter. Re-Injection Well 9 is 12 inches in diameter. The other re-injection wells are all 16 inches in diameter.

In February of 2000, a new injection rate strategy was initiated to help compensate for well downtimes due to maintenance, electrical outages, etc. Injection rate set points may be temporarily increased by 10 percent to 220 gpm toward the end of a month and decreased back to the 200 gpm rate at the start of the subsequent month. When re-injection rates are increased by 10 percent, pumping rates are also increase by 10 percent in the South Field Extraction Wells, and by 20 percent in the South Plume Optimization Wells (Wells 6 and 7). The ability to increase re-injection rates is dependent upon the availability of higher than average groundwater treatment capacity and lower than normal uranium concentrations in the site effluent.

This strategy for adjusting re-injection rate set points may continue in future months depending on the available treatment capacity and uranium concentrations in the site effluent.

Figure 3 illustrates the water level rise in each of the five re-injection wells from August 1, 2000 to September 1, 2000, as measured by the operators at the AWWT Expansion Facility Distributed Control System (DCS). Water levels are recorded three times each day. Water levels inside the re-injection wells are monitored as an indicator of plugging within the wells. Given a constant re-injection rate, as a well screen becomes plugged, the water level in the well rises to compensate for the greater pressure needed to move the same volume of water through a smaller opening.

While it is not the intent of this report to discuss operational issues, the following information is provided to aid in the interpretation of Figures 1 and 3.

SUMMARY OF SYSTEM OUTAGES FOR THE REPORTING PERIOD

For the month of August 2000, the re-injection system was inoperative during the following intervals:

- August 3 and 4, 2000 (sample numbers 2106-2111 [Figure 3]): all wells in the re-injection system were shut down to evaluate the uranium discharge levels after restarting the AWWT Phase III system.
- August 18 and 19, 2000 (sample numbers 2151-2156 [Figure 3]): all wells in the re-injection system were shut down due to the AWWT Phase III system being down.

SUMMARY OF WELL MAINTENANCE FOR THE REPORTING PERIOD

In August, chemical treatment/rehabilitation procedures were completed on one well (IW-8) as described below. In addition, Re-Injection Well 11 was taken out of service in preparation for chemical treatment/rehabilitation, and Re-Injection Well 12 was restarted.

- Re-Injection Well 8 was turned off on July 20, 2000 (sample number 2064 [Figure 3]) for chemical treatment/rehabilitation. The well was treated using approximately 23 gallons of sodium hypochlorite with a concentration of 12.5 percent chlorine. The pumping of the well during treatment resulted in a cumulative volume removal of approximately 8400 gallons. The well resumed re-injecting on August 28, 2000 (sample number 2181 [Figure 3]).
- Re-Injection Well 11 was turned off on August 28, 2000 (sample number 2181 [Figure 3]) during second shift due to high water level. Rehabilitation commenced on August 29, 2000 and continued through the end of the month.
- Re-Injection Well 12 resumed re-injecting on August 8, 2000 (sample number 2122 [Figure 3]) after undergoing chemical treatment/rehabilitation in July 2000; details of the chemical treatment/rehabilitation were discussed in the July 2000 Re-Injection Operating report.

TABLE 1
ANALYSIS OF INJECTATE
Sample Collected August 8, 2000

Constituents ^a	Result ^b	Groundwater FRL ^c	Detection Limit	Constituent Type ^e	Basis for FRL ^f
General Chemistry		mg/L			
Nitrate	0.200 J	11.0		MP	B
Inorganics		mg/L			
Antimony	U	0.006	0.000683	N	A
Arsenic	0.001760 B	0.05		N	A
Barium	0.0518 B	2.0		N	A
Beryllium	U	0.004	0.000010	N	A
Cadmium	U	0.014	0.000130	N	B
Total Chromium	0.001060 B	0.022 ^d		MP	R
Cobalt	U	0.17	0.000010	N	R
Lead	U	0.015	0.000010	N	A
Manganese	0.002240 B	0.9		N	B
Mercury	U	0.002	0.000043	MP	A
Nickel	0.000635 B	0.1		N	A
Selenium	U	0.05	0.000302	N	A
Silver	0.000181 B	0.05		N	R
Vanadium	0.002260 B	0.038		N	R
Zinc	0.000970 B	0.021		N	B
Radionuclides		pCi/L			
Neptunium-237	U	1.0	-0.0000557	MP	R*
Radium-226	U	20.0	0.540	N	A
Strontium-90	U	8.0	0.248	MP	A
Thorium-228	U	4.0	0.00712	N	R*
Thorium-232	U	1.2	-0.00355	N	R*
Total Uranium	1.25	µg/L 20.0		MP	A
Organics		µg/L			
Bis(2-ethylhexyl)phthalate	4.1 J	6.0		N	A
Carbon disulfide	U	5.5	5.0	N	A
1, 1-Dichloroethene	U	7.0	1.0	N	A
1, 2-Dichloroethane	U	5.0	1.0	MP	A
Trichloroethene	U	5.0	1.0	N	A

^aConstituents taken from Table 2-1 of Re-Injection Demonstration Test Plan. Constituents are those previously detected in aquifer zones 2 and 4 at concentrations above their FRL.

^bIf a duplicate sample was analyzed the highest concentration between the regular sample and duplicate sample is reported.

U = Nondetect

B = Lab qualifier (inorganic). Reported result is greater than the instrument detection level but less than the contract required detection limit.

^cFrom Table 9-4 in OU5 ROD.

^dFRL is for hexavalent chromium.

^eConstituent types from Appendix A of IEMP. MP indicates that the constituent has been identified as being able to migrate to the aquifer. N indicates that the constituent has been identified as not being able to migrate to the aquifer.

^fA - Applicable or relevant and appropriate requirement based (MCL, PMCL, etc.).

B - Based on 95th percentile background concentrations.

R - Risk-based

R* - Risk-based radionuclide cleanup levels include constituent specific 95th percentile background concentration.

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TABLE 2

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RE-INJECTION WELL 22107 (IW-8)
OPERATIONAL SUMMARY SHEET
AUGUST 2000

Reference Elevation (feet AMSL) - 539.92 (top of casing)
Northing Coordinate ('83) - 476196.22
Easting Coordinate ('83) - 1347978.25

Hours in reporting period^a = 742.03
Hours not injecting^b = 648.00
Hours injecting^c = 94.03
Operational percent^d = 12.7

Target Injection Rate = 200 gpm

Monthly Measurements		
Month	Million Gallons Injected ^e	Average Operating Injection Rate (gpm) ^f
9/98	8.16	206
10/98	5.78	203
11/98	8.47	196
12/98	5.76	222
1/99	5.35	227
2/99	7.06	196
3/99	7.34	205
4/99	7.75	197
5/99	7.46	216
6/99	8.42	197
7/99	8.93	201
8/99	8.64	199
9/99	3.92	181
10/99	7.86	199
11/99	6.54	196
12/99	7.28	178
1/00	7.74	192
2/00	8.85	212
3/00	9.22	208
4/00	4.07	190
5/00	0	0
6/00	5.70	181
7/00	2.44	203
8/00	1.11	197

^aFirst operational shift reading on August 1, 2000 to first operational shift reading on September 1, 2000.

^bDowntime as noted in the text.

^cHours in reporting period - Hours not injecting

^d(Hours injecting/Hours in reporting period) x 100

^eSummation of daily totalizer differences

^fMillion Gallons Injected/(Hours Injecting x 60)

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TABLE 3

**RE-INJECTION WELL 22108 (IW-9)
OPERATIONAL SUMMARY SHEET
AUGUST 2000**

Reference Elevation (feet AMSL) - 578.025 (top of casing)
 Northing Coordinate ('83) - 476255.74
 Easting Coordinate ('83) - 1348384.49

Hours in reporting period^a = 743.15
 Hours not injecting^b = 172.00
 Hours injecting^c = 571.15
 Operational percent^d = 76.9

Target Injection Rate = 200 gpm

Monthly Measurements		
Month	Million Gallons Injected ^e	Average Operating Injection Rate (gpm) ^f
9/98	8.17	206
10/98	8.30	201
11/98	8.53	197
12/98	5.66	214
1/99	4.33	181
2/99	6.07	156
3/99	5.93	178
4/99	6.66	184
5/99	7.83	200
6/99	8.41	197
7/99	8.79	198
8/99	8.63	198
9/99	5.68	187
10/99	7.80	198
11/99	6.54	185
12/99	3.08	189
1/00	6.12	212
2/00	8.78	218
3/00	9.22	206
4/00	7.54	202
5/00	1.42	164
6/00	5.75	183
7/00	1.57	190
8/00	6.80	198

^aFirst operational shift reading on August 1, 2000 to first operational shift reading on September 1, 2000.

^bDowntime as noted in the text.

^cHours in reporting period - Hours not injecting

^d(Hours injecting/Hours in reporting period) x 100

^eSummation of daily totalizer differences

^fMillion Gallons Injected/(Hours Injecting x 60)

TABLE 4

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**RE-INJECTION WELL 22109 (IW-10)
OPERATIONAL SUMMARY SHEET
AUGUST 2000**

Reference Elevation (feet AMSL) - 576.92 (top of casing)

Northing Coordinate ('83) - 476175.65

Easting Coordinate ('83) - 1348860.53

Hours in reporting period^a = 743.10

Target Injection Rate = 200 gpm

Hours not injecting^b = 168.00Hours injecting^c = 575.10Operational percent^d = 77.4

Monthly Measurements		
Month	Million Gallons Injected ^e	Average Operating Injection Rate (gpm) ^f
9/98	8.13	205
10/98	8.28	200
11/98	8.50	196
12/98	5.72	217
1/99	5.48	229
2/99	8.09	208
3/99	8.13	204
4/99	5.35	190
5/99	8.25	197
6/99	8.36	196
7/99	8.81	199
8/99	8.52	196
9/99	1.97	169
10/99	7.79	198
11/99	6.47	183
12/99	7.58	186
1/00	8.72	195
2/00	6.61	233
3/00	9.11	204
4/00	7.47	200
5/00	1.43	165
6/00	1.26	190
7/00	2.63	204
8/00	6.82	198

^aFirst operational shift reading on August 1, 2000 to first operational shift reading on September 1, 2000.^bDowntime as noted in the text.^cHours in reporting period - Hours not injecting^d $(\text{Hours injecting} / \text{Hours in reporting period}) \times 100$ ^eSummation of daily totalizer differences^fMillion Gallons Injected / (Hours Injecting x 60)

TABLE 5

**RE-INJECTION WELL 22240 (IW-11)
OPERATIONAL SUMMARY SHEET
AUGUST 2000**

Reference Elevation (feet AMSL) - 577.14 (top of casing)
 Northing Coordinate ('83) - 476422.82
 Easting Coordinate ('83) - 1349386.92

Hours in reporting period^a = 743.70
 Hours not injecting^b = 286.00
 Hours injecting^c = 457.70
 Operational percent^d = 61.5

Target Injection Rate = 200 gpm

Monthly Measurements		
Month	Million Gallons Injected ^e	Average Operating Injection Rate (gpm) ^f
9/98	8.39	211
10/98	8.29	199
11/98	8.50	197
12/98	5.68	216
1/99	5.53	230
2/99	8.06	208
3/99	8.04	204
4/99	7.56	192
5/99	8.34	199
6/99	8.42	197
7/99	8.85	199
8/99	8.65	199
9/99	5.64	186
10/99	7.91	200
11/99	6.67	189
12/99	7.62	187
1/00	8.86	198
2/00	8.76	217
3/00	9.19	206
4/00	7.53	201
5/00	1.41	163
6/00	5.77	184
7/00	3.94	198
8/00	5.68	207

^aFirst operational shift reading on August 1, 2000 to first operational shift reading on September 1, 2000.

^bDowntime as noted in the text.

^cHours in reporting period - Hours not injecting

^d(Hours injecting/Hours in reporting period) x 100

^eSummation of daily totalizer differences

^fMillion Gallons Injected/(Hours Injecting x 60)

TABLE 6

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RE-INJECTION WELL 22111 (IW-12)
OPERATIONAL SUMMARY SHEET
AUGUST-2000

Reference Elevation (feet AMSL) - 583.01 (top of casing)
Northing Coordinate ('83) - 476518.64
Easting Coordinate ('83) - 1350105.39

Hours in reporting period^a = 743.12
Hours not injecting^b = 266.00
Hours injecting^c = 477.12
Operational percent^d = 64.2

Target Injection Rate = 200 gpm

Monthly Measurements		
Month	Million Gallons Injected ^e	Average Operating Injection Rate (gpm) ^f
9/98	8.12	205
10/98	8.27	201
11/98	8.53	197
12/98	5.61	219
1/99	5.08	212
2/99	8.06	208
3/99	8.13	203
4/99	7.65	195
5/99	8.27	197
6/99	8.42	197
7/99	8.80	198
8/99	8.67	199
9/99	5.66	187
10/99	7.82	198
11/99	6.65	188
12/99	7.41	198
1/00	8.84	198
2/00	8.77	217
3/00	9.19	206
4/00	7.52	201
5/00	1.45	166
6/00	5.74	183
7/00	1.38	196
8/00	5.77	202

^aFirst operational shift reading on August 1, 2000 to first operational shift reading on September 1, 2000.

^bDowntime as noted in the text.

^cHours in reporting period - Hours not injecting

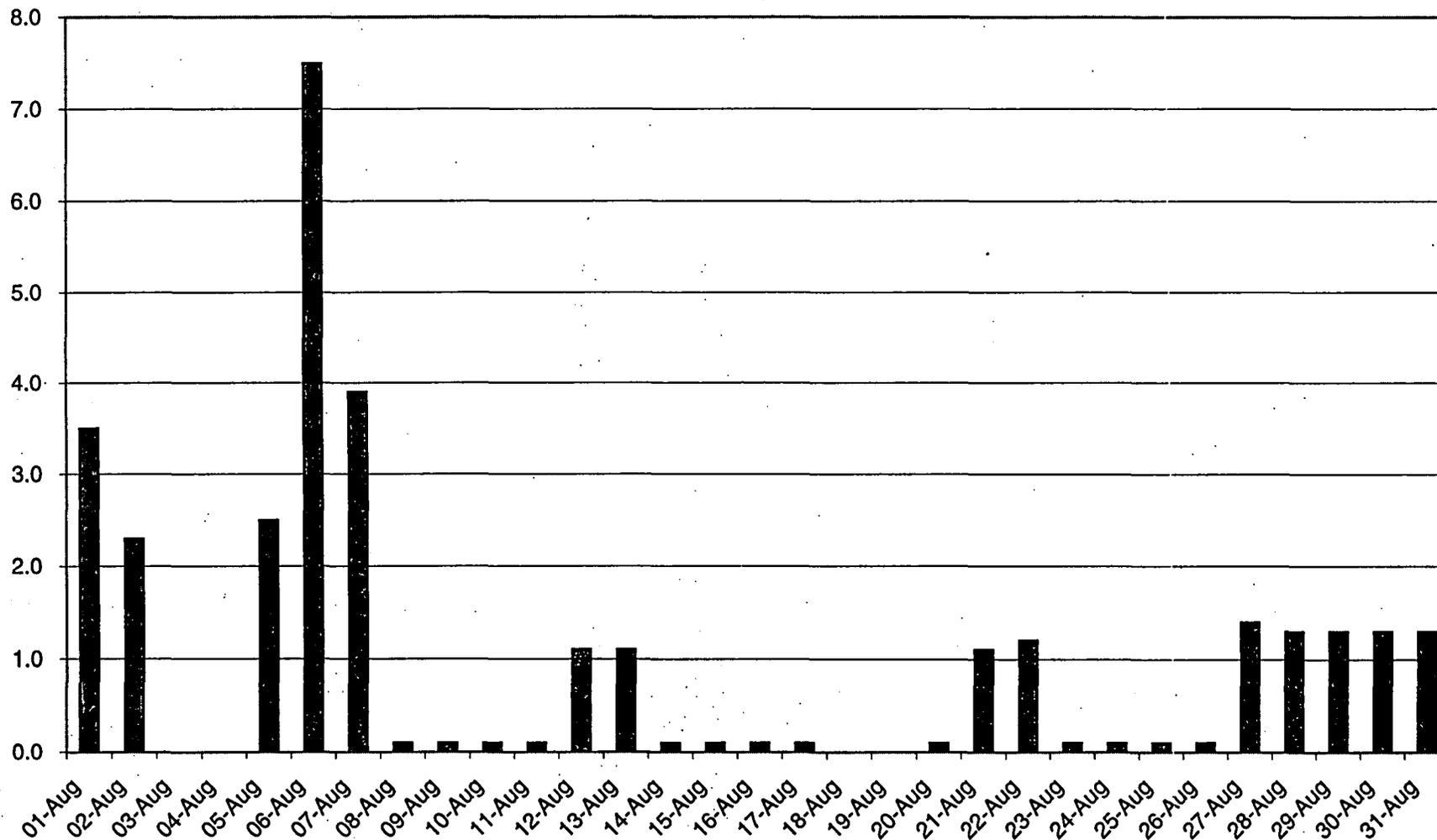
^d(Hours injecting/Hours in reporting period) x 100

^eSummation of daily totalizer differences

^fMillion Gallons Injected/(Hours Injecting x 60)

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Figure 1
AWWT Expansion 1800 System Effluent Total Uranium Concentration (ug/L) on Days when Re-
Injection Occurred

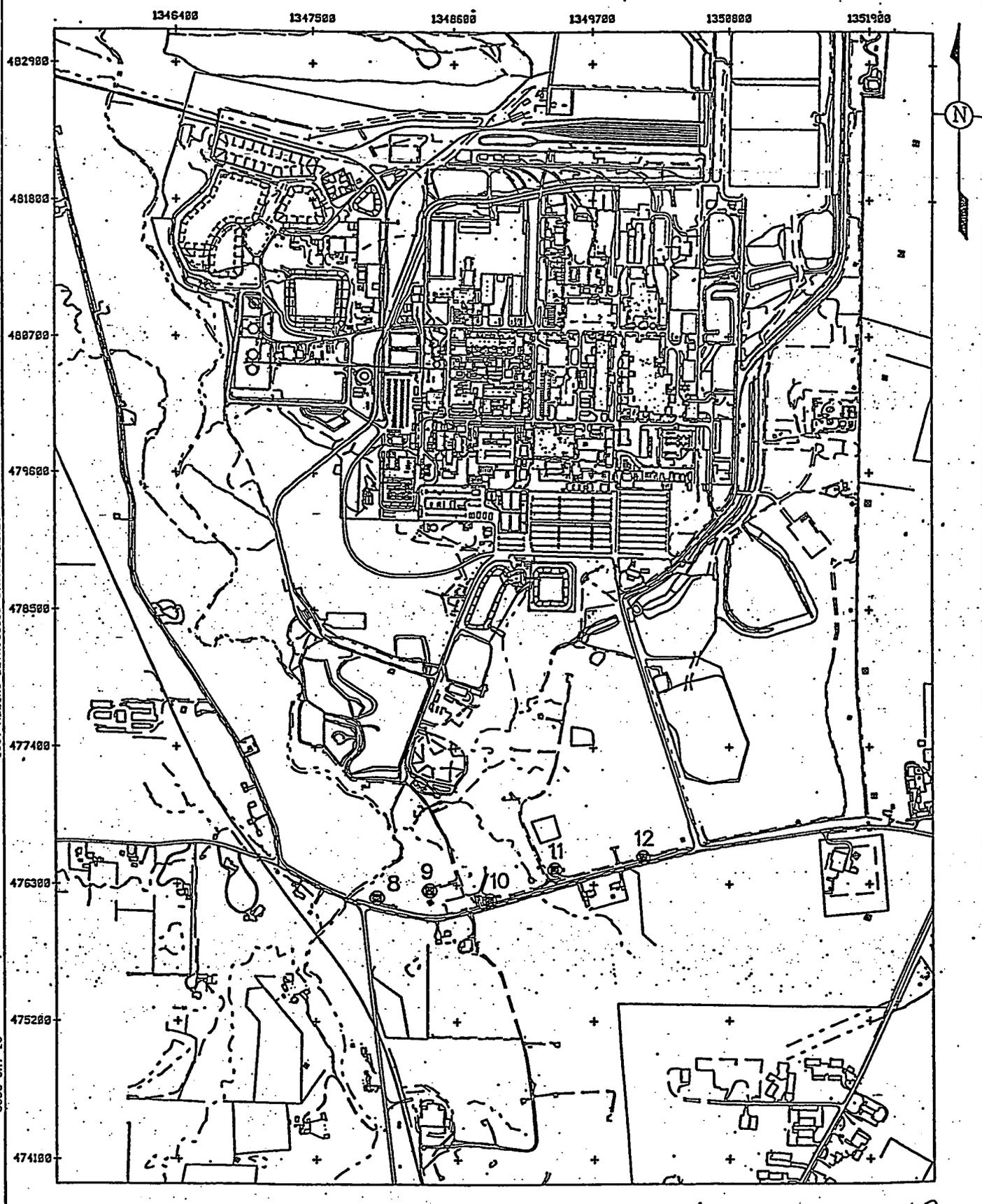


Note: Down times are discussed in the text.

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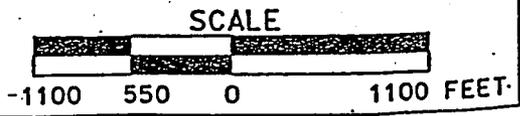
STATE PLANNING COORDINATE SYSTEM 1983

03-AUG-2000



LEGEND:

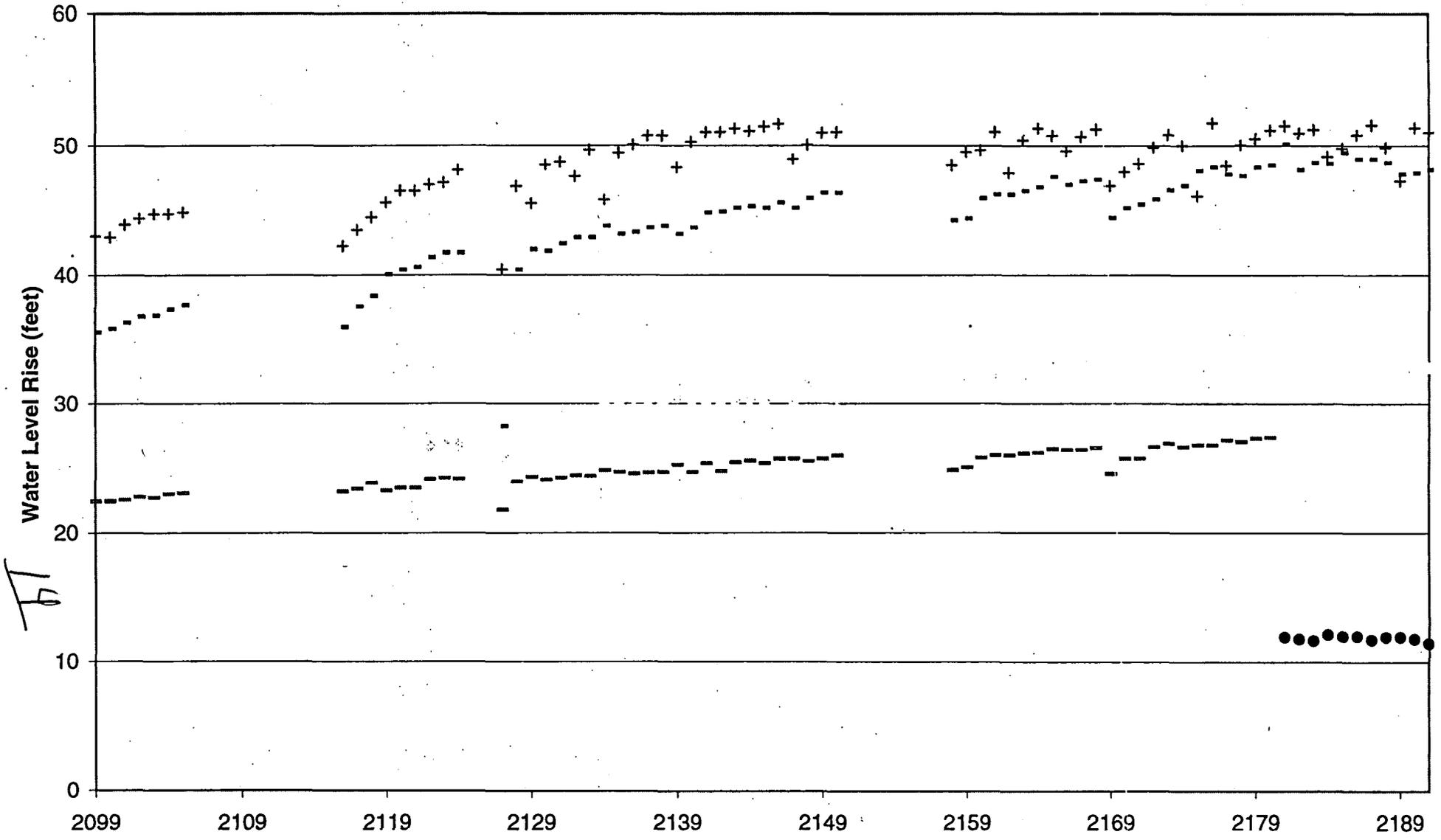
- FEMP BOUNDARY
- ⊙ RE-INJECTION WELL



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FIGURE 2. LOCATION OF RE-INJECTION WELLS

Figure 3
Re-Injection Wells, Water Level Rise
First Shift on August 1, 2000 to First Shift on September 1, 2000



Note: Down times are discussed in the text. Since these samples are from instantaneous readings 3x/day from the DCS, they do not necessarily reflect well operational status over the complete day.

● IW-8 + IW-9 - IW-10 - IW-11 IW-12