



Department of Energy

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04 MAR 2002

RECORD

Mr. James A. Saric, Remedial Project Manager
United States Environmental Protection Agency
Region V, SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 606090

DOE-0361-02

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
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, OH 43216-1049

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

DECEMBER 2001 MONTHLY RE-INJECTION OPERATING REPORT

This letter submits the subject report for your review and approval.

This monthly report is being submitted to the United States Environmental Protection Agency and Ohio Environmental Protection Agency Office of Federal Facilities Oversight in accordance with the Re-Injection Demonstration Test Plan. The monthly report is also being submitted to the Ohio Environmental Protection Agency Division of Drinking and Ground Waters Unit of Underground Injection Control (UIC) in accordance with their guidelines.

04 MAR 2002

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

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DOE-0361-02

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

Sincerely,



Johnny W. Reising
Fernald Remedial Action
Project Manager

FEMP:R.J. Janke

Enclosure: As Stated

cc w/enclosure:

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T. Schneider, OEPA-Dayton (three copies of enclosure)
F. Bell, ATSDR
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M. Schupe, HSI GeoTrans
R. Vandegrift, ODH
D. Brettschneider, Fluor Fernald, Inc./MS52-5
K. Broberg, Fluor Fernald, Inc./MS52-5
W. Hertel, Fluor Fernald, Inc./MS52-5
M. Jewett, Fluor Fernald, Inc./MS52-2
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MONTHLY RE-INJECTION
OPERATING REPORT
DECEMBER 2001

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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.

Re-Injection at Fernald is exempted under 40 CFR 300.400(e)(1) from requiring a permit, as it is a CERCLA action. In accordance with 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.

DOE submits 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 December 1, 2001 to January 1, 2002.

Routine monitoring of the aquifer in the re-injection area is conducted as part of the groundwater remedy performance monitoring program specified in Fernald's Integrated Environmental Monitoring Plan. Results of the Integrated Environmental Monitoring Plan are reported quarterly and are available for viewing on the Fernald Website, www.ferald.gov.

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 groundwater 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 at the on-site laboratory for total uranium. The 24 hour composite sampler samples the combined effluent from the

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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 total uranium results from the AWWT Expansion Facility effluent for days when re-injection occurred are shown in Figure 1.

The monthly grab sample was collected on December 31, 2001. Results are provided in Table 1. These results indicate that no FRLs were exceeded. The total uranium concentration measured in the monthly grab sample was 4.70 micrograms per liter ($\mu\text{g/L}$). The total uranium concentration of the daily composite sample also collected on December 31, 2001 was 5.7 $\mu\text{g/L}$.

VOLUME AND RATE OF RE-INJECTION

The design re-injection set point for each of the re-injection wells is 200 gallons per minute (gpm). The combined design re-injection rate for all five wells is 1000 gpm. Figure 2 illustrates the location of the five re-injection wells; Tables 2 through 6 summarize the current calendar year's operational data by month. The tables also provide averages by year for the calendar years 1998, 1999, and 2000.

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 2000, a new injection rate strategy was initiated to help compensate for well downtimes due to maintenance, electrical outages, etc. Re-injection rate set points may be temporarily increased to 220 gpm toward the end of a month and decreased to the 200 gpm rate at the start of a new month. The ability to increase re-injection rates is dependent upon the condition of the wells, 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 variables noted above.

Figure 3 illustrates the water level rise in each of the operating re-injection wells from December 1, 2001 to January 1, 2002, as recorded 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 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 December 2001, re-injection took place at a reduced rate due to the following outages:

- All re-injection wells were shut down at 08:15 on December 17, 2001 when analysis results from December 16, 2001 operations sampling indicated high total uranium concentration in the AWWT Expansion system discharge (i.e., > 10 µg/L). The wells were placed back online on December 18, 2001 at 10:00 after the total uranium analytical results from the AWWT Expansion system December 17, 2001 operations sampling were confirmed to be below 10 µg/L.
- All re-injection wells were shut down at 07:40 on December 20, 2001 due to maintenance on extraction wells. The re-injection wells were placed back online on December 22, 2001 at 10:30.
- Re-Injection Well 8 was shut off at 21:40 on December 24, 2001 due to high water level, and remained offline for the remainder of the month.
- Re-Injection Well 10 was shut off at 16:25 on December 30, 2001 due to a frozen level transmitter. The well was restarted at 09:30 on December 31, 2001.
- Re-Injection Well 12 was shut off at 16:50 on December 30, 2001 due to a frozen level transmitter.

SUMMARY OF WELL MAINTENANCE FOR THE REPORTING PERIOD

- Re-Injection Well 8 came back online on December 3, 2001 at 14:50 at a rate of 150 gpm. However, the well shut off due to high level on December 24 and will remain off until a replacement well is installed.
- The first re-injection well to come back online was Re-Injection Well 12 on September 26, 2001. Based on the performance of Re-Injection Wells 9, 10, 11, and 12 through December 3, 2001, the following predicts how long they will last until they require another rehabilitation: IW-12 (1 year); IW-11 (300 days); IW-10 (130 days); and IW-9 (32 days). These predictions assume: a linear rise in water level, and that the wells will not be shut down for rehabilitation until the water level reaches 90 percent of the highest allowable water level in each well.

NOTIFICATION OF SIGNIFICANT REDUCTION IN RE-INJECTION EFFICIENCY

The re-injection wells have been subject to increased residual plugging that had effectively stopped re-injection at Re-Injection Well 8. The cessation of re-injection in this well, plus the decision to reduce the setpoint on Re-Injection Well 9 to 150 gpm (instead of 200 gpm) to salvage run time of well, resulted in an overall well field reduction to 75 percent of the design rate at the end of the reporting period, resulting in a re-injection rate of 750 gpm. Until December 24, 2001, however, Re-Injection Well 8 was operational (at a reduced rate of 150 instead of 200 gpm); the system was re-injecting at 900 gpm.

More information, including information beyond the temporal scope of this report (e.g., more recent than December 2001), will be presented in the weekly site conference calls as it becomes available.

TABLE 1

ANALYSIS OF INJECTATE
Sample Collected December 31, 2001

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Constituents ^a	Result ^b	Groundwater FRL ^d	Detection Limit	Constituent Type ^f	Basis for FRL ^g
General Chemistry		mg/L			
Nitrate	0.37	11.0		MP	B
Inorganics		mg/L			
Antimony	U	0.006	0.0017	N	A
Arsenic	U	0.05	0.0032	N	A
Barium	0.0488 B ^c	2.0		N	A
Beryllium	U	0.004	0.00010	N	A
Cadmium	U	0.014	0.00030	N	B
Chromium, total	0.0051 B	0.022 ^e		MP	R
Cobalt	U	0.17	0.00080	N	R
Lead	U	0.015	0.0019	N	A
Manganese	U	0.9	0.00010	N	B
Mercury	U	0.002	0.00010	MP	A
Nickel	U	0.1	0.00110	N	A
Selenium	U	0.05	0.0022	N	A
Silver	U	0.05	0.00060	N	R
Vanadium	U	0.038	0.00050	N	R
Zinc	U	0.021	0.00030	N	B
Radionuclides		pCi/L			
Neptunium-237	U	1.0	0.0557	MP	R*
Radium-226	U	20.0	0.544	N	A
Strontium-90	0.133	8.0		MP	A
Thorium-228	U	4.0	0.0971	N	R*
Thorium-232	U	1.2	0.0339	N	R*
Uranium, total	4.70	30.0		MP	A
Organics		µg/L			
Bis(2-ethylhexyl)phthalate	1 JB ^c	6.0		N	A
Carbon disulfide	U	5.5	1.0	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, then the highest concentration between the regular sample and duplicate sample is reported.

U = Nondetect

^cB = Lab qualifier. Reported result is greater than the instrument detection level but less than the contract required detection limit.

J = Lab qualifier. Reported result is positively detected but is estimated; the result is still usable for making decisions.

^dFrom Table 9-4 in OU5 ROD.

^eFRL is for hexavalent chromium.

^fConstituent 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.

^gA - 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
DECEMBER 2001**

Reference Elevation (feet AMSL) - 539.92 (top of casing)

Northing Coordinate ('83) - 476196.22

Easting Coordinate ('83) - 1347978.25

Hours in reporting period^a = 736.43Hours not injecting^b = 300.00Hours injecting^c = 436.43Operational percent^d = 59.3Target Injection Rate = 150^e gpm

Monthly Measurements		
Month ^c	Million Gallons Injected ^f	Average Operating Injection Rate (gpm) ^h
1998	7.04	207
1999	7.21	199
2000	4.26	149
1/01	0.00	0
2/01	0.00	0
3/01	0.00	0
4/01	0.00	0
5/01	0.00	0
6/01	0.00	0
7/01	0.00	0
8/01	0.00	0
9/01	0.00	0
10/01	0.00	0
11/01	0.00	0
12/01	3.88	148

^aFirst operational shift reading on December 1, 2001 to first operational shift reading on January 1, 2002.^bDowntime as noted in the text.^cHours in reporting period - Hours not injecting^d(Hours injecting/Hours in reporting period) x 100^eAverage for calendar years 1998, 1999, and 2000^fSummation of daily totalizer differences^gFor December 2001, the target re-injection rate was 150 gpm.^hGallons Injected/(Hours Injecting x 60)

TABLE 3

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**RE-INJECTION WELL 22108 (IW-9)
OPERATIONAL SUMMARY SHEET
DECEMBER 2001**

Reference Elevation (feet AMSL) - 578.025 (top of casing)

Northing Coordinate ('83) - 476255.74

Easting Coordinate ('83) - 1348384.49

Hours in reporting period^a = 743.17Hours not injecting^b = 89.35Hours injecting^c = 653.82Operational percent^d = 88.0Target Injection Rate = 150^e gpm

Monthly Measurements		
Month ^c	Million Gallons Injected ^f	Average Operating Injection Rate (gpm) ^h
1998	7.67	204
1999	6.64	188
2000	4.29	164
1/01	0.00	0
2/01	0.00	0
3/01	0.11	204
4/01	0.00	0
5/01	0.00	0
6/01	0.00	0
7/01	0.00	0
8/01	0.00	0
9/01	0.00	0
10/01	0.00	0
11/01	0.48	149
12/01	5.83	149

^aFirst operational shift reading on December 1, 2001 to first operational shift reading on January 1, 2002.^bDowntime as noted in the text.^cHours in reporting period - Hours not injecting^d(Hours injecting/Hours in reporting period) x 100^eAverage for calendar years 1998, 1999, and 2000^fSummation of daily totalizer differences^gFor December 2001, the target re-injection rate was 150 gpm.^hGallons Injected/(Hours Injecting x 60)

TABLE 4

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**RE-INJECTION WELL 22109 (IW-10)
OPERATIONAL SUMMARY SHEET
DECEMBER 2001**

Reference Elevation (feet AMSL) - 576.92 (top of casing)
 Northing Coordinate ('83) - 476175.65
 Easting Coordinate ('83) - 1348860.53

Hours in reporting period^a = 743.20

Target Injection Rate = 200 gpm

Hours not injecting^b = 98.00

Hours injecting^c = 645.20

Operational percent^d = 86.8

Monthly Measurements		
Month ^e	Million Gallons Injected ^f	Average Operating Injection Rate (gpm) ^g
1998	7.66	204
1999	7.07	196
2000	3.96	149
1/01	2.72	206
2/01	6.27	199
3/01	7.82	200
4/01	7.81	201
5/01	8.01	199
6/01	1.28	201
7/01	0.00	0
8/01	0.00	0
9/01	0.00	0
10/01	1.85	197
11/01	4.02	201
12/01	7.66	198

^aFirst operational shift reading on December 1, 2001 to first operational shift reading on January 1, 2002.

^bDowntime as noted in the text.

^cHours in reporting period - Hours not injecting

^d $(\text{Hours injecting} / \text{Hours in reporting period}) \times 100$

^eAverage for calendar years 1998, 1999, and 2000

^fSummation of daily totalizer differences

^gGallons Injected / (Hours Injecting x 60)

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TABLE 5
RE-INJECTION WELL 22240 (IW-11)
OPERATIONAL SUMMARY SHEET
DECEMBER 2001

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

Hours in reporting period^a = 745.15
Hours not injecting^b = 112.00
Hours injecting^c = 633.15
Operational percent^d = 85.0

Target Injection Rate = 200 gpm

Monthly Measurements		
Month ^e	Million Gallons Injected ^f	Average Operating Injection Rate (gpm) ^g
1998	7.72	206
1999	7.61	199
2000	6.38	196
1/01	5.97	200
2/01	6.26	199
3/01	7.76	196
4/01	7.68	202
5/01	8.03	201
6/01	6.61	200
7/01	3.91	198
8/01	4.57	195
9/01	3.31	197
10/01	5.39	198
11/01	4.02	198
12/01	7.63	201

^aFirst operational shift reading on December 1, 2001 to first operational shift reading on January 1, 2002.

^bDowntime as noted in the text.

^cHours in reporting period - Hours not injecting

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

^eAverage for calendar years 1998, 1999, and 2000

^fSummation of daily totalizer differences

^gGallons Injected/(Hours Injecting x 60)

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TABLE 6

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**RE-INJECTION WELL 22111 (IW-12)
OPERATIONAL SUMMARY SHEET
DECEMBER 2001**

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

Hours in reporting period^a = 745.13
 Hours not injecting^b = 108.00
 Hours injecting^c = 637.13
 Operational percent^d = 85.5

Target Injection Rate = 200 gpm

Monthly Measurements		
Month ^e	Million Gallons Injected ^f	Average Operating Injection Rate (gpm) ^g
1998	7.63	206
1999	7.55	198
2000	6.05	180
1/01	0.00	0
2/01	0.00	0
3/01	0.00	0
4/01	0.00	0
5/01	0.00	0
6/01	0.00	0
7/01	0.00	0
8/01	0.00	0
9/01	1.02	150
10/01	6.07	159 ^h
11/01	4.00	200
12/01	7.52	197

^aFirst operational shift reading on December 1, 2001 to first operational shift reading on January 1, 2002.

^bDowntime as noted in the text.

^cHours in reporting period - Hours not injecting

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

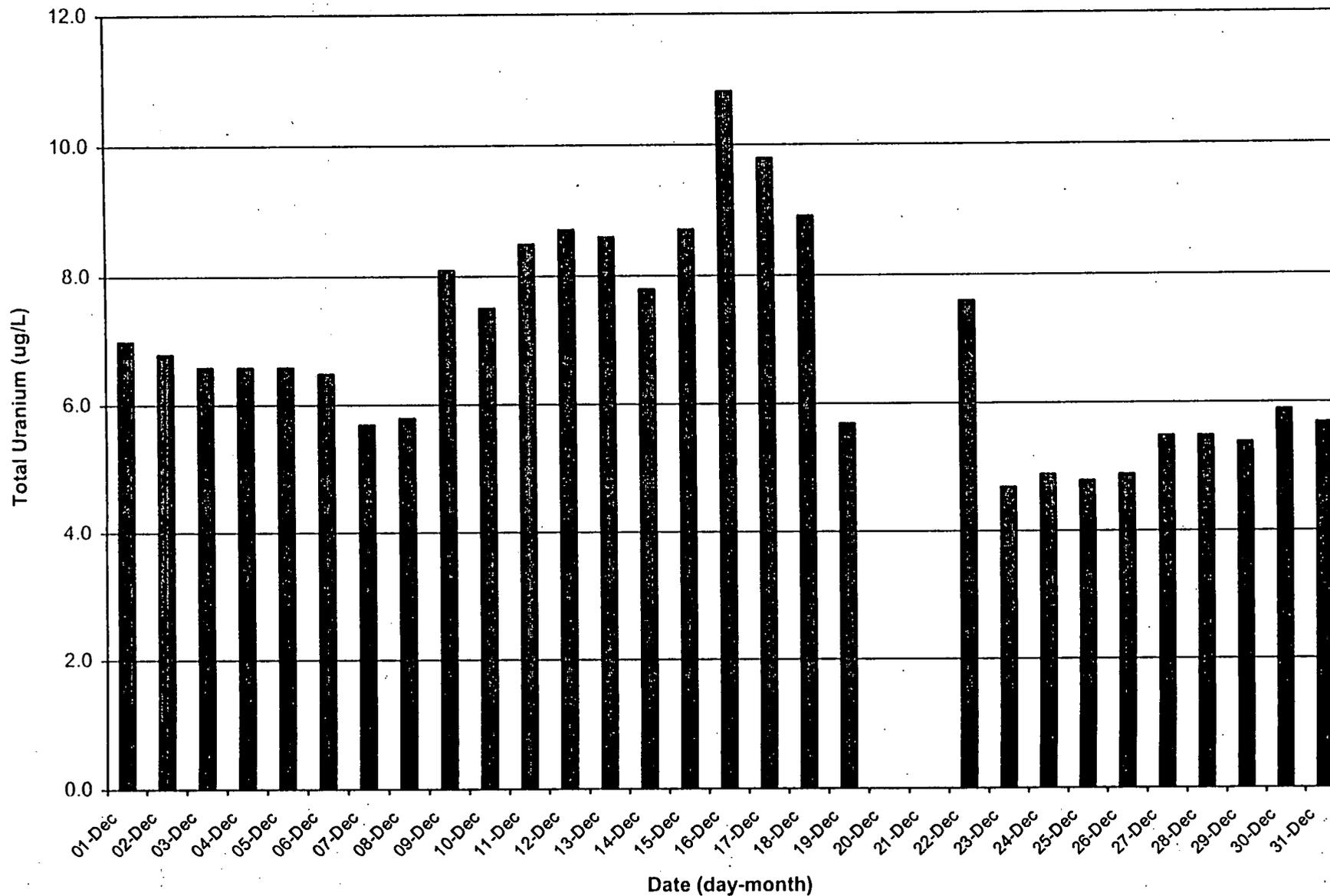
^eAverage for calendar years 1998, 1999, and 2000

^fSummation of daily totalizer differences

^gGallons Injected/(Hours Injecting x 60)

^hFor most of October 2001, the target re-injection rate was 150 gpm.

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



Note: Down times are discussed in the text.

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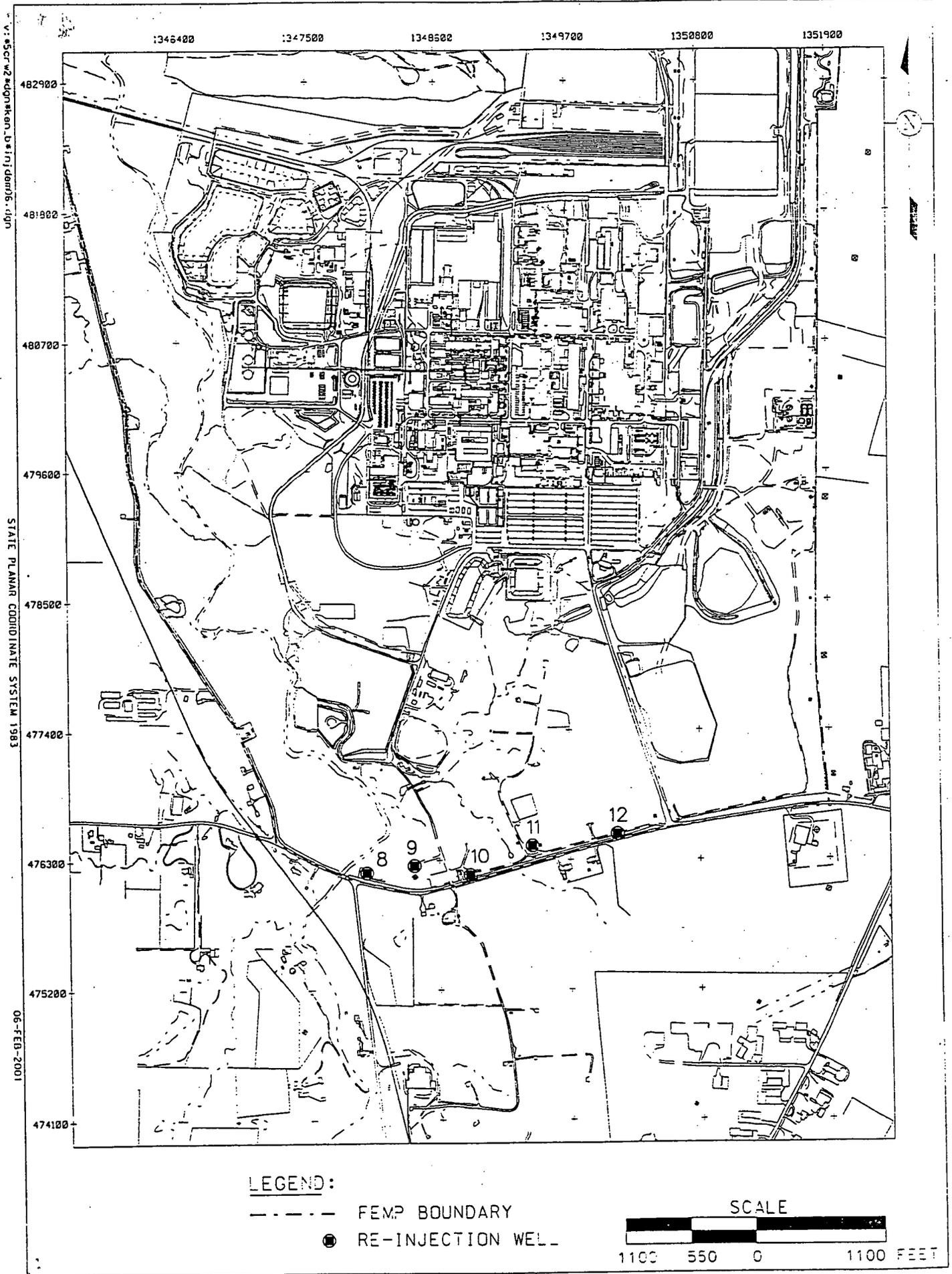
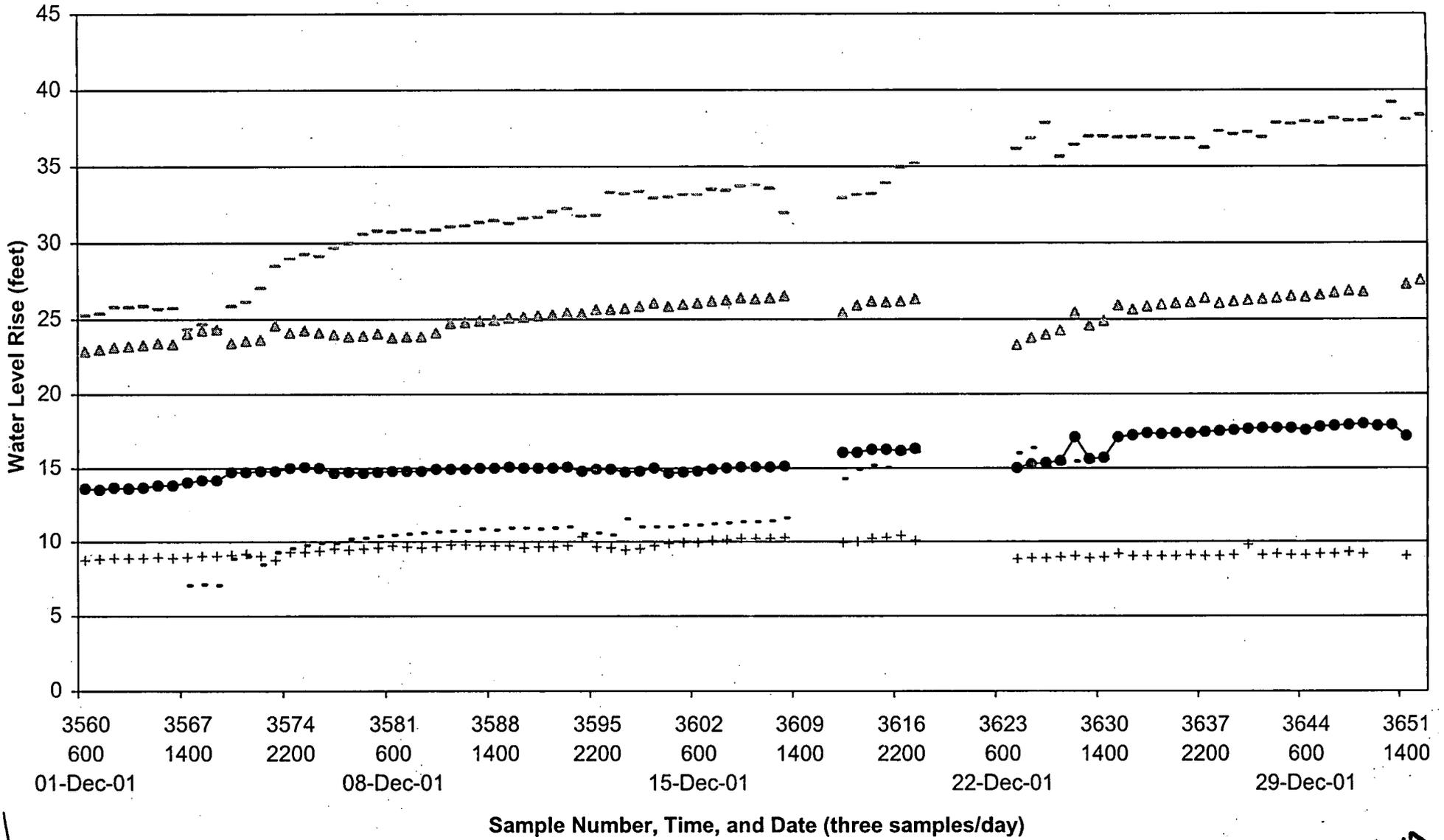


FIGURE 2. LOCATION OF RE-INJECTION WELLS

Figure 3
Re-Injection Wells, Water Level Rise
First Shift on December 1, 2001 (Sample Number 3560) to First Shift on January 1, 2002
(Sample Number 3653)



- IW-8 - IW-9 Δ IW-10 ● IW-11 + IW-12