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**SUBMITTAL OF REMEDIAL INVESTIGATION  
FEASIBILITY STUDY (RI/FS) WORK PLAN  
ADDENDUM (31 ADDITIONAL MONITORING  
WELLS PROGRAM) TO U.S. EPA/OEPA**

**05/14/90**

**DOE-958-90  
DOE-FMPC/EPA  
26  
ADDENDUM**



298

**Department of Energy**

**FMPC Site Office**  
P.O. Box 398705  
Cincinnati, Ohio 45239-8705  
(513) 738-6319

May 14, 1990

DOE-958-90

Ms. Catherine A. McCord  
Waste Management Division  
U.S. Environmental Protection Agency  
Region V - 5H-12  
230 South Dearborn Street  
Chicago, IL 60604

Dr. Richard L. Shank  
Ohio Environmental Protection Agency  
1800 WaterMark Drive  
Columbus, Ohio 43266-1049

Mr. Graham E. Mitchell  
Ohio Environmental Protection Agency  
40 S. Main Street  
Dayton, Ohio 45402

Dear Ms. McCord, Dr. Shank and Mr. Mitchell:

**SUBMITTAL OF REMEDIAL INVESTIGATION FEASIBILITY STUDY (RI/FS) WORK PLAN ADDENDUM (31 ADDITIONAL MONITORING WELLS PROGRAM) TO U.S. EPA/OEPA**

Enclosed is a copy of the RI/FS Work Plan Addendum addressing the installation of thirty-one (31) additional RI/FS ground water monitoring wells. The addendum outlines the location and justification for these wells. The data proposed for collection was not previously approved in the Work Plan and is necessary to complete the RI/FS ground water monitoring program.

If you have any comments or questions please contact Ken Brakken, of my staff, at (513) 738-6660 or FTS 774-6660.

Sincerely,

*Ray Hansen for*  
Gerald W. Westerbeck  
FMPC Site Manager

DP-84:Brakken

Enclosure: As stated

### Additional Monitoring Well Program

This Work Plan addendum presents an analysis of the current need for the installation of additional monitoring wells under the RI/FS. This work plan addendum specifies the locations and justifications for the installation of 19 high priority monitoring wells at both on-site and off-site locations. The completion of the longitudinal profile survey of Paddy's Run is included in this addendum because it is critical to the interpretation of the interaction between water in the creek and ground water in the aquifer. The wells and the survey are required to answer questions that have arisen from a detailed analysis of sample results and water table observations collected over the two years. All work will be conducted under the provisions of the RI/FS Work Plan dated March 1988.

This discussion presents 19 high priority wells for which there is known justification and need as well as 12 low priority wells which are likely to be required in the future to complete the RI/FS. The ultimate need for the 12 low priority wells can only be determined by evaluating the water table and initial sampling results from the high priority wells and completion of the Production and Additional Suspect Area investigation. The low priority wells are presented here to estimate the total number of wells that will be required to complete the RI/FS. Only the priority wells are funded and approved for installation at this time. An RI/FS Work Plan addendum for the additional monitoring wells in the South Plume Area was submitted to US EPA and Ohio EPA on December 15, 1989. This Work Plan addendum incorporates those South Plum wells, as discussed in a January 3, 1990 meeting with US EPA and Ohio EPA. The December 15, 1989 Work Plan is, therefore, being voided and replaced with this addendum.

Justification for individual wells is presented in terms of the needs of individual operable units. The locations of all the wells are shown in Figure 1. Table 1 indicates if the wells are a high or low priority.

All wells will be installed using current procedures for the installation of four inch diameter, 2000- and 3000-series wells in the sand and gravel aquifer. The wells will be sampled twice with a two month interval between sampling events. Samples will be analyzed for the full radionuclides and the general ground water parameters as defined in the RI/FS Work Plan. Therefore, only regulatory concurrence for the location of the wells and the frequency of sampling is required.



**TABLE 1**  
**WELL INSTALLATION PRIORITY**

	<u>HIGH</u>	<u>LOW</u>
Operable Unit 3:	2388	
	2389	
	2120	
	3120	
Operable Unit 1 & 4:	2028	2033
	2032	
Operable Unit 5:	2383	
	2384	
	3046	
	3045	3047
	2385	3385
	2390	3390
	2386	3386
	2387	3387
		Possible new well pair
South Plume Area:	2391	3391
	2392	3392
	2393	
	2394	3394
	2395	3395

### Operable Unit 3

The commitments of the Production and Additional Suspect Area Work Plan specify that if contamination is found in the 2000-series wells on the downgradient side of a facility, additional wells will be installed on the upgradient side of the facility to pinpoint the source of the contamination. Elevated uranium levels in the tens of micrograms per liter range are present in the aquifer in wells 2118 and 2109 on the downgradient side of Plant 6. The 2000 series wells further west in the Production Area indicate that the contamination is not coming from an area upgradient of the Production Area. Therefore, the contingency wells specified in the work plan should be installed on the west side of Plant 6 as Wells 2388 and 2389 at the locations shown in Figure 1. These wells will verify the contamination is only associated with Plant 6.

In addition, a condition of the Work Plan Addendum for the 24-well program specifies a well cluster on the downgradient side of Plant 6 if contamination is found in Wells 2118 or 2109. Since both of these wells indicate elevated levels of uranium, the well cluster should be installed to help define the plume. Given the east northeast ground water gradient in the area, wells 2120 and 3120 should be installed east of Plant 6 in the grass area in front of the new receiving warehouse as shown in Figure 1. This will help to bound the plume under Plant 6 to the east.

### Operable Units 1 & 4

Two wells are required under Operable Units 1 and 4 that will also provide useful data for Operable Unit 5. Well 2028 is required at location 028 to provide an upgradient data point between Paddy's Run and the waste storage pits for Operable Unit 1. Well 2032 should be installed adjacent to existing well 1032, on the west side of the K-65 Silos, to determine if there is vertical migration of the uranium found in well 1032 to the sand and gravel aquifer below. Well 2033 is a low priority well to be installed on the downgradient side of the K-65 silos if well 2032 shows contamination in the aquifer. The sampling program beneath the silos indicates that releases to ground water have occurred.

### Operable Unit 5

#### Paddy's Run Recharge Area

Water table data collected between December 1988 and July 1989 has documented a mounding effect on the water table due to recharge to the sand and gravel aquifer from Paddy's Run. The magnitude of this mound is much greater than had been expected and the impact of the recharge is also quite complex. The complexity arises because the recharge causes very large changes in local gradients in the aquifer. Current data indicate that there is a potential for a reversal of the gradient along the western boundary of the FMPC during the months of maximum recharge. This means that

recharge from Paddy's Run could cause uranium to migrate to the west for some months of the year. The westerly gradient is opposite to the normal eastward gradient direction. While the net migration of the uranium will be to the east, this potential reversal and its impact must be understood to evaluate the risk to receptors on the western edge of the FMPC.

Existing wells at locations 009 and 108 show the highest water levels during the recharge event and provide data showing the vertical magnitude and duration of the recharge. Figure 2 is a hydrograph showing the magnitude of the change in the water level in wells 2009 and 3009 for the period from January 1988 through July 1989. Figure 3 is a hydrograph for wells 2108 and 3108 that shows the same peak water table level. The wells at location 108 were installed in March of 1989.

Two 2000-series wells are proposed for the western boundary of the FMPC as shown in Figure 1. Wells 2383 and 2384 will provide the water level and water chemistry data required to determine the significance and extent of the temporary ground water gradient reversal.

#### South Field Area

Ground water gradient changes due to recharge from Paddy's Run also appear to have a significant impact on the interpretation of data from wells in the South Field Area. The direction of the ground water gradient in the area between well location 047, northwest of the South Field, and location 069, near Willey Road, has been observed to change up to 90 degrees due to the recharge from Paddy's Run. Potentially, this means that a well that is down-gradient from a body of contaminated water during some months may not be downgradient during all months.

Figure 4 is the hydrograph for the wells at location 049, which is adjacent to the confluence of the outfall ditch and Paddy's Run. The hydrograph also shows the total uranium values for the six samples that have been collected from well 2049. The correlation between low water level and low uranium levels could be caused by a change in the direction of the ground water gradient. During recharge the gradient is to the south. During low water level conditions the gradient is more to the east. Other wells on the site have similarly changing uranium values. Only long term monitoring and careful analysis of the relationship between recharge, water levels, and uranium levels will confirm if variations in the direction of the water table gradient are contributing to this apparent uranium concentration variation.

Well 2046, which was installed as part of the 24-well program, has had the highest total uranium level of any well outside the Waste Storage Area. When the gradient was west to east the value was 851 ug/l. When the gradient was southeast or northeast the uranium values were 232 and 309 ug/l, respectively. Wells 2047 and 2045,

HYDROGRAPH FOR WELL CLUSTER AT LOCATION 009

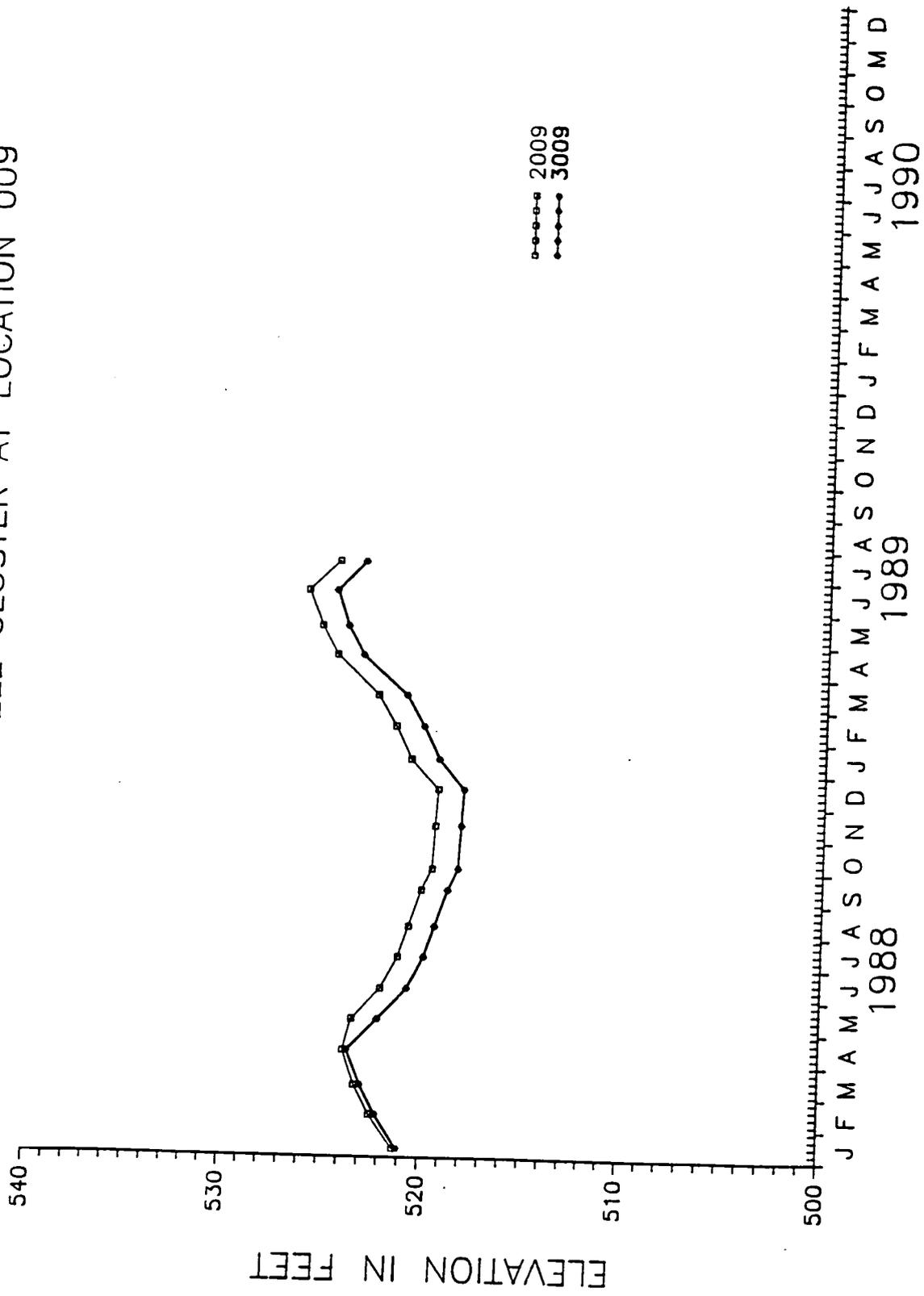


FIGURE 2

# HYDROGRAPH FOR WELL CLUSTER AT LOCATION 108

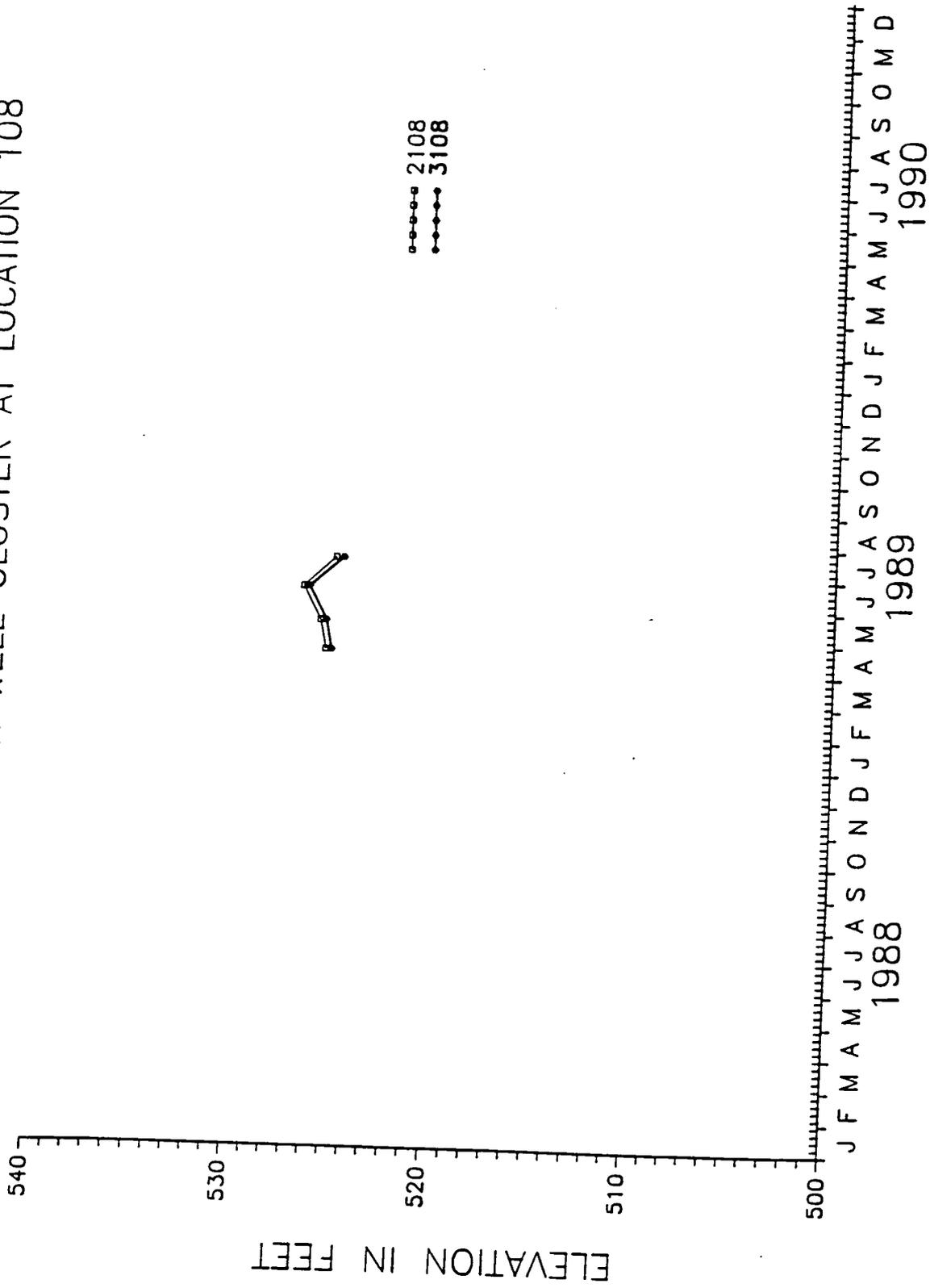


FIGURE 3

HYDROGRAPH AND TOTAL URANIUM DATA  
FOR WELL CLUSTER AT LOCATION 049

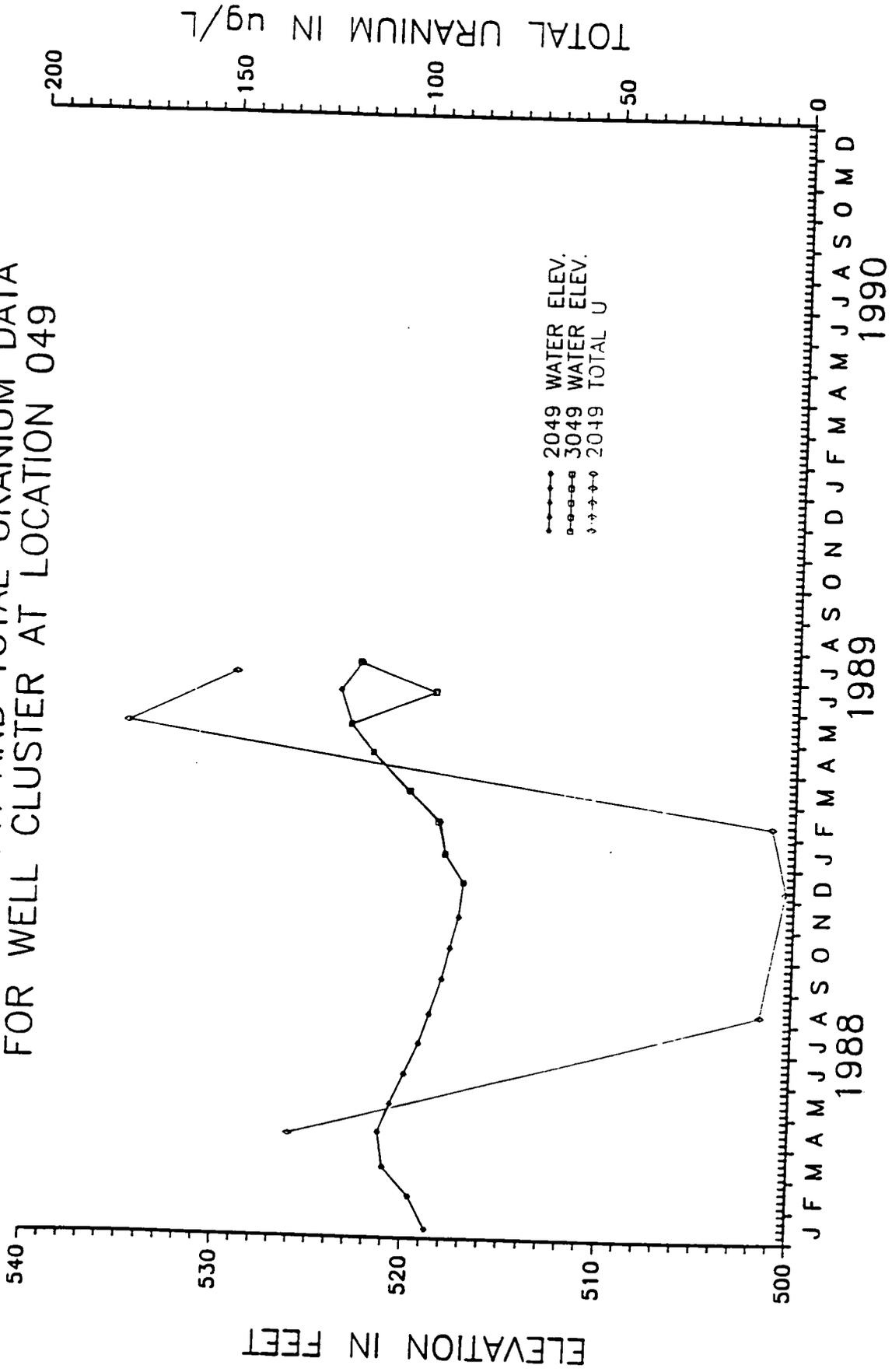


FIGURE 4

drilled in the area of the South Field as part of the 24-well program, have also shown elevated levels of uranium. As shown in Figure 1, wells 3046 and 3045 should be added to the existing well clusters to determine the vertical extent of the uranium plume present in the 2000-series well at these locations. These wells will satisfy a commitment made in the RI/FS Work Plan to install deeper wells if high levels of uranium are found in any wells. If uranium is detected in 3046, then an additional 3000-series well would be required at location 047, which is upgradient from location 046. Well 3047 is considered low priority.

A new well, 2385, should be installed half way between location 046 and 065 to monitor the easterly extent of contamination indicated at location 046. If contamination is found in well 2385 then well 3385 will be required to determine the vertical extent of contamination at that site. Well 3385 is currently considered low priority.

A major unresolved question is whether the uranium plume in the South Field is an ongoing source for the South Plume. The model predicts that the South Plume is very narrow because of the relatively high permeability of the sand and gravel aquifer. Highly permeable aquifers do not present much resistance to flow so the contaminant plume is not forced to disperse laterally. If the uranium plume under the South Field is part of the South Plume, the implications to the FS and the risk assessment are significant. In order to resolve this issue, well 2390 should be installed half way between location 045 and 015. This is where the plume connection must be if the uranium in the two areas is continuous from well 2046 to the South Plume. If contamination is found here then well 3390 will be required to determine the extent of vertical migration. Well 3390 is currently considered low priority.

East of the Outfall Ditch

Infiltration of uranium bearing water through the bottom of the Storm Water Outfall Ditch is generally accepted as the pathway for the introduction of uranium into the sand and gravel aquifer. At the time the original work plan was written, it was assumed that ground water under the outfall ditch flowed to the south. Therefore, monitoring wells were located to measure contamination moving to the south. Water table records from January 1988 through July 1989 indicate, however, that the southerly flow exists during periods of recharge. During low flow periods, the gradient is to the east and could result in a narrow, nor-south trending plume similar to that found south of the FMPC. There are currently no monitoring wells located along the eastern side of the outfall ditch that would have detected such a plume.

Wells 2386 and 2387 are proposed to verify that the gradient shift occurs and to determine if any uranium is migrating in an easterly direction from the outfall ditch. Current data suggest that the easterly gradient is neither steep nor present for very much of the

year. Therefore, any uranium plume should not have migrated far from the outfall ditch. These two wells will provide the data regarding the width and magnitude of the ground water mound that results from recharge along the outfall ditch. They will also indicate if uranium has migrated from the outfall ditch to the east. As with the other proposed 2000-series wells, if elevated uranium is present in wells 2386 and 2387, a 3000-series well would be required in either or both locations. If elevated uranium is found in both 2386 and 2387 an additional well pair should be installed north of location 386 near the southeastern corner of the new Storm Water Retention Basin. Wells 3386, 3387, and the additional well pair are considered low priority.

**South Plume Area**

There are two issues to be addressed in relation to the South Plume. Emphasis has been on the plume that appears to have resulted from infiltration along Paddy's Run when there was uncontrolled runoff from the plant. The highest concentrations of uranium in this plume exceed 250 ug/l. The second issue is the lower levels of uranium which entered the creek system and infiltrated along the length of Paddy's Run downstream from the FMPC. The southernmost well installed for the RI/FS (well 2127) has had total uranium values of 37, 6, and 14 ug/l when sampled in April, May, and July of 1989. It is not clear what is causing this variation in uranium values, but it does seem likely that this variation is related to recharge occurring in the lower stretch of Paddy's Run.

The seven wells have recently been installed in the South Plume well program and data will be available in February 1990 from these wells. In addition data may become available from the Paddy's Run Road Site (PRRS) RI/FS. The location of wells and piezometers in the PRRS RI/FS will help with the interpretation of events along Paddy's Run. The possibility exists that unexpected findings will be forth coming from this data and additional wells will be required to evaluate risk to receptors in the area.

Current model interpretations indicate that the main plume has a long slender shape and that it extends a considerable distance to the southeast as shown in Figure 5. The location of the southern third of the plume is farther to the east than any drilling program proposed by either RI/FS. Well 2391 should be installed at the location shown in Figure 1, to determine if the model prediction of the southern tip of the plume is accurate. The appearance of 4.5 ug/l uranium in well 2094 in January 1988, while not a high value, indicates that uranium is present in the area. Location 094 is downgradient from the location of the two proposed wells in the PRRS RI/FS.

In the event that well 2391 contains elevated levels of uranium in excess of 50 ug/l then well 2392 should be installed at the



location shown in Figure 1, to determine the lateral extent of the plume and well 3391 installed to determine the vertical extent of the plume. If uranium is less than 50 ug/l then the next 2000 series well should be installed northwest of well 2391. In either case the result will be wells at adjacent locations that define or closely locate the southern extent of the plume and provide the necessary data to complete the calibration of the transport model.

Initial water level data from the PPRS RI/FS piezometers indicate that well 2393 should be installed on Rutgers Nease property as shown in Figure 1. This well will fill a large data gap between the other PPRS wells and the Fernald RI/FS wells and should complete the definition of the western boundary of the uranium plume.

Location 391 and the location to the northwest are on land owned by Harrison Poured Foundations Inc. Location 392 is on Century Farms property. One additional well to the east in the vicinity of Highway 128 will be required to verify the eastern boundary of the plume. A possible well location as shown on Figure 1 is also on Century Farms Property. Wells 3391, 3392, 3394, and 3395 are considered low priority at this time.

In order to determine what well locations are best the wells in this area will be drilled in the following sequence. Well 2391 will be drilled first and developed. A sample will be collected and sent to the laboratory for total uranium on a rush basis. Well 2393 will be drilled while the Well 2391 sample is in the laboratory. The results of this sample will determine if the third well is drilled northwest or southeast of well 2391. The determination of the need for and proper location of the remaining wells will be based on water levels readings and uranium concentrations in wells 2391 and 2392. The data will be discussed with the regulatory agencies as part of the decision making process.

**Paddy's Run Profile Survey**

The monthly water table records and quarterly water quality data show that the recharge from Paddy's Run has a tremendous bearing on ground water patterns and contaminant migration. The distance at any point along Paddy's Run between the bottom of the stream channel and the water table is therefore very important. A detailed survey of the longitudinal profile of Paddy's Run was initiated under a Task 9 order in the early spring of 1989. The survey work was completed for most of the length of Paddy's run on the FMPC property. The survey was terminated due to funding limitations before any work was done off-site. We propose that the survey be completed to provide an accurate profile of Paddy's Run so the relationship between flow in the stream and ground water levels may be more accurately used in the interpretation of data and the ground water modeling effort.



January 25, 1990

Department of Energy  
ATTN: Andy Avel  
P.O. Box 398705  
Cincinnati, OH 45239

SUBJECT: Revised Document Change Request No. 38

Attached is the revised Document Change Request No. 38 for review and approval. Justification for additional wells is provided in the attached "Additional Monitoring Well Program". The 19 "priority" wells listed are included in the \$18.7 million, but not the \$18.1 million target budget estimate. The remainder of the 31 proposed wells are unbudgeted.

If you have any questions concerning this matter, please call me or Bob Galbraith.

Sincerely,

Harry L. Windecker  
Interim Project Director

HLW:jf

Attachments

cc: w/attachment: H. Richardson, WMCO  
Project File

w/o attachment: D. Carr, WMCO  
D. Ponke  
R. Galbraith

9992

# DOCUMENT CHANGE REQUEST

This form is used to initiate permanent changes to controlled distribution project-specific procedures, such as the QAPP, Work Plan, and Sampling Plan.

REQUEST NO. 38

Issue Date:

Page \_\_\_ of \_\_\_

Do Not Write In This Block

REQUESTOR: B. GALBRAITH PHONE NO.: 738-3100 DATE: 1/25/90

DOCUMENT TITLE: WORK PLAN

SECTION/PARAGRAPH/PAGE NO.: SECTION 4.2.1.3 DOCUMENT NUMBER: NA

ISSUE DATE: JANUARY 1987 LATEST REVISION DATE: MARCH 1988

### JUSTIFICATION:

Justification for additional wells to complete the RI/FS program is provided in the attached "Additional Monitoring Well Program"

### CONTENT OF CHANGE:

19 high priority wells for which there is known justification and need as well as 12 low priority wells which are likely to be required in the future to complete the RI/FS. Only the priority wells would be included in a work plan addendum at this time.

### EFFECTIVE DATE OF CHANGE:

- When all approvals have been obtained \_\_\_\_\_ Effective Date
- Other (Specify): \_\_\_\_\_

### REQUIRED APPROVALS:

<u>H. [Signature]</u> Project Director	<u>1/25/90</u> Date		
<u>David [Signature]</u> Project QA Officer	<u>1/25/90</u> Date	WMCO QA Officer	Date
<u>Robert M. [Signature]</u> Technical Manager	<u>1/25/90</u> Date	DOE COTR	Date

### TO BE COMPLETED BY DOE

- A. Prior EPA notification required?  Yes  No
- B. Prior EPA approval required?  Yes  No
- C. Immediate implementation?  Yes  No

## Additional Monitoring Well Program

This Work Plan addendum presents an analysis of the current need for the installation of additional monitoring wells under the RI/FS. This work plan addendum specifies the locations and justifications for the installation of 19 high priority monitoring wells at both on-site and off-site locations. The completion of the longitudinal profile survey of Paddy's Run is included in this addendum because it is critical to the interpretation of the interaction between water in the creek and ground water in the aquifer. The wells and the survey are required to answer questions that have arisen from a detailed analysis of sample results and water table observations collected over the two years. All work will be conducted under the provisions of the RI/FS Work Plan dated March 1988.

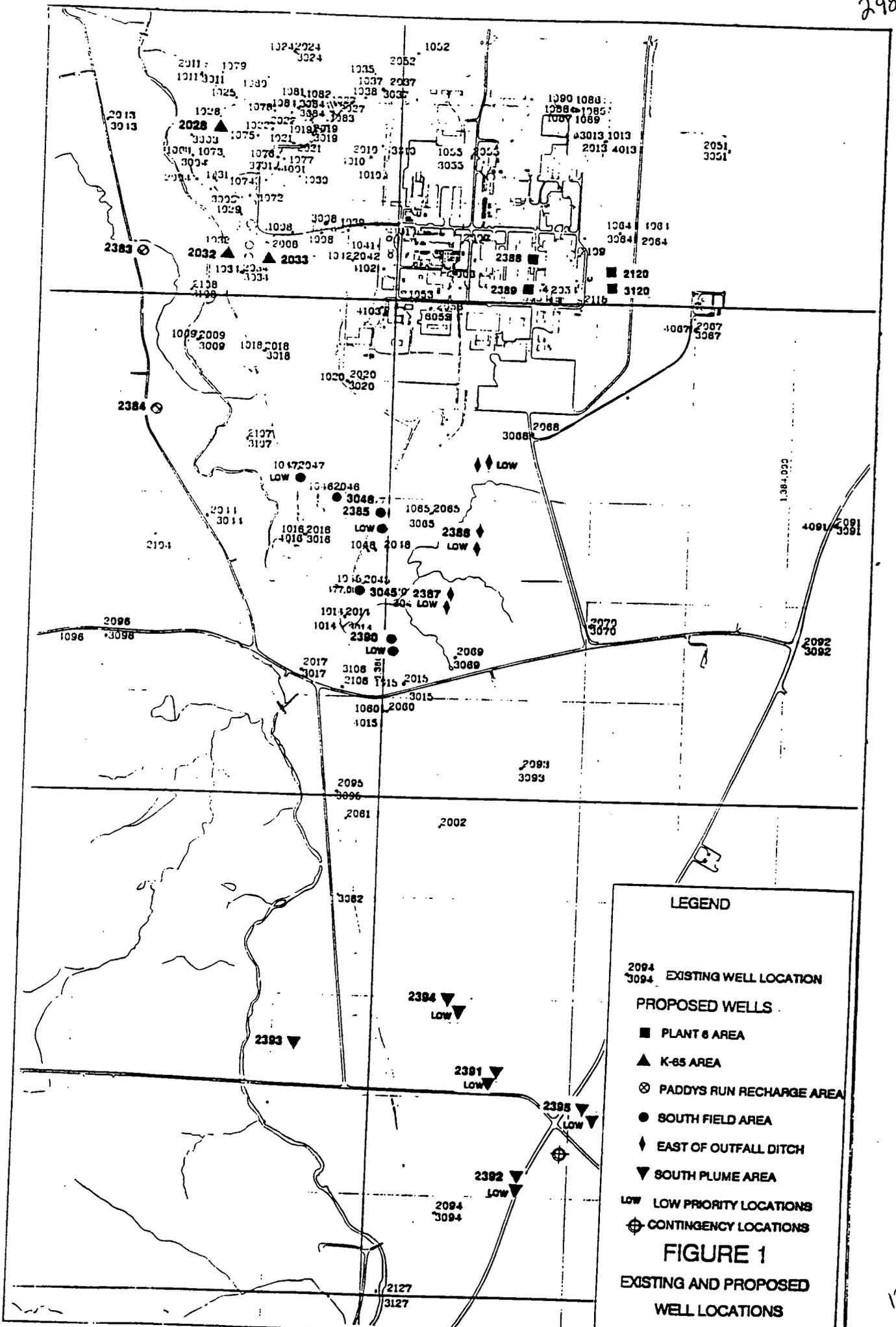
This discussion presents 19 high priority wells for which there is known justification and need as well as 12 low priority wells which are likely to be required in the future to complete the RI/FS. The ultimate need for the 12 low priority wells can only be determined by evaluating the water table and initial sampling results from the high priority wells and completion of the Production and Additional Suspect Area investigation. The low priority wells are presented here to estimate the total number of wells that will be required to complete the RI/FS. Only the priority wells are funded and approved for installation at this time. An RI/FS Work Plan addendum for the additional monitoring wells in the South Plume Area was submitted to US EPA and Ohio EPA on December 15, 1989. This Work Plan addendum incorporates those South Plum wells, as discussed in a January 3, 1990 meeting with US EPA and Ohio EPA. The December 15, 1989 Work Plan is, therefore, being voided and replaced with this addendum.

Justification for individual wells is presented in terms of the needs of individual operable units. The locations of all the wells are shown in Figure 1. Table 1 indicates if the wells are a high or low priority.

All wells will be installed using current procedures for the installation of four inch diameter, 2000- and 3000-series wells in the sand and gravel aquifer. The wells will be sampled twice with a two month interval between sampling events. Samples will be analyzed for the full radionuclides and the general ground water parameters as defined in the RI/FS Work Plan. Therefore, only regulatory concurrence for the location of the wells and the frequency of sampling is required.

### Operable Unit 3

The commitments of the Production and Additional Suspect Area Work Plan specify that if contamination is found in the 2000-series



**LEGEND**

- 2094  
3094 EXISTING WELL LOCATION
- PROPOSED WELLS**
  - PLANT 6 AREA
  - ▲ K-65 AREA
  - ⊗ PADDYS RUN RECHARGE AREA
  - SOUTH FIELD AREA
  - ◆ EAST OF OUTFALL DITCH
  - ▼ SOUTH PLUME AREA
- LOW LOW PRIORITY LOCATIONS
- ⊕ CONTINGENCY LOCATIONS

**FIGURE 1**  
EXISTING AND PROPOSED WELL LOCATIONS

**TABLE 1**  
**WELL INSTALLATION PRIORITY**

	<u>HIGH</u>	<u>LOW</u>
Operable Unit 3:	2388 2389 2120 3120	
Operable Unit 1 & 4:	2028 2032	2033
Operable Unit 5:	2383 2384 3046 3045 2385 2390 2386 2387	3047 3385 3390 3386 3387 Possible new well pair
South Plume Area:	2391 2392 2393 2394 2395	3391 3392 3394 3395

Existing wells at locations 009 and 108 show the highest water levels during the recharge event and provide data showing the vertical magnitude and duration of the recharge. Figure 2 is a hydrograph showing the magnitude of the change in the water level in wells 2009 and 3009 for the period from January 1988 through July 1989. Figure 3 is a hydrograph for wells 2108 and 3108 that shows the same peak water table level. The wells at location 108 were installed in March of 1989.

Two 2000-series wells are proposed for the western boundary of the FMPC as shown in Figure 1. Wells 2383 and 2384 will provide the water level and water chemistry data required to determine the significance and extent of the temporary ground water gradient reversal.

South Field Area

Ground water gradient changes due to recharge from Paddy's Run also appear to have a significant impact on the interpretation of data from wells in the South Field Area. The direction of the ground water gradient in the area between well location 047, northwest of the South Field, and location 069, near Willey Road, has been observed to change up to 90 degrees due to the recharge from Paddy's Run. Potentially, this means that a well that is down-gradient from a body of contaminated water during some months may not be downgradient during all months.

Figure 4 is the hydrograph for the wells at location 049, which is adjacent to the confluence of the outfall ditch and Paddy's Run. The hydrograph also shows the total uranium values for the six samples that have been collected from well 2049. The correlation between low water level and low uranium levels could be caused by a change in the direction of the ground water gradient. During recharge the gradient is to the south. During low water level conditions the gradient is more to the east. Other wells on the site have similarly changing uranium values. Only long term monitoring and careful analysis of the relationship between recharge, water levels, and uranium levels will confirm if variations in the direction of the water table gradient are contributing to this apparent uranium concentration variation.

Well 2046, which was installed as part of the 24-well program, has had the highest total uranium level of any well outside the Waste Storage Area. When the gradient was west to east the value was 851 ug/l. When the gradient was southeast or northeast the uranium values were 232 and 309 ug/l, respectively. Wells 2047 and 2045, drilled in the area of the South Field as part of the 24-well program, have also shown elevated levels of uranium. As shown in Figure 1, wells 3046 and 3045 should be added to the existing well clusters to determine the vertical extent of the uranium plume present in the 2000-series well at these locations. These wells will satisfy a commitment made in the RI/FS Work Plan to install deeper wells if high levels of uranium are found in any wells. If uranium is detected in 3046, then an additional 3000-series well

HYDROGRAPH FOR WELL CLUSTER AT LOCATION 009

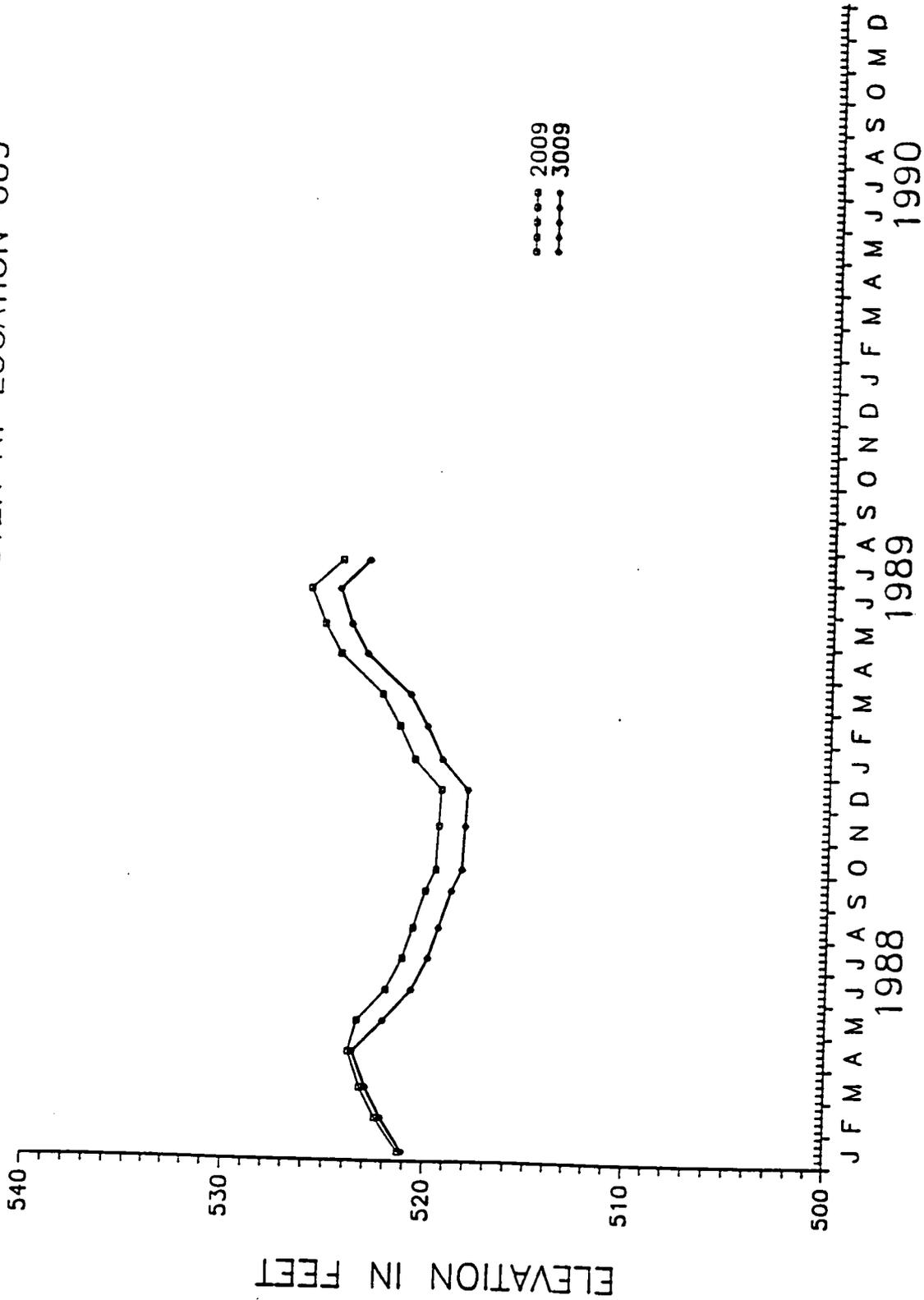


FIGURE 2

HYDROGRAPH FOR WELL CLUSTER AT LOCATION 108

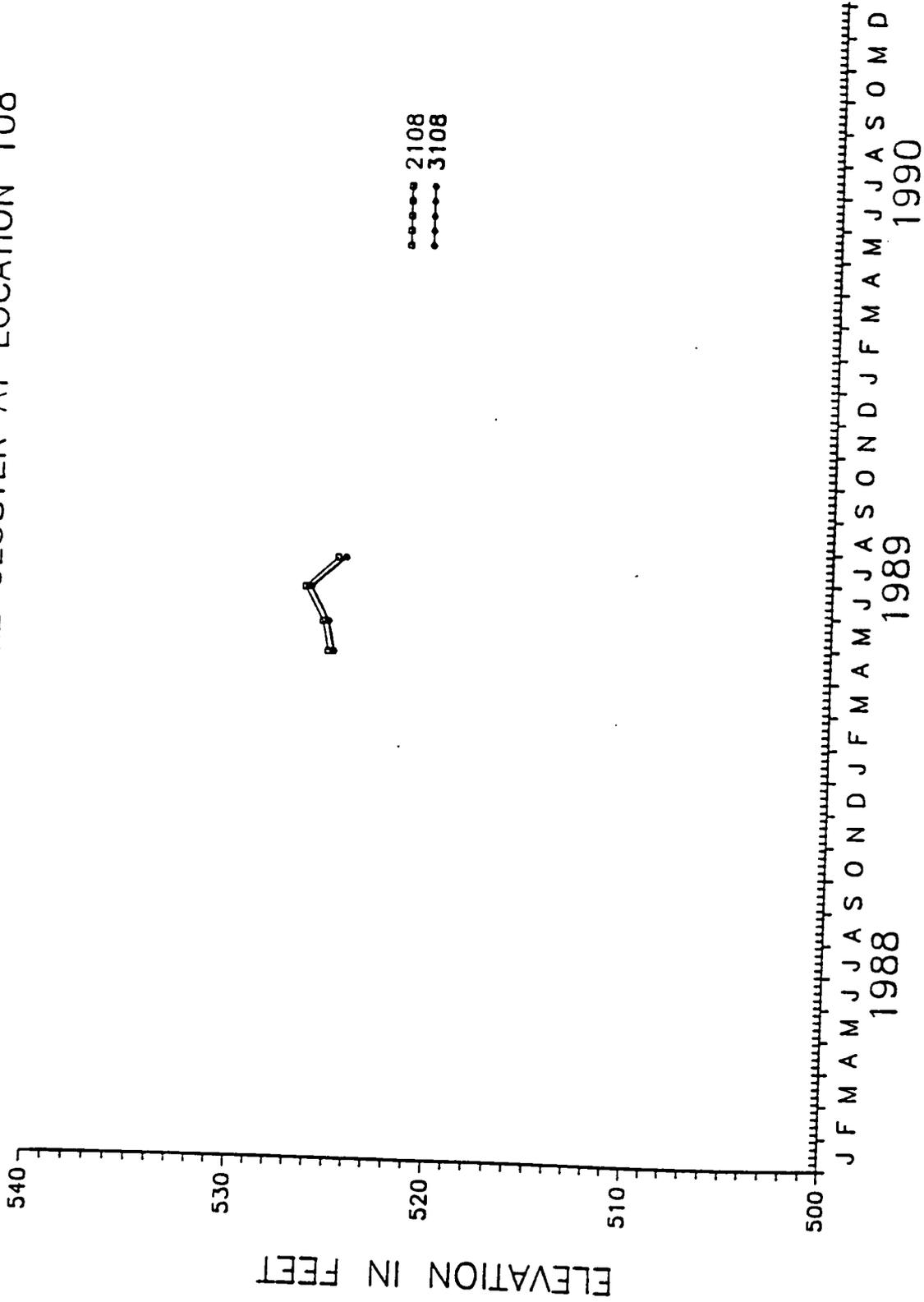


FIGURE 3

HYDROGRAPH AND TOTAL URANIUM DATA  
FOR WELL CLUSTER AT LOCATION 049

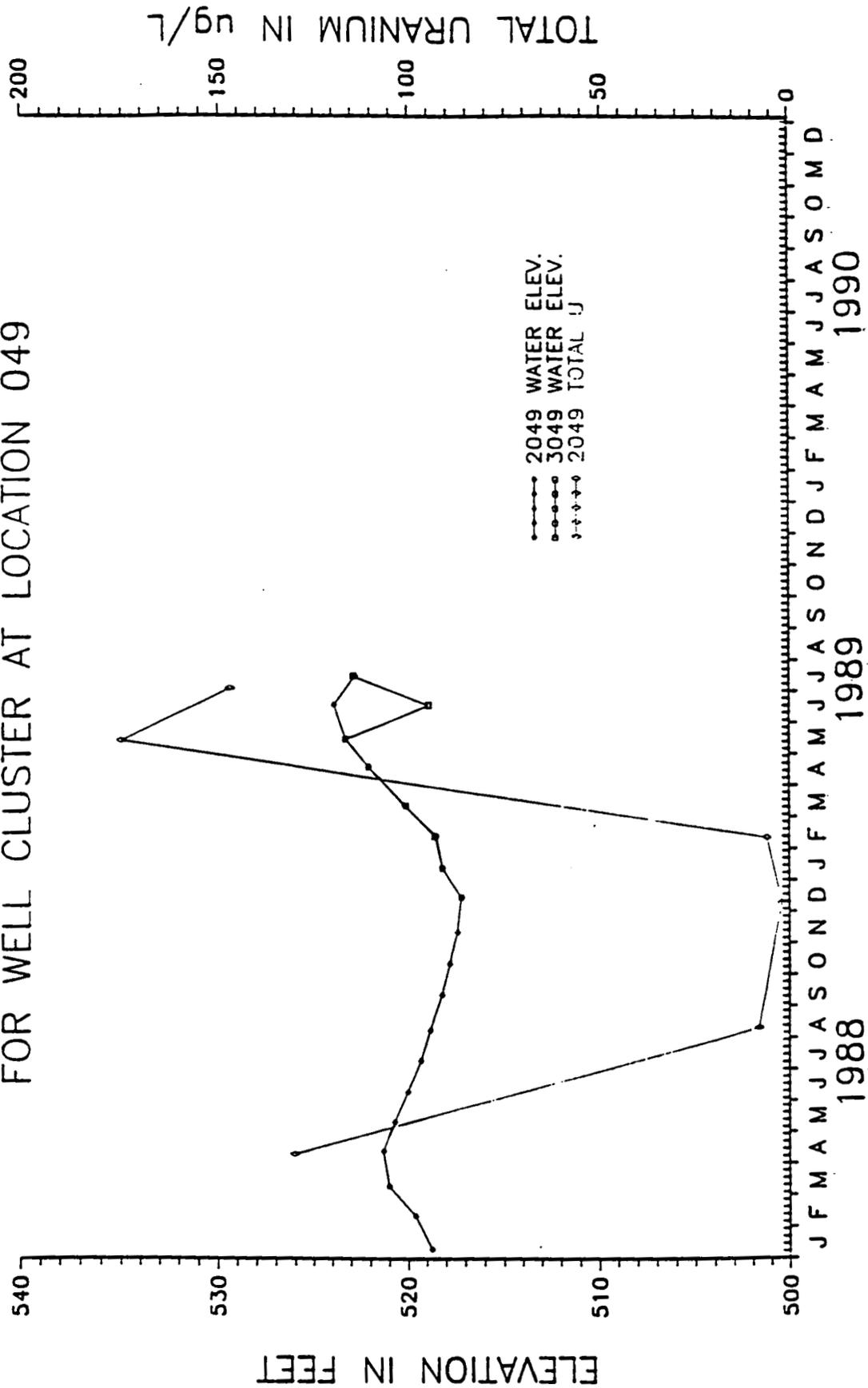


FIGURE 4

would be required at location 047, which is upgradient from location 046. Well 3047 is considered low priority.

A new well, 2385, should be installed half way between location 046 and 065 to monitor the easterly extent of contamination indicated at location 046. If contamination is found in well 2385 then well 3385 will be required to determine the vertical extent of contamination at that site. Well 3385 is currently considered low priority.

A major unresolved question is whether the uranium plume in the South Field is an ongoing source for the South Plume. The model predicts that the South Plume is very narrow because of the relatively high permeability of the sand and gravel aquifer. Highly permeable aquifers do not present much resistance to flow so the contaminant plume is not forced to disperse laterally. If the uranium plume under the South Field is part of the South Plume, the implications to the FS and the risk assessment are significant. In order to resolve this issue, well 2390 should be installed half way between location 045 and 015. This is where the plume connection must be if the uranium in the two areas is continuous from well 2046 to the South Plume. If contamination is found here then well 3390 will be required to determine the extent of vertical migration. Well 3390 is currently considered low priority.

#### East of the Outfall Ditch

Infiltration of uranium bearing water through the bottom of the Storm Water Outfall Ditch is generally accepted as the pathway for the introduction of uranium into the sand and gravel aquifer. At the time the original work plan was written, it was assumed that ground water under the outfall ditch flowed to the south. Therefore, monitoring wells were located to measure contamination moving to the south. Water table records from January 1988 through July 1989 indicate, however, that the southerly flow exists during periods of recharge. During low flow periods, the gradient is to the east and could result in a narrow, nor-south trending plume similar to that found south of the FMPC. There are currently no monitoring wells located along the eastern side of the outfall ditch that would have detected such a plume.

Wells 2386 and 2387 are proposed to verify that the gradient shift occurs and to determine if any uranium is migrating in an easterly direction from the outfall ditch. Current data suggest that the easterly gradient is neither steep nor present for very much of the year. Therefore, any uranium plume should not have migrated far from the outfall ditch. These two wells will provide the data regarding the width and magnitude of the ground water mound that results from recharge along the outfall ditch. They will also indicate if uranium has migrated from the outfall ditch to the east. As with the other proposed 2000-series wells, if elevated uranium is present in wells 2386 and 2387, a 3000-series well would be required in either or both locations. If elevated uranium is found in both 2386 and 2387 an additional well pair should be installed north of location 386 near the southeastern corner of the

new Storm Water Retention Basin. Wells 3386, 3387, and the additional well pair are considered low priority.

#### South Plume Area

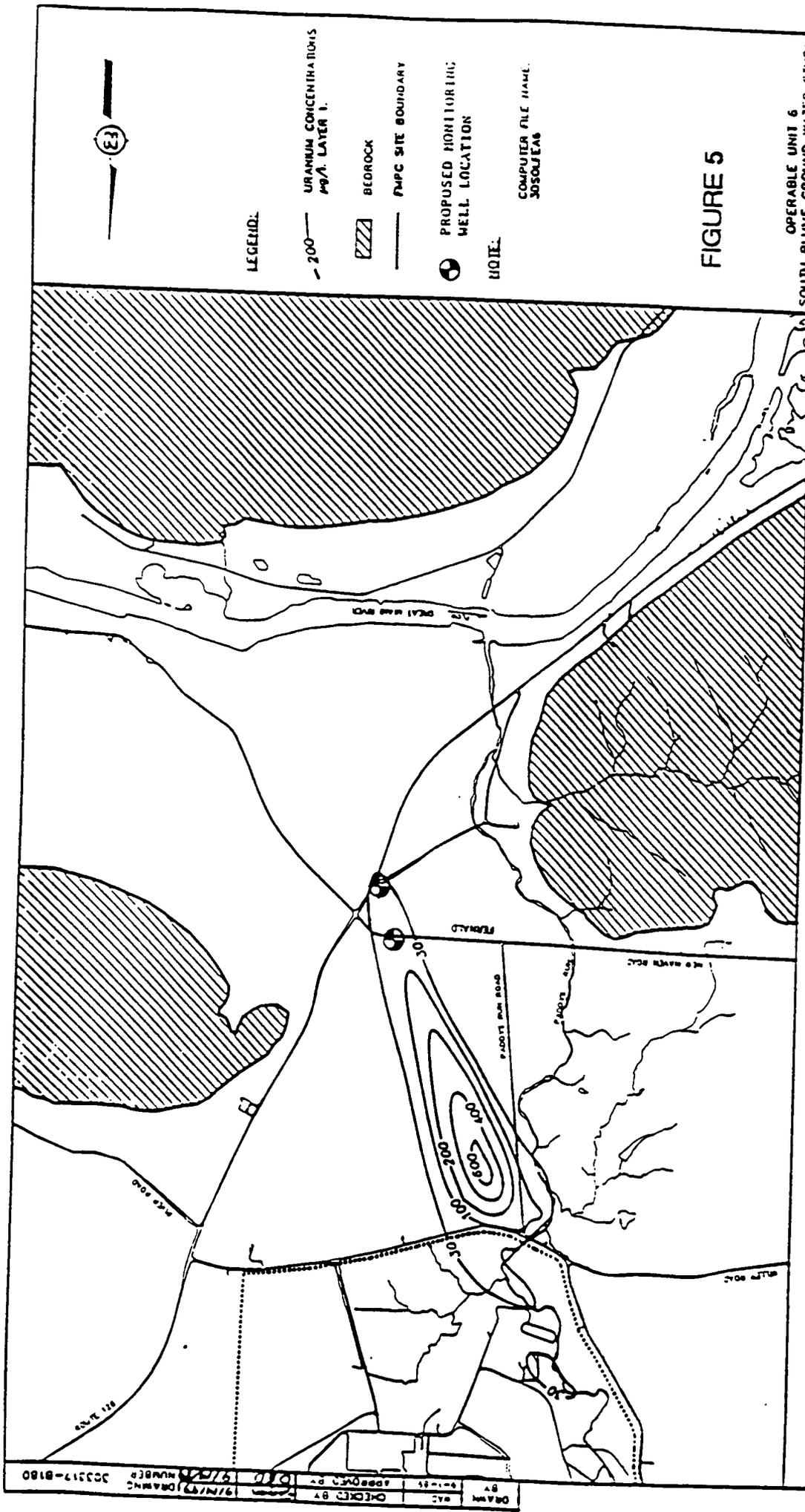
There are two issues to be addressed in relation to the South Plume. Emphasis has been on the plume that appears to have resulted from infiltration along Paddy's Run when there was uncontrolled runoff from the plant. The highest concentrations of uranium in this plume exceed 250 ug/l. The second issue is the lower levels of uranium which entered the creek system and infiltrated along the length of Paddy's Run downstream from the FMPC. The southernmost well installed for the RI/FS (well 2127) has had total uranium values of 37, 6, and 14 ug/l when sampled in April, May, and July of 1989. It is not clear what is causing this variation in uranium values, but it does seem likely that this variation is related to recharge occurring in the lower stretch of Paddy's Run.

The seven wells have recently been installed in the South Plume well program and data will be available in February 1990 from these wells. In addition data may become available from the Paddy's Run Road Site (PRRS) RI/FS. The location of wells and piezometers in the PRRS RI/FS will help with the interpretation of events along Paddy's Run. The possibility exists that unexpected findings will be forth coming from this data and additional wells will be required to evaluate risk to receptors in the area.

Current model interpretations indicate that the main plume has a long slender shape and that it extends a considerable distance to the southeast as shown in Figure 5. The location of the southern third of the plume is farther to the east than any drilling program proposed by either RI/FS. Well 2391 should be installed at the location shown in Figure 1, to determine if the model prediction of the southern tip of the plume is accurate. The appearance of 4.5 ug/l uranium in well 2094 in January 1988, while not a high value, indicates that uranium is present in the area. Location 094 is downgradient from the location of the two proposed wells in the PRRS RI/FS.

In the event that well 2391 contains elevated levels of uranium in excess of 50 ug/l then well 2392 should be installed at the location shown in Figure 1, to determine the lateral extent of the plume and well 3391 installed to determine the vertical extent of the plume. If uranium is less than 50 ug/l then the next 2000 series well should be installed northwest of well 2391. In either case the result will be wells at adjacent locations that define or closely locate the southern extent of the plume and provide the necessary data to complete the calibration of the transport model.

Initial water level data from the PRRS RI/FS piezometers indicate that well 2393 should be installed on Rutgers Nease property as shown in Figure 1. This well will fill a large data gap between the other PRRS wells and the Fernald RI/FS wells and should



LEGEND:

— 200 — URANIUM CONCENTRATIONS  
MG/L LAYER 1.

▨ BEDROCK

— PMP SITE BOUNDARY

● PROPOSED MONITORING  
WELL LOCATION

NOTE:

COMPUTER FILE NAME:  
3050UEA6

FIGURE 5

OPERABLE UNIT 6  
SOUTH PLUME GROUND WATER STUDY  
SIMULATED URANIUM CONCENTRATIONS  
PRESENT CONDITIONS

PREPARED FOR

FERNALD EE/CA  
U.S. DEPARTMENT OF ENERGY  
OAK RIDGE OPERATIONS  
INTERNATIONAL



DATE	BY	CHKD BY	DRWG NUMBER
11/18/83	3050UEA6	3050UEA6	3050UEA6
REV	BY	DATE	DESCRIPTION
1	3050UEA6	11/18/83	ISSUED FOR CONSTRUCTION

complete the definition of the western boundary of the uranium plume.

Location 391 and the location to the northwest are on land owned by Harrison Poured Foundations Inc. Location 392 is on Century Farms property. One additional well to the east in the vicinity of Highway 128 will be required to verify the eastern boundary of the plume. A possible well location is shown on Figure 1 is also on Century Farms Property. Wells 3391, 3392, and are considered low priority at this time.

In order to determine what well locations are best the wells in this area will be drilled in the following sequence. Well 2391 will be drilled first and developed. A sample will be collected and sent to the laboratory for total uranium on a rush basis. Well 2393 will be drilled while the Well 2391 sample is in the laboratory. The results of this sample will determine if the third well is drilled northwest or southeast of well 2391. The determination of the need for and proper location of the remaining wells will be based on water levels readings and uranium concentrations in wells 2391 and 2392. The data will be discussed with the regulatory agencies as part of the decision making process.

**Paddy's Run Profile Survey**

The monthly water table records and quarterly water quality data show that the recharge from Paddy's Run has a tremendous bearing on ground water patterns and contaminant migration. The distance at any point along Paddy's Run between the bottom of the stream channel and the water table is therefore very important. A detailed survey of the longitudinal profile of Paddy's Run was initiated under a Task 9 order in the early spring of 1989. The survey work was completed for most of the length of Paddy's run on the FMPC property. The survey was terminated due to funding limitations before any work was done off-site. We propose that the survey be completed to provide an accurate profile of Paddy's Run so the relationship between flow in the stream and ground water levels may be more accurately used in the interpretation of data and the ground water modeling effort.