ATTACHMENT A

OPERATIONS AND MAINTENANCE MASTER PLAN FOR AQUIFER RESTORATION AND WASTEWATER TREATMENT

OPERATIONS AND MAINTENANCE MASTER PLAN FOR AQUIFER RESTORATION AND WASTEWATER TREATMENT

FERNALD CLOSURE PROJECT

JUNE 2004

U.S. DEPARTMENT OF ENERGY

2505-OM-001
Draft, Revision 2

OMMP Rev 2 Summary 6-25-04

Purpose of Revision:

1) To reflect the revised groundwater Final Remediation Level (FRL) and final effluent discharge standard to the Great Miami River of 30 micrograms per liter (µg/L) as a result of the Explanation of Significant Differences approved by the U.S. Environmental Protection Agency (EPA) on November 30, 2001 (DOE 2001),
   - Global change throughout document

2) To provide updates to information presented in past revisions as a result of 2006 Site Closure Plan,
   - Reflects the step down of treatment facilities, wastewater sources, and engineered wastewater headworks as the site move toward closure
   - Reflects the shutdown of well-based reinjection when CAWWT construction begins (10/04)
   - Reflects new SWRB operational approach where bypassing/overflow will no longer occur after BSL flows are routed to the SWRB (11/04) – *Control: hold water in excavations – pump water to SWRB*
   - Groundwater pumping rates defined through CAWWT construction period (1/05) – *will update later this year after we reach concurrence with the EPAs*
   - Storm water Remediation approach up to removal of SWRB (11/05) – *will update in spring/summer of 2005 after CAWWT stage II design is complete*

3) To reflect changes to operation philosophies resulting from continued refinements in groundwater modeling and wastewater treatment operations, and;

4) To be included as a support plan (Attachment A) for the Draft Comprehensive Legacy Management and Institutional Control Plan (LM&ICP).

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LIST OF ACRONYMS

ALARA	as low as reasonably achievable
ARARs	applicable or relevant and appropriate requirements
AR/WM	Aquifer Restoration/Water Management
ARWWT	Aquifer Restoration and Wastewater Treatment
AWWT	Advanced Wastewater Treatment Facility
BRSR	Baseline Remedial Strategy Report
BSL	Biodenitrification Surge Lagoon
CAWWT	Converted Advanced Wastewater Treatment Facility
CAWWT (EW)	Converted Advanced Wastewater Treatment Facility (excavation water)
CAWWT (GW)	Converted Advanced Wastewater Treatment Facility (groundwater)
CAWWT (SW)	Converted Advanced Wastewater Treatment Facility (storm water)
CERCLA	Comprehensive Environmental, Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
D&D	decontamination and demolition
DOE	U.S. Department of Energy
DSDP	Demolition, Soil, and Disposal Project
EPA	U.S. Environmental Protection Agency
EW	excavation water
ESB	Emergency Spill Basin
FFCA	Federal Facilities Compliance Agreement
FPA	former production area
FRL	Final Remediation Level
FS	Feasibility Study
ft/sec	feet per second
gpm	gallons per minute
GW	groundwater
HAL	Health Advisory Limit
HEPA	high-efficiency particulate air
HNT	high nitrate tank
IAWWT	Interim Advanced Wastewater Treatment Facility
IEMP	Integrated Environmental Monitoring Plan
IRDP	Integrated Remedial Design Package
lbs/yr	pounds per year
µg/L	micrograms per liter
mgy	million gallons per year
mg/L	milligrams per liter
MCL	maximum contaminant level
mrem/yr	millirems per year
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency

LIST OF ACRONYMS
(Continued)

OMMP	Operations and Maintenance Master Plan
OSDF	On-Site Disposal Facility
OSP	Operations and Support Project
PLS	Permanent Lift Station
POTW	Publicly Owned Treatment Works
ppb	parts per billion
PTI	permit to install
PTO	permit to operate
RA	remedial action
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RD/RA	remedial design/remedial action
RI/FS	remedial investigation/feasibility study
RWW	remediation wastewater
SCEP	Soils Characterization and Excavation Project
SDF	Slurry Dewatering Facility
SOP	Standard Operating Procedure
SPIT	South Plume Interim Treatment System
STP	sewage treatment plant
SW	storm water
SWL	solid waste landfill
SWRB	Storm Water Retention Basin
TI	technical impracticability
UIC	Underground Injection Control
VOC	volatile organic compound
WAC	Waste Acceptance Criteria
WPASWRC	Waste Pit Storm Water Runoff Control
WPP	Waste Pits Project
WSA	waste storage area
WTO	Water Treatment Operations
WWTS	Wastewater Treatment System

1.0 INTRODUCTION

This document is the Operations and Maintenance Master Plan (OMMP) for Aquifer Restoration and Wastewater Treatment (ARWWT) at the U.S. Department of Energy's (DOE's) Fernald Site. The OMMP is a formal remedial design deliverable, originally prepared to fulfill Task 2 of the Operable Unit 5 Remedial Design (RD) Work Plan (DOE 1996a). It was first issued in November of 1997. The OMMP has undergone one previous revision, which was issued in December of 1999. This is the second revision, and has been to prepared for three primary reasons:

1) to reflect the revised groundwater Final Remediation Level (FRL) and final effluent discharge standard to the Great Miami River of 30 micrograms per liter (μg/L) as a result of the Explanation of Significant Differences approved by the U.S. Environmental Protection Agency (EPA) on November 30, 2001 (DOE 2001a),

2) to provide updates to information presented in past revisions as a result of 2006 Site Closure Plan, and;

3) to reflect changes to operation philosophies resulting from continued refinements in groundwater modeling and wastewater treatment operations.

1.1 SCOPE OF ARWWT AND OBJECTIVES OF OMMP

The scope of ARWWT includes the design, construction, and operation of the principal groundwater, storm water, remediation wastewater, and sanitary wastewater management facilities that support the Fernald site's overall cleanup mission. ARWWT encompasses all of the water-related elements within Operable Unit 5 and the Fernald site's other source-control operable units (Operable Units 1 through 4) that are necessary to meet their storm water, sanitary, and wastewater treatment and discharge needs.

The fundamental objectives of the OMMP are to guide and coordinate the extraction, collection, conveyance, treatment, and discharge of all groundwater, storm water, sanitary, and remediation wastewater generated site-wide over the life of the Fernald site's cleanup program. Compliance with discharge limits includes a plan of the commitments, performance goals, operating schedule, treated water flow rates, direct discharge flow rates, system-by-system sequencing, and other operating priorities. This plan also allows for balanced site-wide water management and provides the approach for the management of treatment residuals (treatment sludges, retention basin sediments, and spent resins/filtration media) that are by-products of the Fernald site's wastewater treatment processes.

The OMMP serves as a comprehensive statement of management policy to ensure that planned modes of operation and maintenance for ARWWT are consistent with regulatory requirements and satisfy the Fernald site's remedy performance commitments for groundwater restoration and wastewater treatment.

The plan establishes the decision logic and priorities for the major flow and water treatment decisions needed to maintain compliance with the Fernald site's National Pollutant Discharge Elimination System (NPDES) permit and Record of Decision-based surface water discharge limits. The plan also provides the overall management philosophy and decision parameters to implement the day-to-day flow routing, critical-component maintenance, and treatment priority decisions. It is not intended to provide detailed, specific operating or maintenance procedures for ARWWT. The plan also serves to inform EPA and the Ohio Environmental Protection Agency (OEPA) of the planned operational approaches and strategies that are intended to meet the regulatory agreements made during the Operable Unit 5 Remedial Investigation/Feasibility Study (RI/FS) (DOE 1995a and 1995b) process and documented in the Operable Unit 5 decision documents; the Operable Unit 5 Record of Decision (DOE 1996b), the Operable Unit 5 Explanation of Significant Differences, and the Operable Unit 5 Remedial Design Fact Sheet for Fernald Site Wastewater Treatment Updates (DOE 2004).

The plan serves to coordinate and schedule wastewater conveyance and treatment needs with other site projects throughout the duration of the remediation process at the Fernald site. As such, it provides the basis for development of more detailed internal operating procedure documents (e.g., Standard Operating Procedures, Standing Orders, and Preventive Maintenance Plans) that are required for execution of work at the Fernald site. The existing detailed procedural documents that govern the performance of water-related operations and maintenance activities at the Fernald site are expected to be updated (revised, combined, or eliminated) as required to conform with the general strategies, guidelines, and decision parameters defined in this plan.

1.2 BASIS AND NEED

The need for the OMMP arose as DOE and regulators realized that the various water and wastewater flows that originate from Fernald site remediation activities are in direct competition with one another for treatment resources. The wastewater treatment capacities at the Fernald site must, therefore, be prioritized so that: 1) discharge limits can be maintained; 2) a range of flow conditions at various time intervals can be accommodated; and 3) the detrimental effects of exceptional operating circumstances can be effectively managed. The need for treatment (and the accompanying hierarchy of treatment priorities) will vary over the span of the site remedy as new projects come on line, others are completed, and aquifer restoration activities progress.

It was recognized during the development of the Operable Unit 5 Record of Decision, that the monthly average concentration discharge limit for total uranium (established at 20 parts-per-billion [ppb] in the Operable Unit 5 Record of Decision and revised to 30 ppb in the Operable Unit 5 Explanation of Significant Differences) could probably be met under average operating conditions, but that maintaining the limit may not be achievable during periods of exceptional operating conditions. It was further recognized that the application of the discharge limit was not considered as a required component of the remedy to ensure protectiveness, but rather as an appropriate performance-based objective that appeared reasonably attainable through the application of an appropriate level of water treatment. It was recognized that the performance-based discharge limit must be able to accommodate exceptional operating conditions anticipated to occur over the duration of the remedy. Two exceptional operating conditions were actually cited in the Operable Unit 5 Record of Decision that would permit relief allowances from the total uranium monthly average concentration discharge limit, when necessary, for:

- Storm water bypasses during high precipitation events
- Periodic reductions in treatment plant operating capacity that are necessary to accommodate scheduled maintenance activities.

It was agreed, at the time the Record of Decision was signed, that the OMMP would define the operating philosophy for: 1) the extraction/re-injection and treatment systems; 2) establishment of operational constraints and conditions for given systems; and 3) establishment of the process for reporting and instituting corrective measures to address exceedances of discharge limits. The OMMP also contains details of the manner in which exceptional operating conditions are to be accommodated and reported in the demonstration of discharge limit compliance.

The OMMP will be modified during the course of the remedy to accommodate changes to the treatment and well field systems or the retirement of individual restoration modules from service, once area-specific cleanup levels are achieved. The plan is intended to serve as a living guidance document to instruct operations staff in implementing required adjustments to the system over time. The OMMP will thus be evaluated periodically to ensure the most recent instructions regarding treatment priorities and flow routing decisions are available to system operators. Proper notifications for reporting bypasses and maintenance shutdowns of the system, and the reporting and application of corrective measures to address exceedances of discharge limits also are identified in the OMMP.

With site closure in 2006, several water treatment flows will be eliminated or reduced (i.e., remediation wastewater, sanitary wastewater, storm water runoff) from the scope of the treatment operation. Elimination/reduction of these flow streams provides an opportunity to reduce the size of the water treatment facility that will remain to service the aquifer restoration after site closure. Reducing the size of the treatment facility prior to site closure in 2006 will reduce the amount of impacted materials that may need future off-site disposal.

Between October 2003 and March 2004, DOE conducted a series of meetings with public stakeholders, the EPA, and the Fernald Citizen's Advisory Board to identify a more cost effective water treatment facility that would serve as a long-term replacement for the existing Advanced Wastewater Treatment (AWWT) facility. The interactions led to support for a plan to carve down the AWWT facility to permit the 1,800 gallons per minute (gpm) Phase II expansion system to remain as the long-term groundwater treatment facility. The converted 1,800 gpm AWWT facility (CAWWT) will provide 1200 gpm capacity for groundwater and about 600 gpm of storm water capacity (including carbon treatment) to handle the last remaining storm water and remediation wastewater flows. Once those flows have ceased, the CAWWT will provide a dedicated long-term groundwater treatment capacity of up to 1,800 gpm. During the time period that the AWWT is being "carved down" into the CAWWT, groundwater pumping will need to be reduced, and groundwater re-injection will need to be stopped in order to meet discharge limits at the Parshall Flume. The reduced operational flow rates are presented in Section 4. Figure 1-1 provides the timeline for the conversion of the AWWT facility and associated activities.

In addition to decreasing the size of the water treatment facility, operational approaches to the aquifer remedy are also under evaluation to determine if a more efficient way of remediating the aquifer can be found. Scenarios under evaluation include:

- Stopping well-based re-injection.
- Induced infiltration of water through the Storm Sewer Outfall Ditch.

A design evaluation that contains additional groundwater modeling of these two possible operational approaches, and plans for the field testing of the two approaches, will be issued for review at the same time that this revision of the OMMP is issued for review. The design evaluation will define flow rates for the time periods following start up of the CAWWT. Once agreement has been reached as to which approach the site should pursue, the OMMP will be updated to reflect the new, agreed upon design. Groundwater flow rates currently presented in Section 4 will carry the project through the CAWWT Stage I construction period (Operational Period 2 in Table 1-1).

The remaining operational periods and associated key operational parameters for ARWWT are provided in Table 1-1. Operational Period 1 will be in place as this draft of the OMMP (Revision 2) is being reviewed and will therefore be governed by Revision 1 of the OMMP. This OMMP specifies wastewater treatment operations protocol through Operational Periods 2, 3, and 4 - up until the time the Storm Water Retention Basin (SWRB) is taken out of service. The OMMP will be revised prior to shutdown of the SWRB to provide the operational approach for the remaining storm water/remediation wastewater flows after the SWRB is taken out of service.

1.3 RELATIONSHIP TO OTHER DOCUMENTS

The OMMP functions in tandem with several other major ARWWT design support plans. The environmental monitoring activities conducted in support of aquifer restoration performance decisions are being conducted and reported through the Integrated Environmental Monitoring Plan (IEMP) (DOE 2003a). Information obtained through the IEMP will be used to: 1) appraise groundwater restoration progress; 2) assess the need for changing groundwater extraction or re-injection flow rates; and 3) assess the durations of groundwater extraction and/or re-injection activities over the life of the remedy.

The initial design flow rates, planned installation sequence, detailed design basis, and overall restoration strategy for the aquifer restoration modules comprising the groundwater remedy were developed in the Baseline Remedial Strategy Report (BRSR) for Aquifer Restoration (DOE 1997a). The overall restoration strategy has been modified as a result of information gained from the ongoing remedy performance/operations monitoring and pre-design monitoring conducted in support of the Waste Storage Area Phase I Module and the South Field Extraction System Phase II Module.

The Re-Injection Demonstration Test Report (DOE 2000) provided the recommendation that the groundwater remedy incorporate the use of re-injection. The South Field Phase II design report specified the use of re-injection both along the Fernald site southern property boundary and in the South Field area. Although it is determined not feasible to maintain long-term operations of the groundwater injection wells beyond 2004, DOE is committed to exploring alternate efficient ways for continued groundwater reinjection. DOE will be working with the EPA and OEPA to determine the feasibility of continuing re-injection via infiltration of clean groundwater through the base of site drainage ditches. As noted above, the work will be specified in a test plan to be submitted to the EPAs in July 2004.

The Remedial Action (RA) Work Plan (DOE 1997b) for Aquifer Restoration (submitted to EPA and OEPA as Task 10 of the Operable Unit 5 RD Work Plan) conveyed the enforceable RA construction schedule for the initial restoration modules brought on-line in 1998 (the Re-injection Demonstration Module, the South Field Extraction System Module, and the South Plume Optimization Module). It also contained the planning-level RA construction schedule for the remaining modules to be brought online in later years. With the completion and start-up of the Waste Storage Area Phase I Module in 2002 and the South Field Phase II Module in 2003, all of the RA Work Plan specified schedules have been met. The only module remaining to be installed is the Waste Storage Area Phase II Module scheduled for installation in 2005.

The OMMP functions in tandem with several other RD or design support plans prepared by other project organizations outside ARWWT. The Soils Characterization and Excavation Project (SCEP) prepared the Sitewide Excavation Plan (DOE 1998) and continues to prepare a series of area-specific detailed design plans (termed Integrated Remedial Design Packages [IRDPs]) that define the approach and commitments for management of storm water, intercepted perched groundwater, and sediment during soil remediation activities. The Waste Pits Project (WPP) has developed design documents that define the management of storm water and remedial wastewater within that project's boundaries, and the plan for coordinating the treatment of the streams by the ARWWT. The On-site Disposal Facility (OSDF) Project has developed design documents that define the management of storm water and leachate within the boundaries of that project, and the planned hand-offs for delivering these streams for treatment to ARWWT. The Silos Project will produce similar design documentation to coordinate the management and delivery of their process remedial wastewater for treatment by ARWWT. Lastly, the facility-specific implementation plans developed by the Demolition, Soil, and Disposition Project (DSDP) present the coordination strategy for wastewater generated by decontamination and demolition (D&D) activities for treatment by ARWWT. Each of these project organizations is responsible for ensuring that their respective regulatory requirements and commitments for effective management of storm water and remedial wastewater within their project boundaries are met and integrated with ARWWT.

1.4 PLAN ORGANIZATION

The plan is generally organized around the major wastewater streams being managed by ARWWT: groundwater, storm water, remediation wastewater, and sanitary wastewater. The sections and their contents are as follows:

Section 1.0 Introduction: presents an overview of the plan, its objectives, and its relationship to other documents, and its organization.

Section 2.0 Summary of Regulatory Drivers and Commitments: discusses the applicable or relevant and appropriate requirements (ARARs) compliance crosswalk and provides a summary of the other commitments and guidelines that have been activated for ARWWT by the Operable Unit 5 Record of Decision.

Section 3.0 Description of ARWWT Major Components: identifies the major collection, conveyance, and treatment components comprising the Fernald site's system for managing the major wastewater streams, the treatment capacities that are available, and a schedule of major ARWWT activities throughout the aquifer restoration process.

Section 4.0 Projected Flows: provides an estimate of flow generation rates and durations for each of the major wastewater streams. Estimates of the summary yearly flows developed are used in Section 5.0 to evaluate the treatment systems discussed in Section 3.0.

Section 5.0 Operations Plan: establishes the operations philosophy, treatment priorities and hierarchy, treatment operational decisions, well field operational objectives and decisions, maintenance priorities, controlling documentation, management and flow of operations information to successfully operate the groundwater and wastewater systems to achieve regulatory requirements and commitments.

Section 6.0 Operations and Maintenance Methods: addresses the general methods, guidelines, and practices used in managing equipment operation and maintenance; discusses some of the dedicated organizational resources and management systems that will help to assure meeting the requirements in the Record of Decision, describes the key parameters used to monitor the performance of the groundwater and wastewater facilities, and describes the principal features and maintenance needs for the overall operation.

Section 7.0 Organizational Roles, Responsibilities, and Communications: this section presents the organizational roles and responsibilities with respect to implementation of this OMMP. Also presented are information needs and communications protocol for coordination with other Fernald site project organizations outside ARWWT and interaction with the EPA and OEPA.

Appendix A ARWWT Standard Operating Procedures

Appendix B Groundwater Restoration Well Performance Monitoring and Maintenance Plan

1.5 PROGRAM MODIFICATIONS AND REVISIONS

The OMMP will remain in place for the duration of the Fernald site's remediation activities. Periodic reviews of the OMMP will be conducted to respond to needed changes in program emphasis or the addition of new components, as appropriate. As noted in Section 1.2, updates/revisions to the OMMP will be required when the groundwater restoration approach is refined and agreed upon and prior to the time that the Storm Water Retention Basin is taken out of service.

TABLE 1-1
OPERATIONAL PERIODS AND ASSOCIATED KEY OPERATIONAL PARAMETERS

Operational Period	Groundwater Treatment Capacity (gallons per minute)	Storm Water/Remediation Wastewater Treatment Capacity (gallons per minute)	Groundwater Pumping Rate (gallons per minute)	Re-injection (gallons per minute)	Storm Water/Remediation Wastewater Headworks
1) Pre CAWWT Construction Shut down: Present until 9/04	2000+	Up to 1100 gpm	~5800	1325	SWRB/BSL
2) CAWWT Stage I Construction Period: 9/04-1/05	200+	Up to 1100 gpm	~3000	0	SWRB/BSL to just SWRB in 11/04
3) CAWWT Operations w/SPIT & IAWWT: 2/05 – 7/05	1400+	Up to 900 gpm	~4800	0	SWRB
4) CAWWT Operations: 8/05 – Until the SWRB is Shut Down for D&D in 11/05.	1200+	Up to 600 gpm	~4100	0	SWRB
5) CAWWT Operations 11/05 - until Capping of Last Cell in 3/06	1200+	Up to 600 gpm	~4100	0	Tanks at CAWWT, or Soil excavation, or in open Cell for OSDF leachate/storm water
6) CAWWT Operations after last cell is capped (Storm water and remediation wastewater treatment no longer required)	1800	Not required	4000 –5000	0	Not required

Figure 1-1
CAWWT Timeline

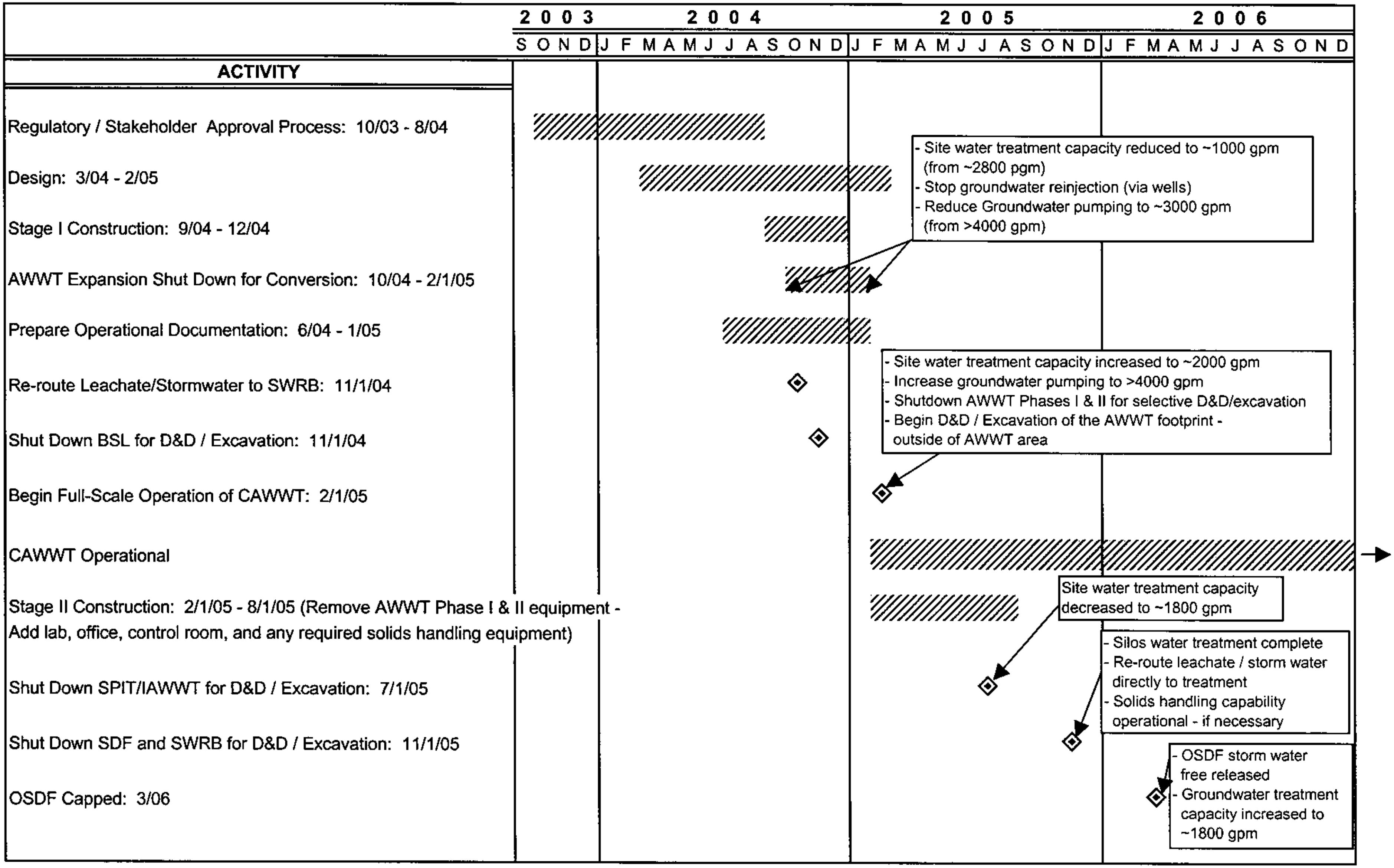

Fig 1-1 Stakehldr Timeline r2c 6-04 06/28/2004 9:43 AM

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2.0 SUMMARY OF REGULATORY DRIVERS AND COMMITMENTS

Section 2.1 summarizes the Fernald site's pertinent regulatory-based requirements, commitments, and operating constraints that have a bearing on either the implementation of or the reporting obligations for the OMMP activities. A review and listing of pertinent requirements was conducted to help ensure that the scope of the OMMP: 1) satisfies the regulatory obligations for operations and maintenance activities that have been activated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process; and 2) meets the expectations of other pertinent criteria that have been developed through the RD process.

Section 2.2 provides the formal permit crosswalk required for inclusion in the OMMP by the RD Work Plan and discusses additional ARARs and To Be Considered requirements. The suite of ARARs and To Be Considered requirements in the Fernald site's approved CERCLA Operable Unit 5 Record of Decision was examined to identify the subset with specific operations and maintenance requirements or permitting issues affecting the OMMP. The Fernald site's existing compliance agreements issued outside the CERCLA process, such as the NPDES permit and existing Air and Wastewater Permits to Install (PTI), Permits to Operate (PTO), and Permit Information Summaries also were reviewed.

2.1 GENERAL COMMITMENTS AND CONSTRAINTS FOR THE ARWWT

General commitments and constraints for the ARWWT can be divided into those applicable to aquifer restoration, storm water management, and wastewater treatment. The general commitments, operating constraints, and performance goals that have originated as part of the post-Record of Decision remedial design process were identified for inclusion in this section.

2.1.1 Aquifer Restoration

The general remedy performance commitments and constraints which have been agreed to with EPA and OEPA regarding aquifer restoration are summarized in the following list. These commitments and constraints were derived from the Operable Unit 5 Record of Decision, the Operable Unit 5 Explanation of Significant Differences, and various remedial design/remedial action (RD/RA) documentation as noted:

- Aquifer Restoration Approach - The Fernald site has received EPA and OEPA approval for the aquifer restoration approach contained in the Waste Storage Area Phase I Module Design (DOE 2001b) and the South Field Extraction System Phase II Module (DOE 2002). In 2004 the aquifer restoration approach is being further refined based on discussions with the EPA, OEPA, and public stakeholders. The refined approach will continue to maintain the commitments specified in the Operable Unit 5 Record of Decision.

- Aquifer Cleanup Levels - Targeted groundwater FRLs were presented in the Operable Unit 5 Record of Decision. In general, the FRLs were based on maximum contaminant levels (MCLs) for drinking water (or 10^{-5} incremental lifetime cancer risk or 0.2 hazard index when no MCL was available). Groundwater remediation is expected to continue until all the constituent-specific FRLs have been achieved or, if necessary, until a technical impracticability (TI) waiver is justified in the event the FRLs cannot be achieved. Alternative best available technologies will be considered prior to requesting a TI waiver.

- Discharge Limits - During site remediation, significant amounts of both treated and untreated water will be discharged to the Great Miami River. Treatment will be applied to storm water, remediation wastewater, and recovered groundwater to the extent necessary to limit the total mass of uranium discharged through the Fernald site outfall to the Great Miami River to no more than 600 pounds per year. This mass-based discharge limit became effective upon issuance of the Operable Unit 5 Record of Decision. Additionally, the necessary treatment will be applied to these streams to limit the concentration of total uranium in the blended effluent to the Great Miami River to no greater than 30 ppb. The 30 ppb discharge limit for uranium will be based on a monthly average and became effective December 1, 2001 replacing the 20 ppb standard to which the Fernald site was subject beginning January 1, 1998.

  Up to 10 days per year are allowed by the Record of Decision for emergency bypass due to storm events. Uranium contained in these bypass events will only be counted in the annually discharged mass, but not in the monthly average concentration calculations. When bypass days in excess of the 10 allowed are required, both the uranium mass and flow weighted concentration of the bypassed water are to be counted toward the 600 pound annual limit and the 30 ppb monthly average discharge. Required relief from the discharge limits is also provided by the Record of Decision to accommodate scheduled treatment plant maintenance activities. Approval by the EPA must be obtained in advance by notification of these planned maintenance periods. The notification must be accompanied by a request for the uranium concentrations in the discharge not to be considered in the monthly averaging performed to demonstrate compliance with the 30 ppb total uranium limit. The Fernald site will make every reasonable effort to prevent bypass of storm water during treatment plant shutdowns for maintenance, including scheduling maintenance shutdowns during the times when dry weather is expected. The NPDES permit will govern all remaining nonradionuclide discharges to the Great Miami River. Many of the gravity-fed storm sewer lines in the former production area have been removed as a consequence of site remediation. Removal of these lines allows for much more control of the storm water flow into the SWRB. Therefore, bypassing of storm water will no longer occur beginning in the fall of 2004.

- Groundwater Treatment Capacity – Groundwater treatment capacity will be fluctuating somewhat from now until the site closure (scheduled for 2006). In the spring of 2004 DOE received EPA, OEPA, and public stakeholder concurrence to reduce the site's water treatment infrastructure. The reduced infrastructure is warranted because the site's water treatment needs are diminishing as a result of the accelerated site remediation and ongoing reduction of uranium concentration in the pumped groundwater. At the time of site closure, a dedicated groundwater treatment capacity of up to 1800 gpm will be available for long-term groundwater treatment.

- Groundwater Treatment Decisions – Groundwater treatment decisions are made based on individual well uranium concentrations. The higher concentration wells go to treatment and the lower concentration wells bypass treatment and are discharged directly to the Great Miami River outfall line. The piping networks that convey on-property extracted groundwater have, or will have as appropriate, double headers, one connected to the main line to treatment and the other to the main discharge line. This design feature is not applicable to the off-property South Plume Module. The extracted groundwater from the South Plume Module is sent to either the treatment facilities or directly to the discharge outfall based on the uranium concentration in the combined flow from the 6 wells comprising this Module. The combined treated and untreated discharge will comply with the 30 ppb discharge limit and the 600 pound per year mass-based limit as described above under Discharge Limits.

- Extraction Rate - The net groundwater extraction rate should not exceed the recharge rate of the regional aquifer or cause excessive water table drawdown. Therefore, based on groundwater modeling, 4000 gpm was established as the limit for the net extraction rate in the Operable Unit 5 Feasibility Study (FS) Report (DOE 1995b). This limit has been raised to approximately 5000 gpm based on subsequent, refined groundwater modeling and aquifer water level monitoring data. The maximum pumping rate for each individual well should not exceed 500 gpm in order to prevent excessive local drawdown and improve uranium mass removal efficiencies. Hydraulic impacts to the groundwater contamination under the Paddys Run Road Site south of the existing South Plume recovery wells should also be minimized; reversing groundwater flow from the Paddys Run Road Site into the South Plume Recovery System needs to be prevented.

- Injection Rate and Quality - Injection technology has been utilized as part of the aquifer restoration approach to reduce groundwater drawdown and to increase the groundwater flushing rate through the plume. Updated groundwater modeling in 2003 indicated that continued re-injection via existing wells will only shorten the remaining remedy duration by 3 years; therefore re-injection via wells is being stopped in the fall of 2004. However, DOE is exploring the possibility of continuing re-injection via site drainages and will be working with EPA and Ohio EPA over the next year to determine its feasibility.

2.1.2 Storm Water Management

The requirements for controlling storm water runoff (and associated sediment loads) at the point of origin are beyond the scope and intent of this document and are the specific responsibility of the source-control projects at the Fernald site. The decision to provide pretreatment must be made in concert with ARWWT recognizing surface water FRLs, NPDES limits, and hydraulic capacity. As site remediation is progressing, storm water is becoming more manageable. As noted above in the discharge limits discussion, many of the gravity fed storm sewers have been disrupted and/or removed as a consequence of remediation, thus allowing for better control of storm water flow. With the removal of the storm sewers, water must be pumped to the SWRB from the various excavation areas of the site. In times of heavy or sequential precipitation events, the excavations in the uncertified areas will provide additional storage capacity above and beyond that provided in the SWRB.

The ARWWT is responsible for:

- Providing treatment for designated streams, upon delivery at the ARWWT treatment headworks
- Coordinating with other site projects to ensure that pumping of storm water to the SWRB does not cause it to reach a level where treatment bypassing or overflow of the basin occurs
- Sediment clean out of the ARWWT treatment headworks
- Coordination and review to ensure similar strategies and criteria for source control in other projects.

In general, all storm water management activities conducted sitewide need to adhere to the commitments and design criteria contained in the Fernald site Storm Water Pollution Prevention Plan.

2.1.3 Wastewater Treatment

The ARWWT is responsible for the following commitments for wastewater treatment:

Leachate Treatment

Leachate from the OSDF is currently pumped to the Biodenitrification Surge Lagoon (BSL) for holding prior to treatment in the AWWT. To support site closure, BSL operations are scheduled to end in November 2004 with the lagoon D&D occurring shortly thereafter. When the BSL goes out of service, leachate will be re-routed to the SWRB for holding prior to treatment. Since the Ohio Administrative Code (OAC) 3745-27-19, Operational Criteria for a Sanitary Landfill Facility, requires treatment of leachate, a new operational plan for the SWRB is required. Currently, overflow from the SWRB is an NPDES permitted outfall, and the Operable Unit 5 Record of Decision allows water from the SWRB to bypass treatment when the basin is in danger of overflowing and when the treatment plants are down for maintenance. As noted above in the discharge limits discussion, the site has much more control of the flow to the SWRB as a result of removal of the gravity-fed storm sewer system; therefore, a new operational plan for managing the SWRB will be in place in the fall of 2004 to ensure that neither treatment bypassing of water draining to the basin nor overflow of the basin will occur from that point on. The revised operational plan is provided in Section 5.0.

Outfall Uranium Concentration and Uranium Mass Loading

- Coordinate the accurate projection of influent quantity, quality, and timing for all the remedial wastewater sources to be received from other generator projects
- Strive to maintain high mass removal efficiency of the treatment facilities through regularly scheduled maintenance activities
- Help coordinate the identification of cost-effective pretreatment at sources of wastewater when appropriate.

Minimize the System Downtime

- Incorporate preventive maintenance considerations into the system design
- Operate within the design envelope
- Establish effective preventive maintenance procedures
- Prepare for potential corrective maintenance needs.

Manage Treatment Residuals within the terms of the Operable Unit 5 Record of Decision

- Characterize residuals for compliance with OSDF waste acceptance criteria
- Arrange for the transport and off-site disposal of residuals not attaining onsite waste acceptance criteria
- Pursue treatment techniques to treat the residuals to attain waste acceptance criteria in the event offsite disposal capacity becomes unavailable or cost prohibitive.

2.2 ANALYSIS OF REGULATORY DRIVERS AND EXISTING PERMIT REQUIREMENTS

The following section provides a summary of the regulatory drivers governing activities initiated under this OMMP, including ARARs and To Be Considered criteria, DOE Orders, Fernald site legal agreements, and existing environmental permits. This section has been organized based on criteria related to: 1) point source air emissions; 2) surface water and treated effluent discharges; 3) groundwater restoration activities; 4) hazardous waste management requirements; and 5) substantive permitting requirements mandated by existing environmental permits and permit information summaries.

The information provided fulfills the commitment made in Section 2.3 of the RD Work Plan to provide a compliance crosswalk that demonstrates how these requirements will be met. The format of the compliance crosswalk is based on mutually agreed format described in the June 12, 1995, letter from DOE to EPA (DOE-1055-95).

2.2.1 Point Source Air Emissions

Any emissions from sources associated with future modifications or expansions to AWWT facilities or other wastewater treatment units will be compared to the following requirements to make sure that activities are conducted in compliance with applicable requirements. Any continuous emission monitoring that may be required for National Emissions Standards for Hazardous Air Pollutants (NESHAP) Subpart H point sources will be described in future compliance crosswalks submitted in the appropriate plans. Future point source air emissions associated with activities within the scope of the OMMP will be evaluated against the following regulatory drivers:

- 40 Code of Federal Regulations (CFR) Part 61, NESHAP Subpart H, which specifies that all radiological emissions (except radon) from the Fernald site must not cause any member of the general public to receive a dose equivalent in excess of 10 millirem per year (mrem/yr). In addition to the 10 mrem/yr site-wide standard, NESHAP Subpart H requires that an application for approval be filed with EPA for those sources that exceed a 0.1 mrem/yr dose equivalent to members of the public. Continuous emission monitoring is required for stacks or vents that have the potential, under normal operating conditions but without emission control devices, to cause a member of the public to receive a dose equivalent in excess of 0.1 mrem/yr. Demonstration of source-specific compliance with the 0.1 mrem/yr dose standards is achieved through computer modeling. Site-wide radiological emissions from the entire site are reported annually in the annual Fernald site NESHAP Subpart H report.

- OAC 3745-31 and OAC 3745-35, Permits to Install and Permits to Operate, require the installation of best available technology when installing, modifying, and operating air contaminant sources. Such requirements associated with any future expansions or modifications to the AWWT or other wastewater treatment units will be included in the project specific design submittals for these projects.

2.2.2 <u>Surface Water and Treated Effluent</u>

The Fernald site's wastewater treatment systems are subject to substantive permitting requirements for wastewater treatment units. Treated wastewater effluent is discharged through the Parshall Flume to the Great Miami River. The site discharge is fully subject to discharge permitting requirements. The following regulatory drivers govern these surface water and treated effluent discharges associated with Fernald site site-wide wastewater treatment units:

- Fernald site NPDES Permit (OEPA Permit No. 1IO00004*FD) triggers a variety of operational and maintenance requirements designed to ensure discharges of treated effluent are conducted in compliance with the terms and conditions of the permit. These requirements include process control sampling and maintenance activities at sampling stations and treatment units.

- OAC 3745-31, Wastewater PTIs are required for new installations or modifications to existing wastewater treatment units. Wastewater PTIs are issued provided the newly installed/modified treatment unit will not adversely impair water quality or cause a violation of applicable effluent standards. All near-term projects requiring a PTI have already been addressed. Compliance with the substantive PTI requirements associated with future projects will be demonstrated in their corresponding project-specific design packages.

2.2.3 <u>Groundwater Restoration</u>

The regulatory drivers governing groundwater-related operation and maintenance activities include only those required as part of the Underground Injection Control (UIC) Program. The injection wells installed under the Injection Demonstration, and under subsequent aquifer restoration modules, must comply with the substantive requirements of this program. This policy is also cited as a To Be Considered requirement in the Operable Unit 5 Record of Decision. The OEPA has primacy for this program, and has issued a policy for those Class V injection wells installed for purposes of groundwater remediation, as described below:

- OEPA Policy 5X26 Aquifer Remediation Projects states that such wells do not need a PTI/PTO if the owner/operator complies with the policy. Since groundwater reinjection via wells will no longer occur beginning in the fall of 2004 this policy is no longer applicable. However, if reinjection via wells were to resume in the future the policy would be followed.

2.2.4 Hazardous Waste Management

Small quantities of wastewater that are known to contain one or more Resource Conservation and Recovery Act (RCRA) listed hazardous waste constituents will be treated in the on-site wastewater treatment system (AWWT Phase II/CAWWT). The DOE and OEPA negotiated a regulatory mechanism under the Mixture Rule Exclusion found at OAC 3745-51-03(A)(2)(e) allowing that wastewaters containing listed constituents could be appropriately managed through existing Fernald site wastewater treatment systems and exempt from associated RCRA listing. Compliance with this exclusion eliminates the need for pre-treatment of wastewaters containing listed constituents and further eliminates the associated listing that would have otherwise been applied to treatment plant residuals (e.g., sludges). This policy was articulated in DOE letter DOE-0678-98 dated April 15, 1998 and approved by OEPA on May 14, 1998.

2.2.5 Existing Environmental Permits and Permit Information Summaries

Tables 2-1 and 2-2 list the environmental permits and permit information summaries, respectively, that are applicable to ARWWT activities initiated under this plan. These tables identify the status of the permits for various wastewater treatment operations and list their corresponding substantive requirements. Cross references to the appropriate Standard Operating Procedures or site documents that describe the manner in which these requirements are addressed in detail are also provided in the tables.

TABLE 2-1

ACTIVE PERMITS TO INSTALL AND OPERATE

Permit No.	Description of Source	Effective Date	Substantive OMMP Requirements	Cross Reference[a]
			Wastewater Permits to Install	
05-0944	Sewage Treatment Plant Ultraviolet Disinfection Unit	June 28, 1984	• Lamps will be cleaned periodically.	SOP 43-C-368
05-1043	SWRB	November 18, 1987	• Periodic assessment of sediment depths and sediment clean out once six inches of deposition has occurred. • Water collected in basin chambers will be removed by means of floating outlet structures.	Installation of Sludge Removal System addresses these requirements
05-2872	Changes to BSL	December 16, 1987	• Periodic assessment of sediment depths and sediment clean out once 500,000 gallons of sediment has occurred. • Sediment removal schedule will be extended if measured sediment is less than 500,000 gallons.	Installation of Sludge Removal System addresses these requirements
05-5722	Fernald site AWWT Facility (Phases I and II)	December 3, 1992	• PTI has been withdrawn. AWWT is currently considered part of a CERCLA Response Action. Substantive permit requirements include the following bulletized items. • Maximum process rate for the AWWT will be 557,118 lbs/hr. The allowable limit for particulate is 0.894 lbs/hr and from uranium the rate is 1.34E-08 lbs/hr.	SOP 43-C-340
			Air Permits to Install and Operate	

[a]See Section 6.0 for a discussion of ARWWT Standard Operating Procedures.

TABLE 2-2

PERMIT INFORMATION SUMMARIES[a]

Description of Source	Submittal Date	Substantive Requirements	Cross Reference[b]
		Permit Information Summaries	
AWWT Slurry Dewatering Facility	December 7, 1995	• Filter cake will be containerized and managed as low-level waste. • All chemical storage tanks (caustic, acid, sludge conditioners) must be equipped with submerged fill devices. • Residual particulate and radiological emissions must be controlled via HEPA filtration devices.	SOP 43-C-358
AWWT Multi-Media Filter Project	November 12, 1996	• Backwash from the carbon and multi-media filters will be collected and discharged to the headworks of the AWWT Facility.	SOP 43-C-340
AWWT Expansion Project	December 20, 1996	• Tanks associated with the multimedia filtration and ion exchange columns operate under pressure in a closed system.	SOP 43-C-367
Sludge Removal Project	July 28, 1998	• Ensure BSL and SWRB sludges are removed to maintain necessary hydraulic capacity and the sludges are managed efficiently.	SOP 43-C-371

[a]Previously submitted to fulfill substantive permitting requirements for various CERCLA response/removal action pursuant to the requirements of CERCLA 121(e), 40 CFR 300, National Oil and Hazardous Substances Pollution Contingency Plan, and Paragraph XIII.A of the Amended Consent Agreement (DOE 1991).
[b]See Section 6.0 for a discussion of ARWWT Standard Operating Procedures.

3.0 DESCRIPTIONS OF MAJOR ARWWT COMPONENTS

The major operating system components of Operable Unit 5 aquifer restoration and wastewater treatment (ARWWT) required to accomplish the associated Operable Unit 5 remedy commitments and goals are described in this section. The existing and currently proposed Fernald site conveyance and treatment system components for managing the major wastewater streams are identified as are treatment capacities. This section also describes key linkages between the components. Figure 3-1depicts the ARWWT facilities as well as remediation wastewater/storm water sources overlayed on a picture of the site taken during an April 2004 flyover.

Figure 3-2 provides a current schedule of major ARWWT activities throughout the aquifer restoration process. With the award of the Closure Contract to Fluor Fernald and a change in the funding profile for the Fernald Site to accelerate Fernald site closure by 2006, the ARWWT is contracturally required to having all necessary infrastructure for groundwater remediation installed by September 2006. Therefore, Figure 3-2 varies from schedules presented in the Operable Unit 5 RA Work Plan and the BRSR, to present the most recent projection of when major elements of the ARWWT will begin operation and, as necessary, be shut down and decommissioned in support of site closure.

The closure contract requires that all site infrastructure be removed and dispositioned with the exception of that required for groundwater remediation, the OSDF, and administrative type facilities to support long-term stewardship. To accomplish these objectives, certain facilities associated with the existing wastewater treatment system infrastructure will be removed from service and adjustments to the flow paths of remaining wastewater streams will be needed. However, the required treatment will continue to be provided for these wastewater streams. Table 3-1 provides a description of the status of all remediation wastewater sources and treatment system infrastructure. The OMMP text and figures contained within present the schedule developed based on the new 2006 baseline.

3.1 GROUNDWATER COMPONENT

The remediation of the Great Miami Aquifer will be achieved by completing area-specific groundwater restoration modules. These modules were specified in the following documents:

- the RD/RA Work Plans for Operable Unit 5
- the Baseline Remedial Strategy Report for Aquifer Restoration
- the Design for the Remediation of the Great Miami Aquifer in the Waste Storage and Plant 6 Areas (DOE 2001b)
- the Design for Remediation of the Great Miami Aquifer South Field Phase II Module (DOE 2002).

During 2003, new information became available (refer to Comprehensive Groundwater Strategy Report [Fluor Fernald, Inc. 2003a]) that allowed for more refined groundwater modeling predictions of when aquifer restoration would be completed. The updated modeling predictions and groundwater remedy performance monitoring data both indicated the aquifer restoration time frame would likely be extended beyond the dates previously predicted. The updated modeling also indicated that the use of groundwater reinjection via wells did not greatly reduce the time required to remediate the aquifer. As reflected in Figure 3-2, aquifer restoration activities are predicted to be necessary until at least the year 2020. As noted in Sections 1 and 2, the DOE is currently working with the EPAs to determine the configuration of the long-term groundwater remedy. This section describes currently operating and proposed modules. The modules are presented in two categories: currently operating modules (Section 3.1.1) and future modules (Section 3.1.2).

3.1.1 Current Groundwater Restoration Modules

Groundwater restoration modules currently in operation are:

- South Plume/South Plume Optimization
- South Field Extraction System Phase I (including three supplemental wells)
- South Field Extraction System Phase II
- Re-Injection Demonstration
- Waste Storage Area Extraction System Phase I.

The geographical locations of each of these modules and associated wells are provided in Figure 3-3. A description of each of the modules is provided in the following subsections.

3.1.1.1 South Plume Module

Five extraction wells were installed in 1993 at the leading edge of the off-property South Plume as part of the South Plume removal action to gain an early start on groundwater restoration. The South Plume removal action well system began pumping in August 1993. The primary intent of the original five well system was to prevent further off-property migration of contamination within the groundwater plume. Two additional extraction wells came online in August 1998 for the active restoration of the central portion of the off-property plume. These two new wells, known as the South Plume Optimization Module have now been incorporated into the South Plume Module for purposes of remedy performance tracking and reporting. Figure 3-3 shows the locations of the wells and Table 3-2 provides the operating status of the South Plume Module.

3.1.1.2 South Field Module - Phase I

The South Field Extraction System Module consists of Phase I and Phase II. South Field Extraction System Phase I Module includes 10 extraction wells. In 1996, as part of an EPA-approved early start initiative, the 10 extraction wells were installed on Fernald site property in the vicinity of the south field/storm sewer outfall ditch. These wells are removing groundwater contamination in an on-property area of the Southern Uranium Plume where uranium contamination levels are highest (Figure 3-3).

Since the installation of the 10 original extraction wells of the South Field Extraction (Phase I) Module three new extraction wells have been added to the module, three of the original wells have been shut down, and one of the original wells has been converted to a re-injection well. The three extraction wells that were shut down are all located in the upgradient area of the plume where total uranium concentrations in the Great Miami Aquifer are now below the FRL. An additional consideration in removing two of these three wells was to accommodate soil remedial activities in the vicinity of the wells.

The three new wells added to the South Field Phase I Module were installed at locations where total uranium concentrations were considerably above the groundwater FRL, in the eastern, downgradient portion of the South Field plume. Two of the three new wells were installed in late 1999 and began pumping in February 2000. The third well was installed in 2001 and will become operational in 2002.

Phase II components of the South Field became operational in 2003. The components include:

- Four additional extraction wells, one in the southern waste unit area, and three along the eastern edge of the on-property portion of the southern uranium plume.
- One additional re-injection well in the southern waste unit area.
- A converted extraction well, which was converted into a re-injection well.
- An injection pond, which is located in the western portion of the Southern Waste Units Excavations.

Table 3-2 provides the operational status of the currently configured South Field Extraction System Module (Phase I and Phase II components).

3.1.1.3 Injection Demonstration Module

Groundwater reinjection via wells is scheduled to stop in September 2004 to support the construction of the CAWWT facility. All re-injection wells will remain in place as potential monitoring points for the groundwater remedy performance monitoring program. Re-injection well locations are shown on Figure 3-3 and Table 3-2 shows the operational status of the re-injection wells.

3.1.1.4 Waste Storage Area Extraction System (Phase I) Module

The Waste Storage Area Extraction system targets contaminants in the Great Miami Aquifer underlying the waste storage area (Operable Units 1 and 4). The Design for Remediation of the Great Miami Aquifer in the Waste Storage Area and Plant 6 Areas separates this system into two distinct modules. Phase I addresses the plume of contamination defined in the vicinity of the Pilot Plant Drainage Ditch. Phase II is deferred until after waste pit area excavations have been completed and the area is accessible for well drilling and construction activities.

The Waste Storage Area Extraction System Phase I module consists of one 12-inch diameter well and two 16-inch diameter extraction wells complete with submersible pumps with variable speed drives, well houses, electrical power, instrumentation and controls, fiber optic communications, and dual discharge headers (one for treatment and one for direct discharge). Initiation of operation of this module was May 8, 2002. The easternmost well in this module (Extraction Well 33063 or EW28) will be taken out of service then plugged and abandoned in July 2004 to make way for soil remediation activities. The well will be replaced in 2005 after soil remediation is completed.

The Design for Remediation of the Great Miami Aquifer in the Waste Storage Area and Plant 6 Area concluded that the uranium concentrations in the Great Miami Aquifer beneath Plant 6 had naturally attenuated to concentrations below 20 ppb. While the current data indicate that no extraction wells and infrastructure will be needed for the Plant 6 area, monitoring of the Plant 6 area will continue until aquifer restoration certification is completed and approved by EPA and OEPA.

3.1.2 Future Groundwater Restoration Modules

- Only Phase II of the waste storage area remains to be installed.

The geographical location of this module is provided in Figure 3-3. The RA Work Plan established the Remedial Action Schedule for the Waste Storage Area Module (Table 3-2), which was met with the installation and start-up of the Waste Storage Area Phase I Module in 2002. As noted on Figure 3-2 the Waste Storage Area Phase II module will become operational in 2005. A description of this planned module is provided below.

3.1.2.1 Waste Storage Area Extraction System Module Phase II

Once the waste pit area is accessible (i.e., after the waste pit material and contaminated soil have been excavated and real-time data indicates the area is "clean"), construction of the Waste Storage Area Extraction System Phase II module can be initiated within this area (Figure 3-3). The construction as currently planned includes installation of the two extraction wells sized to pump 100 gpm each. The

exact number and location of the extraction wells will be determined based on the future groundwater modeling predictions using future uranium plume characterization. Modeling conducted in support of the Design for Remediation of the Great Miami Aquifer in the Waste Storage Area and Plant 6 Area recommended that further evaluation for the need of dual piping (treatment and bypass) would be needed as the modeling indicated treatment for these extraction wells would not be required. Therefore, the specific infrastructure required for Phase II will be determined based on future groundwater modeling predictions of the uranium content of the extracted groundwater. Once completed, the construction will be inspected and accepted, and systems testing will be conducted. After successful testing and standard start-up review, operation of the module will begin.
The schedule dates for this module is as follows:

- Well installation Contract Award: April, 2005
- Infrastructure Contract Award: April, 2005
- Complete Construction: November 2005
- Commence Operations: December 2005.

These dates are contingent on the completion of the source operable unit and soil remedial activities in this area. If these dates must be revised, due to schedule changes during Operable Unit 1 or Operable Unit 5 soil remediation activities, then a revised schedule will be provided.

3.1.3 Groundwater Collection and Conveyance

An extensive system of collection and conveyance piping systems is required for the remediation of the Great Miami Aquifer. These piping systems were specified in the various module-specific design documents. Figure 3-4 provides an overview of the current well field piping. New collection and conveyance systems will not be installed until the soil remediation activities in those areas have been completed through pre-certification via real-time monitoring. This will avoid the need to maintain additional corridors of soil contamination. This is particularly important as it may be necessary to maintain these pipelines in service through groundwater certification. Construction of these modules prior to soil remediation in these areas would delay portions of the soil cleanup unnecessarily.

As described in Section 2, the piping network that conveys on property extracted groundwater from the individual extraction wells has or will have as appropriate, double headers, one connected to the main line to treatment and the other to the main discharge line as shown in Figure 3-4. The double headers allow for treatment/bypass decisions to be made on an individual well basis on-property. This design feature is not applicable to the off-property South Plume Module which was largely in place prior to the design of the on-property piping network. Since individual well bypass/treatment lines are not available on the South Plume wells, treatment/bypass decisions for the six wells comprising this system are made based on the uranium concentration in the combined flow from all the wells as indicated on Figure 3-4.

3.1.4 Great Miami Aquifer Remedy Performance Monitoring

Section 3 of the IEMP provides for the routine remedy performance monitoring of the Great Miami Aquifer. The details of how this remedy performance data are being evaluated and the associated decision making process are located in Section 3.7 of the IEMP. Figure 3-5 illustrates the overall framework for the groundwater remedy performance decision-making process. If it is determined that aquifer restoration program expectations (as identified in the IEMP) are not being met, then the design and operation of the aquifer restoration system will be evaluated to determine if a change needs to be implemented. A change to the operation of the aquifer restoration system would be implemented by a modification to this OMMP. A groundwater monitoring change, if found to be necessary, would be implemented through the IEMP review and approval process. If additional characterization data is needed (e.g., to determine the nature of a newly detected FRL exceedance) a modification to the IEMP would be implemented, or a new sampling plan would be prepared depending upon the anticipated size of the activity.

Prior to operating new modules additional monitoring wells are installed to help monitor the performance of the module. Project specific plans for the additional monitoring wells are provided to the EPAs for review and approval. The new extraction wells are also monitored for uranium concentration on a frequent basis just after start-up as specified in start-up documentation. The site-wide groundwater data collected via the IEMP will be utilized to assess the performance of the site-wide groundwater remedy, which is comprised of several individual modules. The data derived from the additional monitoring wells and new extraction well uranium monitoring is integrated with the IEMP groundwater monitoring such that area-wide interpretations can be made. Changes to the scope of the routine monitoring identified in the IEMP may be necessary based on the findings of the sampling conducted in the new monitoring and extraction wells. These changes would be accommodated as necessary in the annual updates or biennial revisions.

The details of the mid-year and annual reporting of groundwater remedy performance information are also provided in the IEMP, Section 3.7. The reporting subsection provides the specific information to be reported in the mid-year report and in the comprehensive annual report.

3.1.5 Perched Groundwater

As specified in the Operable Unit 5 Record of Decision, the remediation of perched groundwater will be accomplished by the excavation and dewatering of soil containing the contaminated water. These remediation activities will be completed by the Demolition, Soils, and Disposal Project and are therefore not within the scope of this document. The ARWWT will, however, receive water from the SCEP as a result of the excavation dewatering efforts and from storm water runoff collection, as discussed in Section 4.0.

Unless otherwise identified, the term "groundwater" will be used throughout the remainder of this document to mean groundwater from the Great Miami Aquifer.

3.2 OTHER SITE WASTEWATER SOURCES/SYSTEMS

3.2.1 Storm Water Component

3.2.1.1 Storm Water Collection and Conveyance

As indicated in Figure 3-1, the existing storm water collection system for the former production area has been disrupted by soil remediation and the majority of storm water now collects in excavations that must be pumped to the remaining storm sewer lines that still gravity-drain to the SWRB. As noted in previous sections the disruption of the storm sewers allows for more control of the flow to the basin. The anticipated flows volumes and schedules for storm water requiring treatment are detailed in Section 4.

Areas which are remediated outside of the former production area such as areas 1 and 2 (see Figure 4-1) and construction of the OSDF have or will require the construction of new storm water collection and conveyance systems. These systems have been and will continue to be designed and constructed by the Demolition, Soil, and Disposal Project. The ARWWT has and will continue to be actively involved in design review of these facilities to ensure that existing hydraulic limitations are not exacerbated. Their design flows have been included in this OMMP, as described further in Section 4.0. Other systems may be required as remediation progresses.

3.2.1.2 Storm Water Monitoring

Analysis of the discharge from the SWRB will provide data to observe trends in overall influent contamination. Unusual or unanticipated trends will result in further review of influent streams.

The majority of the uncontrolled site runoff (that runoff not requiring treatment for uranium removal) flows to Paddys Run via four existing drainage pathways. Monitoring of these pathways and other locations where uncontrolled surface water leaves the Fernald site currently exists under the IEMP sampling program. This monitoring will continue as described in Section 4 of the IEMP. Information collected will be reported semi-annually as part of the IEMP quarterly meetings/reports.

3.2.2 Remediation Wastewater Component

3.2.2.1 Remediation Wastewater Collection and Conveyance

All remedial wastewaters will typically be directed to the BSL for subsequent treatment in the AWWT Phase II until the BSL is decommissioned (currently scheduled to occur in November 2004). Once the lagoon is removed from service, all remaining flows that formerly went to the lagoon will be routed to the SWRB as indicated in Figure 1-1. As detailed in Sections 4.0 and 5.0, once the former BSL flows are routed to the basin, they will be treated through the AWWT Phase II or in times of higher flows be treated in AWWT Phase I and the Interim Advanced Wastewater Treatment System (IAWWT) until CAWWT comes on line (scheduled for February 2005). Once CAWWT comes online it will be the preferred treatment system for all flows going to the basin. In times of high flow to the basin, the

IAWWT will also be used as noted in Section 5. The AWWT Slurry Dewatering Facility (SDF) is also used for managing remediation wastewater primarily associated with facility decontamination and decommissioning activities.

Each of the source projects will be responsible for: constructing new collection or conveyance systems, coordinating with ARWWT to utilize existing systems to transfer their wastewaters, or transporting flows by tanker truck or dumpster to the appropriate facility.

3.2.2.2 Remediation Wastewater Monitoring

All projects that require pre-treatment for remediation wastewater will require personnel to monitor discharges sent to the headworks of the ARWWT facilities.

Each contributing project will be required to monitor the flow of wastewater from their project(s) to the existing headworks so that actual flows can be checked for consistency against anticipated flows. This information will be used to determine if flows are greater than anticipated and if adjustments to wastewater treatment facilities will be necessary.

3.2.3 Sanitary Wastewater Component

3.2.3.1 Sanitary Wastewater Collection and Conveyance

The extensive system of sanitary sewers installed at the Fernald site has been largely removed from portions of the former production area as a result of site remediation efforts. The remainder of the sanitary sewers will be removed as remediation progresses. The sewage treatment plant is scheduled to be removed from service in June 2005 for D&D in July 2005. Remaining site personnel will use portable chemical toilets or holding tanks.

3.2.3.2 Sanitary Wastewater Monitoring

Monitoring of the effluent from the sewage treatment plant is conducted per the requirements of the NPDES permit. Uranium concentrations in the sewage treatment plant effluent are also monitored to track the impact this flow stream has on the Fernald site's ability to maintain site effluent discharge limits to the Great Miami River.

3.3 TREATMENT SYSTEMS

As noted in Section 1, with site closure in 2006, several water treatment flows will be eliminated or reduced (i.e., remediation wastewater, sanitary wastewater, storm water runoff) from the scope of the treatment operation (Table 3-1). Elimination/reduction of these flow streams provides an opportunity to reduce the size of the water treatment facility that will remain to service the aquifer restoration after site closure. Reducing the size of the treatment facility prior to site closure in 2006 will reduce the amount of impacted materials that may need future off-site disposal. This section reflects the current water treatment systems and the new CAWWT system. The various facility shutdown dates in support of the 2006 site closure are provided in Figure 3-2 and Table 3-1.

3.3.1 Advanced Wastewater Treatment (AWWT) Facility

The original AWWT, consisting of Phases I and II, is located in the southwest corner of the former production area and was placed into operation in January 1995. The AWWT was expanded to incorporate an additional capacity dedicated to groundwater treatment. The expanded groundwater treatment capacity came online in April 1998. The two original AWWT systems and the expansion system are all operated from a central control room.

3.3.1.1 AWWT Phase I

Figure 3-6 shows a simplified process flow diagram of the AWWT Phases I and II treatment processes. The Phase I system consists of the following unit processes:

- Flow equalization and pH adjustment with caustic (when required) in preparation for the downstream coagulation process
- Coagulation with alum and polymer, followed by clarification for reduction of suspended solids, uranium, and some unspecified assumed reduction in other radionuclides and heavy metals. Other coagulant chemicals may be tested as part of process optimization efforts.
- Filtration using multimedia filters to remove suspended solids from the clarifier overflow. The filters are cleaned by backwashing.
- pH adjustment with sulfuric acid if required (not used presently)
- Two trains of three ion-exchange resin vessels (each train) to remove uranium. The wastewater flows through two ion exchange resin vessels in lead/lag series with the third vessel available to be placed into service when needed.
- Final pH adjustment (if required - not presently used), filtration, and discharge. Both the Phase I and Phase II treated streams are combined in the pH mixing/recycle tank, filtered using multi-tubular filters, and discharged.

The Phase I operation has been prioritized to treat storm water collected in the SWRB. In periods of low storm water flow this system also treats groundwater. This system typically operates at 500 gpm providing an annual treatment capacity of up to approximately 260 million gallons.

3.3.1.2 AWWT Phase II

The AWWT Phase II was installed for treatment of previous production wastewaters and site-contaminated remediation wastewater. The AWWT Phase II system is currently configured to allow concurrent treatment of site remediation wastewater, storm water, and groundwater. This system consists of the same unit treatment as the Phase I system, except that carbon filtration is included in the Phase II system to provide treatment of volatile organic compounds (VOCs) that may be present in the remediation wastewaters. Only one train of three ion exchange vessels is present in AWWT Phase II. The inflow to the Phase II system flows through two 80,000-gallon equalization tanks to accommodate fluctuating incoming flow streams. This system typically operates at 300 gpm providing an annual treatment capacity of up to approximately 155 million gallons.

3.3.1.3 AWWT Expansion

As prescribed in the Operable Unit 5 Record of Decision, the existing capacity of the AWWT facility was expanded to the maximum achievable within the confines of Building 51, to enhance the Fernald site's ability to treat groundwater. The unit processes of the AWWT expansion system include aeration, granular multimedia filtration, and ion exchange. The treated effluent from this facility is the source of water for aquifer re-injection. The aeration step is included to help remove iron, thereby reducing biofouling of the re-injection well screen. This system typically operates at 1800 gpm providing an annual treatment capacity of up to approximately 945 million gallons.

3.3.1.4 CAWWT Facility

As noted in Section 1, the AWWT Expansion system is being "converted" to the long-term replacement facility for the existing AWWT facility. The CAWWT will initially provide 1200 gpm capacity for groundwater and 600 gpm of storm water/remediation wastewater capacity (including carbon treatment) to handle the last remaining storm water /remediation wastewater flows. Once those flows have ceased, CAWWT will provide a dedicated long-term groundwater treatment capacity of up to 1800 gpm. The CAWWT process flow diagram is provided in Figure 3-7. The unit processes of the CAWWT system include granular multimedia filtration and ion exchange on all 3 trains and activated carbon filtration on train 3, the storm water/remediation wastewater treatment train.

3.3.2 Interim Advanced Wastewater Treatment (IAWWT) System

The IAWWT is located just north of the SWRB. Currently, either basin water or groundwater may be treated by the IAWWT system before it is discharged to the Great Miami River. The IAWWT system consists of two trailer-mounted treatment systems. Before the influent enters these two trailer systems, it is pumped through granular multimedia filters for suspended solids removal. Each trailer unit currently has two feed pumps and two ion exchange vessels in series (lead, lag). The third vessel acts as a "trap" for any resin that may pass through the strainers in the lag vessel. The treated effluent is discharged through the Fernald site outfall line to the Great Miami River. Backwash from the multimedia filters is routed to the SWRB for subsequent treatment in the AWWT Phase I system as discussed in Section 3.3.1.2 and described in further detail in Section 3.7.2. This system typically operates at 300 gpm providing an annual treatment capacity of up to approximately 155 million gallons.

3.3.3 South Plume Interim Treatment (SPIT) System

The system consists of granular multimedia filtration for particulate removal and ion exchange for uranium removal. The SPIT system uses three ion exchangers in series (lead, lag, and one standby). The treated groundwater is discharged through the Fernald site outfall line to the Great Miami River. Multimedia filter backwash is routed to the SWRB for subsequent treatment in Phase I. The SPIT system will remain dedicated to the treatment of groundwater at the above-stated capacity. This system typically operates at 200 gpm providing an annual treatment capacity of up to approximately 105 million gallons.

3.3.4 Sewage Treatment Plant

The new sewage treatment facility was constructed using relocated equipment from the out-of-service biodenitrification (activated sludge) effluent treatment system and the old sewage treatment plant and was placed into operation in April 1998. The main components of the new sewage treatment plant are comminution, aeration, clarification, sludge thickener, and an ultraviolet disinfection system.

3.4 ANCILLARY FACILITIES

A number of facilities exist that are supplementary to the operation of the various treatment systems. These include system headworks for equalizing the flows to these systems, groundwater flow routing facilities, wastewater collection and transfer facilities, sludge processing facilities, and discharge monitoring facilities. These facilities are described below.

3.4.1 System Headworks

Headwork facilities exist for support of the various wastewater treatment facilities. In general, these facilities provide for flow equalization prior to discharging to the various treatment systems. Details of the headworks follow.

3.4.1.1 Storm Water Retention Basin (SWRB)

The SWRB, located south of the former production area, primarily receives storm water runoff from the former production area (Figure 3-1). When the BSL is removed from service (scheduled for October 2004) the remaining flows, formerly routed to the lagoon, will be routed to the SWRB. These flows are anticipated to consist of OSDF leachate and storm water from the silos and waste storage areas. The schedule for the flows to the SWRB is detailed in Section 4.0. As indicated in Section 2, to maintain compliance with leachate treatment ARARs, once leachate is routed to the SWRB a new operational plan will be required to: 1) prevent pumping water from the SWRB directly to the Great Miami River (storm water bypass) and 2) prevent overflow of water from the SWRB to the Storm Sewer Outfall Ditch. This operational plan is provided in Section 5.0. The SWRB allows for flow equalization and settling of suspended solids. It has a retention capacity of approximately 10 million gallons. The basin consists of an east chamber and a west chamber. The basin consists of a primary bottom bentonite liner and an upper flexible synthetic membrane liner. An underdrain system beneath the synthetic liner is used to monitor and collect leakage through the synthetic liner. The discharge can currently be routed to the AWWT Phases I and II, IAWWT, or directly to the Fernald site outfall line to the Great Miami River. The west basin contains an engineered overflow that passes collected storm water to Paddys Run via the Storm Sewer Outfall Ditch. As indicated above once leachate is routed to the SWRB, bypassing to the Great Miami River and overflowing to the Storm Sewer Outfall Ditch will no longer be permitted to occur.

3.4.1.2 Biodenitrification Surge Lagoon (BSL)

The BSL is located in the southeast section of the waste storage area (Figure 3-1). It is an 8-million-gallon, man-made lagoon that currently receives storm water runoff from the waste pit area perimeter, OSDF leachate, WPP Storm Water Management Pond, and wastewater discharges from the Waste Pit Area Wastewater Treatment System installed and operated by Shaw Environmental, the waste pit remediation contractor.

The lagoon has two synthetic membrane liners and an underdrain collection system beneath each membrane liner. The bottom of the lagoon is lined with a 12-inch thick layer of bentonite. Wastewater is pumped from the lagoon to the AWWT Phase II facility from a pump station located at the southeast corner of the lagoon.

3.4.1.3 Headworks Sludge Removal Systems

Each headworks facility is equipped with the ability to remove collected sediments with a hydro-dredge system. Because the SWRB consists of two chambers (east and west), two dredges are used to avoid continuously moving a dredge from one chamber to the other. The dredges became operational during the summer of 1999.

As required, the dredges will remove the sediment and discharge it into a mixing tank. The mixing tank contents will be slowly discharged into their respective headworks pump pits to be routed to the AWWT. The suspended solids will be settled out at the AWWT clarifiers and sent to the SDF (Section 3.4.5) for dewatering in preparation for disposal.

3.4.1.4 Sanitary Lift Station

All sanitary flow is collected in the Sanitary Lift Station, which has a limited storage volume. Pumps automatically transfer accumulated wastewater to the sewage treatment plant when a certain storage level is reached.

3.4.1.5 Great Miami Aquifer

No specific headworks exist for groundwater. However, because this flow can be adjusted by regulating the extraction wells, the aquifer itself serves as the headworks for groundwater.

3.4.2 SWRB Valve House

The SWRB valve house is located just north of the SWRB west chamber. The valve house contains an extensive array of valves to allow diversion of storm water flow from the SWRB and groundwater flow to the various treatment facilities. This facility also serves as the point of convergence for the effluent from the treatment systems prior to discharge through the Fernald site outfall pipeline. The valves also allow for untreated water from the SWRB to be discharged directly to the Great Miami River to assist in preventing the SWRB from overflowing to the Storm Sewer Outfall Ditch and Paddys Run, due to heavy rainfall or other operational difficulties. Flow monitoring and sampling equipment are also provided in the valve house.

3.4.3 South Field Valve House

As part of the South Field Extraction System Phase I construction, a new south field valve house was constructed, upstream of the SWRB Valve House. The primary purpose of this valve house is to receive the combined South Plume Recovery System and South Plume Optimization System groundwater. It directs all or portions of the combined flow toward treatment and/or to untreated discharge prior to combining with other groundwater flows.

3.4.4 AWWT Slurry Dewatering Facility (SDF)

The AWWT SDF is adjacent to the AWWT facility. The primary purpose of the SDF is the processing (dewatering) of waste slurries and sludges from the AWWT facilities. The dewatering of miscellaneous site waste sludges (i.e., those from the SWRB, sewage treatment plant, etc.) and treatment of miscellaneous wastewaters (i.e., D&D wastewater, wastewater from waste management activities) are also at this facility.

The SDF has a design treatment capacity of approximately 30,000 gallons per day of slurry. The process consists of slurry conditioning (pH adjustment, coagulation/flocculation, filter aid addition), thickening, and pressure filtration. The dewatered waste material is packaged for on- or off-site disposal.

3.4.5 Parshall Flume

Downstream of the effluent aeration facility, the combined flows pass through a Parshall flume and an associated outfall monitoring station for Fernald site discharge flow measurement and monitoring.

3.5 CURRENT TREATMENT PERFORMANCE

The performance of the several ARWWT treatment systems measured against the overriding goal of meeting Operable Unit 5 Record of Decision discharge standards relative to uranium as well as NPDES effluent limits has been satisfactory. The uranium mass loading limit of 600 pounds per year (lbs/yr) has been met every year since the requirement became effective in January 1998. As depicted on Figure 3-8, the monthly average concentration has been met every month since January 1998 with the exception of five months. The Fernald site has been in compliance with NPDES effluent limits well in excess of 99 percent of the time since January 1995; the date the AWWT Phases I and II were placed into service. Figures 3-9 and 3-10 provide treatment system/groundwater uranium mass balances for years 2002 and 2003 respectively.

3.6 CURRENT AND PLANNED DISCHARGE MONITORING

Currently, discharge monitoring is completed under two sampling programs. Conventional pollutants are monitored under the NPDES. Radionuclides and total uranium are monitored under the Federal Facilities Compliance Agreement (FFCA). These two programs have been incorporated into the IEMP sampling program as described in Section 4 of the IEMP. These monitoring programs are described briefly in the subsections below.

3.6.1 NPDES Monitoring

There are nine locations monitored under the current NPDES Permit; six of which relate to permitted Fernald site wastewater/storm water discharge outfalls to State of Ohio waters, two related to upstream and down stream monitoring (relative to the Fernald site outfall line) of the Great Miami River; and one internal location (see Figure 3-11). The permit (Ohio EPA Permit No. 1IO00004*FD) is administered by OEPA and granted to the DOE at the Fernald site. The effluent pollutant limitations, monitoring requirements, and reporting requirements are specified in the permit for each of the nine monitored locations.

Discharges through Outfall 4001 enter the Great Miami River at River Mile 24.73. The sampling and monitoring location for this outfall is the Parshall flume chamber immediately downstream from Manhole 176B. This outfall is the primary Fernald site wastewater discharge outfall consisting of discharges from the AWWT facilities, IAWWT, SPIT, sewage treatment plant, untreated groundwater, and untreated storm water.

Discharge through Outfall 4002 enters Paddys Run at River Mile 2.50. The sampling and monitoring location for this outfall is the SWRB overflow spillway (location 4002O on Figure 3-11). Discharge at this outfall only occurs when the accumulation of storm water in the SWRB exceeds the hydraulic capacity of the SWRB.

Discharges through Outfalls 4003, 4004, 4005, and 4006 are untreated storm water runoff drainage from site areas into Paddys Run. Runoff from eastern and southern areas of the site drains through Outfall 4003, which is just north of Willey Road. Runoff from the area north and west of the inactive flyash pile drains through Outfall 4004, which is just west of the flyash pile. Runoff from the western area of the site drains through Outfall 4005, which is just south of the K-65 Silos. Runoff from areas north of the site drains through Outfall 4006, which is north of Waste Pit 5.

Location 4801 is a location upstream of the Fernald site outfall line in the Great Miami River and is collected from the Venice Bridge (RM 26.2). This location serves as the background location under the IEMP. Location 4902 is the location down stream from the Fernald site outfall line and is collected from the new New Baltimore Bridge (RM 21.4).

Internal sampling station 4601 is the sampling of final effluent from the sewage treatment plant at the Ultraviolet Disinfection Building.

3.6.2 Radionuclide and Uranium Monitoring

The Fernald site conducts a surface water sampling and analytical program for certain specific radionuclides which are potentially present in the regulated liquid effluent and in the uncontrolled storm water runoff from the site. Details of this program are provided in Section 4 of the IEMP. The program consists of uranium analysis of a daily flow-proportional composite sample of the site effluent and grab sampling at quarterly intervals. The monthly samples are analyzed for total uranium, radium-228 and technetium-99, while the quarterly samples are analyzed for lead-210, radium-226 and strontium-90.

The daily total uranium analysis of the site effluent to the Great Miami River is used to track compliance with Operable Unit 5 Record of Decision established limits. Since the issuance of the Operable Unit 5 Record of Decision in January 1996, the Fernald site is obligated to limit the total mass of uranium discharged through the Fernald site outfall to the Great Miami River to 600 lbs/yr.

This daily effluent uranium analysis is also used to demonstrate compliance with the monthly average uranium concentration of 30 ppb uranium in the site discharge to the river. The original requirement for compliance with a monthly average concentration became effective January 1, 1998, as established in the Operable Unit 5 Record of Decision. The Operable Unit 5 Record of Decision established this concentration at 20 ppb uranium, which was the compliance standard from January 1998 through November 2001. The monthly average concentration limit changed from 20 ppb to 30 ppb beginning December 1, 2001 as a result of EPA approval of the ESD for Operable Unit 5 in November 2001. This Operable Unit 5 ESD changed the total uranium groundwater FRL from 20 ppb to 30 ppb as well as established the new monthly average concentration discharge standard. The 600 lbs/yr limit was unaffected by this ESD and remains in effect.

The Operable Unit 5 Record of Decision does allow relief from this monthly average concentration requirement during periods of excessive precipitation and for scheduled maintenance. (Excessive precipitation is an amount of precipitation combined with the projected weather forecast, that causes water levels in the basin to threaten the limit of the holding capacity of the basin.) The uranium concentration in the effluent to the river on up to 10 storm water bypass days a year may be deleted when calculating the monthly average. Section 9.1.5 of the Operable Unit 5 Record of Decision stipulates that notification will be provided to EPA and OEPA within seven days of the implementation of such a direct bypass. The purpose of the bypass is to minimize the possibility of SWRB overflow to Paddys Run. As noted in Section 2.0 and above in Section 3.4.1.1, many of the gravity-fed storm sewer lines in the former production area have been removed as a consequence of site remediation. Removal of these lines allows for much more control of the storm water flow into the SWRB. Therefore, bypassing of storm water will no longer occur beginning in the fall of 2004.

The average monthly uranium concentration is calculated by multiplying each daily flow by the uranium concentration of the flow-weighted composite sample for that respective day. The sum of the values obtained by multiplying the flow times the concentration is then divided by the sum of the flows for the month. The result is a flow-weighted average monthly uranium concentration. The daily flow-weighted concentrations are then multiplied by 8.35 (lb/gal) to obtain the daily pounds of uranium discharged. The sum of the daily masses for the year is used to compare against the 600-lbs/yr limit.

If the average monthly uranium concentration exceeds the 30 ppb limit, the excursion will be reported to the agencies. If a sequence of months (i.e., not a random occurrence) indicate an exceedance of the 30 ppb monthly average, and there has not been above average rainfall, then corrective measures will need to be evaluated. Depending on the reason for the sequence of exceedances, corrective actions could include: modifications to parts of the Fernald site wastewater system, segregation of the South Plume Optimization wells discharged from the combined South Plume Optimization/South Plume Recovery System header to reduce the concentration of uranium in flow bypassing treatment, or other such actions.

The need for corrective measures will be discussed with the EPA and OEPA in periodic meetings/reports. (Summary reporting of how the Fernald site is doing with respect to compliance with the 30-ppb uranium discharge limit and the use of bypass days will be included in the meetings/reports.) In the event that corrective measures are deemed necessary, the situation will be outlined to the EPAs in order to reach consensus regarding what action (if any) is required.

3.6.3 IEMP Surface Water and Treated Effluent Monitoring Program

Significant portions of the current and past programs (NPDES and FFCA) have been incorporated into the IEMP. Section 4 of the IEMP describes these two programs in more detail and also how these two programs have been integrated into the IEMP surface water and treated effluent sampling program. The IEMP also provides for additional monitoring above that required by the NPDES permit and the FFCA. This additional monitoring is performed as a supplement in order to monitor surface water and treated effluent for potential site impacts to various receptors during remediation. Figure 3-11 shows the current NPDES, FFCA, and the IEMP treated-effluent and surface-water sampling locations. In addition to identifying the sampling program requirements, the IEMP provides a comprehensive data evaluation and associated decision-making and reporting strategy for surface-water and treated-effluent. Figure 3-12 depicts the IEMP treated-effluent and surface-water data evaluation strategy and associated actions.

TABLE 3-1

STATUS OF WASTEWATER SOURCES AND TREATMENT SYSTEMS

Note: This table is provided for information only and the dates herein are subject to change.

Status of Remediation Wastewater Sources	
Source	Status
WPP Dryer Operations	Dryer Operations ongoing; scheduled to end August 2004
WPP Excavation/Loading Activities	Waste pit material/soil excavations ongoing; scheduled to end April 2005
Former Production Area Excavations	Excavation dewatering ongoing; scheduled to end March 2005
Former Production Area Storm Water Runoff	Runoff treated, as necessary, until soil clean-up levels attained and certified by EPA and OEPA; scheduled to be complete April 2006
Silo 3 Remediation	Operations begin June 2004; scheduled to be complete September 2004
Radon Control System Condensate	Operations ongoing through August 2005; removed from service for D&D coinciding with the completion of Silos 1 and 2 remediation facility operations
Accelerated Waste Retrieval	Silos 1 and 2 sluicing operations begin August 2004; complete February 2005. Operations supporting Silos 1 and 2 remediation facility scheduled to be complete August 2005
Silos 1 and 2 Remediation	Initiation of operations scheduled to begin September 2004. Operations scheduled to be complete August 2005
D&D of Facilities and Structures	D&D activities or all legacy structures and constructed remediation facilities scheduled to be complete March 2006
Groundwater Remediation	Ongoing through June 2006; ongoing post closure
On-Site Disposal Facility Leachate	Ongoing through June 2006; ongoing post closure. Last cell capped March 2006 resulting in leachate generation being reduced to between 1 and 10 gpm. Beginning November 2004, leachate will be redirected from the BSL to the SWRB. Leachate will be treated through AWWT Phase I and AWWT Phase II during the CAWWT conversion process. Leachate will be discharged directly to CAWWT when the SWRB is removed from service in October 2005

TABLE 3-1
(Continued)

Wastewater Treatment and Control Systems	
System	Status
AWWT Phase 1	Operational through February 2005; removed from service for D&D beginning March 2005
AWWT Phase 2	Operational through February 2005; removed from service for D&D beginning March 2005
AWWT Expansion (Phase III)	Operational through September 2004, removed from service and modified to CAWWT beginning October 2004
CAWWT	Operational February 2005; treating all remaining storm water and remediation wastewater through June 2006; groundwater treatment (and perhaps OSDF leachate) only beginning July 2006 and continuing thereafter until determined unnecessary by DOE in consultation with EPA and OEPA
IAWWT	Operational through June 2005; removed from service for D&D July 2005
South Plume Interim Treatment System	Operational through June 2005; removed from service for D&D July 2005
AWWT Slurry Dewatering Facility	Operational through October 2005; removed from service for D&D November 2005
SWRB	Operational through October 2005; beginning November 2004, the SWRB will be operated to prevent any overflow to Paddys Run or bypassing to the Great Miami River due to the significant reduction in flows coming to the SWRB by gravity. Removed from service for D&D November 2005
BSL	Operational through October 2004; removed from service for D&D November 2004. All remaining flows formerly coming to the BSL will be routed to the SWRB after the BSL is removed from service. These remaining flows will consist of storm water only
Final Aeration Tank	Operational through July 2004; removed from service for D&D August 2004
Shaw Environmental Waste Pits Wastewater Treatment System (WWTS)	Operational through September 2004; removed from service coinciding with the completion of waste pit dryer operations September 2004
Waste Pits Storm Water Management Pond	Operational through April 2005; removed from service for D&D May 2005 coinciding with the completion of soil excavation activities in the waste pit area. From July 2004 through September 2004, will serve as the collection point for wastewaters requiring treatment through the Shaw WWTS replacing the clearwell. From October 2004 through April 2005 discharge rerouted to SWRB.
Waste Pit Area Runoff Control Sump	Operational through April 2005; removed from service for D&D/excavation May 2005 coinciding with the excavation activities in the silos/waste pits area (beginning September 2004 through end of operations discharge rerouted to SWRB/CAWWT)
Sewage Treatment Plant	Operational through June 2005, removed from service for D&D July 2005. Remaining site personnel to use portable chemical toilets or holding tanks

TABLE 3-2
WELL FIELD OPERATING STATUS

Module	Operations Identification	SED Identification	Date of Initial Operation	Current Status	Notes
South Plume	RW-1	3924	08/27/93	Active	
South Plume	RW-2	3925	08/27/93	Active	
South Plume	RW-3	3926	08/27/93	Active	
South Plume	RW-4	3927	08/27/93	Active	
South Plume	RW-5	3928	08/27/93	Inactive	Turned off 9/11/94, not needed
South Plume	RW-6	32308	08/09/98	Active	
South Plume	RW-7	32309	08/09/98	Active	
SouthField	EW-13	31565	07/13/98	Inactive	Turned off 5/22/01
SouthField	EW-14	31564	07/13/98	Inactive	Turned off 12/19/01
SouthField	EW-15	31566	07/13/98	Inactive	Turned off 8/7/98, replaced by EW-15A
SouthField	EW-15a	33262	07/26/03	Active	
SouthField	EW-16	31563	07/13/98	Inactive	Turned off 12/19/02, Converted to IW16
SouthField	EW-17	31567	07/13/98	Active	
SouthField	EW-18	31550	07/13/98	Active	
SouthField	EW-19	31560	07/13/98	Active	
SouthField	EW-20	31561	07/13/98	Active	
SouthField	EW-21	31562	07/13/98	Inactive	Turned off 3/13/03, replaced by EW-21A
SouthField	EW-21A	33298	07/29/03	Active	
SouthField	EW-22	32276	07/13/98	Active	
SouthField	EW-23	32447	02/02/00	Active	
SouthField	EW-24	32446	02/02/00	Active	
SouthField	EW-25	33061	05/07/02	Active	
SouthField	EW-30	33264	07/25/03	Active	
SouthField	EW-31	33265	07/25/03	Active	
SouthField	EW-32	33266	07/25/03	Active	
WSA	EW-26	32761	05/08/02	Active	
WSA	EW-27	33062	05/08/02	Active	
WSA	EW-28	33063	05/08/02	Active	
Re-Injection	IW-8	22107	09/02/98	Inactive	Turned off 12/31/01
Re-Injection	IW-8A	33253	11/07/02	Active	
Re-Injection	IW-9	22108	09/02/98	Inactive	Turned off 3/1/02
Re-Injection	IW-9A	33254	11/07/02	Active	
Re-Injection	IW-10	22109	09/02/98	Active	
Re-Injection	IW-10A	33255	5/22/03	Active	
Re-Injection	IW-11	22240	09/02/98	Active	
Re-Injection	IW-12	22111	09/02/98	Inactive	In standby
Re-Injection	IW-16	31563	07/27/03	Active	Well used to be extration well (EW16)
Re-Injection	IW-29	33263	07/27/03	Active	
Re-Injection	Inj. Pond		07/27/03	Active	

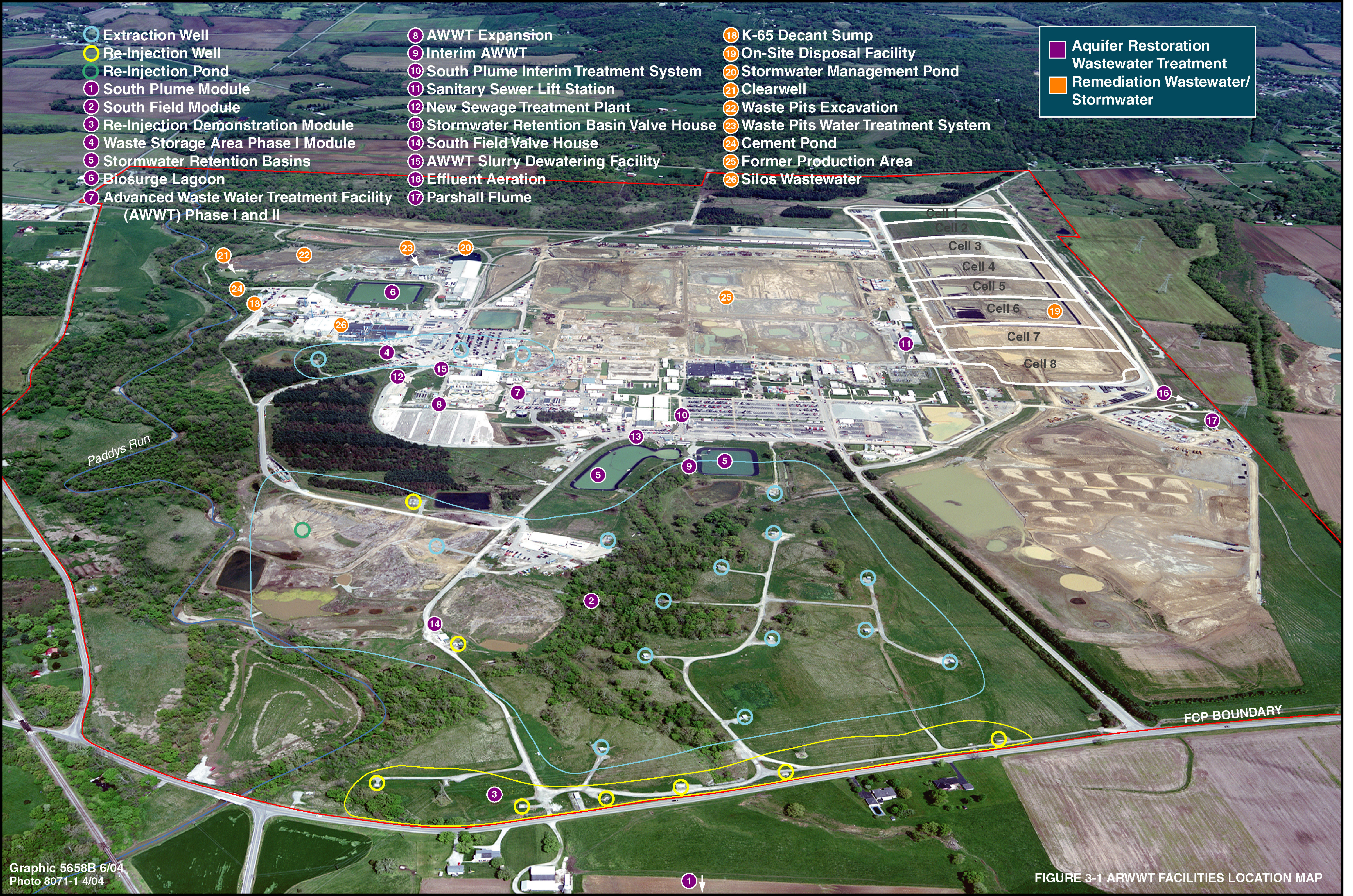
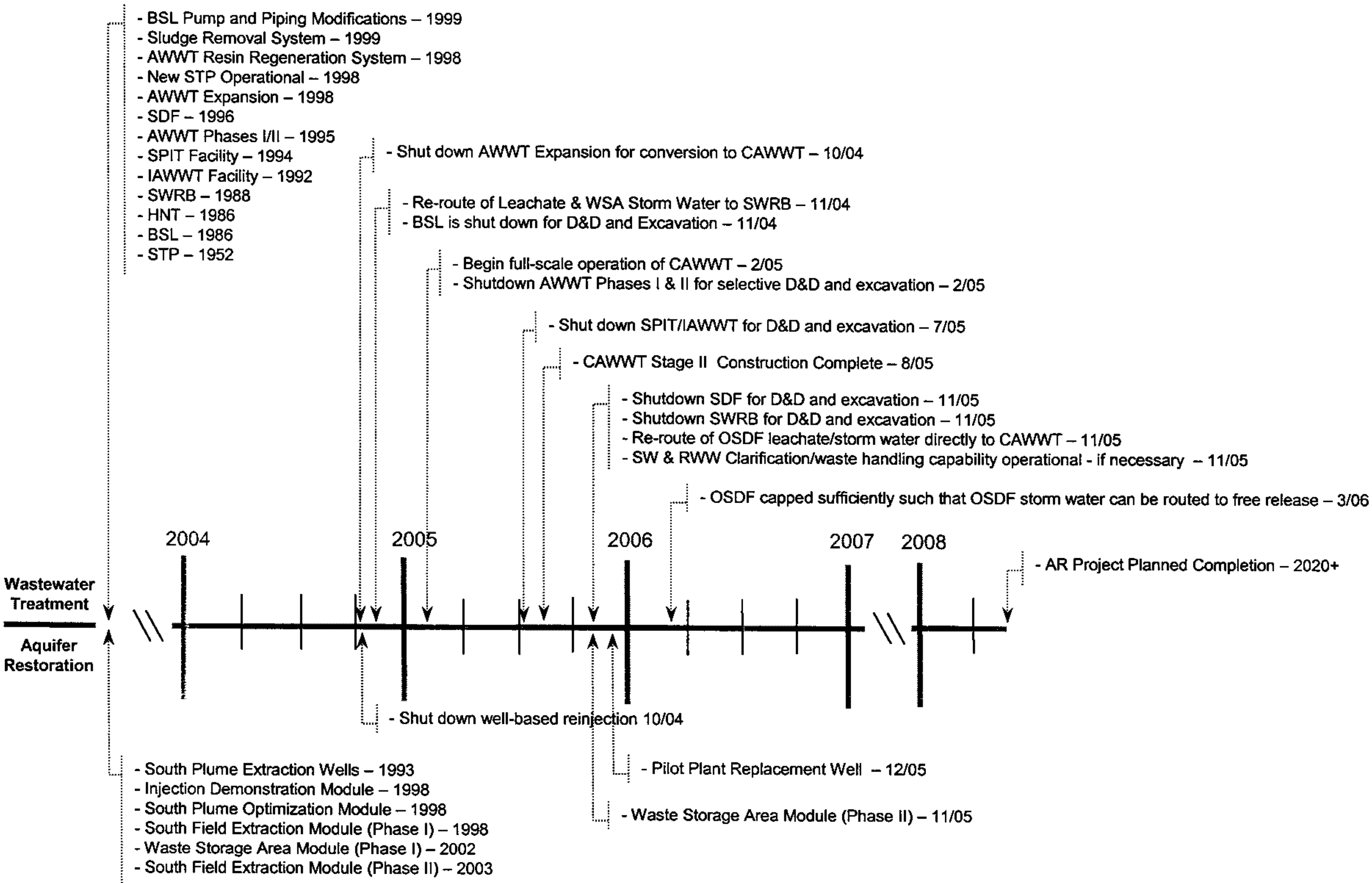


FIGURE 3-1 ARWWT FACILITIES LOCATION MAP

Figure 3-2

ARWWT Timeline



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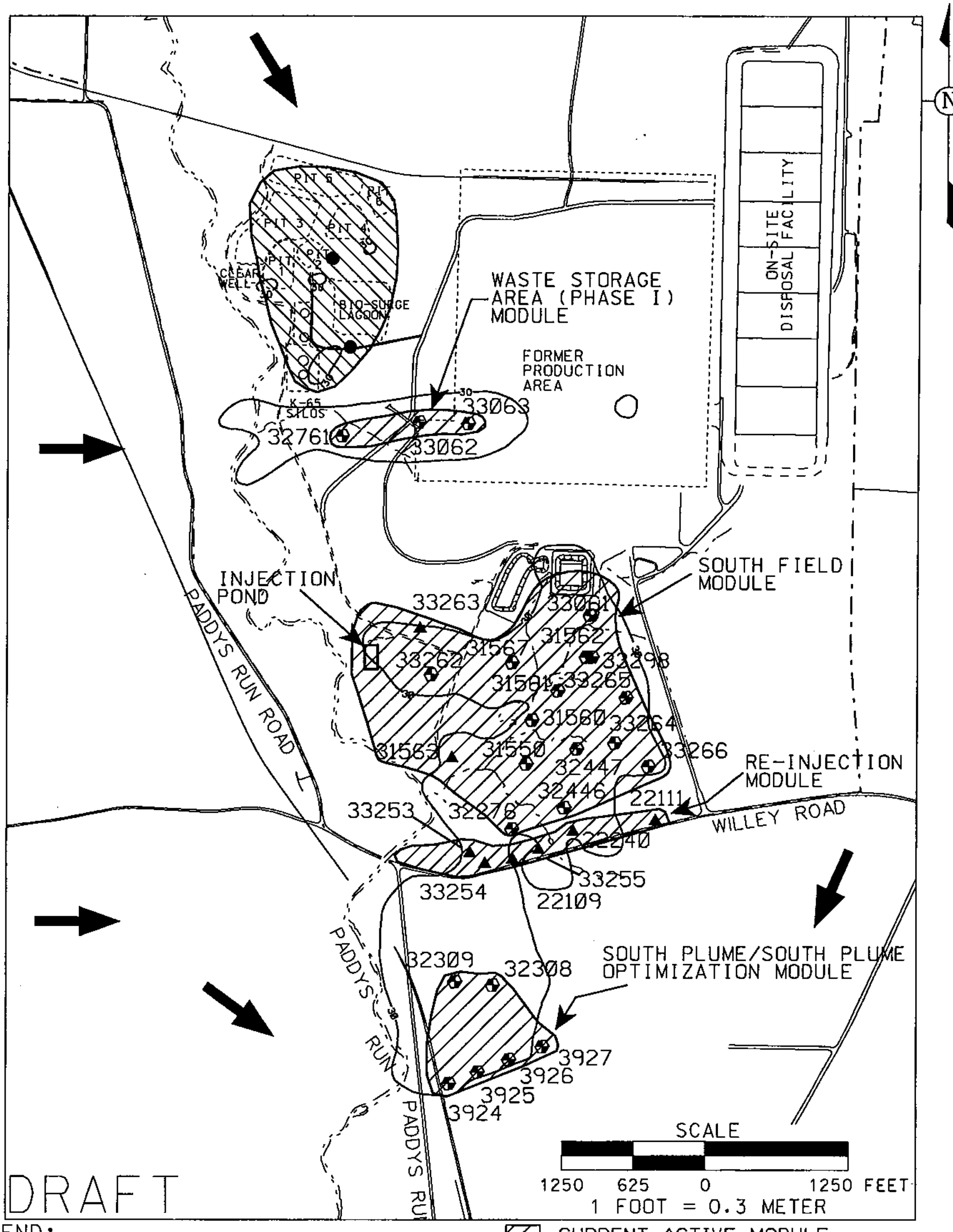
STATE PLANAR COORDINATE SYSTEM 1983

25-JUN-2004



LEGEND:

- FERNALD SITE BOUNDARY
- EXTRACTION WELL
- RE-INJECTION WELL
- FUTURE EXTRACTION WELL
- CURRENT ACTIVE MODULE
- FUTURE MODULE
- 30 μg/L TOTAL URANIUM PLUME FROM SECOND HALF 2003
- REGIONAL GROUNDWATER FLOW DIRECTION

FIGURE 3-3. CURRENT AND FUTURE EXTRACTION AND RE-INJECTION WELLS FOR THE GROUNDWATER REMEDY

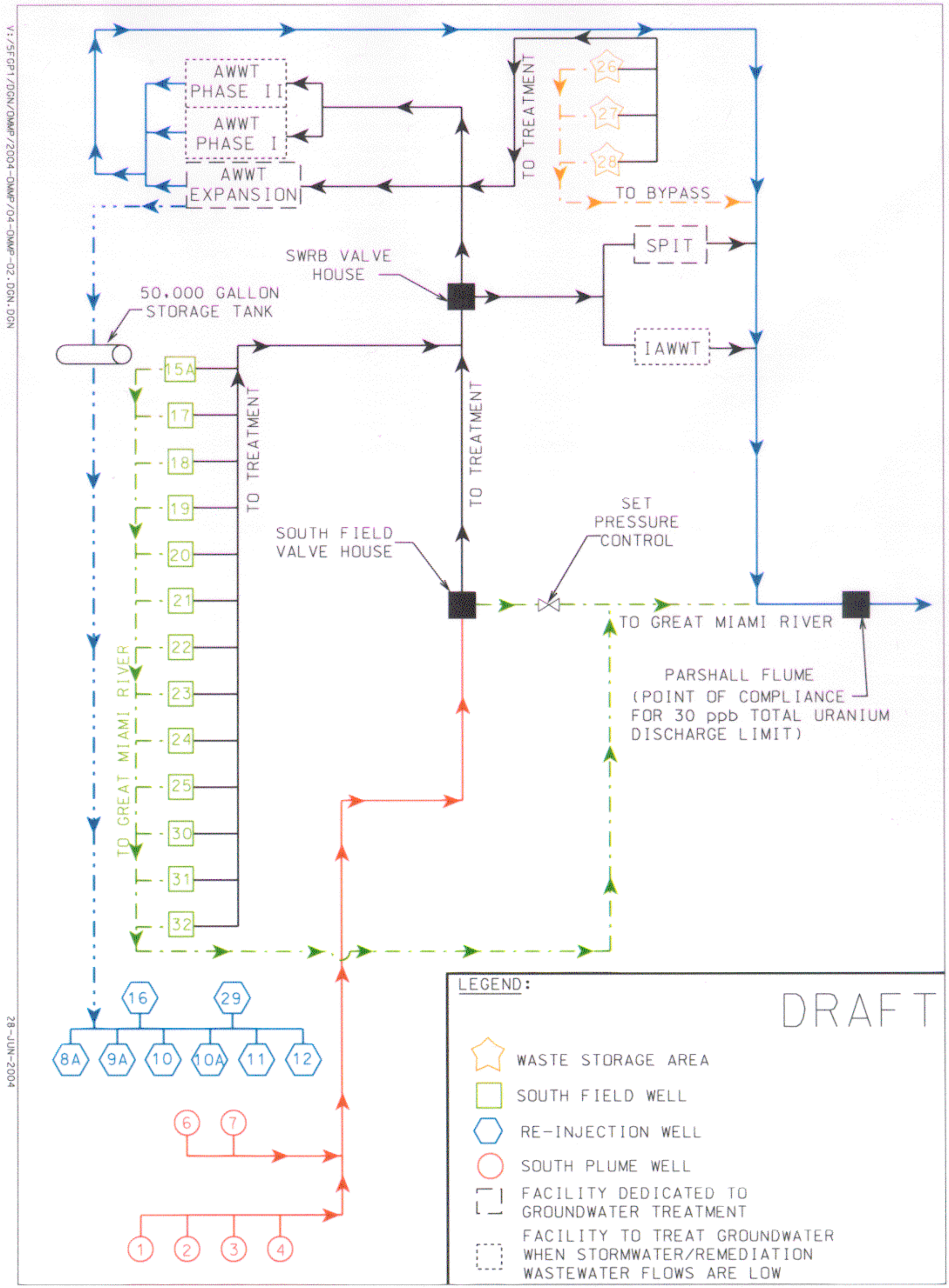


FIGURE 3-4. CURRENT GROUNDWATER REMEDIATION/TREATMENT SCHEMATIC

FIGURE 3-5
AQUIFER RESTORATION DECISION-MAKING PROCESS

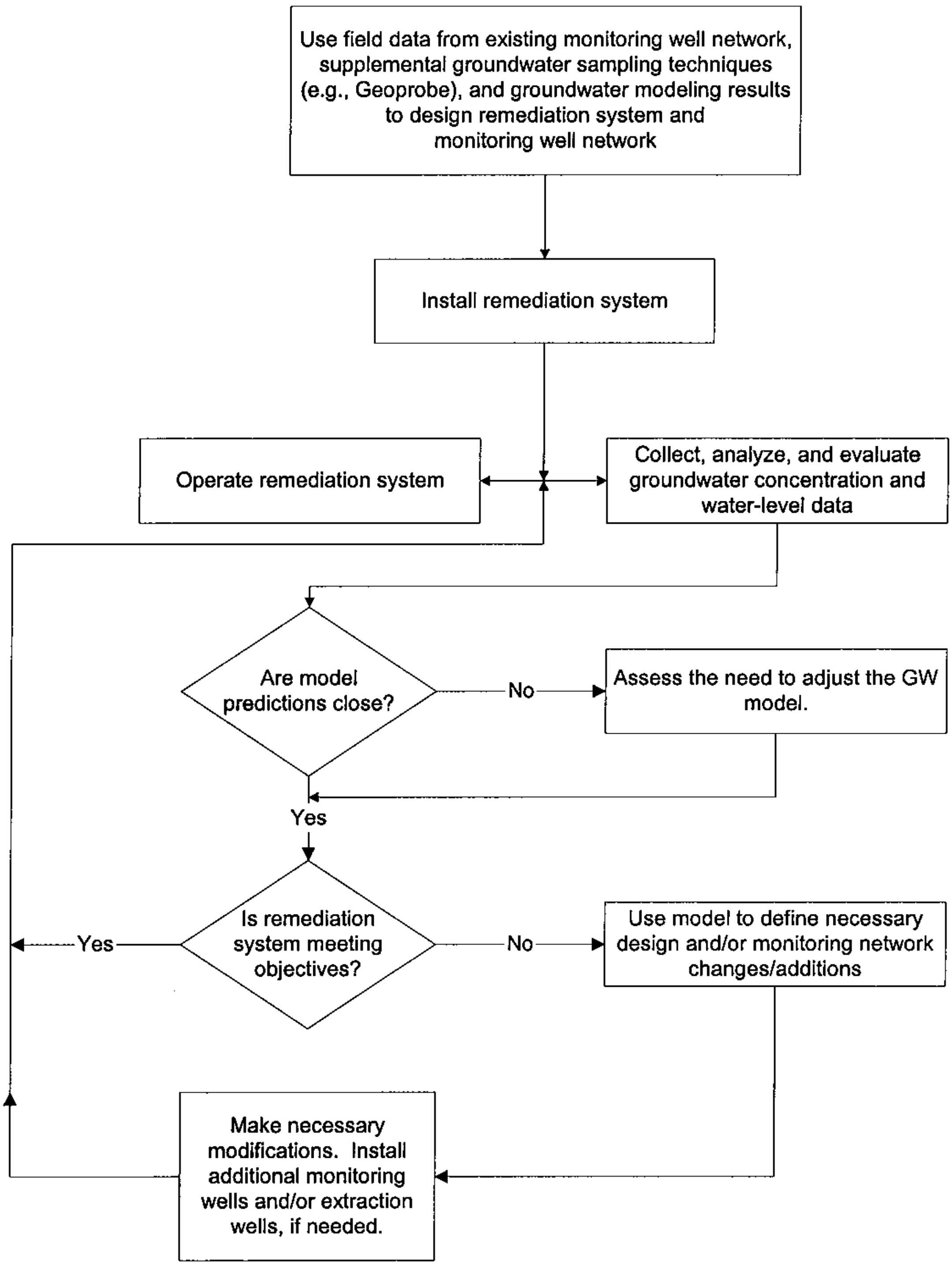
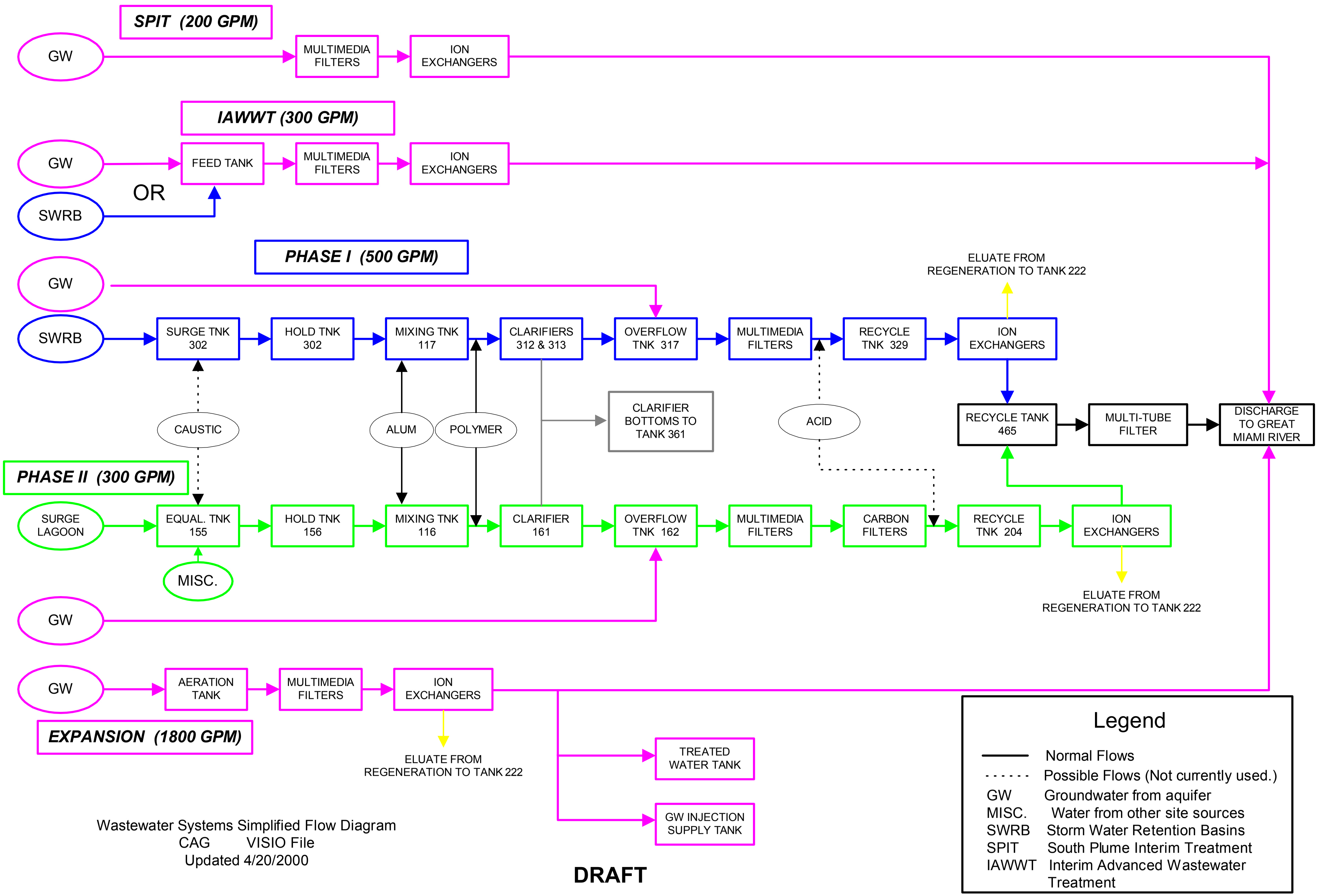


FIGURE 3-6 WASTEWATER TREATMENT SYSTEMS SIMPLIFIED PROCESS FLOW DIAGRAM



Wastewater Systems Simplified Flow Diagram
CAG VISIO File
Updated 4/20/2000

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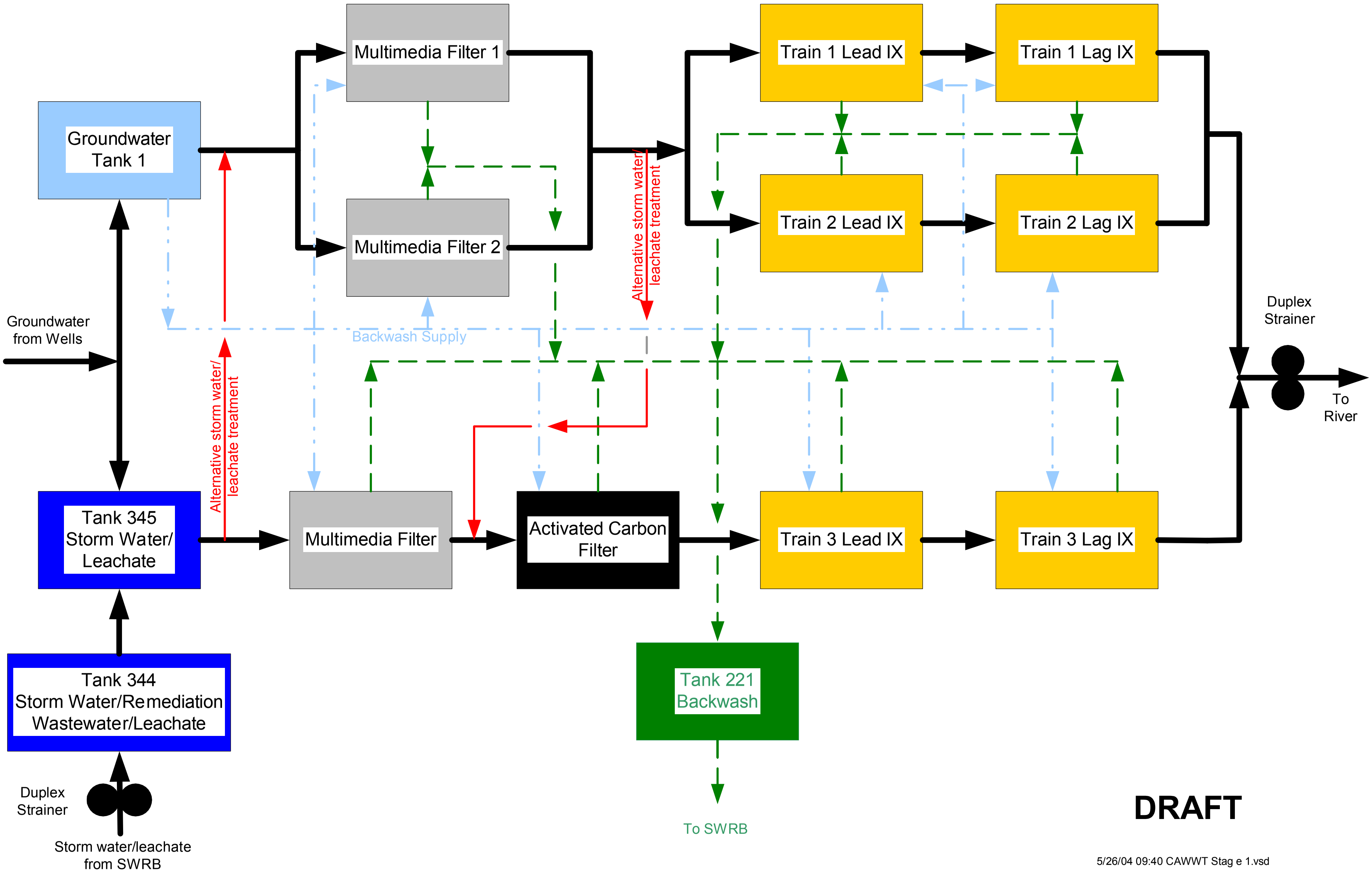
Figure 3-7 CAWWT Process Flow Diagram



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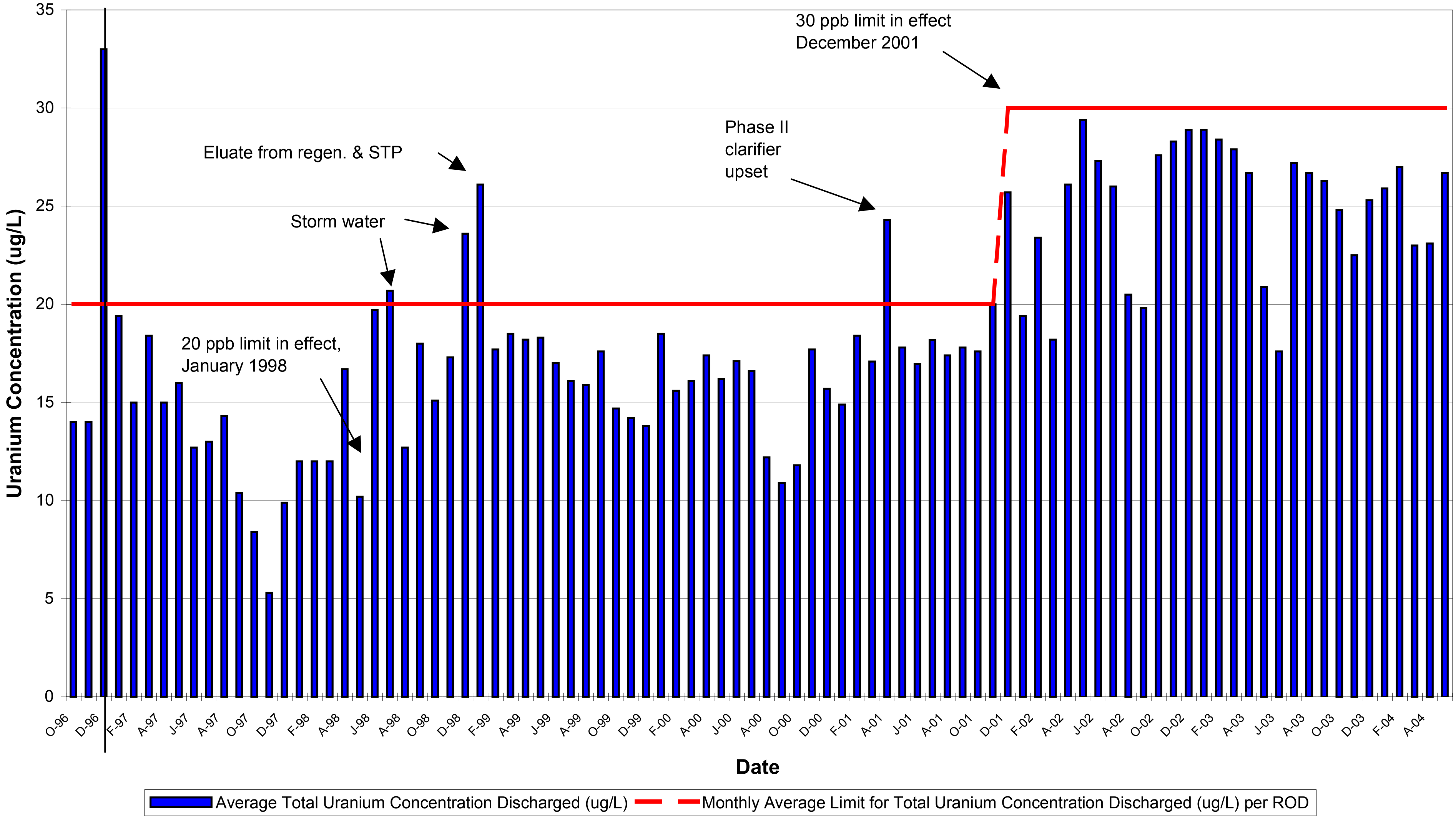
5/26/04 09:40 CAWWT Stag e 1.vsd

Figure 3-8
Monthly Average Uranium Concentration in the Effluent to the Great Miami River at PF4001



FER\OMMP\OMMP 2004\SECTIONS\SEC-3\FIGURE3-8.XLS

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Figure 3-9 Uranium Mass Balance by Treatment System for CY 2002

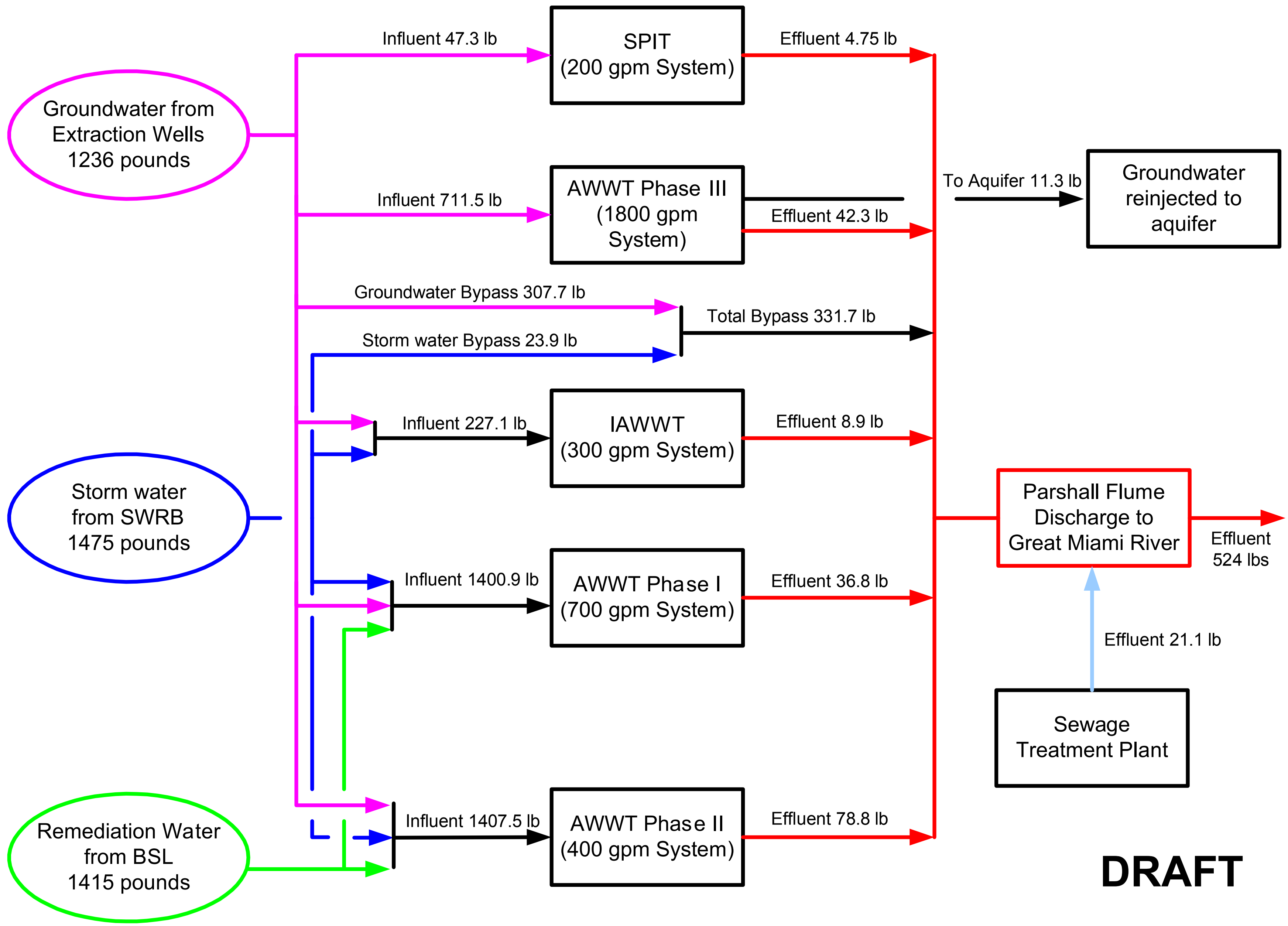
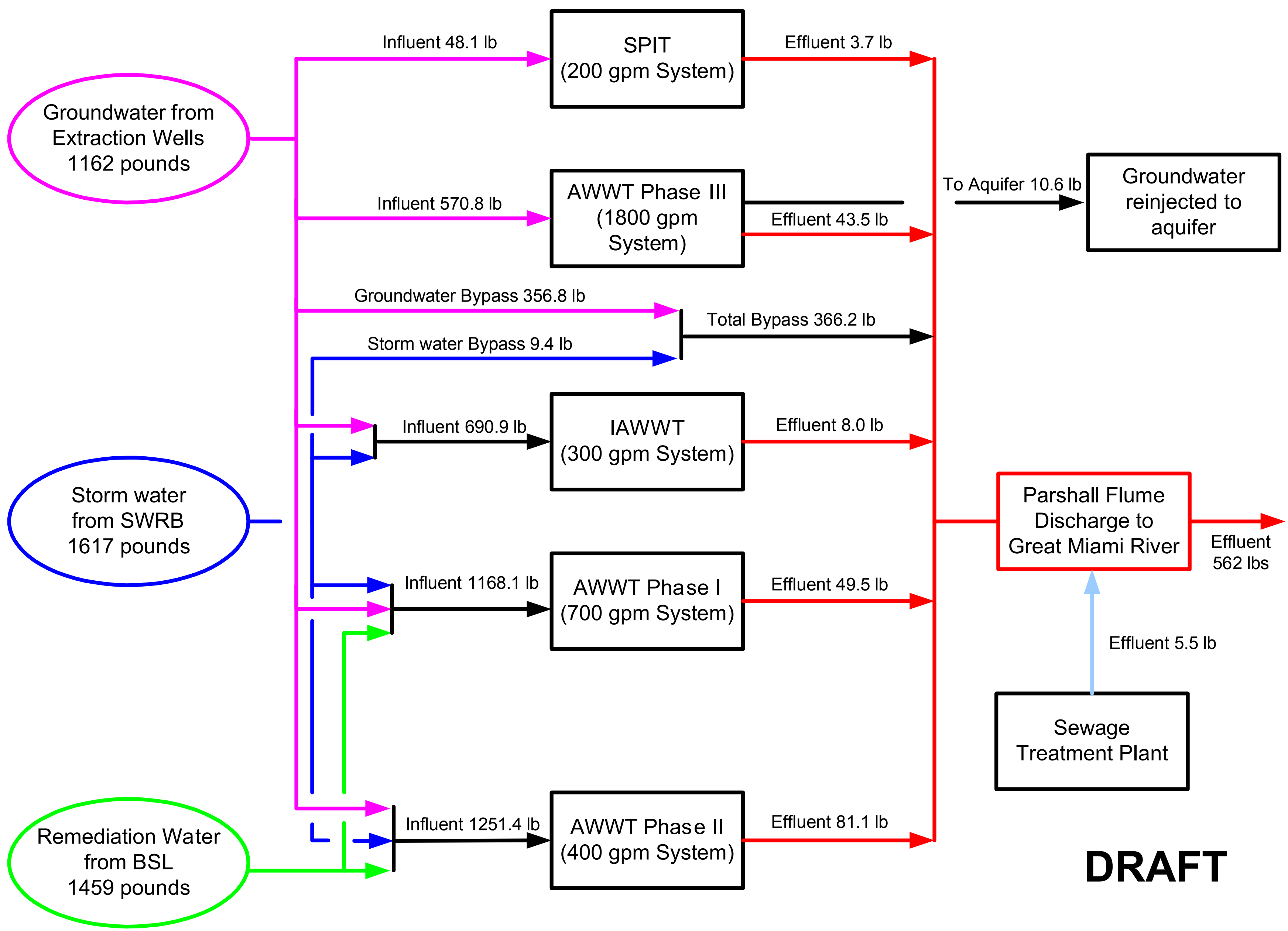


Figure 3-10 Uranium Mass Balance by Treatment System for CY 2003



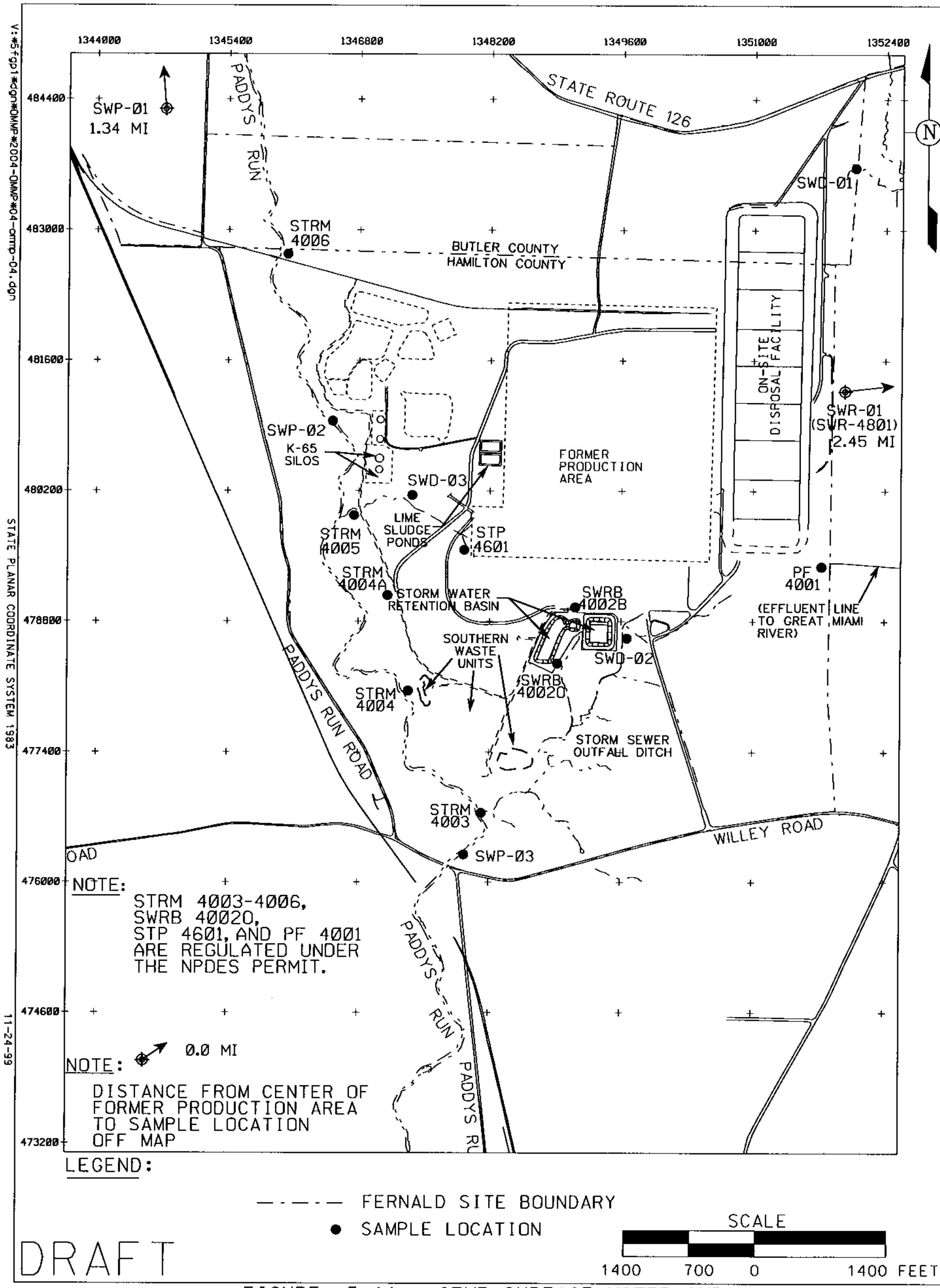
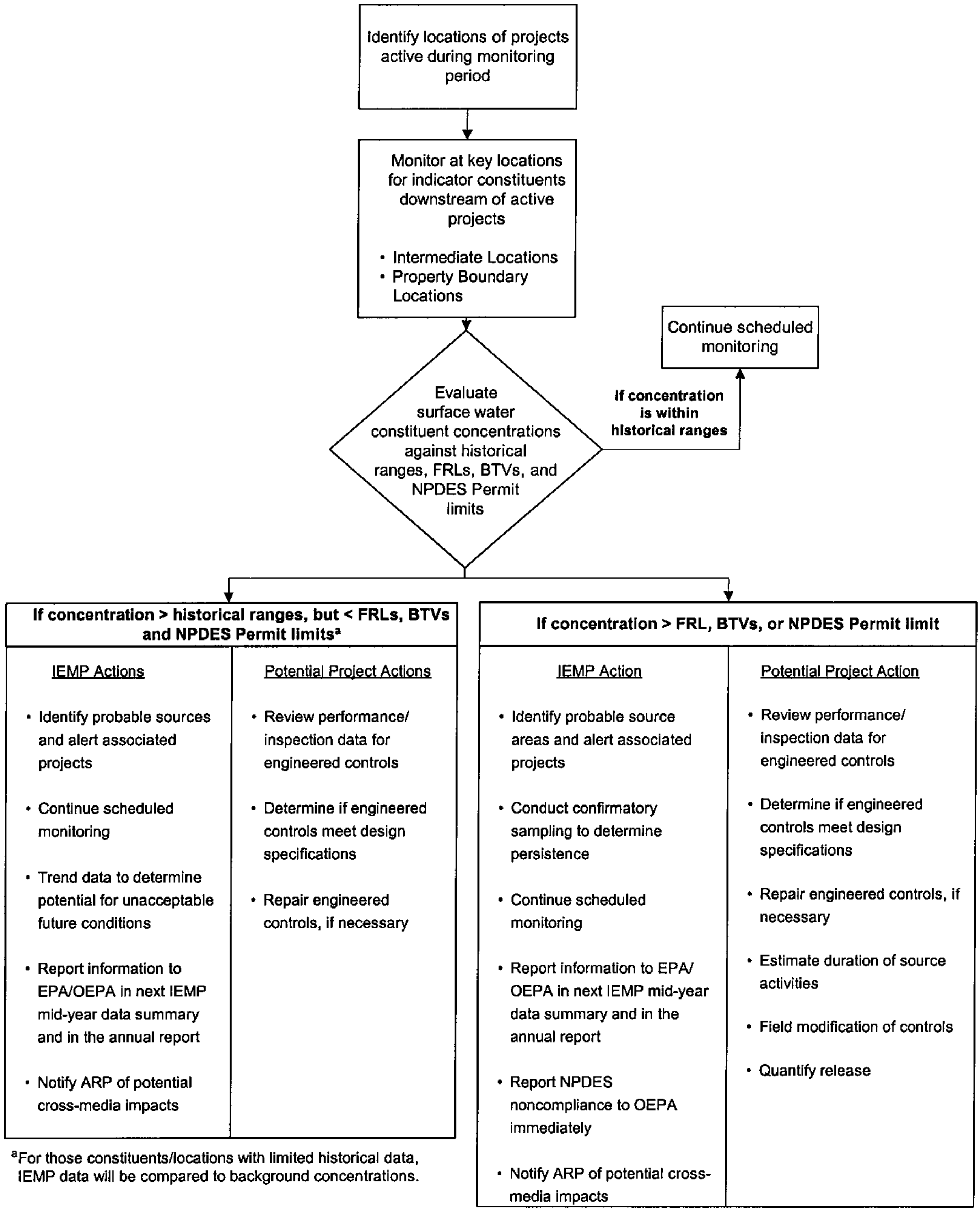


FIGURE 3-11. IEMP SURFACE WATER AND TREATED EFFLUENT SAMPLE LOCATIONS

FIGURE 3-12
IEMP SURFACE WATER DATA EVALUATION AND ASSOCIATED ACTIONS



[a]For those constituents/locations with limited historical data, IEMP data will be compared to background concentrations.

4.0 PROJECTED FLOWS

Wastewater is classified as groundwater, storm water, remediation wastewater, or sanitary wastewater. Sources of wastewater and their relative generation rates, duration, and head works discharge locations related to treatment requirements are presented in this section. Summary flow projections developed for these sources of wastewater are used in Section 5.0 to allocate and evaluate the treatment systems discussed in Section 3.0.

This section addresses the latest understanding of flows for the four types of wastewater and are summarized as follows:

- The overall groundwater pumping rate is based upon available groundwater treatment capacity, achieving discharge limits at the Parshall Flume, maintaining capture of the 30 µg/L uranium plume and volume of re-injected groundwater. Groundwater pumping rates are initially defined for each individual extraction well in remedy design documents. Individual extraction well rates are subject to change over the life of the remedy based on changing remediation conditions. Any pumping rate changes made are done so within the limitations of the operational protocols outlined in the OMMP. Groundwater pumping rates are reduced beginning when CAWWT construction starts. The reduction is due to the decrease in treatment capacity during the construction period. Once the CAWWT facility is up and running, pumping rates will be increased somewhat to utilize the dedicated groundwater treatment capacity of 1200 gpm. The long-term overall pumping rate is to be determined by the design evaluation discussed Section 1.2.

- Peak storm flows to the SWRB have been dramatically reduced due to the large soil excavations in the former production area (reference Figure 3-1). These changes have effectively increased the storage capacity available to hold storm water runoff and eliminated the need for bypass of storm water to prevent overflow of the SWRB. Temporary storage within these excavations allows all storm water to be prioritized and routed to treatment without the threat of SWRB overflow. As the soil excavations have progressed, a corresponding reduction in the storm water runoff coefficient has also served to reduce runoff volumes and peak flow rates.

- Remediation wastewater flow projections have been dramatically reduced as nearly all of the site remediation is complete. When the BSL is taken out of service in the fall of 2004, remediation wastewater flows will be limited to OSDF leachate, D&D wastewater, and Silos Project wastewater.

- Sanitary wastewater flow projections have been reduced for the current period based on actual flows experienced in 2004. The sewage treatment plant is planned to be operational through June of 2005. After that time, any remaining sanitary wastewater flows will likely be dealt with by bulk hauling to a Publicly Owned Treatment Works (POTW).

4.1 GROUNDWATER

Extracted groundwater will be the largest wastewater flow requiring treatment during the remediation of the Fernald site. Unlike storm water and remediation wastewater, groundwater extraction rates can be controlled. Groundwater flows are defined such that discharge limits at the Parshall Flume, and capture of the 30 µg/L uranium plume are achieved. The objective is to pump as aggressively as possible, without exceeding discharge limits. Because groundwater flows can be controlled, pumping rates are periodically adjusted to accommodate other flow streams, such as storm water. During construction of the CAWWT facility (see Figure 1-1), groundwater treatment rates will be temporarily reduced in order to prioritize treatment of storm water in times of excessive rainfall.

4.1.1 Projected Groundwater Extraction Rates

This section provides the groundwater extraction/ rates currently planned for the aquifer remedy through construction of the CAWWT facility. As discussed above, during construction of the CAWWT facility groundwater treatment capacity will be limited and groundwater re-injection via wells will no longer take place. The individual groundwater remediation modules currently comprising the aquifer remedy are presented in Section 3.1. Figure 3-3 depicts the locations of all existing extraction wells. Table 4-1 provides the extraction rate schedule for each of the wells currently operating. The combined pumping rate during the CAWWT construction period is anticipated to average approximately 4500 gpm. When storm water treatment needs dictate, the groundwater extraction rate will be reduced, possibly to as low as 3,000 gpm.

Throughout the duration of groundwater remediation the pumping rates may be modified within system design and operational constraints, as necessary. These rate modifications will be made to maintain, to the degree possible, the aquifer restoration objectives outlined in the remedy design.

4.2 STORM WATER

At the present time, storm water runoff is collected in both the SWRB and the BSL for treatment in AWWT Phases I and II. Contaminated storm water runoff requiring treatment is collected from the former production area (Figure 4-1: Areas 3, 4, and 5), the OSDF, and waste pits area (Figure 4-1, Area 6). After the BSL is removed from service in November of 2004, storm water runoff from the waste pit area runoff collection pond and the Storm Water Management Pond (Figure 3-1) will be redirected to flow to the SWRB for treatment. Table 4-2 shows the projected fluctuation of contributing drainage areas to the SWRB. As noted above, the effective retention volume for storage of storm water has been substantially increased from the previous ~10.2 million gallons in the SWRB due to the large excavation areas within the former production area. The net effect of this change eliminates the need for storm water bypass or the threat of overflow of the SWRB. Table 4-2 shows a short period of time (approximately eight months) when the contributing area for storm water runoff requiring treatment will increase when compared to the current contributing area. However, these areas will be pumped to the SWRB from upstream surface impoundments. This represents a major difference in operational control as compared to past operational practices and provides enhanced control of the SWRB.

The various deep excavations within the uncertified areas of the former production area will be utilized as necessary to store storm water from areas undergoing active excavation or certification. Transfer pumping of accumulated storm water between these excavations will be utilized, as necessary, prior to discharge to the SWRB to ensure that overflow of the SWRB does not occur. Additionally, the pumping rates from these areas to the SWRB will be limited to ensure that bypass or overflow of the SWRB will not occur, while systematically prioritizing pumping from the impoundments such that soil remediation and certification activities can proceed. The pumping of these areas and the management of the SWRB will be as detailed in Section 5. Table 4-2 also shows how the site storm water runoff coefficient has decreased with time as buildings and paved areas are replaced by soil. This reduction in the runoff coefficient provides additional runoff volume reduction and peak flow attenuation.

4.2.1 Storm Water Retention Basin (SWRB)

The SWRB will continue to serve as the primary head-works for storm water treatment in either the existing AWWT and IAWWT through January 2005 and the planned CAWWT storm/process wastewater treatment train until November of 2005. As noted in previous sections, the SWRB is scheduled to be shut down in November 2005 in support of site closure. By November 2005 all areas draining by gravity to the SWRB are scheduled to have been remediated. After the SWRB is shut down, any remaining storm water flows requiring treatment will be pumped from the excavation areas directly to treatment.

The existing pump pit located at the SWRB will remain after removal of the SWRB. This facility will remain in service to provide a discharge point for miscellaneous batch type wastewater flows requiring treatment in CAWWT. Examples include wastewater from well development/rehabilitation or other minor trucked flows from satellite sources.

4.3 REMEDIATION WASTEWATER

Remediation wastewater/storm water includes existing or planned flows that are treated in the existing AWWT Phase II. Historically, the BSL has served as the primary head-works for flows to be sent to this treatment system. After November of 2004, the BSL will no longer be available and streams destined for treatment in AWWT Phase II will need to be sent directly to this system or rerouted to the SWRB.

Flows that have historically been discharged to the BSL for subsequent treatment in AWWT Phase II are categorized as "remediation wastewater," but can be generally classified as either storm water runoff or process wastewater in origin. The storm water runoff sources that were discharged to the BSL were primarily sent there as a convenience due to the location of this impoundment. After the BSL is removed from service, these flows will be rerouted to the SWRB and are included in Table 4-2. These flows include discharges from the Waste Pit Area Storm Water Runoff Control (WPASWRC) sump ("Cement Pond" on Figure 3-1) and the Storm Water Management Pond as described below.

As remediation of the site has progressed, the volume and number of process wastewater streams have declined. The process wastewater streams remaining after shutdown of the BSL include OSDF leachate/storm water, D&D wastewater, and Silos wastewater discharges, as described below.

The BSL will not be available to serve as the headworks to AWWT Phase II for a brief period between November 2004 and February 2005. During this period, the SWRB will serve as the main headworks to AWWT Phases I and II. Treatment of water from the SWRB will be prioritized through AWWT Phase II in order to address potential VOC treatment concerns. However, during wet weather, Phase I, Phase II, and IAWWT will be utilized to treat the discharge from the SWRB as detailed in Section 5.

4.3.1 Storm Water Sources Previously Discharged to BSL

The following storm water sources were previously discharged to the BSL. These flows are strictly considered to be "storm" water in origin and do not have VOC-related concerns associated with them.

Waste Pit Area Storm Water Runoff Control (WPASRC) Facility

The WPASRC Facility, commonly known as the Cement Pond (Figure 3-1) manages runoff from the area surrounding the waste pits area. This facility also collects area runoff from around the Silos Project. It was constructed in 1992 as an Operable Unit 1 Removal Action and was designed to control runoff from a 25-year storm. The primary objective was to minimize discharges of contaminated storm water runoff directly to Paddys Run where they could become a source to increase groundwater contamination as a result of infiltration into the Great Miami Aquifer. The system collects contaminated storm water runoff from the perimeter of the waste pit area using drainage trenches, culverts, topographic features, and two (east and north) Inlet Runoff Control Structures. Flow is directed to a concrete detention sump and will be discharged to the SWRB for treatment in AWWT Phases I and II or IAWWT until CAWWT is brought on line. After CAWWT is on line this water will be treated through the process wastewater train (600 gpm) of the CAWWT and IAWWT if necessary (until June 2005). Rerouting of the discharge from this facility will be included as a utility re-route as part of the soils remediation effort that removes the BSL from service.

The concrete detention sump has dimensions of 5,600 square feet by 10 feet high, giving an effective hold capacity of 360,000 gallons. Four pumps, each capable of discharging approximately 700 gpm, transfer collected water through a force main to the BSL. The four pumps are actuated by automatic level controllers placed within the pump pit area at the east end of the concrete sump. The design of the detention facility requires three pumps to operate. The fourth pump serves as a backup in the event of a failure of one of the other three. A fuel-fired generator is mounted nearby to provide emergency electrical power to the pumps, if required.

The East Inlet Runoff Control Structure is located immediately west of the northwest corner of the BSL and is designed to provide detention of peak storm water runoff flowing to the WPASRC concrete detention sump. The North Inlet Runoff Control Structure is similar in design and function to the East Structure. It is located in the northwest corner of the waste pits area. Orifices installed in each runoff control structure detain peak storm water flows. Each structure has a manual bypass valve in parallel with the orifice to maintain flow if the orifice becomes obstructed. As the soils remediation effort within the waste pit area progresses, these inlet control structures will likely be modified or removed as the upstream drainage areas are remediated.

Pumping of the storm water from this structure will be closely coordinated with soils remediation efforts such that the water levels in the SWRB are maintained at satisfactory levels and such that soil excavation and certification sampling efforts are optimized. It is anticipated that this structure will be operated in conjunction with the Storm Water Management Pond to best manage soil excavation activities in the waste pit area. This may require transfer pumping of flows between storage structures and uncertified areas such that soil excavation and certification can proceed to the extent possible during wet weather.

Storm Water Management Pond

Runoff from areas surrounding the pit remediation activities is directed to the Storm Water Management Pond (Figure 3-1), which is designed to accommodate the 25-year, 24-hour storm event. This water was previously expected to be "clean" and be discharged to Paddys Run. However, based on uranium content, it is currently sent to the BSL for treatment in AWWT Phase II. These waters are anticipated to require collection and treatment through the soils remediation efforts in the waste pit and BSL areas, and are planned to be routed to the SWRB for treatment. As indicated above, this facility will be utilized in conjunction with the WPASRC facility to optimize soil excavation and certification efforts while maintaining acceptable SWRB levels.

4.3.2 Process Wastewaters Previously Discharged to the BSL

The wastewater sources described below were previously discharged to the BSL for treatment in AWWT Phase II. These streams will be rerouted to the SWRB after the BSL is taken out of service in November 2004 for treatment in Phases I and II of the AWWT until such time as the CAWWT system is brought on-line. This configuration is anticipated to exist until the SWRB soil remediation is initiated in November 2005. At that time, these wastewater sources will be routed directly to the CAWWT process wastewater treatment train.

On-Site Disposal Facility (OSDF) Project

Wastewater from the OSDF Project is estimated to average 30 gpm annually. This flow is a combined flow of leachate and active cell runoff. Leachate from the OSDF results from the percolation of storm water through and out the bottom of the cells through installed under drains. The flow is at its maximum when a cell is under construction and uncapped. As evidenced by Cells 1, 2, and 3, the flow will steadily decrease after the cells are capped. The leachate collects in the Permanent Lift Station (PLS) pump sump and is currently transferred to the BSL. This flow will be rerouted to discharge to the SWRB after the BSL is taken out of service in November 2004. Leachate will flow directly to the SWRB until it is removed from service in November 2005, at which time the leachate will be routed directly to the influent tankage at the CAWWT facility.

The PLS discharge capacity is limited by the installed pump capacity to a flow of approximately 220 gpm. The OSDF design allows excess flow to be temporarily stored in the cells. This limited pumping capacity ensures that the OSDF leachate/storm water flow will not exceed the 600 gpm proposed CAWWT treatment capacity.

Silos Project Wastewater

Effluent from the Silos Project was originally to be discharged to the former High Nitrate Tank for eventual treatment in AWWT Phase II. However, this tank was decommissioned as part of the silos infrastructure construction effort. This will require that the process wastewater be piped directly to AWWT Phase II and then to the CAWWT facility. Although actual quantities of Silos wastewater to be treated are unknown, it is anticipated that the bulk of the process wastewater generated by the Silos Project will consist of excess waste from the sluicing of silo material from Silos 1 and 2. During this phase, it is estimated that up to 3 million gallons of wastewater may require pretreatment for radium and lead. The current plan is to provide pretreatment of these wastewaters in either the existing SDF or in a new, modular treatment system installed at the silos project. It is anticipated that this water will be intermittently transferred to pretreatment at the subsequent downstream AWWT/CAWWT treatment system at approximately 25–40 gpm. In addition, wastewater will be generated during the D&D of the Silos Project. It is anticipated that this water will be pretreated and subsequently treated at the AWWT/CAWWT treatment system similar to the wastewater discussed above.

4.4 SANITARY WASTEWATER

The existing sanitary flow averages of 8-10.5 million gallons per year (mgy) (15-20 gpm). This includes some infiltration of contaminated perched water, as discussed in Section 3.2.3. Existing flows are expected to decrease as the Operable Unit 3 remedial actions progress, buildings are shut down, and existing operations cease.

TABLE 4-1

EXTRACTION RATE/RE-INJECTION RATE SCHEDULE

System ID	Location	Ops. Well ID	SED Well ID	Pumping Rates (+) = pumping (-) = injecting (gpm)	
				1/1/04 to 10/1/04	CAWWT Construction Period
I	Waste Pits	WSA-1	32761	300	0
I	Waste Pits	WSA-2	33062	400	0
I	Waste Pits	WSA-4	33063	0	0
	System Totals	Pumped		700	0
II	South Field	EW-15a	33262	200	100
II	South Field	EW-17	31567	275	275
II	South Field	EW-18	31550	200	200
II	South Field	EW-19	31560	200	200
II	South Field	EW-20	31561	200	200
II	South Field	EW-21a	33298	290	100
II	South Field	EW-22	32276	300	300
II	South Field	EW-23	32447	300	300
II	South Field	EW-24	32446	300	100
II	South Field	EW-25	33061	300	300
II	South Field	EW-30	33264	300	100
II	South Field	EW-31	33265	300	300
II	South Field	EW-32	33266	200	200
	System Totals	Pumped		3365	2675
II	Fence Line Injectors	IW-8a	33253	-200	0
II	Fence Line Injectors	IW-9a	33254	-200	0
II	Fence Line Injectors	IW-10	22109	-200	0
II	Fence Line Injectors	IW-10a	33255	-200	0
II	Fence Line Injectors	IW-11	22240	-200	0
II	Fence Line Injectors	IW-12	22111	0	0
II	SF Injector	IW-16	31563	-200	0
II	SF Injector	IW-29	33263	-100	0
II	Injection Pond	Inj-Pond		-100	0
	System Totals	Injected		-1400	0
IV	South Plume	RW-1	3924	300	300
IV	South Plume	RW-2	3925	300	300
IV	South Plume	RW-3	3926	300	300
IV	South Plume	RW-4	3927	400	400
IV	South Plume	RW-6	32308	300	300
IV	South Plume	RW-7	32309	300	300
	System Totals	Pumped		1900	1900
	Total Pumping			5965	4575
	Total Injecting			-1400	0
	Net Extraction			4565	4575

TABLE 4-2

TIMELINE OF SWRB CONTRIBUTING AREAS

Area Description	Date	Approx. Composite Runoff Coefficient	Discharge Method Gravity=G (%) Pumped = P (%)	Incremental Area (acres)	Total Area to SWRB (acres)
Historical Drainage Area	Sep-99	0.60	G=~80% P=~20%	n/a	173
Current Contributing Area	Jun-04	<0.60	G=~40% P=~60%	n/a	136
Area 3A - Removed from SWRB	Sep-04	<0.60	G=~30% P=~70%	(24.1)	111.9
Area 3B - Removed from SWRB	Sep-04	<0.60	P (100%)	(23.2)	88.7
OSDF - Added to SWRB	Nov-04	<0.60	P (100%)	26.8	115.5
WSA and Silos - Added to SWRB	Nov-04	<0.50	P (100%)	53.4	168.9
Area 4A - Removed from SWRB	Mar-05	<0.50	P (100%)	(17.3)	151.6
Cell 5 - Removed from SWRB	Jun-05	<0.50	P (100%)	(6.4)	145.2
Area 4B - Removed from SWRB	Jul-05	<0.50	G=~20% P=~80%	(24.6)	120.5
Cell 6 - Removed from SWRB	Aug-05	<0.50	P (100%)	(6.4)	114.1
Remaining portions of FPA - Removed	Sep-05	<0.50	G=~20% P=~80%	(46.7)	67.4

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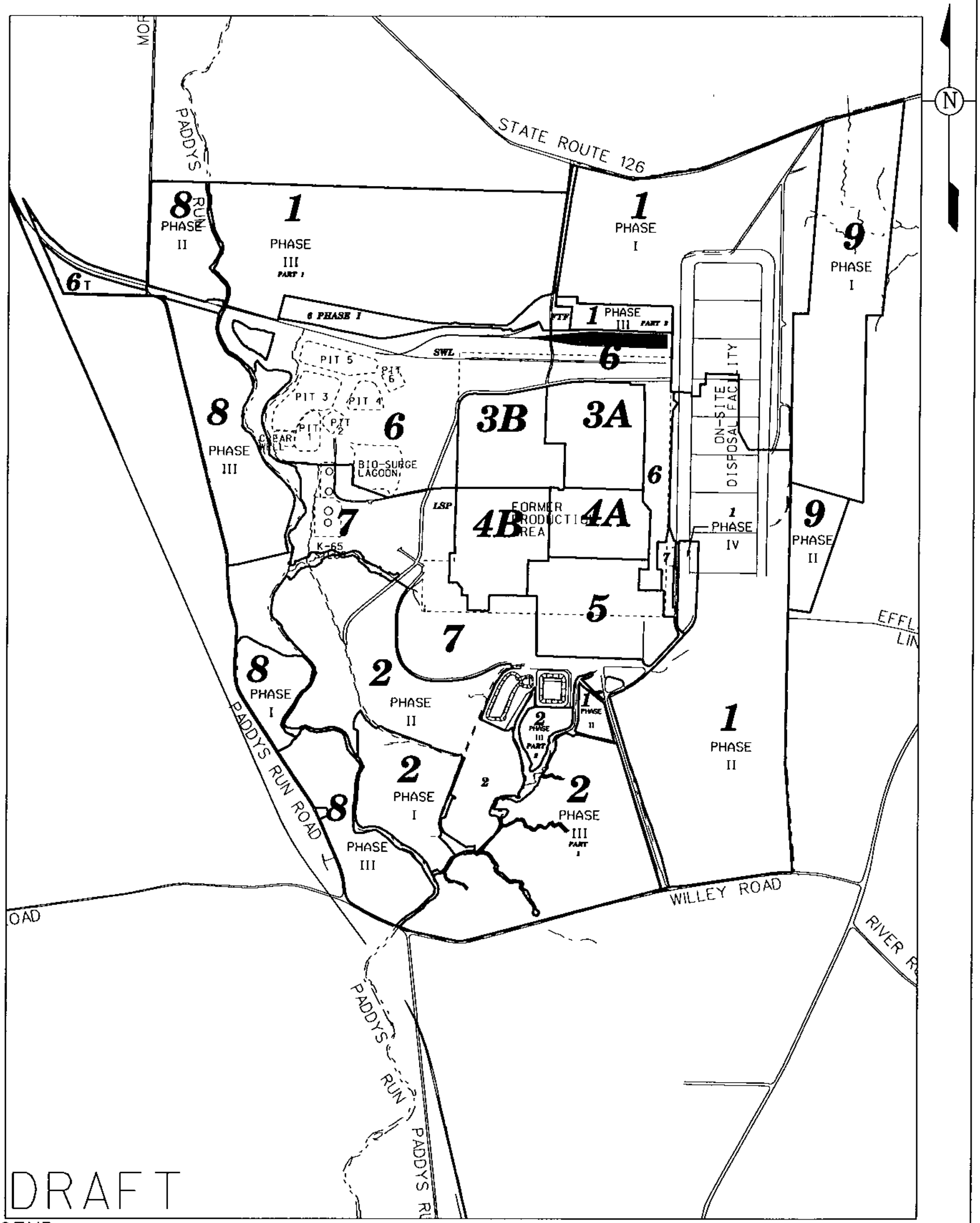

LEGEND:

— · — · — FERNALD SITE BOUNDARY

1 REMEDIATION AREA

———— REMEDIATION AREA BOUNDARIES

SCALE

1500 750 0 1500 FEET

FIGURE 4-1. GENERALIZED SITEWIDE REMEDIATION AREAS

5.0 OPERATIONS PLAN

This section contains the operations philosophy, treatment priorities, hierarchy of decisions, management and flow of operations information, and management of treatment residuals necessary to successfully operate the groundwater extraction and wastewater treatment systems in order to achieve regulatory requirements and commitments. The operational time periods covered by this section are (all dates are subject to change):

Operational Period 2	AWWT Phases I and II Operations with SPIT and IAWWT after BSL Shutdown (September 2004 to January 2005)
Operational Period 3	CAWWT Operations with SPIT and IAWWT after Phases I and II Shutdown (February 2005 to July 2005)
Operational Period 4	CAWWT Operations after SPIT and IAWWT Shutdown until SWRB Shutdown (August 2005 until November)
Operational Period 5	CAWWT Operations after SWRB is Shutdown until Capping of the Last Cell (November 2005 until March 2006) (to be addressed in a future revision)
Operational Period 6	CAWWT Operations after site storm water treatment needs are ended (March 2006 to end of groundwater treatment) (to be addressed in a future revision)

5.2 WASTEWATER TREATMENT OPERATIONS PHILOSOPHY

The primary goals of wastewater treatment operations and maintenance are to: 1) meet effluent discharge requirements; 2) minimize bypassing of untreated groundwater and storm water; and 3) maintain treatment headwork capacities. In keeping with the principles of ALARA (as low as reasonably achievable), this requires making the correct decisions in applying treatment to maximize the quantity of uranium removed from wastewater prior to its discharge to the Great Miami River. Maximizing uranium removal should result in compliance with the objectives as outlined in Section 2.0. Other regulatory discharge requirements, such as NPDES, must also be met. Influent streams to treatment and effluent streams from treatment as well as other process control sampling around specific unit operations (e.g., ion exchangers, carbon beds) are sampled for uranium and other appropriate constituents to provide information needed to help ensure that the objectives are met. Sampling under the NPDES permit and the IEMP is performed to verify requirements and effluent limits for discharges to the Great Miami River are met.

5.2 TREATMENT PRIORITIES

As discussed in Section 3, wastewater treatment systems include the AWWT systems (Phases I, II, and Expansion), the IAWWT system, the SPIT system, and the STP. The effluents from these systems, along with bypassed (untreated) groundwater and storm water, combine at the Parshall Flume to form the Fernald site's regulated discharge to the Great Miami River.

The priority for treatment will always be the stream with the highest uranium concentrations. After the BSL is taken out of service, the highest remaining uranium concentration will exist in the SWRB. The SWRB typically contains water with a uranium concentration of approximately 200 to 500 ppb.

Groundwater from the Great Miami Aquifer recovery wells contains the lowest concentration of uranium of the two remaining wastewater streams. Groundwater sent to treatment typically contains a uranium concentration of 60 to 70 ppb.

During Operational Periods 2, 3 and 4, the maximum possible treatment capacity will be available for treating storm water from the SWRB. The following table shows treatment capacities during each stage.

	Capacity Available for Storm Water Treatment		Capacity Dedicated to Groundwater Treatment		Additional Capacity Available for Groundwater Treatment during "Dry" Weather	
Op. Period 2	Phase I	500 gpm	SPIT	200 gpm	Phase I	500 gpm
	Phase II	300 gpm			Phase II	100 gpm
	IAWWT	300 gpm			IAWWT	300 gpm
Op. Period 3	CAWWT (SW)	600 gpm	SPIT	200 gpm	CAWWT (SW)	400 gpm
	IAWWT	300 gpm	CAWWT (GW)	1200 gpm	IAWWT	300 gpm
Op. Period 4	CAWWT (SW)	600 gpm	CAWWT (GW)	1200 gpm	CAWWT (SW)	400 gpm
Op. Period 5	CAWWT (SW)	600 gpm	CAWWT (GW)	1200 gpm	CAWWT (SW)	600 gpm

5.3 HIERARCHY OF TREATMENT DECISIONS

Figures 5-1A through 5-1C provide logic charts listing operational decisions that must be made for the wastewater treatment systems. These decisions are typically made using guidance provided by management and engineering support staff. The shift supervisor is responsible for operations and direction of maintenance activities at all of the groundwater extraction facilities, all uranium treatment systems and ancillary facilities. The purpose of Figures 5-1A through 5-1C is to provide a consistent logic for operations of all wastewater treatment facilities and a tool for the shift supervisors to ensure they are operating the facilities in the manner most likely to achieve regulatory requirements.

Shift supervision is provided 24 hours per day, seven days per week, 365 days per year. As the supervisor of all operations and maintenance activities that occur on a particular shift, the shift supervisors are responsible for ensuring that treatment and monitoring equipment is operated, maintained and repaired as necessary so that maximum prioritized treatment throughput is achieved at all times. Operations and maintenance are performed in accordance with all appropriate standard operating procedures, standards, and specifications. All shift supervisors, operators, and maintenance personnel have been trained to understand the logic flow chart in Figures 5-1A through 5-1C. They are expected to use their best judgment and experience to respond to situations where the flow chart cannot be applied. Additionally, process engineering support personnel are on-call to provide assistance in problem solving.

5.4 WASTEWATER TREATMENT OPERATIONS DECISIONS

The logic flow charts in Figures 5-1A through 5-1C are explained in detail in this section. The logic flow charts will be followed as written by the supervisors. Any variance from the flow chart will be directed in writing by management. For example, the flow chart directs DSDP can resume pump storm water and excavation water from uncertified excavations when the sum of the SWRB levels drops to 8 feet. If no more precipitation is in the forecast and the levels in the SWRB are dropping continuously, management may provide written guidance allowing DSDP to resume pumping before the levels drop to 8 feet. Table 5-1 contains information for the East SWRB, West SWRB, and the Emergency Spill Basin (ESB) that show how many gallons the basins are holding at different levels and what the remaining capacity of the basins is at those levels. Several examples are included to show how the remaining capacity of the total SWRB depends on the level in the individual basins.

5.4.1 Operational Period 2: AWWT Phases I and II with SPIT and IAWWT

This is the time period of greatest available treatment capacity for storm water and the time of greatest need for storm water treatment. Phase I, Phase II, and IAWWT are all available for storm water treatment for a total of 1100 gpm capacity. Figure 5-1A lists treatment decisions to be made during the second half of Operational Period 2 after the BSL is shutdown. During periods of relatively dry weather, Phase II will be used for SWRB storm water treatment of 200 to 300 gpm. This allows leachate from the OSDF, storm water from the waste storage area, and excavation water from the former production area to be treated through the Phase II carbon filters.

The level in the SWRB will be measured as the sum of the levels of the East and West Basins. When the level in the SWRB reaches a sum of 10 feet, Phase I will be used to start treating storm water from the SWRB along with Phase II. Since the Phase I system can treat storm water and groundwater at the same time, the proportion of storm water treated in Phase I will be increased as the level in the SWRB continues to increase. By the time the level in the SWRB reaches 13 feet, Phase I will be treating only storm water. At that time, the total amount of storm water being treated will be approximately 800 gpm.

When the level in the SWRB reaches a sum of 13 feet, IAWWT will switch from treating groundwater to treating storm water. This will increase storm water treatment to about 1100 gpm. When the level reaches 13 feet, DSDP and Operations and Support Project (OSP) management will be notified that a shutdown of pumping storm water and excavation water from uncertified portions of the former production and waste storage areas into the SWRB is possible.

When the level in the SWRB reaches a sum of 15 feet, DSDP management will be notified to stop pumping all storm and excavation water into the SWRB. Water will be collected in the excavations for pumping after the SWRB levels drop to a sum of less than 8 feet.

When the level in the SWRB reaches a sum of 18 feet, OSP Water Treatment Operations (WTO) will turn the leachate system pumps off. Water will collect in the cells for pumping after the level in the SWRB drops below a sum of 15 feet. Management will be notified that leachate pumping has been stopped.

After the leachate pumps have been turned off, the only flow into the SWRB will be gravity flow from storm sewers in the former production area that cannot be shut off and direct rainfall into the SWRB. If the SWRB begins to overflow, samples will be collected per the NPDES permit and management will be notified of the emergency situation at the SWRB.

5.4.2 <u>Operational Period 3: CAWWT Operations with SPIT and IAWWT</u>

The second time period covered by this document occurs after construction on CAWWT is complete and is operating. The flow rate assumptions for this time period are: CAWWT (SW) is treating up to ~600 gpm storm water; CAWWT (GW) system is treating ~1200 gpm groundwater; SPIT is treating ~200 gpm groundwater; and IAWWT is treating ~300 gpm of either storm water or groundwater. Figure 5-1B lists treatment decisions for this time period.

CAWWT (SW) is the primary system used for storm water treatment. During periods of relatively dry weather, CAWWT (SW) will treat approximately 200-300 gpm storm water and 300-400 gpm groundwater. As the level in the SRWB begins to increase due to precipitation, CAWWT (SW) will treat more storm water and less groundwater until it is treating 600 gpm storm water.

When the level in the SWRB reaches a sum of 10 feet, IAWWT will switch from treating about 300 gpm groundwater to treating about 300 gpm storm water. This will increase storm water treatment to about 900 gpm, the maximum available storm water treatment. If the levels in the SWRB continue to increase, DSDP and OSP management will be notified that a shutdown of pumping storm water and excavation water from uncertified portions of the former production and waste storage areas into the SWRB is possible.

When the level in the SWRB reaches a sum of 12 feet, DSDP management will be notified to stop pumping all storm and excavation water into the SWRB. Water will be collected in the excavations for pumping after the SWRB levels drop to a sum of less than 8 feet. Pumping from the excavations will be stopped earlier than in the previous case because less treatment capability exists. It is necessary to gain control of the basin levels as quickly as possible to prevent an overflow.

When the level in the SWRB reaches a sum of 18 feet, OSP WTO will turn the leachate system pumps off. Water will collect in the cells for pumping after the level in the SWRB drops below a sum of 15 feet. Management will be notified that leachate pumping has been stopped.

After the leachate pumps have been turned off, the only flow into the SWRB will be gravity flow from storm sewers in the former production area that cannot be shut off and direct rainfall into the SWRB. If the SWRB begins to overflow, samples will be collected per the NPDES permit and management will be notified of the emergency situation at the SWRB.

5.4.3 Operational Period 4: CAWWT Operations after SPIT and IAWWT Shutdown until SWRB Shutdown

The third time period covered by this document occurs after D&D of SPIT and IAWWT, and the only treatment system remaining is the CAWWT. Figure 5-1C shows treatment decisions for this operational period.

CAWWT (SW) is the only treatment system for storm water. During periods of relatively dry weather, CAWWT (SW) will treat approximately 200-300 gpm storm water and 300-400 gpm groundwater. As the level in the SRWB begins to increase due to precipitation, CAWWT (SW) will treat more storm water and less groundwater until it is treating 600 gpm storm water.

When the level in the SWRB reaches a sum of 10 feet, DSDP and OSP management will be notified that a shutdown of pumping storm water and excavation water from uncertified portions of the former production area and waste storage area into the SWRB is possible.

When the level in the SWRB reaches a sum of 12 feet, DSDP management will be notified to stop pumping all storm and excavation water into the SWRB. Water will be collected in the excavations for pumping after the SWRB levels drop to a sum of less than 8 feet. Pumping from the excavations will be stopped earlier than in the previous case because less treatment capability exists. It is necessary to gain control of the basin levels as quickly as possible to prevent an overflow.

When the level in the SWRB reaches a sum of 18 feet, OSP WTO will turn the leachate system pumps off. Water will collect in the cells for pumping after the level in the SWRB drops below a sum of 15 feet. Management will be notified that leachate pumping has been stopped.

After the leachate pumps have been turned off, the only flow into the SWRB will be gravity flow from storm sewers in the former production area that cannot be shut off and direct rainfall into the SWRB. If the SWRB begins to overflow, samples will be collected per the NPDES permit and management will be notified of the emergency situation at the SWRB.

5.4.4 Operational Period 5: CAWWT Operations after SWRB is Shutdown until Capping of the Last Cell

Operations during this period will be defined in a future revision of the OMMP.

5.4.5 Operational Period 6: CAWWT Operations after Last Cell is Capped

Operations during this period will be defined in a future revision of the OMMP.

5.4.6 Groundwater

During CAWWT construction, groundwater treatment capacity will be 1300 gpm. Most of this treatment capacity (1100 gpm) will be made available for the treatment of storm water, should it be needed. This leaves 200 gpm (from the SPIT system) dedicated to the treatment of groundwater. If the construction time period is relatively dry and large volumes of storm water treatment are not required, all but 200 of the 1100 gpm made available for the treatment of storm water can be used for the treatment of groundwater. A capacity of 200 gpm will always be dedicated to storm water (Phase II system). Therefore, during the CAWWT construction time period, the range of treatment capacity available for groundwater will be from 200 gpm up to 1100 gpm.

During CAWWT construction, it is anticipated that groundwater extraction wells will be operated at an overall target extraction rate of 4,575 gpm using the individual well pumping rates listed in Table 4-1. Groundwater modeling and particle path interpretations indicate that at the pumping rates listed in Table 4-1, the uranium plume will be captured, and discharge limits will be met at the Great Miami River, provided that a 700 gpm treatment capacity is available for groundwater. October through February is seasonally dry, so it is anticipated that a groundwater treatment capacity of 700 gpm is a realistic target. If a 700-gpm-treatment capacity is used for groundwater, 675 gpm will still be available for the treatment of storm water and remediation wastewater. Storm water/remediation wastewater treatment will take precedence over groundwater treatment. If the capacity available for groundwater treatment falls below 700 gpm, then pumping will be reduced. If pumping rates need to be reduced, meeting discharge limits at the Great Miami River will take precedence over maintaining capture of the 30 μg/L uranium plume, with the exception of the South Plume. Capture at the leading edge of the South Plume in the South Plume Recovery Wells will not be compromised by this approach, and will continue to be maintained. It is anticipated that if lower pumping rates are needed, the need will be short term and will have little effect on the long-term results of the groundwater remedy.

Once the CAWWT is up and running, and use of the SPIT and IAWWT facilities is discontinued, a capacity of 1200 gpm will be dedicated to the treatment of groundwater. With this higher capacity, more aggressive pumping scenarios can, and will be pursued. Many issues currently surround the future of the groundwater remedy (i.e., discontinuing the use of well-based re-injection, induced infiltration down the storm sewer outfall ditch, final design of the waste storage area Phase II system). Once these issues are finalized, an updated groundwater remedy design will be issued. When the updated remedy design is issued, the OMMP will be revised (the use of change pages being the preferred approach) to incorporate operational changes needed to accommodate the updated design.

5.4.6.1 Groundwater Treatment Prioritization vs. Bypassing

Treatment of groundwater well discharges are prioritized in order of uranium concentration, with the highest uranium concentration wells routed to treatment until all available treatment capacity is utilized. Remaining well discharges are bypassed around treatment to the Parshall Flume. As shown schematically in Figure 3-4, treatment/bypass decisions for the Southfield extraction wells are made on a well-by-well basis. The existing four South Plume off-property, leading-edge wells combined with the two wells of the South Plume Optimization Project are routed as a group either for treatment, full bypass, or partial bypass since piping does not exist for well-by-well treatment/bypass decision. The off-property South Plume wells are typically routed directly to bypass at the South Field Valve House since their combined uranium concentration is very near or less than 30 ppb uranium.

5.4.7 Ion Exchange Vessel Rotation

All of the ion exchange systems (except IAWWT) have trains of two ion exchange vessels operating in series, lead and lag. When the ion exchange resin in both vessels is new, the majority of uranium is removed in the lead vessel. As the lead vessel becomes loaded with uranium more passes through into the lag vessel. As the lag vessel becomes loaded, more uranium passes into the discharge stream. When the uranium concentration in the discharge from a particular ion exchange train causes the uranium concentration at the Parshall Flume to exceed 30 ppb, the resin will be removed from the lead vessel and replaced with new resin. The lag vessel is moved into lead and the vessel containing new resin is place in lag. The ability to regenerate ion exchange resin no longer exists for any of the treatment systems after CAWWT construction begins in the fall of 2004.

IAWWT is operated with three vessels in series. The lead and lag vessels contain ion exchange resin and operate as indicated above. The third vessel does not contain resin. It has a screen on the outlet pipe that acts as a "resin trap." Any resin that leaks through the lag vessel will be retained in the "resin trap" and not reach the effluent line.

5.5 WELL FIELD OPERATIONAL OBJECTIVES

Several objectives must be considered when well field operational decisions are made. These objectives are listed in Table 5-2 along with the anticipated actions required to achieve each objective. At times the objectives conflict; therefore, operational decisions are generally made by group consensus of WTO and Aquifer Restoration/Wastewater Project management. These discussions are held on an as-needed basis. Decisions from these meetings that affect wellfield operations are normally communicated to the EPA and OEPA on the weekly conference calls. Operational changes are also reported in the IEMP reports. Changes in groundwater restoration well pumping set points are transmitted to shift supervisors by the WTO manager.

5.6 OPERATIONAL MAINTENANCE PRIORITIES

Maintaining the treatment facilities on line includes ensuring that all equipment is operating properly, that adequate personnel are assigned to operate the treatment systems safely, and that the combined treatment and bypassing systems are removing uranium to below 30 ppb as measured at the Parshall Flume. Following is a list of operational maintenance priorities in their order of importance for each stage of operation covered by this document:

Operational Period 2

- Keeping the AWWT SDF available to process clarifier slurries.
- Keep the AWWT Phase II treatment system on line at maximum capability. This will allow the water from the SWRB to be treated through the carbon filters.
- Keep AWWT Phase I on line to prevent the SWRB from overflowing.
- Keep the sewage treatment plant on line and operating correctly. This will prevent NPDES permit violations by STP discharge.
- Keep the Parshall Flume discharge point and sampling system on line. If the discharge monitoring system were to become nonoperational, discharge monitoring of effluent to the river from the Fernald site would have to be collected manually. The sampling system must be operational so that accurate reports of uranium and NPDES contaminant levels can be made.
- In periods of heavy precipitation or high level in the SWRB, the priority is to keep IAWWT on line. IAWWT, which normally provides additional treatment capacity for groundwater, also provides supplemental and backup capacity for storm water.
- Keep SPIT on line. SPIT provides additional groundwater treatment.
- Keep South Plume Wells 1–4 operating at desired setpoints
- Keep all extraction wells operating at the desired setpoints.

Operational Period 3

- Keep the CAWWT (SW) treatment system on line at maximum capability. This will allow the water from the SWRB to be treated through the carbon filters.
- Keep IAWWT on line to prevent the SWRB from overflowing.
- Keep the sewage treatment plant on line and operating correctly. This will prevent NPDES permit violations by STP discharge.
- Keep the Parshall Flume discharge point and sampling system on line. If the discharge monitoring system were to become nonoperational, discharge monitoring of effluent to the river from the Fernald site would have to be collected manually. The sampling system must be operational so that accurate reports of uranium and NPDES contaminant levels can be made.
- Keep the SDF available to treat sludge generated during cleanout of AWWT Phases I and II.
- Keep the CAWWT (GW) treatment trains operating at full capacity.
- Keep SPIT on line. SPIT provides additional groundwater treatment.
- Keep South Plume Wells 1–4 operating at desired setpoints.
- Keep all extraction wells operating at the desired setpoints.

Operational Period 4

- Keep the CAWWT (SW) treatment system on line at maximum capability. This will allow the water from the SWRB to be treated through the carbon filters.
- Keep the Parshall Flume discharge point and sampling system on line. If the discharge monitoring system were to become nonoperational, discharge monitoring of effluent to the river from the Fernald site would have to be collected manually. The sampling system must be operational so that accurate reports of uranium and NPDES contaminant levels can be made.
- Keep the CAWWT (GW) treatment trains operating at full capacity.
- Keep South Plume Wells 1–4 operating at desired setpoints.
- Keep all extraction wells operating at the desired setpoints.
- More specific details of managing equipment operation and maintenance are contained in Section 6.

5.7 OPERATIONS CONTROLLING DOCUMENTS

Operations at the wastewater treatment facilities are controlled directly by Standing Orders and Standard Operating Procedures (see Appendix C). Standing Orders translate the DOE Orders, conduct of operations principles, guidelines, and procedures into performance requirements for personnel involved in operating the wastewater treatment facilities. The Standing Orders were written to ensure that all operations are conducted in full conformance with DOE conduct of operations requirements.

A more extensive discussion of Standard Operating Procedures and Standing Orders is contained in Section 6.1.2. Standing Orders and Standard Operating Procedures implement the requirements of this plan. The OMMP is not intended to replace Standing Orders or Standard Operating Procedures.

5.8 MANAGEMENT AND FLOW OF OPERATIONS INFORMATION

Samples are taken from each of the treatment systems at locations indicated on Figures 5-1A through 5-1C. The results of the sample analysis are reviewed daily by the shift supervisors, the process engineer, the operations manager and the manager of the Aquifer Restoration/Wastewater Project of DSDP to review system performance and determine if any of the treatment system ion exchange vessels need to be removed from service for resin replacement or regeneration.

The operations manager issues daily and monthly operations reports that summarize flow rates and flow totals as well as uranium concentrations from each wastewater treatment system. The operations manager communicates process information from the operations personnel to the manager of the Aquifer Restoration/Wastewater Project. Information on required well pumping rates is communicated from the manager of the Aquifer Restoration/Wastewater Project to the WTO manager, who in turn communicates to the operations personnel via the operations manager's monthly performance goals and operating orders, as specified in the Standing Orders.

5.9 MANAGEMENT OF TREATMENT RESIDUALS

Treatment residuals consist of exhausted ion exchange resin, used multimedia filter media, used carbon from the carbon filter, and filter cake from the SDF filter press. Filter cake is produced by filtration of clarifier bottoms from AWWT Phases I and II, sludge from the sewage treatment plant, and sludge generated during shutdown of the treatment systems.

The uranium concentration in the exhausted ion exchange resin and the filter cake exceeds the Waste Acceptance Criteria (WAC) for the OSDF. These materials are currently being transferred to WPP for disposal at Envirocare. After WPP shipping is complete, an alternate disposal method must be developed.

Carbon is currently being disposed of with WPP waste. An alternate disposal method for carbon must also be developed.

Media from multimedia filtration should be acceptable for disposal in the OSDF until the last cell is capped.

TABLE 5-1
STORM WATER RETENTION BASIN LEVELS AND CAPACITIES

East Storm Water Retention Basin

Water Depth (feet)	Water Volume (gallons)	Remaining Capacity (gallons)
1	322,000	4,238,000
2	663,000	3,897,000
3	1,022,000	3,538,000
4	1,400,000	3,160,000
5	1,800,000	2,760,000
6	2,210,000	2,350,000
7	2,640,000	1,920,000
8	3,090,000	1,470,000
9	3,560,000	1,000,000
10	4,050,000	510,000
11	4,560,000	0

Total Capacity when level reaches overflow spillway is 4,560,000 gallons.

West Storm Water Retention Basin

Water Depth (feet)	Water Volume (gallons)	Remaining Capacity (gallons)
1	147,000	5,583,000
2	583,000	5,147,000
3	1,050,000	4,680,000
4	1,540,000	4,190,000
5	2,060,000	3,670,000
6	2,600,000	3,130,000
7	3,170,000	2,560,000
8	3,770,000	1,960,000
9	4,400,000	1,330,000
10	5,050,000	680,000
11	5,730,000	0

Total Capacity when level reaches overflow spillway is 5,733,000 gallons.

Emergency Spill Basin (ESB)

Water Depth (feet)	Water Volume (gallons)	Remaining Capacity (gallons)
1	0	578,000
2	26,000	552,000
3	63,000	515,000
4	106,000	472,000
5	155,000	423,000
6	210,000	368,000
7	272,000	306,000
8	339,000	239,000
9	412,000	166,000
10	492,000	86,000
11	578,000	0

Total Capacity when level reaches overflow spillway is 587,000 gallons.

Examples for determining remaining capacity in SWRB at different levels from the flow charts:

Example 1

Sum of basin levels equal to 15 feet:	remaining capacity
East Basin at 6 feet	2,350,000 gal.
West Basin at 9 feet	1,330,000 gal.
ESB at 9 feet	166,000 gal.
Total remaining capacity	3,846,000

Sum of basin levels equal to 15 feet:	remaining capacity
East Basin at 9 feet	1,000,000 gal.
West Basin at 6 feet	3,130,000 gal.
ESB at 6 feet	368,000 gal.
Total remaining capacity	4,498,000 gal.

Example 2

Sum of basin levels equal to 8 feet:	remaining capacity
East Basin at 4 feet	3,160,000 gal.
West Basin at 4 feet	4,190,000 gal.
ESB at 4 feet	472,000 gal.
Total remaining capacity	7,822,000

Sum of basin levels equal to 8 feet:	remaining capacity
East Basin at 6 feet	2,350,000 gal.
West Basin at 2 feet	5,147,000 gal.
ESB at 2 feet	552,000 gal.
Total remaining capacity	8,049,000 gal.

Example 3

Sum of basin levels equal to 18 feet:	remaining capacity
East Basin at 10 feet	510,000 gal.
West Basin at 8 feet	1,960,000 gal.
ESB at 8 feet	239,000 gal.
Total remaining capacity	2,709,000 gal.

Sum of basin levels equal to 18 feet:	remaining capacity
East Basin at 8 feet	1,470,000 gal.
West Basin at 10 feet	680,000 gal.
ESB at 10 feet	86,000 gal.
Total remaining capacity	2,236,000 gal.

TABLE 5-2

WELL FIELD OPERATIONAL OBJECTIVES

Objectives	Actions Required
Operate individual wells within constraints imposed by system design and equipment. Key constraints include: • Pumping equipment is limited to a range of flows that will dictate the flexibility of extraction rates for individual wells • Hydraulic capacity of the piping limits extraction rates • Control range of flow control valves and variable frequency drives for pump motors bound the range of extraction rates for individual wells • Capacity of existing electrical service to each well • Average entrance velocity of water moving into the screen should not exceed 0.1 ft/sec	• Operate well pumps and motors per manufacturer recommendations • Operate extraction and injection systems within design constraints
Perform necessary equipment/well maintenance in accordance with established schedules.	• Per OMMP, Appendix D
Maintain compliance with the discharge limits of 30 µg/L monthly average uranium concentration and 600 lbs/yr for the combined site water discharged to the Great Miami River.	• Monitor discharge concentrations • Modify well set points as necessary to maintain compliance with discharge limits. • Evaluate well set points and treatment routing monthly • Use flow weighted average concentration calculations to predict how changes to set points and routing will effect discharge concentrations. • Compare predictions with actual measurements to evaluate if/how predictions can be improved. • Maintain well set points to the degree possible
Minimize impact to the Paddys Run Road Site plume.	• Pumping from Recovery Well 3924 (RW 1) should not exceed 300 gpm. • Pumping from Recovery Well 3925 (RW 2) should not exceed 300 gpm (if Well 3924 is pumping) and 400 gpm (if Well 3924 is not pumping). • Pumping from Recovery Well 3926 (RW 3) should not exceed 500 gpm if either Well 3924 or Well 3925 goes down. • If the actual capture zone differs significantly from that defined via previous modeling it may be determined that the above-noted pumping rates require modification in order to maintain this objective. Required modifications will be made based on additional modeling projections and verified based on field data.

TABLE 5-2
(Continued)

Objectives	Actions Required
Maintain capture of the 30 µ/L uranium plume along the southern Administrative Boundary.	• The following pumping rates for each South Plume Well provides for the capture (within system constraints) of the uranium plume along the administrative boundary: Recovery Well 3924 at 300 gpm Recovery Well 3925 at 300 gpm Recovery Well 3926 at 300 gpm Recovery Well 3927 at 400 gpm • Adjust the pumping rates of the remaining operable wells in the South Plume module to maintain capture along the administrative boundary when: 1) any single South Plume Module well outage for one week or more occurs; or 2) when multiple well outages for three days or more occur • If the actual capture zone differs significantly from that defined via previous modeling it may be determined that the above-noted pumping rates require modification in order to maintain this objective. Required modifications will be made based on additional modeling projections and verified based on field data.
Maintain hydraulic capture of the remaining portions of the 30 µg/L uranium plume (within areas of active modules).	• Establish pumping rates based on model predictions of required pumping rates to maintain a desired area of capture. • Determine the actual area of capture created when the wells are operating at the modeled rates based on groundwater elevation contour maps derived from field measurements. • Adjust pumping rates within system design and operational constraints, if warranted, when the actual area of capture is not consistent with the modeled area of capture. This will be done in an effort to establish an area of capture consistent with the desired area of capture, as modeled.
Minimize duration of clean-up time for off-property portion of the 30 µg/L uranium plume.	• Give priority to keeping South Plume and South Plume Optimization Wells online when other wells have to be shut down • Maximize pumping rates within the following constraints/considerations: system design and equipment, hydraulic capacity of the aquifer, regulatory limits, interaction with other modules and remedy performance.
Minimize duration of cleanup time for on-property portions of the uranium plume.	• Maximize pumping rates within the following constraints/considerations: system design and equipment, hydraulic capacity of the aquifer, regulatory limits, interaction with other modules
Minimize migration of on-property portion of the plume to off-property areas.	• Balance pumping from the South Field Extraction and South Plume Modules such that the stagnation zone is at or south of Willey Road.
Minimize drawdown in off-property areas.	• Do not exceed set points defined in Table 4-1 unless modified by Aquifer Restoration/Wastewater Project management

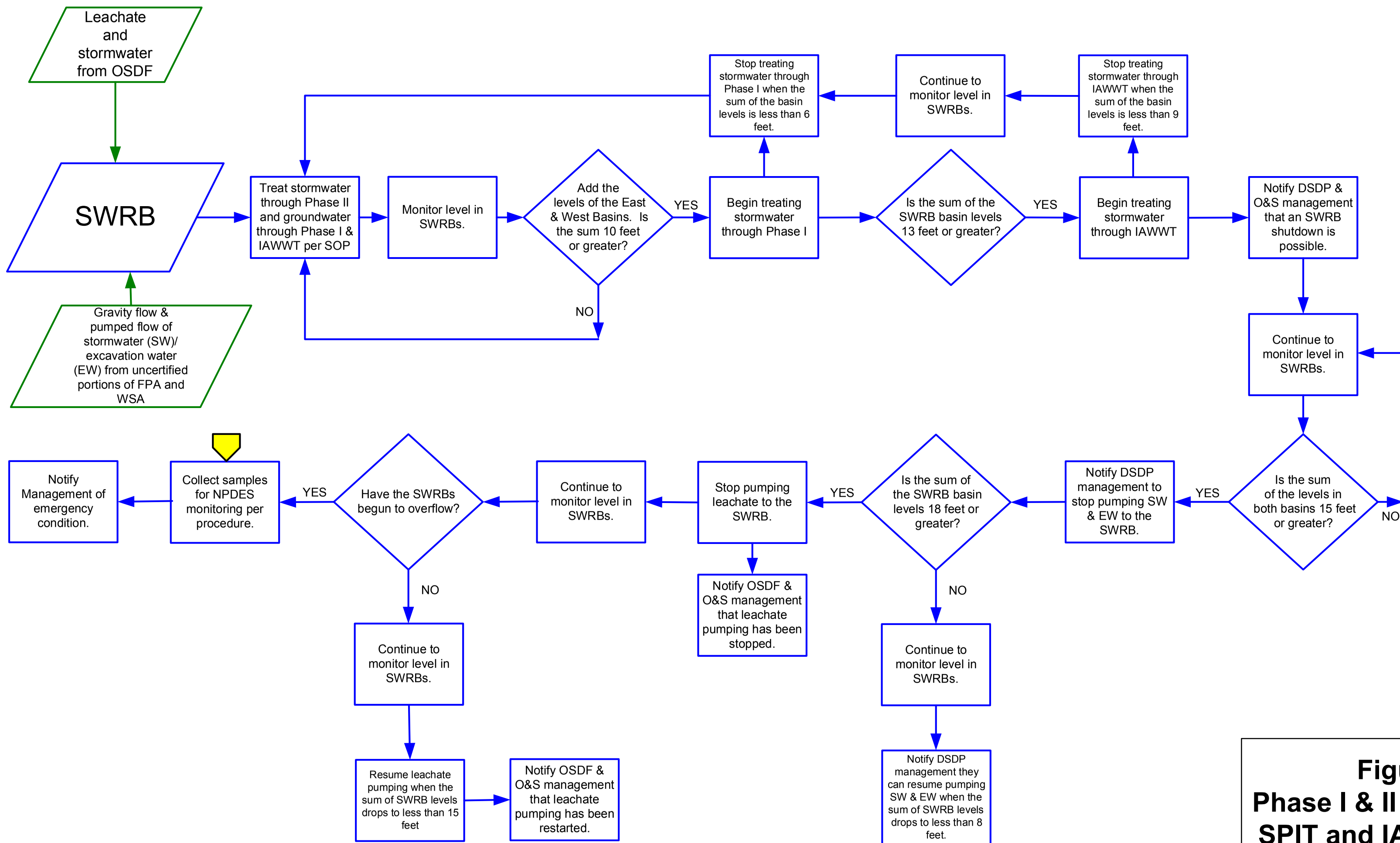

Figure 5-1A
Phase I & II Operations with SPIT and IAWWT after BSL Shutdown

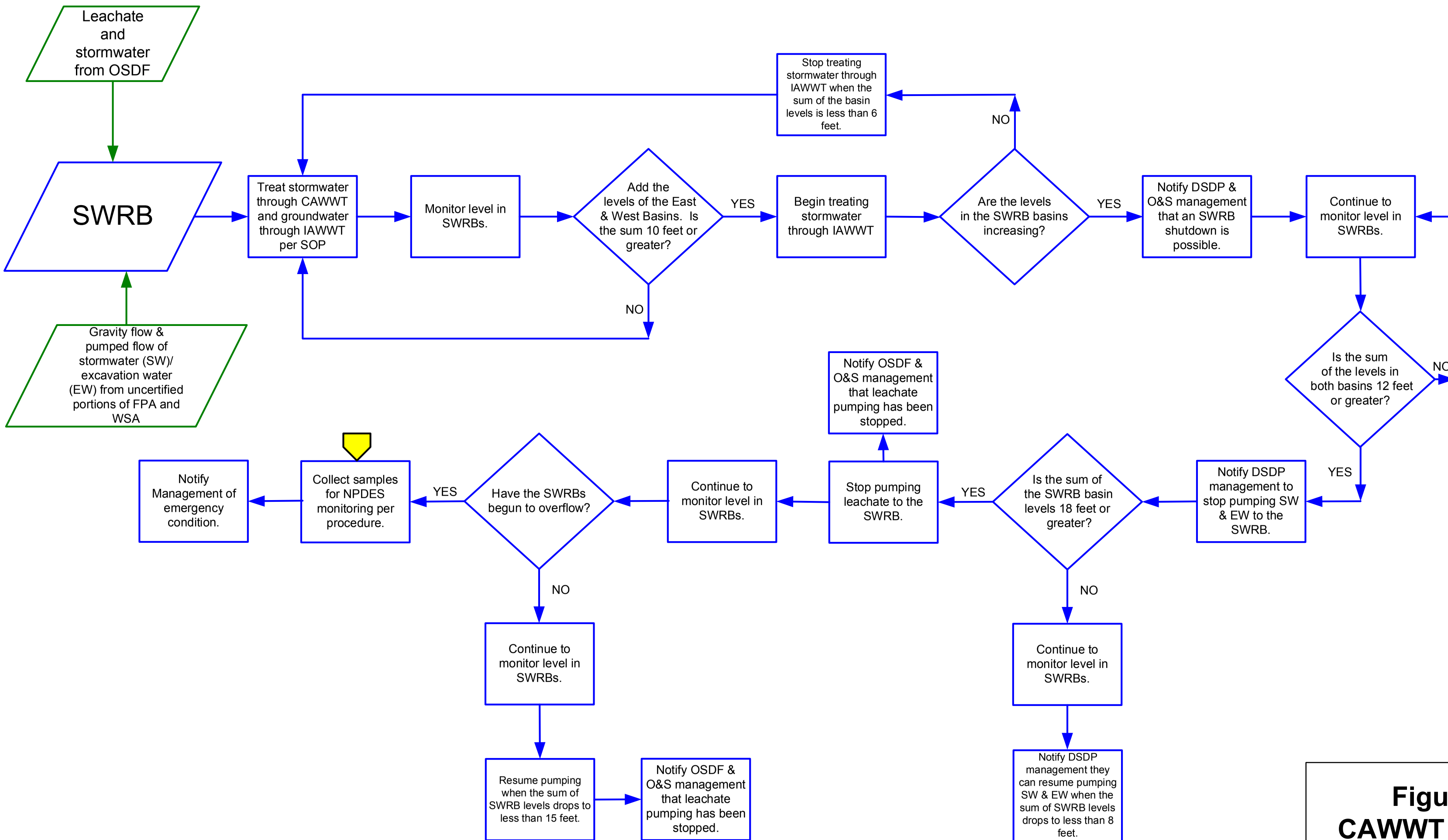

Figure 5-1B
CAWWT Operations with SPIT and IAWWT

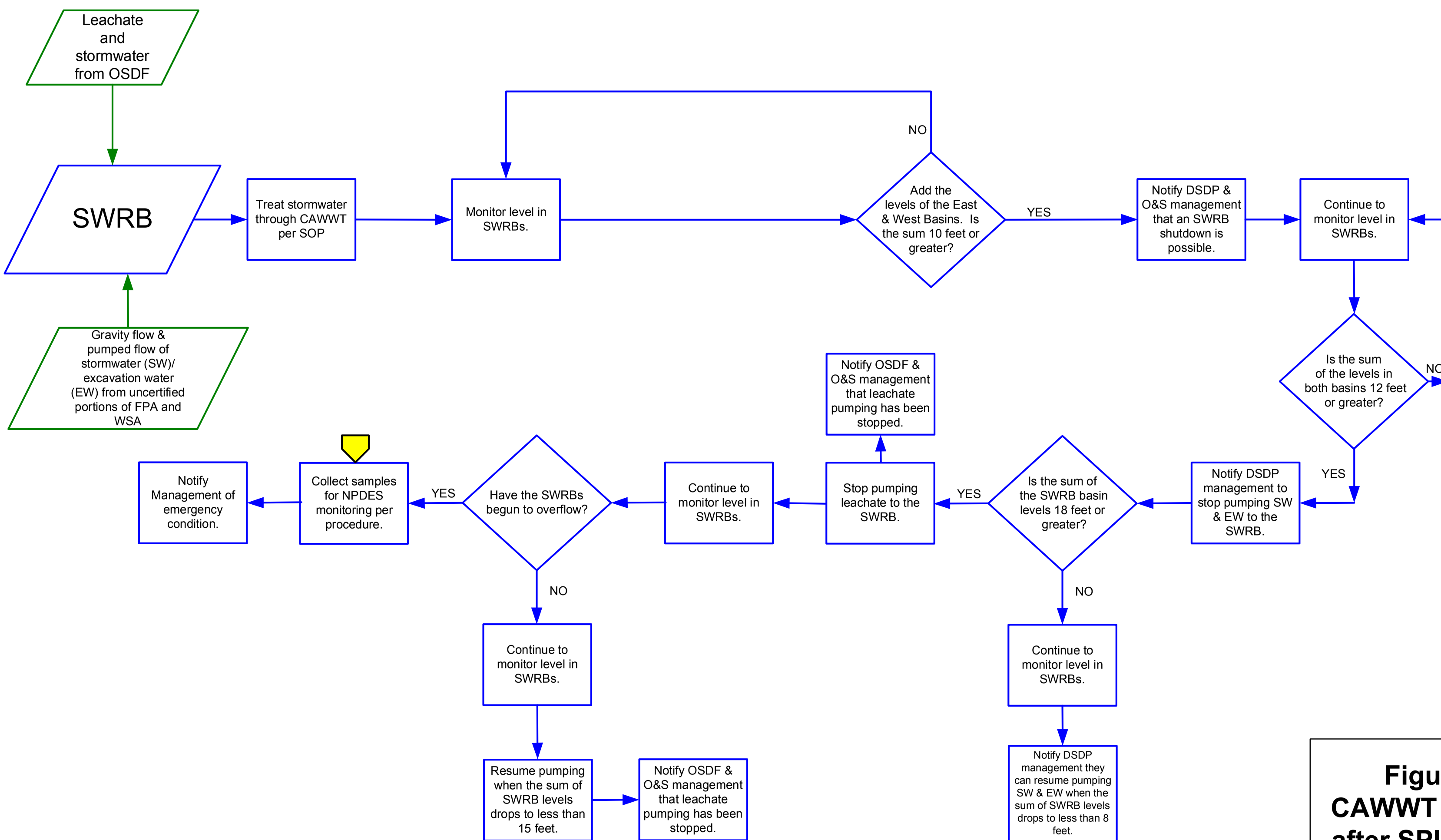

Figure 5-1C CAWWT Operations after SPIT & IAWWT Shutdown

6.0 OPERATIONS AND MAINTENANCE METHODS

This section describes the general methods, guidelines, and practices used in managing equipment operation and maintenance. Managing equipment operation and maintenance in the context of this document includes not only routine control panel monitoring and repair work, but also the preventive, predictive, and proactive actions used to maximize equipment operating efficiency and capacities. This section presents some of the management systems that will help to assure that the Operable Unit 5 Record of Decision requirements are met, describes the key parameters used to monitor the performance of the groundwater and wastewater facilities, and describes the principal features and maintenance needs of the overall operation.

The treatment and restoration well system performance parameters and maintenance requirements have unique differences. The treatment systems are designed and built with many redundant features and equipment to reduce potential downtime (e.g., installed spare pumps and ion exchange units). Those features are not economically practical for the well systems. The equipment in the treatment systems has more easily discernible indicators of equipment condition and is more easily accessed for monitoring by operator walk-through than the underground well system. The methods used to measure the equipment condition and the specific measurable goals for the two systems also are different.

6.1 MANAGEMENT SYSTEMS

6.1.1 Maintenance and Support

The maintenance and operations groups are responsible for routine repairs, preventive maintenance, and minor modifications and improvements needed to maintain the operational capability of Fernald site wastewater treatment facilities. Full-time maintenance supervision and skilled, qualified craftsmen (pipe fitters, welders, millwrights, electricians, instrumentation technicians, and asset preservation specialists) are headquartered in a combination shop/storage/office facility inside of Building 51. The maintenance and operations groups work together closely on a day-to-day basis, promoting a sense of ownership and cooperation between the operators and maintainers of this system.

The technical staff directly supports facility operation and maintenance, and includes chemical and civil engineers, geologists and hydrogeologists, quality assurance, health, safety, and environmental compliance personnel. The technical staff works together to resolve issues and improve operations. They also provide troubleshooting and technical assistance to the day-to-day operations and maintenance groups.

Key responsibilities of the central maintenance group include developing preventive maintenance schedules, developing spare parts inventories, developing maintenance work instructions, and administering the sitewide computerized maintenance database. Specific engineering discipline skills may be utilized from the sitewide facilities engineering group for specific maintenance needs (for example, structural analysis, electrical power distribution design, and instrumentation system configuration). All work involving a modification is reviewed by knowledgeable, technical staff members to ensure that it is appropriate. All maintenance work is formally planned and scheduled, except for emergency repairs, which are handled in a safe, expeditious manner. Major system maintenance turnarounds are planned in detail to help minimize the duration of system outages.

The facilities consist of standard gravel-packed water wells and conventional water and wastewater treatment unit processes that are typical for the industry. It may be expected to have good reliability and has well-documented maintenance guidelines. Routine maintenance practices, as documented by the original equipment manufacturer's maintenance manuals, have been used to provide the basis for Fernald site maintenance procedures and practices. A spare parts inventory (developed from original equipment manufacturer's recommendations) is maintained to expedite the completion of equipment repairs.

6.1.2 Operations

Operating personnel play an important role in maximizing equipment operating efficiency and capacity. One significant duty of the facility operators is to identify and report existing and potential future equipment problems. Operators perform routine scheduled checks, inspections, and walk-throughs of the facilities and systems. Potential problems and maintenance needs are reported to supervision and maintenance work orders are initiated. Operators and Shift Supervisors maintain shift logbooks that document activities and specific actions taken during each shift. Information in the logbooks is used as the basis for transfer of duty from one shift to the next. The logbooks are kept as a historical record of operational activities. Management and technical staff periodically review the logbooks and roundsheets as additional assurance that the systems are being effectively operated.

6.1.2.1 Process Control

Facilities are staffed by operators and shift supervisors around the clock (24 hours per day, seven days per week, 365 days per year). The operators at AWWT and the SDF monitor the process using a computerized control system located in control rooms. The control system receives input from process meters (e.g., tank level and process flow meters) and from devices that indicate equipment status (e.g., valve position limit switches and motor run relays). The control system outputs control signals to regulate the process (e.g., control valve positioning and motor start/stop control). The control system uses desktop-style computer equipment (monitors, keyboards, and pointing devices) to provide a graphic operator-machine interface for the process monitoring and control. The control system operator interface includes various process graphics screens depicting portions of the treatment system in piping and instrumentation diagram format and providing real time process measurements and information. The control system has graphic process trending capabilities, process alert and alarm management, and an historical database of all operator inputs and process alert/alarms. The control system also provides an interface with new and existing well systems to provide enhanced real time monitoring and remote controls. The operators at AWWT, CAWWT, and SDF also access process and equipment information by making "walking rounds" of all equipment in the process.

The other facilities have more traditional control panels or local control boards at the equipment. Operators at all the other facilities perform walking rounds to ensure correct operation of all equipment. Information collected during the walking rounds is documented on rounds sheets, which are reviewed each shift by the shift supervisor. If any unusual conditions are observed during the walking round, the operator immediately notifies the Shift Supervisor and appropriate corrective actions are taken.

6.1.2.2 Standard Operating Procedures

Each operation is performed in accordance with approved Standard Operating Procedures that are developed by the technical staff with the assistance of operations personnel. The Standard Operating Procedures are reviewed periodically and revised as necessary for the safe and consistent operation of treatment processes. A list of current these procedures is contained in Appendix A. The list is current as of the writing of this OMMP. The number of procedures will be reduced as facilities are shut down and the procedures are canceled.

Standard Operating Procedures provide step-by-step instructions for performing wastewater treatment operations activities. They also contain health and safety precautions that must be followed while performing the steps contained in the procedure. The procedures are written from the perspective of the operator who will be performing the steps.

Standard Operating Procedures also contain instructions as to when management must be notified of non-routine operating conditions or events and to whom in management these conditions must be reported. Reporting of these conditions or events to site management and to outside agencies is discussed in Section 7.0 of this OMMP.

6.1.2.3 Conduct of Operations

The DOE Conduct of Operations standards (DOE 2001c) are implemented for operations and maintenance through Standing Orders. The Standing Orders spell out the specific methods used by the project for the implementation of all 18 chapters of DOE 5480.19. The chapter titles (which are indicative of the important operational protocol) are Operations, Organization, and Administration; Shift Routines and Operating Practices; Control Area Activities; Communications; Control of On-Shift Training; Investigation of Abnormal Events; Notifications; Control of Equipment and System Status; Lockouts and Tagouts; Independent Verification; Log Keeping; Operations Turnover; Operations Aspects of Facility Chemistry and Unique Processes; Required Reading; Timely Orders to Operators; Operations Procedures; Operator Aid Postings and Equipment; and Piping Labeling. Implementation of the Standing Orders helps to assure clarity, consistency, and a common purpose in the day-to-day activities.

6.1.2.4 Training

A training and qualification program exists to ensure that all operating personnel involved in treating wastewater are qualified and competent for their positions. The goal of the training and qualification program is to prepare personnel for the operations team and to continually improve the team's knowledge and capabilities. The program consists of two major elements. An initial training program leads to operator qualification in wastewater treatment facilities. A continuing training program provides a means to update team members on changes to regulations, equipment, and procedures as well as information and exercises to improve understanding and performance. Along with the in-house training programs, the operators and supervisors of the wastewater systems affirm their competence through the requirement that they possess a Class I (or higher) wastewater operator's license.

6.1.2.5 Self-Assessments

Verification that personnel are operating according to Standard Operating Procedures is accomplished through self-assessments and audits. Self-assessments are performed regularly to ensure that the Standard Operating Procedures accurately reflect current operating conditions, and to ensure that operations personnel are following the Standard Operating Procedures. Independent audits are performed to ensure that all activities in the wastewater treatment facilities are performed in accordance with internal and external requirements. The results of the self-assessments and audits are used to revise and update procedures and to improve performance of activities involved in wastewater treatment.

6.1.2.6 Oversight

In general, a much greater level of control and oversight exists in government work than that found in the private sector. In-depth safety review and analysis, job-specific health and safety plans and procedures, execution of internally generated permits, and careful reliance on personal protective equipment are used to help reduce employee exposures to risks, to levels as low as reasonably achievable. This level of control requires formal, written documentation, analysis, and justification, lengthier authorization and approval chains, and a greater need to create and to ensure strict adherence to fixed rules and procedures.

6.2 RESTORATION WELL PERFORMANCE MONITORING AND MAINTENANCE

This section describes the key performance monitoring and maintenance guidelines for the groundwater restoration well systems. To complete the aquifer restoration within the accelerated schedule, a high level of on-stream time at the modeled pumping rates is needed for each individual well. Some well downtime is expected and can be accommodated. However, lengthy outages can adversely impact the planned goals. An upgraded well maintenance program has been developed to address this issue. More frequent component preventive maintenance checks along with periodic formal performance testing and well chlorination were identified and included as major program elements to improve well operating efficiency. The following sections provide a description of the highlights of the planned well maintenance program that is detailed in Appendix B.

6.2.1 Operational Monitoring and Performance Testing

The main system performance indicators for the wells will be gathered and summarized using formal performance tests to monitor the recovery well specific capacity and the pump/motor assembly performance. The test results will be used to determine the need for well redevelopment or pump/motor rebuilding. The information will help to minimize unscheduled, unplanned emergency maintenance and will help to shorten the duration of well outages. System operating parameters that will be routinely monitored include: 1) water level - static and pumping; 2) flow; 3) discharge pressure; and 4) motor amperage draw.

Water level, both static and pumping, will be measured periodically to detect significant changes. The drawdown from static water level to the pumping water level, compared to historical drawdown for an individual well, is an indication of the degree of fouling of the well screen and the surrounding formation. The vertical placement of the recovery well pump/motor assemblies is fixed, based upon an anticipated worst-case drawdown that is below the seasonal low-static water levels. While each pump setting has some added submergence to be conservative, pumping levels need to be routinely monitored in order to ensure that adequate pump/motor submergence is maintained and to prevent severe component damage. Each recovery well has an installed pressure transducer that can be linked to an automated data logger. These pressure transducers are located approximately one foot above the pump bowl assembly, well above the required minimum submergence for the pump intake. As long as the pumping water level is maintained above the transducer, adequate pump intake submergence is assured. If the pumping water level above the pressure transducer approaches zero head (i.e., begins to approach the still acceptable level of one foot above the bowl assembly), well/screen maintenance actions will be taken.

Performance testing of the wells is anticipated to require an outage of approximately four-hours each. Until an adequate historical database is developed, the testing is planned to be conducted for each well on a quarterly basis. It is planned to measure static water level, then pump flow, discharge pressure, pumping water level, and motor amperage for at least five different flow rates for each performance test of a well.

The results of the performance measurements will be used to determine the condition of the pump/motor and of the well. The flow and discharge head will be plotted and compared to the manufacturer's pump curve and to previously developed head/flow curves. The amperage draw of the well's pump motor at various flows will also be compared to previous readings and pump/motor manufacturer published information. The static water level and pumping levels will be used to calculate drawdown and specific capacity (flow rate divided by drawdown) within the recovery well at various flows. As fouling and encrustation of the well progresses, drawdown within the well will increase for a given flow rate (the specific capacity will decrease). The need for well screen maintenance activities will be triggered by excessive drawdown. Maintenance work will be planned, scheduled, and performed to avoid costly damage to equipment such as the recovery well pump/motor assembly and to avoid lengthy unplanned outages.

6.2.2 Routine Well/Screen Maintenance

Well/screen routine maintenance is required to maximize system overall on-stream time and to minimize recovery well drawdown and the need for major rehabilitation. The recovery wells will be superchlorinated by the addition of sodium hypochlorite (an industrial strength bleach with 12.5 percent available chlorine). This is a common practice in the well water supply industry. The chlorination will serve to deter bacteria growth and buildup on the screen and in the local formation and will serve to increase long-term well production. The procedure will be performed on each well on a scheduled basis or when pumping drawdown exceeds 8 feet. It is anticipated to require an outage of 72 hours for each recovery well. Routine well superchlorination is currently being performed on a semi-annual basis. It is anticipated that periodic, major rehabilitation efforts will be required every few years, when the drawdown within the well becomes excessive and the superchlorination procedure is not adequately effective.

The basic procedure includes well shutdown, removal of the well cover, feed of a calculated quantity of sodium hypochlorite, well surging by pump stop and start, and a hold time to allow the sodium hypochlorite to react and dissipate. The hypochlorite quantity will be calculated to yield about 2000 to 3000 milligrams per liter (mg/L) available chlorine in the volume of water within the well screen assembly (between the static water level and bottom of the well screen). The reaction/dissipation time will be 24 to 72 hours, during which the free chlorine residual is expected to fall to acceptable limits. It is anticipated that the water initially pumped from a superchlorinated well will contain turbidity and scale. The water quality of this discharge will be documented and controlled through the internal procedure for discharge of miscellaneous wastewater sources to treatment systems (Fluor Fernald, Inc, 2003b). Sampling and analysis of this water will be performed in order to document its chlorine content If, after superchlorination, the drawdown remains excessive, more extensive rehabilitation efforts will be required.

6.3 TREATMENT FACILITIES PERFORMANCE MONITORING AND MAINTENANCE

This section describes the key performance monitoring parameters and maintenance needs for the wastewater treatment systems and their ancillary facilities. Meeting the Fernald site effluent discharge uranium limit of 30 ppb on a monthly average basis within the accelerated schedule is an ambitious undertaking. The experience that has been gained in operating the various Fernald site systems provides an increased confidence level that the limit may routinely be met. Round-the-clock vigilance and wise decision-making will be needed to ensure compliance.

6.3.1 Treatment Facilities Performance Monitoring

All of the Fernald site's wastewater treatment systems use strong base-anion exchange as the final unit process for uranium removal. The strong base-anion exchange resins have a very strong affinity for the uranyl carbonates in the Fernald site's wastewater. The technology is reliable; however, treatment to the effluent levels required at the Fernald site (i.e., < 30 ppb) is not widely practiced in wastewater systems. An expected performance of the various Fernald site treatment systems has been used in this plan to demonstrate the ability to meet the Record of Decision effluent requirements. The performance expectations are, for the most part, based on historical Fernald site operating experience, utilizing new resin, as opposed to vendor performance guarantees or widely published data.

Measurable parameters for the Fernald site treatment systems are the total volume of water treated, the influent and effluent uranium concentrations and mass, and the total mass of uranium removed by treatment. The Fernald site total effluent flow rate is metered. Flow weighted composite samples of the effluent are analyzed daily for total uranium. Those two parameters are used to measure compliance with the Operable Unit 5 Record of Decision requirements for uranium discharge in the Fernald site's effluent. Additionally, each individual wastewater treatment train has flow measurement and control. The individual treatment systems are also routinely sampled at strategic process locations, including the inlet and outlet of each ion exchange vessel. The sample results and treatment flow rates are reported, tracked, and used to determine the need for troubleshooting, process adjustments, and corrective actions. A daily summary sheet of all aquifer restoration and wastewater process data, including individual well and treatment system total flows and treatment train uranium inlet and outlet concentrations, is published and distributed to the project's management and technical staff. All of the routine uranium analytical work is conducted in a laboratory located within the AWWT, Building 51A.

6.3.2 Treatment Facilities Maintenance Practices

The CAWWT and AWWT expansion systems are designed with only two ion exchange units per train. Normally, both units in a train operate in series. For short-duration shutdowns of a single vessel (e.g., backwashing, resin regeneration, minor maintenance, etc.), flow will be routed through one ion exchange unit only. Long-duration outages of a single vessel may necessitate specific well shutdowns, depending on the overall system performance and on the performance of the affected train. The two-vessel-per-train configuration was selected during the project's design to provide a higher total system capacity and better equipment utilization within the remaining serviceable space in Building 51.

As described above, much of the routine preventive maintenance and repair work in the treatment systems can be accomplished without a unit shutdown, because of the installed spare equipment and bypass piping and valving. There are some planned maintenance activities that will result in treatment system outages. The Operable Unit 5 Record of Decision provides for relief allowances from the effluent discharge limit of a monthly average of 30 ppb uranium concentration during periods of treatment plant scheduled maintenance. Decisions regarding well operations during treatment plant scheduled maintenance will be made on a case-by-case basis. For planned maintenance shutdowns, advanced EPA approval will be obtained for relief allowances that may be requested.

Some breakdowns will lead to system shutdowns. Loss of utilities or a failure in the AWWT's computerized control system would result in a system shutdown. All treatment systems will fail safely on loss of a utility or a major component and are not very complicated to restart. Spare parts inventories follow the original equipment manufacturer's recommendations and a corps of experienced, skilled craftsmen is available for emergency repairs in the treatment systems.

7.0 ORGANIZATIONAL ROLES, RESPONSIBILITIES, AND COMMUNICATIONS

This section presents the organizational roles and responsibilities with respect to implementation of this OMMP. Also presented are information needs and communications protocol for coordination with other Fernald site project organizations, and interaction with the EPA and OEPA.

7.1 ORGANIZATION ROLES AND RESPONSIBILITIES

7.1.1 DOE Fernald

The DOE is responsible for providing direction and oversight of all activities at the Fernald site.

7.1.2 Operating Contractor

Fluor Fernald Inc., is the operating contractor for the Fernald site. The OMMP falls under the responsibility of two projects within Fluor Fernald Inc.: 1) the DSDP; and 2) the OSP. Specifics are provided below.

The Aquifer Restoration/Water Management (AR/WM) team within DSDP is responsible for all engineering design and construction activities for the OMMP which include:

- Engineering functional requirements, design basis, and detailed design drawings and documents
- Title III engineering support during construction (in conjunction with WTO)
- Start-up Plans, System Operability Test procedures, and test supervision (in conjunction with WTO)
- Standard Start-up Review Plans and coordinate resolution of issues (in conjunction with WTO)
- Technical support to Operations
- Coordination of project-specific activities associated with procurement and management of construction contractors.

The Aquifer Restoration/Water Management team is also responsible for all aquifer restoration planning and environmental monitoring/reporting activities within the project, which include:

- Developing and maintaining the aquifer restoration strategy
- Developing and implementing remedy performance groundwater monitoring, data evaluation, and reporting
- Technical input to WTO on recovery well operation and maintenance
- Technical input to WTO regarding compliance with discharge limits
- Technical input to design and construction of site groundwater extraction/injection systems
- Preparation of required CERCLA documentation (e.g., RA Work Plan, aquifer remedy design documents, the IEMP groundwater section, and various other required reports).

Environmental Compliance personnel are responsible for:

- Fulfilling site NPDES reporting requirements
- Analysis of state and federal regulations to identify project-specific regulatory requirements

The WTO team within OSP is responsible for all operations and maintenance activities within the project, which include:

- Operations of groundwater extraction and injection well systems
- Operation of all site wastewater treatment systems and their ancillary facilities
- Estimate, plan, and execute corrective and preventative maintenance
- Training and qualification of operators and supervisors
- Develop, review and revise Standard Operating Procedures
- Sampling and analysis of process streams for compliance with operational parameters and established regulatory limits.

The Safety and Health team within DSDP and OSP is responsible for Safety and Health activities within the project, which include:

- Development and revision of Safety and Health Project matrices for operations and construction
- Radiological monitoring of activities
- Industrial health monitoring of activities
- Oversight of construction and operations safety programs
- Safety design reviews and technical input.

The Project Controls teams within DSDP and OSP is responsible for:

- Project cost and schedule baseline development and maintenance
- Monthly performance and variance reporting to DOE
- Estimate at completion funding analysis and reporting
- Change proposal and cost savings coordination
- Project quality assurance oversight.

7.2 INTEGRATION WITH OTHER PROJECT ORGANIZATIONS

Wastewater Acceptance Guidelines have been developed to assist the Fernald site remediation projects in identifying wastewater issues and concerns. The AR/WM team along with WTO will continue to: 1) work with the projects to obtain best estimates of water quality and quantity data during the design review process; 2) apply the guidelines to these estimates to identify areas of concern; and 3) interface with the projects to develop an awareness of the functions and capabilities of existing and planned site-wide water treatment facilities and handling operations. As noted above, this integration occurs during design reviews. These reviews include as necessary, comment resolution meetings and alignment sessions. Integration with the other projects also will occur as necessary to maintain adequate storage capacity in the SWRB in order to ensure no bypassing/overflow of the basin – after the SWRB becomes the headworks for leachate from the OSDF (See Section 5).

7.3 REGULATORY AGENCY INTERACTION

Interaction with EPA and OEPA regarding the OMMP initially occurs during the review and comment resolution process for the document. Future versions of the OMMP will also be submitted for review and will go through a review and comment resolution process similar to this submittal. As noted in Sections 1.0 and 3.0, the IEMP provides for the collection and reporting of groundwater remedy performance (IEMP Section 3.0) and treated effluent (IEMP Section 4.0) information that supports operational decisions regarding groundwater restoration and water treatment.

The current plan is that well field and treatment operational summaries are included in the IEMP reporting process. These summaries allow for agency input as aquifer restoration and water treatment progress. In addition, the NPDES and Federal Facilities Compliance Agreement reporting will continue as outlined in Section 4.0 of the IEMP. The AR/WM and WTO participation in meetings and weekly conference calls will continue as necessary.

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APPENDIX A

AQUIFER RESTORATION AND WASTEWATER TREATMENT STANDARD OPERATING PROCEDURES

AQUIFER RESTORATION AND WASTEWATER TREATMENT STANDARD OPERATING PROCEDURES

PROCEDURE NO.	FILENAME
20-C-510	REMOVAL, TRANSPORT, AND STORAGE OF DECANT SUMP LIQUID FROM K-65 SILOS 1 AND 2
43-C-100	CLEANING GLASS AND PLASTIC LABORATORY WARE
43-C-101	STORING AND HANDLING CHEMICALS
43-C-102	SAMPLE PRESERVATION BY ACID ADDITION
43-C-104	HORIBA WATER QUALITY METER CALIBRATION, OPERATION, AND MAINTENANCE
43-C-105	ION EXCHANGE RESIN SLUICING AND ADDITION - SOUTH PLUME INTERIM TREATMENT (SPIT) SYSTEM
43-C-107	K-65 AREA ROUNDS AND OPERATIONS
43-C-108	IEMP SURFACE WATER SAMPLING
43-C-305	WATER PLANT LABORATORY PROCEDURES
43-C-306	STORM SEWER LIFT STATION
43-C-308	RESPONDING TO INDICATIONS OF OUT-OF-SPECIFICATION EXCURSIONS OF STORM SEWER WATER QUALITY
43-C-326	STORMWATER RETENTION BASIN CONTROL SYSTEM OPERATION
43-C-332	OPERATION OF THE HACH DR/3000 SPECTROPHOTOMETER
43-C-335	IAWWT (STORMWATER RETENTION BASIN) SYSTEM OPERATION
43-C-337	WASTE PIT AREA STORMWATER RUNOFF CONTROL SYSTEM OPERATION
43-C-340	AWWT PHASE I AND II OPERATIONS
43-C-341	ADVANCED WASTE WATER TREATMENT BASELINE VALVE LINE-UP
43-C-343	ADVANCED WASTE WATER TREATMENT (AWWT) BULK CHEMICAL SYSTEMS
43-C-344	AWWT SUMPS OPERATIONS AND RESPONSE TO CHEMICAL SPILLS
43-C-345	REGENERATION, SLUICE IN AND OUT OF ION EXCHANGE RESIN FOR AWWT PHASES I AND II
43-C-347	AWWT EMERGENCY SHOWER SYSTEM OPERATION
43-C-348	AWWT HEATING, VENTILATION AND AIR CONDITIONING SYSTEM OPERATION
43-C-349	AWWT PROCESS ARE MAKE-UP AIR SYSTEM OPERATION
43-C-350	AWWT STEAM AND CONDENSATE SYSTEM OPERATIONS
43-C-353	AWWT TREATED WATER SYSTEM OPERATION
43-C-356	RECEIVING SLURRIES AND CHEMICALS AT THE AWWT SLURRY DEWATERING FACILITY
43-C-357	PRETREATMENT OF MISCELLANEOUS SLURRIES AT THE AWWT SLURRY DEWATERING FACILITY
43-C-358	THICKENING, FILTRATION, AND DISCHARGE AT THE AWWT SLURRY DEWATERING FACILITY
43-C-359	PRETREATMENT OF AWWT SLURRY AT THE AWWT SLURRY DEWATERING FACILITY
43-C-360	BASELINE VALVE LINE-UP FOR THE AWWT SLURRY DEWATERING FACILITY
43-C-361	BUILDING UTILITIES AT THE AWWT SLURRY DEWATERING FACILITY
43-C-362	CLEANING SAMPLE TUBES AT THE AWWT
43-C-364	BACKWASHING IAWWT ION EXCHANGE VESSELS
43-C-365	LEACHATE CONVEYANCE SYSTEM OPERATION
43-C-367	AWWT EXPANSION (PHASE III 1800 GPM) SYSTEM OPERATIONS
43-C-368	NEW SEWAGE TREATMENT PLANT OPERATIONS
43-C-369	OPERATION OF EXTRACTION AND REINJECTION WELLS AT THE AWWT DCS
43-C-370	STARTUP AND SHUTDOWN OF AWWT PHASE I AND II OPERATIONS
43-C-371	SLUDGE DREDGE OPERATIONS
43-C-412	MANAGEMENT OF THE WATER COVER FOR WASTE PIT 6
43-C-413	HANDLING WASTE MATERIALS WITH THE INDUSTRIAL VACUUM LOADER TRUCK (SUPERSUCKER)
43-C-414	INDUSTRIAL VACUUM LOADER TRUCK (SUPERSUCKER) OPERATION
43-C-421	ION EXCHANGE RESIN SLUICING AND ADDITION FOR THE IAWWT (STORMWATER RETENTION BASIN) SYSTEM
43-C-502	INDUSTRIAL VACUUM LOADER TRUCK (GUZZLER) OPERATION

AQUIFER RESTORATION AND WASTEWATER TREATMENT STANDARD OPERATING PROCEDURES (Continued)

PROCEDURE NO.	FILENAME
43-C-505	ENVIRONMENTAL SAMPLING AT THE SEWAGE TREATMENT PLANT AND THE PARSHALL FLUME
43-C-601	INSPECTION/OPERATION OF SURFACE IMPOUNDMENTS
43-C-701	GENERAL SUMP OPERATION
43-C-903	SOUTH PLUME INTERIM TREATMENT (SPIT) SYSTEM OPERATION
43-C-904	RECOVERY WELL FIELD
43-M-1001	DISSOLVED OXYGEN (DO) AZIDE MODIFICATION OF WINKLER METHOD
43-M-1002	DISSOLVED OXYGEN (DO), MEMBRANE ELECTRODE METHOD
43-M-1003	DPD METHOD FOR FREE AND TOTAL CHLORINE TEST
43-M-1004	TOTAL COLIFORM TESTING BY MEMBRANE FILTER METHOD
43-M-1005	FECAL COLIFORM TESTING OF WATER BY MEMBRANE FILTER METHOD
43-M-1006	BRPADAP TEST FOR SOLUBLE URANIUM BY SPECTROPHOTOMETER
43-M-1007	ALKALINITY (TOTAL AND PHENOPHALEIN) TESTING OF WATER
43-M-1008	TOTAL HARDNESS TESTING OF WATER BY EDTA TITRIMETRIC METHOD
43-M-1009	TOTAL PHOSPHORUS TESTING OF WATER BY ASCORBIC ACID METHOD WITH PERSULFATE PREDIGESTION
43-M-1010	STABILITY TEST OF WATER BY SATURATION WITH CALCIUM CARBONATE
43-M-1011	PH (HYDROGEN ION) TESTING OF WATER BY ELECTROMETRIC METHOD
43-M-1012	CONDUCTIVITY/RESISTIVITY TESTING OF WATER BY ELECTROMETRIC METHOD
43-M-1013	SPECTROPHOTOMETRIC TEST FOR NITRATES IN WATER USING MODIFIED CADMIUM REDUCTION METHOD
43-M-1014	TOTAL SUSPENDED (NON-FILTERABLE) SOLIDS IN WATER
43-M-1015	TOTAL DISSOLVED (FILTERABLE) SOLIDS IN WATER
43-M-1016	IGNITION TEST FOR VOLATILE AND FIXED SOLIDS IN WATER
43-M-1017	TOTAL SOLIDS IN WATER
43-M-1018	VOLUMETRIC MEASUREMENT OF SETTLEABLE SOLIDS IN WATER
43-M-1020	CHEMICAL OXYGEN DEMAND OF WATER BY REACTOR DIGESTION METHOD WITH COLORIMETRIC DETERMINATOR
43-M-1021	BICINCHONINATE METHOD FOR TESTING COPPER IN WATER BY SPECTROPHOTOMETER
43-M-1022	QUALITY TESTING OF REAGENT-GRADE WATER
43-M-1023	BIOCHEMICAL OXYGEN DEMAND (BOD) AND CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND (CBOD)
43-M-1024	DETERMINATION OF URANIUM IN WATER: UA-3 LASER INDUCED PHOSPHORESCENCE
43-M-1025	AMMONIA NITROGEN IN WATER BY THE NESSLER METHOD
43-M-1026	IRON IN WATER BY 1,10 PHENANTHROLINE METHOD
43-M-1027	SULFATE IN WATER BY SULFAVER4 METHOD
43-M-1028	NITRATE ION-SELECTIVE ELECTRODE METHOD
43-M-1029	HEXAVALENT CHROMIUM BY COLORIMETRIC METHOD (DR3000)
43-M-1030	FLUORIDE BY ION-SELECTIVE ELECTRODE METHOD
43-M-1031	SOLUBLE URANIUM BY KINETIC PHOSPHORESCENCE ANALYZER (KPA)
43-M-1032	PH TESTING OF WATER BY ELECTROMETRIC METHOD WITH ORION 920A
43-M-1033	PH (HYDROGEN ION) TESTING OF WATER USING ORION 420A
43-M-1034	DETERMINATION OF SPECIFIC GRAVITY USING AN ANALYTICAL BALANCE
43-M-1035	DETERMINATION OF SPECIFIC GRAVITY - DMA-35 DENSITY METER
43-M-1036	WATER TEMPERATURE OF FEMP WASTEWATER
M-123	STANDING ORDERS FOR AWWT OPERATIONS
M-137	WATER TREATMENT PLANT LABORATORY QUALITY ASSURANCE PLAN
M-140	FACILITIES CLOSURE AND DEMOLITION PROJECTS DIVISION PROCEDURE SYSTEM
PO-S-04-006	AERATION FACILITY

APPENDIX B

GROUNDWATER RESTORATION WELL PERFORMANCE MONITORING AND MAINTENANCE PLAN

GROUNDWATER RESTORATION WELL PERFORMANCE MONITORING AND MAINTENANCE PLAN

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

JUNE 2004

U.S. DEPARTMENT OF ENERGY

51400-OM-0001
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GROUNDWATER RESTORATION WELL PERFORMANCE MONITORING AND MAINTENANCE PLAN

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

JUNE 2004

U.S. DEPARTMENT OF ENERGY

FINAL

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1.0 INTRODUCTION

The objective of this Performance Monitoring and Maintenance Plan (PMMP) is to document planned maintenance and monitoring requirements for the groundwater restoration wells to support successful long-term operation of the groundwater restoration system. The activities described within this document will become the basis for providing routine maintenance of the extraction wells comprising the various modules of the system and for monitoring system performance to determine if more extensive maintenance activities are required. Regularly scheduled maintenance of components of the restoration well system is required so that the difficulties associated with continuous operation will be minimized and thus manageable with the resulting system's online time maximized. Continuous operation of the well system, within practical limitations, is required to maintain groundwater restoration objectives at the FCP.

Periodic revision of this document will be necessary as additional operating experience is gained and the various new modules of the groundwater restoration system are activated.

2.0 RESTORATION WELL DESCRIPTIONS

This section provides a general description of the extraction wells comprising the active groundwater restoration modules that are covered by this monitoring and maintenance plan. The active modules are the South Plume, South Field, and the Waste Storage Area.

2.1 SOUTH PLUME EXTRACTION WELLS

The South Plume Module includes six wells that are used to pump groundwater from the off-property portion of the Great Miami Aquifer plume to the FCP Site's South Field valve house. In the valve house, the flow from the south plume is routed to treatment or to the Great Miami River as necessary, to maintain compliance with discharge limitations. These wells are as follows:

Extraction Well ID	Common Well ID	Formal Site Well ID
Extraction Well 1	RW-1	3924
Extraction Well 2	RW-2	3925
Extraction Well 3	RW-3	3926
Extraction Well 4	RW-4	3927
Extraction Well 6	RW-6	32308
Extraction Well 7	RW-7	32309

Each of the South Plume extraction wells contains a submersible pump/motor assembly and has a pitless type adapter near the ground surface that transitions the vertical pump discharge piping to the underground force main. The underground force main from wells RW-1, RW-2, RW-3, and RW-4 passes through individual underground valve pits. These valve pits contain several components of the individual wells control system. RW-6 and RW-7 do not utilize underground valve pits to contain any control system components. All control components for these two wells are located in the South Plume Valve House building.

The design of the flow control systems for each of these six wells is identical; flow is controlled by a flow control loop consisting of a magnetic flow meter, a process control station (PCS), and a motor operated flow control valve. Each well can be controlled locally by the PCS or remotely by the computerized control system located at CAWWT. The normal operational mode is to have the wells operated remotely from the CAWWT computer control system, via the local PCS. Additionally, a local set point is input to the PCS so that the well can automatically revert to local control if communication with the CAWWT computer control system is interrupted.

The desired flow rate set point for each is entered into the computer control system and PCS at the CAWWT and the South Plume Valve House respectively. This value is compared continuously to the actual flow measured by the magnetic flow meter. When required, the CAWWT computer control system or PCS adjusts the position of the flow control valve to maintain the desired flow. Pump AStart@ and AStop@ can be controlled by the DCS or the PCS and can also be controlled from the pump starter panel. The starter panels for RW-1 through RW-4 are located at the individual well heads while the starter panels for RW-6 and RW-7 are located in the South Plume Valve House.

In addition, each of the South Plume extraction wells is equipped with isolation valves, check valves, air releases and pressure indicating transmitters. The pressure indicating transmitters are tied to process interlocks that will shut the pumps down if high or low pressures are maintained for extended periods indicating a closed valve or catastrophic system leak respectively. This interlock is intended to protect the pump/motor assemblies from damage due to closed discharge valves or to shut down the pumps if no system back pressure is sensed. Critical control components are protected by lightning/surge arresters to prevent damage to the control system during electrical storms.

Routine water level monitoring within the well is performed during regularly scheduled performance monitoring and more frequently if required.

Installation details of the South Plume extraction wells are shown in Figure 1.

2.2 SOUTH FIELD AND WASTE STORAGE AREA EXTRACTION WELLS

The South Field and Waste Storage Area (WSA) Modules currently include thirteen and two wells, respectively, that are used to pump groundwater from the Great Miami Aquifer to the FCP Site water treatment facilities or to the Great Miami River if treatment is not required to achieve discharge limitations.

These wells are as follows:

Extraction Well ID	Common Well ID	Formal Site Well ID
Extraction Well 15A		
Extraction Well 17		
Extraction Well 18	EW-15A	33262
Extraction Well 19	EW-17	31567
Extraction Well 20	EW-18	31550
Extraction Well 21	EW-19	31560
Extraction Well 22	EW-20	31561
Extraction Well 23	EW-21	31562
Extraction Well 24	EW-22	3227632447
Extraction Well 25	EW-23	32446
Extraction Well 30	EW-24	33061
Extraction Well 31	EW-25	33264
Extraction Well 32	EW-30	33265
WSA Well 26	EW-31	33266
WSA Well 27	EW-32	32761
	EW-26	33062
	EW-27	

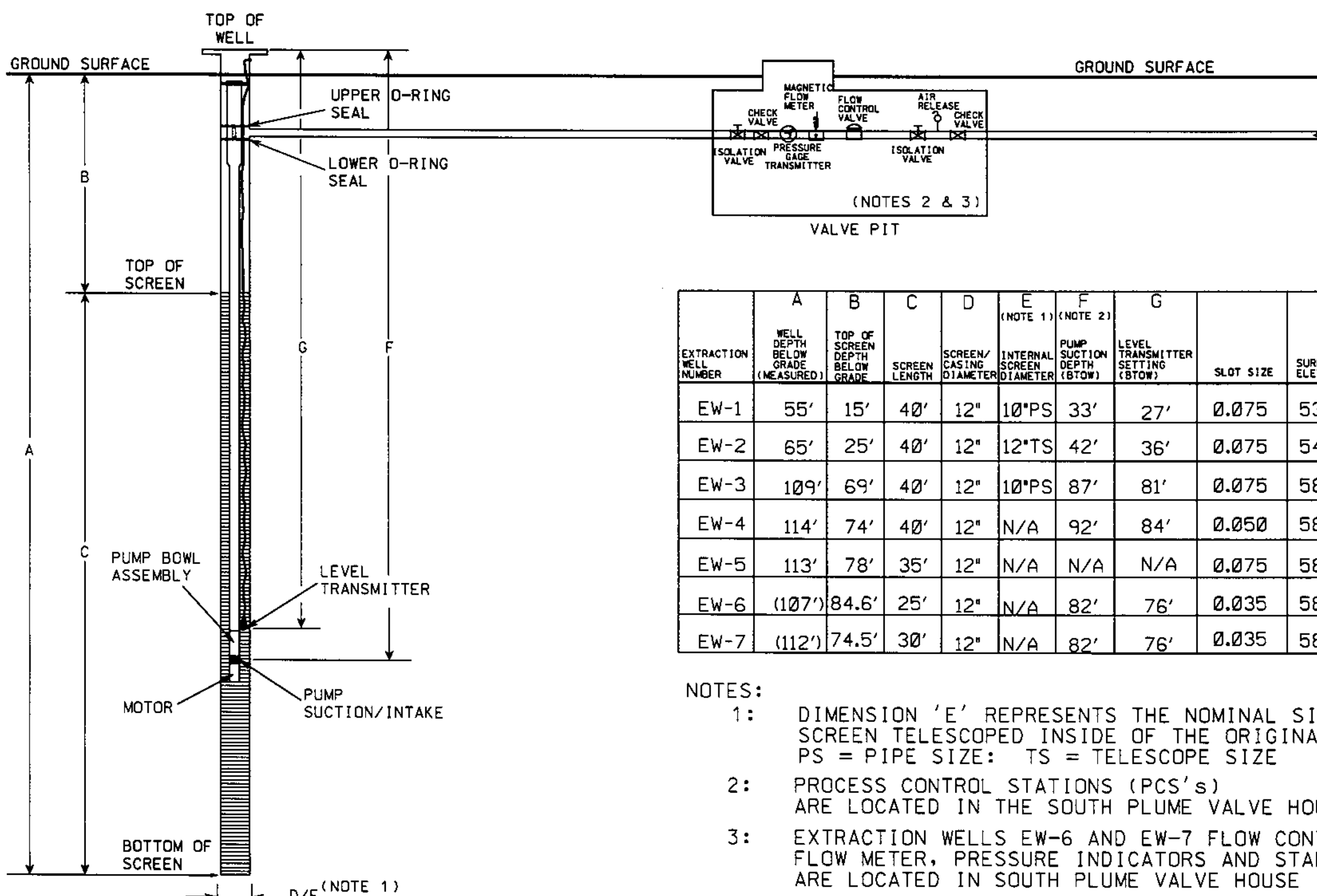
Each of the thirteen South Field and two Waste Storage Area extraction wells is of similar design with the exception of the well depth, screen length, and screen slot size. Each contains a submersible pump/motor assembly. Groundwater is pumped from the below grade pump to the well head at the ground surface via the vertical discharge piping. At the well head, this piping is routed horizontally through a magnetic flow meter and into the individual well houses. All of the individual well control components are located at these well houses.

The flow control system for each of the fifteen extraction wells is identical; flow is controlled by a flow control loop consisting of an magnetic flow meter, a process control station (PCS) and a variable frequency drive (VFD). Each extraction well can be controlled locally by the PCS or remotely by the computerized control system located at CAWWT. The normal operational mode is to have the wells operated remotely from the CAWWT computer control system, via the local PCS. Additionally, a local set point is input to the PCS so that the well can automatically revert to local control if communication with the CAWWT computer control is interrupted.

The desired flow rate set point for each extraction well is entered into the DCS and PCS at the AWWT and the individual well houses, respectively. This value is compared continuously to the actual flow rate measured by the magnetic flow meter. When required, the DCS or PCS adjusts the pump motor speed via the VFD to maintain the desired flow. Pump AStart@ and AStop@ can be controlled by the DCS or the PCS and can also be controlled at the VFD.

In addition, each extraction well is equipped with isolation valves, a check valve, air releases, and a pressure indicating transmitter. Routine water level monitoring within the well is performed during regularly scheduled performance monitoring and more frequently if required.

Installation details of the South Field Extraction Wells are shown in Figure 2.



EXTRACTION WELL NUMBER	A WELL DEPTH BELOW GRADE (MEASURED)	B TOP OF SCREEN DEPTH BELOW GRADE	C SCREEN LENGTH	D SCREEN/ CASING DIAMETER	E (NOTE 1) INTERNAL SCREEN DIAMETER	F (NOTE 2) PUMP SUCTION DEPTH (BTOW)	G LEVEL TRANSMITTER SETTING (BTOW)	SLOT SIZE	SURFACE ELEVATION	TOP OF WELL ELEVATION
EW-1	55′	15′	40′	12"	10"PS	33′	27′	0.075	531.9	533.5
EW-2	65′	25′	40′	12"	12"TS	42′	36′	0.075	540.3	542.0
EW-3	109′	69′	40′	12"	10"PS	87′	81′	0.075	585.0	586.7
EW-4	114′	74′	40′	12"	N/A	92′	84′	0.050	589.0	591.8
EW-5	113′	78′	35′	12"	N/A	N/A	N/A	0.075	588.3	590.2
EW-6	(107′)	84.6′	25′	12"	N/A	82′	76′	0.035	581.4	581.7
EW-7	(112′)	74.5′	30′	12"	N/A	82′	76′	0.035	581.1	581.4

NOTES:

1: DIMENSION 'E' REPRESENTS THE NOMINAL SIZE OF THE SCREEN TELESCOPED INSIDE OF THE ORIGINAL SCREEN.
PS = PIPE SIZE: TS = TELESCOPE SIZE

2: PROCESS CONTROL STATIONS (PCS's) ARE LOCATED IN THE SOUTH PLUME VALVE HOUSE

3: EXTRACTION WELLS EW-6 AND EW-7 FLOW CONTROL VALVE, FLOW METER, PRESSURE INDICATORS AND STARTER PANELS ARE LOCATED IN SOUTH PLUME VALVE HOUSE

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NOT TO SCALE

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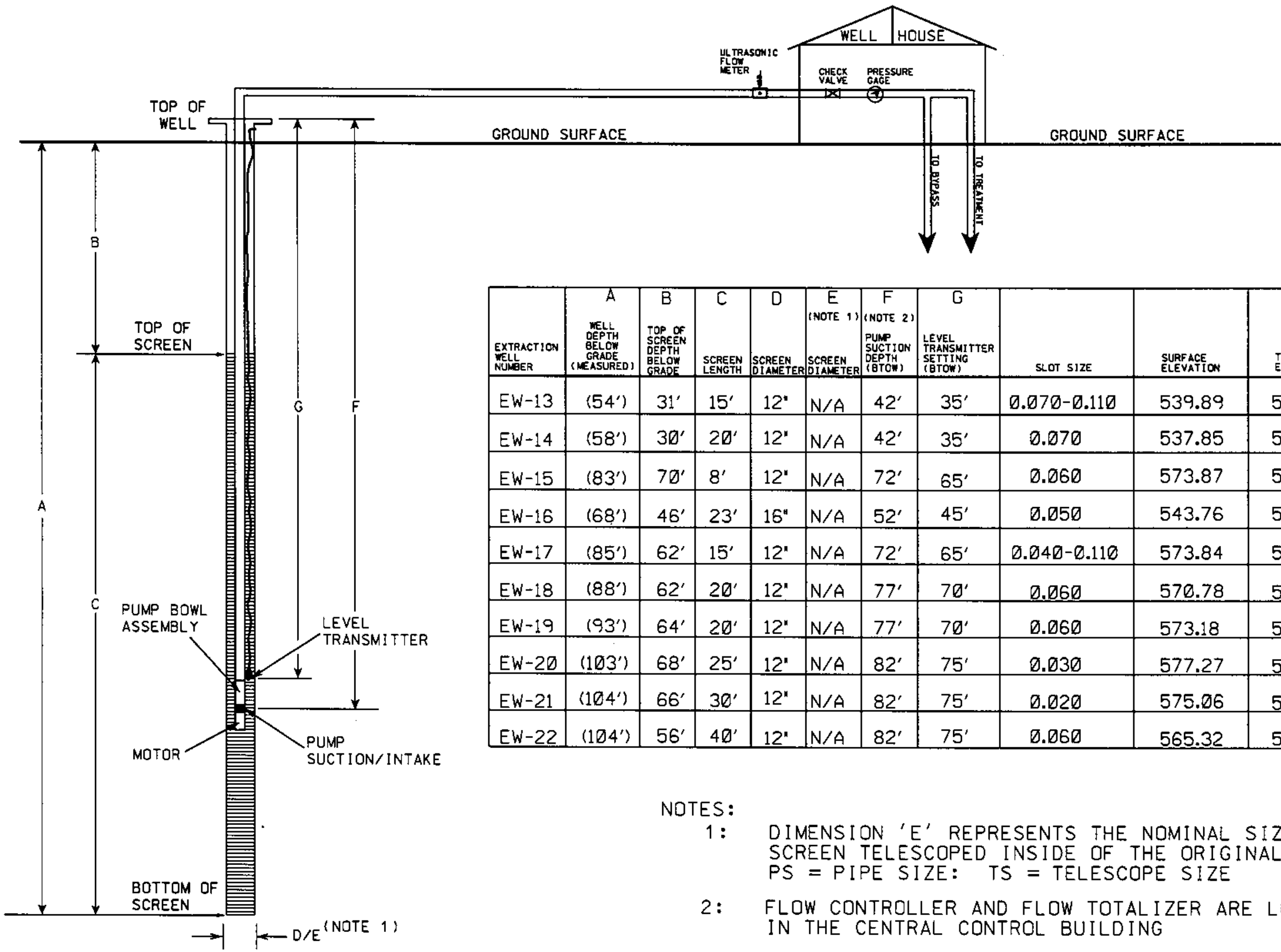
FIGURE 1. SOUTH PLUME MODULE, EXTRACTION WELL INSTALLATION DETAILS



EXTRACTION WELL NUMBER	A WELL DEPTH BELOW GRADE (MEASURED)	B TOP OF SCREEN DEPTH BELOW GRADE	C SCREEN LENGTH	D SCREEN DIAMETER	E (NOTE 1) SCREEN DIAMETER	F (NOTE 2) PUMP SUCTION DEPTH (BTOW)	G LEVEL TRANSMITTER SETTING (BTOW)	SLOT SIZE	SURFACE ELEVATION	TOP OF WELL ELEVATION
EW-13	(54')	31'	15'	12"	N/A	42'	35'	0.070-0.110	539.89	540.72
EW-14	(58')	30'	20'	12"	N/A	42'	35'	0.070	537.85	537.85
EW-15	(83')	70'	8'	12"	N/A	72'	65'	0.060	573.87	573.87
EW-16	(68')	46'	23'	16"	N/A	52'	45'	0.050	543.76	543.76
EW-17	(85')	62'	15'	12"	N/A	72'	65'	0.040-0.110	573.84	573.84
EW-18	(88')	62'	20'	12"	N/A	77'	70'	0.060	570.78	570.78
EW-19	(93')	64'	20'	12"	N/A	77'	70'	0.060	573.18	573.18
EW-20	(103')	68'	25'	12"	N/A	82'	75'	0.030	577.27	577.27
EW-21	(104')	66'	30'	12"	N/A	82'	75'	0.020	575.06	575.06
EW-22	(104')	56'	40'	12"	N/A	82'	75'	0.060	565.32	565.32

NOTES:

1: DIMENSION 'E' REPRESENTS THE NOMINAL SIZE OF THE SCREEN TELESCOPED INSIDE OF THE ORIGINAL SCREEN. PS = PIPE SIZE: TS = TELESCOPE SIZE

2: FLOW CONTROLLER AND FLOW TOTALIZER ARE LOCATED IN THE CENTRAL CONTROL BUILDING

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FIGURE 2. SOUTH FIELD MODULE, EXTRACTION WELL INSTALLATION DETAILS

3.0 FACTORS AFFECTING SYSTEM OPERATION

The original 5 extraction wells comprising the South Plume groundwater restoration module began pumping operations in August 1993, as part of the implementation of the Operable Unit 5 Removal Action No. 3, South Plume Removal Action. In the intervening time period, Fluor Fernald (FF) has obtained valuable operational experience and knowledge that is being used to optimize long-term operation of extraction wells site wide. This experience base has resulted in identification of factors affecting operation life and efficiency, some of which were unknown at the start of pumping operations. These factors have either already been addressed or are incorporated into this plan.

In order to better understand the factors affecting large-scale groundwater pumping operations, FFCP consulted with Moody's of Dayton, a water well maintenance and installation contractor. Moody's has served the water well industry throughout the Great Miami Aquifer for more than 30 years and has extensive experience maintaining large-capacity wells for a number of major water supply systems. Frequencies for routine maintenance and monitoring activities were selected using input received from their evaluation of the South Plume Extraction well system and based on their experience working with systems of similar magnitude in the regional aquifer.

Several factors affect the performance of the extraction wells. In addition, a number of other specific requirements of the FCP's system complicate these factors. All of these factors and requirements were considered in developing this maintenance and monitoring plan. First, all the FCP's extraction wells are placed in and are extracting water from the upper most portions of the Great Miami Aquifer. This fact complicates both pump/motor cooling and iron fouling of the extraction well screen. Normal water well practice would place the screened section of the well deeply in the aquifer and the pump/motor assembly would be placed above the screen in a submerged section of blank casing. Since the extraction wells are intended to intercept a plume of contamination located near the top of the aquifer, the screened sections begin near the normal water level. In order to provide the required submergence of the pump/motor assembly, this assembly must be placed within the screened section. The high flow rates required for plume capture combined with the "surgical" removal of the contamination plume have led to difficulties in ensuring that the flow of water passing the motor is adequate for cooling.

Placement of the pump/motor assembly within a screen that is located on the surface of the aquifer also complicates the impacts of iron-fouling. Moody's has confirmed that iron fouling is prevalent throughout the regional aquifer and that the details of the FCP installation further enhance the problem. Combined with the fact that this region of the Great Miami Aquifer contains some of the highest concentrations of iron and iron-fouling bacteria, fouling of the well screens and other downstream equipment has been experienced.

Continuous operation of the extraction wells also exacerbates the factors noted above. Normal water well industry practice does not require pumping wells to operate continuously. Typical water supply well systems pump between 6 and 10 hours per day and have spare wells that can be rotated in and out as demand requires (especially when maintenance is required). The FCP's extraction well system however, runs continuously and has no spare wells to compensate for wells taken out of service for maintenance. In fact, when a well is shut down for an extended period to perform maintenance, the remaining wells may need to increase their flow to continue the planned capture of the plume.

4.0 MAINTENANCE AND OPERATIONAL MONITORING

Several routine activities are performed to optimize performance of the extraction wells comprising the South Plume, South Field, and Waste Storage Area groundwater restoration modules. The following maintenance and operational monitoring activities are described in this section:

- Routine well/screen maintenance, which includes super-chlorination of the well (semi-annually at a minimum)
- Routine system maintenance, which includes maintenance actions related to valves, instrumentation, and controls associated with each extraction well. This maintenance is performed by FCP Maintenance and Operations personnel, and;
- Operational monitoring, which includes quarterly monitoring of extraction well capacity and pump/motor assembly performance.

4.1 MAINTENANCE OF THE WELL AND SCREEN

Well and screen maintenance is required to maximize system on-stream factors, and to minimize well drawdown and major rehabilitation. The extraction well will be super-chlorinated by the addition of sodium hypochlorite (12.5 percent chlorine). Super-chlorination will be performed on each well every six months, or more frequently if water-level monitoring indicates excessive drawdown, (see Section 4.3). This maintenance action is anticipated to require an outage of 72-hours per extraction well. It is acknowledged in this plan that periodic, major rehabilitation efforts may be required every few years or when the drawdown within the well remains consistently excessive, even after super-chlorination maintenance. These rehabilitation efforts are not considered to be routine maintenance within the context of this plan.

The routine maintenance of the extraction well and screen involves super-chlorination of the well without removal of the pump/motor assembly. This serves to deter iron-bacteria growth and buildup on the screen and in the local formation and therefore serves to enhance long-term well production. The basic steps are detailed below:

Step 1:
Shutdown the extraction well pump and allow the static water level to stabilize.

Step 2:
Inject sodium hypochlorite to obtain a 2,000 to 3,000 milligrams per liter (mg/L) concentration of chlorine. This is determined for each well individually, based on the standing water volume in the well. The volume in each well is a function of the depth of water in each well and the diameter of the screen/casing.

Step 3:
Back surge the chlorinated water into the gravel pack and aquifer by starting the installed extraction well submersible pump and pumping until the water reaches the wellhead. Shut down the pump and open the sampling port at the well head to allow the water to backflow through the 6-inch drop pipe, pump, screen, and to dissipate into the gravel pack. Repeat this procedure for twenty-four hours with approximately five minutes between surges. Allow chlorine to remain in well for 24 hours.

Step 4:
Discharge water by pumping into force main. (Note: The FCP facility owner must be notified prior to discharge of these waters.) This water is sampled and analyzed to document its chlorine content. This sampling and analysis must be completed prior to discharging the bulk of the water within the well and will require that the main discharge valve be closed, the pump started, and samples taken from the sampling port at the well head.

4.2 MAINTENANCE OF PUMPS, PIPING, AND CONTROLS

These maintenance activities are directed primarily at the valves, instrumentation, and controls associated with each extraction well. These actions will be incorporated into the FCP computerized maintenance system. This system provides automatic generation of preventative maintenance work orders to ensure that routine maintenance is performed when required. In addition to formal preventative maintenance activities, several routine system checks are performed by operations personnel, between scheduled preventative maintenance activities, to ensure that equipment is functioning properly.

The following is a list of preventative maintenance and operational checks that are routinely performed:

Process Control Station: Annual
The process control stations for each of the recovery and extractions wells are taken out of service annually. At this time, the operational setup parameters for the specific wells are verified and/or updated to reflect current operating conditions. This is anticipated to require an outage of four hours per well.

Flow Meters: Clean and Calibrate Semi-Annually Cleaning and calibration of the flow meter is anticipated to require an outage of 4 hours per extraction well in the South Plume and 8 hours per extraction well in the South Field.

Check Valves: Inspect and Clean Seat Semi-Annually

Inspection and cleaning of the check valve is anticipated to require an outage of 4 hours per extraction well.

The piping configuration for extraction wells RW-1 through RW-4 includes two check valves. The original check valve cannot be inspected or maintained without removal from the piping system and, because of its location at the extreme end of the piping run in the valve pit, requires that the entire South Plume extraction well system be shut down and drained. The redundant check valve was installed between isolation valves and is a "swing-check" valve that is equipped with a removable inspection plate. Inspection and cleaning of this check valve requires that the individual extraction well be shut down for approximately four hours. Extraction wells RW-6 and RW-7 and all of the South Field Extraction wells have a single in line check valve that is removed, inspected and cleaned. This maintenance activity is anticipated to require each well to be shutdown for approximately 4 hours.

Flow Control Valves and Actuators: Disassemble and inspect annually

Extraction wells RW-1 through RW-4, rW-6 and RW-7 each utilize motor operated flow control valves. These are required to be inspected and cleaned annually to prevent the buildup of iron fouling bacteria encrustation. This maintenance activity will require each well to be shut down for approximately 8 hours.

Pressure Indicating Transmitters: Annual Calibration

Each extraction well has pressure indicating transmitters that are used in performance testing to determine the pump's discharge head (pressure). Accurate pressure sensing in the full range of pumping pressures is required for accurate testing. Annual testing and calibration of these transmitters is anticipated to require an outage of 2 hours per well.

Lightning Arresters: Monthly Test

Extraction wells RW-1 through RW-4, RW-6 and RW-7 each have lightning arresters installed to prevent damage from electrical storms. Routine testing of these devices is required to ensure that they are in working order. An outage of 2 hours per well is anticipated for this maintenance activity.

4.3 OPERATIONAL MONITORING

The main system performance indicators for the South Plume and South Field extraction well modules are gathered and summarized in performance tests conducted quarterly. These tests monitor the specific capacity of each well and the pump/motor assembly performance. Several of the parameters measured may be monitored more frequently to develop additional system data for trending purposes.

4.3.1 Parameters to Be Monitored

Extraction well operating parameters that are required to be routinely monitored include the following:

- Water level - static and pumping
- Flow
- Discharge pressure
- Motor amperage draw.

Water Level Monitoring:

Water level, both static and pumping, is perhaps the most critical parameter measured and therefore needs to be measured routinely. The drawdown from static water level to the pumping water level is used to calculate a specific capacity for the well and is a direct indication of the degree of fouling of the well screen and/or the adjacent formation. The installation depth of the extraction well pump/motor assemblies has been established, based upon an anticipated worst-case drawdown of 10 feet below the seasonal low-static water levels. Historical data were reviewed to determine seasonal lows. While each setting has some added submergence to be conservative, pumping levels are monitored routinely to ensure that adequate pump/motor submergence is maintained.

If the pumping water level measured during the quarterly performance testing approaches the top of the pump's bowl assembly, super-chlorination maintenance will be performed. If, after super-chlorination, pump submergence remains minimal, more extensive rehabilitation efforts may be necessary. Rehabilitation efforts include cleaning of the well utilizing dual swab and airlift pumping to remove debris. After cleaning, the well will be acid treated to break down encrustation on the well screen and within the local formation. This will then be followed by chlorination to inhibit future iron-fouling bacterial growth. These processes may if necessary, be repeated several times to ensure that the well has been rehabilitated to its optimal condition.

Flow Monitoring:

The ability of an extraction well pump/motor to sustain the desired flow is a key indicator of the health of the flow meter, controls, variable frequency drive, well and the pump/motor assembly. Specific testing to determine the ability of a pump/motor assembly to perform as expected will be completed quarterly. This testing is detailed in the performance testing description in Section 4.3.2.

Additionally, individual extraction well flow is monitored continuously by the flow controller for each well. The actual flow verses the controller set point is checked by operations personnel locally, in the field once per shift on first and second shift each day. Any significant deviation from the flow set point is investigated and required maintenance actions are determined then carried out.

Discharge Pressure Monitoring:

Pump discharge pressure, coupled with flow, is monitored quarterly to assess the pump/motor assemblies performance against the manufacturers published performance curves and is detailed in the performance testing description in Section 4.3.2.

Amperage:

As with flow and pressure, amperage is a good indicator of how the pump/motor assembly is performing. During performance testing, motor amperage draw is measured on each of the three phases of the electrical supply. Amperage draw is compared to the motor manufacturer' published specifications. Amperage should be below the manufacturer's full-load amperage and should be approximately equal across the phases of the motor. An imbalance of greater than 20 percent across the phases indicates a motor or electrical supply situation that triggers more extensive diagnosis. Additional diagnostics and repairs are not within the scope of this plan.

4.3.2 Performance Testing

Performance testing of the extraction wells is conducted quarterly to assess their condition; this testing requires an outage of approximately 4 hours per well. Performance testing is currently performed by Moody's of Dayton, the site's drilling and well maintenance subcontractor, and is summarized in written reports. Static water-level measurements are made prior to each performance test. This measurement serves as the basis for computing drawdown within the extraction well. System flow, discharge pressure, pumping level, and motor amperage per phase are measured at each of at least five different flows for the extraction well. These five flows include maximum flow (discharge valve fully open) and zero flow conditions (discharge valve closed).

The results of these measurements are summarized in two ways. First, the flow and discharge head is plotted and compared to extraction well pump manufacturer and previously developed head/flow curves. Second, the static water level and pumping levels are used to calculate drawdown and specific capacity within the extraction well at various flows. As plugging of the well screen due to iron fouling and encrustation progresses, it is expected that drawdown within the well will increase for a given flow rate. Super-chlorination maintenance as described in Section 4.1 will be completed to determine its effect on drawdown levels. If, after super-chlorination, the drawdown remains excessive, more extensive rehabilitation efforts will likely be required.

Additionally, the amperage draw of the well at various flows is compared to previous readings and pump/motor manufacturers published information.

TABLE 4-1

PLANNED OUTAGES OF THE SOUTH PLUME MODULE WELLS (including EW-1 through 4, and EW-6, and EW-7)

Item	Description	PMMP Reference	Frequency	Duration per Event
1	Performance Testing	4.3.2	Quarterly	~ 4 hours/well
2	Maint. of the well and screen [a]	4.1	Semi-Annually [a]	~ 72 hours/well
3	Process Control Station	4.2	Annually	~ 4 hours/well
4	Pressure Transmitter Calibration	4.2	Annually	~ 2 hours/well
5	Magnetic Flow Meter Clean and Calibrate [b]	4.2	Semi-Annually [b]	~ 4 hours/well
6	Check Valve Inspect/Clean	4.2	Semi-Annually	~ 4 hours/well
7	Flow Control Valve and Actuator Cleaning	4.2	Annually	~ 8 hours/well
8	Rehabilitation	4.1	Variable	~ 3 weeks
9	Lightning Arrester Testing	4.2	Monthly	~ 2 hours/well

[a]Well screen maintenance will be completed at a minimum frequency of twice per calendar year. This frequency is dependent upon individual well performance. The need for this maintenance activity will be based upon the monitoring of the specific capacity of the individual wells.

[b]Flow meter calibration may occur as a post maintenance test utilizing a portable flow meter.

TABLE 4-2

PLANNED OUTAGES OF THE SOUTH FIELD AND WASTE STORAGE AREA MODULE WELLS (including EW-13 through EW-22)

Item	Description	PMMP Reference	Frequency	Duration per Event
1	Performance Testing	4.3.2	Quarterly	~ 4 hours/well
2	Maint. of the well and screen [a]	4.1	Semi-Annually [a]	~ 72 hours/well
3	Process Control Station	4.2	Annually	~ 4 hours/well
4	Pressure Transmitter Calibration	4.2	Annually	~ 2 hours/well
5	Magnetic Flow Meter Clean and Calibrate [b]	4.2	Semi-Annually [b]	~ 8 hours/well
6	Check Valve Inspect/Clean	4.2	Semi-Annually	~ 4 hours/well
7	Rehabilitation	4.1	Variable	~ 3 weeks

[a]Well screen maintenance will be completed at a minimum frequency of twice per calendar year. This frequency is dependent upon individual well performance. The need for this maintenance activity will be based upon the monitoring of the specific capacity of the individual wells.
[b]Flow meter calibration may occur as a post maintenance test utilizing a portable flow meter.

5.0 REGULATORY ISSUES

The current extraction well rehabilitation efforts and the proposed routine well/screen maintenance require the addition of chemicals to the well. The only proposed chemicals to be added are sodium hypochlorite and hydrochloric acid. The sodium hypochlorite is used for routine well screen maintenance to disinfect the well and inhibit the growth of iron-fouling bacteria. Non-routine, major well rehabilitation efforts require the use of both sodium hypochlorite and hydrochloric acid. The hydrochloric acid is used to break down flow-limiting encrustation on the well screen. The well is purged of the sodium hypochlorite from routine well screen maintenance by pumping to the common force main and combining with other extraction well discharges. The combined flow is directed to discharge and/or treatment, and ultimately discharges to the Great Miami River via the Parshall Flume. Following major well rehabilitation efforts, the sodium hypochorite and hydrochloric acid are purged from the well by pumping to a tanker truck and discharging the dilute chemicals to the sites storm water retention basin (SWRB) for subsequent treatment at AWWT and discharge to the Great Miami River via the Parshall Flume.

The use of these chemicals in well rehabilitation efforts to date has been monitored closely by FDF Environmental Compliance. Ohio EPA has been notified and has approved of the intended chemical additions and subsequent discharges. After the addition of these chemicals, the water pumped initially from the extraction well is turbid, contain iron residual, dissolved scale, and has a low pH. The discharge of this water will be documented through procedure EP-0005, Controlling Aqueous Wastewater Discharges into Wastewater Treatment System. This procedure requires advance review by FCP Environmental Compliance and the treatment system facility owner. Adequate dilution of this stream by other water sources is anticipated so that chlorine, turbidity, and low pH will not exceed National Pollutant Discharge Elimination System (NPDES) outfall limits. The chlorine residual is expected to fall to acceptable limits prior to pumping.

In order to discharge chlorinated water, the amount of chlorine residual and rate of discharge must not produce a detectable level (currently defined by OEPA as 0.038 mg/L) of residual chlorine at the Parshall Flume (NPDES Outfall 4001). This requirement is tightly controlled through FCP Environmental Compliance review using procedure EP-0005.

6.0 ORGANIZATIONAL ROLES AND RESPONSIBILITIES

This section defines the organizational roles and responsibilities associated with the completion of the work defined in this plan. Descriptions of the key responsibilities of the various project organizations involved are provided below:

The DOE Operable Unit 5 Team Leader is responsible for:

- Providing direction and oversight to the completion of the activities defined in this plan
- Acting as the point of contact within DOE and for the regulators and stakeholders for all communications concerning work carried out under this plan.

The Fluor Fernald Wastewater Treatment Operations Manager is responsible for:

- Providing overall project management and technical guidance to the Fluor Fernald team
- Ensuring the necessary resources are allocated to the project for the efficient and safe completion of plan activities
- Oversight and auditing of plan activities to ensure that the work is being performed efficiently and in accordance with all regulatory requirements and commitments, DOE Orders, site policies and procedures, and safe working practices.
- Providing a technical lead for the collection and interpretation of data

The Fluor Fernald Process Engineer is responsible for:

- The safe and prompt completion of work outlined in the plan
- Oversight and programmatic direction of activities
- Reporting to the DOE Operable Unit 5 Team Leader and the Fluor Fernald Wastewater Treatment Operations Manager on the status of plan activities and on the identification of any problems encountered in the accomplishment of this plan
- Reporting to the Fluor Fernald Project Manager on the progress of plan activities
- Establishing and maintaining extraction well status files
- Interpreting and reporting data collected
- Coordinating maintenance activities with external service contractors as required.

The Groundwater Monitoring Team will be responsible for:

- Collection of water level data

- Compilation of water level data and reporting of data to FDF Technical Lead.

- Providing oversight of external service contractors during their performance of well maintenance.

The Wastewater Treatment Operations Team will be responsible for:

- Operation of the extraction well system
- Conducting preventive maintenance as scheduled in this plan
- Training and qualification of operations personnel.

7.0 PATH FORWARD

This plan contains monitoring and maintenance activities, and frequencies thereof, based on current projections. The need for and frequency of these activities may change based on future experience gained through the operation, maintenance, and monitoring of the extraction wells currently operational in the South Plume and the South Field Groundwater Restoration Modules. Parameter monitoring frequency may change, as well.

Data gathered from quarterly performance testing will be summarized in written reports submitted by the sub-contractor upon completion of each test. Each report will be added to existing reports on file in the extraction well files and compared to past performance. Additionally, water level readings and feedback from maintenance personnel regarding the condition of system components will be evaluated to determine if modifications to the frequencies of preventive maintenance activities are required. The data gathered over the next several months from the South Field extraction wells and the Optimized South Plume Module wells will be logged and trended. This will be completed in order to provide for the identification of any required changes to monitoring and maintenance activities in this plan needed to ensure that the system continues to operates at an optimum on-stream factor.

This plan will be revised as necessary during the life of the groundwater restoration process at the FCP. In addition to the above noted driver for plan revisions, a revised plan will be necessary when FCP new extraction/re-injection well modules are added to the groundwater restoration system. Development of the revised plan(s) will correlate to the individual project schedule driving the revision.

Maintenance feedback and component manufacturer suggestions have been used to develop a spare parts list and stock inventories of the most frequently used parts. The availability of spare parts will assist in minimizing downtimes associated with all maintenance activities.