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**Operation and Maintenance Plan for
Sections 1 and 2 of the
North-South Diversion Ditch at the
Paducah Gaseous Diffusion Plant,
Paducah, Kentucky**



February 2005

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CLEARED FOR PUBLIC RELEASE

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

contributed to the preparation of this document and should not
be considered an eligible contractor for its review.

**Operation and Maintenance Plan for
Sections 1 and 2 of the
North-South Diversion Ditch at the
Paducah Gaseous Diffusion Plant,
Paducah, Kentucky**

February 2005

Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

by Bechtel Jacobs Company LLC
managing the

Environmental Management Activities at the
Paducah Gaseous Diffusion Plant
Paducah, Kentucky 42001

for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-03OR22980

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ACRONYMS

DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
HAZWOPER	Hazardous Waste Operation
NSDD	North-South Diversion Ditch
O&M	operation and maintenance
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
ROD	Record of Decision
URMA	Underground Radiological Material Area
USEC	United States Enrichment Corporation

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) is conducting environmental restoration activities for the North-South Diversion Ditch (NSDD) at the Paducah Gaseous Diffusion Plant (PGDP) to address contamination that is the result of historic operations, waste-handling activities, and disposal practices at the plant. This document contains the Operation and Maintenance (O&M) Plan related to response actions taken on Sections 1 and 2 of the NSDD. This plan supercedes Section 5, "North-South Diversion Ditch Interim Remedial Action," of a previously approved O&M document pertaining to the NSDD (i.e., *Operation and Maintenance Plan for the Surface Water Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1904&D1, September 2000 [DOE 2000]). DOE O&M activities associated with the NSDD remedial action include operation of a lift station (C-400-L) that was incorporated in the NSDD remedial system, keeping the components of the water transfer system clear of debris, activating and inspecting heat tracing on aboveground piping during cold weather, mowing of the surge basin and around structures, inspecting the concrete-paved ditch section and spillway in the surge basin, inspecting the surface cover in the surge basin to ensure maintenance of surface integrity, and conducting inspections to assure postings are legible. Three additional lift stations (C-616-L, C-616-H, and C-616-C) that were incorporated into the NSDD remedial system are maintained by the United States Enrichment Corporation, and maintenance of these three lift stations is not addressed in this document.

1. INTRODUCTION

The U.S. Department of Energy (DOE) is conducting environmental restoration activities for the North-South Diversion Ditch (NSDD) at the Paducah Gaseous Diffusion Plant (PGDP) to address contamination that is the result of historic operations, waste-handling activities, and disposal practices at the plant. As part of its efforts, DOE is submitting this Operation and Maintenance (O&M) Plan documenting the completion of response and remedial actions related to Sections 1 and 2 of the NSDD. This plan follows the general outline for O&M Plans found in Appendix D of the *Federal Facility Agreement* (EPA 1998) and supercedes Section 5, "North-South Diversion Ditch Interim Remedial Action," of a previously approved O&M document for the NSDD (i.e., *Operation and Maintenance Plan for the Surface Water Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1904&D1, September 2000 [DOE 2000]).

2. GENERAL HISTORY

The NSDD originates within the north central portion of PGDP (see Fig. 1 in the Appendix) and joins with Little Bayou Creek to the north of the plant. Historically, the NSDD received wastewater from the C-400 Cleaning Building, coal pile runoff, and storm water runoff. In 1977, the C-616-C Lift Station was constructed upstream of the point where the NSDD exits the PGDP boundary. This lift station diverts all normal flow from upstream locations in the NSDD to the C-616-F Full Flow Lagoon for settlement of suspended solids prior to discharge to Bayou Creek through the Kentucky Pollutant Discharge Elimination System Outfall 001 ditch system. The C-616-H Lift Station (Ditch 001 Lift Station) began operation in 1991. This lift station pumps effluent of the C-335 and C-337 Process Buildings and the C-535 and C-537 Switchyards into the NSDD for downstream capture by the C-616-C Lift Station and treatment through the C-616-F Full Flow Lagoon.

As part of its cleanup effort at PGDP, DOE, in conjunction with the U.S. Environmental Protection Agency (EPA) and with the concurrence of the Kentucky Department for Environmental Protection, signed the Interim Record of Decision (ROD) for the NSDD (DOE 1994). The primary objective of the Interim ROD was to begin control of contaminant releases into the NSDD and to mitigate the spread of contamination. Components of the 1994 Interim ROD included the following:

- Installation of an ion exchange system in the C-400 Cleaning Building to reduce radionuclide levels in the effluent to be discharged to the NSDD.
- Removal of fly ash from the C-600 Steam Plant effluent discharged to the NSDD.
- Construction of lift stations near the C-400 Cleaning Building (C-400-L Lift Station) and the C-600 Steam Plant (C-616-L Lift Station), a diversion dam adjacent to the C-400-L Lift Station, and an aboveground pipeline to convey flow from the southern end of the ditch to a point adjacent to the C-616-H Lift Station where flow from the pipeline was released back into the NSDD. This action was intended to reduce the potential for mobilizing sediments in the southern section of the NSDD and to reduce the amount of contaminated water infiltrating the groundwater.
- Construction of a diversion dam in the NSDD upstream of the C-616-H Lift Station to address the potential for sediment transport to off-site areas from the portion of the NSDD that was bypassed with the aboveground piping (i.e., the section from the C-400-L Lift Station to the C-616-H Lift Station).

- Installation of signs along both sides of portions of the NSDD inside the plant boundary to warn plant personnel of elevated levels of radionuclides, metals, and polychlorinated biphenyl (PCB) compounds in the area (DOE 1994).

The construction of the interim remedial action for the NSDD was completed August 18, 1995. Once construction was completed, two components of the action, the C-400 Ion Exchange and the C-600 Fly Ash Lagoons, were incorporated into the daily operations of PGDP by the United States Enrichment Corporation (USEC), and O&M of these two facilities is performed by USEC. The discharge from the C-400 Ion Exchange is routed into the Outfall 008 storm water drain, which eliminated discharges from the C-400 Building into the NSDD. Lagoons constructed at the C-600 facility eliminated fly ash deposition in the NSDD.

On August 21, 2002, EPA signed a ROD for further remedial action for portions of the NSDD located inside the plant boundary (i.e., Sections 1 and 2) (DOE 2002a). DOE signed the ROD on September 25, 2002. While considered an interim remedial action with respect to the entire NSDD, this ROD is considered a final action for Sections 1 and 2 of the NSDD. The objectives of the remedial action were as follows:

- Prevent future discharge of process water to the NSDD.
- Reduce the risk to industrial workers and ecological receptors from exposure to contaminated surface soil, sediment, and surface water to acceptable levels by eliminating direct exposure to contaminated media at the NSDD.
- Prevent future on-site runoff from being transported via the NSDD.
- Restrict unauthorized access, restrict unauthorized excavations or penetrations below prescribed contamination cleanup depth, and restrict uses of the area that are inconsistent with the assumed industrial land use (e.g., to restrict recreational and/or residential use).

Implementation of the remedial action for Sections 1 and 2 was accomplished in 2 phases. Phase I, initiated in October 2002, included the following activities:

- Installation of piping to route process discharges that currently pass through the NSDD to the C-616 Water Treatment Facility.
- Plugging of the culverts at the downgradient end of Section 2 of the NSDD and in three other ditches within the NSDD watershed to prevent discharge of on-site storm water runoff to sections of the NSDD outside the PGDP boundary.
- Excavation of a surge basin to contain storm-water runoff until it can be routed through the C-616 facility.

Phase II activities were initiated upon completion of construction of the surge basin and consisted of complete excavation of contaminated soils and sediments along Sections 1 and 2 of the NSDD up to a total depth of 4 ft. Following completion of excavation activities, the ditch channel was restored to grade with 2 ft of clay cover and approximately 2 ft of clean soil and revegetated.

Existing lift stations at the NSDD (the C-616-C Lift Station installed in 1977, the C-616-H Lift Station installed in 1991, and the C-400-L and C-616-L Lift Stations installed during the 1994 NSDD remedial action) are utilized in the implementation of this final remedial action. During Phase I

excavation of the surge basin, institutional controls, instigated as part of the 1994 remedial action (e.g., signs along the NSDD warning of contamination), were removed from sections of the NSDD affected by surge basin construction. This removal of institutional controls occurred upon installation of the clay liner in the affected NSDD sections and progressed with the further remediation of the NSDD during Phase II activities. Appropriate Hazardous Waste Operation (HAZWOPER) postings were maintained along those portions of Sections 1 and 2 of the NSDD during remediation until sufficient industrial health data was available to document that the postings were no longer needed.

Upon completion of the remedial action for Sections 1 and 2 of the NSDD, the only institutional controls that remain are postings for an Underground Radioactive Material Area (URMA) in a culvert beneath the NSDD at its junction with the Outfall 001 ditch. This culvert was not included in the scope of the remedial action for Sections 1 and 2 of the NSDD. Maintenance of institutional controls and of both previously and recently installed structures is addressed under this O&M plan.

3. NORTH-SOUTH DIVERSION DITCH, SECTIONS 1 AND 2, OPERATION AND MAINTENANCE

The following paragraphs discuss the various O&M components associated with the response and remedial actions implemented for Sections 1 and 2 of the NSDD.

3.1 EQUIPMENT START-UP AND OPERATOR TRAINING

The *Remedial Design/Remedial Action Work Plan for the North-South Diversion Ditch Piping and Pump Modifications at the Paducah Gaseous Diffusion Plant, Paducah Kentucky*, DOE/OR/07-1967&D2, (DOE 2002b) and the *Remedial Design/Remedial Action Work Plan for the North-South Diversion Ditch Detention Basin at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-2008&D1, (DOE 2002c) summarize the as-built construction and implementation of the final remedial action for Sections 1 and 2 of the NSDD. Construction and implementation activities and an associated chronology are documented in the latest approved version of the *Remedial Action Completion Report for the North/South Diversion Ditch at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-2195&D0, (DOE 2004).

DOE contractors and subcontractors will perform all inspections and maintenance required by the remedial actions implemented for the NSDD as specified below. All personnel working on these tasks will be required to complete the PGDP General Employee Training Program and be trained on all pertinent safety programs.

3.2 DESCRIPTION OF ROUTINE O&M

The four lift stations utilized in this final remedial action are identified in Section 2. Each is fully automated. DOE maintains only the C-400-L Lift Station. As part of the routine O&M for this final remedial action, a DOE contractor or subcontractor will conduct weekly inspections of the C-400-L Lift Station and transfer piping and also will conduct inspections following storm events to ensure that all equipment is operational; that the lift station screens remain clean; and that the transfer pipelines are not leaking. USEC will maintain the C-616-C, C-616-H, and C-616-L Lift Stations. Maintenance of these three lift stations is not addressed in this document.

DOE will conduct quarterly inspections of the URMA postings at the junction of the NSDD with the Outfall 001 ditch. The area adjacent to the pipeline will be mowed twice during the summer months. Heat tracing installed on the aboveground piping will be activated in the fall and deactivated in the spring and, during those months that it is in use, heat tracing will be inspected weekly.

The surge basin will be mowed twice during the summer months. The surface cover of the basin will be inspected semiannually for signs of erosion that could threaten the integrity of the cover; the concrete-paved ditch section and spillway located within the surge basin will be inspected semiannually for cracks or other signs of damage. These semiannual inspections will be conducted at appropriate times of the year (i.e., after mowing the surge basin or in late fall after vegetation has died back).

3.3 DESCRIPTION OF POTENTIAL OPERATING PROBLEMS

Screens on the lift station sump could become obstructed with debris. In such a situation, debris will be manually removed. Piping could develop a leak, or lift station pumps or heat tracing could fail. In these situations, the defective equipment or materials will be repaired or replaced. Signs of serious erosion that could threaten the integrity of the surface cover in the surge basin could be detected. If such erosion is detected, the surface cover will be repaired. The concrete-paved ditch section and spillway within the surge basin could develop cracks or damage that would threaten its integrity. If this were to occur, the concrete-paved ditch section and spillway will be repaired.

3.4 DESCRIPTION OF SAMPLING AND LABORATORY TESTING

No sampling or laboratory testing will be conducted under this O&M Plan.

3.5 DESCRIPTION OF ALTERNATE O&M

Not applicable to this final remedial action for Sections 1 and 2 of the NSDD.

3.6 SAFETY PLAN

Work Control Documents will be issued to personnel conducting O&M on the NSDD. The content of these documents will vary from task to task; at a minimum, the documents will describe the requirements to wear appropriate personal protective equipment. All inspections and maintenance activities will be conducted under the Integrated Safety Management System. All work will be governed by approved health and safety plans, procedures, and activity hazard analyses, as required.

3.7 DESCRIPTION OF EQUIPMENT

The DOE-maintained equipment, materials, and structures incorporated into this remedial action include one lift station (C-400-L), transfer piping, a surge basin containing a concrete-paved ditch section and spillway, and institutional controls.

The lift station consists of a below-grade concrete vault that serves as a sump to collect water flowing into the ditch. The vault contains two electric pumps that convey the water from the vault to the transfer piping.

Approximately 457 m (1500 ft) of welded steel transfer piping was installed during the 1994 remedial action. An additional 2250 ft of piping was installed during Phase I of the final remedial action. Some of the transfer piping is aboveground and some is buried. Aboveground piping that does not gravity drain is insulated and heat traced to prevent freeze damage.

A surge basin was built within Section 2 of the NSDD during completion of Phase I of the final remedial action. This surge basin contains storm-water runoff from on-site sections of the NSDD until the runoff can be routed through the C-616-F Full Flow Lagoon. Following excavation, the surface of the surge basin was completed by installation of 2 ft of clay cover overlain by approximately 2 ft of clean soil. The surface of the surge basin then was revegetated. In addition, a concrete-paved ditch section and spillway was constructed within the surge basin at the point where flow from the NSDD enters. The purpose of this paved ditch section and spillway is to minimize potential for erosion of surface cover within the basin.

Institutional controls remaining at the NSDD following completion of the remedial action consist of URMA postings at the junction of the NSDD with the Outfall 001 ditch. These postings are associated with a culvert that crosses beneath the NSDD. This culvert was not included in the scope of the remedial action for Sections 1 and 2 of the NSDD.

The features described above are annotated on Fig. 1 in the Appendix.

3.8 RECORDS AND REPORTING

An inspection form will be completed and filed with the Environmental Management Enrichment Facilities Document Management Center for each inspection.

All personnel who perform inspections, mowing, and routine monitoring activities will be required to maintain radio contact with the Plant Shift Superintendent, who has the capability to respond to emergency requests.

3.9 PROJECTED O&M COSTS

Projected O&M costs for this response action are based on the routine O&M activities described in Section 3.2. These activities fall into two general categories: 1) routine inspection and monitoring and 2) mowing. Projected costs for each category are summarized below. The total annual cost for the NSDD Remedial Action is projected to be \$37,000. The escalated cost for long-term O&M (i.e., seven years) for this remedial action is projected to be \$278,500.

TASK	COST ¹
Routine inspection and monitoring ²	\$ 33,000
Mowing	\$ 4,000
TOTAL ANNUAL O&M COST ³	\$ 37,000
ESCALATED TOTAL O&M COST ⁴	\$278,500

¹All costs are rounded to the nearest \$500 increment.

²Includes weekly and post-storm event inspection and lift station screen cleaning.

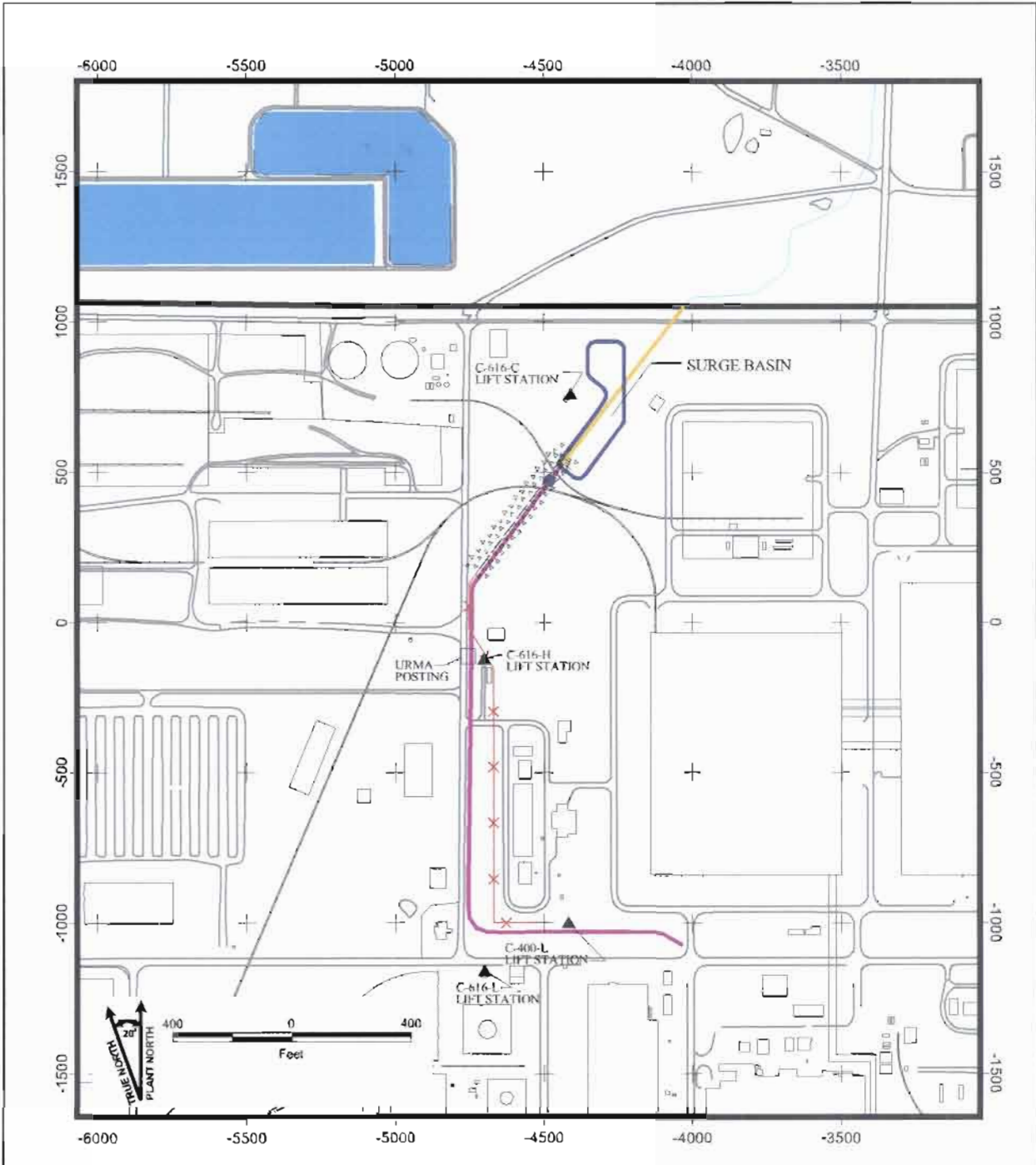
³Repairs and replacement costs are not included in estimate.

⁴2.5% per year beginning in 2004 for 7 years. Assumes plant closure in 2010.

4. REFERENCES

- DOE (U.S. Department of Energy) 1994. *Record of Decision for Interim Action Source Control at the North-South Diversion Ditch, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1213&D3, U.S. Department of Energy, Paducah, KY, March.
- DOE 2000. *Operation and Maintenance Plan for the Surface Water Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1904&D1, U.S. Department of Energy, Paducah, KY, September.
- DOE 2002a. *Record of Decision for Interim Remedial Action at the North-South Diversion Ditch at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1948&D2, U.S. Department of Energy, Paducah, KY, September.
- DOE 2002b. *Remedial Design/Remedial Action Work Plan for the North-South Diversion Ditch Piping and Pump Modifications at the Paducah Gaseous Diffusion Plant, Paducah Kentucky*, DOE/OR/07-1967&D2, U.S. Department of Energy, Paducah, KY, October.
- DOE 2002c. *Remedial Design/Remedial Action Work Plan for the North-South Diversion Ditch Detention Basin at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-2008&D1, U.S. Department of Energy, Paducah, KY, November.
- DOE 2004. *Remedial Action Completion Report for the North/South Diversion Ditch at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-2195&D0, U.S. Department of Energy, Paducah, KY, October.
- EPA (U.S. Environmental Protection Agency) 1998. *Federal Facility Agreement for the Paducah Gaseous Diffusion Plant*, U.S. Environmental Protection Agency, Region 4, Atlanta, GA, February 13.

APPENDIX



LEGEND.

- PLANT BOUNDARY
- FACILITY
- ROAD
- RAILROAD
- NSDD SECTION 1
- NSDD SECTION 2
- PIPELINES ABOVE GROUND
- PIPELINES BELOW GROUND

Fig. 1. North-South Diversion Ditch inside PGDP.

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PADUCAH GASEOUS DIFFUSION PLANT

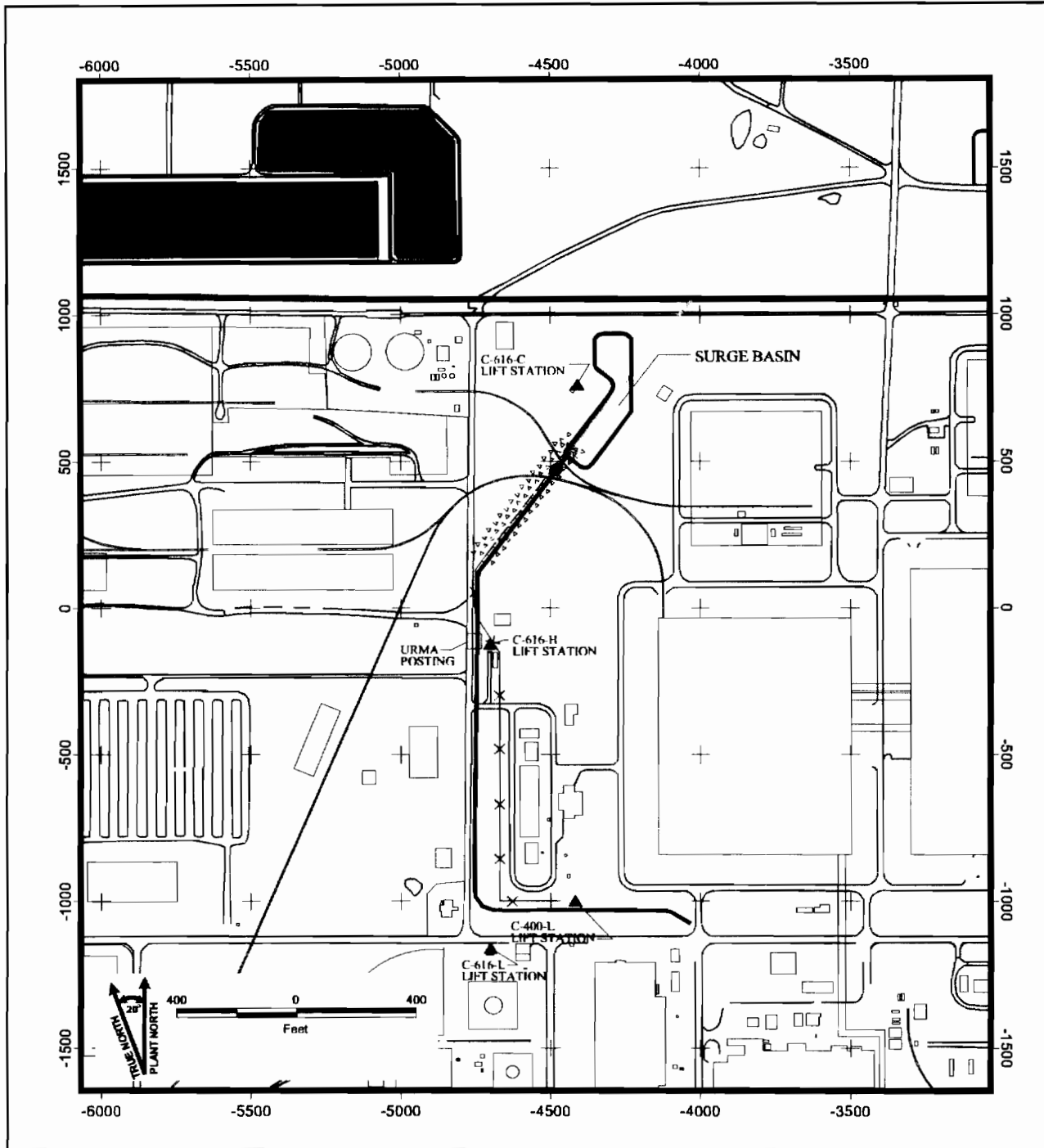


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LEGEND:

- PLANT BOUNDARY
- ROAD
- RAILROAD
- FACILITY
- NSDD SECTION 1
- NSDD SECTION 2
- PIPELINES ABOVE GROUND
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Fig. 1. North-South Diversion Ditch inside PGDP.

U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

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JACOBS**

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