012754

United States Department of Energy

Savannah River Site

Explanation of Significant Differences to the Record of Decision for the TNX Area Operable Unit

CERCLIS Numbers: 21 and 29

WSRC-RP-2005-4030

Revision 1

June 2005

Prepared by:
Westinghouse Savannah River Company, LLC
Savannah River Site
Aiken, SC 29808

Prepared for the U. S. Department of Energy Under Contract No. DE-AC09-96SR18500

This page intentionally left blank.

6/16/05
Date

Jeffrey M. Allison
Manager
U. S. Department of Energy
Savannah River Operations Office

8/5/05
Date

for Winston A. Smith
Director
Waste Management Division
U. S. Environmental Protection Agency - Region 4

9/2/05
Date

Robert W. King, Jr.
Deputy Commissioner
Environmental Quality Control
South Carolina Department of Health and Environmental Control

Introduction and Statement of Purpose

This Explanation of Significant Differences (ESD) is being issued by the United States Department of Energy (USDOE), the lead agency for the Savannah River Site (SRS) remedial activities, with concurrence by the United States Environmental Protection Agency (USEPA) – Region 4 and the South Carolina Department of Health and Environmental Control (SCDHEC). This action is taken pursuant to the Comprehensive, Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA), 42 U.S.C. 117(c), and Section 300.435(c)(2)(1) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This ESD describes a change to the final remedial action plan described in the *Record of Decision Remedial Alternative Selection for the TNX Area Operable Unit (U)*, WSRC-RP-2003-4017, Revision 1, August 2003, signed on March 25, 2004.

Based upon the characteristics of the TNX Area Operable Unit (OU), the OU has been subdivided into four major subunits: the New TNX Seepage Basin/Inactive Process Sewer line/Overflow Discharge Area (NTSB/IPSL/ODA); the TNX Burying Ground/Vadose Zone (TBG/VZ); the Old TNX Seepage Basin/Inactive Process Sewer line/ Discharge Gully (OTSB/IPSL/DG); and the TNX Groundwater. The DG is represented by two OUs, including the Upper Discharge Gully (UDG) of the TNX Area OU and the Lower Discharge Gully (LDG) of the TNX Outfall Delta, Lower Discharge Gully and Swamp OU (TNXOD OU). To optimize resources and to effectively execute the remedial actions, the remediation of the LDG is being conducted with that of the OTSB/IPSL/DG of the TNX Area OU. The changes to the TNX Area OU ROD documented in this ESD only affect the OTSB/IPSL/DG subunit.

Remediation under the TNX Area OU ROD was agreed to prior to the decision by the lead agency, USDOE, to decommission and demolish the structures in T Area, formerly called TNX Area. USDOE believes it is appropriate to include the remediation of process components beneath the slabs at Buildings 678-T and 677-T (i.e., sumps and adjacent soils) that are associated with the OTSB/IPSL/DG. Because the integrity of the sumps and IPSLs are unknown, the adjacent soils are suspected of having contamination that may exceed Principal Threat Source Material (PTSM) criteria. The soil adjacent to the sumps will be tested to determine if PTSM is present.

PTSM from the OTSB and soil adjacent to the 678-T and 677-T sumps will be disposed off-site. Non-PTSM material will be managed under the engineered cap. Any water that may collect in the excavations will be tested to determine if it is contaminated. Water that is not contaminated above soil PTSM levels may be managed under the cap. These activities will be documented in the post-construction report.

One of the Remedial Action Objectives (RAOs) for the OTSB/IPSL/DG is to remove all PTSM. USEPA guidance defines PTSM as those materials that have a high toxicity or mobility and cannot be reliably contained or present significant

risk to human health or the environment (*A Guide to Principal Threat and Low Level Threat Wastes*, USEPA Superfund Publication 9380.3-06FS, November 1991). USDOE-SRS, USEPA Region 4 and SCDHEC have agreed that the PTSM toxicity threshold criterion is a risk level of 1×10^{-3} for the future industrial worker.

The PTSM RAO will be achieved by removing contaminated soil greater than or equal to the Remedial Goal (RG) developed using risk-based criteria. Since the original RGs of 23.44 pCi/g thorium-228 and 21.75 pCi/g radium-228 were established in the TNX Area OU ROD using USEPA guidance (*Health Effects Summary Tables,* FY-99 Annual, EPA/540/R-97/036, August 1999), the calculation methods and toxicity values used for determining risk to the future industrial worker has significantly changed.

The USEPA has issued updated guidance on calculation methods used for determining radionuclide activity screening levels. The toxicity values (i.e., the Cancer Slope Factors [CSFs]) have also been revised. USEPA's Superfund radionuclide preliminary remediation goal (PRG) website, which implements the standard USEPA Risk Assessment Guidance for Superfund (RAGS), provides a database tool to derive risk-based concentrations (i.e., PRGs). The PRGs are calculated using default parameters and the latest toxicity values. The calculation assumes that thorium-228 and radium-228 are in secular equilibrium and, therefore, have the same activities. The revised RG for thorium-228 plus daughters and radium-228 plus daughters is 94 pCi/g. This activity corresponds to a cumulative risk level of 1E-03 (the PTSM threshold) for these two constituents combined.

This ESD proposes to modify the selected remedy and the RGs to address the PTSM in the soil within the OTSB/IPSL/DG and associated with selected sumps (neutralization sump, stainless steel sump in the tank gallery, and the centrifuge sump at 678-T, and the #4 and #8 sump at 677-T) and a small area of contamination on the western exterior of 678-T (Figure 1). These changes do not fundamentally alter the previously selected remedy for the OTSB/IPSL/DG and, therefore, a ROD amendment is not required. The changes will, however, affect the volume of material to be excavated for off-site disposal from the OTSB and soil adjacent to the selected sumps at 678-T and 677-T.

This ESD will become part of the Administrative Record File, which contains information pertaining to the remedy. The Administrative Record File is available at the following locations:

U.S. Department of Energy
Public Reading Room
Gregg-Graniteville Library
University of South Carolina – Aiken
171 University Parkway
Aiken, South Carolina 29801
(803- 641-3465

Thomas Cooper Library
Government Documents Department
University of South Carolina
Columbia, South Carolina 29208
(803) 777-4866

The South Carolina Department of Health and Environmental Control
Bureau of Land and Waste Management
8911 Farrow Road
Columbia, South Carolina 29203
(803) 896-4000

Edisto Savannah District
Environmental Quality Control Office
206 Beaufort Street, Northeast
Aiken, South Carolina 29801
(803) 641-7670

Site History, Contamination, and Selected Remedy

Because this ESD documents changes to the current remedy for the OTSB/IPSL/DG, discussion of the site history, contamination and selected remedy will be focused on this subunit of the TNX Area OU. Additional information on other subunits of the TNX Area OU can be found in the *Record of Decision Remedial Alternative Selection for the TNX Area Operable Unit (U)*, WSRC-RP-2003-4017, Revision 1.

T Area was a pilot-scale testing and evaluation facility that supported fuel and target manufacturing chemical processes and the Defense Waste Processing Facility. The OTSB was an unlined liquid-waste disposal area that operated from the mid-1950s until 1980. The OTSB received a number of chemicals, ranging from inorganic salts and low-level radionuclides to organic solvents, through a series of process sewer lines originating from sumps in Buildings 678-T and 677-T. These sumps and process sewer lines are now inactive.

The process effluents from Buildings 678-T and 677-T were released from the building sumps through gravity-flow process sewer lines. Most of the contaminant mass in the wastewater, including suspended solids, was discharged into the Inlet Basin of the OTSB. When full, the Inlet Basin overflowed into the Main Basin of the OTSB. It is unlikely that significant residual material remains in the IPSLs, but these wastewater conveyances are conservatively assumed to be contaminated at levels consistent with that in the Inlet Basin of the OTSB.

Periodically the Main Basin overflowed downhill into the Savannah River flood plain adjacent to the T Area facilities. In 1980, the process wastewater was re-routed from the OTSB to the NTSB.

During closure of the OTSB in 1981, the remaining liquid was drained to the nearby flood plain. As a result of the overflow events and closure of the OTSB, the slope from the facility to the floodplain was deeply eroded, forming a discharge gully (DG).

As part of the closure activities, the basin was backfilled with clean sand and clay, and was then covered with clay. A portion of the cover was vegetated; an asphalt cover was placed over the remainder of the basin. A storm sewer was constructed to conduct stormwater runoff from the vegetated and asphalt surfaces of the backfilled area into the DG.

The *Resource Conservation and Recovery Act Facility Investigation/Remedial Investigation Report with Baseline Risk Assessment for the TNX Area OU* (WSRC-RP-96-00808, Rev. 1.2, January 1999) and *Corrective Measures Study/Feasibility Study for the TNX Area OU* (WSRC-RP-

97-428, Rev. 1.2, July 2002) contain detailed information and analytical data for all investigations conducted and samples taken during the media assessments of the TNX Area OU. These assessments support the following conclusions for the OTSB/IPSL/DG:

- No final ecological refined constituents of concern (RCOCs) were identified.
- Deep soils at the OTSB/IPSL/DG are contaminated with mercury that may result in groundwater levels in excess of the Maximum Contaminant Level (MCL) and is considered a contaminant migration constituent of concern (CMCOC).
- Deep soils at the DG are contaminated with uranium-233/234, uranium-235 and uranium-238 that may result in groundwater levels in excess of the MCL (CMCOC).
- Soil at the elevation of the original basin bottom is contaminated with thorium-228 and radium-228 at levels that exceed the PTSM threshold criteria.
- The IPSL are likely contaminated at levels consistent with the inlet basin soils of the OTSB.
- Actinium-228, lead-212, radium-228, thorium-228, thorium-234, uranium-233/234, uranium-235, and uranium-238 are human health RCOCs for the future industrial worker at the DG.

The original selected remedy for the OTSB/IPSL/DG subunit of the TNX Area OU is an engineered cap with PTSM removal and institutional controls. This remedy entails the following:

- Removal of existing OTSB backfill
- Excavation of the IPSL (where accessible) and associated radiologically-contaminated soils for disposal
- Plugging the ends of any IPSL sections not excavated during this action with grout
- Excavation of the PTSM layer in the OTSB (2- to 3-ft soil interval at the original bottom of the inlet and main basins)
- Disposal of PTSM-contaminated soils and pipeline (estimated 2,180 yd^3 total) at an approved disposal facility
- Backfill of pipeline excavation and replacement of asphalt
- Backfill of the OTSB and DG
- Placement of an engineered cap (and associated institutional controls) over the OTSB and DG (from the TNX facility to the base of the slope at the TNX Outfall Delta)
- Installation of groundwater monitoring wells and vadose zone monitoring devices to determine if waste left in place impacts or has the potential to impact groundwater above MCLs beneath the subunit
- Implementation of institutional controls to ensure the integrity of the

engineered cap, to prevent the future industrial worker from excavating contaminated media via access controls and field walk down/ maintenance, and to prevent residential use through property notices/ restrictions. Institutional controls will remain in place until it is determined by the five-year statutory process that no unacceptable risk to receptors is present.

Basis for the Document

The original ROD for the TNX Area OU was written prior to the decision by USDOE to decommission and demolish the buildings in T Area. Because the facilities were still in use during the remedial investigations and assessments, no sampling data were available from media in or beneath the buildings.

Subsequent to ROD approval, all buildings within T Area were removed. During the demolition process for Buildings 678-T and 677-T concrete slabs, floor drains and accessible sumps were sampled to determine if chemical or radiological contamination was present. Where contamination was identified, the concrete was scabbled to reduce potential risk to the future industrial worker to less than 1 x 10^{-3}. In addition, one stainless steel sump in Building 678-T was removed. Details of the sampling are provided in *Decommissioning Project Final Report Chemical Semi-Works Building, 678-T* (V-PCOR-T00007) and *Decommissioning Project Final Report Pilot Plant Building, 677-T* (V-PCOR-T00006).

Samples from the slabs, drains and sumps in Buildings 678-T indicated the presence of radionuclides, primarily daughter products of thorium-232, at activities greater than the PTSM criteria of 94 pCi/g for radium-228 plus daughters and thorium-228 plus daughters. Limited soil sampling was conducted beneath and adjacent to these areas of higher radionuclide activities. Because the sub-slab sampling was limited in extent, it is uncertain if PTSM is present in the soil adjacent to sumps at Building 678-T. A small area of contamination with PTSM-level contamination is present on the western exterior of 678-T. Results of this additional soil sampling are provided in the *Remedial Investigation/Focused Feasibility Study/Risk Assessment for the T Area Operable Unit* (WSRC-RP-2004-4050).

The concrete in Building 677-T was also screened for contamination and scabbled to reduce radionuclide activities (primarily uranium-238 plus daughters). Bias sampling of the sumps conducted after decontamination indicated that no radionuclides were present above PTSM criteria, and the sumps were subsequently filled with concrete to prevent ponding of stormwater. Facility drawings indicate that two of the sumps located on the western exterior of the building drained via process sewer lines to the OTSB. Interior building sumps appear to have been self-contained. Because it is unknown if leakage occurred at connections between the process sewer line and the two exterior sumps and because of the process history associated with the OTSB, it is uncertain whether PTSM may be present in the soil beneath these sumps.

Description of Significant Differences

The purpose of this ESD is to document Post-ROD changes to the current remedy for the OTSB/IPSL/DG subunit of the TNX Area OU. The current remedy is excavation of PTSM in the OTSB and IPSL with backfill and placement of an engineered cap over the OTSB/IPSL/DG and institutional controls.

The significant differences of the modified remedy from the current remedy are:

- Additional excavation of potential PTSM in soil adjacent to selected sumps (neutralization sump, stainless steel sump in the tank gallery, and the centrifuge sump at 678-T, and the #4 and #8 sump at 677-T) and a small area of contamination on the western exterior of 678-T (Figure 1). The soil adjacent to the sumps will be tested to determine if PTSM due to toxicity is present. The total estimated volume of material that may be impacted is approximately 700 yd^3. No PTSM due to contaminant migration has been identified for the OTSB and IPSL. A contaminant migration assessment of the T Area cap provided in the *Remedial Investigation/Focused Feasibility Study/Risk Assessment for the T Area Operable Unit* (WSRC 2005) shows that the proposed cap will reduce the recharge rate to 0.003 inches/year and will be effective in preventing contaminants from migrating to groundwater. Unit-specific soil screening limits for contaminant migration constituents of concern (CMCOCs) under the proposed cap are also higher than toxicity PTSM levels. If CMCOCs are present in the soil adjacent to the 678-T and 677-T sumps, the placement of a low-permeability cap as part of the remedial action associated with T Area closure would prevent the contaminants from leaching to groundwater.

- Modification of the RG for PTSM from 21.75 pCi/g radium-228 and 23.44 pCi/g thorium-228 to the current PRG equivalent to 1 x 10^{-3} risk to the future industrial worker of 94 pCi/g for radium-228 plus daughters and thorium-228 plus daughters.

The RGs published in the ROD for the TNX Area OU were 21.75 pCi/g for radium-228 plus daughters and 23.44 pCi/g for thorium-228 plus daughters. These values were calculated using the risk-based activities (RBAs) that were published in January 2000 (WSRC 2000). The Cancer Slope Factors (CSFs) used in the RBA calculation were obtained from the August 1999 version of the HEAST (USEPA 1999). More specifically, the industrial worker soil RBA for radium-228 plus daughters value was 6.59E-02 pCi/g and was 2.5E-02 pCi/g for thorium-228 plus daughters.

The USEPA has since issued updated guidance on calculation methods used for determining radionuclide activity screening levels. The toxicity values (i.e., the CSFs) have also been revised following an extensive peer review. USEPA's Superfund radionuclide preliminary remediation goal (PRG) website, which implements the standard USEPA Risk Assessment Guidance for Superfund (RAGS), provides a database tool with which to derive risk-based concentrations (i.e., PRGs) that are calculated using default parameters and

the latest toxicity values. The PRGs for radiological constituents are identified in an Engineering Calculation (WSRC 2003). The PRG for radium-228 plus daughters is 1.49E-01 pCi/g and for thorium-228 plus daughters is 2.52E-01 pCi/g.

The thorium series is a naturally-occurring radioactive decay chain with thorium-232 as the parent (half-life of 1.4E10 years). Thorium-232 decays to shorter-lived radioactive daughters (i.e., radium-228 and thorium-228). Because the long-lived parent is found in nature, the daughters achieve an equilibrium activity that is significant due to constant in-growth. Therefore, the radium-228 and thorium-228 are in secular equilibrium and have the same activity. The revised RG for radium-228 plus daughters and thorium-228 plus daughters is 94 pCi/g. This activity corresponds to a cumulative risk level of 1E-03 (the PTSM threshold) for these two constituents combined.

These differences will not result in a fundamental change to the remedy selected for the OTSB/IPSL/DG. However, approximately 700 yd^3 of contaminated soil may be excavated from the 678-T and 677-T sump areas. With the RG modification to 94 pCi/g radium-228 plus daughters and thorium-228 plus daughters, the volume of PTSM in the OTSB will be reduced by approximately the same amount. Therefore, the increase in scope for excavation of PTSM at the 678-T and 677-T sump areas will not significantly change the originally estimated cost of remediation.

PTSM from the OTSB and soil adjacent to the 678-T and 677-T sumps will be disposed off-site. Non-PTSM material will be managed under the engineered cap. Any water that may collect in the excavations will be tested to determine if it is contaminated. Water that is not contaminated above soil PTSM levels may be managed under the cap. These activities will be documented in the post-construction report.

Statutory Determinations

USEPA guidance (USEPA 1991) states a preference for treatment of PTSM, wherever practicable. Because of the nature of the long-lived radionuclides present at the waste unit and lack of treatment technologies to reduce the potential toxicity of the contaminated media to less than PTSM levels, treatment was determined to be impracticable, and excavation and off-site disposal at an approved facility was chosen as the modified remedy.

The modified remedy meets the requirements specified in CERCLA Section 121 to: (1) be protective of human health and the environment; (2) comply with applicable or relevant and appropriate requirements; (3) be cost-effective; and (4) utilize permanent solutions to the maximum extent practicable. Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is protective of human health and the environment.

Public Participation Activities

To meet the requirements for public participation set out in the NCP Section

300.435(c)(2)(i), the public has been notified of this ESD through mailing of the *SRS Environmental Bulletin*, a newsletter sent to approximately 3,500 citizens in South Carolina and Georgia, and through the *Aiken Standard*, the *Allendale Citizen Leader*, the *Barnwell People Sentinel*, *The State* and the *Augusta Chronicle* newspapers.

To obtain more information concerning this ESD, contact:

Jim Moore
Westinghouse Savannah River Company
Savannah River Site
Building 742-A
Aiken, SC 29808
1-800-249-8155
jim02.moore@srs.gov

References

USEPA 1991. *A Guide to Principal Threat and Low Level Threat Wastes*, Superfund Publication: 9380.3-06FS, United States Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

USEPA 1999, *Health Effects Summary Tables,* FY-99 Annual, EPA/540/R-97/036, United States Environmental Protection Agency, Office of Research and Development, Office of Solid Waste and Emergency Response, Washington, D.C.

WSRC 2000, *Risk Assessment Screening Calculations*, Engineering Calculation K-CLC-G-00023, Rev. 3, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC, 2003, *Radionuclide Preliminary Remediation Goals,* Engineering Calculation K-CLC-G-00077, Rev. 1, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC 2005. *Remedial Investigation/ Focused Feasibility Study/ Risk Assessment for the T Area Operable Unit*, WSRC-RP-2204-4050, Rev. 1.1, Westinghouse Savannah River Corporation, Savannah River Site. Aiken, SC.

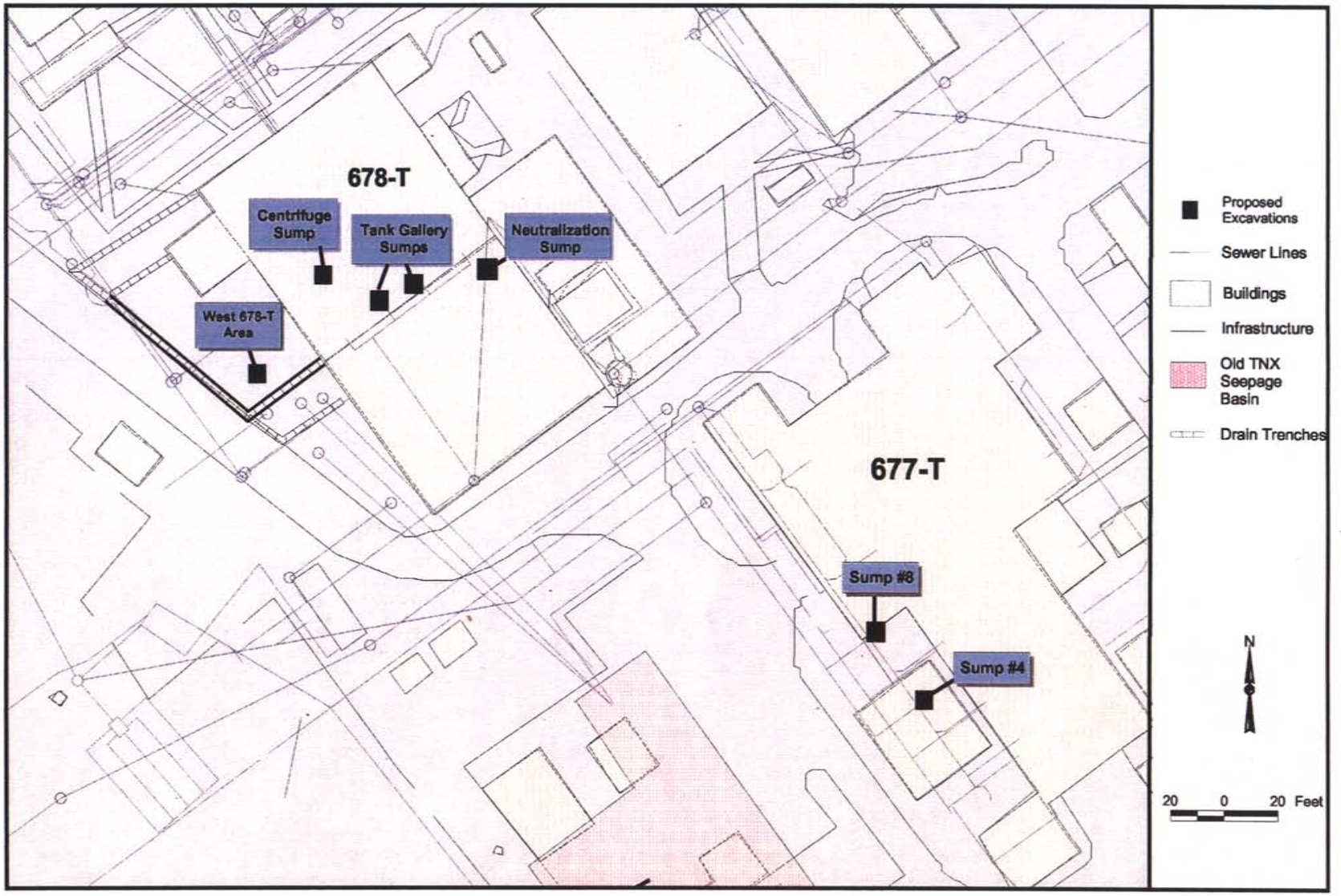

Figure 1. Locations of Proposed Excavations

This page intentionally left blank.