Caleb Jones

From: Caleb Jones
Sent: Thursday, August 6, 2026 12:17 PM
To: Keehna B. Frasier
Cc: Fatina Clark; Shelia Mcfalls
Subject: NOTIFICATION OF PARTIAL CLOSURE OF THE F-AREA INACTIVE PROCESS SEWER LINE MANHOLE P-26 DUE TO ROAD MAINTENANCE AND EXPANSION
Attachments: SRNS-IM-2012-00002 Appendix 6.pdf; Figure 3-3.pdf

Keehna,

In August 2026, Savannah River Site (SRS) will begin the partial closure of the F-Area Inactive Process Sewer Line (FIPSL) Manhole (MH) P-26, with construction expected to commence within the next two weeks. MH P-26 is part of the FIPSL network which is comprised of vitrified clay process sewer lines and manholes located within the F-Area Hazardous Waste Management Facility (FHWMF). This line and the manhole were operated from 1955 to 1982, transporting low-level radioactive and hazardous wastewater to the F-Area Seepage Basins. The location of P-26 is adjacent to the existing F-Area perimeter road, which is being widened directly above the manhole to support the Savannah River Pit Production Facility (SRPPF) project. The manhole is shown on the attached Figure 3-3. This section of the FIPSL is managed under the SRS RCRA permit and governed by the approved closure plan (SRNS-IM-2012-00002, December 2020, Appendix 6, which is attached for your reference). All planned maintenance activities for closure of MH P-26 will meet the objectives specified in this closure plan. After the maintenance work is completed, the manhole will be in a stabilized condition for long term stewardship, consistent with the closure plan, until the final closure of the FIPSL occurs as part of the overall F-Area Operable Unit. Documentation of the partial closure of MH P-26 will be included in the annual 2027 Corrective Action Report. The maintenance steps for this manhole are as follows:

- Collapse the top of the manhole to a minimum depth of 2.5 feet below grade
- Plug all manhole inlet and outlet pipes connected to the manhole
- Fill the manhole in place to prevent human intrusion, with material meeting engineering requirements for the new roadway
- Place new asphalt over MH P-26 as required by the overlying roadway design

Since the maintenance activity will involve placing asphalt over the closed manhole, quarterly inspections will not be conducted for MH P-26 until the entire FIPSL is closed at a future date. Land use controls to prevent human exposure will be maintained through the SRS Site Use/Site Clearance program.

All activities associated with MH P-26 closure are within RCRA/CERCLA Site Index No. 579 “F-Area Operable Unit” of the Federal Facility Agreement, Appendix C.2 (WSRC-OS-94-42). The potential area of disturbance is less than 10% of the waste unit area, characterizing it as “minor intrusive” activity. An O&M plan has been completed per WSRC-RP-96-45, Savannah River Site Plan for Performing Maintenance in Federal Facility Agreement Area (O&M) Plan (U), December 15, 1996.

If you need any additional information, please contact me.

Thanks

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Savannah River Site
2013
Resource Conservation and Recovery Act
Permit Renewal Application

F-AREA
HAZARDOUS WASTE MANAGEMENT FACILITY
POSTCLOSURE

Volume IV

—APPPENDIX 6—
CLOSURE PLAN FOR THE
F-AREA INACTIVE PROCESS SEWER LINE

SRNS-IM-2012-00002
Revision: 0
December 2020

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EXECUTIVE SUMMARY

This appendix to the Resource Conservation and Recovery Act permit application presents the Closure Plan for the F-Area Hazardous Waste Management Facility Inactive Process Sewer Lines. The plan is being submitted in accordance with the schedule for implementation of the Phase 2 corrective action measures for the F-Area Hazardous Waste Management Facility. The Closure Plan herein summarizes the characterization of contamination, identifies the contaminants of concern and their respective concentration/activity limits, and presents a description of the proposed closure and post-closure requirements.

The F-Area Inactive Process Sewer Lines consist of underground vitrified clay sewer lines and high-density polyethylene sewer lines in F-Area. Vitrified clay sewer lines were used from 1955 until 1982 to transport radioactive and hazardous waste from the processing and separations facilities to the F-Area Seepage Basins. In 1974, a 2-inch polybutylene line was placed inside the northern half of the vitrified clay line, using the polybutylene line as a conduit. The 2-inch polybutylene line transfers liquid waste from the F-Area Canyons. The 2-inch polybutylene line is currently active. In 1982, the vitrified clay lines were abandoned in place and replaced with high-density polyethylene pipes that are generally parallel to and located 20-25 feet laterally away from the abandoned clay lines. The vitrified clay lines were abandoned and replaced due to leaking or collapsing of portions of the clay lines allowing contaminated process water to escape.

In 1991, the F-Area Seepage Basins were closed. As a result of this closing, approximately half (1,960 feet) of the high-density polyethylene pipe transporting waste to the basins was abandoned in place. Diversion boxes and additional high-density polyethylene pipe were tied to the remaining high-density polyethylene pipeline to transfer waste streams to the F-Area Effluent Treatment Facility. This section remains active.

Various characterization reports have been issued for the F-Area Inactive Process Sewer Lines that investigated the type and extent of soil and groundwater contamination along the length of the vitrified clay sewer lines and a portion of the high-density polyethylene pipelines. The locations were focused on areas of known collapse/repair or near the manholes. These are the areas most likely to have soil contamination from the process water. Soil cores were taken in 1988 to 1989 and in 1992 to 1993 adjacent to the vitrified clay sewer lines. In addition, in 1992 soil cores were also obtained adjacent to manholes along the abandoned portion of the high-density polyethylene line. Analyses were performed for radionuclide activities, metals, volatiles and physical parameters. The results indicated that radionuclide activities and concentrations of metals and nitrate from the process water exceeded published soil background levels, and some published risk-based levels. A Screening Baseline Risk Assessment for the F- and H-Areas Inactive Process Sewer Lines using these data was completed in August 1994.

Groundwater characterization has also occurred over several intervals of time. Groundwater monitoring wells in the FSL monitoring well series were installed in 1992. In addition, hydropunch™ samples were performed in 1997, and continuous push technology pushes in 2004. Exceedances of the groundwater protection standards have been noted from all three sources.

These analytes include mercury, lead, nickel, nitrate, total radium, nonvolatile beta emitters, alpha emitters, tritium, trichloroethylene and carbon tetrachloride. The exceedances of the groundwater protection standards indicate that the groundwater has been contaminated from releases from either the F-Area Inactive Process Sewer Lines or other upgradient sources.

The primary focus of this Closure Plan is to ensure that the plan for the F-Area Inactive Process Sewer Lines is protective of human health and the environment. To attain this SRS plans to retard infiltration by placing a geo-synthetic cover system over the length of the vitrified clay pipe, except for those areas already covered by pavement or asphalt and around the perimeters of the manholes and trebler associated with the high-density polyethylene line. This is the same type of remedial actions that are being performed per the H-Area Inactive Process Sewer Line Closure. The placement of a cover system allows for the natural decay of the radioisotopes to occur without concern for causing risk to human health or posing a contaminant migration situation. Also, in order to protect the geosynthetic cover those portions of the pipeline that are prone to collapse that could propagate a depression at the surface will be addressed by grouting, reinforcement or topographic enhancement. In addition, the manholes and the treblers will be grouted in place to control human intrusion. Early and post-closure care requirements including institutional controls will insure that the activities performed and the controls put in place are maintained and functioning properly. These activities will be concurrent with the timetable for the F-Area closure.

The closure will be performed concurrent with the closure of the F-Area in order to avoid impacting the safe operation of the F-Area facilities. This is due to the inordinate number of underground and overhead interferences that exist adjacent to and in close proximity to the FArea Inactive Process Sewer Line. These interferences include the following:

- Supervisory Control and Data Acquisition Cables – used for remote operation of the facility;
- Steam Line – used for power for pumping associated with the high-level waste tanks;
- 120-kV electric line – power for high efficiency particulate air filtration;
- Supervisory Communication Line – emergency communication line;
- Potable water line – domestic water source for F-Area;
- C-Road and the F-Area facility access road – provide access to F-Area and other facilities; and
- Other interferences such as storm water transfer lines, electric transfer units, parking lots, etc.

While contamination would not be capped for a short period of time, SRS feels there would be minimal impact because:

- Concentrations of the groundwater contaminants that appear to have been sourced from the collapsed area are declining, indicating a declining source term;
- Those contaminants that are indicated to migrate to groundwater in the near term, as indicated from the contaminant migration evaluation located in Appendix A, have already migrated to groundwater, and as noted above, their concentrations are declining;

- It is anticipated that the groundwater concentrations would continue to decline due to dispersion and radiological decay; and,
- The F-Area Inactive Process Sewer Line is in very close proximity to the F-Area Tank Farm and the Separations Facility and would be within the remedial "footprint" of the area completion. In addition, the residual contamination associated with the F-Area Inactive Process Sewer Line soils will be minimal when compared to residual contamination within the tank farm and separations area.

The operation of the F-Area Tank Farm and Canyon including associated facilities involve nuclear safety class operating systems. Excavation within the general vicinity of steam power used for the transfer of liquid radioactive waste, high voltage lines used for high energy particulate air filtration and underground and emergency communication cables represents an immediate, substantial and acute health and safety risk both to workers involved with the remediation and employees in the tank farm. Interruption of power or other supporting utilities could result in high level releases and consequential exposure.

SRS does not believe that the low threat associated with the FIPSL soils when compared to nuclear safety warrants an interference with nuclear operating systems. Because of these safety issues the minimal threat posed by the FIPSL would best be managed concurrently with the closure of these facilities.

INTRODUCTION

Background

The Savannah River Site (SRS) (Figure 1-1), located in portions of Aiken, Barnwell, and Allendale Counties of South Carolina, produces nuclear materials for national defense. The site is owned by the United States Department of Energy (USDOE).

The F-Area Inactive Process Sewer Line (FIPSL) is located in F Area and is depicted on Figure 1-2. Vitrified clay sewer lines were used from 1955 until 1982 to transport radioactive and hazardous waste from the F Area processing and separations facilities to the F-Area Seepage Basins. Waste effluent included cooling water, rinse water from nuclear materials facilities, purge water from fuel and target storage basins, surface runoff from tank farms, and distillate from the evaporation of various processes and waste streams. In 1974, a 2-inch polybutylene line was placed inside a portion of the vitrified clay line, with the polybutylene line serving as a conduit. This 2-inch polybutylene line emanates from the F-Area Canyons and traverses the northern portion of the vitrified clay line, exiting at manhole # 27. The 2-inch polybutylene line is currently active. In 1982, the vitrified clay lines were abandoned in place and replaced with high-density polyethylene (HDPE). The HDPE lines are parallel to and approximately 20-25 foot laterally from the abandoned clay lines at depths ranging from 3 to 15 feet below ground surface. The abandoned FIPSL is to be closed in accordance with applicable Resource Conservation and Recovery Act

(RCRA) regulations. The portion of the vitrified clay line within the F-Area fence will be closed in accordance with CERCLA as agreed in the Federal Facility Agreement (FFA).

The seepage basins were closed in 1991. As a result of this closing, approximately half (1,960 feet) of the HDPE pipe transporting waste to the basins was abandoned in place. Diversion boxes and additional HDPE pipe was tied to what remained of the HDPE to transfer waste streams to the F-Area Effluent Treatment Project (ETP). This section remains active.

Characterization and assessment of the soils were performed along the length of the abandoned vitrified clay process sewer line from the F-Area Seepage Basin to the F-Area Separations Facility fenceline (approximately 4,050 feet) in 1988-89 and in 1992-93. Characterization was performed in order to determine if there was soil contamination adjacent to the vitrified clay process sewer line. Soil cores at sampling sites adjacent to the vitrified clay sewer line and from background areas in the vicinity of each pipeline were obtained. Sampling sites were selected to focus on areas of known collapse and repair, and other areas possessing a high potential for deterioration and/or leakage (i.e., manhole structures). The analytical results from the soil samples indicated that radionuclide activities and concentrations of metals and nitrate exceed published soil background levels and some published risk-based levels. A Screening Baseline Risk Assessment (SBRA) was compiled from the data and submitted to South Carolina Department of Health and Environmental Control (SCDHEC) in August 1994 (WSRC 1994). The locations of the sampling sites and results are discussed in Section 3.

A series of nine monitoring wells (FSL-1D through FSL-9D) were installed in 1992, to monitor any impact to the water table in the vicinity of the FIPSL. All nine wells were completed in the upper aquifer zone (UAZ) of the Upper Three Runs aquifer (UTRA). A discussion of the sampling results, locations, and analyses of these wells is included in Section 3.

In 1998, the FIPSL Phase III Groundwater Assessment was completed. This assessment included Hydropunch™ groundwater sampling along several transects perpendicular to and downgradient from the sewer lines in F Area, almost entirely in the Upper Three Runs watershed. Groundwater samples were collected from five intervals, two within the UAZ and three within the lower aquifer zone (LAZ) of the UTRA. Analysis of these samples indicated the presence of elevated nitrate-nitrite, radionuclide indicators, tritium and some metals exceeding groundwater protection standards. Water samples obtained from Hydropunch and continuous push technology (CPT) methods generally have turbid samples which yield metal results that are overly conservative and not accurate. The results of this characterization were included in a final report, (WSRC 1998). Section 3.0 contains a discussion of the data and a map depicting the sampling points.

In addition, a series of CPT locations adjacent to the FIPSL were pushed in 2004 for the General Separations Area Western Groundwater (GSAWG) Operable Unit (OU). Groundwater samples were obtained in the upper portion and lower portion of the UTRA from these CPTs. Samples were also obtained from the Gordon aquifer (GA). For the purposes of this Closure Plan, data relating to the upper portion of the UTRA has been evaluated to ascertain groundwater quality underlying the FIPSL. A discussion of the results of the characterization of the UTRA is included in Section 3.0.

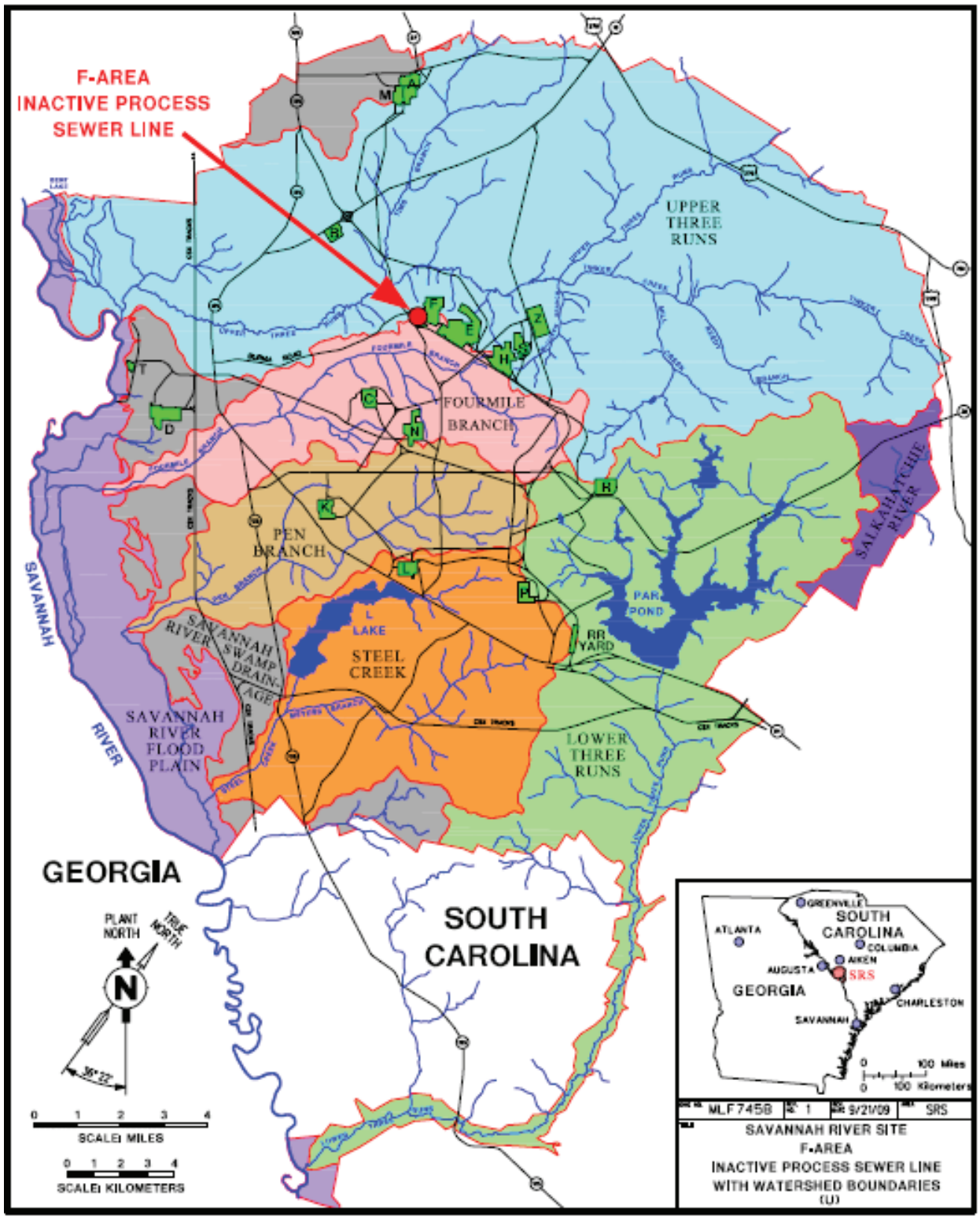


Figure 1-1. Map of SRS Showing the Location of F Area

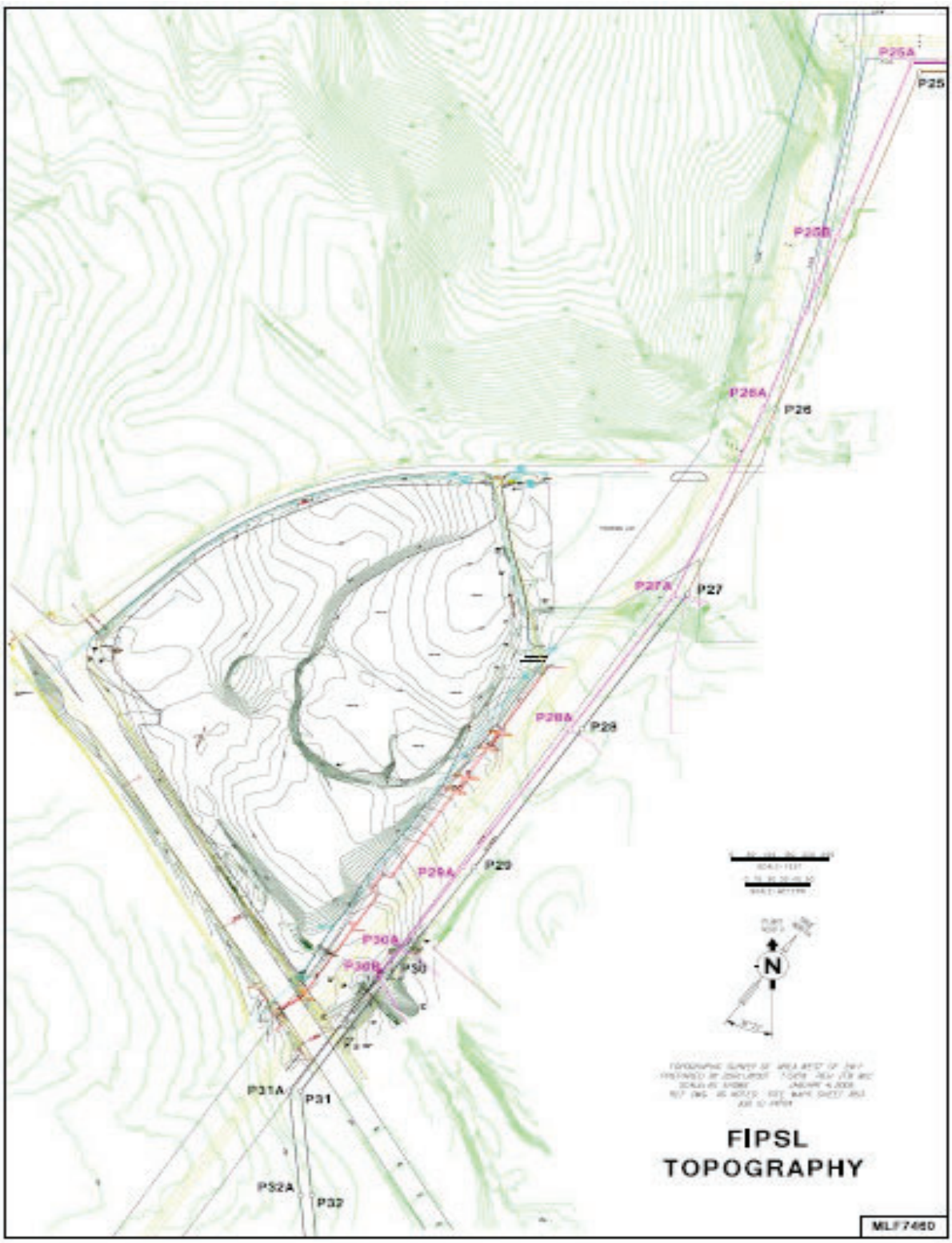


Figure 1-2 FIPSL Topography

Regulatory Basis for Closure

The FIPSL closure pertains only to those areas outlined in this Closure Plan. The FIPSL was originally a portion of the F-Area Hazardous Waste Management Facility (HWMF). Closure design is based upon Regulation R.61-79.265, Subpart G of the South Carolina Hazardous Waste Management Regulations (SCHWMR), and closure activities are to be conducted in accordance with its requirements. Generally this Closure Plan calls for installing a cover system over the vitrified clay portion of the FIPSL, grouting the manholes and the treblers of the vitrified clay and HDPE pipe, addressing those portions of the pipeline that are prone to collapse that could propagate a depression at the surface by grouting the interior of the pipe, reinforcement, or topographic enhancements, controlling access, and institutional controls. Groundwater in this area is managed under the F-Area HWMF Part B Permit Application and the GSAWG OU.

A copy of the approved Closure Plan and all revisions will be maintained at SRS until facility closure is completed and certified in accordance with SCHWMR 61-79.264.115. If changes occur that affect the Closure Plan during design or closure activities, the plan will be amended 60 days prior to the proposed change or no later than 30 days after an unexpected event occurs.

Contiguous Facilities

The closure design of the FIPSL will interface with the other physical facilities of F Area. The closure will be concurrent with the timetable for F Area closure.

Closure Performance Standard

The FIPSL will be closed in a manner that minimizes or eliminates, to the extent necessary to prevent threats to human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the groundwater, surface waters, or to the atmosphere. The closure will also satisfy SCHWMR Regulation R.61-79.264.228 (a) (2) (iii) pertaining to surface impoundments.

To meet these objectives, the FIPSL will be closed in a manner very similar to the HIPSL closure by construction of a final cover system over the FIPSL, grouting the manholes and treblers of the vitrified clay and the HDPE pipe, protecting the cover system by addressing those portions of the pipeline that could collapse and propagate a depression at the surface by grouting the interior of the pipe, reinforcement, or topographic enhancement, controlling access and initiating institutional controls.

The final cover will provide long-term minimization of liquid migration through the soils immediately underlying the vitrified clay pipeline. This will also reduce the potential for surface exposure while allowing for most radioisotopes to decrease in mass by natural decay. The cover will also function with minimum maintenance, promote drainage and minimize erosion or abrasion of the final cover, accommodate settling and subsidence so that the cover's integrity is maintained, and have a permeability less than or equal to the permeability of surrounding natural soils. Post-

closure requirements contained in Subpart G Section 264.117-264.120 will be met by maintaining the integrity and effectiveness of the final cover.

This will be accomplished by the following:

1) making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events,

2) maintaining and monitoring the groundwater via the existing monitoring system,

3) complying with all other applicable requirements of Section 264 Subpart F, and

4) preventing run-on and run-off from eroding and otherwise damaging the final cover.

To meet these objectives, SRS plans to take the following actions:

1) installing an engineered cover system [Geosynthetic Clay Liner (GCL)] extending 7.5 feet to each side of the center line of the vitrified clay pipeline;

2) collapsing the brick manholes to 2.5 feet below grade and grouting the manholes and the trebler of the vitrified clay pipe;

3) grouting the manholes and the trebler of the HDPE pipe to prohibit human intrusion;

4) protecting the integrity of the GCL by addressing those portions of the pipeline where there is a potential for collapse and failure of the GCL. This will be accomplished by grouting the interior of the pipe, reinforcements or topographic enhancement; and

5) installing signs to control access along the length of the pipeline after approval of the closure plan and permanently after all the above have transpired, denoting that the site is a HWMF and was a former radioactive waste management facility, and performing other institutional control measures discussed in Section 6.

The closure will be performed concurrent with the closure of the F-Area in order to avoid impacting the safe operation of the F-Area facilities. This is due to the inordinate number of underground and overhead interferences that exist adjacent to and in close proximity to the FIPSL. These interferences include the following:

- Supervisory Control and Data Acquisition (SCADA) Cables – used for remote operation of the facility;
- Steam Line – used for power for pumping associated with the high-level waste tanks;
- 120-kV electric line – power for high efficiency particulate air (HEPA) filtration;
- Supervisory Communication Line – emergency communication line;
- Potable water line – domestic water source for F-Area;

- C-Road and the F-Area facility access road – provide access to F-Area and other facilities; and
- Other interferences such as storm water transfer lines, electric transfer units, parking lots, etc.

While contamination would not be capped for a short period of time, SRS feels there would be minimal impact because:

- Concentrations of the groundwater contaminants that appear to have been sourced from the collapsed area are declining, indicating a declining source term;
- Those contaminants that are indicated to migrate to groundwater in the near term, as indicated from the contaminant migration evaluation located in Appendix A, have already migrated to groundwater, and as noted above, their concentrations are declining;
- It is anticipated that the groundwater concentrations would continue to decline due to dispersion and radiological decay; and,
- The FIPSL is in very close proximity to the F-Area Tank Farm and the Separations Facility and would be within the remedial "footprint" of the area completion. In addition, the residual contamination associated with the FIPSL soils will be minimal when compared to residual contamination within the tank farm and separations area.

Therefore, it would be more appropriate to integrate the FIPSL into the remedial actions of the Tank Farm and the Separations Area.

The engineered cover system over the process sewer composed of vitrified clay will minimize infiltration of water through contaminated soils, thereby reducing migration of remnant contaminants to groundwater. Sections of the abandoned FIPSL (composed of vitrified clay) that cannot be covered will be grouted and abandoned in place, (i.e. those underlying the parking lots, roads, etc). All the HDPE system manholes are to have a GCL cover extending 10 feet out from the perimeter of the manhole structure.

Both treblers, the one on the HDPE line and the one on the vitrified clay pipe FIPSL, will be grouted and capped with a concrete cap. Contaminated equipment associated with the treblers, such as piping, pumps, handrails, grating, etc., will be dismantled and put into the trebler as possible. The trebler pit will then be grouted. The GCL will extend 10 feet from the perimeter of both treblers to prevent infiltration of surface water to the underlying soil.

Future use of the site will be managed by institutional controls. Institutional controls will consist of access control, posting, maintenance of structures, surveillance, and land use restrictions.

Access to the site will be controlled since the site is located in a secure area operated by the USDOE. Posting will be regularly spaced along the length of the closed facility (pipeline) denoting that the site is a former radioactive and HWMF. Maintenance of the structures and surveillance will be performed on a routine basis to maintain the integrity of the cover system. All of the above are important in that they allow for undisturbed natural degradation of the radioactivity through

isotopic decay. Deed restrictions will contain language that will notify any potential future purchaser that the site is a former radioactive and hazardous waste management facility. As a result, the closed pipeline will not be fenced.

Groundwater monitoring will be used to evaluate releases of hazardous and radioactive constituents from the site. It is expected that the USDOE will maintain institutional control of the site for at least 30 years following closure of the FIPSL.

BACKGROUND DATA

Site Description

The FIPSL at SRS was used to transport liquid waste from F-Area processing and separations facilities to the unlined earthen F-Area Seepage Basins.

The original sewer lines were constructed of vitrified clay and used from 1955 to 1982. Due to deterioration, the vitrified clay lines were abandoned in place in 1982 and replaced with HDPE lines. Inside the F-Area security fence, the inactive process sewer line is governed by CERCLA. The F-Area Seepage Basins and sections of the vitrified clay sewer line that lie outside the F-Area security fences and extend to the seepage basins are subject to RCRA.

The FIPSL is located on a topographic ridge beneath which shallow groundwater diverges toward Upper Three Runs to the north and Fourmile Branch to the south. An extensive network of wells near the F-Area Seepage Basins and along the FIPSL monitor shallow groundwater that discharges to Fourmile Branch and Upper Three Runs.

For a description of the general hydrogeology of the area, see Section 3.3

Waste Unit Characterization

Waste Characterization

Waste effluent in the FIPSL pipelines included cooling water, rinse water from nuclear materials facilities, purge water from fuel and target storage basins, surface runoff from the tank farms, and distillate from the evaporation of various process and waste streams. A description of the waste going to the basins can be found in Section C.1.7.1 of the 1992 Part B Permit Application.

Soil Characterization

During 1988 and 1989, characterization and assessment of the soils were performed along the length of the abandoned vitrified clay process sewers from the F-Area Seepage Basins to the FArea Separations Facility fenceline (approximately 4,030 feet). Samples were obtained from various depths at 51 borings. Sample locations were biased to focus on areas of known sewer line collapse

and repair, and other areas possessing a high potential for deterioration and/or leakage (i.e., manhole structures). The samples were obtained for 3 meters (10 feet) starting at 1.5 meters (5 feet) (which was assumed to be the depth of the bottom of the pipeline). The results of this investigation were included in a report as an attachment to the F-Area HWMF Closure Plan, Rev. 0, submitted to SCDHEC as a portion of the Part B Permit Application (WSRC 1992). The sampling locations are depicted on Figure 3-1. The soil boring locations in Figure 3-1 are shown at their original survey location. Some minor survey errors may exist as the borings do not line up to be adjacent the manholes in all cases. The analysis for the sampling consisted of a comprehensive set of hazardous and radioactive constituents and also the Toxicity Characteristic Leaching Procedure (TCLP) for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. In addition, gross alpha and gross beta analyses were also conducted. A table depicting the results of these analyses is included on the data disc accompanying this document. Tables 3.1 and 3.2 compare the maximum concentrations found in this sampling event to the current preliminary remediation goal (PRG) concentration or riskbased concentration (RBC) and risk-based activity (RBA) values. The tables are presented at the end of the text.

Soil sampling was also performed in 1992 and 1993. This sampling focused on characterization and assessment of the soils along the length of the abandoned vitrified clay process sewers from the F-Area HWMF boundary to the F-Area Separations Facility fenceline (approximately 4,030 feet). Samples were obtained from various depths from eleven sets of soil borings along the length of the FIPSL. As in the previous sampling effort, the sample locations were biased to focus on areas of known sewer line collapse and repair, and other areas possessing a high potential for deterioration and/or leakage (i.e., manhole structures and areas of known collapse). The results of this investigation were included in a SBRA that was submitted to SCDHEC in August 1994 (WSRC 1994). The sampling locations are depicted on Figure 3-1. Tables 3.3 and 3.4 compare the maximum concentrations found in this sampling event to the current primary PRG concentration and RBA values. The tables are presented at the end of the text.

The analysis for the sampling consisted of a comprehensive set of hazardous and radioactive constituents and TCLP for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Analysis for physical parameters was also conducted.

Soil sampling was also performed along the unused portion of the HDPE line in 1992. This sampling focused on characterization and assessment of the soils along the abandoned portion of the HDPE line. Samples were obtained from various depths from four borings at two of the three manholes. At manhole 31A, there were only two borings located at 0.9 meters and 1.8 meters (3 and 6 feet) from the sewer line on the east side of the HDPE line due to the presence of overhead utilities on the west side of the HDPE line. As in the previous sampling efforts, the sample locations were biased to focus on areas possessing a high potential for deterioration and/or leakage (i.e., manhole structures). The sampling locations are depicted on Figure 3-1. All samples were analyzed for inorganic constituents, TCLP metals, and total metals. Analyses for radioactive screens and a set of radioactive constituents were also performed. Tables 3.5 and 3.6 compare the maximum concentrations found in this sampling event to the current PRG and RBA values. The tables are presented at the end of the text.

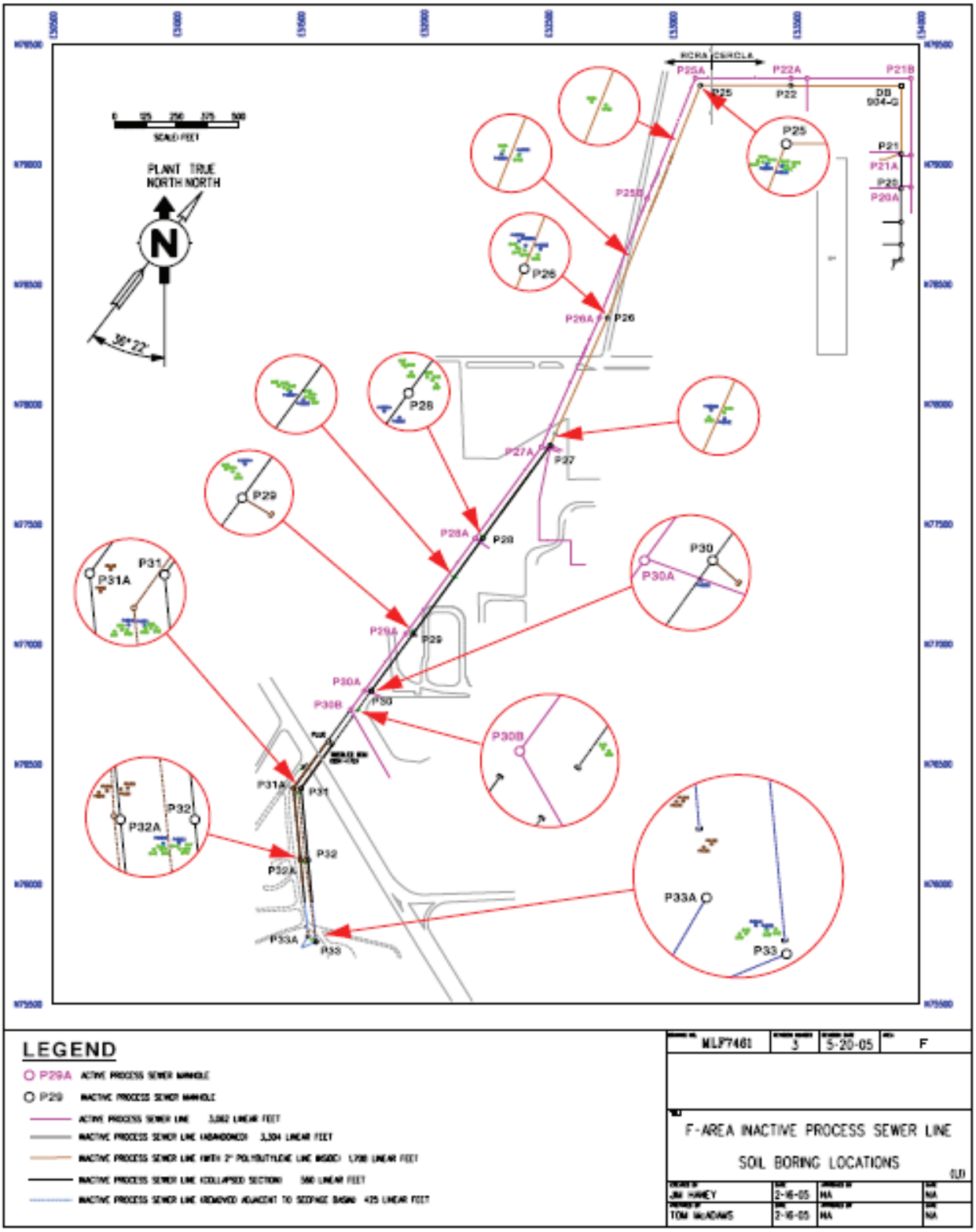


Figure 3-1. Soil Core Location Map for Soil Characterization

In this Closure Plan, the maximum concentration detected in all the above-mentioned investigations is compared to United States Environmental Protection Agency (USEPA) current RBA values (for radiological constituents) or current RBC concentrations (for non-radiological constituents). For comparison purposes, the SRS background values from the 1993-94 data are also included. Because of the timeframe since sampling was performed, the maximum concentrations for short-lived radionuclides have been corrected for radiological decay. The decay corrected values are noted in parentheses. Tables 3.7 and 3.8 compare the maximum concentrations found in all of these sampling events to the current PRG and RBA values. The tables are presented at the end of this chapter. As a portion of the contaminant migration calculation, Table 3-9 compares the maximum contaminant concentration to twice the average background. The table is presented at the end of the text.

The TCLP results for all three sampling events are depicted in Table 3-10. None of the results exceeded their TCLP values.

Groundwater Characterization

In 1993, six boreholes were performed to approximately 250 feet below land surface (bls) to aid in the lithologic determination of the aquifer zones and overall lithology of the area. In 1992, nine monitoring wells, FSL-1D through FSL-9D, were also installed in the UTRA. Samples from these monitoring wells were obtained to aid in determining the nature and extent of contamination as a portion of that groundwater characterization. The locations of the FSL monitoring wells are depicted on Figure 3-2. Table 3-11 depicts the data for the last two years from these monitoring wells and is located at the end of the text.

In 1998, the FIPSL and H-Area Inactive Process Sewer Line (HIPSL) Phase III Groundwater Assessments were completed. The assessment included Hydropunch^{TM} groundwater sampling along several transects perpendicular to and downgradient from the sewer lines in F and H Areas, almost entirely in the Upper Three Runs watershed. For the purposes of this document, only those locations in the vicinity of the FIPSL that were sampled from the UAZ of the UTRA are depicted on Figure 3-2. Groundwater samples were collected from a total of five horizons, two within the UAZ and three within the LAZ of the UTRA. The complete report was submitted to SCDHEC in 2001 (WSRC 2001). Table 3-12 depicts the data used in this report and is located at the end of the text.

In 2004, a CPT groundwater assessment was completed for the GSAWG OU. The assessment included CPT pushes with groundwater sampling in areas where data gaps appeared. Groundwater samples were collected from various horizons within the UAZ and the LAZ of the UTRA. Additionally, five soil borings were drilled using Rotosonic methods, and groundwater samples were obtained from the GA. Analysis of all these samples indicates elevated levels of nitrate-nitrite, radionuclide indicators, tritium, and some metals. Figure 3-2 depicts groundwater sample locations taken in the UAZ in the vicinity of the FIPSL. A table depicting the results of the 2004 CPT investigation is included on the data disc accompanying this document. Analytes exceeding PRG or RBA values are depicted in Table 3-13 at the end of the text.

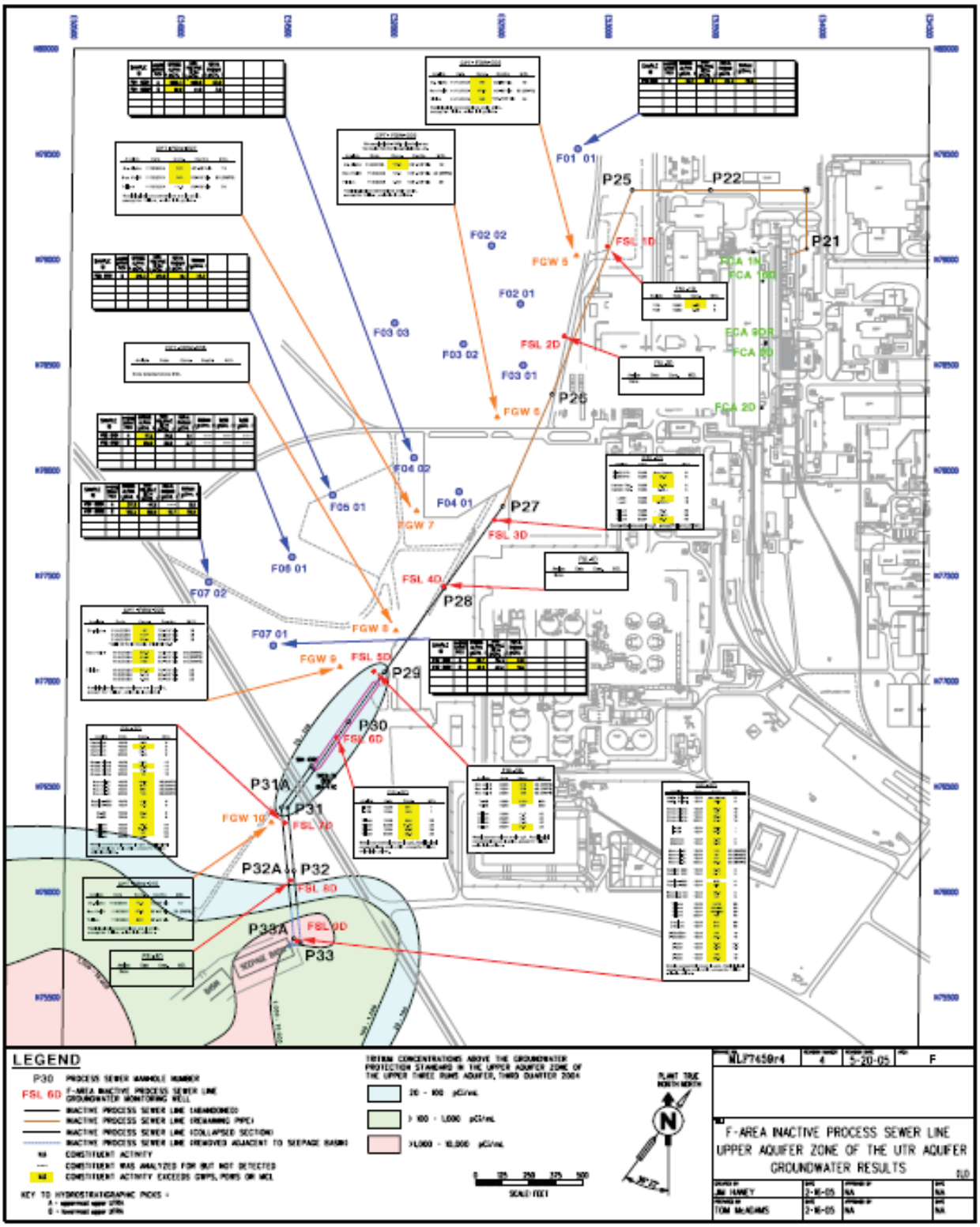


Figure 3-2. Monitoring Well and Hydropunch Location Map

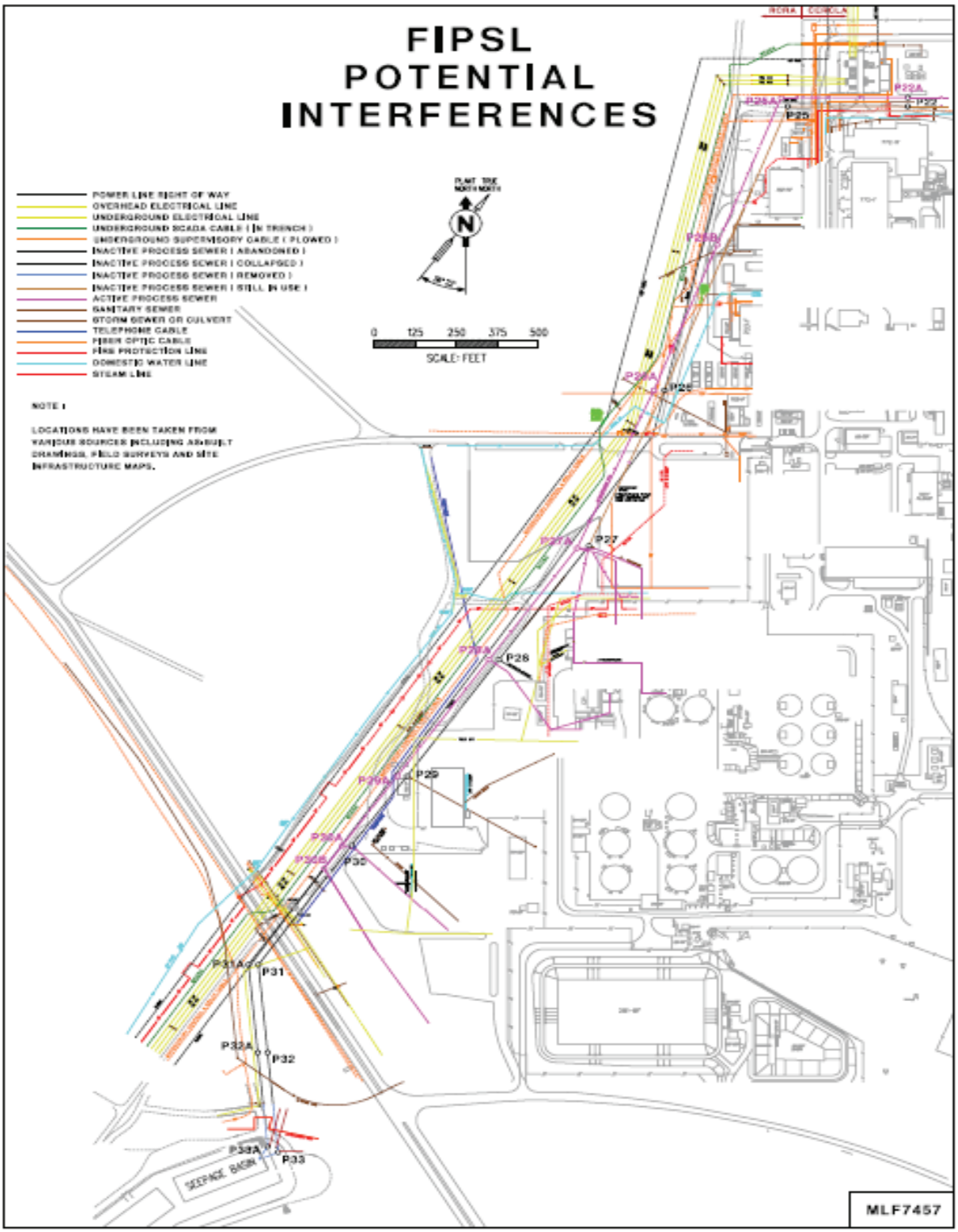


Figure 3-3. Map of F-Area IPSL Showing Interferences

General Hydrogeological Information

The FIPSL overlies the groundwater divide between the watershed of the Upper Three Runs and the Fourmile Branch. The Upper Three Runs has incised to an elevation of approximately 150feet above mean sea level (msl), and its drainage system is the primary controlling influence on groundwater flow direction in the UTRA and the GA in the northern portion of the FIPSL. Fourmile Branch has incised to an elevation of approximately 200-feet above msl in this region. It influences groundwater flow in the UTRA only, and not in the deeper GA. Generally, north of C-Road the groundwater in the UTRA flows toward Upper Three Runs. South of that point, the groundwater in the UTRA flows toward tributaries of Fourmile Branch.

The UTRA includes the Eocene age clastic and carbonate sediments of the Tinker/Santee, Clinchfield, Dry Branch, and Tobacco Road Formations, which were deposited in shallow marine environments (Aadland et al. 1995). Horizontal conductivity values from aquifer stress testing of 91.7 feet/day for the upper zone and 1.5 feet/day for the lower zone of the UTRA have been reported (WSRC 2005). The upper and lower zones of the UTRA are divided by the moderately continuous to discontinuous "tan clay confining zone" of the Dry Branch Formation. Beneath the study area, this clay zone consists of interbedded clay and sand, ranges from 5 to more than 10 feet thick, and typically exhibits vertical hydraulic conductivity values on the order of 10^{-3} feet/day (Flack and Harris 1997; Smits et al 1997). The UTRA is underlain and separated from the GA by clay-rich Eocene age marine sediments of the Warley Hill Formation. Hydrostratigraphically, this formation is the Gordon confining unit. The GA includes Paleocene and Eocene age marine and marginal marine sediments of the Snap, Fourmile, and Congaree Formations (Aadland et. al. 1995). A horizontal conductivity value from aquifer stress testing of 40 feet/day has been reported for the GA (WSRC 2005).

Underlying the area of the FIPSL, hydraulic head differences across the Gordon confining unit create the potential for downward migration of groundwater. However, because the Gordon confining unit is a relatively competent confining unit in the General Separations Area (GSA), there is little actual downward movement. Based on aquifer testing and modeling, leakance coefficients of 10^{-5}/day have been calculated for the Gordon confining unit in the GSA (GeoTrans 1992; CH2M Hill 1989).

More detailed descriptions of the geology and hydrostratigraphy of the GSA are available in many documents (e.g., Aadland et. al. 1995; Flack and Harris 1997; and Smits et. al. 1997).

Site Geology

Based on borings drilled in and around SRS and the FIPSL, the general soil conditions in the area consist of varying mixtures of sand, silt, and clay with local occurrences of gravel developed in the Upland Unit and Barnwell Formations.

Topography

The FIPSL is located near the center of the SRS. A topographic high area runs through F Area, and the surface elevation ranges from approximately 270 to 315 feet above msl. The FIPSL is located near a topographic nosing that divides surface runoff between Upper Three Runs to the north and Fourmile Branch to the southwest. (See Figure 2-1).

Climatological Records

Precipitation at SRS averaged 48 inches per year from 1964 through 1985 (Rogers 1990). Evapotranspiration has been estimated at 32 inches/year, with runoff of 2 inches/year, and groundwater recharge of 15 inches/year (Hubbard and Emslie 1984). This value will vary due to variations in hydraulic conductivity of the shallow layers of sediment, the proportion of the rainfall that falls in the non-growing season, and the antecedent wet or dry conditions. It is significant to note that since the fall of 1998, SRS has been receiving less than average rainfall amounts. This has generally precipitated a declining water table elevation in most areas of the SRS. The rainfall amounts for 2002 were generally near the average value for the region.

Hydrogeologic Conditions

The hydrogeological conditions of this area are detailed within Volume 1 of the F-Area HWMF Closure Plan (WSRC 1992). The water table is relatively high in this part of the site because the Tan Clay layer inhibits the downward movement of water, and the low horizontal hydraulic conductivity of the Barnwell formation does not permit rapid removal of the water in a horizontal direction. Although there are variations in the elevation of the water table, it is generally about 40 feet below the ground surface. The FIPSL is located on an east-west groundwater divide that is situated between Upper Three Runs and Fourmile Branch. Groundwater in the UTRA north of the divide flows toward Upper Three Runs. South of the divide, groundwater in the UTRA flows toward tributaries of Fourmile Branch and adjacent wetlands. In addition, some localized areas may exhibit perched water table elevations that are generally supported by a grain-supported clayey, silty zone of coarse sand to pebbles.

Cover System Design

The FIPSL cover system will utilize a composite, geosynthetic, low-permeability cover system. This cover system is one part of the remedial action and is utilized in addition to grouting the manholes of the unused portion of the vitrified clay pipe and of the unused portion of the HDPE pipe. The cover system serves to retard infiltration of stormwater so that any underlying contamination will not be conveyed to surface water or migrate to groundwater. The cover system will also reduce the potential for surface exposure while allowing for the radioisotopes to decrease in activity by decaying naturally. Also, post construction care will be performed in the way of regular inspections, surveillance, maintenance, and repairs if required. Cross sectional views of the cover system for the FIPSL are depicted in Figure 4-1 and Figure 4-2. The components for closure identified in Figure 4-1 and Figure 4-2 will meet SCDHEC's performance standard (SCHWMR R.61-79.264.111).

Design Objectives

The FIPSL closure is protective of human health and the environment, mitigates contaminant migration to groundwater, and provides access controls to the pipeline. In addition, the cover system that is to be installed will manage contamination by allowing for undisturbed natural degradation of the radioactivity through isotopic decay. The design objectives of the FIPSL closure will meet all applicable requirements specified in SCHWMR R.61-79.264.228 (a) (2) (iii).

Cover System Performance

In accordance with SCHWMR R.61-79.264.111, Closure Performance Standards, the FIPSL will be closed in a manner that minimizes the need for further maintenance and controls. The FIPSL will also be closed in a manner that minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the groundwater, surface waters, or the atmosphere. This closure will be accomplished specifically in accordance with requirements outlined in SCHWMR R.61-79.264.228(a)(2)(iii), which dictates that the final cover will be designed and constructed to minimize exposure to human health and the environment by

- providing long-term minimization of migration of stormwater (rain) through the soil underlying and adjacent to the FIPSL,
- functioning with minimum maintenance,
- promoting drainage and minimizing erosion or abrasion of the cover,
- accommodating settling and subsidence so that the cover's integrity is maintained, and
- possessing a permeability value less than or equal to the permeability of any bottom liner system or natural soils present.

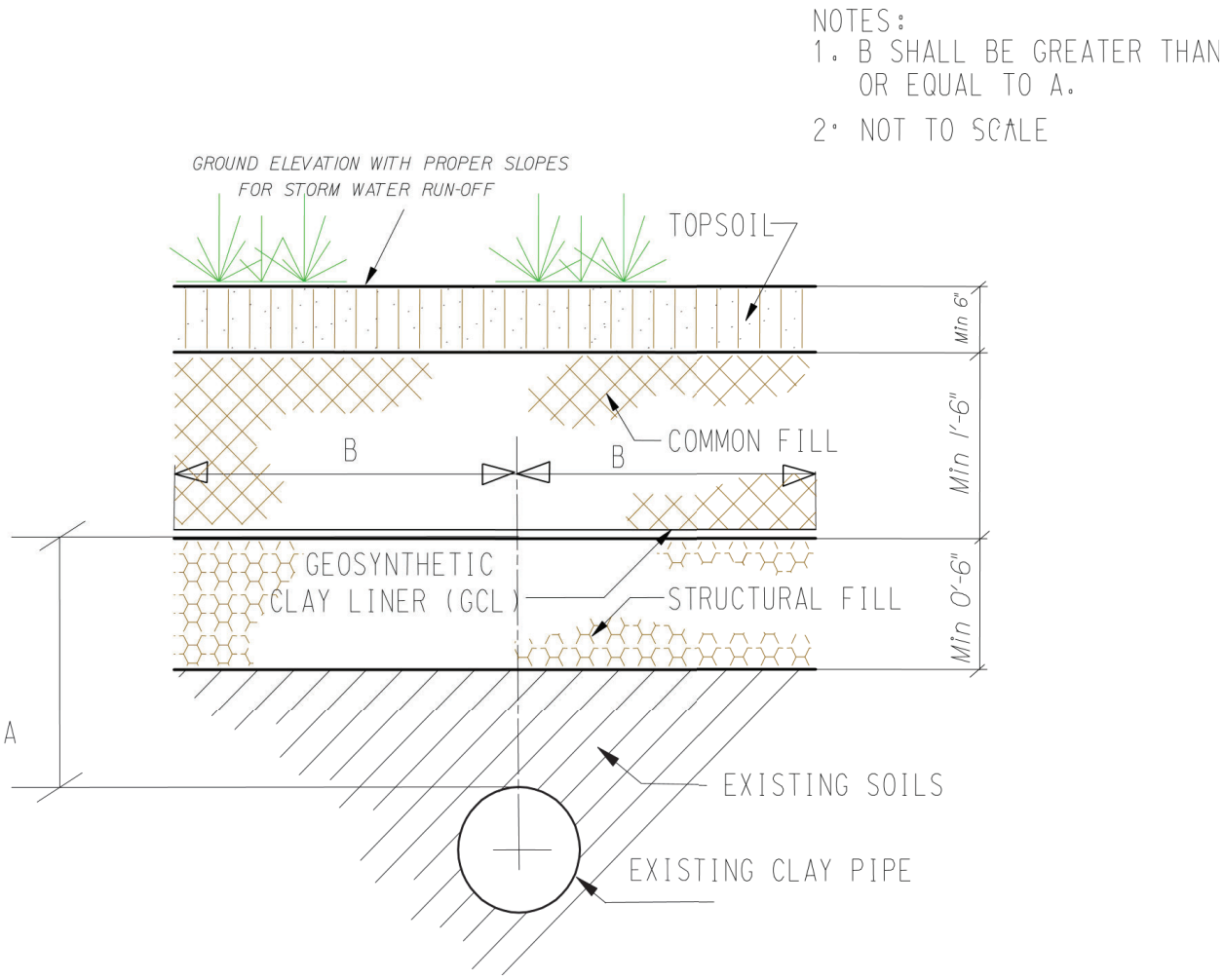
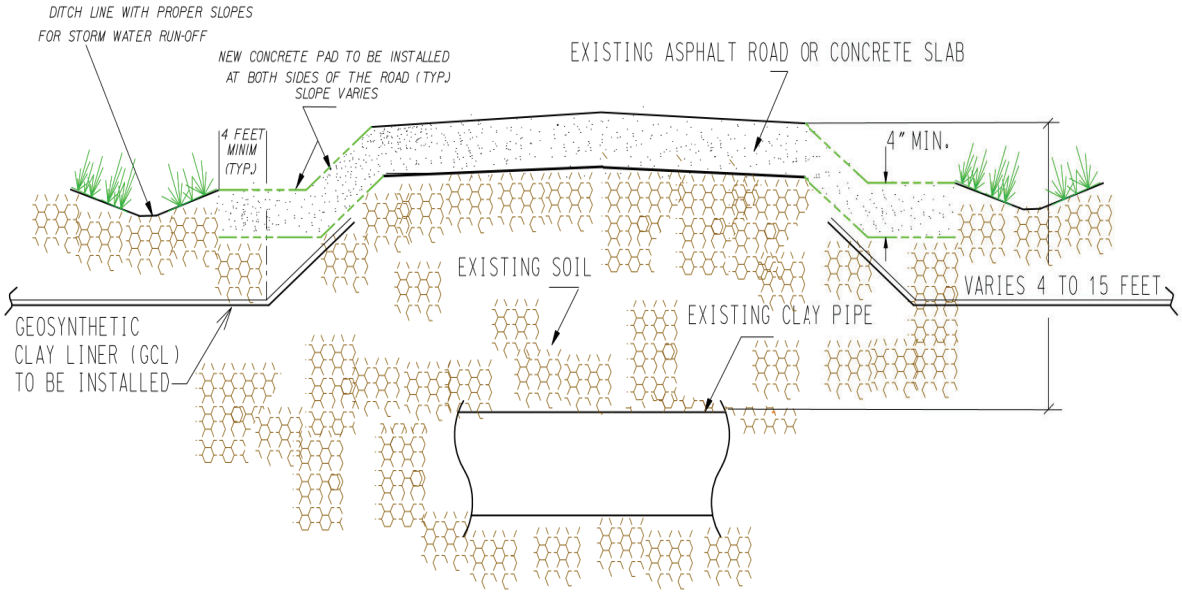


Figure 4-1. Typical GCL Cover System



TYPICAL GCL COVER TRANSITION AT THE EXISTING ROADS, PARKING LOT, AND BUILDING SLABS

NOT TO SCALE

Figure 4-2. Typical GCL Cover Transition at the Existing Roads, Parking lot, and Building Slabs

Contaminant migration calculations have been performed on all of the constituents that exceeded screening criteria for unit-specific constituents (USC) (Table 3-9). The assessment from Table 3-9 indicates that under current natural soil baseline conditions, iodine-129 and neptunium-237 are contaminant migration constituents of potential concern (CMCOPCs) in that they have the potential to migrate to the underlying aquifer in less than 1000 years with a resulting groundwater concentration above the groundwater protection standards (GWPS). Technetium99 initially was a CMCOPC, but considering the limited extent in the soil, the refined assessment indicated it would leach away before exceeding the GWPS. Tritium and nitrate (NO3-NO2) are considered to undergo little to no retardation and therefore migrate through the vadose zone at the same rate as the pore water. In this assessment the pore water travel time under natural soil conditions from the source zone to the water table is estimated at 4 to 5 years. This is ample time for tritium and nitrate to reach the underlying aquifer, which is indicated in the groundwater data from the FIPSL monitoring wells (See Appendix A).

In general, tritium and nitrate concentrations in the aquifer have been declining. Nitrate is presently above GWPS only in the area near the F-Area Seepage Basin (FSL 9D, & 7D), and tritium near the seepage basin and in the section of collapsed pipe (FSL 9D, 6D & 5D). This decline in groundwater concentration, suggest that the source for tritium and nitrates is depleted. Iodine-129 has a relatively low retardation and groundwater monitoring data indicates it is already in the aquifer underlying the FIPSL at concentrations above the GWPS in the area near the seepage basin and in the collapsed pipe section (See Appendix A). Neptunium-237 is below detection in all the FIPSL groundwater monitoring wells. For a complete discussion, see Appendix A.

The closure will be performed concurrent with the closure of the F-Area in order to avoid impacting the safe operation of the F-Area facilities. This is due to the inordinate number of underground and overhead interferences that exist adjacent to and in close proximity to the FIPSL delineated in Section 6.0. While contamination would not be capped for a short period of time, SRS feels there would be minimal impact because:

- Concentrations of the groundwater contaminants that appear to have been sourced from the collapsed area are declining, indicating a declining source term;
- Those contaminants that are indicated to migrate to groundwater in the near term, as indicated from the contaminant migration evaluation located in Appendix A, have already migrated to groundwater, and as noted above, their concentrations are declining;
- It is anticipated that the groundwater concentrations would continue to decline due to dispersion and radiological decay; and,
- The FIPSL is in very close proximity to the F-Area Tank Farm and the Separations Facility and would be within the remedial “footprint” of the area completion. In addition, the residual contamination associated with the FIPSL soils will be minimal when compared to residual contamination within the tank farm and separations area.

Therefore, it would be more appropriate to integrate the FIPSL into the remedial actions of the Tank Farm and the Separations Area.

Commonly available geosynthetic material can be incorporated into a low permeability cover (LPC) system that will control migration of these constituents. The H-Area Retention Basin/Warner's Pond LPC assessment indicates that the LPC designed for those areas will reduce infiltration from a natural soil "cover" by approximately 90 to 95% (Appendix A). In this assessment, reduction of infiltration by 90 to 95% eliminates the above as constituents of potential concern. That is, remaining concentrations of these constituents in the soil will not pose a migration risk; leaching to the aquifer would be reduced such that concentrations in the aquifer would not exceed groundwater protection standards (Appendix A).

Subgrade Preparation

The subgrade portions of the FIPSL closure will be compacted to provide a foundation structure upon which the cover system will be placed. The compaction activities will be followed by placement of backfill and geosynthetic materials to meet final design grades. The following sections describe the subgrade.

Consolidation of Subsoil

As determined in Volume 1 of the F-Area HWMF Closure Plan (WSRC 1992), settlement of the final cover could result from consolidation of the subgrade soils due to the overlying weight of the initial backfill and cover system. This settlement can be estimated using geotechnical engineering design methods that are based on several components. These include elastic compression, which occurs as load is applied; primary consolidation, which occurs over a period of time as water is expelled from the soil voids in the foundation soil; and secondary consolidation/creep, which occurs slowly over a long period of time in certain soils.

Subsidence of Waste/Vitrified Pipe

Some of the areas of the vitrified clay pipe along the FIPSL have been known to collapse in the past. An analysis was performed to determine the effects of vitrified clay pipe collapse on the cover system. Pipe buried at depths less than four feet are potentially unstable. Cover depths range from 0.5 feet to 14 feet. The depth of the settlement trough above a collapsed pipe decreases as depth of pipe increases. These effects will be accounted for in the final design so that the low permeability layer integrity and surface drainage patterns are maintained. If the vitrified clay pipe will underline the GCL by 4 feet or less after installation, then mitigating design features include:

- Grouting sections of pipe to prevent collapse.
- Installing synthetic reinforcement, such as a geogrid, under the low permeability layer.
- Increasing slope of final cover so that drainage away from FIPSL will continue after deformation. This feature would only be used were the low permeability layer would not be damaged by the expected deformation.

The features chosen will be selected based on configuration of the closure area around the pipe. The final closure of F-Area may require grading which will increase depth of pipe cover. It may also create new drainage patterns and alter locations for geogrid reinforcements. Sections of pipe which have collapsed may affect access for grouting so that alternate reinforcement may be required. The final design of the FIPSL cover and subsidence controls will depend on the final design for the F-Area closure.

Preparation of Existing Grade

The closure areas will be rough graded to establish a base for the cover system. To preclude damage to the existing cover, vehicular traffic will be minimized on the existing cap. Additionally, the removal of the vegetative layer will be limited to minimize weathering of the subsoils. To protect the cap, sudden stops, starts, or turns of construction equipment directly on the base will be avoided.

Cover System Components

The cover system material will consist of layers that will be placed from bottom to top as depicted in Figures 4-1 and 4-2. All materials and their placement will meet the design requirements, including provisions for the protection of any existing roadway or parking lot.

Uncertainties exist regarding the collapse of the clay pipes and existence of contaminated soils outside the pipeline. To manage this uncertainty, the selected design will be a low permeability geosynthetic cover system. The cover system will generally be a three-layered system comprising the following from the bottom to top: a compacted foundation layer (typically 6 inches of structural fill or equivalent); a low-permeability GCL (composite GCL); and a vegetation/topsoil layer (18 inches of common fill, typically with six inches of topsoil). The configuration of these layers is shown on Figure 4-1.

The cover system shall be installed over the vitrified clay pipe and adjacent to associated manholes as identified in Figure 4-1, except for the pipeline located under the paved parking lot(s) and under the SRS paved roads. Paved parking lot(s) and roads will be maintained throughout their respective useful time frame. The geosynthetic cover system will tie into roads, parking lots and building slabs as shown in Figure 4-2. The geosynthetic cover system will be installed around all of the manholes of the pipe(s). Foundation Layer

A minimum of 6 inches of clean structural fill material or its equivalent will be placed as a subgrade (foundation layer) for the cover. Subgrade materials will be obtained from onsite sources (North borrow site) in accordance with the design specification.

Prior to placement of the foundation layer, vibratory rolling will stabilize the existing soil cover over the length of the pipe. Once stabilized, the foundation layer material will be placed in layers and compacted. Where grouting of the pipeline is required, grouting will be performed prior to compaction, where practicable.

The surface of the foundation layer must be smooth and free of vegetation, sharp-edged rocks, stones, sticks, and construction debris. The foundation properties and preparation shall be in accordance with the GCL manufacturer's recommendations. The foundation layer provides structural support for the engineered cover system and is not intended to contribute to the hydraulic conductivity requirements in accordance with USEPA guidance, EPA/625/4-91-025, "Design and Construction of RCRA/CERCLA Final Covers" (USEPA 1991).

Geosynthetic Clay Liner

A composite GCL shall form the low-hydraulic conductivity barrier and shall be placed over the subgrade (foundation layer). Shipping, unloading, storage, installation, anchor trenching (if required), seaming, sealing around the penetration (if required), and tie-in activities at the intersection with the roads and asphalt shall be performed per the manufacturer's recommendation and requirements specified in the design documents.

Cover Layer – Common Fill Component

The cover layer will be a minimum thickness of 24 inches: 18 inches of common fill with 6 inches of topsoil to support vegetation. The common fill shall meet the following requirements:

- The first layer of common fill (minimum 9 inches) placed over the GCL shall be free of angular stones or other foreign matter that could damage the GCL.
- The soil selection and installation shall comply with the GCL manufacturer's instructions.

Topsoil Layer/Vegetation

Topsoil Component

The topsoil component shall meet the following requirements:

- The layer should typically be 6 inches thick.
- In order to establish the vegetative layer, the characteristics of the topsoil shall promote rapid seed germination and plant root system development.
- The final surface of the vegetative layer over the pipe, manhole areas, and surrounding area (after allowance for settling and subsidence) shall have a slope proper to promote movement of water away from the cover area.

Minimum compaction requirements for the cover soil shall be determined by SRS.

Vegetation Component

The vegetation layer shall be seeded with locally adapted grasses at sufficient density to minimize soil erosion. The vegetation component should possess the following characteristics:

- resistance to drought and temperature extremes,
- roots that will not disrupt the low permeability layer,
- ability to thrive in low nutrient soil with minimal nutrient additions,
- ability to survive and function with little or no maintenance, and
- sufficient density to minimize cover soil erosion.

Surface Drainage and Erosion Control

Drainage Design Concept

The drainage design will

- minimize run-on from adjacent areas,
- minimize the development of rills, gullies, or sheet erosion on the cover system, and
- meet site drainage requirements without inducing localized flooding,

Erosion Control

Erosion control will prevent erosion along all portions of the FIPSL and any nearby closure areas. Topsoil preparation and vegetation will reduce the potential for soil erosion.

Criteria used in the design of the cover system to reduce erosion include the following:

- minimize top surface slopes to between 3 to 5 percent, where feasible,
- minimize side slope grades wherever possible, and
- establish a cover crop.

Stormwater Management and Sediment Control

The F-Area drainage design will provide for the conveyance of stormwater runoff from designated closure areas. Stormwater management and sediment control measures designed for the FIPSL closure to direct stormwater runoff and mitigate sediment migration will comply with the South Carolina's Stormwater Management and Sediment Reduction Act, R72-300. In addition, these measures must also comply with SCDHEC's National Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Construction Activities, SCR00001.

Postclosure Activities

The post-closure care activities are outlined in Section I of the Part B Permit Application.

Inspection Activities

The condition of the vegetative layer overlying the cover system will be inspected throughout the post-closure care period. Inspection of the entire closure site will consist of periodic surveillance by site personnel to identify signs of subsidence of erosion. Identification and descriptions of the planned monitoring and maintenance activities and the frequency of performance, as well as the name, address, and phone number of the person to contact regarding the facility during the postclosure period, are outlined in Section I of the Part B Permit Application. Inspections will include documentation of the following:

- signs of erosion or surface cracking, indicating possible cover system deterioration,
- signs of standing water, indicating subsidence, and
- visible subsidence events.

To maintain the integrity of the cover system, both the cover system and surface conditions will be monitored so that necessary repairs can be made in a timely manner.

Subsidence Monitoring

The cover system's monitoring program goal is to maintain the integrity of the closure cover system to mitigate expansion of groundwater contamination and to protect human health and the environment. The Post-closure Care Plan contained in the F-Area HWMF RCRA Part B Permit Application identifies the cover system subsidence monitoring system and the associated maintenance responses for breaches of the cover system integrity.

The objective of the monitoring, inspection, and surveys is to identify any of the following:

- erosion damage on and around the existing cover system;
- areas where ponding of water is occurring;

- areas where subsidence activity has permeated to the surface of the cover system;
- formation of localized depressions; and
- breaches of the cover system by burrowing animals.

Because the GCL cover system is to be buried, any subsidence will be inferred from the visual inspections. The monitoring of the cover system consists of routine visual surface inspections and vegetation layer upkeep. Erosion damage, subsidence, and/or animal activity will be acted upon and corrected as appropriate. This subsidence monitoring system is the current operational practice used for closures and, to date, experience has demonstrated the effectiveness and reliability of the system; no breaches of existing compacted clay liner closure cover systems have been identified.

When a potential failure is detected, the cover soil around the area in question will be repaired as required.

Control Benchmarks

Control benchmarks for the FIPSL cover boundaries will not be utilized for this cover system as the GDL/GCL will be placed below grade. The facility custodian will perform routine inspection and visual subsidence inspections at regular intervals during the post-closure care period. All inspection and maintenance records will be kept at SRS during the post-closure care period by the facility custodian and will be available for SCDHEC inspection.

Cover System Maintenance

Inspection and subsidence monitoring will be used to indicate the need for cover system maintenance and/or repair. SRS will provide necessary repairs. All inspection and maintenance records will be kept at SRS during the post-closure care period by the facility custodian and will be available for SCDHEC inspection. Routine and preventive maintenance of the cover system includes upkeep of the vegetative layer, regular cover system maintenance, clearing of debris, removal of weeds and seedlings, and reseeding as necessary. In addition, institutional controls, including limitations on excavation, installation of signs, and regular inspections will begin 60 days after the approval of the Closure Plan, and will continue after the remedial actions.

The maintenance and/or repair for all geosynthetic cover system materials will be specified by the vendor requirements.

Postclosure Care and Use of Property

Post-closure care of the FIPSL will continue for at least 30 years after the date of completing the closure. The activities described will continue throughout the post-closure period unless a demonstration is conducted and accepted by SCDHEC, indicating that certain post-closure

activities are no longer necessary to provide protection for human health and the environment. Post-closure use of the property will not be allowed without approval from SCDHEC.

Groundwater Monitoring

The groundwater monitoring program has been developed for the FIPSL within the F-Area HWMF Part B Permit Application (WSRC 1992). Section E of the F-Area HWMF Part B Permit Application describes the monitoring program details. In addition, the FIPSL is located in the confines of the GSAWG OU. Agreement has previously been reached with the FFA Core Team as to which monitoring wells are to be sampled, the frequency of sampling, and the analytes to be sampled for the GSAWG OU. This agreement will remain in effect throughout the closure activities. However, if some monitoring wells have to be temporarily removed and replaced because of logistics, then the replacement will occur after construction has ceased. If necessary, an abandonment program plan denoting this will be sent to SCDHEC. SRS will not take any of the wells out of service until approval is obtained from SCDHEC.

Site Access

Site access during closure activities and post-closure care will be controlled by barricades during physical activities. Access to the area by the general public is prevented by the site security fences and the SRS security system. At the approval of the Closure Plan, signs will be placed along the length of the FIPSL at regular intervals, denoting that buried waste remains underground. Routine maintenance will be performed on the cover system and the signs.

Site warning signs will include the following:

F-Area Inactive Process Sewer Line (FIPSL)
DANGER
Unauthorized Personnel Keep Out.
This subsurface piping was used to manage Hazardous Substances.
Do not dig or excavate.
Contact the Waste Site Custodian.
Custodian: Manager Post-closure Maintenance
Phone: (803) 952-6882

Other Activities

No other activities are currently planned within the footprint of the FIPSL that would require coordination of the other activities with the closure activities.

Postclosure Care

Routine maintenance will be performed on the vegetative cover overlying the GCL. In addition, the signs will be posted, and routine inspections and maintenance will be performed on the signs to ensure that personnel on site are made aware of the situation. After closure has been completed, the vegetative cover and the signs will be inspected on a monthly basis for the first year, quarterly for the following two years, and annually thereafter. Maintenance of the vegetative cover will be performed as necessitated by the seasonal variations in the growing season.

SRS is responsible for updating, maintaining, and revising the Post-closure Care Plan. The plan will be amended whenever there are changes in the facility design or when events occur that affect post-closure. The revised plan will include the date of revision.

Schedule for Closure

Closure construction will start in a time frame concurrent with the approved Federal Facility Agreement Appendix E implementation schedule for the F-Area Closure and deconstruction of the F-Area Canyon and the F-Area Tank Farm final activities. The duration of the closure construction for the FIPSL as it is presented is estimated at 18 months and will commence after plan approval, completion of final design review, and award mobilization of required contracts. Closure activities include placement of grout in the manholes and treblers, placement of an engineered cover system over the FIPSL, addressing those portions of the pipeline that are prone to collapse, and could propagate a depression at the surface, by grouting, reinforcement or topographic enhancement, performance of the post-closure care as required and institutional controls. They also include compaction of the fill material to near-natural conditions. This closure will be performed concurrent with the closure of the F-Area in order to avoid impact on the operating capacities of the F-Area facilities. This is due to the inordinate number of underground interferences that exist adjacent to and in close proximity to the FIPSL. These interferences include the following:

- SCADA Cables – used for remote operation of the facility;
- Steam Line – used for power for pumping associated with the high-level waste tanks;
- 120-kV electric line – power for HEPA filtration;
- Supervisory Communication Line – emergency communication line;
- Potable water line – domestic water source for F Area;
- C-Road and the facility access road – provide access to F Area and other facilities; and
- Other interferences such as stormwater, transfer units, parking lots, etc.

While contamination would not be capped for a short period of time, SRS feels there would be minimal impact because:

- Concentrations of the groundwater contaminants that appear to have been sourced from the collapsed area are declining, indicating a declining source term;
- Those contaminants that are indicated to migrate to groundwater in the near term, as indicated from the contaminant migration evaluation located in Appendix A, have already migrated to groundwater, and as noted above, their concentrations are declining;
- It is anticipated that the groundwater concentrations would continue to decline due to dispersion and radiological decay; and,
- The FIPSL is in very close proximity to the F-Area Tank Farm and the Separations Facility and would be within the remedial "footprint" of the area completion. In addition, the residual contamination associated with the FIPSL soils will be minimal when compared to residual contamination within the tank farm and separations area.

The operation of the F-Area Tank Farm and Canyon including associated facilities involve nuclear safety class operating systems. Excavation within the general vicinity of steam power used for the transfer of liquid radioactive waste, high voltage lines used for high energy particulate air filtration and underground and emergency communication cables represents an immediate, substantial and acute health and safety risk both to workers involved with the remediation and employees in the tank farm. Interruption of power or other supporting utilities could result in high level releases and consequential exposure.

SRS does not believe that the low threat associated with the FIPSL soils when compared to nuclear safety warrants an interference with nuclear operating systems. Because of these safety issues the minimal threat posed by the FIPSL would best be managed concurrently with the closure of these facilities.

Table 6.1 shows a schedule of the activities to be performed.

Equipment Decontamination

Because personnel may be working with potentially radiologically contaminated soils from the FIPSL, construction equipment may be exposed to contaminated material during removal operations. The Radiological Control Group will monitor daily construction operations and will approve equipment decontamination techniques as necessary. Materials excessed by this closure such as fences, light poles, etc., may be re-used if possible. Any material that cannot be re-used will be disposed of onsite according to SRS policies. Suspect materials will be dispositioned appropriately.

Certification

Closure: Within 60 days of closure completion, USDOE will send SCDHEC, via registered mail, closure certification(s) verifying that the closure has been completed in accordance with this

approved Closure Plan. Both USDOE and an independent professional engineer(s), registered in South Carolina, will certify that FIPSL closure has been completed in accordance with the plan.

Post-closure: Within 60 days of the completion of post-closure care. USDOE will send SCDHEC, via registered mail, a post-closure certification(s) verifying that the post-closure care has been completed in accordance with this approved Post-closure Care Plan. Both USDOE and an independent professional engineer(s), registered in South Carolina, will certify that the FIPSL post-closure care has been performed in accordance the plan.

An Independent Professional Engineer will certify that the FIPSL has been closed in accordance with this approved Closure Plan. A survey plat per Subpart G 264.116 will be provided. In addition, a certification of closure will be provided per Subpart G 264.115.

Notices Required for Disposal Facility

No later than the submission of the closure certification, SRS will submit to the Aiken County Registrar of Mesne Conveyance (local zoning authority) and to SCDHEC a survey plat prepared and certified by a professional land surveyor, licensed in South Carolina, which contains the information required by SCHWMR R.61-79.264.116. This plat will contain a note, prominently displayed, stating that the owner's obligation to restrict disturbance of the hazardous waste disposal unit is in accordance with SCHWMR R.61-79.264 Subpart G.

In addition, SRS will certify that a record of the type, quantity, and location of hazardous wastes disposed of in this facility has been submitted to the Aiken County Registrar of Mesne Conveyance and attached to the previously submitted survey plat. Within 60 days of closure certification, USDOE will submit this waste information certification along with the waste information to SCDHEC.

Closure Cost Estimate

In accordance with SCHWMR R.61-79.264.140(c), federal facilities are exempt from adhering to the requirement for preparing a closure cost estimate.

Financial Assurance Mechanism for Closure

In accordance with SCHWMR R.61-79.264.140(c), federal facilities are exempt from adhering to the requirements for presenting financial assurance mechanisms.

Liability Requirements

In accordance with SCHWMR R.61-79.264.140(c), federal facilities are exempt from adhering to the requirements for having liability coverage.

Financial Mechanisms

In accordance with SCHWMR R.61-79.264.140(c), federal facilities are exempt from adhering to the requirements for presenting financial mechanisms.

Construction Quality Assurance

Closure activities will be performed in accordance with SRS procedures.

Closure activities will comply with ANSI/ANSQ E4, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs," and SRS procedures.

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Appendices

Appendix A Leachability Analyses

Appendix B Soil and Groundwater Characterization Data

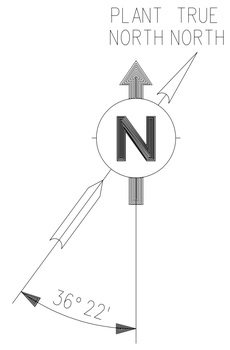
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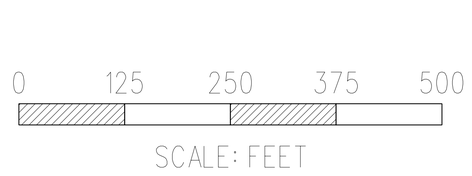
FIPSL POTENTIAL INTERFERENCES

- POWER LINE RIGHT OF WAY
- OVERHEAD ELECTRICAL LINE
- UNDERGROUND ELECTRICAL LINE
- UNDERGROUND SCADA CABLE (IN TRENCH)
- UNDERGROUND SUPERVISORY CABLE (PLOWED)
- INACTIVE PROCESS SEWER (ABANDONED)
- INACTIVE PROCESS SEWER (COLLAPSED)
- INACTIVE PROCESS SEWER (REMOVED)
- INACTIVE PROCESS SEWER (STILL IN USE)
- ACTIVE PROCESS SEWER
- SANITARY SEWER
- STORM SEWER OR CULVERT
- TELEPHONE CABLE
- FIBER OPTIC CABLE
- FIRE PROTECTION LINE
- DOMESTIC WATER LINE
- STEAM LINE

NOTE :

LOCATIONS HAVE BEEN TAKEN FROM VARIOUS SOURCES INCLUDING AS-BUILT DRAWINGS, FIELD SURVEYS AND SITE INFRASTRUCTURE MAPS.





RCRA | CERCLA

P22A
P22
P25A
P25
P25B
P26A
P26
P27A
P27
P28A
P28
P29A
P29
P30A
P30B
P30
P31A
P31
P32A
P32
P33A
P33

SCADA
SUPERVISORY CONTROL & RELAY CABLE
TELEPHONE
115 KV
13.8 KV
150' R.O.W.
SEEPAGE BASIN
SUB STA. 252-21F
GAS STATION
PARKING
PUMP HOUSE

MLF7457