ENVIRONMENTAL SITE INVESTIGATION
BUILDING SERIES 105 INTERIM REPORT

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March 2006
File No.02200070.27

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SECTION 1

INTRODUCTION

At the request of the U.S. General Services Administration (GSA), SCS Engineers initiated a Preliminary Assessment (PA)/Site Investigation (SI) of the St. Louis Federal Center located at 4300 Goodfellow, St. Louis, Missouri (Property). This interim report summarizes the results of the SI conducted by SCS at Building Series 105 to date. Our findings based on these results can be relied upon by GSA as to the conditions that currently exist, but are not intended for use by others at a later date.

PRELIMINARY ASSESSMENT

In 2002, SCS Engineers initiated a PA of the facility, including a detailed inspection of Building 105. Recognized Environmental Concerns associated with possible future occupancy of Building 105 were emphasized. The PA process performed at the site identified the need for a facility SI. The PA determined, based on the site's former use in combination with the future occupancy of the buildings by federal office workers, that an SI be performed starting with Building 105.

A separate PA Report has been prepared by SCS which documents the findings of the PA. The PA identified the need for a removal action associated with the shooting range in the basement of Building 105. Concerns regarding the presence of lead associated with the firing range and the potential for human exposure or a release to the environment necessitated the removal action. The Shooting Range Remediation project was completed by SCS and has been documented in a Removal Action Report.

Other suspect environmental concerns were identified during the PA and subsequent data review process. These suspect environmental concerns are associated with the former use of the Federal Center as a munitions manufacturing facility and include potential environmental impacts to the Property by hazardous chemicals. The PA/SI process, as designed by the Environmental Protection Agency (EPA), will address these potential concerns. This would include a detailed assessment of former and current activities at the Property and would include intrusive sampling of all identified concerns. During the performance of a PA/SI, potential environmental concerns are identified and assessed. The typical PA/SI Scope of Work would include conducting a file review, performance of a thorough site inspection, development of a sampling plan, execution of the data acquisition and analysis, and the interpretation and reporting of the results. The goals of the PA/SI process are to determine if a release of hazardous substances has occurred, if the hazardous substances are of sufficient toxicity and quantity to represent a risk to human health and the environment, and determine if human or environmental targets have the potential to be exposed to the hazardous substances at the site. The performance of a PA/SI at the Property would provide a thorough understanding of the environmental conditions at the Federal Center.

SITE INVESTIGATION PURPOSE

The purpose of this investigation was to screen the Property for potential environmental impacts from on-site activities, past Property use, and/or surrounding properties. The protocol for the investigation is based on the "Guidance For Performing Site Investigations Under CERCLA, EPA540-R-92-021, September 1992." A Site Investigation is intended to:

- Eliminate from consideration those sites that pose no threat to public health and environment.
- Determine the need for a removal action.
- Set priorities for future investigations.
- Gather existing or additional data to facilitate later components of the site assessment process.

A scope of work was developed to assist SCS in collecting defensible data to make informed decisions as to whether the site poses a threat to public health and environment. The scope of work performed by SCS included the collection of wipe samples of interior surfaces, collection of crawl space soil samples, collection of water samples from interior sumps, and the collection of subsurface soil samples using direct-push technology. Sample locations were selected as a part of a detailed sampling strategy designed to eliminate concern over occupation of the building by Federal office workers.

SITE DESCRIPTION AND HISTORICAL USE

The 4300 Goodfellow Federal Center is located on a portion of the former St. Louis Ordnance Plant in St. Louis, Missouri. In January, 1941, construction of the St. Louis Ordnance Plant began and was completed in May 1942. The Ordnance Plant was the largest small-arms ammunition installation in the world and embodied three operating divisions. The facility, a Government-Owned/Contractor Operated (GOCO) plant, produced small arms ammunition (.30 caliber and .50 caliber) and components for the 105-mm shells. Plant No. 1 was located on the east side of Goodfellow Boulevard. During World War II buildings 102, 103, 104, and 105 of Plant No. 1 were operated for the production of small arms ammunition. Buildings 102 and 103 housed the production of .30 caliber ammunition, while Buildings 104 and 105 housed the production of .50 caliber ammunition.

During small arms ammunition manufacturing at Plant No. 1, Building 105 served as one of two .50 caliber production locations. The small arms ammunition production at Building 105 consisted of brass cartridge annealing and shaping, powder and primer packing, lead core insertion, and sorting, packaging, and shipping. Powder and primer were stored in a munitions bunker located south of Building 105. The bunker was removed and was replaced with a parking lot. Powder was moved from the bunker and brought into Building 105E for loading. Primer was brought into Building 105F for packing. Cartridge annealing and shaping took place in Building 105, as did sorting, packaging, and shipping of the completed cartridges. Cartridge manufacturing ended at Plant No. 1 at the close of World War II.

The Department of Defense converted the Property in the 1960's and 1970's to a Federal Office Complex under the management of GSA. The Department of Defense reportedly spent in excess of $50 million dollars in demolition, grading, disposal, and remodeling costs. The four primary munitions manufacturing buildings (102, 103, 104, and 105) were decommissioned and converted into office and warehouse space. The grounds surrounding the buildings were graded and converted into parking and greenspace. The Federal Center has been utilized for over 20 years as a Federal Office Center whose primary tenants have included GSA, USDA, and the Department of Defense (Army).

SECTION 2

WIPE SAMPLING

Main floor and crawl space wipe samples were collected from the basement and main floor level of Building 105 (Areas A, B, C, & D), Building 105E, and Building 105F. A total of twenty four wipe samples was collected for laboratory analysis. In addition, a wipe sample was collected from the tunnel wall between buildings 105E and 105F. Crawl space wipe sample locations were selected at random within each defined area. Each area was divided in half and locations were selected based on proximity to potential hazard exposure, proximity to process areas, and/or spatial considerations. Wipe sample locations are detailed on Figure 2A, 2B, 3A, and 3B in Appendix B. Wipe samples were collected using American Society For Testing and Materials (ASTM), Occupational Safety and Health Administration (OSHA), and Housing and Urban Development (HUD) protocols. All wipe samples were collected from an area 100 cm^2 using cut gauze pads containing appropriate solvent/preservatives (explosives-acetonitrile, polychlorinated biphenyls (PCBs)-hexane, metals-solvent).

LOGGING OF SAMPLE PARAMETERS

All sample locations were documented in the field log and pictures of the sample locations were taken.

WIPE SAMPLE COLLECTION

Each wipe sample was collected from a predetermined location on the main floor and basement levels. Basement level wipe samples were collected from the sides of concrete pillars or walls and were collected from a height of three (3) feet above ground surface. Explosives, PCBs, and metals wipe samples were collected from the same sample locations at the same elevation. Main floor wipe samples were collected from exposed walls, concrete floors, and from exposed steel ceiling girders depending on sample location. All wipe samples were collected by removing the pre-soaked gauze pad from the sample container and wiping an area of approximately 100 cm^2. Explosives, PCBs, and metals wipe samples were collected from the same sample locations, i.e. walls, floors, ceilings. Upon collection, wipe samples were immediately stored in the same laboratory-supplied jars for analysis. Once capped and sealed with a Teflon-lined lid, sample jars were placed on ice in a cooler and held until the end of the day. Samples were placed on ice and submitted under a chain-of-custody to Severn-Trent Laboratories (STL) in University Park, Illinois.

CHEMICAL ANALYSES

Building 105

Analysis of the sixteen wipe samples collected from Sections A, B, C, and D within Building105 included PCBs by Method 8082, explosives by Method 8330, and metals by Method 6010B. Table 1-1 in Appendix D presents a summary of analytical results from the collected wipe

samples within Building 105. Only analytes with reported concentrations above laboratory quantitative limits are listed.

Aroclor 1260 was detected in ten of the sixteen wipe samples collected and analyzed for PCBs. Reported detections of Aroclor 1260 ranged from 0.74 µg/wipe to 18 µg/wipe. The Federal Toxic Substances Control Act (TSCA) defines PCB contamination of a non-porous surface as having a PCB surface concentration >10 mg/100 cm^2 but <100 mg/100 cm^2 as measured by a standard wipe test. Wipe samples collected as part of this investigation were standard wipe tests which covered surface areas 100 cm^2 each.

No other PCBs were detected above laboratory quantitative limits in any of the wipe samples.

Building 105E

The four wipe samples collected from Building 105E were analyzed for PCBs by Method 8082, explosives by Method 8330, and metals by Method 6010B. Table 1-2 in Appendix D presents a summary of analytical results from the collected wipe samples within Buildings 105E. Only analytes with reported concentrations above laboratory quantitative limits are listed.

Aroclor 1260 was detected in one of the four wipe samples collected and analyzed for PCBs. The reported concentration of Aroclor 1260 in sample Bldg105EWS1 was 0.8 µg/wipe. TSCA defines PCB contamination of a non-porous surface as having a PCB surface concentration >10 mg/100 cm^2 but <100 mg/100 cm^2 as measured by a standard wipe test. Wipe samples collected as part of this investigation were standard wipe tests which covered surface areas 100 cm^2 each.

No other PCBs were detected above laboratory quantitative limits in any of the wipe samples.

Building 105F

The four wipe samples collected from Building 105F were analyzed for PCBs by Method 8082, explosives by Method 8330, and metals by Method 6010B. Table 1-3 in Appendix D presents a summary of analytical results from the collected wipe samples within Buildings 105F. Only analytes with reported concentrations above laboratory quantitative limits are listed.

Aroclor 1260 was detected in two of the four wipe samples collected and analyzed for PCBs. Reported detections of Aroclor 1260 ranged from 0.55 µg/wipe to 1.6 µg/wipe. TSCA defines PCB contamination of a non-porous surface as having a PCB surface concentration >10 mg/100 cm^2 but <100 mg/100 cm^2 as measured by a standard wipe test. Wipe samples collected as part of this investigation were standard wipe tests which covered surface areas 100 cm^2 each.

No other PCBs were detected above laboratory quantitative limits in any of the wipe samples.

No explosives were detected above laboratory quantitative limits in the wipe sample.

SECTION 3

SHALLOW SOIL AND SEDIMENT SAMPLING

Shallow soil and sediment samples were collected from the basement level of Building 105 (Areas A, B, C, & D), Building 105 E, and Building 105 F. A total of thirteen shallow soil and sediment samples were collected for laboratory analysis. Shallow soil and sediment sample locations were selected based upon proximity to potential hazard exposure, changes in surface color or texture, proximity to process areas, or spatial considerations. Soil samples were collected from an average depth of 4 - 6 inches bgs. Shallow soil and sediment sample locations are detailed on Figure 3A and 3B in Appendix B.

LOGGING OF SAMPLE PARAMETERS

The color, texture, and moisture content of materials sampled were classified in the field log for each sample location. The classification procedure included texture descriptions of soils according to the Unified Soil Classification System (USCS). Included in the descriptions are principal and minor soil constituents, moisture content, soil color, and other visible features. Color was defined using the Munsell Color System. No unusual odors or other indicators of potential contamination were observed during sampling.

ANALYTICAL SAMPLE COLLECTION

Each sample was collected from a predetermined depth by removing the cover material to expose the layer to be sampled. Crawl space soil samples were collected with a stainless steel sampling tool. VOC samples were collected using USEPA Method 5035. Three discreet 5 gram soil samples were collected in En Core sample containers using an En Core T-handle sampler. The 5035 Method requires the three sample containers to be placed in sealed bags and shipped overnight to the laboratory for preservation and analysis. Upon collection, crawl space soil samples for other analyses were immediately stored in clean, laboratory-supplied jars for analysis. Once capped and sealed with a Teflon-lined lid, sample jars were placed on ice in a cooler, and held until the end of the day. One soil sample from each sample location was submitted for laboratory analysis. Samples were placed on ice and submitted under a chain-of-custody to STL in University Park, Illinois.

CHEMICAL ANALYSES

Building 105

The analysis of the ten shallow soil and sediment samples collected from Sections A, B, C, and D within Building 105 included PCBs by Method 8082; explosives by Method 8330; cyanide by Method 9014/9010B; phosphorous by Method 4500PE; mercury by Method 7471A; metals by Method 6010B; SVOCs by Method 8270C; and VOCs by Method 8260B. Table 2-1 in Appendix D presents a summary of analytical results from the collected shallow soil and

sediment samples within Building 105. Only analytes with reported concentrations above laboratory quantitative limits are listed.

Aroclor 1260 was detected in five shallow soil and sediment samples below the CALM STARC Scenario A screening level of 600 µg/kg. Reported detections of Aroclor 1260 ranged from 9.7 to 190 µg/kg.

No other PCBs were detected above laboratory quantitative limits in any of the shallow soil and sediment samples.

No explosives were detected above laboratory quantitative limits in any of the shallow soil and sediment samples.

Cyanide was detected above laboratory quantitative limits in one of the nine shallow soil samples analyzed for cyanide, and the reported concentration in this sample was below the CALM STARC Scenario A screening level of 5,480 mg/kg. The reported concentration of cyanide in sample 105BSS1 was 0.41 mg/kg.

Phosphorous was detected above laboratory quantitative limits in all nine shallow soil samples analyzed for phosphorous, and reported concentrations in these sediment samples ranged from 120 mg/kg to 700 mg/kg. Currently, no CALM STARC Scenario A screening level has been established for this analyte.

Mercury was detected above laboratory quantitative limits in the shallow soil and sediment samples, and the reported concentration in these samples were below the CALM STARC Scenario A screening level of 0.6 mg/kg. Detections of mercury ranged from 0.019 mg/kg to 0.2 mg/kg.

Arsenic was detected above laboratory quantitative limits in shallow soil and sediment samples, and reported concentrations in the one sediment sample (105 SS-1) exceeded the CALM STARC Scenario A screening level of 11 mg/kg. Detections of arsenic ranged from 3.6 mg/kg to 69 mg/kg. Excluding the sample where the reported arsenic concentration exceeded the screening level, detections of arsenic ranged from 3.6 mg/kg to 7.0 mg/kg.

Beryllium was detected above laboratory quantitative limits in nine of the ten shallow soil and sediment samples, and all nine detections exceeded the CALM STARC Scenario A screening level of 0.05 mg/kg. Detections of beryllium ranged from 0.19 mg/kg to 0.65 mg/kg. However, these reported beryllium concentrations may be indicative of typical background concentrations for this area in the State of Missouri (see Section 7).

Copper was detected above laboratory quantitative limits in shallow soil and sediment samples, and reported concentrations in the one sediment sample (105 SS-1) exceeded the CALM STARC Scenario A screening level of 1,100 mg/kg. Detections of copper ranged from 4.4 mg/kg to 16,000 mg/kg. Excluding the sample where the reported copper concentration exceeded the screening level, detections of copper ranged from 4.4 mg/kg to 430 mg/kg.

Lead was detected above laboratory quantitative limits in all of the shallow soil and sediment samples, and reported concentrations in one sediment sample (105 SS-1) exceeded the CALM STARC Scenario A screening level of 260 mg/kg. Detections of lead ranged from 8.1 mg/kg to 16,000 mg/kg. Excluding the sample where the reported lead concentration exceeded the screening level, detections of lead ranged from 8.1 mg/kg to 160 mg/kg.

All reported concentrations of the remaining metal analytes were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits in the shallow soil and sediment samples.

PAH compounds benzo(a)anthracene, chrysene, benzo(b)flouranthene, benzo(k)flouranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and dibenzo(a,h)anthracene were detected above their respective CALM STARC Scenario A screening levels in one sediment sample (105 SS-1). All reported concentrations of the remaining SVOC analytes for sample 105 SS-1 were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits. All of the SVOC analytes in the remaining nine shallow soil samples were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits.

All reported concentrations of VOCs were below laboratory quantitative limits in the seven shallow soil samples collected from the basement level of Building 105 and analyzed for VOCs (105ASS1, 105ASS2, 105BSS2, 105BTCSUMP, 105CSS1, 105DCSSS1, and 105DCSSS2).

Building 105E

The analysis of the three shallow soil and sediment samples collected from Buildings 105E included PCBs by Method 8082; explosives by Method 8330; cyanide by Method 9014/9010B; phosphorous by Method 4500PE; mercury by Method 7471A; metals by Method 6010B; SVOCs by Method 8270C; and VOCs by Method 8260B. Table 2-2 in Appendix D presents a summary of analytical results from the collected shallow soil and sediment samples within Building 105E. Only analytes with reported concentrations above laboratory quantitative limits are listed.

No PCBs were detected above laboratory quantitative limits in any of the shallow soil samples collected and analyzed for PCBs (105ESS1 and 105ESS2).

No explosives were detected above laboratory quantitative limits in the shallow soil and sediment samples.

Cyanide was not detected above laboratory quantitative limits in the shallow soil samples collected and analyzed for cyanide (105ESS1 and 105ESS2).

Phosphorous was detected above laboratory quantitative limits in the two shallow soil samples collected and analyzed for phosphorous (105ESS1 and 105ESS2), and reported concentrations in these samples ranged from 520 mg/kg to 540 mg/kg. Currently, no CALM STARC Scenario A screening level has been established for this analyte.

Mercury was detected above laboratory quantitative limits in the shallow soil and sediment samples, and reported concentrations in the one sediment sample (105E SS-1) exceeded the CALM STARC Scenario A screening level of 0.6 mg/kg. Detections of mercury ranged from 0.041 mg/kg to 1.1 mg/kg. Excluding the sample where the reported mercury concentration exceeded the screening level, detections of mercury ranged from 0.041 mg/kg to 0.13 mg/kg.

Arsenic was detected above laboratory quantitative limits in shallow soil and sediment samples, and reported concentrations in the one sediment sample (105E SS-1) exceeded the CALM STARC Scenario A screening level of 11 mg/kg. Detections of arsenic ranged from 3.4 mg/kg to 27 mg/kg. Excluding the sample where the reported arsenic concentration exceeded the screening level, detections of arsenic ranged from 3.4 mg/kg to 5.3 mg/kg.

Beryllium was detected above laboratory quantitative limits in all of the shallow soil and sediment samples, and these detections of beryllium exceeded the CALM STARC Scenario A screening level of 0.05 mg/kg. Detections of beryllium ranged from 0.38 mg/kg to 0.47 mg/kg. However, these reported beryllium concentrations may be indicative of typical background concentrations for this area in the State of Missouri (see Section 7).

Manganese was detected above laboratory quantitative limits in shallow soil and sediment samples, and reported concentrations in the one sediment sample (105E SS-1) exceeded the CALM STARC Scenario A screening level of 3,700 mg/kg. Detections of manganese ranged from 160 mg/kg to 5,500 mg/kg. Excluding the sample where the reported manganese concentration exceeded the screening level, detections of manganese ranged from 160 mg/kg to 940 mg/kg.

Silver was detected above laboratory quantitative limits in two of the shallow soil and sediment samples, and reported concentrations in the one sediment sample (105E SS-1) exceeded the CALM STARC Scenario A screening level of 140 mg/kg. Detections of silver ranged from 9.6 mg/kg to 460 mg/kg.

All reported concentrations of the remaining metal analytes were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits in the shallow soil and sediment samples.

PAH compounds benzo(a)pyrene and dibenzo(a,h)anthracene were detected above their respective CALM STARC Scenario A screening levels in one sediment sample (105E SS-1). All reported concentrations of the remaining SVOC analytes for sample 105E SS-1 were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits. All of the SVOC analytes in the remaining two shallow soil samples were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits.

All reported concentrations of VOCs were below laboratory quantitative limits in shallow soil and sediment samples collected from the basement level of Building 105E.

Building 105F

The analysis of the shallow soil samples collected from Buildings 105F included PCBs by Method 8082; explosives by Method 8330; cyanide by Method 9014/9010B; phosphorous by Method 4500PE; mercury by Method 7471A; metals by Method 6010B; SVOCs by Method 8270C; and VOCs by Method 8260B. Table 2-3 in Appendix D presents a summary of analytical results from the collected shallow soil samples within Building 105F. Only analytes with reported concentrations above laboratory quantitative limits are listed.

No PCBs, explosives, cyanide, or VOCs were detected above laboratory quantitative limits in the shallow soil and sediment samples.

Phosphorous was detected above laboratory quantitative limits in the shallow soil samples, and reported concentrations in these samples ranged from 220 mg/kg to 320 mg/kg. Currently, no CALM STARC Scenario A screening level has been established for this analyte.

Mercury was detected above laboratory quantitative limits in the shallow soil samples, and the reported concentrations in both samples were below the CALM STARC Scenario A screening level of 0.6 mg/kg. Detections of mercury ranged from 0.023 mg/kg to 0.07 mg/kg.

Beryllium was detected above laboratory quantitative limits in both shallow soil samples, and both detections of beryllium exceeded the CALM STARC Scenario A screening level of 0.05 mg/kg. Detections of beryllium ranged from 0.51 mg/kg to 0.6 mg/kg. However, these reported beryllium concentrations may be indicative of typical background concentrations for this area in the State of Missouri (see Section 7).

All reported concentrations of the remaining metal analytes were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits in the shallow soil samples.

The PAH compound benzo(a)pyrene was detected above the CALM STARC Scenario A screening level in one shallow soil sample (105FSS2). All reported concentrations of the remaining SVOC analytes for sample 105FSS2 were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits. All of the SVOC analytes in sample 105FSS1 were below laboratory quantitative limits.

SECTION 4

SUBSURFACE SOIL SAMPLING

In September 2002 and December 2003, soil borings were advanced around Building 105, 105E, 105F, and former Buildings 105G, 105H, and 105J. A total of seven soil borings were advanced at locations near Building Series 105. Soil boring locations are detailed on Figure 4 in Appendix C.

Subsurface soil samples were collected using direct-push soil probing technology. Direct-push borings were located around buildings and at former building locations across the Site. Probe locations included areas surrounding existing structures, such as main production buildings and electrical substations. Probe locations also included former powder canning and storage buildings and areas with former underground storage tanks (USTs).

Two of the seven borings (105-5 and SB37) were placed near Building 105 Sections A, B, C, and D. Boring 105-5 was placed near the southern corner of Building 105 and SB37 was placed around the northern corner of Building 105. Boring SB105-4 was advanced to its target depth of twelve feet bgs, and Boring SB37 was advanced to its target depth of twenty feet bgs. Boring 105-3 and 105-4 were placed near the southwestern and northwestern sides of Building 105E, respectively. Boring SB105-3 and 105-4 were advanced to their target depths of twelve feet bgs. Boring SB17 was placed near the southwestern side of Building 105F and was advanced to its target depth of twenty feet bgs. Borings 105-1 and 105-2 were placed within the area of former Buildings 105G, 105H, and 105J. Boring 105-1 encountered probe refusal at a depth of approximately four feet bgs. Boring 105-2 was advanced to its target depth of twelve feet bgs.

Probing was performed by Detech, Inc. (Detech) of Lawrence, Kansas and Below Ground Service, Inc. (BGS) of Lawrence, Kansas. Detech and BGS performed direct-push soil sampling using a truck-mounted Geoprobe® unit equipped with a pneumatic hammer and hollow, two-inch diameter probe rods. At each location, continuous soil cores were collected using a continuous-barrel sampler two feet in length. Soil cores were removed from the sampler using disposable acetate liners. Subsurface soil cores were collected until the target depth (typically twenty feet bgs) or refusal.

When the acetate liners were removed from the continuous-barrel sampler, a handheld photoionization detector (PID) was used to screen vapors for VOCs in the headspace above the soil core. No groundwater samples were collected.

LOGGING OF SUBSURFACE MATERIALS

Building 105

In general, the material encountered at boring location 105-5 consisted of varying amounts of damp clay and silt to its target depth of twelve feet bgs. Field screening of soil cores from 105-5 registered readings below the detection limit of the photo ionization PID

The material encountered at boring location SB37 consisted of varying amounts of clay, sand, and gravel to its target depth of twenty feet bgs. Field screening of soil cores from SB37 registered readings below the detection limit of the PID. Notable increases in moisture content occurred at twelve feet bgs; however static groundwater levels were not identified during the probing effort around Building 105.

Building 105E

In general, the material encountered at boring locations 105-3 and 105-4 consisted of varying amounts of damp clay and silt to their target depths of twelve feet bgs. Field screening of soil cores from 105-3 and 105-4 registered readings below the detection limit of the PID. Static groundwater levels were not identified during the probing effort around Building 105E.

Building 105F

In general, the material encountered at boring location SB17 consisted primarily of clay to its target depth of twenty feet bgs. Field screening of soil cores from SB17 registered readings below the detection limit of the PID. Static groundwater levels were not identified during the probing effort around Building 105F.

Former Buildings 105G, 105H, and 105J

In general, the materials encountered at boring location SB105-1 consisted of damp silt and clay until refusal at four feet bgs. The materials encountered at boring location SB105-2 consisted of damp silt and clay until its target depth of twelve feet bgs. Field screening of soil cores from 105-1 and 105-2 registered readings below the detection limit of the PID. Static groundwater levels were not identified during the probing effort around former Buildings 105G, 105H, and 105J. Static groundwater levels were not identified during the probing effort around Building 105.

ANALYTICAL SAMPLE COLLECTION

Discrete soil samples were extracted directly from the acetate liner and continuous-barrel sampler using a clean, decontaminated stainless steel utensil. Upon extraction from the acetate liners, soil samples were immediately stored in clean, laboratory-supplied jars for analysis. Once capped and sealed, sample containers were placed on ice in a cooler, and held until the end of the day of field investigation. At the end of the day of field investigation, the sample containers were shipped on ice under a proper chain-of-custody via overnight express delivery service to STL in University Park, Illinois

Samples analyzed for VOCs were collected using SW-846 Method 5035. At each sample location, three containers were filled with 5 grams of soil collected discreetly using an En Core™ sampler. Method 5035 requires that these three containers be placed in sealed bags and shipped overnight to the laboratory for preservation and analysis. Once capped and sealed, sample containers were placed on ice in a cooler, and held until the end of the day of field investigation. At the end of the day of field investigation, the sample containers were shipped on

ice under a proper chain-of-custody via overnight express delivery service to STL in University Park, Illinois

CHEMICAL ANALYSES

Building 105

Pre-selected analyses for samples collected around Building 105 Sections A, B, C, and D included PCBs by Method 8082; explosives by Method 8330; TPH by Method 8015B MDRO; cyanide by Method 9014/9010B; phosphorous by Method 4500PE; mercury by Method 7471A; metals by Method 6010B; SVOCs by Method 8270C; and VOCs by Method 8260B. Table 3-1 in Appendix D presents a summary of analytical results from the subsurface soil samples collected around Building 105. Only analytes with reported concentrations above laboratory quantitative limits are listed.

No PCBs or were detected above laboratory quantitative limits in the subsurface soil samples collected around Building 105.

No explosives were detected above laboratory quantitative limits in the subsurface soil sample collected around Building 105 and analyzed for explosives (105-5).

No cyanide were detected above laboratory quantitative limits in the subsurface soil sample collected around Building 105 and analyzed for cyanide (105-5).

TPH-DRO concentrations were detected below the CALM STARC screening level of 200 mg/kg in the subsurface soil sample collected and analyzed for TPH-DRO (SB37). The reported DRO concentration in boring SB37 was 5.1 mg/kg.

Phosphorous was detected above laboratory quantitative limits in the subsurface soil samples collected and analyzed for phosphorous (105-5). The reported phosphorous concentration in boring 105-5 was 510 mg/kg. Currently, no CALM STARC Scenario A screening level has been established for this analyte.

Mercury was detected above laboratory quantitative limits in the subsurface soil samples collected and analyzed for mercury (105-5). The reported concentration for this sample was below the CALM STARC Scenario A screening level of 0.6 mg/kg. The reported mercury concentration in boring 105-5 was 0.039 mg/kg.

Beryllium was detected above the CALM STARC Scenario A screening level of 0.05 mg/kg in the subsurface soil samples collected and analyzed for beryllium (105-5). The reported beryllium concentration in boring 105-5 was 0.4 mg/kg. However, this reported beryllium concentration may be indicative of typical background concentrations for this area in the State of Missouri (see Section 7).

All reported concentrations of the remaining metal analytes were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits in the subsurface soil sample collected and analyzed for metals (105-5).

All reported concentrations of SVOCs were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits in the subsurface soil sample collected and analyzed for SVOCs (105-5).

Acetone was detected below its CALM STARC Scenario A screening level in the soil sample collected from 105-5. No other VOCs were detected above laboratory quantitative limits in the subsurface soil sample collected and analyzed for VOCs (105-5)

Building 105E

Pre-selected analyses for the sample collected around Building 105E included PCBs by Method 8082; explosives by Method 8330; cyanide by Method 9014/9010B; phosphorous by Method 4500PE; mercury by Method 7471A; metals by Method 6010B; SVOCs by Method 8270C; and VOCs by Method 8260B. Table 3-1 in Appendix D presents a summary of analytical results from the subsurface soil sample collected around Building 105E. Only analytes with reported concentrations above laboratory quantitative limits are listed.

No PCBs, explosives, cyanide were detected above laboratory quantitative limits in the subsurface soil samples collected around Building 105E.

Phosphorous was detected above laboratory quantitative limits in the subsurface soil samples. The reported phosphorous concentrations ranged from 430 mg/kg to 520 mg/kg. Currently, no CALM STARC Scenario A screening level has been established for this analyte.

Mercury was detected above laboratory quantitative limits in the subsurface soil sample, and the reported concentrations for these samples were below the CALM STARC Scenario A screening level of 0.6 mg/kg. The reported mercury concentrations in the subsurface soil samples ranged from 0.029 mg/kg to 0.073 mg/kg.

Beryllium was detected above the CALM STARC Scenario A screening level of 0.05 mg/kg in the subsurface soil samples. The reported beryllium concentrations in the subsurface soil samples ranged from 0.36 mg/kg to 0.38 mg/kg. However, these reported beryllium concentrations may be indicative of typical background concentrations for this area in the State of Missouri (see Section 7).

All reported concentrations of the remaining metal analytes were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits in the subsurface soil samples collected from 105-3 and 105-4.

PAH compounds benzo(a)anthracene, benzo(b)flouranthene, benzo(a)pyrene, and dibenzo(a,h)anthracene were detected above their respective CALM STARC Scenario A screening levels in one subsurface soil sample (105-3). All reported concentrations of the remaining SVOC analytes for sample 105-3 were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits. All of the SVOC analytes in the 105-4 subsurface soil sample were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits.

Acetone was detected below its CALM STARC Scenario A screening level in the soil sample collected from 105-4. No other VOCs were detected above laboratory quantitative limits in any of the subsurface soil samples.

Building 105F

Pre-selected analyses for the sample collected around Building 105F included PCBs by Method 8082; TPH by Method 8015B MDRO; TPH by Method 8015B MGRO; SVOCs by Method 8270C; and VOCs by Method 8260B. Table 3-1 in Appendix D presents a summary of analytical results from the subsurface soil sample collected around Building 105F. Only analytes with reported concentrations above laboratory quantitative limits are listed.

No PCBs, TPH-DRO, and TPH-GRO were detected above laboratory quantitative limits in the subsurface soil sample collected around Building 105E.

All reported concentrations of SVOCs were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits in the subsurface soil sample.

Acetone was detected below its CALM STARC Scenario A screening level in the soil sample collected from SB17. No other VOCs were detected above laboratory quantitative limits in the subsurface soil samples collected around Building 105F.

Former Buildings 105G, 105H, and 105J

Pre-selected analyses for samples collected around former Buildings 105G, 105H, and 105J included PCBs by Method 8082; explosives by Method 8330; cyanide by Method 9014/9010B; phosphorous by Method 4500PE; mercury by Method 7471A; metals by Method 6010B; SVOCs by Method 8270C; and VOCs by Method 8260B. Table 3-1 in Appendix D presents a summary of analytical results from the subsurface soil samples collected around former Buildings 105G, 105H, and 105J. Only analytes with reported concentrations above laboratory quantitative limits are listed.

No PCBs, explosives, cyanide were detected above laboratory quantitative limits in the subsurface soil samples collected around former Buildings 105G, 105H, and 105J.

Phosphorous was detected above laboratory quantitative limits in the subsurface soil samples. The reported phosphorous concentrations ranged from 510 mg/kg to 600 mg/kg. Currently, no CALM STARC Scenario A screening level has been established for this analyte.

Mercury was detected above laboratory quantitative limits in the subsurface soil samples, and the reported concentrations for these samples were below the CALM STARC Scenario A screening level of 0.6 mg/kg. The reported mercury concentrations in both subsurface soil samples was 0.022 mg/kg.

Beryllium was detected above the CALM STARC Scenario A screening level of 0.05 mg/kg in the subsurface soil samples. The reported beryllium concentrations in the subsurface soil samples ranged from 0.28 mg/kg to 0.33 mg/kg. However, these reported beryllium concentrations may be indicative of typical background concentrations for this area in the State of Missouri (see Section 7).

All reported concentrations of the remaining metal analytes were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits in the subsurface soil sample collected from 105-1 and 105-2.

The PAH compound benzo(a)pyrene was detected above its CALM STARC Scenario A screening levels in one subsurface soil sample (105-1). All reported concentrations of the remaining SVOC analytes for sample 105-1 were below the CALM STARC Scenario A screening levels or below laboratory quantitative limits. All of the SVOC analytes in the 105-2 subsurface soil sample was below the CALM STARC Scenario A screening levels or below laboratory quantitative limits.

Acetone, 2-butanone, toluene, 1,2,4-trimethylbenzene, and p-isopropyltoluene were detected below their CALM STARC Scenario A screening level in the soil sample collected from 105-2. Acetone also was detected below its CALM STARC Scenario A screening level in the soil sample collected from 105-1. No other VOCs were detected above laboratory quantitative limits in any of the subsurface soil samples.

SECTION 5

BASEMENT SUMP SAMPLING

In September 2002, sump water samples were collected in the basement level of Buildings 105, 105E, and 105F. A total of three sump water samples were collected for laboratory analysis. Sump water sample locations were selected at random within each defined area. Locations were selected based upon proximity to potential hazard exposure, proximity to process areas, and/or spatial considerations. The basement sump sample locations are detailed on Figure 3A and 3B in Appendix B.

ANALYTICAL SAMPLE COLLECTION

Each sump water sample was collected using a stainless dipper. Upon collection from the sump, water samples were immediately stored in clean, laboratory-supplied containers for analysis. Once capped and sealed with a Teflon-lined lid, sample containers were placed on ice in a cooler, and held until the end of the day of field investigation. Samples were placed on ice and submitted under a chain-of-custody to STL in University Park, Illinois.

CHEMICAL ANALYSES

The samples were analyzed by STL for PCBs by Method 8082; explosives by Method 8330; cyanide by Method 9014/9010B; phosphorous by Method 4500PE; mercury by Method 7470A; metals by Method 6010B; SVOCs by Method 8270C; and VOCs by Method 8260B. Table 4-1 in Appendix D presents the results of sump water sample analysis. Only analytes with reported concentrations above laboratory quantitative limits are listed.

No PCBs, explosives, cyanide, or VOCs were detected above laboratory quantitative limits in the sump water samples.

Phosphorous was detected above laboratory quantitative limits in the sump water samples. The reported phosphorous concentrations ranged from 0.099 mg/l to 0.34 mg/l. Currently, no CALM GTARC screening level has been established for this analyte.

Manganese was detected above the CALM GTARC screening level of 0.05 mg/l in all three sump water samples. Reported concentrations ranged from 0.054 mg/l to 0.097 mg/l in the sump water samples.

Mercury was detected above laboratory quantitative limits in one of the three sump water samples at a reported concentration below the CALM GTARC screening level of 0.002 mg/l. Sample 105SUMPH2O had a reported mercury concentration 0.00022 mg/l.

All reported concentrations of the remaining metal analytes were below the CALM GTARC screening levels or below laboratory quantitative limits in the three sump water samples.

The compound bis(2-ethylhexyl)phthalate was detected above its CALM GTARC screening level in two of the three sump water samples (105SUMPH2O and 105ESUMP). All reported concentrations of the remaining SVOC analytes were below the CALM GTARC screening levels or below laboratory quantitative limits in the sump water samples.

SECTION 6

AIR MONITORING

On September 4, 2003, SCS Engineers utilized a HG253 portable mercury vapor analyzer manufactured by Genesis Laboratory Systems to collect and analyze ambient air within Buildings 105. A total of three ambient air samples were collected within Building 105. Samples were collected within the crawl space level, on the main floor, and on the second floor of the building. Mercury vapor concentrations were not identified above the instrument detection limit in any of the sampling areas within Building 105. The OSHA Permissible Exposure Limit (PEL) for mercury is 0.001 mg/m^3.

SECTION 7

MISSOURI RISK BASED CLEANUP STANDARDS (CALM)

The Missouri Department of Natural Resources CALM guidance document outlines a process for determining cleanup goals at sites with known or suspected hazardous substance contamination. The CALM document was developed to service the Missouri Voluntary Cleanup Program law (10CAR 25-15.010). According to the introductory section of the CALM document, "CALM may be used only for setting cleanup goals for sites undergoing cleanup in the department's Voluntary Cleanup Program." While it was not the goal of this investigation to establish an appropriate regulatory jurisdiction for the Property, CALM protocols provide a reasonable, widely-referenced initial standard upon which detected compounds can be assessed.

Appendix B of the CALM document contains a table of Soil and Groundwater Target Concentrations (STARC and GTARC) divided into three Exposure Scenarios. All analytical results were compared to an Exposure Scenario A. Exposure Scenario A applies to sites where no land-use restriction covenants are to be used and are the most restrictive in terms of cleanup goals.

As previously discussed, beryllium exceeded maximum concentrations set forth in CALM (Scenario A – 0.05mg/kg) in numerous shallow soil, sediment and subsurface soil samples analyzed. These Exposure Scenario's are inclusive of a "Direct Exposure" pathway (ingestion/dermal/inhalation). The "Leaching to Groundwater" maximum concentration of 130 mg/kg is far above the levels detected in the soils at the subject site.

Background concentrations of beryllium in the subsurface soils of Missouri have been identified at levels ranging from 0.1 mg/kg to 40 mg/kg (Tidball, 1984). USEPA has published a "Fact Sheet" on *Metal Concentrations in Natural Soils, USEPA, Office of Solid Waste and Emergency Response (April, 1983)* which has defined an average concentration of beryllium in soils at 6 mg/kg. The Tier 2 process within the CALM Guidance allows for a Tier 2 Background assessment to determine background levels of identified contaminates at sites in Missouri. A Tier 2 Background Assessment would establish a background level for beryllium at the subject site and would most likely "risk away" any concerns regarding beryllium levels at the subject site.

A Background Assessment was performed by SCS in December of 2003. Four surface/near surface samples were collected from undisturbed locations within a 2-mile radius of the Federal Facility. Samples were collected from St. Vincent Park, Sverdrup Army Reserve Center across Goodfellow from the Federal Facility, Schnucks Plaza at Natural Bridge and Union Street, and from a vacant lot at the intersection of Clara Street and Ashland Avenue. Average detected beryllium concentrations were approximately 0.27 mg/kg, or many orders of magnitude higher than the MDNR STARC for Scenario A of 0.05 mg/kg.

SECTION 8

CONCLUSIONS AND RECOMMENDATIONS

- Analytical results of the limited sampling performed to date by SCS associated with Building 105, 105E, and 105F would indicate that there are no environmental concerns regarding the occupancy of the respective buildings.

APPENDIX A

FIGURE 1: SITE MAP

SHEET TITLE	REV.	DATE	DESCRIPTION	CK. BY	
FIGURE 1 **SITE MAP**	△				
PROJECT TITLE **INTERIM SI REPORT** **ST. LOUIS FEDERAL CENTER** **4300 GOODFELLOW BOULEVARD** **ST. LOUIS, MISSOURI**	△				
	△				
	△				
	△				
	△				

LEGEND

FENCE

FIRE HYDRANT FH

NO PARKING

SMOKING SHELTER

FORMER BUILDING LOCATION

FIGURE

1

SCALE:
1"=100'

DATE:
MARCH 2006

CADD FILE:
200070.27-02

SCS ENGINEERS

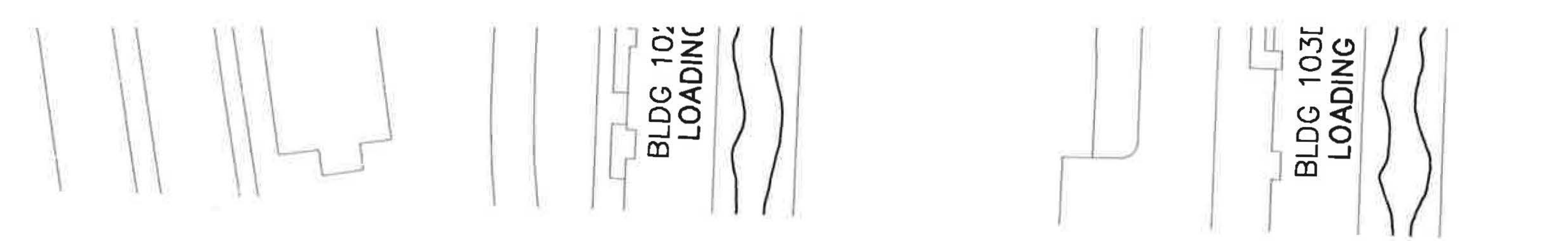
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS

10401 HOLMES ROAD, SUITE 400, KANSAS CITY, MISSOURI 64131
PH. (816) 941-7510 FAX NO. (816) 941-8025
WWW.SCSENGINEERS.COM

PROJ. NO. 02200070.27	DWN. BY: PDM	Q/A RVW BY:
DSN. BY: DEB	CHK. BY:	APP. BY:

CLIENT

**U.S. GENERAL SERVICES ADMINISTRATION
PROPERTY MANAGEMENT DIVISION
GSA PUBLIC BUILDINGS SERVICE
HEARTLAND REGION
1500 E. BANNISTER ROAD, ROOM 201
KANSAS CITY, MO 64131**

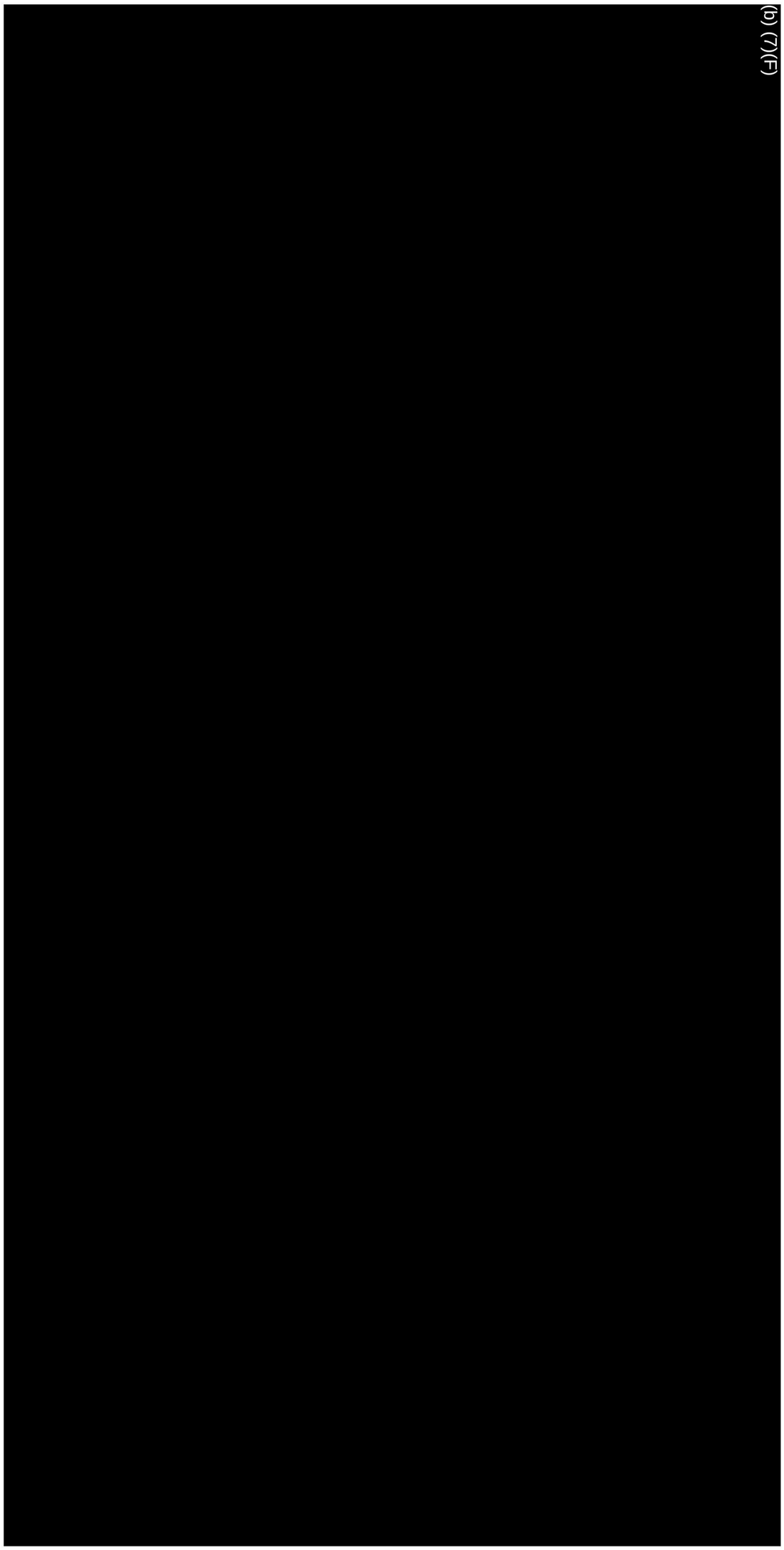


APPENDIX B

SAMPLE LOCATION MAPS

Figure 2A: Sample Location Map (main floor of Building 105, 105E, and 105F)
Figure 2B: Sample Location Map (main floor of Building 105)
Figure 3A: Sample Location Map (basement level of Building 105, 105E, and 105F)
Figure 3B: Sample Location Map (basement Level of Building 105)

D:\SCS\P2D-DWGS\HAZARDS\02\200070.27\ 200070.27-02C.dwg 1=1 03-08-06



LEGEND

■ 105WS1 WIPE SAMPLE LOCATION

NOT TO SCALE

SCS ENGINEERS DSN. BY B. ENGARD CHK. BY D. BREWER DWN. BY P. MORRIS REV:	MAIN FLOOR BUILDINGS 105, 105E, AND 105F FORMER ST. LOUIS ORDNANCE PLANT 4300 GOODFELLOW BLVD. ST. LOUIS, MISSOURI PROJECT NO. 02200070.27 MARCH 2006	FIGURE 2A SAMPLE LOCATION MAP

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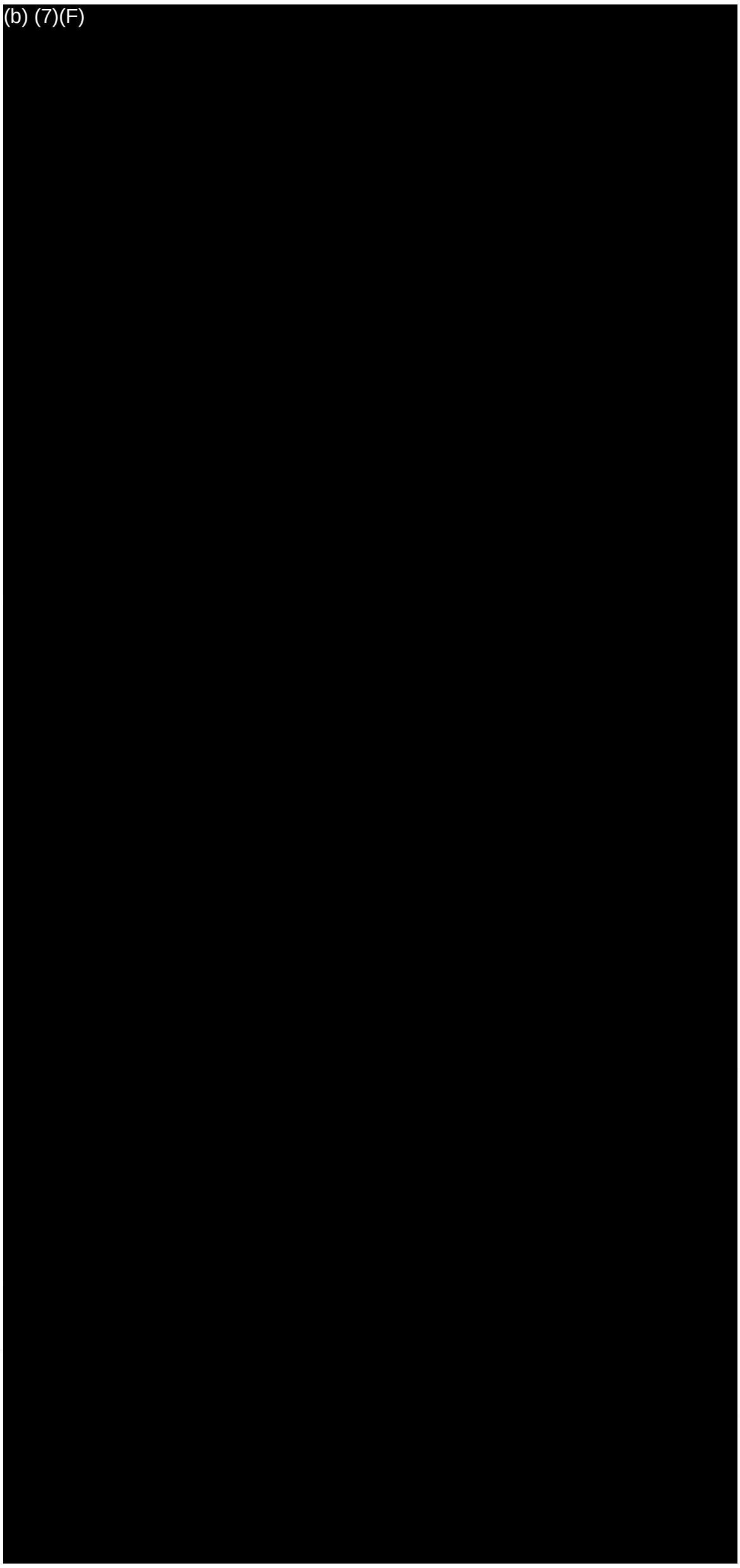
LEGEND

■ 105WS2 WIPE SAMPLE LOCATION



NOT TO SCALE

SCS ENGINEERS DSN. BY B. ENGARD CHK. BY D. BREWER DWN. BY P. MORRIS REV:	MAIN FLOOR BUILDING 105, 105 E, AND 105F FORMER ST. LOUIS ORDNANCE PLANT 4300 GOODFELLOW BLVD. ST. LOUIS, MISSOURI PROJECT NO. 02200070.27 MARCH 2006	FIGURE 2B SAMPLE LOCATION MAP

(b) (7)(F)

[redacted]

LEGEND

■ 105BCSWS2	WIPE SAMPLE LOCATION
● 105BSS1	SOIL SAMPLE LOCATION
▲ 105SS1	WATER SAMPLE LOCATION
○ 105SS1	SEDIMENT SAMPLE LOCATION

NOT TO SCALE

FIGURE 3A
SAMPLE LOCATION MAP

BASEMENT BUILDINGS 105, 105E, AND 105F
FORMER ST. LOUIS ORDNANCE PLANT
4300 GOODFELLOW BLVD. ST. LOUIS, MISSOURI
PROJECT NO. 02200070.27 MARCH 2006

SCS ENGINEERS
DSN. BY J. DOWLING CHK. BY D. BREWER
DWN. BY P. MORRIS REV:

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(b) (7)(F)

[redacted]

LEGEND

■ 105BCSWS2 WIPE SAMPLE LOCATION

● 105BSS1 SOIL SAMPLE LOCATION

○ 105SS1 SEDIMENT SAMPLE LOCATION

NOT TO SCALE

FIGURE 3B
SAMPLE LOCATION MAP

BASEMENT BUILDING 105, 105E, AND 105F
FORMER ST. LOUIS ORDNANCE PLANT
4300 GOODFELLOW BLVD. ST. LOUIS, MISSOURI
PROJECT NO. 02200070.27 MARCH 2006

SCS ENGINEERS
DSN. BY J. DOWLING CHK. BY D. BREWER
DWN. BY P. MORRIS REV:

D:\SCS\P2D-DWGS\HAZARDS\02\200070.27\ 200070.27-02b.dwg 1=1 06-08-06

APPENDIX C

FIGURE 4: SOIL BORING LOCATION MAP

FIGURE 4
BORING LOCATION MAP

BUILDINGS SERIES 104 AND 106
FORMER ST. LOUIS ORDNANCE PLANT
4300 GOODFELLOW BLVD. ST. LOUIS, MISSOURI
PROJECT NO. 02200070.27 MARCH 2006

SCS ENGINEERS
DSN. BY B. ENGARD CHK. BY D. BREMER
DWN. BY R. PHILLIPS REV:

D:\SCS\P2D-DWGS\HAZARDS\02\200070.27\200070.27-03D.dwg 1=1 03-08-06

3RD ST
PATTON ST
4TH ST
5TH ST
INDUSTRIAL DRIVE

SB9
SB8
SB28
SB34
SB22
UST
SB19
SB20
PUMP
SB7
SB21
SB17
SB38
SB37
105-1
105-2
105-3
105-4
105-5

POWDER STORAGE
BLDGS 104G, 104H, 104J

BLDG 104E LOADING
BLDG 104F PRIMER
BLDG 104L
BLDG 104K
BLDG 115 GARAGE
104 ANNEX
BLDG 104 PRODUCTION
D C B A

BLDG 108B SUBSTATION

POWDER STORAGE
BLDGS 105G, 105H, 105J

BLDG 105E LOADING
BLDG 105F PRIMER
BLDG 105L KITCHEN
"J" LOT
"K" LOT
BLDG 105 PRODUCTION
D C B A

GUARD HOUSE
GATE 5
GUARD HOUSE
GATE 4

T C

LEGEND

FENCE	
FIRE HYDRANT	FH
SMOKING SHELTER	
FORMER BUILDING LOCATION	
COMPLETED SOIL BORING LOCATION	SB38

APPENDIX D

SUMMARY OF LABORATORY ANALYTICAL RESULTS

FORMER SAINT LOUIS ORDNANCE PLANT
4300 GOODFELLOW - BUILDING 105 SECTIONS A, B, C, AND D
ST. LOUIS, MISSOURI
U.S. GENERAL SERVICES ADMINISTRAITON

TABLE 1-1 - RESULTS OF WIPE SAMPLE ANALYSIS

SAMPLE NUMBER:		105BCSWS1	105BCSWS2	105CCSWS1	105CCSWS2	105DCSWS1	105DCSWS2	105WS1	105WS2	105WS3	105WS4	105WS5	105WS6	105WS7	105WS8	105WS9	105WS10	SOIL
SAMPLE DATE:		9/11/2002	9/11/2002	9/11/2002	9/11/2002	9/11/2002	9/11/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	TARGET
LAB ID NUMBER:		211976-8	211976-9	211976-6	211976-7	211976-10	211976-11	211929-5	211929-6	211929-7	211929-8	211929-9	211929-10	211929-11	211929-12	211929-13	211929-14	CONCENTRATIONS
PARAMETER (METHOD)	UNITS																	SCENARIO A[1]
PCBs (8082)																		
Aroclor 1260	µg/Wipe	ND	ND	18	ND	ND	ND	2.6	6.2	18	2.5	7.5	0.74	3.2	ND	0.79	11	600 µg/Kg
EXPLOSIVES (8330)																		
Nitrobenzene	µg/Wipe	ND	ND	ND	ND	ND	ND	ND	3.1	ND	ND	ND	ND	ND	ND	ND	ND	12,000 µg/Kg
4-Amino-2,6-Dinitrotoluene	µg/Wipe	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.4	NT
METALS (6010B)																		
Aluminum	mg/Wipe	0.31	0.21	2.6	0.26	0.63	0.99	6.1	11	17	3	5.4	0.44	5.9	1.2	5.4	8.6	NT
Antimony	mg/Wipe	ND	ND	ND	ND	ND	ND	0.023	0.014	0.1	0.0071	0.015	0.0032	0.012	0.0027	0.0082	0.015	85 mg/Kg
Arsenic	mg/Wipe	ND	ND	0.0023	ND	ND	0.001	0.089	0.03	0.035	0.0037	0.018	0.0014	0.022	0.012	0.0099	0.0082	11 mg/Kg
Barium	mg/Wipe	0.0054	0.0049	0.047	0.0052	0.011	0.017	0.9	0.77	0.71	0.1	0.41	0.71	2.5	0.028	2	0.7	14,000 mg/Kg
Beryllium	mg/Wipe	ND	ND	ND	ND	ND	ND	0.0005	ND	ND	ND	0.0004	ND	0.0005	ND	ND	ND	0.05 mg/Kg
Cadmium	mg/Wipe	0.0045	0.0003	0.0007	ND	0.0008	0.0006	0.039	0.05	0.062	0.021	0.033	0.0013	0.04	0.0013	0.041	0.032	110 mg/Kg
Calcium	mg/Wipe	14	18	38	12	19	21	77	170	210	49	58	10	49	14	100	120	NT
Chromium	mg/Wipe	0.0058	0.0011	0.0054	0.0015	0.0032	0.0072	0.35	0.21	0.52	0.042	0.14	0.0059	0.078	0.011	0.13	0.2	2,100 mg/Kg
Cobalt	mg/Wipe	ND	ND	0.0016	ND	ND	0.0006	0.19	0.23	0.11	0.0059	0.036	0.016	0.044	0.001	0.11	0.16	NT
Copper	mg/Wipe	0.0039	0.032	0.036	0.004	0.0068	0.01	3.4	18	11	0.25	2.4	0.027	0.56	0.018	0.96	1.2	1,100 mg/Kg
Iron	mg/Wipe	0.36	0.24	4.3	0.48	0.99	4.4	780	120	240	13	32	1.2	24	2.5	72	16	NT
Lead	mg/Wipe	0.031	0.0055	0.057	0.014	0.017	38	5.5	7.3	10	0.63	4.9	0.39	11	0.086	11	5.1	260 mg/Kg
Magnesium	mg/Wipe	0.32	0.31	1.4	0.22	0.41	0.99	5.6	9.7	10	2	2.1	0.45	2.7	1.4	4.6	8.3	NT
Manganese	mg/Wipe	0.015	0.014	0.12	0.0093	0.017	0.052	3.4	0.8	2.2	0.16	0.32	0.032	0.31	0.044	0.43	0.29	3,700 mg/Kg
Nickel	mg/Wipe	ND	ND	0.0048	ND	0.0013	0.0028	0.19	0.075	0.34	0.016	0.054	0.0037	0.032	0.0053	0.029	0.033	4,800 mg/Kg
Potassium	mg/Wipe	0.38	0.52	5.4	0.36	0.99	1.9	4.2	4.4	6.6	2.3	1.8	0.3	2.2	0.48	4.6	4.1	NT
Selenium	mg/Wipe	0.0008	0.0008	0.0008	0.0008	0.0008	0.0007	0.0096	0.007	ND	0.0014	0.0052	0.0012	0.0052	0.0011	0.002	0.0036	300 mg/Kg
Silver	mg/Wipe	ND	ND	ND	ND	ND	ND	0.0039	0.0053	0.0048	0.0005	0.0043	ND	0.0029	ND	0.0024	0.0037	140 mg/Kg
Sodium	mg/Wipe	1.3	1.4	4.3	1.4	1.6	2.2	9.3	4.6	4.3	2.7	2.4	1.3	ND	1.6	4.8	3	NT
Thallium	mg/Wipe	ND	ND	0.0012	ND	ND	ND	ND	0.0016	0.0021	ND	0.0015	ND	0.0019	ND	0.0021	0.001	17 mg/Kg
Vanadium	mg/Wipe	0.0007	ND	0.0064	0.0006	0.0012	0.0068	0.029	0.047	0.067	0.0074	0.023	0.0014	0.024	0.064	0.014	0.021	1,500 mg/Kg
Zinc	mg/Wipe	0.15	0.074	0.25	0.048	0.11	0.12	6.1	16	8.7	2.9	2.8	2.6	12	0.11	5.8	6.6	38,000 mg/Kg

µg/Wipe = micrograms per wipe
mg/Wipe = milligrams per wipe
NT = No Target Concentration
µg/Kg = micrograms per kilogram
mg/Kg = milligrams per kilogram
ND = Not Detected above laboratory quantitative limits
[1]Target Concentration based on the CALM STARC Scenario A, as directed by personel in the Federal Facility Section of MDNR

FORMER SAINT LOUIS ORDNANCE PLANT
4300 GOODFELLOW - SOIL BORINGS
ST. LOUIS, MISSOURI
U.S. GENERAL SERVICES ADMINISTRAITON

TABLE 3-1 - RESULTS OF SUBSURFACE SOIL SAMPLE ANALYSIS

SAMPLE NUMBER:		101-1	101-2	101-3	101-4	105-1	105-2	105-3	105-4	105-5	SB1-SB4	SB5	SB6	SB7	SB8-SB9	SB10	SOIL TARGET CONCENTRATIONS SCENARIO A
SAMPLE DATE:		9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	12/15/2003	12/15/2003	12/16/2003	12/16/2003	12/16/2003	12/16/2003	
LAB ID NUMBER:		211927-6	211927-7	211927-8	211927-9	211927-5	211927-2	211927-3	211927-4	211927-5	223146-1	223146-2	223146-3	223146-4	223146-5	223146-6	
PARAMETER (METHOD)	UNITS																
PCBs (8082)																	
Aroclor 1260	µg/Kg	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	600 µg/Kg
TPH (8015B MDRO)																	
Diesel Range Organics	mg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	6	NA	NA	NA	NA	NA	200 mg/Kg
THP (8015B MGRO)																	
Gasoline Range Organics	mg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200 mg/Kg
PHOSPHOROUS (4500PE)																	
Total Phosphorous	mg/Kg	NA	NA	NA	NA	510	600	430	520	510	NA	NA	NA	NA	NA	NA	NT
MERCURY (7471A)																	
Mercury	mg/Kg	0.053	0.038	0.038	0.089	0.022	0.022	0.029	0.073	0.039	0.011	0.056	0.029	0.0089	0.019	0.024	0.6 mg/Kg
METALS (6010B)																	
Aluminum	mg/Kg	13000	13000	9900	12000	9900	9700	12000	11000	12000	770	9700	10000	12000	10000	11000	NT
Arsenic	mg/Kg	9.1	8.5	10	8.5	5.7	3.9	5.8	4.3	5.2	0.81	3.6	5	3	5	3.8	11 mg/Kg
Barium	mg/Kg	150	140	130	160	140	93	110	120	210	20	78	72	78	93	44	14,000 mg/Kg
Beryllium	mg/Kg	**0.43**	**0.44**	**0.51**	**0.44**	**0.28**	**0.33**	**0.38**	**0.36**	**0.4**	0.047	**0.72**	**0.78**	**1.2**	**0.76**	**0.67**	0.05 mg/Kg
Cadmium	mg/Kg	0.19	0.2	0.33	0.47	0.16	ND	0.071	ND	ND	0.24	ND	ND	ND	0.1	ND	110 mg/Kg
Calcium	mg/Kg	3200	4800	11000	4000	27000	3800	24000	4100	6900	370000	2100	3400	3400	23000	2200	NT
Chromium	mg/Kg	18	19	21	24	18	18	18	22	19	6.5	15	17	14	18	16	2,100 mg/Kg
Cobalt	mg/Kg	9.2	8.3	6.9	7.6	6.1	4.5	6.5	5.2	5.9	0.49	2.8	3.3	2.1	6.8	4.1	NT
Copper	mg/Kg	18	17	16	22	13	11	13	13	16	6.7	9.3	13	9.2	12	9.5	1,100 mg/Kg
Iron	mg/Kg	18000	18000	17000	18000	14000	14000	15000	15000	20000	1200	11000	15000	12000	15000	12000	NT
Lead	mg/Kg	31	25	25	68	19	15	14	13	22	ND	7.3	11	7	48	7	260 mg/Kg
Magnesium	mg/Kg	2600	2900	4200	2400	3300	2700	2700	2700	2700	5100	1800	2000	2100	6300	1700	NT
Manganese	mg/Kg	800	750	530	600	360	200	420	210	730	46	100	180	220	450	170	3,700 mg/Kg
Nickel	mg/Kg	19	19	15	18	14	13	15	14	20	4.2	9.7	10	13	12	9.3	4,800 mg/Kg
Potassium	mg/Kg	1400	1300	1100	1600	1200	660	1100	1100	950	490	400	470	400	840	390	NT
Selenium	mg/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.1	ND	ND	ND	ND	ND	300 mg/Kg
Sodium	mg/Kg	230	840	630	200	760	380	760	360	320	310	ND	600	ND	1000	120	NT
Thallium	mg/Kg	ND	ND	ND	ND	ND	ND	ND	0.56	ND	0.93	ND	ND	ND	ND	ND	17 mg/Kg
Vanadium	mg/Kg	32	31	35	31	30	28	31	30	26	2.9	17	34	20	26	26	1,500 mg/Kg
Zinc	mg/Kg	64	56	54	87	56	38	42	43	47	9.1	22	34	17	35	24	38,000 mg/Kg
SEMI-VOLATILE ORGANICS (8270C)																	
Acenaphthene	µg/Kg	NA	NA	NA	NA	75	ND	870	ND	150	NA	NA	NA	NA	NA	NA	1,700,000 µg/Kg
Dibenzofuran	µg/Kg	NA	NA	NA	NA	ND	ND	390	ND	79	NA	NA	NA	NA	NA	NA	110,000 µg/Kg
Flourene	µg/Kg	NA	NA	NA	NA	ND	ND	1000	ND	200	NA	NA	NA	NA	NA	NA	1,100,000 µg/Kg
Phenanthrene	µg/Kg	NA	NA	NA	NA	1000	ND	11000	200	1700	NA	NA	NA	NA	NA	NA	NT
Anthracene	µg/Kg	NA	NA	NA	NA	160	ND	1800	ND	330	NA	NA	NA	NA	NA	NA	8,500,000 µg/Kg
Carbazole	µg/Kg	NA	NA	NA	NA	140	ND	990	ND	160	NA	NA	NA	NA	NA	NA	82,000 µg/Kg
Flouranthene	µg/Kg	NA	NA	NA	NA	1400	ND	14000	370	1900	NA	NA	NA	NA	NA	NA	1,600,000 µg/Kg
Pyrene	µg/Kg	NA	NA	NA	NA	1300	ND	11000	270	1700	NA	NA	NA	NA	NA	NA	2,100,000 µg/Kg
Benzo(a)anthracene	µg/Kg	NA	NA	NA	NA	530	ND	**4400**	130	770	NA	NA	NA	NA	NA	NA	1,000 µg/Kg
Chrysene	µg/Kg	NA	NA	NA	NA	700	ND	5300	160	900	NA	NA	NA	NA	NA	NA	36,000 µg/Kg
Bis(2-ethylhexyl) phthalate	µg/Kg	NA	NA	NA	NA	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	410,000 µg/Kg
Benzo(b)flouranthene	µg/Kg	NA	NA	NA	NA	580	ND	**4800**	150	710	NA	NA	NA	NA	NA	NA	900 µg/Kg
Benzo(k)flouranthene	µg/Kg	NA	NA	NA	NA	520	ND	3500	ND	640	NA	NA	NA	NA	NA	NA	8,000 µg/Kg
Benzo(a)pyrene	µg/Kg	NA	NA	NA	NA	**520**	ND	**3700**	130	670	NA	NA	NA	NA	NA	NA	200 µg/Kg
Indeno(1,2,3-cd)pyrene	µg/Kg	NA	NA	NA	NA	350	ND	2400	ND	470	NA	NA	NA	NA	NA	NA	3,000 µg/Kg
Dibenzo(a,h)anthracene	µg/Kg	NA	NA	NA	NA	160	ND	**1100**	ND	ND	NA	NA	NA	NA	NA	NA	200 µg/Kg
Benzo(ghi)perylene	µg/Kg	NA	NA	NA	NA	400	ND	2600	ND	530	NA	NA	NA	NA	NA	NA	NT
VOLATILE ORGANICS (8260B)																	
Acetone	µg/Kg	NA	NA	NA	NA	7.1	100	ND	6.9	13	NA	15	NA	NA	NA	NA	2,700,000 µg/Kg
2-Butanone	µg/Kg	NA	NA	NA	NA	ND	10	ND	ND	ND	NA	ND	NA	NA	NA	NA	NT
Toluene	µg/Kg	NA	NA	NA	NA	ND	9.1	ND	ND	ND	NA	ND	NA	NA	NA	NA	650,000 µg/Kg
1,1,2,2-Tetrachloroethane	µg/Kg	NA	NA	NA	NA	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA	2,000 µg/Kg
1,2,4-Trimethylbenzene	µg/Kg	NA	NA	NA	NA	ND	3.4	ND	ND	ND	NA	ND	NA	NA	NA	NA	100,000 µg/Kg
p-Isopropyltoluene	µg/Kg	NA	NA	NA	NA	ND	46	ND	ND	ND	NA	ND	NA	NA	NA	NA	NT

µg/Kg = micrograms per kilogram
mg/Kg = milligrams per kilogram
NT = No Target Concentration
NA = Not Analyzed

ND = Not Detected above laboratory quantitative limits

FORMER SAINT LOUIS ORDNANCE PLANT
4300 GOODFELLOW - SOIL BORINGS
ST. LOUIS, MISSOURI
U.S. GENERAL SERVICES ADMINISTRAITON

TABLE 3-1 (continued) - RESULTS OF SUBSURFACE SOIL SAMPLE ANALYSIS

SAMPLE NUMBER:		SB28	SB29	SB30	SB31	SB32	SB33	SB34	SB35	SB36	SB37	SB38	SB39	SB40	SB41	SOIL TARGET CONCENTRATIONS SCENARIO A
SAMPLE DATE:		12/17/2003	12/17/2003	12/17/2003	12/17/2003	12/17/2003	12/17/2003	12/17/2003	12/17/2003	12/17/2003	12/17/2003	12/17/2003	12/17/2003	12/17/2003	12/19/2003	
LAB ID NUMBER:		223218-11	223218-12	223218-13	223218-14	223218-15	223218-16	223218-17	223218-18	223218-19	223218-20	223218-21	223218-22	223218-23	223259-1	
PARAMETER (METHOD)	**UNITS**															
PCBs (8082)																
Aroclor 1260	µg/Kg	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	**3900**	**1000**	ND	600 µg/Kg
TPH (8015B MDRO)																
Diesel Range Organics	mg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	3.2	5.1	4.8	27	17	26	200 mg/Kg
THP (8015B MGRO)																
Gasoline Range Organics	mg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13	200 mg/Kg
PHOSPHOROUS (4500PE)																
Total Phosphorous	mg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NT
MERCURY (7471A)																
Mercury	mg/Kg	0.025	0.038	0.029	0.033	0.0068	0.011	0.024	0.016	0.046	NA	NA	NA	NA	0.025	0.6 mg/Kg
METALS (6010B)																
Aluminum	mg/Kg	4800	19000	15000	12000	17000	14000	11000	16000	12000	NA	NA	NA	NA	11000	NT
Arsenic	mg/Kg	3.4	3.1	7.1	4.3	2.9	5.7	7.2	4.4	4.9	NA	NA	NA	NA	8.4	11 mg/Kg
Barium	mg/Kg	58	74	62	57	110	140	150	40	60	NA	NA	NA	NA	150	14,000 mg/Kg
Beryllium	mg/Kg	**0.42**	**0.91**	**0.88**	**0.66**	**0.77**	**2**	**0.88**	**0.76**	**0.84**	NA	NA	NA	NA	**0.93**	0.05 mg/Kg
Cadmium	mg/Kg	ND	ND	ND	ND	ND	0.23	0.18	ND	ND	NA	NA	NA	NA	ND	110 mg/Kg
Calcium	mg/Kg	17000	3300	2600	1600	2700	2400	8300	2400	1800	NA	NA	NA	NA	8000	NT
Chromium	mg/Kg	9.7	23	21	16	17	26	19	22	17	NA	NA	NA	NA	21	2,100 mg/Kg
Cobalt	mg/Kg	4.3	4	2.5	4.1	20	53	7.6	3.5	4.7	NA	NA	NA	NA	11	NT
Copper	mg/Kg	9.1	9.8	**11**	8.6	12	74	33	8.8	9.7	NA	NA	NA	NA	14	1,100 mg/Kg
Iron	mg/Kg	8700	15000	20000	15000	13000	65000	17000	17000	16000	NA	NA	NA	NA	20000	NT
Lead	mg/Kg	14	8.3	7.3	13	10	8.5	110	6.7	9.7	NA	NA	NA	NA	18	260 mg/Kg
Magnesium	mg/Kg	3800	2700	2200	1300	1900	4300	3400	1900	1600	NA	NA	NA	NA	2200	NT
Manganese	mg/Kg	240	61	57	100	650	330	900	86	170	NA	NA	NA	NA	610	3,700 mg/Kg
Nickel	mg/Kg	11	17	14	7.9	9.4	88	19	10	10	NA	NA	NA	NA	17	4,800 mg/Kg
Potassium	mg/Kg	510	700	560	470	700	1300	1200	540	480	NA	NA	NA	NA	590	NT
Seleniun	mg/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	ND	300 mg/Kg
Sodium	mg/Kg	260	150	180	150	230	ND	210	420	340	NA	NA	NA	NA	120	NT
Thallium	mg/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	ND	17 mg/Kg
Vanadium	mg/Kg	13	24	34	34	26	48	32	29	31	NA	NA	NA	NA	39	1,500 mg/Kg
Zinc	mg/Kg	30	27	27	17	23	150	73	21	23	NA	NA	NA	NA	36	38,000 mg/Kg
SEMI-VOLATILE ORGANICS (8270C)																
Acenaphthene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,700,000 µg/Kg
Dibenzofuran	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	110,000 µg/Kg
Flourene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,100,000 µg/Kg
Phenanthrene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NT
Anthracene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8,500,000 µg/Kg
Carbazole	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	82,000 µg/Kg
Flouranthene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,600,000 µg/Kg
Pyrene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2,100,000 µg/Kg
Benzo(a)anthracene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,000 µg/Kg
Chrysene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	36,000 µg/Kg
Bis(2-ethylhexyl) phthalate	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	410,000 µg/Kg
Benzo(b)flouranthene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	900 µg/Kg
Benzo(k)flouranthene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8,000 µg/Kg
Benzo(a)pyrene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200 µg/Kg
Indeno(1,2,3-cd)pyrene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3,000 µg/Kg
Dibenzo(a,h)anthracene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200 µg/Kg
Benzo(ghi)perylene	µg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NT
VOLATILE ORGANICS (8260B)																
Acetone	µg/Kg	NA	NA	NA	NA	NA	NA	9.8	10	NA	NA	NA	NA	NA	NA	2,700,000 µg/Kg
2-Butanone	µg/Kg	NA	NA	NA	NA	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NT
Toluene	µg/Kg	NA	NA	NA	NA	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	650,000 µg/Kg
1,1,2,2-Tetrachloroethane	µg/Kg	NA	NA	NA	NA	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	2,000 µg/Kg
1,2,4-Trimethylbenzene	µg/Kg	NA	NA	NA	NA	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	100,000 µg/Kg
p-Isopropyltoluene	µg/Kg	NA	NA	NA	NA	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NT

µg/Kg = micrograms per kilogram
mg/Kg = milligrams per kilogram
NT = No Target Concentration
NA = Not Analyzed

ND = Not Detected above laboratory quantitative limits