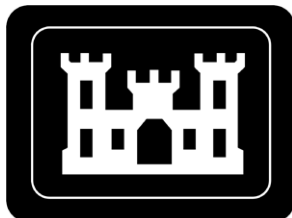

REVISION 0

**PRE-DESIGN INVESTIGATION
SUMMARY REPORT FOR ST. CIN PARK,
THE ARCHDIOCESE OF ST. LOUIS
PROPERTY, AND DUCHESNE PARK**

ST. LOUIS, MISSOURI

JUNE 24, 2015



**U.S. Army Corps of Engineers
St. Louis District Office
Formerly Utilized Sites Remedial Action Program**

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prepared by

U.S. Army Corps of Engineers, St. Louis District Office
Formerly Utilized Sites Remedial Action Program

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*CD-ROM Appendix A

ACRONYMS AND ABBREVIATIONS

Both English and metric units are used in this report. The units used in a specific situation are based on common unit usage or regulatory language (e.g., depths are given in feet and meters, and areas are given in square feet and square meters). Acres are given for areas when applicable.

Ac	actinium
AEC	U.S. Atomic Energy Commission
ASTM	ASTM International
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm	centimeter
COC	contaminant of concern
CSM	conceptual site model
CWC	Coldwater Creek
DOE	U.S. Department of Energy
DOD	U.S. Department of Defense
EM	Engineer Manual
FS	<i>Feasibility Study for the St. Louis North County Site</i>
FSS	final status survey
FSSE	final status survey evaluation
ft	foot/feet
FUSRAP	Formerly Utilized Sites Remedial Action Program
GIS	geographic information system
GM	Geiger Mueller
GWS	gamma walkover survey
HTZ	biased (sample prefix designation)
IDW	investigation-derived waste
LiDAR	Light Detection and Ranging
m	meter(s)
m ²	square meter(s)
MARSSIM	<i>Multi-Agency Radiation Survey and Site Investigation Manual</i>
MDC	minimum detectable concentration
MDNR	Missouri Department of Natural Resources
MED	Manhattan Engineer District
MSD	Metropolitan St. Louis Sewer District
NaI	sodium iodide
NCP	National Oil and Hazardous Substances Contingency Plan
Pa	protactinium
Pb	lead
pCi/g	picocuries per gram
PDI	pre-design investigation
PDI WP	<i>Pre-Design Investigation Work Plan for Coldwater Creek from Frost Avenue to St. Denis Bridge</i>
PDIR	pre-design investigation report
PPE	personal protective equipment

ACRONYMS AND ABBREVIATIONS (Continued)

QA	quality assurance
QC	quality control
Ra	radium
RG	remediation goal
ROD	<i>Record of Decision for the North St. Louis County Sites</i>
SAG	<i>Sampling and Analysis Guide for the St. Louis Sites</i>
SLAPS	St. Louis Airport Site
SOR	sum of ratios
SOR _N	net sum of ratios
SVP	St. Louis Airport Site vicinity property (sample prefix designation)
Th	thorium
U	uranium
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VP	vicinity property
VQ	validation qualifier

1.0 INTRODUCTION

The pre-design investigation (PDI) activities described in this report were performed by the U.S. Army Corps of Engineers (USACE) St. Louis District as part of the Formerly Utilized Sites Remedial Action Program (FUSRAP) in accordance with the *Record of Decision for the North St. Louis County Sites* (ROD) (USACE 2005). The FUSRAP was initiated in 1974 to identify and remediate or otherwise control sites at which residual radioactivity remains from activities conducted while under contract to the Manhattan Engineer District (MED) and U.S. Atomic Energy Commission (AEC) during the early years of the nation's atomic energy program. In 1997, the U.S. Congress transferred responsibility for the execution aspect of the FUSRAP from the U.S. Department of Energy (DOE) to the USACE. The DOE will assume a stewardship responsibility beginning 2 years after completion of the response action at the North St. Louis County Sites.

The USACE was authorized by the U.S. Congress as the lead agency for implementation of the selected remedy. The remedy was selected by the USACE in consultation with the U.S. Environmental Protection Agency (USEPA) and with the concurrence of the Missouri Department of Natural Resources (MDNR).

The work within the scope of this pre-design investigation report (PDIR) was managed by the USACE St. Louis District FUSRAP Project Office and was accomplished in accordance with the National Oil and Hazardous Substances Contingency Plan (NCP) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Cleanup activities will continue to follow NCP and CERCLA guidelines.

Coldwater Creek (CWC) (from top of bank to top of bank) is considered a St. Louis Airport Site (SLAPS) vicinity property (VP) and is located within the ROD boundary as defined by Figure 2-2 of the ROD (USACE 2005). CWC is therefore subject to the requirements of the ROD. Because CWC is subject to flooding, all areas within the 10-year floodplain of CWC have been included within the investigation area and are also subject to the requirements of the ROD. Areas outside the 10-year floodplain may be added to the investigation area if it is determined that contamination extends beyond the boundary of the 10-year floodplain.

The portion of St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park included within the scope of this PDIR is shown on Figure 1. As described in the *Pre-Design Investigation Work Plan for Coldwater Creek from Frost Avenue to St. Denis Bridge* (PDI WP) (USACE 2014), investigations were focused within the 10-year floodplain of CWC. As discussed in Section 5.0 of this PDIR, soil contamination appears to be laterally bounded within the 10-year floodplain; therefore, investigation of these properties outside of the 10-year floodplain was not necessary.

Based on elevations from the *Coldwater Creek, Missouri, Feasibility Report for Flood Control and Related Purpose* (USACE 1987a) and the *Coldwater Creek Watershed Study for Stormwater System Master Plan* (MSD 1998), and on current Light Detection and Ranging (LiDAR) elevation data, the 10-year floodplain of CWC represents areas with a 10 percent chance of flooding in any given year. LiDAR is an optical remote-sensing technique that uses laser light to densely sample the surface of the earth, producing highly accurate 3-dimensional data. The LiDAR data used in this document were downloaded from the Missouri Spatial Data Information Service at <http://www.msdis.missouri.edu/data/lidar/index.html>.

The purposes of the PDI activities at St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park were to obtain analytical data to define the nature and extent of contamination, to determine if residual radiological contamination exceeding ROD remediation goals (RGs) is

present, and to provide analytical data needed to support remedial design (if required) or the final status survey evaluation (FSSE), as applicable.

Radiological contaminants of concern (COCs) apply to the North St. Louis County Sites (including St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park) per Table 2-2 of the ROD (USACE 2005). The primary COCs for these properties are radium (Ra)-226, thorium (Th)-230, and uranium (U)-238. The ROD identifies the selected remedy to address contamination that exceeds RGs at the North St. Louis County Sites. Consistent with the ROD (USACE 2005), non-radiological COCs are not applicable to the properties included in this PDIR.

2.0 PROPERTY DESCRIPTION

2.1 ST. CIN PARK

As shown on Figure 2, two covered picnic structures are located on this property, along with a basketball court, a baseball diamond, and a playground. Paved paths for jogging/walking are positioned along the perimeter of the park. The topography is relatively flat in this area, and the ground cover consists mainly of grass with a few trees. The portion of St. Cin Park most adjacent to the CWC corridor is heavily wooded.

St. Cin Park is owned by the City of Hazelwood and is located at 135 St. Cin Lane, Hazelwood, Missouri. The parcel number associated with St. Cin Park is Parcel 09K520318. The area of St. Cin Park included within the scope of this report is approximately 26,990 square meters (m²) (6.7 acres). St. Cin Park is bound to the west, north, and south by residential property and to the east by the CWC corridor.

2.2 ARCHDIOCESE OF ST. LOUIS PROPERTY

As shown on Figure 2, no buildings or parking lots exist on the area of the Archdiocese of St. Louis Property included in this PDIR. The topography is relatively flat in this area, and the ground cover consists mainly of grass with a few trees. The portion of the Archdiocese of St. Louis Property most adjacent to the CWC corridor is heavily wooded.

The Archdiocese of St. Louis Property, designated as Parcel 09K630484, is owned by the Archdiocese of St. Louis and is located at 205 Manion Park Road, Hazelwood, Missouri. The area of the Archdiocese of St. Louis Property included within the scope of this report is approximately 17,490 m² (4.3 acres). The Archdiocese of St. Louis Property is bound to the west by the CWC corridor, to the north by property owned by the Catholic Cemeteries of the St. Louis Archdiocese, and to the east by additional property owned by the Archdiocese of St. Louis and residential property.

2.3 DUCHESNE PARK

As shown on Figure 2, no buildings or parking lots exist on the portion of Duchesne Park included in this PDIR. The topography is relatively flat in this area, and the ground cover consists mainly of grass with a few trees. The portion of Duchesne Park most adjacent to the CWC corridor is heavily wooded.

Two parcels comprise the area referred to as Duchesne Park: Parcels 08K310888 and 08K220150. Parcel 08K310888 is owned by the City of Florissant and is located at 5 Brower Lane, Florissant, Missouri. Parcel 08K220150 is owned by the Catholic Cemeteries of the St. Louis Archdiocese and is located at 9 Brower Lane, Florissant, Missouri. Together, and in the context established in this document, both parcels are collectively referred to as Duchesne Park. The area of Duchesne Park included within the scope of this PDIR is approximately 10,340 m² (2.6 acres). The portion of Duchesne Park included in the scope of this PDIR is bound to the west by the CWC corridor, to the north by an undeveloped parcel of land (Parcel 08K310866), to the east by the remainder of Duchesne Park not within the scope of this PDIR, and to the south by property owned by the Catholic Cemeteries of the St. Louis Archdiocese.

Table 1 contains the addresses of the properties described in this PDIR and the parcel designations established by St. Louis County (STLCO 2015).

Table 1. Addresses, Parcels, and Designations

Address	Parcel	Designation
135 St. Cin Lane	09K520318	St. Cin Park
205 Manion Park Road	09K630484	Archdiocese of St. Louis
5 Brower Lane	08K310888	Duchesne Park
9 Brower Lane	08K220150	

3.0 HISTORICAL INFORMATION

Historical information was reviewed as part of the PDI planning discussed in the PDI WP (USACE 2014) for these properties to gain insights as to the nature and extent of land development activities on the property that may have occurred in relation to the MED/AEC activities (i.e., the storage and transport of uranium process residues). Land development activities include the addition, modification, and removal of man-made structural elements (e.g., buildings, parking lots, etc.); fill material placement; earth movement; and/or related physical changes to St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park. The historical information was also reviewed to gain insights on drainage and/or erosional features, if present, relative to the land development activities, to determine the potential for radiological contamination around, within, or beneath the identified historical features.

As discussed in the PDI WP (USACE 2014), a conceptual site model (CSM) was developed as part of the CERCLA process for the North St. Louis County Sites (including St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park). Historical data and the CSM were used to determine which areas would require sampling, determine the type of sampling (systematic or random) required, and identify target areas recommended for biased sampling. Biased samples were typically planned for collection within low-lying areas, drainage areas, and depositional areas within the 10-year floodplain.

3.1 HISTORICAL LAND USE

Comparison of St. Louis County GIS Service Center aerial photographs from 1937 to 2014 indicates that St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park were primarily used for agricultural purposes from 1937 through the 1950s. The Archdiocese of St. Louis Property appears to have remained undisturbed since its agricultural usage was discontinued in the 1950s. By 1966, St. Cin Park and Duchesne Park appear to have been established and in use for recreational purposes. The aerial photographs are included as Figures 2 through 9.

The *Coldwater Creek, Missouri, Feasibility Report and Environmental Impact Statement* (USACE 1987b) states (1) that a drainage district was established in 1927 to straighten, widen, deepen, and alter CWC and (2) that most of the channel has been re-aligned to a more curvilinear shape. Aerial photographs from 1937 to 2014 were reviewed and indicate that the re-alignment occurred prior to the initiation of MED/AEC activities in North St. Louis County in 1942. The channel was altered to reduce flooding, which was caused by increased storm-water discharge and sheet-water runoff due to land use development of the surrounding area. The 1937 and 1955 aerial photographs of St. Cin Park and the Archdiocese of St. Louis Property indicate shaded and/or tree-lined areas that seem to follow a curved path through the properties, appearing to be a historic oxbow, which could indicate the original channel of CWC.

Based on the 1935 U.S. Geological Survey (USGS) topographic map, historical elevations on these properties ranged from 500 to 510 feet (ft) (152.4 to 155.4 meters [m]). Elevations still range from 500 to 510 ft (152.4 to 155.4 m), based on the current LiDAR data. The properties generally slope toward the CWC corridor.

3.2 GEOLOGY, HYDROGEOLOGY, AND HYDROLOGY

St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park are situated on a modest upland area between the Missouri and Mississippi River floodplains in northern St. Louis

County. This upland area has Pleistocene sediments and historical shale and limestone bedrock. Faulting is not evident, and bedrock at depth appears to be almost flat.

The soils of this upland area are predominantly silty deposits that originated from former glacial advances and historical Missouri and Mississippi River flooding and depositional activities. The current topographic ground surface of St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park is primarily flat, sloping toward CWC. Ground cover consists of gravel, grass, or trees, with cover material such as concrete or asphalt. The areas that directly border CWC are covered with a narrow band of riparian forest (i.e., trees, brush, and grass) (USACE 2014).

4.0 PRE-DESIGN INVESTIGATION METHODS

The PDI activities at St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park were conducted in accordance with the PDI WP (USACE 2014) and the *Sampling and Analysis Guide for the St. Louis Sites* (SAG) (USACE 2000). Activities performed as part of the PDI consisted of a review of the available historical information, completion of a gamma walkover survey (GWS), collection of PDI soil samples of the appropriate quantity and quality for use in the final status survey (FSS) process, and data review and evaluation.

Soil sampling locations and depths (both systematic and biased) were planned in the PDI WP based on *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)* (DOD 2000) recommendations, the CSM, and information gathered from the historical review and field reconnaissance activities. Subsequent rounds of PDI soil sampling (based on the analytical data from the soil samples collected as a result of the PDI WP) were performed as part of the PDI activities to investigate areas with concentrations of radiological COCs that resulted in a net sum of ratios (SOR_N) value greater than 1.0 (see Section 4.2 for additional information).

4.1 SOIL SAMPLE COLLECTION

Because subsurface sampling could encounter buried utilities, Missouri One Call was utilized to identify any utilities prior to commencement of intrusive subsurface soil sampling activities. Leidos (formerly part of Science Applications International Corporation) maintained a site map depicting the locations of all known utilities, and this map was also reviewed prior to performance of intrusive field activities.

Soil samples were collected by hand-sampling methods (e.g., a scoop, trowel, or a hand auger). Surface vegetation and debris were removed from the immediate area around the marked soil sampling points as needed. A polyethylene sheet was placed around work areas, as necessary, to prevent equipment from coming in contact with potentially contaminated surfaces.

Hand augers with T-handle extensions were used to collect subsurface soil samples. A decontaminated auger, extension, and T-handle were assembled; and the hand auger was then advanced, in 0.5-ft (0.2-m) increments, into the soil to the desired depth. The hand auger was withdrawn from the soil with care to prevent dislodging the sidewall material.

The soil cores extracted during PDI activities were examined and lithologically described (logged) by the field geologist in accordance with the geologic guidance provided in Chapter 13 and Appendix E of Engineer Manual (EM)-1110-1-1906 (USACE 1996) and in the ASTM International (ASTM) Method D2488-09a, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)* (ASTM 2009).

The soil sample intervals were field screened for radiological activity using a Ludlum Model 2221 (scaler/ratemeter) coupled to a Ludlum Model 44-10 (2-inch-by-2-inch [5-centimeter {cm}-by-5-cm] sodium iodide [NaI] detector) and a Ludlum Model 2221 coupled to a Ludlum Model 44-9 (Geiger Mueller [GM] pancake probe). The soil with the highest screening results was collected from the sample interval for laboratory analysis.

Information gathered in the field regarding the sampling activity (PDI sampling or sampling prior to the PDI) was recorded on a boring log form or in a field logbook. A field logbook is used to record information about field activities when samples less than 2.0 ft (0.6 m) below ground surface (bgs) in depth are collected; in all other cases, a boring log is used. For either method, the recorded information includes the sampler name, date and time, location and sample identifier,

property being sampled, coordinates, the soil type, the sampling depth, and the chain-of-custody number. Copies of boring logs and field logbook entries for soil samples are contained in Appendix A (included on the CD-ROM on the back cover of this PDIR).

All large rocks or other organic material (e.g., worms, grass, leaves, roots) were removed from each soil sample prior to packaging and submission for analysis. Using a decontaminated stainless steel or Teflon spoon, spatula, or disposable scoop, as appropriate, each soil sample was placed in a 1-quart container with a tight-fitting lid. Soil sample containers were appropriately labeled and submitted under chain-of-custody to the USACE FUSRAP laboratory for radiological analysis or to the Test America laboratory for analysis of quality assurance (QA)/quality control (QC) split or duplicate soil samples.

4.2 EVALUATION CRITERIA (REMEDIATION GOALS)

Per Table 2-2 of the ROD (USACE 2005), the radiological COCs for surface and subsurface soil at the North St. Louis County Sites are actinium (Ac)-227, lead (Pb)-210, protactinium (Pa)-231, Ra-226, Ra-228, Th-228, Th-230, Th-232, U-234, U-235, and U-238. When multiple radiological contaminants are present, the concentration-based soil RGs are expressed and evaluated in terms of a “unity rule.” The result of a unity rule calculation is referred to as a sum of ratios (SOR) and uses the primary radiological COCs (i.e., Ra-226, Th-230, and U-238) as surrogates for other radionuclides within the North St. Louis County Sites. A SOR_N in excess of 1.0 averaged over 100 m² reflects a land area that exceeds the RG. The subscript “N” represents net concentration(s) above background. The net value for a specific radionuclide is obtained by subtracting the average North St. Louis County background value (background values for applicable radionuclides in North St. Louis County can be found in the *Feasibility Study for the St. Louis North County Site* [FS] [USACE 2003]) from the gross value obtained from the analytical results of the soil sample. Average background values for calculating net radionuclide concentrations were developed from 37 surface and 37 subsurface soil samples collected in the North St. Louis County reference area. Average values (in picocuries per gram [pCi/g]) for this population are presented in Table 2.

Table 2. Radiological Background Values for North St. Louis County Sites

	Ra-226	Th-230	U-238
Surface	0.95	1.49	1.08
Subsurface	1.15	1.83	1.27

The RGs (in pCi/g) for radiological constituents in the ROD (USACE 2005) are presented in Table 3.

Table 3. Radiological Remediation Goals for North St. Louis County Sites

	Ra-226	Th-230	U-238
Surface Soil	5	14	50
Subsurface Soil	15	15	50

The SOR_N calculations for surface (upper 0.5 ft [0.2 m]) and subsurface (0.5 ft [0.2 m] bgs) soil layers are provided in the following equations.

$$SOR_{N-surface} = \frac{Ra-226_N}{5 \text{ pCi/g}} + \frac{Th-230_N}{14 \text{ pCi/g}} + \frac{U-238_N}{50 \text{ pCi/g}}$$

$$SOR_{N\text{-subsurface}} = \frac{Ra-226_N}{15 \text{ pCi/g}} + \frac{Th-230_N}{15 \text{ pCi/g}} + \frac{U-238_N}{50 \text{ pCi/g}}$$

These calculations were performed for the data acquired from each sampling location and depth. An SOR_N value greater than 1.0 indicates that further investigation and/or remediation may be necessary.

For the purposes of this PDIR, the term *contamination* refers to the presence of COCs in concentrations that exceed the ROD RGs. If contamination was identified, all available data were further evaluated to estimate the vertical and horizontal extent of radiological contamination.

The evaluation of the estimated extent of radiological contamination was performed by considering the results of the adjacent soil sample analytical data, GWS results, and any adjacent geological features. Information regarding any structural features or barriers that might influence the path of contaminant migration (e.g., the CWC corridor) was also considered. Because St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park are directly adjacent to the CWC corridor, and because rapid changes in elevation occur at the property lines (i.e., top of the bank of CWC), special attention was paid to topography and changes in elevation when estimating the extent of radiological contamination.

Consistent with the ROD (USACE 2005), non-radiological COCs are not applicable to the properties included in this PDIR.

4.3 INVESTIGATION-DERIVED WASTE

The types of investigation-derived waste (IDW) generated during this effort were soil cuttings, decontamination water, disposable sampling equipment, plastic sheeting, and personal protective equipment (PPE). IDW was managed according to the applicable USACE contractor procedures and the guidelines prescribed in the SAG (USACE 2000).

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5.0 PRE-DESIGN INVESTIGATION RESULTS

From February through April 2014 and January through February 2015, a total of 435 soil samples were collected from St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park as part of the PDI to determine if radiological COCs were present at concentrations exceeding ROD RGs (USACE 2005). Sixteen (16) soil sample locations on St. Cin Park, 27 soil sample locations on the Archdiocese of St. Louis Property, and 6 soil sample locations on Duchesne Park were identified as having at least 1 soil sample with concentrations of radiological COCs that resulted in an SOR_N value greater than 1.0. The analytical results for the soil samples are contained in Appendix B. The locations of these soil samples are shown on Figures 10 through 13.

To facilitate the discussion of the results and subsequent evaluation of the data collected during the PDI, St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park have been divided into five areas (Areas 1 through 5). Radiological contamination was identified within the surface and subsurface soils in each of the 5 areas. The results from the PDI soil sampling, the GWS, and the estimated horizontal and vertical extents of radiological contamination at St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park are discussed in the following sections.

5.1 RADIOLOGICAL SOIL SAMPLE ANALYTICAL RESULTS

The analytical results of systematic and biased radiological soil samples collected by the USACE on St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park during the PDI are included in Tables B-1, B-2, and B-3 of Appendix B, respectively.

The following discussion of the results focuses on those samples with an SOR_N value greater than 1.0. For the purposes of this PDIR, the term *contamination* refers to the presence of COCs in concentrations that exceed the ROD RGs. If contamination was identified, all available data were further evaluated to estimate the vertical and horizontal extent of radiological contamination.

Samples with SOR_N values less than or equal to 1.0 had radiological concentrations of COCs that met the ROD RGs.

5.1.1 St. Cin Park

Systematic soil samples were collected from 23 locations on St. Cin Park. Four (4) of the initial systematic sample locations with St. Louis Airport Site vicinity property (SVP) sample prefix designations (i.e., SVP164075, SVP164069, SVP161934, and SVP161959) had analytical results with concentrations of radiological COCs that resulted in SOR_N values greater than 1.0. Thirty (30) bounding sample locations were planned, and samples were collected to delineate the areas of radiological contamination. Two (2) soil samples with biased (HTZ) sample prefix designations were collected on this property to investigate drainage areas.

The previously discussed soil samples with SOR_N values greater than 1.0 are located in two distinct areas. These areas are referred to herein as Area 1 and Area 2. Area 1 is located in the central portion of the property, and Area 2 is located adjacent to the CWC corridor along the northeastern portion of the property.

Area 1 consists of 12 soil sample locations with SOR_N values greater than 1.0. Table 4 lists the soil sample location IDs, the corresponding depths, and the SOR_N values of the soil samples greater than 1.0.

Table 4. Area 1 Soil Sample Location IDs with SOR_N Values Greater than 1.0

Soil Sample Location ID	Depth (bgs)	SOR_N Value
SVP164069, SVP167089, SVP167091, and SVP171301	0.0 to 0.5 ft (0.0 to 0.15 m)	1.13, 1.67, 1.69, and 1.64
SVP171305 and SVP167117	0.0 to 0.5 ft (0.0 to 0.15 m)	1.26 and 1.03
	0.5 to 1.0 ft (0.15 to 0.3 m)	1.68 and 1.01
SVP177354	1.0 to 1.5 ft (0.3 to 0.46 m)	1.17
SVP167103	1.5 to 2.0 ft (0.46 to 0.6 m)	1.03
	2.0 to 2.5 ft (0.6 to 0.76 m)	1.69
	2.5 to 3.0 ft (0.76 to 0.9 m)	1.23
	3.0 to 3.5 ft (0.9 to 1.1 m)	5.14
SVP177369	2.0 to 2.5 ft (0.6 to 0.76 m)	3.32
SVP167110	2.5 to 3.0 ft (0.76 to 0.9 m)	1.15
	3.0 to 3.5 ft (0.9 to 1.1 m)	1.04
SVP167096	2.5 to 3.0 ft (0.76 to 0.9 m)	1.43
SVP164075	3.0 to 3.5 ft (0.9 to 1.1 m)	2.02

The vertical extent of radiological contamination in Area 1 is delineated by soil samples at each location from deeper intervals, except at locations SVP167117 and SVP177354. The areal extent of radiological contamination is delineated by soil samples from locations SVP171322, SVP171319, SVP171315, SVP171309, SVP171307, SVP177357, SVP164059, SVP174894, SVP174892, SVP177360, SVP171303, SVP177363, SVP177365, SVP177367, SVP163693, SVP171328, and SVP171325. The soil sample locations in Area 1 are shown on Figure 10.

Area 2 consists of 4 soil sample locations with SOR_N values greater than 1.0. Table 5 lists the soil sample location IDs, the corresponding depths, and the SOR_N values of the soil samples greater than 1.0.

Table 5. Area 2 Soil Sample Location IDs with SOR_N Values Greater than 1.0

Soil Sample Location ID	Depth (bgs)	SOR_N Value
SVP161959	0.0 to 0.5 ft (0.0 to 0.15 m)	1.08
SVP179157	0.5 to 1.0 ft (0.15 to 0.3 m)	1.25
SVP161934	0.0 to 0.5 ft (0.0 to 0.15 m)	1.11
	1.5 to 2.0 ft (0.46 to 0.6 m)	2.49
SVP179167	2.0 to 2.5 ft (0.6 to 0.76 m)	4.66
	2.5 to 3.0 ft (0.76 to 1.0 m)	3.35

The vertical extent of radiological contamination in Area 2 is delineated by soil samples at each location from deeper intervals, except at location SVP179167. The areal extent of radiological contamination is delineated by soil samples from locations SVP161929, SVP164083, SVP161949, SVP179153, and SVP179151. The soil sample locations in Area 2 are shown on Figure 10.

5.1.2 Archdiocese of St. Louis Property

Systematic soil samples were collected from 34 locations on the Archdiocese of St. Louis Property. Seventeen (17) of the initial systematic sample locations had analytical results with concentrations of radiological COCs that resulted in SOR_N values greater than 1.0. Eighteen (18) bounding sample

locations were planned, and samples were collected to delineate the area of radiological contamination.

The portion of the Archdiocese of St. Louis Property from which soil samples with SOR_N values greater than 1.0 were collected is referred to as Area 3. Area 3 is located in the central portion of the property.

Area 3 consists of 27 soil sample locations with SOR_N values greater than 1.0. Table 6 lists the soil sample location IDs, the corresponding depths, and the SOR_N values of the soil samples greater than 1.0.

Table 6. Area 3 Soil Sample Location IDs with SOR_N Values Greater than 1.0

Soil Sample Location ID	Depth (bgs)	SOR_N Value
SVP162003, SVP162032, SVP162038, SVP162046, SVP162051, SVP162056, SVP162063, SVP162068, SVP163695, SVP164105, SVP164111, SVP164123, SVP174898, SVP176749, SVP176754, SVP176758, SVP178223, SVP178268, and SVP178270	0.0 to 0.5 ft (0.0 to 0.15 m)	1.40, 1.41, 1.45, 1.17, 1.57, 1.66, 1.88, 2.40, 2.54, 2.64, 1.39, 2.37, 1.44, 3.21, 1.06, 2.72, 1.14, 1.06, and 1.54
SVP162030, SVP162042, SVP176743, SVP176748, SVP178207, and SVP178241	0.0 to 0.5 ft (0.0 to 0.15 m)	1.85, 1.08, 2.63, 3.09, 1.65, and 1.32
	0.5 to 1.0 ft (0.15 to 0.3 m)	1.33, 1.19, 2.17, 2.07, 1.29, and 1.24
SVP162010 and SVP162012	0.0 to 0.5 ft (0.0 to 0.15 m)	3.95 and 2.13
	1.5 to 2.0 ft (0.46 to 0.6 m)	2.73 and 4.14
	2.0 to 2.5 ft (0.6 to 0.76 m)	1.36 and 1.36

The vertical extent of radiological contamination in Area 3 is delineated by soil samples at each location from deeper intervals, except at locations SVP176748, SVP176749, SVP176754, SVP176758, and SVP178241. The areal extent of radiological contamination is delineated by soil samples from locations SVP178227, SVP178225, SVP178221, SVP176757, SVP176756, SVP178211, SVP164117, SVP176753, SVP176752, SVP176750, SVP176751, SVP164097, SVP178243, SVP178245, SVP161971, SVP161976, SVP161985, SVP161990, SVP161996, and additional samples collected from locations within the CWC corridor. The soil sample locations in Area 3 are shown on Figure 11.

5.1.3 Duchesne Park

Systematic soil samples were collected from 12 locations on Duchesne Park. Two (2) of the initial systematic sample locations (SVP164235 and SVP162307) had analytical results with concentrations of radiological COCs that resulted in SOR_N values greater than 1.0. Eight (8) bounding sample locations were planned, and samples were collected to delineate the areas of radiological contamination.

The previously discussed soil samples with SOR_N values greater than 1.0 are located in two distinct areas. These areas are referred to herein as Area 4 and Area 5. Area 4 is located in the southwestern portion of the property adjacent to the CWC corridor, and Area 5 is located in the northwestern portion of the property along the CWC corridor.

Area 4 consists of 1 soil sample location that has soil samples with SOR_N values greater than 1.0. Table 7 lists the soil sample location IDs, the corresponding depths, and the SOR_N values of the soil samples greater than 1.0.

Table 7. Area 4 Soil Sample Location IDs with SOR_N Values Greater than 1.0

Soil Sample Location ID	Depth (bgs)	SOR_N Value
SVP162307	0.0 to 0.5 ft (0.0 to 0.15 m)	2.94
	0.5 to 1.0 ft (0.15 to 0.3 m)	1.42
	1.5 to 2.0 ft (0.46 to 0.6 m)	2.18

Both the vertical and the areal extent of radiological contamination are delineated by soil samples from the following adjacent locations: SVP178262 and SVP178265. Vertical delineation was not performed at SVP162307. The soil sample locations in Area 4 are shown on Figure 12.

Area 5 consists of 5 soil sample locations with SOR_N values greater than 1.0. Table 8 lists the soil sample location IDs, the corresponding depths, and the SOR_N values of the soil samples greater than 1.0.

Table 8. Area 5 Soil Sample Location IDs with SOR_N Values Greater than 1.0

Soil Sample Location ID	Depth (bgs)	SOR_N Value
SVP169481 and SVP162374	0.0 to 0.5 ft (0.0 to 0.15 m)	1.11 and 1.08
SVP164235	1.0 to 1.5 ft (0.3 to 0.46 m)	1.33
SVP169470	0.5 to 1.0 ft (0.15 to 0.3 m)	1.20
	1.0 to 1.5 ft (0.3 to 0.46 m)	1.11
SVP173252	1.0 to 1.5 ft (0.3 to 0.46 m)	1.08

The vertical extent of radiological contamination in Area 5 is delineated by soil samples at each location from deeper intervals. The areal extent of radiological contamination is delineated by soil samples from locations SVP162362, SVP169483, SVP169473, SVP169476, SVP173256, SVP178254, SVP178256, and SVP162350. The soil sample locations in Area 5 are shown on Figure 12.

5.2 GAMMA WALKOVER SURVEY RESULTS

GWSs were performed as part of the PDI activities on St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park prior to the soil sampling activities; the results are shown on Figure 13¹. No additional areas of elevated radiological activity were identified as a result of the GWS; therefore, no additional biased soil samples were collected.

¹ Because MARSSIM recognizes that environmental data generally do not fit a normal distribution and use non-parametric tests, Chebyshev's Inequality was used for setting the ranges of the colors for presentation of the GWS data. The 85th and 95th percentiles of the data were chosen to focus on areas of interest with higher count rates.

6.0 SUMMARY AND CONCLUSIONS

The PDI activities at St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park were conducted from February through April 2014 and January through February 2015 under USACE direction. The USACE initiated PDI activities at these properties based upon the location of these properties within the 10-year floodplain of CWC. The PDI activities were conducted in accordance with the PDI WP (USACE 2014) to obtain analytical data to define the nature and extent of radiological contamination, to determine if residual radiological contamination above the ROD RGs is present, and to provide analytical data needed to support remedial design (if required) and/or the FSSE.

As part of the PDI soil sampling on these properties, a total of 435 soil samples were collected. Soil boring depths ranged from 0.0 to 6.5 ft (0.0 to 2.0 m) bgs, depending on the location of the soil borings in relation to apparent changes in topography over time. As discussed in Section 5.0, the soil on St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park was evaluated for the presence of radiological COCs in excess of ROD RGs. A total of five areas (Areas 1 through 5) on St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park contained 1 or more samples with SOR_N values exceeding ROD RGs.

Because an SOR_N value in excess of 1.0 averaged over 100 m² reflects a land area that exceeds the ROD RGs, area-weighted averaging was performed for areas in which the estimated extent of radiological contamination was less than 100 m². If necessary, soil sample analytical data within the adjacent CWC corridor were utilized for averaging purposes. Results from these evaluations indicated the soil in Areas 1 through 5 exceeds ROD RGs.

Specific conclusions for Areas 1 through 5 are provided in the following subsections.

6.1 AREA 1

Area 1 is located in the central portion of St. Cin Park adjacent to the CWC corridor (see Figure 10). Twelve (12) soil sample locations with SOR_N values greater than 1.0 were identified in Area 1. As discussed in Section 5.1.1, the radiological results from these sample locations were used to estimate the areal and vertical extent of radiological contamination in this area.

6.2 AREA 2

Area 2 is located near the CWC corridor in the northeastern portion of St. Cin Park (see Figure 10). Four (4) soil sample locations with SOR_N values greater than 1.0 were identified, in two separate locations, in Area 2. As discussed in Section 5.1.1, the radiological results from these sample locations were used to estimate the areal and vertical extent of radiological contamination in this area.

6.3 AREA 3

Area 3 is located in the central portion of the Archdiocese of St. Louis Property, adjacent to the CWC corridor (see Figure 11). Twenty-seven (27) soil sample locations with SOR_N values greater than 1.0 were identified in Area 3. As discussed in Section 5.1.2, the radiological results from these sample locations were used to estimate the areal and vertical extent of radiological contamination in this area.

6.4 AREA 4

Area 4 is located near the CWC corridor in the southwestern portion of Duchesne Park, adjacent to the CWC corridor (see Figure 12). One (1) soil sample location with an SOR_N value greater than 1.0 was identified in Area 4. As discussed in Section 5.1.3, the radiological results from this sample location were used to estimate the areal and vertical extent of radiological contamination in this area.

6.5 AREA 5

Area 5 is located adjacent to the CWC corridor in the northwestern portion of Duchesne Park (see Figure 12). Five (5) soil sample locations with SOR_N values greater than 1.0 were identified in Area 5. As discussed in Section 5.1.3, the radiological results from these sample locations were used to estimate the areal and vertical extent of radiological contamination in this area.

7.0 REFERENCES

- ASTM 2009. ASTM International. *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. ASTM Method D2488-09a. West Conshohocken, PA. June 15, 2009.
- DOD 2000. U.S. Department of Defense, U.S. Department of Energy, U.S. Environmental Protection Agency, and U.S. Nuclear Regulatory Commission. *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*. NUREG 1575, USEPA 402-R-97-016, Revision 1. August 2000.
- MSD 1998. Metropolitan St. Louis Sewer District. *Coldwater Creek Watershed Study for Stormwater System Master Plan*. Draft Report. February 1998.
- STLCO 2015. St. Louis County GIS Service Center. St. Louis County. <http://stlouisco.com/OnlineServices/MappingandData/>. Accessed March 2015.
- USACE 1987a. U.S. Army Corps of Engineers. *Coldwater Creek, Missouri, Feasibility Report for Flood Control and Related Purpose*. December 1987.
- USACE 1987b. U.S. Army Corps of Engineers. *Coldwater Creek, Missouri, Feasibility Report and Environmental Impact Statement*. December 1987.
- USACE 1996. U.S. Army Corps of Engineers. *Engineering and Design, Soil Sampling*. Engineer Manual. EM 1110-1-1906. Washington D.C. September 30, 1996.
- USACE 2000. U.S. Army Corps of Engineers, St. Louis District. *Sampling and Analysis Guide for the St. Louis Sites*. Final. October 2000.
- USACE 2003. U.S. Army Corps of Engineers, St. Louis District. *Feasibility Study for the St. Louis North County Site*. Final. May 1, 2003.
- USACE 2005. U.S. Army Corps of Engineers, St. Louis District. *Record of Decision for the North St. Louis County Sites*. Final. September 2005.
- USACE 2014. U.S. Army Corps of Engineers, St. Louis District. *Pre-Design Investigation Work Plan for Coldwater Creek from Frost Avenue to St. Denis Bridge, St. Louis, Missouri*. Revision 0. February 12, 2014.

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FIGURES

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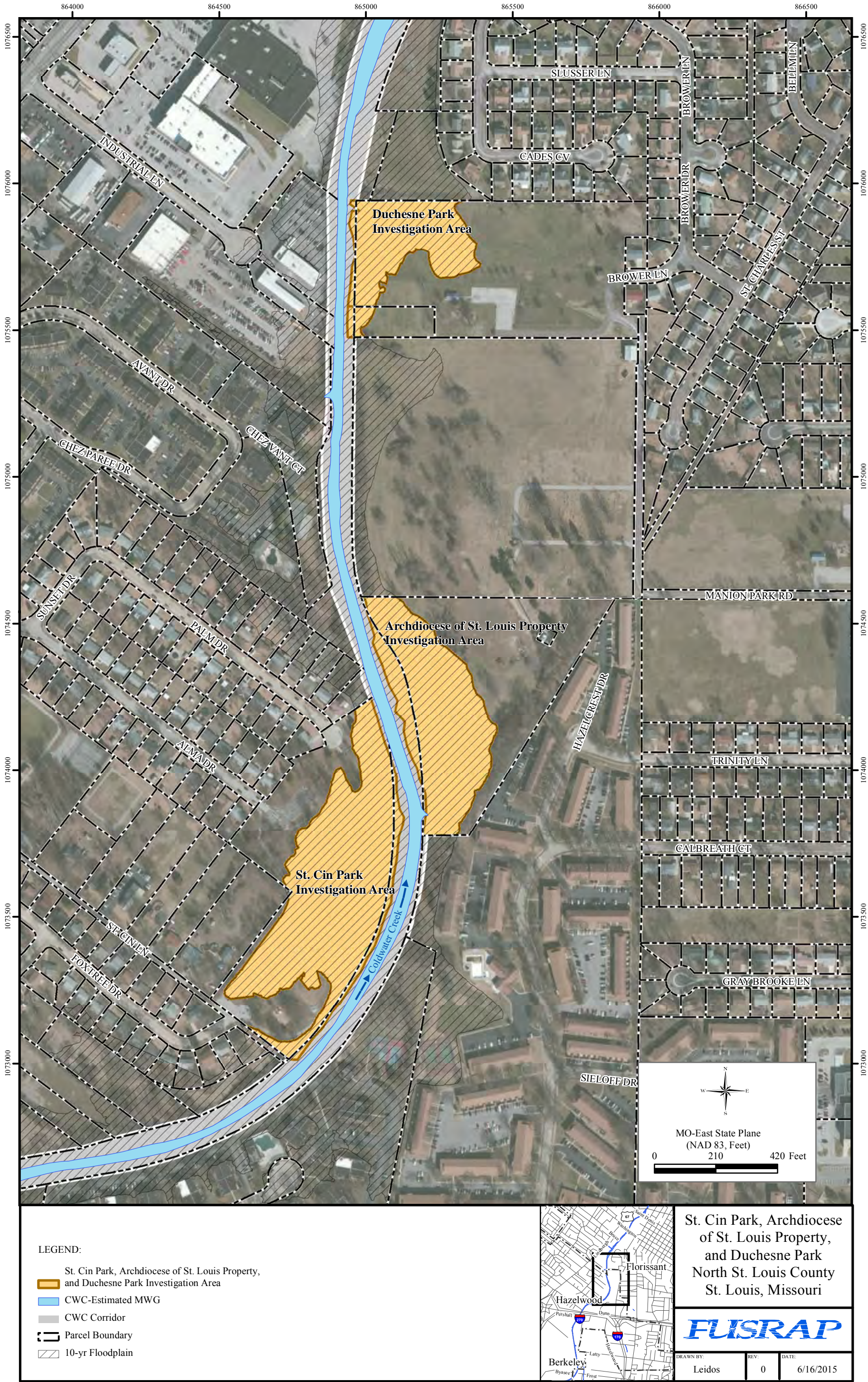


Figure 1. Location of St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park

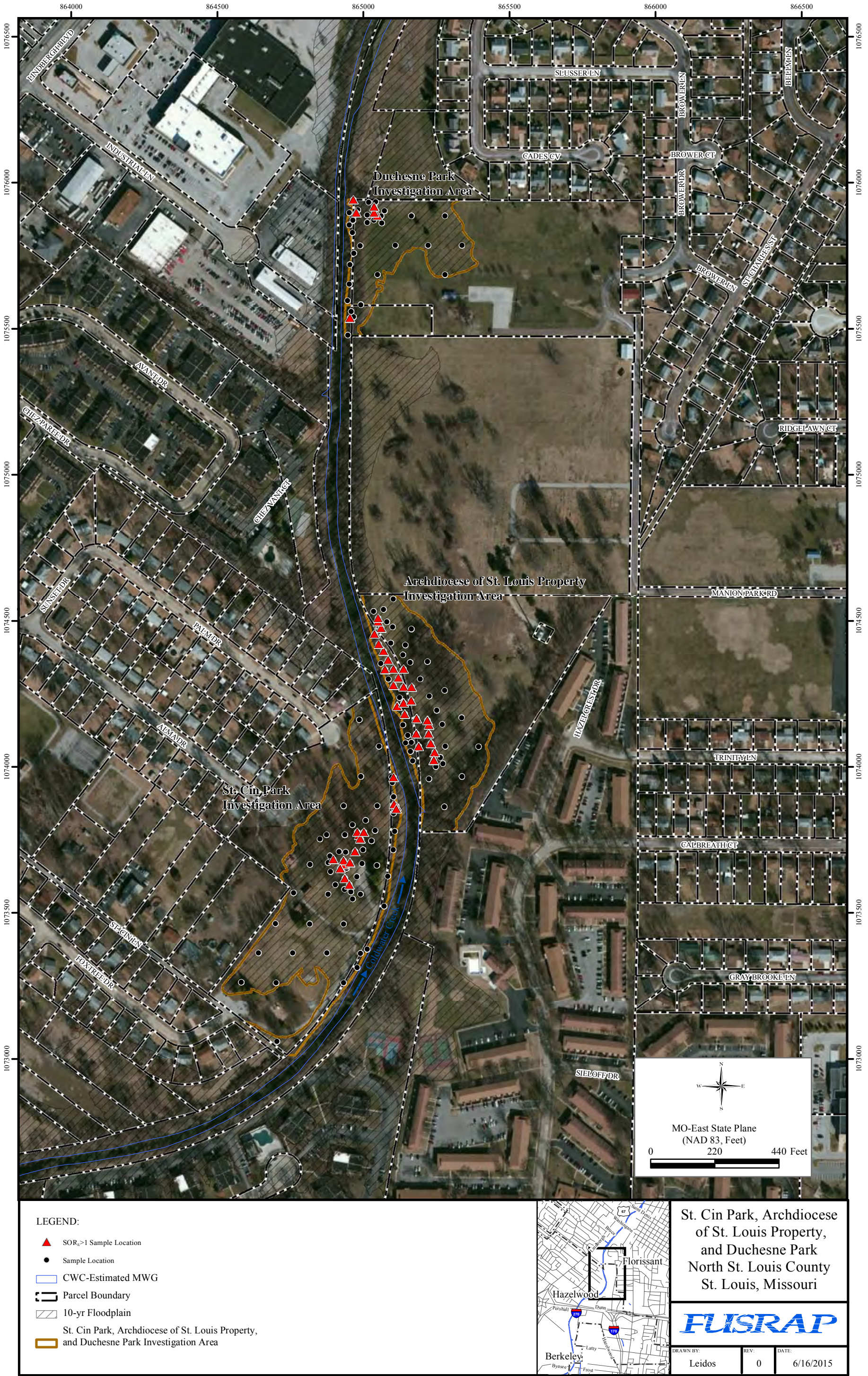


Figure 2. 2014 Aerial Photograph of St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park



Figure 3. 2010 Aerial Photograph of St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park

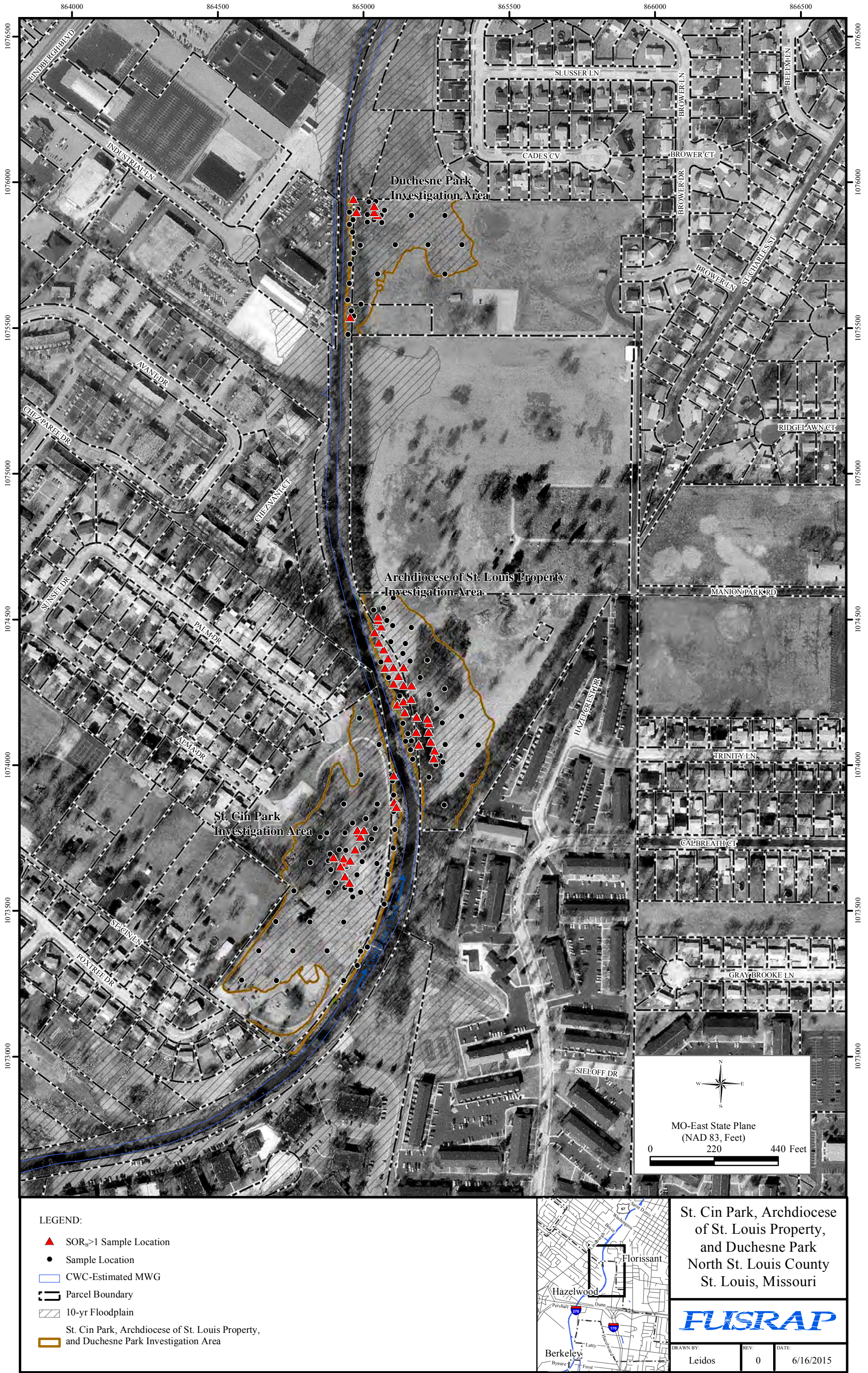


Figure 4. 1995 Aerial Photograph of St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park

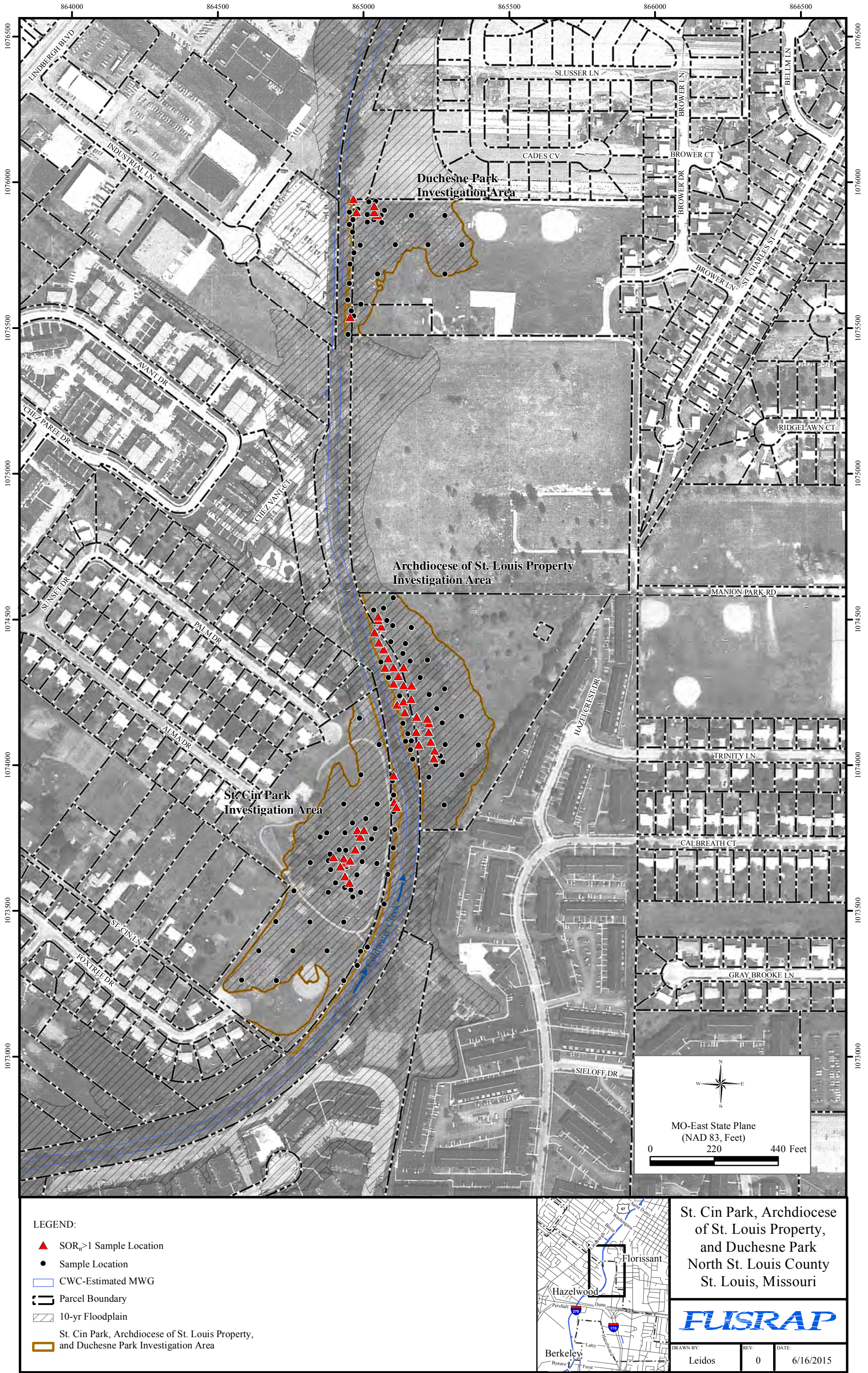


Figure 5. 1981 Aerial Photograph of St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park



Figure 6. 1971 Aerial Photograph of St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park

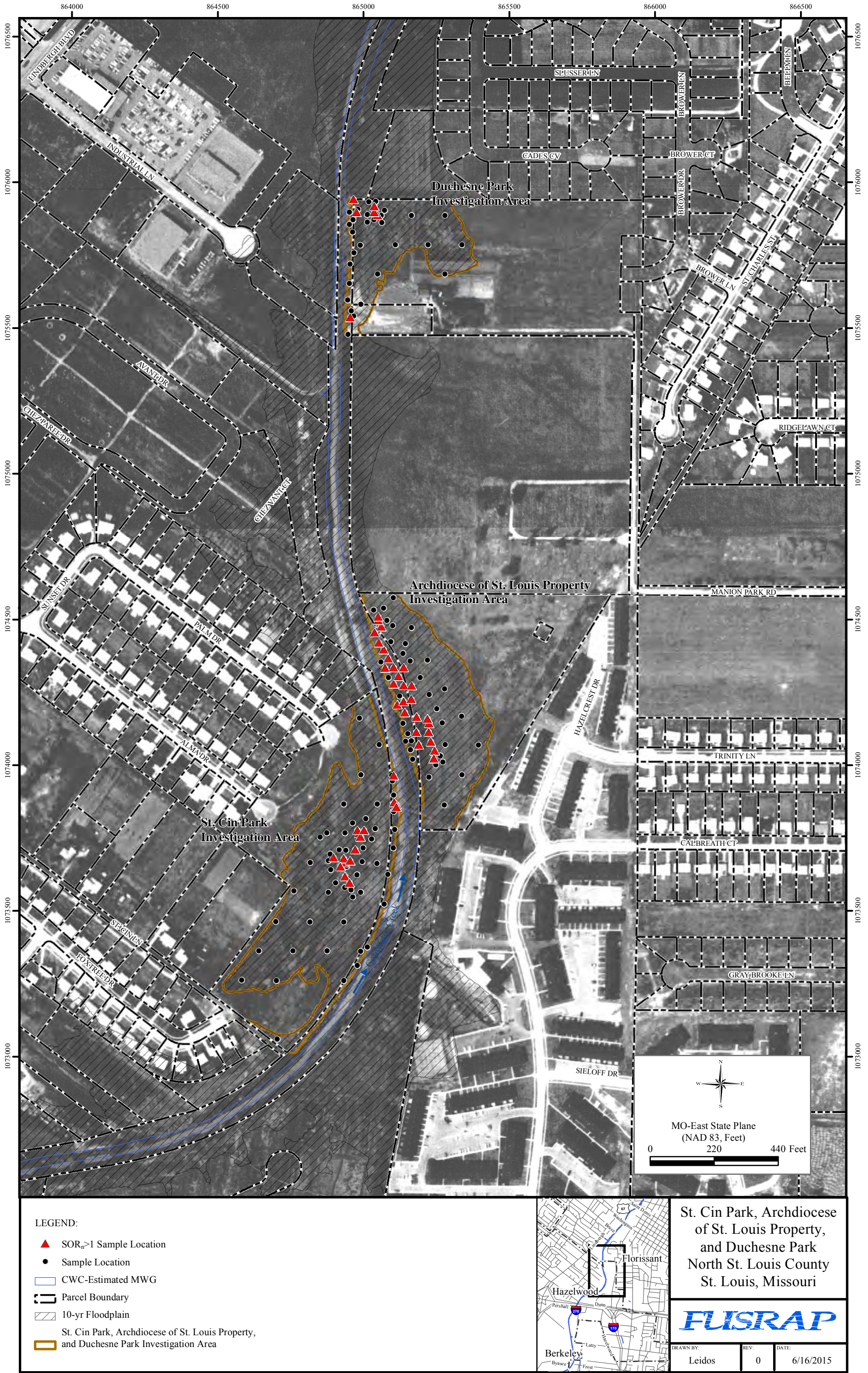


Figure 7. 1966 Aerial Photograph of St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park

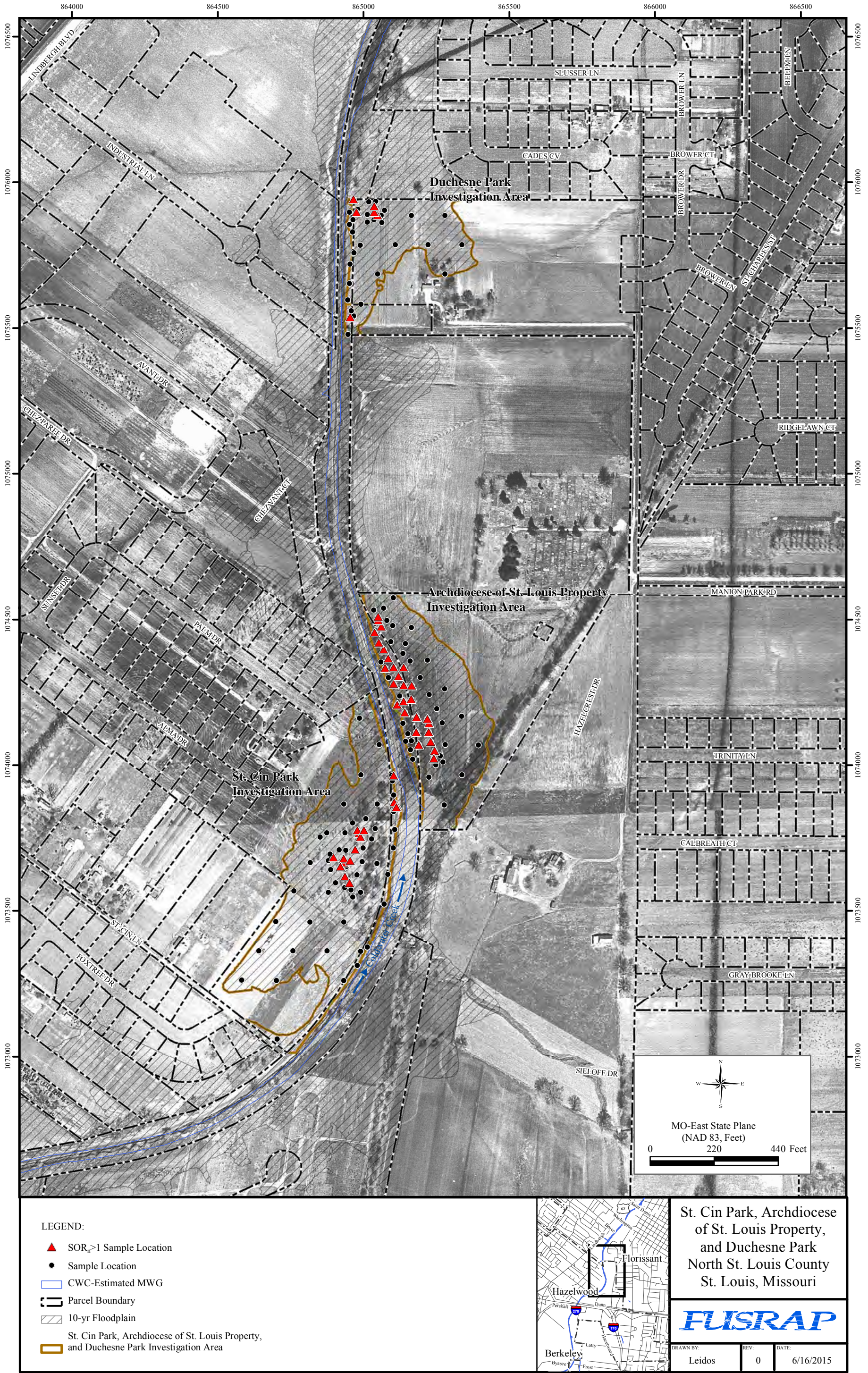


Figure 8. 1955 Aerial Photograph of St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park



Figure 9. 1937 Aerial Photograph of St. Cin Park, the Archdiocese of St. Louis Property, and Duchesne Park

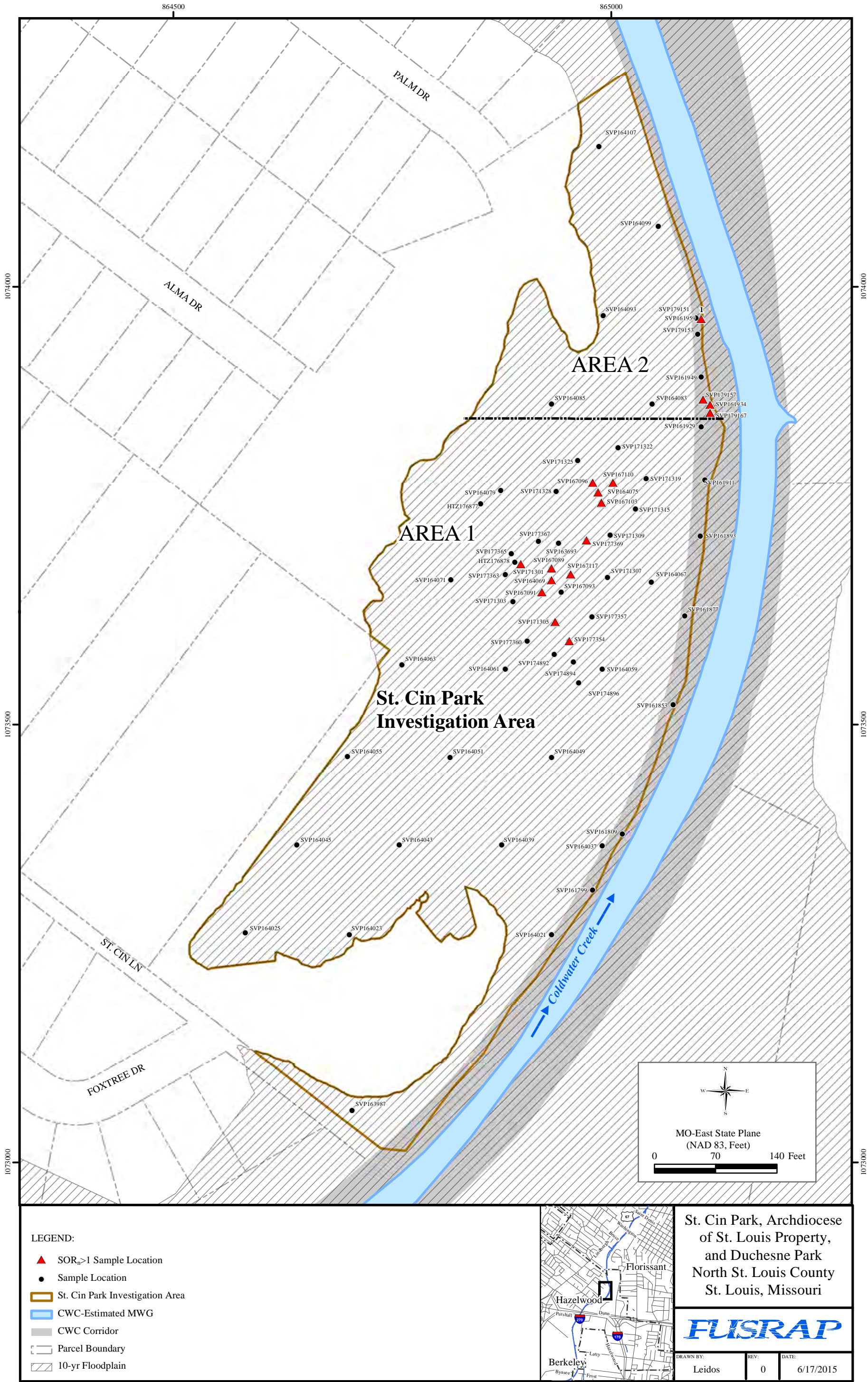


Figure 10. St. Cin Park Radiological Soil Sample Locations

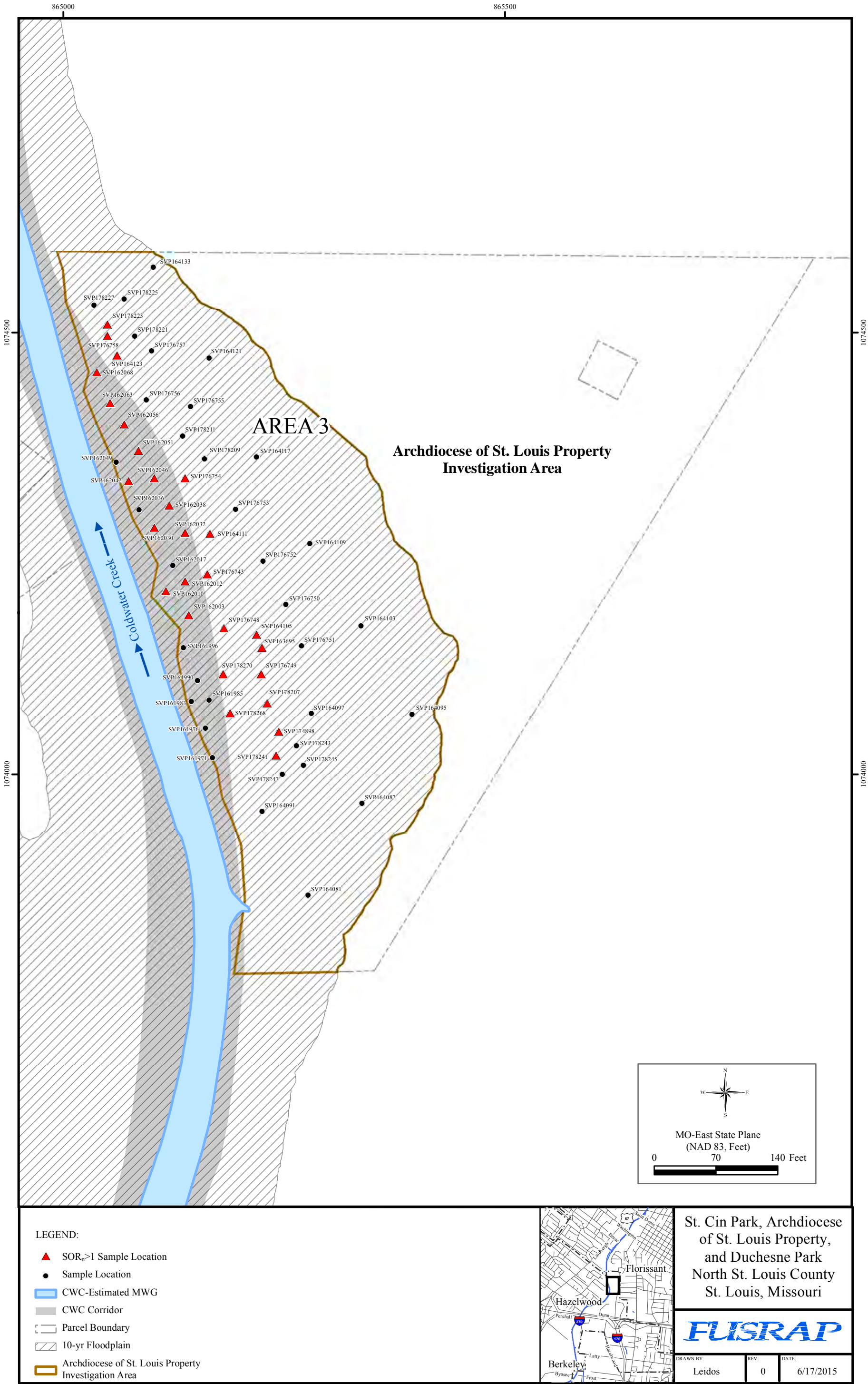


Figure 11. The Archdiocese of St. Louis Property Radiological Soil Sample Locations

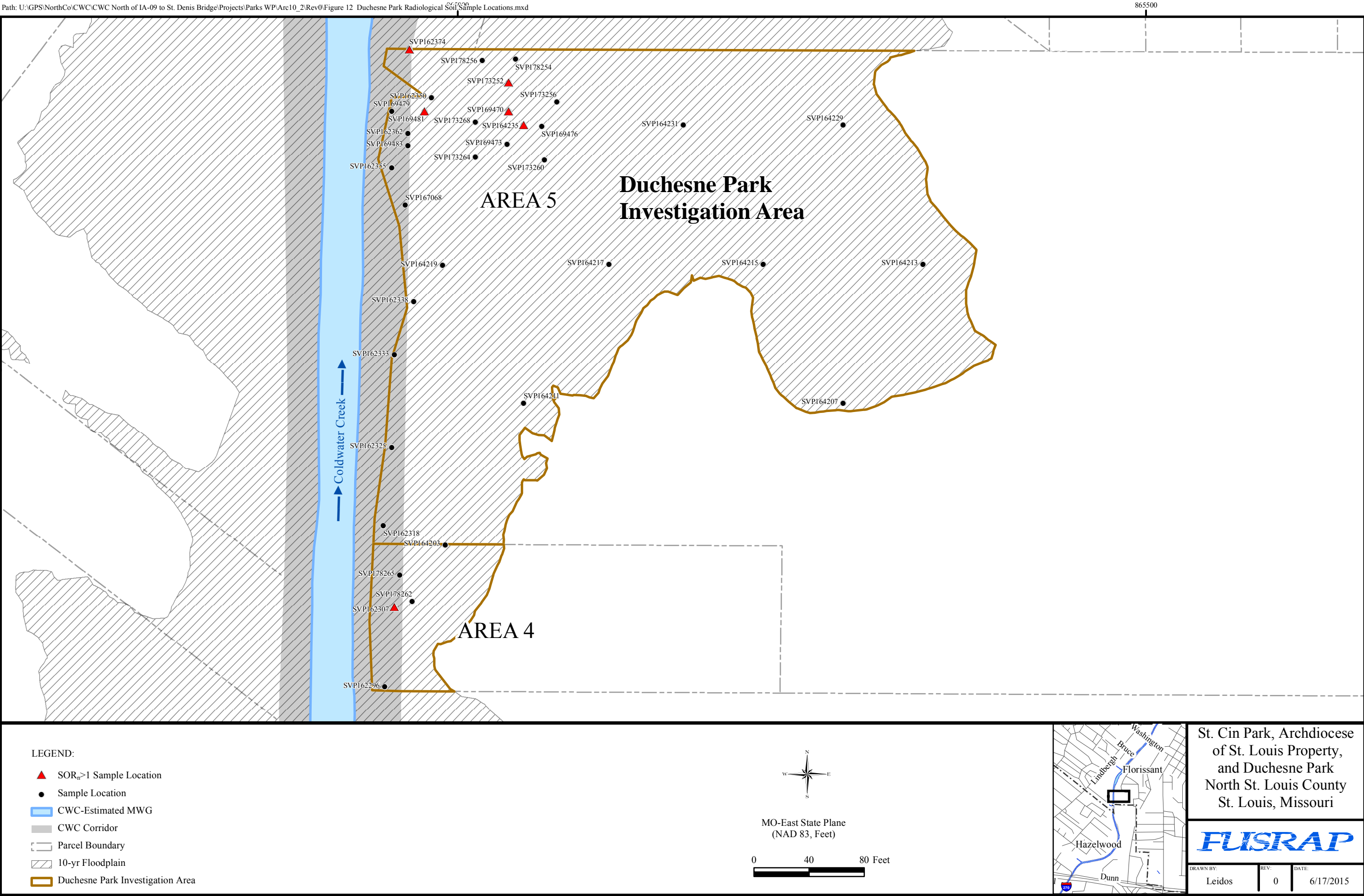


Figure 12. Duchesne Park Radiological Soil Sample Locations

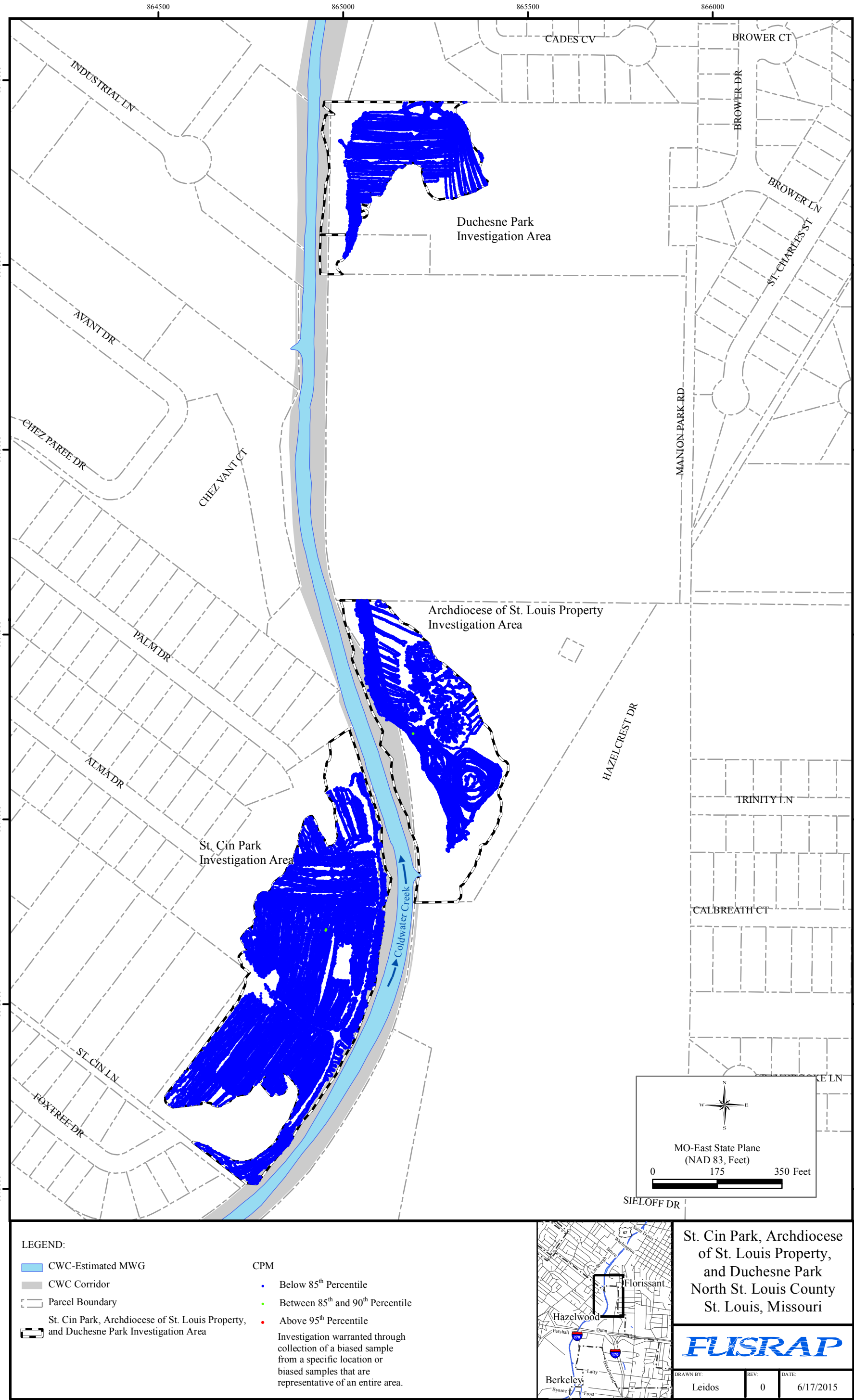


Figure 13. St. Cin Park, Archdiocese of St. Louis Property, and Duchesne Park Gamma Walkover Survey

APPENDIX A

**BORING LOGS AND FIELD LOGBOOK ENTRIES FOR ST. CIN PARK,
THE ARCHDIOCESE OF ST. LOUIS PROPERTY, AND DUCHESNE PARK
SOIL SAMPLES**

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HTRW DRILLING LOG				DISTRICT: St. Louis USACE		HOLE NUMBER SVP 161959	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2			
3. PROJECT: Coldwater Creek				4. LOCATION: # 954 (systematic annu.g.) soil			
5. NAME OF DRILLER: Juan Alvarado / Hope Sauton				6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT		Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES: 08 12.15.14 E 865109.2 N 1073963			
Meter - Background				9. SURFACE ELEVATION: N/A			
44-9 F - 35 cpm				10. DATE STARTED: 2/19/14			
44-10 K - 5854 cpm				11. DATE COMPLETED: 2/19/14			
12. OVERBURDEN THICKNESS: N/A				15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
13. DEPTH DRILLED INTO ROCK: N/A				16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
14. TOTAL DEPTH OF HOLE: 6.0 ft bgs				17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
18. GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED		19. TOTAL NUMBER OF CORE BOXES: N/A	
20. SAMPLES FOR CHEMICAL ANALYSIS		VOC		METALS		RAD SAMPLES	
N/A		N/A		N/A		4	
22. DISPOSITION OF HOLE		BACKFILLED		MONITORING WELL		OTHER (SPECIFY)	
Backfill using bentonite		w/bentonite		N/A		N/A	
23. SIGNATURE OF INSPECTOR: Gary Neutzling				21. TOTAL CORE RECOVERY: N/A			
LOCATION SKETCH/COMMENTS: and press plug 2/19/14 COC #: LE02202014-01H							

Recorded By G. Neutzling Date 2/19/14 QA By [Signature] Date 2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 954
SVP 161959

32

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2			
USCS	Depth (ft bgs)	Description of Materials	449 NAI	449 NAI	Analytical Sample	Blow Counts	Remarks
0		Clayey SILT, brown, trace fine sand, trace roots, low plasticity, moist - ML	61/6201	-	SVP161959 1429 30th gamma spec	-	Collect GCL/AA soil samples SVP161959-1 SVP161959-2
1		w/ little to some clay below 0.5 ft	52/6229	-	1444	-	same less clay
1.5		w/ roots (little to some) from 1 to approx 2 ft	58/6342	-	1447	-	rotten roots
2		SILT, brown, little clay, little to trace fine sand, low plasticity, moist - ML	62/6324	-	SVP161960 1450 30th gamma spec	-	silt
			72/6351	6/339	Archive 1458 30th gamma spec	-	next batch
			57/6513	-	1509	-	bkgnd 43-89 4-1 0/189
3			59/6385	-	1515	-	
			73/6171	-	SVP161961 1520 30th gamma spec	-	
4			68/6318	-	1530	-	
5			59/6330	-	1532	-	
5.4		Silty CLAY, dark brown, trace sand, moderately plastic, moist - CL	77/6640	3/344	SVP161962 1537 30th gamma spec	-	
6.0		Borehole terminated.	61/6489	4/326	Archive 1512 30th gamma spec	-	Soil
7							
8							
9							
10							

Recorded By G. Neutzling Date 2/19/14 QA By [Signature] Date 2-26-14

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HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP 161929	
1 COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3 PROJECT: Coldwater Creek		4 LOCATION # 938 (systematic array) Soil			
5 NAME OF DRILLER: Juan Alvarado / Mandy Myers		6 MANUFACTURERS DESIGNATION OF DRILL: N/A			
7 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8 HOLE COORDINATES E 865103 N 1073839			
Meter - Background 44-9 F - 35 cpm 44-10 K - 5854 cpm		9 SURFACE ELEVATION N/A			
12 OVERBURDEN THICKNESS N/A		10. DATE STARTED: 2/19/14			
13 DEPTH DRILLED INTO ROCK N/A		11. DATE COMPLETED 2/19/14			
14 TOTAL DEPTH OF HOLE 2.0 ft bgs		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
18 GEOTECHNICAL SAMPLES: N/A		19. TOTAL NUMBER OF CORE BOXES: N/A			
20 SAMPLES FOR CHEMICAL ANALYSIS		21 TOTAL CORE RECOVERY: N/A			
22 DISPOSITION OF HOLE		23. SIGNATURE OF INSPECTOR			
Backfill using bentonite		G. Neutzling			
LOCATION SKETCH/COMMENTS		SCALE: None			
and grass plug 2/19/14 COC #: LE02202014-01H					

Recorded By G. Neutzling Date 2/24/14 QA By [Signature] Date 2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER
SVP 161929 938

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling					SHEET 2 of 2	
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Clayey SILT, brown, trace fine sand, low plasticity, moist - ML	56/6449	-	-	SVP161929 1548 IsoTh gamma spec	-	
	0.5		54/6215	-	-	1550	-	
	1.5		68/6136	-	-	SVP161930 1551 IsoTh gamma spec	-	
	2.0	Borehole terminated	50/6096	-	-	1554 IsoTh gamma spec	-	(soil)
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By G. Neutzling Date 2/19/14 QA By [Signature] Date 2-26-14

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HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 922 (systematic auger) soil			
5. NAME OF DRILLER: Juan Alvarado / Miguel Mayers		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT		8. HOLE COORDINATES			
Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		E 865103 N 1073715			
9. SURFACE ELEVATION N/A		10. DATE STARTED 2/19/14			
11. DATE COMPLETED 2/19/14		12. OVERBURDEN THICKNESS N/A			
13. DEPTH DRILLED INTO ROCK N/A		15. DEPTH GROUNDWATER ENCOUNTERED N/A			
14. TOTAL DEPTH OF HOLE 2.0 ft bgs		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A			
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A		18. GEOTECHNICAL SAMPLES N/A			
DISTURBED		UNDISTURBED		19. TOTAL NUMBER OF CORE BOXES N/A	
20. SAMPLES FOR CHEMICAL ANALYSIS		VOC	METALS	RAD SAMPLES	QA/QC SAMPLES
N/A		N/A	N/A	2	0
22. DISPOSITION OF HOLE		BACKFILLED	MONITORING	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Backfill using bentonite		w/bentonite	N/A	N/A	Juan Alvarado
LOCATION SKETCH/COMMENTS					
COC #: LE02202014-014					

Recorded By

J. Neutzel

Date

2/19/14

QA By

J. Neutzel

Date

2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 922
SVP 161893

36

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzel					SHEET 2 of 2	
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	57	Clayey SILT, brown, little fine sandy, low plasticity, moist - ML	6563			SVP161893	1600	
	59		6197			1602		
	68		6454			SVP161894	1605	
	53	Silty CLAY, brown mottled by grey/orange brown, trace sand, moderately plastic, moist - CL	6311			Archive	1558	
	2.0	Borehole terminated						(soil)

Recorded By

J. Neutzel

Date

2/19/14

QA By

J. Neutzel

Date

2-26-14

37

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP 161911	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION: # 930 (systematic amwg) soil			
5. NAME OF DRILLER: Matt Dostal/Mandi Meyers		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES: E 865103 N 1073777			
9. SURFACE ELEVATION: N/A		10. DATE STARTED: 2/20/14			
11. DATE COMPLETED: 2/20/14		12. OVERBURDEN THICKNESS: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
14. TOTAL DEPTH OF HOLE: 2.0 ft bgs		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A		18. GEOTECHNICAL SAMPLES: N/A			
19. TOTAL NUMBER OF CORE BOXES: N/A		20. SAMPLES FOR CHEMICAL ANALYSIS: N/A			
21. TOTAL CORE RECOVERY: N/A		22. DISPOSITION OF HOLE: BACKFILLED			
23. SIGNATURE OF INSPECTOR: Gary Neutzling		24. SIGNATURE OF DRILLER: Matt Dostal			
25. SIGNATURE OF DRILLER: Mandi Meyers		26. SIGNATURE OF DRILLER: Gary Neutzling			
LOCATION SKETCH/COMMENTS: and grass plug 2/20/14 COC #: LE022/2014-01H					

Recorded By G. Neutzling Date 2/24/14 QA By [Signature] Date 2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 930
SVP 161911

38

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2				
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Silty CLAY, brown, trace sand, low plasticity, moist - CL (Possible Fill)	51/6552	-	-	SVP161911	1320	1st Th gamma spec
	0.5	Silty CLAY, brown w/ few pieces of tan silty CLAY, trace sand, low plasticity, moist - CL (Possible Fill)	54/6462	-	-	1327	-	
	1	Silty CLAY, grayish brown, trace sand, low plasticity, moist - CL	52/6475	-	-	1334	-	
	1.5		64/6299	-	-	SVP161912	1338	1st Th gamma spec
	2.0	Borehole terminated						(Soil)
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By G. Neutzling 2/20/14 Date 2/20/14 QA By [Signature] Date 2-26-14

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HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP	
1 COMPANY NAME: Leidos		2 DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3 PROJECT: Coldwater Creek		4 LOCATION: # 913 (systematic array) soil			
5 NAME OF DRILLER: Matt Dostal (Mandi Meyers)		6 MANUFACTURERS DESIGNATION OF DRILL: N/A			
7 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8 HOLE COORDINATES: QB 12-15-14 E 8650854 N 10736224			
9 SURFACE ELEVATION: N/A		10 DATE STARTED: 2/20/14			
11 DATE COMPLETED: 2/20/14		12 OVERBURDEN THICKNESS: N/A			
13 DEPTH DRILLED INTO ROCK: N/A		14 TOTAL DEPTH OF HOLE: 2.0 ft			
15 DEPTH GROUNDWATER ENCOUNTERED: N/A		16 DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
17 OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A		18 GEOTECHNICAL SAMPLES: N/A			
19 TOTAL NUMBER OF CORE BOXES: N/A		20 SAMPLES FOR CHEMICAL ANALYSIS: N/A			
21 TOTAL CORE RECOVERY: N/A		22 DISPOSITION OF HOLE: BACKFILLED			
23 SIGNATURE OF INSPECTOR: Gary Neutzling		24 SIGNATURE OF DRILLER: Matt Dostal			
25 SIGNATURE OF QUALITY ASSURANCE: [Signature]		26 SIGNATURE OF SUPERVISOR: [Signature]			
LOCATION SKETCH/COMMENTS: and grass plot 2/20/14 COC #: LE 022/2014-01H SCALE: None					

Recorded By

G. Neutzling

Date 2/20/14

QA By

[Signature]

Date 2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 913
SVP 161877

40

PROJECT: Coldwater Creek

INSPECTOR: G. Neutzling

SHEET 2 of 2

USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Silty CLAY, brown, trace sand, low plasticity, moist - CL	54	-	-	SVP 161877 1347	-	
	0.5		6467	-	-	ISO TH gamma spec	-	
	1		56	-	-	1352	-	
	1.5		6625	-	-		-	
	2	Silty Clay, brown w/ mix of tan mottled by dark brown & orangish brown, trace sand, low to moderate plasticity, moist - CL	55	-	-	SVP 161878 1353	-	Possible Fill or transition to mottled soil. ?
	2.5		6133	-	-	ISO TH gamma spec	-	
	3		52	-	-	Archive 1349	-	
	3.5		6207	-	-		-	
	4	Borehole terminated						(Soil)
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By

G. Neutzling

Date 2/20/14

QA By

[Signature]

Date 2-26-14

41

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP 161949	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 948 (systematic array) soil			
5. NAME OF DRILLER: Chuck Finkenbain / Rick Whitney		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES Q3 12.15.14 E 865103.2 N 107390.2			
Meter - Background 44-9 F - 38 cpm 44-10 F - 1939 cpm (30 sec count)		9. SURFACE ELEVATION N/A			
12. OVERBURDEN THICKNESS N/A		10. DATE STARTED: 2/24/14			
13. DEPTH DRILLED INTO ROCK N/A		11. DATE COMPLETED 2/24/14			
14. TOTAL DEPTH OF HOLE 2.0 ft bgs		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18. GEOTECHNICAL SAMPLES N/A		DISTURBED		UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES: N/A		20. SAMPLES FOR CHEMICAL ANALYSIS		21. TOTAL CORE RECOVERY N/A	
N/A		VOC		ARCHIVE SAMPLE	
22. DISPOSITION OF HOLE		METALS		RAD SAMPLES	
Backfill using bentonite		N/A		2	
w/bentonite		MONITORING		OTHER (SPECIFY)	
N/A		N/A		N/A	
23. SIGNATURE OF INSPECTOR		SCALE: None			
LOCATION SKETCH/COMMENTS: Soil plug 2/24/14 COC #: LE02242014-09H					

Recorded By

H. Neutzling

Date

2/24/14

QA By

[Signature]

Date

2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER
SVP 161949 948

42

PROJECT: Coldwater Creek

INSPECTOR: Gr. Neutzling

SHEET 2 of 2

Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
0	SILT, brown, some clay to little clay, little fine sand, low plasticity, moist ML	65	-	-	SVP 161949	-	moved 2 ft west.
0.5		2078*	-	-	ISO Th gamma spec	-	
1		67	-	-	SVP 161950	-	
1.5		2052*	-	-	ISO Th gamma spec	-	
2		54	-	-	0802	-	
2.0		2164*	-	-	0804	-	
2.5		54	-	-	Archive ISO Th gamma spec	-	
3		2226	-	-		-	
4	Bar hole terminated						(soil)
5							
6							
7							
8							
9							
10							

* 30 second count

Recorded By

H. Neutzling

Date

2/24/14

QA By

[Signature]

Date

2-26-14

43

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP161853	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 900 (systematic auger) soil			
5. NAME OF DRILLER: Chuck Finkenbein/Rock Whitney		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 812-15-14 E 86506871 N 10735291			
9. SURFACE ELEVATION: N/A		10. DATE STARTED: 2/24/14			
11. DATE COMPLETED: 2/24/14		12. OVERBURDEN THICKNESS: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
15. DEPTH GROUNDWATER ENCOUNTERED: N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A		18. GEOTECHNICAL SAMPLES: N/A			
19. TOTAL NUMBER OF CORE BOXES: N/A		20. SAMPLES FOR CHEMICAL ANALYSIS			
21. TOTAL CORE RECOVERY: N/A		22. DISPOSITION OF HOLE			
23. SIGNATURE OF INSPECTOR		24. SIGNATURE OF INSPECTOR			
25. SIGNATURE OF INSPECTOR		26. SIGNATURE OF INSPECTOR			
27. SIGNATURE OF INSPECTOR		28. SIGNATURE OF INSPECTOR			
29. SIGNATURE OF INSPECTOR		30. SIGNATURE OF INSPECTOR			
31. SIGNATURE OF INSPECTOR		32. SIGNATURE OF INSPECTOR			
33. SIGNATURE OF INSPECTOR		34. SIGNATURE OF INSPECTOR			
35. SIGNATURE OF INSPECTOR		36. SIGNATURE OF INSPECTOR			
37. SIGNATURE OF INSPECTOR		38. SIGNATURE OF INSPECTOR			
39. SIGNATURE OF INSPECTOR		40. SIGNATURE OF INSPECTOR			
41. SIGNATURE OF INSPECTOR		42. SIGNATURE OF INSPECTOR			
43. SIGNATURE OF INSPECTOR		44. SIGNATURE OF INSPECTOR			
45. SIGNATURE OF INSPECTOR		46. SIGNATURE OF INSPECTOR			
47. SIGNATURE OF INSPECTOR		48. SIGNATURE OF INSPECTOR			
49. SIGNATURE OF INSPECTOR		50. SIGNATURE OF INSPECTOR			
51. SIGNATURE OF INSPECTOR		52. SIGNATURE OF INSPECTOR			
53. SIGNATURE OF INSPECTOR		54. SIGNATURE OF INSPECTOR			
55. SIGNATURE OF INSPECTOR		56. SIGNATURE OF INSPECTOR			
57. SIGNATURE OF INSPECTOR		58. SIGNATURE OF INSPECTOR			
59. SIGNATURE OF INSPECTOR		60. SIGNATURE OF INSPECTOR			
61. SIGNATURE OF INSPECTOR		62. SIGNATURE OF INSPECTOR			
63. SIGNATURE OF INSPECTOR		64. SIGNATURE OF INSPECTOR			
65. SIGNATURE OF INSPECTOR		66. SIGNATURE OF INSPECTOR			
67. SIGNATURE OF INSPECTOR		68. SIGNATURE OF INSPECTOR			
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97. SIGNATURE OF INSPECTOR		98. SIGNATURE OF INSPECTOR			
99. SIGNATURE OF INSPECTOR		100. SIGNATURE OF INSPECTOR			

Recorded By J. Neutzling Date 2/24/14 QA By [Signature] Date 2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 900
SVP 161853

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2				
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Clayey SILT, brown, trace sand, low plasticity, moist - ML	54			SVP161853	0819	Collect QC/QA Soil samples SVP161853-1 SVP161853-2
	1.5	Silty CLAY, red tint brown, trace sand, moderately plastic, moist - CL	58			0825		Possible fill??
	2.0		60			SVP161854	0828	
	3.0		55			0830		
	4.0		61			0936		Soil
	5.0		59			0937		
	6.0		70			SVP161859	0939	sample id from loc #903
	7.0		64			0941		
	8.0		51			0952		
	9.0		57			0954		Natural
	10.0		53			0957		
	11.0		61			SVP161860	1001	
	12.0		61			1001		
	13.0		61			1001		
	14.0		61			1001		
	15.0		61			1001		
	16.0		61			1001		
	17.0		61			1001		
	18.0		61			1001		
	19.0		61			1001		
	20.0		61			1001		
	21.0		61			1001		
	22.0		61			1001		
	23.0		61			1001		
	24.0		61			1001		
	25.0		61			1001		
	26.0		61			1001		
	27.0		61			1001		
	28.0		61			1001		
	29.0		61			1001		
	30.0		61			1001		

Recorded By J. Neutzling Date 2/24/14 QA By [Signature] Date 2-26-14

47

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP 164037	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 115 FPS (Floodplain systematic)			
5. NAME OF DRILLER: Chuck Finkenbain/Rick Whitney		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowl, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864990 N 1073361			
9. SURFACE ELEVATION N/A		10. DATE STARTED: 2/24/14			
11. DATE COMPLETED: 2/24/14		12. OVERBURDEN THICKNESS N/A			
13. DEPTH DRILLED INTO ROCK N/A		15. DEPTH GROUNDWATER ENCOUNTERED N/A			
14. TOTAL DEPTH OF HOLE 2.5 ft bgs		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A			
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A		18. GEOTECHNICAL SAMPLES: N/A			
19. TOTAL NUMBER OF CORE BOXES: N/A		20. SAMPLES FOR CHEMICAL ANALYSIS			
21. TOTAL CORE RECOVERY N/A		22. DISPOSITION OF HOLE			
23. SIGNATURE OF INSPECTOR		24. LOCATION SKETCH/COMMENTS			
Backfill using bentonite		and grass plug, 2/24/14			
COC #: LE02242014-09H		SCALE: None			

Recorded By G. Neutzling Date 2/24/14 QA By [Signature] Date 2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 115 FPS
SVP 164037

48

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2				
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Clayey SILT, brown, little fine sand, low plasticity, moist m	62/2038*	-	-	SVP164037 1011 Iso Th gamma spec	-	
	0.5		74/2126*	-	-	1013	-	
	1	Silty CLAY, brown, little fine sand, low plasticity, moist - CL	65/2138*	-	-	1015	-	
	1.5		83/2212*	-	-	SVP164038 1010 Iso Th gamma spec	-	
	2.0		54/2120*	-	-	Archival 1019 Iso Th gamma spec	-	
	2.5	Borehole terminated						(soil)
	6							
	7							
	8							
	9							
	10							

*30 second count

Recorded By G. Neutzling Date 2/24/14 QA By [Signature] Date 2-26-14

51

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP 163987	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 94 FPS (Flood Plain systematic)			
5. NAME OF DRILLER: Rick Whitney / Chuck Finkenbain		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES Q 912.15.14 E 8647064 N 1073058			
Meter - Background		9. SURFACE ELEVATION: N/A			
44-9 E - 32 cpm		10. DATE STARTED: 2/24/14			
44-10 R - 3747 cpm		11. DATE COMPLETED: 2/24/14			
12. OVERBURDEN THICKNESS: N/A		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
14. TOTAL DEPTH OF HOLE: 2.0 ft bgs		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
18. GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES: N/A					
20. SAMPLES FOR CHEMICAL ANALYSIS		VOC	METALS	RAD SAMPLES	QA/QC SAMPLES
N/A		N/A	N/A	2	0
21. TOTAL CORE RECOVERY: N/A					
22. DISPOSITION OF HOLE		BACKFILLED	MONITORING	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Backfill using bentonite		w/bentonite	N/A	N/A	Barry Neutzling
LOCATION SKETCH/COMMENTS: gross plug 2/24/14 COC #: LE02252014-01H SCALE: None					

Recorded By

J. Neutzling

Date 2/24/14

QA By

[Signature]

Date

2.25.14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER

SVP 163987

94 FPS

52

PROJECT: Coldwater Creek

INSPECTOR:

SHEET 2 of 2

USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0.5	Clayey Silt, brown, little fine sand, low plasticity, moist - PL	65 / 3721	-	-	SVP 163987 1217 Iso Th gamma spec		
	1.0							
	1.5							
	2.0	Silty CLAY, red tint brown, trace fine sand, little gravel, low plasticity, moist - CL	52 / 3826	-	-	1219		Change in bowl.
	2.5							
	3.0							
	3.5							
	4.0							
	4.5							
	5.0							
	5.5							
	6.0							
	6.5							
	7.0							
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	92.5							
	93.0							
	93.5							
	94.0							
	94.5							
	95.0							
	95.5							
	96.0							
	96.5							
	97.0							
	97.5							
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	98.5							
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	100.0							
	100.5							
	101.0							
	101.5							
	102.0							
	102.5							
	103.0							
	103.5							
	104.0							
	104.5							
	105.0							
	105.5							
	106.0							
	106.5							
	107.0							
	107.5							
	108.0							
	108.5							
	109.0							
	109.5							
	110.0							
	110.5							
	111.0							
	111.5							

53

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP164025	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 110 FPS (Flood Plain Systematic)			
5. NAME OF DRILLER: Rick Whitney / Chuck Finkbeiner		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864584 N 1073260			
Meter - Background 44-9 F - 32 cpm 44-10 F - 3747 cpm		9. SURFACE ELEVATION: N/A			
12. OVERBURDEN THICKNESS: N/A		10. DATE STARTED: 2/24/14			
13. DEPTH DRILLED INTO ROCK: N/A		11. DATE COMPLETED: 2/20/14			
14. TOTAL DEPTH OF HOLE: 2.0 ft bgs.		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
18. GEOTECHNICAL SAMPLES: N/A		19. TOTAL NUMBER OF CORE BOXES: N/A			
20. SAMPLES FOR CHEMICAL ANALYSIS N/A		21. TOTAL CORE RECOVERY: N/A			
22. DISPOSITION OF HOLE Backfill using bentonite		23. SIGNATURE OF INSPECTOR: Gary Neutzling			
LOCATION SKETCH/COMMENTS: 1 gross plug 2/24/14 COLE: LRE02252014-01H		SCALE: None			

Recorded By

G. Neutzling

Date 2/24/14

QA By

[Signature]

Date 2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 110 FPS
SVP 164025

54

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2				
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Silty Clay, red tint brown, trace sand, low plasticity, moist - CL (Possible Fill)	65 / 3766	-	-	SVP164025 1325 Iso Th gamma spec	-	Collect 2g/2g Soil Samples SVP164025-1 SVP164025-2
	0.5		56 / 3704	-	-	1327	-	
	1.0		55 / 3856	-	-	SVP164026 1330 SVP164026 Iso Th gamma spec	-	
	1.5		50 / 4022	-	-	1332 Iso Th gamma spec	-	
	2.0	Borehole terminated						Soil
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By

G. Neutzling

Date 2/24/14

QA By

[Signature]

Date 2-26-14

55

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP164023	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 109 FPS (Flood Plain Systematic)			
5. NAME OF DRILLER: Rick Whitney / Quentin Dorgie		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864700 N1073260			
Meter - Background		9. SURFACE ELEVATION: N/A			
44-9 F - 32 cpm		10. DATE STARTED 2/24/14		11. DATE COMPLETED 2/24/14	
44-10 F - 3747 cpm					
12. OVERBURDEN THICKNESS: N/A		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
14. TOTAL DEPTH OF HOLE 2.0 ft bgs		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
18. GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES: N/A					
20. SAMPLES FOR CHEMICAL ANALYSIS		VOC		METALS	
N/A		N/A		N/A	
21. TOTAL CORE RECOVERY: N/A		RAD SAMPLES		QA/QC SAMPLES	
		2		1 set of 2	
22. DISPOSITION OF HOLE		BACKFILLED		MONITORING	
Backfill using bentonite		w/bentonite		N/A	
23. SIGNATURE OF INSPECTOR		SCALE: None			
LOCATION SKETCH/COMMENTS Soil 2/24/14 COC #: LE02252014-01H					

Recorded By

S. Neutzling

Date 2/24/14

QA By

[Signature]

Date

2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 109 FPS
SVP 164023

56

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2	
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery
	0.5	Clayey SILT, brown, little fine sand, low plasticity, moist - ML (Possible Fill)	58 / 3659	-	-
	1.0	Silty CLAY, red-tint brown, little to trace sand, low plasticity, moist - CL (possible fill)	75 / 3920	-	-
	1.5		54 / 4062	-	-
	2.0	Borehole terminated	56 / 3882	-	-
	2.5			-	-
	3.0			-	-
	3.5			-	-
	4.0			-	-
	4.5			-	-
	5.0			-	-
	5.5			-	-
	6.0			-	-
	6.5			-	-
	7.0			-	-
	7.5			-	-
	8.0			-	-
	8.5			-	-
	9.0			-	-
	9.5			-	-
	10.0			-	-

Recorded By

S. Neutzling 2/24/14

Date

QA By

[Signature]

Date

2-26-14

57

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP164045	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION: # 118 FPS (Flood Plain Systematic)			
5. NAME OF DRILLER: Rick Whitney / Quentin Bongie		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864642 N 1073361			
Meter - Background 44-9 F - 32 cpm 44-10 F - 3747 cpm		9. SURFACE ELEVATION: N/A			
12. OVERBURDEN THICKNESS: N/A		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
14. TOTAL DEPTH OF HOLE: 2.5 ft bgs		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
18. GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED	
20. SAMPLES FOR CHEMICAL ANALYSIS N/A		VOC N/A		METALS N/A	
22. DISPOSITION OF HOLE Backfill using bentonite		BACKFILLED w/bentonite		MONITORING N/A	
23. SIGNATURE OF INSPECTOR <i>G. Neutzling</i>		RAD SAMPLES 2		QA/QC SAMPLES 0	
21. TOTAL CORE RECOVERY: N/A		ARCHIVE SAMPLE 1		OTHER (SPECIFY) N/A	
LOCATION SKETCH/COMMENTS: w/ grass plug on top COC#: 2E02252014-0131/2/24/14 SCALE: None					

Recorded By

G. Neutzling

Date 2/24/14

QA By

[Signature]

Date

2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 118FPS
SVP 164045

58

PROJECT: Coldwater Creek

INSPECTOR: *G. Neutzling*

SHEET 2 of 2

USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0.5	Silty CLAY, red-tint brown, little fine sand, low plasticity, moist - ML (Possible Fill)	76 / 4002			SVP164045 1347 Iso Th gamma spec		
	1.5		58 / 3956			1350		
	2.5		54 / 3881			1354		
	3.5		73 / 3936			SVP164046 1357 Iso Th gamma spec		mix of soils? go deeper!
	4.5	Clayey Silt, brown, little fine sand, low plasticity, moist - ML	54 / 4097			Archive 1419 Iso Th gamma spec		not so red tint
	5.5	Borehole terminated						Soil
	6.5							
	7.5							
	8.5							
	9.5							
	10.5							

Recorded By

G. Neutzling

Date 2/24/14

QA By

[Signature]

Date

2-26-14

59

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP 164043	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 117 FPS (Floud Plain Systematic)			
5. NAME OF DRILLER: Rick Whitney / Quantina Borjic		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864758 N1073361			
Meter - Background 44-9 F - 32 cpm 44-10 F - 3747 cpm		9. SURFACE ELEVATION: N/A			
12. OVERBURDEN THICKNESS: N/A		10. DATE STARTED: 2/24/14 11. DATE COMPLETED: 2/24/14			
13. DEPTH DRILLED INTO ROCK: N/A		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
14. TOTAL DEPTH OF HOLE: 2.0 ft bgs		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A		18. GEOTECHNICAL SAMPLES: N/A			
19. TOTAL NUMBER OF CORE BOXES: N/A		20. SAMPLES FOR CHEMICAL ANALYSIS			
21. TOTAL CORE RECOVERY: N/A		22. DISPOSITION OF HOLE			
Backfill using bentonite		w/bentonite			
LOCATION SKETCH/COMMENTS and grass plug on top of hole COC #: LE 02252014 - 014 2/24/14		SCALE: None			

Recorded By

G. Neutzling

Date

2/24/14

QA By

[Signature]

Date

2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 117 FPS
SVP 164043

60

PROJECT: Coldwater Creek

INSPECTOR:

G. Neutzling

SHEET 2 of 2

USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Silty CLAY, red-tint brown, little fine sand, low plasticity, moist - CL	54 / 3751	-	-	SVP164043 1400 IsoTh gamma spec	-	
	0.5		67 / 3799	-	-	SVP164043 1403 IsoTh gamma spec	-	
	1		56 / 3845	-	-	1407	-	
	1.5		45 / 4035	-	-	Archive 1411 IsoTh gamma spec	-	
	2.0	Borehole terminated						(Sui)
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By

G. Neutzling

Date

2/24/14

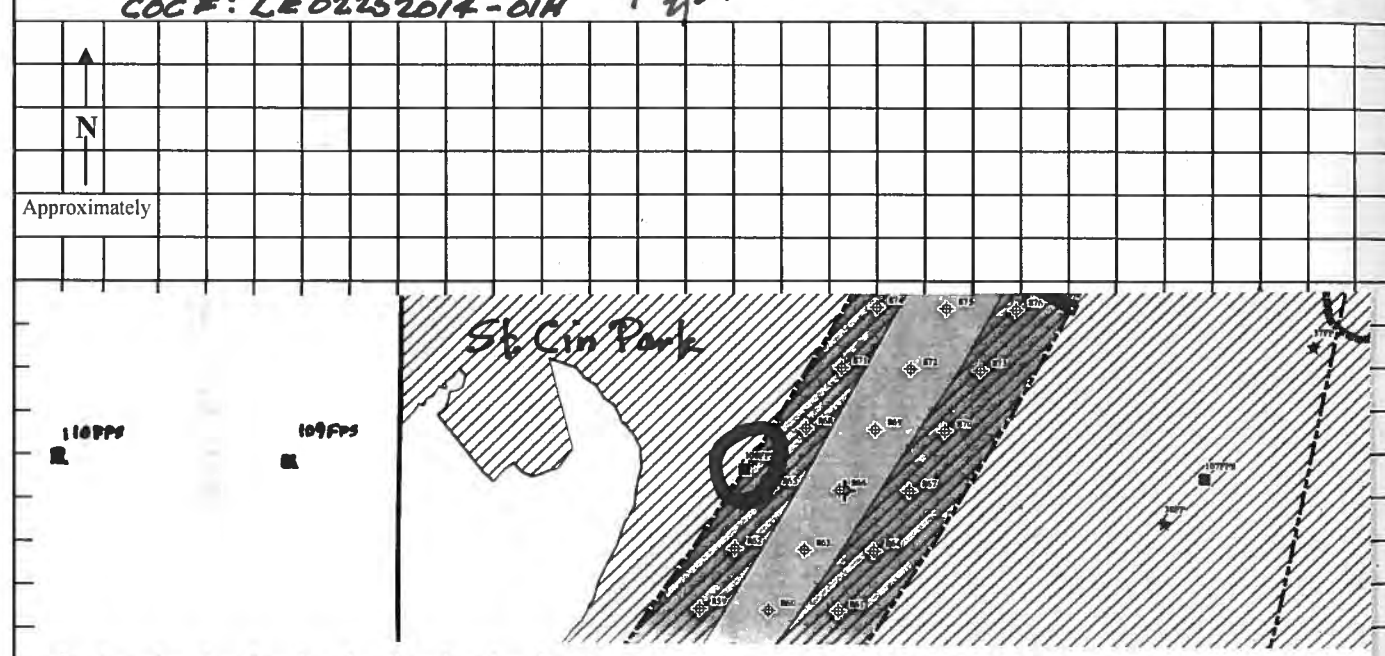
QA By

[Signature]

Date

2-26-14

61

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP 164021	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 108 FPS (Flood Plain Systematic)			
5. NAME OF DRILLER: Rick Whitney / Quantina Borje		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864932 N 1073260			
9. SURFACE ELEVATION N/A		10. DATE STARTED: 2/24/14 11. DATE COMPLETED 2/24/14			
12. OVERBURDEN THICKNESS N/A		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
14. TOTAL DEPTH OF HOLE 2.0 ft bgs		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
18. GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES N/A		20. SAMPLES FOR CHEMICAL ANALYSIS VOC: N/A METALS: N/A RAD SAMPLES: 2 QA/QC SAMPLES: 0 ARCHIVE SAMPLE: 1		21. TOTAL CORE RECOVERY: N/A	
22. DISPOSITION OF HOLE Backfill using bentonite		BACKFILLED w/bentonite		MONITORING N/A OTHER (SPECIFY) N/A	
23. SIGNATURE OF INSPECTOR Gary Neutzling					
LOCATION SKETCH/COMMENTS w/ grass play on top 2/24/14 COC #: LE02252014-DIN SCALE: None					
					

Recorded By G. Neutzling Date 2/24/14 QA By [Signature] Date 2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 108 FPS
SVP 164021

62

PROJECT Coldwater Creek		INSPECTOR G. Neutzling		SHEET 2 of 2				
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Clayey Silt, mix of medium brown & red-tint brown, trace sand, low plasticity, moist - ML	52 / 3700	-	-	SVP164021 1417 Iso Th gamma spec	-	
	0.5	becomes red-tint brown from 1/2 to 1 ft	64 / 3923	-	-	1420	-	
	1.0		67 / 3904	-	-	SVP164022 1424 Iso Th gamma spec	-	
	1.5	Clayey Silt, grayish brown, little fine sand, low plasticity, moist - ML	48 / 4028	-	-	Archive 1427 Iso Th gamma spec	-	
	2.0	Borehole terminated						(soil)
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By G. Neutzling Date 2/24/14 QA By [Signature] Date 2-26-14

63

HTRW DRILLING LOG		DISTRICT St. Louis USACE		HOLE NUMBER SVP 164055	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 122 FPS (Flood Plain Systematic)			
5. NAME OF DRILLER: Rick Whitney/Quantina Perry		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864700 N 1073462			
Meter - Background		9. SURFACE ELEVATION: N/A			
44-9 F - 32 cpm		10. DATE STARTED: 2/24/14		11. DATE COMPLETED: 2/24/14	
44-10 F - 3747 cpm					
12. OVERBURDEN THICKNESS: N/A		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
14. TOTAL DEPTH OF HOLE: 2.0 ft bgs		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
18. GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES: N/A					
20. SAMPLES FOR CHEMICAL ANALYSIS		VOC	METALS	RAD SAMPLES	QA/QC SAMPLES
N/A		N/A	N/A	2	3
21. TOTAL CORE RECOVERY: N/A		ARCHIVE SAMPLE		1	
22. DISPOSITION OF HOLE		BACKFILLED	MONITORING	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Backfill using bentonite		w/bentonite	N/A	N/A	G. Neutzling
LOCATION SKETCH/COMMENTS: typical w/ guess plus 2/24/14 COC #: LE02252014-01H SCALE: None					

Recorded By

G. Neutzling

Date

2/24/14

QA By

[Signature]

Date

2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 122 FPS
SVP 164055

64

PROJECT: Coldwater Creek

INSPECTOR:

G. Neutzling

SHEET 2 of 2

USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Clayey SILT, medium brown, trace little v. fine sand, low plasticity, moist - M	60 / 3839	-	-	SVP 164055 1437 Iso Th gamma Spec		
	0.5	Clayey SILT, yellowish brown, little v. fine sand, low plasticity, moist - M	62 / 3892	-	-	1440 -		
	1		59 / 4008	-	-	SVP 164056 1442 Iso Th gamma Spec		
	1.5		56 / 3955	-	-	Archive 1445 Iso Th gamma Spec		
	2.0	Borehole terminated						Soil
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By

G. Neutzling 2/24/14

Date

2/24/14

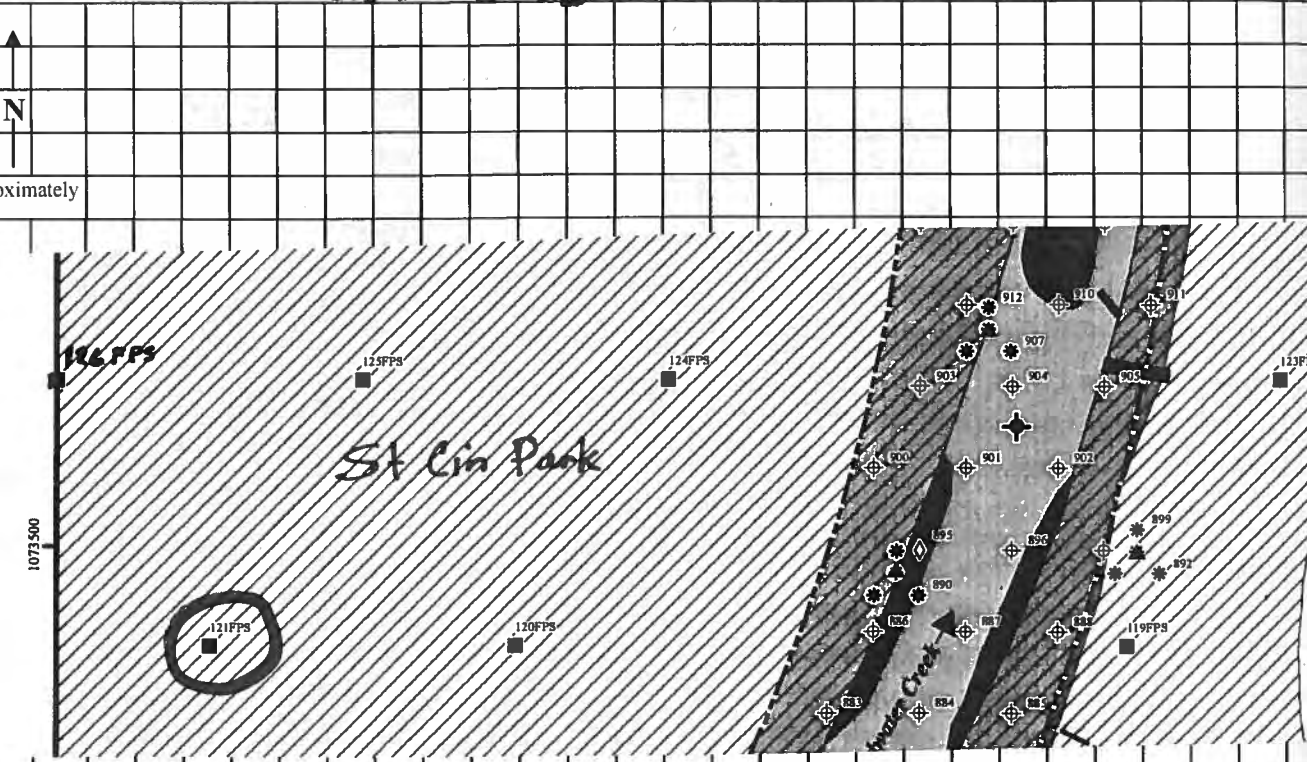
QA By

[Signature]

Date

2-26-14

67

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP164051	
1 COMPANY NAME: Leidos		2 DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3 PROJECT: Coldwater Creek		4 LOCATION # 121FPS (Flood Plain Systematic)			
5 NAME OF DRILLER: Phil Moser / Rhuck Finkenbain		6 MANUFACTURERS DESIGNATION OF DRILL: N/A			
7 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8 HOLE COORDINATES E 864816 N 1073462			
Meter - Background 44-9 F - 37 cpm 44-10 C - 5065 cpm		9 SURFACE ELEVATION: N/A			
12 OVERBURDEN THICKNESS: N/A		10. DATE STARTED: 2/25/14 11. DATE COMPLETED: 2/25/14			
13 DEPTH DRILLED INTO ROCK: N/A		15 DEPTH GROUNDWATER ENCOUNTERED: N/A			
14 TOTAL DEPTH OF HOLE: 6.0 ft bgs		16 DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
18 GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED	
19 TOTAL NUMBER OF CORE BOXES: N/A		20. SAMPLES FOR CHEMICAL ANALYSIS VOC: N/A METALS: N/A RAD SAMPLES: 4 QA/QC SAMPLES: 1 set of 2 ARCHIVE SAMPLE: 0		21 TOTAL CORE RECOVERY: N/A	
22 DISPOSITION OF HOLE Backfill using bentonite		BACKFILLED: w/bentonite MONITORING: N/A OTHER (SPECIFY): N/A		23 SIGNATURE OF INSPECTOR: Gary Neutzling	
LOCATION SKETCH/COMMENTS: and grass plug 2/25/14 Coc #: LE02252014-02H					
SCALE: None					
					

Recorded By G. Neutzling Date 2/25/14 QA By [Signature] Date 2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 121 FPS
SVP 164051

68

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2				
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
0		Silty CLAY, brown, trace sand, low plasticity, moist - CL	55/5930	-	-	SVP164051 0847 IsotHg gamma spec	-	Collect 22/21 soil samples. SVP164051-1 SVP164051-2
1			49/5359	-	-	0849	-	
			59/5554	-	-	0852	-	
2		becomes light brown and slightly moist from approx 1 1/2 to 2 1/2 ft	64/5557	-	-	SVP164052 0856 IsotHg gamma spec	-	powdery modified by lime?? powdery
			62/5570	-	-	0858	-	
2.5		Silty CLAY, brown mottled by orangish brown & gray, trace sand, moderately plastic, moist - CL	60/5853	-	-	0902	-	solid clay begins mottling
3			60/5989	-	-	0903	-	
			69/6118	-	-	SVP164053 0905 IsotHg gamma spec	-	
4			59/6097	-	-	0910	-	more silty w/ little fine sand.
4.5		CLAYEY SILT, mottled brown & orangish brown & gray, little to some v. fine sand, low plasticity, slightly moist - ML	42/6067	-	-	0913	-	
5			60/5977	-	-	0917	-	
			62/5745	-	-	SVP164054 0919 IsotHg gamma spec	-	
6.0		Borehole terminated						Soil
7								
8								
9								
10								

Recorded By G. Neutzling Date 2/25/14 QA By [Signature] Date 2-26-14

69

HTRW DRILLING LOG		DISTRICT: St. Louis USACE	HOLE NUMBER SVP 164049
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos	
3. PROJECT: Coldwater Creek		4. LOCATION: # 120FPS (Flood Plain Systematic)	
5. NAME OF DRILLER: Phil Moser / Chuck Finkenberg		6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864932 N 1073462	
9. SURFACE ELEVATION: N/A		10. DATE STARTED: 2/25/14	
11. DATE COMPLETED: 2/25/14		12. OVERBURDEN THICKNESS: N/A	
13. DEPTH DRILLED INTO ROCK: N/A		14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
15. TOTAL DEPTH OF HOLE: 2.0 ft bgs		16. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A	
17. GEOTECHNICAL SAMPLES: N/A		18. TOTAL NUMBER OF CORE BOXES: N/A	
19. SAMPLES FOR CHEMICAL ANALYSIS: N/A		20. TOTAL CORE RECOVERY: N/A	
21. DISPOSITION OF HOLE: BACKFILLED		22. SIGNATURE OF INSPECTOR: Gary Neutzling	
23. BACKFILL using bentonite		24. SCALE: None	
LOCATION SKETCH/COMMENTS: in grass plg 2/25/14 COC #: LE 02252014-024			

Recorded By

G. Neutzling

Date 2/25/14

QA By

[Signature]

Date

2-26-14

Recorded By

G. Neutzling

Date 2/25/14

QA By

[Signature]

Date

2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 120 FPS
SVP 164049

70

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling				SHEET 2 of 2		
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	54	Silty CLAY, brown, trace sandy low plasticity, moist - GL	5806	-	-	SVP164049 0925 Iso Th gamma spec	-	
	58		5850	-	-	0931	-	
	65		5633	-	-	SVP164050 0932 Iso Th gamma spec	-	
	62	orangish brown	6035	-	-	Archive 0936 Iso Th gamma spec	-	
	2.0	Borehole terminated						(Soil)
	5							
	6							
	7							
	8							
	9							
	10							

71

HTRW DRILLING LOG		DISTRICT St. Louis USACE		HOLE NUMBER SVPI64061	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 125 FPS (Fluvial Plains Systematic)			
5. NAME OF DRILLER: Phil Moser/Chuck Finkenbein		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT		8. HOLE COORDINATES: Q8 12-15-14 E 8648741 N 10735632			
Meter - Background		9. SURFACE ELEVATION N/A			
44-9 E - 37 cpm		10. DATE STARTED 2/25/14		11. DATE COMPLETED 2/25/14	
44-10 C - 5065 cpm		15. DEPTH GROUNDWATER ENCOUNTERED N/A			
12. OVERBURDEN THICKNESS N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A			
13. DEPTH DRILLED INTO ROCK: N/A		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
14. TOTAL DEPTH OF HOLE 2.0 ft bgs		19. TOTAL NUMBER OF CORE BOXES N/A			
18. GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED	
20. SAMPLES FOR CHEMICAL ANALYSIS		VOC		METALS	
N/A		N/A		RAD SAMPLES 2	
22. DISPOSITION OF HOLE		BACKFILLED		MONITORING	
Backfill using bentonite		w/bentonite		N/A	
21. TOTAL CORE RECOVERY: N/A		23. SIGNATURE OF INSPECTOR		24. SIGNATURE OF DRILLER	
LOCATION SKETCH/COMMENTS		SCALE: None		25. SIGNATURE OF DRILLER	
Approximately					

Recorded By

G. Neutzling

Date 2/25/14

QA By

[Signature]

Date

2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 125 FPS
SVP 164061

72

PROJECT: Coldwater Creek		INSPECTOR G. Neutzling		SHEET 2 of 2	
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery
	0	Silty CLAY, brown, fine sand, low plasticity, moist - CL	59/5008	-	-
	0.5		56/5528	-	-
	1		50/5919	-	-
	1.5		49/5679	-	-
	2.0	Borehole terminated			
	5				
	6				
	7				
	8				
	9				
	10				

Recorded By

G. Neutzling

Date

2/25/14

QA By

[Signature]

Date

2-26-14

73

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP 164071	
1 COMPANY NAME: Leidos		2 DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 129 FPS (Flood Plain Systematics)			
5. NAME OF DRILLER: Phil Moser / Chuck Finkenbein		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES: E 864816 N 1073664			
9. SURFACE ELEVATION: N/A		10. DATE STARTED: 2/25/14 11. DATE COMPLETED: 2/25/14			
12. OVERBURDEN THICKNESS: N/A		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
14. TOTAL DEPTH OF HOLE: 2.0 ft bgs		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
18. GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES: N/A		20. SAMPLES FOR CHEMICAL ANALYSIS: N/A		21. TOTAL CORE RECOVERY: N/A	
22. DISPOSITION OF HOLE: Backfill using bentonite		23. SIGNATURE OF INSPECTOR: Gary Neutzling		24. SCALE: None	
LOCATION SKETCH/COMMENTS: and grass play area COC #: LE02252014-02H					

Recorded By

G. Neutzling

Date 2/25/14

QA By

[Signature]

Date 2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 129 FPS
SVP 164071

PROJECT: Coldwater Creek

INSPECTOR: G. Neutzling

SHEET 2 of 2

USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Clayey SILT, brown, little to some v. fine sand, low plasticity, moist - ML	53/5992	-	-	SVP164071 1012 ISO Th gamma spec	-	Collect @ 0.5 Soil sample at SVP164071-1 SVP164071-2 Extra #2 of 13
	0.5		64/5528	-	-	1013	-	
	1.0		53/6041	-	-	1020	-	
	1.5		71/5875	-	-	SVP164072 1023 ISO Th gamma spec	-	
	2.0	Borehole terminated						(Soil)
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By

G. Neutzling

Date 2/25/14

QA By

[Signature]

Date 2-25-14

75

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP164069	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 128 FPS (Flood Plain System)			
5. NAME OF DRILLER: Phil Moser / Chuck Finkenbain		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864932 N1073664			
9. SURFACE ELEVATION: N/A		10. DATE STARTED: 2/25/14			
11. DATE COMPLETED: 2/25/14		12. OVERBURDEN THICKNESS: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
14. TOTAL DEPTH OF HOLE: 2.5 ft bgs		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A		18. GEOTECHNICAL SAMPLES: N/A			
19. TOTAL NUMBER OF CORE BOXES: N/A		20. SAMPLES FOR CHEMICAL ANALYSIS			
VOC		METALS		RAD SAMPLES	
N/A		N/A		2	
21. TOTAL CORE RECOVERY: N/A		22. DISPOSITION OF HOLE		23. SIGNATURE OF INSPECTOR	
BACKFILLED		MONITORING		Other (SPECIFY)	
Backfill using bentonite		w/bentonite		N/A	
LOCATION SKETCH/COMMENTS: and grass play from 2/25/14 COC #: LE 02252014-024					
SCALE: None					

Recorded By

G. Neutzling

Date 2/25/14

QA By

[Signature]

Date 2-26-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 128 FPS
SVP 164069

76

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2	
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery
	0	Silty CLAY, medium brown, trace sandy, low plasticity, moist - CL	62/5803	-	-
	0.5	Silty CLAY, brown, little v. fine sandy, low plasticity, moist CL	49/5941	-	-
	1.2	Silty CLAY, brown mottled by gray & dark brown, some v. fine sandy, low plasticity, moist - CL	59/5814	-	-
	1.5		78/5808	-	-
	2		56/5747	-	-
	2.5	Borehole terminated			
	6				
	7				
	8				
	9				
	10				

Recorded By

G. Neutzling

Date 2/25/14

QA By

[Signature]

Date 2-26-14

77

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP 163693	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION: # 40FP (Biased FP)			
5. NAME OF DRILLER: Phil Moser / Chuck Finkembain		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES Q8 12-15-14 E 8649389 N1073707			
Meter - Background 44-9 F - 43 cpm 44-10 C - 6030 cpm		9. SURFACE ELEVATION: N/A			
12. OVERBURDEN THICKNESS: N/A		10. DATE STARTED: 2/25/14			
13. DEPTH DRILLED INTO ROCK: N/A		11. DATE COMPLETED: 2/25/14			
14. TOTAL DEPTH OF HOLE: 2.0 ft bgs		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
18. GEOTECHNICAL SAMPLES: N/A		19. TOTAL NUMBER OF CORE BOXES: N/A			
20. SAMPLES FOR CHEMICAL ANALYSIS N/A		21. TOTAL CORE RECOVERY: N/A			
22. DISPOSITION OF HOLE Backfill using bentonite		23. SIGNATURE OF INSPECTOR G. Neutzling			
LOCATION SKETCH/COMMENTS and grassy area 2/25/14 COC #: LE 02262014-02H SCALE: None					

Recorded By G. Neutzling Date 2/25/14 QA By [Signature] Date 2-27-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER **40FP**
SVP 163693

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2			
Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
0 to 1.0	Silty CLAY, brown, trace sand, low plasticity, moist - ch	71 / 6762	-	-	SVP163693 1427 Iso Th gamma spec	-	Catch basin Area Inlet
1.0 to 1.5	Silty Clay, brown, trace sand, moderately plastic, moist - CL	60 / 6672	-	-	SVP163694 1430 Iso Th gamma spec	-	
1.5 to 2.0		56 / 6344	-	-	1432	-	
2.0 to 2.5		55 / 6557	-	-	ARCHIVE 1434 Iso Th gamma spec	-	
2.5 to 3.0	Borehole terminated						(soil)

Recorded By G. Neutzling Date 2/25/14 QA By [Signature] Date 2-27-14

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HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP 164059	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 of 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 124 FPS (Flood Plain Systematic)			
5. NAME OF DRILLER: Phil Moser/Chuck Finkenhorn		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864990 N 1079563			
9. SURFACE ELEVATION: N/A		10. DATE STARTED: 2/25/14			
11. DATE COMPLETED: 2/25/14		12. OVERBURDEN THICKNESS: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
14. TOTAL DEPTH OF HOLE: 2.0 ft bgs		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A		18. GEOTECHNICAL SAMPLES: N/A			
19. TOTAL NUMBER OF CORE BOXES: N/A		20. SAMPLES FOR CHEMICAL ANALYSIS			
21. TOTAL CORE RECOVERY: N/A		22. DISPOSITION OF HOLE			
23. SIGNATURE OF INSPECTOR: Gary Neutzling		24. LOCATION SKETCH/COMMENTS			
25. SCALE: None		26. LOCATION SKETCH/COMMENTS			
27. LOCATION SKETCH/COMMENTS		28. LOCATION SKETCH/COMMENTS			
29. LOCATION SKETCH/COMMENTS		30. LOCATION SKETCH/COMMENTS			
31. LOCATION SKETCH/COMMENTS		32. LOCATION SKETCH/COMMENTS			
33. LOCATION SKETCH/COMMENTS		34. LOCATION SKETCH/COMMENTS			
35. LOCATION SKETCH/COMMENTS		36. LOCATION SKETCH/COMMENTS			
37. LOCATION SKETCH/COMMENTS		38. LOCATION SKETCH/COMMENTS			
39. LOCATION SKETCH/COMMENTS		40. LOCATION SKETCH/COMMENTS			
41. LOCATION SKETCH/COMMENTS		42. LOCATION SKETCH/COMMENTS			
43. LOCATION SKETCH/COMMENTS		44. LOCATION SKETCH/COMMENTS			
45. LOCATION SKETCH/COMMENTS		46. LOCATION SKETCH/COMMENTS			
47. LOCATION SKETCH/COMMENTS		48. LOCATION SKETCH/COMMENTS			
49. LOCATION SKETCH/COMMENTS		50. LOCATION SKETCH/COMMENTS			
51. LOCATION SKETCH/COMMENTS		52. LOCATION SKETCH/COMMENTS			
53. LOCATION SKETCH/COMMENTS		54. LOCATION SKETCH/COMMENTS			
55. LOCATION SKETCH/COMMENTS		56. LOCATION SKETCH/COMMENTS			
57. LOCATION SKETCH/COMMENTS		58. LOCATION SKETCH/COMMENTS			
59. LOCATION SKETCH/COMMENTS		60. LOCATION SKETCH/COMMENTS			
61. LOCATION SKETCH/COMMENTS		62. LOCATION SKETCH/COMMENTS			
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73. LOCATION SKETCH/COMMENTS		74. LOCATION SKETCH/COMMENTS			
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77. LOCATION SKETCH/COMMENTS		78. LOCATION SKETCH/COMMENTS			
79. LOCATION SKETCH/COMMENTS		80. LOCATION SKETCH/COMMENTS			
81. LOCATION SKETCH/COMMENTS		82. LOCATION SKETCH/COMMENTS			
83. LOCATION SKETCH/COMMENTS		84. LOCATION SKETCH/COMMENTS			
85. LOCATION SKETCH/COMMENTS		86. LOCATION SKETCH/COMMENTS			
87. LOCATION SKETCH/COMMENTS		88. LOCATION SKETCH/COMMENTS			
89. LOCATION SKETCH/COMMENTS		90. LOCATION SKETCH/COMMENTS			
91. LOCATION SKETCH/COMMENTS		92. LOCATION SKETCH/COMMENTS			
93. LOCATION SKETCH/COMMENTS		94. LOCATION SKETCH/COMMENTS			
95. LOCATION SKETCH/COMMENTS		96. LOCATION SKETCH/COMMENTS			
97. LOCATION SKETCH/COMMENTS		98. LOCATION SKETCH/COMMENTS			
99. LOCATION SKETCH/COMMENTS		100. LOCATION SKETCH/COMMENTS			

Recorded By G. Neutzling Date 2/25/14 QA By [Signature] Date 2-27-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 124 FPS
SVP 164059

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2				
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Silty CLAY, brown, little to some v. fine sand low plasticity, moist - CL	59/6472	—	—	SVP164059 1441 Iso Th gamma spec	—	v. silty
	0.5		66/6366	—	—	SVP164060 1442 Iso Th gamma spec	—	
	1	Silty CLAY, brown, little sand, moderate plasticity, moist - CL	49/6442	—	—	1444	—	
	1.5		40/6393	—	—	Archiv 1446 Iso Th gamma spec	—	
	2.0	Borehole terminated						(soil)
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By G. Neutzling Date 2/25/14 QA By [Signature] Date 2-27-14

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP164079	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 132 FPS (Flood Plain Systematic)			
5. NAME OF DRILLER: Phil Moser / Chuck Finkenbender		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES: E 864874 N1073765			
9. SURFACE ELEVATION: N/A		10. DATE STARTED: 2/25/14 11. DATE COMPLETED: 2/25/14			
12. OVERBURDEN THICKNESS: N/A		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
14. TOTAL DEPTH OF HOLE: 2.0 ft bgs		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
18. GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED	
20. SAMPLES FOR CHEMICAL ANALYSIS: N/A		VOC: N/A		METALS: N/A	
22. DISPOSITION OF HOLE: Backfill using bentonite		BACKFILLED: w/bentonite		MONITORING: N/A	
23. SIGNATURE OF INSPECTOR: Gary Neutzling		RAD SAMPLES: 2		QA/QC SAMPLES: 0	
21. TOTAL CORE RECOVERY: N/A		ARCHIVE SAMPLE: 1		OTHER (SPECIFY): N/A	
LOCATION SKETCH/COMMENTS: and grass plug, 2/25/14 COG #: LEO2262014-02H					

Recorded By G. Neutzling Date 2/25/14 QA By [Signature] Date 2-27-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 132 FPS
SVP164079

PROJECT: Coldwater Creek

INSPECTOR: G. Neutzling

SHEET 2 of 2

USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Clayey Silt, little to brown, little to some very fine sandy low plasticity, moist ML	49			SVP164079		
	1		6454			1449		little v. fine sd.
	1.5		66			SVP164080		
	2		6681			1450		
	3		46			1452		3m v. fine sd.
	3.5		6325					
	4		57			Archive		
	4.5		6175			1453		
	5	Borehole terminated						soil
	6							
	7							
	8							
	9							
	10							

Recorded By G. Neutzling Date 2/25/14 QA By [Signature] Date 2-27-14

HTRW DRILLING LOG		DISTRICT St. Louis USACE		HOLE NUMBER SVP164063	
1 COMPANY NAME Leidos		2 DRILL SUBCONTRACTOR Leidos		SHEET 1 OF 2	
3 PROJECT Coldwater Creek		4 LOCATION # 126 FPS (Flood Plain Systematic)			
5 NAME OF DRILLER Phil Meyer / Chuck Emkanbain		6 MANUFACTURERS DESIGNATION OF DRILL N/A			
7 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8 HOLE COORDINATES 08 12.15.14 E 86475061 N10735637			
Meter - Background		9 SURFACE ELEVATION N/A			
44-9 F - 43 cpm		10 DATE STARTED 2/25/14			
44-10 C - 6030 cpm		11 DATE COMPLETED 2/25/14			
12 OVERBURDEN THICKNESS N/A		15 DEPTH GROUNDWATER ENCOUNTERED: N/A			
13 DEPTH DRILLED INTO ROCK N/A		16 DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
14 TOTAL DEPTH OF HOLE 6.0 ft bgs		17 OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
18 GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED	
19 TOTAL NUMBER OF CORE BOXES: N/A					
20 SAMPLES FOR CHEMICAL ANALYSIS		VOC		METALS	
N/A		N/A		N/A	
22 DISPOSITION OF HOLE		BACKFILLED		MONITORING WELL	
Backfill using bentonite		w/bentonite		N/A	
23 SIGNATURE OF INSPECTOR		RAD SAMPLES		QA/QC SAMPLES	
SCALE: None		N/A		0	
LOCATION SKETCH/COMMENTS		and grass plug dug 2/25/14		COC #: LEO2262014-024	
Approximately					
126 FPS		125 FPS		124 FPS	
St Cin Park		121 FPS		120 FPS	
119 FPS		118 FPS		117 FPS	
116 FPS		115 FPS		114 FPS	
113 FPS		112 FPS		111 FPS	
110 FPS		109 FPS		108 FPS	
107 FPS		106 FPS		105 FPS	
104 FPS		103 FPS		102 FPS	
101 FPS		100 FPS		99 FPS	
98 FPS		97 FPS		96 FPS	
95 FPS		94 FPS		93 FPS	
92 FPS		91 FPS		90 FPS	
89 FPS		88 FPS		87 FPS	
86 FPS		85 FPS		84 FPS	
83 FPS		82 FPS		81 FPS	
80 FPS		79 FPS		78 FPS	
77 FPS		76 FPS		75 FPS	
74 FPS		73 FPS		72 FPS	
71 FPS		70 FPS		69 FPS	
68 FPS		67 FPS		66 FPS	
65 FPS		64 FPS		63 FPS	
62 FPS		61 FPS		60 FPS	
59 FPS		58 FPS		57 FPS	
56 FPS		55 FPS		54 FPS	
53 FPS		52 FPS		51 FPS	
50 FPS		49 FPS		48 FPS	
47 FPS		46 FPS		45 FPS	
44 FPS		43 FPS		42 FPS	
41 FPS		40 FPS		39 FPS	
38 FPS		37 FPS		36 FPS	
35 FPS		34 FPS		33 FPS	
32 FPS		31 FPS		30 FPS	
29 FPS		28 FPS		27 FPS	
26 FPS		25 FPS		24 FPS	
23 FPS		22 FPS		21 FPS	
20 FPS		19 FPS		18 FPS	
17 FPS		16 FPS		15 FPS	
14 FPS		13 FPS		12 FPS	
11 FPS		10 FPS		9 FPS	
8 FPS		7 FPS		6 FPS	
5 FPS		4 FPS		3 FPS	
2 FPS		1 FPS		0 FPS	

Recorded By L. Neutzing Date 2/25/14 QA By [Signature] Date 2-27-14

HTRW DRILLING LOG (Continuation Sheet)						HOLE NUMBER SVP 126 FPS 126 FPS		
PROJECT: Coldwater Creek			INSPECTOR: G. Neutzhing				SHEET 2 of 2	
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Clayey SILT, brown, little v. fine sand, low plasticity, moist - 122	45 6261	-	-	SVP126063 1502 Isot/gamma spec	-	
	1		53 6320	-	-	1504	-	
	1.8	becomes mottled by gray	57 6425	-	-	1506	-	
	2	Silty CLAY, medium brown mottled by orangish brown, gray, and dark brown trace sand, moderately plastic, moist - CL	59 6415	-	-	SVP126064 1508 Isot/gamma spec	-	Clay
	3		55 6631	-	-	1512	-	
	4		62 6494	-	-	1514	-	
	5		59 6575	-	-	1516	-	
	6	becomes mottled by rust color below 4'	71 6176	-	-	SVP126065 1518 Isot/gamma spec	-	
	7		60 6307	-	-	1521	-	
	8		43 6395	-	-	1523	-	
	9		68 6454	-	-	1525	-	more rust color
	10		65 6332	-	-	SVP126066 1527 Isot/gamma spec	-	
	11	Borehole terminated						Soil
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							

Recorded By S. Newlin Date 2/25/14 QA By [Signature] Date 2-27-14

85

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP164085	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION: # 135 FPS (Flood Plain Systematic)			
5. NAME OF DRILLER: Phil Moser / Chuck Finkenbain		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864932 N 1073866			
9. SURFACE ELEVATION: N/A		10. DATE STARTED: 2/25/14			
11. DATE COMPLETED: 2/25/14		12. OVERBURDEN THICKNESS: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
15. DEPTH GROUNDWATER ENCOUNTERED: N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A		18. TOTAL DEPTH OF HOLE: 2.0 ft bgs			
19. TOTAL NUMBER OF CORE BOXES: N/A		20. GEOTECHNICAL SAMPLES: N/A			
21. TOTAL CORE RECOVERY: N/A		22. DISPOSITION OF HOLE Backfill using bentonite			
23. SIGNATURE OF INSPECTOR G. Neutzling		24. SCALE: None			
LOCATION SKETCH/COMMENTS COC #: LE 02262014-02H and grassy plug (2/25/14)					

Recorded By

G. Neutzling

Date 2/25/14

QA By

[Signature]

Date 2-27-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER
SVP164085

135 FPS

PROJECT: Coldwater Creek

INSPECTOR: G. Neutzling

SHEET 2 of 2

USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	SILT, brown, little clay, little v. fine sand, low plasticity, moist ML	57/5441	-	-	SVP164085-1535	-	Collected 3 soil samples SVP164085-1 SVP164085-2 (3 of 13 Extra)
	0.5		58/6374	-	-	1537	-	
	1	W/ some clay below ~1 ft	44/6457	-	-	1539	-	more clayey transition
	1.4		62/6449	-	-	SVP164086-1541	-	SiCL
	1.5	Silty CLAY, brown mottled by rust and dark brown trace sand, moderately plastic, moist - CL						
	2.0	Borehole terminated						(Soil)
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By

G. Neutzling

Date 2/25/14

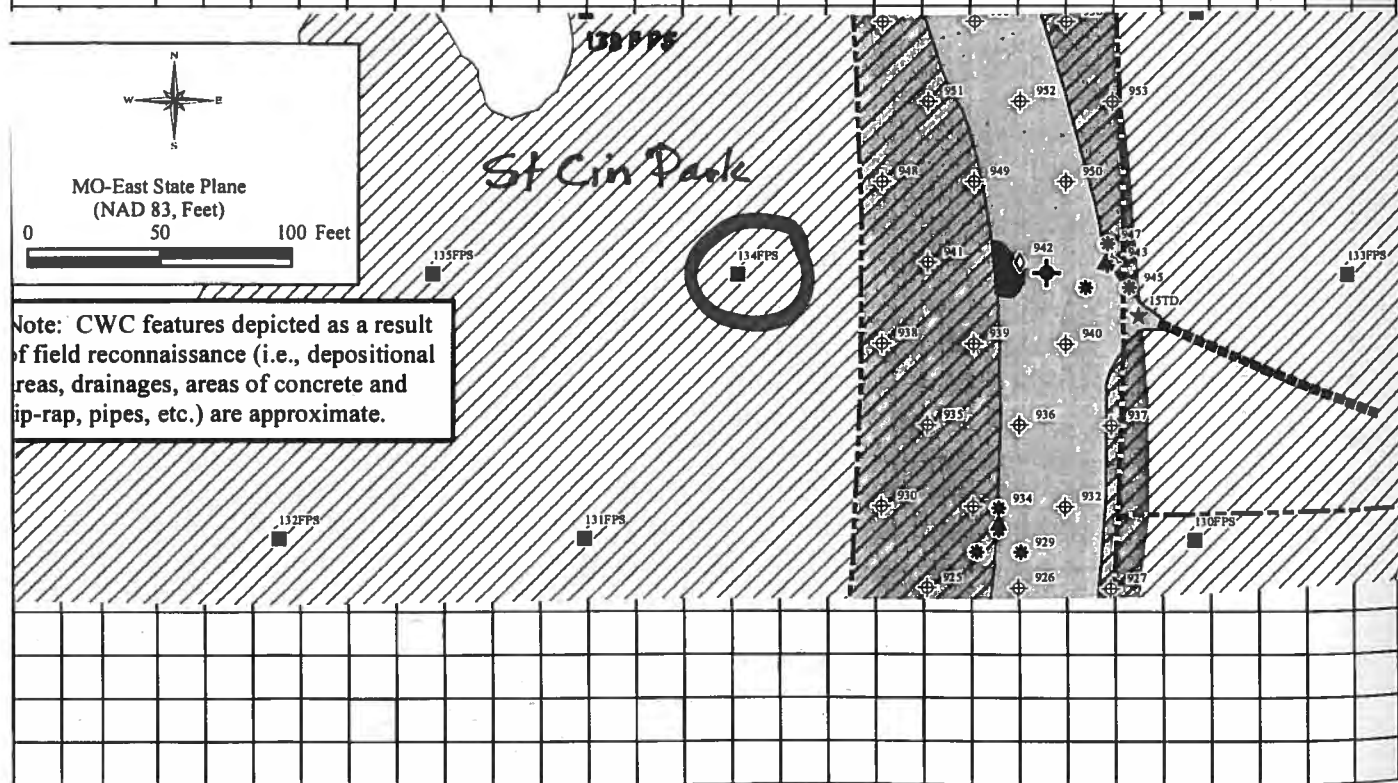
QA By

[Signature]

Date 2-27-14

87

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP 164083	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 of 2	
3. PROJECT: Coldwater Creek		4. LOCATION: # 134 FPS (Flood Plain Systematic)			
5. NAME OF DRILLER: Phil Moser / Chuck Finkenbein		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 865048 N 1073866			
9. SURFACE ELEVATION: N/A		10. DATE STARTED: 2/25/14			
11. DATE COMPLETED: 2/25/14		12. OVERBURDEN THICKNESS: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
15. TOTAL DEPTH OF HOLE: 2.0 ft bgs		16. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A			
17. GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED	
18. SAMPLES FOR CHEMICAL ANALYSIS: N/A		VOC		METALS	
19. TOTAL NUMBER OF CORE BOXES: N/A		RAD SAMPLES		QA/QC SAMPLES	
20. DISPOSITION OF HOLE: BACKFILLED		MONITORING		OTHER (SPECIFY)	
21. TOTAL CORE RECOVERY: N/A		ARCHIVE SAMPLE		22. SIGNATURE OF INSPECTOR	
Backfill using bentonite		w/bentonite		N/A	
LOCATION SKETCH/COMMENTS: and grass plug removed 2/25/14 COC #: LE02262014024					
Approximately					



Recorded By G. Neutzling Date 2/25/14 QA By [Signature] Date 2-27-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 134 FPS
SVP 164083

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2				
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Clayey SILT, brown, little sand, low plasticity, moist - ML	61/6425	-	-	SVP 164083 1547 Iso Th gamma spec		
	0.5	becomes mottled by rust & drk brn.	59/5286	-	-	1548		
	1.3	Silty CLAY, yellowish brown, mottled by rust, little s. fin. sand, low plasticity, moist - CL	63/6465	-	-	SVP 164084 1549 Iso Th gamma spec		
	2.0	Borehole terminated	50/6104	-	-	Archived 1552 Iso Th gamma spec		
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By G. Neutzling Date 2/25/14 QA By [Signature] Date 2-27-14

89

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP164067	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION: # 127 FPS (Flood Plain Systematic)			
5. NAME OF DRILLER: Phil Mason / Chuck Finkenbain		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 865048 N1073664			
9. SURFACE ELEVATION: N/A		10. DATE STARTED: 2/25/14			
11. DATE COMPLETED: 2/25/14		12. OVERBURDEN THICKNESS: N/A			
13. DEPTH DRILLED INTO ROCK: N/A		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
14. TOTAL DEPTH OF HOLE: 2.0 ft bgs		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A			
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A		18. GEOTECHNICAL SAMPLES: N/A			
19. TOTAL NUMBER OF CORE BOXES: N/A		20. SAMPLES FOR CHEMICAL ANALYSIS: N/A			
21. TOTAL CORE RECOVERY: N/A		22. DISPOSITION OF HOLE: Backfill using bentonite			
23. SIGNATURE OF INSPECTOR: Gary Neutzling		24. SCALE: None			
LOCATION SKETCH/COMMENTS: and grass plug 2/26/14 CAC #: LE0226 2014-02H					

Recorded By

G. Neutzling

Date 2/25/14

QA By

[Signature]

Date 2-27-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 127 FPS
SVP164067

90

PROJECT: Coldwater Creek

INSPECTOR: G. Neutzling

SHEET 2 of 2

USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Silty CLAY, brown, little to some v. fine sand, low plasticity, moist - SL	67	-	-	SVP164067	1557	
	0.5		6504	-	-	Iso Th gamma spec		
	1		76	-	-	1559		
	1.5		6385	-	-			
	2		57	-	-	1601		
	2.0	Borehole terminated	6266	-	-			
	2.5		74	-	-	SVP164068	1603	
	3		6544	-	-	Iso Th gamma spec		
	4							Soil
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By

G. Neutzling

Date 2/25/14

QA By

[Signature]

Date 2-27-14

91

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP164107	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 144 FPS (Flood Plain Systematic)			
5. NAME OF DRILLER: Andy Holtkamp / Isaac Alvarado / Adam B...		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864990 N 1074169			
9. SURFACE ELEVATION N/A		10. DATE STARTED 2/26/14			
11. DATE COMPLETED 2/26/14		12. OVERBURDEN THICKNESS N/A			
13. DEPTH DRILLED INTO ROCK: N/A		14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A			
15. DEPTH GROUNDWATER ENCOUNTERED: N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A			
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A		18. GEOTECHNICAL SAMPLES: N/A			
19. TOTAL NUMBER OF CORE BOXES: N/A		20. SAMPLES FOR CHEMICAL ANALYSIS			
21. TOTAL CORE RECOVERY: N/A		22. DISPOSITION OF HOLE			
23. SIGNATURE OF INSPECTOR		24. SIGNATURE OF DRILLER			
25. SIGNATURE OF QUALITY CONTROL		26. SIGNATURE OF SUPERVISOR			
27. SIGNATURE OF PROJECT MANAGER		28. SIGNATURE OF DRILLER			
29. SIGNATURE OF DRILLER		30. SIGNATURE OF DRILLER			
31. SIGNATURE OF DRILLER		32. SIGNATURE OF DRILLER			
33. SIGNATURE OF DRILLER		34. SIGNATURE OF DRILLER			
35. SIGNATURE OF DRILLER		36. SIGNATURE OF DRILLER			
37. SIGNATURE OF DRILLER		38. SIGNATURE OF DRILLER			
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41. SIGNATURE OF DRILLER		42. SIGNATURE OF DRILLER			
43. SIGNATURE OF DRILLER		44. SIGNATURE OF DRILLER			
45. SIGNATURE OF DRILLER		46. SIGNATURE OF DRILLER			
47. SIGNATURE OF DRILLER		48. SIGNATURE OF DRILLER			
49. SIGNATURE OF DRILLER		50. SIGNATURE OF DRILLER			
51. SIGNATURE OF DRILLER		52. SIGNATURE OF DRILLER			
53. SIGNATURE OF DRILLER		54. SIGNATURE OF DRILLER			
55. SIGNATURE OF DRILLER		56. SIGNATURE OF DRILLER			
57. SIGNATURE OF DRILLER		58. SIGNATURE OF DRILLER			
59. SIGNATURE OF DRILLER		60. SIGNATURE OF DRILLER			
61. SIGNATURE OF DRILLER		62. SIGNATURE OF DRILLER			
63. SIGNATURE OF DRILLER		64. SIGNATURE OF DRILLER			
65. SIGNATURE OF DRILLER		66. SIGNATURE OF DRILLER			
67. SIGNATURE OF DRILLER		68. SIGNATURE OF DRILLER			
69. SIGNATURE OF DRILLER		70. SIGNATURE OF DRILLER			
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87. SIGNATURE OF DRILLER		88. SIGNATURE OF DRILLER			
89. SIGNATURE OF DRILLER		90. SIGNATURE OF DRILLER			
91. SIGNATURE OF DRILLER		92. SIGNATURE OF DRILLER			
93. SIGNATURE OF DRILLER		94. SIGNATURE OF DRILLER			
95. SIGNATURE OF DRILLER		96. SIGNATURE OF DRILLER			
97. SIGNATURE OF DRILLER		98. SIGNATURE OF DRILLER			
99. SIGNATURE OF DRILLER		100. SIGNATURE OF DRILLER			

Recorded By G. Neutzling Date 2/26/14 QA By [Signature] Date 2-27-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 144 FPS
SVP164107

92

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2				
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Silty CLAY, brown, some v. fine sand, low plasticity, moist - CL	60	-	-	SVP164107 1020 Iso Th gamma spec	-	Collect 20/21 Soil sampler SVP164107-1 SVP164107-2 (Extra #40413)
	0.5	Silty CLAY, brown, mottled by gray and dark brown, trace v. fine sand, low to moderate plasticity, moist - CL	48	-	-	1022	-	from soil
	1		51	-	-	SVP164108 1024 Iso Th gamma spec	-	
	1.5		43	-	-	Archino 1026 Iso Th gamma spec	-	
	2	Borehole terminated						Soil
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By G. Neutzling Date 2/26/14 QA By [Signature] Date 2-27-14

93

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP 164099	
1. COMPANY NAME: Leidos		2. DRILL SUBCONTRACTOR: Leidos		SHEET 1 OF 2	
3. PROJECT: Coldwater Creek		4. LOCATION: # 141FPS (Flood Plain Systematic)			
5. NAME OF DRILLER: Andy Holtkamp/Adam Queen/Phil Messer		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 865048 N 1074068			
Meter - Background 44-9 E - 31cpm 44-10 C - 5216cpm		9. SURFACE ELEVATION N/A			
12. OVERBURDEN THICKNESS N/A		10. DATE STARTED 2/26/14			
13. DEPTH DRILLED INTO ROCK: N/A		11. DATE COMPLETED 2/26/14			
14. TOTAL DEPTH OF HOLE 6.6 ft bgs		15. DEPTH GROUNDWATER ENCOUNTERED: N/A			
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18. GEOTECHNICAL SAMPLES: N/A		19. TOTAL NUMBER OF CORE BOXES: N/A			
20. SAMPLES FOR CHEMICAL ANALYSIS N/A		21. TOTAL CORE RECOVERY: N/A			
22. DISPOSITION OF HOLE Backfill using bentonite		23. SIGNATURE OF INSPECTOR G. Neutzling			
LOCATION SKETCH/COMMENTS COC #: LE02272014-01H and goes plug down 2/26/14 SCALE: None					

Recorded By

G. Neutzling

Date

2/26/14

QA By

[Signature]

Date

2-27-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER
SVP 164099

141FPS

SHEET 2 of 2

PROJECT: Coldwater Creek

INSPECTOR: G. Neutzling

USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	1	Silty CLAY, brown, some to little v. fine sand, low plasticity, moist - CL	39/5985	1036	-	SVP 164099	-	pieces of yellow brown frozen
	1		594/5813	1039	-	-	-	
	2	becomes mottled by gray/orangish brown below approx. 1 1/2 ft.	65/5996	1041	-	SVP 164099	-	
	2		61/5779	1043	-	-	-	
	2		54/5901	1047	-	-	-	
	3		46/5871	1049	-	-	-	
	3		60/5947	1051	-	-	-	
	4		62/5974	1053	-	SVP 164101	-	
	4		66/5992	1101	-	SVP 164102	-	same as above
	4.7		53/6052	1102	-	-	-	transition
	5	CLAY, brown coating black, some silt, trace sand, moderately plastic, moist - CL	55/6108	1107	-	-	-	LL mud to upper for
	6.0	Borehole transition terminated 2/26/14	60/5987	1105	-	Archived	-	
	7							(soil)
	8							
	9							
	10							

Recorded By

G. Neutzling

Date

2/26/14

QA By

[Signature]

Date

2-27-14

95

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP	
1. COMPANY NAME Leidos		2. DRILL SUBCONTRACTOR Leidos		SHEET 1 of 2	
3. PROJECT: Coldwater Creek		4. LOCATION # 138 FPS (Flood Plain Systematic)			
5. NAME OF DRILLER Andy Holtkamp / Adam Quinn / Phil Moser		6. MANUFACTURERS DESIGNATION OF DRILL: N/A			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8. HOLE COORDINATES E 864990 N 1073967			
9. SURFACE ELEVATION N/A		10. DATE STARTED 2/26/14 11. DATE COMPLETED 2/26/14			
12. OVERBURDEN THICKNESS N/A		15. DEPTH GROUNDWATER ENCOUNTERED N/A			
13. DEPTH DRILLED INTO ROCK: N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A			
14. TOTAL DEPTH OF HOLE 2.0 ft bgs		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18. GEOTECHNICAL SAMPLES: N/A		DISTURBED		UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES: N/A		20. SAMPLES FOR CHEMICAL ANALYSIS		21. TOTAL CORE RECOVERY: N/A	
22. DISPOSITION OF HOLE		BACKFILLED		MONITORING	
Backfill using bentonite		w/bentonite		N/A	
23. SIGNATURE OF INSPECTOR		24. SIGNATURE OF DRILLER		25. SIGNATURE OF QUALITY ASSURANCE	
LOCATION SKETCH/COMMENTS and grass plug 2/26/14		SCALE: None			

Recorded By

G. Neutzling

Date

2/26/14

QA By

[Signature]

Date

2-27-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER **138 FPS**
SVP **164093**PROJECT: **Coldwater Creek**

INSPECTOR:

G. Neutzling

SHEET 2 of 2

USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	0	Silty CLAY, brown, some to 1/16" very fine sand, low plasticity, moist - CL	54 / 5804	-	-	SVP 164093 1116 Iso Th gamma spec	-	Frozen
	0.5		54 / 5891	-	-	SVP 164094 1117 Iso Th gamma spec	-	
	1		44 / 5994	-	-	1119	-	
	1.5		45 / 6184	-	-	Archive 1121 Iso Th gamma spec	-	
	2	Borehole terminated						(soil)
	5							
	6							
	7							
	8							
	9							
	10							

Recorded By

G. Neutzling

Date

2/26/14

QA By

[Signature]

Date

2-27-14

97

HTRW DRILLING LOG		DISTRICT: St. Louis USACE		HOLE NUMBER SVP164075	
1 COMPANY NAME Leidos		2 DRILL SUBCONTRACTOR Leidos		SHEET 1 OF 2	
3 PROJECT: Coldwater Creek		4 LOCATION # 131FPS (Flood Plain Systematic)			
5 NAME OF DRILLER Andy Holtkamp / Adam Queen / Phil Moser		6 MANUFACTURERS DESIGNATION OF DRILL: N/A			
7 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT Stainless Steel (ss) bowl, ss trowel, with ss hand auger 3in ID or ss sediment sampler with plastic sleeve		8 HOLE COORDINATES E 864990 N 1073765			
Meter - Background 44-9 E - 31 cpm 44-10 C - 52.10 cpm		9 SURFACE ELEVATION N/A			
12 OVERBURDEN THICKNESS N/A		10 DATE STARTED 2/26/14			
13 DEPTH DRILLED INTO ROCK: N/A		11 DATE COMPLETED 2/26/14			
14 TOTAL DEPTH OF HOLE 6.5 ft bgs		15 DEPTH GROUNDWATER ENCOUNTERED: N/A			
16 DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A		17 OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18 GEOTECHNICAL SAMPLES: N/A		19 TOTAL NUMBER OF CORE BOXES N/A			
20 SAMPLES FOR CHEMICAL ANALYSIS VOC METALS RAD SAMPLES QA/QC SAMPLES ARCHIVE SAMPLE N/A N/A N/A 4 0 1		21 TOTAL CORE RECOVERY N/A			
22 DISPOSITION OF HOLE Backfill using bentonite w/bentonite N/A		23 SIGNATURE OF INSPECTOR Gary Neutzling			
LOCATION SKETCH/COMMENTS and gross plot 2/26/14 COC #: LE02272014-01H SCALE: None					

Recorded By G. Neutzling Date 2/26/14 QA By [Signature] Date 2-27-14

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER 131 FPS
SVP164075

98

PROJECT: Coldwater Creek		INSPECTOR: G. Neutzling		SHEET 2 of 2				
USCS	Depth (ft bgs)	Description of Materials	449 NAI	PID	Recovery	Analytical Sample	Blow Counts	Remarks
	1	SILT, brown, some very fine sand, little clay, low plasticity, moist - ML	51/5638	-	-	SVP164075 1127	-	Silt
	2		53/5726	-	-	1129	-	
	3		50/6104	-	-	1131	-	
	4		53/6146	-	-	SVP164076 1133	-	
	5		48/5935	-	-	1137	-	
	6		57/6123	-	-	1139	-	
	7		64/5946	-	-	SVP164077 1141	-	>2x
	8		50/6170	-	-	1142	-	
	9		46/5768	-	-	1145	-	same silt
	10		47/6035	-	-	1147	-	
	11		52/5994	-	-	1151	-	
	12		67/6343	-	-	SVP164078 1150	-	>2x
	13		58/5878	-	-	1200	-	encountered piece of VGP.
	14	Borehole terminated						soil

Recorded By G. Neutzling Date 2/26/14 QA By [Signature] Date 2-27-14