

Spring 2012

XRF and the Corrosion Environment at Camp Lawton: A Comprehensive Study of the Archeological Microenvironment of a Civil War Prison Camp

Amanda L. Morrow

Follow this and additional works at: <https://digitalcommons.georgiasouthern.edu/etd>



Part of the [Archaeological Anthropology Commons](#), [Military History Commons](#), [Other Anthropology Commons](#), [Social and Cultural Anthropology Commons](#), and the [United States History Commons](#)

Recommended Citation

Morrow, Amanda L., "XRF and the Corrosion Environment at Camp Lawton: A Comprehensive Study of the Archeological Microenvironment of a Civil War Prison Camp" (2012). *Electronic Theses and Dissertations*. 1007.
<https://digitalcommons.georgiasouthern.edu/etd/1007>

This thesis (open access) is brought to you for free and open access by the Graduate Studies, Jack N. Averitt College of at Digital Commons@Georgia Southern. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of Digital Commons@Georgia Southern. For more information, please contact digitalcommons@georgiasouthern.edu.

XRF AND THE CORROSION ENVIRONMENT AT CAMP LAWTON:
A COMPREHENSIVE STUDY OF THE ARCHEOLOGICAL
MICROENVIRONMENT OF A CIVIL WAR PRISON CAMP

by

AMANDA L. MORROW

(Under the Direction of Sue M. Moore)

ABSTRACT

Handheld X Ray Fluorescence (XRF) technology is a new and emerging method in the field of archeology. This thesis discusses the results of XRF comparative analysis and comparative chemical analysis between a given ferrous metallic artifact's corrosion environment (the surrounding soil matrix) and the subsequent corrosion products formed on the artifact. The hypothesis is that the data will demonstrate a chemical correlation between the two. Iron and chlorine are the two major elements discussed in the study. The artifacts in the sample set have been collected from Camp Lawton (9JS1), a Confederate Prison for Union Soldiers located in Millen, GA that dates to late 1864.

INDEX WORDS: XRF, X ray, Iron, Corrosion, Conservation, Metal detection, Civil War, Prison, Confederacy, Millen, Camp Lawton, Archeology, Chlorides

XRF AND THE CORROSION ENVIRONMENT AT CAMP LAWTON:
A COMPREHENSIVE STUDY OF THE ARCHEOLOGICAL
MICROENVIRONMENT OF A CIVIL WAR PRISON CAMP

by

AMANDA L. MORROW

B.A., GEORGIA SOUTHERN UNIVERSITY, 2010

A Thesis Submitted to the Graduate Faculty of Georgia Southern University in Partial

Fulfillment

of the Requirements for the Degree

MASTER OF ARTS IN SOCIAL SCIENCE

STATESBORO, GEORGIA

2012

© 2012

AMANDA L. MORROW

All Rights Reserved

XRF AND THE CORROSION ENVIRONMENT AT CAMP LAWTON:
A COMPREHENSIVE STUDY OF THE ARCHEOLOGICAL
MICROENVIRONMENT OF A CIVIL WAR PRISON CAMP

by

AMANDA L. MORROW

Major Professor: Sue M. Moore
Committee: Peggy Hargis
Robert Shanafelt

Electronic Version Approved:
May 2012

DEDICATION

This work is dedicated to the memory of my grandparents, Jack and June Keet.

I know they are proud of me.

ACKNOWLEDGMENTS

I would like to extend a sincere and profound thanks to my colleagues and professors at Georgia Southern University, especially Dr. Sue Moore, Kevin Chapman and Matt Newberry. Without their love and support, I surely would have given up long ago.

I am also appreciative of the assistance and cooperation from Innov-x Technologies, the Georgia Department of Natural Resources and the U.S. Fish and Wildlife Service.

TABLE OF CONTENTS

LIST OF TABLES	10
LIST OF FIGURES	11
PREFACE	13
CHAPTER 1: METHODOLOGICAL AND ANALYTICAL REVIEW.....	15
Introduction.....	15
The Corrosion Process.....	17
The Corrosion Environment.....	18
Soil Types Specific to this Research.....	22
Methods of Investigation.....	23
Metal Detection.....	23
X Ray Floresence (XRF) Spectral Analysis.....	26
Wet Chemical Analysis.....	30
CHAPTER 2: HISTORICAL BACKGROUND	33
Archeology of Civil War Prisons in Georgia.....	33
Camp Sumter at Andersonville.....	33
Camp Lawton.....	36
Magnolia Springs State Park.....	37
Bo Ginn National Fish Hatchery.....	38
History Monographs concerning Civil War Prisons.....	39
CHAPTER 3: A BREIF HISTORY OF CAMP LAWTON, A CONFEDERATE PRISON	45
Overview.....	45
Historiography.....	45

<i>The Official Record of the War of the Rebellion</i>	48
A New Prison Site is Sorely Needed.....	48
Construction of the “World’s Largest Prison”.....	49
Abandonment and Aftermath.....	52
Review of Selected Personal Accounts of the Prison.....	53
The Accounts.....	54
Proof or Propaganda? POW Experiences in American Memory...57	
What Archeologists Can Learn.....	60
Land Use at the Site.....	62
Nineteenth Century.....	62
Twentieth Century.....	70
Millen Fish Hatchery.....	71
Magnolia Springs State Park.....	72
Conclusion.....	76
CHAPTER 4 DATA AND METHODS	77
Introduction.....	77
Excavation Methods.....	78
XRF Testing Methods.....	80
XRF in the Field.....	80
XRF in the Laboratory.....	82
Chemical Testing Methods.....	84
Testing for Chloride Ions.....	84

Testing for Free Ferrous Ions.....	85
Testing for Hydronium Ions.....	86
Data.....	87
CHAPTER 5: FINDINGS AND ANALYSIS.....	90
Findings.....	90
Discussion.....	94
Statistical Support for XRF Hypothesis.....	94
pH and Reduction Potential.....	96
What the Chemical Analysis Means.....	97
A Closer Look at Nail Specimens Analyzed.....	100
Conclusion.....	101
CONCLUSION	103
REFERENCES	105
APPENDIX A: HISTORIC PLATS AND MAPS OF THE PROJECT AREA	110
APPENDIX B: XRF SPECTRAL GRAPHS.....	132
APPENDIX C: ARTIFACT DATA.....	159
APPENDIX D: ABBREVIATIONS USED IN TEXT	173

LIST OF TABLES

Table 1: Camp Lawton Chain of Title64

LIST OF FIGURES

Figure 1: Pourbaix Diagram	20
Figure 2: Iron Spoon.....	22
Figure 3: USDA Soil Survey Map.....	22
Figure 4: Metal Detector Diagram.....	25
Figure 5: Atom.....	29
Figure 6: Winder’s Plan of Camp Lawton.....	51
Figure 7: Sneden’s Plan of Camp Lawton.....	61
Figure 8: George Hack Plat Overlay	66
Figure 9: Nancy Brinson Plat Overlay	67
Figure 10: J.T. Reeves Plat Overlay	68
Figure 11: Jenkins County Map Overlay.....	70
Figure 12: Fish Hatchery Plat Overlay.....	72
Figure 13: MSSP Plat Overlay	73
Figure 14: CCC Map Overlay	75
Figure 15: Metal Detection Map	78
Figure 16: Railroad Spike In Situ.....	80
Figure 17: XRF In Situ.....	82
Figure 18: Lab Testing with XRF.....	83
Figure 19: Test Tube with Chlorides	85
Figure 20: Dipyriddy Test Strip.....	86
Figure 21: pH Testing.....	87
Figure 22: XRF Spectral Curve.....	88
Figure 23: Chloride Graph.....	89

Figure 24: Enlarged Spectral Graph	90
Figure 25: Corrosion Process Diagram.....	91
Figure 26: Chloride Graph.....	93
Figure 27: III Corps Badge.....	94
Figure 28: Shaded Pourbaix Diagram.....	97
Figure 29: Chloride Weeping.....	99

PREFACE

Metal fascinates me. The way it flows, the way it shines; it can be crude or it can be beautiful. When I was small, I hoarded like a magpie various metal objects such as funny-shaped coins or keys because to me they seemed real and permanent. In human cultures throughout history and prehistory, metal objects lend power or prestige and wealth to those who own them. Metal items carry an intrinsic value because of what they are made from. Archeologically, metal artifacts are good indicators of time period and use history of a site. The artifact assemblage at a military site is usually almost exclusively made up of metal components.

Camp Lawton (9JS1) is a military site, dating to 1864 at the tail end of the American Civil War. More specifically, it is a military prison stockade constructed to hold Union army prisoners of war deep in the heart of the Confederacy. When my colleague Kevin Chapman began preliminary excavations at Camp Lawton in 2010, he did not expect to recover very many period artifacts at all. It was assumed that the site of the prison had been looted out over the years like any other unprotected Civil War era site would have been. As it turns out, this was not the case.

Suddenly, the archeology lab at Georgia Southern was tasked with curating a massive amount of metal artifacts. I became a graduate student in the program in May, 2010 - just in time to help. I went into the Masters of Arts in Social Science (MASS) program at Georgia Southern wanting to work on a Civil War era site and wanting to study metallic corrosion and conservation. It occurred to me that the soil in which an artifact corroded in was a valuable piece of evidence and a part of the archeological story

of the site. Marine archeologists acquire samples of seawater to assist with their corrosion studies, why shouldn't terrestrial archeologists recover soil matrix for the same reason?

I began formulating a research question and a way to study the interaction between a metal artifact and its environment. I chose to study iron artifacts exclusively for two reasons: iron often corrodes more dramatically than other metals do and iron also forms less of a variety of corrosion products than other metals do. In essence, it was both easier and more pressing to study. I hypothesized that a chemical relationship existed between the corrosion products formed on an iron artifact and the soil matrix that artifact corroded in. Furthermore, that the chemical relationship could be demonstrated through various tests and the extent of that relationship used to gauge the condition of the artifact and the immediate level of need for conservation treatment. In turn, the testing of a small sample of artifacts or soil from the site could be used as a model to plan for larger conservation efforts as the excavations at a site continue.

To that end, I applied for a grant for essential X ray Fluorescence equipment and read vast amounts of dense chemical text. I attended an international conference in Charleston specifically dealing with metallic corrosion in archeological contexts. I worked for months to plan how to collect my data and test my hypotheses. All of the preparation culminated in a couple weeks of fieldwork collecting data on iron artifacts at Camp Lawton. Afterwards began the weeks of lab testing and the synthesis of the data. I feel like every little aspect of my graduate school experience was working towards this end and helped me refine my focus and determine exactly what to do. I am proud of this research and earnestly hope that the reader benefits from my actions as much as I did.

CHAPTER 1

METHODOLOGICAL AND ANALYTICAL REVIEW

Introduction

“Corrosion is the destructive attack of a metal by chemical or electrochemical reaction with its environment” (Lower, 2004, p. 33). The job of a conservator is to halt the corrosion process and to stabilize the metal artifact for storage or display.

Conservation, “the preservation and elucidation of artifacts from excavations,” and archeology have long gone hand in hand (Cronyn, 1990, p. 1). Conservation also represents a large part of the time and cost associated with post-excavation lab work; however without it much information is lost forever (Cronyn, 1990). Ethically, conservation is a preemptive measure to ensure that excavated artifacts survive in collections so that future scientists may avail themselves of the resource. Prior to any excavation, it is the responsibility of the project leader to provide for conservation facilities for any artifacts recovered (Hamilton, 1999). There is also the question of conservation versus restoration: essentially, how far does conservation go before it becomes restoration?

Restoration removes all traces of corrosion and indeed all evidence that the cultural object was even buried in the first place, whereas conservation merely halts all further damage (Hamilton, 1999). Corrosion products and even soil associated with archeological finds contain valuable information for a conservator and should be maintained as provenience along with the artifact. Corrosion layers can contain valuable archeological data due to the slow manner in which they form (Hamilton, 1999).

Removal, versus stabilization, of the corrosion layer is a decision that must be made while taking all aspects of the artifact into account. The corrosion may be protective or aesthetically pleasing, and thus worthy of preservation. Bronzes, for instance, develop desirable patinas over time. Additionally, if the artifact is extremely degraded, removal of the corrosion can be very damaging (Plenderleith & Werner, 1971).

The condition of any artifact upon excavation depends on its material composition and also the environment in which it was buried (Plenderleith & Werner, 1971; Cronyn, 1990). Iron is one of the most common materials excavated at both marine and terrestrial historic sites and also presents the most challenges for conservation (Hamilton, 1999). A conservator must be aware of the chemical nature of corrosion products that formed on a given artifact before attempting to provide treatment (Hamilton, 1999). While all materials are subject to deterioration over time, ferrous artifacts are more unstable than non-ferrous artifacts and may require more aggressive forms of treatment (Cronyn, 1990). The “conservation of iron objects... is notoriously difficult and inclined to be unrewarding” (Western, 1972, p. 83). The ethical duty of the conservator is essentially, then, artifact stabilization with the intent to retain as much data as possible (Hamilton, 1999). By conducting a specialized study of the soil matrix it should be possible, by demonstrating the presence of specific chemical hallmarks, to determine the average preservation state of iron artifacts in an undisturbed context prior to conducting any excavations. This research tests that hypothesis based on the chemical parameters discussed below.

The Corrosion Process

Corrosion, the “deterioration of materials by chemical processes” is one of the biggest dangers to buried archeological objects (Lower, 2004, p. 32). On paper, the oxidation process is deceptively simple and can be described by the following general equation illustrating the loss of an electron:



where M can be any metal as long as the material is in the presence of an electron acceptor (Lower, 2004). Oxygen is one of the most common electron acceptors but hydrogen and even the cations of “noble” metals, like bronze, can stimulate the corrosion process in baser metals such as iron (Lower, 2004). For example, iron nails coated with zinc will last longer because the zinc will preferentially corrode instead of the iron because iron is more “noble” than zinc and will remain negatively charged (Lower, 2004). In this case, the zinc is used as a sacrificial anode while the iron enjoys cathodic protection (Lower, 2004). The anode is where the corrosion process removes material and electrons and the cathode is where the corrosion process deposits material and electrons (Lower, 2004). Metal artifacts, being conductive unto themselves, exhibit both anodic and cathodic locations upon their surfaces (Lower, 2004). Electrons always flow from anodic regions to cathodic regions and in this way an artifact corroding in soil (where it is naturally in the presence of an electrolyte except in the most arid or anoxic conditions) becomes a simple electrochemical cell (Lower, 2004).

The oxidation of pure iron can be illustrated by the following equations:





(Selwyn, Sirois & Argyropoulos, 1999). Again, since this is an electrochemical process, there must be an accompanying reduction reaction, which for most terrestrial sites will be an oxygen reduction (Selwyn et al., 1999). Immediately after inhumation, anodic and cathodic sites can be located on the surface of the artifact (Selwyn et al., 1999). As corrosion continues, however, and the anodic regions continue to deteriorate, the corrosion process itself begins to slow down as the artifact attains a state of equilibrium with its environment (Selwyn et al., 1999).

The Corrosion Environment

“The preservation of antiquities should produce objects that are chemically stable with an aesthetically acceptable appearance,” (Hamilton, 1999). Chemical stability is an essential goal to meet because otherwise artifacts would continue to corrode post-excavation. Artifacts that remain buried for a great deal of time under constant conditions “attain a state of equilibrium with their surroundings,” (Plenderleith & Werner, 1971, p. 2; Cronyn, 1990). This equilibrium can either be a state of complete preservation or a state of complete corrosion, however usually it falls somewhere in between (Cronyn, 1990). Upon excavation, the conditions of course change and the artifact is subject to even further decline (Plenderleith & Werner, 1971). In fact, the time period in which an artifact is at its most vulnerable to deterioration is immediately post-excavation (Cronyn, 1990). Relative humidity, pH and temperature are all factors which can negatively affect the corrosion potential of a given artifact.

Archeologists should collect samples of the soil matrix surrounding artifacts for lab analysis with care taken so as to not contaminate samples between stratigraphic layers (Vogel, 2002). The nature of the soil may either slow or accelerate the corrosion process, depending on the metal comprising the artifact (Plenderleith & Werner, 1971). Collecting data on the corrosion environment provides archeologists with insight about how a given artifact corroded and under what conditions. Some environments have a higher corrosion potential than others based on the pH, the presence of organics, moisture content and oxygen content (Cronyn, 1990). pH (acid vs. alkalinity) is a measure of the concentration of hydrogen ions (H^+) present in a sample (Cronyn, 1990). Determining the pH level in the soil matrix is essential for determining the corrosive potential of the environment (Hough, 1930). Acid and alkaline soils will produce different corrosion products, so with knowledge of the corrosion environment comes a starting point for what treatments to apply. Generally, the pH of soil containing artifact deposits is not extreme but every little change in the pH balance will affect the corrosion potential to some degree (Cronyn, 1990) (See Figure 1). Some corrosive elements present in the soil can also increase the rate at which iron degrades- most notably chlorine and sulfur. In terrestrial environments, sulfur becomes a problem in anaerobic conditions while chlorine can be more of an issue in well-aerated soils (Hamilton, 1999; Plenderleith & Werner, 1971).

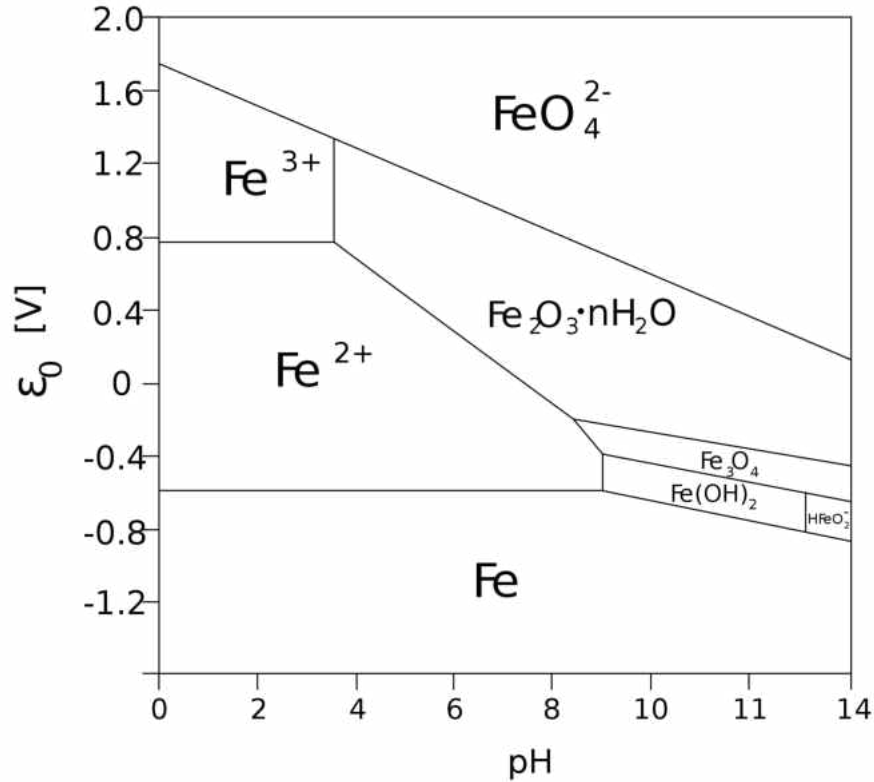


Figure 1. This is a Pourbaix diagram showing the relationship between pH and reduction potential and the ensuing iron reactions that occur.

The reduction potential of a given site directly influences the corrosion process and the stability of certain chemical compounds and elements (Cronyn, 1990). Reduction potential is noted as E_H in equations and scientific formulas (Cronyn, 1990). The *higher* the reduction potential of the soil, the quicker iron artifacts reach the completely oxidized state of $Fe(III)^+$ (ferric ions) (Cronyn, 1990). Correspondingly, lower reduction potentials allow for the continued presence of $Fe(II)^+$ ferrous ions, or at least slow the oxidation process to $Fe(III)^+$ (Cronyn, 1990). pH and E_H are extremely interrelated and demonstrate a strong negative correlation in theoretical scenarios (See Figure 1) (Cronyn, 1990).

Along with acidity and reduction potential, the presence of salt in the corrosion environment can also increase the rate of corrosion (Plenderleith & Werner, 1971). Salts are compounds formed by the interaction of acids and bases and have names like calcium carbonate (CaCO_3) or sodium chloride (NaCl) (Cronyn, 1990). Salts are very damaging to metals and make up the bulk of reagents in corrosion products (Plenderleith & Werner, 1971). The more porous a metal artifact becomes the more salts it retains and thus the longer it takes to treat. The desalination process is the first step in conserving a metal artifact whether it is from a terrestrial site or a marine site (Hamilton, 1999). When soluble salts (sodium salts are some of the most highly soluble) crystallize as moisture evaporates, they increase in volume. When this process occurs inside a porous artifact, the results can be catastrophic (Cronyn, 1990). Post-excavation damage from chloride contamination often forms a compound called akaganéite which appears as weeping on the surface of an artifact (See Figure 2) (Selwyn et al., 1999). The compound is highly acidic, contains high levels of chlorides and free Fe (II)^+ ferrous ions and contributes to further deterioration of artifacts in storage unless the chlorides are removed and the pH balanced (Selwyn et al., 1999). Despite all this, the single most important factor to consider when dealing with salts is their capacity for carrying a charge. In solution, they serve as electrolytes and contribute drastically to the electrochemical corrosion of metals (Cronyn, 1990).



Figure 2. This close up image of an iron spoon excavated from Camp Lawton illustrates the chloride weeping phenomenon.

Soil Types Specific to this Research

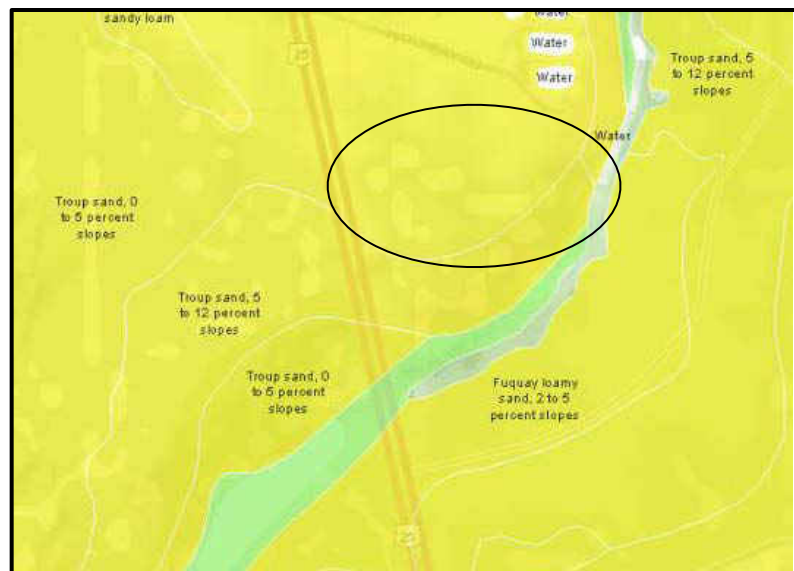


Figure 3. USDA Soil Survey Map. Project Area is roughly circled.

Soil, “the natural body comprised of solids... liquids and gases that occurs on the land surface,” is an essential piece of archeological context and a valuable clue to the condition of the corrosion environment (United States Department of Agriculture [USDA], 2003, p. 9). Archeologically, it is usually referred to as a “matrix” made up of geological, biological and cultural deposits. Camp Lawton, 9JS1, located in Jenkins County, Georgia is made up of several different soil types in the Ultisol family (See Figure 3). The specific project area is comprised of Troup Sand, a grossarenic kandiuult (USDA, 2010; USDA, 2003). This basically means that it is sand, with a large grain size and a high motility/low carrying capacity for fluids. In other words- it is a loose, sandy, mildly loamy soil that is well-aerated with good drainage (USDA, online). The project area has between 0-12% slopes and is covered mainly by pine forest but also exhibits some open grassland (USDA, 2010).

Methods of Investigation

Metal Detection

Remote sensing applications in archeology have enjoyed a boon in recent years as the equipment becomes more accessible and more students are trained to use these technologies. Metal detectors are a very affordable 'instant gratification' form of remote sensing, yet their stigma as the ‘tool of the looter’ still inhibits wider acceptance of their use from the archeological community (Connor & Scott, 1998). However it is important for archeologists to remember that the popular misuse of a tool does not preclude the functionality of the tool itself (Gregory & Rogerson, 1984). Metal detectors can be an

invaluable survey tool for sites where an abundance of metal artifacts is expected, for example a military site (Connor & Scott, 1998). They are also extremely useful for recovering data from disturbed strata, often called the 'plow zone' (Gregory & Rogerson, 1984). Metal detectors may be systematically used in conjunction with traditional shovel testing survey methods to assist in delineating the metallic debris boundary, detecting buried caches, and even outlining structural remains (Connor & Scott, 1998). A major advantage of metal detectors over visual survey techniques is how they can help uncover sites that no longer have any remaining surface features, again like ephemeral military sites (Connor & Scott, 1998). It is also possible to conduct a completely non-invasive survey of a site by leaving metal detection 'hits' marked, but un-excavated (Connor & Scott, 1998). In this way, the metallic artifact distribution can be generally anticipated and more efficient plans can be made for wider excavation of the site.

Metal detectors all generally work the same way and contain the same general components (search coil, control housing, handle) (Connor & Scott, 1998). The search coil (or antenna) comes in different sizes/diameters and is usually interchangeable between detectors of the same manufacturer (Connor & Scott, 1998). Larger coils can penetrate deeper into the subsurface, however smaller coils are more effective at pinpointing artifacts (Connor & Scott, 1998). The coil works by generating a roughly conical electromagnetic field, usually from both sides of the head (See Figure 4) (Connor & Scott, 1998). The field generates eddy currents which circulate around objects in the ground that conduct electricity, for instance an iron artifact (Connor & Scott, 1998).



Figure 4. This diagram shows the interaction of electromagnetic currents emitted by the detector head with an artifact in situ.

Because of the different electromagnetic currents produced by different types of metals in the ground, some detectors have a built-in discriminator to eliminate readings for certain targets (Connor & Scott, 1998). But for an archeological research survey, the intentional elimination of any potential archeological target would be unwarranted (Connor & Scott, 1998). These same electromagnetic properties are also present in highly mineralized soils and a properly tuned instrument is essential for obtaining accurate readings (Connor & Scott, 1998). Like any other survey technique, the more experience the operator has the better the results and the quicker they are obtained (Connor & Scott,

1998). Poor working methods with a high-end detector will not outshine good working methods and a lower-end model (Gregory & Rogerson, 1984).

A systematic metal detection survey should be conducted along linear transects oriented in a logical way (Connor & Scott, 1998). The operator should make smooth, overlapping sweeps along the chosen transects with the metal detector while holding the coil as close to the ground and as level as possible (Connor & Scott, 1998). When multiple targets present in the same localized area, it may be necessary to conduct further sweeps in order to collect all of them (Connor & Scott, 1998). It is good practice to mark ferrous and non-ferrous hits with different colored flags (Gregory & Rogerson, 1984). Usual excavation procedure is to trowel away the overburden until the artifact appears without laying out formal excavation units (Connor & Scott, 1998). This allows a metal detection survey to be much faster and more cost effective than a block excavation, for example, with similar returns on artifact count (Connor & Scott, 1998). When working on a military site especially, the advantages of efficiency when conducting a metal detection survey pay huge dividends in time and in specimen collection (Gregory & Rogerson, 1984).

X Ray Florescence (XRF) Spectral Analysis

X rays are a short wavelength type of electromagnetic radiation located on the spectrum between gamma rays and ultraviolet radiation (Shackley, 2011). German physicist Wilhelm K. Röntgen was the first to discover x rays in 1895 and won the Nobel Prize for his efforts in 1901 (Innov-x, 2009; Shackley, 2011). The first scientist to make the connection that x rays could be used to distinguish elements by atomic number was

Charles Barkla in 1909 (Shackley, 2011). This theory was put into practice several years later when the modern numbering of the periodic table was completed with the help of Henry Moseley in 1913 (Shackley, 2011). Moseley published his research for identifying and quantifying elements with x ray technology that same year (Innov-x, 2009).

The first commercially available models of XRF hit the market in the early 1950's (Innov-x, 2009). These were huge, bulky units that cost a great deal and required very specialized technicians for operation (Innov-x, 2009). These early instruments used a technology called Wavelength Dispersive XRF which had the unfortunate limitation of only being able to analyze the concentration of one pre-programmed element at a time via a specialized crystal array (Innov-x, 2009; Shackley, 2011). The next class of instruments, known as Energy Dispersive XRF came about in the late 1960's and early 1970's (Innov-x, 2009; Shackley, 2011). These machines had the potential to measure the entire elemental spectrum simultaneously, but actually doing so still remained difficult due to the limitations of the individual radioisotopes employed in the process (Innov-x, 2009; Shackley, 2011). Modern XRF analyzers use specialized x ray tubes for excitation rather than actual radioactive material (Innov-x, 2009).

The newest models taking the stage for XRF technology are the portable or handheld models of XRF (pXRF) and this is the particular type of analyzer employed in this study. These instruments are touted as being easy to use with a fast turnaround time for results (Innov-x, 2009). They are indeed very easy to *operate*, most employ a simple trigger system, and results of tests can be obtained on-screen in as little as thirty seconds. However it is very important for archeologists interested in taking advantage of the

technology to realize that these analyzers are *not* calibrated out of the box, even if the manufacturer claims otherwise (Shackley, 2011). It is possible for the end-user to run the calibration protocol, and models of handheld XRF from Innov-x include national standards meant for calibration purposes, but the process itself is daunting, to say the least (Innov-x, 2009). An un-calibrated instrument would be acceptable for a completely qualitative study or for direct comparison of samples within the same lab, but these results would never be relevant to the scientific community at large (Shackley, 2011).

Despite producing radioactivity, pXRF is a very safe technology. Models from Innov-x have a red indicator LED on the top of the housing which flashes when the x ray is engaged (Innov-x, 2009). Additionally, settings can be enabled which require constant pressure on the trigger to continue engaging the x ray (Innov-x, 2009). As a final fail-safe, the x ray beam will shut off if sensors detect open space over the analyzer window rather than a test sample (Innov-x, 2009). Additionally, because of the use of x ray tubes rather than radioisotopes, there is no risk of contamination even in the event the analyzer is damaged (Innov-x, 2009).

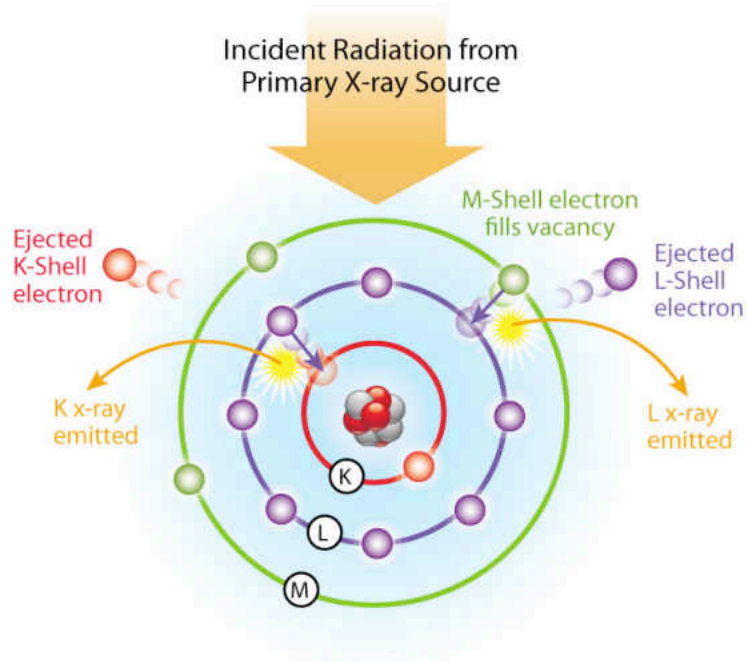


Figure 5. This diagram demonstrates the shifting of electrons that causes fluorescence, in this example aluminum is used. The orbital designations *K*, *L* and *M* represent distinct energy levels of electron shells. (Tawada Scientific, 2011).

X ray fluorescence spectrometry is a completely non-destructive method for revealing the elemental makeup of an artifact (Shackley, 2011). Almost no sample preparation is needed and tests can generate either quantitative or qualitative results (Shackley, 2011). It works by bombarding the sample to be tested with high-energy primary x ray photons (See Figure 5) (Innov-x, 2009). This causes the atoms making up the test sample to become ionized (Shackley, 2011). The photons knock electrons out of orbit in the innermost shells of the bombarded atoms, where the highest amount of energy is located (Innov-x, 2009; Shackley, 2011). To re-stabilize the atom, an electron from one of the outer orbital shells moves down into the empty space at the inner shell and while

doing so emits what is called a secondary x ray photon, also known as fluorescence or florescent radiation (Innov-x, 2009; Shackley, 2011). The energy is released because the nucleus of the atom has a tighter hold on inner orbital electrons than outer orbital electrons (Shackley, 2011). Each element has a specific fluorescence and these secondary emissions are what the analyzer reads to determine elemental composition and relative concentrations of those elements in the tested sample based on the intensity of the florescent radiation (Innov-x, 2009; Shackley, 2011). Because the atom will only fluoresce if it has at least three electron shells, the XRF process is completely inappropriate for detecting extremely light elements such as Hydrogen or Oxygen (Innov-x, 2009).

Wet Chemical Analysis

There are two laboratory methods known to conservation literature to qualitatively detect chlorides in artifacts that rely on chemical reactions. Silver nitrate (AgNO_3) is the most commonly used reagent for determining chloride concentrations, but unfortunately produces only ranged relative concentration levels as continuous data (Hamilton, 1999; Plenderleith & Werner, 1971). Samples that test positive for chloride form a white precipitate in the test tube at various levels of opacity (Hamilton, 1999; Plenderleith & Werner, 1971; Riss, 1993). These test samples may be compared against prepared, known dilutions of chloride at concentrations of 1, 10, 50 and 100 parts per million (ppm) (Riss, 1993). It is extremely important to use absolutely clean glassware to avoid contaminating the test sample (Hamilton, 1999). This method may be used to test the alkaline soak intended to remove chlorides from excavated artifacts or for testing the

level of contamination prior to conducting any treatment (Riss, 1993). Another method, mercuric nitrate [$\text{Hg}(\text{NO}_3)_2$], provides more discrete concentrations of chlorides at low ppm levels, but is a much more difficult and costly test to conduct, and the required reagents are more hazardous than for the silver nitrate test (Hamilton, 1999).

The silver nitrate test requires a sample of 10-20 ml of artifact bathwater, either from an alkaline soak treatment or from leaving untreated artifacts overnight in distilled water, in a clean test tube (Riss, 1993; Hamilton, 1999). The next step is to add several drops of a 10% dilution of nitric acid (HNO_3) plus several drops of a 5% aqueous solution of silver nitrate (AgNO_3) (Riss, 1993; Hamilton, 1999). These reagents will cause a white precipitate to form in the presence of chlorides; however the effect may be very slight if the concentration is very low (Riss, 1993). It is recommended to hold the test tube against a strong sidelight over a dark background to avoid misinterpreting results (Riss, 1993). This method is always accurate if preformed with clean utensils and is extremely sensitive for low levels of chloride concentration; however levels above 250 ppm are indistinguishable from one another (Riss, 1993).

As stated earlier, soil pH is an extremely important factor to consider with regards to the preservation of archeological metals; iron in particular (Matthiesen, 2004). A portion of this thesis involves testing soils for pH in an effort to form a predictive model for the average preservation state of iron artifacts prior to excavation. A similar effort made by Claire Gordon and Jane Buikstra was published in *American Antiquity* in 1981, except they examined the preservation of human remains instead. Gordon notes that while everyone recognizes the relationship between bone preservation and pH, nobody

has really attempted to conduct a study with the intention of producing a predictive model for deterioration (Gordon & Buikstra, 1981, p. 566). Their study overwhelmingly found that the lowest pH levels of the soil (higher acidity) yielded almost no preservation whatsoever while neutral to alkaline states contributed towards better osseous preservation (Gordon & Buikstra, 1981).

Soils may be tested for pH in situ or in the lab as a prepared sample (Matthiesen, 2004). In situ testing must be conducted with an electrode-type meter capable of taking direct readings (Matthiesen, 2004). Prepared lab samples are tested as a combination of soil and distilled water and can be examined with a soil electrode or a standard meter (Matthiesen, 2004). The same samples analyzed through both methods tend to provide results that correspond well enough within a standard measure of error (Matthiesen, 2004).

As stated above, reduction potential interacts with pH to directly influence the corrosion environments and which types of corrosion products may form. The chemical α, α' -dipyridyl is used to determine the reduction potential of soil through chemical testing. The solution, when sprayed directly on a freshly cut soil profile, turns red or pink in the presence of soluble ferrous Fe (II)^+ ions (Childs, 1981). The liquid test has fallen out of common use mainly due to the high toxicity of the α, α' -dipyridyl and the fact that the solution must be freshly made up with acetic acid each time (Childs, 1981). For this research, completely safe to handle paper test strips were used instead of a liquid solution.

CHAPTER 2

HISTORICAL BACKGROUND

Archeology of Civil War Prisons in Georgia

The Confederacy erected two major prison sites in Georgia in 1864: Camp Sumter at Andersonville and Camp Lawton at Millen. The bulk of this thesis concerns fieldwork and analysis conducted at Camp Lawton. It is appropriate, however, to briefly describe archeological efforts at the similar site of Andersonville and previous archeological ventures at Camp Lawton itself.

Camp Sumter at Andersonville

Congress established the Andersonville National Historic Site (ANHS) under National Park Service (NPS) jurisdiction on June 30, 1971 (Bearss, 1970). The first result of the NPS proposal *ANDE-H-1* was a report on the historical baseline of the camp by NPS historian Edwin Bearss. He gathered all the documentary evidence available including maps, photographs and primary accounts of prison life (Bearss, 1970). The report mainly focused on loci that might leave archeological features behind, such as the stockade itself, other support structures and prisoner huts (Bearss, 1970). Importantly, Bearss' report also covers events that took place after the Civil War era occupation that might have left archeological evidence behind and even includes eyewitness descriptions of the condition of the site through the end of the 19th century. Bearss concludes by recommending archeological investigations to verify the locations of historical structures discussed in his report and to provide information to aid in reconstructing the site.

Following Bearss' report, University of West Georgia archeologists Lewis Larson and Ray Crook conducted the first archeological investigations in 1973-1974 (1975). They determined that ANHS contained both historic and prehistoric remains with the historic remains dating primarily to the Civil War (Larson & Crook, 1975). Larson and Crook (1975) recorded several potential archeological features including portions of the outer and inner stockade walls and the north gate. In 1978, Southeast Archeological Center (SEAC) archeologist Ellen Ehrenhard began investigations where she uncovered additional stockade features in the southern portion of the prison along with the south gate, a hospital and Captain Wirz's office (Paglione, 1984). A report was never completed for this fieldwork, unfortunately (Prentice, personal communication, 2012). Ehrenhard also tested one prehistoric site on ANHS property. The assemblage included artifacts ranging from the Paleo-Indian period up until the late Woodland period (Paglione, 1984).

In 1984, SEAC archeologist Teresa Paglione conducted an archeological survey on a tract of land adjacent to the prison site that NPS was considering for disposal. She recommended that NPS retain the parcel because of the relationship the land has with the prison itself and Andersonville National Cemetery and also because of the presence of the Old Dixie Highway running through the tract (Paglione, 1984). In July of 1985, SEAC archeologists conducted a soil resistivity survey of the potential hospital area delineated by Ehrenhard in 1978 (Marrinan & Wild, 1985). Projections for the location of the hospital came from Bearss' original report (1970) and from the recommendations of Ehrenhard (Marrinan & Wild, 1985). They concluded that resistivity was not the ideal remote sensing technique for the sandy soils inherent to ANHS (Marrinan & Wild, 1985).

The second phase of archeological investigations at ANHS by SEAC archeologists began with the spring 1989 field season (Prentice & Mathison, 1989). This was required as a result of a 1987 amendment issued by NPS which proposed building reconstructions of certain stockade features, including the gates and walls (Prentice & Mathison, 1989). The archeologists successfully identified the North Gate during this survey and found that it was constructed with squared posts set in a trench that averaged five feet deep (Prentice & Mathison, 1989). They also excavated the potential north gate area identified by Larson and Crook (1975), but this instead turned out to be the original wall feature (constructed before the prison was enlarged) along with some non-archeological features (Prentice & Mathison, 1989). The artifact assemblage included two iron ax heads and 19 cut nails along with food bone and a number of preserved wooden post samples (Prentice & Mathison, 1989). Extremely well-preserved posts were found in situ by the excavations which delineated the stockade wall from the gate (Prentice & Mathison, 1989).

SEAC archeologists also conducted field investigations in 1990 to locate and investigate the southeastern corner of the inner stockade for reconstruction (Prentice & Prentice, 1990). Post preservation for this area of the stockade was surprisingly poor, which stood in stark contrast with the excellent post preservation noted the previous season (Prentice & Prentice, 1990). Two units from Ehrenhard's 1978 excavation were relocated during this field season (Prentice & Prentice, 1990). Generally the posts here appeared to be squared off like the corresponding northwest corner and main gate area (Prentice & Prentice, 1990). Visitors to the park today can enjoy the fruits of these

archeological labors as both the North Gate and the southeastern corner have been fully reconstructed for interpretation.

In June, 2005, the Georgia Department of Transportation (GDOT) conducted a ground penetrating radar survey (GPR) as part of a joint effort with NPS (Pomfret, 2005). The partnership between NPS and GDOT began in 2003 and a subsequent memorandum of understanding was signed in 2005 before the work at ANHS began (Pomfret, 2005). Their goal was to locate the South Gate, the Dead House and another hospital structure (Pomfret, 2005). The survey precisely identified the location of the South Gate but the other test areas provided only inconclusive evidence (Pomfret, 2005). The crew also conducted a GPR survey of Andersonville National Cemetery which showed that earlier POW graves at the site were dug individually and that it was only later in the occupation period that mass graves came into use (Pomfret, 2005).

Camp Lawton

The Confederacy built Camp Lawton towards the end of 1864 in order to relieve overcrowding at Andersonville. Not much archeological research had been conducted here prior to Georgia Southern University's involvement in 2009. Camp Lawton is also in the unique position of being partially located on state-owned land as Magnolia Springs State Park (MSSP) under the Georgia Department of Natural Resources (GADNR) and partially on federally-owned land as the Bo Ginn National Fish Hatchery under the United States Fish and Wildlife Service (USFWS), Department of the Interior (DOI).

Magnolia Springs State Park

During the planning phase for the widening of US 25/SR 121, New South Associates conducted archeological clearance surveys in the vicinity of Camp Lawton (Joseph, Loubser & Yallop, 1997). During these initial investigations, a feature on the western side of US 25 (on land owned by MSSP), was identified as a potential earthen fortification relating to the Civil War era occupation (Joseph et al., 1997). If construction proceeded according to plan, this potential feature would have been destroyed (Joseph et al., 1997). New South recommended testing of the feature with full mitigation if necessary (Joseph et al., 1997).

In June of 2000, New South returned to the site of the potential earthwork for field testing (Wheaton, 2000). They conducted a metal detection survey along the western side of US 25 where the suggested feature was located (Wheaton, 2000). The excavations yielded nothing but trash and 20th century remains (Wheaton, 2000). When they bisected the potential earthwork itself, the stratigraphy proved to be all wrong for an intentionally constructed earthen fortification and the archeologists concluded that the feature was a pushup pile from prior construction on US 25 (Wheaton, 2000). The archeologists of New South Associates felt that it was “unlikely that much remain[ed] at the Site 9JS1 in terms of archeological features and artifacts,” (Joseph, et al., 1997, p. 43).

Two different GPR surveys have been conducted at the site. GDOT, in conjunction with GADNR, conducted the first GPR survey in October of 2005 in an effort to locate the stockade wall (Patch, 2006). They outlined five survey areas, three located north of the creek (on the Bo Ginn National Fish Hatchery, which had been

temporarily under the control of GADNR) and two located south of the creek (on MSSP) (Patch, 2006). The two areas south of the creek presented with very promising linear features, but later excavations yielded inconclusive results (Patch, 2006; Elliot & Battle, 2010). Dan Elliot of the LAMAR Institute conducted the second GPR survey in 2009 (Elliot & Battle, 2010). A portion of this survey overlapped with the test areas on the MSSP side of the creek described in Patch (2006) (Elliot & Battle, 2010). A large, obvious, L-shaped feature appeared on the GPR scan and this has been interpreted as the corner of the stockade itself (Elliot & Battle, 2010). Georgia Southern University archeologists used this new information to open up new excavation trenches at MSSP in order to locate the potential wall features shown on the GPR scans (Elliot & Battle, 2010).

Bo Ginn National Fish Hatchery

Only one intensive archeological investigation had been conducted at the Bo Ginn National Fish Hatchery (then the Millen National Fish Hatchery) prior to Georgia Southern University's involvement with the site, a Cultural Resources Inventory Survey conducted in 1980 by Lesley Drucker with Carolina Archaeological Services. USFWS wanted to expand the hatchery ponds at the site and tested the potential impact area in compliance with Section 106 of the National Historic Preservation Act (Drucker, 1980). As a part of this survey, Drucker also tested some adjacent land owned by the Rayonier Timber Company to determine if there were any features located there that were related to Camp Lawton, and thus National Register eligible. Drucker laid in a series of 1/2 meter square test units on the western edge of the hatchery property parallel to US 25

(Drucker, 1980). All of these tests were negative for cultural remains and no sites were revealed this way (Drucker, 1980). Based on more recent archeological data, it is certain that all of these tests were located outside the perimeter of the stockade wall. Drucker recommended full-scale stripping of the top 15-20 cm of overburden for further archeological investigation of the hatchery in order to expose the remnants of features in the soil. Thankfully, this did not occur as more recent studies have revealed potentially intact shebang or hut features visible on the ground surface.

History Monographs concerning Civil War Prisons

Most libraries contain copious amounts of literature relating to the American Civil War. Everything from biographies to journals to regimental histories line the shelves. With regards to the sub-study of Civil War Prisons, three books come to mind first: *Civil War Prisons: A Study in War Psychology* (Hesseltine, 1930), *Portals to Hell* (Speer, 1995), and *While in the Hands of the Enemy: Military Prisons of the Civil War* (Sanders, 2005). Each one has a slightly different viewpoint on the intricate, complicated stories of internment on both sides of the seminal American conflict.

These three books represent the minority of monographs about Civil War Prisons in that they attempt to cover the entirety of the subject rather than focusing on a particular site. The first distinction that must be made between these books is one of argument: Hesseltine and Sanders both present arguments and frame them within the context of the stories of prisons on both sides during the Civil War. Speer refrains from presenting a core thesis statement (although he does allude to the arguments that others are making and generally implies that he follows Hesseltine) and mainly presents a collection of

anecdotal stories pulled from primary accounts intermingled with facts from official documents. Both approaches have their place in the historical discipline and serve to appeal to a wider selection of audiences. Speer's declarative style might be more suited for engaging the casual reader while Hesseltine's weighty narrative of a PhD. dissertation is justly appropriate for the realm of academe. Of the three, Sanders does the best job of placing the problems associated with the prison system on both sides within the larger context of the theater of war.

Proceeding chronologically, Hesseltine's dissertation (1930) obviously came first. He provides a narrative briefly describing the fashion in which POWs were treated in wars prior to the American Civil War and then continues into a discussion of the political climate between the North and the South during the early years of the war. He covers the development of the Dix-Hill Cartel for prisoner exchange and its eventual collapse and breakdown altogether, citing from official correspondence. The organization of Hesseltine's work sets a precedent for future monographs on the subject and the other two histories discussed here follow the same general pattern.

Hesseltine's overall thesis states that a "wartime psychosis" dictated the actions of Union officials in their treatment of their Confederate POWs and that a chronic disorganization on the part of the Confederacy affected how Union POWs were treated. In this sense it is both a revisionist history and an apologist history under the guise of true objectivity. According to Hesseltine, the "wartime psychosis" is an attitude that led the Union officials to withhold rations and supplies on the assumption that the same treatment was occurring in southern prisons. Essentially, it was a normal reaction of

aggressive/reciprocative behavior typical of human nature. This approach was novel for the time and considered to be scientific. In fact, the idea remained popular for the following several decades. The concept is reminiscent of the findings from the Stanford Prison Experiment of 1971, where students played roles as prisoners and guards and found themselves immersed in destructive, power-based relationships (Haney, Banks & Zimbardo, 1973).

The convenience of Hesseltine's thesis is that nobody needs to accept any blame for the prison tragedy. He consistently expresses a distaste for "tales about atrocities" published in Union POW survivor accounts after the war and the defensive publications by Davis and other Confederate officials. In his viewpoint, the Confederacy is blameless because they just really did not know any better. Likewise, the Union is also blameless because they were just succumbing to the human nature of "war psychosis." A good part of this obsessively neutral stance comes from an honest desire on Hesseltine's part for objectivity, but it comes off as just a little over-done. Essentially, Hesseltine is an apologist writing in an effort to not seem like an apologist.

Proceeding along the same lines, Speer (1995) does not choose to assign blame in *Portals to Hell*. Surprisingly, this next major work in the historiography of Civil War Prisons was not written by an academic historian and comes almost 70 years after Hesseltine's landmark publication. Speer weaves a detailed and interesting tale about all the major prison sites used on both sides during the war before and after the breakdown of exchange. Overall the book projects a very denotative, exacting tone and the reader is invited to accept the anecdotal stories as truthful representations of what occurred at the

various prison sites. Speer sympathizes with the prisoners on both sides and delights in sharing their stories of making the best of it, but these more enjoyable pieces are tempered by serious pages about the awful conditions and the suffering the prisoners endured. One must always use caution when employing primary accounts, especially prisoner diaries because they are often rife with bias, which given the situation is vastly understandable.

The most recent effort at an all-encompassing monograph is Sanders' *While in the Hands of the Enemy* (2005). Like Speer and Hesseltine, Sanders begins by setting up background information about previous war's handling of POWs and sets the stage for the problems the Confederacy and Union will have. He traces the continued worsening of the problem through the rise and fall of the prisoner exchange cartel and the apex of suffering in 1864. His focus is more macro than Speer and is mainly on the prison systems rather than a systematic review of all the prison sites. Like Hesseltine, Sanders has an argument to make within the pages of his book, but his thesis and Hesseltine's are almost completely at odds with one another. He argues that the Union and Confederate officials are *completely* to blame for the suffering endured by prisoners on both sides. He reveals the Confederate claims that prisoners under their care had as much food as was available to be false (there were great storehouses with millions of rations all around the Confederacy that were seized after Lee surrendered at Appomattox) and likewise makes an argument against the idea that prisoners and guards received the same medical care and suffered the same death rates. He similarly dismisses the argument about there being no way to get the rations to the prisoners because of destroyed railroads and

concludes that Confederate treatment of Union POWs was a result of indifference, coupled with conscious mismanagement at the highest levels.

On the Union side of this, Sanders is even more unforgiving. In the correspondence of Grant and other Union officials he finds damning phrases about the intentional, retaliatory mistreatment of Confederate POWs and the issue of exchange. It is now generally accepted that the reason the exchange was stopped was, privately, a militarily-sound plan to keep the ranks of the Confederate army reduced until broken. Only publicly was the reason declared as the Confederacy's refusal to exchange black soldiers. Confederate officials had long insisted that the Union could have resumed exchanges any time it wished, and now it seems they were correct.

Overall, Sanders argues that the prisoners were seen as an inconvenience, and one that neither side had prepared for because the war was supposed to be over in a matter of months. The lack of preparation and the lack of care taken by those with the power to do something about it led to the worst atrocities committed by either side in the worst conflict of American History. Davis and Lincoln and everyone who served under them knew exactly what was happening in their prisons and exactly what they were going to do about it. Both men were highly intelligent and calculated every action they took for maximum political effect.

Taken together, all three texts present at the same time a wide and more narrow look at the state of the wartime prison. Hesselstine's viewpoint is a product of his time, a time that still remembered the Great War and was not too far off from the next global conflict. People did not want to consider that mankind was capable of conscious mass

cruelty and the idea that it was just a “wartime psychosis” must have been a comforting one. Speer’s book appears in the late 1990’s during a time of booming popularity for Civil War history in mainstream culture thanks to Hollywood movies like *Gettysburg* (1993), *Andersonville* (1996) and *Glory* (1989). Sanders publishes his tome in 2005 with the new post-modern assertions that historians begin using in an attempt to move away from the almost super-human portrayals of Civil War figures that were popular in the 1990’s and earlier. Sanders is the most modern, and thus probably the most currently relevant work, but all three offer something to the discerning student of the Civil War, and most specifically, of Civil War Prisons.

CHAPTER 3

A BREIF HISTORY OF CAMP LAWTON, A CONFEDERATE PRISON

Overview

It is a dark time for the Rebellion in the autumn of 1864. The ever-growing prisoner of war (POW) population was stretching the resources of the Confederacy to its absolute limits and the prospect of exchange negotiations resuming was a bleak joke. General U. S. Grant was in Virginia, overseeing the siege of Petersburg, the last obstacle between the Army of the Potomac and Richmond. He had sent his greatest commander, General William T. Sherman, south to Georgia to squeeze the Confederate forces' supply line at its very source. General John H. Winder, Commandant of Prisons in Georgia and Alabama, knew that one of Sherman's objectives was the release of the tens of thousands of Federal prisoners held at Andersonville and desperately tried to shift the POW populations around the state. A large proportion of these prisoners wound up at Camp Lawton, in Millen Georgia for six weeks towards the end of 1864. As luck would have it, Sherman's chosen route to Savannah took his army right through Millen in the beginning of December, but unfortunately the prisoners had been evacuated only days before.

Historiography

Hesseltine, Speer, and Sanders, described previously, devote very few pages of their monographs to describing Camp Lawton. This is, of course, excusable considering the scope of their works and the fact that the largest body of information (the journals and drawings of Private Sneden) was not yet published when two of the three books reached press.

Hesseltine's (1930) description of the prison is very brief and he cites almost exclusively from the *Official Record of the War of the Rebellion* (abbreviated *OR*, described below) which largely consists of Winder's correspondence. Interestingly, he never calls the site "Camp Lawton," but rather refers to it only as the "Millen Prison" (Hesseltine, 1930). Speer (1995) gives Camp Lawton a luxuriant multi-page entry. His favorite sources are, again, the *OR*, but he also cites heavily from the prison diary of John McElroy (Speer, 1995). He suggests that the prison was named for General A. R. Lawton (Speer, 1995 -See Derden, in press, for an alternative suggestion). Sanders (2005) again uses the *OR*, this time to support an argument in favor of General Winder and his efforts and against the superiors like the Confederate Secretary of War James Seddon and Confederate President Jefferson Davis (Sanders, 2005). Sanders also erroneously states that the Lawton dead were reinterred at Andersonville, most likely due to a misunderstanding (Sanders, 2005, p. 333 see Marvel, 1994, p. 248). Marvel's 1994 history, *Andersonville: The Last Depot*, describes Camp Lawton as well, but largely as a periphery to events actually occurring at Camp Sumter.

There are three histories that focus exclusively on Camp Lawton. The first was a report for the Georgia Department of Natural Resources (GADNR) prepared in 1975 by Billy Townsend. The original copy of this report resides in the Archeological Reports File of the GADNR Historic Preservation Division (HPD). However, the full text of the history section of the report was included in *Disease, Starvation & Death: Personal Accounts of Camp Lawton* in 2005 by William Giles. This book is available for sale at the park office at Magnolia Springs State Park. Townsend gets most of his information

through a combination of the *OR*, McElroy and the prison diary of Robert Kellogg (*Life and Death in a Rebel Prison*). This report appears to be the nucleus of the idea that the prison was named for General A. R. Lawton (Townsend, 1975, p. 1).

The next contribution to the Camp Lawton historiography was a brief article published in the *Atlanta Historical Journal* in 1981. George Rogers and Frank Saunders, history professors at Georgia Southern University (then Georgia Southern College), originally prepared the article for a presentation at the Georgia Studies Symposium in 1980. The authors cover the circumstances leading up to the establishment of the prison as well as the denouement after its hasty abandonment (Rogers & Saunders, 1981). Like usual, the *OR* plays a large role in their description of the prison, however they also employ many more POW diaries on top of the usual McElroy references (Rogers & Saunders, 1981). Most interestingly, they conclude their article with a discussion of the fates of the men buried at Camp Lawton (Rogers & Saunders, 1981). They describe how the short-lived Lawton National Cemetery was dug up and the POWs buried there removed to Beaufort National Cemetery at the request of the landowner, Mrs. Caroline E. Jones (Rogers and Saunders, 1981).

By far, the most exhaustively researched book concerning Camp Lawton is Dr. John Derden's "*The World's Largest Prison*": *The Story of Camp Lawton* (working title, in press). Derden's monograph draws from a much wider range of sources than any previous effort to chronicle Camp Lawton and also presents some new arguments and answers to old questions. He has very generously shared advance copies of his manuscript with the archeology department at Georgia Southern. It will most likely reach

print sometime this year and the historical community will finally have a definitive history of “*The World’s Largest Prison.*”

The Official Record of the War of the Rebellion

The *Official Record of the War of the Rebellion (OR)* is a massive, all-encompassing collection of primary documents related to military activities in the United States (USA) and the Confederate States (CSA) during 1861-1865. The first series is the largest and deals exclusively with formal battlefield reports and correspondence related to troop movements. Series II, however, primarily covers the experiences of Prisoners of War (POWs) and correspondence relating to the construction and administration of prisons on both sides of the conflict. The records are organized chronologically for ease of use and are also indexed by key names of people and places.

A New Prison Site is Sorely Needed

As early as July, 1864, General Winder, CSA, knew that he needed an expanded facility for holding the prisoners at Camp Sumter, Andersonville (*OR*, 2:VII). In one week of July alone, more than 400 prisoners died at Andersonville (*OR*, 2:VII). The prison site was overpopulated with more than 29,000 prisoners at this time, and on top of that General Winder was experiencing difficulties with his supply chain and continuously ran out of rations (*OR*, 2:VII). On July 28th, Winder ordered Captain D. W. Vowles and Captain W. S. Winder (his son) to begin the search for a new prison site (*OR*, 2:VII). On the 5th of August, the two captains wrote back that they had selected a suitable location for the new prison near the Augusta Railroad five miles north of a town called Millen (*OR* 2:VII).

In the middle of August, the Confederate Inspector General examined the condition of Andersonville and found it extremely wanting (*OR*, 2:VII). He recommended that, “arrangements be at once made for [the excess prisoners at Andersonville] ... at the ... additional localit[y] selected by General Winder... near Millen, Ga.,” (*OR*, 2:VII, p. 550). These recommendations made their way up the Confederate chain of command to the Secretary of War (James Seddon). One of the CSA inspectors described the conditions at Andersonville as “a reproach to [the Confederacy] as a nation” and even suggested that General Winder be relieved of duty (*OR*, 2:VII, p. 550-551).

Construction of the “World’s Largest Prison”

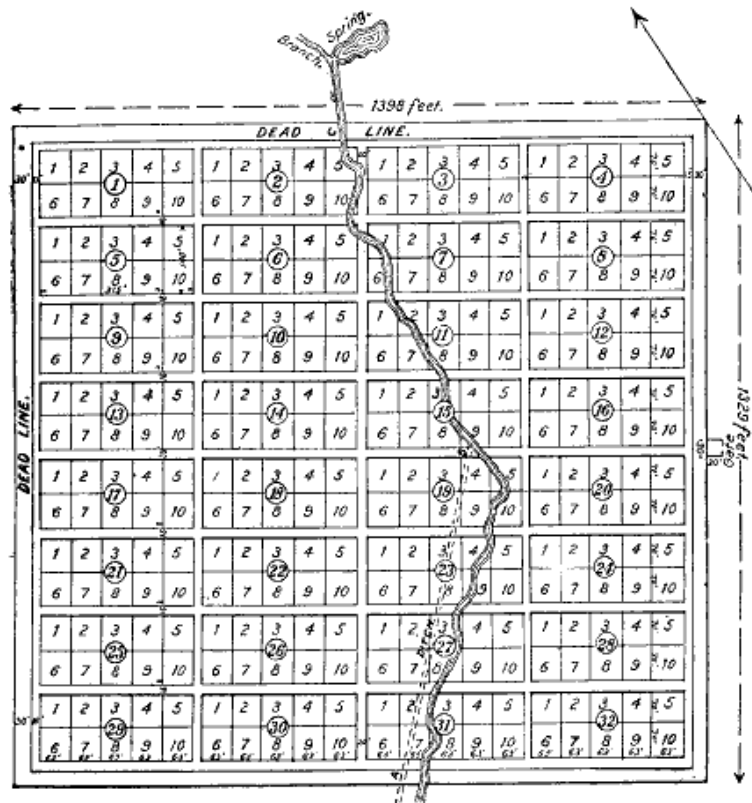
At this time, General Winder was already making arrangements for the construction of the new prison five miles north of Millen (*OR*, 2: VII). He asked top CSA authorities for permission to impress the labor and supplies he needed for construction in order to facilitate construction as soon as possible (*OR*, 2:VII). Secretary Seddon granted him the permission to impress what he needed only if he could not secure it by hire or purchase first and only if he followed the letter of the law regarding impressment by CSA military authorities (*OR*, 2:VII).

The heavy August rains severely damaged the stockade at Andersonville and Winder sent several telegrams pleading for exigency in the construction efforts at Millen (*OR*, 2:VII). He did his best to describe the desperate conditions at Camp Sumter and again repeated his request for the authority to impress all labor and supplies required for completion of the new stockade (*OR*, 2:VII). That same week, he sent an agent to Millen

on his behalf to confer with the officers there (probably Captains Vowles and Winder) and to organize and acquire the requisite labor (*OR*, 2:VII). By September 5th, the stockade in Millen still remained incomplete and empty (*OR*, 2:VII).

Not everyone was eager for the new prison to open, however. A prominent physician from Waynesboro, north of Millen, wrote a letter to CSA Secretary of War James Seddon complaining about the choice of location (*OR*, 2:VII). General Howell Cobb, commanding the Georgia Reserves, also wrote to Secretary Seddon protesting the prison (*OR*, 2:VII). He preferred that a new prison be located in a different state entirely because he felt that his force was far too small to ensure the safety of the prisons and citizens living nearby (*OR*, 2:VII). Despite these objections, plans for constructing the prison stockade at Millen continued to move forward.

On September 13th, Secretary Seddon telegraphed General Winder to begin the transfer of prisoners to the nearly-completed facility at Millen (*OR*, 2:VII). By September 18th, General Winder himself had arrived at the newly-named Camp Lawton and estimated that he could begin receiving prisoners there within the week and also made plans to establish his headquarters there (*OR*, 2:VII). General Winder believed that the site was the “largest prison in the world,” and was very pleased with the choice of location (*OR*, 2:VII, p. 869). He forwarded a plan of the prison to the Confederate authorities that same week (See Figure 6) (*OR*, 2:VII).



PLAN OF STOCKADE AT CAMP LAWTON.

A.—B. Artificial channel. Turn stream into for sinks. Old channel closed.
 B.—C. Natural stream for bathing, washing, &c.
 Each division will contain 1,000 men, and may contain 1,250.

Figure 6. General Winder's plan of Camp Lawton (*OR*, 2:VII, p. 882).

By October 8th, the prison still hadn't been occupied although the construction to enclose the stockade itself had been completed for some time (*OR*, 2:VII). General Winder intimated that this was due to a lack of suitable transportation to move prisoners and supplies and requests that rail cars and engines be furnished to him (*OR*, 2:VII). On October 11th, General Winder established his new headquarters at Camp Lawton and the stockade was finally occupied by Union POWs (*OR*, 2:VII). Winder believed the stockade could easily accommodate 32,000 men and even up to 40,000 without great

inconvenience (*OR*, 2:VII).

Captain Vowles only made one surviving monthly statistical report on the prisoners occupying Camp Lawton, on November 8th, 1864 (*OR*, 2:VII). To that date, 10,299 prisoners had arrived at the prison; of that number 486 had died, 349 had enlisted in Confederate Service, and 285 had been detailed for work at the post (*OR*, 2:VII, pp. 1113-1114). The camp was closed before the second month passed.

Abandonment and Aftermath

By November 19th, barely a month after the prison had first been occupied, General Winder received orders to use his own discretion for the removal of prisoners from Andersonville and Millen because of the presence of General Sherman, USA, in the interior of Georgia (*OR*, 2:VII). At this point, about 1,500 prisoners were at Andersonville and 10,000 at Camp Lawton (*OR*, 2:VII). General Winder began transferring the prisoners out of Camp Lawton on November 20th and by the 22nd of November, almost all of them were gone (*OR*, 2:VII). On November 25th, Winder himself left Camp Lawton for good (*OR*, 2:VII).

Over the next month, Confederate officials were uncertain about what to do with the prisoners removed from Camp Lawton and expended great effort in moving them around the state in advance of General Sherman's movements (*OR*, 2:VII). Eventually, General Winder ordered the prisoners returned to Andersonville as it became clear that General Sherman's objective was Savannah (*OR*, 2:VII). On December 24th, Winder wrote that, "Camp Lawton, five miles from Millen, ... [was] no longer a suitable place for a prison," due to its proximity to Savannah (*OR*, 2:VII, p. 1271). In January, General

Winder wrote to Mrs. Jones, the landowner, releasing the site of the prison to her and promising to settle the accounts as soon as possible (*OR*, 2:VIII). The war itself soon ended and Camp Lawton's almost 150-year long existence in obscurity began.

Review of Selected Personal Accounts of the Prison

Personal accounts of historical events afford the reader a unique viewpoint into the experience of the individual. They can provide remarkable insight into conditions at places like Camp Lawton for the astute student of history and for archeologists because primary documentation is essential. However, these prisoner diaries must be viewed through a critical lens; it is essential to consider the intent of each work as it was both written and published. It was very fashionable during the Reconstruction period to disseminate works disparaging the atrocities of 'rebel prisons' in order to appeal to public fervor in the North (Cloyd, 2010). Many of the more widely known diaries today contain oddly-similar stories and may have influenced one another in the recounting. It is also very important to distinguish between written memoirs created after the fact and published diaries written during the actual period of internment.

This discussion covers a selection of the more accessible prisoner diaries that refer to Camp Lawton in detail; specifically those of McElroy, Ransom, and Sneden. William Giles' compendium *Disease, Starvation & Death: Personal Accounts of Camp Lawton* (2005) is a collection of excerpts from these and other diarists and is a wonderful starting point for reading more primary accounts from Camp Lawton. These particular accounts tend to focus on Camp Sumter (Andersonville), but significant sections are devoted to Camp Lawton as well. Andersonville usually featured prominently in personal reminiscences

of the Confederate prison system due to its overall notoriety when compared to other prisons lesser known to the general public. These diaries have been extremely valuable for adding context to the archeological investigations conducted at Camp Lawton as well. When researchers consider the artifacts and the journals together, a clearer picture of life in the stockade begins to form. It is also important to consider the role these chronicles played in American memory of the conflict and how they may have contributed to continuing sectionalism during Reconstruction. It is unwise to take memoirs such as these at face value because they were often sensationalized and edited for popular consumption in an effort to appeal to public fancy. However, it is equally unwise to discount them entirely, and a scholar ought to simply consider them in the light in which they were written and apply them as a contribution towards the whole body of literature on the subject of Civil War prisons.

The Accounts

Two of the most famous diaries published by prisoners of war in the South are the works of John Ransom (1883) and John McElroy (1879). Both of these accounts devote chapters to time spent at Millen and circulated widely in the latter part of the 19th century. McElroy's *Andersonville: A Story of Southern Prisons* was written in a narrative, journalistic style owing to his experience as a newspaperman (Hesseltine, 1930). Ransom's *Andersonville Diary* on the other hand, is ostensibly a mildly-edited version of the daily notes he kept while a prisoner (Hesseltine, 1930). Both accounts are very interesting and peppered with humor in the face of adversity. However, the two prisoner diaries present different viewpoints of the happenings at Camp Lawton and a direct

comparison is very educational. McElroy, along with his friend Andrews, was one of the very first prisoners into the new stockade at Millen and was afforded many extra comforts over the prisoners that had arrived later (McElroy, 1879). Andrews described their first sight of the stockade thusly: “My God Mc, this looks like Andersonville all over again,” (McElroy, 1879, p. 453). There was a substantial supply of spare wood in the stockade left over from construction which they used to construct, “a house builded with [their] own hands,” (McElroy, 1879, p. 456). John Ransom didn't arrive in Millen until November 1st, almost three weeks after the camp had opened (Ransom, 1883).

One of the more important events that both McElroy and Ransom described was the presidential election of 1864. That year the race was between Abraham Lincoln and George McClellan and they ran on diametrically opposed platforms. McClellan ran on a platform of peace while a Lincoln victory meant the continuation of the war, and thus furthering internment for the weary inhabitants of Camp Lawton (McElroy, 1879). McElroy intones that the Camp Lawton election materials were furnished by the Confederacy in the hope of an overwhelming victory for McClellan at the hands of POWs dissatisfied with the current administration (McElroy, 1879). Ransom, a self-described “War Democrat to the backbone,” proudly campaigns for “Little Mac” at the voting box although he does concede that, “Lincoln is a good man, and a good president,” (Ransom, 1883, p. 161-162). McElroy reports that the Camp Lawton polling center was a landslide victory for Lincoln and that the Rebel officers were very put out by the turn of events (McElroy, 1883). He surmises that it had less to do with a “preponderance of Republicans,” over War Democrats and more to do with an attitude of

prisoners wanting to do nothing “to please the Rebels,” (McElroy, 1883, p. 465).

Even though these two annalists differ on their political viewpoints, they agree most strongly on the point of working for the Confederacy, or more accurately *not* working for the Confederacy. McElroy narrates a surprising event where prisoners are called out in divisions to the parade grounds on the opposite side of the stream running through the stockade (McElroy, 1879). They are offered the chance to enlist in Confederate service, and at that announcement all companies summarily turned about face and marched back towards the stream (McElroy, 1879). This lit off a series of altercations between the prisoners and the guards, but no real damage was done (McElroy, 1879). Ransom was individually invited out of the stockade and offered the position of a clerk, which he politely declined (Ransom, 1883). McElroy relates how prisoners caught trying to accept the offers from the Confederate officers for parole were held back and “taught a lesson in loyalty... by very willing hands,” with a pine switch (McElroy, 1883, p. 469). Eventually, it was decided at large that those who were low enough to offer their services to the Confederacy (according to McElroy, mostly Raiders and unsavory characters) were of no use to the Union anyway and would be of little use to the Rebels (McElroy, 1879). Ransom says that he will have no trouble looking his friends in the face upon returning home because of his refusal to comply with the Confederate request (Ransom, 1883).

The diary of Private Robert Knox Sneden, on the other hand, is of a very different cant than McElroy and Ransom. His experiences were not published until 2000 and had remained unknown to academe for almost as long (Sneden, 2000). He arrived in Millen

on October 16th and was not in a position to construct shelter until the 20th, at which point most of the wood McElroy had commented about was gone (Sneden, 2000). Sneden does not mention the 1864 presidential election and instead focuses his discussion of that period on an escape tunnel he was helping to construct (Sneden, 2000). Like Ransom, Sneden was invited individually out of the stockade where he was then offered a position writing Latin prescriptions for one of the surgeons (Sneden, 2000). His refusal was anything but polite and he spent the evening in irons with the possibility of execution looming over him in the morning (Sneden, 2000). The next morning, Sneden signed the parole offered by General Winder and went to work for Camp Surgeon Isaiah H. White (Sneden, 2000). This move dramatically increased his quality of life while imprisoned, however it may have contributed to his difficulty in securing a pension in his later years (Sneden, 2000).

McElroy claims to have been one of the first to leave the stockade in late November, 1864 (McElroy, 1879). He describes an early morning alarm, where the prisoners were called to assemble in the darkness and then were moved to train cars with no warning (McElroy, 1879). Ransom, being one of the last to arrive, was also one of the last to leave, even though his close comrades had already ‘flanked out’ with earlier departures, and finally left on November 22nd (Ransom, 1883). Sneden also left Camp Lawton on the 22nd, and was one of the last to leave along with the hospital staff and a few other ‘galvanized yanks’ for Savannah (Sneden, 2000).

Proof or Propaganda? POW Experiences in American Memory

The time period after the Reconstruction Era is popularly known as the Gilded

Age and historians generally consider it to cover the late 1870's up until 1890. Seventy different POW memoirs were published during this time period, including those by McElroy and Ransom (Hesseltine, 1935). Sneden made his most vigorous attempts to publish during this era as well (Sneden, 2000). This seemingly late resurgence of interest in telling the POW story can be attributed to the rising requests for government pensions as the veterans of the conflict aged (Hesseltine, 1935). Soldiers who had been imprisoned lacked the benefit of having army surgeons around during the war which caused difficulty in securing the required two witnesses to certify disability on a pension application (Hesseltine, 1935). Persuasive evidence exists that many of the accounts from this time period were "often exaggerated, fabricated, and plagiarized... to increase book sales," (Cloyd, 2010, p. 58). One historian argues that Ransom's entire motivation for publishing his (seemingly fabricated) diary was securing a pension (Marvel, 1995).

No matter the motivation behind the publication or the accuracy thereof; these memoirs hold an important place in American history due in part to their widespread acceptance by the general public as historical fact (Cloyd, 2010). Former prisoners writing about their experiences considered it a new 'cause,' and their writing, accordingly, took on a changed character post-Reconstruction (Hesseltine, 1935). The new arguments thrust to the forefront of the prison narratives from this era were an appeal to the Victorian ideal of heroism, along with adventurous escape, and themes of martyrdom or sacrifice (Cloyd, 2010). The goal of the memoirs was to change the mindset contemporary readers had about the POW experience and cast away the concept of 'passive imprisonment' (Cloyd, 2010). Many POW authors hoped to demonstrate how

long-term confinement by the enemy was just as heroic and traumatic as participating in intense action at major battlefields (Cloyd, 2010).

It was important in the post-Reconstruction era for the prisoners writing memoirs to prominently discuss ways of being actively subversive to the rebels that had them under guard and the cause of the Confederacy as a whole. It became very common for diarists to describe how they were constantly considering escape or to casually mention tunnel projects or escape plots under construction. Sneden illustrates the escape concept very well in his initial discussion with General Winder regarding his parole: “I argued that I had a right to escape when opportunity offered, in fact, that ‘it was my business to run away, and their business to catch me’,” (Sneden, 2000, p. 264). Ransom’s diary, too, climaxes with a story of daring escape off of a moving train car (Ransom, 1883). The timeless idea of Yankee Ingenuity captivated the nineteenth century audience who enjoyed ‘rooting for the underdog’ of the prisoner up against the obstacles of the Confederate prison system (Cloyd, 2010).

For all the high-minded ideals that came to the forefront of POW literature of this period, there were consequences as well. This period of American history is marked with bitter sectionalism left over from the war itself as well as the deep wounds inflicted by Reconstruction. The publication of these memoirs, incensed as they were with political metaphor, contributed towards keeping “alive a hatred of the South,” (Hesseltine, 1935, p. 66). The resurgence of publications in the post-Reconstruction era served as a reminder to the northern public of the atrocities of wartime prisons and at the same time lent fuel to the fire of Republican ‘bloody shirt’ politics (Cloyd, 2010). The popularity enjoyed by the

publications of McElroy and others continued to influence the voting public and worked against the creation of a political mindset where the North and South were truly rejoined (Cloyd, 2010).

What Archeologists Can Learn

Even with all the fabrication present in the more popular POW memoirs, archeologists can still gather priceless tiny details from the text. A grand, sensationalized tale of escape or bravery might make a story more marketable and interesting to read, but on the whole does not provide much detail about the material culture which might be present in the stockade. The tiny details are ultimately of the most interest to archeologists and, fortunately, the least likely to be embellished. McElroy describes packing up his ‘worldly possessions’ of a can and a spoon to prepare for the move to Camp Lawton (McElroy, 1879). Ransom laments the scarcity of containers within the stockade; however this is not really supported archeologically (Ransom, 1883; Morrow, 2010). McElroy and Sneden both describe contraband axes within the stockade used for constructing shelters. Sneden says that a couple were obtained from ‘Negro teamsters’ while McElroy says that one of his fellow prisoners had managed to smuggle an axe in, although it was “as dull as a hoe,” (Sneden, 2000; McElroy, 1879, p. 456).

Apart from the material possessions of the prisoners, the primary documents can be used to make sense of potential archeological features as well. A feature is any piece of archeological evidence that cannot be removed from the ground intact like an artifact would be. The best resource for the stockade itself is Sneden’s huge body of watercolors and maps that he produced after the war (Sneden, 2001). His detailed *Plan of Camp*

Lawton (See Figure 7) has been invaluable to the preparation of archeological investigations of the prisoner occupation area (Sneden, 2001).

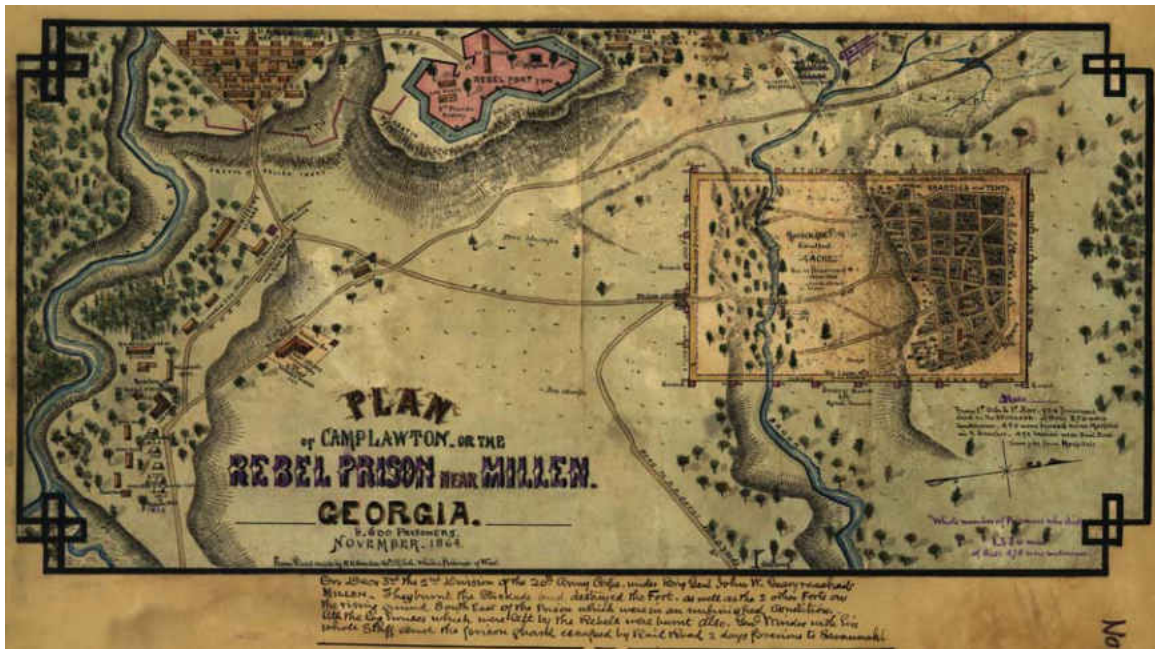


Figure 7. R. K. Sneden's *Plan of Camp Lawton* (Sneden, 2001).

McElroy describes the logs that make up the stockade wall as rough-hewn, and makes a point of mentioning how that was different than at Andersonville (McElroy, 1879). The brick ovens are prominently described by Sneden in his diary where he explains how the prisoners used them for shelter instead of for cooking (Sneden, 2000). He also afforded considerable attention to the ovens in his watercolors of the prison, although they differ in architectural style from image to image (Sneden, 2001).

While the veracity of prisoner accounts is often questioned in academe, they should not necessarily be discounted entirely. When taken in balance with materials from the *Official Record of the War of the Rebellion*, U.S. Sanitary commission reports, and

other official documents the diaries can certainly add a human flavor to the bureaucratic reports without sensationalizing too much. The diarists' greatest legacy (or infamy depending on one's own leanings) is surely the place the POW narrative genre has earned in American historical memory and the role the genre played in the political landscape of the late 19th century. The narratives described above certainly cannot be taken for the literal truth, but they absolutely convey the feeling of what daily life was like for these men held captive in the Confederate States of America.

Land Use at the Site

Nineteenth Century

As stated above, the rights to the land Camp Lawton was situated on reverted to Mrs. Caroline E. Jones, a widower, in January of 1865. As early as July 15, 1866, Mrs. Jones, daughter of William Sapp Jr. and widow of Batt Jones and Dr. Henry Hines, was selling off pieces of her huge estate. She started with selling a five acre parcel of land along the railroad for \$5250 to one George B. Hack (Burke County Deed Book B, p. 140-142). According to the text of the deed, Hack had already built a dwelling house on the site. The deed goes on to discuss arrangements between Mrs. Jones and Hack regarding a portable steam saw mill operation they jointly owned. A portion of the purchase price in the deed went towards Hack acquiring Mrs. Jones' half-ownership of the mill operation and equipment, but not the mill buildings or the land those buildings were sitting on. The mill location was described as "situated immediately upon the tract of [the Augusta and Savannah Railroad] in [Burke] County and near the aforementioned parcel of land" (Burke County Deed Book B, p. 141). This is extremely significant

because the location of the burial trenches reported to the Quartermaster General's Office in November 1865 references Hack's Mill (Derden, in press). There should be two trenches located 300 yards south of the mill and 150 yards east of the railroad (Derden, in press). This corroborates with the location of the mill being described as right on the railroad. These two pieces of evidence provide fairly strong evidence for the longitudinal location of Hack's Mill, and subsequently the burial trenches.

Table 1

Camp Lawton Chain of Title

Date	Grantor	Grantee	Deed Type	Description
8/7/1864				New Prison Site 5 Miles North of Milledgeville Selected
10/10/1864				First Prisoners Arrive On Site
11/25/1864				All Prisoners Have Departed Camp Lawton
11/21/1865				General Winder Surrenders Lease to Jones Property
7/15/1866	Caroline Jones	George Hack	Quitclaim	5 acre tract along railroad where Hack had built a new dwelling place (small plat included)
11/16/1866	Caroline Jones	C.E. and S.E. Clarke	Quitclaim	4 acre tract along railroad with a stone building
11/1/1869	Caroline Jones	George Sapp	Inheritance	
1/9/1871	C.E. and S.E. Clarke	Gustav Wittkaski	Quitclaim	
4/29/1875	George Sapp	Nancy Binson	Quitclaim	4 acre tract described above
1/1/1883	Nancy Brinson Estate	A. O. Wadley	Unknown	Land illustrated by 1875 plat, corresponds with Alwood and English tracts on 1935 plat and Wadley on 1895 plat
2/17/1883	George Sapp	J.T. Reeves	Quitclaim	Wadley holdings illustrated on 1895 plat
11/19/1895	J.T. Reeves	George A. Bolles	Judgment	Land illustrated by 1895 plat as belonging to Reeves
4/21/1896	George A. Bolles	Beulah Brown	Quitclaim	Land illustrated by 1895 plat
11/25/1925	Beulah Brown	W.E. Bush and A. Battery	Unknown	5,751 acres of land (illustrated by 1895 plat, includes future MSSP)
9/26/1934	W.E. Alwood	State Board of Game and Fish	Lease	Large section of land described in 1895 plat
9/26/1934	C.I. English	State Board of Game and Fish	Lease	Lease of land on east side of 25 including Spring Mill Creek for state fish hatchery
9/26/1934	W.E. Bush and A. Battery	State Board of Game and Fish	Lease	Small piece of land east of Spring Mill Creek for state fish hatchery
10/12/1934	W.E. Bush and A. Battery	State Board of Game and Fish	Lease	Bush and Battery property east of highway for state fish hatchery
12/1/1934				Lease of land on west side of 25 for use as a state fish hatchery
3/4/1938	Beulah Matthews	Jenkins Co. Commissioners	Warranty	CONSTRUCTION OF HATCHERY BEGINS
3/4/1938	W.E. Bush and A. Battery	Jenkins Co. Commissioners	Warranty	Tract clearly marked on 1935 plat
3/7/1938	W.E. Alwood	State of Georgia	Warranty	Bush and Battery lands marked on 1935 Plat (includes most English Lands as well)
3/8/1938	Jenkins County Commissioners	State of Georgia	Warranty	Conveys the 58.7 acre tract marked on 1935 plat with Fort Lawton earthworks
3/9/1941				Conveys those lands marked on 1935 plat, including fish hatchery subject to 1934 lease
4/16/1946	A.S. Newton	Department of State Parks	Warranty	Chilham Conservation Corps Occupies Site
5/7/1946	A. Battery	Jenkins Co. Commissioners	Condemnation	Land west of highway marked on 1946 plat
5/15/1947				Land west of highway marked on 1946 plat
3/30/1950	State of Georgia	U.S. of America	Deed of Gift	980K OPENS
6/5/1956	Boz Bonds and Revenues Jenkins Co	State of Georgia	Quitclaim	Opens the land we know as the Bogdans National Fish Hatchery today
7/3/1956	W.E. Alwood, Sr.	State of Georgia	Condemnation	Quitclaim for entirety of State Park from County
7/27/1956	Boz Bonds and Revenues Jenkins Co	State of Georgia	Condemnation	State taking full rights over Alwood tract on 1935 plat
8/29/1956	A.S. Newton	State of Georgia	Quitclaim	Grants the Battery condemnation on the western side of highway to state
9/29/1958	William C. Bush	State of Georgia	Quitclaim	Quitclaim for Newton lands sold in 1946
1/1/1966	State of Georgia	Jenkins County	Act of General Assembly	Lease of William C. Bush, turns over Bush's interest in parcel described in 1946 plat
8/8/2010				Land that is now the Airport
				Georgia Southern Presents Archaeological Finds to Public

KEY:	Historic Events	Modern Events
	Old Fish Hatchery	Western Park Lands
	Main Park Lands	Land Removal from Park
	Historic Deeds	Educated Guesses

The next parcel of land Caroline sold was a four acre plot immediately to the south of the plot Hack purchased. In November of 1866, Caroline sold this parcel to settle a debt of \$1200 to the Clarke brothers (Burke County Deed Book F, p. 65). They were also to pay her a total of \$1200 on top of that over the course of a couple years. Interestingly, this property describes a stone house located on the plot and included in the purchase price. The text of the deed does not specifically detail the plot's location with anything except that it was situated directly on the railroad, but there is strong circumstantial evidence to place it due south of Hack's plot based on other historic maps showing a cutout totaling nine acres existing until the Magnolia Springs State Park lands were fully consolidated in the 1940's. The Clarke brothers sold the parcel again in 1871 to a Gustav Wittkaski (Burke County Deed Book F, p. 66).

Armed with this information, it is then possible to extrapolate a probable latitude for the location of Hack's Mill. The mill would probably not have been south of the plot owned by Hack because it was not described in the deed to the Clarkes at all. Therefore it is much more likely for it to be located just north of Hack's land purchase. When taking the Quartermaster General's report into account, the mill cannot be located too far north of Hack's plot or else the burial trench location would have been within the tract the Clarkes purchased. When measuring in Google Earth (see Figure 8) from the hypothesized location of Hack's Mill, the purported location of the burial trenches becomes the area directly south of the tract purchased by the Clarkes in November, 1866.



Figure 8. Plat attached to 1866 deed from Caroline Jones to George Hack

Caroline died in 1869, and at that point her holdings most likely went to her brother, George Sapp. Even though Caroline was married twice, she had no children (Derden, in press). George Sapp sold a large portion of Caroline's land (200 acres) to Nancy Brinson in April, 1875 (Burke County Deed Book G, pp. 506-507) (See Figure 9). It is also interesting that Wittkaski was then noted as owning the entire nine acre tract previously described. In June of that same year, George put the rest of his holdings (from Caroline) up as collateral for a loan of \$3,267 (Burke County Deed Book G, p. 426). The document reads, "said bargained premises embracing the Dwelling House now occupied by the said George W. Sapp and formerly owned by Caroline E. Jones in her lifetime."

This would seem to indicate that Caroline's house survived the war, an idea which is further supported by newspaper articles dating to 1901, discussed below.



Figure 9. Plat attached to 1875 deed from George Sapp to Nancy Brinson

In February of 1883, George Sapp sold the rest of what had been Caroline's land, a total of 9,000 acres (actually not that much, see below) for a sum of \$50,000 to J.T. Reeves, who had the area surveyed in 1895 (Burke County Deed Book N, p. 220) (See Figure 10). Nancy Brinson still owned the land she purchased from Sapp in 1875 at this time. By 1888, Reeves was in debt to a man from Connecticut, William Bolles, and had entered into an agreement to exchange the land he purchased from Sapp for \$11,000 and a clearance of the rest of his debt (Burke County Deed Book S, pp. 211-212). Something happened that caused this agreement to not go through, and in 1895 the son of the now-deceased William Bolles, George A. Bolles, fought Reeves in the Southern Circuit

Superior Court and actually had the property seized (Burke County Deed Book 2, pp. 460-465). It was during these court proceedings that the tract was actually surveyed and found to contain only 5,751 acres instead of 9,000 as previously believed. Reeves was living on the property at the time, in the permanent residence marked on the 1895 plat, below. Also of note on the 1895 plat, Nancy Brinson's holdings had passed to M.O. Wadley. This is a link that requires more research, which will hopefully connect that section of land to the 20th century landowners. The court ruled that the land must be sold, and the sale advertised, and George Bolles won the land with a bid of \$16,727 in November, 1895. The official deed of sale was recorded in December, Deed Book X pp. 460-464.



Figure 10. Court-ordered plat of the J.T. Reeves property

Bolles wasted no time flipping the property and sold the entire 5,751 acres to Mrs.

Beulah Brown of Massachusetts for \$16,000, slightly less than what he paid (Deed Book 2, pp. 21-22). Mr. and Mrs. J. Feaster Brown owned the land for almost 30 years and so bring the body of Mrs. Jones' property into the 20th Century. There is still a road going through the property called "Brown Road" today. In the March 9th, 1901 issue of the Waynesboro newspaper *The True Citizen*, it is reported that the Jones house burned:

AN OLD MANSION BURNED - A Large and Handsome Old Home Burned Yesterday Near Lawtonville - The dwelling house on the place of Mr. J. Feaster Brown in this county near Lawtonville burned yesterday noon. It was a very fine country residence and was built years ago by Mr. Bat Jones [Caroline's second husband]. This originally cost about \$5,000 and was still excellently preserved tho built 50 years ago. Mr. Brown lives at this time in Augusta and we learn he suffers a total loss as there was no insurance. It was occupied by Mr. B. M. Blackburn whom we learned saved the greater part of his furniture.

A response letter was printed on April 20th, to wit:

Lawtonville - Sometime ago we saw some one reported that Bat Jones had that house built that was burned (on the now called Brown place) we beg to state, that Dr. H. C. Hines [Caroline's first husband] had it built. It was commenced in '52, and was completed in '56. Your correspondent's father was then living on the place. He had the sand hauled from Wallace's bridge [See Figure 11] that was used in plastering. The most of the work was done by the old negroes on the place--Daddy Neger, and Martin-- as they were more familiarly known.

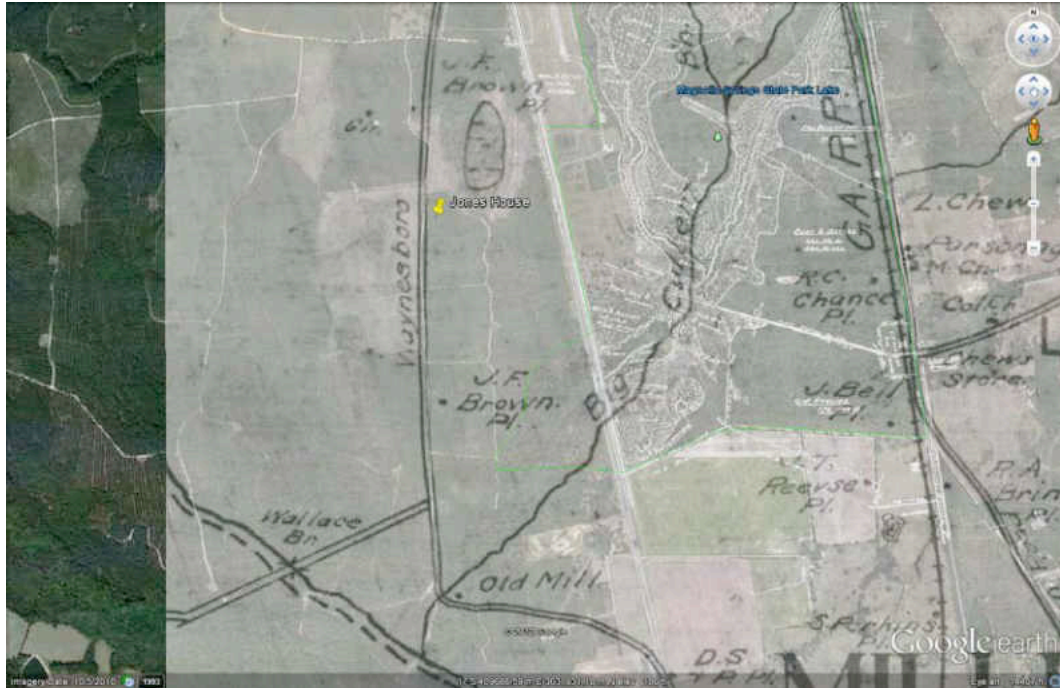


Figure 11. 1909 Jenkins Co. Map showing local property owners and Wallace Bridge

Twentieth Century

November 25, 1925, Beulah Brown sold her entire holdings to William Bush and Alfred Battey, and thus the modern story of land use at the site begins (Letters in Walter Harrison Collection, Box 6). It must be separated into two parts: the old fish hatchery and the state park. It is an extremely complicated story involving multiple parties over multiple years, with a pre-wartime Civilian Conservation Corp operation stuck in the middle. At the heart of the fish hatchery and state park projects was Walter Harrison, mayor of Millen from 1930-1950, state legislator in the house and senate, and editor of *The Millen News*. His extensive papers are curated at the Georgia Southern University Zach. S. Henderson Library in the Special Collections archive.

Millen Fish Hatchery

Walter Harrison was first interested in a national park on the site of the Old Stockade, as it was commonly known in the early 1920's (Letters in Walter Harrison Collection, Box 6). A bill was even introduced in the House of Representatives and Harrison received numerous letters of support (Letters in Walter Harrison Collection, Box 6). Alas, it was not to be. When the depression hit, Harrison set his sights a little lower and worked to establish a fish hatchery at the site in conjunction with the State Board of Game and Fish. To this end, the Board entered into four separate lease agreements with three different landowners for the land that was to comprise the hatchery (See Table 1, See Figure 12). Construction of the hatchery began December 11, 1934 (Letters in Walter Harrison Collection, Box 6). By all accounts, the hatchery project was managed very badly, to the distaste of some of the landowners; notably William Bush (Letters in Walter Harrison Collection, Box 6). Additionally, the widening of the stream to accommodate the fish ponds with a dragline most likely caused a great deal of archeological damage (Letters in Walter Harrison Collection, Box 6). However the State Board of Game and Fish continued to fulfill their obligations of the 10 year lease (harvest at least one fish per annum), and nothing could be done (Letters in Walter Harrison Collection, Box 6).



Figure 12. 1934 consolidated plat showing tracts of land under lease for fish hatchery by J.E. Twitty.

Magnolia Springs State Park

In 1935, Harrison commissioned a local surveyor, J.E. Twitty to prepare a consolidated plat (for the princely sum of \$50!) of the properties in the area he wanted to make a park (Letters in Walter Harrison Collection, Box 6) (See Figure 13). The state House of Representatives approved the park in 1935 via H.B. # 17, called the Jenkins County Park Bill (Letters in Walter Harrison Collection, Box 6). However, the bill did not go any further than that. Harrison also felt that it would be beneficial to Millen to have a Civilian Conservation Corps (CCC) site as well, and that the park location would serve perfectly and tried to pursue park establishment on those grounds (Letters in Walter Harrison Collection, Box 6).

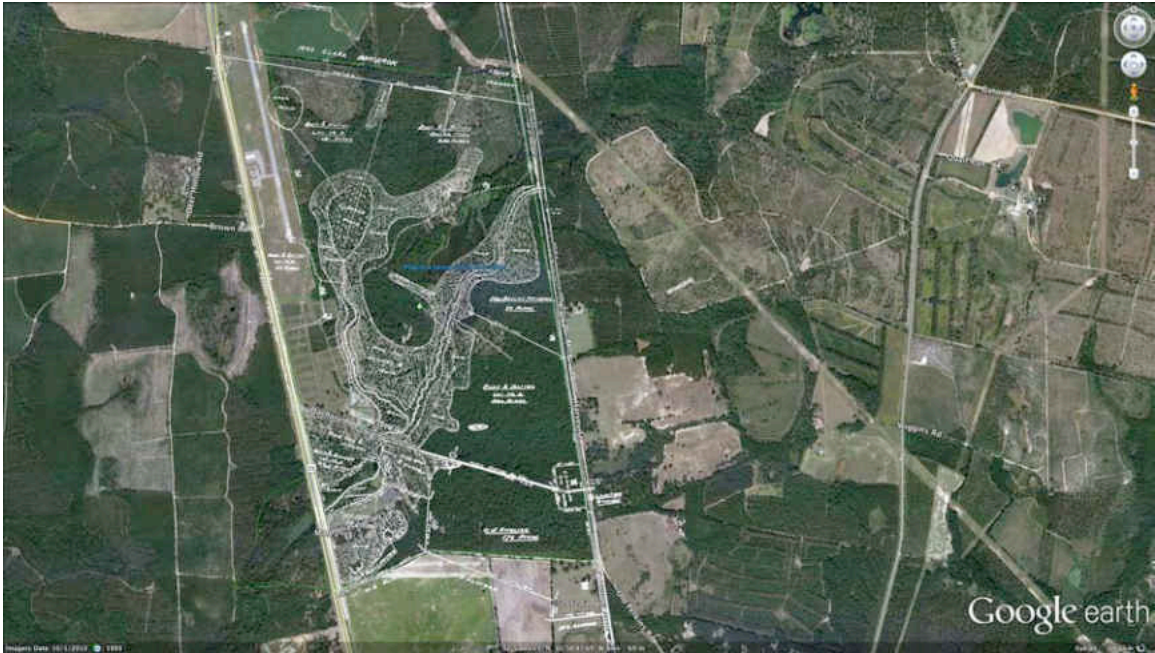


Figure 13. Consolidated plat prepared in 1935 by J.E. Twitty.

In 1938, Harrison was approached by Georgia Department of Natural Resources Commissioner R. F. Burch (Letters in Walter Harrison Collection, Box 6). Burch also suggests that they attempt to secure CCC assistance for the park's development (Letters in Walter Harrison Collection, Box 6). On August 2, 1938, the Jenkins County Board of Commissioners (Roads and Revenues) enacted a resolution to move forward with the park and the acquisition of land held by Bush and Battey (English, seen in Figure 8 had sold to Bush and Battey at this point) and Beulah Matthews (Copy in Walter Harrison Collection, Box 6). The funds for the purchase and development had been tentatively secured through the Public Works Administration, but these unfortunately fell through (Letters in Walter Harrison Collection, Box 6).

In February of 1939, events were moving forward with an application for a CCC

camp on the property, but the land was not yet in possession of the state- a major disqualification for any such applications (Letters in Walter Harrison Collection, Box 6). Bush and Battey entered into a purchase option agreement with the Jenkins County Board of Commissioners that same month (Copy in Walter Harrison Collection, Box 6). On March 4th, 1939, Beulah Matthews and Bush and Battey sold their lands to the Jenkins County Commissioners. March 7th W.E. Alwood donated his parcel directly to the state. March 8th the Jenkins County Commissioners conveyed what they had purchased to the state and thus all the park lands on the eastern side of the highway were consolidated. This was a warranty deed because of the ongoing lease of the fish hatchery lands to the State Board of Game and Fish (those lands had been included in the purchases) and because the CCC camp establishment had not yet been confirmed (Letters in Walter Harrison Collection, Box 6).

Happily, Harrison got his park and his CCC camp, State Park Camp 16; construction of which began April 14th, 1939 (Letters in Walter Harrison Collection, Box 6) (See Figure 14). The camp was supposed to be occupied for at least three years, but the events leading up to U.S. involvement in World War II shortened the camp's lifespan (Letters in Walter Harrison Collection, Box 6). While it was a CCC camp, the spring and pool were still open to recreational swimmers in the right season (Letters in Walter Harrison Collection, Box 6). On May 15, 1947, Magnolia Springs State Park officially opened its gates to the public. In the 1940's and 1950's, quitclaim deeds were executed for the park lands on both sides of the highway and the park's future was further cemented (See Table 1). An historic marker was also placed on the site in the spring of

1944 (Letters in Walter Harrison Collection, Box 6).



Figure 14. 1940 plan map of the park showing CCC development.

Two parcels of land were removed from the body of the park in the mid-twentieth century: Bo Ginn National Fish Hatchery and the Jenkins County Airport. The National Fish Hatchery was conceived through a bill in the House of Representatives (H.R. 2740) and the land was given as a gift from the State of Georgia to the United States on January 30th, 1950 (See Table 1). All subsequent transfers of management of the parcel between the State of Georgia and the U.S. Fish and Wildlife service were conducted via Memorandums of Agreement. The airport was deaccessioned from park lands in 1966 through an act of the General Assembly. Georgia Southern University began fieldwork in 2009, and on August 18, 2010 revealed what they found to the public. Plans are moving forward for an interpretive center on the site and reconstructions of key features of the

prison. Somewhere, Walter Harrison must be very happy.

Larger views of all maps discussed here, plus several others are presented in Appendix A.

Conclusion

The history of Camp Lawton did not end on November 26, 1864. The story of the site continues to be made even today as the archeology continues to reveal even more details of prison life. The formation of Magnolia Springs State Park and the fish hatchery in the 1920's and 1930's is a wonderful narrative in itself, but as of yet it exists only in dusty archival boxes. Tracing this complicated web of land use back through the decades has gradually shed light on what happened to the site since 10,299 prisoners were forced to make it their home; and even perhaps on why it fell out of American memory. Creating a land use history also benefits this body of research because it helps reinforce the idea that minimal disturbance occurred in the project area during the post-Civil War years. While it may have been used for farming, it was never built upon so there is no expectation of encountering intrusive structural remains.

CHAPTER 4

DATA AND METHODS

Introduction

An X ray Fluorescence spectral analyzer was used to conduct a comparative chemical analysis of ferrous artifacts and the surrounding soil excavated from the prisoner occupation area at Camp Lawton (9JS1). The research was designed to test the hypothesis that a proportional chemical relationship exists between the corrosion products on an artifact and the corrosion environment of the soil matrix, specifically with chlorine and iron. The field work and analysis were conducted in the summer and fall of 2011. Innov-x (now Olympus) loaned the analyzer to the project investigator for a period of three months at no cost through their academic grant program.

Twenty-six iron artifacts with matched sets of soil samples were excavated from transects 26 and 27 at Camp Lawton in the summer of 2011 (see Figure 15), yielding 52 field specimens and one additional control soil sample. Non-ferrous artifacts that were excavated were not included in the sample set and an attempt was made to exclude ferrous artifacts that could not be directly tied to the 1864 occupation of the site or those recovered without related soil data (i.e those artifacts not revealed in situ, found in back dirt etc).

Figure 15. The map of the metal detection targets. The two tested transects for this research are circled. Map redacted from public version.

Excavation Methods

Field work at Camp Lawton began in early 2010 and a preliminary metal detection survey to identify the limits of the prisoner occupation area was completed that spring under the supervision of Dr. Sue Moore and Kevin Chapman. Subsurface investigation began with the systematic shovel testing of eight transects oriented east to west at 20 m intervals. Metal detection was then conducted with a Nautilus DMC II B-a detector with an 8-inch head on a one meter wide sweep to the south of each transect. The survey implemented a methodology taught by Dan Battle of Cypress Cultural Consultants

where all excavations stay within the identified plow zone, or disturbed stratum, leaving underlying features undisturbed. The shovel testing conducted prior to the metal detection survey revealed a plow zone at approximately 25 centimeters deep, thus no artifacts were recovered below this depth during additional investigations. As a result of the metal detection survey, a linear limit of metallic targets was identified and hypothesized to represent the deadline inside the stockade wall (See Figure 15).

During the 2011 field season, two of the previously excavated transects were selected for reevaluation with the XRF. These transects, (formerly designated E and F), were selected based on the high concentrations of iron artifacts from the initial surveys in 2010 and were renamed transects 26 and 27 to keep in order with transects surveyed elsewhere at the site. The metal detection survey in this instance covered a one meter wide sweep directly to the north of the chosen transects with a Nautilus DMC II B-a detector with a 10-inch head. Each hit was cleared of the root layer with a flat shovel and then methodically troweled out. Once the artifact appeared, brushes and modified wooden tongue depressors (as described in Sease, 1994) were used to clean off the exposed surface of the artifact. This method greatly increases the time needed for a metal detection survey, but in this case the artifacts had to be revealed in situ for the recovery of the associated corrosion bloom left behind in the soil (See Figure 16). Nonferrous artifacts were recovered as well, but were not examined as a part of this thesis. The artifacts were photographed in situ whenever possible, then removed and bagged. Depth in centimeters, date, composition, identification, and artifact number were all recorded on

the bag and on the metal detection form. All recovered artifact positions were marked with a labeled flag, blue for ferrous and white for non-ferrous.

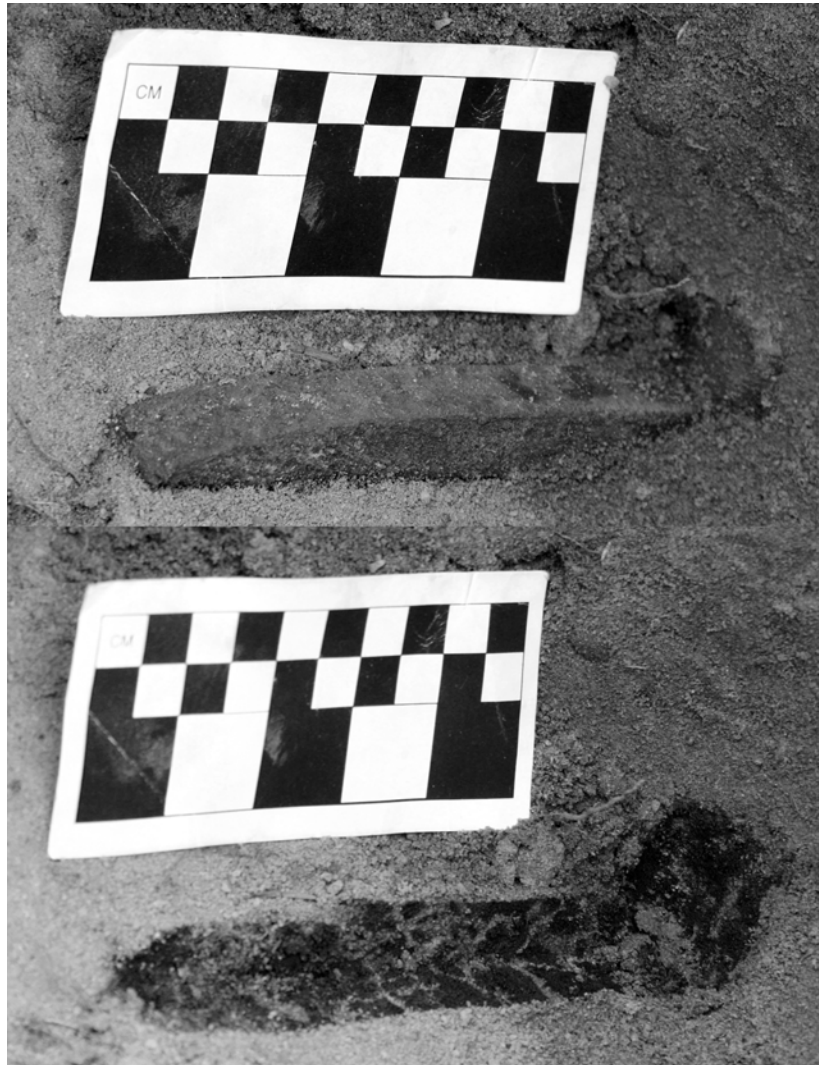


Figure 16. The artifact and the corrosion bloom after removal.

XRF Testing Methods

XRF in the Field

An Omega SiPIN XPD6000 model of handheld XRF was used to analyze the soils and corrosion bloom in situ directly below the ferrous artifacts immediately after they

were removed. It was calibrated to the National Institute of Standards and Technology (NIST) Standard Reference Material (SRM) 2702 for iron calibration and to food grade sodium chloride; the proper calibration was then determined via the atomic mass for chlorine. Tests were conducted in the pre-programmed Soil Mode with Light Element Analysis Protocol (LEAP) enabled for a 120 second test time. After conducting the XRF soil test in situ (See Figure 17), the corrosion bloom was removed with a trowel and bagged and labeled with the same provenience as the associated artifact. A control sample of soil was also collected from several different areas along both transects which were combined together prior to testing.



Figure 17. Testing the corrosion bloom in situ.

XRF in the Laboratory

The in situ XRF field testing ran into a large number of difficulties including issues with battery life and technical problems with the operating system of the instrument. Ultimately, the data collected in the field were not used for this research in favor of the XRF data produced under controlled lab conditions. All collected soil

samples were processed through 1/16 inch hardware cloth to homogenize the samples and remove any debris present prior to the laboratory analysis. It was found that the analyzer performed more consistently when plugged into the AC adaptor instead of powered by the battery and all laboratory testing was performed in this manner (See Figure 18). Calibration and test time remained the same as for the field testing. Artifacts and processed soil samples were tested under the exact same protocol using a neutral plastic buffer as a testing platform to minimize intrusive data.



Figure 18. Testing the processed control under laboratory conditions

Chemical Testing Methods

Testing for Chloride Ions

For comparative purposes, after the XRF analysis, silver nitrate testing was conducted on the soil samples and the artifacts following the methodology prescribed by the National Park Service Conservation Center at Harpers Ferry (Riss, 1993). A 2% by volume solution of reagent-grade silver nitrate in distilled water and a 5% by volume solution of lab-grade nitric acid in distilled water were prepared for the analysis. All artifacts and soils were placed in a 30 ml distilled water bath overnight and the bath water was tested the next day for the presence of chlorides and compared with prepared dilutions of known concentrations of chlorides at 1, 10, 50, and 100 ppm. Two drops of each reagent were added to samples of the bath water and if chlorides were present, a white precipitate formed in the test tube (see Figure 19). If the chloride level is very low, it is sometimes difficult to see the precipitate. For this reason, all samples were held against a strong light to determine a positive or negative reaction. A different pipette and test tube was used for each sample to avoid cross-contamination.



Figure 19. Showing a light concentration of chloride ions in the test water

Testing for Free Ferrous Ions

The same distilled water bath from the silver nitrate analysis was also used in testing for free ferrous ions in the artifacts and soil. Drops of the bathwater were added to alpha-alpha dipyridyl paper test strips and if free ferrous ions were present in solution, the strips turned pink (see Figure 20).



Figure 20. Showing a moderate concentration of free ferrous ions in the test water.

Testing for Hydronium Ions

Hydronium ion concentrations (H_3O^+), more commonly referred to as pH, were measured in the soil samples only. A Hanna Instruments Direct Soil pH meter model HI 99121 was used to take measurements of all collected soil samples. The meter has a glass electrode probe for direct soil measurements but can also be used with laboratory prepared samples. The meter was calibrated with stock buffer solutions at pH 4 and pH 7. A small amount of soil matrix was placed in a testing cup and mixed with the soil testing solution provided with the pH meter. The electrode was inserted into the moistened soil sample and pH readings recorded once the measurements stabilized (see Figure 21). The electrode probe was cleaned in distilled water and completely dried between samples.



Figure 21. Demonstration of sample preparation for pH analysis

Data

XRF spectral and elemental concentration data were exported from the instrument and rendered in graphing software, using a Compton Normalization to smooth the data. This yielded a total of 53 spectral lines- one for each artifact and soil sample and one for the control, none of which had a chlorine peak but all of which had multiple iron peaks (See Figure 22 for an example, Appendix B for entire data set). No chlorine was present in the XRF data because the analyzer has a lower limit of at least 250 ppm in order to detect chlorine. Qualitative data was collected from the silver nitrate and dipyriddy

analysis as well, which was then graphed in a scatter plot (See Figure 23). The relationship between the amount of chloride ions in the artifacts and the Fe (II)^+ ions in the artifacts was demonstrated to be both positive and linear. Comparative concentrations of chlorides from the silver nitrate testing in matched soil and artifact samples were also charted. All artifacts were found to contain chloride in various levels, but only very few soil samples did so. The control soil sample had a chloride concentration between 1 and 10 ppm and most other samples had none at all. pH testing revealed that the soil samples were all on the acidic end of the scale, likely due to the sandy, well-drained soil conditions described earlier.

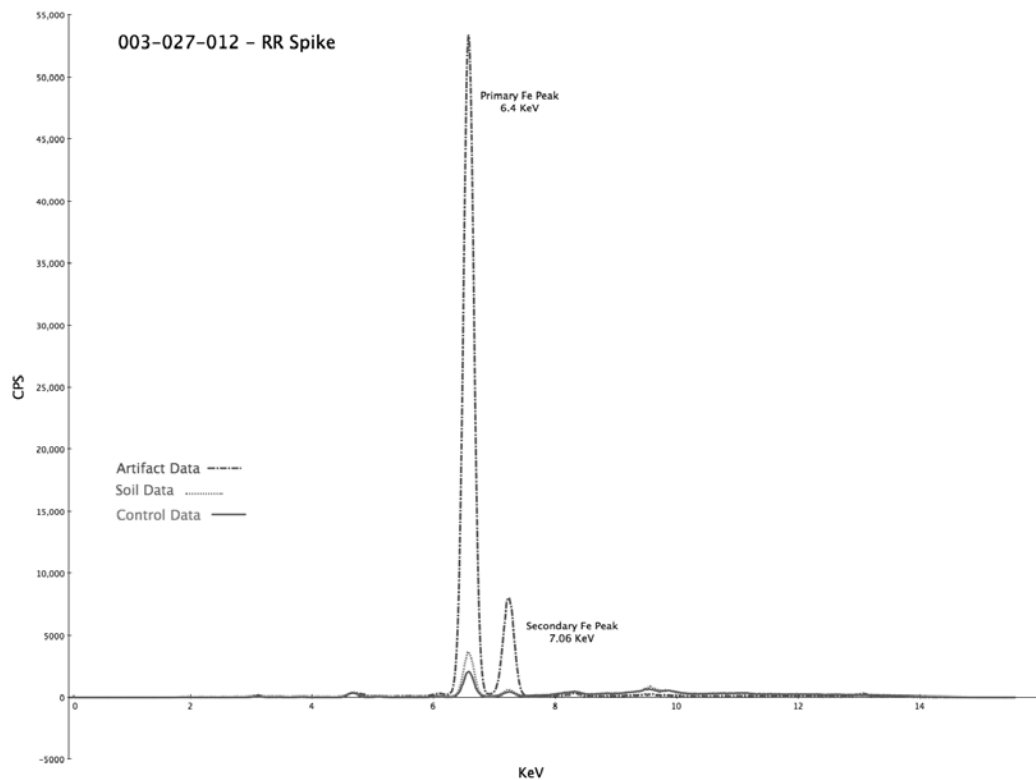


Figure 22. Example of an XRF spectral curve.

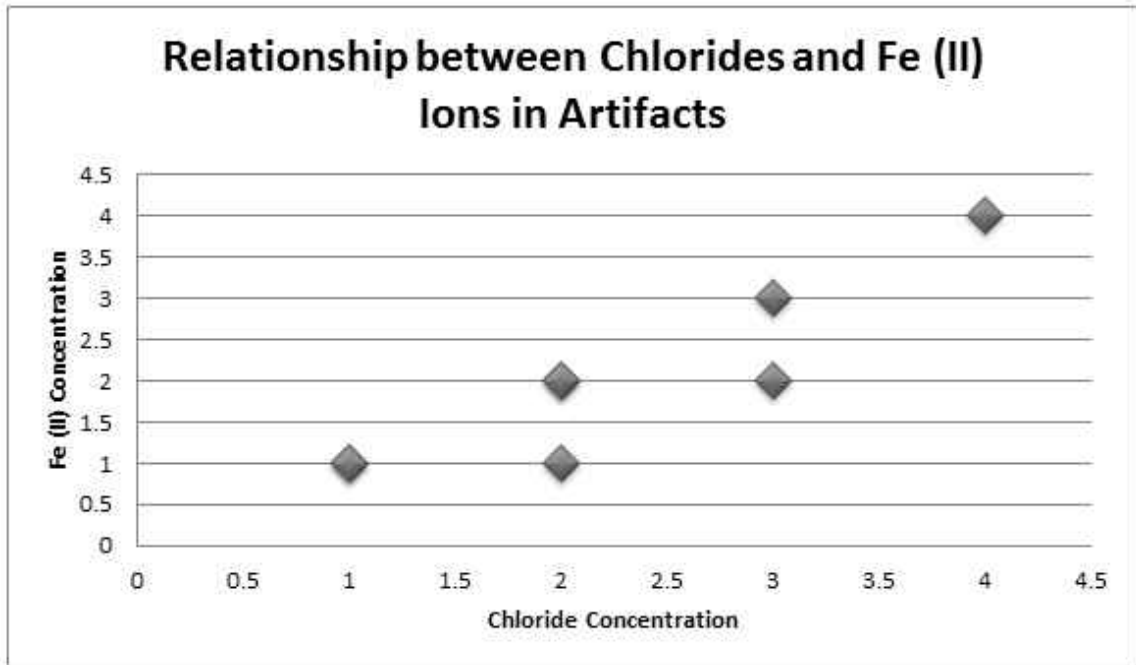


Figure 23. Graph demonstrating positive linear relationship between ferrous ions and chloride ions.

All spectral graphs produced to illustrate this research are presented in Appendix B. A comprehensive listing of artifacts and their associated test data is presented in Appendix C.

CHAPTER 5

FINDINGS AND ANALYSIS

Findings

It was found throughout the testing that a microenvironment, called the corrosion bloom, forms around an iron artifact in the soil as it moves towards a state of equilibrium with its surroundings. The XRF spectra demonstrates this when the iron peaks between an artifact and the surrounding soil are directly compared (See Figure 24). The soil surrounding an artifact consistently exhibited higher iron peaks than the control soil sample. The silver nitrate testing also indicated that the soil samples surrounding artifacts had a lower chloride concentration than the control soil sample.

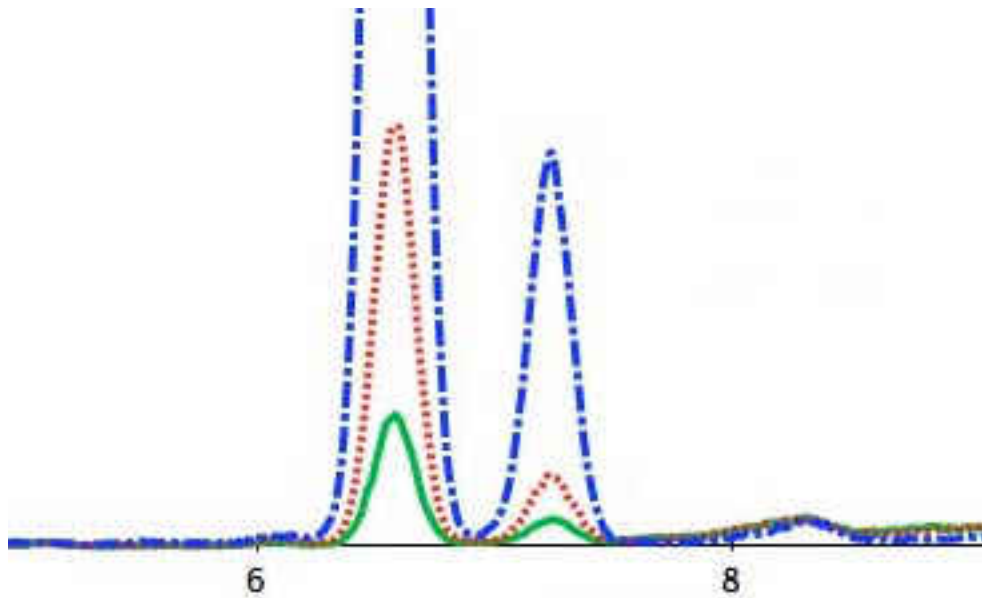


Figure 24: The blue line represents the artifact, the red line represents the corrosion bloom and the green line is the control soil sample.

This could mean that the chlorides naturally occurring in the soil or brought in via rainwater (albeit at extremely low levels at this particular site) were absorbed into the artifacts during the corrosion process (See Figure 25). When taken in context with the XRF data, it is reasonable to infer that at the same time that chlorides were moving from the soil to the artifact, iron was moving from the artifact to the soil in a sort of galvanic reaction (Hamilton 1999). These findings support the hypothesis of a chemical relationship existing between the artifact and the soil and graphically illustrate the connection.

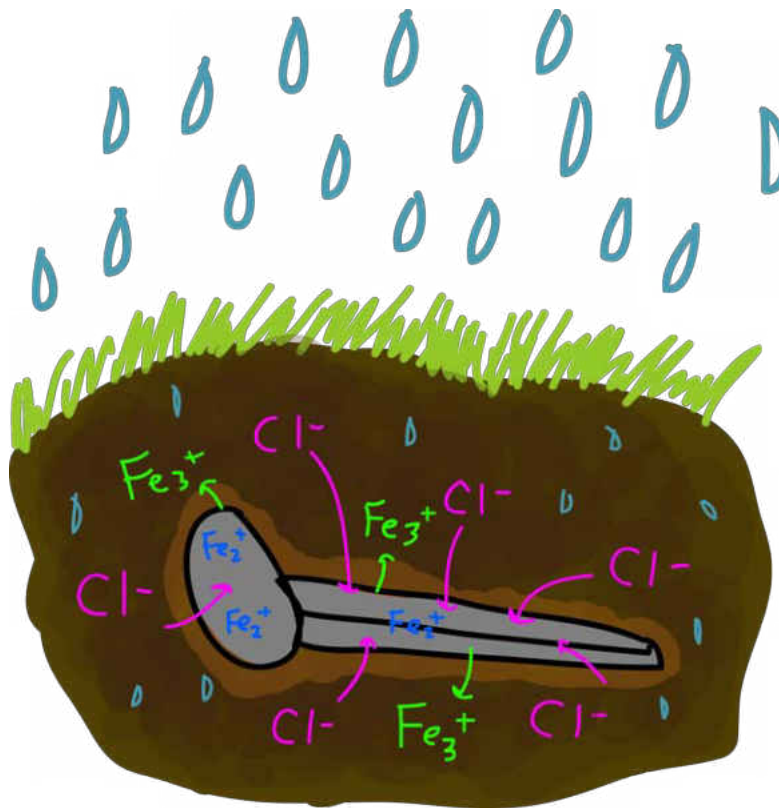


Figure 25. This diagram illustrates the movement of ions between the corrosion environment and the artifact facilitated by introduced moisture, in this case from rain.

The comparative findings from the silver nitrate and dipyriddy tests conducted on the artifacts were even more revealing. They generally showed that the higher the chloride concentration in an artifact, the higher the Fe (II)⁺ ions or in other words the higher remaining oxidation potential (See Figure 26). Such artifacts are more unstable than those with low chloride levels and low Fe (II)⁺ and more prone to post-excavation degradation and damage like chloride weeping (See Figure 27) (Cronyn 1990). Artifacts that are completely oxidized present only with Fe (III)⁺ (ferric) ions with low chloride concentrations and do not require much attention from the conservator. This doesn't mean that the artifact is in a perfect state of preservation, more that it is beyond the point of conservation being useful. However, artifacts that exist in a completely reduced state in the ground may begin corroding anew upon excavation depending on environmental conditions. The pH testing of the soil revealed a consistently acidic landscape with deeper horizons becoming steadily more neutral.

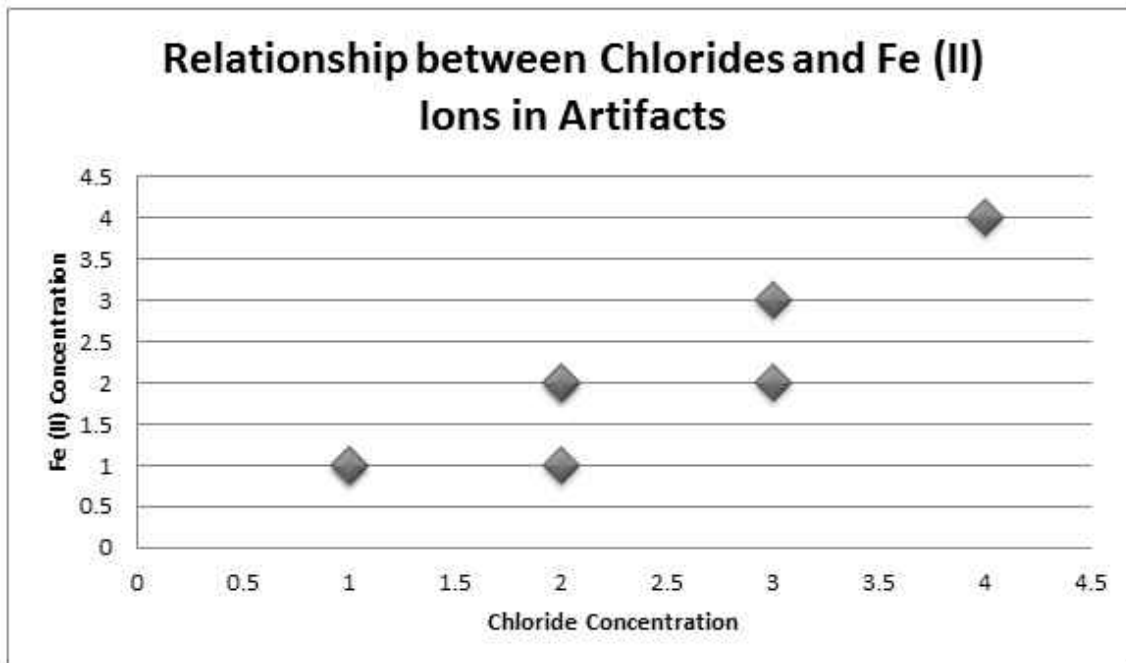


Figure 26. This graph illustrates qualitative data with the numbers simply indicating a general higher or lower concentration. It clearly indicates the strong positive correlation between Cl^- ions and $\text{Fe}(\text{II})^+$ ions.



Figure 27: This photograph illustrates post-excavation damage on an iron III Corps Badge, in this case in the form of chloride weeping. The white droplets in this infrared image are the chlorides seeped onto acid-free tissue.

Discussion

Statistical Support for XRF Hypothesis

The XRF testing was designed to test the hypothesis that soil in which an artifact corroded in exhibited a higher iron content than soil that did not experience the corrosion of an iron artifact. The XRF spectra and other graphs illustrating the data are available in Appendix B and additionally XRF counts of iron in ppm are enumerated sample by sample in Appendix C. The control soil sample tested for iron in the amount of 4194 ppm or about .4%. By examining the XRF data, it is readily apparent that all tested soil samples contained more iron than the control.

By using the Poisson statistical test, it is possible to represent the probability of such an outcome occurring randomly. The Poisson test is a way to statistically determine the likelihood of a specific number of occurrences of a given outcome in a sample set, in this case the outcome that the tested soil sample will contain more iron than the control in parts per million.

$$f(k; \lambda) = \frac{\lambda^k \cdot e^{-\lambda}}{k!}$$

The above equation is the Poisson test. The variable λ is the hypothesized number of occurrences of a given outcome and the variable k is the observed number of occurrences of the given outcome. The equation solves for the probability of the hypothesized number of occurrences actually being observed and is represented by $f(k; \lambda)$. The variable e is the mathematical constant base for natural logarithms and the $!$ symbol represents a factorial function.

As stated above, the alternative hypothesis is that more iron is present in soil surrounding corroded iron artifacts than in sterile soil. Therefore the null hypothesis necessarily must be that the soil surrounding iron artifacts does not contain more iron than sterile soil; or $H_0 \leq 4194$ ppm. To determine if the null hypothesis must be rejected, a Poisson test was calculated for a hypothesis of $n = 26$ observed occurrences of more iron in test samples than in the control and an actual count of $n = 26$ observed occurrences of the same.

$$f(k; \lambda) = \frac{26^{26} \cdot e^{-26}}{26!}$$

$$f(k; \lambda) = \frac{6.16 \times 10^{36} \cdot 5.02 \times 10^{-12}}{4.03 \times 10^{26}}$$

$$f(k; \lambda) = \frac{0.309232}{4.03}$$

$$f(k; \lambda) = 0.077$$

After calculation, it is apparent that the probability that all 26 tested samples contained more iron than the control sample out of random chance is extremely small, certainly small enough to reject H_0 . While the rejection of the null hypothesis does not necessarily prove the alternative hypothesis, it does suggest that the higher iron content present in the test soil samples must be attributed to a cause other than random chance. This in turn supports the overall hypothesis that there is a chemical relationship between the corrosion environment and the subsequent corrosion products formed.

pH and Reduction Potential

As discussed earlier, the pH and the reduction potential of the corrosion environment have a hand in determining the sort of corrosion products formed (See Figure 1, Ch. 2). The average pH for the test soil samples was 4.16, which is in line with the control which tested at 4.32. This is highly acidic, which in fact contributes to increased corrosion in iron. When compared with the reduction potential data gathered from the dipyriddy testing of the soil (which revealed a universal reduction potential of zero) it confirms the chemical analysis which showed Fe (II)^+ present on all excavated artifacts (See Figure 28).

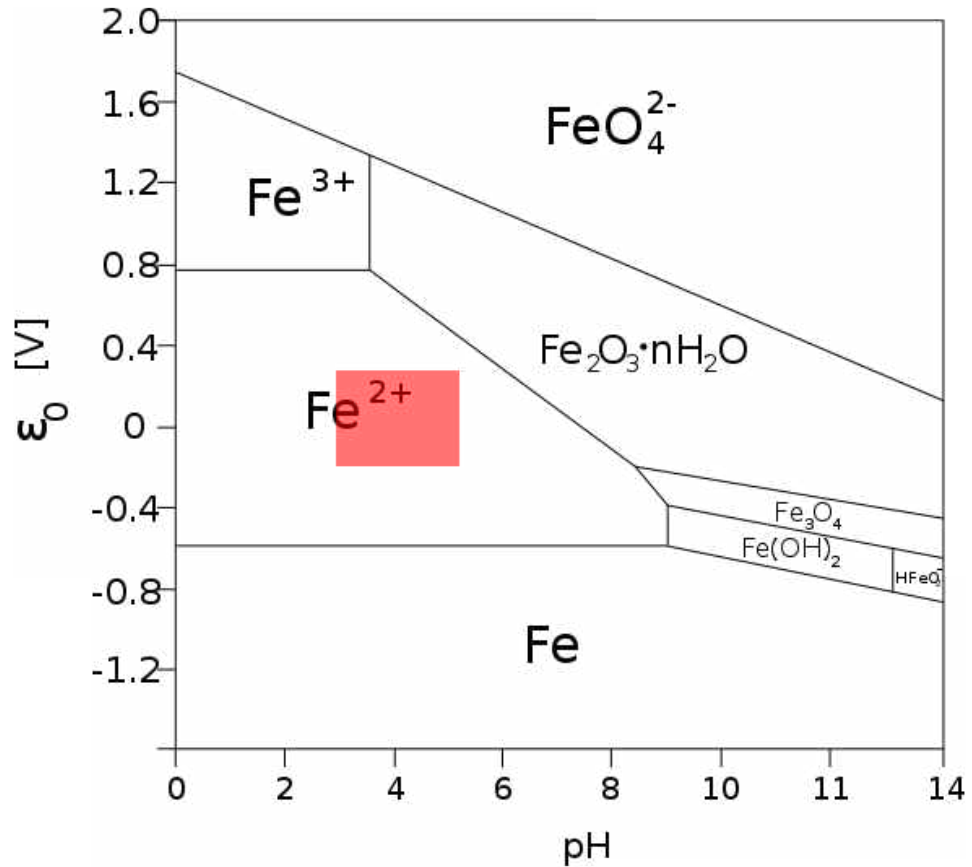


Figure 28. The shaded area on the diagram represents the soil conditions found at Camp Lawton.

What the Chemical Analysis Means

As stated above, the chemical analysis offers insight into the stability of a given artifact in the ground and can be used to make decisions about what conservation methods to apply, if any. A simple visual examination of the ferrous artifacts is enough to conclude if they are well preserved or not, but the state of preservation does not necessarily speak to whether there are active corrosion sites on the artifact surface or not.

Some artifacts from the survey were recovered in very good shape, while others were extremely friable or already broken. The most degraded artifact in the assemblage has been identified as a potential canteen half (002-026-001). When tested, it exhibited very low levels of active corrosion determined by the extremely low amounts of chloride and ferrous ions found present. It is in a much worse preservation state than anything else, yet also has one of the lowest levels of chlorides out of the entire assemblage. To shed light on this discrepancy it is necessary to examine the XRF data. Only about 2.7% of the surface material on this canteen half remains recognizable iron, the rest is corrosion product. By comparison, more than 1.1% of the soil matrix directly underneath the canteen tested for iron. The control sample of soil by contrast exhibited about 0.4% iron. So in this case, the reason the extremely degraded canteen was not chemically active was because it had simply corroded beyond the capacity to remain so. It could have remained buried in this state of equilibrium for hundreds of years without further degradation.

Artifacts that were still highly chemically active when recovered include a suspected washer or bolt (002-026-003), a spoon handle (003-026-001), and a railroad spike (003-027-012), along with a few other fragments of artifacts that are not as diagnostic for the period. The washer/bolt artifact was by far the most chemically active specimen in the entire assemblage, which immediately throws up a red flag. It has also experienced more post-excavation damage than any other artifact, in this case in the form of chloride weeping (See Figure 29).



Figure 29. The hardened “rust bubbles” are what is left behind after post-excavation chloride weeping.

The fact that the washer is so chemically active may indicate that the artifact was deposited more recently than the Civil War era occupation or that it existed in a disturbed context and then became re-deposited. The XRF data supports this conclusion even further. The surrounding soil for the washer exhibited the highest iron content out of the entire sample set at 1.7% iron. By comparison, the washer itself had one the highest measurements for superficial iron content at 23.1%. So in sum, it has extremely active corrosion sites, still contains a large amount of its original iron content on the surface (which is not an indicator of interior metallic content), and has left a large iron footprint in the soil matrix. The fact that so much iron is present around the artifact indicates that the artifact has not been there long enough for the iron to leach away more through the

soil in the groundwater. The artifact was recovered at a depth of 10 cm, so it is located in a position where it would be affected by surface moisture moving into the soil.

The spoon handle and railroad spike mentioned above are almost undoubtedly period to the Civil War era occupation, yet both artifacts also stood out as being highly chemically active among the assemblage. Both of these artifacts were excavated from comparatively deep proveniences; 24 and 35 cm respectively. Both also retained a higher proportion of iron on the surface as shown by the XRF testing. The associated soil samples, however, both had iron concentrations less than 1%. The likely reason for the chemical conditions of these artifacts is that they reached equilibrium in the ground under very mild conditions, because of their depth. This environmental stability corroded the iron to a certain point and once the present reagents were exhausted, the system became closed and corrosion halted. When the artifacts were excavated, the artifacts began corroding again because the environment had changed, like any artifact would. The difference here is that the original environmental corrosion had not been extreme, so there was more iron present to begin corroding anew post-excavation; hence the high level of chemical activity. Artifacts such as these are in the most need of immediate conservation plans post-excavation or they are in danger of deteriorating indefinitely.

A Closer Look at Nail Specimens Analyzed

Of the 26 unique field specimens recovered, 11 were nails or nail fragments. The nails are all in an extremely stable state and exhibit good preservation with low levels of chlorides and ferrous ions. This could be due to several reasons; chief among them manufacturing technique. Machine-made nails appear on archeological sites dated 1790

and later (Hume, 1969). These nails were sliced by machine from sheets of cast iron (Hume, 1969). Earlier machine cut nails had a hand-hammered head, but after 1815 most nails had machine made heads as well and by 1830 the process was well-established and no more changes were made until wire nails were introduced in the late nineteenth century (Hume, 1969). Therefore, these nails excavated from Camp Lawton began life as cast iron, rather than iron wrought by a blacksmith.

The manufacturing process is significant because all metals exhibit a grain structure which is altered through hammering or smelting (Cronyn, 1991). When metal is hammered, the grains are squeezed and the crystalline structure flattened (Cronyn, 1991). Hammered or wrought iron goes through more structural stress during manufacture and is therefore more prone to corrosion and corrosive damage like lamination (Cronyn, 1991). Cast iron in the industrial age contains very few impurities and thereby stabilizes quickly in the ground (Cronyn, 1991). Since these nails were cut from sheets of cast iron, this is a reasonable hypothesis for why they exhibit highly stable chemical properties with few active corrosion sites.

Conclusion

There are many environmental and situational factors which affect an artifact's condition in the ground. Some can be directly measured, like depth and pH while others, like duration of interment, can only be hypothesized. Electrochemical corrosion is a complex reaction, but like any other chemical reaction, if the ingredients are not present the products will not form. Through the use of chemical tests for active corrosion ingredients, archeologists can gauge the potential for future damage to excavated

artifacts. Through physical analysis via XRF, archeologists can gauge the impact corrosive agents have already had on a given artifact. By combining this knowledge, a more efficient conservation plan can be put in place in the early stages of a project before it becomes an issue. These tests make it very easy to decide which artifacts would benefit from stabilization or treatment and which artifacts may be beyond help. Overall, taking this extra measure will save time, money, and artifacts as work progresses.

CONCLUSION

This study answered important questions about the relationship between artifacts and the soil they corrode in. First, it confirmed that there is in fact a chemical relationship between the corrosion products formed on iron artifacts and the soil matrix. Second, it confirmed that this relationship is quantifiable via a combination of test methods. Third, it confirmed that knowledge of this relationship may be exploited in order to better manage conservation procedure of iron artifacts. The next step is to apply these methods to other sites with different environmental conditions and determine if the basic principles still hold.

There may be some difficulties with moving forward with this type of analysis on other sites, however. Most importantly, such a study would be expensive to conduct in both cost of equipment (XRF analyzers run between 20,000\$ and 35,000\$) and time. In the university environment, the time is supplied by summer field school and the equipment via academic grant. In the contracting world, this is not a realistic expectation. Additionally, Camp Lawton is an extremely undisturbed site. Iron artifacts on a continuously plowed parcel of land would not have spent enough time in one place to have a significant corrosion impact on the soil, so no corrosion bloom would form. Furthermore, on a site that would not yield a vastly metallic artifact assemblage, there might not be enough data to study.

And yet the information would be valuable. Metal detection keeps gaining supporters as a valid archeological method. More and more labs will be tasked with the curation of metal artifacts, much of which will be iron in nature. If these objects are not

properly managed, they will be nothing but orange dust within a few short years. Many archeological firms view conservation costs as daunting and overwhelming, which leads to artifacts continuing to deteriorate in curation storage while the scientists decide how to approach it.

After several different sites have been analyzed in the manner described here, there may be enough data for archeologists to prophylactically plan for iron artifact conservation. When a site is expected to yield a large iron assemblage, all the excavation team would need to do is take a few soil samples. The data would then be analyzed in the lab and a projected average condition of ferrous finds would be returned to the principal investigator. With this information, it would be easier to plan for conservation facilities and even to plan a realistic budget for the same. This would save time, money and heartache for iron artifact assemblages and improve the curation integrity for metallic artifacts.

Of course, not every artifact will be significant enough to merit involved conservation procedure, but even a process as simple as chloride removal or control of relative humidity in curation storage will go a long way towards stabilizing iron artifacts post-excavation. There is a lot of information that iron artifacts and corrosion products can teach archeologists about the burial conditions of a site and it is vastly important to the archeological record to study and preserve these items as best as possible. With luck, soon curation facilities will contain more containers of iron artifacts and less containers of orange dust.

REFERENCES

- An Old Mansion Burned. (1901, March 09). *Waynesboro True Citizen*.
- Bearss, E. C. (1970). *Andersonville National Historic Site Historic Resource Study and Historical Base Map*. Washington DC: Office of History and Historic Architecture, National Park Service.
- Burke County Superior Court
- 1866 Deed Book B, pp. 140-142.
 - 1866 Deed Book F, p. 65.
 - 1871 Deed Book F, p. 66.
 - 1875 Deed Book G, pp. 506-507.
 - 1875 Deed Book G, p. 426.
 - 1883 Deed Book N, p. 220.
 - 1888 Deed Book S, pp. 211-212.
 - 1895 Deed Book 2, pp. 460-465.
 - 1895 Deed Book X, pp. 460-464.
 - 1895 Deed Book 2, pp. 21-22.
- Childs, C. W. (1981). Field Tests for Ferrous Iron and Ferric-organic Complexes (on Exchange Sites or in Water-soluble Forms) in Soils. *Australian Journal of Soil Research* 19, 175-180.
- Cloyd, B. G. (2010). *Haunted By Atrocity: Civil War Prisons in American Memory*. Baton Rouge: Louisiana State University Press.
- Connor, M. and Scott, D. D. (1998). Metal Detector Use in Archeology: An Introduction. *Historical Archaeology*, 32 (4), 76-85.
- Cronyn, J. M. (1990). *Elements of Conservation*. New York: Routledge.
- Derden, J. K. (In Press). *The World's Largest Prison: The Story of Camp Lawton*. Macon: Mercer University Press.
- Drucker, L. M. (1981). *A Cultural Resources Inventory Survey at Millen National Fish Hatchery, Jenkins County, Georgia*. Atlanta: U. S. Fish and Wildlife Service Region IV.

- Editorial (1901, April 20). *Waynesboro True Citizen*.
- Elliot, D. T. and Battle, D. E. (2010). *GPR Delineation and Metal Detector Reconnaissance of Portions of Camp Lawton, Jenkins County, Georgia*. Savannah, Georgia: The LAMAR Institute, Inc.
- Giles, W. (2005). *Disease Starvation & Death: Personal Accounts of Camp Lawton, The South's Largest Prison*. Millen, Georgia: Lulu Press.
- Gregory, T. and Rogerson, A. J. G. (1984). Metal-detecting in Archaeological Excavation. *Antiquity, LVIII*, 179-184.
- Gordon, C.G. and Buikstra, J. E. (1981). Soil pH, Bone Preservation, and Sampling Bias at Mortuary Sites. *American Antiquity* 46 (3), pp. 566-571.
- Hamilton, D. L. (1998). *Methods of Conserving Underwater Archaeological Material Culture*.
Conservation Files: ANTH 605, Conservation of Cultural Resources I. College Station, Texas: Texas A&M University.
- Haney, C., Banks, C. and Zambardo, P. (1973). Interpersonal Dynamics in a Simulated Prison. *International Journal of Criminology and Penology* 1, 69-97.
- Hesseltine, W. B. (1930). *Civil War Prisons: A Study in War Psychology*. Columbus: Ohio State University Press.
- Hesseltine, W. B. (1935). The Propaganda Literature of Confederate Prisons. *The Journal of Southern History*, 1 (1), 56-66.
- Hough, H.W. (1930). Significant Developments Regarding Soil Corrosion. *The Scientific Monthly*, 30 (2), 132-140.
- Hume, I. N. (1969) *A guide to Artifacts of Colonial America*. Philadelphia: University of Pennsylvania Press.
- Innov-x Systems (2009). *User Manual for Omega Family: Handheld XRF Analyzers*.
- Joseph, J. W., Loubser, J. H. N. and Yallop, R. J. (1997). *Archaeological Survey and Testing of US 25/SR 121 from Millen to Waynesboro and Phase II Testing of Site 9BK375I*. Stone Mountain, Georgia: New South Associates.

Larson, L. H. and Crook, M. R. (1975). *An Archeological Investigation at Andersonville National Historic Site, Sumter and Macon Counties, Georgia*. Tallahassee: Southeast Archeological Center, National Park Service.

Lower, S.K. (2004). *Electrochemistry*. Simon Fraser University.

Marrinan, R. A. and Wild Jr., K. S. (1985) *Soil Resistivity Survey of the Hospital Site Andersonville National Historic Site*. Tallahassee: Southeast Archeological Center, National Park Service.

Marvel, W. (1994) *Andersonville: The Last Depot*. Chapel Hill: University of North Carolina Press.

Marvel, W. (1995). Johnny Ransom's Imagination. *Civil War History*, 41 (3), 181-189.

Matthiesen, H. (2004). In Situ Measurement of Soil pH. *Journal of Archaeological Science* 31 (10), pp. 1372-1381.

McElroy, J. (1879). *Andersonville: A Story of Southern Prisons*. Reprint (1999). Scituate, Massachusetts: Digital Scanning, Inc.

Morrow, A. L. (2010). The Artifacts of Camp Lawton. Paper presented at the *Southeastern Archeological Conference* in Lexington, KY.

Paglione, T. L. (1984). *Archeological Survey and Testing of Tract 01-142: Andersonville National Historic Site, Georgia*. Tallahassee: Southeast Archeological Center, National Park Service.

Patch, S. M. (2006). *The Search for Camp Lawton: Ground Penetrating Radar (GPR) Investigations at Magnolia Springs State Park, Jenkins County, Georgia*. Atlanta: Parks and Historic Sites Division, Georgia Department of Natural Resources.

Plenderleith, H.J. & Werner, A. E. A. (1971). *The Conservation of Antiquities and Works of Art, 3rd Ed*. London: Oxford University Press.

Pomfret, J. (2005). *Ground Penetrating Radar Survey of Andersonville National Historic Site*. Tallahassee: Southeast Archeological Center, National Park Service.

Prentice, G. and Mathison, M. (1989). *Archeological Investigations of the North Gate at Andersonville National Historic Site*. Tallahassee: Southeast Archeological Center, National Park Service.

Prentice, G. (2012). Personal communication, email.

- Prentice, M. C. and Prentice, G. (1990). *Archeological Investigations of the Southeast Corner of the Inner Stockade at Andersonville National Historic Site, Georgia*. Tallahassee: Southeast Archeological Center, National Park Service.
- Ransom, J. (1883). *Andersonville Diary*. Reprint (1974). New York: Haskell House.
- Riss, D. (1993). Testing for Chlorides with Silver Nitrate. *Conserve O Gram* 3 (6). Harpers Ferry: National Park Service.
- Rogers, G. A. and Saunders, R. F. (1981). Camp Lawton Stockade, Millen, Georgia, C.S.A *Atlanta Historical Society Journal (Winter)*, 80-94.
- Sanders Jr., C. W. (2005). *While in the Hands of the Enemy: Military Prisons of the Civil War*. Baton Rouge: Louisiana State University Press.
- Sease, C. (1994). *A Conservation Manual for the Field Archaeologist 3rd Ed.* Archaeological Research Tools Vol. 4. Los Angeles: University of California, Institute of Archaeology.
- Selwyn, L. S., Sirois, P. J., and Argyropoulos, V. (1999). The Corrosion of Excavated Iron with Details on Weeping and Akaganéite. *Studies in Conservation* 44 (4), pp. 217-232.
- Shackley, M. S. (2011). An Introduction to X-Ray Fluorescence (XRF) Analysis in Archeology. *X-Ray Fluorescence Spectrometry (XRF) in Geoarcheology*. M. S. Shackley, Ed., 7-44.
- Snedden, R. K. (2000). *Eye of the Storm*. Edited by Charles F. Bryan, Jr. and Nelson D. Lankford. New York: Touchstone.
- Snedden, R. K. (2001). *Images from the Storm*. Edited by Charles F. Bryan, Jr., James C. Kelley, and Nelson D. Lankford. New York: The Free Press.
- Speer, L.S. (1997). *Portals to Hell: Military Prisons of the Civil War*. Mechanicsburg, Pennsylvania: Stackpole Books.
- Tawada Scientific (2011). "How XRF Works." <http://www.tawadascientific.com/how-xrf-works.php>. Retrieved May 6, 2012.
- The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies* (1880–1901), Ser. II, Vol. VII. Washington: Government Printing Office.

The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies (1880–1901), Ser. II, Vol. VIII. Washington: Government Printing Office.

Townsend, B. (1975). *Camp Lawton: Magnolia Springs State Park*. Atlanta: Parks and Historic Sites Division, Georgia Department of Natural Resources.

United States Department of Agriculture (1997). *Troup Series*. Online, retrieved 3/23/12.

United States Department of Agriculture. (2003). *Keys to Soil Taxonomy*. Natural Resources Conservation Service.

United States Department of Agriculture. (2010). *Custom Soil Resource Report for Jenkins County, Georgia*. Generated November 8, 2010.

Vogel, G. (2002). *A Handbook of Soil Description for Archeologists*. Arkansas Archeological Survey.

Walter Harrison Papers and Letters (1926-1945), Box 6 (Fish Hatchery and Magnolia Springs State Park). Georgia Southern University: Zach S. Henderson Library Special Collections.

Western, A.C. (1972). The Conservation of Excavated Iron Objects. *Studies in Conservation*, 17 (2), 83-87.

Wheaton, T. R. (2000). *Archeological Data Recovery at the Hypothesized Civil War Gun Battery at Camp Lawton SR 121/US 25 Jenkins County, Georgia*. Stone Mountain, Georgia: New South Associates.

APPENDIX A

HISTORIC PLATS AND MAPS OF THE PROJECT AREA

1861 Plat listing Batt Jones as Adjacent Landowner

1864 Two Maps Drawn by Robert Knox Sneden

(not published in 1864, but representing 1864)

1866 Map of Burke County

1866 Plat from Caroline Jones to George Hack

1869 Map of Burke County

1875 Plat from George Sapp to Nancy Brinson

1895 Plat illustrating holdings of J.T. Reeves

1906 Map of Jenkins County

1909 Map of Jenkins County

1920 Topographic Map

1923 Soil Survey Map

1934 Plat of Fish Hatchery

1934 Plat of Alwood Lands

1935 Plat of English Tract

1935 Plat of Future Park Lands

1940 Map of the Park with CCC Camp

1943 Topographic Map

1946 Plat of the Western Side of the Park

1963 Map of the Park

1965 Map of the Park

1861 Plat listing Batt Jones as Adjacent Landowner

Perkins, S. M.

Scale of 20 Chs per Inch

Regn State H

Batt Jones

Batt Davis

S. Perkins

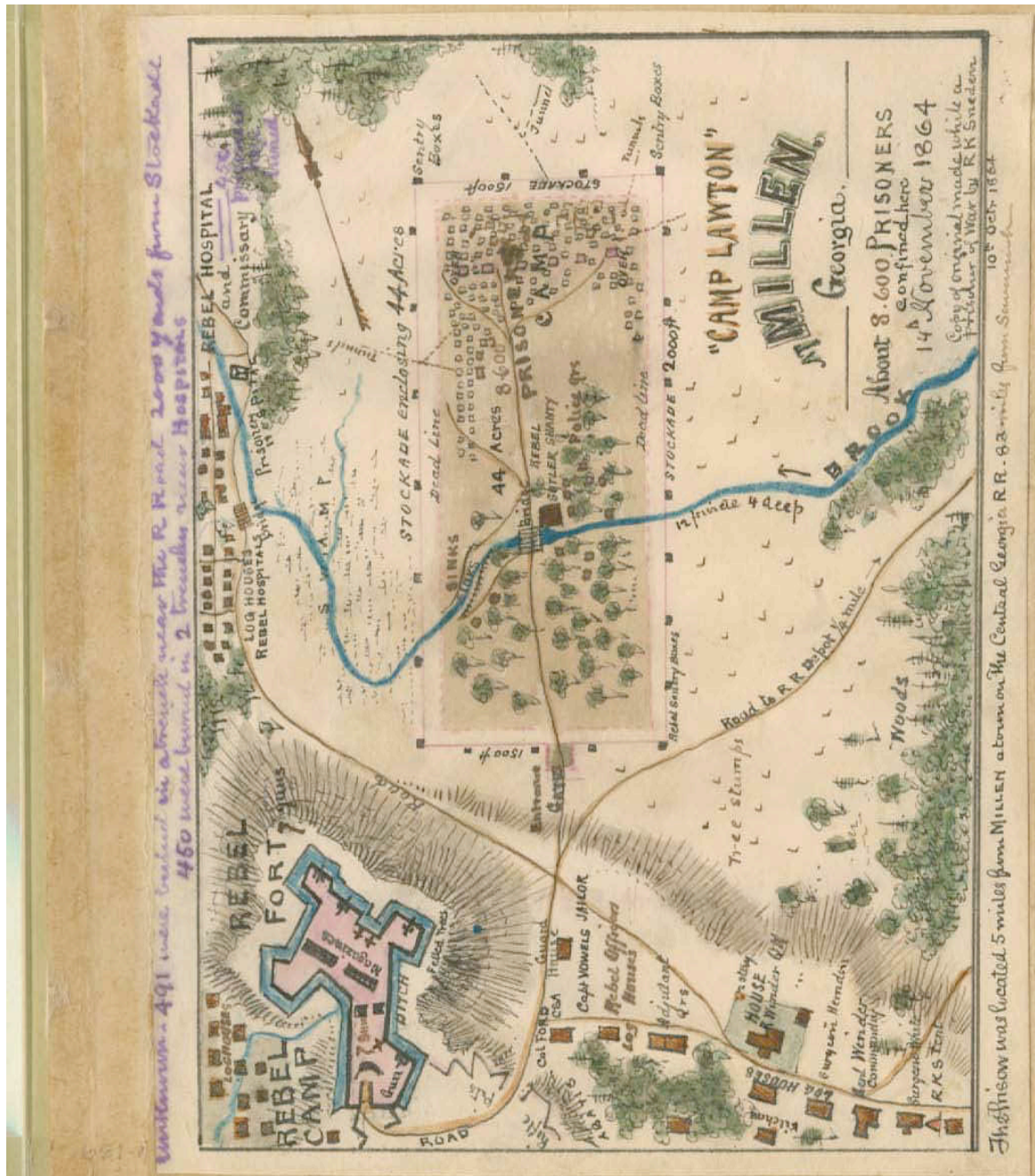
S. C. Perkins & W. H. S.

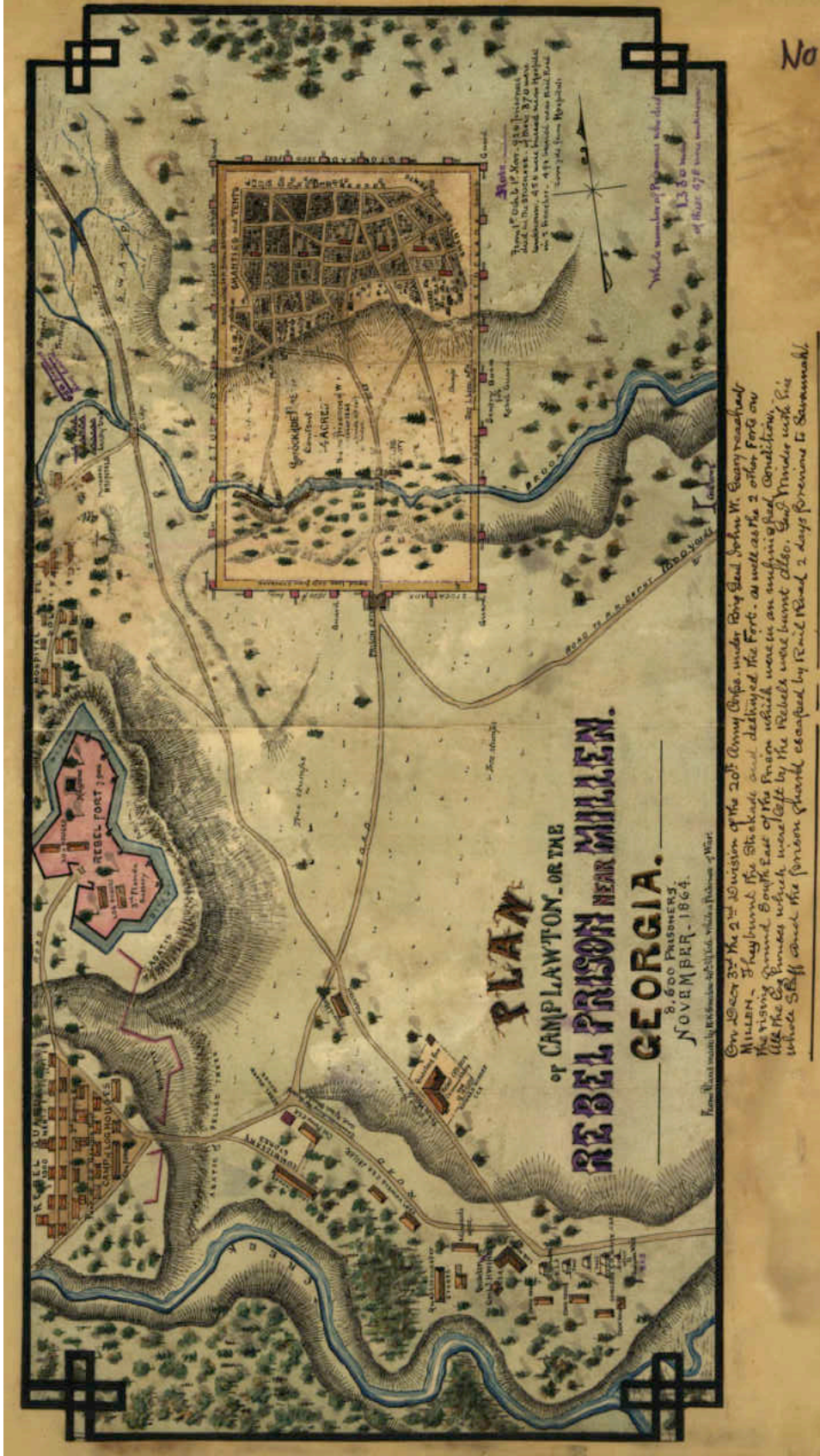
State of Georgia
Bunke County } Warrant dated 7th May 1861
and Duly served 8th May — 1861
for S. M. Perkins who resides in
this State a tract of land containing
1 1/2 acres.

Pat. A. Brinson } Adversely 9th May 1861
Pat. W. Reynolds } Executed &
Certified by } Square, C. C. Clark C.S. 13C

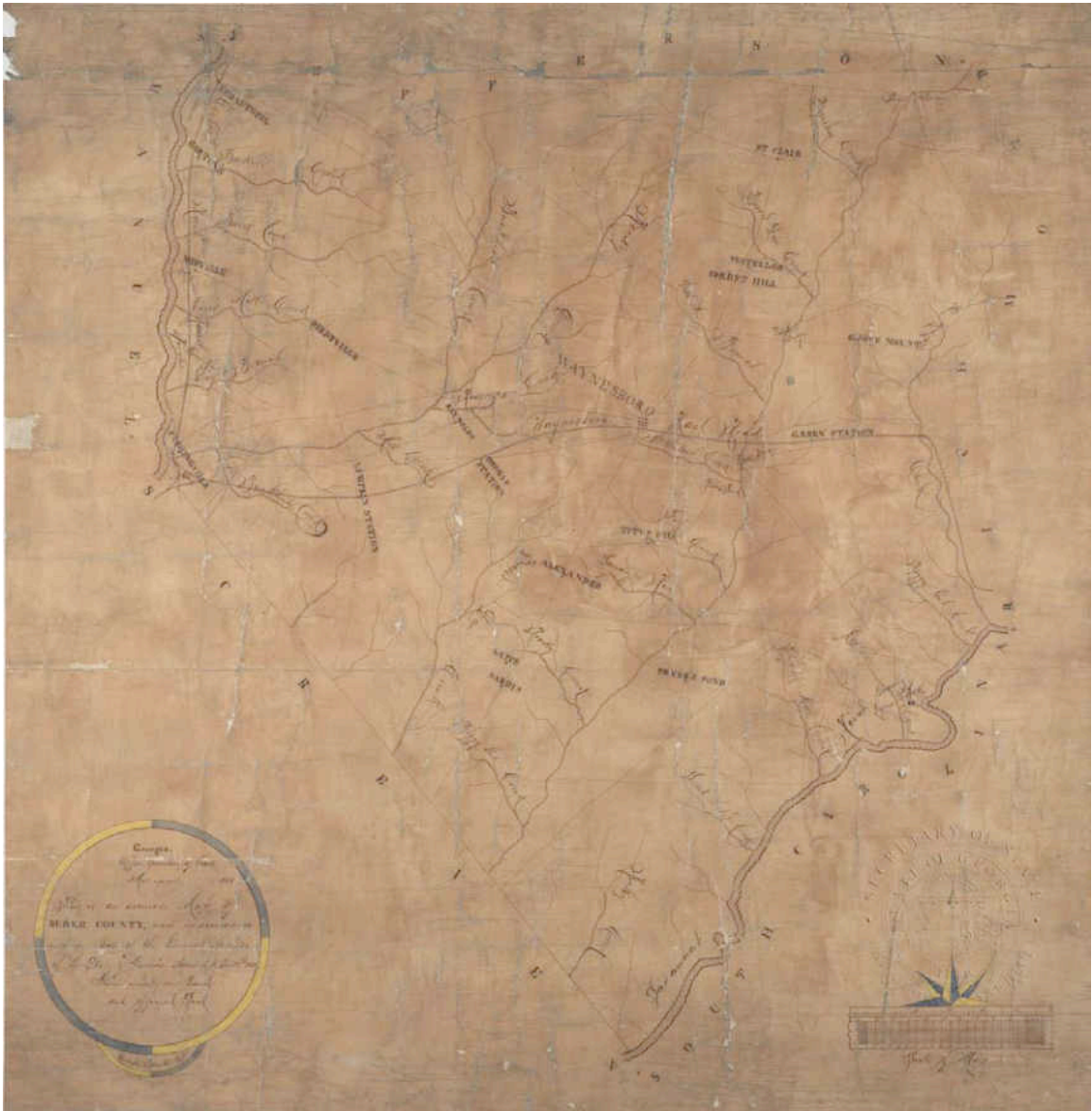
State of Georgia
Bunke County } I hereby certify that I have
duly advertised said piece of land and
that no person or persons are in possession
or claim above piece of land other than
the applicant for this Grant
4th Aug 1861. Square C. C. Clark C.S. 13C

2219

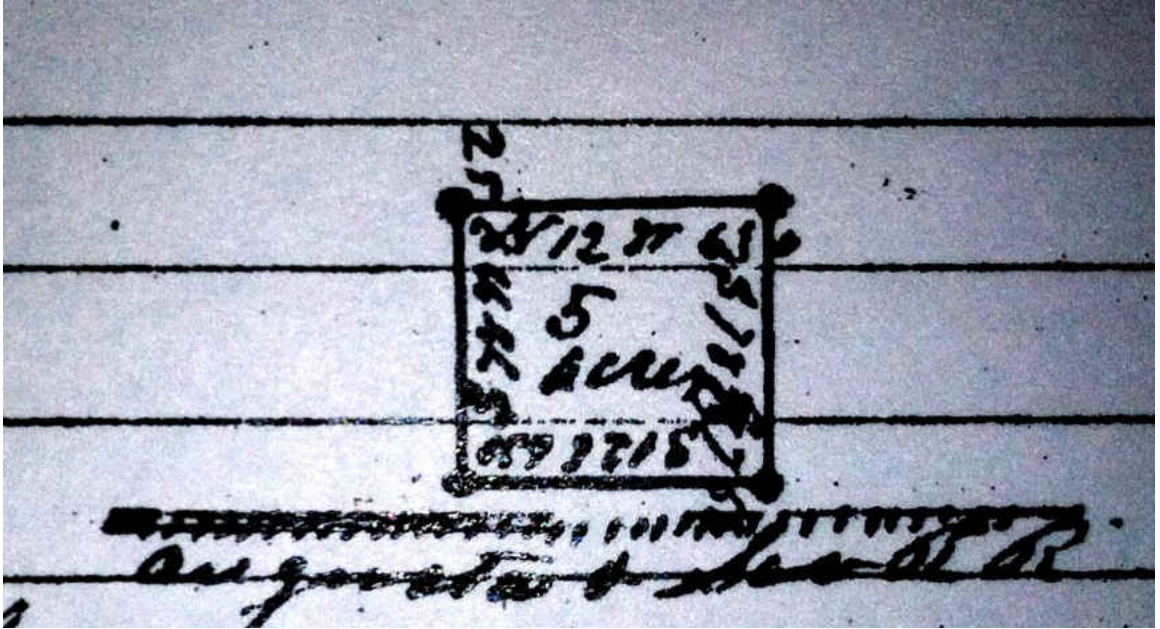




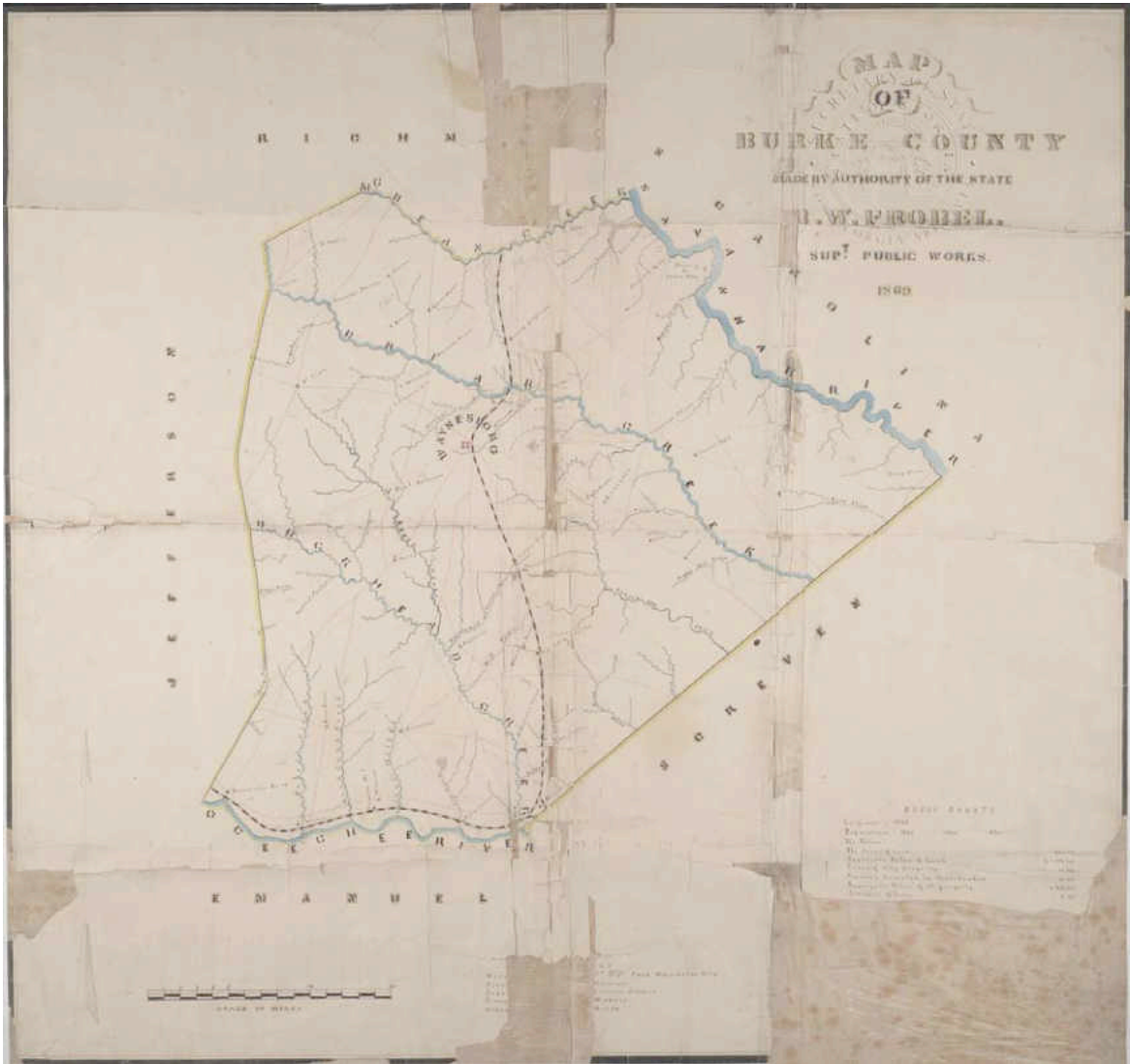
1866 Map of Burke County



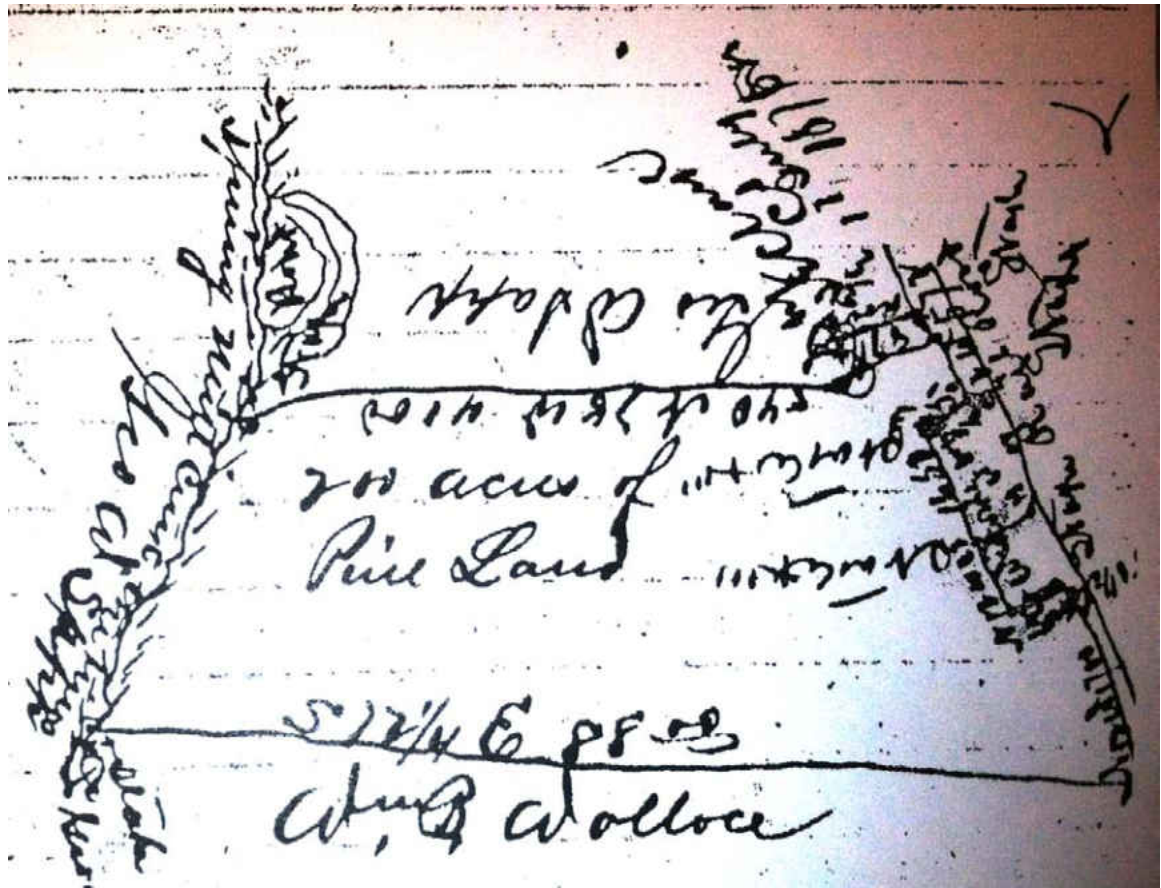
1866 Plat from Caroline Jones to George Hack



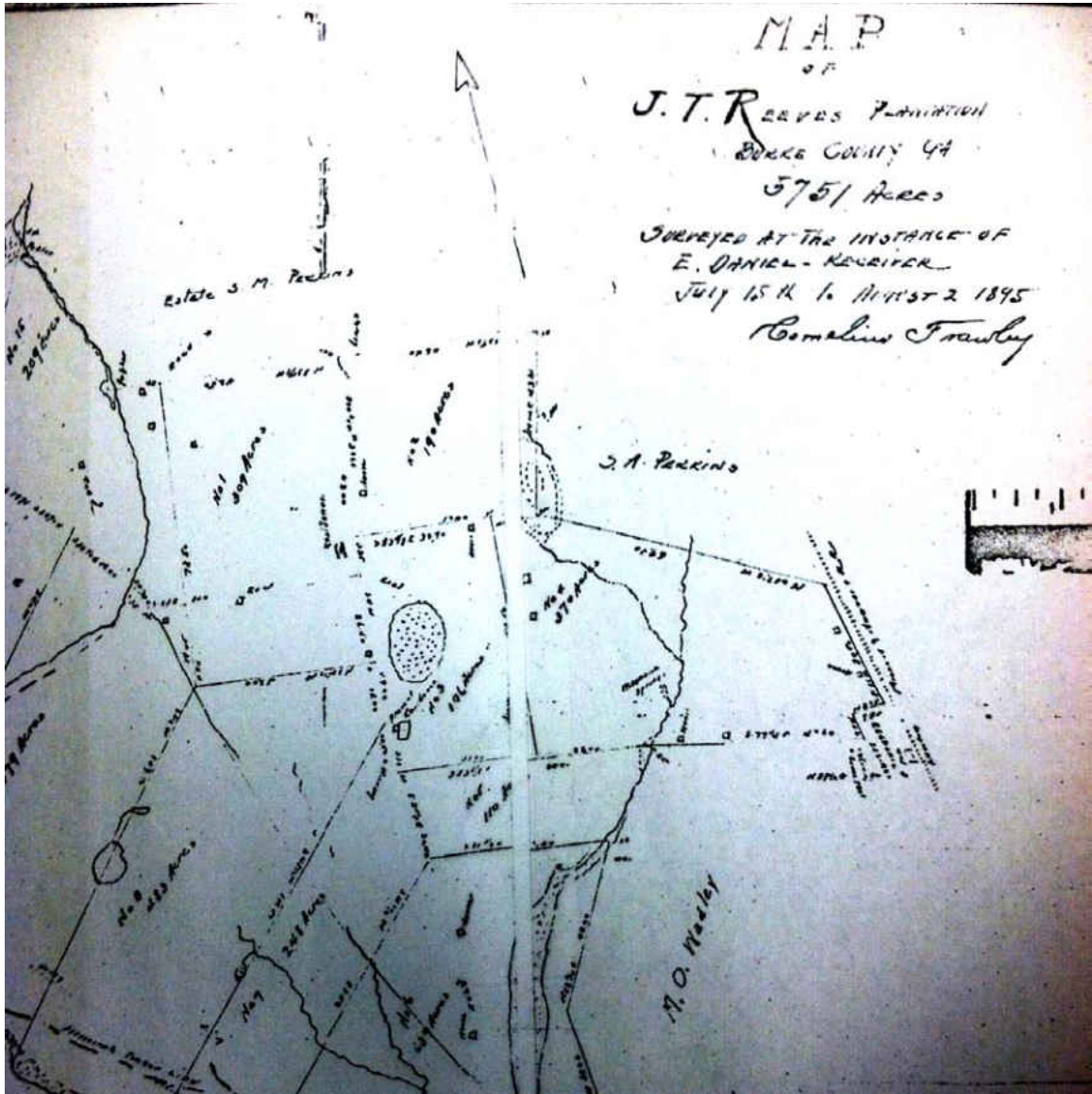
1869 Map of Burke County



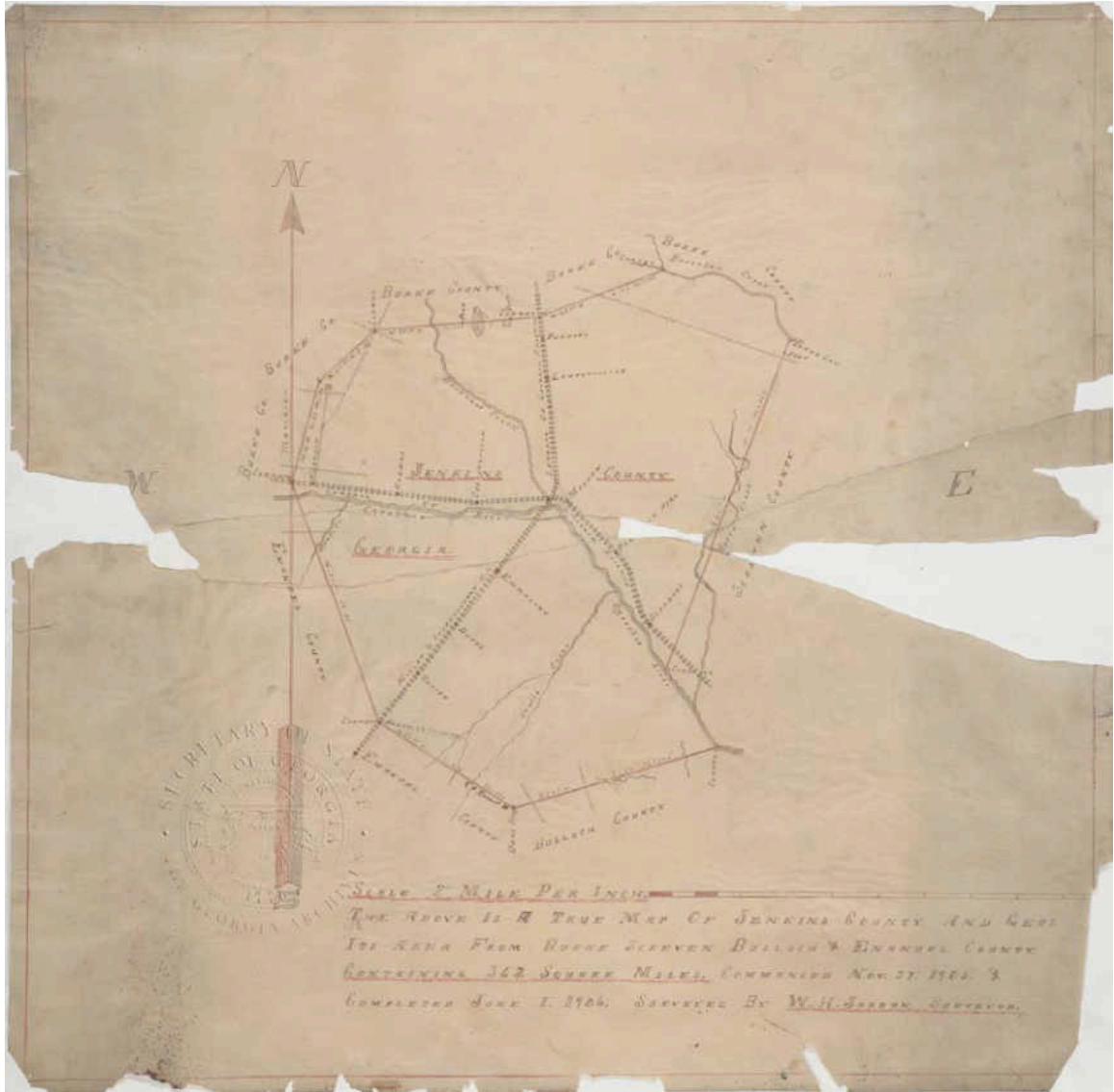
1875 Plat from George Sapp to Nancy Brinson



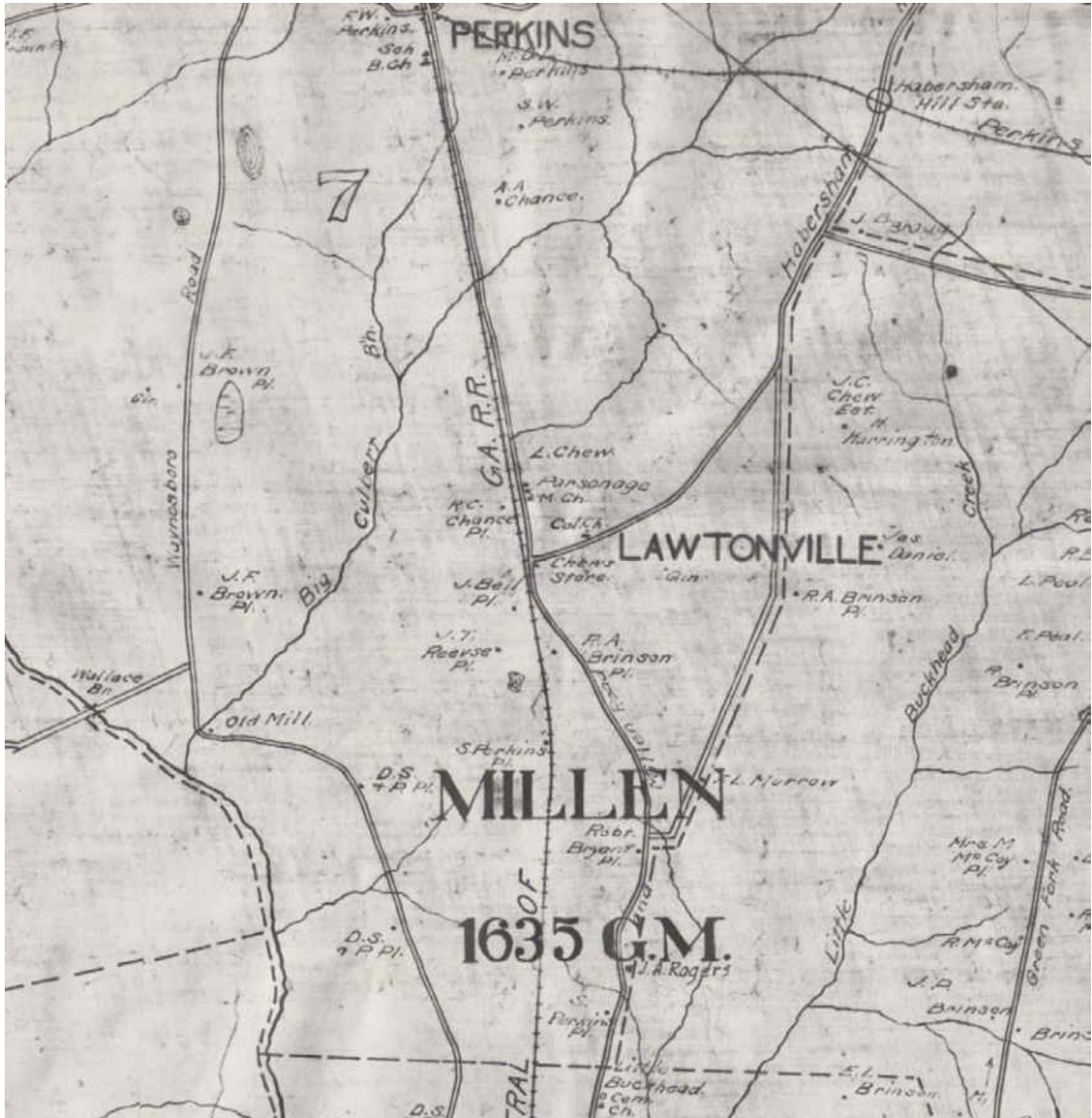
1895 Plat illustrating holdings of J.T. Reeves



1906 Map of Jenkins County



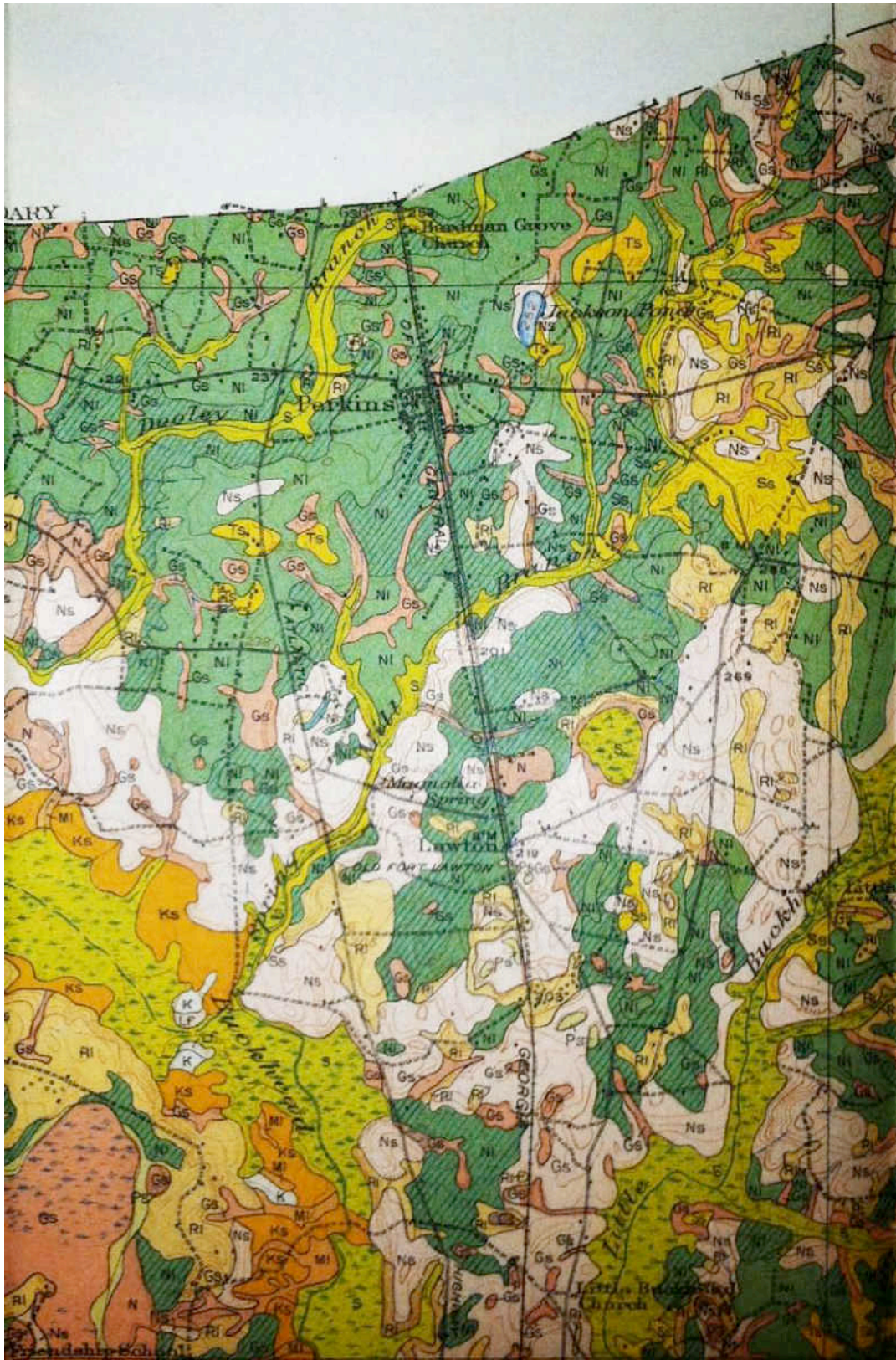
1909 Map of Jenkins County



1920 Topographic Map



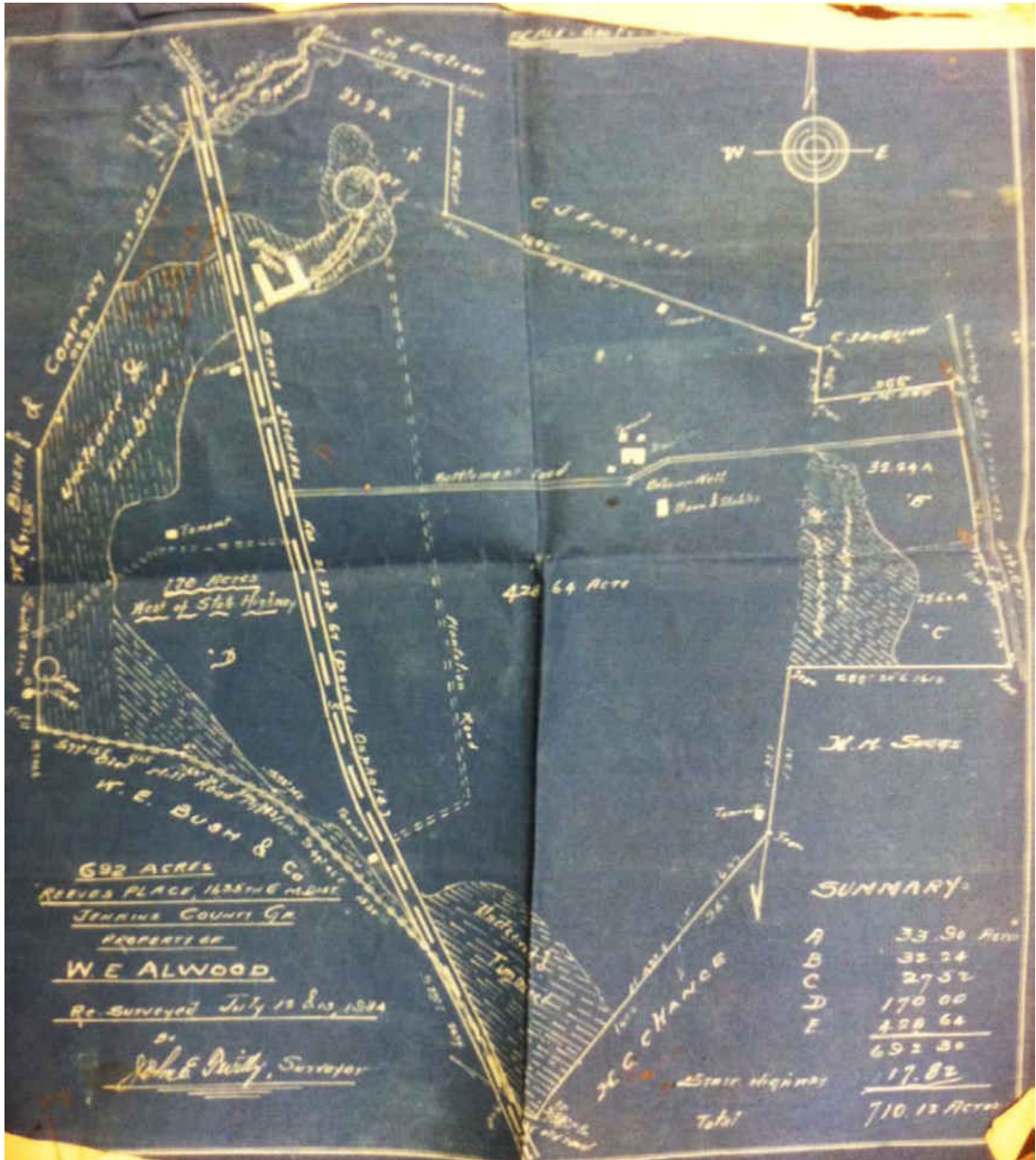
1923 Soil Survey Map



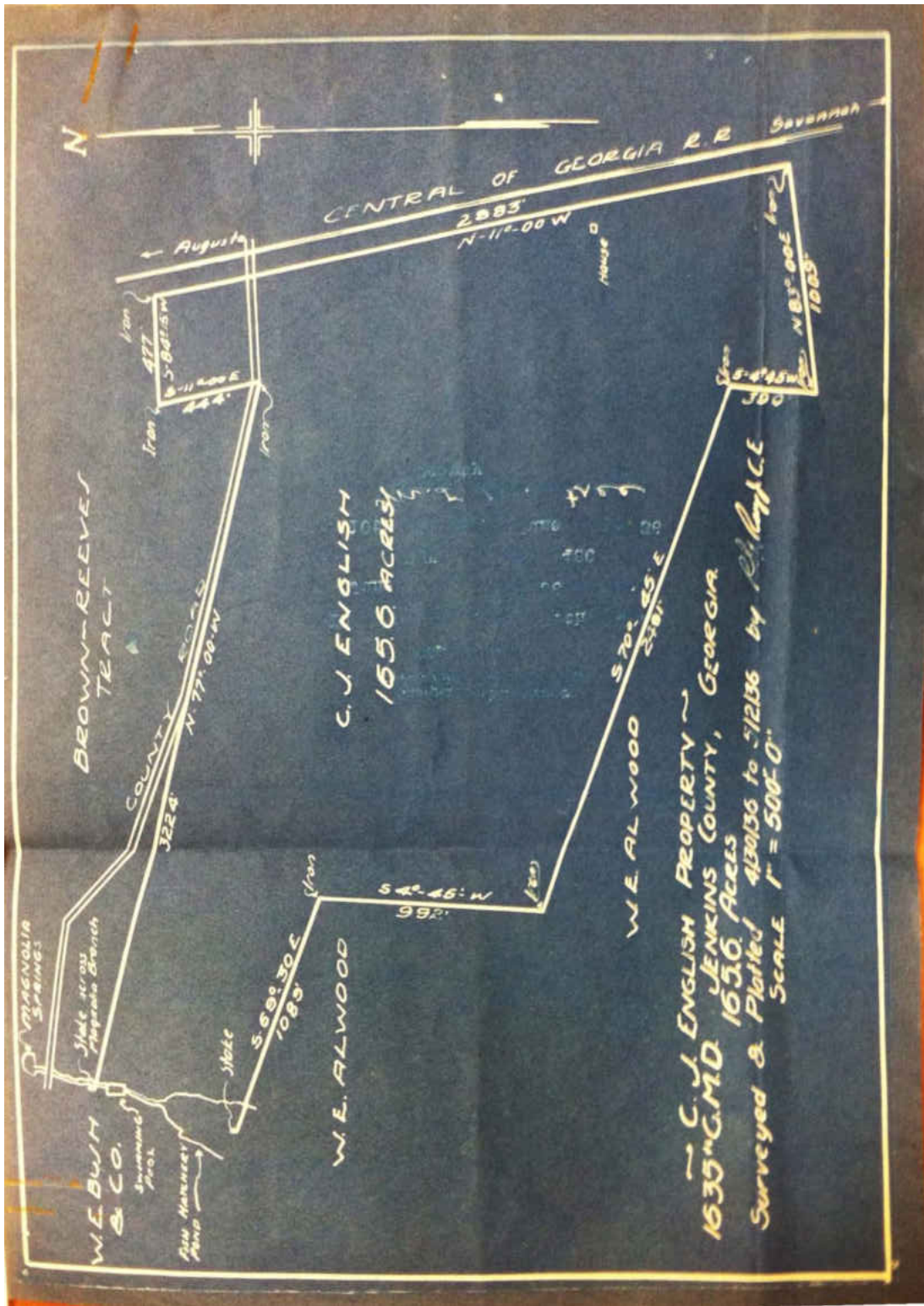
1934 Plat of Fish Hatchery



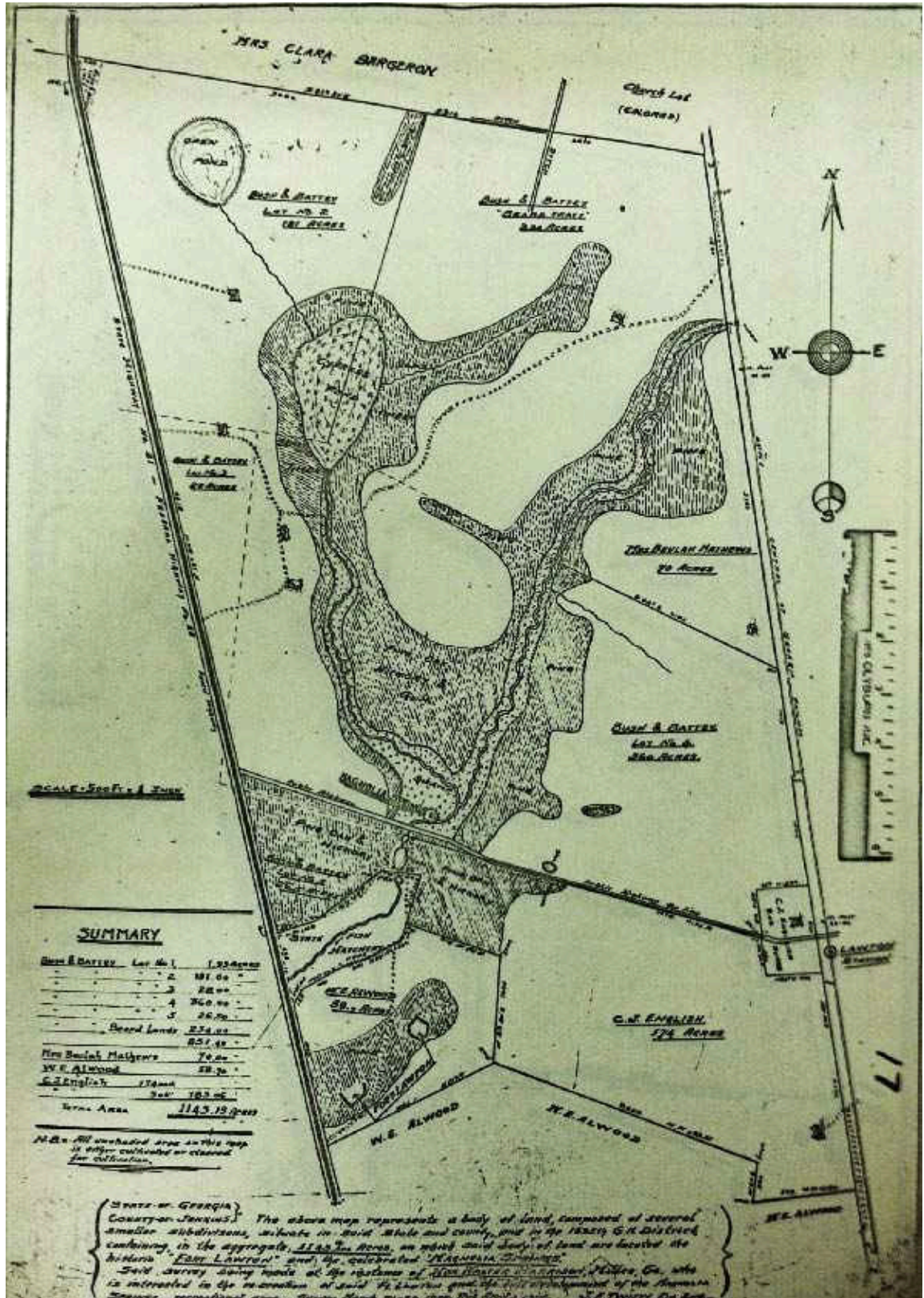
1934 Plat of Alwood Lands



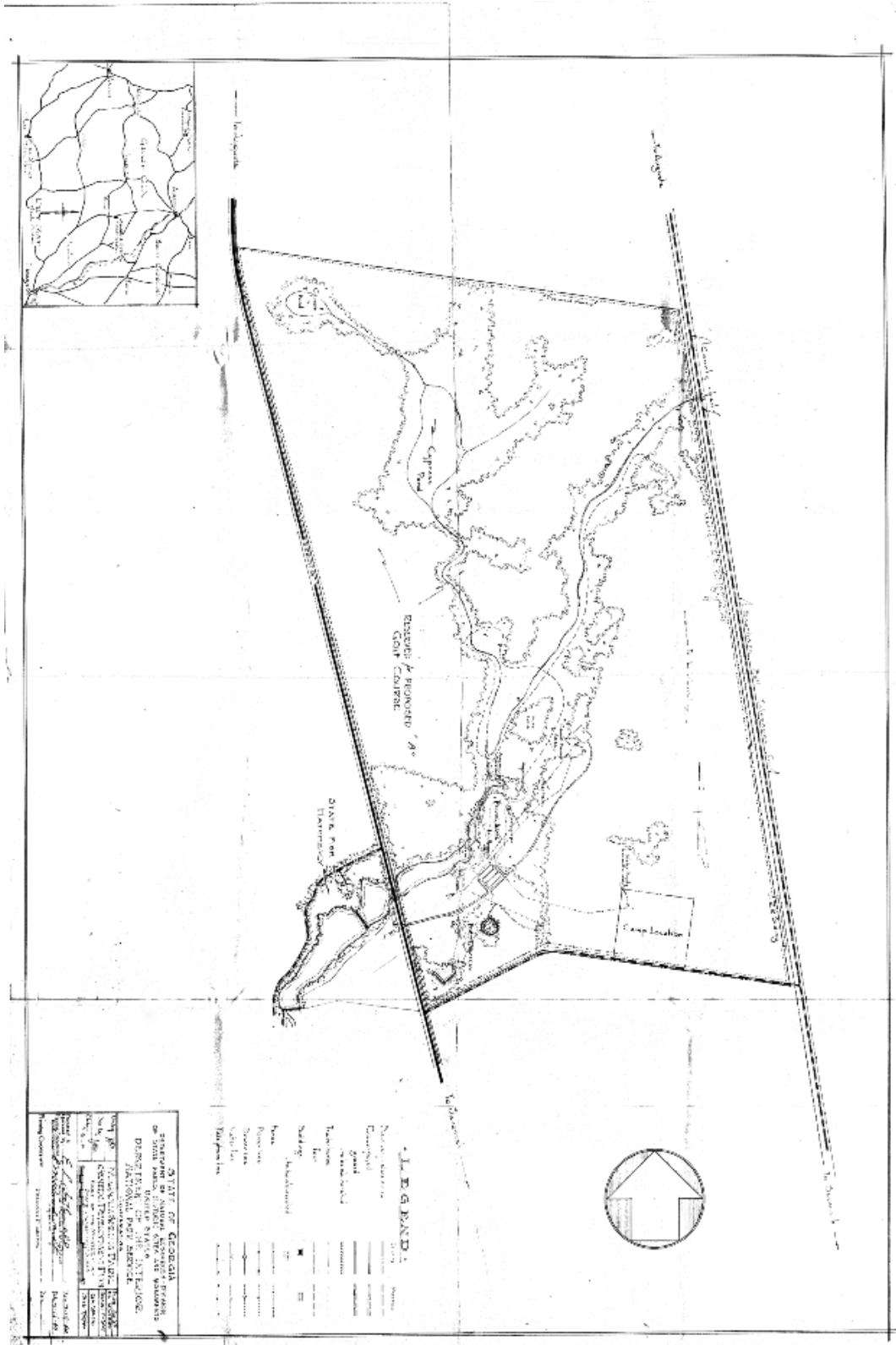
1935 Plat of English Tract



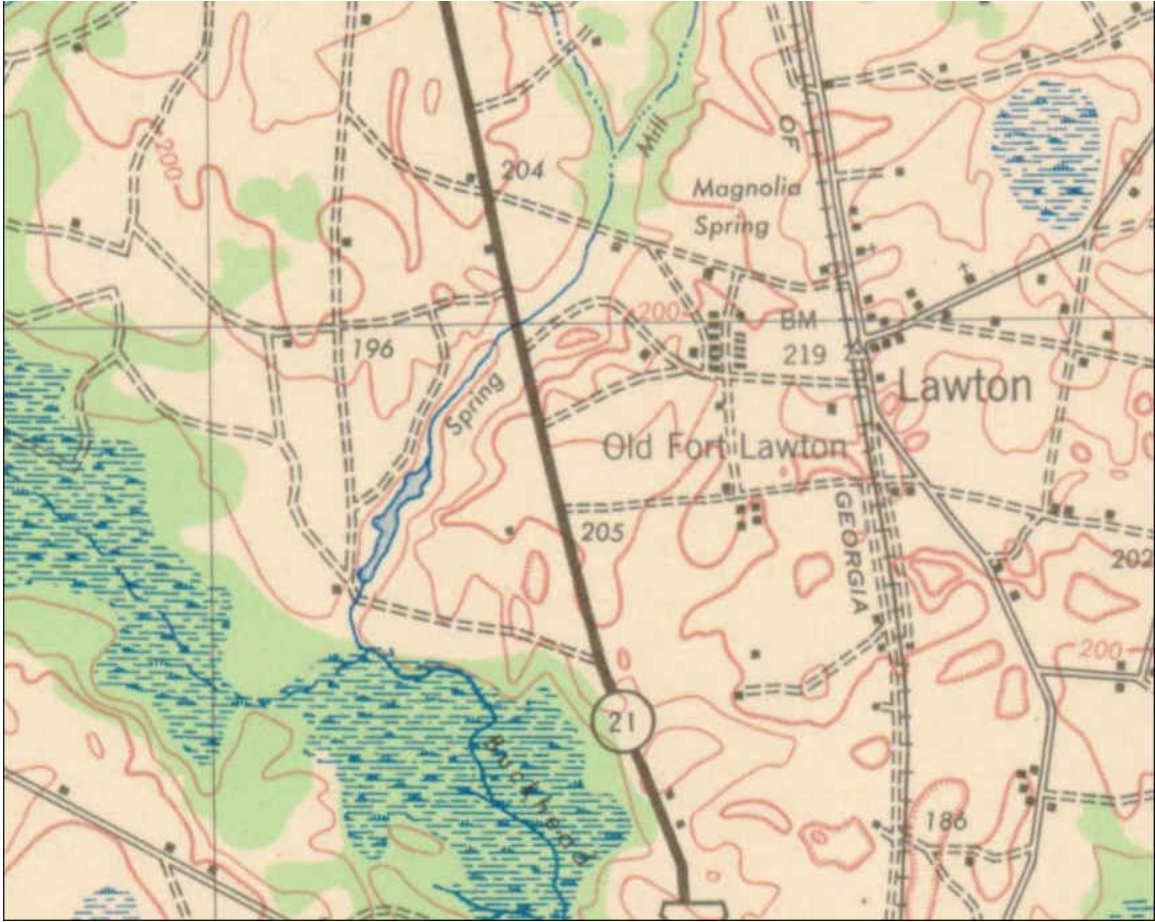
1935 Plat of Future Park Lands



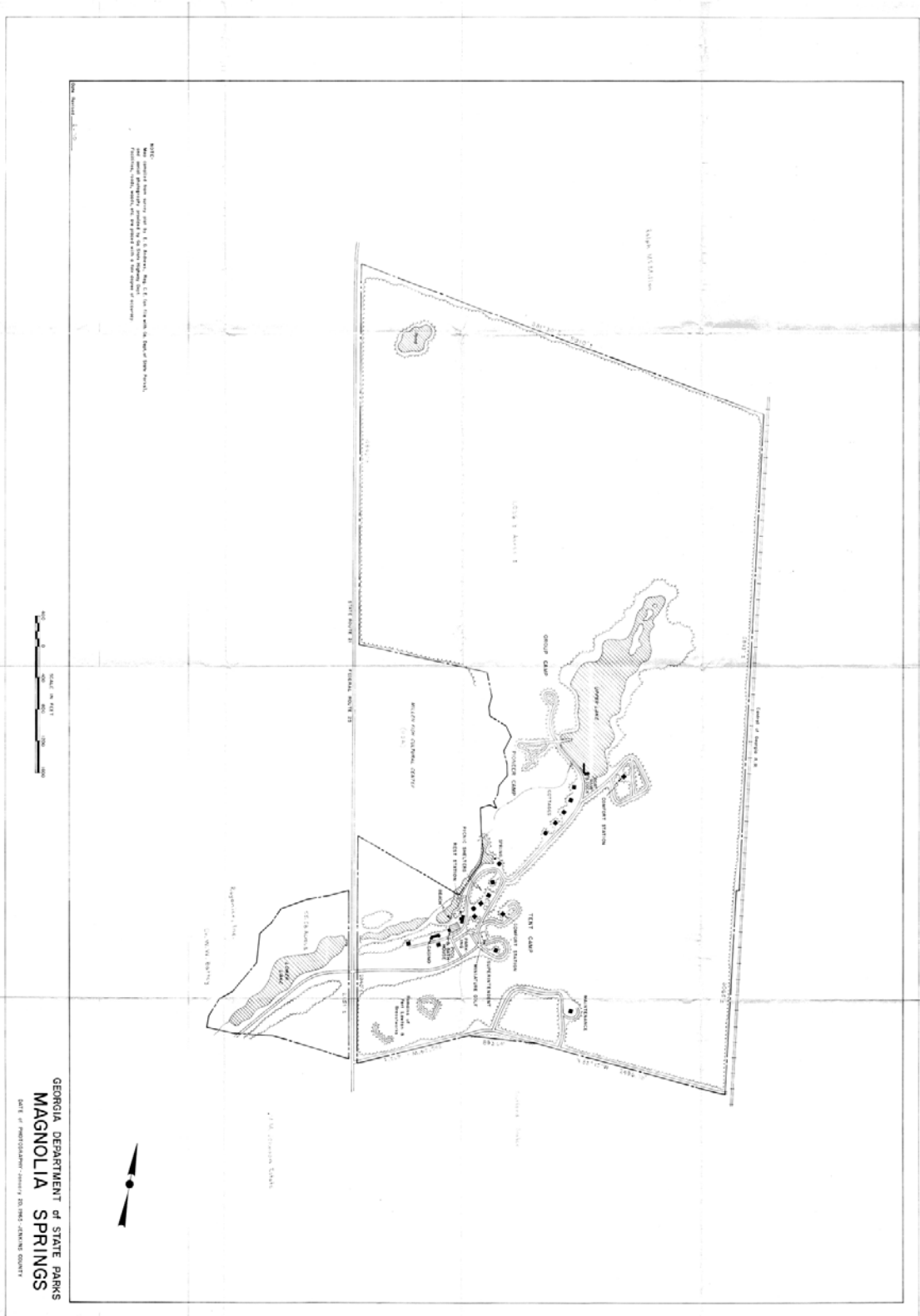
1940 Map of the Park with CCC Camp



1943 Topographic Map



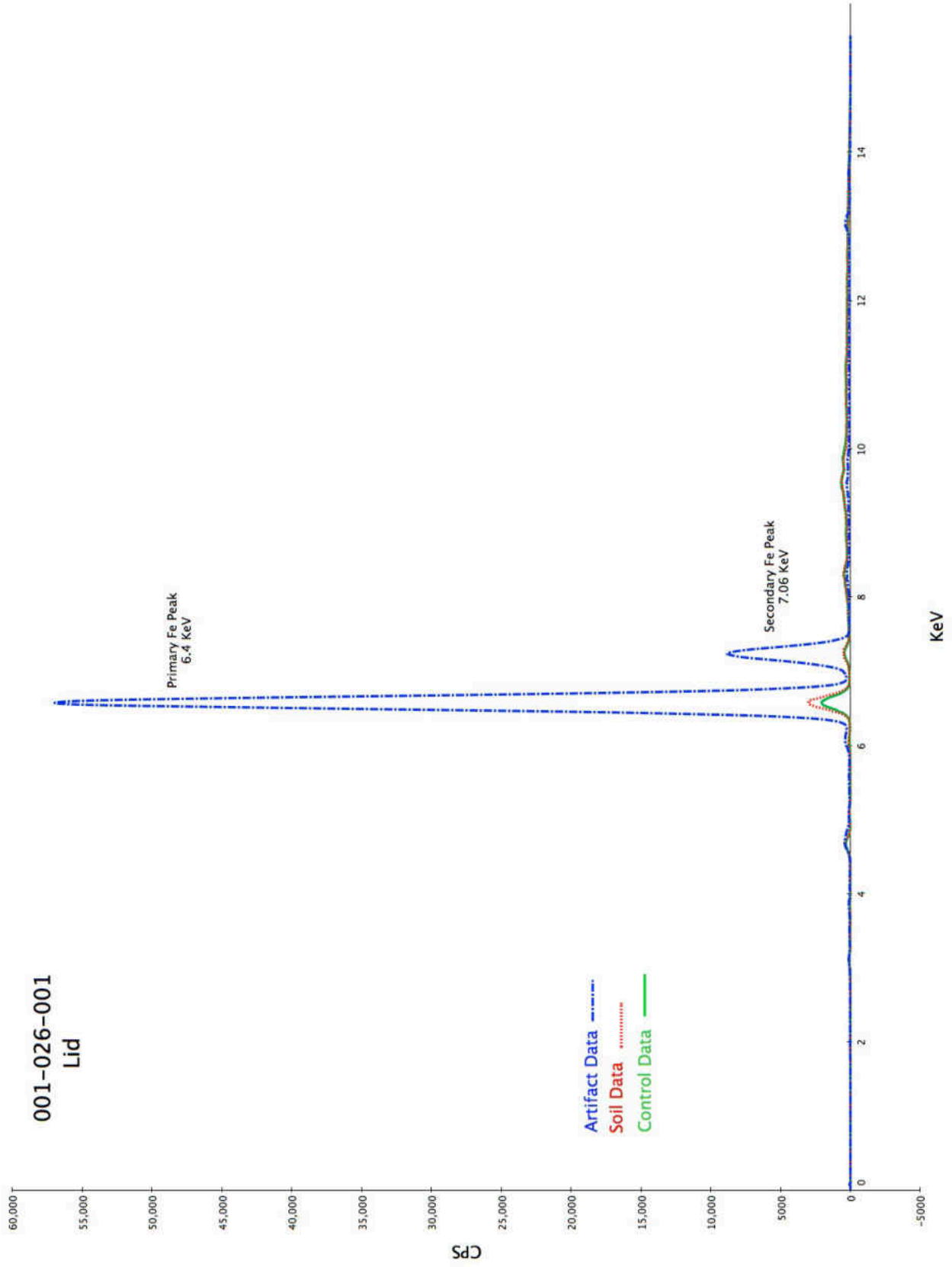
1963 Map of the Park



APPENDIX B

XRF SPECTRAL GRAPHS

The graphs shown below all have three lines on them, one for the artifact, one for the test soil sample and one for the control. All of them also exhibit two iron peaks, the primary and the secondary. The X axis is for the KeV (kilo-electron volts), the specific measure of fluorescence each atom gives off during the XRF process. The Y axis shows Counts Per Second, which is less a measure of concentration and more a measure of intensity of a given signal.



001-026-005
Nail

35,000

30,000

25,000

20,000

15,000

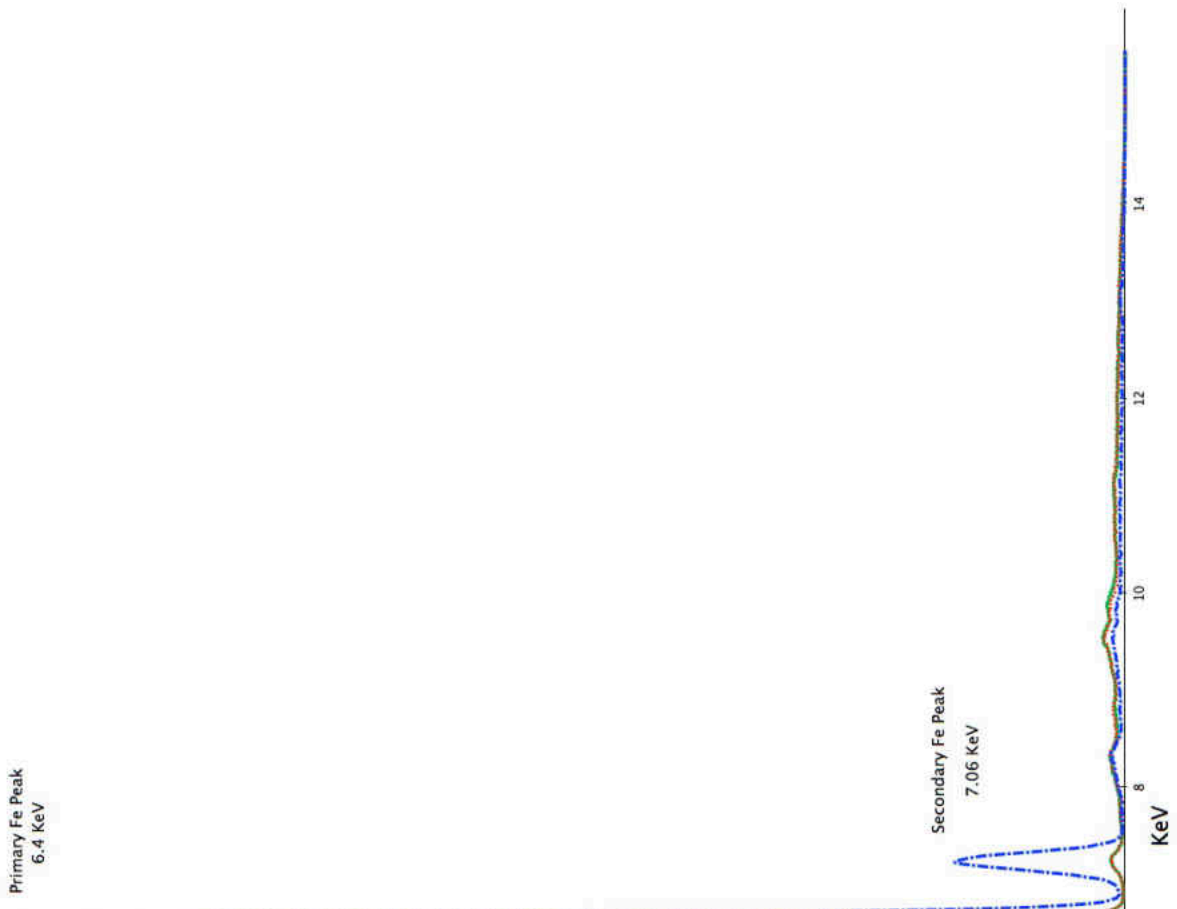
10,000

5,000

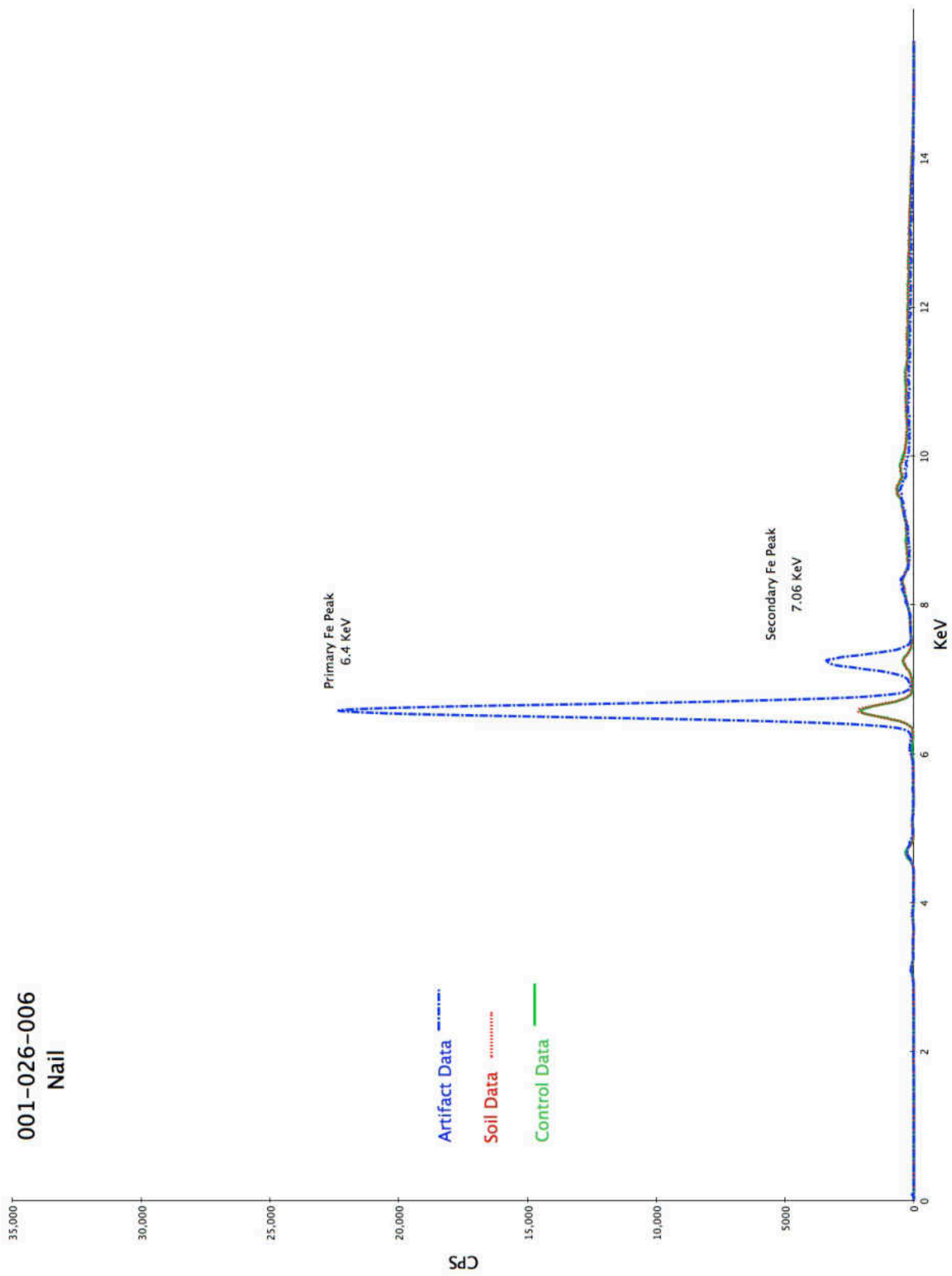
0

CPS

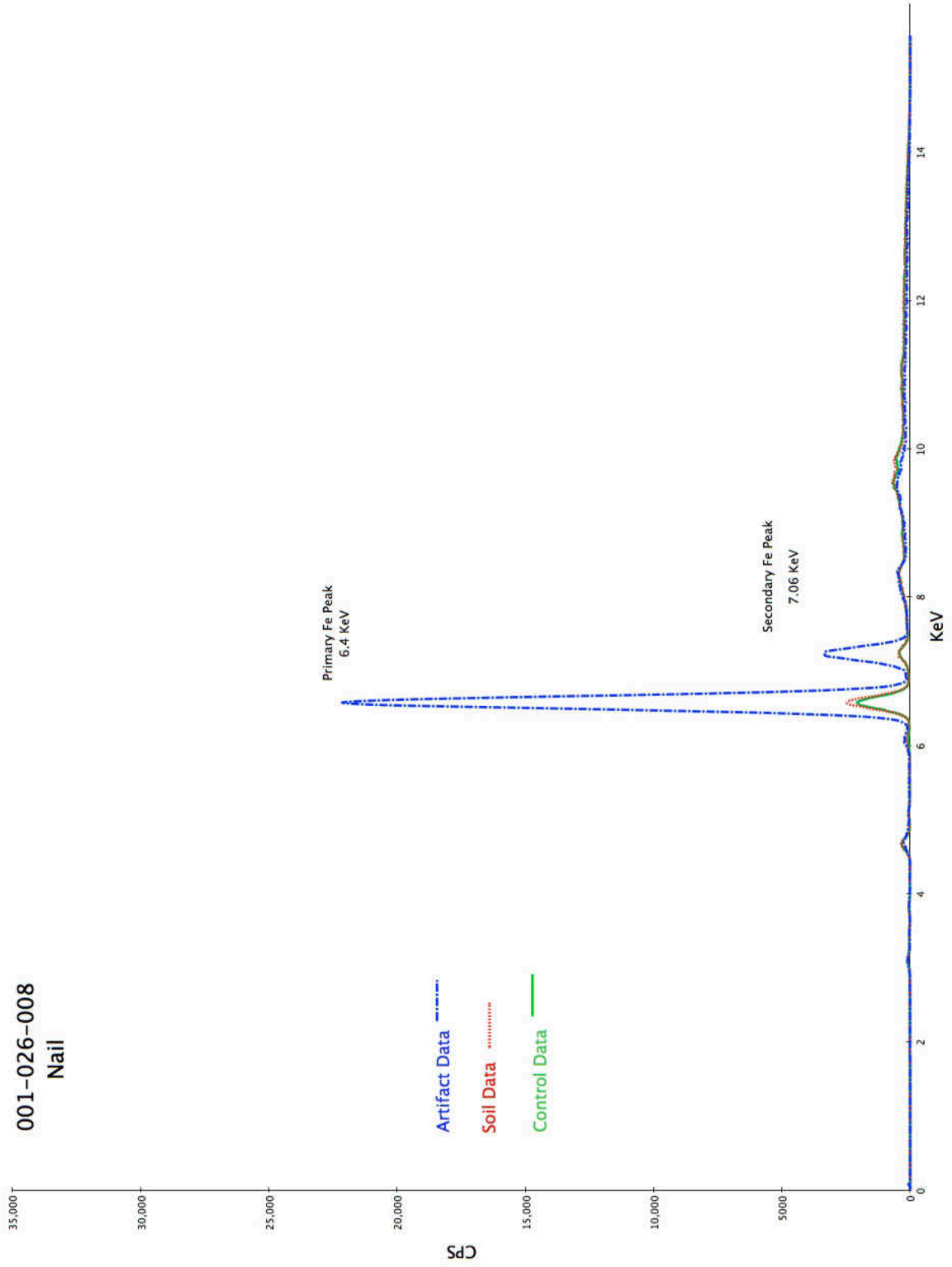
Artifact Data
Soil Data
Control Data

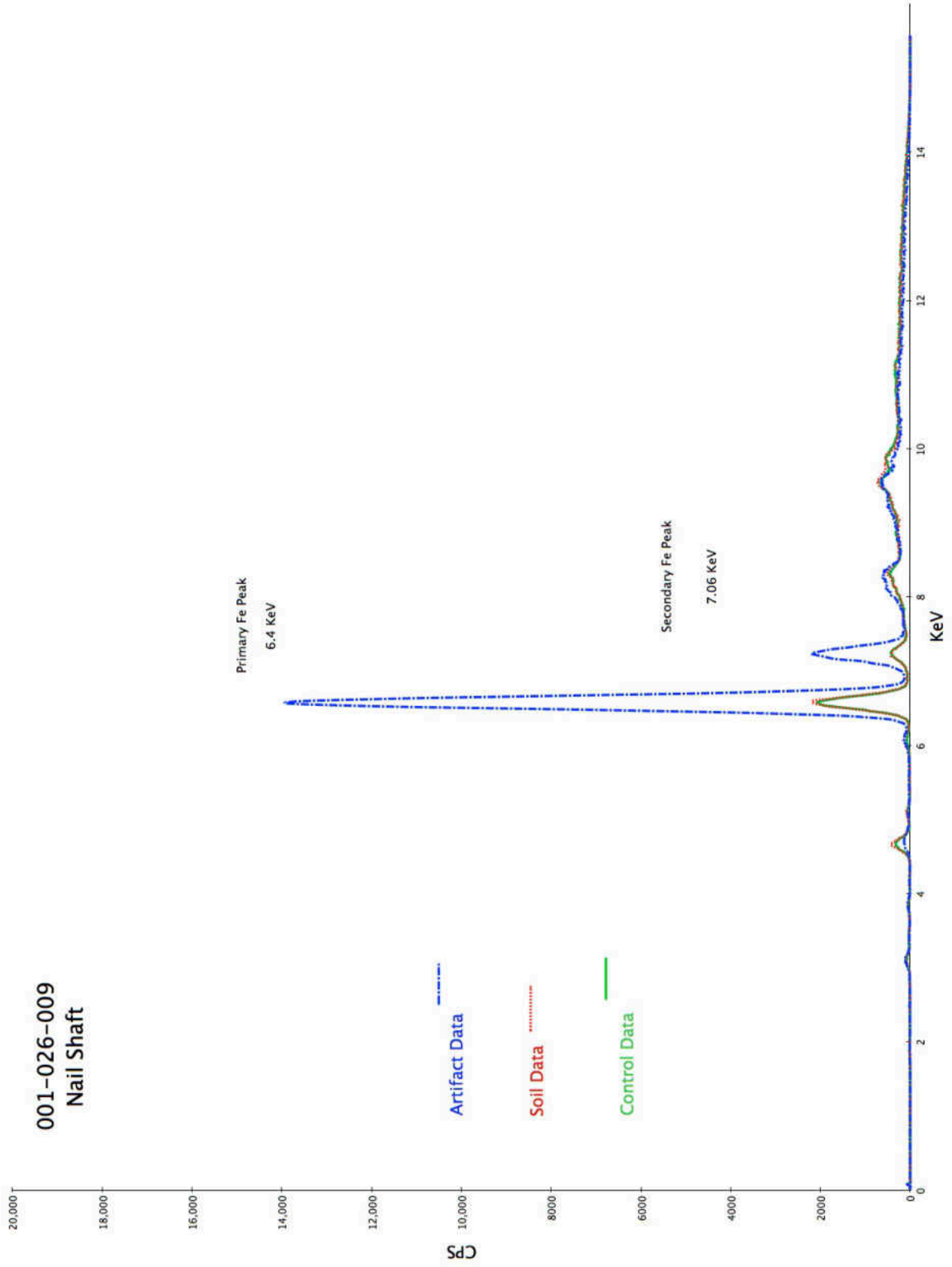


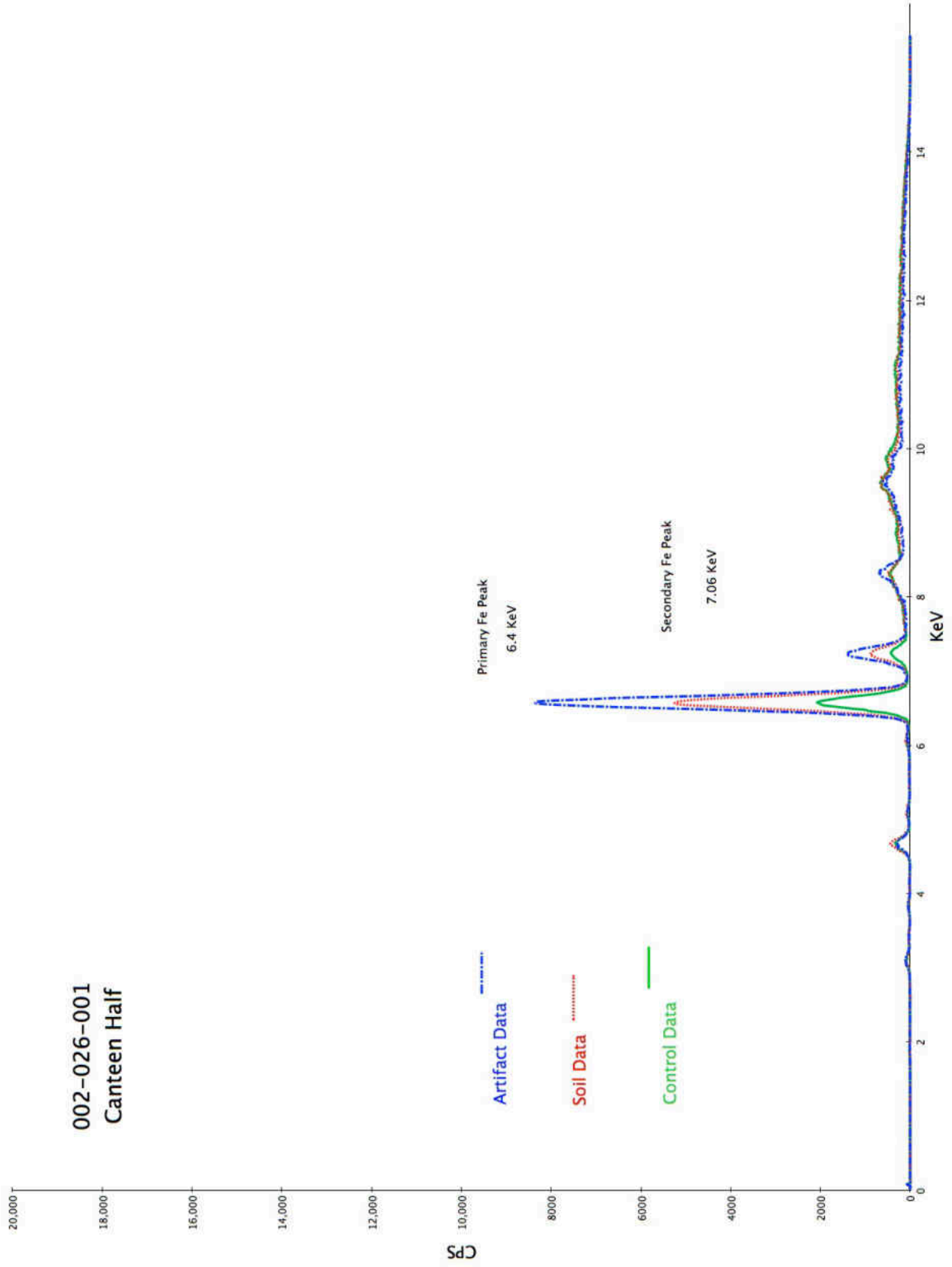
001-026-006
Nail



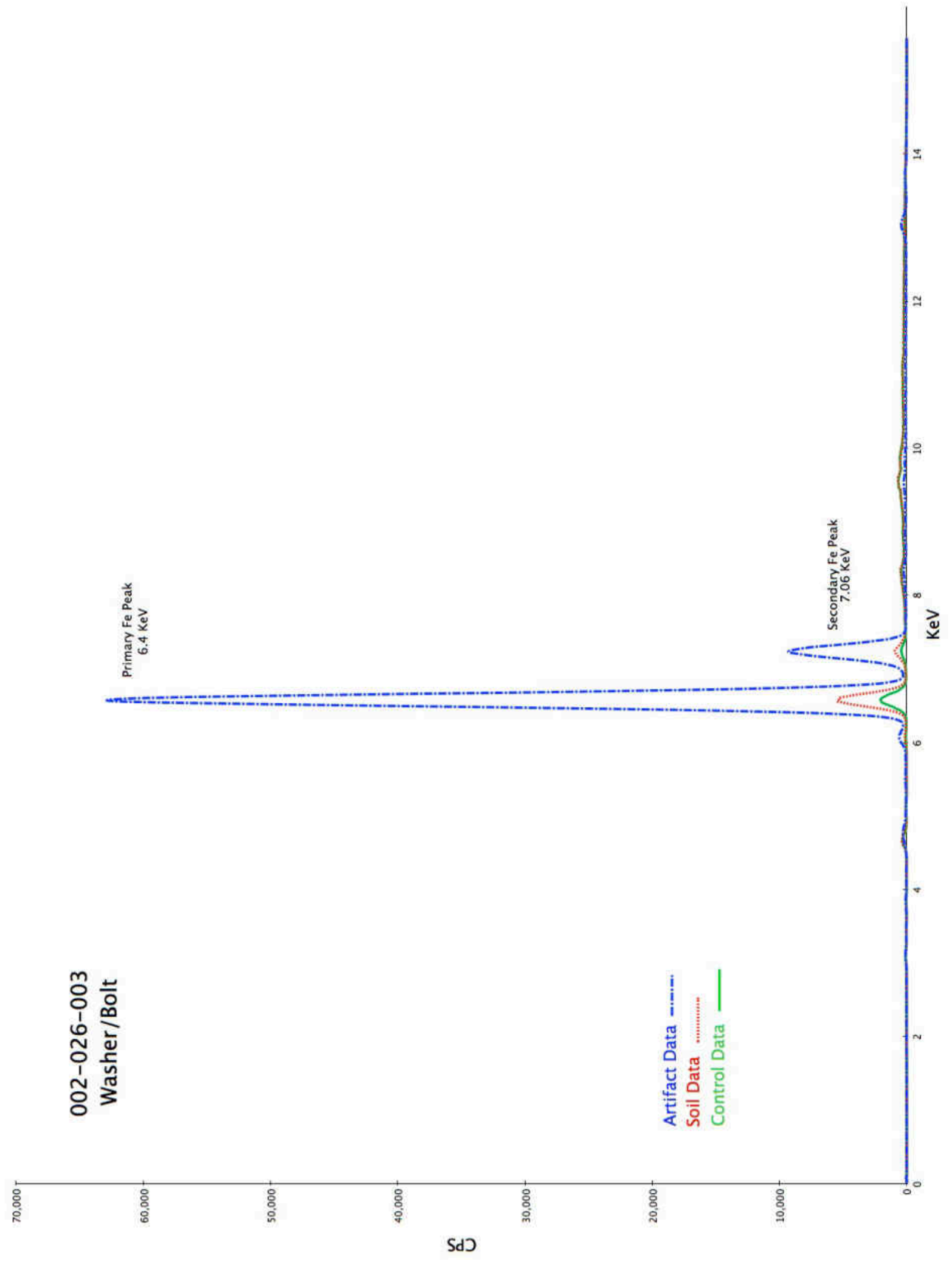
001-026-008
Nail

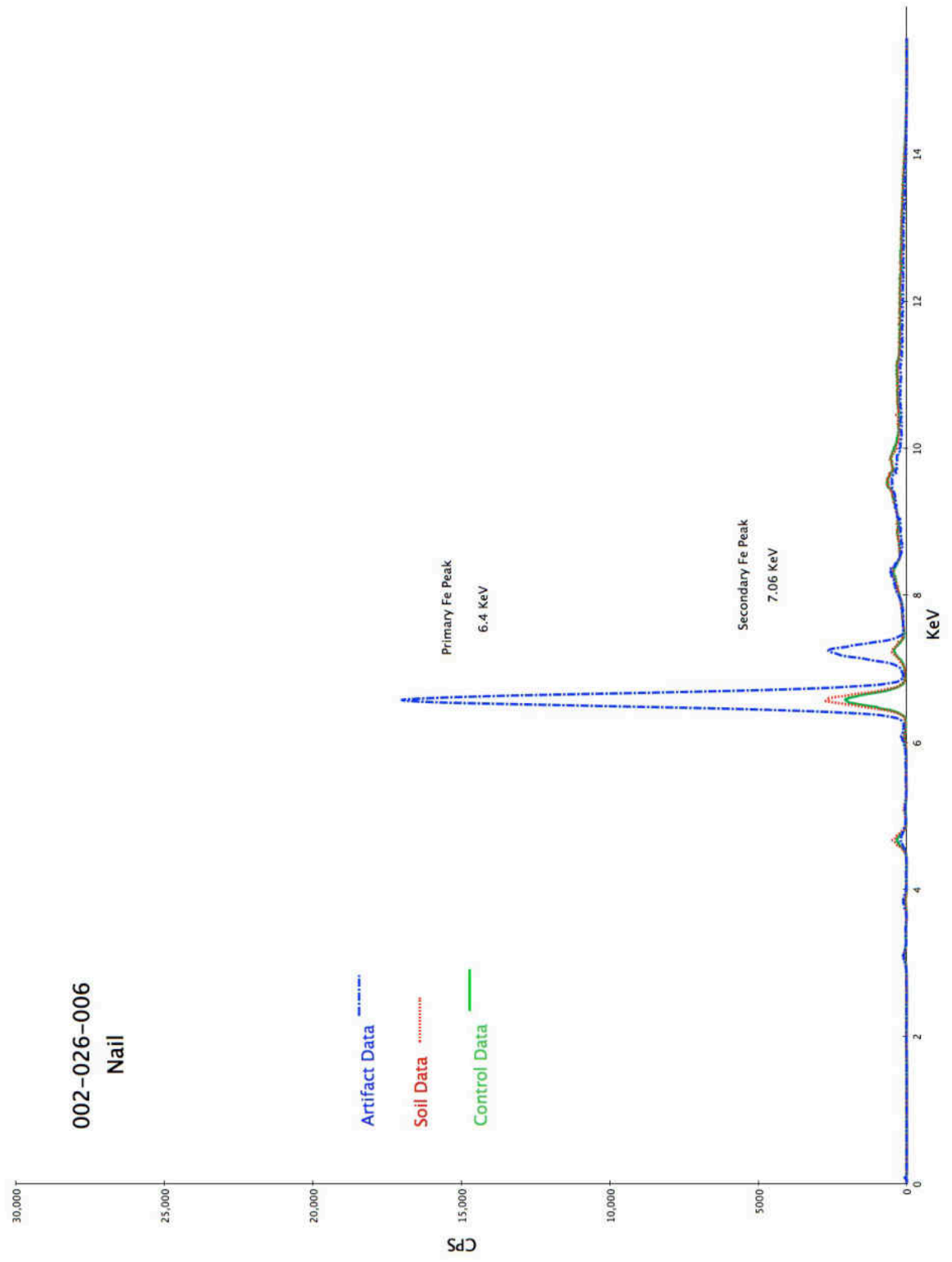


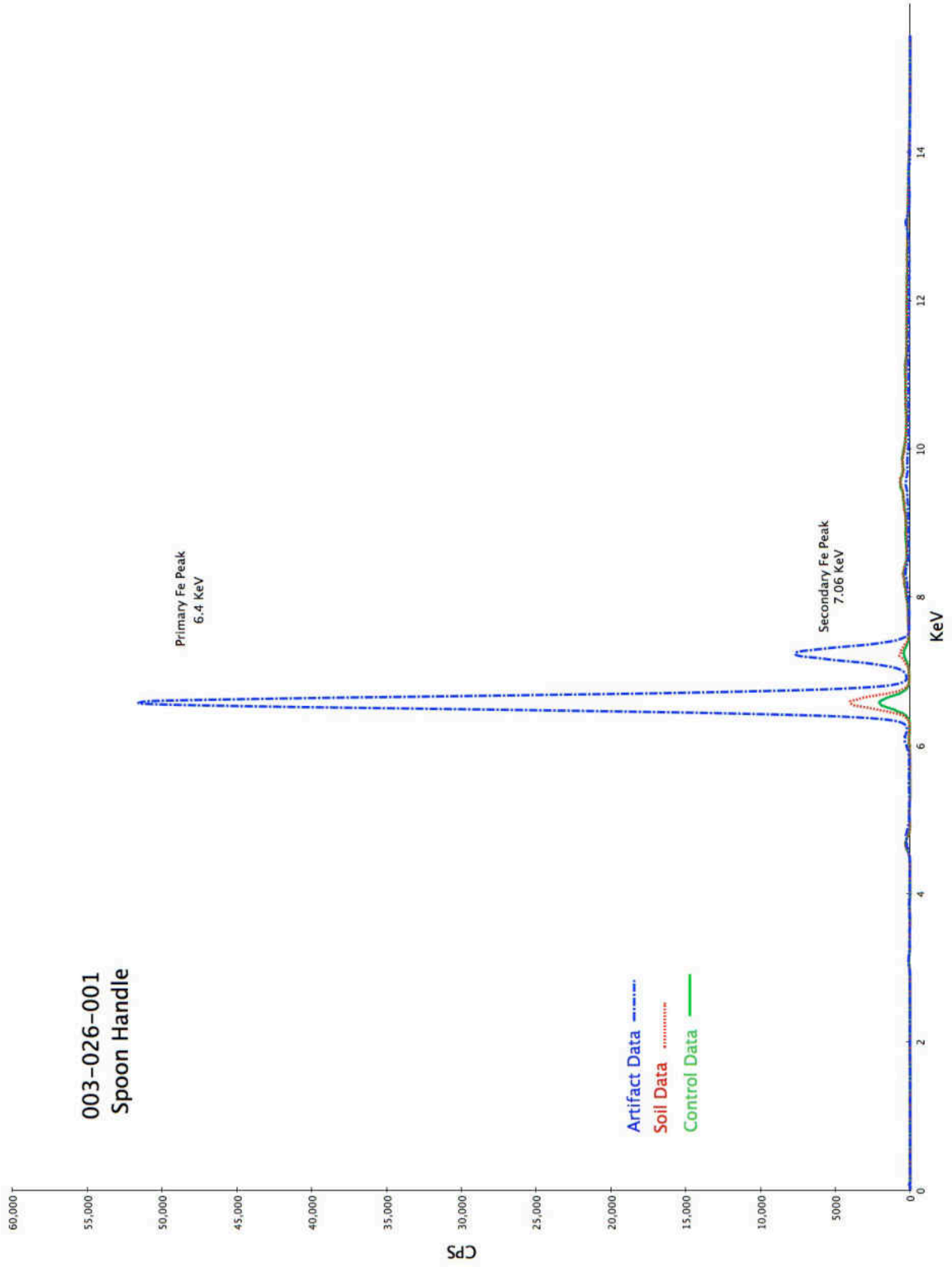


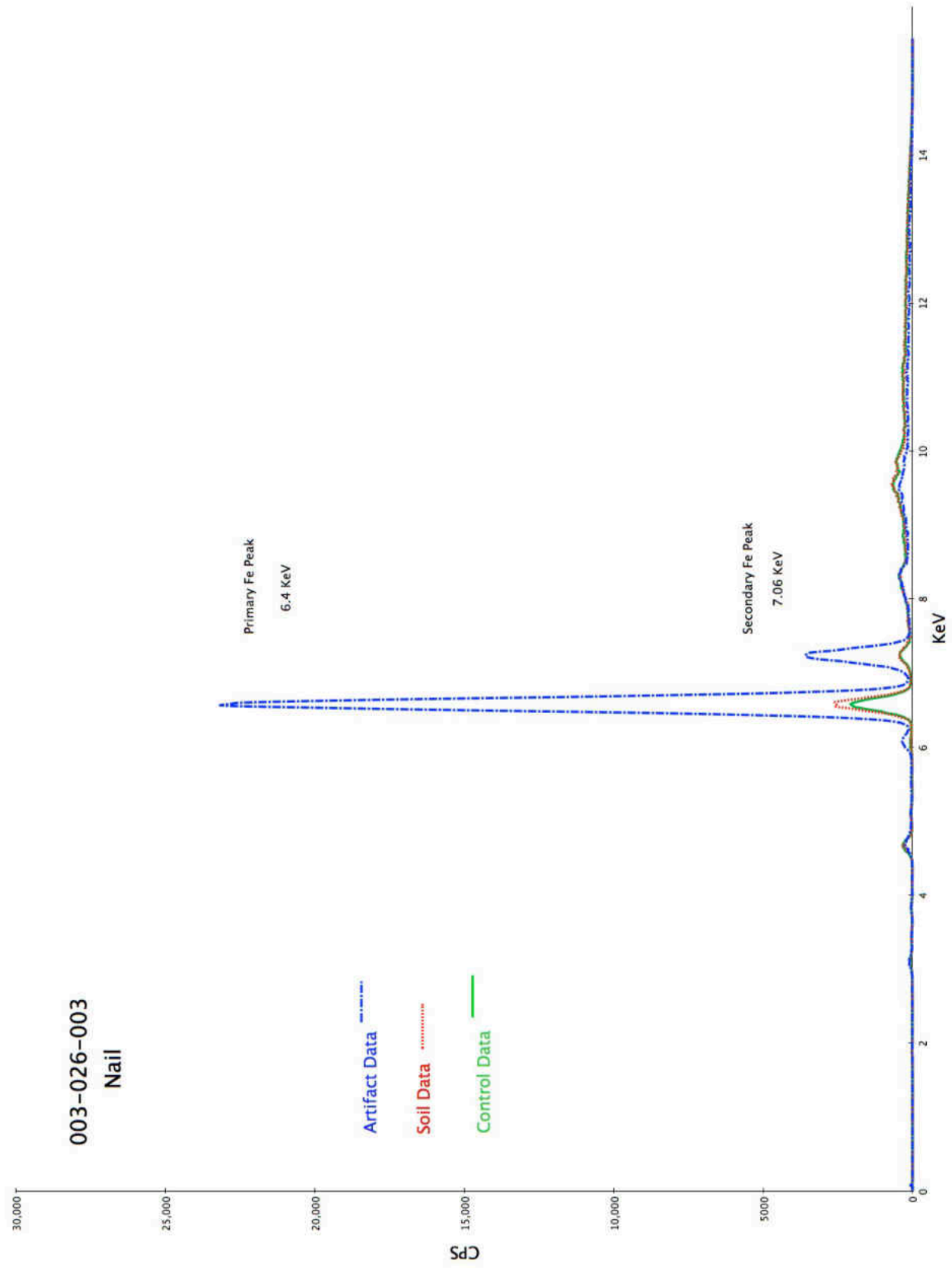


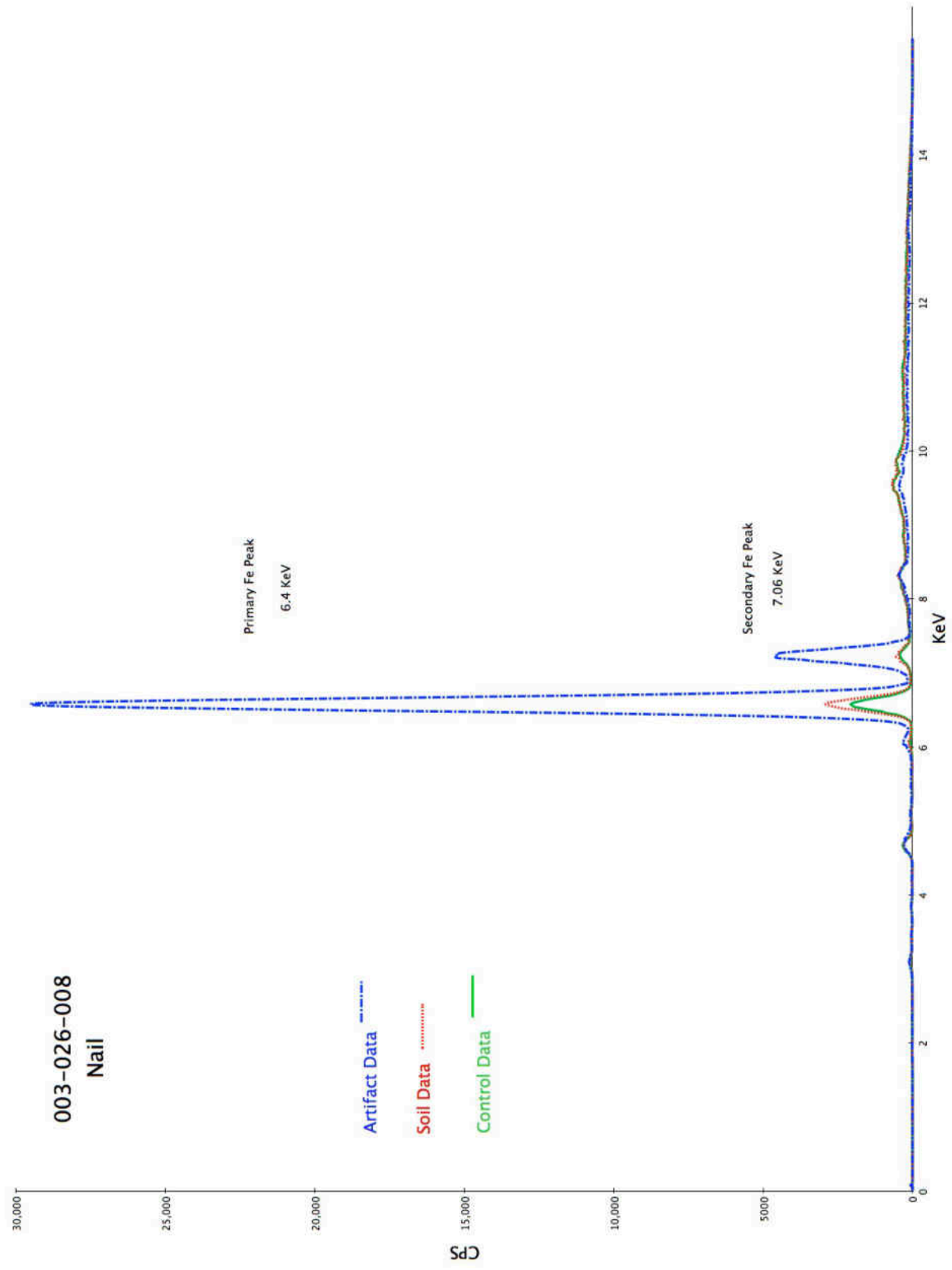
002-026-003
Washer/Bolt

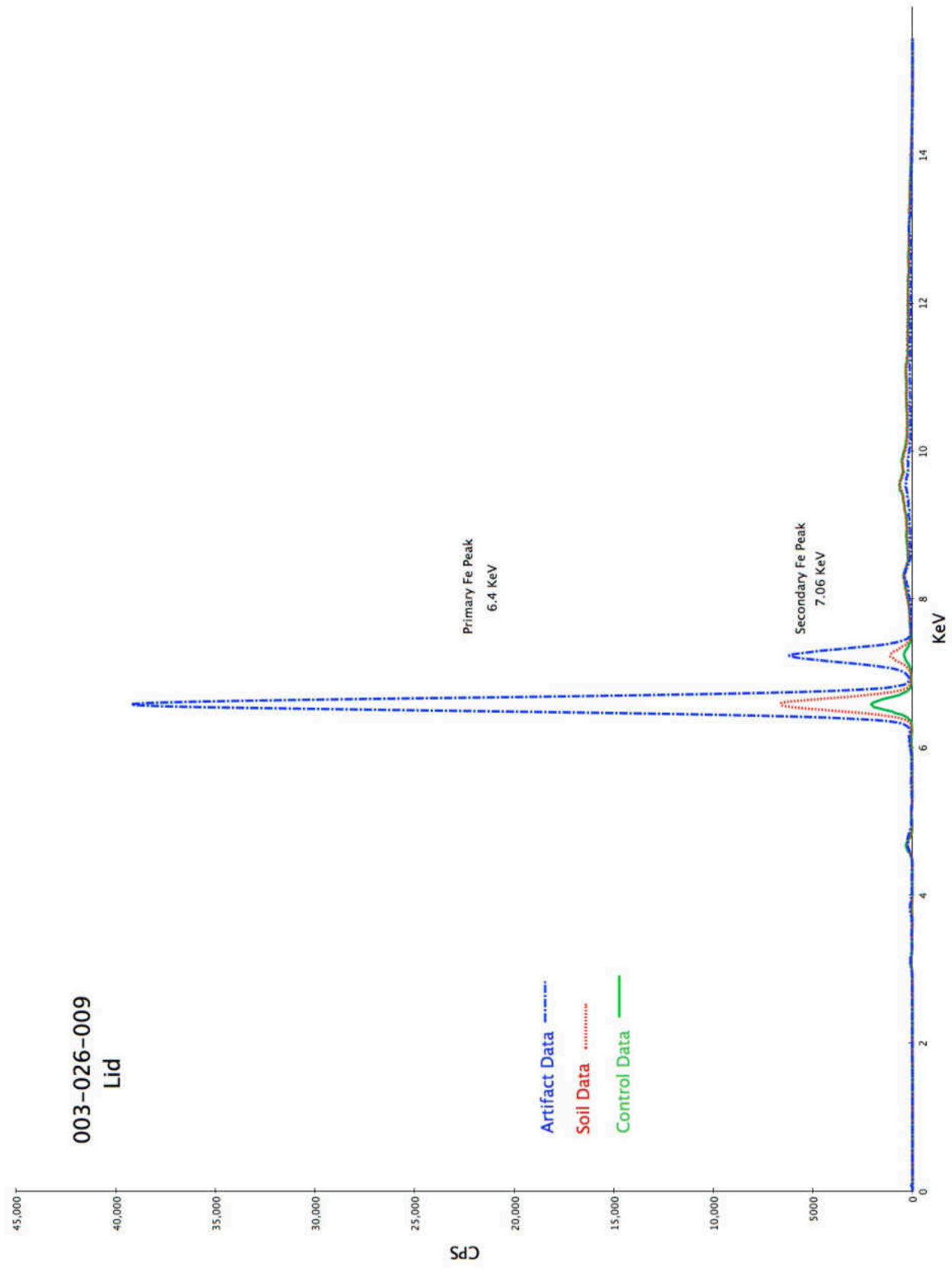


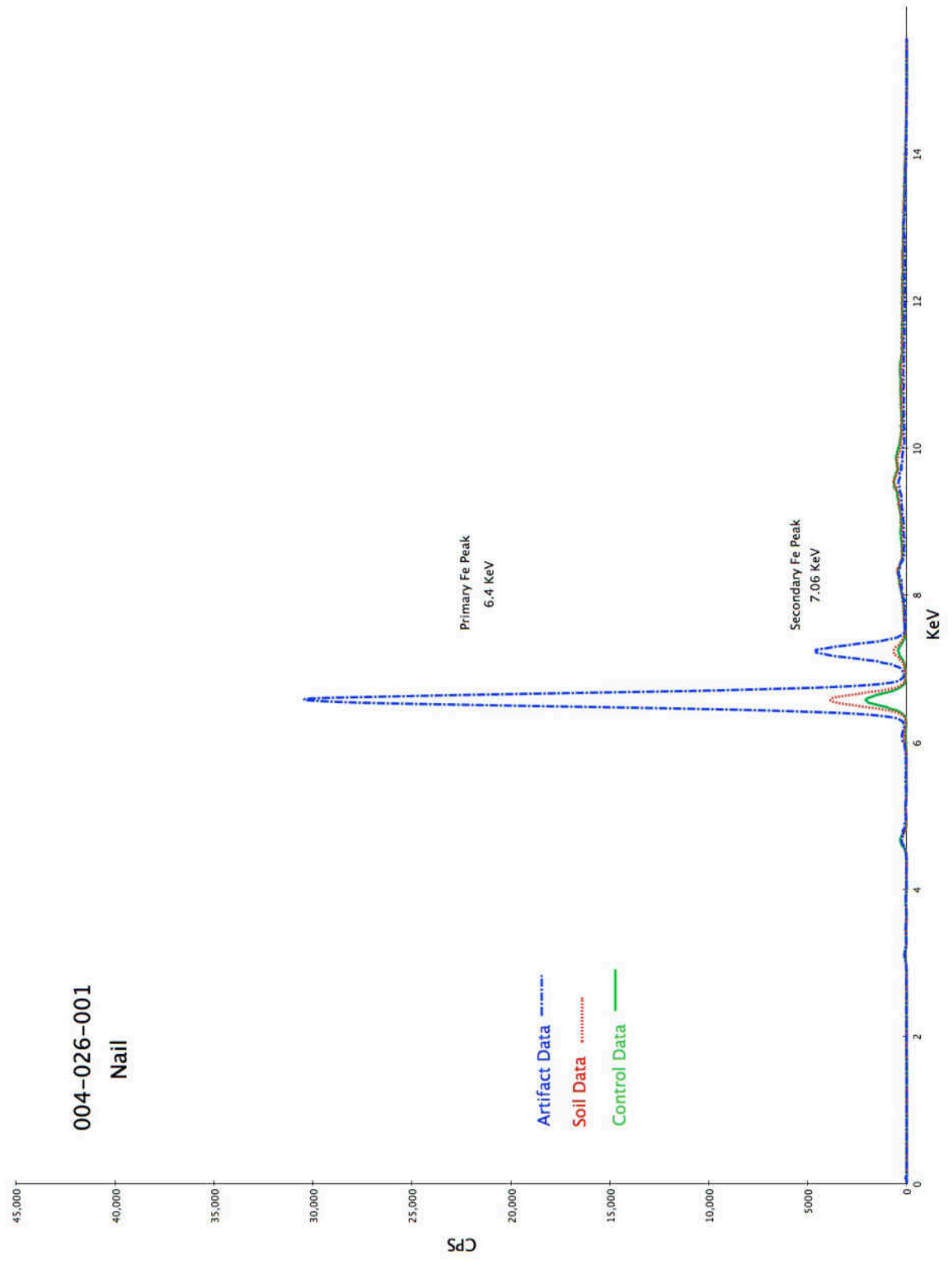


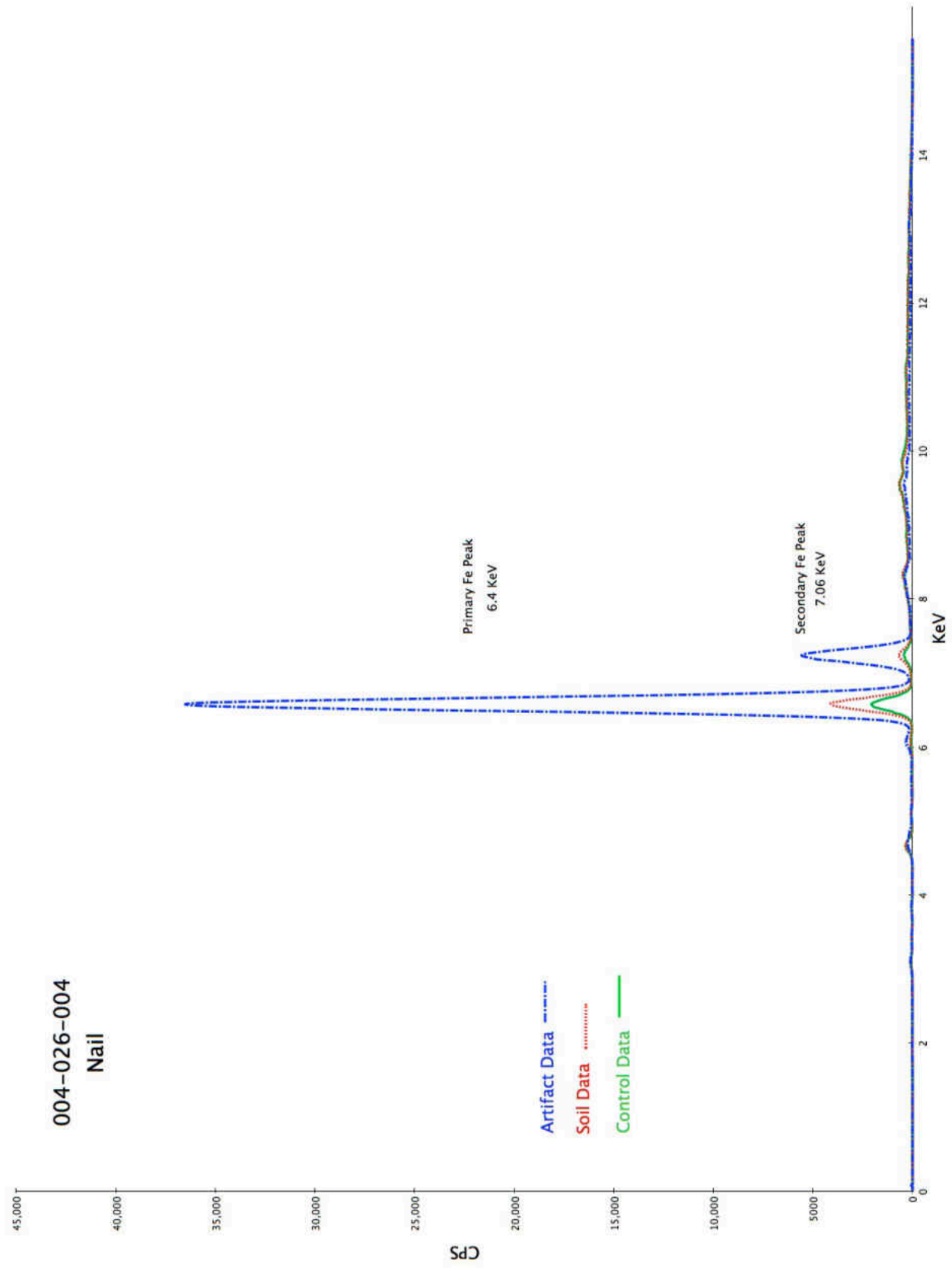


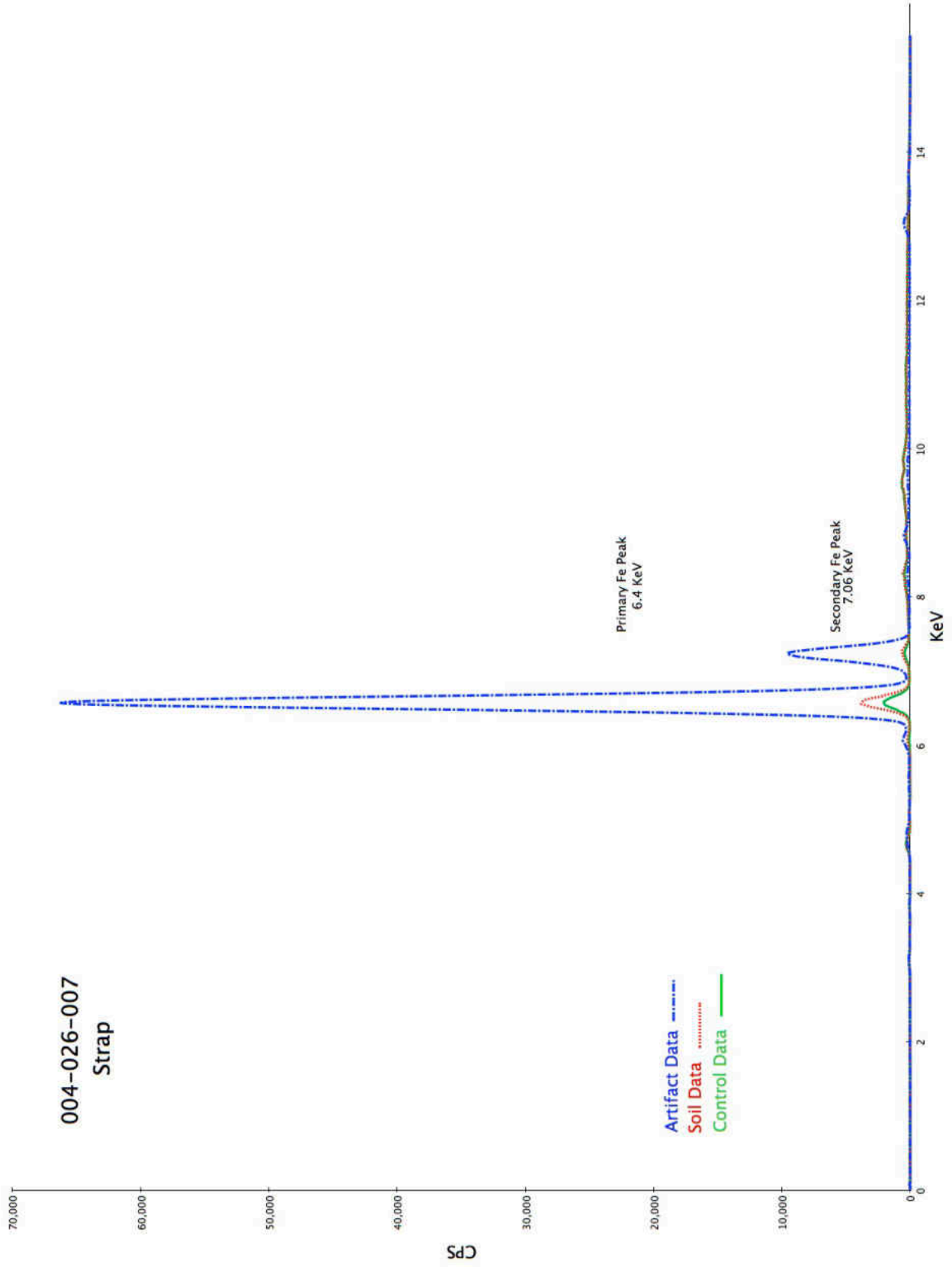


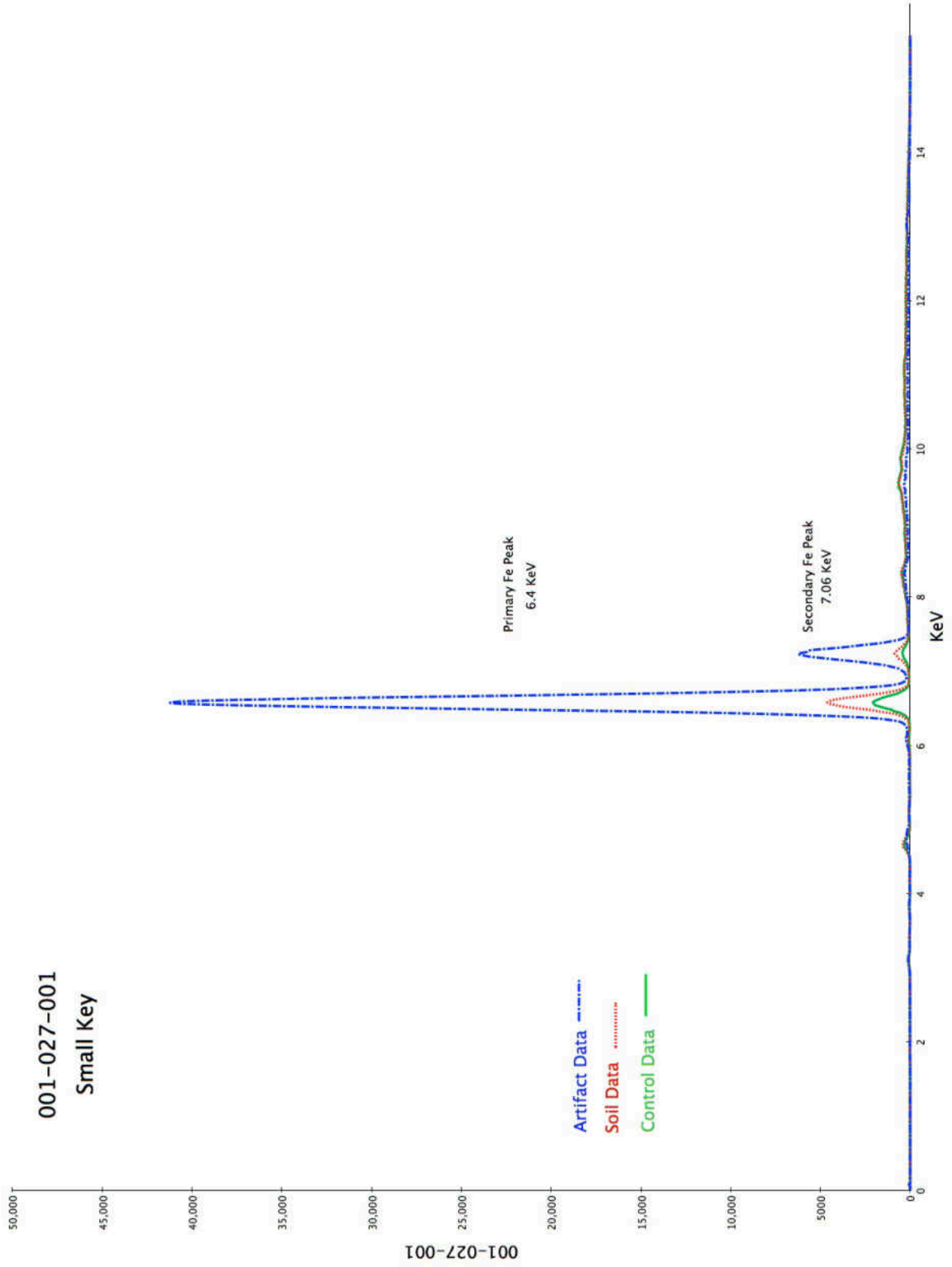


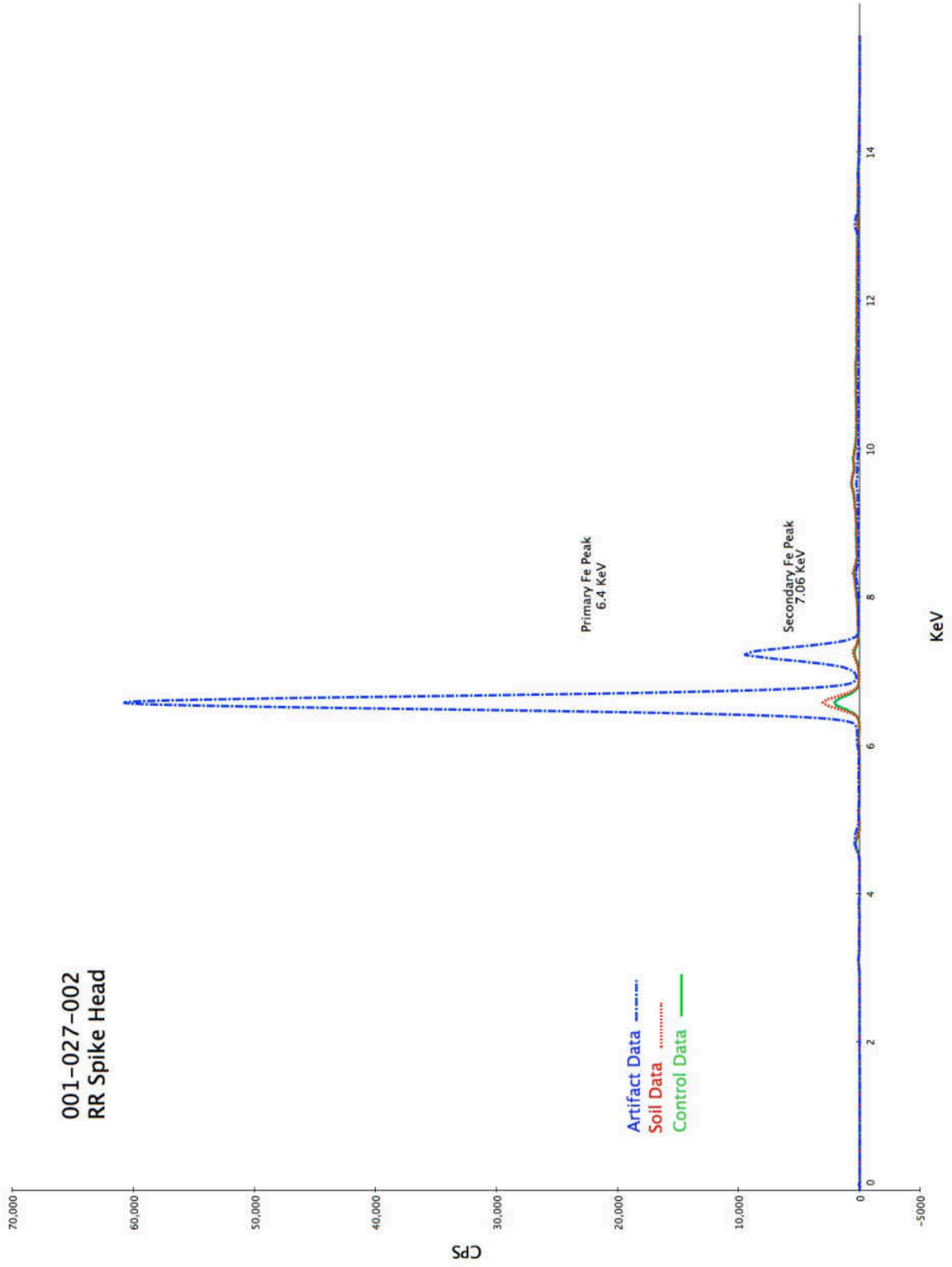


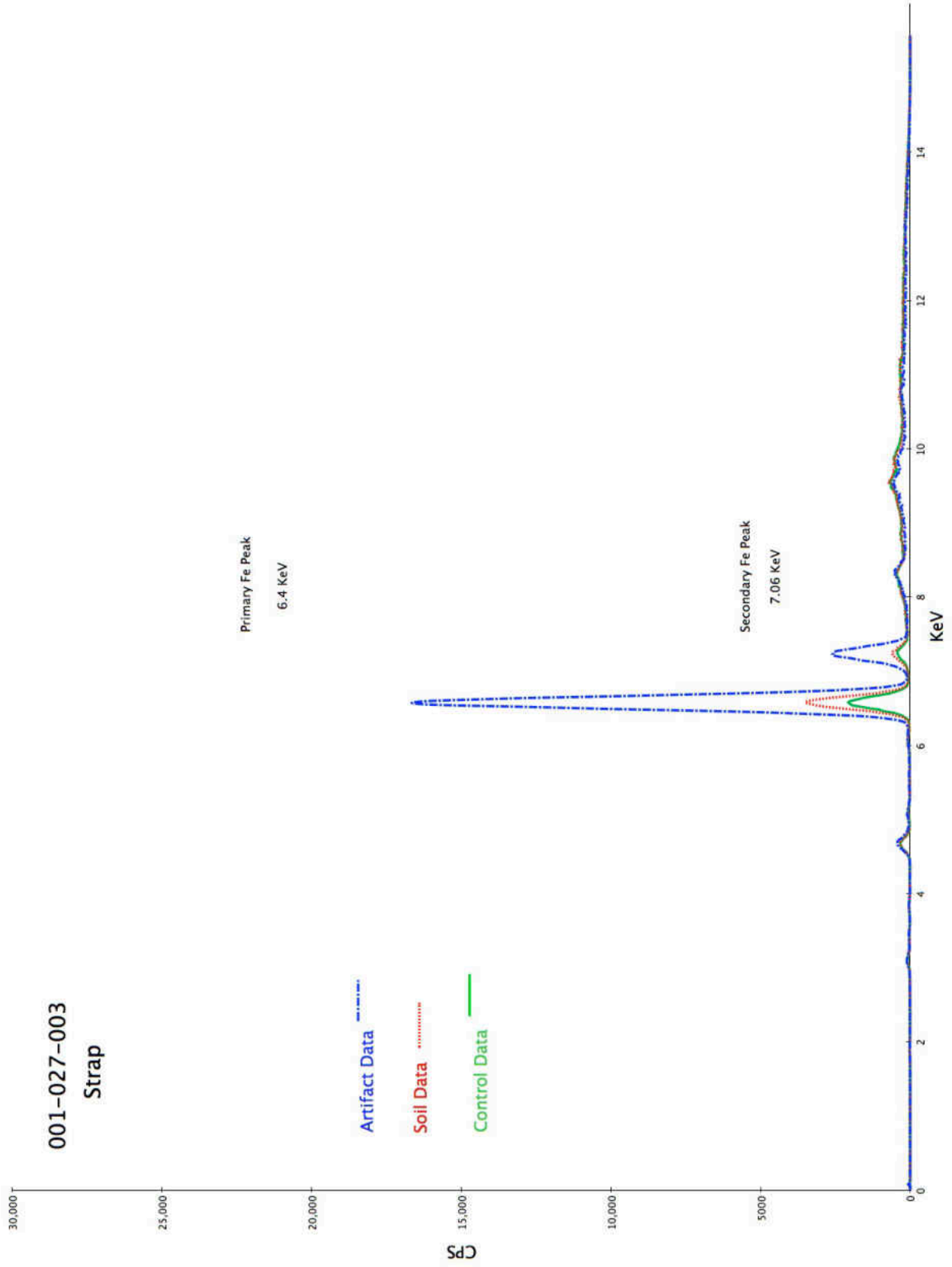


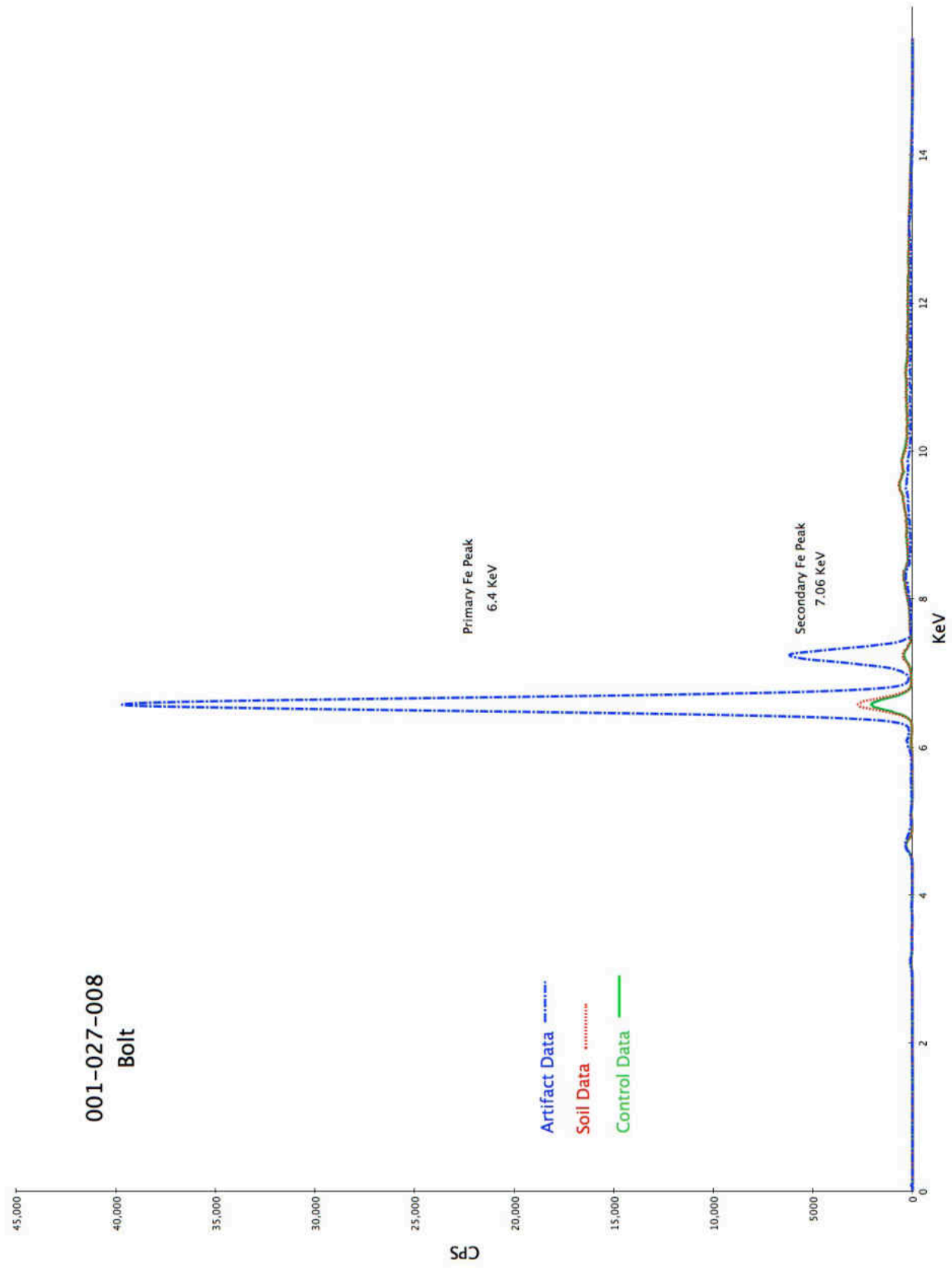




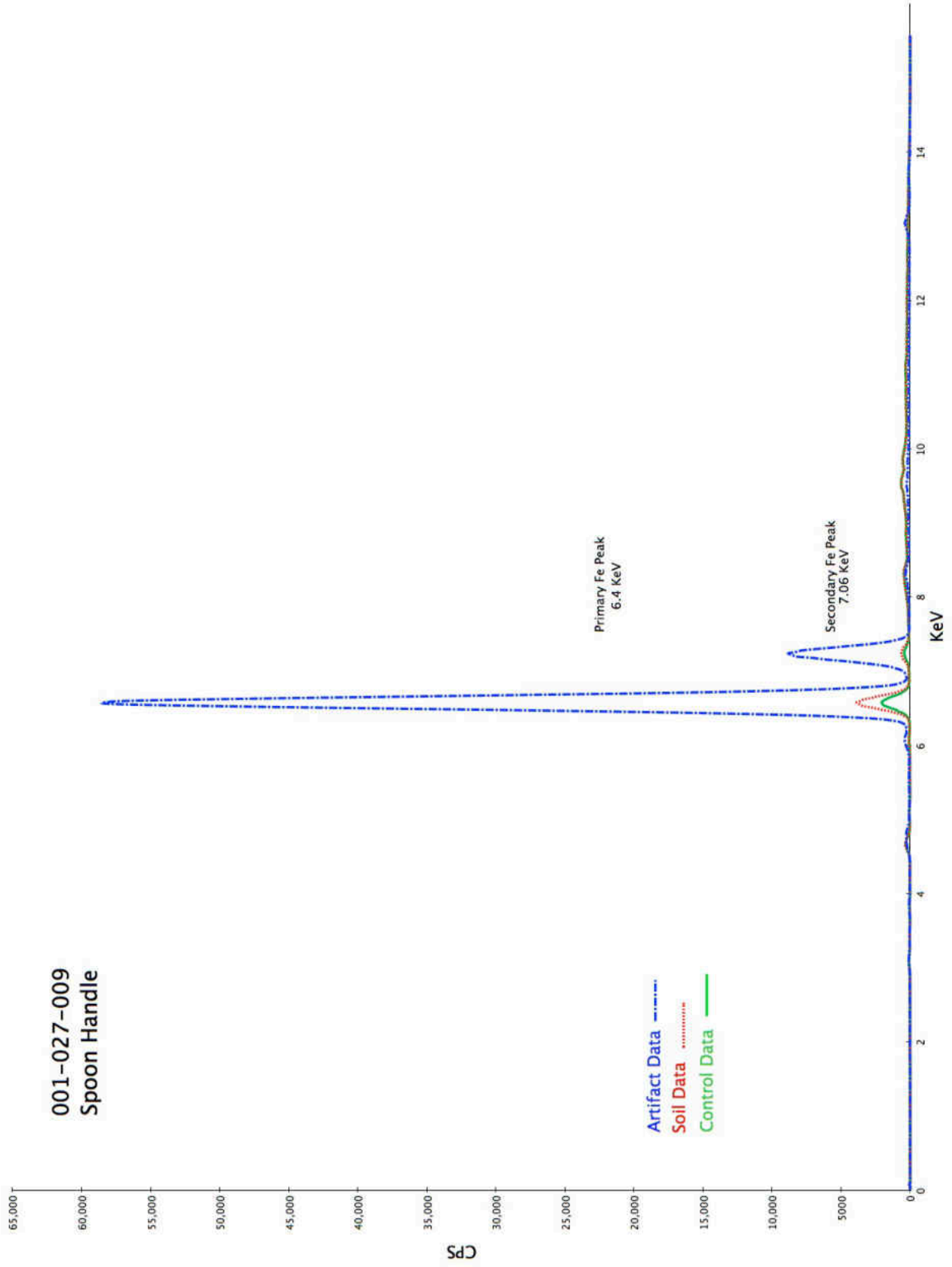


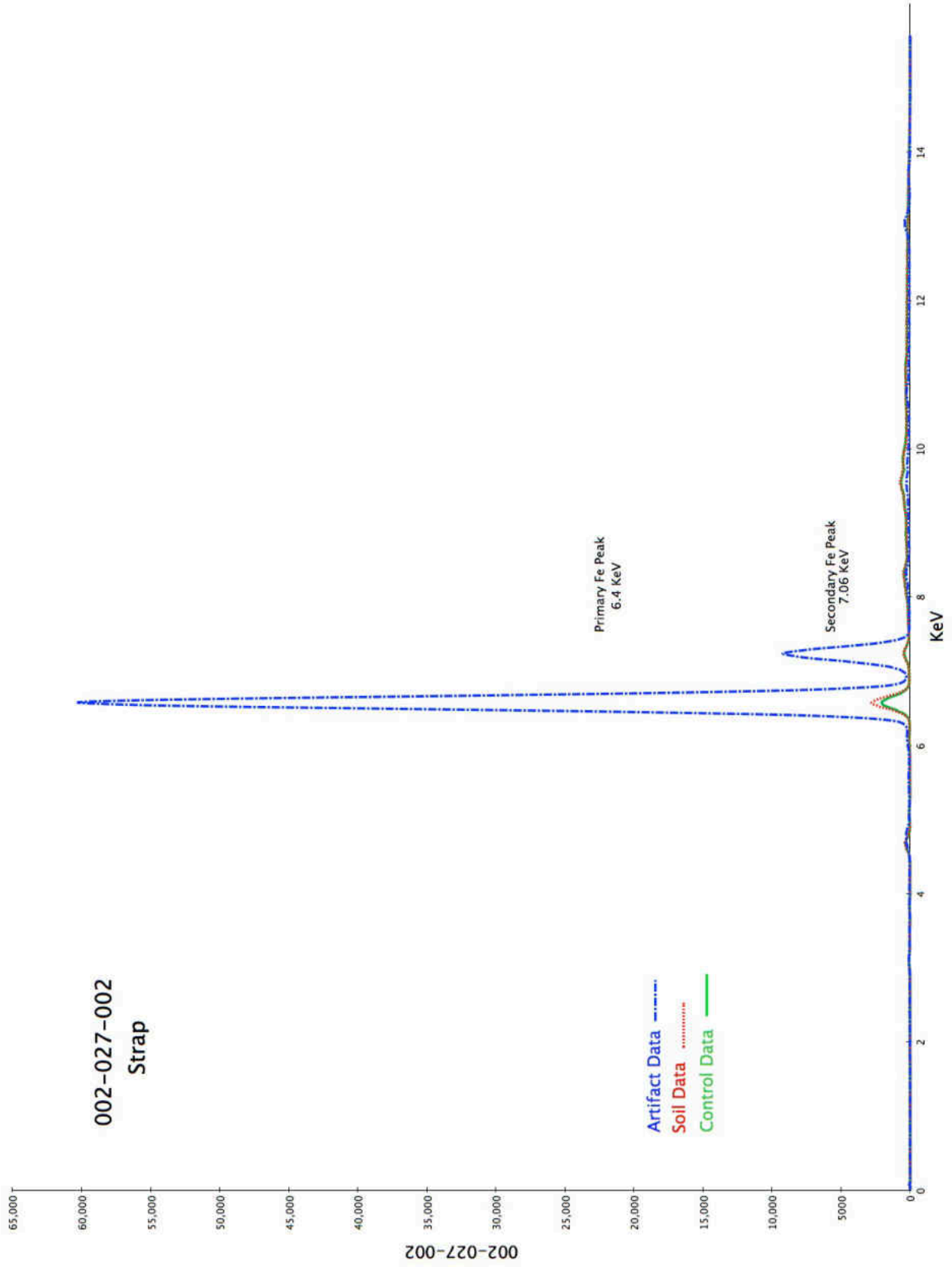


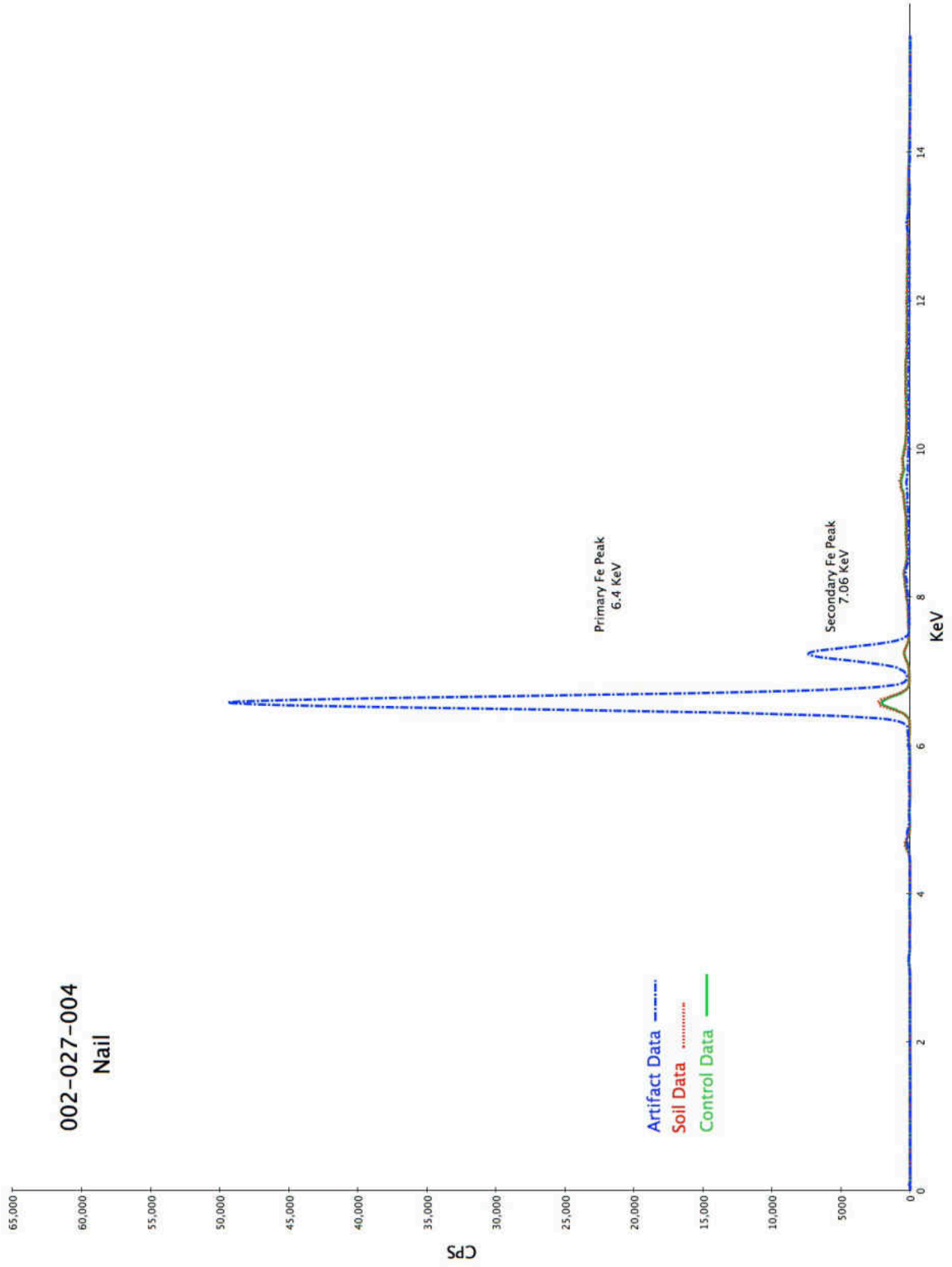


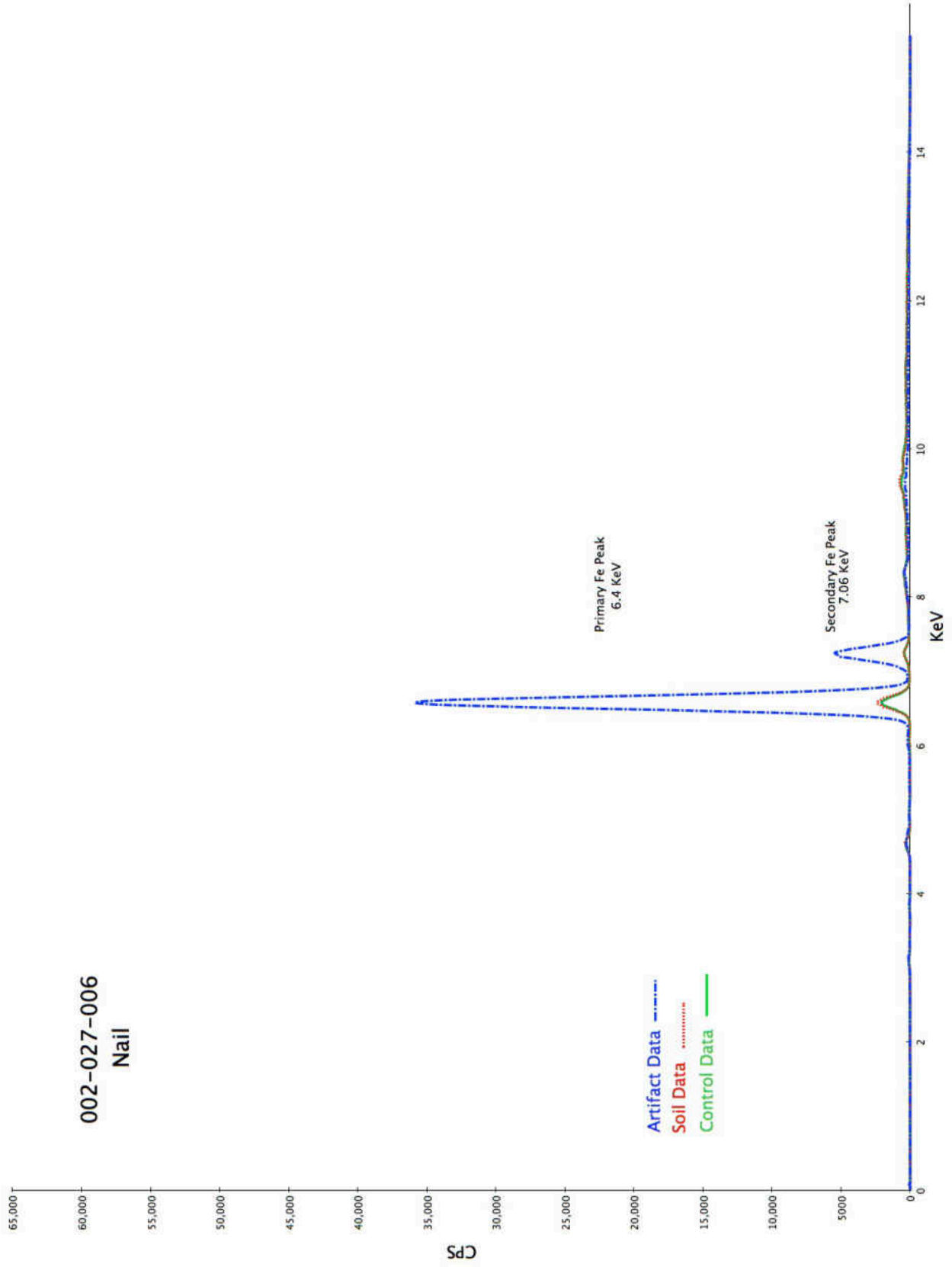


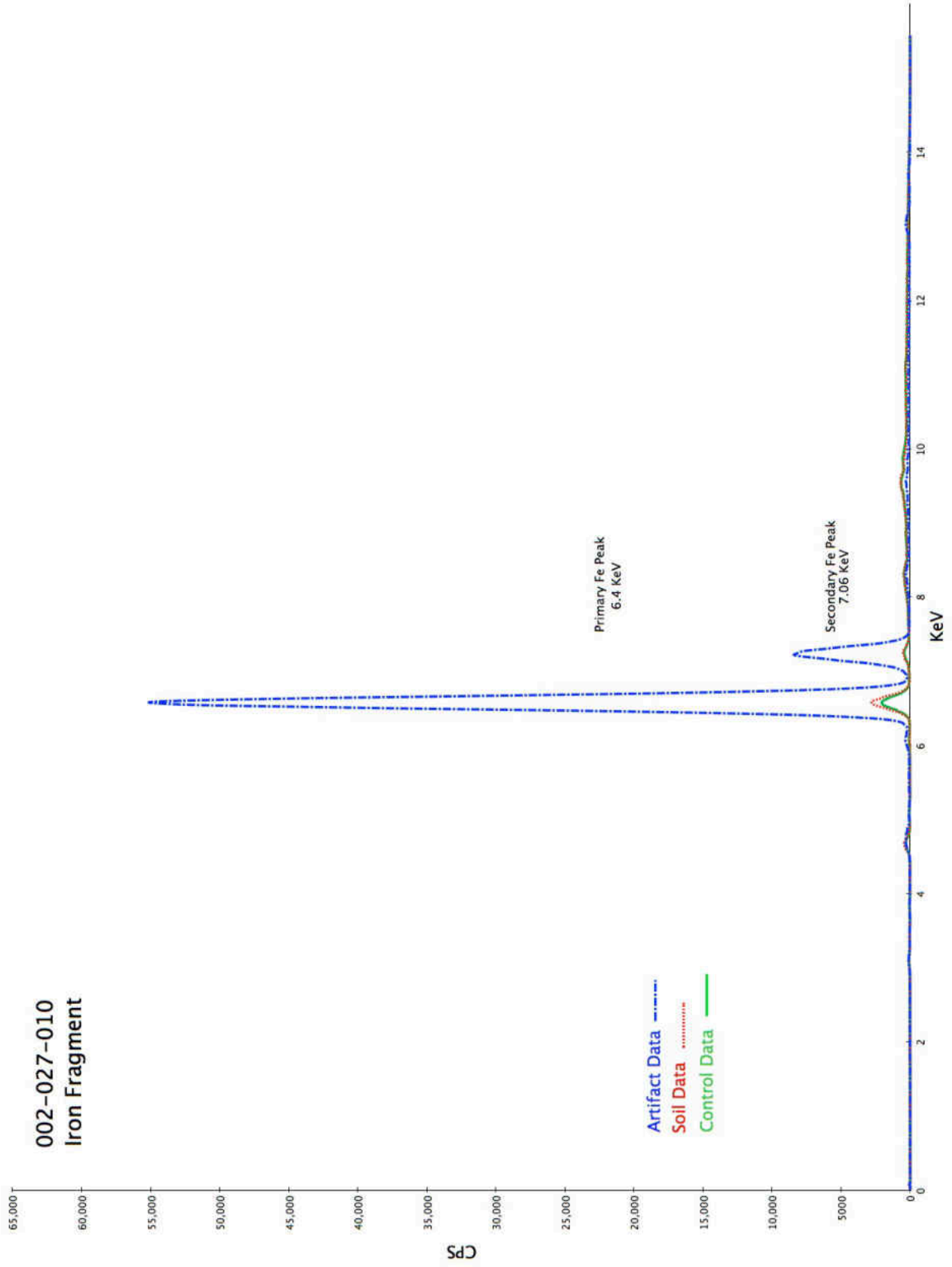
001-027-009
Spoon Handle

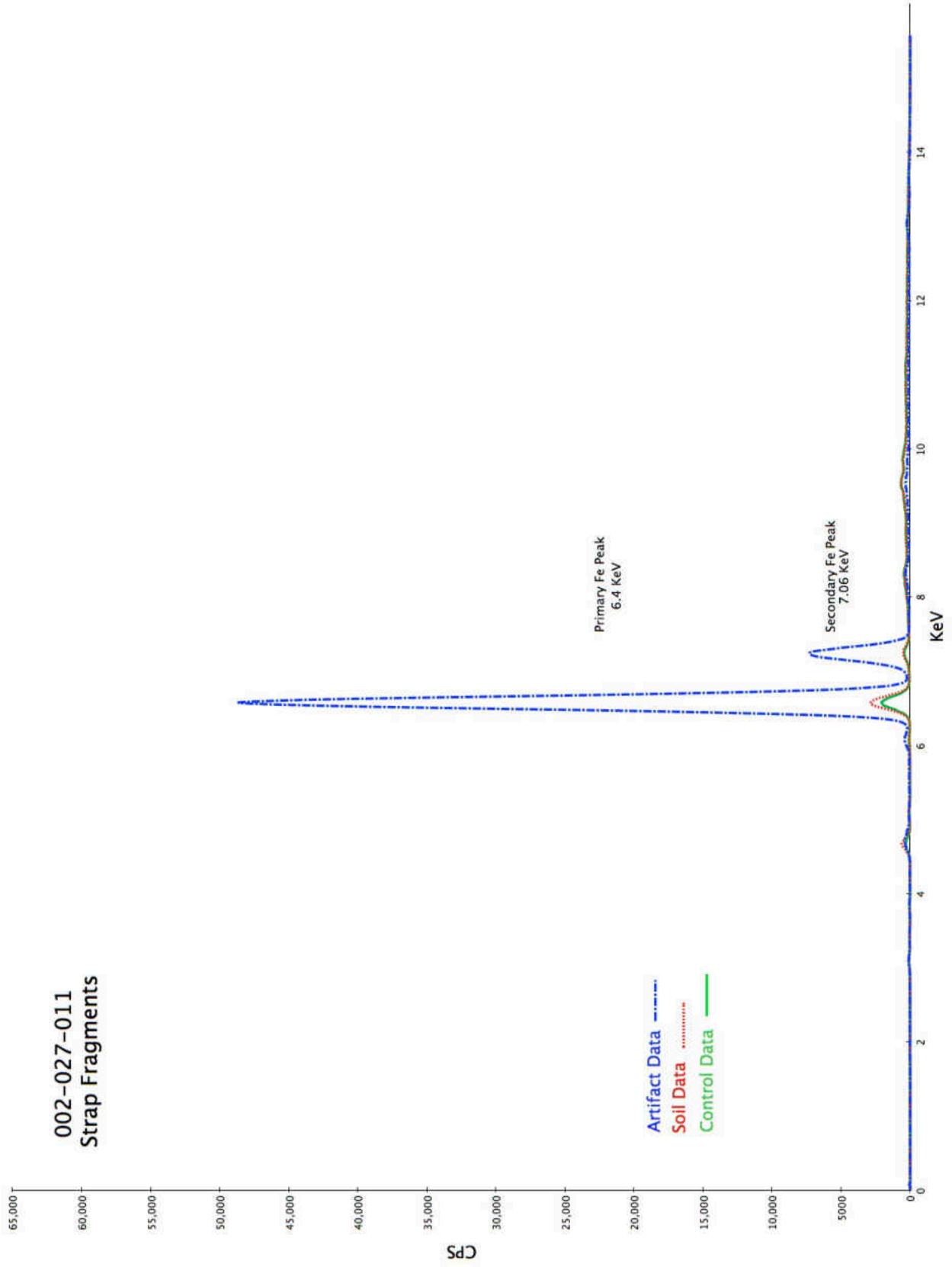


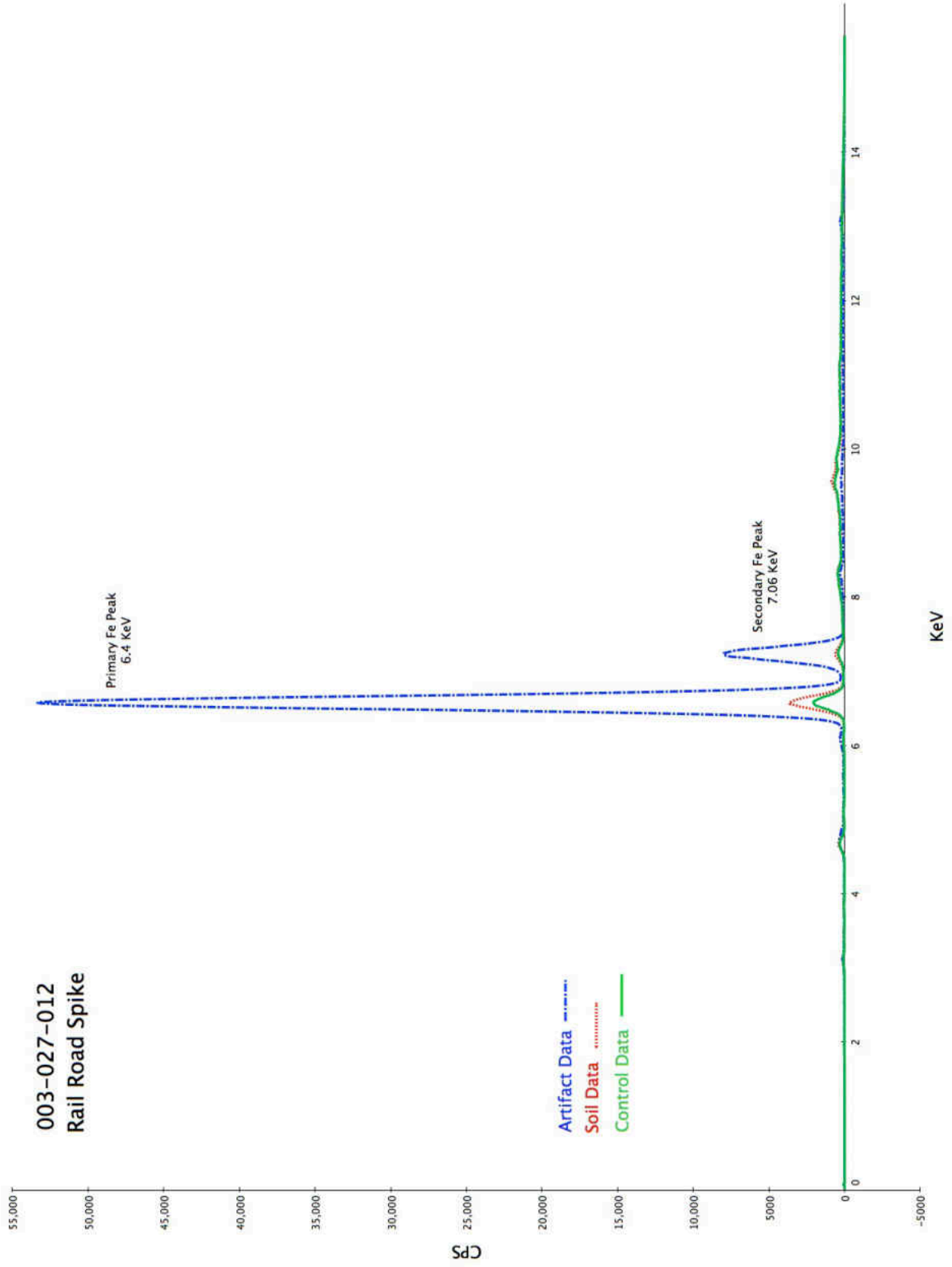












APPENDIX C

ARTIFACT DATA

Artifact

Day-Transect-Artifact #

Depth Recovered at Chloride Level of Artifact Ferrous Ions in Artifact % Fe based on XRF Munsell ID of Soil Chloride Level of Soil Ferrous Ions of Soil % Fe based on XRF pH of Soil	Photograph
--	------------

This key shows how to read the following artifact data sheets.

Lid

001-026-001

Depth: 13 cm
Chloride Level: 50-100 ppm
Ferrous Ions: Medium
Fe: 228483 ppm +/- 4680
Munsell ID: 10 YR 5/3
Chloride Level: <10 ppm
Ferrous Ions: None
Fe: 6352 ppm +/- 101
pH: 4.18



Nail

001-026-005

Depth: 7 cm
Chloride Level: 10-50 ppm
Ferrous Ions: Low
Fe: 184712 ppm +/- 4603
Munsell ID: 10 YR 5/3
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 4708 ppm +/- 74
pH: 4.30



Nail

001-026-006

Depth: 12 cm
Chloride Level: 10-50 ppm
Ferrous Ions: Low
Fe: 102906 ppm +/- 2318
Munsell ID: 10 YR 5/2
Chloride Level: 0 ppm
Ferrous Ions: Low
Fe: 4291 ppm +/- 69
pH: 4.32



Nail

001-026-008

Depth: 4 cm
Chloride Level: <10 ppm
Ferrous Ions: Low
Fe: 99300 ppm +/- 2215
Munsell ID: 10 YR 4/2
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 4898 ppm +/- 78
pH: 4.24



Nail Shaft

001-026-009

Depth: 11 cm
Chloride Level: <10 ppm
Ferrous Ions: Very Low
Fe: 56484 ppm +/- 1193
Munsell ID: 10 YR 5/2
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 4418 ppm +/- 71
pH: 4.61



Canteen Half

002-026-001

Depth: 35 cm
Chloride Level: 10-50 ppm
Ferrous Ions: Very Low
Fe: 26802 ppm +/- 504
Munsell ID: 10 YR 4/3
Chloride Level: 0 ppm
Ferrous Ions: Very Low
Fe: 11736 ppm +/- 185
pH: 4.69



Washer/Bolt

002-026-003

Depth: 10 cm
Chloride Level: 150+ ppm
Ferrous Ions: Very High
Fe: 231307 ppm +/- 4529
Munsell ID: 10 YR 5/2
Chloride Level: 0 ppm
Ferrous Ions: Very Low
Fe: 117418 ppm +/- 182
pH: 4.26



Nail

002-026-006

Depth: 5 cm
Chloride Level: 50-100 ppm
Ferrous Ions: Medium
Fe: 80986 ppm +/- 1876
Munsell ID: 10 YR 5/2
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 5600 ppm +/- 90
pH: 4.07



Spoon Handle

003-026-001

Depth: 24 cm
Chloride Level: 100-150 ppm
Ferrous Ions: Very High
Fe: 215308 ppm +/- 4526
Munsell ID: 10 YR 4/2
Chloride Level: <10 ppm
Ferrous Ions: None
Fe: 8711 ppm +/- 137
pH: 4.18



Nail

003-026-003

Depth: 14 cm
Chloride Level: 10-50 ppm
Ferrous Ions: Low
Fe: 114807 ppm +/- 2695
Munsell ID: 10 YR 5/3
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 5773 ppm +/- 94
pH: 4.12



Nail

003-026-008

Depth: 10 cm
Chloride Level: 50-100
Ferrous Ions: Medium
Fe: 118642 ppm +/- 2463
Munsell ID: 10 YR 5/3
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 5796 ppm +/- 91
pH: 4.03



Lid

003-026-009

Depth: 25 cm
Chloride Level: <10 ppm
Ferrous Ions: Very Low
Fe: 176560 ppm +/- 3898
Munsell ID: 10 YR 3/4
Chloride Level: <10 ppm
Ferrous Ions: None
Fe: 14171 ppm +/- 218
pH: 4.41



Nail

004-026-001

Depth: 5 cm
Chloride Level: 10-50 ppm
Ferrous Ions: Low
Fe: 145317 ppm +/- 3324
Munsell ID: 10 YR 4/2
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 8348 ppm +/- 132
pH: 3.90



Nail

004-026-004

Depth: 2 cm
Chloride Level: <10 ppm
Ferrous Ions: Very Low
Fe: 169451 ppm +/- 3802
Munsell ID: 10 YR 5/3
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 8834 ppm +/- 141
pH: 3.89



Strap

004-026-007

Depth: 6 cm
Chloride Level: 10-50 ppm
Ferrous Ions: Low
Fe: 240785 ppm +/- 4691
Munsell ID: 10 YR 4/3
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 7887 ppm +/- 123
pH: 4.23



Small Key

001-027-001

Depth: 19 cm
Chloride Level: 50-100 ppm
Ferrous Ions: Low
Fe: 199336 ppm +/- 4577
Munsell ID: 10 YR 5/3
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 9814 ppm +/- 154
pH: 4.01



RR Spike Head

001-027-002

Depth: 18 cm
Chloride Level: 10-50 ppm
Ferrous Ions: Low
Fe: 212638 ppm +/- 4059
Munsell ID: 10 YR 5/3
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 6374 ppm +/- 102
pH: 3.80



Strap

001-027-003

Depth: 35 cm
Chloride Level: 100-150 ppm
Ferrous Ions: High
Fe: 50358 ppm +/- 910
Munsell ID: 10 YR 5/4
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 7545 ppm +/- 120
pH: 4.53



Bolt

001-027-008

Depth: 8 cm
Chloride Level: 50-100 ppm
Ferrous Ions: High
Fe: 188337 ppm +/- 4281
Munsell ID: 10 YR 5/3
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 5504 ppm +/- 87
pH: 3.76



Spoon Handle

001-027-009

Depth: 12 cm
Chloride Level: 50-100 ppm
Ferrous Ions: Medium
Fe: 222682 ppm +/- 4454
Munsell ID: 10 YR 4/2
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 8125 ppm +/- 128
pH: 3.96



Strap

002-027-002

Depth: 6 cm
Chloride Level: 50-100 ppm
Ferrous Ions: Low
Fe: 224715 ppm +/- 4459
Munsell ID: 10 YR 5/3
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 5746 ppm +/- 93
pH: 4.12



Nail

002-027-004

Depth: 14 cm
Chloride Level: 50-100 ppm
Ferrous Ions: Low
Fe: 249623 ppm +/- 5872
Munsell ID: 10 YR 4/2
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 4723 ppm +/- 75
pH: 3.95



Nail

002-027-006

Depth: 5 cm
Chloride Level: 10-50 ppm
Ferrous Ions: Low
Fe: 178007 ppm +/- 4145
Munsell ID: 10 YR 5/2
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 5021 ppm +/- 81
pH: 3.83



Iron Fragment

002-027-010

Depth: 17 cm
Chloride Level: 150 + ppm
Ferrous Ions: High
Fe: 217048 ppm +/- 4423
Munsell ID: 10 YR 5/3
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 5939 ppm +/- 96
pH: 3.71



Strap Fragments

002-027-011

Depth: 10 cm
Chloride Level: 100-150 ppm
Ferrous Ions: Medium
Fe: 201626 ppm +/- 4265
Munsell ID: 10 YR 5/4
Chloride Level: 0 ppm
Ferrous Ions: None
Fe: 6297 ppm +/- 102
pH: 3.93



Railroad Spike

003-027-012

Depth: 35 cm
Chloride Level: 100-150 ppm
Ferrous Ions: Very High
Fe: 234878 ppm +/- 5106
Munsell ID: 10 YR 4/4
Chloride Level: <10 ppm
Ferrous Ions: None
Fe: 7664 ppm +/- 121
pH: 5.16



APPENDIX D
ABBREVIATIONS USED IN TEXT

ANHS- Andersonville National Historic Site
CCC- Civilian Conservation Corps
CSA- Confederate States of America
DOI- Department of the Interior
GADNR- Georgia Department of Natural Resources
GDOT- Georgia Department of Transportation
HPD- Historic Preservation Division
LEAP- Light Element Analysis Protocol
MASS- Master of Arts in Social Science
MSSP- Magnolia Springs State Park
NIST- National Institute of Standards and Technology
NPS- National Park Service
OR- The Official Record of the War of the Rebellion
POW- Prisoner of War
ppm- parts per million
pXRF - Portable XRF
SEAC- Southeast Archeological Center
SRM- Standard Reference Material
USA- United States of America
USDA- United States Department of Agriculture
USFWS- United States Fish and Wildlife Service
XRF- X ray Fluorescence