RESIDENTIAL YARD PILOT STUDY
SAMPLING AND ANALYSIS PLAN

Tannery Sludge Farm Fields
Andrew, Buchanan, Clinton and DeKalb Counties

Prepared By:

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Division of Environmental Quality
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Missouri
Department of
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1.0 INTRODUCTION

As authorized under the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986, the Missouri Department of Natural Resources (Department), Hazardous Waste Program (HWP), Site Assessment Unit is conducting Pre-CERCLIS Site Screenings on selected farm fields in Andrew, Buchanan, Clinton and DeKalb Counties where tannery sludge has been applied as a fertilizer.

The purpose of this investigation is to determine the sensitivity requirements for laboratory analysis of hexavalent chromium, and to determine an incremental sampling design that can be used for subsequent residential yard sampling.

2.0 SITE INFORMATION

2.1 Location

Figure 1 shows the overall 4-county area where tannery sludge was applied. The residential yards pilot study will be conducted at one representative residential yard in Buchanan County (Figure 2). This residence is located approximately 10 miles east of St. Joseph within an 89-acre parcel of farm land. The parcel has been used to raise soybeans, corn, milo, and pasture grasses. Tannery sludge was applied as fertilizer to the farmed areas several times in the late 1990s up through May, 2008. The residence is nearly surrounded on all sides by sludge-applied fields.

2.2 History/Previous Investigation

A leather tannery owned by National Beef Leathers (NBL) is located at 205 Florence Road in St. Joseph, Missouri. National Beef purchased the operation in January 2009 from Prime Tanning Corporation, and Prime Tanning operated the tannery beginning in 1983 when it was known as Blueside. Starting in 1983 tannery waste sludge was provided free as fertilizer to farmers in Andrew, Buchanan, Clinton and DeKalb Counties. Tannery records provided by NBL indicate that the sludge was delivered to111 locations in the four County area covering over 56,000 acres of agricultural fields. Sludge was land-applied with a mechanical spreader, and most applications were performed by one individual. The sludge was applied over a period of 26 years, ending in the spring of 2009 when concerns were raised regarding the hexavalent chromium (Cr VI) content of the sludge and potential risks posed to farmers working the land and to residents living adjacent to application areas. MDNR file information indicates the applications were initially conducted under a letter of approval from the Department and, later, under Department-issued permits until 2005, at which time, permits were no longer required.

April/May 2009 MDNR Sampling Event

An initial sampling event took place over two mobilizations by MDNR on April 29, and May 1, 2009 (MDNR 2009a). The scope of that investigation included the collection of agricultural field surface soil, stockpiled material at NBL, sludge, surface water, and groundwater samples to assess for the presence and levels of Cr VI, in addition to other constituents typically associated

with tanning operations. Initial efforts focused upon process wastes at the facility itself with limited surface soil sampling at selected farm fields.

Based on the sample results, it was determined that hexavalent chromium (Cr VI) was the primary contaminant of concern. No Cr VI was detected in surface water collected near the NBL facility or in groundwater samples collected from NBL facility wells and a nearby residential well. Samples of sludge from various points in the tanning process contained Cr VI concentrations between 1.7 mg/kg and 46 mg/kg. Seven soil samples were collected from farm fields that had received sludge, and one background soil sample from a field that did not. Concentrations of Cr VI ranging between non-detect and 49 mg/kg were observed. However, all non-aqueous samples were analyzed using a colorimetric method (EPA SW846-7196A), which is susceptible to positive interferences. Also, duplicate sample results did not agree well with each other indicating poor overall sampling precision.

May 2009 Keystone Pipeline Sampling Event

In May 2009, Transcanada Keystone Pipeline, LP conducted soil sampling in cultivated areas traversed by its pipeline in Caldwell, Clinton and Buchanan Counties (AECOM, 2009). Approximately 260 surface soil grab samples were collected, 5 of which were located in areas that received tannery sludge applications (Figure X). All samples were analyzed for Cr VI by EPA SW846 Method 7199. Hexavalent chromium was detected in seven of the samples at concentrations ranging between 0.54 mg/kg and 2.7 mg/kg. Five of the seven detections occurred in Clinton County, one in Buchanan County, and on in Caldwell County. None of the Cr VI detections occurred in samples collected from areas known to have received sludge applications. The detection level reported by the laboratory was approximately 0.50 mg/kg.

August 2009 MDNR Sampling Event

On August 12, 2009, MDNR conducted a soil sampling event in one selected agricultural field (MDNR, 2009b). The purpose of the event was to determine how well correlated the variability of total Cr (analyzed by XRF) is to the variability of Cr VI (analyzed by the lab) across different spatial scales in the agricultural field soils. If the variability of total Cr XRF data was similar to or greater than the Cr VI variability, it would indicate that the XRF could be used in the field as a real-time analytical tool to provide a conservative estimate of Cr VI variability based on total Cr results. This information will used in the field to determine how many incremental samples to collect and how many increments to collect per sample.

Three small variogram plots were established in different areas across an agricultural field that had received sludge in early 2009. Ten surface soil samples were collected from different spatial scales within each plot, dried, crushed, sieved and analyzed for total Cr by XRF and for Cr VI by EPA SW-846 Method 7199. Statistical analysis showed that the variability of total Cr analyzed by XRF across various spatial scales was generally greater than Cr VI variability, thus making the use of XRF a viable field analytical method for use in sampling of the agricultural fields.

Both the total Cr XRF and laboratory Cr VI data showed very low variability across the spatial scales within the variograms.

Results from the August 2009 sampling event indicate that Cr VI laboratory method will provide the data needed for the agricultural fields assessments. However, due to the lower risk-based screening level for residential yards vs. agricultural fields (2 mg/kg vs. 86 mg/kg), the method will require modification before use on residential yards due. Specifically, a lower detection level will be required, and measures taken to improve subsampling precision. Further, due to sensitivity limitations of the XRF for total Cr, use of the XRF for guiding incremental sampling design in the field may not be practical. A residential yard pilot study is needed to address these issues and determine a sampling design.

3.0 DATA QUALITY OBJECTIVES

To help ensure precise, accurate, representative, complete, and comparable data, all field work and analyses will be conducted in accordance with the Quality Assurance Project Plan (QAPP) for Pre-Remedial Site Assessment/Pre-Removal and Targeted Brownfields Site Assessments Revision 6, December 7, 2007, and ongoing. The QAPP describes the general data quality objectives for site assessment investigations conducted by the HWP and ESP. Data quality objectives specific to this project are described below.

3.1 Problem Statement

Leather tannery waste sludge has been land-applied as fertilizer on over 56,000 acres of agricultural fields in four counties of northwest Missouri. The sludge was applied over a period of 26 years, ending in the spring of 2009. There is concern regarding the Cr VI content of the sludge and potential risks posed to farmers working the land and to residents living adjacent to application areas. A pilot study is needed to prepare a residential yard soil sampling design.

3.2 Planning Team

The planning team for this sampling event includes various project managers in HWP and the Environmental Services Program (ESP), and chemists in the ESP Chemical Analysis Section (CAS) as described in the QAPP. Additional planning team members include Jonathan Garoutte and other staff at the Department of Health and Senior Services (DHSS), Kelly Schumacher, Sue Casteel, Don Lininger and Ron King with EPA Region 7, Deana Crumbling with the EPA Technology Innovation Field Services Division, and Jannel Franklin with Test America Laboratories.

3.3 Conceptual Site Model

Waste sludge from various leather tannery operations was offered as fertilizer to farmers over a 4-county area in northwest Missouri. The sludge contained high levels of phosphorous and nitrogen as well as residual levels of total chromium and potentially other agents used in the tanning process. The sludge may have contained chromium in the reduced form (Cr VI) which could pose a potential health threat.

The sludge was delivered to farm fields and either loaded directly into a mechanized spreader for distribution over the fields, or stockpiled on the ground for subsequent distribution. The applications were nearly all done by one individual working for the tannery. This individual is believed to have applied the sludge in a fairly uniform manner, and to have buffered (not applied) near streams, drainage areas, residences, tree lines. As the applied sludge was exposed to the weather, one would expect some runoff and concentration of chromium in lower elevation areas. One would also expect to see higher, potentially more heterogeneous chromium levels near where the sludge was loaded onto the spreader or staged prior to loading. Areas where the spreader turned corners might also be expected to be more heterogeneous.

The tannery has provided DNR with detailed records describing which fields received sludge, when applications occurred, the mass of sludge applied per acre, total chromium concentrations (not Cr VI however), and total Cr applied per acre. The records indicate that the concentration of total Cr in the sludge has varied over the years, with older sludge generally containing higher levels than more recently generated sludge. Certain fields received higher masses of sludge per application, more applications, and more frequent applications.

The primary exposure route of concern for the residential yards is ingestion/inhalation of Cr VI – containing soil and dust that comes to be located in residential yards due to wind deposition from the sludge-applied fields. Based on this exposure scenario, soil at the surface or near the surface (0-2”) will be of primary interest since that is the fraction most easily mobilized by wind.

Other possible sources of Cr VI in rural agricultural residential yards include the following:

- background levels present in the native soils;
- cement dust;
- wood preservative chemicals and/or preserved wood;
- paints/pigments;
- chromium-based catalytic converters and asbestos linings and road dust containing these materials; and
- antifreeze.

Based on this CSM, one would expect the following regarding residential yards:

- Cr VI concentrations in residential yards should decrease relative to concentrations in the nearest sludge-applied field with distance from that field.
- A fairly uniform distribution of Cr VI concentration across the residential yards due to the nature of wind deposition. However, heterogeneous areas are possible due to wind break features, localized wind pattern effects, and predominant wind directions.

3.4 Resources, Constraints and Deadlines

The project will be funded through the Superfund Consolidated Cooperative Agreement with a grant provided to MDNR by USEPA.

3.5 Decision Statements

- What are the sensitivity requirements needed for laboratory Cr VI analysis on residential yards soil samples?
- Do laboratory subsampling techniques reduce RPD on Cr VI results for lab duplicates over that observed during the agricultural fields pilot study sampling event?
- What is the most conservative, but efficient, generic incremental sampling design to apply to yards during subsequent sampling events?

3.6 Inputs Into The Decisions

The following list inputs required to address the principal study questions.

Risk Based Screening Level for Cr VI:

- 2.0 mg/kg in residential yard surface soil;

The concentration of hexavalent Cr:

- In surface soil (0-2”) of sampling units and decision units established in the yard around the chosen pilot study residential home; and
- In laboratory duplicates.

3.7 Study Boundaries

A single residential yard was chosen for the pilot study, and is shown in Figure 2. Portions of the yard covered by soil or gravel within 200 feet of the residence at a depth of (0-2”)will be considered part of the decision unit (DU). The yard will be divided into sampling units as described in Section 3.8. All sampling will be conducted during a single event in September 2009.

3.8 Sampling Design

The pilot study sampling is designed to provide the data needed to determine the number of increments needed per incremental sample and the QC design for a subsequent residential yard sampling event.

Based on the agricultural farm field pilot study results, the precision of XRF analyses is not adequate to make the discriminations needed if the Cr VI concentrations are near or below the 2 mg/kg screening level. Since implementation cannot be guided by a real-time method (XRF) to adapt to actual conditions, a generic approach will be used that will be similar for each yard. That generic approach will involve an incremental sampling (IS) design based on the assumption of statistical input parameters as determined during this pilot study. Using incremental sampling with the proper spacing and number of increments provides a better estimate of the true average Cr(VI) over the DU than a discrete sampling design that is forced to reduce sampling density

because of analytical costs. An incremental strategy has the benefit of significantly reducing total analytical costs, while actually increasing the sampling density and thus the representativeness of data for supporting determination of a DU's Cr(VI) average concentration.

The entire residential yard will be considered the decision unit. Professional judgment and visual cues will be used to divide the DU into several non-overlapping sampling units (SUs). Divisions will be based on likely differences in exposure potential, Cr VI concentration, Cr VI variability, and other possible observed parameters. An overall DU Cr VI concentration will be calculated using results from the SUs with statistical confidence (i.e. a UCL). At least 4 SUs will be selected within the pilot yard, and a tiered IS approach will be used. This will provide for step-wise QA checks at critical points in order to test the design assumptions. The goal is to provide confidence that the range of variability across yards (the DU) and within sections of the yards (SUs) is understood, and to use that information to optimized data quality needs for the subsequent larger yard sampling event.

Although the XRF will not be useful as a real-time analytical tool for the residential yard sampling event, it will be used as part of the pilot study to assess the representativeness of splitting and subsampling of the initial discrete samples collected as described in Section 4.2.

4.0 FIELD ACTIVITIES

The field activities for this limited event include reconnaissance of the residential yard and determination of number, size and shape of sampling units (SU), collection of locational data, collection of discrete surface soil samples from within each SU, and documenting these activities in a field book, on field sheets, and with photographs. Samples will be returned to the HWP ESP laboratory for processing and analysis by XRF before being sent to Test America Laboratories for Cr VI analysis.

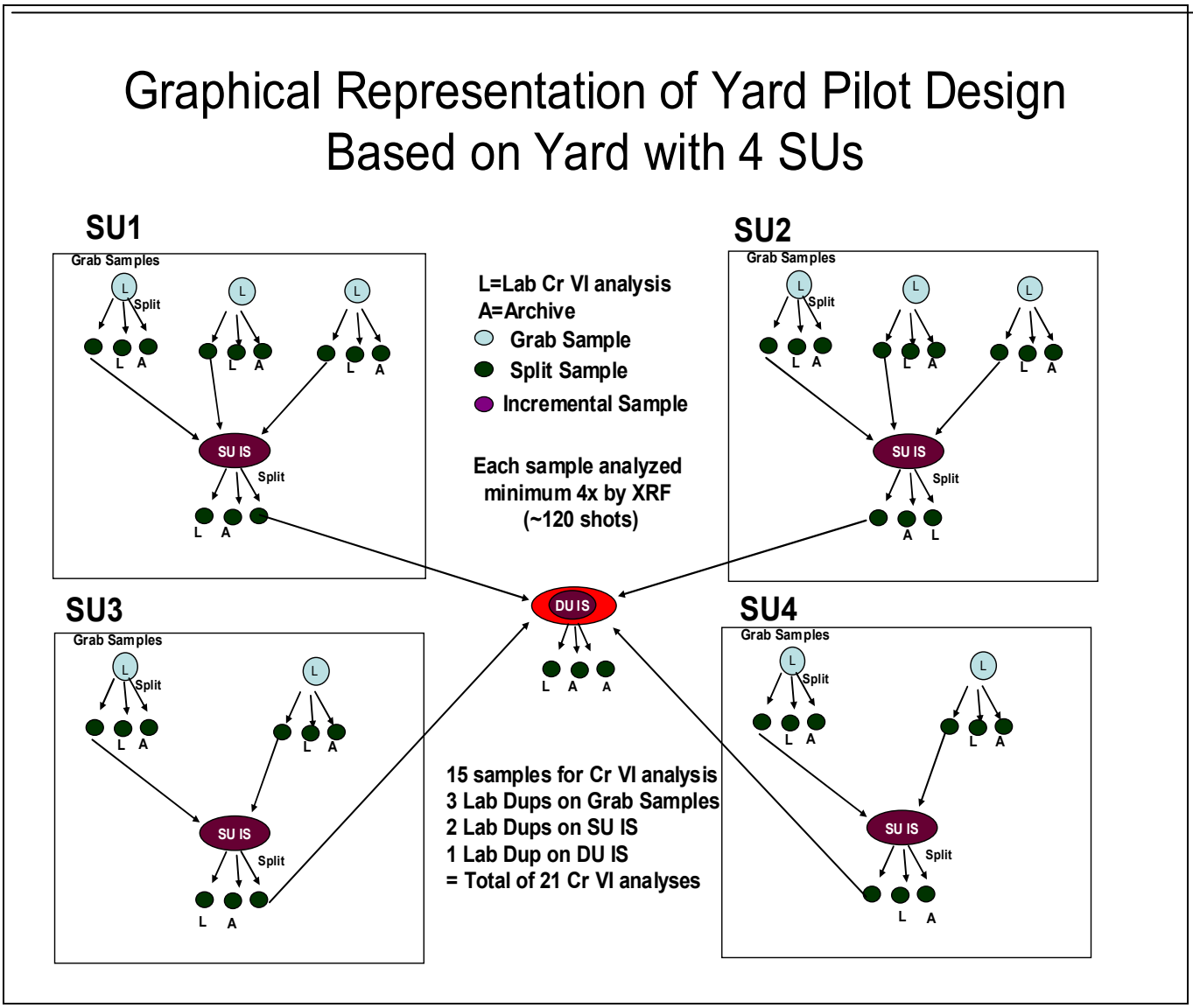
4.1 Residential Yard Soil Sampling

A minimum of 4 SUs will be established in the yard (DU), and a minimum of 10 discrete samples will be collected from within the SUs. Two of the SUs will be sampled at three locations, and the remaining SUs will be sampled at two locations each. The rationale for selecting which SUs will contain 3 locations will include consideration of 1) larger SUs, 2) more "sensitive" SUs from an exposure or receptor standpoint, and/or 3) SUs likely to have more variability in contaminant concentrations.

Discrete grab samples will be collected at each sampling location within the SUs. After removing any vegetation, the to 0-2" of soil will be collected using a stainless steel spoon or scoop. The goal will be to collect a mass of soil that when dried, disaggregated, and passed through a #60 sieve, will yield approximately 120g of soil. The mass collected will depend on soil moisture, but based on past experience will be approximately 500 grams wet weight.

4.2 Sample Preparation

The samples collected in the yard will be air dried in aluminum pans lined with wax paper to <10% moisture by weight, disaggregated with a mortar and pestle, and passed through a #60 sieve. A series of sample splits and preparation of incremental samples will be conducted, using XRF total Cr as a measure of sample homogeneity. These steps are described and shown graphically in the figure below.



4.2.1 Demonstrating Sample Bag Homogeneity

Each sieved sample will be analyzed 4 times by XRF, moving the bag between each analysis. A standard reference material (SRM) will be identified having a similar concentration of Cr as the bagged sample. The variablilty (as standard deviation or SD) of the XRF readings on that SRM will be used as the QC acceptance criteria for the sieved yard sample homogeneity. The SD of the 4 replicate bag analyses will be compared to the SD of the SRM. If the SD of the yard sample replicates is within 3 times the SD of the SRM, sample processing will continue as described below. If the the criteria is not met, but is close, 4 additional XRF analyses will be conducted on the bag, and the comparison repeated on the 8 analyses. If the bag still fails, any procedural weakneses in the sample preparation will be identified and rectified (e.g. disaggregate again, re-sieve, etc.). If the homogeneity QC acceptance criteria cannot be met for certain samples, this will be documented and this sample will be identified to get laboratory duplicate analysis.

4.2.2 Sample Splitting

Once the homogeneity of the sieved sample has been documented using replicate XRF analysis, the sample will be split out into 3 equal subsamples. More than one technique for splitting the samples may be employed, and will be based on results of XRF Cr analyses. The initial technique will be to place the entire sample into a waxed paper-lined surface in a 2D slab. The sample will then be simply divided into 3 equal masses using a spatula, and each subsample placed into separate bags. If the assessment described below demonstrates that this technique produces homogenous, representative subsamples, it will be used for all subsampling/splitting. Otherwise a technique based on incremental subsampling will be used.

After splitting, each split sample will be analyzed 4 times by XRF and statistics calculated. This will document that the splits are homogenous and that they are representative of the pre-split sample. The splits' means should be within the 95% confidence interval of the pre-split sample (using 2-sided t-value). The split's SD should be within +/- 2 times the SD of the pre-split SD. If so, the split samples will used to create an SU IS. If the split criteria is not met, the spit will be analyzed 4 additional times and statistics recalculated on the 8 analyses. If still not met, procedural weaknesses will be identified and corrected. If no correction effort is successful, this will be documented.

4.2.3 Creating Sample Unit Incremental Samples (SUIS)

Once the homogeneity of the split samples are documented, one sample from each set of three splits will be sent for laboratory Cr VI analysis, one will be archived, and one will be combined and homogenized with the a split from the other sample sets within the same SU to form a SU incremental sample.

The homogeneity of the new SUIS bag will be documented by analyzing it 4 times by XRF and calculating statistics. If the SD of the SUIS is within +/- 2SD of the splits, then the SUIS will be

split into 3 new portions using the technique described in 4.2.2. If the SD criterion is not met, but is close, an additional 4 analyses will be conducted, and new statistics calculated on the set of 8 measurements. If the criteria are still not met on the 8 measurements, procedures will be evaluated for weaknesses and corrected.

4.2.4 Creating Decision Unit Incremental Samples (DUIS)

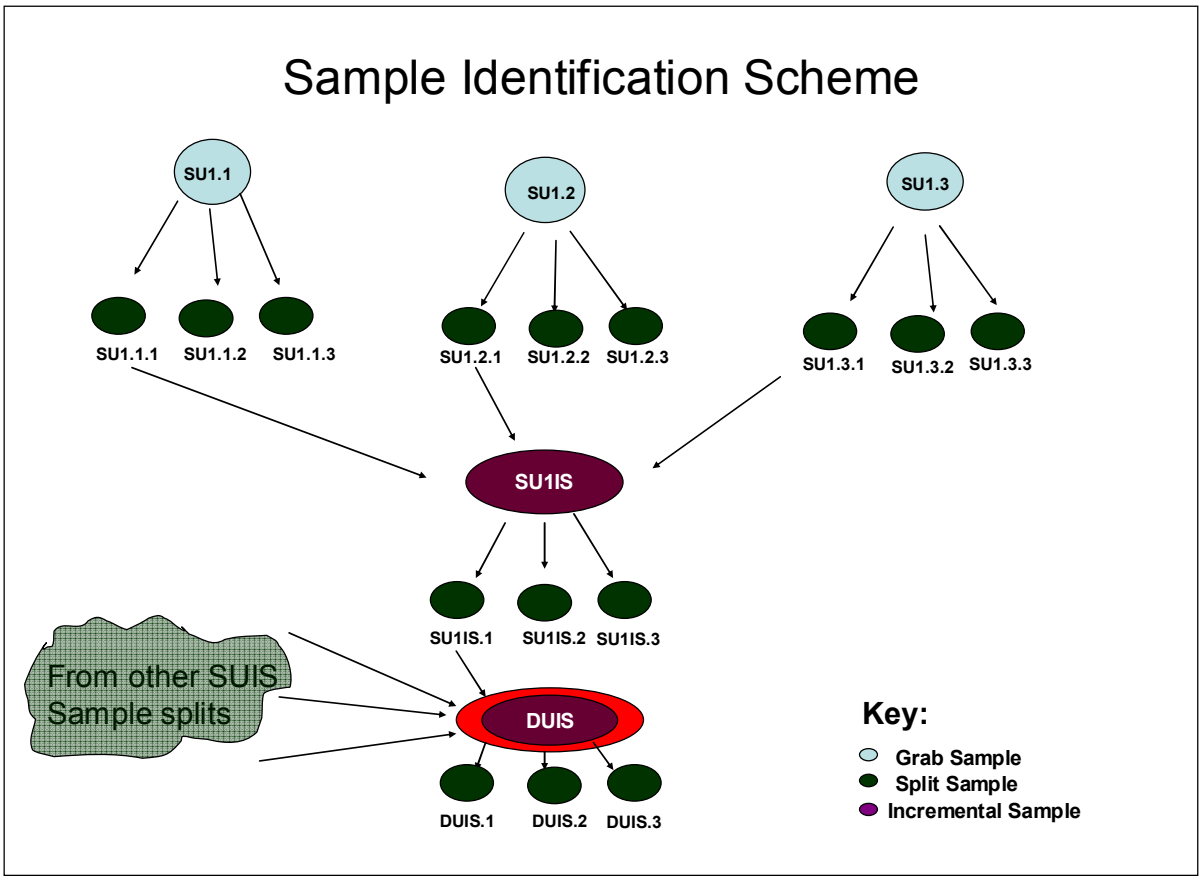
Each of the three portions split from the SUIS will be analyzed 4 times by XRF, statistics calculated, and compared to the results from the SUIS as described in Section 4.2.2. This will document that the splits are homogenous and that they are representative of the SUIS. Once the homogeneity of the splits is documented, one will be sent for laboratory Cr VI analysis, one will be archived, and one will be combined with splits from the other SUIS samples and homogenized to form a DUIS sample that represents the entire yard.

The DUIS bag will be analyzed 4 times by XRF and the SD of the new DUIS bag will be compared to the SD of the split SUIS portions making up the DUIS. If the SD of the DUIS is within +/- 2SD of the SUIS splits, then the DUIS will be considered homogenous, and it will be split into 3 portions using the technique described in 4.2.2. If the SD criterion is not met, but is close, an additional 4 analyses will be conducted, and new statistics calculated on the set of 8 measurements. If the criteria are still not met on the 8 measurements, procedures will be evaluated for weaknesses and corrected.

One of the DUIS splits will be sent for laboratory Cr VI analysis, and the other 2 archived.

4.3 Field Sample Identification

The sample bag numbering scheme shown in the figure below will be used to track the samples. Sample IDs will be written on the sample bags in permanent marker.



A single GPS data point will be collected to represent the location of the residence. It will be collected as near to the apparent primary entrance to the house as feasible.

Data Field	Field Type	Possible Values
Parcel ID.#Residence	Manual Entry	Parcel # from tax assessor. If >1 residence/parcel, use ".#" after parcel # to identify
GPS Operator	Dropdown Menu	Department personnel working on the project
Comments	Manual Entry	Text description of comments

4.4 XRF Analyses

Each sample will be analyzed with a InnovX α-400sl X-ray tube XRF analyzers operated in light element analysis mode (LEAP). The XRFs will be operated in accordance with the standard operating procedures described in Appendix C. The following data will be entered into the XRF analyzer for each sample analysis.

Data Field	Field Type	Possible Values
Sample Number	Manual Entry (or Bar Code Scanned)	8-Character sequential numeric value beginning with "H080"
Standard Ref Material	Dropdown Menu	Blank, 4315, 2709, 3212, RTC408, or 5861
Date Collected	Manual Entry	Format: Day/Month/Year (e.g. 09/28/09)
Analyst Name/XRF Serial Number	Dropdown Menu	Names of all Department personnel working on the project together with XRF serial number.
Sample ID	Manual Entry	Naming convention shown in figure above
Comment	Manual Entry	

4.5 Samples Submitted for Laboratory Analysis

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4.5.1 Sample Quantity

The number of samples submitted for laboratory analysis of Cr VI will depend upon the number SUs delineated at the pilot residence. Four to six SUs are anticipated which will result in 15-21 soil samples plus 6 laboratory duplicates (21-27 samples for Cr VI analysis).

4.5.2 Analyses Requested

All samples will be analyzed for hexavalent chromium by EPA SW-846 Method 3060A/7199. A complete data package with all QC will be requested; the same as received for the August 2009 agricultural field pilot study samples. Expedited turnaround will again be requested for all samples. The representative sub sampling technique known as the 2D Japanese slabcake method will be requested by the laboratory on all samples.

4.5.3 Sensitivity Requirements

The Department has requested that Test America Laboratories provide a lower reporting limit than the 2 mg/kg value typically reported, since the risk-based screening level for the residential yards is 2 mg/kg. The lab is currently working on developing a lower RL closer to the 0.2 mg/kg range.

4.5.4 Sample Container and Preservation Requirements for laboratory samples

The following table summarizes container and preservation requirements on all samples submitted to the Department's environmental laboratory. Note that these tables include only samples collected from residential yard and well sampling. Agricultural field sample numbers will be included in a later addendum to this SAP.

Analysis	Minimum Volume (g)	Optimal Volume (g)/Container	Preservative	Holding Time	Estimated Number of Samples
Hexavalent Cr	10	40g / One 4 oz glass jar	None	30 days	21-27

4.5.5 Laboratory Subsampling

Samples submitted to the laboratory will be subsampled using the 2D Japanese Slabcake technique. The entire sample will be spread evenly onto a 2 dimensional surface at a depth that can be easily penetrated by a scoop. A scoop will then taken by removing an increment that equally represents the entire vertical column of the material and placed in a receiving container. This process is repeated at least 30 times at random locations around the entire sample. A square walled scoop tends to perform the best. Each scoop will ideally represent $1/30^{th}$ of the desired target mass. For example, with an analytical method that requires a 2.5 gram sample to be digested, each scoop should weigh about 83.5 mg (83.5x 30=2,500mg). Before starting the scooping process, a few trial scoops should be taken and weighed, to calibrate the amount needed for each scoop. This process is repeated on samples identified as laboratory duplicates.

4.5.6 Chain-of-Custody

All samples collected during the investigation shall remain in the custody of SAU and/or ESP personnel in the field. Samples will remain in the custody of ESP personnel during sample preparation and be relinquished to SAU personnel for XRF analysis. Following XRF analysis, samples chosen for laboratory analyses will be relinquishing to a sample custodian at ESP in Jefferson City. Samples to be analyzed for Cr VI will be relinquished to Test America Laboratories for analysis. Control of the samples will be documented using the Department's standard chain of custody form.

5.0 QUALITY CONTROL

5.1 Field Methods

Clean disposable nitrile gloves will be worn by sampling personnel. Field personnel shall note all observations, sample locations, and descriptions in personal field notebooks and/or on a standardized field sheet.

5.2 Field Decontamination

A clean sample bag and spoon will be used for each sample collected. Spoons, trowels or ice-cream scoops used to collect soil samples will be disposable, and do not require field decontamination.

The mortar/pestle, sieves and sieve collection pans will be decontaminated between each sample using a small bristle brush, followed by spraying with Simple Green® cleaner and wiping with a paper towel.

5.3 Precision

XRF instrument precision checks will be conducted at frequency of 10% or once per day minimum. Seven replicate analyses will be conducted on a sample bag without moving the bag between analyses. The %RSD should be less than 25%.

Laboratory precision will be evaluated based on results from 6 laboratory duplicate analyses, and from the laboratory's routine MS/MSD analyses required by the method.

5.4 Accuracy

The accuracy of XRF analyses will be assessed by the routine analysis of calibration check standards and blanks containing certified concentrations of chromium. The results of the calibration check standards analyses will be compared to control charts. The XRF's internal calibration and standardization routines will be considered valid if the measured values are within +/- 2 standard deviations of the control chart mean.

Laboratory accuracy will be evaluated using routine instrument calibration verification, continuing calibration verification, and analysis of laboratory control samples.

5.5 Representativeness

Representativeness is addressed by the using the sample processing procedures described in Section 4.2.

6.0 INVESTIGATION DERIVED WASTES (IDW) PLAN

Efforts will be made to minimize IDW generation. IDW may include soils, disposable sampling equipment, and disposable personal protective equipment (PPE).

Field personnel will return unused soils to their source immediately after generation. Disposable PPE and disposable sampling equipment will be handled as solid waste, containerized, and properly disposed.

7.0 SITE SAFETY

A health and safety plan will be generated prior to field mobilization, indicating appropriate emergency contact numbers and safety considerations.

A safety briefing will be held on-site prior to initiating field activities and field personnel will be required to read and sign the site-specific health and safety plan. A copy of the health and safety plan will be available on-site for reference. The site safety plan is attached as Appendix B.

8.0 REPORTING

The analytical results of samples collected will be presented, along with methods of collection and observations, in a formal report to be submitted to the HWP.

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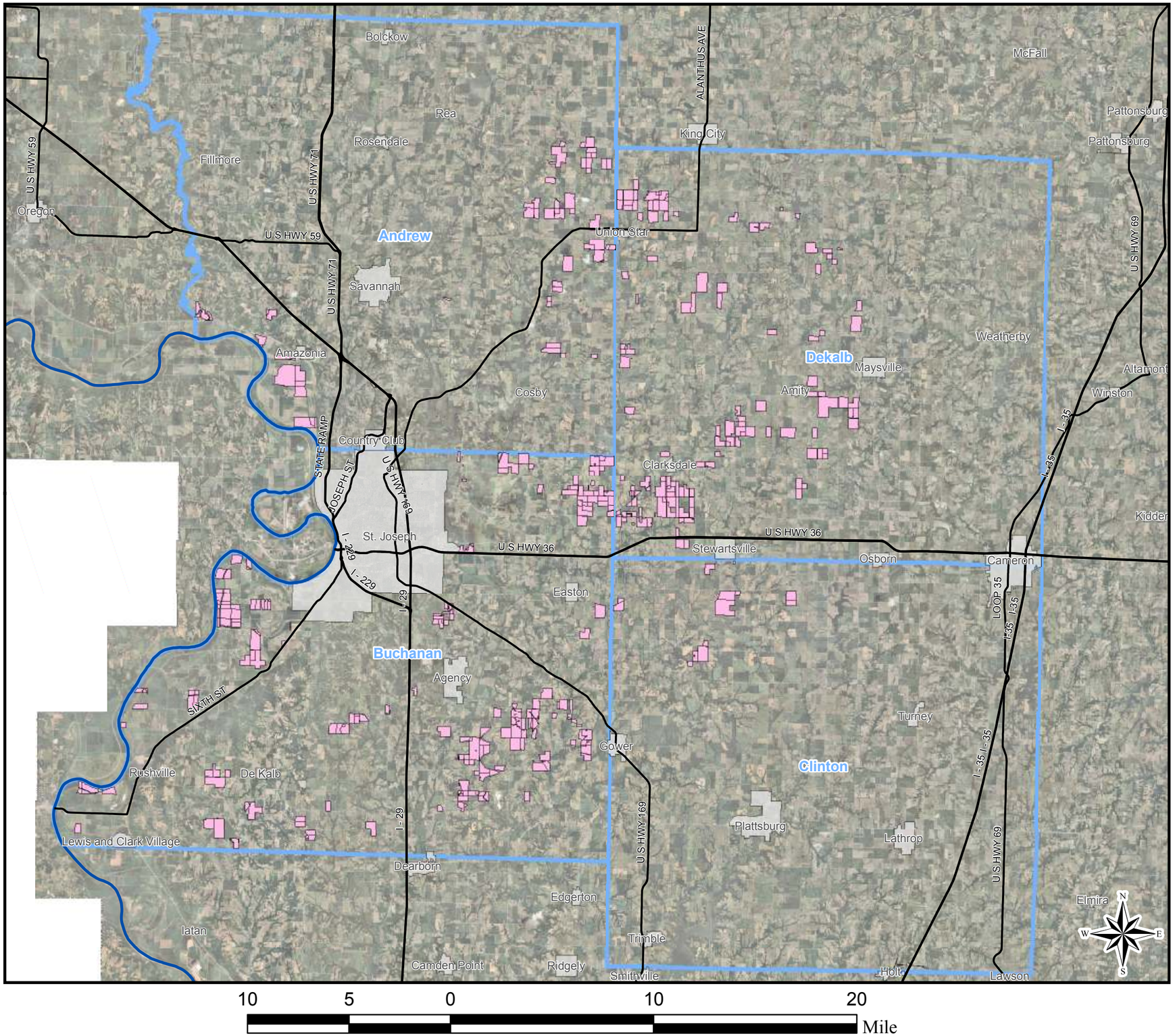
Date: September 30, 2009

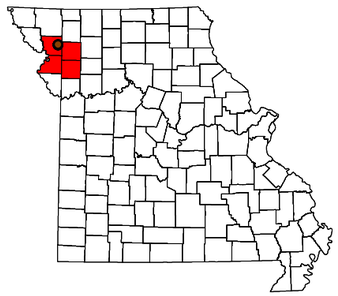
APPENDIX A
FIGURES

Figure 1
Site Location Map
Tannery Sludge Farm Fields Site
Andrew, Buchanan, Clinton, and Dekalb Counties in Missouri



Legend

- Sludge Application Parcel
- Municipality
- State Boundary
- County Boundary
- Road



Created on: February 17, 2006 by Shelly Jackson. This map is located at M/Superfund/....

Base Map: National Agricultural Imagery Program. Flight Date: 2006.

Although data sets used to create this map have been compiled by the Missouri Department of Natural Resources, no warranty, expressed or implied, is made by the department as to the accuracy of the data and related materials. The act of distribution shall not constitute any such warranty, and no responsibility is assumed by the department in the use of these data or related materials.

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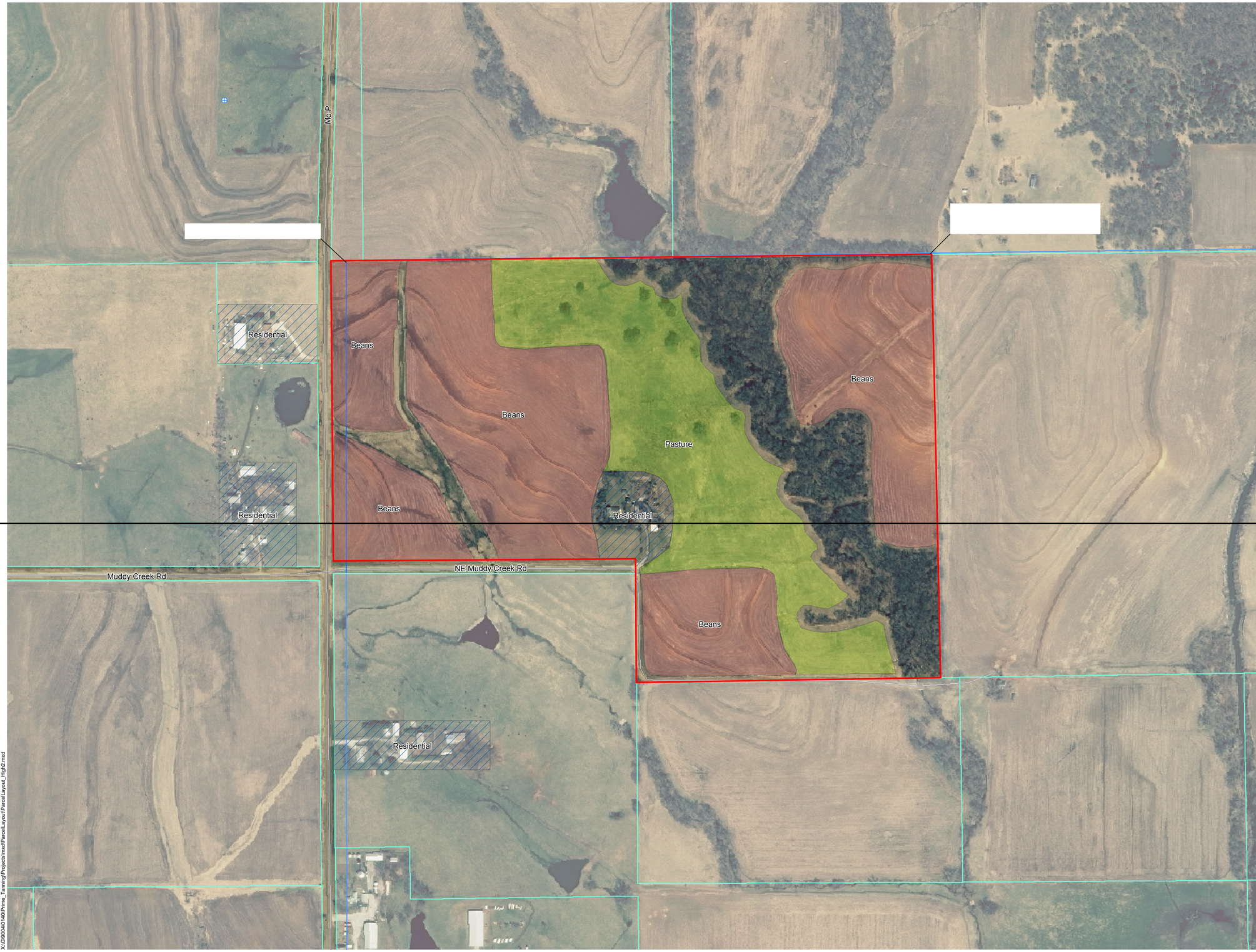
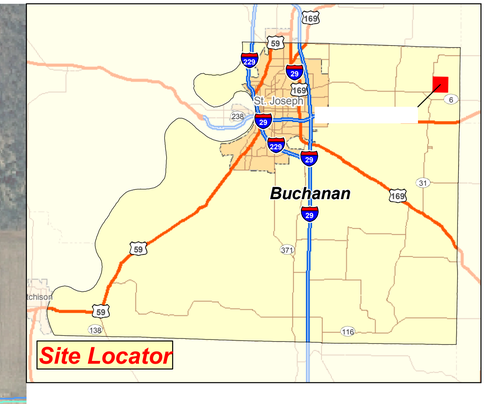
Hazardous Waste Program





Legend

- Approximate well location (No wells in this area)

Registered Wells

- Domestic
- Irrigation
- Public Wells
- Other (Unknown primary usage)

Public Water System

- Intake
- Well
- Streets
- Location High #2 (18 Applications)

Application Area by Field Type

- Beans
- Pasture
- Residential Area
- Surface Water (No surface water in this area)
- Parcel boundary
- Section boundary

N

200 0 200

Feet

Source: Missouri 2 Foot Resolution Aerial Photography, 2008; Buchanan County Parcels, 2009; HSIP Gold, 2007.

Tannery Sludge Farm Fields
Buchanan County, Missouri

Parcel Layout Map
Location High #2

TETRA TECH EM INC.

Date: 071709 Drawn By: Ingrid Tobar Project No: I9004L.08.0140.000

X:\GIS\0040140\Prime_Tanning\Projects\mxd\ParcelLayout\ParcelLayout_High2.mxd

APPENDIX B
HEALTH AND SAFETY PLAN

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL SERVICES PROGRAM

Prime Tanning Corporation Site
SITE HEALTH AND SAFETY PLAN

1.0 INTRODUCTION

This plan has been prepared for implementation by ESP employees, using operating procedures for which they are specifically trained. Any use of the plan by other agencies, organizations, or private individuals is at their own risk.

2.0 KEY PERSONNEL

MDNR OSC: Michael Stroh SAFETY OFFICER: Michael Stroh

OTHER MDNR PERSONNEL/TITLE:

Michael Stroh ES III - ESP

3.0 SITE INFORMATION

Site name Prime Tanning Corporation Site

County/City: Buchanan/Agency

Sampling date: 9/30/09 Site Description: Field where tannery sludge was applied.

3.1 Overall Incident Risk/Hazard Analysis

Chemical: _____Serious _____Moderate XX Low _____Unknown

Physical: _____Serious _____Moderate XX Low _____Unknown

3.2 Contaminant(s) of Concern: Hexavalent chromium and potential contaminants from tanning industry.

3.2.1 Physical State: _____Liquid XX Solid XX Sludge _____Gas/Vapor

Chemical Characteristics: (check all that apply)/

XX a. carcinogen	_____b. biological	_____c. corrosive	_____d. combustible
_____e. explosive	_____f. flammable	_____g. volatile	XX h. poison
_____i. radioactive	_____j. reactive	k. other: _____	

3.2.2 Physical Hazards: (check all that apply)

_____a. overhead_____b. below grade _____c. confined space* _____d. noise
e. splash _____f. fire/burn _____g. puncture _____h. heat stress
_XX_i. cut ___XX_j. slip/trip/fall _____k. cold stress _____l. electrical
_____m. mechanical/heavy equipment _____n. other:_____

* The need for confined space entry by ESP personnel shall be evaluated on a site-by-site basis. A confined space entry permit must be signed by the appropriate Unit or Section Chief prior to ESP employees entering a confined space (29 CFR 1910.146). Confined space entry shall be screened in at least Level B prior to downgrade. **Adequate resources must be available and specific planning and tasks determined before confined space entry is initiated.**

3.3 Task-Specific Risk Analysis (attach additional sheets as necessary)

Task Description	Chemical Hazards	Physical Hazards	Level of Protection
Water sample collection	a h	i j	D
Soil/sludge sample collection	a h	e i j	D

4.0 MEDICAL SURVEILLANCE AND PERSONNEL TRAINING REQUIREMENTS

All ESP field personnel participate in a medical monitoring program and are trained at least to the level of "Hazardous Substance Emergency Response-Technician" as required and specified in the department's written health and safety program located in Section 2 of the MDNR-Hazardous Substances Emergency Response Plan (HSERP). The written policy satisfies requirements set out in 29 CFR 1910.120. MDNR ESP's respiratory protection program meets the requirements of 29 CFR 1910.134.

ESP personnel will ascertain as much information as possible regarding health and safety issues associated with the site prior to initial entry. Information shall include chemical and physical hazards as listed above, types and amounts of materials involved, and citizens/areas threatened by the incident.

5.0 PERSONAL PROTECTIVE EQUIPMENT

ESP shall utilize the Protection Level categories defined in 29 CFR 1910.120, Appendix B, and known as Levels A, B, C, and D. Refer to Section 2 of the MDNR-HSERP for definitions of Protection Levels. ESP personnel shall inspect APRs and SCBAs at least monthly and maintain a record of such to ensure equipment is functional.

Levels of protection shall be reassessed and upgraded as conditions change and information is updated to comply with worker safety while performing site activities.

Action Levels for evacuation of work zone pending reassessment of conditions:

Level D: O_2 < 19.5% or > 25%; explosive atmosphere > 10% LEL; organic vapors > background levels; other_____.

Level C: O_2 < 19.5% or > 25%; explosive atmosphere > 10% LEL; organic vapors (in breathing zone) > 25 m.u., or 3 times background (whichever is less); other_____.

Level B: Explosive atmosphere > 10% LEL; unknown organic vapors (in breathing zone) > 500 m.u.; other_____.

Level A: ESP personnel shall evaluate the need for entry on a site-specific basis and may utilize its emergency response contractor for Level A situations which may arise.

6.0 FREQUENCY AND TYPE OF AIR MONITORING/SAMPLING

Instrument	Contaminant of Concern	Sample Location (Area/Source)	Frequency	Odor Threshold/ Description
N/A				

7.0 SITE CONTROL MEASURES

7.1 The "Buddy-System": ESP personnel performing any work activities within the exclusion zone shall employ the "buddy-system" at all times, as required and defined in Section 2 of the MDNR-HSERP. The "buddy-system" may not be required while an ESP staff member is observing or providing oversight of cleanup activities performed by a contractor or responsible party.

7.2 Safe work Practices: Refer to Section 2 of the MDNR-HSERP for written safety practices to be followed at all times by ESP personnel while on-site at an incident.

7.3 Site Communications: The use of two-way radios or establishment of hand signals for communications shall be determined prior to entering the work zone and followed by ESP personnel.

7.4 Work Zones: ESP personnel shall ensure work zones are established and be aware of their locations.

8.0 DECONTAMINATION PROCEDURE/SOLUTIONS:

Personnel: Soap/water wash all skin exposed to potentially contaminated media

Equipment: Refer to Equipment decontamination procedures specified in the site specific sampling plan.

Instruments: _____

Decontamination fluids/materials may be to be containerized for proper disposal.

9.0 EMERGENCY INFORMATION:

In the event of an emergency, notify the MDNR Environmental Emergency Response Office at 573/634-2436. The Duty Officer will make the appropriate notifications.

10.0 ADDITIONAL EMERGENCY INFORMATION/NUMBERS:

Hospital: South Side Health Center – 5001 Lake Avenue., St. Joseph, MO –816/238-7788
Location/Specific directions from Site: Refer to attached map

	Name/Location	Telephone Number
Ambulance:	St. Joseph Ambulance	911
Police/Sheriff:	St. Joseph Department	911
Fire:	St. Joseph Department	911
Poison Control:		
Cellular Telephones/Other:	Ken Hannon digital phone:	573/644-3217

11.0 SIGNATURES

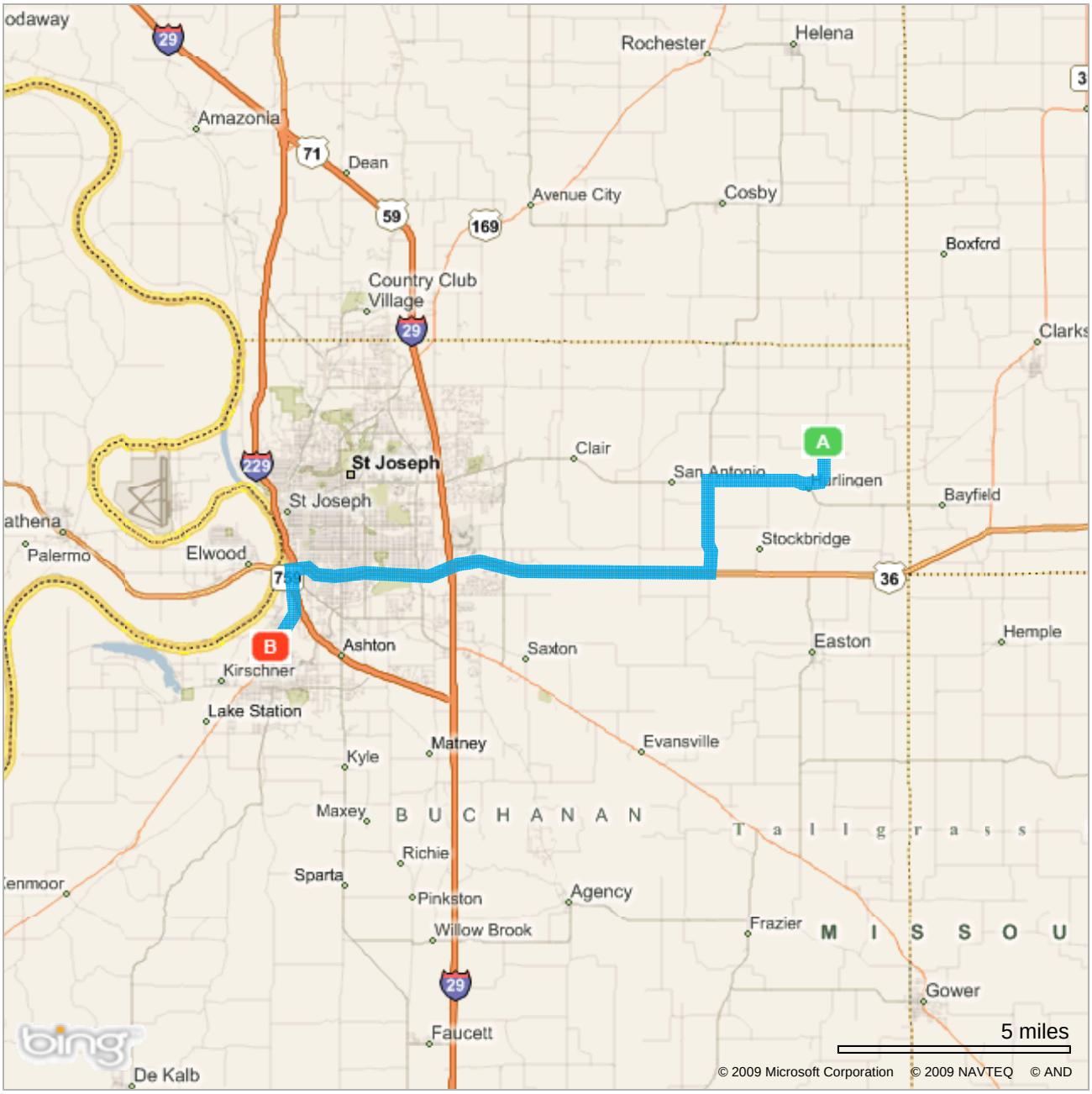
ESP personnel shall certify they have read the plan and addressed any questions regarding worker health and safety by signing and dating below followed by printing their name and title.

Signature	Printed Name/Title	Date	TLD Badge
[signature]	Michael Stroh	9/25/09	
Shelly Jackson	Shelly Jackson	9/25/09	

Start: NE Muddy Creek Road, St. Joseph, MO

End: 5001 Lake Avenue., St. Joseph, MO

Route Summary: 16.4 miles| 20 minutes



Notes:

A **NE Muddy Creek Road, St. Joseph, MO**

Depart SR-P

1.	Turn right to stay on SR-P	0.4 miles
2.	Turn right onto SR-6	2.1 miles
3.	Turn left onto SR-Z	2.0 miles
4.	Turn right onto US-36	9.3 miles
5.	Take ramp left for I-229 South	0.4 miles
6.	At exit 4A, take ramp right for US-59 South / 6th St toward Atchison St	0.2 miles
7.	Bear right onto US-59 / S 6th St	1.4 miles

B Arrive at **5001 Lake Avenue., St. Joseph, MO**

APPENDIX C
XRF STANDARD OPERATING PROCEDURES

Standard Operating Procedure for Innov-X α 400sl XRF Analyzers
Tannery Sludge Fields Residential Yard Pilot Project

The instruments will be operated in the testing stand and controlled from a laptop PC. A 180-second or 90-second analysis time will be used for all samples depending on Cr concentration range. *Note, do not operate the laptop PC software with the laptop connected to the network servers.*

All XRF analyses will be recorded in a written log book for each instrument. The analyst will record the date, the XRF run number (automatically generated by the XRF), the sample ID, and the total Cr result in mg/kg.

Startup

- Power up the analyzer, allow to warm up 15 mintes, then the start the InnovX PC software.
- The instrument will automatically perform an initialization procedure, which lasts for 1-2 minutes.
- Following initialization, place the stainless steel standardization disc over the instrument's sampling window in the test stand and close the stand cover.
- Click the "Standardize" button from the upper left window titled "Soil" in the PC software. The instrument will perform an internal 60-second standardization procedure. During standardization, and any other time the x-ray tube is on, the red light on top of the test stand will flash. When the x-ray tube is off, the red light will remain on solid. ***Do not open the test stand lid when the light is flashing.***
- Following standardization, an information window will pop up displaying the analyzer resolution. Record the resolution in the XRF Log Book along with the Run number automatically assigned by the analyzer.
- The analyzer is now ready to analyze calibration check samples.

Calibration Check

- The NIST 2709, 3212, 4315, RTC408, 5861, and Blank calibration check samples will be analyzed at the beginning of each use (e.g. beginning of the day.
- Place a calibration check sample cup over the analyzer's sampling window, and close the testing stand cover.
- On the PC software main menu bar, select "Edit" and then chose "Edit Test Information". A data entry window will pop up allowing input of information about the next test.
- Select your name from the "Analyst" dropdown menu & select the check sample from the "Chk_Sampl" dropdown list.
- Click OK, and set the analysis time: for SRMs blank, 2709, and 3212, use 180 seconds, for the other SRMs use 90 seconds.

- Click the "Start" button in the Soil Window in the upper left corner of the screen to initiate the test.
- Assess instrument calibration by comparing the measured values to the control chart. Verify that the result is within 2SD of the control chart mean, if so, continue to Bagged Sample Analysis.
- If values outside 2SD are observed, re-analyze the calibration check sample. If the measured value is still outside 2SD, power the XRF, close the PC software, wait 10 seconds, and power them back up, and re-initialize and re-standardize as described above. Re-analyze the standards.
- A blank sand sample will be analyzed at least once per 20 samples, preferably following a high concentration sample.
- Re-standardize each instrument a minimum of once each 4 hours of operation.
- The three different calibration check standards will be analyzed approximately mid-way through sample analysis (e.g. mid-day), again at the end of sample analysis, and anytime the instrument is re-standardized.

Bagged Sample Analysis

- Following successful calibration check, click Edit from the main menu bar and select Edit Sample Information.
- Enter all applicable information about the first sample to be analyzed from the bag label, using the dropdown menus and direct edit fields
- Roll the sieved soil around inside the bag to homogenize;
- Place the sample over the analyzer's sampling window ensuring that the soil and bag are in as close contact with the window as possible.
- Close the stand cover.
- Click the Start button from the Soil window to initiate the test.
- The data being acquired will appear in the Chemistry window in the lower center of the PC screen during analysis.
- The analysis will continue for 180 seconds unless stopped at 90 by the analyst. Analysis may be stopped at 90 sec if the concentration of Cr observed during the first 30 seconds is above 150 mg/kg.
- After analysis, the results will appear in the Results window on the PC.
- A running list of the analyses will appear in the window at the lower left of the PC screen.
- The sample information will remain from the previous test, so no changes are necessary for subsequent replicate analyses on a given sample bag.
- Roll the sieved soil around inside the bag, and re-analyze. Repeat analysis 4 times.
- After completing replicate analysis on a bagged sample, click the Edit Sample Information again and enter information for the next bagged sample as above.

Refer to the SAP for guidance on how to assess the replicate bag readings. Data should be assessed and any additional analyses/measures taken before proceeding to the next bagged sample.

- Place the second sample in the test stand, close the cover and initiate the analysis.
- Repeat for remaining samples
- An instrument precision check will be conducted at a frequency of 5%. This will consist of analyzing a sample seven separate times without moving the sample in between each analysis. The %RSD on the replicate analyses should not exceed 15%.

Daily Data Downloading

- After the last analysis for the day, select Readings from the main menu bar, and chose Export Readings.
- In the Export pop up box, verify that the "Export readings on date" radio button is selected, the Mode to export is "All", and today's date is circled on the calendar.
- Click OK.
- Insert a USB thumb drive in the laptop, download data to it, and then move data onto network server. Select the directory and file name for the downloaded data. For this project, file naming convention is date & XRF serial number (e.g. 101209_5434)
- Verify that the file type is "Comma Separated Values", and click Save.
- A message will pop up indicating a successful download, and asking whether you would like to open the file. Select Yes, and file will open in Excel. Verify that the data appears correct. Make any corrections you had noted in the run log book.
- Choose Save As from the File menu, and select File Type "Microsoft Excel 97 Workbook.
- Close the InnovX software, power down the analyzer, and shut down the laptop PC.
- Copy the file from thumb drive to the network as soon as possible after analyses. Files will be stored in the H:/Sections/Superfund/SiteFiles/Tannery Sludge Fields/XRF data directory.

Note: For any operation that requests a password, the administrator password is lower case z, and the factory password is 1234.