Yard 520
Sampling and Analysis Plan
Pines Area of Investigation
AOC II
Docket No. V-W-'04-C-784

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APPENDICES

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ACRONYMS

AOC II	Administrative Order on Consent, 2004; Docket No. V-W-‘04-C-784
bgs	Below Ground Surface
CAS	Columbia Analytical Services
CCB	Coal Combustion By-Product
COC	Chain-of-Custody
COPC	Constituent of Potential Concern
COPEC	Constituent of Potential Ecological Concern
DQO	Data Quality Objective
ERA	Ecological Risk Assessment
FSP	Field Sampling Plan
GEL	General Engineering Laboratories, LLC
GPS	Global Positioning System
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
ID	Identification
IDW	Investigation-Derived Waste
IDEM	Indiana Department of Environmental Management
m	meters
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NGVD	National Geodetic Vertical Datum
NIPSCO	Northern Indiana Public Service Company
PAH	Polycyclic Aromatic Hydrocarbon
PCDD	Polychlorinated Dibenzodioxin
PCDF	Polychlorinated Dibenzofuran
PDOP	Position Dilution of Precision
PPE	Personal Protective Equipment
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
SMS	Site Management Strategy
SNR	Signal to Noise Ratio
SOP	Standard Operating Procedure
SV	Satellite Vehicle
TAL	Target Analyte List
USEPA	United States Environmental Protection Agency
WGS	World Geodetic System

DISCLAIMER

This document is a document prepared under a federal administrative order on consent and revised based on comments received from the U.S. Environmental Protection Agency (USEPA). This document has been approved by USEPA, and is the final version of the document.

1.0 INTRODUCTION

In April 2004, the United States Environmental Protection Agency (USEPA) and the Respondents (Brown Inc., Ddalt Corp., Bulk Transport Corp., and Northern Indiana Public Service Company [NIPSCO]), signed an Administrative Order on Consent (AOC II) (Docket No. V-W-'04-C-784) to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the Pines Area of Investigation, or Area of Investigation, as set forth in Exhibit I to AOC II, located in the environs of the Town of Pines, Indiana, as shown on Figure 1.

In June 2004, the Respondents submitted the first major document for the RI/FS, a Site Management Strategy (SMS) document (ENSR, 2005a), which outlined a preliminary conceptual model, data gaps, and the strategy for certain elements of the RI/FS. A revised SMS, based on comments received from the USEPA, was submitted in September 2004, and conditionally approved by USEPA in November 2004. The final SMS was submitted in January 2005. The SMS serves as the basis for development of the RI/FS Work Plan (ENSR, 2005b), including the Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and other supporting documents.

The SMS indicates that a baseline human health risk assessment (HHRA) and ecological risk assessment (ERA) will be conducted to evaluate the potential human health and ecological risks of potential exposures to coal combustion by-product (CCB)-derived constituents present in samples of environmental media within the Area of Investigation. As part of the HHRA and ERA, the presence of CCB-derived constituents within the Area of Investigation will be evaluated, and a subset of the constituents identified as constituents of potential concern (COPCs) or constituents of potential ecological concern (COPECs) will be quantitatively evaluated in the risk assessments. The purpose of this Yard 520 Sampling and Analysis Plan (SAP) is to determine whether additional parameter groups, specifically, polychlorinated dibenzodioxins and dibenzofurans (PCDDs and PCDFs), radionuclides, and polycyclic aromatic hydrocarbons (PAHs), may be present at concentrations of potential concern in CCBs in the Area of Investigation, and whether the analytical program for the RI should include any of these constituents.

1.1 Proposed Sampling

As documented in the SMS (ENSR, 2005a), a literature review suggests that PAHs, radionuclides, and PCDDs/PCDFs are not typically present at concentrations of concern in CCBs. Radionuclides tend to be present, but at concentrations typical of many natural materials. PCDDs/PCDFs can be generated during combustion of municipal wastes, but typically not during combustion of coal. While CCBs may contain some residual amounts of unburned coal or carbon, it is not typically in the form of potentially carcinogenic PAHs. However, the USEPA has requested limited sampling (10 samples) of CCBs within the Area of Investigation to confirm that these constituents are not a concern. To meet this objective, samples of CCBs will be collected within Yard 520 (see Figure 1) and analyzed for

PCDDs/PCDFs, radionuclides, and PAHs. Twenty-five samples of native soils will also be collected for analysis of PCDDs/PCDFs, PAHs, radionuclides, and inorganic constituents to provide a baseline for evaluation of the CCB results.

This document outlines a sampling plan, including field sampling procedures and quality assurance requirements, for sampling within Yard 520 and at background locations. This sampling plan includes the objectives of the sampling (Section 2), project organization (Section 3), sampling design and field and analytical protocols (Section 4), and documents and records (Section 5). Supporting attachments to this SAP include the List of Analytical Parameters (Appendix A) and ENSR Standard Operating Procedures (SOPs) (Appendix B). Specifics on the analytical parameters and laboratory methods are provided in the Yard 520 QAPP attached as Appendix C. The Yard 520 SAP was originally submitted to USEPA on December 23, 2004. It was revised and re-submitted on June 3, 2005 based on comments received from USEPA on March 24, 2005. This final SAP was revised based on verbal comments received from the USEPA in June and July 2005, and conditional approvals dated August 5 and August 24, 2005. The comments and the Respondents' responses are included in Appendix D.

Although this plan is intended to be implemented prior to the work identified in the RI/FS Work Plan, the sampling performed under it is designed to be consistent with procedures and protocols that will be used for the RI/FS.

2.0 PROJECT OBJECTIVES

The sampling activities proposed in this sampling plan are intended to confirm whether or not PCDDs/PCDFs, radionuclides, and PAHs are present in the CCBs in the Pines Area of Investigation. The proposed sampling is intended to meet only this objective. Additional characterization of conditions at and around Yard 520 is included in the RI/FS Work Plan (ENSR, 2005b) for the Pines Area of Investigation.

To meet this project objective, samples of CCBs from within Yard 520 will be collected. Yard 520 is a Restricted Waste Facility permitted by the Indiana Department of Environmental Management (IDEM). The majority of material within Yard 520 consists of CCBs from the NIPSCO Michigan City Generating Station. As described in more detail in Section 4.2, Yard 520 was selected as the most appropriate area from which to collect CCB samples to evaluate the presence of PCDDs/PCDFs, PAHs, and radionuclides. Background samples will also be collected from areas where CCBs are not suspected to be present to determine site-specific background concentrations of PCDDs/PCDFs, radionuclides, and PAHs. If the sample results indicate that PCDDs/PCDFs, radionuclides, and/or PAHs are not present above background, or risk-based screening levels, no further evaluation of these parameters will be conducted. Additional evaluation will be recommended only if the sampling indicates that any of these constituents are present at a level above both site-specific background and the risk-based screening level. The screening levels to be used for this evaluation are presented in the RI/FS Work Plan (ENSR, 2005b), specifically the Human Heath Risk Assessment Work Plan and the Ecological Risk Assessment Work Plan. Additionally, background samples will be analyzed for the USEPA target analyte list (TAL) metals plus boron, molybdenum, sulfur, and silicon for general characterization purposes. Obtaining this information will help guide additional RI activities as well as provide additional data for future risk assessment purposes.

During sampling at Yard 520, it is the intention to collect samples consisting only of CCBs. Sampling within Yard 520 will be conducted in a manner that limits the amount of non-CCB material collected. Although Yard 520 consists predominantly of CCBs, other material may be encountered, such as interim cover material used during operation of the facility.

2.1 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of data required to support decisions made during project activities and are based on the end uses of the data to be collected. As such, different data uses may require different levels of data quality. The design of this sampling program is based on the DQO process (USEPA, 2000), a multi-step, iterative process that ensures that the type, quantity, and quality of environmental data used in decision-making is appropriate for its intended application. This DQO process is summarized below.

DQO Step	Description
State the Problem	As documented in the SMS, CCBs from within the Area of Investigation may contain PCDDs/PCDFs, radionuclides, and/or PAHs.
Identify the Decision	The purpose of collecting samples from Yard 520 is to confirm whether or not PCDDs/PCDFs, radionuclides, and PAHs are present in the CCBs from within the Area of Investigation above levels of potential concern. If they are not present above levels of potential concern, no further evaluation of these constituents will be needed during the RI/FS.
Identify Inputs to the Decision	Samples of CCBs will be collected from the Type III (South) Area of Yard 520. The concentrations of PCDDs/PCDFs, radionuclides, and PAHs in samples will be determined. Background samples will be collected from within or nearby the Area of Investigation where no CCBs are suspected to be present to determine site-specific background concentrations. Background samples will also be analyzed for TAL metals plus boron, molybdenum, sulfur, and silicon. This information will be used in the RI/FS for purposes such as characterization and risk assessment.
Define Study Boundaries	Samples will be collected from the Type III (South) Area of Yard 520. Background samples will be collected from the ground surface within or nearby the Area of Investigation where no CCBs are suspected to be present.
Develop a Decision Rule	The concentration of PCDDs/PCDFs, radionuclides, and PAHs in the CCB samples will be compared to concentrations in background samples and to risk-based screening levels. Additional evaluation of these constituents in the RI/FS will be performed only if concentrations in CCBs are above both site-specific background and risk-based screening levels.
Specify Decision Error Limits	A formal statistical design will not be developed for this sampling. However, the data will be considered acceptable if they are collected according to this Sampling and Analysis Plan and they meet the appropriate quality objectives for field and laboratory activities.
Optimize the Study Design	Since a formal statistical design is not being utilized, the iterative process for optimizing the sample design will not be used. However, CCB sample locations were established based on a triangular grid. Sufficient samples from each medium (10 CCBs and 25 background surface soil) will be collected to enable statistical evaluation of results.

2.2 Specific Objectives and Associated Tasks

The objective for this SAP is to determine whether or not PCDDs/PCDFs, radionuclides, and PAHs are present in the CCBs within the Pines Area of Investigation at concentrations warranting further evaluation. Background samples will also be collected from areas where there are no CCBs to determine site-specific background concentrations. To accomplish this objective, the following tasks will be implemented:

- Borings will be advanced at Yard 520 to collect samples of CCBs. Sample locations will be selected to ensure that the material encountered consists of CCBs. During sampling, any other materials encountered (e.g., interim cover) will be omitted from the sample submitted for laboratory analysis. Yard 520 was selected as the location for the sample collection because it is known to have received CCBs, and the CCBs within Yard 520 are less likely to have been affected by other sources, including atmospheric deposition and roadway runoff. The Type III (South) Area of Yard 520 was selected as the location for the sample collection because this area was known to have received CCBs only. The Type II (North) Area received a small amount of other wastes, some of which may not be easily distinguishable from CCBs (such as steel slag). The sample locations in the Type III (South) Area were laid out in two triangular grids.

- Surface soil samples will be collected from within or nearby the Area of Investigation to determine site-specific background conditions. Samples will consist of native soils. Surface soil samples will be collected to document the typical background exposure point concentrations within the Area of Investigation.
- All samples will be submitted for laboratory analysis of PCDDs/PCDFs, radionuclides, and PAHs. Background samples will also be analyzed for TAL metals plus boron, molybdenum, sulfur, and silicon. Additional volume will be also be collected (approximately 1 to 2 liters in volume) and retained and may be used for later visual inspection and chemical/physical analysis, if needed.
- The concentrations of constituents in the CCB samples will be compared to concentrations in background samples and to risk-based screening levels. The screening levels to be used are presented in the Human Heath Risk Assessment Work Plan and the Ecological Risk Assessment Work Plan, which are components of the overall RI/FS Work Plan (ENSR, 2005b).

Laboratory reporting levels need to be established so that appropriate comparison of results to screening levels can be performed. Reporting levels are included in the Yard 520 QAPP in Appendix C of this sampling plan. The levels provided in the QAPP were established to be sufficiently conservative to generate data of a quality that would be usable in a human health and an ecological risk assessment.

2.3 Project Schedule

The proposed schedule for implementation of the Yard 520 SAP is outlined below. A summary of the data evaluation will be submitted to USEPA either as a technical memorandum, or as an addendum to the RI/FS Work Plan.

Activity	Time frame (after USEPA approval)
Sample Collection Activities	1 month
Laboratory Analysis[1]	1 to 2 months
Data Validation	2 to 3 months
Database Activities[2]	3 to 4 months
Data Submittal[3]	3 to 5 months

[1] Analytical turnaround time is 3 weeks.
[2] Includes data upload of validated data to project database.
[3] Submission of electronic data as required by AOC II, no interpretation or analysis.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The lines of authority and communication for this project are presented in the project organization chart (Figure 2). The responsibilities of key personnel are outlined below.

Respondents' Project Manager

The Project Managers for the Respondents, Dan Sullivan and Val Blumenfeld, will be responsible for project direction and decisions concerning technical issues and strategies, budget, and schedule.

ENSR Project Manager

The ENSR Project Manager, Lisa Bradley, will be responsible for technical, financial, and scheduling matters. The ENSR Project Manager also will be responsible for project coordination between the Respondents and USEPA as required.

ENSR Task Manager

The ENSR Task Manager, Paytha Elliott, will have the overall responsibility for implementing the sampling activities. Specific responsibilities of the ENSR Task Manager will include, but not be limited to, the following:

- Providing personnel and equipment for site activities;
- Ensuring that ENSR's associates perform their designated duties in accordance with this SAP and Health and Safety Plan (HASP);
- Ensuring required quality assurance/quality control (QA/QC) procedures are properly implemented and documented;
- Ensuring the sampling activities are completed within the approved schedule;
- Communicating any request for modifications to the approved SAP to the ENSR Project Manager; and
- Promptly notifying the ENSR Project Manager if unforeseen field conditions and/or analytical issues are encountered that affect achievement of the project DQOs.

ENSR Corporate Health and Safety Officer

The ENSR Corporate Health and Safety Officer, Joe Sanders, will coordinate and provide oversight for the health and safety issues during the project. Mr. Sanders developed a HASP for the work to be performed under this SAP (Volume 4 of the RI/FS Work Plan (ENSR, 2005b)).

ENSR Project Quality Assurance Officer

The ENSR Project QA Officer, Debra McGrath, will have overall QA oversight for the project and will report to the ENSR Project Manager. Specific responsibilities include:

- Reviewing and approving QA procedures;
- Ensuring the QA audits of the various phases of the project are conducted as required by this SAP;
- Providing QA technical assistance to the field staff;
- Ensuring that data validation is conducted as required by the Yard 520 QAPP; and,
- Reporting on the adequacy and efficiency of the QA Program to the ENSR Project Manager.

ENSR Field Technical Staff

The Field Technical Staff will be responsible for implementing sampling activities according to this SAP. Other responsibilities may include gathering and analyzing data, and preparing various task reports. The field technical staff will report directly to the ENSR Task Manager.

Laboratory Project Managers

Columbia Analytical Services (CAS) will perform PAH, PCDD/PCDF, and metals analyses. The Laboratory Project Manager for CAS is Janice Jaeger.

General Engineering Laboratories, LLC (GEL) will perform the radionuclide analyses. The Laboratory Project Manager for GEL is Edith Kent.

The Laboratory Project Manager will be the point of contact at the laboratory. Specific responsibilities include:

- Acting as a liaison between the laboratory and ENSR;
- Reviewing project data packages for completeness and conformance to project-specific requirements; and,
- Monitoring, reviewing, and evaluating the progress of the performance of the project in the laboratory.

4.0 FIELD SAMPLING PROCEDURES

4.1 Health and Safety

The HASP (ENSR, 2005b) will be utilized by the field sampling team to ensure sampling activities conducted under this SAP are conducted in a safe manner. The plan addresses potential physical and chemical hazards associated with sampling and discusses the use of appropriate personal protective equipment (PPE).

4.2 Selection of Sample Locations within Yard 520

As described in the SMS, ten samples will be collected to determine whether or not PCDDs/PCDFs, radionuclides, and/or PAHs are present in the CCBs within the Pines Area of Investigation. Samples will be collected from the Type III (South) Area of Yard 520. Ten samples will be collected as suggested by the USEPA and to enable calculation of summary statistics (e.g., averages, 95% upper confidence limits, etc.).

Yard 520 contains CCBs that are mainly from the NIPSCO Michigan City Generating Station (see the SMS, ENSR, 2005a). The northern area of Yard 520 consists of Type II permitted wastes and was used until approximately 1986. This area was closed in 1986-1987 (Weaver Boos, 1996). At that time, the use of the southern area was started. The southern portion of Yard 520 consists of Type III permitted wastes. A 10-foot wide clay barrier was constructed between the northern and southern areas (i.e., between the Type II and Type III areas). The southern area is constructed into the clay confining unit with excavated clay forming the four sidewalls (ATEC, 1989). The closure plan for the Type III (South) Area was approved in September 2003 (IDEM, 2003). Since then, a 2-foot clay cap and 6 inches of top soil is being used to cover the Type III (South) Area of Yard 520.

While the materials in the Type III (South) Area are known to consist of CCBs, the same is not true for the Type II (North) Area. Records suggest that materials may have been disposed in the Type II (North) Area as early as 1966 and that there were small amounts of other types of waste (as described in the SMS). The following information is extracted directly from the original 1981 permit application to the Indiana State Board of Health (Brown, 1981):

> "<u>Letter of Transmittal</u>: During the past fifteen years, Brown Inc. has been maintaining a private land reclamation project incidental to its regular heavy construction and trucking operations. The area, called Yard 520, has been used on an as-needed basis, receiving site clearing overburden, brush and tree stumps, demolition debris and, biannually, fly ash. In 1972, the Town of Pines Town Board passed the resolution granting approval for the site to continue as a private disposal facility.

> Access: Beyond the paved pad [entrance], slag roads are maintained throughout. Coarse slag gives tracked equipment access to the entire site and cleans ash off truck tires before they exit onto the highway.
>
> Operations: At irregular intervals, construction/demolition debris is disposed of at the facility. Schedules, amounts and types of debris vary according to jobs. Typically, broken concrete, bricks, lumber and steel are deposited by twenty-cubic yard semi dump trucks. Site clearing overburden, trees and brush are also mixed in. The amount of this type of debris is insignificant when compared to flyash deposited.
>
> Dust Control: The nature of flyash sludge, once dried, is a very fine powder….For other areas, slag is spread."

These excerpts indicate that while there may not be much, there are some non-CCB materials in the Type II (North) Area. This is the reason it is designated by IDEM a Type II rather than a Type III Residual Waste Site like the Type III (South) Area. Some of these materials may be readily distinguishable from CCBs (such as the concrete, brush, and tree stumps). However, some materials, in particular steel slag, will not be readily distinguishable from CCBs.

Therefore, to meet the objective of determining whether PCDD/PCDFs, PAHs and/or radionuclides may be present in CCBs, it is necessary that samples be collected only in the Type III (South) Area of Yard 520.

The Type III (South) Area was filled horizontally, from west to east over time, starting from 1987 and ending in 2001. The oldest CCBs are present in the western portion with the younger CCBs to the east. The CCBs in the southern area should cover the range of variability expected from the Michigan City Generating Station, including CCBs from before and after the coal source was changed in 1992 and both before and after the change from a wet to a dry processing system in 1998 (see the SMS). The base and four sidewalls of the southern area are constructed of clay. Because of this construction, sample locations were not selected along the edges of the southern area. Due to the clay content in the cap, the top 2.5 feet will not be considered representative material during sampling activities. Interim cover materials also included clay, and may be mixed with the CCBs within the Type III (South) Area. Therefore, geologic logging of the sample material will be necessary while collecting samples (see below).

Figure 3 shows the proposed locations of the samples to be collected within the Type III (South) Area of Yard 520. Five samples are located in the far western portion to capture pre-1992 CCBs (high sulfur); five additional samples are located in the remaining portion of the Type III (South) Area (low sulfur). In each of these areas, the five samples have been placed on a triangular grid. Details on the samples to be collected are provided on Table 1. As discussed in Section 4.7, the 10 CCB samples will be analyzed for PCDDs/PCDFs, radionuclides, and PAHs. A complete list of parameters is provided in Appendix A.

4.3 Selection of Sample Locations in Background Areas

Background surface soil samples will be collected in areas that are not known to contain suspected CCBs to determine site-specific background concentrations. Ten samples from roadway areas and ten samples from non-roadway areas will be collected. Ten samples of each of these groups will enable calculation of summary statistics (e.g., averages, 95% upper confidence limits, etc.). Roadway samples will be collected within the rights-of-way for the roads, but beyond the road and its shoulder. The intention is to collect soil materials and not roadway debris. Non-roadway samples will be collected in areas set further back from roadways. Additionally, five samples will be collected from wetland areas to represent the natural organic soils within the Area of Investigation.

Sample locations have been selected in areas that are not known to contain suspected CCBs. Background samples will be collected from the surface soil horizon (0-6 inches) to provide information regarding background constituent concentrations to which a potential receptor may be exposed for comparison with constituent concentrations in CCBs from Yard 520.

All 25 samples will be analyzed for PCDDs/PCDFs, radionuclides, and PAHs. The results of the samples from the three different groups (road-way, non-road-way, and organic soils) will be compared to the sample results from the Yard 520 samples to help evaluate whether or not the constituents in CCBs are above background levels (in addition to the comparison to applicable risk-based screening levels). Detailed procedures for this comparison are presented in the Human Heath Risk Assessment Work Plan and the Ecological Risk Assessment Work Plan, which are components of the overall RI/FS Work Plan (ENSR, 2005b). The background samples will also be analyzed for TAL metals plus boron, molybdenum, sulfur, and silicon for characterization purposes.

The proposed sample locations are shown on Figure 4. Final sample locations will be established based on conditions in the field. Details on the samples to be collected are provided on Table 1. As discussed in Section 4.7, the 25 background samples will be analyzed for PCDDs/PCDFs, radionuclides, PAHs, TAL metals, boron, molybdenum, silicon, and sulfur. A complete list of parameters is provided in Appendix A.

4.4 Sampling Methods

4.4.1 Global Positioning System (GPS)

At each sample location, a Trimble GPS Pathfinder Pro XRS® (or similar) unit will be utilized to obtain horizontal measurements with an accuracy of ±0.5 meters (m). At the beginning and end of each day, GPS measurements will be collected from a reference point. This reference point will be the same location for each day that the GPS unit is being used. The collection of data from the reference point will allow for comparison in accuracy of the data collected.

The coordinates of each sample location will be collected as a point feature. A data dictionary defining the parameters to collect the data will be pre-defined prior to the collection of any data. Default parameters will be used as they are set to meet the criteria for optimum data collection. However, the following parameters will be checked prior to data collection:

- Satellite Vehicles (SVs) – A minimum of 4 SVs are necessary to obtain latitude, longitude, and altitude (vertical elevation) positions. The default value is set at 3 SVs; therefore, the default value must be changed to 4 SVs if vertical measurements are to be collected. If the number of available SVs is below 4, the data collection will stop; however, it will resume once at least 4 SVs are available. Note that all available SVs will be used (not just the minimum 4 SVs) during data collection.

- Position Dilution of Precision (PDOP) – The default value for PDOP is 6. PDOP values below 6 are required for submeter accuracy on the ProXRS GPS unit. This default value of 6 will prevent position data from being collected if the PDOP is greater than or equal to 6. Data collection will resume once the PDOP drops below 6.

- Signal to Noise Ratio (SNR) – SNR, or signal strength, has a range from zero to 35. The default value for SNR is 6; however, values greater than 20 are optimum but may not be achievable. Data will not be collected if the SNR is less than or equal to 6.

- Logging Interval – A minimum of 5 seconds (2 positions per second) is recommended for each data point collection.

GPS positions will be collected in World Geodetic System (WGS), 1984 during data collection. After data have been collected, the data will be downloaded and converted to the project coordinate system. All associated attribute data used for data collection will be downloaded with the coordinate information. The data will then be added to the project database.

Vertical measurements will also be collected; however, the accuracy is 2 to 5 times less accurate than the horizontal measurements (i.e., ±1m to ±2.5m). All vertical measurements will be for the ground surface and may need to account for the height of the receiver. Actual sample depths can be calculated later based on the ground surface elevation. Vertical measurements will be collected in National Geodetic Vertical Datum (NGVD), 1988 during data collection. Upon data downloading, the datum may be changed as necessary. The data will then be added to the project database.

4.4.2 Photographs

At each selected sampling location, one or more photographs will be taken with a digital camera to document the sampling location and appearance of the material in the field. Each photograph will include an indication of scale (e.g., sampling equipment or actual scale). Where appropriate, additional photographs may be taken of the surrounding area to help document the sample location based on proximity to landmarks.

4.4.3 GeoProbe™ Sampling Methods for Yard 520 Locations

Borings will be drilled at Yard 520 using direct-push methods (e.g., Geoprobe™). CCB samples will be collected using a 2-inch diameter Macrocorer® core barrel that will be pneumatically pushed to the desired depth in 4-foot increments. As the core barrel is advanced downward, CCBs will be driven into the inner 4-foot-long Teflon® sleeve. Once the core barrel is retrieved from the borehole, the inner sleeve will be extracted from the core barrel and the sleeve corresponding to the desired sample depth will be used for descriptive purposes as well as to collect CCB samples for laboratory analysis. The samples will be labeled and placed in a cooler with ice while awaiting transport to the analytical laboratories. A geologic description of the materials encountered will be logged in the field logbook or boring log form (see Section 5.0). Additional volume of CCBs will be also be collected (approximately 1 to 2 liters in volume) and retained and may be used for later visual inspection and chemical/physical analysis, if needed. Field sampling methods will conform to guidelines set forth in the site-specific HASP and ENSR SOP No. 7116Pines (see Appendix B).

All CCB borings from within the Type III (South) Area of Yard 520 will be continuously cored to a depth of 12 feet below ground surface (bgs). CCB samples from the 8 to 12-foot depth interval will be submitted for laboratory analysis. This depth range should be well within the area where CCBs were deposited within the Type III (South) Area of Yard 520 below cover materials and above lower liner(s). Samples from the 8 to 12-foot depth interval will be homogenized (see ENSR SOP No. 7116Pines) then placed in laboratory-supplied containers. Sample container, preservation, and holding time requirements are shown in the table in Section 4.4.4.

Following sample collection, the down-hole equipment will be removed and soil cuttings will be used to backfill the borehole. The borehole will be topped off to the ground surface with a minimum of 3 feet of granular bentonite, which will be hydrated with clean water to ensure the continued effectiveness of the clay cap.

The sample descriptions will be recorded on a boring log in accordance with IDEM requirements (IDEM, 1988). Additional information including sample boring number, sample identification number, date and time of sample collection, sample depth, and photograph number will also be recorded on the boring logs or in the field logbook.

4.4.4 Surface Soil Sampling at Background Locations

Surface soil samples will be collected from 25 background locations where suspected CCBs are not known to be present. At each location, the soil material will be inspected to ensure suspected CCBs are not present. If suspected CCBs are present at the sample location, the sample location will be re-located. Soil samples will be logged for descriptive purposes, and laboratory samples will be collected at a depth of 0 to 6 inches bgs. Surface litter, such as leaves and roots, will be removed from the sample. Soil will be homogenized then placed in laboratory-supplied containers. Additional volume will be also be collected (approximately 1 to 2 liters in volume) and retained and may be used for later visual inspection and chemical/physical analysis, if needed. Sample container, preservation, and holding time requirements are shown on the following table.

Parameter[1]	Matrix	Container[2]	Preservative	Maximum Holding Time[3]
PCDDs/PCDFs	CCBs and surface soil	1 250-mL glass with Teflon®-lined cap	Cool 4°C	30 days to extraction; 45 days from extraction to analysis
PAHs	CCBs and surface soil	1 250-mL glass with Teflon®-lined cap	Cool 4°C	14 days until extraction; 40 days from extraction to analysis
Radionuclides	CCBs and surface soil	1 250-mL amber glass with Teflon®-lined cap	Cool 4°C	Six months to analysis
TAL Metals plus boron, molybdenum, sulfur, and silicon	Surface soil	One wide-mouth 500-mL plastic[4]	Cool 4°C	Six months to analysis; 28 days for mercury and sulfur

[1] Refer to Appendix A for the complete list of analytes.
[2] Alternative sample containers may be provided by the laboratory under the condition that sufficient sample volume is provided and the data quality objectives are met.
[3] Sample holding time begins at time of collection.
[4] If glass containers are used, they must be certified clean for boron and silicon.

Additional details on laboratory methods and procedures can be found in the Yard 520 QAPP in Appendix C.

Field sampling methods will conform to guidelines set forth in the site-specific HASP and ENSR SOP No. 7110Pines (see Appendix B).

Following sample collection, any remaining soil will be used to backfill the sample area.

The soil description will be recorded in the field logbook in accordance with IDEM protocols (IDEM, 1988). Additional information including surface soil number, soil sample identification number, date and time of sample collection, sample depth, and photograph number will also be recorded in the field logbook.

4.4.5 Equipment Decontamination

GeoProbe™ equipment used within the Type III (South) Area of Yard 520 will be decontaminated between sample locations. Equipment used between each background location will also be decontaminated.

Guidance on equipment decontamination is included in Appendix B, ENSR SOP No. 7600Pines. In general, equipment used will be decontaminated using the following procedure:

- Tap water rinse to remove gross contamination;
- Non-phosphate and non-borate detergent water rinse;
- Tap water rinse;
- 10% nitric acid rinse (metal sample locations only);
- Tap water rinse;
- Pesticide-grade methanol rinse (twice);
- Deionized water rinse;
- Air dry or wrap in aluminum foil for later use.

If sample collection tools consist entirely of disposable implements and bowls, then no equipment decontamination is necessary for these items. See Section 4.8 below for information on how to dispose of these supplies.

4.5 Field Quality Control

Field duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples will be analyzed to assess the quality of data resulting from this sampling and analysis program. Field duplicates will be collected by placing the sample material in a bowl, homogenizing it, and dividing it between two identical sets of containers for laboratory analysis. The samples will be labeled as two separate samples (see Section 4.6.1) and carried through analysis and reporting. The field duplicate will be analyzed for the same parameters as its associated field sample. Field duplicate samples will be collected at a frequency of one per 10 (or less) field samples for each of the areas sampled. Therefore, one field duplicate will be collected within Yard 520 and three field duplicates will be collected for the background samples.

MS/MSDs will be designated in the field and will be collected at a frequency of one per 20 (or less) field samples of each of the areas sampled. Therefore, one MS/MSD will be collected within the Yard 520 area and two MS/MSDs will be collected for the background samples. Double sample volume (or the amount requested by the laboratory) will be collected to provide sufficient material for the analysis.

Equipment rinsate blanks will be collected by routing laboratory grade and organic free water (provided by the laboratory) through non-dedicated sampling equipment after equipment decontamination and before field sample collection. Equipment rinsate blanks will be collected at a frequency of one per week per media sampled. MS/MSDs and equipment rinsate blanks will be identified as described in Section 4.6.1.

The number of field QC samples for each matrix is summarized in Table 1.

4.6 Sample Custody

Sample custody will be tracked both in the field and in the laboratory, as discussed below.

4.6.1 Sample Labeling

Immediately upon collection, the adhesive sample label on each container will be completed with the unique sample identification (ID) (as described below), the time and date of sample collection, the sampler's initials, parameters to be analyzed, and preservation, if applicable. The unique sample identification will be an alphanumeric code consisting of the following elements:

- Name of location in five digits (e.g., SS002, etc.). These location names will correspond to logs of the geologic materials, as well as sample locations posted on maps. Names of borings at Yard 520 will start with CB001; background samples will start at SS001.
- Single letter signifying depth of sample (A, B, C, etc. for samples taken at increasing depth, X if this field is not being used). The actual depth measured in the field in feet will be recorded in the field records.
- Two letters signifying the sample matrix (CB for CCBs, SS for surface soil).
- Sampling date consisting of the number corresponding to the month (2 digits), day (2 digits) and year (2 digits), for example, 061404 for samples collected on June 14, 2004.

- Letter denoting the type of sample. Codes for this field include: S – sample; D – field duplicate; B – equipment rinsate blank.

No dashes will be used to separate fields. An example sample ID for this sampling would be: SS001ASS101104D indicating a surface soil sample collected at location SS001 on October 11, 2004. This sample is a field duplicate, and the A represents the sample depth. The sample depth of 0 to 6 inches for this surface sample will be recorded in the field logbook.

Samples designated as MS/MSDs will be noted as such in the comments field of the chain-of-custody (COC) form (ENSR SOP No. 1007Pines).

4.6.2 Field Custody

The field sampler(s) are responsible for the care and custody of the samples until they are shipped to the laboratory. As few people as possible will handle the samples.

Samples will be packaged for shipment to the laboratory under the COC procedures described in ENSR SOP No. 1007Pines and ENSR SOP No. 7510Pines (see Appendix B).

After sample containers are labeled and filled, samples will be placed in plastic zipper-lock bags to contain material in the event of container spillage during shipment. Containers will then be packaged in a cooler for shipment, using inert packing material (e.g., bubble wrap, rubber foam, or equivalent) to prevent breakage during shipment. A multi-form COC form will be completed (an example COC form is presented in Appendix B). The original COC will be placed in a zipper-lock bag that is taped to the lid inside each cooler of samples being submitted to the laboratory for analyses. The back copy of the COC will be maintained with the field records. The cooler will be locked or sealed, and custody seals placed on the outside of the cooler in such a way that the cooler cannot be opened without breaking the seals. Samples will be shipped to the laboratory via commercial overnight courier (e.g., Federal Express).

4.7 Laboratory Analyses

Samples of CCBs from within Yard 520 will be analyzed for PCDDs/PCDFs, PAHs, and radionuclides. The background soil samples collected outside Yard 520 will be analyzed for these parameters plus TAL metals, boron, molybdenum, silicon, and sulfur. Specific analytes are listed in Appendix A.

Samples will be analyzed for PAHs and metals by:

Columbia Analytical Services
1 Mustard Street
Rochester, NY 14609
585-288-5380
Contact: Janice Jaeger

Samples will be analyzed for PCDDs/PCDFs by:

Columbia Analytical Services
10655 Richmond Avenue
Suite 130A
Houston, TX 77042
713-266-1599
Contact: Karen Verschoor

Radionuclide analyses will be performed by:

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29417
843-769-7385
Contact: Edith Kent

Laboratory specifications are provided in the Yard 520 QAPP in Appendix C.

4.8 Investigation Derived Waste (IDW)

Excess CCBs from borings at Yard 520 will be placed back down the borehole. Soils at background sample locations will be replaced in the hole or spread around on the ground surface. Native soils and CCBs are non-hazardous. Therefore, disposable sampling equipment and PPE that have come into contact with sample media will be placed in plastic garbage bags and handled as trash.

Visibly clear borate-free and/or phosphate-free detergent wash water and rinse water decontamination fluids from sampling equipment will be released to the ground upon rinsing, in the immediate vicinity of its point of generation. If warranted based on its condition, the decontamination rinse waters (e.g., methanol) will be contained in 55-gallon drums or bulk containers.

5.0 FIELD RECORDS

Field logbooks will provide the primary means of recording the data collection activities performed during the sampling activities. As such, entries will be described in as much detail as possible so that persons going to the field could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in the project files when not in use. Each logbook will be identified by a project-specific document number.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, and the signature of the person making the entry will be entered. The names of visitors to the site, and the purpose of their visit, will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. All entries will be made in permanent ink, signed, and dated and no erasures or obliterations will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark and the correct entry will be made, signed and dated by the person making the correction. Whenever a sample is collected, or a measurement is made, a detailed description of the sampling location, which includes compass and distance measurements, or, latitude and longitude information (e.g., obtained by using GPS as described in Section 4.4.1) will be recorded. All equipment used to make measurements will be identified, along with the date of calibration. The coordinate system that the GPS unit displays will be recorded.

Information specific to sample collection will include:

- Sample identification number;
- Time and date of sample collection;
- Sample description (color, texture, etc.);
- Depth of sample interval bgs, as measured with a steel measuring tape; and
- Location (GPS coordinates and description).

To streamline data recording, information will be recorded on standardized forms when this approach is logical.

Descriptions of geologic materials and CCBs will be logged in accordance with IDEM guidance (IDEM, 1988).

Representative photographs of sample locations will be taken with a digital camera and the camera picture frame number, date, direction facing, and subject will also be recorded in the logbook.

COC forms will be maintained as part of the field records as described in Section 4.6.2.

Procedural changes in the field may be needed when sample locations are changed or when sampling procedures and/or field analytical procedures require modification due to unexpected conditions. Field changes may be initiated by personnel in the field based on unexpected conditions. The ENSR field staff in consultation with the ENSR Task Manager and ENSR Project QA Officer will recommend the change. The ENSR Task Manager, in consultation with the USEPA, will approve the change, which will be implemented by the ENSR field staff.

If the field change will supplement the existing sampling plan using existing and approved procedures in this SAP, changes approved by the ENSR Task Manager will be documented. If field changes result in fewer samples, alternate locations, etc., which may cause project DQOs not to be achieved, it may be necessary that all levels of project management be notified.

Field changes will be implemented and documented in the field logbook. Field changes will also be documented on a field change order (FCO) form according to ENSR SOP No. 100Pines – Field Change Order Procedures (see Appendix B). No staff member will initiate field changes without prior communication of findings through the proper channels.

6.0 REFERENCES

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Brown Inc. 1981. Application for Construction/Operating Permit for Solid Waste Management Facilities, submitted to the Indiana State Board of Health. December 1, 1981.

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IDEM. 1988. Technical Guidance Document, Volume 1 – Requirements for Describing Unconsolidated Deposits. Indiana Department of Environmental Management. Draft, Revised November 18, 1988.

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