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KOCH NITROGEN COMPANY LLC

December 21, 2010

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RE Response to EPA Comments Letter dated December 6, 2010 on the Koch Nitrogen Company's Revised Volume II: Quality Assurance Project Plan
EPA RCRA ID No. KSD044625010

Dear Ms. Stone:

Koch Nitrogen Company, LLC (KNC) received comments from the U.S. Environmental Protection Agency Region VII (EPA), dated December 6, 2010, on the Volume II: Quality Assurance Project Plan (QAPP) submitted by KNC to the EPA and the Kansas Department of Health and Environment (KDHE) on November 3, 2010.

With this letter, KNC is submitting responses to the EPA comments and updates to the QAPP. Responses are provided in Attachment A. In our responses, we repeat each EPA comment and provide

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our response, and we identify where in the QAPP the text has been modified to address EPA's comments, or where we believe requested information is located. As one of the comments required the addition of text early in the document, which changed the page layout, we have attached the revised table of contents and text of the QAPP as replacement pages to ensure that your request for document replacement pages be complete.

It is our intention to respond as thoroughly and specifically as possible to each comment provided. KNC is committed to working with the EPA and KDHE to produce a QAPP that meets the needs of all parties. In order to facilitate the review, KNC would be happy to meet with the agencies at any time to respond to any questions that may arise from this submittal.

Please call Elise Stucky-Gregg (620) 22708631 Ext. 350 if you have any questions or would like to schedule a meeting to discuss.

In accordance with Section B.22 of the Part II permit, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or other persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Very Truly Yours,

Gary J. LeRock

Gary J. LeRock
Plant Manager
KOCH NITROGEN COMPANY, LLC

Enclosure: Response to EPA's Comments
Revised QAPP Text

cc: Cory Zellers, KNC Dodge City Plant, Dodge City, Kansas
Tom Siegrist, KMS, Wichita, Kansas

RESPONSE TO EPA'S COMMENTS

EPA Comment #1 (Non-Direct Measurements, Page 38): The QAPP should state how the data are used as "a baseline to better evaluate results". What is meant by this statement.

> **KNC Response:** Text in this section has been revised as follows, "Historical analytical data will be used as a baseline in the preliminary identification of "hot spots" or "clean areas" from which future sampling locations will be determined. Previously measured site characterization data will also be used as baseline data to be compared against newly collected data as a general confirmation of the original delineation as well as an indication of possible further migration. Future hydrogeologic measurements will be used to confirm the previously determined baseline hydrogeologic properties of the water-bearing zones."

EPA Comment #2 (NonDirect Measurments, Page 38): The QAPP must state the limitations in using such data.

> **KNC Response:** Text in this section has been revised as follows, "Historical data will be used for general confirmation purposes only. Only data generated under the specifications of this QAPP, using the current approved EPA analytical technologies, will be used for source delineation and characterization of specific constituents present at the SWMU/AOCs."

EPA Comment #3 (Project/Task Description, Page 10): Will additional background soils be assessed? What would indicate additional background soils should be assessed? Where would the samples be located in the areas previously identified in the workplan?

> **KNC Response:** The following text has been added to this section. "Additional soil background levels would be assessed if other naturally-occuring constituents (i.e., inorganics) are frequently detected and determination of background levels of these constituents is required to evaluate risk and/or identify delineation end-points. If additional background samples are collected for constituents other than chromium or nitrate, soil sampling would be performed at the locations and depths identified in the Background Assessment Work Plan utilizing the analytical methods for a specific constituent identified in the QAPP."

Prepared for

Koch Nitrogen Company, LLC
Dodge City, Kansas

SAMPLING AND ANALYSIS PLAN
RCRA FACILITY INVESTIGATION

DODGE CITY, KANSAS

USEPA ID NO.: KSD044625010

VOLUME II: QUALITY ASSURANCE PROJECT PLAN

Prepared by

Geosyntec Consultants

Geosyntec Project Number TXR0118

December 2010

SAMPLING AND ANALYSIS PLAN, RCRA FACILITY INVESTIGATION
DODGE CITY, KANSAS
USEPA ID NO.: KSD044625010
VOLUME II: QUALITY ASSURANCE PROJECT PLAN (REVISION 4)

Prepared for

Koch Nitrogen Company, LLC
Dodge City, Kansas

SAMPLING AND ANALYSIS PLAN
RCRA FACILITY INVESTIGATION

DODGE CITY, KANSAS

USEPA ID NO.: KSD044625010

VOLUME II: QUALITY ASSURANCE PROJECT PLAN

Prepared by

Geosyntec Consultants

Geosyntec Project Number TXR0118

December 2010

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QUALITY ASSURANCE PROJECT PLAN
RCRA FACILITY INVESTIGATION
KOCH NITROGEN COMPANY, LLC
DODGE CITY, KANSAS

Approved by:

Elisa Hurley-Gregg — 12/21/10
KNC Project Coordinator — Date

Gary J. LeRock — 12/21/10
KNC Plant Manager — Date

Andrea R. Stone — 1-13-11
USEPA Project Manager — Date

Dianne Harris — 01/19/2011
USEPA QA Manager — Date

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LIST OF ACRONYMS

AOC	Area of Concern
CFR	Code of Federal Regulations
CHP	Chemical Hygiene Plan
COC	Chain-of-Custody
DOT	Department of Transportation
DQI	Data Quality Indicator
Facility	Koch Nitrogen Facility in Dodge City, Kansas
FSP	Field Sampling Plan
GC/MS	Gas Chromatography / Mass Spectrometry
HASP	Health and Safety Plan
KDHE	Kansas Department of Health and Environment
KNC	Koch Nitrogen Company, LLC
LCS	Laboratory Control Samples
MDL	Minimum Detection Limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS/MSD	Matrix Spike/Matrix Spike Duplicate
PDAs	Personal Data Assistants
QA	Quality Assurance
QC	Quality Control
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
UAN	urea-ammonium nitrate
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SPLP	Synthetic Precipitation Leaching Procedures
SOP	Standard Operating Procedure

LIST OF ACRONYMS (continued)

SVOC	Semi-volatile Organic Compound
SWMU	Solid Waste Management Unit
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

II-1. PROJECT ORGANIZATION AND RESPONSIBILITIES

II-1.1 (A-3) Distribution List

- Andrea Stone, USEPA Project Manager;
- Everett Spellman, KDHE Project Manager;
- Elise Stucky-Gregg , KNC Project Coordinator;
- Tom Siegrist, KNC Quality Assurance Manager;

II-1.2 (A-4) Project/Task Organization

II-1.2.1 Project Organization and Responsibilities

Koch Nitrogen Company, LLC (KNC) maintains responsibility for Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) activities at the Koch Nitrogen Facility (the Facility) in Dodge City, Kansas. The KNC Project Coordinator will have primary responsibility for scheduling conference calls and/or meetings, and providing reports as needed. The United States Environmental Protection Agency (USEPA) is providing regulatory oversight for the RFI investigation activities at the Facility.

The responsibilities of KNC and USEPA project members are described below:

- **USEPA Project Manager** – The USEPA Project Manager will be the liaison with KNC and provide overall regulatory project oversight. Ms. Stone will participate in meetings and teleconferences with KNC and KNC contractors concerning project activities.

- **KNC Project Coordinator** – The Project Coordinator will be responsible for coordination of project activities and schedule at the Facility. Mrs. Elise Stucky-Gregg will provide local oversight for all aspects of KNC activities and responsibilities and participate in meetings and conference calls concerning project activities.

- **KNC Quality Assurance Manager** – Mr. Tom Siegrist (Director of Environmental Compliance – Koch Fertilizer, LLC) or his designee will serve as the KNC Quality Assurance (QA) Manager. The QA Manager must be independent of the unit generating the analytical and field data and is responsible for review of standard operating procedures (SOP), review of field and laboratory data (both chemical and physical) for compliance with QA objectives (precision, accuracy, comparability, and completeness), and

suitability as to reportable values of site relative data, and reporting of any data deficiencies to Project Management.

A general description of the responsibilities of the consultant project team members are described below.

- **Contractor Program Manager** - The Contractor Program Manager is the primary point of contact between the Facility and its Contractors. The Contractor Program Manager's primary responsibility will be to ensure that technical aspects of the project are implemented.

- **Contractor Project Manager** - The Contractor Project Manager will be responsible for operational aspects of the project including ensuring that there is adequate staffing to ensure timely, professional, and safe completion of scopes of work for RFI project tasks for which they are contracted. The Contractor Project Manager will manage the activities of their employees and subcontractors and will provide project status reports to KNC.

- **Contract Project QA Officer**- The Project QA Officer is responsible for review of SOPs, review of field and laboratory data (both chemical and physical) for compliance with QA objectives (precision, accuracy, comparability, and completeness) and suitability as to reportable values of Facility relative data, and reporting of data deficiencies to project management.

- **Contract Field Operations Manager** – The Field Operations Manager will be responsible for supporting the Project Manager on regulatory and technical issues, day-to-day implementation of the project, preparing technical reports, field activities, and coordinating project and field team personnel.

- **Contractor Health and Safety Officer** – The Health and Safety Officer will be responsible for implementing the site-specific health and safety directives in the RCRA Corrective Action Health and Safety Plan (HASP) and documenting all health and safety related activities as specified in the HASP and in accordance with Facility safety procedures.

- **Contractor Field Team Members** – are responsible for KNC requested activities including field operations, performing various field tests (decontamination, air monitoring, etc.) and collecting appropriate environmental samples from the various media under the supervision of a Field Team Leader. The field team is responsible for performing KNC requested fieldwork in accordance with the requirements and procedures stipulated in the project plans.

Depending upon KNC's request and the size of the specific project activities at any given time, project team members may be responsible for several of these roles. If the KNC project team changes, KNC will provide notification to the USEPA.

A Kansas Department of Health and Environment (KDHE) certified laboratory will provide all soil, surface water (if collected) and groundwater laboratory analytical services for the project and the certification will be for the analytes of concern for each phase of work. The laboratory providing analytical services for a specific phase of work will be selected by KNC and identified to USEPA prior to initiation of field activities through an addendum to the Quality Assurance Project Plan (QAPP).

Continental Analytical Services, Inc. located at 525 North Eight Street, Salina, Kansas 67401, will be used for the majority of chemical analyses that currently are being proposed. Information about this laboratory and its procedures may be found in Appendix II-A. Additionally on-site field personnel may be performing initial screening tests on soil and groundwater during the field activities.

Quality assurance personnel at the laboratories may include the following:

- **Project Manager (Lab)** – is responsible for monitoring workloads and ensuring availability of resources and overseeing preparation of analytical reports.

- **Quality Assurance Officer (Lab)** – will provide periodic review and inspection of all project activities as an independent QA Unit Officer and may conduct internal audit(s) of project activities to ensure that analytical testing is in accordance with the specification of the QAPP.

- **Chemical Hygiene Officer (Lab)** – develops and updates the chemical hygiene plan (CHP); provides technical assistance in complying with the CHP, and ensures that employees comply with the CHP.

- **Sample Custodian (Lab)** – is responsible for receiving all samples and maintaining custody of samples and all documentation associated with the project.

II-1.2.2 Quality Assurance Responsibilities

The personnel with quality assurance (QA) responsibilities are distinct from project management in that the oversight performed to ensure data quality will be independent of analytical and field activities. However, corrective measures necessitated by review

of analytical or field activities will be implemented through the project management chain-of-command.

The quality assurance and quality control (QA/QC) officer will oversee both the analytical and field QA/QC activities for the project and will act as the primary contact for the laboratory. Analytical data generated by the laboratory may also be subject to evaluation by the KNC consultant. Data evaluation will be the responsibility of the QA/QC officer.

Quality of data gathered in the field will be the responsibility of the Field Operations Manager. That individual will ensure the quality of data obtained in the field by implementing the sampling and QA/QC procedures specified in the QAPP.

II-1.3 (A5) Problem Definition/Background

II-1.3.1 General Information

This QAPP has been prepared pursuant to the scope of work included in the RFI Work Plan that was prepared pursuant Section C.6 of Part II of the KNC Dodge City Hazardous Waste Management Permit (Part II Permit). USEPA documents used in preparation of this QAPP include: *USEPA Guidance for Quality Assurance Project Plans, QA/G-5, USEPA/240/R-02/009, December 2002* and *USEPA Requirements for Quality Assurance Project Plans, USEPA QA/R-5, USEPA/240/B-01/003, March 2001.*

This QAPP includes details on all field sampling and data gathering methods and focuses on specific QA/QC activities designed to achieve the stated objectives in the RFI Work Plan. It is accompanied by the Field Sampling Plan (FSP) (Volume I) that together comprises the overall Sampling and Analysis Plan (SAP). The reader is also referred to the RFI Work Plan for a more detailed description of the KNC Facility, history of ownership, geologic and hydrogeologic setting, and proposed scope of work. Where necessary, elements of the Work Plan are summarized herein.

This QAPP is a living document and may be updated with specific addenda as needed to reflect new phases of work as they are implemented by KNC. The modifications will be made by the QA/QC Officer and reviewed by KNC. The QAPP will be reviewed as needed by the consultant or KNC to ensure that it accurately reflects any work being conducted at KNC. It is anticipated that this QAPP will be utilized through the selection and implementation of final Corrective Action.

II-1.3.2 Site Location

As shown in Figure II-1-1, the Facility is located three miles east of the city of Dodge City, in Ford County, Kansas, and consists of two separate parcels of land. The southern parcel, which houses the Facility production area and consists of more than 300 acres, is located south of Highway 50 in Section 22, Township 26 South, Range 24 West. The Facility production area consists of approximately 30 acres, located in the NE¼ of Section 22. Highway 50 is the northern boundary of the southern parcel of the Facility property and the Burlington North Santa Fe Railroad comprises its southern boundary. The northern portion of the property is located to the north of Highway 50, in the SE¼ of the SE¼ of Section 15 and most of the S½ of the NE¼ of Section 15. This property consists of approximately 54 acres of undeveloped land that is not fenced but has security.

II-1.3.3 Facility History and Description

Construction of the ammonia production unit began in 1966, and the Facility began operation in 1968. The urea-ammonium nitrate (UAN) production unit was added in 1975. Farmland Industries, Inc. owned and operated the Facility from the time of completion in 1968 until May 20, 2003, when KNC purchased the Facility.

The Facility produces fertilizers: anhydrous ammonia, UAN solution and ammonium polyphosphate. The ammonium poly phosphate liquid fertilizer is produced using a portable fertilizer unit (owned and operated by Mears Fertilizer, Inc.) and a diesel fuel-fired generator. Mears staff transports the equipment on a single semi-trailer to the production site. Raw materials used in the process include anhydrous ammonia, superphosphoric acid, and water. Nitrogen chemicals used in the fertilizer production process [nitric acid (HNO_3) and urea] are also manufactured at the Facility. The ammonia production facilities are Kellogg-designed. KNC leases a portion of the property located to the west of the main process area to Praxair. Praxair purchases excess carbon dioxide from KNC for retail sale.

Undeveloped portions of the Facility property to the north, south, southeast, and west of the production facilities are largely agricultural or unused. Storm water is retained on-site within earthen basins located east and west of the production facilities. The northern portion of the property, approximately 65 acres, is largely undeveloped.

During the 1960s, oil and gas exploration test wells were installed on the property. Based on information from the Facility files, former oil and gas leases for the Facility area authorized exploratory test wells. None of the test wells installed on the property were developed for oil or gas production.

The area surrounding the Facility is primarily agricultural, consisting of pasture and row cropped fields. Approximately eight residences are located within one mile. There has been industrial development in the area of the facility. Active commercial or industrial developments adjoining the Facility are Dodge City Services (formerly Kansas Bi-Products and United Protein, an animal rendering facility) and Hi Plains Feed LLC (formerly Land O' Lakes Feed Mill) to the south. A residence and commercial facility, Coker Trucking, is located to the east of the facility.

II-1.3.4 General Regulatory Background

Numerous soil and groundwater investigations have been completed at the Facility including the investigation of several identified SWMUs and AOCs. In December 2002, a draft RFI Work Plan was submitted to the USEPA and KDHE by the former owner and USEPA provided comments on that draft in January and February 2003. After acquiring the Facility in May 2003, KNC met with USEPA and KDHE in September 2004 and had subsequent discussions to review the technical approach for this work. An RFI Work Plan that included a QAPP was submitted to the USEPA on October 27, 2004. KNC received USEPA comments to the RFI Work Plan and QAPP in a letter dated April 27, 2005. KNC submitted a revised RFI Work Plan in June 2005. After review and incorporation of EPA and KDHE comments the document was revised, finalized, and submitted to the EPA and KDHE in December 2005. In a letter dated January 24, 2006 the EPA approved the revised RFI Work Plan. Since this time, KNC has been implementing the RFI Work Plan and submitting status reports. The RFI Interim Status Report, dated August 20, 2007, provided a summary of the results for the majority of activities identified in the RFI Work Plan. Major submittals have included, but are not limited to, the following:

Approved Document	Submittal Date	Date of Approval (w/ Comments)
Phase II RFI Work Plan	September 24, 2008	October 23, 2008
Addendum #1 to the Phase II RFI Work Plan	December 5, 2008	March 30, 2009
Addendum #2 to the Phase II RFI Work Plan	January 22,2010	March 19, 2010
Addendum #3 to the Phase II RFI Work Plan	March 31, 2010	May 26, 2010
Phase II Work Plan Addendum: Groundwater Characterization	June 11, 2010	Pending

In the EPA approval with comments letter to Addendum #3, it was recommended that KNC update the QAPP. This revised QAPP (Version 2.0) incorporates the 2005 and

2010 agency comments, recent agency discussions, updates based on recent changes to the analytical program and personnel responsibilities, and the requirements of the Part II permit.

II-1.4 (A6) Project/Task Description

The purpose of this QAPP is to present the QA/QC provider to be used to obtain data of sufficient quality to characterize the nature, three-dimensional extent, and the directions(s) and rate(s) of migration of all hazardous wastes and hazardous constituents that have been released to soil, sediment, groundwater and surface water.

This QAPP focuses on conducting activities at those SWMUs or AOCs for which the USEPA has specifically indicated that further work will be required. The scope of work for these investigations was summarized in Table I-2-1 of the FSP. The following SWMUs/AOCs are listed in USEPA's January 24, 2003 letter to the prior owner as needing additional investigation:

SWMUs

- SWMU #1 - South Pond
- SWMU #2 - North Pond
- SWMU #3 - East Pond
- SWMU #4 - Former Disposal Well #1
- SWMU #5 – Land Farm
- SWMU #6 - Former Washout Area
- SWMU #7 - Landfill for General Plant Trash
- SWMU #8 - Former Chrome Destruct Unit
- SWMU #10 - East Cell of the Lime Sludge Pond
- SWMU #11 - West Cell of the Lime Sludge Pond
- SWMU #12 - Disposal Area (North of the South Pond)
- SWMU #17 – East Lime Sludge Landfill
- SWMU #19 - West Lime Sludge Industrial Landfill
- SWMU #21 – UIC Well #2 Cuttings
- SWMU #22 – UIC Well # 3 Cuttings
- SWMU #23 – Neutralization Basin #1
- SWMU #24 - Neutralization Basin #2
- SWMU #25 – Neutralization Basin #3
- SWMU #26 – West Side Basin

AOCs

- AOC #1 – Chromate Spills
- AOC #4 - Former Gas Shed on the Old Farm

- AOC #5 - UAN Tank Leak Area
- AOC #6 - Dakota Formation

Other

- Site-Wide Unconsolidated Groundwater

As documented in the Phase II RFI Work Plan (KNC, 2008a[1]), SWMU #14 ("Chromium Settling Basin" – Former Andco Effluent Clarifier Basin) was added to the RFI program to assess potential migration of site constituents resulting from seepage from cracks in the basin walls.

Addendum #1 to the Phase II RFI Work Plan (KNC, 2008b[2])provided a scope of work to perform soil investigations in the three areas of small releases associated with operation and maintenance of the groundwater recovery system. Addendum #2 to the Phase II RFI Work Plan (KNC, 2010a[3]) provided a scope of work to perform soil investigations in the area of the former Andco effluent clarifier basin now known as the Recovery RO Equalization Basin and in the area of well TW-83.

While AOC 3 – Sanitary Sewage Pump Station was identified as an area that required no further investigation in the approved October 2006 RCRA Facility Investigation Work Plan, during a March 24, 2010 meeting EPA indicated and KNC agreed, that investigation of the north cell of the lagoon system was needed prior to performing any construction-related repair work to the north cell. A scope of work to conduct soil sampling in the bottom of the north cell and along the dike surrounding the cell was provided in Addendum #3 to the Phase II RFI Work Plan (KNC, 2010b[4])

RFI activities are currently being conducted at each of the above areas and are geared towards meeting the objectives defined above. The RFI consists of three types of activities:

- source characterization and delineation;
- groundwater plume characterization and delineation; and
- determination of the hydrogeologic properties of the water-bearing zones containing Facility related constituents.

---

[1] KNC.2008a. Phase II RFI Work Plan. Submitted to the EPA and KDHE on November 11, 2008.

[2] KNC.2008b. Addendum #1 to the Phase II RFI Work Plan. Submitted to the EPA and KDHE on December 5, 2008.

[3] KNC. 2010a. Addendum #2 to the Phase II RFI Work Plan. Submitted to the EPA and KDHE on January 22, 2010.

[4] KNC.2010b. Addendum #3 to the Phase II RFI Work Plan. Submitted to the EPA and KDHE on March 31, 2010.

Source characterization and delineation of the specific constituents present at each SWMU/AOC will be accomplished through the collection and analysis of media from each SWMU/AOC. Table II-1-1 provides a summary of Phase II RFI Work Plan and Addendum #1, #2, and #3 work activities. The surface, subsurface, and deep soil samples will be analyzed for total and hexavalent chromium, nitrate, and nitrite with analyses of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) for select SWMUs (SWMU#7 and SWMU#19). VOC analysis, in addition to total and hexavalent chromium, nitrate, and nitrite analyses will also be performed on soil samples from AOC #3. The borings and data needs for each SWMU/AOC are described in Table II-1-1. These sample results will be used to determine the nature and extent of constituents in soil. If the delineation is not completed initially, additional on- and off-site samples will be collected to complete the delineation.

To address naturally-occurring constituents (e.g., chromium and nitrate), KNC developed and submitted a Background Assessment Work Plan to the EPA and KDHE in December 2005 (KNC, 2005[5]). The results of the background study were provided to the EPA in a March 2006 report (KNC, 2006[6]). Additional assessment of background soil levels that may be required will be performed using the methodology described in the EPA and KDHE approved Background Assessment Work Plan (KNC, 2005). Additional soil background levels would be assessed if other naturally-occuring constituents (i.e., inorganics) are frequently detected and determination of background levels of these constituents is required to evaluate risk and/or identify delineation end-points. If additional background samples are collected for constituents other than chromium or nitrate, soil sampling would be performed at the locations and depths identified in the Background Assessment Work Plan utilizing the analytical methods for a specific constituent identified in the QAPP.

Note that much of the field and laboratory analytical work described in the Phase II Work Plan and subsequent addendums has been completed. Table II-1-1 provides a summary of the work status for these SWMU/AOC assessments and identifies the laboratory analytical methods utilized. Upon approval of this QAPP, KNC will utilize the updated analytical procedures summarized in Table II-1-2 to complete specific constituent of interest delineation in each of these areas, as necessary. The Phase II RFI Work Plan (KNC, 2008a) provided a tiered approach for delineation in each area. Tier 1 sampling (described in Table II-1-1) consists of using the "step-out" approach to assess soil impacts in specific areas beginning in the areas most likely impacted. After completion of the Tier 1 sampling, KNC will revise the existing isoconcentration maps

[5] KNC. 2005. Background Assessment Work Plan. Submitted to the EPA and KDHE in December 2005.
[6] KNC.2006. Soil Background Assessment Report. Submitted to the EPA and KDHE in March 2006.

and create new isoconcentration contour maps for each SWMU and AOC. Based on these data, additional borings will be identified, if needed, to further delineate the horizontal and vertical extent of soil impacts during Tier 2.

The strategy for characterizing the extent of constituents in on-site and off-site groundwater consists of collecting groundwater samples from proposed shallow and deep monitoring wells installed at the top and bottom (above the Granerous Shale) of the shallow groundwater unit. The borings for these wells will be completed using Rotosonic® drilling techniques, which will provide a continuous core from which detailed logging of the subsurface strata can be performed. Monitoring wells will be installed using the procedures described in the Phase II Work Plan Addendum: Groundwater Characterization (KNC, 2010c[7]). These groundwater samples will be submitted for laboratory analysis of nitrate plus nitrite, total chromium, and hexavalent chromium to facilitate the delineation of these constituents in on-site and off-site groundwater.

The delineation of nitrate in on and off-site areas will continue until the reported groundwater concentration of nitrate plus nitrate as nitrogen (NO_3+NO_2-N) is at or below background levels approved by EPA. The delineation of chromium in on- and off-site areas will continue until the reported groundwater concentration is at or below the MCL. Proposed monitoring wells for chromium and nitrate plus nitrite delineation are provided in Figure II-1-2 and discussed further in Section I-3.2.3.

The determination of hydrogeologic and attenuation capacity properties of the water-bearing zones will be accomplished by collecting soil cores (to help define Facility geology), collecting groundwater elevation measurements, and completing pumping and slug tests.

Specific field activities that will be utilized to collect the necessary data to meet the goals of the RFI may include:

- soil coring with direct push drill rigs;
- Rotasonic® drilling;
- soil/settleable matter sampling;
- groundwater sampling;
- test pit excavations;
- monitoring well installation;
- geotechnical and attenuation capacity testing of soils and settleable matter;

[7] KNC.2010c. Phase II Work Plan Addendum: Groundwater Characterization. Revised and submitted to the EPA and KDHE in June 2010.

- laboratory analysis of soil, settleable matter, groundwater, and concrete samples;
- pumping and slug tests; and
- collection of physical, geochemical, and attenuation capacity data to evaluate constituent fate and transport.

Table I-2-1 of the FSP provided a summary of SWMUs and AOCs, the rationale for additional data collection, the proposed investigative sampling program(s), and analytical requirements. Table I-2-2 of the FSP provided a summary of the proposed groundwater plume delineation activities, and Table I-2-3 of the FSP contained detailed information regarding sample identification locations, depth intervals, and proposed analyte lists for each SWMU/AOC. Table II-1-1 provides updated information on the previous investigation activities, Phase II scope of work, and proposed analyses/test methods for the Phase II soil and groundwater sampling based on the Phase II RFI Work Plan (KNC, 2008a), Addendum #1 to the Phase II RFI Work Plan (KNC, 2008b), Addendum #2 to the Phase II RFI Work Plan (KNC, 2010a), Addendum #3 to the Phase II RFI Work Plan (KNC, 2010b), and Phase II RFI Work Plan Addendum: Groundwater Characterization (KNC, 2010c). The specific approach to complete the RFI scope of work is provided in these documents. As noted above, much of this work has already been completed and a status of these investigations is provided in Table II-1-1. Upon approval of this QAPP for those areas where assessment has not been completed, samples will be collected and analyzed for the parameters identified in Table II-1-1 using the methods described in Table II-1-2.

II-1.5 (A7) Quality Objectives and Criteria

II-1.5.1 Data Quality Objectives

Data quality objectives (DQOs) are defined for the project to enable the collection of the appropriate type, quantity and quality of data to meet the project objectives. DQO definition is necessary to generate the data that will meet the project objectives. The DQO process defines the types of decisions that will be made, identifies the intended uses of the data, and designs a data collection program. Articulating DQOs is necessary to ultimately obtain sufficient data of known defensible quality for the intended use. The DQO process will assist in determining the necessary quantities, quality, sensitivity, sample handling procedures, and data assessment requirements for the data collected.

The DQO development presented herein adheres to the framework presented in the USEPA document "Guidance on Systematic Planning Using the Data Quality Objectives Process" (USEPA QA/G-4).

Step 1 – State the Problem

To obtain data of sufficient quality to characterize the nature, three-dimensional extent, and the direction(s) and rate(s) of migration of site constituents that have been released to soil, sediment, groundwater, and surface water.

Step 2 – Goal of the Study

The goals of the study area as follows

- Characterize suspected sources areas (SWMUs and AOCs);
- Delineate the areal and vertical extent of COIs on- and off-site to address areas of uncertainty; and
- Evaluate the distribution of COI concentrations and occurrence in the saturated zone.

Ongoing and previous characterization activities are listed in Table II-1-1.

Step 3 – Identify Information Inputs

Inputs to the decision include the type, quality, and quantity of data that will be collected in order to make decisions. Data type refers to the matrix from which physical and chemical data are collected as well as the presence or absence of special data collection and analysis circumstances, such as field filtering or Synthetic Precipitation Leaching Procedure (SPLP) extraction. Quality refers to the technical rigor that underlies the collected data, which can be quantified or otherwise described through the precision, accuracy, representativeness, comparability, completeness, and sensitivity considerations. Quantity refers to the amount of data necessary to make remedial decisions. Given the quantity of existing data that address all media of concern, samples will be collected using biased sample collection programs in order to focus on the specific characterization programs listed above. Considerations of data type and quantity are addressed in the FSP and addenda and Work Plan and addenda, whereas considerations of quality are addressed in this QAPP. Table II-1-1 indicates the number of samples to be collected during the current characterization activities. Inputs to the decision will include the following:

- Soil samples
- Groundwater samples
- Geotechnical data
- Hydrogeological data

- Groundwater level monitoring data

Step 4 – Define Boundaries of the Study

The physical boundaries of the site are discussed in Section II-1.3.2; and depicted in Figure II-1-1. The study area will be expanded, as required, to complete delineation to off-site properties. For instance, Figure II-1-2 provides a summary of proposed on- and off-site groundwater delineation locations identified in the Phase II Work Plan Addendum: Groundwater Characterization (KNC, 2010c)

Consideration of study boundaries includes temporal in addition to spatial boundaries. To date, the majority of initial and Phase II soil sampling at individual SWMUs and AOCs has been completed. Groundwater delineation activities are anticipated to begin upon EPA approval of the Phase II Work Plan Addendum: Groundwater Characterization.

Step 5 – Develop the Analytic Approach

The analytical testing program was developed as part of the RFI Work Plan development process. Available information on the types of materials managed or suspected to have been managed and previous analytical results for each SWMU and/or AOC were used to identify a preliminary list of COIs. For SWMUs and/or AOCs where limited information was available, a broad suite of analytical parameters were analyzed to identify, as applicable, the presence or absence of these constituents. Subsequent sampling and analysis performed as part of Phase II activities focused on further delineating, as applicable, COIs detected at elevated levels at each SWMU or AOC.

Table II-1-1 provides the proposed analyses for the Phase II sampling activities. If there are detected concentrations of COIs within a SWMU or AOC that exceed risk criteria or background concentrations, the extent of the COIs in the SWMU/AOC will be delineated. If detected concentrations of COIs do not exceed risk criteria or background concentrations, then recommend no further action.

If there are detected concentrations of COIs downgradient of the SWMU/AOC that exceed risk criteria or background, then the migration extent of the downgradient concentrations will be delineated. If detected concentrations of COIs do not exceed risk criteria or background concentrations, then recommend no further action.

Step 6 – Specify Performance or Acceptance Criteria

For the purposes of this phase of work, performance or acceptance criteria will be addressed without the need for statistical test designs as follows:

- The usability of the data collected for both soil and groundwater will be based on measurement activities consistent with accepted guidance documents such as SW846 Test Methods. The testing results will be evaluated against performance based acceptance criteria.

Step 7 – Develop a Detailed Plan for Obtaining Data

All details pertaining to the sample design and procedures are contained in the FSP and addenda and in the Work Plan and addenda. The sampling designs presented in these documents are determined on the basis of the DQO process described herein in order to meet the project objectives.

II-1.5.2 Quality Assurance/Quality Control

Quality Assurance is the overall management process, which includes planning, implementation, assessment, data reporting and quality improvement to ensure that the data generated will meet the project objectives as stated in this document, and associated work plans for the project. Quality control is the overall system of technical activities that is used to verify that the data meets the project objectives.

The overall QA objectives of the project are to assure that sampling, field and laboratory chain-of-custody (COC), laboratory analyses, field and laboratory data measurements, and reporting activities will provide quality data consistent with the intended use. The primary QA objective is to assure that all data collected and used for the Facility are accurate, precise and representative. QA objectives for data are usually expressed in terms of the data quality indicators (DQIs) of accuracy, precision, method reporting limits, completeness, representativeness, and comparability. These terms are generally defined and discussed in Section II-1.5.2 of this document. QA objectives for field measurement systems are also an important aspect of any environmental investigation. Field QA objectives are discussed in Sections II-1.5.2.3, II-2.1, II-2.3, and II-2.7.

The field QA/QC program will be accomplished through the collection of field duplicates, equipment rinsates, field blanks, and trip blanks. The analytical QA/QC program will be assessed through the internal laboratory QC performed, including method blanks, laboratory control samples (LCS) recoveries, surrogate recoveries, and matrix spike/matrix spike duplicate (MS/MSD) recoveries.

This QAPP currently is designed to focus on the data quality objectives for the RFI and includes a range of field and laboratory activities. Some of these activities may not be required during the initial phase of the RFI but could be used in later phases. However, as plans are developed or modified for additional Facility activities, this

document may be modified to reflect new data quality objectives that might be developed for any new phases of the project. The goals set for the DQIs for each phase are presented after the general discussion of the DQIs.

II-1.5.3 Measurement Performance Criteria

II-1.5.3.1 Quantitative DQIs

Quantitative data quality indicators (DQIs) for analytical data are defined as precision, accuracy, completeness, and method detection and quantitation limits. Quantitative DQIs are established to insure the overall quality of the analytical data produced by the laboratory. The quality of the analytical data is insured by the laboratory correctly performing the analytical methods specified in Section II-2, thereby producing QC data within the QC criteria. A general description of each of the quantitative QA objectives is given below while method-specific QA objectives will be based on the QA limits developed by each of the laboratories.

Precision

Precision is a measure of the variability between individual sample measurements under prescribed conditions. The specific criteria of precision are defined within the individual analytical test methods. The measure of precision will be expressed as relative percent difference (RPD), which is calculated for each of the spiked compounds using the equation presented in section II-4.2.2.1. Precision can be inferred through the use of matrix spike/matrix spike duplicates (MS/MSDs) and laboratory duplicates.

MS/MSDs contain known component concentrations, and any variability in the laboratory analysis is likely the result of variability induced by matrix heterogeneity or laboratory procedures. MS/MSDs will be generated in the laboratory during sample preparation. An environmental sample is chosen at random to be used for the MS/MSDs. The MS/MSDs are prepared by measuring two additional aliquots from the sample container and spiking both aliquots with compounds of known concentration. The spiked samples are then prepared and analyzed using the same methodology as the actual environmental sample.

A laboratory duplicate is prepared by measuring an additional aliquot from a sample container chosen at random by the laboratory. The second sample is then prepared and analyzed using the same methodology as the actual environmental sample.

Accuracy

Accuracy refers to the degree of difference between measured or calculated values and the true value. Accuracy is defined as the degree of agreement of a measurement (or average measurement), X, with an accepted reference or true value, T. This is usually expressed as the difference between the two values, X-T, or the difference as a percentage of the reference or true value, 100(X-T)/T, and sometimes expressed as the ratio X/T. Analytical method accuracy may be assessed through the use of MS/MSDs, laboratory control samples and/or surrogates for organics. Analytical method accuracy may be assessed through the use of MS/MSDs, laboratory control samples and/or matrix spikes for inorganics. MS/MSDs, laboratory control samples, matrix spikes and surrogates are generated in the laboratory during sample preparation.

Accuracy will be defined as percent recovery for the compounds of interest from samples designated to be analyzed. The calculation for percent recovery is given in Section II-4.2.2.2.

Reporting Limits

Reporting limits will be based on laboratory-specific method quantitation limits (MQLs) for each compound analyzed. The reporting limits are defined in section II-4.2.2.4. To the extent possible, these reporting limits will be below the lowest potentially applicable screening criteria, subject to qualifiers such as matrix interference and dilution factors. These values are listed in Tables II-1-3 (groundwater), II-1-4 (soil totals analysis), and II-I-5 (soil leachability). The laboratory-specific reporting limits are provided in the laboratory SOP summary sheets attached as Appendix II-A.

Completeness

Completeness is defined as the percentage of total measurements made which are judged to be valid measurements for critical data. The minimum number of sampling points needed to provide sufficient data are known as critical data points. The completeness objective is to obtain a sufficient amount of valid data to enable the goals and objectives of the project to be achieved. The calculation for completeness is given in Section II-4.2.2.3.

II-1.5.3.2 Qualitative QA Objectives

Qualitative QA objectives for analytical data are defined as comparability and representativeness.

Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability can be related to precision and accuracy since these quantities are measurements of data reliability. Samples from the same media (i.e., soil, water) will be considered comparable if the procedures for collecting the samples are complied with and consistent and if the units of measurement are the same.

In addition to obtaining samples in accordance with approved procedures and in a consistent manner, comparability is assured through the use of laboratories using established and approved analytical methods and protocols. The laboratory's quality control program is designed to establish consistency in the performance of the analytical process. The program includes traceability of measurements to standardized reference materials to establish comparability with other laboratory results, and internal controls to verify consistency of a given laboratory's performance. Standard reporting units (e.g., milligrams per kilogram (mg/kg), micrograms per liter (μg/l) will be used for reporting the various parameter results.

All data will be subjected to strict QA/QC procedures and reported in a consistent manner to allow for comparison across data sets.

Representativeness

The representativeness of the data is the degree to which data represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness can be achieved through the use of appropriate sampling designs, sampling techniques, and analytical methodology.

II-1.5.3.3 Field Measurements QA Objectives

General Measurements

Measurement data will be generated in many field activities that are incidental to collecting samples for analytical testing or unrelated to sampling. These activities may include, but are not limited to, the following:

- documenting date, place and time of sampling measurements;
- documenting individual(s) who performed the sampling or measurement;
- documenting physical descriptions of samples taken from soil boreholes;
- documenting the physical condition of the existing monitoring and recovery wells;
- measuring depths in monitoring and recovery wells and static water levels; and

- measuring general water quality parameters such as pH, temperature and conductivity for groundwater samples.

The general DQIs for such measurement data are to obtain reproducible and comparable measurements to a degree of accuracy consistent with the data use. This is accomplished through the documented use of standard procedures described in Section II-2.1 of this document. Table II-1-6 lists the QA objectives for general field measurement methods.

Direct Reading Measurements

QA objectives for data obtained with a direct reading field instrument are completeness and representativeness. Direct reading measurements will have a 90 percent completeness criterion. The field screening data will be considered representative if the samples are collected from locations specified in the RFI Work Plan and subsequent Phase II documents using the procedures outlined in Section II-2.1.

II-1.5.3.4 RFI QA Objectives

Quantitative DQIs

Accuracy objectives will be met by the analysis of MS/MSDs or LCS to assess accuracy. MS/MSDs or LCS will be analyzed at a rate of one per 20 samples analyzed or, if the batch is less than 20 samples, one per analytical batch. When required by the specific method, surrogates are added to every prepared sample (including QC samples) in an analytical batch. The specific criteria ranges for each measurement parameter are defined within the individual analytical test methods. Accurate measurements are also dependent upon sample matrix. Accuracy guidelines (percent recovery) will be based on the QA limits developed by each of the laboratories for the analytical methods specified in Section II-4.2.2.2.

Precision objectives will be met by the analysis of MS/MSDs or laboratory duplicates to assess accuracy. MS/MSDs or laboratory duplicates will be analyzed at a rate of one per 20 samples analyzed or, if the batch is less than 20 samples, one per analytical batch. The specific criteria ranges for each measurement parameter are defined within the individual analytical test methods. Precision measurements are also dependent upon sample matrix. Precision guidelines (percent RPD) will be based on the QA limits developed by each of the laboratories for the analytical methods specified in Section II-4.2.2.1.

Reporting limits will be set at the appropriate concentration level for each individual compound of concern for the chosen analytical methodology.

The completeness criterion is 90 percent. If completeness goals are not met, the Project QA/QC Officer will explain why the goal was not met and if the task can be considered complete. This explanation will be provided to the project management team.

Qualitative DQIs

Comparability will be maintained through the use of the comparable analytical methods that have been used previously for the Facility. Comparability will also be maintained by adherence to the general procedures outlined in Section II-1.5.2.1.

Data are considered representative if the sampling is in accordance with the sampling programs defined in Section II-2.1. Project objectives cannot be achieved without representative data. Analytical data should represent the sample analyzed regardless of the heterogeneity of the original sample matrix. Field designated duplicate samples and field rinsate blanks (if required) will be collected at a frequency of one per 20 samples and analyzed as a means to assess field representativeness. Trip blanks for volatile organic compounds (VOCs) will be included to evaluate potential cross contamination during transport or during field sampling procedures that impacts data representativeness. Field blanks may be included to evaluate potential cross contamination during transport or during field sampling procedures that impacts data representativeness. Representativeness will also be maintained during the sampling effort by performing all sampling in compliance with the procedures described in Section II-2.1. Any deviations that become necessary due to unforeseen field conditions will be documented in the field notebook and/or field sampling sheet(s) and communicated to the QA Officer.

II-1.6 (A8) Special Training Requirements/Certification

All personnel involved with sampling during the RFI investigation activities will have applicable Occupational Safety & Health Administration training for hazardous waste activities. The level of training required for the RFI investigation activities is specified in the HASP.

II-1.7 (A9) Documentation and Records

II-1.7.1 Documentation

The QAPP will be updated as needed to reflect additional field activities at the Plant. Proposed updates or changes to the QAPP will be provided by KNC in progress reports to EPA and KDHE. Upon EPA approval of proposed updates or changes, KNC will direct updates to the QAPP and maintain responsibility for changes to the QAPP. Any update to the QAPP will be submitted to USEPA for review and approval. Updates could occur as either a change to the QAPP or an addendum to the QAPP.

Version control will be implemented through a version control number found on the front page and in the header of the document. Access to the electronic master file will be limited to the consultant Project Manager and QA/QC Officer and KNC.

KNC will maintain responsibility for distribution of the QAPP. The KNC Project Coordinator will communicate in writing the distribution of updates to the QAPP. KNC will maintain the original hard copy of the QAPP and all updates. The consultant Project Manager will be responsible for distribution to personnel working the project.

II-1.7.2 Laboratory Records

II-1.7.2.1 Project Files

A project file will be created by each laboratory for the project. The project file will contain appropriate documents associated with the project including correspondence from the client, sampling container integrity and shipping records, copies of the chain-of-custody records, raw data, copies of entries from laboratory notebooks, which pertain to the project, and a copy of the final report. When a project is complete, all records are passed to the Document Custodian who inventories the file, checks for completeness and puts the file into document archive.

Each laboratory will prepare and retain full analytical and QC documentation for a minimum of three years. Such retained documentation need not be hard (paper) copy, but may be in other storage media (e.g., magnetic tape). Samples and/or sample extracts will be retained for 60 days after issuance of the final data package.

II-1.7.2.2 Data Reports

The data set report may include, as appropriate, laboratory reports and associated QC data deliverables. Each laboratory report may include at a minimum the following information:

- laboratory ID number;
- site ID number;
- sample ID number;
- date sampled;
- date received;
- date analyzed;
- parameters measured;
- units in which each parameter is reported;
- analytical techniques or methods used; and
- reporting limits.

The associated data deliverables may include the following, as appropriate:

- cover sheet listing the samples included in the report and detailed narrative comments describing any problems encountered during analysis and the corrective actions taken;
- copies of signed chain-of-custody records and sample receipt documentation;
- calibration records for each instrument used including raw data;
- maintenance records for each instrument;
- documentation of individual(s) performing analyses; and
- analytical results for laboratory MS/MSDs, method blanks, laboratory control samples, laboratory duplicates and surrogate recoveries as applicable to the analytical method or technique used.

II-1.7.3 KNC Records

A project file will be created by KNC. The project file will contain copies of correspondence from the consultant and USEPA, COC Records, field records including field notebooks and/or field sheets, analytical report packages and the final report. When a project is complete, these records will be retained for the time period allotted in the Part II permit.

II-2. MEASUREMENT DATA ACQUISITION

II-2.1 (B1) Sampling Process Design

II-2.1.1 Design Rationale

Data needs to be collected to meet the objectives of each of the investigation tasks. Table II-2-1 identifies the type of testing to be performed during implementation of the RFI Work Plan and the intended data use. Data to be collected as part of Phase II work are summarized in Table II-1-1 and include:

- soil samples to be analyzed for VOCs, SVOCs, total chromium, hexavalent chromium, sulfate, and nitrate-nitrite to evaluate constituent concentrations;
- subsurface soil samples to be analyzed for nitrate-nitrite, synthetic precipitation leaching procedures (SPLP) VOCs, SVOCs, sulfate, total chromium and hexavalent chromium to evaluate the potential for leaching to groundwater;
- water level data from all groundwater monitoring wells; and
- groundwater samples to establish the extent of VOC, SVOC, total chromium, hexavalent chromium, nitrate, and nitrate constituent concentrations, as applicable, and characterize pertinent geochemical parameters in groundwater.

Table II-2-1 also provides analytical testing methods that were utilized as part of initial RFI work activities and/or may be utilized in subsequent characterization efforts to complete delineation efforts and/or improve the understanding of the controls on the fate and transport of constituents of interest.

II-2.1.2 Sampling Locations

Sampling locations are discussed in the Phase II RFI Work Plan (KNC, 2008), Addendum #1 to the Phase II RFI Work Plan (KNC, 2009), Addendum #2 to the Phase II RFI Work Plan (KNC, 2010a), Addendum #3 to the RFI Work Plan (KNC, 2010b), and Phase II RFI Work Plan Addendum: Groundwater Characterization (KNC, 2010c). The proposed soil sampling locations were presented in the documents identified above, as summarized below.

- Phase II RFI Work Plan (KNC, 2008) – Figures 1 through 17;
- Addendum #1 to the Phase II RFI Work Plan (KNC, 2009) – Figures 2-4, 3-1, and 3-2;
- Addendum #2 to the Phase II RFI Work Plan (KNC, 2010a) – Figure 2 and Figure 3; and
- Addendum #3 to the Phase II RFI Work Plan (KNC, 2010b) – Figure 1.

Groundwater sampling locations for chromium and nitrate delineation are presented in Figure 3 of the Phase II RFI Work Plan Addendum: Groundwater Characterization (KNC, 2010c). Groundwater sampling locations for VOC delineation are presented in Figure 10 of the Phase II RFI Work Plan Addendum: Groundwater Characterization (KNC, 2010c). Sampling locations may be changed with advanced approval by EPA.

II-2.2 (B3) Sampling Method Requirements

Field activities impacting data quality and requiring deviation from SOPs will be documented. Sampling protocols to be used during RFI activities are presented in the FSP (Volume I) and subsequent Phase II addendums. Locations, methods, and collection frequency are described in Table II-1-1. Sample container, preservation, and holding time requirements for analytical testing performed after approval of this QAPP are provided in Table II-2-2.

II-2.3 Sample Handling Custody

A sample is the physical evidence collected from a site or the environment. Custody and tracking of the evidence collected shall be controlled by using the procedures presented in this section. Custody is defined as being one of the following:

- in the actual physical possession of field personnel or custodian;
- in the view of the field personnel or custodian; and/or
- in a designated, locked storage area.

Each cooler of samples collected and delivered or shipped to an analytical laboratory will be accompanied by a chain-of-custody record. The primary purpose of the chain-of-custody procedure is to document the possession of the samples from collection through storage and analysis to reporting. Chain-of-custody forms become the permanent record of all sample handling and shipping. An example chain-of-custody form is provided in Appendix II-A (Continental Analytical Services Quality Manual).

II-2.3.1 Field Custody and Documentation Procedures

The field team is responsible for the care and custody of the samples collected until the samples are transferred to another party, dispatched to the laboratory or disposed. The Field Operations Manager is responsible for enforcing chain-of-custody procedures during fieldwork.

The chain-of-custody procedures are provided below:

- Prior to sample packaging and shipment, the chain-of-custody form is completed for the sample collected.
- When the form is full, or when all samples have been collected that will fit in a single cooler, the field personnel responsible for the samples will check the form for possible errors. Corrections are made to the record with a single strike mark and initialed. All entries will be made in blue or black ink. Each cooler will be accompanied by a separate chain-of-custody.
- If samples are being shipped, a shipping bill is then completed and the shipping bill number recorded on the chain-of-custody.

When transferring custody of samples, the individuals relinquishing and receiving custody of the sample shipping container will document the sample shipping container transfer by signing and dating the chain-of-custody. This process documents sample custody transfer from the sampler, sometimes through an express courier, to the sample custodian at the contracted analytical laboratory. The chain-of-custody will reflect transfer of the shipping container by the analytical laboratory. If an express courier is used the shipping bill number may be noted on the chain-of custody and the shipping bill may serve the purpose of the chain-of-custody until the shipping container is received by the laboratory. All shipping bills will be kept and attached to the chain-of-custody

A copy of each chain-of-custody is retained by the sampling team for the project file and the original is sent with the samples. In conjunction with data reporting, the

analytical laboratory will return the signed chain-of-custody or a copy of the signed chain-of-custody to the Project Manager for inclusion into the central project file.

II-2.3.2 Sample Packing

Following sample collection and documentation, the exterior of the sample containers will be decontaminated and prepared for shipment to the laboratory. Shipping procedures will comply with Department of Transportation (DOT) requirements. All samples will be classified as environmental. The following packaging and shipping procedures will be implemented during field investigations:

- labels will be marked legibly and accurately;
- sample containers will be wrapped and packaged to prevent breakage;
- samples will be packed in ice upon collection and cooled to a temperature of 4 degrees Celsius;
- the chain-of-custody documentation will be sealed in the shipping container with the samples;
- coolers being shipped will be properly marked for shipping via an express courier with the shippers name and address; and
- a custody seal will be placed on the cooler prior to shipping via express courier in a manner to indicate if tampering occurs during shipment and/or delivery.

Samples may be stored prior to delivery or shipment to the designated laboratory in which case the samples will be stored in a secured area.

II-2.3.3 Laboratory Documentation

Upon receipt of the environmental samples, all samples will proceed through an orderly processing sequence specifically designed to ensure continuous integrity of both the sample and its documentation.

All samples will be checked for proper COC Records, broken or leaking sample containers, proper label identification, and any associated discrepancies. If any samples arrive leaking or broken, the custody seal on the shipment coolers is not intact, or other discrepancies are noted, the laboratory Project Manager will be notified of the problem(s) immediately who will in turn notify the KNC Project Coordinator, consultant Project Manager and consultant QA/QC Officer.

If no discrepancies are found, the COC for the sample(s) will be signed by the laboratory Sample Custodian, and the samples will subsequently be assigned a unique laboratory identification number through a laboratory specific documentation system that will be used to file and transfer all essential laboratory project information. The

system, coupled with an internal COC procedure, will ensure that the samples are appropriately tracked from storage through the laboratory system until the analytical process is complete.

After verification of sample integrity and completion of laboratory sample receipt documentation procedures, the samples will be secured in the appropriate sample storage area. The removal of the sample(s) from the secure storage area will be appropriately tracked.

Upon completion of the analysis, the field COC (or a signed copy) will be returned with the analytical data for inclusion into the central project file.

Complete and accurate documentation of analytical procedural information is an important part of the sample custody program. These activities will be conducted with the use of the analytical method SOP, a laboratory data management system, laboratory bench sheets, laboratory notebooks and project files.

Details of analytical and QC protocols are contained in laboratory-specific SOPs. SOPs are documents that contain detailed information on the requirements for the correct performance of a laboratory procedure or analysis.

All SOPs are approved by the laboratory QA department before being implemented. The distribution of current SOPs and archiving of outdated ones is controlled through the laboratory QA department.

Laboratory bench sheets may be used to document information from routine laboratory operations including sample preparation and analysis. Bench sheets may be used to ensure that the information is recorded in a complete and organized manner and that the analysis can be reconstructed, if necessary.

Information typically recorded in laboratory notebooks includes unusual observations or occurrences in the analysis of samples or methods development information.

II-2.4 (B4) Analytical Methods Requirements

II-2.4.1 Analytical Methods

The analytical methodologies to be used are detailed in Table II-2-1. The intended data use for analytical data collected on site samples is summarized in Table II-2-1. Data to be collected for Phase II RFI work activities include:

- soil samples to be analyzed for VOCs, SVOCs, sulfate, total chromium, hexavalent chromium, nitrate, and nitrite to evaluate constituent concentrations;
- subsurface soil samples to be analyzed for nitrate, nitrite, sulfate, synthetic precipitation leaching procedures (SPLP) VOCs, SVOCs, total and hexavalent chromium to evaluate the potential for leaching to groundwater;
- water level data from all groundwater monitoring wells; and
- groundwater samples to establish the extent of VOCs, nitrate and nitrite, and hexavalent and total chromium constituent concentrations, as applicable, and characterize pertinent geochemical parameters in groundwater.

Table II-2-1 also provides analytical testing methods that were utilized as part of initial RFI work activities and/or may be utilized in subsequent characterization efforts to complete delineation efforts and/or improve the understanding of the controls on the fate and transport of constituents of interest.

II-2.4.2 Field Methods

Field measurements are usually conducted in the field in conjunction with the collection of samples for laboratory analyses. Field measurements may include:

- The use of direct reading instruments;
    - groundwater pH, Eh, dissolved oxygen, temperature, conductivity, and turbidity
    - soil headspace screening with an organic vapor meter; and
- Hach test kit for ferrous iron measurements in groundwater.

Section I-4.3 of the FSP identifies parameters that may be measured in the field, along with the requirements for equipment calibration, QC, and corrective actions, and equipment maintenance associated with these field measurements.

II-2.5 <u>(B5) Quality Control Requirements</u>

II-2.5.1 Field QC Checks

Field QA checks are defined for the project to ensure that the right type, quantity and quality of field data are collected to meet the project objectives. Field QA checks will include the review and approval of all field documentation by the Field Manager and/or Project Manager. Signature or initial approval of field documentation will

indicate that the provisions outlined in the FSP and this QAPP have been appropriately implemented.

Field QA checks also include the collection of field QC samples. Field QC samples are generally defined and discussed in the following sections. Section II-2.5.2 describes RFI specific field QC sample collection. Frequency of field QC samples is discussed in Section I-4.5 of the FSP and the QA frequency is summarized in Table II-2-3.

II-2.5.1.1 Field Blank

A field blank consists of analyte-free distilled or deionized water. The field blank is prepared in the field by pouring the appropriate volume of analyte-free distilled or deionized into the sample container without contacting sampling equipment. The field blank is used to verify the integrity of the water being used for decontamination protocol.

II-2.5.1.2 Field Rinsate Blank

A field rinsate blank consists of distilled or deionized water collected from the final rinse of the sampling or purging equipment after the decontamination procedure has been performed. This sample is then subsequently handled like all other samples. The field rinsate blank is used to assess the potential for constituent carryover on non-disposable sampling equipment. Field rinsates will be applied to all matrices sampled.

II-2.5.1.3 Field Duplicates

A field duplicate is an environmental sample, which is collected at the same location and with the same sampling device as the original sample. Field duplicates are collected immediately after the original sample is collected. The initial and duplicate samples will be identified with unique sample identification numbers. The two samples will be prepared and analyzed separately and the results compared to evaluate the effects of the matrix on the precision of the analysis. Results are usually expressed as RPD between the duplicate aliquots analyzed.

II-2.5.1.4 Trip Blank

The trip blank is a sample bottle filled with analyte free water that is carried to the sampling site and remains with other field sample bottles during any storage and

shipping to a project lab. The trip blank is used to assess the potential for cross contamination between samples for VOC analysis during shipping.

II-2.5.2 RFI Field QC Checks

The types of field QC samples to be collected include field blanks, field rinsate blanks, and field duplicates. The acceptability limit for all field blanks and field rinsate blanks is to be below the reporting limits for each compound. Results above reporting limits will be evaluated using the procedures specified in Section II-4.2.2.4. The acceptability limit for all groundwater and field duplicates is to have a RPD not greater that 10 percent more than the established laboratory RPD for laboratory duplicates. The acceptability limit for all soil field duplicates is to have a RPD not greater that 20 percent more than the established laboratory RPD for laboratory duplicates.

A minimum of one field blank will be submitted for each water source (e.g., distilled or deionized water from a commercial vendor) or each large container (i.e., a container on a sampling trailer) used for decontamination procedures. A minimum of one field rinsate will be collected after 20 primary samples have collected. A minimum of one field duplicate per matrix will be collected after 20 primary samples have collected. A minimum of one trip blank will be submitted per shipping container that contains samples for VOC analysis. Samples for VOC analysis will be batched together to limit the number of coolers used for shipment. The estimated frequency of field QC samples to be collected is listed in Table II-2-3.

II-2.5.3 Laboratory Quality Control Checks

Two types of quality checks will be utilized in the laboratory to ensure the production of analytical data of known and documented quality. These include:

- program quality assurance, and
- analytical method QA.

The analytical laboratory has a written Quality Assurance/Quality Control program that provides rules and guidelines to ensure the reliability and validity of all analytical work conducted in their laboratory. Compliance with the QA/QC program is coordinated and monitored by designated laboratory quality assurance personnel.

Objectives of the QA/QC program are to:

- ensure that all procedures are documented, including any changes in administrative and/or technical procedures;

- ensure that all analytical procedures are conducted according to sound scientific principles and have been validated;
- monitor the performance of the laboratory by a systematic inspection program and provide for corrective action as necessary;
- collaborate with other laboratories in establishing quality levels, as appropriate; and
- ensure that all data are properly recorded and archived.

The analytical laboratory will assess each data package provided that both initial and ongoing instrument and analytical QC functions (including holding times) have been met. Corrective action may be initiated on any samples analyzed in non-conformance with the QC criteria. QC samples (method blank, laboratory designated duplicates, laboratory designated matrix spike/matrix duplicate samples, etc.) will be run concurrently with each preparation batch of samples. Laboratory QC samples will be analyzed as specified in the method and in Chapter 1 of SW-846. The laboratory will randomly select samples collected from the Facility to be used as matrix spike/matrix spike duplicate samples provided sufficient sample volume has been provided to the laboratory. Sample volume requirements are specified in Table II-2-2

II-2.6 (B6) Instrument/Equipment Testing, Inspection and Maintenance

To ensure that analytical data generated for the project are reliable, all equipment and instruments will have a prescribed routine maintenance schedule in addition to a calibration schedule. Preventive maintenance will be performed and documented by qualified project personnel.

II-2.6.1 Analytical Laboratory

The analytical laboratory is responsible for the maintenance of its laboratory equipment. Preventive maintenance is done on a scheduled basis to minimize down time and the potential interruption of analytical work. All instruments will be maintained in accordance with the manufacturer's recommendations, normal approved laboratory practice, and any procedures listed in analytical methodology.

Designated laboratory personnel are trained in routine maintenance procedures for all major instrumentation. When repairs become necessary, they will be performed by either trained staff or trained service engineers/technicians employed by the instrument manufacturer or representative.

Both scheduled maintenance and unscheduled maintenance required by operational failures will be noted. The department supervisor will ensure that required maintenance is occurring.

Spare parts for laboratory instrumentation that are part of routine maintenance will be kept at the laboratory. Parts required for repair may be kept at the laboratory or available from the instrument manufacturer on a timely basis.

II-2.6.2 Field

All field instrumentation, sampling equipment and accessories will be maintained in accordance with the manufacturer's recommendations and specifications and established field practice. A list of field equipment that may be utilized during site investigations is presented in Table I-4-2 and Table I-4-3 of the FSP. Field equipment calibration and maintenance requirements are presented in Appendix I-B, SOPs. All maintenance will be performed by qualified personnel. This may become part of the project file and may include the following:

- date and time of maintenance;
- type of equipment and the equipment's identification number;
- maintenance performed and procedure used;
- name of personnel conducting the maintenance;
- results of maintenance performed; and
- additional action taken as applicable.

Equipment that becomes questionable or inoperable during use will be removed from service and segregated to prevent inadvertent utilization. The equipment will be properly tagged to indicate that it is currently inoperable and cannot be used. Such equipment will be repaired and re-calibrated to approved QC standards by the team leader or qualified personnel, as appropriate. Equipment that cannot be repaired will be replaced or discarded. Spare parts for field instrumentation that are part of routine maintenance will be kept at either the KNC Facility or at KNC's consultant or if necessary, obtained from the vendor as needed. Parts required for repair will be available from the instrument manufacturer on a timely basis.

Scheduled maintenance and unscheduled maintenance will be conducted. Unscheduled maintenance, particularly that which could have an adverse effect on field project performance, will be relayed to the Field Operations Manager who will communicate the activity to the project QA/QC Officer and Project Manager.

II-2.7 (B7) Instrument Calibration and Frequency

The calibration and maintenance history of instruments used to take measurements and analyze samples is an important aspect of the QA/QC program for the project. Instrument calibration and maintenance will be performed and documented by trained personnel in accordance with the manufacturers established procedures.

II-2.7.1 Field Instruments and Equipment

The calibration and general maintenance of field instruments is the responsibility of field team leaders or designated personnel. A field logbook or equivalent will be maintained by these individuals to document calibration, maintenance and status of all instruments used during the corrective action. Typical field calibration and maintenance requirements may contain, but are not limited to, the following information:

- date and time of calibration;
- type of equipment and identification number (such as serial number);
- reference standard used for calibration;
- calibration procedure used;
- name of person conducting the calibration; and
- results of calibration performed.

A list of field equipment that may be utilized during site investigations is presented as Table I-4-2 and Table I-4-3 of the FSP. Field calibration will be performed following the manufacturer's directions and using standard calibration solutions and gases.

Results of activities performed using equipment that has failed calibration or recalibration will be evaluated by the project QA Officer or Project Manager. If the activity results are potentially adversely affected, the results of the evaluation will be communicated, appropriate personnel notified and a decision made as to the validity of the results.

II-2.7.2 Laboratory Instruments

Calibration and maintenance of analytical instruments are required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet the specified data quality objectives. Each instrument is calibrated with standard

solutions or gases appropriate to the type of instrument and the range established for the analytical method.

Maintenance, tuning, calibration and standardization procedures for laboratory instruments will generally follow the frequency and procedures established by USEPA for Solid Waste 846 methods. The laboratory will also follow manufacturer's recommended guidelines for maintenance.

Calibration records may include, but are not limited to, the following:

- type and identification number of instrument;
- calibration dates;
- identification of individuals or organizations performing the calibration;
- identification of calibration procedure used;
- accepted calibration tolerances;
- reference standards;
- calibration data;
- documents of calibration provided by the manufacturer and external agencies showing traceability to a national standard, as appropriate;
- information on calibration acceptance or failure and any maintenance performed; and,
- required maintenance or repair work requiring recalibration or calibration checks.

II.2.8 (B8) Inspection/Acceptance Requirements for Supplies and Consumables

All sampling containers will be obtained from the analytical laboratory or outside vendor. The sampling containers will be shipped from the analytical laboratory or the outside vendor with a container cleanliness certificate.

Sampling containers will be inspected by field personnel prior to field activities to verify the accuracy and integrity of the sampling containers for the specific field event. Distilled/deionized water used during decontamination procedures that is not obtained from the analytical laboratory will be tested by the collection of a field blank to verify the integrity of the water.

Inspection of other supplies such as calibration standards for field instruments will be the responsibility of the field personnel assigned to the field event. Outside contractors being utilized for a field event are responsible for documenting the integrity of supplies used during the field event.

II.2.9 (B9) Non-Direct Measurements

Non-direct measurements consist of a broad range of data, mostly historical, that may include: site photos, aerial photographs, previous consultant reports, work plans, and historical laboratory data. Previous investigations have resulted in historical data for chromium, nitrate, and VOC data from soil and/or groundwater. These historical data are considered non-direct measurements and will be used as a baseline to better evaluate results obtained during the RFI.

Historical data will be used for general confirmation purposes only. Only data generated under the specifications of this QAPP, using the current approved EPA analytical technologies, will be used for source delineation and characterization of specific constituents present at the SWMU/AOCs. Historical analytical data will be used as a baseline in the preliminary identification of "hot spots" or "clean areas" from which future sampling locations will be determined. Previously measured site characterization data will also be used as baseline data to be compared against newly collected data as a general confirmation of the original delineation as well as an indication of possible further migration. Future hydrogeologic measurements will be used to confirm the previously determined baseline hydrogeologic properties of the water-bearing zones.

II-2.10 (B10) Data Management

II-2.10.1 Field

All field personnel will typically log all field measurements, observations and field instrument calibrations in bound field notebooks, field sheets or electronic data logging instrumentation or equivalent. Entries will be legible and contain accurate and inclusive documentation of an individual's project activities. Data obtained with electronic data logging instrumentation will be printed off and hard copies retained in the project files. An example of field forms previously used during implementation of the RFI Work Plan (KNC, 2005) and field forms that may be utilized during Phase II activities are provided in Appendix II-B.

II-2.10.2 Laboratory

Each laboratory will perform in-house analytical data reduction and review of analyses under the direction of the laboratory's technical staff, QA Officer, and Project Manager for this project. These individuals are responsible for assessing data quality and advising KNC and its consultant of any data that may be rated "preliminary" or

"unacceptable" or other notations that would caution the data user of possible unreliability. A case narrative prepared by the analytical laboratory assessing data quality will be submitted to the laboratory Project Manager or designee with every data package prior to transmittal to the client.

Data reduction, review and reporting by the laboratory will be conducted as follows:

- raw data produced by the analyst are reduced and checked by the analyst following laboratory SOPs;
- each department head will review the data produced by the analysts in the department;
- the QC Officer or his/her designee will independently review the data for attainment of QA criteria as appropriate for the method; and
- upon acceptance of the data package by the QC Officer, a report is generated and sent to the Laboratory Project Manager.

Data set reports will be prepared and submitted to KNC and its consultant's Project Manager on an ongoing basis by the laboratory.

The laboratory project manager or designee will have primary responsibility in coordinating the distribution of analytical data. This includes distribution of both written data reports and electronic data transfer.

II-3. ASSESSMENT/OVERSIGHT

II-3.1 (C1) Assessment and Response Actions

Internal systems audits, if performed, will be the responsibility of the Project QA Officer. The objectives of the performance and systems audits are to ensure that the quality assurance program developed for this project is being implemented according to the specified requirements, to assess the effectiveness of the quality assurance program, identify non-conformance, and verify that any identified deficiencies are corrected. If any significant deviations from the QAPP are documented, corrective action measures will be immediately implemented and documented as detailed in Section II-3.1.3.

II.3.1.1 Systems Audits

II-3.1.1.1 Project Documentation Systems Audit

Documentation will be monitored by the QA/QC Officer during each phase of the project. If discrepancies are noted, the consultant project manager may request the Project QA Officer to perform an audit. The consultant QA/QC Officer will monitor laboratory activities from the time the field investigation begins until all analytical data have been received. Monitoring will occur on a periodic basis and may consist of a telephone conversation between the consultant QA/QC Officer and the designated laboratory project manager. If problems are noted, a systems audit may be performed at the laboratory facility.

Subsequent to an audit, the QA/QC Officer will develop an audit report that summarizes the audit findings, including those areas found to be in non-conformance (if any) and the proposed corrective measures. This report will be prepared in memo form and submitted to the project managers and copied to the project file. The project manager is responsible for seeing that all recommended corrections occur.

II-3.1.1.2 Field Systems Audit

Field systems audits may be conducted by the QA/QC Officer. The QA/QC Officer will monitor for potential problems by reviewing field documentation on a periodic basis. A field audit may be performed if discrepancies are discovered by the consultant QA/QC Officer. A field audit will consist of a visit to the field to verify that all QA/QC procedures set forth in the QAPP are being followed. The auditor will compare the sampling, collection, and documentation procedures as stated in project

documents to what is actually being performed in the field. Discrepancies will be noted and the appropriate field personnel will be notified so that corrections can be made immediately. A formal field performance audit report will be produced and delivered to the project manager and field personnel. A copy will also be submitted to the files. The project manager is responsible for seeing that all recommended corrections occur.

II-3.1.1.3 Laboratory Systems Audit

A systems audit to review laboratory operations will not be conducted specifically for this project. Auditing of the laboratory occurs as part of the KDHE certification process that implements the National Environmental Lab Accreditation Certification (NELAC). The laboratory(s) to be used also regularly conduct internal audits that include:

- routine audits conducted by the laboratory QA officer;
- special audits conducted by the laboratory QA officer when a problem is suspected;
- special audits conducted by corporate personnel;
- evaluation of procedures; and
- inspection and evaluation of records.

An internal audit is documented by corrective actions taken, if any.

II-3.1.2 Performance Audits

A performance audit verifies the ability of the laboratory to correctly identify and quantitate compounds in blind check samples submitted to the laboratory. Each laboratory has written documentation showing acceptable performance for one or more performance audits for analytical parameters of concern.

II-3.1.3 Documentation of Assessments

When errors, deficiencies, or out-of-control situations exist, the QA program provides systematic procedures, called corrective actions, to resolve problems and restore proper functioning to the sampling and/or analytical system.

II-3.1.3.1 Field Corrective Action

The Field Team Leader or Field Manager will review the procedures being implemented in the field for consistency with the established protocols. Sample collection, preservation, documentation, labeling and shipping will be checked for

accuracy and completeness. Where procedures are not strictly in compliance with the established protocol, the deviations will be documented and reported to the QA Officer and Project Manager. Corrective actions will be defined and documented appropriately.

II-3.1.3.2 Laboratory Corrective Action

The Laboratory Operations Manager or his/her designee will review the data generated to ensure that all QA samples have been run as specified in the protocol. This review will include calibration procedures, frequency and results. Instrument maintenance logs may also be checked. Recoveries of LCS and matrix spike samples will be checked for consistency with method accuracy and precision. Where QC sample results fall outside the acceptable ranges, deficiencies will be reported to the QA/QC Officer who will immediately report the discrepancies to the Project Manager. Corrective actions will be defined by the QA/QC Officer in conjunction with the Project Manager and documented appropriately.

Laboratory personnel are trained to be alerted that corrective actions may be necessary if:

- QC data are outside the acceptable windows for precision and accuracy;
- blanks, or control samples contain contaminants above acceptable levels;
- undesirable trends are detected in spike recoveries or RPD between duplicates;
- there are unusual changes in detection limits;
- holding times have been exceeded;
- deficiencies are detected by the QA department during internal or external audits or from the results of performance evaluation samples; or
- inquiries concerning data quality are received from clients.

Corrective action procedures are often handled at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors, checks the instrument calibration, spike and calibration mixes, instrument sensitivity, etc. If the problem persists or cannot be identified, the matter is referred to the laboratory supervisor, manager and/or QA department for further investigation. The laboratory will follow the procedures in the analytical methodology for performing corrective action and reporting the data with qualifiers, if appropriate. KNC's consultant will evaluate the effect of any deviations in relation to the project Data Quality Objectives. Corrective action may include, but is not necessarily limited to:

- re-analyzing suspect samples;
- resampling and analyzing;

- evaluating and amending sampling and/or analytical procedures;
- accepting data with an acknowledged level of uncertainty;
- recalibrating analytical instruments; and/or
- discarding the data.

II-3.2 (C2) Reports to Management

The reporting system is a valuable tool for measuring the overall effectiveness of the QA program. It serves as an instrument for evaluating the program design, identifying problems and trends and planning for future needs.

II-3.2.1 Field Reports

The Field Manager will communicate to the Site Manager/QA Officer or the KNC consultant's Project Manager on a routine basis regarding progress of the field work and QA issues associated with field activities. These communications will consist of a summary of field activities.

If a need to report corrective action (as detailed in Section II-3.1.3) is identified, a separate communication will be made by the Field Operations Manager and conveyed to both the consultant QA/QC Officer and the KNC consultant's Project Manager.

II-3.2.2 Laboratory Reports

The outside laboratory will maintain procedures of laboratory record keeping in order supporting the validity of all analytical work. Each data set report submitted to the KNC consultant's Project Manager will contain the laboratory supervisor's or authorized designee's written verification that the approved analytical method (without modification) was performed and all QA/QC checks were within the established protocol limits on all samples.

II-3.2.3 Consultant Reports

Conferences to discuss the progress of the project will be held with KNC on a regular basis. Concerns that arise during the course of the work, which may require changes to the scope of work or deviations from the established protocols specified in approved project plans, will be discussed and resolved.

If performance and systems audits are performed, communications will occur (with the exception of the laboratory's internal audit report) as described in Section II-3.1 of this QAPP.

After the fieldwork has been completed and the final analyses are completed and checked, a final quality assurance summary will occur. The summary will include the quality assurance and audit information, indicating any corrective actions taken and the overall results of QAPP compliance.

All data (including QC) collected during the field investigation will be summarized in the RFI report. The report will detail any data discrepancies and the effect, if any, on usability of data.

II-4. DATA VALIDATION AND USABILITY

II-4.1 (D1) Data Review, Validation, and Verification

II-4.1.1 Data Review and Verification

The criteria for data review and verification for field data will be: complete calibration records for field instrumentation and complete field documentation records for all samples collected.

The criteria for data review and verification for analytical data will be: COC records and written documentation between the laboratory and the consultant QA/QC Officer regarding changes in analytical protocol, sample integrity, sample identification, and laboratory QC issues.

II-4.1.2 Data Validation

Validation of field data will use the completeness and representativeness criteria set forward in Section II-1.5.2.3 of this QAPP.

Validation of analytical data will use the qualitative and quantitative DQIs set forward in Section II-1.5.2.4 of this QAPP.

II-4.2 (D2) Verification and Validation Methods

II-4.2.1 Verification Methods

II-4.2.1.1 Field Data

Field data review and verification will consist of:

- review of the documentation of calibration procedures for field instruments to confirm proper procedures were used;
- review of the field documentation to confirm proper documentation procedures were used and are complete;
- comparison of field entries to tabulated results to ensure no transcription errors have occurred; and
- comparison of field data just collected to historical data, if available.

Any discrepancies in field data will be summarized in writing to the consultant Project Manager. The impact of discrepancies will be evaluated with regard to data validity.

II-4.2.1.2 Analytical Data

Analytical data packages received from the analytical laboratory will be reviewed for completeness using the COCs generated during field activities. Sample identifiers and dates sampled will be reviewed for correctness. Receipt of analytical data for all samples collected will be verified.

Geotechnical data packages received from the laboratory will be reviewed for completeness using the COCs generated during field activities. Sample identifiers and dates sampled will be reviewed for correctness. Receipt of geotechnical data for all samples collected will be verified.

II-4.2.2 Validation Methods

Analytical data will be independently validated using the data deliverable package as specified in Section II-1.7 of this QAPP. The data validation will review all analytical data and associated data deliverables. The data will be evaluated for compliance with the QA objectives for the method. The USEPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review will be used as supplemental guidance. Precision, accuracy, and the reporting limits for each compound for each sample will be evaluated during the validation process. The completeness of each matrix will also be evaluated. Details of the evaluation of precision, accuracy, completeness and reporting limit are detailed in the following subsections.

II-4.2.2.1 Precision

Precision is the degree to which the measurement is reproducible. It is frequently determined by comparison of duplicate laboratory control or matrix duplicate samples. Precision will be calculated as the RPD according to SW-846 procedures. The equation is as follows:

$$RPD = \frac{|D1 - D2|}{(D1 + D2)/2} x\,100$$

where: RPD = *relative percent difference*
D_1 = *first sample value*
D_2 = *second sample value (duplicate)*

The RPD goals for this project are established by the laboratory for each methodology. Section II-B5.1 establishes RPD goals for field QC samples. If a variation from these guidelines occurs during analyses, the corrective action procedures outlined in Section II-3.1 will be initiated.

II-4.2.2.2 Accuracy

Accuracy is reported as the percent recovery of a parameter from a sample of known value with a given analytical procedure and analyst. The determination of the accuracy of a measurement requires knowledge of the true or accepted value for the value being measured. Accuracy may be calculated as follows:

$$Percent\ Recovery = \frac{SSR - SR}{SA} X\ 100$$

where: SSR = *spiked sample analytical results (for each compound in the spiking mix)*
SR = *original sample results (for each compound in spiking mix)*
SA = *concentration of spike added to sample (for specific compounds)*

The percent recovery goals for this project are established by the laboratory for each methodology. The percent recovery goals for analytical sampling submitted to laboratories are presented in the laboratories Quality Assurance Manual. If a variation from these guidelines occurs during the analyses, the corrective action procedures outlined in Section II-3.1 will be initiated.

II-4.2.2.3 Completeness

Completeness is a measure of the amount of valid data obtained from a data set compared with the amount that would be expected to be obtained under normal conditions. The percent completeness for a set of samples is calculated as follows:

$$Completeness = \frac{valid\ data\ obtained}{total\ data\ planned} x\ 100\%$$

The percent completeness goal for this project is 90 percent.

II-4.2.2.4 Reporting Limits

Reporting values for soils are in units of milligrams per kilogram (mg/kg) or micrograms per kilogram (µg/kg). Reporting values for groundwater are generally in units of micrograms per liter (µg/L). Reporting limits are established by the analytical laboratory for the analytes specified by the analytical methods at some value above the minimum detection limit (MDL). The reporting limit for each constituent for each method is presented in the laboratory method SOP summary sheets attached as Appendix II-A. Reporting limits are generally 3 to 10 times above the MDL and will be less than or equal to the applicable risk-based criteria, to the extent technically feasible. MDL values will be no greater than the reporting limits. It should be recognized that detection limits are sample matrix dependent and may be raised due to matrix interferences and/or dilution factors. Since reporting limits are based on detection limits, reporting limits may also rise.

II-4.3 (D3) Reconciliation with User Requirements

In order to evaluate the usability of the data for making project decisions, the data must be reconciled with the project objectives. The quality of the data will be assessed for project objective usability using the QC criteria outlined in Sections II-1.5.2 and II-4.2.1. Only data considered to be valid (i.e., the quality of the data is known) as determined through data validation, may be considered for reconciliation with the project objectives. The reconciliation process begins with a comparison of the sample reporting limits to the decision criteria. In general, for the data to be considered usable for making the project decisions, the sample reporting limits for each constituent must be less than or equal to the decision criteria. Reported less than results at sample reporting limits that exceed decision criteria may not sufficient for making project decisions based on those criteria.

After evaluating the usability of the data with respect to sample reporting limits obtained and project decision criteria, any potential biases and imprecision in results suggested by QC results must be assessed in order to evaluate the ultimate usability of the data for making decisions. Potential biases and imprecision in analytical results and data usability will be discussed in the data validation summary presented in the Quarterly Progress Reports and the RFI Report.