

BUREAU OF ENVIRONMENTAL REMEDIATION/REMEDIAL SECTION
GUIDANCE
SCOPE OF WORK (SOW) FOR A COMPREHENSIVE
INVESTIGATION

BER POLICY # BER-RS-018
PAGES: 5

Section Chief:  Date: 10/20/13
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Date of Revision: May 2013
Date of Revision: December 2005
Date of Revision: March 2001
Date of Revision: May 1996

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Date: June 1991

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1. INTRODUCTION

A Comprehensive Investigation (CI) is an investigation undertaken to define the nature and extent of environmental contamination at a site. The CI is generally the first step in the process of cleaning up a contaminated site. It is also a critical step in terms of reaching site closure in the most cost effective and streamlined manner. The data collected during a CI provide the framework for evaluating cleanup alternatives at a site. Thorough and well planned investigations will provide reliable information on which to base future remedial actions and can help facilitate more cost effective cleanup strategies. In order for KDHE to approve CI activities conducted by a potentially responsible party (PRP), they must be completed with our oversight under a formal legal agreement or order with the PRP. CI activities should be tailored to Site-specific circumstances, but generally satisfy the following fundamental objectives:

- Define and characterize known and potential source areas for contaminants of concern (COCs);
- Delineate the lateral and vertical extent of COCs in all environmental media;
- Characterize the environmental setting;
- Characterize the physicochemical properties and characteristics of COCs;
- Identify all human and ecological receptors potentially affected by COCs; and,
- Evaluate potential remedial action alternatives, including interim measures as necessary to protect human health and the environment.

2. PREPARING FOR A CI

The initial step in the CI process is submittal of a work plan that describes how the objectives mentioned above will be met. KDHE encourages frequent communication and coordination between all key project stakeholders throughout the CI process to help ensure that the investigative objectives are efficiently and effectively met.

General Considerations

There are a multitude of investigative activities, tools, and/or considerations that need to be evaluated when preparing a Work Plan. Such considerations may include, but are not necessary limited to, the following:

- Specific media to be assessed (e.g., soil, groundwater, surface water, sediment, soil vapor, indoor air, ambient air, etc.);

- Equipment needed to assess media of concern (e.g., direct-push rig, drill rig, etc.);
- Analytical parameters required for COCs, as well as their respective holding times and containers;
- Geologic and hydrogeologic conditions (i.e., depth to groundwater, depth to bedrock, groundwater flow direction, etc.);
- Geologic and hydrogeologic characteristics (i.e., geophysical surveys, hydrogeological evaluations, surveying, etc.)
- Site history and previous investigation(s) conducted; and,
- Nature and physicochemical properties of COCs (e.g., DNAPL, LNAPL, etc.).

Approach

Sites that pose an actual or eminent threat to human health or the environment must be addressed as quickly as possible, likely through implementing interim measures (IM). Ideally, with sufficient planning, CI activities can be completed in one streamlined phase to minimize mobilizations and costs. However, the initial CI data may not satisfy the CI objectives. In these cases additional investigative phases may be necessary. Additionally, for some sites it may be practical or beneficial to complete a CI in multiple phase(s) to incorporate early investigation findings into subsequent work scopes. PRPs should coordinate with KDHE prior to proposing a phased investigation program to ensure all stakeholders are on board with this approach. If a phased investigation program is approved, the initial work plan submittal should identify the phases in the working schedule. KDHE may request progress reporting to support a phased implementation during the CI process.

Elements of a CI Work Plan

The CI Work Plan must be approved by KDHE prior to commencement of any related activities. The site-specific components of a CI Work Plan generally include a: 1) field sampling plan (FSP); 2) quality assurance project plan (QAPP); 3) health and safety (H&S) plan; and, 4) detailed working schedule.

The FSP should be written so that a field sampling team unfamiliar with the site would be able to gather the samples and field information required. The FSP should also be consistent with State and Federal policies and guidance. Depending on the objectives of the CI, the FSP may include any of several components, including but not limited to the following: investigation procedures for collection of soil, groundwater, surface water, sediment, or air; sampling protocols; analytical methods, sample location rationale, etc.

KDHE requires that QAPPs be prepared in general accord with *EPA Requirements for Quality Assurance Project Plans (QA/R-5)* (EPA 2001) and *Guidance for Quality Assurance Project Plans (G-5)* (EPA 2002). U.S. Environmental Protection Agency (EPA)-has compiled a set of helpful references pertaining to data quality at <https://www.epa.gov/chemical-data-reporting/data-quality-assurance>. In addition, KDHE BER's Standard Operating Procedures (SOP's) are available online at <https://www.kdhe.ks.gov/187/BER-Policies>. All data will need to be validated at the appropriate quality control level to determine its usability.

Subsequently, it will be necessary to determine the number and types of quality control (QC) samples to be collected, which will vary depending on the quantity of samples to be collected and the intended use of the data. The most common types of QC samples collected during a CI are: field duplicates; equipment rinsates; trip blank samples; and field blanks. It is often necessary to update the QAPP throughout a project's lifecycle to ensure that the document encompasses all site-related activities.

A H&S plan submittal is necessary for completion of the Administrative Record (AR) file for a given site; however, KDHE does not review or approve health and safety documentation.

Timely Identification of Actual, Eminent or Potential Threats to Human Health

The most crucial and time sensitive objective of the CI process is to identify any actual, eminent or potential threats to human health posed by site-related contamination (e.g., direct contact with contaminated groundwater, soil and/or vapors). Activities necessary to complete this process may include:

- Conducting water well surveys consistent with BER-RS-056 - Considerations for Performing Water Well Surveys near Contaminated Sites if groundwater is impacted;
- Conducting residential soil testing if site related contamination may be present on nearby residential properties;
- Conducting vapor intrusion assessments if preliminary screenings suggest the pathway may be complete; and/or,
- Other actions as determined necessary by KDHE

The activities should be performed early in CI process or at the point site data indicate the site-related contamination may pose an actual, eminent, or potential threat to human health.

Pilot Tests

It may be appropriate to conduct bench- or pilot-scale treatability studies to evaluate corrective action alternatives as part of the CI process. Treatability studies are conducted to provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the Corrective Action Study (CAS) process and to support the subsequent remedial design of the corrective action alternative ultimately selected by KDHE. Treatability studies also serve to reduce cost and performance uncertainties to acceptable levels for treatment alternatives under consideration to permit a more reliable remedy selection process. Examples of treatability data gathering activities that might be applicable during the CI include: aquifer pumping tests, soil vapor/air sparge extraction pilot tests, or injection pilot tests. If there is a desire or need to conduct such activities, the PRPs must submit a treatability study work plan for KDHE review and approval.

Other Considerations

Environmental data are typically compared to the Tier 2 Levels, as provided in KDHE's RSK

Manual, which become the remedial goals for a site. However, in lieu of such direct comparison or Tier 3 Analysis, PRP's may elect to conduct a site-specific quantitative baseline risk assessment to evaluate human health and ecological risk and arrive at site-specific cleanup goals for a site. Please note, EPA-promulgated Maximum Contaminant Levels (MCLs) will be the cleanup levels for groundwater for all sites where groundwater is threatened or impacted based on appropriate points of compliance as determined by KDHE, independent of risk assessment findings. In these cases, soil cleanup levels will be based on risk and the potential for contaminants to leach from soil to groundwater. KDHE typically utilizes an outside contractor to support technical review of risk assessment documents. KDHE's direct and indirect costs associated with review and oversight of risk assessment activities will be at the PRP's expense. Risk assessments must be conducted in accord with applicable State and Federal guidance. Coordination with KDHE is key throughout the risk characterization and evaluation process. Scoping discussions between KDHE and the Respondent throughout the risk assessment process are essential to successful completion of the risk assessment effort. KDHE will ultimately determine the appropriate cleanup objectives for the site.

KDHE and/or PRPs may determine that numerical modeling may be necessary to fully satisfy the CI objectives. As with risk assessments, KDHE typically uses an outside contractor to support technical reviews of modeling documents. KDHE's direct and indirect costs associated with the review and oversight of modeling activities (including software purchases necessary to adequately review the model) will be at the PRP's expense.

3. CI IMPLEMENTATION

Once the CI Work Plan has been approved by KDHE, the next step in the CI process is implementation of the CI in accordance with the KDHE-approved Work Plan. The PRP must notify the KDHE Project Manager of field work by completing a "Field Activities Notification Form", a minimum of seven (7) days prior to initiation of work. The form is available on KDHE's website at: <https://www.kdhe.ks.gov/formcenter/environmental-remediation-4/bureau-of-environmental-remediation-fiel-46>.

KDHE provides oversight throughout the investigative process. A KDHE project manager may be present onsite for a portion or all of the field activities, depending on the site-specific circumstances and/or objectives. Oversight during the implementation step may include, but not be limited to, field oversight, collection of split samples, site reconnaissance (including the collection of photographic documentation), quality assurance/quality control audits, and/or field screening.

Documentation

Investigative documentation is a critical element to substantiating the data collected during the CI. It is important to demonstrate that project specific documentation supports the approved procedures (i.e., field sampling plan, quality assurance project plan, etc.). All activities should be documented in a field notebook, with photographic documentation as appropriate. Detailed field notes are required to document significant findings and deviations from the approved work

plan and must be provided in the CI Report. All substantive field deviations should be approved by the KDHE Project Manager prior to implementation.

Sampling locations should be documented so that they can be accurately relocated in the field, if necessary. Therefore, all sample locations should be documented using a global positioning system (GPS) instrument and/or survey. In addition, photographic documentation with respect to an identifiable feature should be collected from all sampling locations, as well as detailed measurements from a stationary point using a measuring wheel.

4. CI REPORTING

Once all phases of the CI field work are complete, a CI Report is generated in accordance with program specific and industry standards. The Report should contain a detailed description of the activities performed and an evaluation of the data and subsequent magnitude of environmental impacts with respect to applicable KDHE Tier 2 Risk-Based Standards. The Report should present the data in a clear and concise format with appendices containing relevant supporting documentation such as: field notes, boring logs, laboratory analytical data reports, QA/QC data validation summary, etc. Finally, the report will assess the need for additional investigation and/or remedial action, and will summarize potential implications relative to reported conditions and prospective receptors. An example CI outline is attached.

5. OTHER RELEVANT KDHE POLICIES

These additional KDHE policies (available online at <https://www.kdhe.ks.gov/187/BER-Policies>) may also provide useful information when developing a CI.

- [Recommended Procedures for Characterization and Disposal of Soil Cuttings- BER-RS-003](#)
- [Evaluating Future Land Use – BER-RS-005](#)
- [Final Guidance for Verification Sampling of Non-Hazardous Industrial Wastewater Ponds-BER-RS-006](#)
- [Minimum Standards for Model Use – BER-RS-007](#)
- [Investigation and Remediation of Salt \(Chloride\)-Impacted Soil and Groundwater – BER-RS-013A](#)
- [Potential Applicable or Relevant and Appropriate Requirements \(ARARs\)– BER-RS-015](#)
- [Considerations for Remedial Standards – BER-RS-033](#)
- [Determining Background Levels for Chemicals of Concerns – BER-RS-038](#)
- [BER-041 Total Petroleum Hydrocarbons \(TPH\) and Light Non-Aqueous Phase Liquid\(LNAPL\) Characterization, Remediation, and Management \(PDF\)](#)
- [Monitored Natural Attenuation of Volatile Organic Compounds in Groundwater – BER-RS-042](#)
- [Considerations for Groundwater Use and Applying RSK Standards to Contaminated Groundwater – BER-RS-045](#)
- [Filtering Water Samples Collected for Metal Analysis – BER-RS-046](#)
- [BER-RS-047 Presumptive Remedy Policy: Investigation and Cleanup of Nitrogen at Agriculture Related Sites](#)

- [Considerations for Performing Water Well Surveys near Contaminated Sites – BER-RS-056](#)
- [Sediment Policy – BER-ARS-045](#)

6. REFERENCES

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. § 9601 et seq. as amended by the Superfund Amendments and Reauthorization Act).

National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300).

EPA, 2010a, *National Functional Guidelines for Superfund Inorganic Methods Data Review*, EPA-540-R-10-011, available online at <https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100QR0M.txt> U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation, Washington DC, January.

EPA, 2008, *National Functional Guidelines for Superfund Organic Methods Data Review*, EPA-540-R-08-01, available online at <https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100PGY2.txt>, U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation, Washington DC, June.

EPA, 2002, *Guidance for Quality Assurance Project Plans (QA/G-5)*, EPA 240-R-02-009, available online at <https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2001IHPE.txt>, U.S. Environmental Protection Agency, Office of Environmental Information, Washington DC, December.

EPA, 2001, *EPA Requirements for Quality Assurance Project Plans (QA/R-5)*, EPA-240-B-01-003, available online at <https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1002IW2.txt>, U.S. Environmental Protection Agency, Office of Environmental Information, Washington DC, March.

EPA, 1988, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final*, EPA 540-G-89-004, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington DC, October.

KDHE, 2010a, *Risk-Based Standards for Kansas (RSK) Manual*, available online at <https://www.kdhe.ks.gov/775/Risk-based-Standards-for-Kansas>, Kansas Department of Health and Environment, Bureau of Environmental Remediation, Remedial Section, Topeka, October.

KDHE, 2007, *Kansas Vapor Intrusion Guidance*, available online at <https://www.kdhe.ks.gov/771/Kansas-Vapor-Intrusion-Guidance>, Kansas Department of Health and Environment, Bureau of Environmental Remediation, Remedial Section, Topeka, June.

KDHE, 2006, *Interim Measures*, BER-RS-029, available online at http://www.kdheks.gov/ber/policies/BER_RS_029.pdf, Kansas Department of Health and Environment, Bureau of Environmental Remediation, Remedial Section, Topeka, October.

KDHE, 2005a, *Potential Applicable or Relevant and Appropriate Requirements*, BER-RS-015, available online at http://www.kdheks.gov/ber/policies/BER_RS_015.pdf, Kansas Department of Health and Environment, Bureau of Environmental Remediation, Remedial Section, Topeka.

Attachment

Example CI Report Outline

- Executive Summary
- Introduction
 - Site Background
 - Purpose
- History and Environmental Setting
 - Site History
 - Site Environmental Setting
 - Human Health and Environmental Receptors
- Historical Site Investigations
- CI Field Protocols and Scope of Work
- Investigation Results
 - Groundwater Sample Results
 - Soil Sample Results
 - Vapor Intrusion Sample Results
 - Data Quality Assessment
- Nature and Extent of Contamination
- Contaminant Fate and Transport
- Preliminary Screening of Remedial Actions
- Conclusions and Recommendations
 - Conceptual Site Model
 - Comprehensive Investigation Conclusions
 - Recommendations for Future Actions
- Tables
 - Sampling Program Summary
 - Well Construction Detail
 - Static Water Level/Groundwater Elevation/NAPL Thickness
 - Current and Historical Analytical Results
- Figures (May be combined as appropriate)
 - Site Location/Surrounding Land Use
 - Site Layout
 - Potentiometric Surface Maps
 - Isoconcentration Contour Maps
 - Source Area Maps
- Other Documentation
 - Field Documentation (for all site activities)
 - Boring and Well Logs
 - Laboratory Analytical Reports
 - Photographs