

State of Alaska  
**DEPARTMENT OF ENVIRONMENTAL  
CONSERVATION**

**DIVISION OF SPILL PREVENTION AND RESPONSE  
CONTAMINATED SITES PROGRAM**



**Site Characterization Work Plan and Reporting Guidance  
for  
Investigation of Contaminated Sites**

**March 7, 2017**

# Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites

## Recommended Elements and Their Regulatory Basis

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### Introduction

The purpose of this guidance is two-fold. First, it is designed to increase the consistency of site characterization work plans and reports submitted by numerous consultants working on contaminated sites throughout Alaska. Second, it presents criteria to assist project managers in the Alaska Department of Environmental Conservation (DEC) with their work plan and report reviews under Title 18 of the Alaska Administrative Code, Chapter 75, Section 335 (18 AAC 75.335). While developing and reviewing work plans keep in mind that the work plan should be designed to:

- Determine if a discharge or release of a hazardous substance has occurred;
- Identify each (potential) hazardous substance at the site, include the concentration and extent of contamination; this information must be sufficient to determine cleanup options;
- Identify site characteristics or conditions that could result in ongoing site contamination including the potential for leaching of in situ contamination and the presence of leaking barrels, drums, tanks, pipelines, other containers, septic systems, dry wells or other contaminant sources;
- Evaluate the potential threat to human health, safety, and welfare, and to the environment from site contamination;
- Identify any interim removal action necessary under 18 AAC 75.330;
- Locate sources of known site contamination, including a description of potential releases into soil, sediment, groundwater, or surface water;
- Evaluate the size of the contaminated area, including the concentrations and extent of any soil, sediment, soil gas (if vapor intrusion is a potential concern), groundwater, or surface water contamination;
- Identify the vertical depth to groundwater and the horizontal distance to nearby wells, surface water, and any water supply intakes;
- Evaluate the potential for surface water runoff from the site and the potential for surface water or sediment contamination; and
- Identify the soil type and determine if the soil is a continuing source of groundwater contamination.

The work plan and report checklists which follow combine DEC regulations, Contaminated Sites Program (CSP) requirements, and ASTM International criteria. **The checklists are general guidelines; due to the inherent variability between contaminated sites, all elements of the checklists may not be required for every site work plan.** DEC staff, working with third party consultants, must determine which elements of this guidance document are applicable during the site characterization design and reporting stages.

The site cleanup rules require DEC site characterization work plan and report approval. After a work plan or report is received, CSP staff must ensure a systematic and consistent review. While the checklists are tools for establishing

the completeness of a work plan or report, Tables 1 and 2 will help reviewers determine quality and regulatory compliance. The left hand column of each table presents the specific regulatory citation in 18 AAC 75.335. The right hand column describes review criteria for evaluating each regulatory requirement. The criteria are used when conducting a review, preparing comments on a draft or final submittal, and preparing approval correspondence.

Submittals that meet these criteria are typically ready for review and approval; however, it is important to note that additional criteria may be applicable on a site-specific basis.

The items of a work plan or report detailed in this document are elements that can be used to convey a complete understanding of what is happening at a contaminated site. However, not all elements or items in this document will always be required by a DEC project manager due to variability with site specific needs. How this document is used is up to the discretion of the project manager. One option for use is to review a work plan or report and then check the applicable sections or elements in this document which need to be addressed in more detail. It is the responsibility of the DEC project manager to inform the Responsible Party and consultant of any work plan deficiencies.

## Elements of a Complete Work Plan

### Cover Page

- Name and signature of qualified environmental professional who prepared the work plan
- Site name
- DEC file number
- Hazard identification number

### Table of Contents

- List including page numbers, tables, figures, and appendices

### Acronyms and Abbreviations

- List all acronyms and abbreviations used in the work plan

### Introduction

- Project objectives
- Project time table/schedule
- List of qualified environmental professionals and qualified samplers working onsite

### Site Description and Background

- Current site location map with legend, orientation (north arrow) and scale
- Current vicinity map with legend, orientation, and scale
- Legal description/plat number
- Latitude and longitude datum
- Street address
- Dated aerial photographs
- Interviews with previous land owners, Responsible Parties, or others
- Description of prior land use
- Current institutional controls in place, if any
- Location of site structures/utilities/potable water sources (well)
- Location of property lines, buildings and nearby roads
- Presence of vent/fill pipes from an underground storage tank (UST), above ground storage tank (AST), drums, waste piles, septic systems, or other potential sources of contamination
- Evidence of leaks or stained soils
- Known or suspected releases, spills, disposal areas, and contaminant sources
- Building surveys
- Brief summary of past field efforts, if any

### Contaminants of Potential Concern (COPCs)

- Tabular list of COPCs
- Proposed cleanup levels
- Screening levels
- Analysis to be performed

### Preliminary Conceptual Site Model

- Description of potential receptors

- Potential migration pathways
- Potential points of exposure

### **Sampling Plan**

- Description of problem to be studied
- Actions and decision that may result
- Data quality objectives
- Decision unit identification
- Narrative of sample locations and rationale
- Scaled site diagram with proposed sampling locations (include legend and orientation arrow)
- Options/decision process for additional step-out sampling
- Description of review/approval process for any modifications/deviations to the approved plan
- Deviations from field sampling guidance
- Survey methods for documenting sampling locations, groundwater elevations, and site features

### **Field Screening**

Description of the field screening sample collection intervals/locations and screening methods

- Test kits
- Specification of test kit use, sensitivity, interferences
- Hand held devices
- Headspace methodology
- Direct push UltraViolet Optical Screening Tool (UVOST™), Rapid Optical Screening Tool (ROST™)

### **Sample Collection Methods-** *describe in detail how any of the methods will be used*

Soil samples

- Test pits
- Borings
- Direct push
- Other (specify)

Groundwater samples

- Method of well installation and development
- Purging techniques
- Low flow methods
- Well measurements and instrumentation used
- Groundwater elevations/benchmarks or measuring points (methodology)
- Use of data loggers to monitor groundwater elevations changes over time
- Fuel product recovery and measurement
- Groundwater flow direction
- Use of pumps, or passive diffusion systems
- Specified parameters of measurement
- Ancillary field data such as temperature, dissolved oxygen, pH, water hardness, etc.

Other matrices

Soil gas

- Leak detection methods
- Passive sampling

- Active sampling
- Summa canisters
- Sorbent tubes
- Certification of cleanliness
- Date and calibration of control valves
- Unique Identification (ID) number

Indoor air/Outdoor air

- Summa canisters
- Gas pumps
- Leak detection methods
- Sorbent tubes
- Certification of cleanliness
- Date and calibration of control valves
- Unique Identification (ID) number

Surface water/Sediment

- Clean hands/dirty hands (dedicated sampler and dedicated logistical support)
- Use of equipment such as Van Dorn sampler or Kemmerer bottle, etc.
- Ancillary field data such as temperature, dissolved oxygen, pH, water hardness, etc.
- Subsampling

Biota

- Environmental molecular diagnostics
- Species quantification
- Physiology or biological stresses
- Tissue sampling

Pore water

- Piezometers
- Sediment centrifugation
- Sediment squeezing
- Ancillary field data such as temperature, dissolved oxygen, pH, water hardness, etc.

**Field Quality Control Measures (See also DEC Lab Data and QA Policy Technical Memorandum)**

- Proposed quality control of samples (temp. blanks, trip blanks, field duplicates, chain of custody etc.)
- Sample preservation methods
- Unique ID number
- Use of cooler and “ice”

**Investigative Derived Waste Management**

- Use of liners
- Covered stockpiles
- Decontamination and monitoring well development and purge water
- Other (list)

**Field Documentation**

Log books and recorded field observations

- Date
- Weather and other salient observations
- Sampling team members

- Field measurements
- Documentation of instrument calibration
- Location of activity and site conditions
- Field observations and comments
- Changes to sampling protocol or work plan deviations
- Site photographs
- Site sketches
- Survey and location of sampling points
- Global Positioning System (GPS) coordinates

### **Analytical Methods**

Name of laboratory completing analysis

Request for analysis

- Turnaround times
- Types of containers to be used
- Type of preservation used
- Sample volumes to be collected
- Limit of Detection and Limit of Quantitation

Soil

- Potential constituents
- ADEC/U.S. Environmental Protection Agency (EPA)/Laboratory method

Groundwater

- Potential constituents
- ADEC/EPA/Laboratory method

Surface water

- Potential constituents
- EPA/Laboratory method

Sediment

- Potential constituents
- EPA/Laboratory method

Other

- Potential constituents
- EPA/Laboratory method

### **Other**

- Other project specific needs as determined by the project manager

### **Tables and Figures**

- Include pertinent data in tabular form
- Figures with orientation, scale and legend or key as applicable

### **Appendices**

- List of reference documents or pertinent information that will be reviewed by DEC and used by field staff  
i.e. qualified environmental professionals or qualified sampler resumes

Upon completion of the work plan phase of the project, a report must be submitted to DEC in accordance with 18 AAC 335(c). One purpose of the report is to provide a complete description of the nature and extent of

contamination detected during the field sampling and analysis process. The report is also intended to propose any additional site characterization required to identify the limits of contaminated soil and groundwater, interim cleanup actions, or, if the site characterization is considered to be complete, recommended methods for site cleanup. The site characterization report presents the findings of the implemented work plan. Site figures, maps, the preliminary Conceptual Site Model, and other information from the work plan are updated, and any new supporting tables and figures are added.



## Elements of a Complete Characterization Report

### Cover Page

- Name and signature of qualified environmental professional or qualified sampler responsible for collecting samples.
- Name and signature of qualified environmental professional responsible for interpreting the data.
- Name and signature of qualified environmental professional responsible for reporting the data.
- Site name
- DEC file number
- Hazard identification number

### Table of Contents

- List of page numbers, tables, figures, and appendices

### Acronyms and Abbreviations

- List all acronyms and abbreviations used in the work plan

### Executive Summary

### Introduction

- Project objectives
- Recap of site history
- Legal description
- Current owner operator
- Responsible party
- Latitude and longitude datum
- Other pertinent information that the project manager may deem necessary

### Field work

- Narrative of field activities-include who, what, when, where, and how activities occurred
- Narrative of field modifications/deviations and how they were handled

**Results and Findings-** narrative of site conditions that communicate the nature and extent of contamination present based on the following:

- Analytical results with any data qualifications noted (tabular form) and narrative of findings
  - Soil data
  - Field screening results
  - Analytical results
  - Groundwater analytical data
  - Other environmental media analytical data (such as air, soil gas, surface water, and sediment)

Conceptual Site Model (updated)

Update of maps and figures with text boxes indicating results

- Scale and identification of north direction
- Location and depth of samples including monitoring wells
- Cross sectional view with contamination plumes
- Plan view with contamination plumes
- Ground water elevation contour map and direction of groundwater flow

Exploration logs

- Borings
- Well installation/sampling logs
- Soil gas probe installation log
- Building surveys

### **Proposed Cleanup Levels**

- Include proposed cleanup levels, and narrative to explain why they are appropriate for the site
- Cumulative risk evaluation, if applicable

### **Proposed Cleanup Techniques**

- Include proposed cleanup techniques and discussion of why they were selected or what further information is required to select

### **Quality Assurance Assessment**

#### Data Quality

- Accuracy
- Precision
- Representativeness
- Comparability
- Sensitivity and Quantitation Limits

#### Data Usability

- Data Quality Objectives
- Completeness

### **Conclusions**

- Discussion of conclusions

### **Recommendations**

### **Tables and Figures**

- Updated tables and figures with information based on findings and results
- Historical sample results in tabular form
- Groundwater flow direction and gradient (seasonal variations)
- Statistical analysis of data trends

### **Appendices**

#### Laboratory report

- Copy with analyst signature
- Laboratory Quality Control information
- Case narrative of data qualifiers
- Chain of custody forms
- Laboratory sample receipt forms

#### Technical memorandum requirements

- DEC Laboratory Data Review checklist
- Consultant Quality Assurance narrative

#### Field notes

#### Photos

**Table 1- Work Plan Regulatory Requirements and Review Criteria**

Work Plan Design Element	DEC Review Criteria
<p><b>18 AAC 75.335 (b)(1)</b> Prepared by a qualified environmental professional.</p>	<p>Verify preparer meets qualified environmental professional criteria in accordance with 18 AAC 75.333.</p>
<p><b>...335(b)(2)(A)</b> Determine if a discharge or release of a hazardous substance has occurred. <b>...335 (b)(2)(B)</b> Identify each (potential) hazardous substance at the site, include the concentration and extent of contamination; this information must be sufficient to determine cleanup options.</p>	<p>Sampling approach and data use objectives are clearly stated. Field screening and analytical sampling methods are presented and discussed. SOPs and field Quality Control measures are provided. The site diagram clearly shows proposed contaminant sampling location(s). Analytical methods and the proposed laboratory are provided.</p>
<p><b>...335(b)(2)(C)</b> Identify site characteristics or conditions that could result in ongoing site contamination including the potential for leaching of in-situ contamination and the presence of leaking barrels, drums, tanks, [pipelines], other containers [or other sources].</p>	<p>Site characteristics, such as the presence of preferential contaminant migration pathways, are considered. Potential contaminant sources are identified and discussed. The potential for sub-surface leaching is considered and discussed.</p>
<p><b>...335 (b)(2)(D)</b> Evaluate the potential threat to human health, safety, and welfare, and to the environment from site contamination.</p>	<p>The preliminary conceptual site model (CSM) depicts suspected contaminant sources and potential human health and ecological exposure pathways. The work plan is designed to gather more information about pathways such as the presence/absence of nearby drinking water wells, surface water bodies, buildings with potential VI, etc.</p>
<p><b>...335 (b)(2)(E)</b> Identify any interim removal action necessary under 18 AAC 75.330.</p>	<p>If there is an immediate exposure concern or on-going release, an interim removal action should be considered and may be necessary.</p>
<p><b>...335 (b)(2)(F)</b> Locate sources of known site contamination, including a description of potential releases into soil, sediment, groundwater, or surface water.</p>	<p>All known and suspected source areas and releases to environmental media are identified and are addressed by the information in the preliminary CSM.</p>
<p><b>...335 (b)(2)(G)</b> Evaluate the size of the contaminated area, including the concentrations and extent of any soil, sediment, groundwater, or surface water contamination.</p>	<p>The sampling approach is designed to determine both the lateral and vertical extent of contamination.</p>

<p><b>...335 (b)(2)(H)</b> Identify the vertical depth to groundwater and the horizontal distance to nearby wells, surface water, and water supply intakes.</p>	<p>If necessary, the work plan is designed to determine the depth to groundwater and to measure the horizontal distance to nearby receptors.</p>
<p><b>...335 (b)(2)(I)</b> Evaluate the potential for surface water runoff from the site and the potential for surface water or sediment contamination.</p>	<p>The sampling approach accounts for surface water runoff and is supported by the information in the CSM.</p>
<p><b>...335 (b)(2)(J)</b> Identify the soil type and determine if the soil is a continuing source of groundwater contamination.</p>	<p>The sampling approach accounts for soil-water partitioning characteristics and the potential for contaminants to leach to groundwater.</p>

**Table 2-Site Characterization Report Review and Approval Criteria**

<b>Site Characterization Report</b>	<b>DEC Review Criteria</b>
<p>18 AAC 75.335 (c) (1) Prepared by qualified environmental professional.</p>	<p>Qualified in accordance with 18 AAC 75.333.</p>
<p>18 AAC 75.335 (c) (2) Sets out information obtained from activities in accordance with a site characterization work plan.</p>	<p>Information in the report matches the approved site work plan. The report includes the updated CSM, exploration logs, and a description of unique hydro geologic conditions or other site-specific conditions. Any deviations from the approved work plan are presented, explained, and documented.</p>
<p>18 AAC 75.335 (c) (3) Sets out results of sampling and analysis.</p>	<p>Sampling results are well organized in tabular format. Field screening results can be matched with the corresponding analytical samples. Sample locations are depicted on the site diagram and can be easily cross-referenced against data tables. The requirements in the March 2009 <i>Environmental Laboratory Data and Quality Assurance Requirements</i> technical memorandum have been met.</p>
<p>18 AAC 75.335 (c) (4) Demonstrates that the inspections, sampling and analysis performed adequately characterize the extent of hazardous substance contamination.</p>	<p>Sampling results and the report's narrative conclusions either clearly support that characterization sampling has defined the extent of contamination, both vertically and horizontally, or else identify additional site characterization efforts intended to complete the delineation of the contamination.</p>
<p>18 AAC 75.335 (c) (5) Proposes cleanup techniques for the site.</p>	<p>The proposed cleanup levels are identified and the efficacy of the proposed cleanup method is clearly explained and accounts for site-specific variables and limiting factors.</p>

## References

ADEC, Policy Guidance on Developing Conceptual Site Models, January 2017

ADEC, Monitoring Well Guidance, September 2013

ADEC, Underground Storage Tanks Procedures Manual, Guidance For treatment of Petroleum-Contaminated Soil and Water and Standard Sampling Procedures, August, 2014

ADEC, Technical Memorandum- Environmental Laboratory Data and Quality Assurance Requirements, February 2017

ASTM International, 2013 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process Volume 11.05, 1527-13

ASTM International, 2011 Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process, Volume 11.05, 1903-11