Montana Remedial Investigation Guidance for Petroleum Releases

Draft

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Remedial Investigation of Petroleum Releases

Purpose:	The purpose of this document is to describe the objectives, expectations, and detailed items necessary for a remedial investigation (RI) of a petroleum release to meet requirements in state and federal laws; these include a RI work plan and a RI report of the work, data, results, and recommendations for additional remediation work to resolve the release.
Scope:	This guidance applies to petroleum products and constituents of petroleum products released into the environment from petroleum storage tank systems that are regulated under the Petroleum Storage Tank Cleanup Act (§75-11-301 et seq.) or the Montana Underground Storage Tank Act (§75-11-501 et seq.) and administrative rules promulgated thereunder. This guidance supersedes all previous versions of guidance addressing a RI of petroleum storage tank releases.

Revision Date	Revision Description
October 2017	Extensive update to previous RI guidance including the following: removed formats for RI-02 work plan and report; all RI work are combined in single work plan and single report. The following were added: examples of maps, well/boring logs, tables; and section detailing expectations and form for Release Closure Plan.

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Referenced documents available at DEQ's website:

- MT DEQ Risked-Based Corrective Action Guidance for Petroleum Releases
- MT DEQ Remedial Alternatives Analysis Guidance
- MT DEQ Release Closure Plan
- MT DEQ Vapor Intrusion (VI) Guidance

Remedial Investigation (RI) Guidance

Montana Department of Environmental Quality (DEQ)
Petroleum Tank Cleanup Section (PTCS)

Overview

This DEQ guidance describes the objectives and expectations required for a remedial investigation (RI) to comply with Montana and federal law that addresses petroleum tank release (Release). These include specific items for a RI work plan and detailed items for a RI report. Release in this guidance encompasses all leaks, spills, and overflows of petroleum or petroleum products from petroleum storage tank (PST) systems including but not limited to underground storage tanks (UST), aboveground storage tanks (AST), piping, sumps, and dispensers. The Administrative Rules of Montana (ARM) 17.56.604 include the two following stated requirements:

> *In order to determine the full extent and location of soils contaminated by the release and the presence and concentrations of free and dissolved product contamination in the surface water and in ground water, owners and operators must conduct a remedial investigation of the release, the release site, and the surrounding area possibly affected by the release…*
>
> *A remedial investigation work plan must be submitted to the department prior to implementation by the owners and operators*.

Objectives

The RI objectives for each Release are to collect sufficient information and data needed to meet the following purposes: document the impacts and potential impacts on public health and the environment; recommend and select effective cleanup methods to protect human health and the environment; and consider reliable closure pathways to resolve the Release.

Expectations

DEQ expects an owner and/or operator (O/O) of a PST system – including properties that historically had a PST system (Facility) – associated with a Release to accomplish the following:

- Obtain professional environmental consulting service to plan and conduct a RI; the consultant represents the O/O and should be experienced with successful investigations, cleanups, and resolutions of Releases;
- Meet with the O/O's consultant and DEQ's project manager to discuss the Release, plan work required to complete a RI, and develop a plan to resolve the Release;
- Prepare and submit a RI work plan (WP) to DEQ for review and approval;
- Conduct the RI according to a DEQ-approved WP and maintain contact with DEQ. Recommend and discuss WP modifications required to achieve the RI objectives. DEQ will approve agreed upon WP modifications;
- Submit a single comprehensive RI report that includes a completed Release Closure Plan;
- Complete the RI within 12 months of DEQ's WP approval.

The RI should be conducted using current scientific and engineering principles, technology, and methods to complete with a reasonable degree of certainty all of the following:

- Prepare a Facility history including relevant information concerning the current and historical property use and physical and legal aspects of the property that may affect the Release, its impacts to human health and the environment, or its investigation, cleanup, and monitoring.
- Report on the background of the Release including known and suspected petroleum sources, known and potential petroleum impacts, and previous investigations of petroleum release at the Facility and adjacent properties, and any actions taken to address the Release.
- Determine the horizontal and vertical extent of petroleum impacts to soil via collection and appropriate laboratory analysis of samples as specified in DEQ's Risked-Based Corrective Action Guidance for Petroleum Releases (RBCA) Table A – Testing Procedures for Soils.
- Determine the extent and magnitude of petroleum impacts to surface water and groundwater plume via collection and appropriate laboratory analysis of samples as specified in DEQ's RBCA Guidance Document Table C – Testing Procedures for Groundwater.
- Determine the extent and magnitude of contamination in any other media such as soil gas, petroleum vapors collecting inside structures, and utility lines (including backfill and bedding material) when applicable.
- Identify and investigate currently known and potential receptors that may be impacted by the Release. All potential receptors should be listed whether an impact has been proven or discounted. Include discussion of information and data supporting whether a receptor is or is not impacted.
- Identify and investigate all probable routes of exposure from the Release to identified receptors. In addition to the typical routes such as direct contact or drinking of groundwater, the RI should also consider routes such as petroleum-vapor intrusion into buildings, permeation of water supply lines, or any other potential pathways.
- Mitigate risks if unexpected conditions are identified that may pose an immediate threat to receptors at any time during the investigation; and the O/O or their representative should immediately notify DEQ.
- Identify issues and obstacles that interfere with achieving the RI objectives; promptly discuss issues with DEQ's project manager; and recommend appropriate modifications to the WP that will ensure the RI objectives are met.
- Investigate other site-specific surface and subsurface issues related to the Release as required by DEQ's project manager.
- Prepare detailed maps, cross sections, boring logs, well completion logs, and summary tables that illustrate and summarize the site-specific data.
- Complete a Release Closure Plan using the DEQ-provided form.
- Prepare and submit a RI report to DEQ.

Remedial Investigation Work Plan and Report Expectations

The WP and report expectations discussed in this guidance and detailed below address the issues and expectations for most petroleum releases. Use of this guidance will facilitate preparation and review of documents; ensure that required information is collected to document the impacts and potential

impacts on public health and the environment; recommend and chose effective cleanup methods; and consider reliable closure pathways to resolve the Release.

O/Os and their consultants are encouraged to contact DEQ's project managers to confer on draft work products as they are being prepared for the RI, clarify any portion of a WP request that is not clearly understood, and propose site-specific modifications to WP tasks necessary to meet RI objectives. DEQ will work with the O/Os and their consultants to define the additional WP tasks and expectations. Only DEQ can approve modifications to the WP tasks and report expectations in this guidance.

DEQ will use this RI Guidance to review submitted WPs and reports. DEQ's approval of the modifications is required before the work is completed, not after. O/Os and their consultants may proceed with work plan tasks prior to DEQ's approval of the WP; however, there is a risk of work completed prior to DEQ's approval might result in methods, data, or information not being approved after-the-fact and additional or different work being required.

RI Work Plan

When DEQ requests a RI, the O/O and their consultant will prepare a WP in accordance with the expectations for a RI (refer to WP Expectations detailed below) and submit the WP to DEQ for approval. DEQ may also provide site-specific guidance to the O/O for additional items to be included or excluded in the RI. DEQ will provide a copy of the submitted WP to the county sanitarian and other local or tribal government officials with jurisdiction over the release for review and comment. If a Release is eligible for reimbursement from the Petroleum Tank Release Cleanup Fund (PTRCF), the Petroleum Tank Release Compensation Board (PTRCB) staff will also be provided a copy.

After reviewing and considering comments received from local and tribal governments and the PTRCB staff, DEQ will review and approve the WP if it meets the detailed RI WP Expectations listed below and site-specific guidance provided by the DEQ project manager. The O/O will be notified of DEQ's approval and a deadline to have the work outlined in the WP completed and a report submitted to DEQ. DEQ will determine a reasonable deadline based upon severity of risks posed to human health, safety, and the environment, the amount of prior work completed, and other relevant factors; however, this deadline should not exceed 12 months from the date DEQ approves the WP.

Because remedial investigations begin with many unknowns the full scope cannot be fully determined in many cases until the WP is underway; therefore, additional scopes of work (e.g. utility corridor investigation, petroleum vapor intrusion of structures) may be required to fully define all risks associated with the Release. In the past this process entailed preparation of a new WP; however, under current guidance a modification to the single WP is preferred.

The O/O and their consultant are expected to communicate with DEQ regarding recommendations to modify the WP to better achieve RI objectives and about any issues that are not clearly understood regarding completion of the WP. If unexpected conditions are identified that may pose an immediate risk to receptors at any time during the investigation, the O/O or their consultant should immediately notify DEQ and take steps to mitigate the risks.

RI Report

DEQ expects that one RI report should clearly and comprehensively document the full investigation of the Release (refer to Report Expectations detailed below). Multiple RI iterations are not DEQ's

preferred method; rather, it is incumbent on the O/O and their consultant to be effective and efficient in using a single WP and a comprehensive report to fully investigate and document the Release.

Upon completion of fieldwork, data collection and analysis; the O/O should document the results of the investigation in accordance with the RI Report Expectations below and site-specific guidance provided by the DEQ project manager. The results of all WP tasks, conclusions, recommendations, a completed Release Closure Plan, and all supporting data should be included in the RI report. DEQ will evaluate the submitted report based on the detailed RI report expectations listed below; if DEQ determines additional information, data, analysis, or corrections are required to meet RI objectives then DEQ will notify the O/O and their consultant of report deficiencies.

Remedial Investigation – Work Plan Expectations

Montana Department of Environmental Quality (DEQ)
Petroleum Tank Cleanup Section (PTCS)

This section describes items to assist O/O and their consultants to meet the minimum requirements for a Remedial Investigation (RI) Work Plan (WP) by Montana and federal laws. This guidance provides owners and operators (O/O) and their consultants with the basic expectations for a RI WP before it will be approved by DEQ. It is the O/O's responsibility to confer with the DEQ project manager to determine if, and what, modifications to the WP will be necessary based on potentially changing conditions at the Facility.

DEQ will evaluate the WP against the detailed RI WP requirements listed below; and site-specific guidance provided by the DEQ project manager; and if found to adequately address all requirements the WP will be approved. If the WP is not approved, DEQ will notify O/Os and their consultant of deficiencies. Under normal circumstances the RI should be completed within 12 months of DEQ's WP approval or a mutually agreed upon date; however shorter timeframes may be required based upon the severity of risks the release poses to human health, safety, and the environment.

Section 1: Cover Letter

Cover letter should be no longer than one page and include the following:

- Date
- Responsible party's name, mailing address, and email address
- Contact person's name, mailing address, and email address (if different from above)
- Subject line with the following information:
  - Remedial Investigation Work Plan for the petroleum release at (Facility name, street address, town), MT (zip code)
  - DEQ Facility ID (number), Release (number), and Work Plan (number)
- Introductory paragraph containing reference to DEQ's request for Remedial Investigation Work Plan and general scope of work to be conducted
- Consultant's name, mailing address, and email address (if not on letterhead)
- Name of person who prepared the Work Plan

Section 2: Facility History/ Release Background

Summarize the currently known history of the Facility and Release background including the following:

- Owner/operator/responsible party: addresses, phone numbers
- Previous Facility use/owner/operator information
- Current Release: discovery date, cause and source, type and amount of petroleum products lost
- Type of petroleum products stored at Facility
- Summary of initial actions undertaken/when and by whom

Section 3: Summary of Facility Conditions

Summarize the current Facility conditions including the following:

- Results of initial site reconnaissance
- Surface cover and soil type if known
- Drinking water supply (community, public water system, private wells)
- Depth to first groundwater if known
- Known and suspected contaminants and potential exposure and/or receptor concerns

Section 4: Work Plan Maps

Maps used to illustrate WP are expected to be to-scale and use currently available base maps. If a CAD or drafted-to-scale site map(s) is not available for the Facility then an aerial-photo base is permissible for the WP only. Maps should have a North arrow, scale, map legend, and a title including site name.

- Location map – preferably a reproduction of a USGS or other topographic map annotated with location of Facility
- Site map – map(s) that illustrate features for planning WP tasks including at a minimum the following:
  - Petroleum sources (known and potential) including current and former PST system(s)
  - Facility buildings
  - Planned area(s) of investigation activities
  - Adjacent properties and buildings
  - Property boundaries
  - Surface cover
  - Property access points including named/numbered streets and alleyways
  - Predicted or known groundwater flow direction(s)
  - Underground utility mains and service lines if known
  - Other site-specific map features required by DEQ

Section 5: Objectives of Investigation

State the site-specific objectives for the RI of this Release.

- Specific goals of this investigation
- Identify and state the purpose and objectives of each task

Section 6: Minimum Work Plan Tasks

This section defines expectations for tasks that will be defined, planned, and budgeted in the WP; however, they are not intended to be performed during the generation of the WP. Rather the work defined in these tasks will occur during the implementation of the DEQ-approved WP.

- Project management for all tasks related to the WP
- Participate in a Planning Meeting with the O/O and DEQ's project manager to develop a plan to complete RI and resolve the Release
- Describe the WP tasks; and solicit bids as required from subcontractors
- Prepare a WP and submit it to DEQ for approval
- Mobilization and travel to/from the Facility to conduct onsite WP tasks
- Research and compile a Facility History including the following:
  - Ownership history to at least the time when the Release could have occurred

  - Facility operational history to at least the time when the Release could have occurred
  - History/cause of all releases associated with the Facility
- Complete Receptor Survey
  - Identify all potential exposure media, exposure points, and receptors in the potential area of the Release (e.g. surface/subsurface soil, groundwater, surface water, structures, utility corridors, drinking water and irrigation wells, storm and sanitary sewers, and sumps)
  - Water supply wells located within one-half mile radius of Facility
  - Identify potential migration pathways and discuss completion of potential pathways
  - Determine extent and magnitude of petroleum impacts to the receptors
  - Materials of construction, completion methods, and depth below ground surface of data related to petroleum impacts and receptor
- Investigate each of the following WP-specified media (soil, water, and vapor)
  - Description of investigation methodology (test pits, borings, direct push, etc.)
  - Standard Operating Procedures (SOPs) for sampling methodology, field screening, laboratory analysis, and QA/QC plan for laboratory data
  - Submit all samples to an analytical laboratory for analysis of petroleum constituents as outlined by Montana Risk-Based Corrective Action Guidance for Petroleum Releases (RBCA Guidance) and geochemical indicators as requested by DEQ
  - Determine source area(s) and the extent and magnitude of petroleum impacts
  - Describe method(s) for evaluating the validity of laboratory results (QA/QC methods)
  - Data compilation
- Recommend and discuss additional work to be included in the WP required to achieve the RI objectives; DEQ will approve agreed upon WP modifications. Examples of WP modifications include the following:
  - Additional investigations – petroleum vapor in soil, petroleum vapor intrusion of structures, or utility/utility corridor – warranted based on the petroleum impacts to soil or groundwater
  - Additional borings or monitoring wells necessary to delineate petroleum source and plume
- Prepare detailed maps to illustrate the results of WP tasks (see RI Report Expectations below)
- Prepare a Release Closure Plan (RCP)
  - Complete a Release Closure Plan using DEQ's Excel spreadsheet (refer to RCP format below and use the RCP Excel Spreadsheet form available at DEQ's website)
  - O/O should discuss and review the Release Closure Plan with O/O's consultant and DEQ's project manager prior to RI Report submittal
- Prepare a detailed RI report
  - Consolidation and tabulation of data
  - Evaluation and interpretation of data and results
  - Results, Conclusions, and Recommendations

Section 7: Investigation Methods, Equipment, Technology, and Personnel

Describe the proposed methods used to obtain and analyze field data that will be collected during the assessment of petroleum impacts to soils, groundwater, and other receptors.

- Generic type of drilling rig or auger utilized (hollow stem auger, air rotary drilling rig, etc.)

- Adequate observation and recording of sub-surface conditions requires an experienced geologist or geological engineer (or other experienced professional equivalent) onsite to describe and log the cores from all borings during installation. To meet the objectives of an RI stated in Montana and federal law a professional with proven competency to produce well/boring logs that document and measure onsite geologic conditions affecting fate and transport is necessary. Typical environmental field technicians do not have this skill and experience. These professional expectations are intended to insure the following:
  - Stratigraphy beneath the Facility and Release area is scientifically described in the field
  - Boring is documented with a detailed graphic log using a standard format such as the Unified Soil Classification System (USCS)
  - Document depth to first groundwater and confining layers
  - Document vertical extent of petroleum impacts based on field-screening
  - Screened intervals for wells can be planned with respect water saturated zones(s) and petroleum impacted zones
  - Lateral stratigraphic continuity and/or variability may be evaluated
- Type of soil samples, sampling interval, field screening procedures, sample containers, decontamination procedures, and sample preservation
- Monitoring well installation procedures based on site-specific subsurface stratigraphy will include the following:
  - Total depth(s) for wells
  - Screened interval, length of screen and slot size
  - Type of annular material (sand pack); type of annular sealant, and surface completion
- Minimum expectations for well/boring logs are outlined in this Guidance; inadequate logs may result in DEQ not accepting the RI report
- Monitoring well development procedures including type of development and criteria to be used for determining sufficient well development
- Time interval between well completion and first monitoring event to allow for equilibration
- Product/water level gauging procedures: field surveying methods; method of product/water elevation measurement
- Groundwater sampling method(s), static water levels, depth of sample tube or pump, sample containers, and sample preservation
- Petroleum vapor sampling method(s), locations, types, and sample containers (if requested)
- Methods of waste disposal: soil/rock cuttings, development water, purge water, aquifer test water, and free product
- Chain-of-custody procedures
- Geophysical test procedures (if requested)
- Aquifer test procedures (if requested)
- Analytical procedures: laboratory name and address, analytical methods, trip and field blanks
- Other site-specific methods and procedures specified in WP

Section 8: Schedule and Reporting

The investigation to define the extent and magnitude of contamination of the Release and the RI report are expected to be completed within 12 months of DEQ's WP approval as stated above. O/O or their

consultant is expected to provide sufficient data and information to have a discussion with DEQ's project manager upon the completion of critical tasks such as the following:

- Installation soil borings, monitoring wells, or other sampling points
- Monitoring of petroleum-impacted media
- Recommend modification(s) to work plan
- Receipt of analytical data
- Preparation of Release Closure Plan
- Other site-specific milestones

Section 9: Appendices for Work Plan

DEQ may require site-specific attachments to the WP; however, the following appendices for an RI WP are expected to be included in the report.

- Quality assurance/quality control (QA/QC) plan
- Standard Operating Procedures (SOPs) for all investigation methods and sampling protocols
- Disposal of investigation derived waste plan
- Budget detailing costs for each WP task if the O/O expects to apply for reimbursement from the Petroleum Tank Release Compensation Fund, or upon DEQ's request

Remedial Investigation – Report Expectations

Montana Department of Environmental Quality (DEQ)
Petroleum Tank Cleanup Section (PTCS)

A Remedial Investigation (RI) is required under Montana and federal law to determine the extent and magnitude of contamination associated with a petroleum release (Release) and to evaluate the risk it poses to human health, safety, and the environment. This outline provides owners and operators (O/O) and consultants with the basic Expectations for a Remedial Investigation Report (Report). It is the O/O's responsibility to stay in contact with the DEQ project manager to determine whether modifications to the WP will be necessary to complete RI objectives.

DEQ will evaluate the Remedial Investigation Report against the detailed RI report expectations listed below; and if found to adequately investigate the Release and address all requirements, the Report will be accepted. If DEQ determines additional information, data, analysis, or corrections are required to meet RI objectives then DEQ will notify the O/O and their consultant of report deficiencies. As stated above, the RI is expected to be completed within 12 months of DEQ's approval of the WP or a mutually agreed upon date.

Note: DEQ expects a certain amount of detail in the WPs and reports submitted during the investigation, cleanup, and monitoring of a Release from a PST system to meet the requirements of Montana and federal law. DEQ expects the remedial investigation will be completed in timeframe that will allow for the submittal of one comprehensive report. In the few instances where multiple reports are required, some information may be duplicated in follow-up reports. Information and details that should not change significantly may be excerpted from other reports with little or no modification (e.g., facility location, geology, hydrogeology, sampling protocol followed for drilling or groundwater sampling, QA/QC procedures, Standard Operating Procedures (SOPs), etc.). However, all tables, maps, and the Release Closure Plan should be updated when additional data are collected or available for each successive report.

Title Page

- Title of report: Remedial Investigation Report for
- Facility name
- Facility address
- DEQ Facility ID Number and Release Number
- Responsible party's name, mailing address and phone number
- Contact person's name, mailing address and phone number (if different from above)
- Consultant's name, address and phone number
- Date report prepared

Executive Summary

The executive summary should not exceed one page in length. It should provide a succinct summary of the investigation, findings, conclusions, and recommendations.

Purpose and Objectives of Investigation

State the site-specific purpose of this investigation. List the tasks expected to conduct the investigation and briefly describe the objectives of each.

Facility History and Release Background

The history of the Facility should include detailed information about the current and historical property use; and the physical and legal aspects of the property that may affect the Release and its impacts to human health and the environment. The background of the Release should include known and suspected petroleum sources, known and potential petroleum impacts, any actions taken to address the Release, and previous investigations of petroleum release(s) at the Facility and adjacent properties.

- Describe the history of operation of PST system(s) at the Facility including the following:
  - Owner/operator of the property, the Facility, and of the PST system: addresses, and phone numbers
  - Previous use information of Facility
  - Current Release: discovery date, cause and source, type and amount of petroleum product lost
  - Type of petroleum products stored at Facility (past and current)
  - Summary of initial actions undertaken, when, and by whom
  - Dates (if known) of installation and removal of all existing and former PST systems
  - PST system(s) configuration(s), dimensions and volumes of tanks, layout of piping and dispensers
  - Condition of tanks/piping if removed, location and whether perforated
  - Other available information that would be beneficial in determining the magnitude, extent, and location of the release
- Describe all known and suspected leaks, spills, overfill or other releases from PST systems and other petroleum sources. The following information should be included for each occurrence:
  - Date of release
  - Type of petroleum product(s) released
  - Quantity released
  - Location and source (tank, piping, spill or overfill) of the release
  - Cleanup action taken
  - Off-site effects

Maps required to Illustrate Facility Location and Site Features

All maps should include a north arrow, scale, map legend, and title with the Facility name in the title block. Location and site maps on a true-scale map (annotated aerial photos are not acceptable for these base maps) should be the base for other maps provided in this report and future reports.

- Location map – preferably a reproduction of a USGS topographic map or other equivalent (refer to example Location Map below)
- Area map(s) illustrating the surrounding 2-3 city blocks, other properties, receptors, and relevant features of the site and adjacent areas (refer to example Area Map below). The map(s) should show the following:
  - Adjacent buildings and property use(s)
  - Basements, tile drains, and sump systems on and adjacent to the property

  - Property boundaries and easements
  - All above and underground utilities and conduits (including electrical, gas, water, sanitary and storm sewers, telephone, cable) on and adjacent to the property.
  - Surface cover
  - Street maps or named/numbered streets
- Site map(s) should illustrate Facility details (refer to example Site Map below) including the following:
  - Current and former USTs, ASTs, piping, dispensers, and other sources of petroleum
  - Facility buildings and structures
  - Locations of environmental and construction activities pertinent to the release (excavations, test pits, soil borings, samples, monitoring wells etc.)
  - Remediation equipment and systems (if installed, current and historical)
  - Existing and former hazardous material/waste storage areas
  - Location of all current and previous Releases at Facility and on adjacent properties

Receptor Survey

Identify potential receptors and migration pathways in the areas of petroleum-impacted soil and the groundwater plume. Discuss the exposure potential for receptors as follows:

- Evaluate potential pathways and describe each pathway identified between a petroleum source and identified receptor
- Describe all pathways that are completed or could not be ruled out as incomplete between a petroleum source and identified potential receptors for each of the following:
  - Residential/Public/Commercial Buildings
  - Identify foundation type(s) for all structures (basement, slab on grade, dirt crawl space, etc.) and drains and sump systems on and adjacent to the property
  - Utilities (water, sewer, phone, power, cable, etc.); provide depth(s) below surface for underground utilities and conduits
  - Direct contact with petroleum-impacted soil, water, or vapor
  - All groundwater wells and springs within ½ mile radius of Facility; include their uses (monitoring, recovery, irrigation, etc.)
  - Surface water within one mile radius of Facility including lakes, rivers, ponds, wetlands and irrigation diversion
  - Other site-specific receptors
- Prepare receptor survey map(s) to illustrate the locations of potential and identified receptors in relation to the Release
- Complete the Conceptual Site Model part of the Release Closure Plan (RCP) and summarize the receptors, pathways, and petroleum impacts (refer to Part-2 of RCP format below and use the RCP Excel Spreadsheet form available at DEQ's website)

Soil Investigation

Describe the methods, equipment types, and results of the completed soil investigation including test pits, excavations, and installations of soil borings, laser-induced fluorescence (LIF) borings and monitoring wells. A separate description should be written for each method used in the investigation.

- Summarize field screening results (e.g. petroleum stain and petroleum vapor survey results) in a cumulative table(s) including the date of measurement, depth, location, and blow count or penetration rate if known
- Describe type of soil sampling, sampling interval, field screening procedures, sample containers, decontamination procedures and sample preservation; sampling plans and construction techniques may be referenced and placed in appendices or in a standard operating plan (SOP) submitted to DEQ
- Document analytical procedures: name and address of laboratory, analytical methods, trip and field blanks
- Discuss sample collection deviations, analytical anomalies, and laboratory QA/QC discrepancies
- Describe method(s) of waste disposal: soil/rock cuttings and free product
- Document the stratigraphy of the layers below the Facility and area of the Release – soil, fill, sediment, lithology, etc.– including the thickness and detailed description of each layer using a standard format such as the Unified Soil Classification System (USCS); refer to the Geological Map of Montana and individual quadrangle maps available online from the Montana Bureau of Mines and Geology
- Describe sediment characteristics (e.g., grain size, sorting, stiffness, plasticity, observed moisture content)
- Prepare detailed boring logs, test-pit logs, and monitoring well logs (include in appendices), and include information such as :detailed description of soil profile, contaminant screening levels, field observations, petroleum vapor readings, and water saturated intervals (refer to example Boring/Well Logs below)
- Present soil-sample analytical results in table(s) including field data such sample identification, depth, and collection date (refer to example Soil Table below). Soil analytical results should be compared to current and applicable Risk-Based Screening Levels (RBSLs).
- Present the 2-D and 3-D LIF data plots and interpretations (if applicable) and prepare geologic cross-section(s) from boring/excavation information (if applicable)
- Prepare map(s) illustrating extent and magnitude of petroleum impacts to soil (if applicable).
- Isopleths of concentrations shown on a map and/or a cross-section if requested by DEQ
- Describe the lateral stratigraphic continuity and/or variability across the area of the Facility and Release
- Describe the vertical and horizontal extent and magnitude of petroleum impacts to soil
- Determine whether additional investigations – petroleum vapor in soil, petroleum vapor intrusion of structures, or utility/utility corridor – are warranted based on the petroleum impacts to soil; propose required WP modifications and discuss with DEQ's project manger

Groundwater Investigation

Describe the method(s), equipment types, and results of the completed groundwater investigation including installations of monitoring wells, temporary sampling points, monitoring methodology, laboratory analyses, evaluation of results and trends; include the following:

- Describe monitoring well and sampling point installation procedures: screened interval, length of screen and slot size, length of casing, type of annular material (sand pack), type of annular sealant, surface completion, and total depth; construction techniques may be referenced and placed in appendices or in a standard operating plan (SOP) submitted to DEQ
- Describe well development procedures including: date, type of development, volume of water removed, and water quality
- Provide results of surveyed locations and elevations of wellheads; describe referenced datum
- Groundwater monitoring procedures including: date (sufficient days after well development to ensure well equilibration to aquifer), fluid-level measurement, sampling method, purging method, and stabilization parameters; sampling plans may be referenced and placed in appendices or in a standard operating plan (SOP) submitted to DEQ
- Document analytical procedures: name and address of laboratory, analytical methods, trip and field blanks
- Discuss sample collection deviations, analytical anomalies, and laboratory QA/QC discrepancies
- Describe method(s) of waste disposal: well-development water, purge water, aquifer test water, and free product
- Describe aquifer test procedures (if applicable)
- Describe characteristics of the aquifer(s) and the unsaturated zone(s) based on investigative results including:
  - Hydraulic characteristics
  - Measurements of fluid depths should be presented in a cumulative table
  - Direction(s) of groundwater flow
  - Rate of groundwater flow (if aquifer test results are available)
  - Perched or confined aquifer conditions
  - Other site-specific aquifer characteristics
- Present a graphic monitoring well log for each completed well in an appendix; include well construction details (refer to example Boring/Well Logs below)
- Present groundwater analytical results in cumulative table(s) including field data such as sample identification, screened interval, depth to fluid(s), free-product thickness (if present), and collection date (refer to example Groundwater Table below). Groundwater analytical results should be compared to current Risk-Based Screening Levels (RBSLs) published in RBCA.
- Present groundwater elevation calculations in a table
- Construct maps that illustrate the results of the groundwater investigation including the following:
  - Potentiometric surface with groundwater flow direction(s)
  - Hydrogeologic cross sections

  - Isopleth (iso-concentration) map depicting at least one analyte for each contaminant type (gasoline, diesel, etc.) that best depicts extent and magnitude of that contaminant type. Consult with DEQ's project manager for selection of analytes depicted
  - Groundwater/surface water discharge points (if applicable)
- Describe the vertical and horizontal extent and magnitude of petroleum impacts to groundwater by referring to the table of cumulative groundwater monitoring data and constructed maps
- Determine whether additional investigations – petroleum vapor in soil, petroleum vapor intrusion of structures, or utility/utility corridor – are warranted based on the petroleum impacts to groundwater; propose required WP modifications and discuss with DEQ's project manger

Petroleum Vapor in Soil and Petroleum Vapor Intrusion Investigations (if WP tasks)

Describe in detail the completed petroleum vapor investigation including the rationale for selected sampling locations, investigative methods, and results. Describe methods used to evaluate potential migration of petroleum vapors into utilities or structures. A separate description should be included for each method.

- Describe locations and emplacement of soil vapor sampling points and soil conditions recorded during driving of sampling points (if taken)
- Describe sampling plans, laboratory method(s) and construction techniques; reference and place in appendices or in a SOP
- Describe type(s) of instrument(s) used for petroleum vapor measurements; document vapor-measuring instrument calibration data (may be included on sample collection forms in an appendix)
- Summarize weather conditions during collection of petroleum vapor readings
- Describe surface and subsurface structures and features that may influence the migration of petroleum vapors through the soil
- Record and describe field observations in a table; include sample date, depth, and location, results of field screening, and qualitative or quantitative results
- Annotate map(s) with petroleum vapor sample locations
- Annotate map(s) with isopleths of selected analyte concentrations; a cross-section of sampling results if samples are taken from more than one depth
- Prepare map(s) illustrating extent of free product, dissolved groundwater phase, and petroleum vapors discovered in subsurface structures and utilities
- Prepare map(s) illustrating all structures and subsurface utilities – located within 100 feet of the edge of the plume – that are, or may become, impacted by petroleum vapors associated with the Release
- Assess the results of the soil vapor investigation and recommend whether petroleum vapor intrusion investigations of structures, utilities, or utility corridors are required
- Discuss sample collection deviations, analytical anomalies, and laboratory QA/QC discrepancies

Investigation of Petroleum Vapor Intrusion of Structures (if WP task)

Describe in detail the completed petroleum vapor investigation of structure(s) when reporting results of a Petroleum Vapor in Soil and Petroleum Vapor Intrusion Investigation (above) and include the following:

- Complete an Occupied Building Questionnaire(s) for each structure sampled (use form included in DEQ's Montana Vapor Intrusion Guide)
- Describe petroleum vapor sampling points and other conditions within structures that may influence sampling results
- Describe samples collected to measure for the presence of petroleum vapors within structures
- Evaluate the potential for petroleum vapors to migrate into structures; include calculations for vapor migration potential under existing conditions
- Present sub-slab petroleum vapor and indoor air analytical results in a table(s) including field data such as sample identification, depth, and collection date. Soil analytical results should be compared to current and applicable screening levels

Utility/Utility Corridor Investigation (if WP task)

Describe methods used to complete the utility investigation including review of construction records, field inspection(s), utility locates, fieldwork and include the following:

- Review available records to determine utility construction materials including gaskets, bedding materials, and any other information pertinent to contaminant permeation or migration
- Describe field observations of utility construction, contamination present, and condition of utilities; include any other observations pertinent to contaminant permeation or migration
- Describe methods (test pits, borings, wells, other utility excavation/inspections, petroleum vapor sampling, heated headspace sampling, and other field screening methods) used to evaluate potential for petroleum-contaminated media to impact utilities. A separate description should be written for each method
- Record field observations, screening data, and sample results from material inside utilities (petroleum vapor, water, gas, etc.) if sampled. Present field screening results in table(s) with date, depth, and location
- Present soil sample results (if collected during utility investigation) as detailed in Soil Investigation section above
- Present groundwater sample results (if collected during utility investigation) as detailed in Groundwater Investigation section above
- Present petroleum vapor sample results (if collected during utility investigation) as detailed in the Petroleum Vapor in Soil and Petroleum Vapor Intrusion Investigation section above
- Prepare detailed map(s) of buried utilities and service connections showing petroleum contamination and investigation points
- Prepare cross-section(s) from borings/excavations showing utility corridors in relation to petroleum-contaminated media (if requested)

Other Investigation Methods and Data Collection (if WP tasks)

Describe other DEQ-approved methods used to complete the WP. A separate description should be written for each method used in the investigation. Examples of other methods include the following:

- Detail aquifer test methods and results
- Document geophysical test procedures
- Describe data modeling methods and results

- Describe pilot test methods and results

Data and Results

Interpret all available data and describe in detail the results of the RI; technical evaluations should be stated with reasonable professional certainty and under the standard of care applicable and are expected to include at least the following:

- Describe in detail the horizontal and vertical extent of petroleum impacts to media – soil, groundwater, surface water, petroleum vapor in soil, and petroleum vapors collecting in structures
    - Describe evidence of release(s) of petroleum to the environment such as: free product, petroleum stain, field screening results, laboratory analyses, and a summary of previous releases
    - Describe the type(s), concentration(s) and volume(s) (if known) of petroleum or petroleum products released to date at the facility
    - Detail the analytical results in tables; the report text should be a succinct summary of the analytical results, trends, and petroleum contamination by referring to the details in the tables. Detailed tables for soil and groundwater data should be cumulative and comply with the format in the Example Tables for Soil and Groundwater (refer to example tables below)
    - Describe and discuss the horizontal and vertical extent of petroleum-impacted soil based on the best available information
    - Describe and discuss the horizontal and vertical extent of petroleum-impacted groundwater based on the best available information
    - Describe the areal extent of free product and the potential for free product to migrate
    - Describe and discuss the horizontal and vertical extent of petroleum vapors based on the best available information
    - Describe and discuss the extent and magnitude of petroleum contamination associated with this Release or commingled from other sources. Describe potential risks to human health and the environment, fate and transport, and implications for cleanup
    - Describe locations(s) of petroleum source(s), calculated volume of petroleum-impacted soil, area of groundwater plume, area of petroleum-vapor plume, and migration pathways
- Describe in detail the petroleum migration pathways and exposure potential of receptors:
    - Discuss evidence of, and the potential for, contaminant to migrate to receptors through pathways of air, soil, groundwater, surface water, sediments, or subsurface utility lines
    - Identify, describe, and evaluate known and potential human exposure to contaminants resulting from the Release by inhalation, dermal contact, or ingestion of contaminants
        - Water produced from wells
        - Water from public supply (aquifer contaminated, or pipe permeated)
        - Surface water
        - Petroleum vapors migrating inside or damaging buried utility(s)
        - Petroleum vapors migrating into structure(s)
        - Direct dermal contact with petroleum-contaminated soil

Release Closure Plan (RCP)

The O/O and their consultant should develop plans to cleanup, monitor, and resolve the Release in conjunction with completing the RI. These plans should be based on the data documenting the extent and magnitude of petroleum impacts, professional judgement, and experience in the area. Planning should begin as the RI data, results, and conclusions become available. DEQ expects the Release Closure Plan (RCP format below) should be updated when additional information and data are available; and that an updated RCP should be appended to the RI report and all future reports for the Release.

- Develop a site-specific RCP based on the RI results and conclusions. Use the RCP Excel spreadsheet format available at DEQ's website); it has four interdependent parts:
  - Site Summary and RI Results
  - Conceptual Site Model and Evaluation of Exposure Pathways
  - Evaluation of Cleanup Alternatives
  - Monitoring Required to Close Release
- Propose closure of the Release only if all the data demonstrate that there are no petroleum impacts exceeding risked-based screening levels or regional screening levels for all media or that all exposure pathways are incomplete
- Propose site-specific appropriate cleanup and monitoring methods required to remediate and resolve the Release; refer to DEQ's Remedial Alternative Analysis (RAA) Guidance
  - Each proposed site-specific cleanup method will be evaluated on the six criteria included in ARM 17.56.605(3) – cost, performance, reliability, implementation, safety and effects on public health and the environment
  - Evaluation of Cleanup Alternatives sheet of the RCP will describe the cleanup methods
  - Monitoring Required to Close Release sheet of the RCP will describe the monitoring for each cleanup alternative considered
  - Details and evaluation of proposed site-specific cleanup methods and monitoring that that cannot be captured in the spreadsheet will be described in the report text; a separate description should be included for each cleanup method
- Discuss the Release Closure Plan and proposed cleanup methods with DEQ's project manager while preparing the RI report and prior to submitting report to DEQ
- Complete the Release Closure Plan including a discussion of the plan in the report text and a copy of the Closure Plan spreadsheet in Appendix of RI report

Conclusions

Briefly state whether the RI objectives have been met for the Release; technical conclusions should be stated with reasonable professional certainty and under the standard of care applicable and are expected to include the following:

- Petroleum-impacted media
- Exposure pathways
- Effect on public health and the environment
- Site-specific cleanup methods
- Closure pathways to resolve the Release

Recommendations

State recommendations for additional remediation work required to cleanup, monitor, and close the Release. Technical recommendations should be stated with reasonable professional certainty and under the standard of care applicable and should include the following

- Make site-specific recommendations that are consistent with details in the RI report and summarized in the Release Closure Plan
- Propose method(s) to address critical data gap(s) including pilot test(s)
- Propose site-specific cleanup plan and its immediacy if required
- Propose site-specific monitoring plan if required

Signature page should be signed and dated

Limitations

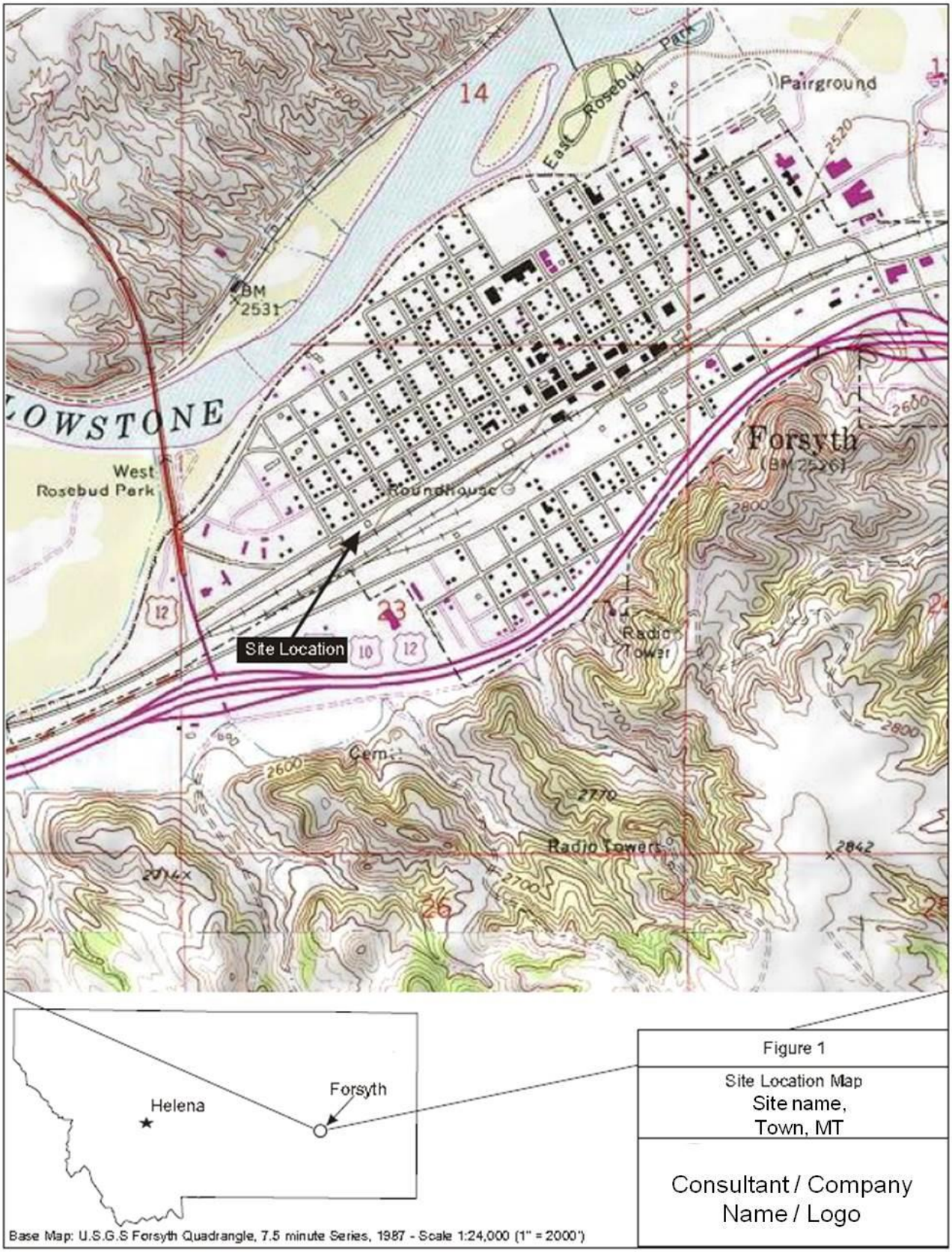
References

Appendices

DEQ may require site-specific attachments to the report; however, the following appendices for all RI reports are typically required.

- Maps
- Tables summarizing laboratory analytical data and filed data for soil, water, and petroleum vapor samples
- Release Closure Plan
- Sampling methods
- Boring logs
- Well completion logs
- Groundwater sampling logs
- Petroleum vapor logs
- Other logs
- Laboratory reports including the following:
  - Original (or copy of original) analytical result reports
  - Chain of custody documentation
  - Sample receipt checklist(s)
  - Quality assurance/quality control report(s)
  - Chromatograms
  - Data Validation Report
- QA/QC plan for laboratory data (unless included in WP)
- SOP (unless included in WP)

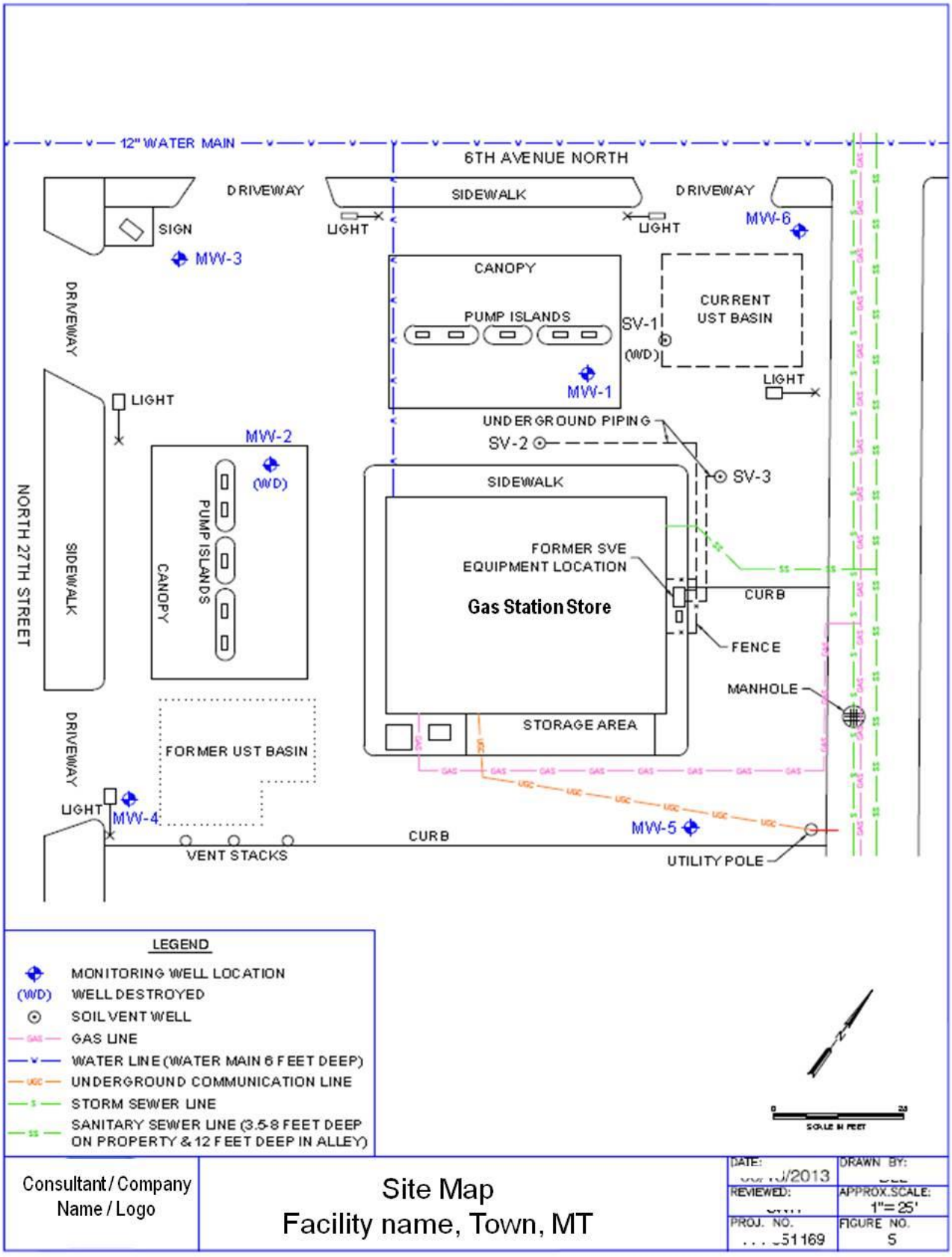
Example – Location Map (adapted from a submitted report)



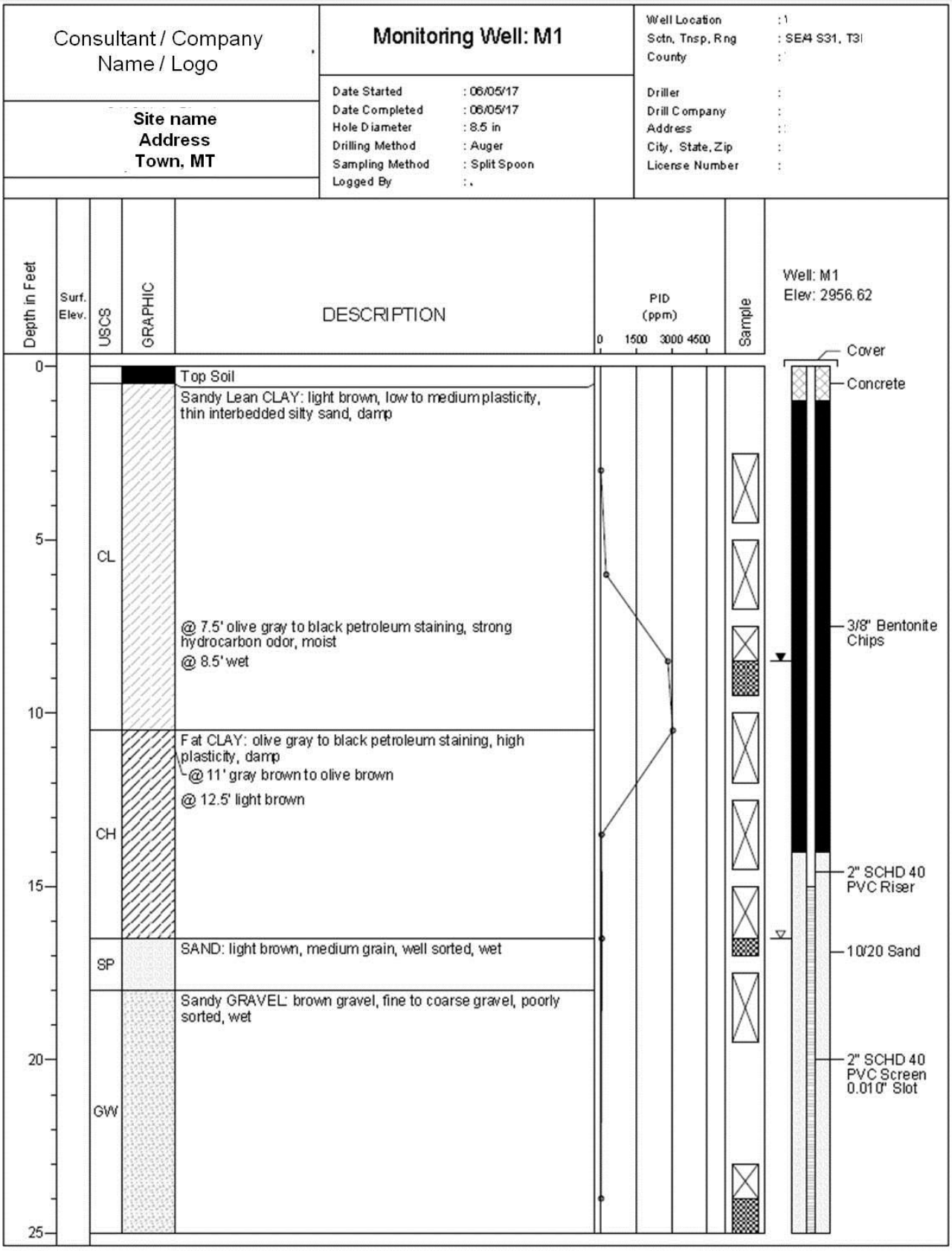
Example – Area Map (adapted from a submitted report)

Consultant / Company Name / Logo	**Area Map** **Site name, Town, MT**	FIGURE 2

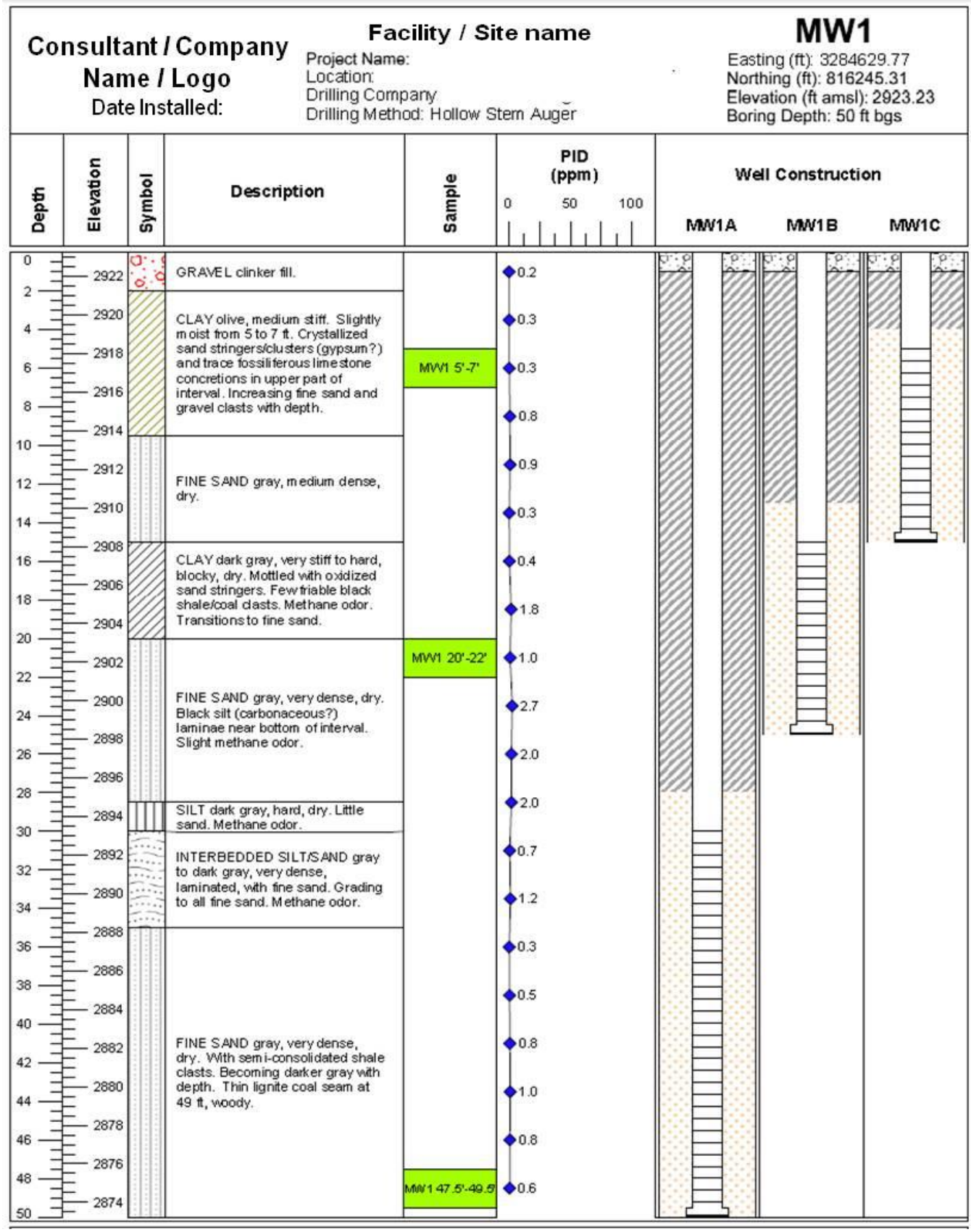
Example – Site Map (adapted from a submitted report)



Example – Boring/Well Log (adapted from a submitted report)



Example – Boring/Well Log (adapted from a submitted report)



Example – Table for Soil Data

Example Table-1: Laboratory Analytical Summary of Soil collected from Borings, 2007 Remedial Investigation

Facility Name, Address, City/Town; Facility ID Number, Release Number

Sample or Boring ID	Sample Information and Field Data					Volatile Petroleum Hydrocarbons (VPH) mg/kg									Lead Scavengers mg/kg		Extractable Petroleum Hydrocarbons (EPH) mg/kg				
	Location	Depth ft. bgs	Petroleum Stain / Odor	PID, ppm	Date Sampled	MTBE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	Total Purgeable HC	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics	DCA 1,2-Dichloroethane	EDB 1,2-Dibromoethane	EPH Screen	Total Extractable HC	C9-C18 Aliphatics	C19-C36 Aliphatics	C11-C22 Aromatics
B1	UST - diesel	8	N	10	11/14/2007	<0.06	0.07	<0.11	1.4	6.0	11	570	20	<11	310			**4,300**	**4,100**	1,800	710	1,500
		12	N	10	11/14/2007	<0.06	0.16	0.18	1.9	11	18	570	<13	32	270			**14,000**	**12,500**	**5,300**	2,000	**4,000**
		20	N	10	11/14/2007	<0.06	<0.06	<0.13	<0.13	0.42	1.8	190	<13	35	46			**2,200**	**1,800**	860	340	710
B2	UST- gasoline	8	N	44	11/14/2007	<0.06	**5**	56	17	110	8.6	1,100	310	120	260	<0.006	#<0.0012	**1,500**	**1,400**	560	150	430
		12	S	43	11/14/2007	<0.06	**10.0**	31	7.5	34	5.0	480	85	<13	193	<0.026	#<0.0013	**830**	**700**	350	100	220
		20	S, O	100	11/14/2007	<0.06	**75**	45	11	48	9.1	710	120	50	250	<0.0064	#<0.0013	**2,600**	**2,450**	970	320	1,000
B3	Dispenser gasoline	4	N	23	11/14/2007	<0.10	**11**	0.17	6.0	7.3	10	920	28	90	400	<0.0065	#<0.0013	**9,800**	**8,800**	**3,800**	1,000	**2,800**
		9	S, O	89	11/14/2007	<0.06	**78**	1.5	4.9	12	7.7	610	33	52	260	<0.0061	#<0.0012	**6,900**	**6,500**	**2,700**	750	2,100
		20	S, O	150	11/14/2007	<0.06	**354**	<0.12	<0.12	<0.37	1.4	290	<12	110	76	<0.0066	#<0.0013	**2,900**	**2,640**	1,300	290	950
B4	Dispenser diesel	8	N	0	11/15/2007	<0.03	**0.18**	0.08	1.2	7.5	1.2	180	12	15	72			**270**	**220**			
		12	N	0	11/15/2007	<0.06	0.13	0.9	1.2	13	3.4	240	79	34	94			**320**	**290**	130	27	90
		20	N	0	11/15/2007	<0.06	**0.51**	2.2	5.7	33	13	890	43	22	**460**			**7,700**	**7,470**	**2,800**	350	**2,200**
B5	up gradient	17.5	N	0	11/15/2007	<0.12	<0.060	<0.060	<0.060	<0.060	<0.32	3.9	2.3	<2.4	<2.4	<0.006	<0.0012	<12	<12	<2.4	2.3	<2.4
B6	down gradeient	16	S, O	133	11/15/2007	*<8.0	**121**	34	63	246	37	4,770	**2,010**	**1,460**	**1,320**	<0.026	#<0.0013	**10,300**	**9,800**	**6,400**	589	**2,460**
	MT DEQ RBSL (sample 10-20 feet to GW)					0.16	0.21	65	84	610	40	NE	410	640	470	0.052	0.000051	200		900	200,000	1,300
	MT DEQ RBSL (direct contact, construction)					8,900	240	5,500	1,300	610	140	NE	410	640	100	110	8	NE	NE	900	200,000	3,900

RBSL Risk Based Screening Level, groundwater 10-20 feet, MDEQ Tier 1 Risk Based Corrective Action, 2016

< Less than the detection limit indicated.

BOLD Concentration exceeds MDEQ RBSL

NE not established

Blank Not analyzed for constituent listed

* Laboratory RL is higher than MT RBSL value, but MCL/QCL is lower than MT RBSL

laboratory Dection Limit is higher than MT RBSL

N no petroleum stainning or odar

S visible petroleum staining

O petroleum odor

Example – Table for Groundwater Data

Example Table 2: Cumulative Groundwater Monitoring (2007 - 2013) at Facility Name, Address, City / Town

Facity ID: number, Release number

Well / Boring ID	Sample / Field Data			Volatile Petroleum Hydrocarbons, ug/l									Lead Scavengers ug/l		Extractable Petroleum Hydrocarbons, ug/l			
	Depth to Groundwater, ft bgs	NAPL Thickness, ft	Date Collected	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Naphthalene	TPH	C5 - C8 Aliphatics	C9 - C12 Aliphatics	C9 - C10 Aromatics	EDB 1,2-Dibromoethane	DCA 1,2-Dichloroethane	EPH Screen	Total Extractable Hydrocarbons	C9 - C18 Aliphatics	C19 - C36 Aliphatics	C11 - C22 Aromatics
MW-1	Screened 5 ft to 15 ft bgs																			
	12.15	---	5/18/2007	<1	<1	<1	<3	<2	<5	<200	<100	<100	<20	NA	NA	<200	NA	NA	NA	NA
	10.30	---	9/10/2007	<1	<1	<1	<3	<2	<5	<200	<100	<100	<20	NA	NA	<200	NA	NA	NA	NA
	11.17	---	12/5/2007	<1	<1	<1	<3	<2	<5	<200	<100	<100	<20	NA	NA	<200	NA	NA	NA	NA
	13.40	---	3/19/2008	<0.5	<0.5	<0.5	<1.5	<2	<1	<200	<100	<100	<20	NA	NA	<200	NA	NA	NA	NA
	10.40	---	6/8/2010	<0.25	<0.25	<0.25	<0.75	<1.0	5.4	<50.0	<50.0	<50.0	<50.0	NA	NA	<111	NA	NA	NA	NA
	13.93	---	1/29/2013	<0.15	<0.23	<0.17	1.3J	<0.29	<0.35	11.7J	2.2J	1.0J	6.1J	<0.0063	<0.088	<112	NA	NA	NA	NA
	14.63	---	4/1/2013	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-2	Screened 5 ft to 15 ft bgs																			
	11.65	---	5/18/2007	<1	<1	<1	<3	<2	<5	<200	<100	<100	<20	NA	NA	<200	NA	NA	NA	NA
	10.52	---	9/10/2007	<1	<1	<1	<3	<2	<5	<200	<100	<100	<20	NA	NA	<200	NA	NA	NA	NA
	11.11	---	12/5/2007	<1	<1	<1	<3	<2	<5	<200	<100	<100	<20	NA	NA	<200	NA	NA	NA	NA
	11.66	---	3/19/2008	<0.5	<0.5	<0.5	<1.5	<2	<1	<200	<100	<100	<20	NA	NA	<200	NA	NA	NA	NA
	10.73	---	6/8/2010	<0.25	<0.25	<0.25	<0.75	<1.0	<2.5	<50.0	<50.0	<50.0	<50.0	NA	NA	<112	NA	NA	NA	NA
	12.78	---	1/29/2013	<0.15	<0.23	<0.17	<0.34	<0.29	<0.35	1.7	<0.91	<0.86	0.55J	<0.0062	<0.088	<122	NA	NA	NA	NA
	13.37	---	4/1/2013	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-3	Screened 5 ft to 15 ft bgs																			
	12.52	**0.25**	5/18/2007	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	10.49	**0.10**	9/10/2007	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	12.14	**sheen**	12/5/2007	**1188**	13	4	4	<2	51	17,800	**7,500**	**3,600**	**2,050**	NA	NA	**3,000**	2,800	280 J	230 J	370
	12.52	**sheen**	3/19/2008	**1050**	<1	<1	<3	<2	<5	11,560	**5,500**	**2,600**	**1,500**	NA	NA	**1050**	590	<200	<200	<200
	---	---	6/8/2010	*source area well removed during remedial excavation, April 2010*																
MW-3a	Screened 5 ft to 15 ft bgs, replacement source-area well, 11/15/2012																			
	13.49	0.00	1/29/2013	**55**	4.5	1.2	2.0	<2	11	1,755	**880**	815	950	NA	NA	340	NA	NA	NA	NA
	14.05	0.00	4/1/2013	**6**	<0.25	<0.25	<0.75	<1.0	<2.5	1,150	**670**	350	165	NA	NA	<111	NA	NA	NA	NA
MW-4	Screened 4 ft to 14 ft bgs																			
	9.35	---	6/12/2007	<1	<1	<1	<3	<2	<5	<200	<100	<100	<20	NA	NA	<200	NA	NA	NA	NA
	8.88	---	9/10/2007	<1	<1	<1	<3	<2	<5	<200	<100	<100	<20	NA	NA	<200	NA	NA	NA	NA
	9.37	---	12/5/2007	<1	<1	<1	<3	<2	<5	<200	<100	<100	<20	NA	NA	<210	NA	NA	NA	NA
	8.01	---	3/19/2008	<0.5	<0.5	<0.5	<1.5	<2	<1	<200	<100	<100	<20	NA	NA	<200	NA	NA	NA	NA
	8.29	---	6/8/2010	<0.25	<0.25	<0.25	<0.75	<1.0	<2.5	<50.0	<50.0	<50.0	<50.0	NA	NA	<108	NA	NA	NA	NA
	8.79	---	1/29/2013	<0.15	<0.23	<0.17	<0.34	<0.29	<0.35	<1.7	<0.91	<0.86	0.26J	<0.0062	<0.088	<114	NA	NA	NA	NA
	9.13	---	4/1/2013	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	MT DEQ RBSLs, 2016			5	1,000	700	10,000	30	100	NE	650	1,400	1,100	0.004	4	1,000	NE	1,400	1,000	1,100

Bold: Analyte >DEQ RBSLs, 2016 NA: Not analyzed ---: not sampled ND: Not Detected NE: Not Established

J: Value is estimated - falls between detection limit & limit of quantitation B: Analyte detected in method blank; not corrected for method blank concentration.

Release Closure Plan – Part 1: Site Summary & RI Results

MT DEQ Petroleum Tank Cleanup Section -- Release Closure Plan (7 Sept 2017)

Part 1: Site Summary & Remedial Investigation (RI) Results

Required for Investigation, Cleanup, Monitoring & Closure of Release

	Facility Name / Address:		Date:	DEQ PM:	
			Consultant:		
	Facility ID:	**Release:**	WP ID:		
Site Information	Release Cause, Source(s) & Petroleum Types:				
	Relationship to other releases (onsite, nearby):				
	Site Use(s) -- Former, Current & Planned:				
	Surface Conditions / Access:				
	former Petroleum Tank Systems:				
	current Petroleum Tank Systems:				
	Other:				
Subsurface	Stratigraphic sequence - layers & thicknesses:				
	Stratigraphic Continuity - Lateral Variation(s):				
	Groundwater Depth & Flow Direction(s):				
	Aquifer(s) unconfined, confined, perched:				
	Receptor Depth/Location (basements, utilities):				
	Other:				
Extent & Magnitude	Petroleum Types, Age & NAPL Mobility:				
	Surface Soil Impacts (0 to 2 ft bgs):				
	Vadose-Zone Soil Impacts:				
	Smear-Zone Soil Impacts:				
	Groundwater Impacts:				
	Surface Water Impacts:				
	Vapor Intrusion Impacts:				
	Other:				
Reports	RI and Monitoring Reports & Dates:				
	Pilot Tests & Results:				
	Results from Cleanup(s):				
	Other:				
What currently prevents Release Closure?					
additional information required for PMZ Closure:					
Information & Data Gaps:					
Recommendations and comments:					

Release Closure Plan – Part 2: CSM - Evaluation of Exposure Pathways

MT DEQ Petroleum Tank Cleanup Section -- Release Closure Plan (7 Sept 2017)

Part 2: Conceptual Site Model (CSM) - Evaluation of Exposure Pathways

Consultant: 0	Date: 1/0/1900	DEQ PM: 0
Facility Name: 0		
Facility ID: 0	**Release:** 0	WP ID: 0

Complete Description for All Receptors

Describe why a Receptor is not threatened or impacted; and Describe proposed Investigation, Cleanup, and/or Monitoring Methods for each threatened or impacted Receptor.

Petroleum Source(s)	Affected Medium	Exposure Medium / Point	Exposure Route	Receptor	Complete Description for All Receptors
Required: Complete Description of the Source(s) of Petroleum Release	Surface Soil (0 - 2 ft bgs)	Soil	Ingestion Dermal	Resident and/or Worker	
		Soil	Leaching	Groundwater	
		Dust/Vapors	Inhalation	Resident and/or Worker	
		Surface Erosion to Surface Water and Sediment	Ingestion Dermal	Recreator, Ecological Receptor [1]	
	Sub-Surface Soil (> 2 ft bgs)	Soil	Ingestion Dermal	Construction Worker [2]	
		Soil	Leaching	Groundwater	
		Indoor Air	Inhalation	Commercial or Residential Indoor Air	
		Dust/Vapors	Inhalation	Construction Worker	
		Buried Water Line	Ingestion Dermal	Resident and/or Worker	
		Buried Utility Line	Inhalation of Indoor Air	Indoor Resident and/or Worker	
	Groundwater	Groundwater		State water [3]	
		Indoor Air [4]	Inhalation of Indoor Air	Resident and/or Worker	
		Groundwater and Vapors	Ingestion Dermal Inhalation	Construction Worker [2]	
		Drinking Water	Ingestion Dermal	Resident and/or Worker	
		Surface Water and/or Sediment	Ingestion Dermal Inhalation	Recreator, Ecological Receptor	
		Buried Water Line	Ingestion Dermal	Resident and/or Worker	
		Buried Utility Line	Inhalation of Indoor Air	Indoor Resident and/or Worker	

Data Gaps:

Recommendations:

Footnotes:

1. Ecological Receptors (e.g. plants and animals) can be added as a separate line associated with surface soil but it is not common for PTC sites.
2. Construction worker covers excavations conducted for building construction, utility installation and repair, as well as residents planting trees, etc.
3. Standard or RBSL exceedence are a complete pathway to a receptor, which is state water (or groundwater).
4. Indoor Air is the exposure medium for a potential or known vapor intrusion setting where a resident or an employee of a business may breathe petroleum vapor from the release.

Release Closure Plan – Part 3: Evaluation of Cleanup Alternatives

MT DEQ Petroleum Tank Cleanup Section -- Release Closure Plan									(7 Sept 2017)
Part 3: Evaluation of Cleanup Alternatives Required for Investigation, Cleanup, Monitoring & Closure of Release			Date: 1/0/1900		DEQ PM: 0				
			Consultant: 0						
Facility Name / Address: 0									
Facility ID: 0		Release: 0		WP ID: 0					
Administrative Rules of Montana 17.56.605(3) requires screening and selection of cleanup methods to develop a matrix evaluation of cleanup alternatives. A cleanup plan requires information on all alternatives and an explanation why any alternative was selected.		Fill-in appropriate site-specific Cleanup Methods that are based on RI results and CSM				fill-in as needed or leave blank	fill-in as needed or leave blank	fill-in as needed or leave blank	
Evaluation Criteria	No Action*	e.g. Excavation	e.g. Excavation & ORC	e.g. SVE & AS					
Estimated Costs									
Performance - Protective									
Performance - method achieves soil & GW RBSLs & DEQ-7 standards									
Reliability -- Short Term <3 yrs.									
Reliability -- Long Term >3 yrs.									
Implementation Issues & Limitations									
Safety Issues									
Effects on Public Health and Environment (includes Receptors)									
Other:									
Advantages of Cleanup Method:									
Disadvantages of Cleanup Method:									
Est. Years to Complete Cleanup Method:									
Cleanup Recommendations:									
Methods to Evaluate Results of Cleanup:									
Information & Data Gaps:									
Recommendations and comments:									
* Note: Cleanup technologies may be removed or added as appropriate for each Release; however, the 'No Action' alternative must be evaluated for comparison at every Release.									

Release Closure Plan – Part 4: Monitoring Required to Close Release

MT DEQ Petroleum Tank Cleanup Section -- Release Closure Plan (7 Sept 2017)

Part 4: Monitoring Required to Close Release

Required for Investigation, Cleanup, Monitoring & Closure of Release

Date: 1/0/1900 | DEQ PM: 0 | Consultant: 0

Facility Name / Address: 0

Facility ID: 0 | Release: 0 | WP ID: 0

Required Monitoring for each Cleanup Method and CSM & RI

	Monitor Cleanup Progress & Results for each Cleanup Method Until Closure	No Action*	e.g. Excavation	e.g. Excavation & ORC	e.g. SVE & AS	fill-in as needed or leave blank	fill-in as needed or leave blank	fill-in as needed or leave blank
Monitoring Required by Cleanup Alternative	Borings/ Monitoring Wells (MWs)							
	GW Monitoring (freq., wells, years)							
	System O/M (frequency & years)							
	Vapor Intrusion (VI) Monitoring							
	Receptor Monitoring							
	Waste Management & LF monitoring							
	Other							
	Est. Years to Complete all Monitoring							
	Estimated costs for O/M & monitoring							
Closure	Estimated Total Years to Closure:							
	Natural Attenuation Trends:							
	What currently prevents Closure?							
	Is this a PMZ Closure Candidate?							
	Other:							
Information & Data Gaps:								
Recommendations and comments:								

* Note: Cleanup technologies may be removed or added as appropriate for each Release; however, the 'No Action' alternative must be evaluated for comparison at every Release.