5.0
INITIAL SITE CHARACTERIZATION AND COMPARISON WITH DEFAULT TARGET LEVELS AND WATER QUALITY CRITERIA

5.1 MRBCA OBJECTIVE OF INITIAL SITE CHARACTERIZATION

With respect to the MRBCA process, the objective of an initial site characterization is to collect sufficient data to determine whether:

- The maximum concentration of each Chemical of Concern (COC) has been identified and subsequently compared to applicable default target levels (DTLs) or Water Quality Criteria (WQC)
- An ecological risk exists,
- The site qualifies for a Letter of Completion,
- The preferred remediation alternative will be to DTLs and/or applicable water quality criteria or alternative levels protective of ecological species, or
- The site will move to a Tier 1, Tier 2, or Tier 3 risk assessment.

Figure 5-1 illustrates the decision process to determine the next course of action. This determination is based on both human health and ecological risks.

A brief description of the initial site characterization process is presented below.

5.2 SITE DESCRIPTION

The remediating party should conduct a thorough site reconnaissance and a historic review of site use and site operations to identify past, existing and potential sources of contamination. This description would be based on available information such as:

- Knowledge of known or documented releases,
- Current and past location of all site features that represent potential contaminant sources (for example, pipelines, process areas, pumps, or transformers),
- Historical aerial photographs, fire insurance maps, etc.,
- Interviews with current and past owners and operators,
- Permits issued for various activities, and
- One or more site visits.

Based on this information, the remediating party should prepare a list of potential COCs and the probable location of sources of COCs. It may be useful to develop an initial conceptual site model to optimize sampling design in order to develop the initial characterization work plan.

5.3 COLLECTION OF DATA

For RCRA and CERCLA sites, prior to the collection of any environmental data, the remediating party must submit the Initial Characterization and Data Collection Work Plan to the department for review and approval. The work plan must meet the minimum Data Quality

Assurance/Quality Control requirements of the department's Quality Management Plan (See Appendix K for more information). After approval, the remediating party should implement the work plan and collect samples of environmental media in areas that are representative of the maximum concentrations. At sites with multiple discrete sources, data should be collected for each of the sources. The exact number of samples, analytical methods, field sampling techniques, and quality assurance/quality control (QA/QC) samples to be collected will vary from site to site.

The objective is to identify with certainty the maximum concentrations of the COCs in each impacted environmental media. However, for sites that may require additional characterization or remediation, it may be more cost effective at this point to delineate the nature and extent of impacts rather than only identifying the highest concentrations. For sites where such data has already been collected, the remediating party must demonstrate that the available data meets appropriate QA/QC requirements.

5.4 DETERMINATION OF ECO-RISK: COMPARISON WITH DEFAULT TARGET LEVELS AND WATER QUALITY CRITERIA

To determine if an ecological risk exists at the site at the default target level, it is necessary to use Table 5-1 (compiled from Missouri's Water Quality Standards, 10 CSR 20-7.031) to answer the following questions. (Tiers 1, 2, and 3 require an eco-screening evaluation, discussed in Section 6 and Appendix F.) This table lists the chemicals for which water quality criteria found in the Water Quality Standards are lower than the domestic use of groundwater standard or for which no domestic groundwater use standard exists.

> *Question 1*: Are any of the COCs detected in groundwater listed in Table 5-1? If not, no further ecological evaluation is necessary because, for all other chemicals with DTLs, the water quality criteria for an ecological receptor is higher than the human health value listed in the DTL table in Appendix B, which means that the DTLs listed in Appendix B are also protective of ecological impacts. However, a yes response for any one of the chemicals in Table 5-1 implies the possibility of ecological impacts; therefore, the second question must be answered.
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> *Question 2*: Does the maximum concentration of any of the COCs found in Table 5-1 exceed its water quality criteria? If not, then no further ecological evaluation is necessary. However, if the maximum concentration for any one of these chemicals exceeds its water quality criteria, then it is necessary to determine if there are any complete pathways for ecological receptors; therefore, the next question must be answered.
>
> *Question 3*: Do any ecological receptors that would result in a complete exposure pathway exist at or near the site? This can be determined by completing the Level 1 Ecological Risk Assessment discussed in Section 6.0 and, if necessary, proceeding to Level 2 and 3.

After completing the Ecological Risk Assessment and any further ecological evaluation

required by the department, if ecological issues exist, then the maximum groundwater concentrations must be compared with the lower of the DTLs or the applicable water quality criteria (only for the chemicals listed in Table 5-1). Sections 6.5.4, 6.11.2 and 6.11.3 provide information on the more detailed eco-risk analysis at Levels 2 and 3.

Note that, if human health risk is not a concern (based upon comparison with the DTLs), then a complete ecological risk assessment may be completed at the default target level if needed. However, if maximum concentrations also exceed human health values at the default target level, then the remediating party may decide to complete the ecological risk assessment in conjunction with any tiered risk assessment.

5.5 COMPARISON WITH DEFAULT TARGET LEVELS

For both ecological and human health risk assessment, the maximum soil and groundwater concentrations must also be compared with the DTLs presented in Appendix B, Table B-1. This table is a compilation of the lowest risk-based numbers calculated in Tier 1 for all soil types and all pathways that allow unrestricted land and groundwater use.

5.6 EVALUATION OF THE NEXT COURSE OF ACTION

Based on the above comparison, the following alternatives are available:

Alternative 1: If the maximum soil and groundwater concentrations do not exceed any of the DTLs and no ecological risk is identified, there is no need to conduct further risk assessment activities because, whatever the pathway or receptor, the DTL represents the lowest of any risk-based target level in Appendix B and further remediation would not be needed. Thus, the remediating party may petition the department for a Letter of Completion.

Alternative 2: If the maximum soil and groundwater concentrations exceed the DTLs and no ecological issue is identified, the remediating party has two choices:
1. Conduct a Tier 1, Tier 2, or Tier 3 risk assessment, or
2. Select the DTLs as the cleanup levels. In this case the remediating party must develop a Risk Management Plan as discussed in Section 12.

Alternative 3: If the maximum soil and groundwater concentrations exceed the DTLs and an ecological risk exists (as determined in Section 5.4), the remediating party has two choices:
1. Conduct a Tier 1, Tier 2, or Tier 3 risk assessment for human health target levels, including an ecological risk assessment (if target cleanup levels for any ecological species were already determined through the ecological risk assessment, then that information would remain the same for a tiered risk assessment), or
2. Select the lower of DTLs and water quality criteria or eco-risk target levels as the cleanup levels. In this case the remediating party must develop a Risk Management Plan as discussed in Section 12.

Alternative 4: If the maximum soil and groundwater concentrations do not exceed any of the

DTLs and existing ecological risk is unacceptable, then the ecological risk assessment must be completed (as determined in Section 5.4).

5.7 ANALYTICAL DETECTION LIMITS

During the course of investigation, the analytical detection limit for certain COCs in environmental media may be higher (sometimes by orders of magnitude) than the corresponding DTL or water quality criteria for that chemical. This happens because the concentrations of chemicals that can be positively detected in the environmental media (soil, groundwater, sediments, and air) are limited by the capabilities of the analytical method used.

For information purposes, the following have been identified in Appendix B:

- COCs with DTLs or Tier 1 risk-based target levels (RBTLs) lower than the detection limit or Practical Quantitation Limit (PQL) of current analytical methods and
- COCs that do not have a standard method listed in SW-846.

This discussion identifies the approaches that may be used for initial characterization of sites where the DTL, water quality criteria, or other investigative screening level for a particular COC(s) cannot be achieved using standard analytical methods. Examples of these approaches include:

1. Check the data to confirm that the standard detection limits are indeed higher than the DTLs or RBTLs and that no errors were committed in any of the processes (for example, transposing numbers, misplacing a decimal point, or unit conversion).
2. Use alternative analytical methods that achieve lower detection limits than the target levels.
3. Use other associated COCs as surrogates for contaminant extent determination, provided that the environmental mobility of the problem chemical(s) is equal to or less than the surrogate's mobility. Where multiple surrogates are possible, select the one with the mobility closest to the problem chemical.
4. Use data that are above the analytical detection limit for COCs with low DTL values to develop areal contaminant trends which can then be used to extrapolate contaminant extent to the DTLs.
5. Use data that are above the analytical detection limit in a fate and transport model to extrapolate contaminant extent.
6. Determine the exposure pathway that was used to estimate the DTLs. If that pathway is not complete for the site, and with prior departmental approval, use alternative exposure pathway-based investigatory threshold levels.

This is not an exhaustive list of approaches. These and other reasonable approaches will be considered by the department and can be approved on a case-by-case basis.

5.8 INITIAL CHARACTERIZATION REPORT

The remediating party should document the results of the initial characterization and comparison with target levels in a report to the department. The report should discuss:

- Site history,
- Site description,
- Current site use and potential future site use,
- Sources and COCs identified at the site,
- Methods used to collect and analyze data,
- Locations and concentrations of all samples (identified on a site map), including sample depths,
- Laboratory results from chemical data analysis,
- Locations, construction and lithology of all borings, wells or piezometers,
- QA/QC information,
- Determination of whether ecological issues are of concern and any resulting ecological risk assessment activities,
- Results of comparison with DTLs and applicable water quality criteria, and
- Recommendation for the next course of action (request for Letter of Completion, remediation, or tiered assessment).

Table 5-1 Eco-Risk Assessment: Chemicals and Target Levels*

Chemicals of Concern with Protection of Aquatic Life (AQL) or Human Health Protection-Fish Consumption (HHF) Water Quality Criteria Less Than Groundwater DTLs or RBTLs

Parameter	Units	Water Quality Criteria
Volatile Organics		
1,1-Dichloroethylene	µg/L	3.2**
1,2-Dichloropropane	µg/L	39**
Chlorodibromomethane	µg/L	34**
Dichlorobromomethane	µg/L	46**
Organics		
2,4-Dichlorophenol	µg/L	7
Ethylbenzene	µg/L	320
Hexachlorocyclopentadiene	µg/L	0.5
Phenol	µg/L	100
1,2,4,5-Tetrachlorobenzene	µg/L	2.9**
Polynuclear Aromatic Hydrocarbons (PAHs)		
Benzo(a)pyrene	µg/L	0.049**
Phthalate Esters		
Bis(2-ethylhexyl) phthalate	µg/L	5.9**
Pesticides		
Demeton	µg/L	0.1
Endosulfan – chronic	µg/L	0.056
– acute	µg/L	0.11
Guthion	µg/L	0.01
Malathion	µg/L	0.1
Parathion	µg/L	0.04
Chlorpyrifos	µg/L	0.04
Persistent, Bioaccumulative, Man-Made Toxics		
Aldrin	µg/L	0.000079**
Chlordane	µg/L	0.00048**
Dieldrin	µg/L	0.000076**
Endrin	µg/L	0.0023**
Endrin aldehyde	µg/L	0.0023**
Heptachlor	µg/L	0.0002
Heptachlor epoxide	µg/L	0.00011**
Lindane (gamma-BHC)	µg/L	0.062**
Methoxychlor	µg/L	0.03
Mirex	µg/L	0.001
Toxaphene	µg/L	0.000073**
2,3,7,8-TCDD (dioxin)	ng/L	0.000014**

Table 5-1 Eco-Risk Assessment: Chemicals and Target Levels* (Continued)
Chemicals of Concern with Protection of Aquatic Life (AQL) or Human Health Protection-Fish Consumption (HHF) Water Quality Criteria Less Than Groundwater DTLs or RBTLs

Parameter	Units	Water Quality Criteria
Persistent, Man-Made Carcinogens		
Hexachlorobenzene	µg/L	0.00074**
Metals		
Aluminum – acute	µg/L	750
Arsenic	µg/L	20
Cadmium– chronic	µg/L	0.2
– acute	µg/L	2.4
Chromium (III) – chronic	µg/L	42
(III) – acute	µg/L	323
Chromium (VI) – chronic	µg/L	10
(VI – acute	µg/L	15
Cyanide, amenable to chlorination – chronic	µg/L	5
– acute	µg/L	22
Copper– chronic	µg/L	4
– acute	µg/L	7
Lead– chronic	µg/L	1
Mercury– chronic	µg/L	0.5
Nickel – chronic	µg/L	29
Nickel – acute	µg/L	261
Selenium	µg/L	5
Silver– acute	µg/L	1.0
Zinc– chronic	µg/L	59
– acute	µg/L	65
Non-organics		
Chlorine, total residual (cold-water) – chronic	µg/L	2***
(warm-water) – chronic	µg/L	10***
(warm-water) – acute	µg/L	19***
Hydrogen sulfide, un-ionized	µg/L	2***
Chloride – chronic	mg/L	230***
– acute	mg/L	860***

Source: 10 CSR 20-7.031, Table A – Water Quality Criteria

* If 10 CSR 20-7.031, Table A Water Quality Criteria changes, the most current regulatory value supercedes the above values.

** Values are based on HHF criteria. All other values are based on AQL. Because some AQL metals criteria differ according to water hardness, the lowest chronic and acute values for common waterbody types are used. If site-specific hardness data are available, the twenty-fifth percentile value and the equations for hardness dependent metals found in 10 CSR 20-7.031, Table A may be used for comparison purposes.

*** Chemicals of concern that do not have groundwater default target levels (DTLs) or risk-based target levels (RBTLs).

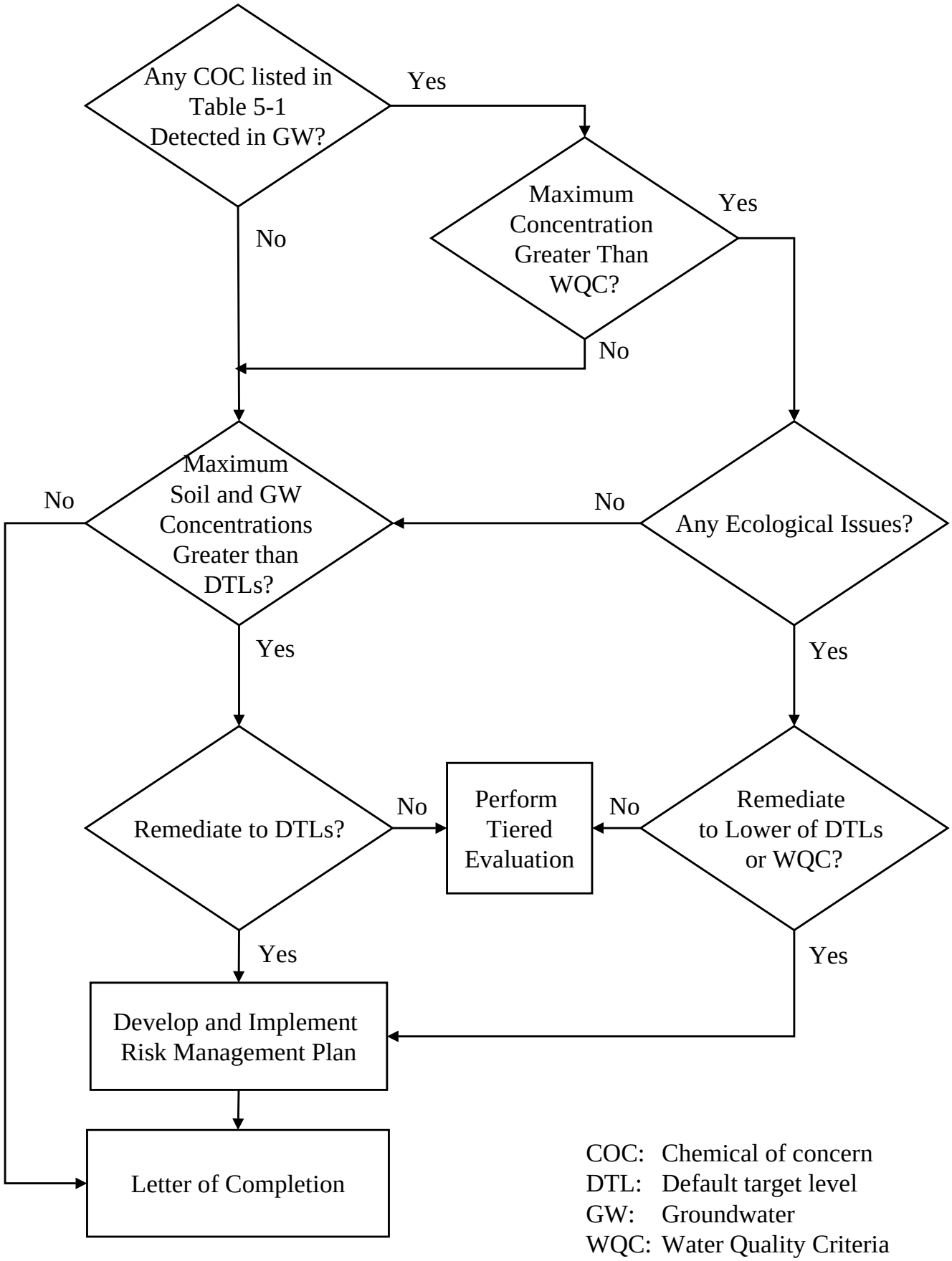

Figure 5-1. Flowchart of MRBCA Decision Process After Initial Site Characterization