

# Contaminant Delineation for Cleanup Projects



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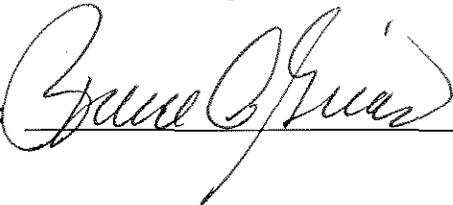
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## 1. Purpose

The purpose of this document is to promote consistent decisions about contaminant delineation requirements at cleanup sites. DEQ cleanup rules require a responsible party to establish the “nature and extent of contamination” and “locality of the facility” (LOF). A 2012 survey of DEQ cleanup project managers (PMs) indicated differences in interpretation of these terms and how they should be applied for cleanup projects, and differences in opinion on standards for contaminant delineation. The Program Development Team (PDT) clarifies the definitions for these terms and identifies appropriate standards in this document.

## 2. Applicability

This document is to be used by DEQ PMs when making decisions about contaminant delineation requirements for site investigations conducted at cleanup sites. The PDT believes this document will be applicable for the large majority of cleanup sites, will improve consistency in contaminant delineation requirements by eliminating a source of uncertainty, and will provide a clear expectation for site investigations. The PDT recognizes that there always will be a small percentage of sites that will require varying from the proposed approach due to unusual or atypical conditions. As always, staff are encouraged to engage their lead worker or manager to develop a site investigation strategy.

## 3. Delineation Approach

The contaminant delineation process should typically follow the steps below and in the attached Contaminant Delineation Decision Matrix (Figure 1) and Decision Matrix for Off-Property Investigation (Figure 2):

1. Make an initial assessment of the locality of the facility (LOF) as described herein. Evaluate the current and reasonably likely future beneficial land and water use at the site and in the site vicinity. Use this information to establish the conceptual site model (CSM) for the project. This may be an iterative process.
2. Once the CSM has been agreed upon, compare the existing data for all media (measured, estimated or modeled) to the applicable human health or ecological risk screening levels (RSLs, RBCs, SLVs, etc.) for all appropriate receptors. It is important to come to agreement with the performing party on the CSM, as it will guide all future work.
3. If contaminants are present above applicable risk screening levels and the extent of contamination above those screening levels has not been defined, continue to gather data until the extent of the applicable risk screening level exceedance area has been defined.
4. When the known/estimated extent of contamination has been delineated such that the impacted media concentrations are equal to or below all applicable risk screening levels per the CSM, and you have information demonstrating that the contamination is stable, no further data gathering – *for the purposes of delineation* – is needed. Contamination is considered stable if it is not significantly increasing in

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concentration or aerial extent. Evaluation of stability may be based on one or more of the following: contaminant source area, presence or absence of free product, concentration trends (over multiple sampling events), contaminant mobility, contaminant mass flux, age of release, concentration gradient, and contaminant transport modeling results.

5. The CSM, LOF, and associated contaminant exposure pathways may be refined as data are collected and evaluated. In this case the contaminant screening in step #2 should be updated as appropriate.
6. As explained above, contaminant delineation may not be necessary beyond the lateral or vertical extent at which concentrations fall below the applicable risk screening levels. In some cases, such as when a drinking water source might be impacted, or when free product is present, additional data collection or analysis may be needed to determine whether a contaminant plume is stable and/or attenuating.

## 4. Background

This section is intended to provide background and additional details to support the above approach.

Oregon Removal and Remedial Action statutes (ORS 465.200 to 465.545) require cleanup when there is a release of a hazardous substance at a facility, as necessary, to protect the public health, safety, welfare and the environment. The term “Facility” is defined (in both ORS 465.200 and OAR 340-122-0115) to include the property where the release occurred or has come to be located. The geographic area of a facility is not necessarily the same as the property ownership boundary; it may be a larger area including some or all of adjacent or other properties.

The term Locality of Facility (LOF) is not defined in the Removal and Remediation Action statutes (ORS 465.200 to 465.545) and is only mentioned once in the statute, in the context of ecological risk assessment, as found in ORS 465.315(1)(b)(A). The LOF is defined in rule under OAR 340-122-0115 and this definition is different than the definition of facility because it requires both the presence of contamination and contact or reasonably likely contact with receptors. The LOF also needs to consider potential future contact if contamination migrates or expands over time to ensure that all relevant exposure pathways are evaluated. The LOF is further mentioned in rule related to standards for degree of cleanup, site evaluation, preliminary assessments, remedial investigation, and risk assessment as noted in Table 1.

The phrase “nature and extent” is not defined or used in the Removal and Remediation Action statutes (ORS 465.200 to 465.545) and only appears once in rule [(OAR 340-122-0080(3)(f)(B))] when discussing considerations for current and reasonably likely future beneficial uses of groundwater and surface water. However, phrases similar to “nature and extent” appear throughout rule as noted in Table 1. Additional statute and rule references are also provided in Table 1.

### Locality of the Facility

OAR 340-122-0115(35) defines the LOF as being “any point where a human or ecological receptor contacts or is reasonably likely to come into contact with facility-related hazardous substances...”, taking into account the nature of the contaminant, contaminant migration, human and biological activity, and time.

The Fall 2013 PDT survey revealed multiple interpretations among project managers about the role and function of the LOF in the course of a project, as well as how the LOF should be defined (e.g., non-detect,

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RBCs, any detection, etc). The PDT concludes that the primary function of the LOF is to identify all relevant exposure pathways to support identification of applicable risk screening levels (RBCs or other relevant screening criteria). Once this conceptual site model has been developed, and the appropriate exposure pathways have been determined, the requirement for identifying the LOF is satisfied and has no further role in the project. The investigation should then focus on evaluating the nature and extent of contamination using applicable risk screening levels and other lines of evidence.

Understandably, the language regarding LOF has sometimes been used interchangeably with “nature and extent”, and interpreted as requiring contaminant delineation to very low or non-detect levels. The PDT concludes that there is latitude for the PM to estimate an LOF using available site data (if available), modeling, and/or best professional judgment and experience, in order to determine the CSM. Collection of quantitative analytical data is not always needed to define an LOF, particularly if beneficial land and water use has been established for a nearby project with similar characteristics, or the highest end use of groundwater (drinking water) or soil (residential) is assumed. Rather, the need for additional data should be driven by the nature and extent investigation as dictated by the CSM.

## Nature and Extent of Contamination

The PDT recommends that appropriate risk screening levels (RBCs or other relevant screening criteria), based on potentially complete exposure pathways in the LOF, be used to delineate the nature and extent of contamination. The term "nature and extent of contamination" is one of the most widely used terms in cleanup guidance and site investigation reports and decision documents. Despite its widespread use, Oregon DEQ cleanup rule and guidance do not explicitly outline requirements or standards for delineating the nature and extent of contamination. The PDT consulted with the Department of Justice to ensure that its recommendation is consistent with rule and statute. The recommendations are reflected in the Contaminant Delineation Decision Matrix (Figure 1). The decision matrix specifies minimum investigation requirements and will assist DEQ PMs and RPs in developing the site investigation scope of work. If site-related contamination is known or suspected to extend off-property, refer to the Decision Matrix for Off-Property Investigation (Figure 2) to help decide if offsite sampling is recommended. DEQ will consider other lines of evidence for identifying the nature and extent of contamination, including source location, contaminant type and mobility, modeling, analytical detection limits, data density, vertical and horizontal concentration gradients, contaminant flux, and background levels.

## 5. Acronyms Used

CSM	Conceptual Site Model
DEQ	Oregon Department of Environmental Quality
LOF	Locality of the Facility
OAR	Oregon Administrative Rules
ORS	Oregon Revised Statutes
PDT	Program Development Team
PM	Project Manager
RBC	Risk-Based Concentration
RSL	Regional Screening Level
SLV	Screening Level Value

## 6. List of Figures and Tables

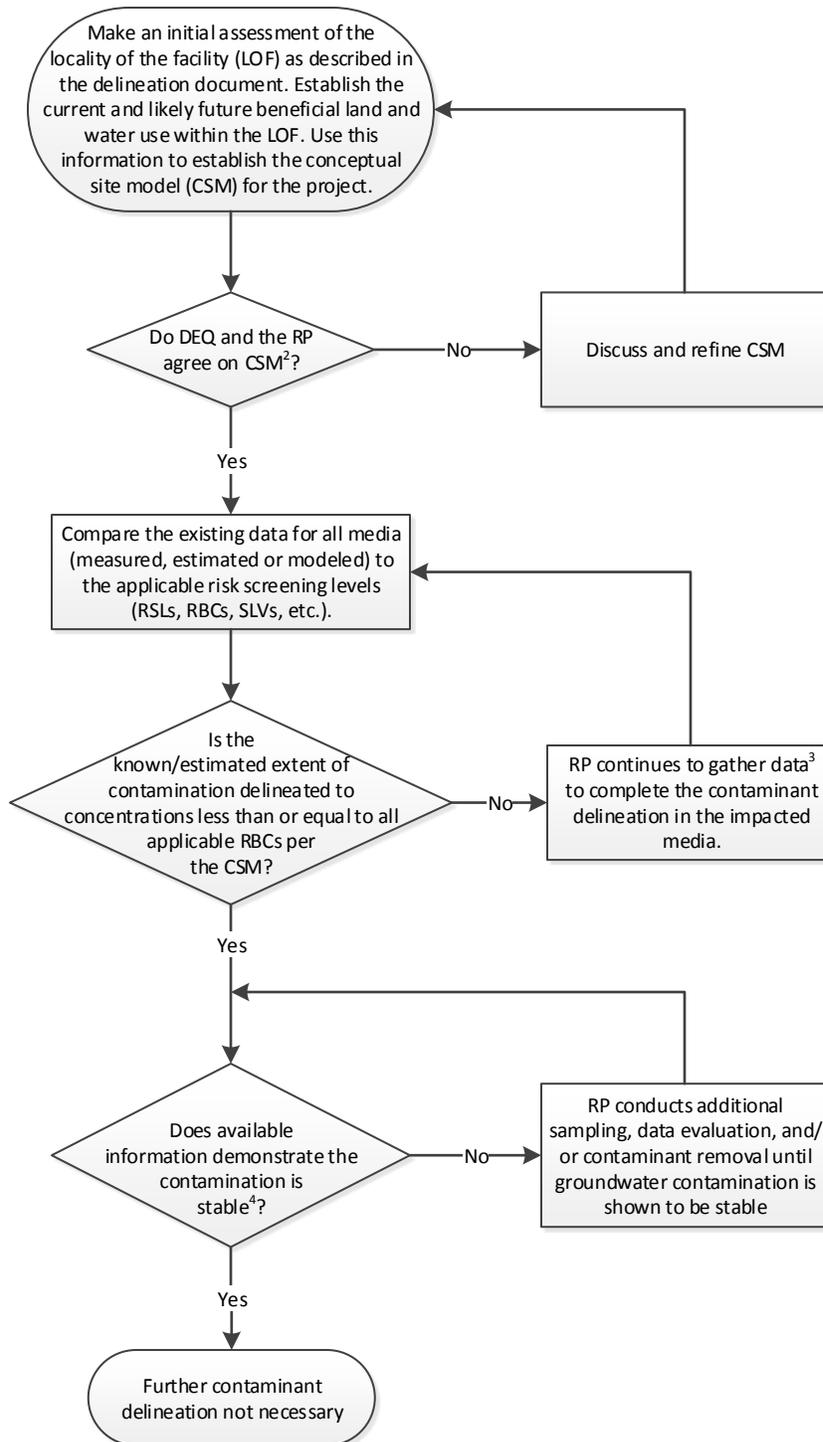
Figure 1. Contaminant Delineation Decision Matrix.

Figure 2. Decision Matrix for Off-Property Investigation.

Table 1. Rule and statute references for key terms.

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## Figure 1. Contaminant Delineation Decision Matrix



### Notes

This decision matrix should apply to the large majority of cleanup sites; however, there always will be a small minority of sites that will require special handling due to unusual or atypical conditions.

<sup>1</sup>The LOF is defined as any point where a human or ecological receptor contacts or is reasonably likely to come into contact with facility-related hazardous substances taking into account the nature of the contaminant, contaminant migration, human and biological activity, and time.

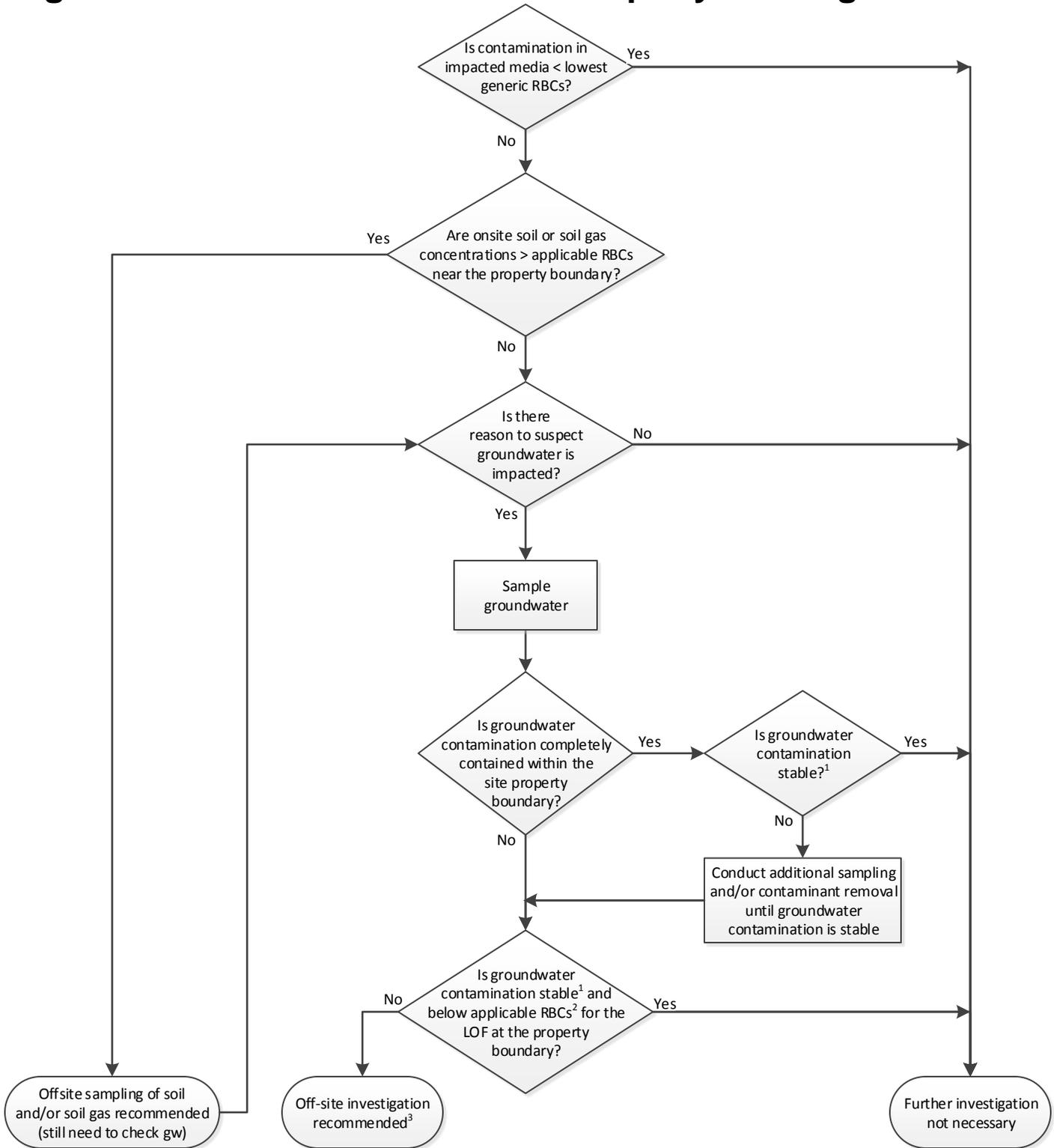
<sup>2</sup>It is important to come to agreement with the performing party on the CSM, as it will guide all future work.

<sup>3</sup>Additional data can be measured, estimated or modeled.

<sup>4</sup>Contamination is considered stable if it is not significantly increasing in concentration or aerial extent. Evaluation of stability may be based on one or more of the following: contaminant source area, presence or absence of free product, concentration trends (over multiple sampling events), contaminant mobility, contaminant mass flux, age of release, concentration gradient, and contaminant transport modeling results.

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## Figure 2. Decision Matrix for Off-Property Investigation



### Notes

This decision matrix considers human health only, and is appropriate as a general guideline at most sites, but may not be applicable if there is LNAPL, DNAPL, preferential contaminant pathways, and/or a threat to a municipal or community water supply well.

<sup>1</sup> Contamination is considered stable if it is not significantly increasing in concentration or aerial extent. Evaluation of stability may be based on one or more of the following: contaminant source area, presence or absence of free product, concentration trends (over multiple sampling events), contaminant mobility, contaminant mass flux, age of release, concentration gradient, and contaminant transport modeling results.

<sup>2</sup> Applicable RBCs include both site property and off-site property in the event there is different land/water use across property line.

<sup>3</sup> The RP may complete further evaluation including modeling, risk assessment, or refinements to the beneficial land and water use determination to substantiate the need for offsite investigation.

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**Table 1. Rule and statute references for key terms.**

Term	ORS / OAR Reference
Facility	<ul style="list-style-type: none"> <li>• Defined in ORS 465.200(13): “Facility” means any building, structure, installation, equipment, pipe or pipeline including any pipe into a sewer or publicly owned treatment works, well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, above ground tank, underground storage tank, motor vehicle, rolling stock, aircraft, or any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located and where a release has occurred or where there is a threat of a release, but does not include any consumer product in consumer use or any vessel.</li> <li>• Defined in OAR 340-122-0115(26): "Facility" or "Site" uses same wording as in statute above.</li> <li>• ORS 465.215 (List of facilities with confirmed release) specifies that DEQ “shall develop and maintain a list of all facilities with a confirmed release” and that the list shall include (among other things and if known) the “Levels of a hazardous substance, if any, in ground water, surface water, air and soils at the facility”</li> <li>• ORS 465.220 (Comprehensive statewide identification program; notice) specifies that DEQ “shall develop and implement a comprehensive statewide program to identify any release or threat of release from a facility that may require remedial action.”</li> <li>• OAR 340-340-122-0080 (Remedial Investigation) discusses “characterization of the facility”</li> <li>• OAR 340-122-0084 (Risk Assessment) discusses both human health and ecological “risks potentially associated with the facility”</li> </ul>
Locality of Facility	<ul style="list-style-type: none"> <li>• Not defined in statute.</li> <li>• Mentioned in ORS 465.315 (Standards for degree of cleanup required; Hazard Index; risk protocol; hot spots of contamination; exemption; rules)</li> <li>• Defined in OAR 340-122-0115(35): "Locality of the facility" means any point where a human or an ecological receptor contacts, or is reasonably likely to come into contact with, facility-related hazardous substances, considering:               <ul style="list-style-type: none"> <li>(a) The chemical and physical characteristics of the hazardous substances;</li> <li>(b) Physical, meteorological, hydrogeological, and ecological characteristics that govern the tendency for hazardous substances to migrate through environmental media or to move and accumulate through food webs;</li> <li>(c) Any human activities and biological processes that govern the tendency for hazardous substances to move into and through environmental media or to move and accumulate through food webs; and</li> <li>(d) The time required for contaminant migration to occur based on the factors described in subsections (35)(a) through (c) of this rule.</li> </ul> </li> <li>• Mentioned in OAR 340-122-0071 (Site Evaluation)</li> <li>• Mentioned in OAR 340-122-0072 (Preliminary Assessments)</li> <li>• Mentioned in OAR 340-122-0080 (Remedial Investigation)</li> <li>• Mentioned in OAR 340-122-0084 (Risk Assessment)</li> </ul>

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Term	ORS / OAR Reference
Nature and Extent	<ul style="list-style-type: none"> <li>• Not defined in statute or rule</li> <li>• Phrase is used in Hazardous Waste statutes ORS 466.225 (Monitoring site; access) and Notice of Environmental Hazards statute ORS 466.360 (Policy)</li> <li>• “Nature and extent” is mentioned in OAR 340-122-0080 (Remedial Investigation); also use phrases “nature, extent, and concentration” and “nature, extent and toxicity”</li> <li>• OAR 340-122-0072 (Preliminary Assessments) mentions “extent of migration”</li> </ul> <p>Under the Cleanup Rules for leaking Petroleum UST Systems:</p> <ul style="list-style-type: none"> <li>• OAR 340-122-0217 (Requirements and Remediation Options) mentions “magnitude and extent” and uses the phrase “fully delineated”</li> <li>• OAR 340-122-0225 (Initial Abatement Measures and Site Check) mentions considering the “nature of the stored petroleum”</li> <li>• OAR 340-122-0230 (Initial Site Characterization) mentions “nature and estimated quantity”</li> <li>• OAR 340-122-0240 (Investigation for Magnitude and Extent of Contamination) mentions “nature, magnitude, and extent”, “areal and vertical extent”, “areal extent”, and “magnitude and extent”</li> <li>• OAR 340-122-0244 (Risk-Based Concentrations) mentions “magnitude and areal and vertical extent”</li> <li>• OAR 340-122-0250 (Corrective Action Plan) mentions “magnitude and extent”</li> <li>• OAR 340-122-0340 (Sample Number and location) mentions “extent, volume, and level of contamination”</li> <li>• OAR 340-122-0355 (Evaluation of Analytical) mentions “apparent extent of contamination”</li> </ul>

## **7. Record of Revisions**

<b>Revision</b>	<b>Date</b>	<b>Changes</b>	<b>Editor</b>
N/A			