

WAC 173-340-350 Remedial investigation and feasibility study.

(1) **Purpose.** The purpose of a remedial investigation/feasibility study is to collect, develop, and evaluate sufficient information regarding a site to select a cleanup action under WAC 173-340-360 through 173-340-390.

(2) **Timing.** Unless otherwise directed by the department, a remedial investigation/feasibility study shall be completed before selecting a cleanup action under WAC 173-340-360 through 173-340-390, except for an emergency or interim action.

(3) **Administrative options.** A remedial investigation/feasibility study may be conducted under any of the procedures described in WAC 173-340-510 and 173-340-515.

(4) **Submittal requirements.** At the completion of the remedial investigation/feasibility study, a report complying with this chapter shall be prepared and submitted to the department. The department may require reports to be submitted for discrete elements of the remedial investigation/feasibility study. A remedial investigation/feasibility study shall comply with the submittal requirements in WAC 173-340-840.

(5) **Public participation.** Public participation will be accomplished in a manner consistent with WAC 173-340-600.

(6) **Scope.** The scope of a remedial investigation/feasibility study will vary from site to site, depending on the characteristics and complexity of the specific facility. This requires that the process remain flexible and be streamlined when possible to avoid the collection and evaluation of unnecessary information so that the cleanup can proceed in a timely manner.

(a) **Incorporation of pre-existing information.** Where information required in subsections (8) and (9) of this section is available in other documents for the site, that information may be summarized and incorporated by reference to avoid unnecessary duplication. However, in all cases sufficient information must be collected, developed, and evaluated to enable the selection of a cleanup action under WAC 173-340-360 through 173-340-390.

(b) **Integration of the remedial investigation with the feasibility study.** Site characterization activities may be integrated with the development and evaluation of alternatives in the feasibility study, as appropriate.

(c) **National priorities list sites.** For facilities on the federal national priorities list, a remedial investigation/feasibility study shall also comply with federal requirements.

(d) **Sediment sites.** In addition to the information required by this chapter, for facilities with sediment impacts, the remedial investigation/feasibility study shall also comply with WAC 173-204.

(7) Procedures for conducting a remedial investigation.

(a) **Purpose.** The purpose of the remedial investigation is to collect the data necessary to adequately characterize the site for the purpose of developing and evaluating cleanup action alternatives. Site characterization activities may be integrated with the development and evaluation of alternatives in the feasibility study, as appropriate.

(b) **Scoping activities.** To focus the collection of data and to assist the department in making the preliminary evaluation required under the State Environmental Policy Act (see WAC 197-11-256), the following scoping activities shall be undertaken before conducting a remedial investigation:

(i) Assemble and evaluate existing data on the site, including the results of any interim or emergency actions, initial investigations, site hazard assessments, and other site inspections;

(ii) Develop a preliminary conceptual site model as defined in WAC 173-340-200;

(iii) Begin to identify likely cleanup levels for the site;

(iv) Begin to identify likely cleanup action components that may address the releases at the site;

(v) Consider the type, quality and quantity of data necessary to support selection of a cleanup action; and

(vi) Begin to identify likely applicable state and federal laws under WAC 173-340-710.

(c) **Workplans.** Prepare a safety and health plan and a sampling and analysis plan prior to

conducting field work for the remedial investigation/feasibility study. These plans shall conform to the requirements specified in WAC 173-340-810 and 173-340-820.

(8) Remedial Investigation Content. A remedial investigation shall include the following information as appropriate:

(a) General facility information. General information, including: Project title; name, address, and phone number of project coordinator; legal description of the **source property** location; dimensions of the **source property**; present owner and operator; chronological listing of past owners and operators and operational history; and other pertinent information.¹

(b) Site conditions map. An existing site conditions map that illustrates relevant current site features such as property boundaries, **site** boundaries, surface topography, surface and subsurface structures, utility lines, well locations, and other pertinent information. **More than one map may be used to convey this information if necessary for clarity.**

(c) Conceptual Site Model. Identification of all potentially relevant current and future human health and ecological exposure pathways using a conceptual site model.

(d) Field investigations. Sufficient investigations to characterize the distribution of hazardous substances present at the site, and threat to human health and the environment.² **The use of expedited site assessment techniques such as the U.S.EPA's "Triad" approach are encouraged to streamline site investigations. For example, the use of field screening methods to guide investigations and the use of an on-site laboratory or fast turnaround laboratory analysis to provide real-time feedback for investigations is encouraged. Where applicable to the site, these investigations shall address the following:**

(i) Surface water and sediments. Investigations of surface water and sediments to char-

acterize significant hydrologic features such as: Surface drainage patterns and quantities, areas of erosion and sediment deposition, surface waters, floodplains, and actual or potential hazardous substance migration routes towards and within these features.

(A) Sufficient surface water and sediment sampling shall be performed to adequately characterize the areal and vertical distribution and concentrations of hazardous substances.

(B) Properties of surface and subsurface sediments that are likely to influence the type and rate of hazardous substance migration, or are likely to affect the ability to implement alternative cleanup actions shall be characterized.

(ii) Soils. Investigations to adequately characterize the areal and vertical distribution and concentrations of hazardous substances in the soil due to the release. Properties of surface and subsurface soils that are likely to influence the type and rate of hazardous substance migration, or which are likely to affect the ability to implement alternative cleanup actions shall be characterized. **Soils shall be classified using the Unified Soil Classification System (ASTM D 2487). This may be supplemented by other methods as appropriate for the site.**

(iii) Geology and ground water system characteristics. Investigations of site geology and hydrogeology to adequately characterize the areal and vertical distribution and concentrations of hazardous substances in the ground water and those features which affect the fate and transport of these hazardous substances. This shall include, as appropriate:

(A) The description, **distribution and** physical properties, of bedrock and unconsolidated materials **such as depth, location, thickness, grain size, permeability, density, fracture patterns and water bearing zones;**

(B) Ground water flow rate and **vertical and horizontal** gradients for affected and potentially affected ground waters;

(C) Ground water divides; areas of ground water recharge and discharge; **preferential seepage pathways; interconnectivity of water bearing zones and likely barriers to contaminant migration;**

¹ "Source property" as used in this section means the property where the release originated. (this footnote will be in the rule)

² All areas where hazardous substances have come to located (above background) shall be characterized. (this footnote will be in the rule)

(D) Location of public and private production wells; and

(E) Ground water sampling representative of areas potentially impacted by the release, including areas beyond the source property.

(iv) **Climate.** Information regarding local and regional climatological characteristics which are likely to affect the hazardous substance migration such as:

(A) Seasonal patterns of precipitation;

(B) The magnitude and frequency of storm events;

(C) Seasonal temperatures and extremes, and,

(D) Seasonal prevailing wind directions and velocities using wind rose diagrams.

(v) **Vapors and Dust.** Sufficient information to evaluate the potential impacts of vapor and dust migration on air quality within current and future buildings and other structures and outdoor ambient air. See WAC 173-340-XXX for vapor evaluation methods.

(vi) **Land use.** Information regarding present and proposed land and resource uses and the comprehensive plan and zoning for the site and potentially affected areas. Include information characterizing human and ecological populations that are reasonably likely to be exposed or potentially exposed to the release based on such uses.

(vii) **Natural resources and ecological receptors.**

(A) Information to determine the impact or potential impact of the hazardous substance from the facility on natural resources and ecological receptors. This includes sufficient information to conduct a terrestrial ecological evaluation, under WAC 173-340-7490 through 173-340-7494.

(B) Identification of the extent of habitat at a site and the surrounding areas, including wetlands, parks, natural forested areas, greenbelts, buffer zones, etc. Also identification of plants and animals present at the site, with special emphasis on any endangered or threatened species that may be present.

(C) At many sites, cleanup actions addressing human health or aquatic exposure pathways will also address terrestrial ecological concerns. Nevertheless, a terrestrial ecological evaluation

must be included in the remedial investigation. And, depending on the outcome of that evaluation, cleanup alternatives addressing terrestrial ecological impacts may need to be included in the feasibility study. An example of how to integrate the terrestrial ecological evaluation into the remedial investigation/feasibility study is provided in WAC 173-340-7495.

(C) The basis for determinations made under WAC 173-340-7490 through 7494 shall be documented and included in the remedial investigation report.

(viii) **Hazardous substance sources.** A description of and sufficient sampling to define the location, quantity, areal and vertical extent, concentration, and sources of releases. This includes identification and sampling of: areas where the release originated; products and waste materials; areas of highest soil and sediment concentrations; and, areas where non-aqueous phase liquid is located. Where relevant, information on the physical and chemical characteristics, and the biological effects of hazardous substances shall be provided.

(ix) **Regulatory classifications.** Regulatory designations for affected air, surface water and ground water, if any. Identify potentially applicable and relevant and appropriate standards for affected media.

(e) **Preliminary Cleanup Levels.** A compilation of preliminary cleanup levels for all potentially relevant current and future exposure pathways. Describe the basis for these cleanup levels, along with a comparison to the hazardous substance concentrations found at the site.

(g) **Other information.** Other information as required by the department.

(9) **Procedures for conducting a feasibility study.**

(a) **Purpose.** The purpose of the feasibility study is to develop and evaluate cleanup action alternatives to enable a cleanup action to be selected for the site.

(b) **When to conduct a feasibility study.** If the remedial investigation finds that concentrations of hazardous substances exceed the potentially relevant cleanup levels at a standard

point of compliance, then a feasibility study must be conducted.

(c) Model remedies. If a model remedy is available under WAC 173-340-390 and is selected up-front as the preferred alternative, there is no need to complete the steps described in this subsection. However, the documentation in subsection (10) of this section must still be submitted.

(d) Alternatives analysis. The following process shall be used to identify, screen and evaluate alternatives for cleaning up a site. See figure 350-1 for a visual depiction of the remedy selection process described here.

(i) Step 1-Remedial Action Goals. Identify the goals expected to be achieved by the cleanup, in addition to compliance with this chapter.

(ii) Step 2-Identify Alternatives. Identify alternatives that address all areas of the site where cleanup levels have been exceeded and for all relevant exposure pathways. The alternatives must provide for protection of human health and the environment (including, as appropriate, aquatic and terrestrial ecological receptors) by eliminating, reducing or otherwise controlling risks posed through each exposure pathway and migration route.

(A) A reasonable number and type of alternatives shall be evaluated, taking into account the characteristics and complexity of the site, including current site conditions and physical constraints.

(B) Sites requiring an environmental impact statement and federal cleanup law sites must include a no action alternative.

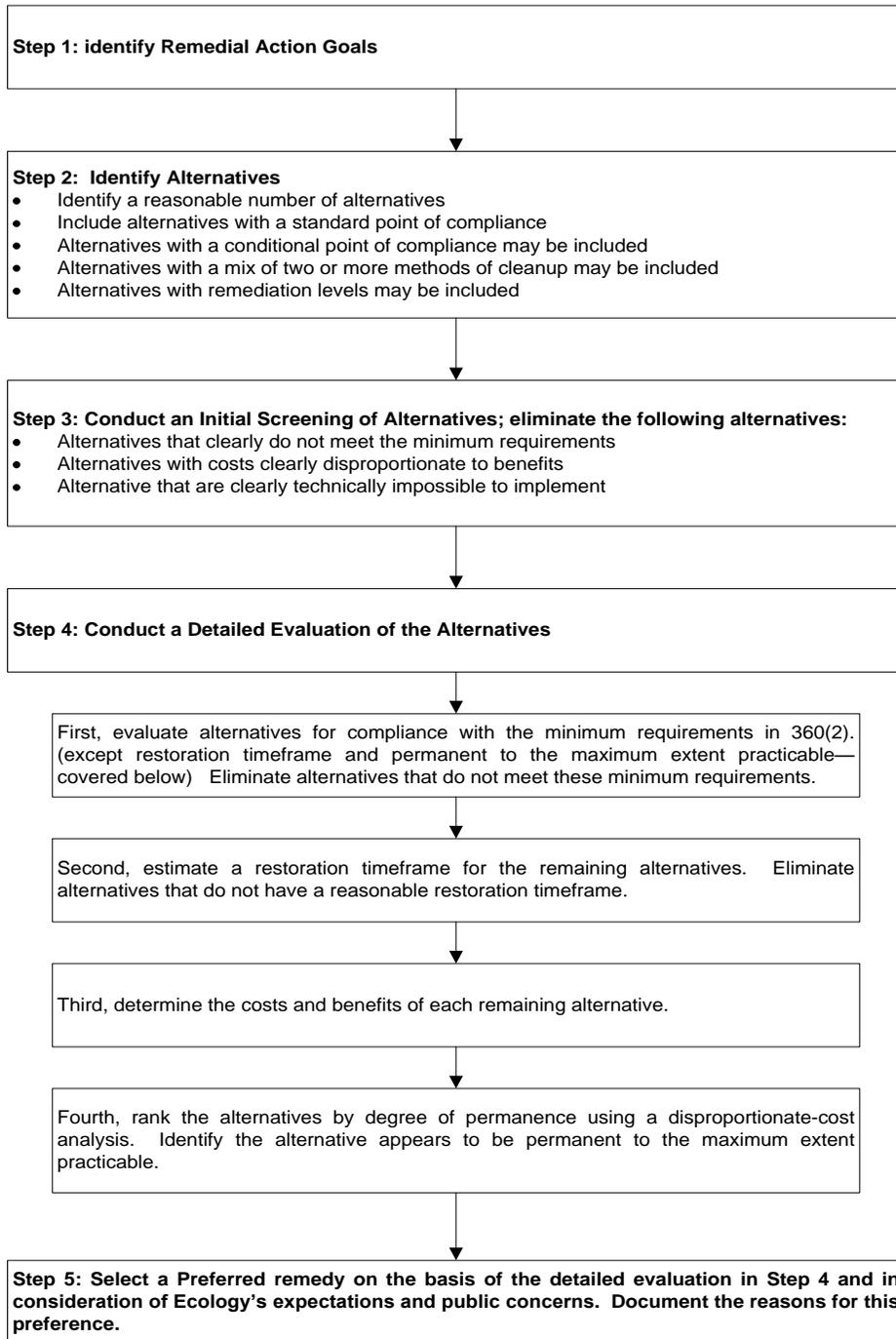
(C) Alternatives shall be included that use a standard point of compliance for each environmental medium. Where appropriate, alternatives with conditional points of compliance may also be included.

(D) Alternatives can be included that consist of a mix of cleanup action components. For example, an alternative that consists of treating the areas of highest soil concentration and off-site disposal of the remaining contaminated soil.

(E) Alternatives can also include remediation levels to define when particular cleanup action components will be used. For example, in the

preceding example in (D), the concentration determining which soils are treated versus which are disposed of would be considered a remediation level. See WAC 173-340-355 for additional discussion of remediation levels.

Figure 350-1: Remedy Selection Process under WAC 173-340-350.³



³ This figure is intended to help the user understand the remedy selection process under this chapter. It does not establish or modify regulatory requirements. (this footnote will be in the rule)

(iii) Step 3-Initial Screening of alternatives. Screen alternatives to, where appropriate, reduce the number of alternatives for the final detailed evaluation. For sites conducting a feasibility study under an order or decree, the department shall make the final determination of which alternatives must be evaluated in detail in the feasibility study. The following cleanup action alternatives or components may be eliminated from the feasibility study:

(A) Alternatives that, based on a preliminary analysis, so clearly do not meet the minimum requirements specified in WAC 173-340-360 that a more detailed analysis is unnecessary.

(B) Alternatives for which costs are clearly disproportionate under WAC 173-340-360(4); and

(C) Alternatives or components that are clearly technically impossible to implement.

(d) Step 4-Detailed evaluation of alternatives. A detailed evaluation of each alternative not eliminated under (c) of this subsection shall be conducted next. This detailed evaluation shall use the criteria specified in WAC 173-340-360 and generally be conducted as follows:

(i) First, evaluate whether the alternatives meet all of the minimum requirements in WAC 173-340-360(2) except the restoration time frame and the permanent to the maximum extent practicable requirements (which are evaluated later). Drop out alternatives that do not meet the minimum requirements.

(ii) Second, estimate a restoration time frame for each alternative and describe the basis for this estimate. Then evaluate the reasonableness of this time frame using the criteria in WAC 173-340-360(3). Eliminate alternatives that do not provide for a reasonable restoration time frame.

(iii) Third, determine the costs and benefits of each alternative using the criteria in WAC 173-340-360(4)(f).

(iv) Fourth, conduct the disproportionate-cost analysis in WAC 176-340-360(4)(e). Rank the alternatives by their degree of permanence. Identify which remedy appears to be permanent to the maximum extent practicable.

(e) Step 5-Select a Remedy. On the basis of the detailed evaluation in step 4, and in

consideration of the expectations in WAC 173-340-370 and known public concerns, propose a preferred remedy.

(10) Feasibility Study Content. A feasibility study shall include the following information, as appropriate.

(a) A summary of the findings from the remedial investigation, updated with the latest information including:

(i) Conceptual site model;

(ii) Applicable state and federal laws;

(iii) Proposed cleanup levels for indicator hazardous substances in each affected medium.

(iv) The proposed point of compliance for each affected medium; and,

(v) Maps, cross-sections, and appropriate calculations illustrating the location, estimated amount and concentration distribution of contamination above cleanup levels for each affected medium.

(b) Results of any additional investigations conducted since completion of the remedial investigation;

(c) The results of any treatability studies conducted to refine proposed alternatives;

(d) Remedial action goals (step 1);

(e) Alternatives identified in step 2 of the feasibility study;

(f) Alternatives eliminated in the step 3 initial screening process and the basis for elimination;

(g) Documentation of the detailed evaluation process in step 4 of the feasibility study. For each alternative this shall include:

(i) The location and estimated amount of each contaminant to be removed or treated by the alternative and the estimated time frame in which removal or treatment will occur; and

(ii) The location, estimated amount and projected concentration distribution of each contaminant remaining on site after implementation of the alternative;

(h) The proposed preferred remedy (step 5) and the basis for this selection;

(i) Applicable local, state and federal laws specific to the proposed preferred remedy, including a description of likely permit conditions;

(j) A completed environmental checklist for the proposed preferred remedy; and

(k) Other information as required by the department.

(11) Additional requirements.

(a) **Cleanup levels.** Unless otherwise approved by the department, cleanup levels shall be established for hazardous substances in each medium where the substances have come to be located, using WAC 173-340-700 through 173-340-760. These are typically initially established during the scoping of the remedial investigation and may be further refined during the remedial investigation and/or feasibility study.

(b) **Compliance with other laws.** The department may require that a remedial investigation/ feasibility study include additional information or analyses to comply with the State Environmental Policy Act or other applicable laws. This includes information necessary to make a threshold determination (see WAC 197-11-335(1)), or information necessary to integrate the remedial investigation/feasibility study with an environmental impact statement (see WAC 197-11-262).

(c) **Treatability and pilot studies.** The department may require treatability and pilot studies as necessary to provide sufficient information to develop and evaluate cleanup action alternatives for a site.

(d) **Other information.** Other information may be required by the department.

(e) **Requirements for managing waste.** Any soil, sediment, water or waste contaminated by a hazardous substance generated during a remedial investigation/feasibility study must be properly managed. These materials shall be either:

(i) Transported to a facility permitted or approved to handle these materials; or

(ii) Treated or disposed of in a manner otherwise approved by the department.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-350, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-350, filed 1/28/91, effective 2/28/91; 90-08-086, § 173-340-350, filed 4/3/90, effective 5/4/90.]

WAC 173-340-355 Development of cleanup action alternatives that include remediation levels.

(1) Purpose. A cleanup action or interim action will often involve a combination of cleanup action components, such as treatment of some soil contamination and containment of the remainder. The purpose of remediation levels is to define when these various components will be used in the cleanup. Remediation levels may be based on a concentration (e.g. all soil above 100 mg/kg will be treated), or other method of identification, such as the physical appearance or location (e.g., all of the green sludge will be removed from the northern area of the site).

(2) Relationship to cleanup levels and clean-up standards. Remediation levels are not the same as cleanup levels. A cleanup level defines the concentration of a hazardous substance above which a contaminated medium (e.g., soil) must be remediated in some manner (e.g., treatment, containment, institutional controls). A remediation level, on the other hand, defines the concentration (or other method of identification) at which a particular cleanup action component (e.g., soil treatment or containment) will be used. Remediation levels, by definition, exceed cleanup levels.

Cleanup levels must be established for every site. Remediation levels may not be necessary or appropriate at a site. Whether remediation levels are used depends on the cleanup action selected. For example, remediation levels would not be necessary if the selected cleanup action removes for off-site disposal all soil that exceeds the cleanup level at the applicable points of compliance.

A cleanup action that uses remediation levels must still meet each of the minimum requirements specified in WAC 173-340-360, including the requirement that the cleanup action must comply with cleanup standards. If the remedial action does not comply with cleanup standards, the remedial action is an interim action, not a cleanup action.

(3) How to develop remediation levels. Remediation levels are proposed and evaluated in the feasibility study. Quantitative or qualitative

methods may be used to develop remediation levels.

For example, ways to develop remediation levels include:

(i) Conducting a quantitative human health risk assessment under WAC 173-340-357 to determine what soil concentrations must be removed to protect people if a soil cap is breached.

(ii) Using a fate and transport analysis under WAC 173-340-747 to determine at what soil concentrations a low permeability cap will prevent further groundwater contamination.

(iii) Conducting a site-specific terrestrial ecological risk assessment under WAC 173-340-7494 to assess the effectiveness of a soil cap in protecting plants and animals.

(iv) Conducting a pilot study to determine the technological limitations of a treatment method.

(4) Examples. The following examples of cleanup actions that use remediation levels are for illustrative purposes only. All cleanup action alternatives in a feasibility study, including those with proposed remediation levels, must be evaluated to determine whether they meet each of the minimum requirements specified in WAC 173-340-360. This evaluation requires, in part, a determination that a more permanent cleanup action is not practicable, based on the disproportionate cost analysis in WAC 173-340-360.

(a) Example of a site meeting soil cleanup levels at the point of compliance. Assume that the soil cleanup level at a site is 20 ppm. This means any soil that exceeds the 20 ppm cleanup level at the applicable point of compliance must be remediated in some manner. Further assume that the cleanup action alternative determined to comply with the minimum requirements in WAC 173-340-360 and selected for the site consists of treatment of soil above 100 ppm and removal (and off site landfilling) of soil above 20 ppm but below 100 ppm. Thus, 100 ppm is a remediation level used to define when these two components are used. The cleanup action may be determined to comply with the cleanup standard because the cleanup level is met at the applicable point of compliance.

(b) Example of a site not meeting soil cleanup levels at the point of compliance. Assume that the soil cleanup level at a site is 20 ppm. **This means any soil that exceeds the 20 ppm cleanup level at the applicable point of compliance must be remediated in some manner.** Further assume that the cleanup action alternative determined to comply with the minimum requirements in WAC 173-340-360 and selected for the site consists of treatment **of soil above 100 ppm** and containment **of any soil above 20 ppm but below 100 ppm.** **Thus, 100 ppm is a remediation level used to define when these two components are used.** Residual contamination above the cleanup level will remain at the site. However, assuming the cleanup action meets the requirements specified in WAC 173-340-740 (6)(f) for soil containment actions, the cleanup action may be determined to comply with cleanup standards.

(c) Example of site meeting ground water cleanup levels at the point of compliance. Assume that the ground water cleanup level at a site is 500 ug/l and that a conditional point of compliance is established at the property boundary. Further assume that the cleanup action alternative determined to comply with the minimum requirements in WAC 173-340-360 and selected for the site consists of: Removing the source of the ground water contamination (e.g., removal of a leaking tank and associated soil contamination above the water table); extracting free product and any ground water exceeding a concentration of 2,000 ug/l; and utilizing natural attenuation to restore the ground water to 500 ug/l before it arrives at the property boundary. The ground water concentration of 2,000 ug/l constitutes a remediation level because it defines the concentration of a hazardous substance at which different cleanup action components are used. As long as the ground water meets the 500 ug/l cleanup level at the conditional point of compliance (the property boundary), the cleanup action may be determined to comply with cleanup standards.

(d) Example of a site not meeting ground water cleanup levels at the point of compliance. Assume that the ground water cleanup level at a site is 5 ug/l and that a conditional point of compliance is established at the property boundary.

Further assume that the remedial action selected for the site consists of: Vapor extraction of the soil to nondetectable concentrations (to prevent further ground water contamination); extraction and treatment of ground water with concentrations in excess of 100 ug/l; and installation of an air stripping system to treat ground water at a water supply well beyond the property boundary to less than 5 ug/l. Further assume that the ground water cleanup level will not be met at the conditional point of compliance (the property boundary). The ground water concentration of 100 ug/l constitutes a remediation level because it defines the concentration of a hazardous substance at which different cleanup action components are used. However, in this example, the remedial action does not comply with cleanup standards, **because the cleanup level is not achieved at the property boundary, since treatment occurs at the off-property water supply well.** Consequently, the remedial action is considered an interim action until the cleanup level is attained at the conditional point of compliance (the property boundary).

WAC 173-340-357 Quantitative risk assessment of cleanup action alternatives.

(1) **Purpose.** A quantitative site-specific risk assessment may be used to help determine whether a cleanup action alternative is protective of human health and the environment. Other factors, in addition to the results of the quantitative risk assessment, may need to be considered when evaluating the protectiveness of the cleanup action. Methods other than a quantitative site-specific risk assessment may also be used to determine if a cleanup action alternative is protective of human health and the environment.

(2) **Relationship to selection of cleanup actions.** Selecting a cleanup action requires a determination that each of the requirements specified in WAC 173-340-360 is met, including the requirement that the cleanup action is protective of human health and the environment. A determination that a cleanup action alternative meets this one requirement using a quantitative site-specific risk assessment does not mean that the other requirements specified in WAC 173-340-360 have been met.

(3) **Protection of human health.** A quantitative site-specific human health risk assessment may be used to help determine whether cleanup action alternatives, including those using a remediation level, engineered control and/or institutional control, are protective of human health. References to Method C in this subsection apply only if the particular medium for which the remediation level is being established qualifies for a Method C cleanup level under WAC 173-340-706.

(a) **Reasonable maximum exposure.** The reasonable maximum exposures and corresponding Method B and C equations in WAC 173-340-720 through 173-340-750 may be modified as provided under WAC 173-340-708 (3)(d). For example, land uses other than residential and industrial may be used as the basis for an alternative reasonable maximum exposure scenario for the purpose of assessing the protectiveness of a containment remedy.

(b) **Exposure parameters.** The Method B and C equations in WAC 173-340-720 through

173-340-750 may be modified as provided in WAC 173-340-708(10).

(c) **Acceptable risk level.** The acceptable risk level for remediation levels shall be the same as that used for the cleanup level.

(d) **Soil to ground water pathway.** The methods specified in WAC 173-340-747 to develop soil cleanup levels may also be used to assess whether a cleanup action will protect groundwater from further contamination. For example, when predicting groundwater impacts of a proposal to use a low permeability cap at a site, it would be appropriate to calculate the amount of infiltration that would occur after the cap is installed and compare that to the pre-cleanup conditions.

(e) **Burden of proof, new science, and quality of information.** Any modification of the default assumptions in the Method B and C equations, including modification of the default reasonable maximum exposures and exposure parameters, or any modification of default assumptions or methods specified in WAC 173-340-747 requires compliance with WAC 173-340-702 (14), (15) and (16).

(f) **Commercial gas station scenario.**

(i) At active commercial gas stations, where there are retail sales of gasoline and/or diesel, Equations 740-3 and 740-5 may be used with the exposure frequency reduced to 0.25 to demonstrate when a cap is protective of the soil ingestion and dermal pathways. This scenario is intended to be a conservative estimate of a child trespasser scenario at a commercial gas station where contaminated soil has been excavated and stockpiled or soil is otherwise accessible. Sites using remediation levels must also use institutional controls to prevent uses that could result in a higher level of exposure and assess the protectiveness for other exposure pathways (e.g., soil vapors and soil to ground water).

(ii) Equations 740-3 and 740-5 may also be modified on a site-specific basis as described in WAC 173-340-740 (3)(c).

(4) **Protection of the environment.** A quantitative site-specific ecological risk assessment may be conducted to help determine whether cleanup action alternatives are protective of the

environment. For example, it may be appropriate to adjust the exposure assumptions in the wildlife exposure model to reflect anticipated future site conditions.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-357, filed 2/12/01, effective 8/15/01.]

WAC 173-340-360 Selection of cleanup actions.

(1) Purpose. This section describes the minimum requirements and procedures for selecting cleanup actions. This section is intended to be used in conjunction with the administrative principles for the overall cleanup process in WAC 173-340-130; the requirements and procedures in WAC 173-340-350 through 173-340-357 and WAC 173-340-370 through 173-340-390; and the cleanup standards defined in WAC 173-340-700 through 173-340-760.

(2) Minimum requirements for cleanup actions. All cleanup actions shall meet the following requirements. Because cleanup actions will often involve the use of several cleanup action components at a single site, the overall cleanup action shall meet the requirements of this section. The department recognizes that some of the requirements contain flexibility and will require the use of professional judgment in determining how to apply them at particular sites.

(a) Threshold requirements. The cleanup action shall:

- (i)** Protect human health and the environment;
- (ii)** Comply with cleanup standards (see WAC 173-340-700 through 173-340-760);
- (iii)** Comply with applicable state and federal laws (see WAC 173-340-710);
- (iv)** Provide for compliance monitoring (see WAC 173-340-410 and 173-340-720 through 173-340-760).
- (v)** Use permanent solutions to the maximum extent practicable (see subsection (4) of this section);
- (vi)** Provide for a reasonable restoration time frame (see subsection (3) of this section); and
- (vii)** Consider public concerns (see WAC 173-340-600).

(b) Permanent ground water cleanup actions. A permanent cleanup action shall be used to achieve the cleanup levels for ground water in WAC 173-340-720 at the standard point(s) of compliance (see WAC 173-340-720(8)) where a permanent cleanup action is practicable or determined by the department to be in the public interest.

(c) Nonpermanent ground water cleanup actions. Where a permanent cleanup action is not required under (2)(b) of this subsection, the following measures shall be taken:

(A) Treatment or removal of the source of the release shall be conducted for liquid wastes, areas contaminated with high concentrations of hazardous substances, highly mobile hazardous substances, and hazardous substances that cannot be reliably contained. This includes removal of free product consisting of petroleum and other light nonaqueous phase liquid (LNAPL) from the ground water using normally accepted engineering practices. Source containment may be appropriate when the free product consists of a dense nonaqueous phase liquid (DNAPL) that cannot be recovered after reasonable efforts have been made.

(B) Ground water containment, including barriers or hydraulic control through ground water pumping, or both, shall be implemented to the maximum extent practicable to avoid lateral and vertical expansion of the ground water volume affected by the hazardous substance and impacts to surface water and sediments.

(C) An alternative water supply or treatment has been provided to impacted water users;

(D) Implementation of institutional controls under WAC 173-340-440 to prevent exposure to contaminated ground water;

(E) A commitment to provide access and information to support the department conducting periodic reviews under WAC 173-340-410 until the ground water is restored to cleanup levels;

(F) Posting of financial assurances under WAC 173-340-440(11) to cover the costs of long term monitoring, operation of any treatment or containment system and periodic reviews;

(G) Other requirements as specified by the department.

(d) Cleanup actions for soils at current or potential future residential areas and for soils at schools and child care centers. For current or potential future residential areas and for schools and child care centers, soils with hazardous substance concentrations that exceed soil cleanup levels must be treated, removed, or contained. Property qualifies as a current or potential residential area if:

(i) The property is currently used for residential use; or

(ii) The property has a potential to serve as a future residential area based on the consideration of zoning, statutory and regulatory restrictions, comprehensive plans, historical use, adjacent land uses, and other relevant factors.

(e) Institutional controls.

(i) Cleanup actions shall use institutional controls and financial assurances when required under WAC 173-340-440.

(ii) Cleanup actions that use institutional controls shall meet each of the minimum requirements specified in this section, just as any other cleanup action. Institutional controls should demonstrably reduce risks to ensure a protective remedy.

(iii) In addition to meeting each of the minimum requirements specified in this section, cleanup actions shall not rely primarily on institutional controls and monitoring where it is technically possible to implement a more permanent cleanup action for all or a portion of the site.

(f) Releases and migration. Cleanup actions shall prevent or minimize present and future releases and migration of hazardous substances in the environment.

(g) Dilution and dispersion. Cleanup actions shall not rely primarily on dilution and dispersion unless the incremental costs of any active remedial measures over the costs of dilution and dispersion grossly exceed the incremental degree of benefits of active remedial measures over the benefits of dilution and dispersion.

(h) Remediation levels. Cleanup actions that use remediation levels shall meet each of the minimum requirements specified in this section, just as any other cleanup action.

(3) Determining whether a cleanup action provides for a reasonable restoration time frame.

(a) Purpose. This subsection describes the requirements and procedures for determining whether a cleanup action provides for a reasonable restoration time frame. A determination that a cleanup action meets this one requirement does not mean that the other minimum requirements specified in subsection (2) of this section have been met. A cleanup action must meet each of the

minimum requirements specified in subsection (2) of this section.

(b) Factors. To determine whether a cleanup action provides for a reasonable restoration time frame, the factors to be considered include the following:

(i) Potential risks posed by the site to human health and the environment during the restoration time frame;

(ii) Practicability of achieving a shorter restoration time frame;

(iii) Current use of the site, surrounding areas, and associated resources that are, or may be, affected by releases from the site;

(iv) Potential future use of the site, surrounding areas, and associated resources that are, or may be, affected by releases from the site;

(v) Availability of alternative water supplies;

(vi) Likely effectiveness and reliability of institutional controls;

(vii) Ability to control and monitor migration of hazardous substances from the site;

(viii) Toxicity of the hazardous substances at the site; and

(ix) Natural processes that reduce concentrations of hazardous substances and have been documented to occur at the site or under similar site conditions.

(c) Adjustment for long term effectiveness. A longer restoration time frame may be used if the selected cleanup action has a greater degree of long-term effectiveness than a cleanup action that primarily uses landfill disposal or on-site containment. If a longer restoration time frame is used, risks to human health and the environment must be acceptably controlled until the cleanup standards are achieved.

(d) Area Background. When off-site sources of contamination would result in recontamination of the site above cleanup levels, cleanup below area background concentrations (see WAC 173-340-200 for definition) may be delayed until the background sources have been controlled. In these cases the remedial action shall be considered an interim action until cleanup levels are attained.

(e) Technological limitations. Sometimes even Method C cleanup levels will be below concentrations that are technically possible to

achieve. In these cases, the cleanup may be based on what is technically achievable. However, the remedial action shall be considered an interim action until cleanup levels are attained.

(f) Extension of restoration time frame. Extending the restoration time frame shall not be used as a substitute for active remedial measures, when such actions are practicable.

(4) Determining whether a cleanup action uses permanent solutions to the maximum extent practicable.

(a) Purpose. This subsection describes the requirements and procedures for determining whether a cleanup action uses permanent solutions to the maximum extent practicable. A determination that a cleanup action meets this one requirement does not mean that the other minimum requirements specified in subsection (2) of this section have been met. To select a cleanup action for a site, a cleanup action must meet each of the minimum requirements specified in subsection (2) of this section.

(b) General requirements. When selecting a cleanup action, preference shall be given to permanent solutions to the maximum extent practicable. To determine whether a cleanup action uses permanent solutions to the maximum extent practicable, the disproportionate cost analysis described in this subsection shall be used. The analysis shall compare the costs and benefits of the cleanup action alternatives. The costs and benefits to be compared are the evaluation criteria identified in (g) of this subsection.

(c) Permanent cleanup action defined. A permanent cleanup action or permanent solution is defined in WAC 173-340-200.

(d) Selection of a permanent cleanup action. A disproportionate cost analysis shall not be required if the department and the potentially liable persons agree to a permanent cleanup action.

(e) Disproportionate cost analysis test. Costs are disproportionate to benefits if the incremental costs of the higher cost alternative over a lower-cost alternative substantially exceed the incremental degree of benefits achieved by the higher cost alternative over that of the lower cost alternative.

(f) Disproportionate Cost Analysis Procedure.

(i) The alternatives shall be ranked from most to least permanent, based on the evaluation under this subsection.

(ii) The most practicable permanent solution shall be the baseline cleanup action alternative against which other cleanup action alternatives are compared. If no permanent solution remains after initial screening under step 3 in WAC 173-340-350(9), the cleanup action alternative that provides the greatest degree of permanence shall be the baseline cleanup action alternative.

(iii) The comparison of benefits and costs may be quantitative, but will often be qualitative and require the use of best professional judgment. In particular, the department has the discretion to favor or disfavor qualitative benefits and use that information in selecting a cleanup action. Where two or more alternatives are equal in benefits, the department shall select the less costly alternative provided the requirements of subsections (2) and (3) of this section are met.

(iv) The relevant expectations in WAC 173-340-370 shall be considered in this evaluation process.

(g) Evaluation criteria. The following criteria shall be used to evaluate and compare each cleanup action alternative when conducting a disproportionate cost analysis under this subsection to determine whether a cleanup action is permanent to the maximum extent practicable.

(i) Costs. The following costs shall be considered in any evaluation.

(A) Construction costs. Capital costs such as, design, labor and materials, waste management (both wastes generated by the process and residual waste left over at the end of treatment), quality assurance and quality control and agency construction oversight.

(B) Long-term costs. The net present value of any long-term costs such as the costs of operation and maintenance, monitoring, equipment replacement, maintaining institutional controls, periodic reviews, financial assurance, and agency oversight. The design life of the cleanup action shall be estimated and the cost of replacement or repair of the remedy shall be

included in the long-term cost estimate. When conducting a present worth analysis, the inflation rate shall be assumed to be equal to the Engineering News Record Annual Construction Cost Index for Seattle averaged over the last 10 years and the rate of return equal to the 10 year T-note interest rate averaged over the last 10 years. Alternative methods may be allowed by the department on a case-by-case basis.

(C) Management of short-term risks. The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks.

(D) Technical and administrative implementability. Ability to be implemented, including consideration of whether the alternative is technically possible, availability of necessary off-site facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions and the need for long-term Ecology involvement.

(ii) Benefits. The following benefits shall be considered in any evaluation.

(A) Protectiveness. Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and off-site risks during and after implementation of the alternative, and improvement of the overall environmental quality.

(B) Permanence. The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.

(C) Effectiveness over the long term. Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time

hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes.

(I) For sites with upland areas at or below elevation X in Counties adjacent to the ocean or Puget Sound, this shall include an evaluation of the impacts of a projected 1 foot rise in sea level by year 2100.

(II) The following types of cleanup action components may be used as a guide, in descending order, when assessing the relative degree of long-term effectiveness:

- Reuse or recycling;
- destruction or detoxification;
- immobilization or solidification;
- disposal in an engineered, lined and monitored facility;
- containment with attendant engineering controls; and
- institutional controls.

(D) Consideration of public concerns. Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.

(iii) For cleanup action alternatives that are equally permanent to the maximum extent practicable, preference shall be given to that alternative with the least greenhouse gas emissions.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-360, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-360, filed 1/28/91, effective 2/28/91; 90-08-086, § 173-340-360, filed 4/3/90, effective 5/4/90.]

WAC 173-340-370 Expectations for clean-up action alternatives. The department has the following expectations for the development of cleanup action alternatives under WAC 173-340-350 and the selection of cleanup actions under WAC 173-340-360. These expectations represent the types of cleanup actions the department considers likely results of the remedy selection process described in WAC 173-340-350 through 173-340-360; however, the department recognizes that there may be some sites where cleanup actions conforming to these expectations are not appropriate. Also, selecting a cleanup action that meets these expectations shall not be used as a substitute for selecting a cleanup action under the remedy selection process described in WAC 173-340-350 through 173-340-360.

(1) The department expects that treatment technologies will be emphasized at sites containing liquid wastes, areas contaminated with high concentrations of hazardous substances, highly mobile materials, and/or discrete areas of hazardous substances that lend themselves to treatment.

(2) To minimize the need for long-term management of contaminated materials, the department expects that all hazardous substances will be destroyed, detoxified, and/or removed to concentrations below cleanup levels throughout sites containing small volumes of hazardous substances.

(3) The department recognizes the need to use engineering controls, such as containment, for sites or portions of sites that contain large volumes of materials with relatively low levels of hazardous substances where treatment is impracticable.

(4) In order to minimize the potential for migration of hazardous substances, the department expects that active measures will be taken to prevent precipitation and subsequent runoff from coming into contact with contaminated soils and waste materials. When such measures are impracticable, such as during active cleanup, the department expects that site runoff will be contained and treated prior to release from the site.

(5) The department expects that when hazardous substances remain on-site at concentrations which exceed cleanup levels, those hazardous substances will be consolidated to the maximum

extent practicable where needed to minimize the potential for direct contact and migration of hazardous substances;

(6) The department expects that, for facilities adjacent to a surface water body, active measures will be taken to prevent/minimize releases to surface water via surface runoff and ground water discharges in excess of cleanup levels. The department expects that dilution will not be the sole method for demonstrating compliance with cleanup standards in these instances.

(7) The department expects that natural attenuation of hazardous substances may be appropriate at sites where:

(a) Source control (including removal and/or treatment of hazardous substances) has been conducted to the maximum extent practicable;

(b) Leaving contaminants on-site during the restoration time frame does not pose an unacceptable threat to human health or the environment;

(c) There is evidence that natural biodegradation or chemical degradation is occurring and will continue to occur at a reasonable rate at the site; and

(d) Appropriate monitoring requirements are conducted to ensure that the natural attenuation process is taking place and that human health and the environment are protected.

(8) The department expects that cleanup actions conducted under this chapter will not result in a significantly greater overall threat to human health and the environment than other alternatives.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-370, filed 2/12/01, effective 8/15/01.

WAC 173-340-380 Cleanup action plan.

(1) Draft cleanup action plan. The department shall issue a draft cleanup action plan for a cleanup action to be conducted by the department or by a potentially liable person under an order or decree. The level of detail in the draft cleanup action plan shall be commensurate with the complexity of the site and proposed cleanup action.

(a) The draft cleanup action plan shall include the following:

(i) A general description of the proposed cleanup action developed in accordance with WAC 173-340-350 through 173-340-390.

(ii) A summary of the rationale for selecting the proposed alternative.

(iii) A brief summary of other cleanup action alternatives evaluated in the remedial investigation/feasibility study.

(iv) Cleanup standards and, where applicable, remediation levels, for each hazardous substance and for each medium of concern at the site. **If the default assumptions or reasonable maximum exposure scenarios are altered to derive cleanup standards, those changes shall be highlighted in the cleanup action plan.**

(v) The schedule for implementation of the cleanup action plan including, if known, restoration time frame.

(vi) Institutional controls, if any, required as part of the proposed cleanup action.

(vii) Applicable **local**, state and federal laws, if any, for the proposed cleanup action, when these are known at this step in the cleanup process (this does not preclude subsequent identification of applicable **local**, state and federal laws).

(viii) A preliminary determination by the department that the proposed cleanup action will comply with WAC 173-340-360.

(ix) Where the cleanup action involves on-site containment, specification of the types, levels, and amounts of hazardous substances remaining on site and the measures that will be used to prevent migration and contact with those substances.

(b) The department may use an order or decree to fulfill the requirements of a cleanup action plan, provided that the information in (a) of this

subsection is included in **the** order or decree. The scope of detail for the required information shall be commensurate with the complexity of the site and proposed cleanup action.

(2) Public participation. The department will provide public notice and opportunity for comment on the draft cleanup plan, as required in WAC 173-340-600(13).

(3) Final cleanup action plan. After review and consideration of the comments received during the public comment period, the department shall issue a final cleanup action plan and publish its availability in the *Site Register* and by other appropriate methods.

(4) Failed Remedies. If the department determines, following the implementation of the **cleanup action plan**, that the cleanup standards or, where applicable, remediation levels established in **that** plan cannot be achieved, the department shall issue public notice of this determination **and proposed actions to bring the site into compliance.**

(5) Federal cleanup sites. For federal cleanup sites, a record of decision or order or consent decree prepared under the federal cleanup law may be used by the department to meet the requirements of this section provided:

(a) The cleanup action meets the requirements under WAC 173-340-360;

(b) The state has concurred with the cleanup action; and

(c) An opportunity was provided for the public to comment on the cleanup action.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-380, filed 2/12/01, effective 8/15/01.]

WAC 173-340-390 Model remedies.

(1) Purpose. The purpose of model remedies is to streamline and accelerate the selection of cleanup actions that protect human health and the environment, with a preference for permanent solutions to the maximum extent practicable.

(2) Development of model remedies. The department may, from time to time, identify model remedies for common categories of facilities, types of contamination, types of media, and geographic areas. In identifying a model remedy, the department shall identify the circumstances for which application of the model remedy meets the requirements under WAC 173-340-360. The department shall provide an opportunity for the public to review and comment on any proposed model remedies.

(3) Applicability and effect of model remedies. Where a site meets the circumstances identified by the department under subsection (2) of this section, the components of the model remedy may be selected as the cleanup action, or as a portion of the cleanup action. At such sites, it shall not be necessary to conduct a feasibility study under WAC 173-340-350(8) or a disproportionate cost analysis under WAC 173-340-360(3) for those components of a cleanup action to which a model remedy applies.

(4) Public notice and participation. Where a model remedy is proposed as the cleanup action or as a portion of the cleanup action, the cleanup action plan is still subject to the same public notice and participation requirements in this chapter as any other cleanup action.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-390, filed 2/12/01, effective 8/15/01.]