

Comments provided by Carl Shapiro

## Non-Aqueous Phase Liquid and Source Control Amendments

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**Note to Reviewers: The proposed amendments below reflect a more accurate understanding of the behavior of LNAPL in the subsurface, consistent with updated science and the recommendations of the MassDEP LNAPL Workgroup. Particular focus is given to (a) the elimination of the ½ inch NAPL Upper Concentration Limit criterion at 310 CMR 40.0996(6), (b) Phase I and Phase II site characterization requirements, as they pertain to LNAPL assessment, and (c) strengthening of source elimination and control provisions as a requirement of a Permanent Solution.**

**Note: amendments proposed in other sections of this public hearing draft (e.g., as part of the vapor intrusion related amendments) that overlap with amendments to address LNAPL and source elimination and control requirements are repeated here.**

40.0006: Terminology, Definitions and Acronyms

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12) For purposes of 310 CMR 40.0000, the following words and phrases shall have the following meanings unless the context clearly indicates otherwise:

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**Note to Reviewers: Consistent with recommendations of the MassDEP LNAPL Workgroup, identification of LNAPL Hot Spots would rely on constituent concentration data, not well thickness measurements.**

Hot Spot means a discrete area where the concentrations of oil or hazardous material ~~or the thickness of Nonaqueous Phase Liquid (NAPL)~~ are substantially higher than those present in the surrounding area. A hot spot shall be identified based on consideration of both the concentrations ~~or thickness~~ of an oil or hazardous material within a contaminated area and the spatial pattern of that contamination. The areal extent and spatial pattern of a hot spot may be determined through the analytical results from multiple samples taken within the area, or the results of limited sampling in combination with other knowledge about the release, such as the presence of discoloration, odors or a defined source area. ~~(a)~~ Discrete areas where the average concentration within the area is greater than ten but less than one hundred times the average concentration in the immediate surrounding area is a Hot Spot unless there is no evidence that the discrete area would be associated with greater exposure potential than the surrounding area. In all cases, a discrete area where the concentration of an oil or hazardous material is greater than one hundred times the concentration in the surrounding area shall be considered a Hot Spot. In no case shall concentrations of oil or hazardous material equal to or less than an applicable Method 1 standard be considered indicative of a Hot Spot.

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**Note to Reviewers: The proposed Conceptual Site Model or CSM definition also appears in the Vapor Intrusion related amendments. In addition to the CSM definition, an LNAPL CSM or "LCSM" term is proposed to address more specifically considerations that apply to developing a CSM for disposal sites with LNAPL.**

~~Conceptual Site Model or CSM means a site specific description of how contaminants entered the environment, how contaminants have been and may be transported within the environment, and routes~~

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~~of exposure to human and environmental receptors that provides a dynamic framework for assessing site characteristics and risk, identifying and addressing data gaps and managing uncertainty, eliminating or controlling contaminant sources, developing and conducting response action strategies, and determining whether those strategies have been effective in achieving desired endpoints.~~

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**1. Wordsmithing only** LNAPL Conceptual Site Model and (LCSM) each means a Conceptual Site Model (as defined in the MCP) that ~~which~~ also includes the body of fundamental scientific principles describing the behavior of fluid and fluid flow in soil or other porous media necessary to assess LNAPL in subsurface strata. (See also Conceptual Site Model).

**Note to Reviewers:** The next set of amendments revise the current definition of NAPL and create new definitions for DNAPL, LNAPL, Non-Stable NAPL and Stable NAPL that are incorporated in turn in the revised source elimination and control provisions at 310 CMR 40.1003(5).

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**2.** Nonaqueous Phase Liquid and NAPL each means oil and/or hazardous material that is present in the environment as a ~~continuous~~ separate phase liquid. The existence of NAPL in subsurface strata is indicated by its presence in a well, excavation or any other subsurface depression.

~~Comment:~~ I am good with this definition, stating the obvious.

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**3. Comment:** I prefer Light/Dense definitions before Stable/Unstable.

Light Nonaqueous Phase Liquid and LNAPL each means NAPL that has a specific gravity equal to or less than one.

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Dense Nonaqueous Phase Liquid and DNAPL each means NAPL that has a specific gravity greater than one.

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**Note to Reviewers:** The definition of Non-Stable NAPL is intended to specifically describe the conditions that represent NAPL that is continuing to expand its footprint through a preferred flowpath or otherwise laterally or vertically.

Non-Stable NAPL means a NAPL that is: (a) migrating along or within a preferred flow path; (b) discharging or periodically discharging to a subsurface structure, utility or surface water body; or (c) spreading or expanding laterally or vertically as a bulk fluid through or from subsurface strata.

4. **Comment:** Although this is a basic definition that can be considered adequate, it should contain a statement about rate of expansion, e.g. 'substantial.' It may be easier to provide a definition of Stable NAPL here, and define Unstable NAPL as 'NAPL that is not Stable.'

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Stable NAPL means NAPL that is not Non-Stable NAPL. *See above.*

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~~Dense Nonaqueous Phase Liquid and DNAPL each means NAPL that has a specific gravity greater than one.~~

...

~~Light Nonaqueous Phase Liquid and LNAPL each means NAPL that has a specific gravity equal to or less than one.~~

...

Residual LNAPL Saturation means the range of LNAPL saturations greater than zero *and* up to the LNAPL saturation at which LNAPL capillary pressure equals pore entry pressure. It includes the maximum LNAPL saturation below which LNAPL is discontinuous and immobile under the applied gradient.

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Transmissivity and  $T_n$  each means the rate at which a liquid of the prevailing kinematic viscosity is transmitted through a unit width of the formation under a unit hydraulic gradient. It is equal to an integration of the hydraulic conductivities across the saturated part of the formation perpendicular to the flow paths.

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***Note to Reviewers: The revision below is strictly editorial to eliminate an inconsistent spelling of "Nonaqueous Phase Liquid".***

Uncontainerized Waste means any discarded oil and/or hazardous material at a disposal site, including, but not limited to, ~~a non-aqueous phase liquid (NAPL)~~, that is not contained in drums, tanks, engineered impoundments, or other fabricated containers.

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***Note to Reviewers: MassDEP proposes the new term "Source of OHM Contamination" to support the source elimination and control requirements at 310 CMR 40.1003(5) for Permanent and Temporary Solutions. The amendments to the existing "Known Source" and "Unknown Source" definitions are***

***intended to make clear that those terms are applicable to the DPS provisions and not applicable to 310 CMR 40.1003(5).***

Source of OHM Contamination means a point of discharge of OHM into environmental media and/or OHM within environmental media, that is migrating or is likely to migrate in a dissolved or vapor state or as a separate phase liquid. Sources of OHM Contamination may include, without limitation:

1. leaking storage tanks, vessels, drums and other containers;
2. dry wells or wastewater disposal systems that are not in compliance with regulations governing discharges from those systems;
3. contaminated fill, soil and sediment;
4. sludges and waste deposits; and
5. Nonaqueous Phase Liquids.

Known Source means, for the purposes of the Downgradient Property Status provisions at 310 CMR 40.0189, the original location of a release that has migrated in or on groundwater or surface water to a downgradient or downstream property, as established by a preponderance of credible scientific and technical evidence.

Unknown Source means, for the purposes of the Downgradient Property Status provisions at 310 CMR 40.0189, the original location of a release that has migrated in or on groundwater or surface water to a downgradient or downstream property, where the original location has not been established by a preponderance of credible scientific and technical evidence.

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***Note to Reviewers: Consistent with the recommendation of the MassDEP LNAPL Workgroup, the Department is proposing one notification threshold based on NAPL thickness in a well and excavation, by retaining a 72-hour notification threshold and eliminating the 120 day threshold. Given that the updated science shows that increased NAPL thickness does not necessarily indicate a greater problem in terms of "Non-stable NAPL" (i.e., NAPL with potential macroscale mobility), the MassDEP LNAPL Workgroup concluded that there is no need for maintaining the different notification triggers. A 72-hour threshold for the presence of any NAPL in a well or excavation is considered more appropriate than 2 hour or 120 day. MassDEP's proposal, therefore, is to reduce the existing 72 hour threshold of ½ inch criterion to 1/8 inch (or 0.01 feet) in a monitoring well or excavation to trigger further assessment of NAPL.***

**5. Comment: This thickness (above) will leave more visual discretion by the LSP, and in some cases result in sheens being reported or ¼ in. thicknesses not reported.**

40.0313: Releases Which Require Notification Within 72 Hours

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(1) a release to the environment indicated by the presence of ~~a subsurface~~ Non-Aqueous Phase Liquid (NAPL) in a groundwater monitoring well, excavation, or subsurface depression ~~having at~~ a measured thickness equal to or greater than 1/8<sup>2</sup> inch;

40.0315: Releases Which Require Notification Within 120 Days

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~~(4) a release to the environment indicated by the presence of a subsurface Non-Aqueous Phase Liquid (NAPL) having a measured thickness equal to or greater than 1/8 inch and less than 1/2 inch.~~

***Note to Reviewers: Assessment to determine the horizontal and vertical extent of NAPL separately is consistent with the fundamental principles of multi-phase fluid flow in porous media, and such assessment has become the standard practice for understanding LNAPL behavior in the environment. The amendments proposed for Phases I and II below are intended to ensure adequate NAPL assessment. (Note: the other amendments to these provisions are related to the vapor intrusion amendment, which are described separately in this public hearing draft.)***

40.0480: Phase I - Initial Site Investigation Report

310 CMR 40.0481 through 0489, cited collectively as 310 CMR 40.0480, set forth requirements and procedures for preparing a Phase I - Initial Site Investigation Report.

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40.0483: Content of Phase I Report

(1) Except as provided in 310 CMR 40.0483(2) and 310 CMR 40.0193, the following information shall be contained in all Phase I Reports submitted to the Department, in the format established below:

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(c) Disposal Site History. The disposal site history shall be presented in the Phase I Report in reverse chronological order, beginning with the current use of ~~the~~ disposal site, and shall include the following:

1. Owner/Operator and Operations History.
  - a. a list of current and relevant previous owners and operators of the properties comprising the disposal site, including dates of ownership and operation; and
  - b. a description of current and historical uses of the disposal site, including residential, commercial and industrial activities and manufacturing processes, and the location of buildings and structures currently or previously located on the disposal site.
2. Release History. A description of any known and relevant releases of oil and/or hazardous material at the disposal site shall be provided. For each relevant release, the description shall include:
  - a. the source and location of the release;
  - b. the known or suspected cause of the release;

- c. the known or approximate date and duration of the release;
  - d. the type of oil and/or hazardous material released;
  - e. the known or approximate volume of the release; and
  - f. any measures taken to assess, contain or -mitigate the release.
3. Oil and/or Hazardous Material Use and Storage History. The Phase I Report shall describe all relevant current and past use and storage of oil and/or hazardous material at the disposal site, and shall include a description of the following:
- a. types of oil and/or hazardous material, including generic names, chemical names and trade names, if available;
  - b. uses of oil and/or hazardous material;
  - c. quantities used;
  - d. periods of use;
  - e. on-site storage locations, underground storage tanks, above-ground tanks, drums, lagoons, pits and piles; and
  - f. age and volume of tanks and other storage containers.
4. Waste Management History. The Phase I Report shall include a general description of all known relevant waste management practices, excluding the off-site disposal of solid waste. This description shall address the types of wastes or waste streams, and the locations of points of discharge or on-site disposal or treatment with respect to the following:
- a. land disposal, including landfills and lagoons;
  - b. subsurface disposal including drains, [dry wells](#), septic systems and leach fields;
  - c. surface water discharges to natural and -man-made water bodies;
  - d. discharges to wastewater treatment plants; and
  - e. any other relevant means of disposal or treatment.
5. Environmental Permits and Compliance History. The Phase I Report shall include a history of all relevant local, state and federal environmental permits and oil and/or hazardous material storage permits issued for the disposal site or on-site facilities, including without limitation information on any permit violations. Relevant permits may include but are not limited to:
- a. permits for M.G.L. c. 21E response actions;
  - b. oil and/or hazardous material storage permits;
  - c. wastewater discharge permits;
  - d. groundwater discharge permits;
  - e. air quality discharge permits;
  - f. wetlands alteration permits;
  - g. Resource Conservation and Recovery Act (RCRA) permits; and
  - h. National Pollution Discharge Elimination System (NPDES) permits.
6. Potentially Responsible Parties. The Phase I Report may include a list of the names and addresses of all Potentially Responsible Parties identified for the disposal site.
- (d) Site Hydrogeological Characteristics. The Phase I Report shall include details of subsurface investigations conducted at the disposal site, together with a preliminary or generalized description and depiction of site hydrogeologic conditions, including, without limitation:
1. a concise description of all relevant geologic, hydrologic, geophysical and other subsurface investigations and assessments conducted to date at the disposal site;

2. documentation on boring advancement, well construction and well development, including copies of well drilling logs, within or appended to the Phase I Report;
  3. a characterization of general site topography, including slope, presence of bedrock outcrops and surface drainage features;
  4. a characterization of geologic and stratigraphic conditions, including:
    - a. soil type(s), stratigraphy and evidence of filling or waste disposal;
    - b. where appropriate, the known or estimated depths to, and description of, bedrock; and
  5. a description and graphical depiction of groundwater flow direction or potentiometric surface elevations, indicating the location of monitoring wells.
- (e) Nature and Extent of Contamination. The Phase I Report shall provide information on the nature and extent of contamination, as determined by Initial Site Investigation Activities and Preliminary Response Actions undertaken to date at the disposal site, including:
1. evidence of releases of oil and/or hazardous material to the environment including visual and olfactory evidence, results of field screening and laboratory analysis, and historical knowledge;
  2. the names, concentrations, and volumes (if applicable) of all released oil and hazardous material detected to date at the disposal site:
    - a. volumes shall be reported in gallons, pounds, tons or cubic feet, as appropriate;
    - b. analytical results for each media sampled shall be summarized in the text and in tables in the body of the Phase I Report;
    - c. for the purpose of disposal site classification, maximum and minimum concentrations for each contaminant detected shall be identified in a summary table in the body of the Phase I Report;
  3. laboratory data sheets, included in an appendix to the Phase I Report;
  4. information and details on the approximate horizontal and vertical extent of contamination ~~based on best available information~~, as obtained from site investigations of scope and detail commensurate with release and site conditions; and
  5. information and details ~~about~~ the presence NAPL, if present, including and thickness, of non-aqueous phase liquids, if encountered and the approximate horizontal and vertical extent of NAPL contamination, as obtained from site investigations of scope and detail commensurate with release and site conditions.

6. Comment: Temporal appearance should be mentioned, and addressed in CSM.

Q: . If NAPL appears periodically considered to be a NAPL site?

- (f) Migration Pathways and Exposure Potential. The Phase I Report shall describe and evaluate known and potential contaminant migration pathways and exposure points, to the extent that such information is known, including:
1. evidence of and the potential for oil and/or hazardous material migration by one or more of the following pathways:
    - a. air;
    - b. soil;
    - c. groundwater;



d. soil gas;

e. ~~including migration along~~ preferential flow pathways such as subsurface utility lines; and/or

df. surface water, including sediments;

2. a discussion of known and potential human exposure to oil and hazardous material present at the disposal site, by inhalation, dermal contact or ingestion of contaminants; and

3. a discussion of known and potential impacts of oil and hazardous material present at the disposal site to environmental receptors, with special attention given to the natural resource areas referenced in 310 CMR 40.0483(1)(a)8.c..

(g) Evaluation for Immediate Response Actions. The Phase I Report shall include an evaluation of the need to conduct an Immediate Response Action, as described in 310 CMR 40.0412.

(h) Conclusions. The Phase I Report shall include a Conclusions section containing a summary of findings and statement of conclusions with respect to the site, present a preliminary disposal site Conceptual Site Model (including a preliminary LNAPL Conceptual Site Model, if LNAPL is present), and ~~shall~~ indicate the outcome of Initial Site Investigation Activities, as documented in the Phase I Report, and as described in 310 CMR 40.0486.

(2) In addition to the Phase I Report requirements set forth in 310 CMR 40.0483(1), such additional information as may be necessary to adequately and completely characterize a disposal site in accordance with the Response Action Performance Standard ~~described in~~ 310 CMR 40.0191, and/or as required by unique release, threat of release and/or site conditions, shall be provided in the Phase I Report. It may also be appropriate to eliminate certain information categories, or investigation or assessment elements from the Phase I Report, as may be consistent with unique release, threat of release and/or site conditions, by application of the Technical Justification standard set forth in 310 CMR 40.0193.

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***Note to Reviewers: The Phase II amendments have been revised to reflect the specific and well-established need to use LNAPL Conceptual Site Model (LCSM) principles to accurately characterize the behavior, nature and extent of LNAPL in the subsurface. Use of the LCSM (i.e., the fundamentals of fluid flow in porous media) is supported by the MassDEP LNAPL Workgroup, the Licensed Site Professional Association LNAPL White Paper, Interstate Technology & Regulatory Council, as well as other states and technical and regulatory organizations.***

#### 40.0830: Phase II - Comprehensive Site Assessment

310 CMR 40.0831 through 40.0849, cited collectively as 310 CMR 40.0830, contain the requirements and procedures for conducting Phase II - Comprehensive Site Assessments at disposal sites.

#### 40.0832: General Provisions

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(1) A Scope of Work, as described in 310 CMR 40.0834, shall be developed and submitted to the Department in accordance with 310 CMR 40.0510 prior to the initiation of Comprehensive Site Assessment activities at any disposal site that has been classified as Tier I or Tier II under the provisions of 310 CMR 40.0500, unless the Phase II fieldwork has been implemented prior to Tier Classification.

(2) A Phase II Report, as described in 310 CMR 40.0835, shall be prepared to document information obtained as a result of Comprehensive Site Assessment activities and support conclusions and Opinions based upon the findings of the assessment. The Phase II Report shall reference or incorporate elements of the Phase I Report, as appropriate, and may be combined with the Phase III Report described in 310 CMR 40.0850.

40.0833: Performance Standards

(1) A Phase II - Comprehensive Site Assessment shall collect, develop and evaluate sufficient information to support conclusions and Opinions regarding:

- (a) the source, nature, extent, and potential impacts of releases of oil and/or hazardous material;
- (b) the risk of harm posed by the disposal site to health, safety, public welfare and the environment; and
- (c) the need to conduct remedial actions at the disposal site.

(2) ~~The~~A Phase II Report shall thoroughly document, evaluate and discuss the findings and conclusions of the Phase II Comprehensive Site Assessment, and where applicable, provide the basis for identifying and evaluating remedial action alternatives.

40.0834: Phase II Scope of Work

(1) Except as ~~otherwise specified~~~~provided~~ by the Department, Department approval of the Phase II Scope of Work shall not be required.

(2) Except as otherwise specified by the Department, the Phase II Scope of Work shall include:

- (a) the scope and nature of investigative and sampling programs that will be undertaken to characterize the source, extent, and migration pathways of oil and/or hazardous material, and the risk of harm posed to health, safety, public welfare or the environment;
- (b) the name and license number of the LSP engaged or employed by the person conducting the Comprehensive Response Action; and
- (c) a schedule for implementation of the Phase II - Comprehensive Site Assessment.

40.0835: Phase II Report

(1) A Phase II Report shall be submitted to the Department at the conclusion of Comprehensive Site Assessment activities pursuant to the applicable deadlines set forth in 310 CMR ~~40.0550 or~~ 40.0560 or at Interim Deadlines specified by the Department.

(2) A Phase II Report shall present, contain, or append relevant information, data, findings, and Opinions related to the Comprehensive Site Assessment of the disposal site.

(3) ~~The~~ Phase II Report shall set forth in narrative and, to the extent possible, in maps, graphs, and tables, the [final disposal site Conceptual Site Model](#), approach, methods and results of the Phase II - Comprehensive Site Assessment.

(4) The information and assessment findings outlined in 310 CMR 40.0835(4) shall be provided in the Phase II Report. Depending upon specific site and release conditions, it may be necessary to provide additional information to adequately characterize the disposal site, consistent with the Response Action Performance Standard described in 310 CMR 40.0191, or it may be appropriate to forgo particular assessment or information gathering elements and provide Technical Justification as described in 310 CMR 40.0193.

(a) Disposal Site Name, Location and Locus Map, -updated, if necessary, from what was provided in the Phase I Report;

(b) Detailed Disposal Site Map(s), updated, as necessary, from the base map(s) provided in the Phase I Report, and depicting all investigatory and sampling points relevant to the Comprehensive Site Assessment, the boundaries of the disposal site in plan view, and, as appropriate, the vertical extent of contamination at the disposal site;

(c) Disposal Site History, -updated, supplemented, or modified, if necessary, from information provided in the Phase I Report;

(d) Site Hydrogeological Characteristics, including -details of subsurface investigations conducted at the disposal site, together with a comprehensive description and depiction of site hydrogeologic conditions, including, without limitation:

1. a description of all relevant geologic, hydrologic, geophysical, and other subsurface investigations and assessments conducted at the disposal site;
2. documentation related to borings, well construction, and well development, including copies of well drilling logs, within or appended to the Phase II Report; and
3. a detailed characterization of geologic and hydrogeologic conditions at the disposal site, including:
  - a. groundwater potentiometric surface(s), gradients, flow rates, and flow direction(s);
  - b. soil type(s), stratigraphy, and permeability;
  - c. where appropriate, bedrock type and characteristics, depths and contours; and
  - d. an evaluation and description of the potential for flooding;

(e) Environmental Fate and Transport of Oil and/or Hazardous Material, including, as appropriate:

1. an evaluation of the environmental fate and transport characteristics of the oil and/or hazardous material identified at the disposal site, including, without limitation, mobility, stability, volatility, persistence and bioaccumulative potential of the oil and/or hazardous material;
2. identification and characterization of existing and potential migration pathways of the oil and/or hazardous material at and from the disposal site, including, as appropriate, air, soil, groundwater, [soil gas, preferential migration pathways such as subsurface utility lines](#), surface water, sediment, and food chain pathways; and

3. an evaluation of the potential for soil, groundwater or LNAPL to be a source of vapors of oil and/or hazardous material to indoor air of occupied structures as described in 310 CMR 40.0900;

(f) Nature and Extent of Contamination, including a characterization of the nature, and vertical and horizontal extent of oil and/or hazardous material in the environment, including any and all source(s), nature, and vertical and horizontal extent of contamination, the presence and distribution of any LNAPL non-aqueous phase liquids at the disposal site, tabulation of analytical testing results, and, where appropriate, a characterization of background concentrations of oil and/or hazardous material at the disposal site;

**7. Comment: Temporal should be included in f.**

(g) Exposure Assessment, including the identification and characterization of all potential human and environmental receptors that could be impacted by oil and/or hazardous material at or migrating from the disposal site, and, as appropriate, the quantification of exposure of oil and/or hazardous material to these receptors, under current and reasonably foreseeable site conditions, as described in 310 CMR 40.0900;

(h) Risk Characterization, as set forth in 310 CMR 40.0900, for all appropriate human and environmental receptors identified at and near the disposal site; and

(i) Conclusions, including a summary of the Phase II Comprehensive Site Assessment findings. The Conclusions section shall provide a thorough discussion of the final disposal site Conceptual Site Model (including a final LNAPL Conceptual Site Model, if LNAPL is present), the reasoning and results used to support the findings, and shall indicate and support the outcome of the Phase II Investigation under as described in 310 CMR 40.0840.

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40.0924: Identification of Exposure Points

(1) All potential Exposure Points shall be identified and described in the documentation of the Risk Characterization after considering the site and receptor information described in 310 CMR 40.0904 through 40.0923.

(2) The identification of an Exposure Point shall be consistent with the type and method of Risk Characterization which is being performed.

(a) Methods 1 and 2 Risk Characterizations - The Exposure Point(s) in groundwater and soil shall be identified and documented for all current and reasonably foreseeable Site Activities and Uses.

1. For groundwater, the Exposure Point(s) shall be the groundwater resource itself, as measured at each wellhead and/or nearest tap of a well screened within the horizontal and vertical distribution of the oil and/or hazardous material in the groundwater. Existing water supply wells and monitoring wells shall be used to represent current or potential groundwater Exposure Points.

2. For soil, the Exposure Point(s) shall be defined by the horizontal and vertical distribution of the contaminated soil in combination with the soil category(ies) determined to be applicable. For a contiguous volume of contaminated soil comprised of one or more soil categories as defined in 310 CMR 40.0933, a

separate and distinct Exposure Point shall be represented by the soil in each category.

(b) Method 3 Risk Characterization - The Exposure Point(s) in all environmental media shall be identified for all current and reasonably foreseeable Site Activities and Uses.

1. For comparisons to Applicable or Suitably Analogous Standards, the Exposure Point shall be identified in a manner consistent with the applicable regulations.

2. Except as provided in 310 CMR 40.0924(2)(b)3., in GW-1 groundwater areas, for the comparison to drinking water standards listed in 310 CMR 22.00 and for the calculation of current and/or potential exposure to the groundwater, the Exposure Point(s) shall be the groundwater resource itself, as measured at each wellhead and/or nearest tap of a well screened within the horizontal and vertical distribution of the oil and/or hazardous material in the groundwater. Existing water supply wells and monitoring wells shall be used to represent current or potential groundwater Exposure Points.

3. In GW-1 areas that are designated GW-1 solely on the basis of being located within a Zone II or an Aquifer Protection District that overlays or is contiguous with a Zone II and where sites meet the following criteria, the Exposure Point shall be the existing Public Water Supply well(s) for the evaluation of current and future drinking water exposures and the Exposure Point Concentration shall be identified pursuant to 310 CMR 40.0926(8)

a. Contamination is limited to Oil;

b. —A Phase II Report for the disposal site pursuant to 310 CMR 40.0830 has been submitted;

c. The disposal site is located at a distance greater than 1,000 feet from a Public Water Supply well;

d. It has been demonstrated that [the source control requirements at 310 CMR 40.1003 have been met to address any LNAPL present-is not present at a thickness equal to or greater than 1/2 inch in any environmental medium;](#)

e. It has been demonstrated through adequate characterization of horizontal migration that groundwater contaminant concentrations are:

i. not detected at or above analytical limits appropriate for a GW-1 area at the downgradient edge of the plume, at least 1,000 feet from the Public Water Supply well(s); and

ii. decreasing within the boundaries of the plume. Demonstration of diminishing contaminant concentrations within the plume shall consider both the spatial and temporal distribution of the contamination and other measures indicative of biodegradation of the contaminants;

f. It has been demonstrated through adequate characterization of vertical migration that contamination has not entered bedrock including the submittal of a profile sectional map showing the following information:

i. known or inferred depth to bedrock;

ii. depths to the top and bottom of the plume throughout the length of the plume; and

iii. existing well screen depths in comparison to the plume; and

g. —It has been demonstrated that there is no potential Exposure Point Concentration in accordance with the criteria specified at 310 CMR 40.0926(8).

40.0956: Substantial Hazard Evaluation

(1) The focus of a Substantial Hazard Evaluation shall be on possible exposures to Human and Environmental Receptors, considering the current use(s) of the disposal site and the surrounding environment and, where applicable, any Activity and Use Limitations for the site.

(a) A condition of No Substantial Hazard to Health would exist if, for an appropriate Exposure Period, no Cumulative Receptor Cancer Risk and no Cumulative Receptor Non-cancer Risk is greater than the Cumulative Receptor Risk Limits specified at 310 CMR 40.0993(6).

(b) The period of exposure to be considered shall be equal to or greater than the time from Notification to the date that the Substantial Hazard evaluation is conducted, plus five years.

(c) A quantitative evaluation of human health risk is not required if there is no current exposure to oil and/or hazardous material at the disposal site.

(2) The focus of an Ecological Substantial Hazard Evaluation shall be on any environmental resource areas, such as wetlands, aquatic and terrestrial habitats, and fisheries, that exist at a site. A condition of No Substantial Hazard to the Environment would exist if steps have been taken to eliminate or mitigate ~~any of~~ the following conditions, where applicable, affecting an environmental resource at a site:

(a) Evidence of stressed biota attributable to the release at the disposal site, including, without limitation, fish and wildlife kills or abiotic conditions;

(b) The visible presence of oil, tar or other ~~non-aqueous separate~~ phase hazardous material in soil within three feet of the ground surface over an area equal to or greater than two acres, or over an area equal to or greater than 1000 square feet in sediment within one foot of the sediment surface;

(c) Continuing discharge of contaminated groundwater to surface water where the levels of the oil or hazardous material attributable to the release already exceed Massachusetts Surface Water standards;

(d) Continuing discharge of contaminated groundwater to surface water where surface water and/or sediment concentrations of Oil and/or Hazardous Material attributable to the release already pose a significant risk;

(e) Migration of oil or hazardous material to additional environmental media or resource area where resultant exposures would have the potential to pose a significant risk of harm in the future; ~~or~~ and

(f) Ecological risk or harm such that recovery would be substantially more difficult or would require more time if conditions were to remain unremediated for even a short period of time.

(3) No assessment of Substantial Hazard is required if a condition of No Significant Risk exists and the site ~~meets the requirements is eligible~~ for a Permanent Solution Class A or Class B Response Action Outcome.

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40.0995: Method 3 Environmental Risk Characterization

The characterization of risk of harm to the environment shall be conducted for all current and reasonably foreseeable Site Activities and Uses identified in 310 CMR 40.0923. Characterization of the risk of harm to the environment shall include an assessment of chemical data, potential contaminant migration pathways, and an evaluation of biota and habitats at and in the vicinity of the disposal site, as described in 310 CMR 40.0995(2), as well as through the application of Upper Concentration Limits, as described in 310 CMR 40.0995(5).

(1) A Method 3 characterization of the risk of harm to the environment shall be based on the site, receptor and exposure information identified in 310 CMR 40.0901 through 40.0920, as well as any relevant data collected during the response action being performed.

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(3) Stage I Environmental Screening. Exposures of site biota and habitats shall be characterized by the Stage I Environmental Screening as follows:

(a) Available evidence shall be evaluated to determine whether there is current or potential future exposure of Environmental Receptors to contamination at or from the disposal site. Sources of such evidence shall include historical records, site data, field observations, statements by present and past residents or employees, and any other relevant source.

1. Evidence of current or potential exposure shall include, but is not limited to:

a. Current or past visible physical evidence that oil and/or hazardous material at or from the disposal site have come to be located in surface soil, surface water, sediment or wetlands. Examples of such evidence include, without limitation, the presence of sheens from oil or hazardous material, ~~non-aqueous phase liquids~~NAPL, oil, tar or other solid or semisolid hazardous material in surface soil, surface water, sediment or wetlands;

b. Records or other evidence of current or past impacts of oil and/or hazardous material from the disposal site on wildlife, fish, shellfish or other aquatic biota. Examples of such impacts include, without limitation, fish kills and abiotic conditions;

...

***Note to Reviewers: MassDEP is proposing to eliminate the NAPL ½ inch UCL. This UCL has prevented parties from achieving a Permanent Solution at some disposal sites. As the technical understanding of LNAPL behavior in particular has evolved, however, the ½" UCL is no longer considered appropriate as a measure of the relative potential future risk posed by the disposal site conditions.***

***§ The updated science has demonstrated that NAPL thickness in a well does not correlate directly to the stability of the NAPL in the environment or the potential for NAPL to migrate or the stability of the NAPL in the environment. Corresponding amendments to NAPL related definitions in 310 CMR 40.0006, the Phase I and II site characterization requirements, and in the source elimination or control provisions at 310 CMR 40.1003(5) are intended to more accurately reflect actual LNAPL behavior and regulatory concerns regarding NAPL sites.***



(1) Upper Concentration Limits in soil and groundwater are concentrations of oil and/or hazardous material which, if exceeded under the conditions specified below, indicate the potential for significant risk of harm to public welfare and the environment under future conditions. If a condition of No Significant Risk has not been achieved for future conditions but all substantial hazards have been eliminated, then the site may be eligible for a ~~Class C~~ [RAO Temporary Solution](#) as described in 310 CMR 40.1050.

...

(3) The risk of harm to public welfare and the environment shall also be characterized by comparing the concentration(s) of oil or hazardous material in soil and groundwater to the Upper Concentration Limits in Soil and Groundwater listed in 310 CMR 40.0996(7) or identified pursuant to 310 CMR 40.0996(8).

...

(b) Except as provided in 310 CMR 40.09 96(4), a level of No Significant Risk of harm to public welfare and to the environment does not yet exist for future conditions if the concentration of one or more oil and/or hazardous materials exceed an applicable Upper Concentration Limit, as described at 310 CMR 40.0996(2). The disposal site may, however, pose No Significant Risk for current conditions and meet the conditions of a ~~Class C Response Action Outcome~~ [Temporary Solution](#) if all other requirements for a ~~Class C Response Action Outcome~~ [Temporary Solution](#) are satisfied.

...

~~(6) The presence of non-aqueous phase liquids (NAPL) having a thickness equal to or greater than 1/2 inch in any environmental medium shall be considered a level which exceeds Upper Concentration Limits.~~

**Note to Reviewers: The proposed amendments to the source elimination and control provisions at 310 CMR 40.1003(5) are intended to preclude a Permanent Solution if "Non-Stable NAPL" (or NAPL with the potential for macroscale mobility) of any type exists. If the NAPL is limited to "Stable NAPL", a Permanent Solution would be achievable with the implementation of an AUL (see related amendment to 40.1012 applicable to LNAPL only, not all NAPL.)**

**9. Sites with any type of NAPL must demonstrate the reduction of NAPL through remedial and/or recovery measures to reduce NAPL volumes to the extent feasible.**

**Comment: This sentence is ambiguous, and may lead LSP/client to taking remediation actions where not necessary/appropriate/feasible.**

**These provisions establish a requirement to eliminate Sources of OHM Contamination (the proposed definition for "Source of OHM Contamination" is repeated here), if feasible, and when not feasible, to control Sources of OHM Contamination. Performance Standards for demonstrating control of Sources of OHM Contamination are proposed at 310 CMR 40.1003(5)(c). MassDEP seeks comment on these proposed indicators of source control, and on whether these should define an uncontrolled source or, in the alternative, should create a presumption that such sources are uncontrolled that is coupled with a mechanism for rebutting the presumption.**



Comments provided by Carl Shapiro

40.0006: Terminology, Definitions and Acronyms

...

12) For purposes of 310 CMR 40.0000, the following words and phrases shall have the following meanings unless the context clearly indicates otherwise:

...

Source of OHM Contamination means a point of discharge of OHM into environmental media and/or OHM within environmental media, that is migrating or is likely to migrate in a dissolved or vapor state or as a separate phase liquid. Sources of OHM Contamination may include, without limitation:

1. leaking storage tanks, vessels, drums and other containers;
2. dry wells or wastewater disposal systems that are not in compliance with regulations governing discharges from those systems;
3. contaminated fill, soil and sediment;
4. sludges and waste deposits; and
5. Nonaqueous Phase Liquids.

10. Q: To what extent is remaining residual soil contamination at a site considered a secondary source that is not controlled? Will a cost-benefit analysis suffice for feasibility?

40.1003: General Provisions for ~~Response Action Outcome~~Permanent or Temporary Solutions

(1) All necessary and required response actions under 310 CMR 40.0000 shall not have been conducted at a site or disposal site unless and until a level of No Significant Risk exists or has been achieved and a ~~Class A or Class B Response Action Outcome~~Permanent Solution has been achieved in accordance with 310 CMR 40.1000.

(2) RPs, PRPs and Other Persons conducting response actions at any site for which a release or threat of release of oil and/or hazardous material has been reported pursuant to 310 CMR 40.0300 shall achieve a ~~Response Action Outcome~~Permanent or Temporary Solution and submit a ~~Response Action Outcome~~Permanent or Temporary Solution Statement to the Department in accordance with the requirements of 310 CMR 40.1000 within the deadlines established in 310 CMR 40.0500, or any other deadline established under 310 CMR 40.0000 or any determination or order issued by the Department.

(3) A ~~Response Action Outcome~~Permanent or Temporary Solution may be achieved, and a ~~Response Action Outcome~~Permanent or Temporary Solution Statement may be submitted for an entire site, disposal site, or a portion of a disposal site.

(4) The location of a site for which a ~~Response Action Outcome~~Permanent or Temporary Solution applies shall be clearly and accurately identified in the ~~Response Action Outcome~~Permanent or Temporary Solution Statement. The boundaries of a disposal site or portion of a disposal site for which a ~~Response Action Outcome~~Permanent or Temporary Solution applies shall be clearly and accurately delineated and provided in documentation submitted with the ~~Response Action Outcome~~Permanent or Temporary Solution Statement.

(5) Source Elimination or Control. A Response Action Outcome Permanent or Temporary Solution shall not be achieved unless and until each Source of OHM Contamination: oil and/or hazardous material which is resulting or is likely to result in an increase in concentrations of oil and/or hazardous material in an environmental medium, either as a consequence of a direct discharge or through intermedia transfer of oil and/or hazardous material;

(a) for a Class A or B Response Action Outcome Permanent Solution, is eliminated or controlled;

(b) - For a Class C Response Action Outcome Temporary Solution, is eliminated or controlled, to the extent feasible, eliminated, controlled or mitigated;

(c) For the purposes of 310 CMR 40.1003(5), sources may include, without limitation:

1. leaking storage tanks, vessels, drums and other containers;
2. dry wells or wastewater disposal systems that are not in compliance with regulations governing discharges from those systems;
3. contaminated fill, soil, sediment and waste deposits; and
4. non-aqueous phase liquids.

(d) For the purposes of 310 CMR 40.1003(5), the downgradient leading edge of a plume of oil and/or hazardous material dissolved in and migrating with groundwater shall not, in and of itself, be considered a source of oil and/or hazardous material.

(c) Parties conducting response actions shall seek to eliminate each Source of OHM Contamination. In cases where such elimination is not feasible, response actions shall control each Source of OHM Contamination. For the purposes of 310 CMR 40.1003(5), control of each Source of OHM Contamination requires:

1. the absence of unpermitted releases of OHM to the environment;
2. the absence of any Non-Stable NAPL;
3. the removal of any LNAPL to the extent feasible, based upon cost-benefit analysis using current LCSM principles which may include, but are not limited to, Transmissivity, Residual Saturation, and/or decline-curve analysis;
4. the absence of any DNAPL constituent concentration greater than 1 percent of its solubility limit; and
5. demonstration that OHM plumes in any environmental media are not expanding.

(d) The feasibility of eliminating or controlling a Source of OHM Contamination shall be evaluated in accordance with the criteria in 310 CMR 40.0860.

**11. Comment: Mobility/transmissivity is the heart of how these regs will allow NAPL sites to demonstrate a Permanent Solution (stable/unstable NAPL). It does not appear that the 5)c. reg above will draw enough focus to it from the LSP – it seems to just be slipped in. I would prefer to see an expanded section of a) Stable/Non-Stable, and b) Mobility/Transmissivity that will provide more direction to the LSP/RP/agent/etc. I think we would like to provide enough direction in the regs to allow an LSP to develop a CSM/LCSM to support an Opinion of Permanent Solution for a site, rather than rejecting RAOs at a high rate just after the regs are promulgated – it would be a trust-shaker.**

**12. Comment: I would also like to have a field screening method like the one that I have used in the field (attached in the email) to help the LSP 1) define whether he has a NAPL site; and 2) identify if the NAPL is stable or unstable by identifying less NAPL in soil samples as he moves away from the source area (most concentrated area). A field screening method to replace the ½ inch**

standard would then provide a clearer technical direction to the LSP to make a good decision about whether he has a

13. General Comment: The use of the word 'any' is not one that is used for controlling a consultant's risk, and should be removed from locations such as c)2 through c)5 above. (and other locations in these regs) because it is not a word that adds value to the intent and can add confusion because it has an 'absolute' implication.

Note to Reviewers: The proposed amendment to 310 CMR 40.1012(2)(d) is intended to provide notice of Stable LNAPL (LNAPL with microscale, but not macroscale, mobility) that is of potential concern for future property development and use. If "Stable LNAPL" is present at a property, a Permanent Solution may be achieved provided an AUL is implemented to provide notice of the presence of LNAPL as a concern for future excavation and construction.

14. Comment: There may be some sites where a defined area (sometimes small) of stable LNAPL exists, where even a partial AUL may be considered to be not necessary. Can there be situations where the regulations do not require an AUL for stable LNAPL?

#### 40.1012: Application of Activity and Use Limitations

(1) The purpose of an Activity and Use Limitation is to narrow the scope of exposure assumptions used to characterize risks to human health from a release pursuant to 310 CMR 40.0900, by specifying activities and uses that are prohibited and allowed at the disposal site in the future. 310 CMR 40.1012 establishes rules for determining when an Activity and Use Limitation must be used, when one cannot be used, and when one may be a factor to be considered in appropriately characterizing soil and groundwater at a disposal site, pursuant to 310 CMR 40.0923(3).

(2) Except as provided in 310 CMR 40.1012(3), Activity and Use Limitations shall be required:

(a) at all disposal sites or portions of disposal sites for which a ~~Response Action Outcome~~ Permanent Solution and the risk characterization pursuant to 310 CMR 40.0900 used to support the ~~RA~~ Permanent Solution are based upon the restriction or limitation of Site Activities and Uses to achieve or maintain a level of No Significant Risk including:

1. any disposal site or portion of a disposal site for which a ~~Response Action Outcome~~ Permanent Solution is based on MCP Method 1 or 2 Soil Standards and the Exposure Point Concentrations of oil and/or hazardous material exceed the S-1 standards but meet applicable S-2 or S-3 standards;
2. any disposal site or portion of a disposal site where a Method 3 Risk Characterization performed pursuant to 310 CMR 40.0990 relies on reduced exposure potential due to the assumption of limited site use; and
3. any disposal site or portion of a disposal site at which the oil and/or hazardous material in soil located at a depth greater than fifteen feet from the ground surface exceeds an applicable Upper Concentration Limit in Soil listed at 310 CMR 40.0996(7) or determined at 310 CMR 40.0996(8).

(b) at all disposal sites for which a ~~Response Action Outcome~~Permanent Solution relies upon Exposure Pathway ~~E~~elimination ~~M~~measures to prevent exposure to levels of oil and/or hazardous material that would otherwise pose a significant risk of harm to health, safety, public welfare or the environment, including:

1. one or more Passive Exposure Pathway Elimination Measures for which an operating permit is not required; or

2. one or more Active Exposure Pathway Elimination Measures for which an operating permit is required pursuant to 310 CMR 40.0750; and

(c) at all sites where an existing private water supply well(s) is removed from service as a source of drinking water and maintained for uses other than as a private water supply in accordance with the provisions of 310 CMR 40.0932(5)(d). and

(d) at any disposal site for which a Permanent Solution is achieved and Stable LNAPL is present.