

**Public Discussion Draft**  
**RSR Wave 2 - Potential Changes to RSRs**  
**Sediment**  
**November 14, 2013**

**The Department of Energy and Environmental Protection is developing “public discussion drafts” of ideas for potential future amendments to DEEP regulations, or new provisions for regulations, to address remediation of releases and sites where hazardous substances or oil have been released. Many of the subject matters for these drafts grew out of the Cleanup Transformation workgroup recommendations from November 2012. The purpose of the public discussion drafts is to provide more detail to the concepts set forth in the November 2012 Workgroup reports and the February 2013 Cleanup Transformation draft report. As a discussion draft, the language is not structured to read exactly as regulation language would, and does not attempt to propose section and subsection outline format. Also, this discussion draft is not a public hearing draft of a proposed regulation. DEEP will further shape and refine the discussion draft after considering public feedback, before proposing any formal proposed regulation for amendment/adoption and before initiating the formal regulation adoption process.**

**Background:**

The November 2012 Soil and Sediment workgroup<sup>1</sup>, composed of stakeholders including LEPs, municipalities, attorneys, non-profit environmental groups and DEEP staff, recommended:

*...that the RSRs clearly indicate the need to address sediment as part of an appropriate standard of care for site investigation and remediation in Connecticut. ...the workgroup envisioned a tiered program that incorporates the current LEP program that would be directed by a guidance document, with DEEP-approved regulatory program exit strategies and checklist.*

DEEP is proposing a regulatory approach to address polluted sediment that will provide a consistent, flexible and cost-effective approach to protecting human health and the environment. This proposal seeks to address the interests of stakeholders and DEEP and is designed to fully support the goals of the cleanup transformation proposal. Specifically, this proposal clarifies when, how and to what extent an evaluation of potential risks associated with polluted sediment is required. The proposal identifies a tiered process for determining if remedial action is required and, if so, provides flexibility in how a sediment pollution issue will be remedied. Finally, the proposal provides for streamlining by increasing the ability for self-implementing compliance options.

Under current requirements, pollution in sediment is addressed on a case-by-case basis with great inconsistency regarding how and when the requirement to address polluted sediment is triggered. DEEP recognizes that if sediment pollution is to be addressed efficiently and effectively, the rule set must be

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<sup>1</sup> Report available at

[http://www.ct.gov/deep/lib/deep/site\\_clean\\_up/comprehensive\\_evaluation/rsr\\_soil\\_workgroup\\_report.pdf](http://www.ct.gov/deep/lib/deep/site_clean_up/comprehensive_evaluation/rsr_soil_workgroup_report.pdf),

Sediment section on page 12.

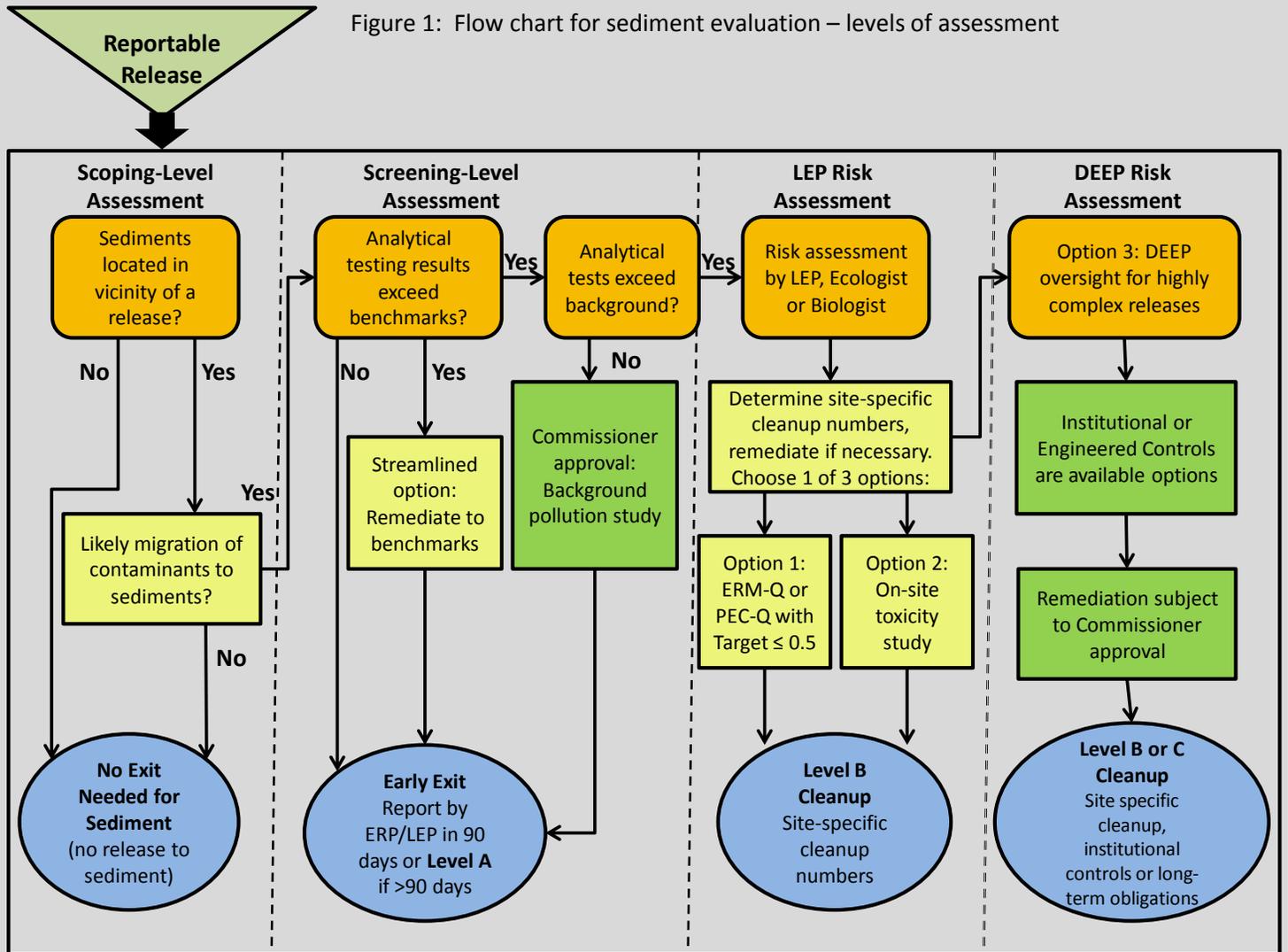
clarified. Responsible parties and their representatives will need to easily understand the conditions that require the evaluation of risks posed by sediment pollution. Flexibility and self-implementation must be central themes that drive how sediment is evaluated to determine if the degree of risk posed by the polluted sediment will require remediation. Self-implementation of the evaluation process and remedy selection should be a part of any comprehensive program to address polluted sediment.

**Concept:**

Assessment and remediation of contaminated sediment would be part of the tiered exit for the site or release, from Early Exit to Class A, B or C. Certain concepts will apply to all cleanups, regardless of which class they fall into. Most importantly, where a release contaminates sediments, unacceptable risks both to human health and ecological receptors will be addressed. The regulations would include specific requirements to address chemicals which bioaccumulate, such as mercury (Hg), pesticides, and polychlorinated biphenyls (PCBs). For protection of human health, additional polluting substances (APS) will be addressed in the same way as they are for soil direct exposure and pollutant mobility criteria. Soils which can be carried to surface water through erosion (for instance contaminated soil on a riverbank) are included as sediment throughout this document. In addition, the terms “release- related” and “site-related” are used interchangeably throughout this document.

The following flow chart (updated from *Draft Proposal for a Transformed Cleanup Program*, Feb 7, 2013, Pg. 43) depicts conceptually the proposed process for assessment and cleanup of sediment releases under the new program and regulations. This graphic shows the many self-implementing options (yellow) that would be added, with only the background study and DEEP Risk Assessments requiring Commissioner's approval (green).

Figure 1: Flow chart for sediment evaluation – levels of assessment



The following table provides a summary of the potential changes to RSRs to address remediation of sediment. A more detailed discussion of the Remediation Classes, the proposed self-implementing provisions, and the alternatives requiring Commissioner approval is provided following the table.

Remediation Class	Self-Implementation	Commissioner Approval
Early Exit or A (cleanup to default criteria)	<u>No Action Needed:</u> Release-related contaminants are below applicable criteria (to be established – see Class A Cleanup discussion below) and no release-related bioaccumulating substances are present (such as Hg, PCBs**, pesticides) above the reporting limit	<u>No Action Needed:</u> Release-related contaminants are below background concentrations For chemicals without default numbers, APS request can be made (based on reference toxicity studies)
	<u>Remediation Needed:</u> Remediate release-related contaminants to meet applicable criteria (to be established – see Class A Cleanup discussion below) and any release-related bioaccumulating substances (such as Hg, PCBs**, pesticides) less than the reporting limit	<u>Remediation Needed:</u> Remediate release-related contaminants to background concentrations
B1 (cleanup to default criteria, may use institutional control)	Not applicable (institutional controls require Commissioner approval)	Institutional Control/ELUR* – No disturbance if area is owned by an entity able to record an ELUR
B2 (cleanup to site-specific or alternative criteria; institutional control)	Remediate release-related contaminants using a release-specific, risk-based approach (see Class B2 discussion below) and any release-related bioaccumulating substances (such as Hg, PCBs**, pesticides) above the reporting limit OR Remediate any release-related contaminants above applicable criteria and exhibiting toxicity based on a prescribed Sediment Toxicity Study	Remediate release-related contaminants above applicable criteria developed by site-specific ecological risk assessment or background determination and any release-related Hg above 0.2 mg/kg and PCBs**, pesticides or other bioaccumulating substances above background. AND/OR institutional control/ ELUR* – No disturbance if area is owned/controlled
C (may use institutional and engineered control or other long-term control (O&M))	Not applicable (engineered controls require Commissioner approval)	Engineered Control with ELUR*, or other long-term control* Remediation same as B2

\* ELURs may be an option in some cases; the Department is working on the details of how this would work conceptually – if you are aware of sites that have successfully used institutional or engineered controls for sediment remediation, please let us know.

\*\*For Sediments with PCBs which are subject to the federal regulations, 40CFR761, EPA approval is needed.

## **Class A Cleanup**

### **Self-Implementing:**

For a Class A cleanup, the sediment will be protective of human health and address ecological risk. Sediment Direct Exposure Criteria (DEC) and ecological based criteria will be established through a formal stakeholder process. The Department is currently proposing that Class A cleanups will have the following requirements:

- meet Sediment DEC, which will be a multiplier of soil DEC based on human exposure scenarios for sediment;
- meet appropriate ecological-based criteria which are to be developed; until then use consensus-based ecological benchmarks:
  - Freshwater sediments meet Threshold Effect Concentrations (TECs)<sup>2</sup>
  - Saltwater/estuarine sediments meet Effects Range Lows (ERLs) concentrations<sup>3</sup>; and
- have no remaining bioaccumulating substances from a release (such as Hg, PCBs, and pesticides).

### **Commissioner Approval to Remediate to Background Alternative:**

All site-related substances would be remediated to background (as defined in the RSRs). Background would be determined as follows, with methods approved by the Commissioner:

- Sediment background concentrations for site-related substances would be established in accordance with a representative sediment sampling program;
- Areas selected for background sediment determination would:
  - have similar land use to that in the vicinity of the release areas,
  - have similar physical characteristics such as grain size distribution and total organic carbon content, and
  - not be within the direct area of influence of other defined or suspected sources of contamination to the environment;
- The reporting limit for the results of all laboratory analyses of samples will be as defined in Laboratory Quality Assurance and Quality Control Reasonable Confidence Protocols Guidance Document using appropriately sensitive methods; and
- Background concentrations will use the 95% Upper Confidence Level of the background concentration.

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<sup>2</sup> MacDonald D.D., C.G. Ingersoll, and T.A. Berger. 2000. "Development and Evaluation of Consensus- based Sediment Quality Guidelines for Freshwater Ecosystems." Archives of Environmental Contamination and Toxicology 39, 20-31.

<sup>3</sup> Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environmental Management Vol. 19, No. 1, pp. 81-97.

## **Class B1 Cleanup**

### **Commissioner Approval:**

Class B1 cleanups would use cleanup options from Class A and have an added feature of an Institutional Control, such as an Environmental Land Use Restriction (ELUR) signed by the Commissioner, as part of the sediment remedy. Institutional controls may be an option in some limited cases; the Department is working on the details of how this would work conceptually – if you are aware of sites that have successfully used institutional or engineered controls for sediment remediation, please let us know.

## **Class B2 Cleanup**

### **Self-Implementing, Site Specific Alternative:**

For a Class B2 cleanup, the sediment will be protective of human health and address ecological risk with the following three requirements:

- meet Sediment Direct Exposure Criteria, which will be a multiplier of soil DEC based on human exposure scenarios for sediment;
- have no remaining bioaccumulating substances (such as Hg, PCBs, or pesticides) from a release above the reporting limit; and
- either:
  - meet Effects Range Median-Quotient (ERM-Q)<sup>4</sup> in saltwater or the Probable Effects Concentration –Quotient (PEC-Q)<sup>5</sup> in freshwater for metals and PAHs with a target ERM-Q or PEC-Q of  $\leq 0.5$ ; or
  - demonstrate that sediments are not chronically toxic to aquatic organisms using sediment toxicity tests, identified below, conducted with samples which accurately represent site-related conditions, including the highest contaminant concentrations. A finding of no chronic toxicity can be made when the results of the toxicity tests using site samples and conducted on two species as specified below is not statistically different from the results obtained using laboratory controls in valid toxicity tests for all test endpoints.

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<sup>4</sup> Long, E.R., L.J. Field and D.D. MacDonald. 1998. Predicting toxicity in marine sediments with numerical sediment quality guidelines. *Environmental Toxicology and Chemistry* 7:714-727.

<sup>5</sup> MacDonald D.D., C.G. Ingersoll, and T.A. Berger. 2000. “Development and Evaluation of Consensus- based Sediment Quality Guidelines for Freshwater Ecosystems.” *Archives of Environmental Contamination and Toxicology* 39, 20-31.

Water Body Type	Test Species	Toxicity Test Method	Reference
Fresh Water	<i>Hyalella azteca</i>	EPA Test Method 100.4: <i>Hyalella azteca</i> 42-d Test for Measuring the Effects of Sediment-associated Contaminants on Survival, Growth and Reproduction	Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates EPA 600/R-99/064
Fresh Water	<i>Chironomus tentans</i>	Test Method 100.5: Life-cycle Test for Measuring the Effects of Sediment-associated Contaminants on <i>Chironomus tentans</i>	Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates EPA 600/R-99/064
Estuarine or Marine Water	<i>Leptocheirus plumulosus</i>	<i>Leptocheirus plumulosus</i> 28-d Chronic Test for Sediment (Survival, growth and reproductive endpoints)	Method for Assessing the Chronic Toxicity of Marine and Estuarine Sediment-associated Contaminants with the Amphipod <i>Leptocheirus plumulosus</i>
Estuarine or Marine Water	<i>Neanthes arenaceodentata</i>	28-d test for measuring toxicity to <i>Neanthes arenaceodentata</i> (survival and growth)	American Society for Testing and Materials (ASTM). 2013. <i>Standard guide for conducting sediment toxicity tests with Polychaetous annelids.</i> Method E1611-00.

### Commissioner Approval, Site-Specific Alternative:

Sediment may meet site-specific criteria based on an Ecological Risk Assessment or background determination, and any release-related Hg above 0.2 mg/kg and PCBs\*\*, pesticides or other bioaccumulating substances above background with Commissioner approval. Sediment will also meet Sediment DEC.

- Background will be determined as described above in the Class A Cleanup section; and
- Criteria will be established based on an Ecological Risk Assessment conducted in accordance with [EPA/630/R-95/002F](#) “Guidelines for Ecological Risk Assessment,” DEEP Ecological Risk Assessment Guidance (to be developed), or other risk assessment method approved by the Commissioner. The risk assessment will include evaluation of cumulative risks from exposure pathways, including direct contact and ingestion of sediment and consumption of affected organisms.

Class B2 cleanups may also use an ELUR to meet compliance, according to the conditions of Class B1.

## Class C Cleanup

Class C cleanups will include an engineered control and an Institutional Control/ELUR to achieve compliance and may use cleanup options from the other classes. Cleanup would still ensure receptors would not be exposed to contaminated sediment by any pathway, currently or in the future. An Engineered Control for sediment will follow the same requirements as Engineered Control for soil, with the following additional requirements.

A request to use an Engineered Control would be submitted to the Commissioner in writing, for review and approval, and accompanied by a detailed written report and plan which evaluates the physical, chemical and biological processes at the release area that may cause or contribute to the vertical or horizontal transport of contaminated sediments within the waterbody considering, but not limited to:

- sediment resuspension;
- sediment transport;
- surface water transport;
- bioturbation;
- groundwater advection;
- currents;
- tidal fluctuations;
- wind inducted fluctuations;
- ice thaw and ice-dam induced scour;
- storm events;
- maintenance or failure of dam structures;
- dredging;
- in-water construction;
- navigational activities including boat propeller wash, wakes, anchor dragging;
- fishing and shell fishing by manual or mechanical methods
- mineralogy;
- sediment types and properties;
- bathymetry; and
- any other information required by the Commissioner.

For further detail and discussion of what could be required for sediment engineered controls, please refer to [EPA Contaminated Sediment Remediation Guidance for Hazardous Waste Sites](#) (December 2005).