

Application of New CERCLA Five-Year Review Guidance at Hanford – 16403

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**ABSTRACT**

Under CERCLA, the implementation of remedial actions established in records of decision (ROD) are required to be reviewed every five years to evaluate their effectiveness in protecting human health and the environment. Past reviews have included evaluation of actions that were not implemented under existing RODs and, therefore, not subject to the requirement. While commendable for its transparency, discussing these out-of-scope actions created confusion and elicited comments that required time and effort to resolve. The fourth CERCLA Five Year Review (FYR) at the Hanford Site embraces the EPA guidance designed to streamline the process and focuses on the specific objectives of the review. This guidance and the training materials developed jointly by multiple federal agencies including EPA, DOE, DOD, and Department of the Interior (DOI), demonstrate a focused approach to the FYR process and offer real-world examples for streamlining this important document. This paper discusses the focused approach and process changes implemented at the Hanford Site that reduced the size and complexity of the document and provided the DOE, Richland Operations Office, with an efficient, effective template for preparing subsequent reviews. One key change was a thorough evaluation of what operable units were discussed and what operable units were not discussed in the five-year review. This process resulted in a reduction of 14 operable unit discussions. Additionally, extensive referencing of previously published CERCLA documents including closure reports and periodic groundwater monitoring reports minimized the amount of analytical data tables necessary to support the discussion. The Hanford five year review made good use of technology and provided internet links to existing documents where detailed information and voluminous analytical data reside. This eliminated the use of extensive data tables and summaries. The resulting five protectiveness determinations include: 1) "Protective" which is used when there is sufficient data to conclude that the remedy is functioning as intended; 2) "Protective in the short term" which is used when the data and/or documentation review raises issues that could affect future protectiveness; 3) "Will be protective" which is used when the remedy under construction is anticipated to be protective on completion; 4) "Protectiveness deferred" which is typically used when additional information is needed; and 5) "Not protective" which is used when risks are not under control. Reviewing only on the appropriate operable units, and supporting the analysis of remedy performance with focused data, the resulting protectiveness determinations and overall effectiveness of the document were significantly improved.

**INTRODUCTION**

The CERCLA or Superfund and the National Contingency Plan (NCP) require the lead federal agency to review, every five years, remedial actions at their sites where waste is left in place and does not allow for unlimited use and/or unrestricted exposure (UU/UE). In the review, the lead agency documents progress and provides a status of implemented remedial actions. While the FYR does not review

the remedial decision, it does review the implementation and performance of the remedy established in the RODs for each operable unit (OU).

In recent years, EPA has worked to improve the FYR process as a result of issues identified by EPA's Office of Inspector General (OIG). The OIG identified the following primary issues in several separate reports:

- Reducing the backlog of sites requiring FYRs
- Ensuring that the due date for the review is every five years
- Improving national consistency between reports
- Reducing the reports' length
- Establishing a policy to ensure that the recommendations in the report are being tracked, monitored, and implemented.

In addition, EPA regional project managers who review FYRs identified several ways to improve the documents and outlined the 10 most common comments. Because the purpose of the review is to assess the protectiveness of a remedy, assessing, choosing, supporting, and writing the protectiveness statements correctly should be the main focus for these EPA reviewers. The 10 most common comments are as follows:

1. One protectiveness statement should be issued for each OU you evaluate during the FYR process.
2. Not all OUs need a protectiveness statement. For example, a remedial action (RA) has not begun (no RA; no ROD) or an OU that was UU/UE in the last review remains unchanged.
3. OUs that are under construction should get a protectiveness statement. Generally, for OUs under construction, the protectiveness statement is "will be protective."
4. Choose the appropriate protectiveness statements consistent with the FYR Guidance (2012 [Office of Solid Waste and Emergency Response] OSWER 9200.2-111 EPA Memo, "Clarifying the Use of Protectiveness Determinations for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews" [2012 Memo] [1]).
5. A sitewide protectiveness statement was not issued when appropriate or vice versa. When a site is designated as "construction complete," but waste is left in place, a sitewide protectiveness determination is required and will generally be the same protectiveness determination as the least protective OU at the site [1].
6. Focus the review on the protectiveness message. Synthesize information from operating and maintenance reports and link the information to the remedial action objectives (RAO). Reproducing all the supporting data is unnecessary.
7. Provide adequate rationale for the protectiveness statements. A remedial action should address one or more RAOs and the technical evaluation should provide evidence that the remedial action is functioning as intended and meeting the RAOs.

8. Focus on the RAOs or risk basis of the ROD. Remedies are selected to meet risk-based RAOs, and they should be the basis of the issues and recommendations.
9. Include adequate information about the status of issues from previous FYRs. EPA uses this information in the *Superfund Enterprise Management System* (SEMS) database to evaluate progress.
10. Focus and track issues that affect current or future protectiveness. EPA uses SEMS for tracking issues.

To respond to the issues identified in the OIG's three specific reports and the EPA's 10 most common comments, the EPA's Federal Facilities Restoration and Reuse Office (FFRRO) formed the FYR Interagency Workgroup. EPA, together with DOI, DOD and its service components (Army, Navy, Air Force, and Office of the Secretary of Defense), and DOE, developed a training module to streamline the FYR process at federal facilities, promote consistency across agencies, and help writers understand and address the reviewers' most common issues. The training was developed as an addendum to OSWER 9355.7-03B-P, *Comprehensive Five-Year Review Guidance* (2001 Guidance) [2]. The training is intended to provide writers of FYRs at federal facilities the tools to produce streamlined, economical reports.

The training included best management practices that address choosing and supporting protectiveness statements and submitting easily reviewed reports that generate fewer regulator comments.

## **DISCUSSION OF HANFORD FIVE YEAR REVIEW**

The Hanford Site is preparing their fourth CERCLA FYR, which reviews remedies implemented in 23 source OUs and 7 groundwater OUs. To improve the process, Hanford authors actively embraced the new training module. The balance of this paper includes information directly from the training module and provides insight on how the Hanford Site authors are using the information to streamline the FYR process.

At a site such as Hanford, one of the first questions is "What should be reviewed?" or "what's in and what's out?" With approximately 30 OUs and limited financial resources, this is a critical question to answer. Common sense dictates that the team review only those OUs that meet the CERCLA FYR criteria.

### **No Review Required**

The FYR evaluates whether an implemented remedy is protective of human health and the environment. If no decision document (e.g., ROD or removal action memo) exists, there is no remedy and an evaluation is not required. If construction of the remedy has not started, a review is not required.

### **Review Required**

FYRs are conducted if an implemented remedial action results in any residual hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for UU/UE. If a removal action will not be followed by an RA, but will result in land-use restrictions (e.g., contaminants remain above UU/UE), a review is generally required. The first FYR is completed no later than five years

after remedial-action construction begins. Subsequent reviews are completed no later than five years after the signature date.

Figure 1 shows a planning tool that can be used to identify OUs that should not be evaluated. In general, if a remedial action has not been selected for an OU, and if the OU or area has been determined to meet the definition of UU/UE, the site should not be evaluated in the FYR report.

OU	FACILITY'S NAME	COMMON NAME	DECISION DATE	REASON
OU3	OT014	Fire Training Area	No ROD	No ROD
OU4	MS015	Munitions Storage Area	9/30/97	UU/UE

Fig. 1. Example Planning Tool to Exclude OUs From Review.

Figure 2 shows a planning tool that can be used to identify OUs that should be included in the review. This type of tool helps focus the review by allowing team members to identify the data and documents needed to assess and determine protectiveness. Achieving this focus helps writers identify the appropriate data tables and maps to best support the protectiveness statements for each OU.

OU	FACILITY'S NAME	COMMON NAME	DECISION DATE	RAOS	REMEDY
OU1	OT020	Sitewide GW plumes	9/29/94 Action Memo 8/30/04 ROD	Prevent exposure to GW > MCL Restore GW	MNA ICs
OU2	ST022	Sump Leach Field	8/30/97 ROD 9/30/02 ESD	<ul style="list-style-type: none"> <li>Reduce GW concentrations</li> <li>Prevent Plume expansion</li> <li>Prevent exposures to HI&gt;1 or risk &gt;10<sup>-5</sup></li> </ul>	MNA ICs

Fig. 2. Example Planning Tool to Include OUs in Review.

Writers should develop a table that fits their site and provides the relevant information to establish the data needs to effectively manage their review. A modification of this table can be useful in the executive summary.

At the Hanford Site, the question of what is in and what is out was answered early in the process using a matrix table that listed each of the 30 OUs and assigning metadata about the OU's status, including decision document status, remedial actions implemented, and previous FYR assessments. This initial screening activity and resulting summary table immediately reduced the OU discussions by 14 from the third to the fourth FYR. The previous reviews evaluated actions that were not implemented under existing RODs and therefore not subject to the requirement. While commendable for its transparency, discussing these out-of-scope actions added unnecessary volume to the document and elicited comments from reviewers that required time and effort for resolve.

**The key here was that a relevant protectiveness statement could not be issued because the remedy either had not been selected through a decision document, or the remedy had not yet been implemented through construction. Therefore, there was no need to write about it.**

Once the appropriate list of OUs was developed, authors identified the relevant documents and data. Sites like Hanford have a long history of CERCLA remediation and have generated abundant documents that provide relevant data that can be reviewed and used to support the conclusions. RODs, remedial-action reports, and institutional control (IC) plans, annual groundwater monitoring reports, annual pump-and-treat reports, and remedial verification packages are just a few.

Generally, summary-level data with citations to the source documents are needed to support the conclusions and protectiveness statements. Every site is different, so the documents will vary by site. Key data and findings should be distilled and cited. To focus the FYR, it is appropriate to summarize the key information from existing CERCLA documents. The Hanford FYR document uses internet links to source documents extensively. This tactic greatly minimized the need to include extensive data tables and summaries.

**Using Internet links to source documents greatly reduces the overall size of the document.**

Annual site inspections and an assessment of the effectiveness of ICs are additional sources of information that can be included as supporting evidence of protectiveness. The Hanford Site prepares an annual IC assessment and combines the previous reports for inclusion into the FYRs.

### **Assessing Protectiveness**

Once the appropriate information has been gathered and digested, it is important to logically present the information via a critical information path, keeping in mind the goal of determining protectiveness. Virtually all information presented should support protectiveness statements; if it does not, critically evaluate whether the information is necessary.

A critical theme that emphasizes protectiveness should run throughout the report from the RAOs, and remedy components through the technical assessment, to the protectiveness statement. This focused message helps keep writers on track, facilitates a concise message, and effectively conveys a realistic protectiveness message.

Regulatory reviewers will evaluate the document's flow to see whether the RAOs and technical assessment tell a complete story, making the issues, recommendations, and protectiveness statements clear.

The Hanford Site FYR document directly copies the RAOs from the decision documents. This information typically includes the risk drivers, land use, and purpose of the action. Because of the complexity of the Hanford Site, the authors determined that using verbatim RAO language was critical to helping the reader frame the remedial action being technically evaluated. Guidance specifies three questions to examine during the technical evaluation. It is important to consider the RAOs throughout the technical evaluation to keep the evaluation focused.

The questions are as follows:

- A. "Is the remedy functioning as intended?"
- B. "Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?"
- C. "Has any other information come to light that could call into question the protectiveness of the remedy?"

The answer to Question A should briefly describe how the performance of the remedy measures up to the RAOs. Basically, it is the "how are we doing?" question. The RAOs established in the decision documents identify the end game and this is the place to talk about progress toward that end and how the remedy is supporting that progress.

Question B concerns changes in the basic decision criteria such as toxicity levels or cleanup levels. New research data may identify potential changes in the toxicity of chemicals of concern (COC). Valuable sources of information to support this evaluation include the following:

- The [Regional Screening Levels](#) (RSL) website
- The [FFRRO](#) webpage for new and emerging contaminants
- The [Integrated Risk Information System](#) (IRIS) webpage to stay up to date about toxicity changes.

Changes in the standards or land use should be viewed in light of a protectiveness determination and whether existing RAOs (if achieved) will be protective.

A change, by itself, doesn't trigger a yes or no answer on protectiveness – the evaluation must be completed to determine whether the change results in an

unacceptable risk, a new exposure pathway, or other changed circumstance that may affect the RAOs and overall protectiveness.

Question C is asking whether any new information has come to light that could call into question the remedy's protectiveness. For example, a flood, earthquake, or wildfire can alter the release or distribution of COCs, potentially affecting remedy protectiveness.

### **Protectiveness Determination**

The following protectiveness determinations are outlined in OSWER 9200.2-111 [1].

#### **1. Protective**

A protectiveness determination of "protective" is typically used when the answers to Questions A, B, and C provide sufficient data and documentation to conclude that the remedy is functioning as intended and all human and ecological risks are under control and are anticipated to be under control in the future.

#### **2. Protective in the Short Term**

A protectiveness determination of "protective in the short term" is typically used when the answers to Questions A, B, and C provide sufficient data and documentation to conclude that the human and ecological exposures are under control and no unacceptable risks are occurring. However, the data and/or documentation review also raise issues that could affect future protectiveness or remedy performance, but not current protectiveness.

#### **3. Will be Protective**

A protectiveness determination of "will be protective" is typically used when the answers to Questions A, B, and C provide sufficient data and documentation to conclude that the human and ecological exposures are under control and no unacceptable risks are occurring in those areas. In addition, the answers to Questions A, B, and C indicate that the remedy under construction is anticipated to be protective on completion and no remedy implementation or performance issues have been identified.

#### **4. Protectiveness Deferred**

"Protectiveness deferred" is generally used when the available information to answer Questions A, B, and C does not provide sufficient data and documentation to conclude that all human and ecological risks are under control and no unacceptable exposures are occurring. When a protectiveness deferred determination is made, the protectiveness statement generally discusses the actions needed to collect the missing information and the timeframe anticipated to complete these actions.

#### **5. Not Protective**

A protectiveness determination of "not protective" is generally used when the answers to Questions A, B, and C provide adequate data and documentation to conclude that the human and/or ecological risks **are not** under control and follow-up actions are required.

### Presenting Data

Using graphics (maps and graphs) and summary tables is preferable over lengthy analytical data tables. Well thought-out graphics that represent the current conditions and demonstrate progress toward achieving the RAOs help streamline the document and improve reader understanding.

The RAOs, in part, will help determine the appropriate data to support a protectiveness statement. For example, if monitored natural attenuation is the selected remedy to restore an aquifer, a graph showing observed progress toward achieving the maximum contaminant levels (MCL) in a reasonable timeframe would support the protectiveness statement.

By using maps, graphs, and tables to tell the story, authors can reduce the amount of text needed to support the interpretation and protectiveness determination.

At Hanford, we made extensive use of links to existing published documents that discuss groundwater plumes in excruciating detail. The FYR warranted a summary of conclusions from those documents, not the detail. This enables the reader to see the changes over time, which again supports protectiveness. Figures 3 through 5 are examples from DOE/RL-2016-01, *Hanford Site CERCLA Five-Year Review Report* [3], that illustrate one way to tie the RAOs to the remedy and the progress toward protectiveness in decreasing plume size with time.

Table 3. Status of 100-XX-X Interim Action ROD Implementation.

100-XX-X Remedy Implementation Summary								
Document Type	Date	Title						
Interim Action ROD, as amended	01/2003	<a href="#">EPA/ROD/RXX-XX/XX</a> , Declaration of the Record of Decision for the 100-XX-X and 100-XX-X Operable Units, Hanford Site, Benton County, Washington						
RDR/RA Work Plans	08/2003	<a href="#">DOE/RL-XX-XX, Rev. 0</a> , Remedial Design Report and Remedial Action Work Plan for the 100-XX-x and 100-XX-x Groundwater Operable Units Interim Action						
<b>RAO</b> (abbreviated description)	<ol style="list-style-type: none"> <li>1. Protect aquatic receptors in the river bottom substrate from contaminants in groundwater entering the Columbia River</li> <li>2. Protect human health by preventing exposure to contaminants in the groundwater</li> <li>3. Provide information that will lead to the final remedy</li> </ol>							
<b>COCs</b>	Hexavalent chromium, strontium-90, technetium-99, tritium, uranium, fluoride, and nitrate							
Interim Action Remedy								
Remedy Component (primary)	Implementation Status (approximate percentage complete as of September 2015) <sup>a</sup>						O&M Duration (~years) <sup>b</sup>	Est'd O&M Finish (year)
	0	1-25	26-50	51-75	76-99	100%		
P&T with ion exchange resins							TBD	TBD
Reinjection /Flow path control							TBD	TBD
Institutional controls							TBD	TBD

Fig. 3. Sample Status Table From DOE/RL-2016-01 [3].



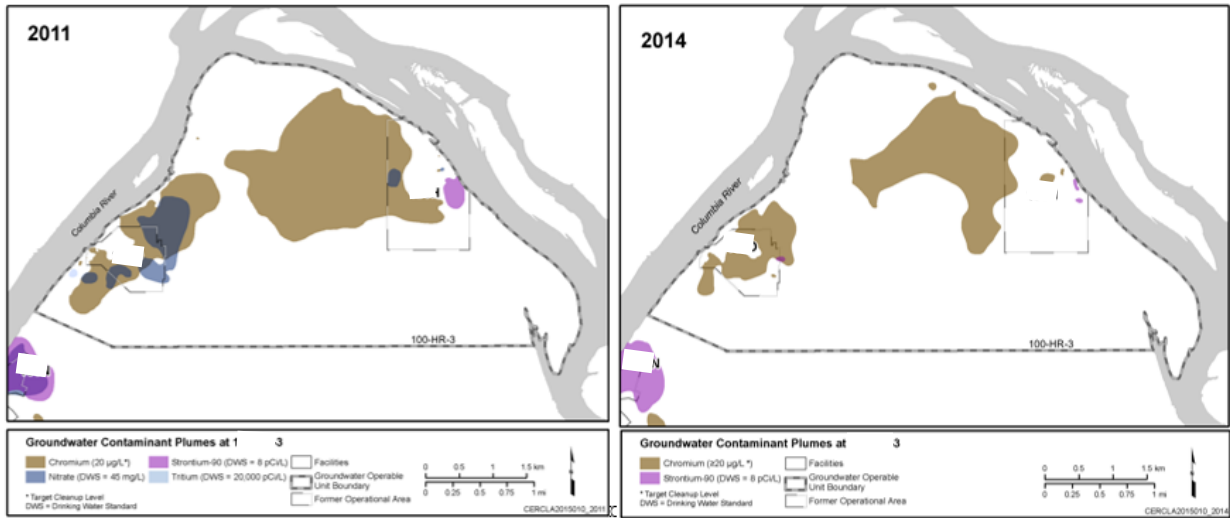


Fig. 4. Comparison of Groundwater Plume Size Over Time [3].

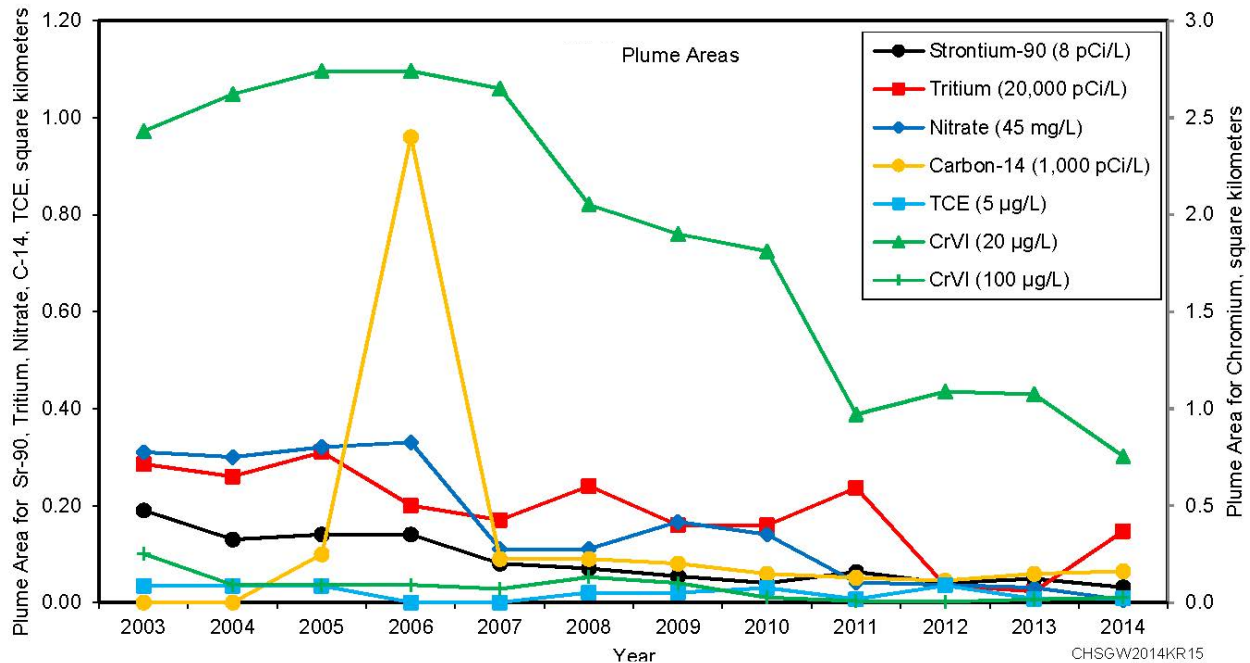


Fig. 5. Depiction of Plume Area Change Over Time [3].

## CONCLUSIONS

When writing the report, keep this “information pyramid” in mind. Each level of the pyramid should contain less detail than the level below it. The report can speak to a broader audience if the messages from the more technical reports it’s based on are distilled down to plain language relating to RAOs and protectiveness. Focus on the data review, technical assessment, and protectiveness status.

The Executive Summary and Factsheet should summarize the most important findings from the FYR. Remember that the audience for the executive summary

and factsheet will be broad, so you may want to alter your writing style and limit the use of acronyms or technical terminology.

Lengthy and complex datasets should be included by reference and summarized in a form that facilitates answering the three technical evaluation questions. Large excerpts from remedial action reports, monitoring reports, and other documents add a lot of volume and can introduce obsolete information. Although a somewhat greater level of detail may be desirable for the first FYR, subsequent reviews should contain less detail and more references.

Stick to the critical information path. Avoid including information that does not affect protectiveness and can obscure key messages about protectiveness. The main body of the report can become so full of information unrelated to protectiveness that the protectiveness message gets lost. Use hyperlinks that take readers to information either in other sections of the document or to external resources to allow them easy access to the supporting information.

Use tables, graphs, maps, and diagrams to tell the main story and use text to tie images together and add information.

At Hanford, EPA provided an informal review concurrent with the DOE-RL review. EPA representatives attended monthly status meetings and DOE subject matter expert briefings. The authors discussed content and format, along with the process to determine what OUs were going to be included and why, with EPA at a very early stage – again in an attempt to eliminate surprises.

## **REFERENCES**

1. OSWER 9200.2-111, 2012, "Clarifying the Use of Protectiveness Determinations for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews," U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C.
2. OSWER 9355.7-03B-P, 2001, *Comprehensive Five-Year Review Guidance*, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C.
3. DOE/RL-2016-001, 2015, *Hanford Site Fourth CERCLA Five-Year Review Report*, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.