

Emphasizing Validation & Human-Centered Generative Artificial Intelligence (GenAI):

The Report Review AI Case Study

Remediation Technologies Symposium, October 15-17, 2025 – Banff Springs, Canada



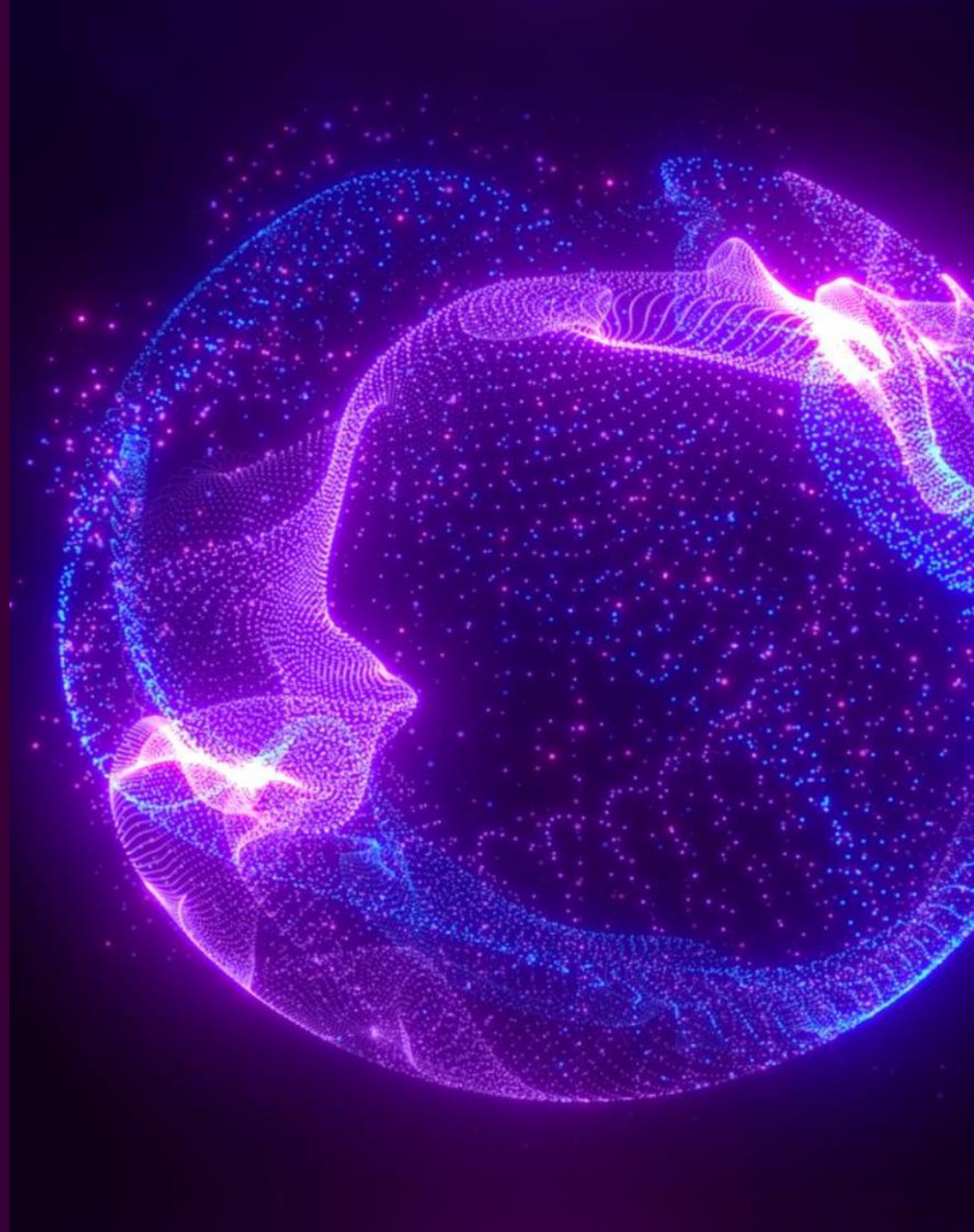
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Support Team:

Max Crutchfield, Andrea
Pearce, Ray Mangan & Kevin
Murphy



Agenda

1. "Human-In-The-Loop"
2. Report Review AI:
 - A. Background & Purpose
 - B. Overview
3. Case Study:
 - A. OU5 Libby Asbestos National Priorities List Site
4. Lessons Learned & Conclusions
5. Next Steps



Human – In – The – Loop (HITL)

What:

Partnership
between people
and artificial
intelligence (AI)

HUMAN IN THE LOOP



Status
tracking



Comments
and feedback



References
to content
(pages, sources)



Validation
and
cross-checking



Changelog
/ audit trail



Confidence
scores



Feedback
loops for
tuning

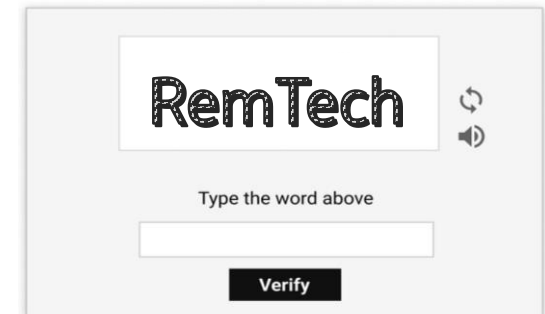


Explainability
(chain of
thought)

Why:

- AI can make mistakes
- Ensures trust
- Complex context

HITL keeps humans in control—AI speeds up routine work, but people provide oversight and judgment



Report Review AI: Background & Purpose

What:

GenAI solution that supports, *rather than replaces*, human reviewers

Why:

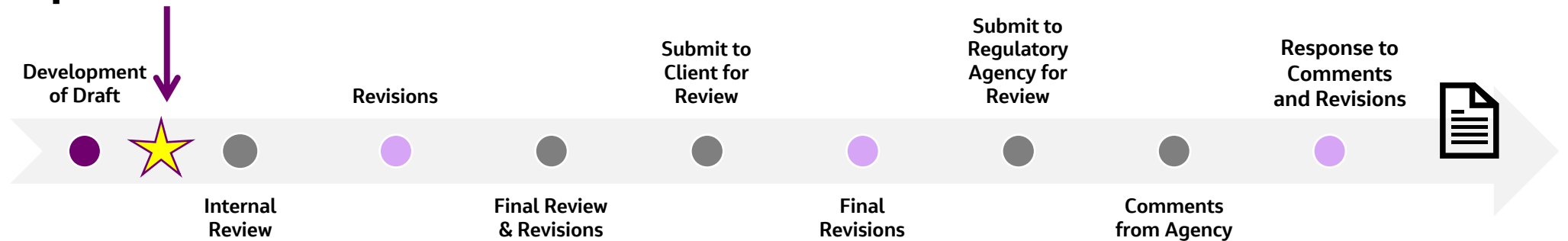
Regulatory report review is a resource-intensive bottleneck

How:

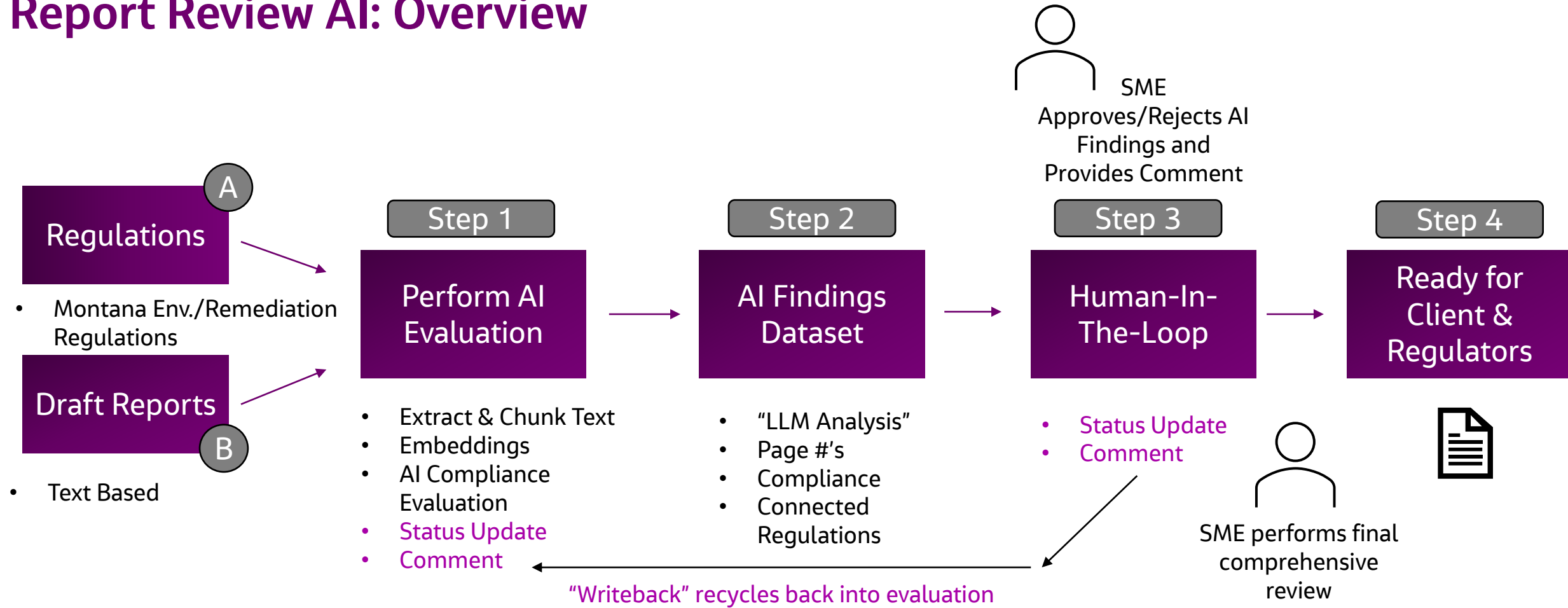
Automates report review technical compliance checking

Report Review AI

Traditional Report Review Workflow



Report Review AI: Overview



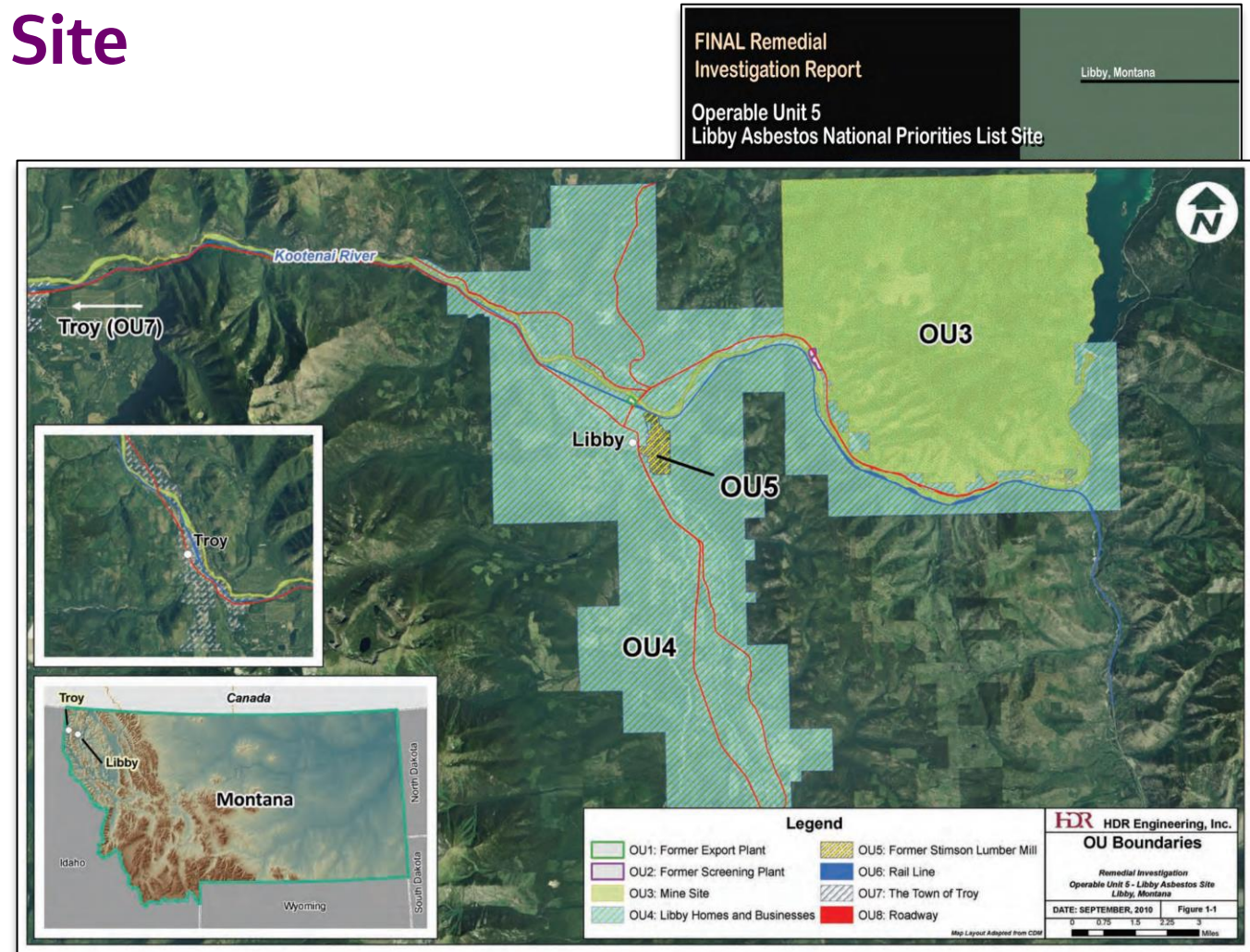
Case Study: OU5 Libby Asbestos Site

Remedial-Investigation (RI) Report (2013)

- Mined for vermiculite since 1881 to 1990
 - Produced 80% of worlds supply of vermiculite while in operation
- Report (210 pages) describes the nature and extent of Libby amphibole (LA) asbestos

Report Review AI on RI Report

- ~25 minutes for data pipeline and AI to assess report and output AI findings (87 AI findings)
- ~2 hours for SME to review AI findings and update status/comment field



[Libby Asbestos OU5, Final Remedial Investigation Report, June 25, 2013](#)

Case Study: OU5 Libby Asbestos Site – 87 AI Findings

Step 1: AI Analysis

Select AI Analysis

Report EPA_Libby_Site_... X

AI Findings 87

Filter List by Compliance Status

Review AI Analysis

Compliance - Partially Compliant

Llm Analysis -

The page describes historical and current land uses, the identification of potential areas of vermiculite and asbestos contamination, residual waste piles, and outlines future redevelopment plans at OU5. These descriptions are directly relevant to the requirements of Montana CECRA Ecological Risk Assessment Guidance, which mandates collection of information on site features, land use, presence/absence of surface water or wetlands, vegetation, and potential for ecological receptors. The level of detail meets the requirements for documenting location, description of site, current/future uses, and attractiveness of the site for ecological receptors. However, while there is mention of limited vegetation and recreational use, there is no explicit mention of presence/absence of animal activity, documentation of ecologic receptors, or direct reference to critical habitat or threatened/endangered species per the regulatory guidance. Therefore, the work plan partially meets the requirements of the CECRA ecological risk assessment guidance for initial site documentation. No other referenced Montana regulations (hazardous waste testing and soil sampling, asbestos project definitions, etc.) appear directly applicable based on the content of this page.

Page Number - 14

Status - No value

AI Analysis

Writeback Enabled Table

Report	Compliance	Page Number	Regulation Summary	Status	Comment
EPA_Libby_Site_Montan a.pdf	Partially Compliant	9	Montana administrative rule 17.74.357 outlines stringent procedures and standards for clearing asbestos projects, requiring thorough fina...	No value	No value
EPA_Libby_Site_Montan a.pdf	Partially Compliant	10	Before any demolition or renovation of a facility in Montana, owners or operators must have the affected area thoroughly inspected for asbestos ...	No value	No value
EPA_Libby_Site_Montan a.pdf	Partially Compliant	14	The Montana Department of Environmental Quality's Ecological Risk Assessment Guidance outlines a tiered approach to evaluating ...	No value	No value
EPA_Libby_Site_Montan a.pdf	Partially Compliant	15	Before any demolition or renovation of a facility in Montana, owners or operators must have the affected area thoroughly inspected for asbestos ...	No value	No value
EPA_Libby_Site_Montan a.pdf	Partially Compliant	16	Montana administrative rule 17.74.357 outlines stringent procedures and standards for clearing asbestos projects, requiring thorough fina...	No value	No value

Exportable Table

Edit table

Select Report

Pie Charts & Graphs

Filter by Compliance

View Statistics

Step 2: Validate

14 of 210

100%

Cross-Validate AI Findings

transferred to the current owner, KBPID. The Site is currently being redeveloped for a variety of uses, both recreational and industrial.

Figure 1-3 shows former and current land uses and buildings throughout the Site that existed in June 2010. One of the largest structures at OU5, the Plywood Plant, was entirely destroyed by fire in early 2010.

During Site interviews conducted in 2001, three specific outdoor subareas of interest were identified (CDM, 2007a) due to potential vermiculite (and associated LA) contamination concerns (Figure 1-3):

- The former Popping Plant was once used as an aboveground storage area for uncontained vermiculite ore. Ore was stockpiled directly on the native soil surface in this area.
- The Railroad Spur was used for shipping raw and unprocessed vermiculite material to and from OU5.
- The former Tree Nursery may have introduced raw vermiculite product into this area as a growth medium and fill material.

Additionally, waste bark piles remain from historical lumber processing activities at OU5.

Under current conditions, OU5 is used mainly for commercial/industrial purposes. Portions of the Site are used for recreational purposes. This includes an area that has been developed as a Moto-Cross (MotoX) Park for dirt biking riding, and a trail along Libby Creek that is popular for hiking and bicycle riding. Most of these features are illustrated on Figure 1-3.

Currently, there is no residential land use on OU5. However, a residential area (part of OU4) lies within the OU5 boundaries as shown on Figure 1-3. In addition, residential neighborhoods surround OU5 to the west and northwest.

Redevelopment plans are currently being formulated for OU5. The Kootenai River Development Counsel was awarded a grant to upgrade the rail lines and electrical system throughout the Site. Plans have also been developed for a walking path and fishing pond.

Limited tree and grass plant species are located within OU5, primarily along the northern boundary and surrounding Libby Creek. The majority of OU5 is un-vegetated and suitable for industrial/commercial development.

Final Remedial Investigation Report
Operable Unit 5, Libby Asbestos NPL Site

1-4

7

Artificial Intelligence (AI) ©Jacobs 2025

Case Study: OU5 Libby Asbestos Site (Example #1 AI Finding)

Step 1: AI Analysis

Select AI Analysis

Report EPA_Libby_Site_... X

AI Findings 87

View Statistics

Filter List by Compliance Status

Review AI Analysis

Compliance • Partially Compliant

Llm Analysis •

The page describes historical and current land uses, the identification of potential areas of vermiculite redevelopment plans at OU5. These descriptions are directly relevant to the requirements of Montana information on site features, land use, presence/absence of surface water or wetlands, vegetation, and for documenting location, description of site, current/future uses, and attractiveness of the site for ecological recreational use. **there is no explicit mention of presence/absence of animal activity,** documentation of threatened/endangered species per the regulatory guidance. Therefore, the work plan partially meets site documentation. No other referenced Montana regulations (hazardous waste testing and soil sampling content of this page.

Page Number • 14

Status • No value

EPA_Libby_Site_Montan a.pdf	Partially Compliant	16	operators must have the affected area thoroughly inspected for asbestos ... Montana administrative rule 17.74.357 outlines stringent procedures and standards for clearing asbestos projects, requiring thorough fina... Oversee and maintain of	No value	No value
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Edit table

Step 2: Validate

14 of 210 100%

transferred to the uses, both recrea

Ecological Risk Assessment Guidance.pdf

1 of 3 83%

animal 1/4



ECOLOGICAL RISK ASSESSMENT GUIDANCE

CECRA requires that a facility be protective of public health, safety, welfare, and the environment. Protectiveness of the environment includes consideration of surface water, groundwater, and ecologic receptors (aquatic organisms, plants, and **animals**). Protectiveness of surface water and groundwater is ensured by requiring that the facility meet DEQ-7 standards and addressing the leaching pathway when determining soil cleanup levels. Protectiveness of ecological receptors requires a different analysis. Most facilities will not require a full eight-step ecological risk assessment as described in the EPA Guidelines for Ecological Risk Assessment but all require some ecological risk analysis to ensure protectiveness of the environment.

When assessing a facility, investigators need to gather information about the site, conduct a site visit, and document the findings. The following are features that should be investigated and relevant information about each feature documented.

- ☐ The presence/absence of surface water or wetlands (e.g., no surface water or wetlands exist at the facility or a slough is impacted by storm water discharge from the facility)
- ☐ Whether there is contamination in the surface water or sediment (e.g., a large river is present at the facility but does not appear to be impacted or contamination is clearly entering the stream and a sheen is present on the water)
- ☐ The presence/absence of evidence of **animal** activity such as scat, nests, dens, and burrows (e.g., pigeon nests and rabbit burrows were noted at the facility; however, facility operators discourage the presence of these **animals** or it is clear that the facility is a nesting ground for osprey or other raptors)
- ☐ A vegetation survey (e.g., the facility is entirely paved or vegetation control measures are part of active facility operations or the facility appears to be represent the primary source of vegetation for the area)

Case Study: OU5 Libby Asbestos Site (Example #1 AI Finding)

Step 1: AI Analysis

Select AI Analysis

Report EPA_Libby_Site_... X

AI Findings 87

View Status

Filter List by Compliance Status

Review AI Analysis

Compliance - Partially Compliant

LLM Analysis -

The page describes historical and current land uses, the identification of potential areas of vermiculite and asbestos contamination redevelopment plans at OU5. These descriptions are directly relevant to the requirements of Montana CECRA Ecological Risk Assessment for documenting location, description of site, current/future uses, and attractiveness of the site for ecological receptors. However, for recreational use, there is no explicit mention of presence/absence of animal activity, documentation of ecologic receptors, or direct threatened/endangered species per the regulatory guidance. Therefore, the work plan partially meets the requirements of the CECRA site documentation. No other referenced Montana regulations (hazardous waste testing and soil sampling, asbestos project definition) content of this page.

Page Number - 14

Status - Approved

Report	Compliance	Page Number	Regulation Summary	Status
EPA_Libby_Site_Montana.pdf	Partially Compliant	9	Montana administrative rule 17.74.357 outlines stringent procedures and standards for clearing asbestos projects, requiring thorough final inspection...	No value
EPA_Libby_Site_Montana.pdf	Partially Compliant	10	Before any demolition or renovation of a facility in Montana, owners or operators must have the affected area thoroughly inspected for asbestos...	No value
EPA_Libby_Site_Montana.pdf	Partially Compliant	14	The Montana Department of Environmental Quality's Ecological Risk Assessment Guidance outlines a tiered approach to evaluating...	Approved
EPA_Libby_Site_Montana.pdf	Partially Compliant	15	Before any demolition or renovation of a facility in Montana, owners or operators must have the affected area thoroughly inspected for asbestos...	No value
EPA_Libby_Site_Montana.pdf	Partially Compliant	16	Montana administrative rule 17.74.357 outlines stringent procedures and standards for clearing asbestos projects, requiring thorough final inspection...	No value

Report Review AI - Overview

How does it really work?

Regulations

Draft Reports

Montana Env./Remediation Regulations

Text Based

Step 1

Transform & Evaluation Using AI

Extract & Chunk Text

Embeddings

AI Compliance Evaluation

Status Update

Comment

Step 2

AI Findings Dataset

"LLM Analysis"

Page #'s

Compliance

Connected Regulations

Step 3

Human-In-The-Loop

Status Update

Comment

SME Approves/Rejects AI Findings and Provides Comment

SME Finalizes Report Based on Report Review AI Findings/Evaluation

Step 4

Ready for Client & Regulators

"Writeback" recycles back into evaluation

Human-In-The-Loop Integration

Approved

SME Comments on Status and Provides Additional Expertise As Needed

No value

Search options...

Approved

Not Applicable

Needs Further Review

No value

No value

Final Remedial Investigation Report

Case Study: OU5 Libby Asbestos Site (Example #2 AI Finding)

Step 1: AI Analysis

Select AI Analysis

Report EPA_Libby_Site_... X

Filter List by Compliance Sta X

AI Findings 6

View Statistics

Review AI Analysis

Compliance • Non Compliant

Llm Analysis •

The work plan describes the air clearance process following an asbestos abatement project, specific samples due to overloading from non-abatement sources (diesel particulate emissions, kerosene k alone, and no valid air clearance sample results were obtained for some areas (notably Area A)) Mo clearance sampling with PCM or TEM analyses to demonstrate compliance with specified concentr permitted if approved in writing by the department in advance. The summary does not indicate su not meet the regulatory requirement for air clearance samples except with such approved alternat requirements of 17.74.357. The property manager's reservations about not having air clearance sa

Page Number • 112

Status • No value

EPA_Libby_Site_Montan a.pdf	Non Compliant	145	Table 4-4 presents background threshold values (BTVs) for various inorganic elements in Montana surface soils, comparing ...	No value	No value
EPA_Libby_Site_Montan a.pdf	Non Compliant	198	Water suppliers must maintain comprehensive testing records to ensure water safety, report violations promptly, and adhere to specific ...	No value	No value

Edit table

Step 2: Validate

112 of 210 125%

Operable Unit 5 C
2/27/12
Page 2

17.74.357.pdf

1 of 3 83%

air clearance 1/17



ADMINISTRATIVE RULES OF MONTANA

17.74.357 STANDARDS AND METHODS FOR CLEARING ASBESTOS PROJECTS AND REQUIREMENTS FOR PERSONS CLEARING ASBESTOS PROJECTS

(1) At the conclusion of any asbestos project conducted in a facility, the owner or operator shall ensure that final visual inspection and air clearance sampling are conducted in all asbestos project work areas prior to expiration of the asbestos project permit.

(2) The concentration of asbestos fibers in air clearance samples collected pursuant to (1) must be:

(a) less than or equal to 0.01 fibers per cubic centimeter of air for each sample collected within the work area, when analyzed by Phase Contrast Microscopy (PCM) using the NIOSH 7400 or NIOSH 7402 method; or

(b) less than or equal to 70 structures per square millimeter for each sample collected within the work area, when analyzed by Transmission Electron microscopy (TEM) using EPA's interim TEM analytical methods provided in 40 CFR 763, subpart E, appendix A.

(3) Final visual inspection and clearance sampling and analysis must be conducted as follows:

(a) a person performing a final visual inspection and final air clearance sampling shall:

(i) observe the entire asbestos project area to verify that the asbestos project contractor has removed all visible asbestos-containing waste, dust, and debris from the work area;

(ii) require any necessary recleaning by the asbestos project contractor and conduct

10

Status: "Needs Further Review"

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Case Study: OU5 Libby Asbestos Site

Internal SME Review on the AI Findings:

Status	Percentage
Approve	44%
Needs Further Review	39%
Not Applicable	17%

Report drafting team to adjust report
Provokes discussion on topic that may have been entirely missed while drafting report

Overall Stats on OU5 Libby Asbestos Site <> Report Review AI:

Review Time Saved (versus traditional approach): 25-45% reduction

Quality & Defensibility Improvement: 15-25% increase

Cost Avoidance (TBD): X-X% reduction in response to comments (RTC's) – to be determined (TBD) in upcoming pilots

Precision/Recall*: 17% “Not Applicable” in identifying true regulatory issues vs. false positives

*Separate page/section may cover the LLM recommendations or regulation does not apply to content of report.



Lessons Learned

- AI findings for report review are efficient and useful but require **human-in-the-loop** for trust and quality
- Explainability is essential, with multi-dimensional metrics (time saved, quality, accuracy, etc.)
- Success comes from co-design (Domain SME + AI SME) and iterative validation stages

Conclusions

- AI supports, not replaces experts (faster reviews, stronger QA/QC)
- Efficiency gains: consistency, speed, measurable outcomes
- Trust through validation: human oversight builds explainability
- **Industry value:**
 - Frees specialists for higher-value analysis and decisions
 - Levels the playing field (junior to senior) for knowledge continuity
 - Potentially improved reports for regulators (i.e. less on the burden)

Subject Matter Expert (SME)
Artificial Intelligence (AI)

Next Steps

- Layer in additional validation stages as needed and assess cost avoidance on pilots
- Link dynamically to regulations across states/countries
- Support response-to-comment analysis
- Evaluate figures & tables with multi-modal vision models

Thank You!

Report Review AI is a framework for responsible GenAI use—pairing automation with validation, transparency, and human oversight to achieve efficiency and trust

Questions & Discussion



Jacobs

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Reinventing tomorrow.



Todd Kremmin

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Todd is a data scientist who helps lead the cultivation, development, and deployment of generative artificial intelligence (GenAI) use-cases and solutions globally across Jacobs.

He leads the Digital & Data (D&D) Global Community of Practice (CoP) – Data Analytics, AI & Insights, the Environmental Data Management & Analysis AI Focus Group, and the Three-Dimensional (3D) Data Visualization CoP at Jacobs, helping foster innovation, best practices, and collaboration across all of Jacobs in these technical areas



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