

An aerial photograph of an industrial facility, likely a refinery or chemical plant, situated along a river. The facility features several large, circular storage tanks, various industrial buildings, and a complex network of pipes and walkways. A river flows along the top edge of the image. To the right, there is a large, rectangular industrial building with a flat roof. The foreground shows a multi-lane highway with traffic, and a dense forest is visible on the left side. The text "Gasco OU FS Comment Discussion" is overlaid in the center of the image.

Gasco OU FS Comment Discussion

Consideration of IRAM and other early removal actions in the FS

Outline

- June 14, 2023 Upland/In-Water Remedy Path Forward Meeting
- Relevant Rule and Policy Requirements
 - Residual Risk Assessment Considerations
 - Balancing Factor Considerations
 - Effectiveness
 - Long-term reliability
 - Cost reasonableness

June 14, 2023 Upland/In-Water Remedy Path Forward Agreements

- DEQ's meeting notes reflect an understanding between DEQ and NW Natural that the hot spot evaluations in the FS would be completed without considering the barrier wall.
- DEQ cannot have our approval to move forward with the ISS barrier wall change our remedy decision making and lead to a remedy that we would not have otherwise selected.
- NW Natural's disagreement around this topic makes the path forward for the barrier wall as an IRAM uncertain.

Relationship between Risk Reduction (Residual Risk) and Balancing Factors

Residual Risk Assessments

OAR 340-122-0084(4):

- Assessment of risk posed by untreated hazardous substances or treatment residuals using the same exposure assumptions used in the baseline risk assessment (in the absence of any engineering or institutional controls)
- Assessment of adequacy and reliability of any institutional or engineering controls used to manage untreated hazardous substances or treatment residuals

Effectiveness

OAR 340-122-0090(3)(a):

- (A) Magnitude of risk from untreated waste or treatment residuals remaining at the facility absent any risk reduction achieved through onsite management of exposure pathways, as determined in OAR 340-122-0084 (Risk Assessment)(4)(a). The characteristics of the residuals shall be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, propensity to bioaccumulate, and propensity to degrade;
- (B) Adequacy of any engineering and institutional controls necessary to manage the risk from treatment residuals and untreated hazardous substances remaining at the facility, as determined in OAR 340-122-0084 (Risk Assessment)(4)(b);

Effectiveness Considerations

(A) Magnitude of risk from untreated waste or treatment residuals remaining at the facility **absent any risk reduction achieved through onsite management of exposure pathways**, as determined in OAR 340-122-0084 (Risk Assessment)(4)(a). The characteristics of the residuals shall be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, propensity to bioaccumulate, and propensity to degrade;

- In considering RAA effectiveness, DEQ must consider the risk posed by untreated contamination “absent any risk reduction achieved through onsite management of exposure pathways”
- Alternatives with more untreated waste are less effective; Alternatives that are less effective pose greater residual risk.
- Evaluating RAA effectiveness (risk reduction) without considering the barrier wall is consistent with Rule.

Effectiveness Considerations

(B) Adequacy of any engineering and institutional controls necessary to manage the risk from treatment residuals and untreated hazardous substances remaining at the facility, as determined in OAR 340-122-0084 (Risk Assessment)(4)(b);

- In considering RAA effectiveness, DEQ must consider the adequacy of engineering and institutional controls
- Effectiveness of engineering and institutional controls are linked with long-term reliability
- Alternatives that rely more on engineering and institutional controls are potentially less effective; Alternatives that are less effective pose greater residual risk.

Long-Term Reliability Considerations

Long-term reliability.

OAR 340-122-0090(3)(a):

- (A) Reliability of treatment technologies in meeting treatment objectives;
- (B) Reliability of engineering and institutional controls necessary to manage the risk from treatment residuals and untreated hazardous substances, taking into consideration the **characteristics of the hazardous substances to be managed** and the **effectiveness and enforceability over time of engineering and institutional controls** in preventing migration of contaminants and in managing risks associated with potential exposure;
- (C) Nature, degree, and certainties or **uncertainties of any necessary long-term management** (e.g., operation, maintenance, and monitoring); and
- (D) Any **other information relevant to long-term reliability**

Long-Term Reliability Consideration: Characteristics of Hazardous Substances to be Managed

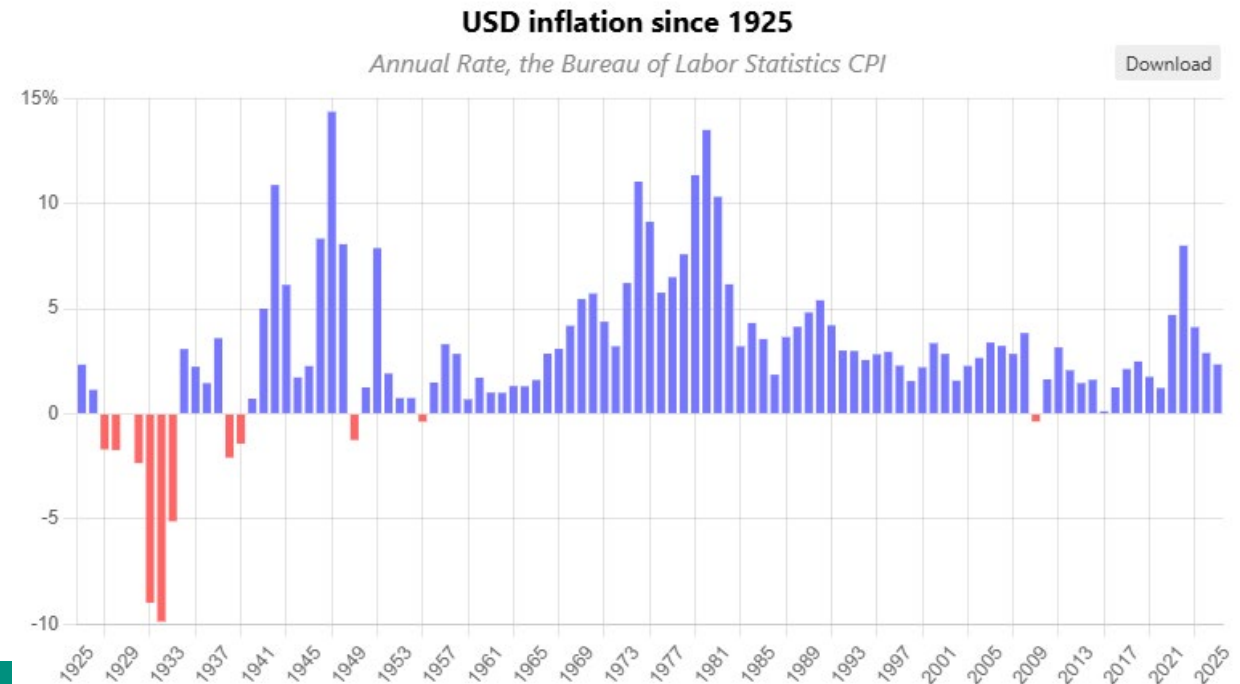
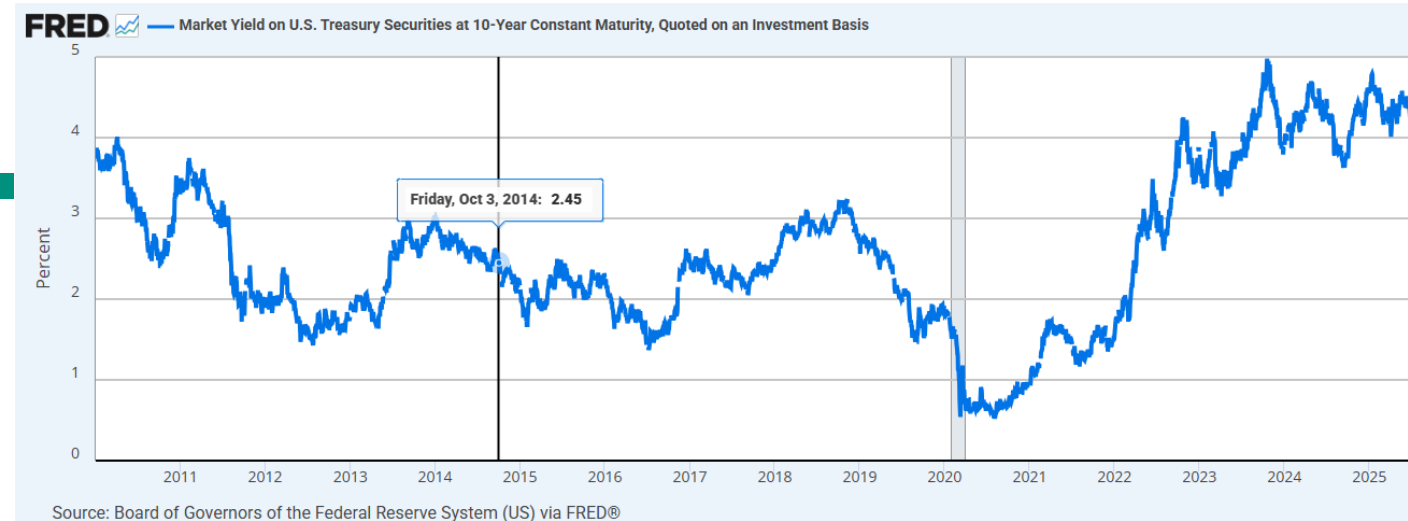
- Highly toxic and highly mobile hot spots
 - >6 million gallons of DNAPL
 - Widespread MGP residuals (tar, spent oxide, lampblack/carbon pitch)
 - Widespread contaminated soils
 - Millions of gallons of contaminated groundwater across tens of acres and multiple water-bearing zones

Long-Term Reliability Consideration: Effectiveness Over Time of Engineering Controls

- Absence of Engineering Controls Could Exacerbate Contamination
- Ease of O&M:
 - “Based on 10 years of operating and maintaining the HC&C system, NW Natural has found that the current HC&C system requires frequent maintenance, including annual chemical treatment of the extraction well screen zones and periodic well replacements” – Revised Segment 3 Source Control Evaluation
- Timeframe for Engineering Control O&M (perpetuity)
- Sustainability of Operation and Maintenance Costs (ability to obtain financial assurance for O&M)

OMM Costs

- Net Present Value
 - Methodology allows for cost comparisons of different remedial alternatives on the basis of a single total cost
 - Represents the amount needed to be set aside at the initial point in time (base year) to assure that funds will be available in the future as they are needed, assuming certain economic conditions
- Escalation/Inflation
 - According to the US Bureau of Labor Statistics' Consumer Price Index, average annual USD inflation over the last 100 years is 2.95%



RAA 4 O&M Costs

Remedial Alternative 4 Cost Element	Cost
Initial Annual O&M Cost	\$9,926,000
100-year O&M NPV @ 3% Discount and no escalation	\$323,580,000
100-year O&M NPV @ 3% Discount and 1.5% escalation	\$526,700,000
Perpetuity O&M w/NPV @ 3% Discount and no escalation	\$340,800,000
Perpetuity O&M w/NPV @ 3% Discount and 1.5% escalation	\$671,660,000

- The long-term reliability of engineering controls can be assessed based on the sustainability of O&M costs.
- Sustainability of O&M costs can be assessed by considering the ability to obtain financial assurance for future costs
- Uncertainty can be assessed by comparing the differences in O&M costs using varying assumptions.

Long-Term Reliability Considerations (RAA 4 vs RAA 8)

Remedial Alternative 4 Cost Element	Cost
Capital Cost	\$124,500,000
Initial Annual O&M Cost	\$9,926,000
100-year O&M NPV @ 3% Discount and no escalation (inflation)	\$323,580,000
100-year O&M NPV @ 3% Discount and 1.5% escalation (inflation)	\$526,700,000
100-year O&M NPV @ 3% Discount and 2% escalation (inflation)	\$640,730,000
Total 100-year Cost w/ NPV @ 3% Discount	\$448,080,000
Total 100-year Cost w/ NPV @ 3% Discount and 1.5% escalation (inflation)	\$651,200,000
Total 100-year Cost NPV @ 3% Discount and 2% escalation (inflation)	\$765,230,000

Remedial Alternative 8 Cost Element	Cost
Capital Cost	\$600,000,000
Initial Annual O&M Cost ¹	\$1,000,000
100-year O&M NPV @ 3% Discount and no escalation (inflation)	\$32,600,000
100-year O&M NPV @ 3% Discount and 1.5% escalation (inflation)	\$53,070,000
100-year O&M NPV @ 3% Discount and 2% escalation (inflation)	\$65,180,000
Total 100-year Cost w/ NPV @ 3% Discount	\$632,600,000
Total 100-year Cost w/ NPV @ 3% Discount and 1.5% escalation (inflation)	\$653,070,000
Total 100-year Cost NPV @ 3% Discount and 2% escalation (inflation)	\$665,180,000

1. DEQ selected value for illustrative purposes. Costs assume long-term hydraulic controls are not necessary where all accessible hot spots are treated.

Long-Term Reliability Considerations (RAA 4 vs RAA 8)

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100-year O&M NPV @ 3% Discount and 1.5% escalation (inflation)	\$53,070,000
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Total 100-year Cost NPV @ 3% Discount and 2% escalation (inflation)	\$665,180,000

1. DEQ selected value for illustrative purposes. Costs assume long-term hydraulic controls are not necessary where all accessible hot spots are treated.

Long-Term Reliability Consideration: Total Project Cost Uncertainty

Remedial Alternative 4 Cost Element	Cost
Total 100-year Cost w/ NPV @ 3% Discount	\$448,080,000
Total 100-year Cost w/ NPV @ 3% Discount and 1.5% escalation (inflation)	\$651,200,000
Total 100-year Cost NPV @ 3% Discount and 2% escalation (inflation)	\$765,230,000

Remedial Alternative 8 Cost Element	Cost
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Total 100-year Cost w/ NPV @ 3% Discount and 1.5% escalation (inflation)	\$653,070,000
Total 100-year Cost NPV @ 3% Discount and 2% escalation (inflation)	\$665,180,000

- Uncertainty in century-scale inflation rates affect which alternative represents the lowest total cost, by a large margin.

Long-Term Reliability Consideration: Other Relevant Information

- Long-term environmental attack
 - Barrier wall integrity
- Seismic susceptibility
 - Barrier wall integrity
 - Pumping well integrity
 - Conveyance and treatment system integrity
 - Release of untreated material to the river

Cost Reasonableness Considerations

FS Guidance Section 3.3.5 (Reasonableness of Cost):

“Although no limiting value has been established for the “higher cost threshold” for treating hot spots of contamination, the Department generally expects that hot spots of contamination will be treated to non-hot spot levels (i.e., to concentrations or conditions which would not produce a hot spot). However, in situations where treatment to these levels is cost prohibitive or technically infeasible, another protective remedial action alternative will be selected. This alternative may include partial treatment of the hot spot, containment of the hot spot, or any other remedial action alternative appropriate for the given site conditions.”

Protection vs. restoration of beneficial uses

Outline

- DEQ's interpretation of the disagreement
- Rule and Policy Requirements for FS Hot Spot Evaluations
- Interpretation of Hot Spot Guidance

DEQ's Interpretation of Disagreement

- Disagreement may represent a misunderstanding of our comments
- For clarification, the definition of “protectiveness” requires groundwater hot spot treatment to the extent feasible
 - Both Rule and policy make a clear distinction between treatment and containment
 - The draft FS does not propose groundwater treatment to the extent feasible, and defaults to containment (of one relevant pathway) and/or institutional controls. The IRAM does nothing to address the industrial groundwater beneficial use.
 - DEQ's comments reflect that we do not approve the concept that the barrier wall and engineering controls “protect” the beneficial use of groundwater since 1) they do not treat the groundwater hot spots, and 2) do not address all relevant beneficial uses.
- We agree that NW Natural must **treat** groundwater to restore or protect its beneficial uses. To meet that requirement, NW Natural must treat groundwater hot spots to the extent feasible. Engineering controls to protect beneficial uses may also be required, but that is in addition to treatment and not in lieu of treatment, unless treatment is infeasible.

Re-Phrased Comment

DEQ disagrees that the IRAM protects the beneficial use of groundwater. The IRAM does not represent a complete remedial action and does not address all relevant exposure pathways or beneficial uses. The definition of “protectiveness,” provided in O.A.R. 340-122-0040, includes groundwater hot spot treatment to the extent feasible. Since the IRAM does not include treatment of groundwater hot spots, it does not ‘protect’ groundwater beneficial uses. Further, the IRAM does nothing to restore or protect the industrial groundwater beneficial use.

Several requirements must be met for DEQ to consider a remedial action to meet the standards for cleanup and be considered protective. These include (but are not limited to):

- Removal and/or treatment of hot spots that are not groundwater (e.g., MGP residuals) to the extent feasible,
- Treatment of groundwater hot spots to the extent feasible
- Effective and reliable engineering controls to manage untreated hot spots and treatment residuals.

Each RAA should describe and quantify the areas and WBZs where groundwater beneficial use will be protected or restored via treatment (with or without additional engineering controls) versus areas where treatment will not restore or protect groundwater beneficial uses within a reasonable timeframe.

Definition of Protectiveness

- (2) In the event of a release of a hazardous substance, remedial actions shall be implemented to achieve:
- (a) Acceptable risk levels defined in OAR 340-122-0115 (Definitions), as demonstrated by a residual risk assessment; or
 - (b) Numeric cleanup standards developed as part of an approved generic remedy identified or developed by the Department under OAR 340-122-0047 (Generic Remedies), if applicable; or
 - (c) For areas where hazardous substances occur naturally, the background level of the hazardous substances, if higher than those levels specified in subsections (2)(a) through (2)(b) of this rule.
- (3) In the event of a release of methane from a historic solid waste landfill, removal or remedial actions shall be implemented to prevent concentrations of methane exceeding or likely to exceed 1.25% by volume in confined spaces and structures, other than in equipment, piping, wells, or other structures designed for the collection and management of methane and approved by the Department.
- (4) In the event of a release of hazardous substances to groundwater or surface water constituting a hot spot of contamination, **treatment shall be required** in accordance with OAR 340-122-0085 (Feasibility Study)(5) and 340-122-0090 (Selection or Approval of the Remedial Action).
- (5) A removal or remedial action shall prevent or minimize future releases and migration of hazardous substances in the environment. A removal or remedial action and related activities shall not result in greater environmental degradation than that existing when the removal or remedial action commenced, unless short-term degradation is approved by the Director under OAR 340-122-0050 (Activities)(4).
- (6) A removal or remedial action shall provide long-term care or management, as necessary and appropriate, including but not limited to monitoring, operation, maintenance, and periodic review

Groundwater Hot Spots

OAR 340-122-0085:

(5) For groundwater or surface water in which a significant adverse effect on existing or reasonably likely future beneficial uses has been identified under OAR 340-122-0080 (Remedial Investigation)(6):

- (a) The feasibility study shall evaluate **treatment** to concentrations that ensure such significant adverse effects will not occur. Specifically, the following shall be evaluated:
 - (A) Whether **treatment** is reasonably likely to restore or protect a beneficial use within a reasonable time; and
 - (B) The extent to which **treatment** is feasible, considering the remedy selection factors set forth in OAR 340-122-0090 (Selection or Approval of the Remedial Action), including application of the higher threshold for evaluating the reasonableness of the cost of treating hot spots of contamination.

Groundwater Hot Spots

OAR 340-122-0090:

(4) The Director shall select or approve a protective remedial action in accordance with the following:

(a) For hot spots of contamination in water, the Director shall select or approve **treatment to the extent treatment is feasible** considering the treatment criteria in OAR 340-122-0085 (Feasibility Study)(5) and the factors set forth in OAR 340-122-0090 (Selection or Approval of the Remedial Action)(3);

Interpretation of Hot Spot Guidance

- Section 1.0 Introduction: “Project managers are encouraged to exercise professional judgment in applying this guidance”
 - DEQ project managers have discretion to apply guidance to each project based on site-specific factors.
 - Specific examples provided in policy guidance may not apply to Gasco.

Other Hot Spot Guidance Excerpts

“The development of a range of remedial action alternatives, as specified in OAR 340-122-085(2), including treatment-based remedial action alternatives intended to restore or protect the beneficial use(s) of water within the recommended and Department approved “reasonable time”. In conjunction with source removal or treatment, where applicable, the remedial alternatives developed should include, at a minimum, i) treatment of the aquifer or surface water body and ii) hydraulic controls intended to prevent further migration of contamination.”

(Section 2.3)