Presentation to the U.S. EPA National Remedy Review Board for the Homestake NPL Site

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Introduction

- Comments and presentation on behalf of Bluewater Valley Downstream Association (BVDA)
- Written comments submitted to NRRB on 10 March 2021
- Technical issues related to HMC’s requests for Alternative Concentration Limits (ACLs) and a Technical Impracticability (TI) waiver for groundwater cleanup standards

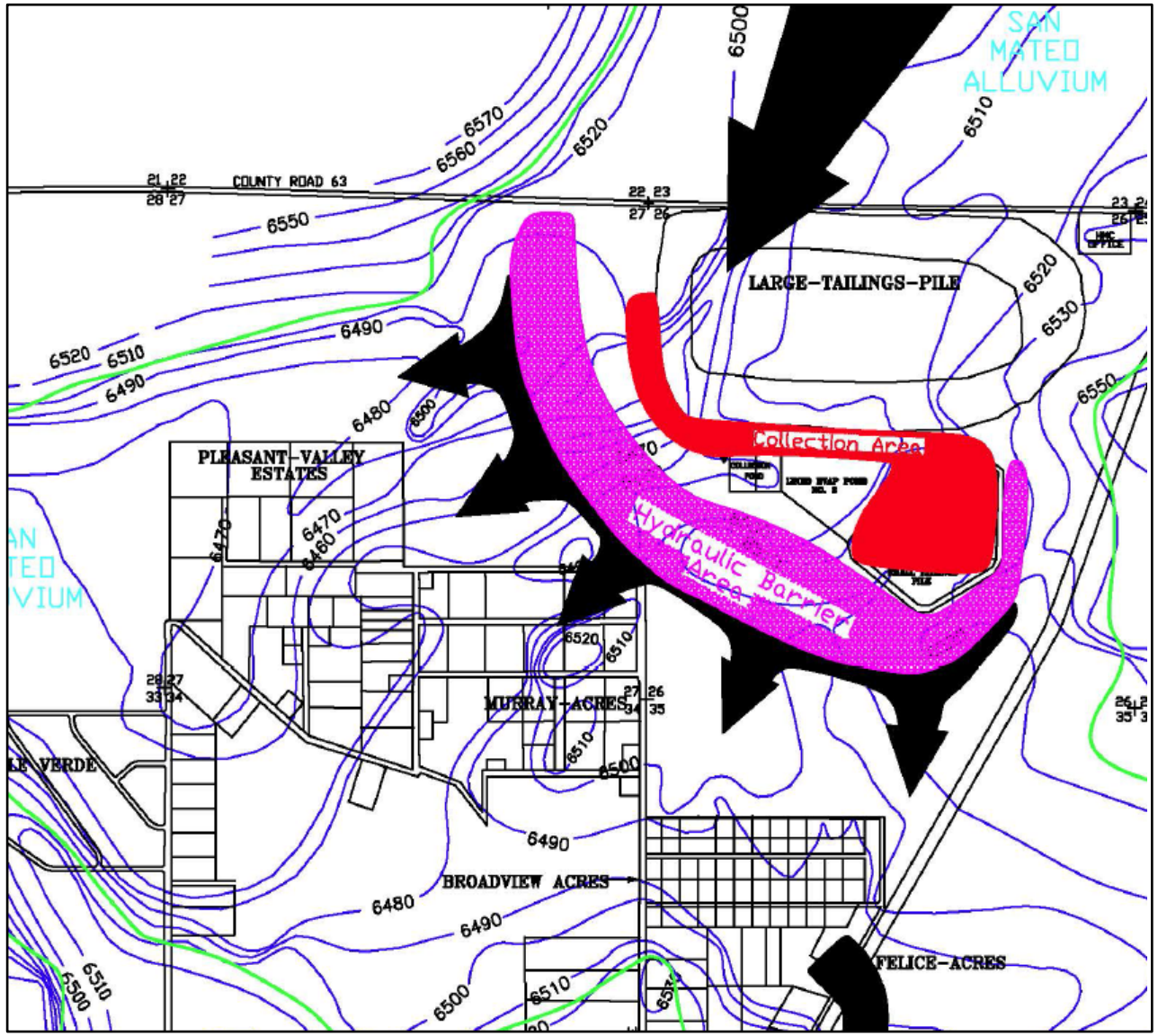
TI Waiver and ACLs are Premature

- Finding of “not reasonably achievable” based on modeling **that is not technically defensible/faulty** indicating long-term contaminant mobilization from the alluvial aquifer and large tailings pile (LTP) seepage
- HMC’s remedies have failed due to improper conceptualization, selection, and execution
- Remedies considered but not retained should be reconsidered

Failed Remedies

- Four remedies considered – three involve continuing same failed approach
  - Incomplete capture of LTP seepage
  - Water treatment not effective
  - Extensive use of San Andres/Glorieta (SAG) aquifer water for dilution
- Hydraulic barrier
  - Doesn’t address escape of LTP seepage via preferential pathways on west and east sides of LTP
  - Uses SAG groundwater for reinjection – 9 billion gallons

Alluvial Flow and Hydraulic Barrier

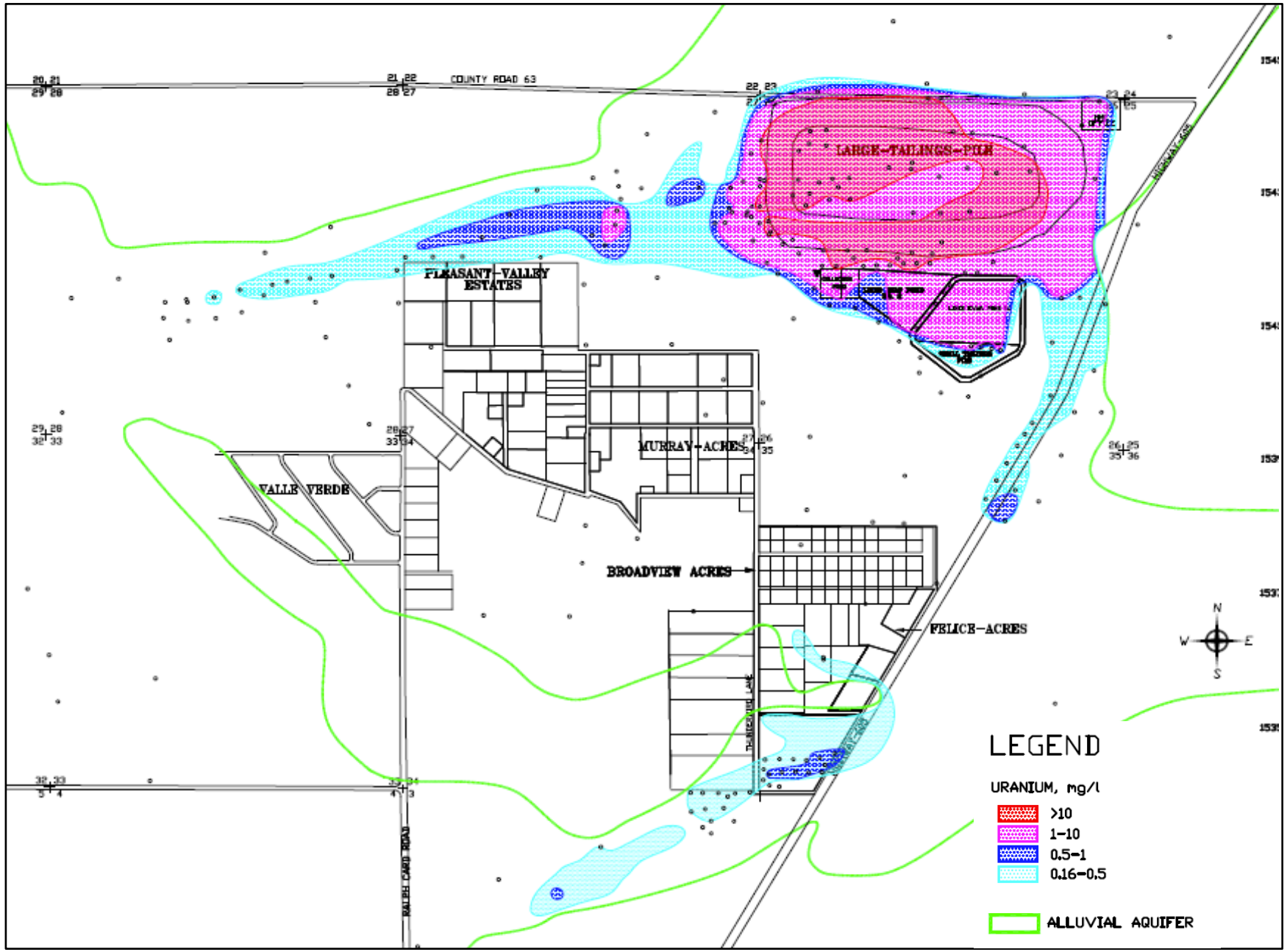


- HMC prediction – didn't work out
- Hydraulic barrier not successful in remediating plumes in preferential flow paths or from land application
- Use of SAG water throwing good water after bad – dilution is not the solution.

Source: Homestake, 2015; Figure 2-20.

Uranium Concentrations, Alluvial Aquifer, 2018

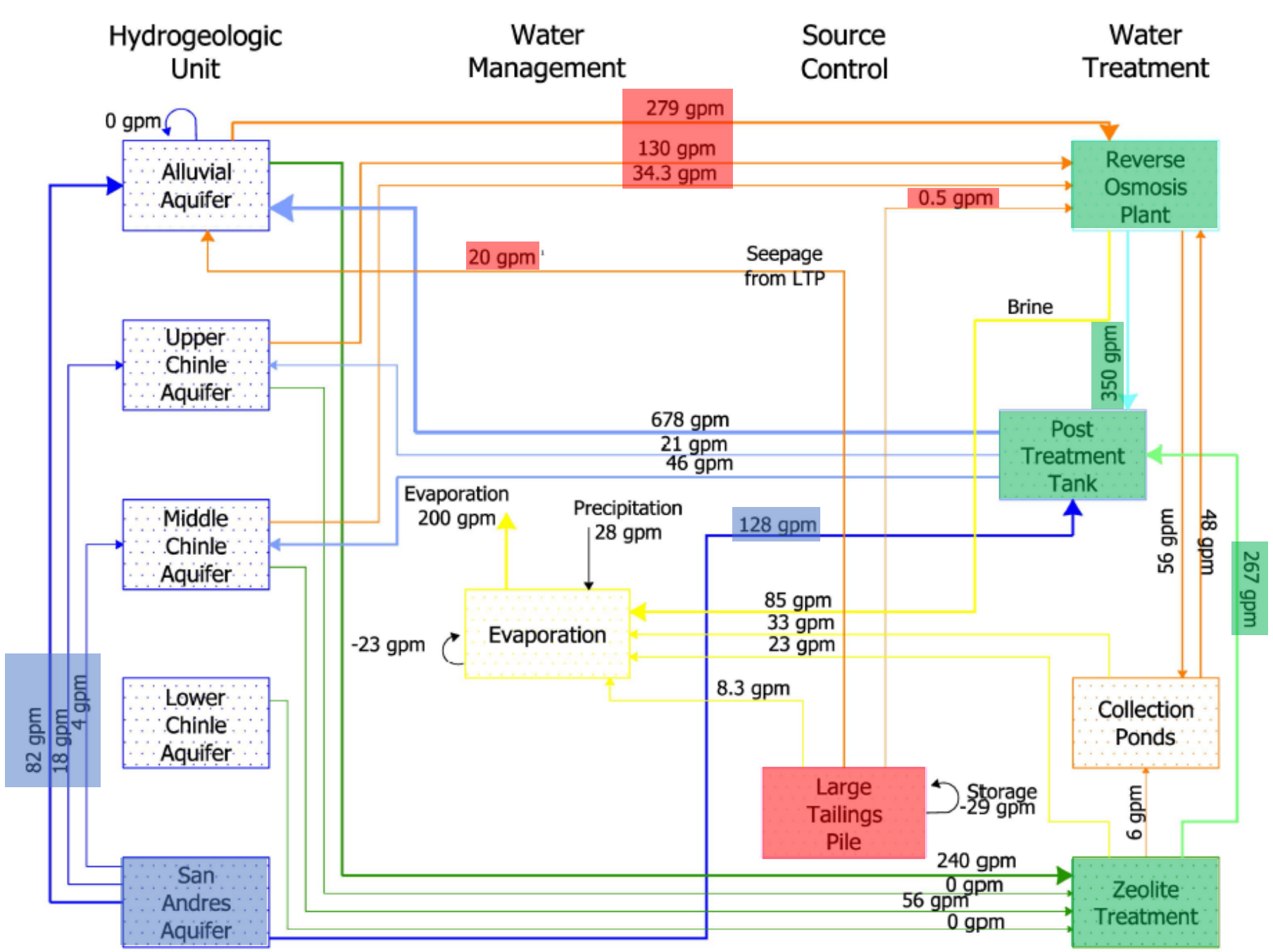
- Preferential pathways for escape of LTP seepage
- U highly mobile; all colored areas exceed site standard



Source: HMC and Hydro-Engineering, 2019. 2018 Annual Monitoring Report, Fig. 1.1-14.

2018 Water Balance: Average Flows

- LTP: 40 times more untreated seepage than treatment

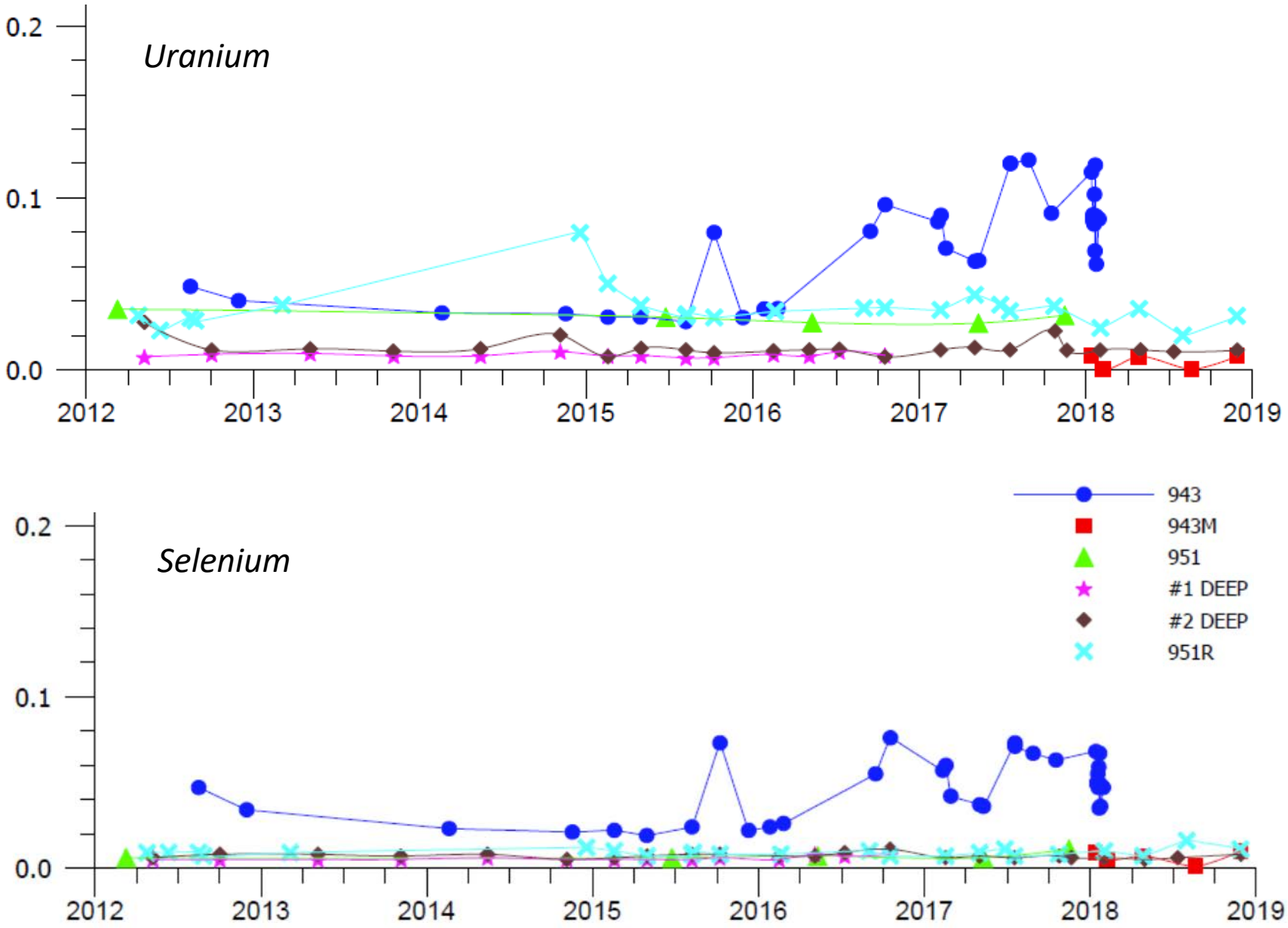


Source: HMC 2020, GCAP, Fig. 6-29.

Failed Remedies: Treatment and Water Balance

- Treatment: reverse osmosis (RO) and, at times, zeolite treatment
  - RO product – 1 exceedance of U site standard, 4 of State/EPA standard.
  - Zeolite product – no exceedances of U site standard, 27 of State/EPA standard.
- Post-treatment tank (PTT): mixed RO + zeolite + SAG water to aquifers
  - PTT – one exceedance of site U standard (0.16 mg/L), 6 exceedances of the State/EPA U drinking water standard
  - Using zeolite-treated water to replace SAG water for reinjection (reduced allowable pumping volumes) will result in more exceedances
- SAG water: only regional water supply aquifer
  - Used SAG water to dilute for quality/quantity reasons
  - Unexplained water quality problems – HMC explanations not accepted by NRC

Concentrations in SAG well 943 increasing

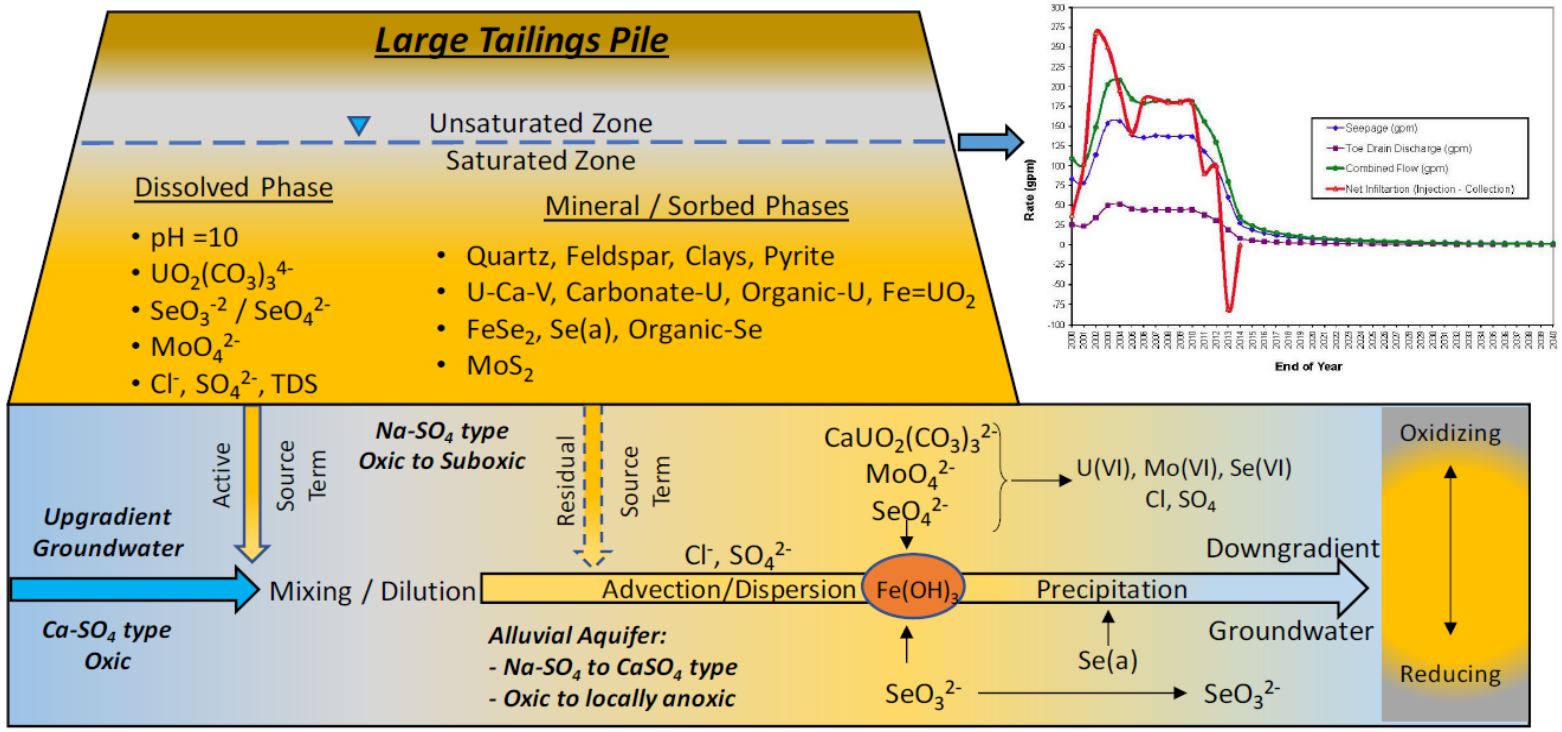


Source: HMC and Hydro-Engineering, 2019. 2018 Annual Monitoring Report, Figs. 8.2-8 & 8.2-10.

Issues with Granting a TI Waiver for the HMC Superfund Site

- Conceptual hydrologic and geochemical models incomplete/incorrect
- “Not achievable” relies on modeling not supported by site-specific characterization or laboratory experiments
- Fate and transport modeling only uses U and Mo
- Site background/GWPS values must be re-evaluated
- Modeling to evaluate effectiveness did not include LTP removal scenario
- More tailings characterization needed.

Flawed LTP and Alluvial Aquifer Conceptual Models



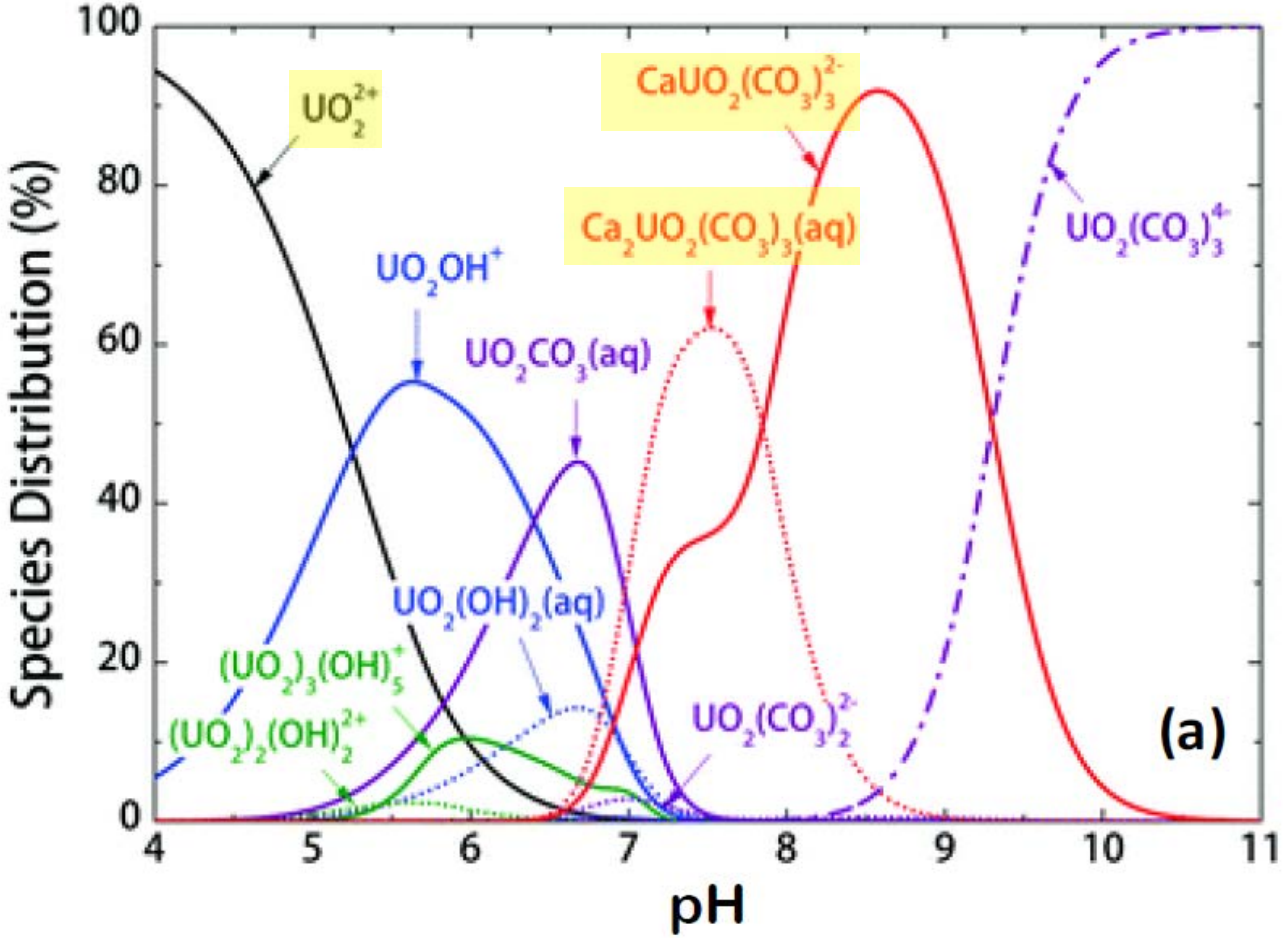
- Conceptual models do not account for
  - Upgradient plumes
  - Contamination of Chinle and SAG aquifers
  - High mobility of U, Se in alluvial aquifer: "natural attenuation" not supported.

HMC's conceptual models do not provide a *"…three-dimensional representation that conveys what is known or suspected about contamination sources, release mechanisms, and the transport and fate of those contaminants"* or an adequate or complete description of the *"site geology, hydrology, ground-water contamination sources, transport, and fate"* required to secure a TI waiver.*

Sources: Diagram: HMC, 2020. GCAP, Figure 4-18;

** EPA, 1993. Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration. Directive 9234.2-25 (p. 10). September. 30pp.*

U Sorption to/from Solids Not Supportable



- HMC invokes adsorption, then desorption from clays/$Fe(OH)_3$ to show futility of cleaning up alluvial aquifer to site standards (GCAP, App. F, Table 5-3)
- U and Se species: little adsorption
- $Ca_2UO_2(CO_3)_3^0$ dominant and highly mobile in alluvial aquifer: low “natural attenuation”

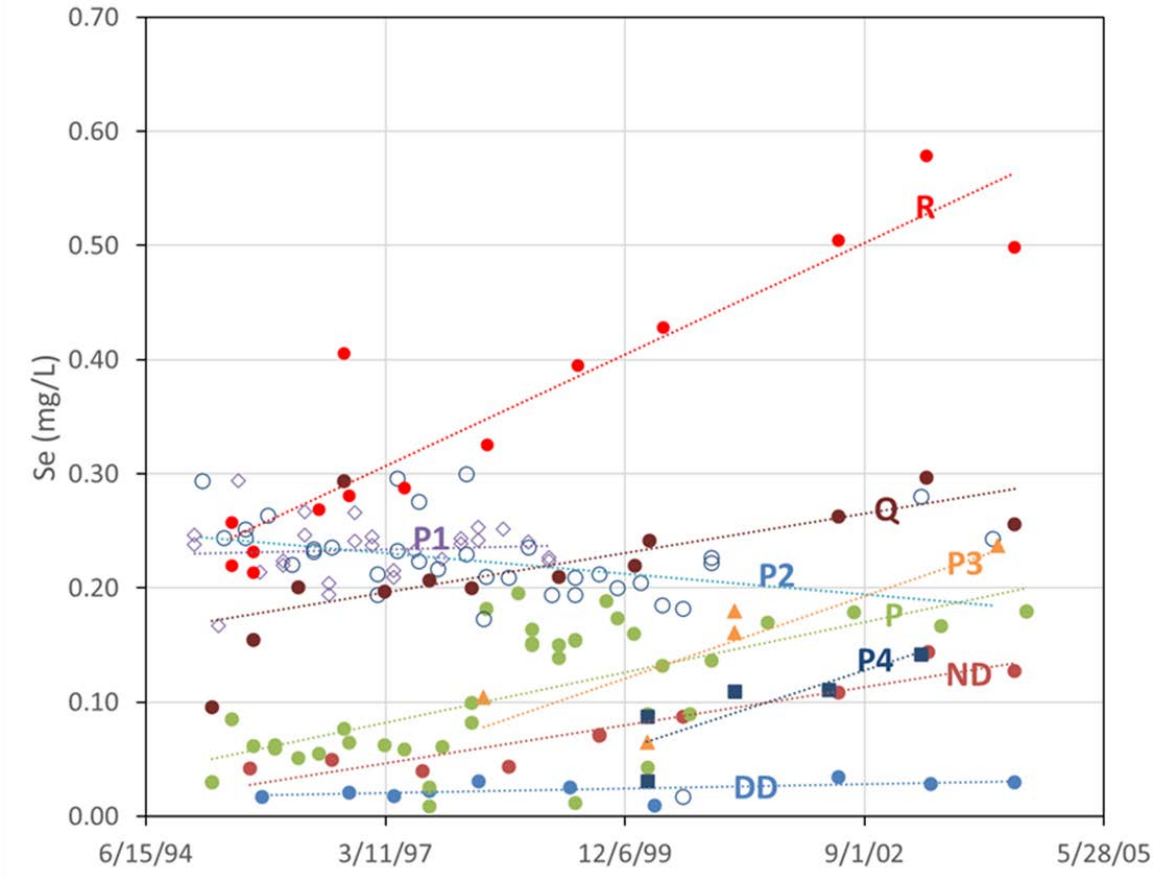
Source: HDR, 2020. RI report, Figure 4-1

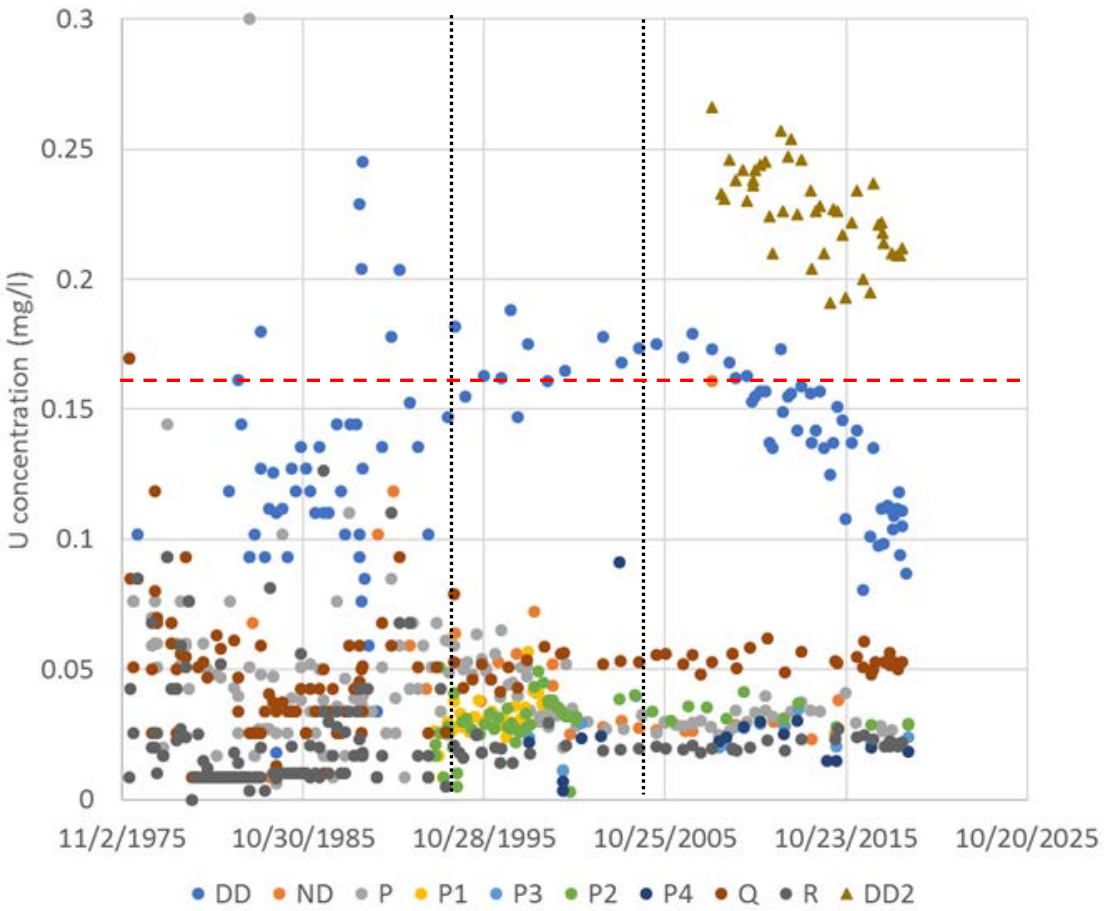
Independent Evaluation of GWPS Values

- BVDA/MASE conducted independent review of current GWPS for selenium and uranium - primary groundwater contaminants
- GWPS should represent non-mining-influenced groundwater quality, but current values include mining-influenced samples
- We excluded values indicating increasing concentrations over time, as they were representative of mining influence; used 95th percentile
- Our studies prompted NMED/EPA to conduct their own re-evaluation of site background groundwater quality

Maest report (Se): https://swuraniumimpacts.org/wp-content/uploads/2021/03/20.03-Maest-Background-Study.pdf;
Myers report (U): https://swuraniumimpacts.org/wp-content/uploads/2021/03/20.03-Myers-Background-Report.pdf

Sample results selected for Current GWPS Show Mining Influence





- Current GWPS used alluvial wells DD, ND, P, P1, P2, P3, P4, Q, and R
- 1995-2004; approx. date range and current GWPS shown
- Well DD should be excluded for U GWPS

Sources: Maest, 2020; Myers, 2020.

Proposed GWPS Values for Se and U (mg/L)

Selenium

Aquifer	Current GWPS	Proposed GWPS
Alluvial	0.32	0.063
Chinle Mixing Zone: Combined	0.14	0.079
Chinle Mixing: Upper	ND	0.011
Chinle Mixing: Middle		0.078
Chinle Mixing: Lower		0.082
Upper Chinle Non-Mixing Zone	0.06	0.024
Middle Chinle Non-Mixing Zone	0.07	0.02
Lower Chinle Non-Mixing Zone	0.32	0.022

Uranium

Aquifer	Current GWPS	Proposed GWPS
Alluvial	0.16	0.04
Chinle Mixing Zone	0.18	0.05
Upper Chinle Non-Mixing Zone	0.09	0.03
Middle Chinle Non-Mixing Zone	0.07	0.04
Lower Chinle Non-Mixing Zone	0.03	0.03

Sources: Maest, 2020; Myers, 2020.

Remedies Preferred, Considered and Rejected

- Alternative 2 preferred (Draft FS, 2021) – institutional controls and long-term monitoring
- Source removal (tailings) not retained, yet "high" effectiveness
  - "Increase in truck and heavy equipment traffic could adversely affect community." "…increase in human health risks from transporting waste…"
    - Community slowly destroyed over time so not valid
  - Costs - TI waivers based on "...engineering feasibility and reliability, with cost generally not a major factor unless compliance would be inordinately costly."
- Impermeable cap rejected, so tailings will continue to leak in perpetuity
- Potential for recovery of valuable metals from tailings not considered at all; more characterization needed
  - Rare earths found in feldspars[1]
  - Inclusions of gold found in calcite[1]
- Source removal only reasonable remedy for long-term protection - placement nearby on liners with a leachate-collection system and monitoring; vadose zone remediation under LTP also likely needed.

1 Worthington Miller Environmental, LLC, 2020. Geochemical Characterization of Tailings, Alluvial Solids and Groundwater Grants Reclamation Project, p. 8-9.

Disparity in Cleanup Priority

- Uranium life cycle starts with mining and ends with nuclear power or nuclear weapons waste disposal
- Much less cleanup effort and funding on “upstream” end; more source removals on “downstream” end
- U mining often in less populated areas with undervalued communities of color – goes against Biden administration’s emphasis on environmental justice and communities
- Nuclear facility “success” stories
  - Rocky Flats, Colorado. Pu triggers. DOE removal actions to Savannah River Site, WIPP, NV Test Site, Hanford. **~$7 billion**. Although not a perfect remediation and concerns still exist, the site today is a wildlife refuge.
  - Oak Ridge, Tennessee. Manhattan Project, WWII weapons. ~10% of waste removed off-site, 90% disposed in safe onsite facilities. At least **$2.9 billion**, completion in 2046.
  - Hanford, Washington State. Manhattan Project, 1943. Groundwater pump-and-treat system will be expanded, “significant reduction of areas of groundwater contamination.” At least **$323.2 billion**.

Disparity in Regional Mill Tailings Site Cleanup Efforts

	Durango Mill, Colorado	Atlas Mill, Moab, Utah	United Nuclear Corp. Mill, Church Rock, NM	Homestake Mill, Milan, NM
Tailings volume (yd^3)	2.5 million	9.1 million tailings	2.0 million + 1.0 million mine waste	12.6 million
Contaminated area (acres)	127	130	125	274
Distance from nearest community (miles)	0.25	3	0.5	<0.25
Offsite disposal/Source removal?	Yes	Yes	No[1]	No
Cost	$120 million (1995)	$844 million to $1.1 billion (2008)	$40-45 million (2012 mine wastes to mill)[1]	$34.9 million NPV (2021 Draft FS, preferred alternative)
Demographics	80.9% White non-Hispanic	90.3% White non-Hispanic	95.0% Native American	65.3% Hispanic Close to Acoma/Laguna Pueblos

Sources: (using 1.76 tons/yd3 for conversions)
Durango: DOE, 2020. Durango Fact Sheet; GAO, 1995. Uranium Mill Tailings Cleanup Continues, but Future Costs Are Uncertain. https://www.gao.gov/assets/rced-96-37.pdf.
Moab: DOE, 2020 https://www.energy.gov/sites/prod/files/2020/06/f75/EM-By-the-Numbers-MOAB-5.19.20-v4-FINAL.pdf; Costs https://www.wise-uranium.org/udmoa.html.
Church Rock: UNC-Church Rock Mill U Recovery Facility, NRC 2020 https://www.nrc.gov/info-finder/decommissioning/uranium/united-nuclear-corporation-unc.html; 1 Wastes from mine to be moved to tailings impoundment. NRC, 2020. Draft EIS Disposal Mine Wastes UNC Mill Site. https://www.nrc.gov/docs/ML2028/ML20289A621.pdf
Homestake Mill: HMC, 2020 GCAP, p. 2-2, HMC, 2021 Draft Feasibility Study presentation.
Demographics: https://datausa.io/profile/geo/durango-co/; https://datausa.io/profile/geo/moab-ut/; https://datausa.io/profile/geo/church-rock-nm#demographics; https://datausa.io/profile/geo/milan-nm.

Summary and Conclusions

- Granting HMC a TI Waiver and ACLs for groundwater is premature and not based on the best available science
- Major uncertainties and errors exist in conceptual site model, background groundwater quality
- Modeling used to conclude that a TI waiver and ACLs are needed based on faulty modeling assumptions not representative of site conditions and does not consider source removal option
- Source removal is most effective solution for long-term groundwater protection.
  - Community impact and cost arguments not supportable; source removals elsewhere
- Long-term protection of regional water supply SAG aquifer is essential.