



Atlantic Richfield Company



Overview – Remedial Investigation / Feasibility Study, First Final Remedial Action & Potential Site-wide Remedy Elements

Leviathan Mine Site
Alpine County, California

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WSP USA Environment & Infrastructure Inc.

September 19, 2023

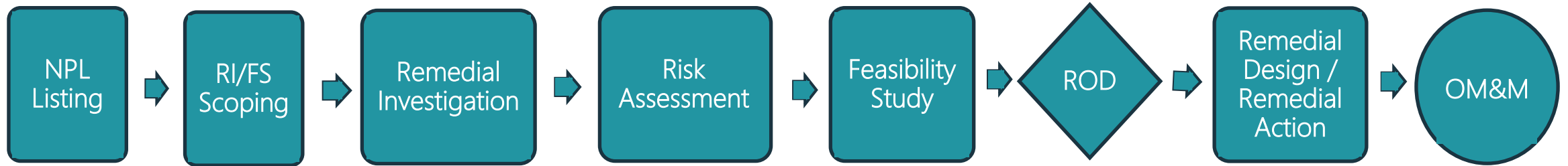
Discussion Topics

- Remedial Investigation / Feasibility Study (RI/FS) Overview
- First Final Remedial Action (FFRA) (formerly EFRA)
 - Focused Feasibility Study (FFS) for Mine Influenced Groundwater and Metals in Surface Water
- Potential Site-wide Remedy Elements



Remedial Investigation Overview

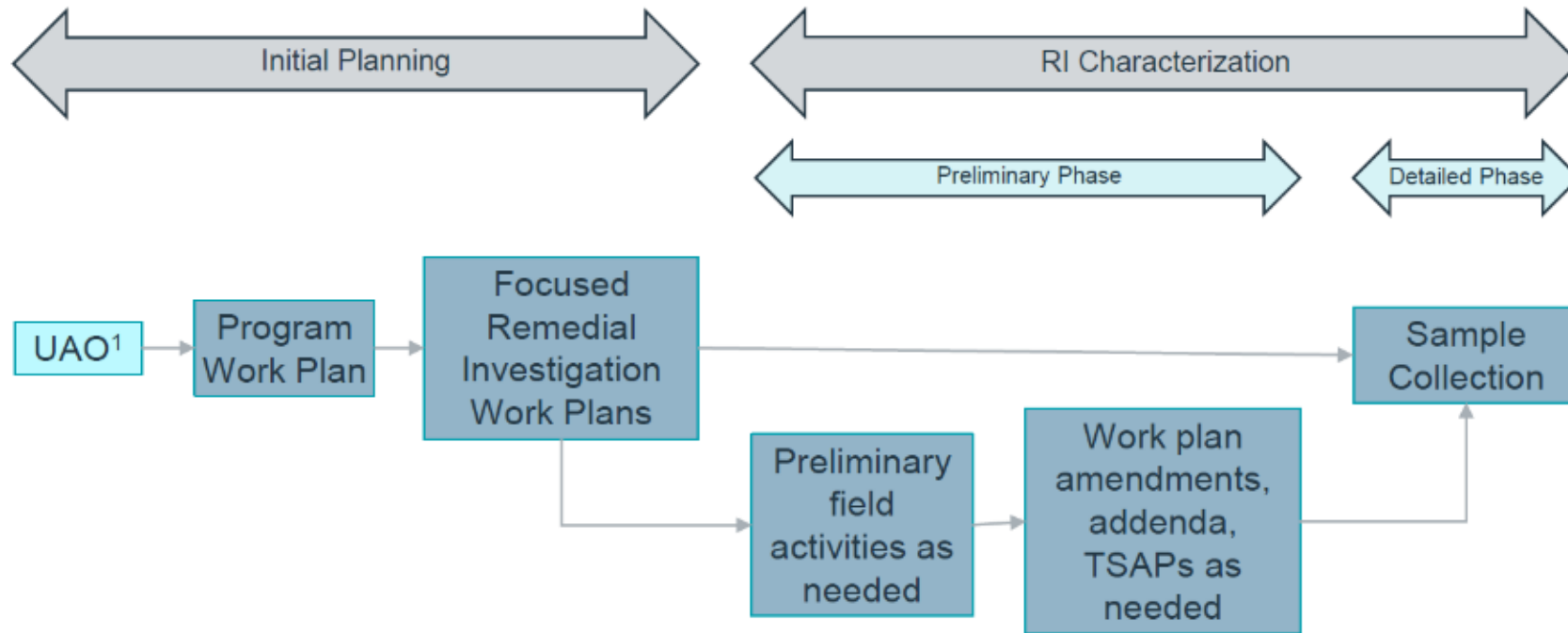
CERCLA Process



- Leviathan Mine Site added to NPL – 2000
- Administrative Order for RI/FS with Statement of Work – 2008
- Scoping and work plans – 2009
- Remedial Investigation - 2010
- Purpose
 - Characterize nature and extent of mining related impacts
 - Use information to assess human health and ecological risk in baseline risk assessments
 - Support evaluation of remedial alternative in FS
- Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA

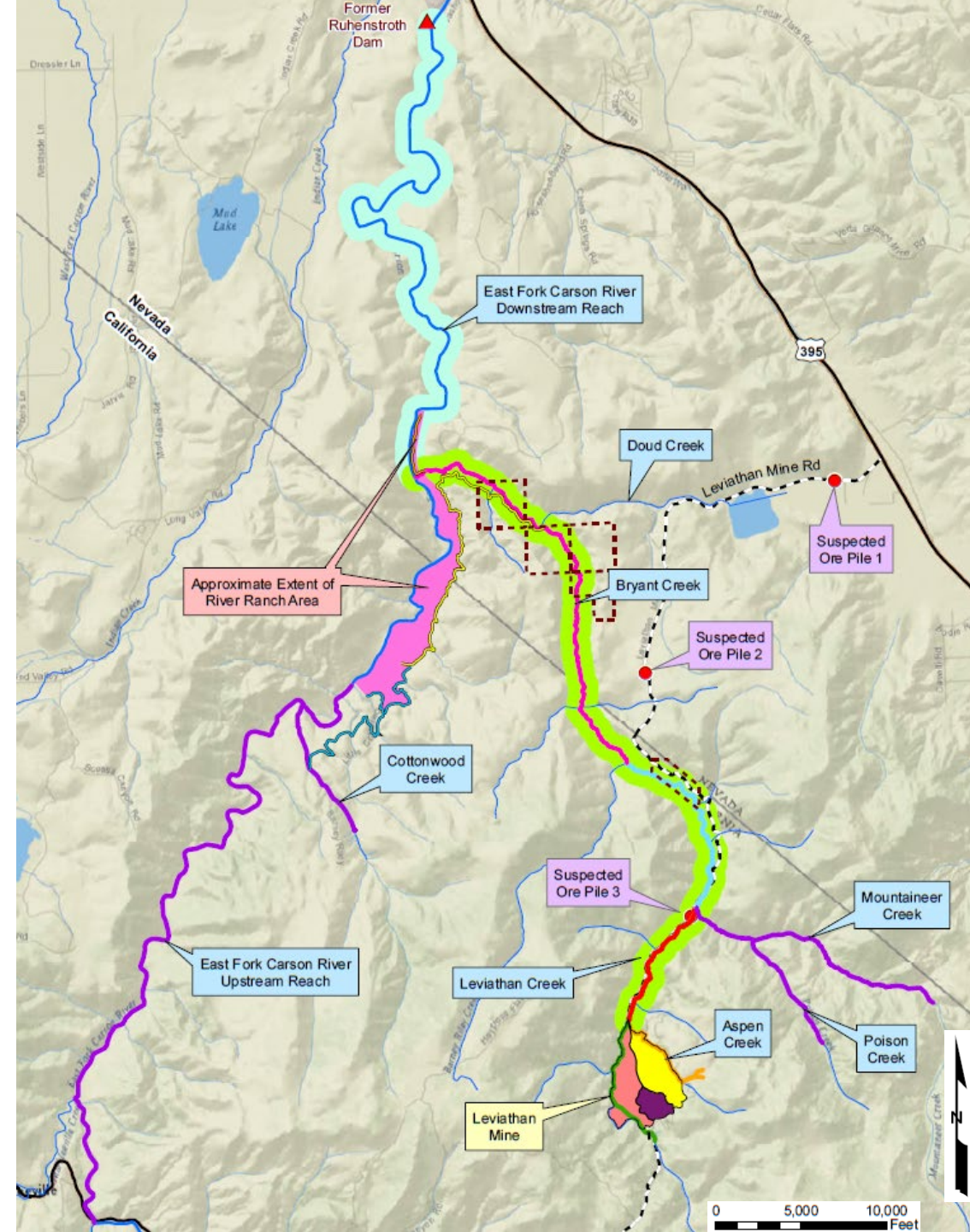
Remedial Investigation Approach and Implementation

- Followed a phased and iterative approach



Remedial Investigation Overview

- RI field data collection began in 2010 and was largely complete in 2018
- Large investigation area
 - ~1,200 acres
 - ~12 miles of creeks
 - ~11 miles of the EFCR
 - ~13 miles of unimproved road



Explanation:

- | | | |
|-------------------------------|----------------------------|------------------------------|
| ▲ Former Ruhenstroth Dam | — East Fork Carson River | — Leviathan Mine Road SSA |
| — On-Property Aspen Creek | — Other Streams | — EFCR SSA |
| — On-Property Leviathan Creek | — Irrigation Canals | — River Ranch SSA |
| — DSA Reach #1 | — Bryant Creek Canal | — Downstream Study Area |
| — DSA Reach #2 | — Bryant Creek North Canal | — On-Property Study Areas |
| — DSA Reach #3 | — Cottonwood Creek Canal | — Aspen Creek Study Area |
| — Reference Stream | ● Ore Pile SSA | — Leviathan Creek Study Area |
| — Pine Nut Allotment | — Leviathan Mine | — Pit Study Area |

Remedial Investigation Overview

Nature and extent of mine-related impacts:

- Mine waste
- Floodplain and terrestrial soil
- Stream sediment
- Fluvial deposits
- Surface Water
- Groundwater
- Biota (benthic invertebrates, fish, terrestrial plants)



Remedial Investigation Overview

- **Remedial Investigation Report**

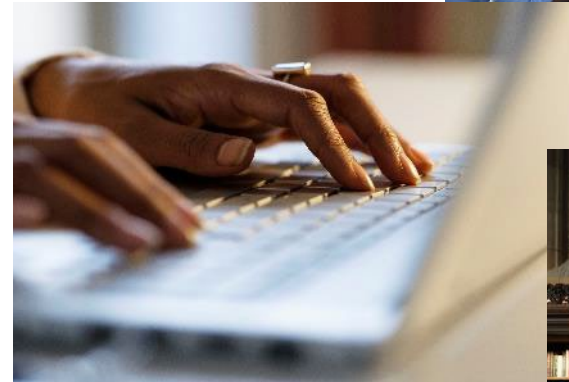
- Submitted to US EPA and stakeholders:
April 28, 2023

- **Baseline Human Health Risk Assessment Report**

- Submitted to US EPA and stakeholders:
September 8, 2023

- **Baseline Ecological Risk Assessment**

- Submitted to US EPA and stakeholders:
September 13, 2023



Feasibility Study Overview

- Remedy Evaluation Step in CERCLA Process
 - Provides a well-reasoned basis for selecting a remedial action alternative for implementation
 - Evaluation of remedial alternatives
 - Site-specific feasibility assessments and treatability studies:
 - Geotechnical Characterization of Site Stability
 - Revegetation Study
 - Interim Combined Treatment Evaluation
 - Beaver Dam/Pond Complex Focused Feasibility Study
 - High Density Sludge (HDS) Treatability Study
 - Informed by past/present removal actions



Removal Actions

- Removal actions conducted over the past 20 years provide extensive site-specific water treatment experience and data
 - Lime precipitation (Pond Water Treatment Systems)
 - Biological treatment (Aspen Seep Bioreactor)
 - Rotating Cylinder Treatment System (RCTS)
 - High Density Sludge Treatment (HDS Plant)

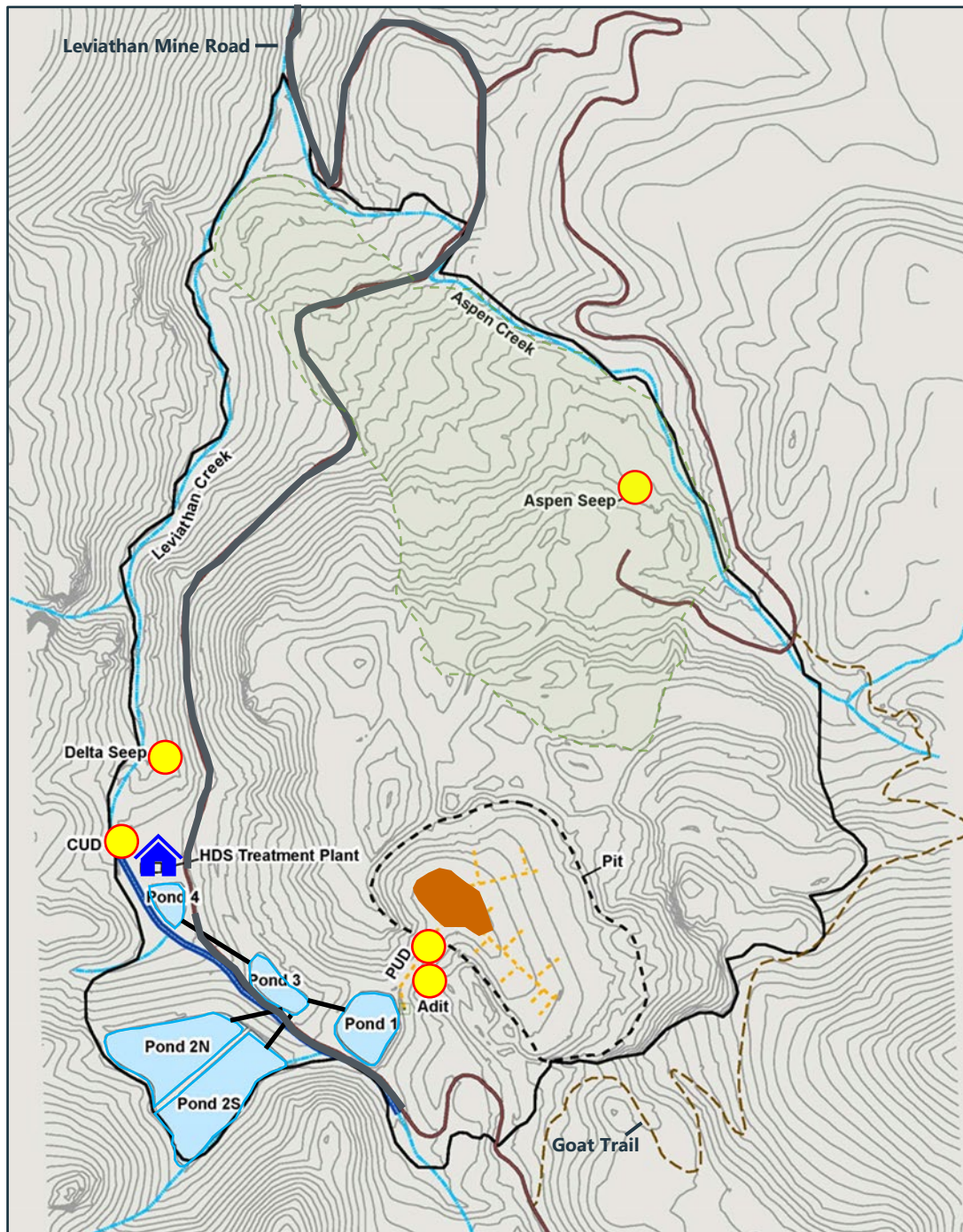


Removal Action Overview

Acid Drainage Sources

Five Primary Acid Drainage (AD) Sources

- Adit
- Pit Under Drain (PUD)
- Channel Underdrain (CUD)
- Delta Seep (DS)
- Aspen Seep



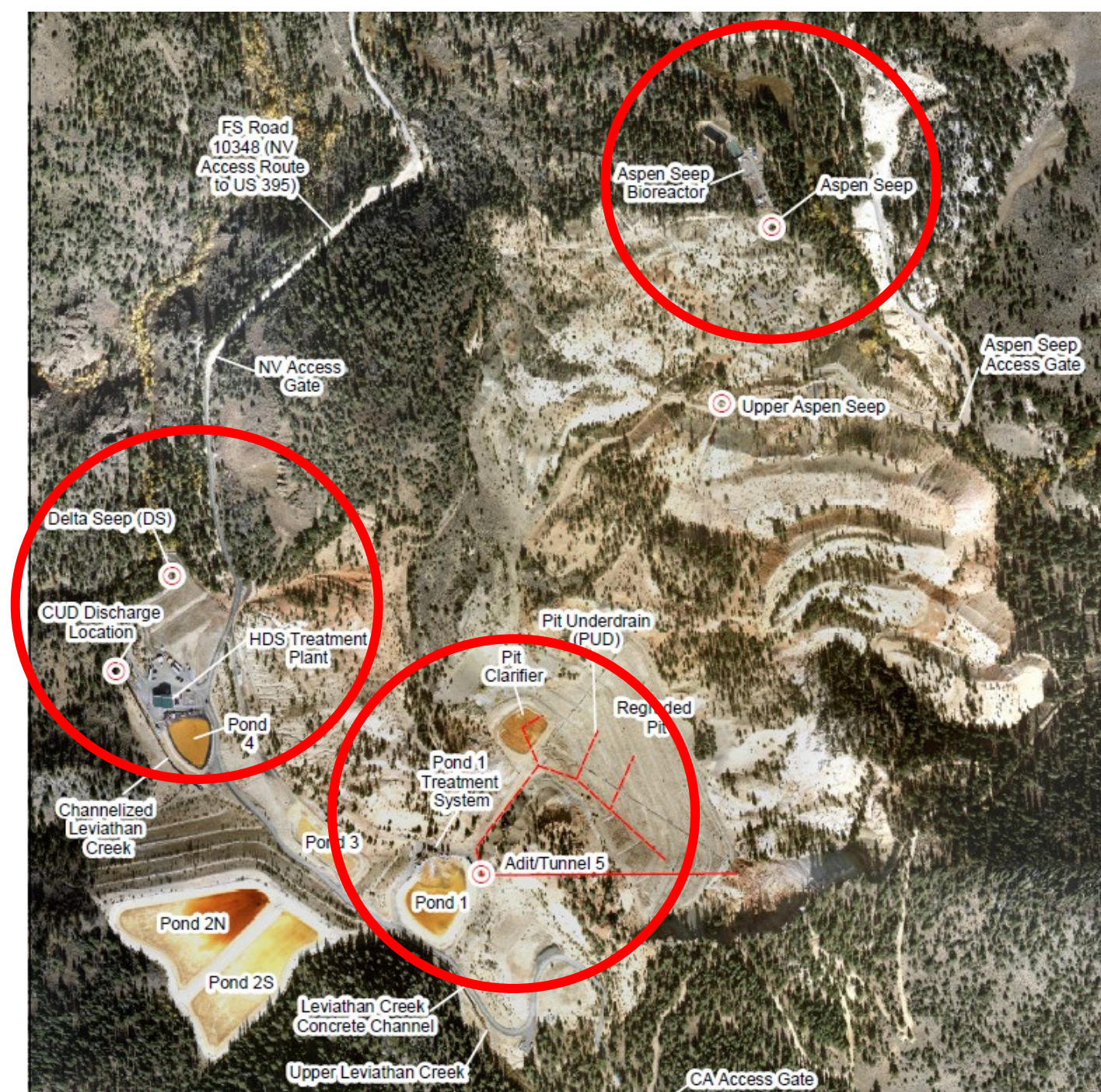
Legend:

- Creeks
- On-Property Boundary
- Roads
- Goat Trail
- Leviathan Creek Basin Landslide



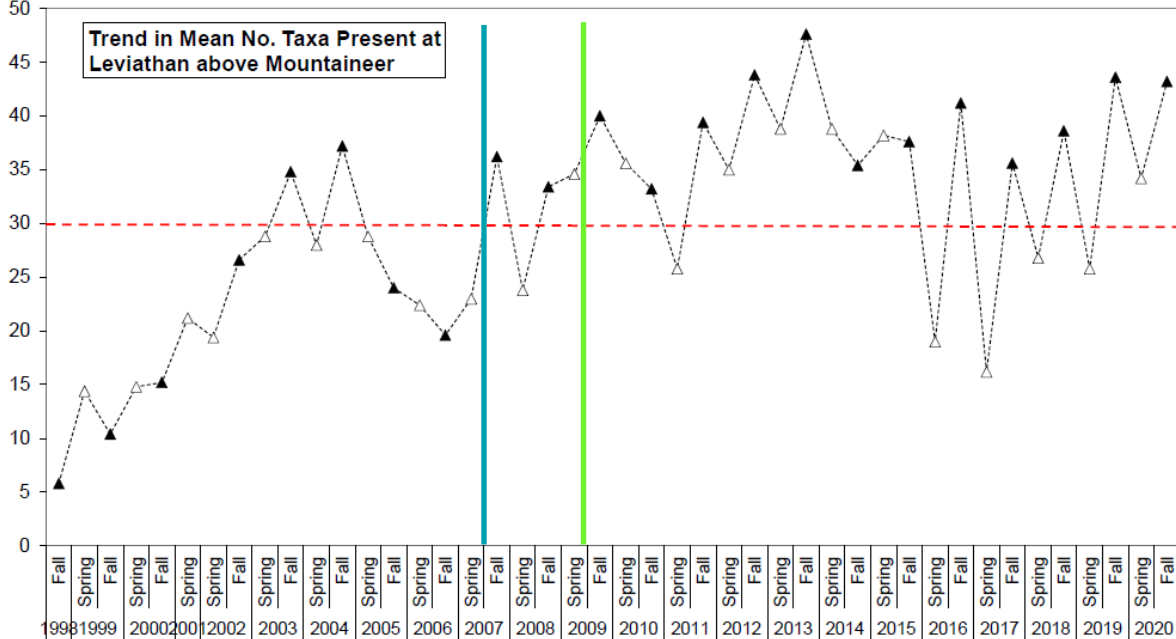
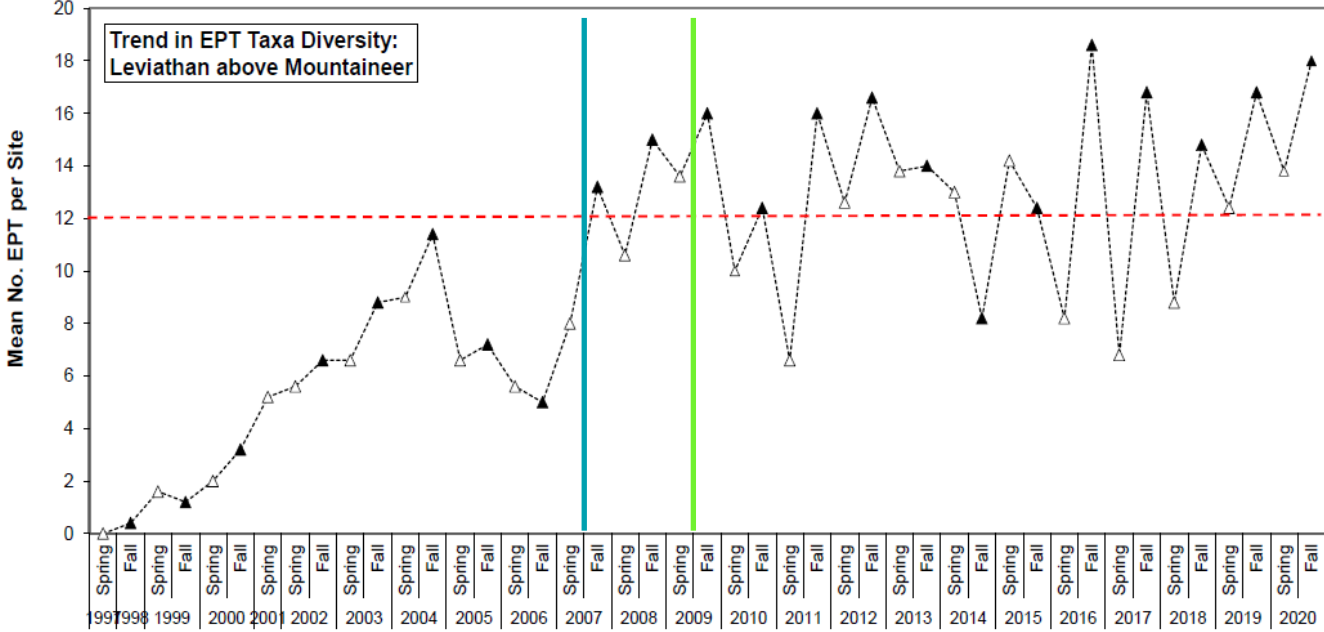
Early Response and Removal Actions

- Three Water Treatment Systems
 - **Pond 1 Treatment System**
 - Year-round capture and campaign treatment of Adit and PUD
 - **Aspen Seep Bioreactor (ASB)**
 - Year-round capture and treatment of AS
 - **High Density Sludge (HDS) Treatment**
 - Seasonal capture and treatment of CUD and DS



Stream Recovery Downstream of the Mine

- Dr. Herbst (UC Santa Barbara) conducting research in the Leviathan-Bryant creeks watershed for past 20+ years to evaluate the effects of AD on aquatic life and the progress of remediation



- Improved capture of CUD and DS, extended treatment season
- HDS Treatment Plant operations began

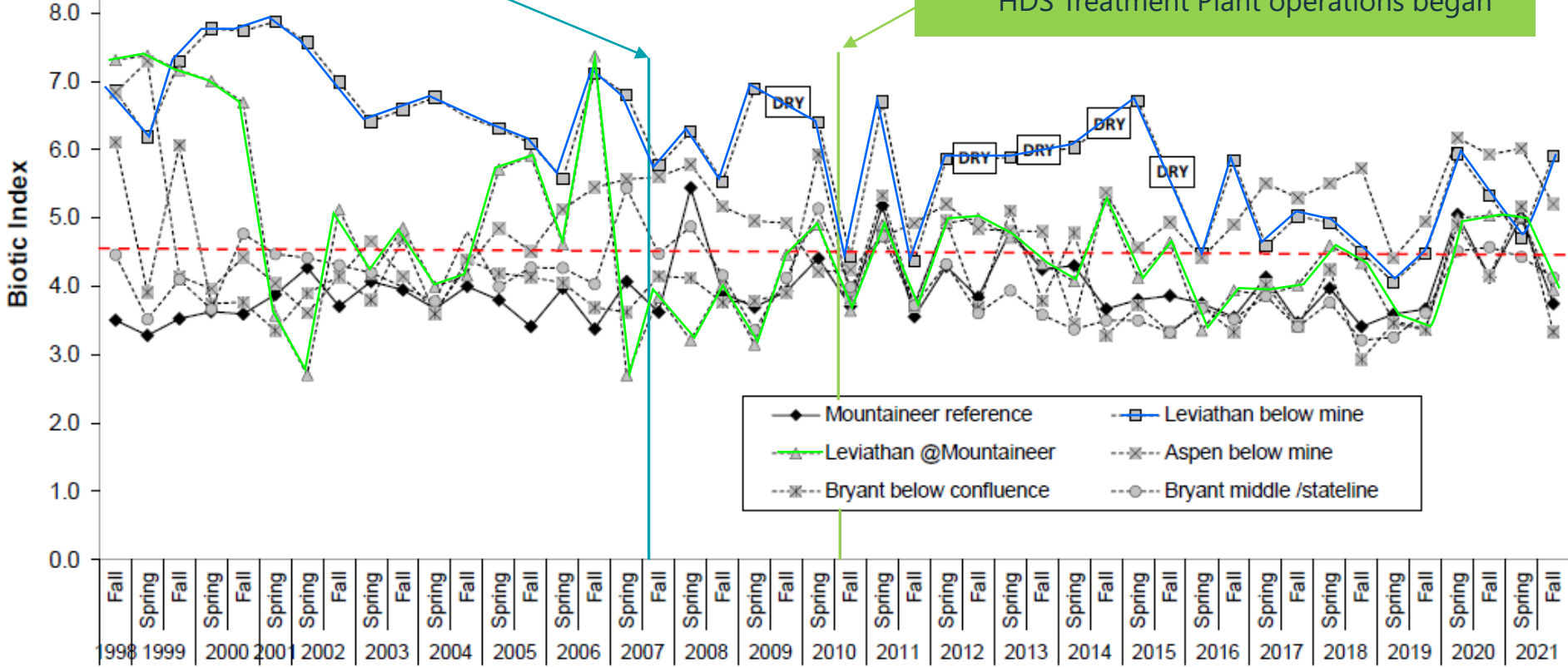
- Overall trend of recover in Leviathan Creek above Mountaineer Creek
- Seasonal patterns coincide with end of seasonal treatment of CUD and DS

Stream Recovery Downstream of the Mine

Improved capture of CUD and DS, extended treatment season

Biotic Index (composite community tolerance) at selected sites in Leviathan Mine drainage

HDS Treatment Plant operations began



----- 95% Confidence for reference, above line fails to meet reference

Confluence of Mountaineer & Leviathan Creeks

Prior to seasonal collection & treatment

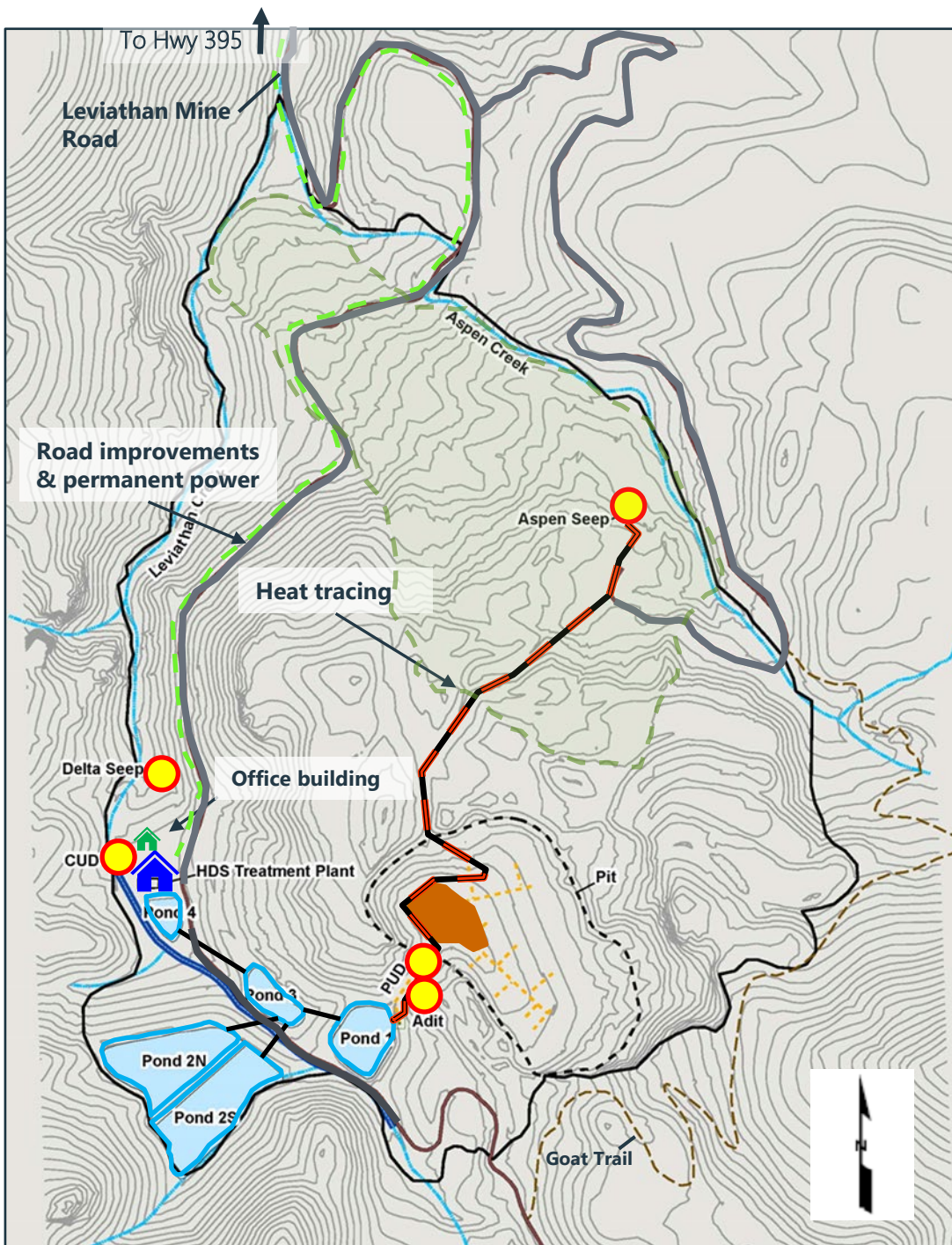
During seasonal collection & treatment



First Final Remedial Action & Potential Site-wide Remedy Elements

Major Elements of Recommended First Final Remedial Action

- Year-round acid drainage (AD) collection at five primary groundwater discharges
- AD conveyance pipeline from Aspen Seep
- Centralized HDS Plant for AD treatment with year-round capability as needed
- AD storage
 - Deepen Pond 2S to increase volume
 - Retain Storage Ponds to enhance storage as needed
- Sludge repository
- Infrastructure improvements
 - Road improvements & permanent power
- Institutional controls for mine influenced groundwater and surface water

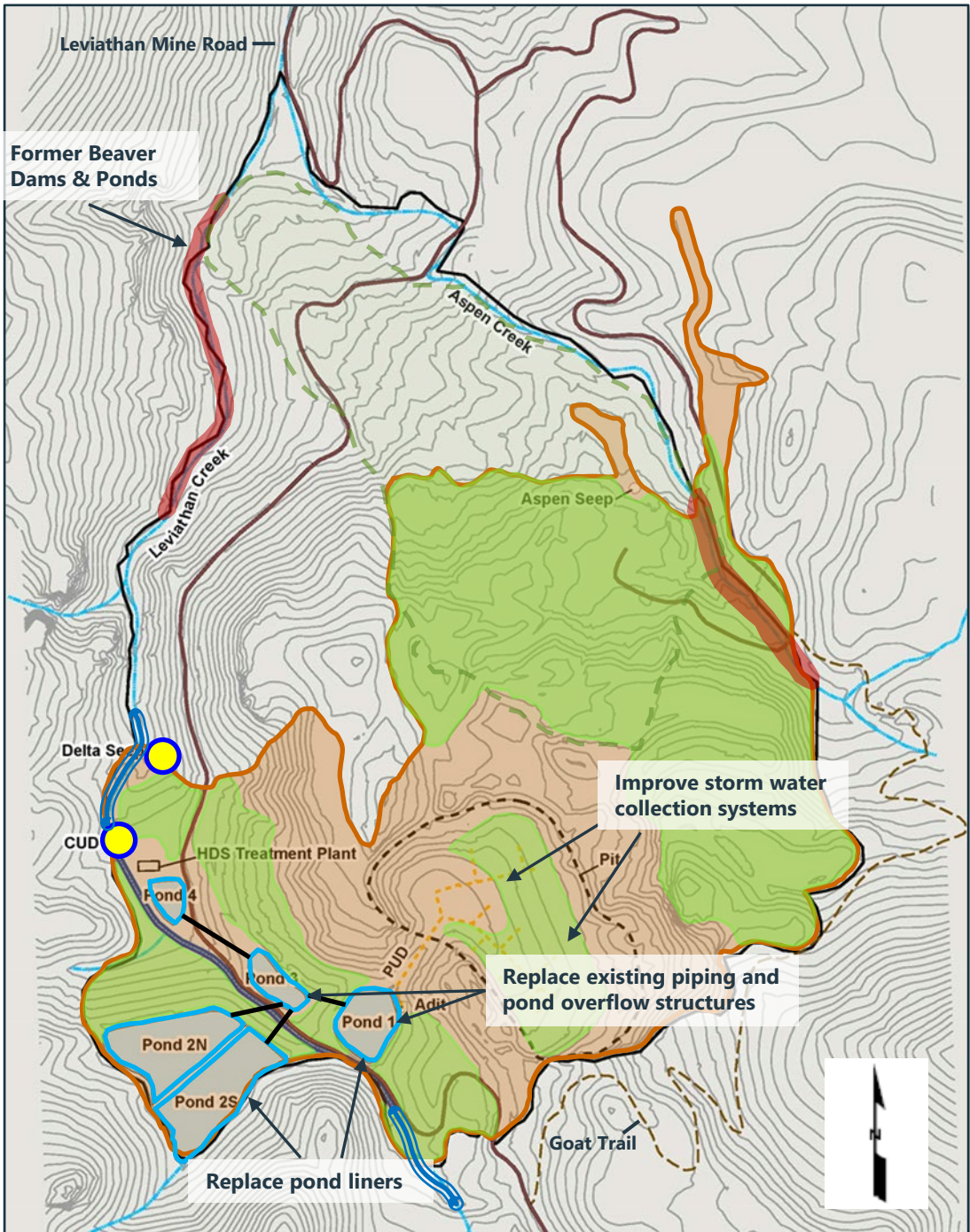


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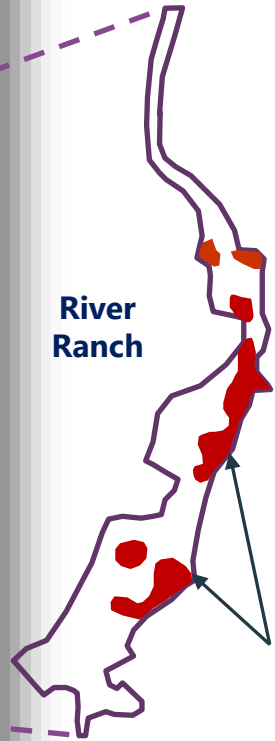
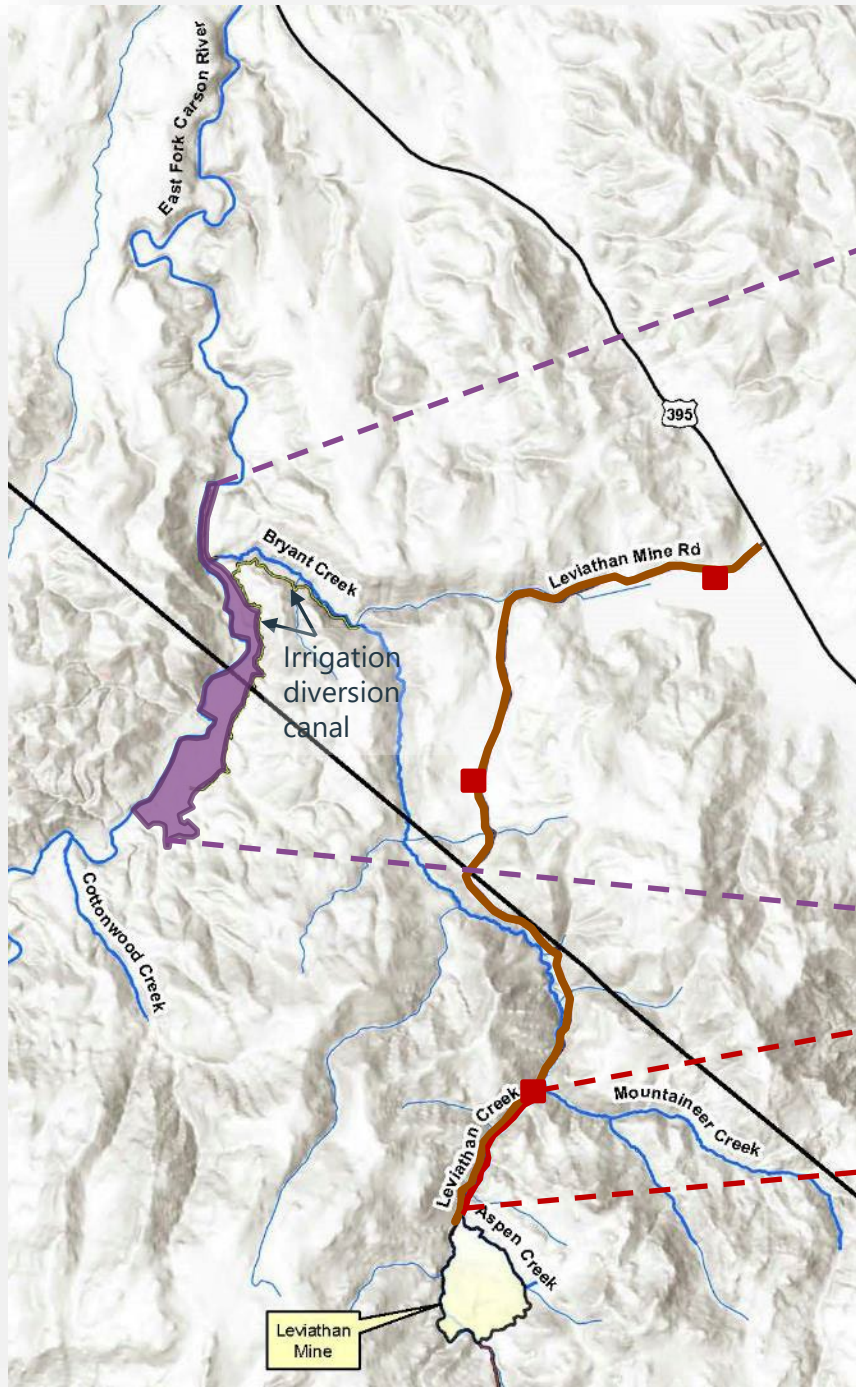
- Creeks
- On-Property Boundary
- Roads (improved)
- Roads (unimproved)
- Leviathan Creek Basin Landslide
- Power Line

Potential Site-wide Remedy Elements – On Site

- Improved AD capture and treatment
- Extension of lined creek channel
- Capping/regrading, storm water controls, and revegetation of ~125 acres of mine-disturbed areas
- Removal / stabilization / separation of mine-derived materials in Aspen and Leviathan Creek channels
- Maintenance/replacement of existing infrastructure
 - Non-FFRA piping, pond liners, and pond overflow structures



Potential Site-wide Remedy Elements – Off-Site



Approximate extent of irrigated soil exceeding RTVs (~85 acres)



- Potential action(s) or controls relating to sediment and floodplain soil downstream in Reach 1 of Leviathan Creek
- Removal of ore piles along Leviathan Mine Road
- Possible deep tilling and/or capping of irrigated soils on River Ranch property

Questions/Discussion