



Completion of Cleanup Action for Residential Soils

February 20, 2018



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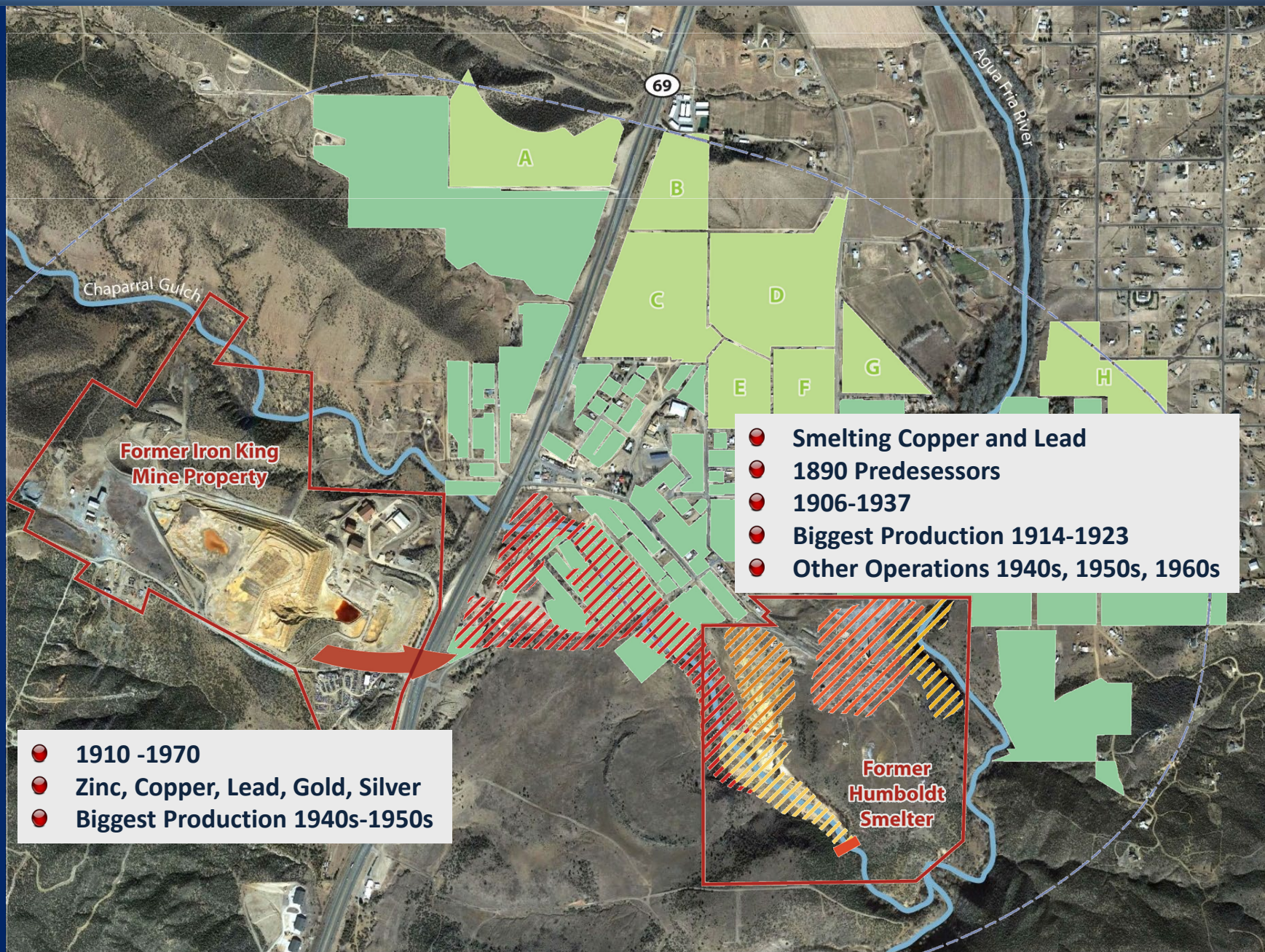


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Community Involvement Coordinator

Iron King / Humboldt Smelter and Vicinity



The Superfund Process at the Simplest Level

Understand It

Investigate it

What Risk
Does It
Pose?

What are the Options for it?

How do they
Compare?

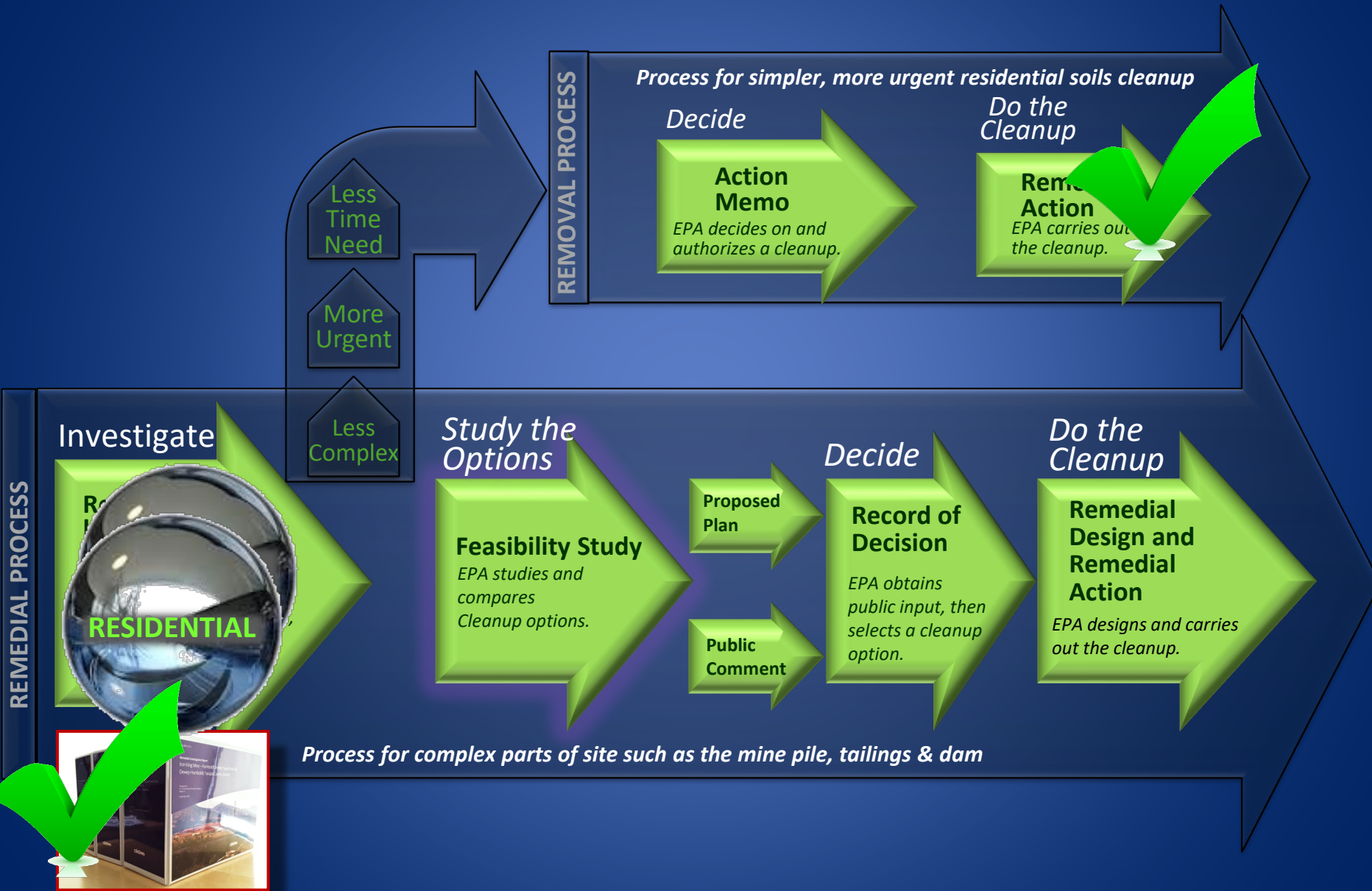
Selection: Make an Informed Decision

Consider
Input

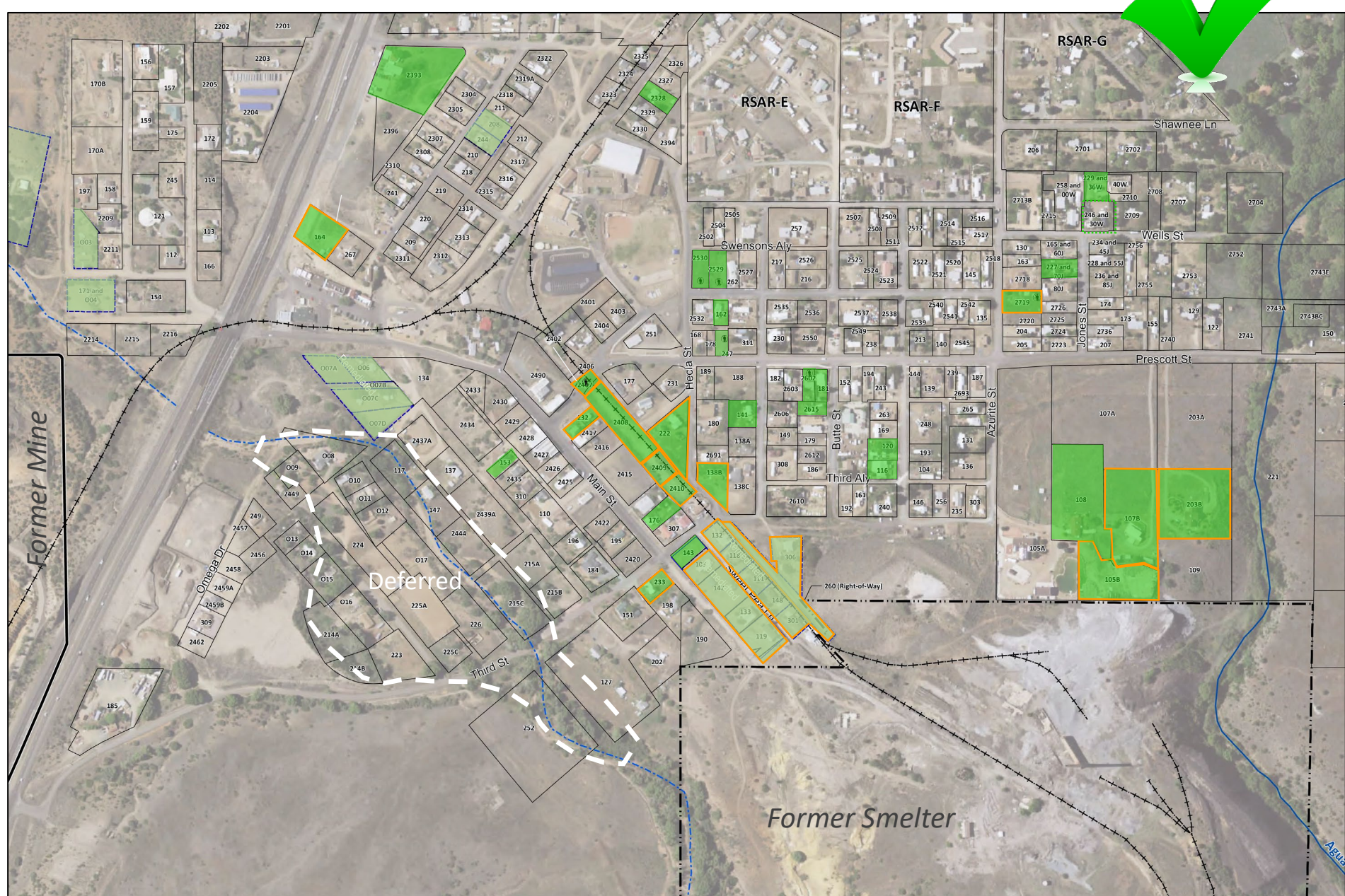
Design the Cleanup Action and Carry it Out

Public Involvement

Superfund Process... and How We Broke It Into Two Parts



Iron King Mine / Humboldt Smelter Superfund Site Completed Residential Yard Removal Actions



Former Mine

Deferred

RSAR-E

RSAR-F

RSAR-G

Former Smelter

Shawnee Ln

Swensons Aly

Wells St

Prescott St

Omega Dr

Main St

Third St

Butte St

Azurite St

Agua

The focus is now turning to



LOTS of

Former Iron King Mine Property



WHAT WAS LEFT BEHIND?

- Mine Tailings
- Waste Rock
- Dross
- Slag
- Mixed up Tailings, Sediments & Soils

Water

Soil

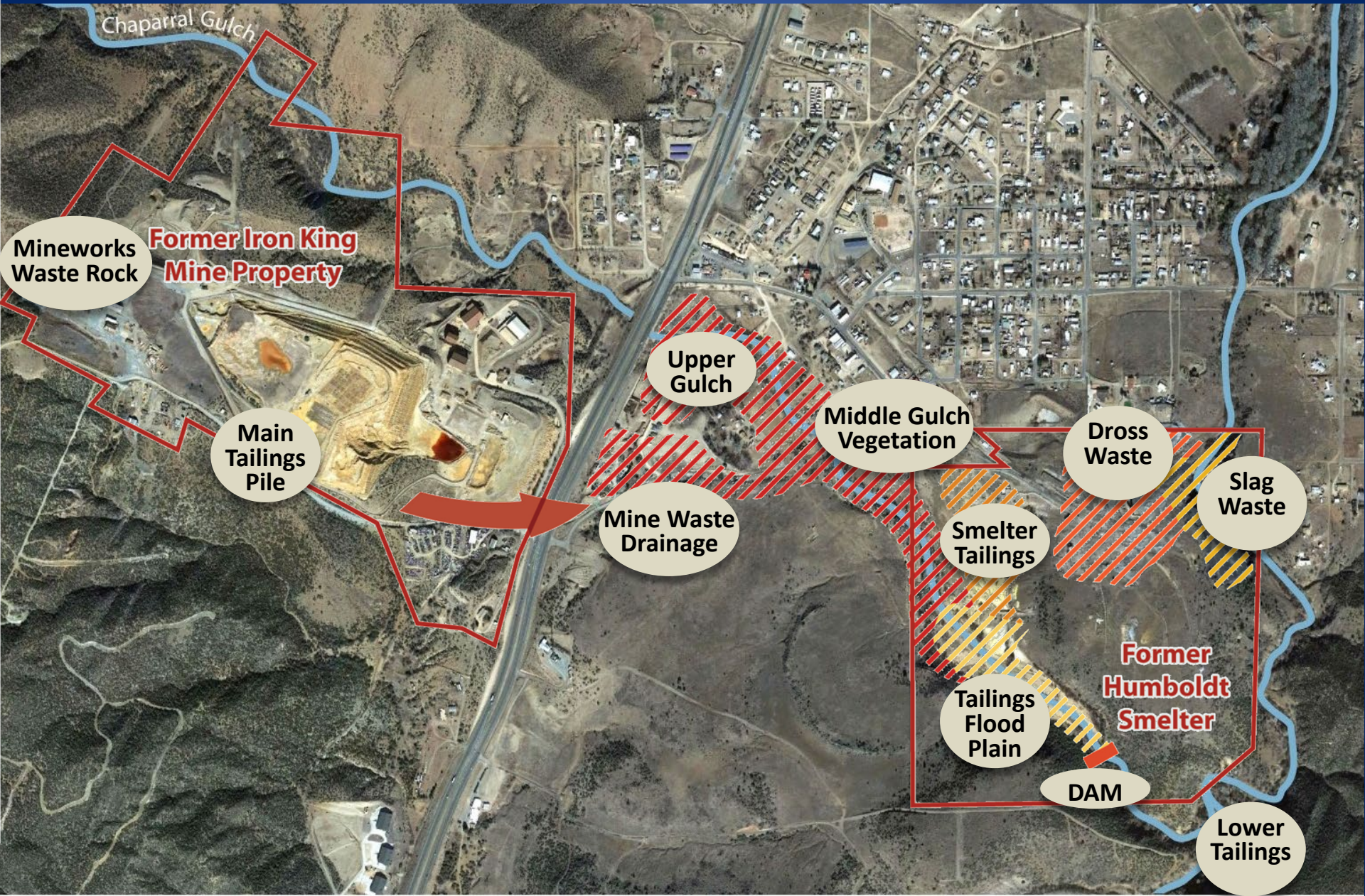


Acid Mine Drainage

WHY ARE TAILINGS A PROBLEM?

- They are **TOXIC** : High levels of arsenic and lead
- They can **MOVE**: Easily in Air, Water, Soil
- They can **REACT** Once in the Environment

The Various Pieces That We Need Solutions For



...From the Operating Days - 45 to as much as 120 years ago

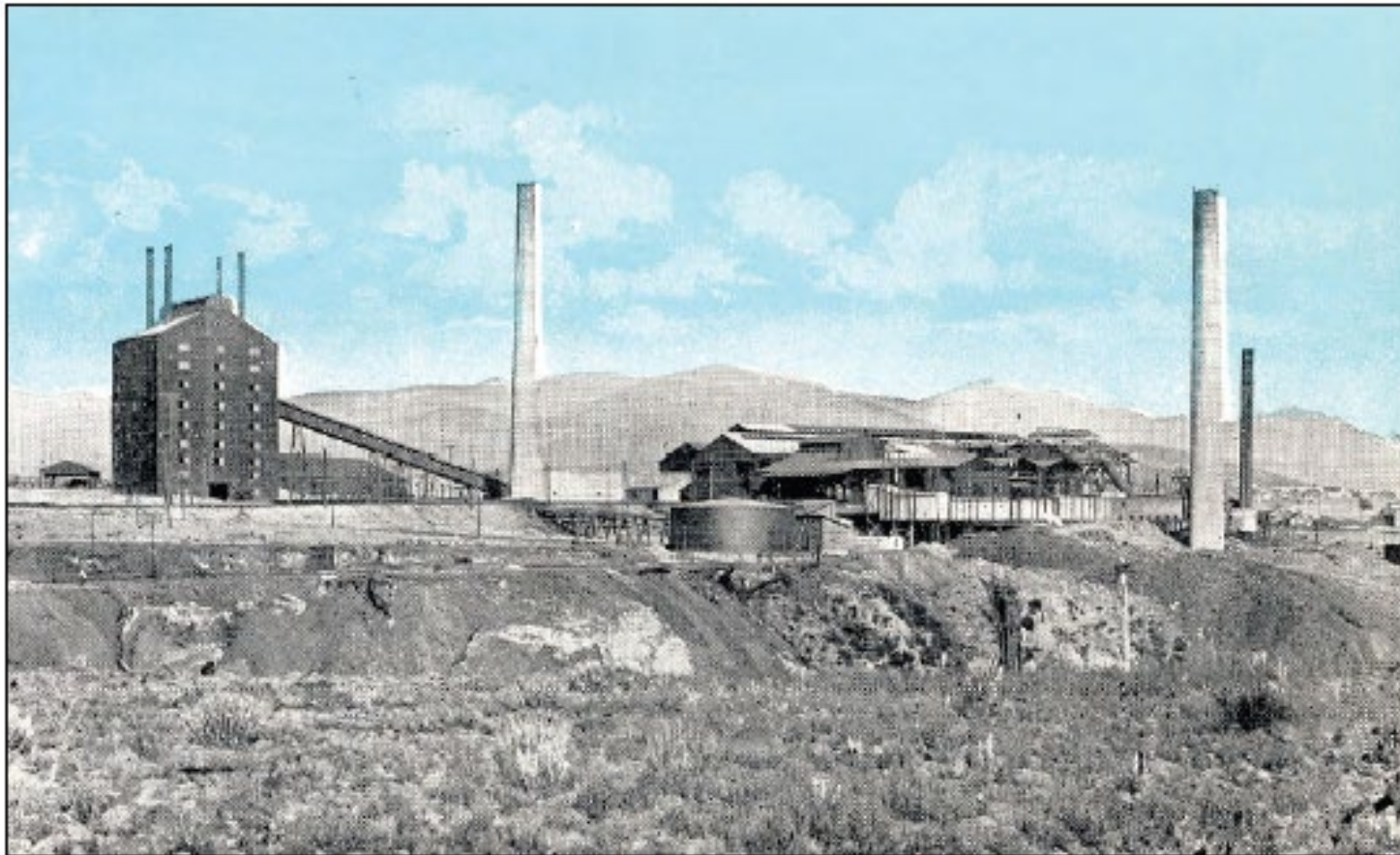


Figure 21. Ca. 1918 Tinted Postcard of Smelter and Sample Mill, Humboldt (image courtesy of Sharlot Hall Museum).

Figure 17. Ca. 1909-1907 Image of Arizona Smelting Company Smelter at Humboldt.

Figure 7. Ca. 1926 Interior View of Headframe and Hoisthouse at Iron King Mine (photograph by ...)

The Iron King Mine 1940 - 2018

2018

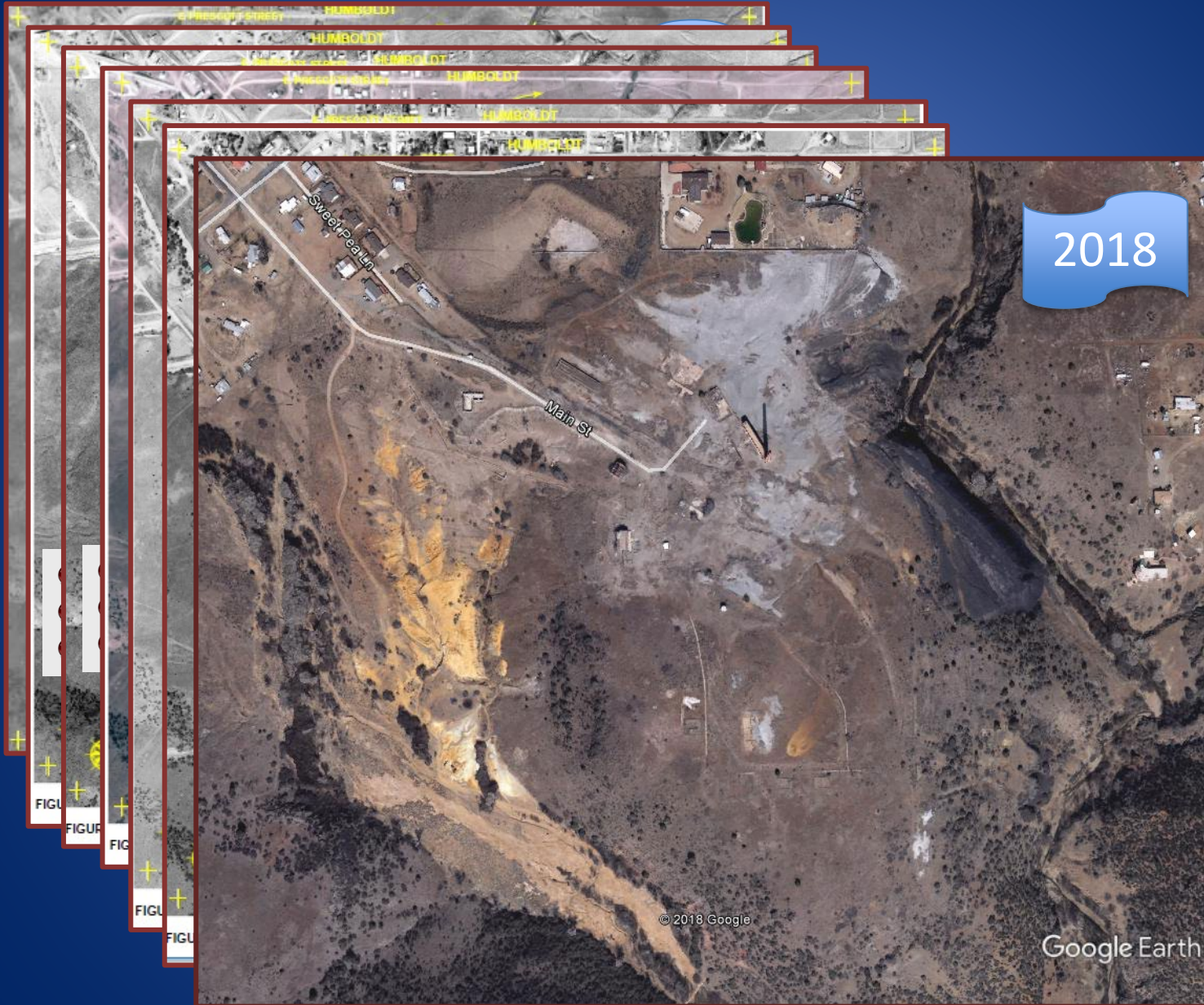


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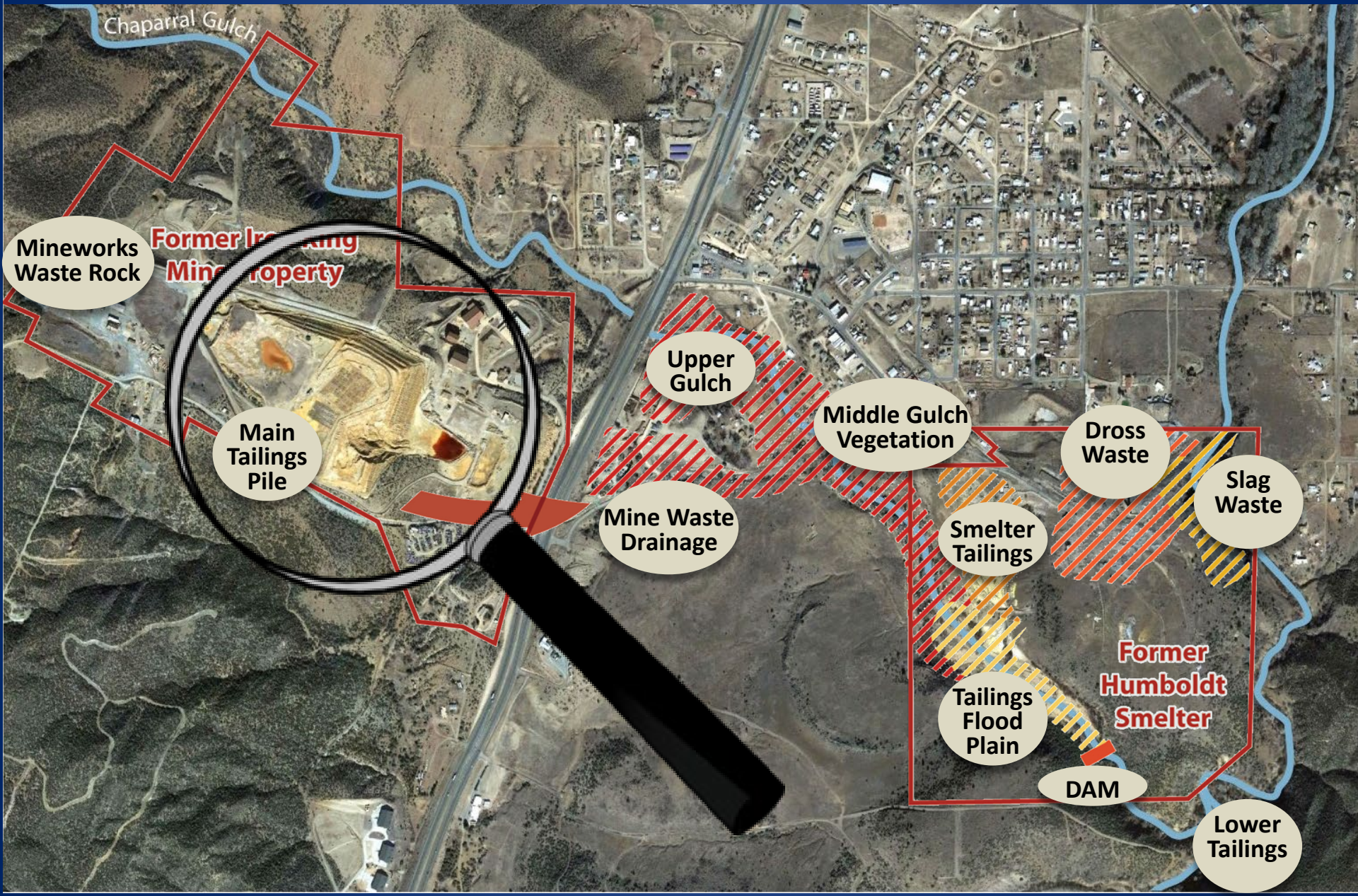
Google Earth

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The Smelter Property 1940-2003 (after Humboldt Smelter)



Exploring the Iron King Mine Main Tailings Pile

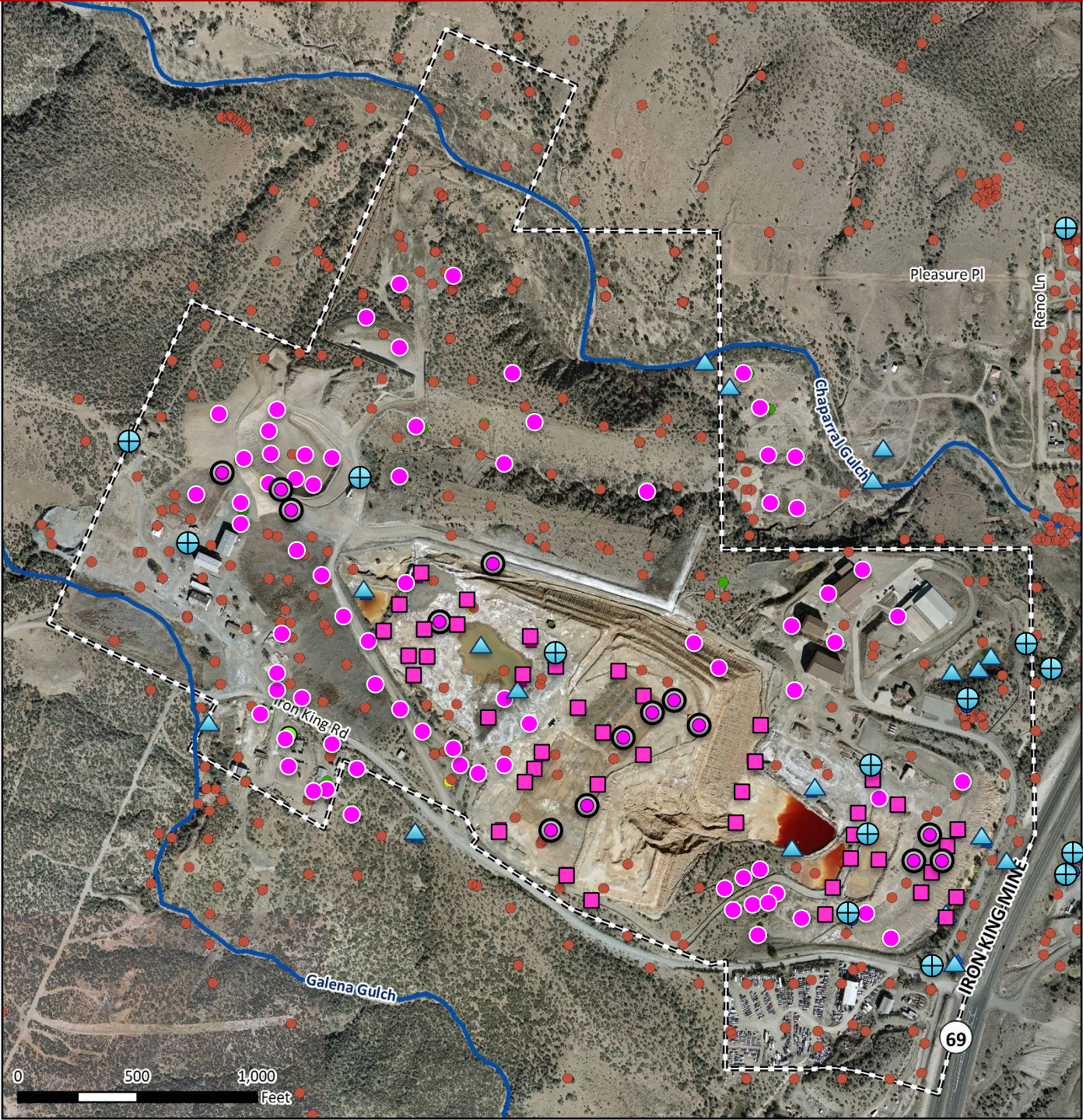


Exploring the Main Tailings Pile



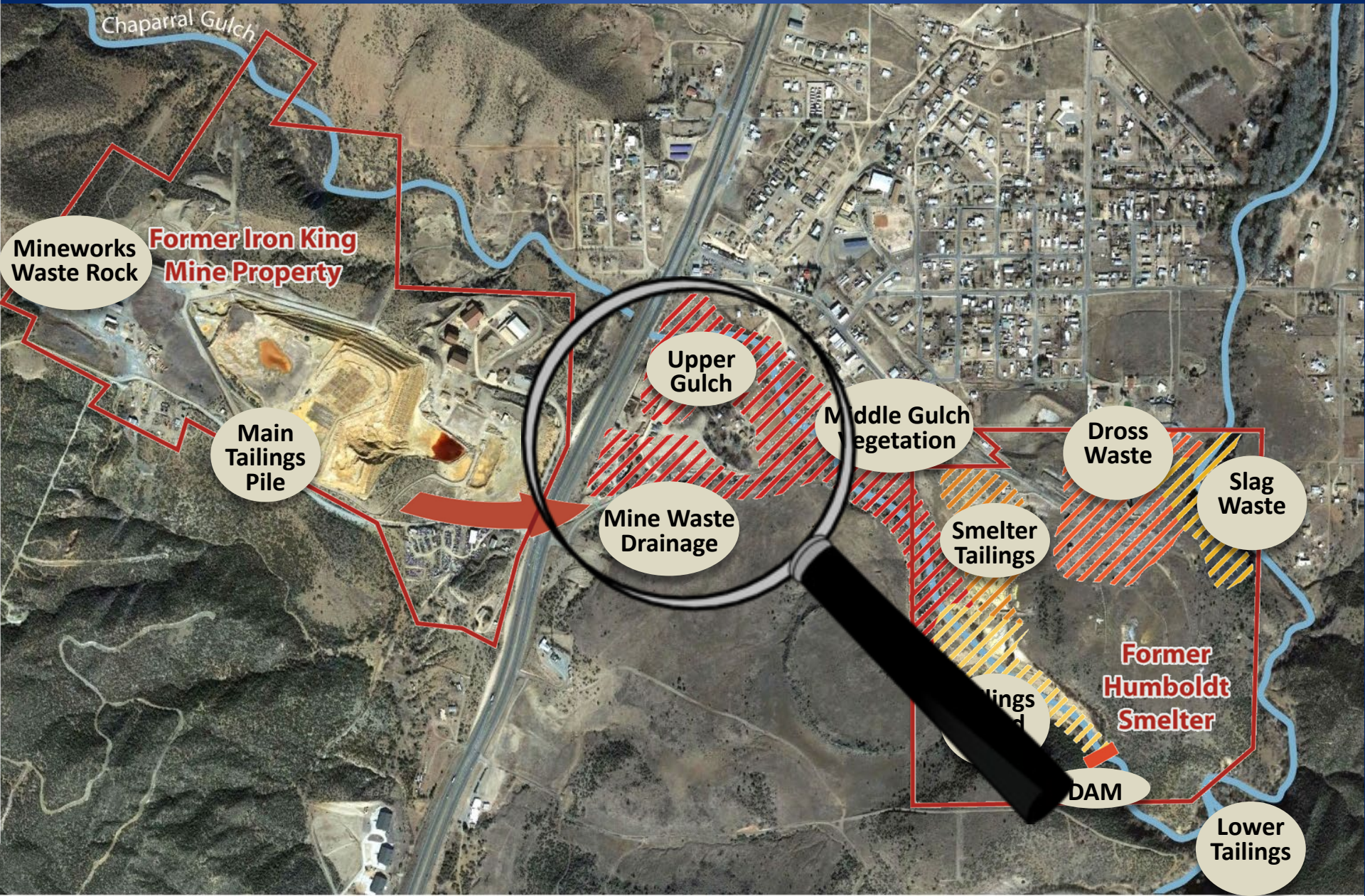
Figure 11. 1999 Aerial view of Iron King mine. Looking East (photograph courtesy of Sandstone Museum).

Main Tailings Pile Investigation



- Surface Sample
- Boring 15 ft or less
- Boring up to 108 ft
- CPT boring up to 125 ft
- ⊕ Groundwater Well to tailings bottom or bedrock
- ▲ Surface water sampling

Exploring the Upper Gulch and Mine Waste Drainage



Exploring the Upper Gulch

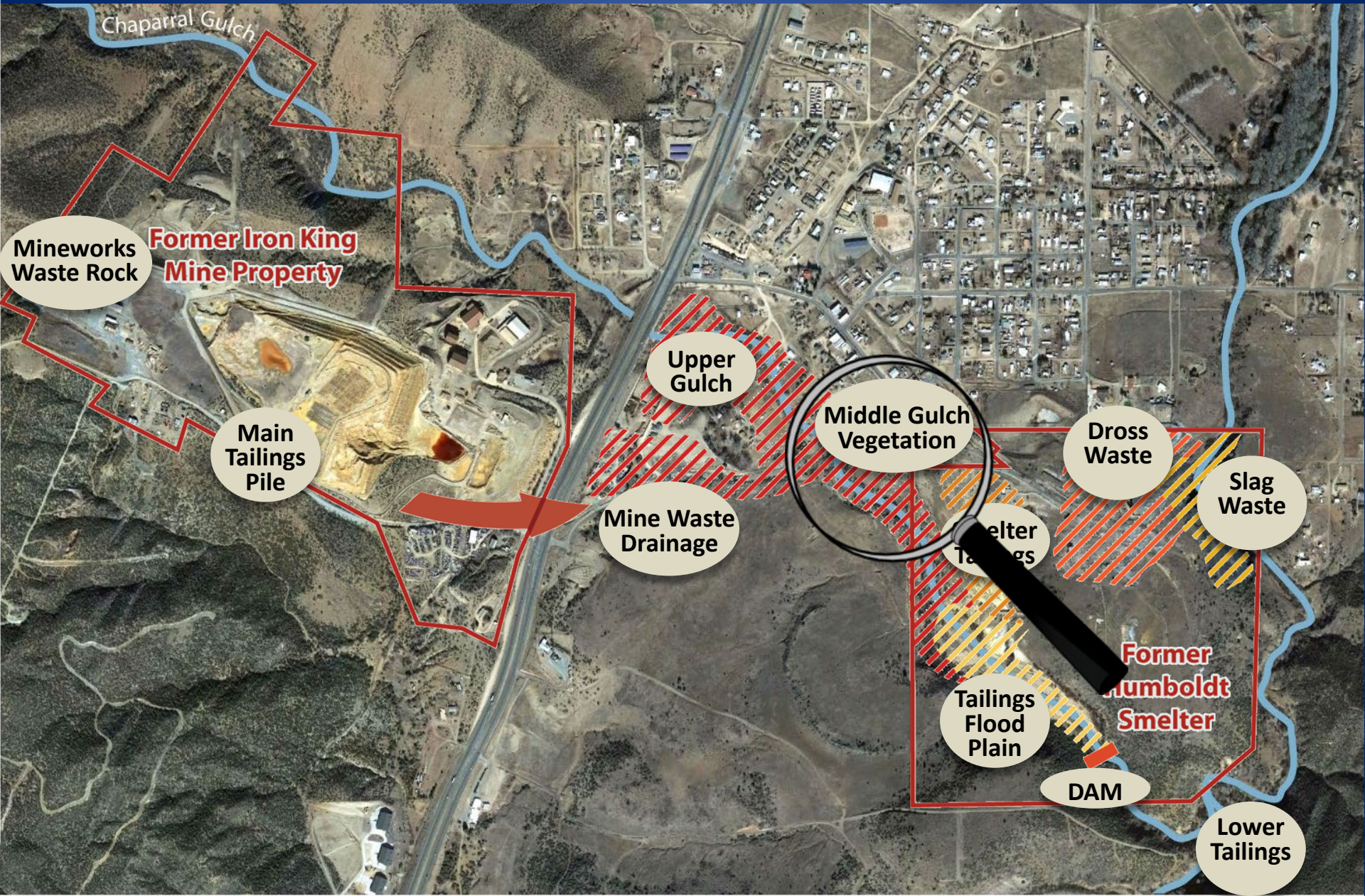


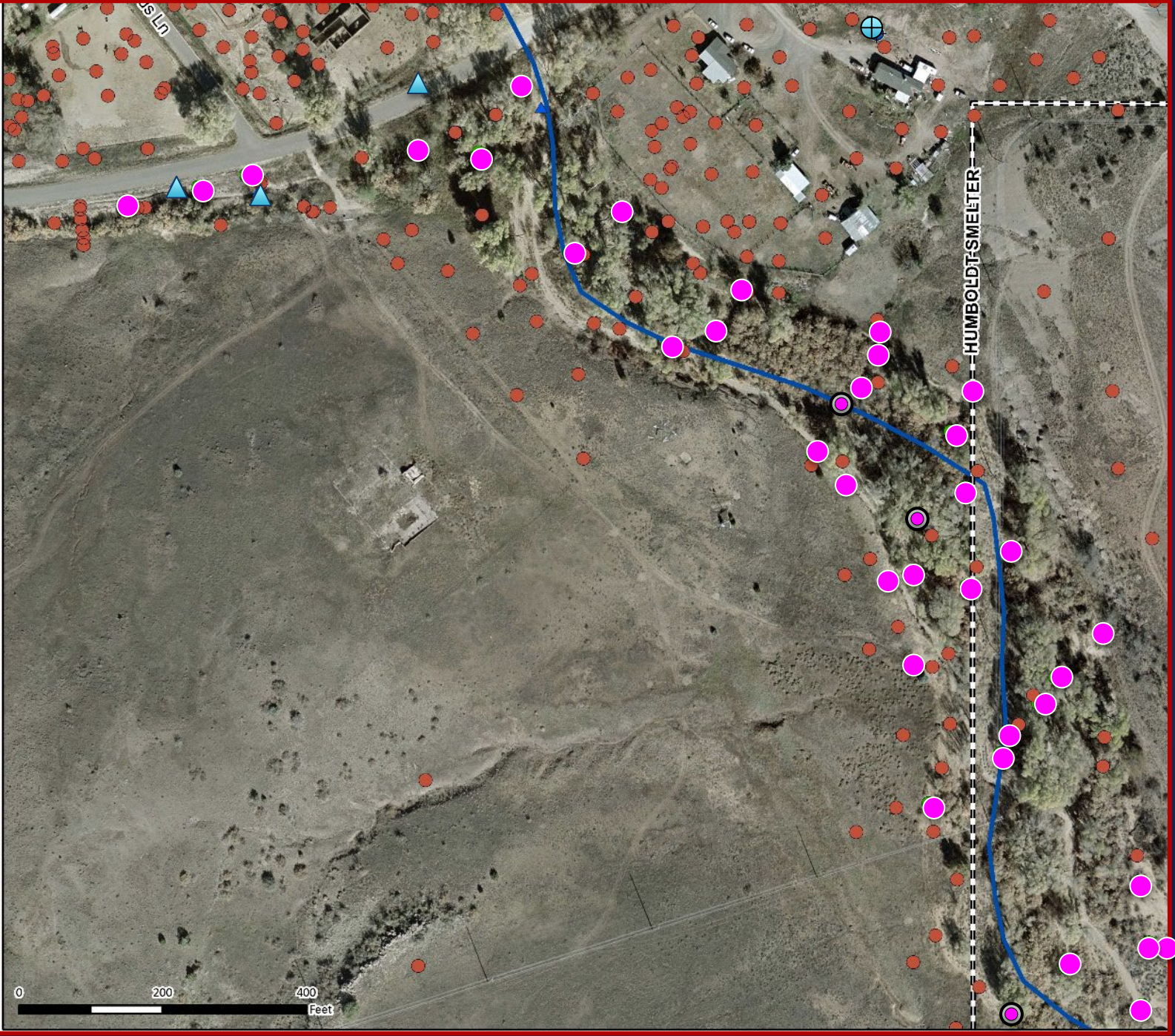
Upper Gulch Investigation



- Surface Sample
- Boring 15 ft or less
- Boring up to 108 ft
- Groundwater Well to tailings bottom or bedrock
- ▲ Surface water sampling

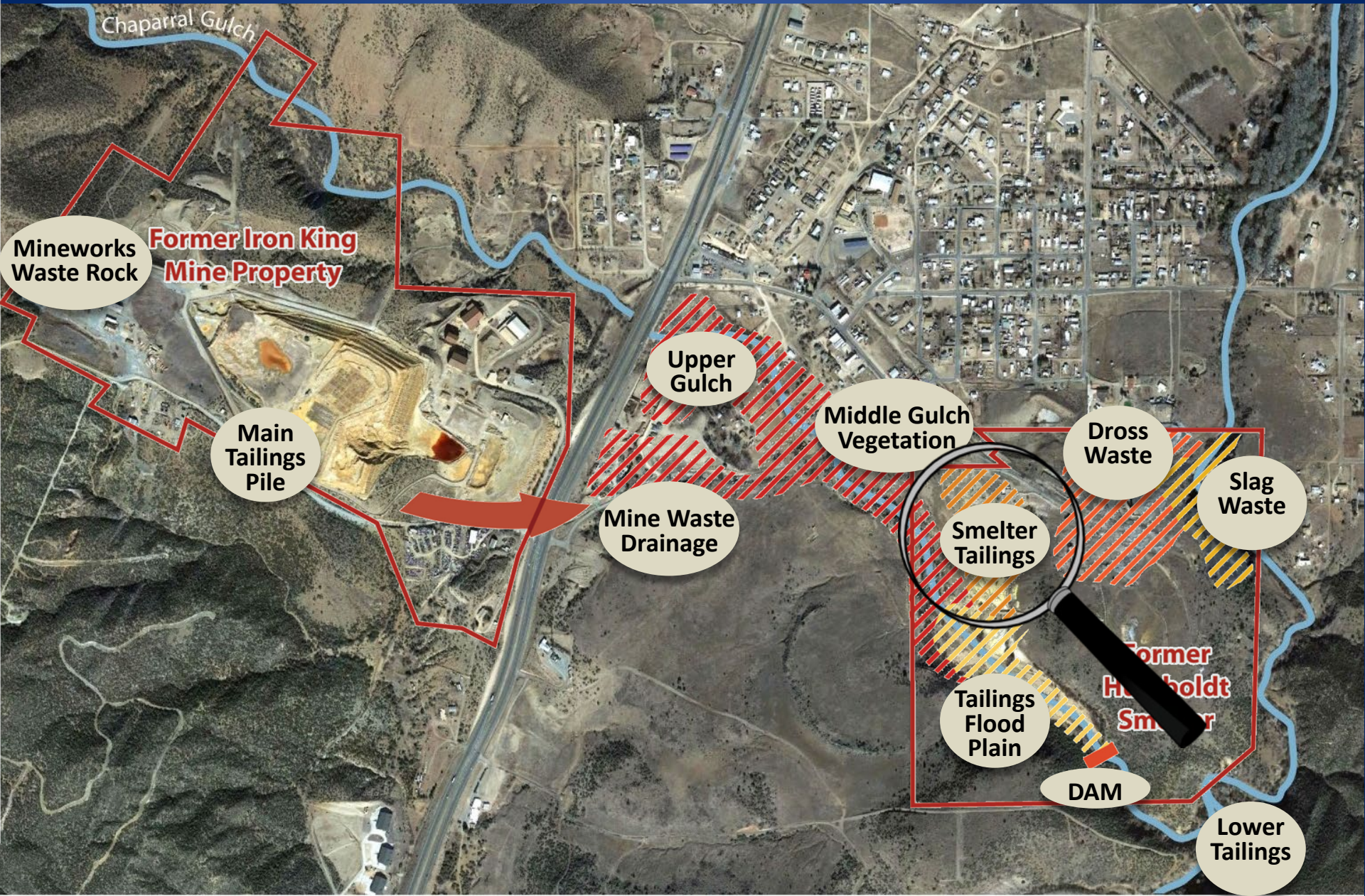
Exploring the Middle Gulch





Middle Gulch Investigation

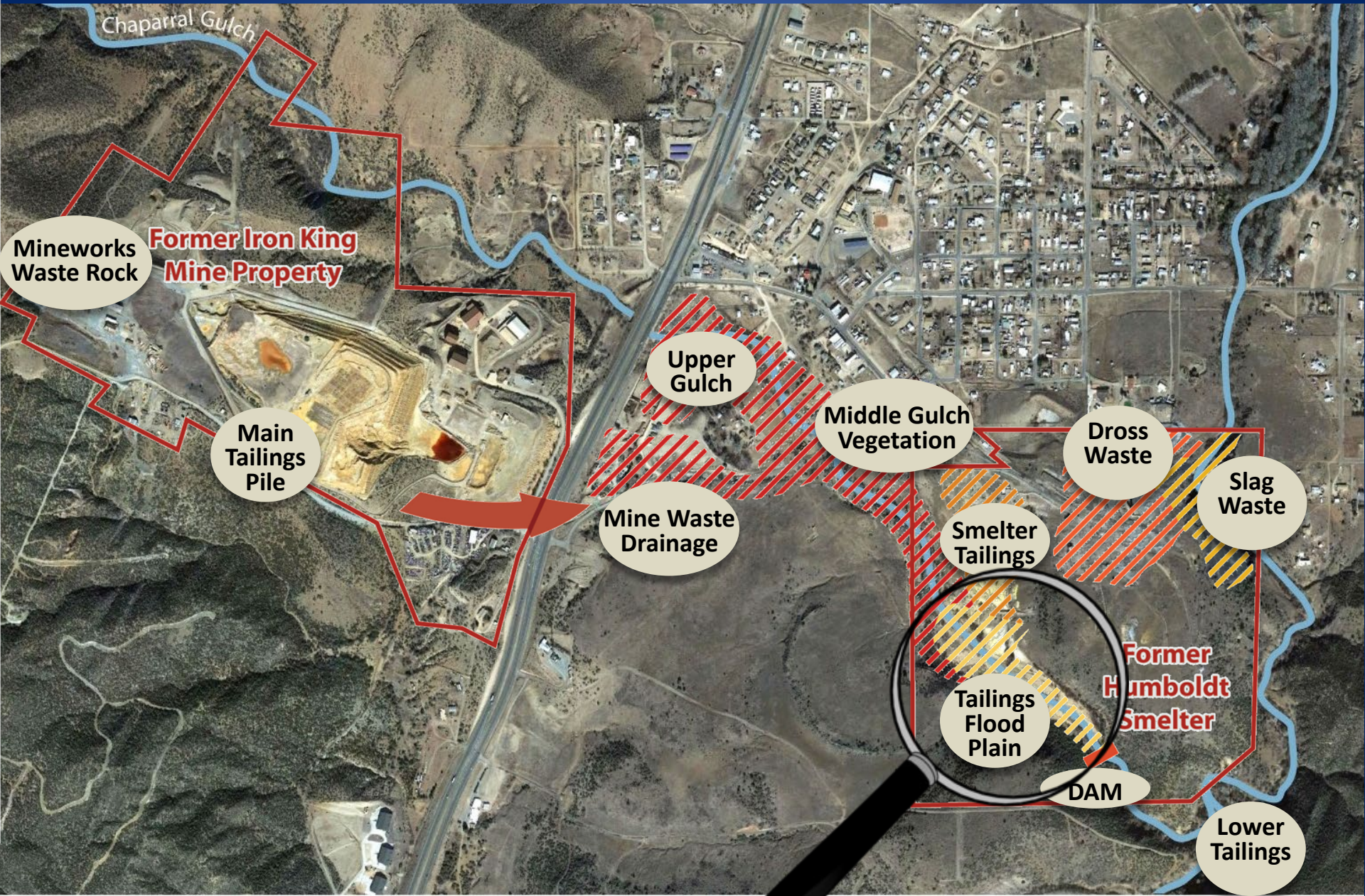
Exploring the Smelter Tailings Swale



Exploring the Smelter Tailings Swale



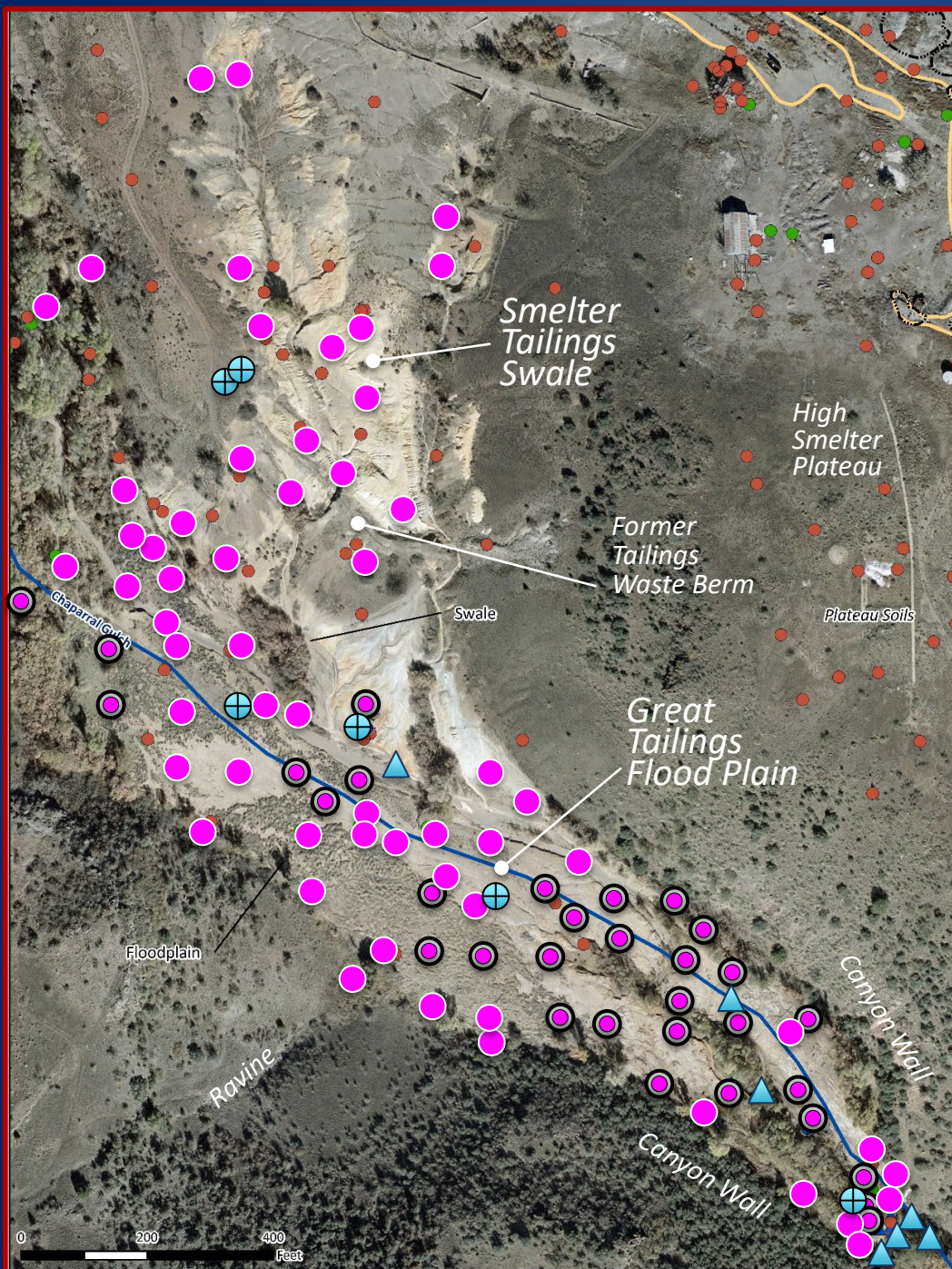
Exploring the Great Tailings Flood Plain



Exploring the Great Tailings Flood Plain



Great Tailings Flood Plain & Smelter Tailings Swale Investigation

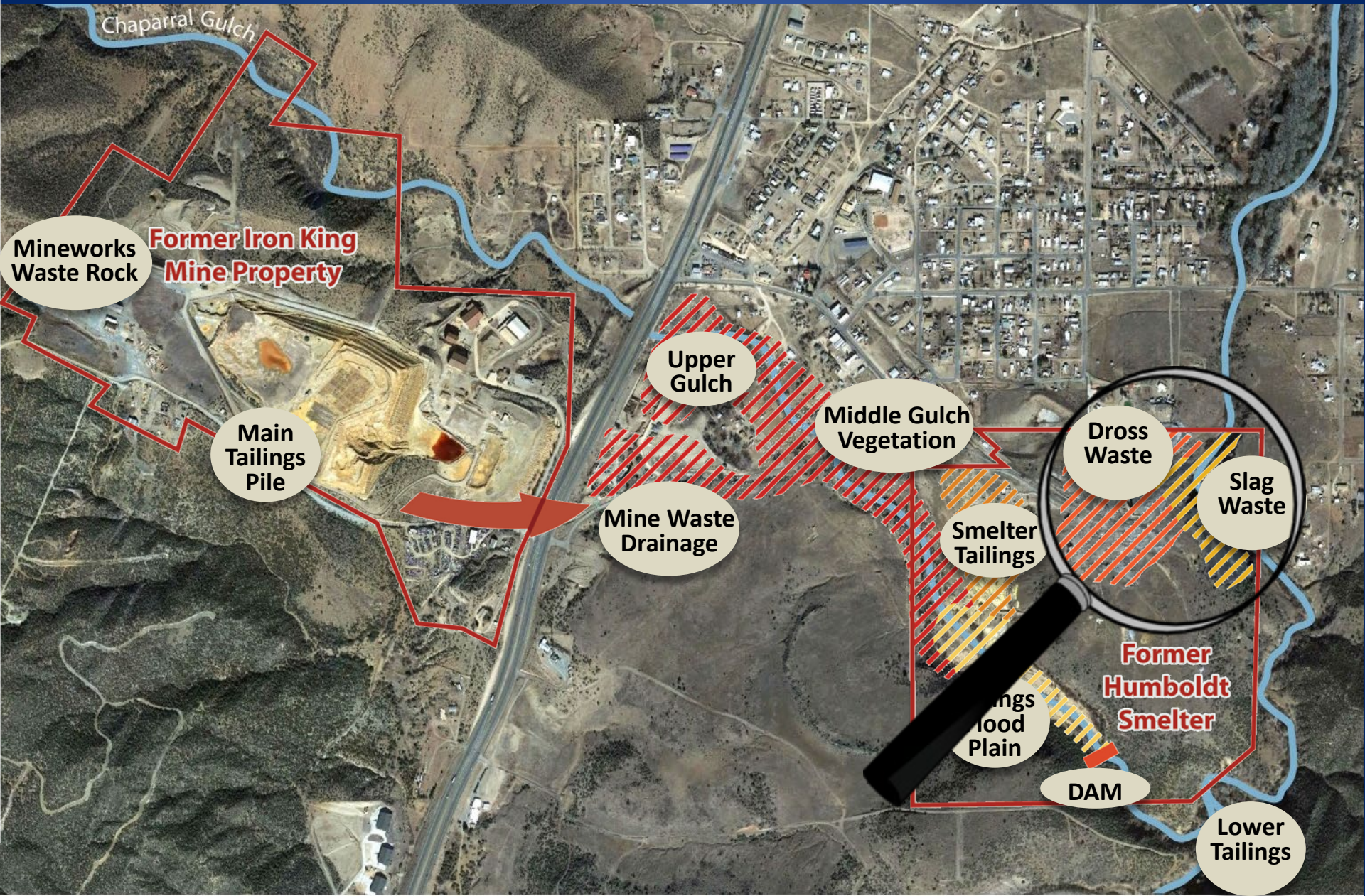


- Surface Sample
- Boring 15 ft or less
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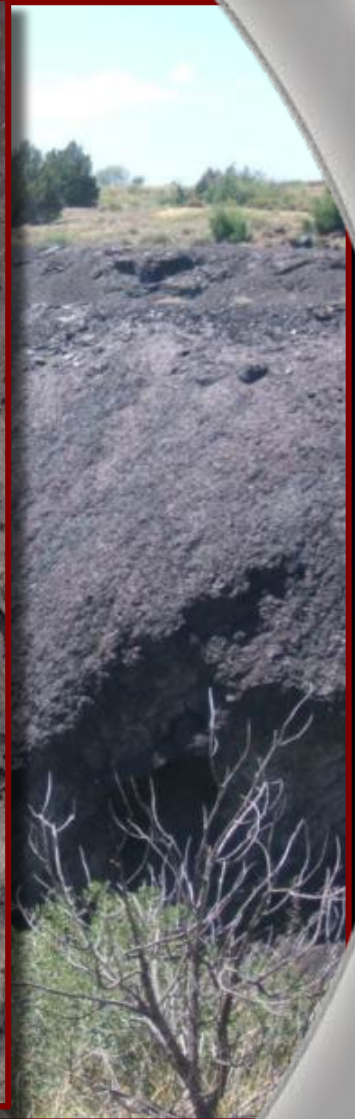
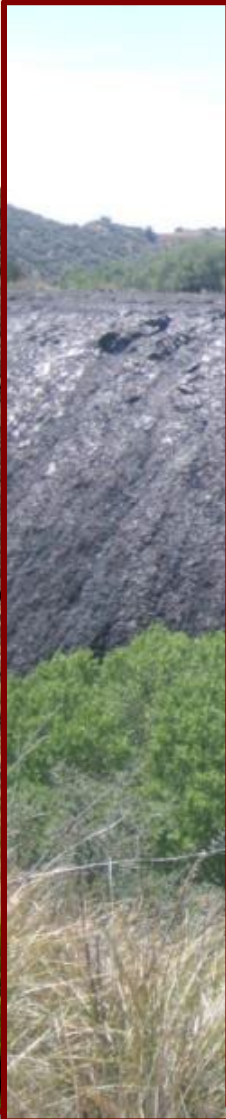
Boring Investigation: Mapping What's Under the Ground



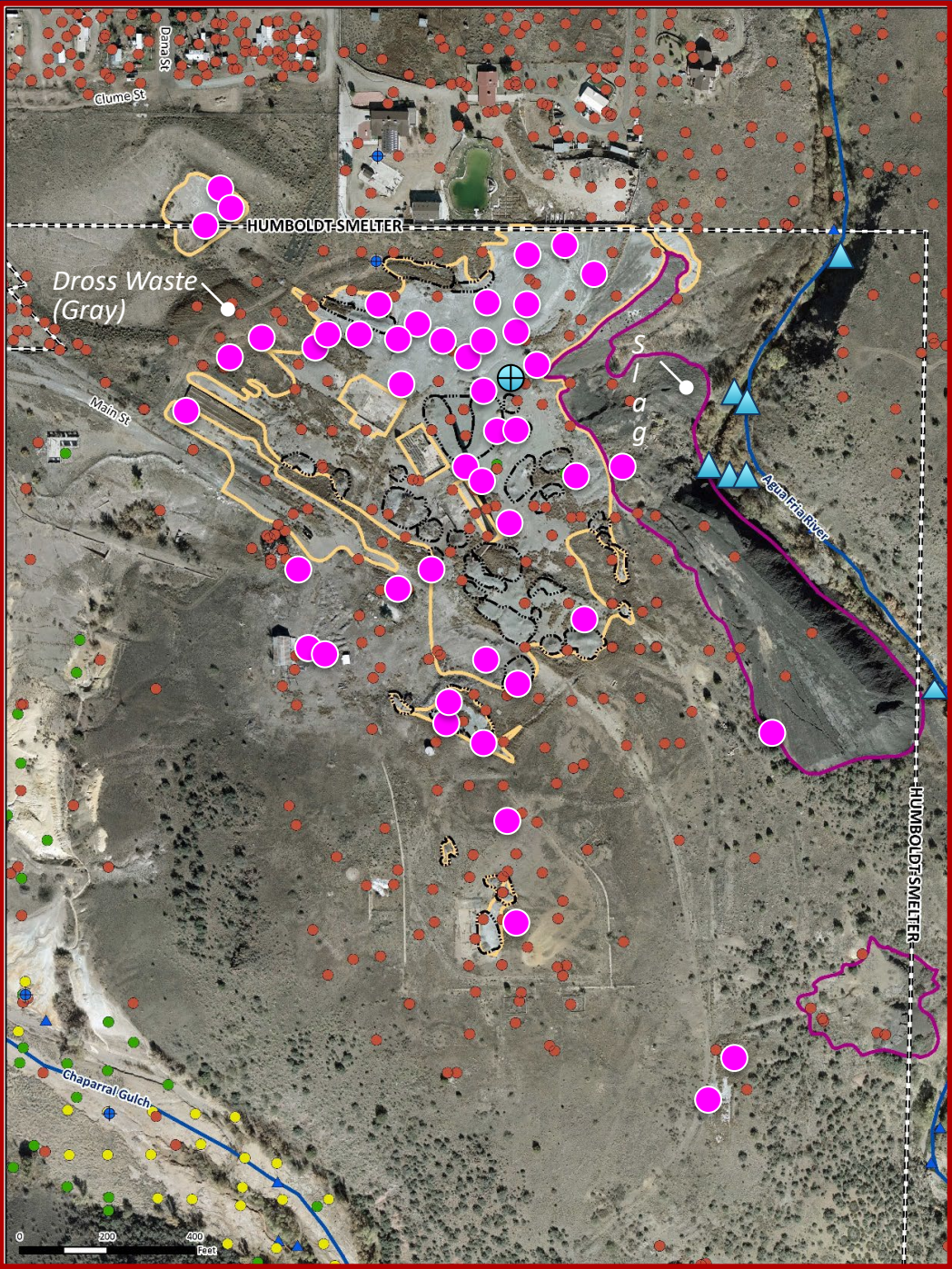
Exploring the Smelter, the Dross, the Slag



Exploring the Smelter, the Dross, the Slag

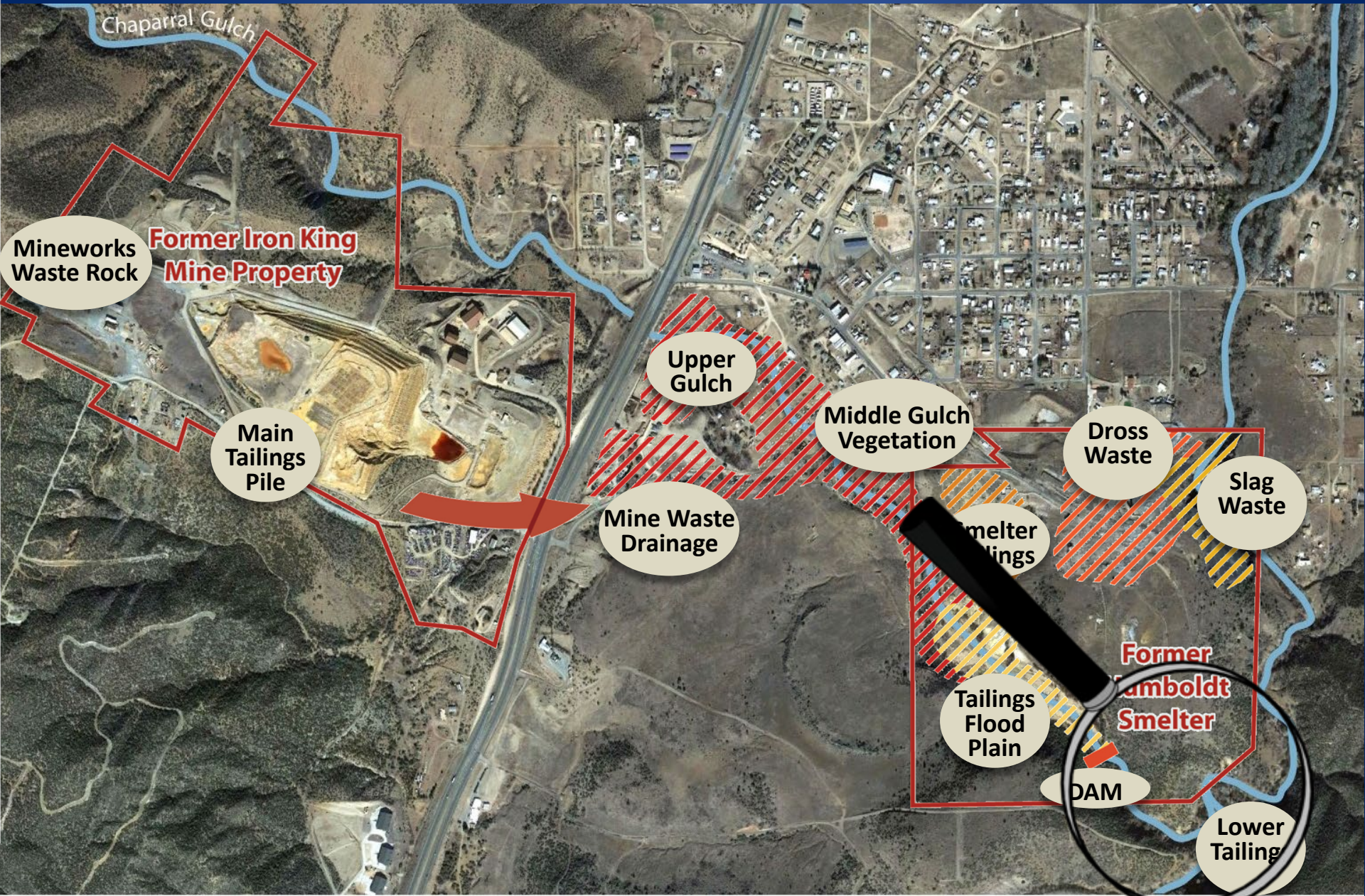


Smelter Dross and Slag Investigation



- Surface Sample
- Boring 15 ft or less
- Boring up to 108 ft
- CPT boring up to 125 ft
- ⊕ Groundwater Well to tailings bottom or bedrock
- ▲ Surface water sampling

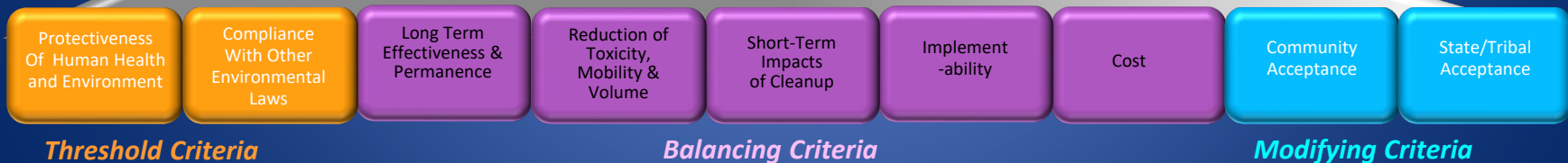
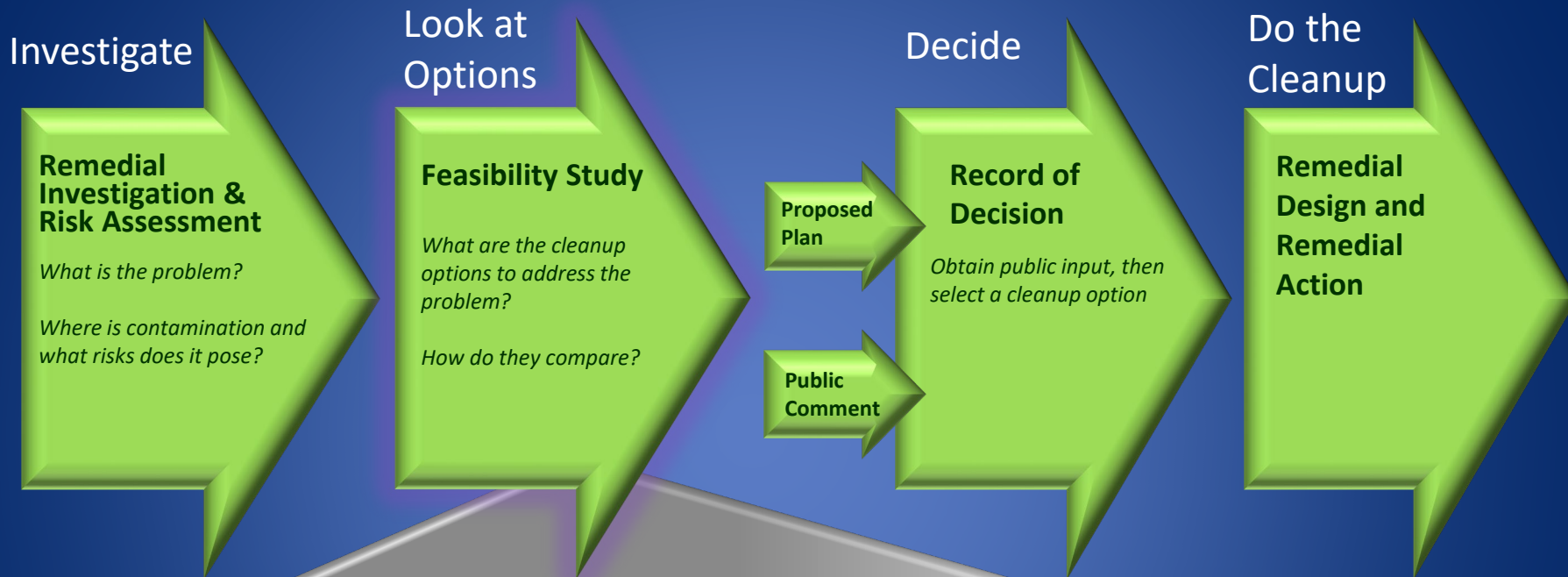
Exploring the Dam and Lower Gulch



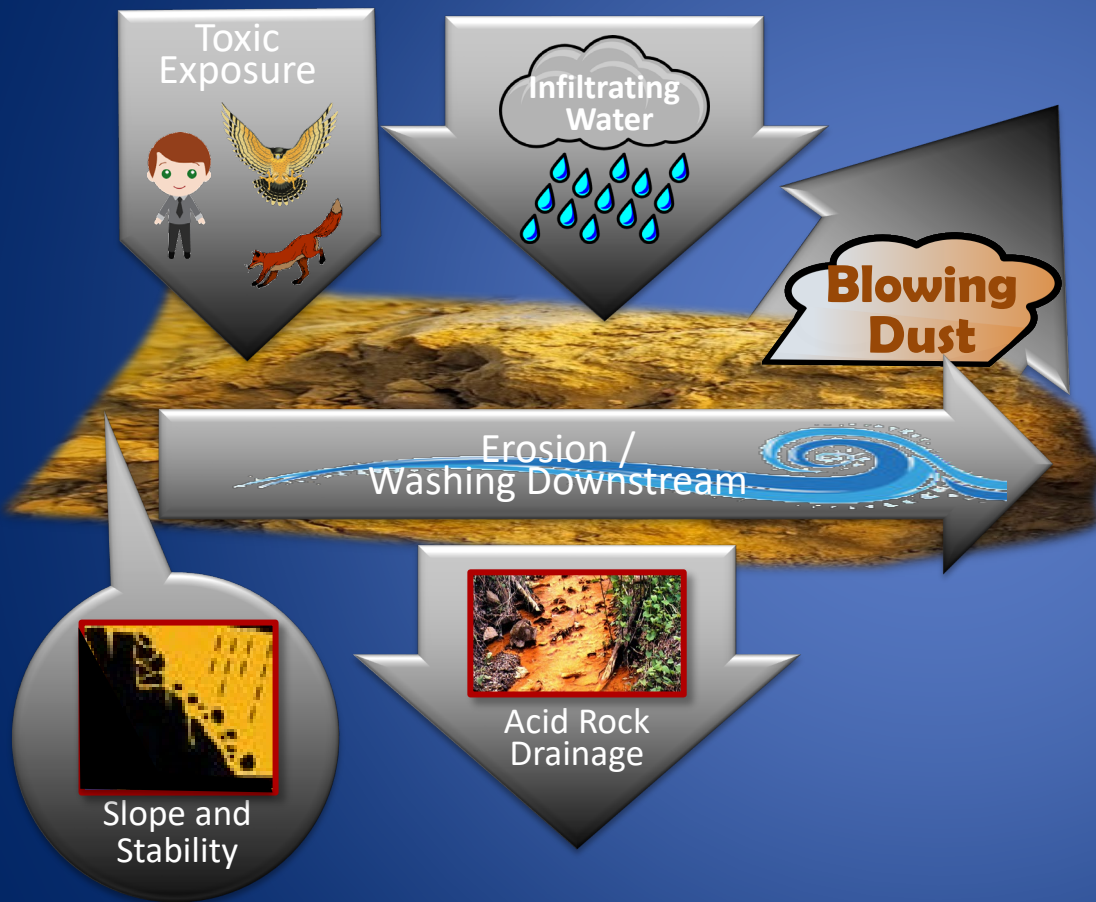
Exploring the Dam and the Lower Gulch



Criteria for Comparing Cleanup Alternatives



Putting Together Cleanup Alternatives: Factors and Goals in Mine Tailings Cleanup



Goals

- Protect people and animals
- Create Stability
- Control Erosion and Drainage
- Channel Water
- Prevent Infiltration of Rainwater
- Don't Form Acid Mine Drainage
- Consider Future Land Uses

Questions

- Move it or cover it where it is?
- What kinds of cover?
- Is there enough cover material?
- Where does the repository go?
- Is there enough repository space?
- Is existing environment preserved?
- What future land uses?
- How would it look?



North of MTP
Open Chaparral Land

Mine Spoils
And Shafts

Chaparral Gulch

Dewey

S Parker St

S Colina Ln

Former
Glory Hole

Contaminated
Soils

Small
Tailings Pile
Remediated

E Corley St

R

Rear Mine
Waste Pile

Former
Mineworks &
Processing

NAI Ops

Unstable

R

MTP Upper Tier

Unstable

Waste
Rock Pile
(WRP)

Iron King Rd

MTP Lower Tier

Unstable /
Blowout

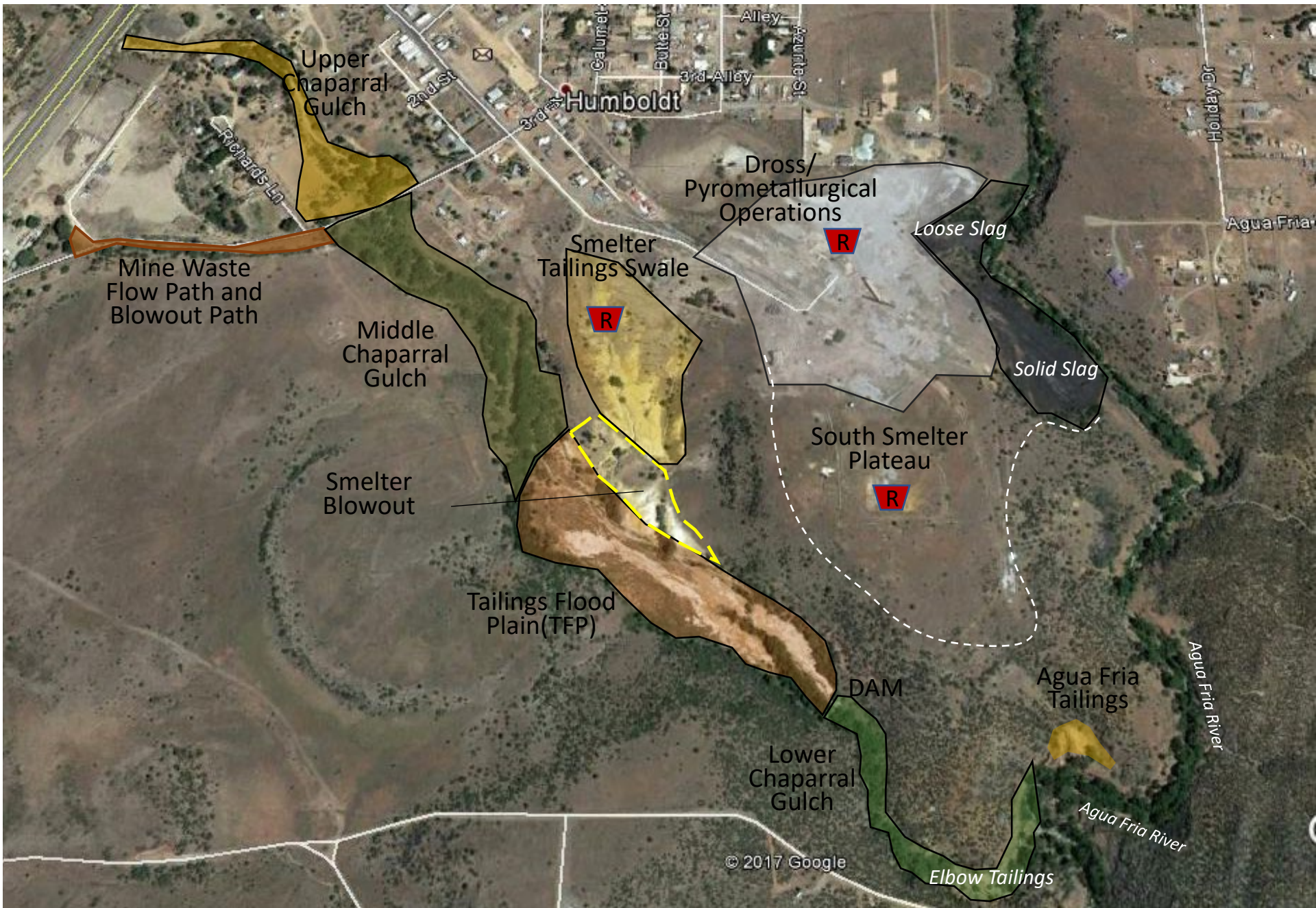
Omega Dr

South of MTP
Open Chaparral Land

Galena Gulch

S Old Black Canyon

69



Upper Chaparral Gulch

Humboldt

Dross/
Pyrometallurgical
Operations

Loose Slag

Solid Slag

South Smelter
Plateau

Smelter
Blowout

Tailings Flood
Plain (TFP)

DAM

Lower
Chaparral
Gulch

Agua Fria
Tailings

Elbow Tailings

Agua Fria River

Agua Fria River

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Examples of Covers on Mining Materials

Big River Mine Tailings Pile - After



Google Earth
© 2017 Google

ings Pile - After



Google Earth
© 2017 Google
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8.53 ft

Examples of One Type of Engineered Channel



TURF REINFORCED MAT)



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Former Iron King Mine Property

IRON KING MINE MAIN TAILINGS PILE

UPPER GULCH

MIDDLE GULCH

SMELTER TAILINGS SWALE

GREAT TAILINGS FLOOD PLAIN

DAM

DROSS SLAG

Former Humboldt Smelter

Tailings DAM

IKM Main Tailings Pile

Smelter Tailings Swale

Blowout Path

Tailings Flood Plain

Smelter / Dross

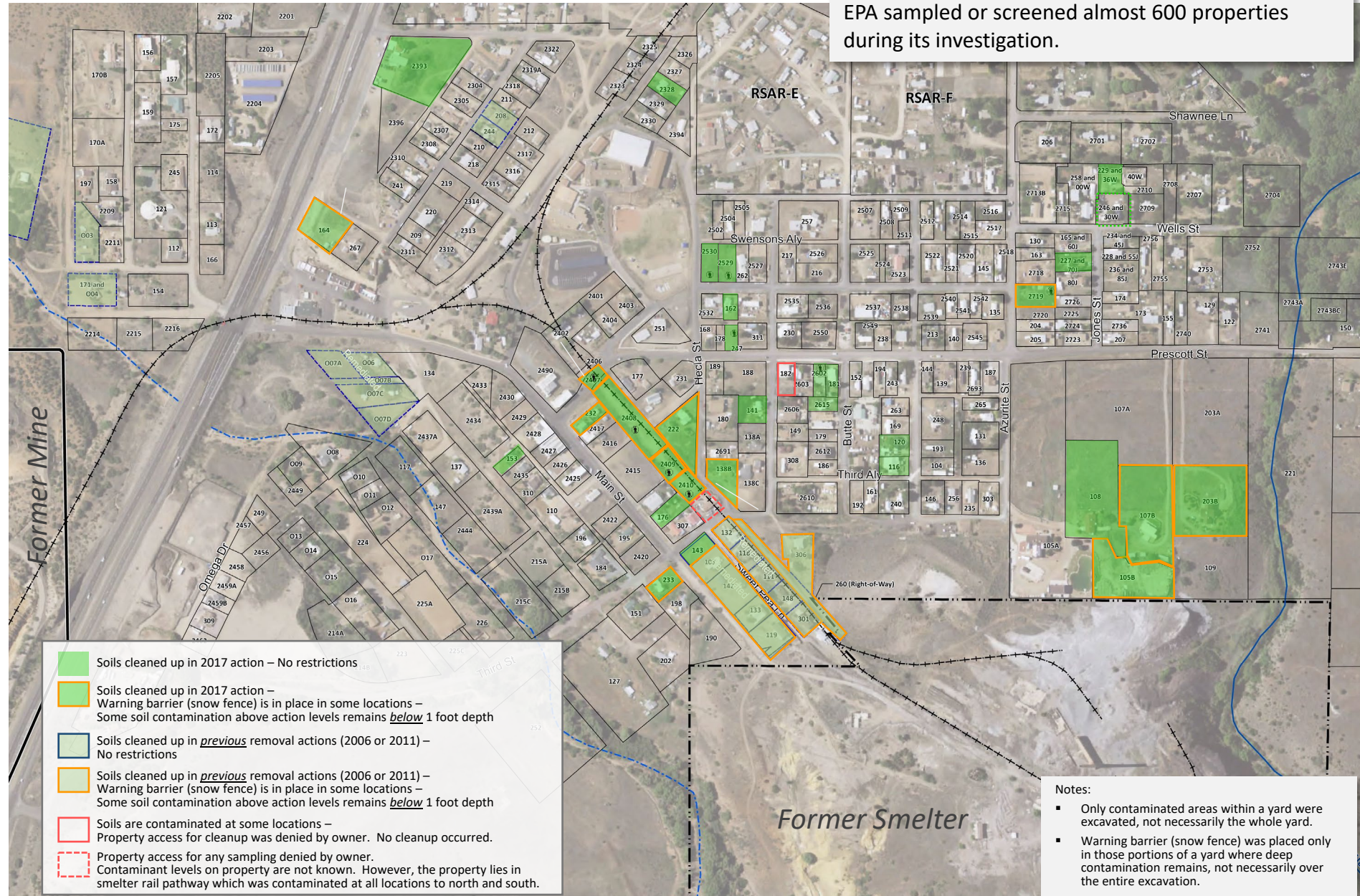
Smelter Slag

Agua Fria

Iron King Mine / Humboldt Smelter Superfund Site Completed Residential Yard Removal Actions

Properties not shaded were sampled or screened and determined not to require cleanup. (Exception: yards in the Chaparral Gulch)

EPA sampled or screened almost 600 properties during its investigation.



- Soils cleaned up in 2017 action – No restrictions
- Soils cleaned up in 2017 action – Warning barrier (snow fence) is in place in some locations – Some soil contamination above action levels remains *below* 1 foot depth
- Soils cleaned up in *previous* removal actions (2006 or 2011) – No restrictions
- Soils cleaned up in *previous* removal actions (2006 or 2011) – Warning barrier (snow fence) is in place in some locations – Some soil contamination above action levels remains *below* 1 foot depth
- Soils are contaminated at some locations – Property access for cleanup was denied by owner. No cleanup occurred.
- Property access for any sampling denied by owner. Contaminant levels on property are not known. However, the property lies in smelter rail pathway which was contaminated at all locations to north and south.

- Notes:
- Only contaminated areas within a yard were excavated, not necessarily the whole yard.
 - Warning barrier (snow fence) was placed only in those portions of a yard where deep contamination remains, not necessarily over the entire excavation.