

LEGEND

- City
- River
- - - Intermittent Drainage
- Surface Water Divide (approximate)
- Former Iron King Mine Property
- Former Humboldt Smelter Property
- Dewey-Humboldt Town Boundary

0 2.5 5
Scale in Miles

Notes:
Hillshade model derived from USGS National Elevation Dataset (grdn35w113_13), dated 2013. Available at <http://nationalmap.gov/viewer.html>. Accessed April 15, 2015.
Rivers and approximate surface water divide from USGS National Geospatial Program, dated May 11, 2015. Available at <http://viewer.nationalmap.gov/viewer.html>. Accessed May 15, 2015.

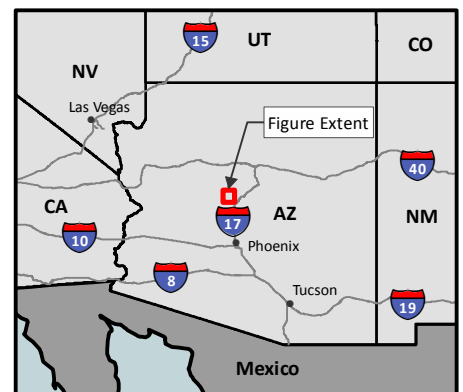
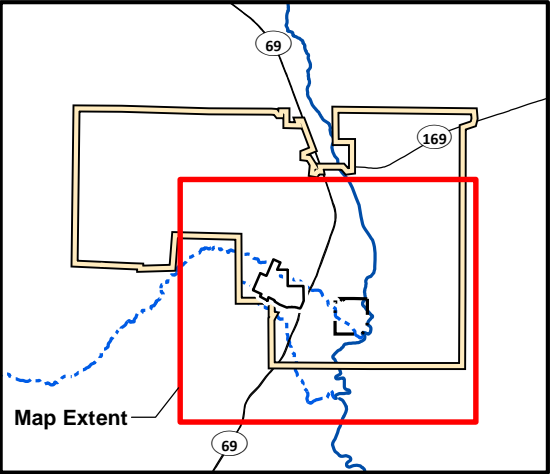
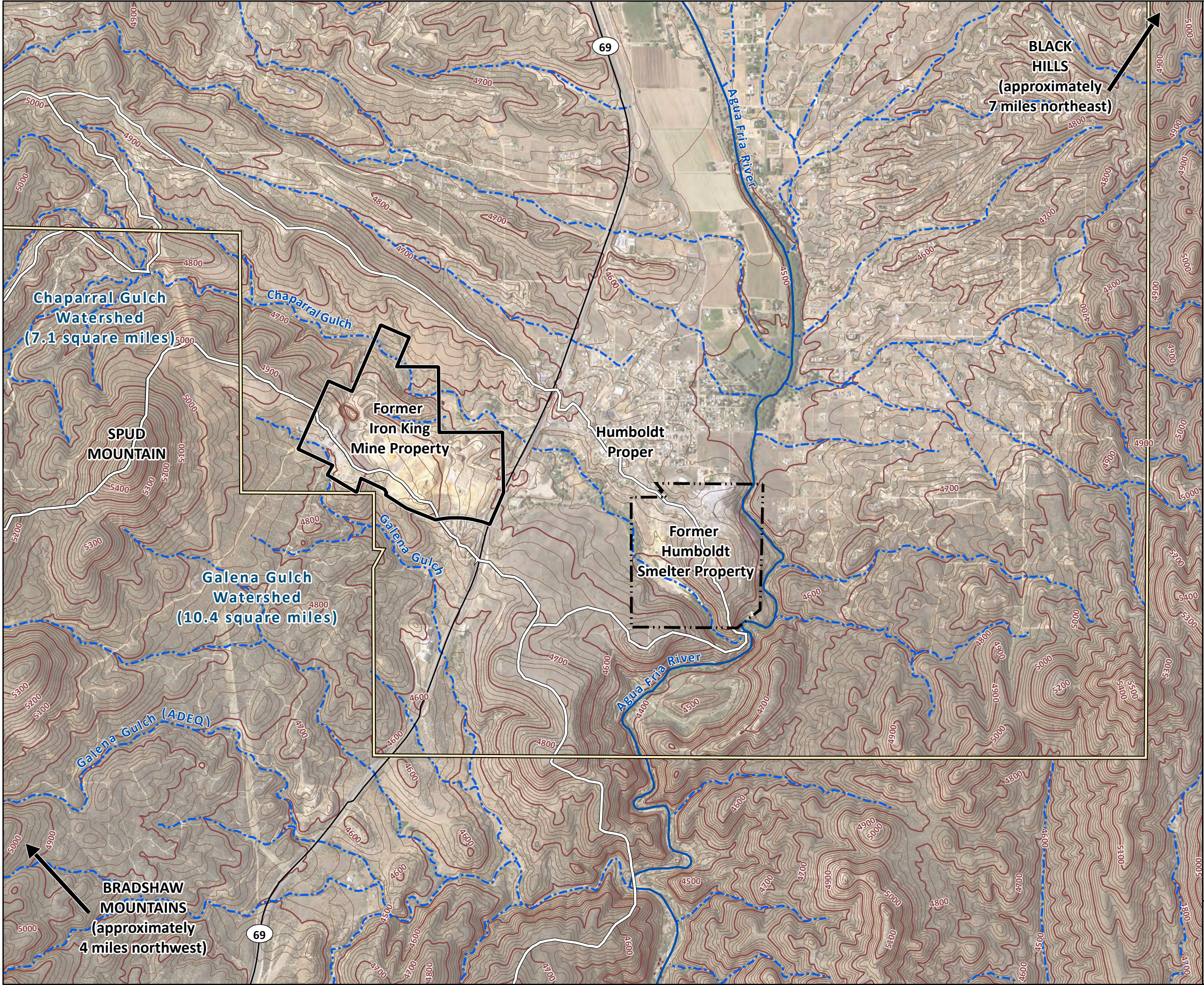


Figure 5-1

Physiographic Setting

*Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona*



LEGEND

- 20-Foot Topographic Contour (feet NAVD88)
- 100-Foot Topographic Contour (feet NAVD88)
- River
- Intermittent Drainage^a
- Watershed Boundary
- Former Iron King Mine Property
- Former Humboldt Smelter Property
- Dewey-Humboldt Town Boundary

0 2,000 4,000
Scale in Feet

^aIn Arizona Department of Environmental Quality (ADEQ) mapping (<https://gisweb.azdeq.gov/arcgis/emaps/?topic=assessed>), the drainage running adjacent to the Iron King Mine property is an unnamed tributary, while the reach identified as Galena Gulch is located to the southwest (ADEQ, 2016). The drainages intersect just upstream of the confluence with the Agua Fria River. The tributary adjacent to Iron King Mine is named Galena Gulch in this RI for consistency with previous documents.

Notes:
NAVD88 = North American Vertical Datum of 1988.
Topographic contours and hillshade model derived from USGS National Elevation Dataset (grdn35w113_13), dated 2013. Available at <http://nationalmap.gov/viewer.html>. Accessed April 15, 2015.
Watershed boundaries from USGS National Geospatial Program, dated May 11, 2015. Available at <http://viewer.nationalmap.gov/viewer.html>. Accessed May 15, 2015.
Imagery from USDA-FSA Aerial Photography Field Office Ortho Imagery (ortho_1-1_1n_s_az025_2015_1), dated 2015. Available at <https://gdg.sc.egov.usda.gov/Catalog/ProductDescription/NAIPM.html>. Accessed January 26, 2016.

Figure 5-2
Site Topography
Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona

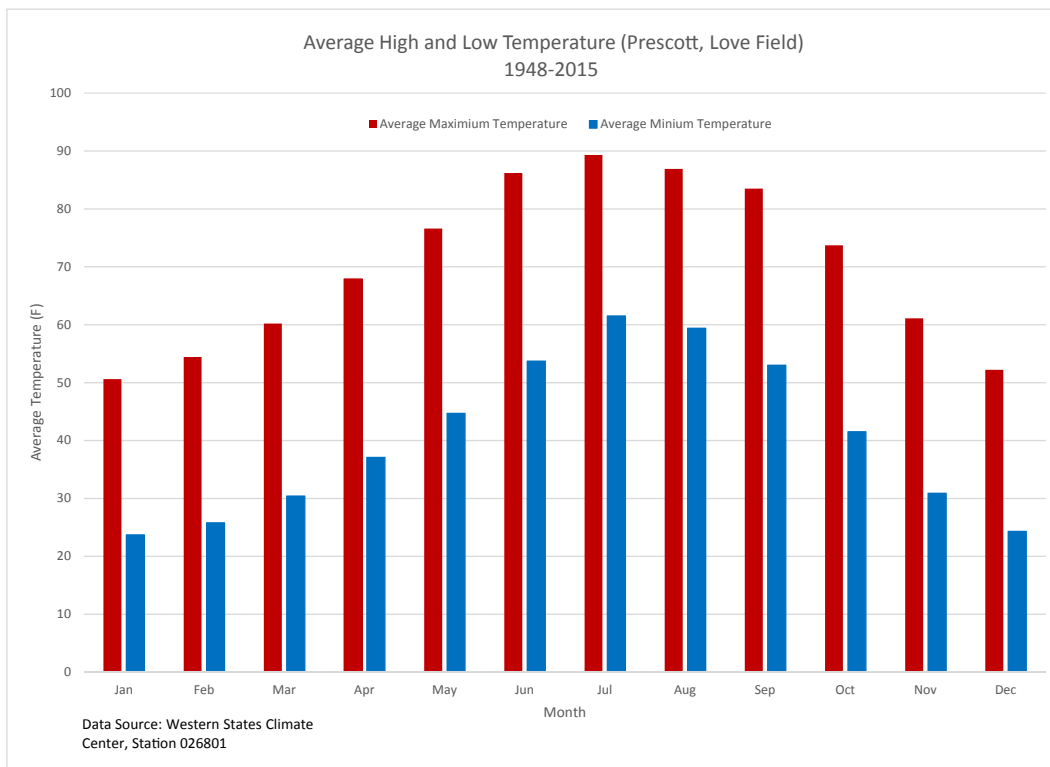
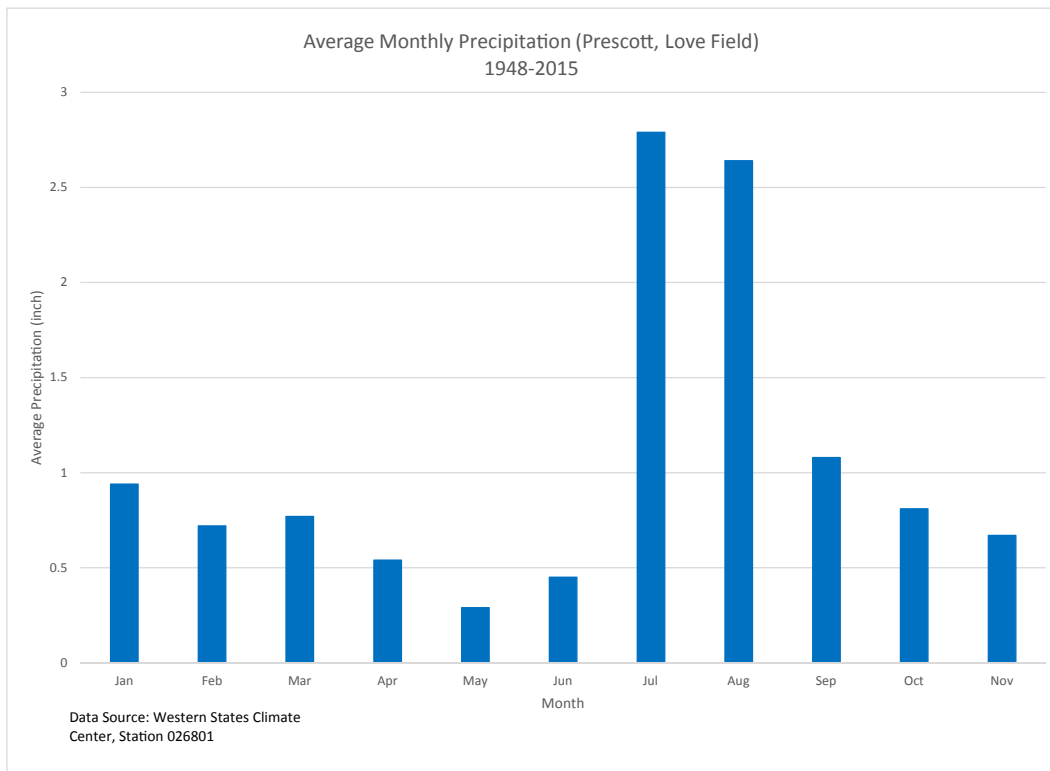


Figure 5-3
Temperature and Precipitation Trends
Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona

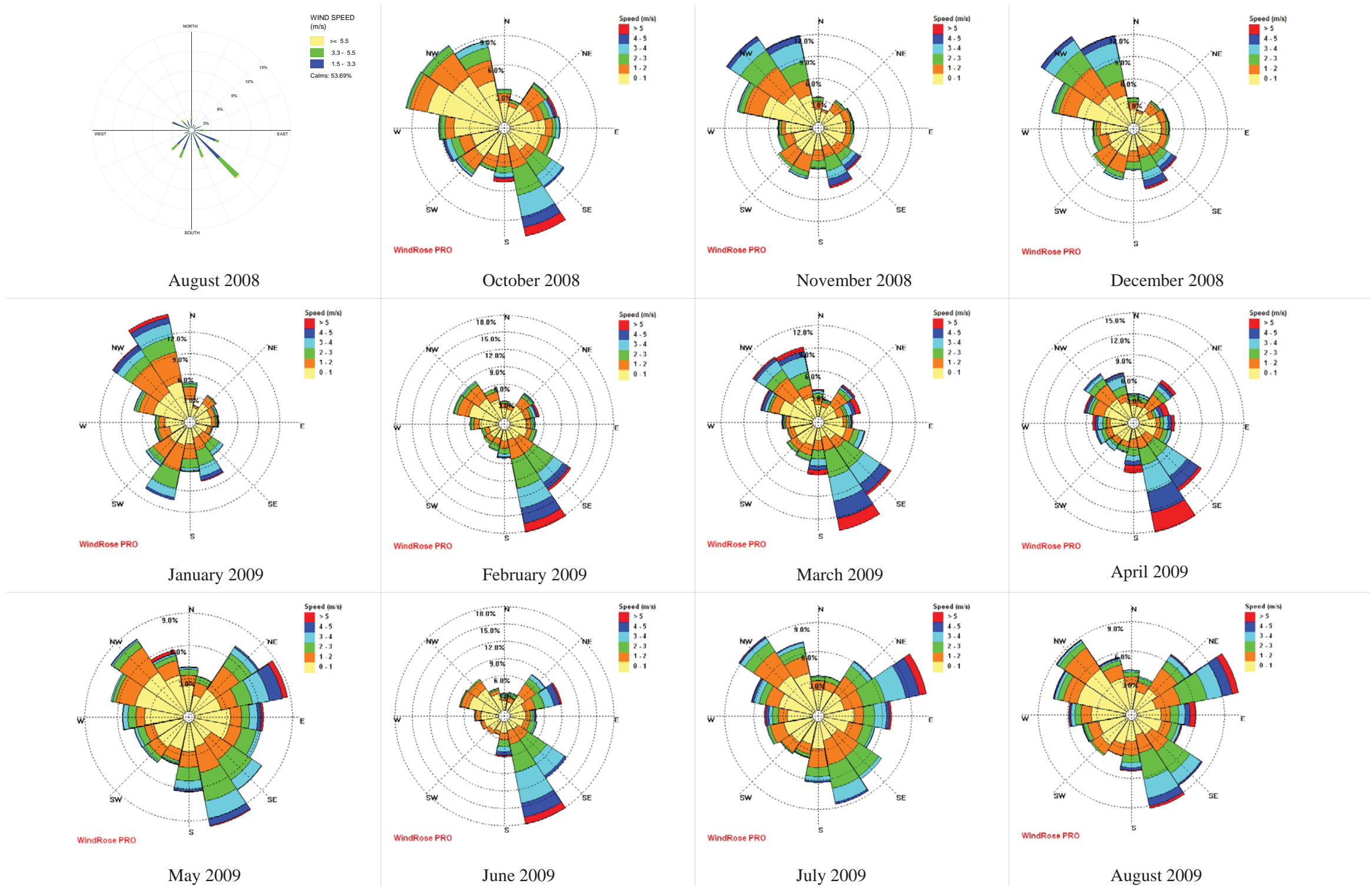
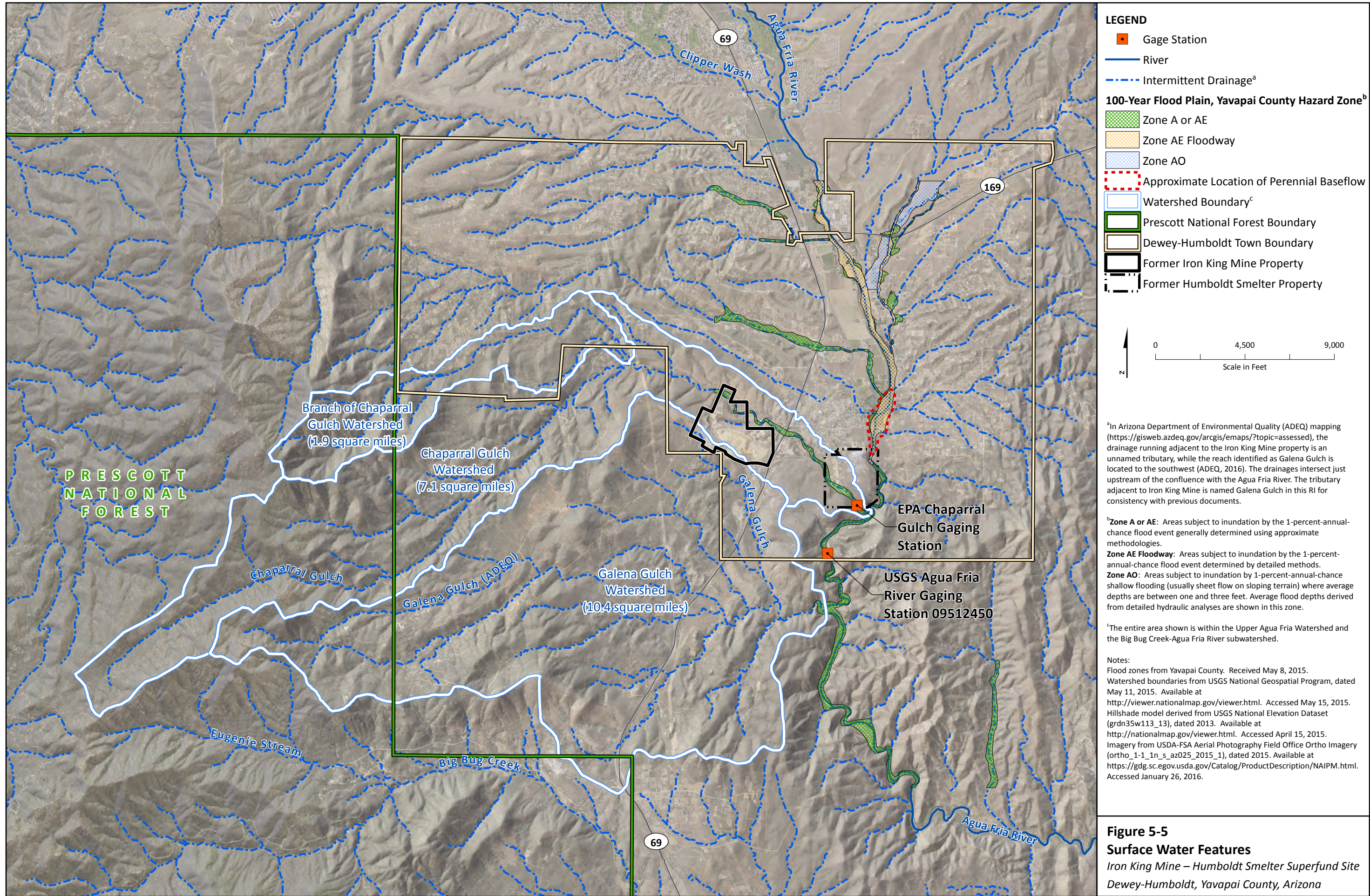
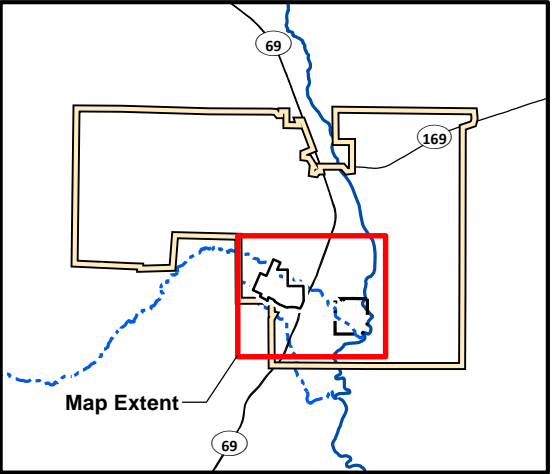
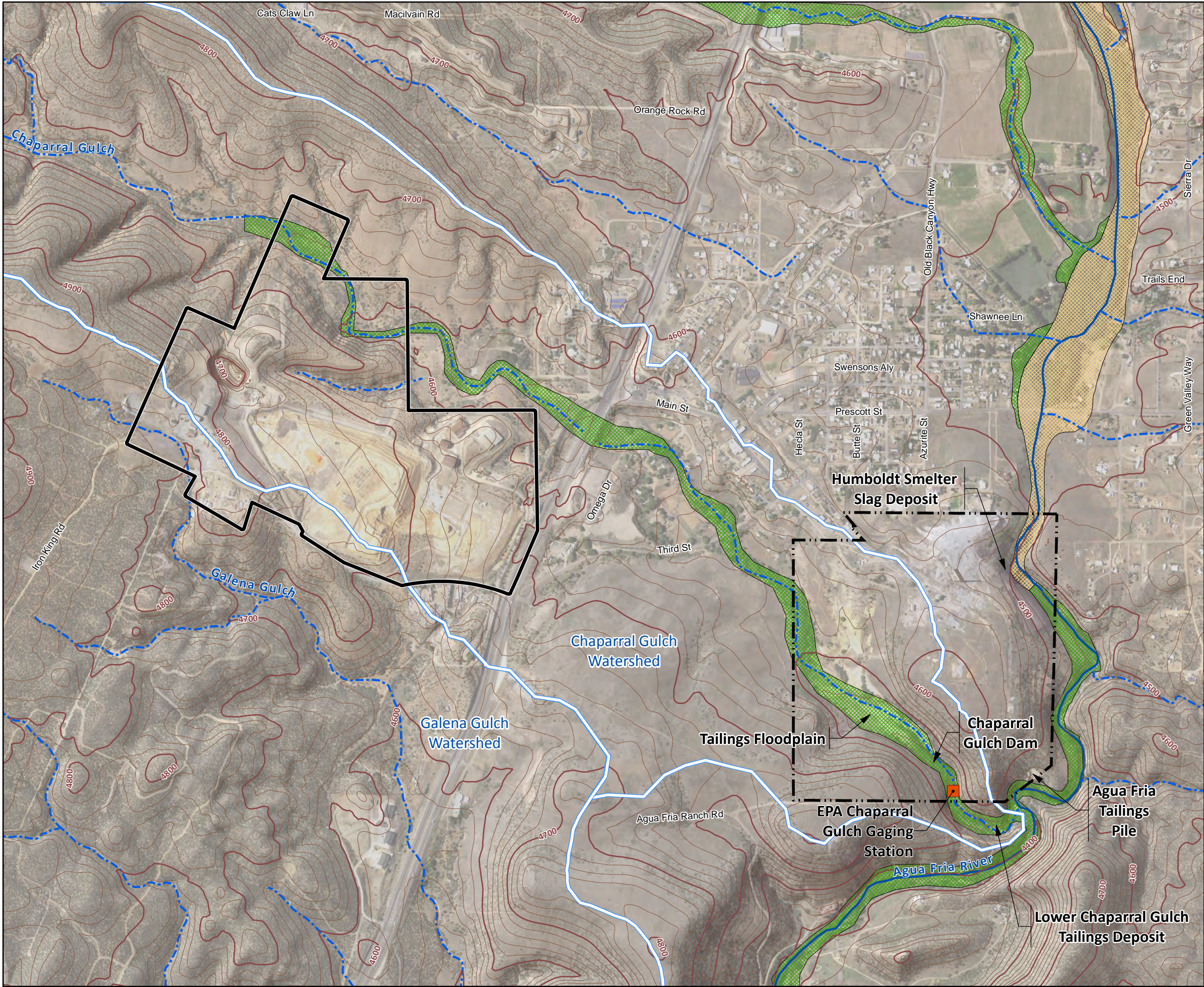


Figure 5-4
Iron King Mine Wind Data
Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona

Notes:
 Figure source: EA, 2010, with modifications
 Wind data were collected at the meteorological station at the former Iron King Mine.



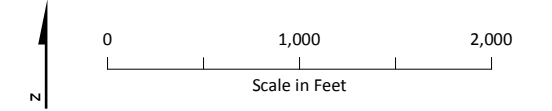


LEGEND

- Gage Station
- 20-Foot Topographic Contour (feet NAVD88)
- 100-Foot Topographic Contour (feet NAVD88)
- River
- Intermittent Drainage

100-Year Flood Plain, Yavapai County Hazard Zone^a

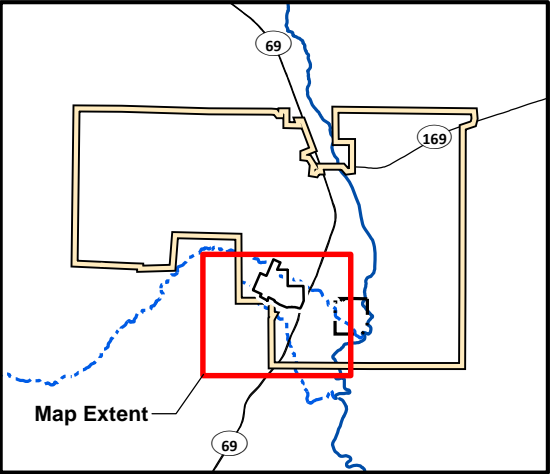
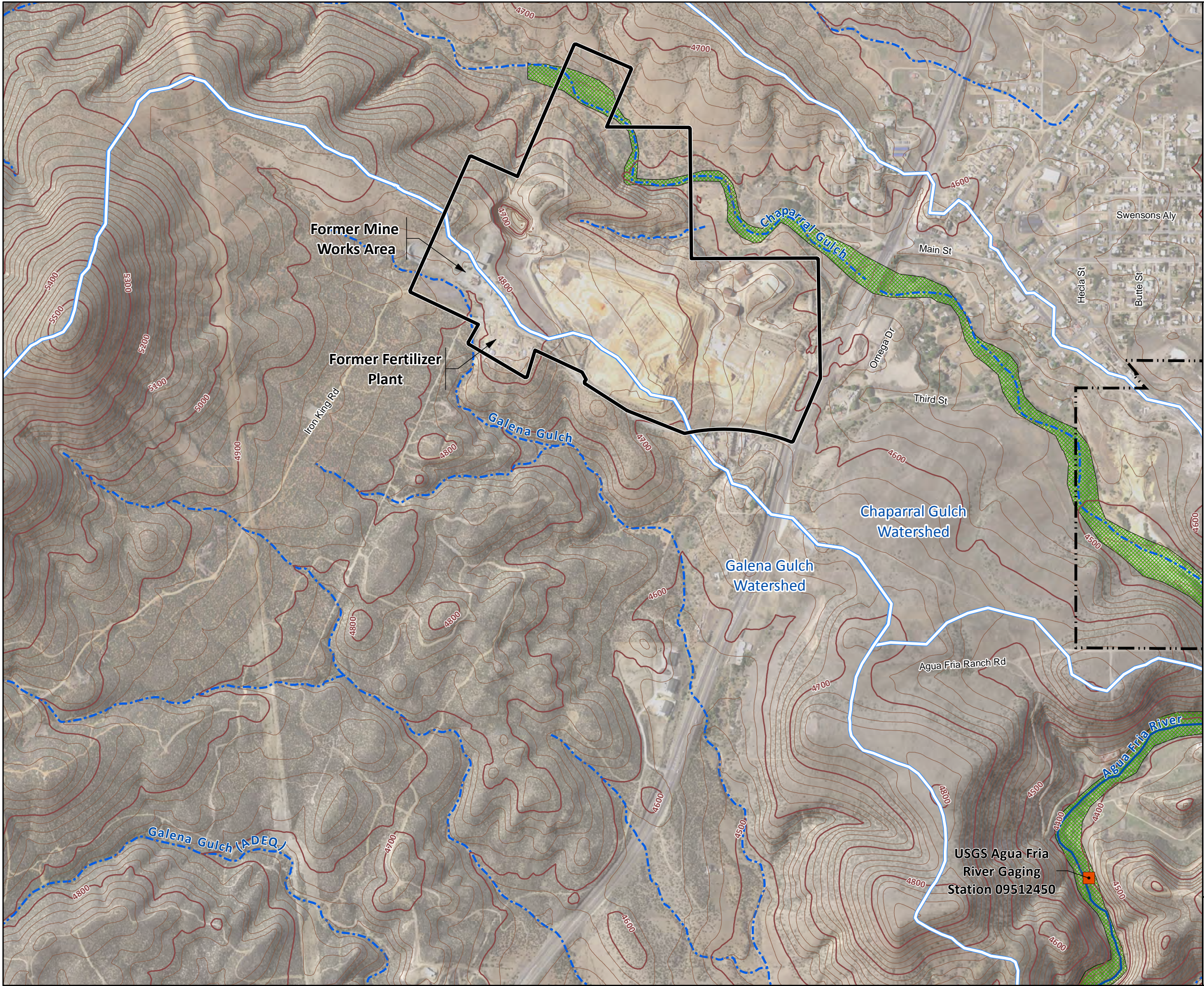
- Zone A or AE
- Zone AE Floodway
- Watershed Boundary
- Former Iron King Mine Property
- Former Humboldt Smelter Property
- Dewey-Humboldt Town Boundary



^a**Zone A or AE:** Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies.
Zone AE Floodway: Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods.

Notes:
 Flood zones from Yavapai County. Received May 8, 2015.
 NAVD88 = North American Vertical Datum of 1988
 Topographic contours and hillshade model derived from USGS National Elevation Dataset (grdn35w113_13), dated 2013. Available at <http://nationalmap.gov/viewer.html>. Accessed April 15, 2015.
 Watershed boundaries from USGS National Geospatial Program, dated May 11, 2015. Available at <http://viewer.nationalmap.gov/viewer.html>. Accessed May 15, 2015.
 Imagery from USDA-FSA Aerial Photography Field Office Ortho Imagery (ortho_1-1_1n_s_az025_2015_1), dated 2015. Available at <https://gdg.sc.gov.usda.gov/Catalog/ProductDescription/NAIPM.html>. Accessed January 26, 2016.

Figure 5-6
Chaparral Gulch Surface Water Features
Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona



LEGEND

- Gage Station
- 20 Foot Topographic Contour (feet NAVD88)
- 100-Foot Topographic Contour (feet NAVD88)
- River
- Intermittent Drainage^a
- 100-Year Flood Plain, Yavapai County Hazard Zone^b**
 - Zone A or AE
 - Watershed Boundary
 - Former Iron King Mine Property
 - Former Humboldt Smelter Property
 - Dewey-Humboldt Town Boundary

Scale in Feet: 0, 1,000, 2,000

^aIn Arizona Department of Environmental Quality (ADEQ) mapping (<https://gisweb.azdeq.gov/arcgis/emaps/?topic=assessed>), the drainage running adjacent to the Iron King Mine property is an unnamed tributary, while the reach identified as Galena Gulch is located to the southwest (ADEQ, 2016). The drainages intersect just upstream of the confluence with the Agua Fria River. The tributary adjacent to Iron King Mine is named Galena Gulch in this RI for consistency with previous documents.

^b**Zone A or AE:** Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies.

Notes:
Flood zones from Yavapai County. Received May 8, 2015.
NAVD88 = North American Vertical Datum of 1988
Topographic contours and hillshade model derived from USGS National Elevation Dataset (grdn35w113_13), dated 2013. Available at <http://nationalmap.gov/viewer.html>. Accessed April 15, 2015.
Watershed boundaries from USGS National Geospatial Program, dated May 11, 2015. Available at <http://viewer.nationalmap.gov/viewer.html>. Accessed May 15, 2015.
Imagery from USDA-FSA Aerial Photography Field Office Ortho Imagery (ortho_1-1_1n_s_az025_2015_1), dated 2015. Available at <https://gdg.sc.gov.usda.gov/Catalog/ProductDescription/NAIPM.html>. Accessed January 26, 2016.

Figure 5-7
Galena Gulch Surface Water Features
Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona

Recent	Tailings	<ul style="list-style-type: none">• <u>Iron King Mine</u> - Pb-rich tailings• <u>Humboldt Smelter</u> - Cu-rich tailings
Quaternary	Fluvial Deposits	<ul style="list-style-type: none">• <u>Channel deposits</u>. Pebbly-sandy silt with some gravel deposits.• <u>Fluvial deposits</u>. Cobbly-pebbly-sandy gravels with a clay matrix. <p style="text-align: center;"><u>Unconformity</u></p>
Tertiary	Hickey Formation	<ul style="list-style-type: none">• <u>Upper</u>: unconsolidated basin fill deposits (i.e. <u>fanglomerates</u>)
		<ul style="list-style-type: none">• <u>Middle</u>: massive to vesicular olivine basalt• mafic tuff_(e.g., ash, cinders and bombs)
		<ul style="list-style-type: none">• <u>Lower</u>: boulder to pebble conglomerate (e.g., basal conglomerate)
<p style="text-align: center;"><u>Angular Unconformity</u> (Up to 500 feet of pre-existing topographic relief with a well-developed regolith that mantles Precambrian Rocks)</p>		
Precambrian	Metavolcanics and Metasediments (Iron King Volcanics and Spud Mtn Series)	<p>Greenschist facies (muscovite-chlorite-calcite mineral assemblage)</p> <ul style="list-style-type: none">• <u>Amygdaloidal andesite flow</u> that is interfingered with tuffaceous sediments (IKV and SMS)• <u>Mafic tuffaceous metasediments</u> with well-developed foliation and relict bedding surfaces (SMS)• <u>Pelitic and tuffaceous metasediments</u> (SMS) <ul style="list-style-type: none">• <u>Granodiorite porphyry</u>• <u>Quartz diorite</u>.• <u>Diorite porphyry</u>• <u>Gabbro-Diorite</u>.

Notes:

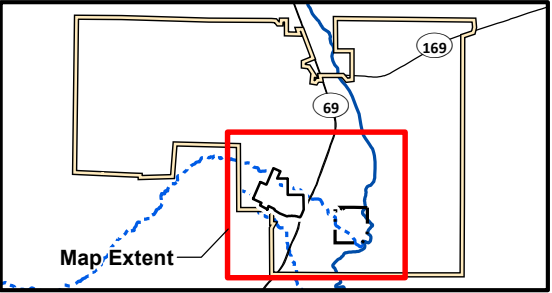
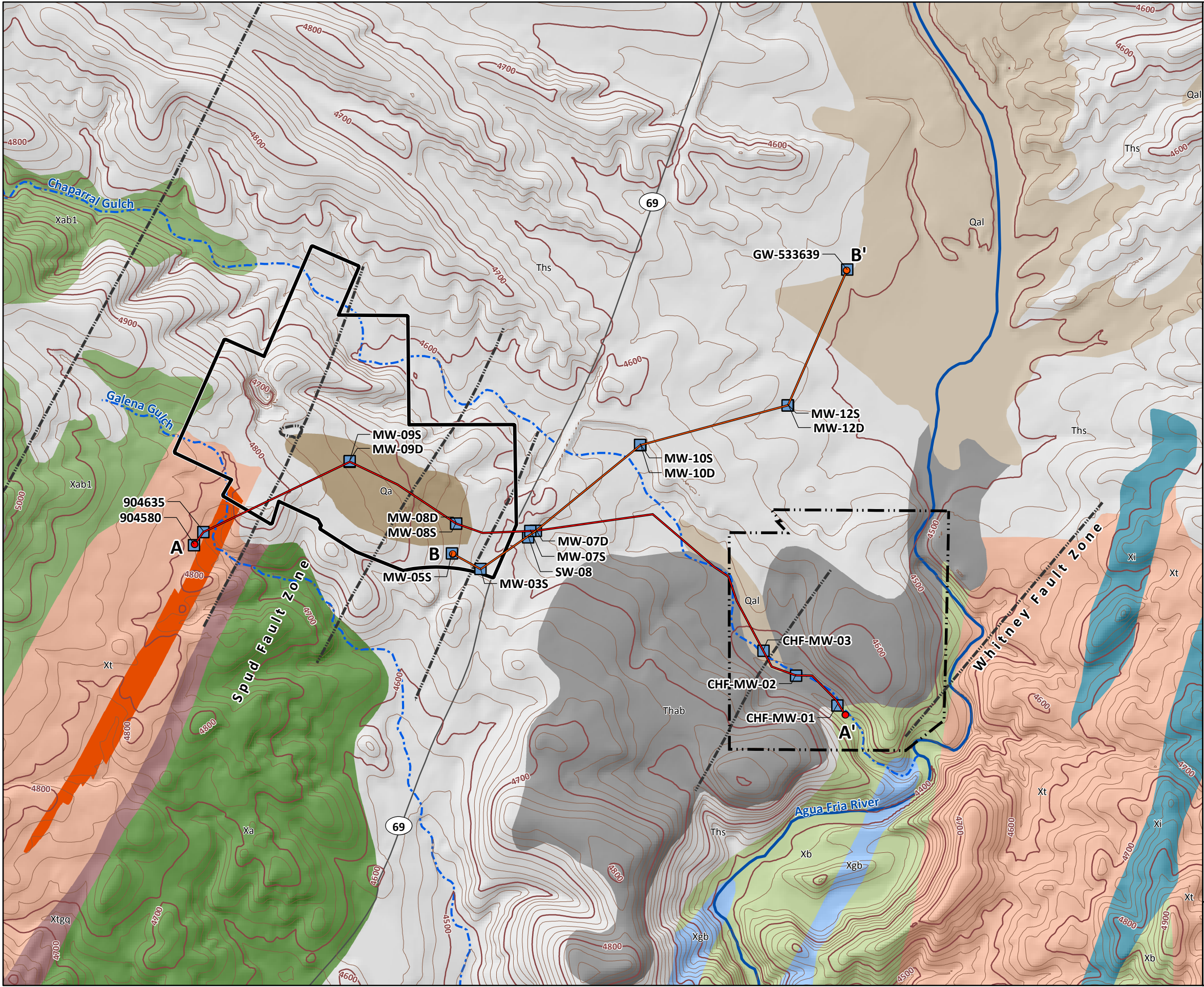
IKV = Iron King Volcanics

SMS = Spud Mountain Series

Modified from Lockheed Martin SERAS, 2015

Figure 5-8
Stratigraphic Column

*Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona*



LEGEND

- Well Location
- A-A' Cross Section Line
- B-B' Cross Section Line
- 100-Foot Topographic Contour (feet NAVD88)
- 20-Foot Topographic Contour (feet NAVD88)
- Fault
- State Route 69
- River
- Intermittent Drainage
- Former Iron King Mine Property
- Former Humboldt Smelter Property
- Dewey-Humboldt Town Boundary

Geologic Data^a

QUATERNARY

- Qa: Artificial fill (OVb)
- Qal: Alluvium (OVb)

TERTIARY

- Thab: Alkali basalt of Hickey Formation (Hbslt)
- Ths: Sedimentary rocks of Hickey Formation (Hunc or Hcgl)

PRECAMBRIAN

Iron King Volcanics (IKV)

- Xa: Metavolcanic rocks (andesitic flows)

Spud Mountain Series (SMS)

- Xab1: Metavolcanic rocks (andesitic basalt breccia) (SMS)
- Xb: Metavolcanic rocks (basaltic flows) (SMS)
- Xgb: Gabbro (SMS)
- Xi: Iron-formation, metachert, and siliceous metavolcanic rocks (SMS)
- Xt: Metatuffaceous, chemically precipitated, and gneissic rocks (SMS)
- Xtgq: Quartzose metasedimentary rocks of Texas Gulch Formation
- Iron King Mine Ore Body

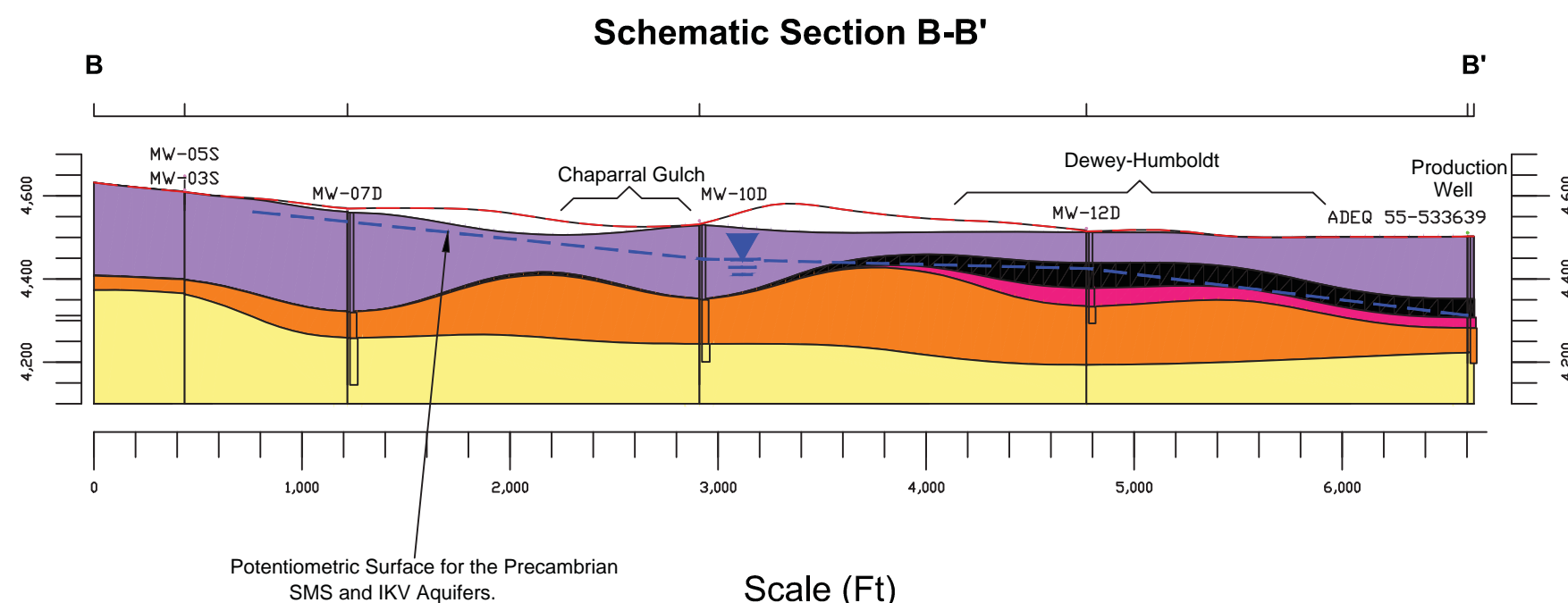
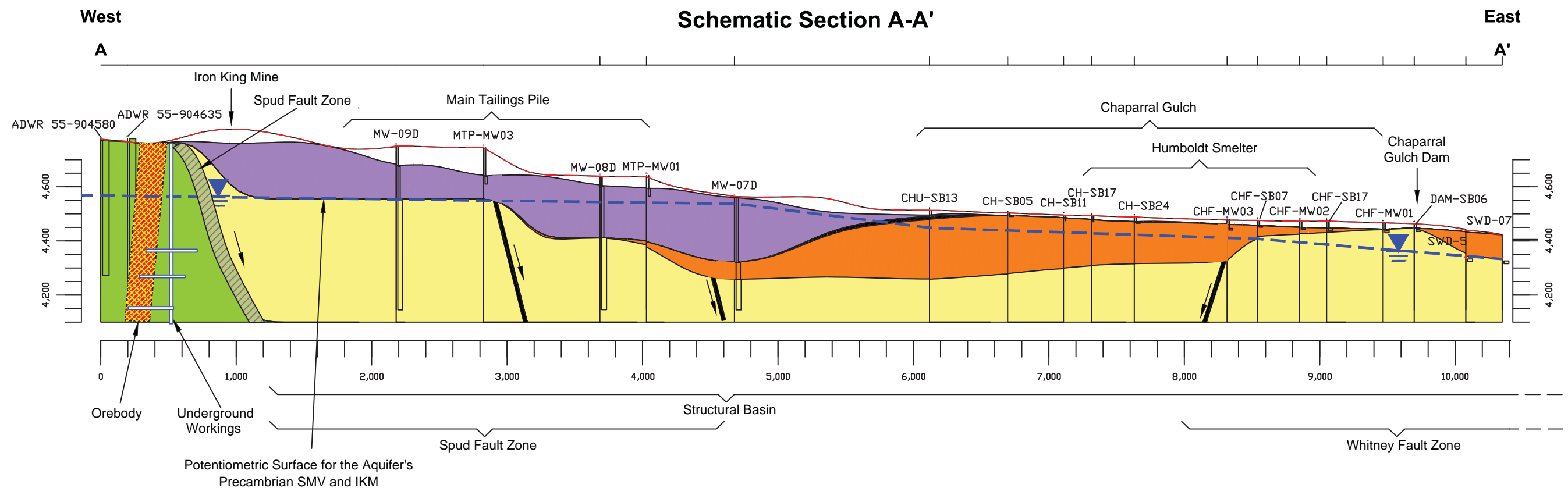
0 1,200 2,400
Scale in Feet

N

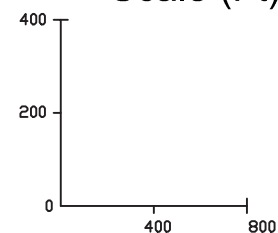
^aGeologic units are further described on Figure 5-8. Sections are presented on Figure 5-10.

Notes:
NAVD88 = North American Vertical Datum of 1988
Geology from USGS, 2008; Iron King Mine Ore Body from Anderson, C.A., and Creasey, S.C., 1958
Tertiary faults from Lockheed Martin SERAS, 2015.
Topographic contours and underlying hillshade model derived from USGS National Elevation Dataset (grdn35w113_13), dated 2013. Available at <http://nationalmap.gov/viewer.html>. Accessed April 15, 2015.

Figure 5-9
Site Geology
Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona



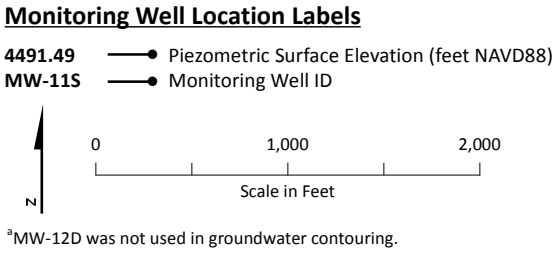
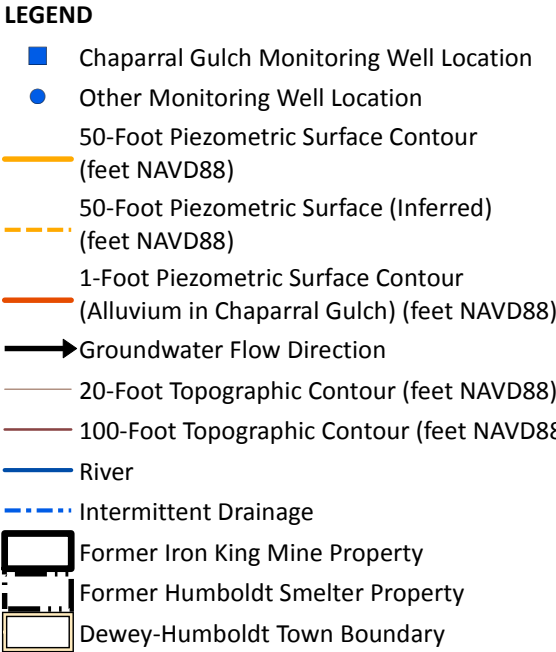
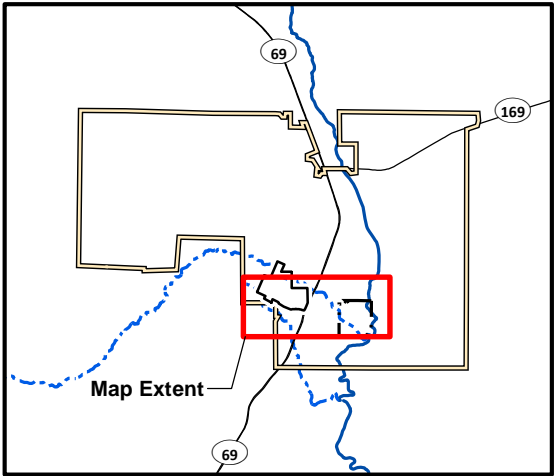
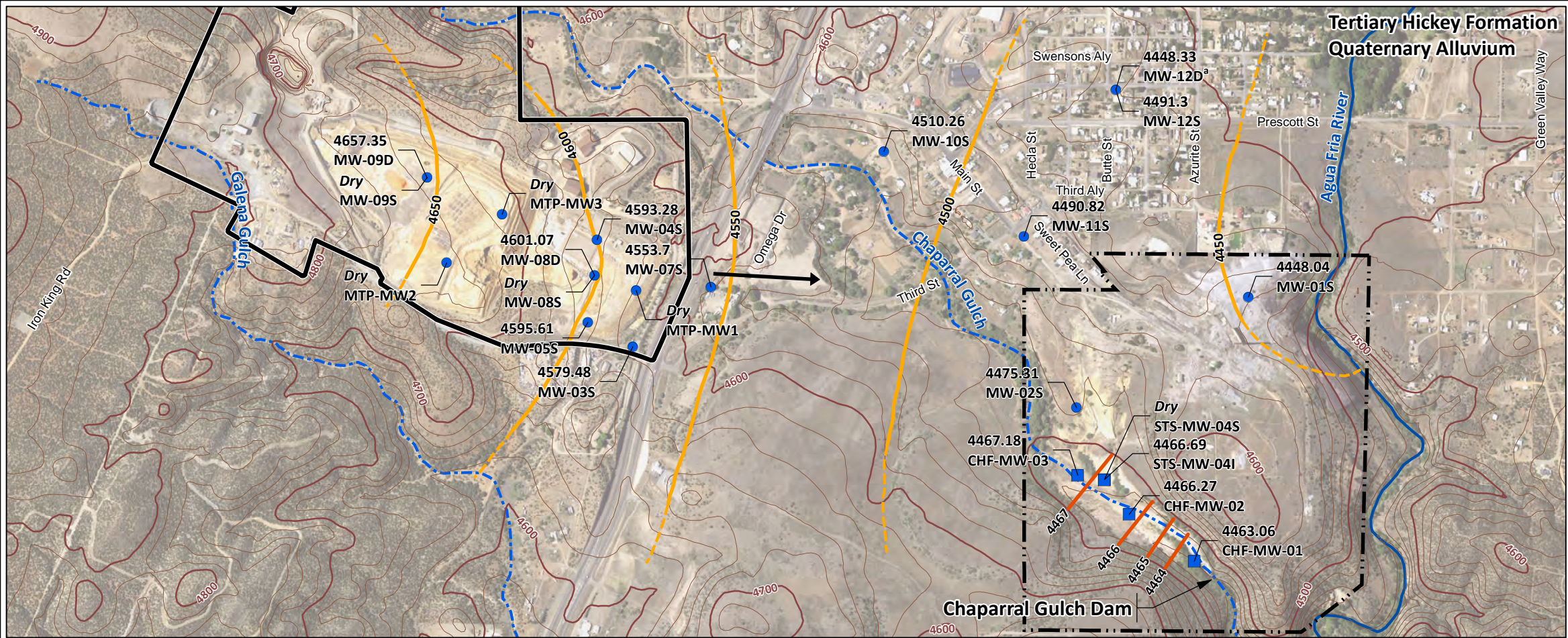
Scale (Ft)



Legend	
Quaternary	<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 10px; border: 1px solid black; background-color: white; margin-right: 5px;"></div> <div>OVB = Overburden (Qa, Qal)</div> </div>
Tertiary	<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 10px; border: 1px solid black; background-color: #cccccc; margin-right: 5px;"></div> <div>Hunc = Hickey Upper Conglomerate (Ths)</div> </div>
	<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 10px; border: 1px solid black; background-color: black; margin-right: 5px;"></div> <div>Hbslt = Basalt (Thab)</div> </div>
	<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 10px; border: 1px solid black; background-color: #ff00ff; margin-right: 5px;"></div> <div>Hash = Hickey Ash/Cinder (Thab)</div> </div>
	<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 10px; border: 1px solid black; background-color: #ff6600; margin-right: 5px;"></div> <div>Hcgl = Hickey Lower Conglomerate (Ths)</div> </div>
Precambrian	<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 10px; border: 1px solid black; background-color: #ffff00; margin-right: 5px;"></div> <div>IKV = Iron King Volcanics (Xa)</div> </div>
	<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 10px; border: 1px solid black; background-color: #00ff00; margin-right: 5px;"></div> <div>SMS = Spud Mountain Series (Xb, Xi, Xit)</div> </div>
<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 10px; border: 1px solid black; background: linear-gradient(to bottom, transparent 49%, blue 49%, blue 51%, transparent 51%); margin-right: 5px;"></div> <div>Groundwater Elevation in the Semiconfined Precambrian Aquifer</div> </div>	

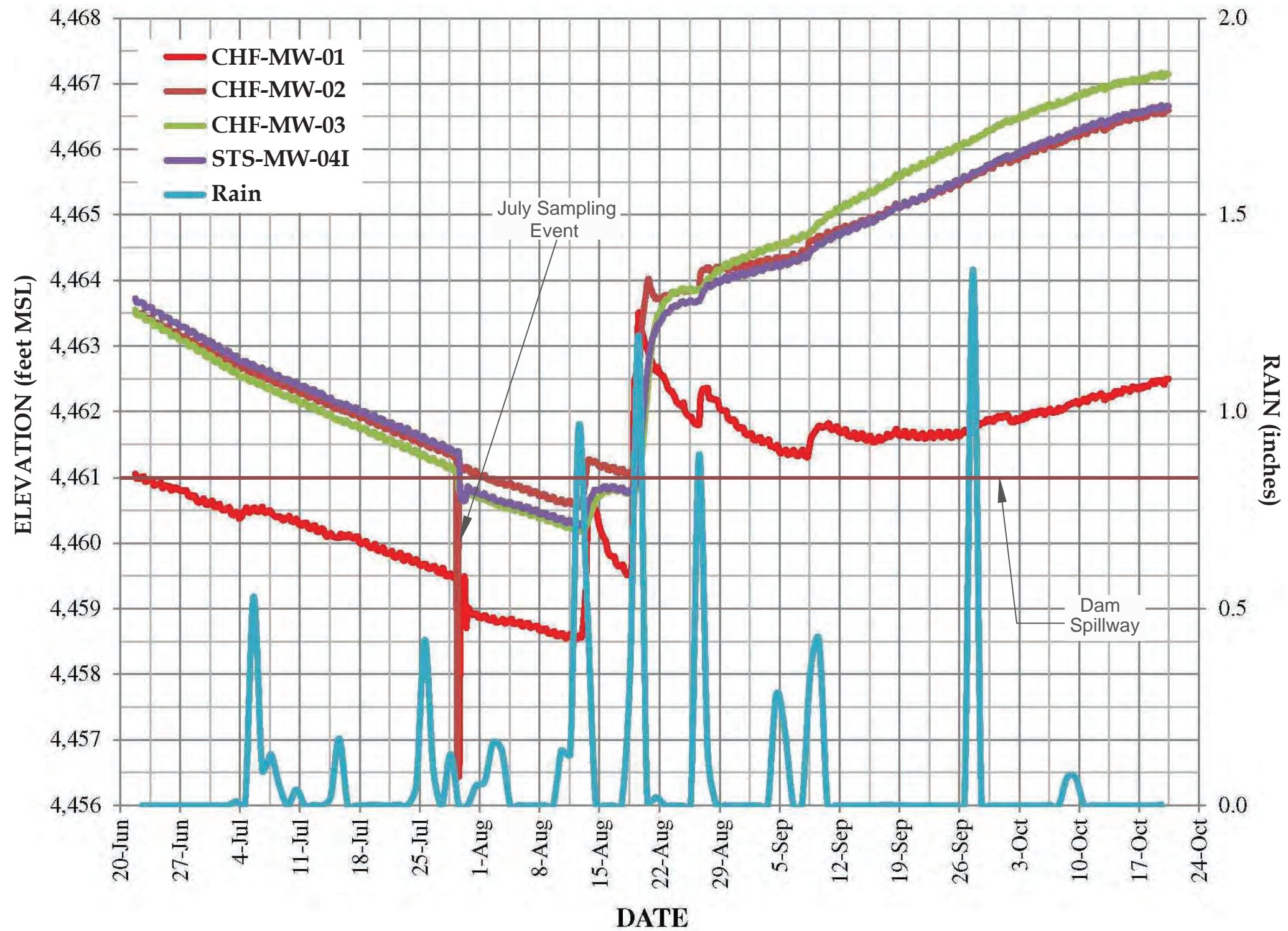
Figure 5-10
Schematic Sections A-A' and B-B'
 Iron King Mine – Humboldt Smelter Superfund Site
 Dewey-Humboldt, Yavapai County, Arizona

Notes:
 Units in Parentheses identified in Site Geology Map (Figure 5-9)
 Figure source: Lockheed Martin SERAS, 2015, with modifications



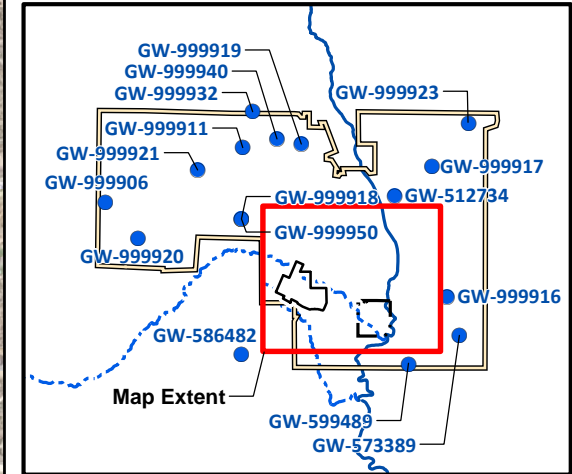
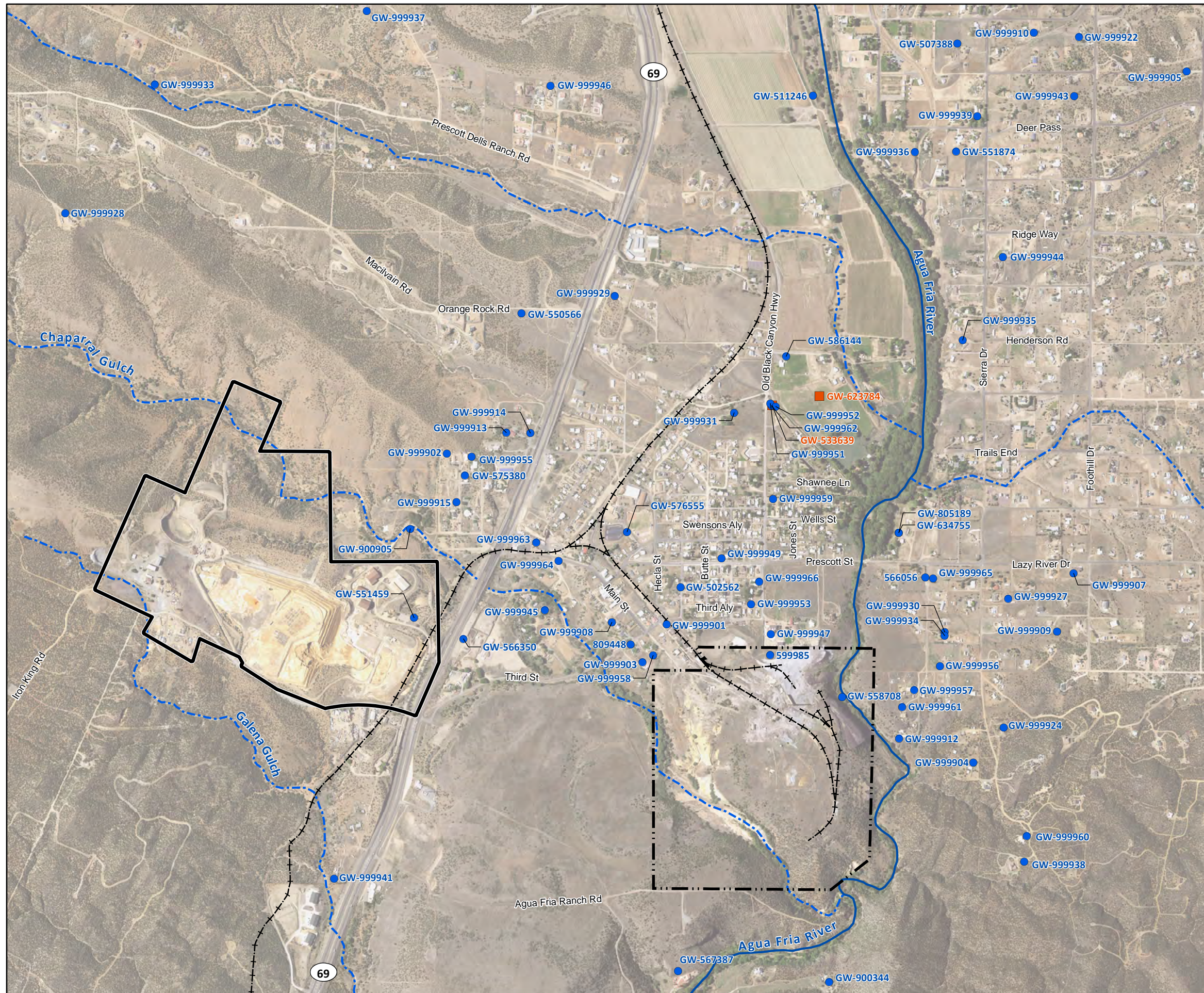
Notes:
NAVD88 = North American Vertical Datum of 1988.
Topographic contours and underlying hillshade model derived from USGS National Elevation Dataset (grdn35w113_13), dated 2013. Available at <http://nationalmap.gov/viewer.html>. Accessed April 15, 2015.
Imagery from USDA-FSA Aerial Photography Field Office Ortho Imagery (ortho_1-1_1n_s_az025_2013_1), dated August 7, 2013. Available at <https://gdg.sc.gov.usda.gov/Catalog/ProductDescription/NAIPM.html>. Accessed November 2, 2015.

Figure 5-11
Piezometric Surface Contours,
October 20, 2014
Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona

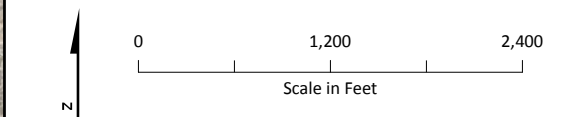


Notes:
Refer to Figure 5-11 for well locations.
Rain data were collected at the Love Field Station, Prescott, Arizona.
MSL = mean sea level.
Figure source: Lockheed Martin SERAS, 2015 with modifications.

Figure 5-12
Chaparral Gulch Groundwater Hydrographs,
June to October 2014
Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona

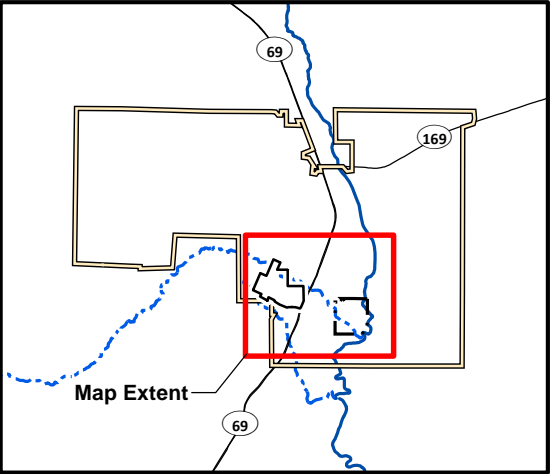
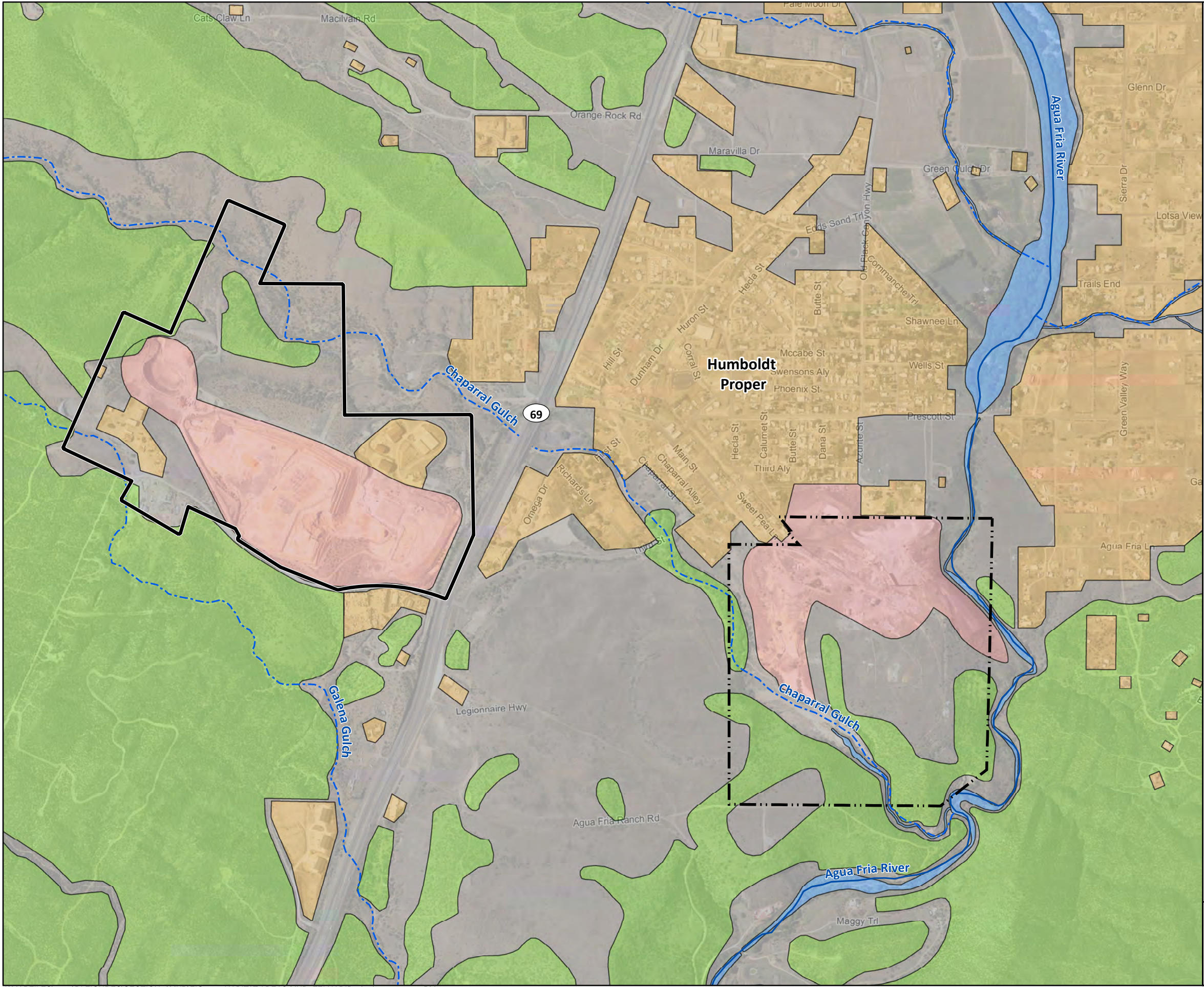


- LEGEND**
- Humboldt Water Company Supply Well
 - Private Supply Well
 - +--+ Historic Rail Line
 - River
 - - - Intermittent Drainage
 - ▭ Former Iron King Mine Property
 - ▭ Former Humboldt Smelter Property
 - ▭ Dewey-Humboldt Town Boundary



Notes:
Groundwater samples were collected from eighteen locations outside of the main map extent. GW-999925 is located over 2 miles south-southwest of the Site, and GW-999926 is located approximately 10 miles south-southeast of the Site. The other sixteen sample locations are shown in the overview inset.
Imagery from USDA-FSA Aerial Photography Field Office Ortho Imagery (ortho_1-1_1n_s_az025_2015_1), dated 2015. Available at <https://gdg.sc.egov.usda.gov/Catalog/ProductDescription/NAIPM.html>. Accessed January 26, 2016.
Underlying hillshade model derived from USGS National Elevation Dataset (grdn35w113_13), dated 2013. Available at <http://nationalmap.gov/viewer.html>. Accessed April 15, 2015.

Figure 5-13
Supply Well Locations
Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona



LEGEND

— River
- - - Intermittent Drainage

Habitat Type

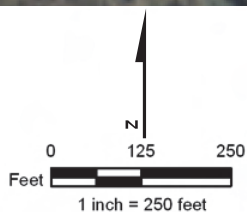
- Chaparral
- Disturbed/Bare Soil
- Residential/Developed
- Riparian
- Semi-Desert Grassland

▭ Former Iron King Mine Property
▭ Former Humboldt Smelter Property
▭ Dewey-Humboldt Town Boundary

0 1,000 2,000
Scale in Feet

Notes:
Habitat areas from SERAS, 2015.
Imagery from USDA-FSA Aerial Photography Field Office Ortho
Imagery (ortho_1-1_1n_s_az025_2015_1), dated 2015.
Available at <https://gdg.sc.egov.usda.gov/Catalog/ProductDescription/NAIPM.html>. Accessed January 26, 2016.

Figure 5-14
Habitat Areas
Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona



Legend

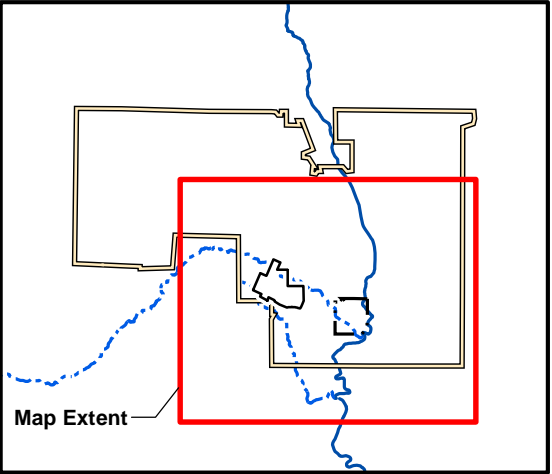
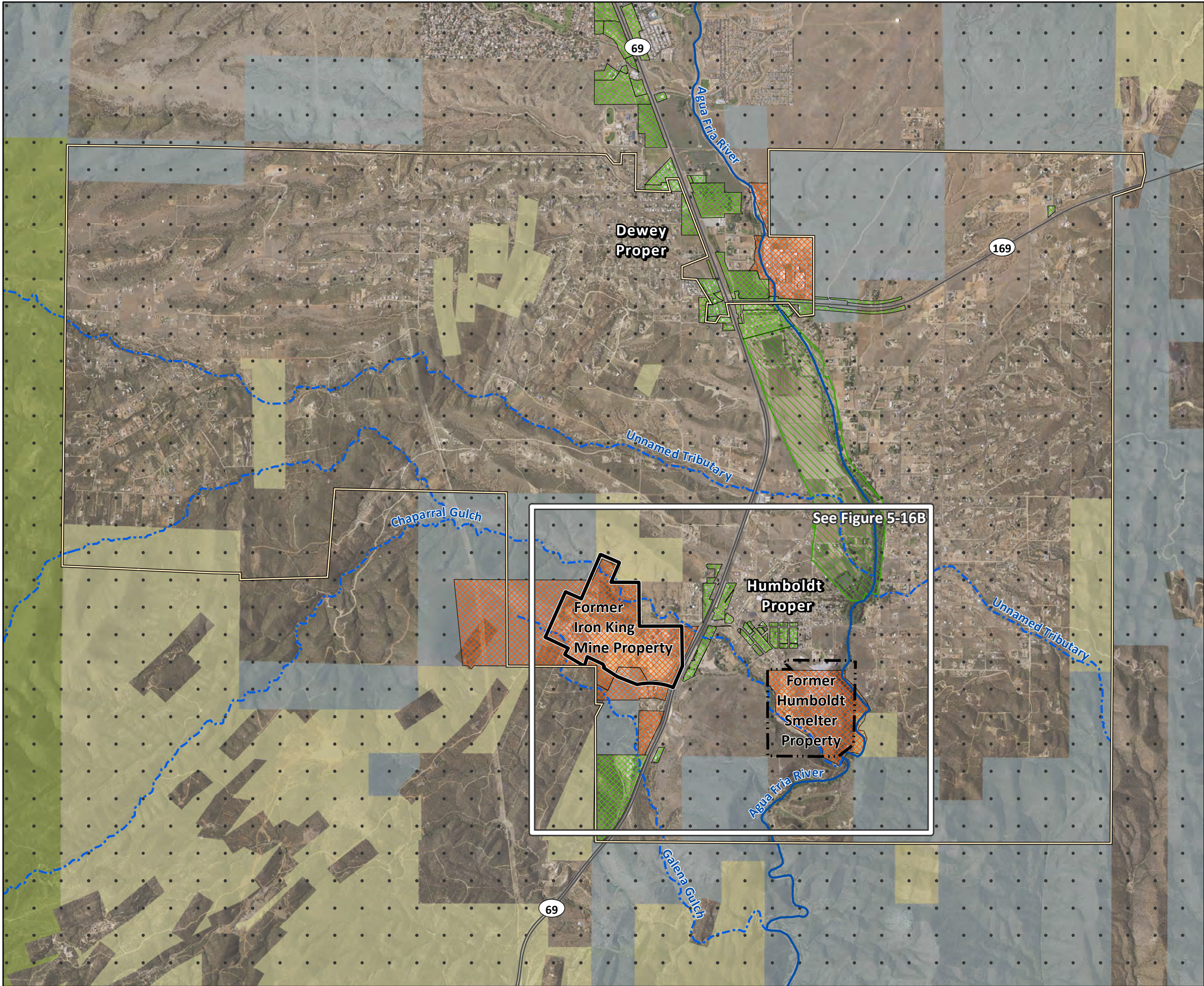
-  Former Humboldt Smelter Property
-  Wetland Boundary
-  Wetland Data Point

Note:

Figure source: WestLand Resources, Inc., 2009 with modifications

Figure 5-15
Wetland Areas

*Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona*



LEGEND

— River
- - - Intermittent Drainage

Land Use Zoning

- Residential^a
- Industrial
- Commercial
- Cropland

Public Land Ownership

- Bureau of Land Management
- State of Arizona
- US Forest Service (Prescott National Forest)

Former Iron King Mine Property
Former Humboldt Smelter Property
Dewey-Humboldt Town Boundary

0 3,000 6,000
Scale in Feet

^aFor the purposes of this figure, areas zoned as planned development, municipal public space (e.g., parks), and rights-of-way are shown as residential.

Notes:
Land use zoning data from Yavapai County. Received January 21, 2016. The source for the extent of Cropland was the Natural Resource Conservation Service Agua Fria River Watershed – Arizona: Rapid Watershed Assessment. (NRCS, 2007). This area is zoned as residential. Public land ownership data from Bureau of Land Management (az_surf_mgmt), dated December 18, 2012. Available at http://www.blm.gov/az/st/en/prog/maps/gis_files.html. Accessed January 27, 2016.
Imagery from USDA-FSA Aerial Photography Field Office Ortho Imagery (ortho_1-1_1n_s_az025_2013_1), dated August 7, 2013. Available at <https://gdg.sc.gov.usda.gov/Catalog/ProductDescription/NAIPM.html>. Accessed November 2, 2015.
Underlying hillshade model derived from USGS National Elevation Dataset (grdn35w113_13), dated 2013. Available at <http://nationalmap.gov/viewer.html>. Accessed April 15, 2015.

Figure 5-16A
Land Use Zoning, Town of Dewey-Humboldt
*Iron King Mine – Humboldt Smelter Superfund Site
Dewey-Humboldt, Yavapai County, Arizona*

