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Trustee of the Multistate Environmental Response Trust
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January 30, 2023

By FedEx and Email — Gary.Spackman@idwr.idaho.gov

Gary Spackman, Director
Idaho Department of Water Resources
322 E Front Street
Boise, ID 83720-0098

Subject: **Petition to Designate an Area of Drilling Concern**
Kerr-McGee Chemical Corp. – Soda Springs Plant Superfund Site, Soda Springs, Idaho

Dear Mr. Spackman:

Greenfield Environmental Multistate Trust LLC, not individually but solely in its representative capacity as Trustee of the Multistate Environmental Response Trust (the Multistate Trust), respectfully submits the enclosed Petition to Designate an Area of Drilling Concern (ADC) for the Kerr-McGee Chemical Corp. – Soda Springs Plant Superfund Site in Soda Springs, Idaho (Site).

As part of the long-term Site risk management, institutional controls (ICs) restricting groundwater usage have been designated as a planned component of the overall Site remedy in accordance with the US Environmental Protection Agency (USEPA) Record of Decision (ROD) (USEPA, 1995) and the ROD Amendment (USEPA, 2000) for the Site. The enclosed petition has been prepared to request the Idaho Department of Water Resources (IDWR) establish an ADC as the specific IC to prevent potential off-Site risk from exposure to contaminated groundwater.

If you have any questions or require additional information, please do not hesitate to contact me at 480-319-3638 or lp@g-etg.com.

Sincerely,

Greenfield Environmental Multistate Trust LLC
Trustee of the Multistate Environmental Response Trust
By: Greenfield Environmental Trust Group, Inc., Member

Lars Peterson, PG, PMP
Senior Project Manager

Enclosure: Petition to Designate an Area of Drilling Concern (7 Hardcopies)

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PETITION TO DESIGNATE AN AREA OF DRILLING CONCERN KMCC SODA SPRINGS SUPERFUND SITE CARIBOU COUNTY, IDAHO

Prepared for:

Greenfield Environmental Multistate Trust LLC
Trustee of the Multistate Environmental Response Trust

Prepared by:
Hydrometrics, Inc.
3020 Bozeman Avenue
Helena, MT 59601

January 2023

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ADC	Area of Drilling Concern
AMSL	Above Mean Sea Level
Anadarko	Anadarko Petroleum Corporation
AOC(s)	Area(s) of Concern
bgs	Below Ground Surface
BLF	Blackfoot Lava Field
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC(s)	Contaminant(s) of Concern
CMT	Continuous Multichannel Tubing
USEPA	U.S. Environmental Protection Agency
°F	Degrees Fahrenheit
FeP	Ferrophosphorus
FFS	Focused Feasibility Study
FS	Feasibility Study
gpm	gallons per minute
ICs	Institutional Control(s)
IDEQ	Idaho Department of Environmental Quality
IDWR	Idaho Department of Water Resources
KMCC	Kerr-McGee Chemical Corporation
LSE	Liquid Source Elimination
LTM	Long-term Monitoring
MCLs	Maximum Contaminant Level(s)
µg/L	Micrograms per Liter
Multistate Trust	Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust
NPL	National Priorities List
PSL(s)	Project Screening Level(s)
RA(s)	Remedial Action(s)
RAOs	Remedial Action Objective(s)
RBPS	Risk-Based Groundwater Performance Standards
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RSLs	Regional Screening Level(s)
S-X Pond	Solvent Extraction Pond
Site	Kerr-McGee Chemical Corp. Soda Springs Plant Superfund Site
SLERA	Screening-Level Ecological Risk Assessment
SRI	Supplemental Remedial Investigation
TBP	Tributyl Phosphate
TCRA	Time-Critical Removal Action
TPH	Total Petroleum Hydrocarbons

Tronox	Tronox Limited
USGS	United States Geological Survey
WRCC	Western Regional Climate Center

1.0 INTRODUCTION

Hydrometrics, Inc. (Hydrometrics), on behalf of Greenfield Environmental Multistate Trust LLC, not individually, but solely in its representative capacity as Trustee of the Multistate Environmental Response Trust (Multistate Trust), has prepared this document to present information in support of a petition to establish an Area of Drilling Concern (ADC) near the City of Soda Springs in Caribou County, Idaho. Groundwater quality in the area has been impacted by contaminant plumes originating from the Kerr-McGee Chemical Corporation (KMCC) Soda Springs Plant Superfund Site in Soda Springs, Idaho (Site). Site-related concentrations of molybdenum and vanadium in groundwater currently exceed U.S. Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) for tapwater in certain areas both on-Site and off-Site (downgradient). Establishment of the Soda Springs ADC in a designated off-Site area is being requested to address potential off-Site human health risk from exposure to concentrations of molybdenum and vanadium exceeding applicable RSLs in groundwater. The ADC petition is being submitted to the Idaho Department of Water Resources (IDWR) and has been prepared in accordance with the relevant provisions of Idaho laws and regulations, including Idaho Code §42-238(15).

1.1 ADC PETITION PURPOSE AND RATIONALE

The ADC described in this petition is proposed as one of the environmental actions to be conducted by the Multistate Trust, as approved by and under the oversight of the U.S. Environmental Protection Agency (USEPA), as Lead Agency for the Site, in consultation with Idaho Department of Environmental Quality (IDEQ), as the Non-Lead Agency. The Multistate Trust's objectives are to ensure that the Site conditions are well-characterized and appropriate actions are taken to protect human health and the environment.

As part of long-term Site risk management, institutional controls (ICs) restricting groundwater usage have been designated as a planned component of the overall Site remedy in accordance with the USEPA Record of Decision (ROD) (USEPA, 1995) and the ROD Amendment (USEPA, 2000) for the Site. For on-Site areas currently owned by the Multistate Trust, groundwater usage is restricted by the fact that the property is Trust-owned and no sale, lease, gift or other disposition of the property is permitted without approval by the USEPA and the State of Idaho. A formal IC to control drilling of wells and groundwater usage for on-Site property in the form of an environmental covenant (Idaho Code §55-3002(4)) is expected to be implemented following approval of a new ROD Amendment for the Site, when revised groundwater cleanup levels are finalized. The process for developing and issuing a ROD Amendment for the Site is underway with completion expected in 2022 or early 2023.

For off-Site areas impacted by groundwater contaminant plumes, the proposed ADC has been identified as the most appropriate form of IC available, to address potential off-Site risk from exposure to groundwater. The establishment of an ADC is described as follows in Idaho Code §42-238(15):

(15) Drilling in a designated "area of drilling concern." The director of the department of water resources may designate, as he determines necessary, "areas of drilling concern" on an aquifer-by-aquifer basis within which drillers must comply with the additional requirements of this section. The director shall designate "areas of drilling concern" to protect public health and to prevent waste or contamination of ground or surface water because of factors such as aquifer pressure, vertical depth of the aquifer, warm or hot ground water, or contaminated ground or surface waters. It is unlawful for any person not meeting the requirements of this subsection to drill a well for any purpose in a designated "area of drilling concern." Any person drilling a new well or deepening or modifying an existing well for any purpose in an "area of drilling concern" as designated by the director as herein provided shall comply with the following additional requirements:

(a) Additional bonding requirements, as determined by the director, to ensure that the well is constructed or abandoned in compliance with the adopted standards for well construction.
(b) Additional experience and knowledge in drilling wells encountering warm water or pressurized aquifers as required by rules adopted by the water resource board.
(c) Document that specialized equipment needed to drill wells in "areas of drilling concern," as determined by the director, is or will be available to the driller.
(d) Provide a notice of intent to drill, deepen or modify a well; submit plans and specifications for the well and a description of the drilling methods that will be used, as required by the director; and receive the written approval of the director before commencing to drill, deepen, or modify any well in a designated "area of drilling concern."

Prior to designating an "area of drilling concern," the director shall conduct a public hearing in or near the area to determine the public interest concerning the designation. Notice of the hearing shall be published in two (2) consecutive weekly issues of a newspaper of general circulation in the area prior to the date set for hearing.

In the event an area has been designated as an "area of drilling concern" and the director of the department of water resources desires to remove such designation or modify the boundaries thereof, he shall likewise conduct a public hearing following similar publication of notice prior to taking such action.

Based on the results of the extensive investigations, remedial actions, and monitoring activities conducted at the Site over the last several decades and described in this petition, designation of the Soda Springs ADC is warranted under Idaho Code §42-238(15) to “protect public health” due to “contaminated ground or surface waters.” As outlined in the statute, a public hearing to determine public interest and to receive comments regarding the proposed ADC would be required prior to designation of the ADC by IDWR.

1.2 ADC PETITION ORGANIZATION

The ADC petition includes the following sections:

- Section 1: Introduction – general information, purpose and rationale for establishment of an ADC at the Site, and ADC petition organization.

- Section 2: Site History and Setting – operational and regulatory history of the Site, along with a description of the physical setting of the Site and the proposed ADC (geography, geology, and water resources).
- Section 3: Site Investigations and Remedial Actions – overview of previous Site investigations, activities, and remedial actions.
- Section 4: Current Site Conditions – summary of the groundwater conceptual site model for the Site and the proposed ADC, current groundwater contaminant plume status for molybdenum and vanadium, and current status of ICs.
- Section 5: Proposed Area of Drilling Concern – description of the geographic limits (lateral and vertical extent) of the proposed ADC, discussion of water supply issues within the proposed ADC, and delineation of proposed restrictions to be implemented in the ADC.
- Section 6: References.
- Tables (including Historical Tables), Figures (including Historical Figures), and Appendices (located at the end of the document).

The Site history and conditions described in Sections 2 through 4 are drawn largely from multiple previous reports, most notably the Supplemental Remedial Investigation (SRI) (Haley & Aldrich, 2019a), the Draft Focused Feasibility Study (FFS) (Pioneer, 2022), and the 2021 Long-Term Monitoring Report (Hydrometrics, 2022). Tables and figures referenced from previous reports are cited using the table and figure numbers from the original report and are included in the Historical Tables and Historical Figures sections.

2.0 SITE HISTORY AND SETTING

The KMCC Site consists of approximately 547 acres located east of Highway 34 in Caribou County, north of the City of Soda Springs, Idaho (Figure 2-1), in an area zoned for industrial use. The Site is bordered by industrial and agricultural land to the north and agricultural land to the east, the former Evergreen Facility and agricultural land to the south, and the Bayer (formerly Monsanto) Corporation phosphate processing plant across Highway 34 to the west. Chemical manufacturing began at the Site in 1963 and continued until 2009. The facility was owned and operated by KMCC to produce vanadium. Secondary by-products such as fertilizer and cathode materials for lithium-manganese batteries were also produced between 1997 and 2009.

Through a multi-step scheme executed between 2002 and 2006, and seeking to evade its debts, KMCC fraudulently conveyed its valuable oil and gas assets into a new corporate entity. The environmental liabilities—including for cleanup of the Site and hundreds of other contaminated properties—were left behind in the old company, which was renamed Tronox Incorporated (Tronox). Undercapitalized and unable to pay for, among other things, environmental cleanup of the Site, Tronox filed for bankruptcy in 2009. The U.S. Bankruptcy Court for the Southern District of New York approved a 2011 settlement agreement with the United States, twenty-two state governments, certain local governments, and the Navajo Nation, resolving Tronox's liability for environmental cleanup of the contaminated Tronox/KMCC properties (Settlement Agreement). Under the Settlement Agreement, the Multistate Trust was established to, among other things, own and clean up the Site and hundreds of other sites, receiving limited funds to address only the most pressing environmental actions. A subsequent settlement agreement approved by the Bankruptcy Court in 2014, resolved the United States' claims for fraudulent conveyance against KMCC, certain KMCC affiliates, and KMCC's parent company, Anadarko Petroleum Corporation (Anadarko Litigation Settlement). Under the Anadarko Litigation Settlement, the Multistate Trust received additional funds between 2015 and 2016, allowing the Multistate Trust to implement multiple environmental actions at the Site, as described below in Section 3.0.

2.1 OPERATIONAL AND REGULATORY HISTORY

The Site was operated by KMCC as a vanadium production facility from 1963 to 1999. The production of vanadium involved the concentration of ferrophosphorus (FeP) ore purchased from Monsanto and FMC Industries (Dames & Moore, 1995). The FeP ore, recovered as a smelter slag by-product from the refinement of phosphate from Permian-age Phosphoria formation host rock, was mined in surficial outcrops west of Soda Springs (Haley & Aldrich, 2019a). The Phosphoria-derived FeP slag had elevated concentrations (and in some cases economically recoverable concentrations) of minerals containing arsenic, cadmium, chromium, fluoride, manganese, molybdenum, selenium, silver, strontium, tellurium, vanadium, and zinc. The crushed FeP ore was combined with limestone, salt, soda ash and catalyst, and then roasted to convert the vanadium-bearing mineral (along with other minerals) to a water-soluble form (Pioneer, 2022). Leaching and precipitation processes produced vanadium and fertilizer products.

Supplemental Remedial Investigation (SRI; Haley & Aldrich, 2019a) Figure 1-3 (see Historical Figures) shows significant former Site features, including lined and unlined ponds, landfills, and industrial plants. Spent solids from the vanadium refinement process were sluiced to one of two unlined calcine tailings repository ponds. Tailings were discharged to the West Calcine Repository from 1963-1973 and the East Calcine Repository from 1973-1999. Water management at the Site evolved over time; sixteen surface water ponds, both lined and unlined, were used for settlement, solvent extraction (S-X) raffinate, tailings storage, product storage, and storm water retention. In addition to direct leaching from the calcine repositories and infiltration from unlined ponds, at least three sudden containment failures were documented between 1981 and 1989, resulting in uncontrolled releases totaling 3.25 million gallons of liquid process water and wastewater to groundwater.

After a site investigation in April 1988, the Site was placed on the National Priorities List (NPL) in 1989, under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). A Remedial Investigation (RI) and Feasibility Study (FS) were completed by KMCC in 1995, focusing on the non-operational portions of the Site. The ROD for the Site was issued in 1995 (USEPA, 1995) and a Consent Decree that required KMCC to implement the remedy was entered in 1997. The selected remedy included remedial actions for groundwater, roaster reject, and windblown calcine. The remedy selected for groundwater included elimination of uncontrolled liquid discharges from the Site (the main source of groundwater impacts), recycling of solid sources (later amended to capping in place), groundwater monitoring, and ICs. KMCC also constructed the East and West 5-Acre Ponds and the 10-Acre Pond in 1996 and 1997 as part of the remedial actions (RAs) for the Site (SRI Figure 1-3; see Historical Figures). The Fertilizer Plant was constructed by KMCC in 1997 to reuse calcine tailings from the Vanadium Plant, but the operation was not viable. The USEPA issued a ROD Amendment in 2000 (USEPA, 2000) requiring KMCC to cap the calcine tailings and roaster rejects rather than continue reuse/recycling of the materials as required by the 1995 selected remedy. The 2000 ROD Amendment also retained several remedy components from the 1995 ROD, including (1) the establishment of ICs in off-Site areas to prevent ingestion of contaminated groundwater, and (2) continued groundwater monitoring.

Twenty buildings and approximately twelve miscellaneous facility components and operating areas were present on the Site until demolition of all but two buildings in 2018 (SRI Figure 1-3; see Historical Figures). The Site is currently vacant, except for two remaining Site buildings and existing waste repositories. Future use of the Site is expected to be industrial. Site-related semiannual or annual groundwater and surface water long-term monitoring (LTM) has been conducted since completion of the original RI, from 1995 to the present (Hydrometrics, 2022).

2.2 PHYSICAL SETTING

The Site is located approximately 1.5 miles north of Soda Springs (Figure 2-1). The Site gently slopes toward the west and is mainly covered by unconsolidated materials with some basaltic rock exposures that protrude through surficial soil. This gentle slope is disturbed by a large fault scarp on the western border of the Site.

2.2.1 Geography and Surface Features

The Site is in the southern part of the Blackfoot Lava Field (BLF) and is bordered by northwest-trending mountain ranges, including the Soda Springs Hills and Chesterfield Range to the west and the Aspen Range east of the Site (SRI Figure 3-1; see Historical Figures). Topographic relief in the region ranges from elevations greater than 8,000 feet above mean sea level (AMSL) in the surrounding mountains to 5,500 feet AMSL in the valley along the Bear River. At the Site, elevations range from 5,960 to 6,020 feet AMSL.

2.2.2 Climate

Based on data for the Soda Springs Airport from 1978 through 2012 from the Western Regional Climate Center (WRCC) (https://wrcc.dri.edu/summary/Climsmsid.html), the average annual high temperature in the area is 55.8 degrees Fahrenheit (°F), average annual low temperature is 26.4 °F, and average annual precipitation is 15.6 inches, with most precipitation occurring between March and June (Hydrometrics, 2022). The prevailing wind direction is predominantly from the southeast based on windrose data from the Allen H. Tigert Airport.

2.2.3 Geology

The subsurface geology underlying and in the vicinity of the Site is heterogenous, comprising 1 to 57 feet of overburden material and up to seven basalt flow sequences of the mid-Pleistocene Blackfoot Basalt, an approximately 230-foot-thick sequence of basalts separated by numerous discontinuous sedimentary interbeds deposited during temporal breaks in volcanic eruptive cycles (Haley & Aldrich, 2019a). Basalts range from extremely vesicular to massive and are fractured and jointed at many locations. The basalt flows range in thickness from 12 to 52 feet, with basalt flow zones separated by interbeds of silt, clay, and cinder material ranging from several inches to more than 26 feet thick.

Where present, surficial deposits are primarily clays and silts with lesser amounts of sands and gravels. Logs from wells and soil borings list those materials as brown silt to silty clay, low plasticity, and stiff, grading to brown fine sandy silt, non-plastic, and loose. The shallow materials represent a combination of wind-deposited loess, stream-deposited alluvium, non-native fill material, and weathered basalt (Haley & Aldrich, 2019a).

The Tertiary Salt Lake Formation unconformably underlies the Blackfoot Basalt (RI Figures 3-4 and 3-5; see Historical Figures). The Salt Lake Formation comprises much of the hills east and south of Soda Springs, including Rabbit Mountain and the lower hills south of the Bear River in the northern end of the Bear River Range (Dames and Moore, 1992). The Salt Lake Formation is of unknown thickness and consists of tuffaceous sandstone, conglomerates, and limestone. The Salt Lake Formation unconformably overlies Permian and Carboniferous rocks.

Faulting in the area occurs primarily as normal faults dipping to the west and striking generally from north to south, with several minor faults striking northeast to southwest, as well as northwest to southeast. Normal faulting along the western border of the Site has created the "Western Graben feature" (SRI Figure 3-5; see Historical Figures), a north-south-trending, down-dropped block. Faults along the Western Graben feature have displaced strata by up to 200 feet vertically. The Western Graben feature's eastern edge is a scarp associated with the Finch Spring Fault that borders the western edge of the Site.

2.2.4 Surface Water Resources

Surface water in the vicinity of the Site is hydraulically interconnected to groundwater and includes Formation Spring (north of the Site), Finch Spring, Ledger Creek (partially ephemeral and originating from several springs east of the Site), and Big Spring and the Bear River (south of Soda Springs) (Figure 2-1). The Ledger Creek drainage south of the Site is comprised of a marshy area that includes multiple seeps and springs, indicating shallow groundwater discharge to the creek drainage. Numerous springs and seeps in the area south of the Site along the Western Graben occur due to the exposure of saturated Blackfoot Basalt layers along the fault scarp bounding the eastern side of the graben. Finch Spring has shown historical water quality consistent with Site impacts, suggesting a hydraulic connection between groundwater beneath the Site and Finch Spring. Further south, Big Spring flows into Big Spring Creek and the Bear River; this spring has also shown detections of some Site contaminants of concern (COCs), indicating migration from the Site and/or other industrial or waste disposal locations to the spring (Haley & Aldrich, 2019a).

The City of Soda Springs drinking water system receives input from six springs: Formation Spring (north of the Site), Spring A, Lower Ledger, Spring 2, Spring 4, and Upper Ledger (Figure 2-1). These locations are routinely sampled as part of the Site LTM program. Monitoring results have shown that concentrations of Site-related constituents in the springs used for City drinking water supply are below regulatory standards and health advisory levels and are expected to remain below these levels (Hydrometrics, 2022).

2.2.5 Regional and Local Hydrogeology

The Blackfoot Basalt, extending from the Blackfoot Reservoir to the Bear River south of Soda Springs, is the principal regional water-bearing formation. Dion (1974) reported that the Blackfoot Basalt "varies locally from a very productive aquifer to only a fair aquifer," citing yields of 200 to 3,500 gallons per minute (gpm). The Blackfoot Basalt consists of an upper unconfined freshwater surficial aquifer in the upper basalt flows and scoria layers and a multi-layered carbonate-rich aquifer semi-confined by the lower basalt flows and scoria cones. Groundwater at and downgradient of the Site exists predominantly within these basalt sequences, composing an interconnected fractured network groundwater system throughout the Blackfoot Basalt (Haley & Aldrich, 2019a).

Depths to groundwater within the basalt layers generally range from 25 to 65 feet bgs beneath the former industrial portion of the Site (Haley & Aldrich, 2019a). Across the complete groundwater monitoring area, from the Site southward through the city of Soda Springs to the Bear River, measured depths to groundwater range from about 1 to 79 feet below the well measuring points (measuring points are typically located 0-3 feet above the ground surface). For example, the 2021 Long-Term Monitoring Report (Hydrometrics, 2022) included measured depths to groundwater of 1.68 to 78.48 feet below the measuring point for the October 2021 monitoring event. An area of thin saturated alluvium overlies the basalt in the eastern part of the Site where the elevation of the basalt/alluvium contact falls below the elevation of the water table. The area of saturated alluvium appears to be limited to the east side of the Site. Water quality data, aquifer test data, and potentiometric surface elevations of wells screened at varying depths within different interbedded layers indicate the entire thickness of saturated basalt is in relatively good vertical hydraulic connection throughout the Site and the downgradient area. The primary permeability of competent, massive basalt is small, and most groundwater in the Blackfoot Basalt aquifer is transmitted along (1) scoria and rubble zones that bound individual basalt flows and (2) secondary features such as joints, faults, or fractures. The presence of high angle fractures and the observed silt-filled vesicles in the basalt indicate preferential pathways exist for groundwater transport between the interbedded layers (Haley & Aldrich, 2019a).

The Salt Lake Formation, tuffaceous sandstones, conglomerates, and limestones underlying the Blackfoot Basalt in the vicinity of the Site, is described as white or light-colored, with the conglomerate consisting of a white, relatively soft, loose-textured, and calcareous matrix (Seitz and Norvitch, 1979). Dion (1969) noted the following regarding the water-bearing characteristics of the Salt Lake formation: “Even though many of the water wells drilled into the Salt Lake Formation have not yielded water, drillers’ logs indicate that those wells that did prove successful, yield as much as 1,800 gpm from beds of sandstone and conglomerate. Many of the wells reportedly drilled into the alluvium near the margins of the major valleys and in smaller tributary valleys may have penetrated, and may be obtaining water from, the underlying Salt Lake Formation.” Seitz and Norvitch (1979) noted that “[m]ost wells completed in the Salt Lake Formation, composed of limestone, sandstone, tuff, and conglomerate, will yield some water, although many drilling attempts have resulted in dry holes.” Dames & Moore (1992) conducted a packer test in fractured quartzite, sandstone, and clay of the Salt Lake Formation as part of the RI conducted at the Bayer/Monsanto facility and reported a hydraulic conductivity of 2.7×10^{-4} cm/sec, within the same range as the hydraulic conductivities estimated for some (deeper) massive Blackfoot Basalt layers. The Salt Lake Formation is of unknown thickness in the vicinity of the Site; test borings and wells installed during the 2018 SRI effort encountered the Salt Lake at depths ranging from about 202 to more than 275 feet bgs (Haley & Aldrich, 2019a).

A water table potentiometric surface map for the shallow basalt aquifer from the Site to the City of Soda Springs is shown on SRI Figure 3-10 (see Historical Figures). Although a westerly direction of groundwater flow is implied by the potentiometric isocontours on SRI Figure 3-10 (see Historical Figures). Groundwater flow indicated by observations of dissolved COC transport in groundwater from the Site is to the south-southwest, as determined by subsurface mapping of the dissolved COC plumes originating on-Site and flowing south-southwest toward the City of Soda Springs. Groundwater transport of Site-related COCs is significantly influenced by anisotropic control attributable to the north-south orientation of faults and fractures at the Site. The observed groundwater flow direction indicated by dissolved phase COC plume mapping through the Site toward Soda Springs is represented on SRI Figure 3-10 by large arrows (see Historical Figures).

Groundwater beneath the Site currently flows generally horizontally to the south-southwest. Downward flow of groundwater and vertical migration of dissolved COCs, however, occurred in the past at the Site during the period of active Site industrial operations, when pumping of a water supply well and leakage of water from unlined process water impoundments contributed to the downward migration of

COC-bearing groundwater. Review of historical datasets indicate that groundwater flow paths have been consistent for decades since Site closure (Haley & Aldrich, 2019).

The permeability and hydraulic conductivity of the shallow basalt aquifer is highly variable. Unfractured, massive basalt flows are nearly impermeable, whereas rubble and scoria zones bounding flows and fractured basalt are quite permeable. Hydraulic conductivity values as high as 340 feet per day were measured in hydraulic tests performed in fractured basalt flows, and groundwater velocities as high as 600 ft/day were measured near the Western Graben (Haley & Aldrich, 2019).

3.0 SITE INVESTIGATIONS AND REMEDIAL ACTIONS

Numerous investigations and remedial actions have been conducted at the KMCC Soda Springs Plant Superfund Site. A chronological listing of key events is provided in FFS Table 1 (see Historical Tables). This section summarizes the major investigations performed, the primary findings and conclusions of these investigations, and the remedial activities undertaken to date at the Site.

3.1 1995 REMEDIAL INVESTIGATION AND RECORD OF DECISION

KMCC conducted a Remedial Investigation at the Site under USEPA oversight from 1991 to 1994, collecting and analyzing air, soil, wastewater, sediment, and groundwater samples (Dames & Moore, 1995). The 1993 human health risk assessment (Science Applications International Corporation, 1993), submitted as Volume 4 of the 1995 RI, demonstrated that the primary exposure route of concern was ingestion of groundwater. The RI concluded the following:

- Air was not a major pathway for exposure.
- Soil contamination was confined to areas near the calcine tailings.
- Metals leaching from solid sources contributed to metals concentrations in groundwater.
- The most significant source of contaminants of concern (COCs) in groundwater was leakage from on-Site ponds.
- The primary chemical transport mechanisms for groundwater were advection and preferential flow through faults and fractures.
- Municipal drinking water was not contaminated by Site operations; however, off-Site groundwater west and southwest of the Site was impacted by Site COCs, and groundwater to surface water impacts (elevated molybdenum concentrations) were observed in Finch Spring and Big Spring.
- On-site exposure risks were not significantly higher than background. Exposure risks could be higher if contaminated solid sources were ingested, or off-Site contaminated groundwater was consumed.
- Ecological risks were estimated to be minimal, but follow-up investigations were ongoing at the time of the RI.

The 1995 ROD for the Site (USEPA, 1995) listed the Site COCs as arsenic, manganese, molybdenum, total petroleum hydrocarbons (TPH), tributyl phosphate (TBP), and vanadium. The remedy selected in the 1995 ROD included the following:

- Elimination of uncontrolled liquid discharges from the Site by replacing unlined ponds with lined ponds (referred to as “Liquid Source Elimination” or LSE);
- Excavation and reuse/recycling of buried calcine tailings (by using calcine to manufacture fertilizer on Site for an eight-year period);
- Excavation and disposal of S-X Pond and Scrubber Pond solids into lined ponds on-Site and placement of solids from the ponds into an on-Site landfill;
- In-place capping or excavation and disposal of windblown calcine and roaster reject material;
- Semi-annual groundwater monitoring to evaluate the effectiveness of source control measures in achieving groundwater project screening levels (PSLs); and

- Inauguration of institutional controls (ICs) for off-Site areas to prevent exposure to groundwater for as long as the groundwater exceeds the PSLs.

3.2 2000 RECORD OF DECISION AMENDMENT

The USEPA issued a ROD Amendment in 2000 requiring KMCC to cap the calcine tailings and roaster rejects rather than continue reuse/recycling of the materials as required by the 1995 ROD. In-place capping was combined with ICs to restrict land use. Additional RA following the 2000 ROD Amendment included the following (Pioneer, 2022):

- In 2001, a cap was installed at the East Calcine Repository over the windblown calcine, roaster reject, reject fertilizer, and active calcine tailings. Infiltration galleries were constructed for the East Calcine Repository (north side in 2002 and south side in 2004).
- The Vanadium Plant was demolished in 2002, and the Fertilizer Plant was demolished in 2003.
- Storm water runoff ponds 4 and 5 were reclaimed in 2003. The East and West 5-Acre Ponds were reclaimed, and the contents, excluding liners, were placed in the 10-Acre Pond in 2004.
- The Multistate Trust consolidated and shipped more than 2 million pounds of residual (hazardous and nonhazardous) waste for off-Site disposal (or recycling) from 2015 to 2016.

3.3 SUPPLEMENTAL REMEDIAL INVESTIGATIONS

The remedial actions conducted at the Site in accordance with the 1995 ROD and the 2000 ROD Amendment, including LSE (elimination of uncontrolled liquid discharges), soil removal and disposal, pond reclamation, and capping resulted in groundwater quality improvements. Decreasing molybdenum and vanadium concentrations were observed at many site monitoring wells for about ten years after LSE was implemented, from approximately 1997 through 2007, as shown on MNA Figure 7 for molybdenum and MNA Figure 8 for vanadium (see Historical Figures). The rates of molybdenum and vanadium concentration decreases slowed over time, however, and have remained at concentrations above remedial goals, and the 2012 and 2017 Five-Year Reviews for the Site conducted by USEPA determined that the remedy was not protective. Therefore, additional Site investigations were conducted from 2015 through 2018, including a Phase I SRI, a Phase II SRI, and a 2018 SRI; these investigations were performed to fill identified data gaps and to achieve the following objectives (Haley & Aldrich, 2019a):

- Phase I SRI - further characterize Site conditions, address remedial action objectives (RAOs) established in the amended ROD, and augment the groundwater monitoring network to better define contaminant plumes.
- Phase II SRI – further investigate sources of Site-related COCs, expand monitoring well network to better define groundwater gradients, physical and anthropogenic effects on area groundwater, and the extent of contamination, and investigate City of Soda Springs water supply sources for potential Site-related COC impacts.
- 2018 SRI – further characterize the nature and extent of primary Site-related contamination (residual waste) and secondary Site-related contamination (COCs transported by leaching or infiltration of waste liquids from former unlined ponds and ditches).

An extensive monitoring well network was installed as part of the SRI for characterization, long-term monitoring, and future remedy performance assessment. USEPA tapwater RSL, project screening level (PSL), and maximum contaminant level (MCL) screening values were used to delineate the vertical and lateral extent of groundwater contamination. Prior to implementing the SRI, most data gaps concerned incomplete delineation of the nature and extent of COCs in groundwater. To address these data gaps, 76 groundwater monitoring wells were installed during the three phases of the SRI, including 48 continuous multichannel tubing (CMT) multilevel wells with 280 sampling ports completed in 2018. Multiple CMT well transects were installed perpendicular to groundwater flow across Site source areas and at several off-Site locations; the groundwater investigation locations used to define the nature and extent of on-Site and off-Site groundwater impacts are shown on FFS Figure 2 (see Historical Figures), and summary geologic cross-sections of the CMT well transects installed during the SRI are on SRI Figure 3-7 (see Historical Figures). Characterization was accomplished by collecting and analyzing over 800 solid phase and 500 liquid samples over three phases of investigation between 2015 and 2018. Additionally, leachability testing, XRF testing, and mineralogical analysis resulted in a more thorough understanding of contaminant transport. Combined, these data facilitated a comprehensive characterization of the nature and extent of Site-related COCs in groundwater.

The 2018 SRI Report was issued in 2019, and included the following primary conclusions (Haley & Aldrich, 2019a):

- The nature and extent of groundwater contamination is primarily limited to molybdenum and vanadium, the only two Site-related, recalcitrant COCs in groundwater that have migrated vertically and laterally in groundwater downgradient of the Site;
- Arsenic and manganese were historically mobilized via reductive dissolution due to Site operations involving organic compounds. As these organic compounds have degraded and conditions have become more oxidizing over time, both arsenic and manganese have become less mobile, and concentrations have decreased and should continue to decrease;
- Lithium was added as a COPC during the 2018 SRI. Although Site activities increased concentrations of lithium in groundwater beneath the Site, the lack of correlation between off-Site elevated lithium and off-site elevated molybdenum and vanadium, as well as naturally occurring sources of lithium identified in the area, suggests off-Site exceedances are not Site-related, and instead are naturally occurring;
- Near-surface primary waste (pond residuals and calcine) and secondary waste (shallow subsurface overburden) are the most significant sources responsible for COC leaching to groundwater. These waste materials were removed to a significant extent as part of Site demolition activities and the 10-Acre Pond TCRA (see Section 3.4). Along with Site regrading activities to minimize infiltration, these actions are expected to substantially reduce COC concentrations in groundwater over time;
- The City of Soda Springs water supply is not impacted by Site-related COCs, and is not expected to be impacted in the future due to preferential plume flowpaths and physical barriers to plume migration from the Site to the water supply springs;
- Other non-Site-related sources potentially contribute to groundwater impacts downgradient from the Site.

3.4 2018 TIME-CRITICAL REMOVAL ACTION, SITE DEMOLITION, AND REGRADING

The 10-Acre Pond (a lined pond constructed in 1997) was removed under a Time Critical Removal Action (TCRA) in 2018. The TCRA included removal of all liquid, sludge, liner, security fencing, and snow fencing from the 10-Acre Pond area and placement of a vegetated soil cover. Additionally, all but two site buildings were demolished, and the West Calcine Tailings/S-X Pond Area, North and South Industrial Landfills, and South Scrap Area materials were removed, regraded to promote positive drainage away from former source areas, and covered with a vegetated soil cover. A new lined repository (East Waste Repository) was constructed to contain the waste materials from the 10-Acre Pond TCRA, the demolition debris from Site buildings, and materials from the removal of the West Calcine Tailings/S-X Pond, North and South Industrial Landfills, and South Scrap Areas. These activities were conducted to remove all primary sources of contamination and all accessible secondary source materials (i.e., soil beneath former sources that had become contaminant sources from historical contaminant migration), with the objective of eliminating the most significant sources of Site-related COCs leaching to groundwater.

Mass removal estimates included in the SRI Report (Haley & Aldrich, 2019a) indicated that the primary and secondary source removals completed during the 10-Acre Pond TCRA removed about 76,000 pounds of molybdenum and 3,000,000 pounds of vanadium from above the uppermost bedrock layer, comprising the bulk of the practically accessible and removable shallow contaminant sources. The SRI Report also estimated that drainage controls implemented during the 10-Acre Pond TCRA are expected to reduce the volume of water infiltrating through the remaining secondary solid source materials by 80% to 90% (Haley & Aldrich, 2019a). Subsequent estimates and calculations provided in the FFS indicate that only 4% of the original (pre-TCRA) molybdenum mass and 1% of the original vanadium mass could be accessible for potential future removals above the uppermost bedrock layer, demonstrating that additional source removal would not be effective. The estimates also show that removing the West Calcine primary source material and the accessible underlying secondary source materials in combination with the surface drainage controls completed in 2018 and 2019 reduced the mass loading from the West Calcine, former S-X Pond, and Limestone Ponds areas for molybdenum and vanadium by up to 97.6% and 99.9%, respectively, when compared to pre-TCRA conditions (Pioneer, 2022).

3.5 SCREENING LEVEL ENVIRONMENTAL AND BASELINE HUMAN HEALTH RISK ASSESSMENTS

Baseline human health and screening level ecological risk assessments were performed for the Site following standard USEPA and IDEQ guidance. Multiple exposure pathways by which people (human receptors) or plants and animals (ecological receptors) could be exposed to contamination at the Site were evaluated. The Screening-Level Ecological Risk Assessment (SLERA) and the Baseline Human Health Risk Assessment (BHHRA) reports for the Site were approved in 2020 (Hydrometrics/TRC, 2020a and 2020b).

A human health conceptual site model was developed to identify potential exposure pathways for human receptors based upon current and anticipated future land use at the Site and included on-Site/off-

Site construction/utility workers, industrial workers, recreational users, and hypothetical on- and off-Site residents (adult and child). For contaminated groundwater, potential exposure pathways for receptors include ingestion and dermal contact. The Site was divided into on-Site and off-Site areas for evaluation, and statistical data analysis provided exposure point concentrations (EPCs) for the applicable media. The BHHRA conclusions regarding Site-related human health risks from groundwater exposure included the following:

- <u>Groundwater</u> – Cancer risk is below the acceptable target risk level (TRL) of 1E-05 for all receptors in each area except for off-Site adult and child residents in Soda Springs, under a hypothetical conservative RME exposure scenario. Cancer risk is due to ingestion/dermal contact with arsenic in tap-water under the RME scenario. Under a central tendency exposure (CTE) scenario, cancer risk drops to the acceptable level.

  Noncancer risk for industrial workers from on-site groundwater is above a hazard index (HI) of 1 due to dermal contact with vanadium in process water. Since concentrations of vanadium are considered Site-related and the results of the CTE evaluation are also above acceptable noncancer levels, exposure to on-Site groundwater may pose a potential health concern for future industrial workers. Noncancer risk for construction workers due to on-Site/off-Site shallow groundwater exposure is below acceptable HI of 1.

  Noncancer risk is above the acceptable HI of 1 for hypothetical future adult and child residents in certain on-Site areas due to ingestion/dermal contact during showering/bathing/swimming due to lithium, manganese, molybdenum, and vanadium in tap-water. These constituents are attributable to the Site and exceedances remain under the CTE scenario. However, risk estimates may be over-estimated based on use of the constituent maximum detected concentration (MDC) from multi-point wells in calculating the EPC to represent actual exposure.

  Noncancer risk is above the acceptable HI of 1 for hypothetical off-Site residents in Soda Springs due to lithium, manganese, and molybdenum in tap-water. Under the CTE scenario, the noncancer risk from ingestion/dermal contact with tap-water remains above acceptable levels. However, risk estimates may be over-estimated based on use of the constituent MDC from multi-point wells in calculating the EPC to represent actual exposure.

Based on the overall human health risks from groundwater via different exposure pathways, the BHHRA identified domestic use of groundwater as tap water (i.e., hypothetical future ingestion of and dermal contact with groundwater) as the risk-driving pathway for off-Site residents. Therefore, an appropriate institutional control for the off-Site area would prevent domestic use of contaminated groundwater as tap water; the proposed restrictions in the ADC outlined in Section 5.3 below provide such an institutional control. In addition, based on the risk assessment results a remedy in the form of an institutional control is proposed to prevent direct contact of industrial workers with on-Site groundwater exhibiting vanadium concentrations exceeding 930 micrograms per liter (BHHRA Table 10-1; see Historical Tables).

3.6 FOCUSED FEASIBILITY STUDY

An FFS has been prepared (Pioneer, 2022) to evaluate the anticipated effectiveness of all RA activities completed at the Site to date, and to present additional RA alternatives that could be implemented at the Site if monitoring shows that additional actions are needed to meet RAOs. Potential RA alternatives were developed based on the technology and process option screening completed in the Supplemental Data Collection Work Plan (SDCWP; Haley & Aldrich, 2018). The screening in the SDCWP was performed before the 10-Acre Pond TCRA was completed, and the available technologies and process options were reconsidered in the FFS based on the outcomes of the TCRA and SRI.

Two technical memoranda were also prepared to support the overall FFS evaluation: (1) the Evaluation of Anticipated Impacts of 10-Acre Pond Time Critical Removal Action (Haley & Aldrich, 2021), included as Appendix C of the FFS, and (2) the Monitored Natural Attenuation Evaluation (Hydrometrics, 2021), included as Appendix D of the FFS. The 10-Acre Pond TCRA Evaluation memo included predictive modeling to assess anticipated improvements in groundwater quality due to the 10-Acre Pond TCRA source removal activities as well as the ongoing attenuation of molybdenum and vanadium concentrations through dilution and dispersion processes (for molybdenum) and dilution and dispersion in combination with adsorption and coprecipitation processes (for vanadium). The predictive modeling results were used to calculate estimated time frames to achieve groundwater RSLs at off-Site locations under a monitored natural attenuation (MNA) remedy scenario (Alternative 2 below) (Haley & Aldrich, 2021). The Monitored Natural Attenuation Evaluation (Hydrometrics, 2021) provided an assessment of the viability of MNA as a potential remedy component, based on the criteria and Site-specific factors outlined in USEPA MNA guidance (USEPA, 2015), including plume stability, the observed mechanism and rate of attenuation, aquifer capacity and immobilized contaminant stability (i.e. remobilization potential), performance monitoring, and contingency remedies (Hydrometrics, 2021).

Source removal was screened out during the FFS process because all accessible primary source materials and most of the potentially accessible secondary source materials above the uppermost basalt layer have been removed (Pioneer, 2022). Removal of the remaining accessible secondary source materials would remove approximately 4% the total molybdenum mass and 1% of the vanadium mass that was present at the Site before the TCRA was completed, so additional removals would provide limited benefit. Capping was screened out as a technology option because capping would only reduce infiltration through the remaining secondary source materials by less than 7% compared to current (post-TCRA) conditions, with even smaller reductions (less than 1%) in COC mass transport. This finding of limited reductions in the COC mass loading to groundwater from capping is consistent with the BHHRA conclusion (Hydrometrics/TRC, 2020b) that leaching to groundwater no longer presents unacceptable risk following completion of the 10-Acre Pond TCRA (Pioneer, 2022).

The following six potential RA alternatives were developed in the FFS based on the remaining technology or process options:

- Alternative 1: No Further Action
- Alternative 2: Monitored Natural Attenuation
- Alternative 3: *In-Situ* Active Groundwater Treatment

- Alternative 4: Groundwater Capture and *Ex-Situ* Treatment
- Alternative 5: Hybrid *In-Situ* and Contingent *Ex-Situ* Groundwater Treatment
- Alternative 6: Downgradient Groundwater Capture and *Ex-Situ* Treatment

In addition to the RA alternatives identified and screened in the FFS, it is important to note that IC(s) to prevent human exposure to contaminated groundwater remain a required remedial action for the Site, as stipulated in the 1995 ROD (USEPA, 1995) the 2000 ROD Amendment (USEPA, 2000), and in the forthcoming ROD Amendment. The IC(s) are therefore a component of all the alternatives considered in the FFS. The ADC is intended as an IC to address off-Site exposure to groundwater with COC concentrations exceeding performance standards.

The six potential RA alternatives identified in the FFS were screened using the USEPA preliminary screening criteria outlined in the USEPA Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA - Interim Final (USEPA, 1988). Cost estimates were prepared for each alternative to support the initial screening and the detailed analysis. The preliminary screening resulted in the following:

- Alternatives 1, 2, 3, 4, and 5 were retained for detailed analysis.
- Alternative 6 would address the middle portion of the plume and would extract a relatively small mass of COCs from the migrating plume downgradient of the former primary source areas but would not address residual secondary sources and would require operation for many decades. Alternative 6 was the most expensive alternative and was not retained for detailed analysis, due to the high cost along with uncertain long-term effectiveness and the availability of other, potentially more effective alternatives at a lower cost.

A detailed analysis for the retained alternatives was conducted in the FFS (Pioneer, 2022). The effectiveness of each alternative was assessed using a semi-quantitative comparative analysis that utilized a qualitative assessment combined with a comparative one-dimensional numerical model to forecast the estimated time to cleanup for each alternative. The time frames provided in the 10-Acre Pond TCRA Effectiveness Memo (Haley & Aldrich, 2021) estimated the time to reach RSLs for Alternatives 1 and 2 and provided a baseline to compare the potential benefits of Alternatives 3, 4, and 5. The same model was used to estimate the time frames and provided a reasonable basis for the comparative analysis. FFS Table ES-1 (see Historical Tables) summarizes the key findings of the detailed RA alternatives analysis.

3.7 LONG-TERM SURFACE WATER AND GROUNDWATER MONITORING

As a part of the 1995 and 2000 ROD remedies, surface water and groundwater LTM at the Site has been conducted to assess the effectiveness of source control in achieving groundwater performance standards. Monitoring of water levels and water quality in monitoring wells and selected springs was conducted by KMCC in 1995 and then on a semi-annual basis through 2010, as required by the 1995 ROD (USEPA, 1995). Following the establishment of the Multistate Trust, groundwater monitoring occurred on a semi-annual basis from 2011 to 2015. In 2016, the sampling frequency for the Site was reduced from semi-annual to annual. Long-term groundwater and surface water monitoring has continued at the Site on an annual or semiannual basis to date. The primary objectives for LTM activities at the Site are to (1) monitor the concentrations of COCs in groundwater and determine the location and extent of PSL and RSL exceedances, (2) assess the status of molybdenum and vanadium groundwater plumes and evaluate concentration trends in groundwater, and (3) provide a basis to evaluate the long-term performance and effectiveness of cleanup actions implemented to date.

The current LTM surface water and groundwater monitoring network for the Site is shown on 2021 LTM Figure 3-1 (see Historical Figures). Routine monitoring consists of an annual monitoring event conducted in the spring, and a supplemental (voluntary) event conducted in the fall. Monitoring is conducted at eleven surface water sites, including all the City of Soda Springs water supply springs, as well as 30 conventional monitoring well locations and 90 CMT monitoring well locations/depths. A comprehensive groundwater level measurement event at all site monitoring wells is conducted as part of each LTM event. LTM results are used to develop updated groundwater potentiometric and contaminant plume maps and to evaluate molybdenum and vanadium concentration trends in both on-Site and off-Site wells.

The most recent LTM report for 2021 (Hydrometrics, 2022) presented the following conclusions pertaining to molybdenum and vanadium distributions and trends in groundwater and surface water:

- Molybdenum concentrations exceeding the PSL (180 µg/L) and/or the RSL (100 µg/L) occurred at most on-Site wells and at numerous off-Site wells. Consistent with previous observations, the groundwater molybdenum plume in 2021 extended south into the City of Soda Springs to the Bear River (2021 LTM Figure 4-6; see Historical Figures). Long-term molybdenum concentration trends are largely decreasing or stable. Molybdenum trends in KM-series wells are nearly all characterized by a general pattern of relatively steep concentration decreases during initial monitoring events, followed by a gradual shift to slightly decreasing or stable trends, with most KM wells currently either at or near the minimum molybdenum concentrations observed during the period of record. Visual inspection indicates that most of the CMT wells have also shown stable or decreasing molybdenum trends to date, with a few exceptions. Representative molybdenum trends at on-Site and off-Site locations through 2020 are shown on MNA Figure 7 (Hydrometrics, 2021; see Historical Figures).
- Vanadium concentrations exceeding the 260 µg/L PSL and the 86 µg/L RSL are common throughout the Site and at off-Site wells up to 0.5 to 1.0 miles downgradient. The vanadium groundwater plume, however, does not extend off-Site as far as the molybdenum plume, with the southern extent of RSL and PSL exceedances for 2021 occurring between the East Hooper well transect and the East 6th North transect (2021 LTM Figure 4-9; see Historical Figures). Vanadium concentration trends are more varied than molybdenum trends, with a mixture of increasing, stable, and decreasing trends. Consistent long-term decreasing trends with gradual stabilization of vanadium concentrations are typical for the on-Site wells with longer periods of record (KM-series wells). Representative vanadium trends at on-Site and off-Site locations through 2020 are shown on MNA Figure 8 (Hydrometrics, 2021; see Historical Figures).
- At the six drinking water source locations sampled (Formation Spring, Upper and Lower Ledger, Spring A, Spring 2, and Spring 4), concentrations of all COCs remained well below PSLs, as well as the arsenic MCL and the lithium, manganese, molybdenum, and vanadium RSLs.

- The non-drinking water sites (Spring 3, Big Spring, Finch Spring, Kelly Pond, and Evergreen) also had COC concentrations below PSLs and MCL/RSLs, except for molybdenum at Big Spring in June 2021. Molybdenum concentrations at Big Spring and Finch Spring, and vanadium concentrations at Finch Spring all show long-term decreasing trends.
- The molybdenum and vanadium concentrations at Evergreen, Finch Spring, and Big Spring are all consistent with the spatial distribution of these constituents observed in groundwater, suggesting that these springs are discharge points for Site-related groundwater.

3.8 DOMESTIC WELL SURVEY

A domestic well survey with sampling was recommended by USEPA in the Third Five-Year Review report for the Site and the nearby Monsanto Superfund site and completed collaboratively between Monsanto and the Multistate Trust. A work plan was prepared by the Multistate Trust, with input from Monsanto and USEPA, to review existing information and identify domestic wells in the survey area (Multistate Trust, 2014). Water quality samples were collected in November 2014 from wells where permission was granted by the owner. Locations identified and sampled as part of the 2014 Work Plan are shown on Domestic Well Survey Figure 1 (Golder, 2015; see Historical Figures) and are described below (note that domestic well owner names included on Historical Figures have been redacted and replaced with generic well identifiers):

- <u>RES-1</u>: this well is located south of the Monsanto site on the east side of Highway 34. The well is 105 feet deep and completed with perforated casing that opens to the Blackfoot Basalt aquifer from 85 to 105 feet bgs. The well has been sampled since 1991 as part of annual water quality activities conducted at the Monsanto site. Monsanto also periodically sampled the well between 1979 and 1991.
- <u>RES-2</u>: this well is located southeast of Soda Springs on South 3rd Street East. The well is 108 feet deep and completed with perforated casing that opens to the Blackfoot Basalt aquifer from 62 to 104 feet bgs. The well is used for drinking water purposes. Water quality samples were previously collected from RES-2 by Monsanto in May 1989, June 1993, and June 2000.
- <u>RES-3</u>: this well is located southeast of Soda Springs on South 3rd Street East. The well is 73 feet deep and completed with perforated casing that opens to the Blackfoot Basalt aquifer from 68 to 72 feet bgs. The well is used for drinking water purposes.
- <u>RES-4</u>: this well is located southeast of Soda Springs on South 3rd East. The well is reported to be 17 feet deep, but no well log is available. The well is used for drinking water purposes.
- <u>RES-5</u>: this spring is located in the basement of a residence on East 1st Street North in Soda Springs. The spring is reportedly developed with perforated horizonal collector pipe under the house. The spring is accessed by a 4-inch-diameter access pipe in the basement floor. The spring is not used for drinking water purposes.

Subsequent to the 2014 domestic well survey, an additional domestic well (RES-6) was identified on property near the Bear River in March of 2018 (SRI Figure 3-10; see Historical Figures). This well was sampled by the Multistate Trust on March 27, 2018. The results of these domestic well surveys and sampling events (Golder, 2015; Multistate Trust, 2018) showed Site-related COC concentrations below the USEPA tapwater RSLs/MCL and PSLs.

3.9 USEPA FIVE-YEAR REVIEWS

The USEPA has completed four Five-Year Reviews for the Site, in 2002, 2007, 2012, and 2017. The Fourth Five-Year Review (CH2M/USEPA, 2017) recommended three actions for the Site. One of the three recommendations pertains to ICs and is thus relevant to the establishment of an ADC, as follows: *"Develop an IC Plan and implement ICs governing groundwater use at locations downgradient of the industrial facility where COCs are known to exceed MCLs or groundwater RBPSs [Risk-Based Performance Standards]."* (CH2M/USEPA, 2017). Discussion of ICs is provided in Section 4.3 below. This ADC petition constitutes one component of the proposed ICs for the Site.

4.0 CURRENT GROUNDWATER CONDITIONS

A robust conceptual site model (CSM) for the shallow basalt groundwater system in the vicinity of the Site, including COC sources and migration pathways in groundwater, has been developed through the extensive investigations conducted at the Site over the last 30 years. Section 4.1 summarizes the current Site CSM as described in the SRI Report (Haley & Aldrich, 2019a) and in the FFS (Pioneer, 2022). The current status of the groundwater contaminant plumes for the two Site-related COCs mobilizing off-Site (molybdenum and vanadium) is presented in Section 4.2, based on the most recent LTM report (Hydrometrics, 2022). Finally, the status of ICs related to the Site is reviewed in Section 4.3.

4.1 CONCEPTUAL SITE MODEL

Geologic and hydrogeologic conditions under and surrounding the Site are complex and control the fate and transport of molybdenum and vanadium. The most significant control on contaminant migration in the Blackfoot Basalt is the presence of fault zones and rubble zones/layers between basalt sequences and secondary structural features including joints, faults, or fractures (Haley & Aldrich, 2019a). The direction of groundwater flow and transport of molybdenum and vanadium from the Site is to the south-southwest. The north-south-oriented faults and fractures at the Site are estimated to transport groundwater at rates up to 600 feet per day.

The most important historical source of molybdenum and vanadium loading to groundwater at the Site was leaching of near-surface primary wastes (pond residuals, calcine) and secondary wastes (shallow subsurface overburden). A significant portion of these waste materials have been removed, although SRI leaching results indicate that leachable molybdenum and vanadium remain in fine-grained material in the vadose and saturated zones. Site regrading activities conducted following waste removal and Site demolition is expected to further mitigate leaching of molybdenum and vanadium to groundwater through improved storm water management and minimization of precipitation infiltration (Pioneer, 2022).

SRI Figure 5-1 (see Historical Figures) delineates the lateral and vertical extent of molybdenum and vanadium in groundwater, from Site source areas to the City of Soda Springs and the Bear River to the south. Groundwater data from multilevel well transects installed during the SRI and sampled during the SRI as well as subsequent LTM events has defined the lateral extents of the plumes, and has demonstrated that the vertical extent of Site-impacted groundwater is generally shallower than 250 feet bgs; however, as shown on SRI Figure 5-1, (see Historical Figures), the depths where groundwater concentrations exceed applicable RSLs for molybdenum and/or vanadium vary throughout the plumes, due primarily to the heterogeneous geology (Haley & Aldrich, 2019a). The majority of molybdenum and vanadium mass in groundwater throughout the plumes is in the upper 200 feet of the basalt aquifer. The SRI also determined that the vertical extent of molybdenum and vanadium in the solid phase (vadose zone and aquifer material) is confined to the Blackfoot Basalt and does not extend deeper into the underlying Salt Lake Formation. In addition, no molybdenum or vanadium concentrations above USEPA RSLs were detected in groundwater samples collected from the Salt Lake formation (Haley & Aldrich, 2019a).

Evaluations conducted during the SRI (Haley & Aldrich, 2019a), as well as in the 10-Acre Pond TCRA Effectiveness Memorandum (Haley & Aldrich, 2021) and the Monitored Natural Attenuation Evaluation (Hydrometrics, 2021) identified dilution and dispersion as the primary attenuation mechanisms governing migration and transport of molybdenum in groundwater at and downgradient of the Site, while vanadium migration and transport is controlled by both dilution and dispersion and by geochemical interaction with the aquifer matrix (adsorption and co-precipitation with iron oxides). The geochemical attenuation of vanadium is reflected in the relative lengths of the two contaminant plumes, with the molybdenum plume extending approximately 3 miles downgradient from the former industrial area of the Site, while the vanadium plume is substantially shorter (approximately 1.5 miles). Attenuation rate calculations and modeling results presented in the 10-Acre Pond TCRA Effectiveness Memorandum and the MNA Evaluation also suggest that, given the observed concentration trends in the off-Site groundwater plumes and the anticipated effects of the RAs conducted at the Site to date, timeframes on the order of decades may still be required for off-Site molybdenum and vanadium concentrations to decrease below USEPA RSLs.

4.2 GROUNDWATER CONTAMINANT PLUME STATUS

The groundwater molybdenum and vanadium plumes migrating from the Site as of 2021 are shown on 2021 LTM Figures 4-6 (molybdenum) and 4-9 (vanadium) (see Historical Figures). Consistent with observations from previous LTM events, the groundwater molybdenum plume exceeding the 100 µg/L USEPA RSL extended south through the City of Soda Springs to the Bear River in 2021. For vanadium, exceedances of the 86 µg/L USEPA RSL extend to a point between the East 6th North well transect and the East Hooper transect. The molybdenum and vanadium plumes shown on 2021 LTM Figures 4-6 and 4-9 are consistent with the plume geometry and overall plume footprints observed during LTM events over the last five years.

The vertical distribution of molybdenum and vanadium in groundwater indicated by the 2021 LTM data is shown on 2021 LTM Figures 4-8 (molybdenum) and 4-11 (vanadium) (see Historical Figures). Molybdenum and vanadium vertical distributions in 2021 were also consistent with previous LTM and 2018 SRI results. The cross-sections in 2021 LTM Figures 4-8 and 4-11 highlight the variability in concentrations with depth in locations throughout the plume, attributable to the highly heterogeneous geology and the fault- and fracture-controlled nature of groundwater flow in the shallow basalt aquifer.

4.3 INSTITUTIONAL CONTROLS

A form of on-Site institutional control currently exists given that the property is owned by the Multistate Trust, and no sale, lease, or use of the property (including groundwater uses) is permitted without approval by the beneficiaries of the Multistate Trust, including the United States (with USEPA acting as lead agency) and the State of Idaho (with IDEQ acting as non-lead agency). A traditional institutional control in the form of an environmental covenant is anticipated after the forthcoming ROD Amendment is completed. The environmental covenant for on-Site land use is anticipated to include: (1) restriction to commercial/industrial land uses, and (2) groundwater use restrictions in accordance with commercial/industrial use of groundwater. The USEPA-approved Human Health Risk Assessment (Hydrometrics/TRC, 2020a) and the FFS (Pioneer, 2022) both propose Preliminary Groundwater Cleanup Levels. For the on-Site commercial/industrial worker, vanadium at levels above 930 µg/L is the only contaminant of concern (COC) that would present an unacceptable risk to human health (presuming commercial/industrial exposure). Based on this information, the IC anticipated to control on-Site groundwater use is an environmental covenant limiting groundwater use to commercial/industrial applications, and preventing commercial/industrial use of groundwater exhibiting vanadium at concentrations above 930 µg/L. However, formal establishment of this institutional control is not expected to be completed until after the ROD Amendment is finalized, because the final approved industrial cleanup level established in the ROD Amendment may not exactly match the cleanup level currently proposed. In the meantime, the institutional control that already exists through ownership of the Site in a trust, with property sale and re-use subject to USEPA and IDEQ approval, should remain protective for on-Site groundwater.

For the off-Site area, as noted previously, this ADC petition has been prepared to propose restrictions on the installation of wells for domestic use where off-Site groundwater contamination has been documented. Based on discussions with USEPA and IDEQ, the ADC administered by the State of Idaho appears to be the most appropriate form of off-Site IC available. The Multistate Trust has also confirmed through communications with the City of Soda Springs that potable water provided by the City to its residents and to select locations outside of city limits is available to the majority of properties that are located geographically within the area of Site-related groundwater contamination and within the proposed ADC (see Section 5.2 and Figure 5-3 below for a discussion of the intersection of the proposed ADC with the city water service area). If a previously unidentified private well were discovered within the area of Site-related groundwater contamination and/or within the proposed ADC, abandonment of the well and use of city water as an alternative would likely be a reasonable option to eliminate the risk of potential exposure to contaminated groundwater.

5.0 PROPOSED AREA OF DRILLING CONCERN

The information obtained as part of past environmental investigations, groundwater monitoring activities, and remediation at the Site (Dames & Moore, 1995; USEPA, 1995 and 2000; Haley & Aldrich, 2019; Hydrometrics/TRC 2020a and 2020b; Hydrometrics, 2022; Pioneer, 2022) and reviewed in this ADC petition supports the following conclusions:

- Shallow groundwater contamination has occurred from historic industrial processes at the Site. The shallow groundwater system and primary local aquifer is the Blackfoot Basalt, a sequence of basalt flows separated by fine-grained interbedded units with groundwater flow directions and rates controlled anisotropically by faults and fractures.
- Groundwater plumes containing molybdenum and vanadium at concentrations above USEPA RSLs extend from the Site in a downgradient direction (south-southwest) approximately 3 miles for molybdenum and 1.5 miles for vanadium. The plumes migrating off-Site are approximately 1,400 feet wide.
- The vertical extent of molybdenum- and vanadium-impacted groundwater is variable due to the heterogeneous geology and hydraulic properties of the shallow Blackfoot Basalt aquifer but extends to the full depth of the Blackfoot Basalt at various points along the downgradient extent of the plumes.
- The lateral and vertical extents of the Site groundwater plumes have been well-characterized through multiple well installation and sampling programs.
- No contamination of the Salt Lake Formation, a light-colored Tertiary unit consisting of tuffaceous sandstones, conglomerates, and limestones underlying the Blackfoot Basalt, was identified from sampling and analysis of aquifer material samples and groundwater from the Salt Lake Formation during the SRI.
- Based on an updated Baseline Human Health Risk Assessment, the primary risks associated with Site-related contaminants are ingestion of and dermal contact with groundwater for hypothetical future use as a domestic tap water source off-Site, and direct contact with on-Site groundwater used by industrial workers during process activities if vanadium concentrations exceed 930 μg/L.
- Site remedial actions have been successful in reducing molybdenum and vanadium loading to groundwater. While molybdenum and vanadium concentrations are decreasing at many on-Site and off-Site monitoring locations, the plume configurations in terms of the extent of RSL exceedances for both molybdenum and vanadium have remained stable for the last several years.
- As discussed in Section 3.6 above, a Focused Feasibility Study was completed to evaluate potential additional remedial actions to address risks from groundwater concentrations exceeding RSLs; review and approval of the FFS is pending.
- Institutional controls were included as part of the groundwater remedy in the 1995 ROD and the 2000 ROD Amendment, and will be included as a requirement in the forthcoming ROD Amendment. The 1995 ROD stipulated ICs "for off-Site areas to prevent exposure to groundwater for as long as the groundwater exceeds the RSLs." (USEPA, 1995). In addition, the Five-Year Reviews conducted by USEPA have recommended implementation of ICs

"governing groundwater use at locations downgradient of the industrial facility where COCs are known to exceed MCLs or RBPSs."

Based on these facts, the Multistate Trust is requesting designation of an ADC for an area defined in the following sections, to address potential off-Site risk from groundwater contaminated with molybdenum or vanadium concentrations exceeding the USEPA RSLs.

5.1 ADC DESCRIPTION AND BOUNDARIES

The proposed Soda Springs ADC boundary is shown on Figure 5-1, along with the Site boundaries (Multistate Trust property boundary), Bayer/Monsanto property boundary, Soda Springs city limits, and the groundwater molybdenum and vanadium plume outlines exceeding USEPA RSLs as of October 2021. The ADC borders Multistate Trust property, includes portions of the Bayer/Monsanto property, and extends south from the Site to the Bear River. Additional detailed maps of the ADC boundary relative to roads and parcel boundaries are presented in separate figures for the southern portion of the ADC (Figure 5-1a), the central portion (Figure 5-1b), and the northern portion (Figure 5-1c). As shown on Figures 5-1a, 5-1b, and 5-1c, the ADC boundary largely coincides with property lines and existing roads to facilitate physical interpretation of the boundary and to avoid splitting parcels. The total area encompassed by the ADC boundary on Figure 5-1 is approximately 1,800 acres and includes all off-Site areas impacted by the groundwater plumes, with a lateral buffer of approximately 300 to 1,000 feet for a margin of safety along the plume edges. Most of the ADC (except for the Bayer/Monsanto property) is within the city limits of Soda Springs.

Vertically, the proposed ADC boundary extends through the full thickness of the shallow Blackfoot Basalt aquifer. The thickness of the basalt aquifer varies but is approximately 230 feet in the vicinity of the Site. The proposed lateral and vertical boundaries of the ADC are consistent with the objective of preventing exposure to groundwater with molybdenum and/or vanadium concentrations exceeding the USEPA tapwater RSLs.

5.2 EXISTING WELLS AND WATER SUPPLY WITHIN ADC

Figure 5-2 shows the proposed ADC boundary along with existing groundwater wells within the ADC boundary. It should be emphasized that designation of the ADC would not impact the use of any existing wells within the boundary; proposed restrictions (Section 5.3) would affect only future drilling activities (i.e., the installation of new wells, abandonment of existing wells, or the extension of existing wells). The wells shown on Figure 5-2 were obtained from the following sources (note that additional wells not included in these sources may be present):

1. Survey information for Multistate Trust monitoring wells obtained from annual long-term monitoring reports;
2. Survey information for Monsanto monitoring wells obtained from groundwater level measurement spreadsheets provided by Monsanto to the Multistate Trust; and
3. a query of the IDWR well database at the following link to obtain a point file of existing local wells: https://maps.idwr.idaho.gov/agol/WellsandGroundwaterManagement/. The wells shown on Figure 5-2 are those identified from the query whose location (based on the database information) is within the proposed ADC.

The wells displayed on Figure 5-2 include Multistate Trust monitoring wells (19 locations), Bayer/Monsanto monitoring wells (74 locations), monitoring wells associated with the "Moyle Petroleum Company" site (3 locations), monitoring wells associated with other sites (7 locations), two wells sampled as part of the domestic well sampling programs described in Section 3.8, and three uncategorized wells from the IDWR database (noted as "Other IDWR Database Wells" on the figure). Well logs show that the uncatogorized wells were installed more than 40 years ago (1966-1974), with the uses of the two wells to the south listed on the logs as domestic, and the well to the north as "washing" (presumably an industrial use). Neither of the two wells identified on well logs as domestic use wells were discovered or sampled during the domestic well survey conducted by Bayer/Monsanto and the Multistate Trust. Two of the three uncategorized wells are in the vicinity of Bayer/Monsanto monitoring wells (one on the plant site and one south of the plant site; see Figure 5-2), and it is possible these wells were repurposed to monitoring wells since they were drilled. The third uncategorized well is shown south of the KMCC Site boundary, near Ledger Creek on City of Soda Springs property (Figure 5-2), and no well is known to currently exist at this location. The information summarized on Figure 5-2 indicates that groundwater use for domestic purposes is exceptionally uncommon within the proposed ADC boundary; the majority of known existing wells are used for groundwater monitoring purposes. The two known domestic wells within the ADC boundary have previously been sampled and exhibited concentrations of Site-related COCs below USEPA tapwater RSLs.

Figure 5-3 shows the proposed ADC boundary relative to the Soda Springs city limits and the Soda Springs city water service area. The city water service area includes populated areas within the city limits, as well as selected areas peripheral to the city limits, including a business district west of Soda Springs, a subdivision northwest of Soda Springs, the Bayer/Monsanto water treatment plant site, Hooper Springs Park, the Bayer Monsanto offices, and the Multistate Trust offices. The city water service area overlaps most of the proposed ADC, with the exception of the area to the south near the Bear River and the Bayer/Monsanto property to the north. Domestic wells identified and sampled during the domestic well sampling described in Section 3.8 are also shown on Figure 5-3, including two wells within the ADC and four locations (three wells and a spring) outside of the proposed ADC. Finally, the locations of the city water supply springs in the Ledger Creek area to the west are also shown on Figure 5-3, relative to the proposed ADC boundary. The information summarized on Figure 5-3 indicates that the proposed ADC is anticipated to include the following water users:

1. Properties serviced by city water that do not have a private well (estimated at >99% of water users;
2. Properties serviced by city water that also have a private well, with the private well verified to be unimpacted by Site-related groundwater contamination (1 location);
3. Properties not serviced by city water that have a private well, with the private well verified to be unimpacted by Site-related groundwater contamination (1 location).

If any additional private wells are discovered (within or outside of the ADC) and determined to be impacted by Site-related groundwater contamination, the Multistate Trust will evaluate the most feasible option for providing clean potable water (e.g., well abandonment, deepening an existing well, drilling a new well, or connecting the user to city water).

5.3 PROPOSED ADC RESTRICTIONS

The following are the restrictions recommended by the Multistate Trust regarding drilling activities within the ADC boundaries shown on Figure 5-1:

1. The restrictions outlined below apply only to the drilling of new groundwater wells within the ADC intended for domestic use (i.e., wells to be used as a tap water source) and to abandonment of existing wells. The restrictions do not apply to new groundwater wells intended for agricultural or industrial uses.
2. Prior to commencing any well drilling activity (including abandonment of an existing well), an application for drilling permit shall be submitted to IDWR. The owner or their representative and the well driller shall sign the application. The practices of issuing an expedited "verbal" drilling permit approval and the "start card" procedure do not authorize drilling in the ADC, as provided in Rule 50.01g of the Idaho Well Driller Licensing Rules (Idaho Administrative Code 37.03.10).
3. An application to drill a new well for domestic use in the ADC shall include a drilling prospectus prepared by an engineer or geologist licensed in Idaho. The prospectus shall include a diagram of the finished well showing all pertinent dimensions, and a narrative describing the construction materials and methods, including well seal methods, to be used in the drilling operation.
4. Drilling methods must be appropriately designed and implemented to prevent commingling of water from the shallow basalt aquifer with the water in underlying formations during drilling.
5. New wells drilled within the ADC must be designed and constructed to draw water from a formation below the shallow basalt aquifer (the Blackfoot Basalt), either from or below the underlying Salt Lake Formation, including the following restrictions:
    a. The top of the well screen must be located a minimum of ten (10) feet below the contact of the Blackfoot Basalt with the underlying Salt Lake Formation, and sealed off from the overlying Blackfoot Basalt.
    b. The completed well must include a full-length annular grout seal from the production (screened) zone to the ground surface, installed from the bottom up, to prevent potential vertical migration of contaminants from the Blackfoot Basalt to underlying formations.
6. An application to decommission (abandon) an existing well in the ADC shall include a prospectus providing for abandonment using a tremie pipe or pressure grouting procedure to place grout from the bottom of the well to the top.
7. Installation or abandonment of monitoring, extraction, or injection wells installed as part of environmental investigations or response actions within the ADC conducted pursuant to section 121(e)(1) of CERCLA, 42 U.S. Code § 9621(e)(1) are exempt from these additional restrictions but must meet all other IDWR requirements.

The proposed Soda Springs ADC is envisioned as a non-permanent IC to protect potential off-Site groundwater users to be in effect only as long as needed to assure protectiveness of the Site remedy. As Site cleanup continues and anticipated additional improvements in off-Site groundwater quality are observed, the ADC could be removed or the boundaries modified, under the provisions of Idaho Code §42-238(15) cited above in Section 1.1.

6.0 REFERENCES

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HISTORICAL TABLES

<u>Focused Feasibility Study (FFS) Tables (Pioneer, 2022)</u>

Table 1	Key Events
Table ES-1	Remedial Action Alternatives Analysis Executive Summary

<u>Baseline Human Health Risk Assessment (BHHRA) Tables (Hydrometrics/TRC, 2020b)</u>

Table 10-1	Preliminary Groundwater Remedial Action Target Levels

TABLE 1: KEY EVENTS

DATE	KEY EVENT
April 1981	Initial discovery of problem at the Site.
May 1985	Preliminary Assessment by the State of Idaho Hazardous Materials Bureau.
April 1988	Site Investigation by U.S. Environmental Protection Agency (EPA).
October 1989	National Priorities Listing by EPA.
March 1990	Kerr-McGee Chemical Corp. (KMCC) identified as a Potentially Responsible Party (PRP) for the Site.
September 1990	Preliminary Health Assessment completed by the Agency for Toxic Substances and Disease Registry.
October 1990	Administrative Order on Consent with KMCC for Remedial Investigation (RI)/Feasibility Study (FS).
October 1993	Risk Assessment completed.
April 1995	Initial RI fieldwork completed.
June 1995	RI Report and FS completed.
September 1995	Record of Decision (ROD) signed.
December 1996 to July 1997	Remedial Design.
July 1997	Remedial Action Start (construction start).
August 1997	Consent Decree with PRP.
July 2000	ROD Amendment.
September 2001	Construction completed (including landfill construction and cap installation at East Calcine Repository).
May/June 2002	Vanadium Plant dismantled.
September 2002	First Five-Year Review.
October 2002 to November 2004	North Infiltration Basins constructed; Fertilizer Plant Building dismantled; Stormwater Runoff Ponds reclaimed; East and West 5-Acre Ponds reclaimed with wastes moved to 10-Acre Pond; and South Infiltration Basins and snow fencing constructed.
2004	KMCC purchased adjacent property.
2005	KMCC created Tronox Incorporated and transferred hundreds of sites into a corporate "shell" company.
September 2007	Second Five-Year Review.
January 2009	Tronox Incorporated and 14 affiliates filed for bankruptcy.
February 2011	Consent Decree and Environmental Settlement Agreement (Settlement Agreement) effective date.

TABLE 1: KEY EVENTS

DATE	KEY EVENT
February 2011	Multistate Environmental Response Trust Agreement (Multistate Trust Agreement) effective data.
February 2011	Litigation Trust Agreement effective date.
September 2012	Third Five-Year Review.
January 2015	Anadarko Litigation Settlement (pursuant to the Settlement Agreement, Anadarko funded the Litigation Trust).
February 2015 to June 2016	The Multistate Trust received funds for the KMCC - Soda Springs Plant Superfund Site.
2015 and 2016	The Multistate Trust consolidated and recycled or disposed of off-Site more than 2 million pounds of residual (hazardous and nonhazardous) waste.
November 2015 to January 2017	Phase I and II Supplemental Remedial Investigation (SRI) fieldwork.
September 2017	Fourth Five-Year Review.
January 2018	Action Memorandum for Time Critical Removal Action (TCRA) for the 10-Acre Pond.
September 2018	Baseline Human Health Risk Assessment (BHHRA)/Screening Level Ecological Risk Assessment (SLERA) initiated.
October 2018	Focused Feasibility Study (FFS) initiated.
October 2018	10-Acre Pond TCRA surface soil sampling completed, and the 10-Acre Pond removed.
November 2018	SRI fieldwork and Surface Soil Sampling and Analysis Plan sampling completed.
December 2018	10-Acre Pond TCRA, building demolition, new on-Site repository construction, and confirmation sampling completed.
April 2019	Final 10-Acre Pond TCRA After Action Report (AAR).
October 2019	10-Acre Pond TCRA AAR Addendum.
October 2019	Final Supplemental Data Collection Technical Memorandum (DCTM) for FFS support.
November 2019	Final Site Demolition and 10-Acre Pond Removal Construction Completion Report.
November 2019	Final SRI Report.
March 2020	Final SLERA.
June 2020	Final BHHRA.

TABLE ES-1: REMEDIAL ACTION ALTERNATIVES ANALYSIS EXECUTIVE SUMMARY

Criteria	Alternative 1 No Further Action (NFA)	Alternative 2 Monitored Natural Attenuation (MNA)	Alternative 3 In-Situ Active Groundwater Treatment	Alternative 4 Groundwater Capture and Ex-Situ Treatment	Alternative 5 Hybrid In-Situ and Contingent Ex-Situ Groundwater Treatment
OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT [1] (most protective to least) 5 = 3 > 4 > 2 >> 1	• Not Protective.	• Protective with Institutional Control Plan (ICP) and Long-Term Monitoring (LTM).	• Protective with ICP and LTM.	• Protective with ICP and LTM.	• Protective with ICP and LTM.
COMPLIANCE WITH ARARS [2] (most compliant to least) 5 = 3 = 4 > 2 > 1	• Mo: 23 to 120 years on-Site and 0 to 50 years off-Site. • V: 40 to 120 years on-Site and 20 to 56 years off-Site.	• Mo: 23 to 120 years on-Site and 0 to 50 years off-Site. • V: 40 to 120 years on-Site and 20 to 56 years off-Site.	• Mo: 9 to 50 years on-Site and 0 to 37 years off-Site. • V: 20 to 50 years on-Site and 17 to 29 years off-Site (for areas currently above the cleanup level [CUL]).	• Mo: 13 to 100 years on-Site and 0 to 37 years off-Site. • V: 37 to 120 years on-Site and 17 to 37 years off-Site (for areas currently above the CUL).	• Mo: 9 to 50 years on-Site and 0 to 37 years off-Site. • V: 21 to 50 years on-Site and 17 to 28 years off-Site (for areas currently above the CUL).
LONG-TERM EFFECTIVENESS and PERMANENCE [3] (most effective to least) 5 = 3 > 4 > 2 >> 1	• Not adequate	• Expected to be adequate.	• Expected to be adequate.	• Expected to be adequate.	• Expected to be adequate.
REDUCTION of TOXICITY, MOBILITY, or VOLUME THROUGH TREATMENT [4] (most reduction to least) 5 = 3 > 4 >> 2 > 1	• None	• None	• Mo: 23% - 38% • V: 48% - 72% • None off-Site.	• 10% - 30% reduction of Mo and V based on the limited mass captured and dilution from reinjected treated water.	• Mo: 26% - 40% • V: 50% - 72% • None off-Site.
SHORT-TERM EFFECTIVENESS [5] (most effective to least) 5 = 4 = 3 >> 2 = 1	• Protective of the environment, workers, and the community for short-term risks.	• Protective of the environment, workers, and the community for short-term risks.	• Protective of the environment, workers, and the community for short-term risks.	• Protective of the environment, workers, and the community for short-term risks.	• Protective of the environment, workers, and the community for short-term risks.
IMPLEMENTABILITY [6] (easiest/most feasible to difficult/least feasible) 2 >> 5 = 4 = 3 > 1	• Not administratively feasible.	• Technically and administratively feasible.	• Technically and administratively feasible. • Difficult to design, construct and control.	• Technically and administratively feasible. • Difficult to design construct, and control. • Difficult winter operations.	• Technically and administratively feasible. • Most flexible to design, construct, optimize, and control. • Difficult winter operations.
COST [7] (most to least expensive) 5 > 4 > 3 > 2 > 1	**$** $7,358,458	**$$** $16,095,875	**$$$** $33,053,106	**$$$$$** $53,329,108	**$$$$$$$** $48,296,487 to $69,815,759 (including contingent ex-situ component)

Mo= molybdenum; V = vanadium

[1] Short- and long-term protection of human health and the environment. Alternative must be able to eliminate unacceptable risks posed by hazardous substances or contaminants present at the Site by eliminating, reducing, or controlling exposure to COC concentrations exceeding remediation goals.

[2] Actions for cleanup of hazardous substances must comply with requirements and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate requirements (ARARs) to hazardous substances or particular circumstances at a site, or a waiver must be obtained.

[3] Long-term effectiveness and permanence, and the degree of certainty that an alternative would prove successful. Magnitude of residual risk: risk posed by untreated waste or treatment residuals at the conclusion of remedial action (RA). Characteristics of residuals are considered to the degree they remain hazardous, i.e., volume, toxicity, mobility, and propensity to bioaccumulate. Adequacy and reliability of controls: containment systems and land use controls necessary to manage treatment residuals and untreated waste must be shown to be reliable.

[4] Considers the following factors: (1) treatment/recycling processes and what is treated; (2) amount of hazardous materials treated; (3) degree of expected reduction in toxicity, mobility, or volume; (4) degree to which treatment will be irreversible; (5) type and quantity of treatment residuals that will remain following treatment; and (6) degree to which treatment reduces the inherent hazards posed by the principal threats at the Site.

[5] Evaluates the period of time needed to achieve protection and whether any adverse impacts on human health and the environment could occur during the construction and implementation period until cleanup levels are achieved.

[6] Evaluates the technical and administrative feasibility of implementing a remedy: (1) availability of materials and services needed to implement; (2) technical difficulties and unknowns associated with a technology; (3) reliability of the technology; (4) ease of undertaking additional RA; (5) monitoring to determine the effectiveness of the remedy and evaluate the risk of exposure; (6) administrative feasibility and coordination with other offices and agencies.

[7] Capital costs include those for construction, equipment, materials and services, waste disposal, engineering, startup/shakedown costs, and contingencies associated with initial construction of the remedy. Annual operation and maintenance (O&M) and periodic costs include operating, supplies and labor costs, maintenance materials and labor, auxiliary materials and energy, disposal of treatment residuals, purchased services, administrative costs, contingency funds, rehabilitation costs, and performance monitoring. Net present value (NPV) cost is based on 30 years at 3%.

Table 10-1
Preliminary Groundwater Remedial Action Target Levels
Kerr-McGee Chemical Corp.
Soda Springs Plant Superfund Site
Soda Springs, ID

COC	CAS Number	MCL (mg/L)	Industrial Worker RATL[1] (mg/L)	Lower Field Adult Resident RATL[2] (mg/L)	Lower Field Child Resident RATL[2] (mg/L)	Lower Field Resident RATL (mg/L)[3]	Off-Site Soda Springs Adult Resident RATL[4] (mg/L)	Off-Site Soda Springs Child Resident RATL[4] (mg/L)	Off-Site Soda Springs Resident RATL (mg/L)[3]
Arsenic	7440-38-2	1.0E-02	NA	NA	NA	NA	7.6E-04	1.5E-03	**1.0E-02**
Lithium	7439-93-2	NA	NA	6.5E-02	3.9E-02	**3.9E-02**	6.5E-02	3.9E-02	**3.9E-02**
Manganese	7439-96-5	NA	NA	6.0E-01	3.8E-01	**3.8E-01**	6.0E-01	3.8E-01	**3.8E-01**
Molybdenum	7439-98-7	NA	NA	1.6E-01	9.2E-02	**9.2E-02**	1.5E-01	8.8E-02	**8.8E-02**
Vanadium	7440-62-2	NA	**9.3E-01**	1.1E-01	7.4E-02	**7.4E-02**	NA	NA	NA

Notes:

COPC = chemical of concern

NA = not applicable

MCL = maximum contaminant level

mg/L = milligrams per liter

RATL = remedial action target level

RATLs based on a cancer target risk level (TRL) of 1x10-5 and noncancer hazard quotient (HQ) of 1

RATLs based on the lesser of the cancer and noncancer value when available

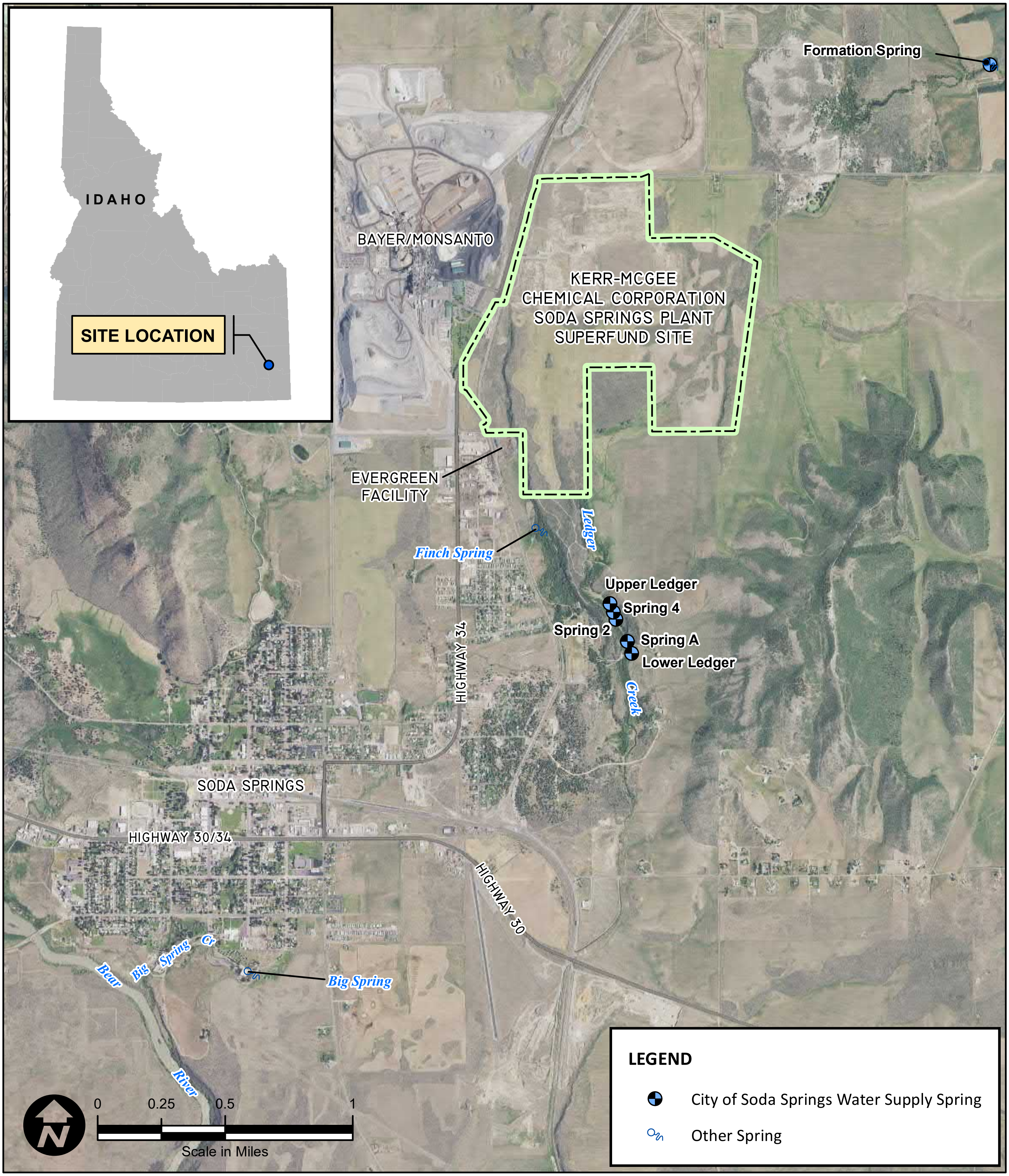
[1] pathways include dermal contact with process water

[2] pathways include ingestion and dermal contact with tap water, dermal contact with swimming pool, and ingestion of homegrown produce irrigated with groundwater

[3] Lower Field and Off-Site Soda Springs Resident RATL based on lesser of the adult and child value, exception is arsenic. RATL = MCL

[4] pathways include ingestion and dermal contact with tap water, dermal contact with swimming pool, ingestion of homegrown produce irrigated with groundwater, and ingestion of beef/dairy fed home-

FIGURES



PREPARED FOR: Greenfield Environmental Multistate Trust, LLC Trustee of the Multistate Environmental Response Trust	PETITION TO DESIGNATE AN AREA OF DRILLING CONCERN KMCC SODA SPRINGS PLANT SUPERFUND SITE	SITE LOCATION MAP	FIGURE 2-1

Hydrometrics, Inc.
Consulting Scientists and Engineers

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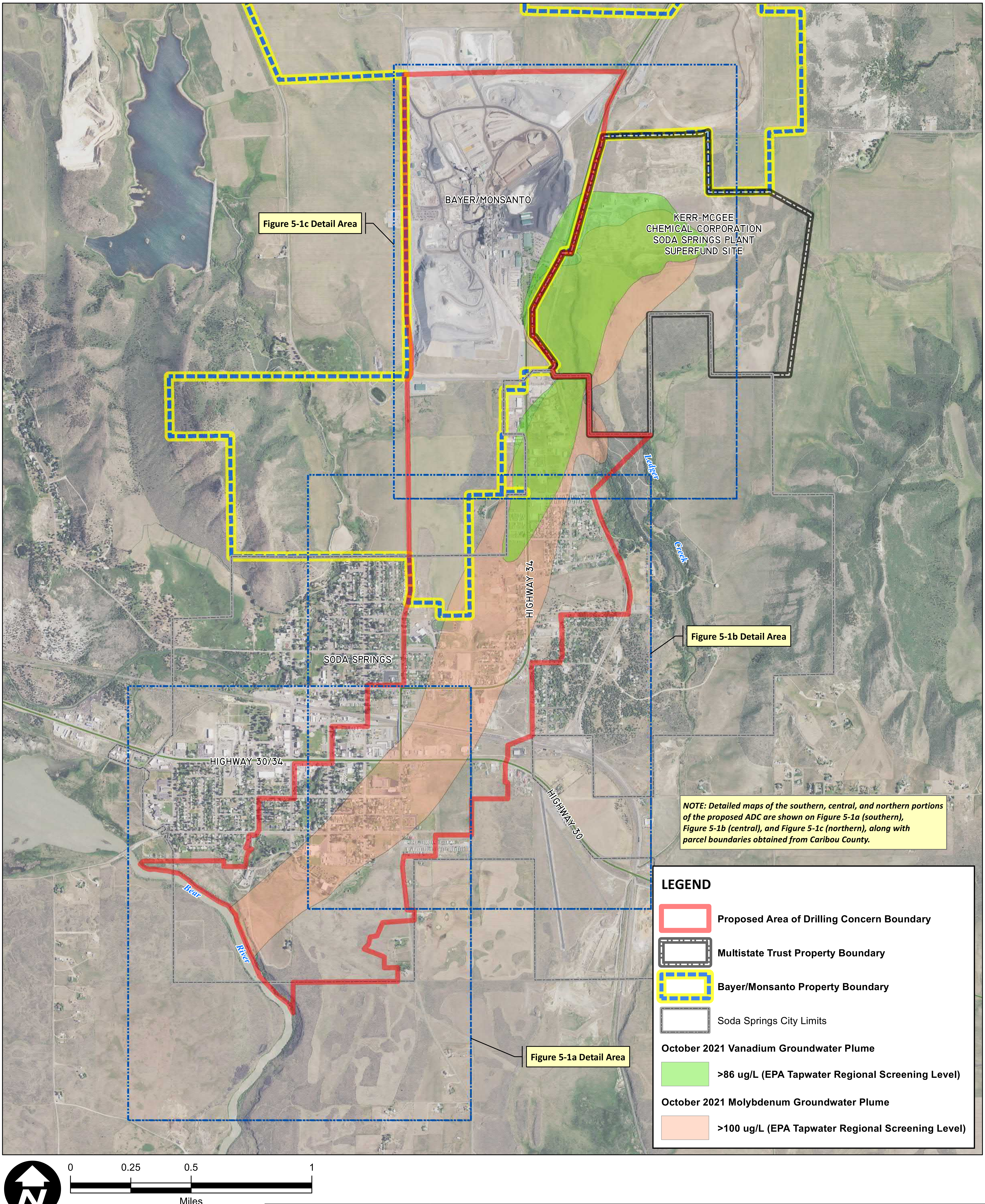

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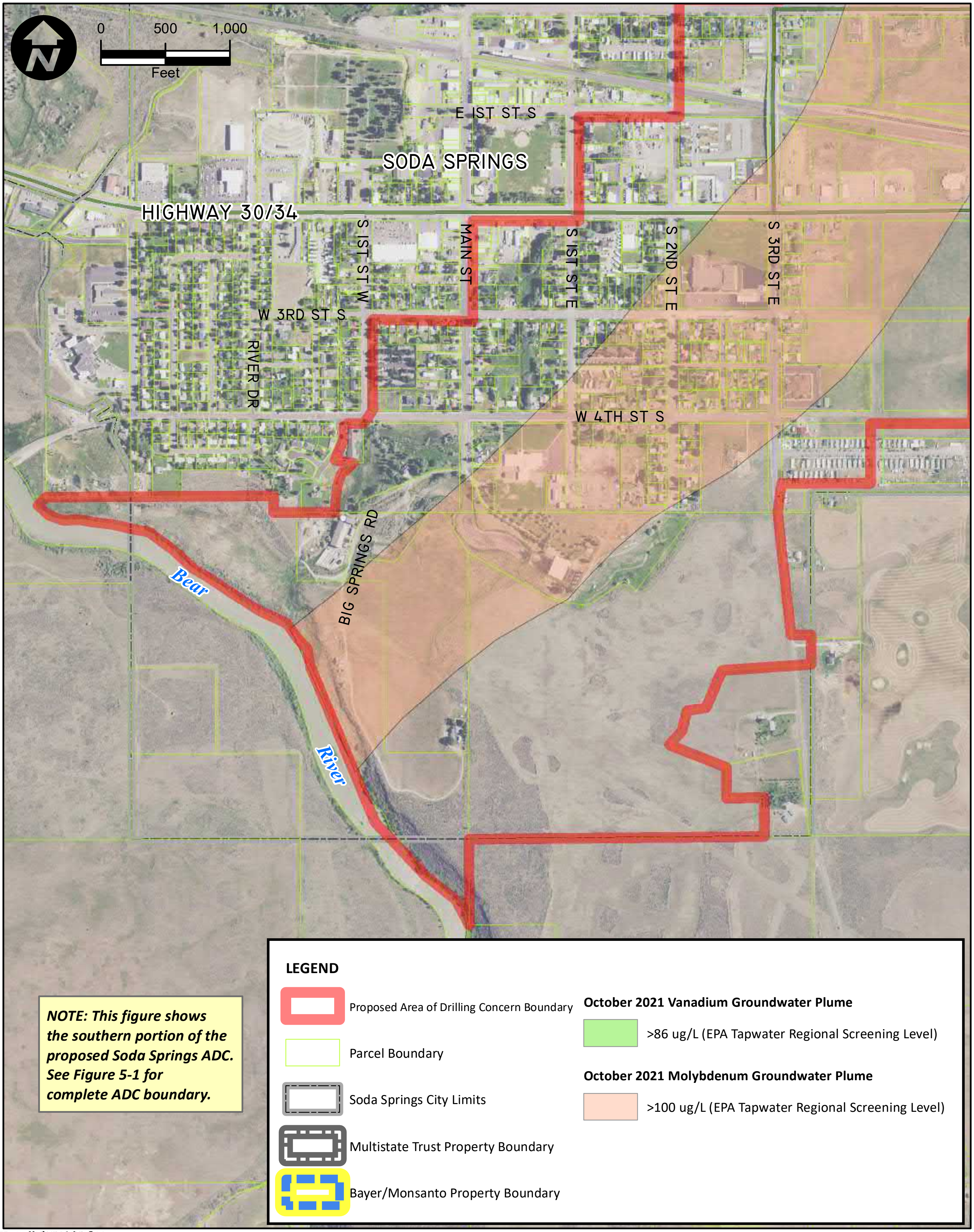
Hydrometrics, Inc.
Consulting Scientists and Engineers

PREPARED FOR:
Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

PETITION TO DESIGNATE AN AREA OF DRILLING CONCERN
KMCC SODA SPRINGS PLANT SUPERFUND SITE
SODA SPRINGS, IDAHO

PROPOSED AREA OF DRILLING CONCERN BOUNDARY

FIGURE 5-1



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Hydrometrics, Inc.
Consulting Scientists and Engineers

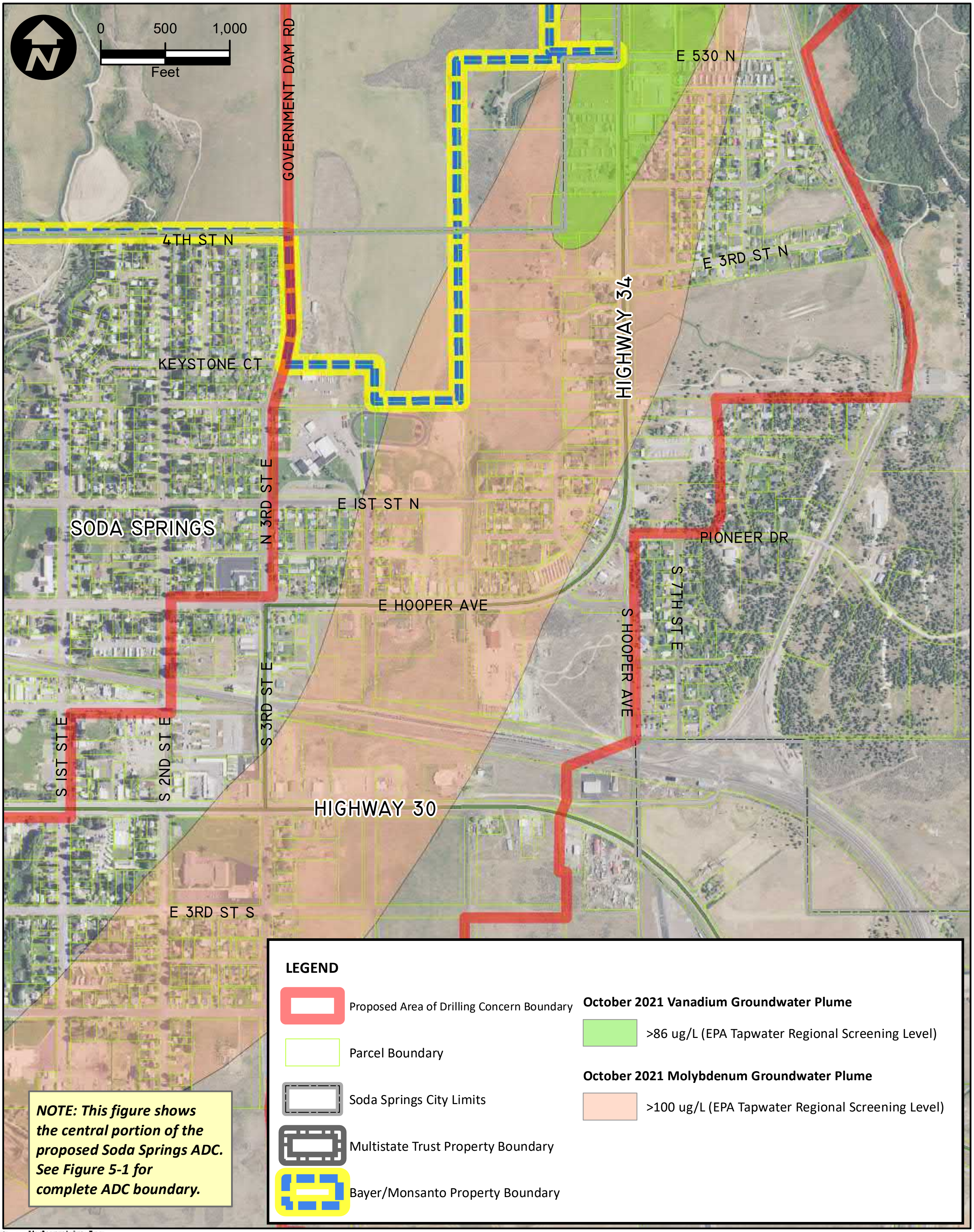
PREPARED FOR:

Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

PETITION TO DESIGNATE AN AREA OF DRILLING CONCERN
KMCC SODA SPRINGS PLANT SUPERFUND SITE
SODA SPRINGS, IDAHO

PROPOSED AREA OF DRILLING CONCERN BOUNDARY SOUTH DETAIL

FIGURE 5-1a



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Consulting Scientists and Engineers

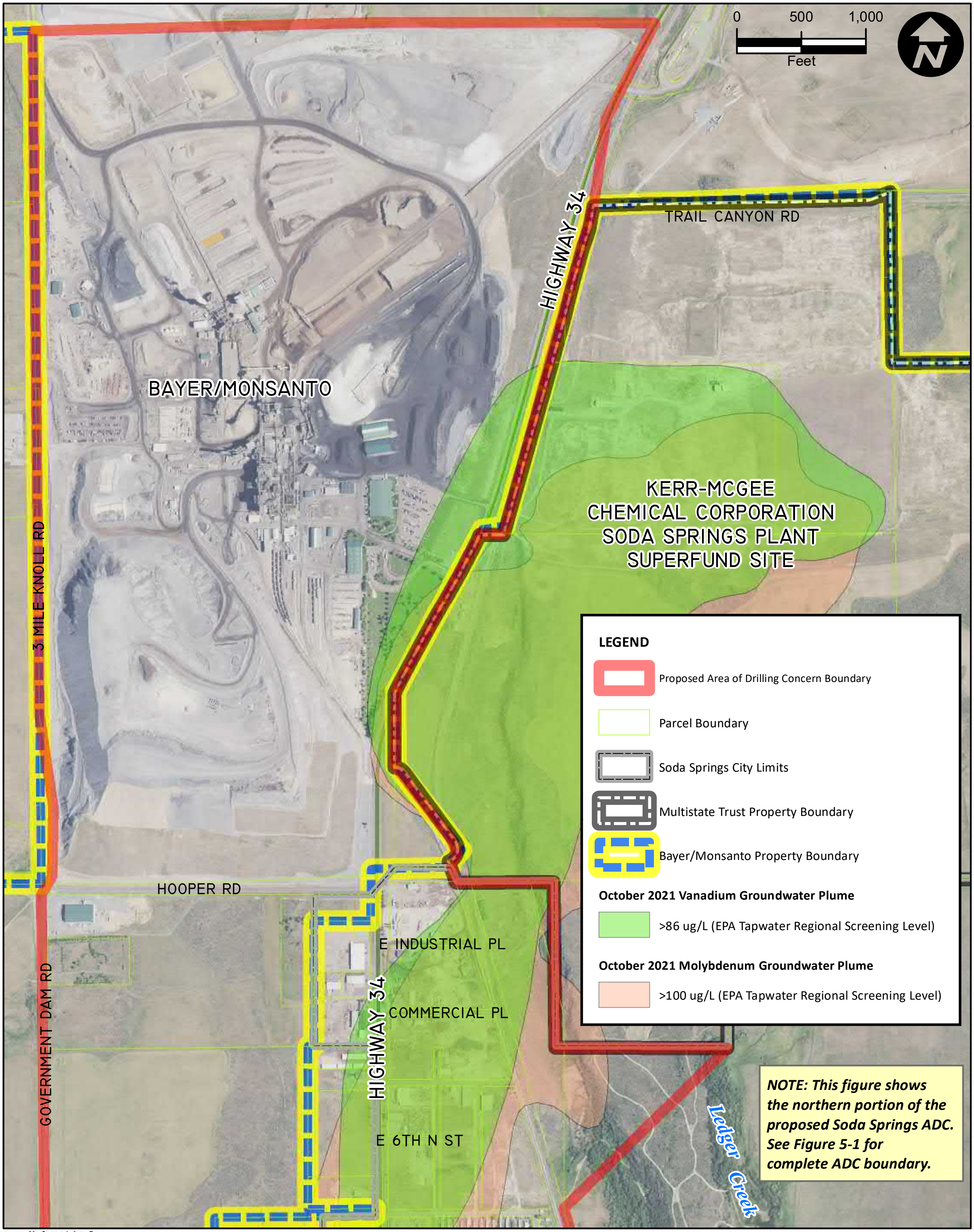
PREPARED FOR:

Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

PETITION TO DESIGNATE AN AREA OF DRILLING CONCERN
KMCC SODA SPRINGS PLANT SUPERFUND SITE
SODA SPRINGS, IDAHO

PROPOSED AREA OF DRILLING CONCERN BOUNDARY CENTRAL DETAIL

FIGURE 5-1b



Hydrometrics, Inc.
Consulting Scientists and Engineers

PREPARED FOR:

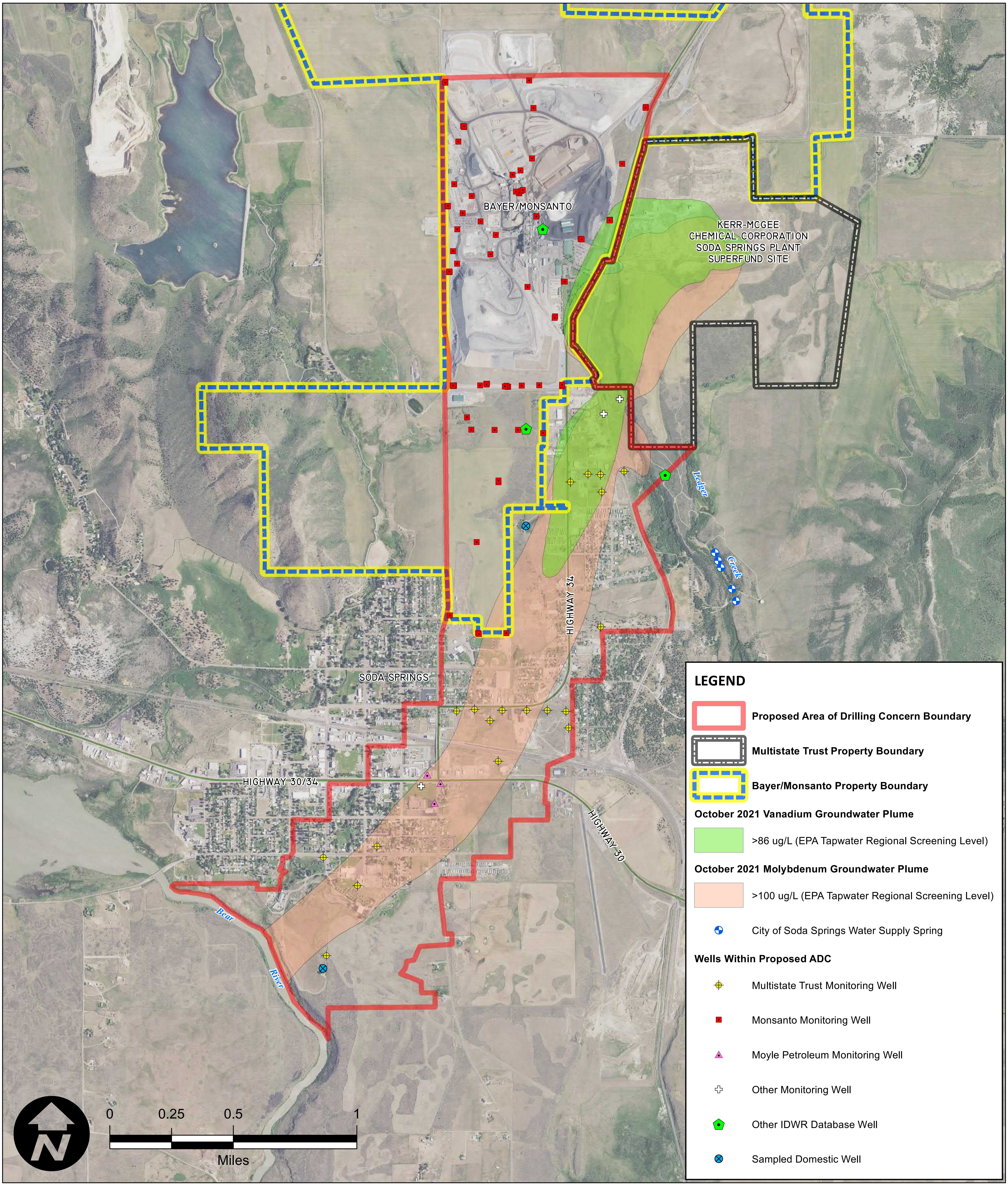
Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

PETITION TO DESIGNATE AN AREA OF DRILLING CONCERN
KMCC SODA SPRINGS PLANT SUPERFUND SITE
SODA SPRINGS, IDAHO

PROPOSED AREA OF DRILLING CONCERN BOUNDARY NORTH DETAIL

FIGURE **5-1c**

G:\PROJECT\17034\ADC\Fig5-1c_ADC_NorthDetail.mxd DATE: 7/6/2022 5:25:27 PM



DATE: 11/17/2022 3:38:11 PM
G:\PROJECT\17034\ADC\Fig5-2_KMCC_ProposedADC_Wells.mxd
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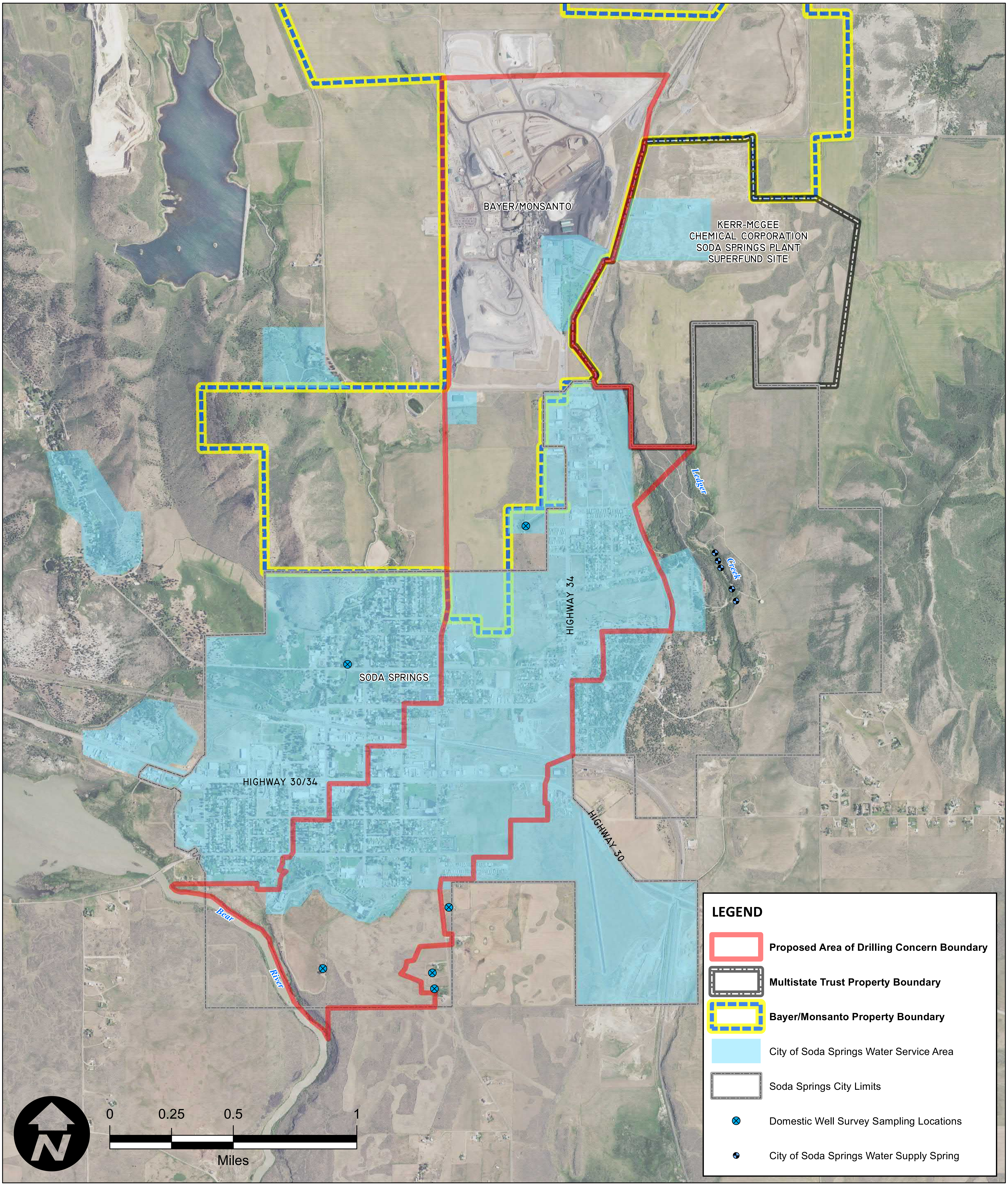
PREPARED FOR: Greenfield Environmental Multistate Trust, LLC Trustee of the Multistate Environmental Response Trust	PETITION TO DESIGNATE AN AREA OF DRILLING CONCERN KMCC SODA SPRINGS PLANT SUPERFUND SITE SODA SPRINGS, IDAHO	EXISTING WELLS WITHIN PROPOSED AREA OF DRILLING CONCERN BOUNDARY	FIGURE 5-2



DATE: 7/6/2022 10:38:42 AM
G:\PROJECT\17034\ADC\Fig5-3_KMCC_ProposedADC_CityH2O.mxd
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Trustee of the Multistate Environmental Response Trust

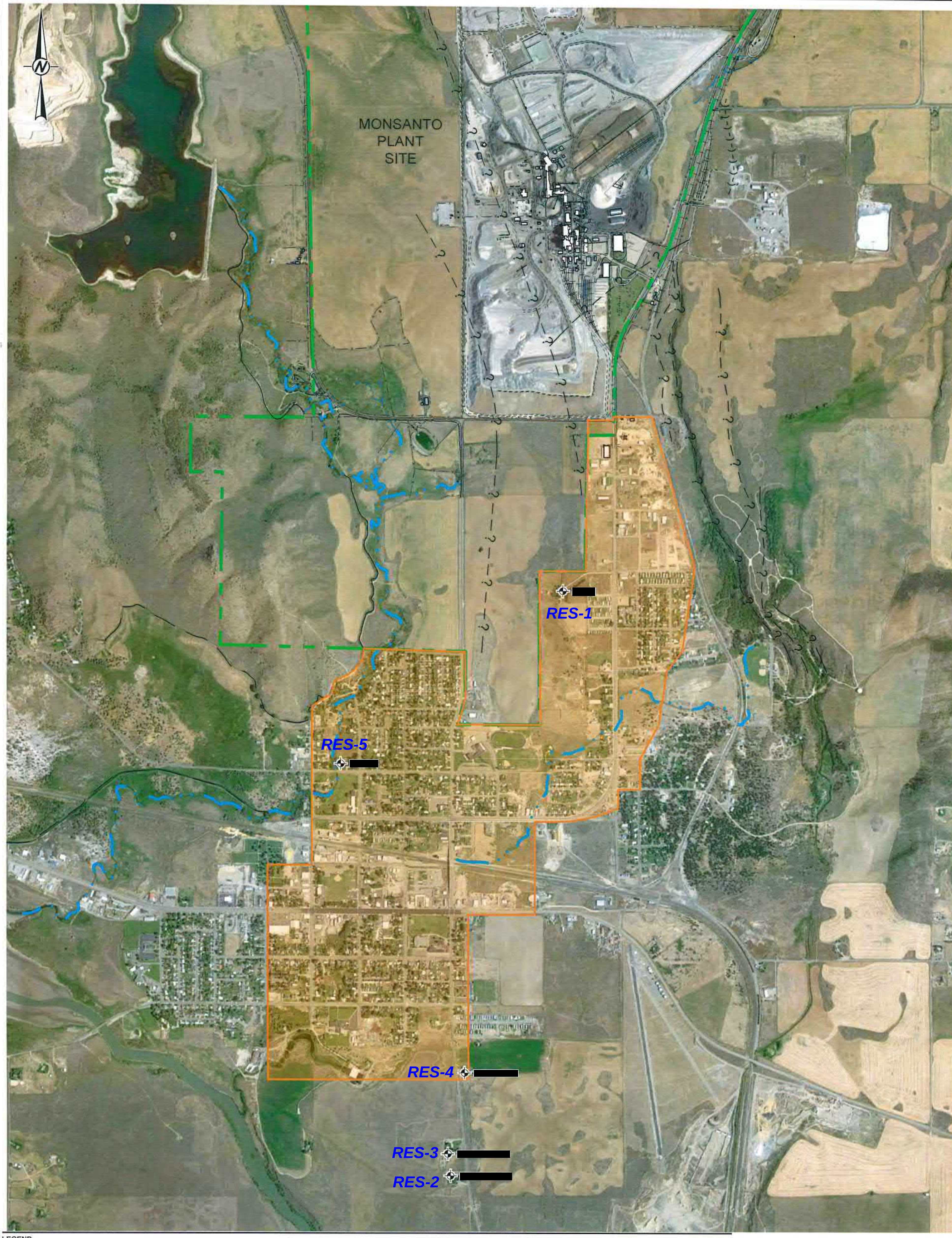
PETITION TO DESIGNATE AN AREA OF DRILLING CONCERN
KMCC SODA SPRINGS PLANT SUPERFUND SITE
SODA SPRINGS, IDAHO

CITY OF SODA SPRINGS WATER SERVICE AREA AND PROPOSED AREA OF DRILLING CONCERN BOUNDARY

FIGURE **5-3**

HISTORICAL FIGURES

Path: \\redmond\geomat$\geomatics | File Name: 913110100400011H-HS-0000.dwg



LEGEND

— — ? — U/D ? ——	FAULT	— · · — · · —	CREEK	LEWIS ⌖	DOMESTIC WELL LOCATION WITH NAME
-)-)-)-)-)-)-)-)-)-)-	FISSURE	———	POWER CANAL		
UBZ-1	GROUNDWATER ZONE	— — — —	IRRIGATION CANAL		
—— — — ——	MONSANTO INSTITUTIONAL CONTROL BOUNDARY	▭	SURVEY AREA		

0 800 1600
SCALE FEET

NOTES

1. NAD83 IDAHO STATE PLANES, EAST ZONE, US FOOT.
2. AERIAL PHOTO FROM GOOGLE EARTH (8/2/2013).

CLIENT
MONSANTO

PROJECT
DOMESTIC WELL SURVEY

CONSULTANT

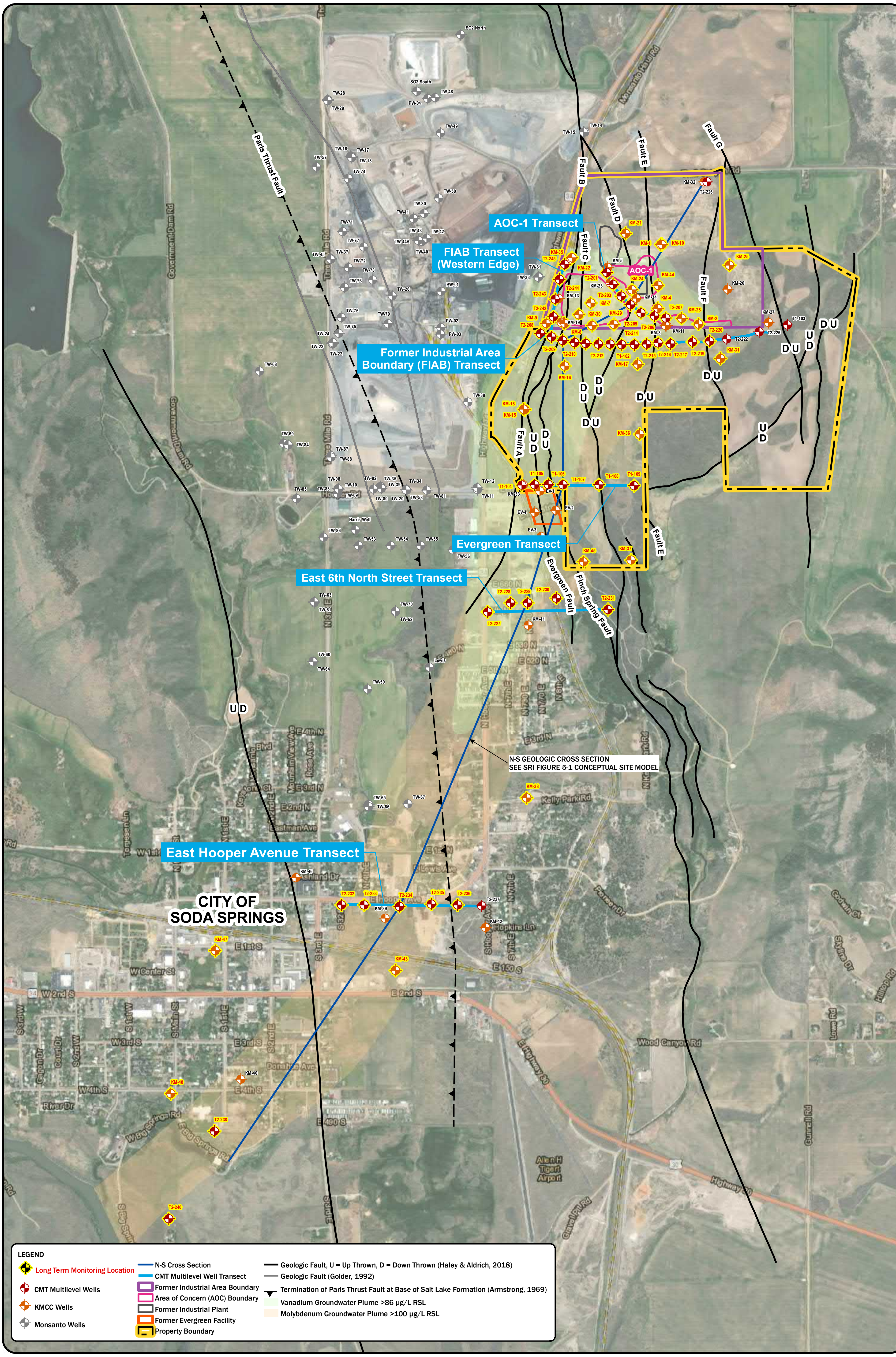
Golder Associates

YYYY-MM-DD	2015-01-07
PREPARED	REDMOND
DESIGN	MK
REVIEW	MK
APPROVED	DB

TITLE
WELL LOCATION MAP

PROJECT No.	CONTROL	Rev.	FIGURE
9131101x004	001.1H	A	1

0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



PREPARED FOR:
GREENFIELD ENVIRONMENTAL MULTISTATE TRUST, LLC
TRUSTEE OF THE MULTISTATE ENVIRONMENTAL RESPONSE TRUST

N

DISPLAYED AS:
PROJECTION/ZONE: ID83E
DATUM: NAD 83, NAVD 88
UNITS: US FEET
SOURCE: PIONEER

0 750 1,500 3,000
Feet

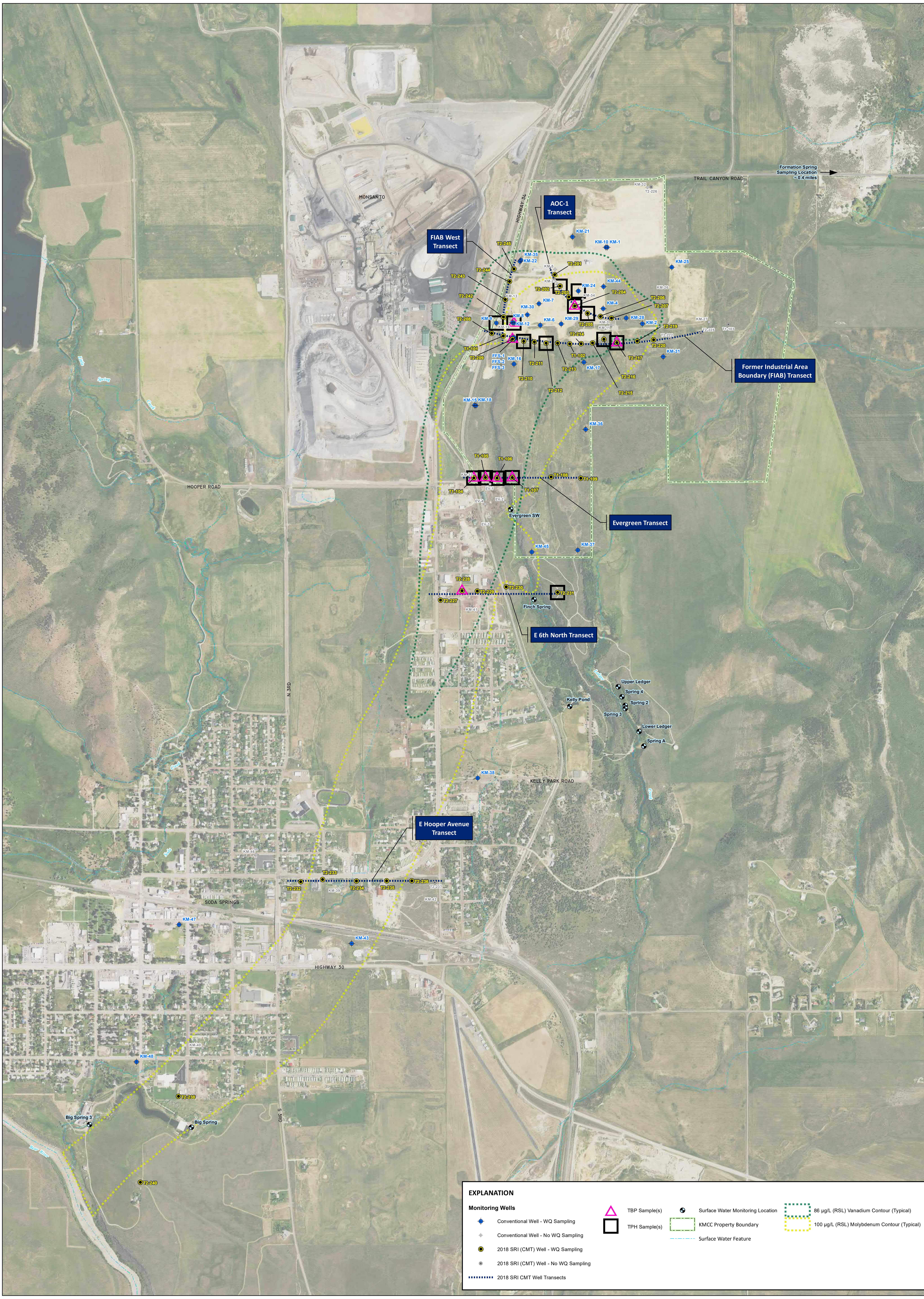
FIGURE 2

PIONEER TECHNICAL SERVICES, INC.

GROUNDWATER INVESTIGATION LOCATIONS

DATE: 2022-04-28

Path: Z:\Shared\Active Projects\GETG\SodaSpringsFFS\GIS\SSFFS-GI-PLN-002-20.mxd



NOTES:

Details regarding locations sampled during 2021 semiannual LTM events are in Tables 3-1 and 3-2.

CMT = continuous multichannel tubing
TBP = tributyl phosphate
TPH = total petroleum hydrocarbons
SRI = Supplemental Remedial Investigation
WQ = water quality
RSL = EPA Tapwater Regional Screening Level
FIAB = Former Industrial Area Boundary

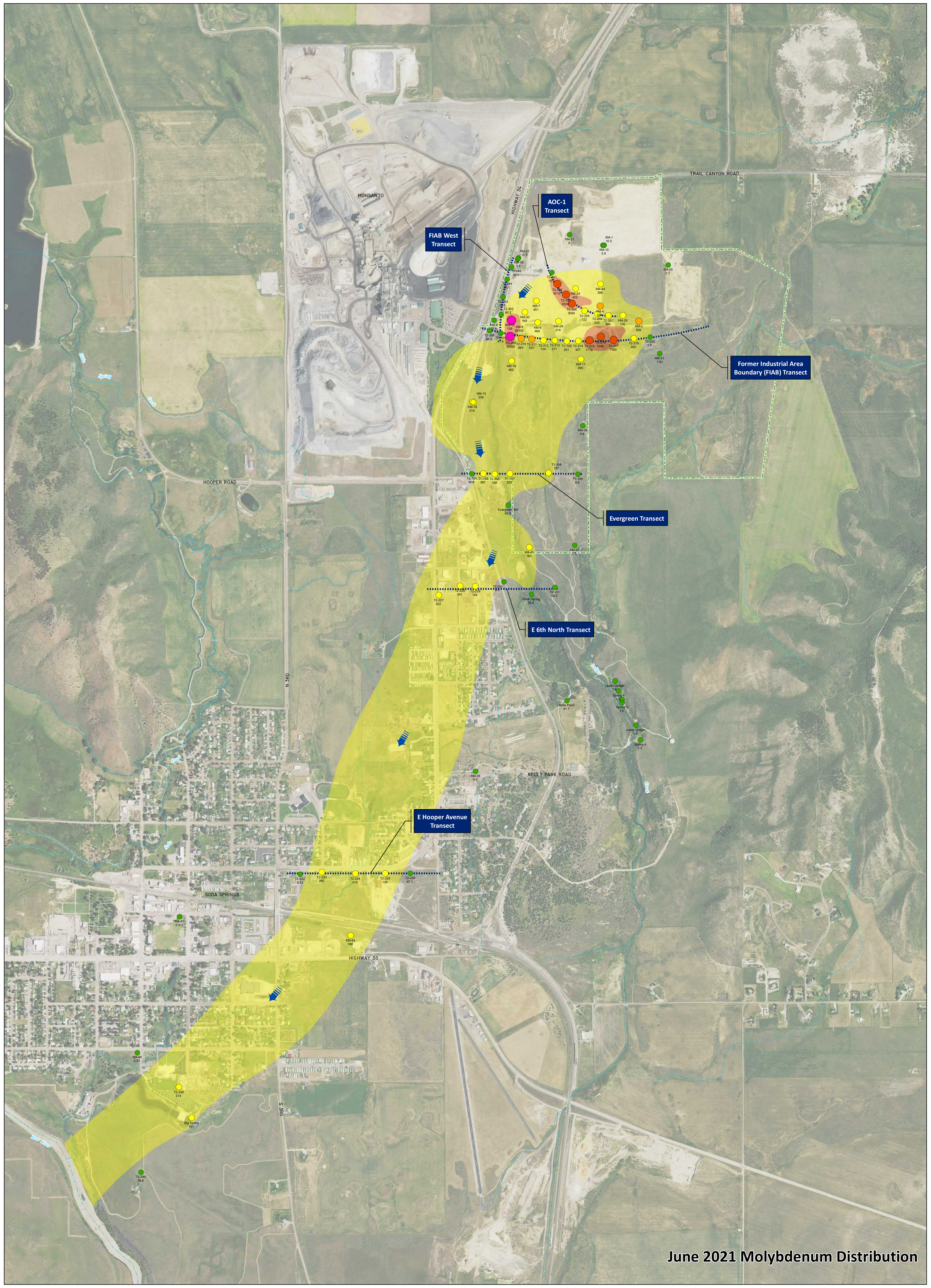
2019 aerial imagery from National Agricultural Imagery Program (NAIP).

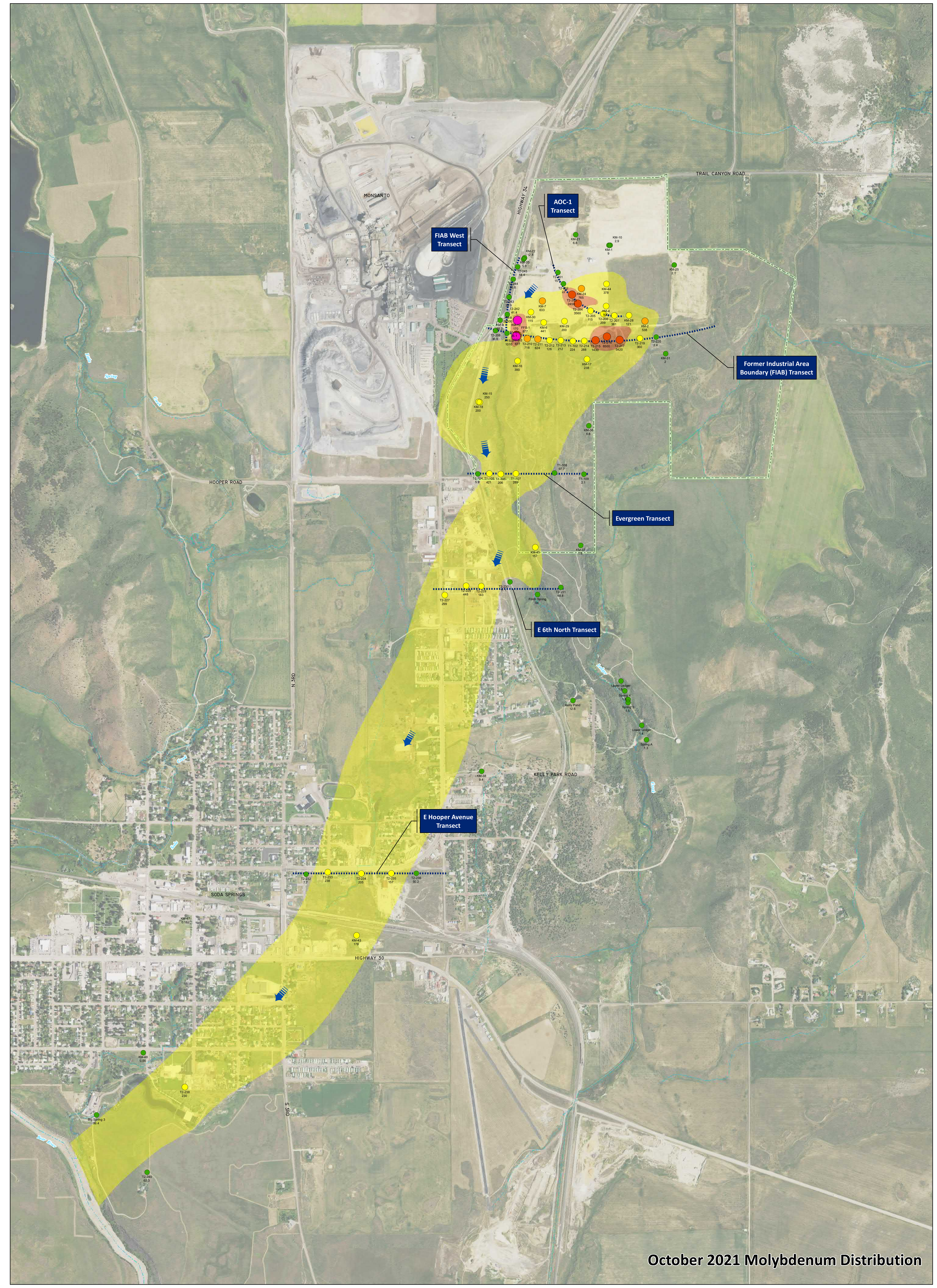
0 400 800 1,600
Scale in Feet

PREPARED FOR: Greenfield Environmental Multistate Trust, LLC Trustee of the Multistate Environmental Response Trust	2021 GROUNDWATER AND SURFACE WATER LONG-TERM MONITORING REPORT KMCC SODA SPRINGS PLANT SUPERFUND SITE SODA SPRINGS, IDAHO	**2021 LONG-TERM GROUNDWATER AND SURFACE WATER MONITORING LOCATIONS**	FIGURE **3-1**

Hydrometrics, Inc. Consulting Scientists and Engineers

DATE: 2/4/2022 7:55:03 AM





0 400 800 1,600
Scale in Feet

EXPLANATION

2018 SRI CMT Well Transects
KMCC Property Boundary
Estimated Groundwater Flow Direction
Surface Water Feature

Molybenum Concentration (µg/L)

- < 100 (< EPA Tapwater RSL)
- 101 - 500
- 500 - 1,000
- 1,000 - 10,000
- > 10,000

Molybdenum Isocontours (µg/L)

- 100 (EPA Tapwater RSL) to 1,000
- > 1,000

NOTES:

CMT = continuous multichannel tubing
SRI = Supplemental Remedial Investigation
RSL = EPA Tapwater Regional Screening Level
FIAB = Former Industrial Area Boundary

2019 aerial imagery from National Agricultural Imagery Program (NAIP).

CMT well concentrations based on maximum observed at all depths.

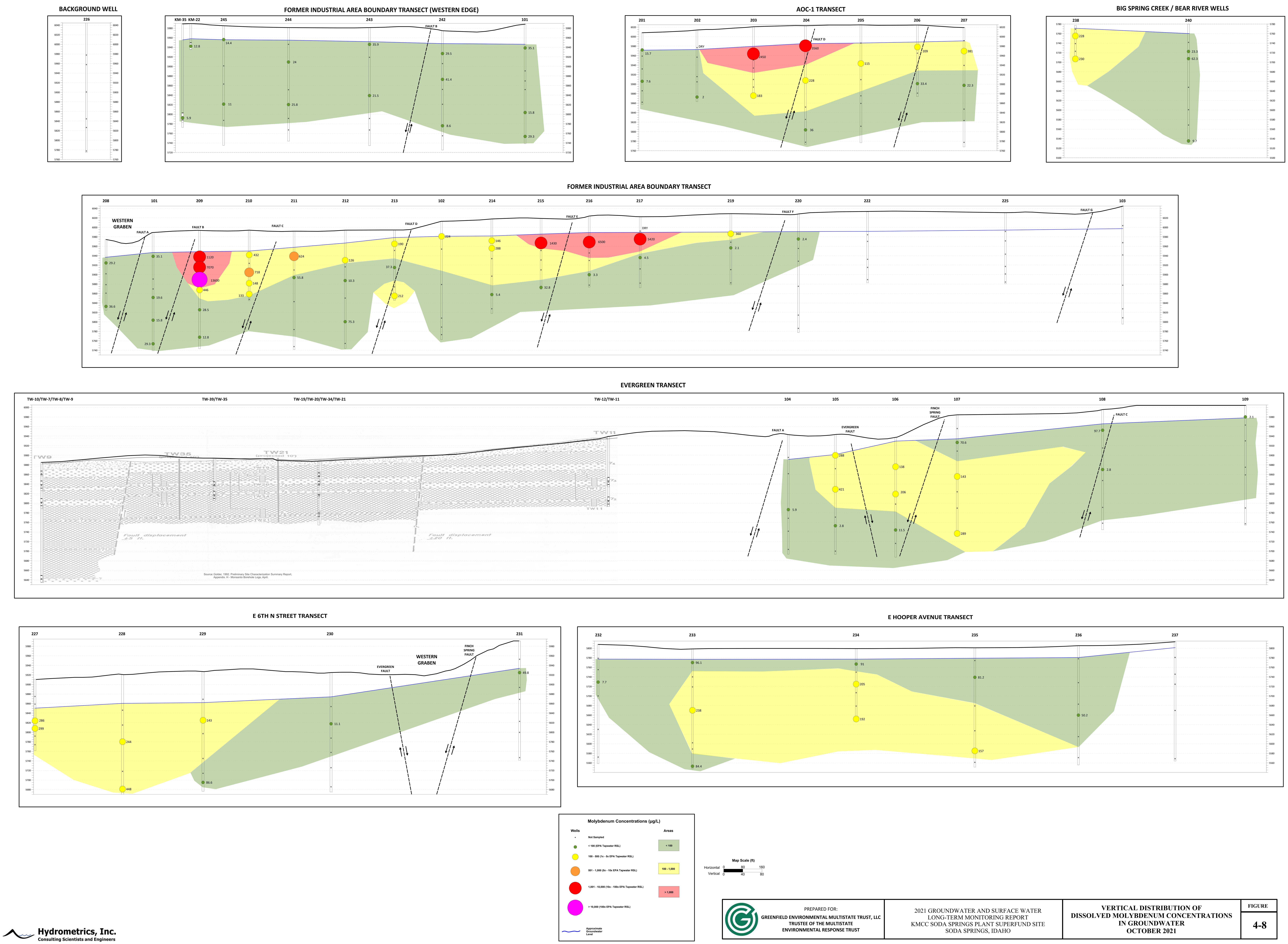
Plume extents shown are approximate.

Groundwater concentrations are dissolved;
surface water concentrations are total.

Hydrometrics, Inc.
Consulting Scientists and Engineers

DATE: 2/7/2022 7:50:27 AM V:\17034\GIS\2021 LTM\Fig4-6_KMCC_2021LTM_Mo.mxd

PREPARED FOR: Greenfield Environmental Multistate Trust, LLC Trustee of the Multistate Environmental Response Trust	2021 GROUNDWATER AND SURFACE WATER LONG-TERM MONITORING REPORT KERR-MCGEE CHEMICAL CORPORATION SODA SPRINGS PLANT SUPERFUND SITE	**2021 LONG-TERM MONITORING MOLYBDENUM CONCENTRATION DISTRIBUTION IN GROUNDWATER AND SURFACE WATER**	FIGURE **4-6**



PREPARED FOR:
GREENFIELD ENVIRONMENTAL MULTISTATE TRUST, LLC
TRUSTEE OF THE MULTISTATE
ENVIRONMENTAL RESPONSE TRUST

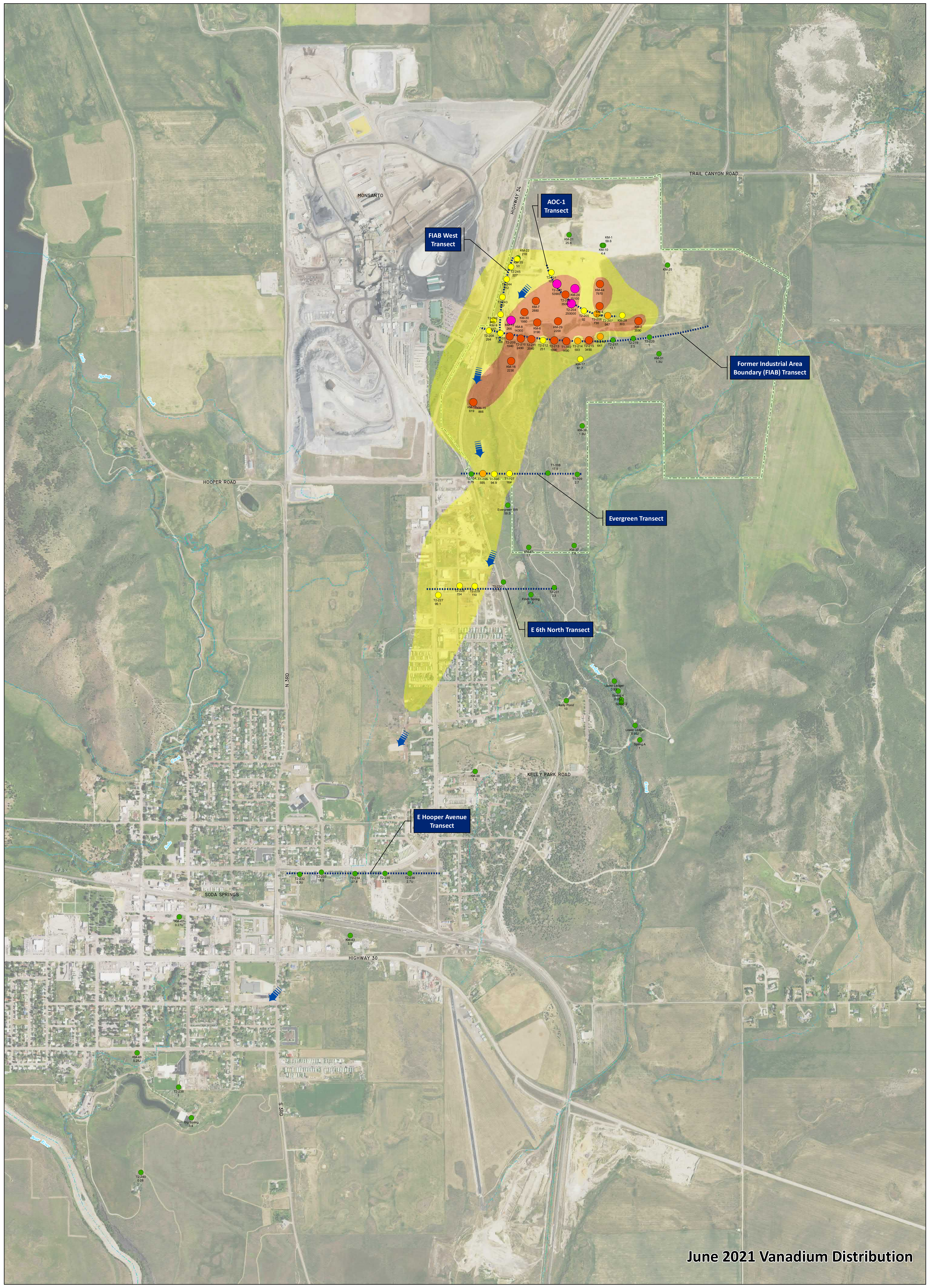
2021 GROUNDWATER AND SURFACE WATER
LONG-TERM MONITORING REPORT
KMCC SODA SPRINGS PLANT SUPERFUND SITE
SODA SPRINGS, IDAHO

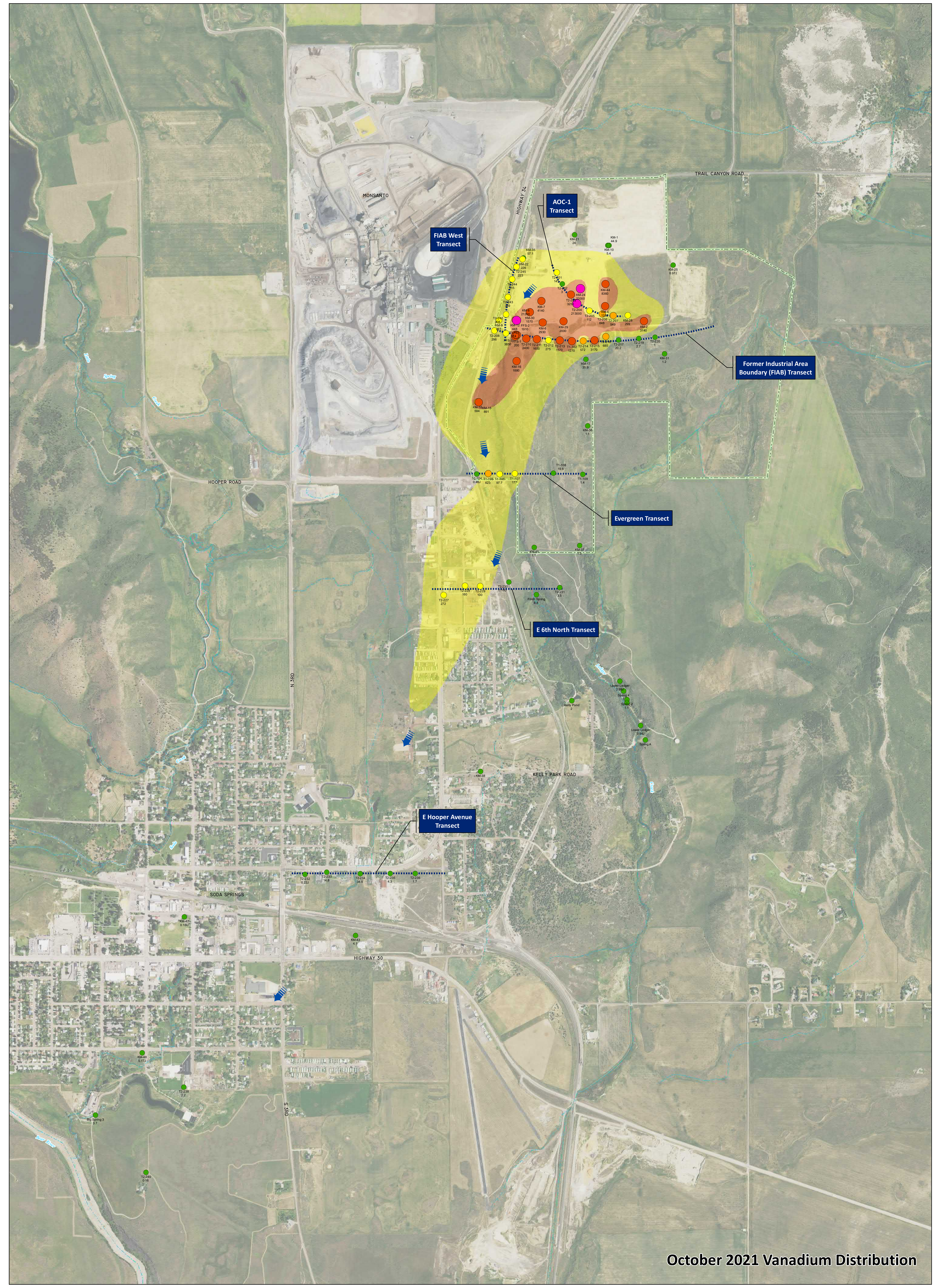
VERTICAL DISTRIBUTION OF
DISSOLVED MOLYBDENUM CONCENTRATIONS
IN GROUNDWATER
OCTOBER 2021

FIGURE
4-8

Hydrometrics, Inc.
Consulting Scientists and Engineers

K:\PROJECT\17034\COC Cross Sections\Moly_XSEC_Oct21.srf





0 400 800 1,600
Scale in Feet

EXPLANATION

2018 SRI CMT Well Transects
KMCC Property Boundary
Estimated Groundwater Flow Direction
Surface Water Feature

Vanadium Concentration (µg/L)

< 86 (EPA Tapwater RSL)
86 - 430
431 - 860
860 - 8,600
> 8,600

Vanadium Isocontours (µg/L)

86 (EPA Tapwater RSL) to 860
> 860

NOTES:

CMT = continuous multichannel tubing
SRI = Supplemental Remedial Investigation
RSL = EPA Tapwater Regional Screening Level
FIAB = Former Industrial Area Boundary

2019 aerial imagery from National Agricultural Imagery Program (NAIP).

CMT well concentrations based on maximum observed at all depths.

Plume extents shown are approximate.

Groundwater concentrations are dissolved;
surface water concentrations are total.

PREPARED FOR:
Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

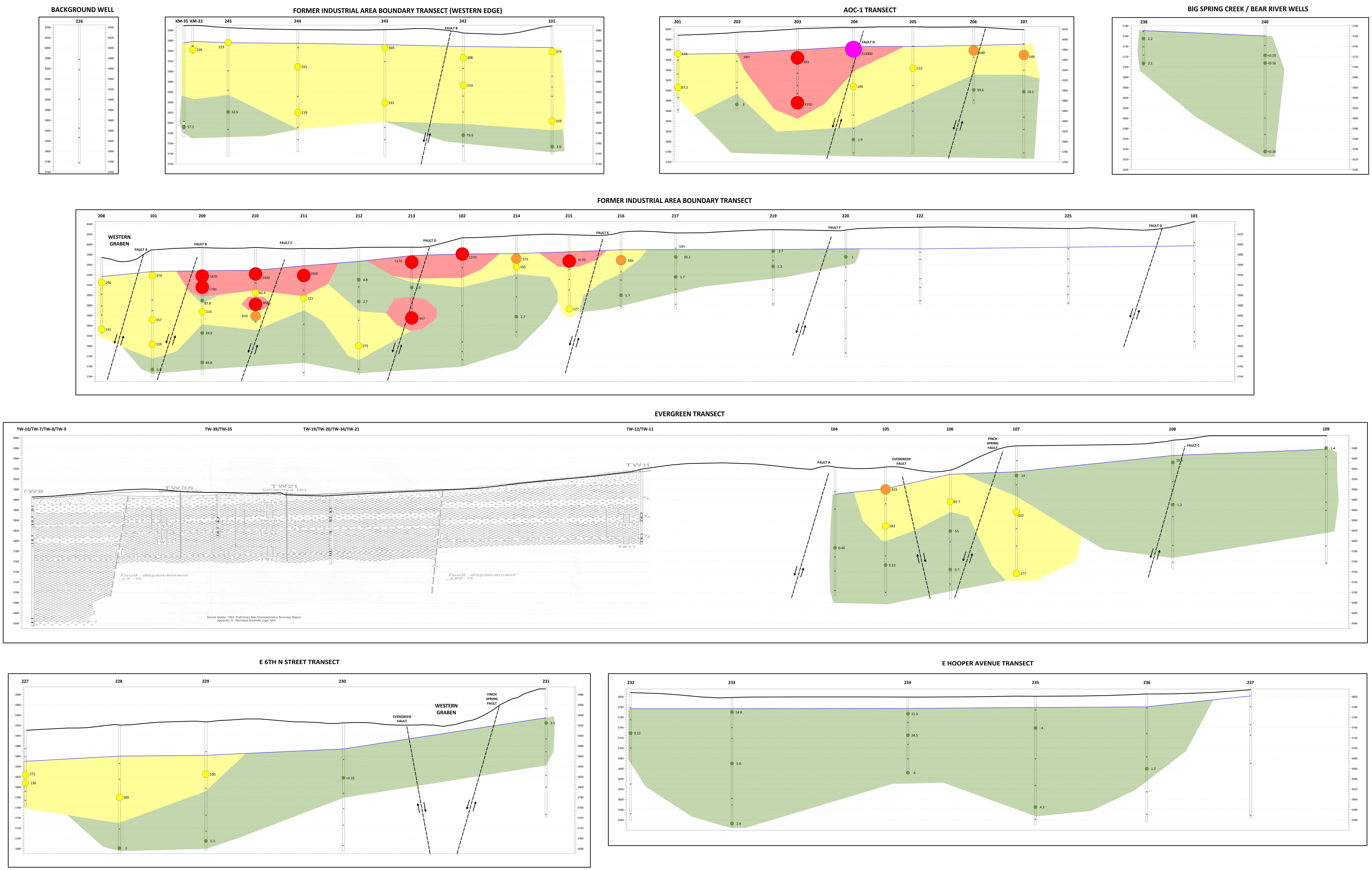
2021 GROUNDWATER AND SURFACE WATER
LONG-TERM MONITORING REPORT
KERR-MCGEE CHEMICAL CORPORATION
SODA SPRINGS PLANT SUPERFUND SITE

2021 LONG-TERM MONITORING VANADIUM CONCENTRATION DISTRIBUTION IN GROUNDWATER AND SURFACE WATER

FIGURE
4-9

Hydrometrics, Inc.
Consulting Scientists and Engineers

DATE: 2/7/2022 8:25:11 AM V:\17034\GIS\2021 LTM\Fig4-9_KMCC_2021LTM_V.mxd



Vanadium Concentrations (µg/L)

Wells		Areas
⊕	Not Sampled	
● (green)	< 86 (EPA Tapwater RSL)	< 86
● (yellow)	86 - 430 (1x - 5x EPA Tapwater RSL)	86 - 860
● (orange)	431 - 860 (5x - 10x EPA Tapwater RSL)	
● (red)	861 - 8,600 (10x - 100x EPA Tapwater RSL)	> 860
● (magenta)	> 8,600 (100x EPA Tapwater RSL)	

Approximate Groundwater Level

Map Scale (ft)
Horizontal 0 80 160
Vertical 0 40 80

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ENVIRONMENTAL RESPONSE TRUST

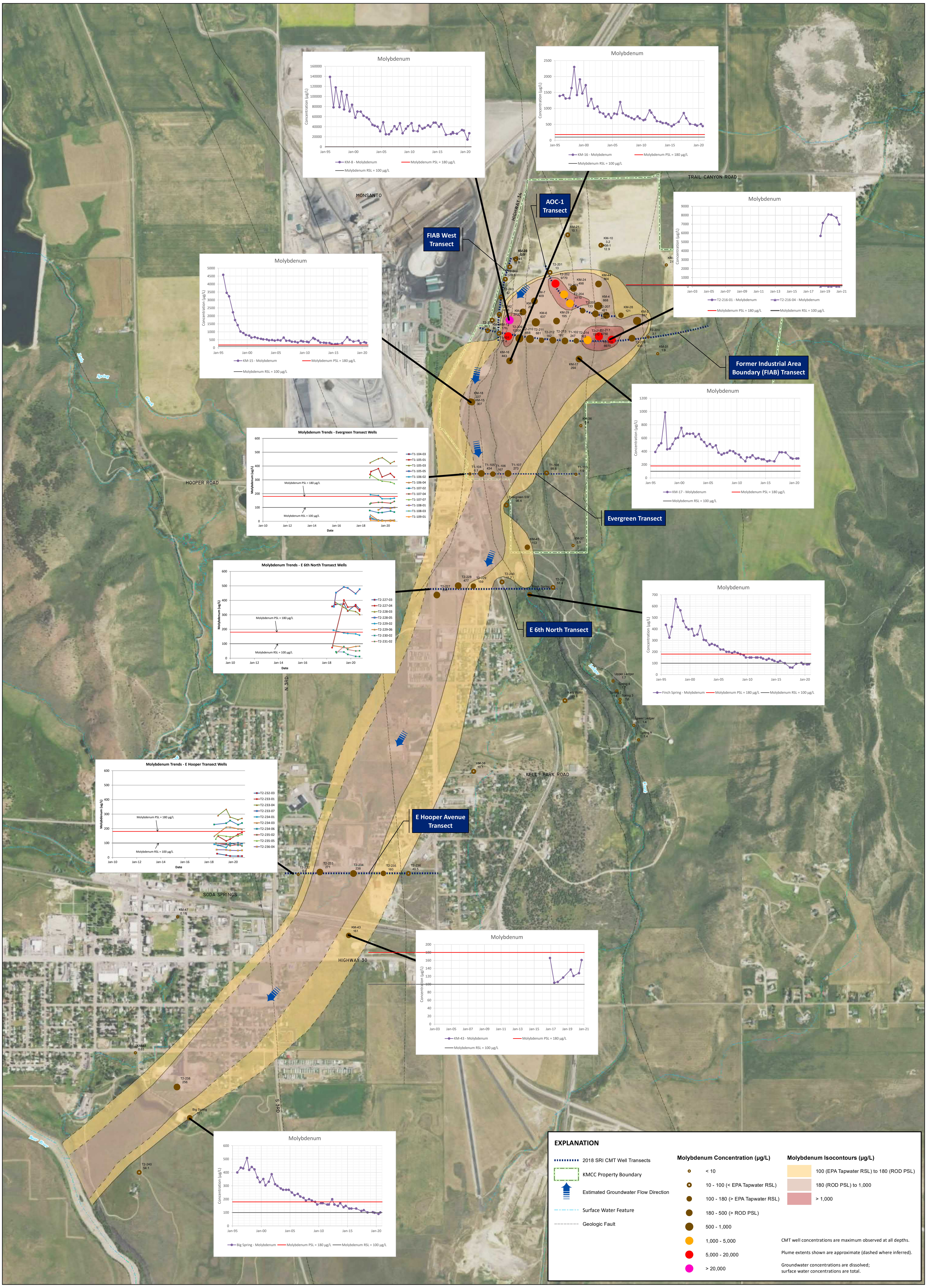
2021 GROUNDWATER AND SURFACE WATER
LONG-TERM MONITORING REPORT
KMCC SODA SPRINGS PLANT SUPERFUND SITE
SODA SPRINGS, IDAHO

VERTICAL DISTRIBUTION OF DISSOLVED VANADIUM CONCENTRATIONS IN GROUNDWATER OCTOBER 2021

FIGURE
4-11

Hydrometrics, Inc.
Consulting Scientists and Engineers

K:\PROJECT\17034\COC Cross Sections\Vana_XSEC_Oct21.srf



NOTES:

CMT = continuous multichannel tubing
SRI = Supplemental Remedial Investigation
WQ = water quality
RSL = EPA Tapwater Regional Screening Level
FIAB = Former Industrial Area Boundary

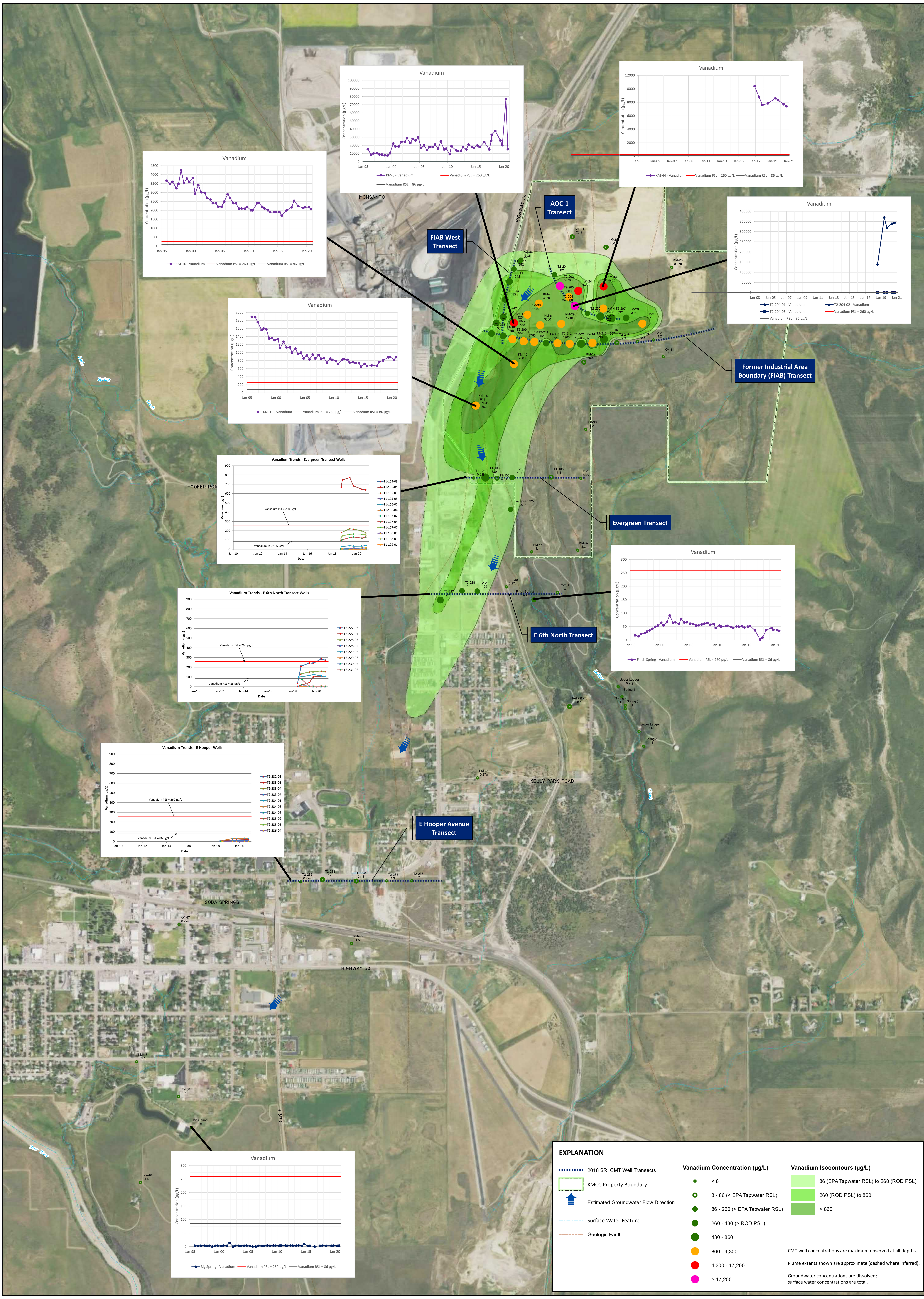
2019 aerial imagery from National Agricultural Imagery Program (NAIP).

0 400 800 1,600
Scale in Feet

PREPARED FOR: Greenfield Environmental Multistate Trust, LLC Trustee of the Multistate Environmental Response Trust	MONITORED NATURAL ATTENUATION EVALUATION KERR-MCGEE CHEMICAL CORPORATION SODA SPRINGS PLANT SUPERFUND SITE	MOLYBDENUM CONCENTRATION TRENDS AT SELECTED GROUNDWATER AND SURFACE WATER MONITORING LOCATIONS	FIGURE 7

Hydrometrics, Inc.
Consulting Scientists and Engineers

DATE: 6/22/2021 5:23:27 PM



0 400 800 1,600
Scale in Feet

NOTES:

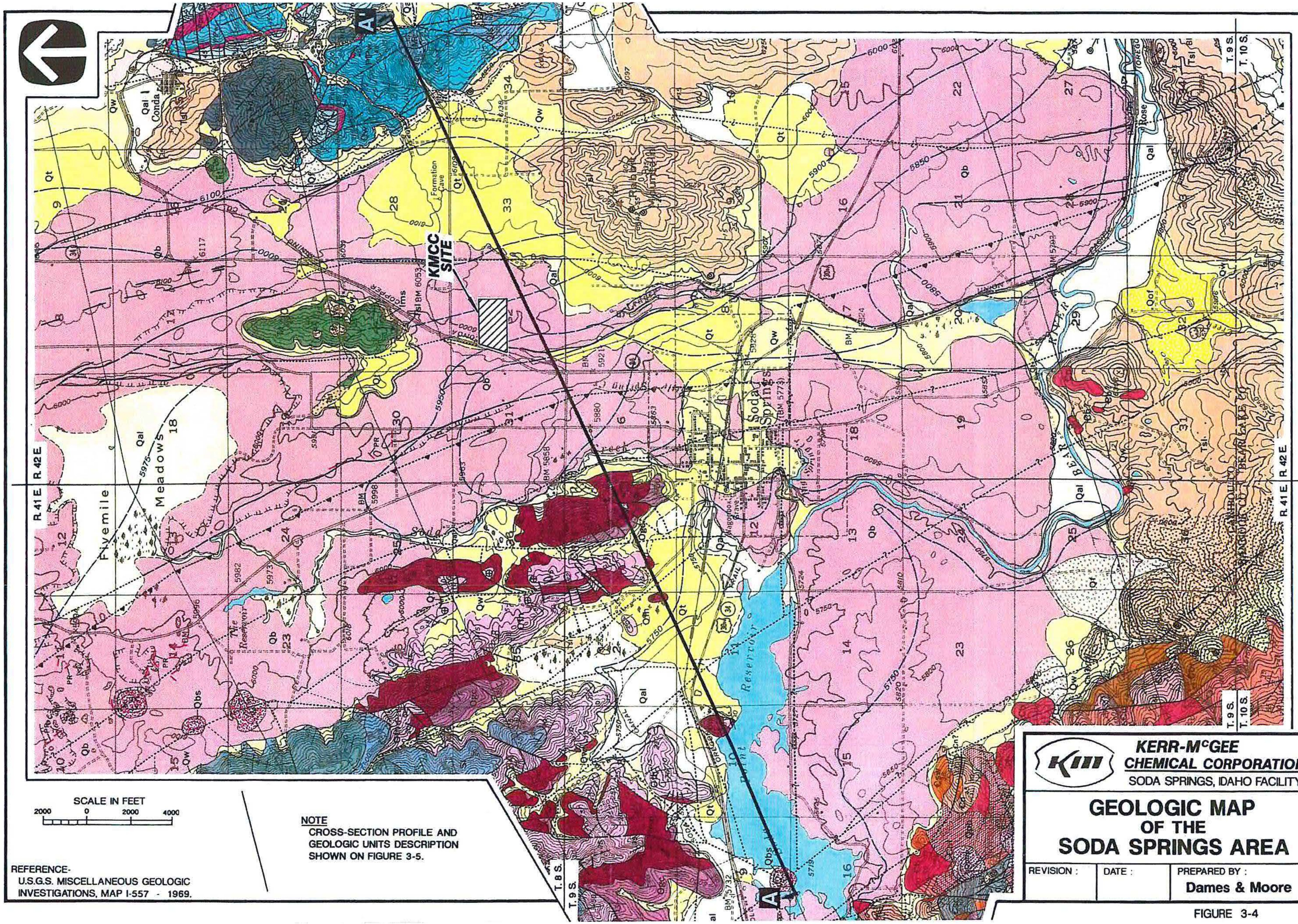
CMT = continuous multichannel tubing
SRI = Supplemental Remedial Investigation
WQ = water quality
RSL = EPA Tapwater Regional Screening Level
FIAB = Former Industrial Area Boundary

2019 aerial imagery from National Agricultural Imagery Program (NAIP).

PREPARED FOR: Greenfield Environmental Multistate Trust, LLC Trustee of the Multistate Environmental Response Trust	MONITORED NATURAL ATTENUATION EVALUATION KERR-MCGEE CHEMICAL CORPORATION SODA SPRINGS PLANT SUPERFUND SITE	VANADIUM CONCENTRATION TRENDS AT SELECTED GROUNDWATER AND SURFACE WATER MONITORING LOCATIONS	FIGURE 8

Hydrometrics, Inc.
Consulting Scientists and Engineers

DATE: 6/23/2021 7:50:35 AM



SCALE IN FEET

2000 0 2000 4000

NOTE
CROSS-SECTION PROFILE AND GEOLOGIC UNITS DESCRIPTION SHOWN ON FIGURE 3-5.

REFERENCE-
U.S.G.S. MISCELLANEOUS GEOLOGIC INVESTIGATIONS, MAP I-557 - 1969.

KERR-McGEE CHEMICAL CORPORATION
SODA SPRINGS, IDAHO FACILITY

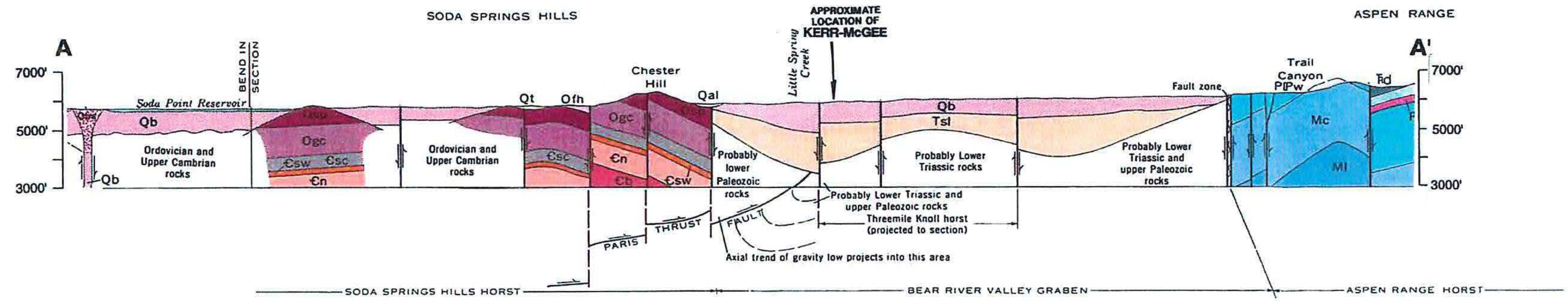
GEOLOGIC MAP OF THE SODA SPRINGS AREA

REVISION :	DATE :	PREPARED BY : Dames & Moore

FIGURE 3-4

FILE ____ BY ____ DATE ____ CHECKED BY ____ DATE ____

466 12 (11-82)



LOCATION OF LINE OF SECTION ON FIGURE 3-4.

QUATERNARY

Qal | Qf | Qls

Gravel, sand, and silt

Qal, alluvium
Qf, fan deposits
Qls, landslide deposits

Qt

Calcareous tufa and travertine

Hot and cold spring deposits

Qw | Qof

Sand, gravel, and silt

Qw, hill wash and older alluvium; stippled where mass-wasting has deposited lag gravel from Salt Lake Formation on hill wash
Qof, old fan deposits being dissected by present cycle of erosion

Ql

Lake deposits

Silt and marl; poorly exposed and probably thin

Qpb | Qpbs

Porphyritic basalt

Qpb, porphyritic basalt
Qpbs, porphyritic basalt scoria

Qb | Qdb | Qbs | Qbc

Olivine basalt

Qb, olivine basalt
Qdb, domed olivine basalt containing collapsed areas
Qbs, basalt scoria
Qbc, basalt cinders

TERTIARY

Tsl

Salt Lake Formation

Sandstone, conglomerate, lacustrine limestone, all of which may be tuffaceous, and rhyolitic vitric volcanic ash and tuff
Stippled where particle size ranges from large boulders to silt; characterized by large boulders from Swan Peak Quartzite and from other Paleozoic formations; in most places boulders concentrated as lag gravel in upper part of unit

Tb

Olivine basalt

TRIASSIC

Dinwoody Formation

Brown, silty, medium-crystalline limestone and light-gray finely crystalline limestone

PERMIAN

Ppr | Ppm

Phosphoria Formation

Ppr, includes massive Rex Chert Member and cherty shale member
Ppm, Meade Peak Phosphatic Shale Member; phosphorite, phosphatic mudstone, and phosphatic limestone

CARBONIFEROUS

PlPw

Wells Formation and associated rocks

Includes Grandeur Tongue of Park City Formation at top. Interbedded sandstone, some of which is calcareous, quartzitic, or dolomitic, and light-gray limestone and brownish-gray medium-crystalline dolomite. Dolomite more abundant in upper half; limestone in lower. Beds of limestone in lower half composed almost wholly of flattened oolites

Mc

Chesterfield Range Group
(Brazer Limestone of older reports)

Upper half is thick bedded limestone that forms bold outcrops; lower part, interbedded thin-bedded limestone and buff fine-grained sandstone; at base, a

Ml

Lodgepole Limestone

Medium- to dark-gray thin-bedded very fossiliferous, locally cherty limestone

ORDOVICIAN

Ofh

Fish Haven Dolomite

Medium-brownish-gray to gray finely to medium crystalline dolomite; chert nodules and lenses in lower part

Osp

Swan Peak Quartzite

White fine-grained pure quartzite composed of well-rounded frosted grains of high sphericity; some sandy limestone near base

Ogc

Garden City Limestone

Interbedded light-gray finely crystalline limestone and intraformational limestone conglomerate; matrix is coarse and locally appears to be composed of fossil fragments; abundant chert nodules and lenses near top and in lower part

CAMBRIAN

Єsc | Єsw

St. Charles Formation

Єsc, dolomite, medium-brownish-gray to gray, finely to medium crystalline; poorly defined bedding; Girvanella in dolomite; distinctive peppered and streaked texture; medium-gray finely crystalline limestone near base
Єsw, Worm Creek Quartzite Member; interbedded arkosic quartzite, quartzite and arkose

CAMBRIAN (CONTINUED)

Єn

Nounan Limestone

Upper part light- to dark-gray and tan-gray finely to coarsely crystalline limestone, locally oolitic and blotchy and tan silty partings; a few red beds
Lower part white coarsely crystalline dolomite and medium-gray finely to medium crystalline dolomite; weathers light tan gray

Єb

Bloomington Formation

Interbedded olive-drab to tan finely micaceous shale and thin-bedded limestone; limestone most abundant near middle. Much coarsely oolitic limestone; oolites tan, red, and black. Much intraformational limestone conglomerate; pebbles have pink margins. Apple-green aphanitic limestone concretions in shale

SCALE IN FEET

2000 0 2000 4000

REFERENCE-
U.S.G.S. MISCELLANEOUS GEOLOGIC INVESTIGATIONS, MAP I-557 - 1969.

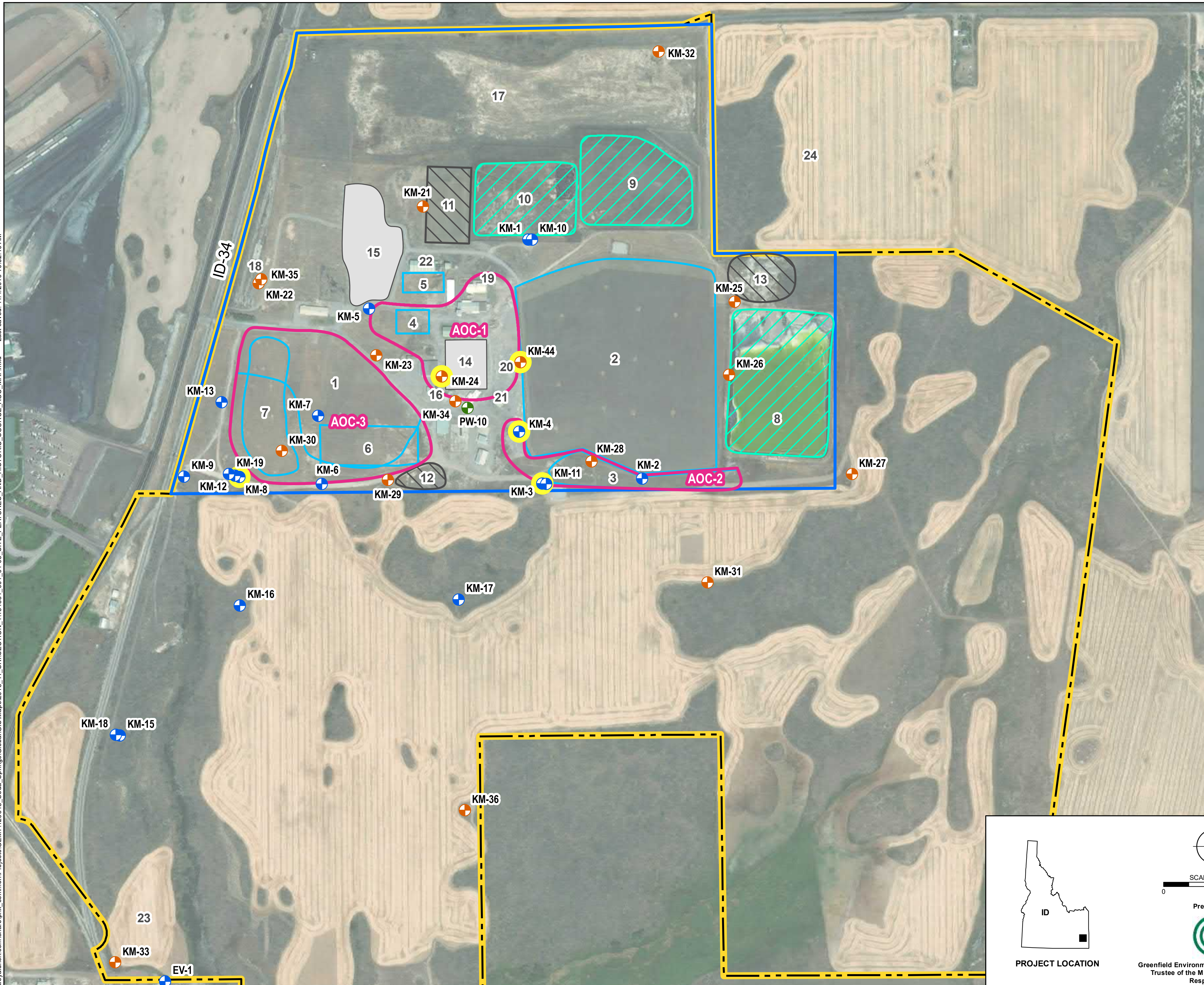
FILE 14626-019-5159 BY ____ DATE ____ CHECKED BY ____ DATE ____

KERR-McGEE CHEMICAL CORPORATION
SODA SPRINGS, IDAHO FACILITY

REGIONAL GEOLOGIC CROSS-SECTION

REVISION :	DATE :	PREPARED BY : Dames & Moore

FIGURE 3-5



SITE FEATURE	NAME
1	West Calcine Repository (Reclaimed)
2	East Calcine Repository
3	Scrubber Pond (Reclaimed)
4	Boiler Blowdown Pond (Reclaimed)
5	MAP Ponds (Reclaimed)
6	Limestone Settling and Stormwater Ponds (Reclaimed)
7	S-X Pond (Reclaimed)
8	10-Acre Pond (Reclaimed)
9	East 5-Acre Pond (Reclaimed)
10	West 5-Acre Pond (Reclaimed)
11	West Waste Repository
12	South Industrial Landfill Area (Reclaimed)
13	North Industrial Landfill (Reclaimed)
14	Vanadium Plant (Dismantled)
15	Fertilizer Plant (Dismantled)
16	Water Supply Well (Abandoned)
17	Cropland (Soil Cap Borrow Area)
18	Rail Spur Area
19	Fugitive Calcine and Roaster Reject Area (Reclaimed)
20	Limestone Stockpile (Removed)
21	Ferrophosphorus Ore Storage Area (Reclaimed)
22	Chemical Storage Building/Calcine Dewatering Building
23	Lower Field
24	Brown Property

EXPLANATION

- Remedial Investigation/Feasibility Study (RI/FS) Well
- Supplemental Remedial Investigation (SRI) Well
- Historical Production Well
- Groundwater Impact Area
- Landfill
- Former Industrial Plant
- Lined Pond
- Unlined Pond
- Area of Concern (AOC) Boundary
- Formal Industrial Plant Boundary
- Property Boundary

NOTES

1. Locations of site features are approximate.
2. Aerial imagery source: Esri

ID

PROJECT LOCATION

SCALE IN FEET

0 280 560

Prepared for:

Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

KERR-MCGEE CHEMICAL CORP.
SODA SPRINGS PLANT SUPERFUND SITE
SODA SPRINGS, IDAHO

Figure 1-3

SITE FEATURES AND HISTORIC SOURCE AREAS OF CONCERN MAP

PROJECT: 131831	BY: CRAUMANN	REVISIONS:
DATE: OCT 2019	CHECKED: AK	

HALEY & ALDRICH

\\haleyaldrich.com\share\phx_common\Projects\GEMT\129648_Soda_Springs\Global\GIS\Maps\2018_11_SRI\SECTION_1\131831_001_01-03_SITE_FEATURES_AND_HISTORIC_SOURCE_AOC_MAP.mxd — Last saved: 11/1/2019 10:52:40 AM

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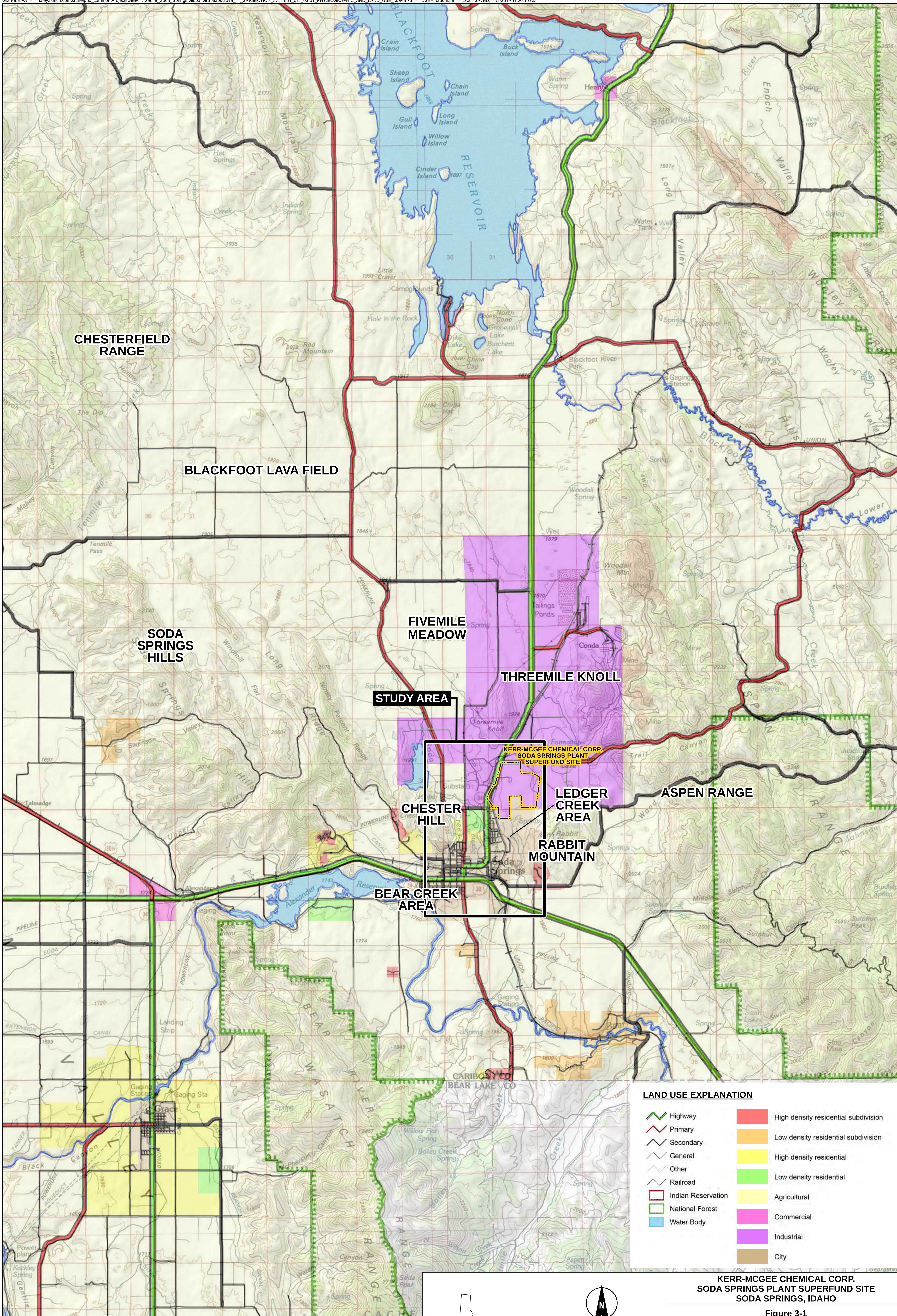


EXPLANATION

Study Area

Property Boundary

NOTES

1. All locations and dimensions are approximate.
2. Topographic base map source: Esri
3. Land use base map source: Caribou County, 2008

PROJECT LOCATION

SCALE IN MILES
0 0.5 1 1.5 2

Prepared for:

Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

KERR-MCGEE CHEMICAL CORP.
SODA SPRINGS PLANT SUPERFUND SITE
SODA SPRINGS, IDAHO

Figure 3-1

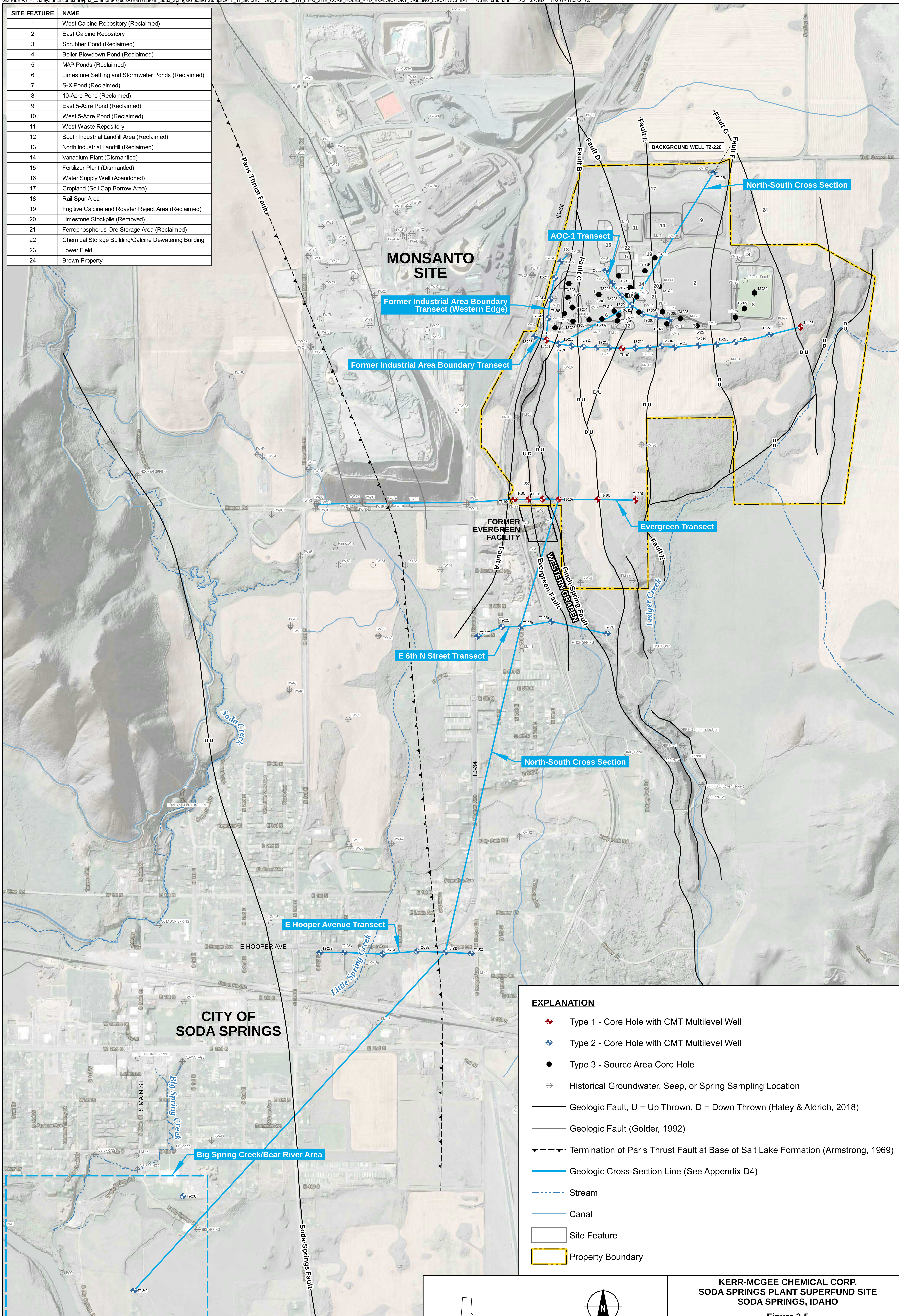
PHYSIOGRAPHIC AND LAND USE MAP OF STUDY AREA

PROJECT: 131831	BY: CRAUMANN	REVISIONS:
DATE: OCT 2019	CHECKED: AK	

HALEY & ALDRICH

GIS FILE PATH: \\haleyaldrich.com\share\phx_common\Projects\GEMT\129648_Soda_Springs\Global\GIS\Maps\2018_11_SRI\SECTION_3\131831_011_03-05_SITE_CORE_HOLES_AND_EXPLORATORY_DRILLING_LOCATIONS.mxd — USER: craumann — LAST SAVED: 11/1/2019 11:05:24 AM

SITE FEATURE	NAME
1	West Calcine Repository (Reclaimed)
2	East Calcine Repository
3	Scrubber Pond (Reclaimed)
4	Boiler Blowdown Pond (Reclaimed)
5	MAP Ponds (Reclaimed)
6	Limestone Settling and Stormwater Ponds (Reclaimed)
7	S-X Pond (Reclaimed)
8	10-Acre Pond (Reclaimed)
9	East 5-Acre Pond (Reclaimed)
10	West 5-Acre Pond (Reclaimed)
11	West Waste Repository
12	South Industrial Landfill Area (Reclaimed)
13	North Industrial Landfill (Reclaimed)
14	Vanadium Plant (Dismantled)
15	Fertilizer Plant (Dismantled)
16	Water Supply Well (Abandoned)
17	Cropland (Soil Cap Borrow Area)
18	Rail Spur Area
19	Fugitive Calcine and Roaster Reject Area (Reclaimed)
20	Limestone Stockpile (Removed)
21	Ferrophosphorus Ore Storage Area (Reclaimed)
22	Chemical Storage Building/Calcine Dewatering Building
23	Lower Field
24	Brown Property



EXPLANATION

- Type 1 - Core Hole with CMT Multilevel Well
- Type 2 - Core Hole with CMT Multilevel Well
- Type 3 - Source Area Core Hole
- Historical Groundwater, Seep, or Spring Sampling Location
- Geologic Fault, U = Up Thrown, D = Down Thrown (Haley & Aldrich, 2018)
- Geologic Fault (Golder, 1992)
- Termination of Paris Thrust Fault at Base of Salt Lake Formation (Armstrong, 1969)
- Geologic Cross-Section Line (See Appendix D4)
- Stream
- Canal
- Site Feature
- Property Boundary

NOTES

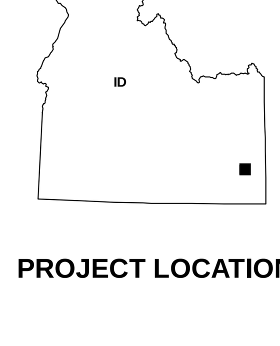
1. All locations and dimensions are approximate.

2. The North-South Cross Section Line is also used in the conceptual site model (CSM) shown on Figure 5-1.

3. Hydrology data source: USGS National Hydrology Dataset

4. Fault locations are preliminary and interpreted from 2018 LiDAR survey and, where named, where additionally based on subsurface correlation along the transects and the North-South cross section.

5. Aerial imagery source: Esri



PROJECT LOCATION

SCALE IN FEET
0 350 700 1,050 1,400

Prepared for:

Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

KERR-MCGEE CHEMICAL CORP.
SODA SPRINGS PLANT SUPERFUND SITE
SODA SPRINGS, IDAHO

Figure 3-5

STUDY AREA CORE HOLES AND EXPLORATORY DRILLING LOCATIONS

PROJECT: 131831	BY: CRAUMANN	REVISIONS:
DATE: OCT 2019	CHECKED: AK	

HALEY & ALDRICH

KERR-MCGEE CHEMICAL CORP.
SODA SPRINGS PLANT SUPERFUND SITE
SODA SPRINGS, IDAHO

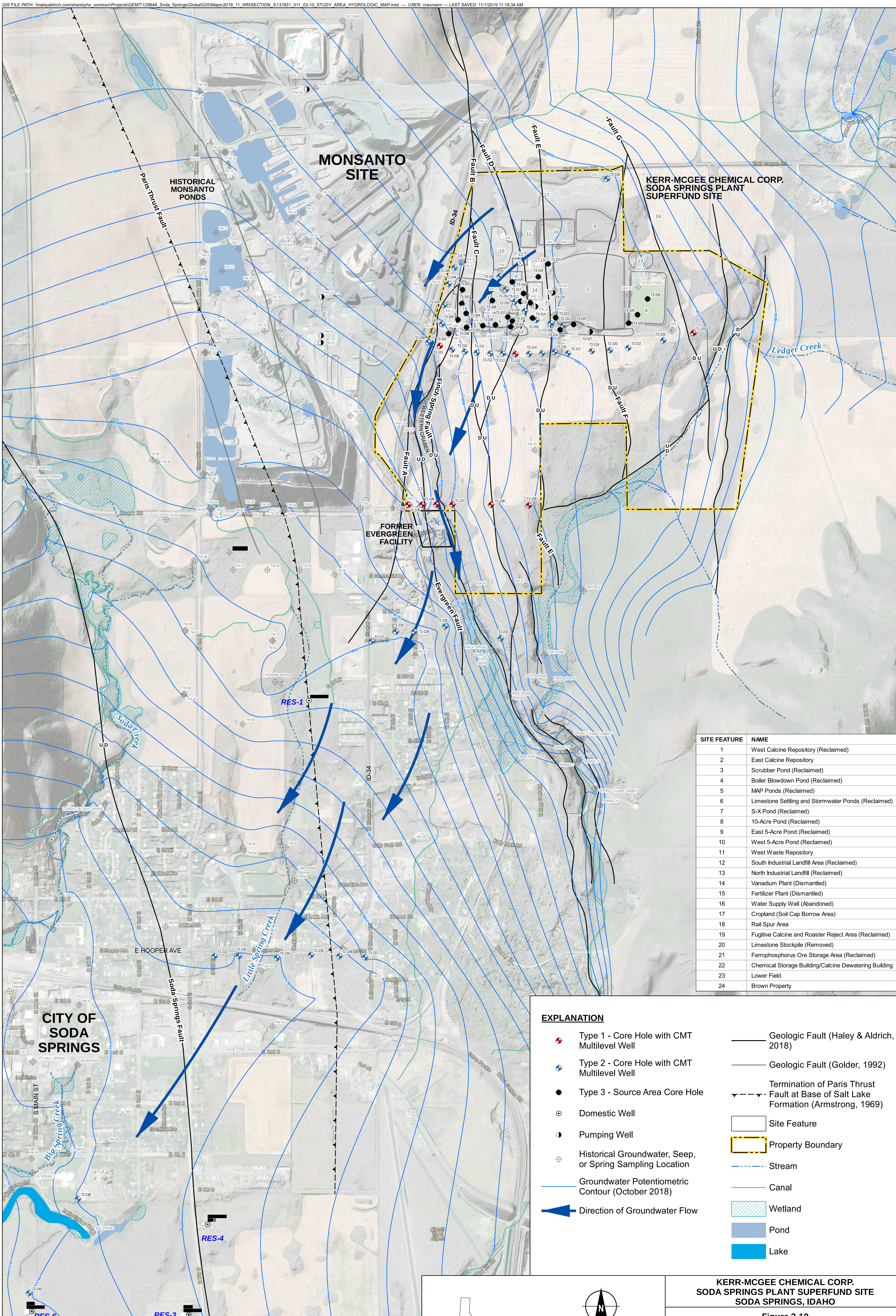
Figure 3-7

SUMMARY CROSS SECTIONS

PROJECT: 131831	BY: MW	REVISIONS:
DATE: OCT 2019	CHECKED: AK	

HALEY & ALDRICH

GIS FILE PATH: \\haleyaldrich.com\share\phx_common\Projects\GEMT\129648_Soda_Springs\Global\GIS\Maps\2018_11_SRI\SECTION_3\131831_011_03-10_STUDY_AREA_HYDROLOGIC_MAP.mxd — USER: craumann — LAST SAVED: 11/1/2019 11:16:34 AM



SITE FEATURE	NAME
1	West Calcine Repository (Reclaimed)
2	East Calcine Repository
3	Scrubber Pond (Reclaimed)
4	Boiler Blowdown Pond (Reclaimed)
5	MAP Ponds (Reclaimed)
6	Limestone Settling and Stormwater Ponds (Reclaimed)
7	S-X Pond (Reclaimed)
8	10-Acre Pond (Reclaimed)
9	East 5-Acre Pond (Reclaimed)
10	West 5-Acre Pond (Reclaimed)
11	West Waste Repository
12	South Industrial Landfill Area (Reclaimed)
13	North Industrial Landfill (Reclaimed)
14	Vanadium Plant (Dismantled)
15	Fertilizer Plant (Dismantled)
16	Water Supply Well (Abandoned)
17	Cropland (Soil Cap Borrow Area)
18	Rail Spur Area
19	Fugitive Calcine and Roaster Reject Area (Reclaimed)
20	Limestone Stockpile (Removed)
21	Ferrophosphorus Ore Storage Area (Reclaimed)
22	Chemical Storage Building/Calcine Dewatering Building
23	Lower Field
24	Brown Property

EXPLANATION

- Type 1 - Core Hole with CMT Multilevel Well
- Type 2 - Core Hole with CMT Multilevel Well
- Type 3 - Source Area Core Hole
- Domestic Well
- Pumping Well
- Historical Groundwater, Seep, or Spring Sampling Location
- Groundwater Potentiometric Contour (October 2018)
- Direction of Groundwater Flow
- Geologic Fault (Haley & Aldrich, 2018)
- Geologic Fault (Golder, 1992)
- Termination of Paris Thrust Fault at Base of Salt Lake Formation (Armstrong, 1969)
- Site Feature
- Property Boundary
- Stream
- Canal
- Wetland
- Pond
- Lake

NOTES

1. All locations and dimensions are approximate.
2. Asterisk (*) indicates that a spring serves as a water supply source for the City of Soda Springs.
3. Hydrology data source: USGS National Hydrology Dataset
4. Fault locations are preliminary and interpreted from 2018 LiDAR survey and, where named, where additionally based on subsurface correlation along the transects and the North-South cross section.

PROJECT LOCATION

SCALE IN FEET
0 350 700 1,050 1,400

Prepared for:

Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

KERR-MCGEE CHEMICAL CORP.
SODA SPRINGS PLANT SUPERFUND SITE
SODA SPRINGS, IDAHO

Figure 3-10

STUDY AREA HYDROLOGIC MAP

PROJECT: 131831	BY: CRAUMANN	REVISIONS:
DATE: OCT 2019	CHECKED: AK	

HALEY & ALDRICH

APPROXIMATE EXTENT OF SITE
(1) BACKGROUND
(2) AOC-1 TRANSECT
(3) FORMER INDUSTRIAL AREA BOUNDARY (FIAB) TRANSECT
(4) EVERGREEN TRANSECT
(5) E. 6TH N TRANSECT
(6) E. HOOPER AVENUE TRANSECT
(7) BIG SPRINGS/ BEAR RIVER
T2-226
T2-204
T2-209
T1-107
T2-229
T2-236
T2-240
EXPLANATION
BLACKFOOT FLOWS AND FLOW SEQUENCES
INTERBEDDED AND OVERBURDEN SEDIMENTARY UNITS
FAULT E
FAULT D
FAULT C
FINCH SPRING FAULT
WESTERN GRABEN
FINCH SPRING (projected)
EVERGREEN FAULT
KELLY PARK
CITY OF SODA SPRINGS
SODA SPRINGS FAULT
BIG SPRINGS CREEK
BIG SPRING
BEAR RIVER
SALT LAKE FORMATION
VANADIUM VERTICAL EXTENT (RSL = 86 ug/L)
MOLYBDENUM VERTICAL EXTENT (RSL = 100 ug/L)
Groundwater Flow Direction
Groundwater Vertical Gradient
Molybdenum Vertical Extent
Vanadium Vertical Extent
Spring Location
Water Table
HORIZONTAL 0 400 800 FEET
VERTICAL 0 40 80
NOTES
1. All locations and dimensions are approximate.
2. Hydrology data source: USGS National Hydrology Dataset
3. Fault locations are preliminary and interpreted form 2018 LiDAR survey and, where named, where additionally based on subsurface correlation along the transects and the North-South cross section.
4. Aerial imagery source: Esri
EXPLANATION
Type 1 - Core Hole with CMT Multilevel Well
Type 2 - Core Hole with CMT Multilevel Well
Type 3 - Source Area Core Hole
Historical Groundwater, Seep, or Spring Sampling Location
Geologic Fault, U = Up Thrown, D = Down Thrown (Haley & Aldrich, 2018)
Geologic Fault (Golder, 1992)
Termination of Paris Thrust Fault at Base of Salt Lake Formation (Armstrong, 1969)
Geologic Cross-Section Line (See Appendix D4)
Stream
Canal
Site Feature
Property Boundary
Conceptual Site Model Longitudinal Line of Section
North-South Cross Section
Evergreen Transect
AOC-1 Transect
Former Industrial Area Boundary Transect
Former Industrial Area Boundary Transect (Western Edge)
E 6th N Street Transect
E Hooper Avenue Transect
Big Spring Creek/ Bear River Area
BACKGROUND WELL T2-226
Ledger Creek
Little Spring Creek
WESTERN GRABEN
FORMER EVERGREEN FACILITY
Paris Thrust Fault
Soda Springs Fault
Finch Spring Fault
Evergreen Fault
Fault A
Fault B
Fault C
Fault D
Fault E
Fault F
Fault G
MOLYBDENUM HORIZONTAL EXTENT (RSL = 100 ug/L)
VANADIUM HORIZONTAL EXTENT (RSL = 86 ug/L)
KERR-MCGEE CHEMICAL CORP. SODA SPRINGS PLANT SUPERFUND SITE SODA SPRINGS, IDAHO
Figure 5-1
CONCEPTUAL SITE MODEL
PROJECT: 131831
BY: MW
REVISIONS: CP
DATE: OCT 2019
CHECKED: AK
Prepared for: Greenfield Environmental Multistate Trust, LLC Trustee of the Multistate Environmental Response Trust
HALEY & ALDRICH