SECOND FIVE-YEAR REVIEW REPORT FOR
FRENCH GULCH SITE
SUMMIT COUNTY, COLORADO

Prepared by

U.S. Environmental Protection Agency
Region 8
Denver, Colorado

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Date

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LIST OF ABBREVIATIONS AND ACRONYMS

3DVA	Three-Dimensional Visualization and Analysis
ARAR	Applicable or Relevant and Appropriate Requirement
CD	Consent Decree
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
CSM	Conceptual Site Model
CWQCC	Colorado Water Quality Control Commission
DCM	Discharge Control Mechanism
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
gpm	Gallons per Minute
IC	Institutional Control
ln	Natural Log
MCL	Maximum Contaminant Level
mg/L	Milligrams per Liter
NA	Not Applicable
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PA/SI	Preliminary Assessment/Site Investigation
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RPM	Remedial Project Manager
SOW	Scope of Work
TSS	Total Suspended Solids
TVS	Table Value Standards
USGS	United States Geological Survey
UU/UE	Unlimited Use and Unrestricted Exposure
WTP	Water Treatment Plant
µg/L	Micrograms per Liter

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the second FYR for the French Gulch site (the Site). The Site is not currently included on EPA Superfund program's National Priorities List (NPL) but EPA considers the Site an NPL-caliber site. Due to state and community concerns, EPA deferred an NPL-listing decision and has proceeded to address the Site through a community-based environmental protection framework. The triggering action for this discretionary review is the previous FYR, issued September 30, 2015. This FYR has been prepared to meet the requirements of a 2005 Consent Decree and because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

Separate response actions at the Site address surface waste (Capping Action) and water quality (Water Quality Action). The 2005 Consent Decree states that EPA will conduct a review of whether the Water Quality Action is protective of human health and the environment at least every five years.[1] Therefore, the Water Quality Action is the subject of this FYR Report. This report also summarizes activities for the Capping Action.

EPA remedial project manager (RPM) Andrew Schmidt led the FYR. Participants included EPA community involvement coordinator (CIC) Lisa McClain-Vanderpool, Mary Boardman and Alex Hedgepath from the Colorado Department of Public Health and Environment (CDPHE), and Treat Suomi and Jill Billus from Skeo (EPA FYR support contractor). The town of Breckenridge and Summit County (Town and County), parties responsible for operation of the Wellington-Oro water treatment plant (WTP), were notified of the initiation of the FYR. The review began on 1/10/2020.

EPA has determined in the FYR that the cleanup at the French Gulch site is not protective. Although the current remedy is protective of human health and allows for recreational reuse, it is not protective of the environment. Concentrations of zinc in surface water of Blue River Segment 2a do not meet water quality standards that support attainment of an adult brown trout fishery.

Site Background

The Site includes mine wastes and the flooded mine pool associated with the former Wellington-Oro Mine complex, located near the town of Breckenridge in Summit County, Colorado. The Wellington-Oro Mine complex is 2.2 miles upstream of the confluence of French Creek and the Blue River near Breckenridge (Figure 1). Mining and milling operations occurred at the mine from the late 1940s to the early 1970s. Acid mine water flowing through the mine workings becomes highly contaminated with dissolved metals, exits the mine in the form of seeps and enters French Creek. EPA investigations in the late 1980s determined that the Wellington-Oro Mine pool was the major contributor of zinc and cadmium load from French Creek into the Blue River.

[1] Section V of the 2005 Consent Decree required that the buyers (Town and County) perform the actions necessary to implement the Water Quality Action Memorandum in accordance with the Statement of Work (SOW), which was attached as Appendix 4 to the Consent Decree. The SOW states, "Buyers will cooperate with EPA, in order to permit EPA to conduct reviews of whether the Water Quality Action is protective of human health and the environment at least every five (5) years in accordance with EPA's "Comprehensive Five-Year Review Guidance," OSWER Directive 9355.7-03BP, dated June 2001 (the "Guidance")."

French Creek flows from east to west in the vicinity of the Wellington-Oro Mine complex and drains into the Blue River. The Blue River flows north through Breckenridge toward Dillon Reservoir, where it forms the southern arm of the reservoir about 6 miles north of Breckenridge. Dillon Reservoir is a drinking water supply for Denver, Colorado.

Due to physical habitat barriers and elevated metals concentrations, fish are not present in French Creek downstream of the Wellington-Oro Mine complex. Water quality above the mine is very good and supports a Cutthroat trout population. Chemical and physical barriers prevent the migration of fish from the Blue River into the upper reaches of the water body.

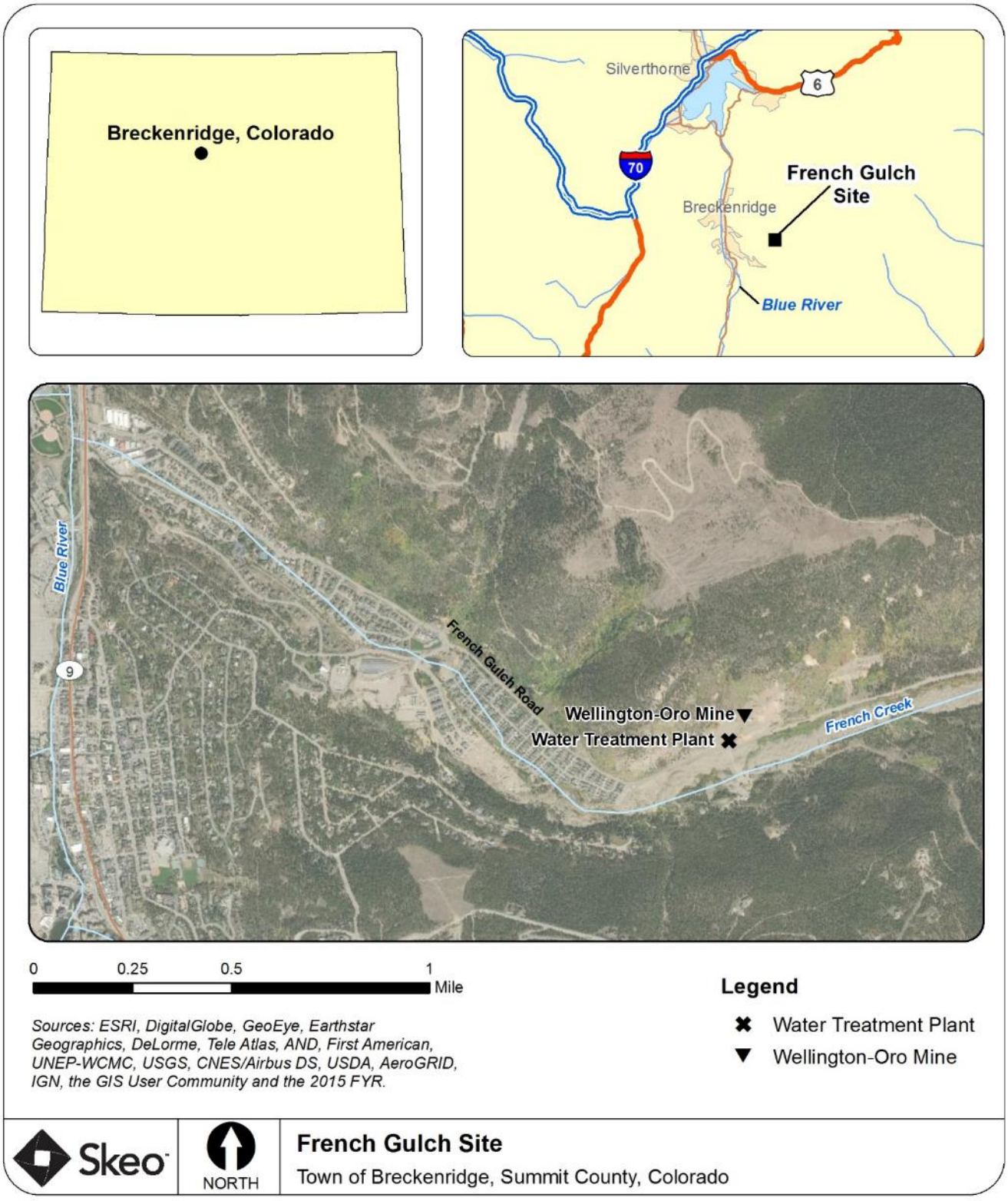
There are various land uses in the site area. Near the mouth of French Creek, the area is zoned for industrial and commercial uses. Further upstream, there is an area of existing residential development known as the Wellington Neighborhood and an associated development known as Lincoln Park. Recreational uses in the French Gulch area include biking, horseback riding, hiking and jogging. The Town and County own and manage about 1,800 acres near the Site as open space. This area includes the Wellington-Oro water treatment plant (WTP).

Appendix A provides a list of resources used in preparation of this FYR Report. Appendix B provides a chronology of site events.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: French Gulch		
EPA ID: CO0001093392		
Region: 8	**State:** Colorado	**City/County:** Breckenridge/Summit
SITE STATUS		
NPL Status: Non-NPL		
Multiple OUs? No	**Has the Site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: EPA		
Author name: EPA RPM Andrew Schmidt, with contractor support provided by Skeo		
Author affiliation: EPA Region 8 and Skeo		
Review period: 1/10/2020 – 9/30/2020		
Date of site inspection: 5/22/2020		
Type of review: Discretionary		
Review number: 2		
Triggering action date: 9/30/2015		
Due date *(five years after triggering action date)*: 9/30/2020		

Figure 1: Site Vicinity Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Conditions at the Site posed two primary public health and environmental issues. The first was the potential risk to human health from exposure to elevated levels of lead and arsenic in the surface wastes. The second environmental issue at the Site is the exposure of fish and aquatic invertebrates to heavy metals downstream from the Site. EPA's May 2002 ecological risk assessment found that dissolved metals in surface water downstream of the Wellington-Oro Mine are acutely toxic to fish and invertebrates. There were no risks to non-aquatic species from metals contamination in the stream. The contaminants of concern (COCs) are cadmium and zinc. EPA's human health risk assessment found no adverse effects to human health associated with elevated concentrations of dissolved metals in French Creek or the Blue River.

Response Actions

EPA and the state of Colorado began evaluating the area near the Wellington-Oro Mine complex in the late 1980s under Section 319 of the Clean Water Act for a non-point source project. Between 1989 and 1995, the state conducted significant investigations at the Site to determine the nature and extent of contamination. In 1995, it was determined that the scope and complexity of the problems at the Site exceeded the capacity of the non-point source program. Therefore, after conducting a preliminary assessment and site investigation (PA/SI), EPA continued the investigations and remediation of the Site under CERCLA authority. However, due to state and community concerns, EPA deferred an NPL-listing decision and has proceeded to address the Site through a community-based environmental protection framework.

EPA has separated response actions at the Site into the surface waste action (Capping Action) and the Water Quality Action. The Water Quality Action is the subject of this FYR Report.

Surface Waste (Capping Action)

The U.S. Department of the Interior's Bureau of Reclamation, under an interagency agreement with EPA, sampled surface waste at the Site in 1996 and identified elevated concentrations of lead and arsenic in the waste material. Following a screening-level risk assessment, EPA determined that the surface wastes presented an imminent and substantial endangerment warranting response actions including a non-time-critical removal action. In 1998, a potentially responsible party (PRP) (B&B Mines) completed an engineering evaluation/cost analysis (EE/CA) for the Wellington-Oro Mine complex that focused on reducing the risks associated with human exposures to waste containing lead and arsenic. The EE/CA addressed areas on the north side of French Gulch from the Union City Mine and Mill Site on the west to the X10U8 Waste Rock Dump on the east. The area was generally referred to as the French Gulch site or the Wellington-Oro Complex, even though the actual Wellington-Oro Mine was only one of the sites discussed. A secondary goal of the proposed action was to reduce the rate of leaching of metals into the surface and groundwater systems at the Site, although existing data indicated that the surface wastes were not significant contributors to groundwater or surface water contamination.

In September 1998, EPA issued an Action Memorandum that provided for the consolidation and capping of roaster fines, mill tailings and waste rock. The PRP, with EPA's oversight, performed the removal action under an administrative order issued in September 1998. The work included moving mine wastes to an area with reduced potential for human contact and capping with impermeable clay and clean gravel. The PRP also installed drainage ditches to reduce infiltration of rain and snow melt into the mine wastes. This work finished in June 1999.

Water Quality Action

Beginning in 1989, EPA and the PRP conducted many investigations into the surface and groundwater near and downgradient of the Wellington-Oro Mine complex. The investigations included sampling to determine the sources and magnitude of metals contamination and migration pathways to French Creek and the Blue River.

In May 2002, EPA and the PRP completed a second EE/CA that focused on the impact of metals and acidity being released from the Wellington-Oro Mine complex on the water quality in French Creek and the Blue River. The 2002 EE/CA concluded that the underground workings of the Wellington-Oro Mine constitute the largest source of metals loading to groundwater and surface water and that a natural seep, referred to as FG-6C, was thought to be the primary conduit of mine pool water into French Creek. At the time of the EE/CA, the seep was reported to flow year-round at a rate of about 100 gallons per minute (gpm).

In November 2002, EPA issued an Action Memorandum to address water quality issues at the Site as a non-time-critical removal action. EPA updated the 2002 Action Memorandum with Addendum #1 in November 2004. The 2004 Addendum #1 addressed changes in the proposed action based on site-specific water quality standards for French Creek and the Blue River adopted by the Colorado Water Quality Control Commission (CWQCC) after the initial memorandum was issued.[2] The 2004 Addendum #1 also allowed for an alternative to passive treatment of seep FG-6C to be selected. The 2002 Action Memorandum and 2004 Addendum #1 are collectively referred to as the Water Quality Action Memorandum. The goal of the response action was to improve water quality in French Creek and reduce metals loading from French Creek into the Blue River. The primary goal was to improve water quality in the Blue River so it will support a population of adult brown trout.

Major components of the proposed response action included:

- Collection of water discharging at seep FG-6C, the primary source of acid mine drainage from the Wellington-Oro Mine.
- Construction of a WTP where water from seep FG-6C will be pumped and treated to neutralize the acidity of the water and remove zinc and cadmium. The maximum pumping rate will be 150 gpm. During spring runoff, flows are expected to exceed this pumping rate. During that time, flows exceeding 150 gpm will bypass the treatment system.
- Use of physical/chemical processes to remove contaminants from the water. The treatment process will be selected based on cost, performance, reliability, sludge disposal and operator preferences. The effluent water quality discharged is to have a cadmium concentration of less than 4 micrograms per liter (µg/L) and a zinc concentration of less than 225 µg/L.
- Separation of solids generated from the treatment process from the water prior to discharge.
- Discharge of treated water into the French Creek alluvium.
- Collection and disposal of metal sludges into either the abandoned mine workings or a solid waste landfill, or sale as a metal concentrate.
- If necessary, construction and maintenance of a physical barrier in French Creek that will prevent non-native trout from migrating from the Blue River into upper French Creek.
- Operation of the water treatment system for 24 hours a day, seven days a week, until water discharging from seep FG-6C no longer poses a risk to the environment.

The 2002 Action Memorandum specified the following performance standards for the Water Quality Action:

- Limit the concentration of dissolved cadmium in the Blue River to 4 µg/L, as measured at the United States Geological Survey (USGS) gauging station BR-2, located 115 feet downstream of the confluence with French Creek.
- Limit the concentration of dissolved zinc in the Blue River to 225 µg/L, as measured at the USGS gauging station BR-2, located 115 feet downstream of the confluence with French Creek.

The 2004 Addendum #1 further clarified that the performance standards for the Water Quality Action are the CWQCC water quality standards for zinc and cadmium in Segment 2a of the Blue River (Table 1). The water

[2] The site-specific water quality standards approved by the CWQCC were originally proposed by the Summit Water Quality Committee, a group of local governments and major municipal dischargers in Summit County, in the group's May 2003 Use-Attainability Analysis, Lower French Gulch and Blue River Downstream from French Gulch near Breckenridge, Summit County, Colorado.

quality standards support attainment of an adult brown trout fishery in the Blue River for three miles downstream of its confluence with French Creek. EPA found that attaining the standards in Segment 2a of the Blue River would result in achieving the water quality standards in subsequent downstream segments. Table 1 summarizes the CWQCC site-specific water quality standards for Blue River Segments 2a and 2b as well as Blue River Segment 11 (French Creek) in effect at the time of the 2004 Addendum #1 and still current. Figure G-1 in Appendix G shows the locations of the stream segments.

Table 1: CWQCC Water Quality Standards for Blue River Segments 2a, 2b and 11 (French Creek)[a,b]

COC	Segment 2a[c]	Segment 2b	Segment 11 (French Creek)
Cadmium	4.0	$0.5e^{(1.016(\ln(\text{hardness})-3.132))}$	Ambient
Zinc	$e^{(1.25(\ln(\text{hardness})+0.799))}$	$e^{(0.9805(\ln(\text{hardness})+1.402))}$	Ambient

Notes:

a) Performance standard values listed in the Site Cleanup Goals and Objectives Memorandum issued by EPA in October 2004.

b) Based on cadmium and zinc toxicity to the different life stages of brown trout expected to occur in the Blue River below French Creek.

c) Compliance with the CWQCC water quality standards for zinc and chromium in Segment 2a of the Blue River is the performance standard for the Site's Water Quality Action.

All surface water quality standards are in µg/L.

ln = natural log

EPA's Site Cleanup Goals and Objectives Memorandum, dated October 2004, noted that, based on observed hardness found in the Blue River, the zinc standard in Segment 2a would range from 500 µg/L to 850 µg/L.

In May 2005, after several years of negotiations and related work, EPA, CDPHE, the local governments of the Town and County, and B&B Mines entered into a Consent Decree requiring that the Town and County build and operate a WTP to address contaminated mine water pursuant to the Water Quality Action Memorandum and Scope of Work. EPA set effluent limitations for discharge from the WTP in the Statement of Work included as Appendix 4 of the 2005 Consent Decree. EPA finalized the limitations in the Wellington Oro Mine Water Treatment Plant applicable or relevant and appropriate requirement (ARAR) Compliance Document Discharge Control Mechanism (DCM), dated November 15, 2008. The DCM established specific discharge requirements that comply with the federal and state ARARs discussed in the Water Quality Action Memorandum. The discharge limits were protective of existing conditions in Blue River Segment 11 (French Creek) and were predicted to allow for attainment of the water quality standards in Blue River Segment 2a (Table 2).

Table 2: Water Treatment System Effluent Limitations[a]

Parameter[b]	Effluent Limit	
	30-Day Average	Daily Maximum
Cadmium	4 µg/L	NA
Zinc	225 µg/L	NA
pH	NA	6.5 – 9.0
Oil and grease	NA	10 mg/L
Total suspended solids	20 mg/L	NA

Notes:
a) Source is the Wellington Oro Mine Water Treatment Plant ARARs Compliance Document Discharge Control Mechanism, dated November 15, 2008; effluent limits became effective November 18, 2008.
b) An additional requirement of the DCM is "There shall be no discharge of floating solids or visible foam in other than trace amounts."
All metals are in total recoverable form.
Limits apply to Outfall 001. No limits apply to discharges through Outfall 002 (bypass).
NA = not applicable
mg/L = milligrams per liter
pH reported in standard units.

Status of Implementation of the Water Quality Action

In 2004, EPA determined that two large existing culverts in French Creek act as the fish barriers required by the Water Quality Action Memorandum. No additional barriers were necessary to prevent the movement of non-native fish in French Creek.

The 2005 Consent Decree required that the Town and County implement the Water Quality Action. The Town and County also agreed to purchase 1,800 acres of land from B&B Mines, including the Wellington-Oro Mine complex, and restrict development on and administer the lands as open space. The Institutional Control Review section of this FYR Report includes further detail on the institutional controls required by the Consent Decree.

In December 2005, the Town and County submitted plans for the design and construction of a WTP near the FG-6C seep. EPA and CDPHE approved pre-final and final designs for the treatment plant in 2006 and 2007, respectively. The control system for the treatment plant was a proprietary system provided by BioteQ Environmental Technologies, Inc. (BioteQ).

WTP Operation

The Town and County constructed the Wellington-Oro WTP in 2008 and began operating the plant in November 2008. The WTP is designed to treat up to 150 gpm of water and remove zinc and cadmium collected from mine drainage. The treatment plant uses a sulfide precipitation process to cause the precipitation of zinc and cadmium sulfides. A small amount of soda ash (sodium carbonate) was initially added into the process to change the pH to the optimal range for sulfide precipitation. Sulfides, in the form of sodium hydrosulfide, were also added in a controlled dose. Dosing is carefully managed so sufficient quantities of zinc and cadmium are removed to meet discharge limits, but excess hydrogen sulfide gas is not created (nor is too much iron precipitated). The precipitated solids settle to the bottom of a clarification tank while the treated water flows off the top. Solids generated from the treatment process are separated from the water prior to discharge. Soda ash is no longer used in the treatment process, and has been replaced with sodium bicarbonate (discussed in greater detail in subsequent sections). Initially, the zinc concentrate was recycled for metals recovery. However, more recently, the non-hazardous concentrate will be shipped off site for disposal at a local landfill because the smelter that was recycling the sludge does not meet the requirements of the CERCLA Off-Site Rule.[3]

[3] The Off-Site Rule, promulgated on September 22, 1993 (58 FR 49200), requires that CERCLA wastes may only be placed in a facility operating in compliance with the Resource Conservation and Recovery Act (RCRA) or other applicable federal or state requirements.

Treated water is released back to French Creek via shallow injection well Outfall 1. Discharge from the WTP that does not meet water quality limits is returned to the mine pool. Should the flow rate from the FG-6C seep exceed 150 gpm, the excess untreated flow passively bypasses the collection structure through Outfall 2.

Numerous problems with the plant caused frequent and extended periods of failure to meet the effluent standards, resulting in diversion of the water back to the mine pool. EPA completed an Optimization Review of the system in 2013. The Optimization Review identified the following key issues:

- Flow rate from seep FG-6C was only about 50 gpm, much less than the 150 gpm for which the plant was designed. The system typically operated at less than 50% of its capacity and would have the capacity to handle mine water from additional seeps if they were identified.
- The treatment plant experienced a series of mechanical issues, including corrosion of equipment, clogging of pipes and scaling related to the soda ash system, and inadequate controls and backfilling capabilities for the pressure filters. The filter system was the primary reason for the plant failing to meet effluent standards.
- During upset conditions, flows were directed back to the Wellington-Oro mine shaft. During 2012, the plant recycled partially treated water (which did not quite meet the zinc standard of 225 µg/L, but from which 99% of the zinc had been removed) to the mine for about 50% of the time it was operating. This additional contact time between the partially treated water and the mineralized rock within the mine workings could generate higher concentrations in the mining-impacted water.

Since the Optimization Review, EPA, the Town and County, and their contractors have been working to address issues identified at the Site. Additional work conducted at the Site since 2015 is discussed in Section III of this FYR Report (Progress Since the Previous FYR).

Institutional Control (IC) Review

The 2005 Consent Decree required institutional controls for the approximately 1,800-acre property purchased by the Town and County from B&B Mines and associated parties. The property includes among other areas, the Wellington-Oro site, the Jessie Mine and Mill site and the IXL/Royal Tiger site. The 2005 Consent Decree required that the Town and County record a restrictive covenant to establish the property as public open space in perpetuity. The 2005 Consent Decree also required additional environmental covenants specific to the Wellington-Oro site, the Jessie Mine and Mill site, and the IXL/Royal Tiger site. Additional institutional controls are in place for areas west of the Site, which include the Union Mill and Neighborhood Fill and Cover Areas, as required by a 1999 Prospective Purchaser Agreement between EPA, the State, Brynn Grey V, LLC and Wellington Neighborhood, LLC. Only the environmental covenant for the Wellington-Oro site is addressed further as part of this FYR.

The environmental covenant for the Wellington-Oro site covers a 4.7-acre portion of the site property in the vicinity of the Wellington-Oro Mine and seep FG-6C. The Town and County recorded an environmental covenant for the subject property with the Summit County Clerk & Recorder's Office in November 2007. Table 3 summarizes the requirements and restrictions of the implemented institutional control. Figure 2 shows the area of the implemented institutional control required by the 2005 Consent Decree, specific to the Wellington-Oro Mine.

The 2005 Consent Decree also required institutional controls to ensure long-term maintenance of any barriers that exist in French Creek to impede upstream movement of non-native fish. The 2005 Consent Decree required that the Town and County consult with the U.S. Fish and Wildlife Service and the Colorado Department of Natural Resources (DNR) prior to planning any alterations to or removal of the structures. In addition, a placard with the following statement was to be installed on both structures:

> *This structure provides a vital function in the protection of threatened aquatic species. Prior to any modification of this structure or its outflows, the Colorado Division of Wildlife and the U.S. Fish and Wildlife must be notified and consulted.*

Table 3: Summary of Implemented Institutional Controls (ICs)

Media, Engineered Controls, and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil, surface water, groundwater, WTP	Yes	No[a]	4.7 acres of Wellington-Oro mine and seep FG-6C property (see Figure 2)	Prohibit residential and agricultural use, restrict excavation, prohibit use of groundwater and surface water, prohibit well construction and protect the integrity of the cleanup actions; requires that the property be used and maintained as public open space.	Environmental Covenant 2007 Instrument ID: HMCOV00044

Notes:

a) Although institutional controls were called for in the 2005 Consent Decree, site decision documents (i.e., the action memoranda) did not call for institutional controls.

Environmental Covenant available at: http://www.colorado.gov/cdphedir/hm/envcovenants/covenants/hmcov00044.pdf.

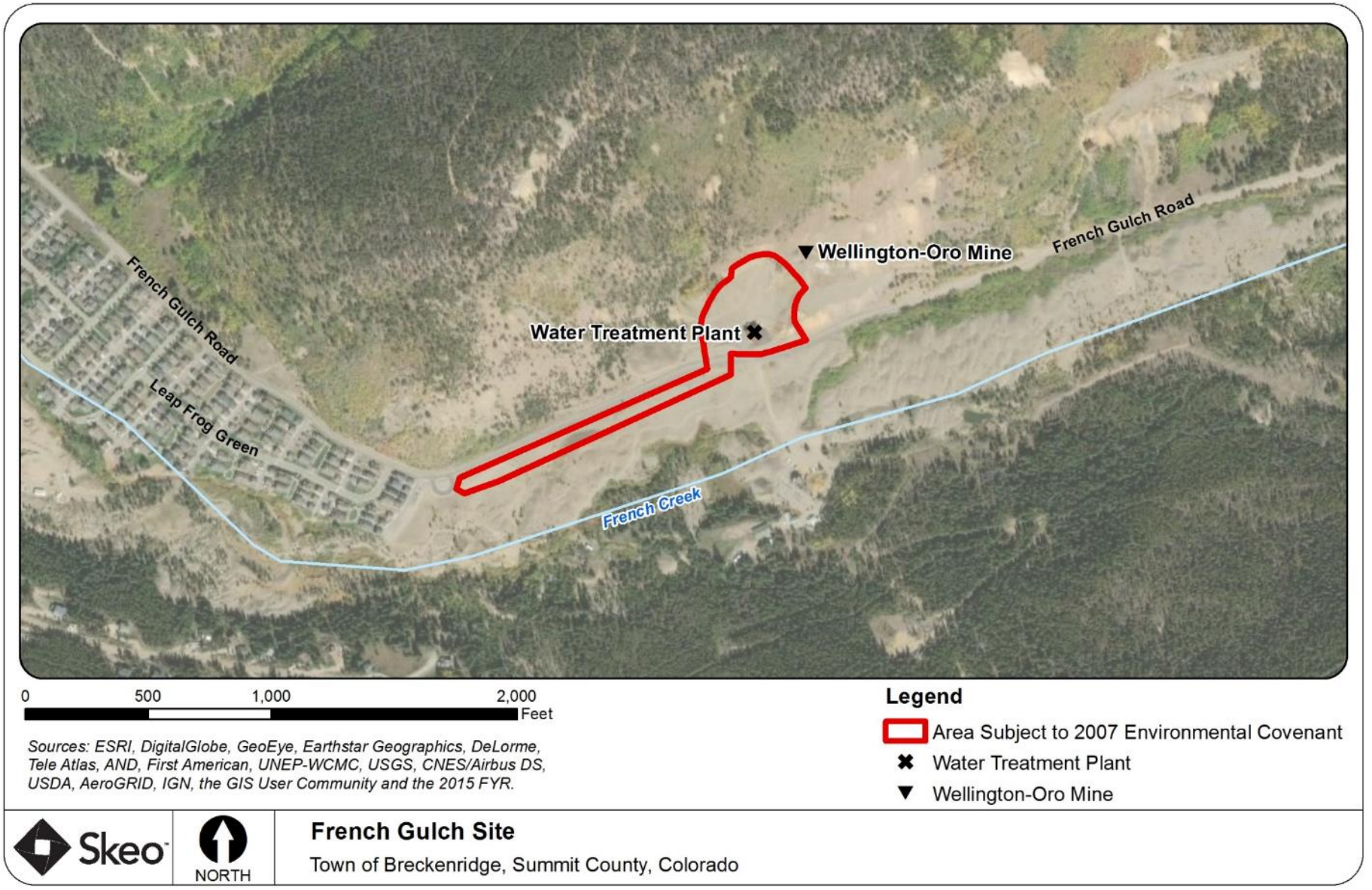
Systems Operations/Operation and Maintenance (O&M)

The Town and County conduct O&M activities associated with the WTP. The Town and County also report the status of the water treatment operations to EPA and the state on a quarterly basis, as required by the Scope of Work included in the 2005 Consent Decree, and prepare an annual report summarizing the system's performance, discussing any variances from facility performance goals, identifying O&M procedures conducted during the past year and planned for the next year, and providing water quality data for the influent, effluent, French Creek and Blue River.

The Town and County are required to collect water quality data in Segment 2a of the Blue River to evaluate if the water quality performance standards set forth in the Action Memorandum have been attained.

EPA contractors also collect surface water and groundwater samples from French Creek and the Blue River regularly (two times per year).

Figure 2: Area of 2007 Environmental Covenant



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site

III. PROGRESS SINCE THE PREVIOUS REVIEW

Table 4 includes the protectiveness determinations and statements from the 2015 FYR Report. Table 5 includes the recommendations from the 2015 FYR Report and the status of those recommendations. Additional work conducted at the Site since the 2015 FYR is addressed in more detail following Tables 4 and 5.

Table 4: Protectiveness Determinations/Statements from the 2015 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
OU1 (Water Quality Action)	Not Protective	The response action at the Site is not protective of the environment, as the cleanup goals established in the 2004 addendum and incorporated into the 2005 Consent Decree are not being met. This FYR is addressing water quality issues as they relate to the 2002 action memo. No human health risks were identified relating to water quality at the Site. Human health concerns related to contaminated sediment were dealt with under the 1998 action memo. The numeric water quality standards for cadmium and zinc in segments 2a and 2b of the Blue River downstream of French Creek, identified as ARARs, have not been met. There has been no consistent reduction in dissolved cadmium or zinc concentrations in the Blue River since the WTP began operation in late 2008. The WTP operations have not resulted in consistent discharges of treated water to the designated discharge point, and the volume of water treated is significantly lower than the maximum design capacity. The following actions need to be taken: • Continue efforts to optimize the WTP operation and consider additional response action modification as appropriate. • Continue to monitor water quality in French Creek and the Blue River. • Review monitoring schedule and locations to determine if sampling during additional seasons or at additional seeps would be helpful in the evaluation of the Site. • Evaluate other potential seeps including alluvial seeps from Wellington-Oro Mine, which may be adding cadmium and zinc loads into French Creek. • Complete an evaluation or focused feasibility study to determine if the WTP could more fully utilize current design capacities by capturing and treating additional flow from the seeps near FG-6C, including the seep identified as Opp-2. • Evaluate the threshold criteria and procedures for pumping flow back into the Wellington-Oro Mine. • Review the Discharge Control Mechanism (DCM) for any possible adjustments in the limits set on the WTP discharges and evaluate the 2005 CD with regard to implementing any necessary changes to the DCM. • Evaluate whether manganese should be added as a contaminant of concern (COC) for the Site, and pursue next steps, as appropriate. • Amend action memo to document these actions. • Evaluate response alternatives for the impoundments known as the red ponds. Although this does not affect protectiveness, it would alleviate a potential safety hazard at the Site.

Table 5: Status of Recommendations from the 2015 FYR Report

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU1	There has been no consistent reduction in dissolved cadmium and zinc concentrations in the Blue River since the WTP began operation in late 2008. The WTP operations have not resulted in consistent discharges of treated water to the designated discharge point, and the volume of water treated is significantly lower than the maximum design capacity.	Optimize WTP operation and consider additional response action modifications, as appropriate.	Addressed in Next FYR	The Town and County have been working closely with BQE Water (formerly BioteQ), the water treatment process design engineers, to update treatment system components and troubleshoot issues as they arise. More information on the plant improvements is provided after this table. Additional data will be needed to determine if the treatment plant improvements result in a consistent reduction in dissolved cadmium and zinc concentrations in the Blue River.	N/A
OU1	The WTP is treating a flow rate of 50 gpm, which is lower than the maximum design flow of 150 gpm.	Complete an evaluation or focused feasibility study to determine if the WTP could more fully utilize current design capacities by capturing and treating additional flow from the seeps near FG-6C, including the seep identified as Opp-2.	Addressed in Next FYR	The Town and County have been working closely with BQE Water to update treatment system components and troubleshoot issues as they arise. More information on the plant improvements is provided after this table. Additional evaluation may be needed to determine if the plant can handle increased flow rates in light of the issues caused in 2019 with higher than average flow rates as a result of the 2018/2019 snowpack.	N/A
OU1	Monitoring data indicate that there are likely other potential seeps from Wellington-Oro Mine adding sources of cadmium and zinc loading to French Creek, but these sources have not been identified.	Complete an evaluation of other potential seeps adding cadmium and zinc loads to French Creek.	Addressed in Next FYR	EPA is working with USGS and EPA contractors to evaluate other potential seeps adding cadmium and zinc loads to French Creek.	N/A
OU1	Recycling water back to the mine, due to standards not being met or mechanical issues with the plant, may be causing active generation of additional contaminants.	Review the Discharge Control Mechanism for possible modifications.	Under Discussion	As part of the WTP treatability study, EPA allowed a short-term modification to the effluent standards to allow the system to continuously discharge rather than recycle back into the mine pool. The modifications to the WTP conducted during the FYR period have shown some improvement in treatment capabilities of the WTP.	N/A

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU1	Manganese is not listed as a COC but it is monitored and concentrations consistently exceed water quality standards in French Creek and the Blue River.	Evaluate whether manganese should be added as a site COC and pursue next steps, as appropriate.	Addressed in Next FYR	Monitoring for manganese and additional metals is ongoing at the Site. Following additional evaluation, EPA will determine whether manganese should be added as a site COC, as appropriate.	N/A

Work Completed Since the 2015 FYR

WTP Updates

In May 2015, the Town and County began a treatability study for the WTP, with the approval of EPA and CDPHE. The treatability study allowed for a two-year modification to the effluent standards to help the system continuously discharge treated water and to assist with determination of whether treatment goals could be met. Due to substantial improvements in plant operation and efficacy, the treatability study was extended for an additional year, to May 1, 2018, to allow for further evaluation. During this time, the Town and County worked closely with BQE Water (formerly BioteQ), the water treatment process design engineers.

Multiple modifications have been implemented to the WTP during this FYR period to correct issues that have occurred and to improve the plant's efficiency. Modifications have included updates to the programmable logic controller and the plant's monitoring software, modifications to piping to prevent plugging, updates to the as-built process diagrams and modifications to the reagent dosing systems. In 2016, use of sodium hydroxide (caustic soda) was trialed to replace soda ash as a pH-adjustment reagent. However, sodium hydroxide did not provide the desired results due to the precipitation of metal hydroxides. Subsequently, a sodium bicarbonate addition was tested. It provided adequate results and continues to be used.

In 2019, the WTP experienced additional operating issues due in part to an unusually large snowpack in 2018-2019 that caused influent flowrates between 110 gpm to 130 gpm and lasted several days. These flow rates caused a decrease in retention time and mechanical issues due to high pressure (including cracked piping, breaking of pipe brackets and issues with reagent dosing). Other equipment and mechanical issues also occurred in 2019. The Town and County are working with BQE Water to address the operational issues with flow and treatment and consistently remove zinc and cadmium to below discharge limits.

2018 USGS Water Quality Evaluation

In 2018, USGS completed a review of the French Gulch/Wellington-Oro site water quality data and provided suggestions for future work. Tasks included in this effort were: (1) compilation of available data into a comprehensive database of more than 1,000 surface water, groundwater and pore-water samples collected from 1992 through 2017; (2) comparison of 2017 cadmium and zinc data for French Creek and the Blue River with water quality standards; (3) examination of historical French Creek and Blue River water quality data considering treatment plant operations; and (4) suggestions for future work. The findings were presented in a November 2018 memorandum to EPA. A few key observations from the 2018 USGS memorandum are presented below:

- Synoptic sampling showed that concentrations of cadmium and zinc increased downstream in French Creek, particularly between locations FG-5 and FG-5.5, and between FG-8 and FG-9A (Figure 3). These concentration increases indicate there are sources of metals to the stream between these locations.
- Concentrations of cadmium and zinc at four sites downstream from the treatment plant were lower in 2017 than in previous years, potentially indicating a positive effect of the treatment plant on water quality. Continued monitoring is needed to confirm this provisional observation.

- Review of data from Blue River surface water locations generally indicates decreasing cadmium and zinc concentrations through time and particularly during 2016 and 2017. The treatment plant may be responsible for improved water quality in 2017, but not in 2016 because the plant was not discharging treated effluent to the French Creek alluvium for most of the year. However, the 2016 improvement could have been caused by the continued collection of water from seep FG-6C and recycling it back into the mine pool during that year. Additional data are needed during continuous treatment plant discharge and variable hydrologic conditions to continue to assess the effectiveness of the WTP.

USGS made the following recommendations:

- Continue water quality monitoring with the addition of a few constituents and parameters (including sodium, alkalinity and streamflow data). Additional sampling could include automated sample collection and sonde measurements (for pH, temperature, specific conductance and dissolved oxygen) over 36-to-48-hour periods.
- Additional evaluation to understand locations of metal loading to French Creek, particularly between the FG-5 and FG-5.5 stream reach and the FG-8 to FG-9a reach. Additional techniques suggested, in addition to streamflow measurements, include detailed temperature sensing, shallow geophysical techniques, and spatially detailed stream sampling and loading analysis.
- Addition of historical data from all sources to the combined dataset for the Site.

The USGS Memorandum concluded that a robust understanding of the spatial distribution of cadmium and zinc sources in French Gulch is needed to assess future remediation. Water quality monitoring should continue to acquire longer-term record of effect (or lack of effect) of the Site's treatment plant on cadmium and zinc concentrations in French Creek and the Blue River.

2019 Three-dimensional Visualization and Analysis (3DVA) Technical Memorandum

In 2019, EPA contractors completed a three-dimensional visualization and analysis (3DVA) to assess conditions at the Site, based on existing datasets of the mine workings, geology, hydrogeology and surface water and groundwater contaminant chemistry as well as interpolated variable values. The visualization provided an integrated model of the surface and subsurface of the Wellington-Oro Mine complex and French Gulch area and is considered a component of the Site's conceptual site model (CSM).

Integration of the four components (mine workings, geology, hydrology and chemistry) in the model allowed analysis of the relationships between the datasets. The 2019 3DVA Technical Memorandum included the following initial observations of the integrated model:

- The mine workings result in a very large portion of void space (at least 858,000 cubic yards), about 8% of which is water filled. The workings are cut into highly mineralized geologic materials that may be continuing sources of cadmium and zinc to the groundwater.
- The geology of the area is very complex, making detailed analysis of groundwater flow and source-pathway-receptor relationships difficult.
- The intersection of the surface expression of faults with French Creek appears to show increased concentrations of cadmium and zinc that are seasonally influenced.

The 2019 3DVA Technical Memorandum also noted the following observations of potential data gaps and uncertainties:

- The geometry and location of one of three major faults cutting through the mine workings (the 11-10 fault) near the ground surface is uncertain. The 11-10 fault may be a significant contributor to the contaminant load in French Creek either directly or through discharge to the overburden/dredge materials so understanding the subsurface geometry may assist in better identifying the discharge pathway.

Geophysical surveys, temperature surveys, water conductivity surveys and geological mapping could improve the understanding of the fault location and metals loading in French Creek.

- Groundwater level and groundwater quality data have been inconsistently collected and recorded, and there is no recent comprehensive synoptic water-level data to assess current conditions. Groundwater data collection events should include depth-specific information from the Oro shaft.
- Use of the 3DVA along with re-evaluation of existing data, including dye trace studies, temperature surveys, water chemistry data and treatment system performance, supplemented with new surface and groundwater data, should be used to update the CSM to support site management decisions.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

EPA published a public notice in the Summit Daily newspaper on March 18, 2020 (Appendix C). It stated that the FYR was underway and invited the public to submit any comments to EPA. The results of the review and the report will be made available at the Site's information repository, Summit County Library, located at 103 South Harris Street in Breckenridge, Colorado.

During the FYR process, EPA conducted interviews with CDPHE representatives, as well as local community members and interested parties, to document any perceived problems or successes with the remedy implemented to date. The interviews are summarized below. Appendix D includes the completed interview forms.

Mary Boardman and Alex Hedgepath, CDPHE – CDPHE representatives noted that little has occurred at the Site (in terms of remediation) since the inception of WTP operations. However, ongoing efforts to further characterize the Site and optimize treatment and monitoring look promising. The work planned for 2020 to further characterize the Site should be very useful in determining the performance of the remedy in regard to further identifying inflow and outflows of the Oro Shaft Mine and the French Gulch. Previous disruptions in the operations of the WTP made it difficult to determine if the WTP had a beneficial impact on downstream water quality. The CDPHE representatives noted that a community member has expressed concern over the appearance of French Creek; another community member has presented additional or replacement cleanup strategies for the Site (This individual is in fact not a community member, but a consultant who previously worked for site PRPs). The CDPHE representatives noted that the state is not comfortable with the status of institutional controls at the Site; however, it was determined through further follow-up with the state that the concerns are associated with institutional controls that fall outside of the Water Quality Action. The state is not aware of any changes in state laws that might affect the protectiveness of the remedy. The CDPHE representatives also noted that several RPMs have been assigned to the Site, resulting in a lack of continuity and loss of institutional knowledge.

Laura Lynch, Town of Breckenridge – Ms. Lynch noted that she is well informed regarding the operation of the Site's WTP, but she is unclear regarding the effectiveness of the remedial progress. She noted that the recent USGS report concluded that more analysis is needed to determine the WTP's effectiveness. She noted that a lot of time and money is spent operating the plant, but it is unclear if it is making a difference in the water quality of the Blue River. She was unaware of any changes to state laws or local regulations that might affect the protectiveness of the Site's remedy.

Brian Lorch, Director, Summit County Open Space and Trails – Mr. Lorch was involved in coordinating efforts to initiate cleanup and choose a cleanup technology at the Site. He feels well informed and feels that the community has had an appropriate level of engagement throughout the cleanup process. He notes that the best mechanism for public outreach is through public meetings hosted by the local governments, with EPA staff providing site-related information. He notes that the state is currently reviewing water quality standards in French Creek. He also notes that EPA's independent redefinition of the zinc ore product produced by the treatment plant as waste may threaten the continued sustainability of EPA-approved technology. He is unaware of any projected land use changes at the Site. Mr. Lorch also states that the County appreciates EPA's assistance and the site manager's ongoing efforts to work with the community to improve water quality and habitat in French Creek.

Local Business Owner – A local business owner has been involved with the Site since 1999. The local business owner indicated that he was involved in developing the Wellington Neighborhood, which he reported is now home to thousands of Breckenridge residents. The business owner noted that the banks of the creek that run through the neighborhood are stained red from iron, which he noted occurred shortly after the Site's water treatment plant was completed. The business owner suggested that funds that the Wellington Neighborhood paid for purchase of the property from B&B Mines be used to clean up French Creek, particularly the part that runs through the neighborhood. The business owner also suggested EPA work more closely with the Wellington Neighborhood Homeowners Association to best provide site-related information in the future.

Data Review

EPA and EPA contractors have conducted regular surface water/seep sampling events at the Site since 2009, following implementation of the removal actions. Sampling is conducted to determine if the Water Quality Action (e.g., treatment of water from seep FG-6C) is improving water quality in French Creek and the Blue River. During this FYR period, surface water samples were collected at locations along Blue River, French Creek and at numerous seeps, and analyzed for total and dissolved metals. Figure 3 shows the locations sampled in 2019.

EPA added groundwater sampling events to the monitoring program in 2017; groundwater had not been routinely sampled since 2000. Examination of concentrations in groundwater provides information about mine-pool water that might be a source of elevated cadmium and zinc to surface water in French Creek. Figure 4 shows the monitoring wells sampled in 2019.

The focus of this review is on cadmium and zinc, the COCs identified in the 2005 Consent Decree. Included below are an evaluation of surface water quality at the Blue River point of compliance, a summary of a 2018 USGS evaluation of compliance with surface water quality standards and an evaluation of 2017 to 2019 cadmium and zinc concentrations in groundwater. Recent data from the WTP are also presented.

Based on this review, it is unclear if the treatment of water from seep FG-6C is having an effect on the water quality of French Creek and the Blue River, as zinc concentrations remain elevated above removal action goals and surface water quality standards, and there is no consistent reduction in dissolved zinc or cadmium concentrations. This may be due, in part, to inconsistent treatment caused by various issues with the WTP. Additionally, groundwater data demonstrate that there is significant contamination remaining in mine-pool water. A data gap that remains is determining significant loading sources to French Creek, other than the known FG-6C seep. EPA and USGS plan to conduct further investigations to better understand the spatial distribution of cadmium and zinc sources in French Creek and possible ways to improve cleanup of the Site.

Blue River Surface Water Point of Compliance Evaluation

The Water Quality Action Memorandum identified Blue River surface water sampling location BR-2 as the point of compliance for the removal action. BR-2 is located 115 feet downstream of the confluence with French Creek (Figure 3). Table 6 summarizes the dissolved cadmium and dissolved zinc concentrations at BR-2 between 2016 and 2019. BR-2 was not sampled in 2015. Sampling events generally coincide with high-stream flow events (May and June) and low-stream flow events (September).

Dissolved cadmium concentrations at BR-2 met the removal action goal of 4 µg/L during all sampling events from 2016 to 2019. Zinc concentrations consistently did not meet the zinc removal action goal of 225 µg/L at compliance point BR-2. Zinc concentrations have also fluctuated during the FYR period with no consistent reduction at BR-2.

Table 6: Surface Water BR-2 Dissolved Cadmium and Zinc Concentrations, 2016 to 2019[a]

Sample Date	Cadmium	Zinc
	Removal Action Goal = 4 µg/L	**Removal Action Goal = 225 µg/L**
5/18/2016	3.21	**1,080**
6/15/2016	0.897	**282**
9/8/2016	2.07	**525**
5/23/2017	2.29	**738**
6/12/2017	1.02	**319**
9/22/2017	1.38	**373**
6/12/2018	1.12	**362[b]**
9/6/2018	3.42	**1,180**
6/27/2019	0.852	**254**
9/3/2019	0.922	**281**

Notes:

a) 2016 and 2017 data obtained from the file ERT.CascadeWQData_final.xlsx, compiled by USGS; 2018 data obtained from the French Gulch Wellington-Oro Mine Site Sampling Activities Report, 2018 Sampling Events Final, Prepared by TechLaw for EPA Region 8, dated April 2019; 2019 data obtained from the French Gulch Wellington-Oro Mine Site Sampling Activities Report, 2019 Sampling Events Final, Prepared by TechLaw for EPA Region 8, dated March 2020

b) Value reported is the higher of the primary/duplicate sample.

Concentrations reported in µg/L.
Result reported in **bold** text indicates concentration exceeds the removal action goal.

2018 USGS Memorandum Water Quality Standards Evaluation

The 2018 USGS Memorandum included an evaluation of compliance with surface water quality standards for French Creek and the Blue River using the 2017 dataset. The relevant standards for surface water are protective of aquatic life and vary by segment. Table 7 summarizes the standards used for the USGS evaluation.

The USGS Memorandum evaluation found that in 2017 in French Creek Segment COUCBL11 (also referred to as Blue River Segment 11), the site-specific standards of "existing quality" were attained over the entire segment for both acute and chronic cadmium and zinc standards. On a location-by-location basis, all 2017 samples in segment COUCBL11 attained both chronic and acute cadmium and zinc standards, except for zinc values at French Creek location FG-9A that exceeded the chronic standard in May 2017 (dissolved zinc concentration of 2,410 µg/L in May 2017 compared to a calculated chronic zinc standard of 2,288 µg/L).

All Blue River samples collected in segment COUCBL2a (Blue River Segment 2a) in 2017 attained the chronic and acute cadmium water quality standards. The site-specific chronic zinc standard was also attained. The site-specific hardness-based acute zinc standard was exceeded in segment COUCBL2a in 2017, because two samples exceeded the standard.

Table 7: Relevant Surface Water Quality Standards for French Creek and the Blue River

Location or site identification	Segment	Cadmium standard (dissolved)	Reference	Zinc standard (dissolved)	Reference
All French Gulch stream sites from 1.5 miles below Lincoln to confluence with the Blue River	COUCBL11	Existing quality	Colorado Department of Public Health and Environment, Water Quality Control Commission, 2018, page 18	Existing quality	Colorado Department of Public Health and Environment, Water Quality Control Commission, 2018, page 18
BR-2	COUCBL2a: Compliance point	4 µg/L	U.S. Environmental Protection Agency, 2002, page 9	225 µg/L	U.S. Environmental Protection Agency, 2002, page 9
BR-2, BR-EPA1, BR-EPA2, BR-EPA2U, 12304A	COUCBL2a	Site-specific value: Chronic = Acute = 4 µg/L	Colorado Department of Public Health and Environment, Water Quality Control Commission, 2018, page 11.	Site specific equation, Chronic = acute toxicity: = (e^(1.25 (ln(hardness) +0.799))	Colorado Department of Public Health and Environment, Water Quality Control Commission, 2018, page 11.

Notes:
Extracted from Table 2 in the 2018 USGS Memorandum.
The "existing quality" standard for cadmium and zinc in segment COUCBL11 is an ambient standard, which is "a site-specific characterization of existing quality derived from 'available representative data'" (Colorado Department of Public Health and Environment, Water Quality Control Division, 2017, Appendix B., p. 1).

Groundwater Evaluation

EPA contractors collected groundwater samples from monitoring wells at the Site semi-annually in 2017, 2018 and 2019. The groundwater data provide information about mine-pool water that might be a source of elevated cadmium and zinc to surface water in French Creek. Table 8 summarizes the minimum and maximum detected concentrations of dissolved cadmium and zinc during each monitoring event.

Table 8: Minimum and Maximum Detected Dissolved Cadmium and Zinc Concentrations in Groundwater, 2017 to 2019

Date	Dissolved Cadmium				Dissolved Zinc			
	Minimum (µg/L)	Location	Maximum (µg/L)	Location	Minimum (µg/L)	Location	Maximum (µg/L)	Location
June 2017	0.226	MW-20	146	MW-3	35.3	MW-20	208,000	MW-3
September 2017	0.308	MW-20	54.2	MW-4	37.3	MW-20	104,000	MW-3
June 2018	0.27	MW-20 (15-20)	151 D	MW-3 (15-20)	28.3	MW-20 (15-25)	127,000 D	MW-3 (15-20)
September 2018	0.309	MW-20 (15-25)	51	MW-3 (15-20)	34.9	MW-20 (15-25)	103,000	MW-4 (46-51)
June 2019	0.219	MW-20	499 D	MW-3	36.8	MW-20	168,000	MW-3
September 2019	0.280	MW-20 (15-25)	49.9 D	MW-4 (20-30)	45.3	MW-20 (15-25)	161,000 D	MW-3 (45-50)

Notes:
D = the analyte was diluted prior to analysis.
Higher of the primary/duplicate sample result is reported.
2017 data obtained from the file ERT.CascadeWQData_final.xlsx, compiled by USGS; 2018 data obtained from the French Gulch Wellington-Oro Mine Site Sampling Activities Report, 2018 Sampling Events Final, Prepared by TechLaw for EPA Region 8, dated April 2019; 2019 data obtained from the French Gulch Wellington-Oro Mine Site Sampling Activities Report, 2019 Sampling Events Final, Prepared by TechLaw for EPA Region 8, dated March 2020.

The results in Table 8 show that the highest concentrations of dissolved zinc and cadmium are reported in wells MW-3 and MW-4, both of which are located downgradient of the WTP and north of French Creek. Lowest concentrations were detected in monitoring well MW-20, located on the south side of French Creek. Review of 2017, 2018 and 2019 groundwater data also show elevated zinc concentrations in monitoring well MW-7, the westernmost well sampled. Dissolved zinc in MW-7 was 19,800 µg/L in June 2018 and 29,200 µg/L in September 2019. Neither the 2005 Consent Decree nor the Water Quality Action Memorandum set cleanup goals for detected constituents in groundwater. However, to provide a frame of reference for the detected concentrations in consideration of likely discharge of mine-pool water to French Creek, USGS calculated the French Creek chronic surface water quality standard for cadmium to be 8.7 µg/L and the chronic surface water quality standard for zinc to be 2,288 µg/L (based on surface water data collected from French Creek between 2012 and 2016).[4] Cadmium and zinc concentrations in mine-pool water remain elevated and are likely a continuing source of metals to surface water in French Creek, although the exact pathways are unknown.

Groundwater samples collected in 2017, 2018 and 2019 were also analyzed for manganese. Dissolved manganese concentrations in groundwater ranged from an estimated concentration of 2.01 µg/L in MW-20 (September 2019) to 84,000 µg/L in MW-3 (June 2017). Like the distribution of dissolved zinc and cadmium, the highest concentrations of dissolved manganese are reported in wells MW-3 and MW-4.

WTP Operation

The WTP has been operating and discharging sporadically during this FYR period as operators implemented significant modifications to the system (described earlier in this FYR Report). Table 9 presents a summary table of operations between 2008 and 2017, presented in the 2018 USGS Memorandum. EPA also evaluated WTP operations in 2018 and 2019, using data presented in the quarterly plant operations logs, with the following results:

- In 2018, the WTP operated and discharged on 84 percent of the days; operated with a combination of discharging/recycling on 12 percent of the days; and operated and recycled water back into the Wellington-Oro mine pool on 4 percent of the days.
- In 2019, the WTP operated and discharged 65 percent of the days; operated with a combination of discharging/recycling on 12 percent of the days; and operated and recycled water on 21 percent of the days.
- In 2018 and 2019, the WTP was shut down and not operating 1 percent of the time.[5] The WTP has been operating on a more consistent basis since 2017.

In 2019, the plant achieved 96% plant availability (percentage of time the FG-6C pumps are running), 90% mechanical availability (percentage of time that the plant feed pumps are running relative to the FG-6C pumps) and 88% process availability (percentage of volume reporting to discharge relative to the total volume of effluent produced). This resulted in total discharge of 27.74 million gallons in 2019. Zinc removal rate for the year was 79%, which was lower than the previous year due to operational challenges during 2019.

Treatment system effluent data from 2019, presented in the monthly discharge monitoring reports, was also reviewed.[6] Treatment system discharge exceeded the effluent limit for total suspended solids (TSS) of 20 mg/L (30-day average) in the months of March and May through November 2019; pH was outside the daily minimum of 6.5 in April 2019. The cadmium limit of 4 µg/L was exceeded in July and October 2019, and the zinc limit of 225 µg/L was exceeded in May, July, and September through November 2019. WTP operators have been working

[4] The relevant standard for cadmium and zinc in segment COUCBL11 (French Creek) is an ambient standard which is "a site-specific characterization of existing quality derived from available representative data." The 2018 USGS Memorandum calculated cadmium and zinc standards using available representative data from a 5-year period (2012-2016) for all stream sites located in COUCBL11. The values presented in this FYR Report are the USGS-calculated standards.

[5] Percentages by year may not total 100 percent due to rounding. Only days with reported data in the operations logs were included in the evaluation.

[6] The discharge monitoring report for August 2019 was unavailable for review.

to address issues that arose in 2019. All discharge criteria were met in December 2019. When the discharge criteria are not met, the water is recycled back to the Wellington-Oro mine pool.

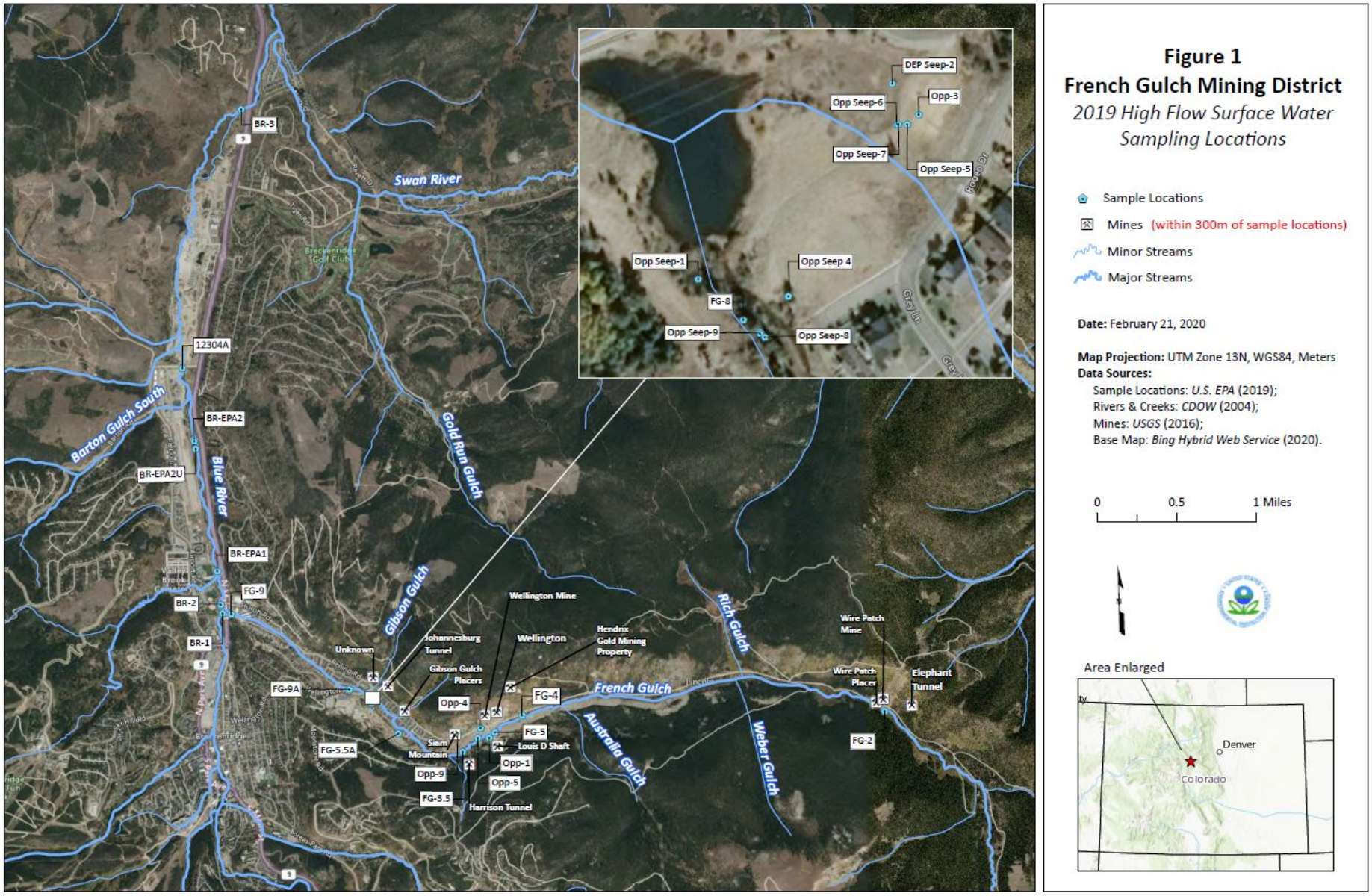
Table 9: Record of Operations at Wellington-Oro Water-treatment Plant, November 2008 to 2017*

[X, plant operating and discharging; --, plant not discharging; P, time of periodic, not continuous, discharge; X(P), plant operating and discharging for most of the month with a few periods of no discharge; -- (P) plant not discharging most of the month, with a few periods of discharge]

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2008											P	P
2009	P	P	P	--	P	--	P	P	P	X	--	P
2010	--	--	--	--	--	--	--	--	--	--	--	--
2011	--	P	P	P	--	--	--	--	--	--	--	--
2012	--	--	--	P	X	X	X	P	P	P	--	--
2013	P	X	X (P)	P	-- (P)	--	X	P	P	X (P)	P	P
2014	P	P	X	X	P	--	P	--	--	--	--	--
2015	--	--	P	X	P	P	P	-- (P)	P	-- (P)	P	X
2016	P	--	--	--	--	--	--	--	--	--	--	P
2017	X	P	X	X	P	P	P	X	X	P	X	X (P)

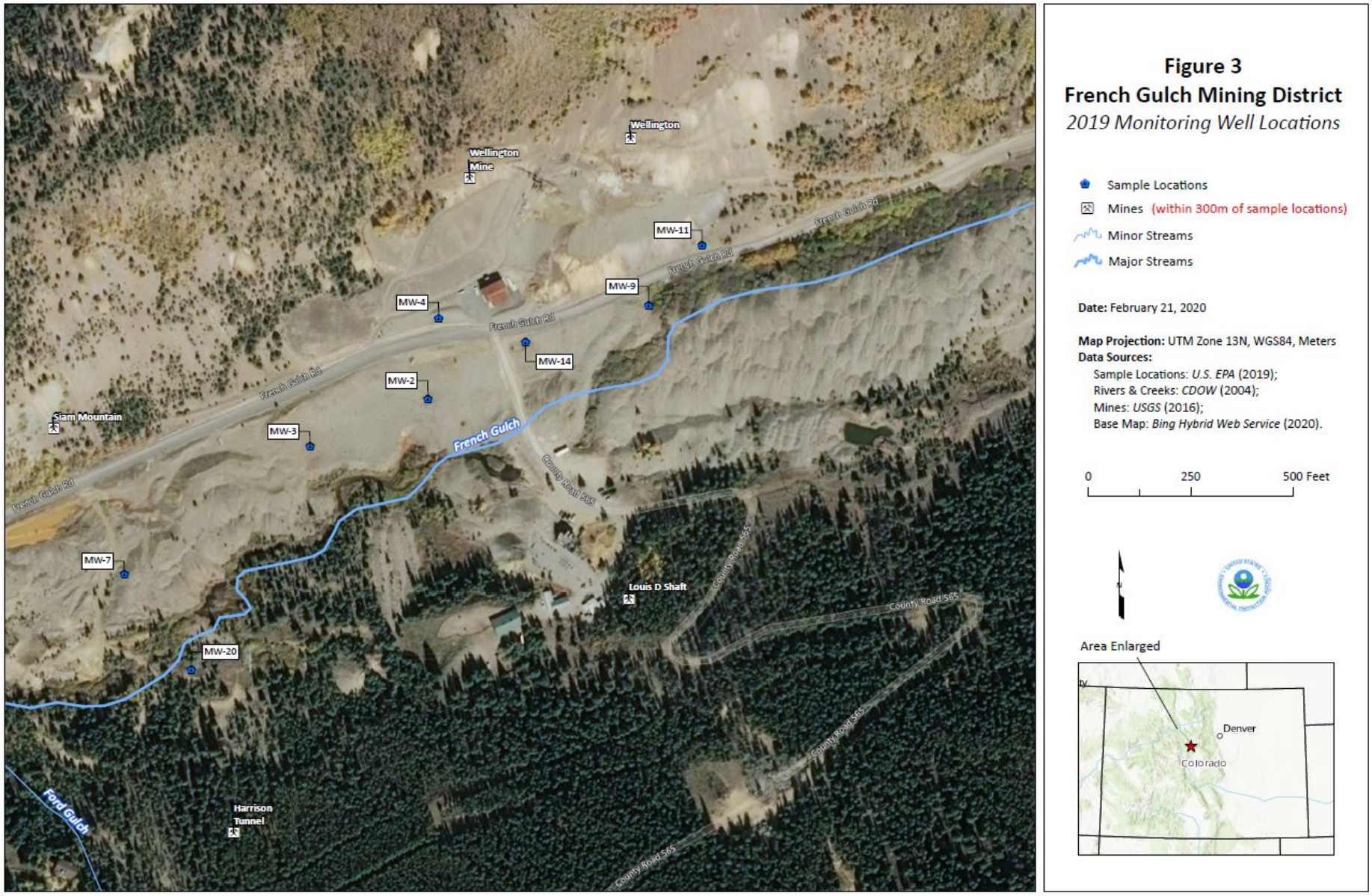
*Extracted from the November 2018 USGS Memorandum to EPA, Review of French Gulch/Wellington-Oro Site water-quality data and suggestions for future work (based on written communication with CDPHE).

Figure 3: 2019 High Flow Surface Water Sampling Locations



Source: 2019 Sampling Events Final, French Gulch Wellington-Oro Mine Site Sampling Activities Report, Breckenridge, Colorado, prepared by TechLaw, Inc. for USEPA Region 8, dated March 2020.

Figure 4: 2019 Monitoring Well Locations



Source: 2019 Sampling Events Final, French Gulch Wellington-Oro Mine Site Sampling Activities Report, Breckenridge, Colorado, prepared by TechLaw, Inc. for USEPA Region 8, dated March 2020.

Site Inspection

The site inspection took place on May 22, 2020. Treat Suomi of Skeo conducted the inspection. The purpose of the inspection was to assess the protectiveness of the remedy. The site visit began at the B&B Trailhead near the WTP. Skeo then proceeded to view site features including groundwater monitoring wells and waste rock piles. Skeo met with City of Breckenridge WTP operator, Brian Huber, to tour the WTP. The operator walked Skeo through the treatment process and opened the cover for FG-6C, which is pumped to the WTP for treatment. Skeo also observed the treated water discharge location, the Wellington Neighborhood, Dead Elk Pond, the fish barriers in French Creek and the confluence of French Creek and Blue River. The WTP and site features were well maintained and appeared to be operating as designed. Multiple people were observed recreating on the public access trail through the Site. Appendix E includes the completed site inspection checklist. Appendix F includes photographs from the site inspection.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

No, the Water Quality Action is not functioning as intended by the decision documents. Although significant improvements have been made to the WTP during this FYR period, operations were sporadic during the upgrades between 2015 and 2017; additional challenges resulting from higher-than-normal flow rates from an unusually large snowpack of 2018/2019 required additional repairs in 2019. Effluent discharge limits for TSS, zinc and cadmium were not consistently met in 2019 and water was recycled back into the mine pool. Overall, however, the WTP is operating more consistently than it had been during the previous FYR period, and it is expected to continue to operate more consistently in the future with the ongoing optimization efforts of the treatment system design team.

Based on currently available information, it is unclear if the treatment of water from seep FG-6C is improving the water quality of French Creek and the Blue River. Zinc concentrations remain above removal action goals and surface water quality standards at the Blue River point of compliance, and there has been no consistent reduction in concentration since the WTP began operating. Groundwater results also demonstrate that there is significant contamination remaining in mine-pool water near the Wellington-Oro Mine complex that is likely a continuing source of metals to surface water in French Creek. EPA and USGS are currently working to address data gaps identified in the understanding of the Site's CSM, as outlined in the 2018 USGS Memorandum and the 2019 3DVA Technical Memorandum. A primary goal of these future investigations is to better understand other potential pathways of significant contaminant loading to French Creek. USGS plans to conduct a geophysical study, a water temperature study and a tracer study as part of the additional characterization efforts to better delineate potential subsurface migration pathways (faults/fractures). EPA also continues to collect surface water and groundwater samples regularly.

Institutional controls are in place for a 4.7-acre property in the vicinity of the Wellington-Oro Mine and seep FG-6C. The institutional controls prohibit residential and agricultural use, restrict excavation, prohibit use of groundwater and surface water, prohibit well construction, and protect the integrity of the cleanup actions, including the WTP. The institutional controls are effective in preventing unacceptable exposure to contaminated media.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Question B Summary:

Yes, the exposure assumptions, toxicity data, cleanup levels and RAOs (in the form of removal action objectives) remain valid.

Response actions are required to comply with the ARARs identified in the Water Quality Action Memorandum Addendum #1, which EPA approved in November 2004. Appendix G includes a summary of the ARARs.

Water Quality Action Memorandum Addendum #1 further clarified that the performance standards for the water quality action are compliance with the CWQCC water quality standards for zinc and cadmium in Segment 2a of the Blue River. Water quality standards for French Creek below the Wellington-Oro Mine (Blue River Segment 11) and Blue River Segment 2b also apply as these reaches are affected by site-related contamination. The site-specific water quality standards in Blue River Segments 2a and 2b are protective of an adult brown trout fishery in the Blue River.

In 2019, CWQCC proposed revised water quality standards (acute and chronic table value standards [TVS] for cadmium and zinc) in Blue River Segments 2a and 2b and lower French Creek (Blue River Segment 11). However, following the proposed rulemaking proceedings, CWQCC retained the existing standards. Therefore, the existing cleanup levels in the 2004 Addendum #1 the Action Memorandum remain valid.

CWQCC also noted that the Water Quality Control Division will work with interested parties to complete a use attainability analysis for Blue River Segment 11 (French Creek), including a comprehensive alternatives analysis that meets the requirements in 31.7(1)(b)(ii), prior to an anticipated 2024 rulemaking hearing. CWQCC intends that the Water Quality Control Division and interested parties will work to identify appropriate cadmium and zinc standards to protect the highest attainable use on Blue River segments 2a and 2b as part of the effort to develop site-specific standards on Segment 11. If site-specific water quality standards change at that time, the next FYR will evaluate their effect on the protectiveness of the remedy.

EPA also set effluent limitations for discharge from the WTP in the Wellington Oro Mine Water Treatment Plant ARARs Compliance Document Discharge Control Mechanism, dated November 15, 2008. The discharge limits were protective of existing conditions in Blue River Segment 11 (French Creek) and would allow for attainment of the water quality standards in Blue River Segment 2a. The effluent limits set in the Discharge Control Mechanism have not changed and remain valid. Additionally, the cadmium and zinc effluent limits of 4 µg/L and 225 µg/L, respectively, are also protective of human health (both are below federal MCLs of 5 µg/L [cadmium] and 5,000 µg/L [zinc]).

Manganese was not identified as a site COC in the 2005 Consent Decree. However, the 2015 FYR Report raised the question as to whether manganese should be considered a site COC since detected concentrations exceeded water quality standards in French Creek and the Blue River. EPA continues to monitor surface water and groundwater for manganese as well as additional metals and will determine if manganese should be included as a Site COC following the additional site characterization and evaluation efforts planned for the Site.

The Water Quality Action Memorandum did not specify performance standards for groundwater. However, groundwater at the Site discharges to French Creek, for which surface water quality standards have been identified. Groundwater at the Site is not used for drinking water and institutional controls are in place to prevent use of groundwater for drinking water in the future.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
None

Issues and Recommendations Identified in the FYR:

OU(s): Water Quality Action	**Issue Category:** Remedy Performance			
	Issue: Concentrations of zinc in surface water of Blue River Segment 2a do not consistently meet water quality standards that support attainment of an adult brown trout fishery. There has been no consistent reduction in dissolved cadmium or zinc concentrations in the Blue River since the WTP began operation in late 2008. Data gaps remain in the understanding of the Site's CSM, including potential sources of significant contaminant loading to French Creek.			
	Recommendation: Address data gaps identified in the understanding of the Site's CSM, as outlined in the 2018 USGS Memorandum and the 2019 3DVA Technical Memorandum, with a primary goal of identifying other potential pathways of significant contaminant loading to French Creek. Consider additional response action modification as appropriate to address other significant sources of cadmium and zinc loading to French Creek.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	EPA	EPA/State	9/30/2023

OU(s): Water Quality Action	**Issue Category:** Remedy Performance			
	Issue: Although significant modifications to the WTP occurred during this FYR period, operational challenges with the WTP continue to arise, which have resulted in sporadic and inconsistent discharge of treated water.			
	Recommendation: Continue efforts to optimize the WTP operation to address the issues with flow, treatment and recycling minimally-impacted water back into the mine pool, and to consistently remove zinc and cadmium to below discharge limits. Additional evaluation may also be needed to determine if the plant can handle increased flow rates in light of the issues caused in 2019 with higher than average flowrates as a result of the 2018/2019 snowpack.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Other – Town and County	EPA/State	9/30/2023

OTHER FINDINGS

Several additional recommendations were identified during the FYR. These recommendations do not affect current and/or future protectiveness.

- The Town and County have concerns regarding the zinc sludge generated as part of the WTP operation. They are currently shipping zinc sludge off site for disposal at cost rather than recycling the sludge. The Town and County should continue to research other possible recycling facilities that can meet the requirements of the CERCLA off-site rule if they choose to recycle; however, the Water Quality Action Memorandum does allow for shipment off site to a solid waste landfill. Any disposal facility receiving the WTP zinc sludge must meet the CERCLA off-site rule requirements.
- Continue to monitor surface water and groundwater for manganese as well as additional metals. EPA will reevaluate whether manganese should be included as a site COC after the additional site characterization and evaluation efforts are conducted at the Site.
- Recent genetic analysis indicated cutthroat trout in French Creek were a mix of strains, mostly Yellowstone, and not native species. Appropriate documents that identify native trout species as the predominant strain should be updated to reflect current information known about fish species in French Creek.

VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement
Protectiveness Determination: Not Protective
Protectiveness Statement: The Water Quality Action, as specified in the 2002 Water Quality Action Memorandum, amended in 2004, and incorporated into the 2005 Consent Decree, is not protective of the environment because concentrations of zinc in surface water at Blue River Segment 2a consistently exceed zinc water quality standards that support attainment of an adult brown trout fishery. In order to be protective, the following actions need to be taken to ensure protectiveness of the environment: • Address data gaps identified in the understanding of the Site's CSM, as outlined in the 2018 USGS Memorandum and the 2019 3DVA Technical Memorandum, with a primary goal of identifying other potential sources of significant contaminant loading to French Creek. • Consider additional response action modification as appropriate to address other significant sources of cadmium and zinc loading to French Creek.

VIII. NEXT REVIEW

The next FYR Report for the French Gulch site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

2018 Sampling Events Final, French Gulch, Wellington-Oro Mine Site, Sampling Activities Report, Breckenridge, Colorado. Prepared by TechLaw, Inc. April 2019.

2019 Sampling Events Final, French Gulch, Wellington-Oro Mine Site, Sampling Activities Report, Breckenridge, Colorado. Prepared by TechLaw. March 2020.

Administrative Order for Non-Time Critical Removal Action in the Matter of French Gulch/Wellington-Oro Mine Site. Docket No. CERCLA-VIII-98-6754. September 24, 1998.

Annual Report for Wellington Oro (WEO) Mine Site Water Treatment Plant. Prepared by Laura Lynch, Town of Breckenridge Water Division Manager. January 29, 2020.

Approval Memorandum for the Engineering Evaluation/Cost Assessment for the French Gulch/Wellington-Oro Site. Prepared by EPA Region 8. May 12, 1998.

Approval of Addendum #1 of the November 24, 2002 Action Memorandum for a Non-Time Critical Removal Action at the French Gulch/Wellington Oro Site, Summit County, Colorado. Prepared by EPA Region 8. November 30, 2004.

Consent Decree, United States of America and The State of Colorado v. The B&B Mines, French Gulch Mines, Inc., Diamond Dick Co., Eckart Patch Co., Little Lizzie Limited Liability Company, and Wire Patch Limited Liability Company. May 31, 2005.

Discharge Monitoring Reports, Wellington Oro Water Treatment Plant. Prepared by Town of Breckenridge, Summit County Gov. January through December 2019.

Ecological Risk Assessment for French Gulch/Wellington-Oro Mine Site. Prepared by Region 8 EPA. May 2002.

Enforcement Addendum to Action Memorandum for French Gulch/Wellington Oro Non-Time Critical Removal Action. Prepared by EPA Region 8. June 4, 1998.

First Five-Year Review Report for French Gulch, Breckenridge, Summit County, Colorado. Prepared by EPA Region 8. September 2015.

French Gulch Superfund Site 3DVA Technical Memorandum. Prepared by Cascade Technical Services. June 24, 2019.

French Gulch Surface Waste Removal Action, Engineering Evaluation/Cost Analysis. Prepared for French Gulch Mines, Inc. by L.F. Brown & Associates, Inc. August 3, 1998.

Optimization Review for French Gulch/Wellington-Oro Mine Site Water Treatment Plant. Prepared by Tetra Tech. April 8, 2013.

Removal Action for the French Gulch/Wellington Oro Site, Summit County, Colorado. Prepared by EPA Region 8. November 24, 2002.

Review of French Gulch/Wellington-Oro Site water-quality data and suggestions for future work, Memorandum. Prepared by USGS. November 29, 2018.

Statement of Work for Engineering Evaluation/Cost Analysis, Mine Pool and Surface and Groundwater, French Gulch/Wellington-Oro Site, Breckenridge, Colorado. Prepared by EPA Region 8. January 29, 1999.

Summary of WEO Site Trip #2. Prepared by BQE Water. September 27, 2019.

The Wellington Oro/French Gulch Site Cleanup Goals and Objectives. Prepared by EPA Region 8. October 4, 2004.

URS, 2002. Wellington-Oro Mine Pool Engineering Evaluation/Cost Analysis. Prepared by URS Operating Services, Inc. for EPA Region 8. May 29, 2002.

Use-Attainability Analysis, Lower French Gulch and the Blue River Downstream from French Gulch near Breckenridge, Colorado. May 2003.

Wellington Oro Mine Water Treatment Plant ARARs Compliance Document. Prepared by EPA Region 8. November 15, 2008.

WEO ChemSulfphide Plant Optimization Memorandum. Prepared by BQE Water. July 7, 2017.

APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
Underground and placer mining operations began in the area	1850s
B&B Mines Group, Diamond Dick Co., Eckart Patch Co., French Gulf Mines, Inc., Little Lizzie Limited Liability Co. and Wire Patch Limited Liability Co., collectively referred to as the B&B Mines, conducted mining and milling operations at the Site	1940s – 1970s
EPA and the state of Colorado began evaluating the area near the Wellington-Oro Mine complex	Late 1980s
EPA conducted a preliminary assessment/site investigation	1995-1996
EPA conducted a site inspection	April 1997
EPA issued an Administrative Order to B&B Mines directing the entity to conduct an EE/CA for surface wastes	April 1998
EPA, the State, B&B Mines and the Town and County began negotiations for a Prospective Purchaser Agreement	June 1998
B&B Mines submitted a final EE/CA to EPA	August 1998
EPA issued an Administrative Order to B&B Mines to conduct a non-time-critical removal action for the surface wastes	September 1998
B&B Mines conducted the removal action for surface wastes	October 1998 – June 1999
EPA issued an Administrative Order to B&B Mines to conduct an EE/CA for the mine pool	July 1999
EPA notified the PRP that EPA would complete the EE/CA for the mine pool	April 2002
EPA completed the EE/CA for the mine pool	May 2002
EPA issued the Water Quality Action Memorandum for the mine pool	November 2002
The Summit Water Quality Committee completed a Use Attainability Analysis	May 2003
The CWQCC revised water quality standards for French Creek and the Blue River	September 2003
EPA issued a Site Cleanup Goals and Objectives memorandum	October 2004
EPA issued Addendum #1 to the Water Quality Action Memorandum	November 2004
EPA, the State, B&B Mines and the Town and County signed a Settlement Agreement, Covenants Not to Sue and Consent Decree	May 2005
The Town and County submitted plans for the design and construction of the WTP	December 2005
The Town and County filed an environmental covenant with the Summit County Clerk & Recorder's Office	November 2007
Effluent limitations for the WTP were finalized in the Wellington Oro Mine Water Treatment Plant ARARs Compliance Document, Discharge Control Mechanism; the Wellington-Oro WTP began operations	November 2008
EPA issued an Optimization Review for French Gulch/Wellington-Oro Mine Site Water Treatment Plant	May 2013
The Town and County began a treatability study for the WTP with EPA and state approval	May 2015
EPA released the Water Quality and Treatment Plant Data Summary Report	June 2013
EPA issued the Site's first FYR Report	September 2015
USGS issued a memorandum documenting review of the Site's surface water quality data and suggestions for future work	November 2018
EPA's contractor issued the French Gulch 3DVA technical memorandum	June 2019

APPENDIX C – PRESS NOTICE

United States Environmental Protection Agency

The U.S. Environmental Protection Agency, Region 8 Announces the Second Five-Year Review for the French Gulch Site, Breckenridge, Colorado

The U.S. Environmental Protection Agency (EPA), in cooperation with the Colorado Department of Public Health and Environment (CDPHE), is conducting the second five-year review (FYR) of the French Gulch site in Breckenridge, Colorado. The purpose of the FYR is to make sure that the cleanup actions completed to date are adequately protecting human health and the environment. The five-year review is scheduled to be completed by September 2020.

EPA's cleanup goal at this site is to reduce metals loading from French Creek into the Blue River to support a sustainable brown trout fishery in the Blue River directly downstream of the confluence with French Creek. A water treatment plant at the Wellington-Oro Mine collects and treats water from the mine and discharges it into the French Creek watershed.

We want to hear from you! Community members are always encouraged to share information that may help EPA make determinations regarding the protectiveness and effectiveness of the remedies at the site. You may contact EPA if you would like to send your comments:

Lisa McClain-Vanderpool, EPA Community Involvement Coordinator
Phone: 303-312-6077 Email: mcclain-vanderpool.lisa@epa.gov

Mailing Address: U.S. EPA Region 8 (8ORA-PA-CI)
1595 Wynkoop Street, Denver, CO 80202-1129

Additional site information is available at:

EPA Superfund Records Center
1595 Wynkoop Street
Denver, CO 80202-1129
303-312-7273

Or online at: https://go.usa.gov/xdF95

APPENDIX D – INTERVIEW FORMS

FRENCH GULCH SUPERFUND SITE	
Site Name: French Gulch	
EPA ID: CO0001093392	
Interviewer name: Andrew Schmidt	**Interviewer affiliation:** EPA
Subject name: Mary Boardman/Alex Hedgepath	**Subject affiliation:** CDPHE
Subject contact information: mary.boardman@state.co.us / alex.hedgepath@state.co.us	
Interview date: 3/10/2020	**Interview time:** 8:00 a.m.
Interview location: Remote	
Interview format (circle one): In Person Phone Mail (Email) Other:	
Interview category: State Agency	

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   Little has occurred at the Site since the inception of the WTP. Ongoing efforts to further characterize the Site and optimize treatment and monitoring look promising.

2. What is your assessment of the current performance of the remedy in place at the Site?

   There still appear to be some data gaps that prevent the full evaluation of the performance of the remedy. The work planned for 2020 to further characterize the Site should be very useful in determining the performance of the remedy in regard to further identifying inflow and outflows of the Oro Shaft Mine and the French Gulch.

   Previous disruptions in the operations of the WTP made it difficult to determine if the WTP had a beneficial impact on downstream water quality.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   A nearby residential developer has expressed continued concern over the appearance of the French Gulch. In addition, a local environmental engineer has expressed that he believes additional or replacement remedy strategies would better the remedial goals at the site. Some of these strategies were presented at a meeting in late 2019.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

   Activities have been limited since the WTP began operating in late 2008. CDPHE has received and reviewed monthly discharge monitoring reports and other correspondence regarding the WTP operations. Additionally, CDPHE participates in meetings and calls with interested parties, when coordinated by EPA.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

   No.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

   No. The agencies are relying on the developer to convey information about the Site.

7. Are you aware of any changes in projected land use(s) at the Site?

   No.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   The Site had several RPMs assigned to it, resulting in a lack of continuity and a loss of institutional knowledge. CDPHE is looking forward to the further characterization work that is being planned for 2020, these efforts should help address remaining data gaps at the Site.

9. Do you consent to have your name included along with your responses to this questionnaire in the FYR Report?

   Yes.

French Gulch SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: French Gulch	
EPA ID: CO0001093392	
Interviewer name:	**Interviewer affiliation:**
Subject name: Laura Lynch	**Subject affiliation:**
Subject contact information: laural@townofbreckenridge.com 970-453-3378	
Interview date: 3/9/20	**Interview time: 11:30am**
Interview location:	
Interview format (circle one): In Person Phone Mail (Email) Other:	
Interview category: Local Government	

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date? I'm aware of the former environmental issues but don't know the past clean-up activities in great detail.

2. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future? I'm well-informed regarding the site's operation of the Wellington Oro Wastewater Treatment Facility, but still a little unclear regarding the effectiveness of the remedial progress. I believe the most recent USGS report summarized that more analysis is needed to determine the effectiveness of the plant.

3. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing? We very occasionally get people that stop by looking for directions, or trying to get out of the rain (bikers)

4. Are you aware of any changes to state laws or local regulations that might affect the protectiveness of the Site's remedy? No

5. Are you aware of any changes in projected land use(s) at the Site? No

6. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future? I feel informed of activites at the site, I can't speak for the neighbors.

7. Do you have any comments, suggestions or recommendations regarding the project? A lot of time and money is spent operating the plant. Is it making a difference in water quality in the Blue?

8. Do you consent to have your name included along with your responses to this questionnaire in the FYR report? Yes.

FRENCH GULCH SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: French Gulch	
EPA ID: CO0001093392	
Interviewer name: Andrew Schmidt	**Interviewer affiliation:** EPA
Subject name: Brian Lorch	**Subject affiliation:** Summit County
Subject contact information: brian.lorch@summitcountyco.gov	
Interview date: 2/27/2020	**Interview time:** 12:30 p.m.
Interview location: Open Space Office computer	
Interview format (circle one): In Person Phone Mail (Email) Other:	
Interview category: Local Government	

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   Yes, I am very aware as I was instrumental in coordinating efforts to initiate the cleanup and choosing the technology approved by the EPA.

2. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   I feel well informed and feel the community has had the appropriate level of engagement throughout the process.

3. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   Not that I am aware of.

4. Are you aware of any changes to state laws or local regulations that might affect the protectiveness of the Site's remedy?

   The state is currently reviewing water quality standards in French Creek. The primary recent change has been the EPA's independent redefinition of the zinc ore product produced by the treatment plant as a waste, despite the signed agreement by the federal government to the contrary. This may threaten the continued sustainability of the EPA-approved technology.

5. Are you aware of any changes in projected land use(s) at the Site?

   None are anticipated.

6. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site?

   Yes.

7. How can EPA best provide site-related information in the future?

The best mechanism for public outreach is probably through public meetings hosted by the local governments with EPA staff providing site-related information.

8. Do you have any comments, suggestions or recommendations regarding the project?

   We appreciate the assistance of the EPA and the site manager's ongoing efforts to work with the community to improve water quality and habitat in French Creek.

9. Do you consent to have your name included along with your responses to this questionnaire in the FYR Report?

   Yes.

FRENCH GULCH SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: French Gulch	
EPA ID: CO0001093392	
Interviewer name: Andrew Schmidt	**Interviewer affiliation:** EPA
Subject name: Local Business Owner	**Subject affiliation:** Wellington Neighborhood Founder
Subject contact information: N/A	
Interview date: 5/14/2020	**Interview time:** N/A
Interview location: N/A	
Interview format (circle one): In Person Phone Mail (Email) Other:	
Interview category: Resident/Local Business	

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   Yes, intimately.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   I have been involved with the Site since 1999. At that time there were dozens of federal, state and local government agencies attending French Gulch Remediation Opportunity Group meetings trying to find a way forward with the Wellington-Oro Site. The Keystone Center was a contract facilitator. We suggested that one possible outcome could best be thought of as a "three-legged stool" – remediation, housing and open space. If every agency would focus on the larger goal, rather than their individual mandate, the log jam could be broken and something, something great, could be accomplished. And we did create some great things – a housing project, the Wellington Neighborhood that is home to over a thousand Breckenridge locals and which has been characterized as "gold standard" for workforce housing; almost 2,000 acres purchased by the Town and County which is now permanently protected open space; and remediation, the surface areas around the mine have been capped and cleaned up. As a result, a Denver Post Editorial declared the Wellington Neighborhood a model for the entire state and at a ceremony at the National Building Museum in Washington, DC, the EPA Administrator presented the Mayor of Breckenridge and the Wellington Neighborhood founder the EPA's highest award, the National Award for Smart Growth Achievement.

3. What have been the effects of this Site on the surrounding community, if any?

   Profound. People often say how charming and lovely the Wellington Neighborhood is when, in fact, the real legacy is the over thousand locals that live there – Town Council members, Planning Commission members, County Commissioners, Town Managers, first responders, teachers, small business owners, etc. But for the neighborhood, these people that are critical to Breckenridge and preserving its community character would have been forced to leave. The legacy is the people who call Wellington home.

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   In the course of developing the Wellington Neighborhood, working with the EPA, French Creek was diverted away from the mine pool so that it ran clean with apparently no iron loading past the Wellington-Oro Mine site and through the Wellington Neighborhood. Shortly after the water treatment plant was completed, French

Creek as it ran past the remediation plant discharge point, was once again loaded with iron and the banks of French Creek as it ran through the neighborhood turned red.

5. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future?

   I'd suggest the EPA could work more closely with the Wellington Neighborhood Homeowners Association, a robust and active neighborhood group.

6. Do you own a private well in addition to or instead of accessing city/municipal water supplies? If so, for what purpose(s) is your private well used?

   No.

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

   Back in 1999 part of the deal concerning the Wellington Neighborhood purchasing the property from B&B Mines was that the over $1 million paid by the Wellington Neighborhood would be put in a lock box for use in connection with remediating the Site. Those original funds remain in the lock box. It would be great to put those funds to work cleaning up French Creek, particularly the iron loading as French Creek runs through the Wellington Neighborhood.

APPENDIX E – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: French Gulch	**Date of Inspection:** 05/22/2020
Location and Region: Breckenridge, Colorado 8	**EPA ID:** CO0001093392
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature:** Sunny and 65 degrees Fahrenheit

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other: Seep collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** Laura Lynch (Name) Town of Breckenridge (Affiliation) _____ (Date)
   Interviewed ☐ at site ☐ at office ☒ by email Phone: _____
   Problems, suggestions ☒ Report attached: Appendix D includes a completed interview form.

2. **O&M Staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

   Agency CDPHE

Name	Title	Date	Email
Mary Boardman and Alex Hedgepath	_____	03/10/2020	mary.boardman@state.co.us / alex.hedgepath@state.co.us

   Problems/suggestions ☐ Report attached: Appendix D includes the completed interview form.

   Agency Summit County

Name	Title	Date	Email
Brian Lorch	_____	02/27/2020	brian.lorch@summitcountyco.gov

   Problems/suggestions ☐ Report attached: Appendix D includes the completed interview form.

   Agency _____

Contact Name	Title	Date	Phone No.
_____	_____	_____	_____

   Problems/suggestions ☐ Report attached: _____

4. **Other Interviews** (optional) ☒ Report attached: Local business owner. Appendix D includes the completed interview form.

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)				
1.	**O&M Documents**			
	☐ O&M manual	☒ Readily available	☐ Up to date	☐ N/A
	☐ As-built drawings	☒ Readily available	☐ Up to date	☐ N/A
	☐ Maintenance logs	☒ Readily available	☐ Up to date	☐ N/A
	Remarks: _____			
2.	**Site-Specific Health and Safety Plan**	☒ Readily available	☐ Up to date	☐ N/A
	☒ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: _____			
3.	**O&M and OSHA Training Records**	☒ Readily available	☐ Up to date	☐ N/A
	Remarks: _____			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☒ Effluent discharge	☒ Readily available	☒ Up to date	☐ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
7.	**Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☒ Water (effluent)	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
IV. O&M COSTS				
1.	**O&M Organization**			
	☐ State in-house	☐ Contractor for state		
	☐ PRP in-house	☐ Contractor for PRP		

☐ Federal facility in-house ☐ Contractor for Federal facility

☒ Town and County operate the WTP

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☒ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate: The 2002 Action Memorandum estimated annual O&M costs of $192,000. ☐ Breakdown attached

Total annual cost by year for review period if available

From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A

Remarks: _____

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☒ N/A

Remarks: The WTP is secured.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by): _____

Frequency: _____

Responsible party/agency: _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up to date ☐ Yes ☐ No ☒ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☒ No ☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: _____

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☐ N/A

Remarks: A portion of the Site now has a bus turnaround area.

3. **Land Use Changes Off Site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads Damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable (water treatment of seep) ☐ N/A

A. Groundwater Extraction Wells, Pumps and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☒ Good condition ☒ All required wells properly operating ☐ Needs maintenance ☐ N/A

Remarks: _____

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☒ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (check components that apply)

☒ Metals removal (sulfide precipitation process) ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☒ Filters: _____

☒ Reagents: Sodium hydrosulfide, sodium bicarbonate

☐ Others: _____

☒ Good condition ☐ Needs maintenance

☒ Sampling ports properly marked and functional

☒ Sampling/maintenance log displayed and up to date

☒ Equipment properly identified

☐ Quantity of groundwater treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: WTP operations data are presented in the Data Review section of the FYR Report.

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☒ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☒ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair

☒ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☒ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☒ Good condition

☒ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring Data Suggests:**

☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☒ N/A

Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

The goal of the response action was to improve water quality in French Creek and reduce metals loading from French Creek into the Blue River. The primary goal was to improve water quality in the Blue River so that it will support a population of adult brown trout. Based on review of site data, it is unclear if the treatment of water from seep FG-6C is improving the water quality of French Creek and the Blue River, as zinc concentrations remain elevated above removal action goals and surface water quality standards. This may be due, in part, to inconsistent treatment caused by various issues with the WTP. Additionally, groundwater data demonstrate that there is significant contamination remaining in mine-pool water. A data gap that remains is determining significant loading sources to French Creek, other than the known FG-6C seep. EPA and USGS plan to conduct further investigations to better understand the spatial distribution of cadmium and zinc sources in French Creek and possible ways to improve cleanup of the Site.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
The FYR Report addresses issues identified with the WTP during this FYR period and actions taken to address them.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.
The FYR Report describes issues and observations associated with operation of the WTP.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
The EPA, CDPHE and the Town and County are continuing to identify opportunities for optimization of the WTP and overall remedy.

APPENDIX F – SITE INSPECTION PHOTOS

Entrance to the Wellington-Oro Mine located adjacent to the WTP

WTP exterior

Interior of the WTP


Discharge location for treated effluent; WTP in the background

WTP influent flow meter

WTP discharge meter

FG-6C with Wellington Neighborhood in the background

Open housing for pump at FG-6C

Locked monitoring well MW-11

Environmental covenant area with recreation trail

New bus turnaround on site


Wellington Neighborhood

Dead Elk Pond

Fish barrier below Dead Elk Pond at Wellington Road

Surface water located adjacent to the road with WTP in the background

Fish barrier at French Creek and Magnum Bonum Drive

Confluence of the Blue River and French Creek

APPENDIX G – ARARs Review

Water Quality Action Memorandum Addendum #1, dated November 2004, identified the following ARARs as practicable for the Site:

- The Federal Clean Water Act
- Colorado Water Quality Standards
- The Safe Drinking Water Act, Underground Injection Control Program
- The Colorado Solid Waste Disposal Regulation
- The Colorado Mine Land Reclamation Act
- The Endangered Species Act
- Colorado Environmental Covenant Requirements – CRS 25-15-317-327

Surface Water

Water Quality Action Memorandum Addendum #1 further clarified that the performance standards for the water quality action are to comply with CWQCC water quality standards for zinc and cadmium in Segment 2a of the Blue River. Table G-1 summarizes the water quality standards for Segment 2a of the Blue River as well as water quality standards for French Creek below the Wellington-Oro Mine (Blue River Segment 11) and Blue River Segment 2b, which are also affected by site-related contamination. The water quality standards were presented in EPA's memorandum, Wellington Oro/French Gulch Site Cleanup Goals and Objectives, October 2004. Figure G-1 shows the locations of the Blue River Stream Segments.

Table G-1: Site-specific Water Quality Standards Adopted by CWQCC

Blue River Segment	Dissolved Cadmium (µg/L)	Dissolved Zinc (µg/L)
2a	4	$e^{(1.25(\ln(\text{hardness})+0.799))}$
2b	$0.5e^{(1.016(\ln(\text{hardness})-3.132))}$	$e^{(0.9805(\ln(\text{hardness})+1.402))}$
11	Ambient	Ambient

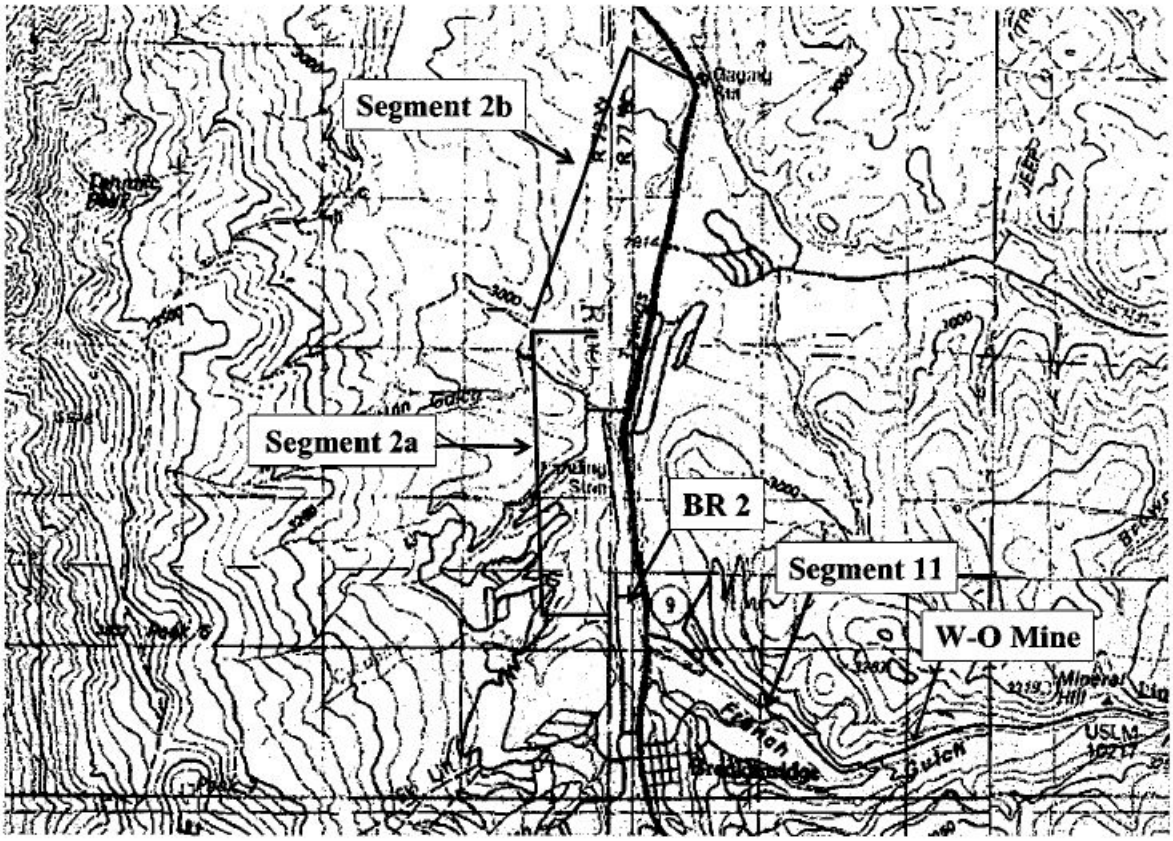
In 2019, CWQCC proposed revised water quality standards for the Blue River and lower French Creek (e.g., acute and chronic TVS for cadmium and zinc). Following the proposed rulemaking proceedings, CWQCC retained the existing standards. The following explanation for the decision was presented in Section H of Colorado Regulation 33.62: Statement of Basis, Specific Statutory Authority and Purpose; June 10, 2019 Rulemaking; Final Action August 12, 2019; Effective Date December 31, 2019, also available at https://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=8432&fileName=5%20CCR%201002-33:

> *The commission recognizes that the 2016 acute and chronic cadmium criteria and zinc TVS are not currently attainable. The commission anticipates the necessary information will be collected to support the adoption of site-specific standards for cadmium and zinc in the next Upper Colorado basin hearing in 2024 or sooner if possible.*
>
> *The 2016 revisions to Regulation No. 31.7 provide that where sources and causes of elevated pollutant levels are determined to be attributable to anthropogenic activity, a comprehensive alternatives analysis must be conducted to identify the extent to which conditions could be improved by implementing feasible pollution controls. Substantial anthropogenic impacts have been identified and studied in French Gulch. In partnership with EPA, Summit County and the Town of Breckenridge have made substantial investments in water quality studies and treatment efforts in Blue River Segment 11. Numerous non-point source clean-up projects have been completed, and in 2008 the Wellington Oro (W-O) wastewater treatment plant began operating. While a great deal of information and data were shared in this hearing, more recent information to characterize the effects of these changes is not currently available. The division will work with interested parties to complete a use attainability analysis for Segment 11,*

including a comprehensive alternatives analysis that meets the requirements in 31.7(1)(b)(ii), prior to the 2024 rulemaking hearing.

In 2003, in addition to the "existing quality" standards adopted on Segment 11, site-specific numeric standards were adopted downstream on Blue River segments 2a and 2b. The 4 µg/L acute and chronic cadmium standards on Segment 2a were described as a "CERCLA treatment target concentration" (NWCCOG Rebuttal Statement). By contrast, the zinc standards on Segment 2a and cadmium and zinc standards on Segment 2b were adopted to protect various life stages of brown trout. No changes were proposed or adopted for Blue River segments 2a and 2b in this rulemaking hearing. However, because the W-O treatment facility has been operating for a decade, additional cadmium and zinc toxicity data have become available, and habitat improvements have been made in segments 2a and 2b, there is a need to review the cadmium and zinc standards as part of a use attainability analysis. The commission intends that the division and interested parties will work to identify appropriate cadmium and zinc standards to protect the highest attainable use on Blue River segments 2a and 2b as part of the effort to develop site-specific standards on Segment 11.

Figure G-1: Blue River Stream Segments



Source: The Wellington Oro/French Gulch Site, Site Cleanup Goals and Objectives, prepared by EPA, October 2004.

Groundwater

The Water Quality Action Memorandum did not specify performance standards for groundwater.