THIRD FIVE-YEAR REVIEW REPORT FOR FREMONT NATIONAL FOREST/WHITE KING AND LUCKY LASS URANIUM MINES (USDA) SUPERFUND SITE LAKE COUNTY, OREGON

SEPTEMBER 2020

Prepared by

U.S. Environmental Protection Agency
Region 10
SEATTLE, WASHINGTON

CALVIN TERADA
Digitally signed by CALVIN TERADA
Date: 2020.09.23 13:58:55 -07'00'

Calvin Terada, Division Director

9/23/20

Date

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LIST OF ABBREVIATIONS & ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
HQ	Hazard Quotient
IC	Institutional Control
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
NCP	National Contingency Plan
pCi/g	Picocuries per Gram
pCi/L	Picocuries per Liter
NPL	National Priorities List
ODEQ	Oregon Department of Environmental Quality
OU	Operable Unit
OMMP	Operation and Maintenance and Monitoring Plan
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
USDA	United States Department of Agriculture
UU/UE	Unlimited Use and Unrestricted Exposure

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 third FYR for the Fremont National Forest/White King and Lucky Lass Uranium Mines (USDA) Superfund site (the Site). The triggering action for this statutory review is the completion date of the previous FYR. The FYR has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of one operable unit (OU), which is addressed in this FYR Report. EPA remedial project manager (RPM) Anne Christopher led the FYR. Participants included Oregon Department of Environmental Quality (ODEQ) project manager Bob Schwarz, United States Department of Agriculture (USDA) Forest Service project manager Michael Wilcox, Oregon Department of Energy project manager Tom Sicilia, and Ryan Burdge from Skeo, EPA support contractor. The review began on 7/2/2019.

Site Background

The Site is located in south-central Oregon, about 17 miles northwest of Lakeview, Oregon (Figure 1). The Site consists of two former uranium mines located within a mile of each other, the White King Mine and the Lucky Lass Mine, which collectively encompass about 140 acres (Figure 2). Portions of the Site are within the Fremont National Forest, managed by the United States Forest Service (Forest Service). Other portions of the Site are on private, undeveloped lands. Most of the White King stockpile (also referred to as Consolidated Stockpile) and all of the Lucky Lass Mine stockpile are on Fremont National Forest lands. The Site is situated in a remote area. The closest permanent inhabitants to the Site live near the intersection of FS 8270 and County Road 16B, approximately 12 miles southeast of the Site. The area around the Site is used for recreational purposes, including hunting and snowmobiling. Wood-cutting and cattle grazing also occur in the general area of the Site.

Mining began at the Site in 1955 and continued until about 1979. Available records indicate that the White King Mine produced about 138,146 tons of ore and the Lucky Lass Mine produced about 5,450 tons of ore during their periods of operation. The Lucky Lass area drains to the Augur Creek valley, intercepting Augur Creek upstream from the White King Mine. The White King Mine also drains to the Augur Creek Valley and Augur Creek. Mining operations contaminated soil, sediment, surface water and groundwater with metals and radionuclides. In addition, acidic conditions occurred in the White King Pond.

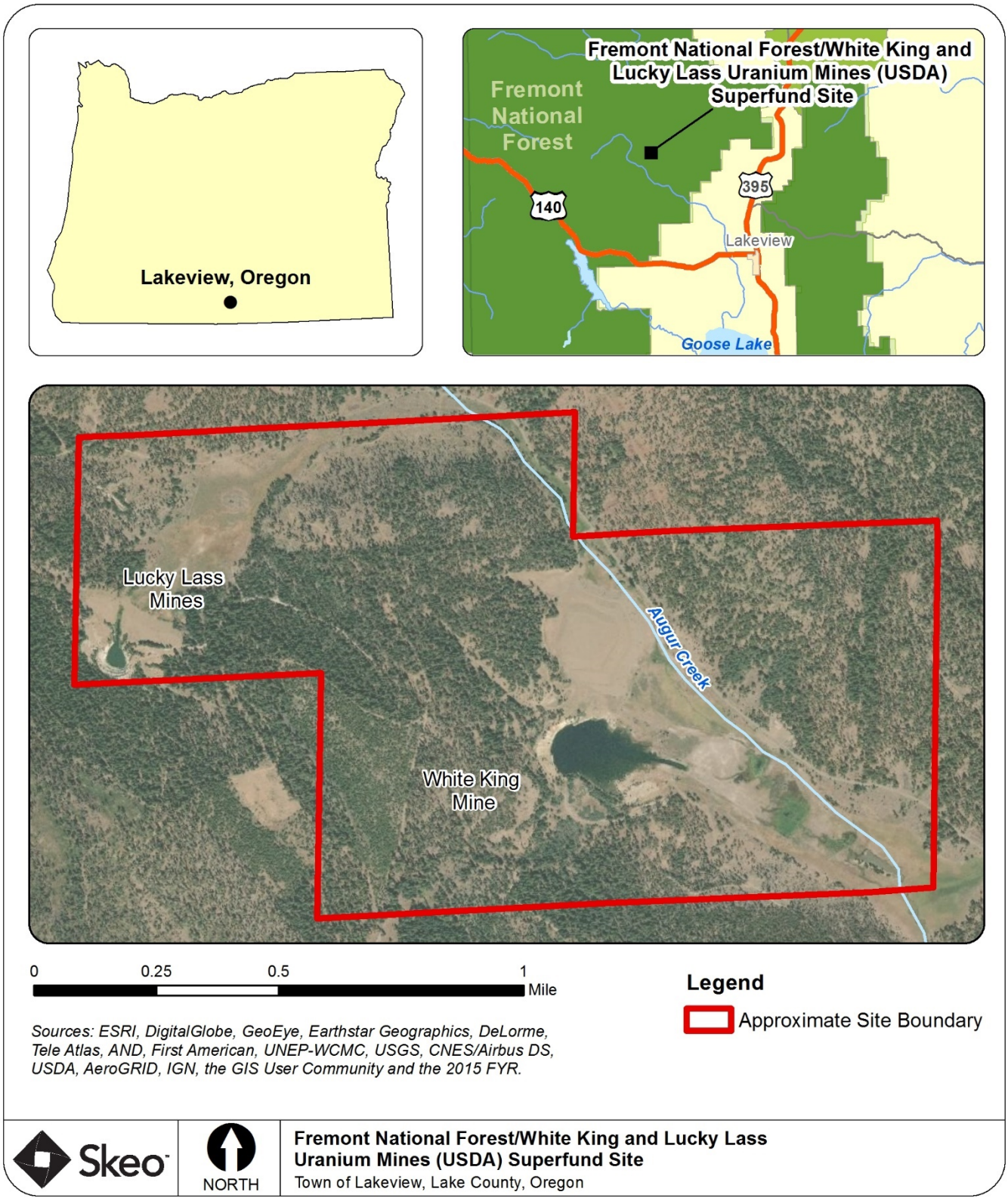
Prior to remedial action, major features at the White King Mine included the White King Pond (formed when water collected in the open pit mine) and two stockpiles consisting of overburden material (referred to as Protore Stockpile and Overburden Stockpile). A grassy meadow and wetlands separated the two piles. These areas contained a combined volume of almost one million cubic yards. Major features at the Lucky Lass Mines includes the Lucky Lass Pond and the overburden stockpile. Currently, the Site includes two covered stockpiles, one at White King and one at Lucky Lass.

For the current White King stockpile, water flowing through the stockpile flows into the alluvium above the bedrock. In the immediate vicinity of this stockpile, the alluvial groundwater can flow into the shallow bedrock, but may also seasonally discharge directly into Auger Creek. The groundwater in both the alluvium and the shallow bedrock groundwater will eventually discharge into Augur Creek further downstream. For the Lucky Lass

stockpile, stockpile leachate discharges as seeps and into underlying alluvium/bedrock groundwater, and can discharge into Augur Creek as surface flow and/or groundwater.

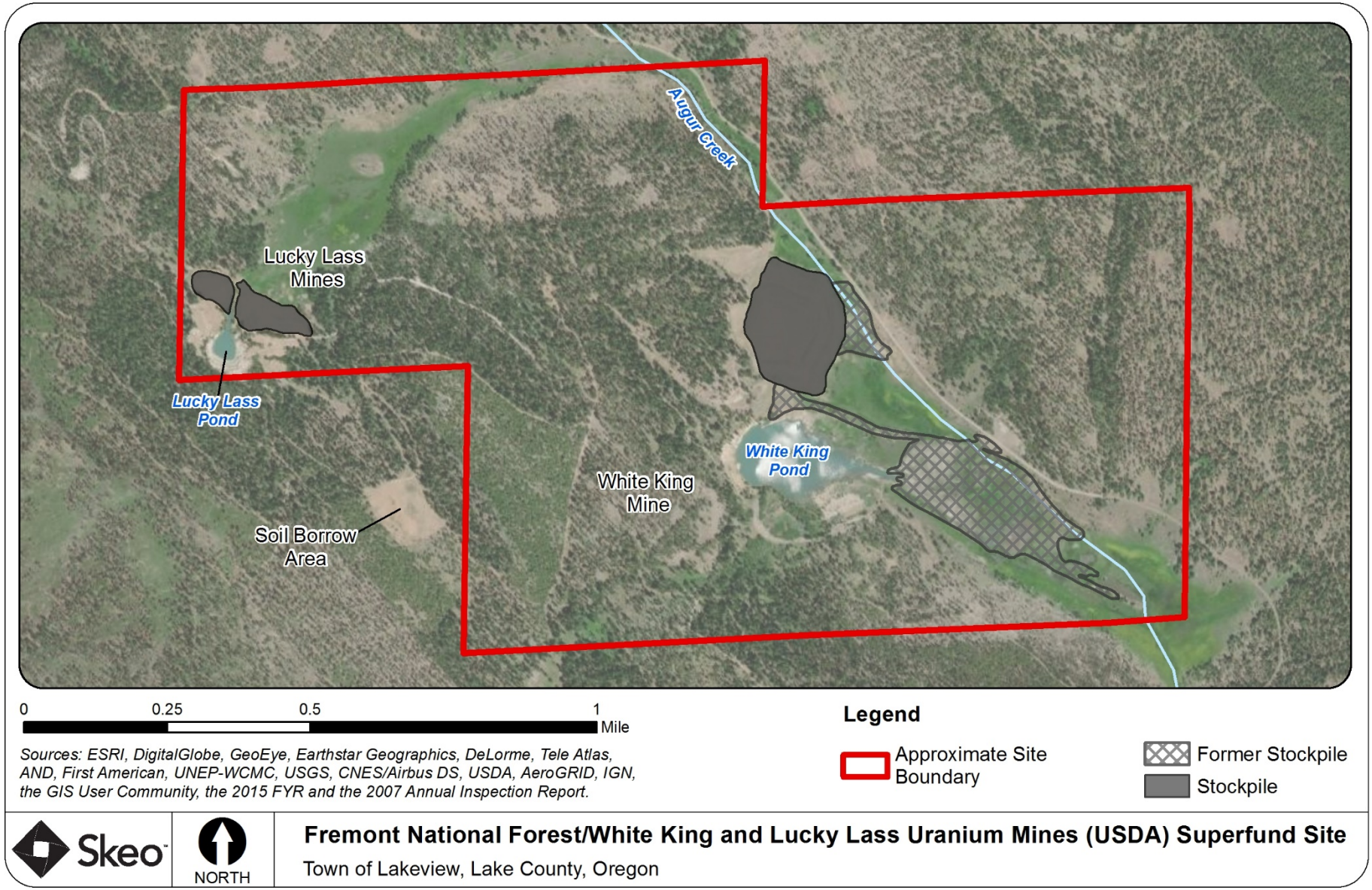
Refer to Appendix A for additional resources and to Appendix B for the Site's chronology of events.

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.

Figure 2: Site Map



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FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Fremont National Forest/White King and Lucky Lass Uranium Mines (USDA)		
EPA ID: OR7122307658		
Region: 10	**State:** OR	**City/County:** Lakeview/Lake
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the Site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Anne Christopher, with additional support provided by Skeo		
Author affiliation: EPA Region 10		
Review period: 7/2/2019 - 9/30/2020		
Date of site inspection: 7/30/2019		
Type of review: Statutory		
Review number: 3		
Triggering action date: 9/23/2015		
Due date *(five years after triggering action date)*: 9/23/2020		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In 1994, the Forest Service, EPA and the state of Oregon agreed to implement a removal action and develop a remedial investigation and feasibility study (RI/FS) for the Site. In 1995, EPA added the Site to the Superfund program's National Priorities List (NPL). In May 1995, a Memorandum of Understanding was signed between EPA and the Forest Service to facilitate coordination between the two federal agencies during the Site's RI/FS.

The 1996 RI/FS found that the primary hazards associated with the wastes included external exposure to gamma radiation, release of radon gas and environmental contamination by heavy metals and the radioactive constituents in off-pile soil, surface water and groundwater.

The potential future risks from groundwater were associated with selected wells within the Overburden Stockpile. Surface water and sediments in Auger Creek and nearby wetlands had also been contaminated by mining activities. The primary contaminants of concern (COCs) for the Site are uranium isotopes and radium (Ra-226). Arsenic is a COC for the White King Mine portion of the Site.

The ecological risk assessment used a tiered or phased approach. It showed some potential adverse impacts, based on screening-level assessment only, for selected terrestrial receptors and plants exposed to non-radionuclides such as arsenic, selenium and antimony in surface and subsurface soils at the White King Mine. The risk assessment also identified potential adverse impacts, based on screening-level assessment only, for aquatic invertebrates exposed to non-radionuclides in the sediments of the White King Pond and Augur Creek. The White King Pond pH ranged from 3 to 4.5 whereas Lucky Lass Pond pH values ranged from 7 to 7.5. There were no adverse impacts to ecological receptors predicted for the radionuclide and non-radionuclide contaminants of potential concern in water of White King Pond, Lucky Lass Pond or Augur Creek. Little aquatic life was observed in White King Pond, believed to be the result of the historically low pH water prior to pond neutralization.

Response Actions

EPA selected the Site's remedy in the Site's September 2001 Record of Decision (ROD). The remedial action objectives (RAOs) for both the White King and Lucky Lass mines areas are:

Soils

- Reduce exposure to stockpiles and contaminated off-pile soil by humans (ingestion and external exposure) and ecological receptors (ingestion). Demonstrate protectiveness to an excess risk level of 1 x 10^{-6} for carcinogenic risk (or a non-cancer hazard quotient [HQ] of 1) based on reasonable maximum exposure for an individual or background concentration, whichever is higher.
- Reduce and eliminate the release and migration of contaminants from soils to groundwater or surface water via erosion, oxidation or leaching to protect for beneficial uses (recreational, agricultural and aquatic habitat).
- Prevent the removal or use of stockpile soils for any purpose.

White King Pond

- Protect the potential beneficial uses (aquatic life) of the White King Pond from exposure to COCs above applicable standards (state water quality standards) or background concentrations, if background concentrations are higher than the applicable standard.
- Maintain a neutral pH in the White King Pond water to reduce the toxicity of the acidic water and lower the concentrations of dissolved metals in the water.

Augur Creek

- Reduce exposure to aquatic invertebrates and recreational users from COCs in Augur Creek surface water and sediments above protective risk-based levels for recreational users, applicable standards (state water quality standards) or background concentrations, if background concentrations are higher than the applicable standard or protective level.
- Monitor surface water to ensure that the potential beneficial uses of surface water are maintained and/or to establish a trend toward background concentrations.

Groundwater

- Prevent any human exposure and future use of groundwater beneath the stockpiles with contaminant concentrations in excess of federal and state drinking water standards or protective levels.
- Monitor groundwater upgradient and downgradient of the stockpiles to ensure that the potential beneficial uses of groundwater (discharge to surface water) meet applicable standards (state water quality standards) at the boundary of the waste management area with Augur Creek and/or to establish a trend toward background concentrations.

To meet the RAOs, the remedial action included the following major remedy components for waste and soil:

- Recontouring the White King Protore Stockpile so that it is no longer in the Auger Creek 500-year floodplain.

- Removal of designated soils from the White King Mine haul road and certain "off-pile" areas where there was mine-related waste above site remediation levels (Table 1), and placement of these materials on the regraded White King stockpile.
- Excavation of the White King Overburden Stockpile and placement of the material on the White King stockpile (also referred to as Consolidated Stockpile).
- Placement of 20 inches of cover soil and 4 inches of a topsoil/armor gravel mixture on the White King stockpile surface sufficient to support vegetation and seeding of the stockpile surface.
- Placement of 3 inches of topsoil and reseeding of those areas where soil was removed.
- Installation of fencing and warning signs around the stockpiles to physically restrict access.
- Excavation and consolidation of "off-pile" material in the Lucky Lass Stockpile.
    - The ROD had anticipated that the remaining exposed materials would be below the Lucky Lass remediation level (Table 1). A post-ROD gamma radiation survey of this stockpile indicated that achieving the remediation level solely by removal would removal of a much larger volume of material than the 3,000 cubic yards anticipated in the ROD. As a result and in 2006, EPA issued an Explanation of Significant Differences (ESD) to record the following modifications to the remedy:
        - During construction of the selected remedy at the Lucky Lass Stockpile, a greater volume of contaminated material near the surface was identified. The ESD provided for additional grading and cover of this area to achieve the cleanup goals, rather than removal of all material above cleanup levels.
        - During construction of the selected remedy at the Lucky Lass Stockpile, construction equipment was unable to access the off-pile area near the toe of the Lucky Lass Stockpile. These materials were covered in place with four inches of soil from the Soil Borrow Area.
        - Inspection and maintenance activities were added for the Lucky Lass Stockpile, as described in the 2005 Operations, Maintenance, and Monitoring Plan (OMMP) for the White King Stockpile.
- Implementation of land use restrictions.

To meet the RAOs, the remedial action included the following remedy components for surface water and groundwater:

- Implementation of groundwater use restrictions.[1]
- Implementation of groundwater and surface water monitoring.
- Continued in-situ neutralization of the White King Pond; neutralization is conducted when pH in the mixed pond water is less than 5.5.

Remediation levels for relevant media are listed in Table 1.

Table 1: Remediation Levels

Media	COC	Remediation Level	Basis
White King Mine Soil	Arsenic	442 mg/kg	Background (95% UTL lognormal subsurface soils)
	Radium-226	6.8 pCi/g	Background (95% UTL normal subsurface soils)
Lucky Lass Soil	Arsenic	38 mg/kg	Risk assessment for recreational user
	Radium-226	3.6 pCi/g	Background (95% UTL normal subsurface soils)
White King Pond	Arsenic	0.033 mg/L	95% UTL Background
	pH	7-9 su	Oregon Goose Lake Basin Criteria

[1] EPA determined active remediation of groundwater is not required in order to achieve protection of human health as institutional controls are being used to restrict use of groundwater beneath the stockpiles.

Media	COC	Remediation Level	Basis
Augur Creek Surface Water	Arsenic	0.033 mg/L	95% UTL Background
Augur Creek Sediment	Arsenic	6 mg/kg	Lowest Effect Level Ontario Sediment Quality Guidelines
	Manganese	1,610 mg/kg	Background Highest Upgradient Concentration
White King and Lucky Lass Groundwater	Arsenic	0.033 mg/L	95% UTL Background for Surface Water
	Radon	704 pCi/L	95% UTL Background for Surface Water

Notes:
mg/kg = milligrams per kilogram
pCi/g = picocuries per gram
mg/L = milligrams per liter
pCi/L = picocuries per liter
Source: ROD section 12.6.1

Status of Implementation

Construction Activities

After the ROD was signed, a group of potentially responsible parties (PRPs) agreed to take primary responsibility for implementing remedial action and specified post-remediation monitoring at the Site in accordance with a Consent Decree (effective date January 20, 2006). Following the 2015 FYR, the White King Consent Decree was amended after EPA recovered funds from the Tronox bankruptcy for anticipated future clean up needs at the White King Site. The Consent Decree Amendment served two purposes: first, it excused the Fremont Lumber Company and Western Nuclear Incorporated from future cleanup obligations; second, it removed Kerr-McGee Chemical Worldwide LLC as a party from the Consent Decree.

Remediation construction took place during 2005 and 2006. Major construction activities included:

- White King Mine
    - Excavation and recontouring of the Protore Stockpile, excavation of the Overburden Stockpile and excavation of the soil above cleanup levels in the White King off-pile areas, as delineated by gamma surveying (Figure 2).
        - In the event that gamma surveys indicated that site cleanup levels were not achieved during initial excavation, supplemental excavation of an additional 6 inches of soil was prescribed. During the 2005 construction season, many areas of the White King meadow surface were saturated and/or gamma surveys after the removal of the initial 6 inches of soil indicated that the cleanup levels had not been achieved. As a result of these factors, the upper 12 inches of the meadow surface soils were removed in many of the subject areas during 2005.
        - Restoration was performed in areas where soil had been removed or disturbed. Prior to re-seeding, the excavated and disturbed areas of the Site were regraded to establish suitable surfaces for seeding and revegetation.
    - Placement and compaction of excavated soils on the White King stockpile.
    - Completion of fine grading of the White King stockpile.
    - Completion of the placement and grading of clean cover soil and the armor/topsoil layers on the White King stockpile.
        - Cover thickness was based on gamma survey of test pads
        - Five clean borrow source areas for fill cover materials were identified during the remedial design. Recontouring of borrow areas followed completion of remediation activities to blend the work areas with the natural surface contours and to promote positive drainage. Sufficient quantities of stockpiled topsoil were left at each borrow area for post-construction restoration to support the re-seeding and vegetative growth. The

reclaimed borrow areas were covered with a minimum of 3 inches of topsoil and seeded with the general seed mix after recontouring of the borrow areas finished.
    - Installation of fencing and signage around the White King stockpile.
    - Relocation of Augur Creek into historic channels.
- Lucky Lass Mine
    - Excavation of soil above cleanup levels in the Lucky Lass off-pile areas.
    - Placement of excavated Lucky Lass soils on the Lucky Lass stockpile.
    - Regrading of the Lucky Lass stockpile.
    - Cover placement on the Lucky Lass stockpile.
        - Cover thickness was based on gamma survey of test pads
    - Installation of fencing around the Lucky Lass stockpile.

Gamma radiation surveys were used to determine whether cleanup levels were met. The final gamma radiation surveys indicate that cleanup levels were met within all remediation areas at both White King and Lucky Lass.

In addition to the ROD remedy, the PRPs performed a Supplemental Environmental Project (SEP) in 2006.The SEP was required by the agreement that resolved a separate enforcement action taken by EPA. The project consisted of creating wetlands in the White King meadow, which were constructed in conjunction with remedial action construction. The purpose and environmental benefit of the project was enhancement of habitat associated with Augur Creek and White King Pond. The Consent Decree specified maintenance and monitoring for the Supplemental Environmental Project will consist of annual inspection of wetlands fencing for five years and include restrictive easements or similar instruments to prevent people and livestock from accessing, using or disturbing the White King constructed wetlands.

Institutional Control (IC) Review

Institutional controls were established to prevent human exposure to contaminated soils and groundwater (Table 2). The Site extends over federal lands managed by the Forest Service and privately-owned lands held by the Coppin Family Trust and by Fremont Lumber (Figure C-2).

Easement and Equitable Servitude documents were recorded in 2007 in Lake County deed records for both the Fremont property and the Coppin Trust property. These documents include restrictions on the use of groundwater as long as the contaminant concentrations exceed risk-based standards; protection of the stockpiles and wetland areas; and land use restrictions that prevent residential and agricultural use of the properties.

For the federal portion of the Site, a 2001 Forest Plan amendment prohibits residential use of the Site, drinking water well drilling, permanent recreation sites, removal of stockpile material and any other uses that impact the integrity of the mine waste stockpiles, including grazing and off-road vehicle use. This institutional control applies to portions of the White King mine area and the entirety of the Lucky Lass area.

Table 2: Summary of Planned and/or 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	Yes	Yes	Coppin Family Trust and by Fremont Lumber	Prevent residential and agricultural (food crops) use of the properties. Prohibit any use or disturbance of the	November 5, 2007 Easement and Equitable Servitude January 29, 2007 Easement and Equitable Servitude

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)
				White King Stockpile (Consolidated Stockpile) that would affect the integrity of the repository. Access into or use of the material within the fenced boundary of the stockpile is prohibited.	
			USDA Forest Service portion of the Site	Prohibit residential use of the Site, permanent recreation sites, removal of stockpile material and any other uses that impact the integrity of the mine waste repositories, including grazing and off-road vehicle use.	2001 Forest Plan Amendment
Surface Water	Yes	Yes	Coppin Family Trust Portion of the Site	Prohibit use of the White King Pond for domestic, livestock or recreational purposes. The water in the White King Pond shall not be withdrawn and used for any purpose.	November 5, 2007 Easement and Equitable Servitude
Groundwater	Yes	Yes	Privately-owned portion of the Site	Restrict groundwater use.	November 5, 2007 Easement and Equitable Servitude January 29, 2007 Easement and Equitable Servitude
			USDA Forest Service portion of the Site	Prohibit drinking water well drilling.	2001 Forest Plan Amendment

Systems Operations/Operation and Maintenance

After completion of the remedial action, the PRPs began long-term monitoring of groundwater, White King Pond benthic invertebrates and pH, Augur Creek sediment, and benthic invertebrate, as per the 2005 OMMP. The 2005 OMMP specifies operations, maintenance and monitoring requirements. The plan states that inspections will be performed by the Forest Service, which would then notify the PRPs of maintenance needs identified by the inspections. After the Tronox bankruptcy and Consent Decree Amendment, EPA and the Forest Service signed an Interagency Agreement under which EPA uses the settlement funds to pay the Forest Service to conduct O&M at the Site, including addressing any maintenance needs identified by the inspections. EPA intends to optimize site

monitoring and will update the frequency and analyte list, as appropriate. In addition, the OMMP will be updated to specify current fencing, signage and gate requirements as well as health and safety protocols.

Inspection and Maintenance
Inspections will be performed annually, except that vegetation will be inspected semi-annually the first year after remedial action has been completed to determine if establishment is adequate. Annual inspections are ongoing with maintenance performed as needed, based on the inspection results. Inspection and maintenance of the stockpiles includes:

- Preventing/repairing erosion of the stockpile cover
- Repairing holes in the cover from uprooted trees
- Preventing/repairing settlement in the cover leading to ponding on the stockpile
- Confirming condition of the cover vegetation
- Preventing/repairing erosion of stormwater drainage ditches
- Securing physical institutional controls (fencing, gates, locks, and warning signs).

Soil cover and side slopes of the capped stockpiles will also be inspected. The plan states no mowing or tree removal will be performed on the stockpiles.

Groundwater Monitoring
The OMMP provided that groundwater monitoring would continue for five years after completion of the remedial action. In 2012, EPA and the support agencies agreed that annual monitoring could be discontinued until 2014, when a round of monitoring would provide additional data to support FYR report years. Groundwater monitoring took place in 2005 and 2006 to provide a baseline. Groundwater monitoring took place annually from 2006 through 2011, in 2014, and in 2019 in support of FYRs and to assess an increase in Ra-226 in 2014.

White King Pond pH and Habitat Monitoring

- Post-remediation monitoring of White King Pond included:
    - Monitoring pH annually (twice per year) to determine whether application of additional neutralizing agents will be necessary.
    - Bio-surveying of benthic macroinvertebrates to support bioassessment of the pond.

The pH criteria for White King Pond are:

- pH suitable for establishing and maintaining a benthic biological community.
- pH such that the pond discharge does not cause pH in Augur Creek to go outside the water quality limits.

If the pond becomes too acidic to meet the above criteria, an alkaline agent is added to raise the pH of the upper 10 feet of the pond. Benthic pH monitoring determines if the pH has dropped too low for healthy aquatic habitat. A pH of <5.5 is taken as a sign that the pH may be too low for healthy aquatic habitat. Prior to this FYR period, the pond was last neutralized in 2009. The 2015 FYR Report included monitoring data from 2009 through 2014 that indicated that the pH has remained above the criterion and neutralization has not been required. Since the 2015, pH monitoring has been conducted in 2018, 2019 and 2020.

Benthic invertebrate monitoring took place annually until five years after completion of remedial action. During a meeting with EPA and the support federal and state agencies during the 2012 annual site inspection, the agencies agreed that benthic macroinvertebrate surveys in the White King Pond were no longer needed.

Augur Creek
The 2005 OMMP specified that Augur Creek monitoring would occur once within one year of completion of remediation activities to assess residual effects of remedial action construction. Additional creek monitoring would be performed only if the stockpile inspection identified a breach of either the White King or Lucky Lass stockpile covers, or if groundwater monitoring indicates that stockpile leachate has the potential to adversely affect Augur Creek water quality. Monitoring of surface water and sediments in Augur Creek was

performed once in 2007 (one year after completion of remedial action) to assess residual effects of remedial action construction and again in 2008.

In 2009, at the request of ODEQ, a study assessed the relative health of the benthic macroinvertebrate communities in Augur Creek upstream and downstream from the White King consolidated stockpile. ODEQ made this request due to concern that elevated arsenic concentration in sediments may be impacting Augur Creek biota. The monitoring report concluded that it was not possible to distinguish between potential effects of elevated arsenic and impacts from unauthorized cattle grazing in the meadow and recommended that no additional remedial actions for sediments were warranted.

Following the 2015 FYR, the White King Consent Decree was amended after EPA recovered funds from the Tronox bankruptcy for anticipated future clean up needs at the White King Site. EPA signed an Interagency Agreement with the Forest Service for the Forest Service to take on site stewardship responsibilities. Responsibilities now conducted by the Forest Service include:

- Annual inspection and maintenance of the covers at the White King and Lucky Lass stockpiles.
- Groundwater monitoring for the White King Consolidated Stockpile (when needed to support FYRs).
- Groundwater monitoring for the Lucky Lass Stockpile (when needed to support FYRs).
- Maintaining physical institutional controls (fencing and access controls).
- Monitoring the pH of the White King Pond (twice per year, July and October).
- Addition of lime, as needed, to adjust the pH of the White King Pond.
- Annual reports, which are due on January 31 each year, and will include the results of the pH monitoring, any groundwater monitoring results and findings of site visits since the last report.

The Forest Service completed site inspections in 2017, 2018, and 2019. The Forest Service, EPA, ODEQ, and ODOE decided to cancel the 2020 site inspection due to travel concerns related to the Covid-19 pandemic. . In 2018, the Forest Service contracted site monitoring to Alta/Golder, the same contractors previously used by the PRPs at the Site. The Forest Service oversaw environmental monitoring in 2018 (pH monitoring), 2019 (pH and groundwater monitoring), and 2020 (pH monitoring), similar to monitoring described in existing documents for the Site, including the 2005 OMMP and the Quality Assurance Project Plan.

III. PROGRESS SINCE THE PREVIOUS REVIEW

This section includes the protectiveness determinations and statement from the previous FYR Report. The 2015 FYR Report did not identify any issues or recommendations that affect long-term protectiveness. However, it noted three potential issues identified that could potentially affect future protectiveness: 1) the need for continued periodic neutralization of the White King Pond; 2) maintenance of fencing and warning signs; and 3) maintenance of stockpile covers.

Table 3: Protectiveness Determinations/Statements from the 2015 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The remedial actions at the Mines Site are protective of human health and the environment. Based upon the review of relevant documents and the site inspections, the remedy is functioning as intended by the ROD and ESD. There have been no changes in the physical condition of the Site that would affect the protectiveness of the remedy. Long-term protectiveness of the remedial actions will continue to be ensured and verified by Institutional Controls (ICs) and implementation of the OMMP. The OMMP contains the criteria for long-term monitoring and maintenance, including monitoring and periodic neutralization of White King Pond; inspection and maintenance of the White King Consolidated stockpile and the Lucky Lass stockpile caps, fences and warning signs; and an additional round of groundwater monitoring prior to the next FYR.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

A public notice was made available by a newspaper posting on 7/31/2019. It stated that the FYR was underway and invited the public to submit any comments to the EPA. The results of the review and the report will be made available at the Site's information repository, Lake County Library, located at 26 S G St, Lakeview, Oregon, 97630.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. Conversations with local Forest Service staff indicate a general uncertainty with safety at the Site, in particular related to fire response. Fire management staff stated the office does not view the White King Pond as a potential source of water for fire suppression.

Data Review

Groundwater

Groundwater monitoring is performed to verify that the stockpiles are not adversely affecting the water quality in Augur Creek. Monitoring is conducted upgradient and downgradient at each of the two stockpiles, using the wells shown on Figures 3 and 4. Although the ROD only specified groundwater cleanup goals for arsenic and radon, groundwater sampling in the OMMP includes hardness, alkalinity, total dissolved solids, calcium, magnesium, uranium (U-Nat, U-235, U-238), and radium (Ra-226). Analysis for arsenic is included for the White King wells. EPA and the Forest Service intend to reassess the analyte list, frequency, and number of wells for future groundwater monitoring. Groundwater monitoring took place in 2019 by Forest Service contractors in support of this FYR. Monitoring data are included in Appendix Table G-1.

The groundwater monitoring data indicate that contaminant concentrations have not exceeded standards since 2005. In 2014, EPA and the Forest Service noted that although Ra-226 concentrations remained below standards, concentrations exhibited a statistically significant increase compared to prior years. The 2015 FYR therefore recommended additional sampling to monitor for any increasing trends. In 2019, total Ra-226 concentrations in monitoring wells were lower than the 2014 results and less than those collected in 2005, with the exception of White King monitoring well WK-05-1-A and Lucky Lass monitoring well 6A-S. Concentrations reported in these monitoring wells in 2019 were lower than 2014 concentrations, but remained slightly higher than those reported

in 2005. All 2019 dissolved Ra-226 results were non-detects. Calcium, magnesium and arsenic were not included in 2019 analyses.

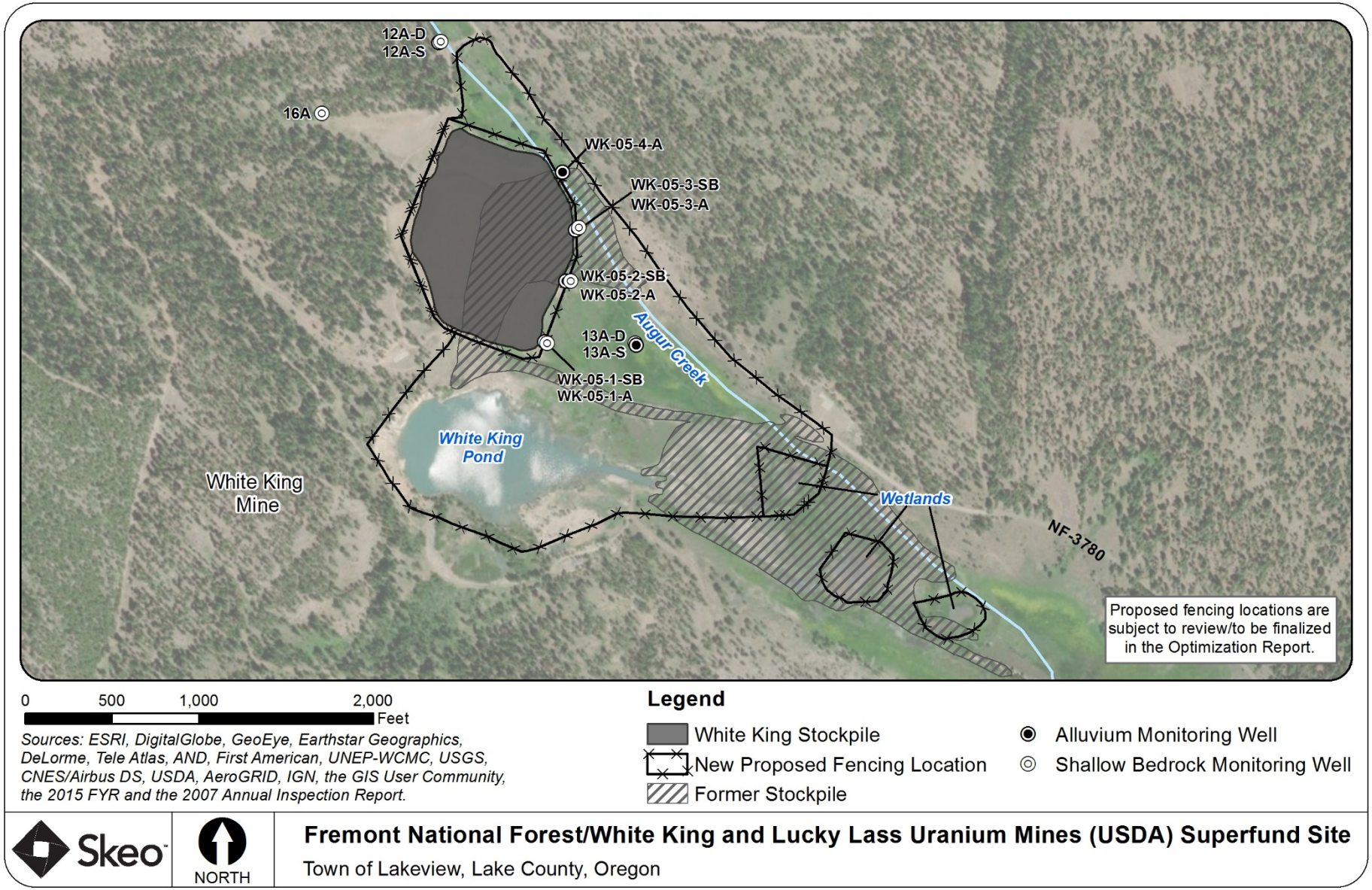
White King Pond pH Monitoring

The purpose of the pH monitoring is to assess the effectiveness of historical neutralization of the pond and to evaluate the variation of pH in the water column at each monitoring station. The ROD established a remediation level for pH (7-9 standard units) as a guide for the neutralization actions being taken on the pond. The OMMP states that maintenance of a stable pH range that is within the tolerance range of benthic invertebrates in the shallower depths of White King Pond would address the ROD goals. The sampling pH criteria described in the OMMP for White King Pond specifies if the pond becomes too acidic to meet the above criteria, then pond re-neutralization will be performed by adding hydrated lime or other suitable alkaline agent to raise the pH of the upper 10 feet of the pond. A pH less than 5.5 is considered the threshold at which the pH may be too low for healthy aquatic habitat. White King Pond neutralization last occurred in 2009.

In 2018 and 2019, Forest Service contractors conducted pH monitoring at seven stations in the White King Pond during the summer stratification period and in the fall after natural mixing of the pond (Table G-2).

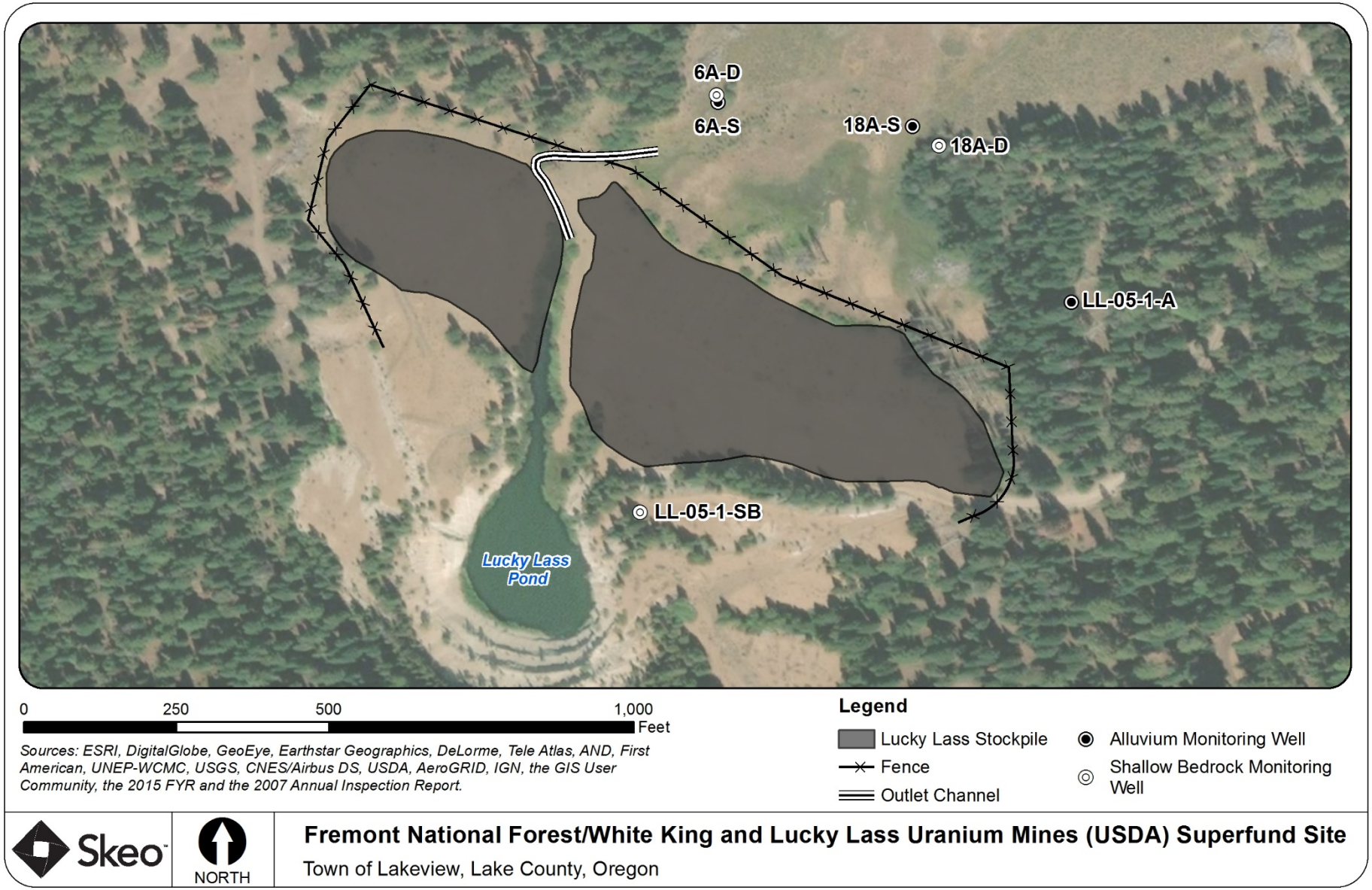
The 2018-2019 monitoring results of pH by depth in White King pond are consistent with previous historical monitoring from 2003 to 2015. While within range of historical monitoring, Station 3 exhibited lower pH in October 2019 at intermediate and lower depths than have been measured at this station since 2006. The October 2019 pH measurements at Station 3 for the 4-meter, 7-meter and 10-meter depths are all less than 5.50 standard pH units. Additional monitoring will indicate whether lime additions are warranted to adjust the pH. Other than the low pH measurements at Station 3, there are no indications of changes in White King pond conditions and the pond has not needed to be neutralized. EPA and the Forest Service intend to reassess the frequency of pH monitoring needed in White King Pond following this FYR.

Figure 3: White King Mine Detailed Site 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.

Figure 4: Lucky Lass Mines Detailed Site 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.

Site Inspection

The site inspection took place on 7/30/2019. Participants included EPA RPM Anne Christopher and Forest Service project manager Michael Wilcox. In addition, representatives from ODEQ, ODOE, the local district Forest Service field office and EPA contractor Skeo participated in the site inspection. The purpose of the inspection was to assess the protectiveness of the remedy. Refer to Appendix E and F for the site inspection checklist and site inspection photos.

The White King stockpile and Lucky Lass stockpile caps and side slopes were in good condition and appeared undisturbed. Trees were observed on the stockpile covers and are to be left in place unless a determination is made to remove them in the future if they pose a risk to the stockpile cap. The stockpile fencing was generally in good condition with no evidence of trespassing or vandalism. However, few warning or no trespassing signs were present. The site perimeter fencing had numerous openings due to lack of maintenance and in some cases snipping of barbed wire by unknown persons. The fencing surrounding the White King meadow wetland areas was also damaged and cut in numerous locations. EPA and the Forest Service intend to reestablish sitewide fencing following the FYR. A potential new fence location is shown in Figure 3.

Cattle were observed on site, grazing on the property. The cattle have clearly trodden and caused damage to unsecured portions of the wetlands. Inspection participants discussed the merits of the double-fencing and agreed that both the perimeter and wetland fences should be delineated, repaired and maintained. In addition, outreach to local permittees was discussed to ensure that the cattle owners do not cut fencing to allow cattle onto the Site for grazing and water access. Site inspection participants discussed the fire response planning for the area and confirmed local Forest Service staff would not use White King Pond water for fire suppression and local Forest Service staff would avoid going onto the capped repositories during fire response.

Site inspection participants also visited the main soil borrow area for the White King repository to discuss concerns raised by the local Forest Service. The area appeared stressed by erosion and lack of established vegetation. Local Forest Service staff indicated additional restoration efforts would be needed to prevent further erosion. Maintenance of the soil borrow area is not included in the OMMP Plan or the Forest Service IA SOW. EPA and the Forest Service will continue discussions about how to handle restoration efforts in this area.

Following the site inspection, Skeo staff visited the local document repository at the Lake County Library, located at 26 S G St, Lakeview, Oregon, 97630. Site documents were unavailable at the repository.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

Yes. The review of the monitoring reports and site inspection results indicates that the remedy is functioning as intended in the ROD and ESD. The soil covers over the stockpiles and off-pile areas show no significant erosion, and only minor erosion that did not penetrate the cover was observed in a few areas. Stockpile slopes are stable and vegetation is established, indicating that the remedy is performing as expected with respect to preventing direct exposure of contaminated soils to humans and the environment. Small trees are present on the stockpiles.

Groundwater monitoring data show no indication of release of contaminants from the capped areas and the 2019 data for Ra-226 show a decrease from the previously elevated 2014 data. The 2018-2019 monitoring results of pH by depth in White King Pond are consistent with previous historical monitoring from 2003 to 2015. While within range of historical monitoring, Station 3 exhibited lower pH in October 2019 at intermediate and lower depths than have been measured at this station since 2006. Future monitoring efforts will be used to determine whether lime should be added to the ponds to adjust the pH.

Fencing is in place and is necessary for long-term protectiveness, but it has been damaged in multiple places. Because cattle currently are accessing and grazing on the meadow and wetland areas, inspections of and maintenance to the fencing should be continued. Human access appears to be limited by the fencing, gates, and remaining warning signs. However, as noted above, fence maintenance and delineation, additional signage, and public outreach is needed to reduce the frequency of cattle and public intrusion into the Site.

The OMMP has not been updated since 2005. At that time the PRP maintained responsibility for the Site and monitoring occurred more frequently. In addition, the 2005 groundwater analyte list does not align with the ROD groundwater COCs or 2019 sampling. EPA is conducting an optimization review of site monitoring evaluating the frequency, analyte list, and monitoring locations. In addition, the OMMP will be updated to specify current fencing, signage and gate requirements as well as health and safety protocols.

Institutional controls are in place and functioning as intended by the ROD. The privately-owned portion of the Site includes a 2007 Easement and Equitable Servitude recorded that restricts the use of groundwater and prohibits residential and agricultural use of the properties. For the federal portion of the Site, a 2001 Forest Plan amendment prohibits residential use of the Site, drinking water well drilling, permanent recreation sites, removal of stockpile material and any other uses that impact the integrity of the mine waste repositories, including grazing and off-road vehicle use. The Forest Service will update the 2001 Forest Plan amendment, as appropriate.

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

Question B Summary:

Yes. The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of remedy selection are still valid for the stockpile consolidation. Fencing and signage ensures there are no completed human exposure pathways at the stockpiles. In addition, remediation levels are based primarily on background concentrations in the area (see Table 1). Therefore, the RAO to reduce exposure to stockpiles and contaminated off-pile soil by humans and ecological receptors (ingestion) has been met.

Ongoing monitoring includes White King Pond and groundwater. Although the ROD establishes groundwater remediation levels for radon and arsenic, the ROD and ESD also specify that groundwater is to be monitored to ensure that the potential beneficial uses of groundwater (discharge to surface water) meet Oregon's state water quality standards (OAR 340-041) at the boundary of the waste management area with Augur Creek and/or to establish a trend toward background concentrations. Therefore, additional parameters were included in the sampling such as total dissolved solids, alkalinity, and hardness. EPA will revise the groundwater sampling plan based on the optimization review and will ensure that all appropriate parameters are included and appropriate standards are used as the basis of evaluation.

The ROD specifies that White King Pond pH meet the Oregon standard for pH in the Goose Lake Watershed (Goose Lake Basin Criteria OAR 340-041). The ROD indicates the range as 7-9. Current state standards require a less acidic pH range of 7.5 to 9.5.[2] The optimization review will consider the need to update the White King Mine pH requirements and modify the trigger for addition of alkaline agents to raise the pH and the OMMP will be revised accordingly.

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.

[2] 340-041-0145 Basin-Specific Criteria (Goose and Summer Lakes): Water Quality Standards and Policies for this Basin; https://secure.sos.state.or.us/oard/displayDivisionRules.action?selectedDivision=1458

VI. ISSUES/RECOMMENDATIONS

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

Issues and Recommendations Identified in the FYR:

OU(s):	Issue Category: Operations and Maintenance			
	Issue: The OMMP is not up-to-date and current monitoring is not conducted per the 2005 monitoring plan. Updates may include groundwater sampling plans, White King Pond neutralization, and fence and gate maintenance requirements.			
	Recommendation: Update the OMMP to incorporate appropriate monitoring and maintenance requirements.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA	12/31/2021

OU(s):	Issue Category: Monitoring			
	Issue: The long-term frequency and analyte list for the groundwater monitoring program is not specified.			
	Recommendation: Complete optimization review and update the groundwater monitoring plan to implement appropriate groundwater monitoring requirements.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA	12/31/2021

OTHER FINDINGS

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

- Cattle intrusion is an ongoing issue. EPA and the Forest Service will work with local officials and permittees to limit cattle grazing to permitted areas.
- The October 2019 pH measurements at Station 3 are outside of the target pH. Future monitoring will be conducted to determine whether additional lime will be added to the pond to adjust the pH.
- Site inspection participants also visited the main soil borrow area sourced as cover material for the White King repository. The area appeared stressed by erosion and lack of established vegetation. Local Forest Service staff indicated additional restoration efforts would be needed to prevent further erosion.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy currently protects human health and the environment because there are no completed exposure pathways to remaining contaminated groundwater. For the remedy to be protective over the long term, the following actions need to be taken: determine the appropriate groundwater monitoring schedule and update the OMMP to incorporate appropriate monitoring and maintenance requirements.	

VIII. NEXT REVIEW

The next FYR Report for the Fremont National Forest/White King and Lucky Lass Uranium Mines (USDA) Superfund site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Alta, Science and Engineering. 2019. 2018-2019 Environmental Monitoring Report for the White King and Lucky Lass Mines, Fremont-Winema National Forest, Oregon, December 23, 2019.

EPA, 2001. White King / Lucky Lass Superfund Site Record of Decision, Office of Environmental Cleanup, EPA Region 10, Seattle, Washington, September 2001.

EPA, 2006. White King/Lucky Lass Superfund Site Explanation of Significant Difference, Office of Environmental Cleanup, EPA Region 10, Seattle Washington, June 2006.

EPA, 2010. First Five-Year Review Report for White King Lucky Lass Mines Site - Lakeview, Oregon, Office of Environmental Cleanup, EPA Region 10, Seattle Washington, May 18, 2010.

EPA, 2015. Second Five-Year Review Report for White King Lucky Lass Mines Site - Lakeview, Oregon, Office of Environmental Cleanup, EPA Region 10, Seattle Washington, September 30, 2015.

Golder, 2005. Operation, Maintenance, and Monitoring Plan for the White King / Lucky Lass Mines Superfund Site, Golder Associates Inc., Redmond, Washington, April 1, 2005.

Golder, 2006. Report on the Supplemental Environmental Project at the White King/Lucky Lass Mines Superfund Site, prepared by Golder Associates Inc., Redmond, Washington, December 8, 2006.

Golder, 2007. Final Construction Completion Report for the White King/Lucky Lass Mines Superfund Site, prepared by Golder Associates Inc., Redmond, Washington, May 25, 2007.

Golder, 2009. Construction Completion Report for Erosion Repairs, Fence Maintenance, and Pond Neutralization at the White King/Lucky Lass Mines Superfund Site prepared by Golder Associates Inc., Redmond, Washington, November 20, 2009.APPENDIX B – SITE CHRONOLOGY

APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
Mining began at the Site	1955
Forest Service began investigations at the Site	1989
Forest Service submitted Draft Environmental Impact Statement Remedial Investigation/Feasibility Study for the Cleanup and Rehabilitation of the White King and Lucky Lass Uranium Mines	August 1991
Kerr McGee Corporation entered into Administrative Order on Consent to implement RI/FS	April 24, 1995
EPA listed the Site on the NPL	April 25, 1995
PRP completed RI/FS Report EPA signed ROD selecting the remedy	September 28, 2001
Kerr McGee Chemical Worldwide LLC, Fremont and WNI entered into Consent Decree to implement remedial design and remedial action	January 20, 2006
EPA completed ESD to document changes in the site remedial technical basis and specific remedial goals	September 28, 2006
PRP completed remedial action	May 25, 2007
EPA completed first FYR	May 18, 2010
EPA completed second FYR	September 23, 2015
EPA and the US Forest Service entered into an Interagency Agreement that allows EPA to fund the US Forrest Service to perform O&M activities at the Sites using settlement funds	2016

APPENDIX C – SITE MAPS

Figure C-1: Historical Site Features

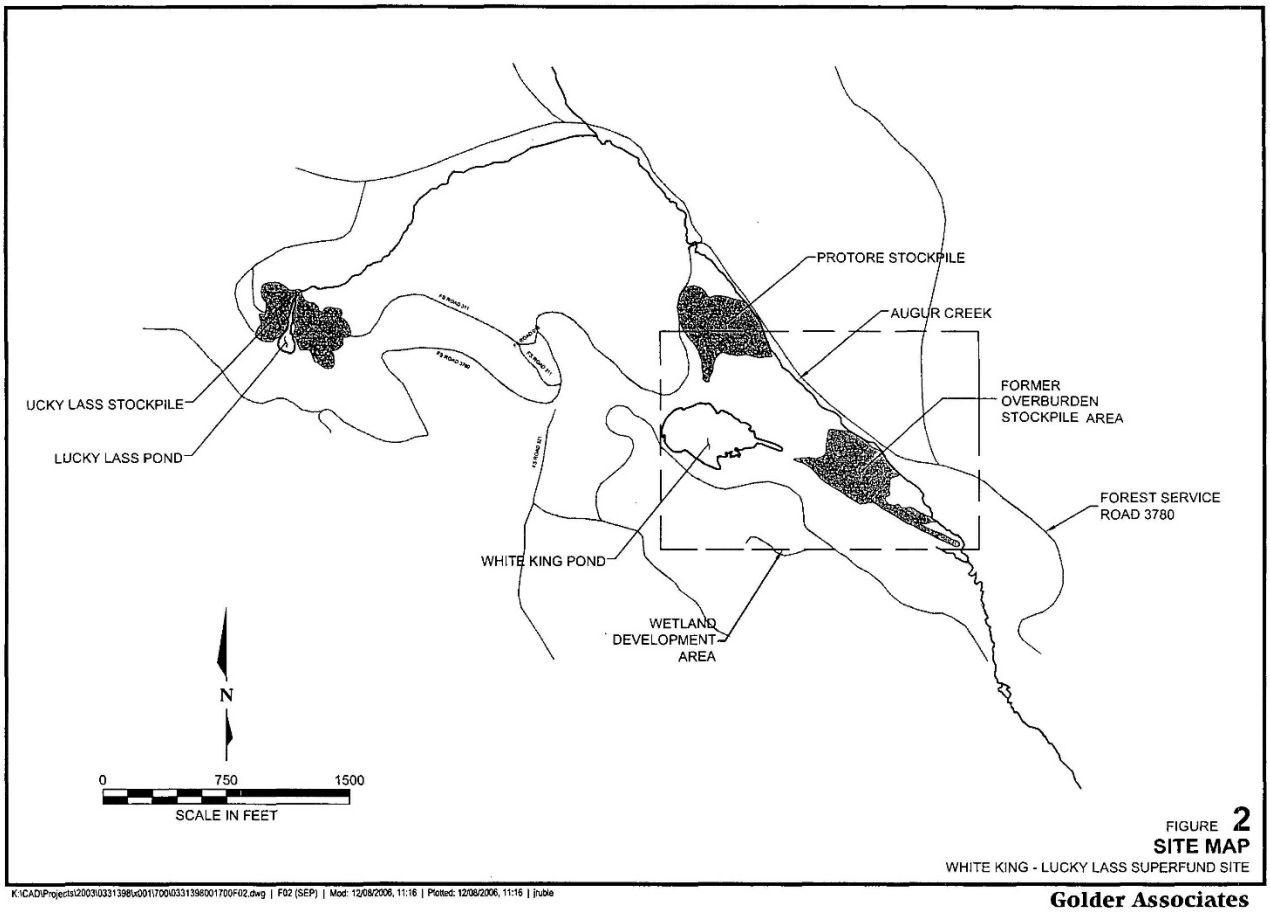
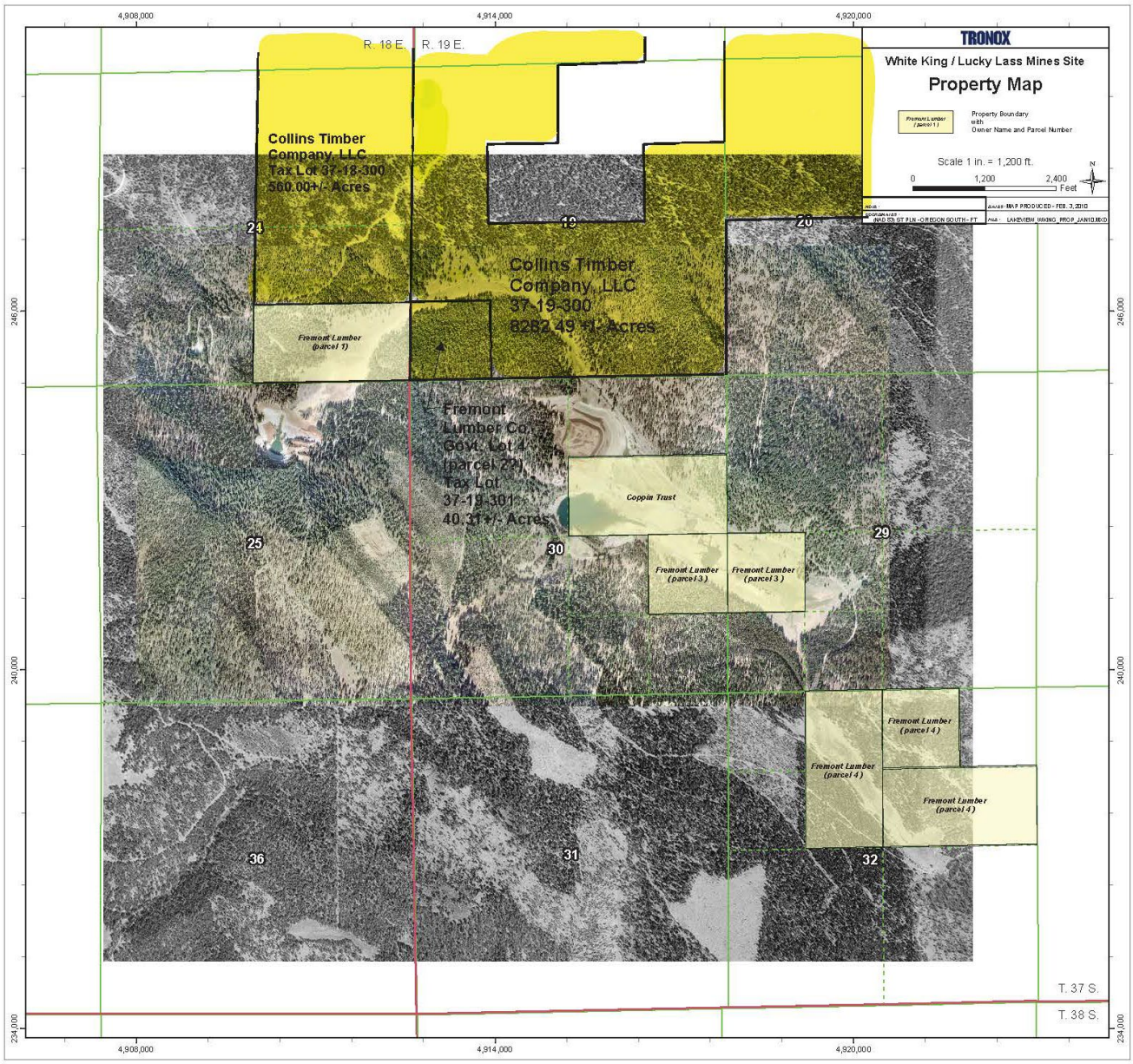


Figure C-2: Property Ownership



APPENDIX D – PRESS NOTICE

EPA United States Environmental Protection Agency

Cleanup Reviewed for Fremont National Forest's White King and Lucky Lass Uranium Mines Site Visit on July 30, 2019

Site Visit July 30, 2019

As part of its five-year review process, EPA's site team will be visiting the Fremont National Forest/White King and Lucky Lass Uranium Mines Superfund Site in Lakeview, Oregon.

We Want to Hear from You

We like to keep the community informed about site activities. We also like to hear from you if you have any information or observations about the Site that can help our review team.

EPA staff will be interviewing stakeholders and community members who have concerns, questions or information about the Site. If you would like to participate in an interview or have any questions, ***please contact EPA project manager Anne Christopher, christopher.anne@epa.gov or (503) 326-6554*** *or FS on-scene coordinator Michael Wilcox,* ***michael.wilcox@usda.gov*** *or* ***(208) 768-7527 by July 29th.***

Or Answer Questions On-line

Visit the EPA website to answer a few questions about the site. We appreciate your time and input.
www.epa.gov/superfund/white-king-lucky-lass

For More Information

More information and site-related documents such as past five-year reviews are on EPA's website page:
www.epa.gov/superfund/white-king-lucky-lass

What and Why

EPA will be reviewing the status of the environmental cleanup activities at the White King and Lucky Lass Mine Sites. EPA reviews Superfund sites every five years when contaminants remain on site. The purpose of the review is to ensure that cleanup actions are working as intended and continue to protect human health and the environment.

About the Superfund Site

The Site encompasses 140 acres affected by mining activities at two former uranium mines, the White King Mine and the Lucky Lass Mine. Mining operations at the Site occurred between the 1950s and 1960s. Waste materials left on site contaminated soil, surface water, sediment and groundwater with heavy metals and radioactive constituents.

About the Cleanup

The cleanup for the Site is complete. The Site's long-term remedy included recontouring, excavating and covering various stockpiles of mining materials. Additional cleanup actions included placing final covers at the White King consolidated stockpile, recontouring and covering the Lucky Lass overburden stockpile, revegetating, and constructing a wetland near the former White King overburden stockpile.

Current Activity

Following cleanup, operation and maintenance activities are ongoing. Planned activities through 2020 include regular groundwater monitoring, pH sampling of the pond for acidity, fence repairs, updating signs, and tree removal where roots may damage the cap covering contaminated areas.

Land-use Restrictions (Institutional Controls)

Land use restrictions protect people and animals from being exposed to contaminants at the site and keep the site intact. Fencing and restricting activities such as grazing or off-road vehicle use protects the wetlands and the vegetative covers on the stockpiles of contaminated mining materials. Water from wells and other water sources may not meet safe water quality standards and cannot be used as a drinking water source. Any long- term site use, such as permanent camping sites, are not allowed. Due to the nature of the contaminants (radionuclides) use restrictions are expected to remain in place indefinitely.

TDD and/or TTY users may call the Federal Relay Service at 800-877-8339. Then please give the operator number (503) 326-6554 to reach EPA project manager Anne Christopher.

Lakeview Examiner

APPENDIX E – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Fremont National Forest/White King and Lucky Lass Uranium Mines (USDA)	**Date of Inspection:** 07/30/2019
Location and Region: Lakeview, OR 10	**EPA ID: OR7122307658**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature:** 85 degrees, sunny

Remedy Includes: (check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: _____
- ☐ 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** _____ Name _____ Title _____ Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems, suggestions ☐ Report attached: _____

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 _____
   Contact _____ Name _____ Title _____ Date _____ Phone No.
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____Name _____ Title _____ Date _____ Phone No.
   Problems/suggestions ☐ Report attached:_____

   Agency _____
   Contact _____ Name _____ Title _____ Date _____ Phone No.
   Problems/suggestions ☐ Report attached:_____

   Agency _____
   Contact _____ Name _____ Title _____ Date _____ Phone No.
   Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attached: _____

4. **Other Interviews** (optional) ☐ Report attached: _____

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

☐ _____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☒ Unavailable

Original O&M cost estimate: _____ ☐ 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: Evidence of regular fencing vandalism and cattle intrusion.

B. Other Access Restrictions

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

Remarks: _____

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: Institutional controls are adequate, but require additional enforcement efforts.

D. General

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

Remarks: Extensive cattle intrusion and fence-cutting.

2. **Land Use Changes On Site** ☒ N/A

Remarks: _____

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

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☒ Settlement not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident

Lengths: _____ Widths: _____ Depths: _____

Remarks: _____

3.	**Erosion**	☐ Location shown on site map	☒ Erosion not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
4.	**Holes**	☐ Location shown on site map	☒ Holes not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
5.	**Vegetative Cover**	☒ Grass	☒ Cover properly established
	☒ No signs of stress	☒ Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: _____		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☒ N/A
	Remarks: _____		
7.	**Bulges**	☐ Location shown on site map	☒ Bulges not evident
	Area extent: _____		Height: _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Area extent: _____
	☐ Ponding	☐ Location shown on site map	Area extent: _____
	☐ Seeps	☐ Location shown on site map	Area extent: _____
	☐ Soft subgrade	☐ Location shown on site map	Area extent: _____
	Remarks: _____		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☒ No evidence of slope instability		
	Area extent: _____		
	Remarks: _____		

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ No evidence of settlement
Area extent: _____ Depth: _____
Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type:_____ Area extent: _____
Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Area extent: _____ Depth: _____
Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Area extent: _____ Depth: _____
Remarks: _____

5. **Obstructions** Type: _____ ☐ No obstructions
☐ Location shown on site map Area extent: _____
Size: _____
Remarks: _____

6. **Excessive Vegetative Growth** Type: _____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Area extent: _____
Remarks: _____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
Remarks: _____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
Remarks: _____

4. **Extraction Wells Leachate**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A

Remarks: _____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs maintenance ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A

Remarks: _____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A

Remarks: _____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A

☐ Siltation not evident

Remarks: _____

2. **Erosion** Area extent: _____ Depth: _____

☐ Erosion not evident

Remarks: _____

3. **Outlet Works** ☐ Functioning ☐ N/A

Remarks: _____

4. **Dam** ☐ Functioning ☐ N/A

Remarks: _____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident

Horizontal displacement: _____ Vertical displacement: _____

Rotational displacement: _____

Remarks: _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident

Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☐ Vegetation does not impede flow

Area extent: _____ Type: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident

Area extent: _____ Depth: _____

Remarks: _____

4. **Discharge Structure** ☐ Functioning ☐ N/A

Remarks: _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Performance Monitoring** Type of monitoring: _____

☐ Performance not monitored

Frequency: _____ ☐ Evidence of breaching

Head differential: _____

Remarks: _____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ 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

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Surface Water Collection 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: _____

C. Treatment System ☐ Applicable ☐ N/A

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

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ 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: _____

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 soil repositories and former mining areas are in good condition and are functioning as intended. However, there is evidence of regular cattle intrusion in the meadow and wetland areas.

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.
Regular fence maintenance is needed.

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.
None noted.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
EPA intends to perform an optimization assessment.

APPENDIX F – SITE INSPECTION PHOTOS

Cow near wetland area

Auger Creek

White King Pond

White King stockpile with fencing and signage

Stormwater diversion ditch on Lucky Lass stockpile

Lucky Lass Pond

APPENDIX G – MONITORING DATA

Table G-1: Groundwater Monitoring Results

DRAFT

Table 3: White King Groundwater Analytical Results
White King / Lucky Lass Mines Superfund Site

Well ID	Date Sampled	Lab Report	Field Measurements				Physical Tests			Metals (total)			Radionuclides (total)				Radionuclides (dissolved)
			pH (s.u.)	Conductivity (mS/m)	Temperature (°C)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Alkalinity (mg/L as $CaCO_3$)	Hardness (mg/L as $CaCO_3$)	Calcium (ug/L)	Magnesium (ug/L)	Arsenic * (ug/L)	Ra-226 (pCi/L)	U-235 (ug/L)	U-238 (ug/L)	U-nat (ug/L)	Ra-226 (pCi/L)
Upgradient Wells																	
12A-S	10/21/2005 10/24/05	148733 148972	5.8	0.125	10.6	-	121	NA	38.9	9,650	3,590	*2.34*	<0.419	<0.01	<0.05	<0.05	-
	5/30/2006	164282 164283	5.6	9	6.1	-	109	33.8	25.4	6,800	2,040	<1.5	<0.388	<0.01	0.123 J	0.124 J	-
	9/18/2007	194233 194590 194603	6.53	10	14.3	-	118	56.2	38.5	9,690	3,480	*4.52*	<0.438	<0.01	0.125 J	0.129 J	-
	10/6/2008	217288 217358	6.76	11.9	13.7	-	106	55.5	37.4	9,350	3,410	*2.6*	<0.381	<0.01	0.125 J	0.125 J	-
	9/21/2009	237826	6.61	-	13.9	-	108	57	36.4	9,030	3,350	*2.41*	0.654 J	<0.01	0.149 J	0.149 J	-
	10/18/2010	265157 265162	6.57	8.7	12.3	-	124	58.1	39.8	10,000	3,590	*2.86*	<0.475	<0.010	0.135 J	0.135	-
	10/24/2011	288989 289212 289219	6.35	8.7	11.0	-	111	55.5	42.2	10,600	3,820	*2.89*	<0.430	<0.010	0.0733 J	0.0733 J	-
	7/23/2014	353489 353494 353501	6.09	15	13.5	9.83	57.1	53.7	39	9,730	3,580	*3.09 J*	1.4	<0.01	0.141 J	0.141 J	0.562
	8/1/2019	486883	6.28	10.47	14.3	8.50	-	-	-	-	-	-	<0.280	-	-	-	<0.454
12A-D	10/21/2005	148733 148972	6.48	0.14	9.3	-	140	58.1	49	11,100	5,140	*2.25*	<0.381	<0.01	0.058 J	0.059 J	-
	5/30/2006	164282 164283	5.7	12	9.1	-	131	56.3	47.5	10,700	5,080	*2.1*	0.462 J	<0.01	0.11 J	0.111 J	-
	9/18/2007	194233 194590 194603	6.53	8.4	10.4	-	120	65.4	48.4	10,800	5,190	*4.2*	<0.426	<0.01	0.082 J	0.082 J	-
	10/6/2008	217288 217358	6.81	13.4	9.9	-	120	65.4	47.2	10,600	5,050	<1.5	<0.421	<0.01	0.13 J	0.13 J	-
	9/21/2009	237826	6.4	-	9.5	-	118	69.2	45.1	10,300	4,710	*1.65*	0.406 J	<0.01	0.09 J	0.09 J	-
	10/18/2010	265157 265162	6.64	9.6	9.8	-	124	64.7	51	11,500	5,400	*2.87*	<0.359	<0.010	0.128 J	0.128 J	-

Table 3: White King Groundwater Analytical Results
White King / Lucky Lass Mines Superfund Site

Well ID	Date Sampled	Lab Report	Field Measurements				Physical Tests			Metals (total)			Radionuclides (total)				Radionuclides (dissolved)
			pH (s.u.)	Conductivity (mS/m)	Temperature (°C)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Alkalinity (mg/L as $CaCO_3$)	Hardness (mg/L as $CaCO_3$)	Calcium (ug/L)	Magnesium (ug/L)	Arsenic * (ug/L)	Ra-226 (pCi/L)	U-235 (ug/L)	U-238 (ug/L)	U-nat (ug/L)	Ra-226 (pCi/L)
	10/24/2011	288989 289212 289219	6.4	10	8.7	-	116	66.9	54.3	12,400	5,650	*3.7*	<0.365	<0.010	0.0978 J	0.0978 J	-
	7/23/2014	353489 353494 353501 353498	6.17	10.6	10.7	0.52	114	62.3	49.3	11,100	5,250	*1.81 J*	2.47	<0.01	0.0844 J	0.0844 J	0.428
	8/1/2019	486883	6.35	18.79	14.1	0.64	-	-	-	-	-	-	<0.179	-	-	-	<0.0921
16A	2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5/30/2006	164282 164283	6.3	10	9.0	-	132	85.9	59	16,700	4,220	*3.06*	0.452 J	<0.01	0.145 J	0.146 J	-
	9/19/2007	194233 194590 194603	6.5	14.9	10.4	-	190	148	116	31,700	9,060	*4.87*	<0.436	<0.01	0.113 J	0.114 J	-
	10/6/2008	217288 217358	6.89	14.8	13.3	-	114	75.9	56.4	15,400	4,360	*3.0*	0.558 J	<0.01	0.97 J	0.97 J	-
	9/22/2009	237826	6.49	-	13.1	-	103	63.4	43.9	12,400	3,130	<1.6	0.45 J	<0.01	0.078 J	0.078 J	-
	10/19/2010	265157 265162	6.33	12	11.3	-	103	56.1	45.7	12,900	3,280	<1.6	<0.264	<0.010	0.0874 J	0.0874 J	-
	10/25/2011	288989 289212 289219	6.6	12.7	8.6	-	87	57	50.6	14,200	3,660	3.7	<0.264	<0.010	0.141 J	0.141 J	-
	7/22/2014	353489 353494 353501 353498	5.47	10	14.4	10.2	126	71	57.3	15,800	4,350	*3.82 J*	0.877	<0.01	0.0847 J	0.0847 J	0.223 J
	7/31/2019	486883	6.1	23.89	14.0	2.8	-	-	-	-	-	-	0.385	-	-	-	<0.558

Table 3: White King Groundwater Analytical Results
White King / Lucky Lass Mines Superfund Site

Well ID	Date Sampled	Lab Report	Field Measurements				Physical Tests			Metals (total)			Radionuclides (total)				Radionuclides (dissolved)
			pH (s.u.)	Conductivity (mS/m)	Temperature (°C)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Alkalinity (mg/L as $CaCO_3$)	Hardness (mg/L as $CaCO_3$)	Calcium (ug/L)	Magnesium (ug/L)	Arsenic * (ug/L)	Ra-226 (pCi/L)	U-235 (ug/L)	U-238 (ug/L)	U-nat (ug/L)	Ra-226 (pCi/L)
Downgradient Wells																	
WK-05-1-A	10/23/2005	148962 148972	6.6	0.263	8.7	-	200	51.5	79.7	19,700	7,390	*3.16*	<0.365	0.018 J	2.59	2.61	-
	5/31/2006	164282 164283	6.7	22	10.6	-	185	75.7	68.1	16,500	6,510	*4.09*	0.514 J	0.035 J	5.84	5.88	-
	9/18/2007	194233 194590 194603	6.85	13.8	13.5	-	180	79.7	74.7	17,800	7,350	7.74	0.645 J	0.033 J	4.69	4.72	-
	10/6/2008	217288 217358	6.79	25.6	12.6	-	198	66.5	81.1	19,600	7,800	*4.2*	<0.411	0.022 J	3.70	3.70	-
	9/21/2009	237826	6.5	-	13.8	-	199	81.3	69.0	16,100	6,980	5.19	<0.308	0.024	3.84	3.87	-
	10/18/2010	265157 265162	6.62	18.7	12.5	-	197	82.4	90.7	21,200	9,190	5.5	0.704 J	0.0309 J	4.38	4.41	-
	10/24/2011	288989 289212 289219	6.55	19.5	11.1	-	190	88.1	101.0	23,700	10,100	9.33	<0.337	0.0282 J	3.93	3.96	-
	7/23/2014	353489 353494 353501 353498	7	22.3	15.69	4.41	167	75.1	82.8	19,100	8,530	5.57	1.97	0.0128 J	1.87	1.89	0.73
	7/31/2019	486883	6.7	22.18	16.4	4.1	-	-	-	-	-	-	0.421	-	-	-	<0.2
	10/23/2005	148962 148972	7.36	0.257	11.3	-	150	75.8	79	17,000	8,880	5.17	1.75	<0.01	0.363	0.366	-
	5/31/2006	164282 164283	6.8	24	11.7	-	195	83.9	80.4	17,300	9,030	*4.25*	0.408 J	<0.01	0.316	0.318	-
	9/18/2007	194233 194590 194603	7.03	14.9	12.3	-	196	88.4	83.1	18,100	9,200	*4.16*	0.684 J	<0.01	0.208	0.209	-

Table 3: White King Groundwater Analytical Results
White King / Lucky Lass Mines Superfund Site

Well ID	Date Sampled	Lab Report	Field Measurements				Physical Tests			Metals (total)			Radionuclides (total)				Radionuclides (dissolved)
			pH (s.u.)	Conductivity (mS/m)	Temperature (°C)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Alkalinity (mg/L as $CaCO_3$)	Hardness (mg/L as $CaCO_3$)	Calcium (ug/L)	Magnesium (ug/L)	Arsenic * (ug/L)	Ra-226 (pCi/L)	U-235 (ug/L)	U-238 (ug/L)	U-nat (ug/L)	Ra-226 (pCi/L)
WK-05-1-SB	10/6/2008	217288 217358	6.76	23.7	12.4	-	185	87.4	86.3	18,600	9,650	5.2	0.269 J	<0.01	0.19 J	0.19 J	-
	9/21/2009	237826	6.78	-	12.8	-	157	90.3	79	17,000	8,900	*4.29*	0.956 J	<0.01	0.172 J	0.172 J	-
	10/18/2010	265157 265162	6.55	19.4	12.7	-	208	89.5	102	22,200	11,300	6.44	0.725 J	<0.01	0.204 J	0.204 J	-
	10/24/2011	288989 289212 289219	6.61	20.1	12.1	-	184	92.8	109	23,200	12,300	6.78	0.453 J	<0.01	0.178 J	0.178 J	-
	7/23/2014	353489 353494 353501 353498	6.2	23.7	13.3	0.46	166	84.2	88.8	19,300	9,880	4.55 J	3.23	<0.01	0.162 J	0.162 J	0.811
	7/31/2019		6.8	23.57	14.9	2.30	-	-	-	-	-	-	0.412	-	-	-	<0.387
WK-05-2-A	10/27/2005	149142 149144	6.59	1.32	8.0	-	1,100	161	633	148,000	63,700	*1.73*	0.65 J	0.135	19.3	19.4	-
	5/31/2006	164282 164283	6.4	0.15	7.3	-	1,100	163	688	161,000	69,500	<1.5	0.689 J	0.114	18.3	18.4	-
	9/18/2007	194233 194590 194604	6.54	86.7	11.0	-	1,120	59.2	676	162,000	66,200	<1.5	0.686 J	0.035 J	4.9	4.94	-
	10/6/2008	217288 217358	6.71	0.187	10.2	-	1,410	149	1010	243,000	96,500	<1.5	<0.454	0.031 J	4.7	4.7	-
	9/21/2009	237826	6.18	-	11.0	-	1,500	132	929	220,000	92,100	*2.03*	0.185 J	0.025 J	4.03	4.06	-
	10/18/2010	265157 265162	6.07	1.273	10.0	-	1,600	139	889	212,000	87,100	*<1.6*	1.58	0.0266 J	3.57	3.6	-
	10/24/2011	288989 289212 289219	6.06	1.45	10.1	-	1,740	133	1220	303,000	113,000	*8.5*	<0.232	0.0261 J	3.42	3.44	-
	7/23/2014	353489 353494 353501 353498	6.82	129.9	10.7	4.23	1,050	133	656	162,000	61,000	<1.7	0.425	0.0163 J	2.33	2.34	0.723

Table 3: White King Groundwater Analytical Results
White King / Lucky Lass Mines Superfund Site

Well ID	Date Sampled	Lab Report	Field Measurements				Physical Tests			Metals (total)			Radionuclides (total)				Radionuclides (dissolved)
			pH (s.u.)	Conductivity (mS/m)	Temperature (°C)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Alkalinity (mg/L as $CaCO_3$)	Hardness (mg/L as $CaCO_3$)	Calcium (ug/L)	Magnesium (ug/L)	Arsenic * (ug/L)	Ra-226 (pCi/L)	U-235 (ug/L)	U-238 (ug/L)	U-nat (ug/L)	Ra-226 (pCi/L)
	7/31/2019		5.96	170	13.6	10.1	-	-	-	-	-	-	0.274				<0.123
WK-05-2-SB	10/27/2005	149142 149144	7.22	0.277	7.2	-	180	127	642	151,000	64,500	*1.55*	0.39 J	0.138	19.4	19.6	-
	5/31/2006	164282 164283	6.6	31	9.1	-	216	138	105	22,000	12,200	*2.42*	<0.327	0.041 J	6.72	6.76	-
	9/18/2007	194233 194590 194605	7.05	19.1	9.8	-	210	138	92.9	19,600	10,700	*1.99*	<0.474	0.014 J	1.96	1.98	-
	10/6/2008	217288 217358	6.69	30.6	9.7	-	203	138	104	22,100	11,800	*4*	<0.371	0.012 J	2.00	2.00	-
	9/21/2009	237826	6.75	-	10.4	-	208	136	86.5	18,300	9,920	*2.25*	<0.259	0.011 J	1.66	1.67	-
	10/18/2010	265157 265162	6.54	21.4	10.4	-	212	138	92	19,100	10,700	*1.81*	<0.334	0.0107 J	1.53	1.54	-
	10/24/2011	288989 289212 289219	6.56	21.7	9.6	-	201	144	103	21,400	12,000	*2.31*	<0.281	<0.010 J	1.26	1.26	-
	7/23/2014	353489 353494 353501 353498	7.29	28.1	12.3	1.28	183	133	86.7	18,400	9,910	*2.71 J*	0.915	<0.01	1.06	1.06	1.49
	7/31/2019		6.72	27.41	12.8	1.30	-	-	-	-	-	-	<0.0868	-	-	-	<0.022
WK-05-3-A	10/28/2005	149142 149144	7.26	1.47	8.1	-	1,190	240	673	148,000	73,900	<1.5	<0.489	0.049 J	7.19	7.24	-
	5/31/2006	164282 164283	6.5	0.19	8.2	-	1,380	205	676	155,000	70,300	*1.55*	0.613 J	0.03 J	4.78	4.81	-
	9/18/2007	194233 194590 194605	6.77	0.112	13.6	-	1,340	221	575	131,000	60,400	<1.5	<0.417	0.022 J	3.08	3.1	-
	10/6/2008	217288 217358	6.51	0.18	12.1	-	1,340	194	753	169,000	80,400	<1.5	0.557 J	0.018 J	2.70	2.80	-
	9/21/2009	237826	6.28	-	14.9	-	1,430	193	797	177,000	85,900	<1.6	<0.435	0.017 J	2.68	2.7	-

Table 3: White King Groundwater Analytical Results
White King / Lucky Lass Mines Superfund Site

Well ID	Date Sampled	Lab Report	Field Measurements				Physical Tests			Metals (total)			Radionuclides (total)				Radionuclides (dissolved)
			pH (s.u.)	Conductivity (mS/m)	Temperature (°C)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Alkalinity (mg/L as $CaCO_3$)	Hardness (mg/L as $CaCO_3$)	Calcium (ug/L)	Magnesium (ug/L)	Arsenic * (ug/L)	Ra-226 (pCi/L)	U-235 (ug/L)	U-238 (ug/L)	U-nat (ug/L)	Ra-226 (pCi/L)
WK-05-3-SB	10/18/2010	265157 265162	6.2	13.13	12.3	-	1,470	164	848	181,000	96,300	<1.6	0.31 J	0.0166 J	2.3	2.31	-
	10/24/2011	288989 289212 289219	6.13	13.54	11.8	-	1,560	140	983	218,000	106,000	8.5	0.566 J	0.0114 J	1.53	1.54	-
	7/23/2014	353489 353494 353501 353498	6.76	139.7	13.8	1.67	1,120	102	644	146,000	68,100	<1.7	<0.31	<0.01	0.527	0.527	0.371 J
	7/31/2019		6.02	160.1	15.1	2.77	-	-	-	-	-	-	<0.0678	-	-	-	<0.363
	10/23/2005	148962 148733 148734	7.29	0.785	9.2	-	506	109	306	70,800	31,400	6.51	<0.399	<0.01	1.29	1.3	-
	5/31/2006	164282 164283	6.6	91	10.5	-	10	116	333	74,100	35,800	7.3	<0.477	<0.01	1.03	1.04	-
	9/18/2007	194233 194590 194605	6.91	66.4	10.9	-	823	119	500	107,000	56,700	*4.32*	0.557 J	<0.01	0.776	0.782	-
	10/6/2008	217288 217358	6.7	0.127	10.5	-	888	125	572	123,000	64,500	*3*	<0.368	<0.01	1.00	1.00	-
	9/21/2009	237826	6.53	-	11.8	-	947	136	591	128,000	66,100	*3.53*	<0.333	<0.01	1.20	1.20	-
	10/18/2010	265157 265162	6.26	9.27	11.1	-	1,030	134	654	135,000	77,100	*2.36*	<0.289	0.0103 J	1.40	1.41	-
	10/24/2011	288989 289212 289219	6.34	9.62	10.8	-	1,090	139	723	154,000	82,100	*11.1*	0.486 J	0.0108 J	1.45	1.46	-

Table 3: White King Groundwater Analytical Results
White King / Lucky Lass Mines Superfund Site

Well ID	Date Sampled	Lab Report	Field Measurements				Physical Tests			Metals (total)			Radionuclides (total)				Radionuclides (dissolved)
			pH (s.u.)	Conductivity (mS/m)	Temperature (°C)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Alkalinity (mg/L as $CaCO_3$)	Hardness (mg/L as $CaCO_3$)	Calcium (ug/L)	Magnesium (ug/L)	Arsenic * (ug/L)	Ra-226 (pCi/L)	U-235 (ug/L)	U-238 (ug/L)	U-nat (ug/L)	Ra-226 (pCi/L)
	7/23/2014	353489 353494 353501 353498	7.19	139.1	12.0	1.24	1,120	145	723	157,000	80,100	*3.13 J*	0.922	0.0138 J	1.98	1.99	0.243 J
	7/31/2019		6.44	145.5	14.0	1.20	-	-	-	-	-	-	<0.264	-	-	-	<0.331
WK-05-4-A	10/28/2005	149142 149144	6.84	1.89	7.7	-	1,510	243	939	201,000	106,000	20.9	0.469 J	0.059 J	8.53	8.59	-
	5/30/2006	164282 164283	6.6	0.18	8.8	-	1,420	233	848	186,000	93,200	*3.4*	<0.389	0.057 J	9.36	9.42	-
	9/19/2007	194233 194590 194605	6.9	0.13	8.5	-	210	226	806	170,000	92,900	*2.01*	<0.460	0.039 J	5.75	5.79	-
	10/6/2008	217288 217358	6.74	0.214	11.2	-	1,490	264	1,140	244,000	129,000	<1.5	0.594 J	0.057 J	8.7	8.8	-
	9/21/2009	237826	6.51	-	12.4	-	1,600	302	950	193,000	114,000	<1.6	<0.441	0.039 J	6.35	6.39	-
	10/18/2010	265157 265162	6.48	1.385	10.8	-	1,650	285	1,060	216,000	126,000	*3.85*	0.42 J	0.0536 J	7.75	7.8	-
	10/24/2011	288989 289212 289219	6.35	1.365	10.0	-	1,710	292	1,260	261,000	147,000	*8.5*	<0.357	0.0475 J	6.17	6.22	-
	7/23/2014	353489 353494 353501 353498	7.18	187	12.5	2.56	1,600	267	1,080	230,000	123,000	*<1.7*	0.866	0.0408 J	5.85	5.89	0.423
	7/31/2019		6.25	181.7	10.3	13.9	-	-	-	-	-	-	<0.251	-	-	-	<0.367

Table 3: White King Groundwater Analytical Results
White King / Lucky Lass Mines Superfund Site

Well ID	Date Sampled	Lab Report	Field Measurements				Physical Tests			Metals (total)			Radionuclides (total)				Radionuclides (dissolved)
			pH (s.u.)	Conductivity (mS/m)	Temperature (°C)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Alkalinity (mg/L as $CaCO_3$)	Hardness (mg/L as $CaCO_3$)	Calcium (ug/L)	Magnesium (ug/L)	Arsenic * (ug/L)	Ra-226 (pCi/L)	U-235 (ug/L)	U-238 (ug/L)	U-nat (ug/L)	Ra-226 (pCi/L)
WK-05-4-AD (Duplicate)	9/21/2009	237826	6.51	-	12.4	-	1,560	283	1,100	218,000	135,000	<1.6	0.45 J	0.048 J	7.50	7.55	-
	10/18/2010	265157 265162	6.48	1.385	10.8	-	1,680	286	1,110	224,000	134,000	*1.68*	<0.266	0.0516 J	7.73	7.78	-
	10/24/2011	288989 289212 289219	6.35	1.365	10.0	-	1,710	292	1,270	261,000	151,000	*8.67*	<0.266	0.0477 J	6.40	6.45	-
	7/23/2014	353489 353494 353501 353498	7.18	187	12.5	2.56	1,590	265	1,080	230,000	122,000	*<1.7*	0.308	0.041 J	6.03	6.08	0.829

Notes:
* Many arsenic values reported by laboratory affected by arsenic detected in blanks, as discussed in data validation report for the year analyzed.
- = Not Analyzed
J = Values are laboratory estimates, less than the practical quantitation limit (PQL).
< = analytical result was not detected above the method reporting limit shown
The remediation goal for arsenic is 33 ug/L.

Table 5: Lucky Lass Groundwater Analytical Results
White King / Lucky Lass Mines Superfund Site

Well ID	Date Sampled	Lab Report	Field Measurements				Physical Tests			Metals (total)		Radionuclides (total)				Radionuclides (dissolved)
			pH (s.u.)	Conductivity (S/m)	Temperature (°C)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Alkalinity (mg/L as $CaCO_3$)	Hardness (mg/L as $CaCO_3$)	Calcium (ug/L)	Magnesium (ug/L)	Ra-226 (pCi/L)	U-235 (ug/L)	U-238 (ug/L)	U-nat (ug/L)	Ra-226 (pCi/L)
Upgradient																
LL-05-1-SB	10/28/2005	149142 149144	8.14	0.589	6.9	-	329	261	200	54,300	15,500	0.322 J	0.053 J	7.56	7.61	-
	5/31/2006	164282 164283	7.10	52	9.6	-	379	379	265	73,900	19,700	0.544 J	0.035 J	5.7	5.74	-
	9/19/2007	194590	6.87	28.4	7.4	-	350	247	219	59,500	17,100	<0.354	<0.01	1.14	1.15	-
	10/6/2008	217288 217358	6.74	46.5	9.0	-	340	235	213	55,300	18,100	<0.340	<0.01	1.1	1.1	-
	9/21/2009	237826	6.74	NA	8.2	-	331	240	166	42,800	14,300	0.428 J	<0.01	0.974	0.974	-
	10/19/2010	265157 265162	6.67	28.8	8.2	-	329	212	181	47,500	15,100	0.439 J	<0.010	0.959	0.959	-
	10/25/2011	288989	6.47	27.4	7.2	-	327	201	170	43,800	14,800	0.406 J	<0.010	0.691	0.691	-
	7/23/2014	353494	6.04	45.8	10.1	7.47	314	220	183	47,300	15,700	4.03	<0.01	0.926	0.926	<0.061
	8/1/2019		6.82	43.14	9.1	15.40	-	-	-	-	-	<0.0661	-	-	-	<0.042
Downgradient																
6A-S	10/26/2005	148962 148972	6.60	0.295	7.6	-	201	129	67.1	18,300	5,190	<0.38	<0.01	<0.05	<0.05	-
	5/30/2006	164282 164283	6.50	19	8.1	-	176	102	55.7	15,200	4,310	<0.326	<0.01	0.108 J	0.109 J	-
	9/19/2007	194590	7.03	17.9	10.8	-	168	130	67.1	18,300	5,220	<0.281	<0.01	0.104 J	0.105 J	-
	10/6/2008	217288 217358	6.65	22	11.0	-	166	113	51.9	14,000	4,120	<0.364	<0.01	0.088 J	0.088 J	-
	9/22/2009	237826	6.68	NA	11.8	-	159	112	42.5	11,600	3,300	0.463 J	<0.01	0.106 J	0.106 J	-
	10/19/2010	265157 265162	6.79	1.6	11.0	-	174	113	44	12,000	3,400	<0.308	<0.010	0.146 J	0.146 J	-
	10/25/2011	288989 289212 289219	6.54	1.53	10.6	-	163	104	36.6	10,000	2,810	<0.341	<0.010	0.11 J	0.11 J	-
	7/22/2014	353489 353494 353501 353498	6.09	18.5	9.6	3.9	131	89.2	32.4	8,920	2,460	1	<0.01	0.076 J	0.076 J	0.494
	7/30/2019		6.56	19.05	13.0	2.59	-	-	-	-	-	0.71	-	-	-	<0.266

6A-SD (duplicate)	7/30/2019		6.56	19.05	13.0	2.59	-	-	-	-	-	0.655	-	-	-	<0.118
18A-S	10/26/2005	149142 149144	7.21	0.237	8.3	-	150	106	70.9	16,500	7,210	<0.423	<0.01	0.376	0.379	-
	5/30/2006	164282 164283	6.50	19	7.0	-	176	98.2	65.9	15,200	6,800	<0.423	<0.01	0.396	0.398	-
	9/19/2007	194233 194590 194603	7.00	15.3	11.6	-	189	126	93.3	21,700	9,530	0.535 J	<0.01	0.60	0.605	-
	10/6/2008	217288 217358	6.69	22.3	11.1	-	193	130	102	23,800	10,400	<0.414	0.014 J	2.31	2.33	-
	9/22/2009	237826	6.73	NA	12.3	-	174	116	73.9	17,400	7,420	0.676 J	<0.01	0.657	0.657	-
	10/19/2010	265157 265162	6.59	1.58	10.7	-	169	115	87.2	20,400	8,800	0.218 J	<0.01	0.683	0.683	-
	10/25/2011	288989 289212 289219	6.61	1.57	9.1	-	161	104	79.4	18,300	8,160	0.386 J	<0.010	0.342	0.342	-
	7/22/2014	353489 353494 353501 353498	6.60	20.5	12.2	11.8	171	96	69	16,000	7,030	0.67	<0.01	0.327	0.327	<0.237
	7/30/2019		6.72	20.2	13.4	3.0	-	-	-	-	-	0.244	-	-	-	<0.26
LL-05-1A	10/27/2005	149142 149145	6.87	0.122	6.7	-	120	55.6	33.1	8,230	3,040	<0.385	<0.01	0.12 J	0.121 J	
	5/30/2006	164282 164283	5.60	11	5.8	-	123	56.3	33.9	8,380	3,160	0.503 J	<0.01	0.091 J	0.092 J	-
	9/19/2007	194233 194590 194603	6.76	7.3	7.7	-	116	55.7	33.3	8,060	3,190	0.507 J	<0.01	0.087 J	0.088 J	-
	10/6/2008	217288 217358	6.74	11.7	8.4	-	114	56	31.3	7,760	2,890	<0.373	<0.01	0.078 J	0.078 J	-
	9/22/2009	237826	6.42	NA	8.2	-	119	56.5	31.3	7,690	2,950	0.362 J	<0.01	0.105 J	0.105 J	-
	10/19/2010	265157 265162	6.44	7.9	7.9	-	119	54.6	33.9	8,440	3,120	<0.317	<0.010	0.111 J	0.111 J	-
	10/25/2011	288989 289212 289219	6.13	8.2	6.1	-	107	56.6	35.4	8,780	3,260	<0.330	<0.010	0.067 J	0.067 J	-
	7/22/2014	353489 353494 353501 353498	5.57	9.1	8.6	0.86	123	52.3	34.1	8,540	3,100	0.788	<0.01	0.0848 J	0.0848 J	0.649
	7/31/2019		6.24	11.05	7.0	1.70	-	-	-	-	-	0.317	-	-	-	<0.578

Notes:
Arsenic is not a constituent of concern (COC) for Lucky Lass.
- = Not Analyzed
J = Values are laboratory estimates, less than the practical quantitation limit (PQL).
< = analytical result was not detected above the method reporting limit shown

Table G-2: White King Pond pH Monitoring Results

Historical White King Pond Monitoring Data - pH
White King Mine

Station	Date/Depth (m)	pH (S.U.)										
		1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m
1	6/18/2003	6.88	6.93	6.26	5.78	5.64	5.07	4.74	4.64			
1	9/5/2003	7.27	7.29	7.29	7.23	7.19	6.74	4.96	4.68	4.58	4.52	
1	10/16/2003	6.55	6.59	6.60	6.59	6.60	6.62	6.62	6.61	6.64		
1	11/6/2003	6.63	6.62	6.62	6.62	6.61	6.61	6.61	6.61	6.61		
1	6/4/2004	7.07	7.05	6.97	6.67	5.82	5.75	5.65	5.57	5.39	5.43	
1	7/14/2004	6.91	6.97	6.96	6.95	5.55	5.37	5.09	4.83	4.78	6.41	
1	9/24/2004	6.47	6.54	6.56	6.55	6.54	6.52	6.50	6.48	6.41	6.18	5.95
1	9/30/2004	6.98	6.95	6.94	6.94	6.93	6.92	6.90	6.85	6.76	6.60	
1	10/5/2004	5.89	6.53	6.59	6.58	6.57	6.57	6.58	6.55	6.53	6.49	6.36
1	10/13/2004	6.28	6.41	6.46	6.47	6.51	6.52	6.52	6.52	6.53	6.54	6.52
1	10/19/2004	7.30	7.16	7.10	7.04	6.96	6.92	6.89	6.87	6.85	6.82	
1	11/5/2004	7.24	7.16	7.10	7.05	7.01	6.96	6.92	6.89	6.85	6.82	
1	6/1/2005	7.27	7.16	6.86	6.17	6.10	5.91	5.76	5.64	5.55	5.34	
1	7/20/2005	6.84	6.95	6.96	6.91	6.02	5.80	5.52	5.36	5.28	5.15	
1	8/11/2005	6.72	6.84	6.90	6.97	6.91	6.06	5.71	5.48	5.33	5.21	
1	10/6/2005	6.59	6.61	6.63	6.64	6.65	6.65	6.66	6.67	6.68	6.69	
1	10/20/2005	7.44	7.13	7.18	7.11	7.08	7.07	7.05	7.02	6.97		
1	11/17/2005	6.70	6.71	6.72	6.73	6.73	6.74	6.74	6.75	6.75	6.77	
1	6/14/2006	6.42	6.10	5.83	5.35	5.07	4.72	4.50	4.29	4.12	4.73	
1	9/18/2006	8.30	7.33	7.21	7.09	7.04	6.35	5.31	5.01	4.64	5.34	
1	11/16/2006	5.81	5.82	5.90	5.95	6.04	6.13	6.19	6.40	6.55	6.61	
1	6/12/2007	7.42	7.40	7.34	7.35	7.13	7.05	6.96	6.98	7.00	7.06	
1	9/27/2007	5.87	6.18	6.18	6.10	6.06	6.07	6.14	6.14	6.13	5.93	
1	11/2/2007	5.44	5.40	5.55	5.70	5.72	5.72	5.78	5.85	6.14	6.24	
1	7/21/2008	6.43	6.35	6.45	6.29	6.24	6.16	6.08	6.01	5.94	5.84	
1	11/4/2008	5.31	5.33	5.27	5.29	5.27	5.24	5.25	5.22	5.25	5.27	
1	6/1/2009	6.14	5.67	5.47	5.45	5.47	5.48	5.19	5.25	5.36	5.14	
1	9/9/2009	7.73	7.66	7.64	7.55	7.38	6.29	5.85	5.60	5.40	5.36	
1	11/10/2009	7.3	7.31	7.31	7.32	7.32	7.33	7.33	7.34	7.34	6.73	
1	10/26/2011	6.47	6.53	6.59	6.64	6.68	6.70	6.71	6.70	5.57	6.11	
1	8/28/2012	8.23	8.20	8.23	8.19	7.91	6.62	6.44	6.16	5.93	5.88	
1	10/30/2012	7.40	7.37	7.29	7.30	7.28	7.26	7.23	7.18	7.10	7.08	
1	8/21/2013	8.38	8.32	8.31	8.29	8.20	7.05	6.62	6.58	6.43	5.26	
1	10/29/2013	5.72	6.13	6.09	6.29	6.28	6.61	6.59	6.57	6.56	6.36	
1	7/24/2014	8.74	8.75	8.75	8.72	8.61	7.69	7.52	7.38	7.28	7.16	
1	10/30/2014	7.76	7.80	7.84	7.88	7.89	7.85	7.87	7.82	7.78	7.80	
1	7/9/2015	8.39	8.33	8.24	8.19	7.99	7.92	7.63	7.26	6.95	6.73	
1	10/22/2015	7.55	7.57	7.62	7.65	7.66	7.67	7.65	7.60	7.57	7.50	
1	9/27/2018	7.73	7.77	7.80	7.82	7.87	7.88	7.86	7.74	7.55	7.34	
1	11/17/2018	6.41	6.16	6.10	6.05	6.06	6.04	6.00	6.01	6.01	5.99	
1	7/30/2019	7.77	7.79	7.75	6.86	6.78	6.72	6.60	6.56	6.48		
1	10/30/2019	6.69	6.74	6.73	6.73	6.73	6.72	6.71	6.69	6.64	6.41	

Historical White King Pond Monitoring Data - pH
White King Mine

Station	Date/Depth (m)	pH (S.U.)																		
		1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	15 m	16 m	17 m	18 m	19 m
2	6/18/2003	6.37	6.44	6.47	5.88	5.48	5.35	5.02	4.71	4.64	4.53									
2	9/5/2003	7.14	7.21	7.23	7.20	7.20	7.14	6.39	4.88	4.67	4.52	4.47	5.70	6.05						
2	10/16/2003	6.58	6.60	6.61	6.62	6.60	6.60	6.58	6.53	6.49	6.50	6.43	6.32	6.15						
2	11/6/2003	6.62	6.62	6.61	6.61	6.61	6.61	6.61	6.60	6.60	6.60	6.60	6.60	6.64						
2	6/4/2004	6.98	7.01	6.87	6.38	5.86	5.79	5.74	5.62	5.27	5.28	5.30	5.46							
2	7/14/2004	6.95	6.96	6.96	6.91	6.05	5.39	5.32	4.93	4.69	4.70	4.68	4.37							
2	9/24/2004	6.55	6.58	6.59	6.57	6.56	6.56	6.54	6.52	6.48	6.19	5.70	4.20	3.42	4.18					
2	9/30/2004	6.22	6.46	6.51	6.56	6.57	6.60	6.61	6.60	6.48	6.30									
2	10/5/2004	6.62	6.62	6.62	6.62	6.62	6.62	6.61	6.60	6.55	6.47	6.43	5.71	4.28						
2	10/13/2004	6.65	6.67	6.66	6.65	6.65	6.65	6.66	6.66	6.65	6.48	6.45	7.65	6.24						
2	10/19/2004	6.72	6.71	6.69	6.68	6.67	6.67	6.66	6.65	6.65	6.64	6.64	6.63	6.43						
2	11/5/2004	6.79	6.78	6.77	6.76	6.75	6.74	6.73	6.73	6.72	6.72	6.71	6.71	6.70						
2	6/1/2005	7.20	7.12	7.00	6.22	6.14	6.09	5.94	5.65	5.51	5.30	5.16	4.83							
2	7/20/2005	7.08	7.13	7.15	7.15	7.03	6.03	5.94	5.77	5.53	5.33	5.20	5.10	4.50						
2	8/11/2005	6.78	6.86	6.92	6.96	6.95	6.22	5.82	5.55	5.31	5.00	4.89	4.73							
2	10/6/2005	6.72	6.70	6.70	6.70	6.70	6.68	6.67	6.65	6.65	6.63	6.61	6.65	8.49						
2	10/20/2005	6.98	6.95	6.94	6.93	6.93	6.91	6.89	6.88	6.84	6.86	6.81	6.80	6.66						
2	11/17/2005	6.79	6.79	6.79	6.79	6.79	6.79	6.80	6.80	6.80	6.80	6.80	6.80	6.81						
2	6/14/2006	6.91	6.60	6.22	5.82	5.25	4.58	4.59	4.54	4.34	4.17	3.95	3.83	3.78	3.69	3.57	3.52	3.53	3.54	6.55
2	9/18/2006	7.13	7.22	7.26	7.29	7.26	6.27	4.94	4.69	4.54	4.45	4.39	4.16	4.10	4.08	3.81	3.70	4.06	6.58	
2	11/16/2006	6.69	6.65	6.51	6.60	6.64	6.70	6.74	6.78	6.79	6.82	6.82	6.80	6.78	6.75	6.74	6.73	6.71	6.71	6.38
2	6/12/2007	7.25	7.44	7.57	7.62	7.66	7.61	7.36	7.19	7.06	6.81	6.64	5.59	5.05	5.66	5.33	4.24	4.05	3.96	5.75
2	9/27/2007	6.47	6.59	6.65	6.69	6.74	6.78	6.73	6.63	6.17	6.10	5.76	5.75	5.20	4.62	4.01	3.90	4.36	4.80	5.65
2	11/2/2007	6.27	6.26	6.25	6.31	6.38	6.48	6.59	6.67	6.72	6.78	6.77	6.71	6.72	6.71	6.49	6.51	6.50	6.31	
2	7/21/2008	6.09	6.21	6.34	6.33	6.29	6.30	6.25	6.18	6.12	6.05	5.97	5.86	5.85	5.70	4.93	4.16	4.28	4.05	4.05
2	11/4/2008	5.25	5.23	5.22	5.28	5.34	5.31	5.31	5.28	5.30	5.27	5.24	5.20	5.18	5.26	5.25	5.22	5.26	5.22	5.24
2	6/1/2009	5.42	5.43	5.49	5.57	5.60	5.62	5.68	5.67	5.63	5.60	5.33	5.23	5.12	5.03	4.51	4.01	3.62	3.58	5.59
2	9/9/2009	7.86	7.86	7.84	7.79	7.66	7.16	6.34	6.10	5.87	5.81	5.73	5.73	5.66	5.66	5.85	6.04	6.30	6.86	6.82
2	11/10/2009	7.33	7.34	7.35	7.35	7.35	7.35	7.36	7.36	7.36	7.37	7.37	7.37	7.36	7.36	7.35	7.32	6.89	7.3	7.08
2	10/26/2011	6.73	6.78	6.82	6.84	6.87	6.84	6.85	6.83	6.62	6.06	5.57	5.18	4.69	4.40	4.52	5.03	5.20	5.33	6.79
2	8/28/2012	8.57	8.55	8.42	8.26	8.30	6.40	6.20	6.12	5.99	5.81	5.82	5.64	5.65	5.60	5.66	5.92	6.14	6.27	6.31
2	10/30/2012	7.30	7.30	7.30	7.30	7.30	7.29	7.28	7.25	7.22	7.15	7.05	6.79	6.24	6.17	6.10	6.27	6.47	6.59	6.73
2	8/21/2013	8.72	8.69	8.60	8.60	8.45	6.89	6.71	6.56	6.31	6.03	5.98	5.95	5.87	5.86	5.50	6.02	6.41	6.64	6.72
2	10/29/2013	6.42	6.46	6.61	6.69	6.71	6.71	6.74	6.69	6.64	6.60	6.53	6.54	6.51	6.48	6.45	6.42	6.38	6.21	6.41
2	7/24/2014	8.83	8.70	8.73	8.76	8.47	7.75	7.49	7.33	7.24	7.21	7.15	7.12	7.12	7.13	7.11	6.85	6.68	7.14	7.56
2	10/30/2014	7.81	7.87	7.87	7.85	7.85	7.83	7.84	7.79	7.84	7.80	7.76	7.78	7.72	7.68	7.60	7.39	6.55	7.52	7.53
2	7/9/2015	8.20	8.25	8.25	8.18	8.02	7.95	7.48	7.12	6.84	6.63	6.47	6.29	6.22	6.15	6.09	6.02	5.88	5.78	5.90
2	10/22/2015	7.55	7.63	7.68	7.70	7.71	7.72	7.73	7.69	7.63	7.55	7.21	6.84	6.61	6.47	6.35	6.33	6.37	6.39	6.44
2	9/27/2018	8.09	8.11	8.11	8.10	8.09	8.07	8.01	7.96	7.76	7.54	7.35	7.14	6.98	6.79	6.72	6.45	6.40	6.47	6.56
2	11/17/2018	6.43	6.40	6.50	6.35	6.30	6.32	6.22	6.23	6.21	6.24	6.19	6.14	6.15	6.18	6.13	6.16	6.16	6.85	6.89
2	7/30/2019	7.79	7.79	7.63	6.88	6.83	6.61	6.56	6.51	6.42	6.33	6.22	6.14	6.06	6.03	5.99	5.97	6.80	6.62	6.43
2	10/30/2019	6.46	6.39	6.30	6.24	6.20	6.15	6.10	5.99	5.92	5.86	5.84	6.71	5.57	5.47	5.43	5.38	5.90	6.18	6.54

Historical White King Pond Monitoring Data - pH
White King Mine

Station	Date/Depth (m)	pH (S.U.)																
		1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	15 m	16 m	17 m	18 m
3	6/18/2003	6.85	6.89	6.43	5.84	5.74	5.33	4.80	4.69	4.60	4.46								
3	9/5/2003	7.20	7.21	7.21	7.20	7.09	6.63	4.89	4.61	4.48	4.40	4.74	4.28	4.14					
3	10/16/2003	6.62	6.60	6.60	6.60	6.59	6.58	6.55	6.54	6.48	6.37	6.35	6.29	5.73	4.53	6.36			
3	11/6/2003	6.36	6.46	6.50	6.53	6.54	6.55	6.55	6.56	6.57	6.57	6.61	6.62	6.63	6.54				
3	6/4/2004	7.02	7.02	6.96	6.53	6.02	5.84	5.75	5.64	5.42	5.29	5.24							
3	7/14/2004	6.96	7.00	7.01	6.94	6.61	5.56	5.30	5.09	4.73	4.74	4.62	4.35						
3	9/24/2004	6.47	6.53	6.56	6.55	6.56	6.57	6.55	6.50	6.41	6.01	5.73	4.40	3.97	3.75	3.48	3.22	3.19	4.03
3	9/30/2004	6.80	6.80	6.81	6.81	6.81	6.82	6.81	6.76	6.56	6.49								
3	10/5/2004	6.44	6.48	6.51	6.52	6.54	6.55	6.58	6.55	6.53	6.49								
3	10/13/2004	7.77	7.66	7.60	7.52	7.47	7.41	7.35	7.31	7.28	7.23	7.07							
3	10/19/2004	6.71	6.69	6.69	6.67	6.65	6.64	6.64	6.63	6.62	6.61	6.60							
3	11/5/2004	6.71	6.70	6.70	6.70	6.69	6.69	6.69	6.69	6.69	6.68	6.68							
3	6/1/2005	6.53	6.58	6.29	6.10	6.09	6.04	5.93	5.73	5.62	5.49	5.18							
3	7/20/2005	6.79	6.88	6.94	6.94	6.42	6.15	5.95	5.79	5.51	5.35	5.25							
3	8/11/2005	6.78	6.86	6.91	6.93	6.85	5.94	5.73	5.51	5.31	5.19	5.12							
3	10/6/2005	7.08	7.04	6.96	6.93	6.91	6.90	6.88	6.85	6.81	6.71	6.67							
3	10/20/2005	6.90	6.89	6.89	6.89	6.88	6.89	6.88	6.88										
3	11/17/2005	6.82	6.82	6.81	6.81	6.82	6.82	6.82	6.82	6.82	6.82	6.82	6.74						
3	6/14/2006	7.22	6.88	6.21	5.82	5.51	5.24	4.74	4.52	4.26	4.54								
3	9/18/2006	7.20	7.26	7.29	7.30	7.31	6.14	5.43	5.18	4.93	4.82	4.62	4.39	4.73					
3	11/16/2006	6.95	6.96	6.95	6.93	6.95	6.95	6.94	6.94	6.93	6.73								
3	6/12/2007	7.12	7.19	7.26	7.33	7.37	7.40	7.25	7.15	7.05	6.85	6.69							
3	9/27/2007	6.36	6.51	6.54	6.61	6.63	6.66	6.68	6.58	6.17	5.89	5.45	5.57						
3	11/2/2007	6.66	6.61	6.60	6.59	6.56	6.57	6.54	6.53	6.53	6.49	6.46	6.44						
3	7/21/2008	5.66	6.49	6.52	6.55	6.55	6.53	6.51	6.48	6.43	6.32	6.16	6.11						
3	11/4/2008	5.50	5.46	5.49	5.57	5.60	5.53	5.56	5.53	5.50	5.51	5.50	5.54						
3	6/1/2009	6.24	6.35	6.28	6.20	6.30	6.24	6.17	5.91	5.72	5.60	5.48	5.39						
3	9/9/2009	7.82	7.89	7.93	7.87	7.77	7.25	6.71	6.47	6.30	6.17	6.10	6.03						
3	11/10/2009	7.40	7.40	7.38	7.38	7.38	7.38	7.38	7.37	7.37	7.37	7.36	7.36						
3	10/26/2011	7.00	7.08	7.11	7.12	1.14	7.13	7.14	7.05	7.02	6.79	5.93	5.49						
3	8/28/2012	8.59	8.57	8.49	8.39	8.34	6.82	6.66	6.46	6.30	5.94	5.89	5.79						
3	10/30/2012	7.38	7.38	7.38	7.36	7.35	7.34	7.33	7.32	7.32	7.26	7.20	7.05	6.67					
3	8/21/2013	8.61	8.62	8.62	8.58	8.34	7.03	7.00	6.60	6.35	6.02	5.88	5.78						
3	10/29/2013	6.62	6.81	6.93	6.97	6.92	6.89	6.84	6.79	6.75	6.75	6.72	6.62						
3	7/24/2014	8.85	8.84	8.76	8.74	8.61	7.57	7.66	7.38	7.27	7.15	7.00	7.04						
3	10/30/2014	7.77	7.81	7.89	7.96	7.78	7.85	7.81	7.79	7.74	7.76	7.73	7.70						
3	7/9/2015	8.34	8.35	8.32	8.24	8.09	7.95	7.68	7.40	7.13	6.67	6.50	6.34						
3	10/22/2015	7.58	7.60	7.64	7.63	7.60	7.69	7.70	7.68	7.64	7.54	7.06	6.72						
3	9/27/2018	7.96	7.98	7.97	7.96	7.94	7.94	7.93	7.70	7.47	7.11	7.10	6.78						
3	11/17/2018	6.53	6.50	6.47	6.41	6.39	6.35	6.31	6.36	6.33	6.34	6.34	6.29						
3	7/30/2019	7.67	7.72	7.69	6.66	6.45	6.43	6.38	6.31	6.26	6.17	6.13	6.03						
3	10/30/2019	6.19	5.84	5.52	5.29	5.07	4.89	4.75	4.66	4.56	4.42	4.40	4.42						

Historical White King Pond Monitoring Data - pH
White King Mine

Station	Date/Depth (m)	pH (S.U.)																			
		1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	15 m	16 m	17 m	18 m	19 m	20 m
4	6/18/2003	6.78	6.80	6.35	5.71	5.35	4.86	4.54	4.41	4.35											
4	9/5/2003	7.19	7.24	7.26	7.23	7.11	6.64	4.95	4.71	4.64	4.52	4.36	4.24	4.03	3.96	3.88	3.56	3.49	3.81	4.17	
4	10/16/2003	6.53	6.52	6.51	6.50	6.51	6.51	6.49	6.48	6.43	6.35	6.25	6.07	5.87	4.20	3.85	3.57	3.55	4.13	4.59	
4	11/6/2003	6.43	6.42	6.42	6.42	6.42	6.42	6.42	6.42	6.42	6.43	6.43	6.43	6.43	6.44	6.44	6.44	6.45	6.45	6.40	
4	6/4/2004	6.91	6.97	6.95	6.55	5.95	5.85	5.78	5.62	5.50	5.39	5.20	4.90	4.73	4.59	4.49	4.10	3.98	3.95	3.94	4.16
4	7/14/2004	6.96	7.02	7.02	6.99	5.99	5.44	5.25	5.05	5.02	4.89	4.81	4.52	4.11	4.01	3.84	3.29	3.18	3.11	3.18	4.27
4	9/24/2004	6.42	6.48	6.52	6.53	6.56	6.56	6.55	6.51	6.44	6.20	5.64	4.34	4.00	3.74	3.50	3.22	3.18	3.48	4.00	3.23
4	9/30/2004	6.80	6.82	6.82	6.82	6.83	6.84	6.84	6.78	6.66	6.47	6.06	4.89	4.51	4.36	4.25	3.59	3.68	5.48	7.13	
4	10/5/2004	6.63	6.64	6.66	6.66	6.65	6.65	6.62	6.59	6.54	6.46	6.29	4.90	4.22	4.03	3.91	3.21	3.44	4.56	6.25	11.27
4	10/13/2004	6.87	6.87	6.88	6.87	6.87	6.87	6.86	6.86	6.84	6.81	6.80	6.73	6.67	4.83	4.38	3.76	3.77	5.43	6.22	11.17
4	10/19/2004	6.63	6.63	6.62	6.62	6.62	6.60	6.59	6.58	6.58	6.57	6.56	6.54	6.52	6.44	6.36	4.40	4.30	5.79	6.39	11.00
4	11/5/2004	6.69	6.69	6.68	6.68	6.68	6.68	6.68	6.68	6.68	6.68	6.68	6.68	6.67	6.67	6.67	6.67	6.67	6.67	7.65	7.48
4	6/1/2005	6.55	6.66	6.33	6.02	6.05	5.94	5.80	5.78	5.64	5.50	5.20	5.00	4.67	4.48	4.28	3.90	3.74	3.69	3.66	3.72
4	7/20/2005	6.98	7.05	7.07	7.01	6.08	5.98	5.90	5.82	5.66	5.54	5.26	5.13	4.88	4.59	4.31	4.16	3.67	3.61	3.58	3.57
4	8/11/2005	6.85	6.93	6.96	6.98	6.94	5.85	5.74	5.48	5.40	5.23	5.02	4.81	4.44	4.19	4.13	3.66	3.55	3.56	3.87	
4	10/6/2005	6.76	6.75	6.75	6.74	6.74	6.73	6.73	6.72	6.70	6.64	6.63	6.61	6.47	6.36	3.83	3.69	3.94	4.81	9.03	
4	10/20/2005	6.88	6.88	6.87	6.87	6.87	6.87	6.86	6.83	6.81	6.79	6.77	6.74	6.70	6.67	6.63	6.44	5.71	4.67	6.73	
4	11/17/2005	6.83	6.83	6.83	6.83	6.83	6.83	6.83	6.84	6.83	6.84	6.84	6.84	6.84	6.84	6.84	6.84	6.84	6.85	6.85	7.05
4	6/14/2006	7.17	6.99	6.50	5.79	5.07	4.94	4.80	4.66	4.48	4.21	4.04	3.90	3.81	3.65	3.58	3.55	3.57	3.58	3.59	6.14
4	9/18/2006	6.92	7.11	7.18	7.21	7.19	6.14	5.40	5.09	4.75	4.53	4.47	4.17	4.00	3.96	3.74	3.66	4.16	4.43	4.69	6.91
4	11/16/2006	6.95	6.94	6.92	6.94	6.94	6.91	6.89	6.87	6.82	6.84	6.85	6.82	6.74	6.75	6.75	6.74	6.69	6.39		
4	6/12/2007	6.96	7.13	7.23	7.28	7.34	7.26	7.16	7.07	6.96	6.75	6.62	6.46	6.20	5.77	5.31	4.36	4.10	4.31	5.62	6.47
4	9/27/2007	6.76	6.82	6.79	6.86	6.87	6.87	6.94	6.86	6.83	6.53	6.19	5.82	5.53	5.08	4.88	4.02	3.95	4.56	4.79	5.46
4	11/2/2007	6.64	6.64	6.70	6.66	6.66	6.65	6.64	6.61	6.58	6.56	6.57	6.55	6.56	6.54	6.53	6.46	6.42	6.41	6.50	
4	7/21/2008	7.15	7.21	7.25	7.19	7.09	6.80	6.73	6.66	6.58	6.48	6.33	6.02	5.83	5.09	4.21	4.46	4.65	4.88	5.55	
4	11/4/2008	5.62	5.57	5.65	5.62	5.55	5.55	5.58	5.55	5.57	5.50	5.54	5.53	5.45	5.46	5.43	5.49	5.45	5.40	5.45	5.40
4	6/1/2009	5.84	5.89	5.90	5.83	5.80	5.80	5.82	5.82	5.82	5.81	5.79	5.72	5.66	5.47	5.25	4.30	3.72	3.66	3.62	4.67
4	9/9/2009	8.14	8.13	8.05	8.06	7.85	7.27	6.62	6.32	6.20	6.14	6.07	6.02	5.94	5.92	6.04	6.23	6.50	7.25	8.27	9.40
4	11/10/2009	7.40	7.39	7.39	7.38	7.39	7.38	7.38	7.37	7.37	7.37	7.37	7.37	7.37	7.37	7.36	7.36	6.99	7.26	7.52	7.57
4	10/26/2011	6.72	6.82	6.83	6.85	6.87	6.89	6.86	6.86	6.82	6.56	6.22	5.73	4.87	4.55	4.48	4.90	5.30	5.51	5.62	5.78
4	8/28/2012	8.54	8.55	8.52	8.54	7.87	6.64	6.45	6.32	6.17	6.02	5.89	5.85	5.70	5.60	5.62	5.83	6.02	6.20	6.49	6.71
4	10/30/2012	7.35	7.35	7.35	7.35	7.34	7.33	7.31	7.28	7.20	7.16	6.61	6.40	6.33	6.23	6.27	6.41	6.66	6.79	6.86	7.13
4	8/21/2013	8.67	8.68	8.65	8.64	8.26	7.73	6.65	6.61	6.28	6.02	5.95	5.80	5.72	5.67	5.52	5.93	6.19	6.32	6.81	7.03
4	10/29/2013	6.98	6.94	7.00	6.95	6.85	6.84	6.85	6.77	6.71	6.61	6.56	6.53	6.51	6.47	6.46	6.42	6.37	6.28	6.28	6.47
4	7/24/2014	8.78	8.69	8.72	8.70	8.68	7.95	7.67	7.52	7.32	7.30	7.11	7.03	6.98	6.93	6.91	6.74	7.14	7.22	7.25	7.22
4	10/30/2014	7.72	7.71	7.74	7.73	7.75	7.90	7.87	7.80	7.85	7.85	7.82	7.75	7.73	7.67	7.65	7.76	7.67	7.62	7.39	7.41
4	7/9/2015	7.96	8.19	8.26	8.26	8.18	8.08	7.69	7.31	7.01	6.80	6.64	6.54	6.44	6.32	6.25	6.14	6.05	6.47	6.67	6.88
4	10/22/2015	7.71	7.72	7.71	7.73	7.71	7.69	7.68	7.70	7.56	7.40	7.09	6.74	6.50	6.43	6.40	6.40	6.42	6.43	6.46	6.67
4	9/27/2018	7.68	7.69	7.73	7.70	7.69	7.71	7.71	7.61	7.17	6.93	6.76	6.76	6.68	6.47	6.34	6.15	6.31	6.32	6.34	6.53
4	11/17/2018	6.47	6.45	6.33	6.50	6.40	6.40	6.29	6.32	6.34	6.34	6.34	6.29	6.31	6.30	6.26	6.32	6.38	6.76	6.94	6.99
4	7/30/2019	7.82	7.85	7.76	6.88	6.82	6.75	6.68	6.61	6.48	6.41	6.32	6.23	6.18	6.15	6.12	6.07	6.35	6.58	6.64	6.74
4	10/30/2019	6.82	6.80	6.81	6.81	6.78	6.77	6.76	6.72	6.65	6.61	6.57	6.58	6.55	6.53	6.45	6.37	6.07	6.70	6.89	6.97

Historical White King Pond Monitoring Data - pH
White King Mine

Station	Date/Depth (m)	pH (S.U.)								
		1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m
5	6/18/2003	6.91	6.51	6.52	5.67	5.44	5.09	4.75	4.56	4.79
5	9/5/2003	7.29	7.30	7.32	7.26	7.15	6.59	4.98		
5	10/16/2003	6.53	6.52	6.52	6.52	6.52	6.51	6.51	6.51	6.51
5	11/6/2003	6.42	6.41	6.41	6.41	6.41	6.41	6.41	6.42	6.42
5	6/4/2004	6.96	7.02	6.97	6.65	6.09	5.85	5.73	5.58	5.51
5	7/14/2004	6.78	6.94	6.98	6.96	6.12	5.48	5.31	5.09	4.87
5	9/24/2004	6.37	6.50	6.55	6.58	6.59	6.56	6.54	6.48	6.40
5	9/30/2004	6.57	6.62	6.69	6.73	6.77	6.76	6.74	6.73	6.65
5	10/5/2004	7.38	7.29	7.24	7.17	7.12	7.08	7.01	6.75	
5	10/13/2004	7.17	7.09	7.07	7.05	7.04	7.02	7.00	6.97	6.94
5	10/19/2004	7.38	7.29	7.22	7.18	7.15	7.13	7.11	7.07	7.05
5	11/5/2004	7.05	6.99	6.96	6.94	6.92	6.90	6.89	6.89	6.93
5	6/1/2005	6.86	6.86	6.66	6.24	6.06	5.93	5.81		
5	7/20/2005	6.92	7.02	7.04	7.03	6.25	6.04	5.96	5.73	5.51
5	8/11/2005	6.79	6.87	6.93	6.99	6.97	5.90	5.78		
5	10/6/2005	7.07	7.06	7.04	7.02	7.02	7.01	7.02	7.01	
5	10/20/2005	7.13	7.11	7.06	7.05	7.03	7.03	7.03		
5	11/17/2005	6.96	6.95	6.94	6.93	6.92	6.92	6.92		
5	6/14/2006	7.06	6.84	6.32	5.91	5.56	5.37	5.91		
5	9/18/2006	6.82	7.05	7.17	7.23	7.24	6.42	5.39	5.98	
5	11/16/2006	7.25	7.25	7.24	7.23	7.13	7.12	7.08	6.95	
5	6/12/2007	7.09	7.22	7.38	7.44	7.42	7.31	7.19	7.07	6.93
5	9/27/2007	6.88	6.84	6.81	6.86	6.89	6.87	6.84	6.77	6.19
5	11/2/2007	6.89	6.92	6.88	6.87	6.79	6.82	6.82	6.79	6.77
5	7/21/2008	6.91	6.96	6.99	6.93	6.88	6.84	6.78	6.72	6.55
5	11/4/2008	5.57	5.49	5.61	5.53	5.56	5.52	5.60	5.61	5.55
5	6/1/2009	6.57	6.64	6.52	6.43	6.32	6.03	5.93	5.84	5.80
5	9/9/2009	8.20	8.14	8.11	8.10	7.93	7.41	6.67	6.38	6.24
5	11/10/2009	7.50	7.49	7.48	7.46	7.45	7.43	7.42	7.42	7.42
5	10/26/2011	6.49	6.66	6.72	6.80	6.83	6.84	6.85	6.87	6.72
5	8/28/2012	8.57	8.57	8.58	8.51	8.03	6.69	6.52	6.42	6.35
5	10/30/2012	7.63	7.59	7.54	7.49	7.48	7.44	7.41	7.35	7.30
5	8/21/2013	8.68	8.65	8.62	8.62	8.17	7.20	6.86	6.41	6.18
5	10/29/2013	6.99	7.05	7.02	7.03	6.96	6.90	6.82	6.79	6.80
5	7/24/2014	8.74	8.73	8.77	8.68	8.59	7.96	7.64	7.15	7.06
5	10/30/2014	7.81	7.84	7.82	7.86	7.81	7.80	7.86	7.91	8.00
5	7/9/2015	8.19	8.25	8.27	8.22	8.10	7.97	6.94	7.25	
5	10/22/2015	7.54	7.54	7.61	7.61	7.64	7.68	7.75	7.93	7.75
5	9/27/2018	7.63	7.63	7.61	7.52	7.51	7.52	7.53	7.47	7.03
5	11/17/2018	6.36	6.45	6.46	6.41	6.36	6.41	6.39	6.39	6.33
5	7/30/2019	7.83	7.84	7.83	6.88	6.75	6.66	6.62	6.59	6.60
5	10/30/2019	6.91	6.93	6.96	6.92	6.91	6.90	6.91	6.89	6.89

Historical White King Pond Monitoring Data - pH
White King Mine

Station	Date/Depth (m)	pH (S.U.)			
		1 m	2 m	3 m	4 m
6	6/18/2003	6.93	6.97	6.98	
6	9/5/2003	7.30	7.33		
6	10/16/2003	6.52	6.52	6.52	
6	11/6/2003	6.41	6.41		
6	6/4/2004	7.01	7.04	7.02	
6	7/14/2004	7.00	7.15		
6	9/24/2004	6.67	6.66		
6	9/30/2004	6.84	6.85		
6	10/5/2004	6.96	6.97		
6	10/13/2004	7.01	7.02		
6	10/19/2004	6.96	6.95		
6	11/5/2004	6.85	6.84		
6	6/1/2005	6.83	6.85	6.50	5.95
6	7/20/2005	7.01	7.06		
6	8/11/2005	6.92	6.98		
6	10/6/2005	6.95	6.95		
6	10/20/2005	7.01	6.98		
6	11/17/2005	6.92	6.91	6.91	
6	6/14/2006	7.49	6.88		
6	9/18/2006	7.34	7.40	7.37	
6	11/16/2006	7.05	6.99		
6	6/12/2007	7.74	7.76	7.76	
6	9/27/2007	6.61	6.68	6.76	
6	11/2/2007	6.93	6.74	6.85	
6	7/21/2008	7.36	7.45	7.16	
6	11/4/2008	5.66	5.61	5.60	
6	6/1/2009	6.24	6.32	6.18	
6	9/9/2009	7.83	7.93	8.01	
6	11/10/2009	7.43	7.43	7.42	
6	10/26/2011	7.00	7.01	7.04	
6	8/28/2012	8.51	8.47	8.50	
6	10/30/2012	7.44	7.44	7.43	
6	8/21/2013	8.68	8.62	8.62	
6	10/29/2013	7.02	7.06	6.98	
6	7/24/2014	8.77	8.78	9.11	
6	10/30/2014	7.85	7.83	7.88	
6	7/9/2015	8.27	8.37	8.39	
6	10/22/2015	7.82	7.81	7.81	
6	9/27/2018	7.39	7.42	7.39	
6	11/17/2018	6.65	6.46	6.21	
6	7/30/2019	7.87	7.88	7.87	
6	10/30/2019	6.86	6.87	6.89	

Historical White King Pond Monitoring Data - pH
White King Mine

Station	Date/Depth (m)	pH (S.U.)		
		1 m	2 m	3 m
7	6/18/2003	7.02	7.13	
7	9/5/2003	7.42	7.47	
7	10/16/2003	6.43	6.51	
7	11/6/2003	6.13	6.38	
7	6/4/2004	7.08	7.08	
7	7/14/2004	7.21	7.24	
7	9/24/2004	6.75	6.77	
7	9/30/2004	6.91	6.95	
7	10/5/2004	7.01	7.09	
7	10/13/2004	7.08	7.08	
7	10/19/2004	6.94	6.93	
7	11/5/2004	6.83	6.83	
7	6/1/2005	6.81	6.87	6.90
7	7/20/2005	7.21	7.24	
7	8/11/2005	7.10	7.13	
7	10/6/2005	7.00	7.00	
7	10/20/2005	7.03	7.03	
7	11/17/2005	6.92	6.92	
7	6/14/2006	7.64	7.22	
7	9/18/2006	7.05	7.28	
7	11/16/2006	7.03	7.03	
7	6/12/2007	7.84	7.80	
7	9/27/2007	6.95	7.09	
7	11/2/2007	6.81	6.83	
7	7/21/2008	7.70	7.54	
7	11/4/2008	5.65	5.61	
7	6/1/2009	6.66	6.70	
7	9/9/2009	8.12	8.07	
7	11/10/2009	7.50	7.49	
7	10/26/2011	7.14	7.12	
7	8/28/2012	8.53	8.47	
7	10/30/2012	7.47	7.47	
7	8/21/2013	8.57	8.45	
7	10/29/2013	7.10	7.05	
7	7/24/2014	8.85	9.09	
7	10/30/2014	7.90	7.98	
7	7/9/2015	8.18	8.16	
7	10/22/2015	7.80	7.83	
7	9/27/2018	6.84	6.85	
7	11/17/2018	6.48	6.52	
7	7/30/2019	7.54	7.67	
7	10/30/2019	6.23	6.21	