

**FIRST FIVE-YEAR REVIEW REPORT
HOLDEN MINE SITE
OKANOGAN-WENATCHEE NATIONAL FOREST
CHELAN COUNTY, WASHINGTON**



Prepared by:

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ACRONYMS AND ABBREVIATIONS:

ASFS	Addendum to the Supplemental Feasibility Study
AMD	Acid Mine Drainage
AOIs	Areas of Interest
ARARs	Applicable or Relevant and Appropriate Requirements
ARD	Acid Rock Drainage
AOC	Administrative Order on Consent
BMP	Best Management Practices
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLs	Cleanup Levels
CPOCs	Contaminants of Potential Concern
COCs	Contaminants of Concern
DSHH	Downslope of Honeymoon Heights
DRI	Draft Remedial Investigation
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ECSWPPP	Site-Wide Erosion Control and Storm-water Pollution Prevention Plan
FS	Feasibility Study
Forest Service	United States Department of Agriculture Forest Service
FYR	Five Year Review
GCL	Geosynthetic Clay Liner
HHWRP	Honeymoon Heights Waste Rock Piles
HHRA	Human Health Risk Assessment
ICs	Institutional Controls
ICIAP	Institutional Control Implementation and Assurance Plan

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LWA	Lower West Area
MCLs	Maximum Contaminant Levels
MTCA	Model Toxics Control Act
NPDES	National Pollution Discharge Elimination System
NPL	National Priority List
NWQC	National Recommended Water Quality Criteria
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	Operable Unit
O&M	Operations and Maintenance
OMMP	Operations, Maintenance, and Monitoring Plan
PRP	Potential Responsible Party
PSVP	Performance Standards Verification Plan
RA	Remedial Action
RAO	Remedial Action Objectives
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SFCMF	Sludge Filter Cake Management Facility
SFS	Supplemental Feasibility Study
SOW	Statement of Work
TPs	Tailing Piles
UAO	Unilateral Administrative Order
UU/UE	Unlimited Use and Unrestricted Exposure
WMAs	Waste Management Areas
WTP	Water Treatment Plant

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EXECUTIVE SUMMARY

This document summarizes the first five-year review (FYR) for the Holden Mine Site (Site) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Holden Mine is an abandoned copper mine located approximately 9 miles west of Lake Chelan in the Railroad Creek Valley, in the Okanogan-Wenatchee National Forest, in Chelan County, WA. This mine remediation is the largest and most complex single mine cleanup project being conducted under CERCLA in the United States Department of Agriculture Forest Service (Forest Service) Pacific Northwest Region.

Ore extracted and processed from the Holden Mine produced copper concentrate and other valuable minerals. As a result of the separation process millions of tons of tailings were deposited in large impoundments (referred as tailing piles) directly south of and adjacent to Railroad Creek, on the National Forest (and portions of the adjacent private land). Tailing piles composed of reactive minerals and toxic metals leached out into the surrounding environment contaminating groundwater and surface water.

The Forest Service and the United States Environmental Protection Agency (EPA) identified the need for remedial actions at the Site several years ago. From 1989 to 1991, the Forest Service took interim actions to prevent the tailings piles at the Site from eroding into Railroad Creek or being distributed by the wind. On April 5, 2000, the Forest Service, acting in collaboration with the EPA and the Washington State Department of Ecology (Ecology), entered into an Administrative Order on Consent (AOC) with Alumet Corporation (Alumet), requiring the company to investigate and remediate the Site. As noted below, Alumet was the successor to Howe Sound Company, which operated the Holden Mine from 1938 until 1957.

The Forest Service and the EPA issued a Record of Decision (ROD) in January 2012 identifying the selected remedy for the cleanup of the Site using their authority under CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The State of Washington concurred with the selected remedy as it satisfied Ecology's criteria for selecting a cleanup action under the Model Toxics Control Act (MTCA).

The ROD provides for a comprehensive cleanup of the Site, and the selected remedy is set forth more particularly in the Statement of Work (SOW) that is part of the CERCLA Unilateral Administrative Order (UAO) that the Forest Service and EPA issued to Intalco Aluminum Corporation (Intalco), the successor to Alumet, in 2012. The remedy selected in the ROD would reduce the potential risk of exposure to humans and ecological receptors to soils, groundwater, surface water, and sediments contaminated by hazardous substances including arsenic, cadmium, copper, lead, zinc, iron compounds, aluminum compounds, and petroleum hydrocarbons.

The principal components of the selected remedy include containment, collection, and treatment of impacted groundwater; consolidation and capping of tailings, waste rock, and some impacted soil; *in situ* soil remediation of some areas of impacted soil; surface water and sediment cleanup actions; and institutional controls.

As more fully described in the ROD, the selected remedy is being implemented in two phases, including early works to prepare for the two major phases of construction. Implementation of Phase 1, which includes the majority of the remedial tasks, started in spring 2013 and is expected to be substantially completed by the end of 2018. The second phase of the remedy will include construction of an additional section of the groundwater barrier wall and correspondent collection system upgradient of the barrier. During the interval between these phases, the ROD allows Intalco to undertake three years of monitoring to attempt to demonstrate that groundwater at the site meets surface-water cleanup standards in specified locations and certain other conditions. If these conditions are met, then an Agency decision to permit either modification or elimination of Phase 2 may be appropriate. Otherwise, Phase 2 design and construction will follow in the fourth and fifth years following completion of Phase 1 (2022 and 2023), respectively.

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Response actions implemented at the Site during 2013 – 2018 have reduced risks, including the following:

- Reduced risks to terrestrial plants and animals by capping the tailings, waste rock piles, and several other areas.
- Reduced risks to Railroad Creek by regrading and stabilizing the tailings piles that lie adjacent to the creek.
- Reduced risks to aquatic plants and animals by intercepting and treating contaminated groundwater from the underground mine workings and from beneath a portion of the tailings piles.

Phase 1 response actions will be maintained as described in the *Phase 1 Operations, Maintenance, and Monitoring Plan* (OMMP) and the *Operations and Maintenance of Manual (O&M Manual) for the Water Treatment Plant* (WTP).

A monitoring plan to assess the performance of Phase 1 of the remedy (the Performance Standards Verification Plan) is being developed and is expected to be implemented beginning in 2019.

Other components of the remedy that remain to be implemented include establishment of institutional controls (signage, environmental covenant, etc.) and evaluation of in situ soil treatability studies to potentially address risk to plants and wildlife in areas not amenable to conventional remedial actions.

1.0 INTRODUCTION

The purpose of a FYR is to evaluate the implementation and performance of a remedy in order 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 Forest Service is preparing this FYR pursuant to CERCLA Section 121, consistent with the NCP (40 CFR § 300.430(f)(4)(ii)) and guidance and policies of the EPA. This is the first FYR for the Site. The triggering action for this statutory review is the on-site construction start date of the remedial action. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for Unlimited Use and Unrestricted Exposure (UU/UE).

The Forest Service is the lead agency for oversight of the remedial action, with assistance from Hart Crowser consultants. Contributors included Mario Isaias-Vera, Remedial Project Manager (RPM) for the Forest Service - Region Six, Mark Dagele, Senior Associate for Hart Crowser, and staff from the Chelan Ranger District, Okanogan-Wenatchee National Forest.

The FYR was submitted for review and comment to EPA, Ecology, and the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation). Other interested parties that were also notified of the initiation of the FYR report included the responsible party (Intalco/Rio Tinto), and the communities of Holden Village, WA, Wenatchee, WA, and Chelan, WA. The site inspection began on 10/3/2017 with a tour of the recently constructed Mine Water Treatment Plant, and other site inspections occurred during the month of October, 2017.

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1.1 Site Background

Holden Mine is a former and inactive underground copper mine located approximately 9 miles west of Lake Chelan in the Railroad Creek Valley in Chelan County on the eastern slopes of the Cascade Mountains in Washington State (see figure 1). Developed and operated by the Howe Sound Mining Company (Howe Sound) between 1937 and 1957, the mine lies within the Okanogan-Wenatchee National Forest except for about 235 acres of patented mining claims owned by Holden Village.

The Site includes an area of approximately 125 acres impacted by direct releases of hazardous substances from the mine. Major features of the mine site included a former mill building, approximately 8.5 million tons of tailings piles, and about 250,000 tons of waste rock piles (see figures 2 and 3). The main portal of the mine and the former mill building were located on the south side of the valley, near the base of a relatively steep valley slope. The waste rock piles and tailings piles, now covered on site by processed soil and rock mulch, riprap, and recently planted vegetation, are located south of and adjacent to Railroad Creek.

During development of the approximately 57 miles of underground workings (see figure 4), Howe Sound removed approximately 300,000 cubic yards of waste rock from the tunnels and deposited this material in two waste rock piles. Ore was extracted from the mine and processed onsite to produce over 90,000 tons of copper concentrate that was shipped off site for smelting. Roughly 8.5 million tons of tailings were produced as a byproduct of the milling operations, most of which were deposited in three large impoundments (Tailing Piles 1, 2, and 3) directly south of and adjacent to Railroad Creek, in the National Forest (see figure 5). Tailing Piles consist of reactive minerals (most notably iron sulfide) and toxic metals. Toxic metals detected in the groundwater included aluminum, cadmium, copper, iron, and zinc.

In 1960 Howe Sound transferred property it owned at the Site to the Lutheran Bible Institute, which, in 1961, transferred this property to Holden Village. Holden Village currently owns the land where the mill facility ruins were located, the land containing the ore body, and the portions of the tailings and waste rock piles not located on National Forest System land (the Honeymoon Heights).



Figure 1. Location of the Holden Mine.

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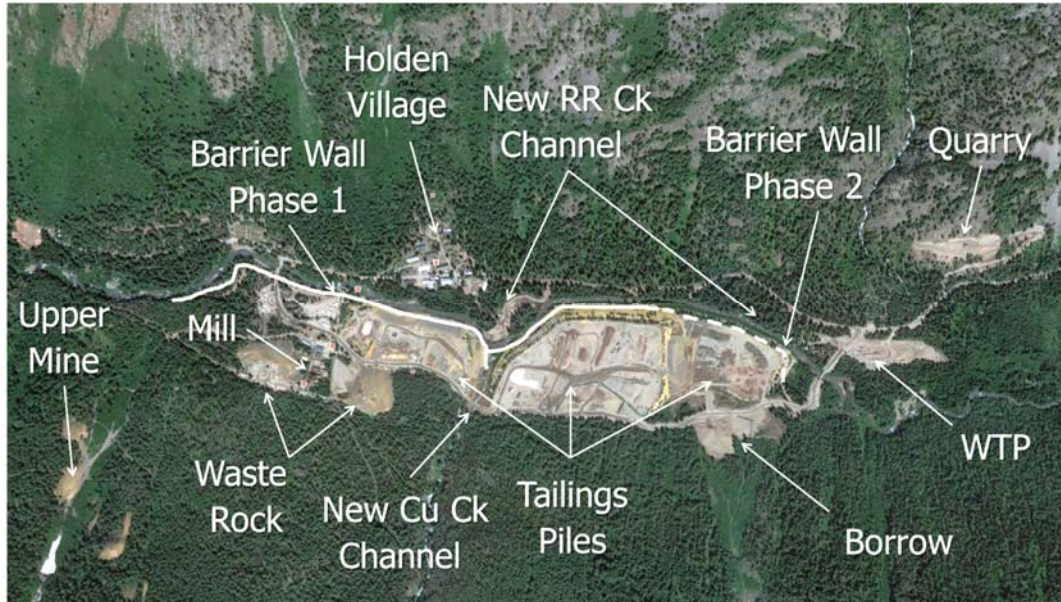


Figure 2. Features at the Holden Mine Site.



Figure 3. View of the Former Mill Building, Tailings Piles, and Waste Rock Piles.

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1.2 Five-Year Review Summary Form

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Holden Mine Site		
EPA ID: WA9122307672		
Region: 10	State: WA	City/County: Chelan County
SITE STATUS		
NPL Status: Non-NPL		
Multiple OUs? No	Has the site achieved construction completion? No	
REVIEW STATUS		
Lead agency: USDA Forest Service		
Author name: Mario A. Isaias-Vera, Environmental Engineer/Remedial Project Manager		
Author affiliation: USDA Forest Service, Pacific Northwest Region		
Review period: 5/13/2013 - 5/13/2018		
Date of site inspection: 10/3/2017		
Type of review: Policy		
Review number: 1		
Triggering action date: 5/13/2013		
Due date (five years after triggering action date): 5/13/2018		

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2.0 RESPONSE ACTION SUMMARY

2.1 Basis for Taking Action

The selected remedy for the Site addresses the ongoing releases of significant contamination resulting from past mining activities, including but not limited to contamination associated with the mine portal as well as the tailings and waste rock piles generated by the mining activity. Hazardous substances from these sources have impacted aquatic life in Railroad Creek and pose a risk to plants and wildlife in the Railroad Creek valley, and have represented unacceptable risks to human health and the environment.

These sources have had substantial adverse effects on groundwater and surface water quality. Before implementation of the remedy, surface water in Railroad Creek had concentrations of hazardous substances above aquatic life protection criteria over several miles of distance downstream of the mine site. Vegetation was visibly distressed in wetlands and in areas impacted by the tailings piles. Concentrations of contaminants in seeps flowing into the creek were up to several orders of magnitude above cleanup levels.

Surface water and groundwater are the primary pathways for the transport and release of Contaminants of Concern (COCs) at the Site. Surface water and groundwater on the Site are generally controlled by the physical conditions of the watershed, including the natural topography, geology, and climate as well as mine-related alterations to the topography and geology.

Soil contained concentrations of hazardous substances that exceeded regulatory levels for the protection of human health or the environment (via ingestion and dermal absorption). In addition, leachate from tailings piles resulted in high concentrations of hazardous substances impacting groundwater that discharges to surface water. The primary COCs included aluminum, arsenic, cadmium, copper, iron, zinc, and lead. Soil in the former vehicle Maintenance Yard had also been impacted by petroleum hydrocarbons such as gasoline, diesel fuel, or heavy oils. Terrestrial hazard quotients ranged up to 300 for various COCs.

Wind-blown (dust) tailings expanded the Site footprint and may have posed possible health risks at the Site, but this pathway was largely addressed by early actions taken by the Forest Service, which subsequently conducted an air quality study in 1994 that identified concentrations of airborne Contaminant of Potential Concern (CPOCs) below EPA risk-based concentrations. The human health risk assessment (HHRA) performed as part of the Draft Remedial Investigation (DRI) concluded that the inhalation pathway is incomplete and, therefore, there are no significant human health risks related to the soil to air pathway; provided a cap is maintained on the tailings to prevent generation of wind-blown tailings.

Groundwater contaminants have exceeded regulatory levels for drinking water or levels that are protective of aquatic organisms in Railroad Creek for aluminum, cadmium, copper, iron, lead, and/or zinc at a number of locations at the Site, most notably from the Main Portal, seeps, Tailings Piles 1, 2, and 3, the East and West Waste Rock Piles, the Honeymoon Heights Waste Rock Piles, and the Lower West Area.

Surface water in Railroad Creek has been impacted by groundwater discharges from the Main Portal, and contact with tailings and discrete seeps. Groundwater draining from the Main Portal contains concentrations of hazardous substances that exceed state and federal chronic toxicity water quality criteria for the protection of aquatic life.

Iron precipitates had formed in Railroad Creek from the release of ferric sulfate and other hazardous substances from the tailings piles. Observed effects included ferricrete and iron and aluminum flocculent, which fills interstitial pore space in the sediment and coats gravel, cobbles, and boulders in the stream channel. The ferricrete and flocculent had caused damage to the aquatic habitat.

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Releases from the Site had resulted in concentrations of hazardous substances in sediments in Railroad Creek and the Lucerne Bar that exceeded values considered by the state to be protective for freshwater sediments for a number of hazardous substances. COCs for sediments include aluminum, cadmium, chromium, copper, iron, silver, and zinc.

Railroad Creek is the second largest hydrologic source to Lake Chelan and contributes approximately 10 percent of the annual basin input. The area where the mine operated is the largest of only a few floodplain valley reaches in the Railroad Creek drainage and one of the few floodplain valleys in the entire Lake Chelan drainage. Therefore, this floodplain valley is important to the overall ecology of the Lake Chelan Basin. The forest surrounding the Site provides key habitat for riparian-dependent species and important resources for both riparian and upland species.

From 1989 to 1991, the Forest Service took actions to prevent the tailings piles at the Site from eroding into Railroad Creek or being distributed by the wind. The Forest Service, acting in coordination with the EPA and Ecology, subsequently entered into an Administrative Order on Consent (AOC) with Alumet, requiring the company to investigate and remediate the Site.

Between 1998 and 2004, Intalco, successor to Alumet, conducted a Remedial Investigation (RI) and prepared a Feasibility Study (FS) Report that presented several remedial alternatives. Upon review of these studies, the Agencies determined that none of the alternatives presented in the FS were adequate. The Agencies developed and evaluated additional remedial alternatives presented as the Supplemental Feasibility Study (SFS).

In 2008, Intalco proposed alternative remedial components. The Agencies identified additional information necessary to evaluate these new alternatives. In 2008 and 2009, Intalco conducted additional site investigation activities to address data gaps identified by the Agencies.¹

On June 1, 2010, the Forest Service issued the Addendum to the Supplemental Feasibility Study (ASFS) to incorporate the findings of these supplemental investigations. Concurrently, the Agencies issued a Proposed Plan identifying the preferred remedial alternative (Alternative 14) and published it for public comment. On January 27, 2012, the Agencies issued the ROD pursuant to CERCLA and the NCP. The ROD set forth the final selected remedy and included the Agencies' responses to public comments. The Washington State Department of Ecology concurred with the selected remedy pursuant to the MTCA.

On June 26, 2012, the Forest Service and EPA issued to Intalco the CERCLA UAO directing Intalco to develop the Remedial Design for the remedy described in the ROD and to implement the Remedial Design by performing the Remedial Action, Operation and Maintenance, and other work required by the UAO.

The ROD provides for a comprehensive cleanup of the Site and the required remedial action is set forth more particularly in the UAO (including the UAO's statement of work). The selected remedy includes implementation of the following major components:

- Containment, collection, and treatment of impacted groundwater;
- Consolidation and capping of tailings, waste rock, and impacted soil;
- *In situ* remediation of some areas of impacted soil;
- Surface water and sediment cleanup actions (i.e., tailings stabilization and relocation of a portion of Railroad Creek); and
- Institutional controls.

¹ "Agencies" refers to the USDA Forest Service, the US Environmental Protection Agency, and the Washington State Department of Ecology.

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The remedy selected in the ROD would reduce significantly the potential risk of exposure to humans and ecological receptors to soils, groundwater, and surface water contaminated by hazardous substances including arsenic, cadmium, copper, lead, zinc, iron compounds, and aluminum compounds. The ROD describes that the selected remedy would be implemented in phases, including an early works phase to prepare for two major phases of construction. Phase 1, which includes the majority of the remedial action tasks, has been in progress since spring 2013 and it is expected to be substantially completed by the end of 2018. The ROD specified a 5-year interval between Phase 1 and Phase 2.² Consequently, implementation of Phase 2 is expected to begin in 2023.

Phase 1 of the remedy includes regrading and capping the tailings and main waste rock piles, construction of a groundwater barrier wall and groundwater collection system around Tailings Pile 1 and the Lower West Area (LWA), construction of a new groundwater treatment facility, beginning *in-situ* soil treatment in areas of interest (AOI), and implementing Institutional Controls and initiating Performance Verification monitoring. Currently, most tasks under Phase 1 have been executed and implemented; however *In-situ* treatment is a remedy component that is still under technical review and consideration for implementation due to environmental constraints, potential destruction of established forests and habitats, rough topography, and practicability of the remedy.

Phase 2 of the remedy includes extending the Phase 1 barrier wall and groundwater collection system to encompass the uncontained portions of Tailings Piles 2 and 3, and possibly expansion of the groundwater treatment facility.

² The period between the first and second phases presents an opportunity for Intalco to collect data and to seek to modify the second phase if warranted. The ROD allows for the collection of additional data following implementation of the first phase of cleanup, and includes the provision that the barrier wall design could be modified or eliminated if the phase 1 work was demonstrated to be sufficiently protective as specified in the ROD.

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2.2 Remedial Action Objectives

The Remedial Action Objectives (RAOs) as defined in the ROD for the Remedial Design/Remedial Action (RD/RA) are:

1. Protection of Aquatic Life: Reduce concentrations of COC to levels that are protective of aquatic life; complying with applicable or relevant and appropriate requirements (ARARs) in Railroad Creek and other surface waters.
2. Mitigation of Sediments: Reduce exposure to contaminants of concern in sediments, including the adverse effects of ferricrete on aquatic life in Railroad Creek, to protect aquatic life; complying with ARARs.
3. Protection of Groundwater: Prevent migration of COC that exceed cleanup levels in groundwater, including the Main Portal discharge and the on-site waste management areas (WMAs), to protect aquatic life; complying with ARARs.
4. Prevent Migration of COCs that exceed Cleanup Levels: Reduce exposure to COC in soil, including tailings and other wastes, to protect terrestrial organisms; complying with ARARs. Prevent future releases of tailings and other wastes into surface water to protect aquatic receptors from COC.
5. Protection of Human health: Protect human health and comply with ARARs by reducing human exposure to COC in soil and other wastes, controlling exposure to contaminated groundwater, and by restoring groundwater beyond the WMAs to its beneficial use as a drinking water resource.
6. Compliance with ARARs: Implement the remedial action in a manner that complies with ARARs and protects human health, welfare, and the environment, including the Holden Village residential community during and after construction.

Besides meeting the RAOs and performance standards, the selected remedy must be implemented in accordance with various ARARs. ARARs generally fall into one of three categories: ambient or chemical-specific requirements, performance, design or other action-specific requirements, and location-specific requirements. ARARs are defined in the NCP (40 CFR § 300.5) as follows:

- Applicable requirements means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.
- Relevant and appropriate requirements means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a site that their use is well suited to the Site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.

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2.3 Regulatory Requirements

The selected remedy attains the mandates of Section 121 of CERCLA, 42 U.S.C. § 9621 and the NCP. The selected remedy will:

- Be protective of human health and the environment;
- Comply with ARARs, unless a waiver is justified;
- Be cost-effective;
- Use permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable; and
- Satisfy the statutory preference for treatment as a principal element of the remedy (i.e., which permanently and significantly reduces the toxicity, mobility, or volume of hazardous substances as a principal element through treatment).

Soil: Soil exceeding cleanup levels would be addressed through a combination of removal, containment, in situ soil treatment, and monitoring. The selected remedy is expected to meet chemical specific ARARs for soil established under the MTCA.

Under the MTCA, soil cleanup levels and points of compliance are established separately for human exposure via direct contact, the protection of groundwater, and the protection of terrestrial ecological receptors [WAC 173-340-740]. The MTCA point of compliance for soil based on human exposure via direct contact is from the surface of the soil to 15 feet below the ground surface. However, capping and/or institutional controls will be established at various locations at the Site to prohibit excavation and other activities to eliminate the direct contact exposure pathway for humans.

A point of compliance for soils has been established based on risk to terrestrial ecological receptors. This point of compliance is the biologically active zone, which is assumed to extend to a depth of 6 feet, or a site-specific depth based on a demonstration that an alternative depth is appropriate per WAC 173-340-7490(4)(a). Soil cleanup to protect downgradient groundwater, surface water, and sediment is required wherever soils exceed criteria and are not within a groundwater containment area [WAC 173-340-740(1)(d)].

Surface water: The selected remedy is expected to satisfy potential chemical-specific ARARs for surface water including the National Recommended Water Quality Criteria (NWQC), National Toxics Rule, Maximum Contaminant Levels (MCLs), Washington State Drinking Water Standards, Washington State Water Quality Standards for Surface Water, and Ecology's MTCA regulations.

The point of compliance for surface water cleanup levels is the point or points where the release enters the surface waters, unless Ecology has authorized a mixing zone [WAC 173-340-730(6)]. MTCA does not allow a mixing zone for groundwater discharges into surface water [WAC 173-340-720(8)(d)(i)(C)].

Groundwater: The groundwater barrier wall will provide containment so that the areas within the wall qualifies for designation as a Waste Management Area (WMA). Without these WMAs, MCLs would need to be met throughout the Site. Groundwater exceeding MCLs would be contained within WMAs. Following implementation, the Remedial Action alternative is expected to meet chemical-specific ARARs for groundwater in areas at and beyond the edge of the WMAs.

CERCLA and the NCP provide that groundwater should be returned to its beneficial use within a reasonable time frame whenever practicable. When restoration of groundwater is not practicable, it is necessary to prevent further migration of the plume and to prevent exposure to the contaminated groundwater [40 CFR § 300.430(a)(2)]. The NCP provides that groundwater cleanup levels should generally be attained throughout the contaminated plume. However, the NCP recognizes that groundwater may remain contaminated within a waste management area, and

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groundwater cleanup levels attained at and beyond the edge of the waste management area (55 Fed Reg 8712, 8753, March 8, 1990).

MTCA requires the point of compliance for groundwater be throughout the Site, from the uppermost level of the saturated zone to the lowest depth that could potentially be affected. MTCA requires that groundwater cleanup levels be attained in all groundwater from the point of compliance to the outer boundary of the hazardous substance plume [WAC 173-340-720(8)].

MTCA allows a conditional point of compliance for groundwater for limited circumstances where it is not practicable to meet the cleanup level throughout the site within a reasonable restoration time frame. The ROD provides for a conditional point of compliance such that groundwater discharging to surface water must meet surface water cleanup standards at a conditional point of compliance before the groundwater-surface water interface. Groundwater cleanup levels protective of surface water must be achieved before the portion of the hyporheic zone that supports aquatic life, including fish spawning and benthic macroinvertebrates to be protective of aquatic life, and not simply in the surface water column after dilution has occurred.

MTCA allows approval of a conditional point of compliance as close as practicable to the source of hazardous substances [WAC 173-340-720(8)(c)] and not to exceed a point located within surface water as close as technically possible to the point or points where groundwater flows into surface water [WAC 173-340-720(8)(d)(i)]. MTCA does not allow a mixing zone for groundwater discharges into surface water [WAC 173-340-720(8)(d)(i)(C)].

CERCLA and MTCA both require protection of all affected media and receptors, including those aquatic receptors in the hyporheic zone. Cross-media impacts must be considered and cleanup levels must be established at concentrations that prevent violations of cleanup levels for other media (WAC 173-340-700(6)(b) and 173-340-702(8)). At the Holden Mine Site, this means that cleanup levels established for the protection of aquatic life must be achieved before the portion of the hyporheic zone that supports aquatic life, including fish spawning and benthic macroinvertebrates, and not simply in the surface water column after dilution has occurred. Based on this, a POC for groundwater entering into surface water (which is a conditional POC under MTCA) is established within groundwater before (i.e., hydraulically upgradient of) the groundwater-surface water interface. Groundwater quality at this POC shall be monitored using upland monitoring wells.

Permits:

CERCLA Section 121(e)(1) states that “no Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely on-site where such remedial action is selected and carried out in compliance with [Section 121].” 42 U.S.C. § 9621(e)(1). The term “on-site” is clarified in the NCP at 40 C.F.R. § 300.5, which states that “on-site means the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action.”

The Agencies have determined that the Site includes the Railroad Creek valley from the Ballfield Area west of the Holden Mine to the area of contaminated Lake Chelan sediment at Lucerne. The Agencies will determine the substantive requirements that are to be met in lieu of permits that otherwise would be required for implementation of the remedy within this on-site area.

National Pollutant Discharge Elimination System – ARAR applicable to the Water Treatment Plant

The conditions of the National Pollutant Discharge Elimination System (NPDES) permit must meet state water quality standards and other requirements of the state water pollution control act. The NPDES permits address water pollution from point sources into surface waters like rivers, lakes, and streams. Regulations requiring the establishment of monitoring and reporting conditions in the NPDES permits are in Title 40 of the CFR §122.44(i) and §122.48. NPDES permits require the permittee to conduct routine or episodic self-monitoring of permitted

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discharges and report the analytical results to the permitting authority (in this case, the USDA Forest Service) with the information necessary to evaluate discharge characteristics and compliance status (EPA 2010).

Monitoring is used to: 1) determine compliance with effluent limitations established in NPDES permits, 2) establish a basis for enforcement actions, 3) assess treatment efficiency, and 4) characterize effluents and receiving water. Permittees are required to monitor pollutant mass and effluent volume, and to provide other measurements using the test methods established at Part 136. All permits must specify the monitoring type, intervals, and frequency sufficient to yield data that are representative of the activity and must also specify requirements concerning the proper use, maintenance, and installation of monitoring equipment or methods (including biological monitoring methods when appropriate).

In July 18, 2017, the USDA Forest Service approved the O&M Manual for the Holden Mine Water Treatment Plant. The O&M Manual complies with the Washington Administrative Code for operations and maintenance manuals, WAC 173-240-150(1) and (2). The WTP is designed for removal of metals and acidity in support of the overall mine site remediation.

Beginning 2 years after the final approval date of the O&M Plan and lasting five years from the effective date of the permit, the Permittee is authorized to discharge Holden Mine Water Treatment Plant (WTP) Outfall 001 to Railroad Creek at the permitted location subject to complying with the following limits (see table 2.1 and 2.2):

Table 2.1 WTP Final Effluent Limits

COC	Total Metals Effluent Limit ($\mu\text{g/L}$)	
	MDL	AML
Aluminum	233	135
Cadmium	1.12	0.65
Copper	61	35
Iron	1643	948
Lead	30.3	17.5
Zinc	372	215

Notes:

COC = contaminant of concern

MDL = maximum daily load

AML = average monthlt load

3 State chronic freshwater criterion (WAC 173-201A)

4 National Toxics Rule 40 CFR 131.36(b)(1)

Table 2.2 Effluent Final Limits for Other Parameters.

Analyte	Units	Limit
pH	std	6.5 to 8.5
Temperature	$^{\circ}\text{C}$	7 -DAD Max of 16
DO	mg/l	9.5
TDG	% of saturation	<110
Turbidity	NTU	5 NTU over background when background is less than or equal to 50
TDS	mg/l	1,500 throughout the year with the exception of a requirement of 500 from May 01 to July 31

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°C = degrees Celsius
DO = dissolved oxygen
mg/L = milligram per liter
NTU = Nephelometric Turbidity Units
std = standard
TDG = total dissolved gas

2.4 Response Actions

2.4.1 Pre-ROD Removal Actions

Between 1989 and 1991, the Forest Service performed site response actions, including but not limited to:

- Regrading the tailings pile surfaces to increase surface water runoff.
- Constructing diversion ditches to reduce surface water run-on to the tailings piles.
- Constructing channels within the Copper Creek drainage to direct flow between Tailings Piles 1 and 2 through two culverts located at the southern edge of the piles.
- Reducing erosion of the tailings piles along Railroad Creek by placing riprap on the stream banks.
- Placing about 6 inches of gravel over the surface of the tailings piles to reduce wind-borne transport of tailings.
- Revegetating portions of the tailings piles and conducting limited revegetation studies in several test plots.
- Placing limestone rock fragments on the drainage substrate as a form of passive treatment to add alkalinity and increase the precipitation of metals from the portal drainage before it reached Railroad Creek.

In 2000, Intalco secured the mine entrances and fenced off the abandoned Mill Building to prevent trespass. Subsequently, in 2003, 2004, and 2006, Intalco completed additional time-critical stabilization measures to control erosion and repair flood damage to the tailings piles.

In 2003 and 2006, high water flows in Railroad Creek and Copper Creek eroded Tailings Piles 1 and 2 at the Site. While Intalco conducted time-critical removal actions to mitigate flow damages, significant risk remained that during major flood events Railroad Creek and Copper Creek would erode or cause partial collapses of the tailings piles.

2.4.2 Post-ROD Remedial Actions

In 2011, Rio Tinto began implementation of Intalco's responsibilities and initiated implementation of the early construction actions needed at the Site. These early activities consisted mostly of site access and infrastructure improvements that were necessary before major construction started and included development of infrastructure facilities, road improvements, building two bridges and a by-pass road, constructing hydraulic bulkheads, development of quarries and borrow sites, and establishing staging areas.

The 2011 and 2012 construction activities were performed according to the *Final 2011 Early Works Implementation Plan, Holden Mine, Chelan County, Washington* (MWH, 2011a, MWH, 2011e), and the *Draft Remedial Action Work Plan, Holden Mine, Chelan County Washington* (MWH, 2012a). Specifically, activities focused on the following:

- Establishment of temporary uplake and downlake barge facilities for transport of equipment on Lake Chelan.

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- Timbering to clear construction areas of trees and brush.
- Development of borrow sources for production of fill.
- Modifications and improvements to USFS Road 8301.
- Construction of the Holden Village Bypass Road.
- Establishment of construction laydown and staging areas, including construction of a temporary office complex.
- Construction of equipment maintenance, fueling area, and water load-out facilities.
- Construction of the Ballfield Access Road.
- Establishment of construction field offices.
- Development of the Lower East Ten-mile Creek quarry.
- Construction of bulkheads in the Main and Vent portals.
- Pilot testing of a dewatering system for the Railroad Creek Realignment.
- Cleanup of debris from around the Site.
- Construction of a temporary maintenance facility for Holden Village.
- Implementation of the Barrier Wall Geotechnical Investigation Work Plan.
- Construction material investigations.
- Well abandonment.

Rio Tinto started implementation of Remedy Components for Phase 1 in 2013 in accordance with the Final 100% Remedial Design report for Post-2012 Phase 1 (date August 2014). Under the oversight of the Forest Service, Rio Tinto received the appropriate clearances and approvals to execute the Phase 1 remedial design. The Forest Service has monitored, inspected, and supported the implementation of the remedy components through the present.

2.4.3 Description of Remedy Components for the Selected Remedy

The following remedy components for Phase 1 have been implemented at the Site or are expected to be completed by the end of 2018 (see figure 6):

- 1) Stabilization and regrading of Tailings and Waste Rock Piles.
- 2) Placement of soil cover and revegetation of the Tailings and Waste Rock Piles.
- 3) Relocation and improvements of Railroad Creek and Copper Creek.
- 4) Removal of contaminated soils and placing soil cover on portions of the Lower West Area and Lagoon.
- 5) Remediation of contaminated soil at the Maintenance Yard.
- 6) Demolition of Former Mill Building and placing soil cover over the site.
- 7) Remediation of soils at the Surface Water Retention Area.
- 8) Establishing groundwater containment and collection by building a groundwater barrier wall and groundwater collection system around the Lower West Area, Tailings Pile 1, and part of Tailings Pile 2.
- 9) Installation of Portal Bulkheads and Hydraulic Controls.
- 10) Control and diversion of surface water.
- 11) Removal of ferricrete and relocation of a segment of Railroad Creek.
- 12) Removal of tailings and replacement of soils in Wetland East of Tailing Piles 3.
- 13) Construction of a Water Treatment Plant.
- 14) Construction of other Infrastructure.

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Outstanding tasks to be initiated in 2019:

- 15) In-Situ Remediation Treatability Studies.
- 16) Establishment of Institutional Controls.
- 17) Implementation of Phase 1 Performance Monitoring.

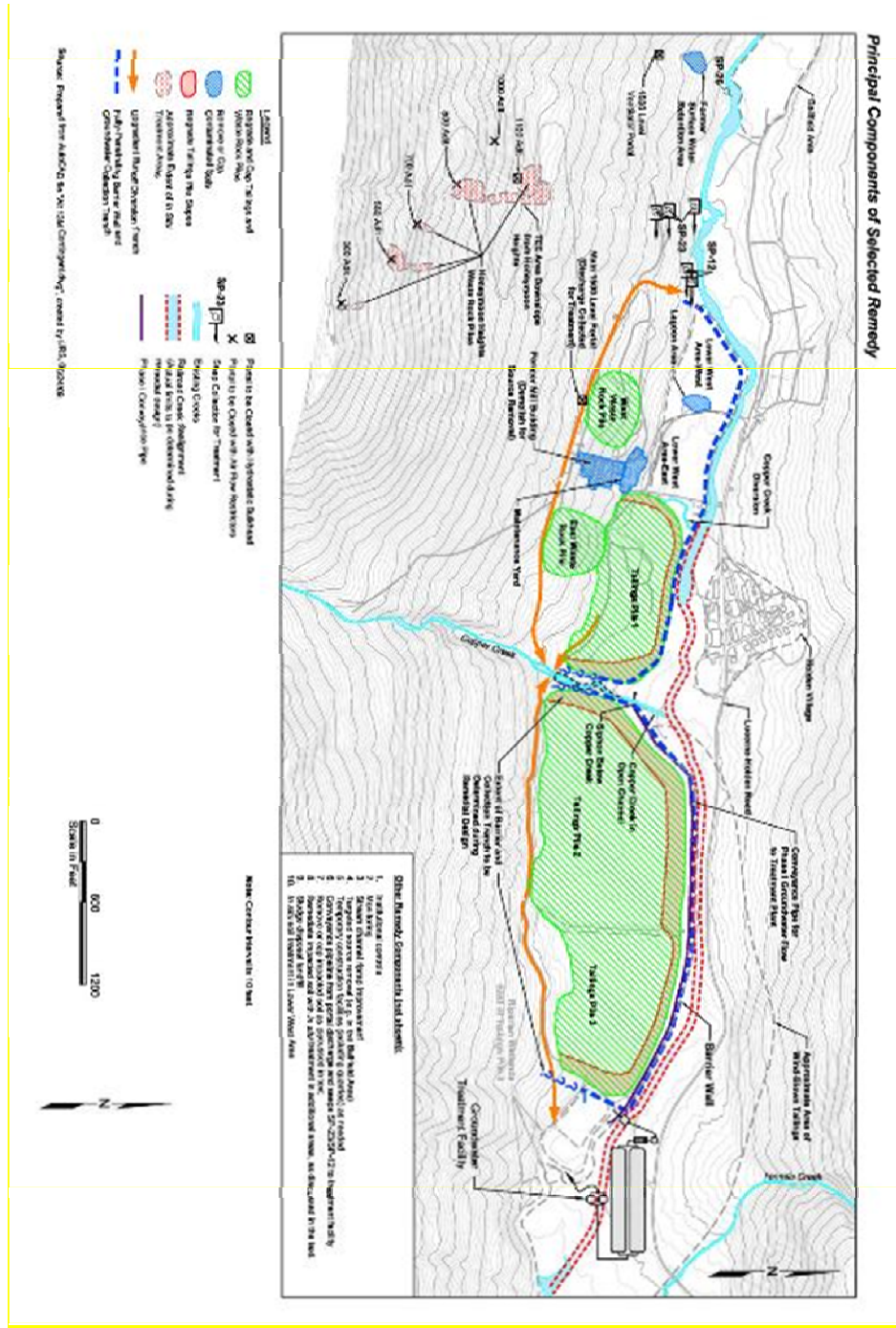


Figure 6. Remedy Components at the Holden Mine.

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Summary of Phase 1 Construction Tasks Performed at the Site:

Stabilization and regrading of Tailings Piles: Tailings Piles 1, 2, and 3 (TP-1, TP 2, and TP-3) contain approximately 8.5 million tons of material covering an area of roughly 75 acres. Piles ranged between 40 and 120 feet above and immediately adjacent to the south bank of Railroad Creek. They were unstable prior to the remediation efforts and stream banks eroded on a regular basis into Railroad Creek, contaminating it with hazardous substances. The tailings contain reactive minerals, most notably toxic metals and iron sulfide. The iron sulfide reacts with oxygen and water to produce soluble iron and sulfate; a reaction that is accompanied by the production of acidic conditions and increased solubility of a number of metals.

Tailing Piles 1, 2, and 3 were regraded, and the slopes and foundations were improved to provide greater stability under steady-state and seismic conditions. This included using earth-moving equipment to regrade the slopes to more stable conditions, contouring the surfaces to promote run-off and reduce infiltration, and constructing benches for erosion control and buttressing. Strengthening the zone of overbank deposits, on which the tailings piles were built, was a critical element to improving their stability. The overbank deposits have low shear strength and could liquefy during a seismic event. The foundation improvements included constructing 788 jet grouted in situ columns of soilcrete in TP-2 and TP-3 to provide post-earthquake stability. Following regrading and stabilization, the tailings piles were covered with an 18 to 30 inch layer of clean soil and $\frac{3}{4}$ inch mulch and re-vegetated with native shrubs and trees.

Stabilization and regrading of Waste Rock Piles: The East and West Waste Rock Piles consist of an estimated 250,000 tons of waste rock that cover an area of approximately 8 acres and range in height up to about 165 feet. These piles were regraded to configurations that are stable under steady state and seismic conditions, promoting maximum run-off and reducing infiltration. This included reducing the slope from the angle of repose to a flatter 2H:1V slope. The top and side slopes of the waste rock piles were covered with 12 to 18 inches of native soil plus 6 to 12 inches of rock mulch for erosion control, and re-vegetated with native species.

Placement of soil cover and revegetation of the Tailings and Waste Rock Piles: The use of a minimum soil cover depth and/or rock mulch, and native trees and shrubs were included in the cover design for the tailings piles and waste rock areas to support conifers and other species in the surrounding forest. The cover will protect the underlying tailings and waste rock from water and wind erosion, be maintainable, and, to the extent practical, be self-sustaining. The surface layer will also serve other purposes, such as promoting evapotranspiration, satisfying project aesthetics, and enhancing ecological objectives by providing a growth medium for vegetation.

The cover design was based on an ecological risk assessment demonstrating that a minimum 1.5 foot thick cover would be protective of plants and animals. The final cover consisted of a growth medium ranging from 1.5 to 2.5 feet thick of soil with rock smaller than 0.3 feet diameter. The cover soil was from an onsite colluvium borrow source. Slopes that are steeper than 3H:1V included a 1-foot thick layer of 3-inch rock mulch for erosion protection.

Relocation and improvements of Railroad Creek and Copper Creek: Railroad and Copper Creek had concentrations of metals above water quality standards as a result of contact with mill tailings and near-surface seeps. To provide sufficient access for construction of the reclamation components, to reduce the risk of erosion of the tailings, and to improve the stream ecosystem, two reaches of Railroad Creek approximately 3,700 feet in length combined, were relocated northward into reconstructed river channels (see figure 7). In addition, approximately 4,800 feet in length of the creek received treatment for scour protection with large diameter riprap. Approximately 1,050 feet of the Copper Creek channel, which divides TP-1 and TP-2, was modified and improved to reduce the risk of erosion of TP-1 and TP-2 and lined to reduce infiltration of clean surface water into the groundwater collection and treatment system. Railroad Creek and Copper Creek improvements began in 2012 and were substantially completed by the end of 2015.



Figure 7. Plan View of Regraded Tailing Piles and Relocation of Railroad Creek.

Removal of contaminated soils and placing soil cover on portions of the Lower West Area and Lagoon: The LWA was divided into east and west sub-areas. The eastern parcel consisted of open areas and sparse forest, while the western parcel consisted of the Lagoon area and denser forest. The Lagoon was an impoundment of approximately 1 acre that was originally constructed during the mine operation to serve as a settling basin for mine water from the 1500 Level Portal. Impacted soils in this area were either removed and placed into the TPs, or capped and managed in place.

Remediation of contaminated soils at the Maintenance Yard: Soils in this one-acre area contained elevated concentrations of metals and total petroleum hydrocarbons in the form of gasoline, diesel fuel, and motor oil. Soils exceeding clean-up standards in the Maintenance Yard area were capped and managed in place or excavated and consolidated into the tailings piles.

Demolition of Former Mill Building and placing soil cover over the site: The Mill Building and surrounding foundations and structures were demolished in 2014 and consolidated within the former Mill Building footprint to eliminate the safety risk associated with the unstable structure. Material from the West Waste Rock Pile was blended with debris and used as fill to achieve a 2H:1V slope with an average length of 180 feet.

Remediation of soils at the Surface Water Retention Area: This area is located at the west end of the site and was formerly used as a water detention pond where fine sediments in water from the mine ventilator tunnel (1100 Level) settled out and the water discharged via a decant structure. The deposited fines in this limited area had elevated concentrations of metals. Soils above agency established clean-up levels in this area were removed. The side berms around the excavation were then collapsed into the original retention depression, and the area graded to be consistent with the surrounding hillside.

Establishing groundwater containment and collection by building a groundwater barrier wall and groundwater collection system around the Lower West Area, Tailings Pile 1, and part of Tailings Pile 2: Groundwater beneath the tailings piles and along the south edges of Railroad Creek exceeds groundwater and/or surface-water regulatory levels for aluminum, cadmium, copper, iron, lead and zinc. The concentrations of these metals and the groundwater flow rate into Railroad Creek vary seasonally along the length of the three tailings piles, with greater flows observed in the spring as a result of snow melt.

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A fully penetrating groundwater barrier wall, 4,756 feet in length (approximately 0.9 miles), 3-foot wide minimum, and with depths ranging from 23 feet at the Lower West Area to 92 feet at Tailings Pile 2 (see figure 8 and 9), along with a groundwater collection system, were constructed in 2014 and 2015 around the LWA, TP-1, and a portion of TP-2.

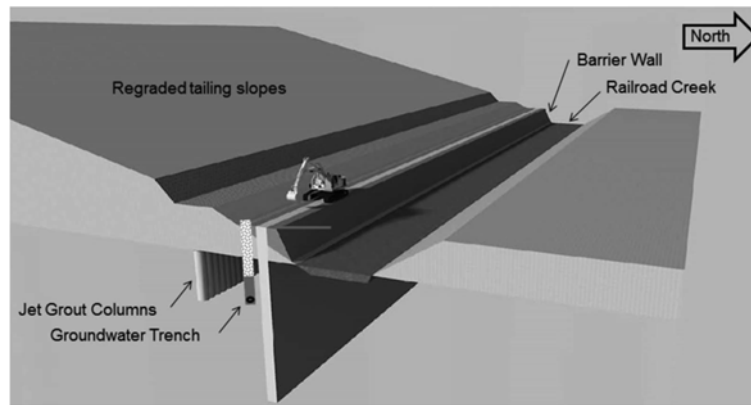


Figure 8. Sketch of Barrier Wall and Collection System at the Holden Mine Site.

Notice in Figure 8 Railroad Creek, the barrier wall, the groundwater collection trench, jet grout columns, and the tailings. The barrier wall acts and groundwater collection system as an impermeable “dam” that impedes contaminated groundwater from reaching Railroad Creek.



Figure 9. Location of the Barrier Wall at the Holden Mine Site.

Installation of Portal Bulkheads and Hydraulic Controls: Concrete bulkheads were constructed in 2014 to control flow discharges from the 1500 Level Main Portal and the 1100 Level Ventilator Tunnel. Air restricting plugs were also placed in the upper mine ventilation portals in the Honeymoon Heights area to minimize air flow through the mine, thus reducing the rate of oxidation of sulfidic materials and attenuating contaminant concentrations in the portal discharge. The Main Portal bulkhead discharge pipe (see figure 10) is equipped with a valve to allow controlled flow from the mine. The bulkheads enable the mine workings to function as a hydraulic equalization reservoir by allowing water to build up behind the bulkheads in the spring and maintain a more consistent flow from the portal to the treatment plant.

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Figure 10. Bulkhead at the Main Portal -1500 Level

Control and diversion of surface water: A network of approximately 30,710 linear feet (approximately 5.8 miles) of permanent surface water control features were built in 2015 and 2016 to control surface water run-on and run-off at the Site. This included, approximately 9,300 linear feet (approximately 1.7 miles) of riprap-lined interceptor channels to capture stormwater runoff from upstream drainage basins and divert it around the mine waste piles into Railroad or Copper creeks. The channels include both vegetation lined swales and riprap-lined trapezoidal-shaped channels to convey surface water run-off from the covered tailings piles and divert and control surface water run-on upgradient from the Tailings and Waste Rock Piles. The riprap-lined trapezoidal channels are between 4 and 5 feet wide with 2H:1V side slopes and range in gradients from 0.5 to 13 per cent.

Sediment channels were constructed on the tailings piles to collect and convey the surface water runoff from the top of the tailings piles, in order to reduce the sediment loadings to Railroad Creek until vegetation has been established. The channels include BMPs, such as temporary check dams to reduce sediment in the surface water runoff prior to discharge to Railroad Creek and to encourage the growth of vegetation.

Removal of ferricrete and relocation of a segment of Railroad Creek: Iron precipitates had formed in Railroad Creek as a result of the release of ferric sulfate and other constituents from the tailings piles and adjacent seeps. Observed effects included ferricrete (stream channel gravels cemented with an iron oxide precipitate) and iron flocculent, which filled interstitial pore space in the sediment and coated gravel, cobbles, and boulders in the stream channel. Relocation of Railroad Creek has diverted stream flow away from most areas impacted by ferricrete formation within the streambed. Some ferricrete was excavated from the streambed along certain reaches adjacent to TP-2 as part of the Railroad Creek stream diversion.

Removal of tailings and replacement of soils in Wetland East of Tailings Pile 3: A portion of a wetland, east of Tailings Pile 3 (see figure 11), was remediated because soils were adversely impacted by the presence of visible tailings along with contaminated runoff and sedimentation (as well as shallow groundwater impacted by leaching of the tailings) from the adjacent tailings pile. A layer of contaminated soils and tailings ranging from 1 to 3 feet in depth were removed and replaced with clean imported material. Native logs were placed and native wetland species were planted under supervision of a wetland specialist and Forest Service personnel.

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Figure 11. Remediation of Wetland – East of Tailing Piles 3.

Construction of a Water Treatment Plant: A notable new feature at the Site, and a major component of the remedial design, is a water treatment plant (WTP) located on the east end of the site, downgradient of TP-3, and on the north side of Railroad Creek (see figures 12 and 13) with a capacity to treat up to 2,200 gallons per minute of contaminated groundwater. The WTP remedial component construction began in 2015 and was completed in 2016.

The WTP receives contaminated water from the 1500 Level Portal, from seeps, and from the groundwater collection system behind the barrier wall. Collected water is conveyed by gravity to the WTP where it is treated for acidity and metals, then discharged to Railroad Creek. The treatment process employs high density sludge and chemical precipitation processes that utilize hydrated lime as an alkalinity source to neutralize acidity, and induce precipitation of metal oxyhydroxides. A sulfide reagent may be added as a polishing step to further reduce dissolved metals concentration. A final effluent filtration step provides additional reduction of suspended particulate metals concentrations. Precipitant dewatering is accomplished with plate and frame filter presses. Sludge management and storage facilities are included at the WTP, with final disposal at the Sludge Filter Cake Management Facility located on top of Tailings Pile 1. The anticipated flowrate of collected groundwater is between 550 and 1,400 gallons/minute; however, the treatment plant has been designed to treat up to 2,200 gallons/minute to accommodate flow from the future Phase 2 barrier wall and groundwater collection system.

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Figure 12. Water Treatment Plant at the Holden Mine Remediation Site.

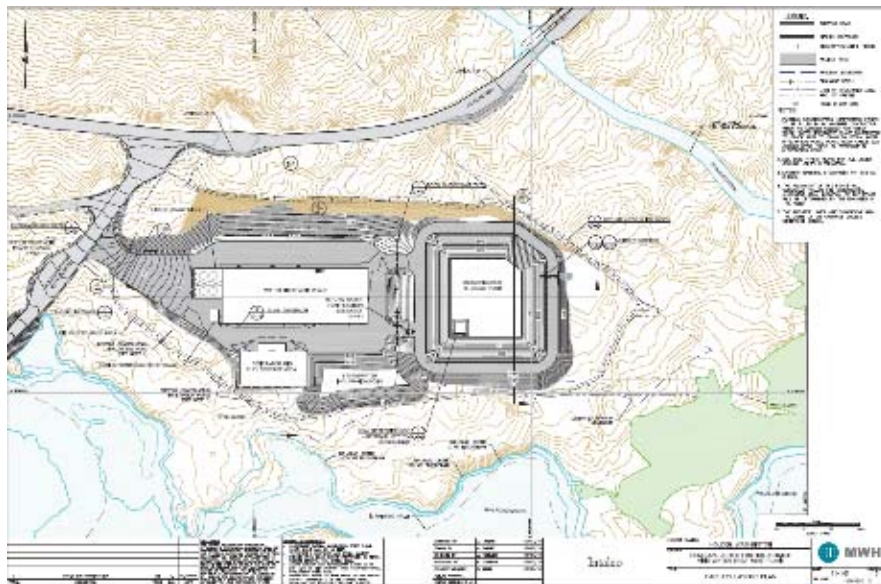


Figure 13. Map of the Water Treatment Plant

The WTP is divided into four main rooms that provide distinct functions within the overall treatment system:

1. Lime Room: The Lime Room is an access corridor for makeup water piping, lime slurry piping, and operator access to mechanical equipment at the base of each lime storage silo. It is located at the far western end of the WTP. The primary function of this room is to provide direct and safe access to the lime makeup and feed systems.

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2. Process Room: Adjacent to the Lime Room is the Process Room. The Process Room includes all the equipment necessary for treating the influent water. The DensaDeg system, Disk Filter, utility water, and future systems are all located in this room. In addition, the interior space of this area includes the Control Room, Electrical Room, Restroom, Laboratory/Sample Room, and Break Room. The primary function of this room is addition of chemicals to the influent water, the separation of solids produced during treatment, and operator support facilities.
3. Filter Press Room: Solids that are generated in the treatment process are dewatered in the Filter Press Room. This room contains solids conditioning and Filter Press equipment. The function of this room is to prepare and store Clarifier underflow solids until they are dewatered by the plate and frame Filter Presses, converting the solids from a liquid to a “cake.” Cake that is formed by the plate and frame units is manually moved from a collection point below the elevated presses to the Sludge Room.
4. The Sludge Room: The Sludge Room is an enclosed area of the treatment plant that is not heated. The area of the Sludge Room is sized to provide approximately six months of winter storage for the dewatered filter cake. Thus, dewatered residuals are stored in the Sludge Room until weather conditions in the spring allow for transfer to the permanent disposal facility on Tailings Pile 1.

The overall treatment process relies on a Return Water Storage Pond located outside and east of the WTP for operation and control of flows and parameters. It provides capacity to store influent flow that is diverted around the WTP or process water that does not meet operating specifications. Planned or unplanned maintenance activities that interrupt the primary process equipment operation results in diversion of influent to the Return Water Storage Pond. This type of diversion activity occurs when the maintenance activity is short in duration. Prolonged WTP shutdowns result in release of water at the Collection Structure to Railroad Creek to preserve capacity in the Return Water Storage Pond (See figures 14).

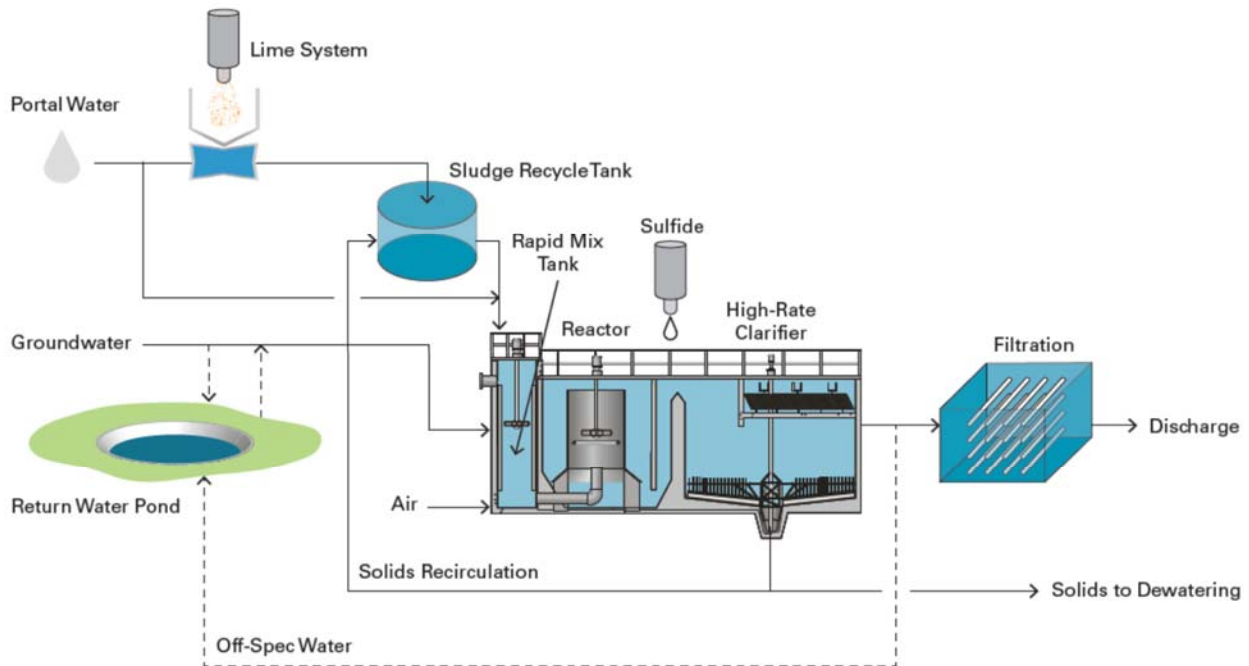


Figure 14. General Flow Diagram of the Groundwater Treatment System

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Construction of other Infrastructure: Development of other infrastructure took place from 2011 to 2017, and included: development of a quarry and borrow sites, reconstruction of the Lucerne barge landing facility, construction of temporary work camps, infrastructure improvements at Holden Village, improvements to the FS Road 8301 (Lucerne to Holden Village) including switchbacks and a new bridge, developing a network of trails and a pedestrian bridge, construction of several buildings to support Holden Village's operations, and other infrastructure. In the future, the Agencies consider development of a hydroelectric power generating capacity to be highly desirable.

In-Situ Remediation Treatability Studies: The ROD describes that soil in some AOIs will be treated by *in-situ* application of agricultural lime where soil excavation or capping is not feasible (such as steep slope areas) or where excavation or capping will cause more severe adverse impacts than the existing hazardous substances. *In-situ* treatment would adjust pH and thereby reduce bioavailability and mobility of hazardous substances in areas where critical and sensitive habitat limit or preclude more intrusive actions. The methods and rate of application will be determined by treatability test studies.

Establishment of Institutional Controls: Institutional Controls will notify the public of contaminated areas that will be left on site and will also protect the integrity of the reclamation by preventing changes in site use that would reduce the effectiveness of the remediation. A draft Institutional Controls Implementation and Assurance Plan (ICIAP) is currently under review.

Implementation of Phase 1 Performance Monitoring: Monitoring of performance elements for Phase 1 will be described in the Phase 1 Performance Standards Verification Plan (PSVP). This plan is currently being developed.

Operation & Maintenance: There are two documents that address Operation and Maintenance at the Holden Mine Site. These are the *Operations and Maintenance for the Holden Mine Water Treatment Plan*, and the *Phase 1 Operations and Maintenance Manual Plan for the Holden Mine*.

- 1) The O&M Manual for the WTP establishes the procedures and criteria for operation of the water treatment plant and the water quality criteria for effluent discharged from the plant to Railroad Creek. The O&M Manual was developed in collaboration with the Forest Service, Ecology, the EPA, and the Yakama Nation; and prepared by MWH in May 2017 and updated in July 2017 with final approval by the Forest Service in July 2017. The WTP is designed for removal of metals and acidity in support of the overall mine site remediation. The Manual complies with the Washington Administrative Code for operations and maintenance manuals, WAC 173-240-150 (1) and (2). Substantive compliance to start operating the WTP is demonstrated by the 100% Design, the manual, and the final permit.
- 2) The Phase 1 OMMP Plan will specify the activities required to maintain the "effectiveness of the Remedial Action" (USFS, 2012a). These are periodic activities that are required to support the remedy. The first draft version was prepared by Stantec Consulting Services, Inc. in January 2017 and delivered to the Forest Service soon after. The Plan is still under the review/resubmittal process and has not yet been finalized. However, the final version is expected to be completed in 2018.

The primary Phase 1 OMMP tasks will address routine and periodic inspections of remedial components and features at the Site (e.g. final cover, groundwater and seep collection, and Railroad Creek), and will include operation and maintenance on different tasks required at the site (e.g. snow removal, erosion and pollution control, surface water control, infrastructure (including roads), Sludge Filter Cake Management Facility, Main Portal and Ventilator).

3.0 FIVE-YEAR REVIEW PROCESS

3.1 Community Notification

Public notifications informing the community of the FYR process were placed in March, 2018 at several locations in the State of Washington, including the Okanogan-Wenatchee National Forest Headquarters in Wenatchee, WA, the Chelan and Entiat Ranger Stations in Chelan, WA and Entiat, WA, respectively, the Post Office in Chelan, the Chelan Public Library, and Holden Village.

Government agencies and stakeholders involved in the remedial process also received the notification February 27, 2018 by email, including EPA, Ecology, the Yakama Nation, and U.S. Fish and Wildlife Service. Rio Tinto also received the notification the same day by email.

A legal notification of the FYR for the Holden Mine Remediation project ran the week of March 5th, 2018 in the Wenatchee World and the Chelan Mirror. The text of the notification is as follows:

OKANOGAN-WENATCHEE NATIONAL FOREST
HOLDEN MINE SITE FIVE-YEAR REVIEW
CHELAN COUNTY, WASHINGTON

The USDA Forest Service is conducting its first five-year review (FYR) of the ongoing remedial activities at the Holden Mine Site. This review seeks to confirm that the cleanup activities are, or will be upon completion, protective of human health and the environment. A summary of the remedial activities and an evaluation of the protectiveness of these activities will be included in the FYR report. Currently the Record of Decision for the project can be found online at: go.usa.gov/xnMe7 or in-person at the Chelan and Wenatchee USDA Forest Service Offices. It is anticipated that the FYR will be available for public review in mid-summer 2018 at these same locations.

If you have any questions about the site or the FYR process, please contact: Holden Mine Remedial Project Manager, Mario Isaias-Vera at (503) 347-1801 or maisaias-vera@fs.fed.us

3.2 Data Review

Phase 1 of the remedy is currently being completed so there is no post-remedy data available for review. Therefore, *the focus of the FYR is to document that the remedy has been constructed in accordance with the requirements of the ROD and UAO, including the approved remedial design.*

3.3 Site Inspections

The Forest Service RPM, and members of his technical support team, including Resource Specialists from the Okanogan-Wenatchee NF, have been very involved during all phases of the remedial implementation process. The RPM and team members have also visited and inspected the Site frequently during Phase 1 implementation. However, this section focuses on the site inspections performed in October 2017 and during 2018 that were conducted as part of the FYR process.

Field inspections were conducted at the Site during the month of October 2017. The first site inspection for the FYR process was performed on October 3rd, 2017 and included a Mine Water Treatment Plant and Site tour with the Lake Chelan Watershed Planning Unit and staff from the Chelan Ranger District, Okanogan-Wenatchee National Forest.

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Other Site inspections were conducted by the RPM at the end of the 2017 construction season. The RPM inspected and documented existing site conditions prior to shutting down outdoor activities for the season. The RPM made visual inspections on most remedial components implemented at the Site. Site visits were performed on October 3rd, October 4th, October 5th, October 24th, October 25th, October 26th, and October 27th, 2017, before the site was covered with snow and ice. The Mine WTP continued with normal treatment operations.

Site Inspections resumed in spring and summer 2018, and will continue throughout the 2018 construction field season.

4.0 TECHNICAL ASSESSMENT

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

- A. *The remedy is being constructed in accordance with the requirements of the ROD, the UAO, and approved remedial design.*
- B. *Minor design changes and field adjustments have been implemented based on new data and existing site conditions*
- C. *The remedy is expected to be protective when it is completed.*

Summary:

Remedial Action Performance

- The Phase 1 remedial actions implemented so far appear to be operating and performing as designed.
- Interim effluent limits for the WTP are being met.
- Post-Phase 1 environmental monitoring data will begin to be collected in 2018 to start documentation of the performance of Phase 1.

System Operations and O&M

- Operating procedures, as implemented to date, are working in a manner that appears to be maintaining the effectiveness of the Phase 1 remedy.

Implementation of Institutional Controls and Other Measures

- Institutional Controls will be implemented in the near future to prevent human exposure to areas with COC
- Access controls to restricted areas are in place and are proving to be effective in preventing exposure (e.g. restriction to water treatment plant and to main and ventilator portal).
- If immediate threats are identified at the Site, they will be addressed and/or mitigated.

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

Summary:

Changes in Standards and TBCs

- None at this time

Changes in Toxicity and Other Contaminant Characteristics

- None at this time

Changes in Risk Assessment Methods

- None at this time

Changes in Exposure Pathways

- None at this time

Expected Progress Towards Meeting RAOs

- *The remedy is progressing as expected towards meeting RAOs*

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

- None at this time

FIVE YEAR REVIEW REPORT FOR THE HOLDEN MINE SITE

5.0 RECOMMENDATIONS

Operable Unit (OU): Holden Mine Site

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): Holden Mine Site	Issue Category: Institutional Controls			
	Issue: The <i>Institutional Control Implementation and Assurance Plan</i> has not been completed, therefore, Institutional Controls at the Site have not been implemented.			
	A draft ICIAP was prepared and submitted to the lead agency in July, 2017. The lead agency responded and provided comments on February, 2018, and requested the responsible party to address comments.			
	The Forest Service will work with all parties, including the responsible party and Holden Village, on implementing an ICIAP that meets the intent of the ROD and UAO, including warning the public of areas of concern and protecting the remedy.			
Recommendation: The Institutional Control Implementation and Assurance Plan should be completed this year (2018). Institutional Controls at the Site should be implemented within the next year (2019).				
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
Yes	Yes	PRP	Forest Service	11/30/2019

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): Holden Mine Site	Issue Category: Operations and Maintenance			
	Issue: The <i>Phase 1 Operations and Maintenance Plan</i> has not been finalized, therefore, O&M tasks for the Site are still being defined.			
	A draft Phase 1 O&M Plan was prepared and submitted to the lead agency in January 2017. The lead agency responded and provided comments on December, 2017, and requested the PRP to address comments.			
	Recommendation: The Phase 1 O&M Plan will be completed this calendar year (2018). Phase 1 O&M tasks will be clearly defined at the Site and implemented within the next year (2019).			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
Yes	Yes	PRP	Forest Service	11/30/2018

FIVE YEAR REVIEW REPORT FOR THE HOLDEN MINE SITE

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): Holden Mine Site	Issue Category: Monitoring			
	Issue: The <i>Performance Standards Verification Plan</i> has not been completed, therefore, monitoring standards and protocols for sampling and testing at the Site are still undefined. A draft PSVP was prepared and submitted to the lead agency in February 2018. The lead agency responded and provided comments on April, 2018, and requested the PRP to address comments.			
	Recommendation: The PSVP will be completed this year (2018). PSVP tasks for monitoring will be clearly defined for the Site and implemented within the next year (2019).			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
Yes	Yes	PRP	Forest Service	11/30/2018

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): Holden Mine Site	Issue Category: Remedy Performance			
	Issue: <i>Treatability Studies of In-situ Treatment of Areas of Interest</i> have not been completed, therefore this ROD remedial action has yet to be addressed. A “Feasibility Study of the Use of Agricultural Lime for Remediation of Metals” was prepared and submitted to the lead agency in May, 2017. The lead agency reviewed the technical document, and provided comments on October, 2017 requesting the PRP to address comments.			
	Recommendation: <i>Treatability Studies of In-situ Treatment</i> will begin next year (2019).			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
Yes	Yes	PRP	Forest Service	11/30/2019

FIVE YEAR REVIEW REPORT FOR THE HOLDEN MINE SITE

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): Holden Mine Site	Issue Category: Other			
	Issue: The <i>Wetland Mitigation Plan</i> has not been completed, therefore, activities to mitigate wetlands affected by remedial activities are still unclear and have not started. The lead agency has requested Intalco to submit a “Wetland Mitigation Plan”. Intalco must finalize and implement this Plan.			
	Recommendation: A Wetland Mitigation Plan shall be submitted to the lead agency for review in this calendar year (2018).			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	No	PRP	Forest Service	11/30/2018

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): Holden Mine Site	Issue Category: Operations and Maintenance			
	Issue: Maintain cover on sludge cake solids at TP1 and restrict access to the Sludge Filter Cake Management Facility Wildlife (e.g. deer) and visitors have easy access to the SFCMF. The solids stored at TP-1 should not be accidentally ingested (e.g., by children) or used for unintended purposes (e.g., pottery).			
	Recommendation: Signs and access restrictions at TP1 shall be implemented. Currently, there are plans to install a fence to restrict access.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
Yes	Yes	PRP	Forest Service	6/29/2018

FIVE YEAR REVIEW REPORT FOR THE HOLDEN MINE SITE

6.0 PROTECTIVENESS STATEMENTS

1) Tasks Completed

Protectiveness Statement(s)		
<i>Operable Unit:</i>	<i>Protectiveness Determination:</i>	<i>Planned Addendum Completion Date:</i>
Holden Mine Site	Protective	10/30/2017
<i>Protectiveness Determination Statement:</i>		
<p><i>Regrading of Tailing Piles and East and West Waste Rock Piles; Soil Covering & Revegetation; Reclamation of Lower Waste Area and Lagoon; Demolition of Former Mill Building; Cleanup of Maintenance Yard; and Remediation of Soils at the Surface Water Retention Area have adequately addressed all exposure pathways that could result in unacceptable risks to human health and terrestrial plants and animals in these areas.</i></p>		

2) Tasks Not Completed

Protectiveness Statement(s)		
<i>Operable Unit:</i>	<i>Protectiveness Determination:</i>	<i>Planned Addendum Completion Date:</i>
Holden Mine Site	Will be Protective	9/30/2020
<i>Protectiveness Determination Statement:</i>		
<p><i>In-Situ Treatment in Areas Of Interest (AOIs) is expected to be protective of human health and the environment. Treatability Studies and site characterization (for changed-site conditions) will determine specific areas for treatment. A few AOIs were remediated through soil removal, regrading and capping, and Revegetation. Institutional Controls will address areas were In-Situ Treatment may not be effective and practical.</i></p> <p><i>The implementation of Institutional Controls is expected to be protective of human health and the environment in those areas identified in the ROD as requiring institutional controls.</i></p>		

Protectiveness Statement(s)		
<i>Operable Unit:</i>	<i>Protectiveness Determination:</i>	<i>Planned Addendum Completion Date:</i>
Holden Mine Site	Will be Protective	9/30/2023
<i>Protectiveness Determination Statement:</i>		
<p><i>Groundwater Containment, Collection, and Treatment, including Installation of Portal Bulkheads and Hydraulic Control; Control and Diversion of Surface Water; Interception of groundwater and treatment in the Water Treatment Plant are expected to be protective of human health and the environment once Phase 2 barrier wall has been implemented. Protectiveness of Phase 1 will be assessed through development and implementation of a Performance Standards Verification Plan.</i></p>		

7.0 NEXT REVIEW

The next five-year review report for the *Holden Mine* site is required five years from the completion date of this review.

APPENDIX A

**Substantive Compliance Requirements for the Water Treatment Plant Operations at
Holden Village, Washington**

Attached to end of this document

FIVE YEAR REVIEW REPORT FOR THE HOLDEN MINE SITE

REFERENCES:

USFS. 2012. *Record of Decision*. Holden Mine Site, Chelan County, Washington. United States Department of Agriculture Forest Service. 4769-16.

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Stantec. 2017. *Surface Water Retention Area, Removal Action Report*, Holden Mine Site. Holden Mine Remedial Action, Chelan County, WA; March 2017.

Stantec. 2017. *Phase 1 Operations and Maintenance Plan for the Holden Mine*, Chelan County; January 2017.

Stantec. 2017. *Maintenance Yard Removal Action Report*, Holden Mine Site; March 2017.

ATTACHMENT 1

REGULATORY REQUIREMENTS (PERMIT)

Substantive Compliance Requirements for the Water Treatment Plant Operations at Holden Village, Washington

Developed for compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1342 et seq.

Rio Tinto Aum
4700 Daybreak Parkway
South Jordan, Utah 84095

is authorized to discharge in accordance with the Special and General Conditions that follow.

Facility Location: Holden Village Washington, 98816	Receiving Water: Outfall 001 Railroad Creek Latitude: 48.19545 N Longitude: 120.75631 W
Treatment Type: single-stage pH adjustment and addition of a sulfide reagent	Categorical Industry: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Unilateral Administrative Order (UAO)
Industry Type: Holden Mine Remediation Water Treatment Plant (WTP)	

Mario A. Isaias-Vera, M.S.
Holden Mine Remedial Project Manager
Forest Service
Region Six, Pacific Northwest
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Summary of Permit Report Submittals

This table summarizes the Special and General Conditions of this permit for additional submittal requirements.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A	Discharge Monitoring Report (DMR)	Quarterly	October 15, 2017
S3.F	Reporting Permit Violations	As necessary	-
S4.A	Operations and Maintenance Manual	--	August 2015
S4.A	Operations and Maintenance Manual Update or Review Confirmation Letter Modification to Treatment System Operating Plan Update or Review Confirmation Letter	Annually and with permit renewal	May 2017 followed by Update July 2017
S4.B	Reporting Bypasses	As necessary	—
S6.C	Modification to Solid Waste Plan	As necessary.	April 2017 as included in the Site-Wide O&M Plan
S7	Application for Permit Renewal	1/permit cycle	January 2022
S8	Spill Plan	1/permit cycle, updates submitted as necessary	January 2017
S9	Stormwater Pollution Prevention Plan	1/permit cycle	June 2017
S10.A	Acute Toxicity: Characterization Written Report	Spring and Fall for two years	First Data Report due July 30, 2020 after testing begins in spring of 2020. Following initial sampling, reports will be provided July 30 after spring testing (April through June), and January 30th after Fall testing (September through December).
S10.B	Acute Toxicity Effluent Test Results with Permit Renewal Application	Once	Once in the year of submission of the Renewal Application assuming compliance monitoring is necessary.

S11.A	Chronic Toxicity: Characterization Written Report	Spring and Fall for two years	First Data Report due July 30, 2020 after testing beginning in the spring of 2020. Following initial sampling, reports will be provided July 30th after spring testing (April through June) and January 30th after fall testing (October through December).
S11.B	Chronic Toxicity Effluent Test Results with Permit Renewal Application	Once	Once in the year of submission of the Renewal Application assuming compliance monitoring is necessary.
G1	Notice of Change in Authorization	As necessary	
G4	Permit Application for Substantive Changes	As necessary	
G5	Engineering Report for Construction or	As necessary	
G7	Notice of Permit Transfer	As necessary	
G10	Duty to Provide Information	As necessary	
G21	Compliance Schedules	As necessary	

Special Conditions

S1. Discharge limits

S1.A. Process wastewater discharges

All discharges and activities authorized must be consistent with the terms and conditions herein. The discharge of any of the following pollutants more frequently than, or at a level in excess of that identified and authorized herein violates the terms and conditions of this authorization.

Beginning on the effective date and lasting 2 years after the final approval date of the O&M Plan, the Permittee is authorized to discharge Holden Mine Water Treatment Plant (WTP) Outfall 001 to Railroad Creek at the permitted location subject to complying with the following limits:

Interim Effluent Limits: Outfall 001		
Latitude 48.19545 N Longitude 120.75631 W		
Parameter	Average Monthly^a	Maximum Daily^b
TSS, mg/L ^c	20	30
Copper, µg/L	150	300
Cadmium, µg/L	50	100
Lead, µg/L	300	600
Zinc, µg/L	750	1,500
	Minimum	Maximum
pH, s.u.	Within the range of 6.0 to 9.0.	
a	Average monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured.	
b	Maximum daily effluent limit is the highest allowable daily discharge. The daily discharge is the average discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, calculate the daily discharge as the total mass of the pollutant discharged over the day. This does not apply to pH or temperature.	
c	No BAT limit available.	

Beginning 2 years after the final approval date of the O&M Plan and lasting five years from the effective date of the permit, the Permittee is authorized to discharge Holden Mine Water Treatment Plant (WTP) Outfall 001 to Railroad Creek at the permitted location subject to complying with the following limits:

The table below includes compliance limits that will become effective two years following commissioning of the WTP.

Compliance Effluent Limits: Outfall 001 Latitude 48.19545 N Longitude 120.75631 W		
Parameter	Average Monthly^a	Maximum Daily^b
TSS, mg/L	20	30
Iron, µg/L	948	1,643
Aluminum, µg/L	135	233
Copper, µg/L	35.3	61.2
Cadmium, µg/L	0.65	1.12
Lead, µg/L	17.5	30.3
Zinc, µg/L	215	372
	Minimum	Maximum
pH, s.u. ^c	Minimum is equal to or greater than 6.5 standard units.	Less than or equal to 8.5 standard units.
a	Average monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured.	
b	Maximum daily effluent limit is the highest allowable daily discharge. The daily discharge is the average discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, calculate the daily discharge as the total mass of the pollutant discharged over the day. This does not apply to pH or temperature.	
c	In accordance with Core Summer Salmonid Habitat defined in WAC 173-201A-200 and requiring no human caused variation of more than 0.2 standard units. When pH is continuously monitored, excursions between 5.5 and 6.5, or 8.5 and 9.5 shall not be considered violations provided no single excursion exceeds 60 minutes in length and total excursions do not exceed 7 hours and 30 minutes per month. Any excursions below 5.5 and above 9.5 are violations.	

S1.B. Mixing zone authorization Mixing zone for Outfall 001

The CORMIX model was used to calculate effluent dilution factors under three 7Q10 Chronic Aquatic Life Criteria scenarios:

- 1) Model Run 1 – Annual, Low Flow, Low Discharge
- 2) Model Run 2 – Annual, Low Flow, High Discharge
- 3) Model Run 3 – May-July, Low Flow, High Discharge (when salmonids are potentially spawning)

Available Dilution (dilution factor)	
Acute Aquatic Life Criteria	1.0 (100% effluent)
Chronic Aquatic Life Criteria (Model Run 1)	1.7 (58.8% effluent)
Chronic Aquatic Life Criteria (Model Run 2)	1.2 (83.3% effluent)
Chronic Aquatic Life Criteria (Model Run 3)	4.1 (24.4% effluent)

The paragraphs below define the maximum boundaries of the mixing zone.

Chronic mixing zone

WAC 173-201A-400(7)(a) specifies the mixing zone must not:

- (i) Extend in a downstream direction for a distance from the discharge port(s) greater than three hundred feet plus the depth of water over the discharge port(s), or extend upstream for a distance of over one hundred feet;
- (ii) Utilize greater than twenty-five percent of the flow; and
- (iii) Occupy greater than twenty-five percent of the width of the water body.

The width of the chronic mixing zone is limited to a distance of 4.8 feet (1.46 meters). The length of the chronic mixing zone extends 0 feet (0 meters) upstream and 0.62 feet (0.19 meters) downstream of the outfall. The mixing zone extends from the bottom to the top of the water column. The concentration of pollutants at the edge of the chronic zone must meet chronic aquatic life criteria and human health criteria.

Acute mixing zone

The width of the acute mixing zone is limited to a distance of 4.8 feet (1.46 meters) in any horizontal direction from the outfall. The length of the acute mixing zone extends 0 feet (0 meters) upstream and 0.06 feet (0.019 meters) downstream of the outfall. The mixing zone extends from the bottom to the top of the water column. The concentration of pollutants at the edge of the acute zone must meet acute aquatic life criteria.

S2. Monitoring requirements

S2.A. Monitoring schedule

The plant operator must monitor the wastewater according to the following schedule and use the specified analytical methods. If the operator uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report. If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) with appropriate laboratory documentation.

Parameter	Units	Laboratory Method	Minimum Sampling Frequency ^a	Sample Type
(1) Wastewater Effluent				
Flow	mgd	EPA-600/S2-84-188	Once/day	Metered/recorded
pH ^b	standard units	Hydrolab or equivalent	Once/day	Metered/recorded
TSS	mg/L	SM 2540 D	Once/week	grab
Temperature ^c	°C	Analog recorder or Use micro-recording devices known as thermistors	Once/week	grab
DO	mg/L	Hydrolab or equivalent	Once/week	grab
TDG	% of saturation	Hydrolab or equivalent	Once/week	grab

Parameter	Units	Laboratory Method	Minimum Sampling Frequency ^a	Sample Type
Turbidity	NTU	EPA 180.1	Once/week	grab
TDS	mg/L	EPA 160.1	Once/week	grab
Total Hardness	mg/L as CaCO ₃	EPA 130.1 or EPA 130.2	Monthly	grab
Iron	µg/L	E200.7 and E200.8	Monthly	grab
Aluminum	µg/L	E200.7 and E200.8	Monthly	grab
Copper	µg/L	E200.7 and E200.8	Monthly	grab
Cadmium	µg/L	E200.7 and E200.8	Monthly	grab
Lead	µg/L	E200.7 and E200.8	Monthly	grab
Zinc	µg/L	E200.7 and E200.8	Monthly	grab
(2) Permit Renewal Application Requirements – Final Wastewater Effluent				
pH ^b	standard units	SM 4500-H ⁺ B	Once/week	grab
Total Hardness	mg/L as CaCO ₃	EPA 130.1 or EPA 130.2	Monthly	grab
Iron	µg/L	E200.7 and E200.8	Monthly	grab
Aluminum	µg/L	E200.7 and E200.8	Monthly	grab
Copper	µg/L	E200.7 and E200.8	Monthly	grab
Cadmium	µg/L	E200.7 and E200.8	Monthly	grab
Lead	µg/L	E200.7 and E200.8	Monthly	grab
Zinc	µg/L	E200.7 and E200.8	Monthly	grab
(3) Whole Effluent Toxicity Testing – Final Wastewater Effluent – to begin Spring 2019				
Acute Testing	% Effluent dilution series	Fathead minnow (<i>Pimephales promelas</i>) 96-hour static renewal test EPA-821-R-02-012 Daphnid (<i>Ceriodaphnia dubia</i> , <i>Daphnia pulex</i> or <i>Daphnia magna</i>) 48-hour static test EPA-821-R-02-012	Spring and Fall	grab or composite
Chronic Toxicity Testing	% Effluent dilution series	Environment Canada EPS 1/RM/28 Second Edition, 1998;; Rainbow Trout (<i>Oncorhynchus mykiss</i>) and Brook Trout (<i>Salvelinus fontinalis</i>) 7-day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol. 53, 397–405 Ceriodaphnia Survival and Reproduction EPA-821-R-02-013	Spring and Fall	grab or composite
a	Sampling and analysis frequency will be increased during commissioning and startup of the WTP and other events where influent or process changes occur.			
b	Samples to be analyzed on site in the Laboratory/Sample Room.			
c	Measured with a bench-top instrument in the Laboratory/Sample Room.			

S2.B. Sampling and analytical procedures

Samples and measurements taken to meet the requirements herein must represent the volume and nature of the monitored parameters, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions affecting effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136 (or as applicable in 40 CFR subchapters N [Parts 400–471] or O [Parts 501-503]) unless otherwise specified in this permit. Ecology may only specify alternative methods for parameters without limits and for those parameters without an EPA approved test method in 40 CFR Part 136.

S2.C. Flow measurement, field measurement, and continuous monitoring devices

The Permittee must:

1. Select and use appropriate flow measurement, field measurement, and continuous monitoring devices and methods consistent with accepted scientific practices.
2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard, the manufacturer's recommendation, and approved O&M manual procedures for the device and the waste-stream.
3. Calibrate continuous monitoring instruments weekly unless it can demonstrate a longer period is sufficient based on monitoring records. The Permittee:
 - a. May calibrate apparatus for continuous monitoring of dissolved oxygen by air calibration.
 - b. Must calibrate continuous pH measurement instruments using a grab sample analyzed in the lab with a pH meter calibrated with standard buffers and analyzed within 15 minutes of sampling.
 - c. Must calibrate continuous chlorine measurement instruments using a grab sample analyzed in the laboratory within 15 minutes of sampling.
4. Calibrate micro-recording temperature devices, known as thermistors, using protocols from Ecology's Quality Assurance Project Plan Development Tool (*Standard Operating Procedures for Continuous Temperature Monitoring of Fresh Water Rivers and Streams Version 1.0 10/26/2011*). This document is available online at: http://www.ecy.wa.gov/programs/eap/qa/docs/ECY_EAP_SOP_Cont_Temp_Mon_Ambient_v1_0EAP_080.pdf
Calibration as specified in this document is not required if the Permittee uses recording devices certified by the manufacturer.
5. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
6. Establish a calibration frequency for each device or instrument in the O&M manual that conforms to the frequency recommended by the manufacturer.
7. Calibrate flow-monitoring devices at a minimum frequency of at least one calibration per year.
8. Maintain calibration records and provide in final reports.

S2.D. Laboratory accreditation

The Permittee must ensure that all monitoring data required by Ecology for permit specified parameters is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories*. Flow, temperature, settleable solids,

conductivity, pH, and internal process control parameters are exempt from this requirement. The Permittee must obtain accreditation for conductivity and pH if it must receive accreditation or registration for other parameters.

S2.E. Request for reduction in monitoring

The Permittee may request a reduction of the sampling frequency after twelve (12) months of monitoring. The Lead Agency will review each request and at its discretion grant the request when it re-issues the permit or by a permit modification.

The Permittee must:

1. Provide a written request.
2. Clearly state the parameters for which it is requesting reduced monitoring.
3. Clearly state the justification for the reduction.

S3. Reporting and recording requirements

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted is a violation of the terms and conditions of this authorization.

S3.A. Discharge monitoring reports

The first monitoring period begins on the effective date of the permit (unless otherwise specified). The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period in a discharge monitoring report (DMR). Include data for each of the parameters tabulated in Special Condition S2. Report a value for each day sampling occurred (unless specifically exempted in the permit) and for the summary values (when applicable).
2. Report single analytical values below detection as “less than the detection level (DL)” by entering < followed by the numeric value of the detection level (e.g. < 2.0).
3. If the method used did not meet the minimum DL and quantitation level (QL) identified in the permit, report the actual QL and DL in the comments or in the location provided.
4. Report the test method used for analysis in the comments if the laboratory used an alternative method not specified in the permit and as allowed in S2.
5. Calculate average values and calculated total values (unless otherwise specified in the permit) using:
 - a. The reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value.
 - b. One-half the detection value (for values reported below detection) if the lab detected the parameter in another sample from the same monitoring point for the reporting period.
 - c. Zero (for values reported below detection) if the lab did not detect the parameter in another sample for the reporting period.

An electronic copy of the laboratory report must be included as an attachment. The contract laboratory reports must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.

6. Ensure that DMRs are submitted no later than the dates specified below, unless otherwise specified in this permit.

7. Submit DMRs for parameters with the monitoring frequencies specified in S2 (monthly, quarterly, annual, etc.) at the reporting schedule identified below. The Permittee must:

Submit quarterly DMRs, unless otherwise specified in the permit, by the 15th day of the month following the monitoring period. Quarterly sampling periods are January through March, April through June, July through September, and October through December. Assuming this permit is authorized in the Spring of this year, the Permittee would submit the first quarterly DMR on October 15, 2017 for the quarter beginning on July 01, 2017.

S3.B. Permit Submittals and Schedules

Reports must be postmarked or received electronically no later than the dates specified by this permit. Reports should be sent to USFS at:

Mario A. Isaias-Vera, M.S.
Holden Mine Remedial Project Manager
Forest Service
Region Six, Pacific Northwest
1220 SW 3rd Avenue
Portland, Or 97208

S3.C. Records retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by the Lead Agency.

S3.D. Recording of results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement.
2. The individual who performed the sampling or measurement.
3. The dates the analyses were performed.
4. The individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

S3.E. Additional monitoring by the Permittee

If monitoring of any pollutant is done more frequently than required by Special Condition S2 of this permit, then this must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR unless otherwise specified by Special Condition S2.

S3.F. Reporting permit violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise

stop the noncompliance and correct the problem.

2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to the Lead Agency within thirty (30) days of sampling.

a. Immediate reporting

The Permittee must immediately report to the U.S. Forest Service and the Department of Ecology and the Department of Health, Drinking Water Program (at the numbers listed below), all:

- Collection system overflows discharging to a water body used as a source of drinking water.
- Plant bypasses discharging to a waterbody used as a source of drinking water.

Central Regional Office	509-575-2490
Department of Health,	800-521-0323 (business hours)
Drinking Water Program	877-481-4901 (after business
Chelan-Douglas Health District	hours) 509-886-6400

b. Twenty-four-hour reporting

The Permittee must report the following occurrences of noncompliance by telephone, to the Agencies at the telephone numbers listed above, within 24 hours from the time the Permittee becomes aware of any of the following circumstances:

1. Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.
2. Any unanticipated bypass that causes an exceedance of any effluent limit in the permit (See Part S4.B., “Bypass Procedures”).
3. Any upset that causes an exceedance of an effluent limit in the permit (See G.15, “Upset”).
4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.
5. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limit in the permit. This requirement does not include industrial process wastewater overflows to impermeable surfaces which are collected and routed to the treatment works.

c. Report within five days

The Permittee must also submit a written report within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above. The report must contain:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times.
3. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.
4. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

d. Waiver of written reports

The Lead Agency may waive the written report required in subpart c, above, on a case-by-case basis upon request if the Permittee has submitted a timely oral report.

e. All other permit violation reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in subpart c, above. Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

S3.G. Other reporting

a. Spills of Oil or Hazardous Materials

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280 and chapter 173-303-145. You can obtain further instructions at the following website: <http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm>.

b. Failure to submit relevant or correct facts

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to the Lead Agency, it must submit such facts or information promptly.

S3.H. Maintaining a copy of this permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Agency inspectors.

S4. Operation and maintenance

The Permittee must, at all times, properly operate and maintain all facilities or systems of treatment and control (and related appurtenances), which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes keeping a daily operation logbook (paper or electronic), adequate laboratory controls, and appropriate quality assurance procedures. This provision of the permit requires the Permittee to operate backup or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of this permit.

The Permittee must schedule any facility maintenance, which might require interruption of wastewater treatment and degrade effluent quality, during non-critical water quality periods and carry this maintenance out according to the approved O&M manual or as otherwise approved by the Lead Agency.

S4.A. Operations and maintenance (O&M) manual

a. O&M manual submittal and requirements

The Permittee must:

1. Update the O&M Manual that meets the requirements of 173-240-150 WAC and submit it to the Lead Agency for approval by January 2016.
2. Review the O&M Manual at least annually and confirm this review by letter to

the Lead Agency by January of each year.

3. Submit to the Lead Agency for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual.
4. Keep the approved O&M Manual at the permitted facility.
5. Follow the instructions and procedures of this manual.

b. O&M manual components

In addition to the requirements of WAC 173-240-150, the O&M Manual must be consistent with the guidance in Table G1-3 in the *Criteria for Sewage Works Design* (Orange Book) 2008. The O&M Manual must include:

1. Emergency procedures for plant shutdown and cleanup in the event of a wastewater system upset or failure.
2. A review of system components which if failed could pollute surface water or could impact human health. Provide a procedure for a routine schedule of checking the function of these components.
3. Wastewater system maintenance procedures that contribute to the generation of process wastewater.
4. Any directions to maintenance staff when cleaning, or maintaining other equipment or performing other tasks which are necessary to protect the operation of the wastewater system (for example, defining maximum allowable discharge rate for draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine).
5. Wastewater sampling protocols and procedures for compliance with the sampling and reporting requirements in the wastewater discharge permit.
6. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.
7. Treatment plant process control monitoring schedule.

c. Treatment system operating plan

The Permittee must summarize the following information in the initial chapter of the O&M Manual entitled the “Treatment System Operating Plan.” For the purposes of this permit, a Treatment System Operating Plan (TSOP) is a concise summary of specifically defined elements of the O&M Manual.

The Permittee must submit an updated Treatment System Operating Plan to the Lead Agency January 2022 (with the application for renewal). The Permittee must update and submit this plan, as necessary, to include requirements for any major modifications of the treatment system.

The TSOP must not conflict with the O&M Manual and must include the following information:

1. A baseline operating condition, which describes the operating parameters and procedures, used to meet the effluent limits of S1 at the production levels used in developing these limits.
2. In the event of production rates, which are below the baseline levels used to

establish these limits, the plan must describe the operating procedures and conditions needed to maintain design treatment efficiency. The monitoring and reporting must be described in the plan.

3. In the event of an upset, due to plant maintenance activities, severe stormwater events, start ups or shut downs, or other causes, the plan must describe the operating procedures and conditions employed to mitigate the upset. The monitoring and reporting must be described in the plan.
4. A description of any regularly scheduled maintenance or repair activities at the facility which would affect the volume or character of the wastes discharged to the wastewater treatment system and a plan for monitoring and treating/controlling the discharge of maintenance-related materials (such as cleaners, degreasers, solvents, etc.).

S4.B. Bypass procedures

The plant may not Bypass and discharge directly into the creek. The Lead Agency may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

This permit authorizes a bypass if it allows for essential maintenance and does not have the potential to cause violations of limits or other conditions of this permit, or adversely impact public health as determined by the Lead Agency prior to the bypass. The Permittee must submit prior notice, if possible, at least ten (10) days before the date of the bypass

2. Bypass is unavoidable, unanticipated, and results in noncompliance of this permit.

This permit authorizes such a bypass only if:

- a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.
 - b. No feasible alternatives to the bypass exist, such as:
 - The use of auxiliary treatment facilities.
 - Retention of untreated wastes.
 - Stopping production.
 - Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass.
 - Transport of untreated wastes to another treatment facility.
 - c. The Permittee has properly notified the Lead Agency of the bypass as required in Special Condition S3.F of this permit.
3. If bypass is anticipated and has the potential to result in noncompliance of this permit.

- a. The Permittee must notify the Lead Agency at least thirty (30) days before the planned date of bypass. The notice must contain:
 - A description of the bypass and its cause.
 - An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.
 - A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
 - The minimum and maximum duration of bypass under each alternative.
 - A recommendation as to the preferred alternative for conducting the bypass.
 - The projected date of bypass initiation.
 - A statement of compliance with SEPA.
 - A request for modification of water quality standards as provided for in WAC 173- 201A-410, if an exceedance of any water quality standard is anticipated.
 - Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.
- b. For probable construction bypasses, the Permittee must notify the Lead Agency of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during the project planning and design process. The project- specific engineering report as well as the plans and specifications must include details of probable construction bypasses to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.
- c. Ecology will consider the following prior to issuing an administrative order for this type of bypass:
 - If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.
 - If feasible alternatives to bypass exist, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.
 - If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, the Lead Agency will approve or deny the request.

S5. Facility loading

S5.A. Design criteria

The flows or waste loads for the permitted facility must not exceed the following design criteria except in the case of extreme storm events:

Parameter	Design Quantity (GPM)	
	Low Flow	High Flow
Portal	100	300
West Seeps	0	140
East Seeps	0	60
Groundwater Collection Trench	645	839
Total Phase 1	745	1,339
Groundwater Collection Trench Phase 2	236	397
Total Phase 1 + 2	981	1,736

S6. Solid wastes

S6.A. Solid waste handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

S6.B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available, and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee must apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

S6.C. Solid waste control plan

The Permittee must submit all proposed revisions or modifications to the solid waste control plan to the Lead Agency for review and approval at least 30 days prior to implementation. The Permittee must comply with the approved solid waste control plan and any modifications once approved. The Permittee must submit an update of the solid waste control plan by January 2022, the application for permit renewal date.

S7. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this permit by January 2022.

The Permittee must also submit a new application or addendum at least one hundred eighty (180) days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

S8. Spill control plan

S8.A. Spill control plan submittals and requirements

The Permittee must:

1. Submit to Ecology an update to the existing spill control plan by January 2020.
2. Review the plan at least annually and update the spill plan as needed.
3. Send changes to the plan to the Lead Agency.
4. Follow the plan and any supplements throughout the term of the permit.

S8.B. Spill control plan components

The spill control plan must include the following:

1. A list of all oil and petroleum products and other materials used and/or stored on-site, which when spilled, or otherwise released into the environment, designate as Dangerous Waste (DW) or Extremely Hazardous Waste (EHW) by the procedures set forth in WAC 173-303-070. Include other materials used and/or stored on-site which may become pollutants or cause pollution upon reaching state's waters.
2. A description of preventive measures and facilities (including an overall facility plot showing drainage patterns) which prevent, contain, or treat spills of these materials.
3. A description of the reporting system the Permittee will use to alert responsible managers and legal authorities in the event of a spill.
4. A description of operator training to implement the plan.

The Permittee may submit plans and manuals required by 40 CFR Part 112, contingency plans required by Chapter 173-303 WAC, or other plans required by other agencies, which meet the intent of these laws.

S9. Stormwater pollution prevention plan (SWPPP)

A current site-wide permit exists for construction. A final facility specific plan was approved by the Agency on May 1, 2017.

S10. Acute toxicity**S10.A. Effluent characterization**

The Permittee must:

1. Conduct semi-annual acute toxicity testing on the final effluent starting in the 2nd Quarter 2019. Semi-annual means spring (April/May) and fall (September through December).
2. Submit a semi-annual written report to the Lead Agency by July 30, 2020. Each subsequent report is due on July 30th and January 30th of each year. Further instructions on testing conditions and test report content are in Section B below.
3. Use a dilution series consisting of a minimum of five concentrations and a control. The five concentrations should include the ACEC of 100% effluent.
4. Conduct the following two acute toxicity tests on each sample:

Acute Toxicity Tests	Species	Method
Fathead minnow 96-hour static-renewal test	<i>Pimephales promelas</i>	EPA-821-R-02-012
Daphnid 48-hour static test	<i>Ceriodaphnia dubia</i> , <i>Daphnia pulex</i> , or <i>Daphnia magna</i>	EPA-821-R-02-012

The need for an acute toxicity limit will be evaluated for inclusion in the next permit issuance. The evaluation will be based upon whether:

- The median survival of any species in 100% effluent is below 80%.
- Any one test of any species exhibits less than 65% survival in 100% effluent.

S10.B. Sampling and reporting requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria. Reports must contain toxicity data, bench sheets, and reference toxicant results for test methods. In addition, the Permittee must submit toxicity test data in electronic format (CETIS export file preferred) for entry into Ecology's database.
2. The Permittee must collect grab or composite samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 72 hours after sampling was completed.
3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.
4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Subsection C and the Ecology Publication No. WQ-R-95-80, Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria. If the Lead Agency determines any test result to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.
5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Section A or pristine natural water
6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.
7. The Permittee shall conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the acute critical effluent concentration (ACEC). The ACEC equals 100% effluent.
8. All whole effluent toxicity tests, effluent screening tests, and rapid screening tests that involve hypothesis testing must comply with the acute statistical power standard of 29% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

S11. Chronic toxicity

S11 A. Trout sublethal toxicity testing

The Permittee must:

1. Conduct semi-annual trout sublethal toxicity testing on the final effluent for two years starting in the Spring three years after permit approval. Semi-annual means spring (April/May) and fall (September through December).
2. Submit an initial semi-annual written report to the Lead Agency by July 30, 2020. Each subsequent report is due on July 30th and January 30th of each year. Further instructions and test report content are in Section C below.
3. Conduct trout sublethal toxicity testing during effluent characterization on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC) of 100% effluent (Permit Section S1.B). The series of dilutions must also contain the CCEC of 24.4% effluent (Permit Section S1.B).
4. Conduct the following two trout sublethal toxicity tests on each sample:

Trout Sublethal Test	Species	Method
Rainbow trout embryo test (E Test)	<i>Oncorhynchus mykiss</i>	E Test in Environment Canada EPS 1/RM/28 and Canaria, E.C., J.R. Elphick, and H.C. Bailey. 1999. A Simplified Procedure for Conducting Small Scale Short-Term Embryo Toxicity Tests with Salmonids. <i>Env. Toxicol.</i> 14, 301-307.
Rainbow trout 7-day survival and growth	<i>Oncorhynchus mykiss</i>	Lazorchak, J.M. and M.E. Smith. 2007. Rainbow Trout (<i>Oncorhynchus mykiss</i>) and Brook Trout (<i>Salvelinus fontinalis</i>) 7-day Survival and Growth Test Method. <i>Arch Environ Contam Toxicol.</i> 53, 397–405.

Each toxicity test report for a rainbow trout sublethal test must also determine whether there is a statistically significant difference in survival between the control and the CCEC of 24.4% effluent. If a statistically significant difference between the CCEC and control is determined for either rainbow trout test, the Permittee shall submit a Toxicity Identification/Reduction Evaluation (TI/RE) plan to the Lead Agency within sixty (60) days. The TI/RE plan shall be based on WAC 173-205-100(2)(b) and (c). The TI/RE plan shall be implemented in accordance with WAC 173-205-100(3) upon notification from the Lead Agency of plan approval.

The Permittee must determine the statistical significance by conducting a hypothesis test at the 0.05 level of significance (Appendix H, EPA/600/4-89/001). If the difference in response between the control and the CCEC is less than 20%, the Permittee must conduct the hypothesis test at the 0.01 level of significance.

S11B. Chronic effluent characterization

The Permittee must:

1. Conduct semi-annual chronic toxicity testing on the final effluent for two years starting in the spring of the third year after permit approval. Semi-annual means spring (April/May) and fall (September through December).
2. Submit an initial semi-annual written report to the Lead Agency fby July 30, 2020. Each subsequent report is due on July 30th and January 30th of each year. Further instructions on testing conditions and test report content are in Section C below.

3. Conduct chronic toxicity testing during effluent characterization on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC) of 100% effluent (Permit Section S1.B). The series of dilutions must also contain the CCEC of 24.4% effluent (Permit Section S1.B).
4. Conduct the following chronic toxicity test on each sample:

Chronic Toxicity Test	Species	Method
Ceriodaphnia Survival and Reproduction	<i>Ceriodaphnia dubia</i>	EPA-821-R-02-013, method 1002.0

The need for a chronic toxicity limit for the *Ceriodaphnia* Survival and Reproduction Test will be evaluated for inclusion in the next permit issuance. The evaluation will be based upon whether a statistically significant difference in response exists between the ACEC of 100% effluent and the control.

S11.C. Sampling and reporting requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. Reports must contain toxicity data, bench sheets, and reference toxicant results for test methods. In addition, the Permittee must submit toxicity test data in electronic format (CETIS export file preferred) for entry into Ecology’s database.
2. The Permittee must collect grab or composite samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 72 hours after sampling was completed.
3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*.
4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA method listed in Section B. and the Ecology Publication no. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If the Lead Agency determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.
5. The laboratory must use control water and dilution water meeting the requirements of the EPA manual listed in Subsection B. or pristine natural water of sufficient quality for good control performance.
6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.
7. The Permittee may choose to conduct a full dilution series test during testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the CCEC and the ACEC. The CCEC and the ACEC may either substitute for the effluent concentrations that are closest to them in the dilution series or be extra effluent concentrations. The CCEC equals 24.4% effluent. The ACEC equals 100% effluent.
8. All whole effluent toxicity tests that involve hypothesis testing must comply with the chronic statistical power standard of 39% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

WAC 173-205-030(4) The department may delay effluent characterization for whole effluent toxicity for existing facilities that are under a compliance schedule in a permit, administrative order, or other legally enforceable mechanism to implement technology-based controls or to achieve compliance with water quality-based effluent limits.

WAC 173-205-030(6) The department may conduct or require permittees to conduct toxicity tests on ambient water or may use or require permittees to use ambient water as dilution water in order to facilitate the determination of compliance with WAC 173-201A-100.

General Conditions

G1. Signatory requirements

1. All applications, reports, or information submitted must be signed and certified per the UAO.

G2. Right of inspection and entry

The Permittee must allow an authorized representative of the Agencies, upon the presentation of credentials and such other documents as may be required by law:

1. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit.
2. To have access to and copy, at reasonable times and at reasonable cost, any records required to be kept under the terms and conditions of this permit.
3. To inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.
4. To sample or monitor, at reasonable times, any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G3. Permit actions

This approval may be modified, revoked and reissued, or terminated either at the request of any interested person (including the permittee) or upon the Lead Agencies initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62,

122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

1. The following are causes for terminating this permit during its term, or for denying a permit renewal application:
 - a. Violation of any term or condition herein.
 - b. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.
 - c. A material change in quantity or type of waste disposal.
 - d. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination.
 - e. A change in any condition that requires either a temporary or permanent

reduction, or elimination of any discharge or sludge use or disposal practice controlled by the permit.

2. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:
 - a. A material change in the condition of the waters of the state.
 - b. New information not available at the time of permit issuance that would have justified the application of different permit conditions.
 - c. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.
 - d. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.
 - e. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.
 - f. The Lead Agency has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.
3. The following are causes for modification or alternatively revocation and reissuance:
 - a. When cause exists for termination for reasons listed in 1.a through 1.e of this section, and the Lead Agency determines that modification or revocation and reissuance is appropriate.
 - b. When Lead Agency has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer (General Condition G7) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. Reporting planned changes

The Permittee must, as soon as possible, but no later than one hundred eighty (180) days prior to the proposed changes, give notice to the Lead Agency of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in:

1. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b).
2. A significant change in the nature or an increase in quantity of pollutants discharged.
3. A significant change in the Permittee's sludge use or disposal practices. Following such notice, and the submittal of a new application or supplement to the existing application, along with required engineering plans and reports, this permit may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G5. Plan review required

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with chapter 173-240 WAC. Engineering reports, plans, and specifications must be submitted at least one hundred eighty (180) days prior to the planned start of construction unless a shorter time is approved by Lead Agency. Facilities must be constructed and operated in accordance with the approved plans.

G6. Compliance with other laws and statutes

Nothing in this permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. Transfer of this permit

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which must be forwarded to the Lead Agency.

1. Transfers by Modification

Except as provided in paragraph (2) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

2. Automatic Transfers

This permit may be automatically transferred to a new Permittee if:

- a. The Permittee notifies Lead Agency at least thirty (30) days in advance of the proposed transfer date.
- b. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.
- c. Ecology does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G8. Reduced production for compliance

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. Removed substances

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. Duty to provide information

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. Other requirements of 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. Additional monitoring

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. Upset

Definition – “Upset” means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the Permittee can identify the cause(s) of the upset.
2. The permitted facility was being properly operated at the time of the upset.
3. The Permittee submitted notice of the upset as required in Special Condition S3.F.
4. The Permittee complied with any remedial measures required under S3.F of this permit.

In any enforcement action the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G14. Property rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

G15. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G16. Toxic pollutants

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G17. Penalties for tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than two (2) years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment shall be a fine of not more than \$20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

G18. Reporting requirements applicable to existing manufacturing, commercial, mining, and silvicultural dischargers

The Permittee belonging to the categories of existing manufacturing, commercial, mining, or silviculture must notify Ecology as soon as they know or have reason to believe:

1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in this permit, if that discharge will exceed the highest of the following “notification levels:”
 - a. One hundred micrograms per liter (100 µg/L).
 - b. Two hundred micrograms per liter (200 µg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony.
 - c. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7).
 - d. The level established by the Director in accordance with 40 CFR 122.44(f).

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in this permit, if that discharge will exceed the highest of the following “notification levels:”
 - a. Five hundred micrograms per liter (500µg/L).
 - b. One milligram per liter (1 mg/L) for antimony.
 - c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7).
 - d. The level established by the Director in accordance with 40 CFR 122.44(f).

G19. Compliance schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than fourteen (14) days following each schedule date.

ATTACHMENT 2

REGULATORY COMPLIANCE MONITORING

1 Introduction

The National Pollutant Discharge Elimination System (NPDES), as regulated by the U.S. Environmental Protection Agency (EPA), requires facilities discharging pollutants to waters of the United States to periodically monitor the effluent and provide the results to the permitting authority (EPA 2010). Monitoring is used to (EPA 2010):

- determine compliance with effluent limitations established in NPDES permits,
- establish a basis for enforcement actions,
- assess treatment efficiency, and
- characterize effluents and receiving water.

1.1 Regulatory Requirement

Regulations requiring the establishment of monitoring and reporting conditions in NPDES permits are in Title 40 of the Code of Federal Regulations (CFR) §122.44(i) and §122.48. NPDES permits issued by the EPA require the permittee to conduct routine or episodic self-monitoring of permitted discharges and report the analytical results to the permitting authority with the information necessary to evaluate discharge characteristics and compliance status (EPA 2010).

Permittees are required¹ to monitor pollutant mass (or other applicable unit of measure) and effluent volume, and to provide other measurements (as appropriate) using the test methods established at Part 136.

All permits must² specify the monitoring type, intervals, and frequency sufficient to yield data that are representative of the activity and must also specify requirements concerning the proper use, maintenance, and installation of monitoring equipment or methods (including biological monitoring methods when appropriate).

1.2 Site Location

The area proposed for the Water Treatment Plant (WTP) and the proposed discharge from this facility are provided in Figure 1-1.

2 Monitoring Conditions

This section describes the monitoring conditions that have been volunteered by the permittee for inclusion in the permit. These conditions include the monitoring locations, monitoring frequencies, sample collection methods, and analytical methods.

2.1 Monitoring Location

The location proposed for effluent monitoring is at the discharge point of the outfall where it will release into a graveled and lined channel. It is expected the sample will be from the pipe prior to contact of the effluent with the channel leading to Railroad Creek. EPA (2010) in summarizing the regulatory intent³ of the monitoring location notes that the most appropriate monitoring location is a safe and accessible sampling point that is representative of the discharge and well mixed.

Since influent conditions to date are estimated, influent samples will be collected quarterly over the two years of WTP operation and then reviewed. Effluent limits are provided in Tables 2-1 and 2-2.

¹ §122.44(i)

² §122.48

³ § 122.41(j)(1)

Table 2-1. Effluent Limits for Metals.

COC	Total Metals Effluent Limit (µg/L)	
	MDL	AML
Aluminum	233	135
Cadmium	1.12	0.65
Copper	61	35
Iron	1643	948
Lead	30.3	17.5
Zinc	372	215

Notes:
 COC = contaminant of concern
 MDL = maximum daily load
 AML = average monthly load

2.2 Monitoring Frequency

The principal factor in determining the frequency of monitoring is the anticipated variability in concentrations of monitored parameters (EPA 2010). At the Site, variability in effluent mixing with the receiving water is expected to be bounded by high (spring, May-June) and low (fall, October) creek flow periods. This variability is expected to have more of an influence on possible impacts to the receiving water than possible variability in influent concentrations which may also vary seasonally. While monitoring twice annually would be sufficient to capture these high and low flow periods, we are proposing to monitor the effluent monthly for the first two years of permit implementation followed by a data review with the Agencies to determine if reduced monitoring frequency is effective at maintaining effluent compliance. This approach is consistent with a tiered approach to the monitoring schedule as described by EPA (2010).

Table 2-2. Effluent Limits for Other Parameters.

Analyte	Units	Limit
pH	std	6.5 to 8.5
Temperature	°C	7-DAD Max of 16
DO	mg/L	9.5
TDG	% of saturation	<110
Turbidity	NTU	5 NTU over background when background is less than or equal to 50
TDS	mg/L	1,500 throughout the year with the exception of a requirement of 500 from May 01 to July 31

Notes:

°C = degrees Celsius

DO = dissolved oxygen

mg/L = milligram per liter

NTU = Nephelometric Turbidity Units

std = standard

TDG = total dissolved gas

2.3 Sample Collection Methods

Grab (individual sample) and composite (continuous sampling or mixing of discrete samples) collection methods are the types most frequently used (EPA 2010). We propose that grab sample collection is sufficient since:

- The flow and characteristics of the waste stream being sampled are relatively constant over the grab sample collection period that is not to exceed 15 minutes (EPA 2010).
- The effluent monitoring is not intended to provide information about instantaneous concentrations of pollutants at a specific time

Sufficient sample volume will be collected during each monitoring event to satisfy the field and analytical laboratory requirements described in Section 2.4.

2.4 Sample Analytical Methods

Field measurements for analytes described in Table 2-2 will be collected at the time of sample collection. Collected samples will be transported off-site for analyses at an analytical laboratory for total metals (EPA Method 6010C) and other parameters (pH by EPA Method 150.1 and TDS by EPA Method 160.1). In addition to field and chemical analytical laboratory testing, effluent samples will also be submitted for Whole Effluent Toxicity (WET) testing using the protocols and test species described in:

- Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. 5th ed. (EPA 2002a).
- Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. 4th ed. (EPA 2002b).

WET testing is another means of determining compliance with water quality goals and directly measures the potential aggregate toxic effect of a mixture of pollutants in the effluent.

Acute and chronic WET tests may be required for NPDES permitting as described in Table IA, 40 CFR Part 136. Acute and chronic WET testing following EPA protocols (2002a,b) is proposed as summarized in Table 2-4.

Table 2-4. WET Test Methods.

Test Type	Test Organism	Test Endpoints	Test Design	Test Method
acute	daphnid (<i>Daphnia magna</i>)	survival	Lab water control, Receiving water control, and 5 concentration effluent dilution series (6.25%, 12.5%, 25%, 50%, and 100%)	2021.0 (EPA 2002a); 96-hr. static non-renewal
acute	fathead minnow, (<i>Pimephales promelas</i>)	survival		2000.0 (EPA 2002a); 96-hr. static non-renewal
chronic	daphnid (<i>Ceriodaphnia dubia</i>)	survival and reproduction		1002.0 (EPA 2002b); 7- day* static renewal
chronic	fathead minnow, (<i>Pimephales promelas</i>)	survival and growth		1000.0 (EPA 2002); 7-day static renewal

Notes:

hr. = hour

* The test is terminated once 60% or more of surviving control females have three broods, which is typically 7 days. At a maximum the test will be extended to 8 days.

A 4-L (1-gal) CUBITAINER® will provide sufficient sample volume for most tests (EPA 2002a,b).

For static renewal chronic tests a minimum of three samples are collected on Test Days 1, 3, and 5, the first sample would be used for test initiation, and for test solution renewal on Day 2.

The second sample would be used for test solution renewal on Days 3 and 4. The third sample would be used for test solution renewal on Days 5, 6, and 7.

Figure 2-2 identifies the locations of receiving water collection.

The lapsed time (holding time) from grab sample collection to first use must not exceed 72 hours; sample holding time begins when the last grab sample is collected (EPA 2002).

Selected laboratories for both analytical chemistry and WET testing will be currently certified with the EPA National Environmental Laboratory Accreditation Program (NELAP).

3 Reporting

Monitoring records will, at a minimum, include the following:

- Date, place, time of sampling.
- Name of sampler.
- Date of analysis.
- Name of analyst.
- Analytical methods used.
- Analytical results.
- Data Validation.

4 References

EPA. 2010. NPDES Permit Writers' Manual. EPA-833-K-10-001. U.S. Environmental Protection Agency, Office of Wastewater Management.

EPA. 2002a. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. Fifth Edition. EPA-821-R-02-012. U.S. Environmental Protection Agency, Office of Water. October.

EPA. 2002b. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. Fourth Edition. EPA-821-R-02-013. U.S. Environmental Protection Agency, Office of Water. October.