GREENS CREEK MINE

2024 Reclamation Plan Approval Audit

FINAL

December 2024

Hecla Greens Creek Mining Company

Juneau, Alaska

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Abbreviations and Acronyms

AAC	Alaska Administrative Code
ABA	Acid Base Accounting
ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
APDES	Alaska Pollutant Discharge Elimination System
ARD	Acid Rock Drainage
Audit Team	HDR Audit Team
AWQS	Alaska Water Quality Standards
DMLW	Alaska Division of Mining, Land, and Water
DST	dry short tons
EIS	Environmental Impact Statement
GPO	General Plan of Operations
HDR	HDR Engineering, Inc.
HGCMC	Hecla Greens Creek Mining Company
NNP	Net Neutralization Potential
O&M	Operations and Maintenance
RCP	Reclamation and Closure Plan
RPA	Reclamation Plan Approval
SOP	standard operating procedure
SRCE	Standard Reclamation Cost Estimator
TDF	Tailings Disposal Facility
TRI	Toxic Release Inventory
USFS	U.S. Forest Service
VWP	vibrating wire piezometer
WMP	Waste Management Permit
WRMP	Waste Rock Management Plan

1.0 Purpose and Objectives

HDR Engineering, Inc. (HDR), conducted an audit of the Reclamation Plan Approval (RPA) for Greens Creek Mine, located on Admiralty Island near Juneau, Alaska, for the Hecla Greens Creek Mining Corporation (HGCMC) and the Alaska Department of Natural Resources (ADNR). This report outlines the audit purpose and approach, findings, observations, and recommendations to verify HGCMC's compliance with applicable laws and regulations associated with the RPA, while also serving as a reference for consideration during the future renewal process of the RPA.

The Greens Creek Mine RPA was approved in 2020 by the ADNR, Division of Mining, Land and Water (DMLW) for a term of five years, which requires an audit prior to its renewal in 2025. The audit will be an objective, systematic, and documented review of the conditions, operations, and practices related to the RPA as well as financial assurance for mine closure and long-term maintenance and Appendices 3, 11, and 14 of the General Plan of Operations (GPO) for the mine as adopted by the RPA. A prior environmental audit was completed at the mine in 2019.

The objectives of this audit were as follows:

Assess the Greens Creek Mine's compliance and performance under the RPA and Greens Creek Mine GPO as it is associated with the following:

- Appendix 3: Tailings Disposal Facility Plan (TDF Management Plan).
- Appendix 11: Waste Rock Management Plan (WRMP).
- Appendix 14: Reclamation and Closure Plan (RCP), November 2019.
    - Appendix B: Basis of Cost Estimate for Greens Creek Mine.
- Financial Assurance Requirements associated with the Solid Waste Disposal Permit.
- Evaluation of active water management from the TDF, waste rock sites, and other disturbances at the completion of mining and milling operations.
- Evaluated the adequacy of financial assurances for reclamation, closure, and long-term operation, maintenance, and inspection of post-closure facilities.
- Evaluation of on-site controls to determine if they provide reasonable assurances that the objectives established under the RPA are being achieved and are functioning as intended.
- Verify compliance with applicable laws and regulations associated with the RPA.
- Identify potential corrective actions associated with the RPA and its associated documents.
- Identify common or systemic environmental conditions that may affect closure or post-closure plan activities and provide recommendations for resolution.

State or federal environmental requirements not incorporated in the RPA and its associated requirements that were not included in the scope of the Audit included:

- Alaska Pollution & Discharge Elimination System (APDES) permit,
- The Integrated Monitoring Plan,

- Stormwater discharge permits,
- Air quality permits,
- Solid waste disposal permit (those elements not associated with the financial assurance requirements of the RPA),
- Toxic Release Inventory (TRI) reporting,
- Water Use Authorizations,
- Fish Habitat Permits,
- 404 Permit; and
- Dam Safety Certifications and Periodic Dam Safety Inspection Reports.

The HDR Audit Team (Audit Team) was composed of the following personnel in the respective audit roles:

Cindy Helmericks, Project Manager

Paul McLarnon, Project Manager/Lead Auditor

Alyssa Vetch, Reclamation, Closure, and Financial Sureties

Caleb Stock, Tailings Disposal Management Plan and Waste Rock Management Plan

2.0 Audit Overview

The pre-audit activities were performed prior to the facility visits. Activities included review of available project permits and plans and participation in a project kickoff meeting prior to the on-site visit.

2.1 Permit and Plan Review

The intention of the preliminary review was to obtain a high-level understanding of the applicable permits and plans in place at the time of the permit review. The Audit Team gathered available permits, plans, and agency authorizations from online resources available through the ADNR Large Mines Program and directly from HGCMC.

2.2 Project Kickoff Conference Call

The Audit Team performed an on-site audit of the Greens Creek Mine and ADNR Large Mines Team on July 18, 2024, and participated in the following: an on-site kickoff meeting, site walk-through, review of provided documents, and interviews.

2.3 On-Site Kickoff Meeting

Upon arrival at the site, the Audit Team attended a site-specific safety training and a site meeting to introduce HGCMC environmental staff to the Audit Team. The purpose of the meeting was to review the scope and purpose of the audit, introduce the personnel conducting it, and outline the schedule of tours and interviews of key personnel responsible for compliance programs and reporting.

2.4 On-Site Walk-Through

The Audit Team participated in a walk-through of the mine on July 23 and 24, 2024, guided by the HGCMC Environmental Manager, Paula Lillesve. During the walk-through, the Audit Team viewed facilities and activities specific to the RPA, and Appendices 3, 11, and 14 of the GPO, as well as operational and monitoring elements of the various facilities. Field observations were discussed with site personnel during the walk-through and in interviews. In addition to the mine site walk-through, individual Audit Team members toured the following facilities with the relevant Environmental Team personnel:

- Tailings Disposal Facility (TDF)
- Site 23 / Pond 23 Waste Rock Storage Facility
- Water Treatment Plant including Ponds 7 and 10
- Inactive Waste Rock Disposal Sites
    - Site 1350 (in reclamation)
    - Sites C, D, and E and associated contact water ponds
- Borrow Sites – Pit 405, Pit 174, Pit 6, Pit 7
- Test Reclamation Sites
- 920 Area/Mill Site

2.5 Interviews

The Audit Team conducted interviews with HGCMC Mine representatives responsible for environmental regulatory oversight to obtain an understanding of the environmental programs and procedures for compliance with permits and plans and to assess how well those programs are understood and implemented.

2.6 Records and Document Review

The Audit Team reviewed applicable permits and reports that were either readily available on site or available on the ADNR's Large Mines Program website (Large Mines Program – Alaska Division of Mining, Land, and Water).

2.7 Briefing Sessions

The Audit Team met with Environmental Team personnel daily to review each day's (two days) progress, ask questions, and discuss specific observations with mine site staff.

2.8 Post-audit Activities

Following the audit, a close-out meeting was held via teleconference with the HGCMC Environmental Team on July 24, 2024, to discuss observations and findings.

2.9 Interviews

The Audit Team interviewed various HGCMC Mine personnel responsible for environmental management program tasks, **Table 1**. lists the interviews with brief summaries of their purpose.

Table 1. Audit Interviews with HGCMC Mine Personnel

Name and Title	Role	Date	Summary/Topic
Paula Lillesve	Environmental Manager for the mine site	7/23-7/24/24	Primary contact for audit and introduced subject matter experts on different aspects of environmental and operations management. Discussed monitoring and inspections as well as reclamation plan. Discussed activities since the last permit update.
Matt Zeeck	Surface Operations Manager	7/23/24	Surface operations at the mine including tailings and waste rock deposition, water, and road management.
Dan Mitchell	Senior Civil Engineer (geotechnical/geological)	7/23/24	Geotechnical monitoring and inspections of the TDF and Site 23.
Cameron Sell	Senior Environmental Engineer	7/23/24	"Guide" for inspection on 7/23/24. Presented site features and discussed monitoring, inspections, operations, and history of mine.
Zack Wrzeszcz	Environmental Engineer	7/24/24	"Guide" for inspection on 7/24/24. Presented site features and discussed monitoring, inspections, operations, and history of mine.
Jennifer Stoutamore	Senior Environmental Engineer	7/23-7/24/24	New employee to Hecla who attended site visits.

3.0 Reclamation Plan Approval

3.1 Regulatory Setting for Reclamation, Closure, and Long-Term Care

Mine closure and reclamation activities, including RCP approval and financial assurance, is overseen by the ADNR's DMLW under Alaska Statutes, Chapter 27.19 (Reclamation) and Alaska Administrative Regulations in 11 Alaska Administrative Code (AAC) 97 (Mining Reclamation).

With respect to reclamation and long-term care, including financial assurance, the environmental audit focused on Hecla's Greens Creek, *GPO,* Appendix 14: RCP, dated November 2019. The ADNR approved the plan on February 20, 2020 (RPA – J20202682RPA). The effective date for plan approval is February 20, 2020, to February 20, 2025. The plan was also approved by the United States Forest Service (USFS) through a memorandum of

understanding with the ADNR (the original MOU is dated June 30, 2014, and was modified on January 23, 2015).

The Audit Team examined the following reclamation/closure items:

- Review conditions and status of RPA (J20202682RPA);
- The adequacy of approved reclamation plan; and
- The adequacy of approved financial assurance.

3.1.1 Reclamation and Closure Plan approval (J20202682)

The Audit Team reviewed the ADNR's RPA requirements and HGCMC's status of meeting the approval conditions, **Table 2**. summarizes only the pertinent RPA requirements, questions, and status. Requirements not relevant to this audit are excluded for clarity. No changes to the RCP or to bonding have been identified since 2019.

Table 2. RPA (J20202682) Conditions and Status

#	Requirements/Audit Questions	Status
Financial Assurance		
1	Approval by ADNR and USFS of financial assurance mechanism. Documentation needs to be approved by ADNR no later than 60 days after RPA.	Total financial amount approved is $92,176,539. The state holds a post-closure surety bond for $ 14,680,059, as of 4/1/2020 (Bond #K08399232).
Terms of Plan Approval		
3	Any changes in Reclamation Plan must be approved by ADNR? Changes (amendments since 2019)?	No amendments since 2019.
Authorized Officer		
4	Authorized officer for ANDR.	HGCMC to be notified of changes to the Authorized Officer as needed.
Reporting		
5	Is the annual report summarizing activities conducted during the previous year and addressing adequacy of financial responsibility, changes to operations, etc., submitted by March 3rd each year? Also includes maps illustrating current development of all facilities.	Biannual reports submitted to the Alaska Department of Environmental Conservation (ADEC) and ADNR each year (filed at Greens Creek Mine – Alaska Division of Mining, Land, and Water).
Environmental Audit		
6	A periodic third-party environmental audit shall be conducted during the final year of the permit term (or sooner if final closure starts during permit term). The audit will include all aspects of the RPA and include evaluation of the approved financial assurance.	In progress (this report).
Closures (Temporary/Permanent)		
7	Notification to Authorized Officer in writing of temporary or permanent closure.	No closures have occurred.
Erosion Standards		
8	Erosion features must be stabilized, inspections completed to verify rills and gullies do not persist.	The site visit occurred during and just after a heavy rain event, roadside drainage ditches were well vegetated, sedimentation ponds, and other stormwater best management practices

#	Requirements/Audit Questions	Status
		(BMP's) were functioning as intended. There were no signs of erosion or sedimentation migrating from disturbed areas throughout the mine site at the time of the site visit.
Inspection and Entry		
9	ADNR inspections between 2019 and current. Documentation of inspections?	Inspections have been conducted by the ADNR and USFS; inspections mostly focused on operations. Some reclamation has occurred on site and, where observed by ADNR, ADEC, and USFS, is described in the inspection reports or field visit notes (on file Greens Creek Mine – Alaska Division of Mining, Land, and Water).
Modifications		
12	Amendments to the Reclamation Plan? Amendments may, at discretion of ADNR, require bond review and update.	No modifications since 2019.

The GPO (HGCMC, 2020a) provides standards to minimize and/or avoid environmental impacts during mine operations as well as provide preparations for eventual mine site reclamation and closure. The GPO includes operational plans, BMP's, closure plans as appendices that are applicable to the RPA which includes the following focus areas for the audit:

- Appendix 3: Tailings Disposal Facility Plan
- Appendix 11: Waste Rock Management Plan
- Appendix 14: Reclamation and Closure Plan

3.2 Appendix 3: Tailings Disposal Facility Plan

3.2.1 Management Objectives

Management Objectives for the TDF listed below cover the entire life cycle of the facility including design, construction, operations, monitoring and eventual closure.

- Construct facility expansions per approved construction drawings.
- Safely receive approved waste material within the designed TDF capacity constraints during the operational period of the mine.
- Minimize run-on water entering the TDF from upgradient sources.
- Maintain water management system components as designed with an understanding of geochemical and hydrological processes. Control surface water, groundwater and interior facility water to prevent off-site water quality impacts.
- Minimize fugitive dust impacts from the TDF operations to surrounding land and wetlands areas.
- Maintain short- and long-term geotechnical stability.
- Reduce impacts to the receiving environment and ultimately reclaim the facility in a manner that will support and protect designated beneficial uses.

The following section addresses the observations by the Audit Team based on the management objectives established for the TDF.

3.2.2 Construction of Facility Expansions

At the time of the site visit, there were no on-going construction activities for the expansion of the TDF. At the time of the site visit, no dredging activities had occurred, and no material was removed from Pond 10. Sediment bags and piping were pre-emptively set up in Pond 10 for expected operation, but the dredge was non-operational during the summer. The Audit Team did not observe any active or previously expanded areas of the mine that were not consistent with the approved TDF construction plans.

3.2.3 Safely Receive Approved Waste Material within the Designed TDF Capacity Constraints

The audit team observed tailings being delivered to the TDF by lidded trailer trucks from the mill. Tailings were being end-dumped on site, actively spread with a dozer, and then vibratory roller compacted in small discreet areas (see Appendix A, **Photograph 1**). The Audit Team did not observe tailings disposal occurring outside of the TDF boundary, and tailings were being graded smooth to promote surface water runoff and prevent ponding.

3.2.4 Minimize Run-On Water from Entering the TDF from Upgradient Sources

During the time of the audit, water was not observed entering the TDF from upgradient sources. Contact storm water from areas located upgradient of the TDF was being captured for treatment at the water treatment plant and non-contact storm water was being managed and treated using Storm Water BMP’s prior to discharge.

3.2.5 Maintain Water Management System Components as Designed

Contact water from the mill site, mine portal area, and upgradient waste rock sites was being collected in lined drainage ditches that drained to lined collection ponds where it was pumped and piped to the water treatment plant for treatment prior to discharge. Non-contact water from access roads, borrow sources, and growth media storage locations was being diverted into vegetated drainage ditches and sediment ponds prior to discharge.

3.2.6 Minimize Fugitive Dust Impacts from the TDF Operations

HGCMC has been monitoring fugitive dust emissions from the TDF. HGCMC installed wind screens on the top of the TDF to deflect wind away from areas where tailings were being offloaded and spread at the top of the TDF. The slopes of the TDF were well vegetated and working areas were being kept to a minimum at the time of the Audit.

3.2.7 Maintain Short- and Long-Term Geotechnical Stability

HGCMC is implementing construction practices to increase both short- and long-term geotechnical stability by drying tailings to near optimum moisture content prior to disposal, placing tailings in sub-horizontal lifts and compacting with a smooth drum roller compactor, grading to drain surface water, and co-disposing waste rock within the tailings at a target ratio of 4 to 1 (tailings to waste rock).

3.2.8 Reduce Impacts to the Receiving Environment and Ultimately Reclaim the Facility in a Manner That Will Support and Protect Designated Beneficial Uses

The Audit Team observed that HGCMC is taking steps to reduce impacts to the environment and reclaimed areas are serving beneficial uses to the surrounding environment. For example, water management at the mine is thoroughly managed and actively maintained though a complex series of lined storm water and sediment collection ponds and is treated prior to discharge. Areas of the TDF that are not being actively worked and are near final grading were in interim reclamation stages and showed no signs of active erosion or instability at the time of the site visit; they were well vegetated, and several areas were being used by wildlife. Several black tailed deer were observed using revegetated slopes of the TDF as browsing habitat.

3.2.9 Tailings Characteristics

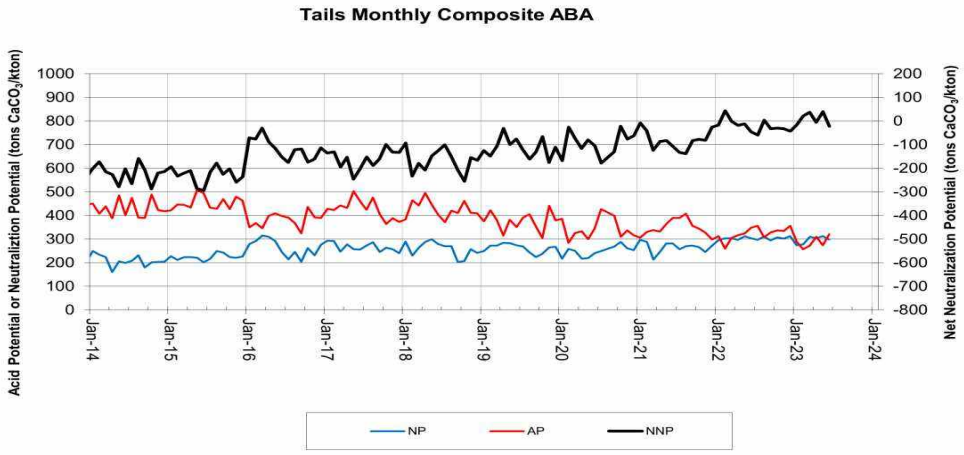
The TDF is a partially lined disposal facility with a permitted footprint of approximately 68 acres (excluding the pond systems). A slurry wall surrounds the unlined areas of the TDF. The primary function of the TDF is the disposal of dry stack tailings that are produced by the Mill. The Mill at the Greens Creek Mine generates approximately 1,800 dry short tons (DST) of filter-pressed tailings per day, which equates to approximately 650,000 DST annually. Tailings from the Mill are dewatered in a filter press and approximately 50 percent of the tailings are mixed with cement and hauled back into the mine as backfill. The other 50 percent of the tailings are trucked to the TDF for permanent disposal (Hecla H2 2023 Biannual Report; HGCMC, 2023). HGCMC is compacting tailings (see Appendix A, **Photograph 1**) co-disposed with waste rock at an approximate ratio of 4 to 1 which increases shear strength and factor of safety against instability and reduces erosion. Grade control GPS tracks placement of Class 1 rock (surplus of carbonate to counter acid-generating drainage) to the exterior 2 feet of the TDF in accordance with the GPO. The Waste Management Permit (WMP), though not part of the scope of this audit, requires that tailings be filter pressed prior to placement in the TDF. It is important to the requirements of overall RPA that acid generating tails are managed to prevent acid generation.

Tailings contain pyritic sulfur, which through weathering processes can lead to acid generation. However, the tailings also contain significant carbonate, which neutralizes the acid. Previous studies have shown that the lag time for acid generation from exposed tailings is on the order of decades. The prevention of acid generation from the TDF is one of the primary management objectives. As part of the TDF standard operating procedure (GPO Appendix 03, Attachment A), composite samples are collected from the tailings filter press monthly for Acid Base Accounting (ABA) analyses. Example analytical results for samples collected during the reporting period are shown in **Table 3**. Samples had an average acid potential of 316 tCaCO3/kt, an average neutralization potential of 284 tCaCO3/kt, and an average net neutralization potential (NNP) of -32 tCaCO3/kt. Figure 1 graphs the results from tails monthly composite ABA samples collected since 2014. NNP has shown an upward trend over the past 10 years due to a decreasing trend in acid potential. (Hecla H2 2024 Biannual Report; HGCMC, 2024).

Table 3. Acid Base Accounting

2023	Acid Potential	Neutralization Potential	Net Neutralization Potential
July	359.47	302.85	-56.62
August	361.26	289.16	-72.10
September	259.02	303.24	44.22
October	256.15	298.75	42.60
November	292.74	283.47	-9.27
December	370.95	229.59	-141.36
Average	**316.60**	**284.51**	**-32.09**

Figure 1. Tails Monthly Composite ABA



HGCMC appears to be following the GPO and RPA with regards to the TDF; the following recommendations are provided for consideration as part of the renewal of the RPA:

Stabilization and protection of surficial soil materials from wind and water erosion is required in the RPA (ADNR, 2020). Fugitive dust emissions from the TDF are a concern for operations and could continue into reclamation. HGCMC has been monitoring fugitive dust emissions from the TDF since 2011 using 10-liter atmospheric depositional pails mounted approximately 1.3 meters off the ground. Eight atmospheric depositional pail systems have been deployed 50 to 100 meters from the base of the dry stack tailings pile. Results from the analysis show that the deposition is seasonal with fugitive dust emissions occurring primarily in winter under cold, dry desiccating conditions with moderate wind speeds from the north or northeast. Because of the lag in results through this method, HGCMC supplements dust emissions monitoring with real time data and visual monitoring as reported in the Hecla H2 2023 Biannual Report (HGCMC, 2023). HGCMC has implemented numerous abatement measures including minimizing open surfaces, hydroseeding outer slopes where appropriate, covering interim slopes with rock, limiting snow removal to only active placement areas, wind fencing, and applying water to tailings as necessary. Recently, HGCMC has experimented with erosion suppression products over select areas with varying amounts of success and attributed a more beneficial application when the products are applied in dry conditions. The Audit Team recommends continued wind

and water erosion abatement and experimentation during operations in preparation for having the most effective methods identified prior to reclamation.

HGCMC is following the requirements in the RPA (ADNR, 2020) by producing biannual reports summarizing activities, presenting monitoring data, and updating maps. The Audit Team recommends HGCMC continue to produce this annual report, work towards long-term reclamation and closure criteria for the TDF, and present mitigation strategies for potential issues that could cause non-compliance with the RPA.

3.3 Appendix 11: Waste Rock Management Plan

Waste rock generated from mining is sorted by HGCMC geologists underground into four classes based on acid generating potential. Class 4 rock has the highest acid generating potential and is cemented and disposed of underground. Class 1, 2, and 3 waste rock is brought to the surface if not needed underground for backfill and is stored at Site 23 or co-disposed of with tailings in the TDF as described above. To verify ABA, HGCMC submits chip samples on a quarterly basis for laboratory testing and reports the results in the Biannual Report (HGCMC, 2023).

Site 23 is the primary disposal site for waste rock and the only active waste rock disposal location with a predicted life expectancy through the year 2028. At Site 23, the waste rock is segregated into Class 1 or Class 2/3 by depositing Class 1 waste rock on the south side of the dump and Class 2/3 on the north side of the dump. Section 3.3.1.1. of the WRMP states that Class 1 material is placed on at least the outer two feet of the pile. Waste rock is placed in less than 2-foot tall, compacted lifts at an overall inclination of approximately 2.85H:1V. At closure or before, all waste rock contained in Site 23 will be relocated either to the TDF or to the underground workings for final disposal (Appendix 14, HGCMC, 2019b).

Since the waste rock will be relocated from other inactive storage locations (sites other than Site 23, which is currently active) as part of site reclamation, the Audit Team cannot respond to current compliance with Appendix 14 (HGCMC, 2019b) of the GPO for the inactive sites on the topics of 1) class(es) of waste rock, 2) compaction of waste rock, or 3) placing Class 1 (argillite, low ARD potential) on the outer 2 feet. Follow up correspondence with HGCMC found that the standards associated with placing Class 1 (argillite, low ARD potential) on the outer 2 feet did not exist when the other (now inactive) waste rock disposal sites were active, so compliance with that standard cannot be confirmed for the inactive waste rock sites. With regards to Site 23 the Audit Team can state that HGCMC is knowledgeable of what is expected during closure and is working in accordance with Appendix 11 at the time the on-site walkthrough. Audit Team interviews with HGCMC staff indicate compliance with methods from Appendix 11 for segregating waste rock for disposal at the active waste rock dump Site 23. Quarterly ABA quality assurance testing results are presented by Class in the Biannual Report (HGCMC, 2023).

The Audit Team recommends continuation of this practice during operations to reduce potential contaminant loads during operation plus reduce required closure construction and bonding. Appendix 14 indicates that surface waste rock will be relocated to underground workings or to

Error! Reference source not found. lists the volume of waste rock disposed of underground from January 2024 to June 2024.

Table 4. Underground Waste Rock Disposal

Month	Tailings (DST)	% of Tailings Generated	Waste Rock (tons)
Jan 2024	28,368	47%	5,839
Feb 2024	27,551	44%	3,539
Mar 2024	28,478	43%	4,807
Apr 2024	25,787	42%	3,912
May 2024	27,169	45%	3,554
Jun 2024	27,373	34%	1,647
Total	164,726		23,298

Source: H1 2024 Biannual Report (HGCMC, 2024) for the State of Alaska Waste Management Permit No. 202DB0001

No records were available that showed that these repositories have sufficient capacity to store the surface waste rock, so the Audit Team recommends that HGCMC conduct a volume analysis to compare the required volume of relocated waste rock to available storage. With respect to the RPA (ADNR, 2020), the Audit Team recommends HGCMC continue to monitor, update maps, and report findings in the biannual report.

HGCMC manages its waste rock facilities to safely receive material during production, maintain pile stability, reduce impacts to the receiving environment, and ultimately return the land to natural use. Practices consistent with industry standards are employed to achieve management objectives. Objectives applicable to surface waste rock site management include the following:

- Segregate waste rock for disposal based on the Greens Creek Mine defined classification scheme (e.g., class 1–4).
- Maintain surface water controls by using best management practices.
- Reduce potential for water quality issues caused by air and water entry into the waste rock mass.
- Place and maintain interim argillite cover over the disposal site.
- Construct and maintain waste rock sites in a manner that ensures operational stability.

3.3.1 Segregate Waste Rock for Disposal

Audit Team interviews with HGCMC staff indicate compliance with methods from Appendix 11 for segregating waste rock for disposal at the active waste rock dump Site 23. Quarterly ABA quality assurance testing results are presented by Class in the Biannual Report (HGCMC, 2023). Six inactive waste rock areas are present on the property including the 1350 Site, 960 Site, Mill Backslope, Site C, Site D, and Site E.

3.3.2 Maintain Surface Water Controls by Using BMP

HGCMC constructed an upstream diversion ditch to reduce run-on to Site 23 where the majority of the mine's waste rock is stored. In addition, waste rock is compacted to reduce infiltration and erosion and improve surface water quality, see Appendix A, **Photograph 2**. A geomembrane lined diversion ditch captures surface runoff at the toe of Site 23 where it is pumped and piped to the water treatment plant.

Inactive waste rock storage sites are partially vegetated or in active removal (Site E). Geomembrane lined stormwater collection ditches were constructed downstream of waste rock dumps to manage contact stormwater by conveying it to the water treatment plant.

3.3.3 Reduce Potential for Water Quality Issues Caused by Air and Water Entry

Active waste rock disposal at Site 23 is compacted to reduce air and water infiltration which can lead to acid rock drainage and metal loading of surface water. Furthermore, positive grading minimizes ponding on the Site 23 waste rock to reduce infiltration. The Audit Team is unaware if this practice was implemented during placement of waste rock in the inactive waste rock disposal areas.

3.3.4 Place and Maintain Interim Argillite Cover Over the Disposal Site

Audit Team interviews with HGCMC staff indicate that Class 1 material (argillite) is being placed on at least the outer two feet of the Site 23 disposal area once grading is completed at that elevation. The Audit Team is unaware of the practice of placing an interim argillite cover over the inactive waste rock dumps.

3.3.5 Construct and Maintain Waste Rock Sites in a Manner that Ensures Operational Stability

Waste rock is being placed at grades equal to or flatter than 2.85H:1V in accordance with Appendix 11 to provide operational stability. Waste rock is placed in lifts less than 2 feet thick and compacted to increase stability.

Site 23 is on a paleo, regional block slide that is monitored by HGCMC and reported on in the Biannual Report (HGCMC, 2023). Less than 3 inches of lateral displacement has occurred since 2006, and the movement occurred at a depth corresponding to the base of the underlying slide/colluvium int and the top of dense till in the foundation rather than within the waste rock dump.

3.4 Appendix 14: RCP Review

The WMP (2020) addresses reclamation and closure requirements for the mine. The permit references and incorporates the 2019 Hecla Greens Creek *GPO,* Appendix 14: *Reclamation and Closure Plan* (November 2019), financial responsibility and mine termination (closure). The *Reclamation and Closure Plan* sets performance goals applicable to interim, concurrent, and final reclamation and addresses post closure monitoring. Overall, the Audit Team finds the plan to be complete and comprehensive. Updates to financial assurances are required for the renewal of the WMP and renewal of the RPA.

The *Reclamation and Closure Plan* and financial responsibility cover the following mine-related facilities:

- TDF and associated ponds
- Underground mine workings
- 920 mill and portal area

- Waste rock dumps (active and inactive): Site 23, 1350, C, D, and E; the plan is to move waste dump materials either to the underground workings or to the TDF for final disposal.
- Roads – 1350, Access A, and Access B
- Hawk Inlet and Marine Loadout Area
- Young Bay dock facility
- Utilities – power line
- Growth media stockpile areas and borrow areas

Waste rock storage – HGCMC's plan is to not leave waste rock above ground at the time of closure; rather the rock will be placed back into the underground mine or will be placed in the lined and covered TDF. Given that some waste rock is acid generating, this will alleviate long-term concerns of acid rock drainage (ARD) from reclaimed and closed dumps. The following is a list of waste rock storage sites:

- Site 23 is active and has a leachate and stormwater collection system. This was the only active waste rock site at the time of the on-site audit. This site also has a lined pond (23 Pond) that collects leachate and stormwater from the waste rock dump and this water is pumped to the TDF treatment system. Pond D is further downgradient, and it picks up additional curtain drain water associated with Site 23.
- The H2 2023 Biannual Report (and previous reports) state that the Site 23 covers approximately 18 acres. The Standard Reclamation Cost Estimator (SRCE) Model and Reclamation Closure Plan state that the acreage for Site 23 is 20 acres. It is recommended that the overall size of Site 23 be clarified as well as the area within Site 23 that is permitted to receive waste rock.
- Site 1350 and portal area (former disposal site) had some waste rock moved to Site 23 for temporary storage, but this has since been hauled underground for disposal. The site has been temporarily reclaimed, and remaining waste rock will be removed during site closure and reclamation and placed underground or at the TDF.
- Sites C and D waste rock will be removed and placed underground or at the TDF.
- Site E waste rock has been periodically moved to the TDF over the last several years, but at the time of the site visit, no waste rock had been moved in 2024.

Borrow sources – HGCMC has a number of borrow sources on site that will require reclamation or are currently being reclaimed. The Audit Team viewed Pit 7, the sand quarry, Pit 174, Pit 405, and Pit 6. Stabilization measures (hydroseeding, broadcast seeing, and placement of growth media) have been implemented for these sources in accordance with the stabilization approach in the RCP, and in general appear to be working, as the Audit Team observed little or no evidence of erosion on sloped hillsides. HGCMC plans to minimize use of borrow areas (not create new borrow sources), which means it will rely on previously stockpiled growth media material (some stored at Pit 405, 174, Pit 6, Pit 7, and Site 23, as well as stockpiles along A and B Roads) and on imported materials for final reclamation and closure activities (cover material for TDF).

920 Portal and Mill Area – This area will be reclaimed by removing all buildings and related structures and possibly removing some surface material if it has the potential for ARD. Material with the potential to generate acid would be placed underground and cemented, or at the TDF. Pond A collects stormwater and mine water, which is then treated at the 920 and used in the mill process or conveyed to the water treatment plant located at the TDF.

At the time of the site visit, HGCMC showed the Audit Team a new concrete catchment structure by the ore pad, constructed to capture sediment from stormwater from the ore pad, which is conveyed to Pond A and is subsequently treated at Pond 7 water treatment plant or the mill water treatment plant at the TDF. This was constructed to reduce the amount of sediment reaching Pond A, see Appendix A **Photograph 9**. USFS Inspection Report 431 (USFS, 2023a) shows that this was completed in early 2023.

During closure, a bulkhead will be constructed at the 920 portal and workings will be allowed to flood naturally. Modeling estimated that portal 920 would begin to seep (and would be flooded) 50 years after mine closure. This seepage water will be conveyed to the pond system at the TDF for storage and batch treatment. Thus, this water seepage, collection, and batch treatments represent long-term treatment (perpetuity). The timing of when water will appear from the portal, the quality of that water, and the volume of water are all important factors for understanding financial assurance adequacy. The TDF environmental impact statement (EIS) evaluated the adequacy of this model prediction. The Audit Team recommends that with each permit renewal a water model update be completed. Given that the mine is in full operations and that site geology, hydrogeology, and water balances are now better understood than when the modeling was first completed, the model could be re-calibrated to determine if the prior predictions should be updated.

TDF – This site is active and continues to grow in size, per design. Material from Site 23/D will be transported to the TDF (or underground) for final disposal. The water treatment facility is located at the TDF and treats stormwater and leachate not only from the TDF, but also from upstream sources (Site 23, the mine area, and Hawk Inlet). The TDF contains water storage ponds 7 and 10. The TDF will be closed in place with a cover and is the only facility for which HGCMC is planning an engineered cover. Based on the review of USFS inspection Report 432 (USFS 2023b), a new de-grit basin was constructed at the TDF in 2023.

Mass instability monitoring of the TDF is required per Appendix 14 of the GPO. Five of the six piezometers reported in the Hecla H2 2023 Biannual Report (HGCMC, 2023) indicate a rising phreatic surface since 2020, which increases instability. Interviews with HGCMC personnel indicated these pneumatic piezometers are presenting erroneous data and additional vibrating wire piezometers (VWP) installed at the site do not show this trend. These additional VWP data along with inclinometer data are shared with the project Engineer of Record through a data logger and semi-annual reading frequency respectively.

B-Road – The B-Road provides access between Hawk Inlet (from the junction with A-Road) and the 920/Mill Site area. In the *Reclamation and Closure Plan*, HGCMC states that primary access roads, including that from the TDF to the mill area and portal, will be removed at closure. At the time of the site visit, HGCMC showed the Audit Team the area at 5.6-mile B-Road where

additional buttressing and road stabilization occurred following a recent landslide. USFS inspection reports for the site show that stabilization activities occurred throughout 2022 (USFS 2022a, 2022b, 2023c).

Growth Media – HGCMC defines growth media as a material that supports vegetation following reclamation. In the *Reclamation and Closure Plan*, HGCMC states that "topsoil" is not necessary for successful re-vegetation of disturbed areas on site. HGCMC keeps an inventory of reclamation stockpiles to document their locations (GPO, Appendix 14 *Reclamation and Closure Plan* Table 2). At the time of the site visit, the table and map appeared up to date, however the Audit Team recommends that HGCMC verify and update the inventory for the permit update and that a map be provided showing each location of stored growth media (not just the major stockpiles). Additionally, Sites D and E are listed in the *Reclamation and Closure* Plan as having material suitable for the barrier layer of the cover for the TDF (excavated from mill site during construction of mill; currently overlain by waste rock at sites D and E). Reclamation of Sites D and E will entail removing the waste rock in a manner that prevents comingling with the till material. Once the waste rock is removed, the till will be available for use in construction of the cover at the tailings facility. The clay matrix of the till has inhibited downward flow of drainage from the waste rock through the till.

As stated in the plan, "additional growth media needed to complete reclamation will be imported from off-island sources as needed for cover cap construction and revegetation". Volumes and locations of stored material should be updated in the permit renewal as needed. Updates to the cost of imported material should be made in the SRCE model during permit renewal.

3.4.1 Review of Reclaimed Areas and Specific Plant Community Goals

The Audit Team assessed reclamation of the 1350 portal area. This area was a former waste rock area, where a portion of the waste rock was moved to Site 23 for temporary storage (the waste rock will go either underground in the mine or in the TDF). The area has been re-contoured and has a drainage system established, which, according to HGCMC, includes two new drill collars installed in 2022 to drain water to the underground workings for collection and subsequent treatment. Minimal reseeding and little or no topsoil are present. HGCMC has indicated that "top soil" is not necessary for the vegetation to re-establish itself quickly in unconsolidated material. The review of the 1350 portal area supports HGCMC statements on vegetation establishment, with minimal topsoil and even limited active reseeding. The vegetation re-establishment in the 1350 portal area was strong, with desirable plant species showing further growth since the 2019 audit (and associated 2018 site visit). The Audit Team did not do a formal vegetative survey; rather, this is a qualitative assessment of site conditions based on experience with reclamation projects. The area showed minimal erosion and runoff, and site runoff collection/ponding for drainage the underground workings appeared to be working (see Appendix A, **Photograph 2**).

In addition to the 1350 portal area, the Audit Team visited the 960 area, Pit 405, Pit 6, and Pit 174. Each area showed good vegetative growth (see Appendix A, **Photograph 3** through **Photograph 7**).

The *Reclamation and Closure Plan* describes revegetation (Section 6.2.1). The plan describes that disturbed areas will be reclaimed to upland meadows, upland forest, or wetlands vegetations types, with specifics on seed mixtures, woody seedling density, and maps of the vegetation types to be submitted with the final reclamation plan and associated subsequent reports. Specific plant community goals (Section 6.2.2) state that vegetation on concurrent and final reclaimed areas will be subject to monitoring requirements and performance standards to be derived from consultation with appropriate regulatory agencies after revegetation and consideration of site-specific conditions. The exception to this will be roads used for permanent access and other areas where buildings are maintained for post-mining use.

3.4.2 Review of Annual Reports for Reclamation and Financial Assurance

Per the WMP under Section 2.4.2.6 – Annual report, the permittee shall "address the adequacy of the financial responsibility including, but not limited to significant changes in reclamation activity costs, concurrent reclamation, expansion or other changes to the operation of the facility."

HGCMC provides a summary update of reclamation activities and adequacy in the second half 2023 biannual report entitled *H2 2023 Biannual Report for the State of Alaska WMP No. 2020DB0001* (February 29, 2024). HGCMC stated in the biannual report:

> Since the issuance of the WMP in February 2020, there have been no substantive changes to the operations that affect the reclamation cost estimate.

3.4.3 Review of Inspection Report for Reclamation and Financial Assurance

The audit team reviewed U.S. Department of Agriculture (USDA) inspection reports since 2019 (posted online) for review of possible changes to evaluate adequacy of financial assurance. In the inspection reports, the audit team identified the following new structures:

1) A new de-grit basin at the TDF.
2) Upgrades/replacements for Zinc Creek, Killer Creek, and Falls Creek bridges.
3) A stormwater conveyance structure at 920.

These new structures should be added to the SRCE model during the next permit update.

3.5 Financial Responsibility

3.5.1 Reclamation and Closure Costs Estimation

Per Alaska Statutes Chapter 27.19 (Reclamation) and Alaska Administrative Regulations in 11 AAC 97 (Mining Reclamation), the permittee shall provide the ADNR with proof of financial responsibility for reclamation and closure of the mine and post-closure monitoring. **Table 5** summarizes reclamation and closure costs (including post closure) for the 2019 update. The cost schedule assumes 4 years for reclamation activities and 100 years for the long-term care phase and water treatment to represent water treatment in perpetuity.

Table 5. Reclamation/Closure Cost Estimate and Bond Evaluation from 2019

Items	2019[1]
Earthwork/Recontouring	$33,197,259
Revegetation/Stabilization	$366,788
Detox/water treatment/disposal	$22,240,656
Structure, Equipment, Facility Removal, Misc.	$4,409,501
Monitoring	$7,592,854
Construction Management & Support	$341,245
Closure Planning, G&A, and Human Resources	$22,080,079
Direct Totals	$90,228,382
Indirect Cots	$37,219,208
Grand Total	$127,447,590

[1] Costs presents labor, equipment, materials, mobilization/demobilization.

The total proof of financial assurance is less than the total amounts shown in Table 5, as it accounts for real rate of return, which in 2019 was set at 3.97 percent, but it also accounts for inflation, which in 2019 was set at 1.28 percent. The total proof of financial responsibility was set as follows:

- $77,496,480 for reclamation – bond held by USFS
- $14,680,059 for Long-Term Care, bond held by ADNR and ADEC
- Total $92,176,539

The ADNR approved the bond for $92,176,539 on February 20, 2020. No updates to bonding or financial assurance have been made since permit renewal and subsequent approvals.

3.5.2 Reclamation and Closure Costs Estimation

HGCMC used the SRCE for the 2019 reclamation and closure costs presented in Table 5. Cost estimate assumptions are presented in Section 9.1 and in Appendix B of the *Reclamation and Closure Plan*. SRCE is a Nevada cost estimator (series of spreadsheets in Microsoft Excel format) that provides a consistent basis for estimating reclamation and closure costs for mining operations in Nevada with the goal of ensuring consistency among users and regulators. The estimator can be applied to other states and provides a good platform for cost estimation that is growing in popularity with both the mining and regulator communities.

The State of Alaska is required to obtain financial assurances to ensure that the approved reclamation tasks are completed in the event HGCMC fails to perform the necessary tasks as outlined in the reclamation and closure plan. The RPA requires that the environmental audit evaluate the adequacy of the approved financial assurance.

HGCMC prepared the 2019 plan and estimated reclamation costs in accordance with standard engineering cost estimation procedures which are consistent with methods commonly used by industry as well as state and federal agencies (using the SRCE platform). Costs for individual reclamation tasks are based on unit costs to support a third-party reclamation through varying years. General costs sources are as follows (from Section 9.0 and Appendix B in the plan):

- Labor rates – Alaska Department of Labor and Workforces Development, Division of Labor Standards and Safety's *Laborers' & Mechanics' Minimum Rates of Pay* (Pamphlet 600) (Alaska "Little Davis-Bacon").
- Material costs – Local vendors, 2011 RS Means Heavy Construction Cost Data, Western Edition.
- Productivity data and calculations – Caterpillar Handbook. Edition 36, for productivity calculations; 2011 RS Means Heavy Construction Cost Data.

Most of the above-referenced cost sources have been updated since 2014. HGCMC used older versions of the above-referenced documents for the 2019 estimate (according to HGCMCM this is due to the time lag between bond calculation submittal and agency approval), though they did use an inflation factor that accounted for changes in time. For the 2024 update, the Audit Team recommends that HGCMC use the most current references to update costs.

Tributary Creek is currently listed as Impaired by ADEC Total Maximum Daily Loads & Alternative Recovery Plans and may not be returned to non-impaired status at the time of mine closure which may require continued monitoring of water quality, sediment element concentrations, and biomonitoring to document habitat and water quality conditions of the water. This potential cost item has not previously been incorporated into the facility's reclamation/closure cost estimates. The Audit Team Recommends HGCMC provide an evaluation and estimate of potential future costs of continuing monitoring requirements of Tributary Creek as part of the financial responsibility

The Audit Team did not "re-estimate" the financial assurance estimates created by HGCMC; instead, the Audit Team spot checked calculations, verified assumptions listed in the plan, and evaluated the overall adequacy of the approved financial assurance.

Assumptions, reclamation tasks, and associated costs are listed in the Reclamation and Closure Plan. The following is a reiteration of what was listed in the 2019 audit:

- Long-term water treatment into perpetuity as it relates to volume of water, storage of water, and treatment requirements. Updating (or re-verifying) the hydrologic/water quality model for water seepage from the underground mining is recommended.

3.5.3 Cost Estimation Approach

The Audit Team reviewed the approved 2019 financial assurance estimates. Overall, the cost estimate approach appears to be complete and consistent with mine activities reviewed during the audit. HGCMC customized SRCE to fit their needs by creating 20 user sheets. The spreadsheet contains a table of contents that defines each of the user sheets, and these user sheets contain many of the details and assumptions. The Audit Team recommends the following for the 2024 updated plan relating to cost estimation:

- Verify quantity of growth media stockpiled at the site, primarily the volume at 1.9-mile B-Road as the volume in the SRCE model does not match the RCP (1,000 cubic yards compared to 100 cubic yards). Update throughout if volume in model is incorrect.

- Update equipment costs with newer versions of the references used, for comparison with estimates from costs adjusted for inflation (what was previously used for the last two permit updates).

3.5.4 Indirect Costs

The State of Alaska has published several documents on cost estimation approaches, including the following:

- Draft Mine Closure and Reclamation Cost Estimation Guidelines dated December 2013 (ADNR/ADEC, 2013).
- Mine Closure and Reclamation Cost Estimation Guidelines: Indirect Costs Categories (ADNR/ADEC and prepared by DOWL, 2015).

The first document remains in draft form and has not been adopted as official policy. The goal of the guidance is to provide consistent methodology for estimating the amount of financial assurance required for mine closure and for use by regulatory agencies when reviewing the closure cost estimates. The second document supplements the 2013 draft guidelines in that it assesses the variability that drives the ranges of indirect costs observed with reclamation and closure projects and then makes recommendations about what changes ADNR/ADEC should consider in order to improve the accuracy of the indirect costs portion of the guidelines.

The following discussion focuses on indirect costs, compares recommended indirect costs with HGCMC estimates, and makes recommendations for the 2024 update.

ADNR/ADEC define the following seven indirect cost categories for reclamation and closure:

- Contractor Profit – Calculated as revenue gained from reclamation/closure activities after accounting for contractor expenses, costs, and taxes.
- Contractor Overhead - Contractor overhead refers to all ongoing business expenses not including or related to direct labor, direct materials, or third-party expenses that are billed directly to a project.
- Performance and Payment Bond – Bond to protect owner (in this case the state) from contractor failure to perform contracted scope of work, and also to cover payment to subcontractors and others receiving payments from the contractor. State of Alaska statutes (AS 36.25.010) require both a performance bond and a payment bond for construction of projects administered by the State of Alaska.
- Insurance – Liability insurance taken out by the contractor and required by the state.
- Contract Administration – Cost incurred by state (and cooperating federal agencies, if applicable) to oversee reclamation and closure activities.
- Engineering Redesign – Typically involves updating the mine's reclamation and closure plan and plan of operations. Often done to provide sufficient details to obtain bids from contractors for mine site reclamation and closure. Generally performed by an independent engineer contracted by the state.

- Contingency – Accounts for unknown or unforeseen costs arising during the reclamation and closure work. The two types of contingency costs are related to the scope of work and to contractor bids.

Other indirect costs often reported (may show up in direct costs, or are not accounted for) include the following:

- Inflation proofing - Additional anticipated project costs due to general economic inflation are often included in the indirect cost category when determining the total estimated reclamation and closure cost. This is more often shown below direct and indirect costs since inflation adjustments should account for both types of costs.
- Mobilization/demobilization – Typically, these costs are included in direct costs (except for USFS, whose guidelines indicate these should be included as indirect costs).

In 2013, HGCMC, ADNR/ADEC, and the USFS had a series of meetings to discuss and develop recommended indirect costs. These are reflected in the 2019 indirect costs used in HGCMC's plan (based on use in the 2014 plan). The Audit Team compared 2014 HGCMC indirect costs calculations and 2019 indirect cost calculations to the indirect costs recommended by ADNR/ADEC in the *Draft Mine Closure and Reclamation Cost Estimation Guidelines* (DOWL recommended edits in Appendix A, 2015) (**Table 6**).

Table 6. Comparison of Indirect Cost Percentages for Reclamation/Closure Costs between 2014 HGCMC, ADNR/ADEC Guidelines, and 2019 HGCMC

Indirect Costs Category	2014 HGCMC	AK Guidelines 2015 DOWL Draft[1]	2019 HGCMC
	Percent of direct costs		
Contractor Overhead and Profit	15	4 to 8 (OH) 6 to 10 (profit)	15
Performance and Payment Bond	3.0	2.5 to 3.5	3.0
Insurance	0.5	1.5	0.5
Contract Administration	3.5	5 to 9	3.5
Engineering Re-Design	2.75	3 to 7	2.75
Contingency	6.5 (scope) 6.5 (bid)	6 to 11 (scope) 4 to 9 (bid)	6.5 (scope) 6.5 (bid)
Inflation Proofing (apply to both direct and indirect costs)	2.31	An inflation factor based on Anchorage CPI average over previous 5 years, and compounded for next 5 years	1.28
Mobilization/Demobilization	Part of direct costs	Part of direct costs	Part of direct costs

[1] Appendix A in Mine Closure and Reclamation Cost Estimation Guidelines: Indirect Cost Categories, prepared by DOWL for ADNR/ADEC, April 2015.

In summary, HGCMC's 2019 indirect costs estimates and assumptions are generally consistent with ADNR/ADEC draft guidelines and industry standards. Given that HGCMC and the agencies negotiated the indirect costs for the 2014 plan (which were continued in the 2019 plan), the Audit Team recommends that a similar process be used for the 2024 plan.

4.0 Adequacy of State Oversight to Protect State Resources

The Audit Team reviewed permits, annual reports, and inspection reports from ADNR and the USFS. The inspection reports (between 2020 and 2024) summarize their inspection tours and any findings or observations and provided photographs. The primary topics covered by the inspection reports were descriptions of needed upgrades and upgrades to BMPs at the time of inspection, road repair operations at several locations along B-Road due to landslides (primarily at 5.6-mile B-Road), bridge repair and replacements, waste rock movement from Site E to TDF, sediment dredging from Pond 7 and associated dewatering, and smaller scale construction/replacement activities. The regulatory staff for the mine are knowledgeable and have a good understanding of mining methods, mitigation measures, and state regulations.

5.0 Conclusions and Recommendations

5.1 Overview

The Audit Team reviewed programs under the RCP approval, including financial assurance; and appendices 3, 7, and 14 from the GPO. The Greens Creek Mine is generally in compliance with operations and reporting for the current authorizations. The Audit Team did not identify or observe common or systematic environmental conditions that may affect closure or post-closure plan activities and provide recommendations for resolution.

5.2 Recommendations

The following is a consolidated list of recommendations from prior sections in the report.

RPA and Financial Assurance

1) **Site 23** – The WMP states that Site 23 is 11 acres in size. The H2 2023 Biannual Report (and previous reports) state that the site boundary covers approximately 18 acres. The SRCE Model and RCP state that the acreage for Site 23 is 20 acres. It is recommended that the overall size of Site 23 be clarified as well as the area within Site 23 that is permitted to receive waste rock.

   Growth Media – HGCMC defines growth media as a material that supports vegetation following reclamation. In their *Reclamation and Closure Plan,* HGCMC states that “topsoil” is not necessary for successful revegetation of disturbed areas on site. HGCMC keeps an inventory of reclamation stockpiles to document their locations (table with locations and acreage in the *Reclamation and Closure Plan*). The map in the *Reclamation and Closure Plan* shows the major stockpile locations, but not the smaller stockpiles listed in the table as being located along the A-Road or B-Roads. It is recommended that a figure showing locations of stored reclamation material be included in the revised *Reclamation and Closure Plan* in 2024 and volumes updated as needed

(including the identified difference in volume of one stockpile between the RCP and SRCE model).

1) **Reclaimed Areas and Specific Plant Community Goals –** Based on visual observations by the audit team, the revegetation of reclaimed areas appears to be successful. For the purposes of validation and defensibility the Audit Team recommends that as part of the updated *Reclamation and Closure Plan,* HGCMC conduct some level of quantitative vegetation surveys of reclaimed areas to corroborate visual observations that the revegetation goal to reclaim with seed, then let natural regeneration ensure succession of naturally occurring site species is meeting this goal as intended.

2) **Annual Reports –** It is recommended that for the next RPA update, the Reporting section of the RPA be updated to reflect the use of a biannual report and related submission instead of the use of an annual report submission.

3) **Reclamation and Closure Costs Estimation –** HGCMC prepared the 2019 plan and estimated reclamation costs in accordance with standard engineering cost estimation procedures, which are consistent with methods commonly used by the industry as well as state and federal agencies (using the SRCE platform). Costs for individual reclamation tasks are based on unit costs to support a third-party reclamation under varying years. Most of the referenced cost sources have been updated since 2019 (and prior). It is uncertain why HGCMC used older versions of the above referenced documents for the 2019 estimate (as well as the previous 2014 estimate), even if an inflation factor was used that accounted for changes in time. The Audit Team recommends that HGCMC use the most current references to update costs for the 2024 update and that the agencies and HGCMC coordinate on the appropriate indirect costs to be used in the SRCE model. Audit Team also recommends that the new de-grit basin at the TDF and Upgrades/replacements for Zinc Creek, Killer Creek, and Falls Creek bridges be added to the SRCE model during the next permit update.

4) **Cost Estimation –** The following is recommended for the 2024 updated plan relating to cost estimation:
    a) Long-term water treatment in perpetuity as it relates to volume of water, storage of water, and treatment requirements. Updating (or re-verifying) the hydrologic/water quality model for water seepage from the underground mine is recommended.
    b) Update growth media and cover material mass balance updates, especially as it relates to estimating material that will need to be imported to the mine to support closures, as import costs are double using on-site sources (this includes verifying volumes and making sure they match between RCP and SRCE).
    c) Add new structures such as the new de-grit basin at the TDF and the new sediment capture structure near the ore pad.
    d) Add post closure water quality sampling of Tributary Creek to the Financial Assurance cost estimate

5) **Tailings Disposal Facility –** Mass instability of the TDF requires monitoring and reporting per Appendix 14 of the GPO. Five of the six piezometers reported in the H2 Hecla 2023 Biannual Report (HGCMC, 2023) indicate a rising phreatic surface since 2020 which increases instability. Interviews with HGCMC personnel indicated these pneumatic piezometers are presenting erroneous data and additional VMPs installed at the site do not show this trend. These additional VWP data along with inclinometer data are shared with the project Engineer of Record through a data logger and semi-annual reading frequency respectively. The Audit Team recommends HGCMC share these data prior to and during the closure phase to help demonstrate the TDF is stable.

6) **Waste Rock Management Plan –** HGCMC is following the requirements in the RPA (ADNR, 2020) by producing a biannual report summarizing activities, presenting monitoring data, and updating maps. The Audit Team recommends HGCMC continue to produce this biannual report, work towards long term reclamation and closure criteria of the TDF, and present mitigation strategies for potential issues that could cause non-compliance with the RPA.

7) **Waste Rock Management Plan –** relocation of waste rock from inactive Site E to final deposition locations is currently underway and is following the WRMP and Reclamation Plans. The Audit Team recommends continuation of this practice during operations to reduce potential contaminant loads during operation plus reduce required closure construction and bonding.

6.0 References

ADNR (Alaska Department of Natural Resources). 2020. Hecla Greens Creek Mine, Reclamation Plan Approval. No. J2020268RPA, ADNR Division of Mining, Land & Water. February 20.

Hecla Greens Creek Mining Company (HGCMC). 2019a. Hecla Greens Creek Mining Company General Plan of Operations, Appendix 11: Mine Waste Rock Management Plan. April.

HGCMC. 2019b. Hecla Greens Creek General Plan of Operations, Appendix 14: Reclamation and Closure Plan. November.

HGCMC. 2020a. Hecla Greens Creek General Plan of Operations, Greens Creek Mine, Admiralty Island, Alaska. June.

HGCMC. 2020b. Hecla Greens Creek General Plan of Operations, Appendix 1: Integrated Monitoring Plan (IMP). November.

HGCMC. 2020c. Hecla Greens Creek Mining Company General Plan of Operations, Appendix 7: Integrated Waste Management and Disposal Plan. May.

HGCMC. 2020d. Hecla Greens Creek Mining Company General Plan of Operations, Appendix 3: Tailings Disposal Facility Management Plan. May.

HGCMC. 2023. Hecla Greens Creek Mining Company, H2 2023 Biannual Report. February 29.

HGCMC. 2024. Hecla Greens Creek Mining Company, H1 2024 Biannual Report. August 29.

U.S. Forest Service (USFS). 2023a. Inspection Report 431: Greens Creek Mine. Inspection June 7, 2023, Report June 23, 2023.

USFS. 2023b. Inspection Report 432: Greens Creek Mine. Inspection July 29, 2023, Report August 28, 2023.

USFS. 2023c. Inspection Report 427: Greens Creek Mine. Inspection December 7, 2022, Report January 2023.

USFS. 2022a. Inspection Report 425: Greens Creek Mine. Inspection September 28, 2022, Report October 12, 2022.

USFS. 2022b. Inspection Report 426: Greens Creek Mine. Inspection October 26, 2022, Report December 5, 2022.

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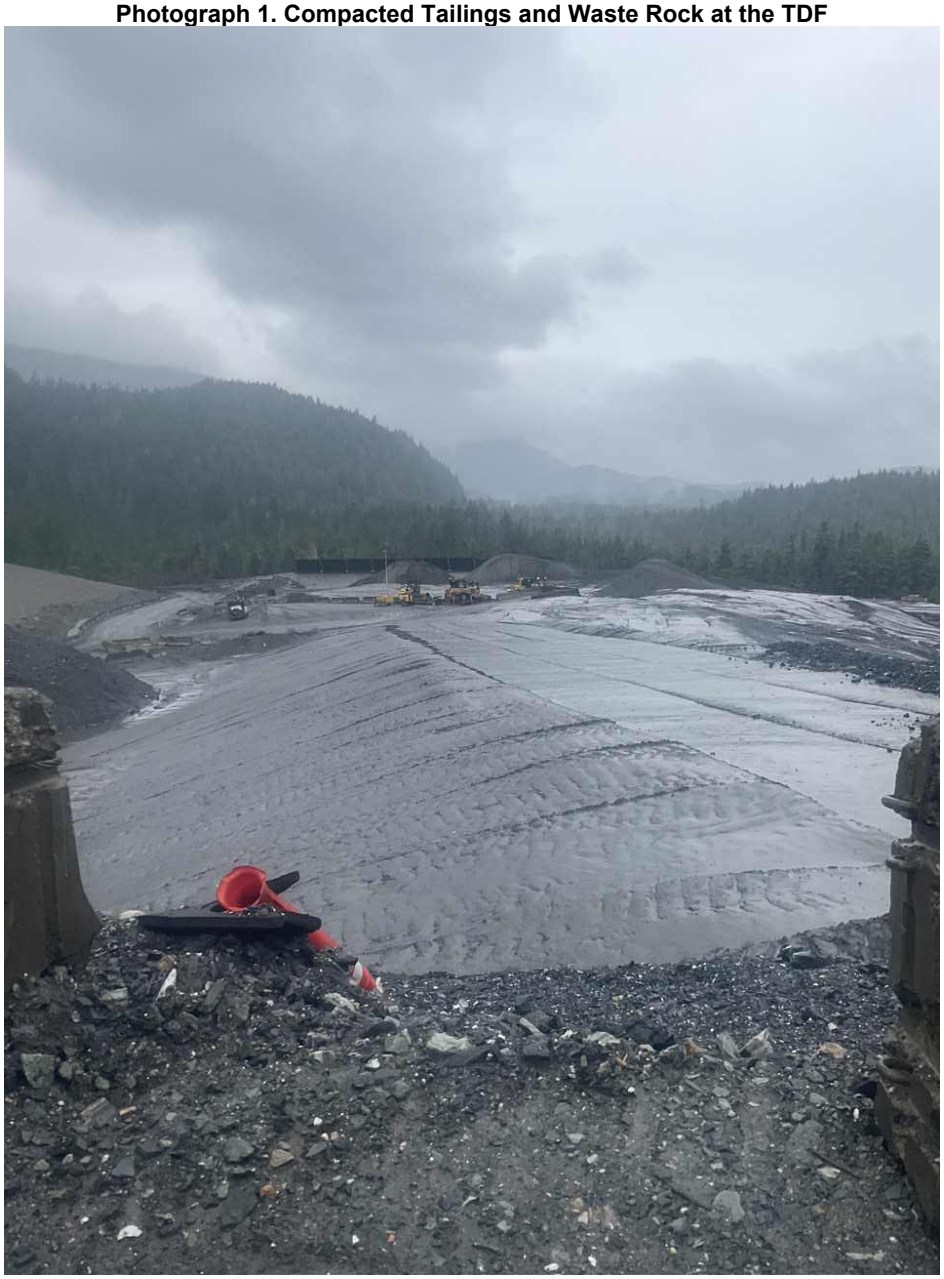
Appendix A

Site Photographs

Photograph 1. Compacted Tailings and Waste Rock at the TDF



Photograph 2. Compacted Waste Rock at Site 23

Photograph 3. Reclamation Area at the 1350 Portal

Photograph 4. Reclamation and vegetation growth at 960 area

Photograph 5. Vegetation growth at Pit 405

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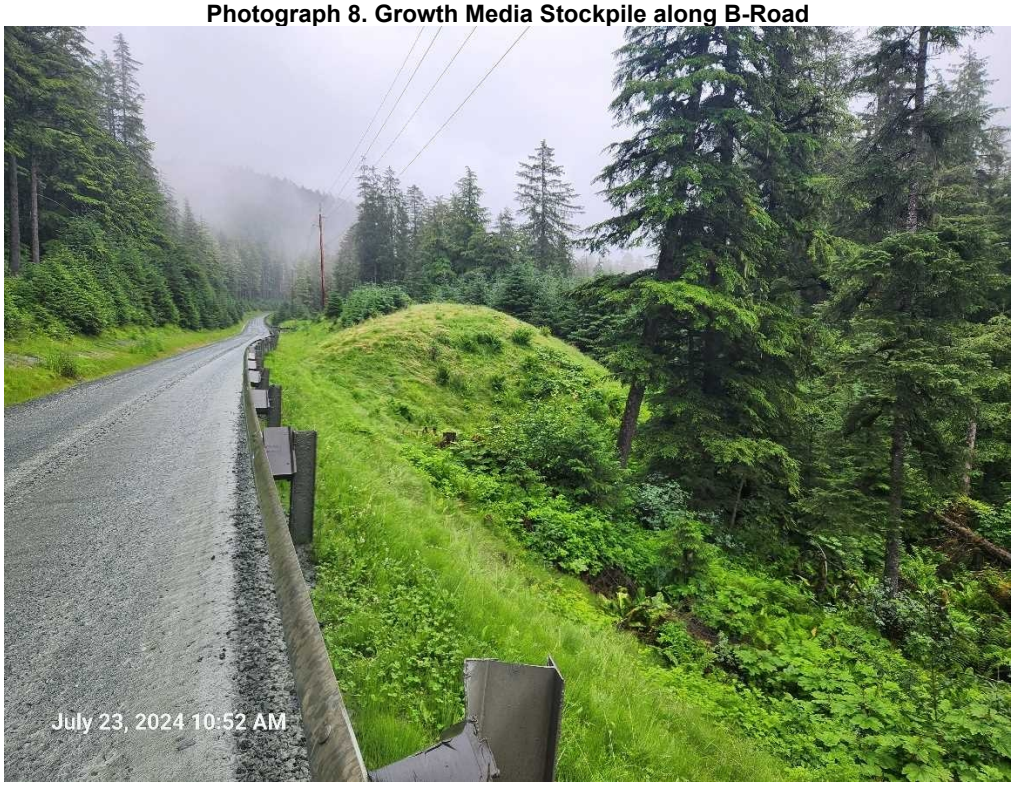
Photograph 6. Vegetation growth at Pit 6.

Photograph 7. Vegetation growth at Pit 7.

Photograph 8. Growth Media Stockpile along B-Road



Photograph 9. New Drainage on Mill Backslope

Photograph 10. New Sediment Capture Structure Near Ore Pad