Mitigation Plan
for
Hecla Greens Creek Mining Company
Greens Creek Mine Stage 3 Expansion

Oblique aerial view of Nevada Creek Mitigation Site located in lower half of photograph.

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ELS Project Number 2039.01

Executive Summary

Ecological Land Services, Inc. (ELS) was contracted by Nevada Creek Mitigation Partners to prepare this mitigation plan for the Hecla Greens Creek Mining Company (HGCMC) existing Greens Creek Mine tailings disposal facility expansion identified as the Stage 3 Expansion project. This mitigation plan was prepared according the *Federal Rule on Compensatory Mitigation: Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (33 Code of Federal Regulations (CFR) Parts 325 and 332* 2008) as implemented by the U.S. Army Corps of Engineers (USACE/Corps) Alaska District Regulatory Guidance Letter Identification Number 09-01.

HGCMC initially submitted a Section 404 permit application in 2012 that was put out for public notice on April 20, 2012 (Reference Number POA-1988-0269-2). In September 2013 the U.S. Forest Service (USFS) issued the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD), titled the *Final Environmental Impact Statement and Record of Decision for the Greens Creek Mine Tailings Disposal Facility Expansion Project on the Admiralty Island National Monument and Juneau Ranger District, Tongass National Forest* (USFS 2013) that the Forest Service prepared in cooperation with other agencies such as the USACE. The *Amended Section 404 Permit Application* (ELS 2014) which includes this mitigation plan, incorporates amendments to the 2012 Section 404 application to align with the ROD Selected Alternative.

The Stage 3 Expansion project will impact a total of 13.91 acres of wetlands, comprised of 0.59-acre of Forested Wetland, 2.45 acres of Scrub-Shrub Bog, and 10.87 acres of Fen occurring within the eight digit hydrologic unit code (HUC) 19010204. Due to the impracticability of on-site or off-site Admiralty Island compensatory mitigation options, HGCMC is proposing off-site permittee-responsible mitigation through wetland preservation and restoration of a site with similar in-kind resources as compensation for proposed project impacts. Using a three to one ratio, compensation for the proposed wetland impacts requires 41.73 acres of mitigation. The proposed mitigation site, identified as the Nevada Creek Mitigation Site, occurs within the eight digit HUC number 19010301 located on southeast Douglas Island in the City/Borough of Juneau. The proposed mitigation site totals 51.6 acres and contains 48.3 acres of wetlands comprised of 30.3 acres of Bog/Bog Woodland and 18 acres of Forested Wetlands. The total of 48.3 acres of wetland mitigation proposed as compensation for impacts to 13.91 acres of wetland more than satisfies the required amount of 41.73 acres of permittee-responsible mitigation using a three to one ratio[1].

Summary of Project Impacts &Proposed Mitigation			
Proposed Impact Area	***Total Proposed Impacts (acres)***	***Total Proposed Impacts (acres)***	***Total Proposed Mitigation***
Fen	10.87	13.91	51.6 total acres containing 48.3 acres of wetlands
Bog	2.45		
Forested Wetland	0.59		

[1] The 3 to 1 ratio for proposed mitigation follows the USACE *Alaska District Regulatory Guidance Letter No. 09-0l (RGL 09-01)*, and is the highest mitigation ratio presented by the guidance letter.

Table of Contents

Executive Summary ii
Introduction 1
Project Description 1
Table 1. Summary of Stage 3 Expansion Project Components & Wetland Impacts 2
Table 2. Summary of Stage 3 Expansion Project Wetland Impacts &Proposed Mitigation 3
Project Site Wetland Delineation 4
Soils 4
Hydrology 4
Vegetation 5
Project Site Baseline Information 5
Historic Baseline Conditions 5
Existing Baseline Conditions 6
Wildlife & Habitat 6
Cultural Resources 6
Project Site WESPAK-SE Assessments 7
Mitigation Sequencing & Site Selection 7
Site Selection Rationale 9
Proposed Mitigation Site 10
Site Description 10
Landscape Position & Geomorphology 11
Nevada Creek 11
Project Site Wetland Delineation 11
Soils 11
Hydrology 12
Vegetation 12
Mitigation Site WESPAK-SE Assessment 14
Table 3. Summary of proposed mitigation site WESPAK-SE wetland service ratings. 14
Table 4. Comparison of WESPAK-SE service function scores summary. 15
Mitigation Site Baseline Information 16
Historic Baseline Condition 16
Existing Baseline Conditions 17
Main Working Tunnel Water Quality 17

Nevada Creek Water Quality in Vicinity of Main Working Tunnel 18
Wildlife & Habitat 18
Aquatic Wildlife & Habitat 20
Cultural Resources 20
Risks to Mitigation Site Resources 21
Mining 21
Timber Harvest 21
Mitigation Objectives & Performance Standards 22
Table 5. Summary of performance standards completion or achievement & documentation. 23
Long-Term Maintenance and Monitoring Plan & Adaptive Management 23
Long-Term Protection & Financial Assurances 27
Mitigation Site Work Plan 27
References 29

FIGURES

Sheet 1 Project Site & Mitigation Site Location
Sheet 2 Project Site Ownership Map
Sheet 3 Project Site Map Overview
Sheet 4 Project Site Map
Sheet 5 Tailings Storage Area Detail
Sheet 6 Tailings Storage Area Cross Sections A-D
Sheet 7 Tailings Storage Area Cross Sections E-H
Sheet 8 Clean Rock Storage Area Detail & Cross Sections
Sheet 9 Pond 10 Detail
Sheet 10 Pond 10 Details & Cross Sections
Sheet 11 Mitigation Site Ownership Map
Sheet 12 Mitigation Site Map
Sheet 13 Mitigation Site National Wetlands Inventory (NWI) & USFS Stream Type Map
Sheet 14 Waste Rock Dump Side Slope Stabilization Detail
Sheet 15 Adit Closure Grate Detail

APPENDIX A

Jurisdictional Wetland Delineation Report for Stage 3 Tailings Expansion for Hecla Greens Creek Mining Company (Bosworth Botanical Consulting 2011)

APPENDIX B

Application of Final WESPAK-SE for Rapid Assessment of Functions and Values of Wetlands Associated with Some Proposed Hecla Activities at Greens Creek, Southeast Alaska Report for Hecla Greens Creek Mining Company (Adamus 2012)

APPENDIX C
Nevada Creek Wetland Delineation Datasheets

APPENDIX D
Proposed Nevada Creek Mitigation Site *Wetland Ecosystem Services Protocol for Alaska–Southeast* (WESPAK-SE) Assessment

APPENDIX E
Draft Conservation Easement

Introduction

Ecological Land Services, Inc. (ELS) was contracted by Nevada Creek Mitigation Partners to prepare this mitigation plan for the Hecla Greens Creek Mining Company (HGCMC) for the expansion of the existing Greens Creek Mine tailings disposal facility (TDF), identified as the Stage 3 Expansion project (U.S. Army Corps of Engineers (USACE) Reference Number POA-1988-0269-2). The Greens Creek Mine is an underground metals mine (primarily lead, zinc, silver, and gold) located near Hawk Inlet on northern Admiralty Island in Section 26, Township 43 South, Range 65 East of the Copper River Meridian (Sheets 1 and 2). The Greens Creek Mine is located approximately 18-miles southwest of Juneau, Alaska, and 38-miles north of Angoon, Alaska. The mine portal and mill processing facilities, portions of the existing TDF and the Stage 3 Expansion project are situated within the Admiralty Island National Monument (Monument). The remainder of the mine's facilities, north of the existing TDF, are located on National Forest system lands (Tongass National Forest Juneau Ranger District) or on privately held land near Hawk Inlet where the mine's onsite headquarters, staff facilities, and marine terminal are located. The National Forest system lands, and the Monument lands, are both administered by the U.S. Forest Service (USFS).

Bosworth Botanical Consulting conducted a delineation of jurisdictional waters of the U.S. in and adjacent to the Stage 3 Expansion project area as documented in the *Jurisdictional Wetland Delineation Report Stage 3 Tailings Expansion for Hecla Greens Creek Mining Company* (Bosworth Botanical Consulting 2011; Appendix A). Koren Bosworth of Bosworth Botanical Consulting also contributed to the WESPAK-SE functional assessment of the wetlands potentially affected by the expansion project (Adamus 2012; Appendix B).

HGCMC initially submitted a Section 404 permit application in 2012 that was put out for public notice on April 20, 2012. In September 2013 the USFS issued the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD), titled the *Final Environmental Impact Statement and Record of Decision for the Greens Creek Mine Tailings Disposal Facility Expansion Project on the Admiralty Island National Monument and Juneau Ranger District, Tongass National Forest* (USFS 2013) that the USFS prepared in cooperation with other agencies such as the USACE. To align with the 2013 FEIS and ROD, the initial Section 404 permit application has been amended (*Amended Section 404 Permit Application* ELS 2014) and now includes this mitigation plan prepared according the *Federal Rule on Compensatory Mitigation: Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (33 Code of Federal Regulations (CFR) Parts 325 and 332* 2008) as implemented by the USACE Alaska District Regulatory Guidance Letter (RGL) Identification Number 09-01.

Project Description

With continued positive exploration results, improved metal prices, and ongoing operational efficiencies, HGCMC requires additional tailings and waste rock disposal capacity to allow for continued operations. To extend the timeline that the existing TDF will reach full capacity, HGCMC is proposing expansion of the facility, identified as the Stage 3 Expansion project (Sheets 3 through 10).

The ROD Selected Alternative authorizes the Greens Creek Mine to expand the existing tailings disposal facility by about 18 acres, further south into the Admiralty Island National Monument (Monument); please see Appendix A of Section 404 Permit Application for a copy of the 2013 FEIS and ROD). The Selected Alternative expands the existing facility's capacity by about 2.1 million cubic yards which at the expected rate of fill, delays the time at which capacity is reached by approximately 10 years. Components of the ROD Selected Alternative include:

- Expansion of the existing tailings disposal facility southward into the Monument;
- Development of a reclamation material storage area near the junction of the A and B Roads, outside of the Monument;
- Development of a rock quarry north of the existing TDF, and access from within the existing facility, outside of the Monument;
- Development of a new water management pond south of the existing TDF and expansion of existing water management ponds; and
- Relocation of the B Road and truck wheel wash facility to accommodate the TDF expansion.

In moving forward, HGCMC is not proposing all of the aforementioned ROD Selected Alternative project components. The major Stage 3 Expansion Project components that HGCMC is proposing is as follows; Pond 10, the Clean Rock Storage Area, and the Tailings Storage Area which includes tailings storage, tailings access road, new wheel wash, outlet from clean diversion ditch and embankment toe access road (Sheets 3 through 10). Details on the project components that HGCMC is proposing for the Stage 3 Expansion is also presented in Table 1 below:

Table 1. Summary of Stage 3 Expansion Project Components & Wetland Impacts

Project Component	Project Component Impact		Project Component Fill Volume (Cubic Yards/CY)
	Impact Footprint	Wetland Type Impacted	
Tailings Storage Area			
Tailings Storage	10.13 acres	10.13 acres Fen	220K[1] CY
Tailings Access Road	0.56 acre	0.56 acre Fen	
New Wheel Wash	0.12 acre	0.12 acre Fen	
Outlet from Clean Diversion Ditch	0.01 acre	0.01 acre Fen	
Embankment Toe Access Road	0.07 acre	0.05 acre Fen 0.02 acre Forested Wetland	
Clean Rock Storage Area	0.69 acre	0.34 acre Scrub-Shrub Bog 0.35 acre Forested Wetland	13K[1] CY
Pond 10	2.33 acres	2.11 acres Scrub-Shrub Bog 0.22 acre Forested Wetland	20K[1] CY
Total	***13.91 acres***	*10.87 acres Fen* *2.45 acres Scrub-Shrub Bog* *0.59 acre Forested Wetland*	*253K[1] CY*

[1]K = abbreviation for thousand.

The Stage 3 Expansion Project component identified as the Tailings Storage Area requires placement of approximately 220,000 cubic yards of fill within 10.89 acres of wetland to develop the tailings storage, the tailings access road, the new wheel wash, the outlet from clean diversion ditch and the embankment toe access road (Table 1; Sheets 3 through 7). The relocation of the section of the B Road that is part of the Tailings Storage Area component does not impact wetlands, therefore no impact footprint/fill volume is presented for this project component. The project component identified as the Clean Rock Storage Area requires placement of approximately 13,000 cubic yards of fill within 0.69 acre of wetland (Table 1; Sheets 3, 4 and 8). The project component identified as Pond 10 requires placement of approximately 20,000 cubic yards of fill within 2.33 acres of wetland (Table 1; Sheets 3, 4, 9 and 10). HGCMC has discussed the proposed location of Pond 10, now located immediately south of an existing treatment pond identified as Pond 7, with the USFS as it is located in a different area than indicated in the ROD (identified as New Facilities-G-Pond by the ROD-Figure 2 on of the 2013 FEIS). Although the ROD Selected Alternative authorizes the Greens Creek Mine to develop an additional 8 acres outside of the Monument for the development of a rock quarry north of the existing TDF, expansion of an existing water management pond identified as Pond 9, and new reclamation material storage site near the junction of the A Road and B Road (ROD-Figure 2 of the 2013 FEIS), HGCMC is not proposing to develop these areas and/or facilities.

The Stage 3 Expansion project will impact a total of 13.91 acres of wetlands, comprised of 0.59-acre of Forested Wetland, 2.45 acres of Scrub-Shrub Bog, and 10.87 acres of Fen occurring within the eight digit hydrologic unit code (HUC) 19010204. Due to the impracticability of on-site or off-site Admiralty Island compensatory mitigation options, HGCMC is proposing off-site permittee-responsible mitigation through wetland preservation and restoration of a site with similar in-kind resources as compensation for proposed project impacts. Using a three to one ratio, compensation for the proposed wetland impacts requires 41.73 acres of mitigation. The proposed mitigation site, identified as the Nevada Creek Mitigation Site, occurs within the eight digit HUC number 19010301 located on southeast Douglas Island in the City/Borough of Juneau (Sheet 11). The proposed mitigation site totals 51.6 acres and contains 48.3 acres of wetlands comprised of 30.3 acres of Bog/Bog Woodland and 18 acres of Forested Wetlands (Sheet 12). The total of 48.3 acres of wetland mitigation proposed as compensation for impacts to 13.91 acres of wetland more than satisfies the required amount of 41.73 acres of permittee-responsible mitigation using a three to one ratio[2]. The following Table 2 presents a summary of proposed wetland impacts and required mitigation:

Table 2. Summary of Stage 3 Expansion Project Wetland Impacts &Proposed Mitigation

Proposed Impact Area	***Total Proposed Impacts*** *(acres)*[1]	***Total Proposed Impacts*** *(acres)*	***Total Proposed Mitigation***
Fen	10.87	13.91	51.6 total acres containing 48.3 acres of wetlands
Bog	2.45		
Forested Wetland	0.59		

[1]Mapping from the delineation wetland boundaries documented by the *Jurisdictional Wetland Delineation Report for Stage 3 Tailings Expansion for Hecla Greens Creek Mining Company* (Bosworth Botanical Consulting 2011; Appendix A) was used to calculate proposed project impacts.

[2] The 3 to 1 ratio for proposed mitigation follows the USACE *Alaska District Regulatory Guidance Letter No. 09-0l (RGL 09-01)*, and is the highest mitigation ratio presented by the guidance letter.

Project Site Wetland Delineation

Bosworth Botanical Consulting delineated wetlands within the Stage 3 Expansion project area as it was proposed at that time by the initial Section 404 permit dated February 2012 that was submitted prior to the release of the 2013 FEIS and ROD prepared by the USFS. The delineation followed the *Routine Determination Method* according to the U.S. Army Corps of Engineers, Wetland Delineation Manual (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region* (USACE Research and Development Center 2007). The delineated was conducted in 2010 from July 5 through July 9, and September 22 to September 25. The *Jurisdictional Wetland Delineation Report for Stage 3 Tailings Expansion for Hecla Greens Creek Mining Company*, dated January 2011, prepared by Koren Bosworth of Bosworth Botanical Consulting, documents the wetland delineation methodology and findings (Appendix A).

Soils

Classifications of subgroup/soil series and complete soil series descriptions that occur within the project site area are included in Appendix I of the *Jurisdictional Wetland Delineation Report Stage 3 Tailings Expansion for Hecla Greens Creek Mining Company* (Bosworth Delineation) (Bosworth Botanical Consulting 2011). This report identifies and maps the area soils to the subgroup level. To include micro site variation, two subgroups are listed for each identified unit and discussed at the series level.

Hydrology

Section 5.4 Hydrology of the Bosworth Delineation discusses the drainage basins that the existing TDF, and proposed Stage 3 Expansion project, occur in. The Stage 3 Expansion project will be further extended southward into the Tributary Creek drainage, Section 5.4.1 Tributary Creek of the delineation report specifically addresses this drainage as follows:

> *The Tributary Creek basin gently slopes to the south towards Zinc Creek, and primarily consists of bog vegetation interspersed with stands of forested wetland and upland vegetation. Prior to construction of the <existing> tailings facility, the headwaters of Tributary Creek were forested slopes east of the <existing> tailings facility and the bog areas currently within the footprint of the <existing> tailings facility. Since construction of the <existing> tailings facility, the headwaters of Tributary Creek are small seeps and numerous small channels flowing through the bog vegetation south of the <existing> tailings. Additionally, surfaced run-off flows from east of the <existing> tailings facility are captured and routed in ditches south to Tributary Creek and north in ditches to Cannery Creek. The seeps and channels lying to the south of the <existing> tailings facility are fed from the shallow groundwater regime in the peat and sand substrate. High flows generally result in the fall (high rainfall period) and in the spring (snowmelt), while low flows occur in late summer and mid-winter (Bosworth Botanical Consulting 2011).*

Vegetation

Section 5.6 Vegetation of the Bosworth Delineation discusses the project area vegetation, National Wetland Inventory (NWI) mapping, and related Cowardin classification (Cowardin et al. 1979).

Project Site Baseline Information

Admiralty Island's topography ranges from gentle, rolling, near sea-level elevations to snowcapped mountains up to 3,000 feet high. The island is generally dominated by temperate Sitka spruce-western hemlock rainforest interspersed with freshwater wetlands. Timberline typically begins at 1,500 to 2,000 feet, above timberline, the temperate rainforest forest gradually transitions to alpine-tundra with rock outcrops and permanent to semi-permanent ice fields. All but the northern end of the island that contains an unpopulated section of the City/Borough of Juneau, is designated wilderness. The northern end of the island also falls within the Juneau non-subsistence use area. Angoon, approximately 38-miles south of the Greens Creek Mine Tlingit community, is the only settlement on the island.

The FEIS (USFS 2013) and prior EIS documents discuss the current and historic ecological condition of the proposed Stage 3 Expansion project area. The 2013 FEIS document has in-depth information on ecological conditions as the following is a generalized discussion of the project area ecological condition using information from the 2013 FEIS and prior EIS documents.

Historic Baseline Conditions

Prior to mining, historic baseline conditions within and in the vicinity of the project area were similar to the existing conditions found elsewhere on Admiralty Island. The historic habitat consisted primarily of upland Sitka spruce-western hemlock forests interspersed with a mosaics of lowland, non-forested plant communities that included aquatic habitats such as peat wetlands, scrub-shrub wetlands, and sedge meadows, with riparian habitats occurring along streams. These habitats supported a number of mammals, avian, and fish species (USFS 2012).

Upland vegetation primarily occurred within well-drained bedrock ridge slopes, and the flatter basin and terrace areas, underlain by uplifted marine silts and glacial tills that perch the water table, supported wetland vegetation of various types (Bosworth 2011). According to the 2013 FEIS little is known about historic baseline conditions prior to mining of the wetlands that occur within areas that have already been disturbed. Prior EIS documents discuss wetlands and state that muskeg plant communities occurred within areas that have already been disturbed. These wetlands were characterized as poorly drained, non-forested areas covered with sphagnum and lichens, as well as vascular plants including sedges, ericaceous shrubs, and goldthread, and Western hemlock and mountain hemlock that ranged in size from small shrubs to stunted trees. Riparian plant communities were characterized by alder (*Alnus* spp.), graminoids, ferns, and *Ribes* spp (USFS 2012 & 2013).

Prior to development of the Greens Creek Mine, wildlife and habitats in the vicinity were exposed to an existing level of localized disturbance. The mine's current marine terminal at the mouth of Cannery Creek previously served as a fish cannery and a limited amount of mining in

adjacent areas has historically taken place. Hawk Inlet and Admiralty Island as a whole has also been, and continues to be, used for recreation and subsistence.

Existing Baseline Conditions

The Stage 3 Expansion project area is generally located within an area of poorly drained lower elevation basin and terrace landforms located west of upper elevation bedrock ridge and mountain slopes. The current baseline conditions from the construction and operation of the existing Greens Creek Mine has resulted in the majority of disturbance occurring within upland Sitka spruce-western hemlock forested habitats, with a small amount of disturbance occurring within aquatic habitats such as the freshwater wetland communities and riparian areas (USFS 2013). The wetlands that occur within the Stage 3 Expansion are located on the poorly drained lower elevation basin and terrace landforms where peat wetlands such as bogs and fens are generally dominant.

Wildlife & Habitat

Occurrence of wildlife in the vicinity of the mine site and project area is described in more detail within the 2013 FEIS; please refer to the 2013 FEIS for detailed information. Sitka spruce-western hemlock forested uplands and aquatic habitats occurring within and adjacent to the project area support a number of species. However, no Endangered Species Act (ESA) listed species occur within the project area. Other important wildlife populations and/or associated habitats occurring in or near the vicinity of the Greens Creek Mine include brown bear, bald eagle, Sitka black-tailed deer, waterfowl/shorebirds, and furbearers such as marten, river otter, beaver, and mink. Brown bears and Sitka black-tailed deer, both Tongass National Forest management indicator species (MIS), are frequently observed in the vicinity of the mine site, and thus appear have adapted to ongoing operations to some degree.

Cultural Resources

According to the 2013 FEIS, nine documented historical and cultural resource sites are located in an area bounded by the head of Hawk Inlet to the north, the southwest corner of Young Bay to the east, Chatham Strait to the west, and as far south as the mouth of Hawk Inlet. Site types in the area include mining sites with accompanying built environment resources, early twentieth century homestead claims cabins, prehistoric shell middens, a reported petroglyph/pictograph, and the Hawk Inlet Cannery. Five sites of the nine sites have been evaluated for inclusion on the National Register of Historic Places (NRHP) with two sites determined eligible for the NRHP, and three sites determined to be ineligible for inclusion on the NRHP. The remaining four sites have not been evaluated for eligibility to the NRHP. No cultural resources are expected to be encountered during construction of the Stage 3 Expansion. However, if any inadvertent discoveries of unknown cultural or historic resources are made or otherwise encountered during the construction and pre-development of the tailings facility expansion, work will cease in the area of the discovery and HGCMC will notify the USFS for identification, and development and implementation of appropriate resource protection measures.

Project Site WESPAK-SE Assessments

In September 2011, Paul Adamus of Adamus Resource Assessment Inc. and Koren Bosworth of Bosworth Botanical Consulting performed a functional assessment of wetlands occurring within and adjacent to the Stage 3 Expansion project area. The wetland assessment was documented within a report prepared by Paul Adamus titled the *Application of Final WESPAK-SE for Rapid Assessment of Functions and Values of Wetlands Associated with Some Proposed Hecla Activities at Greens Creek, Southeast Alaska Report for Hecla Greens Creek Mining Company* (Adamus 2012). To view the entire WESPAK-SE assessment document prepared by Paul Adamus see Appendix B; assessment unit locations are shown in the report's enclosed Figure 1 and the assessment scores are presented in Table 1.

As documented within the wetland assessment report, three of the wetland assessment units identified as GC Forested Althea, GC Forested North Creek, and GC Forested Helipad are located outside of the currently proposed expansion area. These units are therefore not discussed in this mitigation plan. The assessed units that occur within or immediately adjacent to the expansion area are identified as follows; GC Forested Trib, GC Fen, GC Bog, and GC Shrub Bog.

The WESPAK-SE assessment scores for the units that occur within or immediately adjacent to the expansion area exceeded regional median reference site scores as presented within Appendix B and below:

- GC Fen - 12 scored functions exceeded regional median scores
- GC Forested Trib - 8 scored functions exceeded regional median scores
- GC Shrub Bog - 11 scored functions exceeded regional median scores
- GC Bog - 6 scored functions exceeded regional median scores

As shown in Table 1 of the assessment report (Appendix B), the assessed wetland unit wetland that had both the most above-average function scores and above-average value scores associated with those same functions was the GC Fen wetland. To view the entire WESPAK-SE assessment document prepared by Paul Adamus please see Appendix B; assessment unit locations are shown in the report's enclosed Figure 1 and the assessment scores are presented in Table 1.

Mitigation Sequencing & Site Selection

The consideration, or analysis, of alternatives to the proposed TDF Expansion project has been reviewed through the NEPA process as detailed in the 2013 FEIS. According to the 2013 FEIS, full avoidance is not feasible as there is no practicable or less environmentally damaging alternative to the proposed Stage 3 Expansion project due to the technical constraints of constructing a geotechnically stable disposal facility. Additionally, according to the FEIS ROD, it was determined that the project as proposed in this mitigation plan and amended Section 404 application, and identified in the FEIS as the Selected Alternative, includes all reasonable measures to minimize impacts to wetlands. The Clean Water Act (CWA) Section 404(b)(1) guidelines requiring consideration of wetland impacts through avoidance (first) and minimization (following avoidance) prior to consideration of compensatory mitigation, have been also been

addressed through current and prior NEPA processes for the proposed project. In accordance with CWA Section 404(b)(1) guidelines, various onsite compensatory mitigation measures involving restoration, enhancement, establishment, and preservation have been assessed. Assessments of onsite compensatory mitigation measures demonstrate the difficulties that onsite compensatory mitigation poses, as described below:

- Major portions of the mine are located on National Forest system lands and the proposed Stage 3 Expansion is located in the Admiralty Island National Monument (Monument). National Forest system and Monument lands are administered by the USFS, and in accordance with USFS mandates, the Greens Creek Mine is required to reasonably minimize mine operation disturbance footprint(s). Currently, there are no areas of disturbance that are not in use that could be reclaimed at this time for compensatory mitigation purposes for the proposed expansion. To the extent possible, and practical, HGCMC will restore wetlands as part of future reclamation activities. During final reclamation wetland restoration will likely occur on flat areas that remain after permanent project cessation, however, creation of wetlands on reclaimed dry-stack tailings will be avoided as the disposal facility must be designed and constructed to shed water rather that allowing water to infiltrate into the facility.

- As the areas surrounding the mine are comprised of relatively undisturbed National Forest System and Monument lands administered by the USFS, there are no opportunities for wetland restoration, enhancement, or establishment near the current HGCMC mine site facilities. It is not practicable to mitigate (through creation) project impacts within the steep upland areas within and adjacent to the mine site.

To comply with the U.S. Army Corps of Engineers (Corps) Federal Compensatory Mitigation for Losses of Aquatic Resources Final Rule (2008), mitigation plans must include an evaluation of options for compensatory mitigation types and locations whether an option is available or not. Options for compensatory mitigation are mitigation bank credits, in-lieu fee program credits, permittee-responsible mitigation using a watershed approach, permittee-responsible mitigation through on-site and in-kind mitigation or off-site and out-of-kind mitigation. Upon evaluation, the following types of compensatory mitigation were found to not be available or practicable:

- Wetland Mitigation Bank - No wetland mitigation banks issuing bank credits currently exist within the CBJ.

- In-lieu Fee Program (ILF) - Currently there are two ILF programs that service Southeast Alaska, the Southeast Alaska Land Trust (SEAL) and the Great Alaska Land Trust (GALT). Both of these third party mitigation programs offer only preservation opportunities to Section 404 permit applicants. There are no active and approved third party mitigation programs in Southeast Alaska (mitigation banks and/or In-lieu Fee Programs) that carry out restoration, enhancement and/or creation to offset permitted unavoidable impacts with no-net-loss to aquatic resources, which results in temporal loss and can result in negative cumulative impacts to wetlands and resources in the long term. With preservation-only options available, there was a desire to explore mitigation options

that actually performed some degree of wetland and/or habitat restoration or enhancement.

- Permittee-responsible Onsite/In-kind or Offsite/In-kind Compensatory Mitigation - Onsite in-kind compensatory mitigation that is tied to the impact location is not feasible. Mitigation sites on Admiralty Island were looked for, and outreach was conducted with Admiralty Island residents to find a mitigation site or mitigation effort that would be potentially acceptable. No site was found on Admiralty Island that would provide wetland or habitat functional lift through restoration, enhancement or remediation.

Due to the lack of on-site or Admiralty Island mitigation options, effort was made to seek potential mitigation sites in the proximity of the City and Bureau of Juneau (CBJ) that had previous disturbances to wetlands and habitat that could be restored or enhanced. Several sites in this area were examined and considered, including old gravel mine sites, borrow sites, fill sites, and shaft mining sites. These sites were assessed for their capacity for functional lift through restoration or enhancement, their availability, cost, and potential to successfully achieve mitigation goals and objectives in advance of impacts.

HGCMC is proposing off-site permittee-responsible mitigation for impacts to wetlands through preservation and restoration of a site with similar in-kind resources. Restoring high quality aquatic habitat impacted by historic mining is appropriate mitigation for proposed impacts to wetlands at the Greens Creek Mine. Offsite/in-kind mitigation allows for a more thorough consideration of resources such as wildlife habitat corridors and watershed dynamics in locating a mitigation site, and wetland impacts are off-set in advance of impacts. It allows for mitigation to be sited at a selected, pre-approved mitigation site, thereby focusing economic resources where they provide the most benefit to the environmental resources to be preserved and restored.

The selected site is an abandoned mine site on south Douglas Island at Nevada Creek, potentially threatened by future mining and/or logging. High quality wetlands such as fens that are sensitive and would benefit from protection occur within the site. Potential contaminants from un-stabilized waste rock piles that continue to erode into Nevada Creek offer functional lift opportunities through restoration of these areas. Human access to the site, caused by the attraction to mine tunnels, shafts, adits, and abandoned equipment is a further perturbation to wetlands through use of trails and foot traffic on the historic mine road.

Site Selection Rationale

In evaluating the potential mitigation site, considered sites had to be located within a relatively similar geomorphic setting with similar resources, and be located relatively near the impact site. Potential sites also needed to offer enough acreage to accommodate compensatory mitigation for the proposed project and be cost effective. Other factors in determining the site selection are as follows:

- Self-sustaining mitigation site that can achieve mitigation objectives and performance standards without continual long-term maintenance. Mitigation efforts are also achievable

within logistical constraints for access, timing, and technology.

- Offers opportunity for preservation and restoration of a mitigation site likely eligible for listing on the National Register of Historic Places that has experienced similar mining impacts.

- Free of ownership or legal constraints that would prevent long term protection.

Proposed Mitigation Site

Due to the impracticability of onsite, or Admiralty Island offsite, in-kind compensatory mitigation options, HGCMC is proposing off-site permittee-responsible mitigation through preservation and restoration of a site with similar in-kind resources as compensation for proposed impacts to 13.91 acres of wetlands. Using a three to one ratio, compensation for the proposed wetland impacts requires 41.73 acres of mitigation. The proposed mitigation site, identified as the Nevada Creek Mitigation Site, occurs within the eight digit HUC number 19010301 located on southeast Douglas Island in the City/Borough of Juneau (Sheet 11). The proposed mitigation site totals 51.6 acres and contains 48.3 acres of wetlands comprised of 30.3 acres of Bog/Bog Woodland and 18 acres of Forested Wetlands (Sheet 12). The total of 48.3 acres of wetland mitigation proposed as compensation for impacts to 13.91 acres of wetland more than satisfies the required amount of 41.73 acres of permittee-responsible mitigation using a three to one ratio[3].

The proposed mitigation site has historically experienced similar impacts as the Greens Creek site and consists of two and one-half platted mining lodes totaling 51.6 acres owned by one landowner. The proposed mitigation site offers similar in-kind natural resources such as 30.3 acres of Bog/Bog Woodland wetlands, 18 acres of Forested Wetlands with occurrences of toe-slope fens, and a portion of the lower reach of Nevada Creek and the associated riparian area of the stream (3.2 acres). Preservation of the site's natural resources also presents an opportunity to preserve the cultural resources associated with the Alaska Treasure Mine middle adit that occurs within the proposed mitigation site. Through the Section 106 review process, it is anticipated that the cultural resources associated with the Alaska Treasure Mine will be deemed eligible for listing on the National Register of Historic Places.

Site Description

The Nevada Creek Mitigation Site is situated on a wide glaciomarine terrace with an eastern aspect that ranges in elevation from approximately 150- to 250-feet above Gastineau Channel before the terrace gently slopes down to sea-level at the channel's shore. The middle reach of Nevada Creek is located within the mitigation site. Nevada Creek is a small second-order stream that originates east of McDonough Peak. The stream generally drains to the east and eventually discharges into Gastineau Channel. Wetlands occurring within the mitigation site typically occur within drainage slopes, shallowly sloped depressions, riparian zones, and throughout the wide glaciomarine terrace perched above Gastineau Channel.

[3] The 3 to 1 ratio for proposed mitigation follows the USACE *Alaska District Regulatory Guidance Letter No. 09-0l (RGL 09-01)*, and is the highest mitigation ratio presented by the guidance letter.

Landscape Position & Geomorphology

The proposed Nevada Creek Mitigation Site is located on southeast Douglas Island where metamorphosed slates, schists, and phyllites generally occur. The mitigation site is situated on a wide glaciomarine terrace with an eastern aspect that ranges in elevation from approximately 150- to 250-feet above Gastineau Channel before gently sloping down to sea-level at the channel's shore.

Photograph of Nevada Creek taken May 2013.

Nevada Creek

Nevada Creek is a small second-order stream that originates east of McDonough Peak. The stream generally drains to the east and eventually discharges into Gastineau Channel. The middle reach of Nevada Creek is located within the mitigation site. The stream is generally only deeply incised in areas where it flows down from steep upslope gradients to terrace elevations that flatten out, such as the northern mitigation site boundary were steeper upslope gradients converge with terrace elevations that flatten out, and shortly inland from the stream's confluence with Gastineau Channel where the terrace drops down to the channels' shorelands. High flows within the stream are generally during high rainfall periods in the fall and in the spring snowmelt, while low flows occur in late summer and mid-winter.

Project Site Wetland Delineation

Delineation of wetlands occurring within the proposed mitigation site was performed by ELS and Bosworth Botanical Consulting during May and June of 2013 using the Routine Determination Method according to the U.S. Army Corps of Engineers *Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region* (U.S. Army Engineer Research and Development Center 2007).

Delineation of the mitigation site generally confirmed National Wetlands Inventory (NWI) mapping of palustrine, scrub-shrub, broad-leaved evergreen, saturated and scrub-shrub, needle-leaved evergreen, saturated wetland (PEM1B/SS4B) with occurrences of palustrine, emergent, persistent saturated wetland (PEM1B) as the delineation identified 30.3 acres of Bog/Bog Woodland, with the aforementioned mapped NWI Cowardin vegetation classes, located within the mitigation site on the wide glaciomarine terrace perched above Gastineau Channel (Sheets 12 and 13). However, the delineation identified 18 acres of sloped Forested Wetlands with occurrences of toe-slope fens that were not mapped as wetlands according to the NWI mapping of the slopes above the wide glaciomarine terrace perched above Gastineau Channel (Sheets 12 and 13).

Soils

The entire Douglas Island area has been overridden by glaciers, and glacial till occurs throughout the island, especially in mid- to lower elevation areas. The majority of the Nevada

Creek site's soils range from well-developed, deep, colluvial soils occurring on moderate to steep slopes, to poorly drained organic soils occurring on shallowly sloped areas and glaciomarine terraces. The USDA Soil Conservation Service (NRCS) does not offer digital information on the mapped soils that occur on the site. However, the *Soils of the Juneau Area, Alaska* (NRCS 1974) maps lower elevation soils occurring adjacent or near to the Gastineau Channel. The site soils mapped by the NRCS are as follows:

- KaD- Kaikli mucky peat, 12 to 20 percent slopes
- KiB- Kina peat, 3 to 7 percent slopes
- KiC- Kina peat, 7 to 12 percent slopes
- MaC- Maybeso mucky peat, 7 to 12 percent slopes
- MaD- Maybeso mucky peat, 12 to 20 percent slopes
- ToF- Tolstoi-McGilvery complex, 35 to 75 percent slopes

Soils within the Bog/Fen Mosaic wetlands are generally saturated, deep organic peat soils with low chroma soil colors. Soils occurring within the Forested wetlands located on steeper slopes areas occurring within the site were generally comprised of organic mucks with low chroma soil colors (Appendix C).

Hydrology

Wetlands

Hydrology within the Bog/Bog Woodland wetlands is driven by precipitation and shallow groundwater levels. Hydrological regimes within the wetlands range from saturated to seasonally inundated with areas of permanent inundation within acidic pools. Hydrology within the Forested Wetlands is driven by shallow groundwater levels and groundwater flows, and surface water flows during periods of high precipitation. Hydrological regimes within the wetlands range from saturated to seasonally inundated (Appendix C).

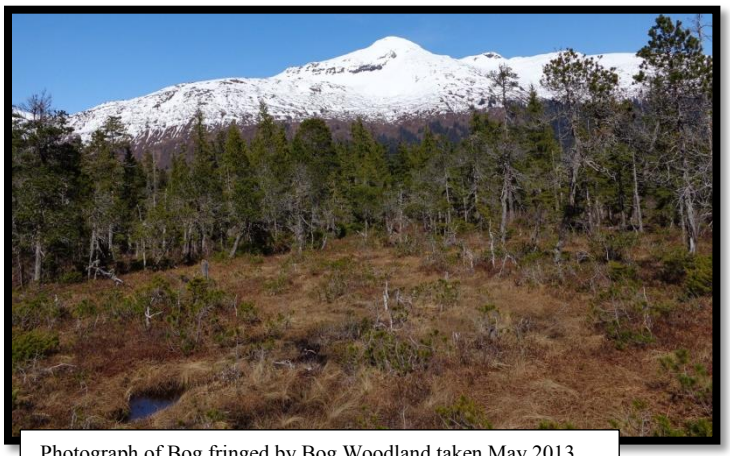
Streams

High flows within Nevada Creek and associated tributaries typically occur in the fall during the high rainfall period and in the spring during snowmelt. Low flows typically occur in late summer and mid-winter.

Vegetation

Bog/Bog Woodland: PEM1B/SS4B & PFO4B

National Wetlands Inventory (NWI) mapping generally captures the full extent of the Bog/Bog Woodland comprised of bogs with emergent and scrub-shrub Cowardin vegetation classes. However, the areas mapped by the NWI as PFO4B coincide with a



Photograph of Bog fringed by Bog Woodland taken May 2013.

larger extent of scrub-shrub bog (PSS4B) as the area mapped as PFO4B is dominated by acid tolerant *Vaccinium* species and stunted trees that generally do not reach heights over 20 feet (Sheet 13; Appendix C).

The Bog/Bog Woodland wetlands that occur within the mitigation site are located throughout the glaciomarine terrace above Gastineau Channel. These wetlands transition/grade from pockets of open emergent bog with obligate wetland species such as roundleaf sundew (*Drosera rotundifolia*, OBL), cotton grass (*Eriophorum angustifolium*, OBL), and *Carex* spp. grow amongst *Sphagnum* to a stunted tree bog woodland with lodgepole pine (*Pinus contorta,* FAC), and mountain hemlock (*Tsuga mertensiana*, FAC) dominant in the overstory, and Labrador tea (*Ledum groenlandicum*, FAC), crowberry (*Empetrum nigrum*, FAC), cloudberry (*Rubus chamaemorus*, FACW), and *Sphagnum* dominant in the understory. Species dominant within areas of the Bog Woodland where trees are sparse are acid tolerant species such as oval-leaved blueberry (*Vaccinium ovalifolium*, FAC) and Alaska blueberry (*Vaccinium alaskaense*, FAC).

Forested Wetlands (PFO4B)

The Forested Wetlands are comprised of slope and toe-slope fen wetlands. National Wetlands Inventory (NWI) mapping generally captures the occurrence of the toe-slope fen wetlands. However, the NWI does not capture the forested slope wetlands that occur on the slopes above the wide glaciomarine terrace perched above Gastineau Channel (Sheet 13; Appendix C).

Photograph of Forested Wetland taken May 2013.

The Forested slope wetland community is comprised of the facultative species western hemlock (*Tsuga heterophylla*, FAC) dominant in the overstory, and Alaska blueberry (*Vaccinium alaskaense*, FAC) and the facultative upland species false azalea (*Menziesia ferruginea,* FACU) dominant in the sparse understory, and obligate wetland species such as American skunk cabbage (*Lysichiton americanus*, OBL) dominant within the herbaceous stratum (Appendix D). The Forested Wetland toe-slope fen community is comprised of facultative species such as red alder (*Alnus rubra*, FAC) dominant in the overstory, with lady fern (*Athyrium felix-femina*, NI) and skunk cabbage dominant in the herbaceous stratum.

Uplands

The uplands that occur within the mitigation site are primarily forestlands comprised of facultative upland species such as Sitka spruce (*Picea sitchensis*, FACU) dominant in the overstory and western oakfern (*Gymnocarpium dryopteris*, FACU) and bunchberry dogwood (*Cornus Canadensis*, FACU) dominant within the herbaceous stratum (Appendix C).

Mitigation Site WESPAK-SE Assessment

Using the *Wetland Ecosystem Services Protocol for Alaska–Southeast* (Adamus Resource Assessment Inc. 2012) (Appendix D) to assess the functions and values of the wetlands occurring at the Nevada Creek site typically yielded function scores that were comparable, or exceed, the function scores of the wetlands within the proposed permit expansion boundary area. ELS biologists initially completed the WESPAK-SE assessment of the wetlands that occur within the proposed mitigation site on September of 2012, and finalized the assessments in June and July of 2013. Two generalized wetland assessment units, Forested Wetland and Forested Peatland, drawn from hydrological patterns and the dominant vegetation/habitat type occurring within the site, were assessed as summarized by Table 3 below:

Table 3. Summary of proposed mitigation site WESPAK-SE wetland service ratings**.**

Services	**Forested Wetland**	**Forested Peatland (Bog/Bog Woodland)**
Aquatic Habitat		
Streamwater Cooling	+3	+2
Streamwater Warming	+3	+2
Stream Flow Support	+3	+1
Aquatic Invertebrate Habitat	+3	+3
Anadromous Fish Habitat	+1	+1
Resident & Other Fish Habitat	+3	+3
Amphibian Habitat	+3	+3
Terrestrial Habitat		
Waterbird Feeding Habitat	+1	+3
Waterbird Nesting Habitat	+1	+1
Songbird, Raptor & Mammal Habitat	+3	+3
Pollinator Habitat	+3	+3
Native Plant Habitat	+2	+3
Wetland Sensitivity	+3	+3
Wetland Ecological Condition	+1	+3
Wetland Stressors	+2	+2
Services Score Key:		
+3	Above median score compared to other wetlands in the region	
+2	Median scores compared to other wetlands in the region	
+1	25% < Median score compared to other wetlands in the region	

The EIS and ROD (USFS September 2013, on Page 3-118) provides an interpretation of the project area assessed WESPAK-SE wetland service rating scores, and this approach was used for the comparison of the wetland service rating scores for the wetlands proposed for impact, and the wetlands proposed as mitigation, as summarized by Table 4 below:

Table 4. Comparison of WESPAK-SE service function scores summary**.**

Services	Greens Creek Fen Wetlands[1,2]	Greens Creek Bog Wetlands[1]	Nevada Creek Forested Peatland (Bog/Bog Woodland)	Greens Creek Forested (Tributary Creek) Wetlands[1,2]	Nevada Creek Forested Wetlands
Aquatic Habitat					
Streamwater Cooling	+3	+1	+2	+3	+3
Streamwater Warming	+2	+3	+2	+3	+3
Stream Flow Support	+3	+2	+1	+3	+3
Aquatic Invertebrate Habitat	+3	+2	+3	+3	+3
Anadromous Fish Habitat	+3[2]	NA	+1	+3[2]	+1
Resident & Other Fish Habitat	+3	+2	+3	+2	+3
Amphibian Habitat	+3	+2	+3	+3	+3
Terrestrial Habitat					
Waterbird Feeding Habitat	+3	+2	+3	+1	+1
Waterbird Nesting Habitat	+3	+1	+1	+1	+1
Songbird, Raptor & Mammal Habitat	+3	+3	+3	+3	+3
Pollinator Habitat	+1	+1	+3	+3	+3
Native Plant Habitat	+3	+2	+3	+3	+2
Wetland Sensitivity	+3	+3	+3	+3	+3
Wetland Ecological Condition	+3	+2	+3	+1	+1
Wetland Stressors	+1	+1	+2	+1	+2

Services Score Key:	
+3	Above median score compared to other wetlands in the region
+2	Median scores compared to other wetlands in the region
+1	25% < Median score compared to other wetlands in the region

[1] Greens Creek wetland service ratings taken from 2013 final EIS Table 3.8-2 Wetland Service Ratings on Page 3-118.

[2]The final EIS explains (see Page 3-117) that Greens Creek Fen and Forested (Tributary Creek) wetlands support anadromous fish habitat within Tributary Creek, and thus were given additional service points because the original 2012 Adamus Resource Assessment study did not recognize this.

Using the WESPAK-SE, assessment of the Nevada Creek Forested Peatland wetlands resulted in service function scores that were comparable to the service function scores of the Fen wetlands proposed for project impacts, as shown by the Table 4 above. Although few of the individual the WESPAK-SE function service scores of the Forested Peatland wetlands occurring at the proposed Nevada Creek mitigation site match up with the service scores of the Bog wetlands proposed for project impacts, as shown by the Table 4 above, the Nevada Creek Forested Peatlands offer comparable overall services when the service scores are averaged.

Assessment of the Forested Wetlands occurring at the proposed Nevada Creek mitigation site typically yielded service function scores that were comparable to the service function scores of the Greens Creek forested wetlands proposed for project impacts, as shown by the Table 3 above. Both the service scores for the Nevada Creek and Greens Creek Forested Wetlands were above the regional median for downstream temperature regulation, aquatic invertebrate and amphibian habitat, including habitat for songbird, raptors and mammals.

Mitigation Site Baseline Information

Gold was discovered in Nevada Creek in the late 1880s and by the early 1900s the Alaska Treasure Mine was established and worked/explored for gold occurrences (CEC 1980; Redman et al. 1988). A portion of the Alaska Treasure Mine Site, identified as the middle adit where the main working tunnel is located to this day, occurs within the proposed Nevada Creek Mitigation Site.

Historic Baseline Condition

Before the Nevada Creek Mitigation Site was impacted by historic mining, the site's environmental condition was likely similar to the intact areas that surround the site today. Well-drained areas were likely comprised of forested uplands with Sitka spruce and western hemlock in the overstory, early and Alaska blueberry in the understory, and spiny wood fern and dwarf dogwood within the herbaceous stratum. Poorly-drained areas areas were likely comprised of forested wetlands with western hemlock in the overstory, false azalea and devils club dominant within the understory, and skunk cabbage dominant within the herbaceous stratum. Depending on the topography along the stream, Nevada Creek's riparian zone vegetation was likely comprised of a combination species that occurred within the site's uplands and wetlands.

Upon the establishment of the Alaska Treasure Mine, the middle adit area that occurs within the mitigation site consisted of a mining camp, the main working tunnel located on the west bank of Nevada Creek immediately above a small gorge channel carved by the stream, and waste rock dump area along the what is now the east bank of Nevada Creek. West of the middle adit a narrow gauge railroad with associated steam piping ran from the middle adit to a lower mine area adjacent to the Gastineau Channel shoreline. Remnants of the railroad and associated steam piping are evident to this day, as are portions of a log corduroy road that connected the middle adit to the Alaska Treasure Mine Hudson Tunnel upper adit and a lower mine area adjacent to the Gastineau Channel.

Historic impacts within the middle adit area consisted of waste rock dumping into Nevada Creek and clear-cut logging of the surrounding riparian areas, forested uplands, and wetlands. The waste rock dump at the middle adit is the most extensive of associated Alaska Treasure Mine dump areas in the vicinity. Due to the extent and proximity of the waste rock dump to Nevada Creek, the dump likely historically altered the course of the stream significantly. Wood from logging the surrounding riparian areas, forested uplands, and wetlands was likely used for the construction of the mining camp and corduroy road connecting the middle adit to upper and lower mine areas, and reinforcing of the main working tunnel and associated shafts. Wood would have also been used for the mining camp heating and cooking. Increased human presence, and initial and ongoing mining activities, would have also historically impacted wildlife that occurred within the middle adit and corduroy road/narrow gage railroad areas.

Existing Baseline Conditions

The middle mine area's main working tunnel remains accessible to this day. Side-slope areas (adjacent to Nevada Creek) of the main working tunnel waste rock dump were observed to be actively eroding. However, testing of Nevada Creek conducted in 2012 concluded that there are no existing water quality issues (HGCMC Memo 2012); see paragraph below. Assorted small pieces of metal and remnant equipment were also observed within the vicinity of the area's historic mining camp. Today, the vegetation within the middle adit area consists of a sparse understory, but an overstory comprised of Sitka spruce, western and mountain hemlock that have colonized the waste rock dump and previously disturbed adjacent areas. Red alder has was observed to have colonized the majority of the corduroy road alignment, with spiny wood fern and dwarf dogwood dominant within road alignment's upland herbaceous stratum, and skunk cabbage dominant within road alignment's wetland herbaceous stratum.

The waste rock dump area exhibits evidence of continual erosion and material deposition into Nevada Creek as little to no vegetation has colonized the dump side slope contiguous with the stream. Dr. Pete Condon with PetrosGeo Consulting visited the site and assessed the condition of the waste rock area. Dr. Condon identified a significant disproportion of pyrite material within the waste rock that has the potential to produce acid rock drainage. Dr. Condon confirmed that "Stabilization of the bank would slow the rate at which the waste rock enters the creek. If vegetation can be established it will replace some of the strength lost by the rock as it weathers." Therefore, the restoration component of this mitigation plan involves stabilization of the waste rock dump side slope contiguous with Nevada Creek by constructing anchored terraces and establishing native vegetation within the terraces. The construction and in-perpetuity establishment of these stabilization features will prevent the introduction of acidifed material, should acidification of the waste rock occur in the future.

Main Working Tunnel Water Quality

On August 9, 2012, Kerry Lear of Hecla Greens Creek Mining assessed the existing water quality conditions within the Alaska Treasure Mine's middle adit main working tunnel. The main working tunnel was explored for approximately the first 1000 feet. The tunnel is generally wetter than the upper adit Hudson tunnel as small seeps and drips occurred more frequently throughout the length explored. Oxide coatings along the ribs are also more common and are dominated by dark reddish-brown to black manganese-oxides mottled with yellowish to orange-brown (iron) Fe-oxides. The wetter conditions lead to a discernible flow along the tunnel floor

which is covered by a heavy, orange- brown sludge up to 1 centimeter thick. This sludge rises 5 to 10 centimeters up the rib which may indicate that water levels fluctuate inside tunnel. During a previous trip there was a low-volume (2-l parts per millionth (pm)) direct discharge of contact water flowing directly into Nevada Creek. A water chemistry sample site was selected approximately 100-feet inside the tunnel. There was a very low but distinct flow at the site. Water sampling indicates that there are no immediate water quality issues from the tested main working tunnel. However, if hydrologic conditions were to change inside the tunnel, there are enough oxide coatings that could become soluble to be of concern, and the main working tunnel appears to have a larger reservoir of this type of material than the upper adit Hudson Tunnel (HGCMC Memo 2012).

Nevada Creek Water Quality in Vicinity of Main Working Tunnel

Two Nevada Creek water quality samples were also taken, one upstream and one downstream of the main working tunnel discharge. However, the downstream sample could also be influenced by any contact water discharge from the waste rock dump adjacent to the stream. The two samples returned essentially the same constituents values with the upstream sample values slightly, but not significantly, greater than the downstream sample. None of the metals analyzed are near levels of concern with regard to Alaska Water Quality Standards (HGCMC Memo 2012).

Wildlife & Habitat

The Nevada Creek Mitigation Site contains forested upland habitat, and aquatic habitats such wetlands and riparian areas that have remained relatively undisturbed since historic mining activities ceased. No Endangered Species Act (ESA) listed threatened or endangered species occur on the site, although the Queen Charlotte goshawk, a Forest Service listed Sensitive Species is suspected or known to occur on Douglas Island. Queen Charlotte goshawks are inhabitants of late seral forests and are closely associated with productive old-growth (POG).

Upper elevations areas adjacent to the mitigation site that were not disturbed by historic mining contain stands of old growth. The table below and on the following Page 19 includes the native mammals that occur on Douglas Island as indicated by *Mammals and Amphibians of Southeast Alaska* (MacDonald, S.O. and J.A. Cook 2007), and presents the occurrence of the mammals associated habitat within the Nevada Creek Mitigation Site, in comparison to the occurrence of the species and/or habitat on Admiralty Island within the Greens Creek Mine permit expansion boundary area that includes the Stage 3 Expansion project.

Comparison of Native & MIS Mammal Associated Habitat Occurrence[1]					
Species Common Name	**Species Scientific Name**	**Habitat Association**	**Associated Habitat Occurs within Nevada Creek Mitigation Site**	**Tongass National Forest Management Indicator Species (MIS)[2]**	**MIS or Other Species and/or Associated Habitat Occurs within Proposed Permit Expansion Area**
Rodents					
American Beaver	*Castor canadensis*	Forested riparian	Yes	--	Not likely to be American beaver. Likely beaver endemic to Admiralty Island (*Castor Canadensis phaeus*)
Hoary Marmot	*Marmota caligata*	Tree lined slopes	Yes	--	-
Long-tailed Vole	*Microtus longicaudus*	Forested meadows	Yes	--	--
Northern Red-backed Vole	*Myodes rutilus*	Forested & Shrubland	Yes	--	-
Northwestern Deermouse (Keen's Mouse)	*Peromyscus keeni*	Forested & Shrubland	Yes	--	-
Porcupine	*Erethizontidae dorsatum*	Forested	Yes	--	-
Red Squirrel	*Tamiasciurus hudsonicas*	Forested	Yes	✓	Yes
Pikas & Hares					
-	*Lepus americanus*	Forested	Yes	--	-
				--	-
-	*Sorex cinereus*	Forested	Yes	--	-
-	*Sorex monticolus*	Forested	Yes	--	-
Bats					
Little Brown Bat	*Myotis lucifgus*	Forested	Yes	--	-
Carnivores					
American Black Bear	*Ursus americanus*	Forested	Yes	✓	-
American Mink	*Neovison vison*	Forested riparian	Yes	--	-
Ermine	*Mustela ermine alascensis*	Forested	Yes	--	-
North American River Otter	*Lontra canadensis*	Aquatic	Yes	✓	Yes
Red Fox	*Vulpes vulpes*	Forested	Yes	--	-
Wolf	*Canis lupus*	Forested	Yes	✓	-
Ungulates					
Sitka Black-tailed Deer	*O.h. sitkensis*	Forested-meadows	Yes	✓	Yes

[1]As indicated by Mammals and Amphibians of Southeast Alaska (MacDonald, S.O. and J.A. Cook 2007).
[2]Management indicator species for the Tongass National Forest according to 2012 DEIS (USFS 2012).

Aquatic Wildlife & Habitat

Nevada Creek is identified as a small order stream that originates on the east side of McDonough Peak, and generally flows east for approximately two miles until discharging into Gastineau Channel. Cutthroat trout (*Oncorhynchus clarki*), Dolly Varden (*Salvelinus malma*), coho salmon (*O. kisutch*), pink salmon (*O. gorbuscha*), chum salmon (*O. keta*), and sculpin (*Cottus* sp.) occur within the lower reach of Nevada Creek, with pink salmon the most abundant (CH2MHILL 1996). Resident fish are assumed to occur within the middle reaches of Nevada Creek. According to the *Channel Type User Guide - Tongass National Forest Southeast Alaska* (CTUG) (USFS 1992) the classification of the mainstem of Nevada Creek and two of its mapped tributaries, are as follows (Sheet 13):

- HC6 (Deeply Incised Mountain Slope Channel) - HC6 is a channel type that is a shallowly to deeply incised, high gradient (over 6 percent) moutainslope stream. HC6 channels are most commonly found on mountainslope or hill landforms and are primarily sediment transport systems. They occur in large ravines, with a consistent sideslope length greater than 10 meters. They usually initiate as first order streams and commonly extend to ridgetops and summits. Because of high stream gradient, high flow velocity, seasonally low water and migration barriers, HC6 streams are generally not accessible to anadromous or resident fish species. These channels contain negligible spawning or rearing habitat (USFS 1992). ELS field observations of the higher elevation drainage areas within the Nevada Creek site were consistent with the HC6 classification.

- MM1 (Narrow Mixed Control Channel) - MM1 is a moderate gradient channel type with mixed control process where sediment deposition processes is limited. The MM1 stream is normally situated in the middle reaches of small drainages basins. Small bedrock knickpoints and short cascades or falls may be present. According to the CTUG, MM1 channels are generally accessible to anadromous fish species, with downstream barriers accounting for most cases where access is restricted (USFS 1992). ELS field observations of the middle reaches of Nevada Creek were consistent with the MM1 classification.

- MC1 (Narrow Shallow Contained Channel) - MC1 is a moderate gradient channel contained process with narrow, shallow incisions. Stream flow is completely contained by adjacent landforms and upper channel banks. A MC1 stream is found consistently in glacially scoured lowland landforms (USFS 1992). Although MC1 channels are generally not accessible to anadromous species because of downstream barriers, an anadromous waters catalog has mapped approximately last 300 feet of Nevada Creek's MC1 classified channel as salmon bearing (CH2MHill 1996).

Cultural Resources

The cultural resources associated with the middle adit portion of the Alaska Treasure Mine that occurs within the proposed Nevada Creek Mitigation Site is currently in the process of Section 106 coordination and review by the Army Corps of Engineers and the Alaska State Historic Preservation Office (SHPO). It is likely that through the Section 106 review process the middle adit area will be deemed eligible for listing on the National Register of Historic Places. Initial assessment of the proposed mitigation site's potential to contain cultural resources related to sites and materials of prehistoric Native American, and historic Tlingit origin, has been determined to

be unlikely. However, the Section 106 review process is still on-going, and a final determination has yet to be made.

Risks to Mitigation Site Resources

Mining

Gold was discovered in Nevada Creek in the late 1880s, and the Alaska Treasure Mine (Redman et al. 1988), that occurs within the proposed Nevada Creek Mitigation Site, was established by the early 1900s, and the areas identified as the upper, middle, and lower adits had been worked/explored for gold occurrences (CEC 1980). A report completed in 1914, the *Report of the Alaska Treasure Mine* prepared by Fred Close, valued the Alaska Treasure Mine remaining ore upwards of thirty-five million dollars. According to a more recent report prepared by the California Exploration Corporation (CEC 1980) titled the *Geology, Economic Potential and Exploration Recommendations for the Nevada Creek Property* dated November 12, 1980, the entire Alaska Treasure Mine site has been re-visited several times by exploratory mining and survey companies to determine the extent of mineral deposits and the viability of mining. Documented exploration of the site was conducted by the Al Ven Corporation during 1968 and 1969, and the Occidental Minerals Corporation in 1979 (CEC 1980). The CEC evaluation completed in 1980 concluded that the site had a gross mining value of 2.8 billion at that time (CEC 1980).

There will continue to be interest in the future as worldwide economic demand increases for precious metals such as gold and silver, and industrially important metals such as copper and zinc. The site has a history of mining and mine surveys, an historic access road that could be restored–operationally and good access to navigable water for import of equipment and supplies, and export of mined product. A previously considered mine operation, the AJ Mine Project, contemplated the Alaska Treasure Mine site for vast deposition of mine overburden and tailings (CH2MHil 1996). Obviously, mining at this location would entail multiple potentially significant impacts to aquatic resources from clearing, overburden placement, mine tailings and other associated mining-related impacts.

Timber Harvest

Forested habitat within the mitigation site is at risk from clearcut and selective timber harvest. A timber valuation of the all the Alaska Treasure Mine lode plats conducted in 1996 by Curran Consulting, Incorporated, documented a gross log sales revenue value of $2,764,800.00 (Curran Consulting, Inc. 1996). While access remains the greatest challenge to timber harvest at the site, the evidence on the ground of past timber harvests is a reminder that economic conditions drive the feasibility of logging. The site has a mix of both large and medium-sized timber, both hardwood (red alder) and softwood (western hemlock, Sitka spruce, and Alaska yellow cedar). The site has relic access from the shoreline area that could be made passable for log hauling to the shoreline area and shipping via barge to market.

Mitigation Objectives & Performance Standards

The primary overall goal of the proposed mitigation is to compensate for project impacts by preserving the aquatic resources occurring within the Nevada Creek Mitigation Site in perpetuity and restoring Nevada Creek riparian habitat. Preservation of the mitigation site also provides an opportunity to preserve the cultural resources associated with the Alaska Treasure Mine middle adit that occurs within the site. Through the Section 106 review process, it is anticipated that the mining area and cultural resources associated with the Alaska Treasure Mine Site, will be deemed eligible for listing on the National Register of Historic Places.

Long-term Protection

Objective 1. Long Term Protection of Aquatic Ecosystem Functions
Permanently protect aquatic ecosystem functions at the mitigation site by instituting the mitigation plan, and implementing an approved legal protection instrument.

Performance Standard 1a. Preserve through long-term, legally-binding protection the functional condition of the mitigation site's aquatic resources by protecting a total of 51.6-acres located within the middle reaches of the Nevada Creek Watershed. Performance Standard 1a for Objective 1 is completed when the long-term, legally-binding protection instrument is signed by all pertinent parties, placed on the property title, and is officially recorded with the City/Borough of Juneau.

Restoration

Objective 2. Restoration of Nevada Creek Riparian Area Impacted by Waste Rock Dump
Restoration of the portion of Nevada Creek's riparian area impacted by a waste rock dump through stabilization of the dump side slopes.

Stabilization of Waste Rock Dump Side Slopes:

Performance Standard 2a. Stabilize the waste rock dump side slopes eroding into Nevada Creek and promote soil formation through creation of stair-stepped terraces through installation of anchored waddles or (anchored) wood cribs/horizontal logs and planting native trees and/or shrubs within created terraces (e.g. behind waddles or wood cribs/horizontal logs) (Sheet 10). Performance Standard 2a for Objective 2 is completed when the creation and total amount of stair-stepped terraces and planting of native trees and/or shrubs is documented within an As-built Report or Year 1 monitoring report.

Performance Standard 2b. By Year 5, 100 percent of the created stair-stepped terraces along the waste rock dump side slopes will still remain.

Vegetative Structure:

Performance Standard 2c. By Year 5, the aerial cover of planted native trees and/or shrubs, and/or naturally colonizing native trees, shrubs, herbaceous species, or organic material (duff) occurring within created stair-stepped terraces along the waste rock dump side slopes will be 30 percent.

Table 5. Summary of performance standards completion or achievement & documentation.

Anticipated Completion or Achievement of Establishment Period Performance Standards			
Performance Standard	**Year**	**Completed or Achieved**	**Documentation**
1a	Year 0	Completed	As-Built Report
2a	Year 0 or Year 1	Completed	As-Built Report or Year 1 Monitoring Report
2b	Year 5	Achieved	Year 5 Monitoring Report
2c	Year 5	Achieved	Year 5 Monitoring Report

Long-Term Maintenance and Monitoring Plan & Adaptive Management

During the mitigation site's establishment period, the applicant will be responsible for ensuring that maintenance and monitoring plan is implemented to protect and maintain the functional condition of the mitigation site. Once the mitigation site is transferred to a long-term steward, the steward will be responsible for any required long-term maintenance and monitoring.

Maintenance

General maintenance will be periodically performed to address conditions that may limit the success of the mitigation site and attainment of performance standards and objectives. The applicant, and eventually the long-term steward, is responsible for all site maintenance activities. Maintenance activities will include, but are not limited to, repair of any areas subject to erosion, control of invasive species, general maintenance including garbage removal, and repairing damage from vandalism.

Monitoring

Establishment period performance monitoring will be implemented in Years 1, 3, and 5, to determine the degree of success of the mitigation site's restoration activities and to demonstrate to the regulatory agencies that pertinent performance standards have been achieved. Long-term monitoring site evaluations may include periodic surveys to assess encroachment such as garbage dumping and vandalism, and documentation of the functional condition of the site.

Monitoring Reports

The applicant will prepare and submit establishment period monitoring reports to the regulatory agencies in Years 1, 3, and 5 that will document of the status of the mitigation site and success of restoration activities. These reports will document site conditions and provide the supporting

information required to document the attainment of objectives and performance standards. Monitoring reports will be submitted by February 1 of the following year. Each monitoring report will contain the following information:

Permanent Representative Sample Plots

Representative sample plots will be established within the Nevada Creek riparian restoration area. Monitoring photo point locations will also be established within the restoration area and throughout the mitigation site. The restoration area will have at least one monitoring plot per created terrace. Sample plot locations will be placed on an As-built drawing and submitted with a Year 0 As-built Report or Year 1 Monitoring Report. The As-built drawing will be included in the annual monitoring reports.

Monitoring Report Contents

Monitoring reports will follow the guidance outlined by the USACE's *Mitigation Monitoring Report Format* (2008). Monitoring reports will provide the following required monitoring report elements:

Project Overview

1. Project name and USACE Permit Reference Number.
2. Name of the party responsible for conducting the monitoring and the date(s) the monitoring was conducted.

3. Description of the project, acreage and type of aquatic resources impacted, and mitigation acreage, and type of aquatic resources authorized to compensate for the aquatic impacts.

4. Description of the location, any identifiable landmarks of the mitigation project including information to locate the site perimeter(s), and coordinates of the mitigation site (expressed as latitude and longitude).

5. Dates the mitigation project commenced and/or was completed.

6. Statement on whether the performance standards are being met.

7. Dates of any recent corrective or maintenance activities conducted and a description of those activities since the previous report submission.

8. Specific recommendations for any additional corrective or remedial actions. The recommendations will include a detailed discussion about the likely cause and impact of any setback or failure that occurred along with the recommendations for future actions and strategies that might resolve these problems.

Monitoring Overview

9. Listing of the monitoring requirements and performance standards, as specified in the approved mitigation plan and any special conditions of the permit.

10. Evaluation of whether the mitigation project site is successfully achieving the approved performance standards; tables are recommended for comparing the performance standards to the mitigation site conditions.

Monitoring Data

11. The following monitoring data as specified by yearly performance standards will be collected and documented within the annual monitoring reports:

    Nevada Creek Riparian Restoration Area Vegetation
    To assess the establishment of planted native trees and/or shrubs within created terraces along the waste rock dump side slopes the vegetation monitoring will measure the following:

    a) Percent cover of planted species and beneficial recruits; visually determine percent cover using 5-foot diameter sample plots.

    b) Document the mitigation site over time, and changes in the restoration area plant community using photographs from permanent photo points and panoramic view(s).

    Soils
    To assess the development of soil and/or duff within the created terraces within the waste rock dump restoration area document the following:

    c) Using a Munsell Soil Chart Soil, description of soil profile and matrix percentages from 0" to 6" or until waste rock is encountered.

Monitoring Summary

1. Provide summary data to substantiate the compensatory mitigation project's success and/or potential challenges.

2. Provide monitoring data to assess the measureable criteria of each mitigation performance standard. Summarized monitoring report data collection efforts must focus on determining whether performance standards are being met.

3. Provide photo documentation to support the findings and recommendations referenced in the monitoring report and to assist in assessing whether the compensatory mitigation project is meeting applicable performance standards for that monitoring period.

4. In addition to photos at designated photo points, photo documentation to include panoramic views of appropriate areas of the mitigation site. Photos should be formatted on standard 8.5" by 11" paper, or 11” by 17” paper for panoramic views, and dated with the date the photo was taken, in addition to clearly labeling the area of the mitigation site shown in the photograph and the direction from which the photo was taken.

Maps

Maps are to clearly delineate the mitigation site perimeter(s), in order to assist regulatory agencies in locating the mitigation area(s) during site inspections. Provide maps to showing the location of the following compensatory mitigation site features:

5. Photo location points to be identified on the appropriate maps.

6. Habitat types

7. Sampling data points, locations of photographic reference points, and other features pertinent to the mitigation plan.

8. As-built plans may be included.

Conclusions

9. Provide an overview of the current ecological condition of the mitigation site, including a discussion of the restoration areas.

10. Effectiveness of the mitigation restoration activities accomplished to date, and progress of the mitigation site in achieving the specific performance standards. If performance standards are not being met, provide details about the likely cause and impact of any setback or failure that occurred and recommendations of future actions and strategies and/or contingency or remedial measures that might resolve the problem(s). Explanations of the need for any future actions and strategies and/or contingency or remedial measures, and detailed proposals for their implementation, along with an implementation timetable is to be provided.

11. Pertinent additional information on such aspects of the mitigation site as wildlife use of the area, recreational and scientific use, and natural events such as disease, wildfire, and flooding, etc., that may have occurred.

Adaptive Management Plan

If the monitoring reports, or inspection by regulatory agency representatives, indicate persistent failure to achieve and maintain the prescribed performance standards, the applicant will propose adaptive management actions to correct shortcomings. A thorough analysis may result in the identification of other factors, not identified in the performance standards or monitoring data, causing the project to fall short of its objectives. The adaptive management plan shall specify the nature of further examination of potential causes of failure and/or corrective action to be

conducted, the schedule of completion for those activities, and a monitoring report for assessing the effectiveness of the corrective action. The objective of the adaptive management plan shall be to attain the originally prescribed project objectives, either through achieving the original performance standards or through new standards subsequently developed based on evaluation of the site as temporal changes occur and are assessed. All adaptive management actions will be undertaken only after consulting and gaining approval from the appropriate regulatory agencies.

Long-Term Protection & Financial Assurances

The proposed Nevada Creek Mitigation Site is owned by the Nevada Creek Mitigation Partners. As a means of long-term site protection, a conservation easement will be placed on the proposed mitigation site; a draft conservation easement is provided in Appendix E. Additionally, a financial assurance fund of $5,000.00 will be created for completion of all tasks related to the restoration of the Nevada Creek riparian area at the middle adit, as described in Performance Standards 2a through 2c. The amounts required for the Financial Assurance of the Performance Standards, described above, will be deposited by Nevada Creek Mitigation Partners into an escrow account accessible by the appropriate permitting agency, or agencies, for the completion of said tasks if necessary to comply with the objectives of the Mitigation Plan. Upon receipt and approval of the final monitoring reports confirming the satisfactory completion of the Performance Standards, any and all remaining amounts remaining in the escrow account shall be returned to Nevada Creek Mitigation Partners.

Mitigation Site Work Plan

The majority of the project work for the Nevada Creek Mitigation Site is anticipated to take place during the summer of 2014 from June to August, except where noted otherwise, and specifically consists of the following elements:

Restoration of Nevada Creek Riparian Area Impacted by Waste Rock Dump
Proposed work associated with the restoration of the Nevada Creek riparian area impacted by a historic mining waste rock dump through stabilization of the eroding side slopes involves the creation of stair-stepped terraces through installation of either anchored waddles or (anchored) wood cribs/horizontal logs along eroding slopes, and planting native trees and/or shrubs within terraces (Sheet 14).

To provide materials for the proposed anchored wood cribs/horizontal logs, and to increase heterogeneity in stand density and canopy cover within the closed canopy dense re-growth upland forest that now dominates the top of the waste rock dump, a “skips and gaps” (Christensen 2012) treatment is proposed. The treatment is also proposed in order to provide more light for subdominant trees and understory plants that provide wildlife forage as the top of the waste rock dump completely lacks an understory. Thinning intensity will be generally be light as specific trees, not stands, will be targeted to create gaps with some stand areas left completely un-thinned (“skips”). Trees targeted for thinning will be carefully identified using the following considerations and criteria:

Basic Guidelines

- Trees above 12" DBH will not be targeted for thinning
- Retain canopy closure at least 25-feet from what is now the top-of-bank for the Nevada Creek stream valley
- No Alaska yellow cedar will be targeted for thinning
- No saplings will be targeted for thinning

Hand tools and chainsaws will be used for the proposed work associated with restoration through waste rock dump side slope stabilization. Equipment and supplies for the aforementioned work will likely be dropped off and picked up by helicopter and/or walked in and out.

Main Working Tunnel Closure

To restrict public access, closure of the main working tunnel is proposed by the installation of either permanent or locking rebar grates at the adit openings, according to guidance presented by *Managing Abandoned Mines for Bats* (Bat Conservation International 2009). The grates at the adit opening will be constructed onsite using rebar, welding equipment, rock drills, and cement that will be transported on and off-site by helicopter (Sheet 15).

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