Mineral Potential of the Blue Lake Area

Prepared by
Gregory P. Streveler
and
Daniel M. Mann

Icy Strait Environmental Services
Box 94
Gustavus, AK 99826

for

The City of Sitka

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INTRODUCTION

The City of Sitka proposes to raise the Blue Lake dam in order to increase the capacity of the Blue Lake Reservoir. This action would result in inundation of 430 acres around the lake periphery and along the stream entering Blue Lake from the east. (Figure 1). As part of the permitting process, the City has been tasked by the U.S. Forest Service with characterizing the mineral potential that may be foregone by the proposed action. Specifically, the City is charged to "Identif(y) any existing mineral claims under US mining laws in the project area. … [with] emphasis on identifying any locatable mining claimants, historical prospects, and minerals potential." The City has engaged Icy Strait Environmental Services to evaluate the present activity and mineral potential as they relate to the proposed action. Historical aspects of mining are not dealt with in this report.

STUDY AREA

Three nested areas will be studied with increasing levels of detail: the Region bounded by Katlian Bay and River, Glacier Lake, Mount Bassie and Silver Bay (Figure 2); the watershed of Blue Lake as well as the Sawmill Creek valley to Silver Bay; and the Project Area, here described as all lands within 100 ft. of the 430 acres to be inundated.

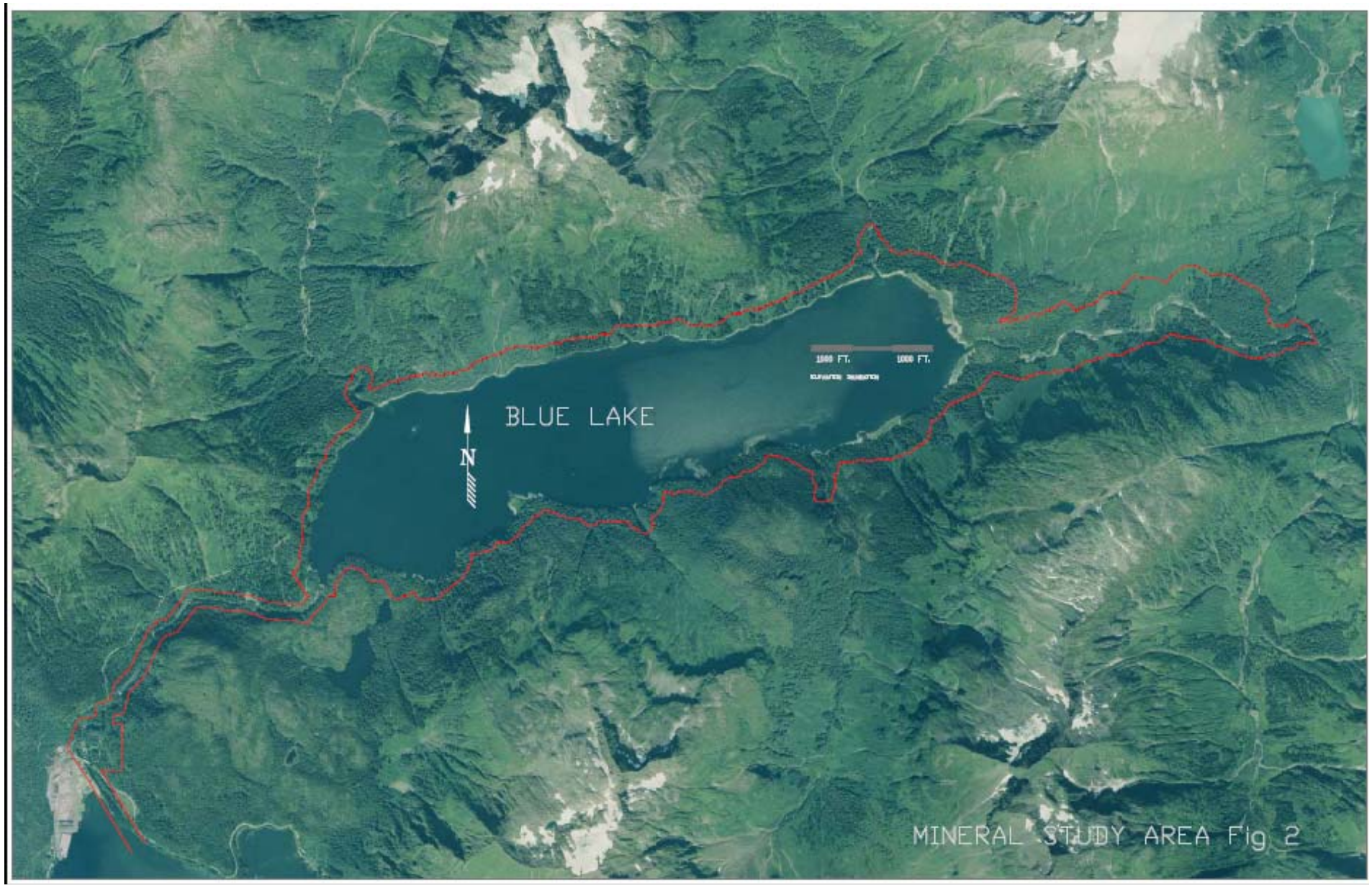

Figure 1. The Project Area

OBJECTIVES

- Characterize the geology of the Region, Watershed, and Project Area.
- Describe present minerals-related activities in the Watershed and Project Area.
- Estimate the mineral potential of the Project Area, including: fossil fuels (oil, gas), geothermal, metallic minerals (gold, silver, heavy metals), alkali metals (sodium, potassium), radioactive minerals (uranium, thorium), nonmetallic and industrial materials (rock, sand, gravel).
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METHODS

- Provide from the published US Geological Survey literature a general overview of Regional geology, including: a general description, rock units, structural features, and tectonic history.
- Describe in more detail the lithology, surficial geology, and structural characteristics of the Watershed and Project Area, using published and unpublished sources as available.
- List, locate and describe minerals claims within the study area, from records maintained by the US Bureau of Land Management, providing information available on their present status.
- Estimate the potential for undiscovered minerals in the Watershed and Project Area by reference to the pertinent literature.

RESULTS

GEOLOGIC SETTING

THE REGION

<u>Lithology and History</u>

The extreme western rim of the Blue Lake Region is delimited by a unit of highly metamorphosed schist and other contact metamorphics related to the large granitic Warmsprings Bay pluton (Figure 3). Adjacent to it, in the Glacier Lake watershed, is a phyllite unit. Both are of inferred Jurassic or Triassic age (Loney et al., 1975).

The northwestern two thirds of the Region is comprised of rocks referred to the mid-Cretaceous to Late Jurassic, Kelp Bay Group (Loney et al., 1975). Brew (1997) divides rocks of this formation in the Region into two facies: 1) an upland unit predominantly comprised of complexly interrelated argillite, slate, phyllite, greenstone, greenschist and semischist; and 2) a mélange belt closer to the coast made of an even more complex assemblage of the same rock types as the upland unit, along with small bodies of chert, metacarbonate, diorite, mafics, and ultramafics that include serpentinite. All are metamorphosed to some degree.

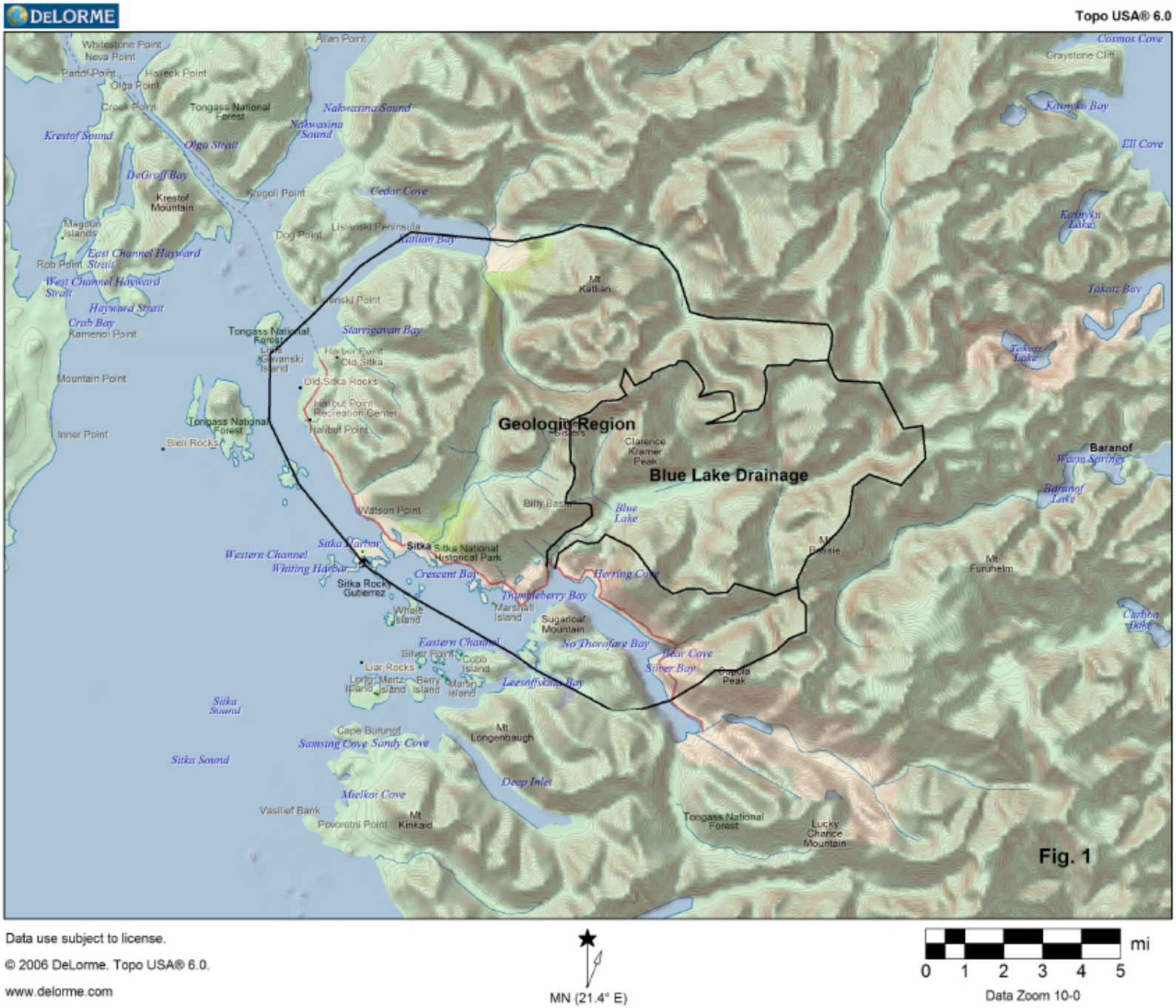

Figure 2. The Region and Watershed

Figure 3 Geology of the Region

(from Loney et al., 1975)

Key

Qu - undifferentiated quaternary sediments.

Tet - hornblende-biotite tonalite, subordinate biotite tonalite and hornblende-biotite granodiorite.

TrP - Phyllite, some quartzite, greenschist, greenstone, grawacke semischist, and metachert.

JTrs Biotite schist and gneiss, some amphibolite, quartzite, phyllite and hornfels.

KJs - greywacke and argillite, minor conglomerate and limestone.

JTrK - greenstone, greywacke, greenschist, metachert, phyllite and minor limestone.

Mzu - undifferentiated ultramafic rocks.

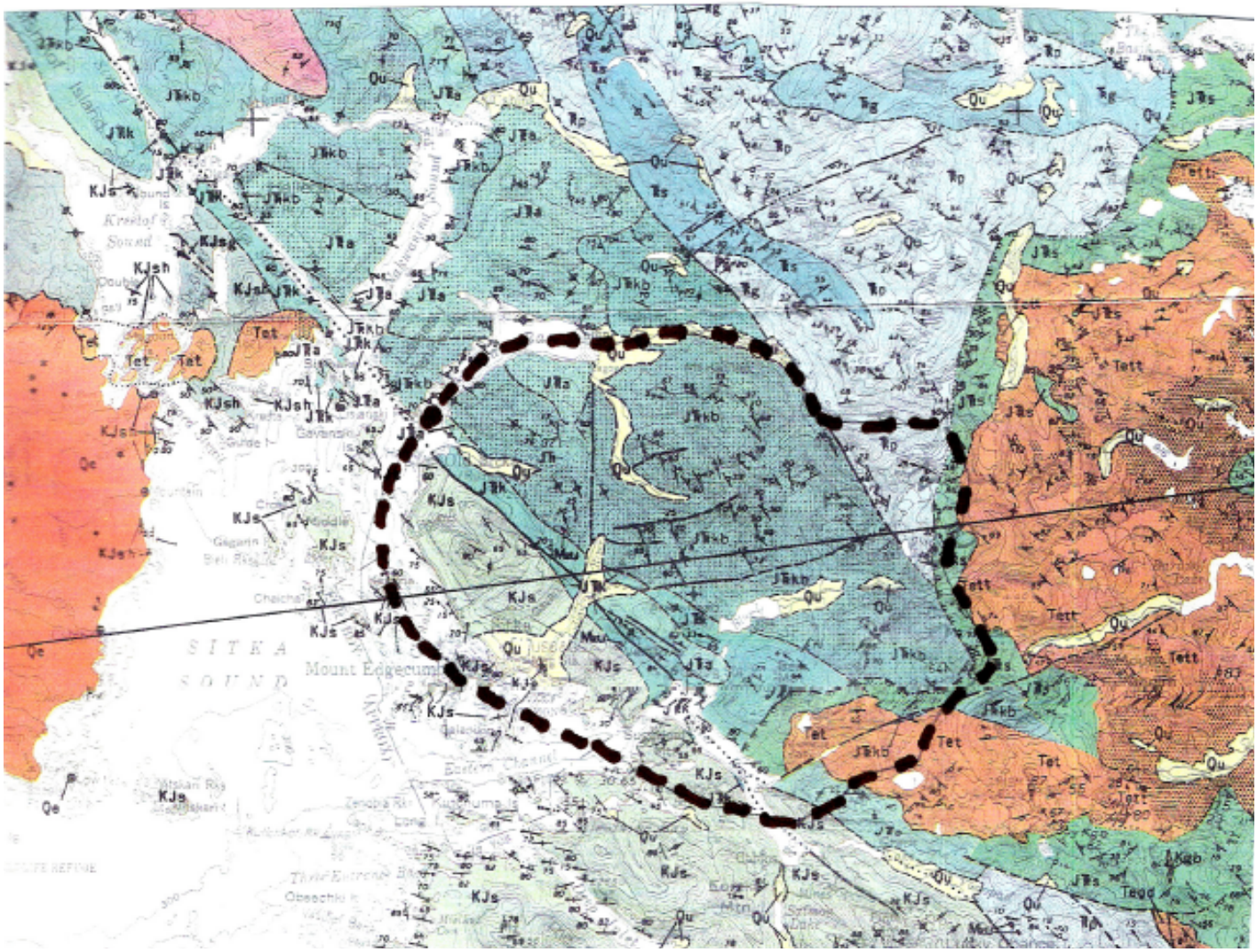

Figure 3. Geology of the Region

Farthest to the seaward, the above-described rocks give way, probably conformably, to the somewhat younger Sitka Graywacke, a lightly metamorphosed sandy mudstone with minor inclusions of conglomerate, variously interpreted as part of the Kelp Bay Group (Loney, et al., 1975) or as its own formation (Brew, 1997). The Region's southwest extremity is dominated by a Tertiary age granitic pluton, surrounded by a zone of amphibolite derived metamorphically from Kelp Bay rocks.

The Region's rocks are generally assigned to the Chugach Terrane. Their character has been strongly influenced by 1) Mid-Cretaceous or later compression of the Kelp Bay and Sitka Greywacke rocks against more ancient units to the east, which movements are prominently implicated in the general regional metamorphism, and 2) Tertiary fault activity parallel to the modern coast, related to emplacement of granitic plutons and related contact metamorphism (Brew, 1997).

Faulting

The 200km-long Sitka Fault Zone (Brew, 1997; Loney et al., 1975) parallels the west coast of Chichagof and Baranof Islands. This belt includes the prominent Border Ranges Fault, a major crustal discontinuity that separates the Chugach Terrane from the Wrangellia Terrane to the east. Within the Region, the Sitka Fault Zone is comprised of the Patterson Bay fault and minor associates, which tend to trend NE-SW, though Loney et al. (1975) map one splay in the Blue Lake Watershed that runs nearly at right angles to the general trend. This fault zone occupies the boundary between the mélange and more easterly facies of the Kelp Bay Group. It has played a prominent role in the formation and distribution of metallogenic deposits.

THE WATERSHED and PROJECT AREA

The Blue Lake watershed contains all rock units mentioned for the Region. Karl (2009) describes the rocks of the Project Area as "incompetent slaty artillites and phyllites with steep walls and shear planes." Loney maps a fault that trends roughly east-west through Arrowhead Peak and parallel to the north shore of Blue Lake within these rocks.

Loney et al. (1975) maps alluvial deposits in two places along the main tributary to Blue Lake; a third smaller but more accessible alluvial body lies in the Beaver Lake drainage just south of the dam site. Two of these three deposits lie all or in part within the Project Area. Their composition is unknown but is assumed to consist predominantly of stream gravels.

CURRENT MINERAL-RELATED ACTIVITY

According to the US Bureau of land Management ACRES system of mineral claim records, there are several currently active minerals-related claims in the Blue Lake Region watershed. Specifically, the records show:

T56S, R64E: 1 pending lode claim in Sec 24, at the southernmost margin of the Region near Silver Bay, outside the Watershed and Project Area.

2 pending lode & placer claims in Sec 25, at the southernmost margin of the Region near Silver Bay, outside the Watershed and Project Area.

T56S, R65E: 4 pending lode and placer claims in Sec 30, at the southernmost margin of the Region near Silver Bay, outside the Watershed and Project Area.

T55S, R64E: no active claims within the Region

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These claims are all valid at the time of this writing, according to USBLM records.

Since no valid and existing claims appear to occur either in or near the Project Area, we conclude that no presently valid claim would be affected by the Project.

MINERAL POTENTIAL

Fossil fuels (oil, gas)

There are no records of oil or gas exploration in the Blue Lake Region, nor would we expect there to have been such. Given the degree of metamorphism, faulting, jointing and general disruption of the Project Area's geology, there is negligible chance that oil or gas reserves could be located there.

Geothermal

The Edgecumbe Volcanic Field (Riehle et al., 1983) with its great geothermal potential lies about 20km to the west of the Project Area. The Goddard hot springs occur a similar distance to the south. Both of these geothermal sources are separated from the Project Area by the Sitka Fault Zone, whose high-angle fractures almost certainly separate the abovementioned geothermal activity from the Project Area. No geothermal surveys are known from the Project Area, and no surface expressions of geothermal activity have, to our knowledge, been reported.

Metallic minerals (gold, silver, heavy metals)

The Patterson Bay fault group is genetically related (Brew et al., 1991; Brew,1997) to the distribution of metallogenic deposits in the Blue Lake Region. Brew, et al. (1991) consider the Sitka Fault Zone to comprise a metallogenic belt termed the Yakobi-Chichagof District, which in the Region is mapped to encompass the Patterson Bay fault and its associated faults. The District so mapped encompasses the southwestern third of the Project Area, including former mining claims at Arrowhead peak, Bear Mountain, and Silver Bay in the Region. Nearly all previous claims in the Region are distributed within this belt (Loney et al., 1975;Brew et al., 1991). "The gold-silver deposits appear to be genetically related to the Tertiary intrusive belt and would not be expected to occur away from that belt" (Loney et al., 1975).

According to Loney et al. (1975), "although there has been extensive prospecting and some development in the Silver Bay area since 1871 (Knopf, 1912), there is little, if any, recorded production". The great preponderance of activity in the Yakobi-Chichagof District has related to gold in "swarms of Au-Qu(art)z veins [that] parallel … large linear

shear zones" (Brew et al., 1991). Such shear zones do not appear on Brew's (1997) detailed map (Figure 4) of the southern third of the Project Area.

A USGS mineral assay done above the shore of Blue Lake at the base of Arrowhead Peak just outside the Project Area, in mafic igneous rock, contained traces of Cr, Ni, Cu, Co, and Zn, of which Chromium was listed as a mineral of possible interest. A second site also in mafic igneous rock, outside the Project Area at Bear Mountain, produced "one sample [that] contained 0.99%Cu, 0.20%Ni, 0.09%Co" (Brew et al., 1991). Per recent communications from Brew (2009), as corroborated by a search of USGS ARDF database, these data are the latest information available for the Project Area vicinity. These assays are limited to a rock type that is mapped by Brew (1997) as small, isolated bodies unlikely to occur in sufficient volume to be of commercial interest. He maps the southern third of the Project Area in great detail (Figure 4), and shows none of these bodies there.

Alkali metals (sodium, potassium)

Sodium and Potassium typically occur in commercially important quantities in association with sedimentary rocks formed by evaporation. No such rocks are mapped for the Region. Other rarer alkalai metals such as lithium, caesium and rubidium usually occur in association with granitic pegmatites, which are not known from the Region.

Radioactive elements (uranium, thorium)

These elements usually occur in commercial quantities as uraninite (pitchblende), most commonly found in pegmatites and hydrothermal replacement deposits. Pegmatites are not mapped for the Region. The only permissive geology for pegmatites is in association with the Tertiary batholith and a gneiss zone at the Region's northwestern periphery, neither of which occurs in the Project Area. Hydrothermal replacement deposits are present in the Region in association with gold and other heavy metals, but again not in any appreciable quantity within the Project Area.

Nonmetallic and industrial materials (rock, sand, gravel)

Three significant alluvial deposits are mapped for the Blue Lake watershed (See discussion under "Watershed and Project Area", above). Development of the project would preclude use of the two deposits along the Blue Lake tributary as a gravel resource, by partially inundating one and further complicating any practical access to the other. The accessibility of the Beaver Lake deposit would remain unchanged by Project development. Given the much greater accessibility of gravel resources elsewhere along the Sitka road system, these gravels appear to us to be of negligible commercial value whether or not the dam is raised.

Bedrock of similar or superior quality for roadbuilding and similar uses is abundant around Sitka, including sites far more accessible than the Project Area.

Figure 4 Detailed Geology of the Metallogenic Belt
Including the Southwestern Portion of the Project Area
(From Brew, 1997)

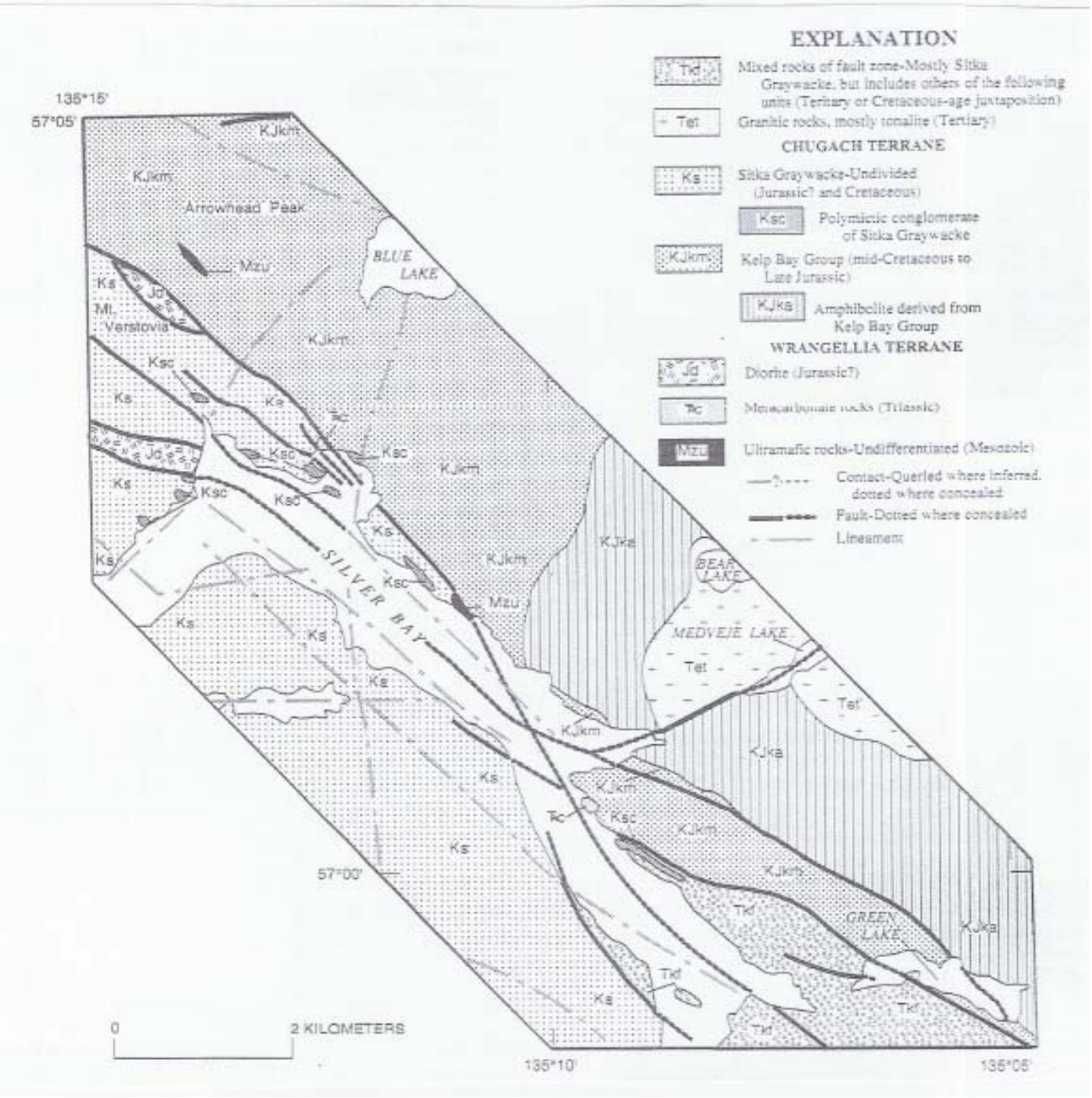

Figure 4. Detailed Geology of the Metallogenic Belt

CONCLUSIONS

- No presently active claims occur within the Project Area, or are so situated as to be affected in any way by the proposed action.
- Available information on the geology and mineralogy of the Project Area leads us to conclude that the mineral potential forgone by the proposed action is small to nonexistent.

LITERATURE CITED

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FIGURES

FIGURE 1 - The Project Area
FIGURE 2 - The Region and Watershed
FIGURE 3 - Geology of the Region
FIGURE 4 - Detailed Geology of the Metallogenic Belt