Overview of Environmental and Hydrogeologic Conditions at Puntilla Lake, Alaska

By Joseph M. Dorava and James D. Hall

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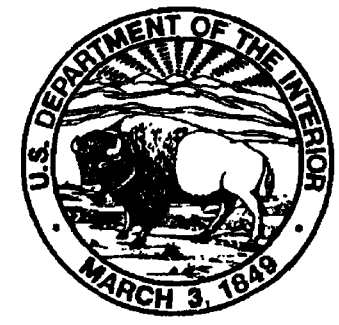

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CONTENTS

FIGURE

TABLE

CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
millimeter (mm)	0.03937	inch
meter (m)	3.281	foot
kilometer (km)	0.6214	mile
degree Celsius (°C)	°F = 1.8 x °C + 32	degree Fahrenheit (°F)

Sea level:

In this report "sea level" refers to the National Geodetic Vertical Datum of 1929--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

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ABSTRACT

The Federal Aviation Administration is conducting preliminary environmental assessments at most of its present or former facilities in Alaska. The Federal Aviation Administration owns and operates airway support facilities at Puntilla Lake, Alaska. They wish to consider the current environmental setting when evaluating options for compliance with environmental regulations and potential remediation. Information about environmental conditions at Puntilla Lake are presented in this report including an overview of local geology, hydrology, and a description of general geohydrologic conditions. Because of the remote location and small year-round population, information is limited.

INTRODUCTION

The Federal Aviation Administration (FAA) owns and (or) operates airway support and navigational facilities throughout Alaska. Fuels and potentially hazardous materials may have been used or disposed of at many of these sites. To determine if environmentally hazardous materials have been spilled or disposed of at the sites, the FAA is conducting environmental studies mandated under the Comprehensive Environmental Response, Compensation, and Liability Act and the Resource Conservation and Recovery Act. To complete these more comprehensive environmental studies, the FAA requires information on the hydrology and geology of areas surrounding the sites. This report, the product of compilation, review, and summary of existing hydrologic and geologic data by the U.S. Geological Survey in cooperation with the FAA, describes general environmental conditions for the FAA facility and nearby areas at Puntilla Lake, Alaska (fig. 1).

BACKGROUND

Location and History

Puntilla Lake (fig. 1) lies within an area informally known as "Rainy Pass," in the central region of the Alaska Range of southcentral Alaska (Wahrhaftig, 1965). Rainy Pass is in a gently sloped glacial valley. Puntilla Lake is bordered on the north by Lookout Hill and on the south by Round Mountain. Access to the area is limited to air transport or travel on the Old Iditarod Trail, a sled dog route between Nome and Anchorage, Alaska.

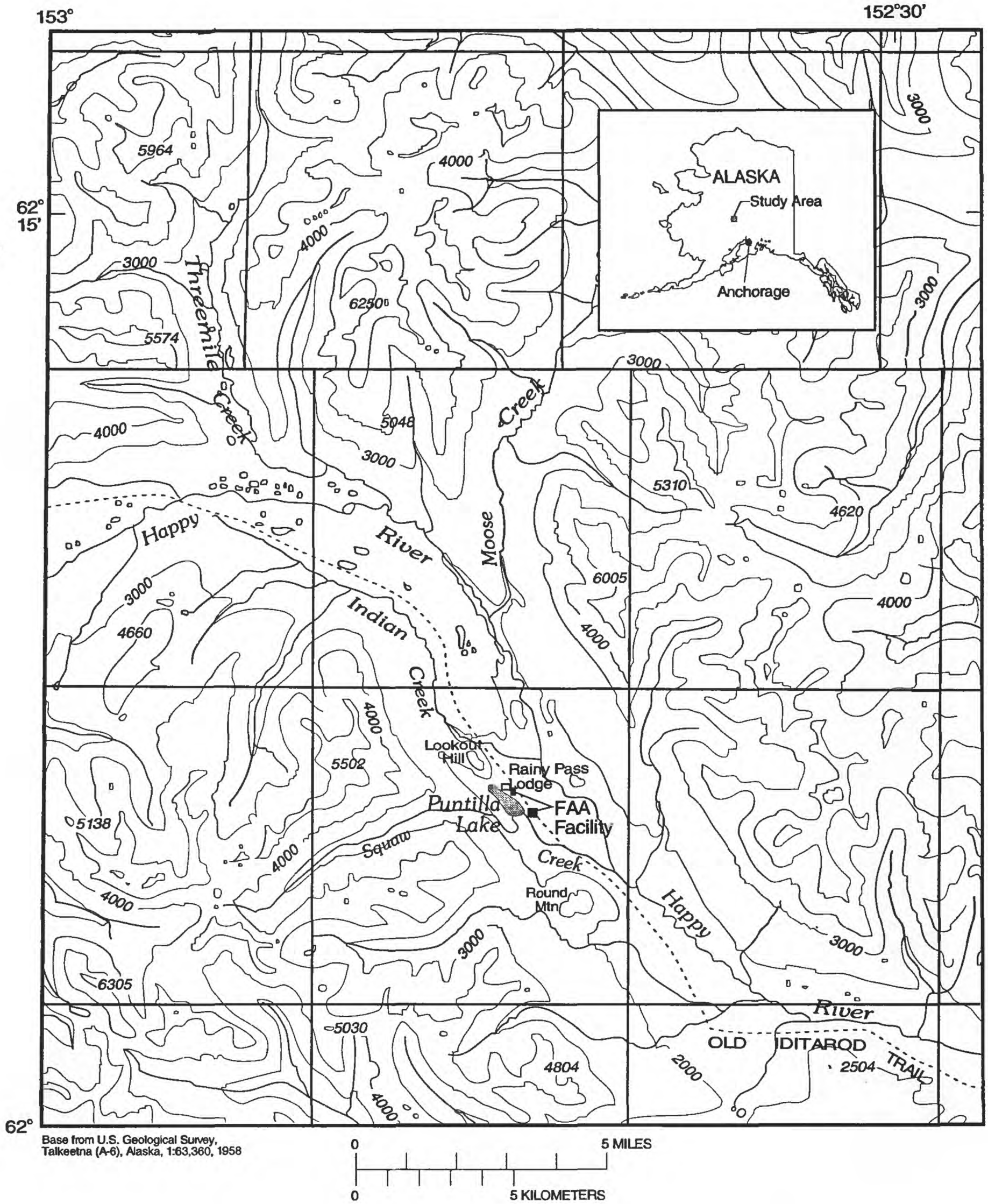

Figure 1. Location of Puntilla Lake, Alaska and the Federal Aviation Administration facility.

The FAA facility at Puntilla Lake (fig. 1) is an air navigation station located on the northeastern shore of the lake. It is at about lat 62°04'N. and long 152°44'W., at an approximate elevation of 565 m above mean sea level. The facility consists of a non-directional beacon supported by transmission facilities and a generator building. A detailed description of the FAA facility at Puntilla Lake can be found in a report by Ecology and Environment, Inc. (1993).

The FAA facility at Puntilla Lake was built in 1952 to facilitate air navigation through Rainy Pass. The facility is currently maintained by personnel from Anchorage. The only permanent residents in the area are operators of the Rainy Pass Lodge, located less than 1 km northwest of the FAA facility.

Climate

Puntilla Lake lies in a transitional climate zone (Hartman and Johnson, 1984). The region experiences cool summers and moderately cold winters. The mean annual temperature is -3.1 °C; however, temperatures range from a July mean maximum of 17.1 °C to a January mean minimum of -20.8 °C (Leslie, 1989). Mean annual precipitation is about 450 mm. Approximately 2,280 mm of snow falls annually (Leslie, 1989). Mean monthly and annual temperature, precipitation, and snowfall are summarized in table 1.

Table 1. Mean monthly temperature, precipitation, and snowfall for the period 1942 to 1987, Puntilla Lake

[Modified from Leslie (1989); °C, degree Celsius; mm, millimeter]

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
						Temperature (°C)							
Mean maximum	-10.6	-8.1	-4.0	2.0	8.9	15.3	17.1	15.0	9.7	1.1	-6.8	-10.4	2.4
	(Record maximum 30.0° C, June 1953)												
Mean minimum	-20.8	-19.8	-17.3	-10.6	-2.3	3.1	5.8	4.2	0.0	-8.5	-17.0	-20.4	-8.7
	(Record minimum -43.9° C, February 1947)												
Mean	-15.7	-14.0	-10.7	-4.3	3.3	9.2	11.4	9.6	4.9	-3.7	-11.9	-15.4	-3.1
						Precipitation (mm of moisture)							
	28.7	38.4	29.0	14.7	15.5	47.8	54.4	59.9	65.8	39.9	29.0	31.2	454.2
						Snowfall (mm)							
	375.9	348.0	299.7	157.5	38.1	2.5	0.0	0.0	12.7	256.5	386.1	403.9	2278.4

Vegetation

Vegetation around Puntilla Lake consists of open spruce and poplar forest and large areas of alpine tundra (Viereck and Little, 1972; Selkregg, 1976). Forested areas are composed of white spruce and balsam poplar interspersed with Alaska paper birch and quaking aspen. Alpine tundra vegetation consists primarily of matlike low shrubs and herbs.

GEOLOGY

The FAA facility at Puntilla Lake is situated in a U-shaped glacial valley in the central Alaska Range (Reed and Nelson, 1980; Wahrhaftig, 1965). Bedrock is composed of marine sedimentary rocks and volcanic rocks. Surficial deposits consist of glacial drift and flood plain alluvium. Rainy Pass and the Puntilla Lake FAA facility lie within the zone of discontinuous permafrost (Ferrians, 1965).

Bedrock Geology

Reed and Nelson (1980) describe the bedrock in the area. Bedrock near the FAA facility is exposed at higher elevations where it has not been buried by glacial sediments. Exposures are found near the peaks of Round Mountain and Lookout Hill, and along the steep valley walls to the east and west of the FAA facility. Along the valley bottom, surficial deposits are sufficiently thick to obscure bedrock.

Bedrock exposures along the valley walls consist of marine sedimentary rocks of late Cretaceous age composed of argillite, graywacke, and siltstone, and clasts of chert, conglomerate, phyllite, and impure limestone. On Round Mountain, bedrock is composed of interbedded tuffs, mafic volcanic flows, sandstone, shale, and minor calcareous mudstone. Round Mountain is a Tertiary volcanic center and may be the source of nearby Tertiary volcanic deposits. Two types of bedrock are exposed on Lookout Hill: granodiorite and undifferentiated marine sedimentary rocks. The granodiorite is a plutonic rock similar to that found on Mount Estelle, approximately 25 km southwest of Lookout Hill (Reed and Lanphere, 1973). The sedimentary rock is similar to that exposed along valley walls.

Surficial Deposits

The surficial deposits of the area have been described by Nelson and Reed (1978) and Reed and Nelson (1980). The Puntilla Lake area is underlain by unconsolidated sediment of Quaternary age. An alluvial deposit lies immediately east of the FAA facility along the Happy River flood plain. Depth of unconsolidated sediments is unknown.

The FAA facility at Puntilla Lake is built on glacial drift deposits of Quaternary age (Rieger and others, 1979). In some areas, the drift is covered by thin lenses of well-drained silty volcanic ash. Deposits of gravelly and stony colluvium can be found near the steep hillsides of the valley. Along the valley bottom and in depressions, soils are covered by a mat of poorly drained fibrous organic material. Soils in the area tend to be strongly acidic.

Two talus aprons are located on the eastern side of the Happy River Valley, about 5 km from the FAA facility. The aprons were formed by active or recently active rock glaciers and they extend into the valley 1 to 2 km (Reed and Nelson, 1980). The talus slopes are composed of rubble and diamicton originating from the erosion of exposed marine sedimentary rocks (Nelson and Reed, 1978).

Permafrost is generally absent in areas adjacent or beneath large lakes and rivers. Ferrians (1965) and Hopkins and others (1955) have reported that permafrost near Puntilla Lake is discontinuous and varies greatly with specific location. Permafrost studies specific to the Puntilla Lake FAA facility have not been done.

HYDROLOGY AND DRINKING WATER

The streams of Rainy Pass are fed by a combination of rain, snowmelt, and glacier melt. Surface water generally flows from Rainy Pass in the northwest to the Yentna River, about 100 km southeast. The Happy River, a tributary to the Yentna River, flows about 3 km east of Puntilla Lake. Happy River tributaries in the Puntilla Lake area include Indian Creek, Moose Creek, and Threemile Creek (fig. 1). Squaw Creek, which feeds and drains Puntilla Lake, joins the Happy River 3 km southeast of the FAA facility. The Happy River is partially fed by glacial melt, and the suspended-sediment load of the river is likely higher than that of other nonglacial streams. Despite an abundance of streams in the Puntilla Lake area, hydrologic data are rare.

More than 50 lakes are within a 5-km radius of the Puntilla Lake FAA facility. Most are glacial lakes. These lakes are probably fed by a combination of ground-water flow and precipitation. If lakes are not perched on permafrost or bedrock, the elevation of the lake surface may be used to estimate the level of the water table. If numerous lakes are in equilibrium with the water table, then the slope of the water table can be estimated from the elevations of the lake surfaces. The slope of the water table determines the direction of ground-water flow. Specific data regarding the lakes near the Puntilla Lake FAA facility are inadequate to determine shallow ground-water flow directions. Without information concerning the depth to ground water and its flow direction, most hydrologists assume that shallow ground-water flow will follow local topography.

Glacial drift deposits underlying the FAA facility at Puntilla Lake are the likely aquifer in the area. Water may also be present in fractured bedrock. During periods of reduced runoff, ground water may provide base flows to local streams such as Squaw Creek and Happy River. No investigations have been made of the local ground-water resources.

Puntilla Lake is the principal source of drinking water in the area. Because the lake is used for landing float planes, concerns have increased regarding the quality of this water. Although surface water is abundant, most of it is unavailable during the winter months. Ground water could potentially provide an alternative source of drinking water; however, little information is available to confirm this.

SUMMARY

The FAA facility at Puntilla Lake lies in a remote glacial valley in the central Alaska Range. Because of the remote location of this facility, few hydrologic and geologic studies have been made. Puntilla Lake is the principal source of drinking water for the local residents.

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