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PRELIMINARY GEOLOGIC MAP OF FIRE ISLAND, MUNICIPALITY OF ANCHORAGE, ALASKA

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Fire Island, about 17 km^2 in area, lies at the head of Cook Inlet at the point where the inlet bifurcates to form Knik Arm to the north and Turnagain Arm to the south. It occupies the westernmost part of the Municipality of Anchorage, and is separated from the mainland by an unnamed strait about 4.7 km in width.

The island rises to elevations of about 90 m and consists almost entirely of hilly and hummocky topography that generally ranges from 25 to 75 m in elevation. The island is almost completely rimmed by very steep bluffs that average about 60 m in height. Only at the northeastern tip and the narrow western end of the island are there small areas that lie near sea level. These areas are separated from the rest of the island by bluffs that are less steep and less high than the others.

Except for relatively small areas of alluvial, pond, beach, and lagoonal deposits that are probably no more than a few meters in thickness, and for an impressive belt of cliff-head dunes along the southeast side that may be as much as 40 m thick, the entire island appears to be composed of a single suite of deposits. These consist of complexly interbedded and interfingered sand, gravel, and diamicton, with minor silt and clay beds, and extend to at least 15 m below sea level; below that is at least 35 m of similar but perhaps substantially older material. These deposits appear to be a remnant of a once extensive unit that may in part still be present beneath the waters of Cook Inlet and its tributaries and that may be represented on the mainland by the deposits that extend from Point Woronzof to Point Campbell (map unit af, Schmoll and Dobrovolny, 1972). Although these deposits have been mapped as moraine (Cederstrom and others, 1964) our examination of the exposures in the bluffs around the island leads us to believe that they are more likely the product of subaqueous deposition in a delta. Such a delta would have been similar in size to the delta of the present-day Susitna River several kilometers to the northwest, but included coarser grained material and was probably closer to, and (or) intimately involved with the presence of a glacier lobe that occupied the Susitna valley. This interpretation differs from that offered by Miller and Dobrovolny (1959) only in the degree to which the relatively extensive but not continuous diamicton in the upper part of the deposits requires the presence of glacier ice for its deposition. The extent, number, and continuity of diamicton beds and their relationship to interfingering sand and gravel beds is the subject of on-going investigations which should further elucidate the origin of these deposits. Pending further clarification, these deposits are referred to as glaciodeltaic.

Silt-clay beds reported from wells on the island (W. W. Barnwell, written commun., 1968) and observed at only one point along the north shore of the island, may be tongues of the lower part of the Bootlegger Cove Clay. The glaciodeltaic deposits are thought to be contemporaneous with at least the lower part of the Bootlegger Cove Clay, and possibly with the upper part, which has been dated at about 14,000 years B.P. (Schmoll and others, 1972). Such correlation is consistent with minimum ages of 9,300±250 years B.P. (Miller and Dobrovolny, 1959, W-536, p. 32) and 8,290±250 years B.P. (Meyer

Rubin, U.S. Geological Survey, written commun., October 8, 1969, W-2306) on peat overlying the glaciodeltaic deposits.

The strait between Fire Island and the mainland is nearly filled with tidal deposits, chiefly silt and very fine grained sand. These deposits are exposed during low-tide stages except in relatively narrow channels, and are covered by perhaps 6 m of water at high-tide stages. The tidal deposits are soft, water saturated, and very unstable, treacherous even to walk upon. They are reworked daily by the tides, and are actively eroded especially along tidal channels. They probably are similar to deposits described in the upper Turnagain Arm by Ovenshine and others (1976). The present-day tidal deposits are not shown on the geologic map.

DESCRIPTION OF MAP UNITS

NONGLACIAL DEPOSITS (HOLOCENE)

Dune deposits--Almost entirely medium to fine grained sand, very well sorted; includes some organic debris--standing tree trunks as well as more finely comminuted material. Elongate dunes formed as sand is blown up from face of underlying sea bluffs, deposited on top of bluffs, and reworked into dunal forms

da Active dunes--Free of vegetation and subject to continual wind erosion and deposition

d Stabilized dunes--vegetation covered

b Beach deposits--Almost entirely medium grained sand, very well sorted; occur in low ridges a few meters high; similar present-day beach deposits ring the island but not shown on map

l Lagoonal or older tidal deposits--Probably silt and (or) very fine grained sand; not observed in detail; occur in flat-lying area likely to be soft and wet

p Pond and peat deposits--Chiefly silt, organic silt, and peat. Occurs in bogs and in other small flat-lying areas adjacent to ponds; includes two small exposures of peat deposits exposed beneath cliff-head dunes

DEPOSITS RELATED TO GLACIATION

Channels possibly underlain by alluvial deposits (lower Holocene and upper Pleistocene)--Relatively low-lying areas probably underlain at least in part by gravel and sand; differentiated on basis of general elevation

a_4 Grades northward from about 15 to about 5 m; only the channel mapped as a_4 is known to be underlain by about 1-2 m of gravel that is clearly separable from underlying glaciodeltaic complex

a_3 Grades westward from about 25 to 15 m

a_2 Grades northward from about 30 to about 25 m

a_1 Grades southwestward from about 45 to about 35 m

Glaciodeltaic deposits of Fire Island (upper Pleistocene)--Sand, gravel, and diamicton, complexly interbedded and interfingered; includes minor amounts of silt and clay in discrete beds. Differentiated on map by topographic occurrence. Areas included within map units gh and gm may be underlain by thicker accumulations of coarse material (gravel or diamicton) than the lower lying areas, but evidence available to date suggests that any such correlation between topography and sediment type is tenuous

gh Boldly hummocky--Hills commonly rising above 75 m in elevation and with relief of 10-20 m

gm Moderately hummocky to smooth--Surface generally above 50 m in elevation, and with local relief probably less than 5 m

gl Gently hummocky--Generally lying below 50 m in elevation and with local relief of less than 10 m

gb Sea bluffs--Glaciodeltaic deposits are either (a) nearly continuously exposed (southeast side) or (b) intermittently exposed, concealed elsewhere by colluvium, chiefly diamicton, derived from glaciodeltaic deposits (north and west sides of the island); Miller and Dobrovolny (1959, p. 89) estimate that

the fully exposed bluffs on southeast side of island have retreated at an average rate of about 0.6 m/year during the last 600 years

CONTACT--Generally well defined

x_1 CARBON-14 LOCALITY:

1. W-536, 9,300±250 years B.P.
2. W-541, 620±200 years B.P.
3. W-2306, 8,290±250 years B.P.

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