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REPORT ON

THE BLUFF MINING AREA OF SEWARD

PENINSULA, ALASKA

By

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U. S. DEPARTMENT OF LABOR
WAGE AND HOUR DIVISION

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REPORT ON THE BLUFF MINING AREA OF SEWARD PENINSULA, ALASKA.

I N T R O D U C T I O N

The area herein considered lies on the southern coast of Seward Peninsula, about 50 miles east of Nome, approximately between longitude 163°35'W. and longitude 163°55'W., and latitude 64°27'N. and latitude 64°40'N., embracing roughly about 100 square miles.

The general characteristic of the area is a maturely dissected upland with broad, concordant summits about 800 ft. high and wide, shallow valleys. This upland terminates along the sea coast except where cut by valleys, in bluffs and cliffs, whence originated the name of the area.

The area was first examined by G. B. Richardson in 1900 for the U.S.G.S. In 1904, Alfred H. Brooks made an examination for the U.S.G.S., the results of which were published in Bulletin 328, pages 283-293. Lastly S. H. Cathcart made an examination of the lodes, and incidently the placers, of the Bluff Area for the U.S.G.S. in 1920.

On the present investigation the writer was alone. He left Nome on the morning of October 7, 1931, landing at the airplane field below Koyana Creek an hour later. The rest of the day was spent examining Koyana Creek and environs, and Swede Creek, walking to Daniels Creek roadhouse late that evening. October 8 was spent in examining the Daniels Creek placers and lodes. The morning of October 9 was spent in examining the Eldorado Creek placers, leaving that

afternoon by airplane for Nome. Every assistance was rendered by the miners in the district,for which the writer is duly appreciative.

G E O G R A P H Y

DRAINAGE

The northern two-thirds of the area is drained by northward or northeast- flowing tributaries of Klokerblok River, which itself flows east to Golovin (Golofnin) Bay. The southward flowing streams, excepting Topkok River, are all comparatively small and flow into Norton Sound. The creeks considered in this report are Twin or Trilby Creek, Koyana Creek, Swede Creek, Daniels Creek, Eldorado Creek and Ryan Creek.

RELIEF

Most of the area is occupied by a maturely dissected highland. The main axis of this highland seems to lie in a general northwest-southeast direction. It is defined on the west and northwest by the broad marshy plain bordering Golovin Bay, on the north by the valley of Klokerblok River, and on the west by the valley of Topkok River. On the south the highland is terminated by bluffs and cliffs bordering Norton Sound. The hills composing the highland have broad, flat summits all about 800 feet in elevation and are "very suggestive of a surface uplifted and dissected by erosion". (Bulletin 328, page 284).

Slightly to the east of the center in the Bluff area herein considered, the highlands culminate in a broadly rounded mountain mass whose highest point is slightly over 1200 feet in elevation. The axis of this mountain seems to be light north and south or at about an angle of 70° to the axis of the rest of the highlands. It is this mountain mass which ends in the cliffs along Norton Sound just east of

of Daniels Creek. The highest point of the mountain has no name so far as could be ascertained. For the sake of brevity in the present report the writer will call it temporarily "Airplane Mountain" since on its broad, level summit a plane can conveniently land.

The creek valleys ~~are incised~~ which are incised into the upland are all broad and shallow and have fairly low gradients. Low, wide gaps and passes connect the heads of the principal valleys. The valleys of Daniels, Eldorado and Ryan Creeks have partially coalesced so the highlands are here reduced to a roughly semi-circular lowland whose broadly rolling surface marks the shallow drainage areas of the above creeks.

E C O N O M I C S

POPULATION

In summer the population of the Bluff Area consists of about 27 inhabitants, all engaged, directly or indirectly, in placer mining. In winter only about 11 persons make the Bluff area their permanent home.

TRANSPORTATION AND COMMUNICATION

The small amount of supplies and mining machinery brought into the Bluff area are all handled by small coasting vessels. This increases the transportation costs over that of Nome by about 50 per cent or around $10 a ton for fairly large amounts of freight. There are no roads in the area though a road connecting with the Nome-Council road could be constructed without excessive grades or cost per mile if future development should ever warrant it. Such a road

would be about 16 miles long.

There is an airplane field constructed by the Territory between Koyana and Twin Creeks. Airplanes can also land on the top of the mountain at the heads of Eldorado and Basin Creeks; called in this report "Airplane Mountain".

Winter transportation is confined entirely to dogteams and airplanes.

The only present means of communication are a rather uncertain weekly mail and an unsatisfactory and rather costly telephone service to Nome or Chéenik on Golovin Bay.

CLIMATE

The climate of the Bluff Region is subarctic. The summers are cool and inclined to be cloudy. Most of the precipitation occurs during the latter part of July, August and September. The precipitation is probably a little less than at Nome which averages around 17 inches annually. The winters, though the temperature rarely goes below -40 F., are marked by frequent and high winds which make travelling both difficult and dangerous.

The placer mining season for surface workings averages from the latter part of June to the first part of October or about 110 days.

VEGETATION

There is quite a large stand of spruce timber on the lower Klokerblok River. Except for a few stunted spruce, none over 3 feet high, and dwarf willows along the larger streams, the Bluff area proper is without tree growth. However the ground is covered with a thick covering of moss and sod which as a rule obscures all outcrops.

ANIMAL LIFE

With the exception of a few ptarmigan and an occasional Arctic hare, the Bluff area is without game animals or birds. Of the furbearers a few white and red fox, and still fewer mink, are occasionally taken by native trappers. Parka squirrels (citellus sp.) inhabit all the more hilly ground.

To the natives who originally lived, and still do in some winters, at the mouth of the Topkok River, the sea offers a bountiful supply of fish, and in the wintertime, seal and at times, walrus.

A supply of fresh meat may be obtained from the native or white companies at Cheenik on Golovin Bay who own the numerous herds of reindeer in that section.

G E O L O G Y

GENERAL OUTLINE AND CHARACTER OF ROCKS

The main rocks exposed in the Bluff Area are schists and limestones, and are probably all sedimentary in origin(with the possible exception of the mineralized schist lode zones in the limestone which may be altered intrusives). Besides these several small extents of greenstone have been mapped towards the eastern boundary of the area.

The limestone is exposed along the coast of Norton Sound and for a mile to 2 miles up the streams flowing into the sound. However at Daniels Creek the limestone lies in a triangular shape, the apex of the triangle reaching past the head of Daniels Creek to the high hills at the head of Eldorado Creek, the base reaching from Eldorado Creek to Twin Creek where the limestone outcrops end.

STRUCTURE

The main structure of the Bluff Area seems to be a series of slight rolls or folds whose axes lie in a general north of east,- south of west direction. Superimposed on the east-west folding is the mountain mass of Airplane Mountain which seems to be a low dome whose axis lies in a north-south direction. In the writer's opinion, for reasons given later, this dome represents a granitic boss or laccolith which has not been exposed by erosion.

STRATIGRAPHY

Smith and Eakin in Bulletin 449, Plate 6, map the mica schist north of the limestone as pre-Silurian and possibly pre-Cambrian, while the limestone which underlies the schist and probably is of greater age is mapped as Silurian to Carboniferous. In Bulletin 328, Plate 10, A. H. Brooks, etal., map the metamorphic rocks, both limestone and schist, as belonging to the Nome series of Silurian and Ordivician age. To whatever section in the geological column the schist and limestone should be placed, they are most probably of the same geological age, the limestones being the older.

METAMORPHIC ROCKS

The schists lying to the north of the limestone are mainly micaceous and contain some thin beds of limestone. It seems to be the concensus of opinion that they are of sedimentary origin. The schist bands or strata interbedded in the limestone in the writer's opinion are of sedimentary origin also although they may possibly be of igneous origin. A. H. Brooks, in Bulletin 328, says of these schist bands: "The schist, whatever its original character, has been intensely deformed and----

------intruded by many quartz veins. It is now composed essentially of quartz and mica, with some chlorite, and its mineral composition might be that of either an altered sediment or an altered igneous rock. Further evidence of the intrusive character----is found in the fact that at various localities the limestone walls near the contact with the schists are more or less metamorphosed. These facts, together with the irregular distribution of the schist, indicate an igneous origin, though it must be confessed that the evidence is by no means conclusive. "

S. H. Cathcart in U.S.G.S. Bulletin 722, page 194, says of these schist bands: "The little-altered schist of the lode (Sea Gull Lode) is a gray silvery rock, containing considerable sulphide both in the quartz and in the micaceous portion of the schist. On decomposition it becomes buff. Microscopic examination of a specimen from the hanging-wall contact shows the presence of abundant kyanite and of sillimanite in very fine crystals, together with the usual strained quartz, muscovite, chlorite, and decomposed sulphides. A polished surface of the quartz veinlet material shows free gold in very minute particles."

Paralleling Daniels Creek and about 6500 feet west there may be another schist belt interbedded with the limestone. This belt forms the bedrock in the deep channel on No. 1 Above Discovery Claim on Eldorado Creek. Neither its width nor its other features could be ascertained because of the depth of alluvium covering it. Or the uppermost schist band on Daniels Creek (Sea Gull Lode) may be exposed on Eldorado Creek by the dip of the schist and limestone beds becoming horizontal. The deep channel would therefore cut through the limestone to the schist. The writer is inclined to this latter theory

which only more mining and detail geological work will prove. An anologous condition is thought to occur on Daniels Creek.

S. H. Cathcart in U.S.G.S. Bulletin 722, page 191, recognizes two different limestones, a dark blue or black limestone and a gray limestone interbedded with mica and chlorite schist. Of these he says: "The lithology of the limestones is not uniform but shows variations which are dependent largely upon structural relations. The limestones are everywhere marmarized and show massive, slightly schistose, and highly schistose phases."-------"The blue limestone at the contact (with the grey limestone) is dense, dark blue and platy. The rock contains abundant graphite and considerable muscovite. Quartz is present in scattered grains that show the effects of strain. Cordierite is also present in small amounts. The overlying gray limestone is altered for a distance of several feet from the contact to a coarsely crystalline marble. The limestone lamination planes are marked by iron stain, which gives to the cross-fracture surfaces a blotched appearance." The writer recognizes three different limestones which are as follows: (1) a dark blue limestone; (2)a bluish gray limestone;and,(3) a gray limestone. The first two are correllated with Cathcart's dark blue and gray limestones. The gray limestone composes the limestone exposed along the sea-coast from Eldorado Creek eastward to about 600 feet east of Daniels Creek. It is also the limestone composing the bedrock on lower Daniels Creek. It appears to be a finer textured crystalline rock than the other limestones, and, in the writer's opinion, overlies them. It may possibly be the same rock as the bluish gray limestone but less altered. It is apparently in this limestone that the schist belt on Eldorado Creek occurs if there is such a belt.

IGNEOUS ROCKS

The greenstones which are mapped along the eastern margin of the Bluff Area, and also possibly the schist bands or strata in the limestone at Daniels Creek, all of which are metamorphic, are the only rocks of igneous origin known to occur in the area. However, as said before, in the writer's opinion, "Airplane Mountain" marks the crest of a granitic stock, boss or laccolith, which has not been exposed by erosion. The reasons for this opinion are given in the writer's "Report on the Status of the Coal and Lode Prospects of Soward Peninsula in the Summer of 1929", page 3.

UNCONSOLIDATED DEPOSITS

All the stream valleys in the Bluff Area are buried in alluvium derived from the surrounding hills. This varies from 11 and 12 feet deep on Koyana and Swede Creeks to 60 feet deep on Daniels Creek and about 75 feet deep on Eldorado Creek. According to A. H. Brooks in U.S.G.S. Bulletin 323, page 237, an old beach deposit lay about 8 feet below the original surface of the alluvium. Quoting Brooks: "Near the mouth of Daniels Creek a well-defined beach deposit lies about 10 feet above the present beach--------. Much of this upper deposit has been removed by the mining operations, but enough remains to show the typical beach character of the gravels. The deposit dips towards the sea, contains some shingle, and is overlain by about 8 feet of clay and muck." Brooks does not state if the elevation of this beach was taken from sea level or from the highest part of the present beach, nor does he state how far up Daniels Creek this beach was located. Scaling from his sketch (fig.16) on page 237, Bulletin 323, would bring this old beach line about 1000 feet up Daniels Creek from its mouth. If

it were about 8 feet below theo original ground surface, the original elevation of this old beach would be about 35 feet or in other words Brooks' elevation was taken from the highest part of the present beach.

Just east of Koyana Creek there is another old elevated beach. This will be dealt with more fully later under "Placer Mining on Various Creeks."

On No. 1 Above Discovery Claim on Eldorado Creek there is a deep channel from 50 to 75 feet below the surface. In this channel the bedrock is schist, although on the rest of the claim the bedrock is limestone, the depth to bedrock averaging about 12 feet.

On No. 1 Daniels Creek claim a drill hole 56 feet deep near the beach and a mining pit whose bottom has at present (1931) reached about 50 feet below the original surface, indicates a possible old channel. It is not known what the bedrock is in this old channel, but if the theory which the writer is inclined to favor is correct, it will be schist. Again there are two possible theories to be considered in regard to these deep places in the alluvia of Eldorado Creek and Daniels Creek. The first is that they are parts of all channels (or channel), through which Daniels and Eldorado Creeks flowed when the land surface stood at a higher elevation than at present. The second is that they are large sink holes or pot holes dissolved out of the limestone by perculating waters, and which were subsequently filled with detrital material from the surface. The writer is decidedly inclined to the first theory because the position of the sands and gravels in the pit on Daniels Creek would seem to indicate the action of actively running water such as a stream flowing on the surface in a deep, narrow cut resembling the present Swede Creek. It is also possible that the two channels may be connected and represent

a narrow canyon-like valley running in a northeast-southwest direction across both Eldorado and Daniels Creek and heading up the main or left fork of Eldorado Creek.

QUATERNARY AND RECENT HISTORY

The writer has forumlated a tentative hypothesis to account for certain facts in the Pleistocene and Recent history of Alaska. The Bluff Area fits into this hypothesis fairly well. Using it as a working basis, the history of the Bluff Area is as follows:- During most of the Pleistocene the Bluff Area, which had substantially the same configuration as now, stood at a higher elevation, the base level being lower by at least 50 feet. During the close of the Pleistocene there was a gradual sinking of the land surface. This sinking was very slow, long halts being made at various levels ~~which~~ which now constitute the ancient buried beaches. The rise in the base level may have been as much as 300 feet above the present and possibly 800 feet. During this submergence, detrital material from the land filled in the various valleys. As the sea rose higher this detrital material was covered with a more typical sea bottom deposit which subsequent erosion has in large measure removed. After subsidence had reached a maximum, there was a relatively much more rapid elevation of the land surface, a long halt only being made, so far as known, about 35 feet above the present sea level.

E C O N O M I C G E O L O G Y

HISTORY OF MINING AND DISCOVERIES

KK 53-35

According to A. H. Brooks in U.S.G.S Bulletin 328, page 288, gold was said to have been found by William Hunter and Frank Walker at the mouth of Daniels Creek in September 1899, and the first claims

staked by J. S. Sullivan, George Ryan and others in December, 1899. However, John C. Green informed the writer when a boy in Nome that he had found a little gold in the 1880's somewhere along the coast near Bluff but had done nothing about it. This was probably the first gold found on Seward Peninsula. The Seward Peninsula gold placers thus escaped by the narrowest margin being found 15 years before their actual discovery. K-53-35

In 1902, the Topkok Ditch Company was organized and the Klokerblok ditch started. By 1906 the ditch had been extended 20 miles and active hydraulic operations carried on from 1904 until the placer deposits of Daniels Creek were considered exhausted. In 1930, J. R. Sullivan organized the Topkok Chief Mines Company and began the mining of the deep channel on Daniels Creek, which a drill hole had indicated years before, by means of a crescent scraper. Such mining is continuing to the present time.

The present beach placers were soon exhausted. Many schemes had been tried to mine the auriferous sands which lie underneath the sea from the mouth of Daniels Creek. About 1924, the Allen Mining Company installed a cableway excavator to handle these submarine sands. The operation was not a success, principally because, it is claimed, the waves washed most of the sand from the excavator so that it could not secure a full load, and the enterprise was abandoned about 1927.

The lode claims near the mouth of Daniels Creek were staked in 1900 by Charles Megan, Henry Megan, John Corrigan and W. J. Somerville. K-53-45

PLACER MINING ON VARIOUS CREEKS

SILVERBOW CREEK K-53-41

This creek was a small producer in the early days of Bluff mining towards its lower end. At present no one is mining on the creek.

RYAN CREEK KT 53-43

This is a small creek flowing into Norton Sound between Silverbow and Eldorado Creeks. It was a producer in the early days of the Bluff placer mining but at the present time is said to be mined out. No one is working on the creek.

ELDORADO CREEK KT 53-42

This creek was the heaviest gold producer next to Daniels Creek in the Bluff Mining District. With the exception of the deep channel, it is said to be mined out. The deep channel has not been mined to any extent because there has been in years past no known method of handling such deep wet ground on an economical basis. The Crescent Sauerman bottomless scraper may solve this problem.

At present only one man, Patrick McGrath, is working on the creek on No. 1 Above Discovery Claim. Where he was operating the depth to the limestone bedrock averages about 12 feet. He ground-sluices (booms) off the overburden down to within about 3 feet of the bedrock, then shovels in the remainder. The gravel appears rather coarse though there are very few large boulders.

Owing to poor health, McGrath was doing very little work in 1931. Work on the claim had started in 1900.

DANIELS CREEK KT 45-35

On claim No. 4 Bench, Right Limit, Chas. V. Olson operates (1931) a small hydraulic plant in a bench channel of Daniels Creek. The ground is owned by Chas. V. Olson and Chas. Megan. The depth to bedrock is about 20 feet. The bedrock is a dark-blue carbonaceous limestone. There is an abrupt drop of about 20 feet in the bedrock just below the present pit, probably due to an east-west fault which will be

discussed later under lode claims. The lower channel was worked out under lease by Oscar Ashby from Paul Kjegsted and S. O. Graven, former owners. The grade of the bedrock is about 3 per cent. The deposit is practically all gravel, there only being about 2 feet of vegetable muck below the surface. The gravel is composed of rough angular limestone rocks, although no large boulders are found. The gold is fine but rough and with much attached quartz. It is worth about $17.45 an ounce. Olson uses 8-inch pipe connecting onto hose with a small 2-inch handnozzle. Water from Daniels Creek and from rain ditches is used under about a 25-foot head. The water is collected in a small reservoir and "splashed" through the nozzle. He uses twelve 12x18-inch boxes 12 feet long. Rail riffles are used in the lower 8 1/2 boxes. Work was started in 1927. Up to 1931, about 4600 square feet of bedrock had been cleaned. In 1931, he only cleaned about 400 square feet of bedrock.

Near the upper end line of No. 1 Daniels Creek Placer (U.S. Mineral Survey No. 333, U.S. Patent No.394812), the Topkok Chief Mines Company is taking out a pit. The ground is owned by the Northern Mining and Trading Company. In 1931, the pit was from 50 to 75 feet wide and about 200 feet long. The depth was about 25 feet or practically to sea level. No bedrock had been found as yet. This pit is sunk in what was originally considered bedrock. The Topkok Ditch Company had mined off about 25 feet of gravel containing a few thin strata of clay from the original surface of the ground. The gravel was mostly frozen and almost cemented (very tight). Their main workings extended from about 300 feet above the lower line of No. 3 Daniels Creek Placer to the sea, and were about 150 feet wide. The gold was distributed all through the gravel but thinned out, and the ground did

K+ 53-36

not pay well above where their main workings stopped. No pay at all was found in the valley of Daniels Creek above where the schist lodes cross it. The Topkok Ditch Company worked on lower Daniels Creek down to a flat limestone bedrock. This bedrock seemed to extend from rim to rim on the creek and have a natural grade toward the sea. The claims were considered to have been worked out. No consideration was given to the fact that next to the beach near the mouth of the creek, a drill-hole was sunk 56 feet deep. $1.86 was recovered from this drill-hole. In 1930, J. T. Sullivan, the present manager of the Topkok Chief Mines Company, secured a lease on the supposedly worked out claims, and started the present pit in June, 1931.

In the present pit there is a limestone point or reef located about half way between the two ends of the pit and extending from the right limit about three-fourths of the distance across its width. This reef may be a slide but, as far as could be told, more resembled a steep, high point in a rather sharp turn of a narrow, canyon-like valley. It lies or breaks up in large angular blocks and greatly interferes with mining operations. Most of the detrital material in the pit is a fine, reddish, clay-like earth, interspersed in which are a few angular limestone boulders. This earth appears megascopically to be mainly composed of hematite and quartz with a little micaceous material and limestone. The consistency and feel is almost that of a clay, but with no cohesion when wet like a clay. No water action could be seen in its deposition. It is undoubtedly derived from the lodes on the upper end of the creek. Toward the left limit of the cut there is a streak of fine gravel about 10 feet or more wide. This gravel is composed of small subangular limestone and quartz pebbles with a little of the red earth mixed in towards its right

limit edge. It resembles, but is finer than, the gravel seen on Eldorado Creek. It is mostly frozen and very tight and is said to have coalesced and been continuous with the original gravel that was mined previously on Daniels Creek above it.

The gold is distributed all through the reddish earth. It is also distributed throughout the gravel but in much less quantity. The gold is mostly fine though a few coarse pieces up to 4 ounces are found. It is very little worn and rough. It runs about 875-1/2 fine. The coarser pieces of gold are much more worn than the fine gold. The gold runs about 15 points higher fine than other Daniels Creek gold.

The Topkok Chief Mines Company is using (1931) a 1-ton Crescent (Sauerman) bottomless scraper. The haul is 300 feet and the scraper dumps into a 14x16-inch flume 800 feet long. Rail riffles are used in the first 72 feet, the rest of the flume being lined with steel plates. The first 72 feet of flume are set on a grade of 6.95 per cent, the rest on a grade of 2.77 per cent. An 80 H.P. 4-cylinder gasoline Le Roy France engine is used on a 2-drum hoist for the scraper. Water is pumped from Norton Sound a little over 800 feet with a 30-foot lift with an Allis Chalmers 8-inch (10-inch inlet) centrifugal pump coupled to an 80 H.P. 4-cylinder gasoline Le Roy France engine. A small gasoline engine and a 2-inch centrifugal pump are used in the pit to remove seepage water. The ground averages about $1.00 a cubic yard in gold content. During the summer 3 shifts were worked and 14 men besides a cook and manager were employed. In the fall, at the time of the writer's visit, only 7 men were employed and one shift worked.

SWEDE CREEK

K+ 63-44

This is a small creek about 2 miles east of Daniels Creek flowing due south into Norton Sound. The valley of the creek is a

narrow V-shaped trough which empties into the sound over a sea-cliff about 80 feet higher. The bedrock in Swede Creek is about 12 feet deep and is composed of gray-colored, porous limestone. There are also some potholes in the bedrock about 3 feet deeper than the general level. The grade of the bedrock is about 5-1/2 per cent. Thegravel is apparently all limestone with very little fine material, being practically all limestone boulders from 2 to 3 feet long. Near the head of the creek, the removal of the overburden in a small pit about 50 feet square, has revealed gravel composed of waterworn quartz boulders of large size. No bedrock has as yet (1931) been uncovered in this pit.

The gold on Swede Creek is very coarse and rough, the main body of it being composed almost entirely of small nuggets of $1 to $2 size. The remainder of it consists of nuggets of about $10 size. Much quartz adheres to the gold. Its fineness is 886.

It is evident from the above that Swede Creek has cut an old channel or beach-line,which lay on or contiguous to a mineralized schist band in the limestone. No quartz stringers were seen in the limestone, nor does it seem likely that material of its composition would be mineralized. It is thought that the gold in the creek has been derived,directly or indirectly, from a mineralized schist strata near the head of the creek. This gold the steep grade has distributed all down the creek channel.

A. S. Tucker owns all of Swede Creek. He has mined out a strip from the mouth of the creek about 50 feet wide and 1200 feet long. About 750 square feet of this was stripped in 1931. He uses an 800-foot flume composed of 12x14-inch 12-foot boxes with wooden riffles.

There is practically no running water in the creek, so mining is carried on by storing water caught in side hill rain ditches in a reservoir. About one to four splashes of 1/2 hour duration are thus obtained in 10 hours. The large rocks are piled to one side, sometimes by means of a derrick, and the remaining sediment shovelled into the boxes. The ground runs approximately about $3.30 a cubic yard. Besides himself, one man is employed.

KOYANA CREEK K+ 53-46

This creek is slightly smaller than Daniels Creek and flows from Airplane Mountain, a little east of south to Norton Sound. The bedrock is about 11 feet deep and is composed of schist. About 3/4 mile upstream from the mouth of the creek the schist contacts with limestone which from there on composes the bedrock. The schist also contacts the limestone on the left limit of the creek about 500 feet west from its mouth. The gravel of Koyana Creek is rather fine but contains many small schist and limestone boulders up to 2 feet in diameter.

Brede Hanson owns the T and H Association (40 acres) on the lower end of Koyana Creek. He started operations in 1911, but has worked only intermittently. No mining was done in 1931. An area 20 feet by 250 feet has been mined out. He has not been able to mine to bedrock because of lack of grade. Water is obtained from West Twin Creek. A canvas hose and hand-nozzle were used with the water under a 20-foot head. The ground will run, in a very rough approximation, about 80 cents a cubic yard.

About 1/4 mile east of Koyana Creek, A. A. Chittick is ground-sluicing into the high bluff rising from the beach. The water is obtained by a ditch from East and West Twin Creeks. The amount of water is not sufficient to remove the slabby slide rock and clay. He

therefore shovels the material from the face into a wheelbarrow and dumps it into a flume emptying into the sea. He has incised his cut into the bluff about 50 feet. He is not in pay so produced no gold in 1931.

Alongside of and west of the present cut, Chittick in 1926 ran an adit (discovery adit) about 10 feet in elevation above sea level, 120 feet long. This adit is on schist bedrock and apparently struck an old beach line. The paystreak was about 1-1/2 feet thick and thinned out rapidly towards the present beach. Chittick claims it went about $14.50 a cubic yard. The gold is a very fine beach gold said to be worth $17 an ounce. At the back end of the adit the bedrock rose rather abruptly into smoothly rounded knobs and humps, but no actual sea cliff was seen. The actual beach deposit is about 15 feet deep. The deposit itself looks like sea bottom rather than a beach deposit. It is possible that the actual beach line may be at 25 feet higher elevation than the present level of the adit, thereby corresponding with the raised beachline on Daniels Creek. Only more extensive prospecting or continuation of Chittick's cut will reveal the actual location.

A little over 50 feet west of discovery adit, Lomen Bros. ran an adit into the bluff 110 feet long. From the end of this adit, a drift 50 feet long was run to the west almost connecting wtih discovery adit. About 300 feet to the east of discovery adit, an adit 120 feet long was run into the bluff, and also about 100 feet to the west of discovery adit, another adit 120 feet long was run into the bluff. The old beach deposit seems to be cut away by the indentation made in the coastline by Koyana Creek about 500 feet east of the mouth of that creek, Also at Twin Creek, the old beach deposit is cut away about 500 feet west of the mouth of the creek.

TWIN OR TRILBY CREEK

This creek is two small creeks or gulches, East and West Twin, which united about 500 feet from and flow south into Norton Bay. The creek is situated about 1/2 mile east of Koyana Creek. No pay has been found on this creek. A shaft 38 feet deep was sunk on West Twin without reaching bedrock. The shaft was entirely in a creek deposit.

PRODUCTION

It is probably almost impossible to get correct figures for the total production of the Bluff Area. A rough estimate would be around $1,500,000. Eldorado Creek has produced around $100,000, which has fallen to McGrath's production in 1931 of about $100. Daniels Creek has produced well over a million dollars. Swede Creek has produced about $25,000 of which amount about $1000 belongs to 1931. Koyana Creek has produced about $900 from Brede Hanson's workings. Chittick on the old beach line has produced about 150 ounces or roughly $2550. What the other past operators in the district took out, the writer has no way of ascertaining.

FUTURE PLACER DEVELOPMENTS

All future placer developments in the Bluff Area must necessarily be on a small scale. There are no dredging or large scale mining operations possible in the district. ~~possible~~. However, more extensive prospecting may reveal old channels and beach lines not suspected by past operators. If these are found, judging by similar finds in the past, they should yield excellent returns. However, in the writer's opinion, the surest future for the Bluff Area lies in lode mining, which will be dealt with in another section of this report. The

district needs more detail mapping and a more thorough examination which the lateness of the season did not allow the writer to make in 1931.

NORTH END OF TOPKOP CHIEF MINES COMPANY PIT ON DANIELS CREEK. KT 53-35

END OF HAUL IN TOPKOK CHIEF MINES COMPANY PIT ON DANIELS CREEK. KT 53-35

KX53-46

CHITTICK'S OPEN CUT
EAST OF KOYANA CREEK.

KX 53-44

UPPER END OF TUCKER'S OPEN
CUT ON SWEDE CREEK.

LODE MINES AND PROSPECTS

GOLD

Six different quartz lode prospects were reported in the Bluff area by S. H. Cathcart in U.S.G.S. Bulletin 722, pagees 187 and 188. Of these, four were visited by the writer. K-53-49

The first was the Hill Lode which is situated in the bluff on the west or left limit side of Koyana Creek and is claimed by Brede Hanson. The shaft and adit had caved so badly that they could not be entered. According to Cathcart: "The property was last worked in 1910. Material on the dump of the shaft is quartz-mica schist and quartz vein material, apparently of the later-vein type." Nothing was seen of the Lylles adit in the west side of Koyana Creek. It seems to have been forgotten by the miners of the district as no mention was made of it. Because of the lack of time the Bunker Hill Lode at the head of Lost Creek was not visited as the old workings were caved and no new development work had been done.

The three other quartz lode prospects are situated on the left limit or ~~west~~ East side of Daniels Creek and consist of three strata or bands of mineralized schist interbedded with limestone. The relation of these schist bands to the limestone and their mineralized character has been discussed previously in this report. These bands are named respectively from west to east, the Sea Gull lode, Idaho lode and Eskimo lode. K-53-45 The lodes outcrop in the sea cliff east of Daniels Creek. The foot of the outcrop on the Sea Gull lode is about 990 feet east of the mouth of the creek, on the Idaho lode about 1185 feet east and on the Eskimo lode about 1980 feet east. The strikes of the lodes are practically parallel and are about N.35°40°E . The dips are all to the west. In the sea cliff, the outcrop of the Sea Gull lode is

about 10 feet wide and dips about 30°W. At the top of the sea cliff the outcrop of the Idaho lode is about 20 feet wide and dips about 35°W. The base of Eskimo lode, because of encroachment by the sea, was not approachable. However Cathcart on page 192 of Bulletin 722, states that: "The Eskimo lode, the most easterly of the three schist zones, is about 150 feet wide. It dips about 70°W. and occurs in fault contact with both footwall and hanging wall." The lower part of the Idaho lode is rotated over and dragged out on itself as shown on the sketched section along the sea coast in the map accompanying this report.

Cathcart states that both walls of the Eskimo lode are in fault contact with the limestone. Both walls of the upper part of the Idaho lode are in fault contact with the limestone but the rotated lower part of the lode seems to follow the bedding planes of the limestone and be conformable with it. The hanging wall side of the Sea Gull lode is in fault contact with the limestone. Because of the slough from the top of the cliff it was impossible to see whether or not the footwall side of the Sea Gull lode was in fault contact, but it is thought that such is probably the case. All these faults seem to be reverse faults. The drags appear to be on the west sides of the faults and down on the east sides.

The face of the sea cliff shows many faults besides those along the walls of the three lodes. Most of these faults are minor, many turning off into bedding planes. However there are a few large faults and as these may have a relationship to the present locus of the lodes they will be described in more detail. Firstly, the escarpment on the east or left limit side of Daniels Creek most likely is a fault.

However this was so obscured at its seaward end that its true nature could not be observed. Secondly, about 600 feet east of the mouth of Daniels Creek is a well-defined fault, dipping about 30°W. The drag on this fault appears to be down on the west and up on the east, or in other words, it is a normal fault. Thirdly, about 810 feet east of the mouth of Daniels Creek are 2 well-defined faults which apparently meet at the base of the sea cliff. The dip of the first is about 65°W. and of the second about 45°W. The first appears to be a reverse fault and the second a normal fault - a triangular shaped block seeming to have slipped down between to other blocks of limestone. Fourthly, about 1775 feet from the mouth of Daniels Creek is a well-defined fault which dips about 70°W. This is also apparently a reverse fault. East of the Eskimo lode is another fault. Because of encroachment by the sea, this fault could only be seen from a distance. From Cathcart's description and figure, it is a normal fault dipping (from scaling) at about 55°W.

To the east of the second fault (calling the fault on the left limit of Daniels Creek the first fault), the country rock is a grey limestone. To the west of the same fault as far as the Eskimo lode, the country rock is a dark blue limestone. From thence to the sixth or last fault described east of the Eskimo lode, the country rock is a bluish grey limestone.

A closer examination of the third and fourth (or double) fault as shown in the section reveals a possible method by which the different lodes assumed their present attitudes. Thus in the Idaho lode it is assumed that another fault plane, since eroded away, intersected and cut off the fault-plane of the footwall of the lode. Then if the block of limestone to the east of both fault-planes was pushed up along the schist lode, and at the same time rotated counter-clockwise a little

over 90°, the same relationship of limestone and schist would arise as appears on the cliff face. At the same time the rotation would cause the drag to appear as a normal fault.

The same or similar movements can be hypothecated to explain the relationsips of the limestone blocks and the lodes at the other faults, except that of the eastern-most (or sixth fault) shown,where, according to Cathcart, there is a simple normal fault. Otherwise along the sea cliff so far as seen, there seems to be a series of block faulting, each block separated by faults intersecting at acute angles and more or less rotated.

On No. 4 Daniels Creek Placer, there is a sharp drop of about 15 feet in the bedrock just below where the Sea Gull lode crosses the creek. At this place the Sea Gull lode appears to have a dip of about 15°W. This sharp drop continues on across the right limit bench where it is about 20 feet high. It is thought that this drop may represent a northwest-southeast fault.

About 6 feet in elevation above the beach an adit has been driven in the sea cliff face on the Idaho lode. A short distance from the portal, this adit was so badly caved it could not be entered. About 4000 feet from the beach a work shaft has been sunk a little over 100 feet deep on the Idaho lode. Considerable mining was carried on from this shaft in years past. At present the hoisting aparatus at the shaft is dismantled and the small Cover rodmill nearby in disuse. No active mining has been done on the lodes during the last 5 years. All present information on the lode at this point is that obtained by Cathcart. On pages 194, 195 and 196, U.S.G.S. Bulletin 722, Cathcart days: "Work was being done--------on the Idaho lode about 4,000 feet

from the beach. This was the only working acdessible. A 90-foot shaft has been sunk on a quartz vein, and about 220 feet of drifts have been run along its strike. The vein is almost vertical. Where opened at the surface it was 8 inches wide, but on the 80-foot level it has a width of 7 feet. As exposed the vein shows three distinct types---an iron-stained shattered quartz, a green phase, and a softer hematitic phase. Where the three types are present, the quartz almost always forms the central part of the vein. The other types are less uniformly disposed. The hematitic material tends to localize along the walls, but in places it is confined to one wall. The green rock occurs between the hematite and the quartz or, if the hematite is absent, next to the wall. In several places it was observed extending into the quartz, and in one place it is surrounded by quartz."

"The quartz of the vein is white and opaque and shows columnar crystals oriented transverse to the vein. Openings showing well-terminated crystals are common. The veins are of the later-vein type. They are badly shattered, and in the fractures a green chloritic material commonly occurs. The green rock of the vein is composed chiefly of the chloritic material, in which occurs considerable of the vein quartz and fresh sulphides, chiefly arsenopyrite and some pyrite. In thin section the chloritic substance is pale yellow, is highly birefringent, and occurs as minute flakes in aggregate structure. In hand specimen the rock is deep green to yellowish green, hard, and usually cellular. The hematitic material is badly decomposed quartz schist. It is soft and crumbles in the hand. The unaltered wall rock is a silvery gray quartz-mica schist in which quartz is the chief constituent. The vein quartz is prominent even in small specimens of the

schist. Viewed as a whole the wall rock is schistose; in detail it is essentially quartz. Next to the veins it breaks down readily and is of buff color."

"The vein is continuous so far as followed but is not constant in width and shows still greater variation in make-up. In some places the quartz rock predominates, in others the green rock, and near the surface the red oxidized material of the vein. The red rock is favored by the operators, because of its high gold content and also because it is free milling. The buff schist is said to carry some gold but is not considered good pay. A certain amount of it is mined with the vein material and is milled as a part of the run of mine ore, which is said to have a value of $5 to $6 a ton, All the veins encountered in the prospect shafts are said to have been of this general type, varying in width and in proportion of the materials. The green rock occurs on the Sea Gull and probably on the Eskimo lode. Near the surface some of the veins are composed almost entirely of red oxidized material."

"Prospecting has been confined to the oxidized zone of the lodes. The sulphide material was nowhere seen exposed, and its relations could not be determined. In specimens the relations are further obscured by the great amount of chloritic material associated with the sulphides. This chloritic substance is an infiltration product and is clearly later than the sulphide and quartz. The freshest of the quartz is cut by microscopic veinlets of this material, areas of unaltered arsenopyrite are surrounded by it, and shattered crystals are seamed with it. From the nature of the decomposed vein material and from similar occurrences elsewhere on Seward Peninsula, the sulphides are judged to be later than the quartz veins, having impregnated the schist of the vein walls and filled fractures in the quartz. The decomposed hematitic material, which is undoubtedly schist that has been

impregnated by sulphides and weathered, mills free gold, but some gold is not recovered on the plates, and the gold content is probably in part base. Gold also occurs in the quartz of the open-structured veins, so that more than one period of gold mineralization may be represented."

"In local usage the terms "hard ore" and "soft ore" are applied to the quartz-vein material and the schist country rock, respectively. Both the hard and soft ore are reported to carry gold, but the hard ore is said to be of higher grade than the soft. This relation does not necessarily mean that the schist and the quartz were mineralized individually, for the quartz solutions have so squeezed through the schist mass that the smallest openings have been filled, and many of the veinlets are so minute and occur in such an attitude that they would impart little of their hardness or resistance to the schist mass as a whole. The quartz may still remain the gold carrier, and thus the gold content of the soft ore or schist may be due to its contained metallized quartz veinlets. The larger veins have probably been considerably enriched by the later sulphide mineralization."----------

"Concentrates from Daniels Creek show scheelite and cinnabar, but neither of these minerals was observed to occur in the mill concentrates. The source of the scheelite is not definitely known, although it is probably present as a minor consituent of the quartz veins. Veins of this type carry scheelite in the Nome region. The cinnabar is said to have been found in place in the Eskimo lode associated with the schist. The working in which this was discovered is now caved, and the occurrence was not seen by the writer. Cinnabar is also said to be present in small amounts in the Idaho and Sea Gull lodes, and mercury is sometimes liberated on heating the mill pulp. It is also known in the placers of Eldorado and Swede creeks but has not been traced to its source. The fact that little placer ground has been discovered on Daniels Creek above the point where the lode

system crosses its valley is further evidence that these lodes supplied the gold for the rich beach and creek placers."

Many other shafts, pits and open cuts are distrubted from the most northerly lode claims to the beach. All of these have now caved or sloughed in. At present only assessment work is being done by removing the overburden on the lodes near the edge of the sea cliff, by ground sluicing with water obtained from rain ditches.

In the writer's opinion these three lodes constitute the best lode prospects so far found on Seward Peninsula, although the extraordinary widths of 100, 200 and 200 feet respectively given by Cathcart is believed by the writer to be due to the flattening out of the dip. If the widths are only what they appear on the cliff face, still with depth, the tonnage available would be very large. With cheap water transportation and large tonnage, a mine should pay large returns even if the general average ~~tenure~~ tenor of the ore did not run over $5 a ton. Of course it would take considerable more development work and a fairly large expenditure of money before the 3 lodes could be shown to be worth a large investment. It is said that this would have been done years ago if some of the owners at that time had been reasonable in their demands.

KK 53-50

QUICKSILVER

As mentioned by Cathcart in U.S.G.S. Bulletin 722, page 196, cinnabar occurs in the concentrates of Eldorado, Daniels and Swede creeks. G. B. Richardson also mentions the occurence of cinnabar in Daniels Creek in a special publication in 1900 of the U.S.G.S. called "Reconnaissances in the Cape Nome and Norton Bay regions."

In 1923, cinnabar ore was found in place on the face of the sea cliff about 150 feet east of the mouth of Swede Creek. The property is owned by the Alaska Mercury Corporation. A complete

description of the surface outcrop and work done up to Sepbember, 1929, is given in the writer's "Report on the Status of the Coal and Lode Prospects of Seward Peninsula in the Summer of 1929," pages 2 and 3, and will not be again repeated here. However as a correction to the above, the writer is now of the opinion that the 6 to 12-inch seam of grayish talc may be dickite, a soft hot-water kaolin with a talc-like feel. During the writer's visit in 1931, the mouth of the incline was boarded up and the incline itself said to be too dangerous to enter. The following notes on the development work done were taken from data furnished by J. J. Keenan. In 1930, the incline was continued following the hanging wall of the ore body for 125 feet. The body of high-grade ore was lost 12 feet from the portal. From this place to 65 feet from the portal, the incline was in low-grade ore. At 65 feet, a small pocket containing 2 tons of high-grade (2 per cent) ore was found. Thence in 60 feet to the face, the incline was again in low-grade ore, said to average $2 to $3 a ton at the 1931 price of quicksilver.

The ore body seems to pitch north into the hill at an angle of 15° to 20° from the horizontal. The entire ore body or cinnabar lead most probably marks the site of former hot springs action.

At about 1200 feet from the mouth of Swede Creek, the cinnabar in the concentrates becomes very large and unworn. It is thought that somewhere near this place, the cinnabar lead crosses the creek.

In the writer's opinion development work has shown this body or lead of cinnabar to be too small to justify the large expenditure of money which would be needed in trying to prospect it. It is not thought that there is much possibility of a quicksilver mine being developed at this place, especially at the present price of that metal.

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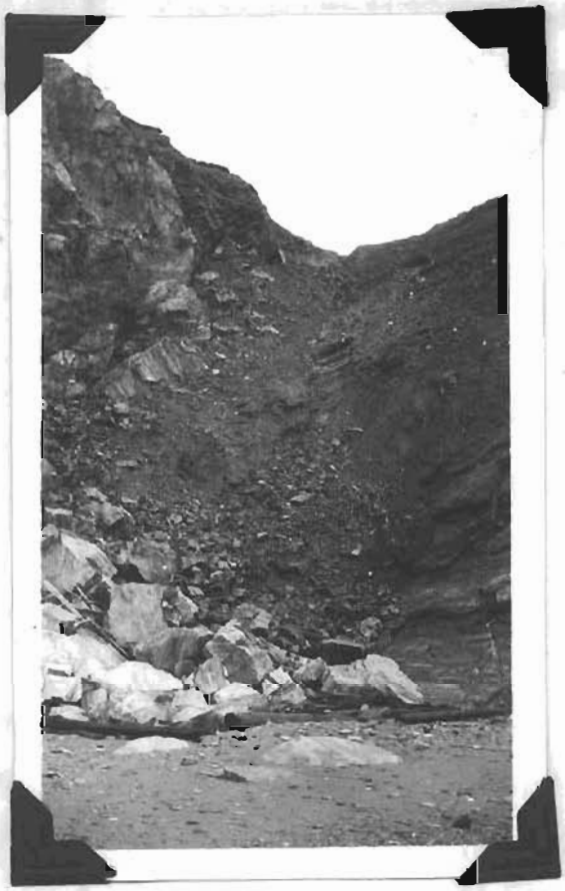
Associate Territorial Mining Engineer

Portal to incline on quicksilver prospect, Swede Creek.

Seacliff from near mouth of Daniels Creek, also showing part of elevated dump and sluice boxes for cableway excavator.

Idaho lode from beach showing portal of adit. K4 53-45

Showing Idaho lode crumpled and overturned east of portal. K4 53-45



Sea Gull lode from beach

Kt 53-45

Eskimo lode from top of cliff.

Kt 53-45