2434 2435 2436
2437 2438 2439
2442 2443 2445
2446 2447

Form 504

U. S. COAST AND GEODETIC SURVEY

DEPARTMENT OF COMMERCE

DESCRIPTIVE REPORT

Type of Survey Topo. T 2434-2436, 2436 2437, 2438 2439

Field No. Hydro Office No. 2442-2443, 2444-2445-2446, H 2447

LOCALITY

State Alaska

General locality Yukon

Locality River

1899

194

CHIEF OF PARTY

G R Putnam

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DATE

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H. 2442 - H 2443 - H 2444 - H 2445 - H 2446 H 2447

2442

D. & G. Cht. No. 9370

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

H. S. Pritchett
Superintendent.

State: Alaska

DESCRIPTIVE REPORT.

Hyd C *Sheet No* 2442

LOCALITY:

Kwikluwak Pass and
Yukon River
Sec

Topo 2434

1899
~~190~~

CHIEF OF PARTY:

G. P. Putnam

2442

2443

Diag. Cht. No. 9370

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

H S Pritchett
Superintendent.

State: Alaska

DESCRIPTIVE REPORT.

Hyd° *Sheet No* 2443

LOCALITY:

Kwikkowak Pass and
Yukon River
See
Topo 2434

~~1899~~
~~190~~

CHIEF OF PARTY:

G R Putnam

2443

2444

Diag. Cht. No. 9370

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

H S Pritchett
Superintendent.

State: Alaska

DESCRIPTIVE REPORT.

Hyd C *Sheet No* 2444

LOCALITY:

Kwikluwak Pass and
Yukon River
See
Top C 2434

1899
~~190~~

CHIEF OF PARTY:

G P Putnam

2444

2445

Diag. Cht. No. 9370

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

H. S. Pritchett
Superintendent.

State: Alaska

DESCRIPTIVE REPORT.

Hyd C *Sheet No.* 2445

LOCALITY:

Kwikluwak Pass and
Yukon River
See

Type 2434

~~1899~~
~~190~~

CHIEF OF PARTY:

G R Putnam

2445
2445

2446

Diag. Cht. No 9370

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

H.S. Pritchett
Superintendent.

State: Alaska

DESCRIPTIVE REPORT.

Hyd^c *Sheet No:* 2446

LOCALITY:

Kwikluwak Pass
and Yukon River
See
Top^c 2434

1899
~~190~~

CHIEF OF PARTY:

G R Putnam

2446

2447

Diag. Cht. No. 9370

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

H S Pritchett
Superintendent.

State: Alaska

DESCRIPTIVE REPORT.

Hyd^c *Sheet No.* 2447

LOCALITY:

Kwikluwak Pass
and Yukon River
See
Top^c 2434

~~1899~~
~~190~~

CHIEF OF PARTY:

G R Putnam

2447

File under

2434—2439

2442—2447

U. S. COAST AND GEODETIC SURVEY.

Henry S. Pritchett, Superintendent.

State: Alaska

DESCRIPTIVE REPORT.

Topo. & Hydc. Sheet No. 2434-39 2442-47

LOCALITY:

Kwichlowak Pass and Yukon River

1899.

CHIEF OF PARTY:

G. R. Putnam

JUL - 1 1902 C 9300

Yukon River and Kwiklowak Pass Alaska

Descriptive report to accompany the following sheets:-

Title	Number of Topographic sheet	Hydrographic sheet
Kwiklowak Pass; The mouth to Utakakit	2434	2442
Kwiklowak Pass; Utakakit to Kwikpak Pass	2435	2443
Yukon River; Head of the Delta	2436	2444
Yukon River; Tunuroksak to Ingikchum Slough	2437	2445
Yukon River; Ingikchum Slough to Tukamiut	2438	2446
Yukon River; Tukamiut to Andreafski River	2439	2447

General description. These sheets comprise the results of the surveys of 1899 from the Kwiklowak mouth up that Pass and the Yukon River to near Andreafski, a distance of 87 statute miles (triangulated). A summary of the method of survey will be found at the end of this report.

The Kwiklowak Pass is much the largest outlet of the Yukon, carrying over 75% of the water of the river, and does not differ materially in its characteristics from the river above. It is 45 statute miles from the Kwiklowak mouth up to where the Kwikpak Pass branches off, which we have taken as the Head of the Delta, and above this point have designated the main stream as the Yukon; it is credibly reported however that a small outlet, the Kachunuk, leaves the Yukon some distance above Andreafski.

The Kwiklowak Pass flows through an alluvial country with apparently no land near its banks not subject to overflow, as evidenced by the debris (drift logs, etc) found lodged on its banks. The banks on the channel side are on an average 8 to 15 feet above the water (late summer stage). These banks are almost perpendicular and rapidly cutting. At the Kwiklokchun Astronomical Station

the bank had cut away over 40 feet in one year (1898 to 1899). On the opposite side the shore was usually low and sandy, though sometimes both banks are abrupt and cutting with middle ground between. The banks are in general covered with a heavy growth of alder and willow bushes growing to the edge, and from 12 to 20 feet in height. Back from the river the bushes are less dense, with more open marsh. No bushes are found on the outer coast, and even near the coast they are confined to the neighborhood of the river banks. Scattered clumps of cottonwood trees are first seen on the banks of the Kwikluak near the entrance to the Aproka, and from here up they are increasingly mingled with the bushes. Land could be seen on the Kwemeluk and Akularak sloughs which was clearly above overflow.

Above the head of the delta and opposite the upper end of Tunyrokpak the open tundra country comes down to the river, on the east side, with banks probably 20 to 30 feet above the water, and not subject to overflow. The first high land is Ingrikchoa Hill on the west side (but not on the main channel) and Azacharak Hill on the east side, close to whose base the river flows. From the Andreafski River to Azacharak the river flows along the foot of the hills on the north east side, with the low delta country to the southward as far as one can see.

Except on sand bars and mud flats, frozen ground will ordinarily be found about 1/2 foot below the surface throughout the summer in all this region.

No rocks or gravel are found except at and above Azacharak Hill. The bars are in varying proportions of fine sand and mud, the latter bluish and sticky. The sediment carried by the river during the latter part of the summer is very fine and whitish in color - it is not excessive in amount. The main channels are entirely free from snags, although enormous quantities of drift wood are lodged along the river banks.

There are no white inhabitants along this stretch of river below Andreafski, except one or two men temporarily at the Catholic Mission fishing station near the Ittakahk. There are numerous Eskimos living at the Kwikluwak mouth, and a considerable number on the stretch below Andreafski, but very few on the remaining intervals of this part of the river and pass.

The Kwikluwak Pass is not used by steamboats. Two light draft boats entered this pass from Bering Sea in 1898, but none during 1899 so far as known. Besides the survey steamer "Yukon" only one steamboat is known to have been in its waters in 1899, a small boat belonging to the Catholic Mission. Above the head of the Delta the Yukon River is used by a large steamboat trade, running between St. Michael and upper river points, via the Kwikpak and Apoon Passes. There is practically no commerce in the south part of the delta except among the Eskimos in their umiaks or skin boats, and an occasional trip of a white or half-breed trader in a sailing boat.

On the track of the river steamboats the Eskimos maintain wood camps at intervals of a few miles; they cut and pile the best of the drift wood they find along the banks, and sell to the boats at rather exorbitant rates. It was said in 1899 that the amount cut along the river was far in excess of the present demand.

Navigation is simple throughout this stretch except at the head of the Delta, where the river is wide with numerous shoals. With a fair chart no difficulty would be found in taking a boat along this part of the river without a pilot. Pilots are necessary however in going through the Kwikpak and Apoon passes. There are no aids to navigation above the Apoon mouth.

From the Kwikluwak mouth to Andreafski there is a good channel with minimum depth of 20 feet (at the head of the Delta). The maximum depth obtained was 84 feet, and the greatest width of open water 2.2 miles.

Tidal observations were made at the following points:

Avogon (self-registering gauge) at Kwiklowak mouth,	lat.	62° 36' 55"	long. 164° 50' 52"
Kwegnuk	"	62 44 54	" 164 29 34
Ltakaht	"	62 42 58	" 164 16 23
"Maid" S^m sta.	"	62 39 11	" 164 05 18
"Bright" S^m sta.	"	62 10 58	" 163 58 06

At the last named station (62 st. miles from the Kwiklowak mouth) the mean range of tide was 0.4 foot. The soundings were corrected for tide only on the two lower hydrographic sheets (Nos. 2434 and 2435).

The flood tide does not overcome the river current so as to change its direction above the mouth of the Kwemeluk, really well outside the Kwiklowak mouth. 14 current observations were made throughout this stretch, indicating an average current in the channel of somewhat over one knot per hour; the maximum observed was off Azacharak Hill, 2.2 knots per hour.

At the latter point, 73 st. miles from the Kwiklowak mouth, observations were made to determine the discharge of the Yukon. At this point the river is confined in one stream. A cross section was sounded and surface current observations made at five places on this section. The area was 160 000 sq. feet, and the discharge was computed to be 436 000 cubic feet per second on Sept. 8, 1899. This was at the low summer stage about 12 feet below the flood high water line as indicated by the gravel beach on the north shore and the debris on the banks on the south shore. It is believed however that the river discharge is much less during the winter months, so that the above may not be far from the average for the year. A comparison of cross sections of the Kwikpak and Kwiklowak passes just below the separation indicates that the latter carries over 75% of the waters of the river. The branch of the former that is used by the steamers, the Apoon, carries apparently less than 1% of the total discharge of the Yukon; the Kawanak about 14% and the Okwega about 3%. (For diagrams of cross sections see season's report to Superintendent, Apr. 30, 1900)

Only on a few occasions was fog seen on the lower river during the summer of 1899. Gales and mists are common however, even during the summer months. A strong wind blowing against the current will sometimes raise a considerable chop sea. The strongest winds in summer are from N.E, E. and S.E.

The stage of water was very steady during the summer of 1899 as far as could be judged. It is reported that there is generally a great rise and flood after the break up of the ice the latter part of May. It is probable that the ice action cleans out the river channels, and that great quantities of sediment are carried out by the floods.

The Eskimo names for streams and localities were ascertained and are placed on the sheets. As the region is settled only by Eskimos these are the names that are of use to a stranger in identifying localities. The name Kwiklowak adopted for the main outlet of the Yukon, is both that used by the native population of the delta, and that which appeared on the Russian Admiralty Chart of 1852.

Where elevations are given they are above mean sea level. The elevations were first determined from the river water level, and this was estimated to slope 0.1 foot per mile from the mouth up. This would give the following elevations for the river surface on the upper topographic sheets; No. 2437 6 feet, No. 2438 8 feet, No. 2439 9 feet. 100 ft. contours are drawn on the upper sheets.

Numerous photographs were taken illustrating the topography, scenery, inhabitants, and the survey work; see list transmitted May 16, 1900. A considerable number were taken with photo-topographic camera at the upper triangulation stations.

The projections are based on the St. Michael astronomical position carried through Assistant Faris' triangulation. The field results were used in the projections; to make them accord with the final office values, all latitudes must be increased 0."18 (or parallels moved south 5.5 metres) and all longitudes must be diminished 0."56 (or meridians moved west 8.0 metres). This is a uniform correction to be applied to the projection of all

the Yukon River and Delta work of 1899. The projections of work of party of Assistant Pratt in 1898, were made on different data, and a correction must be applied to join these to 1899 sheets.

On the following pages notes are given descriptive of the separate sheet.

Kwiklowak Paso; The mouth to Ttakakht (sheets topg. 2434, hygd. 2442)

This is an open stretch of river averaging about one mile in width, and without islands or bare bars near channel. The Kwegyk and Alakanuk sloughs make off to the west and have separate outlets into Bering Sea. (See topographic sheets 2432, 2440, 2441). The only native villages are at the entrances to these two sloughs, each having about half a dozen huts. At the Alakanuk there is a log house built by a white trader, Bill Moore. It is now occupied by Eskimos.

Kwiklowak Paso; Ttakakht to Kwikpak Paso (sheets topg. 2435, hygd. 2443)

A more complicated stretch of river, with sharp bend at its lower end; open water 3200 metres wide at this bend. There is a deceptive shoal in middle of river just below this bend and opposite "Pointer" Δ^{m} sta.; there is an extensive middle ground in the Paso above the Aproka, and above this the channel crosses rather sharply from the west to the east side.

The Ttakakht slough (2.5 miles long) is a cut off for the bend, but saves little in distance. It is narrow and somewhat crooked in places, and has minimum depth in channel of 5 feet. There is good water at both its ends.

Bugonowick slough makes off to the northward and has a separate outlet to the sea; it is not known to be navigable (see topg. sheets 2432, 2441); is quite small.

The Aproka is a cut off flowing across the delta from the Kwiklowak to the Kwikpak Paso; it is about 8 st. miles long, and saves about 3¼ miles in going between the lower portions of these Passes. Its entrance from the Kwiklowak is behind a large sand island behind which the waters flows in an opposite direction to that in the river. The entrance at the west end of this island appeared in 1899 to be shoaling up, and that across its center to be cutting deeper. About five feet could be taken through the latter at high tide

The Aproka is navigable for small river steamboats.
The Aproka is deep, narrow, and has several sharp turns; there is good water where it joins the Kwikpak.

The Akularak leaves the river on the south side just above the bend, and is a small slough which joining with others forms the Kwemeluk. The Catholics have two wooden houses, (formerly used as a mission) on the lower Akularak, where there is high rolling land. They state that they can navigate this slough with their little river steamers. The C.&G.S. launch "Alpha" drawing about 3 feet, was unable to ascend from the Kwemeluk into the Akularak in 1899.

The Akoggak is a small slough joining the Akularak, and the Takwaklamuk and Kaningolapak on the other side of the river, are reported to find their way into the Kwikpak Pass.

For the upper part of this sheet there are only open bars sparsely covered with grass between the two passes.

The only inhabitants are at the two Eskimo villages at the bend, one Eskimo hut in the Eltakalk, and those (usually 1 or 2 white men) temporarily at the Catholic Mission, summer fishing station, which in 1899 was located on the west side of the bend.

Yukon River; Head of the Delta (sheets topog. 2436, hydrog. 2444).

This is a very complicated and wide stretch of the river. The Head of the Delta has been taken at the forking of the Kwiklowak and Kwikpak Passes at the small island on which is located "Fork" △M signal. The large Tunuksak slough leaves the Yukon River 8 miles above this and flows back into the Kwiklowak Pass about 3 miles below. The Tunuksak is free from islands and comparatively straight, and averages a half mile in width. It carries a large volume of water, perhaps as much as the main river.

Through this stretch the entire river between extreme banks varies from 3800 metres to 4800 metres in width.

The Yukon proper however is very narrow just below "Narrow" △ sta., being only 470 metres wide.

There are three channels from the Yukon into the Kwikluwak, one on each side and one in the middle; the latter has the best water with 20 feet, this being the shoalest place in the channel up from the Kwikluwak mouth. Between the channels there are numerous bars showing bare at low tide, at this stage of the river. The channel running close along the Kwikpak side heads near "Great" △ sta., and there is no crossing above. Apparently the best crossing from the Yukon into the Kwikpak is about ⅓ mile below "Great", and has about 11 ft. of water.

About 12 ft. is the best that can be carried into Tunnuksepak slough at its head, but below this it has a much deeper channel throughout its length. The remarkable narrow ridge separating the lower end of the Tunnuksepak from the main river, is being rapidly cut away on both sides.

Ingikchuun slough comes into the Tunnuksepak from the south. This leaves the Yukon some distance up, and is said to have a branch coming from the base of Ingikchon hill.

The tundra country begins on the east side between "Steep" and "Ice" triangulation stations. This is higher than the delta region, and apparently stretches back to the hills. Ice was frequently seen under the crests of these tundra banks in August.

The only inhabitants were at an Eskimo camp at "Ford" △ station, where was one hut.

Yukon River; Tunnuksepak to Ingikchuun slough (sheets top. 2437, hyd. 2445)

This is a comparatively straight stretch of river, with deep channel (mostly over 40 feet) throughout length of sheet. There are numerous sand bars and islands, and a large branch slough on the east side. The tundra country ends at "Well" △ sta., two miles below the Anuk River, which is said to flow from the hills. Ingikchuun slough leaves the river

on the west side. Ingikchoa Hill (625 ft. high) is west of "Bright" Δm sta. and is the first elevation near the river.

The only settlement is Arolokovik with one Eskimo hut.

Yukon River; Ingikchuun Slough to Tukamiut (sheets top. 2438, hydro. 2446)

This stretch comprises most of the great bend, the river changing its direction about 90°. There is a clear open channel the entire length of the sheet. Numerous sloughs are on the inside of the bend, of which Azacharuun slough is the largest; it would save little in distance however, and is not known to be navigable throughout. Beginning at Azacharak Hill (527 ft. elevation) the river runs close to the foot of the hills, which here make a sharp turn from East and West to North and South. The hills average 250 ft. high along North side. At Azacharak Hill the entire river is confined between banks 1510 metres apart, the bank being 12 feet above the water on the South shore.

Settlements are, Kazhutakamiut (winter village 2 huts), Mukialik (winter village 3 huts), Azacharak (8 huts), Tukamiut 5 huts (all Eskimo).

Yukon River; Tukamiut to Andreafski River (sheets top. 2439, hyd. 2447)

There is a clear open channel the entire length of sheet as far as sounded; apparently about six feet can be carried in the channel behind the islands past old Andreafski. The river flows close to the hills 200 ft. and over in elevation. The highest is Andreafski Mt., 660 ft. The north bank is a broad gravel beach and back of this bushes, and back of these the grass and moss covered hills. The south bank is alluvial with heavy bushes at the edge and back of these the delta marsh and lakes. The upper part of this topographic sheet was sketched from the views and angles obtained at "Finis" Δm sta.

. Settlements: Gobolunuk (6 huts), old Andreafski (2 huts, Russian cemetery), village above "Finn's" (5 huts), Petka's Point (3 houses), village near "Jay" (5 huts). The winter quarters of the Alaska Commercial Company (the present Andreafski) are up the Andreafski River, and were not reached by the survey.

Outline of methods of survey employed

Astronomical observations for latitude and time were made at Kwikhokchun and Avogon near the Kwikhowak mouth, and at Anuk, 58 miles up. Longitude of Kwikhokchun was computed from two voyages from St. Michael in 1899 and two in 1898. The St. Michael data brought down by the connected triangulation was finally adopted for all this work, so that these astronomical determinations at present serve only as a check.

The azimuth for the triangulation depends on that determined at Kwikhokchun in 1898, and on two observations on Polaris at Anuk in 1899. The discrepancy between these, carried through 73 figures, was 4" so small that no adjustment was considered necessary.

The lengths are controlled by four bases:

Name	Length metres	Discrepancy between two measurements	Distance between bases	Discrepancy between bases
Kwikhokchun (1898)	2310		28 st. miles	$\frac{1}{3500}$
Aproka	1603	$\frac{1}{100\,000}$	10 " "	$\frac{1}{3200}$
Kwikpak (Paris 1899)			31 " "	$\frac{1}{2600}$
Great Bend	2429	$\frac{1}{30\,000}$		

A simple length adjustment was made by distributing the discrepancy between each two bases, equally among the intervening figures.

The instruments used in the triangulation were an 8 in. Gambey and a 7 in. Buff & Berger, the latter having vertical circle. The observations were generally confined to a simple round of directions with telescope direct, and again with telescope reversed. There were 192 triangles, of which 170 were closed. The average closing error was 10" and the maximum 33". No figure adjustment was made beyond the closing of triangles.

At a number of points the triangulation stations were marked with rocks, bottles, etc., and on the hills at the upper end of the work four stations were carefully marked by

rocks, cairns, etc. All the other stations were marked by heavy wooden stubs driven in the ground, with a wire spike for station point. It is thought these will in general be recoverable as long as any station could be found in the delta country, subjected to the shifting and flooding of the river.

The topography up the Yukon and Tanana rivers was obtained with sextant, theodolite and sketch book. A continuous sketch was made of each side of the river, and on the opposite pages of the book were recorded sextant angles, which were taken at all prominent points and bends, usually three angles on neighboring triangulation signals; these were plotted with three arm protractor in the same manner as hydrographic positions. The accuracy of this method depends on the number of positions taken. In addition, with the theodolite at the triangulation stations tangents were taken to points, bends, islands and bars, and vertical and horizontal angles to hills and mountains. The topography is further controlled by the frequency of the triangulation stations, and by the hydrographic positions, often taken near the banks.

The hydrography was developed mostly by a system of traverse lines run with the steam launch under charge of Assistant Flowers. Some few longitudinal lines were run with the "Yukon"

The survey of the Tanana slough is controlled by a sextant triangulation, joining the regular triangulation at each end.

G. R. Putnam
Assistant.

May 25, 1900

NOTE:
PHOTOGRAPHS MISSING FROM
ORIGINAL DOCUMENT

Photographs illustrating KWIKLOWAK
Yukon River and Kwikowak Pass — PASS

(See complete descriptive list — LIST
on file in Library & Archives

LIBRARY & ARCHIVES

BACKS

Frames are written on backs of prints

Many additional photos in Archives. — ARCHIVES

MANY

ADDITIONAL

ON ORIGINAL
DOCUMENT