

FINAL
GEOLOGICAL REPORT
ON
"THE UPPER PEEL RIVER AREA"
YUKON TERRITORY, (Canada)
IMPERIAL OIL LTD., CANOL PROJECT

Assignment No. 23.

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YUKON TERRITORY, (Canada)

A B S T R A C T

The Upper Peel River area is located in northern Yukon on the Peel river plateau north of the Mackenzie Mountains, and was mapped by the writer with two assistants during the 1943 field season.

Cambrian, Ordovician and lower Silurian beds are composed of fine clastics reaching the tremendous thickness of 10,000 feet. Silurian and Middle Devonian limestones of 1500 feet thickness are absent in parts of the area due to pre-Upper Devonian erosion. Upper Devonian and Lower Cretaceous strata, both sandstones and shales, are separated by an erosional unconformity. Continental Tertiary beds occupy the basin of the Wind and Bonnet Plume rivers.

The main structure of the area is a broad overturned anticline which is axially linked with the Rat River anticline. Broad pronounced arching is present in the Upper Devonian outcrop area east of the Lower Canyon of the Peel River.

Manifestations of oil are common to the whole area and to much of the stratigraphic section. The strata outcropping between Calamites and Margery Creek, on the crest of a broad arch there, reveal petrolierous content almost everywhere.

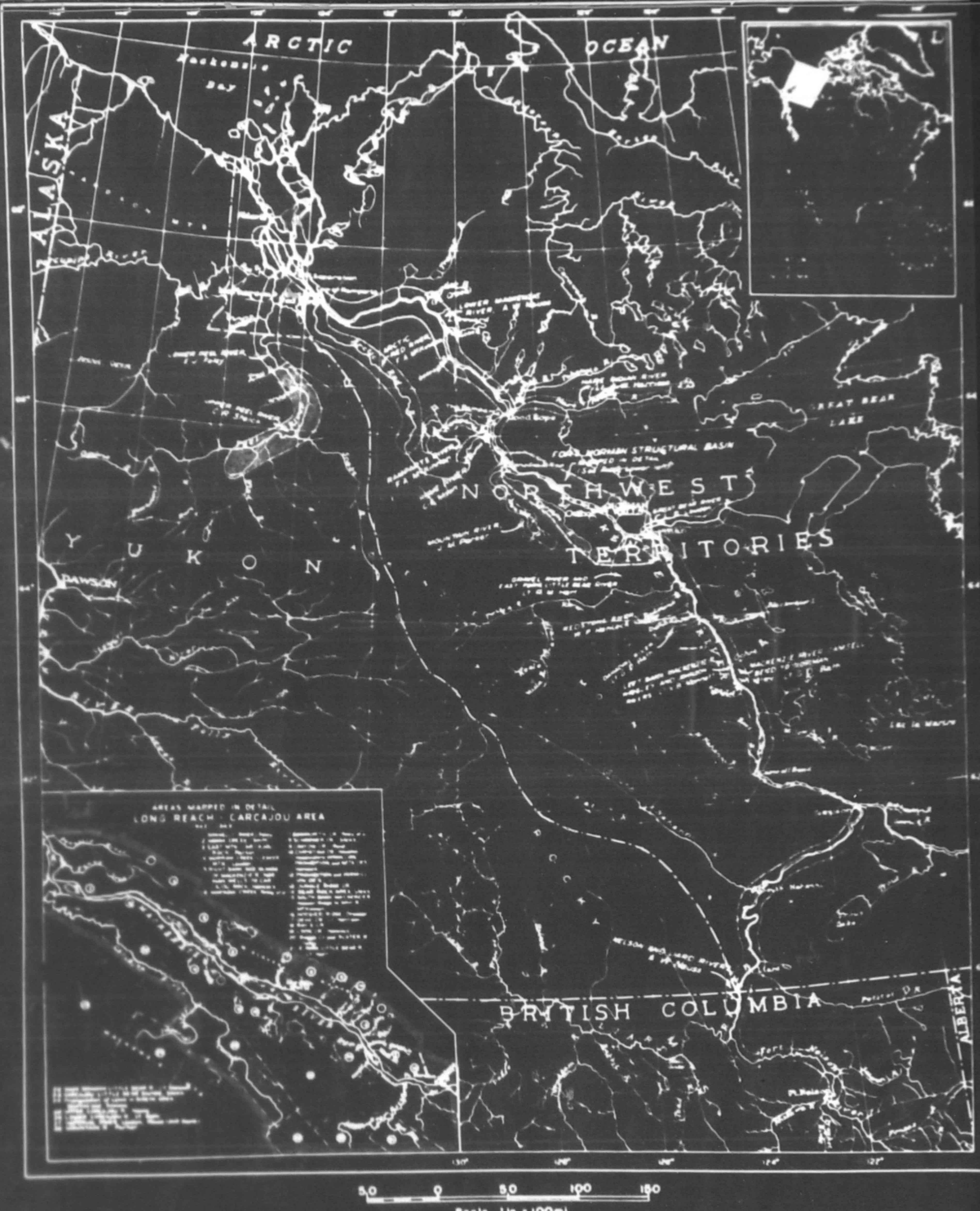
It is recommended that detailed mapping be carried out in the "Big Bend" area of the Peel River to detail the favorable structures found.

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INDEX MAP OF
NORTH WESTERN CANADA SHOWING
LOCATION OF UPPER PEEL RIVER AREA

Chapter I

INTRODUCTION

The Upper Peel River area of this report includes a belt of country running from Hungry Lake to Trail River along the major drainage. The work included oil-structure reconnaissance and stratigraphic examinations. The area was previously mapped in 1904 by C. Camsell, whose map provided a remarkably accurate base for the work.

Field Work

On August 8, 1943, Party 'B' consisting of C.R. Stelck, Geologist, Pte. E. Umbach and J.L. Carr, Assistants, left Norman Wells for Fort McPherson to work Assignment No. 23 (Upper Peel River). They accompanied E.J. Foley's party on the river boat "T.A. Link". On August 19, a small cache of supplies was flown into the mouth of the Snake River and on August 20, Party 'B' was flown into Hungry Lake by two pontoon planes piloted by George Matiche and R. Blackwood. The downstream trip was made in two sixteen foot canoes and stations were recorded entirely on aerial photographs. On September 19, Party 'B' rejoined Party 'F' on the "T.A. Link" at a rendezvous a few miles below Trail River. The party returned to Good Hope from whence they were flown back to Norman Wells.

The weather was wet and cold for the entire period and several days were lost by excess rain and fog. The abnormal rains raised the river to flood proportions exceeding the spring floods. This made travelling very difficult, and eliminated many of the river's edge rock exposures as well as making landings near outcrops extremely hazardous. No long side trips were made beyond a day's walk, and the party worked as one unit. The shortening of the days and the continual cloudiness did not permit of the longer working days that were enjoyed earlier in the season.

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Ganselli's map and report (Ref. 1) provided a base for working. Aerial photographs, U.S.A.A.F. 5 - 2643 - 5P - 3 - 362 RVL - 1 to 97 were used for detailed work.

Fossil suites 3790 to 3832 were collected on this trip.

Geographical position and Accessibility

The Upper Peel River area is in the Northern part of Yukon Territory, Canada, Lat. $65^{\circ} 30'$ N., Long. $135^{\circ} 50'$ W. to Lat. $66^{\circ} 40'$ N., Long. $134^{\circ} 40'$ W. It is 80 to 200 miles south of Fort McPherson and about 170 miles north east of Dawson City. It is approximately 170 miles east of the Alaska boundary and crossed by the Arctic circle. The area examined included about 250 miles of river and lies completely north of the Mackenzie Mountains.

There are no roads whatever in the area. Capt. Peterson has taken power boats up the Peel River and into the Canyon of the Wind River. At certain stages of water it is impossible to ascend past the whirlpools in the Lower Canyon of the Peel River. It is advisable to portage canoes around the Whirlpools coming downstream. Land on the south bank above the Whirlpool and the portage goes up over the cliff across the mouth of a small creek that flows into the south whirlpool. This portage is new and very steep and was constructed by the party.

Small pontoon planes can land on Hungry Lake but the lake is very shallow and rocky. It is suitable for ski planes in winter. Pontoon planes can land on the Peel River. There is a good stretch of water (although swift) just below the mouth of Snake River. Other large lakes on the uplands appear favorable for pontoon landings. Undoubtedly "cat roads" could be brought into the area on the uplands, but the canyons of the creeks and rivers would prove difficult to cross unless the roads were kept well back from the major drainage.

Culture and Vegetation

There was only one family living in the entire area, viz., that of Pierre Lexie at the mouth of Cariboc River. There is an abandoned trading post on the north shore of Hungry Lake. This area was formerly used by the Locheux Indians of McPherson and the Indians of Dawson City via the Hart River pass. The main fur attractions were Marten and Beaver, the latter still very plentiful. The first cabin noted downstream was an old one at the mouth of Margery Creek, but below the Snake River cabins were noted along the river bank at frequent intervals. Most of these cabins belong to P. Lexie, although they were built by various trappers. Trap lines are not registered in this area.

There is no sign of "Wind City" mentioned by Camsell at the mouth of the Wind River. It has completely rotted or been washed away. Two main trails run through the area. One trail runs from Mountain River to Trail River, to cut off the big bend and bad water of the Peel River. The other trail runs west from Hungry Lake to the Hart River pass. Lesser trap trails are ill defined and follow stream beds and game trails.

The region is covered with patches of scrub spruce and general tundra growth. The river valleys carry poplar in much greater profusion than found along the Mackenzie. This favors the establishment of beavers. Along the river flats and islands several good stands of tie timber occur with the odd tree of lumber size. Fires in the past have resulted in the destruction of much larger timber which has not yet been replaced by second growth. The valley sides are a mass of tangled alder and dogwood where not forested.

Previous and Pertinent Reports

In 1904 Camsell made the first geological survey of the Peel River (Ref. 1). E.J. Foley worked the lower section of the Peel river below

Trail River at the same time that the writer was working above Trail River. Simultaneously the Arctic Red River was being explored by F.A. McKinnon and new data were obtained on the extension of the Peel River plateau in that direction. The Preliminary report on the area by the writer is listed under the Canol number G.C. 43 41.

Acknowledgments

The writer is deeply indebted to his two assistants Pte. E. Umbach and J.L. Carr. Their essential cheerfulness and effective observations, no matter what the conditions, are responsible for the success of the expedition. The writer wishes to express his thanks to E.J. Foley and the crew of the "T.A. Link" for handling all business with regard to transportation to and from the area. Mr. Alec. Frame constructed the base maps for Sheet I and Sheet III as submitted in this report.

Chapter II

TOPOGRAPHY

The map sheets of the Upper Peel River area cover a portion of the gently dipping Cretaceous and Devonian basin of the lower Mackenzie, and a set of hills on the west side, representing the roots of old Tertiary Mountains which were eroded to a peneplain in pre-glacial times. The country is a dissected plain with rejuvenated drainage. The topography has been well discussed by Camsell (Ref. 1).

Drainage

All the drainage of this area is by tributaries of the Peel River which flows into the Mackenzie River delta below Fort McPherson. The Peel River flows through the entire set of map sheets and is joined by the Wind, Bonnet Plume, and Snake Rivers from the south, and the Mountain, Cariboo, and Trail Rivers from the north and west side. Numerous unnamed creeks enter the Peel River directly. George Creek, "Margery Creek" and "Calamites Creek" are tributaries of the Peel River and Hungry Creek is a tributary of the Wind River. The Wind and Peel Rivers are adequately described by Camsell (Ref. 1).

Hungry Creek joins the Wind River from the west at Mt. Deception. It drains a long west trending valley which may be an old pre-juvenation course of the Hart River. Hungry Creek flows out of Hungry Lake and meanders in its valley to gather the waters of several streams from the mountains to the south. The stream increases in gradient as it approaches the Wind River and finally spills over a wide delta to join the Wind River. The upper part of Hungry Creek is blocked at regular intervals by beaver dams but is suitable for canoe work.

Hungry Lake, Lat. $65^{\circ}30'$ N. Long. $135^{\circ}50'$ W. (Mr. Frame's map) is about six miles long and three quarters of a mile wide. Hungry Lake

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is retained in size primarily by beaver damming of the outlet. The original basin was blocked by a terminal moraine and the glacial boulders lie within two to three feet of the water surface all over the east half of the lake. This makes pontoon landings risky. No other major lakes of the area were visited but aerial reconnaissance shows large numbers of good sized lakes on the flat interstream areas.

Land Forms

The area involved in this report is part of the "Peel River Plateau". It is plateau type topography, but the highest elevation within the mapped area is around 2400 feet on Mount Deception. The area is an uplifted plain dissected by recent rejuvenation. On the plain are retained uplands belonging to an earlier period of planation. Total relief is around 2000 feet with a local relief never exceeding about 800 feet.

The overall drainage has a mature pattern physiographically speaking with the main drainage antecedent not only to the present topography but also to the previous level of the north south range of mountains. Subsidiary drainage is subsequent. The valleys are extremely juvenile with all creeks and rivers running in canyons or in steep-walled troughs. The small streams usually descend from the upland level by waterfalls in the lower stretches. Interstream areas are gently rolling and undissected.

There are two main sets of hills that run north and south across the Peel River, divided by the intermontane plain area of the basin of the Wind and Bonnet Plume Rivers. The western set of hills, lying west of the Wind River, form a series of dip slope erosional scarp mountains with a relief of 1000 feet. Mount Deception belongs to this group and runs north and south rather than east and west as shown on Camzell's early map. Here the west set of hills crosses the Peel River the latter has cut the "Upper Canyon". The hills north of Hungry Lake are arranged in north west

trending subparallel ridges of appalachian pattern. South of Hungry Lake the hills trend east and west to parallel the trend of the Mackenzie Mountain front.

East of the Bonnet Plume river a set of north-south trending hills cross the Peel River at the Lower Canyon to unite with the western group of hills north of the Bonnet Plume basin to form a southern extension of the Richardson Mountains.

South of the Peel River, at the headwaters of Margery Creek, is an easterly concave crescent-shaped ridge about ten miles long. East of this crescent-shaped ridge lie the Trevor Mountains. The Trevor Mountains are a set of low rounded hills forming an upland about 400 feet above the plateau level.

A small group of hills at Lat. $66^{\circ}17'$ N., Long. 135° W., between the headwaters of Cariboo and Trail Rivers, is probably the one Gansell (Ref. 1) indicates on his map as occurring between the two rivers much closer to the Peel River. No set of hills is present where they are indicated on his map there.

Local details on the topography along the Peel and Wind Rivers are given by Gansell (Ref. 1).

Physiography

The range of hills which lie west of the Wind River is carved from west dipping Paleozoic beds on the west flank of a huge overthrust anticline. The over-turned east limb forms the range of hills east of the Bonnet Plume River. The deeply eroded crest of this anticline has formed the basin of the Wind and Bonnet Plume Rivers. The junction of the east and west limbs of the anticline on a northerly plunge creates a single range, a southern extension of the Richardson range.

The long arcuate ridge at the head of Margery Creek is undoubtedly anticlinal in origin. The Trevor Mountains may be carved from the basal

Cretaceous on the east limb of the above anticline. North of Hungry Lake there is a large spoon shaped synclinal mountain not visited by the writer.

The Upper and Lower Canyons of the Peel are carved from steep-dipping early Paleozoic argillites and the Bonnet Plume - Wind River basin is underlain by soft Tertiary rocks. The Peel River plateau is underlain by gently dipping Cretaceous and Upper Devonian shales.

Glaciation has left long oblique northwest ridging on the hills east of the Bonnet Plume River. Glaciation undoubtedly scooped out part of the valley of Hungry Creek as Hungry Lake is blocked by Cordilleran terminal moraines and the valley is much wider than the present drainage warrants. Uplift after removal of the ice load is responsible for the present rejuvenated pattern of the drainage.

The banks of the Peel River below George Creek are subject to large scale slumping. This probably arises from an old system of terraces cut in the soft shales which slump separately, giving a composite effect of one large slump over a mile wide.

Geography

Most of the features are unnamed and the party felt it necessary to give names to some of the features.

"Margery Creek". A creek entering the Peel River from the south about $6\frac{1}{2}$ miles above the Snake river. This creek joins the Peel River on U.S.A.A.F. photo 5-26-43-5P 2 362V 33, and shows on the left oblique of this vertical. This creek has a definite restricted meander pattern within a valley about one quarter mile wide. The mouth of the stream is choked at present with boulders and log jams over a wide flood channel. There is a small cabin with dog hutches just south of the mouth of the creek and a dog team trail runs back to the first bend in the valley tributary.

"Calamites Creek". A creek entering the Peel River from the north-east about eight miles below the Lower Canyon. This creek joins the Peel River on U.S.A.A.F. photos 5-26-43-5P-9-362W-37 and the right oblique. The creek valley is fairly wide and retains a deep trench for at least seven miles upstream. Calamites Creek is the main stream crossing the middle foreground of U.S.A.A.F. photo 5-26-43-5P-3-362R-35. The water of this creek is rusty colored. This creek has no forks in the lower six miles.

Chapter III
STRATIGRAPHY

General

In the Upper Peel River area the writer recognized strata of Cambrian, Ordovician, Silurian, Devonian, Cretaceous and Tertiary ages.

The Cambrian, Ordovician and lower Silurian make up a thickness of around 10,000 feet of argillites and shales. This thickness of geosynclinal deposits is overlain by limestones of Silurian and Middle Devonian age. The Upper Devonian strata are fine clastics with coarser phases carrying primitive plant remains. Unconformably overlying Devonian strata are Lower Cretaceous sandstones and shales. Tertiary gravels, sands and lignites occupy the basin of the Wind and Bonnet Plume Rivers and lie unconformably on early Paleozoic rocks. Major unconformities are recognized between Silurian and Devonian, between Devonian and Cretaceous, and below the Tertiary. A disconformity is indicated between Lower and Upper Devonian strata. The general stratigraphy is summarized in the following table and detailed lithology is shown on Plate VI.

(see table on following page)

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SUMMARY OF GEOLOGICAL FORMATIONS

Quaternary	Recent	Talus, landslides, river gravels, peat.	
	Pleistocene	Cordilleran Glacial Drift Kervatin Glacial Drift Pre-glacial gravels?	
Tertiary		Sands, sandy clays gravels, lignite	1055° \pm
Lower Cretaceous		Shales, marine	850° \pm
		Sandstones and shales	400° \pm
Upper Devonian	Bosworth and higher	Shales and some sandstones with plant remains	1050° \pm
	Fort Creek	Shales and sandstones	980°
		Basal conglomerate	0- 226°
Middle Devonian	Beavertail- Rasparts	Brown limestones	0- 500°
	Bare Indian River shales	Brown marley shales	0- 150°
Silurian		Porous dolomites	0-1000°
		Shales and argillites	2584°
Ordovician		Shales and argillites	1500°
Ordovician and/or Cambrian		Shales argillites and schists	7000°

Ordovician and/or Cambrian

The lowest strata observed within the Upper Peel River area are exposed on Mountain Creek and consist of argillites, slates and schists. Although the slaty cleavage developed is at high angles to the bedding, the schistosity in the coarser phases is parallel to the original bedding. This latter feature, combined with the presence of muscovite micas in the schists, and the absence of high temperature mineralization, suggests a metamorphism of excessive burial load rather than of thermal or structural origin. No attempt was made to subdivide the lower beds, and except for

Tetractinellid remains, no other indication of their age was obtained.

At least 7000 feet of strata intervene above the lowest beds observed, before known Ordovician horizons appear in the Lower Canyon of the Peel River. The upper several thousand feet of these beds are thick bedded argillites and slates and carry dark chert toward the top. In the head of the Lower Canyon the alternate limy argillite bands weather white giving a vertical banding to the canyon walls above the whirlpools. The contact with the overlying Ordovician is arbitrarily drawn on the disappearance of chert in the argillite and the appearance of thinner bedded shales. The writer made no detailed study of these early beds as they are considered too low in section for oil prospects.

Ordovician

Known Ordovician beds are around 1500 feet in thickness and consist of black graptolite-bearing, thin bedded, shales and argillites. The Ordovician strata outcrop in the Lower Canyon of the Peel River in a big overturned section immediately above the whirlpools. They occur in the Upper Canyon above the mouth of the Wind River. Two horizons of graptolites (Suites 3815, 3816) were collected from the middle of this section. The presence of Tetragraptus was sufficient to indicate the Ordovician age of the faunas. These shales are correlated with Ordovician shales reported by Keele on the upper Keele (Gravel) River (Ref. 3). It is assumed that these beds belong to a geosynclinal sequence and thin out very rapidly to the east, i.e. in the Mackenzie basin.

Silurian of the Peel River Canyons

Silurian shales and argillites outcrop in a large overturned section in the Lower Canyon of the Peel River below the Whirlpools. These shales also outcrop on the uplands southwest of the junction of the Wind and Peel Rivers. A section measured in the Lower Canyon revealed 2584 feet

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of beds. The division with the underlying Ordovician beds was made at the base of a bed of black limestone, fifty feet thick which is brecciated and conglomeratic. The beds above the basal limestone are argillites and silty shales carrying thin bands of crinoidal limestone and numerous graptolite horizons.

A detailed section of the Silurian beds in the lower canyon reveals the following lithology:

.....	Shales and conglomerates of Devonian age.
.....	Contact, unconformable.
250 ⁰ +	Shales, black soft, graptolite suite 3819 at top.
20 ⁰	Argillite, thick bedded limy.
120 ⁰	Shales, nodular with thin argillites and thin coquine bands, Suite 3818 (graptolites).
60 ⁰	Argillites, dark with interbedded shales.
67 ⁰	Shales, soft, fissile.
20 ⁰	Shales, soft with graptolites, Suite 3817.
72 ⁰	Shales, slatey dark grey.
66 ⁰	Shales, fissile with marcasite.
20 ⁰	Shale, hard with graptolites, Suite 3811.
20 ⁰	Shales, carrying graptolites and thin crinoidal limestone, Suite 3810.
8 ⁰	Shales, silty.
12 ⁰	Shales silty with graptolites, Suite 3809.
12 ⁰	Shales silty with graptolites, Suite 3808.
10 ⁰	Shale, dark grey.
50 ⁰	Shales, with some 4" bands of argillite.
30 ⁰	Shales, somewhat platy, Suite 3806.
20 ⁰	Shales, thin fissile.
21 ⁰	Shales, with graptolites, Suite 3805.
100 ⁰	Shales with some marcasite, carrying thin beds of crinoidal limestones, Suite 3807.
72 ⁰	Shales, clay weathering and silty shales.
90 ⁰	Shales, fissile with thin black argillitic limestone bands.
3 ⁰	Shales, with graptolites, Suite 3804.
54 ⁰	Shales, silty with interbedded clean shales and thin, argillitic limestones.
42 ⁰	Shales with rusty streaks and thin argillites.
1 ⁰	Limestone, shaly.
3 ⁰	Shale, fissile, marcasitic.
51 ⁰	Shale, limy, grey weathering.
48 ⁰	Shale, black fissile.
6 ⁰	Argillites, silty, bedded.
12 ⁰	Shales, rusty, slatey.
12 ⁰	Shales, rusty sulphurous, fissile.
9 ⁰	Shales, silty thick bedded.
2 ⁰	Shales, dark grey.
3 ⁰	Argillite, calcareous with siltstones.
6 ⁰	Shales and argillites very thinly interbedded.

10 ⁰	Shales, silty with interbedded thin calcareous siltstones.
20 ⁰	Shales, dark grey.
8 ⁰	Shales and thin bedded calcareous argillites.
30 ⁰	Shales with occasional argillite bed.
6 ⁰	Argillites, calcareous with shale.
12 ⁰	Shales, with thin argillites.
5 ⁰	Limestone conglomerate, shales, crinoidal limestones with corals, Suite 3803.
2 ⁰	Shales with graptolites, Suite 3802.
6 ⁰	Shales with thin sandy conglomerate streak.
6 ⁰	Argillite, lime conglomerate and shales.
20 ⁰	Argillites, massive with thin shales.
11 ⁰	Shales, thin bedded angular weathering.
1 ⁰	Shales with fossiliferous lime nodules.
8 ⁰	Shale, slatey, thin bedded, sheared.
3 ⁰	Shale, fissile with nodules of argillite.
6 ⁰	Shales, thin bedded.
36 ⁰	Argillites and shales developing slatey habit.
20 ⁰	Shales silty, showing crossbedding, grading into shales.
16 ⁰	Shales dark grey thick bedded.
20 ⁰	Shales, grey brown, light weathering.
6 ⁰	Shales, grey thick bedded.
40 ⁰	Shales, grey, marly, thin bedded, soft.
80 ⁰	Shales, concealed in part here, but carrying crinoidal lime conglomerate bed, Suite 3801.
300 ⁰	Shales, and argillites with Suite 3813 from near base.
500 ⁰ +	Shales and argillites with Suite 3814 from near base badly concealed on south side of canyon.
50 ⁰	Limestone, black brecciated with some limestone conglomerate.
—	Contact apparently conformable.
—	Shales and argillites of Ordovician age.

The section is unconformably overlain by Devonian strata. The Silurian of Mount Deception is placed higher in the section, and it is assumed that erosion in pre-Upper Devonian time is responsible for its absence in the Lower Canyon section.

The contact with the underlying Ordovician strata is assumed conformable although the presence of the lime conglomerate at the base of the sequence suggests a local uplift of some sort at this time. The conglomerate at the base is placed in the Silurian as lesser lime conglomerates are found higher in the section containing Silurian fauna and not in the lower known Ordovician strata.

The beds below the whirlpool in the Lower Canyon are dated Silurian

on the presence of a Monograptus fauna. This Monograptus fauna was also found in the argillites and slates on the upland, southwest of the junction of the Wind and Peel Rivers, on the west limb of the anticlinorium. These shales are correlated with the Silurian shales found by Cameron on the south Nahanni River (Ref. 2, p. 17).

Silurian of Mount Deception

On Mount Deception, 1000 feet or more of heavy porous fractured dolomites occur below the Devonian. These dolomites become thinner-bedded toward the base, and include thin greenish bands and thin shaly beds. The beds look "older" than the Devonian, weather white, and have an east-west fracture pattern healed by calcite veining that does not extend into the overlying Devonian. The beds seem conformable with the Devonian.

The beds are similar in appearance to the Silurian limestones of the Mackenzie River basin and the writer has little hesitation in suggesting a correlation. The only fossils found were brachiopods too badly recrystallized and fractured to permit of collection.

The underlying contact was not observed but it is assumed that these lower dolomitic limestones of Mount Deception lie on the Silurian shales bearing the Monograptus fauna. These dolomites were eroded sufficiently in early Devonian time to eliminate them from the Lower Canyon area. How much of the underlying shales was also eroded is unknown. The dolomites on Mount Deception carry bitumen in the geodal cavities. The Silurian limestones would make excellent reservoir beds, although some of the permeability might be lost by the calcite veining.

Middle Devonian

Middle Devonian beds of thickness around 500 feet overlie the Silurian dolomites on Mount Deception and show a similarity to the lithology of the Middle Devonian of the Mackenzie River area. The upper beds are

shales. The dating of this conglomerate is difficult, but is probably late Middle Devonian or early Upper Devonian and it is discussed under "Upper Devonian".

There seems to be good evidence that there is a late Middle Devonian period of erosion in the Peel River area with the maximum amount of erosion taking place in the region of the Lower Canyon. The erosion was sufficient to expose Silurian limestones and Silurian shales as boulders of these horizons are found in the basal conglomerate of the Devonian in the Lower Canyon. The maximum uplift took place still further north and continued on into Upper Devonian time with fluctuation of the Upper Peel River area in Upper Devonian time.

The Middle Devonian limestones have a certain amount of porosity where recrystallized. No bitumen was found associated with the Middle Devonian limestone in the Mount Deception area.

Upper Devonian

The Upper Devonian of the Peel River area consists of around 2000 feet of shales and sandstones. It outcrops around Hungry Lake and on the Peel River below the Lower Canyon to eight miles below Snake River. The strata are assumed equivalent to Fort Creek, Bosworth and higher formations. The entire section appears marine, with the upper beds carrying primitive plant remains suggesting a near-shore phase. The sandy or dolomitic beds are usually petrolierous and are burned to a rose red at numerous localities.

The basal section overlies an unconformity, and at the foot of the Lower Canyon is represented by a considerable thickness of conglomerate made up of large blocks of limestones and argillites. Interbedded shales carry Tentaculites. Rasparts fossils are represented in the conglomerate. A section above the Silurian shales shows the nature of this basal horizon at the foot of the Lower Canyon.

massive limestones that resemble the Beavertail-Ramparts limestones of the Bear Rock area. The lower part of the section is softer and argillaceous but does not appear to carry the prolific fauna of the Ramparts shales elsewhere or the marly shales found in the Hare Indian River formation. Excessive recrystallization may account for the apparent absence of fossil content.

No contact was observed with the overlying beds on Mt. Deception. Contact with the underlying Silurian appeared conformable. The Middle Devonian massive limestones are absent at the Lower Canyon.

Two brief suites were collected from the Middle Devonian on Mt. Deception.

Suite from upper 40' limestone, Mt. Deception
 Alveolites
 Cyathophyllum
 Martinia
 Atrypa
 Crinoid stem

Suite from 100' below top of limestone, Mt. Deception
 Syringopora
 Stromatoporoid
 Cup Coral

Fifty miles to the northeast of Mount Deception, on Margery Creek, the Hare Indian River shales are present immediately below the Fort Creek Shales. The shales are soft, marly, brown with occasional fossiliferous lime nodules. Only about 150 feet of the Hare Indian River shales were examined below the Fort Creek formation. They carry the "Acervularia" fauna of the Hare Indian River shales with Proetus, Atrypa and Paracyclaspis, Suite 3630.

On Margery Creek no massive Beavertail-Ramparts was found above the Hare Indian River shales. At the foot of the Lower Canyon no Hare Indian River shales were found, but here a conglomerate with Ramparts fossils was found above the Silurian shales and below the Fort Creek

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shales. The dating of this conglomerate is difficult, but is probably late Middle Devonian or early Upper Devonian and it is discussed under "Upper Devonian".

There seems to be good evidence that there is a late Middle Devonian period of erosion in the Peel River area with the maximum amount of erosion taking place in the region of the Lower Canyon. The erosion was sufficient to expose Silurian limestones and Silurian shales as boulders of these horizons are found in the basal conglomerate of the Devonian in the Lower Canyon. The maximum uplift took place still further north and continued on into Upper Devonian time with fluctuation of the Upper Peel River area in Upper Devonian time.

The Middle Devonian limestones have a certain amount of porosity where recrystallized. No bitumen was found associated with the Middle Devonian limestones in the Mount Deception area.

Upper Devonian

The Upper Devonian of the Peel River area consists of around 2000 feet of shales and sandstones. It outcrops around Hungry Lake and on the Peel River below the Lower Canyon to eight miles below Snake River. The strata are assumed equivalent to Fort Creek, Bosworth and higher formations. The entire section appears marine, with the upper beds carrying primitive plant remains suggesting a near-shore phase. The sandy or dolomitic beds are usually petroliferous and are burned to a rose red at numerous localities.

The basal section overlies an unconformity, and at the foot of the Lower Canyon is represented by a considerable thickness of conglomerate made up of large blocks of limestones and argillites. Interbedded shales carry Tentaculites. Rasparts fossils are represented in the conglomerate. A section above the Silurian shales shows the nature of this basal horizon

	15.
100'	Horizons above this, shales and sandy shale, obscured. Shales.
15'	Limestones, thin with <u>Cladopora</u> , interbedded with shale. Containing tar.
60'	Limestone, and lime breccia and conglomerate with <u>Cladopora</u> , Suite 382f.
8'	Stromatoporoidal reefs, limestone conglomerates.
45'	Shales with thin coquina limestones, Suite 3825. ✓
15'	Conglomerate of limestone and shale with boulders to 3 feet, Suite 3824. ✓
4'	Limestone with <u>Favosites</u> , Suite 3823. ✓
20'	Limestone, grey bedded petrolierous.
2° to 20'	Shale, with <u>Tentaculites</u> , <u>Lingula</u> , Suite 3822. ✓
0° to 10°	Biohermal limestone lense, with thin shale at base, Suite 3821 from here and subjacent bed.
10°	Biohermal limestone lense with thin shale at base.
10°	Biohermal limestone lense, Suite 3820.
8°	Limestone, gray coarse lensing.
6°	Shale, hard slatey with <u>Corularia</u> .
	Shales carrying graptolites, contact hard to determine. Contact unconformable.
359°	Total section measured above Silurian shales.

Undoubtedly the above section also includes upper Middle Devonian strata, but with the large rounded bioherms of coral it is difficult to determine whether they are in place or transported. Reworking of soft Hare Indian River marls would leave a rubble of bioherms not too badly abraded. These beds were dated basal Upper Devonian on the lithological feature of black interbedded shales carrying Tentaculites. The writer correlates the Cladopora limestones above the conglomerate with the Lower Fort Creek.

On Margery Creek the basal conglomerate is absent, but about 50 feet of shales come in below the Cladopora horizon, and show an angular relation of around 10° with the upper shales. The Cladopora occur as individual colonies scattered in the shale and not in lime bands as at the foot of the Lower Canyon.

Above the Cladopora horizon on Margery Creek are 900 feet of marine shales containing very large concretions. These shales are platy, silty, and locally carry an Actinoceras fauna, Suite 3831. These shales are sometimes burnt rose-red by combustion of petrolierous silty horizons.

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At the top of the shale section is a twenty-foot bed of heavy cross-bedded sandstone which was used in mapping, to mark the top of the Fort Creek formation within the map area. This sandstone is penetrated by two bituminous dykes below the mouth of Calamites Creek at Stations 221 and 224.

Above the cross-bedded sandstone (*supra*), plant remains appear in the shale and are found throughout the remainder of the section. A simple Calamites flora occurs in the lower part of the section. Lepidodendron types come in before the top of the section. Oxycalyxina was collected with Lepidodendron from the highest beds seen on Calamites Creek. These 1050-~~+~~ feet of plant-bearing shales and sandstones probably constitute an equivalent of the Bosworth sandstones of the Norman Wells area. Petroliferous sandstones, suitable for reservoir beds, occur in the lower 280 feet of the plant bearing beds, and petroliferous shales occur at 500 and 650 feet above the base of this division. These petroliferous horizons are frequently burned to a bright rose color.

Upper Devonian beds occur around Hungry Lake and on Hungry Creek but outcrops are poor and infrequent and the exact relationships of the different outcrops were not worked out stratigraphically. The writer collected Goniatite remains on Hungry Creek and a Pteropod fauna typical of the Upper Devonian. The beds vary from black shales (Fort Creek?) to quartz sandstones carrying plant remains. (Bosworth or higher).

Lower Cretaceous

Cretaceous beds outcrop along the Peel River from eight miles below Snake River to Trail River and below. Except near the Devonian contact the beds are flat lying. The basal 400 feet of the Cretaceous section is made of greenish, soft, argillaceous sandstone and sandy shales which lie unconformably on the Devonian. These beds carry an early

Cretaceous fauna and are separated from the overlying Cretaceous shales on lithological grounds. The boundary with the shales is transitional and the thickness of 400 feet is an arbitrary unit.

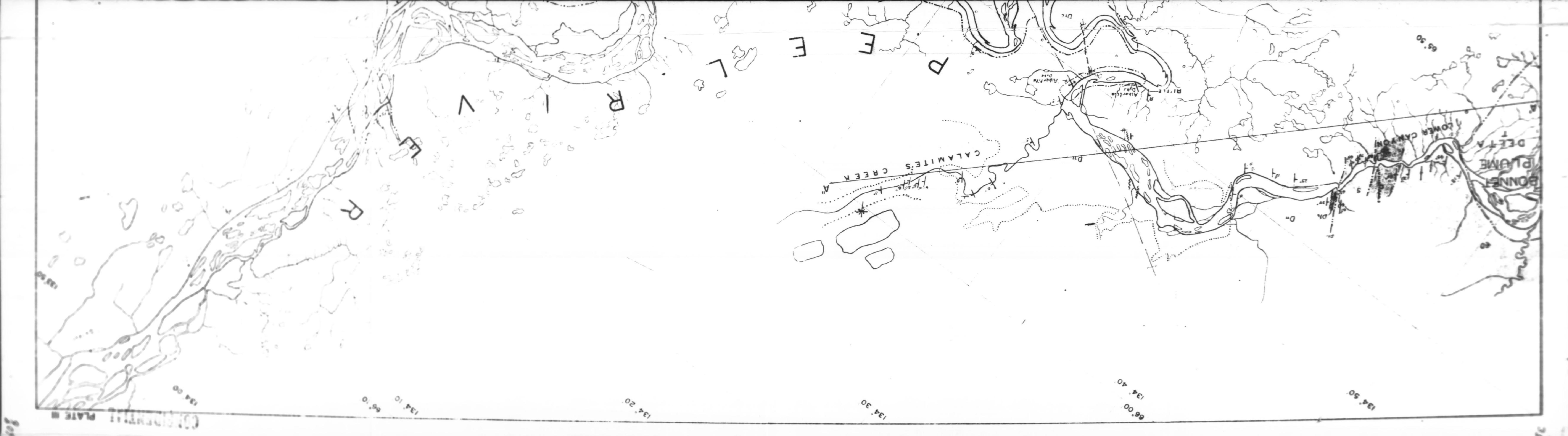
The upper 850 feet of Cretaceous beds, overlying the basal sandstones, are shales. These shales carry a considerable percentage of sandy material where first seen below Snake River but lose their arenaceous content and carry thin bands of ironstones northward. The shales are characterized by the presence of the diagnostic Beudanticeras fauna of late Aptian age. The shales are correlated with the "B unit" Cretaceous on the Arctic Red River (Ref. 5) and with the Clearwater shales of northern Alberta. Gossell reports (Ref. 1, p. 49) Cretaceous fossils from twenty miles up the Snake River.

No bituminous material was found associated with the Cretaceous beds, but the basal Cretaceous sandstones could form an excellent reservoir. Tertiary

Over 1050 feet of Tertiary beds underlie the basin of the Bonnet Plume and Wind Rivers. The beds are continental in origin and consist of gravels, sands and some shales with lignite beds. Tertiary or pre-glacial Pleistocene gravels form a synclinal filling west of Mount Reception, along Hungry Creek. The Tertiary beds lie with high angular unconformity, and with high primary dips, on Ordovician beds and earlier in the Bonnet Plume basin.

At numerous localities the lignite associated with the Tertiary has burned and stained red the gravels and sands, and often the underlying slates. The lignite is still burning in one locality on the south side of Peel River about one mile above the delta of the Bonnet Plume.

A composite section taken above the canyon of the Wind River on the east side of the Wind valley shows the following lithology:



24.

Creek is petroliferous. This anticline plunges north and would make a good oil structure although no closure was obtained to the south. The beds near the Fort Creek - Middle Devonian contact should make ideal reservoir horizons. If Silurian limestones are present at depth they are ideally situated on a wedge pinch out on a structural high. No gas seepages were noted.

Hot springs are reported by Camsell from the west side of the delta of the Bonnet Plume River. Alum springs are common on Calamites Creek. Lignite seams are common in the Tertiary but the majority of these are poor quality or have been burned at outcrop. No thermal mineralization was noted in the entire area.

G.S. Hume in "Petroleum Geology of Canada" (G.S.C. Bull. 98, 1944, p. 58) mentions a seepage reported from the mouth of Hungry Creek. This seepage was not seen by the writer.

Chapter VII

CONCLUSIONS AND RECOMMENDATIONS

This is a first class area for petroleum prospects. Petroliferous shales are found throughout the Devonian; bituminous limestones are found from Ordovician to Devonian; Albertite? dykes are present in two places. A tremendous thickness (10,000 feet) of dark shales form source beds for petroleum. There are porous dolomites in Silurian and Devonian, basal conglomerates, possible coralline horizons in Silurian and Devonian, and sands in the Upper Devonian and Cretaceous. All of these form possible reservoir horizons within reasonable drilling depth. Structures in the area are broad and not too deeply eroded. Several major unconformities provide the possibility of stratigraphic traps in the broad arches even on the down plunge of the axes to the north.

Since the area is still remote from any development whatsoever a further mapping program is recommended to warrant exploration with a view to large scale exploitation.

An intensive mapping program should be carried out in the area contained in the "big bend" of the Peel River, i.e., between the Peel, Mountain and Trail Rivers. Creeks in this area provide good outcroppings. This program would outline the structures where the cover is somewhat thicker than on the Peel River itself.

General reconnaissance should be carried out south of the Peel River to the east of Bonnet Plume River and over to the Trevor Mountains.

The Tertiary basin of the Bonnet Plume and Wind Rivers is underlain by Ordovician and Cambrian, carries hot springs, and does not warrant further work.

The writer is not in a position to draw any conclusions as to possibilities in the Hungry Lake area except to add that the strata of the area do not seem excessively indurated and the structures seem to be Appalachian type open folds.

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1. Gamwell, G. "Peel River and Tributaries" G.S.C. Annual Report 1904, Vol. XVI, part CC, pp. 1 - 49, 1906.
2. Cameron, A.E. and Warren, P.S. "Geology of South Nahanni River, N.W.T." Canadian Field Nat. Vol. LIX, No. 2, pp. 15 - 21, 1938.
3. Keele, J. "Pelly, Ross and Gravel Rivers" G.S.C. publication No. 1097, 1910.

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4. Foley, E.J. "Lower Peel River Area". Final Geological report, Imperial Oil Ltd., Canol Project, 1944. Assignment No. 23a.
5. McKinnon, F.A. "Arctic Red River Area". Final Geological report, Imperial Oil Ltd., Canol Project, 1944. Assignment No. 22.
6. Stelck, C.R. "Upper Peel River Area". Imperial Oil Ltd., Canol Project Preliminary Report, 1943.

APPENDIX

Fossil Identification

Suite No.	Date (1963)	Location	Fossil	Accession No.	Age
3795	Sept. 1	Sta. 122, Peel River	Discina Graptolite	42812 42813	Silurian •
3803	Sept. 7	Lower Canyon, Peel River	Syringopora	42814	Silurian - Ordovician
3818	Sept. 8	Lower Canyon, Peel River	Dolmanella	42815	Silurian
3830	Sept. 14	Hargrave Cr., Peel River Sta. 250	Acervularia	42816	Hare Indian River
---?	Aug. 21	Float, Hungry Creek	Goniatite Crinoid	42817 42818	Devonian •
3811	Sept. 7	Lower Canyon, Peel River	Monograptus	42819	Silurian
3822	Sept. 8	Lower Canyon, Peel River	Tentaculites	42820	Ft. Creek
---?	Sept. 4	Mountain River, Peel River	Sponge spicules Schist	42821 42822	Cambrian- Ord.
3825	Sept. 8	Foot of Lower Canyon, Peel River	Acervularia Favosites Alveolites Acervularia Cladopora Cystiphyllum Stromatoporoid	42823 42824 42825 42826 42827 42828 42829	Ramparts • • • • • •
---?	Sept. 8	Float 1st Creek, Lower Canyon. N. Bank, Peel River	Atrypa ? Atrypa	42830 42831	Devonian •
3814	Sept. 7	Lower Canyon, Peel River	Graptolites	42832	Silurian
---?	Sept. 1	ls. egl. below upper 3 graptolites zones, - Sta. 121, Upper Canyon, Peel River	Rock samples	42833	Silurian- Ord.
3819	Sept. 8	Foot of Lower Canyon, Peel River	Graptolites	42834	Silurian
---?	Aug. 25	100' below top of ls. Mount Deception	Syringopora Stromatoporoid Brachiopod Cup coral	42835 42836 42837 42838	M. Devonian • • •
3829	Sept. 8	Foot of L. Canyon, Peel River	Atrypa Favosites	42839 42840	M. Devonian •

Fossil Identification

<u>Suite No.</u>	<u>Date (1943)</u>	<u>Location</u>	<u>Fossil</u>	<u>Accession No.</u>	<u>Age</u>
3823	Sept. 8	Foot of L. Canyon, Peel River	Orthoceras	42841	M. Devonian
3808	Sept. 7	Lower Canyon, Peel River	Graptolites	42842	Silurian- Ord.
---?	Sept. 7	Lower Canyon, Peel River	Graptolites	42843	Silurian- Ord.
---?	Sept. 7	Lower Canyon, Peel River	Crinoidal ls. with pyrite	42844	Silurian
3821	Sept. 8	Foot of L. Canyon, Peel River	Acervularia Stromatoporoid	42845 42846	M. Devonian "
3801	Sept. 7	L. Canyon, Peel River	Conehidium ? Bryozoan Brachiopod Dolmanella	42847 42848 42849 42850	Silurian- Ord.
---?	Sept. 3	Lower end Upper Canyon, Peel River	Sponge spicule	42851	Ord. ?
3820	Sept. 8	Bottom of L. Canyon, Peel River	Favosites ? Alveolites	42852 42853	M. Devonian "
3794	Aug. 29	Sta. 115, Peel River	Graptolites	42854	Ord. - Silurian
---?	Aug. 25	Top 40' of ls. Mount Deception, Peel River	Alveolites Cyathophyllum Martinia Atrypa Brachiopods Crinoid stem	42855 42856 42857 42858 42859 42860	M. Devonian " " " " "
3809	Sept. 7	L. Canyon, Peel River	Brachiopod	42861	Silurian- Ord.
3794	Aug. 29	Sta. 115, Peel River	Dictyonema	42862	Ordovician
3805	Sept. 7	L. Canyon, Peel River	Graptolites	42863	Silurian- Ord.
3803	Sept. 7	L. Canyon, Peel River	Syringopora Brachiopod Cyathophyllum	42864 42865 42866	Silurian- Ord. "
3815	Sept. 7	Lower Canyon, above whirlpool, Peel River	Graptolites	42867	Ordovician

Fossil Identification

<u>Suite No.</u>	<u>Date (1949)</u>	<u>Location</u>	<u>Fossil</u>	<u>Accession No.</u>	<u>Age</u>
3832	Sept. 16	Sta. 265, Peel River	Neopliites ?	42868	Cretaceous
3829	Sept. 11	Sta. 216, Calamites Cr. Peel River	Sponge remains Lepidocerasid con Goniatite	42869 42870 42871	U. Devonian • •
3816	Sept. 7	Lower Canyon, above Whirlpool, Peel River	Tetragraptus	42872	Ordovician
3812	Sept. 7	Lower Canyon, above Whirlpool, Peel River	Graptolite	42873	Ordovician
3794	Aug. 29	Sta. 115, Peel River	Dictyonema, etc.	42874	Ord.
3828	Sept. 10	Sta. 204, Peel River	Calamites, etc. Crinoid frag- ments, etc.	42875 42876	U. Devonian •
3806	Sept. 7	Lower Canyon, Peel River	Graptolites	42877	Silurian
---?	Aug. 25	East side Mtn. Deception	Brach & Godes	42878	Silurian
3807	Sept. 7	Lower Canyon, Peel River	Crinoidal ls.	42879	Silurian
3804	Sept. 7	Lower Canyon, Peel River	Graptolites	42880	Silurian
3813	Sept. 7	Lower Canyon, Peel River	Graptolites ?	42881	Silurian
3815	Sept. 7	Lower Canyon above Whirlpool, Peel River	Graptolites	42882	Ordovician
3826	Sept. 8	Foot of Lower Canyon, Peel River	Alveolites Leiorhynchus Syringeopora	42883 42884 42885	Devonian • •
---?	Sept. 18	----- Caribou River	Neopliites	42886	Lower Cretaceous
3796	Sept. 1	Sta. 125, Peel River	Graptolites	42887	Silurian
3795	Sept. 1	Sta. 122, Peel River	Graptolites	42888	Silurian
3831	Sept. 17	Sta. 243, Margery Cr.	Orthoceras Gastropod	42889 42890	Fl. Creek •
3827	Sept. 9	Sta. 200, Peel River	Calamites	42891	Upper Devonian
3824	Sept. 8	Foot of Lower Canyon, Peel River	Tentaculites	42892	Silurian

Fossil Identification

<u>Suite No.</u>	<u>Date (1943)</u>	<u>Location</u>	<u>Fossil</u>	<u>Accession No.</u>	<u>Age</u>
3802	Sept. 7	Lower Canyon, Peel River	Graptolites	42893	Silurian- Ord.
3825	Sept. 8	Foot of Lower Canyon, Peel River	Sieberella ? Cystiphyllum Schizophoria Atrypa Conocardium Cystiphyllum	42894 42895 42896 42897 42898 42899	Devonian • • • • •
3813	Sept. 7	Lower Canyon, Peel River	Graptolites ?	42900	Silurian- Ord.
3817	Sept. 8	Foot of Lower Canyon, Peel River	Graptolites	42901	Silurian
3794	Aug. 29	Sta. 115, Peel River	Graptolites Trilobite	42902 42903	Silurian- Ord.
3797	Sept. 1	Sta. 124, Peel River	Graptolites	42904	Silurian- Ord.
---?	Aug. 27	Sta. 105 - 106 Wind R.	Plant remains	41132	Tertiary
---?	Aug. 28	Sta. 112, Wind R.	Sponge spicules	41133	Comb.-Ord.

Edmonton, Alberta,
Feb. 16, 1944.

TO: Dr. T. A. Link
RE: Fossil Identification

The attached list is a tentative identification of
fossils collected by Mr. C. R. Stelek on Assignment No. 23,
Upper Peel River Area.

C. R. Stelek

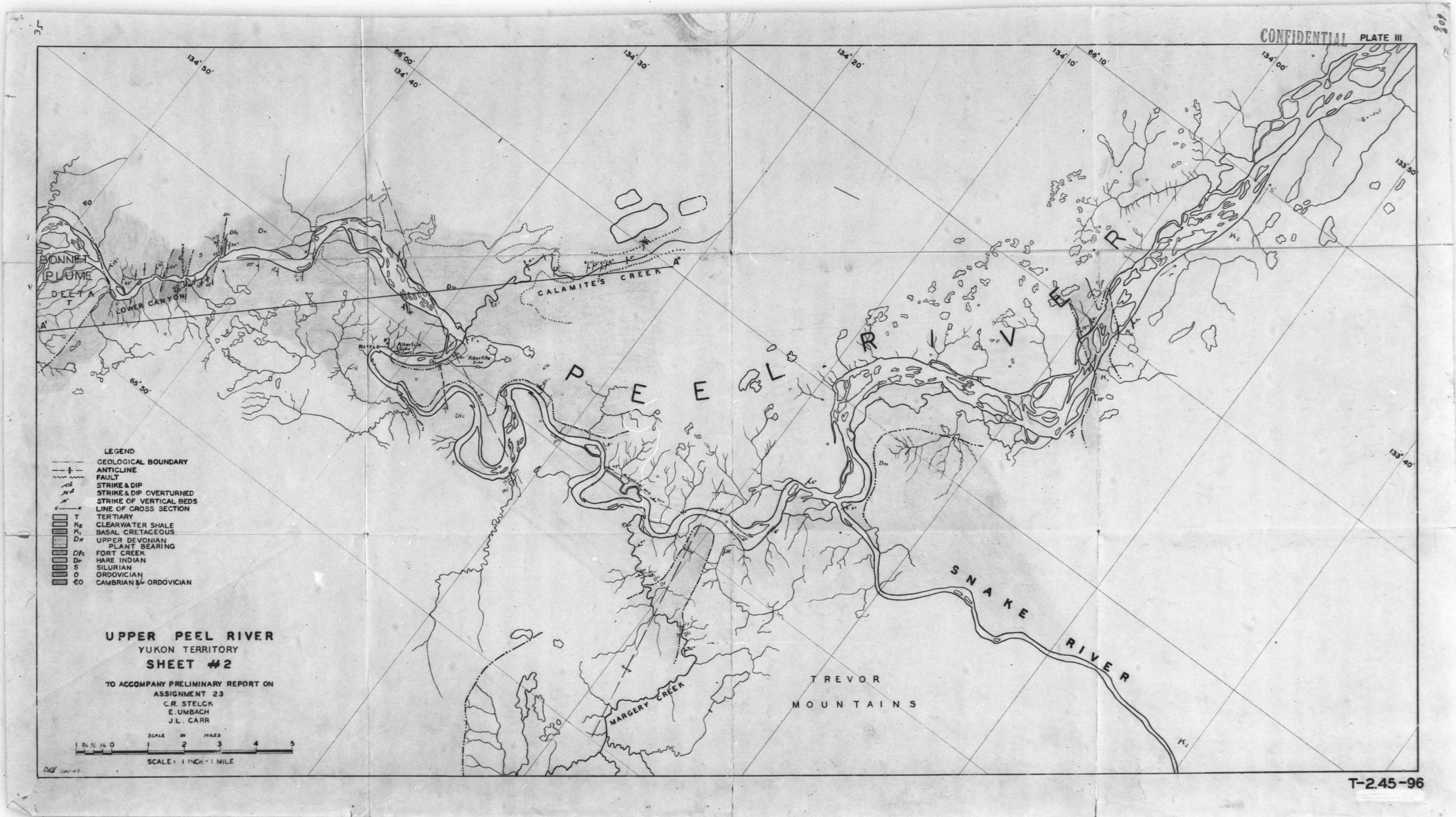
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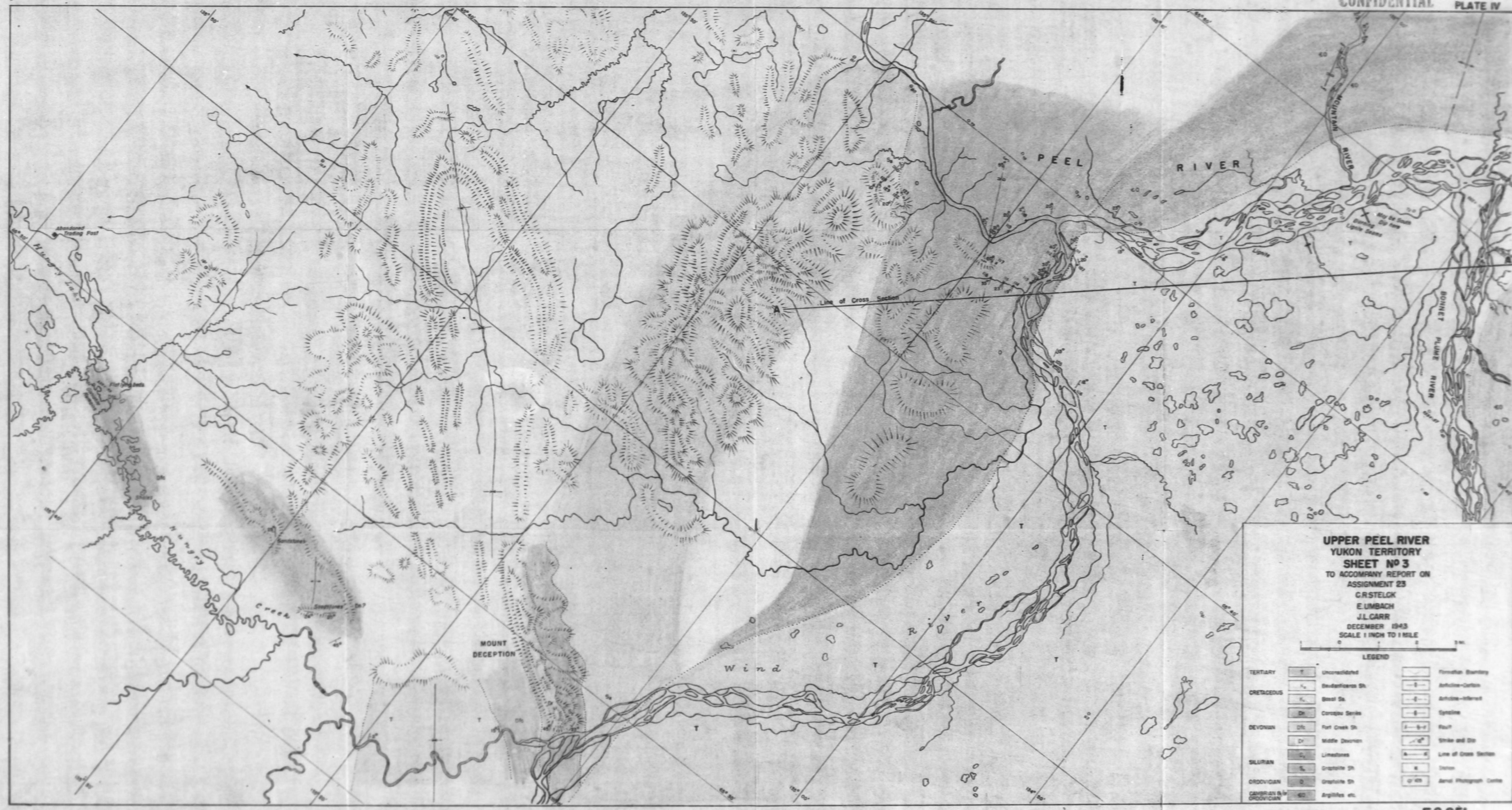


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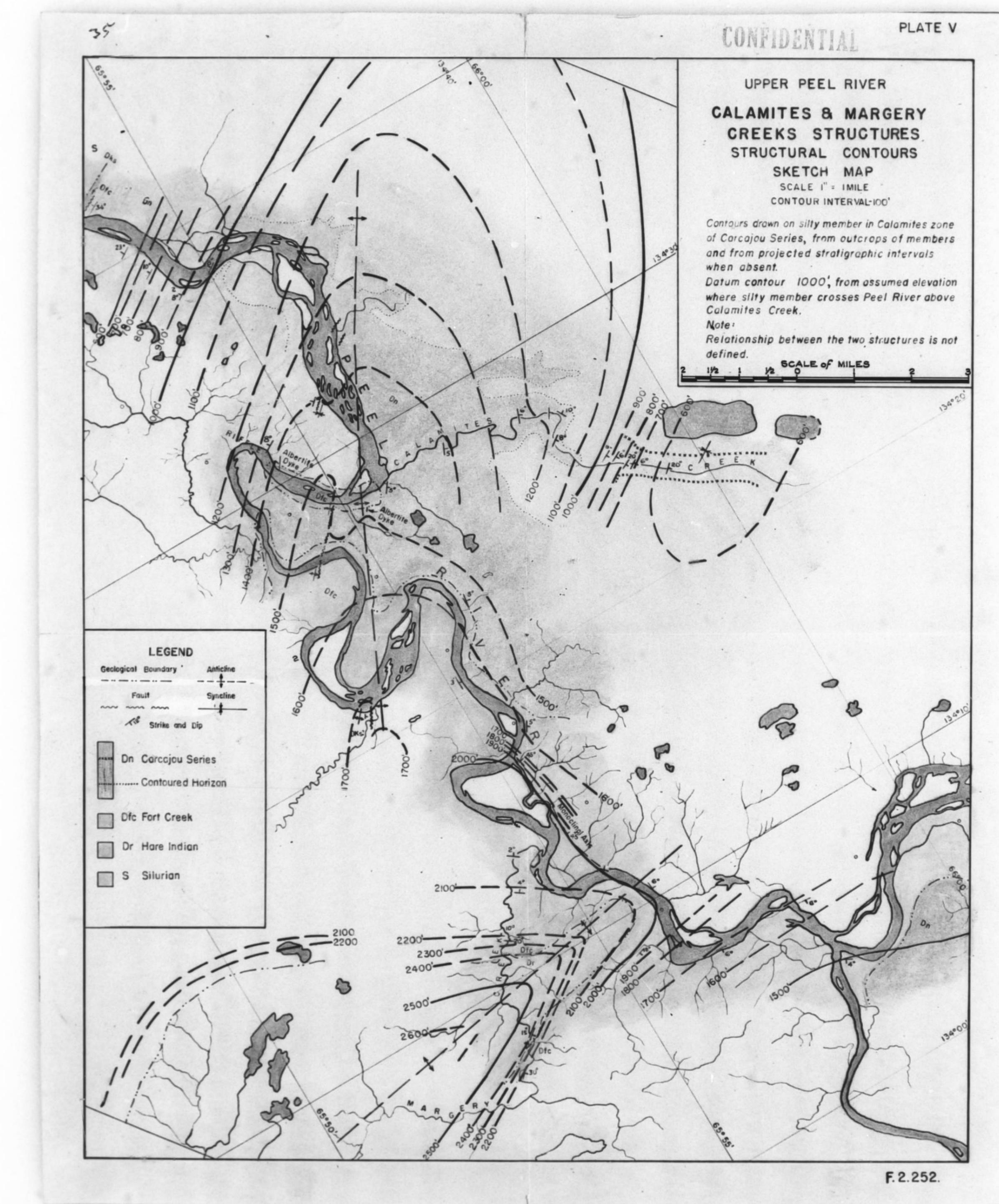


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PLATE IV



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STRATIGRAPHIC COLUMNAR SECTIONS
UPPER PEEL RIVER

ASSIGNMENT 23

PARTY B

G.R.Sherk P.W.Limbach J.L.Garr

SCALE: 1"=100'

