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36

FINAL

GEOLOGICAL REPORT

ON

"BEAR ROCK BLUEFISH AREA"

N.W.T. (Canada)

IMPERIAL OIL LTD., Canol Project

Assignment No. 1

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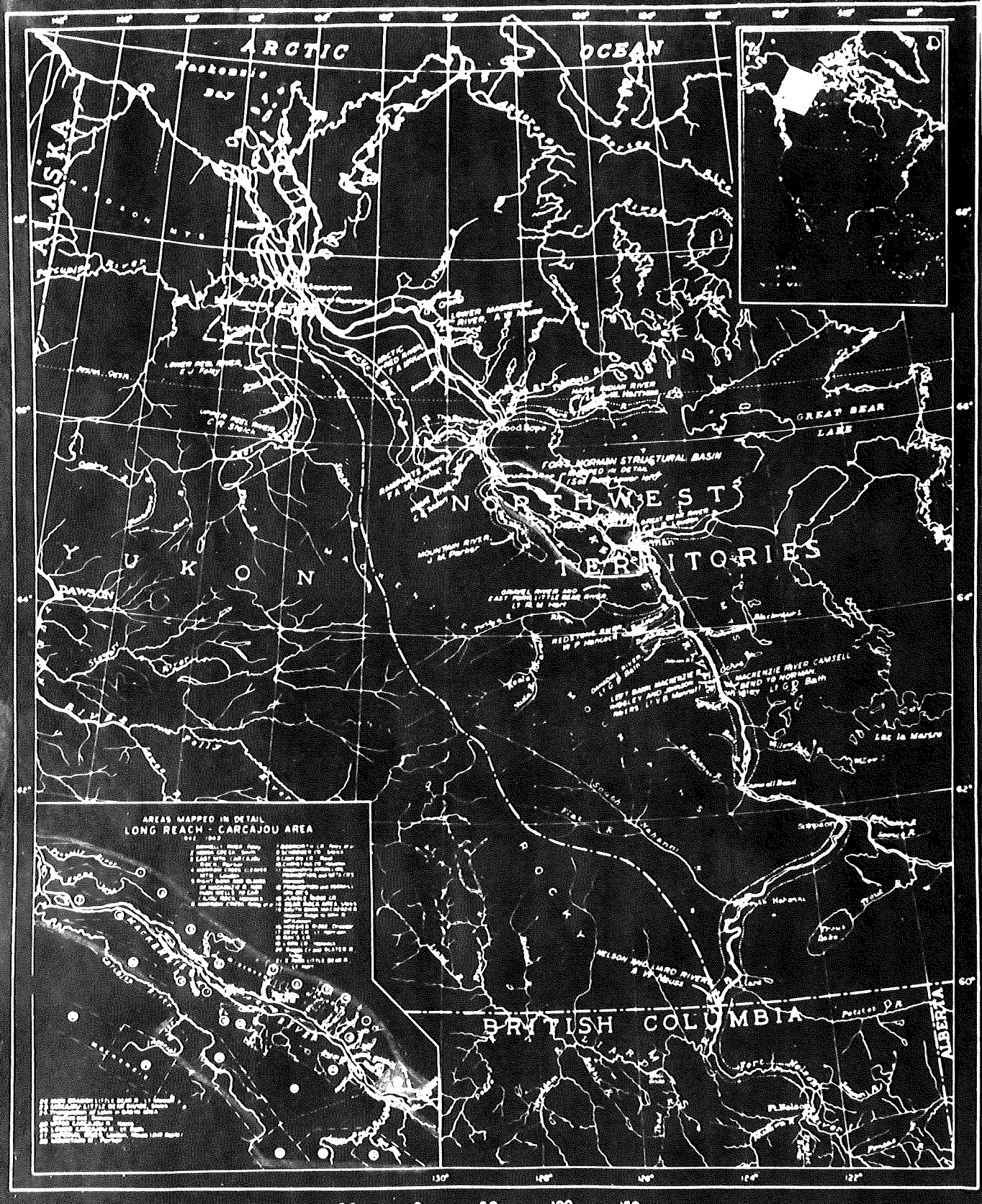
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INDEX MAP OF
NORTH WESTERN CANADA SHOWING
BEAR ROCK - BLUEFISH AREA

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A B S T R A C T

The Bear Rock-Bluefish area includes mountains carved from upthrust early Paleozoic rocks and lowlands developed on gently dipping Upper Devonian, Cretaceous and Tertiary beds. The oldest rocks exposed are gypsiferous shales and red beds and these are overlain by thin-bedded dolomites of the Franklin Mountain formation. The Mount Kindle formation (Middle Silurian) is missing at Bear Rock. Following the erosional unconformity gypsiferous lime deposits and breccia were laid down, to be followed by evenly bedded Middle Devonian limey strata. Upper Devonian shales are unconformably overlain by Upper Cretaceous shales and sandstones. Continental Eocene beds complete the section.

The Bear Rock uplift is a half anticline, plunging and elongate north and south. It carries minor folds and faults. The surrounding lowlands carry several minor structures some favorable to oil accumulation. A large post-Eocene fault of at least 1000 feet upthrow to the west, is indicated west of Bluefish Creek. Bear Rock has been a structural and topographic high at various times since late Silurian.

Bituminous shales and several small seepages were found along the Mackenzie River below Bear Rock. Poor quality lignite and small gypsum deposits are found within the area.

Only one small anticlinal structure, approximately 2-3/4 miles upstream from Bluefish Creek, is recommended for a shallow drilling test. A test on this structure to the top of the Bear Rock formation would not exceed 600 feet.

CHAPTER I

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

This report includes an area around Bear Rock just west of Fort Norman, and a reconnaissance of the lower 15 miles of McKay (Kay) Mountain Creek to the south of Fort Norman.

The area had previously been mapped by several workers, and the object of the report was to provide more detailed stratigraphic information and more detailed structural studies.

Field Work

On May 28, Party 'B', consisting of C.R. Stelck, geologist, Ivan Six and J.L. Carr assistants left Norman Wells for Bear Rock on a barge pushed by the U.S.E.D. river tug "Hague". E.J. Foley's party and Lt. R. Hart's party accompanied party 'B' as far as Slater and Little Bear Rivers respectively. On May 30, Party 'B' was landed below Bear Rock and established a base camp there. This camp was retained with temporary camps used for the longer trips back of Bear Rock and up McKay Mountain Creek. Ivan Six was withdrawn from the Party on June 16 and the reconnaissance of McKay Mountain Creek was carried out by the remaining members of the party. The party returned to Norman Wells on June 26, coming downstream from Bear Rock in an 18 foot canoe.

Continual daylight made long walking trips possible. The weather was fair so little time was lost in the field.

Mr. Alec Frame's map, (1" = 1 mile, Fort Norman sheet) was used as a base map, and stations were recorded on aerial photographs, C.P.A. job 199, 506-516, 357-364, 374-383, 714 725, 700-710, and on plane table sheets 1,2,3,4 and 5.

Since Party 'B', visited the area, the Bluefish #1A well was drilled, and the writer has examined the cuttings, samples and cores from

the well. The log of this well is included in summary form.

Geographical Position and Accessibility

The Bear Rock - Bluefish map area is in the District of Mackenzie, Northwest Territories of Canada, latitude 64°45' to 65°03' N and longitude 125°20' to 126°00' W. It is 40 miles upstream from Norman Wells and includes Fort Norman at the junction of the Great Bear and Mackenzie Rivers. It is readily accessible by river boat and pontoon planes, or by ski planes and tractor trains in the winter. "Cat" trails are common in the country between Bear Rock and Discovery Range where the winter tractor trail from Fort Norman to Norman Wells finds a pass. The trails cut across south of Jungle Ridge and head toward lower Vermillion Creek. There is a wide stripped and graded roadway running in from the Bluefish location to Jungle Ridge and out toward Vermillion Creek in a large three quarter circle. Several location roads have been cut parallel to the Mackenzie about a mile or less back from the river. On the south side of the river one "cat" trail leads in from the mouth of McKay Mountain Creek to the Little Bear River. A telephone line, at present under construction, runs through the area. A road runs up the Great Bear River from Fort Norman to the portage and pipe line to Great Bear Lake. Other roads run out into the bush around Fort Norman to service the settlement.

Culture and Vegetation

Fort Norman is the only permanent settlement in the area and has a hospital, churches, school, trading posts, police barracks, and storage tanks. It is a stop on the winter road from Great Slave Lake to Norman Wells.

The old and new Bluefish well locations clearing at the mouth of Bluefish Creek has only two permanent log buildings, uninhabited, and the temporary structures set up for drilling were removed after abandonment of the IA Bluefish Well.

Indians camp along the beach in summer, moving their camps as fishing or fancy dictates. Several largeencampment places, with permanent drying frames, are scattered along the south bank of the Mackenzie from Little Bear River to opposite Fort Norman. About 12 miles up McKay Mountain Creek is an old set of Indian camps located at the Fort Norman - McKay Mountain trail crossing. Old cuttings are common everywhere.

The uplands carry stunted spruce with bare rock jutting through. The lowlands carry scrub spruce of size not often beyond six inches diameter. The islands of the river and the river's edge carry poplar and spruce of tie timber size to occasionally larger. The ground is mantled with a tundra and, except along the watercourses and lake edges, true muskegs are rare. Birch, alder and willow make up the tangled hillside vegetation.

Previous and Pertinent Reports

Every Mackenzie River traveller has seen Bear Rock and many of the passersby have written about this feature. We are not attempting to outline the literature on Bear Rock, so only the geological workers are mentioned.

R.G. McConnell (Ref. 3) in 1888 on his historic trip outlined the geology of this area. On a large scale map the areal map is still much as he showed it. E.M. Kindle and Bosworth, (Ref. 2), and T.A. Link, (Ref. 14 & 15) made the first stratigraphic studies within the area. G.S. Hume (Ref. 1), M.Y. Williams (Ref. 4) and T.A. Link (Ref. 14 & 15) in the early 1920's were the workers who laid down the basic geological pattern of the area.

In 1942 and 1943 Canol geologists turned out various memoranda and reports on the Bear Rock - Bluefish area. Included in this group are E.J. Foley, "Jungle Ridge" (Ref. 8), C.R. Stelck, "Preliminary report on

Bear Rock" (Ref. 18), L.R. Laudon "Port Creek structure", (Ref. 12), T.P. Storey reported on well operations at Bluefish 1A, (Ref. 17), L. Desjardins made aerial studies of Bear Rock, (Ref. 7). Lt. W. Dawson did seismic work in the area, (Ref. 6).

Adjacent areas were worked by G.D. Bath, "Wrigley to Fort Norman" (Ref. 5); R.M. Hart "McKay Mountains area" (Ref. 11), L.R. Laudon "Great Bear River" (Ref. 13), W.P. Hancock "Headwaters Vermillion and Nota Creeks" (Ref. 10), E.J. Foley "Slater River - Halfway" (Ref. 9).

Regional studies by Camsell, Dowling, etc. include this area but, contain no additional pertinent data.

Acknowledgments. The writer is indebted to J.L. Carr and Ivan Six for their efficient co-operation in the field. Ivan Six did most of the plane-tabling and when he was forced to leave, he so efficiently instructed Mr. Carr in the uses of the alidade that the latter was able to do all the plane-tabling for the remainder of the field season. Mr. Carr also constructed the 4" = 1 mile section map of the area. Mr. Storey kept a very good set of samples on the Bluefish well so correlation with the field outcrops proved to be a relatively simple matter. H.A. Gibson did the drafting on the various plates accompanying the report. The Cretaceous data on Little Bear River for the map is taken from Dr. T.A. Link's reports.

CHAPTER II

T O P O G R A P H Y

The map sheet of the Bear Rock - Bluefish area covers portions of low flat-lying post-middle Devonian basins and portions of the mountainous limestones. The flat muskeg country is dominated by Bear Rock rising 1200 feet above the water's edge on Mackenzie River.

Drainage. This is part of the Mackenzie River drainage. The Mackenzie River flows through the area. Great Bear River, Little Bear River and McKay Mountain Creek, Bluefish Creek and Charles Creek, the major and minor tributaries respectively, join the Mackenzie within the map sheet. The headwaters of Jungle Ridge Creek drain the area northwest of Bear Rock and the tributaries of the Brackett River drain the area northeast of Bear Rock.

The Mackenzie River, flowing east to west through the area, is from a mile to 2½ miles wide. The current is two to three miles per hour. The banks are about 80 feet high, and the normal stage of water fills the entire incised channel.

The Great Bear River is about 500 yards in width and runs in a channel incised into the Tertiary basin. The water of the Great Bear is clear and stays as a blue water channel for several miles below Bear Rock before mingling with the murky waters of the Mackenzie.

McKay Mountain Creek drains an area north of the McKay Mountains and heads in them. The lower part of McKay Mountain Creek is incised into lake clays. The upper part of the creek is subject to much beaver damming and meanders in a valley about one quarter mile wide. The stream is not satisfactory for canoe work.

Small lakes are common over the entire area, the vast majority unnamed and unimportant. These lakes are the results of glacial disrup-

tion of the original drainage pattern.

Land Forms. Bear Rock - Bluefish area includes parts of the Franklin Mountains and part of the Mackenzie lowlands basin. The drainage of the basin is disrupted over the general surface by glacial deposition and by beaver work, and by the universal seepage springs originating in the continual melting of seasonal ground ice. Muskeg growth prevents gullying except along the edge of the Mackenzie River and on steep scarp faces.

There are five levels of erosion cycles present. The oldest erosion cycle is represented by the tops of Bear Rock and Discovery Range and may be as old as Tertiary. A pre-glacial peneplanation by the Mackenzie (?) is represented by the basin level and interstream areas. A post glacial-laking period of lateral planation is represented by the valley of the upper part of Kay Mountain Creek, the valley walls of the Little Bear River and the plain level along Great Bear River. A cycle of rejuvenation (quite recent) is represented by the incision of the Great Bear River and Mackenzie River, with two erosion levels, one represented by the Mackenzie flood plain where it exists and Windy Island, and the other by the aggraded level of the bars and gravel flats along the Mackenzie.

Bear Rock is a mesa-like hill rising 1200 feet above the surrounding country. The west side of the "Rock" carries several long parallel hogbacks and the east side is a very abrupt scarp face. The northwest part of the top of Bear Rock is weathered to hoodoo and badland shapes.

North of Bear Rock the highland falls away to give place to a rough series of hills through which the winter road to Norman Wells, finds a pass. These low hills connect with the south end of Discovery Range.

The only other separate topographic high is Jungle Ridge. This ridge, in the northwest corner of the map sheet, stands out in the flat basin-land, about 250' relief, and has a scarp face north and a gentle

dip slope south.

Glaciation has grooved Bear Rock and the hills north of Bear Rock into long east west trending ridges that have no relation to the strike of the underlying rocks. These ridges have often better than 50 feet relief. Basins have been scooped out of the uplands and have since filled with water. A long esker forms the road bed for the first seven miles from Bluefish well location to Jungle Ridge. Occasional sand hills and pot-hole lakes attest to morainal deposition.

Physiography. Bear Rock and Discovery Range are formed from hard resistant pre-Middle Devonian limestones that have been thrust up. The lowlands of the basin are underlain by the softer Upper Devonian and Cretaceous shales and sandstones and by the unconsolidated Tertiary and Recent beds. The Middle Devonian limestones form long ridges on the south and west of Bear Rock and Discovery Range. The Jungle Ridge limestone member of the Fort Creek shales upholds Jungle Ridge.

The scarp face on the northeast side of Bear Rock is maintained by the competent Silurian limestones overlying soft red beds and gypsum. Cliff faces are also maintained in Middle Devonian limestone as the subjacent beds are shaley.

Hoodoo forms are common to the upper Bear Rock formation and the badland topography on the northern part of Bear Rock is carved from upper and lower Bear Rock formation. Glaciated hogbacks and "roches moutonees" are commonest in the unbedded basal Bear Rock formation north of Bear Rock and more rarely in the upper Bear Rock and in the Beavertail. Jointing in the Beavertail and the upper part of the Silurian is responsible for most vertical cliffs. Landslides are common in Tertiary and Cretaceous shales.

The small reef, one mile below Bear Rock, is formed by the

Beavertail limestone pinched up in an anticline, and the riffle two and one half miles below Bear Rock is the fault trace of Jungle Ridge limestone out in the water. On top of Bear Rock a narrow lake lies in an anticlinal valley carved by glacial action out of a small fold in the Silurian. The rejuvenation pattern stamped on the river systems is considered due to a post-glacial uplift of around 300 feet or so since the release of the ice load.

Geography. No new terms were introduced for features in this area and all feature names are taken from previous reports. The new Bluefish well (I_A) is approximately the same site as the old Bluefish well (1) drilled at the mouth of Bluefish Creek.

CHAPTER III

S T R A T I G R A P H Y

General. The Bear Rock - Bluefish area provides a section of strata of age from pre-Silurian to Tertiary. Red-beds and gypsum make up the lowest beds encountered in the area and these are overlain by about 1000 feet of limestones ranging in age from Lower Silurian to Middle Devonian. The Upper Devonian beds are mainly fine clastics and they are unconformably overlain by upper Cretaceous shales and sandstones. The highest beds are continental sands and conglomerates of Tertiary age. Several major disconformities are recorded viz. post-Middle Silurian - pre-Middle Devonian, post Upper Devonian - pre Upper Cretaceous, post Upper Cretaceous - pre Eocene.

The section of strata revealed in this area corresponds closely with the other sections along Discovery Range and differs from the Upper Caroajou sections in lacking most of the Middle Silurian and the upper Bosworth section.

The stratigraphy of the area is best summarized in the following tables. The first is a summary compiled from field data, the second is a summary of the log of Bluefish 1A well. The detailed stratigraphy below the Fort Creek contact is best illustrated by Plate IV accompanying this report.

Summary of Geological Formations (from field notes)

Quaternary	Recent	River silts, gravels, peat	
		Sands with wood fragments	30'
		Laking clays, (blue clay)	50' +/-
	Pleistocene	Glacial boulder clays, esker material, moraine	
Tertiary	Eocene	Sands, clays, gravels and lignite	100' +/-
Upper Cretaceous	East Fork series	Sandstones, etc. (not recognised)	
	Little Bear R. formation ?	Sandstones	400' +/-
	Slater River	Marine shales of Benton age	200' +/-
Lower Cretaceous		Unknown	
Upper Devonian	Bosworth	Marine calcareous ss.	80' +/-
	Fort Creek	Upper shale, sandy	600' +/-
		Jungle Ridge limestone	60'
		Shale member, micaceous	220'
		Kee scarp (not recognised)	
		Lower shale member bituminous at base	615'

Middle Devonian	Beavertail	Brown limestones	60'
	Ramparts ls.	Brown limestones	42'
	Ramparts sh.	Shaley limestones	240'
Devonian or Silurian	Bear Rock	Dolomites, breccia gypsiferous limestone	215' - 295'
Silurian		Thin bedded limestones	598'
Silurian or Ordovician		Red beds and gypsum	170' +/-

Summary of Bluefish Well #A (log)

		Description	Drilling Depth	Thickness
Quaternary	Recent	Unconsolidated	0' - 30'	30'
Tertiary		Gravels and sands	30' - 360'	330'
Cretaceous		Shales and sandstones	360' - 1150'	790'
Upper Devonian	Bosworth	Absent	--- ---	---
	Fort Creek	Upper Fort Creek sandy shales	1150' - 1618'	468'
		Jungle Ridge ls.	1618' - 1780'	162'
		Shale member silty	1780' - 1907'	127'
		Lime member (Kee Scarp)	1907' - 1913'	6'
		Shale member (Kee Scarp)	1913' - 2010'	97'
		Lime member (Kee Scarp)	2010' - 2060'	50'
		Lower Fort Creek shale	2060' - 2535'	475'

Summary of Blueflish Tell LA (Log) cont'd

		Description	Drilling Depth	Thickness
Middle Devonian	Beavertail - Ramparts ls.	Massive limestone	2535' - 2650'	115'
	Ramparts sh.	Argillaceous limestone and shales	2650' - 2910'	260'
Devonian or Silurian	Bear Rock	Dolomitic limestones and gypsum	2910' - 3340'	430'
Silurian		Crystalline porous limestone	3340' - 3539' total depth	199'

Silurian

The scarp face of Bear Mountain reveals 768 feet of beds lying below the Bear Rock formation. These beds were originally included in Kindles' "Bear Mountain" formation but are separated by the writer from the overlying Bear Rock and are placed in the Silurian and correlated with the Franklin Mountain and Saline River formations of Williams.

At the base of Bear Mountain are 175 feet of red and green shales that carry gypsum. Overlying the "red-beds", and making the east scarp, are 598 feet of thin bedded limestones that weather light, are banded and characterize not only Bear Rock scarp but the entire scarp face of the Discovery Range.

The age of the beds making up Bear Mountain are unknown but they are assigned to the following groups. Ordovician or Silurian age is assigned to the "Red-beds", Lower Silurian age is assigned to the thin-bedded limestones, Devonian or Silurian age is assigned to the Bear Rock formation.

Ordovician or Silurian. "Red-beds" S2.

The east side of Bear Rock exposes 175' of red beds in a small

gully near the south end. North along the east face of Bear Rock the red-beds reappear and form a series of reddish terraces along the foot of the cliffs. No measured section was made at the latter place, but around 250 feet of "red-beds" seem to be involved. A section of the "red beds", taken just across the gully from Sta. 144. (Photo), revealed the following lithology:

2'	Shales, thin greenish buff. S3.
16'	Shales, covered.
----	Arbitrarily chosen contact between S3 and S2 conformable and transitional.
6'	Gypsum and greenish shale.
45'	"Red-beds" with white gypsum bands.
30'	Shales greenish and reddish with thin limestone bands.
4½'	Limestones, dark grey, bedded.
7'	Shales, greenish, with thin limestone.
15'	"Red beds" with thin white gypsum bands.
1'	Limestone, thin bedded greenish gypsiferous
18½'	"Red beds" and soft greenish gypsiferous marls.
1½'	Gypsum, white.
13'	"Red-beds" and lenticles of gypsum.
30'	"Red-beds", shales etc. badly covered by talus.
171'	Total measured partial section of "red-beds" S2.

The bottom of the section was not seen and no information was obtained on probable thicknesses or relationships to subjacent formations. The upper contact was arbitrarily drawn at the first occurrence of "red-beds" below the Bear Rock formation. It would be reasonable to include the soft covered interval 16' (supra) with the red-beds, as the bedded limestones do not start below or in this interval. The contact, as drawn, is suitable for mapping purposes but otherwise is not apparent. The overlying beds are conformable and transitional. Gypsiferous shales continue into the overlying beds for another 200 feet, and the greenish and pink coloration, although much lighter, continues to the top of the Silurian section. However, no clean primary gypsum is found in the overlying beds.

The writer correlates this section S2 of "red-beds" with the Silurian S2 section of the Caracajou - Little Bear River Divide area. The sections are not coextensive as the S2 section of the latter area includes some of the overlying dark shales. The "red-beds" section of Bear Rock - Bluefish is correlated with the upper parts of the Saline River formation in the Franklin Mountains. Williams has dated the Saline River formation Cambrian on fossil evidence. However, the "red-beds" of Great Slave Lake have yielded an Ordovician fauna. It would appear that the evaporite basins persisted for a long time. No fossils were found in the "red-beds".

Silurian S3. Franklin Mountain Formation

Overlying the "red beds" at the base of Bear Mountain and underlying the Bear Rock formation capping Bear Mountain are beds 598 feet in thickness, made of thin bedded, light weathering limestones interbedded with shales. The upper part carries more limestone and the shale content increases downward. The beds are well exposed on the scarp face of Bear Mountain and are mapped as Silurian S3 in this report.

A composite section made for Silurian S3 on the scarp face of Bear Rock reveals the following lithology.

---	Bear Rock formation at Sta. 148 not more than 20' above last Silurian beds.
---	Contact of Bear Rock and Silurian S3, unconformable.
14'	Limestone, light grey, fine grained, 4" beds.
9'	Limestone, thin bedded, slatey, grey and green.
8'	Limestone, medium grained, grey.
2'	Limestone, soft shaley and shale.
2½'	Limestone, fine, mottled grey and greenish white underlain by 4" of soft greenish shale.
5½'	Limestone, grey to buff, thick bedded, fine, underlain by 4" of light green soft shale.
28'	Limestone, thick bedded, fine grained, grey to cream.
½'	Shale, light greenish with limestone.
3½'	Limestone, fine grained, light grey.
2'	Limestone, gypsiferous, pink.
1'	Limestone, fine grained, white.
1½'	Limestone, oolitic flaxseed.
7'	Limestone, grey massive jointed with black flecks.
2½'	Dolomite, mottled brown crystalline with black flecks.

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1½'	Anhydrite or dolomite, purple grey, very fine.
3½'	Limestone, lenticular grey mottled.
3'	Limestone, jointed massive, fine grained, white.
5'	Limestone, sandy textured, reddish buff, flaxseed colite band in middle.
3½'	Limestone, fine grained, buff.
1'	Limestone, fine, white weathering, light buff.
1'	Limestone, grey, sandy textured.
2½'	Limestone, gypsiferous, sandy textured, iron stained.
2'	Limestone, dark brown, white weathering with crossbedding.
11'	Limestone, dolomitic, medium grained, light brown, slightly porous with algal growths.
2'	Limestone, mottled, fine grained, white.
2'	Dolomite, shaley, dark brown.
2½'	Limestone, white, fine grained.
1½'	Dolomite, shaley, dark brown.
1½'	Limestone, white, fine grained.
5'	Dolomite, brown, fine grained, rubbly surface.
2'	Dolomite, brown, fine grained, thin bedded.
1'	Limestone, thin bedded, fine white.
4'	Dolomite, fine, brown with paper thin shales ½" to ¼" apart.
2'	Limestone, grey brown.
5'	Limestone, mottled, fine grained, brown, shaley.
6'	Limestone, brown, fractured, vuggy.
3½'	Dolomite, blocky, dark brown, fine.
3½'	Limestone, amorphous looking, with paper thin shales.
7'	Limestone, dolomitic, porous, massive, medium grained, brown.
2'	Limestone, thin bedded, shaley.
4'	Limestone, thick bedded, dark.
3'	Limestone, thin bedded, shaley.
1'	Sandstone, dolomitic, dark brown.
3'	Limestone, thick bedded, dark.
3'	Shale, gypsiferous, light grey, thin bedded, and limestone.
12'	Dolomite, gypsiferous, bedded.
10'	Dolomite, bedded, brown, white weathering.
2'	Limestone, shaley, gypsiferous.
14'	Limestone, massive, yellow weathering, vuggy at top.
1'	Limestone, white, gypsiferous.
8½'	Shale, pink-weathering, dolomitic with gypsum stringers.
4½'	Limestone, blocky weathering, light buff.
1'	Limestone, light buff.
3½'	Dolomite, shaley to slatey, buff.
½'	Shale, pink and green.
1'	Dolomite, blocky, mottled brown and buff.
4½'	Limestone, light colored, blocky, bedded, gypsiferous.
1½'	Shale, limey, gypsiferous grey.
2½'	Limestone, gypsiferous, nodular light colored.
3½'	Limestone, shaley gypsiferous, light colored.
4'	Limestone, blocky, light colored.
4'	Limestone, brown purple, with gypsum nodules at top.
1'	Shale, gypsiferous, grey and limestones.

6½' Limestone, lensing light purple grey.
10' Limestone, blocky bedded, very fine grained, light buff.
2' Limestone, massive, light grey lensing with white inclusions.
3' Limestone, blocky thin bedded.
2' Shales, calcareous, light.
2½' Limestone, fine grained, buff.
½' Shale.
1' Limestone, shaley.
1' Shale, calcareous, hard, light colored.
12' Limestone, shaley, cross-bedded, lensing, grey buff.
½' Gypsum, yellow, shaley.
8' Shales, light colored and shaley limestone.
4' Shales and dolomitic limestone, light buff.
18' Limestone, grey brown dolomitic with thin hard shales.
2½' Dolomite, blocky to laminated, dark.
1½' Shale.
2' Dolomite, blocky.
½' Shale.
1½' Dolomite, platey shaley.
1' Shale.
10' Dolomite, platey to blocky, dark brown.
5' Dolomite, dark grey brown, thick bedded.
5½' Dolomite, brown buff, platey.
1' Shale.
4' Dolomite, grey buff with crumpled paper thin shale.
1' Dolomite, bedded, grey buff, top of lower softer zone.
8' Dolomite and shales, platey with gypsiferous bands.
19' Dolomite, dark platey with 20% grey shale.
1' Dolomite, dark with pseudo-plant-remains.
14' Dolomite, grey bedded with 30% interbedded grey shale.
2' Dolomite, dark with pseudo-plant-markings.
7' Shales, hard slatey dolomitic with thin dolomites.
2' Shales, grey.
½' Dolomite, gypsiferous, light cream buff.
1½' Shale, green with thin light colored gypsiferous dolomite.
1' Shale, green.
6' Dolomite, brown blocky with greenish grey shale.
2' Shale, dark green grey.
½' Shale, gypsiferous, pink buff.
9' Shales, green with 4" beds of dark blocky dolomite.
1' Dolomite, dark grey blocky.
4' Shales, green with 1" beds of blocky dolomite.
1½' Dolomite, grey brown, gypsiferous.
1½' Dolomite, shaley slatey.
1' Dolomite, dark brown, gypsiferous.
4' Shales, green grey to grey, fissile.
½' Dolomite, grey buff brown.
1' Shale, green to dark grey with thin dolomites.
½' Dolomite, dark.
1' Shale, greenish to dark grey.
4' Dolomite, blocky to shaley.
1' Dolomite and shale, lenticular.
1' Dolomite, dark with bedding laminae.
5' Shales, green grey with blocky dolomites.

½'	Dolomite hard with gypsum stringers.
1½'	Dolomites, thin bedded, blocky, grey buff.
1'	Shale, greenish.
3½'	Dolomite, blocky with thin shale and nodules of black gypsum.
4½'	Shale, greenish with thin limestone.
5½'	Dolomite, thin blocky weathering with green shale.
2'	Shale, greenish.
1'	Dolomite, green argillitic.
1'	Shale, green.
1½'	Dolomite, gypsiferous.
1'	Shale, sandy greenish.
2'	Dolomite, silty dark.
1½'	Shale, greenish and thin dolomitic shale.
1'	Limestone, grey dolomitic.
1'	Shale, dolomitic, slatey grey.
2'	Shale, green.
1½'	Dolomite, dark purple with gypsiferous oolites.
2'	Dolomite, dark.
3½'	Shales, greenish with thin dolomites.
1'	Dolomite, grey.
½'	Sandstone, gypsiferous with some black shale.
1'	Dolomite, purple.
1½'	Shale, silty, green grey.
3'	Limestone dolomitic, purple grey, jointed.
4½'	Shales, greenish grey.
1'	Dolomites, silty purple grey with oolitic band.
1½'	Limestone, argillitic with pseudo-plants, 3621.
42'	Shales, green grey becoming calcareous and platey toward the top.
4'	Limestone, purple grey, platey to blocky, fine grained.
2'	Shales, greenish buff, cremulated bedding.
16'	Shales, covered.
—	Contact "red beds" S2 and S3, conformable, arbitrarily chosen.
—	"Red beds" of S2.

The above rather lengthy description is submitted to complement the description of the upper part of the S3 section of Carcajou River - Little Bear River Divide area. Most of the upper part of the section described in detail from the latter area is lacking on Bear Mountain.

The basal contact was arbitrarily drawn at the appearance of "red beds" but is merely a mapping division and is not considered to represent a time break or any major change in depositional conditions. The upper contact is definitely unconformable and on Bear Mountain the basal Bear Rock formation is underlain by a variation of Silurian S3 beds of over 100 feet stratigraphic range. The section above is taken at

a place where Silurian S3 ranges highest stratigraphically on the scarp face. On the northwest part of Bear Mountain the Bear Rock formation lies on the beds about 75' from the top of the section given above.

The writer correlates the Silurian S3 section of the Bear Rock area with the Franklin Mountain formation of Williams (Ref. 4). The Bear Mountain section is correlated with the Silurian S3 of the Carcajou River - Little Bear River Divide area with some of the basal shaley beds of the former included in the Silurian S2 of the "Divide" area and some of the upper cherty beds of the latter, lacking in the Bear Mountain section by previous erosion.

The scarp face of Discovery Range in the Schooner Creek area is the same section of Silurian S3 as the scarp face of Bear Mountain. The Silurian beds lying above the horizon represented by the crest of Discovery Range north of Norman Wells were eroded off in the Bear Mountain area before the Bear Rock formation was laid down. That is, the top of the Silurian on Schooner Creek is around 400' higher stratigraphically than the top of the Silurian at Bear Mountain.

Williams has dated the Franklin Mountain formation as Lower Silurian on fossil evidence. The only fossils collected from Silurian S3 by the writer were algal forms, but Kindle reported a meagre Silurian suite from his "Bear Mountain" formation in beds presumably from the part designated S3 by the writer.

Silurian S3 is not satisfactory for an oil reservoir.

In the Bluefish 1A well the top of the Silurian is believed to have been penetrated at drilling depth 3340 feet. Drilling stopped 199 feet in the Silurian at 3539 feet. The Silurian here was light crystalline porous limestone, suitable as a reservoir horizon and is considered by the writer to belong to the Mount Kindle formation i.e. Middle Silurian

or higher than the Silurian S3 outcropping on Bear Rock.

Devonian or Silurian - Bear Rock formation

The top of Bear Mountain is protected from erosion by a formation 195' to 280' thick known and defined in the Schooner Creek area as the Bear Rock formation by Canol Geologists. The Bear Rock formation mantles the top and three sides of Bear Rock, forms the hills north of Bear Rock and forms the central ridge of the south end of Discovery Range. It weathers to rounded and badland forms and is characterized north of Bear Mountain by much pronounced east west glacial grooving.

There are two distinct divisions of the Bear Rock formation, a lower lensing gypsiferous division and an upper brecciated division.

The basal division is a white weathering, massive, tough, gypsiferous dolomite that is absent on the south end of Bear Rock but appears a short distance back from the southern scarp edge and rapidly thickens to over 60 feet onthe north side of Bear Rock. The hills north of Bear Rock are carved from this zone and its total thickness there may well exceed 100 feet. The basal division shows local bedding but as it usually weathers by spalling the bedding is concealed.

The upper division of the Bear Rock formation on Bear Mountain consists of 175 feet of a breccia of brown dolomitic limestone boulders in a matrix of dolomitic limestone. This is separated from the underlying white basal member by 30 feet of poorly bedded grey dolomite and limestone and from the overlying Ramparts formation by ten feet of bedded limestone and dolomite breccia. The formation lies unconformably on the Silurian and is conformably and transitionally overlain by the Middle Devonian limestone.

The age and origin of this formation is unknown. The writer ascribes a primary origin to the breccia, places the major unconformity at

the base of this formation, and prefers to place it in the early Devonian. The lower gypsiferous division is correlated with the grey gypsum deposits found by Williams on Mount Charles near Great Bear River (Ref. 4, p. 81B) and placed by him in the Lone Mountain formation. This would place the edge of this gypsum basin within the map area, deepening to the northeast.

The upper "breccia" division is correlated with the Bear Rock formation of the Schooner Creek area and of the Carcajou River area. It is correlated with the upper part of the Lone Mountain formation of the Franklin mountains by Kindle (Ref. 2, p. 45) and Williams (Ref. 4, p. 80). The Bear Rock formation is defined as the upper part of the "Bear Mountain formation" above the post-Middle Silurian unconformity. There were no fossils found in this formation.

The formation is considered unsuitable for an oil reservoir although sulphur springs are common at the Ramparts - Bear Rock contact. In the Bluefish well, 430' of Bear Rock was drilled from 2910 to 3340 feet, and a small sulphur water flow was encountered just below the contact at 2927 feet. The section revealed some gypsum in the upper 260 feet of limestone breccia and much anhydrite and shales in the lower 170' of dolomites.

Middle Devonian - Ramparts - Beavertail.

The Middle Devonian of the Bear Rock area consists of the Ramparts shales and limestones overlain by the Beavertail limestone. The Ramparts and Beavertail limestones cannot be distinguished without the aid of fossil evidence. The total thickness of the Middle Devonian is around 350 feet.

The Middle Devonian outcrops along the south and west side of Bear Mountain and on the south flank of the Discovery range. The upper massive Beavertail - Ramparts limestone forms a series of hogbacks west of Bear Mountain where the beds are upturned on the flank of the uplift.

The section of Middle Devonian in the Bear Rock area is similar to the Schooner Creek section in thickness, variations, and faunal horizons except the limestone content is much higher and a deeper water facies is indicated.

A section of the Beavertail - Ramparts limestones shows the following lithology:

---	Shale Fort Creek with 3" bed of argillite at base.
---	Contact Fort Creek - Middle Devonian, conformable.
6'	Limestone, dark grey, thin bedded, slightly rubbly. Suite 3588.
9½'	Limestone, black course rubbly; alternate shale ¼ inch, limestone 1 inch, Suite 3587.
3'	Limestone, with Cladopora, Syringopora, beds 8".
35'	Limestone, massive jointed dark grey brown, Suite 3591.
2'	Limestone, dark grey with ¾" shale parting below.
---	Arbitrarily drawn contact - Beavertail - Ramparts, conformable, based on ¾" shale here.
16'	Limestone, massive brown.
26'	Limestone, massive brown with colonial Cystiphyllum at base, Suite 3602.
2½'	Limestone, dark brown rubbly with Syringopora, Suite 3599, Suite 3596 from here and subjacent beds.
3½'	Limestone, dark grey brown, fractured.
2½'	Limestone, dark brown rubbly. Suites 3597, 3598, arbitrarily drawn contact, Ramparts sh - Ramparts limestone, wholly conformable and transitional.
2½'	Limestone, dark brown, rubbly. Suite 3600.
1½'	Limestone and brown marly shale, rubbly.
4'	Limestone dark, rubbly, Suite 3601.
105'	Covered. (Shaley limestones).
20'	Limestone, shaley bedded, carries Schuchertella, Suite 3603, 3604.
60'	Covered (Shaley limestones).
20'	Limestone, thin bedded blocky, weathering dark with Modiola and Actinoceras.
---	Contact Bear Rock - Ramparts conformable.
---	Bedded Bear Rock breccia.

The above section can be correlated very closely with the Middle Devonian of the Schooner Creek area, and the division of the section into Beavertail, Ramparts limestone, Ramparts shales corresponds in the two areas.

The basal contact is difficult to locate exactly as the beds above and below the contact are similar in lithology. Beds of breccia usually appear close to the top of the Bear Rock formation and serve as a marker

for locating the contact. The contact is apparently conformable. The contact with the overlying Fort Creek shales is also conformable and easy to define. There is probably a time break between the two formations but no erosion interval is indicated.

The writer correlates the Middle Devonian of the Bear Rock area with the Middle Devonian of the Schooner Creek area and with the Middle Devonian of the upper Carcajou areas. These correlations are based on lithology, stratigraphic position and faunal sequences and the beds are considered laterally and vertically coextensive. Detailed correlation with type sections of the Ramparts and Beavertail is not attempted at this stage. The beds are dated Middle Devonian on the strength of the prolific fauna they contain, and an early Middle Devonian fauna is recorded.

An occasional small amount of bituminous matter is found associated with the limestones of the upper part of the Middle Devonian, but porosity is very slight and the horizon in this area is not rated as a good reservoir bed. The porosity of the lower part of the Middle Devonian is destroyed by its shale content.

Fossils collected from the Middle Devonian include the following Suites:

Suite 3596. From Sta. 106 (picture) Ramparts.

Syringopora	Crinoid stems
Atrypa	Blastoid (?)
Favosites	Gastropod
Cladopora	Stromatoporoid

Suite 3626, (Sta. 191), Beavertail

Stromatoporoid

Suite 3575, Sta. 17, Ramparts shale.

Stromatoporoid	Productella
Alveolites	Pachyphyllum
Cladopora	Hederella
Atrypa	
Schuchutella	

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Suite 3607, Sta. 10. Top of Beavertail

Ostracods
Proetus
Gastropod

Suite 3601, Suite 3599, Suite 3622, Beavertail-Ramparts limestone.

Prismatophyllum

Suite 3598, Ramparts.

Heliophyllum

Suite 3630, Sta. 28, Beavertail

Stromatoporoid
Prismatophyllum

Suite 3588, Sta. 104, Beavertail - Ramparts limestone.

Cladopora
Stromatoporoid
Favosites
Cyathophyllum
Crinoid stems
Ostracods
Prismatophyllum

Suite 3581, Sta. 31, Beavertail - Ramparts limestone

Prismatophyllum
Favosites

Suite 3597, Sta. 106, Beavertail.

Cystiphyllum
Ostracods

Suite 3630, Sta. 28, Beavertail

Cystiphyllum
Prismatophyllum
Syringopora
Favosites

Suite 3598, Sta. 104, Ramparts limestone.

Alveolites
Cystiphyllum

Suite 3601, Sta. 108 - 109, Ramparts limestone

Cladopora
Stromatoporoid

Suite 3604, Sta. 119, Ramparts shale.

Acervularia
Cystiphyllum
Stromatoporoid

Suite 3584, Sta. 102, Beavertail.

Prismatophyllum
Cladopora

Suite 3591, Sta. 104, Beavertail.

Stromatoporoid
Cyathophyllum
Alveolites

Suite 3603, Sta. 118, Ramparts shale.

Favosites
Odontocephalus
Productella
Blastoid (?)
Schuchertella
Martinia
Eucomphalus
Bellerophon
Pleurotomaria
Stromatoporoid

Suite 3595, Sta. 105, Beavertail.

Prismatophyllum
Acervularia
Syringopora
Alveolites

Suite 3602, Sta. 115, Beavertail

Cyathophyllum
Stromatoporoid
Syringopora
Proetus

Suite 3574, Sta. 17, Middle Ramparts

Proetus
Atrypa spinosa
Stromatoporoid
Ostracods
Martinia
Pteria

Suite 3600, Sta. 109, Ramparts

Cyroceras

Suite 3578, Basal Ramparts

Modiola
Actinoceras

Suite 3604, Sta. 119, Ramparts

Stromatoporoid
Favosites
Cladopora
Schuchertella
Bederella
Gastropod
Parecyclas
Leptaena
Alveolites

Many other brief suites were collected for local correlation which are not listed above. A brief comparison with the Schooner Creek area shows the following horizons in common:

Upper Beavertail - Syringopora, Proetus

Ramparts limestone - Prismatophyllum colonial Cystiphyllum.

Top of Ramparts shale - Gyroceras.

Ramparts shale - Favosites, Alveolites.

Middle Ramparts shale - Schuchertella, Martinia.

Basal Ramparts shale - Modiola.

The term Beavertail is used for the combined Beavertail - Ramparts limestone of isolated outcrops.

In the Bluefish well the Middle Devonian was penetrated with 115 feet of massive limestone (Beavertail - Ramparts limestone) overlying 260 feet of shaley limestones (Ramparts shale). The upper contact with the Fort Creek shales is placed at 2535 feet drilling depth, and the lower contact with the Bear Rock is placed at 2910 feet. The placement of the lower boundary is made on cuttings samples.

Upper Devonian - Fort Creek formation

No complete section of Fort Creek shales is found exposed in the Bear Rock - Bluefish area. Drilling at Bluefish penetrated 1385 feet thickness of Fort Creek shales from 1150' to 2535' drilling depth, but as the Bosworth sandstone was absent this is not considered a complete section. However, a complete section of Fort Creek would not exceed the figure of 1385 feet by very much. In the Bluefish well the lithology was revealed as follows:

(1150' - 1618') - 468' - Sandy micaceous shales, greenish and limey.

(1618' - 1780') - 162' - Limestone, silty and shaley, Jungle Ridge limestone.

(1780' - 1907') - 127' - Shale, silty and micaceous.

(1907' - 1913') - 6' - Limestone, dark brown, shaley, Kee Scarp Horizon.

(1913' - 2010') - 97' - Shale, dark grey, Kee Scarp Horizon. Carries Buchiola.

(2010' - 2060') - 50' - Limestone, dark brown, shaley and shales, Kee Scarp Horizon.

(2060' - 2535') -475' - Shale dark grey, carries Buchiola. Lower Fort Creek.

The basal portion of the Lower Fort Creek is exposed in several places and reveals an apparently conformable contact with the Middle Devonian. The upper contact is a disconformity overlain by Cretaceous beds that lie on Bosworth sandstone southwest of Bluefish Creek, on Upper Fort Creek shales in the Bluefish well, and on Lower Fort Creek shales just below Bear Rock.

The basal portion of the Lower Fort Creek carries large bituminous nodules in a bituminous silty shale which carries Leiorhynchus, Tentaculites, Conularia, Lingula and Discina. Suites 3589, 3592, 3590.

The Lower Fort Creek is a hard blue-black weathering shale which, in the Bluefish well, carried Buchiola. Two limestone bands at 1907' (6') and at 2010' (50') are considered by the writer to represent the horizon of the Kee Scarp limestones, although in the well they are but poor dark shaley limestones and they were not recognised in the field.

Silt and micaceous content increases in the Upper Fort Creek, and a silty limestone member known as the Jungle Ridge limestone appears at 917' (top) above the base of the Fort Creek shales, at 1618' in the Bluefish well. The Jungle Ridge limestone varies in thickness. On Jungle Ridge itself the limestone is around 200 feet thick, in the Bluefish well the electrolog shows 162 feet of Jungle Ridge limestone, on the north shore of the Mackenzie at Sta. 1 the outcrop reveals only 60 feet of Jungle

Ridge limestone. This member pinches out before it reaches the Canyon Creek area. A sandstone member occurring below the Jungle Ridge limestone on Vermillion Creek is not recognized in the Bear Rock area. The only faunas collected from the Jungle Ridge limestone at Jungle Ridge and Sta. 3 - 1 included a small Athyrid that is unreported from elsewhere. The Jungle Ridge limestone is too much indurated and cemented with calcite to show much porosity but this may be a surface and down dip phenomenon and the horizon may retain a fine porosity at depth. In the latter case this horizon would make an excellent reservoir prospect as the shales enclosing it are sufficient for cap and source.

The upper part of the Fort Creek shales is quite sandy, micaceous and greenish-colored, and with the Jungle Ridge limestone should be included in the Carcajou River series. An incomplete section of 468 feet of these shales above the Jungle Ridge limestone was drilled in the Bluefish Well. The horizon entered at 1150 feet is believed to be less than 250 feet below the Bosworth sandstone contact. It is doubtful if the thickness of these shales under the Bosworth sandstone member, as exposed at Sta. DV3, is more than 800 feet.

The Lower Fort Creek is correlated with the Simpson shale. The Upper Fort Creek is correlated with the Hay River shales.

Upper Devonian - Bosworth Sandstone

The Bosworth sandstone is exposed on the north bank of the Mackenzie about two miles below Bluefish Creek. In the Bluefish area and around Bear Rock the Bosworth is missing by erosion in pre-Upper Cretaceous time.

Only fifty feet of Bosworth is exposed at Sta. DV1 (below Bluefish Creek), and the upper and lower contacts are unknown. The exposure shows a series of thick to thinly-bedded, calcareous, greenish

sandstones and shales carrying a prolific fauna.

The following section was measured between Sta. DV1 and DV2.

---	Glacial drift.
1'	Sandstone, grey platey.
0'6"	Sandstone, grey shaley.
1'	Sandstone, grey, platey.
1'	Shale, grey gypsiferous? very sandy.
3'6"	Sandstone, grey, fine, platey.
3'	Sandstone, grey, shaley to platey, fine, limey with Fenestella, Suite 3646.
0'4"	Sandstone, hard shaley with thin rusty band.
2'	Shale, soft sandy greenish to brown.
2'6"	Sandstone, soft grey with corals, Suites, 3645, 3644, 3643.
3'6"	Sandstone, greenish calcareous, some crossbedding. Suite 3651.
8'	Sandstone, greenish, calcareous, fine, not micaceous, Suite 3647.
2'	Sandstone, 2' beds, greenish limey with iron stain, Suite 3648.
3'	Sandstone, greenish, micaceous, shaley.
0'4"	Sandstone, as below, iron stained.
6'	Sandstone, greenish, micaceous, shaley, limey, Suite 3649.
6'6"	Sandstone as above with carbonaceous shales, Suite 3650.
---	River level.
43'8"	Total measured section exposed.

The Bosworth sandstone at Sta. DV1 is correlated with the Hay River limestone. It is correlated with the Bosworth sandstone of Halfway Islands and with the Bosworth sandstone on the delta of Bosworth Creek. The sandstone is nowhere buried in this area, so is not considered as a potential reservoir.

The following faunal suites were collected from the Bosworth between Sta. DV1 and Sta. DV2.

Suite 3643

Streptelasma
Cladopora

Suite 3647

Actinopteria
Prismatophyllum

Suite 3649

Pleurotomaria	Atrypa
Cyrtospirifer	Bellerophon
Plant remains	Paracyclas
Pecten	Encephalus

Suite 3645

Gastropod	Stropheodonta
Pachyphyllum	Phillipsastrea sp. 1
Streptelasma	Phillipsastrea sp. 2
Nucula	Fenestella
Cladopora	Acervularia
Crinoid stem	Alveolites
Ontaria?	Comularia
Ostracods	

Suite 3651

Pachyphyllum	Stromatoporoid
Prismatophyllum	Gastropod
Strophedonta	Streptelasma
Fenestella	Cladopora
Atrypa	Syringopora
Schizophoria	Cyrtospirifer

Suite 3650

Cyrtospirifer	Pleurotomaria
Acervularia	Paracyclas
Gastropod	

Suite 3648

Chonetes
Cyrtospirifer
Cladopora

The remarkable spread of this coralline fauna into the arenaceous facies of the Hay River limestones implies a very quiet inland sea with almost constant depth over wide areas. This was probably the time of maximum uplift in the Upper Devonian without emergence of this area.

CRETACEOUS

The Cretaceous strata of the Bear Rock - Bluefish area are poorly exposed and exact relationships are confused. These strata are known to lie unconformably on the Devonian with Bosworth sandstone present below Bluefish Creek, but absent at the Bluefish well. The Cretaceous lies

directly on lower Fort Creek shales near Bear Rock itself. The Cretaceous on the north side of the Mackenzie River consists of a basal portion of sandy shales overlain by soft sandstones. The total thickness assigned to the Cretaceous in the Bluefish well is 790' at 360 to 1150 feet drilling depth. The contact of the Cretaceous and overlying Tertiary is assumed to be unconformable.

In the Bluefish well cuttings revealed numerous fish remains in the Cretaceous, and a core from 1100' revealed a considerable microfauna including Haplophragmoides. The only fossils collected in the field represented an Upper Cretaceous - Benton fauna. One zone of the Benton was represented with Watinoceras, Scaphites, Placenticeras, Inoceramus labiatus, Fish remains.

This zone is correlated with the Watinoceras zone of the Kaskapau member of the Smoky River shales in Alberta. The shale beds are correlated with the Slater River shales. The upper sandy beds are assigned on the basis of stratigraphy alone to the Little Bear series of Link. The arbitrary division made by means of well cuttings would give 240 feet to the Slater River shales and 550 feet thickness to the overlying Little Bear sandstone, although the latter figure might include some Tertiary.

It is interesting to note that no Lower Cretaceous was found within the area. This indicates a possible uplift at the end of Lower Cretaceous that caused the removal of the Lower Cretaceous and part of the Upper Devonian.

At several places along the Devonian - Cretaceous contact oil seepages were noted but there were no suitable structures found on the north side of the Mackenzie River to make this horizon worth testing on this side of the river. The possibilities of the stratigraphic "pinch-out" of the Lower Cretaceous sandstones and shales below the Upper Cretaceous shales adds another horizon worth searching for on the south side of the river toward the basin.

TERTIARY

The Tertiary beds of the Bluefish and McKay Mountains creek area are poorly consolidated and unconsolidated gravels, shaley sands and lignites. The total thickness is unknown and in the Bluefish area it is possibly 600 feet thick with a partial section of 330 feet drilled in the Bluefish well from 30 feet to 360 feet drilling depths. The formation slumps badly and the nature of the contact with the underlying Cretaceous is unknown but assumed unconformable.

The beds of Tertiary age around Norman have been assigned Eocene age on the evidence of fossil flora. (Ref. 4, p. 76) and the Tertiary of the Bluefish area and McKay Mountain Creek area is correlated directly with these Eocene beds. On McKay Mountain Creek the gravels show high depositional angles suggesting possible piedmont origin. The pebbles of the conglomerates are chert, quartzite, limestone and sandstones and no gneous pebbles were noted. This is considered sufficient criterion to separate the glacial and Recent Gravels from the Tertiary gravels.

A section made at Sta. 236 on McKay Mountain Creek shows the following lithology:

—	Top of bank.
0'6"	Lignite.
3'	Lignite dirty with thin white clays.
1'	Lignite.
2'6"	Lignite, dirty.
1'	Clay, white.
0'3"	Clay, grey lignitic.
0'4"	Clay, grey white.
2'	Shale, coaly mud.
6'	Shale, coaly mud with white streaks.
12'	Clay, grey sandy shaley.
7'	Shale, grey thick bedded.
0'8"	Sand, yellow fine.
5'	Sand, bedded shaley, grey.
0'1"	Lignite brown.
3'	Sand, crossbedded, truncated by the lignite.
22'6"	Sand, crossbedded, occasional thin lignitic streaks.
0'4"	Gravel, pebbles of quartzite and limestone to 6".

	1'6"	Sand, crossbedded with lignitic material.
	0'2"	Gravel, fine of shale, chert and lignite pebbles.
	4'	Sand, grey, crossbedded with pebbles and plant remains. Is a channel filling in the underlying sand.
	6'	Sand, yellow, crossbedded.
	1'	Gravel, lignite, limestone, chert pebbles, quartzite, ironstone pebbles.
	3'6"	Sand grey, crossbedded with coarser phases.
	2'	Sand as above, channel filling in underlying sand.
	1'	Sand, grey, crossbedded.
1	2'	Conglomerate, pebbles of quartzite, limestone, ironstone and lignite to 1 foot in diameter. Sand matrix.
	5'	Sand, massive, crossbedded, top indurated.
	5'	Sand, grey crossbedded, truncated by above bed.
	3'	Gravels and sand. Pebbles of arkose, chert, limestone, quartzite and lignite. Pebbles to 6".
	4'	Sand.
		Creek level.
104	4"	Total of outcrop section measured.

QUATERNARY

The Glacial drift in the Bear Rock area is Keewatin in origin and includes several eskers and small kame-type hills in the area, as well as ordinary ground moraine. No pre-glacial Pleistocene gravels were noticed. The post-glacial period introduced laking and the south side of the Mackenzie River, from Little Bear River to opposite Fort Norman, is carved from laking "blue" clays and Recent silts. Heavy deposits of peat on the south shore opposite the west tip of Windy Island extend in a slumping ledge, well out over the undercut recent silt deposits.

CHAPTER IV.

S T R U C T U R A L G E O L O G Y

General

Bear Mountain is a large uplift exposing Silurian rocks. It is flanked on the north by an area of gently dipping Bear Rock strata that separates the Mountain from the Discovery Range. On the west and south Bear Mountain is flanked by Devonian beds that dip away from the mountain. East and south of Bear Mountain the Tertiary basin consists of gently dipping unconsolidated strata that bears little reflection of any major structure. On the west of Bear Mountain and southwest of Discovery range lies the Bluefish basin that carries later beds dipping southwest with a few structures that have possibilities as oil traps. These structures are discussed separately.

There seems to be considerable evidence that Bear Rock has been developed by a series of uplifts in the past, and the present structural pattern is a compromise and the consummation of its several uplifts, in late Silurian time, in early Upper Cretaceous time, in late Cretaceous time and in Eocene time and in post-Eocene time. For how long or how many of these times Bear Rock was a topographic or structural high is difficult to estimate, but it shows the reflection of being a structural high since Silurian time and the reflection of being a topographic high since early Upper Cretaceous time. Structures in the Paleozoic rocks are believed to be extant below the gently dipping Tertiary beds.

Tertiary Basin

The Tertiary rocks around Fort Norman dip gently east away from Bear Rock. South of the river on McKay Mountain Creek the Tertiary dips gently to the southwest. Higher angle dips are recorded from the Tertiary on the coarser phases where the piedmont nature of the deposits

is retained. Any small structures determined on the Tertiary probably do not carry to depth, although the regional pattern of an upwarp between MacKay Mountain Creek and Fort Norman, and a syncline between MacKay Mountain Creek and MacKay Mountains would possibly extend to depth. Post Eocene faulting has involved the Tertiary in the Bluefish structure but the effect of this faulting on the Tertiary basin is concealed beneath recent deposits on the south side of the Mackenzie River.

Bear Rock Structure

Bear Rock is an elongate half anticline carrying several minor folds and faults. This half anticline is open to the east, exposing Silurian and is cloaked on the other three sides by flanks of Bear Rock and Middle Devonian limestones.

If considered as a half dome the axis of Bear Mountain runs north and south. If considered as the truncated steeply plunging nose of an easterly plunging anticline then the axis of Bear Rock should run east and west and be projected across the Tertiary basin lying to the east. In the latter case pre Eocene erosion removed the center of some larger anticline which must still exist under the Tertiary mantle. It is not known whether a fault lies immediately east of Bear Rock or not.

Superimposed upon the Bear Rock uplift is an overthrust anticline running through the twin lakes that lie on top of Bear Mountain. This anticline has an axial trend parallel to the trend of the Discovery range. This anticline plunges to the south and to the north making an elongated narrow domal effect. Where the axis of this anticline crosses the west side of the Bear Rock structure intense fracturing and faulting is found in the Beavertail and Bear Rock formations. On the east side of Bear Rock the crest of this anticline becomes faulted [illegible]
The overthrust pattern of the faults and of the [illegible]

from the southwest parallel to the late structural pattern of the Mackenzie Mountains. This anticline reveals early Silurian at the crest and is not considered worthy of oil prospecting.

Along the northwest side of Bear Rock is a strong topographic line that represents the trace of a north-south trending fault which is upthrown on the east side. This trends north to cut off the various oblique ridges of the south end of the Discovery range. This seems to indicate that the Bear Rock structural unit is upthrown relative to the south end of the Discovery range. The throw on this fault is not over 500 feet and seems to die out to the south. Lesser faults of small throw are connected with the flanks of the structure and occur on the crest of Bear Mountain.

Bluefish structure

Drilling of the Bluefish 1A well has revealed the necessity for a structure west of Bluefish Creek and east of Sta. DV1.

At the Bluefish well the top of the Upper Fort Creek was encountered at 1150 feet drilling depth, or approximately 1100 feet below the level of the Mackenzie River. The dips on beds one quarter mile west of here are 24° S W., strike N 145° E. and these beds are stratigraphically higher than those at the Bluefish well. Three quarters of a mile west of this latter outcrop relatively flat lying Bosworth sandstone appears on the surface. Therefore around 1400 ' of stratigraphic displacement is involved in this covered interval of three quarters of a mile. The writer suggests a fault upthrown on the west with the fault trace concealed by the unconsolidated Tertiary involved. If this was a monoclinal fold the Cretaceous beds would probably have some expression on steepening dips. It is anomalous that a fault of this throw should have so little topographic expression but the strike of Bluefish Creek valley may be a

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Jungle Ridge Structure

This structure was best exposed [illegible] The writer can see no evidence for a definite structure [illegible] owing in strike to W type S on the east end of the ridge. [illegible] the possibility of a fault associated with the ridge will be noted on the southwest side to form the ridge. This would in some reflect the swing in strike of Discovery Range itself

Anticlinal Structure between Bear Rock and Bluefish

The most important structure outlined was an anticline striking about N 110° E on the north bank of the Mackenzie River, and best exposed in a small creek two and three quarters miles upstream from the Bluefish location (Sta 9). In this creek a good reversal occurs in Lower Fort Creek shales. Southwest dips of 10° are recorded west of this creek along the river bank Sta. 10 to Bluefish location. Northeast dips of 20° are recorded along the river upstream from Sta. 10 for one quarter of a mile Basal Fort Creek is exposed on the beach about 300 feet above the creek mouth. Both upstream and downstream from this outcrop of bituminous basal Fort Creek are flanks of Fort Creek shales followed by Cretaceous shales. Oil seepages occur at the Devonian-Cretaceous contacts or near the contacts in both cases. This structure seems to have a fairly good axial extent along the bank of the Mackenzie and to be fairly broad, but little is known of its axial trend or behaviour. This structure would be ideal for shallow testing of Beavertail or Bear Rock and a 1000 foot test would encounter the Silurian also.

CHAPTER V

H I S T O R I C A L G E O L O G Y

The Bear Rock area shows special phases of the history of Silurian-Devonian time and adds some new chapters on the history of the Cretaceous.

Silurian

The earliest strata exposed are red beds bearing gypsum, representing a period of scattered saline depositing basins in pre-Silurian time. The saline basins were destroyed by flooding and by Lower Silurian time the seas were depositing thin bedded dolomites with minor amounts of gypsiferous muds (Franklin Mountain formation). The seas became cleaner in Middle Silurian time and heavier beds of clean dolomite (Mount Kindle formation) were laid down. Subsequent erosion after uplift in late Silurian or early Devonian removed most of the Middle Silurian beds. A pronounced bevelling of the Silurian beds took place at this time and Bear Rock area suffered greater erosion than the rest of Discovery range area.

Devonian

A large basin northeast of Bear Rock was formed at the end of Silurian time and thick deposits of gypsiferous limestone were laid down in the Mount Charles area. Further uplift drained these basins and a breccia of limestone and dolomite boulders was laid down before Middle Devonian time. This Bear Rock breccia is not very thick and probably underwent erosion before the succeeding flooding took place.

In Middle Devonian time a widespread flooding of the area was introduced with a fair amount of clastics being laid down with limestones (Ramparts shales). The later Middle Devonian seas were cleaner and massive limestones were laid down. (Beavertail-Ramparts limestones).

Early Upper Devonian seas received a flush of fine clastics and bituminous shales were deposited. (Fort Creek shales). The clastics became coarser and calcareous sands were laid down (Bosworth sandstones). The area was locally quiet and many corals were able to live in the sandy facies. This indicates a favorable depth of water just below wave disturbance level.

The record for late Devonian, Carboniferous, Permian, Triassic, Jurassic is lost by subsequent erosion or non deposition.

Cretaceous

It is not known whether the Lower Cretaceous sea covered the area. If it did then uplift and erosion took place in early Upper Cretaceous. This erosion was sufficient to develop 1000 feet of bevelling on the Upper Devonian beds between Little Bear River and Bear Rock. This seems to be the main beginning of Bear Rock as a structural high. Erosion levelled the area and Upper Cretaceous beds were laid down although Bear Rock itself may have remained as an island. The land continued rising and continental Cretaceous beds were deposited. The uplift continued and some of the continental beds were eroded off before the final uplift and structural deformation in Tertiary time.

Tertiary

In Eocene time thick deposits of piedmont deposits were laid down in the intermontane basins. This was followed by further uplift and faulting and erosion.

The local structures such as overthrust faulting and crumpling developed after Eocene time.

A long period of erosion by the Mackenzie River carved the "low lands of the Mackenzie" out of the later softer sediments leaving the earlier limestones as ridges.

Quaternary

In glacial time the Keewatin ice sheet covered all features and brought sculpturing and moraimal debris. Long ridges were gouged out of the Paleozoic limestones at obtuse angles to the subsequent ridge patterns. Drainage was disrupted by the excess moraimal detritus.

Post glacial laking filled the Mackenzie valley with clays and covered much of the boulder clays.

Disappearance of the ice and uplift caused some incision of the Mackenzie channel and of the local tributaries.

CHAPTER VI

OIL, GAS AND MINERALS

There are several oil seepages along the north beach of the Mackenzie River below Bear Rock. These seepages occur at and near the contact of the Fort Creek shales and Cretaceous shales. The seepages near Sta. 13 consist of small shallow cups of oil in the ice-disrupted shales and clays. The oil dries into the mud and shale as the mud loses its water content. The oil is dark brown, heavy and stains the clays a dark buff brown. There is not sufficient oil present to cause any flowage except when excess rain floats off the accumulated pockets. The seepages below Sta. 4 are similar in nature only the clays seem much more impregnated and free oil was not visible. These seepages occur on the flanks of a small anticline in the Fort Creek shales.

Several localities revealed the presence of bituminous shales at the base of the Fort Creek. Here the bitumen occurs in the shales and in smaller jetty veinlets in the large argillitic nodules associated with the basal horizons. These bituminous shales are seen at Sta. 103 and Sta. 10. A small amount of bitumen is present in the top of the Beavertail-Ramparts limestone at Sta. 103 but the amount is slight and the porosity of the limestone is very small. No gas seeps were noted except on McKay Mountain Creek where marsh gas causes a few bubbles in the quieter eddies of the stream. These probably arise from the Tertiary lignite seams and from the recent beaver work and buried log jams.

Strata suitable for oil reservoir were found at the top of the Silurian in the Bluefish well, where a light crystalline porous dolomite, capped by gypsiferous beds, was encountered. This horizon would be worth exploring higher on structure. There is some porosity at the top of the Bear Rock but a certain amount of gypsum destroys porosity in the breccia

portion. The Beavertail - Ramparts limestone does not show any marked porosity on outcrop.

There is lignite associated with the Tertiary but no commercial seams were noticed and the lignites were very dirty and mixed with sand and shale.

Gypsum of considerable purity occurs associated with the red beds on the scarp face of Bear Mountain. Development of these deposits would not be warranted unless further strip exploration were carried out to determine whether the beds of gypsum continue their thickness in the buried section. The thickest bed of gypsum recorded by the writer was eighteen inches. This is not large enough for commercial development. The gypsum associated with the basal Bear Rock is not clean enough in the area to justify exploitation.

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

Several horizons would make suitable reservoir beds for oil, viz. the top of the Silurian in the Bluefish well, the top of the Bear Rock formation. The top of the Middle Devonian is too tight in outcrop areas but may retain a finer porosity at depth. The Jungle Ridge limestone and Bosworth sandstone are both indurated on outcrop but may retain a certain porosity in some buried areas. The basal Cretaceous sands may be present in parts of the area but are unknown.

Only three structures are worth investigation. The structure in the Fort Creek shales revealed near Sta. 10 is sufficiently large to warrant shallow drilling tests to 1200 feet. A recommended location for such a test is at Sta. 8. A test of 1200 feet would reach the top of the Bear Rock and, if the Bear Rock formation thins over this structure the test would reach the top of the Silurian.

The fault west of Bluefish Creek should be located by means of further seismic work. If this fault is of the magnitude indicated, then the west or upthrow side of the fault should represent a suitable trap out of the Carcajou Mackenzie river basin. Further seismic work should also be done on the south side of the river to locate the extension of this fault as the Cretaceous beds are involved in this structure.

The Jungle Ridge structure is not sufficiently established to justify a drilling test, but since a road has been built into Jungle Ridge, seismic work would be possible. The main possibility provided by Jungle Ridge is the catching of the sandstone member in the Fort Creek shales that lies below the Jungle Ridge limestone on Vermillion Creek. This sandstone member is porous and bituminous on Prohibition Creek. It would make an ideal reservoir and a shallow stratigraphic core test of less than 500 feet at Jungle Ridge

would reveal its presence or otherwise.

A detailed examination of the unconsolidated materials along Bluefish Creek would probably reveal some Tertiary or Upper Cretaceous beds that would ordinarily be overlooked as bedrock. Such an examination would probably reveal the presence of Tertiary much further inland than had been assumed formerly. The strike of Bluefish Creek may be along some contact in the Tertiary. Care would have to be taken in differentiating between Recent and Tertiary gravels and between slumps mixing later debris with the earlier unconsolidated bed rock. This type of work should be preverably undertaken by someone who has had former experience in working with unconsolidated formations.

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APPENDIX

Edmonton, Alberta,
Feb. 9, 1944.

TO: Dr. T. A. Link

RE: Fossil Identification

The attached list is a tentative identification of fossils collected by C. R. Stelck on Assignment No. 1, Bear Rock to Blue Fish Creek.

C. R. Stelck

KH/tm

FOSSIL IDENTIFICATION - BEAR ROCK TO BLUE FISH CREEK

Suite No.	Date	Location	Fossil	Accession No.	Age
3631	June 6-13	2 mi. downstream from P.M.211 Sta. 13, Bear Rock Area	Fish and fish scales	42435	U. Cretaceous
			Inoceramus	42436	"
			Placenticeras ?	42437	"
			Watinoceras	42438	"
			Scaphites	42439	"
			Fish scales	42440	"
			Inoceramus	42441	"
			Scaphites	42442	"
			Watinoceras	42443	"
			Placenticeras	42444	"
3642	June 23	Large nodule between Sta. 14 & 15, Bear Rock Area	Inoceramus labiatus	42445	U. Cretaceous
			Fish scales	42446	"
			Placenticeras	42447	"
			Scaphites	42448	"
3576	June 23	Sta. 13, Bear Rock Area	Inoceramus	42449	U. Cretaceous
3577	May 31	Sta. 2 - 4, Bear Rock Area	Inoceramus	42450	U. Cretaceous
3641	June 23	Sta. 12, Bear Rock Area	Watinoceras	42451	U. Cretaceous
			Inoceramus	42452	"
			Scaphites	42453	"
3576	---	Sta. 13, Bear Rock Area	Fish scales	42454	U. Cretaceous
			Watinoceras	42455	"
3643	June 24	Sta. Dv1 Below Bluefish, Bear Rock Area	Streptelasma	42456	Bosworth
			Cladopora	42457	"
3647	June 24	---------- Bear Rock Area	Actinopteria	42458	----
3653	June 23	Sta. Dv5. Opp. Halfway Island, Bear Rock Area	Atrypa	42459	Bosworth
3653	June 23	Sta. Dv.5 Opp. Halfway Island, Bear Rock Area	Chonetes	42460	Bosworth
			Cyrtospirifer	42461	"
			Strophecdonta	42462	"
			Gastropod	42463	"
			Schizophoria	42464	"
			Martinia	42465	"
			Pleurotomaria	42466	"
			Fenestella	42467	"
			Crinoid column	42468	"
3652	June 25	Sta. Dv.4. Opp. Halfway Island, Bear Rock Area	Cyrtospirifer	42469	Bosworth

Fossil Identification

Suite No.	Date	Location	Fossil	Accession No.	Age
3652	June 25	Sta. Dv.4. Opp. Halfway Island Bear Rock Area	Chonetes	42470	Bosworth
			Productella	42471	"
3649	June 24	Sta. Dv.1, Below Bluefish, Bear Rock Area	Pleurotomaria	42472	Bosworth
			Cyrtospirifer ?	42473	"
			Leaf	42474	"
3651	June 23	Sta. Dv.2 Below Bluefish, Bear Rock Area	Pachyphyllum	42475	Bosworth
			Prismatophyllum	42476	"
			Strophecdonta	42477	"
			Fenestella	42478	"
			Atrypa	42479	"
			Stromatoporoid	42480	"
			Gastropod	42481	"
			Streptelasma	42482	"
			Cladopora	42483	"
			Syringopora	42484	"
			Cyrtospirifer	42485	"
			Schizophoria	42486	"
3650	June 24	Dv. 2 Below Blue-fish, Bear Rock Area	Cyrtospirifer	42487	Bosworth
			Acervularia	42488	"
			Gastropod	42489	"
			Pleurotomaria	42490	"
			Paracyclas	42491	"
3654	June 24	Dv. 6 - Dv. 7 Opp. Halfway Is. Bear Rock Area	Streptelasma	42492	Bosworth
			Cyathophyllum	42493	"
			Cyrtospirifer	42494	"
			Crinoid	42495	"
			Pleurotomaria	42496	"
			Strophecdonta	42497	"
			Leptaena	42498	"
			Acervularia	42499	"
3649	June 24	Dv. 1 Below Bluefish, Bear Rock Area	Gastropod	42500	Bosworth
			Pecten	42501	"
			Cyrtospirifer	42502	"
			Atrypa	42503	"
3655	June 25	Sta. Dv. 9. Mackenzie River	Pelecypod	42504	Bosworth
			Fenestella	42505	"
			Cyrtospirifer	42506	"
			Leiorhynchus	42507	"
			Crinoid	42508	"
			Atrypa	42509	"
			Ontaria	42510	"
			Ostracod ?	42511	"
			Cladopora	52512	"
			Pugnax	52513	"
			Strophecdonta	52514	"

Fossil Identification

Suite No.	Date	Location	Fossil	Accession No.	Age
3645	June 24	Sta. Dv. 1, Below Bluefish, Bear Rock Area	Streptelasma	42515	Bosworth
			Nucula	42516	"
			Strophecdonta	42517	"
			Phillipsastrea	42518	"
			Acervularia	42519	"
			Alveolites	42520	"
			Onteria ?	42521	"
			Gastropod	42522	"
			Pachyphyllum	42523	"
			Cladopora	42524	"
			Crinoid	42525	"
3648	June 24	Sta. Dv. 1 Below Bluefish, Bear Rock Area	Chonetes	42526	Bosworth
			Cyrtospirifer	42527	"
			Cladopora	42528	"
3577	May 31	Sta. 2 - 4, Bear Rock Area	Inoceramus	42529	Cretaceous
			Watinoceras	42530	"
			Scaphites	42531	"
			Placenticeras	42532	"
3656	---	Dv. 12, Mackenzie River	Cyrtospirifer	42533	Bosworth
			Pleurotomaria	42534	"
			Orthoceras	42535	"
			Pecten	42536	"
			Chonetes	42537	"
3650	---	----- ------	Orthoceras	42538	Bosworth
3647	---	----- ------	Prismatophyllum	42539	Bosworth
			Cyathophyllum	42540	"
3576	May 30	Sta. 13, Bear Rock	Placenticeras	42541	Cretaceous
			Scaphites	42542	"
3640	June 23	Between Sta. 14 & 15 Bear Rock Area	Plants	42543	Cretaceous ?
---	---	Sta. 143 ----	Plant fragments	42544	Tertiary
3596	June 2	Sta. 106, Bear Rock Area	Syringopora	42545	Ramparts
			Atrypa	42546	"
			Favosites	42547	"
			Cladopora	42548	"
			Crinoid	42549	"
			Coral	42550	"
			Blastoid ?	42551	"
			Gastropod	42552	"
			Stromatoporoid	42553	"
3592	---	---- Bear Rock Area	Conularia, etc.	42554	Basal Ft. Creek
3590	June 2	Sta. 104, Bear Rock Area	Conularia, etc.	42555	Basal Ft. Creek

Fossil Identification

Suite No.	Date	Location	Fossil	Accession No.	Age
3572	May 31	Sta. 1, Bear Rock Area	Sponge spicules	42556	Fort Creek
			Worm track	42557	"
3626	---	Sta. 191, -------	Stromatoporoid	42558	Beavertail
3575	May 30	Sta. 17, Bear Rock Area	Stromatoporoid	42559	M. Ramparts
			Alveolites	42560	"
			Cladopora	42561	"
			Atrypa	42562	"
			Schuchertella	42563	"
			Productella	42564	"
			Pachyphyllum	42565	"
			Hederella	42566	"
3607	June 4	Sta. 10, Bear Rock Area	Ostrocods	42567	Top of Beaver-
			Trilobite ?	42568	" tail
			Gastropod	42569	"
3606	---	--- Bear Rock Area	Stromatoporoid	42570	Silurian
3601	---	--- Bear Rock Area	Prismatophyllum	42571	Beavertail
3598	---	--- ---	Heliophyllum	42572	--- ?
3579	June 1	--- Bear Rock Area	Algae ?	42573	Silurian
3630 ?	June 1	Sta. 28, Bear Rock Area	Stromatoporoid	42574	Beavertail
			Prismatophyllum	42575	"
3621	---	--- Bear Rock Area	Algae ?	42576	Silurian
			Algae	42577	"
3588	June 2	Sta. 104, Bear Rock Area	Cladopora	42578	Beavertail
			Stromatoporoid	42579	"
			Favosites ?	42580	"
			Cyathophyllum	42581	"
			Brachiopod ?	42582	"
			Crinoid ?	42583	"
			Ostracods	42584	"
			Prismatophyllum	42585	"
3581	---	Sta. 31, Bear Rock Area	Prismatophyllum	42586	Beavertail
			Favosites	42587	"
3597	June 2	Sta. 106, Bear Rock Area	Cystiphyllum	42588	Beavertail
			Ostracod	42589	"
3630	June 1	Sta. 28, Bear Rock Area	Cystiphyllum	42590	Beavertail
			Prismatophyllum	42591	"
			Syringopora	42592	"
			Favosites ?	42593	"

Fossil Identification

Suite No.	Date	Location	Fossil	Accession No.	Age
3605	June 3	Sta. 121, Bear Rock Area	Stromatoporoid	42594	M. Devonian
3598	June 2	Sta. 109 ? Bear Rock Area	Alveolites	42595	M. Devonian
			Cystiphyllum	42596	"
3601	June 2	Sta. 108 - 109 Bear Rock Area	Cladopora	42597	M. Devonian
			Stromatoporoid	42598	"
3606	June 3	Sta. 129, Bear Rock Area	Stromatoporoid	42599	Silurian
			Algae	42600	"
3625	June 9	---- Jungle Ridge	Brachiopods	42601	Jungle Ridge
			Pelecyped	42602	"
3604	June 3	Sta. 119, Bear Rock Area	Acervularia	42603	Ramparts
			Cystiphyllum	42604	"
			Stromatoporoid	42605	"
---?	May 30	Talus at Sta. 36, Bear Rock Area	Gastropod	42606	Basal Ramparts
3584	June 3	Sta. 102, Bear Rock Area	Prismatophyllum	42607	Beavertail
			Cladopora	42608	"
3591	June 2	Sta. 104, Bear Rock Area	Stromatoporoid	42609	Beavertail
			Cyathophyllum	42610	"
			Alveolites	42611	"
3603	June 3	Sta. 118, Bear Rock Area	Favosites	42612	Ramparts
			Odontocephalus	42613	"
			Productella	42614	"
			Blastoid ?	42615	"
			Schuchertella	42616	"
			Martinia	42617	"
			Euomphalus	42618	"
			Bellerophon	42619	"
			Pleurotomaria	42620	"
			Stromatoporoid	42621	"
3593	June 2	Sta. 105, Bear Rock Area	Favosites	42622	Ramparts
3589	June 2	Sta. 104, Bear Rock Area	------?	42623	Beavertail ?
3595	June 2	Sta. 105, Bear Rock Area	Prismatophyllum	42624	Beavertail
			Acervularia	42625	"
			Syringopora	42626	"
			Alveolites	42627	"
3602	June 3	Sta. 115, Bear Rock Area	Cyathophyllum	42628	Beavertail
			Stromatoporoid	42629	"

Fossil Identification

Suite No.	Date	Location	Fossil	Accession No.	Age
3602	June 3	Sta. 115, Bear Rock Area	Syringopora	42630	Beavertail
			Proetus	42631	"
3578	June 1	Sta. 34, Bear Rock Area	Modiola	42632	Basal Ramparts
3574	May 30	Sta. 17, Bear Rock Area	Proetus	42633	M. Ramparts
			Atrypa ?	42634	"
			Stromatoporoid	42635	"
			Ostracods	42636	"
			Martinia	42637	"
			Atrypa	42638	"
			Pteria	42639	"
3598	June 2	Sta. 108 - 109, Bear Rock Area	Pachyphyllum	42640	U. Ramparts
3600	June 1	Sta. 109, Bear Rock Area	Gyroceras	42641	Ramparts
3594	June 2	Sta. 105, Bear Rock Area	Cystiphyllum	42642	U. Ramparts
3630	June 1	Sta. 28, Bear Rock Area	Syringopora	42643	Beavertail
3598	June 2	Sta. 108 - 109, Bear Rock Area	Acervularia	42644	U. Ramparts
3588	June 2	Sta. 104, Bear Rock Area	Stromatoporoid	42645	Beavertail
3599	June 2	Sta. 108 - 109, Bear Rock Area	Prismatophyllum	42646	U. Ramparts
3580	June 1	Sta. 29, Bear Rock Area	Paracyclas	42647	U. Ramparts
3622	June 8	Sta. 174, Bear Rock Area	Prismatophyllum	42648	Beavertail
3595	June 2	Sta. 105, Bear Rock Area	Cladopora	42649	Beavertail
			Cystiphyllum	42650	"
3596	June 2	Sta. 106, Bear Rock Area	Acervularia	42651	U. Ramparts
			Alveolites	42652	"
			Ostracods	42653	"
3625	June 9	Jungle Ridge	Brachiopod	42654	Jungle Ridge
3629	June 1	Sta. 23, Bear Rock	Strombodes ?	42655	Ramparts
3630	June 1	Sta. 28, Bear Rock	Cystiphyllum	42656	Beavertail
3580	May 30	Sta. 29, Bear Rock	Sponge	42657	Beavertail

Fossil Identification

Suite No.	Date	Location	Fossil	Accession No.	Age
3577	May 31	Sta. 2 - 4, Bear Rock Area	Fish scales & Inoceramus	42658	Cretaceous
3593	June 2	Sta. 104, Bear Rock Area	Prismatophyllum	42659	U. Ramparts
			Stromatoporoid	42660	"
3585	June 2	Sta. 103, Bear Rock	Bryozoan	42661	Beavertail
			Cladopora ?	42662	"
3571	May 31	Sta. 1, Bear Rock Area	Cladopora	42663	Jungle Ridge
			Athyris ?	42664	"
3604	June 3	Sta. 119, Bear Rock Area	Stromatoporoid	42665	Ramparts
			Favosites	42666	"
			Cladopora	42667	"
			Schuchertella ?	42668	"
			Gastropod	42669	"
			Paracyclas	42670	"
			Leptaena	42671	"
			Alveolites	42672	"
			Hederella	42673	"
3627	June 10	Sta. 205, Bear Rock Area	Stromatoporoid	42674	Silurian
3628	June 10	Sta. 220, Bear Rock Area	Oolites or Ostracods	42675	Ramparts ?
3574	May 30	Sta. 17, Bear Rock Area	Productella	42676	M. Ramparts
			Ostracod	42677	"
3587	June 2	Sta. 104, Bear Rock Area	Gastropod	42678	Beavertail
			Syringopora	42679	"
			Cladopora	42680	"
			Brachiopods	42681	"
			Stromatoporoid	42682	"
3599	June 2	Sta. 108 - 109, Bear Rock Area	Prismatophyllum	42683	U. Ramparts
			Favosites	42684	"
			Cystiphyllum	42685	"
3586	June 2	Top of Hill. E. of Sta. 104, Bear Rock Area	Stromatoporoid	42686	Beavertail
			Cladopora	42687	"
3583	June 2	Sta. 102, Bear Rock Area	Algae	42688	Beavertail
			Cladopora	42689	"
			Brachiopod	42690	"
			Blastoid	42691	"
			Alveolites	42692	"