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Illustrations

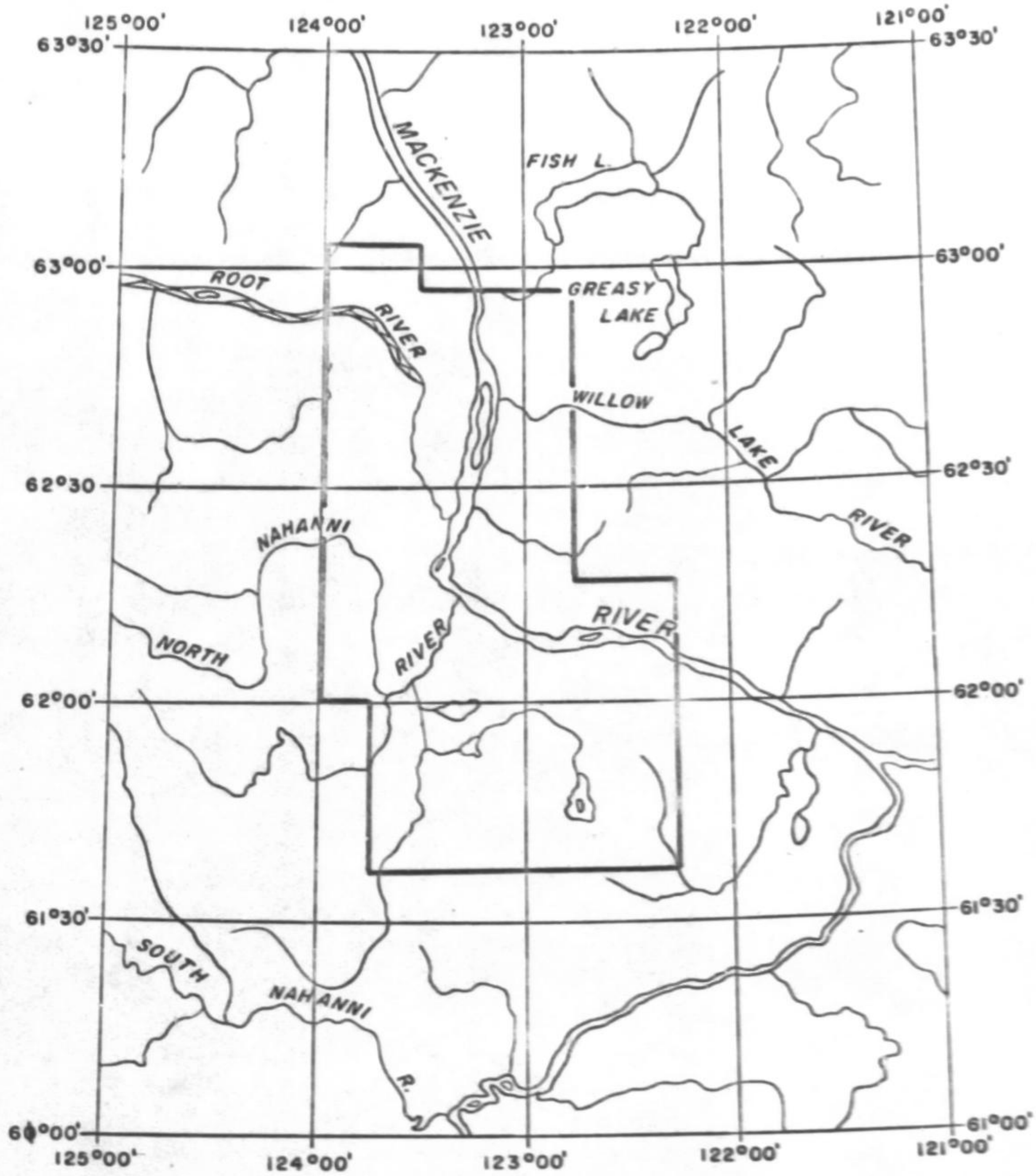

PLATE I

REGIONAL LOCATION

MAP

SCALE: 1" TO 32 MILES

V. ZAY SMITH ASSOCIATES LTD.

Specific references to published and unpublished material in the body of the report are indicated by the author's name followed by the year of publication or preparation. The complete list of references appears in the Selected Bibliography at the end of the report. Well cards obtained from Well Information Services Ltd. and mechanical logs provided some measure of subsurface control.

SUMMARY AND CONCLUSIONS

The Camsell Bend project area embraces three physiographic subdivisions: Franklin Mountains, Mackenzie Plain and Interior Plains. The landscape relates closely to rock structure and lithology It consists of youthful to early mature, stream-dissected plains and folded and faulted mountains that have undergone continental glaciation and are now being eroded intensively.

Sediments exposed in the area range in age from Silurian to Recent, and a maximum composite section would be about 10,000 feet thick. The exposed Paleozoic section is comprised by Silurian, Middle Devonian, Upper Devonian and Carboniferous strata. The sequence consists mainly of marine shale containing marine carbonate and minor amounts of sandstone. The top of the Paleozoic section is marked by a conspicuous unconformity. Rocks of Mesozoic age are not known to be present within the project. A variable thickness of Pleistocene glacial drift and Recent alluvium mantles bedrock in places, especially in the Mackenzie and Interior Plains. Soft Upper Devonian shale containing interbedded carbonates form bedrock throughout the greater part of the Interior Plains and Mackenzie Plain, whereas Middle Devonian and Silurian strata crop out mainly in the Franklin Mountains. Recent interpretation of fossil evidence has suggested that part of the section considered Silurian is actually Ordovician in age.

Two structural provinces are present in the area: the Interior Plains and the Mackenzie Mountain area. The Mackenzie Mountain area forms a north-northwesterly trending, 100 to 150-mile wide structural belt lying between the Interior Plains to the east and the highly disturbed Selwyn Mountains to the west Structures in the Mackenzie Mountains consist mainly of broad to tight folds and high angle longitudinal faults which reflect the basement block control of deformation. The Interior Plains lie between the Precambrian Shield to the east and the Mackenzie Mountain area to the west, and structures appear much more gentle and subdued than those present in the mountains to the west.

Only part of the eastern foreland of the Mackenzie Mountain area is included by the project. The Franklin Mountains and part of the Mackenzie Plain comprise the foreland. The area can be divided roughly into two blocks, each being somewhat similar in structural aspect. The east face of the Nahanni and Camsell Ranges forms the eastern boundary of the west block. The eastern block is pie-shaped, pointing to the south. It's eastern boundary is drawn at the east face of the McConnell Range and along a line projected to the south to the vicinity of Camsell Bend. Because bedrock is mantled by glacial drift and Recent alluvium in the area of the projection of the trend, the structural relationships are not clear. Nevertheless, the two blocks are marked on the east by a high angle thrust fault or zone of intense folding and deformation and accompanied on the west by complex synclines and anticlines. The eastern block is less complex structurally than the western block and shows the gradual easterly decrease in intensity of deformation accompanying the Laramide orogeny.

The Interior Plains occupy most of the eastern part of the project. Upper Devonian shale forms bedrock throughout most of the area and is mantled by extensive deposits of glacial drift at most places. Thus it is extremely difficult to map structure consistently and authoritatively on air photographs. Consequently, many of the structures are defined by geomorphic evidence, and any interpretation based on geomorphic evidence is subject to many hazards.

Potentially productive reservoir beds together with suitable source rocks are present in the stratigraphic section of the Camsell Bend area. It is attractive for oil and gas exploration. The area is relatively unexplored. Only four wells have been drilled in the project and vicinity, and they are shown on the evaluation map.

Only two of the wells, B.A. - Hudson's Bay Trail Creek No. 1 and B.A. - Hudson's Bay Lone Mountain No. 2, reached Middle Devonian and older targets. The other two wells were abandoned in Upper Devonian shale. None of them were located favorably with respect to structure as mapped on the accompanying evaluation map.

Drilling depths are quite practical, and a 5,000 foot deep well should be able to test the section to the base of the Silurian at any location selected within the project.

Several types of structural and stratigraphic traps capable of effecting oil and gas accumulation can be visualized. Obviously, most prospects are located in areas where Upper Devonian shale forms bedrock confining the older, underlying strata to the subsurface. Study of literature dealing with the Camsell Bend area reveals several porous beds present in Middle Devonian and Silurian strata. Fox, et al (1953) discusses in considerable detail the potential of these beds and outlines the significances of observed facies changes. Thus, potential traps are visualized where these target beds are buried beneath Upper Devonian shale and where a structural or stratigraphic closure is effected. Consequently, some prospects can be established directly from photogeology where co-ordinated with subsurface and field stratigraphic and structural information. In the Interior Plains photogeologic leads to structures should be investigated further by structure test mapping or geophysical exploration in order to help confirm or condemn them as oil and gas prospects.

PHYSIOGRAPHY

Three main physiographic subdivisions are included by the Camsell Bend project area: Franklin Mountains, Mackenzie Plain and Interior Plains.

The eastern part of the project includes a small part of the Interior Plains which form a vast area lying between the Precambrian Shield to the east and the Canadian Cordillera to the west. Within the project the Interior Plains stand at elevations ranging from about 500 feet to about 2,000 feet. Bedrock consists mainly of soft Upper Devonian shale. Except where some resistant rock is present, local relief seldom exceeds two hundred feet. The landscape of the Interior Plains consists of a stream-dissected plain that has been subjected to continental glaciation and partly reverted to the youthful stage in the erosion cycle after having reached a mature stage.

The Mackenzie Plain is an elongate, 10 to 50 mile wide valley which extends from the vicinity of Nahanni Butte northerly and northwesterly to the Ramparts River near the Arctic Circle. Generally, the Mackenzie Plain lies between the Franklin Mountains to the east, which border on the Interior Plains, and the Mackenzie Mountains to the west. Within the project area the Mackenzie Plain surrounds the Camsell Range of the Franklin Mountains. The northwesterly flowing Mackenzie River enters the Plain at Camsell Bend and continues within it until it flows into the Interior Plains near the vicinity of the junction of the Mackenzie and Ramparts Rivers. Elevations range from 500 to 2,500 feet. As much as 2,000 feet of relief is apparent locally where streams have eroded deep canyons. Physiographically, the Mackenzie Plain in the Camsell Bend area consists of the relatively flat, featureless Mackenzie River flood plain and a youthful to early mature, stream-dissected, folded and faulted mountain landscape that has been subjected to continental glaciation. The rugged terrain in the Mackenzie Plain is undergoing vigorous erosion.

The Franklin Mountains are made up of a series of linear mountain ranges parallel to and lying within and to the east of the Mackenzie Plain. Within the project area three of the ranges are present: The Nahanni Range to the south, the Camsell Range in the western part, and the southern part of the McConnell Range in the northeast. These ranges are elongate, narrow northerly trending ridges. The ridge crests of the Nahanni and Camsell Ranges stand slightly above 4,000 feet whereas that part of the McConnell Range included by the project stands at an elevation of 2,000 feet. Most of the ridges are asymmetrically shaped, the east flank being the steeper and at most places marked by a thrust fault. The ranges are in the youthful stage of the erosional cycle and are undergoing intensive erosion. Thus, the landscape consists of a stream-dissected youthful tightly to gently folded and faulted mountain region.

The Camsell Bend area has been subjected mainly to continental glaciation, and it occurred near the westernmost limit of the continental ice sheets. Most of the Interior Plains and low-lying parts of the Mackenzie Plain are mantled by glacial drift, which is quite variable in thickness. Numerous drumlins present in some parts of the project show that the last glacial advance was generally in a northwesterly direction. Drumlins and glacial grooves are present in parts of the mountainous areas indicating that some of the ranges were overridden by the ice sheets.

PREPARED FOR

HUDSON'S BAY OIL AND GAS CO. LTD.

BY

V. ZAY SMITH ASSOCIATES, LTD.

MAY, 1960

PLATE I

REGIONAL LOCATION

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V. ZAY SMITH ASSOCIATES LTD

SILURIAN

The Silurian system has been divided into three formations by most geologists who have worked previously in the vicinity of the Camsell Bend project area. Recent interpretation of fossil evidence indicates the possibility that the two lower formations are Ordovician in age (Bell, 1959). However, in this evaluation Silurian (or Ordovician) strata could not be delineated separately from the overlying Middle Devonian series. Consequently the system is mapped together with the Middle Devonian series as an undivided unit and labeled DmS on the evaluation maps. Nevertheless, in parts of the Nahanni, Camsell, and McConnell Ranges a stratigraphic break, labeled SB_D on the evaluation map, was traced and is considered to mark the approximate top of the Silurian system.

Franklin Mountain formation

The name Franklin Mountain formation was applied by Williams (1922) to Lower Silurian green and red sandy shale present in the Franklin Mountains. Williams estimated the thickness of the section to be in excess of 500 feet. Dann (1953) studied the Franklin Mountain formation at Mount Kindle north of the project and measured 812 feet of light grey to red dolomitic, partly argillaceous limestone underlain by 400 feet of covered section, which probably consists of red to brown shaly, dolomitic limestone.

Recently, Bell (1959) presented evidence to suggest that the Franklin Mountain beds are Middle or Lower Ordovician in age.

The Franklin Mountain formation is probably not exposed in the Camsell Bend project area.

Mount Kindle formation

Williams (1922) proposed the name Mount Kindle formation for a section exposed at Mount Kindle. It consists of approximately 500 feet± of grey magnesian coralline limestone. Numerous fossils collected from the formation indicate it to be Middle Silurian in age. However, Bell (1959) asserted that the Mount Kindle fossil suite indicates an Upper Ordovician age.

Dann (1953) measured an incomplete section, 375 feet thick, of the Mount Kindle formation and reported it to be comprised of grey fine to coarse crystalline, fossiliferous, reefoid, vuggy dolomitic limestone. As reported by Fox, et al (1953), Paskevich measured 530 to 559 feet of Mount Kindle formation, and they tentatively correlated the Silurian section that underlies the Upper Silurian Lone Mountain dolomite at Little Doctor Lake with the Mount Kindle formation. Thus, the Mount Kindle formation probably is present at scattered places in the Camsell Bend project. However, it could not be delineated separately and is included in the map unit labeled DmS on the evaluation map.

Lone Mountain formation

The Lone Mountain formation consists mainly of marine light-grey to black, brown dense to porous dolomite. Williams (1922) estimated that the section was about 500 feet thick in the Franklin Mountains. However, Dann (1952) measured 1,650 feet of section at Little Doctor Lake, and Fox et al (1953) reported that Paskevich measured 1,228 feet of Lone Mountain beds near the north end of the Camsell Range.

The upper part of the Lone Mountain formation undergoes a marked lithologic change and this has been noted in the Camsell Range north of the Root River and in the McConnell Range to the east. At these places the upper part of the Lone Mountain formation consists of a vuggy, cavernous gypsiferous dolomite and dolomitic limestone breccia. It is considered by Fox, et al (1953) to correlate with the Bear Rock formation of the Norman Wells area and is referred to by them as the Bear Rock facies. The Lone Mountain formation has been assigned an Upper Silurian age by previous workers on the basis of its stratigraphic position and lithologic character.

Within the Camsell Bend project the Lone Mountain formation is exposed at many places along the Nahanni, Camsell and McConnell Ranges. However, it was included in the map unit labeled DmS on the evaluation map because it could not be everywhere differentiated from the overlying Middle Devonian series. Nevertheless, a stratigraphic break, labeled SB_D on the evaluation map, has been traced at the approximate base of Middle Devonian strata where the breakdown could be made on air photographs. The facies change noted above whereupon the upper part of the Lone Mountain formation becomes a dolomite and limestone breccia is very apparent on air photographs. The section appears quite amorphous, bedding is indistinct, and several sink holes are present.

The Lone Mountain formation is very resistant and provides good dip control at most places on air photographs.

MIDDLE DEVONIAN

Middle Devonian strata exposed in the project consist of marine dark grey to black, light grey-weathering, hard, dense thin bedded to massive, fossiliferous, in part reefoid limestone, dolomitic limestone, and minor dolomite. Williams (1922) estimated the thickness of Middle Devonian limestones to be between 1,000 and 2,000 feet. Fox, et al (1953) measured sections in the Nahanni and Camsell Ranges and reported thicknesses ranging from 960 to 992 feet. They correlated the rocks with the Ramparts formation of the Fort Norman area and the Slave Point, Presqu ile and Pine Point formations of the Great Slave Lake area. In addition, these Middle Devonian limestones probably correlate with the Nahanni formation defined by Hage (1945) in the Nahanni Butte area about 30 miles south of the project.

Middle Devonian strata are exposed in the Nahanni, Camsell and McConnell Ranges and along a ridge in the Interior Plains east and parallel to the southern part of the McConnell Range. The Middle Devonian series is very resistant and forms long linear ridges and mountainous terrain. It provides excellent dip control for structural interpretation. The contact between Middle Devonian carbonate and overlying Upper Devonian shale is quite sharp on air photographs and appears conformable. However, Middle Devonian carbonate and underlying Silurian strata have quite similar photographic characteristics. Consequently, they could not be differentiated everywhere in the project and were mapped together as an undivided unit, labeled DmS on the evaluation map. However, in the Nahanni Range a stratigraphic break, labeled SB_D on the map, was positioned at the base of the Ramparts formation as noted by Dann (1952) at Little Doctor Lake. This stratigraphic break has been traced on air photographs to the north and south along the Nahanni Range.

Regional

The Camsell Bend area involves parts of two structural provinces, -the Interior Plains and the Mackenzie Mountain area, and they correspond closely to the physiographic subdivisions. The Interior Plains lie between the Precambrian Shield to the east and the Mackenzie Mountain area to the west. Structures in the Interior Plains appear much more gentle and subdued than those in the mountains to the west, and they decrease in intensity to the east reflecting the diminishing effects of Laramide orogeny.

The Mackenzie Mountain area forms a north-northwesterly trending, 100 to 150 mile-wide structural belt lying between the Interior Plains to the east and the highly disturbed Selwyn Mountains of the structurally complex Interior System of the Canadian Cordillera. Structures in the Mackenzie Mountains consist mainly of broad to tight folds and high-angle longitudinal faults which reflect the basement block control of deformation. To the south, structures of the Mackenzie Mountain area extend into the Liard Plateau, gradually changing in form and character eventually merging with the structural aspect of the Rocky Mountains and Rocky

Most of these ranges consist of anticlinal structures, faulted on the east flank, or the upturned, westerly dipping, eastern edge of a northerly to northwesterly trending fault block. Many structural complications are present locally within the ranges.

Local

The Camsell Bend project includes only part of the eastern foreland of the Mackenzie Mountain area, the Franklin Mountains, and embraces the northern part of the Nahanni Range, the greater part of the Camsell Range, and the southernmost end of the McConnell Range.

The Nahanni Range consists of a northerly trending, two to four mile wide ridge extending from the southern project boundary northerly to Lone Mountain near the junction of North Nahanni and Mackenzie Rivers. The ridge consists of westerly dipping (at most places ranging from 10° to 45°) Middle Devonian and Silurian carbonates displaying minor folds

Structure in the Camsell Range is more varied and more complex than that in the Nahanni Range simply because the Camsell Range embraces a wider belt of land whose structural aspect can be traced to the south and is present west of the Nahanni Range but excluded from it by geographic definition. The Camsell Range can be divided, in the Carlson Lake area, into roughly three structural subdivisions. The easternmost is formed by a north-northwesterly to northerly trending ridge extending from the vicinity of Mount Camsell northerly to the northern project boundary and beyond. The ridge consists of westerly dipping (ranging from about 10° to 50°) Middle Devonian and Silurian carbonates and Upper Devonian shale and carbonates. The eastern flank of this ridge is marked by a high-angle thrust fault, the Camsell Range fault, which is undoubtedly a continuation of the structural zone marked by the Nahanni Range fault to the south, only developed slightly en echelon to the west of it.

The second structural unit of the Camsell Range consists of a long northerly to northwesterly trending, doubly plunging, syncline.

Thus the structure of the Franklin Mountains contained within the project may consist of parts of two large blocks bounded on the east by major thrust faults and accompanied on the west by synclines and anticlines. The structural complexity within these blocks seems to decrease to the east, marking the gradual easterly decrease in intensity of deformation accompanying the Laramide orogeny. One puzzling aspect of the eastern block is the nature of the structure present to the south of the McConnell Range and on trend with it. In this area several features are shown on the areal geology and structural interpretation map, from north to south: the Berry Island fault, a distinctive alignment, and the Camsell Bend anticline. These structures and features appear to be aligned along the southern extension of the structure of the McConnell Range or are the southern extension of the West Willow Lake River anticline, - an anticlinal, faulted ridge of Middle Devonian and Silurian carbonates located in the Interior Plains about 6 miles east and parallel to the southern end of the McConnell Range. However, the complete structural nature of

Hume (1922) reported the thickness of the Leiorhynchus zone to range between 800 and 1,000 feet and pointed out its basal gradational contact with the underlying Simpson shale. The unit is quite fossiliferous, Leiorhynchids being especially abundant, and these together with the remaining fossil suite allow identification of the zone. Hume also mentioned the presence of a coral reef containing crinoid beds.

Fox, et al (1953) suggested that the type section of the Leiorhynchus zone be 4 miles south of Carlson Lake (Army Camp Lake), and here Dann reported 800± feet of Leiorhynchus zone. As reported by Fox, et al (1953), Paskevich measured a 1,100 foot thick section of the Leiorhynchus zone on a mountain west of Carlson Lake (Army Camp Lake).

The contacts delineating the Leiorhynchus zone, which is labeled D_4 on the evaluation map, were positioned from ground photographs, taken in the area south of Carlson Lake (Army Camp Lake) and provided by Mr. Dann of Hudson's Bay Oil and Gas Company Ltd., and published maps. As pointed out in the discussion dealing with the Simpson shale, a stratigraphic break is present in the Simpson shale, which seems lower in the section than the contact as mapped in the North Nahanni River valley area. To the north the Leiorhynchus zone and the stratigraphic break cannot be separated on air photographs. The section between them appears to become more limy.

The Leiorhynchus zone was delineated separately throughout part of the western part of the project area where it forms bold hogback ridges and caps upland hills. It provides excellent structural dip control. East of the Camsell and Nahanni Ranges it is included with the Upper Devonian undivided map unit. However, in the Root River area a stratigraphic break, labeled SB_4 on the evaluation map, was traced throughout part of the area and is considered to mark the approximate base of the Leiorhynchus zone. At several places in the Interior Plains notes are positioned in areas where the presence of the Leiorhynchus zone has been reported in the literature.

Second shale

The Second shale is a nonresistant section consisting of a lower grey to green-grey fissile shale interbedded with thin red fossiliferous limestone bands overlain by dark purple-red and red shale and red shaly limestone that gradationally overlie the Leiorhynchus zone.

Hume (1922) applied the name Shale Zone #2 to this section and measured 1,000 to 2,100 feet of it in the Root River area. Dann (1953) described 1,475 feet of the section in the Camsell Bend area. Within the project the Second shale is mapped separately in a synclinal belt extending from the vicinity of Carlson Lake (Army Camp Lake) southerly to latitude 62° 00' N. It is labeled D_5 on the evaluation map and provides limited structural dip control on air photographs. To the east everywhere in the Interior Plains it cannot be differentiated on air photographs from adjacent Upper Devonian units and is included in the Upper Devonian undivided map unit. However, in the area near Root River a stratigraphic break, labeled SB_5 on the evaluation map, has been traced at the approximate base of the Second shale.

Athyris angelica zone

Hume (1922) reported about 200 feet of yellowish limestone with some interbedded grey shale exposed in the North Nahanni and Root River areas to which he applied the name Athyris angelica zone, because of the presence of an abundance of the fauna. Dann (1953) described 175+ feet of brown-grey, yellow-weathering dense, thin to medium-bedded, fine-to medium-crystalline, fossiliferous limestone and interbedded shale containing abundant Athyris angelica from exposures in the North Nahanni River valley. This section was assigned to the Athyris angelica zone.

Within the project the Athyris angelica zone, labeled D_6 on the evaluation map, is present at scattered places in the Camsell Range and parts of the Mackenzie Plain where it forms hogback ridges and small plateau-like hills. Because of its resistant nature it provides good structural dip control on air photographs. East of the Camsell and Nahanni Ranges it could not be delineated separately and, where present, it is included with the undivided Upper Devonian map unit. In the area between the Camsell Range and Root River, Hume and Williams (1922) and Fox, et al (1953) report the presence of this zone in front of the Camsell Range fault.

Third shale

The Third shale consists of dark nonresistant fissile unfossiliferous shale overlying the Athyris angelica zone present in the North Nahanni River valley. Hume (1922) reported that its thickness is not greater than 100 feet. Fox, et al (1953) assigned several hundred feet of shale to this unit that is exposed between the Camsell Range and the Root River. Within the project the Third shale could be mapped separately only in the centre of the synclinal structure southeast of Carlson Lake (Army Camp Lake). Conceivably it is present in the southern part of the project below Carboniferous strata. However, it could not be identified on air photographs and if present is included with other Upper Devonian map units.

CARBONIFEROUS

Mattson formation

The name Mattson formation was applied by Patton (1958) to a section exposed in the Jackfish River area of the Northwest Territories about 30 miles south of the project. Patton reported that the section conformably overlies the time equivalent of the lower part of the Mississippian Rundle group and Banff formation and consists of $3{,}734^{+}$ feet of white, light-yellow, yellow-grey, fine-to medium-grained massive cross-bedded quartzitic sandstone with interbedded shale, siltstone, and rare dolomite and coal. The formation is exposed in the Labiche and Liard Ranges and is considered to extend northerly into the southern part of the Camsell Bend area. Patton correlated the Mattson sandstone with the upper part of the Rundle group and Greenrock formation on fossil evidence and suggests that some of the beds at the top may be Pennsylvanian in age.

A section of similar lithology was reported in the Liard Range south of the project by Hage (1945). He pointed out that some of the shale is bituminous and that oil could be distilled from them.

In the Jackfish-Nahanni Butte area south of the project the Mattson formation is underlain by shale considered by Patton to correlate with the lower part of the Rundle group and Banff formation. It is not known if this Mississippian shale is present in the southern part of the Camsell Bend project. If present, it has been included with the Upper Devonian shale. Unless there is an unconformity between Mississippian and Upper Devonian strata in this part of the Northwest Territories, one should expect some Mississippian shale preserved below what is considered equivalent to the Mattson formation in the syncline located in the southern part of the project west of the Nahanni Range. The Mattson formation seems to wedge out to the north and east of the project, where Cretaceous strata rest directly on Upper Devonian shale.

QUATERNARY

Quaternary deposits are composed mainly of Pleistocene glacial drift, Recent alluvium, hillwash and landslide material. The deposits are very variable in thickness and in some places, especially along the Mackenzie River valley and in parts of the Interior Plains, are several hundred feet thick. The logs of wells drilled in the area confirm this impression gained from study of air photographs. The mapping of Quaternary deposits has been kept to a minimum and has been restricted generally to major stream valleys and some low-lying areas in the Interior Plains and the Mackenzie Plain. Throughout much of the Interior Plains bedrock is mantled by extensive deposits of glacial drift which has obscured most morphological expression of bedrock. However, areal relationships suggest that bedrock is comprised mainly of Upper Devonian shale, and it is mapped in this manner.

Most of these ranges consist of anticlinal structures, faulted on the east flank, or the upturned, westerly dipping, eastern edge of a northerly to northwesterly trending fault block. Many structural complications are present locally within the ranges.

Local

The Camsell Bend project includes only part of the eastern foreland of the Mackenzie Mountain area, the Franklin Mountains, and embraces the northern part of the Nahanni Range, the greater part of the Camsell Range, and the southernmost end of the McConnell Range.

The Nahanni Range consists of a northerly trending, two to four mile wide ridge extending from the southern project boundary northerly to Lone Mountain near the junction of North Nahanni and Mackenzie Rivers. The ridge consists of westerly dipping (at most places ranging from 10° to 45°) Middle Devonian and Silurian carbonates displaying minor folds and longitudinal and oblique faults. The eastern face of the Nahanni Range is marked by a northerly trending, high angle thrust fault, -the Nahanni Range fault, which has thrust Middle Devonian and Silurian carbonates upon Upper Devonian shales. The relatively straight surface trace, associated anticlinal folding immediately west of the fault, evidence from minor associated faults, relationship of disturbed strata east of the fault and the structural aspect of the region as a whole clearly indicate the thrust or reverse nature of the fault. Close inspection shows that the fault trace is slightly sinuous. This is attributed mainly to gentle flexing of the fault Plane rather than being evidence for a low-angle fault. Note how the bedding west of the fault and the Nahanni Range itself closely parallels the fault trace. The fault seems to cut across section very gradually, except locally. The Nahanni Range fault could extend north of Lone Mountain beneath the Mackenzie River flood plain, but more likely it probably dies out quickly to the north, with the Camsell Range fault taking over the displacement along the Camsell - Nahanni Range fault trend.

Structure in the Camsell Range is more varied and more complex than that in the Nahanni Range simply because the Camsell Range embraces a wider belt of land whose structural aspect can be traced to the south and is present west of the Nahanni Range but excluded from it by geographic definition. The Camsell Range can be divided, in the Carlson Lake area, into roughly three structural subdivisions. The easternmost is formed by a north-northwesterly to northerly trending ridge extending from the vicinity of Mount Camsell northerly to the northern project boundary and beyond. The ridge consists of westerly dipping (ranging from about 10° to 50°) Middle Devonian and Silurian carbonates and Upper Devonian shale and carbonates. The eastern flank of this ridge is marked by a high-angle thrust fault, the Camsell Range fault, which is undoubtedly a continuation of the structural zone marked by the Nahanni Range fault to the south, only developed slightly en echelon to the west of it.

The second structural unit of the Camsell Range consists of a long northerly to northwesterly trending, doubly plunging, syncline. The eastern part of the Camsell Range forms the eastern flank of the syncline. The westernmost structural unit in the Camsell Range is formed by Army Camp Lake anticline.

Thus the structural aspect of the Camsell and Nahanni Ranges and areas immediately adjacent to the west consists essentially of one continuous structural belt marked on the east by a high angle thrust fault. The belt contains a central syncline which is paralleled on the west by an anticlinal trend, in places asymmetric and giving a sense of motion to the east. Stratigraphic throw along the Camsell and Nahanni Range faults appears to range from about 2,000 feet to as much as 5,000 feet.

Only the southernmost part of the McConnell Range is included by the project. It consists of a narrow north-northeasterly trending ridge extending from near the vicinity of the Junction of Willow Lake and Mackenzie Rivers to the northern project boundary and beyond. Middle Devonian and Silurian carbonates are exposed in the McConnell Range along an anticlinal structure marked on the east flank by a thrust fault. Displacement along this fault appears to be less than that along the Nahanni and Camsell Range faults, and the throw decreases to the south where the fault trace disappears beneath Quaternary deposits along the Mackenzie River valley. The structure in the area west of the McConnell Range, between it and the Camsell Range, resembles somewhat the structural aspect of the Camsell and Nahanni Ranges: -an adjoining syncline and anticlinal structure, the Root River anticline, which may correspond to the Army Camp Lake anticline and adjoining syncline.

Nevertheless, indications of rather intense deformation are suggested by the relatively steep dips observed at places along Willow Lake River and the fact that Williams (1922) observed folded, contorted and metamorphosed Upper Devonian shale in some outcrops along Willow Lake River.

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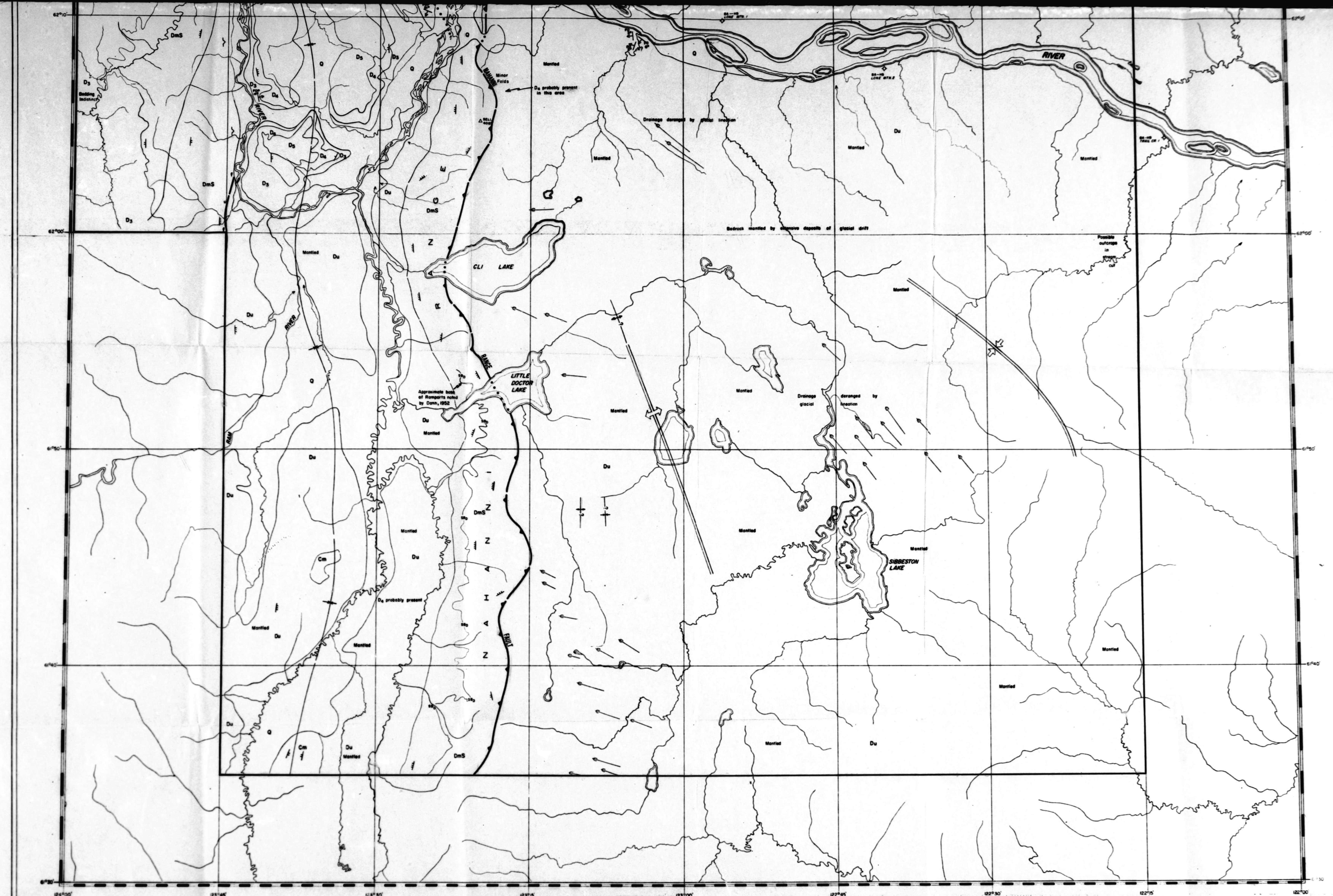


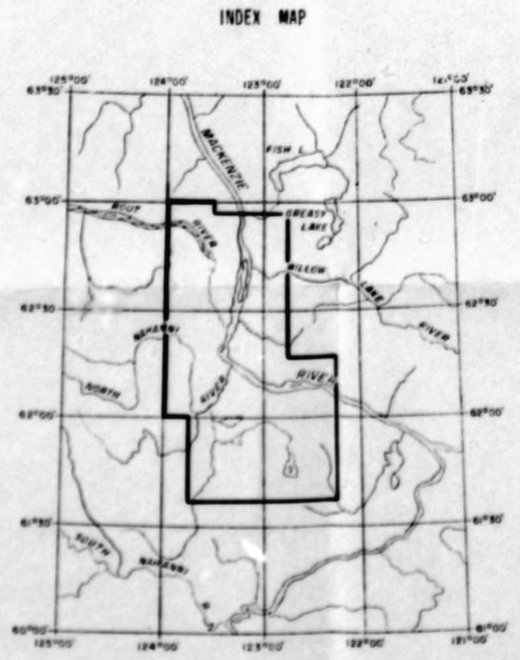
LEGEND

AGE	SYMBOL	FORMATION
QUATERNARY	Q	Recent alluvium, glacial drift, hillwash and landslide material
CARBONIFEROUS	Cm	Mattson
	D7	Third shale
	D6	Athyris angelica zone
UPPER DEVONIAN *	D5	Second shale
	D4	Leiorhynchus zone
	D3	Simpson shale
MIDDLE DEVONIAN and SILURIAN	DmS	Middle Devonian Ramparts and Silurian undivided. top marks approximate base of Middle Devonian.

Du — Upper Devonian undivided. sec marks approximate base of Second shale. sbs marks approximate base of Leiorhynchus zone.

* Upper Devonian terminology adapted from Hume (1922) and Fox et al (1953).

INDEX MAP



GEOLOGICAL SYMBOLS

- Bedding appears horizontal on photographs
- Recognizable dip 1° or less
- Dip group 1, 1° to 3°
- Dip group 2, 3° to 10°
- Dip group 3, 10° to 25°
- Dip group 4, 25° to 45°
- Dip group 5, 45° to nearly vertical
- Bedding appears vertical on photographs
- Overturned bedding
- General dip of beds having subordinate folds
- Dip and strike. Amount of dip cannot be estimated on photographs
- Dip component
- Field observed dip or component
- Field observed published dip
- Photo estimated dip
- PDS Possible dip slope
- SB Strike line of prominent ridge or bedding. Direction of dip cannot be determined on photographs.
- Fracture or joint
- DA Distinctive alignment, possible structural significance
- Fault, dotted where extended through Quaternary deposits
- Fault, position indefinite
- Fault, inferred
- Thrust fault, triangles on thrust sheet
- Trace of bedding in stream cut appears horizontal. May represent flat-lying beds or strike.
- Anticline, Arrow denotes plunge. Diamond denotes approximate position of apex.
- Syncline, Arrow denotes plunge. Break and cross bars denote approximate position of high point.
- Anticline and syncline, position indefinite
- Anticline and syncline, inferred
- Anticline and syncline overturned. Arrows denote direction of dip of limbs and are on side of normal dip.
- Axis of anticline appears to coincide with fault trace
- Axis of syncline appears to coincide with fault trace
- Structural terrace
- Monocline
- Apparent unconformable contact
- Contact, dashed where indefinite
- Contact, inferred
- Key bed
- SB Stratigraphic break
- X Outcrop area
- X? Possible outcrop area
- Prominent scarp or steep slope
- Minor scarp or slope
- Glacial lineation indicating direction of ice movement

GEOMORPHIC SYMBOLS

- Linear stream segment interpreted as strike controlled.
- Linear or curvilinear stream segment interpreted as structurally controlled.
- Anticline and syncline based on geomorphic evidence. Dashed where position indefinite. Arrow indicates direction of plunge.
- Strike and dip interpreted from geomorphic evidence

CULTURAL AND GEOGRAPHICAL SYMBOLS

- Provincial highway
- Improved road
- Unimproved road, main access
- Minor road or trail
- Mine or quarry
- Airstrip
- Triangulation station
- Bench mark
- Town, population 1 - 250
- Town, population 251 - 1000
- Town, population over 1000
- Building
- Group of buildings
- Fence
- Streams
- Braided stream
- Lake or pond
- Intermittent lake or pond
- Depression or sink hole
- Swamp or marsh area (muskeg)
- Well location or drilling well
- Abandoned location
- Oil well
- Abandoned oil well
- Gas well
- Oil and gas well
- Suspended location
- Dry and abandoned test
- Permit acreage

AREAL GEOLOGY AND STRUCTURAL INTERPRETATION MAP OF THE CAMSELL BEND AREA NORTHWEST TERRITORIES

-Prepared by-

V. ZAY SMITH ASSOCIATES LTD.

CALGARY, ALBERTA

SCALE

One inch to two miles

10000 6000 2000 0 10000 20,000 30,000 FEET

2 1 1/2 0 2 4 6 MILES

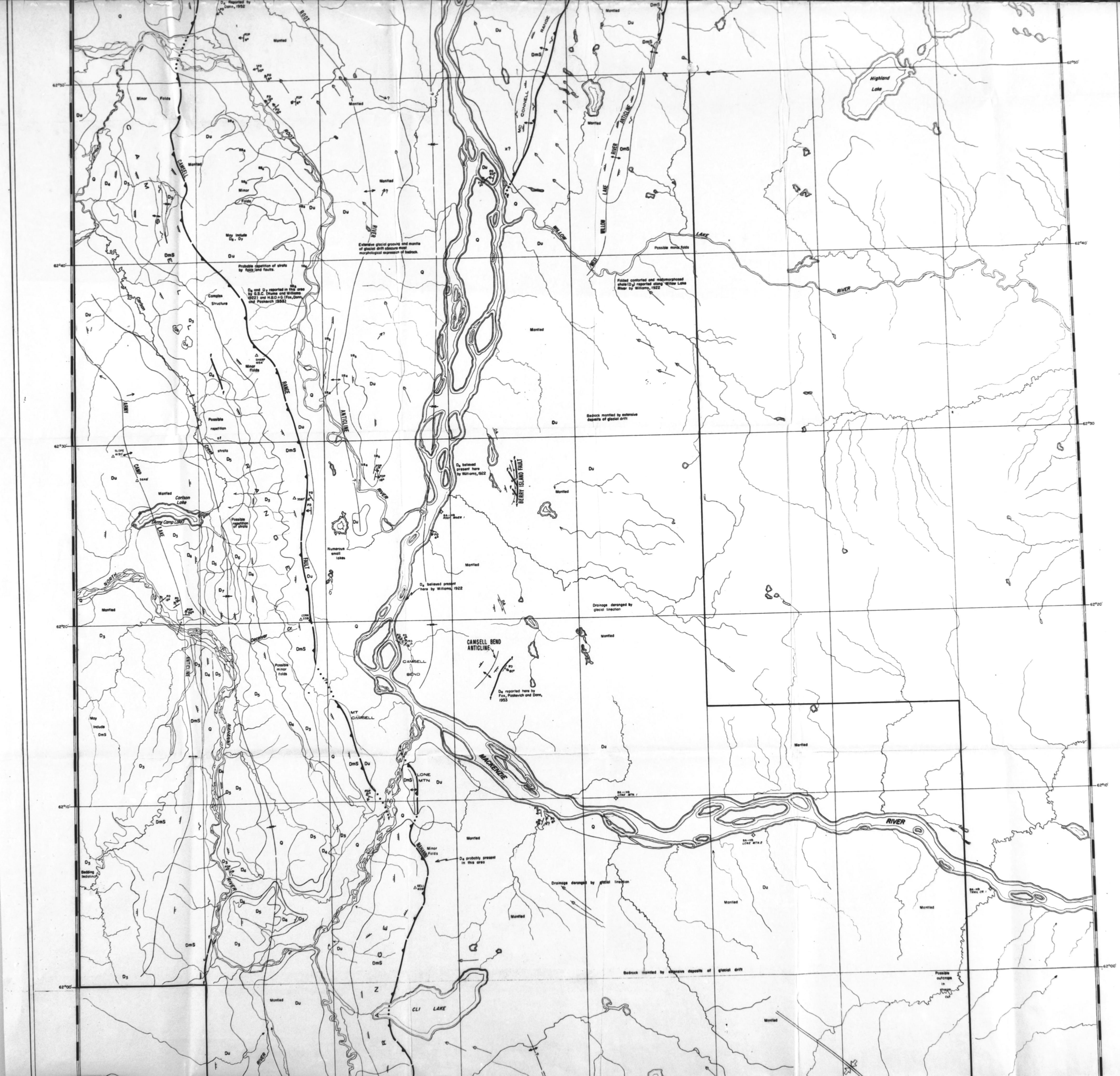
-Prepared for-

HUDSON'S BAY OIL & GAS CO. LTD.

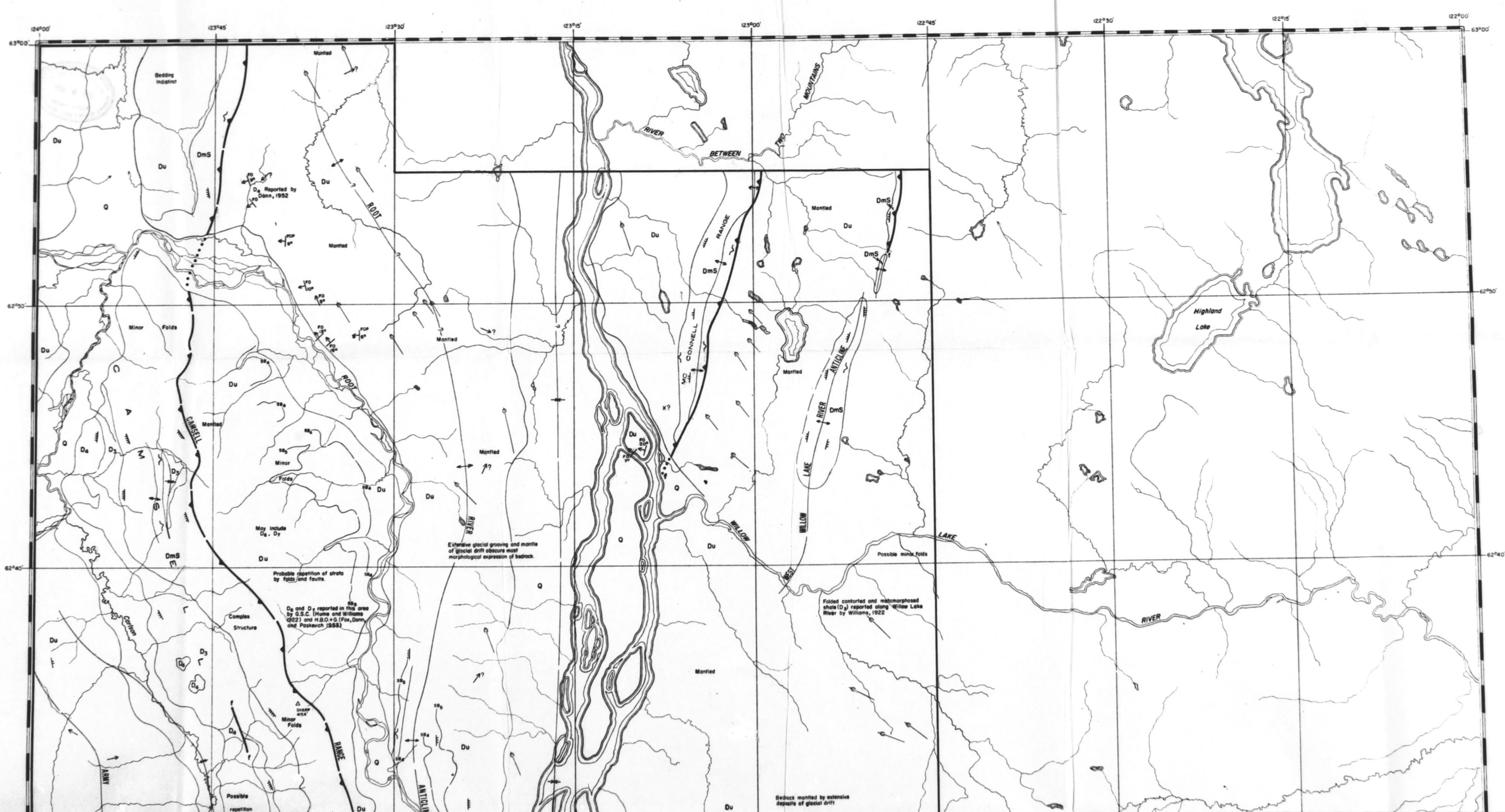
May, 1960

38-1-4-1

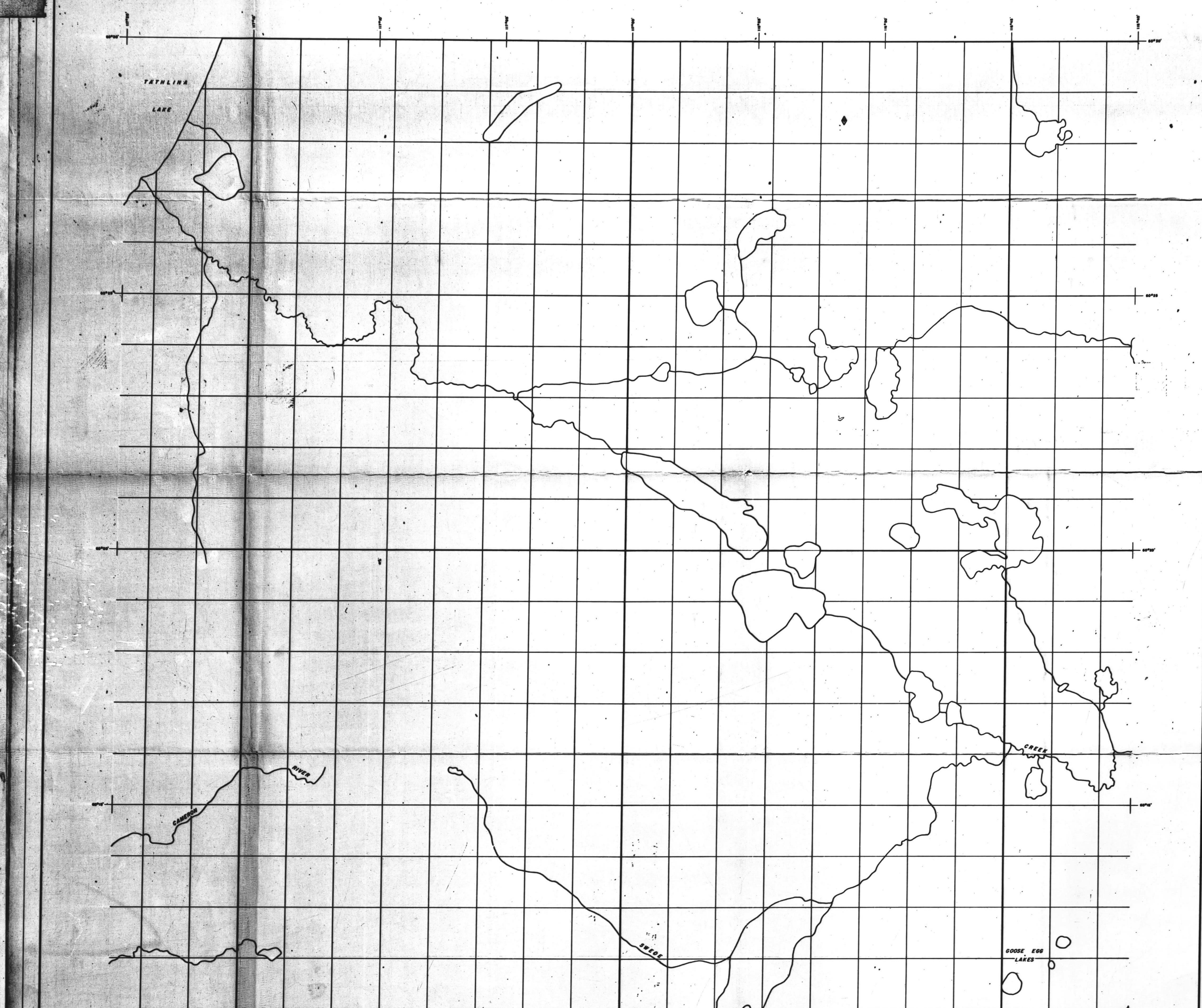
220



Highland Lake
MACKENZIE
RIVER
CAMSELL BEND
ANTICLINE
CAMSELL
BEND
MT CAMSELL
LONE MTN
BERRY ISLAND FAULT
CLI LAKE
Carlson Lake
Drainage deranged by glacial invasion
Bedrock mantled by extensive deposits of glacial drift
Extensive glacial grooving and deposits of glacial drift obscure most morphological expression of bedrock.
Probable repetition of strata by folds and faults
Possible repetition of strata
Numerous small lakes
Minor Folds
Complex Structure
Mantled
Du
DmS
Q



124°00'
123°45'
123°30'
123°15'
123°00'
122°45'
122°30'
122°15'
122°00'
63°00'
62°50'
62°40'
Bedding Indistinct
D₆ Reported by Dann, 1952
Mantled
ROOT RIVER
RIVER BETWEEN TWO MOUNTAINS
MC CONNELL RANGE
CAMSELL RANGE
Minor Folds
May include D₆, D₇
Probable repetition of strata by folds and faults.
D₆ and D₇ reported in this area by G.S.C. (Hume and Williams 1922) and H.B.O.+G. (Fox, Dann, and Paskevich 1953)
Complex Structure
Extensive glacial grooving and mantle of glacial drift obscure most morphological expression of bedrock.
Carlson
ARMY
Possible repetition
ANTICLINE
WILLOW LAKE RIVER ANTICLINE
WEST WILLOW LAKE RIVER
Possible minor folds
Folded contorted and metamorphosed shale (D₃) reported along Willow Lake River by Williams, 1922
Bedrock mantled by extensive deposits of glacial drift
Highland Lake
Du
DmS
Q



PROJECT HISTORY

93-0-8 H/1

DATA ON THIS MAP HAVE BEEN CORRECTED BY:

- O NORMAL UPHOLE
- O CRITICAL DISTANCE
- O TIME INTERCEPT
- O CURVE PATH
- O

CAMERON RIVER	SWEDE CREEK	GRUMBLER
ESK LAKE	STEEN RIVER	JAMES CREEK

INDEX TO MAP SHEETS

Hudson's Bay Oil and Gas Company Limited
EXPLORATION DEPARTMENT
CALGARY ALBERTA

SWEDE CREEK
GEOPHYSICAL MAP

CONTOUR INTERVAL: sec. ('for " '/sec.)
TIME or INTERVAL: sec. THICKNESS or DEPTH: ft.
ELEVATION REFERENCE: ft. VELOCITY: '/sec.
AUTHORS AFFILIATION or MAP SOURCE:

SCALE: 1" = 4,000' AUTHOR: DATE:
FILE No: C-1-A 1176

38-06-04-10

38-06-04-10-1