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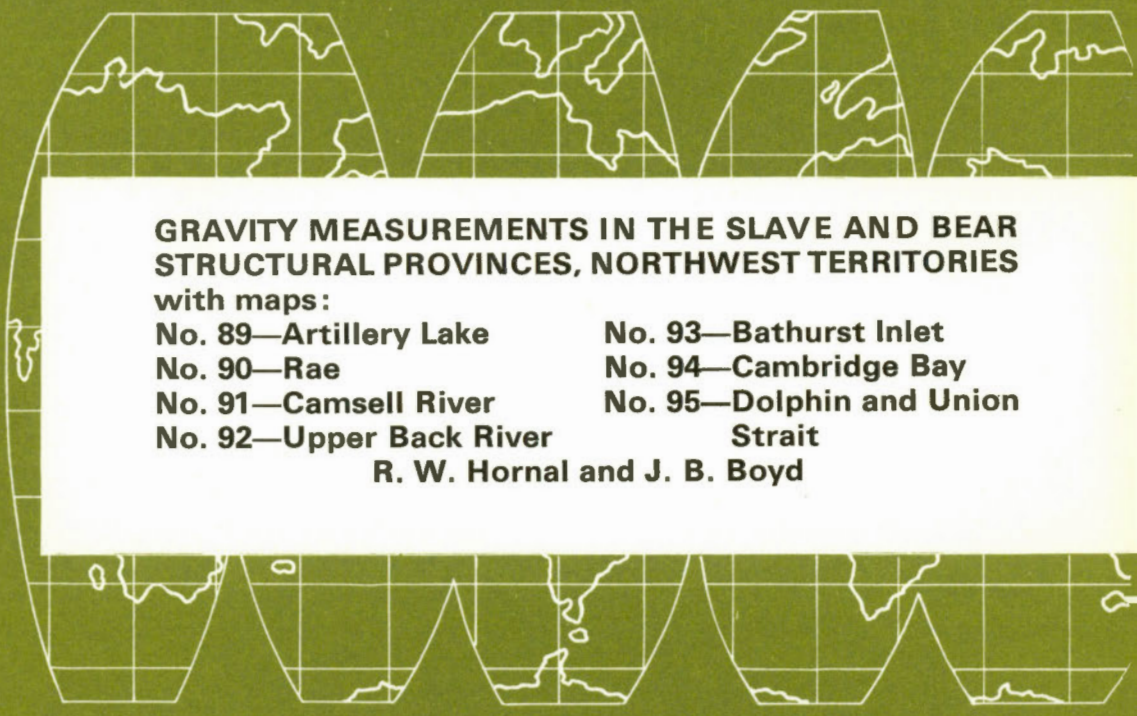

GRAVITY MEASUREMENTS IN THE SLAVE AND BEAR STRUCTURAL PROVINCES, NORTHWEST TERRITORIES

with maps:

No. 89—Artillery Lake
No. 90—Rae
No. 91—Camsell River
No. 92—Upper Back River
No. 93—Bathurst Inlet
No. 94—Cambridge Bay
No. 95—Dolphin and Union Strait

R. W. Hornal and J. B. Boyd

DEPARTMENT OF ENERGY, MINES AND RESOURCES
OTTAWA, CANADA 1972

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ABSTRACT - Some 4,700 gravity observations were used to compile seven Bouguer anomaly maps at a scale of 1:500,000 covering an area of the Canadian Shield bounded by latitudes 62° and 70° N and longitudes 104° and 120° W. An eighth map within these boundaries has previously been published (Hornal, 1968). The area includes the Bear and Slave Structural Provinces and portions of the Churchill Structural Province and the Interior Plains.

Gravity highs occur over the basic volcanics of the Yellowknife Group. A 30 mgal gravity high over the East Arm of Great Slave Lake is associated with basic intrusions beneath or within the sediments of the Great Slave Supergroup. A steep gravity gradient, extending from Artillery Lake to the Western River at the boundary between the Slave and Churchill Structural Provinces, is attributed to a density contrast between basement gneisses in the Churchill Structural Province and a large granite batholith in the Slave Province. A continuation of the Coppermine River High over large areas of western Victoria Island may indicate the northward extension of the basaltic flows of the Coppermine River Group beneath the Paleozoic sediments. Local gravity lows in excess of 20 mgal are underlain by the Dubawnt sandstone and the sandstones of the Parry Bay Formation.

RÉSUMÉ - Environ 4,700 observations gravimétriques ont servi à la compilation de sept cartes des anomalies de Bouguer au 1:500,000 représentant le secteur du Bouclier canadien compris entre les 62° et 70° N de latitude et les 104° et 120° W de longitude. Une huitième carte de cette même région a fait l'objet d'une publication antérieure (Hornal, 1968). Le secteur comprend les provinces structurales de l'Ours et des Esclaves et certaines parties de la province de Churchill et des plaines Intérieures.

Les anomalies positives ont été observées sur les formations volcaniques du groupe de Yellowknife. Une intensité de 30 mgal sur le bras Est du Grand lac des Esclaves est liée aux intrusions basiques reposant sous ou au sein des sédiments du super groupe du Grand lac des Esclaves. Le gradient gravimétrique prononcé qui s'étend du lac Artillery à la rivière Western, le long de la limite entre les provinces des Esclaves et de Churchill, est attribué à une différence de densité entre les gneiss de fond de la province structurale de Churchill et un immense batholite granitique dans la province des Esclaves. Le prolongement de la zone de forte intensité gravimétrique de la rivière Coppermine sur un vaste secteur de l'ouest de l'île Victoria peut indiquer une extension vers le nord des coulées de basalte du groupe de la rivière Coppermine sous les sédiments paléozoïques. Les points isolés de faible intensité excédant 20 mgal reposent sur les grès de Dubawnt et ceux de la formation de Parry Bay.

INTRODUCTION

The Bouguer anomaly maps accompanying this report are the result of a gravity survey conducted in 1966 by members of the Gravity Division, Earth Physics Branch, Department of Energy, Mines and Resources, in an area bounded by latitudes 62° and 70° N and longitudes 104° and 120° W (Figure 1). The area includes eight complete NTS 1:500,000 map sheets one of which, Coppermine, is already published in the Gravity Map Series (Hornal, 1968). The gravity mapping of a small area over the Paleozoic cover rocks south of Great Bear Lake was not completed until 1969 at which time a gravity survey of the Mackenzie Basin was completed (Hornal, Sobczak, Burke and Stephens, 1970).

The purpose of the 1966 survey was threefold; to extend the 8-mile gravity grid over an additional 250,000 square miles in the District of Mackenzie; to investigate the gravity field over the Bear and the Slave geological provinces; and to delineate the extension of the Coppermine River (gravity) High discovered during the 1962 field season (Hornal, 1968). This report includes descriptions of the field techniques, the accuracy of the measurements, and the major gravity anomalies.

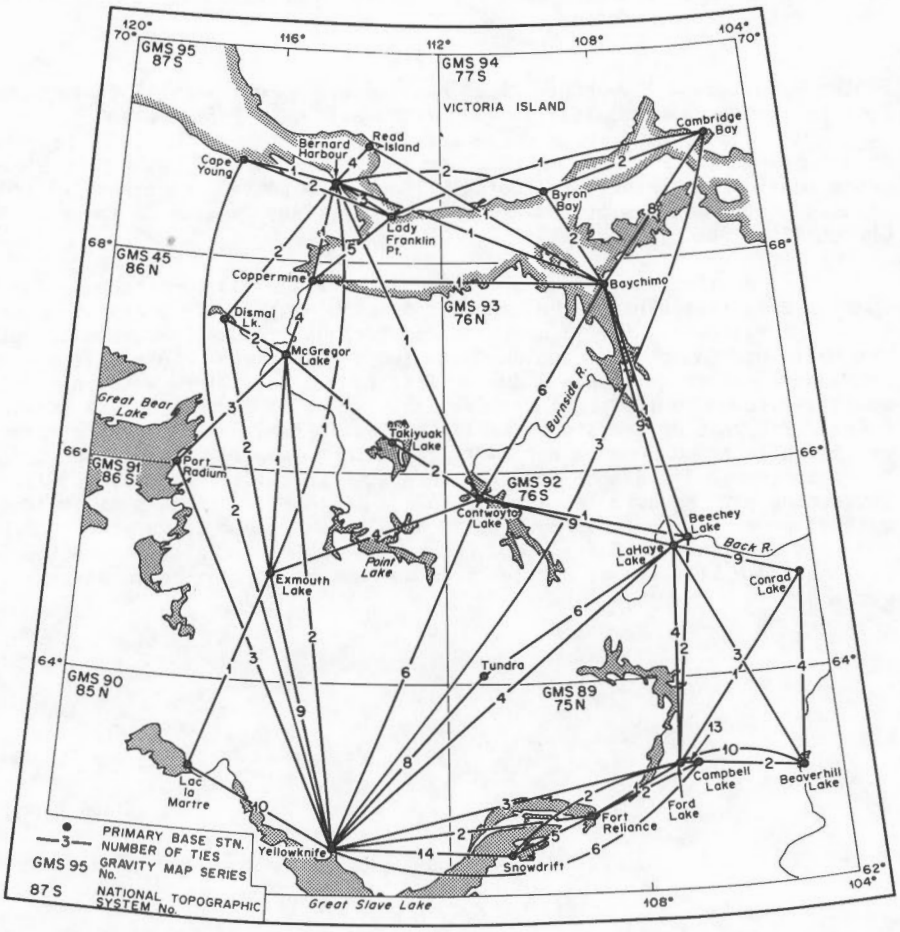

Figure 1. Location map showing gravity base network.

FIELD AND REDUCTION PROCEDURES

Transportation and logistics

Early preparation for the survey included a winter gas caching operation that was carried out in the months of February and March 1966. During that period some 11,000 gallons of aviation gas and related supplies were positioned out of Yellowknife by Bristol freighter aircraft. Sites for the gas caches were tentatively selected by a reconnaissance trip in a Beaver aircraft during the previous summer and confirmed by a later flight during the winter to check ice and surface conditions suitable for the wheel equipped Bristol aircraft. A total of four large caches was established at Exmouth, Contwoyto, Campbell and LaHaye* lakes (Figure 1).

The summer survey was conducted by a crew of twelve men from May 8, 1966 to Sept. 1, 1966. Transportation was provided by two Bell 47G4 helicopters and a DeHavilland Beaver aircraft. Camp moves and additional gas caching during the summer were accomplished using Otter, Bristol, Cessna, Beechcraft and DC3 aircraft, all chartered from Yellowknife as needed.

Weather during the summer was excellent. Of the 188 helicopter days available (94 field days for two helicopters) only 16 days were lost for weather. Another 27 days were lost due to helicopter unserviceability and 16 days were lost waiting for ice to leave Ford Lake and LaHaye Lake. The long hours of daylight experienced during the survey permitted twice the normal number of flying hours using one machine and two crews while the other helicopter was down for repair.

During the summer 4,696 stations were observed, of these 144 were control stations. The majority of the stations are spaced at 7- to 8-mile intervals but extra stations were added in areas of extreme gradients.

Gravity observations

A control network was established consisting of 25 relocatable primary bases (Figure 1) and over 100 secondary control stations located mainly at gas caches. A LaCoste and Romberg gravimeter (G75) was used exclusively for base ties. During the summer the instrument drift was 1.3 mgal but no large tares were recorded. The element of the instrument was kept at a temperature of 51°C by a temperature control unit powered by 12-volt nickel-cadmium batteries. The control network was adjusted by the method of least squares using programs developed by the Gravity Division. After adjustment, the standard deviations of the gravity values for the main base stations were all less than 0.06 mgal.

Worden gravimeters 391, 433 and 540 were used to collect the regional gravity data. All were used without temperature control. Base ties were made at least three times a day. The drift rates were small, usually under 0.1 mgal per hour. Repeated observations at the same station on different days confirm that the observed gravity values for the stations are better than 0.20 mgal.

Elevations and horizontal control

Elevations for most regional gravity stations were computed from Wallace and Tiernan altimeter readings taken concurrently with the gravity readings and then corrected for changes in temperature, humidity and pressure. Water levels are available for Great Slave Lake and Great Bear Lake and the coastal

*LaHaye Lake is not a recognized geographic name but refers to a circular lake about 12 miles west of the south end of Beechey Lake (see Figure 1 and Gravity Map Series 92).

areas. Additional elevation control was provided by the Surveys and Mapping Branch, Department of Energy, Mines and Resources. There are three level lines between Great Slave Lake and the Arctic Ocean, one level line running north-northwest along the Rae River to Bluenose Lake and one level line down the Dubawnt River. Between the level lines there are numerous altimeter measurements and lines of altitude profile recorder measurements and many elevations derived from photogrammetric bridging techniques. Elevations from the last source could only be used as a check but both the APR work and the previous altimeter work agreed very well with the gravity party's altimetry.

On Victoria Island and on the mainland south of Dolphin and Union Strait the elevation control is of poorer quality. It is estimated that the relative error in elevations in this portion of the survey area may reach 40 feet whereas the relative error in the southern sections should be everywhere less than 20 feet. These errors are equivalent to errors of 2.4 mgal and 1.2 mgal in the Bouguer anomalies.

Topographic maps at a scale of 1:250,000 were used for horizontal control where available. On Victoria Island some 1:250,000 sheets had not yet been compiled in 1966 so the positions of these gravity stations were plotted on air-photo mosaics and then transferred to the best available maps. Errors in positioning are believed to be less than $\pm$1,200 feet which is equivalent to an error in Bouguer anomaly values of less than 0.2 mgal.

Terrain corrections have not been applied to the results. Changes in relief are usually not severe except in the vicinity of Port Radium and Bathurst Inlet where hills of 1,000 feet or more are found. Several sample calculations were made and, although a few stations may have corrections as great as 2 mgal, over 99 per cent of the stations would have terrain corrections of much less than 1 mgal.

Bouguer anomalies

Bouguer anomalies were calculated with a density of 2.67 g/cm^3 used for the Bouguer correction term. The values used to contour the accompanying maps are believed to be accurate to $\pm$2 mgal except in the interior of Victoria Island where elevation errors may lead to inaccuracies of up to $\pm$2.5 mgal.

The principal facts for all gravity stations and descriptions of base station locations are available at cost from the Gravity Division, Earth Physics Branch, Department of Energy, Mines and Resources, Ottawa.

GEOLOGY

A much simplified geological map of the region is shown in Figure 2. The area encompasses the exposed rocks of the Bear and Slave (structural) Provinces and portions of the Churchill Province. The boundaries of the provinces are drawn from Stockwell's Tectonic Map of the Canadian Shield (1965).

The Slave Province in the centre of the map-area contains rocks of Archean age. Much of the area is underlain by granitoid rocks of uncertain origin. Within the granitic framework are troughs of steeply dipping volcanic and sedimentary rocks of the Yellowknife Group. The volcanic rocks are mainly greenstones and amphibolites derived from andesitic and basaltic flows. The sediments consist of layers of greywacke, impure quartzite, slate and argillite or the metamorphic equivalents of these rocks. The Archean granites and the Yellowknife Group are overlain by generally unmetamorphosed Aphebian sediments in the East Arm of Great Slave Lake (the Great Slave Supergroup) and to the west of Bathurst Inlet (the Goulbourn Group). These sedimentary basins abut against two large strike slip faults, the MacDonald Fault and the Bathurst Fault.

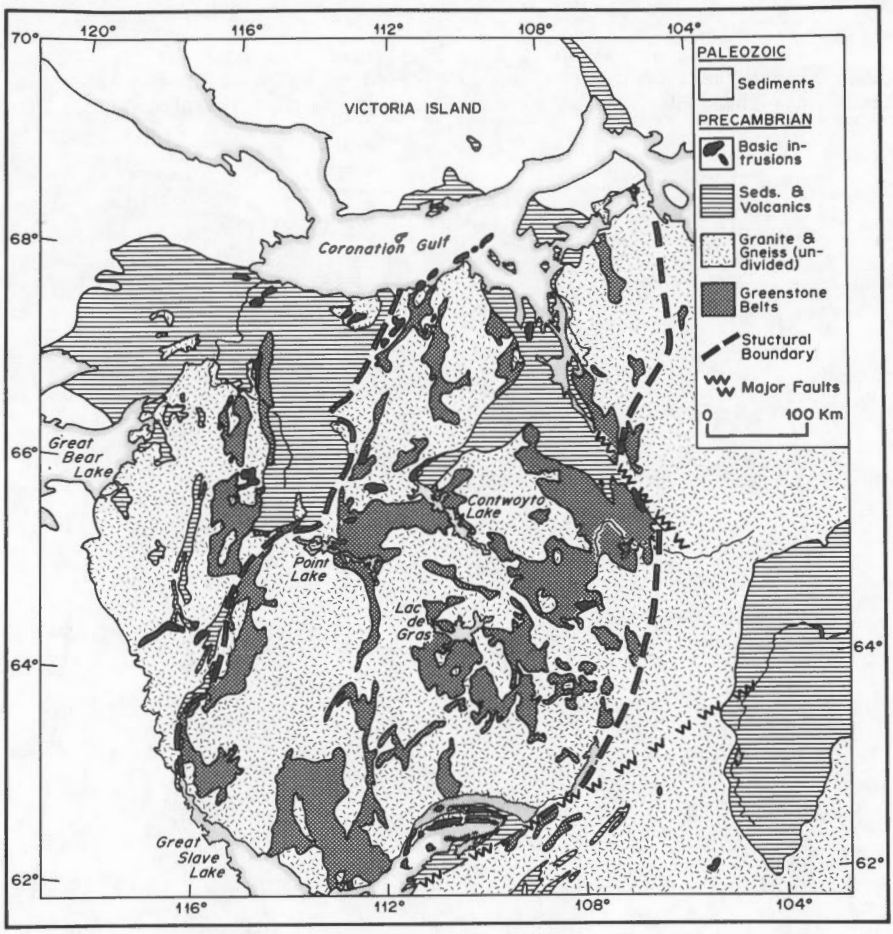

Figure 2. Simplified geological map.

The Bear Province lies to the west and north of the Slave Province. Granites within this province have Proterozoic ages. In the southern part of the province long narrow basins of sediments and volcanics make up the Snare and Balser Lake Groups. South of Coronation Gulf a series of sediments named the Epworth Group lies along the border of the Slave Province. These rocks are Aphebian in age and have been correlated with the Goulburn Group (Fraser and Tremblay, 1969) and the Great Slave Supergroup (Hoffman, 1970). Northeast of Great Bear Lake there is a homoclinal sequence of Helikian and Hadrynian sediments and volcanics that dips gently to the north. This sequence includes the Hornby Bay Group which consists of sandstone and dolomite members, overlain by the Coppermine River Group which consists of a basaltic sequence overlain by sandstones, and a younger group of shales, sandstones and carbonate rocks (Fraser, 1960; Baragar and Donaldson, 1970). The rocks of the Bear Province are covered in the west and north by Lower Paleozoic carbonates and shales.

Rocks of the Churchill Province, which give Aphebian metamorphic ages, lie to the east and south of the Slave Province. Within the map-area they are generally mixed gneisses, granitic rocks and amphibolites (Fraser, 1964; Wright, 1967). In the extreme east these metamorphosed rocks are overlain by the flat-lying Dubawnt sandstone (Donaldson, 1969).

DESCRIPTION OF THE BOUGUER ANOMALY FIELD

The gravity field is shown in a simplified form in Figure 3. In general values higher than -30 mgal may be considered to be positive anomalies and values less than -50 mgal may be considered to be negative anomalies.

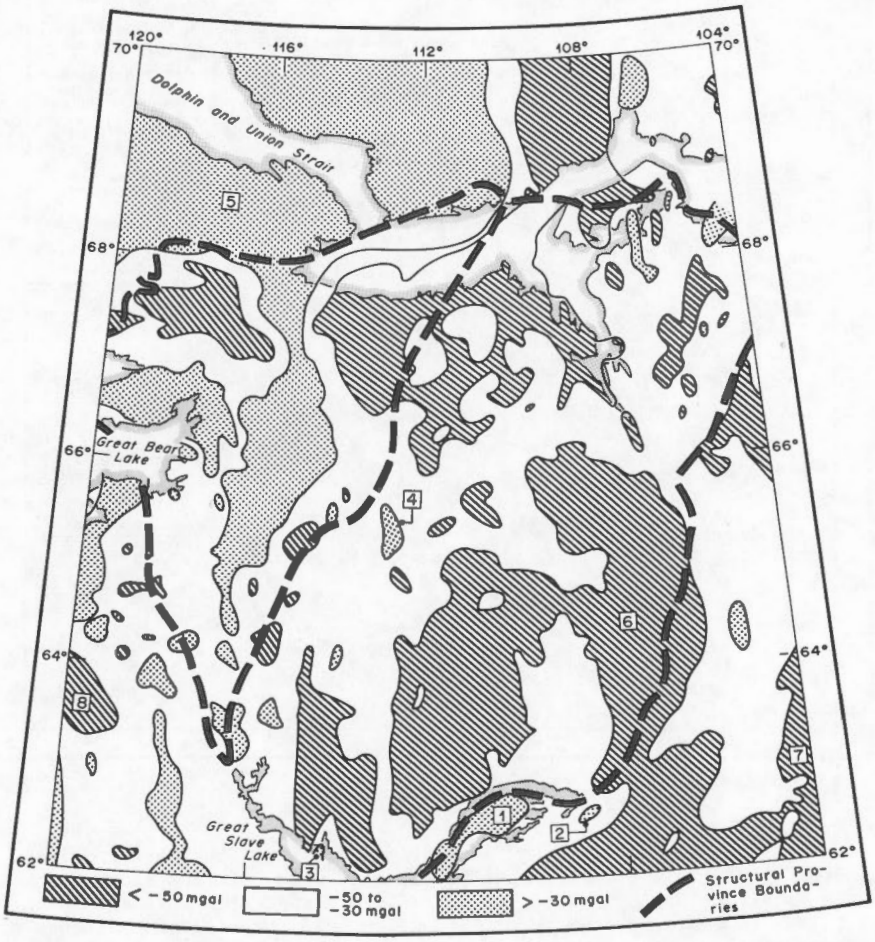

Figure 3. Simplified Bouguer anomaly map. Prominent gravity features mentioned in the text include: 1. Pethei High, 2. Glacier Creek High, 3. Yellowknife High, 4. Point Lake High, 5. Coppermine River High, 6. Artillery-Beechey Lakes Low, 7. Dubawnt Low, and 8. Cartridge Mountains Low.

The Bear Province has generally higher gravity values than the Slave and Churchill Provinces. A large high, the Coppermine River High dominates the northwestern quadrant of the map-area, and a band of higher values extends southward from this high through the middle of the Province. In contrast a large gravity low, the Artillery-Beechey Lakes Low, dominates the gravity field of the Slave Province and low values extend southward into the Churchill Province. Local highs occur over the East Arm of Great Slave Lake and over greenstone belts in the Slave and Bear Provinces. Gravity lows of considerable extent occur over the Dubawnt sandstones and over the granitic rocks in the Bear and Slave Provinces.

In the following sections the relationship between the geology and the gravity anomalies is discussed in more detail.

Artillery Lake (Gravity Map Series 89)

The Pethei High (1, Figure 3) is centred over the Pethei Peninsula in the East Arm of Great Slave Lake. It is about 40 miles wide and 120 miles long and strikes northeast parallel to the trend of the lake. Its maximum value is -14 mgal, about 30 mgal above the regional gravity field. The high lies over the Great Slave Supergroup a sequence of nearly 12.2 km of unmetamorphosed lower Proterozoic sedimentary and volcanic rocks described by Stockwell (1936) and Hoffman (1968, 1969). Overlying and cutting these rocks are sills and moderately dipping dykes of diabase and gabbro, some of which are hundreds of feet thick. The source of the gravity high, centred over these basic rocks, may be the parent body of the dykes and sills.

A second 30 mgal gravity high, the Glacier Creek High (2, Figure 3), lies 15 miles southeast of the settlement of Reliance and south of the MacDonald Fault. It strikes northeast for 50 miles and is 15 miles wide. The anomaly is underlain by a zone of highly metamorphosed Yellowknife Group metavolcanics and paragneisses (GSC Map 1123A, 1968).

The largest gravity low discovered during the survey, the Artillery-Beechey Lakes Low (6, Figure 3), extends from south of Artillery Lake north-northeast to the vicinity of the Western River (see the Upper Back River map-sheet, GMS 92) a distance of 250 miles. It is about 80 miles wide. The low has a maximum amplitude of -50 mgal. The eastern border of the low is marked by a steep gravity gradient of up to 4 mgal/mile that lies over the boundary of the Slave and Churchill Provinces (Stockwell, 1965; Wright, 1967). The western edge of the anomaly has a gentle gradient usually less than 1 mgal/mile. Much of the anomaly is underlain by massive granitic rocks and metasediments and greenstones of the Yellowknife Group (Wright, 1967). The gravity contours are often deflected, and the gradients reduced over the Yellowknife Group rocks but in general these rocks appear to be a thin cover over a large Archean batholith which is in contact with denser Proterozoic gneisses to the east. The position and steepness of the gradient over this contact suggests that the contact must be nearly vertical.

North of the East Arm of Great Slave Lake the anomalies are generally less than -50 mgal over essentially granitic rocks. Local highs of 10 to 15 mgal occur over the basic rocks of the Yellowknife Group south of Camsell Lake and Indian Hill Lake.

Broad gentle lows occur within the Churchill Province south and east of Great Slave Lake over gneissic terrain. At the eastern edge of the map-area over the Dubawnt sandstone, the Dubawnt Low has minimum values of less than -75 mgal (7, Figure 3).

Rae (Gravity Map Series 90)

Within the Slave Province, east of longitude 116° W, the gravity field corresponds well to known geology. The more negative anomalies are centred over areas of granitic rocks whereas the more positive anomalies are underlain by metavolcanics of the Yellowknife Group which outcrop in the vicinity of Yellowknife, the Cameron River, the Beaulieu River and Prang Lake (Moore, Miller and Barnes, 1951; Henderson and Jolliffe, 1941; Henderson and Brown, 1966; Baragar, 1966).

At Yellowknife additional gravity stations were observed in an attempt to delineate the positive anomaly over the Yellowknife Group. This high (3, Figure 3) is underlain by volcanic rocks of the Group, has a steep gradient on its western flank and increases in magnitude from north to south which

suggests that the greenstones lie in a trough with a steeply dipping western margin and that the trough deepens from north to south. The metasediments accompanying the volcanics have little gravity expression.

A large granodioritic batholith (Henderson and Brown, 1966) is associated with a large gravity low which lies west of Yellowknife and extends northward from Great Slave Lake to the upper border of the map-area. Although granitic rocks have been mapped over most of the area between Yellowknife and Marian Lake the gravity contours suggest that there are compositional or structural differences between the granodiorite in the east and the granitic rocks in the western half of this large region.

The gravity field of the Bear Province and the Paleozoic cover rocks west of longitude 116° is generally 20 mgal higher than that of the Slave Province. Barr (1970) reports that the crust under the Bear Province in the vicinity of the Marian River is 3.2 km thinner than the crust under the Slave Province to the east. This change in crustal thickness may be related to the higher level of the Bouguer anomalies in the Bear Province.

The major anomalies observed in the area of Paleozoic cover rocks have been described by Hornal *et al.* (1970). The low values over the Horn Plateau in the vicinity of Willow Lake are probably due to the low density Cretaceous sandstones and shales which constitute the bulk of the rocks underlying the plateau (Douglas and Norris, 1960). The Cartridge Mountains Low in the northeastern corner of the map (8, Figure 3) may also be partially explained by a thickening of the Cretaceous sediments but the magnitude and the gradients of the low suggest that it may be caused by a granitic intrusion in the Precambrian rocks beneath the sediments.

Camsell River (Gravity Map Series 91)

This map-area lies to the southeast of Great Bear Lake and is largely underlain by rocks of the Slave and Bear Provinces except to the west of the Camsell River and Hottah Lake where the Precambrian surface is covered by a veneer of Lower Paleozoic sediments. The boundary between the Slave and Bear Provinces runs north-northeast from Mattberry Lake to the Hepburn River (Stockwell, 1965) and is generally to the east of the -35 mgal contour which runs through the centre of the gravity map.

The gravity field is extremely variable. Values range from -70 mgal in the southeast corner of the map-area to -2 mgal over rocks of the Snare Group west of the Wopmay River. The 20 mgal difference between the average gravity values over the Slave and Bear Provinces discussed above is not as noticeable on this map-sheet. This is probably due to the more complicated surface geology in the area.

The Yellowknife basic volcanics in the Slave Province and the basic volcanics of the Snare Group in the Bear Province are responsible for most of the more positive anomalies. Yellowknife basalts and metabasalts underlie local highs in the vicinity of Beauparlant Lake, Point Lake (4, Figure 3), Redrock Lake, Grenville Lake and Indian Lake.

The gravity lows near Starvation Lake, northwest of Rawalpindi Lake and near Mattberry Lake can be correlated with granitic rocks mapped in the same areas (Fraser, 1958, 1960; Lord, 1942).

The gravity anomalies in the western quarter of the map-area are probably caused by Precambrian structures beneath the thin Paleozoic cover.

Upper Back River (Gravity Map Series 92)

The area is situated south of Bathurst Inlet and north of Artillery Lake. Rocks of the Slave Province lie west of longitude 106° and gneisses and schists of Aphebian age lie between longitude 106° and the eastern border of the map-area (Wright, 1967; Fraser, 1964).

The gravity field, with the exception of the strong gradient along the Slave-Churchill boundary (the Thelon Front), is gently varying. Anomaly values range from -25 mgal to -91 mgal. The large gravity low just to the west of the Slave-Churchill boundary is the northward continuation of the Artillery-Beechey Lakes Low (6, Figure 3).

The western half of the map-area is underlain by granites, quartz monzonites, biotite granites, granodiorites and related rocks. Where these rocks are covered by a veneer of Yellowknife Group sediments the gravity field ranges from -50 mgal to -40 mgal. Where the sediments are absent the gravity field is generally less than -50 mgal.

In the Churchill Province, gneisses, schists and migmatites predominate. The gravity field ranges from -40 mgal to -30 mgal. Values higher than -30 mgal suggest a concentration of dense gneisses, granulites or amphibolites. The higher gravity values correlate well with magnetic highs shown on the aeromagnetic maps of the Geological Survey of Canada (Geophysics Papers, 7859, 7873).

Bathurst Inlet (Gravity Map Series 93)

Gravity values in this area range from -71 mgal over the sandstones of the Parry Bay Formation north of the settlement of Bathurst Inlet to -17 mgal over basic volcanics of the Yellowknife Group about 45 miles east of Baychimo (Fraser, 1964). Again the more positive anomalies (those greater than -40 mgal) are generally associated with rocks of the Yellowknife Group especially the basic greenstones and amphibolites. The gravity data suggest that the thickest sequences of metavolcanics occur south of the Hood River and east of Baychimo. The gravity anomaly just west of Ellice River at latitude 67° 15'N is underlain by a narrow band of amphibolite mapped by Fraser (1964) which lies within the Churchill Province and is surrounded by hornblende and amphibolite gneisses and migmatite. A major gravity low lies within the Bathurst Inlet Fault zone and is associated with the low density sandstone unit of the Proterozoic Parry Bay Formation.

Cambridge Bay (Gravity Map Series 94) and Dolphin and Union Strait (Gravity Map Series 95)

The major gravity high in the survey area, the Coppermine River High (5, Figure 3) is the most prominent feature of the whole area. The Coppermine River High originates just north of the Muskox Intrusion, about 60 miles south of Coppermine on Gravity Map Series 45 (Hornal, 1968) and spreads east and west over the entire area covered by Gravity Map Series 95 and the western third of the area covered by Gravity Map Series 94. Its eastern and southern boundaries are marked by a steep gravity gradient of up to 3 mgal/mile. Its western boundary is not as clearly marked but many of the gravity contours turn northward in the vicinity of Bluenose Lake (Gravity Map Series 95). Its northern boundary is as yet undefined. Values greater than +25 mgal occur on the mainland 15 miles west of Cape Kendall and on Victoria Island 40 miles northeast of Lady Franklin Point. These values contrast with values of less than -60 mgal found just to the east of the gradient on Victoria Island and to the south of the gradient in the Coronation Gulf area and Dismal Lakes area (Gravity Map Series 45).

The gravity high is underlain by generally flat lying Lower Paleozoic dolomitic rocks (Thorsteinsson and Tozer, 1962; Fraser, 1960). The thickness

of the dolomites is unknown in this area but elsewhere on Victoria Island Thorsteinsson and Tozer report up to 2,000 feet of Ordovician and Silurian dolomites. The southern border of the high is underlain by Proterozoic basalt flows of the Coppermine River Series which are at least 10,000 feet thick and dip gently to the north (Fraser, 1960; Baragar, 1969). Proterozoic calcareous and arenaceous sediments up to 15,000 feet thick overlie these basalts on the mainland. Similar Proterozoic sediments outcrop on Victoria Island north of the Richardson Islands. Late Proterozoic gabbroic sills cap islands in Coronation Gulf and occur on the mainland east and west of Coppermine.

Hornal (1968, 1969) attributes the large gravity high to the extension of the Coppermine River basalts northward beneath the sediments on the mainland and on Victoria Island to cover an area of at least 60,000 square miles. He considers that the local gravity highs on Victoria Island and the mainland within the framework of the broader Coppermine River High are indicators of the positions of the igneous centres through which the basalt was extruded. Large thicknesses of basic rock would depress the crust in this region. Such a depression is noted by Wickens and Pec (1968) who studied seismic surface waves between Tucson, Arizona and Mould Bay, Northwest Territories. They found that the base of the crust between Coppermine and Mould Bay had been depressed over 8 km relative to the crust between Yellowknife and Coppermine. They also show a high velocity zone in the upper crust between Mould Bay and Coppermine which may represent the basalt.

Fahrig and Jones (1969) suggest on the basis of isotopic dates and paleomagnetic work that the Coppermine River basalts, the Muskox Intrusion, the Mackenzie dyke swarm, the diabase sheets in the East Arm of Great Slave Lake and other igneous rocks beyond the area described in this paper are all related and that the igneous episodes which formed these intrusive and extrusive rocks about 1,200 million years ago should be referred to as Mackenzie igneous events. Certainly the formation of a basaltic province of more than 60,000 square miles would be one of the largest events in this series.

To the east of the Coppermine River High on Gravity Map Series 94 lies a second band of gravity highs which trends northerly from Hope Bay, through Elu Inlet to Victoria Island north of Wellington Bay. This band can be correlated with Yellowknife Group rocks at Hope Bay and in Elu Inlet (Fraser, 1964). A Precambrian inlier of quartz sandstones is mapped north of Wellington Bay by Thorsteinsson and Tozer (1962) and these may well conceal rocks of the Yellowknife Group. Certainly inspection of this map-sheet suggests that Precambrian rocks continue under the Paleozoic dolomites on Victoria Island and it is likely therefore that the gravity field is controlled by these formations.

A positive anomaly of more than 40 mgal is underlain by amphibolite gneisses in the vicinity of Conolly Bay and Melbourne Island (Fraser, 1964). The trend of this anomaly is northeasterly whereas the anomalies associated with the Yellowknife Group trend generally north. The gradients in the flanks of this anomaly approach 6 mgal/mile which suggests that the source of the anomaly is very near the surface.

SUMMARY

The gravity measurements made in the Bear and Slave geological provinces reveal several large structural features. The Great Slave Supergroup in the East Arm of Great Slave Lake is intruded by sills and dykes which may originate from a basic intrusion that underlies the Supergroup.

The boundary between the Slave and Churchill Provinces is marked by a steep gravity gradient between Artillery Lake and the Western River but is not well defined by the gravity contours east of Bathurst Inlet. The gravity gradient is the result of the change in density between an Archean granite

batholith and dense Proterozoic gneisses. The gravity field in the Bear Province is generally 20 mgal higher than the gravity field in the Slave Province. This may reflect a thinner crust beneath the Bear Province. The Coppermine River High is related to a Proterozoic basaltic province which extends over an area of at least 60,000 square miles in the northwest quarter of the map-area.

Gravity highs also lie over the basic volcanics of the Yellowknife Group and the equivalent metamorphic rocks. Gravity lows are associated with granitic intrusions, the Dubawnt sandstone and the sandstone of the Parry Bay Formation.

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