GENERAL GEOLOGY

The Foxe and Committee Fold Belts extend in an east-northeast direction from southern Melville Peninsula to central Baffin Island. They are composed of granitoid gneissic rocks engulfing metamorphosed sediments and volcanic rocks all of Archaean age, overlain by metasedimentary rocks of Early Proterozoic age of the Penrhyn and Piling Groups. These fold belts suffered polyphase deformation and metamorphism mostly during the Hudsonian Orogeny. Generation and emplacement of plutonic rocks preceded, accompanied and followed deformation. Diabase dykes of presumed Late Proterozoic age cut older rocks.

The Archaean rocks form a basement complex predominantly of granitoid gneiss ($\bar{A}ggdn$), layered quartzo-feldspathic gneiss ($\bar{A}gn$) and foliated grantic rocks ($\bar{A}g_1$, $\bar{A}g_2$ and $\bar{A}g_3$), within which are relatively minor amounts of amphibolite ($\bar{A}m$) and metasedimentary and metavolcanic rocks of the Prince Albert Group. The gneissic and plutonic rocks are largely quartz monzonitic to granodioritic in composition; leucocratic and mafic ($\bar{A}g_3$) varieties are common but do not constitute a large volume of the complex. Gneissic layering and mineral foliation formed of biotite and hornblende are ubiquitous but not always clearly visible. Metavolcanic ($\bar{A}Am_1$, $\bar{A}Ab$, $\bar{A}Ava$, $\bar{A}Aub$) and metasedimentary ($\bar{A}An$, $\bar{A}Anm$, $\bar{A}Aif$, $\bar{A}Aq$) rocks occuring as discontinuous zones and lenses within the basement complex of the Foxe Fold Belt are correlated with the Prince Albert Group of the northwesterly adjacent Committee Fold Belt on the basis of considerable lithologic similarity. The stratigraphy of that part of the group within the Foxe Fold Belt is unknown but it has been described by Campbell (1974) and Schau (1975a) within the Committee Fold Belt. A lensoid sill of anorthositic gabbro ($\bar{A}Ab$) and layered amphibolite ($\bar{A}Am_1$), as well as possibly related amphibolitic dykes ($\bar{A}Am_2$) may intrude or be genetically related to the group.

Amongst the gneissic rocks of the complex are presumed to be some that form the basement to the Prince Albert Group but unconformable relations, if present are masked by deformation and plutonic activity. Some gneissic units, particularly parts of unit $\bar{A}gn$, may be derived from the Prince Albert Group or some still older metasedimentary succession by migmatitic processes. Granitoid gneiss units of probable plutonic origin ($\bar{A}g_1$, $\bar{A}g_2$, $\bar{A}g_3$) may be older and younger than the Prince Albert Group. In the Committee Fold Belt, porphyritic granite resembling that of unit $\bar{A}g_2$ has intruded the group (Schau, 1975a). Elsewhere, age relations are commonly equivocal. More detailed studies of the basement complex have been made by Frisch (1974, 1975) and Schau (1975a, 1975b).

The Penrhyn Group consists of paragneiss (APn, APnc) and marble (APc) with some quartz-mica psammite (APqb, APqm) and calcium-silicate gneiss (APcs). Minor orthoquartzite (APq), amphibolite (APm), pelite (APp) and very minor iron formation (APif) are also present. Complete understanding of the stratigraphic succession is lacking as most units are discontinuous and lensoid and the possibility of the existence of facies changes, unconformities and cryptic early structures renders its delineation difficult. A general order to the units can be indicated nonetheless. A thin (50-100 m) basal sequence includes orthoquartzite, rusty sillimanite schist, a suspected metaregolith and minor amphibolite, dolomitic marble quartzo-feldspathic grit, rusty pyrite-magnetite iron formation and conglomerate with quartz and hematite clasts. This sequence is overlain by a predominantly calcareous unit of marble, calcium-silicate gneiss and some paragneissic interbeds. The calcareous unit is followed by a thick unit of paragneissic rocks and a unit of marble, calcium-silicate gneiss and biotite quartzite. At the highest observed structural and stratigraphic levels is a unit of quartz-biotite and/or muscovite psammite and metagreywacke. This unit is variable in gross lithology and variously interbedded and compositionally gradational with paragneiss (APnqb), calcium-silicate gneiss and minor marble. The top of the Penrhyn Group has not been observed. The relationship between present and original thickness of the group is well disguised by the rival processes of thinning during deformation, repetition by folding and dilation by syntectonic plutonism.

The Penrhyn Group appears to lie unconformably on the basement complex. Tectonism has obliterated any angular discordance and unconformable relationships are inferred because of the clear lithologic contrast and the common presence of the thin orthoquartzite unit with rare feldspathic grit and hematite-clast conglomerate beds lying upon a variety of rock types in the complex.

Metamorphism in the Foxe Fold Belt produced the assemblages garnet-biotite-sillimanite and cordierite-sillimanite-garnet in paragneiss and, in marble, diopside-forsterite-calcite as well as scapolite and a humite group mineral. In pelitic and semi-pelitic rocks, the reactions:

$$\text{muscovite} + \text{quartz} \longrightarrow \text{sillimanite} + \text{K feldspar}$$
$$\text{andalucite} \longrightarrow \text{sillimanite}$$

can be delineated in restricted areas. Retrograde, or later low grade metamorphism is probable because of extensive alteration of high grade minerals.

Polyphase structures indicating numerous episodes of deformation of the basement complex, the Prince Albert Group and the Penrhyn Group exist throughout the two fold belts but unequivocal sequential relationships among them are rare. The earliest deformational phase is inferred to have affected the basement complex prior to deposition of the Penrhyn Group. Tectonic trends in the basement complex and the Prince Albert Group within the Foxe Fold Belt are for the most part conformable with those of the overlying Penrhyn Group and pre-Penrhyn structures are not readily distinguishable. Structures in the Committee Fold Belt have been described by Campbell (1973, 1974), Frisch (1974), Reesor, et al. (1975) and Schau (1973, 1974, 1975a, 1975b). Some deformation of the Prince Albert Group may have also preceded deposition of the Penrhyn Group.

A second phase of folding, the earliest observed in the Penrhyn Group, is believed to have formed attenuated isoclinal folds and ubiquitous foliation. In all but a few outcrops this foliation is parallel to bedding. Meagre evidence suggests that the trend of early Penrhyn structures may have been northerly. The effects of this folding episode on the Penrhyn Group remain problematical, but may have resulted in some of the observed discontinuity of units described above.

Later episodes of folding produced prominent meso- and megascopic folds that impose an east-northeast structural grain on the Foxe Fold Belt. Tight to nearly isoclinal recumbent structures are folded by later nearly coaxial, more open, upright to overturned folds. These later folds can often be observed to have deformed earlier structures.

In numerous places gneissic bodies of the basement complex can be seen to lie on and possibly within the Penrhyn Group. Such relationships suggest either the presence of large allochthonous nappes or smaller scale, locally overturned folds and thrust faults. The time of movement of the basement masses is uncertain but as they are folded about northeasterly trending axes, they are presumed to have been emplaced during the early deformation of the Penrhyn Group.

North to northeasterly trending broad transverse flexures alter the plunges of pre-existing folds. Few mesoscopic structures associated with this phase were observed. It may be related to syn- and post-tectonic plutonic intrusion. Steeply dipping fractures and faults, many with northerly and northwesterly trends are evidence of the last major phase of deformation. Most fault displacements appear to be left lateral and east-side-up. Minor evidence of east-west faulting that may have affected Late Proterozoic diabase dykes (Hld) has been observed.

Metamorphism is believed to have accompanied all phases of deformation up to the late northeasterly trending open folding. It possibly reached its zenith during the preceding northeasterly-trending isoclinal phase, but mineral recrystallization outlasted much of the penetrative deformation. Retrogressive metamorphism may have accompanied latest folding episodes or been post-tectonic. Contact metamorphic aureoles are likely present around post-tectonic granitic plutons (Ag).

Massive and foliated plutonic rocks ($\bar{A}g_1$, $\bar{A}g_2$, $\bar{A}g_3$, Ag), chiefly of hornblende and biotite granodiorite, quartz monzonite and granite intrude the basement complex and the Penrhyn Group. Foliated plutonic rocks, except where observed to have intruded the Penrhyn Group are assigned to the complex. Where intrusive into the group (Ag) they are considered to be pre- or syn-tectonic to the main phases of deformation. Common local generation of pegmatite and leucocratic granitic rock (Ag) is believed to be coeval with deformation also. Massive, often cross-cutting plutons (Ag) invaded the Penrhyn Group after cessation of deformation.

Available results of radiometric analyses indicate formation of the basement complex prior to 2500 Ma ago, with some events occurring possibly as long as 2900 Ma ago (R.K. Wanless, personal communication, 1976). Acid volcanic rocks of the Prince Albert Group on the west side of Melville Peninsula have yielded a preliminary date of about 2700 Ma (R.K. Wanless, personal communication, 1977). Deformation of the basement complex and the Penrhyn Group may have taken place 2134 Ma ago (Jackson and Taylor, 1972) and again during the Hudsonian Orogeny (circa 1700 Ma ago). Post-tectonic plutons (1600 Ma old, Heywood, 1967) were emplaced into the fold belt late in the orogenic history. Following extensive uplift and erosion, diabase dykes (Hld) presumed to be part of the Mackenzie dyke swarm of about 1000 Ma age (Fahrig, 1970), cut rocks of the fold belt. These are spacially associated with faults and fractures trending northwest. Subsequent uplift and erosion was followed by deposition of Silurian and Ordovician carbonate rocks (OSc), remnants of which lie north and south of the Committee and Foxe Fold Belts and bordering Foxe Basin.

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DESCRIPTIVE NOTES

Map-area 46 O/13 contains mostly scattered outcrops of gneissic ($\bar{A}gn$) and plutonic ($\bar{A}g_1$, $\bar{A}g_2$) units of the basement complex and some of paragneiss ($\bar{A}An$), layered amphibolite ($\bar{A}Am_1$) and ultramafic bodies ($\bar{A}Aub$) possibly part of the Prince Albert Group. In a few localities, zenoliths of paragneiss and amphibolite imbedded within foliated granite ($\bar{A}g_1$) form a migmatitic unit ($\bar{A}ng$). Deformed amphibolite ($\bar{A}Am_2$) and ultramafic dykes ($\bar{A}Aub$) may have intruded the plutonic units. No definitive pattern to the distribution of units in the complex is evident. Much of the northeastern quarter of the area is underlain by foliated augen granite ($\bar{A}g_2$) around which, to the west and south, are areas underlain predominantly by foliated granodiorite ($\bar{A}g_1$) and layered gneiss ($\bar{A}gn$). The latter lies above the Penrhyn Group in the southeast corner of the area and is also exposed in a small antiform within the group.

Marble (APc), calcium-silicate gneiss (APcs) and paragneiss (APn) of the Penrhyn Group here form part of the northwest limb of the major antiformal structure extending from map-area 46 O/12 (Reesor et al. 1976) to 47 A 3. The basal succession of the Penrhyn Group is not exposed in this area.

Description of plutonic and tectonic events is incomplete because of lack of exposure of critical relationships. The basement complex evolved in part through intrusion, migmatization and deformation of the Prince Albert Group. At least parts of units $\bar{A}g_1$ and $\bar{A}g_2$ post-date the group but other portions, and unit $\bar{A}gn$ may be older. None of the plutonic units intrude the Penrhyn Group. Northeasterly structural trends in the complex are essentially parallel to those in the Penrhyn Group and no reliable distinction among fold phases is possible.

Northwest trending diabase dykes (Hld) intruded older rocks.

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LEGEND

PHANEROZOIC
PALAEOZOIC
ORDOVICIAN AND SILURIAN

Unit	Description
OSc	Buff and light grey dolomite

UNCONFORMITY

LATE(?) PROTEROZOIC
HADRYNIAN

Unit	Description
Hld	Brown weathering, dark green to black, fine to medium grained pyroxene diabase.

INTRUSIVE CONTACT

EARLY PROTEROZOIC
APHEBIAN AND YOUNGER(?)

Unit	Description
Ag	Orange and buff weathering, white, tan and grey, massive and foliated, medium to coarse grained, biotite and hornblende granodiorite, quartz monzonite, granite and leucocratic equivalents. Some porphyritic varieties. Pegmatite commonly containing quartz, feldspar, muscovite and biotite; rarely tourmaline. Pre-and post-tectonic plutons are not differentiated. Includes zenoliths of older units.

INTRUSIVE CONTACT

APHEBIAN
PENRHYN GROUP

Unit	Description
APqm	Grey, fine to medium grained, thin to thick bedded, quartz-muscovite-feldspar psammite, some with andalucite(?) porphyroblasts; muscovite schist, meta-greywacke.
APp	Black, fissile, very fine grained, "sooty" pelite.
APqb	Grey, fine to medium grained, thin to thick bedded, quartz-biotite-feldspar psammite and meta-greywacke, some with garnet and rarely cordierite. Gradational contacts with unit APn in some areas.
APn	Brown, rusty and tan weathering, buff and grey, fine to medium grained, quartz-biotite-feldspar, quartz-feldspar-biotite-garnet-sillimanite and quartz-feldspar-biotite-graphite paragneiss and minor schist. Minor cordierite-bearing paragneiss. Includes some interbeds of units APnc, APc and APcs.
APnqb	Units APqb and APn; interbedded, gradational and undifferentiated.
APcs	Grey and grey-green, medium to coarse grained thin bedded, calcium-silicate gneiss and marble-quartzite with quartz-calcite-plagioclase-diopside and accessory scapolite, actinolite, graphite, epidote and biotite. Commonly interbedded with and passing laterally into unit APc.
APc	White, grey and grey-blue, medium to coarse grained, massive and bedded marble with calcite-diopside-microcline-quartz and minor dolomite, scapolite, phlogopite, graphite, a humite group mineral and tremolite. Interbedded with and passing laterally into unit APcs. Includes small beds of unit APn. Pegmatite of unit Ag is ubiquitous.
APnc	Rusty, fine to medium grained, graphitic paragneiss with pyrite and pyrrhotite.
APm	A dark green, fine to medium grained, massive and foliated amphibolite; some biotite-garnet amphibolite.
APq	White to grey-blue, medium to coarse grained, massive and faintly bedded, orthoquartzite with minor feldspar, white mica and phlogopite. Minor quartzo-feldspathic grit, conglomerate with hematite clasts, grey-green diopside-chlorite rock (meta-regolith?). Biotite-garnet-sillimanite schist and amphibolite.
APif	Rusty, massive pyrite, magnetite iron formation.

UNCONFORMITY

ARCHAEAN

Unit	Description
$\bar{A}g_1$	Foliated, massive and porphyritic granite and granitoid gneiss.
$\bar{A}g_2$	Foliated feldspar augen granite; minor granitoid gneiss.
$\bar{A}g_3$	Foliated hornblende granodiorite and amphibolitic granitoid gneiss.
$\bar{A}gn$	Layered granodioritic gneiss; minor amphibolite.
$\bar{A}ng$	Migmatite of units $\bar{A}g_1$, $\bar{A}g_2$ and/or $\bar{A}gn$.
$\bar{A}ggdn$	Orange, grey and tan, medium to coarse grained, layered and foliated, biotite and hornblende granodioritic, quartz monzonitic and leucocratic gneiss. Includes rock of units Ag, $\bar{A}g_1$, $\bar{A}g_2$, $\bar{A}gn$, $\bar{A}ng$ and small bodies of $\bar{A}m$.
$\bar{A}m$	Dark green foliated amphibolite, meta-gabbro and hornblende-plagioclase gneiss.

PRINCE ALBERT GROUP

Unit	Description
$\bar{A}Am_2$	Foliated amphibolite dykes.
$\bar{A}Am_1$	Layered amphibolite.
$\bar{A}Ab$	Foliated and massive, dark grey, coarse grained anorthositic gabbro; minor amphibolite.
$\bar{A}Aub$	Foliated, serpentinized ultramafic rock.
$\bar{A}An$	Quartz-biotite-feldspar paragneiss, some hornblende-bearing.
$\bar{A}Anm$	Muscovite-quartz-feldspar paragneiss.
$\bar{A}Aif$	Dark blue-grey layered oxide facies iron formation.
$\bar{A}Aq$	White, medium to coarse grained, massive orthoquartzite; muscovite- and rarely fuchsite-bearing.
$\bar{A}Ava$	Light grey, fine grained layered acid volcanic rocks.

Geological boundary (defined, approximate).

Boundary of areas extensively drift-covered.

Geological boundary gradational, poorly-exposed, imprecisely located or not observed.

PLANAR STRUCTURES

Bedding and compositional layering (horizontal, inclined, vertical)

Foliation, schistosity, gneissic layering and cleavage (horizontal, inclined, vertical, dip unknown); earliest or only observed.

Axial planes (inclined, vertical) associated with folds deforming bedding and compositional layering. Earliest or only observed.

Axial planes (inclined, vertical); associated with folds of later phases observed to have deformed bedding or early foliation.

LINEAR STRUCTURES

Lineation (plunging, horizontal); formed by fold axes, bedding foliation intersection (X), mineral growth or rodding (R), mullion (M), and boudin axes (B); earliest or only observed.

Lineation (plunging, horizontal); formed by bedding-foliation and foliation-foliation intersection (X), mineral growth or rodding (R) and mullion (M) and fold axes associated with folds observed to have deformed bedding or early foliation.

FAULTS

High angle fault (defined, approximate); arrows indicate apparent relative movement.

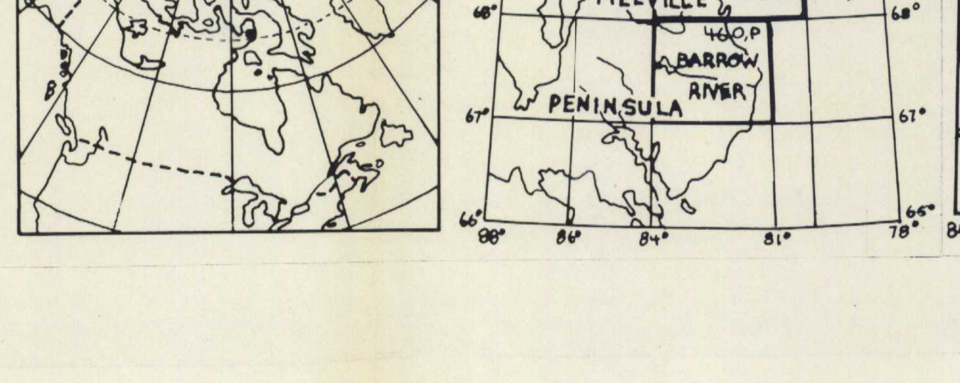
Low angle fault (defined, approximate); teeth in direction of dip.

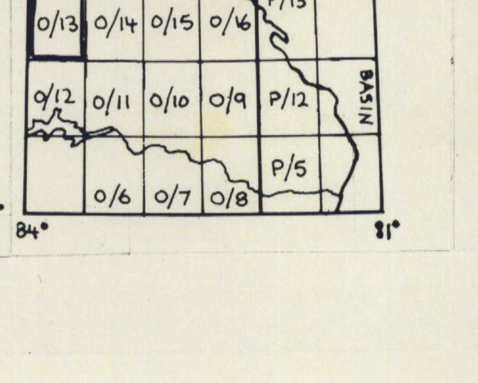
NOTE ON DATA PRESENTATION

Lithologic and structural data shown is that obtained in the field augmented by only limited interpretation. No attempt has been made to extend lithologic units to construct an integrated stratigraphic and structural model. Lithologic units in the legend are not arranged in temporal order, as this is largely uncertain, except that basal units of the Penrhyn Group are listed below other parts of the group. Description of mesoscopic structures is limited to morphology of common types. Mesoscopic structures are assigned a position (early or late) in the tectonic hierarchy based upon interpretation of local field relationships only. This position cannot be directly related to deformational phases which formed large folds or to mesoscopic structures in nearby areas. No attempt has been made to integrate mesoscopic features into a megascopic structural synthesis. Axial traces of megascopic features are not portrayed as those of early folds are largely interpretative and those of late folds can be deduced from attitudes of planar structures on the map.

Geological mapping by: J.R. Henderson; J.E. Reesor; M. Turay
Geological cartography by: M. Turay; A.V. Okulitch
Descriptive notes by: A.V. Okulitch

Notice of any revisions or additional geological information known to users of these maps would be gratefully received by the authors.





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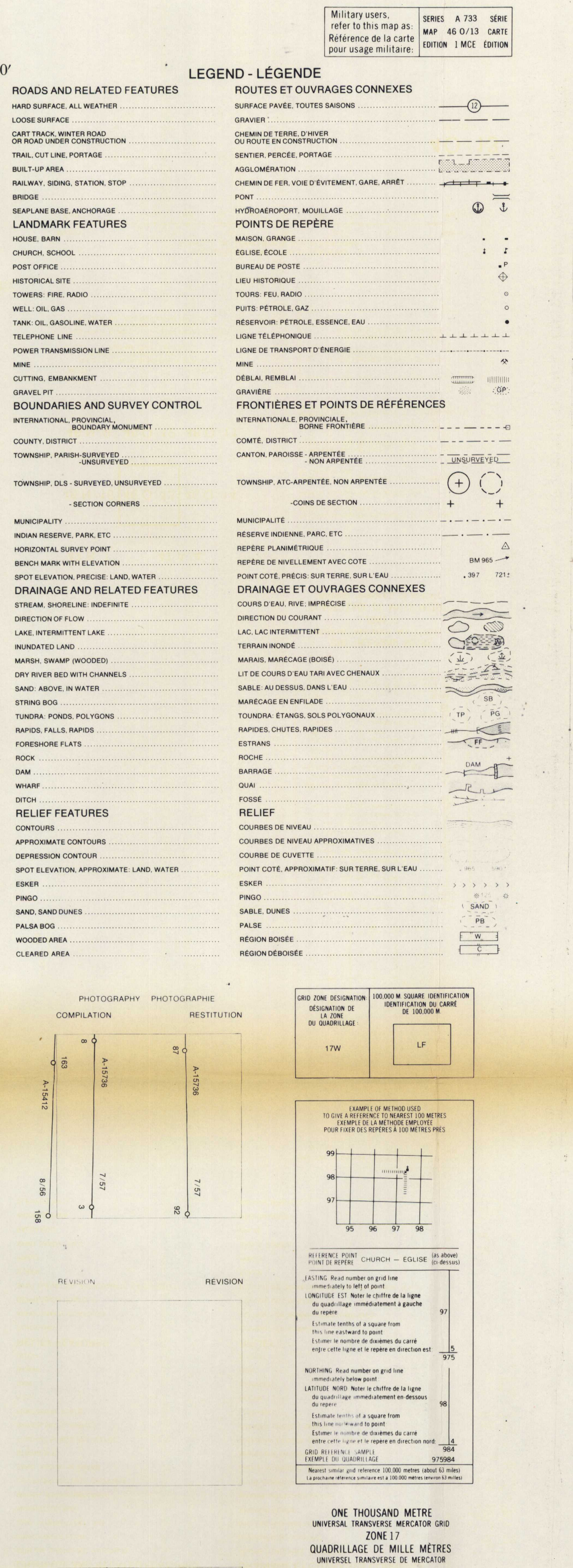

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ELEVATIONS IN METRES ABOVE MEAN SEA LEVEL

CONTOUR INTERVAL .... 10 METRES

NORTH AMERICAN DATUM 1927

TRANSVERSE MERCATOR PROJECTION

DISTRICT OF FRANKLIN

NORTHWEST TERRITORIES

Scale 1:50,000 Échelle

ÉLÉVATIONS EN MÈTRES AU-DESSUS DU NIVEAU MOYEN DE LA MER

ÉQUIDISTANCE DES COURBES .... 10 MÈTRES

SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NORD-AMÉRICAIN 1927

PROJECTION TRANSVERSE DE MERCATOR

ÉTABLIE PAR LA DIRECTION DES LEVÉS ET DE LA CARTOGRAPHIE, MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES, OTTAWA, EN 1974.

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46 O/13