CANADA
DEPARTMENT
OF
MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

URANIUM CITY

SHEET 2

SASKATCHEWAN

PRELIMINARY MAP 54-15

Scale: One Inch to 800 Feet = 1/9,600

Feet: 800 0 800 1600 2400

PUBLISHED, 1955

Printed by the Surveys and Mapping Branch

LEGEND

PROTEROZOIC

15 — *Gabbro, basalt; in part diabasic;* **15a,** *amygdaloidal, porphyritic*

ATHABASCA SERIES (10-14)

14 — *Siltstone; minor arkose, conglomerate, green shale;* **14a,** *arkose abundant;* **14b,** *brecciated*

13 — *Arkose; minor conglomerate, siltstone;* **13a,** *siltstone abundant* **13b,** *conglomerate abundant;* **13c,** *massive;* **13d,** *calcareous;* **13e,** *brecciated*

11, 12 — **11.** *Amygdaloidal, porphyritic andesite and basalt;* **11a,** *intense red;* **11b,** *pillow lava* **12.** *Intrusive gabbro, in part diabasic; minor basalt;* **12a,** *aphanitic and porphyritic*

10 — *Conglomerate; minor arkose, siltstone;* **10a,** *containing many fragments of gneiss (3);* **10b,** *containing many fragments of gneiss (2);* **10c,** *containing many fragments of arkose and siltstone;* **10d,** *mainly composed of angular fragments;* **10e,** *mainly composed of rounded fragments*

9 — *Granite, pegmatite;* **9a,** *mylonite, breccia*

TAZIN GROUP (1-8)

8 — *Coarse- to medium-grained, metasomatic granite, in part mylonitized and brecciated;* **8a,** *dense*

7 — *Amphibolite, hornblende-feldspar gneiss; minor gabbro and diorite; in part granitized;* **7a,** *includes some quartzitic rocks;* **7b,** *includes some granite;* **7c,** *serpentinized;* **7d,** *includes remnants of carbonate rocks, probably limestone;* **7e,** *mica rich* **7f,** *porphyritic (feldspar)* **7g,** *wholly or in part altered to chlorite and/or biotite schist; may be in part older than 2 and 3. (3, garnet-bearing)*

6 — *Quartz-feldspar-chlorite-sericite gneiss and schist, probably granitized derivatives of chlorite-sericite schist; augen structures; minor quartzite impure quartzite, greywacke;* **6a,** *massive, impure quartzite, greywacke; minor gneiss and schist;* **6b,** *breccia and mylonite;* **6c,** *includes granite*

5 — *Quartz-biotite schist containing over 50 per cent biotite; in part granitized;* **5a,** *in part containing hornblende (on Sheet 1 only)*

4 — *Diopside-actinolite rock, probably derived from impure dolomite*

3 — *Red to reddish white, banded and/or finely gneissic, quartz-feldspar and feldspar gneiss, contains from 15 to 50 per cent biotite, chlorite, and/or hornblende; probably granitized impure sandstone; includes minor amounts of 2;* **3a,** *contains considerable 2;* **3b,** *content of biotite, chlorite, and/or hornblende exceptionally low;* **3c,** *contorted and drag-folded;* **3d,** *mylonitized and in part brecciated;* **3e,** *includes many granite dykes and sills*
3A. *Brecciated and mylonitized quartz-feldspar gneiss, in part containing much hematite (G, garnet-bearing)*

2 — *Buff to white, quartz and quartz-feldspar gneiss, contains up to 15 per cent biotite, chlorite, and or hornblende, probably granitized quartzitic rocks;* **2a,** *in part quartzite;* **2b,** *contains garnet and in part pock-marked;* **2c,** *banded like 3 but quartzitic;* **2d,** *mylonitized and in part brecciated;* **2e,** *includes narrow bands of amphibolite;* **2f,** *contorted and drag-folded;* **2g,** *includes many granite dykes and sills*
2A. *Massive to gneissic quartzite;* **2Aa,** *in part schistose;* **2Ab,** *in part brecciated;* **2Ac,** *in part granitized*

ARCHÆAN OR PROTEROZOIC

1 — *Garnetiferous quartz-biotite-sericite schist; in part granitized (on Sheet 1 only)*

Areas of gravel and sand
Rock outcrop too small to pattern
Horizon traced during field mapping
Bedding (inclined, vertical, dip unknown)
Bedding (direction of dip known, upper side of bed unknown)
Schistosity (inclined, vertical, dip unknown)
Foliation (inclined, vertical, dip unknown)
Lineation
Fault (defined, assumed)
Anticline (position approximate)
Syncline (position approximate)
Drag fold
Minor fold (direction of plunge indicated)
Glacial striæ
Rock trenches and stripped areas
Mineral occurrence (hematite, He; pitchblende, U; pyrite, Py; tourmaline-bearing pegmatite, T) × Py
Radioactive occurrence

Geology by L.P. Tremblay, 1952, 1953

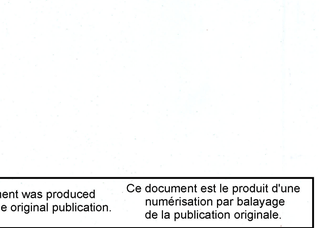
Road
Trail or portage
Building
Power line
Stream (position approximate)
Rapid
Marsh
Foreshore flats
Contours (interval 50 feet)
Height in feet above mean sea-level 800

Approximate magnetic declination, 25°55′ East

Cartography by the Geological Cartography Unit, 1955

Air photographs covering this map-area may be obtained through the National Air Photographic Library, Topographical Survey, Ottawa, Ontario

Geographical names subject to revision



Joins Preliminary Map 54-15 "Uranium City Sheet 1"

DESCRIPTIVE NOTES

The area is served by aircraft from Edmonton and Prince Albert. From early June to early October it can be reached by barge from Waterways to Bushell and most of the heavy freight is transported in this way.

Physically the map-area is similar to most of the Canadian Shield; it looks flat from the air but in detail is rugged. Relief is between 100 and 250 feet except west and east of Nero Lake where it is up to 500 and 450 feet respectively. From the south-western corner to the northern boundary of the area the land rises from an elevation of 700 to 1,200 feet. Rock outcrops average 60 per cent of the land surface except in areas underlain by rocks of the Athabasca series where they may be as little as 20 per cent. Drainage is disorganized but eventually leads into Lake Athabasca to the south.

The rocks of the Tazin group (1 to 8) are mainly gneisses and granitized schists. Originally they were probably a bedded sequence of shales, sandstones, and minor amounts of dolomites and limestones and have assumed their present form by intense metamorphism and granitization. All are composed of the same minerals, quartz, feldspars, hornblende, biotite, and chlorite, but in various proportions. The age sequence shown in the legend is based mainly on a few structural features and the apparent stratigraphic succession.

The schists (1) occur only on the western boundary of the map-area a little north of Bushell Inlet where they appear to be along the axis of an anticline. They consist of dirty reddish to greenish brown, schistose rocks with feldspar and quartz-feldspar augen and large garnet metacrysts.

The gneisses (2) comprise all rocks that resemble quartzite and contain less than 15 per cent mafic minerals. Where they are obviously quartzite (2a), they are massive to finely bedded, glassy white to black on fresh and weathered surfaces, and are composed almost entirely of quartz. Where the resemblance to quartzite is more obscure, they contain also white feldspar and the mafic minerals are concentrated in planes and bands to produce a rock that is finely gneissic and/or coarsely banded. They weather white to reddish white and buff, and are white to almost black where fresh.

Quartz constitutes some 30 per cent of the gneiss, and microcline and oligoclase, both white and occurring as meta-crysts in the quartz, about 45 and 20 per cent respectively. Biotite, chlorite, and/or hornblende account for not more than 15 per cent and, in addition to being concentrated in planes and bands, occur also in lenses that weather to characteristic rusty patches. The quartzose appearance of these rocks, their white weathering and rusty patches serve to distinguish them from the next group of gneisses (3). Garnet may be present as metacrysts. Small amphibolite lenses are generally found in some abundance associated with these gneisses. Near the Black Bay fault brecciation has made some of these rocks so dense that they resemble chert.

The quartz-feldspar and feldspar gneisses (3) include all rocks with a granitic appearance. Most show a pronounced coloured banding or are at least finely gneissic. The mafic minerals constitute between 15 and 50 percent of the rock and occur in fine lines, streaks, and irregular lenses or bands. The rock is generally massive, fine- to medium-grained, and weathers various shades of red and brown to orange red and reddish white. It contains about 45 per cent oligoclase and up to 20 per cent quartz and 20 per cent microcline. Much granitic material has been introduced as dykes, sills, and irregular masses.

Unit 4 consists of coarse-grained, light green weathering rock composed mainly of large yellowish green diopside in light to dark green, fibrous amphibole.

The schist (5) occurs only as small masses, lenses, and pockets mainly at the nose of drag-folds in the gneisses (3). It weathers rusty brown. Quartz may be abundant and is there concentrated in bands.

The gneisses and schists (6) apparently are confined to a syncline crossing the centre of the area. They were probably once chlorite and chlorite-sericite schists but the schistose character has been largely lost. They have a granitic appearance with streaks, lines, and lenses of a dirty green chloritic material irregularly distributed through the rock but in parallel alinement. In places, however, particularly near the contacts of large amphibolite masses, the original chlorite schist is largely unaltered. They weather light to dark greenish brown and are composed of quartz, feldspar, chlorite, and sericite and/or biotite. The quartz and feldspar may be segregated into augen, lenses and streaks. Interlayered with these gneisses are dirty brown weathering quartz-rich rocks mapped as 6a.

The amphibolite (7) occurs as sills or dykes, lenses, and irregular masses, in places as clusters or zones. The amphibolite is generally gneissic but may be massive. It is medium to coarse grained with a dark green or dark to light brown weathered surface. Where massive it is composed of about 65 per cent hornblende and 30 per cent plagioclase but where banded contains also much quartz and biotite. In places it contains much granitic material in the form of seams, patches, sills, and dykes. Most of the amphibolite, at least the largest bodies, are probably intrusions, but some are evidently altered carbonate rocks. In two places northwest of the Boom Lake fault a dark grey patchy, green weathering rock (7d) is clearly of this origin and is enclosed in or near amphibolite. It is composed mainly of calcite and diopside, in places altered to serpentine.

Granite (8), in the northeastern corner of the map-area, grades within a few hundred feet into gneisses (3). It is a medium- to coarse-grained, red to white rock, vaguely gneissic and with the original sedimentary structure still faintly visible.

Granite (9) occurs as dykes, sills, and small irregular masses cutting the various rocks of the Tazin group. Most of it is red to reddish white, massive and coarse- to medium-grained, the former being pegmatitic. Colour banding is present in many of the smaller, finer grained masses. Quartz, microcline, and oligoclase are the principal constituents.

The Athabasca series (10-14) covers practically all the south-eastern half of the map-area. The conglomerate (10) occurs both at and near the base of the series and higher up, inter-bedded with arkose and siltstone. The basal conglomerate contains angular to subrounded fragments ranging from less than an inch to 2 feet in diameter, so closely packed that the matrix forms less than 25 per cent of the rock. Much of this matrix is arkosic but part resembles siltstone. Most of the fragments appear to be derived from Tazin gneisses (2, 3). The interbedded conglomerate (10c) contains rounded to sub-rounded, well sorted pebbles less than 6 inches in diameter composed of both Tazin gneiss and arkose and siltstone. The matrix forms at least 50 per cent of the rock.

The lavas (11) are interbedded with arkose. Most are massive, amygdaloidal and porphyritic varieties being common. Pillow structures were observed. Both weathered and fresh surfaces are various shades of green and brown. They are andesites composed of plagioclase laths in a fine-grained mass of feldspar and mafic minerals. The gabbros (12) are more massive and coarser grained than the lavas (11), and are less commonly amygdaloidal. They form sills with apophyses into the adjacent arkose and are probably intrusive phases of 11 although they also resemble late gabbro (15).

The arkose (13) is a medium-grained, sandy looking rock with an orange red to reddish brown and white weathered surface. Great thicknesses are formed of fine to coarse beds, but much is finely to coarsely interbedded with siltstone, con-glomerate, and andesite flows (11). Individual beds however, rarely extend for great distances. Crossbedding, ripple marks, and grain gradation were recognized in the field. Here and there large rounded fragments of Tazin rocks were noted and, where overlying andesite (11), the arkose contains occasional fragments of the lava. The average composition of the arkose is 65 per cent feldspar, 30 per cent quartz, and 5 per cent iron oxide. The white variety contains more quartz and also some carbonate.

The siltstone (14) occurs in narrow beds finely interbedded with arkose and some conglomerate. It is a dense, fine-grained rock, deep red on both weathered and fresh surfaces.

The gabbro (15) occurs mainly as dykes and sills intruding rocks of the Tazin group, but at two places in the southwestern corner of the map-area gabbro cuts rocks of the Athabasca series or is intruded between them and the underlying Tazin rocks. The gabbro is a fine- to coarse-grained rock with a light reddish to greenish brown weathered surface. It is in part diabasic in texture and the average composition is 60 per cent plagioclase, 10 per cent opaque substances, and the rest chlorite, carbonate, and interstitial felsic minerals.

All rocks in the map-area have been folded and faulted. Folds in the Tazin group are almost isoclinal. They trend northeasterly, plunge to the northeast at about 30 degrees, and have steeply dipping limbs. The few fold axes shown on the map are based on scanty information and their position must be considered as only approximate. Tops could not be deter-mined in the Tazin group. The rocks of the Athabasca series have been folded in a broad, open syncline that strikes north-easterly and plunges to the northeast at about 35 degrees.

Faults are of two ages, early and late, but only the late faults are shown on the map. These strike in three principal directions; slightly south of east, slightly west of north, and northeasterly; directions that are also followed by the joints. All are clear cut fractures characterized by a narrow zone of coarse, bright red, brecciated material on each side. Their movement is mainly left handed. The northeasterly striking faults can be traced for great distances but are not easily recognized as they parallel the trend of the formations.

The early faults are not indicated on the map but probably strike similarly to the late faults. They are characterized by wide zones of intense brecciation and mylonitization that obscures both their attitude and offsets along them. The Black Bay fault, for example, is a late fault that follows approximately the path of an early fault. The early fault, however, probably strikes slightly more to the north than the fault mapped.

Uranium is the only metal of economic interest in the map-area. It occurs mainly as pitchblende along mylonite zones and late faults or in joints subsidiary to the late faults. There are many occurrences and most of the known ones are indicated on the map. In most of them, however, there is too little pitch-blende or else the veins are too narrow and short to be of economic importance. The property of Rix Athabasca Uranium Mines Ltd. near Boom Lake contains the only workable deposit so far developed. Reports of this deposit claim 156,000 tons of ore containing 0.22 per cent equivalent uranium oxide. The ore is in a narrow mylonite zone that trends approximately at right angle to the formations. The mylonite zone is believed to represent an early fault and several late faults are known in the underground workings.

In the writer's opinion, more attention should be paid to prospecting the mylonite zones of the early faults, and particularly those in the gneisses (3). The late faults should, however, not be overlooked as they may also carry ore, but probably in small lenticular bodies.

PRELIMINARY MAP 54-15
URANIUM CITY
SHEET 2
SASKATCHEWAN