Preliminary Geologic Map of the Wakefield Quadrangle Gogebic County, Michigan

by

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and

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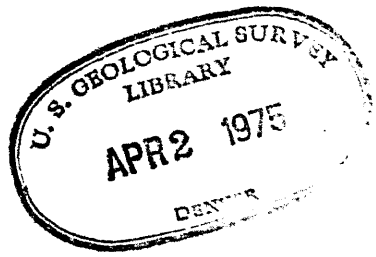

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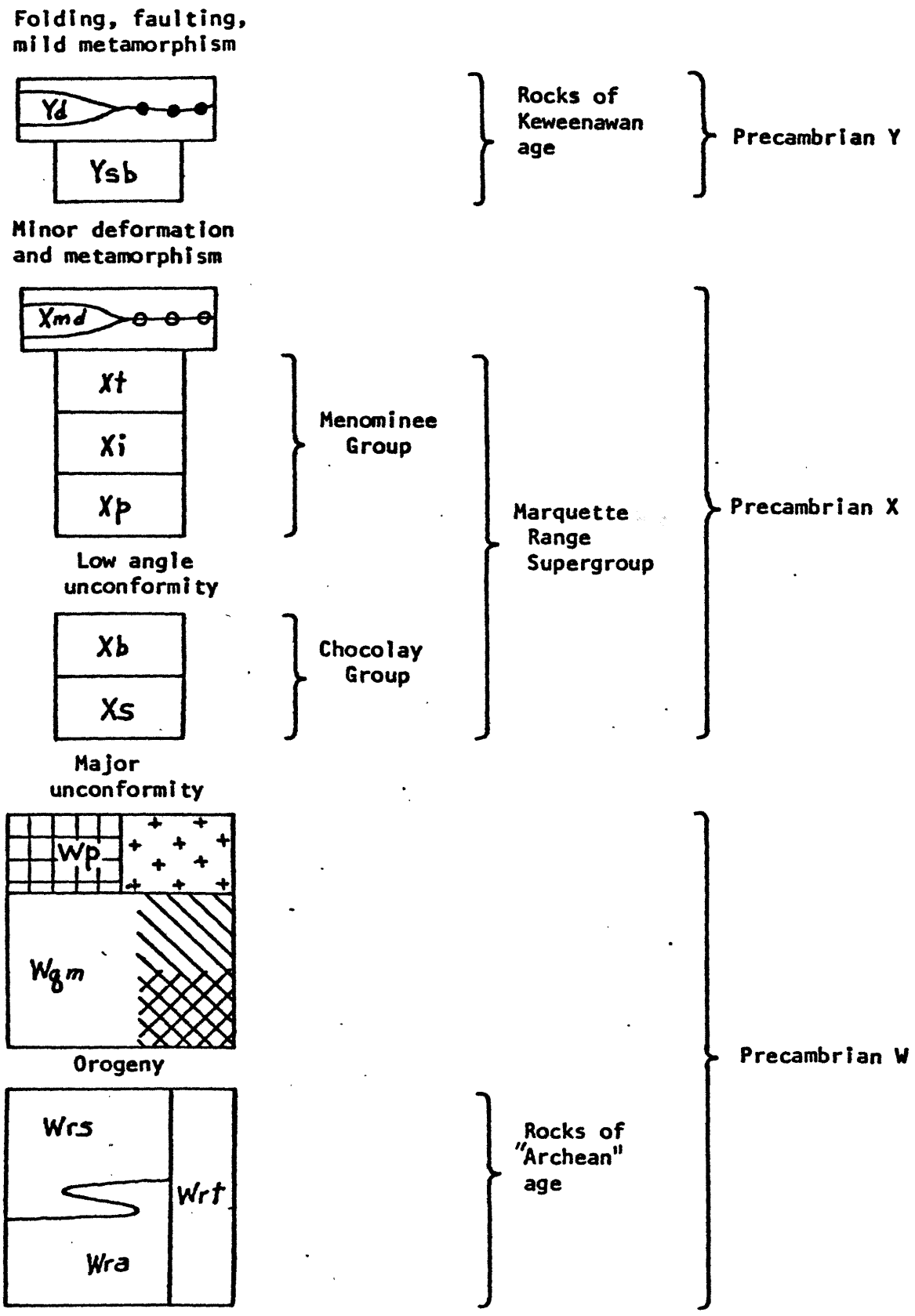
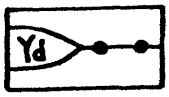
Correlation of map units



Description of map units

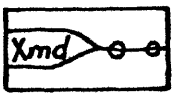


Diabase (Precambrian Y).--Fine- to medium-grained, black to greenish black diabase in dikes a few cm to 50 m thick. Consists of labradorite and pyroxene with or without olivine. Magnetite is an abundant accessory. Unmetamorphosed and generally unaltered; some pyroxene is uralitized. The dikes are inversely polarized and give sharp negative magnetic anomalies. Diabase dikes cut Siemans Creek Formation and most older units.

Ysb

Siemans Creek Formation and Bessemer Quartzite of early Keweenawan age (Precambrian Y).--Siemans Creek Formation is predominantly a massive, uniform-appearing fine-grained basalt which occurs in subaerially extruded lava flows. The flows average about 2.1 m in thickness but vary to a maximum thickness of 7.5 m. Smoothly undulating pahoehoe-type tops show 2-8 cm relief in 3 m of strike length. Rinds of brownish fine-grained rock 5 to 10 mm thick occur at most flow tops and bottoms. Flow tops contain less than 5 percent amygdules, generally filled with chlorite, but some filled with quartz, epidote, chlorite, and rare chalcedony. Sparse pipe-shaped vesicles up to 10 cm long at base of a few flows, generally filled with quartz and epidote. Source of flows lay to the south or southwest. Basalt is olive-gray to dark green, mottled with irregular patches of chlorite, and some basalt in upper half of unit is bluish green gray and contains less chlorite than the lower part. Plagioclase (An_{20-48}) laths form about half of the rock; clinopyroxene, 10-20 percent;

chlorite, 3-10 percent; magnetite and leucoxene, 7-22 percent; and epidote, 4-10 percent. A few flows occurring between 450 m and 900 m above the base of the formation are porphyritic with plagioclase phenocrysts 0.4 to 1 mm long. Upper contact of unit not exposed; In the Ironwood quadrangle to the west where the upper contact is observed, thickness is about 1350 m. Bessemer Quartzite is a very poorly exposed thin unit of earliest Keweenawan age. It is fine- to medium-grained and predominantly moderate red to pale reddish brown; the finer-grained beds are light brownish-gray and light gray to medium dark gray. The unit contains thin layers of crossbedded quartzite interbedded with laminated quartzite. Some quartzite is composed of subangular to subrounded quartz grains in a very fine-grained matrix. Quartz grains show secondary overgrowths of quartz. Rock well cemented and commonly fractures across grains. The Bessemer is about 90 m thick in Ironwood quadrangle.



Metadiabase and metagabbro (Precambrian X; some may be Precambrian W).--Metamorphosed mafic dikes and sills from a few cm to 250 m thick. Thinner ones are fine-grained greenstone; thicker ones are medium- to coarse-grained, green to dark green metadiabase and metagabbro. Metamorphosed to greenschist facies throughout the quadrangle; metamorphic grade increases slightly to south. Composed mainly of amphibole (actinolite or hornblende), plagioclase, epidote, and quartz; most contain chlorite; some also contain carbonate; relic pyroxene is common in the north, whereas biotite occurs in the south;

pyrite is an abundant accessory mineral, magnetite is rare. Generally massive with very well-preserved original igneous textures; rarely foliated. Cuts rocks as young as Ironwood Iron-formation.

MENOMINEE GROUP (PRECAMBRIAN X)

Xt Tyler Formation.--Exposed only in two outcrops along Black River at west edge of quadrangle. The exposures are metamorphosed iron-rich sedimentary rocks that are transitional between chemical sediments (iron-formation) below and predominantly clastic sediments (argillite and slate) typical of the Tyler west of the quadrangle. The lowermost exposures (southern outcrop) consist of interbedded ferruginous dark green to red chert and clastic rocks--argillite and arkose. Some chert beds contain considerable magnetite. The clastic beds commonly contain angular fragments of chert. The northern outcrop consists of well-bedded cherty iron carbonate and pyritic black chert. The cherty iron carbonate consists of coarse carbonate grains with interstitial chert. The pyritic black chert contains scattered sand grains and small lenses of sand. Tyler in the Wakefield quadrangle is at least 1,000 m thick.

Xi Ironwood Iron-formation.--Interlayers of thick and irregular bedded ferruginous chert and chert-siderite iron-formation, thin and regular bedded chert-siderite-silicate iron-formation, and ferruginous slate. Some jasper occurs in the thin-bedded iron-formation. Magnetite is locally

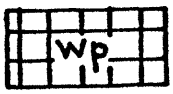
abundant, particularly in the thin-bedded and slaty units. Unit weathers to hematite and limonite. 450-500 m thick. Unit is known mainly from old mine and drilling records. Best exposures are on Verona Hill in the S 1/2 Sec. 7, T. 47 N., R. 45 W.

Xp — Palms Formation.--Interbedded, gray, greenish-gray, and reddish-brown impure quartzite, slaty quartzite, argillite, and slate; thick to thin bedded. Unit becomes more quartzitic and ferruginous toward the top. Basal conglomerate in NE 1/4 NW 1/4 Sec. 14, T. 47 N., R. 45 W. contains pebbles of buff chert derived from Bad River Dolomite. 225-350 m thick.

CHOCOLAY GROUP (PRECMABRIAN X)

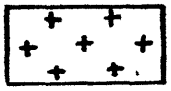
Xb — Bad River Dolomite.--Not exposed in quadrangle. To the east, it consists of gray to buff dolomite and cherty dolomite with common algal structures.

Xs — Sunday Quartzite.--White, gray, or red quartzite; thick bedded and commonly corss bedded. Intraformational breccia consists of quartzite fragments as long as 15 cm showing contorted bedding enclosed in a quartzite matrix. Conglomerate at the base of the unit contains fragments of the underlying rock. 0-30 m thick.



Pegmatite (Precambrian W).--Massive pegmatite composed of pink K-feldspar crystals as long as 50 cm, quartz, and muscovite. Contains sparse irregular-shaped masses of aplite a few metres across. The aplite is composed of quartz, microcline, albite, muscovite, and sparse garnet. Contacts with pegmatite are sharp or gradational. Aplite probably younger than pegmatite.

Pegmatite commonly contains inclusions of quartz-biotite schist probably derived from the Ramsay Foramtion.



Areas in which Ramsay Formation or Puritan Quartz Monzonite (Precambrian W) are cut by dikes, schlieren, or large irregular masses of pegmatite. The cross cutting bodies vary from a few cm to several 10's of metres in thickness, truncate foliation in schists, and exhibit sharp to gradational contacts with the Puritan Quartz Monzonite.

$W_q m$

Puritan Quartz Monzonite (Precambrian W).--Medium- to coarse-grained quartz monzonite; gray to buff, rarely pink; generally massive; some is porphyritic. Composed of albite-oligoclase, microcline, quartz, and some muscovite. Plagioclase commonly shows sericitic alteration whereas microcline is fresh. Some samples also contain chlorite, epidote, or biotite.

Puritan Quartz Monzonite containing inclusions of quartz-feldspar-biotite schist. Feldspar in the schist is albite-oligoclase and some K-spar; most feldspar shows sericitic alteration. Epidote is abundant in some schist; chlorite, carbonate, and muscovite are present locally. Most inclusions are 1-10 m long and contacts with quartz monzonite are generally sharp. Some inclusions are cut by folded quartz veins and granitic stringers.

Mixed unit composed mainly of medium-to coarse-grained Puritan Quartz Monzonite and fine- to medium-grained quartz monzonite or granodiorite. The composition of the finer grained phase is similar to that of the Puritan Quartz Monzonite except that it contains less microcline and muscovite and more biotite. Finer grained phase occurs as angular inclusions in the Puritan

Quartz Monzonite phase or is interlayered with Puritan Quartz Monzonite and some quartz-feldspar-biotite schist. Coarser grained phase cuts finer grained one. Puritan Quartz Monzonite phase of mixed unit also contains inclusions of quartz-feldspar-biotite schist and wispy biotite-rich streaks that probably represent partially digested inclusions. Some migmatite showing contorted layering occurs in the southern part of the quadrangle. Probably correlates with the Van Buskirk Gneiss of the Bessemer and Ironwood quadrangles to the west.

Ramsay Formation (Precambrian W).--Metamorphosed volcanic rocks--mafic to intermediate pyroclastics (Wrt), mafic to intermediate flows (Wra), and felsic schist and pyroclastic rocks (Wrs). Regionally metamorphosed before deposition of rocks of Precambrian X age; metamorphic grade increases from chlorite grade (greenschist facies) in the north and east to garnet grade (amphibolite facies) in the south and west. Some retrograde minerals formed during the post-Precambrian X greenschist facies metamorphism.

Wrs Felsic schist and pyroclastic member--where least metamorphosed, membed is metarhyolite or metarhyodacite composed of quartz, albite-oligoclase, and K-feldspar with some carbonate, epidote, chlorite, biotite, and muscovite; pyrite locally abundant. Original textures are poorly preserved, but fragmental texture in some outcrops indicates that member is at least partly pyroclastic. Some porphyritic rock with feldspar phenocrysts may have been a flow or shallow intrusive. Most of the member has been metamorphosed to garnet grade and is quartz-feldspar-

biotite schist, some of which contains abundant muscovite or chlorite or sparse amphibole or epidote; garnet is widespread but nowhere abundant. Feldspar occurs as both albite-oligoclase and K-feldspar and is commonly altered to sericite. Some schist is strongly lineated and some is laminated. Member is 2,500 to 3,000 m thick in the west but thins rapidly to the east.

Wra — Mafic to intermediate flow member--mostly greenstone composed of albite-oligoclase, quartz, epidote-zoisite, chlorite and/or pale amphibole; some also contains biotite or carbonate; feldspar commonly sericitized. Amphibolite at higher metamorphic grade (amphibolite facies) is composed of plagioclase, quartz, pleochroic amphibole, some of which is poikiloblastic, and some carbonate and biotite; some samples may contain retrograde chlorite. Rocks are massive to schistose, some are strongly lineated. Ellipsoidal (pillow) and amygdaloidal structures are commonly well preserved. Flows are andesitic to dacitic in composition. Also included are some beds of pyroclastic rocks as thick as 50 m. This member is apparently 3,000 m thick, but may be repeated by undetected faults.

Wrt — Mafic to intermediate pyroclastic member--Metamorphosed pyroclastic rocks ranging from fine-grained tuff to lapilli tuff to volcanic conglomerate and breccia containing boulders as much as 1.5 m across; also includes some graywacke. Some tuffs are thin bedded and slaty; others are thick bedded and massive. Clasts include metaandesite, quartz, and broken feldspar commonly altered to sericite. Mineralogy is like that of the intermediate to mafic flow member.

Explanation

Contact--showing dip where known. Most are concealed; accuracy of location can be inferred from distribution of outcrops. In much of area underlain by Xi projected to surface from mine workings and drill holes.

Fault--U, upthrown side; D, downthrown side; direction of dip shown where known.

Outcrop or area of abundant outcrops.

55 Strike and dip of beds or flows.

65 Strike and dip of foliation.

Strike of vertical foliation.

60 Bearing and plunge of lineation.

20 FA Bearing and plunge of minor fold axes.

FA Bearing of horizontal minor fold axes.

Ellipsoidal (pillow) structures--arrow points toward top.

Mine shaft

Adit

x^if Test pit or shallow shaft--showing lithology of rock on dump. No lithology given indicates that the dump contains no material thought to be derived from bedrock.

Quarry for sand and gravel or crushed stone.

Explanation (cont'd)

Open pit iron mine

Abbreviations

and	andesite
cg	conglomerate
ch	chert, cherty
Fe	ferruginous
fel	felsic
gst	greenstone
hem	hematite
if	iron-formation
jas	jasper
md	metadiabase, metagabbro
mt	magnetite, magnetic
py	pyrite
rhy	rhyolite
sch	schist
sl	slate, slaty
tf	tuff
vol	volcanic