

- SURFICIAL DEPOSITS**
- QUATERNARY**
- Holocene**
- NONGLACIAL ENVIRONMENT**
- 15 **ORGANIC DEPOSITS:** mainly muck and peat in peatlands, swamps, and poorly drained areas; 1-3 m thick
 - 14 **ALLUVIAL DEPOSITS:** stratified sand, silty sand, silt, minor gravel and clay; 2-5 m thick
 - 13 **Alluvium on floodplains of present rivers.** 14a, alluvium of river terraces in main river valleys
 - 12 **Alluvium of fan deposits of small tributary streams**
 - 11 **EOLIAN DEPOSITS:** uniform, medium to fine grained, buff sand; derived from older glacioluvial and glaciolacustrine sediments; includes areas of blowouts and areas of hummocky or ridged dune topography; 2-15 m thick
- PROGLACIAL AND GLACIAL ENVIRONMENT**
- Late Wisconsinan**
- 10 **DELTAIC DEPOSITS:** well sorted and bedded, medium to fine grained, buff sand and gravel built into glacial lakes by glacial meltwaters and at the mouths of spillways; 2-5 m thick
 - 9 **LACUSTRINE DEPOSITS:** clay, silty clay, silt, and sand thick enough (>1m) to mask underlying topography; occurs as flat or gently undulating plains
 - 8 **Coarse sand, silty sand, and minor silt.** 10a, sand and gravel, 1-3 m thick, of possible shoreline or nearshore origin
 - 7 **Fine silt, silty clay, clay, and minor sand;** 1-5 m thick
 - 6 **COLLAPSED GLACIOLACUSTRINE DEPOSITS:** silt, silty clay, clay, and minor sand; ridged and kettled lake sediments resulting from deposition over or partly over and adjacent to bodies of glacial ice and disrupted by the melting of underlying ice; includes moraine and dead-ice plateaus
 - 5 **Hummocky topography, strongly developed;** 10-40 m local relief. 8a, sand, fine sand, and minor silt; maximum thickness >30 m
 - 4 **Hummocky topography, moderately or weakly developed;** 2-10 m local relief. 7a, sand, fine sand, and minor silt; 2-15 m thick
 - 3 **GLACIOLUVIAL (ice-contact and ice-frontal) DEPOSITS:** gravel and sand, poorly to well sorted and bedded, mainly coarse to medium grained, with numerous cobbles and boulders
 - 2 **Outwash deposits:** well sorted and bedded sand and gravel in flat plains and terraces deposited at and beyond the ice front by meltwater; includes pitted and nonpitted outwash plains, valley trains, and kame terraces; 2-10 m thick
 - 1 **Hummocky or ridged ice contact deposits;** well to poorly sorted and bedded sand and gravel, locally including lenses of till, in steep-sided mounds and ridges; 2-15 m thick; includes kames and eskers
- GLACIAL ENVIRONMENT**
- 11 **HUMMOCKY MORAINES:** till, with minor sand, gravel, and silt; 2-30 m thick; knob and rimmed kettle topography with many stagnant and dead-ice features
 - 10 **Hummocky topography, strongly developed;** 10-40 m local relief. 4a, ridged (characterized by sharp ridges and rimmed kettles)
 - 9 **Hummocky topography, moderately or weakly developed;** 2-10 m local relief. 3a, locally covered by a thin veneer of sand not thick enough (<2m) to mask underlying topography; 3b, moraine deposits washed and channelled by meltwater
 - 8 **GROUND MORAINES:** till, with minor sand, gravel, and silt; unsorted material ranging from pebbles to cobbles and boulders in a clayey to silty and sandy matrix; 2-30 m thick; topography undulating to gently rolling
 - 7 **Oriented:** includes streamlined features such as drumlins, drumlinoids, flutings, grooves, and furrows
 - 6 **Unoriented:** 1a, locally modified by lakewater and commonly bevelled; 1b, washed and channelled by meltwater and including lag gravel and sand; 1c, locally covered by a thin and commonly discontinuous veneer of sand not thick (<2m) enough to mask underlying topography
- ROCK**
- PRE-QUATERNARY**
- R **BEDROCK:** shale, sandy shale, sandstone, coal, and bentonite; exposed as valley-side outcrops or covered by thin slump, alluvium, or drift; includes colluvium and landslide material derived from glacial, glacioluvial, and glaciolacustrine deposits
- Geological boundary (defined).....
- Ice-flow ridges: individual or groups of straight parallel till ridges, 3-15 m high, parallel to ice flow direction; includes drumlins, drumlinoid ridges, and flutings.....
- Moraine ridges: straight to arcuate till ridges, 5-20 m high, mainly transverse to ice flow direction; includes ice thrust ridges, recessional moraines, and ridged end moraines.....
- Washboard moraine ridges: succession of minor, straight to arcuate, parallel till ridges, 1-15 m high, mainly transverse to ice flow direction and displaying a characteristic swell-and-swale topography.....
- Ice-disintegration ridges: fields of minor, straight to curved, commonly intersecting till ridges, 1-8 m high, mainly oblique to ice flow direction; includes crevasse fillings.....
- Kettles.....
- Circular rim ridges: areas of small, closed depressions in moraine and glaciolacustrine and glacioluvial deposits and result from the late melting of buried ice blocks; ridges commonly composed of the same material as that of the unit in which they occur.....
- Meltwater channels: includes spillways, wind gaps, ice-marginal and ice-frontal channels (major, minor).....
- String bog ridges: groups of parallel and sinuous, low ridges composed of organic material.....
- Crest lines of large sand dunes.....
- Escarpment in bedrock or unconsolidated materials; mainly present-day or abandoned river valley walls and lakeshore bluffs.....
- Landslide area showing location of headscarp; slump ridges generally consist of bedrock, till, or overlying sediments on steep valley slopes.....
- Fossil locality; commonly vertebrate bones or freshwater shells.....
- Gravel, sand, or clay pit.....
- Radiocarbon date.....
- Date Material Lab No. Elevation

Geology by S.H. Richard, 1969

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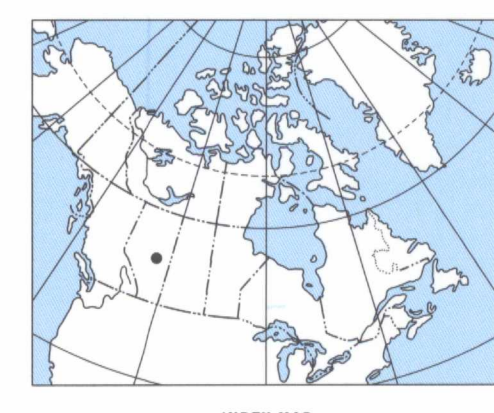
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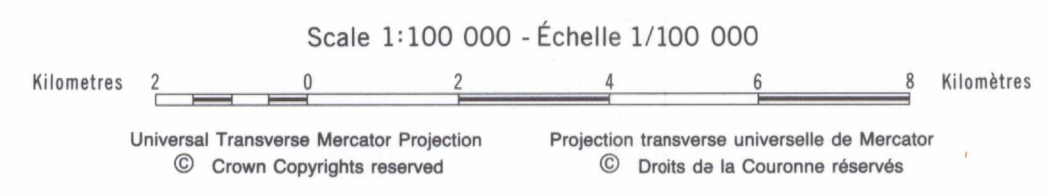
Mean magnetic declination 1986, 21°19' East, decreasing 18.5' annually. Readings vary from 21°28' E in the SW corner to 21°12' E in the NE corner of map.

Elevations in feet above mean sea level

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MAP 9-1986
 SURFICIAL GEOLOGY
CROSS LAKE
 WEST OF FOURTH MERIDIAN
 ALBERTA



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