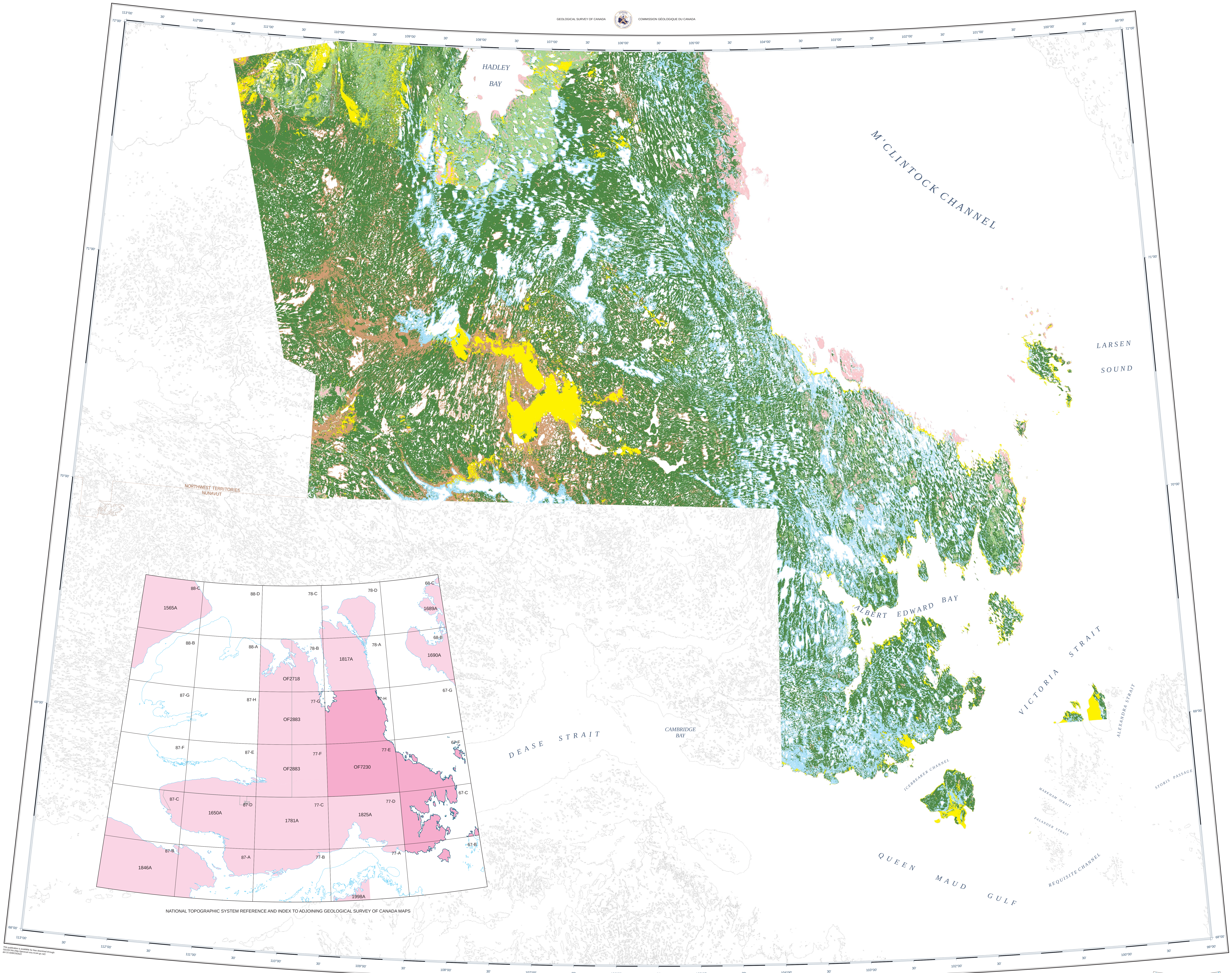
Natural Resources Canada   Ressources naturelles Canada

GEOLOGICAL SURVEY OF CANADA   COMMISSION GÉOLOGIQUE DU CANADA



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

LEGEND

Surficial materials interpretation follows the tonal description

🟫 ***VERY HIGH MOISTURE CONTENT (INLAND AFFINITY):*** *Dark tonal areas associated with local topographic low points and/or thick accumulations of fine-grained sediments. Commonly occurs in proximity to lakes, or flanks river channels.*
Colluvial deposits: *Silty to pebbly diamicton, 1-10 m thick wedges, resulting from solifluction of till, sand and gravel, and slope sediment.*

🟦 ***VERY HIGH MOISTURE CONTENT (COASTAL AFFINITY):*** *Dark tonal areas associated with local topographic low points and/or thick accumulations of fine-grained sediments. Occurs within an elevation envelope between 0 and 100 m above modern sea level. Frequently occupies bedrock depressions in coastal areas. May extend inland in regional topographic lows.*
Marine (veneer) sediments: *Sandy silt with stones, 0.1-2 m thick, reworked by waves and currents from till, glaciofluvial and glaciomarine sediment and washed bedrock; may form strandlines and beaches.*

🟨 ***LOW MOISTURE CONTENT (NO VEGETATION):*** *Light tonal areas with unique tone/reflectance (distinct from other low moisture content areas). Occurs as a thin drape or more extensive sediment cover over bedrock and all other landforms. Commonly has irregular surface topography and boundaries. Associated with sandy river floodplains with low moisture content.*
Sand and gravel: *Sand and gravel deposits, 1-10 m thick, of fluvial origin including terrace, fan, and deltaic sediments*
Sand and gravel deposits, 1-10 m thick, of glaciofluvial origin including kame, esker, outwash plain / terrace, and outwash deltas.
Sand deposits 1-3 m thick of eolian origin. Irregular blanket with dunes covers any landscape; may be reworked by streams.

🟩 ***LOW MOISTURE CONTENT (MINOR VEGETATION)*** *Light tonal areas occuring in various landform/landscape settings, most common on local topographic highs. Commonly associated with bedrock zones where it forms thin sediment cover showing underlying bedrock structure. Also associated with glacial landforms along crests and high flanks of drumlins and near tops of hummocks. May occur entirely within small glacial landforms (drumlins and hummocks).*
Till veneer: *Sandy stony diamicton, 1-2 m thick, with high carbonate content and some Shield erratics; occurs downflow of bedrock escarpments and adjacent to/ within scour zones.*

🟩 ***HIGH MOISTURE CONTENT:*** *Intermediate tone areas encompassing the majority of the map area. Occurs above the lowest-lying areas and below the crests of the highest glacial landforms. Commonly dominates within glacial landforms (drumlins, hummocks) and frequently is composed entirety of glacial landforms.*
Till blanket: *Sandy to stony diamicton, 1-10 m thick, with high carbonate content and some Shield erratics; occurs as till plains and swarms of streamlined landforms; may occur as bouldery lag below marine limit.*

🟥 ***BEDROCK:*** *Distinctive very light tonal areas occurring in various topographic settings. Unique tone/reflectance distinct from other classes. Can be spatially associated with areas of very low moisture content and thin sediment cover.*
Bedrock: *Paleozoic dolomite, limestone, and shale; sub-horizontal; abraded and scoured near escarpments with thin cover of washed till; may contain surface boulders and/or be sediment free; rare Pre-Cambrian inliers; dark ultramafic rocks occur in northwest.*

DESCRIPTIVE NOTES

1) Data sources, software, and pre-classification processing for spectral mapping:

LANDSAT Enhanced Thematic Mapper+ scenes (30 m pixel resolution) covering part or all of NTS Map sheets 67-C, B, F; 77-E, F, G , H. These data were used in the image classification.

SPOT 5 panchromatic datasets (10 m resolution). These data were used to develop training areas and, following image classification, to verify classified pixels.

A digital terrain model from the Canadian Digital Elevation Dataset (CDED) was used for display purposes following image classification, and to define the ~100 m marine limit boundary.

LANDSAT images were tiled into a single mosaic. However, some spectral imbalances could not be fully corrected and remained in the classified image (northwest region). SPOT 5 data were used on a per-scene basis to verify specific locations. Datasets were re-projected to a common projection and datum: Lambert conformal conic projection using NAD 83.

Data processing and analysis were performed with a commercially available image analysis and Geographic Information System (GIS) software. Satellite images were tiled and balanced using the PCI Geomatica software suite. ArcGIS software was used to digitize training areas and assign signature files (see 2 below). Analysis and image classification (see 3 below) were performed with ENVI software suite.

2) Production of training datasets and signature files:

Selection of training data is a crucial step for Remote Predictive Mapping (RPM) classifications since it is central to the classification process. The quality and accuracy of the final classification is directly related to the quality of the training area signal. Identification of training areas relies on many of the same principles as aerial photograph interpretation, namely that distinct areas can be identified and differentiated based on visual characteristics such as tone, texture, size, shape, pattern, and association with other image features. On multi-spectral datasets, spectral tone is the most easily manipulated variable, and provides the ability to examine feature tones in various spectral bands, thus allowing for precise differentiation of features and material types. Moisture content has the greatest influence on surface tonal characteristics (pixel reflectance). However, a range of factors affect tonal characteristics associated with moisture content: sediment texture (grain size), relative topographic position, slope, aspect , vegetation, material thickness, and lithology. Seasonal variations in moisture content were not considered to be significant variables in this classification based on the fact that images were taken at similar time periods. Lithologic variations occur within the classified images. These are most prevalent in the northwest of the mapped area where outcropping ultra-mafic rocks result in spectrally-dark sediments. These bedrock outcrops are readily distinguished from the dominantly spectrally-light carbonate bedrock occurring throughout most of the mapped area. However, sediment resulting from these ultra-mafic outcrops leads to some spectral confusion during classifications based on moisture content (solutions to this spectral confusion are discussed in the next section).

Training areas were mapped as polygons and grouped into four distinct classes representing moisture end-members: i) bedrock (no moisture and distinctive spectral signature), ii) very high moisture content, iii) high moisture content, and iv) low moisture content. Limited classes were developed in order to provide the most basic and descriptive characterization of tonal characteristics (surface materials) associated with distinct landscape positions. In each case, ~35-45 training polygons, distributed throughout the study area, were digitized. As much as possible, differences in the total number of pixels contained within each training area class were kept low to avoid over-/ under-representing certain classes in statistical calculations. Due to spectral imbalances within the LANDSAT mosaic, and because of lithologic variations within some scenes, three distinctive sets of training areas were employed in three areas of the mosaic. The spatial consistency of resulting classifications was assessed visually between these three areas. Defining training areas relied on expert knowledge on glacial sediment-landform associations, landscape genesis and on integration of field data from this area.

Signature files associate a spectral signature with a given training area. A set of training areas therefore has a composite spectral signature reflecting the variability of tonal characteristics encountered within the polygons of the given class. Defined signature files enables the computer algorithm to associate the remaining unclassified pixels with a known class as specified by the training area signatures.

3) Image classification and results

A supervised classification method (Maximum Likelihood classification algorithm) was used for image classification. This classification scheme assigns a value to every pixel based on the probability that the spectral signature of a given pixel belongs to a pre-defined class (from trained signature files).

Results of the image classification highlight pixels of similar spectral characteristics that can be associated with the pre-defined moisture-content or bedrock classification of the signature files. Two spectral end-members emerge from this classification: i) areas of bedrock, and ii) areas of very high moisture content, typically occurring in topographic depressions (lakes common), and, frequently associated with accumulations of sediment, vegetation and organic material. Remaining classes represent spectral and tonal characteristics that are transitional to these two end-members.

Further distinctions between moisture content classes are informed by variables such as topographic position of pixels or pixel clusters, relationship to certain landforms, and inferred thickness of surface materials. The intent of this map is a rapid RPM completion to identify areas to guide field data collection and sampling in an area with limited published geological knowledge. The final product then reflects and captures the variability of surface materials which can be linked to specific material types (e.g. till, sand and gravel, etc), to produce a surficial geology map, using post-processing rules based on expert knowledge.

Canada

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Geology by J.E. Lesemann, D. R. Sharpe. and D. Giroux, 2012

Cartography by S. Klassen and S. Eagles

Initiative of the Geological Survey of Canada as part
of the Natural Resources Canada's Geomapping for
Energy and Minerals (GEM) program

Base map at the scale of 1:250 000 from Natural Resources Canada,
with modifications

OPEN FILE 7230

A REMOTE PREDICTIVE SURFICIAL MATERIALS MAP

EASTERN VICTORIA ISLAND

NORTHWEST TERRITORIES AND NUNAVUT

Scale 1:500 000/Échelle 1/500 000

kilometres 10 0 10 20 30 40 kilomètres

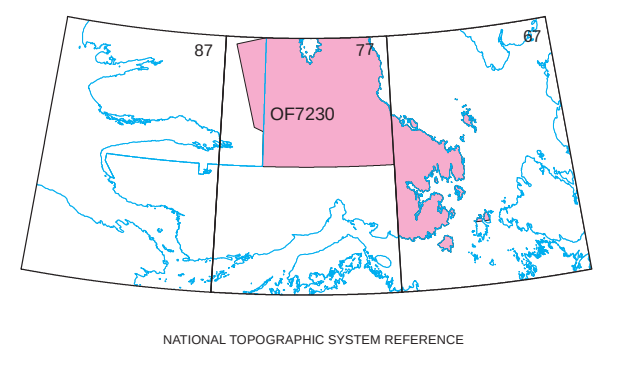
Lambert Conformal Conic Projection
North American Datum 1983

Projection conique conforme de Lambert
Système de référence géodésique nord-américain, 1983

Proximity to the North Magnetic Pole causes the
magnetic compass to be erratic in this area
Mean magnetic declination 2013, 8° 49'E, decreasing 39' annually.
Readings vary from 1° 44' W in the SE corner to 17° 50' E
in the NW corner of the map.

Any revisions or additional geological information known to the user
would be welcomed by the Geological Survey of Canada

This map is not to be used for navigation purposes



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE

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GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
2013

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