

Geological Map for Part of NTS 11E/06, Truro Area, Nova Scotia

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Scale 1:50 000

Halifax, Nova Scotia



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Descriptive Text

The St. Mary's Basin, central mainland Nova Scotia, is dominated by a Late Devonian(?) - Early Carboniferous intracratonic alluvial fan-fluvial-lacustrine basin-fill sequence that occupies the current boundary between the Meguma and Avalon terranes of the Canadian Appalachians. The Basin rocks belong to the Horton Group which is divided into six, partially equivalent, formations. The stratigraphically lowest rocks are predominantly exposed in the central part of the Basin in a series of an euhelical anticlinal closures (11E/06-08). These clastic rocks were deposited in a longitudinal drainage system represented by a lacustrine (Little Stevacke River Formation) and an overlying braided fluvial (Barrens Hills, Lochiel and Graham Hill Formations) environment, which are in turn overlain by the Cross Brook and West River St. Mary's Formations. These rocks unconformably overlie the Meguma Group, reflecting a decrease in accommodation space and implying that the St. Mary's Basin is underlain, at least in part, by Meguma basement.

This map area (11E/06) is partially underlain by the Little Stevacke River and Barrens Hills formations. The contact between these formations is exposed to the east (11E/07), where facing directions in the vicinity of the contact clearly show that the Barrens Hills Formation overlies the Little Stevacke River Formation. However, contact relationships between these formations are still being mapped out, so they are presented as an undivided unit on this map. The Little Stevacke River Formation, which consists of interstratified, thick bedded, bedded mudstone, fissile, light to dark grey and black shale and siltstone, and light to dark grey sandstone, frequently contains abundant comminuted plant debris. Coarsening- and thickening upward cycles, 2-25 m thick, occur with individual beds ranging in thickness from 2 mm to 15 cm. In some localities the sandstones display a stony cleavage. Siltstone/shale-sandstone contacts are either sharp or transitional, or less commonly, erosional. Sandstones are typically grey or dark grey weathering, very fine- to fine-grained and micaceous, and in some localities, moderately feldspathic. Primary and post-orogenic sedimentary features include normal grading, parallel lamination, ripple cross-lamination, leading features and bioturbation. Sandstone strata generally vary from millimetres to decimetres in thickness. As the contact with the overlying Barrens Hills Formation is approached, the upper member lithologies are coarser, anisotropically amalgamated with channel scours and possible wavy cross-stratification, and display large scale (10-20 cm) trough cross-stratification. Fine, organic debris is often abundant in these sandstones and their weathering colour darkens accordingly.

The Barrens Hills Formation is characterized by resistant intervals of light grey to grey-white weathering, fine- to very coarse-grained sandstone, monomict or polymict granitoid and conglomerate interstratified with recessive intervals of micaceous, grey to dark grey weathering shale and/or siltstone. Interbeds of minor red siltstone and sandstone also occur. The sandstones are dominated by quartz and feldspar, although grey sedimentary lithic clasts are common near the base of the Formation. Feldspars are generally intensely weathered to clay minerals. Locally, the sandstones may be slightly micaceous, moderately feldspathic, and contain varying, but significant amounts of dark grey sedimentary lithic clasts of schist and sandstone, some with a fabric, that are probably derived from the Meguma Terrane south of the St. Mary's Basin. The Barrens Hills Formation underlies large areas of both the central and eastern Basin where it outcrops along a broad, regional, north-eastward-trending anticlinal axis. To the west of the Stevacke River region the Formation thins dramatically and passes into the laterally equivalent Graham Hill Formation. To the east, it passes into the laterally equivalent Lochiel Formation.

The basal contact of the Barrens Hills Formation is positioned where sand- to granule-sized quartz-rich clastic sediment starts to predominate over the darker and more thinly bedded lithologies of the Little Stevacke River Formation. This contact is exposed in the Stevacke River region (11E/07) where it is transitional over 1 m. It is recognized by the abrupt occurrence of thin (10-20 cm) lenses of small pebble conglomerate at the base of the Barrens Hills Formation.

The Graham Hill Formation consists of 1220 m of red and maroon weathering, fine grained litharenite to feldspathic litharenite and siltstone with thick intervals of grey weathering, interstratified, coarse grained sandstone, pebbly sandstone and granule to pebble conglomerate. It is well exposed in Victoria Park, Truro. Clasts include quartz, mica, intraformational siltstone (0.5-1 cm), and flow-banded rhyolite. Regional relationships indicate that the Graham Hill Formation is also a lateral facies equivalent of the Barrens Hills Formation. In separate stratigraphic sections, both formations conformably overlie the Little Stevacke River Formation. In the eastern portion of this map sheet, the Graham Hill Formation is complexly interstratified with both the Barrens Hills and Little Stevacke River formations. This indicates that the three formations are, at least in part, time equivalents. This style of interfingering is thought to characterize the stratigraphic relationships between formations throughout the Basin.

The Cross Brook Formation, which consists of grey-green weathering sandstone interstratified with less abundant grey-green weathering siltstone, shale and conglomerate and rare limestone, and the West River St. Mary's Formation, which consists of reddish-brown to grey-brown weathering conglomerate interstratified with grey-brown weathering sandstone, are not exposed in this map area. Further to the east they occur along the southern flank of the Basin, and contain abundant clasts of Meguma Terrane lithologies, suggesting a strong tectonic influence on sedimentation. In contrast, the character of the sediments does not vary with proximity to the northern margin (Chedabucto Fault), suggesting that the Fault does not constitute the original Basin margin, and that an unknown portion of the Basin and its Meguma basement have been tectonically removed and may be found north of the Fault.

The St. Mary's Basin is an example of basin development and evolution adjacent to an intra-continental fault zone associated with oblique convergence during orogenesis. Its evolution provides constraints on the potential relationship between the termination of the mid-Paleozoic Acadian Orogeny, subsequent basin development and the ongoing interactions between the Avalon and Meguma terranes, and between Laurentia and Gondwana during the assembly of Pangaea. More generally, because the relationship between tectonic development and rotation along continental strike-slip faults in continental zones is difficult to interpret, the sedimentology and structural geology in basins developed along these fault zones may preserve a less ambiguous record of the main tectonic events.

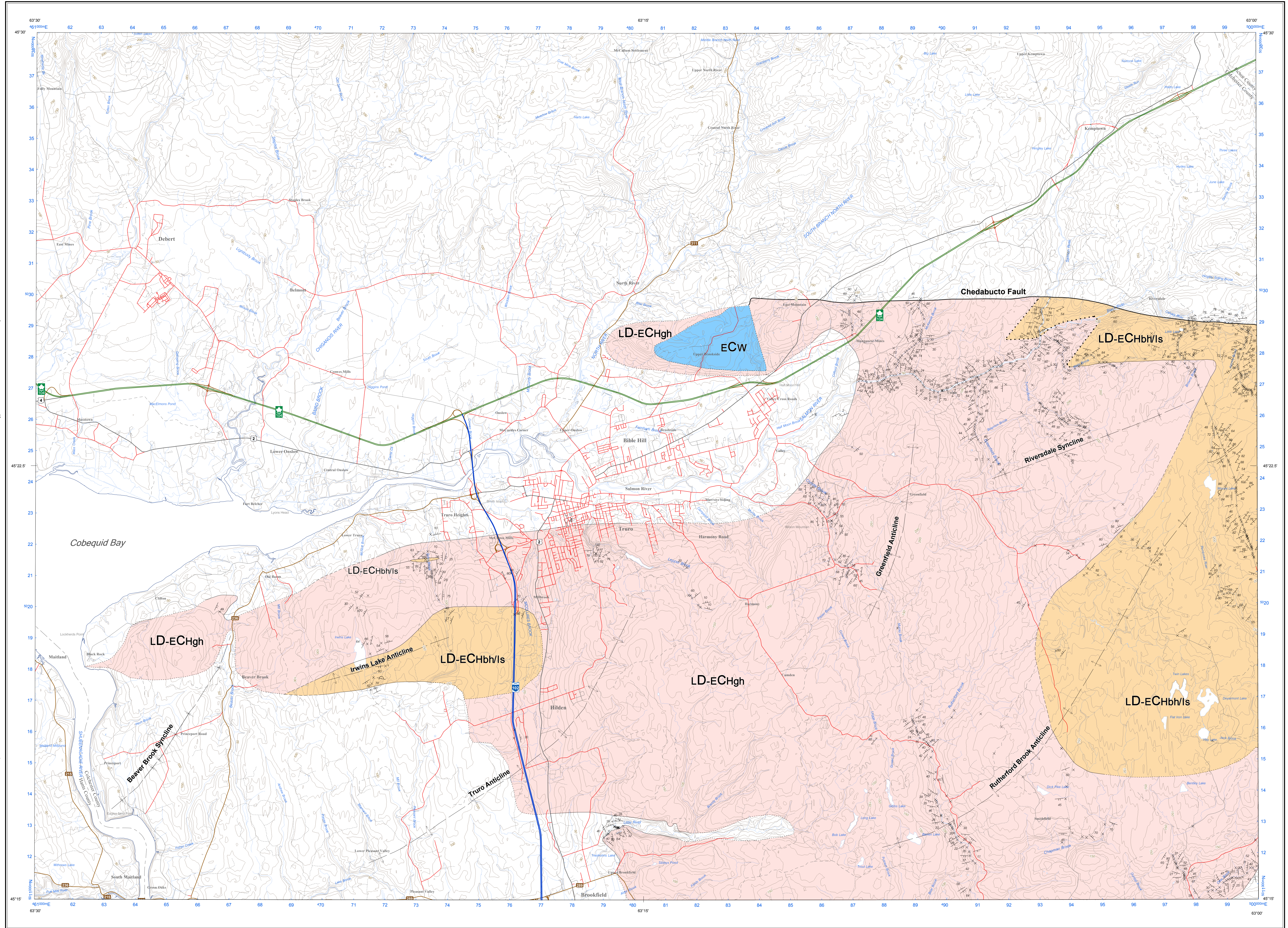
The evolution of the St. Mary's Basin preserves evidence of protracted dextral shear along an intracratonic fault zone during orogenesis and the assembly of Pangaea. The origin and evolution of the Basin are attributed to either dextral or progressive left-lateral shearing along the Minas Fault Zone (MFZ) between the Late Devonian and Late Carboniferous. Evidence for the Late Devonian origin of the Basin is recorded along its southern flank by the fabrics of the deformed ca. 370 Ma granites, the overall sedimentary facies distribution and some syndepositional features within the clastic rocks. The most intense deformation within the Basin is concentrated in a narrow east-north-eastward trending zone, in which predominantly the grained clastic rocks are deformed into periclinal folds and related reverse faults. The orientation of this zone, relative to the MFZ, is consistent with dextral shear. At least some of this deformation occurred after the deposition of the overlying Visian Windsor Group (11E/06). The style of deformation along the present northern margin of the Basin (the Chedabucto Fault) is also consistent with regional dextral shear.

Disclaimer

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LEGEND

CARBONIFEROUS

WINDSOR GROUP

ECW undivided

LATE DEVONIAN - EARLY CARBONIFEROUS

HORTON GROUP

LD-EChgh WEST RIVER ST. MARY'S FORMATION* reddish-brown to grey-brown weathering, pebble to boulder conglomerate interstratified with grey-brown weathering sandstone. Abundant clasts derived from the Meguma Terrane.

LD-EChhb Irwings Lake Anticline LD-EChhb/ls CROSS BROOK FORMATION* grey-green weathering sandstone, interbedded light-green weathering conglomerate, shale, conglomerate and rare limestone. Abundant clasts derived from the Meguma Terrane.

LD-EChgh LD-ECh LD-EChhb/ls GRAHAM HILL, LOCHIEL, BARRENS HILLS and LITTLE STEVACKE RIVER FORMATIONS

GRAHAM HILL FORMATION (LD-EChgh) undivided
GRAHAM HILL FORMATION (LD-EChhb/ls) red and maroon weathering, fine grained litharenite to feldspathic litharenite and siltstone with thick intervals of grey weathering, interstratified, coarse grained sandstone, pebbly sandstone and granule to pebble conglomerate. Clasts include quartz, mica, intraformational siltstone (0.5-1 cm), and flow-banded rhyolite.

LOCHIEL FORMATION (LD-EChgh) grey to green, fine- to very coarse-grained, micaceous and feldspathic sandstones, interbedded minor granitoid, calc. grey siltstone.

BARRENS HILLS AND LITTLE STEVACKE RIVER FORMATIONS (LD-EChhb/ls) undivided

BARRENS HILLS FORMATION: resistant grey to grey white weathering, fine- to very coarse-grained sandstone, monomict or polymict granitoid and conglomerate interstratified with recessive micaceous, grey to dark grey weathering shale and/or siltstone, minor red siltstone and sandstone.

LITTLE STEVACKE RIVER FORMATION: unresistant, thinly bedded, bedded mudstone, fissile, light to dark grey and black shale and silt, and light to dark grey sandstone containing comminuted plant debris.

*bedrock units are not mapped in this map area
Outcrop data from Stevenson (1958), although not illustrated, were used locally to help support map interpretation. Map users should refer to Stevenson (1958) for additional outcrop locations and structural measurements.

Geological Symbols

- Outcrop
- Bedding, tops known (inclined, overturned, vertical, horizontal)
- Bedding, tops unknown (inclined, vertical, horizontal)
- Intersection lineation, 1st generation
- Cleavage or foliation, 1st generation (inclined, vertical)
- Minor fold axis
- Anticline and syncline (approximate)
- Minor fault
- Major fault (defined)
- Geological boundary (defined, approximate, assumed)
- Interfingering contact, approximate (units of approximately similar age, units of differing age)

Legend

- Contour
- Index Contour
- Depression Contour
- Index Depression Contour
- Coastline
- Lakes, Single-line Rivers, Streams
- 100 Series Highway
- Trans-Canada Highway
- Trunk Highway
- Collector Highway
- Hard Surface Road
- Road Under Construction
- Loose Surface/Resource Access Road
- Vehicle Track
- Trail/Footpath
- Railway
- Railway Inactive
- County Boundary