Product access guide to High Resolution Digital Elevation Model Mosaic (HRDEM Mosaic)

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This guide explains three different approaches to access elevation data from the HRDEM Mosaic, offered through WMS and WCS on NRCan's Data Cube platform: the GIS approach, the GetCoverage/GetMap approach and NRCan's dynamic extraction tool. For the GIS approach, due to issues in recent versions of QGIS, we do not recommend using this approach with versions of QGIS higher than 3.22.8.

GIS approach

Note that we have recently experienced issues when loading the WCS in some versions of QGIS. The steps below were done with QGIS 3.22.8. It currently doesn't work with QGIS 3.28.10 and only partially with QGIS 3.32.2. This guide will be updated once the QGIS issues are solved.

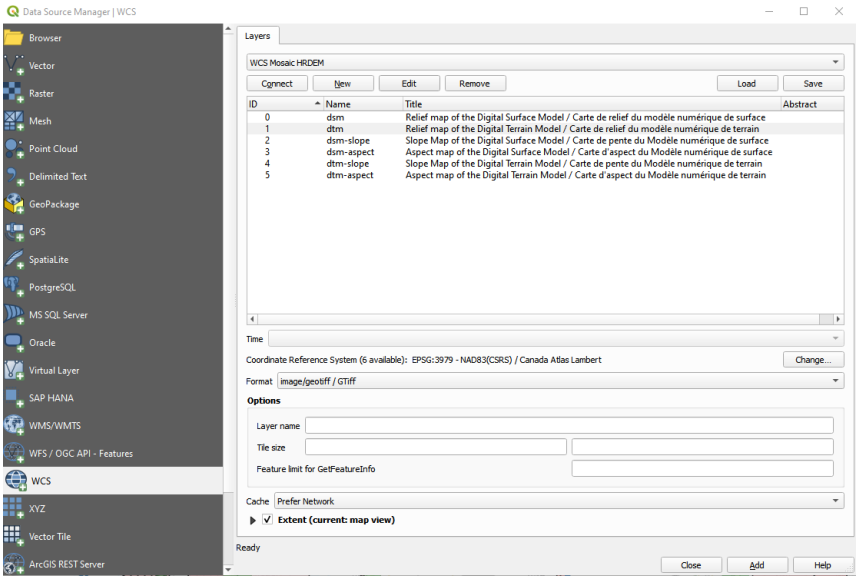
Using QGIS, it's possible to manually extract specific portions of the HRDEM Mosaic through the WMS or the WCS. This section presents the WCS approach to directly access the elevation data.

Although the HRDEM WCS and WMS support several projections, we suggest setting the Project Coordinate Reference System to EPSG:3979 prior to loading the WCS in QGIS.

To access it in QGIS, use the WCS link provided in the Data Resources section of the HRDEM Mosaic:

https://datacube.services.geo.ca/ows/elevation?service=wcs&request=GetCapabilities

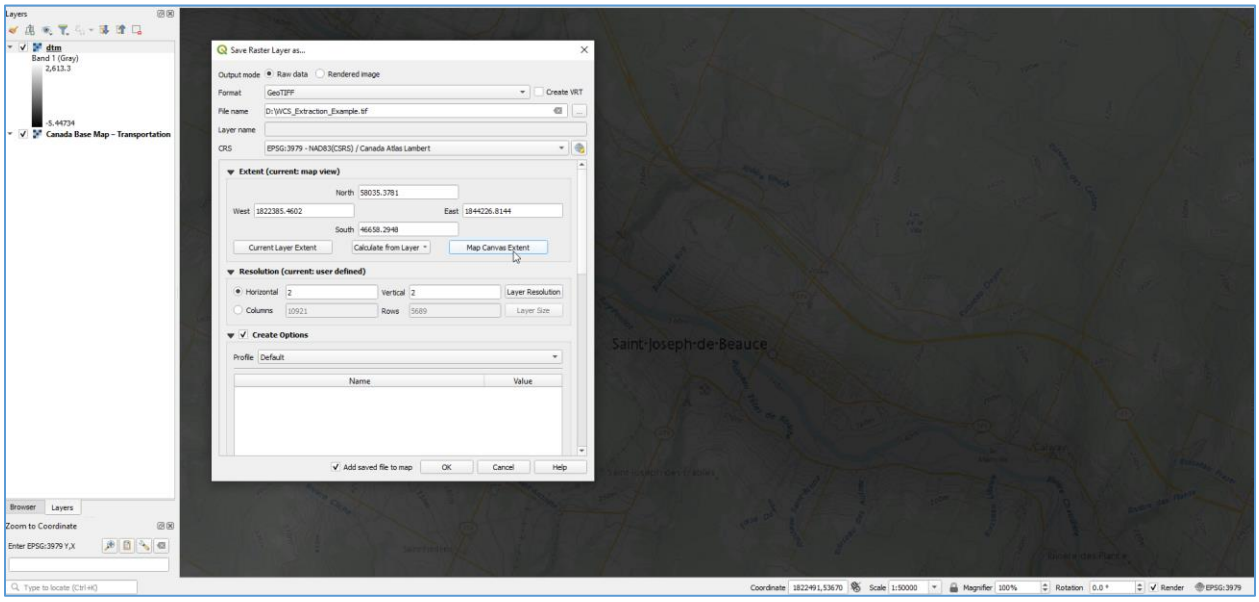
Using the Data Source Manager, choose WCS and create a new connection using the link above. This will provide 6 layers to choose from, including the dtm, dsm, dtm-slope, dtm-aspect, dsm-slope and dsm-aspect.



Once the layer is loaded, for example if you are using the dtm layer, you can extract and download the raw elevation data from the WCS for a given area of interest (AOI). To do so, zoom on your AOI, right click on the dtm layer and use the 'Export/Save as'. Then select 'raw data' in the output mode section and select the extent and resolution of your choice.

Note that requests for large files with high resolution can lead to timeouts or can take quite some time to export. We suggest using small extents when extracting at high resolution.

In this example below, we zoomed at about 1:50 000 and chose the EPSG:3979 CRS with a 2 meters resolution. We clicked on the Map Canvas Extent button in order to save only the AOI portion. With these settings, the creation of the file took about 10 minutes. With a slightly coarser resolution or a smaller extent, the file creation would be faster.



WCS GetCoverage and WMS GetMap queries

The HRDEM Mosaic can be accessed through GetCoverage queries using the WCS endpoint.

The WCS services are compliant with the version 1.1.1 of the OGC WCS standard. This specification version offers extra query parameters on the GetCoverage query that allow controlling the resolution of the resulting coverage. These extra parameters allow defining the bounding box (BOUNDINGBOX), the grid origin (GRIDORIGIN - always the upper left corner) and the spatial resolution (GRIDOFFSETS). These parameters also help to adjust the size of the query to ensure it can be requested within the current timeout threshold defined on our web servers. This limit is currently set at 5 minutes on our web servers.

The WCS services require the output resolution to be explicitly included in the GetCoverage request in order to avoid being determined in an approximate or erroneous way. We therefore recommend that

GetCoverage requests include the following parameter: GRIDOFFSETS. It is also possible to control other properties of the resulting grid via the parameters GRIDBASECRS and GRIDORIGIN.

For a complete list of the available parameters, please visit the WCS standard specification.

Here are some GetCoverage query examples performed on the dtm layer. The other layers available through the WCS are dsm, dtm-slope, dtm-aspect, dsm-slope and dsm-aspect.

Halifax (resolution of 0.00005 degrees, using the EPSG:4326 coordinate system)

https://datacube.services.geo.ca/ows/elevation?SERVICE=WCS&VERSION=1.1.1&REQUEST=GetCoverage&FORMAT=image/geotiff&IDENTIFIER=dtm&BOUNDINGBOX=44.6,-63.7,44.75,-63.45,urn:ogc:def:crs:EPSG::4326&GRIDBASECRS=urn:ogc:def:crs:EPSG::4326&GRIDORIGIN=44.75,-63.7&GRIDOFFSETS=-0.00005,0.00005

Maritime Provinces (200 m resolution, using the EPSG:3979 coordinate system)

https://datacube.services.geo.ca/ows/elevation?SERVICE=WCS&VERSION=1.1.1&REQUEST=GetCoverage&FORMAT=image/geotiff&IDENTIFIER=dtm&BOUNDINGBOX=1897100.0,-176900.0,2851900.0,510100.0,urn:ogc:def:crs:EPSG::3979&GRIDBASECRS=urn:ogc:def:crs:EPSG::3979&GRIDOFFSETS=200.0,-200.0

Coastal area near Halifax (resolution of 5m, using the EPSG:2961 projected coordinate system)

https://datacube.services.geo.ca/ows/elevation?SERVICE=WCS&VERSION=1.1.1&REQUEST=GetCoverage&FORMAT=image/geotiff&IDENTIFIER=dtm&BOUNDINGBOX=536284.0004916692,4967490.7738740705,551051.9872473435,4992494.7738740705,urn:ogc:def:crs:EPSG::2961&GRIDBASECRS=urn:ogc:def:crs:EPSG::2961&GRIDOFFSETS=5,-5.0&GRIDORIGIN=536284.0004916692,4992494.7738740705&Gridcs=urn:ogc:def:cs:OGC:0.0:Grid2dSquareCS&gridtype=urn:ogc:def:method:WCS:1.1:2dSimpleGrid

NOTE: When extracting elevation data from the WCS at high resolution and for large AOIs, we suggest 'chopping' the extents of the AOI in smaller areas (therefore meeting the timeout set on our servers), and then merge back the downloaded grid tiles to create a merged DEM of your large AOI.

For visualisation of the data, it is preferable to use a GetMap query on the alternate WMS endpoint. Here are some examples using geographic coordinates.

Canada extent:
https://datacube.services.geo.ca/ows/elevation?SERVICE=WMS&VERSION=1.3.0&REQUEST=GetMap&BBOX=35.77539765623554047,-163.8115225421603327,84.3195656233574482,-32.40629995016166731&CRS=EPSG:4326&WIDTH=644&HEIGHT=239&LAYERS=dsm-hillshade&STYLES=&FORMAT=image/png&DPI=120&MAP_RESOLUTION=120&FORMAT_OPTIONS=dpi:120&TRANSPARENT=TRUE

Province of New-Brunswick:
https://datacube.services.geo.ca/ows/elevation?SERVICE=WMS&VERSION=1.3.0&REQUEST=GetMap&BBOX=43.7148898963398409,-70.62212673819233544,49.04109302822782013,-

62.4093003261924153&CRS=EPSG:4326&WIDTH=643&HEIGHT=418&LAYERS=dsm-hillshade&STYLES=&FORMAT=image/png&DPI=120&MAP_RESOLUTION=120&FORMAT_OPTIONS=dpi:120&TRANSPARENT=TRUE

The BBOX, HEIGHT and WIDTH parameters should be adjusted to follow the user requirements. The examples above are based on the dsm-hillshade layer but other related layers are also available such as: dtm, dtm-hillshade, dtm-slope, dtm-aspect, dsm, dsm-hillshade, dsm-slope and dsm-aspect.

For a complete list of the available parameters, please visit the WMS standard specification.

Geospatial Data Extraction Tool

It is also possible to download portions of the HRDEM Mosaic (Terrain, surface or derived products) using the Geospatial data extraction tool offered by NRCan here: https://maps.canada.ca/czs/index-en.html

The maximum size of the AOI to extract with this tool is 500 km2. Once your task is submitted, you will receive the result of your task by email a few minutes after.