

Digital Geology Map of British Columbia

Release 1.0, January 2005

Introduction

Digital regional compilations of the geology of B.C. at 1:250,000-scale were made by staff of the Geological Survey Branch in 1992-96 in support of the Mineral Potential Project. These were released as Open Files (see References) and digital downloads from the GSB website (<http://www.em.gov.bc.ca/geology>). They were also used as the geology base for the Map Place (<http://www.mapplace.ca>).

However, numerous errors and inconsistencies were noted within these data sets. The Digital Geology Map of British Columbia Project was designed to address these problems and, in the process, try to produce a seamless digital map of the Province with consistent geological tagging. Where feasible, updates to the geology have also been incorporated during the editing process. However, some “scratch lines” remain in the data reflecting problems due to unresolved differences in geological designations in original sources.

Release of the recompilation is based on the same tiles as the Cordilleran GIS Map Library (Journeay and Williams, 1995) which conforms to the International Map of the World standard used for indexing 1:1,000,000-scale topographic maps (Figure 1). This differs from the numbering convention used for the National Topographic System maps. NTS sheets contained within each tile are listed in Table 1. Preliminary versions of the tiled data were released in 2003, with updates in 2004. This new province-wide version, and associated tiled data, supersedes the earlier files.

All data sets are in shape file format that should be readily usable by most GIS software. They are presented as either decimal degrees (suffix _ll) or BC Albers (suffix _alb)¹. Tiled data are also available in UTM (suffix _utm) projections. All projections use NAD83 as the datum. The data sets are intended to be used at 1:250,000-scale and their use at larger scales is not recommended.

Data sets

Each data set includes several topographic and geological shape files:-

Topographic data:

BC_road important roads (excludes many roads in built-up areas); the legend file, e.g. BC_road_ll.avl, will symbolize for paved or gravel surface (lines).

¹ Parameters for BC Albers:

Units	metres
Spheroid	GRS 80
Datum	NAD 83
Central meridian	126 00 00 W
Latitude of origin	45 00 00 N
1st standard parallel	50 00 00 N
2nd standard parallel	58 30 00 N
False easting	1000000
False northing	0

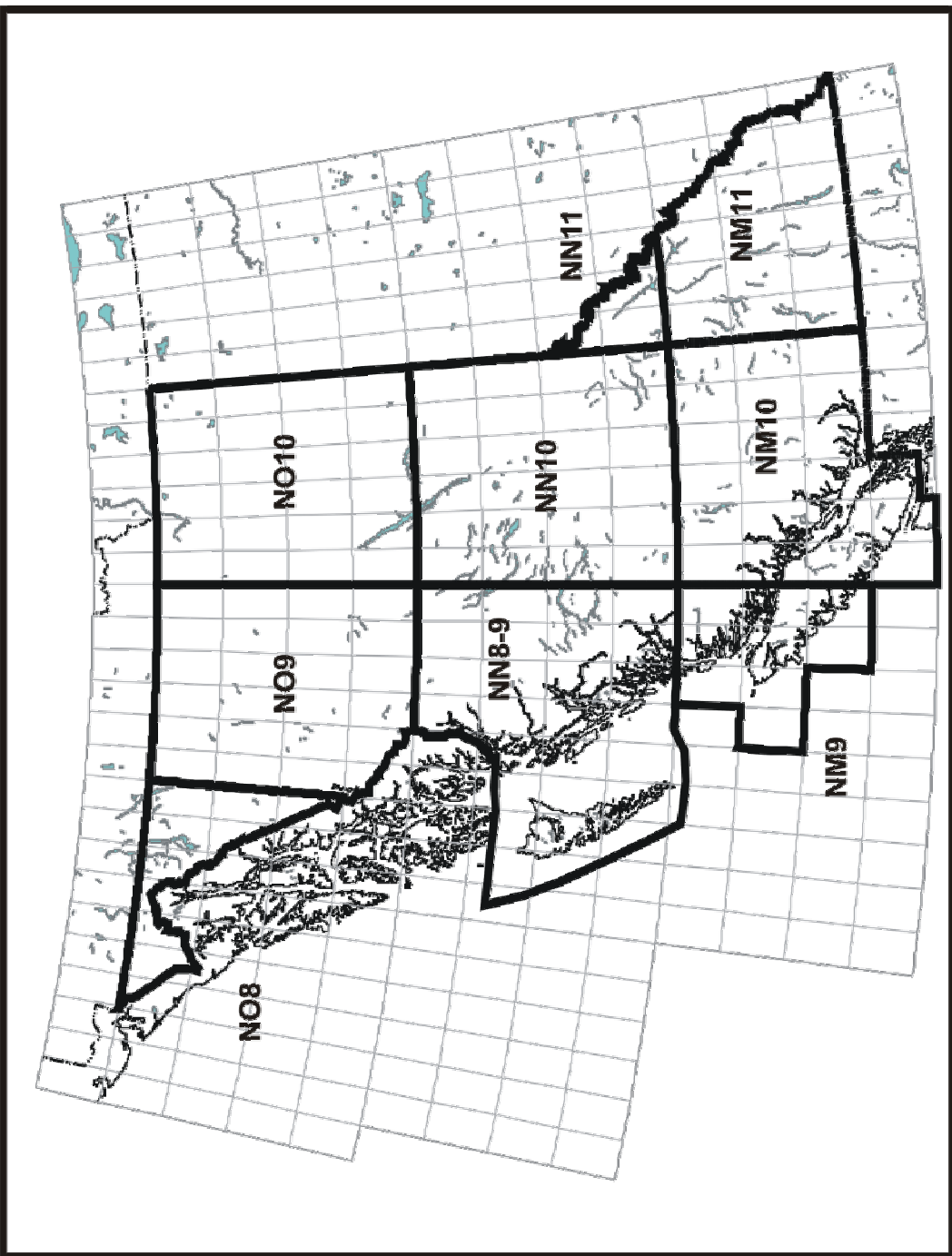


Figure 1: Locations of individual tiles of digital geology

Tile	NTS sheets
NM9 <i>Mid Coast</i>	92E, 92L, 92M, 102I and 102P
NM10 <i>Southwest BC</i>	92B, 92C, 92F, 92G, 92H, 92I, 92J, 92K, 92N, 92O and 92P
NM11 <i>Southeast BC</i>	82E, 82F, 82G, 82J, 82K, 82L, 82M, 82N and 82O
NN8-9 <i>North Coast and QCI/Haida Gwaii</i>	93D, 93E, 93L, 93M, 102O (part), 103A, 103B, 103C, 103F, 103G, 103H, 103I, 103J, 103K 103O and 103P
NN10 <i>Central BC</i>	93A, 93B, 93C, 93F, 93G, 93H, 93I, 93J, 93K, 93N, 93O and 93P
NN11 <i>Mid Rockies</i>	83C, 83D and 83E
NO8 <i>Northwest BC</i>	104F, 104K, 104L, 104M, 104N, 114I and 114O
NO9 <i>North Central BC</i>	94D, 94E, 94L, 94M, 104A, 104B, 104G, 104H, 104I, 104J, 104O and 104P
NO10 <i>Northeast BC</i>	94A, 94B, 94C, 94F, 94G, 94H, 94I, 94J, 94K, 94N, 94O and 94P

Table 1: 1:250,000 NTS sheets covered by tiled datasets

BC_rail	rail track; includes some disused lines (lines).
BC_communities_2M	regionally significant population centres; attributed for name (points).
BC_250Kgrid	1:250,000 NTS map sheet grid (polygons).
BC_tile	areas of tiled data (polygon).
BC_ocean	coastline (polygon).
BC_river	rivers (lines).
BC_riverpoly	major rivers (as polygons).
BC_lake	lakes (polygons).
BC_ice	areas of permanent ice cover (polygons).

Geological line work: intended for cartographic purposes only:

BC_fltln	faults, attributed for type of fault – fault, normal fault, thrust fault, extensional fault (lines).
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Note: lines for faults follow a "right-hand rule" such that appropriate symbology (e.g. teeth on thrusts) should be placed on the right-hand side of the line. A suitable legend file, e.g. BC_fltln_ll.avl, is included for ArcView 3.x users. ArcMap 8.x users can use the BCDigitalMap.style style sheet.

Geological polygons:

BC_quaternary	Quaternary alluvium and cover; note that the extensive Quaternary deposits of the Rocky Mountain foothills and the Peace River area have been omitted as they would completely cover and obscure the bedrock geology (polygons).
BC_geology	Bedrock geology; see below for explanation of attributes (polygons).

Due to intentional overlaps between different polygon data sets, they should be stacked in the following order for correct cartographic representation:

Top: BC_ice; BC_riverpoly; BC_lake; BC_ocean; BC_quaternary; BC_geology: Bottom.

Other files should be stacked on top of the polygons - relative order is not so critical.

Extracting the datasets

All data sets are packaged into zip files located in the Data directory. When extracted, files will sit in a directory \BCGeology.² To extract the files:

1. Locate the required file on the DVD (e.g. \data\nm10.zip).
2. Copy to your hard drive e.g. in C:\ temp.
3. Extract the files using whatever zip utility you have (e.g. WinZip, Power Archiver, etc.). Extract them to the root of your hard drive (e.g. C:\) The files will be written to a new \BCGeology directory (e.g. \BCGeology\nm10)

² It is recommended that this default directory structure not be changed if use is to be made of the supplied ArcExplorer 2 project files. These files are hard coded for file locations and will not work if data files are removed or directories renamed.

4. After successful extraction, delete the zip file from your hard drive.

Note: Before unpacking any data set, check to make sure that you have enough free disk space on your hard drive. File sizes are listed in Table 2.

Tile	Unzipped size (Mb)	Zipped size (Mb)
BC	946	528
NM9	58	38
NM10	214	139
NM11	154	98
NN8-9	248	166
NN10	213	137
NN11	40	28
NO8	127	84
NO9	252	163
NO10	170	111

Table 2: File sizes for data sets.

Viewing the data sets

All data is in ESRI's shape file format and is readily importable into any GIS package. For those who cannot access a GIS, several data viewer programs are available that allow the import of shape files (e.g. <http://spatialnews.geocomm.com/features/viewers2002/>). A copy of ESRI's ArcExplorer 2 viewer is provided on the DVD for those operating in a MS Windows environment. To install this:

1. Locate the file on the DVD (\utilities\asetup.exe).
2. Copy to your c:\temp directory.
3. Double click on asetup.exe and follow all the dialogues choosing the default settings.
4. After installation, delete asetup.exe from c:\temp

First-time users are advised to consult the extensive help files which accompany the program.

Additional information can be obtained from ESRI's web site

(<http://www.esri.com/software/arcexplorer/>). A Java-based version of ArcExplorer is also

available from the ESRI web site, for those who use a different operating system, e.g. Unix, Mac OS, etc.

A ready-made project file (e.g. nm10_utm.aep) is provided with each tile of data for use with ArcExplorer2³. To open the file:

1. Open ArcExplorer 2
2. Select File/Open Project (or click on the open project icon on the toolbar)
3. Navigate to the project file (e.g. C:\BCGeology\nm10\nm10_utm.aep)
4. Select file and click open. Be patient, the file may take several minutes to open depending upon the resources available on your computer.

Notes: A project file has been supplied using each of the BC Albers or UTM versions of the data sets. The geology is coloured for attribute strat1. Fault types and railways are unornamented – due to the limited number of line types available in ArcExplorer.

B.C. Digital Geology attribute fields

BC_geology polygons have the following attribute fields -

AREA	Polygon area in square metres.
PERIMETER	Polygon perimeter in metres.
KEYCODE	Original geological tag; derived from the Mineral Potential geological compilations; also includes new tags assigned during this compilation in updated areas.
TECUNIT	Tectonic assemblage code; derived from GSC Map 1712A and Journeay & Williams (1995) with slight modifications. Codes used are listed in BC_Tecunit.xls.
STRAT_UNIT	Recommended stratigraphic tag. This is in standard geological unit label format, comprising various elements including the age, stratigraphic name (Group and/or Formation) and lithology. Age and stratigraphic codes are listed in BC_Stratcode_Components.xls; lithological codes are listed in BC_Lithology.xls.
ERA	Geological Era within which the unit lies.
PERIOD	Geological Period within which the unit lies.
STRAT_AGE	Stratigraphic age range of unit.
STRAT_NAME	Stratigraphic name of unit; Group and/or Formation where assigned.
STRAT_AGECD	4-digit age code; first four digits of AGECODE, <i>qv</i> ; see BC_Agecodes.xls.
GROUP_SUITE	Group or Suite name.
FORMATION_	Formation or lithodeme name.
ROCK_TYPE	Generalized lithological description; see BC_Lithology.xls.
ROCK_CODE	One or two letter code for rock type; see BC_Lithology.xls. May be used as a component of the STRAT_UNIT code.
ROCK_CLASS	Intrusive, volcanic, sedimentary or metamorphic; see BC_Lithology.xls.
ORIGINAL_D	Original author's description of the unit; from the Mineral Potential Geological Compilations, plus original author's descriptions for new additions and amendments.
AGE_MAX_TE	Maximum age of unit (text); see BC_Agecodes.xls.

³ These files will not work with the Java-based ArcExplorer 4 or 9.

AGE_MIN_TE	Minimum age of unit (text); see BC_Agecodes.xls.
AGE_MAX_NU	Maximum age of unit (numerical, Ma); see BC_Agecodes.xls.
AGE_MIN_NU	Minimum age of unit (numerical, Ma); see BC_Agecodes.xls.
PROJECT	Original Mineral Potential Project area, or other major project (Nechako (GSC-GSB) and Queen Charlotte (GSC)), that was the source for the unit.
AGEGROUP	Combination of 3-digit code for Geological Period and ROCK_CLASS.
AGECODE	5-digit code for age; see BC_Agecodes.xls; recommended for querying units or sorting for a geological legend, etc.
LITHCODE	2-digit numerical code for lithology; see BC_Lithology.xls.
SOURCE_ID	Numeric code for data source, see BC_Sources.xls.
UNIT	Concatenation of STRAT_UNIT, ERA, STRAT_NAME and ROCK_TYPE; may be useful for building geological legends.
REMARKS	any significant comments about unit and its attributes.
BELT	Morphotectonic belt.
TERR_CODE	2-letter code/label for tectono-stratigraphic terrane.
TERRANE	Name of tectono-stratigraphic terrane.
TERR_CLR	Colour code for terrane; used in assigning colour in terrane.avl legend file; see BC_Colours.xls for RGB values.
BASIN_CODE	3-letter code/label for sedimentary basin.
BASIN	Name of sedimentary basin.
BASIN_AGE	Age of basin.
BAS_CLR_1	colour code for basin – unique colour for each basin; used in assigning colour in basins1.avl legend file; see BC_Colours.xls for RGB values.
BAS_CLR_2	colour code for basin – grouped by age of basin; used in assigning colour in basins2.avl legend file; see BC_Colours.xls for RGB values.
STRAT1	Stratigraphic tag for use at 1:1,000,000 scale or smaller; see BC_Strat_2M.xls for complete listing.
STRAT1_CLR	colour code for STRAT1; used in assigning colour in strat_2M.avl legend file; see BC_Colours.xls for RGB values.

In order to produce a geological map, it is recommended that one of the fields strat_unit, tecunit or strat1 be used for symbolization.

All tables (*.xls) referred to above, are located in the \Documentation directory on the DVD.

Symbolization of data sets

Recommended Colour table

Note: all colours are optimized to a HP 800PS plotter; other plotters or printers may not exactly reproduce the recommended colour legends.

BC_Colours.xls contains the RGB values used in the construction of the legend files (below); values 1-952 were derived from a Pantone colour set (compiled by Andy Bury, SCDNR-MRD (burya@cofc.edu) and available from ESRI's ArcScript download site (<http://arcscrippts.esri.com/>); 953-956 are white, red, blue and green respectively; 1001-1062 are USGS recommended colour values for stratigraphic eons, eras, periods and epochs

(available from the International Committee on Stratigraphy at <http://www.stratigraphy.org/>). The table is located in the \Documentation directory on the DVD.

Non-ArcView users can use this table to construct legends by joining to the appropriate colour code attribute field (e.g. TERR_CLR).

ESRI users (*.avl and BCDigitalMap.style)

ArcView legend files are supplied for all data set files (e.g. NM10_roads_1l.avl). These will automatically symbolize the data when loaded into ArcView. Geology can be symbolized in various ways depending upon the user's requirements. The following legend files are supplied for this purpose.

BC_basins1.avl	sedimentary basins: each with a unique colour
BC_basins2.avl	sedimentary basins: grouped by age
BC_lithology.avl	colours bedrock geology by lithology (ROCK_TYPE)
BC_strat_2M.avl	colours bedrock geology by stratigraphy (units being grouped at a regional level, commensurate with a 1:2,000,000-scale); colours have been assigned based on stratigraphic age for all rock types.
BC_tecass.avl	colours bedrock geology by tectonic assemblage (TECUNIT); colours are as close as possible to those used by Wheeler and McFeely (GSC Map 1712A)
BC_terranes.avl	colours bedrock geology by tectono-stratigraphic terrane (TERRANE)

Tile specific versions of these legend files (e.g. NM10_tecass.avl) are also supplied with the tiled data.

ArcMap 8.x users should use the supplied BCDigitalMap.style style sheet to symbolize all data sets except geology. The style sheet is included in all the zip files. The above avl files can be imported into ArcMap for geology symbolization.

References:

- Bellefontaine, K., Alldrick, D. and Desjardins, P.J., 1994: Mid Coast (all or parts of 92F, G, J, K, L, M, N; 93D; 102P; 103A), Ministry of Energy, Mines and Petroleum Resources, Open File 1994-17.
- Bellefontaine, K., Legun, A., Massey, N.W.D. and Desjardins, P.J., 1995: Mineral Potential Project, Digital Geological Compilation NEBC South half, (83D, E; 93F, G, H, I, J, K, N, O, P), Ministry of Energy, Mines and Petroleum Resources, Open File 1995-24.
- Desjardins, P.J., 1994: Digital Geology Polygons; Vancouver Island Region (matches OF 1994-6) Kootenay Region (matches OF 1994-8) Cariboo - Chilcotin Region (matches OF 1994-7), Ministry of Energy, Mines and Petroleum Resources, Open File 1994-27.
- Höy, T., Church, B.N., Legun, A., Glover, K., Gibson, G., Grant, B., Wheeler, J.O., Dunne, K.P.E., Cunningham, J. and Desjardins, P.J., 1994: Kootenay Area (82E, F, G, J, K, L, M, N, O; 83C, D), Ministry of Energy, Mines and Petroleum Resources, Open File 1994-8.
- Journey, J.M. and Williams, S.P., 1995: GIS map Library: a window on Cordilleran geology (version 1.0); Geological Survey of Canada, Open File 2948.
- MacIntyre, D.G., Ash, C. and Britton, J., 1994: Nass-Skeena (93/E, L, M; 94/D; 103/G, H, I, J, P; 104/A, B), Ministry of Energy, Mines and Petroleum Resources, Open File 1994-14.
- MacIntyre, D.G., Legun, A., Bellefontaine, K. and Massey, N.W.D., 1995: B.C. Mineral Potential Project: Digital Geological Compilation, Northeast British Columbia 94A, B, C, F, G, H, I, J, K, N, O, P), Ministry of Energy, Mines and Petroleum Resources, Open File 1995-6.
- Massey, N.W.D., Desjardins, P.J. and Grunsky, E.C., 1994: Vancouver Island (92B, C, E, F, G, K, L; 102I), Ministry of Energy, Mines and Petroleum Resources, Open File 1994-6.
- Mihalynuk, M., Bellefontaine, K., Brown, D., Logan, J., Nelson, J., Legun, A. and Diakow, L., 1996: Digital Geology, NW British Columbia (94/E, L, M; 104/F, G, H, I, J, K, L, M, N, O, P; 114/I, O, P), Ministry of Energy, Mines and Petroleum Resources, Open File 1996-11.
- Schiarizza, P., Panteleyev, A., Gaba, R.G., Glover, J.K., Desjardins, P.J. and Cunningham, J., 1994: Cariboo - Chilcotin Area (92J, K, N, O, P; 93A, B, C, F, G, H), Ministry of Energy, Mines and Petroleum Resources, Open File 1994-7.
- Schiarizza, P. and Church, N., 1996: The Geology of the Thompson - Okanagan Mineral Assessment Region, Ministry of Energy, Mines and Petroleum Resources, Open File 1996-20.

Appendix I: Suggested bibliographic references for complete and tiled data sets:

Massey, N.W.D., MacIntyre, D.G., Desjardins, P.J. and Cooney, R.T., 2005: Digital Geology Map of British Columbia, B.C. Ministry of Energy and Mines, Open File 2005-2, DVD.

Massey, N.W.D., MacIntyre, D.G., Desjardins, P.J. and Cooney, R.T., 2005: Digital Geology Map of British Columbia: Whole Province, B.C. Ministry of Energy and Mines, Geofile 2005-1, scale 1:250,000.

Massey, N.W.D., MacIntyre, D.G., Desjardins, P.J. and Cooney, R. T., 2005: Digital Geology Map of British Columbia: Tile NM9 Mid Coast, B.C. Ministry of Energy and Mines, Geofile 2005-2, scale 1:250,000.

Massey, N.W.D., MacIntyre, D.G., Desjardins, P.J. and Cooney, R.T., 2005: Digital Geology Map of British Columbia: Tile NM10 Southwest B.C., B.C. Ministry of Energy and Mines, Geofile 2005-3, scale 1:250,000.

Massey, N.W.D., MacIntyre, D.G., Desjardins, P.J. and Cooney, R.T., 2005: Digital Geology Map of British Columbia: Tile NM11 Southeast B.C., B.C. Ministry of Energy and Mines, Geofile 2005-4, scale 1:250,000.

Massey, N.W.D., MacIntyre, D.G., Haggart, J.W., Desjardins, P.J., Wagner, C.L. and Cooney, R.T., 2005: Digital Geology Map of British Columbia: Tile NN8-9 North Coast and Queen Charlotte Islands/Haida Gwaii, B.C. Ministry of Energy and Mines, Geofile 2005-5, scale 1:250,000.

Massey, N.W.D., MacIntyre, D.G., Desjardins, P.J. and Cooney, R.T., 2005: Digital Geology Map of British Columbia: Tile NN10 Central B.C., B.C. Ministry of Energy and Mines, Geofile 2005-6, scale 1:250,000.

Massey, N.W.D., MacIntyre, D.G., Desjardins, P.J. and Cooney, R.T., 2005: Digital Geology Map of British Columbia: Tile NN11 Mid Rockies, B.C. Ministry of Energy and Mines, Geofile 2005-7, scale 1:250,000.

Massey, N.W.D., MacIntyre, D.G., Desjardins, P.J. and Cooney, R.T., 2005: Digital Geology Map of British Columbia: Tile NO8 Northwest B.C., B.C. Ministry of Energy and Mines, Geofile 2005-8, scale 1:250,000.

Massey, N.W.D., MacIntyre, D.G., Desjardins, P.J. and Cooney, R.T., 2005: Digital Geology Map of British Columbia: Tile NO9 North Central B.C., B.C. Ministry of Energy and Mines, Geofile 2005-9, scale 1:250,000.

Massey, N.W.D., MacIntyre, D.G., Okulitch, A.V., Desjardins, P.J. and Cooney, R.T., 2005: Digital Geology Map of British Columbia: Tile NO10 Northeast B.C., B.C. Ministry of Energy and Mines, Geofile 2005-10, scale 1:250,000.

Appendix 2: Previous Provincial Geology Compilations

Dawson, G.M. (1901): Geological Map of the Dominion of Canada (western sheet); Multicoloured Map, 783 (1:3,168,000).

Anonymous (1948): Geological Map of British Columbia; Geological Survey of Canada, Map 932A (1:1,267,200).

Anonymous (1962): Geological Map of British Columbia; Geological Survey of Canada, Map 932A, 2nd edition, (1:1,267,200).

Jackson, E.V. (1976): Generalized Geological Map of the Canadian Cordillera 48°N to 65°N; BC MEMPR Miscellaneous Map A, prepared to accompany CIM Special Volume 15 (1:2,500,000).

Tipper, H.W., (1978): Tectonic Assemblage, Map of the Canadian Cordillera; Geological Survey of Canada, Open File 572 (1:3,000,000).

Tipper, H.W., Woodsworth, G.J. and Gabrielse, H. (1981): Tectonic Assemblage Map of the Canadian Cordillera and Adjacent Parts of the United States of America: Geological Survey of Canada, Map 1505A (1:2,000,000)

Jackson, E.V. (1982): British Columbia Geological Highway Map, MEMPR Miscellaneous Map 2, (1:1,250,000)

Wheeler, J.O. and McFeely, P. (1987): Tectonic Assemblage Map of the Canadian Cordillera and Adjacent Parts of the United States of America: Geological Survey of Canada, Open File 1565 (1:2,000,000)

Wheeler, J.O. and McFeely, P. (1991): Tectonic Assemblage Map of the Canadian Cordillera and Adjacent Parts of the United States of America: Geological Survey of Canada, Map 1712A (1:2,000,000)

Wheeler, J.O., Brookfield, A.J., Gabrielse, H., Monger, J.W.H., Tipper, H.W. and Woodsworth, G.J. (1991): Terrane Map of the Canadian Cordillera/Carte des Terranes de la Cordillère Canadienne, Geological Survey of Canada, Map 1713A (1:2,000,000)

Journey, J.M. and Williams, S.P. (1995): GIS Map Library: a Window on Cordilleran Geology (version 1.0), Geological Survey of Canada, Open File 2948, - digital version of Wheeler and McFeely (1991)