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GEOLOGICAL SURVEY OF CANADA | COMMISSION GÉOLOGIQUE DU CANADA

NOTES

The Anyox pendant underlies a 400 km² region of Paleozoic(?) to Mesozoic volcanic, sedimentary, and plutonic rocks within the Coast Belt. Strata were deformed in an unknown number of events prior to being engulfed by Tertiary granite. The eastern two-thirds of the pendant consists of Jurassic turbidites of the Bowser Lake Group, underlain by Jurassic volcanic rocks. Age, stratigraphic position, and structural history of the western third of the pendant are enigmatic. Units are highly strained and include felsic granitoid, mafic intrusive rocks, ultramafic rock, and metasedimentary and metavolcanic rocks. They are transected and bounded by a network of cataclastic and mylonitic shear zones. Pendant rocks and Tertiary granite are intruded by lithologically distinctive dyke swarms. A more thorough description is in Evenchick and Holm (1997); this map includes age determinations not available previously. Notes on the Quaternary geology of west Nass River map area are in McCuaig (1997). Descriptions of parts of the Anyox pendant can also be found in Grove (1986).

Granitoid rocks of the Hyder pluton are dominantly granite, with lesser quartz monzonite, quartz monzodiorite, and granodiorite. They are white to cream and light grey weathering, leucocratic, and commonly have 5 to 15% fresh biotite and/or hornblende. Garnet, and locally muscovite, occur in mafic-poor varieties. Texture varies from equigranular to K-feldspar megacrystic, and the structure is massive except for rare gneissic layering in the south. South of Granby Peninsula garnet-bearing granite hosts several molybdenite rich zones. U-Pb zircon ages on samples of the granite from the east shore of Observatory Inlet range from ca. 53 to 61 Ma (V. McNicoll and C. Evenchick, unpublished data, 1997). Mafic dykes are ubiquitous. They are dark grey, green, and brown weathering, aphanitic to coarse grained, equigranular and porphyritic, and massive. They commonly dip steeply to the northwest or southeast, and are typically 10 cm to several metres wide. Quartz monzodiorite or quartz diorite dykes 50 cm to several metres wide comprise a distinct northwest-trending swarm extending from the mouth of Alice Arm across northern Larcom Island to the west side of Observatory Inlet. The swarm is informally named the Larcom dyke swarm. Dykes are composed of zoned plagioclase phenocrysts, fresh hornblende and biotite in a very fine grained groundmass of quartz and feldspar. Tertiary stratified rocks are dark, blocky weathering, massive volcanic flows, breccia, and cobble conglomerate with granite and volcanic clasts. They form a west-dipping unit more than 500 m thick which caps a ridge. Based on the lack of tectonic fabric and metamorphism they are assumed to be Tertiary.

The eastern half of the pendant and eastern Alice Arm are underlain by folded and hornfelsed mudstone, siltstone, and sandstone turbidites of the Bowser Lake Group. Siltstone and mudstone are dark grey on weathered and fresh surfaces, and are massive or laminated. Sandstone is light to medium grey on weathered and fresh surfaces and is typically medium grained, although gritty beds and fine pebble conglomerate are present. Thick bedded medium grained sandstone locally has irregular calcareous concretions; calcareous sandstone is rare. The turbidites are similar to those in Alice Arm map area (Evenchick and Mustard, 1996; Evenchick, 1996). They occur as massive or parallel laminated medium grained sandstone fining up to siltstone and mudstone in T_{BD}, T_{ABCD}, and lesser T_{ABCE} turbidites. Units of amalgamated sandstone beds up to 15 m thick and units of dominantly siltstone and mudstone several tens of metres thick are present. Common sedimentary structures are graded bedding and flame structures; convoluted bedding, cross bedding, and rip-up clasts are also present. Correlation with the Bowser Lake Group is based on lithology. Well preserved ammonites were found near a locality which previously yielded an equivocal age. The new collection indicates a late Middle Jurassic age (Bathonian - Callovian boundary; H.W. Tipper, pers. comm., 1996; F on map and cross section).

The Bowser Lake Group is conformably underlain by a unit dominated by pillowed and massive volcanic flows and breccia, with minor siliceous volcanic and/or sedimentary rock. The large volume of volcanics, and stratigraphic position conformably below the Bowser Lake Group are the basis for correlation with the Hazelton Group. Volcanics are light to dark green weathering, and have aphanitic or fine grained groundmass with feldspar and/or hornblende phenocrysts. Tuff occurs as light coloured siliceous lenses up to 100 m or more long, and commonly 3 to 10 m thick. Thin bedded, rhythmically bedded metachert marks the top of the volcanic sequence discontinuously along the contact. This distinctive, resistant unit is locally pyritic and hosts the eight sulphide orebodies which comprise the Hidden Creek mine. The eastern parts of the map unit were described in detail by Sharp (1980) and Macdonald et al. (1996). Rocks in the western half of the unit are similar, but cut by shear zones and intruded by gabbro, diorite and pyroxenite bodies which have both intrusive and structural contacts with the volcanics. Sharp (1980) considered the intrusive rocks to be subvolcanic feeders to the lava flows. The western boundary of the unit is a fault. Previous workers determined that the volcanics have geochemical affinities of tholeiitic mid-ocean ridge basalts and inferred a back-arc or marginal basin setting (Sharp, 1980; Smith, 1993; Macdonald et al., 1996). A possibly coeval pillowed volcanic succession farther north is the Eskay Creek facies of the Salmon River Formation, which has similar geochemical affinities (Roth, 1993; R.G. Anderson, pers. comm., 1997).

The informal term Clashmore complex is here given to the region of structurally interleaved and highly strained metasedimentary, metavolcanic, and meta-intrusive rocks which occur west of the Hazelton Group.

A cataclastic to mylonitic granitoid unit (DJCg) occupies the east side of the Clashmore complex. It is cream to white weathering. Its structure ranges from cataclasite with random angular fragments millimetres to centimetres across, to oriented fragments, to strongly foliated and lineated mylonite with sub-millimetre scale foliation and quartz ribbons; "c-s" structures and shear bands are also present. All textural varieties occur throughout the belt and at its boundaries. Lenses of gabbro, diorite, or metavolcanics bounded by shear zones are minor constituents. The planar fabric is mainly steeply east-dipping on ridges at the head of Tauw Creek, and steeply to moderately west-dipping east of Mt. Clashmore. Lineations are moderate to steeply plunging. A preliminary interpretation of sense of shear indicators is that displacement on the shear zone was west-side-up. A preliminary U-Pb zircon age on a sample from the unit is ca. 177 Ma (V. McNicoll and C. Evenchick, unpublished data, 1997).

West of the sheared granitoid unit is a belt of highly strained metasedimentary and metavolcanic rocks intruded by large volumes of mafic intrusive rocks (DJCsv, DJCsvm). Stratified rock types include black phyllite, green chlorite phyllite, metasandstone, minor conglomerate with chert and other lithic clasts, siliceous tuff and/or siltstone, volcanic breccia with chlorite phyllite matrix, pillowed volcanics, and minor marble and calc-silicate rock. Deformed granite is rare. A sample of hornblende granite from Swamp Point has a preliminary U-Pb zircon age of ca. 186 ma (V. McNicoll and C. Evenchick, unpublished data, 1997). In some regions mafic intrusive rocks occupy 85% of the rock volume. The grade of metamorphism, high degree of strain, large volumes of intrusive rock and lack of stratigraphic continuity hinder stratigraphic correlation. Detrital zircons from conglomerate east of Mt. Clashmore are as young as ca. 172 Ma (V. McNicoll and C. Evenchick, unpublished data, 1997); the conglomerate is either Hazelton Group or basal Bowser Lake Group, but stratigraphic relationships are obscured. Metasedimentary rocks east of the highest point on Mt. Tourney are similar to Bowser Lake Group, and it is possible that the contact between Hazelton and Bowser Lake groups, which hosts the sulfide lenses of the Hidden Creek mine, is repeated in the Clashmore complex.

In the central part of the Clashmore complex is a belt of gabbroic or dioritic rocks (DJCmp). They are fine to coarse grained and fabrics include massive, gneissic layering, and penetrative to mylonitic foliation. A leucocratic phase of this zone yielded a Devono-Mississippian U-Pb zircon age (364 ± 4 Ma; Aldrick et al., 1996). Serpentinized ultramafic rock (DJCu) occurs in a belt 20 to 50 m wide on the west side of this mafic intrusive complex. They are rusty/orange, pink/orange, brown, dun brown, light and dark green, blocky weathering outcrops along a pronounced linear depression. Massive and rhythmically layered varieties occur at most localities. Layering, defined by carbonate, magnetite and grain size is assumed to be tectonic, and tectonic breccia is common.

Structure in the Anyox pendant is characterized by coherent mappable folds in the Bowser Lake Group, and by shear zones and tectonic lenses of a variety of sizes in the western Hazelton Group and Clashmore complex. The deformation does not affect the Hyder pluton, and is therefore pre-Tertiary. Folds in the Bowser Lake and Hazelton groups are considered to be part of the Cretaceous Skeena Fold Belt (Evenchick, 1991), and it is possible that shear zones farther west are mid-crustal expressions of the same contraction. Transposition of earlier fabrics near the contact with the Hyder pluton are probably related to intrusion of the pluton. The age, style and amount of pre-Cretaceous deformation in the Clashmore complex is unknown.

Folds in the Bowser Lake Group are northwest and northeast trending, upright to overturned (to the east), and gently plunging. They are generally tens to hundreds of metres in wavelength. Northeast trending folds are most common, and accommodated a significant amount of horizontal shortening. Northwest trending folds occur along the northeast boundary of the pendant, and as local warps which interfere with northeast trending folds. Folds and foliation are transposed into parallelism with intrusive contacts of Tertiary granite within 100 m of the contact. Penetrative fabric defined by biotite and locally muscovite is common in pelitic rocks but sporadic in sandstone. It is locally parallel with the axial surface of defined folds, and is folded. It is overprinted by random biotite, andalusite, and cordierite, and commonly flattened around these porphyroblasts. There are no stratigraphic marker horizons within the Hazelton Group, so folds are rarely discernable in outcrop, although large scale structures are recognized from the map pattern. Fabrics in the unit range from massive to penetrative, with shear zones more common in the west. Planar fabrics are steeply dipping, and lineations are generally steep.

All units in the Clashmore complex have a strong planar fabric, which is commonly steeply east or west dipping, but ranges from moderate to the east (along Portland Canal) to moderate to the west (in the granitoid shear zone east of Mt. Clashmore); lineations are generally down-dip. Shear zones commonly bound units. The sense of shear in a 20 m wide shear zone in the mafic intrusive complex northwest of Mt. Clashmore and in the sheared granitoid are west-side-up. Mafic intrusive rocks and metavolcanic rocks appear to occur as tectonic lenses which are typically weakly to moderately deformed internally and have strongly foliated margins. Primary contacts are also present. The tectonic lenses vary in size from outcrop scale to large mappable units.

The Big Dam fault is a structure which offsets the contact of Bowser Lake and Hazelton groups, and can be extrapolated as a lineament to a zone of brittle deformation in the Hyder pluton south of the head of Granby Bay. Because the fault is post earliest Tertiary in age and parallel with a number of lineaments and prominent topographic features (including Hastings Arm and Portland Canal), it is possibly a neotectonic feature.

Andalusite, biotite, muscovite, and cordierite are common in the more pelitic metasedimentary rocks of the Bowser Lake Group. Strata were probably metamorphosed to greenschist facies prior to intrusion of Tertiary granite. Andalusite, cordierite, and biotite are a result of contact metamorphism associated with intrusion of the Hyder Pluton. The grade of metamorphism in the western part of the pendant is upper greenschist to lower amphibolite facies. Hornblende, actinolite, and chlorite are common in mafic rocks. Pelitic and calc-silicate rocks are rare in the western part of the pendant; garnet, diopside, and tremolite were noted at two localities.

Lineaments, shown as light grey lines on the map, are generally northeast and northwest trending. They correspond to the dominant joint and dyke sets. North-northwest trending ones may be features similar to the Big Dam fault.

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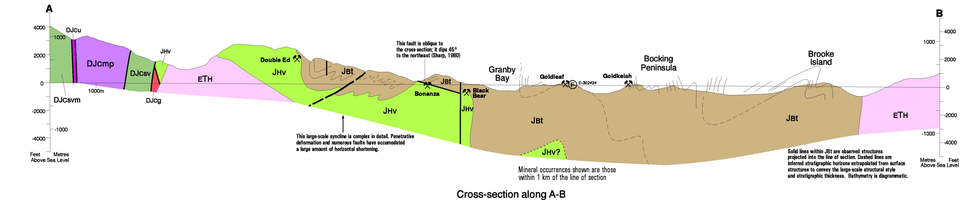

Cross-section along A-B

LEGEND

QUATERNARY

PLEISTOCENE AND RECENT

- Q,S — *Glacial till, alluvium, colluvium; S denotes 60 year old slag heap at mouth of Anyox Creek. Unit designators in parenthesis are assumed to underlie Quaternary sediments*

TERTIARY

- Tv — *Volcanic breccia and flows, volcanic- and granite-pebble and cobble conglomerate*

LARCOM DYKE SWARM

- ETL — *Fine grained leucocratic granitoid dykes with plagioclase and hornblende phenocrysts*

EOCENE

HYDER PLUTON

- ETH — *Biotite-hornblende granite, quartz monzonite, and granodiorite, includes minor garnet +/- muscovite granite; locally with potassium feldspar megacrysts*

ALICE ARM INTRUSIONS

- ETA — *Quartz monzonite porphyry*

JURASSIC

UPPER MIDDLE TO UPPER(?) JURASSIC

BOWSER LAKE GROUP

- JBt — *Siltstone, mudstone, fine and medium grained sandstone; minor coarse grained sandstone and fine pebble conglomerate; turbidites; biotite hornfels*
- Jm — *Highly strained metasedimentary and metavolcanic rock; age and correlation uncertain*

LOWER(?) TO LOWER MIDDLE JURASSIC

HAZELTON GROUP

- JHv — *Metavolcanic rock; volcanic breccia, pillowed volcanics, massive volcanic flows, chlorite schist; minor siliceous volcanic and/or sedimentary rock, including metachert; thin mafic dykes; minor sills of diorite, gabbro and pyroxenite*

DEVONIAN TO JURASSIC

CLASHMORE COMPLEX

- DJCg — *Cataclastic to mylonitic biotite granite (ca. 177 Ma); includes tectonic lenses of strained mafic rock (DJCm)*
- DJCsv DJCsvm — *Highly strained complex of metasedimentary, metavolcanic and metaplutonic rock; includes volcanic breccia, pillowed volcanics, massive flows, chlorite schist, psammitic schist, siliceous metavolcanic or metasedimentary rock, grit, conglomerate, mafic intrusive rock; DJCsvm is as above, but includes minor marble; DJCsvb, DJCsva, DJCsvg, and DJCsvf are tectonic lenses of volcanic breccia, sedimentary rock, gabbro, and felsic plutonic rock respectively; age and correlation uncertain*
- DJCu — *Ultramafic rock; fine tectonic(?) layering, and common fault breccia; age and correlation uncertain*
- DJCmp — *Mafic intrusive rocks, diorite to gabbro; massive to gneissic, and locally mylonitic; U-Pb age on zircon of 364 +/- 4 Ma*

Geological boundary (defined, approximate, assumed, or inferred under Q)

Trace of individual beds from ground observation and airphoto interpretation

Lineament

Fault, unknown displacement (defined, approximate, assumed)

Normal fault, ornament on downthrown side (defined, approximate)

Anticline, trace of axial surface (defined or approximate, assumed, overturned)

Syncline, trace of axial surface (defined or approximate, assumed, overturned)

Bedding (inclined and top known, inclined and top unknown, overturned, vertical)

Foliation (undivided, transposition, mylonitic, gneissic)

Fault (displacement sense unknown, dextral, sinistral, contractional, extensional)

Shear zone (hanging wall up, hanging wall down)

Axial surface of fold (generation unknown, first generation, second) generation, crenulation)

Fold axis (generation unknown, 'x' fold generation unknown 'z' fold generation unknown, first generation, second generation, crenulation)

Lineations (stretching, mineral, slicken striae)

Joints (inclined, vertical)

Dykes, mostly basalt (inclined, vertical)

Veins (inclined)

Fossil locality — O-302424 (F)

BC MINFILE occurrence and map reference number. Refer to table below for deposit name, BC MINFILE number, deposit status and commodities — 15

MINERAL OCCURRENCES

MAP NO.	NAME	MINFILE NUMBER	UTM EAST	UTM NORTH	STATUS	COMMODITIES
1	UTOPIA	103P 122	467430	6148790	Showing	Ag,Au,Zn,Pb
2	SWAMP POINT	103O 017	434625	6147500	Past producer	Lst
3	EDEN	103P 026	444060	6147050	Deposit	Cu,Zn
4	TIDEWATER	103P 111	465010	6148840	Past producer	Mo,Ag,Au,Pb,Zn,Cu,W
5	SNYDER	103P 258	443640	6146450	Showing	Zn
6	LARCOM ISLAND	103P 227	452775	6146200	Past producer	Si,Ag,Au
7	DEADWOOD - EMMA	103P 243	447190	6145750	Showing	Cu
8	QUARTZ	103P 152	447870	6145440	Prospect	Cu,Ag,Au,Pb,Zn
9	OUTSIDER	103O 018	436360	6144260	Past producer	Cu,Ag,Au,Si,Zn
10	HILLSIDE	103P 232	447160	6144170	Showing	Cu,Pb
11	HIDDEN CREEK	103P 021	447960	6143800	Past producer	Cu,Au,Ag,Co,Zn
12	STAR	103O 019	436470	6143590	Past producer	Si,Cu,Ag,Au,Zn
13	FRIDAY	103O 009	435870	6143395	Past producer	Si
14	MACY	103P 112	468240	6143500	Past producer	Si
15	APLITE	103P 253	445425	6143130	Showing	Zn,Cu,Pb
16	EAGLE - MAY QUEEN	103P 240	437410	6142810	Deposit	Cu,Zn
17	RAINY	103P 254	444880	6142680	Showing	Zn,Cu,Pb
18	KNOB HILL	103P 250	444250	6142625	Showing	Zn,Cu
19	COMSTOCK	103P 040	437100	6142365	Showing	Cu
20	SEA OTTER	103P 110	456850	6142030	Showing	Ni,Cu,Au,Ag,Au,Pt
21	PRINCESS	103P 048	437410	6141910	Deposit	Cu,Au,Ag
22	CD	103P 241	445245	6141525	Showing	Cu,Zn
23	RESERVE	103P 252	446840	6141090	Past producer	Si,Au,Ag,Pb,Cu,Zn
24	DOUBLE ED	103P 025	444080	6142765	Deposit	Cu,Zn
25	BLUE BELL	103P 242	436700	6142735	Prospect	Cu,Ag,Au
26	GRANBY POINT	103P 022	450000	6142640	Past producer	Si,Au,Ag,Pb,Cu,Zn
27	RAMBLER	103P 226	446500	6142300	Past producer	Si,Au,Ag
28	HOMESTAKE	103P 204	446810	6139810	Showing	Si,Au,Ag
29	WAYNE	103P 151	466230	6138090	Showing	Mo
30	BONANZA	103P 023	446200	6138600	Past producer	Cu,Ag,Au,Zn
31	BLACK BEAR	103P 031	446610	6137510	Showing	Cu,Mo
32	REDWING	103P 024	445900	6137270	Deposit	Cu,Au,Ag,Zn
33	GOLD LEAF	103P 028	448715	6136910	Prospect	Au,Ag,Zn,Pb
34	GOLDKEISH	103P 045	448945	6136775	Past producer	Si,Au,Ag,Zn,Pb
35	GROUNDHOG	103P 246	447675	6136535	Past producer	Si,Au,Ag,Pb
36	MOLY MAY	103P 229	446815	6134740	Prospect	Mo,Ag,Au
37	MAY	103P 027	447600	6134540	Past producer	Si,Au,Ag,Zn,Pb,Cu
38	ANYOX SLAG HEAP	103P 257	447940	6140835	Producer	Si,Zn

Copies of this map may be obtained from the Geological Survey of Canada
601 Booth Street, Ottawa, Ontario K1A 0E8
101-605 Robson Street, Vancouver, B.C. V6B 5J3

LOCATION MAP

Geology by C.A. Evenchick, K. Holm, V. McNicoll, D.J. Alldrick and L.D. Snyder. Contacts between Bowser Lake and Hazelton groups modified from Sharpe (1980). Contact of Alice Arm intrusion north of Alice Arm is from Carter (1984).

Map compilation by C.A. Evenchick, 1996
Reviewed by G.J. Woodsworth, 1997

Digital base assembled and modified by the Geoscience Information Division from digital bases supplied by Geomatics Canada

Copies of the topographical edition of this map may be obtained from the Canada Map Office, Natural Resources Canada, Ontario K1A 0E9

OPEN FILE 3454

GEOLOGY

OBSERVATORY INLET

BRITISH COLUMBIA

Scale 1:50 000 - Échelle 1/50 000

Kilometres 1 0 1 2 3 4 Kilometres

Transverse Mercator Projection
CM 129°45', Scale Factor 1.0, NAD27

Projection transverse de Mercator
M.C. 129°45', facteur d'échelle 1.0, NAD27

Digital cartography by T.D. Feeney and R.B. Cocking

Approximate magnetic declination 1997, 24°21' East, decreasing 9.1' annually

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

Elevations in feet above mean sea level

Contour lines and drainage have been modified from NAD83 to NAD27

Some icefield limits have been modified to 1996 extents based on airphoto and ground interpretation

Published 1997

103O/9	103P/12	103P/11
103O/8	103P/5 OF 3454	103P/6 OF 3272
103O/1	103P/4	103P/3

NATIONAL TOPOGRAPHIC SYSTEM REFERENCE

OPEN FILE
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