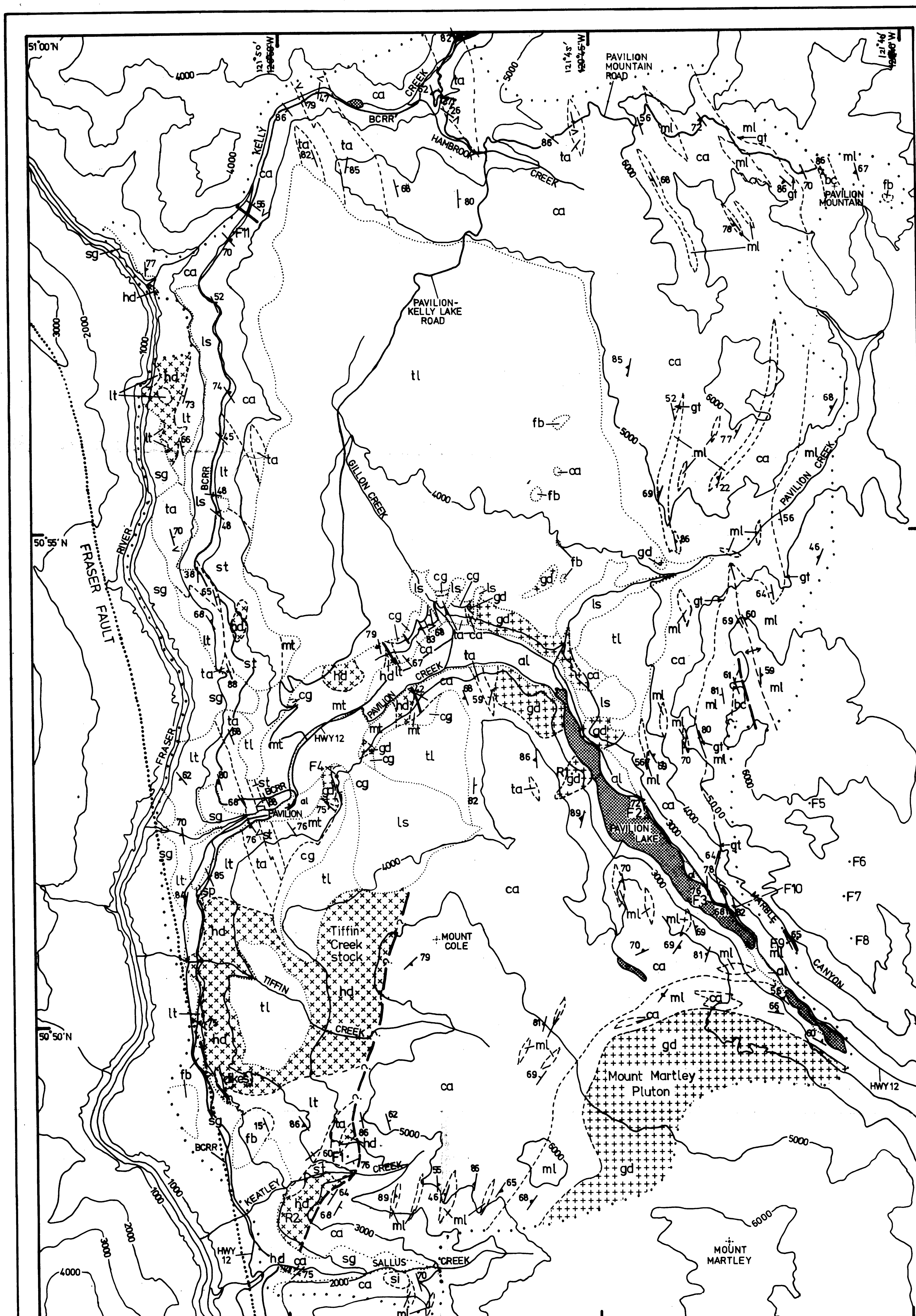


KEY

SEDIMENTARY, VOLCANIC AND METAMORPHIC ROCKS

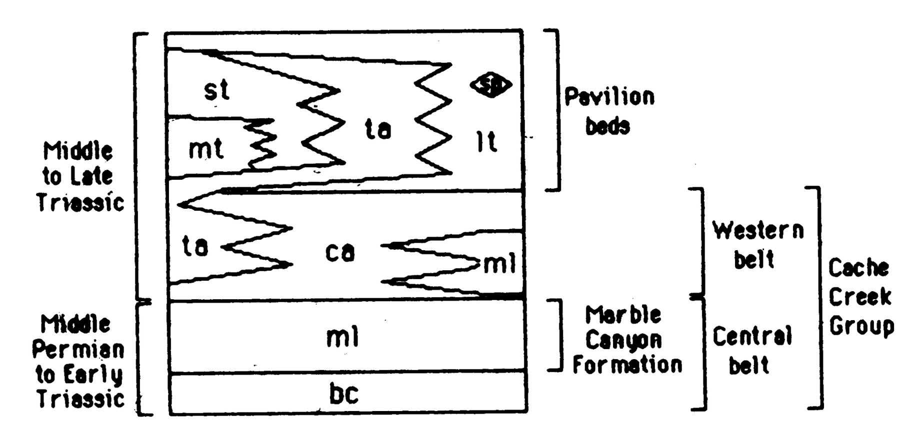
QUATERNARY

al	Alluvium in Pavilion Creek drainage
ls	Landslide deposits in Pavilion Creek drainage and talus below B.C. Railroad in Fraser Canyon
sg	Fluvio-glacial silt, sand and gravel in Fraser Canyon
tl	Glacial till on upland plateaux. Contains boulders up to 2m in diameter in a sticky, red and grey clay matrix

TERTIARY AND CRETACEOUS

fb	Red and brown lava flows and volcanic breccias. Inferred to be of Tertiary age except for outcrop north of Keatley Creek which has been correlated with the mid-Cretaceous Spences Bridge Group by Monger and McMillan (1984). Dikes just north of this outcrop are probably Spences Bridge feeders
cg	Red chert-pebble conglomerate and sandstone. Fine-grained beds locally contain wood and leaf fragments

PERMIAN AND TRIASSIC



Inferred stratigraphic relationships between map units

lt	Interbedded limestone volcaniclastic sandstone and siltstone (tuff), siliceous argillite, argillite and subordinate chert. Metamorphosed to hornfels and marble adjacent to outcrops of hd
sp	Dark green foliated serpentinite, south of Pavilion
ta	Rhythmically interbedded light grey silicic volcaniclastic sandstone (tuff) and dark grey siliceous argillite. Commonly shows graded bedding
st	Grey silicic tuff comprising volcaniclastic breccia and moderately well sorted angular crystal lithic sandstone
mt	Green mafic to intermediate tuff comprising volcaniclastic breccia and sandstone. Minor basaltic and andesitic flows. Hornfelsed adjacent to outcrops of hd and gd
ca	Intercalated grey chert, argillite and siliceous argillite with subordinate limestone and tuff. Proportion of limestone increases towards eastern contact with ml
ml / gt	Generally massive, poorly bedded light and dark grey limestone and schistose marble, sometimes with black chert stringers. At localities marked gt, along contact with unit ca, carbonate contains interbeds of green tuff, metabasalt and argillite and, where unrecrystallized, platy limestone
bc	Interbedded green metabasalt, tuff and grey chert. Minor limestone

PLUTONIC ROCKS

AGE UNKNOWN

si	Silicified and gossanized diorite (?) plug in Sallus Creek drainage

--NOT SHOWN ON MAP-- andesitic dikes cutting Permian and Triassic rocks

JURASSIC

gd	Grey-white hornblende biotite granodiorite of the Mount Martley pluton and associated stocks
hd	Green-grey altered hornblende diorite of the Tiffin Creek stock (informal name) and associated minor intrusions. Secondary minerals include actinolite, prehnite and chlorite. Igneous textures range from pegmatitic to medium grained inequigranular. Near Fraser Fault, the diorite is typically sheared and strongly jointed

SYMBOLS

- Contact between Quaternary deposits and underlying rocks
- Geologic contact / Fault contact — Solid where accurately located, dashed where approximately located, queried where very approximately located
- Dip and strike of bedding, arrowhead points in direction of stratigraphic younging (determined from graded bedding)
- Dip and strike of cleavage and schistosity
- Axial trace of anticline, approximately located
- Limit of mapping
- F1 Fossil locality / R1 Radiometric age locality — Refer to accompanying sheet for details

Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources
GEOLOGICAL SURVEY BRANCH

OPEN FILE MAP NO. 1987–18

GEOLOGICAL MAP OF PART OF NTS 92I/13

GEOLOGY AND COMPILATION BY N. MORTIMER

0 — 5 Km
Scale 1:50000

Geology by N. Mortimer, August and October 1985 and July 1986. Topography from N.T.S. sheet 92I/13, scale 1:50000, Government of Canada 1980. Position of Fraser Fault from Monger and McMillan (1984). Stratigraphic nomenclature, symbols, and ages of units do not necessarily correspond with those used by the Geological Survey of Canada

BC

0005037443

C.2

INTRODUCTION

This map is the result of 36 days fieldwork near Pavilion during the summers of 1985 and 1986. The 250km^2 area was previously mapped as part of larger areas by Duffell and McTaggart (1952), Trettin (1961) and Monger and McMillan (1984). The present investigation resulted in more detailed subdivision of the rock units and changes to the position and nature of lithologic contacts compared with these previous studies. The main purpose of mapping was to investigate the structure and lithology of the western belt of the Cache Creek Group (Duffell and McTaggart, 1952; Trettin, 1980) and its relationship with adjacent pre-Cretaceous rock units. Adequate accounts of the regional geologic setting and stratigraphic framework of the Cache Creek Group near Pavilion have been given by Trettin (1980) and Monger (1981) and are therefore omitted from this report.

COVER ROCKS

About half of the mapped area is underlain by Quaternary deposits which are subdivided on the map into alluvium, landslide deposits, fluvio-glacial material, and till. Mazama tephra is also exposed in two places near Pavilion (Bovis, 1985). The Quaternary deposits were not investigated in detail; for more information see Bovis (1985) and references therein.

Small patches of lava and volcanic breccia in the area were correlated with the Tertiary Kamloops Group and Cretaceous Spences Bridge Group by Monger and McMillan (1984). A new patch of ?Tertiary lava, located approximately 1km E of the summit of Pavilion Mountain, was discovered during mapping.

Red chert-pebble conglomerate and sandstone, in part of mid-Cretaceous age, is mapped on the north and south sides of Pavilion Creek with a different outcrop pattern to that shown by Trettin (1961) and Monger and McMillan (1984). This unit varies in thickness from 0 to 150m, is subhorizontal, unmetamorphosed, and rests unconformably on deformed and metamorphosed basement rocks. Near Gillon Creek, it is cut by several NNW trending faults with throws of a few meters. Most of these are too small to show on the map.

BASEMENT ROCKS

These were the main subject of investigation and are distinguished on the map as lithologic units. The diagram in the map key shows a correlation of these lithologic units with the stratigraphic units of Trettin (1980). An interpretive discussion of some of the basement rocks is given below.

Central belt of the Cache Creek Group

In Marble Canyon, most carbonate is recrystallized to schistose marble although bedding is sometimes recognizable in platy and massive limestone. About 3km N of Marble Canyon, a possible stratigraphic section in the central belt was identified. The section was not accurately measured, but at least 150m of basalt and chert (map unit bc) are overlain by about 400m of limestone and marble, massive with black chert stringers in the lower part and dolomitic and platy at the top (map unit ml). Bedding in the section dips 60-80°W but exposure is not continuous and structural thickening of the section cannot be ruled out. This 400m estimate of thickness of the Marble Canyon Formation is greater than the thicknesses of 300m in Marble Canyon and 200m near Clinton (just N of the map-area) estimated by Monger (1981) and Trettin (1980) respectively.

Western belt of the Cache Creek Group

Most of the western belt consists of argillite and siliceous argillite with subordinate (though locally abundant) ribbon chert, carbonate and volcaniclastic sandstone. The proportion and size of carbonate bodies increases eastward towards the contact with the central belt, some forming ridges which are up to 3km long. A few large unrecrystallized carbonate bodies consist of polymict limestone conglomerate (a lithology unknown in the Marble Canyon Formation) and may be olistostromal in origin. Other, more schistose, carbonate ridges may be tightly folded anticlinal cores of Marble Canyon Formation. Sandstones that contain angular volcanic clasts of silicic and intermediate composition are locally abundant in Gillon, Hambrook and Kelly Creeks. These sandstones are sometimes graded and commonly rhythmically interbedded with siliceous argillite.

Contact between central and western belts of the Cache Creek Group

Trettin (1961) originally drew this contact some distance west of the westernmost edge of the Marble Canyon Formation, such that it lay within dominantly argillaceous rocks. However near Clinton, Trettin (1980) has redefined the central belt-western belt contact to be at the western edge of the Marble Canyon Formation. This redefinition is well suited to the present map-area as it represents a convenient lithologic and geomorphic break, between cliff-forming carbonate to the east and recessive chert and argillite to the west. At several places along this contact, where exposure is adequate, a transitional sequence, up to 30m thick, of interbedded dark grey platy and partly dolomitized limestone, argillite, and green metabasalt and tuff is exposed between the central belt massive carbonate and western belt chert and argillite (marked 'gt' on map). This thin sequence apparently constitutes a transitional marker horizon between the carbonate-dominated central belt and argillite-dominated western belt. The fact that it can be recognized at several places along the contact suggests that the central belt/western belt contact is stratigraphic and is not marked by a major fault. The limited paleontologic data from the map-area also support a stratigraphic contact between the two belts, as fossil ages get consistently younger to the west without any apparent break across the contact (see map and Table 1).

Near Clinton, Trettin (1961, 1980), believed the western belt-central belt contact to be tightly folded but depositional. Near Pavilion, various authors including Monger (1981), Travers (1982), and Monger and McMillan (1984) have interpreted the contact as being faulted, but the present mapping indicates this is not so. The central and western belts of the Cache Creek Group should thus be treated as a single tectonostratigraphic unit.

Pavilion beds

The informally named Pavilion beds of Trettin (1980) were subdivided into 4 map units during the present study (see map key). As noted by Trettin (1961), the Pavilion beds are clearly faulted against the western belt of the Cache Creek Group in the Pavilion Creek drainage. This faulted contact is also present to the south in the Sallus Creek drainage but cannot be located north of Pavilion. Map unit lt of the Pavilion beds is lithologically similar to the eastern parts of the western Cache Creek belt and sections of rhythmically interbedded volcaniclastic sandstone and siliceous argillite in the Pavilion beds are indistinguishable from those in the western Cache Creek belt (map unit ta). These lithologic similarities suggest that the Pavilion beds are a more western and volcanic/volcaniclastic part of the western Cache Creek belt and not a separate tectonostratigraphic unit.

Plutonic rocks

The Mount Martley pluton is a Late Jurassic (Table 1) medium-grained hornblende-biotite granodiorite, several satellitic stocks of which are exposed at the north end of Pavilion Lake. The Tiffin Creek stock (new name) consists of texturally heterogeneous hornblende diorite that, especially near the Fraser Fault, is fractured, chloritized and prehnitized (Duffell and McTaggart, 1952). The Tiffin Creek stock is interpreted to underlie the Pavilion beds at shallow depth as these latter strata are hornfelsed, and intruded by numerous small stocks of the diorite. Cross-cutting field relations between the Tiffin Creek stock and Mount Martley pluton are absent but the Tiffin Creek stock has also yielded a Late Jurassic K-Ar age (Table 1).

STRUCTURE & METAMORPHISM

Bedding, cleavage and schistosity dip steeply in the area and generally strike NNW except in the vicinity of the Mount Martley pluton where the strike is parallel to the pluton margin. Argillite and siliceous argillite contain an anastomosing cleavage; bedding in chert is generally transposed and lenticular. Bedding is sometimes recognizable in carbonates but, most often, recrystallization has produced a streaky, schistose marble. The only definite map-scale fold in the area is an upright anticline NE of Pavilion Lake that folds the central belt-western belt contact (see map). Elsewhere, tight macroscopic folding is suspected (because of low angles between cleavage and bedding, elongate marble ridges in the western belt and variable facing directions in volcaniclastic rocks) but cannot be conclusively demonstrated. Rare syn- and post-cleavage mesoscopic folds near the central belt/western belt contact indicate that W-dipping beds are structurally upright and E-dipping beds are overturned, in agreement with the stratigraphic and paleontologic data.

The style of deformation is generally more coherent than the block-in-matrix melange of the eastern belt of the Cache Creek Group (Monger, 1981). However in the argillaceous portions of the western belt, competent lithologies such as limestone, tuff and chert are variably boudinaged and isolated as lozenge-shaped blocks. This is especially noticeable close to the Fraser Fault in the lower part of the Kelly Creek drainage where chert blocks are totally isolated in an argillite matrix. The involvement of weathered ?Cretaceous dikes in this semi-brittle deformation suggests that it is related to Tertiary movement on the Fraser Fault. A fault-bounded sliver of serpentinite containing blocks of Tiffin Creek diorite is exposed on the BC Railroad, 2km SW of Pavilion also attests to locally severe tectonic disruption in the Pavilion beds.

Subvertical bedding plane faults, marked by 5cm - 1m thick zones of unlithified bright red clay gouge and marble breccia occur in the massive carbonate cliffs of Marble Canyon. Individual faults can be traced for no more than a few tens of metres (in one case 200m). The unlithified nature of the gouge along with steeply and gently plunging slickenslides on these fault planes, suggest that they accomodated minor movement in a zone between the Fraser Fault and the Hat Creek graben (which is at the SE end of Marble Canyon). No evidence was found during mapping for a major throughgoing fault in Marble Canyon.

Calcareous and argillaceous lithologies do not contain any useful metamorphic index minerals; mafic volcanic and volcaniclastic rocks of the Pavilion beds and western Cache Creek Group generally contain prehnite-pumpellyite and greenschist facies mineral assemblages. Hornblende hornfels facies is attained within a few metres of the contacts of the plutonic rocks.

GEOLOGIC HISTORY

Late Paleozoic shallow water carbonate-dominated deposition gave way to deeper water chert and argillite-dominated deposition in Early Triassic time, the change coinciding with local minor volcanism (at the central belt-western belt boundary). The chert-argillite basin persisted until at least the Late Triassic by which time Pavilion beds volcanism was active and sending volcaniclastic detritus into the basin.

Cleavage formation and most folding apparently predated the Late Jurassic intrusion of the Mount Martley pluton and Tiffin Creek stock and is thus dated as Early to Middle Jurassic. The Mount Martley pluton was forcefully intruded and warped the western belt/central belt contact around its margin. Minor high-angle faulting juxtaposed the Tiffin Creek stock and Pavilion beds with the western belt prior to mid-Cretaceous time when the chert-pebble conglomerate unit was deposited unconformably across them. Minor faulting in Marble Canyon and local melange development in argillaceous rocks is likely contemporaneous with Early Tertiary movement on the Fraser Fault.

Quaternary glaciation and post-glacial erosion are largely responsible for the landforms observed today.

ACKNOWLEDGEMENTS

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PALEONTOLOGICALLY DATED MATERIAL

#	Age	Original sample # and reference
F1	Middle Triassic to Recent corals	C-54824, E.W. Bamber in Trettin (1980)
F2	Dienerian conodonts	MaCa3, Orchard (1981)
F3	Late Carnian or Early Norian conodonts	MaCa1, Orchard (1981)
F4	Middle to Late Albian microflora	C-61552, C-61553, A.R. Sweet in Monger and McMillan (1984)
F5	Mid-Permian fusulinids	CC19, Monger and McMillan (1984)
F6	Mid- to Late Permian fusulinids	CC20, Monger and McMillan (1984)
F7	Late Permian fusulinids	CC21, Monger and McMillan (1984)
F8	Late Permian fusulinids	CC22, Monger and McMillan (1984)
F9	Late Permian fusulinids	NM85-51A, W.R. Danner (pers. comm.)
F10	Mid- to Late Permian fusulinids	NM86-1B, N. Mortimer identification
F11	Middle to Late Triassic radiolarians	PO7, F. Cordey (personal communication)

ISOTOPICALLY DATED MATERIAL

#	Age	Original sample # and reference
R1	141±5Ma, K-Ar biotite	WT-76-1, Preto and others (1979)
R2	152±5Ma, K-Ar hornblende	NM85-52A, new date, %K=0.394, 40Ar rad/40Ar tot=0.873, 40Ar rad=2.434x10-6 cc/g, decay constants 4.96/0.581/1.167, K & Ar determinations by K. Scott & J. Harakal at UBC

TABLE 1: Details of paleontologically and isotopically dated material in the map area (see map for locations).