British Columbia Geological Survey
Geological Fieldwork 1981

GEOLOGY OF THE WHITEHOUSE CREEK AREA

(92B/13f, g)

By G.E.P. Eastwood

INTRODUCTION

The Whitehouse Creek area (Figure 1) overlaps the Mount Richards area on the northwest and represents a continuation of the Sicker mapping project. Some of the mapping was done in 1978 and 1979 but most was done during four weeks in 1981. The principal object of the study is to relate the Sicker rocks north of the Chemainus River to the section established on Mount Richards.

Physiographically the area includes the widening valley of the Chemainus River, the north footslope of Big and Little Sicker Mountains, and the extreme southeast footslope of Mount Brenton. The valley narrows to a notch in the west part of the area. Within it the river has been incised through thick drift and, along most of the included length, deeply into

LEGEND

NANAIMO GROUP

4d	Sandstone dyke
4c	Siltstone and shale
4b	Sandstone
4a	Conglomerate and grit

INTRUSIVE ROCKS

3	Hornblende shonkinite
2	Quartz feldspar porphyry

SICKER GROUP

1d	Quartz-mica schist
1c	Siltite and fine quartzite
1b	Hornblende trachyte
1a	Mafic trachyte; chlorite schist

Symbols

Outcrop; outcrop area ....

Geological contact ....

Bedding; schistosity ....

Orientation of sandstone dyke ....

Trend and plunge of minor fold; combined with bedding .....

Direction of overriding (vergence) on minor folds ....

Fault ....

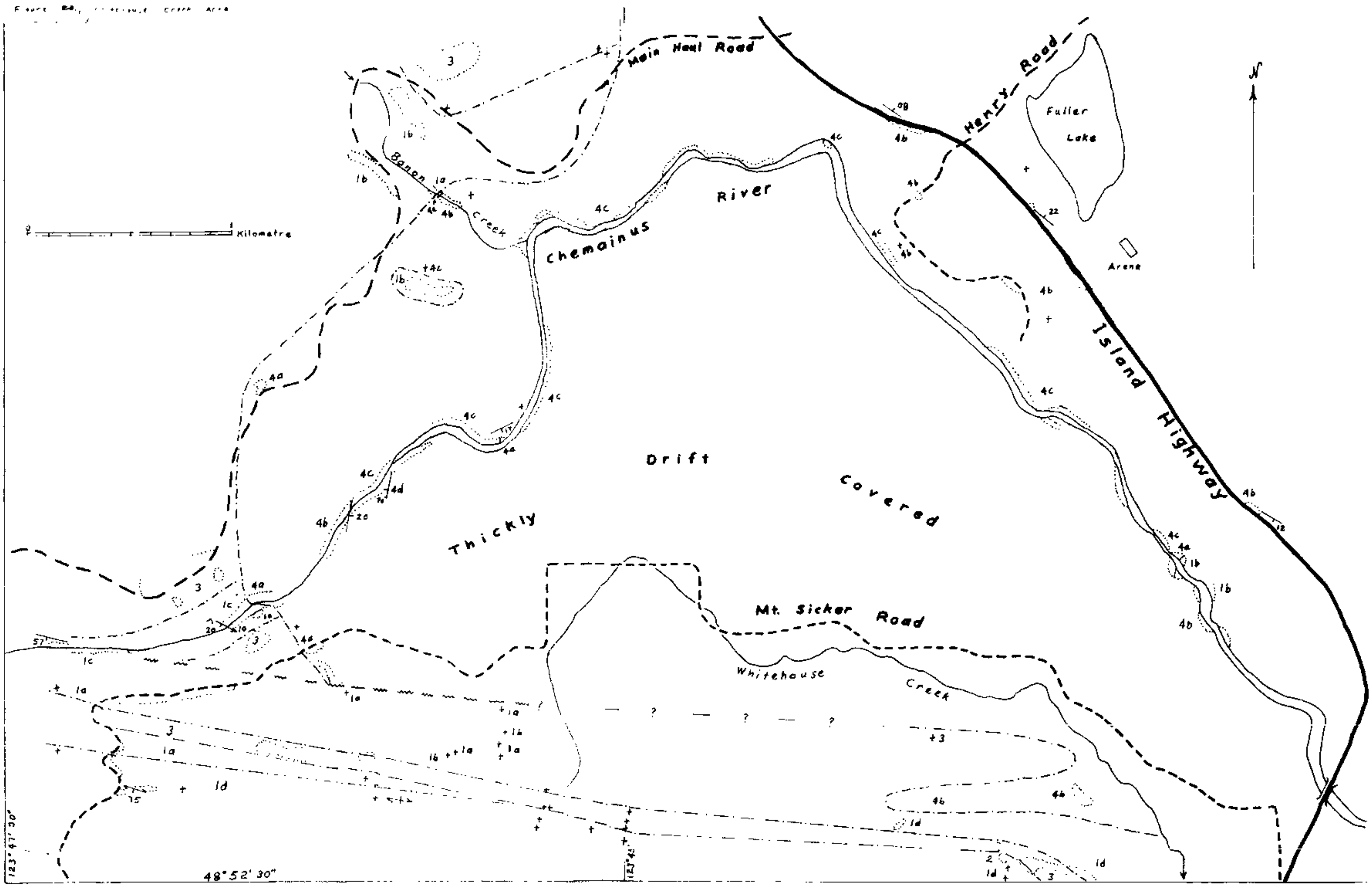


Figure 1. Whitehouse Creek area.

bedrock. In summer it is possible to walk long stretches of the river on bedrock pavement and gravel bars, crossing where necessary by rock-hopping or wading. Two canyons in the west part are inaccessible but the section between them can be reached with the aid of a rope.

Thick drift in the valley extends up the slope of Big Sicker Mountain, and outcrops are mostly confined to a few exposures in watercourses and road cuts. Most of this slope is covered by tall timber, and airphotos are virtually useless. Mapping here was done by altimeter and compass traverses using a contour map at 1:2500 obtained through the courtesy of Serem Limited.

GENERAL GEOLOGY

Volcanic and sedimentary rocks of the Paleozoic Sicker Group have been intruded by small bodies of quartz feldspar porphyry, deformed, then intruded by larger bodies of hornblende shonkinite. The thick Lower Mesozoic section seen elsewhere on Vancouver Island is missing from this area, and the older rocks are directly and unconformably overlain by clastic sedimentary rocks of the Upper Cretaceous Nanaimo Group. The Nanaimo beds form a lobe extending some distance up the ancestral Chemainus River valley.

SICKER GROUP

Trachyte characterized by medium to coarse-grained hornblende phenocrysts is the dominant Sicker rock north of the Upper Cretaceous lobe. It is similar to a band of hornblendic trachyte traced through the Mount Richards area. Outcrops are massive and erosion-resistant, forming low hills and ridges. The outcrop area south of Banon Creek is interpreted as a hill in the pre-Nanaimo surface. The inlier in the lower Chemainus River may be a similar hill or it may represent tilting on a post-Nanaimo fault. Coarse volcanic breccia occurs in the area of hornblendic trachyte in Banon Creek both near the Nanaimo contact and at the base of a transmission pylon east of the creek. It is probable that the hornblendic phase was repeated several times in the volcanic sequence, so the Banon Creek unit cannot be positioned in the sequence from the present mapping.

Mildly deformed sedimentary rocks are exposed in the Chemainus River upstream from the Nanaimo Group basal conglomerate. They consist of dark grey to black argillite, chert-like siltites, and fine-grained light grey quartzite. The siltites are more or less banded in white and shades of grey. A few tuffaceous beds are intercalated. These rocks resemble the upper, sedimentary part, of the Sicker Group in the Cowichan Lake area to the west and are probably somewhat younger than unit 1d of the Mount Richards area. Mafic volcanic rocks appear to overlie these beds in a small bluff south of the Nanaimo contact, but this section is complicated by faulting and the mafic rocks do not occur in an equivalent stratigraphic position in the river bed.

A belt of volcanic rocks occurs south of the Sicker and Nanaimo sedimentary rocks. The volcanic rocks are mostly mafic, though a few thin bands of the hornblendic phase are intercalated. The rocks are variably chloritized and slightly to completely schistose. A hornblende band appears to overlie the Sicker beds in the right bank of the river near the southwest limit of mapping, but the contact is sheared and is close to a projected fault. The position of these mafic volcanic rocks in the Sicker sequence is uncertain.

Unit 1d has been traced along Crofton and Breen Ridges, north of Mount Richards, across the flats, and along the north slope of Big Sicker Mountain to the mine road. Where least deformed, the rock is a white to light grey siltite. Most of it is schistose, and the intensity of schisting increases northward; the outcrops shown on Figure 1 are white to light brown quartz-mica schists. This schist belt is interpreted to be a diffuse fault zone. The largest single movement apparently occurred in the siltites at the contact with the mafic volcanic rocks but the total movement was distributed over a considerable thickness of rock. Bands of chlorite schist indicate that some movement took place in the volcanic rocks. An undisturbed shonkinite dyke angles across the contact, consequently the movement is pre-shonkinite.

INTRUSIVE ROCKS

A few small dykes of quartz feldspar porphyry occur in the schist belt, and are schisted along with the siltites, but none have been found to the north.

Three, or possibly four, bodies of shonkinite (mafic hornblende syenite) were found in the map-area. One extends out of the area to the north and appears to be a stock. A second appears to be a thick sheet dipping gently westward up the Chemainus River. It rests on Sicker sedimentary rocks and is overlapped by Nanaimo sedimentary rocks. A small outcrop south of Whitehouse Creek may represent a faulted segment of this sheet or perhaps a completely separate body. A relatively narrow dyke angles through the schist belt in the south part of the area and appears to be an extension of the much thicker body that underlies Crofton Ridge.

NANAIMO GROUP

The Nanaimo beds are well exposed along the walls and bed of the Chemainus River and sporadically elsewhere. The early sedimentation varied from place to place. Along the west edge of the lobe there is a thick, coarse basal conglomerate. In Banon Creek this conglomerate thins to 30 metres. In both places it is overlain by sandstone which fines upward. In the river near the highway, 4.5 metres of hard grit (granule conglomerate and poorly sorted sandstone) overlies the Sicker rocks. The sandstone and grit are overlain by a thick section of dark grey silt-stones and black shales, which in turn are overlain by fine-grained sand-stone which is exposed along the highway. South of Banon Creek siltstone appears to rest directly on the Sicker inlier. In the Chemainus River south of Banon Creek, a 5-metre grit bed has a discordant strike and rests on rumpled siltstone; it may be the basal unit thrust northwest over the younger beds.

Fossiliferous sandstone dykes cut the siltstones in two places: just above the discordant grit bed, south of Banon Creek in Chemainus River at the place marked 4d. The attitude symbol is for the largest dyke, one which is 20 to 30 centimetres thick. Others are as thin as 5 centimetres and curved. One was seen to bifurcate upward.

STRUCTURAL GEOLOGY

Pre-shonkinite and post-Nanaimo episodes of faulting occurred. In addition the Sicker sedimentary rocks (1c) have been folded and the dip of the Nanaimo beds suggests that the area has been tilted eastward. The overall dip of the Sicker beds is to the south-southwest. A syncline-anticline pair indicate overriding or vergence to the north. A shear zone on the flank of the anticline dips 32 degrees south and is probably a thrust. The timing of this folding and faulting is unclear but it is probably pre-Nanaimo.

The sense of movement in the schist belt is unclear. If the mafic volcanic rocks to the north are correlative with those on Mount Richards then at least a component of the movement was north side up. However, the mafic volcanics may be intercalated in the sediments in this area.

A significant post-Nanaimo fault is indicated by the abrupt termination of the basal conglomerate and by a large notch in the river wall. A major component of the movement had to be south side up. Not enough work has been done to indicate its westward extension, and to the east it passes under extensive glacial cover.

The Nanaimo-Sicker contact has been offset 30 metres to the left on a tight vertical fracture which angles across the river bed. A possible thrust in the Nanaimo beds has been noted above. And because the basal grit is not repeated there may be a fault along the south side of the Sicker inlier in the Chemainus River.

ECONOMIC GEOLOGY

No significant mineralization was found. Pyrite occurs in the schist belt and in the mafic volcanic rocks. The shonkinites contain sporadic grains of chalcopyrite.

REFERENCES

Clapp, C.H. (1917): Sooke and Duncan Map-Areas, Vancouver Island, British Columbia, with Sections on Sicker Series and the Gabbros of

East Sooke and Rocky Point by H.C. Cooke, Geol. Surv., Canada, Mem. 96, pp. 125-172, Map 42A.

Eastwood, G.E.P. (1979): Sicker Project - Mount Richards Area, B.C. Ministry of Energy, Mines & Pet. Res., Geological Fieldwork, 1979, Paper 80-1, pp. 49-51.

.... (1980): Geology of the Mount Richards Area, B.C. Ministry of Energy, Mines & Pet. Res., Prelim. Map 40.

Fyles, J.T. (1955): Geology of the Cowichan Lake Area, Vancouver Island, B.C. Ministry of Energy, Mines & Pet. Res., Bull. 37.

Muller, J.E. (1980): The Paleozoic Sicker Group of Vancouver Island, British Columbia, Geol. Surv., Canada, Paper 79-30.

UPPER SUTTON CREEK AREA

(92C/16c)

By G.E.P. Eastwood

INTRODUCTION

This area lies south of Cowichan Lake and may be reached from either Honeymoon Bay or Caycuse by main logging roads. Local access is provided by Truck Road 3, which is badly eroded but was still passable by four-wheel-drive vehicle as far as Sutton Creek in 1981 (see Figure 1).

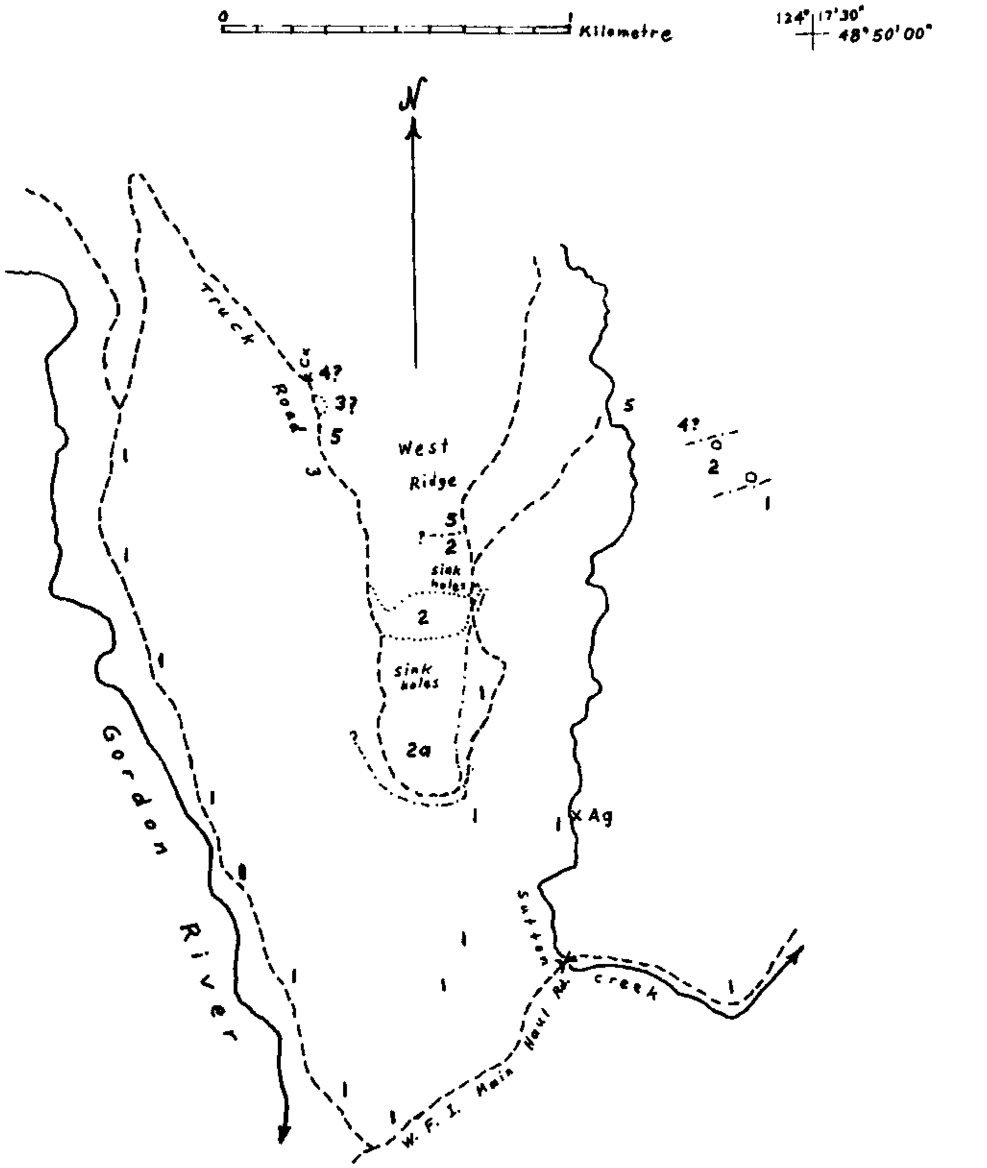
Sutton Creek flows down a steep V-shaped valley between two spur ridges onto a flat-floored valley followed by the main haul road. The west ridge is fairly flat crested. Much of the area is covered with second-growth timber, and growth is thick on the Gordon River slope.

About 1971 Western Forest Industries leased the mineral rights to a tract of land extending westward from upper Sutton Creek from the Esquimalt and Nanaimo Railway. In 1980 the company instructed its prospector, V. Allan, to assess the mineral potential. He asked for assistance with the geology, and the writer spent an aggregate of 13 days in 1981 cruising roads in and east of the area of Figure 1 and mapping on the west ridge. The company kindly provided free accommodation for the writer and his assistant.

GENERAL GEOLOGY

Most of the area between Cowichan Lake and the main haul road is underlain by Bonanza volcanic rocks, but along the section of the Gordon River road (Figure 1) the rocks are dark greenish grey or grey amygdaloidal Karmutsen Formation lavas. On the south nose of the west ridge the rock is generally much sheared and rubbly, a feature characteristic of the Bonanza, but creek exposures show that the rocks are Karmutsen.

A solid mass of blue-grey Quatsino limestone occupies part of the summit and west slope of the west ridge. It is massive, a typical feature of Quatsino limestone that has been moderately metamorphosed. A few andesite dykes occur in the limestone at the north end of the exposure. Both north and south the area is largely covered, but numerous sink holes indicate extension of the limestone. On the south part of the ridge crest small outcrops of limestone are interspersed with outcrops of massive andesite, and limestone is exposed in two road cuts. No limestone was found below the road. In the Kennedy Lake area and elsewhere on Vancouver Island the Quatsino limestone is extensively intruded by massive andesite or basalt, which is believed to represent a resurgence of Karmutsen volcanism. Intrusion into the lower part of the limestone



LEGEND

5 Areas of abundant porphyry dykes
4 Bonanza Formation
3 Parson Bay Formation
2 Quatsino Formation
  2a: limestone remnants in intrusive andesite
1 Karmutsen Formation

Symbols

Area of continuous outcrop ....
Inferred formational contact ..
Mineral occurrence x

Figure 1. Upper Sutton Creek area.

on the west ridge has completely disaggregated the limestone so it now occurs as blocks in the andesite. Along the south part of the third leg of Truck Road 3 the rock is mostly amygdaloidal Karmutsen lava. Two outcrops of limestone occur on the east ridge and suggest that the limestone body strikes northeastward. Here the limestone is succeeded to the north by a reddish grey volcanic rock which is assumed to be Bonanza. Near the end of the east branch of Truck Road 3 the reddish rock passes northward to a chert-like rock such as is seen in lower Bonanza in other areas. Westward, the limestone does not reach the Gordon River road within the map-area. It must either be faulted or dip at a low angle to the north and pass under the covered area around the first switchback.

After a covered interval, the second leg of Truck Road 3 cuts through andesite containing bands of limestone and calcareous argillite. Some thin limestone bands are black and resemble Parson Bay Formation, but one comprises 10 metres of thinly banded light grey limestone. This section has no counterpart on the east ridge. The andesite is intruded by a 4.5-metre monzonite dyke and by many small dykes of fine-grained light grey feldspar porphyry. Shear zones cut all the rocks in several directions.

On the east ridge the Bonanza-like rocks are cut by diorite dykes up to 25 metres wide. These in turn are cut by small dykes of feldspar porphyry. At the road junction on the west ridge a similar porphyry dyke intrudes limestone and intrusive andesite, and farther north another intrudes a nondescript grey rock.

STRUCTURAL GEOLOGY

The distribution of the Quatsino limestone suggests that it dips moderately northwestward on the east ridge and gently toward the west-northwest on the west ridge. A flow contact in Karmutsen on the Gordon River road, 365 metres south of the foot of Truck Road 3, strikes east-west and dips 25 degrees north. The banded limestone strikes 050 degrees and dips 55 degrees northwest. However, the belt south of Cowichan Lake is intricately faulted and isolated attitudes may not be significant. Individual shear zones are legion, but no major faults have been demonstrated.

ECONOMIC GEOLOGY

Two mineral occurrences have been found in the map-area. At the point indicated on Truck Road 3 (Figure 1) a little chalcopyrite and arsenopyrite occur with pyrite in a rusty, altered, dense rock. At the point indicated in Sutton Creek a little wire silver occurs with pyrite in a shear zone in Karmutsen lava. However, there is much barren shearing in the area and the prospects are poor. There is also a lack of skarn development in andesite intrusions into Quatsino limestone; such alteration usually occurs where mineralizing solutions migrate through the rocks.

REFERENCE

Eastwood, G.E.P. (1968): Geology of the Kennedy Lake Area, Vancouver Island, British Columbia, B.C. Ministry of Energy, Mines & Pet. Res., Bull. 55, 63 pp.