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VANCOUVER ISLAND

GEOLOGICAL INTERPRETATION OF ~~TEXADA'S~~ AEROMAGNETIC MAPS

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Introduction

In 1975 the Department of Mines and Petroleum Resources purchased an aeromagnetic survey ~~which had been made~~ made by by Scintrex Surveys Ltd. in 1973 for Texada Mines Ltd. Eight areas on Vancouver Island and one on the Mainland coast were covered. ~~The material~~ Data obtained included a set of mylar positives of magnetic contours drawn over a subdued photomosaic, strip charts of continuous in-flight recordings, flight line film rolls, flight lines on photomosaics, and mosaics of NTS 1:50,000 maps. The method of data processing is not described, but is assumed to be essentially the same as that described in Assessment Reports submitted by other clients of Scintrex where similar equipment was used. ~~No evaluation or interpretation of the data was received.~~

Survey Data

Aircraft:	Alouette II helicopter
Magnetometer:	MAP-2 proton precession
Altimeter:	Bonzer TRN-700 radar
Camera:	Vinten Mark III 16 mm
Terrain clearance:	500 feet, mean
Flight line spacing:	1,000 feet
Area:	Approximately 1,500 square miles, covered by 8,103 miles of flight record.

Method of Interpretation

~~The method used~~ Interpretation has been a purely visual analysis of the magnetic contour maps. No mechanical or mathematical manipulations have been attempted, nor has any attempt been made to model the magnetic fields. The analysis has been limited to relating the magnetic responses to topography and known geology, and pointing

out discrepancies. Where the geology has been mapped in some detail — 1 mile or less to the inch — the correlation is generally good within the limitations of the aeromagnetic survey. With less detailed geological mapping the correlation is poorer, and many of the discrepancies probably arise from inaccuracies in small-scale geological mapping. The Departmental study, "Airborne Magnetometer Surveys, 1956-57", demonstrated that magnetic responses from most known magnetite deposits are weak to modest in comparison with formational responses and topographic effects. For these reasons the terms "anomaly" and "anomalous" have been avoided.

Topographic Effects and Survey Limitations

Ideally, the aircraft would maintain constant speed and a constant distance from the ground surface along its flight path. ~~In practice,~~ both goals are frequently unattainable ~~with real aircraft~~ under actual flying conditions; ~~The~~ aircraft tends to fly low over ridges and peaks and high over valleys. Since the magnetic fields attenuate with distance, a relatively stronger response is frequently obtained from peaks and ridges with no necessary variation in the rocks. This is referred to in this interpretation as the topographic effect.

~~The~~ aircraft also tends to fly slower climbing up over a ridge and to pick up speed descending into a valley. In surveys which produced records at constant time intervals, the plotted position of the response from a ridge or susceptible rock ~~was~~ is displaced from its true ground position. Averaging from alternate lines flown in opposite directions reduced the displacement, but frequently failed to eliminate it. It is assumed that the continuous recording and more sophisticated data reduction used in the present survey should essentially ~~have~~ eliminated this displacement, and no allowance is made for it.

Sample D

1TERMINOLOGY..USEDs10M,

oMaGNETIC..FEATURE:...A part

of the overall magnetic response etc.

oSIZE..AND..INTENSITY:...Size terms

such as large etc.

However, the proximity of certain magnetic features to geological features in some places suggests that some ~~slippage~~ displacement ~~may have occurred~~ could be inherent in the survey. The survey also has limits of resolution. A rock possessing low susceptibility will give a low, flat response, but this will be modified at the edges by oblique responses from more susceptible rocks. If the response of the adjoining rocks is strong and the outcrop of the weakly responding rock is narrow, it will be completely masked and magnetically undetectable at the ground clearance flown.

Terminology Used

Magnetic feature: A part of the overall magnetic response that is distinguishable from its surroundings by the arrangement of the magnetic contours. Features include highs and lows, magnetic ridges and troughs, and magnetic gradients. Very low responses are probably negative local responses that are superimposed on the earth's magnetic field, and are termed magnetic depressions. A magnetic dipole is a paired high and low in close proximity.

Size and intensity: Size terms such as large and small refer to the area apparently covered by the magnetic feature. Terms such as strong and weak refer to the relative intensity of the magnetic response, regardless of sign. High and low indicate positive and negative differences in response as compared with the immediate surroundings.

Local magnetic datum: This is an arbitrary level of magnetic response for a local area determined by visually estimating equal areas above and below a magnetic contour. It is a device which is in places useful for interpretation, but it has no fundamental significance.

Magnetic relief: This is the average intensity of the magnetic features in a map-area or part of a map-area. Approximate, relative terms such as weak, modest, and moderate are used; they represent somewhat different ranges of gamma-values from area to area.

Magnetic patterns: The arrangement of magnetic features in a map-area or part of a map-area. One common pattern comprises random equidimensional highs and lows and shows moderate to strong magnetic relief; it is characteristic of igneous rocks containing appreciable disseminated magnetite, and has commonly been referred to as noisy. Where the highs and lows are elongated they are commonly aligned and define a magnetic grain. Alternating narrow magnetic ridges and troughs produce a banded magnetic pattern. A festoon pattern is an abrupt and large widening of a magnetic gradient between two narrow segments. Mountain masses consisting largely of intrusive rocks may show a fluted or lobate magnetic pattern with generally high values and high relief, and the flutes or lobes may or may not correspond with ridges extending out from the central mass. An area showing this pattern is called a magnetic massif, regardless of topography or known geology.

Sample (3)

lsUN-10B,AREA,,1,,,,,,(92L/4E, 5)s10M,

om476, [References:sI,,,,Geological
of Canada,sM, Paper 74-8 and Map 4-1974.]

jm504,This sheet is too complex to analyse without some filtering. A print was taken and the 1,000, 1,500, and 2,000-gamma contours were coloured. The 1,500-gamma contour appears to constitute a satisfactory datum for comparing areas and perceiving magnetic patterns.

jThe area etc.

Area 1 (92L/4E, 5~~E & W~~) Ref: G.S.C. Paper 74-8 and Map 4-1974

Lifting.

This sheet is too complex to analyze without some ~~aid~~. A print was taken and the 1,000, 1,500, and 2,000-gamma contours were coloured. The 1,500-gamma contour appears to constitute a satisfactory datum for comparing areas and perceiving magnetic patterns.

The area between Klaskish and Klaskino Inlets generally shows low magnetic relief and low values. There is a strong dipole near the head of Klaskino Inlet and a group of small magnetic highs around Klaskish Basin. The magnetic grain trends northwest. ~~Rather surprisingly~~, most of this area has been mapped as Karmutsen, with a block of Parson Bay sedimentary rocks northwest of the dipole. The two formations are not magnetically distinct. A small ~~patch~~ area of Bonanza volcanic rocks appears to be responsible for a small relative high over Yaky Kop Cone. There is no apparent geological reason for the dipole.

A broadly arcuate magnetic low follows the Klaskish River and continues off the northeast side of the map-area. It separates two magnetic regions on the northwest from the dominant one on the southeast. Geologically it corresponds with the Brooks fault zone, though it does not accurately match any one fault within the zone. A weak double dipole over Klaskish Basin corresponds with a small plug of the granite Island Intrusions. A sharp magnetic high east of the head of Klaskino Inlet ~~lies~~ is situated approximately over a small fault striking west through Karmutsen volcanic rocks. A magnetic trough to the north of this high strikes toward ~~the~~ Klaskino Inlet and ~~approximates~~ is close to the Karmutsen - Parson Bay contact.

The north third of the map-area ~~approximates~~ represents a magnetic plateau on which magnetic troughs and ridges are superimposed. Most of this plateau is outlined by the 1,500-gamma contour, but on the

southwest side, along Klaskino Inlet, the 1,400-gamma contour fits the pattern better. In the southwest part the magnetic ridges and troughs are short and isolated, and strike variously from west to north. In the northeast part they are longer and more or less connected, forming five larger, sinuous features: three ridges and two troughs, with an overall northwest trend. The northeasterly trough extends from O'Connell Lake across the Klaskish River low and into the southeast area. It coincides with a fault ~~which was~~ thought to be truncated by the Brooks fault zone, but which ~~would seem to~~ apparently continues across it. The intersection of the trough with the low belt produces a strong magnetic depression. The northeast ridge is underlain partly by Bonanza volcanic rocks and partly by a faulted segment of an elongate Island Intrusion. The north part of this magnetic ridge appears to be ~~a~~ due to topography ~~effect~~, but the south part ~~appears to be a response from~~ may represent the intrusion. The faulted northwest end of the intrusion corresponds more or less with the southwest magnetic ridges and intervening trough. An akimbo band of Parson Bay sedimentary rocks cannot be identified from the magnetics. The rest of this area is underlain by Bonanza volcanic rocks, ~~and the magnetic pattern in~~ is not inconsistent. 1 line

(0) ← The concept of a modified magnetic plateau is ~~scarcely~~ not tenable for the southeast half of the map-area, because areas of flat magnetics are ~~small~~ of limited extent. However, the 1,500-gamma contour still provides a useful reference datum. Three sub-areas can be distinguished: a western area marked by north-trending magnetic grain, a central area of rather noisy magnetics, and a northeast belt showing strong northwesterly magnetic banding.

(1) ← Part of the western sub-area coincides with a granitic stock. The west contact is defined by the 1,500-gamma contour ~~as far as~~ up to the

jogs in the creek flowing into Klaskish Inlet. On the north and east, however, the contact has no magnetic expression, ~~it~~ crossing magnetic features at random. The magnetic trough west of the stock is over Bonanza volcanic rocks and is unexplained. The north part of the western area is also over Bonanza, but the pattern is consistent ~~with~~ for these rocks. A fault extending from Colonial Creek nearly to Klaskish Inlet has no magnetic expression. A sinuous magnetic ridge extends over the topographic ridge to Johnson Lagoon. It suggests a magnetic rock unit dipping to the northeast, ~~but this does not correspond to~~ reflected by the mapped geology. A shallow magnetic trough flanking it on the west is similarly unexplained.

(1) ← The central sub-area is underlain by both Bonanza and Karmutsen volcanic rocks and by a thin intervening band of Parson Bay sedimentary rocks. This band has no magnetic expression, crossing highs and lows indiscriminately. The Bonanza and Karmutsen are magnetically indistinguishable. A notable feature of this sub-area is a string of magnetic lows through the centre. The two westerly lows are shallow and probably normal for these rocks, but the deep depression over Nasparti Lake and especially the depressions to the north and ~~east~~ northeast require explanation. It is possible that they reflect the siliceous core of a volcanic centre.

(4) ← Mapping by Rio Tinto Canadian Exploration and Imperial Oil has partly outlined a granitic stock between the head of the Klaskish River and Heart Lake at the head of the Nasparti River. This is evidently a continuation of the stock that was offset ~~on~~ by the O'Connell Lake fault, and ~~shows~~ indicates that it is continuous across the Brooks fault zone. Magnetically it is represented by two shallow troughs and a weak intervening ridge. The magnetic high northeast of Heart Lake overlies Bonanza rocks in a high ridge and is probably a topographic

Sample A

1AREA,,2,,,,,,(92E/14W, 92L/3W, 4E)s10M,

om476, [References:sI,,,,Geological
Survey of Canada,sM, Paper 74-8 and Map 4-1974.]

jm504,This map-area shows two general magnetic styles:

o(1) The south two-thirds is characterized by generally low values and low magnetic relief, and is a continutation of the low values along the southeast margin of area 1. Local datum appears to be 1,300 gammas.

o(2) A belt etc.

effect. A magnetic ridge southwest of the stock overlies both Karmutsen and Bonanza volcanic rocks. The magnetic trough southwest of this ridge appears to represent a southeast extension of the O'Connell Lake fault. The magnetic ridge southwest of this trough coincides with another mountain ridge, which is underlain by Bonanza volcanic rocks.

Generally low values are registered along the southeast margin of the map-area. A broad low with two magnetic depressions straddles the upper course of the Power River and coincides approximately with a block of Parson Bay sedimentary rocks shown on Map 4-1974. The small magnetic ridge to the west coincides with the ridge between the upper and lower courses and overlies Karmutsen volcanic rocks. It may also in part reflect scattered magnetite mineralization known to occur in this ridge. An arcuate magnetic depression east of the head of Nasparti Inlet overlies Bonanza volcanic rocks and coincides approximately with a cross-fault.

Area 2 (92E/14W, 92L/3W, 4E) Ref: GSC Paper 74-8 and Map 4-1974

This map-area shows two general magnetic styles:

(1) The south two-thirds is characterized by generally low values and low magnetic relief, and is a continuation of the low values along the southeast margin of area 1. Local datum appears to be 1,300 gammas.

(2) A belt of higher magnetic relief and ~~slightly~~ moderately to distinctly higher values along the northeast and east sides of the map-area. Datum rises from about 1,400 gammas in the south to about 1,700 gammas in the north corner of the map-area.

The area of highest magnetic values overlies the summit and upper slopes of Power Mountain. This area has been mapped in detail by

Texada Mines Ltd. A wedge of fine-grained diorite and its sheet-like apophyses have intruded andesite, basalt, and metasedimentary rocks, and magnetite lenses have formed adjacent to the contacts. In ground surveys the magnetite was found to possess strong to intense remanent magnetization with a nearly flat inclination, producing strong negative readings at the edges of magnetite lenses. Most of the rocks were found to contain finely disseminated magnetite and to possess a moderate magnetic susceptibility, exceeding that of similar rocks on Vancouver Island not associated with magnetite deposits. The strong magnetic response thus appears to combine the topographic effect with the response from susceptible rocks and the magnetic field of the magnetite ~~lodestone~~ lenses.

(2) ← A second area of high magnetic values extends from Diorite Lake southeast to Little Creek. The values are only a little lower than over Power Mountain, although they are over the ridge slope. This area has not been mapped in detail. Map 4-1974 shows it to be underlain by Karmutsen volcanic rocks, although such rocks ~~but even they~~ do not normally (in this survey) give ~~rep~~ responses as high as 2,500 to 3,000 gammas. This area would appear to be an excellent target for exploration for magnetite.

(2) ← The magnetic depression extending south from Diorite Lake may be a dipolar edge effect, ~~otherwise it is unexplained~~. This area also has not been mapped in detail. A small magnetic low northeast of Power Mountain overlies metasedimentary rocks. A deep magnetic trough farther to the northeast overlies a narrow band of magnetite along an andesite-diorite contact, and does not seem to be adequately explained.

(1) ← A magnetic trough, with small depressions, defines the southwest side of the belt along the Power River as far as the bend above Power

Lake, where it intersects a less well defined trough extending across the belt and continuing as a series of lows and saddles over Power Lake and a mile beyond. These troughs do not reflect known geology and appear to ~~be largely~~ reflect topographic ~~in origin~~, but the valleys may follow unmapped faults. There is some left hand displacement of the north-northeast-trending trough by the northwest one.

(3) ← An area of moderately high values and appreciable magnetic relief overlies the mountain mass east and northeast of Power Lake. The regional geological map shows this area to be underlain by Karmutsen volcanic rocks, which is consistent with the magnetics when the topographic effect is taken into account. A small granitic plug at the head of Ououkinsh Inlet is not ~~magnetically detected~~ indicated by the survey.

(4) ← The Ououkinsh fault bounds this area on the northeast, and is represented by a chain of small magnetic lows as far as the bend of the Malksope River. Beyond this point the fault is not clearly indicated by the magnetics. A similar chain of small lows splits off at the bend of the Ououkinsh River and extends to the head of Malksope Inlet, transecting the regionally mapped geology. It has no topographic expression. A triangular area between these two chains of lows shows somewhat above average values and magnetic relief, and is not topographically distinct from the area to the southwest. The regional mapping shows it to be underlain mainly by Bonanza rocks.

(5) ← Another area of appreciable magnetic relief lies between the Ououkinsh fault and Kashutl Inlet, and extends from the bend of the Malksope River to Easy Inlet. It is ~~indicated to be~~ underlain mainly by Bonanza volcanic rocks. The topographic correlation is not good, and changes should be looked for in the magnetic nature or condition of the rocks. A magnetic depression over Easy Inlet is not reflected ~~in~~ by the known geology, and a fault extending west-

northwest from the south end of the Inlet is not reflected ~~in~~ by the magnetics.

A final area of moderate magnetic relief overlies the high country between the southerly creek flowing into Easy Inlet and McKay Cove. This area is shown to be underlain by Bonanza volcanic rocks, and there is no known geological or topographic reason why it should be magnetically distinct from the areas to the west and north. It is bounded on the west by a chain of weak magnetic lows extending toward Kyuquot which in part overlie Clanninick Creek and may represent a fault.

The large area of weak to modest magnetic relief ~~affords~~ renders little geological information. For the most part the magnetic pattern correlates with the topography, and any differences in the magnetic responses of the various rocks are too slight to be discernible. A chain of weak magnetic lows southwest of Mount Seaton may represent a fault. An east-trending magnetic trough north of the Bunsby Islands and Mount Paxton could be an extension of such a fault, but could be entirely topographic in origin. Linear magnetic depressions southeast of Malksope Inlet and northwest of St. Pauls Dome follow creek valleys. A linear depression southwest of St. Pauls Dome coincides with a fault which brings Parson Bay sedimentary rocks on the southwest in contact with Bonanza volcanic rocks.

Area 3 (92/6~~E & W~~L) Refs: Preliminary Geologic Map Alice Lake - Benson Lake, B.C. Dept. of Mines & P. Res. G.S.C. Paper 74-8 and Map 4-1974

The main geological features are generally reflected ~~in~~ by the magnetics patterns. ~~A narrow band of noisy~~ A noisy pattern along the northeast edge is typical of ~~the~~ underlying Karmutsen rocks.

Northeast of Kathleen Lake the magnetics extend the width of known Karmutsen nearly to the crest of the ridge. The large low over Benson Lake ~~cannot be~~ is not explained.

From the northwest edge of the map-area to the outlet of Kathleen Lake ~~the~~ Quatsino limestone is represented by a weak diagonal magnetic gradient. This diagonal relationship may signify some warping ~~in~~ of the basal contact. A large magnetic depression overlies the limestone southeast of ~~the~~ lower Benson River, and is not readily explained. A wedge of Parson Bay argillite is mainly represented by a broad, weak magnetic high between Howlal and Yootook Creeks. It pinches out to the southeast of Yootook Creek and is not magnetically identifiable.

High magnetic relief and high values over the Merry Widow Mountain area, between Craft and Rainier Creeks, correspond fairly well with a stock of monzonite and gabbro-diorite. The northwest contact is approximated by the 2,000-gamma contour. Bonanza volcanic rocks to the northwest produce a subdued noisy pattern, with values between 1,100 and 1,500 gammas. Southwest of the stock, values over a high ridge of the volcanic rocks range up to 3,000 gammas; ~~this effect is probably largely~~ which may be largely due to topography. The pattern over the stock is decidedly noisy, with a high background and strong magnetic relief. The response is partly topographic, since Merry Widow Mountain ~~has been largely carved from~~ is primarily underlain by the stock. The highest value, ~~of~~ 4,100 gammas, is over the north peak of the mountain, which ~~has been carved from~~ is underlain by a roof pendant of Bonanza volcanic rocks. The mined-out Merry Widow open pit is marked by a 200-gamma high above local background, but the mined-out Kingfisher pits underlie a weak magnetic low. The small high to the north is ~~about~~ roughly over the site of the machine shop and close to the partly-mined Raven magnetite orebody. The other

small magnetite occurrences along the eastern margin of the stock have no apparent magnetic expression.

A narrow magnetic ridge extends from the southeast end of Kathleen Lake to the former millsite of Empire Development Ltd., broken at the southeast end of Benson Lake by a trough which continues south to the west of the ridge. The ridge corresponds fairly well with the "Old Sport horizon", a stratiform body of skarn and magnetite at the top of the Karmutsen Formation. The south-trending part of the trough may merely reflect the underlying Quatsino limestone. The part transecting the ridge overlies a barren, garnetite section of the "horizon", but this does not fully explain it.

From the millsite nearly to the head of Blue Ox Creek the magnetic trough and ridge continue as a flat band in a broadening reverse magnetic gradient. There is no evident cause of this flat band. The gradient overlies Quatsino limestone and patches of Bonanza volcanic rocks, and obliterates any magnetic distinction between them. It is termed reverse because values increase in the direction of dip of the limestone. It is not therefore caused by the Underlying Karmutsen rocks, but rather by an east-dipping susceptible rock, presumably the gabbro-diorite. The gradient expands into a festoon of contours over Bonanza volcanic rocks and Parson Bay argillite between Rainier Creek and the west fork of the Benson River. This terminates against a weakly noisy pattern over volcanic rocks across the middle courses of Blue Ox Creek and the west fork. The change in response of the volcanic rocks appears to reflect increased topographic relief. The festoon and noisy pattern terminates on the southeast against a marked magnetic break.

The Quatsino limestone is repeated by a fault along the Benson

River, and near Iron Lake and Lac Truite is represented by a weak magnetic trough. A weak high east of Lac Truite overlies the contact with the Karmutsen rocks. To the south an area of nearly flat magnetics reflects a topographically low area underlain mainly by ~~the~~ limestone. Sections of normal gradient occur near the Karmutsen contact, which is followed by the Raging River. A band of Bonanza volcanic rocks east of the Benson River is faintly reflected in the magnetics.

A weak magnetic trough across the upper Raging River and along the south-flowing tributary west of the lakes coincides approximately with a fault which offsets the Karmutsen-Quatsino contact to the left. East of the fault the magnetics are unusual in that a weak ridge overlies the limestone and is flanked by a low over Karmutsen in the vicinity of the lakes.

The magnetic break extends east-northeast from the middle fork of the Benson River toward the lakes at the head of the Raging River, and appears to offset the magnetic patterns to the left. Detailed geological mapping ended here, but the regional map does show a left handed fault nearly coincident with this break.

The rest of the map-area exhibits a tripartite pattern typical of the southwest-dipping sequence. A noisy pattern with high magnetic relief occurs over Bonanza volcanic rocks, and evidently is accentuated by topography. A normal magnetic gradient occurs over Parson Bay and Quatsino sedimentary rocks. And another noisy pattern occurs over Karmutsen rocks: values and relief are relatively low due to subdued topography. The regional map shows a fault northeast of Cross Lake offsetting the Quatsino-Karmutsen contact to the left. This coincides with a small break in the magnetic pattern and with a linear on the photomosaic. A weak magnetic ridge overlies Quatsino east of the fault and is unexplained.

Area 4 (92L/7W, 10W, 11E) Ref: GSC Map 1029A

GSC Paper 74-8 and Map 4-1974

The magnetics of the area west of the Nimpkish River show little correlation with the regionally mapped geology. A ridge opposite Haddington Island may represent suberop sub-outcrop of Tertiary lavas along the shore. The belt of flat magnetics along the highway overlies Suquash clastics, but so rocks as does part of the area of higher magnetic relief to the south. The area south of the highway is generally noisy, with moderate magnetic relief becoming low west of Nimpkish Lake. This area is underlain, in sequence, by Suquash, Parson Bay, Bonanza, and Karmutsen; thus, the weaker relief is produced by the volcanic rocks. Faults are not detectable from ed by the magnetics. patterns.

The area east of Nimpkish Lake and River is dominated by a magnetic massif and basin. The local magnetic datum is about 1,700 gammas. In a general way, the massif overlies Bonanza and Karmutsen rocks and the basin overlies Parson Bay and Quatsino, but the correlation is not close. A smaller basin opposite Cormorant Island is underlain mostly by Parson Bay, but a patch an arch of Bonanza volcanic rocks underlies the lowest values. A small magnetic ridge plunging toward this magnetic basin from Telegraph Cove overlies Karmutsen rocks. A granitic stock underlying the cove and the area to the southeast gives a weak magnetic response comparable with the sedimentary rocks. A narrow band of limestone is marked by a short magnetic trough south of the ~~short~~ small magnetic ridge, but is virtually undetectable where it passes under the massif. A weak magnetic break coincides with the Tsulton River fault. Southeast of this fault Karmutsen rocks are represented by high magnetic relief and high values as far as the lowest bend in the Kokish River; values

as high as 3,100 gammas are rather high for these rocks, and they cannot be ~~ascribed~~ due to topographic ~~enhancement~~ effect, therefore some additional source of the magnetic response should be sought.

Along the northwest-flowing section of the Kokish River the Karmutsen rocks are represented by a subdued noisy pattern and lower values. A weak depression over the upper north-flowing section has no apparent explanation. A small low to the southwest of this overlies the bend of the Quatsino limestone.

In the magnetic basin, weak noise west of Thiemer Lake and southeast of Sua Lake overlies Parson Bay rocks, and may ~~reflect~~ reflect ~~tuff beds~~ tuffaceous lavas. Bonanza volcanic rocks capping a hill are not detected magnetically. They also cap a small plateau west of Ida Lake, where they give a flat, apparently non-magnetic response. The weak high ~~over~~ west of the small lakes appears to be a topographic effect over a spur carved from Parson Bay rocks. Weak highs east of the north-flowing section of the Tsulton River overlie both Quatsino and Parson Bay, rocks, and are unexplained.

An area of noisy magnetics bounds the magnetic basin on the west, from west of Sua Lake to the Halfway Islands, and corresponds well with Karmutsen exposures. Farther south, an area of moderate magnetic relief and fairly high values corresponds approximately with an arc of Karmutsen rocks and the northwest end of a granitic stock. The highest value overlies the Karmutsen - stock contact south of Noomas Creek and may ~~perhaps~~ represent ~~unrecorded~~ magnetite mineralization.

Area 5 (92L/2W, 3E, 6E, 7W) Ref: GSC Maps 1028A, 1029A
GSC Paper 74-8 and Map 4-1974

A tripartite pattern over part of area 3 continues over the western part of area 5. Bonanza volcanic rocks on the southwest exhibit a noisy pattern with high magnetic relief. Parson Bay and Quatsino sedimentary rocks dip southwest and show a normal magnetic gradient. Karmutsen volcanic rocks between the upper Tahsish River and Hustan Lake are represented by a noisy pattern with moderate magnetic relief and ~~medium~~ intermediate values. A north-northeast - striking fault east of Mount Renwick, inferred from the regional mapping to offset the formations to the left, ~~does not offset the~~ is not reflected by the magnetic patterns. A widening of the gradient immediately south of the west-flowing section of the Tahsish River ~~probably~~ represents a simple widening of ~~the~~ Parson Bay outcrop, probably due to a flatter dip. There is however a north-trending break in the magnetic patterns, ~~which could mark~~ possibly marking a fault, west of Atluck Lake. The magnetic nose extending across this trend is unexplained. The gradient belt is effectively terminated by a small magnetic trough extending northeastward across it west of Mook Peak.

To the southeast the sedimentary belt is not clearly defined by the magnetics ~~,~~ patterns although it is distinguished in a general way by a smoother pattern. The 2,000-gamma high north of the Artlish River overlies the northeast contact of the Zeballos batholith, and could reflect some magnetite mineralization. The Bonanza volcanic rocks have been wedged out to the southeast, and the noisy pattern in the south corner of the map-area essentially represents the granitic rocks. The sedimentary rocks are effectively masked southeast of the upper fork of the Artlish River. Over the Karmutsen belt, values are generally highest along the Quatsino contact and decrease to the northeast ~~, the cause is not apparent.~~

A long, narrow magnetic trough extends from the north end of Hustan Lake up Atluck Creek, over Wolf Lake, and up Pinder Creek to the lakes near its head. This coincides with a fault on the regional map, offset to the left ~~on~~ along another fault passing under Atluck and Mukwilla Lakes. A string of magnetic lows between Mukwilla Lake and the north end of Hustan Lake coincides with another fault inferred from the regional mapping. The magnetics indicate a smooth reverse curve in the main fault, rather than an offset, and a fault between Mukwilla and Hustan Lakes conflicts with the more detailed mapping. The regional map shows the main fault extending north along a Karmutsen - Quatsino contact to the west side of Nimpkish Lake, but there is no magnetic evidence of this extension. At the south end the magnetic trough disappears into a broad magnetic depression on the east flank of Mook Peak, for which there is no apparent cause. From the topography it is reasonable to conclude that the main fault continues under the saddle and down the upper Zeballos River, where it was identified ~~in the~~ by more detailed geological mapping. A weak magnetic ridge flanking Pinder Creek on the southwest may be a rather subtle topographic effect.

A large, strong magnetic ridge follows the east side of Kaipit Creek nearly to the Nimpkish River, then crosses the creek to follow the river to the south end of Nimpkish Lake. It overlies Karmutsen rocks, but is near and parallel to the southwest contact of the Nimpkish batholith as ~~a~~ far as Woodengl Creek. Between Teisum Creek and the step-like bends of the river below Woodengl Creek the Karmutsen rocks are flanked by Quatsino limestone on the southwest. To the northwest the weakening ridge overlies limestone and alluvium, suggesting that the magnetically susceptible rock continues at increasing depth. The mined-out Iron Crown open pit underlies the

southeast nose of one of the highs on this ridge. The ridge is flanked on the northeast by two magnetic troughs: the southerly one overlies Nimpkish batholith, whereas the northerly one overlies mainly Bonanza volcanic rocks. The cause or causes of the magnetic ridge are not apparent: it does not seem to be due to ~~the~~ concentration of magnetite along the border of the batholith, because it continues beyond the batholith to the northwest; and it does not represent a stratigraphic unit in the Karmutsen because it diverges markedly from the Quatsino contact to the southeast.

The area of Quatsino limestone south of Tsiko Lake is represented generally by flat magnetics and by a steep gradient adjacemt to the magnetic ridge. Northwesterly from Tsiko and Mukwilla Lakes the pattern over the limestone is uncharacteristically noisy, suggesting that the limestone may form only a thin cover and that the response is essentially from the underlying Karmutsen rocks. A magnetic trough from Tsiko Lake to the southwest corner of Anutz Lake may represent a thicker section of limestone, possibly along a syncline. The patch of Bonanza volcanic rocks west and northwest of Anutz Lake is represented by generally flat magnetics. A belt of low magnetic relief and somewhat low values extends up the west side of Nimpkish Lake, over Karmutsen as well as Quatsino rocks.

In the southeast part of the map-area a magnetic trough over the lower west branch of Kaipit Creek and a parallel magnetic ridge may represent stratigraphic units in the Karmutsen. The noisy pattern to the southeast is characteristic of the Karmutsen, but values are somewhat low.

Area 6 (92L/~~2E&W~~ 2,7 7E&W) Refs: GSC Maps 1028A, 1029A
GSC Paper 74-8 and Map 4-1974

This area is dominated by a magnetic massif, which lies across

the magnetic basin from the massif of area 4. The basin extends onto area 6, where its south edge is marked approximately by the 1,800-gamma contour. On the southwest a belt of moderate values and low to medium magnetic relief separates the massif from the magnetic ridge of area 5.

As on area 4, the magnetic basin reflects lower Bonanza and flanking Parson Bay and Quatsino rocks. In spite of 2,500 feet of relief west of the north end of Bonanza Lake there is little topographic effect. The basin extends east almost to the Bonanza River and Ida Lake. Around this lake a weak noisy pattern overlies Karmutsen rocks.

To In the west, the magnetic high south of Noomas Creek continues as an arcuate ridge, first following the contact between Karmutsen rocks and the granitic stock, then passing over an unnamed peak carved from the stock, and continuing across the stock as a weak narrow ridge. The low over Noomas Creek overlies the stock. A block of limestone south of the Karmutsen is represented by a magnetic gradient. A magnetic saddle extends northeast across the stock. The Smith copper-lead-zinc deposit has no magnetic expression.

The magnetic massif overlies a variety of rocks and appears to be largely topographic in origin. Most of this area is high — above 2,500 feet - and this is reflected in magnetic values generally above 2,000 gammas. A weak high over Mount Hoy also coincides with a small granitic stock. Mount Kinman has no particular magnetic expression, but a high ridge to the southeast, which is crossed by the northwest contact of the Nimpkish batholith, coincides with a moderate high. The relative low northeast of Mount Kinman overlies a creek valley. The sinuous magnetic trough west and south of Mount Hoy meanders over the small stock, Bonanza volcanic rocks, and a narrow strip of limestone along the northeast contact of the large

stock. The highs of 3,000 and 3,500 gammas overlie a contact between Quatsino limestone and the southeast tongue of the large stock, and could represent magnetite mineralization. The Nimpkish Copper (Kinman) showings coincide with part of a shallow magnetic trough. The narrow magnetic ridge along the southwest side of Bonanza Lake centres on the Quatsino-Karmutsen contact. Southeast of Bonanza Lake a noisy pattern with generally fairly high values overlies Karmutsen rocks and the northeast part of the Nimpkish batholith; highs of 3,000 and 3,500 gammas appear to reflect known magnetite mineralization.

A large granitic stock along the northeast side of Bonanza Lake yields a generally flat magnetic pattern. A weak low over a creek mouth and a fairly strong magnetic ridge over the north end of the stock have no apparent explanation. A weak magnetic trough marks the contact with Karmutsen rocks, and a small high of 2,500 gammas coincides with a hill.

The area southwest of the magnetic massif has been mapped as underlain by Bonanza volcanic rocks, but the magnetic troughs and gradients and locally flat magnetics are more indicative of sedimentary rocks. Topography seems to have little effect, and a broad high southwest of Kinman Lake overlies the head of a creek valley.

Southeast of Woodengl and Steele Creeks rocks of the Nimpkish batholith yield a rather noisy pattern with northwest-trending magnetic grain and moderately high values. Widely-spaced flights north of the Nimpkish River failed to detect the Bon magnetite showing. The area south of the Nimpkish River is entirely underlain by rocks of the Nimpkish batholith, and no reason is evident for variations in the magnetic pattern.

New Tape

Area 7 (92E/15E ~~& W~~, 92L/2E ~~& W~~) Ref: GSC Maps 1027A & 1028A
BCDM Bull. 27 & Fig. 2
GSC Paper 74-8 & Map 4-1974

The magnetic massif on the northwest side in part overlies the Zeballos batholith. The small magnetic ridge north of the Kaouk River coincides with magnetite-pyrrhotite mineralization along the batholith - Bonanza - Quatsino contact zone. The high of 2,800 gammas between the Kaouk River and Fault Creek is slightly displaced from the Churchill magnetite deposit at the batholith-limestone contact. The high of 2,500 gammas over Blacksand Creek is slightly displaced from the Mined-out F.L. magnetite deposit. A magnetic ridge along the west side of the upper Zeballos River overlies Karmutsen rocks. A tongue of the batholith south of the F.L. deposit has no apparent magnetic expression. A magnetic gradient along the south side of the massif overlies the contact of the batholith with Bonanza volcanic rocks.

To the southwest the magnetic gradient ~~passes~~ changes to a magnetic trough. A depression over the Zeballos River overlies a topographic basin which may contain a considerable depth of alluvium. To the southwest of the trough values increase sharply and the pattern is noisy. The difference in response is probably stratigraphic: a virtually non-magnetic member of the Bonanza Formation is succeeded by a member containing appreciable disseminated magnetite.

A chain of lows along the upper Zeballos River coincides approximately with the Zeballos River fault as far as the depression west of Zeballos Peak. The fault has been mapped along the river almost to the saddle at its head, but the magnetic trough jogs to the west, and back again along the edge of area 5, for no apparent reason. A fault slice of limestone underlies a diagonal magnetic gradient.

East of the fault the pattern is generally noisy, reflecting the

underlying Karmutsen rocks. A broad, weak high west of Kaipit Lake appears to be a topographic effect. Magnetic depressions over the outlet of Zeballos Lake are unexplained. A large magnetic high with uncharacteristically smooth pattern overlies Karmutsen rocks on the southwest flank of the Haihte Range. Surprisingly, the upper slopes yield lower values. A magnetic ridge overlies the contact with Quatsino limestone, but the limestone produces a magnetic trough along the Nomash River.

Quartz diorite southeast of the Zeballos River has been remapped as a separate, Tertiary intrusion. The northern part shows low magnetic relief and low values, indicating an almost non-magnetic rock. However, the pattern becomes decidedly noisy around the head of Goldvalley Creek and southeastward. The high magnetic ridge overlies Bonanza volcanic rocks south of the intrusion, but could be related to magnetite concentration adjacent to the contact. The contrasting magnetic response suggests that the granitic rock south and east from Lukwa Mountain may be a separate intrusion, possibly Jurassic. The 3,000-gamma high west of the Nomash River coincides approximately with the south contact of the intrusion with limestone and may indicate magnetite mineralization. East of the Nomash the magnetic pattern over the intrusion displays the large highs generally characteristic of large granitic intrusions.

J.S. Stevenson mapped gabbro on both sides of the Zeballos River south of Golden Gate Creek, and it may be responsible for values above 2,000 gammas near the river. A sharp break in the magnetic pattern along Friend Creek corresponds with a fault mapped along the upper part of the creek by J.W. Hoadley. However it was not found to offset a small granitic stock. This stock is ~~magnetically undetectable.~~ not detected by the magnetics.

Southwest of the magnetic ridge adjacent to the magnetically noisy intrusion a large area of low magnetic relief overlies Bonanza volcanic rocks. A small stock south of the Little Zeballos River has no magnetic expression. A belt of noisy magnetics along Hecate Channel from Barr Creek to McBride Bay would indicate another magnetically susceptible unit in the Bonanza Formation.

Bands of Karmutsen, Quatsino, and Parson Bay rocks along the upper Nomash River and southward to Tahsis are generally too narrow to be magnetically distinguishable. A wider section of the limestone is represented by an area of flat magnetics extending south over the group of small lakes and by a magnetic gradient to the east. Karmutsen rocks along the Tahsis River are represented by higher values and moderate magnetic relief as far as Extravagant Creek. A small stock along this creek has no magnetic expression. A weak high occurs over limestone, and may indicate magnetite mineralization in it; there is a sharp drop in values in passing to the Parson Bay rocks.

A magnetic trough along the Tahsis River happens to coincide with a fault, but it is probably caused mainly by deep alluvium. Karmutsen rocks east of the river and the head of Tahsis Inlet are represented by a noisy pattern with fairly high relief.

Area 8 ~~(XXXX~~ (92E/9W, 10E, 15E, 16W) Ref: GSC Map 1027A
~~GSC Paper 53-17~~

A belt of noisy magnetics along Hecate Channel in area 7 comes to an abrupt end at Tahsis Narrows, suggesting that the Tahsis fault, or a branch from it, may cut through the peninsula west of Mozino Point. The noisy pattern resumes over Bonanza rocks south of Products Creek. The north lobe of the Ehatishat batholith is marked

by low values and low magnetic relief. The southwest part yields moderate values and relief, but the strip down the west side of Tahsis Inlet again produces relatively low values. Magnetic troughs over the inlet may reflect deep alluvium under the water. or simply a topographic effect. Bodega Island lies beyond the limit of mapping, and the cause of the magnetic depression is not known.

A deep trough marks the fault along the lower Perry River, and a magnetic depression and saddle to the northwest suggest that it may continue through to the Tahsis fault. A cross fault along the upper Sucwoa River is marked by a swing of the magnetic trough along it; this trough ends abruptly at a magnetic peak over the south peak of Tahsis Mountain. The continuation of the cross fault up upper Perry River is not really apparent from the magnetics; a magnetic depression has the wrong orientation and is not connected magnetically with the trough. Another magnetic trough starts just east of Malaspina Lake and follows the valley of the Sucwoa River and Head Bay to Tlupana Inlet off Perpendicular Bluff. At least to the edge of mapping, it coincides with a fault, in effect a continuation of the one along the lower Perry River, with a small offset on the cross fault.

Northeast of this fault the Karmutsen volcanic rocks yield a characteristic noisy pattern with moderate values and magnetic relief. Locally there is a northerly magnetic grain. A magnetic trough over Canton Creek may mark a north-striking fault. The continued noisy magnetic pattern would indicate that the Karmutsen rocks continue at least to Nesook Bay. The high over Quadra Saddle ~~rather faithfully~~ reflects the topography.

Southwest of the Perry Lake fault small magnetic ridges overlie two bands of Karmutsen rocks, and the intervening band of limestone is in part represented by a magnetic trough. A small stock

underlies part of one ridge, and is masked by the Karmutsen response. The Perry Lake stock produces a noisy pattern and somewhat low values. The high of 1,700 gammas over the south end could possibly represent magnetite mineralization along the contact with limestone. The area of Quatsino and Parson Bay sedimentary rocks on the east side of Tahsis Inlet and south of the Karmutsen rocks is represented by a diagonal magnetic gradient. The high over Parson Bay ~~over a~~ rocks on a north peak of Tahsis Mountain is probably a topographic effect. A high of 1,800 gammas over the contact with the Perry Lake stock in the northwest wall of a cirque could represent magnetite mineralization. The magnetic gradient flattens out and ends in two small lows over the wedge of sedimentary rocks between the stock and the Bonanza volcanic rocks.

A large area of Quatsino limestone southeast of the cross fault is not readily identifiable from the magnetics. A magnetic ridge paralleling the cross fault begins with a high over a peak of Bonanza rocks, but is displaced westward from the limestone ridge. The lobe of limestone across the head of the Tsowwin River is generally represented by a broad magnetic trough, but values above 1,500 gammas occur. A 1,700-gamma high appears to represent a granitic dyke. The magnetic ridge extending southeast from Malaspina Lake overlies a slice of Karmutsen rocks southwest of the fault. An extension of this ridge has no apparent explanation. The Glengarry-Stormont magnetite deposit has no magnetic expression. The 2,000-gamma high northeast of Deserted Lake lies outside the mapped area; it overlies a low hill, but this appears inadequate to explain it. The magnetic ridges northwest of Deserted Lake overlie topographic ridges, but in part overlie limestone and are not fully explained.

The magnetic pattern over the Bonanza rocks east of Tahsis Inlet generally reflects the topography of Tahsis Mountain, Santiago Mountain, and an unnamed mountain group to the southeast. The lobe of the batholith northwest of Santiago Creek is characterized by a noisy pattern and moderate values.

A southern band of Quatsino limestone is represented by a magnetic gradient along the Tsowwin River and its south fork. The continuation through to the main belt at the head of Hisnit Inlet is not magnetically detectable. Two weak highs over the contact with the Ehatishat batholith along Hisnit Creek may indicate magnetite mineralization. The batholith yields somewhat low values and low magnetic relief. The 1,100-gamma low opposite Bodega Island lies outside the area of geological mapping; it may represent a large sedimentary inclusion in the batholith. The magnetic pattern east of Hisnit Inlet appears to be largely topographically controlled. By projection from the mapped area most of the rock should be limestone.

Area 9 (92K/11W, 12E) Ref: GSC Map 65A

Little useful information can be extracted from the survey of this area, due to the wide flight-line spacing, the lack of topographic mapping more detailed than 1:250,000, and the paucity of geological information. ~~The spacing used over other areas would doubtless produce~~ A very different contour pattern would doubtless emerge had the flight line spacing been similar to that used for the other areas.

Shoreline mapping in 1907 portrayed dominantly granitic rocks containing lenses or septa of metamorphosed sedimentary and volcanic rocks. One such lens at Fanny Bay was known to contain at least two magnetite deposits. The magnetics would indicate that this lens probably continues through from Fanny Bay to across the upper course of Gray Creek, but that it probably pinches out east or northeast of

Jack Lake. The 300-gamma low may represent one half of a dipole over one of the magnetite deposits. The high north of Hewitt Point is probably a topographic effect, but could represent magnetite mineralization along the northeast contact of the lens.

A metamorphic lens north of Wignell Point evidently extends only a short distance inland. Low values south of the south fork of Gray Creek could indicate another metamorphic lens. The 2,000-gamma high southwest of Fanny Bay overlies a 3,500-foot mountain and is clearly a topographic effect. The other magnetic results appear consistent with a dominantly granitic terrane.

Area 10 (92K/5W, 92L/8E) Ref: GSC Paper 74-8 and Map 4-1974

The western two-thirds of the map-area is dominated by a magnetic plateau overlying both Karmutsen rocks and granodiorite/quartz diorite of the Adam River batholith. Relief over much of the plateau is fairly low - 200 or 300 gammas - and the magnetic features are too widely spaced to form a typical noisy pattern. The Adam River and Karmutsen rocks cannot be distinguished from the magnetics. The weak depression around Keta Lake appears to be largely topographic in origin. Higher values north and northeast of Keta Lake reflect higher elevations; the closed 3,000-gamma contour matches the 2,400-foot contour closely. The triangular high north of Tlowils Lake also reflects topography. The weak trough to the west may reflect a fault. The magnetic nose over the small lake west of Tlowils Lake extends over the contact of the batholith with Parson Bay sedimentary rocks, and may indicate magnetite mineralization. A weak magnetic low over the west side of the batholith one-third of the way up the sheet is unexplained, as is a high northwest of the unnamed lake west of the White River. The large magnetic trough trending north over Tlowils Creek may mark a fault; if so, the lower values to the east

could be explained as overlying sedimentary rocks brought northward by left hand movement.

A magnetic trough over the Adam River in the southwest part of the area overlies a north-striking fault which brings a wedge of Quatsino and Parson Bay sedimentary rocks on the west into contact with the batholith. To the north, the elongate low overlies limestone. The three small highs nearby are close to the limestone-quartz diorite contact and could represent magnetite mineralization. From a junction with the fault, an intrusive contact with the limestone extends down the Adam River and is overlain by a small magnetic low. Lower values along the west and southwest margins of the batholith probably reflect lower elevations. East of the fault the intrusive contact extends southeast up the valley of Tlowils Lake, and the sedimentary rocks on the southwest yield somewhat lower values.

The eastern part of the area has not been geologically mapped. At the Iron Mike property 3 miles west of the junction of the White and Salmon Rivers, however, limestone and basalt are reported to be intruded by granitic rocks and gabbro. A compilation map of Vancouver Island shows a considerable area of Quatsino and Parson Bay rocks west of the White River and south of Keta Creek. This area includes the east part of the magnetic plateau, and should be modified by systematic mapping. The Iron Mike magnetite occurrences would appear to coincide with weak lows just inside the ?,000-gamma contour.

A deep magnetic trough coincides with the deep, steep-walled valley of the White River. This valley has been interpreted as developed over a fault, but its youth, as compared with the maturity of the Salmon River valley, renders this questionable. A broad magnetic trough over the Salmon River valley probably reflects deep valley fill. Subsidiary troughs near Keta Creek are unexplained. East of the White and Salmon Rivers the magnetics generally reflect

the topography. A northeast-trending magnetic trough between the rivers is not adequately explained. In the southeast corner of the map-area the pattern grows rather noisy and consistent with Karmutsen rocks.

Area 11 (92K/4W, 92L/1E) Ref: GSC Paper 74-8 and Map 4-1974

This area is marked by high values and generally moderate to high magnetic relief. The local magnetic datum is about ?,100 gammas. A weak magnetic trough more or less following the White River divides the area, ~~magnetically in half.~~ This trough is broader than on area 10, reflecting a widening of the valley. A sharp depression within this trough near the north border is unexplained. The straightness of the valley is suggestive of a fault.

There is geological control for the west half of the area. A fault has been inferred along upper Tlowils Creek and southward past the triangular lake. Quatsino and Parson Bay sedimentary rocks underlie a 3,300-foot mountain in the northwest corner of the map-area, and right-hand movement on the fault has brought the Quatsino south to the creek draining the triangular lake. Values over the 3,300-foot mountain are generally less than ?,000 gammas and relief is fairly low. A ?,?00-gamma high may represent magnetite mineralization adjacent to the Karmutsen contact. A north-trending magnetic trough appears to reflect the general topography of the swampy valley; it is truncated or offset in the south by another trough which has no apparent explanation. The south part of the trough overlies a moderate topographic slope and Quatsino limestone. Between this trough and the White River trough a large area of low magnetic relief is doubtless underlain by sedimentary rocks. High values to the north could reflect the faulted southeast end of the Adam River batholith.

The rest of the west half of the map-area is underlain by Karmutsen rocks, which yield a fairly characteristic noisy pattern with moderate magnetic relief. A magnetic trough near the southwest corner appears to reflect a deep canyon of a White River tributary.

The area east of the White River has not been geologically mapped. However, the geological compilation map of Vancouver Island shows a granitic stock underlying the highland area northwest of the North Memekay River, and this correlates fairly well with a magnetic massif rising to 3,400 gammas. An area of flat magnetics and gentle gradients west of this massif doubtless represents a continuation of the Quatsino and Parson Bay sedimentary rocks across the White River. These rocks may possibly continue under the gentle gradient on the southwest side of the massif to the south fork of the North Memekay River. The noisy magnetics southwest of this gradient probably represent Karmutsen rocks. Low magnetic relief over the steep north slope of the highland may indicate an extension of the sedimentary rocks in that area. The broad valley and saddle to the north are reflected in a general way by the magnetics, but individual features appear indicative of Karmutsen rocks, and the noisy pattern west of the two small lakes is characteristic. Low magnetic relief north of these lakes is unexplained.

A sharp magnetic ridge east of these lakes corresponds with a broad topographic ridge, but does not seem to be fully explained by it. It could also represent a large mafic dyke. The magnetic basin along the east side of the area overlies an area of low topographic relief and possibly deep overburden.

Area 12 (92K/4E)

This area yields a generally noisy magnetic pattern, with small massifs in the northeast and southwest and a central area of low magnetic relief extending southeast from Paterson Lake. It has not been geologically mapped, but adjoins the Alberni map-area on the north. This sheet shows a narrow band of Quatsino limestone over Becher Lake, but otherwise shows Karmutsen and Bonanza volcanic rocks entering the area. Values as high as 3,000 gammas in the small massifs suggest that they may overlie small granitic stocks sattelitic to the Quinsam stock. The southwest massif adjoins Karmutsen rocks, but values and relief are uncharacteristically high. The area of low magnetic relief cannot be explained by deep overburden because the photo-mosaic appears to show bedrock exposed over a considerable part of it. It may overlie a nearly horizontal plate of Quatsino limestone. The small high over a hill north of Martha Lake would then likely represent an outlier of Bonanza volcanic rocks. Alternatively, the area of low magnetic relief could overlie an outlier of Nanaimo sandstone. The Karmutsen and Bonanza volcanic rocks are magnetically indistinguishable.

Area 13 (92F/14W) Ref: GSC Paper 68-50 and Map 17-1968

A belt of noisy magnetics and relatively higher values trends north-northwest through an area of low magnetic relief and relatively lower values. These magnetic patterns overlie respectively Karmutsen volcanic rocks and Nanaimo sandstone. The local magnetic datum is tilted to the east, and the contacts are represented approximately by the 700-gamma contour on the east and the 1,100-gamma contour on the west. The Iron River magnetite deposit is clearly marked by a pair of sharp magnetic peaks. The weak ridge to the northwest overlies a fault-block of Bonanza volcanic rocks. The

magnetic ridge along the west side of the Karmutsen belt is probably partly topographic in origin, but the highest value overlies the Quinsam River, and additional explanation is required. A small granitic stock extends from the magnetite deposit southeast under the small lake and under the 860-gamma low. The weak high to the west of this low is probably a response from volcanic rocks through the sandstone. A wedge of Bonanza volcanic rocks underlies the southwest corner of the map-area, but is not magnetically identifiable.

Area 14 (92F/13E, 14W) Ref: GSC Paper 68-5C and Map 17-1968

The 2,500-gamma contour outlines a triangular area northwest of the Iron River and east of Sihun Creek underlain by block-faulted segments of The Quinsam granitic stock, Quatsino limestone, Parson Bay argillite, and Bonanza volcanic rocks. Remnants of the Iron Hill magnetite deposit are represented by a strong magnetic dipole. Otherwise the highest values overlie Quinsam granodiorite. Bonanza rocks south of the arrowhead-shaped lake are marked by a weak magnetic ridge, and the argillite to the south by a steep magnetic gradient. The limestone as mapped shows low magnetic relief, but the area of low relief continues south and east over the head of the Iron River, over rocks mapped as Karmutsen. The magnetic pattern along the west side of the map-area is somewhat noisy, but not to the degree characteristic of the Karmutsen. Parson Bay argillite along the Iron River is marked by a fairly gentle magnetic gradient away from the stock. Nanaimo conglomerate underlies the eastern part of the map-area and yields relatively low values and low magnetic relief.

Area 15 (92F/12E) Ref: BCDM Prelim. Map - Buttle Lake Area

This area is underlain by Sicker volcanic rocks. It yields low values and low magnetic relief. The Lynx (Western Mines) sulphide deposit has no magnetic expression whatever.

Area 16 (92C/9W, 10E, 15E, 16W) Ref: GSC Paper 76-1A, Fig. 22.1.
BCDMPR GEM 1972, Fig. 24.

Magnetically, the whole map-area is noisy, and both values and relief tend to increase from southwest to northeast. Geologically, about 60% of the map-area is underlain by Bonanza volcanic rocks. Another 25%, mainly in the south, is underlain by granitic rocks of the Island Intrusions. The remaining 15% is underlain by fault blocks of Karmutsen volcanic rocks, lenses of Quatsino limestone, and a small body of Westcoast diorite complex southeast of Nitinat Lake.

The area of higher values between Nitinat Lake and Hitchie Creek overlies Bonanza rocks and is unexplained. The Marg sulphide occurrence at the mouth of Hobiton Creek underlies the flank of a magnetic depression; some magnetite may have been destroyed during alteration and mineralization. The diorite complex is characterized by higher magnetic relief, and appears to terminate northeast of Smokehouse Mountain. A fault slice of Quatsino limestone near the mouth of the Caycuse River is marked by a weak depression and reverse magnetic gradient. A limestone lens west of Mount Vernon is not magnetically detectable.

A magnetic high over Tuck Lake overlies the southeast tip of an Island Intrusion, and the magnetic ridge and trough to the south overlie a fault-block of Karmutsen and Quatsino rocks. The magnetic high over the hill north of Vernon Creek overlies Bonanza volcanic rocks. The forked magnetic trough over Vernon Creek appears to be a topographic effect. The noisy magnetic high over Mount Vernon and

the ridge to the west overlies Bonanza volcanic rocks which have in part been altered and pyritized. The rather high magnetic relief between Raymond and Hinne Creeks overlies fault-blocks of Karmutsen rocks. A magnetic ridge over Towincut Mountain is partly topographic in origin, but also reflects a fault-block of granitic rocks under the mountain and a fault-block of Karmutsen rocks under the ridge to the southeast.

In the central southeastern part of the map-area the north end of a granitic batholith is represented by slightly higher values, as compared with the surrounding Bonanza volcanic rocks. A magnetic depression over McClure Lake is unexplained. Granitic rocks shown on the GSC map southeast of Smokehouse Mountain are not magnetically distinguishable from the Bonanza rocks.

A series of magnetic lows and troughs along the Caycuse River may merely reflect the valley, but it may also represent alteration along a fault zone. The Kelly skarn-sulphide showing underlies the end of one of these troughs. Multiple magnetic troughs along a tributary of the Caycuse River trend almost due north, and can be explained neither by topography nor by any known faulting. Another series of magnetic troughs passes southwest of Mount Vernon and overlies another tributary of the Caycuse River and part of the upper course of the river; it trends northwest and coincides fairly well with a fault.

The magnetic grain is west to northwest over much of the map-area, but a small magnetic ridge, rising to peaks of 1,700 gammas, north of the Caycuse River trends northeast and is unexplained.

Area 17 (92C/9E~~&W~~, 10E, 16W) Ref: GSC Paper 76-1A, Fig. 22.1.

The northern part and south edge of the map-area are areas of low magnetic relief. In marked contrast, a broad belt of high

magnetic relief trends east-southeast to east across the southern part. Most of the map-area is shown to be underlain by plutonic rocks of the Island Intrusions, including nearly all of the area of high magnetic relief. The character of these plutonic rocks is not fully known, but on Renfrew Creek they grade from average diorite to a hybrid intrusive complex containing much mafic rock. The western part of the belt of high magnetic relief consists of complex magnetic ridges and troughs, whereas east of Braden Creek one of these ridges widens to a magnetic massif which occupies the whole belt. Some topographic effect is evident, but the change in magnetic pattern mainly appears to reflect some basic change in the character of the rock.

A wedge of Quatsino limestone and Bonanza volcanic rocks along Walbran Creek in the west corner transects the west-northwest magnetic grain and is not magnetically detectable. The southerly magnetic trough coincides approximately with a fault separating the plutonic rocks from the Westcoast Complex. It is offset to the left at Camper Creek. A northeast-striking fault has been inferred to underlie Camper Creek, but no displacement was found in the boundary fault. Between Camper Creek and the Gordon River an area of low magnetic relief and low values has been mapped as underlain by the Westcoast Complex. The string of magnetite bodies along Bugaboo Creek underlies a magnetic trough, but the largest, at the loop of the creek, appears to produce a magnetic dipole. A patch of limestone shown on the GSC map west of Brown Creek lies askew to the magnetic grain and is evidently not detectable magnetically. Exposures of paragneisses near the upper course of Brown Creek suggest that a band of them may underlie the magnetic trough. The sharp magnetic peak east of Brown Creek underlies a mountain summit, but the high northeast of Brown Lake overlies a lower part of the ridge and would appear to be partly geologic in origin.

East of Brown Creek the area of low values and gentle magnetic gradient flanking the magnetic massif on the south is underlain mainly by metasedimentary rocks of the Leech River Formation. The lows over Fairy Creek are caused partly by topography, but are not fully explained by it. East of Renfrew Creek a group of inexplicable magnetic troughs, trending north to northwest, overlies continued Leech River and part of the intrusive complex.

The magnetic massif probably overlies the intrusive complex in the main. However, the north band of limestone on Renfrew Creek is now known to be more extensive than shown on the GSC map, extending over the ridge and down to the east-flowing section of Hemmingsen Creek. A magnetic high southwest of the fork in the creek overlies two magnetite deposits in the limestone. The high to the east may be significant: some small magnetite showings have been found on this slope, and they may be more extensive and continuous than is presently realized. If both of these highs are accounted for by magnetite, the magnetics over the limestone bands are somewhat smoother than in other parts of the massif. A magnetite body in diorite west of Renfrew Creek underlies a magnetic trough, and several magnetite-sulphide occurrences in the creek valley do not appear to have any magnetic expression. East of the lower section of Hemmingsen Creek the 2,500-gamma high overlies exposures along a small creek which from a distance appeared to be limestone. The west prong of the large magnetic depression overlies a cap of limestone on a low ridge.

The generally low values and low magnetic relief in the north part of the map-area are underlain, according to the GSC map, by plutonic rocks, Bonanza and Karmutsen volcanic rocks, and Quatsino limestone. These rocks are not magnetically distinguishable. No reason is known for the magnetic depressions along the margin of the magnetic massif.