COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND DEVELOPMENT.

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

REPORT No. 1947/41
Plans 1473-5

Reconnaissance Survey of Dam Site at Geehi Swampy Plain River, N.S.W.

by

Clive W. Ball
Geologist

No appendix.

CANBERRA

30th April, 1947.

DEPARTMENT OF SUPPLY & SHIPPING

Bureau of Geology, Geophysice & Mineral Resources.

RECONNAISSANCE SURVEY OF DAM SITE AT GEEHI SWAMPY PLAIN RIVER. N.S.W.

Report No. 1947/41.
Plans 1473-5.

INTRODUCTION:

An examination was made of a proposed dam site at Geehi on 16th and 17th April. Only five hours were spent in the examination, the remainder of the time being spent in gaining access to the site.

Transport arrangements were made by Mr. E.F. Rowntree, Hydraulic Engineer, Department of Works and Housing, Melbourne, who led the party. Mr. G. Thomas, Geologist of the Melbourne Office of the Bureau accompanied the party and assisted in the survey.

PREVIOUS REPORTS:

There is no record of any previous geological examination of the dam site. A geological map of the area to the immediate north and east of the site has been prepared but has not yet been published. (See Preliminary Geological Report on Proposed Hydro-Electric Works in the Kosciusko Area by L.C. Noakes, December 1945.)

ACCESS:

The motor road from Corryong ends at the Khancohan Footbridge near Waterfall Farm. From this point the party rode on horseback to Geehi Hut, a distance of approximately 11 miles. The left bank of the dam site was examined on the first day and the right bank was traversed on the return journey the following day. The steep slopes and moderately heavy vegetation ruled out detailed geological mapping in the short time available. The position of the dam site is shown in Figure 1.

GENERAL GEOLOGY OF DAM SITE:

The prevailing rock type at the dam site is phyllite. The strike is predominantly north-south (mag.) and in most of the outcrops observed the schistosity was practically vertical. At one point on the south bank however the strike was 355 degrees (mag.) and the dip 55 degrees west. Intercalated with the phyllites are thin bands of greywacke which is also schistose. Floaters of quartz-felspar porphyry were noted in the gorge on the right bank of the river. (See Fig. 3). Occasionally the phyllites are traversed by thin quartz veins usually only about ¼" thick. These strike principally in the directions - north - south and at approximately 210 degrees (mag.) respectivaly. The phyllites have vertical joints which strike east-west (mag.) and also a system of flat joints.

Some floaters of quatzite were noted but these are not very common. Water-worn quartz grains were detected in the quartzite. The phyllites and associated metamorphic rocks are of Early Palaeozoic Age.

The Khancohan granite, a normal biotite granite outcrops at a point approximately 1½ miles from the dam site. The granite is medium to coarse grained and even textured. The quartz felspar porphyry noted on the right bank is undoubtedly an intrusion sent out from the granite.

No unusual rock types were observed but several floaters of schist resembled the characteristic "fleck schiefer" which would indicate low-grade contact metamorphism.

Near the Geehi Hut a gneiss outcrop was observed.

No faulting could be observed at the dam site but an unusual brecciated rock was observed in the bed of Bogong Creek. The breccia possessed vertical schistosity striking 320 degrees (mag.) with quartz veins parallel to the schistosity.

Several of the specimens are being sectioned by Mr. W.B. Dallwitz and his petrological report will be submitted as an appendix.

EVIDENCE FROM AERIAL PHOTOGRAPHS:

A study of the aerial photographs (Run 3, 18106-18109 and Run 4, 18067-18070, Kosciusko Area) has enabled an interpretation of broad structural trends to be made. It is suggested that the dam site lies close to the axis of a synclinal fold.

North of the dam site a contact between the metamorphic rocks and the granite has been established. An unmapped boundary line is indicated running south-west from the dam site. This could possibly be a faulted contact between the metamorphic rocks and the granite.

No evidence of faulting in the vicinity of the dam site could be deduced from a study of the air photos.

SUITABILITY OF DAM SITE:

The Geehi dam site lies in a remarkable V-shaped gorge and its profile is shown in Figure 2.

The predominant rock type is phyllite with subordinate thin beds of greywacke and quartzite intercalated, white quartz-felspar porphyry occurs as floaters assumed to be derived from a dyke.

Very few outcrops were observed and there is a large amount of talus. This is only to be expected on slopes of the order of 40 degrees. Where talus does occur it is impossible to estimate the thickness of soil cover.

No faulting could be detected at the dam site.

As to the permeability of the foundation rocks, it is safe to assume that the phyllite will be relatively impermeable, apart from possible leakages along joint planes. The joints observed in the field were fairly tight but some grouting may be necessary if open jointing is encountered in the excavations.

The greywacke may have low to moderate porosity but in any case this type of rock only occurs as thin beds at the dam site. The quartzite and quartz-felspar porphyry would have low porosity.

As the axis of the proposed dam will probably lie in a north-south direction, it would be almost parallel to the strike of the phyllite. This strike combined with the vertical dip are favorable features from the point of view of dam construction.

The conclusion of the reconnaissance survey is that the geology of the dam site appears to be favorable.

However, should dam construction be planned in this locality it would be necessary to make further geological examination in conjunction with a geophysical survey to ensure full assessment of the site.

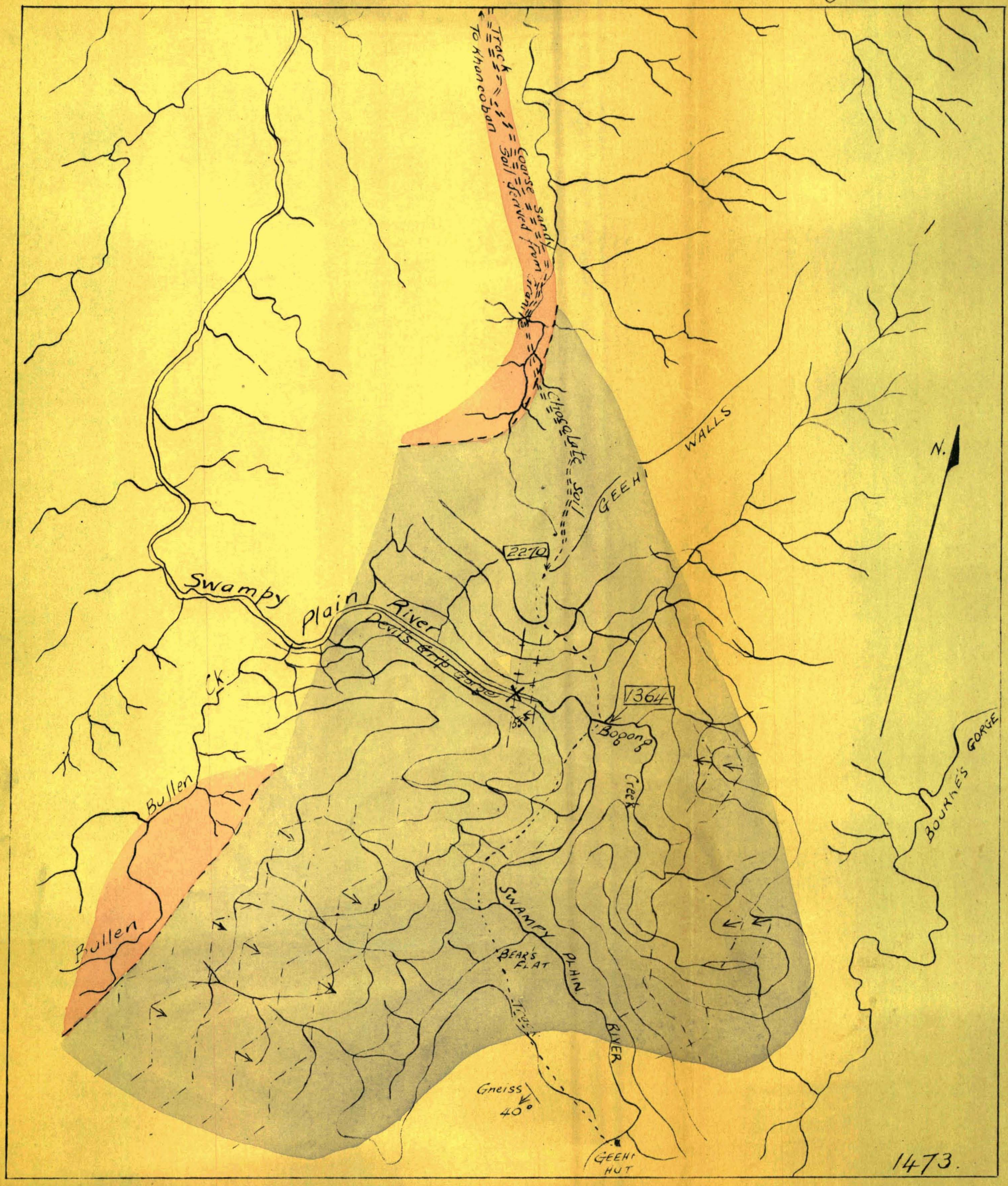
(C.W. Ball)
Geologist.

CANBERRA.
30. April 1947.

BAROMETRIC READINGS

Date	Place	Elevation	Time
April 15th	Water level at Khancohan Swing Bridge.	1024	8.15 am.
16th	Black Creek Crossing	1406	11.25am.
16th	Geehi Crossing just above Dam Site.	1364	2.40pm.
16th	Top of climb on left bank at Dam Site.	1876	4.15pm.
16th	Geehi Crossing just above Dam.	1360	4.50pm.
17th	Geehi Hut.	1336	8.53am.
17th	Water level, Geehi River opposite Geehi Hut.	1324	8.57am.
17th	Geehi Crossing	1264	10.25am.
17th	Bogong Crossing	1274	1.45pm.

Figure 1.



Map of Geehi District showing drainage and dam site with geological information.

Base Plan by Army Survey Directorate.

Scale 1 inch - ½ mile.

Granite. Metamorphics (Phyllite, greywacke, quartzite).

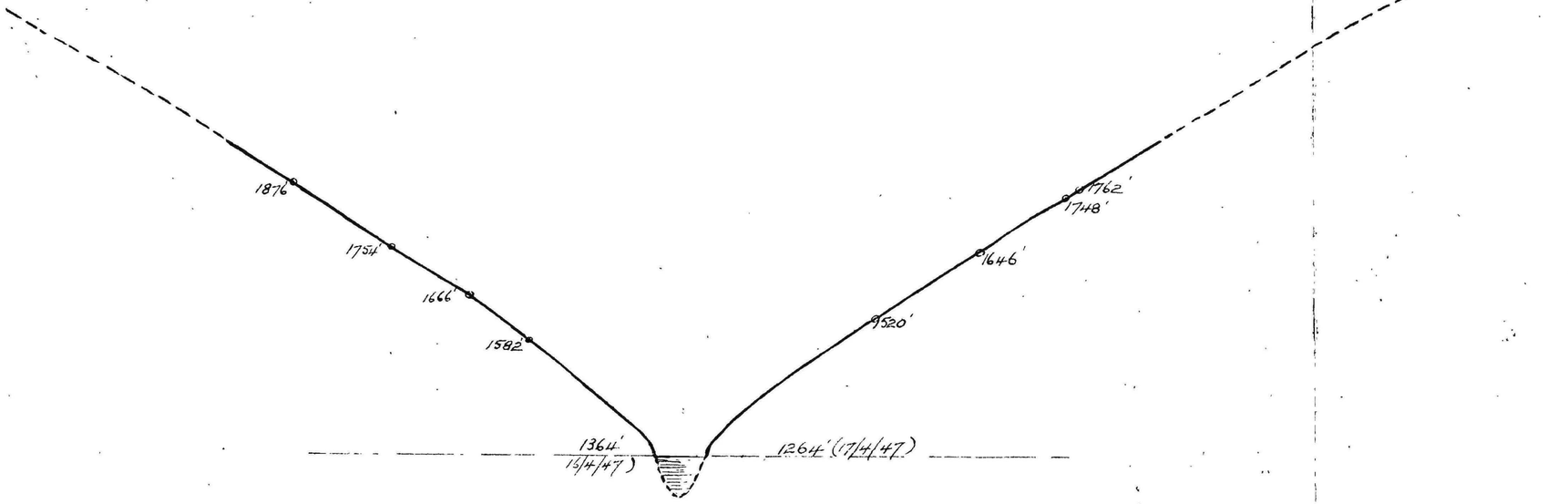
----- Geological boundaries -·-·-·- Bedding planes inferred from Air Photos.

Form lines. ∠55° Strike and dip of schistosity. X = Position of Dam Site.

1364 Barometric Heights (uncorrected) in feet above sea level.

Geology by Bureau of Mineral Resources, Canberra.

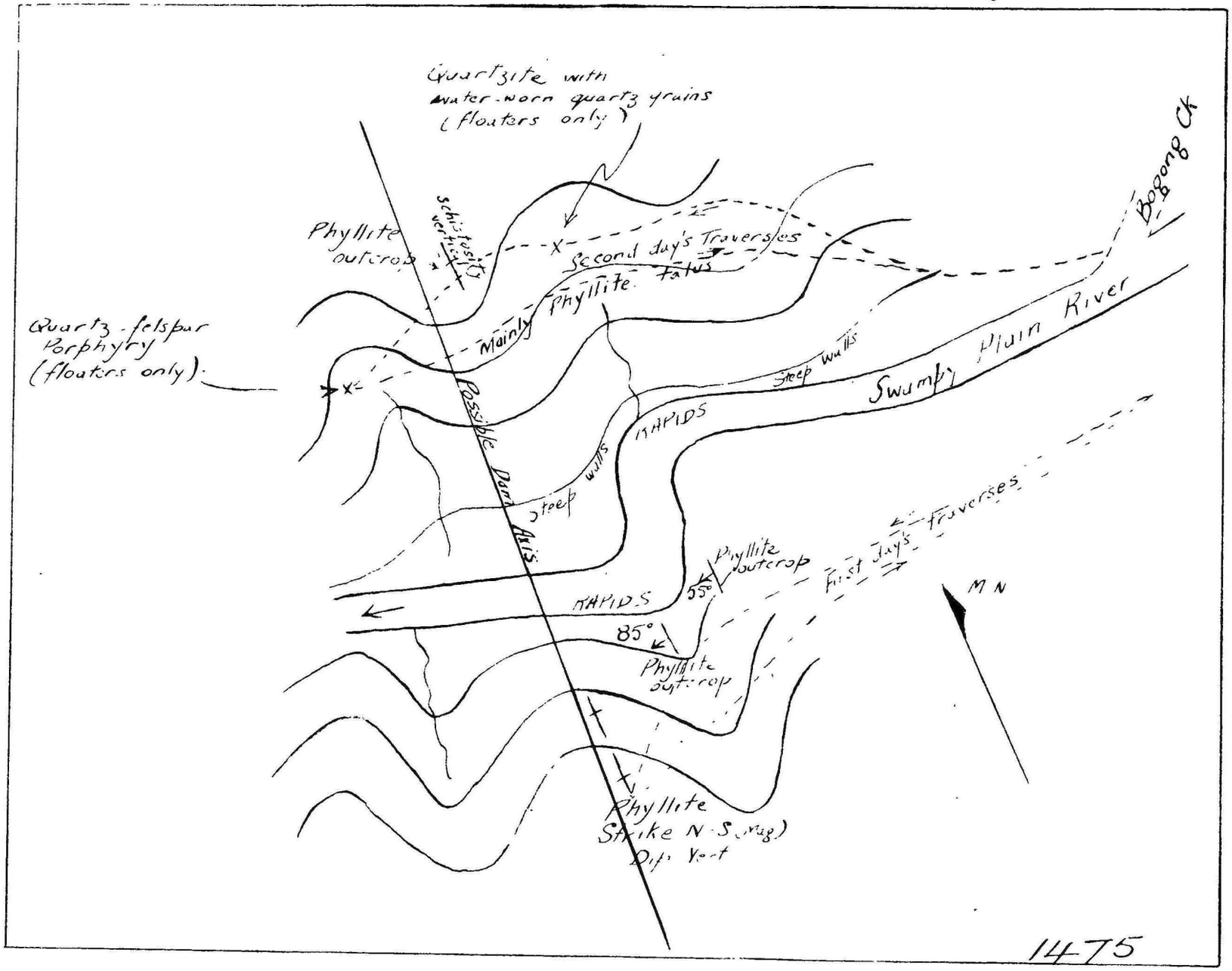
Figure 2.



PROFILE OF GEEHI DAM SITE
LOOKING DOWNSTREAM.
Scale : 1 inch = 200 feet (natural.)
Barometric readings (uncorrected) taken on 16th & 17th April
BUREAU OF MINERAL RESOURCES
CANBERRA.

1474.

Figure 3.



Sketch showing nature of traverses along left and right banks of Geehi Dam Site. (not to scale).

BUREAU OF MINERAL RESOURCES, CANBERRA.

PETROGRAPHIC REPORT ON ROCKS FROM GEEHI DAM SITE.

Appendix to Report No.1947/41.

Following are petrographic descriptions of eight rocks passed on to me for examination. They were collected by Messrs. C.W. Ball and G.A. Thomas from the vicinity of the Geehi dam site, Swampy Plain River, N.S.W., during a reconnaissance-survey which they made there recently.

SPECIMEN E - Granodiorite, Swing Bridge, Khancoban.

In the hand specimen this rock is seen to consist of about 45 to 50 per cent glassy quartz, 45 to 40 per cent white felspar and 10 per cent biotite. Its average grain-size is probably of the order of 2 mm., though numerous grains are up to 4 or 5 mm. across.

In section the typical granitic texture of the rock is clearly shown, and the essential minerals are found to be quartz, plagioclase and biotite; the accessories are muscovite, epidote, orthoclase, zoisite, chlorite, sphene, apatite and zircon, in decreasing order of abundance.

The quartz occurs in anhedral grains which often show moderate undulose extinction.

Nearly all of the felspar is plagioclase; most of the grains, which are subhedral in outline, are strongly zoned, and their average composition would be considerably more albitic than that shown by the cores ($Ab_{55}An_{45}$ - basic andesine), though sections favourable for the measurement of its actual variation without the help of a universal stage do not appear in the slide at hand. The plagioclase has been partly saussuritised, particularly in the basic cores of the grains, the minerals developed being zoisite and coarse sericite. Examples of twinning on the Carlsbad and pericline laws, as well as albite twinning, were noted. One instance of eutectic intergrowth of plagioclase and quartz was seen.

Only a few grains of orthoclase are present; they are distinguishable from the soda-lime felspar by their being anhedral and less altered, and having a R.I. much lower than that of the latter mineral.

Biotite, pleochroic from very dark brown to pale brownish yellow, is the only primary ferromagnesian. A little muscovite is associated with it.

Pale yellow-green, distinctly pleochroic epidote has been formed during the alteration of some of the biotite to chlorite; this process has been concomitant with the saussuritisation of the plagioclase, some of the lime from the latter combining with the iron of biotite to form epidote, alumina and silica being common to both of the primary minerals.

A few grains of colourless sphene occur in the slide; these are generally embedded in biotite, in which they give rise to pleochroic haloes.

Some small crystals of apatite are present; these are usually in biotite. Zircon is rare - several minute grains in biotite are bordered by pleochroic haloes, while one larger grain occurs in quartz.

Small limonite-stained areas and cracks filled with the same mineral have been formed in the rock through weathering.

SPECIMEN F - Porphyritic Hornblende - dacite, Right bank, Geehi dam site.

Macroscopically this rock consists of a medium-grey, finely-crystalline ground-mass containing a large number of phenocrysts of pale flesh-coloured felspar, the biggest of which is about 7.5 mm. across, though the average size is 3 to 4 mm. A few crystals of semi-vitreous quartz up to 7.5 mm. in diameter and a number of prismatic crystals of hornblende are also distinguishable.

The groundmass is holocrystalline and shows granophyric texture in many places, due to the intergrowth of orthoclase and quartz. It is composed predominantly of these two minerals, but a large amount of green hornblende, usually in columnar to needle-like crystals, is also present. The orthoclase occasionally shows Carlsbad twinning, while the hornblende sometimes has a greenish tinge. Other minerals present in the groundmass are epidote and zoisite in small and large grains, chlorite, black iron ore (usually bordered by sphene), rare zircon, and a little limonite in the form of stains. If, as is likely, plagioclase occurs in the groundmass, it cannot readily be distinguished from orthoclase, as it does not show multiple twinning.

With regard to the porphyritic crystals, it was found to be very difficult to distinguish orthoclase from plagioclase, because the latter is often untwinned. In fact, no orthoclase was determined with certainty; however, even if all doubtful grains are taken as being orthoclase, the undoubted plagioclase would still be more than three times as abundant as is the possible potash-felspar. Thus the rock must be called a dacite. In the hand-specimen, judging by the colour of the felspar phenocrysts, there is no suggestion that there are two varieties of this mineral present; if there were, it is more than probable that the differences would have shown up as a result of weathering. Therefore, it appears that the only definite orthoclase is in the groundmass.

The plagioclase, in subhedral to euhedral crystals, is often zoned, though not so strongly as that in the granodiorite. Its composition, as determined from extinction-angles in the symmetrical zone, is Ab_{70} An_{30}(oligoclase-andesine). It is more or less uniformly flecked with small grains of zoisite and sometimes contains very small amounts of chlorite and black iron ore in addition. Some crystals show traces of antiperthitic structure. A few grains have sieve-structure developed, the embedded mineral being quartz, though some of the included flecks are composed of a eutectic of quartz and felspar. Numerous crystals of plagioclase (and doubtful orthoclase) are bordered by a zone in which graphic intergrowth with quartz has taken place. Multiple twinning is common, Carlsbad is much less so, and pericline is rare in the soda-lime felspar.

Porphyritic crystals of hornblende and quartz, especially of the latter, are very subordinate in quantity to those of felspar.

It is probable that this rock is genetically related to the granodiorite E previously described. The main distinctions to be noted between the two are the facts that the plagioclase is more albitic in the dacite and that hornblende in the latter is represented by biotite in the plutonic rock. The mica is to be expected as a result of slower cooling in the granodiorite (Bowen's Reaction-series).

SPECIMEN D - Brecciated Albitite. Bogong Creek crossing, upstream from Geehi dam site.

Macroscopically this is a fine-grained, pale grey rock resembling sandstone, it is traversed by at least two sets

of joints, as well as by cracks, along all of which limonite - staining has found itw way. A few tabular grains which could be taken for felspar phenocrysts and some quartz veinlets are also distinguishable.

Under the microscope, an uneven, brecciated appearance is quite evident, and the rock is soon to consist almost entirely of angular and sub-angular fragments of fresh albite, nearly all of which is un-twinned. A considerable amount of very fine sericite occurs between the felspar-grains. Large, clear areas having the shapes of felspar phenocrysts resolve themselves, between crossed nicols, into numerous fragments, pointing to the probability that the crystals have been crushed; most of these fragments show strong strain-effects. It is thought possible though confirmatary tests could not be made, that these broken phenocrysts consist of orthoclase or microperthite.

The accessories are pale yellow-green chlorite, haematite, leucene, tourmaline and zircon. No quartz appears in the slide examined.

This rock may also be a differentiate from the same magma which gave rise to rocks E and F; the preponderance of plagioclase over orthoclase in all three suggests some inter-relationship between them.

SPECIMEN C - Biotite-gneiss, Cliff near Geehi Hut.

In the hand-specimen this is a weathered, limonite-stained, gneissic rock, of medium to fine grain, in which the only mineral that can be definitely identified is biotite.

In section, the dominant mineral is found to be strongly sericitised felspar; no grains are sufficiently unaltered for one to be able to tell whether they were originally orthoclase or plagioclase. A good deal of pale yellow-green chloritic material is mingled with the sericite in some parts of the section.

Biotite, showing directional orientation, is the only ferromagnesian, and it makes up about 25% of the rock. It is pleochroic from red-brown to pale yellowish brown. A little muscovite is associated with it. Much of the biotite has pleochroic haloes developed in it, though usually no mineral grain can be seen in their centres; when such a grain is visible, it is too small to be identified.

Quartz, in equidimensional as well as in elongated grains, is virtually the only other mineral present, and comprises about 15% of the whole. Some grains show mild strain-effects. Granules of the mineral are often studded through the sericitised areas; this feature is suggestive of sieve-structure in the original felspar.

Limonitic areas, which are responsible for the rusty colour of the rock in the hand specimen, are fairly plentiful in the slide.

Without a detailed study of the field occurrence, it is difficult to say whether this rock is an ortho- or a paragneiss. However, judging by the grade of metamorphism of other rocks reported and collected in this area, it is more likely to be an orthogneiss, since no rocks beyond the grade of a spotted schist were observed. However, there is also a strong possibility that the rock is a partly granitised sediment; the basis for this statement is the fact that the biotite-rich bands are unevenly spaced, as would be expected if a sediment, particularly an argillaceous one, had been subjected to granitisation.

SPECIMEN A - Schistose Micaceous and Felspathic Sandstone, South Bank, Geehi dam site.

Macroscopically this is a light grey, medium-grained rock

of a flaggy nature. Quartz and muscovite can be distinguished, and a few white spots which probably represent altered felspar are present.

Under the microscope this rock is found to consist predominantly of partly crushed quartz and sericite, the latter being slightly iron-stained. The quartz grains are of various sizes and sometimes show slight wavy extinction; they are usually elongated parallel to the direction of schistosity. The sericite-shred of course, also lie parallel to this direction.

The accessory minerals are orthoclase (some times crushed and sericitised) rate plagioclase, chlorite, black iron ore, biotite and zircon, the last four being present in very small amount only.

SPECIMEN H. Schistose Micaceous and Felspathic Sandstone. Loose boulder in steep valley facing Bogong Creek, approximately one third way up; right bank, Geehi dam site.

This rock is closely similar to A. It differs in being slightly less schistose, less micaceous, slightly more felspathic (acid plagioclase is more plentiful than in A), and more stained with limonite (as seen in thin section) This last feature is probably due to the greater amount of black iron ore present.

The accessories are the same as those in A., with the exceptions that detrital apatite and brownish grey tourmaline occur in addition.

SPECIMEN B. Phyllite. South bank, Geehi dam site.

Macroscopically this medium - to light-grey rock is a typical phyllite with the characteristic sheen on the cleavage faces.

In section its grain-size is found to be very fine. The only minerals distinguishable are quartz (in elongated grains) sericite (in parallel shreds), and accessory black iron ore. Slight staining by limonite has taken place.

SPECIMEN G. Phyllite. Left bank, Geehi dam site.

This rock is, in nearly every respect, similar to B. However, in the hand-specimen, it is somewhat darker, very slightly crenulated, and considerably iron-stained along cleavages and joints. This latter feature is also apparent in section, and is due to the presence of black iron ore, which is, moreover, more plentiful than in B.

The metamorphic rocks C, A, H, B and G described above point to the operation of low-grade regional rather than thermal metamorphism in the area within which they were collected.

W.B. Dallwitz,
Geologist.

PARLIAMENT HOUSE,

CANBERRA, A.C.T.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS - REPORTS.

The Bureau of Mineral Resources, Geology and Geophysics in my Department is now engaged in a variety of technical investigations, the results of which are of value not only to persons directly interested in particular projects but to the mining community and to the public generally.

Publication of the results of the Bureau's investigations is the best means of ensuring that they will be available to interested persons and for exchange with kindred organisations at home and abroad.

Publications of the Bureau include Bulletins, which deal with the more important projects in some detail and Summary Reports, which summarise the information available concerning individual metals and minerals.

It has been found, however, that in addition to present difficulties and delays in printing, the preparation of Bulletins takes considerable time, and there are many investigations of the Bureau in which the public is interested which hitherto have not been available in printed form. In these respects our experience is similar to that of other countries such as U.S.A. and Canada which have found it necessary to adopt a policy of issuing preliminary statements summarising work done as soon as possible after the investigations have been completed, and without waiting for the results to be worked out in detail.

Accordingly, in order to ensure that results of work carried out by the Bureau will be available to those interested with a minimum of delay, it has been decided to begin issuing a series of Reports. The method of reproduction used for these Reports has been adopted because of their preliminary nature and to avoid the delay that would occur if they were printed.

In issuing this statement I am pleased to be able to refer to the friendly co-operation which exists between the Bureau and industry and to thank those persons in industry who have so freely made available information which has greatly enhanced the value of the Bureau's service to the community.

(W. P. ASHLEY)

Minister for Supply and Shipping.

17th March, 1948.