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Internal Technical Report

STONY ISLANDS COPPER SHOWING: SLAVE RIVER, ALBERTA

by

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CONTENTS

ILLUSTRATIONS

Page

STONY ISLANDS COPPER SHOWING: SLAVE RIVER, ALBERTA

Introduction

A copper mineral showing reported at Stony Islands was close enough to the 1973 field map area to be examined in the course of the Precambrian Shield fieldwork.

Stony Islands refers to a group of four islands within the Slave River and for ease of reference they have been designated - West, Mid, East and Tid Islands (Fig. 1).

A preliminary geological examination was carried out on West Island involving about half a day.

Geology

Stratigraphy

A general stratigraphic column is presented below (Fig. 2) showing the range of thicknesses of each lithology as observed at West Island.

Precambrian Crystalline Rocks: includes garnetiferous, quartzitic metasedimentary rocks, and sheared, foliated porphyroblastic (1/2 to 3/4 inch) feldspar granite. Just below the unconformity with the Devonian these rocks show alteration ranging from rusty-coated fractures to extensive oxidation and in places has developed an earthy texture. This alteration is related to pre-Devonian surface weathering effects.

The rocks in this category form part of the Precambrian Shield which is extensively exposed and currently being mapped, just to the east.

Granite Wash (Regolith): grey colored, somewhat friable (poorly cemented) to very well cemented (like concrete) with calcite. Matrix is highly porous. Granular in appearance, with rounded to subangular cobbles and boulders. The granular material is of a crystalline shield nature (i.e., from a local source) and may be highly altered, e.g., feldspars are thoroughly kaolinized. Lenses and vugs, from 1 to 6 inches long, with coarse-grained, clear calcite are scattered through the granite wash.

The granite wash is locally derived from the underlying Shield rocks by surface weathering, but this weathered product has been washed and size sorted to some extent (removal of the fine particles) by the invading Devonian seas. There is a vague appearance of discontinuous, irregular bedding in the granite wash. Though the granite wash appears to be draped over most of the irregular Precambrian rock surface there is a tendency for it to thicken in the topographic lows (Fig. 3).

Later weathering, probably of Tertiary age, responsible for the development of karst topography on the overlying limestones, probably also affected the granite wash by further deterioration of the crystalline rock boulders and cobbles. At the same time, carbonate-enriched groundwater circulating through the permeable granite wash was responsible for partial cementation of the granite wash and the formation of calcite vugs.

Turbidity Bedded Limestone: irregular, slump-turbidity bedding characterizes this sandy to silty limestone which locally contains granules and angular pebbles of Precambrian Shield rocks, obviously derived from the underlying granite wash. This rock has not been acid tested and could be dolomitic.

Turbidity bedded limestone, locally rubbly bedded, appears to be draped continuously over the irregular Precambrian rock surface, whereas the underlying granite wash may pinch out on some Precambrian rock topographic highs. Initial dips in the turbidity limestone range from 0 to 18 degrees, but high dips and the related domal and basinal structures all appear related to sedimentation and compaction conditions and not to subsequent tectonic activity.

Thin Bedded, Slabby Dolomite: typically thin, uniformly bedded dolomite (checked with cold 10% HCl), with good parting along the bedding surfaces to produce thin slabs (less than 1/2 inch thick) or less commonly up to 1 inch thick (i.e., flaggy bedded dolomite). The rock is a brown-grey, fine-grained dolomite, probably with a fine silt content.

Most of the observed mineralization, marcasite nodules and less commonly chalcopyrite, has been found in this bed, especially in the top 2 to 3 inches.

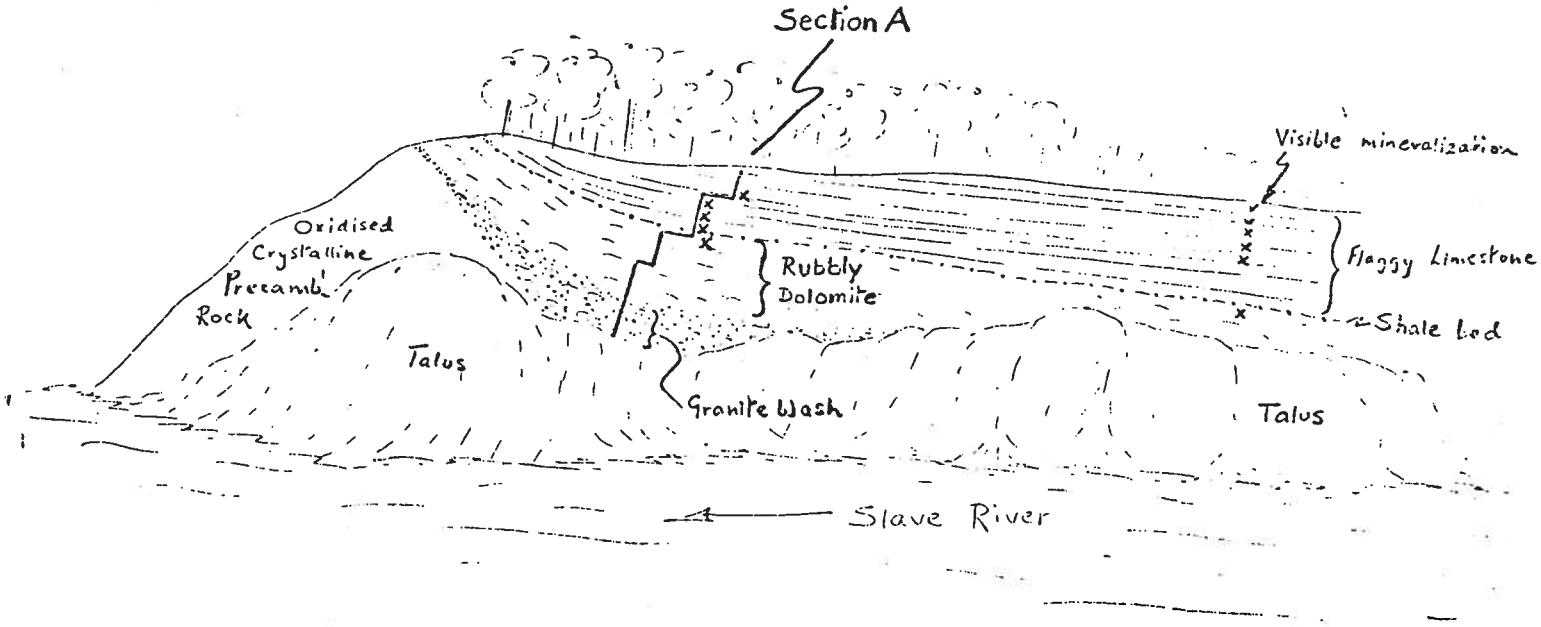

Figure 3. Sketch of bedrock geology at southwest corner of West Island. Looking eastward, showing Devonian limestone overlying granite wash and Precambrian crystalline rocks. Draped form of limestone beds is evident over a former Precambrian topographic high. Note relative positions of shale marker bed and visible mineralization

Shale: a dark grey limy shale bed from 3/4 to 3 inches thick has been found at about the same relative stratigraphic position in sections around West Island and hence is assumed to be the same continuous bed and can be used as a marker bed.

Flaggy Limestone: brown, uniformly bedded limestone, with good parting along bedding surfaces to produce flaggy, or less commonly slabby, tabular blocks. Locally contains a thinly bedded (1/20 to 1/10 inch thick), medium to dark brown cellular (highly porous) limestone. Samples of flaggy limestone have been acid checked at Section A only.

Overlying the bedrock described above are glacial deposits from the Pleistocene continental glaciation.

Stratigraphic Sections

A (see figure 3 for schematic diagram)

	Rock Type	Thickness	
	Flaggy limestone	2 feet 6 inches+	
	Brown limestone	3 feet 8 inches	thin bedded, cellular, highly porous
	Slabby limestone	8 inches	
	Shale, limy	2 - 3 inches	
	Rubbly dolomite	3 feet 7 inches	irregular, rubbly bedded (2 - 6 inch beds) limestone; chalcopyrite in upper 8 inches
	Shaly dolomite	10 inches	thin bedded, shaly-limestone
	Granite wash	2 feet	granular, calcite lenses and vugs
	Underlain by Precambrian Crystalline Rock		
B	Flaggy-slabby limestone	4 feet	
	Gap	6 feet	
	Granite wash	1 foot	well cemented
	Precambrian Crystalline Rock		

C (see figure 4 for schematic diagram)

Flaggy limestone	6 feet+	
Shale, limy	3/4 inch	
Slabby dolomite*	1 foot	marcasite nodules and disseminated copper mineralization in top 2 inches
Turbidity bedded limestone	1 foot	

D (see figure 5 for schematic diagram)

Flaggy limestone Slabby limestone	10+ feet	
Shale, limy	1± inch	
Flaggy dolomite*	1 foot	with 1% marcasite nodules in three separate layers
Turbidity bedded limestone	3+ feet	

E	Flaggy limestone	8 - 10 feet
	Shale, limy	2 inches
	Flaggy dolomite*	2 - 3 feet
	Turbidity bedded limestone	2 - 2 1/2 feet
	Granite wash	6 - 8 feet
	Precambrian Crystalline Rock	4+ feet

Structure

The gentle dips and folds of the Devonian strata in the area of Stony Islands are all characteristic of sedimentation-compaction conditions and appear to be related to an irregular, locally steep-sloped, Precambrian rock surface (Fig. 6). It is unnecessary to invoke tectonic activity as a significant factor in the development of the observed folded structures.

Although observed from a distance only, stratigraphic and structural relationships similar to those described on West Island are evident on Mid Island (Fig. 7) and are also assumed to be the case for East Island and possibly Tid Island (Fig. 1).

*assumed, not checked with cold 10% HCl

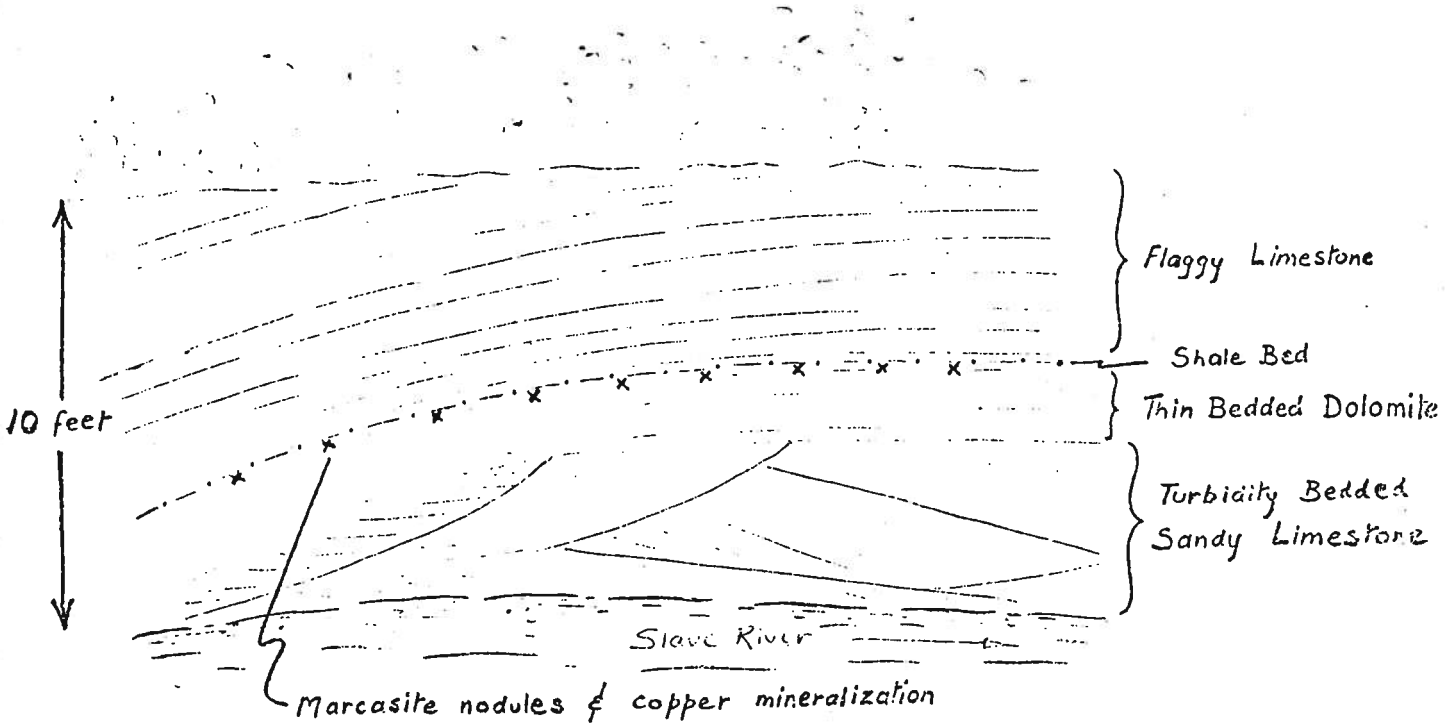

Figure 4. Ten-foot thick section of limestone beds exposed, including the shale marker bed and underlying mineralization

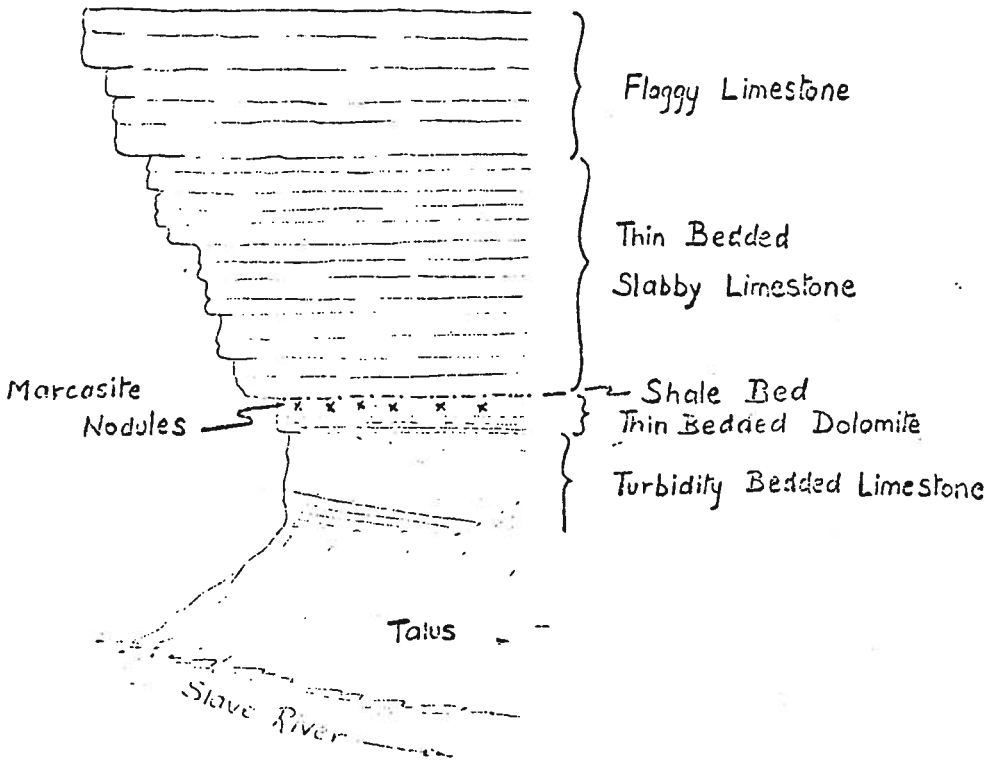

Figure 5. Fourteen-foot thick section of limestone above talus slope. Granite wash and Precambrian rocks probably concealed by talus materials. Note relative position of shale marker bed

WEST ISLAND, STONY ISLANDS, SLAVE RIVER, ALBERTA

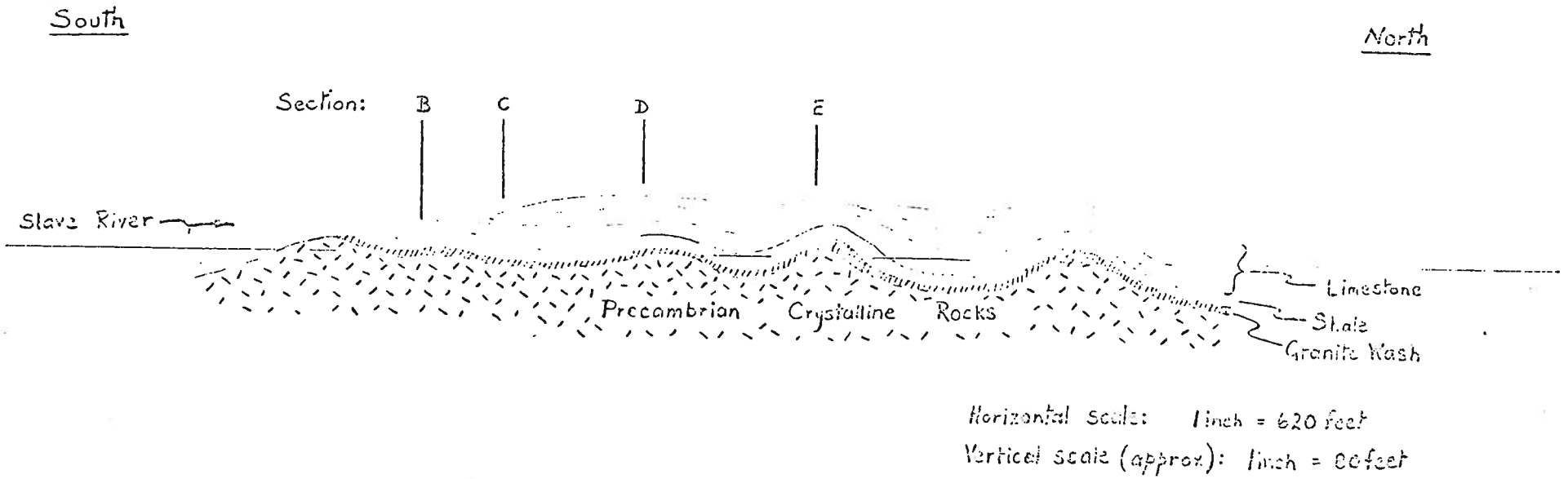

Figure 6. Schematic geological vertical section along the east "shore zone"

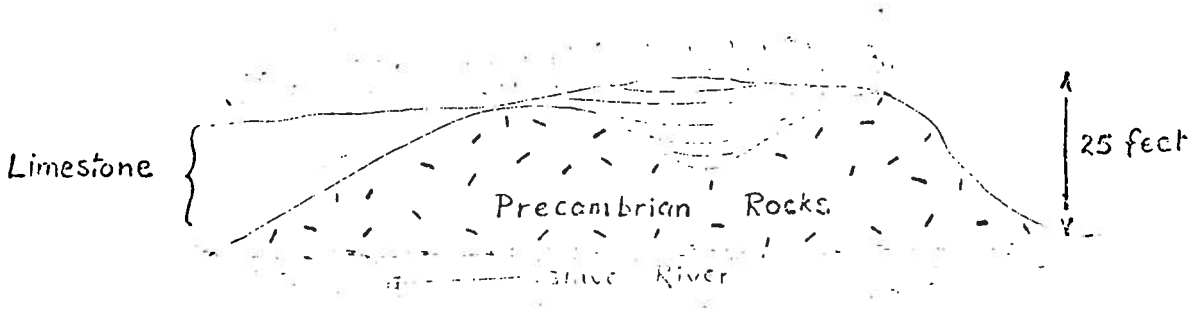

Figure 7. Distant view of southwest shore of Mid Island from West Island. Showing limestone beds draped over topographic highs of underlying irregular Precambrian rock surface

Mineralization

Visible mineralization includes marcasite nodules (1/2± inch diameter) and disseminated specks of chalcopyrite which appear to be largely restricted to the Devonian dolomite overlying the granite wash and Precambrian crystalline basement. The tiny specks of chalcopyrite occur dispersed either in patches of 1 to 2 inches length or in beds <1 inch thick.

There is a strong tendency towards stratigraphic control of the visible mineralization, both marcasite and chalcopyrite being associated with the thin bedded slabby dolomite, lying just above the turbidity bedded limestone. Most of the mineralization occurs towards the top of the bed, in the upper 2 to 3 inches, just beneath the shale marker bed. In only one of four fairly well represented sections was additional disseminated copper mineralization found over a five foot thickness of flaggy limestone (Section A, Fig. 3), although in another one of these sections (Section E) the overhanging flaggy limestone could not be checked because of its inaccessibility.

Not all of the copper sulphide mineralization has an associated secondary mineral bloom in this area. Consequently, prospecting must be carried out carefully, looking at and breaking numerous rock faces and not relying on observing green copper bloom as a

guide to copper mineralization. Even on freshly broken rock surfaces the dispersed tiny specks of chalcopyrite could be overlooked in some places.

Copper bloom and chalcopyrite found at one location is the only suggestion that copper mineralization may also occur in the granite wash. This small patch of stain may represent primary chalcopyrite mineralization which has survived transportation, sedimentation and weathering of the granular Precambrian Shield rock debris. At the moment, it does not appear that the granite wash is a particularly favourable host in the local search for copper mineralization, but should not be overlooked.

The mineralization appears stratiform in character, i.e., it is primarily present in one specific thin bed, and hence is assumed to be of sedimentary origin. It is presumed that chemical precipitation of sulphide mineralization took place contemporaneously with deposition of the slabby dolomite, but that similar subsequent environmental conditions also led to the formation of the overlying shale bed.

It is presumed that the nearby Precambrian Shield rocks were the source of the metals in these sulphides. Chemical weathering of the Shield land surface placed the metals in solution in the drainage system and they were then co-precipitated in the adjacent sedimentary basin along with the carbonates. This hypothesis would suggest that the underlying granite wash, largely representing surface weathered material, would probably have been leached of any primary minor sulphide minerals, and hence would now be barren.

The presence of chalcopyrite in three separate samples from Section A has been confirmed by X-ray analysis.

One selected grab sample with a visible thin seam of sulphide-mineralization from Section A has been assayed by Loring Laboratories Ltd. to yield 1.08% copper. (See assay sheet at end of report.)

Conclusions

1. The copper mineralization is stratiform, i.e., of sedimentary origin, and is largely restricted to a 12 inch thick dolomite bed.

2. The copper mineralization is of low grade, probably less than 0.3% on the average even over the 2 to 3 inches of limestone in which the mineralization is relatively concentrated. However, mineralization could be widespread and similar stratigraphic situations in the general area should be checked.

3. If the suggested origin for this mineralization is correct, then as a guide to future prospecting - the granite wash should be systematically checked, but not over-emphasized;
   - the slabby dolomite and the shale marker bed should be thoroughly checked;
   - the flaggy limestone, especially the lower beds, should be given a routine systematic check.

4. Prospecting for copper mineralization should not rely on observing green copper bloom in this area; rocks need to be freshly broken by hammer in looking for this fine-grained, disseminated sulphide mineralization.

Recommendations

1. It would be worthwhile to continue the search for sedimentary copper mineralization in this same geologic environment during progress of the Shield mapping to the northward.

To: RESEARCH COUNCIL OF ALBERTA,
87th Ave. and 114th Street,
EDMONTON, Alta.

ATTN: Mr. John D. Godfrey

File No. 7077
Date October 3, 1973
Samples Chip

Certificate of ASSAY

LORING LABORATORIES LTD.

SAMPLE No.	% Cu
119-4	1.08

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

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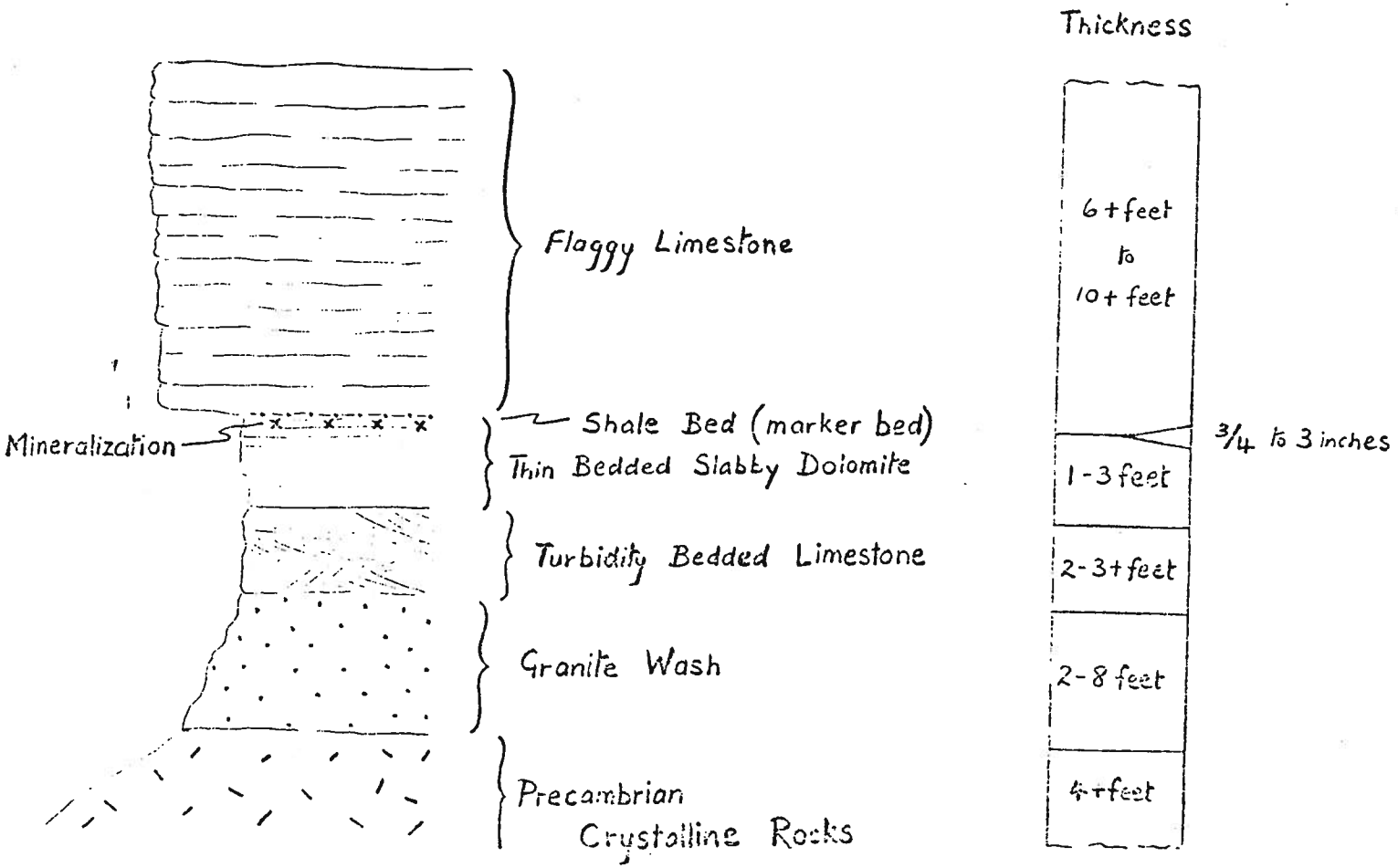
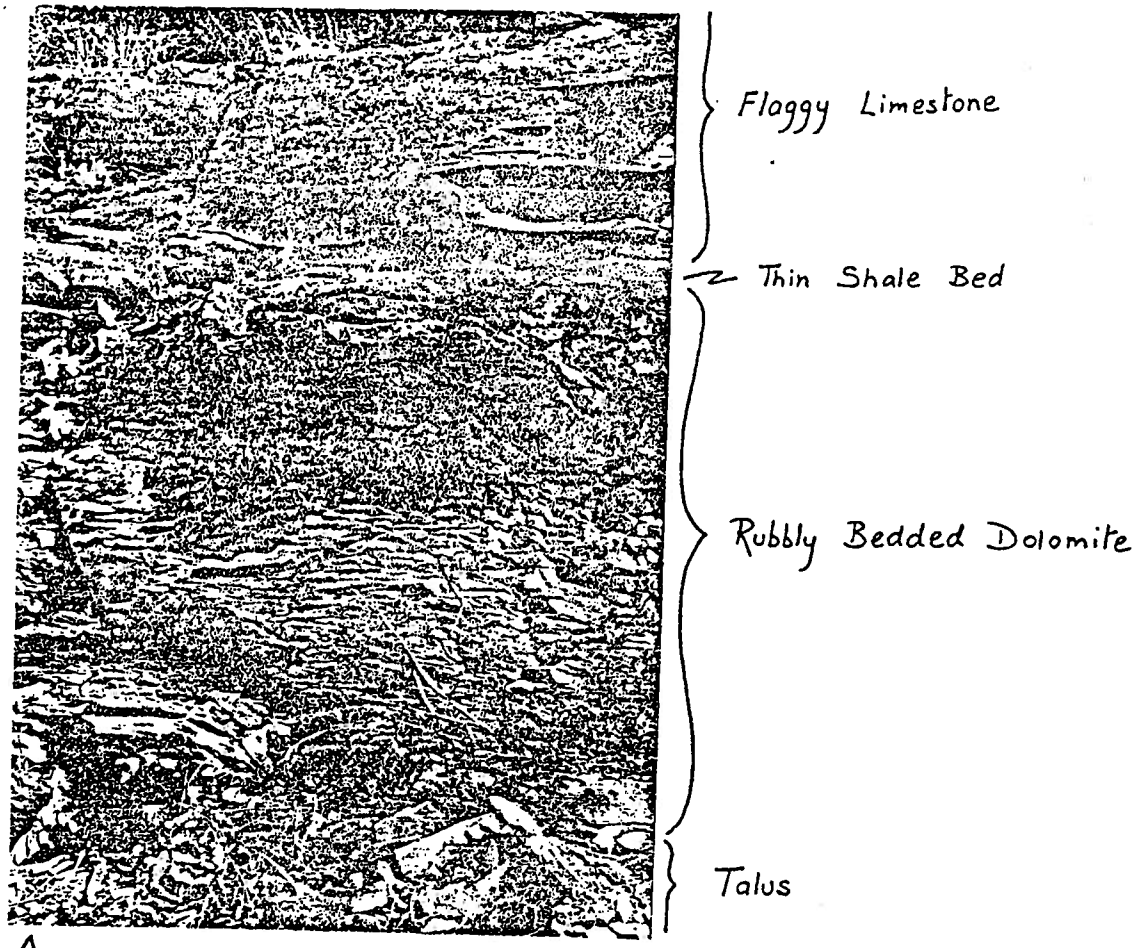


Figure 2. Generalized stratigraphic column, showing thicknesses, for West Island, Stony Islands



A

Plate 1A Centre of section A, sketched in figure 3. Showing from base upwards: talus; rubbly bedded dolomite; thin shale bed; flaggy limestone.

B

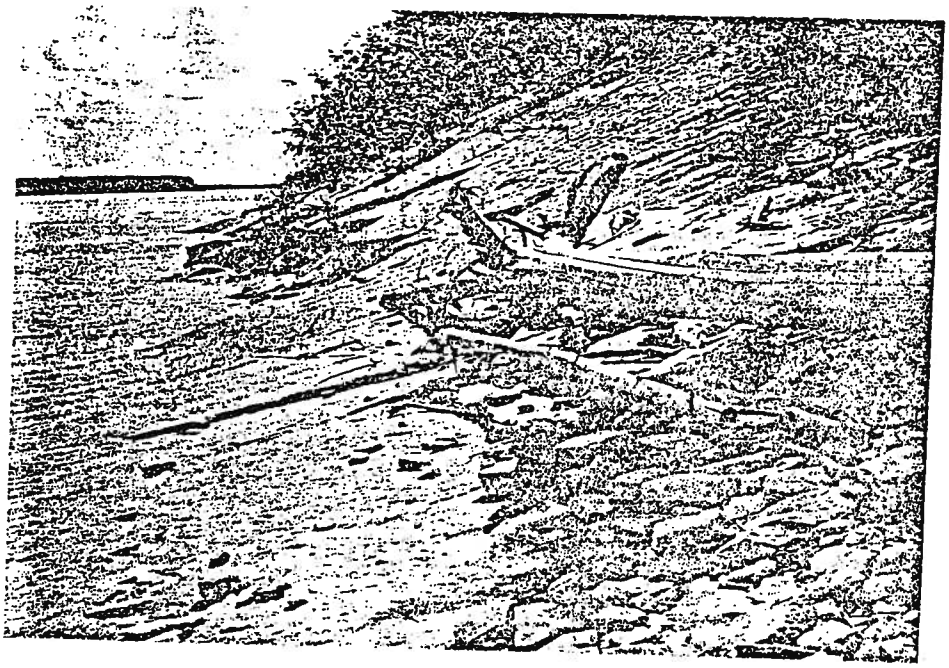


Plate 1B Ripple-marked sandy limestone beds dipping at 18 degrees to the southwest.

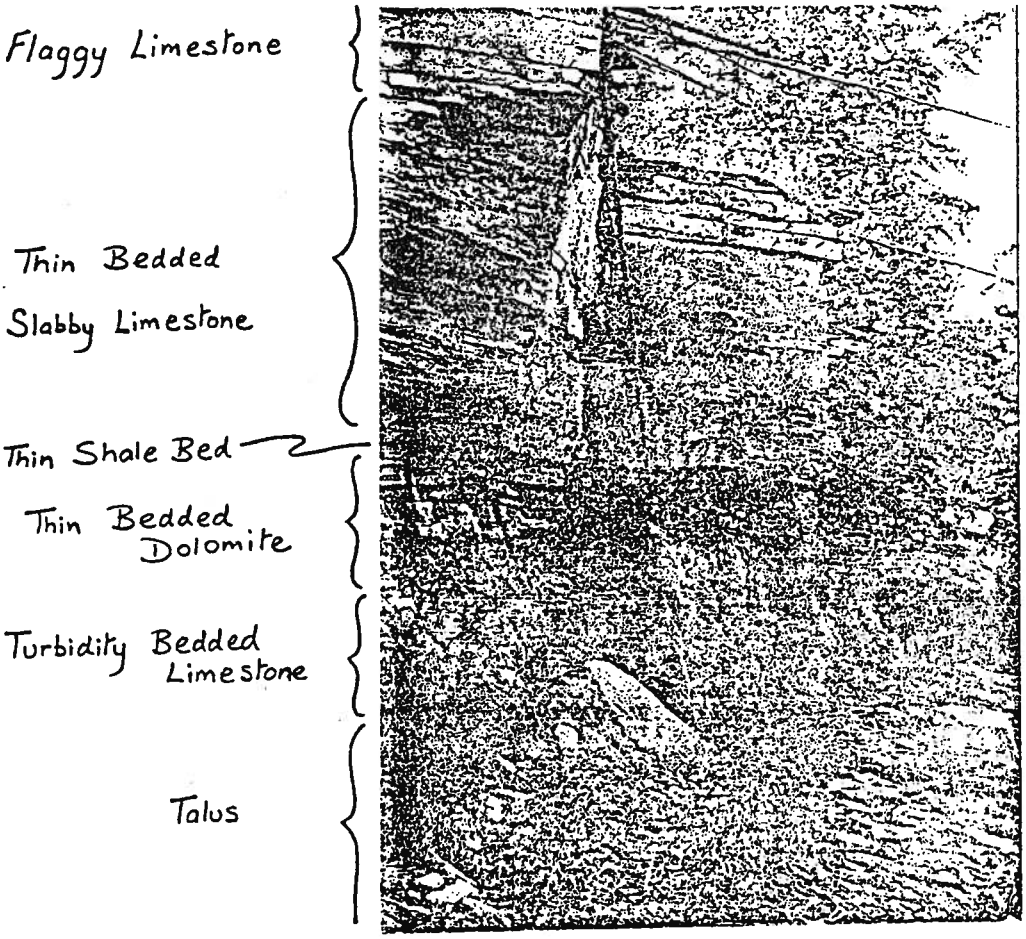
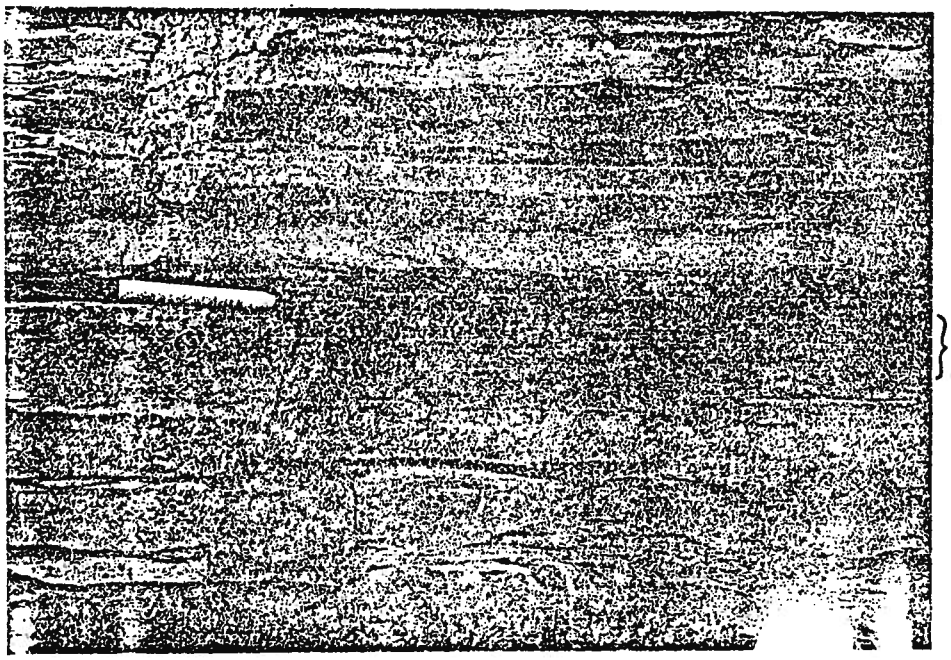
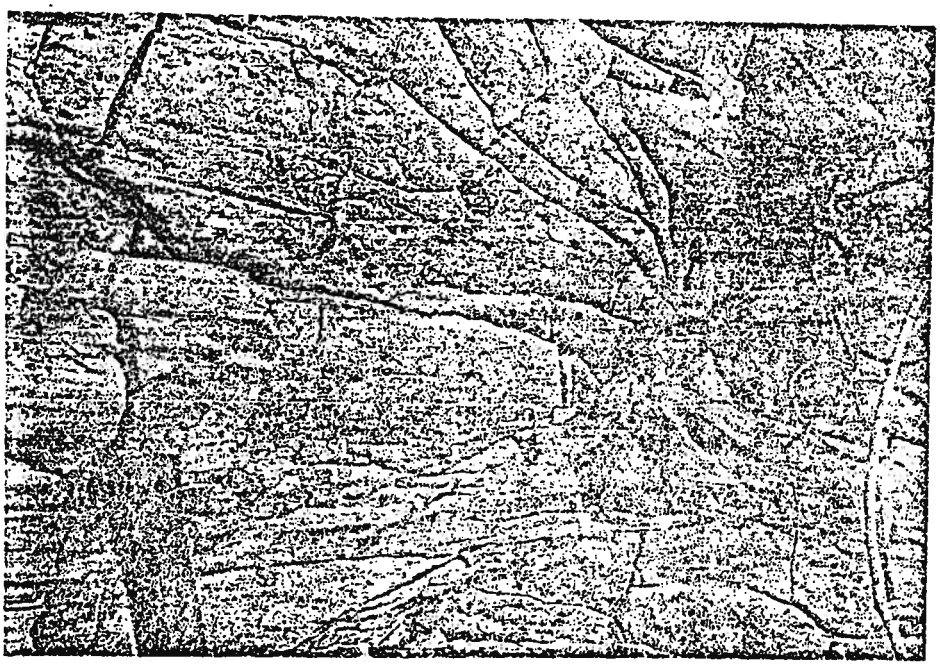


Plate 2 Section D, sketched in figure 5. Showing from the base upwards: talus; turbidity bedded limestone; thin bedded dolomite; very thin shale bed (just beneath overhang); thin bedded, slabby limestone; flaggy limestone.



A

Plate 3A Close-up view of dark marcasite nodules, section D, in thin bedded dolomite just beneath the very thin shale bed (behind pen).



B

Plate 3B Close-up view of granite rock fragments weathering out in turbidity bedded limestone, Section D.

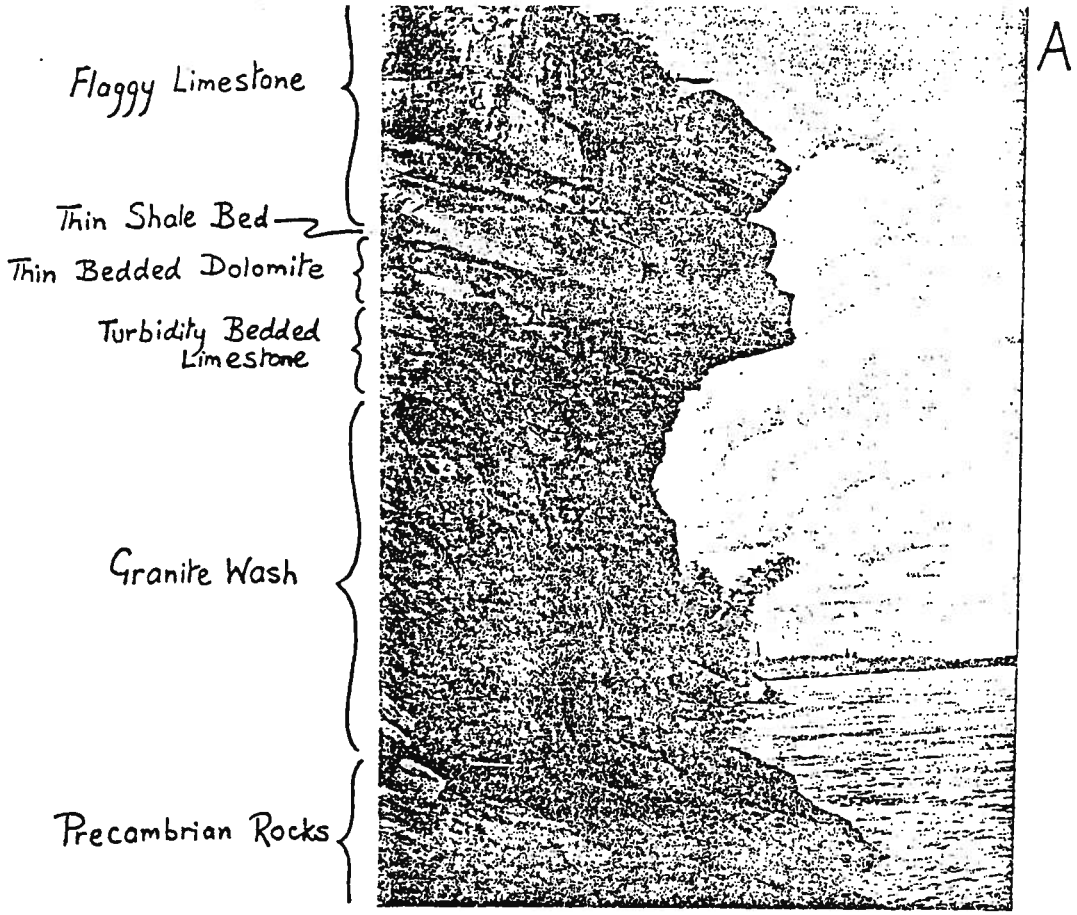


Plate 4A Section E. Showing from the base upwards: Precambrian rocks (beneath feet of geologist); granite wash (to extended hand of geologist); turbidity bedded limestone (to just above hammer handle); thin bedded dolomite; very thin shale bed (just beneath overhang); flaggy limestone.

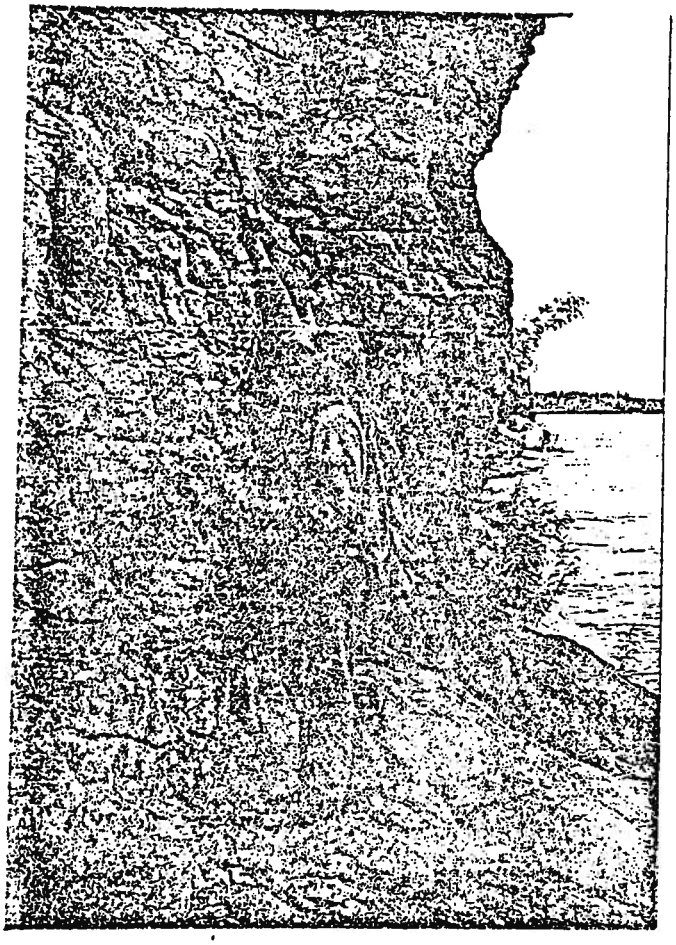


Plate 4B Section E, close-up view. Note calcite-filled vug to right of hammer handle.

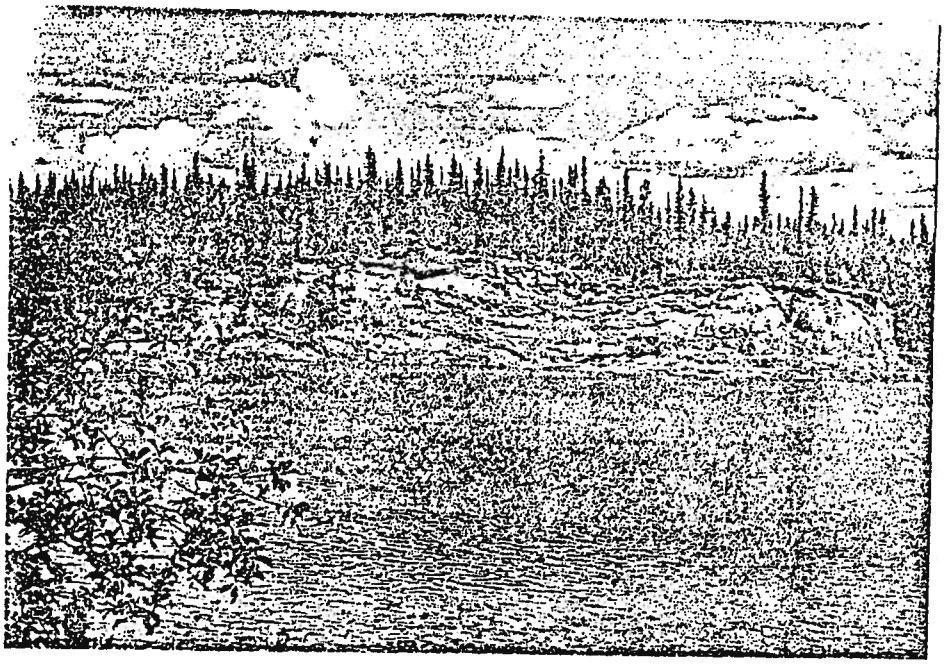


Plate 5 View of southern end of Mid Island, from the west side. Showing Palaeozoic limestone beds draped over Precambrian rock topographic highs. See diagrammatic representation - figure 7.

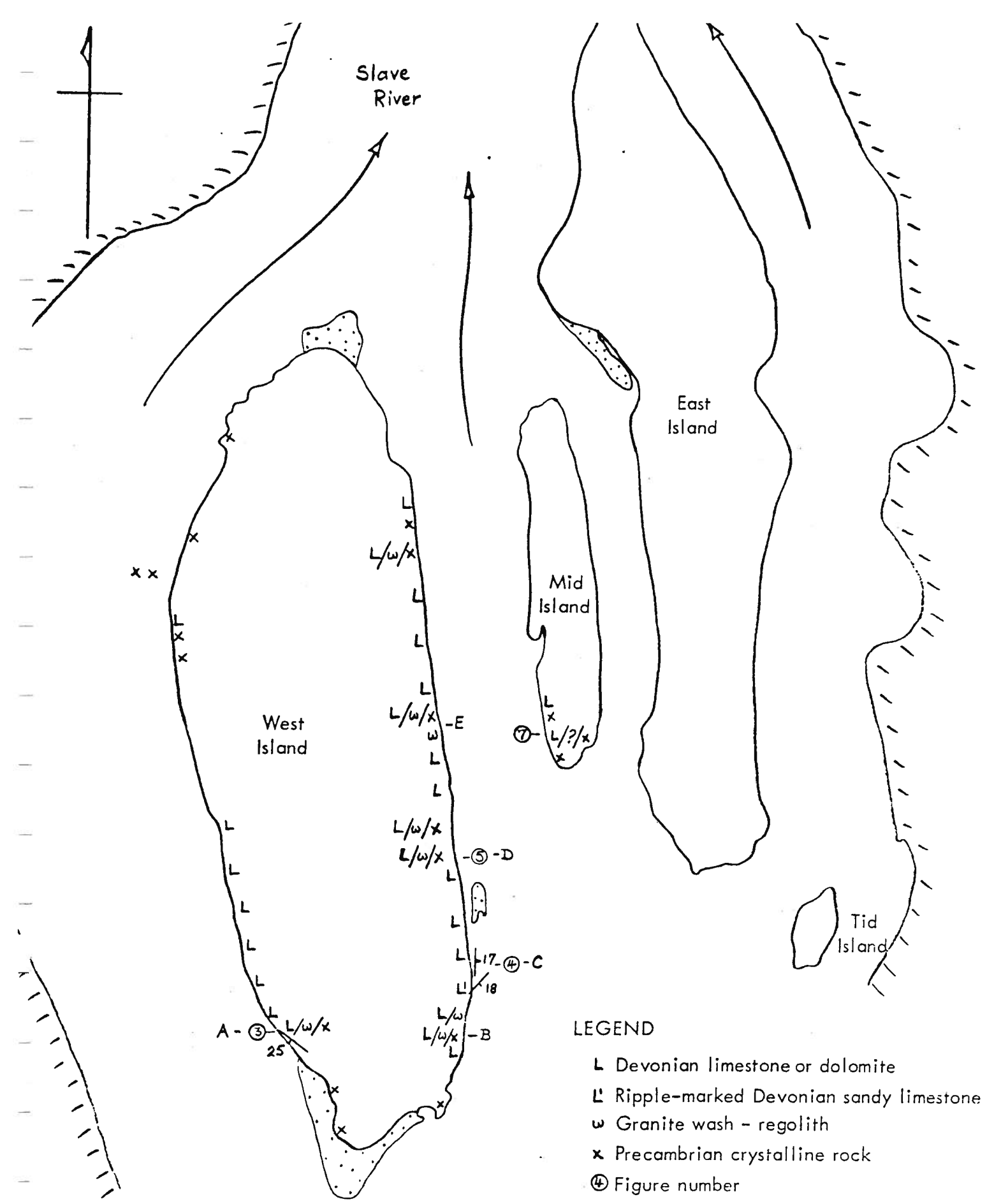


Figure 1. Sketch map of Stony Islands, Slave River, showing general geology of West Island