Report No. 141

Report on a Detailed-Reconnaissance Soil Survey

of the

METADING-BALINGIAN-SARUPAI AREA

3rd. Division

by

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HUNTING TECHNICAL SERVICES

Report on a Detailed-Reconnaissance Soil Survey of the Metading - Balingian - Sarupai Area Third Division

I.M. Scott

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(all scale 1:30,000)

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INTRODUCTION

Semi-detailed soil survey was requested in 1970 of a large number of coastal areas between Kuala Igan and Kuala Sarupai, with a view to assessing their suitability for Block Alienation for Coconut Planting Schemes. The requests included three blocks between Kuala Sarupai and Kuala Satapang and a continuous strip divided into over twenty blocks between Kuala Balingian and Sg. Penian.

In view of the urgent need for a decision regarding the future of these blocks and the very large acreage concerned, soil survey was undertaken at a detailed-reconnaissance rather than semi-detailed level, rentises being spaced at approximately $\frac{3}{4}$-mile intervals. While the soil boundaries drawn on the basis of this information are not sufficiently accurate for acreage calculations to be worthwhile, the soil map is sufficiently detailed for the agricultural status of each locality to be estimated and is adequate for the purpose in mind. As a result, a greater proportion of the area requested could be surveyed in the time available than would have been practicable at a semi-detailed level and the maps included with this report cover all blocks between Kuala Sarupai and Sg. Metading Bezar. (It is hoped to survey the remaining areas during 1971).

The locations of the proposed blocks were supplied to the Soil Surveyor on tracings from the standard 1:50,000 scale sheets. It was known, however, that there has been considerable coastal erosion in this area and that the coast as shown on these sheets is now very inaccurate. The location of the block boundaries on the ground was therefore known only very approximately. The Soil Surveyor has therefore ignored the boundaries as given, surveyed a continuous strip from Kuala Sarupai westwards and continued field work inland to the point where a cover of deep peat soils is dominant and there is little prospect of agricultural development.

As no accurate base maps are available on any scale for this area, an enlarged air-photo mosaic was used as a base for field work and final maps included with this report are based on reductions from this mosaic. Little control was available and orientation to north is approximate only, the error probably varying to some extent between localities.

To assist in locating areas of interest and, in particular, those areas in which recent coconut planting has taken place, a simplified land use map has been drawn and included with this report. It was hoped that Forest Reserve boundaries could also be located and plotted in relation to the soil and land use pattern but this was not possible. On some rentises between Kuala Balingian and Kuala Sarupai cut-lines were crossed which appeared to be portions of Reserve boundaries and these have been indicated on the 'Sampling Lines' map. On the majority of rentises, however, such lines, if crossed, were not noted.

The field work was undertaken by Assistants Rosli bin Sahari and Timothy Kinok in conjunction with reconnaissance work by the writer elsewhere in the Balingian Basin. It was carried out in three phases between February and July, 1970. The area covered by the soil map and this report is estimated at approximately 62 square miles.

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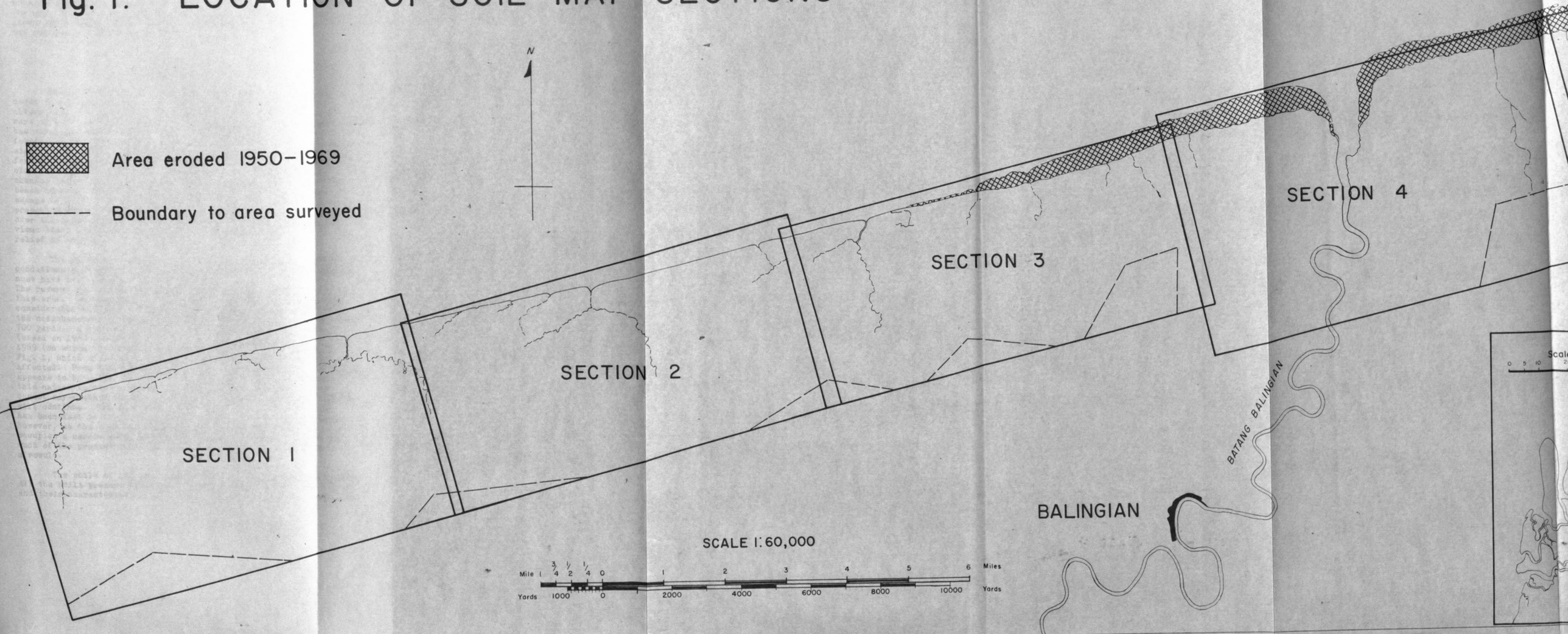
Fig. 1. LOCATION OF SOIL MAP SECTIONS



SECTION 5

SECTION 4

S. Sarupai

Scale in Miles

0 5 10 20 30 40 50 Miles.

AREA ENLARGED ABOVE

BINTULU

MUKAH

Btg. Balingian

FOURTH DIVISION

Btg. Igan

Btg. Oya

Btg. Mukah

SIBU

BINATANG

SARIKEI

Btg. Rajang

THIRD DIVISION

For ease of handling, the maps have been divided into five sections and the soils, agricultural potential and land use of each section are shown together to facilitate comparison. The keys to each map, which are standard for all sections, are given separately. The locations of the sections in relation to one another are shown in Fig. 1.

SOILS

The soil pattern in this area is typical of much of the coast in central Sarawak. A complex of sandy beach deposits alternating with clayey tracts has formed in the past, orientated more or less parallel to the present beach. As coastal deposition has developed seaward the sandy beach material has been left as fossil strand lines at some distance inland. They have not formed significant landform features, these deposits rising only a few feet above neighbouring clay swales. Wide tracts of estuarine clay have either not formed in this area, or have been eroded by changes in the coastal currents. Peat has developed behind the beach complex and has accumulated to produce large basin peat swamps in which the mineral alluvium is many feet beneath the present surface. A shallow mantle of peat has spread seawards over the older beach deposits, infilling depressions in the previous beach landscape and contributing to the general lack of relief in the area.

The pattern of mineral alluvial material indicates that conditions allowing the progressive accumulation of beach deposits must have been present for a considerable period in the past. The reverse appears to be the case at the present time in much of this area. Between Kuala Sarupai and Kuala Buloh there has been considerable erosion in the last twenty years and the coast in the neighbourhood of Kuala Balingian has moved inland approximately 700 yards. A comparison of the coast shown on published maps (based on 1950 air photographs) and that on air photos taken in 1969 (on which the present soil map is based) is illustrated in Fig. 1, which shows that only the Buloh-Sarupai area has been affected. From Kuala Buloh westwards to Mukah and beyond the coast appears to be quite stable. It is assumed that local erosion of this nature is due to changes in the offshore currents and one cannot say whether this is a temporary condition or a trend which will continue. The fact that some 3 square miles in this area has been lost in the last twenty years is of obvious importance, however, as the land most suitable for agriculture normally occupies a narrow strip immediately behind the present beach and much of the present cultivated area is threatened by erosion as a result.

The soils of the area have been mapped in eight associations. All the soils present have been described in detail in many reports and their characteristics will therefore only be briefly summarised.

Pendam Association

This association comprises soils mainly of the Pendam Family: poorly-drained bluish grey to dark grey clays of estuarine or marine origin which are weakly to moderately saline. They are found associated with similar but younger soils of the Rajang Family, which are strongly saline. The vegetation of the area suggests that Rajang Family soils are of limited extent and that most soils in this association are of the Pendam Family. The association is widespread in the estuary of the Batang Balingian, forms an intermittent and narrow strip along the coast (except in the west), and extends inland as narrow ribbons along the banks of major streams, such as the Bedengan, Bayan, Buloh, Setuan and Sarupai, which are subject to tidal influence.

These soils are inherently fertile but, except for wet rice, require drainage improvement and salt leaching before a wide variety of crops can be recommended. Provided drainage works can be supplied the main limitation to agriculture is possible sulphate concentrations. This is a major limiting hazard in Rajang soils but is less likely to be important in soils of the Pendam Family. In most areas these soils are of such restricted extent that they are not of importance in development planning. If drainage improvement of adjacent soils is planned, however, the Pendam soils can be incorporated in the improvement area.

Tatau-Matu Association

The Tatau-Matu Association comprises soils developed in beach sands without significant surface peat accumulations. These soils are present near Kuala Sarupai but except for the area immediately around Kuala Balingian kampong are virtually absent farther west until Sg. Liuk is reached. From Sg. Liuk westwards they become progressively more important and in the Sg. Bayan area are dominant over a mile-wide band from the coast inland.

The Association is dominantly one of soils in the Tatau and Matu Families. The former comprises poorly-drained sands, pale yellow to light grey in colour, commonly mottled, with the water-table normally within 20 inches of the surface. The latter comprise very poorly-drained sands, completely gleyed, in which surface peat is present but is less than 10 inches in thickness. Tatau and Matu soils commonly occur in complex association, Matu occupying depression sites and Tatau undulations with slightly better drainage conditions.

On the present beach Tatau soils generally grade into well-drained brownish yellow to light grey sands of the Kabong Family. While these are present in this area they occupy a band too narrow to be mapped and have been included in this association. Also included are some soils with suggestion of humus accumulation at some level in the profile, which are transitional to Buso soils, described under the next association. Near Sg. Bedengan sandy soils under mixed nipah and swamp forest are present. While these have been included in the Tatau-Matu Association it is possible that they are sufficiently saline to be classed in the Nonok Family.

These soils are commonly used for coconut in their present state but are only recommended for this crop if the drainage condition can be regulated and improved. If drainage improvement is introduced it is at present recommended that the water table should be maintained at 2-3 feet when the palm is young and lowered progressively to 5-8 feet as the palm grows. Appropriate fertilizer applications are also necessary on these very sandy soils.

Buso Association

West of Sg. Bayan, and particularly in the Metading-Bedengan area, Tatau soils are replaced by, or are found in complex association with, soils of the Buso Family. In the latter, weakly developed podzol features are present. The profile is normally a pale brown to light grey sand overlying a dark brown sand, the dark horizon resting in turn on yellow to pale olive sands. The profile is loose throughout, the dark brown sand horizon showing no signs of cementation.

The Buso soils appear to be at a slightly higher elevation that adjacent Tatau soils and are generally dry at the surface. The difference in elevation is not great, however, and the water table at the time of survey was rarely more than 2 feet below the surface.

Buso soils are of low natural fertility and, in the present situation, are also likely to be droughty if adjacent soils are drained. Provided coconuts on these soils can be fertilized they can be used for this crop but heavy applications are likely to be necessary for optimum growth. Without fertilizer these soils are best avoided as growth is likely to be poor.

Igan and Mukah Associations

Soils in which more than 10 inches but less than 40 inches of surface peat has accumulated are classed in the Igan Family, if the peat rests on sands, and Mukah Family, if the peat is underlain by clays (intermediate textures are rarely found in these soils). Igan Family soils are thus transitional between Matu soils and deeper peats and occupy an intermittent, but generally fairly broad, belt west of Kuala Balingian between the Tatau-Matu Association and the Anderson Association. They are less important east of Kuala Balingian where coastal sandy deposits are restricted in extent. Mukah Family soils are quite widespread in this locality, however, as a transition between soils of the Pendam and Anderson Families although they are only patchily present elsewhere.

These soils require drainage improvement before they can be recommended for dry-land crops and, if the land is to be used for coconuts, the initial lowering of the water table must be of the order of 4-7 feet to allow for shrinkage and oxidation of the surface peat mantle. It should be borne in mind that drainage improvement together with peat shrinkage and consolidation must precede planting as there will otherwise be a danger of the palms toppling later when the crown has developed. While this applies to Igan and Mukah soils, it is a much greater hazard in the deeper Anderson peats discussed below. Fertilizer is required, and particularly heavy applications are likely to be necessary on Igan soils.

Anderson Association

The Anderson Association is dominantly a consociation of Anderson Family soils, these comprising all peat soils in which the peat mantle is thicker than 40 inches. Three depth phases are recognised and have been indicated on the map: Anderson 1 - peats 40-80 inches deep; Anderson 2 - peats 80-120 inches deep; and Anderson 3 - peats deeper than 120 inches. The texture of the underlying mineral horizons is not considered in classifying these deep peats but the approximate pattern of sand deposits under the peat mantle has been shown on the soil map. The soil map shows that the transition inland from Anderson 1 soils to peats deeper than 10 feet is quite rapid.

The suitability of these soils for coconuts depends largely on the practicability of draining them and consolidating the peat mantle. In their present state they are not recommended for this crop.

AGRICULTURAL POTENTIAL and RECOMMENDATIONS

All soils in this area are likely to benefit from fertilizer applications, particularly the sandy soils of the Tatau-Matu and Buso Associations. The main limiting factor to extended coconut planting in this area is, however, poor drainage condition. Improved drainage is particularly important in the Igan, Mukah and Anderson Associations. Unless such improvement can be implemented, this crop is best confined to the soils of the Tatau-Matu Association (and any adjacent Pendam soils).

Efficient improvement in drainage of the order required for this crop is possible only by means of a large drainage scheme involving bunding off the area for improvement from the interior deep peat swamps into which the soils of the area grade to the south. As all land in this area is very low-lying, pumping would be required and a scheme would be further complicated by the complex pattern of basal sands. It is unlikely that such a scheme would be practicable. It must be emphasised that, short of a major scheme of this kind, provision of drains alone is not likely to be useful and may well make the present drainage condition worse by attracting water into the planted area from the swamps to the south.

The agricultural potential of the area within the context of coconut planting and the degree of drainage improvement required for that crop is shown on the 'Potential' map, in which the Classes employed are those of the Drainage Requirement classification, defined in previous reports.

It is probably more realistic to discourage coconut planting except on Tatau and Matu soils and investigate the possibility of improving drainage in these areas alone, as here the drainage requirement for this crop is least and improvement may well be practicable. A comparison of the soils and land use maps shows that much of the coconut and cleared land (presumably cleared at least in part for coconut also) in mid-1969 is concentrated on these soils and in many areas little scope for expansion exists. Elsewhere, however, extension is possible and the Bayan and Buloh areas (Sections 2 and 3) look particularly promising.

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The soils and land use maps show that both the best soils for agriculture and (logically enough) the bulk of the cultivated land occupy a narrow ribbon along the coast. It has already been noted that part of this coast is eroding rapidly. This process may reverse itself but may equally well continue and spread to other areas. There is an urgent need for investigations into the possibility of stabilising the coast before more land is lost and this is particularly urgent if an investment in drainage improvement work is anticipated.

METADING-BALINGIAN-SARUPAI COAST

KEYS

Soils

Mapping Unit	Soil Families	Main Soil Characteristics	
Pnd	Mainly Pendam, some Rajang on coast and in main estuaries.	Weakly to strongly saline poorly-drained clay soils developed in marine alluvium.	
Tta/Mtu	Mainly Tatau and Matu. Some Kabong on present beach. Buso locally present, also Mukah in some depression sites.	Imperfectly to poorly drained sands developed in marine alluvium. Thin surface peat horizons common. Well-drained sands restricted to present beach and old beach ridges.	
Bso	Mainly Buso with some Tatau and Matu.	Weakly-developed podzols with soft humus pans in old beach sands now found on low raised terrace sites. Moderately-well-drained to poorly-drained.	
Ign	Mainly Igan with some Anderson I. Locally in complex association with Mukah.	Shallow peat soils, generally 10-40 inches thick, normally underlain by sands.	
Mkh	Mainly Mukah with some Anderson I. Locally in complex association with Igan.	Shallow peat soils, generally 10-40 inches thick, normally underlain by clays.	
A1	Dominantly Anderson 1 soils.	Peat soils more than 40 inches thick underlain by either sand (stippled on the map) or clay. Divided into the following depth phases based on depth to underlying mineral horizons:-	40-80 inches.
A2	Dominantly Anderson 2 soils.		80-120 inches.
A3	Dominantly Anderson 3 soils.		more than 120 inches.

Potential

Mapping Unit	Rating	Drainage Requirement and Agricultural Potential
	—	Infertile soils, not recommended for development without heavy fertilizer applications. Where this is practicable, suitability as Class DIIB.
DIIA	Class DII	Suitable at present for wet padi; minor drainage improvement required for coconuts. Possibly includes some land with problems of high sulphide concentrations limiting ease of development (Class DV land).
DIIB		Not recommended for wet padi; minor drainage improvement required for coconuts..
DIIIA	Class DIII	Minor drainage improvement required for wet padi; moderate drainage improvement required for coconuts.
DIIIB		Moderate drainage improvement required for coconuts; not recommended for wet padi.
DIV	Class DIV	Major drainage improvement required for coconuts. With moderate drainage improvement suitable in part for wet padi (not stippled areas).

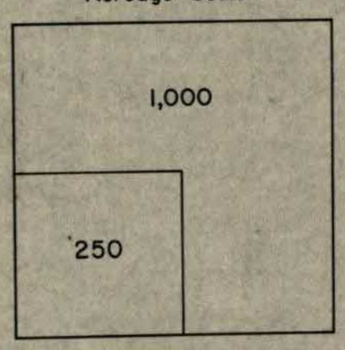
Land Use, May 1969.

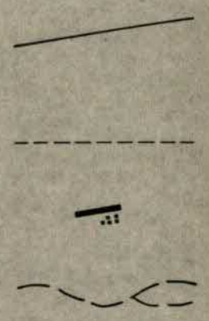
Mapping Unit	Land Use or Vegetation
	Coconut; includes some bananas and other tree crops.
	Recently cleared land; padi land, low regrowth and new clearances for coconut.
	Secondary growth; presumably mainly old padi land; includes regrowth of varied age.
	Peat swamp forest.
	Nipah forest.
	Mangrove forest, mangrove and nipah complexes and other vegetation associated with saline areas.

Miscellaneous

Approximate orientation of sections. Base map derived from uncontrolled mosaics. Northpoint may therefore be variable over area covered.

Acreage Scale





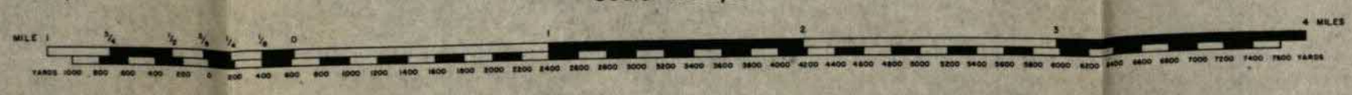
rentis sampled on present survey.

cut line recorded in field and presumed to be portion of Forest Reserve boundary.

longhouse or other permanent settlement.

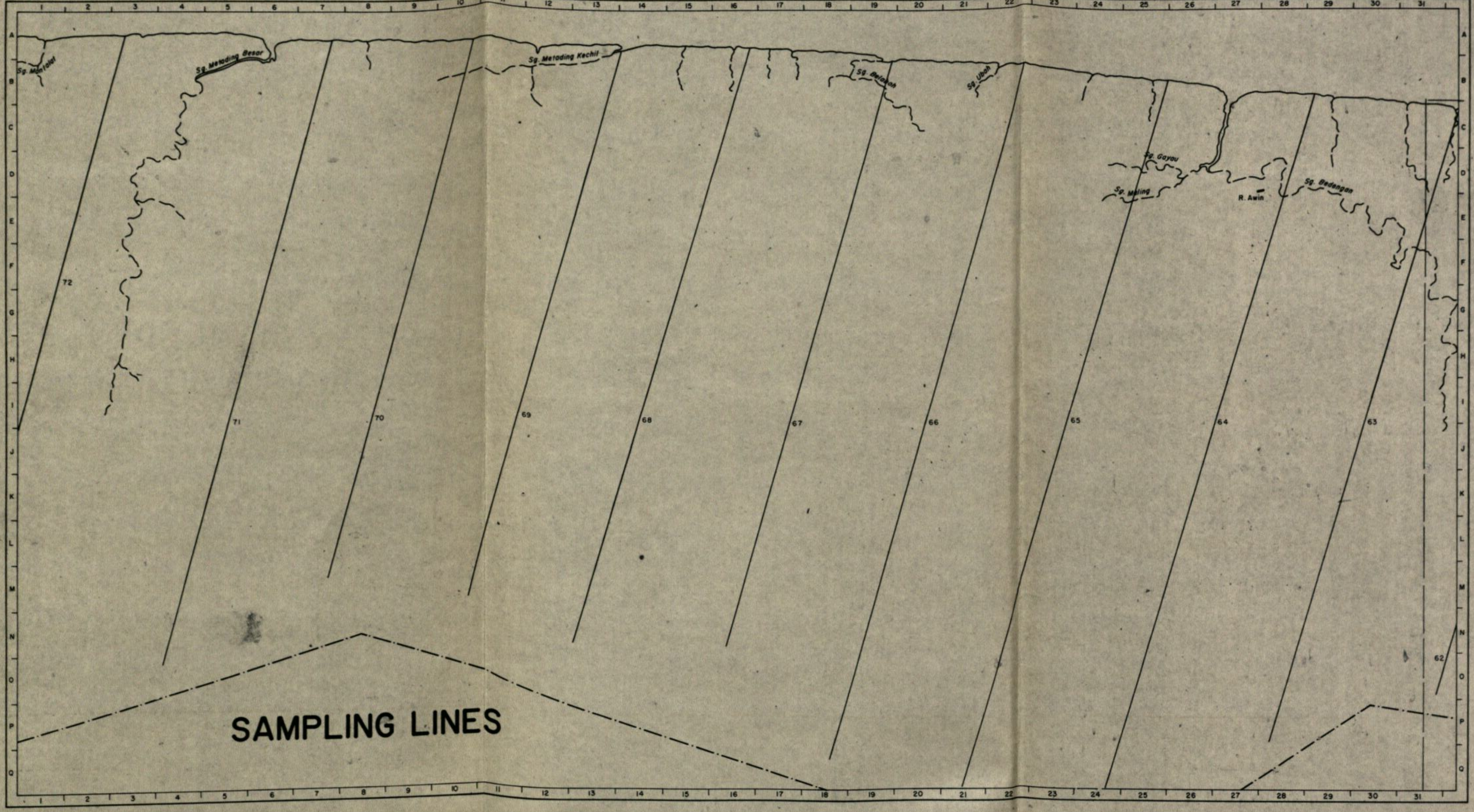
stream, approximately located.

Scale 1:30,000



Soil Survey Drawing No. 247a,b,c,d,e. Survey Area No. 141

Compiled by: I.M. Scott Drawn by: H.B. Hapsah & May Lim September, 1970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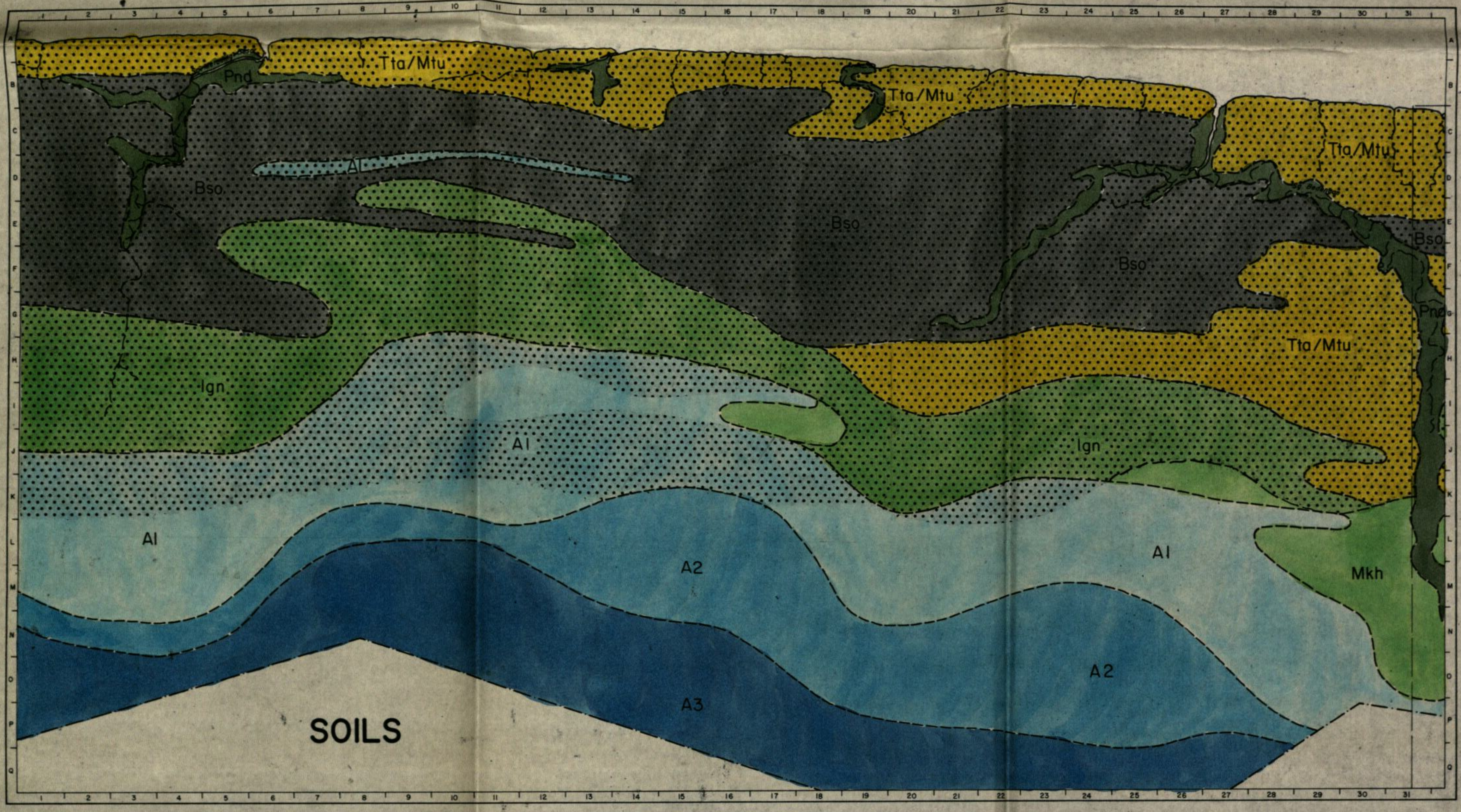
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Bsg
Ign
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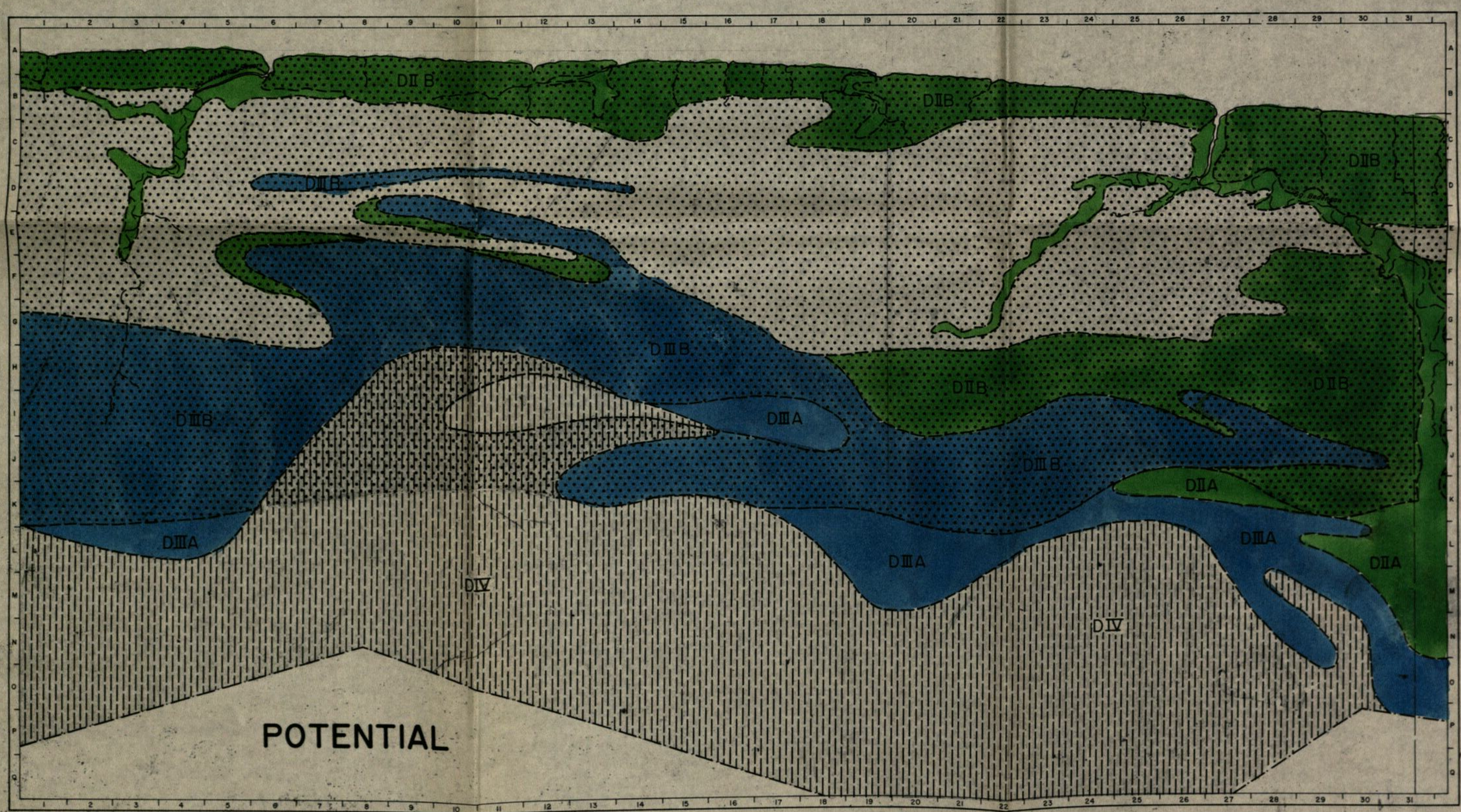
A2
A3
Mkh
SOILS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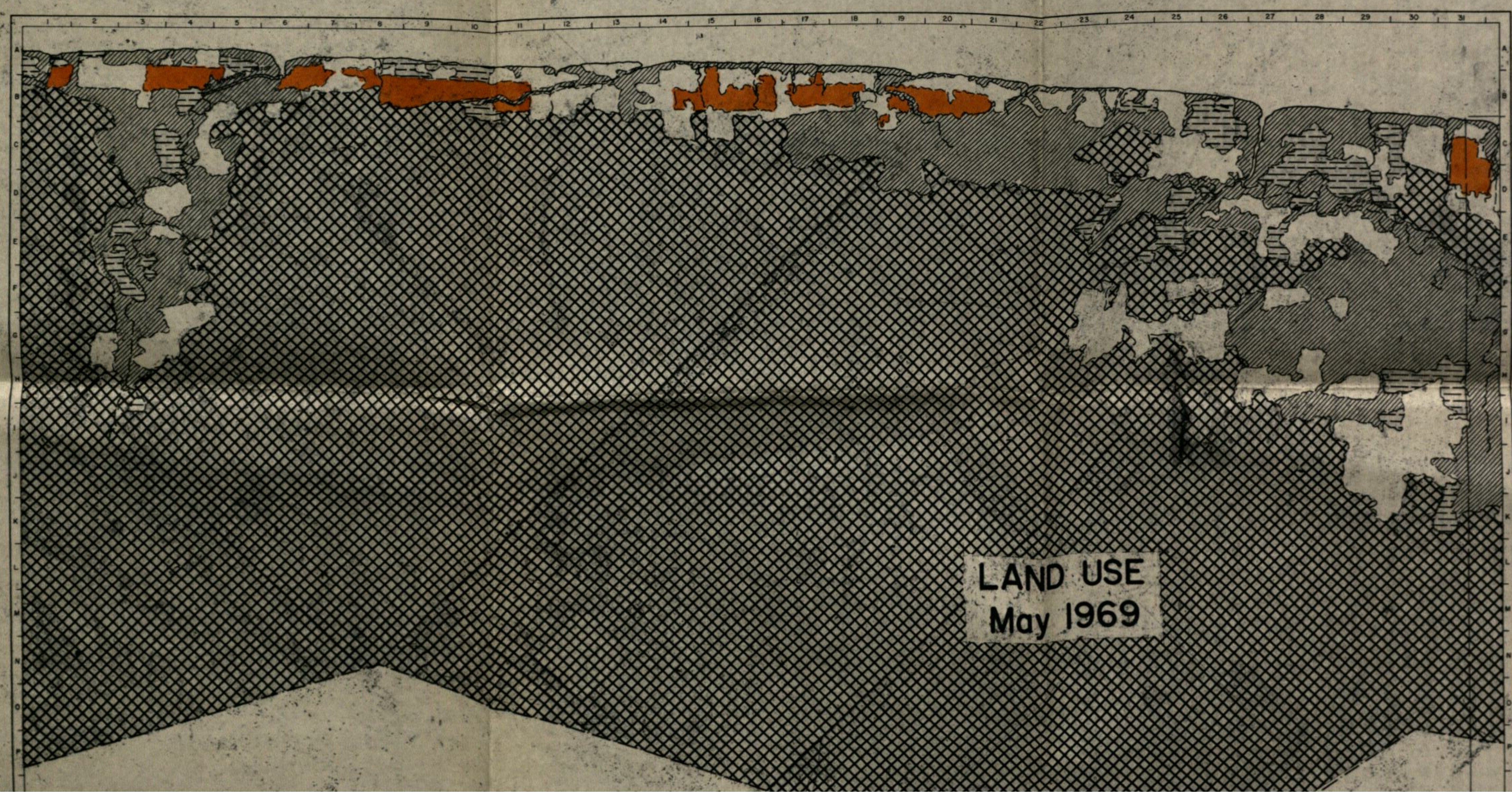
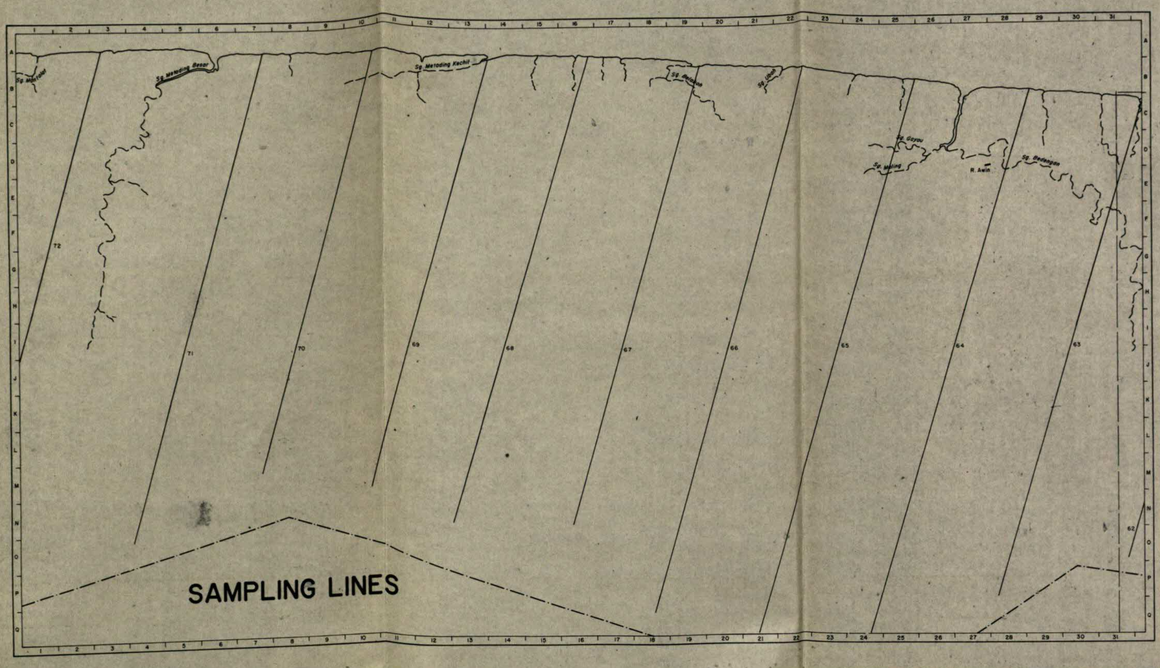
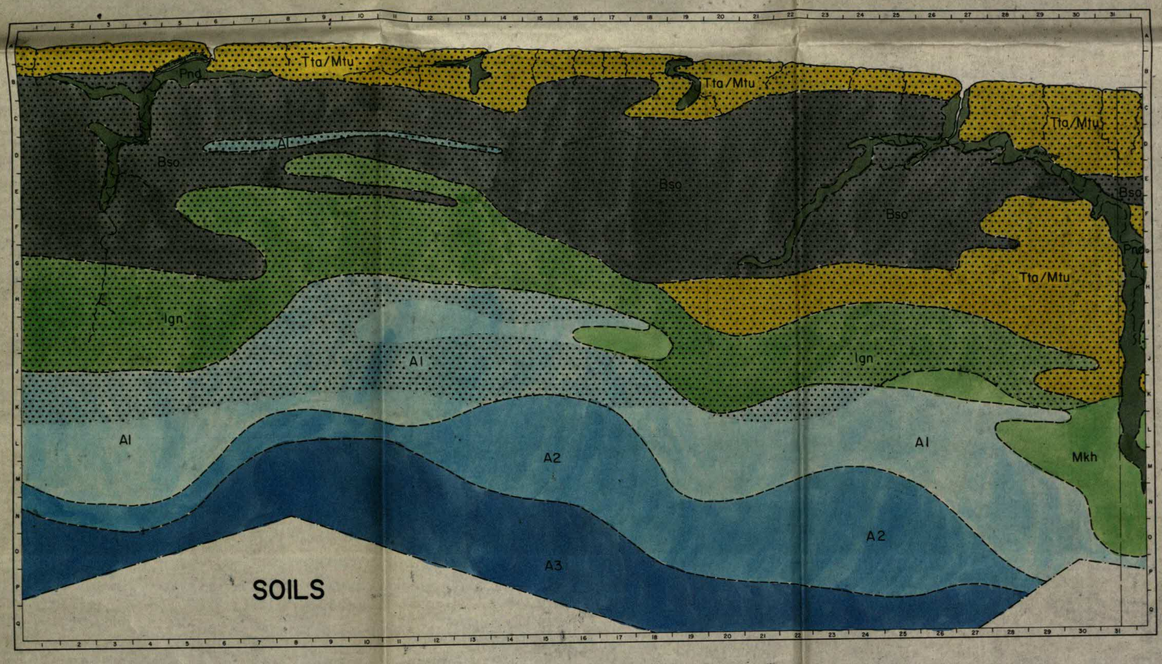
POTENTIAL

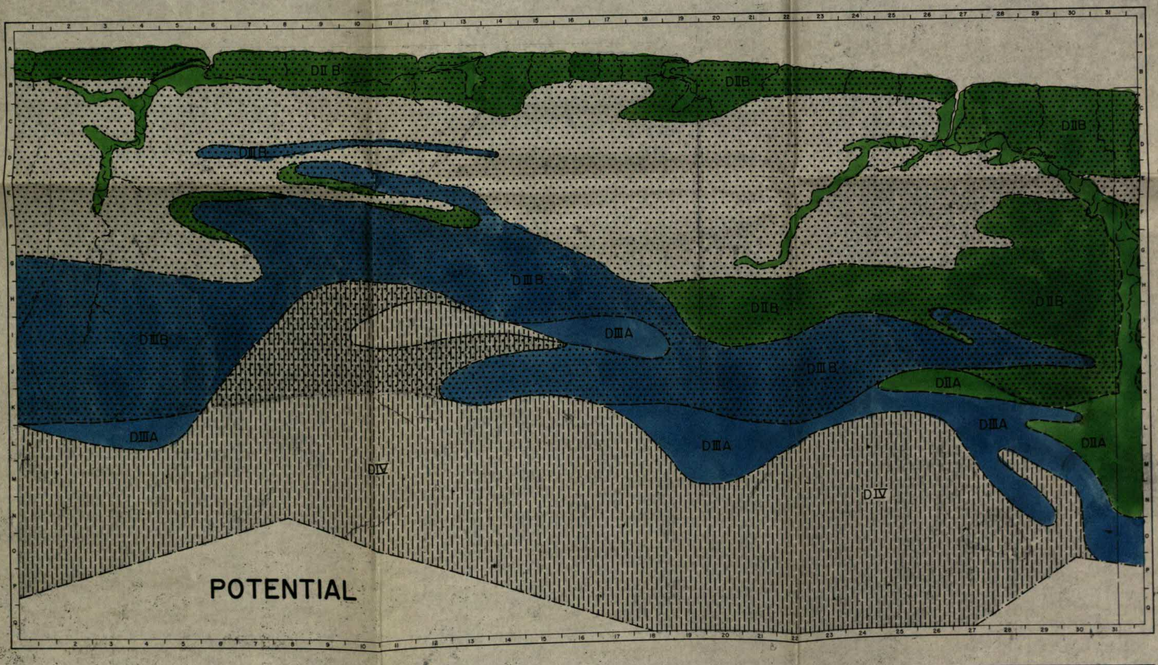

LAND USE
May 1969

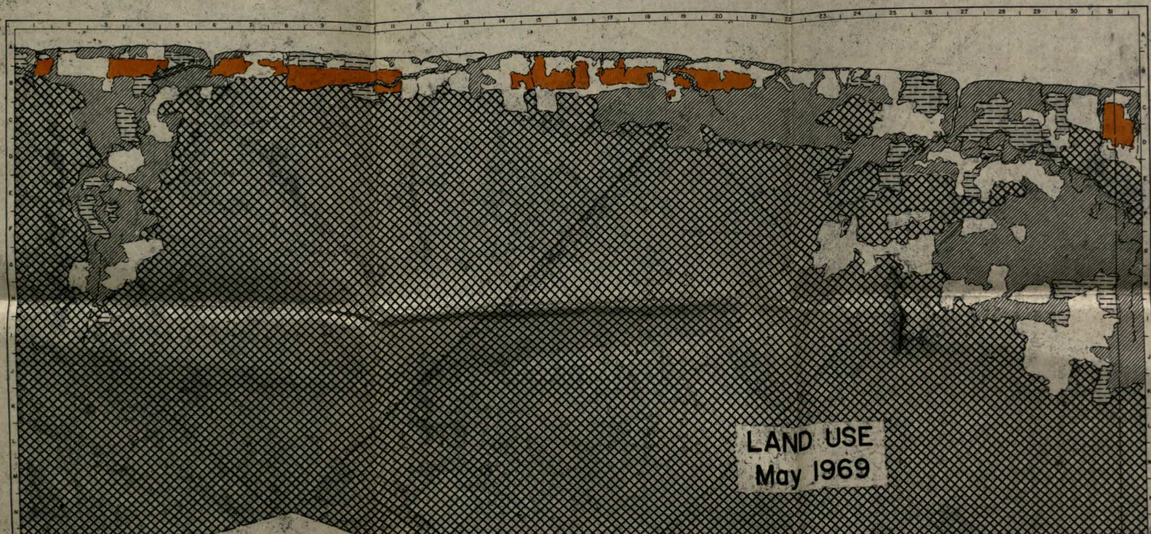
SECTION I

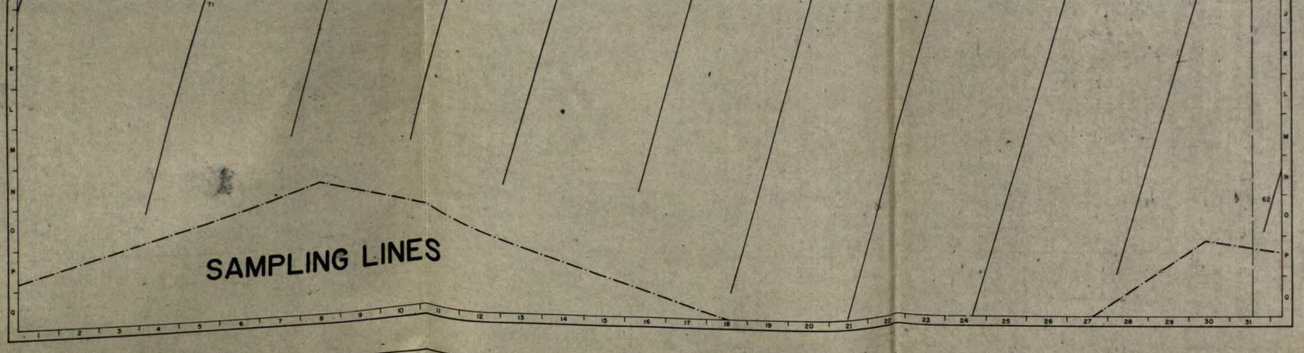
METADING - BEDENGAN







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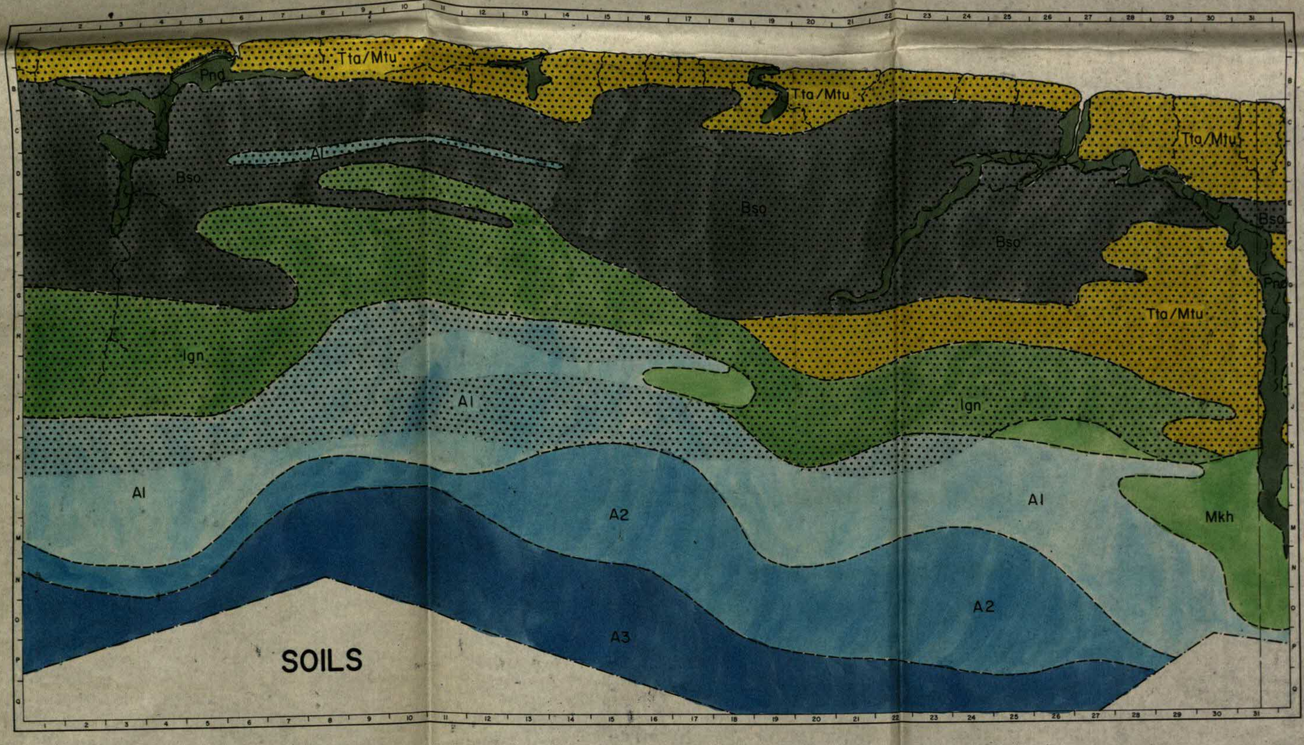
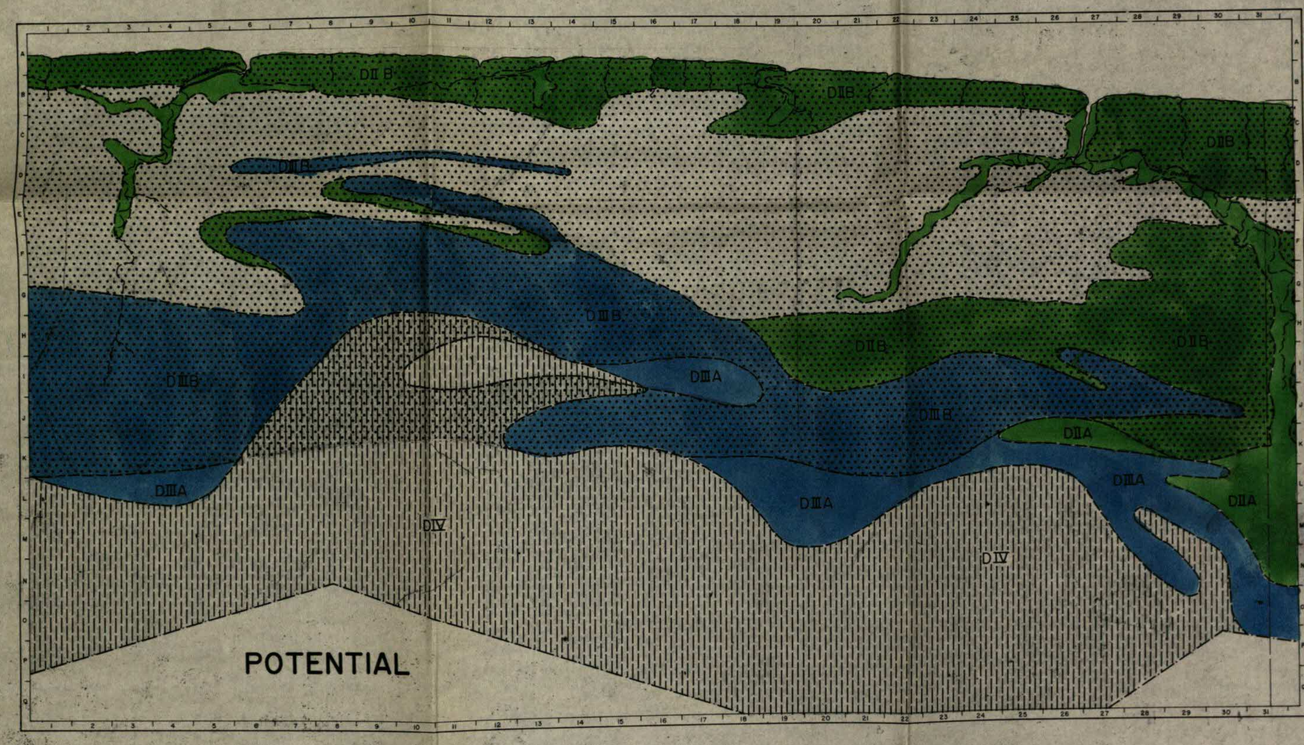
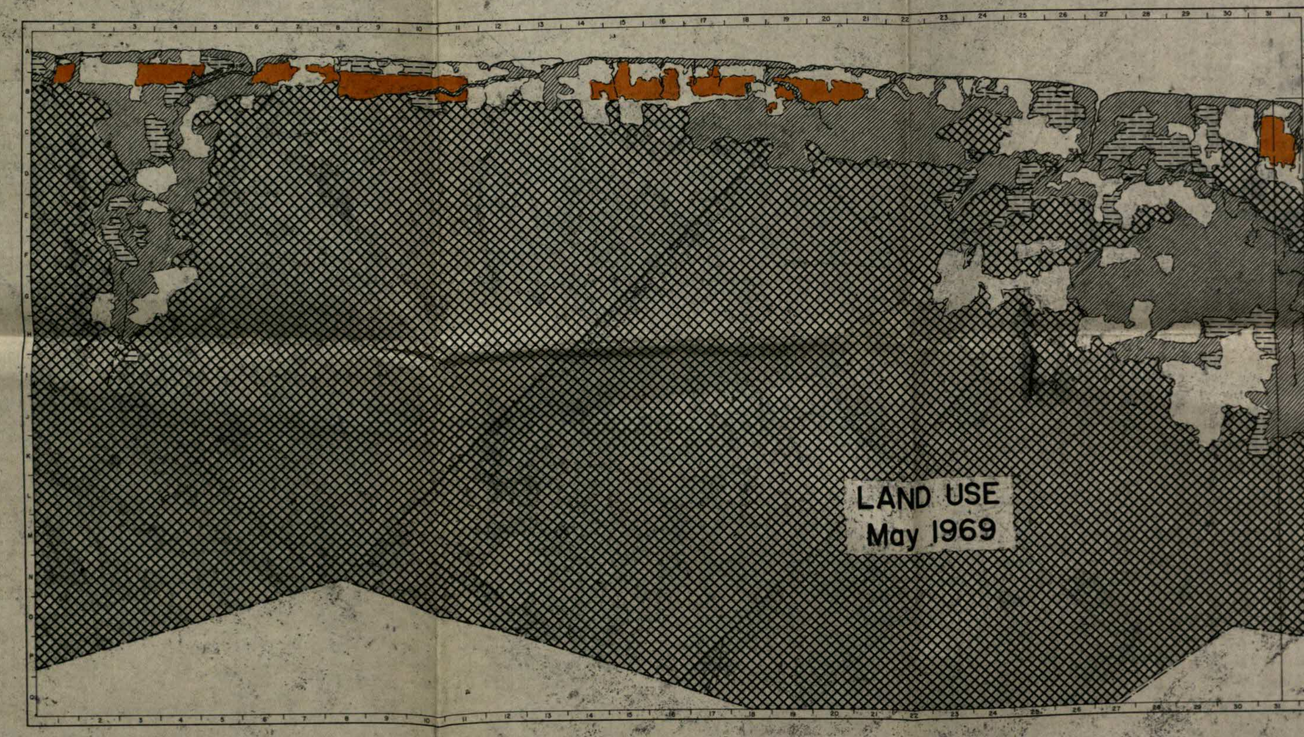
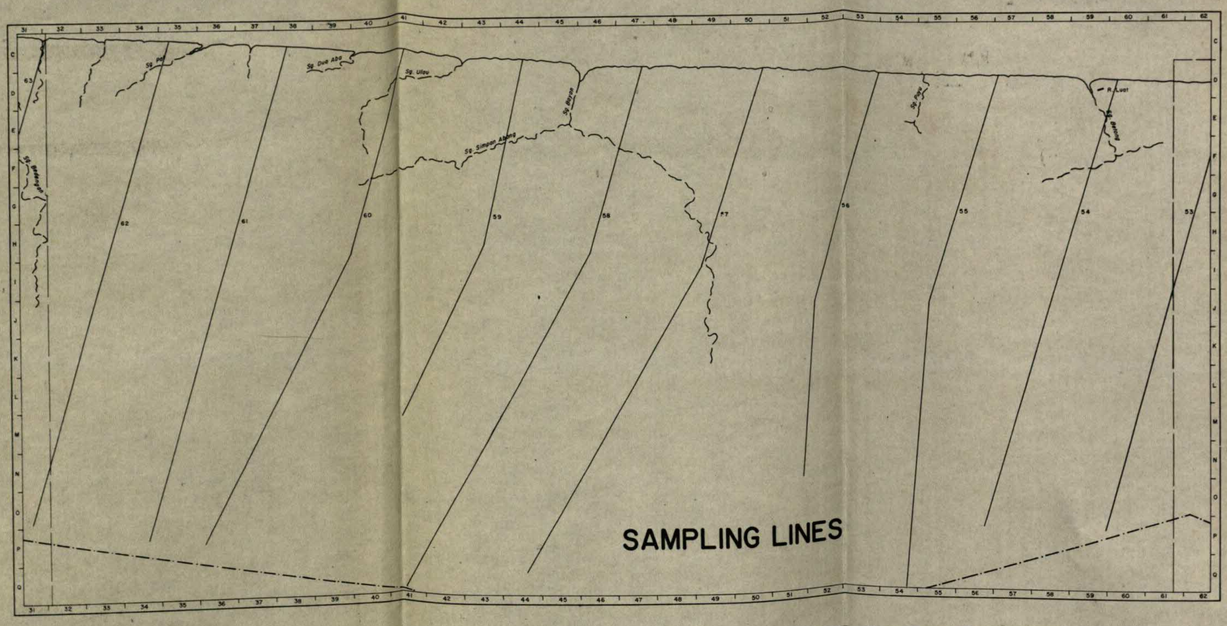

Pnd
Tta/Mtu
Bso
Al
Ign
A2
A3
Mkh
SOILS

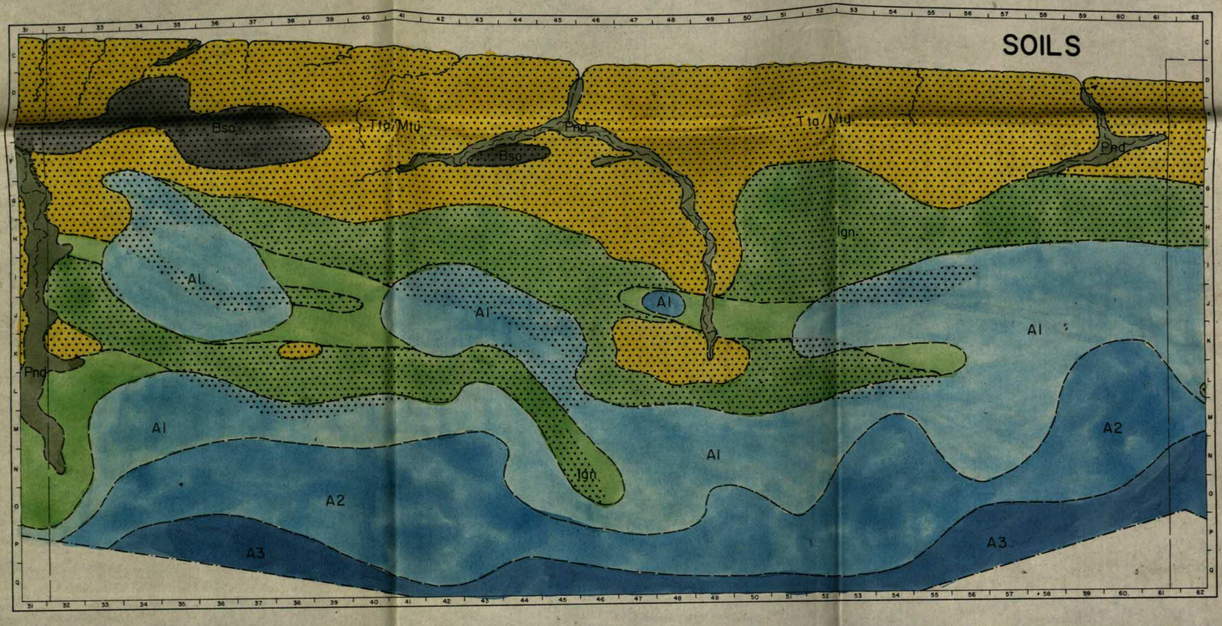

DIIB
DIIIB
DIIIA
DIIA
DIV
POTENTIAL

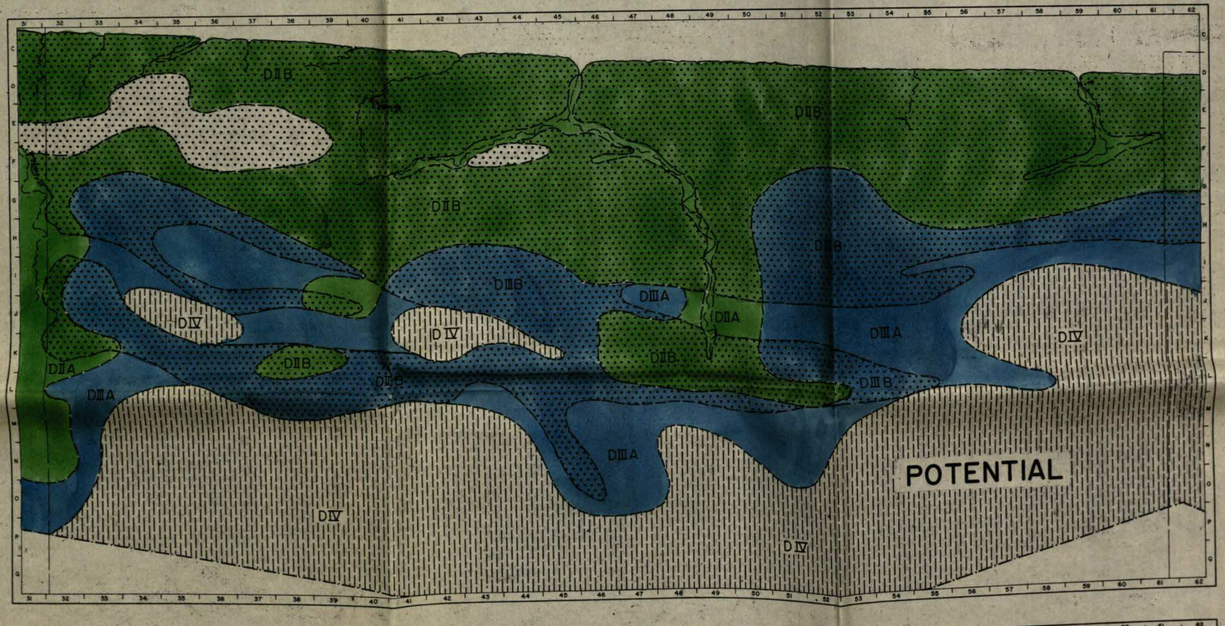

LAND USE
May 1969

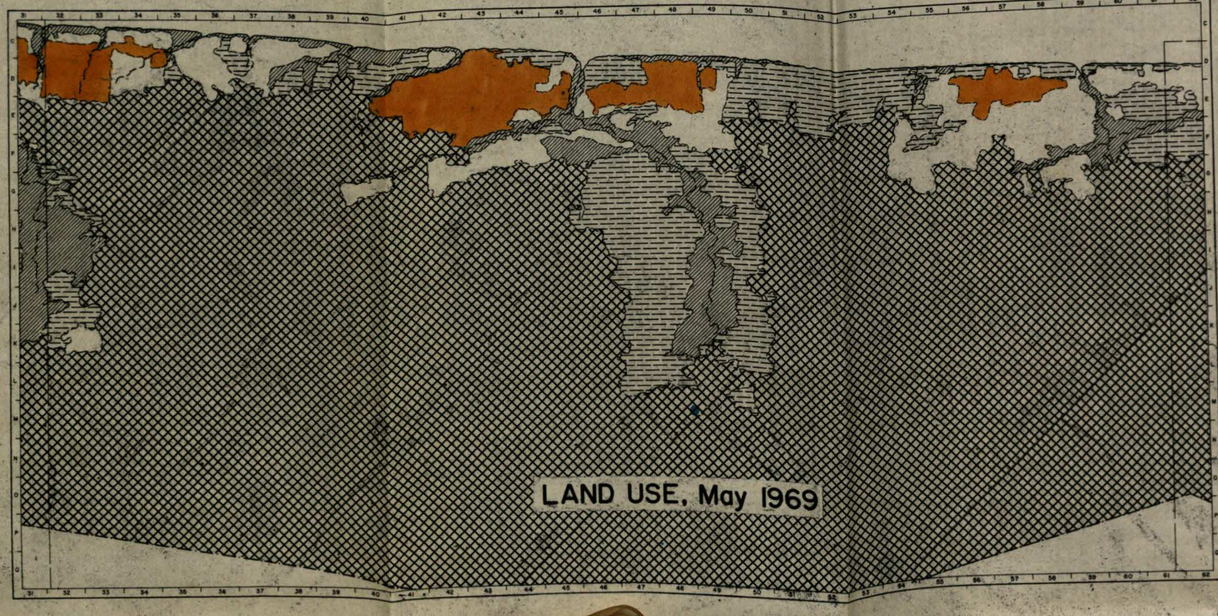
SECTION 2

BAYAN - BETONG



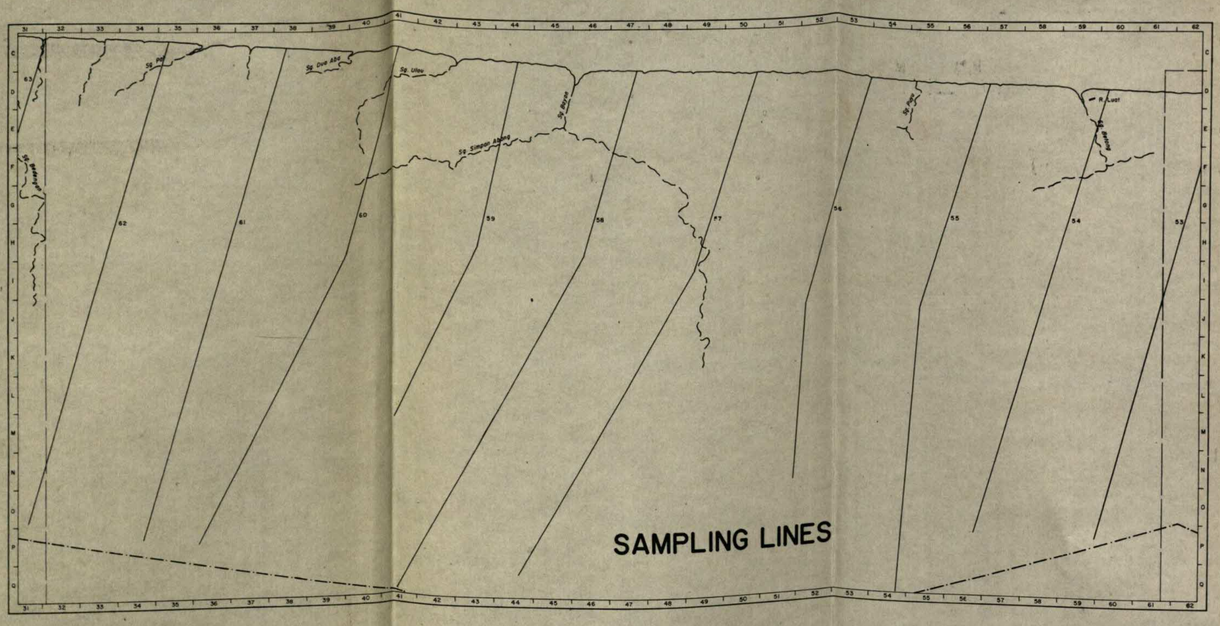


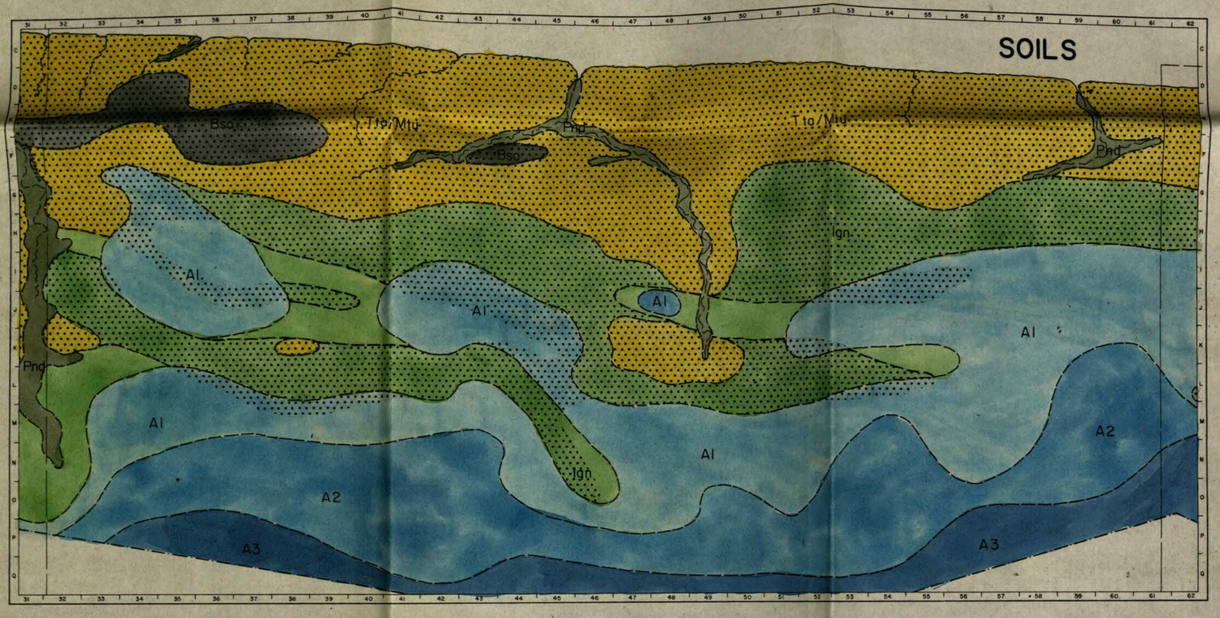


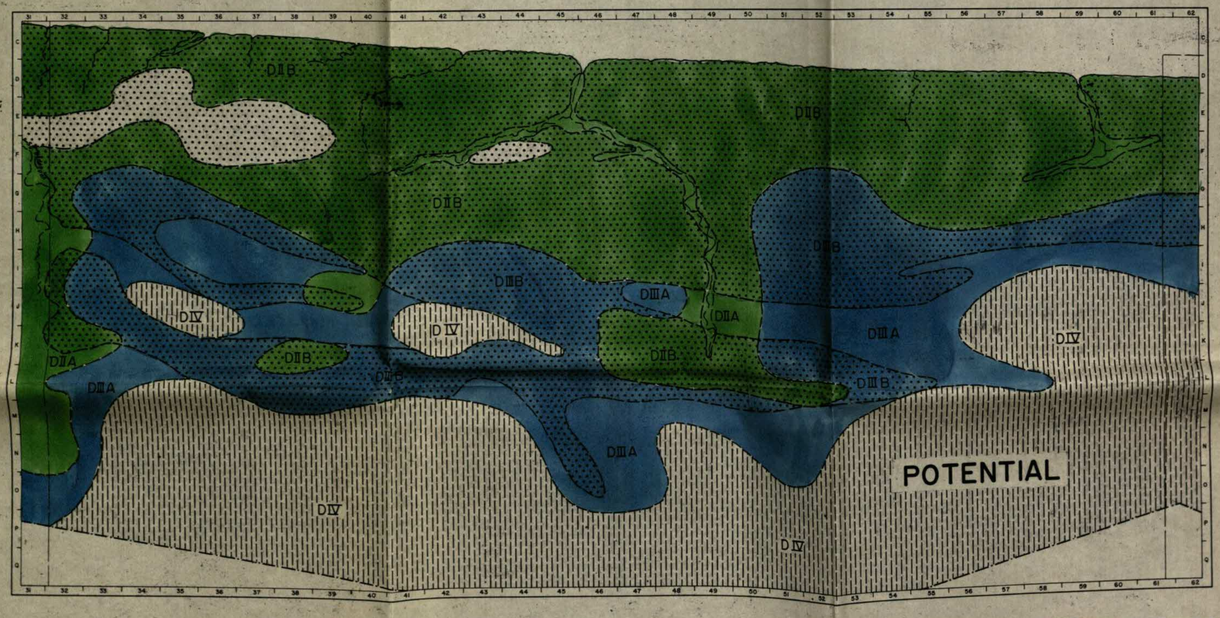


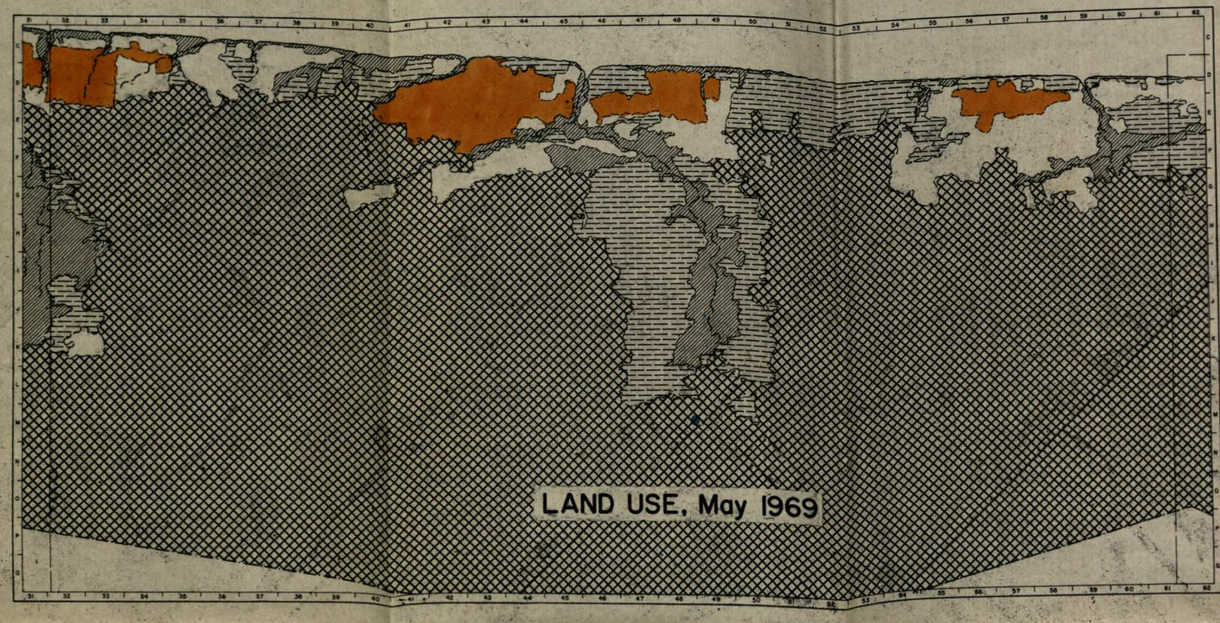
SECTION 2

BAYAN - BETONG



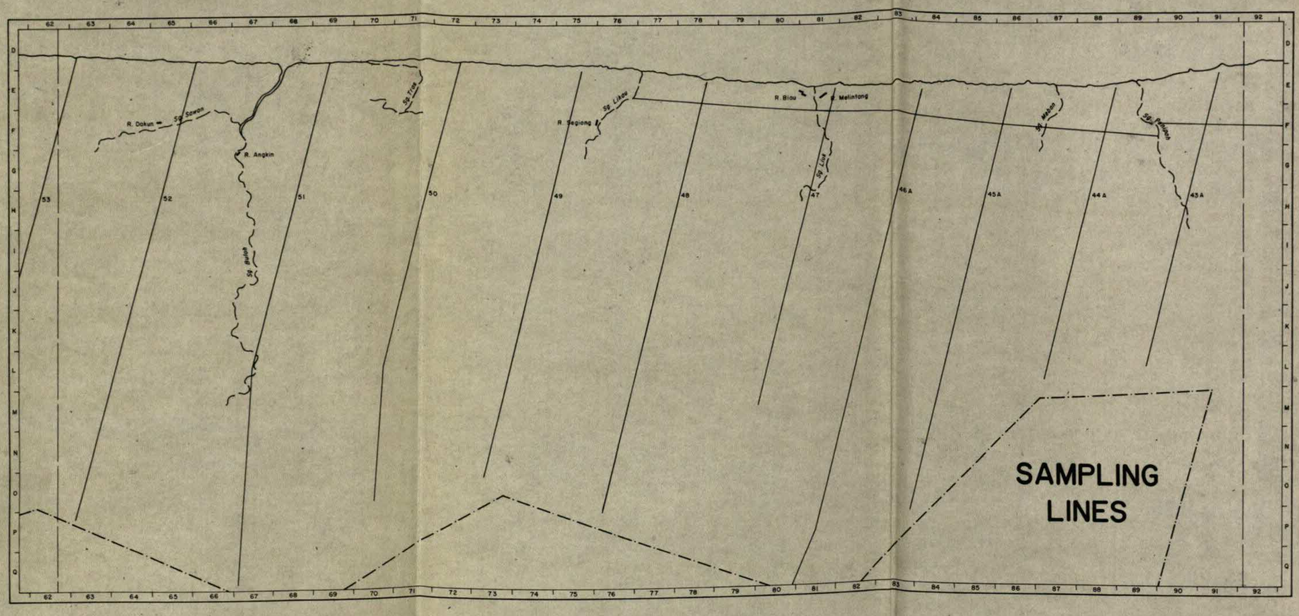


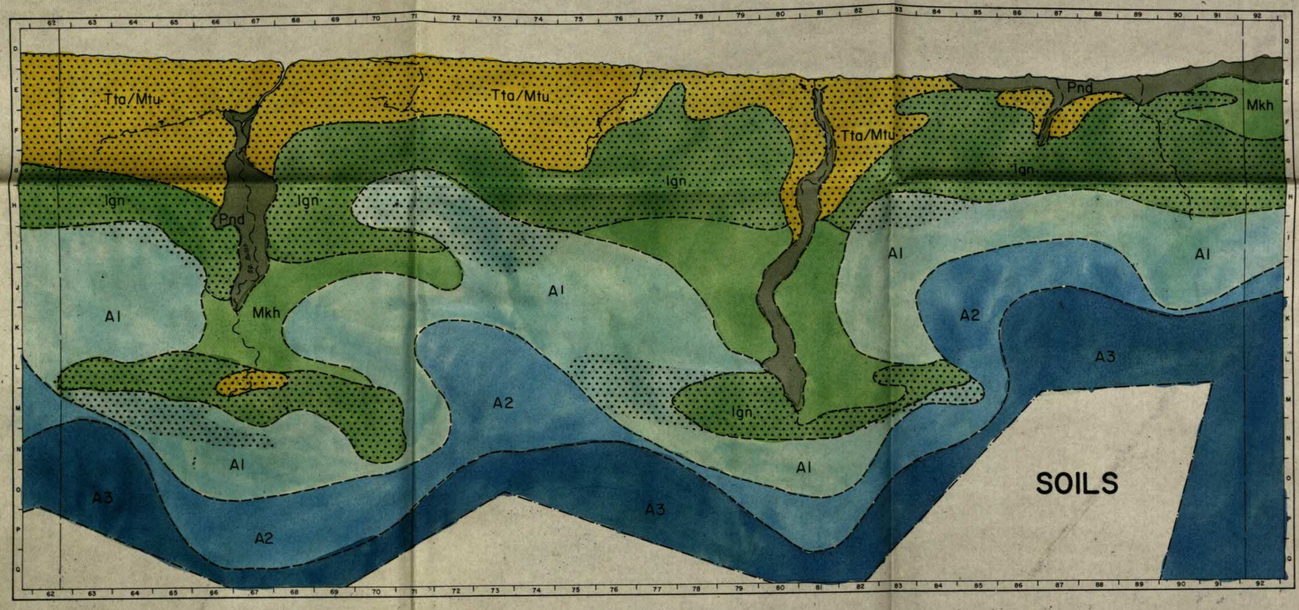


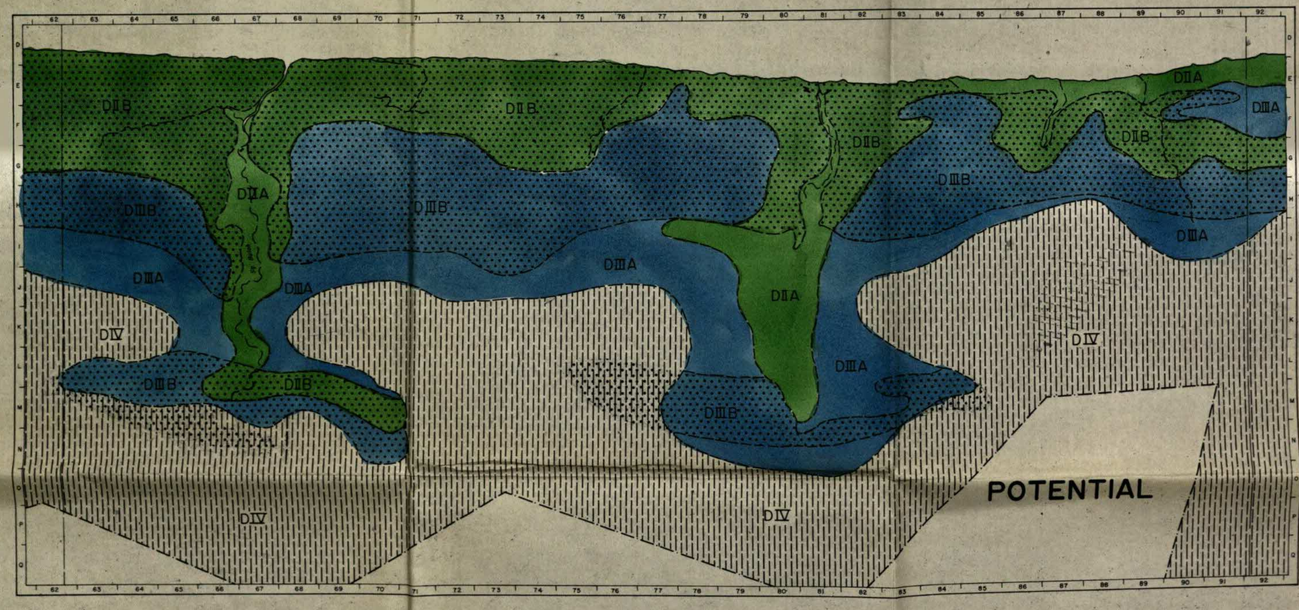


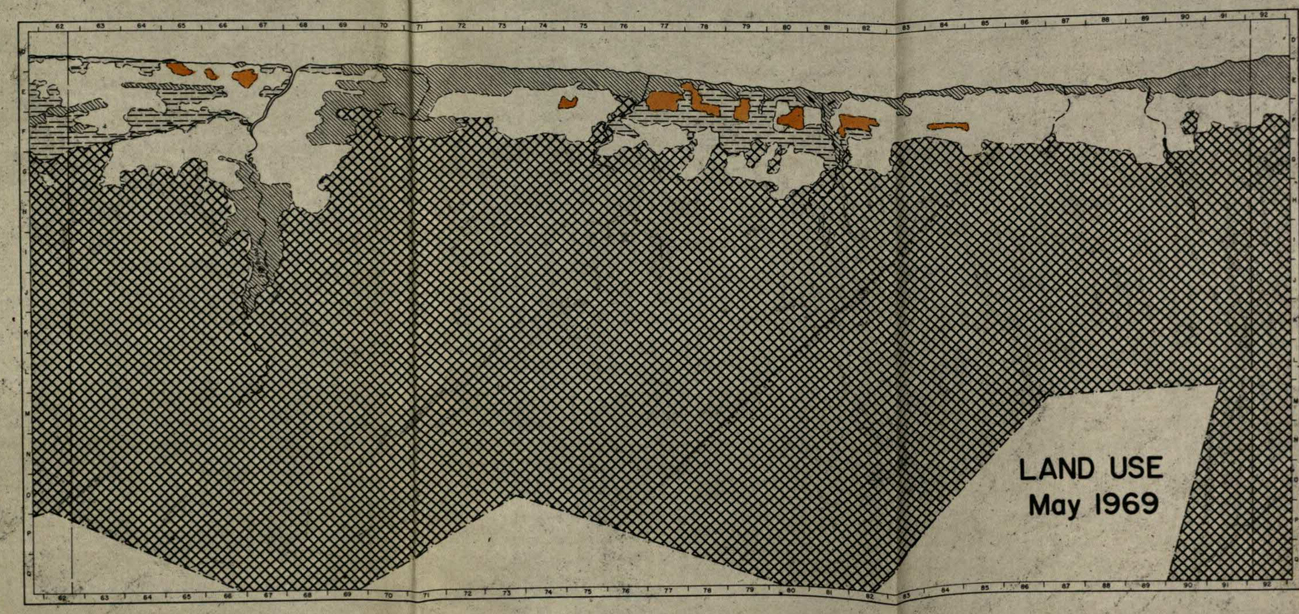
SECTION 3

BULOH - PENIPAH



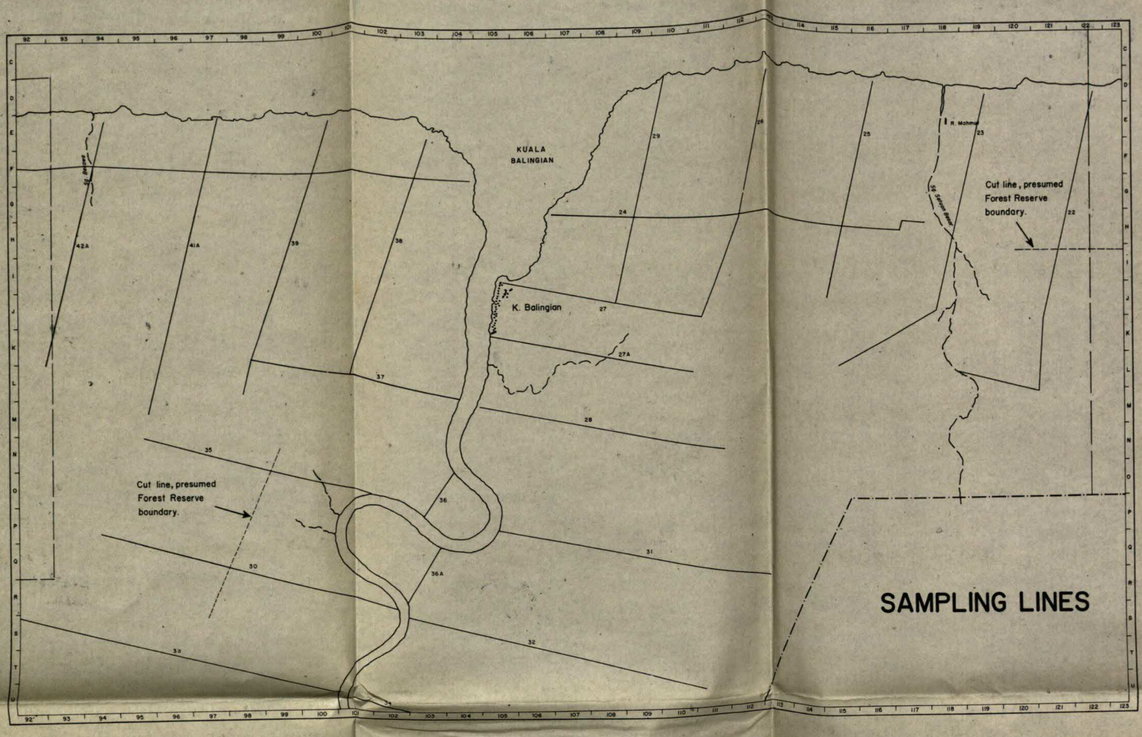




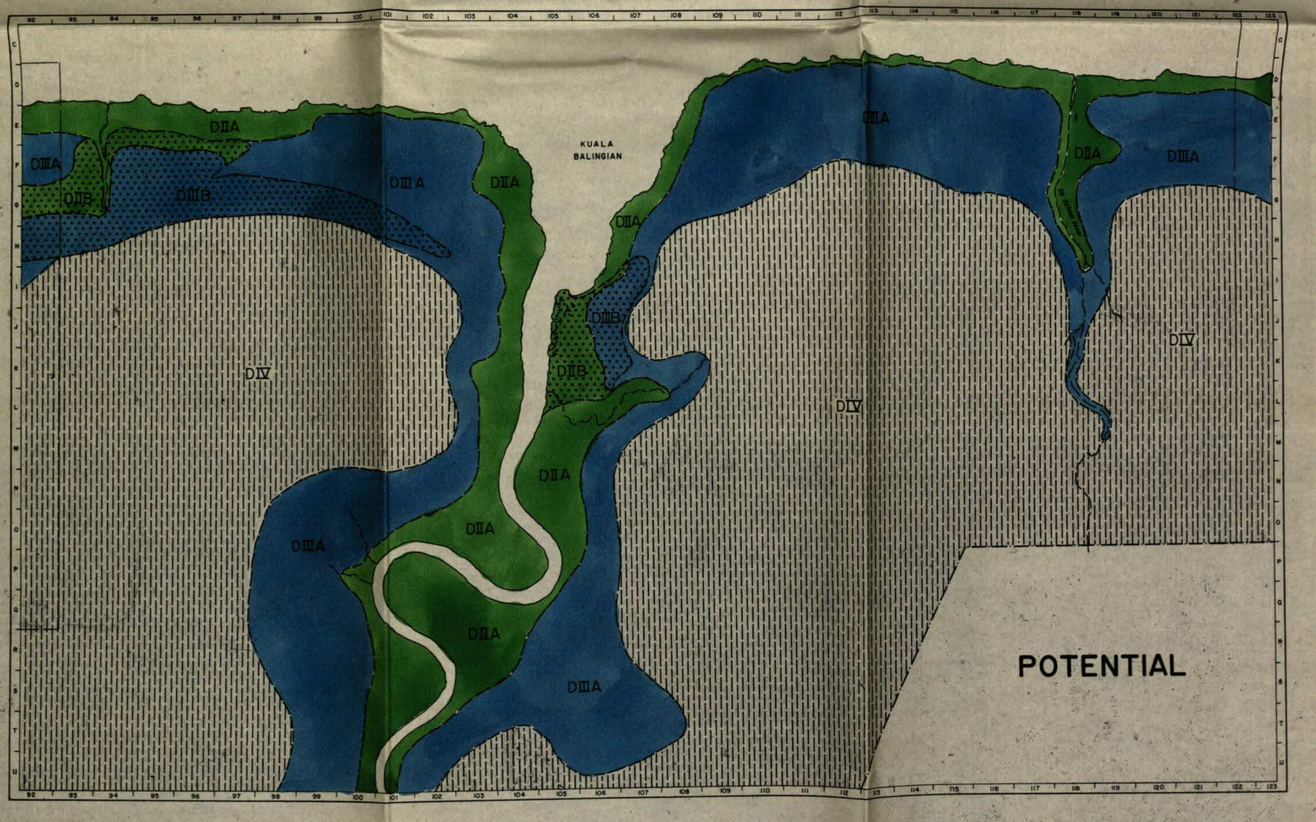


SECTION 4

BALINGIAN - SEVOAN




KUALA
BALINGIAN
Pnd
Mkh
Igh
A1
A2
A3
SOILS


KUALA
BALINGIAN
DIIA
DIIIA
DIIIB
DIV
POTENTIAL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LAND USE
May 1969

SECTION 5

SETEJOK - SARUPAI