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RAC-TP-320

APRIL 1969

Area Analysis for Counterinsurgent Operations: Selected Southeast Asian Areas (U)

by
David B. Doan
Ellen E. Kraus
Charles R. Lewis
Perry F. Narten

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FOREWORD

Area analysis, as a technique of investigating problems in military operations and presenting options for tactical decision, has evolved in many directions since its inception in the WWII era. Directions of development have largely reflected a response to the kinds of problems that have unfolded—conventional war, national surveys and strategic summaries, general war with potential nuclear battlefields, and, in the 1960's, the problems of unconventional warfare, the subject of this study. This report attempts to improve and update current area-analysis techniques by suggesting new and timely approaches to the problem of locating insurgent bases.

The authors were assisted by Mr. James R. Burns in their initial research; by Mr. Allen H. Nicol and Mrs. Mary E. McCusker, who respectively screened prisoner of war reports and abstracted part of the published intelligence data; and by Mrs. Janet G. Strong. The full cooperation of the Defense Intelligence Agency in providing consultation and information and of the Military Geology Branch, US Geological Survey, in providing access to their bibliographic files, is gratefully acknowledged. Helpful advice and information on soils were provided by the World Soil Geography Unit, Soil Conservation Service, Department of Agriculture, and by the US Army, Engineer Agency for Resource Inventories.

The research culminating in this report was supported in large part by the Advanced Research Projects Agency of the Department of Defense, but the final month of report preparation was supported solely by RAC.

John M. Breit
Acting Head, Unconventional Warfare Department

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SUMMARY

Problem

(C) To prepare an area analysis of selected Cambodian border areas in a form suitable for use in planning and conducting operations against insurgent bases.

Facts

(C) Area analyses for many specific types of military activities have been routinely produced by US agencies for many years. Systematic area analyses directed toward insurgent operations, however, have not been specifically addressed. The Advanced Research Projects Agency (ARPA), Project AGILE, recognized this deficiency and asked RAC to undertake development of area-analysis techniques for counterinsurgency purposes. This exploratory work was to cover specific Cambodian border areas (see Fig. 1).

Discussion

(C) The Cambodian border area selected for analysis was divided into three environmentally distinct sectors. For each sector, natural and cultural environmental factors that were deduced to be critical to insurgent base-area development were identified and analyzed on the basis of data available in the Washington, D. C., area. Selected insurgent activities, based on US intelligence documents, were analyzed in an attempt to identify environmental criteria evidently influencing the location of base areas. On the basis of these analyses, maps for each sector were constructed at 1:250,000 (and reduced for printing) to show the suitability of the environment for insurgent basing as well as to describe and evaluate the environmental factors that are critical to insurgent basing.

Results

(U) Three separate and distinct alternative methods of area analysis for counterinsurgent operations are presented. The analysis prepared for the Northern Sector represents an approach closely keyed to an existing tactical situation; the analysis for the Middle Sector develops quantitative relations between base locations and sustenance and cultural factors; the analysis of the Southern Sector reflects traditional methods of area analysis that draw heavily on deductive reasoning.

(U) The analytical procedures are generally believed applicable to similar environments elsewhere in Southeast Asia and in other parts of the world.

SUMMARY

(C) Fig. 1—Index Map of Study Areas

Area analysis for counterinsurgency operations, selected Southeast Asian Sectors.

Area Analysis
for Counterinsurgent Operations:
Selected Southeast Asian Areas

RAC

ABBREVIATIONS

AMS	Army Map Service
ARPA	Advanced Research Projects Agency
CIA	Central Intelligence Agency
DIA	Defense Intelligence Agency
DOD	Department of Defense
DOD/J2	Department of Defense Joint Intelligence Staff
FARK	Royal Cambodian Army Forces
IComZ	Insurgent Communications Zone
ITacZ	Insurgent Tactical Zone
LOC	lines of communication
NVN	North Vietnam
PAVN	People's Army of Vietnam (North Vietnam)
PW	prisoner of war
RVN	Republic of Vietnam (South Vietnam)
USARPAC(G2)	US Army Pacific (Intelligence Staff)
UTM	universal transverse mercator
VC	Viet Cong

INTRODUCTION

OBJECTIVE

(U) The principal objective of the research reported in this paper has been to develop new methods of area analysis that would be potentially useful in planning and conducting operations against insurgent activities, particularly in the location of their bases of operations. Analytical results were needed in the form of map graphics of medium scale.

BACKGROUND

(U) Area analysis, as the term is generally used in the US intelligence community, is a military geographic study of an area in which aspects of the environment such as relief, geology, soils, vegetation, and lines of communication (LOC) are first mapped and described and then interpreted and evaluated in terms of their effect on military activities; based on these findings, new maps are commonly synthesized that depict areal variations in the suitability of the environment for specific military activities. Subject matter ranges widely, and the number of environmental aspects necessary for a particular analysis may be more extensive than those listed. In the past most area analyses have been concerned with conventional military operations. Even existing military geographic studies aimed at unconventional warfare in Southeast Asia consist largely of evaluations of the environment for the more or less conventional military activities that are employed in counterinsurgent operations. The techniques of area analysis have not, however, been fully employed in terms of the general operating problems of the insurgent, the predictability of his operating constraints, and the advantages to friendly forces of knowing these beforehand.*

(U) In particular, area analysis has not been fully employed in terms of one of the most critical problems of insurgents—the development of secure bases. This problem exists at all levels of insurgency, whether the bases are needed for temporary meeting and encampment or for permanent logistical storage, training, equipping, and staging of operations. One way to cope with the insurgent is to locate and neutralize his bases. Area analysis offers a

*One exception is the application of area-analysis techniques to a significant military problem in Vietnam involving tunnel detection.[1]

potential means of narrowing the zones of search to areas in which insurgent bases have the highest probabilities of occurrence.

ASSUMPTIONS AND SCOPE

(U) This study is based on the following assumptions: (a) that a relation exists between insurgent operations and the physical and cultural environment within which these operations take place; (b) that in order to achieve their goals insurgents may use and depend on the environment in ways that differ significantly from those of conventional military operations; and (c) that area-analysis techniques can provide interpretations of the utility of the environment to the insurgent, particularly in regard to critical aspects such as basing.

(C) The entire Cambodian side of the border with the Republic of Vietnam (RVN) is treated in this study, except for a segment of approximately 110 km. The study area, mutually agreed on by ARPA-AGILE and the authors, was divided into three sectors of similar size (see Fig. 1). In order to derive alternative methodologies, each sector is treated more or less independently.

METHODOLOGY

(U) The area of study was selected to provide both a maximum range of variation of different environments in which insurgents were active and manageable area sizes for research purposes. From north to south the three sectors are: a sparsely populated, mountainous to hilly upland (Northern Sector); a moderately populated rolling tableland (Middle Sector); and heavily populated flat lowlands (Southern Sector).

(U) Although the methodological techniques used in defining the suitability of each sector for insurgent basing are distinct, the basic research methods were similar. Research was first directed to understanding and describing the environment in suitable terms and detail; then known insurgent activities were analyzed where possible to attempt to establish systematic and verifiable relations between specific activities and the environment; and finally the critical factors were synthesized to produce a map that describes the suitability of the environment for insurgent basing. The descriptive environmental analysis covers factors deduced to be directly or indirectly important to the problem. In this study slope, geology, geomorphology, soil, vegetation, drainage and water sources, population distribution, LOC, and land use were identified for map study. These factors have various degrees of importance in the three sectors, both in basic understanding of the area and in the determination of the final methodology. Maps of factors determined to be most significant to the understanding of the approach to the problem of a given sector are included.

(U) The analysis of insurgent activities was carried out independently for each of the three sectors; the analyses vary considerably among the sectors owing both to differences in the amount and type of insurgent-activities information available and the basic approaches that are used. Activities related specifically to insurgent basing were abstracted, categorized, plotted on 1:50,000 topographic maps, and compared with the environmental data.

(U) Based on these analyses, critical environmental aspects were identified and, where necessary to the particular methodology, were reduced to 1:250,000-scale maps. These various aspects were then synthesized into new maps that show the distribution of map units representing different degrees of environmental suitability for insurgent basing. All maps have been further reduced for printing.

USES AND LIMITATIONS

(U) The three map methodologies presented in this study are intended as alternative prototypes of maps for planning operations against insurgents. They indicate, as do all interpretative area-analysis maps, probabilities rather than certainties and are intended to be used in conjunction with, and in support of, timely political or tactical information. With this proviso they should be of significant aid in the allocation and conservation of surveillance and detection resources.

(C) These analytical procedures are believed applicable not only in Cambodia but in similar terrains elsewhere in Southeast Asia and other parts of the world.

(U) The final product for each sector approach is a map showing the suitability of the sector for insurgent basing. In addition, the supporting maps that depict basic environmental factors either provide interpretations or are easily interpreted for a number of conventional military operational needs. Such supplementary maps can be construed either to be a normal part of an area-analysis presentation or a working step toward a specific map. In these prototype studies they are judged necessary both for documentation purposes and to serve as data sources from which new basing maps can be readily prepared as criteria change or are found to be in error.

(U) As in most area-analysis studies it should be recognized that all maps presented are in themselves the end result of a series of interpretations and judgments, so that the accuracy of a specific factor at a given point is consistent with map scale and source information. However, because much of the basic information on both insurgent activity and environmental factors was first compiled at scales of 1:40,000 and 1:50,000 before reduction to the report scale, the maps are believed generally reliable for the purposes intended.

DATA SOURCES

(U) The research described in this report is based on information sources available in the Washington, D. C., area. Basic data on the physical and cultural environments were obtained from both published and unpublished sources, and the research included extensive use of air photos (made in 1957–1958) supplemented by recent topographic maps. Air-photo interpretation was a major data source for mapping of the physical-environmental topics. Most information on insurgent use of terrain and insurgent activities came from intelligence reports of various elements of the Department of Defense (DOD) and their contractors and of the Central Intelligence Agency (CIA). These were supplemented by prisoner of war (PW) interrogation reports and published information from US newspapers and periodicals.

Section I

AREA ANALYSIS: NORTHERN SECTOR*

INTRODUCTION

(C) The objective of this section is the development of new techniques and formats in area analysis showing the effects of the physical and cultural environment on insurgent forces, activities, and organization where the insurgents operate from political sanctuary on the Cambodian side of the Cambodia–RVN border. Specifically, the new area-analysis methods are intended to evaluate known insurgent activity, in terms of environmental constraints on operations, for purposes of preparing regional map analyses depicting the suitability for insurgent basing in reasonably detailed resolution. It is believed that such maps might be of material assistance in the allocation of detection and surveillance resources by narrowing significantly the areas of search, or at least enabling the assignment of priorities according to the probability of success in detection of new insurgent activities. Furthermore the study provides other information useful in planning countermeasures against all insurgent activities in the areas involved.

(C) The phrase "political sanctuary" is taken in this study to mean areas of insurgent operations contributing to the war in the RVN but located on the Cambodian side of the border within the territory of a self-proclaimed neutral country and thus out of reach of offensive action by regular forces of the RVN or the US. The term does not necessarily imply that any aid or approval is extended to the insurgents as a matter of policy by the host country or that, in principle, the insurgents are not a palpable threat to the host country. Thus the term "host" is used not in the social but in the biological sense, in which an organism becomes a host for parasites that may or may not destroy it. For purposes of this study, consequently, it is assumed that communist insurgents operating in Cambodia have reason on principle to disguise their bases and activities from both the government of the host country and US/RVN forces across the border and that any arrangements between insurgents and Cambodians involving tolerance or support are not a matter of Cambodian national intentions but rather the result of local negotiations between individuals.

(C) The underlying assumption of this study is that a relation exists between the organization of insurgent forces, bases, and operations and the almost

*By David B. Doan and Ellen E. Kraus.

infinitely varied physical and cultural environment, whether in the RVN or across the border in the Cambodian sanctuary. The relation between operations (particularly basing) and environment may be complex, but it is believed not to be hopelessly obscure; thus an appropriate sequence of analysis and careful extrapolation in the light of insurgent operational realities should sufficiently expose the relation. Large areas can then be analyzed to determine their suitability for insurgent basing in terms of highly localized variations depicted by finely divided map units. In order to do this, the environment itself must be systematically describable in highly resolved parametric terms, whose usefulness depends on their ability to describe what the insurgent thinks he sees around him as he explores and plans. In simpler words, an environmental analysis must be very refined or it will be virtually useless.

(U) The most productive techniques of investigation involve determination of the entire physical surroundings: geology, relief, slopes, quantitative topography, drainage, soils, microrelief, vegetation, and climate. Systematically determined and mapped in terms of independently verifiable parameters, these characteristics can be manipulated by reduction to the simplest composite expressions of topical combinations to produce environmental map units relating to the problem at hand—in this case the suitability for insurgent basing. The characteristics and distribution of people in the area of study must also be considered, as well as their interaction with, and exploitation of, the environment, especially agriculture and water-supply development.

(C) The approach used in the Northern Sector study is based on accepted techniques of environmental analysis but differs somewhat from them in what is believed to be a new format for the application of these techniques applied to the analysis of insurgent-basing suitability.

(C) The Northern Sector comprises approximately 7050 sq km, for which mapping-quality vertical air photography was used throughout for study of geology, soils, and vegetation.[2] Although obtained in 1957 and 1958, this 6-in.-focal-length high-quality coverage enables regional comparisons that would be much more difficult with larger-scale reconnaissance photography of greater focal length. US Army Map Service (AMS) 1:50,000-scale Series 7011, 7014, 7015, and 7016 maps were used for principal plotting and compilation of working drafts after photoanalysis at 1:40,000 and supplementary analysis on AMS 1:25,000-scale Series 8020 Pictomaps.[3] Plotting of insurgent activities was on the 1:50,000-scale maps. Reductions of all information were initially made to 1:250,000 scale as overlays on Joint Operations Graphic (Ground) Series 1501 sheets ND 48-8, ND 48-12, and ND 48-16, also published by AMS.[4]

DESCRIPTION OF AREA

General

(C) The Northern Sector, an extension of the Central Highlands of RVN, represents the northeast corner of the Kingdom of Cambodia (see Fig. 1). Its northernmost point is approximately 14° 42′ N and it extends south to 12° 50′ N. West to east it extends from roughly 106° 50′ E to 107° 38′ E, but not all the area between these coordinates is considered. Actual limits commence on the

north with the Laos–Cambodia–RVN triple-border point, westward along the Laos–Cambodia border to universal transverse mercator (UTM) grid coordinates YB425019, thence south to YA413600, west to YA1060, south to YV1080, east to YV6080, south to YV6020, and east to YV761200 intercepting the Cambodian border with RVN. Maximum dimensions are 205 km north–south and 75 km east–west.

(C) The area is a hilly to mountainous upland, displaying mostly undulating to steep and sharply dissected topography except where cut by two major rivers, the Tonle San in the north and the Tonle Srepok in the south, both originating eastward in the Central Highlands of RVN and flowing westward across the study area to the Mekong. They reach confluence east of Stung Treng, flow 30 km west to confluence with the Tonle Kong at Stung Treng, and then 2 or 3 km further to discharge into the Mekong. These rivers are navigable to fairly large motorized rivercraft (30 to 40 ft long) most of the year, from the Mekong all the way upstream into the study area, where rapids require portage or transshipment for heavily loaded craft. These large rivers are fed by numbers of smaller streams, many of them perennial in their lower reaches but intermittent or ephemeral in their upper reaches in the higher land. The Tonle San forms the border with the RVN for a distance of about 15 km in the area west of Duc Co.

(C) The principal axis of land transportation through the area is Route 19, originating on the RVN coast at Qui Nhon and extending westward through An Tuc, Pleiku, and Duc Co to the Cambodian border. There it changes from an all-weather road to a loose-surface seasonally poor road, extending westward through a number of small villages to Ba Kev (Bo Kheo), a town with an airfield, westward to Bung Lung, which also has an airfield, and then beyond the study area to Stung Treng, roughly 100 km away. Route 15 stretches from Bung Lung northwest about 30 km to Virachey, a town with an airfield on the Tonle San River just west of the study area. Finally, an unnumbered spur road from Bung Lung extends about 25 km south to Lomphat, a town with an airfield in the southwest corner of the area. Other poorer roads and trails are sparsely distributed within the area, particularly the central part, where the geology has provided good agricultural possibilities and the inhabitants practice rai (slash and burn) cultivation on the deep volcanic soils. All in all, the area is remote, not easily accessible, but agriculturally productive enough to support a few scattered villages in the central part between the two main rivers.

Climate

(C) The Northern Sector has a tropical climate with alternating rainy and dry seasons. The rainy season usually begins in April or May with the wet air masses of the Southwest Monsoon, reaches a peak in August, and then decreases rather rapidly in October and November, at which time the dry season begins with the onset of the Northeast Monsoon. Long-term meteorological stations are nonexistent within the study area, but Virachey, 15 km west of the area on the Tonle San River, may expect approximately 100 in. of rain per year. Total precipitation for most points in the sector is probably a function of elevation, with the greatest amounts in the dense rain forests of the mountainous northern parts. Streams rising in these areas feed the lower-lying rivers rapidly enough

that the rise and fall of river water levels respond quickly to seasonal changes in precipitation.

(U) Reliable numerical temperature data are not available for specific points within the area, but in general maximum temperatures are probably in the 90's during the summer (Southwest Monsoon) and may be as low as 60° F in the winter (Northeast Monsoon), particularly in the mountains.[5]

Geology

(C) Fundamental to any understanding of the physical environment of an area such as the Northern Sector is a detailed study of the regional and local geology, which controls or influences everything else except, perhaps, climate. Previous work[6] was too generalized for adequate planimetric control, so that the geology of the Northern Sector was analyzed and interpreted from 1:40,000-scale air photos of topographic mapping quality, with compilation at 1:50,000. Reference was made to the 1:500,000-scale geologic map, Khong (East), for guidance as to the distribution of lithologic units, but much of the information on this map is 35 years old and reflects the difficulty of systematic field investigation in 1930. The structure and lithology are considerably more complex than suggested on this only published reference.[6] Results of this study are contained in Fig. I-1. Notable are the possible tuffs (unit 2), which may not have been recognized heretofore; the several episodes of effusion of felsitic extrusives (unit R) in the southernmost part of the sector; and the pronounced northeast–southwest structures in the northwest part of the sector just south of the Tonle Srepok River, which are so complex that no analysis of individual fault traces or displacements has been attempted for the time being. Also the schists (unit S) seem in general to overlie the granites (unit G), a point that is certainly not clear from previous work.

(C) The dominant geological features of the area are the large extrusions of basalt flows and associated fragmental rocks, probably Pliocene and Pleistocene in age, that occupy the central part of the Northern Sector and have probably diverted the Tonle San River significantly from its previous course to its present northward arc around the basalts as it flows eastward toward Stung Treng. These basalts and pyroclastics have weathered to the deep latosol and regur soils of high agricultural potential, which are abruptly different and significantly better for upland or dry-crop farming than any other soil in the area. Also noteworthy are the numerous vertically displaced geologic structures that have caused some blocks or masses of sharp topographic relief in the border areas.

Slopes

(U) Slopes (see Fig. I-2) were analyzed on AMS 1:50,000-scale topographic maps. Slope classes selected for delineation were 0 to 5 percent, 5 to 20 percent, 20 to 45 percent, and 45 or more percent. The results of this analysis depict the relief and topographic relations rather sensitively. For purposes of the existing requirement for presentation at 1:250,000 scale, the third and fourth slope categories are necessarily combined. The 1:50,000-scale stable-base overlay information was reduced by photographic methods and recompiled on 1:250,000-scale stable base, resulting in an accurate high-resolution information base for adjustment and compilation of other topical information.

(U) It should be noted that slope is not elevation, and inspection of the slope map does not afford much idea of hypsometry, or measures of relative elevation above sea level. The slope map does show areas of comparative relief—the greater slopes being greater obstacles to foot movement, transportation, road and trail construction, and any other operations involving work against gravity. Slope influences the choice of direction, the exact route for truck trails, and the moving of artillery and heavy equipment on the surface of the ground. Foot trails and locations of commo-liaison stations are conspicuously slope-constrained in several parts of the Northern Sector. Finally, slope is a major factor in soil development and a detailed slope map provides much information critical to the mapping of soils.

Soils

(C) Soils (see Fig. I-3) were analyzed according to geology/slope relations with considerable reference to Crocker's reconnaissance survey shown on 1:1,000,000-scale maps.[7] Crocker had adequate geologic information for only a very generalized analysis utilizing great soil group and subgroup divisions. These divisions have largely been retained in this study, but delineated in greater detail. Tentative estimates (see Table I-1) have been made to categorize the soil units according to the US Army Corps of Engineers Unified Soil Classification System. Generalized relations of groundwater, vegetation, and agricultural potential are included in Table I-1 for further development in combination with certain aspects of insurgent operations.

(C) The soils map of the Northern Sector shows that very little of the entire area is suitable for wetland rice cultivation in contrast to the broad areas of rice culture in the lower lands associated with downstream reaches of the Mekong, or even the broad basins upstream in Northeast Thailand. Although accessible to early migration through the valleys of the Tonle San and Tonle Srepak, the area under study may never have been attractive to cultures depending on rice, a fact that has had notable effect on present demography.

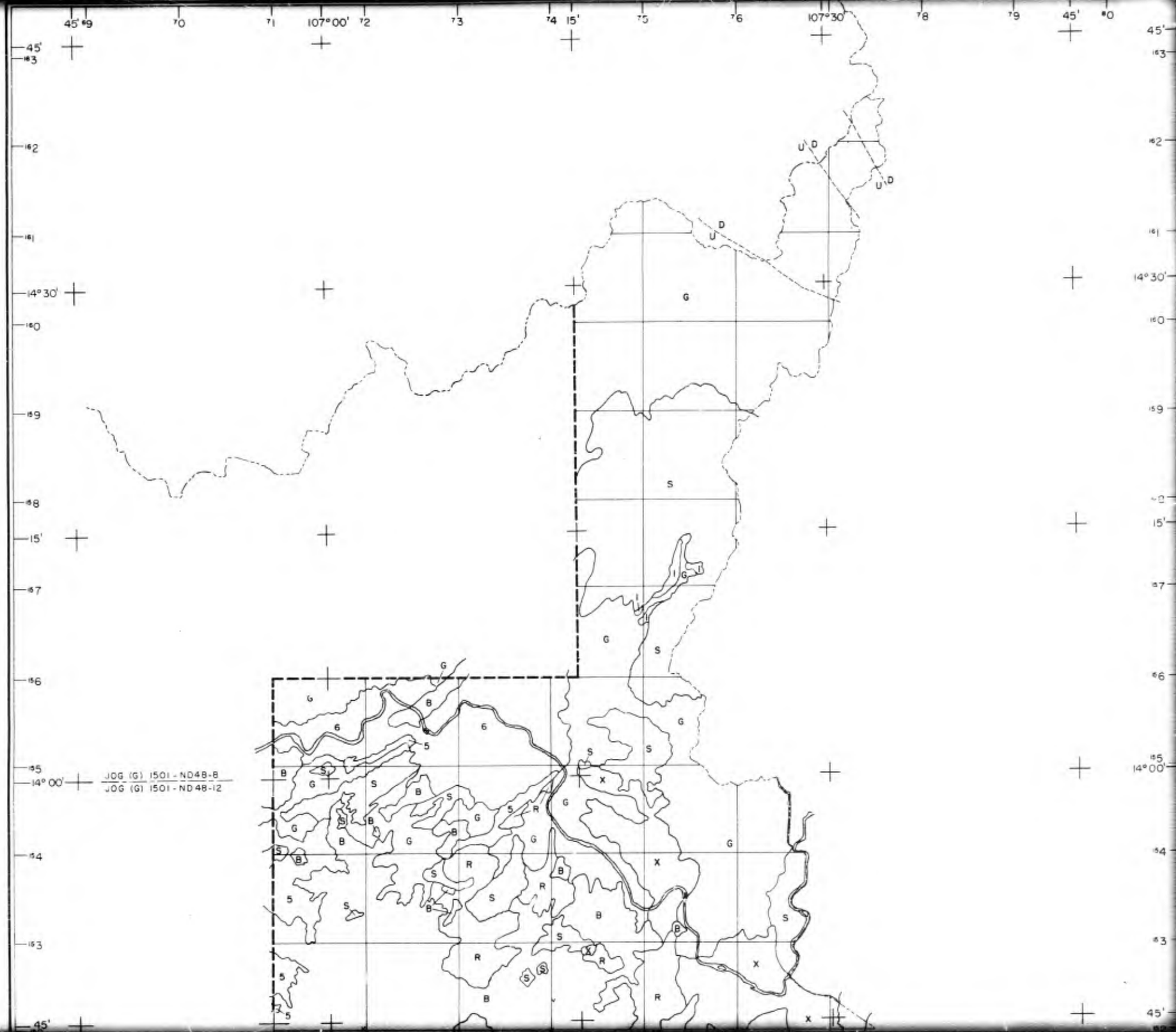
Vegetation

(C) Vegetation (see Fig. I-4) was interpreted largely from the AMS 1:50,000-scale topographic maps and locally updated by a study of the 1:25,000 Pictomaps[3] in combination with the soils map, primarily to make changes in cultivation sites.

(U) Vegetation unit groupings are oriented toward their utility for concealment. Because of the fact that cultivation proceeds at the expense of dense forest stands and because 1966-1967 insurgent operations may have modified vegetation in places, the vegetation map is necessarily obsolescent until up-to-date photography can be analyzed, which was not envisioned as part of the present study.

Demography

(C) The total permanent-resident population of the Northern Sector is not known, but the reported population density is very low[8]—less than 13 people/sq km in contrast to densities of greater than 200 per sq km in the Phnom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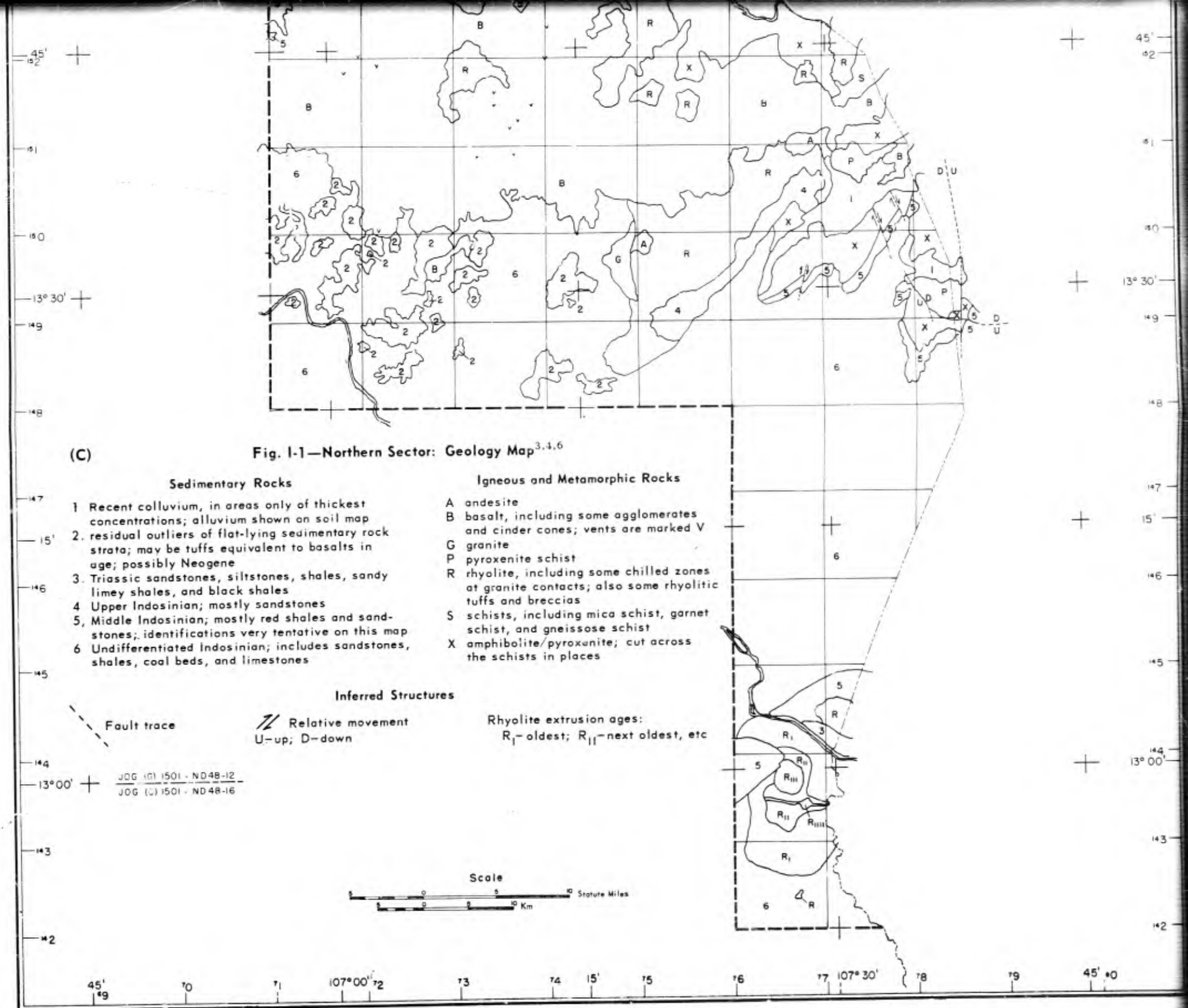


(C)

Fig. I-1—Northern Sector: Geology Map[3,4,6]

Sedimentary Rocks

1 Recent colluvium, in areas only of thickest concentrations; alluvium shown on soil map
2. residual outliers of flat-lying sedimentary rock strata; may be tuffs equivalent to basalts in age; possibly Neogene
3. Triassic sandstones, siltstones, shales, sandy limey shales, and black shales
4 Upper Indosinian; mostly sandstones
5, Middle Indosinian; mostly red shales and sandstones;. identifications very tentative on this map
6 Undifferentiated Indosinian; includes sandstones, shales, coal beds, and limestones

Igneous and Metamorphic Rocks

A andesite
B basalt, including some agglomerates and cinder cones; vents are marked V
G granite
P pyroxenite schist
R rhyolite, including some chilled zones at granite contacts; also some rhyolitic tuffs and breccias
S schists, including mica schist, garnet schist, and gneissose schist
X amphibolite/pyroxenite; cut across the schists in places

Inferred Structures

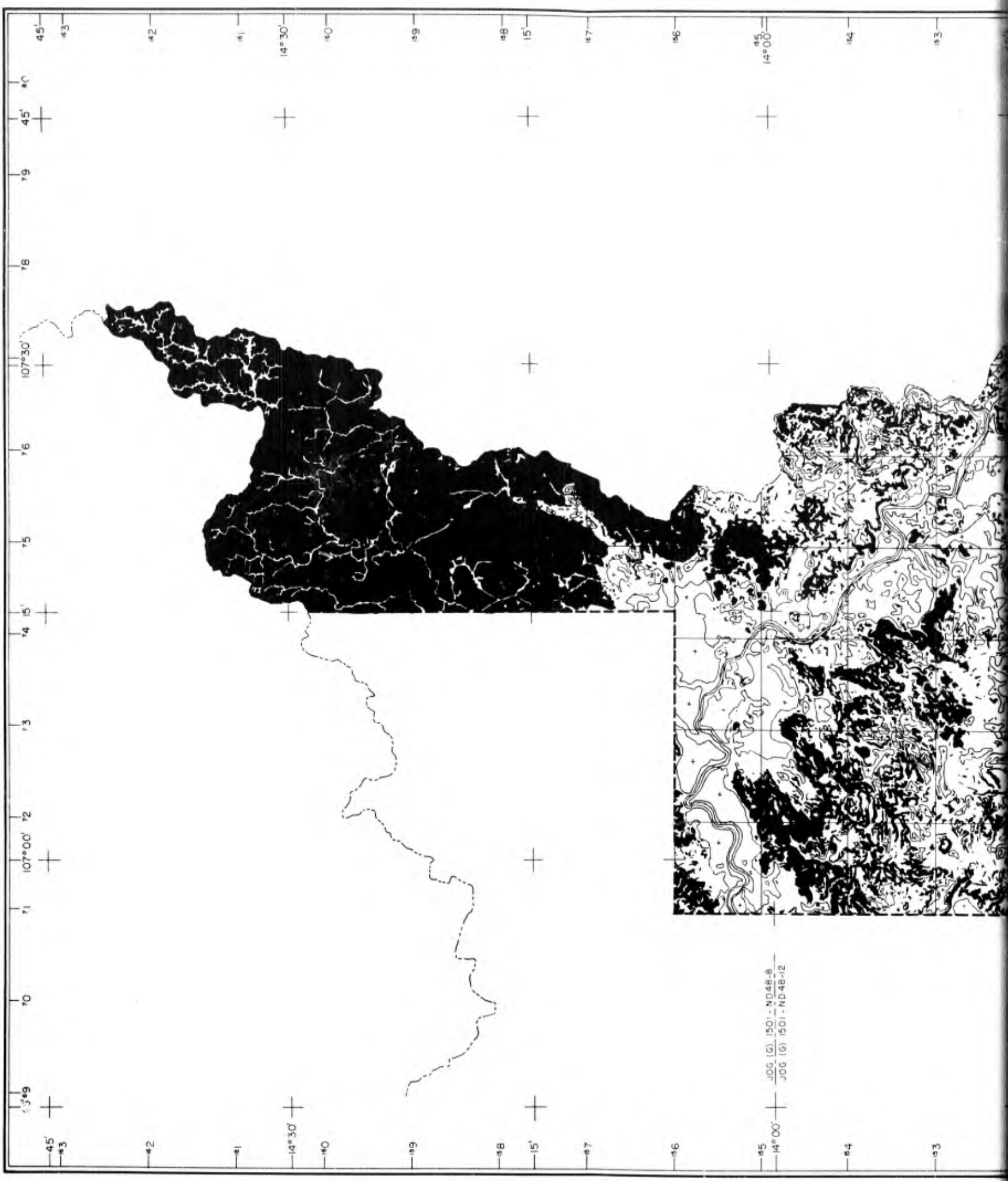
Fault trace

Relative movement
U–up; D–down

Rhyolite extrusion ages:
R_I – oldest; R_{II} – next oldest, etc

JOG (C) 1501 - ND48-12
JOG (C) 1501 - ND48-16

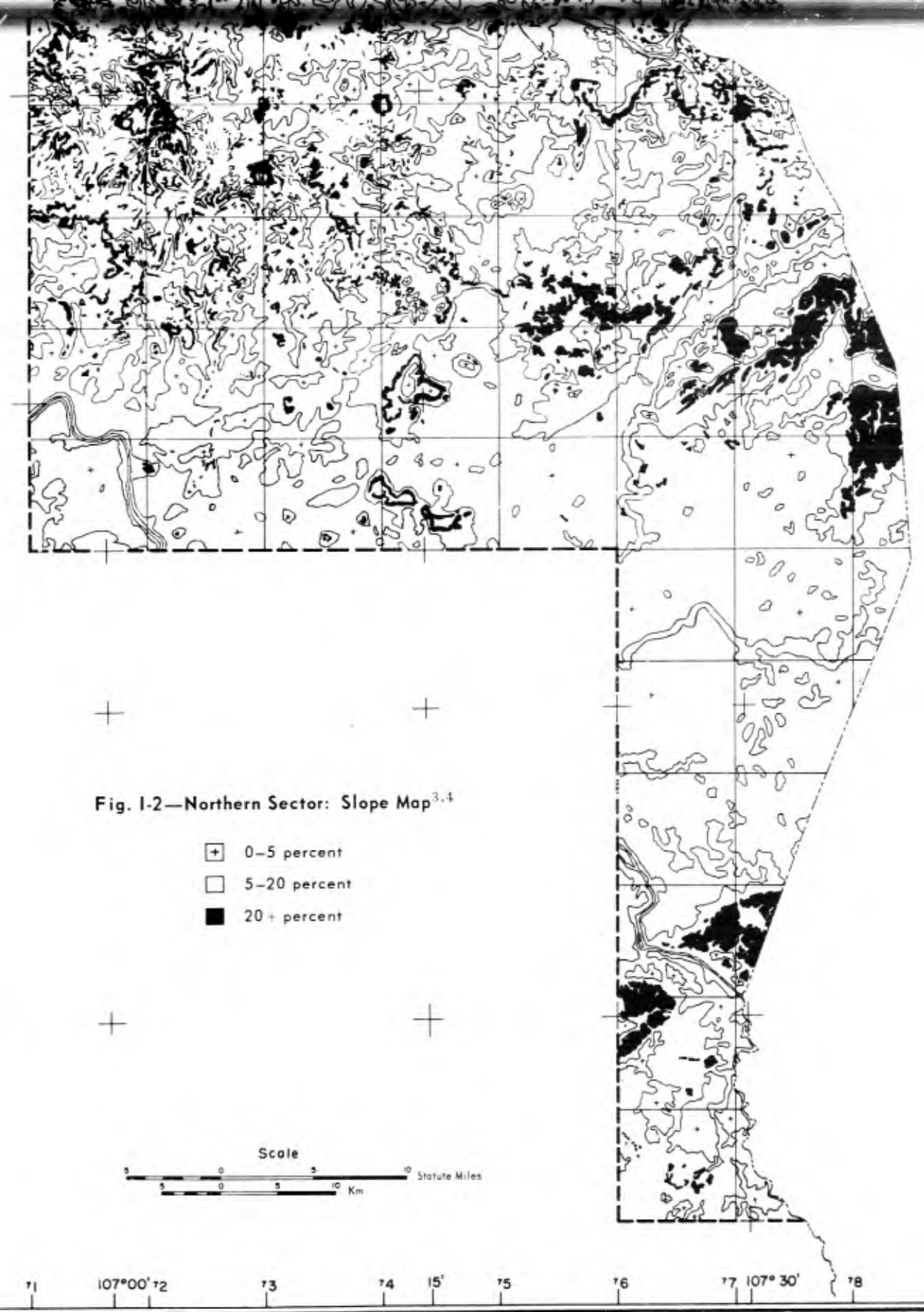
Scale
Statute Miles
Km

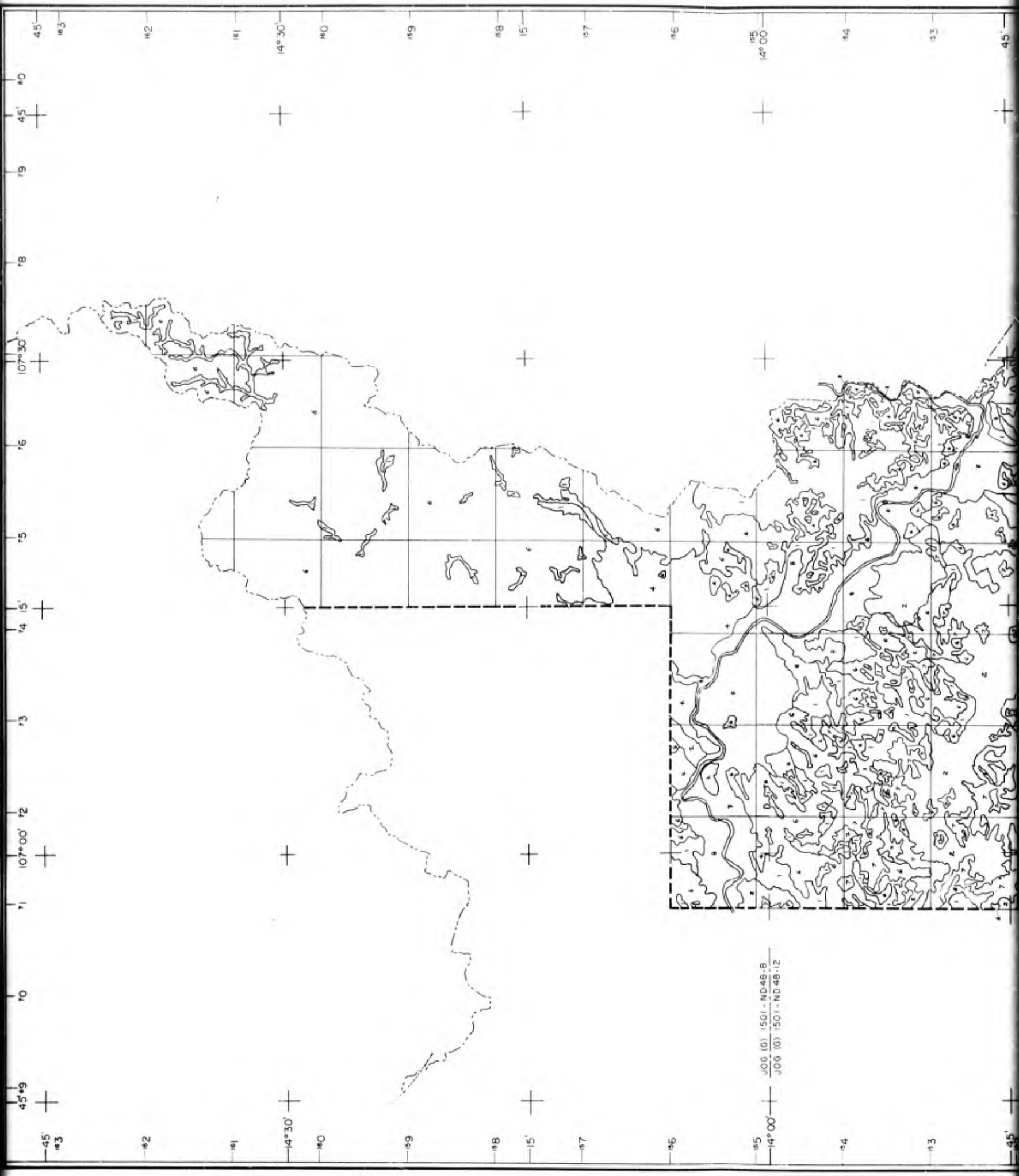


1

(C)

Fig. I-2—Northern Sector: Slope Map[3,4]

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(C)

Fig. 1-3—Northern Sector: Soils Map[4,7]

1 red-yellow podzols
2 latosols
3 plinthite podzols
4 gray hydromorphics
5 regurs
6 acid lithosols
7 basic lithosols
8 alluvium

JOG (G) 1501 - ND 48-12
JOG (G) 1501 - ND 48-16

Scale
5 0 5 10 Statute Miles
5 0 5 10 Km

TABLE I-1

Northern Sector: Soil Characteristics

(Keyed to Fig. I-3)

Map unit	Soil order	Suborder	Great soil group	Description	Source materials[a]	Approximate profile thickness, cm	Consistency	pH	C
1	Zonal Pedalfers: pedologically mature or normal soils formed under humid climatic conditions or conditions conducive to sesquioxide accumulations	Lateritic: of forested warm-temperature and tropical regions	Red-yellow podzols	Acid soils with leached A horizons and alluvial B horizons of variegated red, yellow, and/or gray clay accumulations	Unit 1	40–300; more in a few places	Hard when dry, friable when moist	4.2–5.8	Loa loa pla
2			Latosols	Deeply weathered, uniformly leached, acid soils of fairly uniform characteristics throughout the profile in depth	Unit B	30 to more than 330; rarely as much as 3000 where weathering has penetrated deeply	Hard when dry, friable when moist, sticky when wet	5.5–6.8	Silty
3	Intrazonal Pedologically immature or partially developed soils in a formative stage in a group of factors has dominated the morphological development and the resulting characteristics of the soil profile	Hydromorphic: of marshes, swamps, and flats; soils that are influenced by either a high permanent, a fluctuating high and low (rainy season high, dry season low) or a near-surface groundwater table	Plinthite podzols	Soils with pronounced accumulations of ferruginous-bauxitic concretions at depths varying markedly with erosion and texture of original profile materials, which are formed under marked fluctuation of the groundwater table resulting from pronounced dry–rainy season moisture variations	Mainly unit 6	25–120 for upper part; plus lower zone 30 to possibly 500	Upper part loose when dry or moist; lower zone plastic until exposed, then becomes hard	4.2–5.8	San ma cr sa cl
4			Gray hydromorphics	Soils with fluctuating water table at or near the surface most of the year; they have a shallow gray surface horizon over heavy-textured, mottled gray, red, and yellow clayey substrata	Probably all units, but mostly same as for soil unit 6	30 to probably 1500	Firm to friable when moist; sticky when wet	4.0–5.7	Silt cl c
5			Regurs	Very dark gray-brown to black, young, shallow clays overlaying partially weathered basic parent material; occur on colluvial outwash materials from basalt, with some basalt boulders occurring in and on the soil profile	Unit 2	30–300	Hard when dry, firm when moist, plastic when wet	5.2–8.0	Sil g c s
6	Azonal Pedologically new, young, or formative soils in initial stages of formation, in which the geologic and physiographic factors are the predominant characteristics of the soil; and soils in which the pedologic profile development processes are not significant	—	Acid lithosols	"Rock soils," or those composed of shallow mantles of weathering material over unweathered rock, resulting from erosion removal of soil materials as rapidly as these materials are developed from rock decomposition; occur on acidic source rock such as granite, sandstone, shale, etc	Units 1, 3, 4, 5, R, A, G, X, P, S	5–30; many deeper pockets	Generally loose or friable	4.5–6.5	Gr s l v
7			Basic lithosols	Stony soils derived from basalt or other basic igneous rocks; other comments on profile and weathering same as for unit 6	Unit B	0–50; some deeper pockets	Hard when dry, friable when moist, some material plastic when wet	6.5–8.0	C
8			Alluvium	Geologically recent deposits of water-transported sediment in which processes of soil formation have not yet produced significant horizon differentiation; profile differences are the result of primary textural stratification	All units, but dominantly same as for soil unit 6	0–2000 (?)	Friable when dry, firm when moist, slightly sticky to plastic when wet	4.5–6.5	M

[a]See Fig. I-1.

TABLE I-1

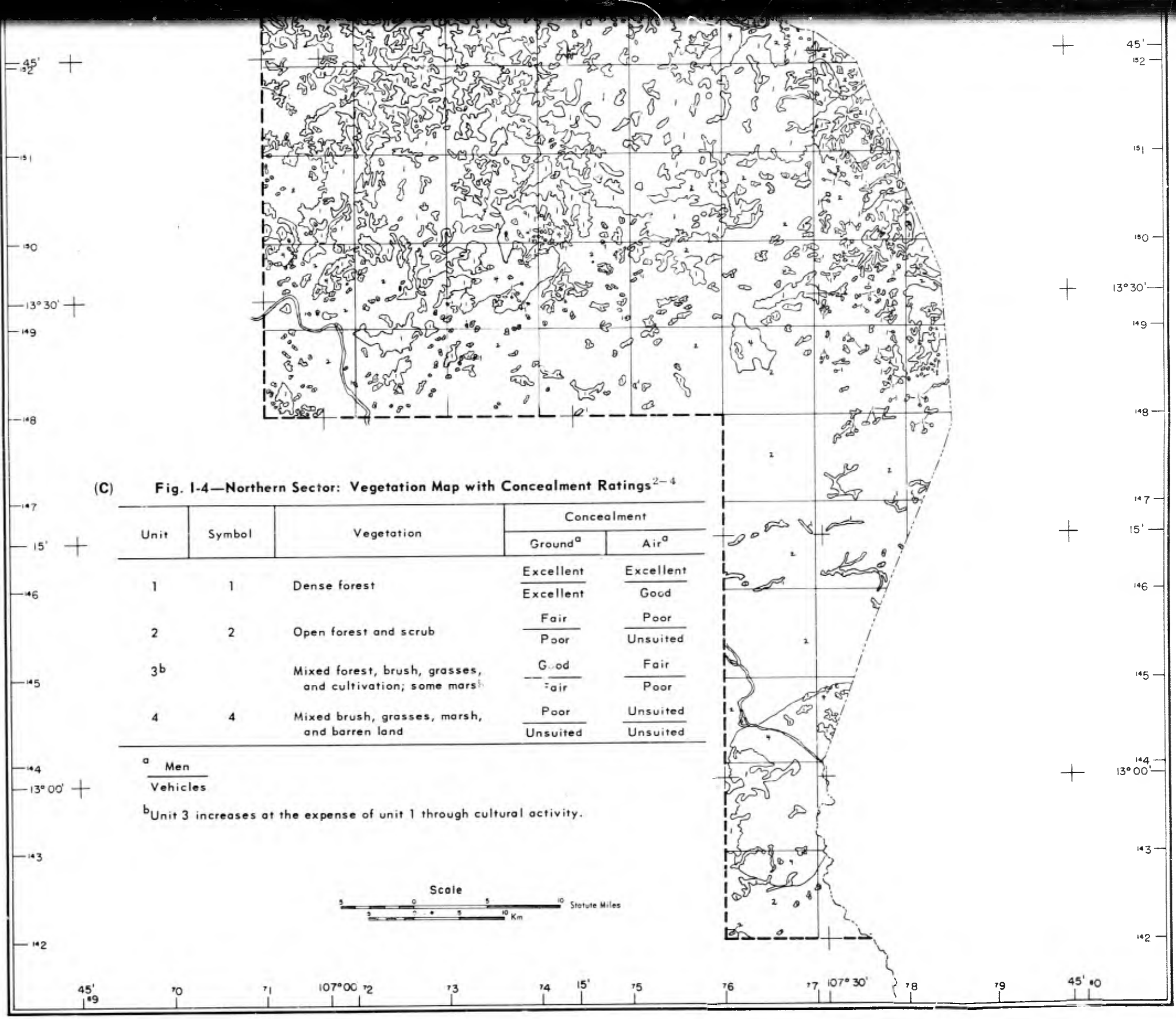
hern Sector: Soil Characteristics

(Keyed to Fig. I-3)

roximate rofile ness, cm	Consistency	pH	Composition	Estimated engineer type	Slope range, %	Estimated seasonal depth to water table, m		Drainage		Vegetation	Agricultural suitability
						Wet	Dry	Internal	Surficial		
00; more few es	Hard when dry, friable when moist	4.2–5.8	Loamy sand, sandy loam; clayey in places	SC-CL	0–20	1–2	May be below profile	Good near surface	Generally little or none	Mixed forest stands; rubber, tobacco, vegetables, minor rice farming	Fair to poor; low natural fertility
more than rarely as h as 3000 re weath- g has etrated ply	Hard when dry, friable when moist, sticky when wet	5.5–6.8	Silty clay loam	CL-ML	0–20	1–3	3-deep	Good	Generally none	Mixed tropical forest; rubber plantations; much rai cultivation; grassland where burned	Good; very high potential if fertilized
20 for r part; lower 30 to ibly 500	Upper part loose when dry or moist; lower zone plastic until exposed, then becomes hard	4.2–5.8	Sandy loam with many iron concretions; also sandy clay and clay	SC-CL/CH	Mostly 0–20; 20–45 in a few places	0–1	Very deep	Poor; little or no effective downward percolation for groundwater recharge	May be considerable in wet season, with accompanying erosion	Generally grasses, scrub; in places a poor open-forest wilderness, frequently burned over	Poor; very limited potential even with extensive care
probably 0	Firm to friable when moist; sticky when wet	4.0–5.7	Silty clay loam; clay and sandy clay	ML-CL/MH	0–5	At surface	0.5–1	Poor; soils moist much or most of year	Very slow	Good mixed tropical forest; some paddy and upland subsistence crops	Fair; potential good for paddy; good for dry-crop farming if treated
00	Hard when dry, firm when moist, plastic when wet	5.2–8.0	Silty clay and gravelly silty clay; some basalt boulders	CL-CH	0–20 generally; 20–45 in a few places	At or near surface	1–2	Poor and slow	Moderately slow	Mostly dense stands of mixed tropical forest; some second-growth forest and bamboo	Good; most fertile natural soil in map area
many er kets	Generally loose or friable	4.5–6.5	Gravelly loamy sand, sandy loam; generally very stony	GM/GC-SC	0–100 or more	Deep, generally within underlying bedrock		Good to poor depending on bedrock interface	Moderate to rapid	Dense forest; open forest; mixed tropical forest	Poor; suited mainly for forest and cattle range
some er kets	Hard when dry, friable when moist, some material plastic when wet	6.5–8.0	Clay loam overlying clayey gravel	MH-GW	5–100	Deeper than soil profile, generally within bedrock		Generally good	Slow but complete	Dense tropical forest with some rai cultivation and old rai covered with bamboo or brush	Fair to poor generally; suited mainly for forest
0 (?)	Friable when dry, firm when moist, slightly sticky to plastic when wet	4.5–6.5	Mostly clay loam; some thin layers of sands and gravels	MH-SP/GP	0–2	At or near surface	1–5	Poor	Fair to good	Good stands of tropical forest and grasslands; some fallow paddy	Good for paddy farming, dry-season grazing; potentially high rice production

2

JOG (G) 1501 - ND48-8
JOG (G) 1501 - ND48-12



(C) **Fig. I-4—Northern Sector: Vegetation Map with Concealment Ratings**[2–4]

Unit	Symbol	Vegetation	Concealment	
			Ground[a]	Air[a]
1	1	Dense forest	Excellent / Excellent	Excellent / Good
2	2	Open forest and scrub	Fair / Poor	Poor / Unsuited
3[b]		Mixed forest, brush, grasses, and cultivation; some marsh	Good / Fair	Fair / Poor
4	4	Mixed brush, grasses, marsh, and barren land	Poor / Unsuited	Unsuited / Unsuited

[a] Men / Vehicles

[b] Unit 3 increases at the expense of unit 1 through cultural activity.

Penh-Saigon-Delta areas. The Central Highlands are areas of pronounced low population density in both Cambodia and RVN, apparently inhabited by semi-nomadic Montagnard tribes with their own kinds of cultivation (see Fig. I-5).

(C) By and large the Halang occupy the northern part of the Northern Sector south to approximately the north flank of the valley of the Tonle San, where their neighbors, the Jarai, have moved in.[9] The Jarai have settled in the fertile basalt uplands with productive deep latosol soils and in the Chu Phong uplands on the border with RVN, penetrating to about the western edge of the Northern Sector where the basalt uplands yield to the lower lands forming the east bank of the Mekong. The Jarai are more or less symmetrically distributed north and south of Route 19 in evident preference for the farming characteristics of the basalt lands.

(C) The Rhade and some M'nong occupy the southern end of the sector, south of the Chu Phong Massif and along the axis of the Tonle Srepok as it flows into the area from the direction of Ban Me Thuot in RVN.

(C) Villages are extremely few and fairly far apart except in the center of the Northern Sector along Route 19. It may be that the Jarai villages are less mobile and tend to remain fixed in the areas of good rai cultivation in contrast to greater movement of the Halang to the north and the Rhade to the south, where generally the soils are less favorable. A "flourishing" Jarai culture may have originally attracted trade along trails that the French later consolidated into Route 19, with the intention of developing rubber plantations.

INSURGENT OPERATIONS

General

(C) The information contained in the following paragraphs relating to Viet Cong/People's Army of North Vietnam (VC/PAVN) operations is based on a sampling of processed intelligence published as reports by the Defense Intelligence Agency (DIA), CIA, National Photographic Interpretation Center (NPIC), DOD/J2, and US Army, Pacific (Intelligence Staff) [USARPAC(G2)] during the period May 1966–February 1967, as well as some VC PW interrogation reports and an open-source clipping file of US daily, weekly, and monthly periodicals.[4,10–16] No suggestion is intended or implied that this paper represents a formal threat analysis for the area involved or that the data on insurgent activities and dispositions are other than a sample extract from a significantly larger body of information. The sole objective is to utilize enough information to develop a rationale of insurgent activity sufficient for the problem of modeling insurgent base-development suitability in the area concerned. Such modeling requires realistic arguments but disclaims any possibility of assessing the entire military/political situation.

History

(C) The Northern Sector includes the easternmost penetration of Cambodia into the RVN. Although both countries share the Central Highlands terrain in this region, the Cambodian side is isolated from principal Cambodian centers of culture and commerce and very sparsely populated, except for the

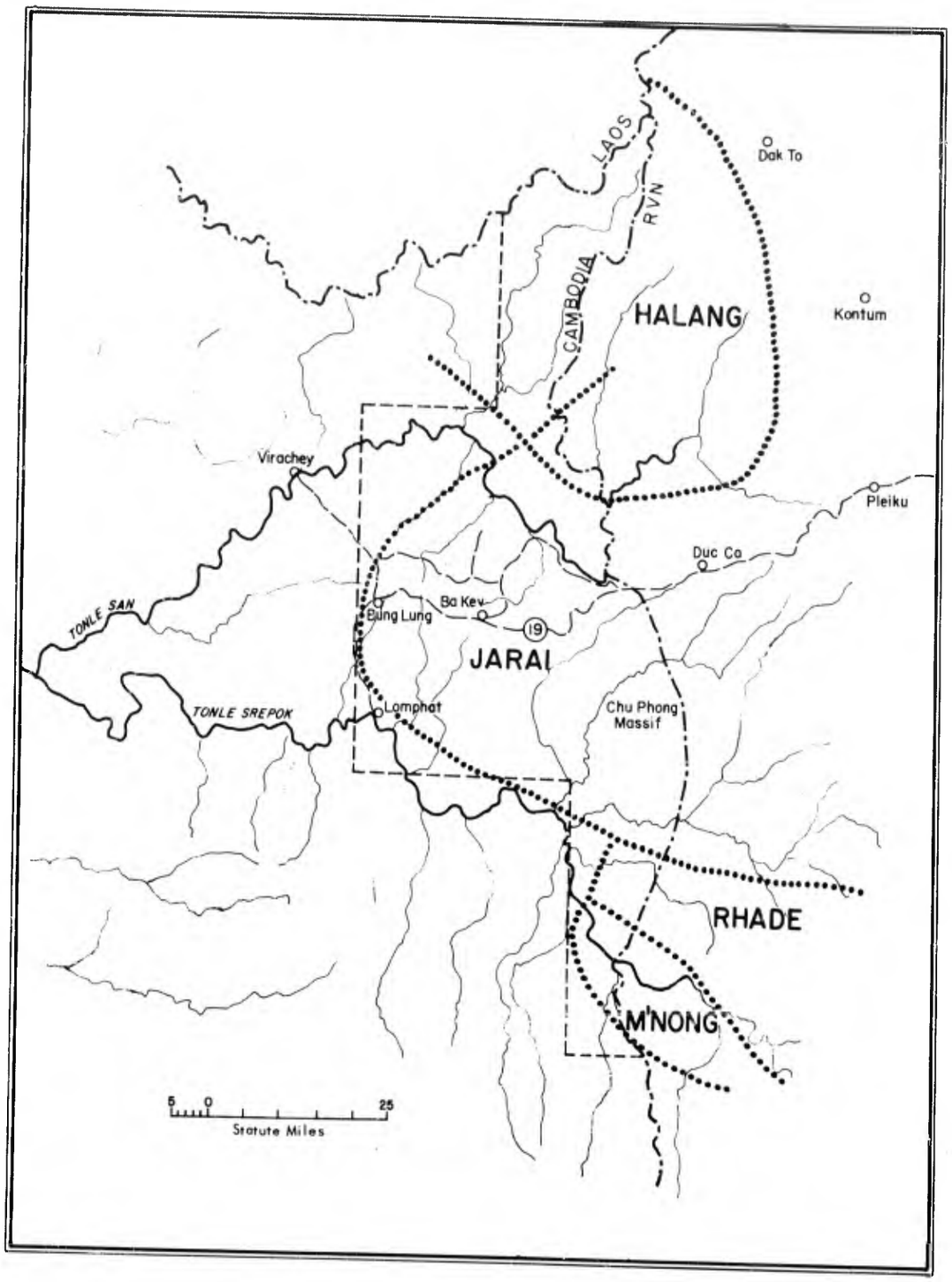


Fig. I-5—Northern Sector: Distribution of Cultures

small rural towns of Ba Kev, Lomphat, Bung Lung, and Virachey just outside the study area. Across the border in Vietnam, however, are the equally rural but more highly populated centers of Kontom, Pleiku, and Ban Me Thuot, all at main road junctions, and the smaller settlements of Duc Co and Dak To. Before 1965 these places were targets of VC operations, but they were also approachable, without unacceptable risk, from local bases on RVN soil and regionally, if necessary, exclusively through RVN territory from the north. When and where expedient, Laos and occasionally Cambodia were utilized as infiltration routes into the RVN. The Mekong River and Laotian roads in the Mekong Valley (Routes 9, 23, 16, 18, and 13) were used for convenient transportation, but probably under conditions of only minor urgency for resupply of the VC operating forces and very little pressure to attempt to conceal the nominal volume of supplies being moved. It is here speculated that until 1965, when Saigon was virtually encircled by VC battalions ready to move in and finish off, no undue strain had been placed on a VC logistical transfer system extending from North to South Vietnam, and advantage was freely taken of the fact that the shortest and easiest distance from Hanoi to Saigon is through Laos and Cambodia.

(C) However, intervention by US forces in 1965 changed all this. With the onset of US combined arms operations against the VC, with all that this implied, Cambodia in particular quickly became a political sanctuary rather than a convenience.[17] As patrolling and reconnaissance operations were carried out in the RVN, as air surveillance and detection increased, and as demand for a vastly increased VC throughput of materiel and new troops materialized, a heavy premium had to be placed on secure transfer operations by those managing the entire VC/PAVN logistical input system. The use of Cambodia changed from that of a physical shortcut to a political sanctuary, whose proclaimed neutrality the VC/PAVN are exploiting for operating purposes as much as possible without being obvious. In the Northern Sector there is evidence of a significant increase of insurgent base-development activity from 1965 to 1967, which suggests a major military investment by VC/PAVN as a part of their plans for coping with US/RVN operations in the RVN proper.

Recent Situation

(C) With the US 1st Cav Div (Air Mobile) based at An Khe, the 4th Inf Div at Pleiku, additional troops at Duc Co, and other potential targets in the RVN north and south of Route 19, this avenue of movement would appear to have gained significant importance in 1966 and 1967 in addition to its basic geographic importance as an east-west route transecting the RVN through the Central Highlands from Cambodia to Qui Nhon. This route, together with its fortification, seems to have induced a concentration of VC/PAVN activities on the Cambodian side of the border in the Northern Sector, where the VC have established a tactical staging area and major logistical support area for their operations across the border in South Vietnam. The relatively sparse distribution of villages and civilian population abets and enables these operations, as does the fact that this sector is close to the Ho Chi Minh logistical transit system through southern Laos as well as being the part of Cambodia farthest from the capital of Phnom Penh. Details of any intended cooperation between

the Royal Cambodian Army Forces (FARK) and the VC/PAVN insurgents are beyond the scope of this study, but activities analyzed to date indicate knowledge, contact, and close juxtaposition of these forces. In particular, FARK trucks driven by Cambodian troops are transporting VC/PAVN troops and materiel between rear areas and the border zone.

(C) It is clear that people, commodities, and probably instructions are entering the Northern Sector as inputs to a system that converts them to tactical power in the form of insurgent troops possessing light, medium, and heavy weaponry for operations across the border in the RVN.

Distribution of Activities

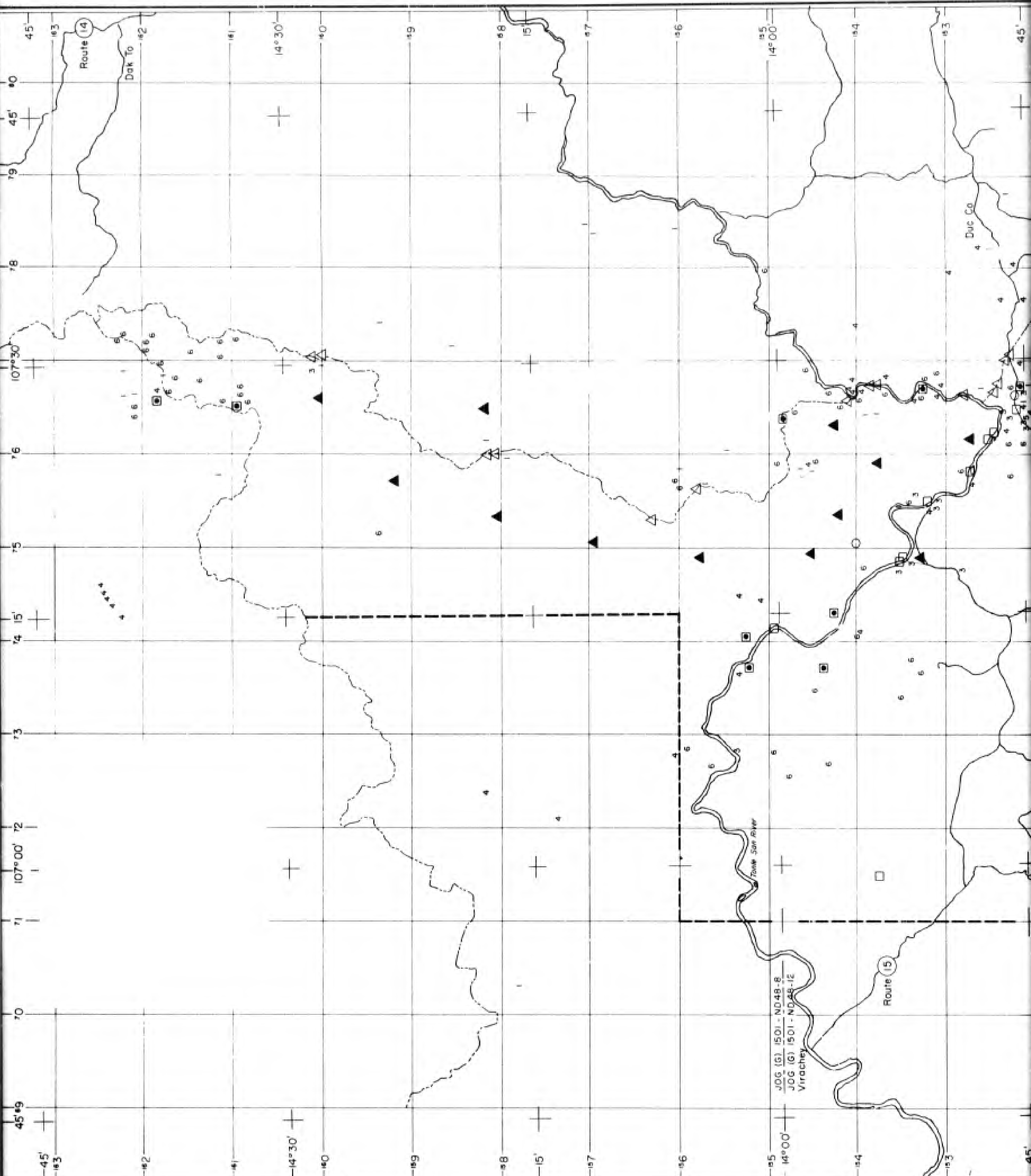
(C) Pertinent information relating to the insurgent activities sample (shown in Fig. I-6) has been examined for linkages of various kinds with physical and cultural features of the Northern Sector. Principal concentrations of activity, in approximate order of size and density, are: along the south side of Route 19; about 10 km south of Route 19 just north of the Ia Drang River; on the north and west sides of the Chu Phong Massif; at the northern end of the Northern Sector in the Triborder area; along two reaches of the Tonle San River in the area 20 km north of Route 19; along the Tonle Srepok River within 10 km of the border; and at Ba Kev, Lomphat, and Bung Lung. New activity seems to be developing 25 km east of Lomphat in a rather broad area where unverified bivouac, wetland rice culture, and row-crop farming are suspected. Finally, a string of commo-liaison stations extends from the northern end of the sector roughly 100 km southward to the Chu Phong Massif and generally within 10 km of the border with RVN.

(C) Areas of least fixed activity for the period sampled are most parts of the northern extension of the sector on either side of the transit activity associated with the commo-liaison stations; a broad area east of a point 10 km south of Lomphat; a long stretch north and south of Route 19 between Bung Lung and Ba Kev, and several smaller areas from the Chu Phong Massif west and south to the Tonle Srepok River.

(U) Although this distribution is quantitatively restricted to a particular period of time and qualitatively aggregated into a fairly simple categorical breakdown (see Fig. I-6), the sample is believed large enough, and the distribution wide enough, to enable environmental correlations and projections.

Patterns and Correlations of Activities

(C) The dominant strategic feature of the Northern Sector is the RVN-Cambodian border itself, and the physical locations of all insurgent activities are selected with some deliberate relation to this border. Granting its position, however, such selections are probably made on the basis of the juxtaposition of (a) the available routes of logistical movement and transportation into the border zone and (b) the tactical targets across the border and the desirable avenues of approach toward these targets. Although transportation into the area is by air, riverboat, road, and foot, the airfields depend on roads, and foot movement depends greatly on stream valleys. The Tonle San and Tonle Srepok Rivers and Route 19 are the most important routes of movement into the Northern Sector, and where the Tonle San and Route 19 approach to


Route 14
Dak To
Duc Co
Tonle San River
Route 15
Virachey
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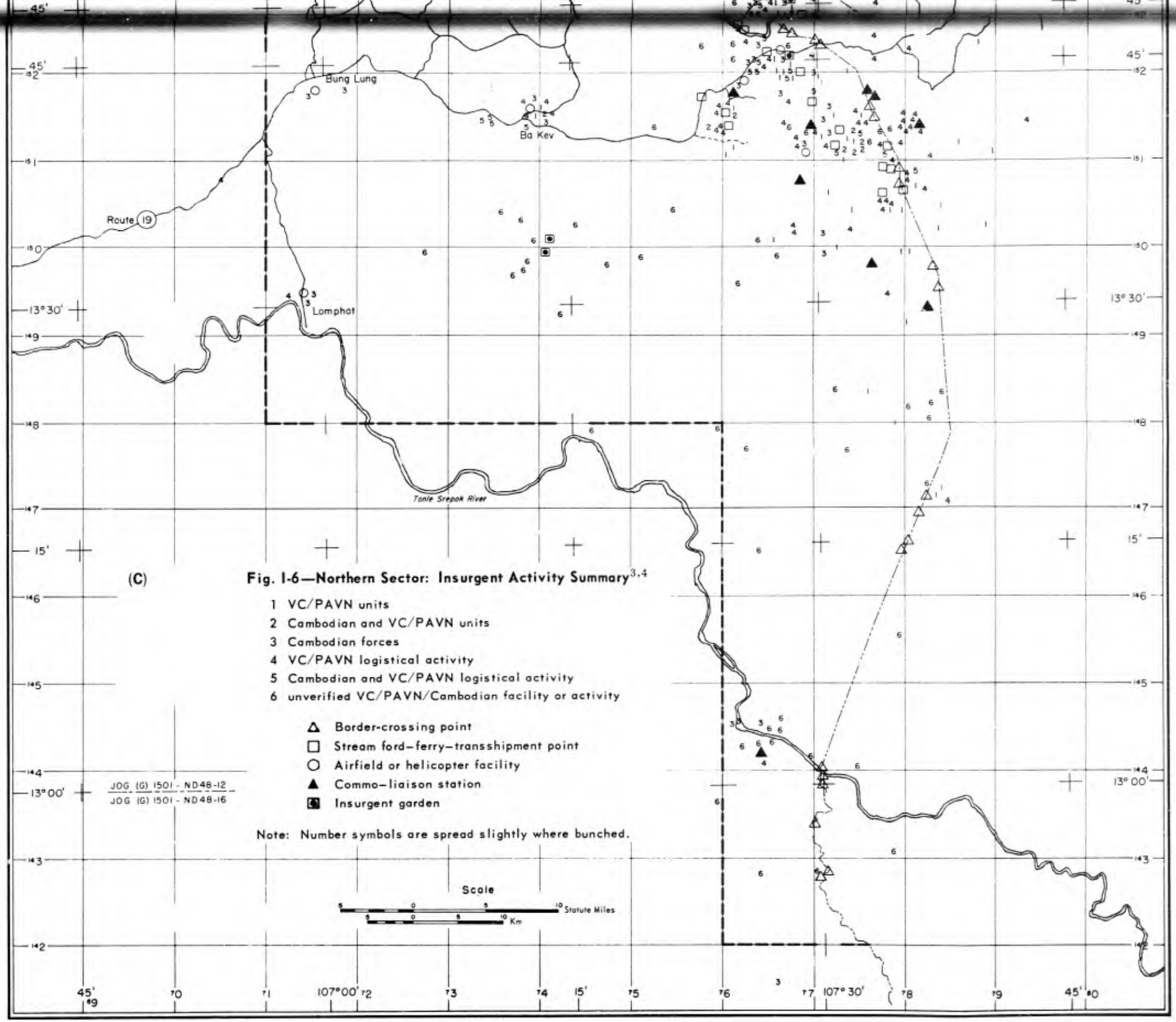
JOG (G) 1501 - ND48-12
14°30'
14°00'
107°30'
107°00'



(C)

Fig. I-6—Northern Sector: Insurgent Activity Summary[3,4]

1 VC/PAVN units
2 Cambodian and VC/PAVN units
3 Cambodian forces
4 VC/PAVN logistical activity
5 Cambodian and VC/PAVN logistical activity
6 unverified VC/PAVN/Cambodian facility or activity

△ Border-crossing point
□ Stream ford–ferry–transshipment point
○ Airfield or helicopter facility
▲ Commo–liaison station
◙ Insurgent garden

Note: Number symbols are spread slightly where bunched.

JOG (G) 1501 - ND48-12
JOG (G) 1501 - ND48-16

within 2 km of each other, less than 3 km from the border, they create a natural delivery zone that has become a prime logistical support area for receiving troops, equipment, ammunition, medical supplies, and foods including rice, row crops, and live cattle and pigs. Much of this must be held or stored within reasonable distance in timber or bamboo warehouses or in caches buried below the soil. Other items and food must be issued or delivered to troops in bivouac who are phasing in, training, equipping, and staging for tactical operations. Food is either live and fresh or preservable as dry stores. Cooking is possible, but refrigeration is not. Rice can be carried for long distances by troops infiltrating from NVN or moving on tactical deployments, but quick delivery of perishables is necessary. Row crops are farmed in several locations 30 to 40 km down the Tonle San and shipped by boat. Live pigs and cattle are either driven or trucked in from as far away as the area east of Lomphat and south of Ba Kev, which is evidently a live-meat supply area also being developed as a rice/row-crop garden support area. To avoid unacceptable shortages or surpluses too great for handling and local storage, the coordination of procurement, shipment, delivery, storage, and issue/consumption requires reliable communication with procurement areas, which are widely dispersed, and with tactical-unit headquarters, which are conveniently located close enough not to strain secondary distribution resources. In other words, the Tonle San–Route 19 convergence that affords the creation of a major VC/PAVN regional logistical-support complex also more or less defines the surrounding area as most desirable for concentration, equipping, training, and operational staging of tactical units. The questions are: How large is the area? Within the eligible area, what defines actual site suitability for bivouac?

(C) Interrogations elicit the information that, in general, units in bivouac should be dispersed not more than 1 day's march (approximately 7 to 10 km) from higher headquarters, at least for battalions in relation to regimental headquarters. For a staging area including perhaps between one and two divisions or their equivalent, such a dispersal might require more space than warehousing and distribution could easily support, and it is obvious from the distribution of units plotted that many are closer than a day's march. The main staging area seems to occur largely within a radius of 20 km of the center of the logistical complex and particularly in a north–south direction along the border. It is believed on the basis of one or two reports that field training exercises are held farther south around the Chu Phong Massif. New truck trails have been extended down from Route 19 through the staging area in recent months, affording greater dispersal and/or the servicing of more units. Probably both reasons are involved as the US/RVN buildup continues across the border.

(C) The question of site suitability may be rephrased and expanded: Given the requirement for locating units and bases in a general area, what determines the exact locations? Primary emphasis is placed on concealment, according to reports from almost all sources, but further breakdown by type of activity is required. To start with, site suitability for insurgent activities varies with the specific activity and with the proximity of the activity to the border or to the principal supply routes. Units of VC/PAVN tactical forces 2 km from the border have stringent requirements for bivouac that they do not have 70 or 80 km toward the interior. The necessity for concealment,

accessibility, water, food, construction materials, and soil workability all change somewhat for units, bases, and other activities such as food production or rest camps according to where these activities are in relation to the entire insurgent operating network as it extends back from the tactical staging area into the rear area of insurgent communications zone (IComZ).

(C) For purposes of analysis, it becomes expedient to separate the area adjoining the border from the remainder of the Northern Sector for special consideration. The first 20 km from the border toward the interior of Cambodia are defined as the insurgent tactical zone (ITacZ), in which occur logistical supply, storage, medical, and maintenance and repair bases; VC/PAVN bivouacs and headquarters facilities; and food production and distribution. Although the principal staging areas are contained within the ITacZ, the entire zone is sensitively involved, actually or potentially, with network concentrations of insurgent activities, even if limited to transit or tactical border crossings.

(C) To the rear of ITacZ is the IComZ, through which LOC extend from the rear, as far away as the Mekong River, forward to ITacZ. These LOC include rivers, roads, and some air routes terminating at Lomphat, Bung Lung, and Ba Kev. Areas in IComZ for roughly 5 km on either side of the river and road LOC are utilized for logistical bases involved in the movement of materiel forward to ITacZ but involve mostly insurgent service forces rather than line

Table I-2

Northern Sector: Occurrence of Insurgent Bases in Respective Zones

Type of base	ITacZ	IComZ, distance from LOC, km	
		< 5	> 5
Bivouac	×	—	—
Fixed facility	×	×	—
Garden	×	×	×

or tactical units. Row crops and some wetland rice are produced along the LOC for insurgent food supply both in the ITacZ and beyond the border in RVN. More than 5 km away from the LOC are wide areas used principally for food crops; some training and rest-camp facilities may occur in these areas, but they are not easy to fix or identify.

(U) The principal categories of insurgent activity whose locations are verifiably constrained by the environment are taken to be (a) unit camps or bivouacs; (b) all fixed logistical activities including supply, storage, repair, and medical facilities; and (c) rice and row-crop cultivation for insurgent food supply. For ease of reference these are called bivouacs, fixed facilities, and gardens respectively and lumped together under the single term "bases."

(U) Table I-2 summarizes the occurrence of important insurgent bases, by type, in the ITacZ and the two subdivisions of IComZ.

(C) From all information extracted from the sample of insurgent activities, whether verbal iteration by members of VC/PAVN, observation of base locations, or correlation of base locations with known characteristics of the physical environment, sufficient criteria for site selection emerge to yield a coherent picture of insurgent decision making. For bivouac the requirements (in order of significance) are taken to be:

(a) Concealment and physical security
(b) Water-supply availability
(c) Accessibility for logistical support
(d) Suitability for hasty fortification; soil workability and natural construction materials such as timber and rock

(C) For fixed facilities the requirements are:

(a) Concealment
(b) Accessibility to transport system
(c) Construction feasibility for light structures; foundation, drainage, and construction materials
(d) Water-supply availability
(e) Food supply (local) and accessibility to food shipment

In a large minority of cases accessibility has governed at the obvious expense of concealment, so that the difference in importance between the two is not great. Level, well-drained sites, not sloping ones, have generally been selected for fixed facilities, with construction using nearby materials. Although water can be a small distance away, it nonetheless usually must be carried in to workers at the various fixed facilities for economy of time. Food is evidently brought in, mainly as rice, but later grown nearby as row crops wherever possible. Finally, for gardens, the requirements seem to be:

(a) Soil fertility
(b) Irrigation suitability (wetland rice)
(c) Accessibility
(d) Concealment

Concealment by natural vegetation is marginal at best, for crops require exposure to sun and, generally, an absence of competing plants. Ordinarily concealment may be more important for paths or other routes of accessibility than for the gardens themselves.

(C) In the correlation of insurgent activities with the separate elements of the environment, it is evident that most bivouacs and fixed facilities correlate with dense forest, unit 1 on the vegetation map (Fig. I-4), although some occur in dense forest patches in unit 3. Insurgent gardens are in units 3 and 4. Unit 2, open forest and scrub, is suitable for FARK but generally not for insurgents.

(C) Soils are more diverse in number and type, but it is reasonably clear that the latosols, unit 2 on the soils map (Fig. I-3), support the best stands of dense forest, are fairly good for overall ease of road construction, and are easily exploited for rai cultivation as well as insurgent gardens. Regurs, unit 5, are perhaps the most fertile of all and evidently the insurgents are beginning to discover this, for they have started more extensive gardens in the regurs area 20 km south of Ba Kev. Alluvium, unit 8, and the gray hydromorphs, unit 4, are level and good for paddy farming and have good all-year water-supply potential. Some gardens, including both row crops and wetland

rice, are located on these soils close to the Tonle San River LOC. The red-yellow podzols, unit 1, are poor for gardens in comparison with the other soils, although the insurgents have apparently attempted gardening in these soils in a few places for reasons of convenience. Units 1 and 2, red-yellow podzols and latosols, are well-drained, workable soils suitable for excavations for foxholes and caches.

(C) Slopes exert very conspicuous influence and control over insurgent activities. Bivouac is preferred on the sides of steeper slopes, generally greater than 20 percent (see Fig. I-2), or on foot slopes of 5 to 20 percent, both of which afford observation of surrounding areas and well-drained bivouac sites; drainage is significant because, in the ITacZ, foxholes are commonly excavated in bivouac. The FARK seems to be content with flatlands, 0 to 5 percent slope, where permanent construction is easier and no hill climbing is necessary. Insurgent fixed facilities are mostly in flatlands for the same reasons, or else on the foot slopes (5 to 20 percent) where relief is regionally pronounced or where vegetation for concealment is restricted to the slopes.

(U) Rock types most favored by the insurgents for all activities seem to be (Fig. I-1) unit B, basalt, which gives rise to the latosol soils, followed by a combination of unit G, granite, unit R, rhyolite, and unit X, amphibolite/pyroxenite—all three giving rise to the red-yellow podzols. Principal factors involved are water-supply potential (fairly good), soil workability and drainage for excavation and construction (good), and fertility (good to poor), as well as the fact that where slopes are not too great these rocks react with climate to produce soils that give rise to very dense forest stands affording good concealment. Unit 2, tuffs and pyroclastics (?), produce regur soils providing fertility and good prospects for gardening.

Generalizations

(C) The dominant strategic feature of the insurgent activity system under consideration is the international border between Cambodia and the RVN, as influenced and modified in the Northern Sector by (a) the major river LOC (Tonle San and Tonle Srepok), (b) the main road LOC (Route 19), (c) the locations of principal targets across the border in the RVN, and (d) the best avenues of tactical approach to these targets. Taken together, these factors define the desirable staging areas and the resultant insurgent-sanctuary tactical and communications zones on the Cambodian side of the border, particularly in the absence of any political constraints exerted by the Cambodian government. Beyond this, the characteristics of the physical environment, including geology, slopes and relief, soils, and vegetation, further modify the distribution of insurgent activities by specifying the acceptability of areas and sites for particular military uses, not necessarily in the same ways in the tactical and communications zones.

(C) Empirically, the principal considerations in base location relative to the entire network of insurgent sanctuary operations are stated in more detail as follows:

(a) Movement and surface transport by road, river, trail, and (to some degree) air

(b) Proximity to tactical targets in the RVN consistent with the protection of sanctuary

(c) Storage and cache site availability

(d) Suitability for communication and liaison

(C) Specific site requirements for VC/PAVN bases, within these general limits, are listed as follows:

(a) Security against surveillance and detection, ground or air

(b) Physical security against ground approach or contact, including cover, good observation, and unobstructed fields of fire

(c) Water supply, preferably not requiring exposure

(d) Natural construction materials (timber, thatch, and bamboo) and soil workability

(e) Food supply, particularly suitability for row crops supplementary to rice

INSURGENT-BASING SUITABILITY

Map Compilation

(U) The procedure for compilation of the map (Fig. I-7), "Suitability for Insurgent Basing," is outlined in the following paragraphs. Where indicated, information relating to the physical environment is abstracted from preceding maps; a description of the insurgent terrain is given in Table I-3.

(C) A zone 20 km deep is measured from the Cambodia/RVN border toward the interior of Cambodia. This is the ITacZ in sanctuary. This area is analyzed for suitability for three kinds of insurgent bases: bivouac, fixed facilities, and gardens. The remaining area is the IComZ.

(U) Zones 5 km wide on each side of major road and river LOC are established. These LOC areas are analyzed for suitability for insurgent fixed facilities and gardens.

(U) The remaining area in the IComZ is analyzed for suitability for insurgent gardens. Additional comments on some other kinds of possible insurgent bases or operations are included in a later section.

(U) After these steps are taken (see Fig. I-8), the individual operating zones are compiled according to the plans shown in Fig. I-8, relating to ITacZ, IComZ LOC, and IComZ respectively.

Uses and Limitations

(C) Fig. I-7 does not attempt to display any units whose smallest dimension is less than 250 m on the ground. Some generalization of boundary crenulations is necessary in order to reduce from a 1:50,000 to a 1:250,000 scale. Where a discrepancy exists between the 1:250,000-scale maps (overlays) generated by this report and the 1:250,000-scale base maps,[4] it is because in some areas, particularly along the Cambodia/RVN border, the 1:50,000-scale source maps show different information, which has been incorporated in the various reductions.

(U) Furthermore, in the final compilation depicting insurgent-basing suitability, it has been difficult to bring the northernmost extension of the study area into analytical compatibility with the central and southern areas because of extreme differences in terrain characteristics. Thus, because so many areas well suited for bivouac exist in the north, the best overland routes have been selected and areas suited for insurgent bivouac have been related to these routes.

(C) Some uses of terrain by the insurgents, such as the excavation of tunnels for crossing the border into RVN or for use as underground bases potentially difficult to detect from the air, are not specifically addressed by this study.

(U) In spite of these considerations, it is believed that Fig. I-7 indicates the likely places for insurgent activity of various kinds and can serve as a significant aid in the conservation of surveillance and detection resources if allocations of air, remote sensing, and ground-observation effort are directed accordingly.

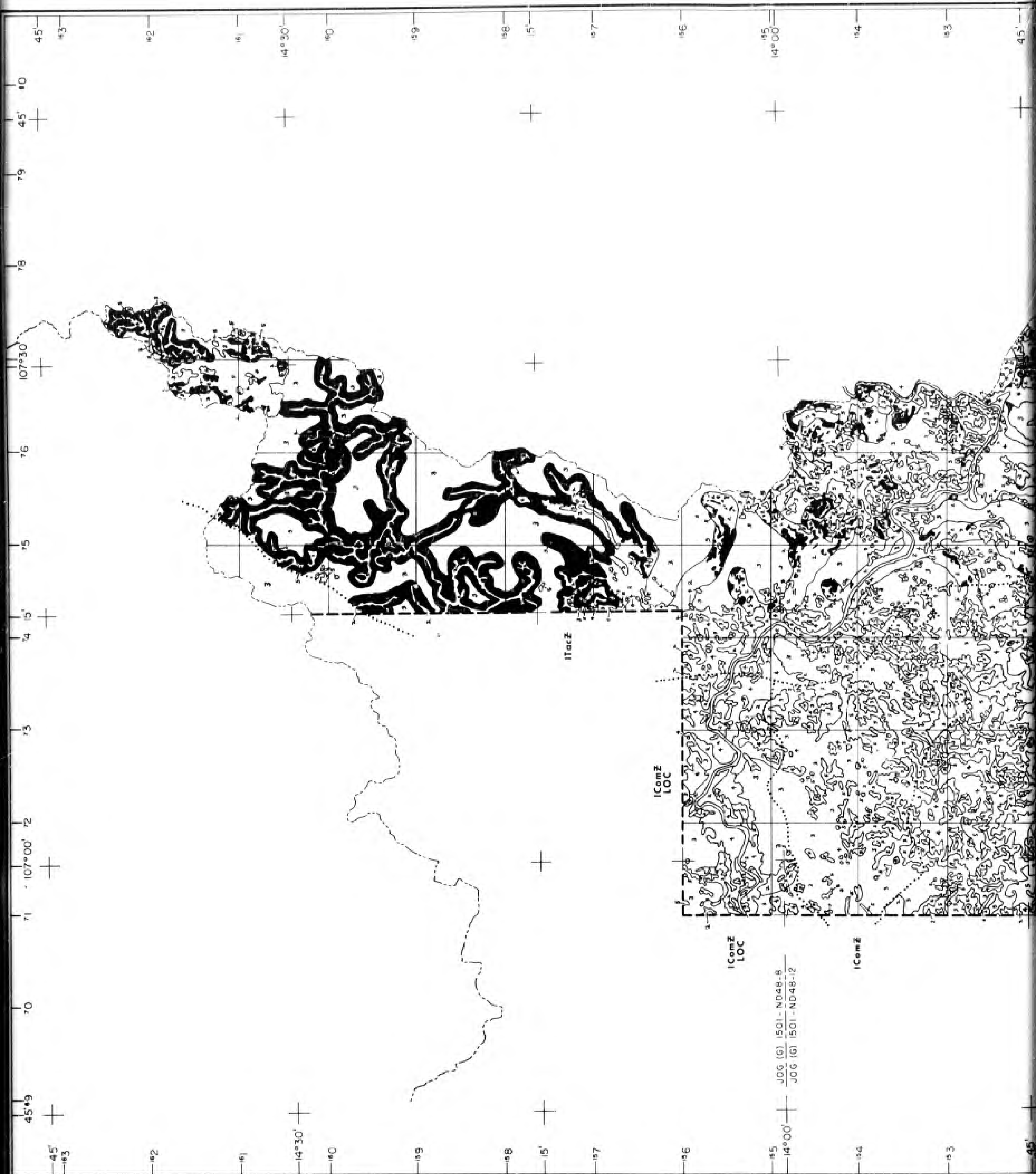
SUMMARY

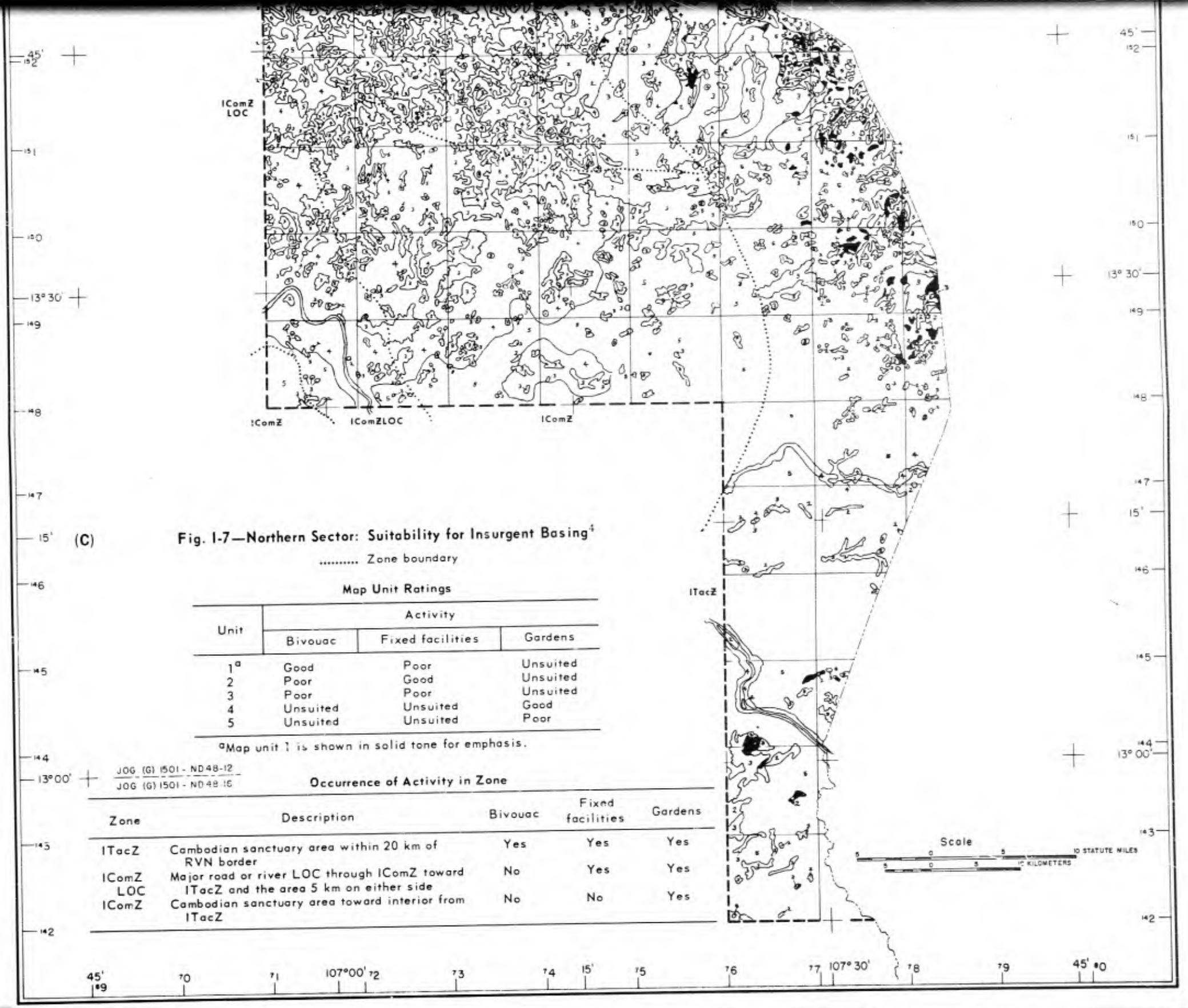
(C) The conservation and allocation of surveillance and detection resources during military operations against insurgents require consideration of the nature of insurgent operations in order to select the areas having the highest probability of their presence. This study aims at the development of new techniques in area analysis based on the assumption that a relation exists between the organization of insurgent operations and the configuration of the physical and cultural environment. The area analyzed is a sector of Northeast Cambodia along the border with the RVN where insurgents are operating from sanctuary bases in Cambodia. This sector is an extension of the Central Highlands of RVN, a hilly to mountainous upland, remote and sparsely populated, cut by the Tonle San and Tonle Srepok Rivers and Route 19 extending across the border toward Duc Co and Pleiku. The physical environment (geology, relief, slopes, drainage, soils, microrelief, vegetation, and climate) has been assessed, and new maps of geology, slopes, soils, and vegetation have been produced for purposes of this project. The cultural environment has been studied, with attention to the characteristics and distribution of the inhabitants as well as their exploitation of the physical environment for purposes of agriculture, food production, and water supply.

(U) Insurgent activity in the study area has been investigated on the basis of a sampling of published intelligence information for the period May 1966–February 1967 and some unprocessed PW interrogation reports for roughly the same period.

(C) Empirical results of analysis show that the principal considerations in insurgent-base location relative to the entire network of insurgent-sanctuary operations are movement and surface transport by road, river, trail, and (to some degree) air; proximity to tactical targets in RVN consistent with the protection of sanctuary; storage and cache site availability; and suitability for communication and liaison.

(C) Specific site requirements for VC/PAVN bases, within these general limits are listed as follows: security against surveillance and detection, from ground or air; physical security against ground approach or contact, including cover, good observation, and unobstructed fields of fire; water supply, preferably not requiring exposure; natural construction materials (timber, thatch, bamboo) and soil workability; and food supply, particularly suitability for row crops supplementary to rice.


14°30'
14°00'
107°30'
107°00'
ITacZ
IComZ LOC
IComZ
JOG (G) 1501 - ND48-8
JOG (G) 1501 - ND48-12



(C) **Fig. 1-7—Northern Sector: Suitability for Insurgent Basing**[4]

..... Zone boundary

Map Unit Ratings

Unit	Activity		
	Bivouac	Fixed facilities	Gardens
1[a]	Good	Poor	Unsuited
2	Poor	Good	Unsuited
3	Poor	Poor	Unsuited
4	Unsuited	Unsuited	Good
5	Unsuited	Unsuited	Poor

[a]Map unit 1 is shown in solid tone for emphasis.

JOG (G) 1501 - ND48-12
JOG (G) 1501 - ND48-16

Occurrence of Activity in Zone

Zone	Description	Bivouac	Fixed facilities	Gardens
ITacZ	Cambodian sanctuary area within 20 km of RVN border	Yes	Yes	Yes
!ComZ LOC	Major road or river LOC through !ComZ toward ITacZ and the area 5 km on either side	No	Yes	Yes
!ComZ	Cambodian sanctuary area toward interior from ITacZ	No	No	Yes

C)

TABLE I-3

Northern Sector: Description of Insurgent Terrai

(Keyed to Fig. I-7)

Map unit	Terrain description	Local population	Access	Water supply	Light construction and storage suitability	Shallow
1	Heavily forested upland areas, affording excellent concealment of men and vehicles from ground observation, excellent concealment of men and good concealment of vehicles from air observation; having slopes greater than 20 percent and dependable supplies of surface water within 1 km or less; this unit occurs only within 20 km of the border with RVN	Extremely sparse except for the Route 19–Tonle San River area; dominantly Jarai Montagnards; settlements are small, relatively permanent villages	Access by road and then trail in central area around Route 19; otherwise only by trails, streams, and cross-country movement	Good; dependable supplies of surface water within 1 km; soils drain rapidly and are not well suited for dug wells to exploit groundwater	Fair to good; construction timber and thatch available; some bamboo, some available rock for rubble masonry; foundations well drained and suitable for light structures; uphill haulage of supplies and equipment necessary to locations some distance from main LOC	Fair; soils shallow but well deeper p erally av hasty for or cache
2	Heavily forested lowland areas, affording excellent concealment of men and good concealment of vehicles from air observation; having slopes less than 20 percent and dependable supplies of surface water within 1 km or less; this unit occurs only within 20 km of the border with RVN or 5 km of major road and river LOC leading toward the border	Sparse, but less so than units 1 and 3 because of more level land and proximity to water; dominantly Jarai Montagnards but some Halang tribes in extreme northern part; settlements are small, relatively permanent villages in central part, but very small and more nomadic in northern part	Some access in central part by road; otherwise rivers, streams, and trails along streams through well-developed valley bottoms; cross-country movement necessary for short distances in some places	Excellent; dependable supplies of surface water within 1 km; soils drain slowly and generally are suited for dug wells to exploit groundwater	Excellent; construction timber and thatch available; some bamboo; rock for rubble masonry not easily available; foundations for light structures not well drained but elevated floors can protect materiel stored; haulage of supplies and equipment over level ground not far from main LOC	Fair; soils thick but drained; dry seas fortificat cache, b in wet se
3	Heavily forested upland and lowland areas having concealment similar to units 1 and 2, but having no dependable supplies of surface water within 1 km	Very sparse, more so than unit 2 but not so sparse as unit 1; mostly Jarai Montagnards in fairly large permanent villages; some Budong or other Mon-Khmer tribes in westernmost part, also in permanent villages; some Halang tribesmen in northernmost part in very small villages and somewhat nomadic	Access by road and river in central part, followed by trails along streams and cross-country movement; access by trail and cross-country movement in north part, most difficult of entire Northern Sector; river, trails, and cross-country movement in south part	Variable; dependable supplies of surface water occur within 1 km in very few areas; otherwise generally poorly suited for dug wells to exploit groundwater except in lowland areas and valley bottoms, where soil drainage is slow	Good to fair; construction timber, thatch, and some bamboo available; rock for rubble masonry not everywhere available; foundations for light structures generally well drained but in many parts of Northern Sector haulage of supplies and equipment necessary over considerable distances from LOC and/or through rough, uphill terrain	Poor to go range fro thick and to well d able site can be fo some eff
4	Areas of mixed forest and brush, cultivation, grasses, second growth and some marsh, affording mixtures of fair, poor, and unsuitable concealment; having slopes less than 20 percent and composed of fertile soils including latosols, gray hydromorphics, regurs, and alluvium	Sparse, but more populated than any other unit in Northern Sector; mostly Jarai Montagnards and some Mon-Khmer and French mixed racial types; settlements range from small villages up to largest towns in Northern Sector—Lomphat, Ba Kev, Bung Lung	Access generally by road or river, then by trail, and in a very few places by cross-country movement; access by air to large towns where 2-engined aircraft are accommodated	Good; dependable supplies of surface water available in many places; soils slowly drained and generally suitable for dug wells to exploit groundwater in almost all of unit area	Fair to poor; construction timber not readily available, although thatch plentiful and bamboo more common than in other map units; foundations poorly drained in some areas but floors can be elevated; haulage of supplies and equipment mostly over level ground but in many places long distances from main LOC with poor concealment	Good to po generally easy to e both hast tions and alluvium streams ly or not wet seas ing effec
5	Areas of open forest and scrub, and some barren land, affording mixtures of fair, poor, and unsuitable concealment; having slopes exceeding 20 percent or relatively unproductive soils including red-yellow podzols, plinthite podzols, and acid or basic lithosols	Extremely sparse in major occurrence of unit 5 in south part of area, where Rhade and M'nong tribes move through area seminomadically; some Jarai tribesmen in west central part of area in more permanent settlements	Access by streams, trails, and much cross-country movement in southern expanses of unit 5; in west central part of area similar to unit 4	Generally poor; seasonal supplies of surface water available from small streams in some parts of unit area; not well suited for dug wells to exploit groundwater because too well drained in steeper-sloping areas and little effective circulation or recharge in remaining areas	Poor; construction timber generally unavailable; thatch not everywhere available; little or no bamboo; foundations adequate but generally not rapidly drained; haulage of supplies and equipment mostly over level ground but in many places long distances from main LOC with little or no concealment	Fair to po very slo season i

1

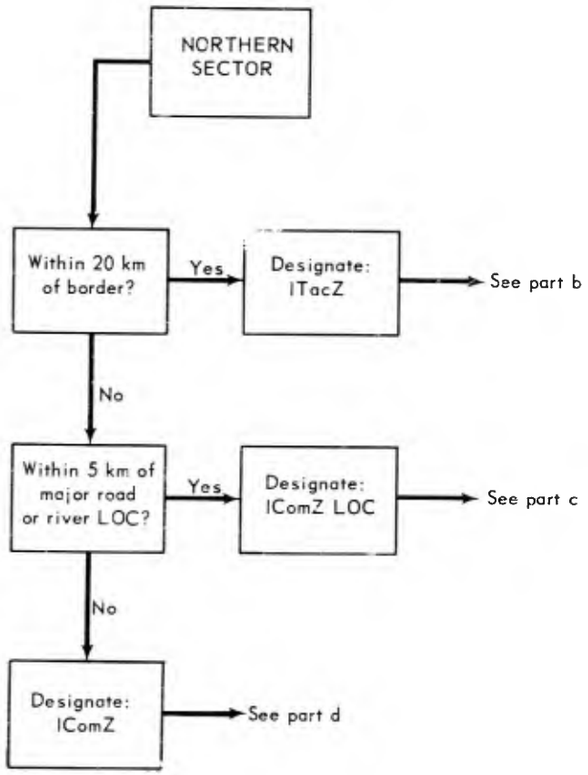
TABLE I-3

thern Sector: Description of Insurgent Terrain

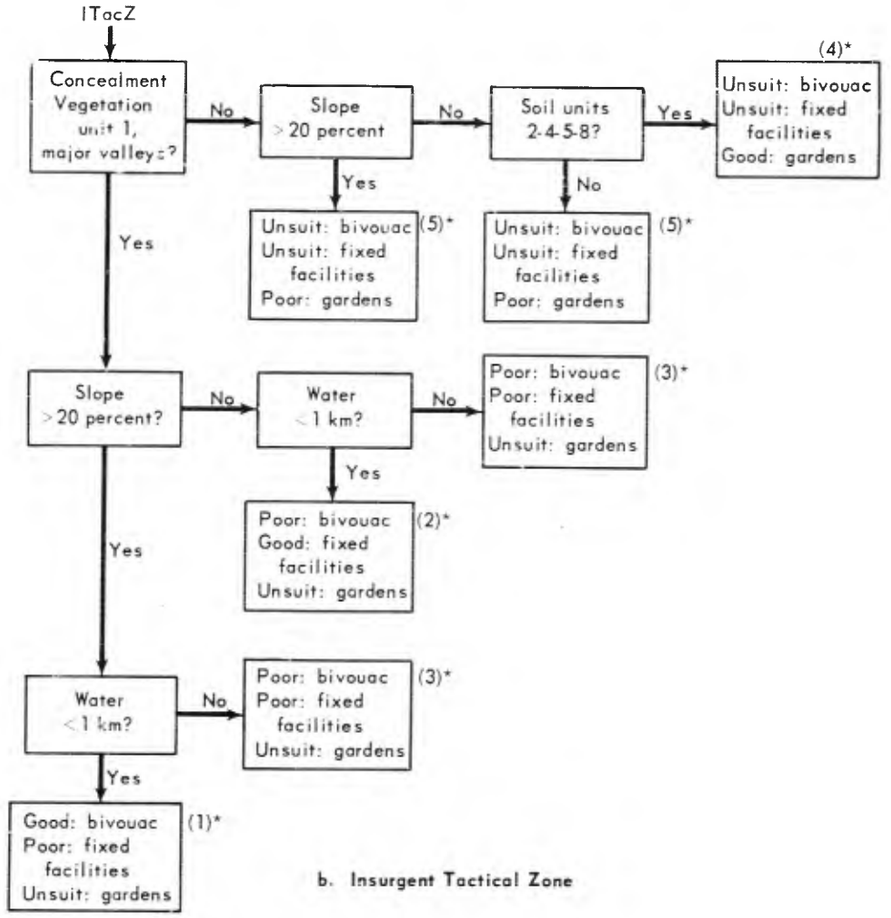
(Keyed to Fig. I-7)

	Light construction and storage suitability	Soil factors		Insurgent tactical security	Countermeasures	Counteroperations
		Shallow excavation	Crops			
of lls	Fair to good; construction timber and thatch available; some bamboo, some available rock for rubble masonry; foundations well drained and suitable for light structures; uphill haulage of supplies and equipment necessary to locations some distance from main LOC	Fair; soils mostly shallow and rocky but well drained; deeper pockets generally available for hasty fortifications or cache	Poor; suited mainly for forest and cattle range	Excellent; concealment generally ideal (see first column); cover generally good and augmented by hasty fortification; observation good from relatively high ground; fields of fire also good with complete enfilade generally possible	Photographic imagery effective for finding trails and some poorly hidden or camouflaged structures; defoliation helpful for neutralizing concealment at suspect bivouac sites; trail watch effective for establishing sites, order of battle, and operating routine; dogs useful in detection of sites and personnel by ground teams	Foot movement impeded but only means of approach; cross-country movement for tracked vehicles difficult to unsuited; airdrop not suitable; helicopter landings not suitable
hin ıd ıg ter	Excellent; construction timber and thatch available; some bamboo; rock for rubble masonry not easily available; foundations for light structures not well drained but elevated floors can protect materiel stored; haulage of supplies and equipment over level ground not far from main LOC	Fair; soils generally thick but not well drained; suitable in dry season for hasty fortification and cache, but unsuited in wet season	Good; many potential wet rice-farming sites; some row crops and dry-season grazing	Fair to good; concealment generally ideal (see first column); cover fair to good but hasty fortification may be necessary; observation poor because of lowland position and vegetation density; fields of fire fair generally but poor where thick vegetation flanks streams	Photographic imagery effective for finding trails and some poorly hidden or camouflaged structures, logistical transfer points, training grounds, fords and ferries, depot storage, boats, and logistical vehicles; infrared scanning obscured by foliage but vehicle and boat engines possible targets; defoliation helpful to neutralize hidden fixed facilities; trail watch effective for establishing size, type, and function of logistical facilities	Foot movement easy to impeded but generally best means of approach; cross-country movement for tracked vehicles poor generally but fair in some areas along valley floors; airdrop not suitable except in scattered small areas; helicopter landings not suitable
ies hin in ge	Good to fair; construction timber, thatch, and some bamboo available; rock for rubble masonry not everywhere available; foundations for light structures generally well drained but in many parts of Northern Sector haulage of supplies and equipment necessary over considerable distances from LOC and/or through rough, uphill terrain	Poor to good; soils range from thin to thick and from poorly to well drained; suitable sites generally can be found with some effort	Poor; low natural fertility generally and many areas suited only for forest or cattle range	Fair to excellent; 20 percent of area similar to unit 1; 80 percent similar to unit 2, but with observation tending from poor toward fair, and fields of fire tending toward poor	Similar to units 1 and 2: photographic imagery principal technique; infrared scanning obscured by foliage, costly in time and effort vs photography; trail watch difficult because of size of area and indeterminate insurgent operations and targets; defoliation not appropriate until potential target areas located; this map-unit area requires monitoring but not active investigation	Foot movement easy to impeded but may be best means of approach; cross-country movement for tracked vehicles poor generally but fair in certain directions and good along some forest trails; airdrop not suitable except in scattered small areas; helicopter landings generally not suitable
of it of	Fair to poor; construction timber not readily available, although thatch plentiful and bamboo more common than in other map units; foundations poorly drained in some areas but floors can be elevated; haulage of supplies and equipment mostly over level ground but in many places long distances from main LOC with poor concealment	Good to poor; soils generally thick and easy to excavate for both hasty fortifications and cache; alluvium along streams drains slowly or not at all during wet season, precluding effective use	Excellent; very high potential if fertilized and generally good for short-term cultivation in well-drained areas; less well-drained lowlands ideal for wet rice farming	Fair to poor; concealment poor; cover poor, hasty fortifications necessary; observation fair to good; fields of fire fair to good	Photographic imagery very effective for finding gardens; infrared scanning not obscured by dense foliage, can register vehicles, fires associated with agricultural activity; trail watch effective for identifying type, size, and character of logistical activity, particularly gardens; defoliation effective for neutralization of food crops but unnecessary for surveillance	Foot movement generally easy, cross-country movement for tracked vehicles fair to good; airdrop fair to good but obstructed by brush, mixed forest, bamboo, and second growth in many places; helicopter landings good in many scattered small areas, otherwise unsuited
p- il- ot to se r-	Poor; construction timber generally unavailable; thatch not everywhere available; little or no bamboo; foundations adequate but generally not rapidly drained; haulage of supplies and equipment mostly over level ground but in many places long distances from main LOC with little or no concealment	Fair to poor; drainage very slow in wet season in most areas	Poor; limited potential even with very extensive care	Poor; concealment poor; cover poor; observation good; fields of fire fair to good	Photographic imagery ideal for continuous surveillance and monitoring of extensive areas not well suited to insurgent activity; infrared scanning not obscured by dense foliage but generally not necessary; defoliation no significant help; trail watch probably not effective	Foot movement easy; cross-country movement for tracked vehicles generally good but with some obstacles that can be bypassed; airdrop fair to good but many obstacles to large coordinated landings; helicopter landings fair generally, but with many obstacles that must be avoided

2



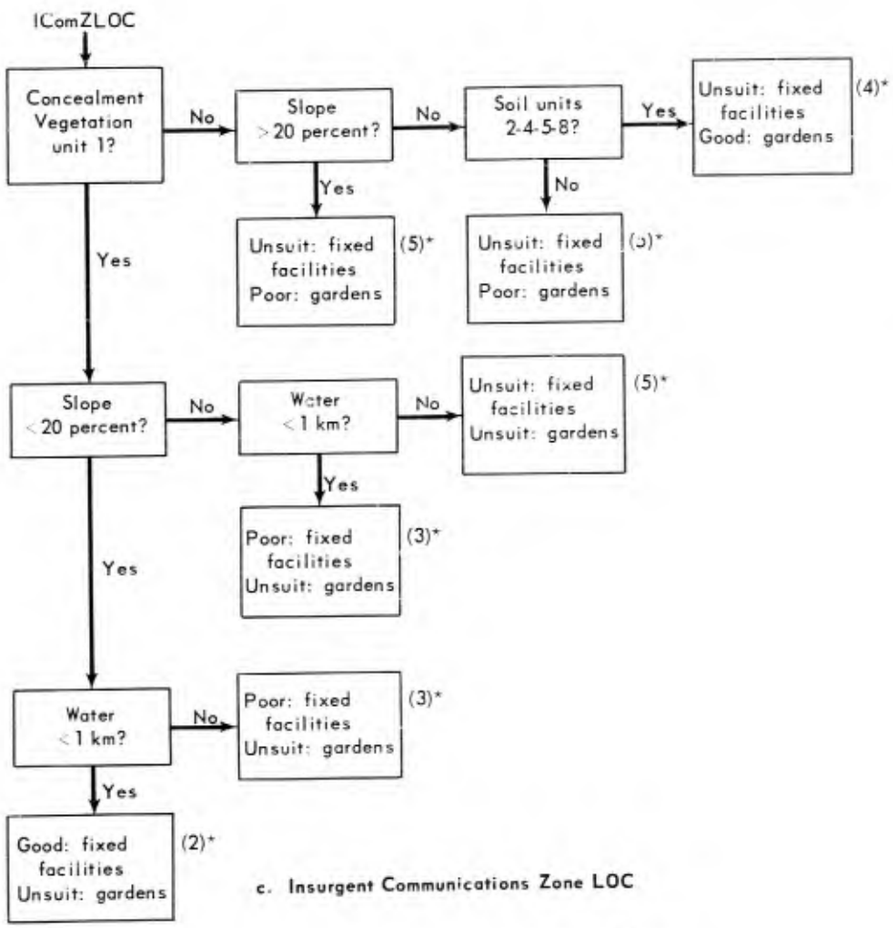
a. Northern Sector Study Area



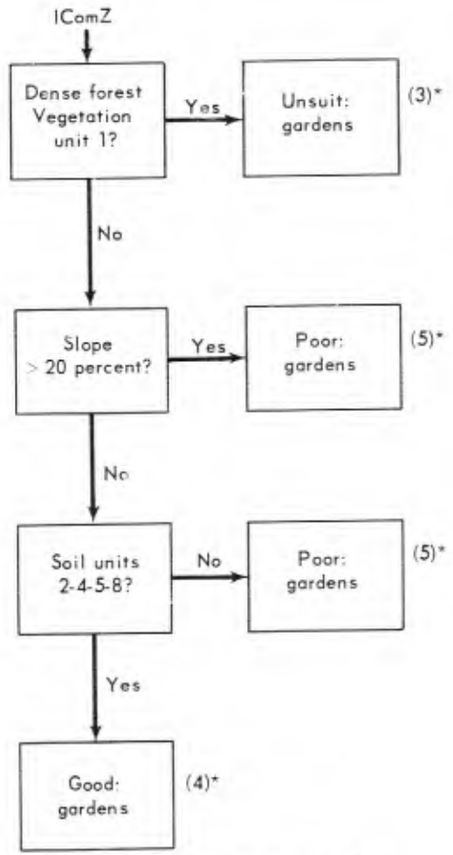
b. Insurgent Tactical Zone

(U) Fig. I-8—Procedure for Analysis of Insurgent-Basing Suitability of Northern Sector

*Final map unit number, Fig. I-7.



c. Insurgent Communications Zone LOC



d. Insurgent Communications Zone

Fig. I-8 (continued)

(U) Based on these criteria of insurgent base-site suitability, converted to equivalent factors in terms of environmental analysis, a method is presented for compilation and synthesis of a map of the study area, "Suitability for Insurgent Basing," which divides the area into an ITacZ and an IComZ. This map depicts the suitability of the former zone for insurgent bivouac, fixed facilities, and gardens and the suitability of the latter zone for fixed facilities along major LOC and gardens everywhere in the zone.

Section II

AREA ANALYSIS: MIDDLE SECTOR*

INTRODUCTION

Background

(C) This section analyzes the Middle Sector, one of three distinct terrain regions along the Vietnamese border of Cambodia. The area analysis, like that developed for the Northern and Southern sectors (Sections I and III of this paper), addresses the problem by producing a map showing the suitability of the area for insurgent basing. The final map for this sector is different, however, in that it depends primarily on distance relations.

(U) Assumptions and Scope. Area analysis, in intelligence-community usage, usually implies a map study of a geographic area. Subject matter is diverse but mostly related to environmental factors. Most area analyses, or, specifically, terrain analyses, provide at least one interpretation of the military significance of the units mapped. This approach demands the isolation of factors independent of real-world activities in the geographic and political sense. Maps constructed using the area-analysis approach form a broad intelligence base and are independent of time. In contrast, the targeting approach uses selected intelligence indicators to predict the locations of critical points and areas and is time dependent. (Studies related to the identification of bases in the Vietnam theater of operations basically approach the problem in this way.) This sector study follows the area-analysis approach and is designed to be independent of real-world data on specific targets, but it could profitably be used in conjunction with such information.

(U) The development of a working model of insurgent basing was basic to the study. What level(s) of insurgency to consider, what constituted a "base," and, most important, what criteria to use in evaluating areas for base siting were problems requiring resolution.

(U) Both the insurgency level and the definition of a base were decided using the basic precepts of area analysis. Ideally, the study would not be oriented toward any particular level of insurgency or type or size of base but would be applicable to all. Since no empirical data on insurgent activity in the study area existed initially, base requirements were originally established by synthesizing data from other regions in conjunction with a rationale of what

*By Perry F. Narten and Ellen E. Kraus.

base needs should be. As project support became available, examination of operational activities related to the Vietnamese conflict became the principal source of data used in criteria determination. Although Vietnam data are strongly target- and tactic-oriented and insurgency levels are high, whereas the synthesis approach represents an idealized concept and low insurgency levels, the two methods yielded basically compatible data.

(U) Except for one general-purpose map to be discussed later in this section, the Middle Sector was mapped according to the criteria factors established and these in turn were combined to prepare a final area-analysis map showing the suitability for insurgent basing at 1:250,000. Although the factor maps are also at 1:250,000, most data from which they were constructed were resolved to scales of 1:50,000. To the extent that transfer is practical and legible at 1:250,000, this was the ultimate resolution of the sector study. All maps have been reduced in printing.

General Setting

(C) The Middle Sector covers about 4822 sq km of Cambodia (see Fig. 1) in a generally flat to rolling region adjacent to the Vietnam border. It is irregular in shape and meets the border at about 11° 24′ N on the west and 106° 55′ E on the east. The UTM coordinates are WT960600, WT815600, WU815268, XU360268, XU360542, YU100542, and YU100340.

(U) Average elevations increase from less than 15 m in the southwest to 125 to 200 m in the northeast. Regionally, slopes are mostly less than 5 percent but do reach 20 to 30 percent along the hilly eastern margin. The area is irregularly broken by steeper slopes associated with hills of sandstone and basalt or with inc sed stream systems in the eastern half. Rainfall and areas of dense forest also increase eastward together with poorer and more shallow soils and sparser cultivated land, population, and road systems.

(U) Principal land use, population, and economic development show a close tie to two well-defined clay-soil provinces. Rice, the main food crop, occupies the thick alluvial clays and silts of better-drained valley borders and large floodplains and characterizes much of the western region.

(U) Rubber (about 200 sq km) is grown exclusively on clays developed over basalt. These areas of basalt and related soils stand out as distinct entities north of about 11° 45′ and west of 106° 30′ and comprise about one-third of the total study area. They rise as large hills to flat-topped domes about 30 to 50 m above the surrounding terrain, with the highest parts reaching 70 m in the west and 200 m eastward. Soils are distinctive and agriculturally productive. Very deep red to red-brown clays (latosols) cover the flat tops of the hills and thick to thin black plastic clays (regurs) occur on the lower flanks. Heavy concentrations of upland cultivation surround and reach up the hill flanks. The areas remaining in forest range from almost exclusively bamboo to mixtures of bamboo and dense forest. The major towns are associated with the rubber areas.

(U) Vegetation Map. A multipurpose vegetation map (Fig. II-1) was prepared for the Middle Sector. The 11 vegetation units are described in Table II-1 in terms of landform and soil relations, including type, thickness, moisture relations, and factors related to agricultural potential where applicable. Each unit is specifically evaluated in terms of concealment from both air and ground

visual observation and also in terms of effects on cross-country movement; soils are considered but slope is not. Descriptors used for vegetation, soil, and water relations are largely based on technical references on these subjects used in conjunction with photographic interpretations of soils and geology.

(C) Most unit boundaries shown on this map are from interpretations of 1:40,000-scale air photography flown from December 1957 to January 1958.[2] Areas of rubber (map unit 4) are based on the 1:25,000 Pictomaps where available and on the latest 1:50,000 maps.[3] Minor changes were also made in some other units based on the 1:50,000 maps postdating the photography. (Other non-cultivated vegetation patterns on the Pictomaps are generally too diffuse and variable to permit reliable changes.)

(U) For the most part the units are considered reliable as delineated despite the 10-year age of the photography used. Whereas small shiftings of some unit boundaries might be expected, the vegetation system as interpreted and described seems to be largely in equilibrium with the human factors that could change it. Such changes as would normally evolve are thought to be local, largely restricted to an ! inherent in the rai cultivation–old field areas (map unit 3). There is little evidence that this unit expands at the expense of other adjacent units; more likely it would be intruded on by the miscellaneous crops unit (map unit 2) or by dense forest and brush (map unit 9). Significant area changes in the map would be largely relatable to three factors: (a) the expansion of the rubber plantations (map unit 4) together with satellite subsistence cultivation (map unit 2), mostly at the expense of areas of bamboo or dense forest (map units 9 and 10); (b) large-scale government "new lands" and/or irrigation projects; and (c) the degradation of agricultural lands due to war-related activities.

(U) Of these factors, the existence only of the first could be identified and corrected by use of the recent topographic maps.

BASING CRITERIA

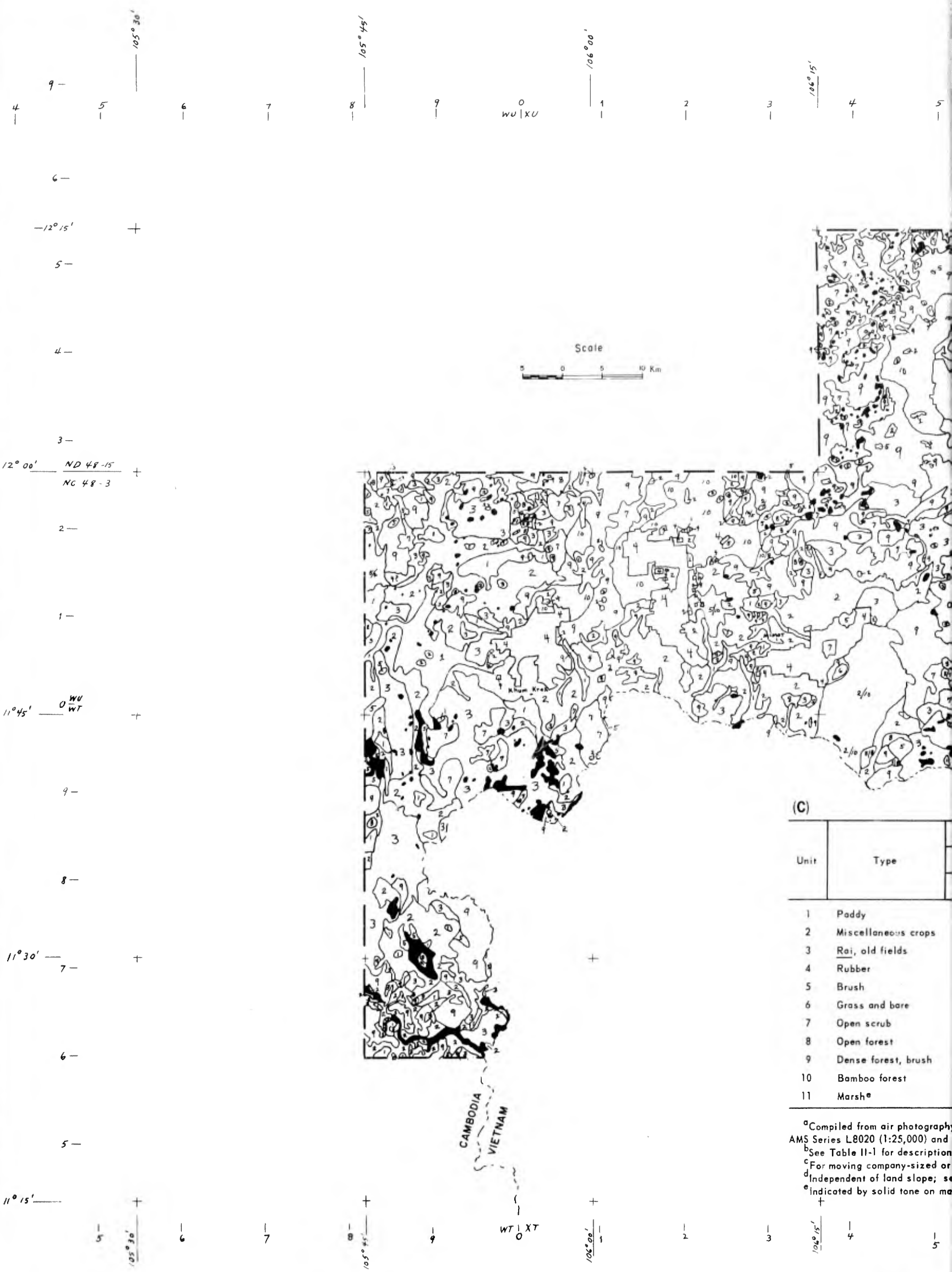
General Considerations

(U) Insurgencies will be closely tied to political, economic, social, and ethnic aspects of the country in which they develop. These are complex time and space variables of the real world that cannot always be predetermined and that may change rapidly in importance. They do affect insurgencies at any level (and whatever type or size of base) and make them essentially target-oriented. Knowing the targets or possible targets, it should be possible to predict the most likely areas from which insurgents move and return—the base of operation—by reference to a basing-suitabilities map prepared from factors that change slowly or not at all.

(U) A basic premise used in the analysis of this sector for insurgent-basing suitability was thus that the product should not be target-oriented and that all terrains in the area fitting idealized sets of functions look equally good.

Base Definition

(C) The primary objective was to produce a map identifying the relative suitability of an area for insurgent basing. The term "base," if undefined,

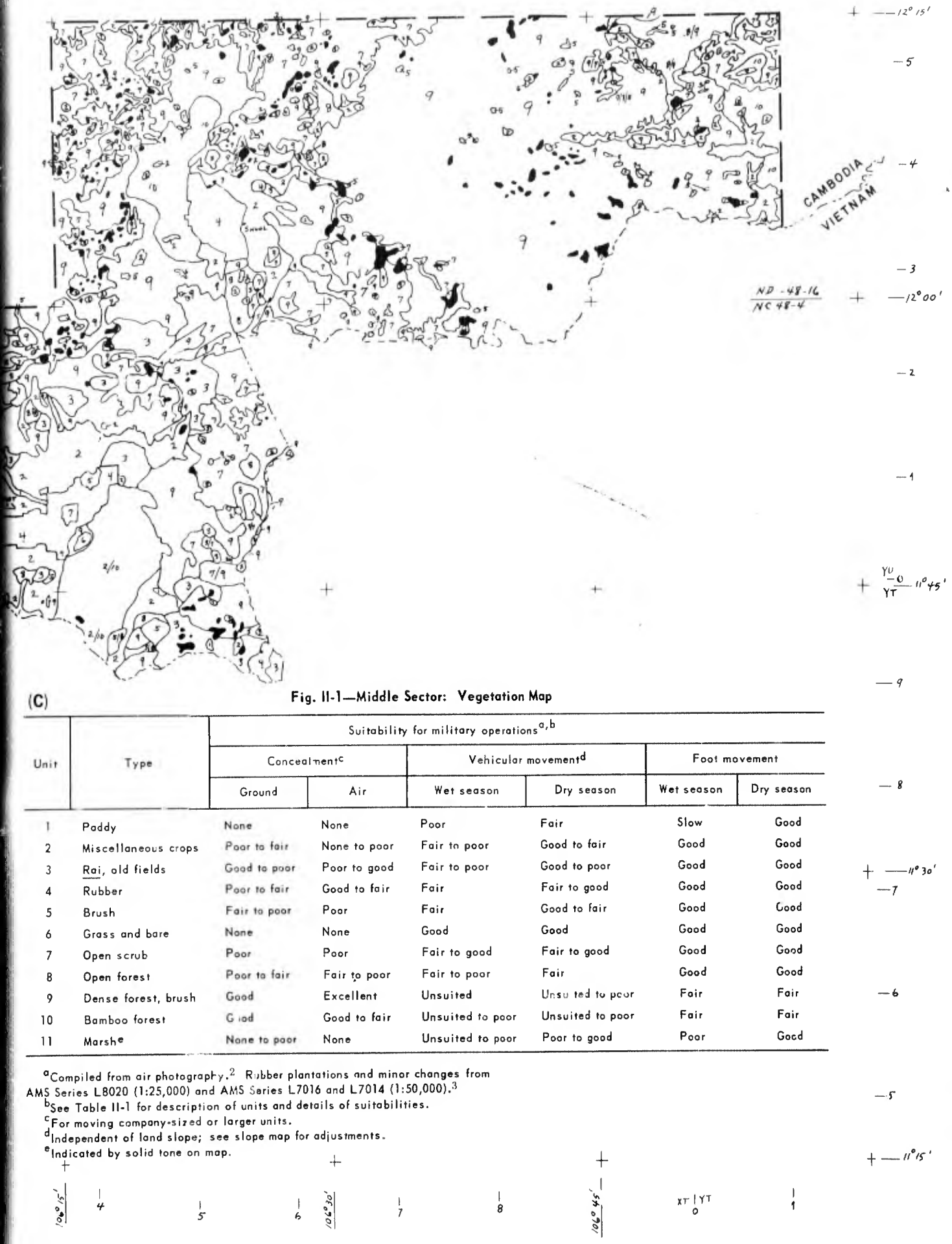


(C)

Unit	Type
1	Paddy
2	Miscellaneous crops
3	Rai, old fields
4	Rubber
5	Brush
6	Grass and bare
7	Open scrub
8	Open forest
9	Dense forest, brush
10	Bamboo forest
11	Marsh[e]

[a]Compiled from air photography
AMS Series L8020 (1:25,000) and
[b]See Table II-1 for description
[c]For moving company-sized or
[d]Independent of land slope; se
[e]Indicated by solid tone on ma

1



(C)

Fig. II-1—Middle Sector: Vegetation Map

Unit	Type	Suitability for military operations[a,b]					
		Concealment[c]		Vehicular movement[d]		Foot movement	
		Ground	Air	Wet season	Dry season	Wet season	Dry season
1	Paddy	None	None	Poor	Fair	Slow	Good
2	Miscellaneous crops	Poor to fair	None to poor	Fair to poor	Good to fair	Good	Good
3	Rai, old fields	Good to poor	Poor to good	Fair to poor	Good to poor	Good	Good
4	Rubber	Poor to fair	Good to fair	Fair	Fair to good	Good	Good
5	Brush	Fair to poor	Poor	Fair	Good to fair	Good	Good
6	Grass and bare	None	None	Good	Good	Good	Good
7	Open scrub	Poor	Poor	Fair to good	Fair to good	Good	Good
8	Open forest	Poor to fair	Fair to poor	Fair to poor	Fair	Good	Good
9	Dense forest, brush	Good	Excellent	Unsuited	Unsuited to poor	Fair	Fair
10	Bamboo forest	Good	Good to fair	Unsuited to poor	Unsuited to poor	Fair	Fair
11	Marshe	None to poor	None	Unsuited to poor	Poor to good	Poor	Good

[a]Compiled from air photography.[2] Rubber plantations and minor changes from AMS Series L8020 (1:25,000) and AMS Series L7016 and L7014 (1:50,000).[3]
[b]See Table II-1 for description of units and details of suitabilities.
[c]For moving company-sized or larger units.
[d]Independent of land slope; see slope map for adjustments.
[e]Indicated by solid tone on map.

(U)

TABLE II-1

Middle Sector: Description of Map Units[2,3]

(Keyed to Fig. II-1)

Map[a] unit	Vegetation type	Description and landform	Soil relations	Military significance			
				Concealment,[b] visual		Movement[c]	
				Ground	Air	Vehicular	Foot
1	Paddy	Many small diked wetland rice fields; fallow or dry-cropped in dry season.[d] Marginal areas and local higher ground as in map unit 2. Some long-flooded areas as in map unit 11. In large flat floodplains, valley bottoms, and depressions; slopes less than 2 percent.	Mostly alluvial soils deep to very deep; clayey to silty at surface, variable deeper, often sandy. Near rubber (map unit 4) may be thinner, locally rocky, and plastic. Soils wet most of wet season,[d] moist to dry in dry season. Groundwater table seldom lower than 5 m in dry season; mostly less than 3 m.	Very limited when in crops. None when fallow.	None.	Passable with difficulty for tracks in wet season; fair in dry season. Unsuited for trucks when wet. Restricted when dry.	Slow only when flooded.
2	Miscellaneous crops	Miscellaneous field crops, largely subsistence; some fruit trees. Commonly separated by dense hedgerows of brush, low trees, and bamboo. In many places intermixed with paddy. Towns usually in this unit. Some areas usually fallow including conversion to brush or grass. Often gradational to map unit 3. On flat to rolling terraces, floodplains, basin margins, and fertile hilly uplands. Slopes mostly less than 10 percent, up to 45 percent in basalt hills.	Soils variable as in map unit 1 but usually drain faster and are sandier, particularly in higher parts. Water table usually within 2 to 10 m in dry season except in highest places.	Poor; fair to good in areas of hedgerows, brush, and in towns.	Little except within hedgerows, groups of fruit trees, and dwellings.	Generally good in dry season except when hedgerowed. Fair to poor in wet season.	Good.
3	Rai cultivation and old fields	Very variable within short distances (50 to 500 m). Usually widely scattered and irregular complex fields, brush, and low forest, all in various growth stages. In south and west largely abandoned. Some large areas of brush-covered old fields with higher hedgerows. On level to rolling terraces and interfluves; slopes mostly less than 5 percent, locally to 10 percent.	Soils variable, mostly deep to very deep; clayey and often thin or rocky in vicinity of rubber (map unit 4). In west and southeast includes large areas of probable fine sandy loams of low productivity. Locally gradational to map units 2 or 7. May contain hard laterite layers at depths of 1 to 8 m. Most surface-soil layers dry to very dry in dry season.	Good to poor.	Poor to good within short distances.	Generally passable by tracked vehicles; wheeled vehicles restricted to stopped. Most clayey areas very sticky when wet.	Good.
4	Rubber	In plantations. Trees up to 50 ft high and 12 in. in diameter: mostly less and usually in rectangular blocks of different-sized classes, seedlings to mature. Spaced 17 by 17 or 10 by 25 ft; undergrowth clear or weedy Mostly on flat to gently rolling hilltops, extending on margins to slopes up to 30 percent. Some terracing.	Essentially restricted to latosols developed on basalt rock. Mostly very deep, red to red-brown clay and clay-silt loams. Thinner on hill margins and trees shorter. Soils staple, drain well but moisture-retentive. Water table commonly deep.	Poor to fair in weeded plantations. Fair to good where weedy or in low dense saplings. Azimuth-oriented.	Generally good. Fair during short maximum leaf-drop period. Poor in youngest saplings.	Generally passable most of year, but azimuth-restricted.	Good.
5	Brush	Moderately dense to open spacing of shrubs, saplings, and stump-sprout growth; some widely scattered trees. Undergrowth grass, herbs, or seasonally almost bare. Flat to gently sloping valley margins, depressions, and hill slopes.	Soils variable, thick to thin; most abandoned marginal agricultural land. In southwest and east mostly fine-grained and wet for long periods.	Fair to poor depending on spacing density. Best in wet season when undergrowth tall.	None.	Good.	Good. Visibility restricted in wet season.
6	Grass or bare	Mostly tall (1.25–1.60 m) upland clump grasses; mixed with very widely scattered shrubs and trees. Partially reverting to brush like map unit 5. Commonly burned seasonally and ground bare. Slopes mostly less than 5 percent; to 20 percent near Mimot rubber plantation.	Soils mostly medium-grained in east; clayey and rocky near Mimot.	Mostly poor; none when burned.	None.	Good.	Good. Visibility restricted in wet season.
7	Open scrub	Mostly widely to very widely scattered dwarf evergreen to semideciduous trees and brush. Undergrowth low, sparse, mostly grass. Some drainage ways with dense riverine forest; small hillocks and ridges usually in denser vegetation, often forest. Generally low plains, slopes less than 5 percent. Steeper in northeast.	In central parts mostly on thin, clayey to sandy soils over folded sedimentary rocks. In vicinity of rubber plantations and in northeast corner some thin clays over basalt. In southwest mostly fine sandy loams on thick terrace deposits. Hard laterite layers frequent at shallow depth (1.5 m or less), usually asso-	Mostly poor; locally fair to good in elevated patches.	Generally very poor; locally good in dense forested patches. Trails detectable.	Fair to good most places for tracked vehicles. Generally fair for wheeled vehicles. Little seasonal variation. Microrelief moderately strong in central parts, as linear ridges. Strong in east.	Good.

		terracing.					
5	Brush	Moderately dense to open spacing of shrubs, saplings, and stump-sprout growth; some widely scattered trees. Undergrowth grass, herbs, or seasonally almost bare. Flat to gently sloping valley margins, depressions, and hill slopes.	Soils variable, thick to thin; most abandoned marginal agricultural land. In southwest and east mostly fine-grained and wet for long periods.	Fair to poor depending on spacing density. Best in wet season when undergrowth tall.	None.	Good.	Good. Visibility restricted in wet season.
6	Grass or bare	Mostly tall (1.25–1.60 m) upland clump grasses; mixed with very widely scattered shrubs and trees. Partially reverting to brush like map unit 5. Commonly burned seasonally and ground bare. Slopes mostly less than 5 percent; to 20 percent near Mimot rubber plantation.	Soils mostly medium-grained in east; clayey and rocky near Mimot.	Mostly poor; none when burned.	None.	Good.	Good. Visibility restricted in wet season.
7	Open scrub	Mostly widely to very widely scattered dwarf evergreen to semideciduous trees and brush. Undergrowth low, sparse, mostly grass. Some drainage ways with dense riverine forest; small hillocks and ridges usually in denser vegetation, often forest. Generally low plains, slopes less than 5 percent. Steeper in northeast.	In central parts mostly on thin, clayey to sandy soils over folded sedimentary rocks. In vicinity of rubber plantations and in northeast corner some thin clays over basalt. In southwest mostly fine sandy loams on thick terrace deposits. Hard laterite layers frequent at shallow depth (1.5 m or less), usually associated with more clay-rich soils but rare on basalt soils. Soils mostly sterile and very droughty, may represent end product of old cultivation/burning practices.	Mostly poor; locally fair to good in elevated patches.	Generally very poor; locally good in dense forested patches. Trails detectable.	Fair to good most places for tracked vehicles. Generally fair for wheeled vehicles. Little seasonal variation. Microrelief moderately strong in central parts, as linear ridges. Strong in east.	Good.
8	Open forest	Scattered semideciduous tall trees, crowns rarely touching. Second story rare. Undergrowth moderate to sparse brush and herbs, commonly thorny. Where dense usually very low and grassy. Some brush and dense forest patches as in map units 5 and 9. Logs and stumps common. Variable terrain.	Soils variable, mostly deep, agriculturally poor. Droughty in dry season.	Generally fair where understory high; poor where low and grassy.	Fair to poor.	Restricted in places but generally passable for tracked vehicles all seasons. Difficult for wheeled vehicles, particularly in wet season.	Good; slow where brush dense or thorny.
9	Dense forest and brush	Mostly very dense closed canopy, mixed evergreen, and semideciduous tall forest with several lower tree layers; undergrowth may be thin to open; in places moderately dense with dense understories; in southwest and locally in northeast mostly very dense tall brush with or without scattered trees; terrain variable; most slopes less than 5 percent, to 30 percent along streams in east and 45 percent in central and western basalt hills.	Largest areas on clay soils associated with basalt and higher, better-drained sandy soils of old terrace deposits; common on tops of scattered low to high hills and ridges and along rivers.	Good; fair when ground layer thin.	Good.	Mostly unsuited to poor for tracked vehicles; impassable to wheeled vehicles.	Usually fair but slow; very slow in dense brush.
10	Bamboo forest	Open forest of widely scattered tall trees with 15-m second story of dense, many-stemmed (culms) bamboo. Local patches of dense to open forest. Variable terrain, commonly steep.	Mostly restricted to weakly acid to neutral pH clay and clay-silt soils developed over basalt bedrock and associated colluvium (latosols and regurs). Moisture-retentive. In hilly eastern margins soils coarser-grained and thinner over granite-like rocks.	Generally good. Fallen bamboo leaves noisy when dry.	Generally good; moving bamboo culms easily seen.	Maneuver and visibility difficult for tracked vehicles. Impassable to wheeled vehicles.	Fair to very slow when culms thick.
11	Marsh	Tall to short grass or bare. Ground flooded and/or saturated for long periods, some lakes. Sparse brush and isolated trees locally on margins and high spots. Cultivated in places dry years, dikes remaining. Mostly river, high water-collecting areas, and abandoned channels in west. Many isolated depressions in east. Flat ground, slopes 1 percent or less.	Soils deep, mostly clays and silts, locally sandy. Plastic and/or strongly acid in places. Moist or wet much of year but most eventually hard and dry at surface. Water table near surface most of year.	Generally none to poor. Locally fair in tall cane grass but moving canes detectable.	None; tracks easily visible.	Generally unsuited when flooded or wet; locally passable with difficulty by tracked vehicles. Fair to good when moist or dry.	Slow to impassable when flooded and wet. Good other times.

[a]Combinations of numbers on map, such as 2/10, are mosaics where separate unit designations would be too confusing at scale of presentation. First number is the most prominent type.
[b]Evaluated for moving groups of 150 persons or more. Most map units will provide some concealment for individuals or small groups when stationary. Buildings can be concealed at random only in map units 4 and 9, and locally in 3.
[c]Additional restrictions caused by land slope not considered here; see slope map for adjustments.
[d]Wet season includes Southwest Monsoon and following transition period; generally mid-May through October. Dry season includes Northeast Monsoon and following transition period; generally early November to early May.

however, is open-ended. In low levels of insurgencies a base may be little more than a permanent to semipermanent camping, emergency, or meeting place. At higher levels they may be compared to the bivouac areas or temporary camping stops periodically used by the VC troops in movements through War Zone C in Vietnam. At the other end of the spectrum, bases may be specialized logistical or manufacturing depots of any size for munitions, food, medicine, or other material; they may be hospitals, training areas, PW camps, communication centers, command or political headquarters; or they may be strictly troop bases. (In some intelligence data even a buried rice cache was identified as a base site.) All combinations of these are also possible.

(C) Some limits must be established—the larger or smaller a base, the greater or less are its requirements for space, concealment, water, food, etc. A man can hide anywhere; a battalion cannot. As defined in a 1966 intelligence publication,[15] a base is "two or more different type [military support] activities within a 400-meter area." (The part in brackets is omitted in some parts of the same study.) Size is the important parameter in this study. A 400-m area probably equates to about 0.25 sq km. This is not very large, particularly for military units,* although some types, e.g., medical and manufacturing sites, may be quite compact. Few intelligence reports identify the area of a base as such. When viewed in the perspective of ground generally controlled, very large areas often qualify and perhaps are better described as a system of bases. The area of northern Tay Ninh Province in Vietnam contains many concentrations of base points, which probably represent (or did) either individual points in a base complex or duplications of intelligence reports at slightly different locations, or both.

(C) As defined in this section, a base must

(a) Serve a primarily offensive purpose, in a military, not a political, sense.

(b) Include a company of about 130 to 150 men, a minimum figure chosen because VC companies average this size.

(c) Occupy an area of 1 sq km (for internal security reasons).

(d) Have easy access to selected targets (i.e., be near LOC and population centers).

(e) Perform one or more of the following activities: food or ordnance manufacture and supply, medical treatment, training, PW detention, and basing or control of troops.

Synthesized Factors

(U) Basing criteria relatively independent of real-life changes are not likely to be complicated. One has only to ask himself where he would choose to base. The answers would be fairly simple and initially related to existence needs, the desire to be protected, to see and not be seen. Certainly a ready source of water and food is a prerequisite, and at least overhead concealment may be basic to survival. Other factors such as general accessibility through existing trail systems, roughness of ground as relating to movement, the

*The RAC division-level war game TACSPIEL used the following deployment areas, in square kilometers: platoon, 0.25; company, 1 (4); battalion, 4 (9); support command or service support group, 9. The numbers in parentheses are requirements for extended deployment.

development of resupply systems, and such protective features as lookout points and soils deep enough to develop protective cover would seem of importance. Other aspects more relatable to the function of the base, at least in terms of distance, would include the road network and the populated areas. As insurgencies grow and organizations and systems develop, the relative importance of these factors will differ but most should remain significant.

(U) These general considerations, however rational, need further documentation or perhaps quantification. It is unlikely that any set of detailed instructions will ever materialize for base locations and, even if prepared, less likely that they will be rigorously followed. Such decisions would, as in military usage, be subject to the preferences of the local base commander and the tactical situation. One can hope, through study of existing camps and base areas, to get some data on preferences and limits.

(C) Few historical records of any real precision are available on base-requirement documentation, and it is doubtful if there ever will be or that precision is a valid concept in this context. British operations research studies[18] during the Malaysian campaign indicated that communist terrorist camps were located preferably not more than 0.1 km from water and 1.6 to 3.2 km from food-growing areas or towns (98 percent), and were usually located on the middle slopes of hills with good observation points and escape routes. Rhyne,[19] in reporting on insurgent activity in southern Thailand, and in comparison with the British data, found that of the 14 small camps examined, 29 percent were within 0.1 km of water and 86 to 93 percent were within 3.2 km of cultivation or villages. A location 1 to 2 km from abandoned cultivation was favored because new cultivation would not be unduly surprising, and camps were kept away from major roads and trails used by villagers. R. D. Crawford[20] reports that studies of insurgent camps in Northeast Thailand indicate they are generally located within 1 to 2 km of water supply and within 3 to 5 km of villages as located on base maps. No comparable study data were located for Vietnam; however, some 1964 PW reports from War Zone C stated troop-camp locations should be 0.5 to 1 km from rivers and roads, 1 km from rice storages, no closer than 2 km from hamlets, and in hilly regions on middle slopes (Viilu[20]).

(U) Using these data in conjunction with "best guesses" through rationalization of most general missions of bases, the distance factors shown in Table II-2 were prepared as a working hypothesis for initial mapping of the geographic factors.

Activity Measurements

(C) Method. The previously described empirical distance data are largely from Malaysia and Thailand. Only two reports from PWs were available from Vietnam and none from Cambodia. To get some relatable values for the study area required that insurgent-activity data be plotted on a base from which measurements could be directly made. The best available detailed work sheets for all the study area are the AMS topographic maps at 1:50,000,[3] and these were used as the data-base sheets. From activities plotted on these maps straight-line distances were measured in kilometers to the nearest town, rice paddy, road, track, trail, perennial and intermittent streams, lakes, marshes, areas subject to flood, and all types of vegetation. Evaluations of these map-face parameters are included with the results later in this section.

(C) The compilation of an activity map that is internally complete and consistent proved to be a task beyond the limits of the study. Initial examination of intelligence information indicated very little usable data in Cambodia. The effort was therefore expanded to include a large part of the adjacent area in Vietnam since terrain aspects across the border are generally the same.

(U) TABLE II-2

Middle Sector: Hypothetical Distance of Base from Geographic Factors

(In kilometers)

Geographic factor	Distance	
	Maximum	Minimum
Water supply		
Perennial		
Lakes, rivers, and wells	3	0.5
Seasonal		
Ponds and streams	1	0
Own dug well	1	0
Concealment	0	0
Food source		
Storage–cache	2	1
Growing point	3	1
Population center	5	2
Lines of communication		
Road	5	2
Cart track	2	1
Trail	0.5	0
Observation point	5	1

Numerous sources were screened for intelligence data on basing and base locations, and from the most useful the activity plots shown later in Fig. II-10 were made.[12–15, 21–23] Data to be plotted as base-oriented were selected under the assumptions previously identified. Under these broad generalizations most activities that even suggested a permanent or semipermanent camping place were included. However, the compilations tried to group similar or reported activities separately to determine if separate relations could be distinguished. The groupings are shown in Table II-3.

(U) Measurement data results also are indicated by the groupings; however, because of the limitations discussed in the following section, they are not analyzed separately. Time limitations, both for further analysis and measurements, precluded any further consideration of the entire groupings listed as Defense and Troop siting. Some would no doubt qualify as bases but others represent only movements, strong points, and tactical operations.

(U) Limitations. The designators used are largely those initially reported in the intelligence documents. These reference definitions and usages often proved to be inconsistent for the same plotted point in different references. When the term "base" was used it was so plotted and grouped despite the fact

that its content and meaning, where described, might suggest another rating group to be better suited.

(U) The intelligence data came in over a long period of time and not all available material was included. The net effect of the time lag was that the integrity of the group designators tended to weaken with additional or conflicting data. Detailed cross-checking of information was not possible and contradictions were usually not resolved. Some activities listed under the broad Base category might better have been placed in the Ordnance or the Support group.

(C) TABLE II-3

Middle Sector: Grouping of Activities

Activity type	Plotted[a]	Measured[b]			Comments
		Cambodia	Vietnam	Total	
Base	41	15	26	41	Variable: general production to warehouse
Base, medical	33	3	29	32	Major hospital, dispensary, school
Ordnance	37	6	31	37	Depots and manufacturing centers
Support	116	9	28	37	Variable: of those measured, 51 percent are food-storage–related and 40 percent general depots
Camp, confirmed	12	8	4	12	Includes 3 PW camps in Vietnam and 1 in Cambodia
Camp, probable	14	9	5	14	—
Camp/support facility, suspect	28	23	4	27	Includes 21 support/rest areas, all in Cambodia
Billeting area	11	11	0	11	—
Training area	27	3	20	23	—
Defense	149	nd[c]	nd	0	Includes 13 underground entrances and 11 bunkers
Troop siting	79	nd	nd	0	Plat to regt size
Total	547	87	147	234	—

[a]Local differences in Tables II-4–II-8 reflect data lacks or item deletions to make the group stronger.

[b]Time limitations restricted measurements of all data plots in the Defense and Troop siting groups. Differences in other types reflect later judgments of their validity. Those in or nearest Cambodia were measured first. Locations of plotted points shown in Fig. II-10.

[c]nd, not determined.

Conversely, some activities in the Support group might have been better classified as Ordnance or Base or perhaps separated into a new Food category. Because of the ambiguities in the basic information and the time needed to resolve them, all points that did not physically overlap were plotted as discrete entities. In many cases they might well have represented the same basing area or separate functions within a base. The plots also contain such built-in errors as those indicated by the terms "probable" and "suspect" used with Camp (many other individual activities also so qualify). Furthermore, it should be noted that information pointed out on US maps by informants or PWs is very likely to have a low order of reliability even if the data are meant to

be genuine and the map is accurate. Many informants have never seen or cannot read a map. Finally, a 6-digit UTM grid location, even if it contains the whole activity, is only accurate to about 100 m.

(U) For all these reasons, quantity must be considered more important than quality, and it is hoped that the volume of the information offsets its deficiencies. A partial saving grace is that if the assumed requirement of 1 sq km comes at all close to actual base-size requirements, it can cover many locational errors.

(C) One final caveat must be expressed. All the plotted and measured data pertain to the Vietnam conflict—a very late stage of insurgency. Data obtained from Cambodia also might be particularly suspect because Cambodia is a wholly safe area—a sanctuary—and basing demands might be greatly diminished. It is believed, however, that the early doctrine used in Vietnam is still employed and that it has been transferred by the same force groups to Cambodia. The most easily observable difference should be the lack of concealment. This is not attested to in the measurements in general, although two groupings are somewhat distinct and are singled out in the discussion of concealment. Insurgent and Cambodian reluctance to have the sanctuary use documented through US surveillance and the desire of VC and NVN troops not to antagonize Cambodian natives excessively by being too obvious probably account for the similarity between activities and geographic-suitability factors in Vietnam and Cambodia.

Measured Factors

(U) Concealment. The need for concealment—in particular, overhead concealment from air observation—was considered a probable major requirement for basing. Within the minimum base-size considerations previously set, concealment is judged good when buildings, trails, and moving persons would be very difficult to detect. Such concealment can be provided to some degree by both villages and vegetation. Only the latter is considered here as applicable in the broad context of the study.

(U) Maps showing vegetation,[4, 24, 25] including topographic maps, must be interpreted for concealment factors, and most are too generalized to be very useful to the basing problem. The best way to check whether an activity is concealed is to examine recent photography. Time limitations did not permit even the systematic transfer of the activity-data points to the older photography used. To provide a better statistical foundation for what is generally suspected or locally known, measurements were made between activity points plotted on the most recent AMS topographic maps and specific vegetation units identified on these maps. More detail is shown on these maps than on any others.

(U) Activities were assumed to be in good concealment* if plot points fell on or within 0.1 km of plantations (rubber) or dense forest. The majority of

*Vegetation symbols and colors shown on the topographic maps are largely interpretations from air photography. The evaluations given for their concealment potential are based on their comparisons with direct interpretations of the 1957–1958 mapping photography[2] from which the L 7011 Series maps were made. Later series (L 7014 and L 7016)[3] generally follow the older series interpretations or at least the photography, except for cultural changes. The evaluations are considered reliable for the purposes of this study.

points not in dense forest were in open forest or brushwood, both considered to have fair to poor concealment potential.

(C) Concealment by type of activity is shown in Table II-4. These data show that 78 percent of the 230 points measured have good concealment and 95 percent when those within 0.5 km of good concealment are added. No important differences in concealment requirements were noticeable between activities located in Cambodia and those located in Vietnam except for the type of activity grouped as Support/rest area. All 21 of these are in Cambodia and only 6 (29 percent) have good vegetation concealment. However, an additional 48 percent would have village concealment. It is concluded that good concealment is a major factor in base-site selection.

(C) TABLE II-4

Middle Sector: Concealment of Activities from Air Observation[a]

Activity			Concealment					
Type	Total number	Percent in Cambodia	Good in area[b]		Good within 0.5 km		Fair to poor	Absent
			Number	Percent	Number	Percent		
Base	41	37	33	80	6	15	1	1
Base, medical	29	10	23	79	4	14	1	1
Ordnance	37	16	31	84	3	8	2	1
Support	36	25	31	86	4	11	0	1
PW camp	4	25	4	100	0	0	0	0
Camp, confirmed	8	13	4	50	1	12	3	0
Camp, probable	14	64	14	100	0	0	0	0
Camp/support, suspect	6	50	6	100	0	0	0	0
Support/rest area, suspect[c]	21	100	6	29	4	19	1	10[d]
Billeting area	11	100	9	82	2	18	0	0
Training area	23	13	18	78	3	13	0	2
Total	230	36	179	78	27	17	8	16

[a]Evaluated for vegetation[3] as follows: dense forest = good; clear forest and brushwood = fair to poor; all other = absent.

[b]Also considered "in" if plot point was within 0.1 km of dense-forest symbol.

[c]All 21 near food-producing areas.

[d]Forty-eight percent in village concealment.

(U) No separate map was compiled for concealment since the concealment potential was the principal factor in preparing the vegetation map and it is generally evaluated in Fig. II-1 and Table II-1. As indicated on that map, the evaluations are based on company-sized units. Most areas provide some measure of concealment for smaller groups, but buildings can be concealed at random only in areas shown as rubber and dense forest and locally in areas of rai cultivation. Areas covered by dense forest and/or tall brush are judged Excellent for insurgent basing. The rubber plantations and bamboo forest are rated Good since they have, at least seasonally, some undesirable features. Open forests and areas of old fields and rai cultivation are rated Fair, as are

composite vegetation units where the predominant type provides good concealment. Open scrub areas and those in miscellaneous upland crops are rated Poor for concealment. All others shown on the vegetation map (paddy, brush, grass, and marsh) are Unsuited.

(U) Water Supply and Availability. The existence of an immediately available water supply is considered a primary factor in base-area selection. Such sources within the study area are both perennial and seasonal. Their location and classification as portrayed on the 1:50,000 AMS topographic maps were assumed to be largely correct for analysis purposes. Classifications largely based on interpretations of air photography are not always reliable. Most aerial mapping photography in Southeast Asia is flown from November to February to utilize the most cloud- and smoke-free period. Thus lakes that appear during this period may not exist later in the dry season, or, in a wetter year, intermittent lakes or flooded areas might be more extensive. The classification of the perennialness of rivers is particularly questionable in areas of dense forest. The only changes made in this study on the basis of air photography were the deletion or reduction of some areas indicated as subject to flooding. It was equally apparent that more areas of flooded ground could have been added. These, however, would mostly be very small and would not materially change the study.

(U) Perennial sources are year-round flowing rivers and streams, small lakes, and wells. Dug wells, although not indicated on topographic maps, probably exist around most villages* with some drilled wells in the larger towns and on the rubber plantations. Seasonal sources are the intermittent streams, intermittent lakes, marshes, and areas seasonally flooded (identified on topographic maps as "land subject to inundation").

(C) Undeveloped subsurface (ground) waters are both extensive and easily exploited in many places. Although evaluated here in that context, it is believed that, except at the shallowest depths, these sources should not be considered a primary factor. Well digging is done by specialists having local knowledge in Vietnam, i.e., little or no do-it-yourself well digging.[1] This division of labor is probably even more common among the less ambitious Cambodians. It is unlikely that low-level insurgencies would have voluntarily enlisted such know-how. With rising levels of insurgencies and consequent greater water needs per base area or needs to stay in areas supplied only by seasonal sources, such help may be assumed for the digging of wells. The general depth limit for dug wells in areas of similar terrain in Vietnam is 20 m, and this figure was used in the analysis. Year-round groundwater supplies in areas of hard rock, in areas with shallow hard laterite layers, or in areas where water is at depths greater than 20 m would require development by other methods than digging. This potential is not considered applicable to insurgents.

*Comparison of locations of villages on the 1:250,000 maps[4] with drainage data indicates most are within 1 km of at least seasonal surface-water supplies except in the big rice areas of the south and west. There they are independent of such mapped sources and must, as those in areas of intermittent surface-water supplies, get their supplies from dug wells at least part of the year. Observations and consultations in both Vietnam and Thailand indicate that most villages depend on wells for domestic water supplies and the same probably applies in Cambodia.

(U) To obtain some quantitative figure for acceptable base-distance relations to water supply in the general study area, the straight-line distances were measured from 230 activity plots to the types of surface-water supplies previously listed. Relations to perennial bodies of water (rivers and lakes) are shown in Table II-5. As indicated, 96 (42 percent) of the activities are within 1 km of such supplies, and 149 (65 percent) are within 2 km. Only 9 percent are beyond 5 km, and none of these is farther than 9 km. Even 2 km, however,

(C) TABLE II-5

Middle Sector: Distance of Activities from Perennial Surface-Water Supply[a]

(All activities)

Activity type[b]	Number			Percent within indicated kilometer range[c]				
	Vietnam	Cambodia	Total	Within 0.5	0.6 to 1	1.1 to 2[d]	2.1 to 5[d]	>5[d,e]
Base	26	14	40	40	15	20	23	10
Base, medical	26	3	29	10	21	35	35	0
Ordnance	31	6	37	38	24	24	14	0
PW camp	3	1	4	25	25	25	0	25
Camp	7	1	8	25	13	50	13	0
Camp, probable	5	9	14	7	0	14	36	43
Camp/support, suspect	4	23	27	19	0	15	44	22
Support, miscellaneous	28	9	37	39	11	25	19	6
Billeting area	0	11	11	0	27	36	18	18
Training area	20	3	23	30	13	9	39	9
Total	150	80	230	28	14	23	26	9

[a]Perennial rivers and lakes as depicted on 1:50,000 topographic maps.[3]

[b]Activity types as grouped from category listings in Refs 12–15, 21–23.

[c]Based on straight-line measurements from reported activity UTM coordinate to nearest water source.

[d]Distances to seasonal sources for these ranges shown in Table II-6.

[e]Maximum distance is 9 km.

is a long way to carry water. Distances to seasonal surface-water supplies were therefore measured for the 133 activity locations (58 percent) more than 1 km from perennial sources. The resulting data are shown in Table II-6 in reference to the three longer-range groupings of Table II-5. The great majority (70, 85, and 85 percent by grouping) of the activities are within 1 km of seasonal supplies. Going out to 2.5 km adds an even 15 percent in each range grouping. Only three activities (2 percent) are farther, and these are 3 and 3.5 km from sources.

(U) In summary, of the 230 activities measured, 96 are within 1 km of a perennial surface-water supply and 85 percent of the remainder are within 1 km of a seasonal surface-water supply. Thus 90 percent of all activities are within 1 km of surface-water supplies that are available all or part of the year. None was farther than 3.5 km from such sources. Distances to wells in villages were not considered in the activity analyses on the assumption that insurgents normally would stay away from daily contact with the local population. However, the majority of activities farthest from surface-water sources were close to villages.

(C)

TABLE II-6

Middle Sector: Distance of Activities from Seasonal Surface-Water Supply[a]

(For activities greater than 1 km from perennial supply)

Activity type	Range from perennial supply,[b] km											
	1.1–2				2.1–5				5.1–9			
	Distance to seasonal supply, km											
	<0.5	>0.5≤1	>1<2.5	>2.5	<0.5	>0.5<1	>1<2.5	>2.5	<0.5	>0.5≤1	>1≤2.5	>2.5
	Number of activities											
Base	5	2	1	—	1	6	2	—	1	—	—	—
Base, medical	3	3	3	1	6	3	1	—	—	—	—	—
Ordnance	3	2	2	2	—	4	1	—	—	—	—	—
PW camp	1	—	—	—	—	—	—	—	1	—	—	—
Camp	4	—	—	—	1	—	—	—	—	—	—	—
Camp, probable	—	1	1	—	3	1	1	—	3	1	2	—
Camp/support, suspect	3	1	—	—	7	4	1	—	4	2	—	—
Support	5	4	—	—	4	2	1	—	2	—	—	—
Billeting area	3	1	—	—	2	—	—	—	2	—	—	—
Training area	—	1	1	—	3	4	2	—	1	—	1	—
Total	27	15	8	3	27	24	9	0	14	3	3	0
Percent in range block	51	28	15	6	45	40	15	0	70	15	15	0

[a]Seasonal includes intermittent streams and lakes, seasonally flooded areas, and marshes as depicted on AMS 1:50,000 map series.[3]

[b]See Table II-5 for perennial surface-water supply data.

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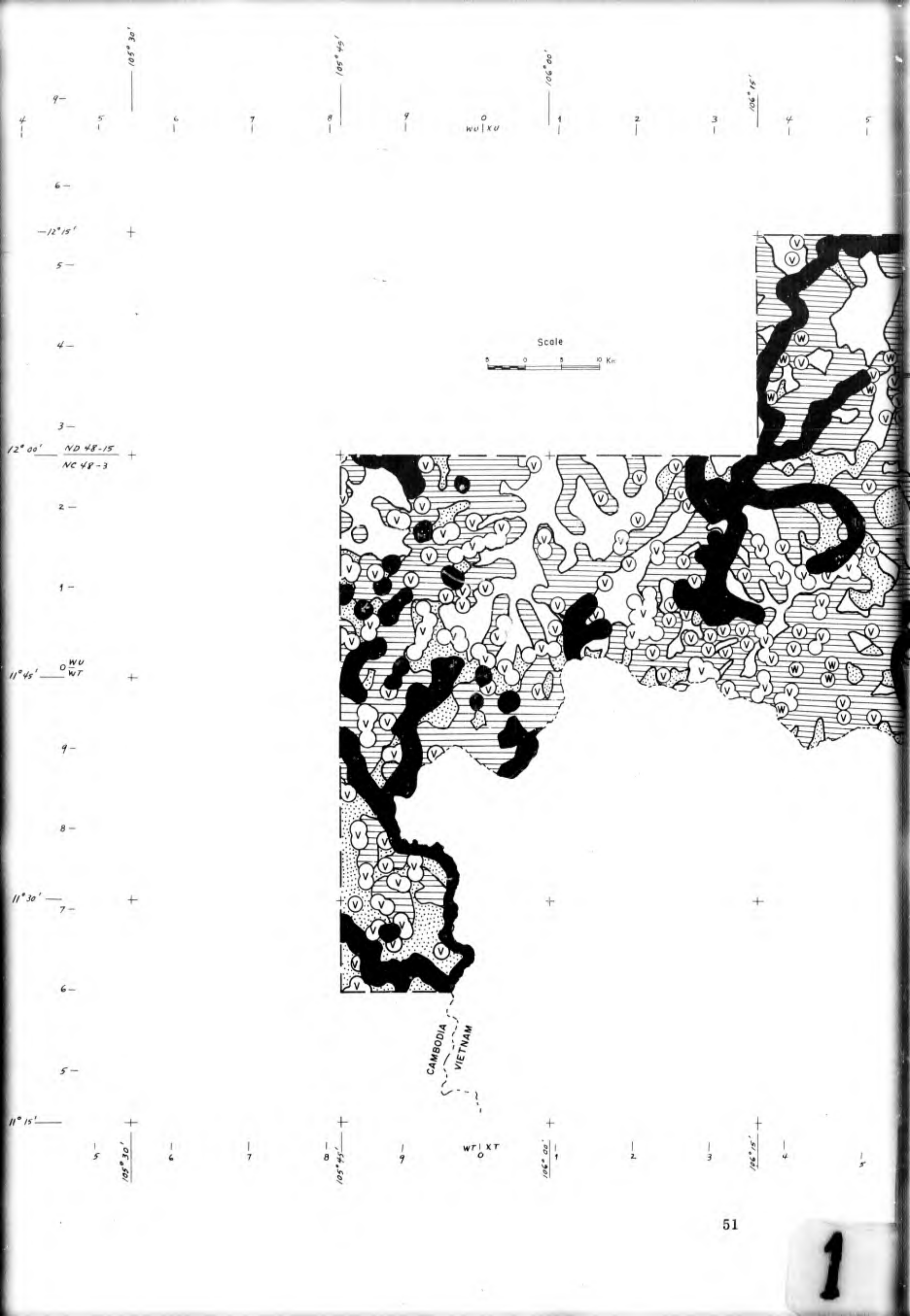
(U) It was concluded from the measurements reported here and corroborating data from previously cited sources that water-supply availability is a prime requirement for base-area selection and that a maximum distance of 1 km is essential. On this basis the water availability map (Fig. II-2) was prepared. Unit boundaries on this map are first based on immediately available sources within a distance of 1 km, including the larger population centers (relative to the subarea in which they are plotted). The remaining areas are evaluated in terms of their potential for development of subsurface waters by dug wells of 20 m or less. (Conceptual methodology and limiting factors developed by Burns[1] in similar terrain in Vietnam applied to areas underlain by alluvial and old-terrace deposits.)

(U) The ratings of suitability for basing shown on Fig. II-2 are based on a distance of 1 km. Areas are rated Excellent if insurgents can obtain water from perennial surface-water sources. Good areas are those where natural surface sources are seasonal in nature, or where insurgents must resort to village wells for all-year water sources without digging wells themselves. Areas are considered Fair where wells must be dug for base water supplies and such supplies can be easily obtained within 20 m or less from the ground surface. In the remaining areas water supplies must also come from wells, but siting would be difficult or impossible near wells 20 m or less in depth. These are rated Poor to Unsuited.

(U) Neither the quantity nor the quality of the available water was specifically considered in the ratings. The water resources are deemed sufficient in quantity everywhere except in parts of the Poor to Unsuited areas shown on Fig. II-2. Dug wells in villages, however, will have yield limits, and any large base demands may not be readily met, especially in the smaller villages. Biological water contaminants are presumably rampant near all inhabited places and to a lesser degree elsewhere. The general acceptance of, or indifference of native populations in Southeast Asia to, such unseen water contamination precludes consideration of it in base-selection criteria. Taste and physical appearance, however, could have local influences. The existence of any strong chemical contaminants such as salt in the surface- and near-surface-water resources in this sector of Cambodia is not known. The least potable waters are those of the marshes and flooded areas, particularly near the end of their seasonal existence, and the probable local occurrences of groundwaters with high iron content. Neither was considered sufficiently widespread or identifiable to affect the water availability ratings.

(U) Lines of Communication. Some accessibility to roads had been assumed to be a desirable factor in base locations on the basis that roads expedite the logistical and communication requirements, provide rapid access to and from target areas, provide orientation to base users, and are useful for outpost positioning to warn of roadbound actions against the base.

(C) The study area is fairly well served by roads only in the west. All-weather roads (Routes 7 and 13) connect the rubber plantations with each other and extend outside the area to the Mekong River ports of Kratie and Kampong Cham. Route 13 extends southward from the Snoul plantation to the Loc Ninh plantation in Vietnam and on to Saigon. From Route 7 at the Krek plantation, Route 78 reaches to the Vietnam border and, extending as Route 22, to Tay Ninh. Fair- or dry-weather roads connect the big agricultural areas along the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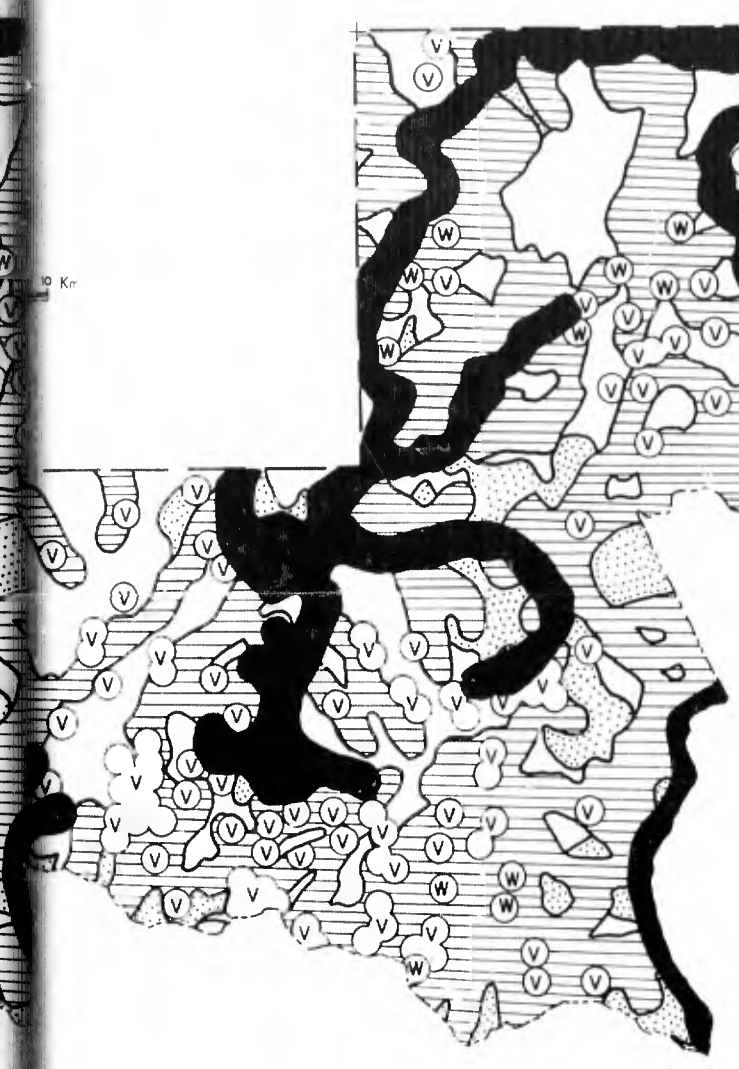

(C) **Fig. II-2—Middle Sector: Water Availability Map**

Suitability for insurgent basing	Symbol	Water source
All-Season Water Supply[a] within 1 Km		
Excellent	■	Perennial river or lake
Good	(W)	Known well
	(V)	Assumed well (in village)
Seasonal Surface Supply within 1 Km[b]		
Good	▤	Intermittent river or lake, marshes, and long-flooded areas
Subsurface All-Season Supply Easily Exploitable by Dug Wells[c]		
Fair	⁘	Groundwater generally available within 20 m; in paddy areas within 10 m
Subsurface Supplies Mostly Not Exploitable by Dug Wells		
Poor to unsuited	□	Groundwater generally too deep part or all of year, yields too low and/or hard rock or thick laterite close to surface. Best potential in areas under cultivation. (See Fig. II-1.)

[a]Surface-water data mostly from AMS 1:50,000 map Series L 7011, L 7014, and L 7016.[3] Groundwater data interpreted from soil, geology, and topography relations. Village location from AMS 1:250,000 maps JOG(G) 1501.[4] Water quality not considered.

[b]Generally available June to early November.

[c]Depth limit of dug wells assumed to be 20 m.

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western margin of the areas, reaching the Vietnam border in five places. Eastward, except for one short segment south of Mimot almost reaching the border and the dense lattice on the rubber plantations, dry-weather roads are restricted to Route 131, which traverses the center of the eastern area and meets Route 14 near its entry to Vietnam near the eastern border. A branch from 131 extends southeastward from about XU700400 to XU800300, stopping 5 km short of the border. Cart tracks connect the roads with most large cultivated areas of any size. Numerous foot trails complete the linkages of the road systems.

(C) To examine the validity of the assumption, measurements were made from the plot points of activities to the nearest road (by class), cart track, and trail. Ranges and average values by activity grouping are shown in Table II-7.

(C)

TABLE II-7

Middle Sector: Distance of Activities from Roads, Tracks, and Trails

Activity type[a]	Number			Distance, km[c]					
				Roads		Cart tracks		Trails	
	Vietnam[b]	Cambodia	Total	Range	Average	Range	Average	Range	Average
Base	26	15	41	0.3–11	0.7[d]	0–6	1.8	0–2.2	0.4
Base, medical	26	3	29	0–10	3.3	0.2–6.5	2.9	0–6.5	1.1
Camp	4	8	12	0.4–11	2.9	0–6	2.6	0–5.5	1.7
Camp, probable	5	9	14	2.5–9	5.9	0–6	1.5	0–7	1.4
Camp/support, suspect	4	23	27	0–11	2.7	0–4	1.4	0–2.5	0.5
Ordnance	31	6	37	0–7	2.2	0–5	2.3	0–8	0.6
Support	28	9	37	0–11	2.7	0–7	3.2	0–2.5	0.9
Billeting area	0	11	11	2.5–12	6.0	0–4	1.1	0–1	0.3
Training area	20	3	23	0.1–5.5	2.1	0–7	2.6	0–6	0.7
Total	144	87	231	0–12	2.8	0–7	2.9	0–8	—

[a]Activity type generalized from categories reported in Refs 12–15, 21–23.

[b]Coverage in Vietnam south to about 106° 20' in west to 107° 00' in east.

[c]Straight-line distances measured from reported activity UTM coordinates to nearest route type on 1:50,000 topographic maps.[3]

[d]Low value reflects concentrations of 18 data points in Vietnam vicinity of WT970750, WT990630, and WT990600.

In this tabulation all classes of roads are combined; no significant relations could be established between road class and activity type. Of the 231 activities measured, 87, or 28 percent, were in Cambodia; most were within 5 km of the border, and very few were beyond 13 km. This strong orientation toward Vietnam has some unevaluated effect on the statistics; however, all measurements were made irrespective of the border. Those wholly in Cambodia, identified as "Billeting area," may not be bases in the sense construed here. They have the highest average distance from roads (6 km).

(U) Based on the foot-rate figure for porters on trails—22 km per 8-hr day[26] and an approximate rate of 3 km/hr—the following generalizations can be made from the totals of activities.

(a) All roads are within a march of about half a day from base-oriented activities; the average distances are usually less than 1 hr, and almost all are within 2 hr.

(b) No cart tracks are farther away from activities than a march of about 2 hr, with averages of ½ to 1 hr.

(c) Relations to trails are variable. They are particularly suspect, because it is likely that identification on the maps used is both incomplete and out of date. None, however, is farther than 2½ hr, and the average of all activities is ½ hr or less.

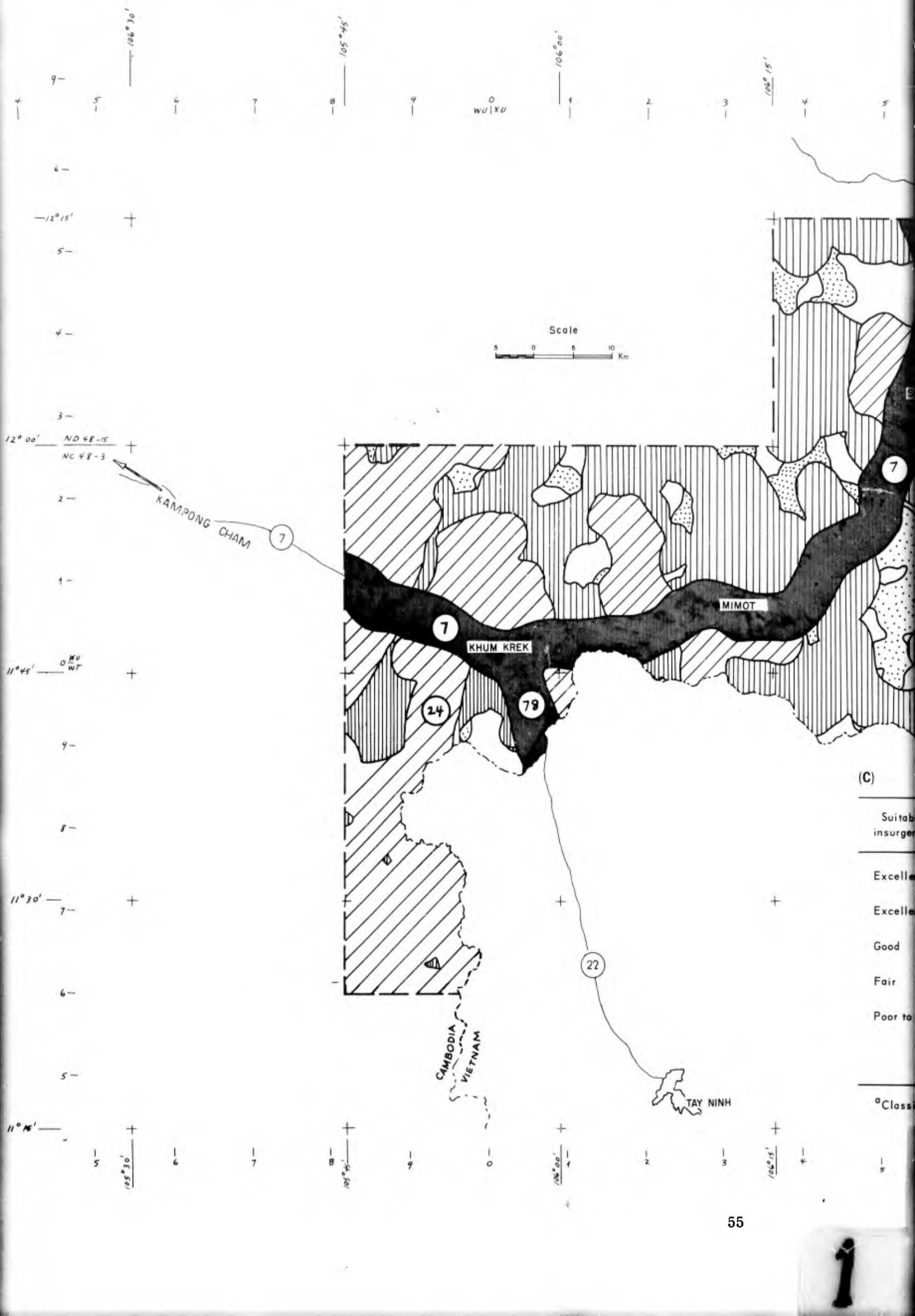
(U) Some finite numbers, however, are needed for graphic analysis. The average distance for all activities to roads and cart tracks is essentially the same (2.8 and 2.9 km). In addition, the majority of activities located more than 3 km from roads are 3 km or less from cart tracks. A value of 3 km was therefore used as most meaningful in the compilation of the lines of communication map (Fig. II-3) for roads and cart tracks.

(U) In all probability trails must actually extend to the base itself, and it is reasonable to expect that existing trails would normally be used for points of departure. As previously indicated, the completeness of this trail information is suspect, and total average figures were not compiled. A value of 1.5 km was arbitrarily taken for mapping purposes, largely on the basis that it was about the maximum of the activity averages in Table II-7.

(C) The use of rivers as lines of communications was not evaluated statistically. In most of the area they add little to what is already available and are subject to seasonal variations. East of about 106° 30′ large perennial streams could linearly serve most of the large areas not covered by any land-route systems. In the large area in the vicinity of 12° 00′ N and 106° 45′ E, only intermittent streams are indicated on the topographic maps.

(U) Rating evaluations for insurgent basing shown in Fig. II-3 are based on these empirical data, which indicate that accessibility to surface LOC is desirable. Proximity to roads of any class was judged Excellent on the basis that base areas would be less seasonally dependent—roads would be more trafficable when wet than cart tracks, which were rated Good. The actual difference is probably minimal, since much of the road network is of the fair-weather class. Of the remaining areas, where trails are within 1.5 km, they carry a Fair rating; beyond this distance they are considered inaccessible and therefore are rated Poor to Unsuited.

(U) Population Centers. Distance to population centers was considered a possible factor in base selection. Villages provide a local labor source, food and domestic supplies, and cover for informants, as well as being possible target areas. To test this factor, straight-line distances were measured from the plotted activities to the nearest inhabited place as shown on the 1:50,000 topographic maps. The population size at such places is only conjectural, based on the number of symbols suggesting house density. Initially a density pattern of 7 to 10 closely spaced "boxes" was considered. Most actual measurements were made to villages identified by place names on the base. In the more remote, less-populated places a concentration of five boxes was locally used.



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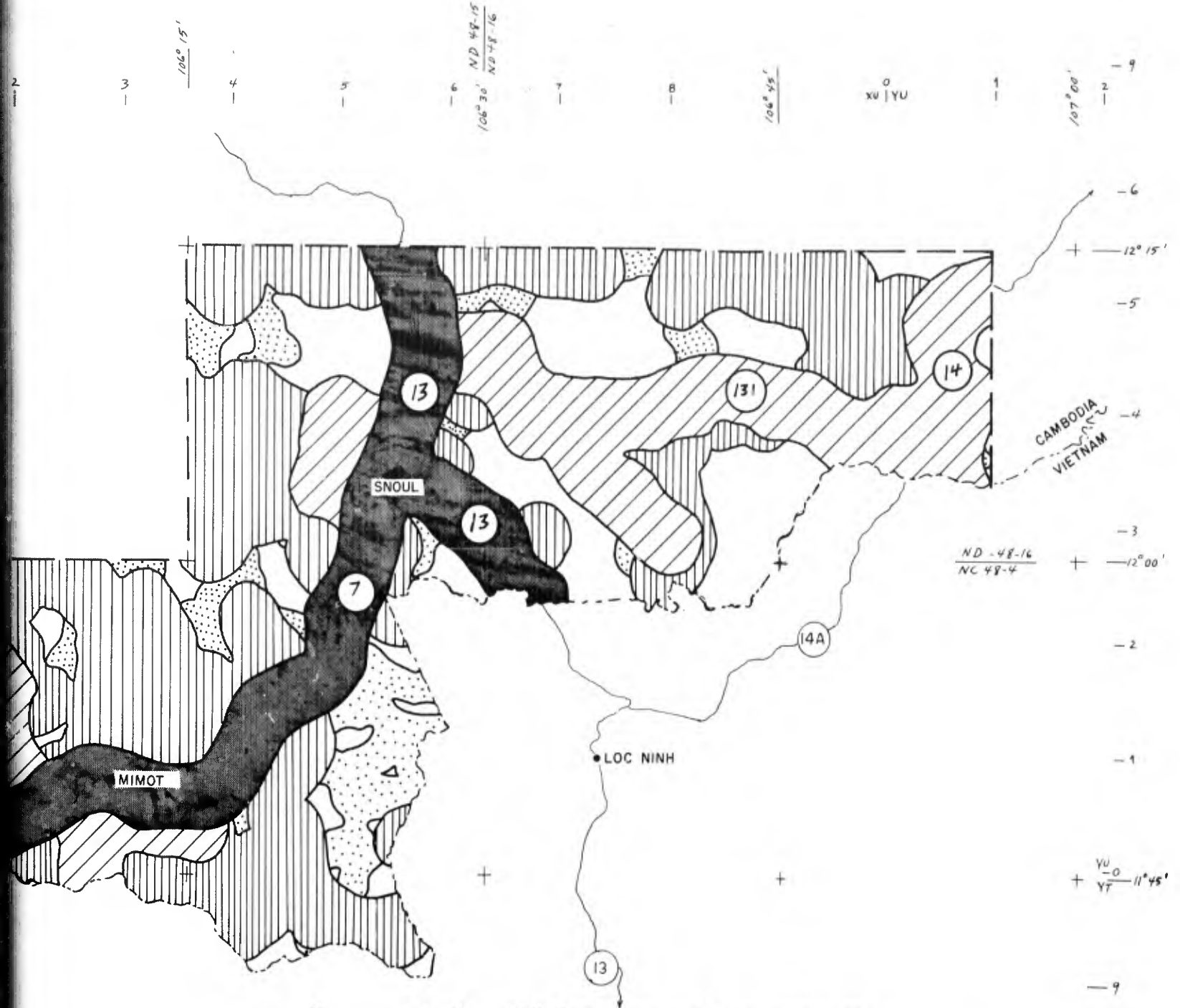

(C) **Fig. II-3—Middle Sector: Lines of Communications Map**

Suitability for insurgent basing	Symbol	Distance to LOC[a]
Excellent	■	All-weather road within 3 km
Excellent	▨	Fair- or dry-weather road within 3 km
Good	▥	Cart track within 3 km
Fair	⁘	Trail within 1.5 km
Poor to unsuited	□	All surface routes more than 1.5 km
	⑦	Selected highway-route number

[a]Classification and location from AMS 1:50,000 maps.[3]

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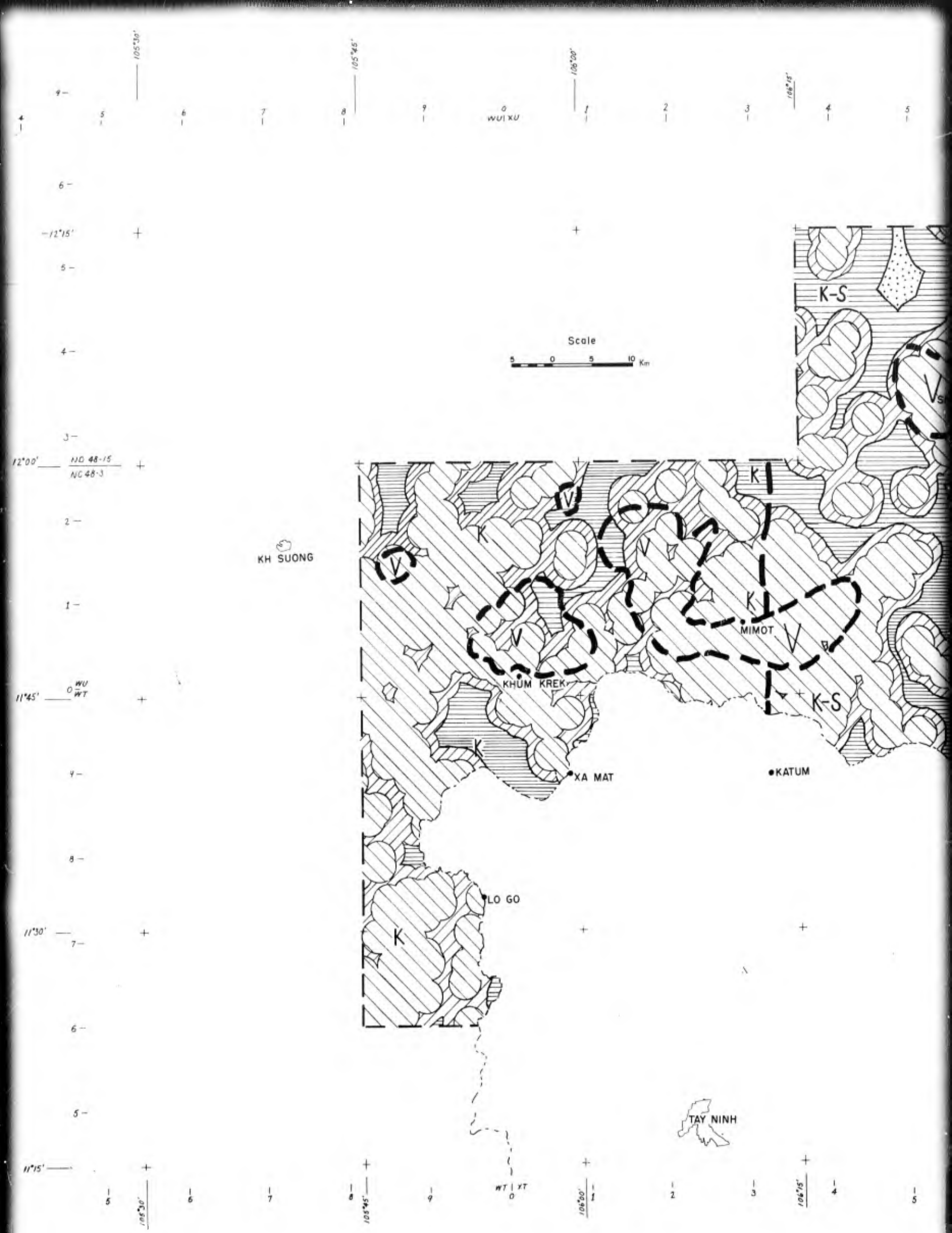

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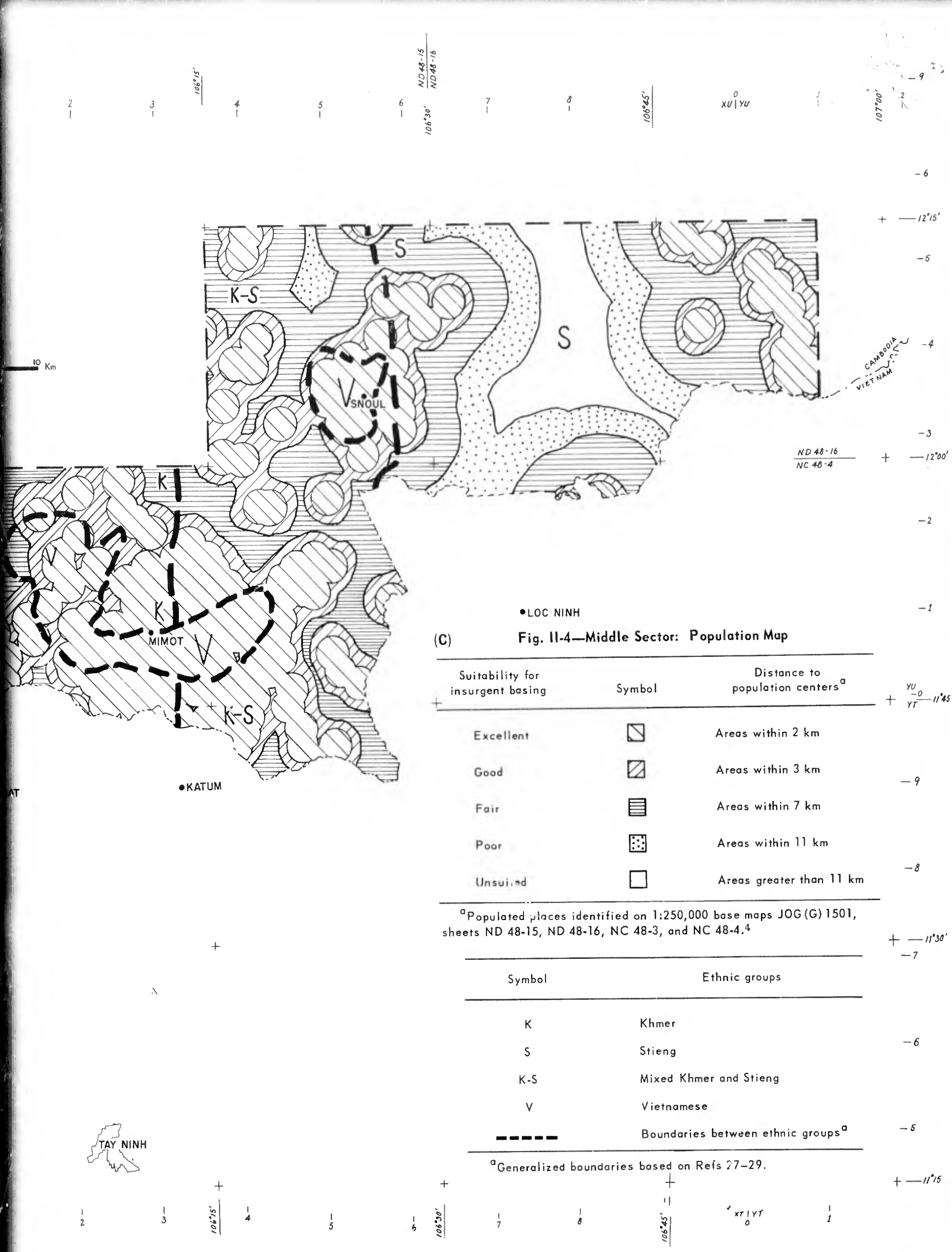

(C) **Fig. II-4—Middle Sector: Population Map**

Suitability for insurgent basing	Symbol	Distance to population centers[a]
Excellent		Areas within 2 km
Good		Areas within 3 km
Fair		Areas within 7 km
Poor		Areas within 11 km
Unsuited		Areas greater than 11 km

[a]Populated places identified on 1:250,000 base maps JOG (G) 1501, sheets ND 48-15, ND 48-16, NC 48-3, and NC 48-4.[4]

Symbol	Ethnic groups
K	Khmer
S	Stieng
K-S	Mixed Khmer and Stieng
V	Vietnamese
-----	Boundaries between ethnic groups[a]

[a]Generalized boundaries based on Refs 27–29.

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(C) The resulting data are summarized in Table II-8 to show for each type of activity the range in distance to villages, the average distance, and the number falling within five range groupings. The 32 activities grouped under Billeting area and Support/rest area are closely associated with villages, and slightly over one-half (4 and 9 respectively) fall within 0.2 km of villages. Both activity types are in Cambodia.

(U) The average for all activities plotted is 2.1 km,and, as indicated in Table II-8, 61 percent of all activities are within 2 km of villages. Going out about 1 km more increases the figure to 78 percent. Of the 22 percent remaining, only 5 percent are farther than 7 km. No detailed attempt was made to clarify those types of activity in which a moderate percentage was farther than 3.5 km from villages. It would be expected, however, that training areas involving firing ranges would need greater space. Also the Medical base, Ordnance, and Support activities, one-fourth of which are located farther than 3.5 km, do include some listings, such as caches and field dispensaries, that could be construed as temporary, i.e., more tactical than base relatable.

(C) The relative proximity of activities to villages can be considered as a result of one or more of the following:

(a) General basing preference

(b) Specific relation to "own turf" villages (the measurements in Vietnam cover large parts of War Zone C, long a VC stronghold)

(c) Neutral inviolate ground (Cambodian sanctuary)

(d) Village density patterns do not permit it to be otherwise

(U) Such determinations per activity, however, would have consumed more time than was permissible for the study. As there are few consistent examples of avoidance of villages it is concluded that, for whatever reason, a positive correlation exists, and a 2-km distance was judged Excellent for basing requirements in compiling the population map (Fig. II-4). A rating of Good was assigned to areas 3 km from villages. This 1-km difference is slight and, as will be shown later, had little bearing on overall ratings of areas. Areas within 7 km were considered as Fair for basing and areas within 11 km as Poor. Beyond 11 km from villages all areas are assumed to be unsuitable for base siting since less than 1 percent of all the activities measured fell in that range.

(U) Data-source points used in map compilation represent only the villages symbolized on the JOG (G) 1501 1:250,000 base sheets.[4] (A few villages on the 1:250,000 maps were not included because they were shown as abandoned on the 1:50,000 maps.[3]) At this map scale such symbols may represent very disparately populated places. In the least inhabited places, particularly in the east half of the study area, a symbol usually represented very small settlements, but most are included. Conversely, in the most densely populated areas only the larger villages are included.

(U) Ethnic differences were not considered a factor in the first-order analysis of environmental parameters for area analysis. Allegiances of ethnic minority groups can vary with the insurgent cause. They are in a sense, like the targets of insurgents, a real-world aspect to be applied (overlaid) to more unchangeable factors.

(C) The principal ethnolinguistic peoples in the study area are the Khmers, the Stieng tribal group, and the Vietnamese (Fig. II-4). Khmers are found

(C)

TABLE II-8

Middle Sector: Distance of Activities from Villages

Activity type	Number	Range	Average	Distance, km									
				0–2		2.1–3.5[a]		4–7		8–11		> 11	
				Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Base	40	0–13	1.9	30	75	3	8	6	15	0	0	1	2
Base, medical	28	0.5–10.5	3.4	9	32	6	21	10	36	3	11	0	0
PW camp	4	1–5.5	3.3	2	50	0	0	2	50	0	0	0	0
Camp, confirmed	8	0.1–5.5	1.0	6	75	2	25	0	0	0	0	0	0
Camp, probable	14	0.7–5.5	2.3	8	57	4	29	0	0	2	14	0	0
Camp/support, suspect	6	1–3.5	2.4	2	33	4	66	0	0	0	0	0	0
Support/rest area, suspect	21	0–2.5	0.4	20	95	1	5	0	0	0	0	0	0
Ordnance	37	0–7	2.2	22	59	7	19	8	22	0	0	0	0
Support	37	0–11	2.5	20	54	7	19	9	24	1	3	0	0
Billeting area	11	0–3.5	0.6	10	91	1	9	0	0	0	0	0	0
Training area	24	0–9	2.5	12	50	4	17	5	21	3	12	0	0
Total	230	0–13	2.1	141	61	39	17	40	17	9	4	1	<1

[a]All but 5 are 3 km or less.

from the western study border to a roughly north–south line about 5 km east of Mimot.[27] Here they become intermixed with the Stieng to a similar north–south line just east of Snoul. Further east Stieng tribesmen occupy the remaining area to the study boundaries. The Stieng are primarily hunters and fishers,[28] and it can probably be safely assumed, in their overlap areas with the Khmer, that they do not live in cultivated areas (see Fig. II-1: map units 1, 2, and 4). Peoples of Vietnamese origin, under French direction, form the working force on the rubber plantations.[29] They are not identified on the ethnolinguistic map. Lines identifying their general distribution on Fig. II-4 are therefore based on the areas under rubber cultivation plus an adjacent area allowance for subsistence crops.

(C) From a practical standpoint in relation to the war in Vietnam, the rubber plantation areas (Vietnamese) are recognized loci for both political and military insurgent activity. The Stieng are generally not sympathetic to either side and their areas are neutral.[28]

(C) Food Supply. Availability to sources of food was considered an important criterion in basing. The food requirements of a base can be supplied alone or in combination by direct bartering or confiscation of local village supplies, by a base's own garden plots, or by cache-storage systems. Starch and protein foods can be stored, but fresh vegetables and fruit, necessary for balanced diets, must be produced locally.[30] Distance should be an important factor in all cases, and measurements were therefore made on the 1:50,000 maps between the activity plots and the nearest area indicated as rice fields. The average distance for all activities to the nearest edge of a rice field was about 3.5 km. The highest average values (7 km) were for the Confirmed Camp category, and the lowest (0.8 km) for the Suspect Rest-Area category. The usefulness of a figure so derived can be suspect. The relations of a particular activity to other activities, particularly those grouped under the Support category (51 percent of those measured were food-storage depots), are not considered, nor are relations to villages. Although most large villages are adjacent to rice fields, many are not.

(C) Examination of photography suggests that much of the area, at least in Cambodia, that is indicated on the topographic maps as "brushwood" is actually in upland fields or used in rai cropping. As a practical matter small "bare" areas on the 1:50,000 maps of Cambodia are similarly in cultivation as are some areas identified as "clear forest." The large bare areas in Tay Ninh Province in Vietnam, however, are mostly grass-covered ground that stay wet for long periods. These wet areas have the best agricultural potential in the general area in which they occur.[31] Distances to "brushwood" were therefore also measured from the activity plot points. Average distance values for each activity group were always significantly closer to "brushwood" than to rice fields. Since the preferred 2-km distance from villages, established in the measurements to population centers, at least partly indicated a food relation, all activities more than 2 km from rice fields were particularly examined. Almost all such activities were less than 2 km from "brushwood." The noticeable exceptions were in the Support-Activity category, and here the specific activities concerned were all identified as food or general depots.

(U) It is concluded that the measurement data as interpreted indicate that a prime requirement in base siting is nearness to existing food-supply areas or areas capable of producing such supplies, and that normal maximums would

be in the order of 2 km. Work on base requirements in southern Thailand indicated a desire to locate near abandoned cultivated land so that new cultivation would not be suspect.[19]

(U) Agricultural areas or potential areas are identified on the vegetation map (Fig. II-1) in three categories, which generally become less pure in small areas, particularly in the eastern part of the sector area. In "paddy" (unit 1) and in "miscellaneous crops" (unit 2), the food-supply potential at any random point or given year is generally good. In unit 3, identified as "rai cultivation and old fields," most or even all of a specific area is normally not being cropped in a given year. These are mostly marginal agricultural lands where only scattered food crops would be expected. Cultivation in drier years would also be expected in at least the margins of map unit 11, "marshes."

(C) The four vegetation map units were used to produce a food potential map (Fig. II-5) to show the progressive availability of food-supply areas and/or potential food-growing areas for insurgent-basing needs. Areas within 2 km of wetland paddy are rated Excellent because rice is the principal component of local diets and would be most available. Areas within 2 km of miscellaneous subsistence crops, including rice, beans, and fruits, are rated Good. In most places such areas are also available within the areas rated Excellent. A Fair rating is given to areas within 2 km of marginal cultivated lands, as well as to areas that have been in cultivation at some time and in which new cultivation would not be suspect. A Poor rating is given to areas within 2 km of low ground that is saturated or flooded much of the year. Some cultivation is possible in these areas late in the dry season or for longer periods in dry years. They would not be unduly suspect when located near villages or in small plots elsewhere, especially in the areas occupied by the Stieng tribal groups (see Fig. II-4). All other types of vegetation/soil associations are rated Unsuited.

(C) Topography and Slope. Some consistent relations between bases and topography have been suggested in Malaysia, in Southern Thailand,[19] and in Vietnam (PW reports), where bases were preferentially sited on mid-slopes of hills, apparently to facilitate observation against countermeasures. Mid-slope positions also ensure better living conditions; i.e., better drainage and air movement.

(C) In view of the general flatness of the study area and the resolution of both the topographic contours and activity plots, there are relatively few places to make measurements. In most places the location of a site 2 km from water or food and in good concealment necessitates its being on slightly higher ground than its surroundings. Visual check of activities on more hilly ground in Cambodia (mostly around rubber plantations) places most on middle to lower slopes rather than the crests. Rubber does cover most flat crests, however, so the meaning, if any, of the data is obscured. From a practical sense it may be safe to assume that topography does have a role in any final site selections of base areas or at least parts of them, but it is below the level of areawide analysis conceived here.

(U) A slope map (Fig. II-6), prepared for general analysis purposes, was constructed and evaluated in terms of cross-country movement rates by foot and by tracked and wheeled vehicles and for the landing of groups of helicopters. These values are more relevant to countermeasures, which are not treated further in this study. The slope map could be combined with evaluations shown on the vegetation map (Fig. II-1) to produce a new cross-country movement

105°30' 105°45' 106°00' 106°15'

12°15'

12°00'

ND 48-15
NC 48-3

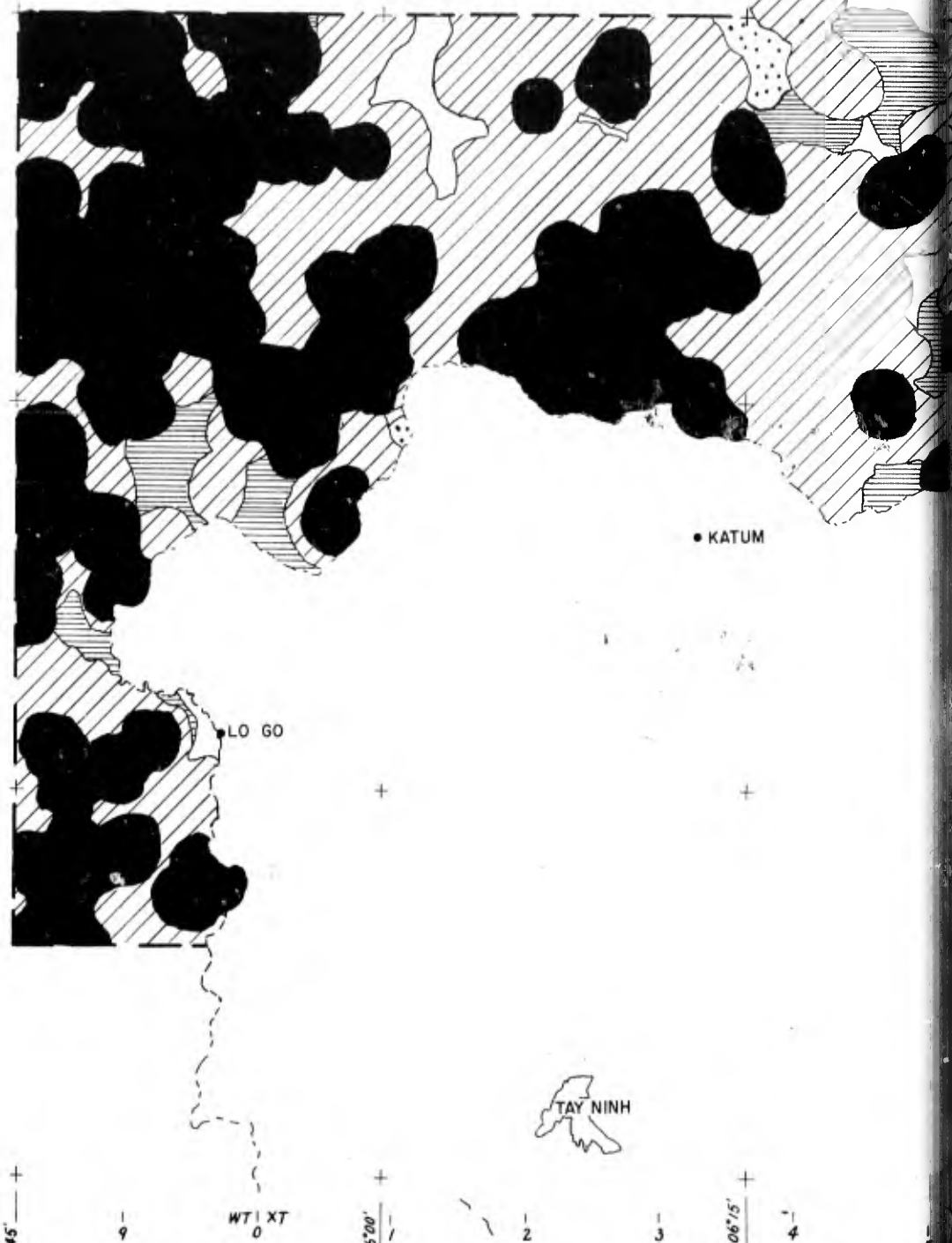
11°45'

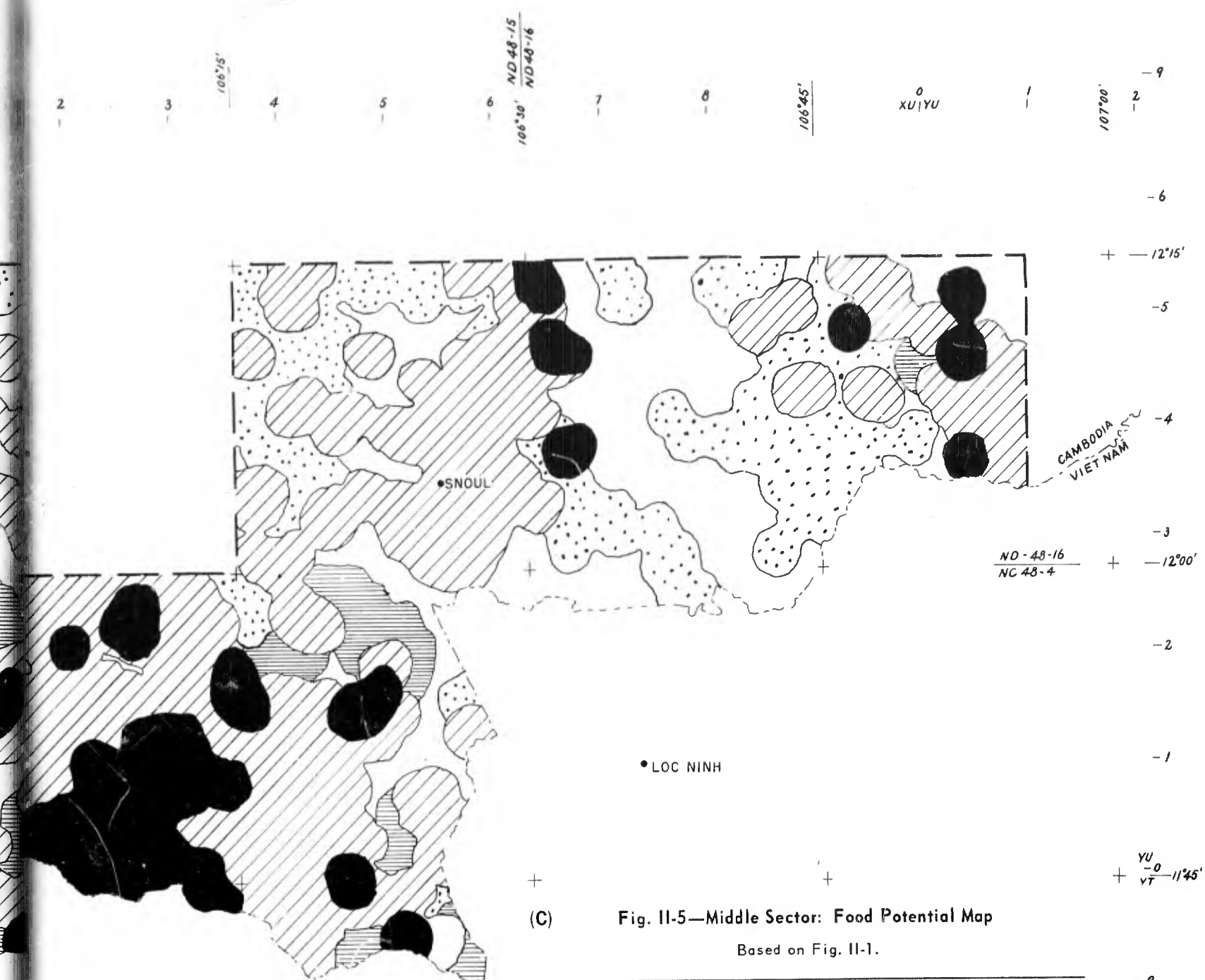
11°30'

11°15'

Scale

5 0 5 10 Km



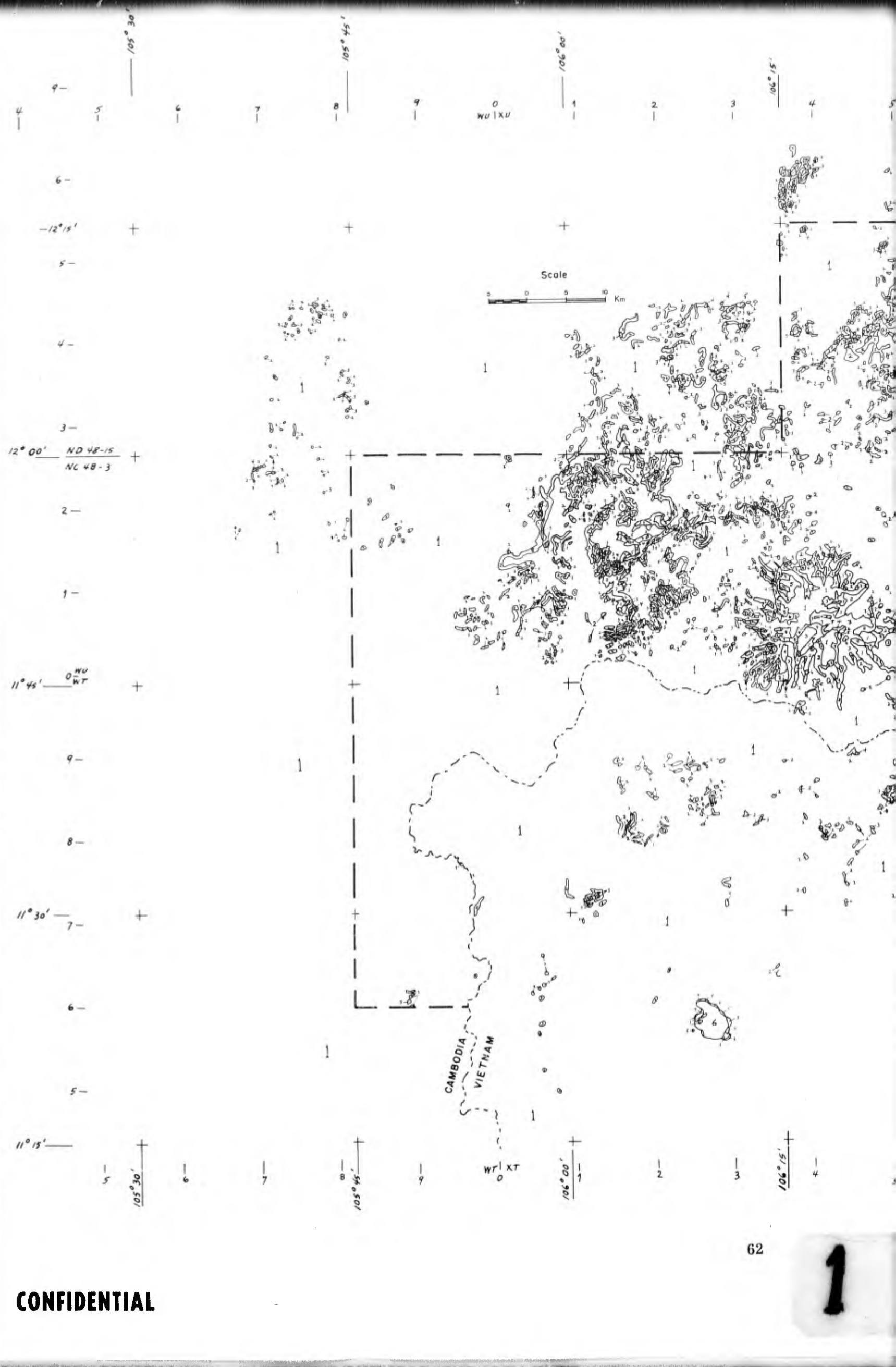


(C) **Fig. II-5—Middle Sector: Food Potential Map**

Based on Fig. II-1.

Suitability for insurgent basing	Symbol	Description
Excellent	■	Areas in or within 2 km of wetland rice fields
Good	▨	Areas in or within 2 km of various upland subsistence crops, including rice
Fair	▤	Areas in or within 2 km of sporadically cropped lands of generally low agricultural potential
Poor	⁘	Areas in or within 2 km of generally long-flooded land; locally cultivatable at least on margins in dry years
Unsuited	□	Areas farther than 2 km from cropped or potentially cropped areas

2



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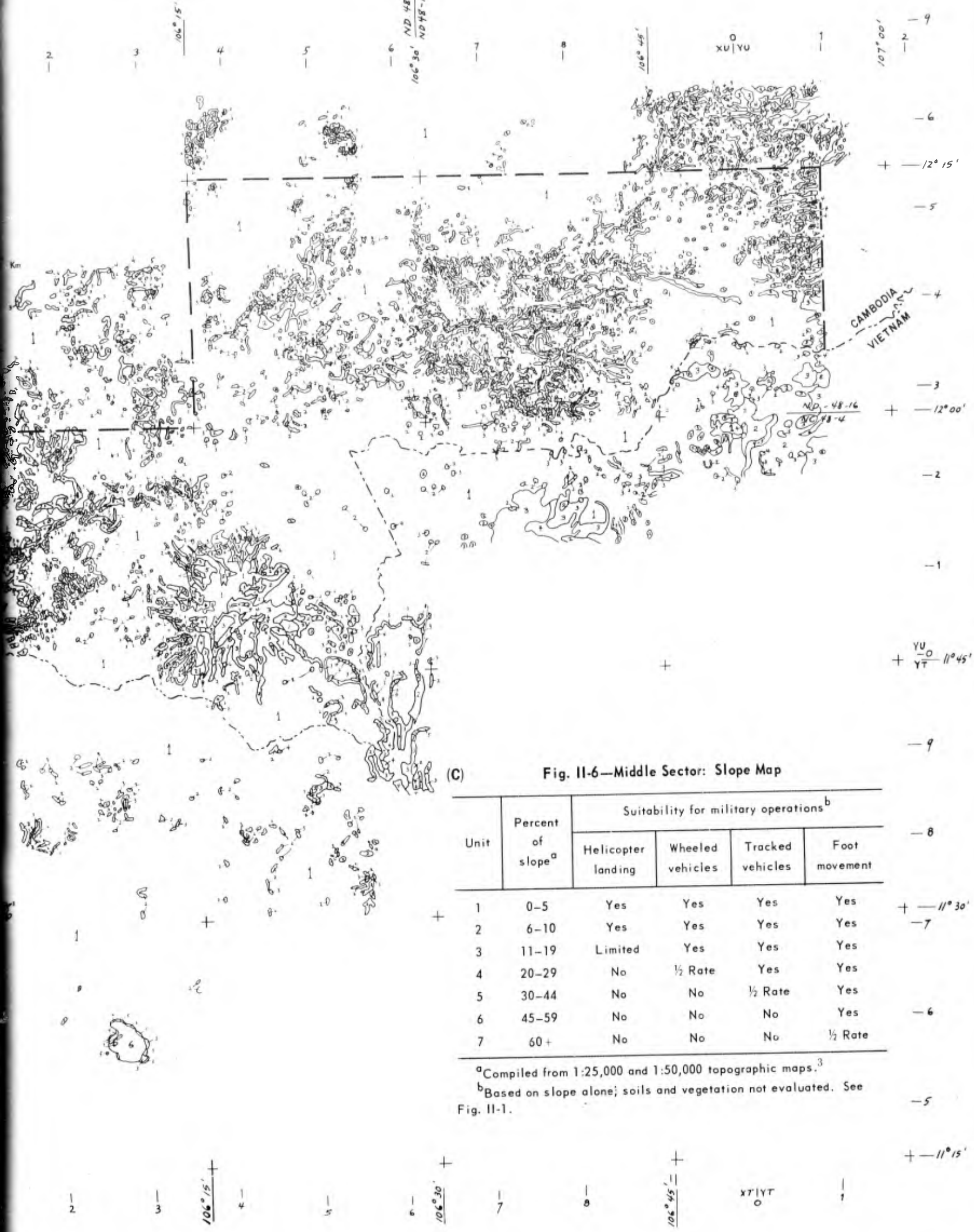


(C)

Fig. II-6—Middle Sector: Slope Map

Unit	Percent of slope[a]	Suitability for military operations[b]			
		Helicopter landing	Wheeled vehicles	Tracked vehicles	Foot movement
1	0–5	Yes	Yes	Yes	Yes
2	6–10	Yes	Yes	Yes	Yes
3	11–19	Limited	Yes	Yes	Yes
4	20–29	No	½ Rate	Yes	Yes
5	30–44	No	No	½ Rate	Yes
6	45–59	No	No	No	Yes
7	60+	No	No	No	½ Rate

[a]Compiled from 1:25,000 and 1:50,000 topographic maps.[3]

[b]Based on slope alone; soils and vegetation not evaluated. See Fig. II-1.

map. (The currently available cross-country movement map[4] is more or less satisfactory for unit boundaries, but some of its ratings are considered quite conservative.) Used together, these maps provide adequate terrain data for planning most military operations.

(C) General comparisons of activities with steepness of slope (see Fig. II-6) indicate that almost all activities are on the lowest slope-range mapped (0–5 percent). However, much of the examined area, including most of the Cambodia–Vietnam border, also falls in this range category. No activities or cart tracks are in slopes greater than 20 percent; thus, based on the slope parameter alone, all activities are easily reachable by wheeled vehicles.

(C) Other Factors. In view of the problems caused by tunnels in Vietnam[1] the suitability of terrain for protective construction (bunkers and tunnels) was initially considered as a possible factor. In the area covered by the activity data, too few activities that could be reliably identified as tunnels bore any identifiable relation to basing. Most of the "defenses" activity data so plotted were listed as "underground entrance" and "bunkers." Almost all were in Vietnam and in War Zone C on thick, deep, stable soils. Similar deep soils suitable for underground protective construction cover most of the western half of the study area but are more local eastward, principally on the basalt hills and in the area indicated with many scattered marsh units on the vegetation map (Fig. II-1) centered near XU900400. (One "base" activity on the Snoul rubber plantation, identified as a cave, is in soils exceeding 30 m in thickness.) Where soil depths are considered important to users of this study, these data can be interpreted for critical areas from the soils data contained in Table II-1.

(U) None of the activities in the category of defenses was measured or further evaluated. In the context of this investigation, protective construction is viewed as below the usable limit and probably more relatable to operational problems. Similarly the availability of local construction materials—for buildings, building and repairing bridges and log roads, etc—was thought to be a purely local decision. Insurgent needs would expectably be limited, and in most suitable or currently used areas adequate vegetation is available for simple construction needs.

(U) Summary of Activity Measurements. In summary, it is believed that the activity measurements, with all their inherent faults and limitations, do provide a useful body of relations and statistics relative to base-selection parameters. They are more or less in agreement with the scattered data available from other sources and areas in Southeast Asia and with common sense. In Table II-9 the functional numbers derived from the measurements are compared with those of the early hypotheses (Table II-2). As the area occupied by a base must be greater than that indicated by a plotted point, the functional numbers are considered conservative.

BASING SUITABILITY

Methodology for Map Preparation

(U) Five separate and mappable parameters were established as being empirically important to base-site selection as measured. To combine the separate factor maps into an areawide map showing suitability for insurgent

(U) TABLE II-9

Middle Sector: Comparison of Measured and Hypothetical Distances of Base from Geographic Factors

(In kilometers)

Geographic factor	Hypothetical distance[a]		Measured distance		
	Maximum	Minimum	Maximum[b]	Minimum	Average
Water supply					
Perennial					
Lakes, rivers, and wells	3	0.5	5	0	1
Seasonal					
Ponds and streams	1	0	3.5	0	1
Own dug well	1	0	na[c]	na	na
Concealment	0	0	0.6	0	0
Food source					
Storage–cache	2	1	na	na	na
Growing point	3	1	6.8[d]	0	3.4[d] 2[e]
Population center	5	2	3.4	0	2.1
Lines of communication					
Road	5	2	6	0	2.8
Cart track	2	1	3.2	0	2.9
Trail	0.5	0	na	na	na
Observation point	5	1	na	na	na

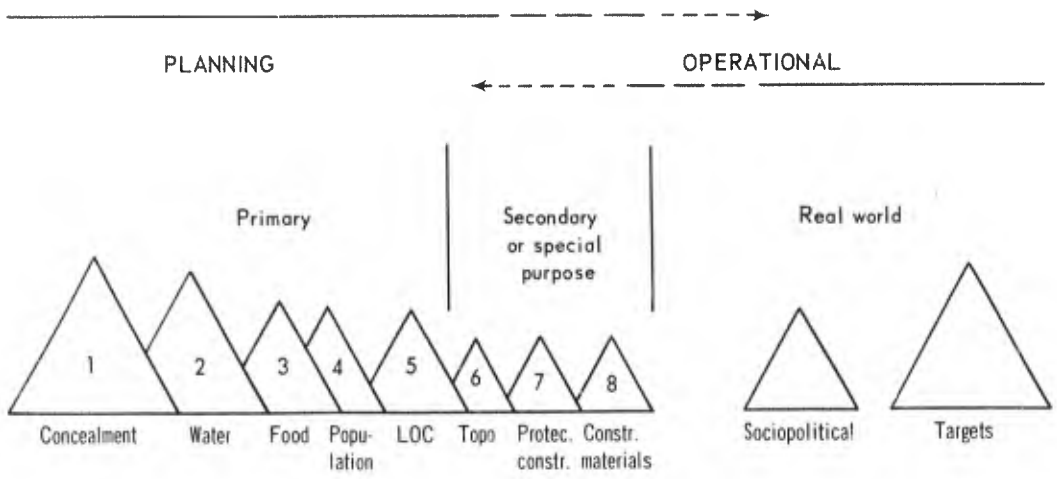
[a]Taken from Table II-2.
[b]Maximum of the average values of the activity groupings.
[c]na, not available.
[d]Rice.
[e]All.

basing requires that their relative weighting importance be identified, both alone and in relation to each other, and, further, that the various mapped factor units be given an internal-suitability rating.

(U) Order and weighting of factors are perforce the analyst's personal choice based on assumed practicalities. The choices as identified in this study are supported by the average distance numbers of Table II-9 and are shown in schematic form in Fig. II-7. This figure also indicates the probable relation of other geographically oriented factors not assessed in the final map compilation. The size of the factor listed as "targets" is worthy of special note. The real-world situation would expectably have a strong influence on final selection of bases.

(U) The suitability ratings assigned to mapped units in each of the five selected primary factors* are indicated in Fig. II-8 in reference to the unit areas depicted in Figs. II-1 to II-5. The process of stacking rated factor maps on each other—a standard procedure in producing interpretative terrain-analysis maps for military subjects—displays many combinations of ratings that have

*Concealment ratings for composite units (i.e., 10/5) on the vegetation map (Fig. II-1) are based on the quality of the first unit. None is rated more than fair.



(U) **Fig. II-7—Middle Sector: Order of Importance and Weighting Values of Geographic Basing Factors**

Importance order indicated by number. Importance weight indicated by size. Relative interdependence on adjacent factor indicated by amount of overlap.

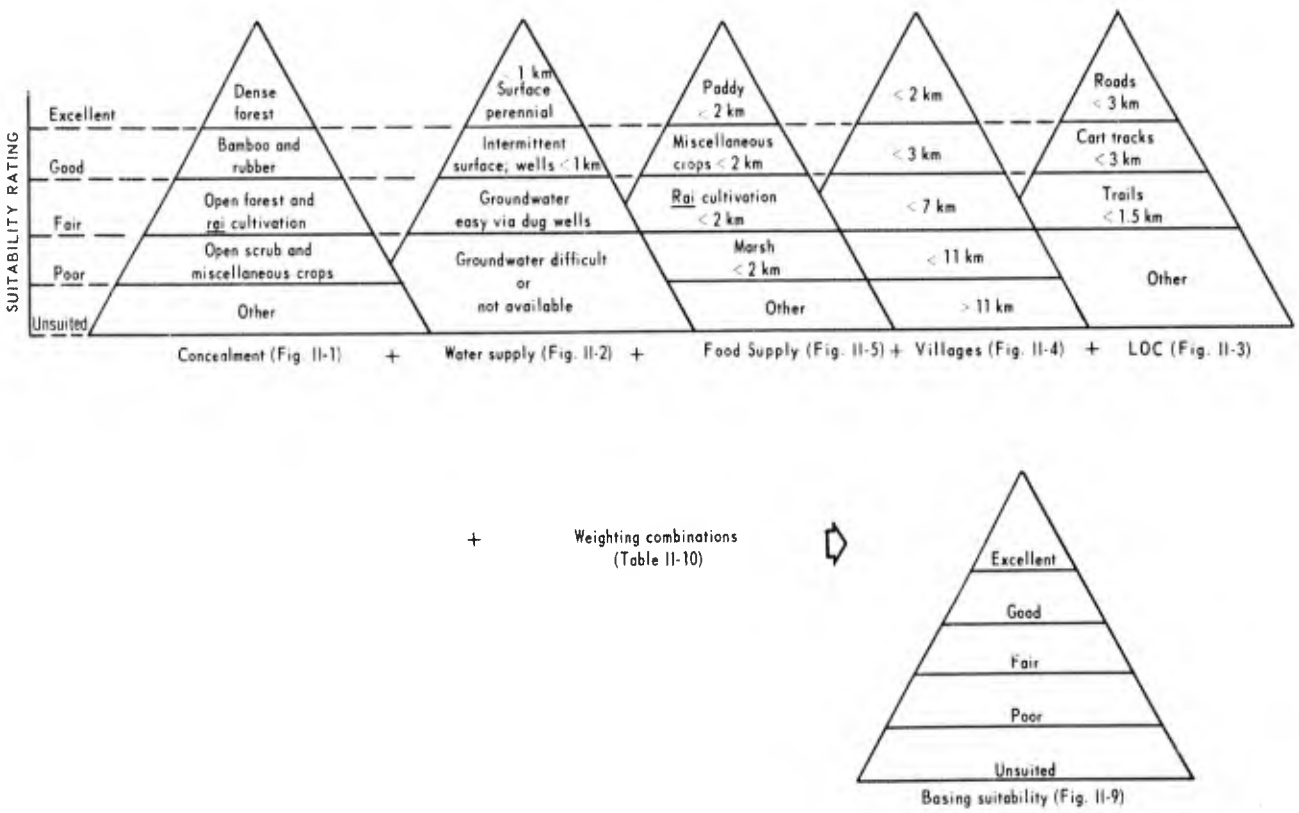


Fig. II-8—Middle Sector: Factor-Suitability Ratings and Map Construction Flow Chart

RAC

different weight values in base-site selection. Weighting combinations of the separate factor ratings used to produce the final map are shown in Table II-10. A final map represents a series of value judgments. Decisions at many points, from the original interpretations to ratings to final weighting, have a strong effect on map boundaries and the final suitability ratings. Figure II-9 shows that suitabilities of the study area for insurgent-base camps are based on a set of rigorously applied empirical factors. To the extent that basic data and decisions made from them are reliable, the map is considered reliable.

(U) TABLE II-10

Middle Sector: Weighting Combinations of Factors for Basing Suitability[a]

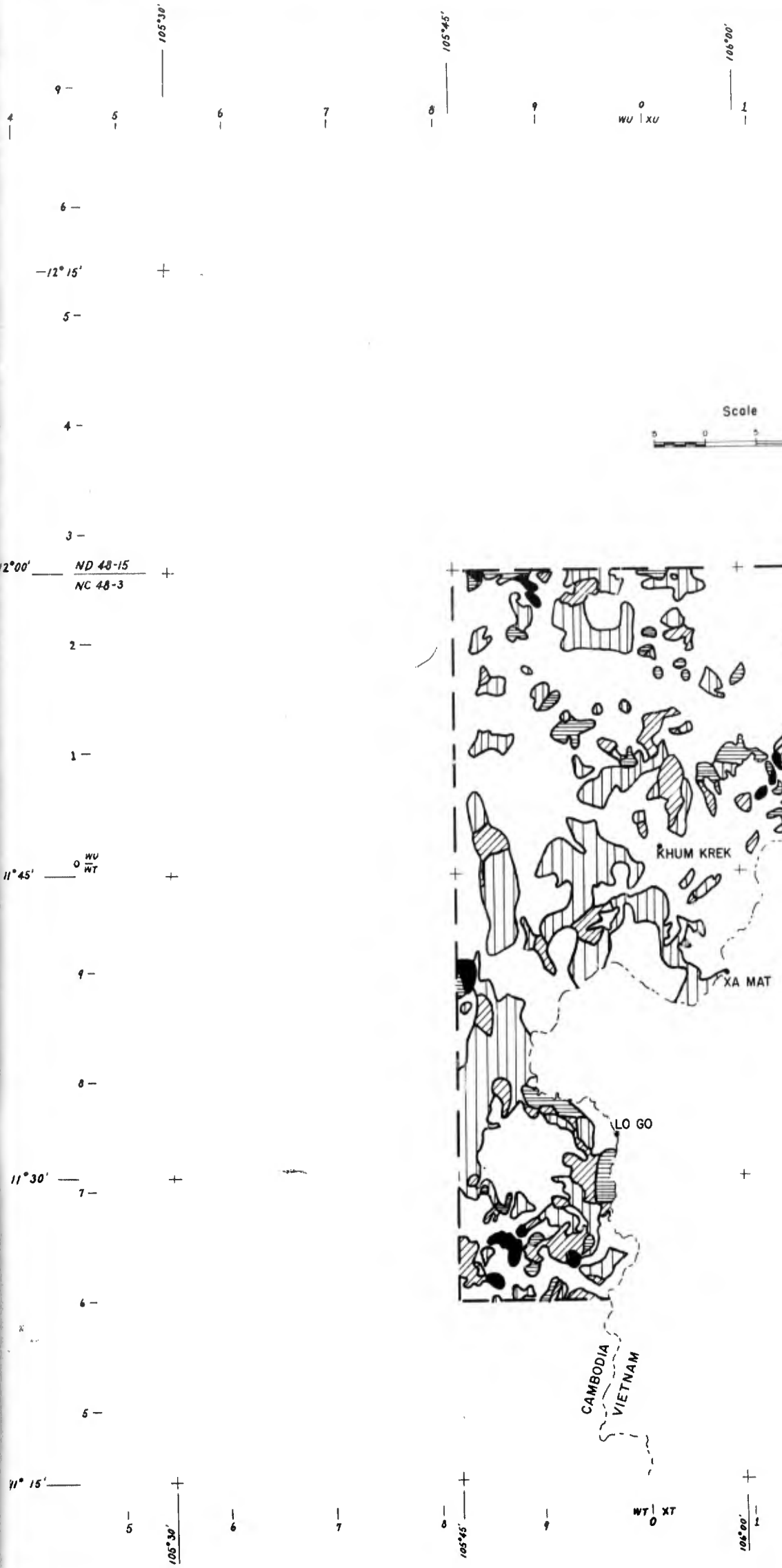
Basing suitability	Factor rating				
	Concealment	Water	Food	Population center	LOC
Excellent	E	E	E	G–E	G–E
Good	E	G–E	G–E	F–E	G–E
	G	E	G–E	G–E	G–E
Fair	E	G	E	G–E	P–US
	E	G–E	F	F–G	F–P
	E–G	F	F–E	G–E	G–E
	G	E	G–E	F–US	F–G
	G	E	F–G	G–E	F–P
	G	G	G–E	G–E	F–E
	G	F	G–E	E	E
	F	E	E	E	G–E
Poor	E–G	P	F–E	F–E	F–E
	G	G	G–E	F–US	G–E
	G	F	G–E	E	E
	G	G	G–E	F–US	G–E
	G	F	G–E	E	E
	F	F–G	E	F–E	F–E
	P[b]	E	E	F–E	F–E
Unsuited	All other combinations				

[a]Ratings as shown in Fig. II-8: E, excellent; G, good; F, fair; P, poor; and US, unsuited.

[b]Not shown on Fig. II-9.

Use and Limitations

(U) Figure II-9 presents a graphic summary of the study area as analyzed for geographic factors affecting insurgent-base selection. A fivefold rating system from excellent to unsuited is employed primarily to identify the general potential of regions. Differences between rated units are not great. The first two ratings, Excellent and Good, differ essentially only in the kind of good concealment available. In places in the Good unit, only temporary water supply (wet season) is available or water must be obtained from village wells. Concealment is also mostly good in the map areas rated as Fair, but water



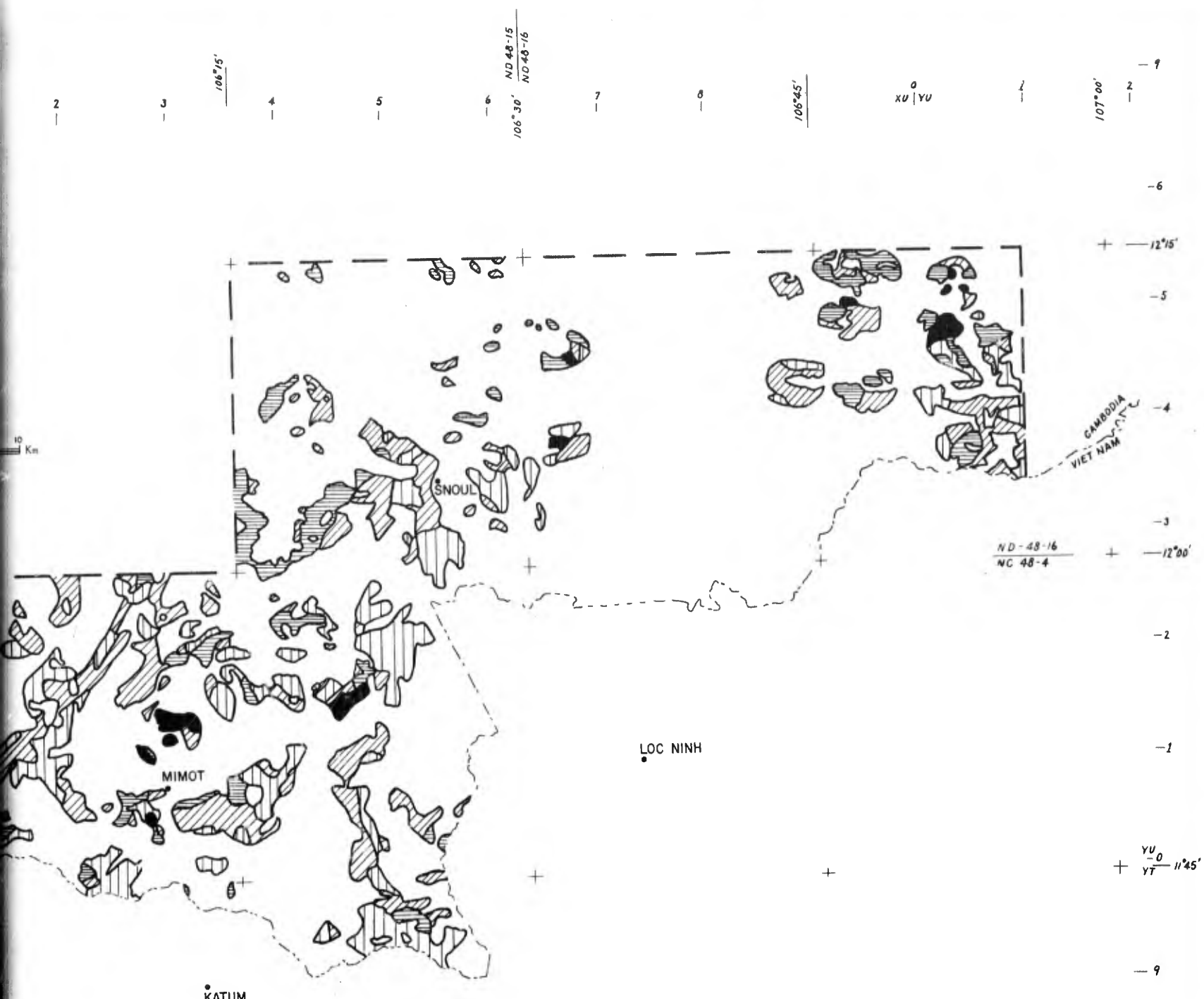
(C)

Fig. II-9—Middl

Suitability for insurgent basing	Symbol	
Excellent	■	In dense forest c villages, and 3
Good	▤	In dense or bamb seasonal, and Roads and/or c
Fair	▨	Mostly in vegeta within 1 km fr must be dug. 3 km, locally i
Poor	▥	In concealment streams and p within 3 km or
Unsuited	□	Concealment w 7 km of crop o

[a]Condensed from Table II-10, factor potentials from four units associated with increases in other factor po
[b]Concealment rated as Poor (Fig. II-7) not included

1



(C)

Fig. II-9—Middle Sector: Suitability for Insurgent Basing

Suitability for insurgent basing	Symbol	Description[a]
Excellent		In dense forest concealment within 1 km of perennial rivers or lakes, 2 km of rice fields, 3 km of villages, and 3 km of roads or cart tracks.
Good		In dense or bamboo forest or rubber plantation concealment within 1 km of rivers or lakes, some seasonal, and wells. Within 2 km of cropped land and mostly 3 km of villages, locally to 7 km. Roads and/or cart tracks within 3 km.
Fair		Mostly in vegetation concealment as above, in places in open forest or rai culture areas. Water within 1 km from mostly perennial lakes and rivers, some seasonal, and wells. In places wells must be dug. Cropped land or land suitable for cropping within 2 km. Villages mostly within 3 km, locally in some areas to 7 or more than 11 km. LOC may be more than 3 km.
Poor		In concealment[b] as in Fair unit. Water supply available within 1 km mostly from wells or seasonal streams and ponds. In places wells must be dug and locally no water can be developed. Villages within 3 km or locally to more than 11 km. Roads or cart tracks within 3 km, trails within 1.5 km.
Unsuited		Concealment where suitable mostly further than 1 km of any easily developed water supply and 7 km of crop or potential crop areas or villages.

[a]Condensed from Table II-10, factor potentials from Fig. II-7. Decreases in concealment and/or water-availability potential in first four units associated with increases in other factor potentials.

[b]Concealment rated as Poor (Fig. II-7) not included. All other factors must be excellent to qualify and the total area added is negligible.

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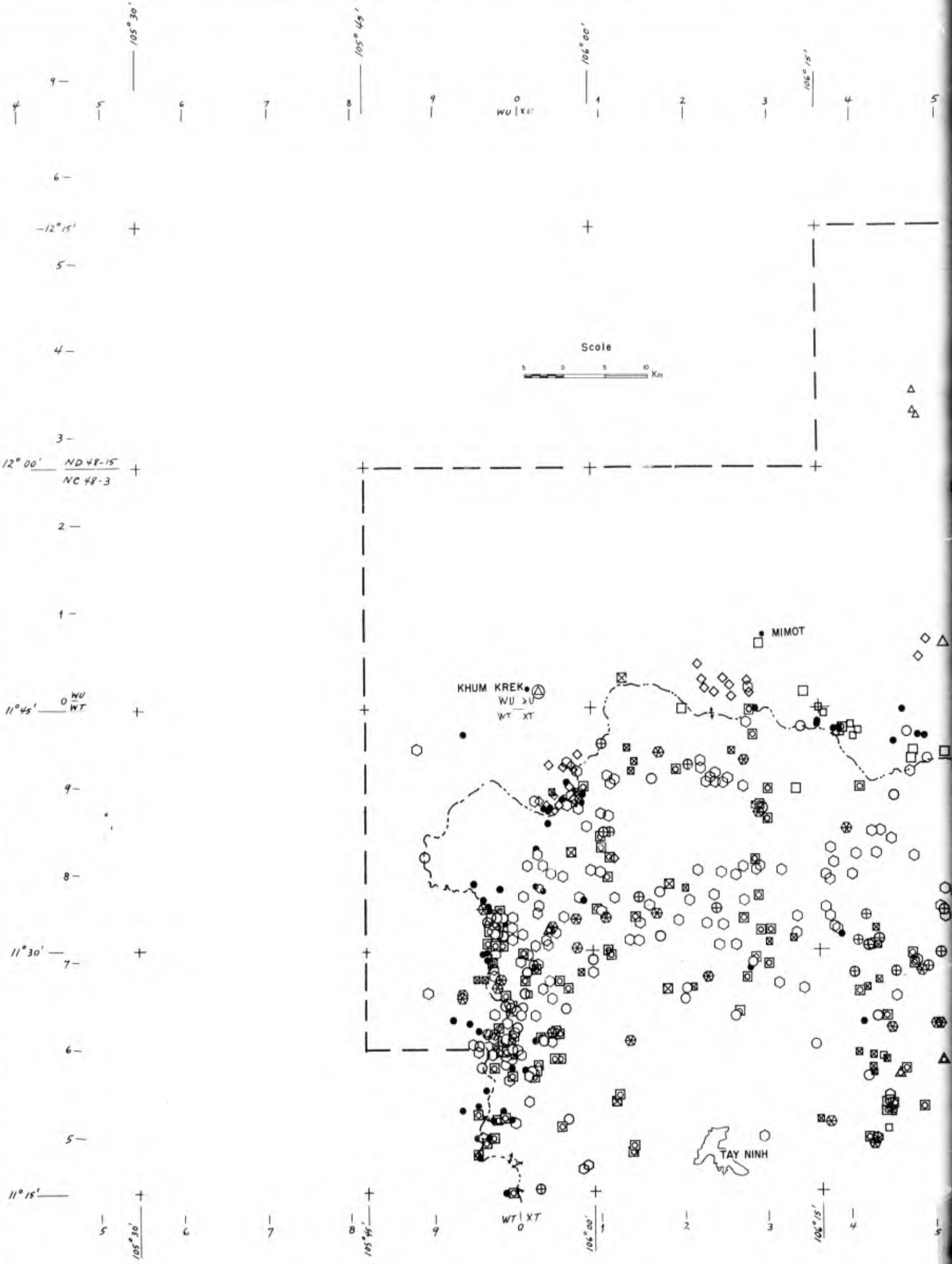

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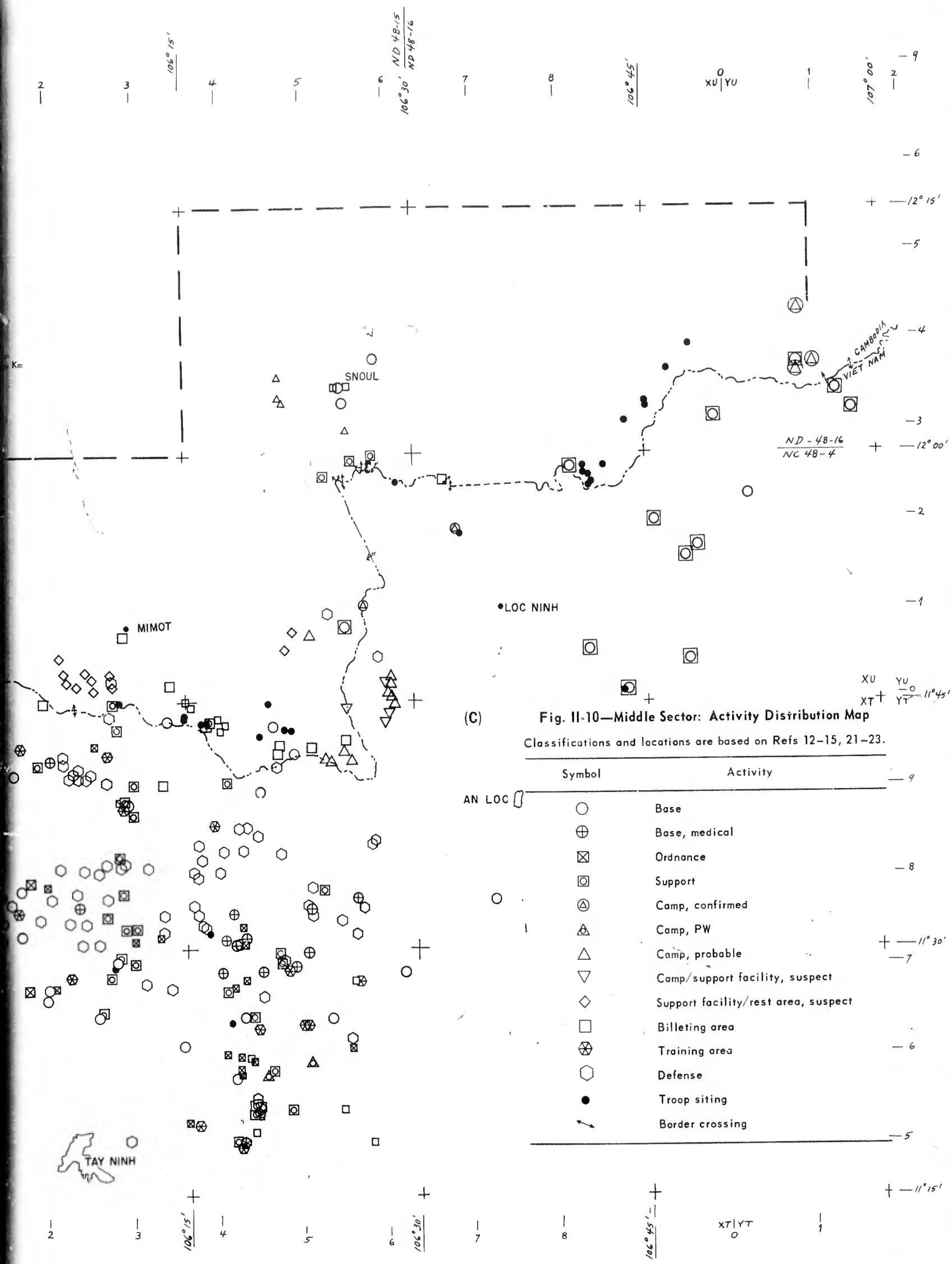


(C) **Fig. II-10—Middle Sector: Activity Distribution Map**

Classifications and locations are based on Refs 12–15, 21–23.

Symbol	Activity
○	Base
⊕	Base, medical
⊠	Ordnance
◎	Support
◬	Camp, confirmed
◬	Camp, PW
△	Camp, probable
▽	Camp/support facility, suspect
◇	Support facility/rest area, suspect
□	Billeting area
⊛	Training area
⬡	Defense
●	Troop siting
↘	Border crossing

2

availability is largely only seasonal or from existing wells. Locally, wells must be dug by the insurgents. Factors of proximity to food-growing areas or to villages largely separate this unit from areas rated as Good. Locally, however, concealment is only judged Fair, and it then becomes the deciding factor. Unit areas are identified as Poor largely because water availability is generally poor.

(U) Insurgent problems in any area are identified by the interactions of the insurgents with people or things, and all of these have geographic places. Plotting of such activities on a map of suitability for insurgent basing such as Fig. II-9 indicates the most likely adjacent areas from which insurgents may operate and thus serves as an initial aid to countermeasure operations. At the initial resolution of the study (1:250,000), the suitability units are indicated to slightly below 1 sq km. Such isolated small areas are of marginal value since a basic assumption of the study was that a base-area size to be considered must accommodate about a company of men. The map is thus not well suited for groups of much smaller size, particularly when there are limited or no needs for buildings. Small areas and groups or rows of concealing trees or dense brush may occur widely throughout areas rated as unsatisfactory because of general poor concealment potential.

(U) Area-analysis maps of this type serve a useful purpose, but they are vulnerable to parameter and value changes derived from other interpretations or later data, or for special needs. Such maps should be supported by basic-data maps so that changes can be readily made as they are needed. For this study area it is considered that the vegetation map (although itself an interpreted map) best supports changes that might be needed. Although descriptions to a generally usable degree are included in the vegetation map, a separate map identifying the agricultural potential and depths of soils and the depths to shallow groundwater would give greater flexibility. Other factors considered in this study (LOC, population centers, and surface water or drainage characteristics) can be readily obtained from topographic maps.

ACTIVITY DISTRIBUTION

(C) As indicated previously, the locations of activities possibly related to base locations were plotted on 1:50,000-scale topographic maps for analysis. The distribution of these plots is illustrated in Fig. II-10 for general comparative purposes. Not all points shown were measured (see Table II-3). None of the Defense and Troop sitings was included because data were too indefinite. Only about one-third of the Support locations were measured, including all points in and adjacent to Cambodia.

(C) A comparison with the real world was neither a study objective nor even a valid comparison as the area analysis produced here applies to an in-house insurgency—applicable to Cambodia itself—independent of Vietnam or a sanctuary condition. Nevertheless it was tempting to make since 37 percent of the measurements did come from Cambodian activities, and since the interpretations of two different data sets—air photography and topographic maps—could be examined. These sets have controls on such factors as concealment, food potential, and water availability. Overlaying the activities map on the final

basing-suitability map (Fig. II-9) will show a negative correlation, with most measured plot points falling into areas rated as Poor to Unsuited for basing. This disparity between the idealized base-requirement concept and the actually discovered or suspected activities related to basing does in no sense degrade the concept. Indeed it illustrates only that the operational and targeting needs may transcend specific factor needs in site locations. The results of comparing the activity plots to the specific factor maps are shown in Table II-11. The correlations are good for the basic-need factors of LOC, population, food, and water availability. A general indifference to the concealment factor is indicated, although 63 percent do have at least Fair concealment. Concealment,

(U) TABLE II-11

Middle Sector: Relation of Activities to Basing-Suitability Ratings

Factor[a]	Rating categories		
	Excellent to good, percent	Fair, percent	Poor to unsuited, percent
LOC	91	6	3
Population	84	15	1
Food potential	83	5	12
Water availability	97	2	1
Concealment, vegetation	30	33	37
Suitability for basing	6	10	84

[a]Listed in order of assumed increasing importance to base requirements.

which involves security needs, is of course the overall controlling factor and thus had a strong bearing on the final poor correlations. Although again no justification is believed needed, it should be pointed out that there are other elements in concealment that pertain to its poor demand here, irrespective of the sanctuary-situation needs and variances in mapping interpretation. Adjacent to the Vietnam border there are few areas of good concealment that fall within the 1-km mapping restrictions and also fit other factor needs. Concealment does exist locally for less restrictive area sizes and particularly in buildings—village concealment, which was not assessed. The latter element alone would raise the most anomalous types of activity—Billeting and Support rest area—to 86 percent in good concealment. Finally, within the political constraints of the sanctuary situation, it is likely that only those activities most easily seen have been identified.

DATA DEFICIENCIES AND COMMENTS ON SOURCES

(U) In view of the sources used and the concepts developed in this study, better information in the following major categories would have improved the direction and reliability of this section of the study.

(U) Activity Data. A more systematic use of activity designators in intelligence reporting would permit considerations in depth of the requirements

of specific types and uses of base-related activities. The foibles of intelligence per se, however, suggest that any classification based on rigid data sets would be suspect. With or without such a classification, it would be desirable to have intelligence reports include some distance measurements or estimates of the factor requirements identified in this study.

(U) Wells. Data are needed on the validity of the assumption that insurgents do not normally dig wells. Information on the existence and depth of dug wells in base areas searched and more information on the extent and depth of wells in populated places would be of value.

(U) Concealment. Ranking of concealment is a subjective deduction. Validity or changes should be confirmed through discussions with both air and ground tactical field personnel and by comparison with recent photography of areas through which they had operated. The vegetation maps used[24,25,32] are not satisfactory. The topographic maps are variable in quality and of marginal use except for boundary delimitations. A standardization of vegetation terms such as proposed by Williams[32] would be desirable, keyed to photographs and commented on by tactical people who had been in the photographed area.

(U) Soils and Geology. The best available map for soils, geology, and land-use implications[33] covers only one-third of the area. Compy[34] and Haley[35] have no maps but provide additional support to Castagnol.[33] Map coverage for all the area for soils and geology is included only in Refs 7 and 30. Neither is considered very reliable, and both are best in the areas already covered by Castagnol.[33] There are map-boundary differences between these maps that should not exist, even considering the small map scales and the minor inclusions within the units mapped. Border differences between the Crocker soil map[7] and that of Moorman[36] are often irreconcilable. The reliability of the Crocker map, considered poor by Compy,[37] could not be substantiated in most places with examined air photography in the area of study, although it was largely based on the same photography.

SUMMARY

(U) This section outlines and illustrates a graphic methodology for initially determining the overall suitability of areas for insurgent basing in the Middle Sector of the report area (see Fig. 1). A basic assumption made in the analyses is that the final product should be independent of data that are most variable in terms of time—in essence, the political situation. The term "base" was given the broadest meaning in terms of size and function so that the product would be applicable at various levels of insurgency. Company-sized units were considered minimal. The general approach was to examine, through rational assumption and empirical data, those mappable geographically oriented factors that would have the strongest bearing on the selection of base sites. A number of factors were examined and discounted as not being of overriding importance either to the sector area or at the scale of presentation; however, map evaluations of cross-country movement by foot or vehicle were included for planning counteroperations.

(U) The methodology used was the empirical determination of both desirable factors and distance relations to them, evaluation of their relative

worth, the consequent separate mapping of the value determinations, and the integration of the separate factor maps as preference values by map stacking to produce an overall map of suitability for insurgent basing. Important geographic factors and distance relations to suitable base sites are identified in order of probable importance in the accompanying tabulation:

Criterion	Distance, km
Concealment	0
Water supply	1
Food supply	2
Population centers	2
Roads and cart tracks	3

(C) It is believed that the general extension of these factors and preference distances to produce basing-suitability maps of similar areas in Cambodia, in Southeast Asia, and elsewhere in the world would be valid where insurgents are essentially dependent on foot movement. Area-analysis maps compiled under this technique can be done at any resolution, but the final product used alone has limited flexibility to parameter changes. Its association with more basic terrain-interpreted maps would extend its usefulness by providing the basis for any substantive changes. Such maps evaluating concealment potential, agricultural potential, and water-supply potential would be important backup data not available on standard topographic maps.

(U) The data as compiled and presented are believed generally accurate at least to the scale of presentation and in reference to the date of the information sources.

Section III

AREA ANALYSIS: SOUTHERN SECTOR*

INTRODUCTION

Background

(C) In this section, maps are provided to show terrain data, terrain analyses, and interpretations in a form suitable for use in planning and conducting operations against insurgent bases in the Southern Sector of the Cambodian border area.

(U) Area analysis for counterinsurgent operations is here approached with the belief that an evaluation of the suitability of an area for insurgent basing would partly fulfill unmet needs for planning for irregular-force operations related to insurgent activities, including guerrilla, subversive, resistance, terrorist, and revolutionary activities.

(U) The chief value of area analysis for counterinsurgent operations, as well as for other types of military or paramilitary operations, is in showing the general range of expectable environmental conditions and their potential effects on certain types of activities. Factors relating to the overall pattern of insurgency or the requirements of insurgents for bases in a certain area were not considered to be within the scope of this analysis; thus the distribution of actual or potential targets for insurgents is not considered. Potential target distribution is a topic requiring separate analysis and presentation; as such it would be a necessary supplement to the area analysis for planning tactical counterinsurgent operations. Therefore the study should be judged not necessarily on its success in predicting the actual location of an insurgent base base but rather on its success in telling the planner the alternative situations to expect.

General Setting

(C) The Southern Sector encompasses the Cambodian–South Vietnamese border area from 11° 24′ N latitude to the Gulf of Thailand (see Fig. 1). It consists chiefly of the broad flat floodplains and low terraces of the Mekong/Basak River system at the apex of the Mekong Delta. Sandy natural levees, backed by annually flooded silty and clayey alluvial plains and backwater marshes, flank the Mekong and Basak Rivers in the central part of the sector; most of the eastern and western parts of the sector consist of low clayey terraces that lie only a few meters above the flood plains. Part of a gently rolling high terrace

*By Charles R. Lewis.

surface rising to less than 15 m above sea level occurs along the extreme northern border of the sector; isolated steep rocky hills abruptly rise several hundred meters above the surrounding plains in the western part of the sector. Except for these hills, the entire sector is underlain by thick deposits of unconsolidated materials.

(C) The sector contains some of the most densely populated areas of Cambodia. Rural villages and settlements are concentrated on the parts of the plains that are least susceptible to flooding, chiefly on the natural levees, on the highest parts of the low terraces, and on gentle slopes bordering the hills in the west. The settlements and villages are connected by a dense network of tracks, trails, and a few fair-weather roads.

(U) Most of the sector is intensively cultivated. The terraces and parts of the floodplains are almost completely covered by wetland rice cultivation; alluvial plains in the south central and eastern parts of the sector and natural levees along the rivers are chiefly in dryland crops. Natural vegetation of the sector consists mainly of grass and reeds in the backwater marshes, brush in alluvial plains along perennial streams and rivers, and open to dense evergreen forest on and adjacent to hills in the west and on the high terrace in the north. Hedgerows are common around fields and settlements on the higher parts of the terraces; trees and brush are generally lacking in the rest of the cultivated areas.

(U) The Southern Sector is subject to pronounced seasonal variations in climate that critically affect the terrain. During the wet period—May through November—rivers are at high water, floodplains are flooded most of the time, wetland rice fields are covered by water, and most ground is wet and soft. During the dry period—December to May—streams reach low-water stages, wetland rice fields stand fallow, and, except in the marshes, much of the ground becomes dry and firm.

DEVELOPMENT OF SUITABILITY MAP

(U) The approach followed in this section of the study is one applied to an area that offers relatively little in the way of natural security for insurgent base-area development. The approach is considered applicable, however, to other areas that may offer much greater security for base areas.

(U) Figure III-1 shows map units that depict areas of varied suitability for insurgent basing in the Southern Sector. The units are arranged in order of estimated decreasing security for base-area development.

(U) This map was developed by means of the traditional area-analysis methodology:

(a) Deduction of mappable environmental factors pertinent to insurgent basing in general. These factors and their significance for insurgent base-area development are summarized in Table III-1.

(b) Detailed mapping of critical environmental factors. The environmentally related phenomena considered conducive to base-area security in the Southern Sector and thus favorable for base-area development are listed as follows: (1) remoteness from populated areas and areas of existing or potential intensive land use, (2) concealment from air and ground observation, (3) hindrances to conventional military forces, and (4) availability of food and

(U)

TABLE III-1

Southern Sector: Significance of Environmental Factors for Base-Area Development

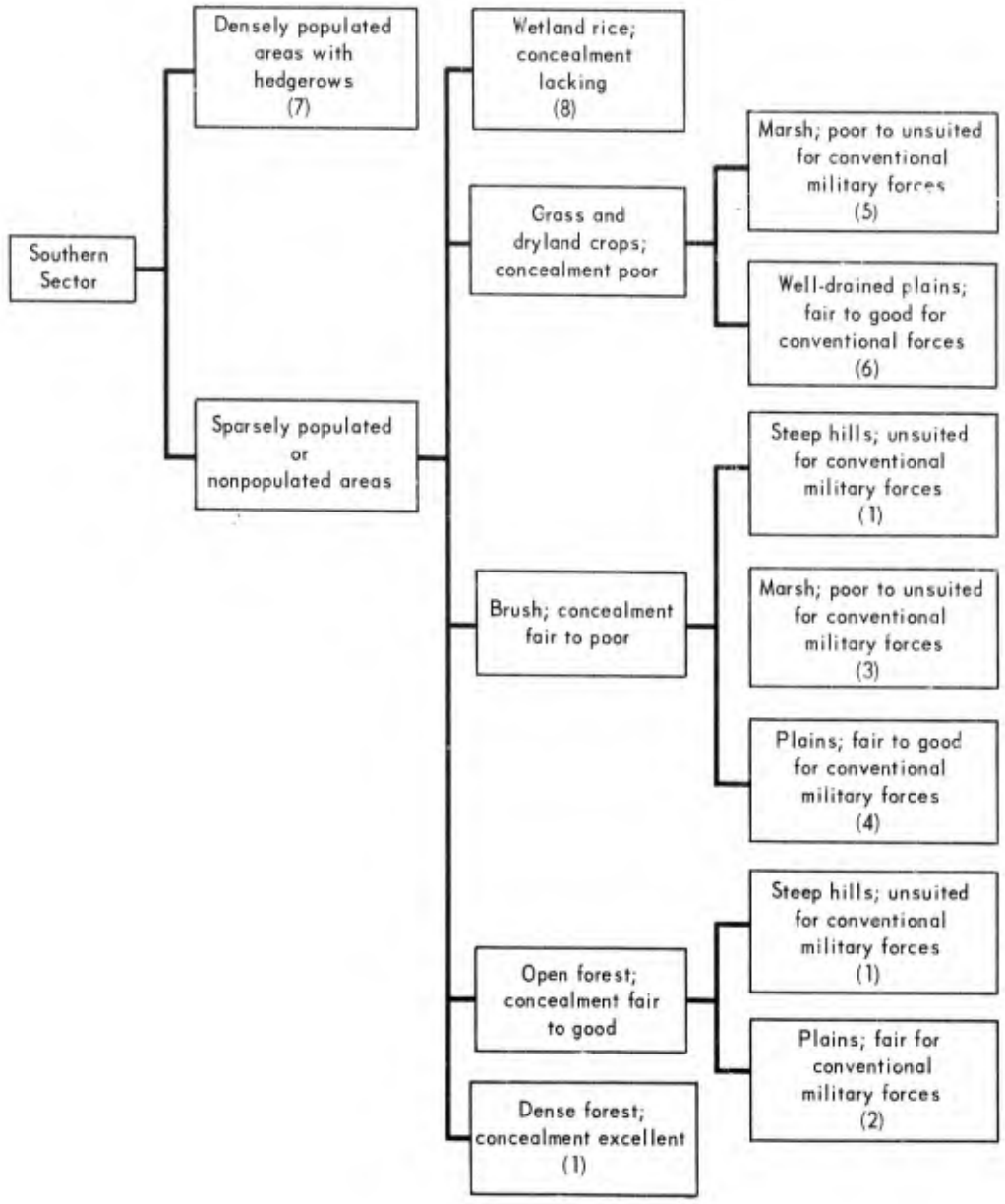
Factor	Significance
Surface configuration	Effect on cover and concealment, observation, fields of fire; effect on mobility of conventional forces; effect on remote sensing devices
Vegetation	Concealment; sustenance; effects on mobility of conventional forces; construction materials for shelters and fortifications; relation to overall pattern of cultural activities; effect on remote sensing devices
Soils and rocks	Agricultural potential for sustenance crops; effect on construction of underground shelters
Hydrology	Water supply; effect on shallow excavations; effect on mobility of conventional forces; navigability of streams for LOC use; effects on state of ground (flooding)
Population patterns	Source of sustenance, supplies, and recruits; cover and concealment potential; relation to overall pattern of cultural activities
LOC	Routes from bases to potential targets; escape routes; potential ambush sites; usefulness to conventional forces

water. Basic data affecting these phenomena are mapped and described in later sections.

(c) The critical factors were then deductively weighted and combined in various ways to yield a workable number of discrete map units. The resulting units were then generalized and combined to achieve a map pattern compatible with the scale and purpose of the analysis. Figure III-1 shows schematically the actual synthesis of the map (Fig. III-2). Note that the actual number of combinations is minimized in the Southern Sector owing to the close relations among many of the factors.

(U) Although the research compilation was done at 1:40,000 and 1:50,000 and the product maps at 1:250,000 (before reduction for printing), the approach is considered essentially scale-independent in the sense that it can be applied to maps ranging from small-scale studies of the National Intelligence Survey type to large-scale tactical operational maps. The differences would be chiefly in the levels of generalization and overall complexity of the maps and descriptions. The thoroughness of research should be the same in each case and generally should reflect greater attention to terrain details than does that done in the past for conventional military operations.

(C) The evaluations shown on Fig. III-2 may be used for planning purposes, both with respect to a future insurgency against Cambodia itself or in the present situation of Cambodia as a sanctuary for foreign insurgents. (The suitability map was developed for the dry period in order to demonstrate the methodology. A separate map is recommended to show wet-period suitability. The data on which Fig. III-2 is based, which are presented in a later section, would also support the development of a wet-period suitability map.) Because sanctuary basing reflects a specific tactical situation in the overall problem of insurgent basing, it was not specifically considered in the design of the suitability map. The descriptions of the map units given in Table III-2 are aimed at providing information suitable for operational planning in either type of



(U) Fig. III-1—Synthesis of Southern Sector Suitability Map

Numbers refer to map units of Fig. III-2.

(C) **Fig. III-2—Southern Sector: Suitability for Insurgent Basing**

Ratings apply to dry period only.

Good–Fair

1 Nonpopulated areas of dense forest and/or steep hills
2 Nonpopulated plains with open forest
3 Nonpopulated marshy plains with brush
4 Nonpopulated alluvial plains with brush

Fair–Poor

5 Nonpopulated marshy grassland
6 Sparsely populated grassland with crops

Poor–Unsuited

7 Populated wetland rice areas with hedgerows
8 Populated wetland rice areas without hedgerows

Reliability: Fair to good.

TABLE III-2

Southern Sector: Description of Suitability Fac

(Keyed to Fig. III-2)

Map unit	Terrain description	Population	Roads and trails	Concealment
1	Steep rocky hills and gentle colluvial slopes covered by generally dense evergreen forest having high, complete canopy. Also includes steep rocky hills with open forest and open to dense brush.	Generally uninhabited; rural villages and houses in adjacent units.	Lacking in steep hills; a few widely spaced footpaths elsewhere.	Concealment from air observation excellent for men and buildings in dense forest; fair to good in open forest and brush. Ca may provide excellent concealment in lim stone hills. Shallow excavations easily d on colluvial slopes; require hard-rock exc vation in hills.
2	Flat to very gently sloping alluvial plains, terraces, and colluvial slopes; generally with open forest and brush with patches of dense forest. In extreme north and extreme west, includes typical rai-cultivation pattern.	Generally uninhabited. A few widely scattered rural houses and settlements.	Sparse network of foot trails and cart tracks. Vehicular roads generally lacking.	Concealment from air observation generally fair to good, locally excellent for men and small buildings. Excavations, including tunnels, easily constructed in most place
3	Plains of backwater marshes; dense to open brush in patches and clumps. Tall marsh grass and reeds where not in brush. Soils soft, wet, and poorly trafficable most or all of year.	Generally uninhabited.	Roads and trails generally lacking; a few footpaths across areas.	Fair concealment from ground and air obser vation for men and small structures. Shal low excavation and tunnels generally sub ject to flooding owing to high water table
4	Chiefly flat floodplains including accretion areas associated with natural levees. In extreme west, colluvial slopes. Vegetation chiefly brush, in places in mosaic with grassland; on colluvial slopes also in mosaic with dryland cultivation.	Generally uninhabited; a few scattered individual rural houses and settlements.	Roads and trails generally lacking; a few footpaths and cart tracks in some areas.	Brush provides fair concealment from ground and air observation for men and small structures. On colluvial slopes and on levees, shallow excavations above water table easily dug; elsewhere subject to flooding by groundwater.
5	Backwater marshes with extremely low relief over broad areas. Surface in internal drainage very poor; much standing water on surface throughout dry season. Vegetation chiefly dense coarse grass and reeds 1–2m high with only a few widely spaced clumps of low brush. Soil soft, wet, and poorly trafficable most or all of year.	Generally uninhabited.	Roads and trails generally lacking; a few widely spaced footpaths and cart tracks. Many small streams and canals potentially navigable by small boats.	Grass affords concealment from ground observation for small units of foot troops; concealment from air observation generally lacking for buildings and moving troops. Partial concealment from air observation available for small camps in widely scattered patches of brush. Shallo excavations generally subject to flooding by groundwater.
6	Flat alluvial plains, including some natural levees and accretion areas along main rivers. Vegetation chiefly grassland and dryland crops including corn, sugar cane, and bananas. Widely scattered small patches of brush.	A few widely scattered rural houses and small settlements.	Roads and trails generally lacking or in sparse network. A few roads cross parts of area.	Grass and dry-season crops when mature afford concealment from ground observation for small units of foot troops; concealmen from air observation generally lacking for buildings. Partial concealment from air observation available for small camps in widely scattered patches of brush. Shallow excavations above water table easil dug on levees; elsewhere subject to groun water flooding.
7	Higher parts of low terrace, crests of natural levees, and in west, colluvial slopes bordering hills. Nearly continuously cultivated in wetland rice; dense hedgerows commonly border fields and houses. Dryland cultivation on levees. Fields largely barren or with sparse growth of grass and weeds in dry period.	High density of small rural villages; commonly have linear pattern along main roads or are nucleated around road or trail intersections.	Most larger villages on dry-weather and a few all-season roads. Smaller villages connected by dense network of trails and tracks.	Some hedgerows provide fair concealment from ground and surface observation for temporary camps of small units of foot troops. Elsewhere concealment lacking. Shallow excavations above water table easily dug on highest areas; elsewhere re stricted by groundwater.
8	Flat alluvial plains and lowest parts of low terrace. Vegetation chiefly doubly transplanted wetland rice, not harvested until mid-dry period. Includes dryland crops in places. Hedgerows generally lacking around fields. Locally, small villages and settlements, as in map unit 7.	A few widely scattered rural houses and small settlements, as in map unit 7.	Moderate to high density of tracks, trails, and a few dry-season roads.	Generally lacking; available locally around some settlements as in map unit 7. Matur rice affords limited concealment for foot troops from ground observation.

1

TABLE III-2

tor: Description of Suitability Factors

(Keyed to Fig. III-2)

Concealment	Food and shelter	Suitability for conventional operations	Remarks pertinent to base-area detection
alment from air observation excellent uen and buildings in dense forest; to good in open forest and brush. Caves provide excellent concealment in lime- e hills. Shallow excavations easily dug olluvial slopes; require hard-rock exca- on in hills.	Food not procurable within area; soils on colluvial slopes have fair to excellent agriculture potential, but cultivation would commonly require clearing. Water supply not readily available. Abundant timber available for shelters and fortifications.	Unsuited for cross-country movement or airborne operations.	Generally medium to dark gray tones on conventional aerial photography during dry periods. Fresh agricultural clearings and new trails are potential indicators of base areas. Vegetation generally poorly suited for induced defoliation. Poorly suited for infrared detection.
alment from air observation generally to good, locally excellent for men and ll buildings. Excavations, including els, easily constructed in most places.	Food generally not procurable locally but readily grown in old rai-cultivation areas with minimum forest clearing. Water supply not readily available. Abundant timber available for shelters and fortifications.	Poor to unsuited for cross-country movement by tracked vehicles or for paradrop operations. Local rai clearings suitable for helicopter landings; easily sabotaged or ambushed.	Generally gray tones on conventional aerial photography during dry period. Fresh garden plots and new trails are potential indicators of base areas. Vegetation fair to poorly suited for induced defoliation. Fair for infrared detection.
oncealment from ground and air obser- on for men and small structures. Shal- excavation and tunnels generally sub- to flooding owing to high water table.	Food generally not locally procurable; soils generally not suitable for cultivation. Surface water and shallow groundwater readily available; chemical quality likely to be poor. Grass suited for thatch; small timbers available for shelters and fortifications.	Generally poor to unsuited for cross-country movement by tracked vehicles or for paradrop or helicopter operations.	Generally dark gray tones on conventional aerial photography during dry period. Increased use of trails in area is potential indicator of base area. Brush poor for induced defoliation. Grass areas have limited suitability for conflagration in dry period. Fair to good for infrared detection.
provides fair concealment from ground air observation for men and small ctures. On colluvial slopes and on es, shallow excavations above water e easily dug; elsewhere subject to ding by groundwater.	Food locally procurable in extreme west; elsewhere good agricultural potential would favor local cultivation. Water supply varies; readily available from perennial streams in many areas, by constructing shallow wells in other areas.	Fair to poor suitability for cross-country movement during most of year when soils not wet; scattered sites suitable for helicopter and paradrop operations.	Medium to dark gray tones on conventional aerial photography during dry period. Newly cultivated fields and new trails are potential indicators of base areas. Grassland has limited suitability for conflagration in late dry period; brush poorly suited for induced defoliation. Fair to good for infrared detection.
affords concealment from ground ob- vation for small units of foot troops; cealment from air observation gen- ly lacking for buildings and moving ps. Partial concealment from air ob- vation available for small camps in ely scattered patches of brush. Shallow avations generally subject to flooding roundwater.	Food generally not locally procurable; soils generally not suited for cultivation. Surface water and shallow groundwater readily available but chemical quality likely to be poor. Grass suitable for thatch; wood for construction generally lacking. Generally unsuited for shallow excavations owing to high water table.	Generally unsuited for cross-country vehicular movement owing to untrafficable soils during most of year. Suitable for paradrop and helicopter operations in many places.	Medium to dark gray tones on conventional aerial photography during dry period. New or increased use of trails and tracks may be potential indicator of base-area activity. Grass well suited for conflagration in late dry period.
and dry-season crops when mature af- concealment from ground observation small units of foot troops; concealment air observation generally lacking for dings. Partial concealment from air ervation available for small camps in ely scattered patches of brush. Shal- excavations above water table easily on levees; elsewhere subject to ground- er flooding.	Wide variety of food locally procurable. Good agricultural potential of soils would favor cultivation where now in grassland. Surface water and shallow groundwater readily available.	Fair suitability for cross-country vehicular movement; widely suited for paradrop and helicopter operations.	Medium to dark gray tones on conventional aerial photography during dry period. Fresh cultivation and new or increased use of trails may be potential indicators of base-area activity. Grass and mature crops commonly well suited for conflagration in late dry period.
hedgerows provide fair concealment n ground and surface observation for porary camps of small units of foot ps. Elsewhere concealment lacking. llow excavations above water table ily dug on highest areas; elsewhere re- cted by groundwater.	Wide variety of food locally procurable in towns and villages. Water supply available from existing domestic wells. Surface-water supply lacking.	Widely suited for cross-country vehicular movement during dry season; fair to poorly suited for paradrop and helicopter operations.	On conventional aerial photography, tessellated pattern of highly reflective rectangles bounded by dark-toned hedgerows.
ally lacking; available locally around e settlements as in map unit 7. Mature affords limited concealment for foot ps from ground observation.	Rice locally procurable. Water supply generally readily available from small perennial streams and canals.	Poor for cross-country vehicular movement during early half of dry period; fair during last half of dry period; widely suited for helicopter and paradrop operations. Observation and fields of fire generally unrestricted.	On conventional aerial photography, dark tones before rice harvest; light tone after harvest as in unit 7. Mature rice suitable for conflagration.

2

situation. The suitability map represents many compromises based on subjective judgments and deductions that are not supported by quantitative analyses. It is believed, however, that within the limitations of terrain-intelligence mapping it does represent an approach that can be applied on a production basis to many other areas of the world that may require counterinsurgent operations.

SUITABILITY FOR INSURGENT BASING: DRY PERIOD

(U) The Southern Sector is predominantly Poor to Unsuited for insurgent basing owing chiefly to the widespread lack of concealment, the intensive land-use patterns over much of the area, and the general suitability of much of the terrain for conventional military forces during the dry period, approximately December to May (see Fig. III-2).

(U) Nearly three-fourths of the Southern Sector consists chiefly of low terraces and, in part, floodplains completely covered by barren wetland rice fields that generally offer little or no security for insurgent-base areas (map units 7 and 8). Only on the higher parts of terraces (map unit 7) are there brush and trees, chiefly surrounding villages and settlements and on paddy-field dikes, that would provide a limited amount of partial concealment for small encampments. Additional temporary concealment might be obtained by constructing shallow excavations, including tunnels, on the highest parts of the terraces, but in most places the prevailingly high groundwater table would greatly restrict the depth and utility of such excavations. Food, water, and other supplies would be easily procurable from villages, but because of the relatively dense rural population it would be difficult to conceal the existence of a camp from the local inhabitants. Basing activities in these wetland rice areas, therefore, would generally have to be centered around houses and settlements to achieve maximum concealment. In addition, these wetland rice areas are widely suited for such conventional operations as cross-country vehicular movement and helicopter and paradrop operations.

(C) Somewhat better suited for insurgent base-area development is the one-fourth of the sector encompassing the remaining parts of the floodplains, which consist of sparsely populated to nonpopulated alluvial plains that are not in wetland rice (map units 5 and 6). These areas are predominantly in grass and dryland crops (map unit 6) and occur chiefly east of Svay Rieng, along the Vietnam border in the southeastern and central parts of the sector, and on broad natural levees along the Mekong and Basak Rivers. They also include the extensive grass-covered backwater marshes that lie inland from the levees along the Mekong and Basak and that make up smaller border areas in the extreme eastern and southwestern parts of the sector (map unit 5). Throughout most of these areas of grass-covered and cultivated plains, the sparse population would permit the siting of base areas that would involve little or no disturbance of existing cultural activities. Grass, some mature crops, and rare scattered patches of brush offer partial concealment from ground and air observation for small units of men. In most of the alluvial plains a variety of foods is available; the marshes are generally not suited for cultivation. Development of new trails, increased use of the existing sparse network of tracks and trails, and fresh agricultural activity are potential indicators of base-area

activity. The alluvial plains and natural levees (map unit 6) are fairly well suited for ground operations during the dry period; the marshes (map unit 5) are poor to unsuited for conventional ground operations owing to soft wet soils. For this reason the marshy plains are rated more suitable for insurgent bases than the nonmarshy alluvial plains.

(U) The most suitable areas for insurgent bases occur in the remaining approximately 1 percent of the sector in which vegetation, ranging from open brush to dense forest, provides some degree of concealment from air observation not only for men but for buildings and other installations (map units 1, 2, 3, and 4). Because these areas are all sparsely populated or uninhabited, the establishment of insurgent bases would not impinge on any existing land-use patterns and would involve minimum interference with any local cultural activities. Tracks, trails, and agricultural activity are lacking or sparse in most of these areas and the existence of any fresh trails or newly cultivated clearings would be potential indicators of insurgent base-area activity. Excellent concealment for varied types of base-area activities is available only in the dense evergreen forest that covers scattered rocky hills and adjacent gentle colluvial slopes in the western part of the sector (map unit 1). The dense vegetation and the steep hill slopes would preclude cross-country vehicular movement and helicopter and paradrop operations, thereby greatly enhancing the security of these areas for bases. Limited areas of predominantly open forest, chiefly very gently rolling high terraces in the extreme northeast and the plains adjacent to some hills in the western part of the sector (map unit 2), provide fewer opportunities for concealment from air observations for men and small buildings. They commonly contain, however, rai cultivation that would provide a variety of local food supplies and allow new cultivation by insurgents with minimum disturbance of the existing land-use pattern. Areas predominantly in brush (map units 3 and 4), chiefly floodplains along the perennial rivers and streams and in small scattered areas of alluvial plains and backwater marsh, provide partial concealment for small bases. Brush-covered areas within marshes (map unit 3) provide somewhat better base-area security owing to their unsuitability for conventional ground operations and their general remoteness from densely populated areas.

ENVIRONMENTAL ANALYSIS OF SOUTHERN SECTOR

Introduction

(U) The following maps and tables contain the basic environmental data on which the estimates of the suitability for insurgent basing in the Southern Sector were based. Because most of the basic data are contained in the maps and tables, a detailed discussion of the various topics is not considered necessary; however, the descriptions and interpretations of the basic data are an essential part of the area analysis.

(U) Because basic data in the detail needed for this study were generally not available, it was necessary to prepare such data specifically from sources available in the Washington, D. C., area. The compilation of the basic data was a major part of the study.

(U) Because the insurgent's detailed knowledge of the land is a source of great strength to his operations, emphasis was put on developing data in as

much detail as possible. The chief contribution of this study, in terms of basic environmental data, is the relatively detailed delineation of terrain features that have been described by other authors.

(U) Because the land and soil are little modified by artificial means (except in the case of readily identifiable diked paddy fields), land use is a widespread indicator of natural soil and drainage conditions. For example, houses and villages are built where susceptibility to flooding is least; crops are grown where natural fertility will support them. In addition, land is nearly completely used in the most suitable way in much of the Southern Sector—if soil and water will support rice, rice is grown; where rice is not grown, soil or water will probably not support rice. Recognition of the close relations among all environmental factors and between the people and the environment was of critical importance in mapping the basic data for the Southern Sector.

(U) The original basic-data sheets were prepared as stable overlays keyed to stable film positives of individual 1:250,000 topographic maps.[4]

Discussion

(C) The geomorphology map (Fig. III-3) represents an original mapping effort based almost entirely on detailed study of aerial photography. Various aspects of the geomorphology and related terrain factors are described and evaluated in terms of insurgent activities (Table III-3). The general mapping scheme, however, owes much to the detailed descriptions presented in "Exploratory Survey of Soils of Cambodia,"[5] a principal textual source of terrain data on Cambodia.

(U) Although many delineations are conjectural, the geomorphology map is considered, in general, of fair to good reliability and suitable as basic data for a variety of terrain-intelligence uses in addition to counterinsurgent operations.

(U) The vegetation map (Fig. III-4) is also based on air-photo interpretation. The accompanying descriptive material (Table III-4) draws heavily on Fosberg[25] and the National Intelligence Survey.[10,38] It too represents an attempt to map and describe vegetation as basic data suitable for general terrain-intelligence uses in addition to counterinsurgent operations. Although the vegetation map is also rated of fair to good reliability, the separation of early-maturing from late-maturing rice is probably tenuous. It is considered a desirable distinction, however, and one that could better be made with aerial photography taken in different seasons.

(C) The map showing the agricultural potential of soils (Fig. III-5) is chiefly a refinement of the 1:1,000,000 General Soil Map of Cambodia.[7] Because the pedological-soil nomenclature used in the map generally follows Crocker,[7] detailed soil descriptions may be obtained from that source. Soils were mapped specifically only to show their agricultural potential. Other detailed aspects of pedological soils were not considered pertinent to insurgent basing; pertinent aspects of engineering soils are touched on in Table III-3.

(C) Because flooding is a dynamic aspect of wide significance in this part of Cambodia, a map showing susceptibility to flooding (Fig. III-6) was prepared. This map was developed chiefly on the basis of population pattern, vegetation distribution, and geomorphology. Although susceptibility to flooding was not

used in developing the dry-period suitability map, it would be a critical factor for a wet-period analysis; it is included here for that purpose.

(U) An attempt was made to map rural population patterns (Fig. III-7). The delineations were based chiefly on aerial photography supplemented by 1:50,000 topographic maps. Descriptions of villages and urban centers (Table III-5) were taken largely from Section 25 of the NIS.[38] Ethnic characterizations were based on the Vietnamese Ethnolinguistic map.[27]

(U) LOC and water supply are two other potentially significant mappable terrain factors that are not specifically mapped for this study. Roads and trails were not mapped because of their relatively high density and because they are adequately shown on topographic maps. Data on the navigability of small canals and streams would, if available, have provided a useful input to insurgent LOC potential. Water supply was not specifically mapped for the Southern Sector because it is readily available almost everywhere, and areas lacking in readily available water correlate with areas having other distinctive characteristics that have been mapped.

ENVIRONMENTAL ANALYSIS OF INSURGENT-BASE AREAS

(U) Selected VC military activities in the Southern Sector were compiled from intelligence reports and summaries[12–15,21–23] covering a period from late 1965 to early 1967, and plotted on 1:50,000 working maps. Although the compilation is believed far from complete, it has served to indicate the chief areas of VC base-area activity. VC military-type activities were then grouped into several categories and their locations shown on the map (Fig. III-8) to permit comparison with the various environmental factors mapped for this study.

(U) Not all these activities represent base-area development. Therefore, for the purpose of this analysis, base areas were defined as (a) individual camp sites; (b) areas of camp sites and concentration of other VC activities including repeated reports of VC units, logistical activities, and fortifications; and (c) areas in which VC forces have repeatedly been reported, but in which specific camp or base sites have not been identified. In the Southern Sector eight areas met these criteria. They are indicated by large circles on Fig. III-8.

(C) Base-area activities that are shown on the map but were not used in the analysis were considered to be probable billeting activities in Cambodian villages and thus did not meet the base-area definition. Data were not available to differentiate moving from encamped units among the VC-force sitings. Single-unit sitings were not considered camps; most such sitings fall on roads or trails or in villages. (Those that do not tend to lie in areas having environmental characteristics similar to the selected base areas, which may indicate that these sitings also represent base areas or encampments.)

(U) The environment of the selected base areas was then analyzed by inspection of air photos, 1:50,000 topographic maps, and the basic-data maps prepared for this study. It was hoped that the intelligence reports and summaries themselves would provide data pertinent to environmental criteria of VC basing, but such data were not available. The results of this analysis are summarized in Table III-6.

(C) **Fig. III-3—Southern Sector: Geomorphology**

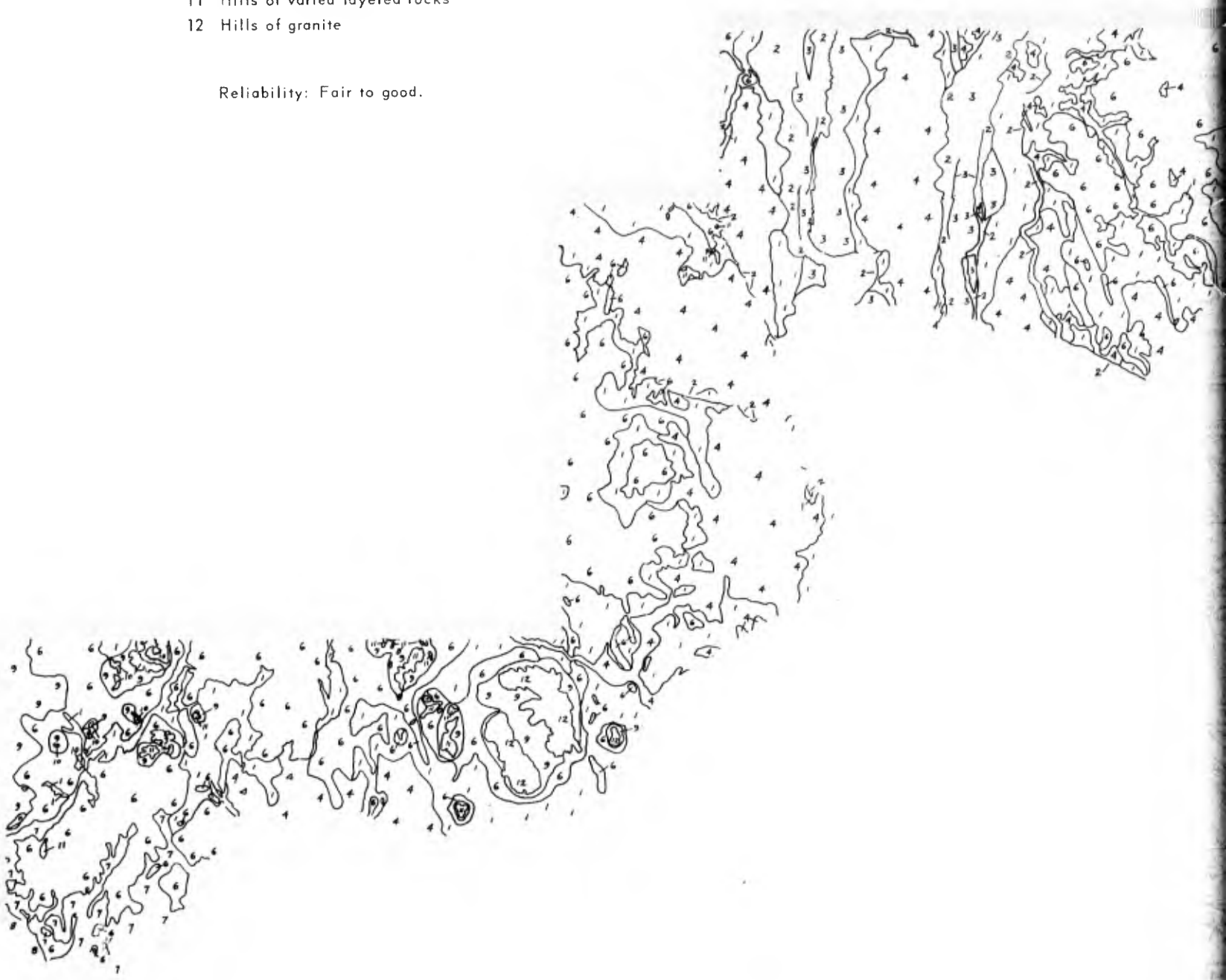
Features Formed of Unconsolidated Materials

1 Alluvial plains
2 Natural levees
3 Point-bar accretion areas
4 Backwater marsh and swamp
5 High terrace
6 Low terrace
7 Marine plains
8 Beach ridges and swales
9 Colluvial slopes

Features Formed of Bedrock

10 Hills of limestone
11 Hills of varied layered rocks
12 Hills of granite

Reliability: Fair to good.



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(U)

TABLE III-3

Southern Sector: Military Geology

(Keyed to Fig. III-3)

Map unit	Landforms	Drainage characteristics	Military effects of topography	
			On insurgent operations	On conventional operations
1	Flat plains. Slopes < 2 percent; relief generally 1 m or less. Merges gradually with most adjacent units; along smaller streams, unit commonly sharply defined by low, gentle escarpment bordering unit 6.	Internal drainage poor; surface dries slowly during early dry period.[a] Generally integrated drainage system of main streams and small tributaries; includes many canals in places	Small streams and canals provide LOC and supply for small units. Fords and bridges, common in this unit, provide potential ambush sites. Embankments along main roads provide local cover and concealment for small units.	Topography widely suited for conven military operations including cross country movement by tracked vehic and helicopter and paradrop operati
2	Narrow to broad asymmetric ridges occurring chiefly in pairs flanking main streams. Highest near streams; slope (< 2 percent) gently away from streams. Levee crests generally 1 to 2 m above adjacent lowlands. Unit merges with units 1 or 4.	Internal drainage good. Levees segmented in places by shallow streams or canals normal to levee axis, especially along Mekong.	Potential ambush sites at many fords and bridges.	Topography widely suited for conven military operations including cross country movement by tracked vehic and helicopter and paradrop operati Fields of fire unrestricted.
3	Series of alternating, arcuate, low, narrow ridges and shallow swales. Ridge crests about 1 m above adjacent swales; ridge flanks slope < 5 percent. Boundary of unit sharply defined by ridge and swale pattern.	Internal drainage good on ridges; poor in swales. Swales often marshy late into dry period.	Ridges afford limited cover from flat-trajectory small-arms fire and limited concealment from ground observation.	Topography generally suited for cros country movement; somewhat chann by ridge and swale pattern; poor fo paradrop and helicopter operations Fields of fire unrestricted.
4	Flat plains; slopes < 1 percent over broad areas. Relief 1 m over broad areas.	Internal drainage very poor; water stands on surface during much of dry period. Generally poorly integrated drainage net; interior drainage common. Many small shallow lakes and ponds.	In many places canals and small streams provide LOC and supply for small units.	Topography generally suited for cros country movement; many helicopter landing sites. Fields of fire unres over broad areas.
5	Flat to very gently rolling upland plains. Slopes < 5 percent, relief < 3 m. Merges gradually to unit 6; may include some small areas of unit 6.	Internal drainage good. No streams.	Topography locally provides limited cover from flat-trajectory small-arms fire.	No topographic restrictions to conve tional military operations. Fields fire unrestricted by topography in places.
6	Flat plains. Broad areas with slopes < 2 percent; maximum relief < 3 m. Overall gentle regional slope toward southwest. In many places merges almost imperceptibly with adjacent units 1, 5, 7, and 9. In northeast may include parts of unit 5; in places may include unit 1, especially along Prek Cham.	Internal drainage poor. Surface drainage impeded in most places by diked paddy fields. Streams generally lacking. Scattered small rain-fed ponds and tanks common. A few small canals at lowest elevations in "Parrots Beak" area; some small seasonal streams in extreme southwest.	Dikes bounding rice fields provide limited cover from flat-trajectory small-arms fire and limited concealment from ground observation.	Few topographic restrictions on con ventional military operations. Fie of fire unrestricted by topography most places.
7	Flat plains; slopes < 1 percent, relief < 1 m; local, small, raised beach ridges as in unit 8.	Internal drainage poor. Network of closely spaced, small, sluggish, perennial, commonly tidal streams and canals.	Local, low beach ridges may provide limited cover from flat-trajectory small-arms fire.	Network of streams slows or greatly stricts cross-country movement an severely limits paradrop operation Fields of fire generally unrestrict by topography.
8	Low beach ridges alternating with shallow swales. Relief generally < 1 m; slopes on ridges < 5 percent. Includes salt pans.	Internal drainage good on ridges; poor in swales. No streams. Network of small canals and ditches serve salt pans.	Low beach ridges may provide limited cover from flat-trajectory small-arms fire.	Few topographic obstacles to cross country movement or to helicopter paradrop operations. Fields gene unrestricted by topography.
9	Flat to very gently rolling plains adjacent to hills and low mountains; slopes < 5 percent; relief generally < 5 m.	Internal drainage good. A few widely spaced small seasonal streams; scattered small ponds and tanks.	A few shallow gullies may provide limited cover from flat-trajectory small-arms fire.	Few topographic obstacles to cross country movement or paradrop and copter operations. Fields of fire stricted by topography in most pla
10	Steep, hummocky hills rising abruptly from adjacent plains; slopes commonly 45 percent or more; summits 60 to 200 m above adjacent plains. Sinkholes in places; may contain small caves in places	Internal drainage excessive. No streams.	Topography affords cover, concealment, and excellent observation posts. Small caves may provide cover and concealment for men and equipment.	Steep slopes preclude conventional military operations with tracked v or airborne operations.
11	Steep hills rising fairly abruptly from adjacent plains; summits 60 to 450 m above adjacent plains. Slopes commonly 45 percent or more.	Internal drainage good. No streams.		
12	Same as 11.	Internal drainage good. No streams.		

[a]Dry period: December through May; wet period: June through November.

TABLE III-3

Southern Sector: Military Geology

(Keyed to Fig. III-3)

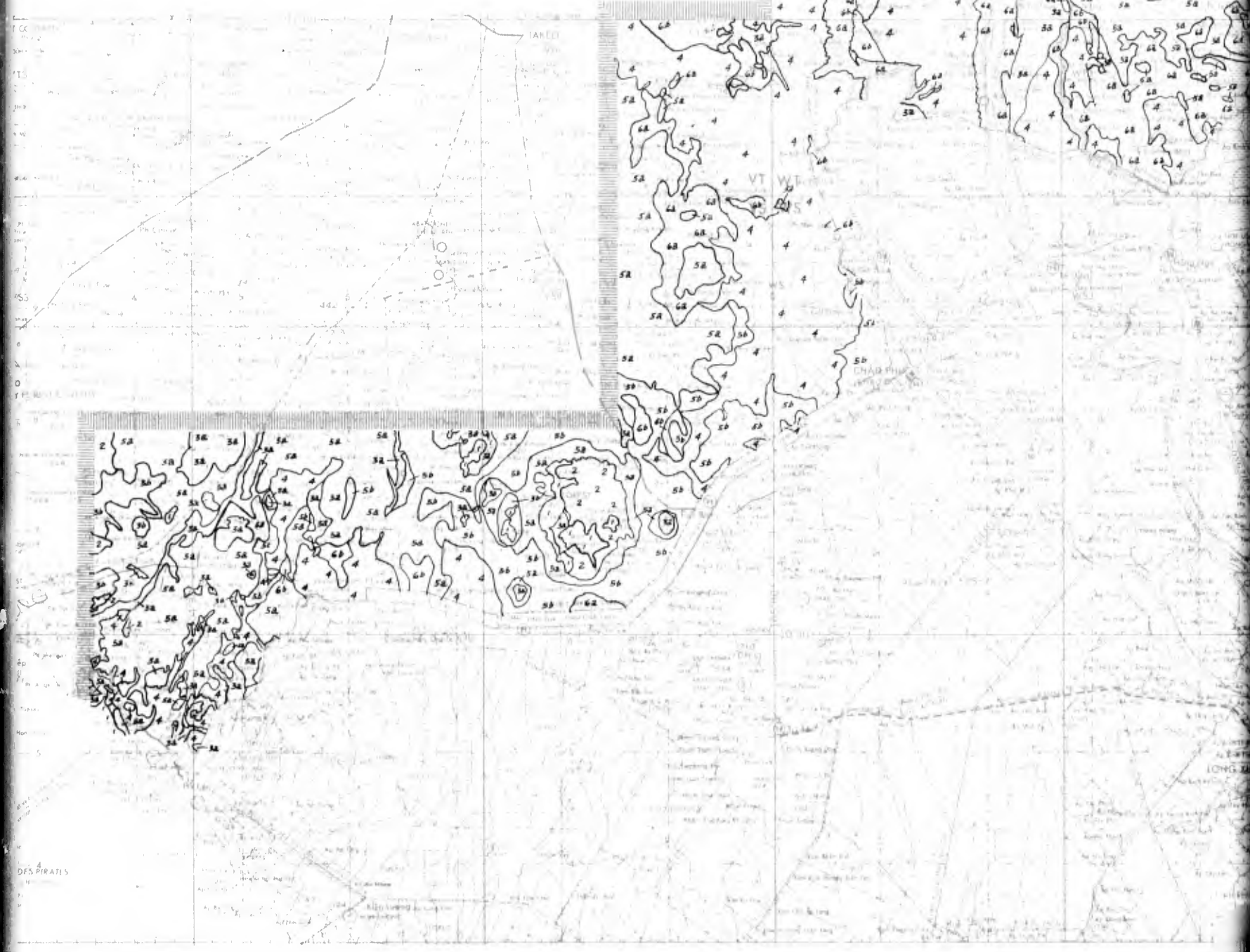
Military effects of topography		Geology and groundwater table	Military aspects of geology
urgent operations	On conventional operations		
nd canals provide LOC small units. Fords and on in this unit, provide sh sites. Embankments ds provide local cover nt for small units.	Topography widely suited for conventional military operations including cross-country movement by tracked vehicles and helicopter and paradrop operations.	Thick unconsolidated alluvial deposits of silt, sand, and clay. Surface layers of silt and silty sand as much as 3 m thick. Groundwater near surface most of year; drops slightly in dry period.	Shallow excavations and tunnels easily dug but most would fill with groundwater. Surface soils poorly trafficable when wet, good when dry.
h sites at many fords	Topography widely suited for conventional military operations including cross-country movement by tracked vehicles and helicopter and paradrop operations. Fields of fire unrestricted.	Thick silts, sand, and sandy silts, irregularly stratified in discontinuous layers and lenses. Groundwater table near surface in wet period; drops to 4–5 m in dry period.	Sites for shallow tunnels above groundwater table available in dry period. Shoring generally required. Soil trafficability fair to poor when wet, good when dry.
imited cover from flat-ll-arms fire and limited rom ground observation.	Topography generally suited for cross-country movement; somewhat channelized by ridge and swale pattern; poor for paradrop and helicopter operations. Fields of fire unrestricted.	Ridges of silty, sandy alluvium; swales of silty and clayey alluvium. Groundwater table at or near surface; drops slightly in ridges during dry period.	Sites for shallow tunnels above groundwater table on low ridges during dry period. Excavation easy; shoring commonly required. Soil trafficability poor in swales, fair to good on ridges.
canals and small streams nd supply for small units.	Topography generally suited for cross-country movement; many helicopter landing sites. Fields of fire unrestricted over broad areas.	Thick alluvium. Chiefly plastic clay near surface; underlain irregularly by stratified discontinuous layers and lenses of silt and sand at varied depths.	Sites generally lacking for tunnels or shallow excavations above water table. Excavation easy. Soil trafficability poor to unsuited most of year.
ally provides limited cover ctory small-arms fire.	No topographic restrictions to conventional military operations. Fields of fire unrestricted by topography in most places.	Unconsolidated alluvium of ancient Mekong Delta; chiefly silty, sandy surface layer as much as 4 m thick, underlain by thick silts, sand, clay, and local thin discontinuous beds of quartz gravel. At depth may include marine deposits. In places may include laterite layer near surface. Groundwater table fluctuates seasonally, relatively deep during dry period.	Many sites for tunnels and underground storage sites above water table much of year; excavation easy. Soil trafficability fair when wet, good when dry.
rice fields provide limited t-trajectory small-arms d concealment from ation.	Few topographic restrictions on conventional military operations. Fields of fire unrestricted by topography in most places.	Thick unconsolidated alluvium, chiefly silt and clay silt, in upper parts; underlain by layered sequences of silt, clay, and sand. Groundwater table fluctuates.	Sites for shallow tunnels above groundwater table available in dry period. Soil trafficability fair to poor when wet, good when dry.
ch ridges may provide from flat-trajectory e.	Network of streams slows or greatly restricts cross-country movement and severely limits paradrop operations. Fields of fire generally unrestricted by topography.	Thick marine and estuarine clay; commonly salty. Merges inland with alluvium of unit 1. Ridges of beach sand as in unit 8.	Shallow excavations easily dug, but may fill with water in most places during most of year. Soil trafficability poor to unsuited most of year.
es may provide limited t-trajectory small-arms	Few topographic obstacles to cross-country movement or to helicopter or paradrop operations. Fields generally unrestricted by topography.	Beach ridges of white to yellow sand; swales of tidal, saline clay.	Shallow excavations easily dug on low sandy ridges; may fill with water at high tides. Soil trafficability fair on ridges, poor to unsuited in swales.
gullies may provide from flat-trajectory e.	Few topographic obstacles to cross-country movement or paradrop and helicopter operations. Fields of fire unrestricted by topography in most places.	Thick colluvium and residuum developed from underlying bedrock. Silty and sandy adjacent to sandstone, shale, and granitic bedrock; clayey adjacent to limestone. Merges with alluvium of unit 6.	Shallow excavations easily dug above groundwater table most of year. Soil trafficability fair to poor when wet, fair to good when dry.
ords cover, concealment, observation posts. Small ovide cover and conceal-and equipment.	Steep slopes preclude conventional military operations with tracked vehicles or airborne operations.	Hard limestone of Permian Age; mostly in massive, inclined beds; rock at surface or beneath thin, stony, clayey soil. Groundwater occurs irregularly at varied depths in limestone. Chiefly hard schist, gneiss, quartzite, sandstone, minor limestone; of early Paleozoic Age. In thin to thick steeply inclined beds; at surface or beneath thin, stony, silty, sandy soil. Hard massive granitic rock at surface or beneath thin, stony, silty, sandy soil.	Shallow excavations easily dug only in local pockets of thick soil above groundwater table most of year. Extensive tunnel system would require hard-rock excavation.

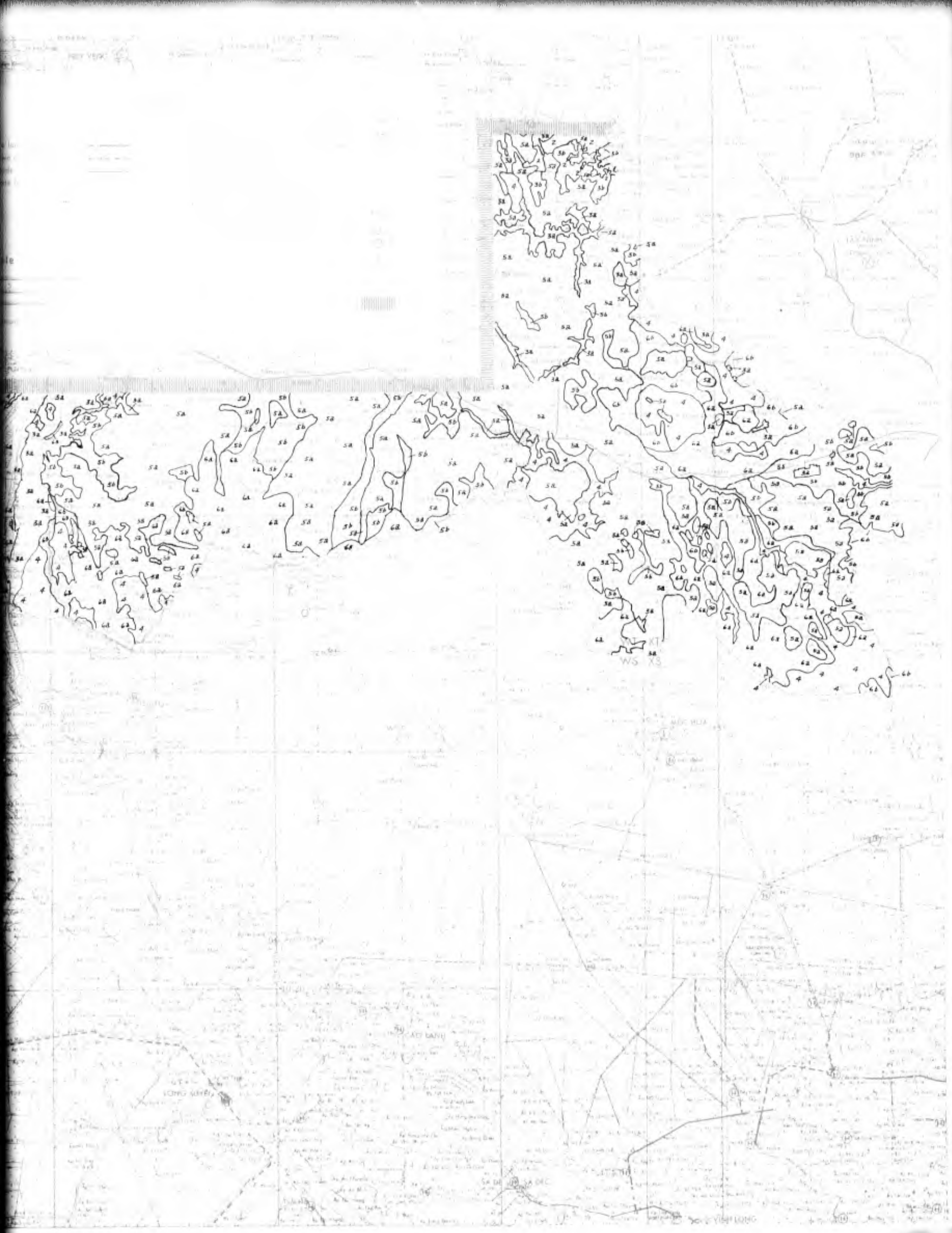
2

(C) Fig. III-4—Southern Sector: Vegetation

1 Dense forest, including mangrove; in places, dense brush
2 Open forest and brush
3 Brush, brush and grass: (a) without cultivation, (b) with cultivation
4 Chiefly grass
5 Wetland rice: (a) early-maturing rice; (b) late-maturing rice
6 Miscellaneous dryland cultivation: (a) nearly continuously cultivated, (b) in mosaic with grassland

Reliability: Fair to good.





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(U)

TABLE III-4

Southern Sector: Description of Vegetation

(Keyed to Fig. III-4)

Map unit	Description	Significance for insurgent operations
1	Dense forest of tall, broadleafed, evergreen trees with dense undergrowth. Very local small clearings near margins in cultivation or in various stages of forest regrowth. Continuous high canopy. Includes narrow fringe of mangrove swamp along coast; exaggerated in extent.	Excellent concealment widely available from both air and ground observation fo individuals, small units, equipment, and base camps throughout year. Trunks provide cover for individuals from small-arms fire. Timber widely available fo construction of shelters, fortifications, and traps.
2	Open secondary forest with light to moderate undergrowth in extreme north and west; includes mosaic of small patches of dense forest and clearings in various stages of rai cultivation, brush, or secondary forest; open canopy in much of area.	Excellent concealment locally from air and ground observation for individuals, equipment and small camps in patches of dense forest and tall brush; partial cealment available elsewhere. Timber widely available for construction of shelters and fortifications. Limited amounts of food for forage available in n and west.
3	Evergreen and deciduous brush and low trees in open to dense clumps, separated by grass as in unit 5. At margins includes cultivated vegetation as in unit 6. Includes patches of open forest as in unit 2. Brush of varied height, generally of closely spaced trees 2 m high. In southwest and in acid-soil areas brush predominantly low fresh-water mangrove. Brush most dense along streams and near margin of alluvial plains and low terrace.	Discontinuous partial concealment from air and ground observation for individu and small units, equipment, and buildings. Small amounts of timber and small logs available for construction of shelters, fortifications, and traps. Food ge erally not available for forage.
4	Mosaic of brush, grass, and miscellaneous, mostly dryland cultivation.	Discontinuous concealment from air and ground observations for small units of troops. Small sticks locally available for construction of shelters and traps. Food available for forage.
5	Chiefly tall dense growth of coarse sharp-bladed grasses, rushes, reeds, 1–2 m tall; some areas nearly barren; a few widely spaced small clumps of evergreen and deciduous shrubs; a few scattered occasionally cultivated fields.	Tall grass in places affords concealment for small units of foot troops from gro observation; concealment from air observation fair for individuals and small u of foot troops, poor for buildings. Grass suitable for thatch; food widely ava ble for forage in wet and dry periods.
6	Wetland rice: dense grassy growth 1–1.3 m high at harvest; in fields 0.04–0.4 hectares bounded by silty clay dikes 0.3–0.5 m high, 0.3–0.6 m wide. Fields in low grass or weeds or barren when fallow. (a) Early-maturing rice: grown above annual flood levels, dependent chiefly on retention of rainwater; seeded June or July, harvested December and January. Fields generally smaller, dikes higher than in 6b; hedgerows commonly have brush, palms, bamboo. Smaller groups of rural dwellings on highest ground commonly canopied by open to dense clumps of bamboo and evergreen trees. In west around margins of limestone hills includes many widely spaced fruit trees; vegetable gardens and dryland crops also grown around many villages. (b) Late-maturing rice: seeded June or July, harvested February or March. Fields larger, dikes low or lacking; hedgerows generally lacking. Merges with and includes dryland cultivation as in unit 7. Fluctuates in extent from year to year depending on extent of flooding.	Mature rice affords limited concealment from ground observations for foot troop Trees, brush, and bamboo of hedgerows and around villages afford concealme for small units of foot troops from air and ground observation throughout year Rice widely available; variety of vegetables and fruits available for forage a villages in growing season. Bamboo and small sticks around villages and ar fields on highest ground suitable for shelters and traps.
7	(a) Predominantly miscellaneous dryland cultivation including corn, sugarcane tobacco, vegetable gardens, rice. In some areas grown after wetland rice harvest. Includes small patches of grass as in unit 5 and brush as in unit 3. Crops irrigated in places. Merges with unit 6b in southeast. (b) Mosaic of crops and grassland crops as in unit 7a, grassland as in unit 5.	Mature corn and sugarcane, small patches of brush, and tall grass afford limit concealment from ground observation for small units of foot troops. Wide va of vegetables and fruits available for forage during growing season.

[a]Dry period: December through May; wet period: June through November.

TABLE III-4

outhern Sector: Description of Vegetation

(Keyed to Fig. III-4)

e for insurgent operations	Seasonal aspects	Significance for counterinsurgent operations
ilable from both air and ground observation for ent, and base camps throughout year. Trunks n small-arms fire. Timber widely available for ations, and traps.	No significant changes. Imparts dark tone to conventional aerial photography.	Precludes movement of vehicles and airborne operations. Observation and fields of fire severely restricted. Poorly suited for induced defoliation.
m air and ground observation for individuals, atches of dense forest and tall brush; partial con- Timber widely available for construction of ited amounts of food for forage available in north	No significant changes. Imparts mixed dark to medium-gray tones to conventional aerial photography; in places, "salt and pepper" tones.	Greatly hinders vehicular movement, precludes airborne operations. Local clearings suitable for helicopter landings in north and west; easily sabotaged or ambushed. Observation and fields of fire generally limited. Fair suitability for induced defoliation.
t from air and ground observation for individuals buildings. Small amounts of timber and small f shelters, fortifications, and traps. Food gen-	No significant changes. Imparts dark tone to conventional aerial photography.	Moderate to large hindrance to vehicular movement; scattered sites for helicopter landings and paradrops but sites commonly easily ambushed or sabotaged; observation and fields of fire restricted in places by brush. Fair to poorly suited for induced defoliation.
ir and ground observations for small units of foot ilable for construction of shelters and traps.	No significant changes. Imparts dark tone to conventional aerial photography in dry period.[a]	Little or no hindrance to vehicular movement; observation and fields of fire generally clear. Grassland and crops suitable for conflagration in late dry period.
ealment for small units of foot troops from ground ir observation fair for individuals and small units . Grass suitable for thatch; food widely availa- iods.	Green May to October. Sere and brown in dry period. Imparts medium to dark gray tones to conventional aerial photography.	No hindrance to cross-country vehicular movement; many sites for helicopter landings and paradrop operations; widely suited for conflagration in late dry period. Ground observation locally restricted by tall grass and reeds.
alment from ground observations for foot troops. dgerows and around villages afford concealment m air and ground observation throughout year. f vegetables and fruits available for forage around mboo and small sticks around villages and around e for shelters and traps.	Rice fields brilliant light green soon after transplanting; brown when mature. Brown, barren, or stubble after harvest. In growing season imparts moderate to dark gray tone to conventional aerial photography. Fallow fields have high reflectivity, appear extremely light on conventional aerial photography.	In most places vegetation presents little or no hindrance to cross-country vehicular movement or helicopter or paradrop operations. Hedgerows are local hindrance on higher ground. Fields of fire unrestricted by vegetation except in villages and in hedgerows. Mature rice suitable for conflagration.
ll patches of brush, and tall grass afford limited vation for small units of foot troops. Wide variety ble for forage during growing season.	Crops planted following rice harvest in late fall to mid-winter; harvested in late spring. Impart dark tones to conventional aerial photography.	Vegetation little or no hindrance to cross-country vehicular movement or helicopter or paradrop operations. Ground observation and fields of fire generally unrestricted.

2

(C)

Fig. III-5—Southern Sector: Agricultural Potential of Soils

Evaluations are without regard to rainfall or the effects of flooding.

1 Excellent; brown alluvial soils, brown hydromorphic soils, calcimorphic regurs

2 Good, locally poor; alluvial soils, locally acid

3 Fair; red–yellow podzolic soils

4 Fair to poor; low humic gley soils

5 Poor; gray podzolic soils

6 Very poor to unsuited; (a) very acid and saline soils, (b) basic and acidic lithosols

Reliability: Fair to good.

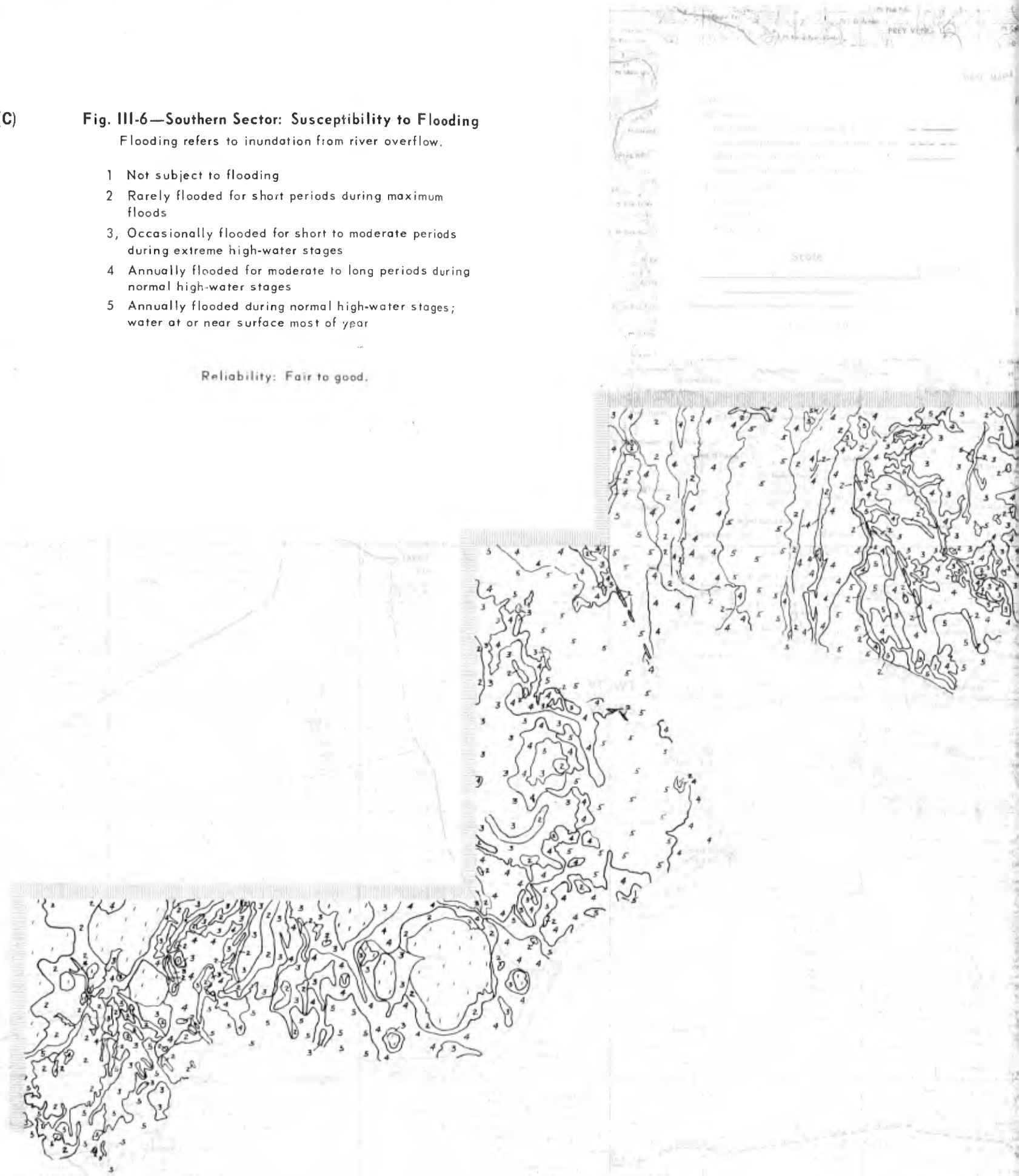
2

(C) **Fig. III-6—Southern Sector: Susceptibility to Flooding**

Flooding refers to inundation from river overflow.

1 Not subject to flooding
2 Rarely flooded for short periods during maximum floods
3, Occasionally flooded for short to moderate periods during extreme high-water stages
4 Annually flooded for moderate to long periods during normal high-water stages
5 Annually flooded during normal high-water stages; water at or near surface most of year

Reliability: Fair to good.



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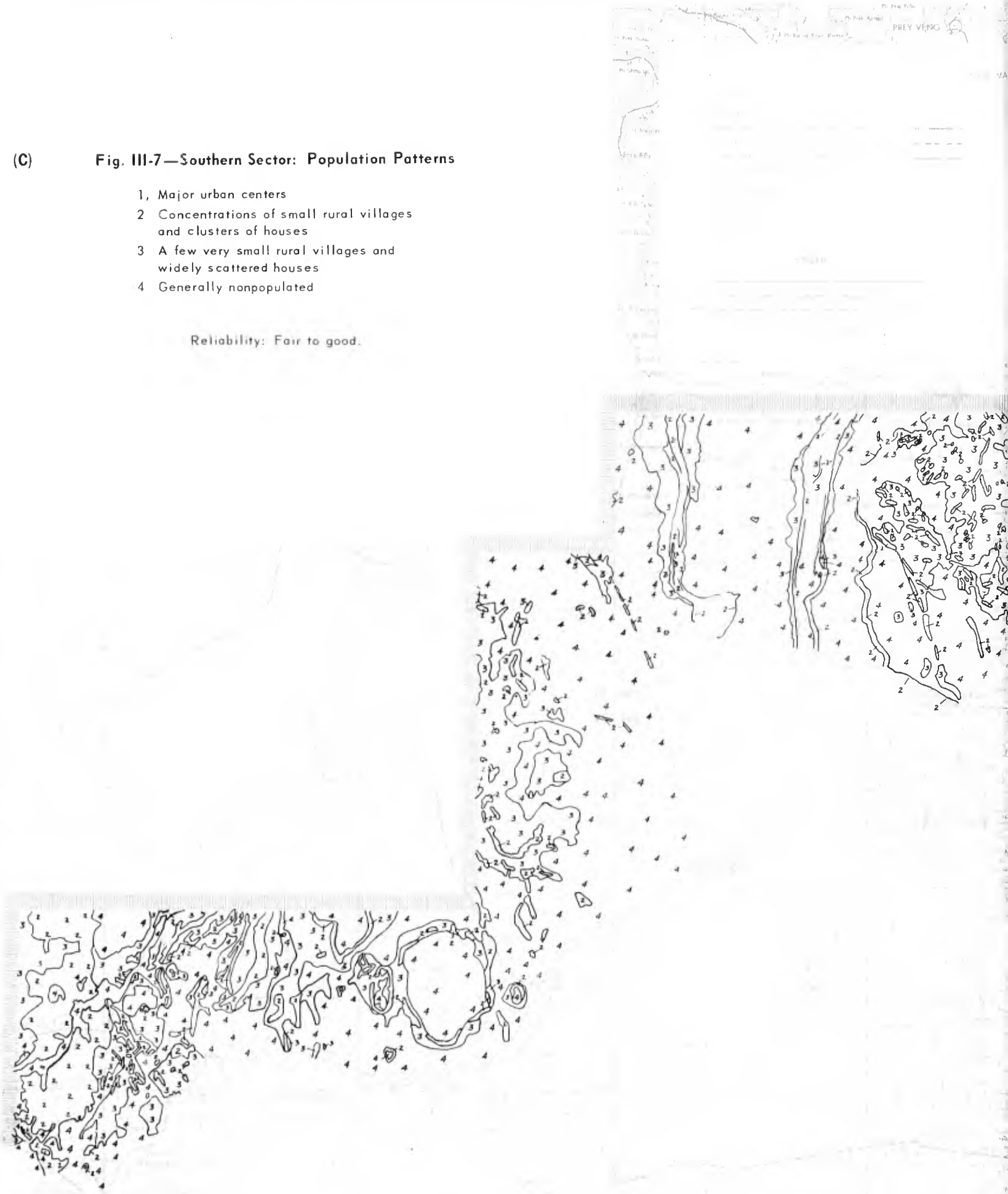
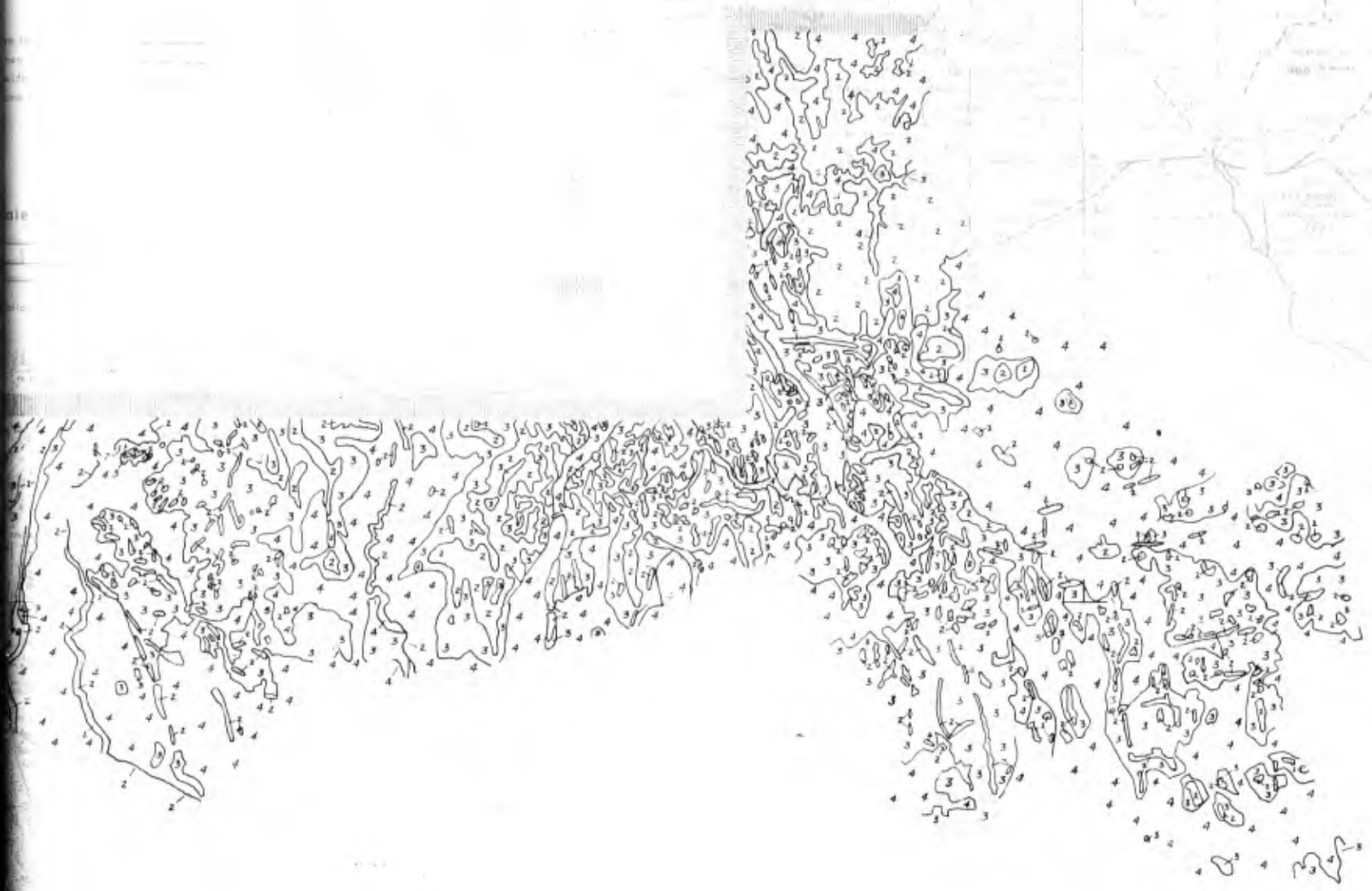
(C) **Fig. III-7—Southern Sector: Population Patterns**

1, Major urban centers
2 Concentrations of small rural villages and clusters of houses
3 A few very small rural villages and widely scattered houses
4 Generally nonpopulated

Reliability: Fair to good.





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(U)

TABLE III-5

Southern Sector: Description of Population Patterns

(Keyed to Fig. III-7)

Map unit	Description	Location	
1	Small urban centers with population of a few thousand Contain small central commercial–administrative area surrounded by dwellings; schools, churches, many masonry and frame buildings. Streets tree-lined. Function chiefly as marketing and transportation centers for agriculture products, and as local administrative centers.	On low terrace above regular flood levels; commonly along perennial streams or on major roads.	Chief potential of governmen diversity and contact with supplies. Po rural villages
2	Village houses irregularly grouped and separated by narrow winding lanes; in places, long linear populated places consist of a line of rural dwellings one row deep flanking roads or trails. Chiefly agriculture processing centers; chiefly rice milling, storing, and marketing. In places include temples. Houses normally have thatched roofs and bamboo walls; locally where subject to regular flooding some houses on pilings. Larger villages have schools, temples, local administrative office; and a few frame and masonry buildings. Tall thick bamboo hedges common in and around villages. Accessible by foot trails and dry-season roads.	Located chiefly above regular flood levels on natural levees and on highest parts of terraces. Occasionally flooded during highest water stages.	Provide cover a units of foot farmers. Pro and sources domestic wel
3	A few very widely spaced hamlets or small groups or rural dwellings. Characteristics similar to villages in unit 2 but generally smaller and accessible only by foot trails. Includes also widely scattered single dwellings. Area contains moderately dense network of trails, tracks, and dry-season roads.	Chiefly on lower parts of terraces, and, in places, on floodplains.	Provide concea
4	Generally uninhabited; roads and trails generally lacking. Only rare very small, very widely scattered individual dwellings or small clusters of rural dwellings along a few trails.	On alluvial plains regularly flooded each year; on marshes and swamps; and, in west, on steep hills.	General lack o clandestine

1

TABLE III-5

Southern Sector: Description of Population Patterns

(Keyed to Fig. III-7)

	Location	Significance to insurgent operations
Contain unded by me buildings. nd transportation istrative centers.	On low terrace above regular flood levels; commonly along perennial streams or on major roads.	Chief potential target during later stages of insurgency owing to presence of government offices, military or civil-forces headquarters. Ethnic diversity and relatively high population enhances potential utility for contact with nonlocal supporters for procurement and exchange of supplies. Potential centers for coordinating insurgent activities in rural villages of surrounding area.
arrow winding ist of a line of s. Chiefly storing, and nally have ject to regular ave schools, e and masonry d around villages.	Located chiefly above regular flood levels on natural levees and on highest parts of terraces. Occasionally flooded during highest water stages.	Provide cover and concealment from air and ground observation for small units of foot troops. Provide source for purchase of food from local farmers. Provide recruitment sources in early stages of insurgency and sources of taxation revenues. Water supply available from shallow domestic wells.
rural dwellings. erally smaller idely scattered network of	Chiefly on lower parts of terraces, and, in places, on floodplains.	Provide concealment for individuals or very small units.
king. Only rare ngs or small	On alluvial plains regularly flooded each year; on marshes and swamps; and, in west, on steep hills.	General lack of local inhabitants favors use of many of these areas for clandestine insurgent activity.

(C) **Fig. III-8—Southern Sector: Selected Viet Cong Activities**

- □ Bases and related activities
- △ Varied logistical activities, including supply and storage depots of varied types and procurement, exchange, and resupply points
- o VC forces (250–1000 men) observed or reported
- ◂▸ Border-crossing points
- ○ Base areas selected for analysis; numbers keyed to Table III-6.

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TABLE III

Southern Sector: Environmental Analysis

(Keyed to Fig.

Base area	Type of base activity	Landforms	Vegetation	Agricultural potential
1	Probable VC base area reported; many buildings and fortifications. 7.5 km from border.	Flat alluvial plain underlain by silt, clay, and sand; bordered by low terrace.	Dense to open brush, some low forest; affords fair concealment from air observation. Chiefly grassland, some dryland cultivation where not in brush. Wetland rice on adjacent terrace.	Fair to good on alluvial soils for crops.
2	Suspect VC training area; recruits reported nearby. 4.3 km from border.	On flat alluvial plain underlain by silt, clay, and sand.	Chiefly grass with open brush and some dryland crops; grass and brush afford limited concealment from air observation.	Good on alluvial soils; probably potential for dryland crops.
3	Eight VC "installations" reported, several storage and supply depots, foxholes, and trenches; located on main infiltration route. Covers 12–14 sq km adjacent to border.	On flat alluvial plain underlain by silt, clay, and sand; bordered on three sides by backwater marsh.	Chiefly grassland; affords limited concealment from air observation.	Fair to good on alluvial soils for cultivation.
4	Suspect VC camp. Repeated reports of VC units in surrounding area, mostly along roads. Strongpoint and trenches; logistic activities. 2.5 km from border.	Narrow flat floodplain of small stream underlain by silt and clay; bordered by low terrace.	Open brush on floodplain; affords limited concealment from air observation. Wetland rice on terrace.	Fair on alluvial soils for dryland
5	Suspect VC camp. Repeated reports of VC units in area, mostly along roads. Strongpoint and trenches; logistic activities. 1.5 km from border.	Flat alluvial plain underlain by silt, clay, and sand.	Chiefly fields of dryland crops mixed with some grassland; affords very limited concealment from air observation.	Good on alluvial soils; probably for dryland crops.
6	Two camp sites reported, logistic activities, VC forces reported moving into and out of area; area about 16 sq km; located on border.	In transition area between flat alluvial plains and backwater marsh; underlain by silt, clay, and sand. Separated from Mekong River by natural levee.	Grass with patches of open to dense brush on alluvial plain; grass with patches of open brush on marsh. Adjacent levees in dryland crops. Grass and brush afford fair concealment from air observation.	Poor on acid soils of marsh; good alluvial soils. Probably has potential for dryland crops.
7	Several camps reported, repeated reports of VC forces in area; area about 20 sq km; located on border.	Encompasses several floodplain features: narrow natural levees along Mekong River, alluvial plains, accretion area, and backwater marsh. Underlain by silt, clay, and sand.	Dryland cultivation on levees; grass with patches of brush on alluvial plains and accretion ridges; grass in marsh. Brush and grass afford limited concealment from air observation.	Good to excellent on alluvial and alluvial soils for dryland crops; acid soils in marsh.
8	VC base camp reported. Regimental headquarters units reported nearby.	Accretion area of low ridges and shallow swales; ridges of silty sand and sand; swales of silt and clay. Separated from Basak River by natural levee.	Chiefly grass with scattered fields of dryland crops, mainly on low ridges.	Good to excellent on alluvial and alluvial soils; probably has tential for both wetland and dry

[a]All base-area activities described here were observed or reported during dry period only (December through May).

1

RAC

E III-6

is of Selected Viet Cong Base Areas[a]

Fig. III-8)

tial	Hydrology	Population and ethnology	Roads and trails
ls for dryland	Surface water: on or adjacent to small perennial river; small tributary stream crosses area Flooding: regularly flooded during normal high-water stages Groundwater: at or near surface most of year; drops slightly in late dry period	Small rural villages and clusters of houses within 0.5 km of area; Khmer.	Adjacent to dry-weather road. Footpaths cross area.
ably has unused s.	Surface water: borders small irrigation canal; small irrigation ditches serve fields Flooding: area regularly flooded during normal high-water stages Groundwater: near surface; drops slightly in dry period	Small rural houses line canal adjacent to site. Mixed Khmer and Vietnamese.	Footpath and cart trail cross area. 3 km to dry-weather road.
ls for dryland	Surface water: system of small drainage/irrigation ditches crosses area Flooding: most of area regularly flooded during normal high-water stages Groundwater: near surface; drops slightly in dry period	Uninhabited; 3–4 km to nearest settlement. Chiefly Khmer with Vietnamese elements.	Footpaths cross area. 3–4 km to dry-weather road.
yland crops.	Surface water: less than 1 km from small perennial stream; small irrigation ditches serve fields Flooding: regularly flooded during normal high-water stages Groundwater: near surface; drops slightly during dry period	Small rural village within 0.5 km of site; chiefly Khmer, with some Vietnamese elements.	Dry-weather road borders site.
ably fully used	Surface water: on small perennial stream Flooding: regularly flooded during normal high-water stages Groundwater: near surface; drops slightly during dry period	Uninhabited. 3 km to nearest settlement; Khmer.	Footpaths leading to fields. 3 km to dry-weather road.
s good on has unused s.	Surface water: small drainage canal passes through area Flooding: most of area flooded for long period during and after normal high-water stages Groundwater: very near surface most of year	Immediate area uninhabited. Line of rural houses on levee; chiefly Khmer with Cham, Malais, and Vietnamese elements.	Footpath enters area. Dry-weather road on adjacent levee.
l and brown crops. Poor on	Surface water: borders Mekong River; perennial tributary crosses area Flooding: subject to flooding during high-water stages of Mekong River Groundwater: probably within 1–2 m of surface everywhere; at surface in marsh most of year	Line of rural houses on levee; chiefly Khmer, with Cham and Malais elements. Uninhabited elsewhere.	Footpaths on levees and alluvial plain. 5–6 km to dry-weather road. Stream navigable by small boats.
l and brown s unused po- d dryland crops	Surface water: shallow ponds in swales; irrigation ditches serve some fields Flooding: swales flooded for moderate to long periods during high-water stages; ridges flooded for short periods	Immediate area uninhabited. Rural houses line levees; Khmer with Cham and Malais elements.	Dry-weather road and cart tracks on crest of levees.

2

(U) Although the actual number of base areas in the Southern Sector is too small to provide an empirical data base from which to develop insurgent-basing criteria, the following general relations may be worth setting down:

(a) All selected base areas were reported only in the dry period.

(b) Sites were all located in areas that show as dark tones on conventional aerial photography taken during the dry period.

(c) Sites were generally located in nonpopulated areas although commonly adjacent to small rural settlements.

(d) Sites were generally located in areas affording the best (although generally not good) concealment from air observation on or within a few kilometers of the Vietnam border.

SUMMARY

(U) Critical aspects of the environment of the Southern Sector were systematically analyzed, mapped, and described in terms of their potential influence on insurgent base-area development. Known base areas were then analyzed in terms of these environmental characteristics. The number of bases identified and analyzed in this sector was too small to provide empirically any insurgent-basing criteria. On the basis of the environmental analyses and using deduced basing criteria, a map was constructed at 1:250,000 showing the range in suitability for insurgent base-area development throughout the Southern Sector. The estimate of suitabilities was developed largely as a result of value judgments using a traditional area-analysis methodology. The suitability map demonstrates a methodology that can be applied to many areas of the world that may require operational planning for counterinsurgency.

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13. ABSTRACT

(U) The physical environment of three selected areas adjacent to war zones of South Vietnam was analyzed on the basis of information available in Washington, D. C. Topical maps were constructed showing geology, soils, vegetation, slopes, water supply, geomorphology, land use, and population patterns. Selected insurgent activities were analyzed to identify environmental criteria influencing the location of base areas. Environment/base-area relations were developed and new maps were synthesized to show the suitability of the environment of each area for insurgent basing. These maps demonstrate three methodologies in area analysis for counterinsurgency operations.

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