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TECHNICAL REPORT NO. 3-726

MOBILITY ENVIRONMENTAL RESEARCH STUDY
A QUANTITATIVE METHOD FOR DESCRIBING TERRAIN FOR GROUND MOBILITY

Volume III

SURFACE GEOMETRY

by

W. K. Dornbusch, Jr.



September 1967

Sponsored by

Advanced Research Projects Agency
Directorate of Remote Area Conflict

Service Agency

U. S. Army Materiel Command

Conducted by

U. S. Army Engineer Waterways Experiment Station
CORPS OF ENGINEERS
Vicksburg, Mississippi

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FOREWORD

The study reported herein was performed by the U. S. Army Engineer Waterways Experiment Station (WES) for the Office, Secretary of Defense (OSD), Advanced Research Projects Agency (ARPA). This report describes portions of two tasks of the overall Mobility Environmental Research Study (MERS) sponsored by OSD/ARPA for which the WES was the prime contractor and the U. S. Army Materiel Command was the service agent. The broad mission of Project MERS is to determine the effects of the various features of the physical environment on the performance of cross-country, ground-contact vehicles and to provide therefrom data that can be used to improve both the design and employment of such vehicles. A condition of the project is that the data be interpretable in terms of vehicle requirements for Southeast Asia. The funds employed for this study were allocated to WES through AMC under ARPA Order No. 400. The study was performed during the period June 1964-November 1965 under the general guidance and supervision of the MERS Branch of the WES, the staff element of WES responsible for the technical management and direction of the MERS program.

This volume is one of an eight-volume report entitled A Quantitative Method for Describing Terrain for Ground Mobility. These volumes are:

I: Summary
II: Surface Composition
III: Surface Geometry
IV: Vegetation
V: Hydrologic Geometry
VI: Selected Air-photo Patterns of Terrain Features
VII: Development of Terrain-Type Maps for Ground Mobility
VIII: Terrain Factor-Family Maps of Selected Areas

Field data were collected in Thailand between July 1964 and May 1965. Personnel who actively participated in the collection of surface geometry data during part or all of this period were: Messrs. D. E. Andrews, Geology Branch, Soils Division, and W. W. Allred and V. J. Piazza, Area Evaluation Branch (AEB), Mobility and Environmental (M&E) Division, WES; R. E. Frost and A. O. Poulin, U. S. Army Cold Regions Research and Engineering Laboratory; and Sarid Srithirom and Sriwiroj Chantawong, MERS Thailand Detachment. Field sampling was conducted under the direct supervision of a data collection leader. This position was occupied for periods of 3 to 4 months each by Messrs. W. J. Dornbusch, Jr., and J. D. Broughton, WES Geology Branch, and Mr. Ruangvitya Chotibitayathamin, MERS Thailand Detachment. Data reduction and map preparation were accomplished by a team composed of Messrs. W. K. Dornbusch, Jr., team captain, V. J. Piazza, D. E. Andrews, and H. K. Woods, WES Geology Branch. The report was written by Mr. Dornbusch. The technique of identifying and categorizing air-photo patterns presented in this report was developed principally by Dr. R. J. Lutton, Geology Branch. The data reduction and map preparation phase was conducted under the direction of Mr. J. H. Shamburger, Geology Branch. Technical assistance in various phases of the work was provided by Mr. A. A. Rula, Chief, Mobility and Environmental Research Studies Branch. All phases of this study were conducted under the direct supervision of Mr. W. E. Grabau, Chief, AEB, and Mr. C. R. Kolb, and Mr. W. B. Steinriede, Jr., Chief and former Chief, respectively, of the Geology Branch, and under the general supervision of Messrs. W. G. Shockley and S. J. Knight, Chief and Assistant Chief, respectively, of the M&E Division, and Messrs. W. J. Turnbull and A. A. Maxwell, Chief and Assistant Chief, respectively, of the Soils Division.

Directors of the WES during the conduct of this study and preparation of this report were COL Alex G. Sutton, Jr., CE, and COL John R. Oswalt, Jr., CE. Technical Director was Mr. J. B. Tiffany.

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SUMMARY

This volume presents the methods used to collect, tabulate, and analyze basic data on the surface geometry of selected areas in Thailand. The descriptions of surface geometry features are so designed that the descriptive values can be used directly as input to an analytical model for predicting the cross-country speed of selected military vehicles. A method for classifying, interpreting, and mapping surface geometry factors from aerial photographs (air photos) was developed. Utilizing the field data collected and the air-photo interpretation methods developed, 25 surface geometry factor-family maps were prepared, together covering six selected study areas (Nakhon Sawan, Lop Buri, Chiang Mai, Pran Buri, Khon Kaen, and Chanthaburi). These maps are presented in Volume VIII of this report.

Air-photo interpretation methods for predicting and mapping surface geometry factors were largely successful. However, the degree of accuracy achieved for each of these factors varied considerably, being a function of the scale, quality, and vintage of the existing photography. It is recommended that studies be continued to develop air-photo interpretation techniques to improve the reliability of estimation of surface geometry factor values.

Appendix A gives the location of each site in each study area and summarizes the surface geometry data collected at each site.

MOBILITY ENVIRONMENTAL RESEARCH STUDY
A QUANTITATIVE METHOD FOR DESCRIBING TERRAIN FOR GROUND MOBILITY

VOLUME III: SURFACE GEOMETRY

PART I: INTRODUCTION

Background

1. Military operations requiring both tactical and logistical support are becoming increasingly dependent upon knowledge of the relations between military vehicles and the terrain over which they must travel. In addition, the increasing requirement for vehicles capable of operating in extreme environments has substantiated the need for more sophisticated information on terrain and terrain-vehicle relations. Such information is required for three general purposes: (a) to make it possible to predict the cross-country performance of existing military vehicles for both tactical and logistical purposes; (b) to make it possible to evaluate competing experimental vehicles in quantitative terms; and (c) to provide realistic information on which the selection of design criteria for new vehicles can be based.

2. The development of quantitative terrain-vehicle relations is dependent upon a comprehensive and systematic procedure for describing, classifying, and portraying in quantitative terms the terrain attributes or factors that significantly affect vehicle performance. This report as a whole is concerned exclusively with those factors. There are a relatively large number of factors that, acting singly or in concert, can be demonstrated to significantly affect vehicle performance (which, in this context, is defined as sustainable average speed across a unit of terrain).

3. The factors that significantly affect vehicle performance can be grouped into four sets (factor families), according to similarities of the effects they impose on vehicles: (a) surface composition, (b) surface geometry, (c) vegetation structure, and (d) hydrologic geometry. This

volume is concerned exclusively with surface geometry.

4. Surface geometry is considered to be the configuration of the earth's surface without regard to composition or mode of origin. Thus, surface geometry is a general term that includes all morphological features of the landscape. For purposes of mobility analysis, the features included for consideration are those to which vehicles react immediately and directly. Therefore, large-scale features such as ranges of hills and mountains, large floodplains, etc., have been deliberately omitted. The small-scale features considered herein exhibit great variations in type, size, and distribution in Southeast Asia in general, and in Thailand in particular. Noteworthy examples are ditches, rice-field bunds, road embankments, borrow pits, ravines, and boulder fields.

5. Surface geometry factors are important chiefly because they strongly affect vehicle dynamics. For example, cross-country speeds of selected military vehicles in Thailand, especially in the dry season, are controlled chiefly by the bumps or shocks imposed on the driver, the vehicle, or the cargo. When the shocks become so severe as to be uncomfortable, damaging, or dangerous, the driver slows down. Four factors describing certain properties of the size and shape of surface geometry features are of by far the greatest significance. These factors are slope, spacing of vertical obstacles (i.e. surface geometry features that induce primarily vertical motions in vehicles that encounter them), terrain approach angle (of vertical obstacles), and step height (of vertical obstacles). These factors are defined in paragraphs 10, 11, 12, 18, and 20.

6. Each of the four significant factors occurs in a wide range of values. In order to map the geographic (areal) distributions of these factor values, the total ranges must be subdivided into appropriate class ranges. The rationale for selecting appropriate ranges is described in detail in Part III of this volume. The development of maps showing the areal distributions of factor values is essential to the development of a comprehensive system for predicting the performance of ground-contact vehicles for tactical or other military purposes, since it is the only way currently available for presenting on a regional scale the data necessary to predict cross-country speed.

Purpose and Scope

7. The overall purpose of this study was to: (a) collect, tabulate, and analyze basic terrain data on surface composition, surface geometry, vegetation, and hydrologic geometry that would adequately describe those terrain variations that significantly affect vehicle performance in six selected study areas (fig. 1) that were chosen as representative of Thailand; (b) develop a method for interpreting, classifying, and mapping terrain factors; and (c) utilize the field data collected and the method developed to prepare factor-family maps of six selected study areas in Thailand (Nakhon Sawan, Lop Buri, Chiang Mai, Pran Buri, Khon Kaen, and Chanthaburi).

8. The specific purpose of this volume of the report is to present the methods used and techniques developed to accomplish the above-mentioned items for the surface geometry factor family. Appendix A gives the location of each site in each study area and summarizes the surface geometry data collected at each site. The surface geometry factor-family maps compiled from these data are presented in Volume VIII.

Discussion of Terms

9. To clarify the following discussions regarding surface geometry factors and their effects on vehicle performance, terms used in a restrictive sense in this report are explained in the following paragraphs.

Slope

10. Slope in its classical sense is defined as the angular deviation of a surface from the horizontal, measured perpendicular to the topographic contours. Slope so defined is approximately measurable from topographic maps or aerial photographs (air photos). Because such a general slope is not necessarily coincident with that slope that is sensed by a vehicle at a particular moment, for purposes of mobility analysis slopes were categorized into two types:

a. Topographic slopes are those that retain an approximate uniformity of inclination longer than the wheelbases of the vehicles that are to traverse them. Since the wheelbase of the longest test vehicle (the M35A1) is 330 cm

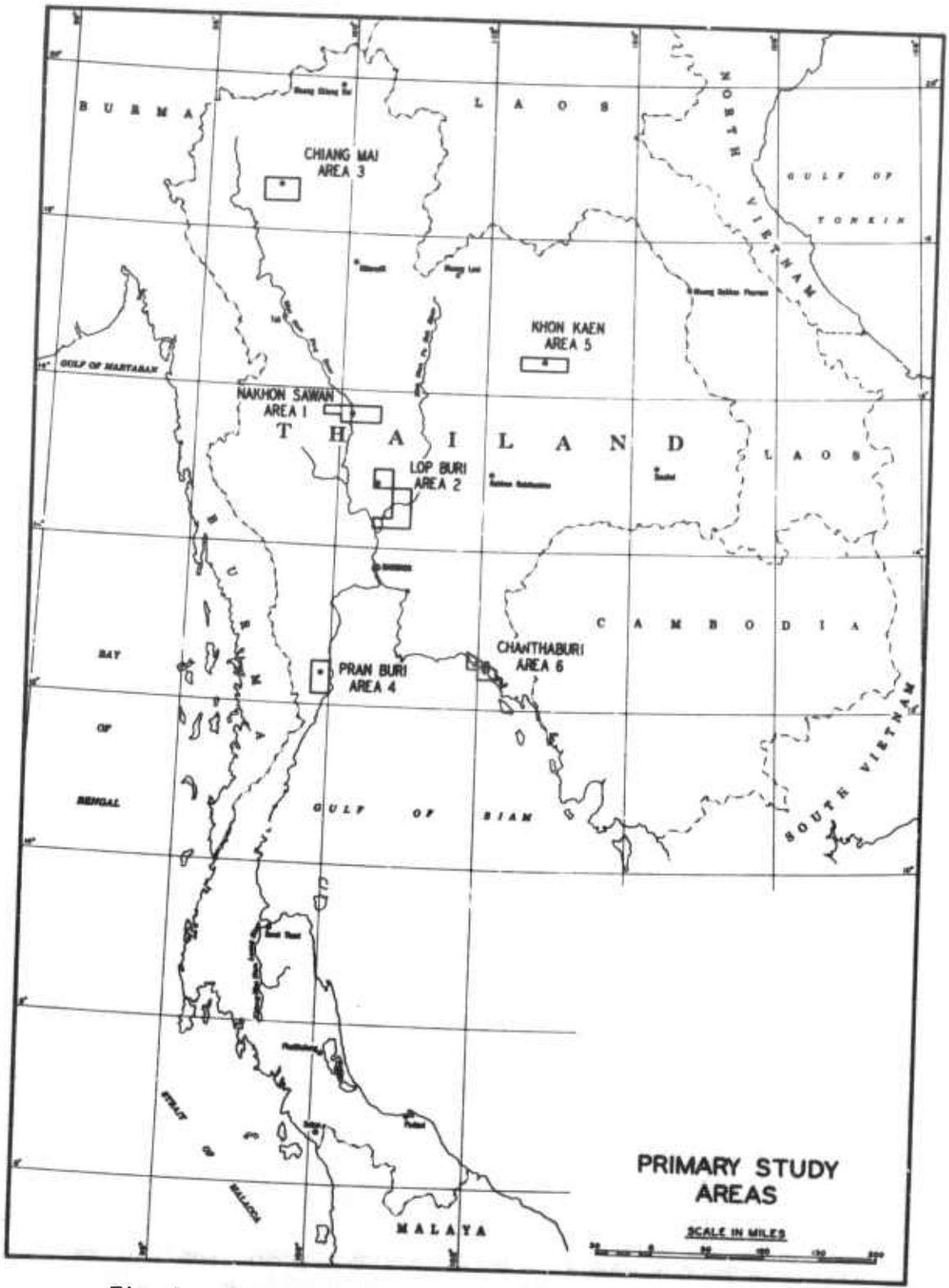


Fig. 1., Mapping limits of Thailand primary study areas

long, that value was accepted as the minimum length of topographic slope.

b. Slope segments are those slopes that retain an approximate uniformity of inclination for a distance less than 330 cm.

11. The general rationale is that in order to predict the negotiability of particular terrain the terrain surface must be considered as being composed of a series of contiguous topographic slopes and slope segments. The slope values presented in the factor maps are mainly descriptors of topographic slopes, without annotation as to direction* of slope.

Vertical obstacles

12. Minor irregularities on the general terrain surface (features composed of slope segments) are considered to be vertical obstacles, since they force the vehicle traversing them to move in the vertical plane (up and down). Vertical obstacles may have either positive (above the general level of the terrain, such as a rice bund**) or negative (below the general level of the terrain, such as a ditch) expressions. The majority of those measured in Thailand were of the positive type. No distinction was made as to whether such obstacles were of natural or cultural origin.

13. Although no rigid scalar restriction regarding definition of vertical obstacles was imposed, treatment was confined to small surface features. As a general rule, features flanked by topographic slopes (see subparagraph 10a) were regarded as general topographic features. Thus, only those flanked by slope segments (see subparagraph 10b) were considered to be vertical obstacles.

Vehicle contact surface

14. The vehicle contact surface (VCS) is the surface generated by passing a plane through the points of contact between the vehicle and the

---

* If slope is measured in a direction perpendicular to the topographic contours, it is necessary to know the direction of the trend of those contours within an area if the performance of a vehicle in a preferred direction is to be evaluated. However, this attribute was not mapped as an independent factor, because it was assumed that such data could be readily obtained directly from topographic maps (but see Conclusions and Recommendations, paragraph 120).

** The term "bund" is commonly used to describe the small earthen dikes that bound most of the rice fields in Thailand.

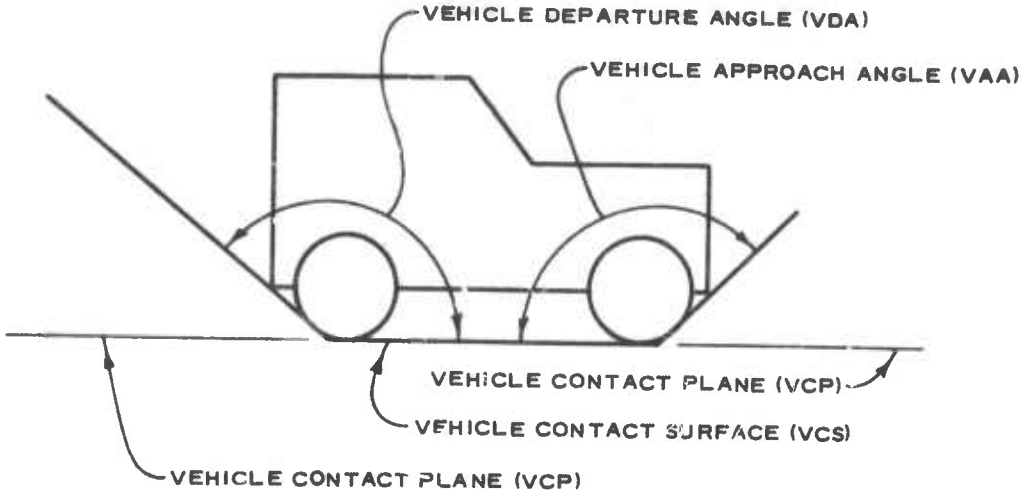


Fig. 2. Vehicle terms

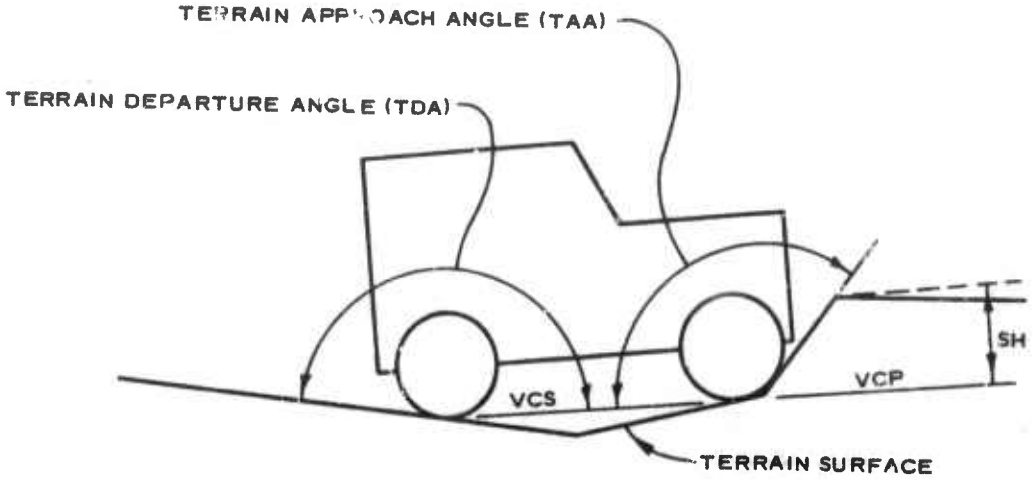


Fig. 3. Terrain-vehicle terms

surface on which it is resting (figs. 2 and 3). For example, a vehicle with front and rear wheels on opposite sides of a ditch generates an imaginary contact surface that coincides with the actual surface only at the points of contact of the wheels. The VCS includes only that area within the compass of the wheels or tracks. Four or more points of contact frequently may not be in the same plane; in such instances, the VCS is adjusted so that the sum of the squares of the distances from the generated plane to the support elements is at a minimum. In effect, the VCS is the plane of best fit.

Vehicle contact plane

15. The vehicle contact plane (VCP) is the planar extension in all directions of the VCS (fig. 2).

Vehicle approach angle

16. The vehicle approach angle (VAA) is the vertical angle* formed by the VCS and the plane generated by the leading edges of the wheels or tracks and the foremost portion of the vehicle extending beyond those edges (fig. 2). If no portion of the hull extends beyond the leading edges of the wheels or tracks, the VAA is 90 deg.

Vehicle departure angle

17. The vehicle departure angle (VDA) is the vertical angle* formed by the VCS and the plane generated by the trailing edges of the wheels or tracks and the rearmost portion of the vehicle extending beyond those edges (fig. 2). If no portion of the vehicle hull extends beyond the trailing edges of the wheels or tracks, the VDA is 90 deg.

Terrain approach angle

18. The terrain approach angle (TAA) is the vertical angle formed by the VCS and the slope with which the vehicle is in contact, and is measured in the manner illustrated in fig. 3. Because the VCS does not necessarily coincide with the terrain surface, this angle cannot be measured directly from the profile alone. The TAA is always vehicle-dependent and changes as a function of vehicle wheelbase as the vehicle senses the terrain surface.

Terrain departure angle

19. The terrain departure angle (TDA) is the vertical angle formed by the VCS and the slope that extends beyond the rear of the vehicle, and is measured in the manner illustrated in fig. 3. The TDA is vehicle-dependent and therefore cannot be measured directly from the profile alone.

Step height

20. The step height (SH) is the minimum distance between the VCP and the top of the slope comprising features with single uniform side

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* This angle is the supplement of the angle normally defined in military manuals.

slopes (fig. 3). For features bounded by multiple slope segments (i.e. sides exhibiting one or more breaks in slope), SH is the minimum distance from the point of intersection of the most critical slope segment (the one generating the minimum approach angle) bounding a feature and the VCP to the top of the slope segment. SH is to some degree vehicle-dependent, and its value, like those of TAA and TDA, cannot be accurately determined from the profile alone.

PART II: DATA COLLECTION PROCEDURES

21. The most satisfactory method of describing surface geometry features, including vertical obstacles, is the recording of relative-elevation profiles along several parallel traverses across the feature. The data taken in this form allow accurate graphical reconstruction of the feature. In addition, the data (which are recorded in the form of x-y coordinates) can be accepted as input for existing computer programs for a terrain-vehicle model.

22. Data collection procedures reported herein were standardized to ensure consistency of results. Generally speaking, these procedures involved four phases: (a) site selection, (b) location and topographic description of sites, (c) description of surface geometry features, and (d) collection of supplementary data. Detailed instructions were prepared for each of these phases of data collection, and standardized forms were used for reporting the information.[1] The following paragraphs summarize the steps involved in each of these phases.

Site Selection

23. Sites where surface geometry data were taken were selected as being representative of the various vertical obstacles (small-scale features) to be found within each of the study areas. Whenever possible, sites were sampled in sufficient detail that the complete range of variation of each factor (topographic slope, obstacle spacing, TAA, and SH), which in combination constitute a surface geometry type, could be obtained from the data. It was assumed that analysis of data from these sites would permit the determination of variations of discrete vertical obstacle sizes and types in noncontiguous and/or morphologically dissimilar study areas.

24. Site selection procedures were as follows:

a. Available air photos were studied, and as many discrete surface geometry patterns as possible were identified. Points for possible sampling were selected within each homogeneous area and carefully marked on the appropriate air photos or maps. Due consideration was given to the

difficulty of access, so that as a general rule, points near roads or cart trails were chosen wherever possible.

b. Low-level air reconnaissance of study areas was made whenever possible. This process was of major importance since the air photos available at the time the data collection teams were in the field were more than 10 years old. During those 10 years, the rapid Thai economic expansion has markedly altered the appearance of the landscape in many places; therefore, interpretations of the existing air photos of such areas were subject to gross error. As a result, the low-level air reconnaissances (photographs 1 and 2) revealed the necessity for many additional samples and in some cases permitted the elimination of previously selected locations. Information obtained in low-level reconnaissances was immediately plotted on the generally excellent 1:50,000-scale maps or on suitable existing air photos.

c. Ground areas selected through the methods described in subparagraphs a and b were then visited wherever possible. Some locations were inaccessible, and inspection was impossible. In such cases, alternate sites were selected in areas exhibiting similar photographic images.

d. Ground reconnaissance also revealed that a number of vertical obstacle types had not been detected by either air-photo interpretation or low-level air reconnaissance. Supplemental sample sites were established in as many as possible of the areas characterized by such obstacle types.

Location and Topographic Description of Sites

25. The utility of any environmental description is strongly dependent upon knowledge of a site's exact location and of the geographic context (or topographic position) in which the sample was taken. Accordingly, for every sample area in this study, these data were recorded on a topographic position data form (surface geometry) (fig. 4). Also, a surface geometry site map was sketched for each site (fig. 5).

26. The horizontal, and in some cases the vertical, distances required for the profile position data were determined from a topographic map or by ground measurement. However, the vertical distances were usually not determinable from maps because these distances were appreciably less than the contour intervals. In such cases, the vertical distance was

WES FORM NO. 1372
FEBRUARY 1964

TOPOGRAPHIC POSITION DATA FORM

(SURFACE GEOMETRY)

MAP REFERENCE: Amphoe San Kamphaeng, Chiangmai Thailand 4867 III Series L 708 Sc. 1:50,000 SITE NO.: 3-SG-128

GEOGRAPHIC COORDINATES OF SITE: Lat. 18°42'37" Long. 99°08'43"

SITE ELEVATION: 305 Meters MAX. REGIONAL SLOPE: _____ AZIMUTH: 310°

UNIT MEASURE: Feet DATE: 25 Oct 1964 SHEET 1 OF 1

Mil. Grid Coords. 15307040

POSITION NO.	HORIZONTAL DISTANCES FROM HI TO:			VERTICAL DISTANCE FROM INSTRUMENT POSITION TO:			NOTES
	SLOPE INTERCEPT	TOPO. HIGH	SITE	SLOPE INTERCEPT	TOPO. HIGH	SITE	

INDETERMINATE - FLAT

Fig. 4. Completed surface geometry topographic position data form

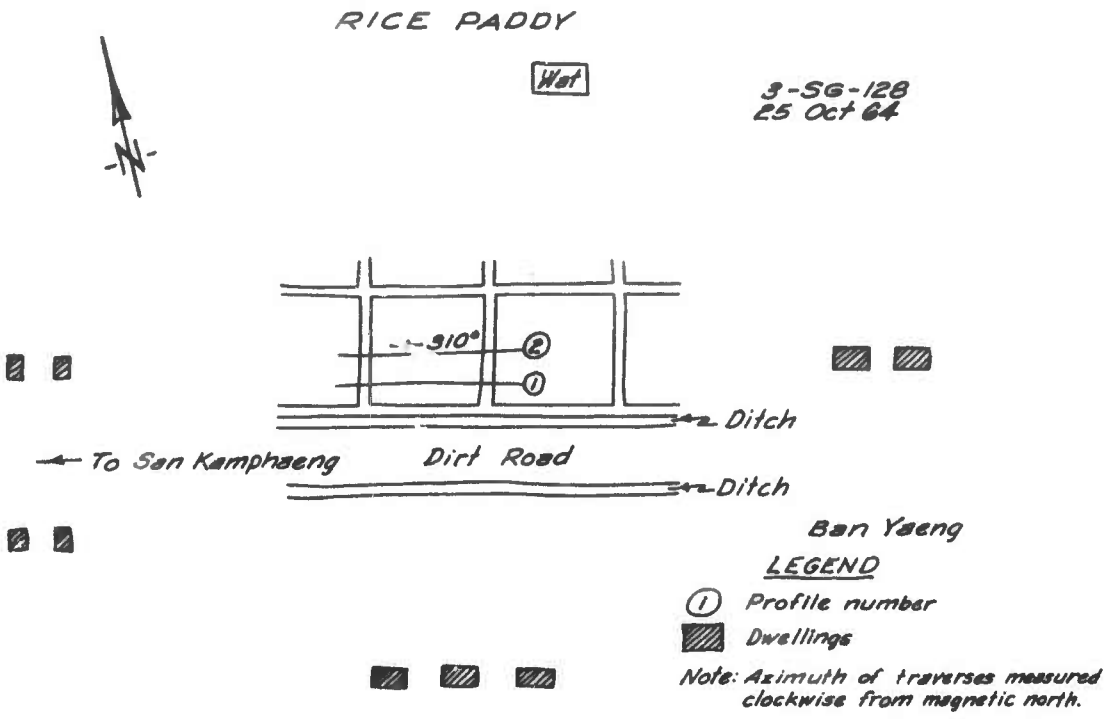


Fig. 5. Surface geometry site map

determined by hand-leveling. As a general rule, for such measurements an accuracy of plus or minus 5 percent of the total vertical distance measured was considered adequate.

Description of Surface Geometry Features

27. Surface geometry data were collected and recorded on the form shown in fig. 6. It was recognized that the variability of features to be found would probably be great, and that to impose rigid rules on measurement procedures at the outset of the program would have almost certainly defeated its purpose. Consequently, the technique outlined here was used as a general guide as to the type of information to be obtained. Where the circumstances dictated that a different approach be used, the method was modified accordingly.

28. A vehicle crossing any surface reacts only to that portion of the topographic configuration with which it comes in contact. Consequently, at each site chosen for study, sufficient profiles were measured to portray

WES FORM NO. 1371
FEBRUARY 1964

SURFACE GEOMETRY DATA FORM

DESCRIPTION: Rice Paddy Bunds SITE NO.: 3-SG-128

LOCATION: 1.9 miles approx. from fork east of San Kampaeng*

MEASURED BY: Piazza, Sarid, Sirvioi DATE: 25 Oct 64

UNIT MEASURE: Feet SHEET: 1 OF 1

TRAVERSE NUMBER	TRAVERSE OFFSET	STATION NUMBER	VERTICAL OFFSET	TRAVERSE NUMBER	TRAVERSE OFFSET	STATION NUMBER	VERTICAL OFFSET
1	0	0.0	5.5	2	10'	0.0	5.5
		3.0	5.5			3.0	5.4
		3.5	4.7			3.5	4.7
		4.5	4.7			4.5	4.8
		5.0	5.7			5.0	5.6
		15.0	5.8			15.0	5.8
		24.0	5.7			35.0	5.8
		38.0	5.8			40.0	5.8
		47.0	5.6			47.5	5.6
		47.5	5.0			47.5+	4.9
		48.5	5.0			49.0	5.0
		49.0	5.7			49.0	5.7
		53.0	5.9			53.0	5.9
		62.0	5.9			62.0	5.9

* Take south fork of road, from site you can see wat at Ban Sai Mun (site Grid Coord 159750 estimated, Sheet 4867 III)

Fig. 6. Completed surface geometry data form

the surface encompassed by the width of a vehicle. Since few ground-contact vehicles exceed 10 ft* (approximately 3 m) in width, this dimension was used as the width of a set of parallel profiles so oriented as to cross linear features (photograph 3) at approximately right angles; the orientation with respect to circular or irregular features was left entirely to the judgment of the sampling team. A minimum of two profiles was prepared in each set. The number and spacing of profiles taken within the set were determined by the degree of complexity of the feature. Sufficient profiles were made so that an adequate model of the surface of the 10-ft-wide path could be reproduced.

29. The measurement procedures were to some extent dependent upon the height and width of the feature. As a general rule, procedure a below was used for those features low enough to permit a horizontal line of sight from a level or transit mounted on a standard tripod to pass over them; since the normal instrument height is about 5 ft (1.5 m), that height constitutes the upper limit. A second consideration was that the width of the feature be less than the length of a 50-ft tape; thus, the feature had to be less than about 15 m wide. Procedure b below was used for all features either more than 1.5 m high or more than 15 m wide.

a. For those features less than 1.5 m high or deep, as the case may be, and less than 15 m wide, a base line was established close to the feature (fig. 7), and the first traverse was established at right angles to the base line. A steel tape with its origin on the base line was stretched along this traverse. A level (an Abney level or a site-marker transit) was set up and leveled near the traverse. The horizontal offsets (station numbers) were read directly from the tape (photograph 4), and the vertical offsets were read from the level rod. Readings were taken at each recognizable break (i.e. obvious change) in slope along the traverse. Additional traverses (fig. 7) were added as required.

b. Surface geometry features more than 1.5 m high or deep, as the case may be, and more than 15 m wide were measured by setting the level on top of the feature, shooting vertical

* Data were recorded in British units (ft and in.) primarily because the available tapes and Philadelphia rods were calibrated in British units. However, all data were converted to metric units in the data reduction phase.

angles for vertical offsets, and reading stadia for the horizontal offsets.

In those cases where it was impractical or impossible to establish the profile along the traverse by the more expedient methods mentioned above, the profile was determined by differential leveling.

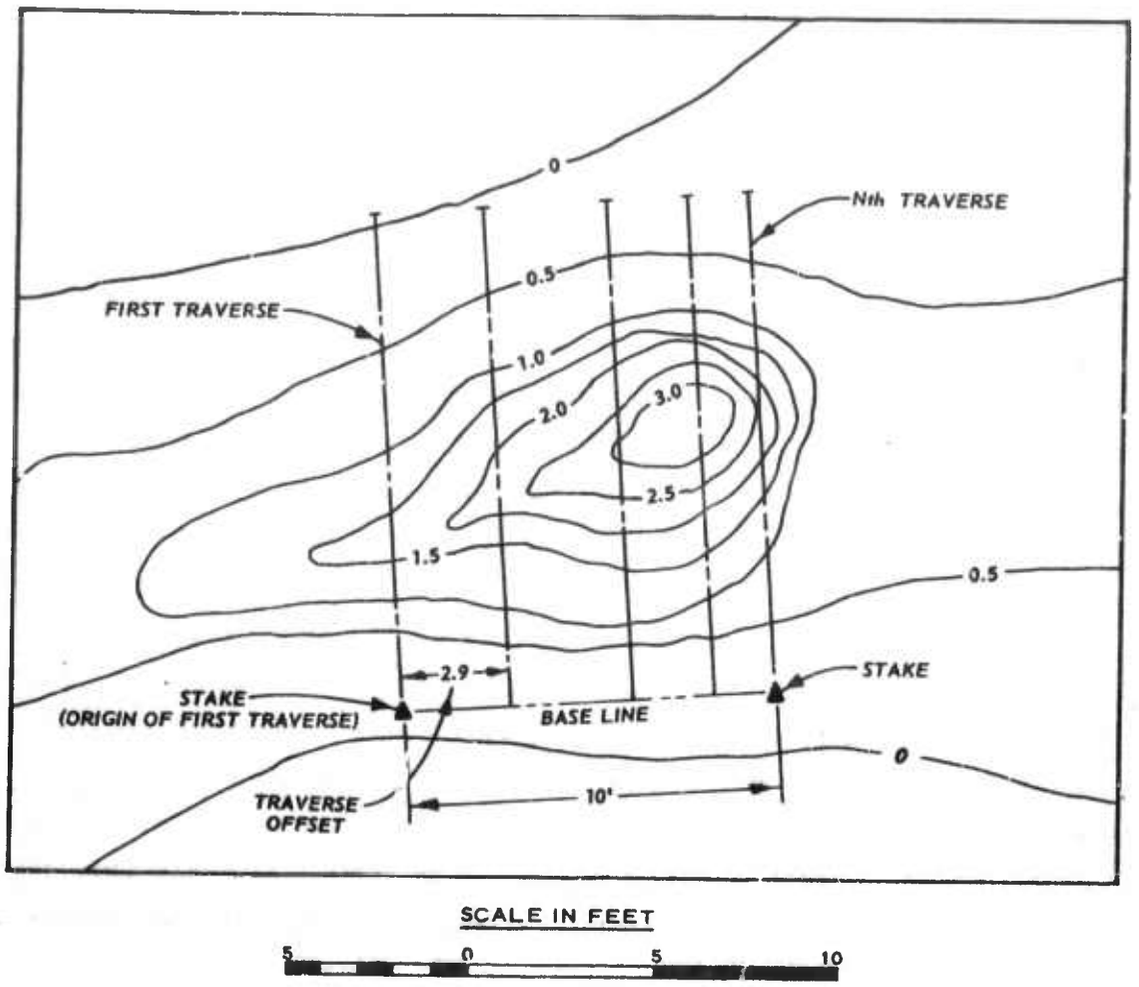


Fig. 7. Layout for measuring surface geometry features

30. Two- and three-man teams collected the surface geometry data using these methods, with substantially greater speed being achieved by three-man teams.

Supplementary Data Sources

31. Significant amounts of surface geometry data were also collected

by the U. S. Army Cold Regions Research and Engineering Laboratory (CRREL) personnel during the latter half of 1964. These data were collected according to much less rigorous accuracy specifications. The procedures and results are presented in Volume VI.[2] In addition, a limited amount of reliable quantitative data was collected by the Preliminary Survey Team (PST) in 1962. These data have been previously reported.[3]

32. Because the cost of film and photographic processing is negligible when compared with the cost of time and manpower required to measure terrain data, photography was utilized to the fullest extent in documenting the occurrence and magnitude of surface features. Extensive ground photographs (such as photograph 5) taken during visits to sample sites and during reconnaissances proved very useful for data analysis and mapping. Photography included stereoscopic coverage at each site, usually from several directions, and single photographs relating the sites to the surrounding terrain. An object of known dimension, such as the range pole centered in the buffalo wallow in photograph 6, was usually included in each picture so that distances and sizes could be estimated with some reliability.

33. Published data applicable to this study include maps, air photos, and written descriptions recorded by travelers. The quality and availability of the first two of these general data types are discussed in detail in Volume I. Evaluations of published data have also been published.[4] These sources provided only very general impressions of surface geometry, and none merit special mention. Data derived from air photos and topographic maps were of considerable value in predicting and extrapolating terrain characteristics within the study areas.

PART III: DATA REDUCTION AND ANALYSES

34. Most of the surface geometry data taken from the six study areas was collected by the U. S. Army Engineer Waterways Experiment Station (WES) field parties expressly for the Mobility Environmental Research Study (MERS) program in the period between July 1964 and June 1965. Field data were also collected by PST and CRREL personnel. A breakdown of the data collected by these three groups and tabulated according to study areas is presented below. Reduced field data for the WES sites are included in Appendix A; data from CRREL sites are presented in Volume VI, and PST data have also beer published.[3] The mapping limits of the study areas are shown in fig. 1.

Study Area		Collection Group and Number of Sites		
Number	Designation	WES Sites	CRREL Sites	PST Sites
1	Nakhon Sawan	60	--	--
2	Lop Buri	167	--	11
3	Chiang Mai	165	124	4
4	Pran Buri	82	--	--
5	Khon Kaen	300	--	2
6	Chanthaburi	112	48	8
	Total	886	172	25*

* Samples were taken by PST during 1962 over all of Thailand. Only those obtained within the limits of the currently defined study areas have been included in this tabulation.

Data Reduction

35. Surface geometry data were brought in from the field on forms such as that shown in fig. 6. The first step in data reduction involved the construction of the recorded profiles at a standard scale, as illustrated in fig. 8. For ease in interpretation of TAA's, the profiles were constructed with identical vertical and horizontal scales. During this process, all scalar values were converted from British to metric units.

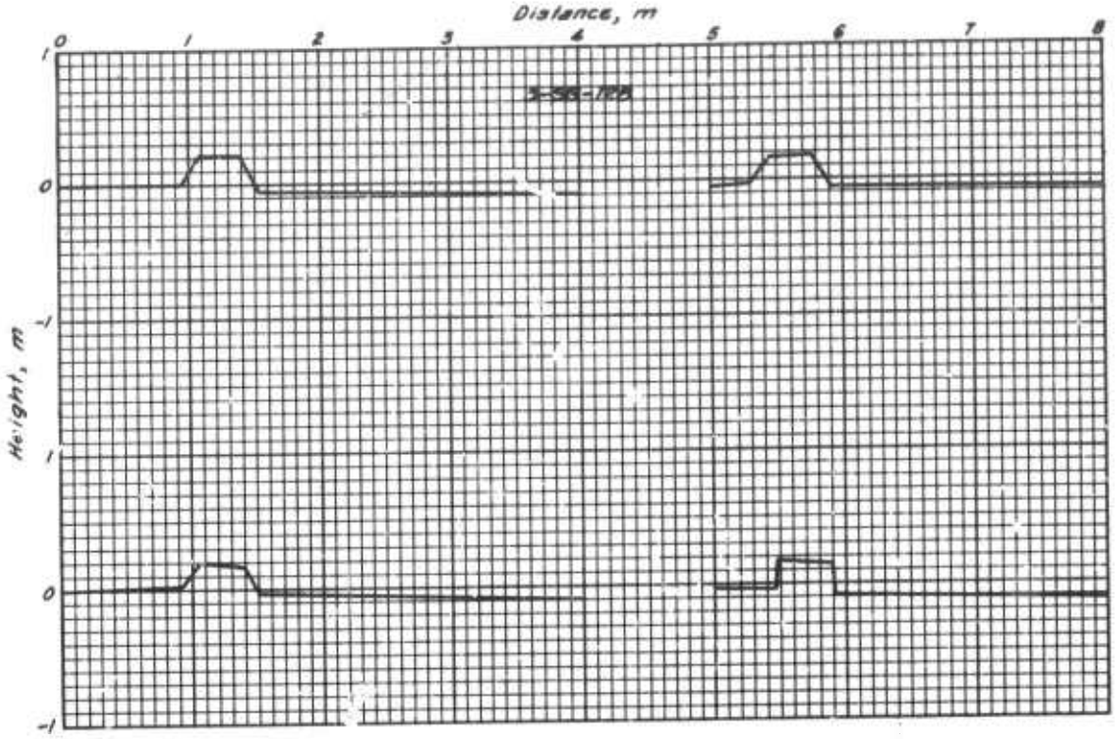


Fig. 8. Profile of surface geometry features at site 3-SG-128

36. Upon completion of the profile diagrams, TAA's and SH's (fig. 3) of each obstacle were measured. These parameters are dependent upon the length and configuration of the bounding surfaces (side slopes) of the obstacles. Since many obstacles had complexly shaped sides, a set of ground rules for identifying the parameters had to be developed. As a result, the obstacles were divided into three major categories, the first consisting of two cases, the second consisting of three cases, and the third consisting of a single case. Category 1 (fig. 9) consists of features bounded by single, uniform slopes and having approach angles of less than 180 deg; category 2 consists of features bounded by multiple slopes (sides exhibiting one or more breaks in slope) and having approach angles of less than 180 deg; and category 3 consists of obstacles having approach angles of more than 180 deg. The methods of dealing with these three categories were slightly different.

37. The TAA is often strongly vehicle-dependent. For example, the

PART III: DATA REDUCTION AND ANALYSES

34. Most of the surface geometry data taken from the six study areas was collected by the U. S. Army Engineer Waterways Experiment Station (WES) field parties expressly for the Mobility Environmental Research Study (MERS) program in the period between July 1964 and June 1965. Field data were also collected by PST and CRREL personnel. A breakdown of the data collected by these three groups and tabulated according to study areas is presented below. Reduced field data for the WES sites are included in Appendix A; data from CRREL sites are presented in Volume VI, and PST data have also been published.[3] The mapping limits of the study areas are shown in fig. 1.

Study Area		Collection Group and Number of Sites		
Number	Designation	WES Sites	CRREL Sites	PST Sites
1	Nakhon Sawan	60	--	--
2	Lop Buri	167	--	11
3	Chiang Mai	165	124	4
4	Pran Buri	82	--	--
5	Khon Kaen	300	--	2
6	Chanthaburi	112	48	8
	Total	886	172	25*

* Samples were taken by PST during 1962 over all of Thailand. Only those obtained within the limits of the currently defined study areas have been included in this tabulation.

Data Reduction

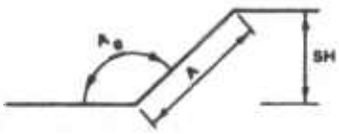
35. Surface geometry data were brought in from the field on forms such as that shown in fig. 6. The first step in data reduction involved the construction of the recorded profiles at a standard scale, as illustrated in fig. 8. For ease in interpretation of TAA's, the profiles were constructed with identical vertical and horizontal scales. During this process, all scalar values were converted from British to metric units.

CATEGORY 1: OBSTACLES WITH SINGLE BOUNDING SLOPES (A) AND APPROACH ANGLES (A_a) LESS THAN 180°



CASE I:

A < 15 CM
A_a = 165-180°
SH = 0-10 CM



CASE II:

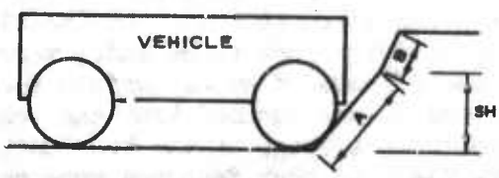
A > 15 CM BUT < 330 CM
A_a > 90° BUT < 180° (MEASURED DIRECTLY WITH PROTRACTOR)
SH = ANY VALUE > 0

CATEGORY 2: OBSTACLES WITH MULTIPLE BOUNDING SLOPES (A & B) AND APPROACH ANGLES (A_a) LESS THAN 180°



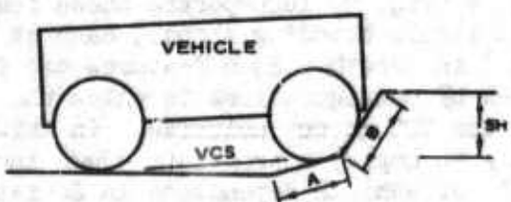
CASE III:

A < 15 CM
B < 15 CM
A + B > 15 CM
SEE FIG. 10 FOR DETERMINATION OF A_a AND SH



CASE IV:

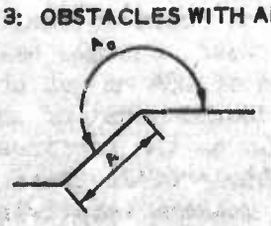
A > 15 CM
B > 15 CM
SEE FIG. 11 FOR DETERMINATION OF A_a AND SH



CASE V:

A > 15 CM
B > 15 CM
SEE FIG. 12 FOR DETERMINATION OF A_a AND SH

CATEGORY 3: OBSTACLES WITH APPROACH ANGLES (A_a) GREATER THAN 180°:



CASE VI:

A = ANY VALUE
A_a > 180° BUT < 270° (MEASURED DIRECTLY WITH PROTRACTOR)
SH = 0

NOTE: SH = STEP HEIGHT, A_a = TERRAIN APPROACH ANGLE.

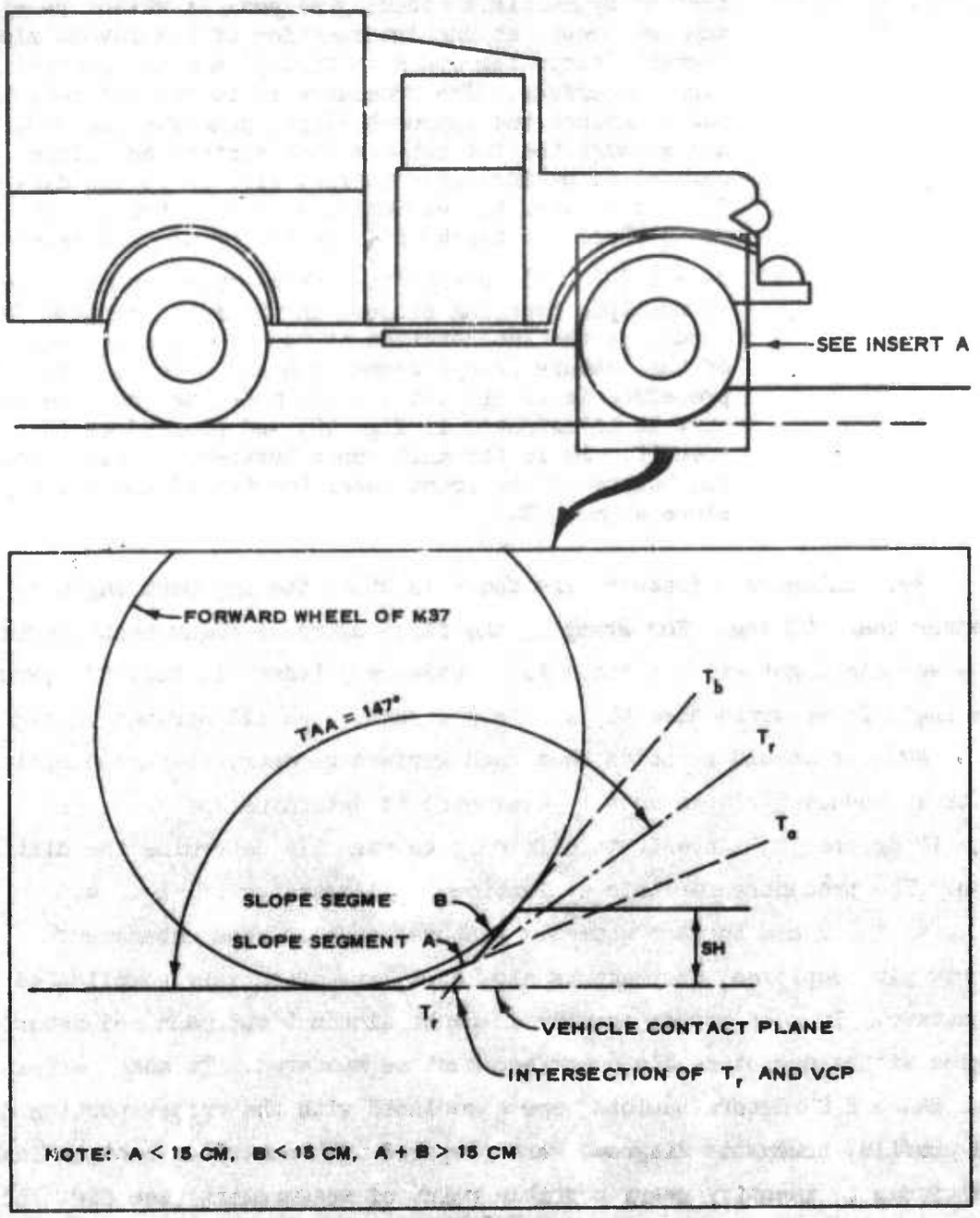
Fig. 9. Categorization of surface geometry features

TAA of the profile illustrated in fig. 13, page 24, is 141 deg for the short-wheelbase vehicle, and 133 deg for the long-wheelbase vehicle. Ideally, each surface geometry feature should be evaluated from this point of view. However, many features were so situated that the topographic surface approximately coincided with the VCS, and it seemed reasonable to measure the approach angles of such features without consideration of the test vehicles. Upon examination, nearly all category 1 (fig. 9) features fell in this group. As a result, the TAA of case II was measured directly off the profile diagrams with a protractor. SH's were measured as illustrated in fig. 3. An exception was made for features in which the bounding slope was less than 15 cm (6 in.) long (fig. 9, case I). Virtually all such features exhibited a SH of less than 10 cm (4 in.), so they were automatically grouped into a single class, as illustrated in fig. 9.

38. The determination of TAA's for category 2 features involved more complex considerations than the determination of TAA's for category 1.

a. Case III features are characterized by two bounding slopes, each less than 15 cm (6 in.) long but having a combined length greater than 15 cm (6 in.). At the time the initial data reduction decisions had to be made, very few data were available on the effects of small-surface features on vehicle dynamics, and it was assumed that the vehicle would sense an approximate average of the two short slopes. Accordingly, the TAA's of such features were measured in accordance with the procedure described in fig. 10.

b. Cases IV and V (fig. 9) incorporate those features characterized by multiple bounding slopes, each of which exceeds 15 cm (6 in.) in length. Such features are frequently characterized by configurations in which the topographic surface and the VCS do not coincide. In this context, it was necessary to employ a procedure that incorporates the principle of vehicle dependence in deriving the TAA. Ideally, each feature should be measured against the wheelbase characteristics of each of the test vehicles, and each set of values thus derived should be used as the basis of factor maps. However, time and economic constraints prohibited such procedures. Instead, one medium-sized vehicle, the M37, with a wheelbase of 284 cm was chosen as a convenient compromise. A cardboard model of the M37 was constructed at the same scale as the profiles (1 in. = 1 m), and moved along the profile until the front wheel contacted the slope segment comprising the terrain approach slope. Two cases are possible.



INSERT A

T_b = EXTENSION OF SLOPE SEGMENT B

T_a = EXTENSION OF SLOPE SEGMENT A

T_r = BISECTOR OF ACUTE ANGLE FORMED BY T_a AND T_b

TAA IS FORMED BY THE EXTENSION OF T_r AND THE VCP

Fig. 10. Measurement of TAA and SH of case III surface geometry features

(1) Case IV (fig. 9) incorporates those features characterized by multiple bounding slopes, in which the minimum TAA occurs at the intersection of the lowest slope segment (slope segment A in fig. 9) and the general terrain surface. The procedure is to fit the vehicle model against the approach slope, generate the VCS, and measure the TAA between that surface and slope segment A, as indicated in fig. 11. SH is the difference between the elevation of the bottom of the front wheel (or track) and the top of slope segment A.

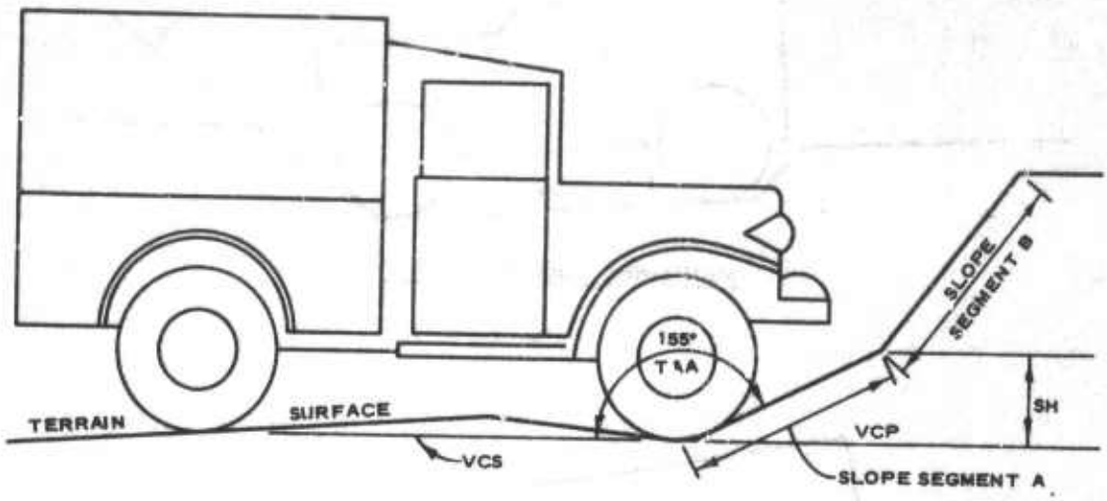
(2) Case V (fig. 9) incorporates those features characterized by multiple bounding slopes, in which the minimum TAA occurs at the intersection of two of the slope segments of the feature (slope segments A and B in fig. 9). The procedure is to fit the vehicle model against the feature as illustrated in fig. 12, and proceed as in case IV. SH is the difference between the elevation of the bottom of the front wheel (or track) and the top of slope segment B.

39. Category 3 features are those in which the approach angle is greater than 180 deg. For example, the first approach angle encountered by a vehicle negotiating a ditch is a category 3 (case VI, fig. 9) feature. The angle is measured directly with a protractor, as illustrated in fig. 9.

40. It should be noted that each surface geometry feature exhibiting multiple bounding slopes must be evaluated to determine whether it is case IV or case V, since it is difficult to visually determine the distinction. The procedure for this evaluation is illustrated in fig. 14.

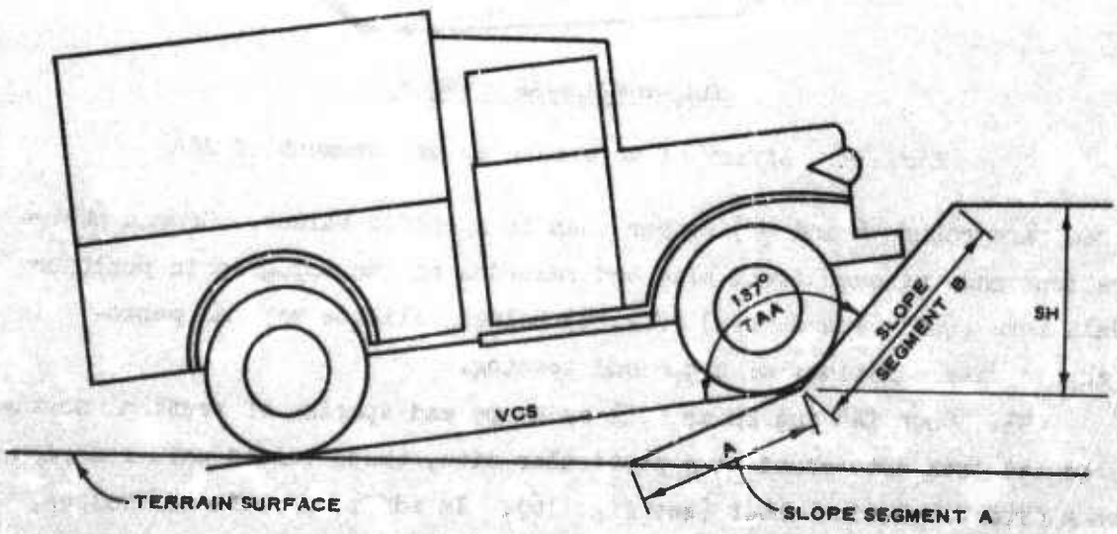
41. Certain surface geometry features such as road embankments, borrow pit complexes, drainage canals, etc., are often very complicated in nature. In some cases, as many as eight distinct approach and departure angles with associated SH's occur and must be measured. To make certain that TAA and SH determinations were associated with the proper portion of the profile, schematic diagrams were prepared with numerical designations positioned to identify every possible point of measurement (see fig. 15).

42. Determination of slope and spacing of vertical obstacles requires measurements over extended areas that encompass much more length and area than that covered by the profiles. Data for these parameters were taken directly from the topographic maps and/or air photos. For convenience, slope and spacing were measured in terms of class ranges



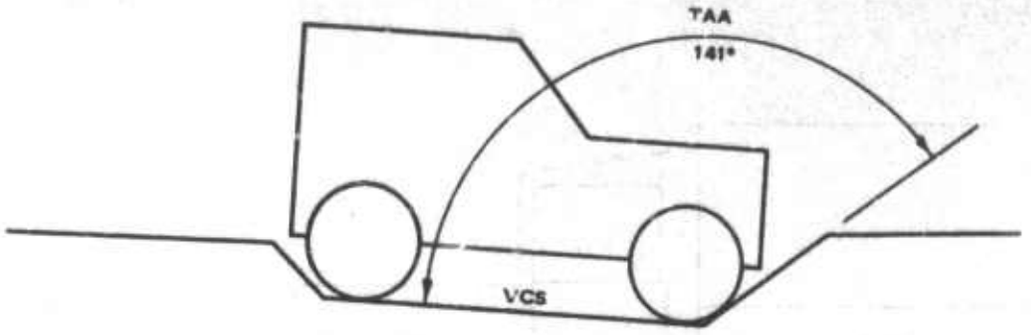
NOTE: A > 15 CM, B > 15 CM.

Fig. 11. Determination of TAA and SH for case IV surface geometry features

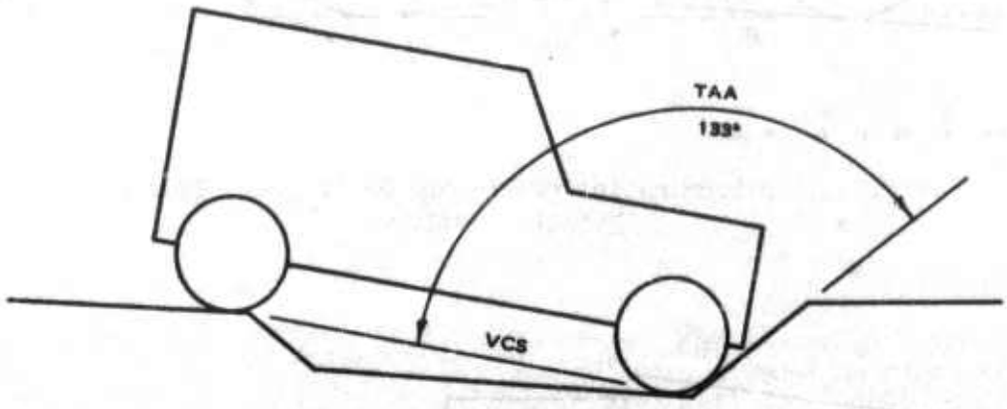


NOTE: A > 15 CM, B > 15 CM

Fig. 12. Determination of TAA and SH for case V surface geometry features



SHORT-WHEELBASE VEHICLE

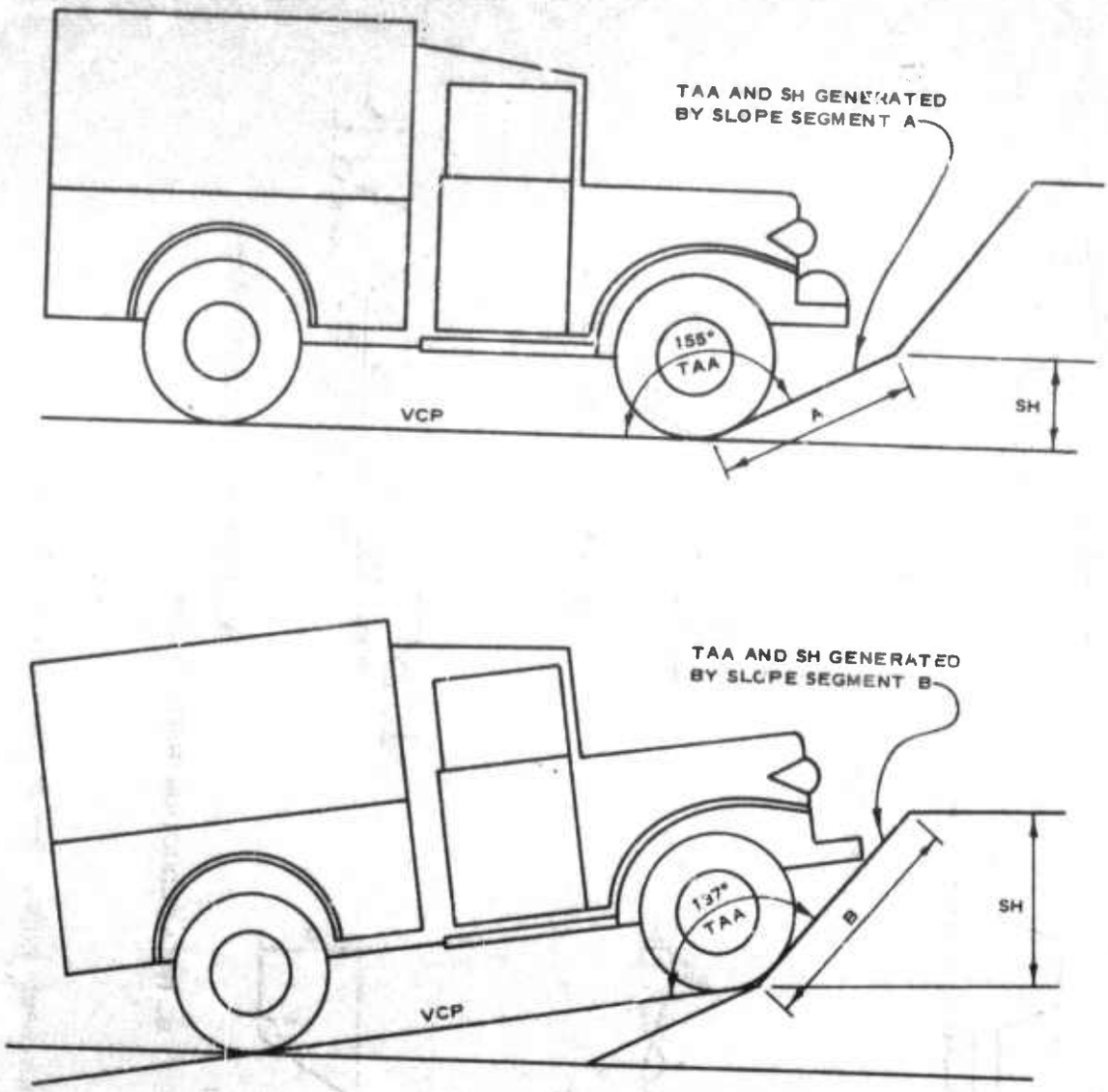


LONG-WHEELBASE VEHICLE

Fig. 13. Effect of wheelbase on measurement of TAA

(see paragraphs 46 and 47) rather than in specific values. Ground observations made at each field site and recorded on the topographic position data form (surface geometry) (fig. 4) helped validate map and photographic determinations of slope and spacing.

43. Once TAA and SH as well as slope and spacing of vertical obstacles had been determined at a particular site, these values were recorded on a data tabulation sheet (see fig. 16). In addition to factor values, other data recorded on this sheet were study area and number, site number, profile number, bund number (if applicable), map coordinates in both the geographical and military grid systems, map reference, and type of feature.

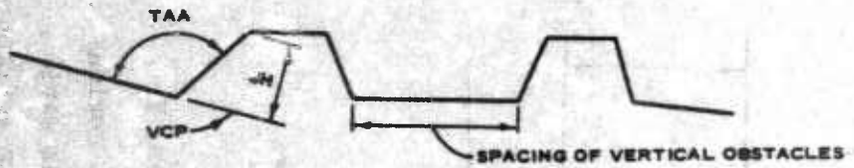


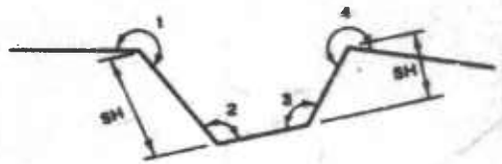
PROBLEM: DETERMINE THE POINT ON A VERTICAL OBSTACLE AT WHICH THE TAA IS SMALLEST

SOLUTION: MEASURE THE TAA'S GENERATED BY EACH SLOPE SEGMENT AND ITS CORRESPONDING VCP AS SHOWN ABOVE. THE TAA GENERATED BY SLOPE SEGMENT A IS 155 DEG, AND THAT GENERATED BY SLOPE SEGMENT B IS 137 DEG. THE ILLUSTRATED VERTICAL OBSTACLE IS THEREFORE CASE V (FIG. 12).

Fig. 14. Procedure for differentiating between cases IV and V

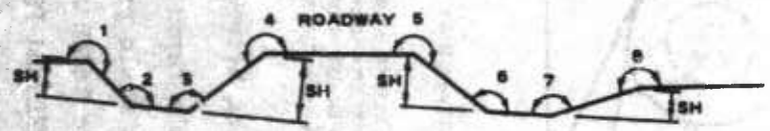
44. Measurements of the TAA's and SH's represent the most copious store of factor data accumulated during the field program. It is estimated that some 10,000 TAA measurements were taken at the 886 WES sites in the six primary study areas; the 197 CRREL and PST sites in the same





DRAINAGE DITCH (DD)

A. DEFINITIONS



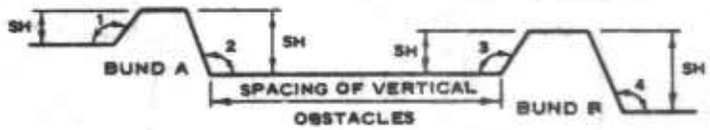
ROADSIDE BORROW PITS (BP)



SINGLE RICEFIELD BUNDS (RB-S)



ROAD EMBANKMENT (RE)



MULTIPLE RICEFIELD BUNDS (RB-M)

B. DATA REDUCTION INSTRUCTIONS

NOTE: NUMBERS INDICATE POINTS WHERE TAA'S SHOULD BE MEASURED.

Fig. 15. Measurement system for surface geometry features

SURFACE GEOMETY

Area Name and Number *Khon Kaen (Study area No.2)*

Site No.	Profile No.	Bund No.	Grid Coord. Geol. Coord.	Quad Sheet	Approach Angle and Step Ht of Critical Approach Angles 1	2	3	4	5	6	7	Deg / In 8	Slope	Spacing of Vertical Obstacles	Type of Feature
300	1	A		5560 II	115° / 27"	112° / 27"									
					2* / 4	2 / 4									
		B			195° / 17"	194° / 17"									
					3 / 3	3 / 3									
		C			118° / 12"	120° / 18"									
					2 / 2	2 / 3									
300	2	A		5560 II	128° / 16"	124° / 27"									
					3 / 3	2 / 4									
		B			198° / 17"	135° / 16"									
					3 / 3	3 / 3									
		C			116° / 12"	126° / 16"									
					2 / 3	3 / 3									

* Map class for measured values in columns 1 and 2.

Fig. 16. Completed surface geometry data tabulation sheet

areas yielded approximately 1000 additional measurements. Of these, the vast majority were taken in rice-field areas. The remainder were fairly evenly divided among road embankments, termite mounds, borrow pits, sinkholes, and irrigation ditches. In addition, a relatively small number of measurements were taken on almost unique configurations in forested areas and on steep hills or mountainsides.

Selection of Mapping Classes

45. Preliminary analysis of the Thailand site data indicated that the reduced data were sufficiently detailed to permit categorization in terms pertinent to terrain-vehicle relations. Therefore, the data for each factor were further examined to determine if natural groupings of values occurred. If such groupings were present, it was hoped that they would be compatible with critical structural characteristics of the proposed test vehicles. Reduced data for each geometry factor were analyzed separately; the results are discussed in the following paragraphs.

Slope

46. The surface geometry sites were selected primarily for variations in obstacle characteristics, and the size of the sites *per se* was ordinarily not sufficient for meaningful determinations of topographic slope. However, field observations of the regional slope at each site were made and recorded on the topographic position data form (fig. 4). Despite this, the observations were too limited in number to permit development of a classification system. A study by Vanderbilt University,[5] under contract to WES, established that slopes have a natural tendency to group in preferred categories. The topographic slope values observed in the field in Thailand were compared with the tables of values compiled by Vanderbilt University, and the two aggregations were found to be essentially compatible. The slope class ranges derived from the Vanderbilt study were therefore adopted for this study as follows:

Unit	Slope Class Ranges, deg
1	0-1.5
2	>1.5-4.5

(Continued)

Unit	Slope Class Ranges, deg
3	>4.5-9
4	>9-18
5	>18-30
6	>30-45
7	>45

These slope classes can be recognized with acceptable reliability in existing maps and air photos. Moreover, they are acceptable from the point of view of mobility analysis.

Spacing of vertical obstacles

47. Initial examination of the reduced data on this factor revealed no definite natural grouping. Accordingly, class interval selections could be made only on the basis of the minimum distance that could be reliably measured using the available air photos and on the speed characteristics of the test vehicles. The best air photos, at a scale of approximately 1:15,000, permitted features about 2 m (7 ft) apart to be distinguished, and this value was therefore accepted as the upper limit of the smallest spacing class. Comparison of the speed characteristics of the test vehicles yielded no obviously useful divisions. As a result, the class intervals finally chosen were established as an approximate logarithmic series as follows:

Unit	Spacing Values	
	m	ft
1	<2	<7
2	2-4	7-12
3	>4-15	>12-50
4	>15-46	>50-150
5	>46	>150

Terrain approach angle

48. Approximately 11,000 TAA measurements were analyzed to see if there was any propensity toward grouping into distinctive ranges of values.

A histogram was prepared with the TAA's expressed in 1-deg increments as the abscissa and the frequency of occurrence as the ordinate (see fig. 17).

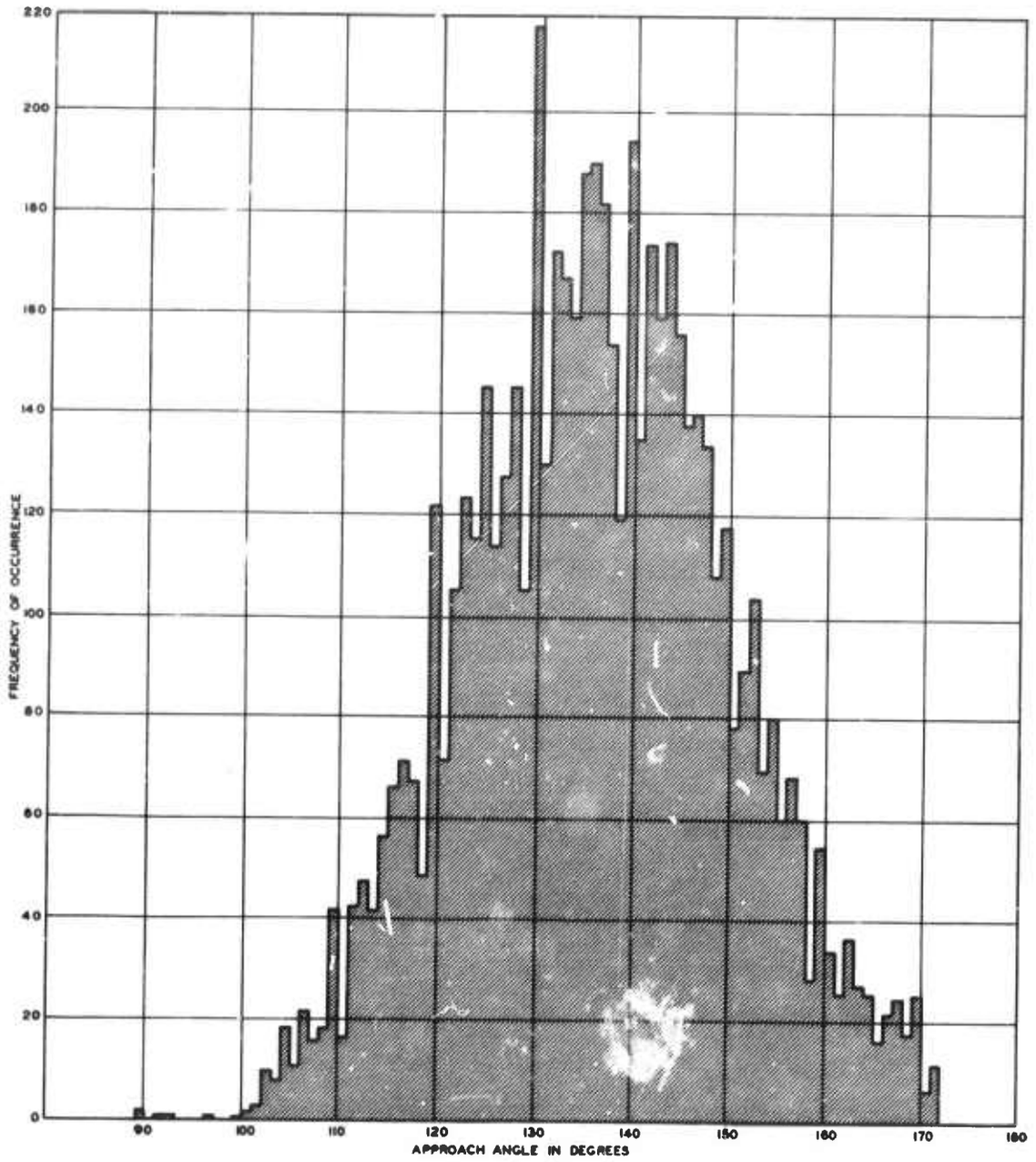


Fig. 17. Distribution of TAA's in the Thailand primary study areas

This histogram showed the distribution to be approximately normal with the mean at about 132 ($\bar{X}$ = 132.1, standard deviation = 14.2). One standard deviation includes all values within the 125- to 150-deg range, a relation

that was used to advantage in the mapping program. This fact probably reflects the predominance of rice-field measurements in the samples.

49. Ideally, the selection of class ranges for TAA's should be based either on natural divisions of the slope values as discussed above, or on the effects that specific ranges of values have on vehicle performance. However, since no natural divisions could be identified, the dynamic responses of the test vehicles to TAA's were examined. At the time that the class intervals had to be fixed, the vehicle test program had yielded a modest body of data that suggested that the TAA of small vertical obstacles was not very significant. However, the data were meager and subject to question. As a result, the factor was mapped on the assumption that it would subsequently be found to exert a significant influence on performance, even though such an influence could not be demonstrated at that time.

50. Because neither natural nor vehicular performance criteria could be used, the ability to detect variations, either directly or through interpretive processes, from air photos was used as the criterion for establishing class intervals. The class ranges that were finally chosen for mapping were:

Units	TAA Class Ranges, deg
1	0-100
2	>100-125
3	>125-150
4	>150-165
5	>165-180
6	>180-200
7	>200-210
8	>210-220
9	>220

Obstacle step height

51. Histograms were also prepared of field measurements of the SH factor (fig. 18). Unlike the case of the TAA, SH's are strongly skewed, with the mode at about 23 cm and at least a suggestion of a bimodal distribution with a very weak secondary mode at about 115 cm. Approximately

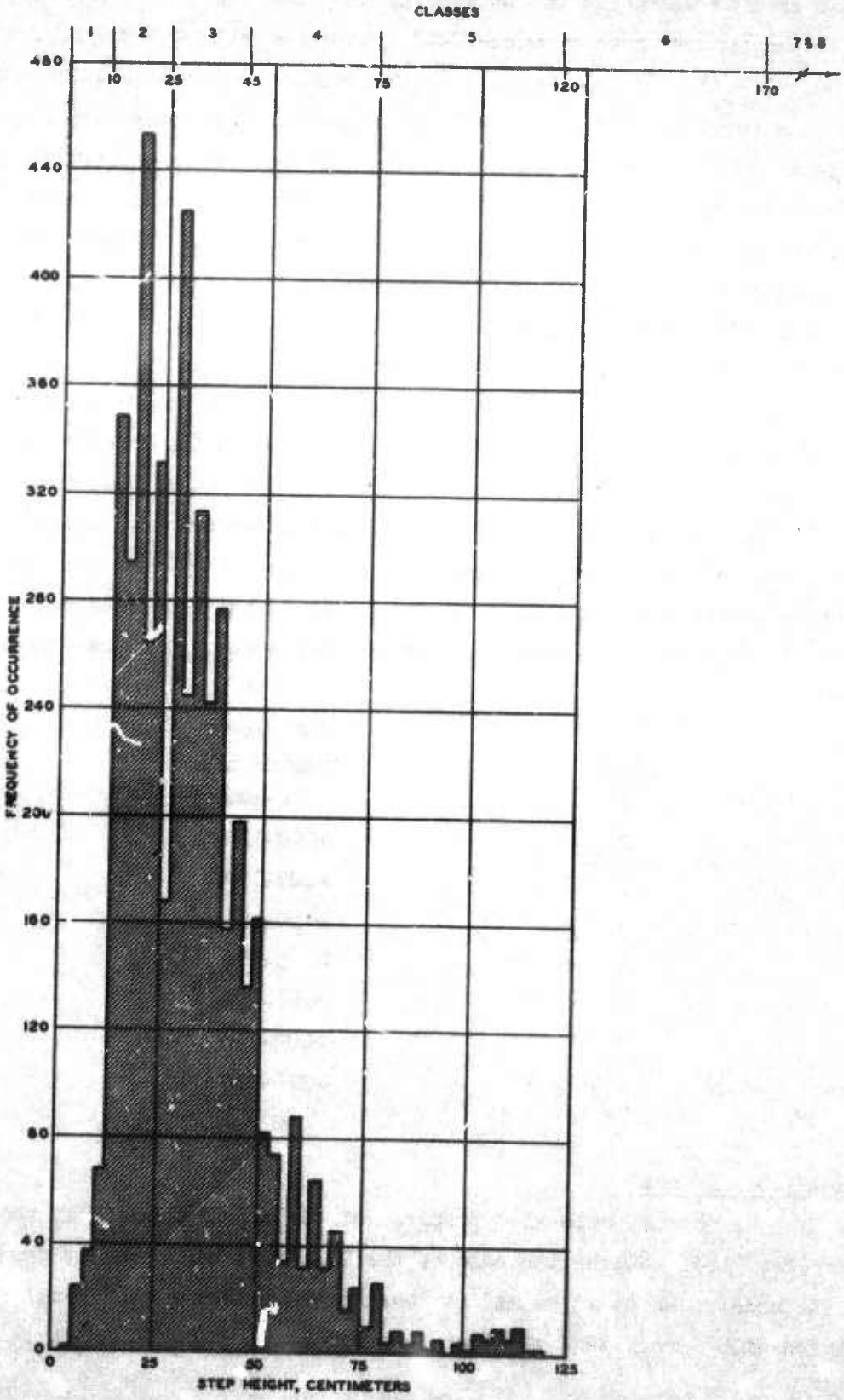


Fig. 18. Distribution of SH's in the Thailand primary study areas

85 percent of the values occur between 10 cm (4 in.) and 50 cm (20 in.). There are, however, no obvious discontinuities in the distribution that could be used for fixing class limits. It should be noted that the bulk of the measurements responsible for the distribution peak around 25 cm was derived from rice-field bunds. SH's greater than about 75 cm (30 in.) are almost entirely derived from nonrice-field features, such as borrow pits, ditches, termite mounds, etc. As a result, the class interval at 75 cm provides a useful separation. Examination of the modest amount of test data elucidating the effects of step height on vehicle performance, which was available at the time the class intervals had to be fixed, suggested that SH's of less than 10 cm (4 in.) could probably be largely ignored, since vertical obstacles of that size did not seriously inconvenience the test vehicles. Accordingly, 10 cm (4 in.) was selected as the upper limit of the first SH class. The test data also suggested that SH's greater than about 45 cm (18 in.) had to be surmounted at creep speed, especially when the TAA's were small. Accordingly, this value was chosen as a class limit. Since the distribution diagram (fig. 18) showed no discontinuities, all other subdivisions were established arbitrarily at positions that gave an approximate exponential series as follows:

Units	SH Class Ranges	
	cm	in.
1	0-10	0-4
2	>10-25	>4-10
3	>25-45	>10-18
4	>45-75	>18-30
5	>75-120	>30-45
6	>120-170	>45-68
7	>170-210	>68-84
8	>210	>84

Data Storage

52. For speed and convenience in the manipulation of site data, key-sort punch cards (fig. 19) were employed. The descriptive and numerical

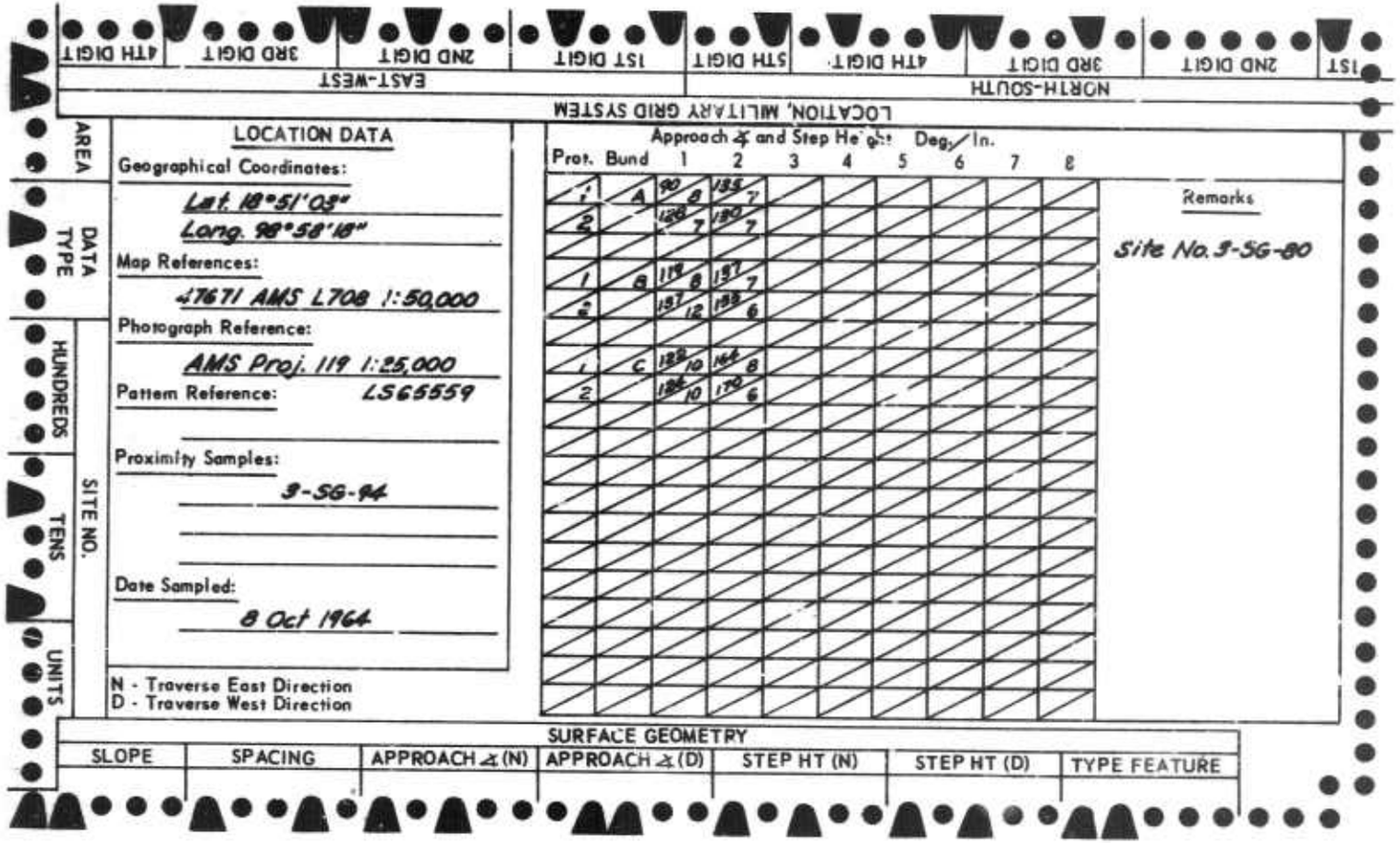


Fig. 19. Arrangement of surface geometry site data on key-sort punch card

categories discussed in the previous paragraphs were printed on each card, and data were manually transferred from site tabulation sheets (fig. 16) to the cards. In addition, the appropriate class codes for all four factors were punched in the edges along the four margins of the cards. Thus, data are retrievable by study area, data type, site number, location, and class codes for each of four surface geometry factors. Immediate access to site data in these terms permits efficient application to various mapping problems, since it facilitates the rapid stratification of the data on the basis of any desired factor or other item of information. It materially simplifies the task of photo interpretation, since it permits detailed site data to be found and examined without undue loss of time, and permits data from two or more sites to be found and compared without extensive search routines.

PART IV: INTERPRETATION AND MAPPING TECHNIQUES

53. Although an enormous quantity of data was collected within the six primary study areas in Thailand, vast areas still remain unsampled. To permit quantitative determinations in unsampled portions of the study areas (and ultimately all of Thailand), it was essential that photo-interpretative devices be developed that would permit reasonably accurate predictions of terrain conditions without ground measurements.

54. Although considerable progress has been made in the field of photo interpretation since the end of World War II, existing techniques were not designed to obtain the type of data and the degree of detail required by the MERS program. In addition, relatively little work has been done in tropical areas in assessing the effect of indigenous cultural practices. For example, in Thailand the diversion of practically all rainfall for irrigation has obscured most of the drainage patterns that are normally exploited as photo-interpretation keys.

55. Unfortunately, the available Thailand photography revealed considerable variation in both quality and scale. Recent 1:15,000-scale photographs taken for Project MERS were available for the Lop Buri and Pran Buri study areas. Available photographs of the Nakhon Sawan, Chiang Mai, Khon Kaen, and Chanthaburi study areas had been taken during 1953-1954 at scales varying from 1:20,000 to 1:50,000. The degree and accuracy of resolution obtainable from these two coverages were significantly different, and the recent 1:15,000-scale air photos proved unquestionably superior in every way.

56. The discussion in this report dealing with interpretation and mapping techniques is directed toward: first, the semiquantitative description of air-photo patterns; second, the development of photo-interpretative devices to assist in and guide the recognition of terrain conditions in unsampled areas; and third, the reliable extrapolation of these recognized terrain conditions throughout a homogeneous area.

Air-Photo Pattern Description

57. One of the major problems in interpreting air photos covering

large areas is that of ensuring internal consistency. Nearly every photo interpreter has worked through a series of photos, meticulously outlining a particular pattern, and gone back to the first photo examined only to discover that the boundaries on the first and last photos do not agree. This means, of course, that the criteria used to identify the pattern were not sufficiently rigorous or held clearly enough in mind during the time interval between examination of the first and last photos. Serious errors in interpretation occur because of this phenomenon, which might be called "recognition drift," especially if the areas of presumed similarity were noncontiguous.

58. Many photo interpreters attempt to alleviate the problem of changing recognition criteria, or recognition drift, by selecting a sample photo pattern and referring to it frequently to reestablish the pattern in their minds. Another and ultimately more useful procedure would be to describe the pattern in sufficient detail and with sufficient accuracy that a similar pattern could be positively identified in another locality, or after a long lapse of time. This procedure would consist of putting both patterns through the objective (and, hopefully, quantitative) description process and matching the descriptive terms. Identity of terms would imply identity of pattern.

59. The necessity of interpreting air photos of widely separated areas in Thailand suggested that the problem of recognition drift would be relatively severe. Accordingly, in an attempt to reduce the problem as much as possible, a description of photo patterns was developed and applied. It was hoped that reasonably-rigorous comparisons of patterns both within and among the study areas would result in greater overall accuracy and increased consistency between the study areas. The description and classification system that evolved is described briefly in paragraphs 60-76. Each pattern is described in terms of 14 inherent characteristics involving its tonal, textural, and geometrical characteristics. Classes for each characteristic are given in table 1.

Terms relating to grain

60. A grain is the smallest discrete entity that can be detected in an air photo. It is characterized by an essentially uniform tone. In

effect, the grains are the "atoms" of which the entire picture is composed. Since not all grains are of equivalent tone, size, and shape, it is necessary to include descriptive terms.

61. Grain tone. The general tone of the grain is classified into five categories as follows:

a. White

b. Light gray

c. Medium gray

d. Dark gray

e. Black

62. Grain size. Grain size is determined by measuring the short dimension of the grain, employing the following classes:

a. Very fine. Individual grains are defined essentially by the graininess of the emulsion being used. Normally this is well below the resolution threshold of the human eye, and the area therefore looks uniform in tone.

b. Fine. Distance across the grain is less than 0.3 mm (0.01 in.).

c. Intermediate. Individual grain is between 0.3 mm (0.01 in.) and 0.5 mm (0.02 in.) across.

d. Coarse. Distance across the individual grain is between 0.5 mm (0.02 in.) and 1.0 mm (0.04 in.). If the smallest discrete area is greater than 1.0 mm (0.04 in.) across, it is considered to be a component, and its grain size is classified as very fine.

63. Grain spacing. In an area in which the grains are discernible, one of two situations must exist: first, a distinct grain may be superimposed on a uniform field of different tone; or second, two or more grains of different tones and sizes are present. Accordingly, the distance between grains must be specified. Thus, a grain spacing is the average distance from the center of a grain of specific type to the center of the nearest grain of the same type. The following classes are used:

a. Small. Distance between centers of grains is less than 0.5 mm (0.02 in.).

b. Medium. Distance between centers of grains is 0.5 mm (0.02 in.) to 1.0 mm (0.04 in.).

c. Large. Distance between centers of grains is greater than 1.0 mm (0.04 in.).

d. Indeterminate. This class is used only in those instances in which only a single grain of a specific type occurs in the area of examination.

64. Grain proportion. Not all grains are of the same shape, and variations of shape produce components of markedly different appearances. Three classes dependent upon the ratio of length to width are distinguished:

a. Linear. Length/width ratio is more than 10.

b. Elongate. Length/width ratio is 2 to 10.

c. Equidimensional. Length/width ratio is less than 2.

65. Grain shape. Grains may vary widely in shape as well as proportion. Three qualitative classes are employed:

a. Straight. A line drawn through the center of the grain from end to end is essentially not curved, or only very slightly curved. The lines exhibited by newly plowed fields are commonly of this type. Grains that are equidimensional are always classed as straight.

b. Arcuate. A line drawn through the center of the grain from end to end is obviously curved.

c. Sinuous. A line drawn through the center from end to end curves in more than one sense (it swings from side to side).

66. Grain margin. Marked differences in appearance result from variations in the sharpness of the margins or edges of grains. Accordingly, three qualitative classes are used to describe these variations:

a. Sharp. Grain terminates at a distinct, sharply drawn line or edge.

b. Blurred. Grain has a core of relatively uniform tone, which then grades in a relatively short distance into the tone or tones surrounding it.

c. Indistinct. Grain has no core of relatively uniform tone, so that gradations exist throughout the extent of the grain, and a precise margin is difficult or impossible to establish.

Terms relating to components

67. The most elemental unit into which grains can be organized is the component. Thus, a component is (with the exception noted in subparagraph 62d) a specific combination of grain and a uniform field, or of two or more kinds of grains arranged in a specific planimetric relation.

The area throughout which this specific arrangement is exhibited is a component. It is the "molecule" of which the picture is composed. Since not all components are of equal sizes and shapes, it is necessary to use descriptive terms for these attributes.

68. Component size. The component size is the length of the short dimension of the component. To define component size, the following classes are used:

a. Fine. Distance across component is less than 0.5 mm (0.02 in.).

b. Medium. Distance across component is between 0.5 mm (0.02 in.) and 1.5 mm (0.06 in.).

c. Coarse. Distance across component is greater than 1.5 mm (0.06 in.).

69. Component spacing. Because any area in an air photo is normally characterized by the two fundamental conditions described in paragraph 67, it is necessary to describe the spacing, shape, and planimetric arrangement of the components. Accordingly, the component spacing is the average minimum distance between the approximate geometric centers of components of similar type. The classes are:

a. Small. Average distance between centers of neighboring components of similar type is less than 1.0 mm (0.04 in.).

b. Moderate. Average distance between centers is between 1.0 mm (0.04 in.) and 2.0 mm (0.08 in.).

c. Large. Average distance between centers is greater than 2.0 mm (0.08 in.).

70. Component shape. The shape of the component is described in terms of the following relatively qualitative classes:

a. Square. Component is characterized by four approximately right angles, and length/width ratio is less than 1.5.

b. Rectangular. Component is characterized by four approximately right angles, and length/width ratio is between 1.5 and 6.

c. Circular. No obvious angles in the circumscribed perimeter, and length/width ratio is less than 1.5.

d. Oval. No obvious angles in the circumscribed perimeter, and length/width ratio is between 1.5 and 6.

e. Linear. Length/width ratio is greater than 6.

f. Irregular. Shapes are indeterminate or nonuniform.

71. Unit cell. The unit cell defines certain attributes of the planimetric arrangements of components of similar type with respect to each other. It is an imaginary polygon, the corners of which are fixed by the approximate geometric centers of four similar components. The unit cell is described in the following classes:

a. Rectangular. The four angles described by imaginary lines connecting the four components are approximately right angles.

b. Trapezoidal. Two opposite angles of the polygon are obviously acute, and the other two are obviously obtuse.

c. Irregular. The four angles are randomly arranged, excluding the two classes described above.

72. Component orientation. The component orientation is intended to describe the geometric arrangement of adjacent components of similar type with respect to each other. The orientation of a single component is established by constructing an imaginary line through the long dimension of the component from end to end. It is the arrangement of these imaginary lines with respect to each other that is described as component orientation. The following qualitative classes are recognized:

a. Parallel. All adjacent or nearby components of similar type are approximately parallel.

b. Concentric. All adjacent or nearby components of similar type are curved in the same sense and to approximately the same degree.

c. Reticulate. All adjacent or nearby components of similar type are arranged in a netlike fashion, not necessarily at right angles to each other.

d. Random. There is no apparent preferred orientation of nearby or adjacent components of similar type. All components that are approximately circular, or irregular but approximately equidimensional polygons, or of indeterminate shape are automatically classed as random.

73. Component symmetry. A number of components consist primarily of two or more parallel grains. These components are the photo images of such highly significant surface geometry features as rice-field dikes, ditches, road embankments, and canals. A major consideration is to determine whether they are positive or negative features. Since the position of the shadow with respect to the sun position conveys such information, it is important

to record this information. Three categories are used:

a. Symmetric. There is n >vious shadow.

b. Negative asymmetry. Shadow (normally a dark streak) is on the same side of the component as the sun.

c. Positive asymmetry. Shadow is on the side opposite the sun.

74. Component curvature. Many components, especially the strongly linear ones such as those generated by road grades and canals or ditches, are curved to a greater or lesser degree. The degree of curvature is often an important recognition feature. Five classes are used to define this attribute:

a. Straight. Long dimension of the individual component curves less than 5 deg per cm. The number of senses of curvature per centimeter is not considered.

b. Simply curved. Long dimension of the component curves between 5 and 30 deg per cm, but in one sense only in any one centimeter.

c. Simply bent. Long dimension of the component curves between 30 and 80 deg per cm, but in one sense only in any one centimeter.

d. Multiply curved. Long dimension of the component curves in two or more senses per centimeter, one segment of which curves between 5 and 30 deg.

e. Multiply bent. Long dimension of the component curves in two or more senses per centimeter, one segment of which curves between 30 and 80 deg. In the event the component bends more than 80 deg in any one centimeter, it is arbitrarily considered to be two examples of the same component with the point of maximum curvature representing the point of discontinuity.

Terms relating to pattern

75. A pattern is the largest unit that exhibits approximate homogeneity of tone, texture, and geometric characteristics that can be delineated in an air photo. It is composed of a specific aggregation of two or more components set in a specific planimetric arrangement with respect to each other. That is, it is the largest entity in an air photo that exhibits a repetition of internal, structural "building blocks." Patterns are the "compounds" out of which the picture as a whole is constructed. The pattern is classified according to the areal shape of the pattern as a

whole and according to the planimetric attributes of the unit cells of which it is composed.

76. Patterns are classified into four qualitative types on the basis of overall shape:

a. Linear. Pattern extends conspicuously only in one dimension; that is, it is a long thin strip.

b. Areal. Pattern extends conspicuously in two dimensions, but overall shape is relatively compact.

c. Interrupted. Overall shape of the pattern is amoeboid, or it encloses enclaves of other patterns.

d. Amorphous. Pattern extends in two dimensions, but boundary separating it from other patterns is indistinct or gradational.

Descriptive process

77. The descriptive process is not, at the present level of development, entirely objective or mechanical. Certain situations arise in which judgments must be made. Description always starts with the grains of which the chosen area is composed. In general, one of four situations will obtain:

a. No grains can be detected with the naked eye. In this case the area encompassed by the uniform tone (see subparagraph 62d) will automatically be classified as a component.

b. The area will be characterized by a grain type on what appears to be a relatively uniform groundmass. In this case the grain type (subsequently identified as G-1) is described in accordance with the definitions given in paragraphs 60 through 66, and the tone of the groundmass is recorded.

c. The area will be characterized by two or more grain types on what appears to be a relatively uniform groundmass. In this case, each grain type is described independently according to the definitions given in paragraphs 60 through 66, and the tone of the groundmass is recorded. The most prominent grain type is defined as G-1, and the subordinate types are numbered sequentially in order of prominence.

d. The area will be characterized by two or more grain types without any obvious groundmass. That is, the grains comprise the entire area. In this case, each grain type is described independently, according to the definition given in paragraphs 60 through 66. The most prominent grain type is designated G-1, and the subordinate types are numbered sequentially in order of prominence.

78. The following example will illustrate both the general procedures and a few of the areas in which judgment is still called upon to resolve a difficulty. The example chosen for description is illustrated in fig. 20. The form on which the descriptions are recorded is presented in fig. 21.



Fig. 20. Air photo (1:15,000) of rice-field complex in Khon Kaen study area, Thailand

a. Select a point on the air photo more or less at random, such as that indicated by the intersection of the marginal arrows in fig. 20.

b. Classify the grains of which the immediate area is composed. By using an ordinary reading glass or desk magnifier, the faintly flecked appearance of the area around the intersection of the marginal arrows in fig. 20 can be resolved into an aggregation of grains of medium gray tones on a light gray background. The medium gray grains are designated G-1. Close examination reveals that the G-1's occur at a rate of about six per millimeter, and that the intergrain space is approximately as wide as the grains. Accordingly, the grains are approximately 0.08 mm across, and the grain size is therefore fine. Since there are about six G-1's per millimeter, the grain spacing is about 0.17 mm and is therefore small. Examined under a magnifying glass, the G-1's appear to average about 0.3 mm

Pattern Description Record Form

Photo Identification _____ Scale _____ Date and Time _____

Grain designation		G-1	G-2	G-3	G-4	GM	G-1	G-2	G-3	G-4	GM
Tone:	White Light gray Medium gray Dark gray Black	X				X	X	X			
Size:	Very fine Fine Intermediate Coarse	X					X	X			
Spacing:	Small Medium Large Indeterminate	X					X	X			
Proportion:	Linear Elongate Equidimensional	X					X	X			
Shape:	Straight Arcuate Sinuous	X					X	X			
Margin:	Sharp Blurred Indistinct	X					X	X			

Component designation		C-1	C-2
Size:	Fine Medium Coarse	X	X
Spacing:	Small Moderate Large	X	X
Shape:	Square Rectangular Circular Oval Linear Irregular	X	X
Unit cell:	Rectangular Trapezoidal Irregular	X X	X X
Orientation:	Parallel Concentric Reticulate Random	X	X
Symmetry:	Symmetric Negative asym Positive asym	X	X
Curvature:	Straight Simply curved Simply bent Multiply curved Multiply bent	X	X

Pattern designation		P-1
Shape:	Linear Areal Interrupted Amorphous	X

Fig. 21. Example of completed pattern description record form

in length, and their average length/width ratio is 0.3/0.08, or about 3.8, which classifies the grain proportion as elongate. An imaginary line drawn through the long axis of the G-1's is not obviously curved; thus, the grain shape is straight. The precise margins of the grains are difficult to establish; therefore, the grain margins are classified as indistinct. Since the background appears to be relatively uniform, it is identified as the groundmass (GM) (see subparagraph c below), and its tone is light gray.

c. The area encompassed by the relatively uniform repetition of G-1's is a component and will hereinafter be designated C-1. C-1 is, then, a homogeneous expanse of G-1 and a groundmass. Following this area to a point of nonhomogeneity reveals a narrow, dark band. This band is clearly not a part of C-1, and is therefore presumably another component. Accordingly, the band must be described in terms of its grain composition.

d. Examination of the narrow band, hereinafter called C-2, under magnification shows that it consists essentially of two almost completely continuous streaks, one dark and one light, of approximately equal width. Since the combination looks dark to the naked eye, the dark streak is assumed to be the more prominent and is therefore designated G-1. The light streak is designated G-2.

e. The general tone of G-1 is black. The entire component is about 0.3 mm wide, of which about half is occupied by G-1; thus, G-1 is about 0.15 mm wide and is therefore classified as fine. Since the entire component consists of only two grains, each of different types, the spacing is indeterminate. The determination of grain proportion requires a special rule. The dark band extends to junctions with other dark bands to form a reticulate appearance in the air photo. In such instances, the component is assumed to extend only from one junction to another. If there are a number of similar components in the vicinity, the grain length is assumed to be the approximate average of several grains in neighboring components of the same type. In this case, the average of ten neighbors is about 4.4 mm. The length/width ratio is therefore 4.4/0.15, or about 29.3, and the grain proportion is therefore linear. A line drawn through the long axis of G-1 will be virtually without curvature; therefore, the grain shape is straight. Because the grain margins are quite distinct they are classified as sharp.

f. The general tone of G-2 is light gray. Because the dimensions and shape are similar to those of G-1, the same categories obtain: grain size is fine, spacing is indeterminate,

proportion is linear, shape is straight, and margin is sharp.

g. It is apparent in the air photo that in the vicinity of the point of intersection of the marginal arrows there are a number of discrete areas very similar to C-1, each of which is enclosed by an example of C-2. These two components, therefore, comprise a pattern that will hereinafter be called P-1. Describing the general configuration and characteristics of the components comprising the pattern is the next step in the descriptive process.

h. In C-1 a number of neighbors exhibit short dimensions ranging from 1.2 to 3.2 mm, averaging about 2.0 mm. Thus, the component size is classified as coarse. The average minimum distance between adjacent examples of C-1 is also about 2.0 mm, and the component spacing is large. Each example of C-1 contains four approximately right angles, and the average length/width ratio is about 2.6, resulting in a rectangular component shape. Locating the approximate geometric centers of a number of sets of four adjacent examples of C-1 and constructing polygons with them shows that a majority are approximately rectangular, but that some are clearly irregular. To indicate this duality, the unit cell is designated as rectangular-irregular. The imaginary center lines through the long dimension are obviously nearly aligned, and the component orientation is therefore parallel. There are no apparent shadows; thus the symmetry is symmetric. Because the imaginary lines through the long dimension curve less than 5 deg per centimeter, the curvature is classified as straight.

i. In C-2 nearly all neighbors exhibit short dimensions of about 0.3 mm, and the component size is therefore fine. The average minimum distance between the geometric centers of neighboring examples of C-2 is 3.6 mm. For this reason spacing is classified as large. The average length of the component is about 3.6 mm, producing a length/width ratio of 3.6/0.3, or about 12, making the component shape linear. Locating approximate geometric centers of a number of sets of four adjacent examples, and constructing polygons with them, shows a majority of them to be approximately rectangular. Some, however, are clearly irregular. Thus, the unit cell is designated as rectangular-irregular. The imaginary center lines through the long dimension are obviously arranged in two sets at right angles to each other, and the orientation is therefore reticulate. Because the dark streak (G-1) is on the side of the component opposite the sun, the symmetry evaluation is positive asymmetry. The imaginary lines through the long dimension curve less than 5 deg per centimeter; thus the curvature is straight.

j. Consideration of the areas characterized by the superimposed arrangement of C-1 and C-2 makes it apparent that a substantial area in the lower central portion of fig. 20 can readily be delineated. However, it is also obvious that the area contains components that have not yet been described, namely the crudely oval dark-toned areas scattered at random across the area. Descriptions of these would be added to the right of the form illustrated in fig. 21.

k. After all components of the pattern have been described, the area for which the descriptions of components obtain is outlined and assigned a pattern designation as illustrated in fig. 21. The shape of the area enclosed by the boundary is then examined and assigned to one of the general shape classes defined in paragraph 76. In the case of the example partially described above, the area is two-dimensional and reasonably compact; therefore, it is classified as areal.

79. Whenever any class designator changes at any level (i.e. grain, component, or pattern), a new pattern results. As a result, the number of patterns normally found in any substantial geographic area is quite large, and rigorous description and classification are both laborious and time-consuming.

80. The classes in the description and classification system are related only to the air photos and not to the ground. Classifications change with changing scale. For example, a large-scale (i.e. 1:5,000) air photo of a cornfield will normally result in a relatively coarsely and strongly flecked appearance. At a scale of 1:20,000 the flecking is weak but still apparent. At 1:50,000 the appearance of the field in the air photo is normally a smooth gray tone with no trace of flecks. Accordingly, it is extremely important to record not only the scale of the photograph but also any other pertinent information, such as the date and time at which the picture was taken, if available.

Air-Photo Interpretation Techniques

81. To make use of the pattern classification system efficient, pertinent information had to be coded and recorded in some manner that permitted easy reference. The method chosen was to place the type of picture, its classifications, and a body of supplementary data on standard

8- by 5-in. edge-punch cards. The front and back of such a card, punched with the classification of the most prominent grain (G-1) of the first component (C-1) of the example described in paragraph 76 and summarized in fig. 21, are illustrated in figs. 22 and 23.

82. The legends of the card are largely self-explanatory. The "type" example is presented on the front of the card in a stereopair. Standard location and reference data are annotated on the left side, and some convenient name and brief verbal description of the type are also provided. For example, in the card illustrated in fig. 22, the area being described is one of slightly terraced rice fields with scattered trees. The three fields allotted to site number on the left margin of the card are intended to reference a MERS data collection site, if one happens to fall in the area of the photo on the card. It will be noted that there are two unused holes at the upper left corner of the card and another three at the upper right; four of these are assigned to the four factor families to provide prefixes on the sample numbers (i.e. V-18, H-116, etc.). On the card, V codes vegetation sites, G codes surface geometry sites, H codes hydrologic geometry sites, and S codes surface composition sites. The "photo-scale" fields in the upper left corner of the front of the card record only the fourth and fifth digits of the denominator of the representative fraction. Thus, in the example in fig. 22, the number coded is 15, representing a representative fraction of 1:15,000. The photo identification number on the upper edge is the standard flight number and exposure number that are normally printed on the upper left corner of air photos. In this case, the number coded is 17-127 in the standard edge-punch numerical code.

83. The codes for the pattern classification are the same as those given in paragraphs 60-76. The fields labeled "number" at the lower left corner (in the grain category) and lower right corner (in the component category) indicate the position of prominence of the grain and component in the pattern being described. Thus, in fig. 22, the example is coded for G-1, C-1, as defined in fig. 21. Obviously, to entirely describe or classify a pattern it is necessary to have as many cards as there are grains in that pattern. For example, three cards would be required to carry all the information in fig. 21.

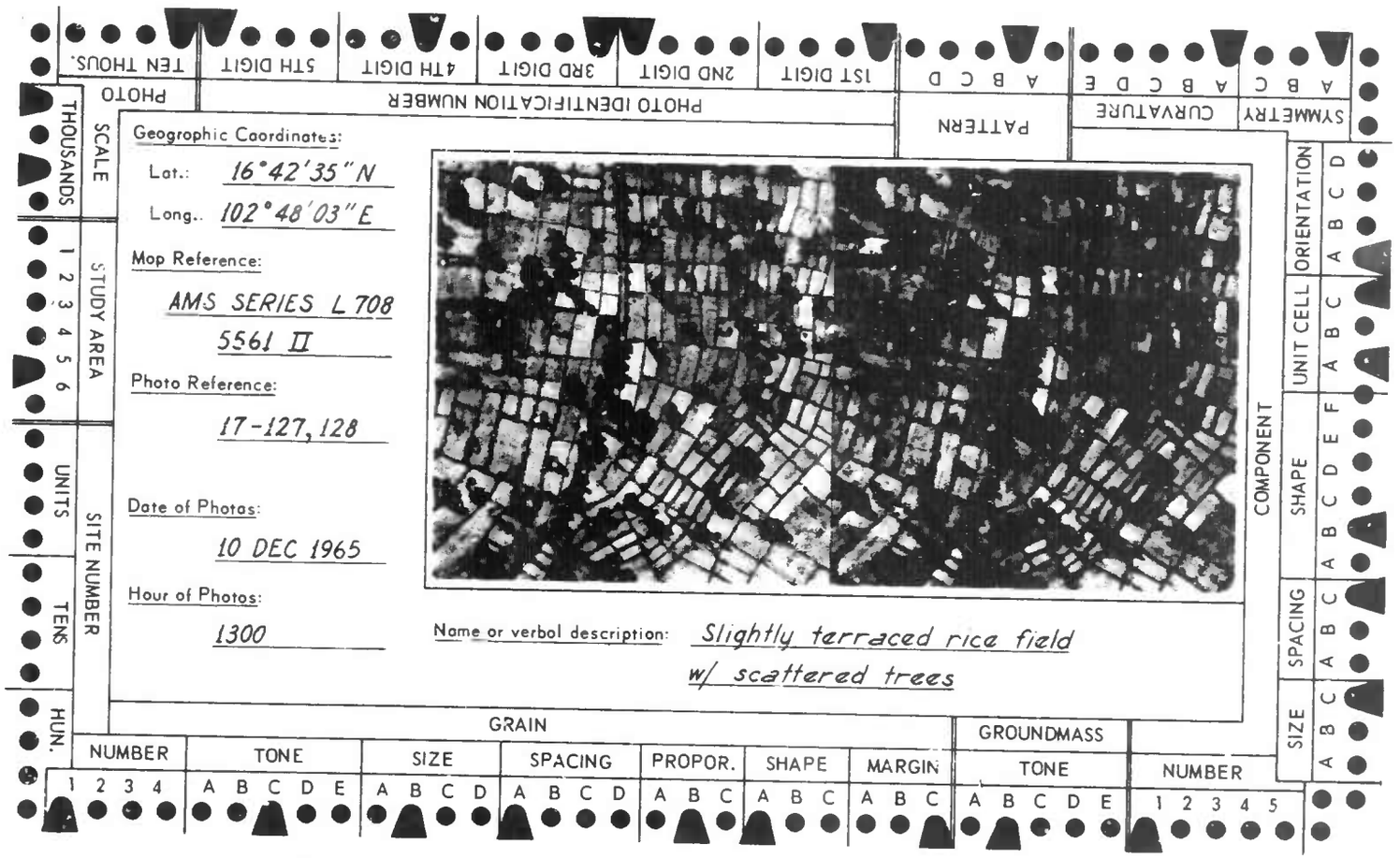


Fig. 22. Front of air-photo pattern classification card

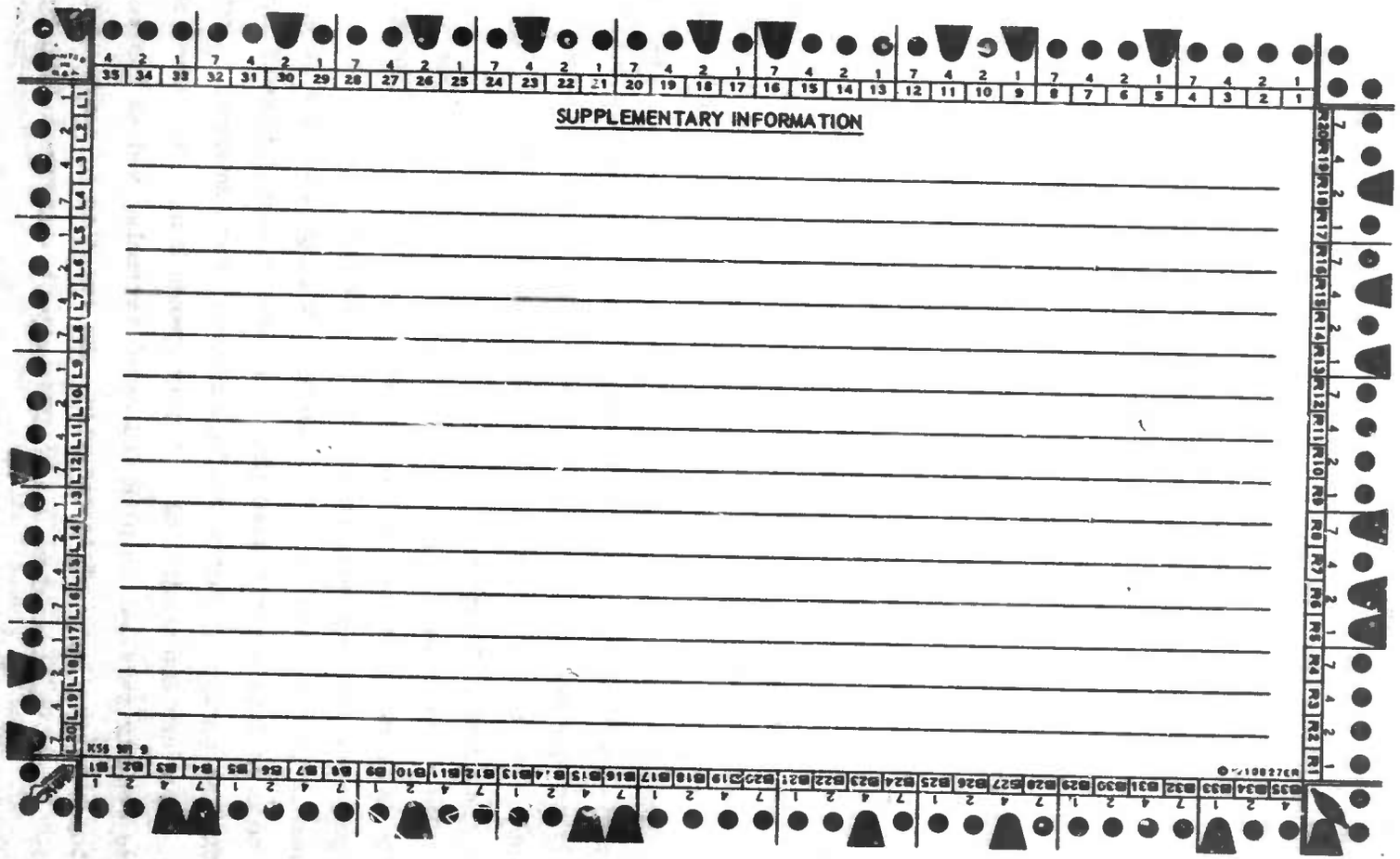


Fig. 23. Back of air-photo pattern classification card

84. The seeming redundancy of information on components and patterns is actually a useful property of the system. For example, it is often desired to examine the component compositions of a set of patterns of a given type. Sorting for pattern type automatically includes all components. Conversely, it is sometimes useful to determine in which pattern a particular component type occurs. Sorting for that pattern type will identify all patterns in which that component type plays a part. The classification codes for characteristics of grain can be used in a similar way. As a result, an enormous number of potentially useful stratifications are possible.

85. The major difficulty with the rigorous employment of the classification system is that it requires much time to make the necessary determinations. In theory, no area under study should be delineated as being representative of a particular pattern until several samples of it have been checked against the type sample to certify that all elements of the classification are identical. However, this turned out to be too time-consuming to be practical for this project. As a result, the type patterns were used as a guide for subjective decisions concerning similarity, and the rigorous comparison procedure was used only in those instances in which the interpreter found it impossible to reach a decision. This procedure, which is based on the assumption that a skilled air-photo interpreter consciously or subconsciously evaluates every element in the photo for significance, is believed to be an acceptable compromise between desired objectivity and required speed.

86. The pattern cards were supplemented by the simultaneous development of the keys and relations normally used by air-photo interpreters. For this purpose, the many samples of surface geometry features that had been collected in the field were invaluable. In many instances it proved possible to correlate a particular photo pattern or association of patterns with particular surface geometry configurations. For instance, in certain areas and under certain conditions, closely spaced bunds that were curvilinear and roughly parallel in plan indicated terracing and an increase in general topographic slope. This deduction was verified by numerous field measurements, and was therefore accepted as a photo-interpretation key.

87. An expected finding was that each of the four factors required by the mobility model (slope, spacing of vertical obstacles, TAA, and SH) involved somewhat different keys and associations. A general discussion of the procedures used to interpret the four factors is presented below.

Slope

88. Measurement of slope was accomplished principally from the available topographic maps supplemented by air-photo examination and photogrammetric measurements in selected areas. The contour interval of the maps (20 m) made it mandatory to examine the air photos to check for the occurrence of more than one slope category between widely spaced contours (low slope areas). Also, topographic highs less than 20 m high are not determinable within this contour interval but can be identified in the air photos. Slope values in the above-mentioned cases were obtained from the photographs using a slope meter or parallax ladder (photogrammetric measuring devices). Ground observations were naturally used where available.

89. Numerous photogrammetric methods are available to measure images precisely on air photos. Several such methods were employed in mapping slope. In most cases, the results satisfied the need. Unfortunately, these methods are painfully slow and require an experienced operator to achieve the desired proficiency. Because of project time restrictions, only selected measurements were made to supplement the maps.

Spacing of vertical obstacles

90. Class units of this factor were mapped in cultivated or sparsely vegetated areas almost entirely from the air photos by direct measurement. In areas of dense vegetation and steeply sloping terrain, classes were mapped using interpretative techniques supported by ground observation. Field data for the most part were taken in areas of level terrain where repetitive surface geometry features such as rice-field bunds occurred. Where obstacles were readily recognizable on air photos, spacing determinations were efficiently made by simple measurement. A template was designed for rapidly and accurately making these direct measurements. Photograph 7 shows a rice paddy area in the Nakhon Sawan study area mapped as spacing unit 5.

91. Measuring obstacle spacing in densely vegetated and steep slope areas in the air photos was normally impossible because the obstacles could not be isolated and identified. Ground observations of nonrepetitive, irregular surface geometry obstacles in these areas were useful only to convey a general picture of the actual conditions, and limited sampling proved of little use. Interpretation of obstacle spacing in such areas was accomplished through analysis of such elements as slope, surface rock type, drainage pattern, degree of dip and attitude of bedding, soils, vegetative cover, and associated landforms. Analysis of these elements in terms of their influence on spacing of vertical obstacles is given in the following paragraphs.

92. Slope. As the slope of topographic highs increases, the probability of a closer spacing of obstacles normally increases proportionately. Obviously, influence of one or several of the other elements may cause local variations. Topographic highs bounded by steep slopes and characterized by high percentages of exposed surface rock were usually classified as unit 4 (50 to 150 ft), but occasionally first-hand information indicated these areas to be unit 3 areas (12 to 50 ft). Highs with relatively smooth bounding slopes and a minimum of rock exposures due to a thick soil mantle were classified as unit 5 (greater than 150 ft apart).

93. Surface rock. Surface rock in Thailand is a useful indicator of frequency of obstacles. The limestone weathers to more rugged landscapes than sandstone, shale, and igneous rocks. The limestone areas are characterized by steep dips and dense arrangements of vertical joints suggestive of close obstacle spacing. Photograph 8 shows a typical limestone ridge in the Nakhon Sawan study area. Sandstone and igneous rocks are less resistant to erosion than limestone, resulting in more subdued landscapes; wide obstacle spacing normally prevails in such terrains.

94. Keys to identification of rock types in air photos include their structural characteristics and types of drainage patterns. Presence of consistent dip and strike plus detectable lineation indicative of bedding are characteristic of sedimentary rocks. Conversely, the absence of these characteristics suggests igneous and/or metamorphic rocks. Regional and local drainage patterns in sedimentary rocks are usually of

the trellis type. In limestone areas, the trunk channel of the trellis pattern is usually parallel to the strike of ridge mountains with the tributary channels joining at approximately right angles. Typically, with local exceptions, limestone surfaces are characterized by shallow depressions and an absence of small surface streams. Where surface drainage exists, it is usually oriented in the direction of the dominant joint set. The trellis drainage patterns on shale are characterized by widely spaced channels, but they are often poorly developed and difficult to recognize. Drainage patterns in sandstone are also typically trellis, but extensive areas of dendritic or rectangular patterns are not uncommon. Drainage patterns in igneous and metamorphic topographic highs are usually of the dendritic or rectangular type, and areas of both are often found immediately adjacent to each other. Stream channels are more closely spaced in metamorphic than in igneous rocks.

95. Landforms, landform genesis, and associated surface rock types often suggest type and characteristics of soils which together with data such as drainage can be useful in predicting probable ranges of obstacle densities. Although numerous other elements, both natural and cultural, were used in mapping spacing, it would be impossible to discuss all of them adequately. Each situation usually requires analysis of certain combinations of these elements.

Terrain approach angle

96. Obstacle spacing in cultivated areas was determined directly from air photos, but the TAA's of these obstacles were not resolvable because of the low magnitude of relief coupled with the scale of the photographs. Therefore, interpretation and ultimate prediction of TAA's require comprehensive analysis of both man-made and natural features. The most significant of these contributing elements are topographic expression, irrigation practices, and soil type.

97. Topographic expression. Rice cultivation in Thailand often occurs in gently sloping areas (photograph 9) as well as the usual flat areas. Only rarely is it found terraced on steep slopes. Air photos and ground observations indicated that a certain degree of compatibility exists between topographic expression and paddy and bund characteristics.

Supporting criteria for this conclusion include:

a. Paddies and bounding bunds are adjusted to even the subtlest changes in surface configuration. Where surface expression exhibits multidirectional surface irregularities, two-dimensional terracing is characteristic. Although this terracing is not evident in air photos, the surface irregularities are or can be inferred from other criteria. Bund geometry is always asymmetrical with the larger SH and greater TAA on the down-dip side (see photograph 10). However, it should be pointed out that this variation is often classifiable within the same map class. Similarly, bunds bordering paddies that now occupy abandoned stream courses have larger SH's and greater TAA's on the down-gradient side (see photograph 11).

b. In areas of minimal topographic expression, the paddies are larger and naturally the bunds are more widely spaced. In addition, bund heights are characteristically lower and TAA's less severe.

c. Paddies in more steeply sloping areas are characterized by a series of curvilinear bunds more or less parallel to the topographic contours; connecting bunds are perpendicular and usually irregularly spaced--probably for convenience of irrigation (see photograph 12).

d. Paddies occurring on regional slopes exhibit a weakly defined but evident parallelism in a direction perpendicular to the topographic contours. This tendency is not apparent to the ground observer.

98. Irrigation practices. Irrigation practices in Thailand can be conveniently classified into two types: modern and traditional. Modern irrigation methods are employed mainly in floodplains of major streams and where a continual source of large quantities of surface water is available. Crops in these areas are grown year-around and are irrigated by mechanical methods from a dense network of canals. The paddies are large (shortest dimension is generally greater than 100 ft) and are generally characterized by uniform low bunds with relatively large TAA's (photograph 13). Carefully positioned ground control data permit reliable extrapolation often for great distances.

99. Areas irrigated by traditional practices are characterized by highly irregular paddy configurations (photograph 14) and bund characteristics that are attributed to the personal whims of individual rice farmers. Bund building is done entirely by hand, and as a result both

bund height and TAA's vary widely. Often there is significant variation along the length of a single bund. The paddies are much smaller where traditional irrigation methods are practiced than where modern techniques are used.

100. Soil type. TAA's are generally less in heavy clay soils than in those containing high percentages of sand and silt. This general rule cannot be applied in instances where bunds, regardless of soil type, are shaved periodically to compensate for settling and flattening of their slopes. The shaved sides of the bunds exhibit a smaller angle, and the shaved material placed on top of the bunds increases the heights.

Obstacle step height

101. Measurement and interpretation of SH were always performed simultaneously with measurement of TAA. The photo-interpretation elements discussed for TAA are equally applicable to obstacle SH determination; however, it is worth mentioning that innumerable instances occur where SH values defy logical categorization. Such instances are almost invariably the product of some personal idiosyncrasy of the individual rice farmer and are not predictable.

Significant surface geometry features

102. The preceding discussion of the elements affecting TAA and SH variation is admittedly oriented toward rice bund geometry. This is not intended to imply that other surface geometry features are of little or no significance. Features such as road embankments (photograph 15), termite mounds (photograph 16), borrow pits, sinkholes, and drainage ditches are repetitive throughout Thailand and locally have a very decided effect on vehicular mobility. The road embankments, borrow pits, and drainage ditches are man-made features of linear definition that are somewhat larger than the rice bunds. Also, features peculiar to specific areas such as beach ridges and terraces (photographs 17-20) and shrimp ponds (photograph 21) may affect vehicular mobility.

103. Photo-interpretation criteria for such features are limited but are worthy of mention. Road embankments and borrow pits are almost invariably associated with each other (see photograph 22). In areas subject to periodic inundation, the pits are deeper and more continuous

and the embankments are higher with steeper approach angles. Drainage canals in extensive floodplain areas are characteristically deeper, wider, and straighter than those found in areas of higher topographic position. In areas where natural drainage patterns have been converted into an irrigation system, bounding dikes are usually associated with individual channels (see photographs 23 and 24). These dikes impose a much more critical angle of entry into the drainage feature than is characteristic in the man-made variety. Termite mounds are seldom free of a dense vegetative cover and present more of a problem from the vegetation standpoint than from surface geometry. A termite mound free of vegetative cover is shown in photograph 25.

104. The experience and ground observations of the members of the various field parties proved invaluable in this study. They have on countless occasions provided the means of filling in serious data gaps in areas where factor values were otherwise beyond reliable resolution.

Extrapolation of Surface Geometry Characteristics

105. Terrain data in this study were extrapolated on the assumption that similar terrain conditions will exhibit similar photo patterns. With this assumption, most of the air-photo patterns in the study areas were identified according to the pattern identification procedure previously discussed. After the patterns were identified, distinctive patterns were selected and assigned ranges of values (mapping classes) for each surface geometry factor from the field data or through photo-interpretation techniques. After this had been accomplished, a systematic extrapolation procedure was employed whereby the surface geometry factor values for each distinctive air-photo pattern type were assigned to similar air-photo patterns throughout the study areas.

Map Preparation

106. Prior to initiating the factor mapping, all site data from the six primary study areas in Thailand were categorized into map classes

(paragraphs 46 through 51) and plotted on 1:50,000-scale topographic maps. Mosaics were then made from the best available air photos for each study area and reduced or enlarged as the case required to the map scale (1:50,000). The sites plotted on the topographic sheets were then transferred to the aerial mosaics. Factor map preparation of each factor is discussed in the following paragraphs.

107. As stated previously, slope was mapped directly from topographic maps aided by selected measurements from air photos. The first step was to construct a template having a series of circles with diameters equal to the horizontal distance between contours at the upper and lower limits of each slope class. This template, prepared on a transparent base, was manipulated over the topographic sheets isolating areas characterized by the various slope classes. The contour interval (20 m) did not always permit discernment of areas or zones of slope change by this method. However, in such cases analysis of the air photos permitted sufficiently accurate division into desired slope categories. Use of air photos was more often necessary in areas characterized by lower slope classes, i.e. classes 1, 2, and 3.

108. Obstacle spacing was determined by use of a scale (graduated in feet) included on the slope template discussed above. This device had its greatest utility in bund areas where these obstacles were easily recognized in air photos, and areas of homogeneous spacing values (photograph 26) were isolated by manipulating the template. These areas were identified in the aerial mosaic, and this information was transferred to the topographic map. Determination of obstacle values in areas devoid of bunds was accomplished by use of the previously discussed photo-interpretation techniques and by the determinations recorded on the photo mosaics and respective maps.

109. Class values of the TAA and SH of each sample site were taken from tabulation sheets and recorded on the appropriate aerial mosaics as the initial step for mapping these factors.

110. The next step in the map preparation involved extension of the limits of class values at these points to areas of homogeneous type. Extension of the limits of homogeneity, identification of remote

undesignated areas, and the extrapolation of similar or identical pattern characteristics were accomplished by techniques previously discussed.

111. After the individual factor maps had been completed, they were superposed on a single base to compile the geometry factor-family map. Each area in the maps was identified by an array of four digits which represented map classes of each of the four factors. These arrays were stratified in numerical order by combinations of four factors always in the following sequence: (a) slope, (b) spacing of vertical obstacles, (c) TAA, and (d) SH.

112. After the factor-family maps had been made for all the study areas, a tabulation composed of each distinctive array was made which revealed that 288 distinctive combinations occur in the six study areas. To minimize the cartographic problems, a number between 1 and 288 was assigned to represent each four-digit combination on the final maps.

113. The surface geometry factor-family maps of the six study areas are presented in Volume VIII of this report series. These maps are on base sheets at a scale of 1:50,000 taken from the Army Map Service (AMS) Series L-708. The limits of these maps do not, in all instances, coincide with those of the AMS sheets because new base sheets were made, where needed, to reduce the number of partially mapped sheets (see fig. 24). These limit changes were in most cases a matter of shifting the latitude or longitude 5 or 10 deg from those of the AMS sheets. Preparation of new base sheets resulted in a reduction of the total number of base sheets covering the six study areas from 32 to 25.

114. An example of a portion of a surface geometry factor-family map of the Lop Buri study area (LB III sheet) and the accompanying legend are shown in fig. 25. Since only a portion of the map is shown, all combinations included in the legend do not occur on the map segment.

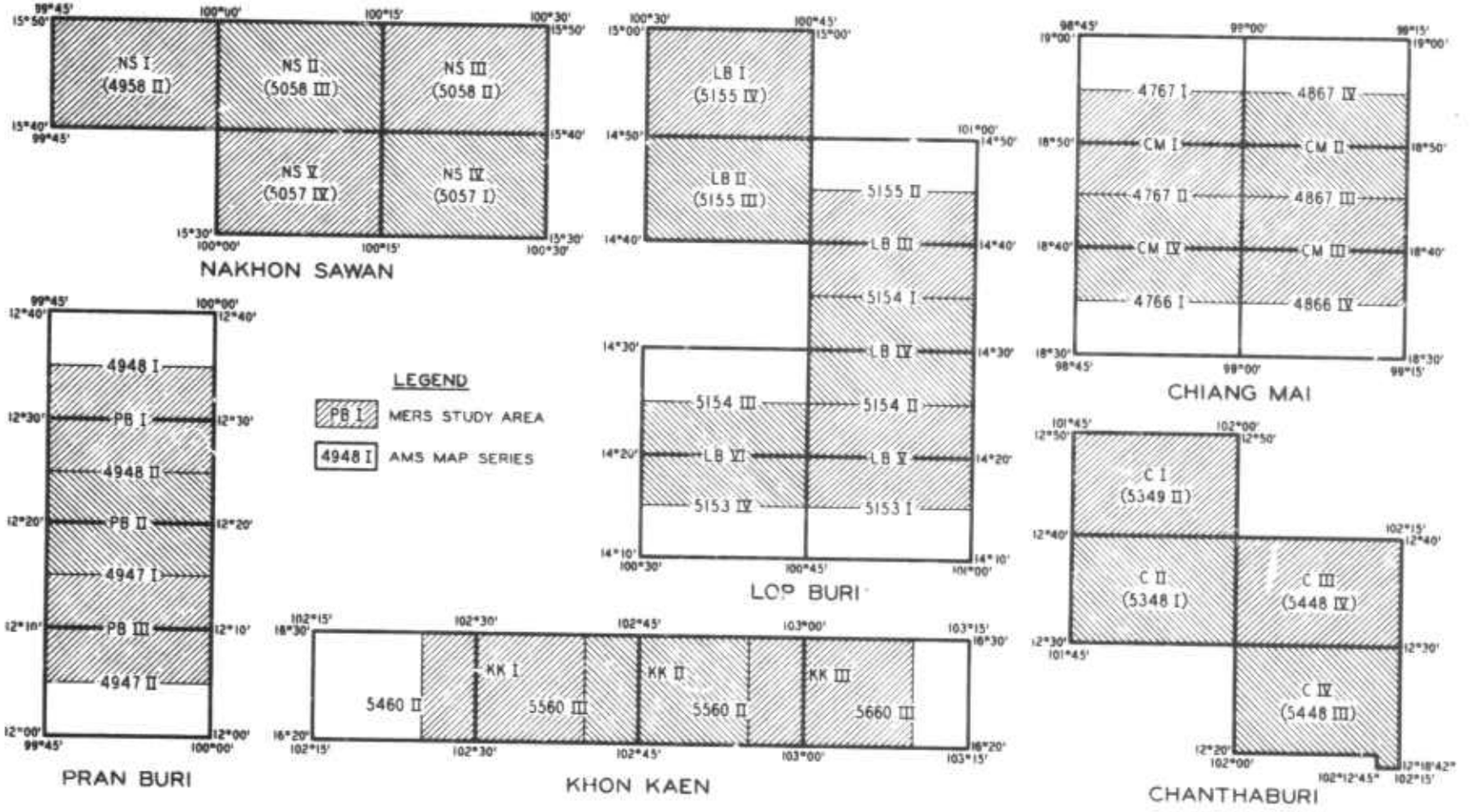


Fig. 24. Relation between MERS and AMS quadrangles

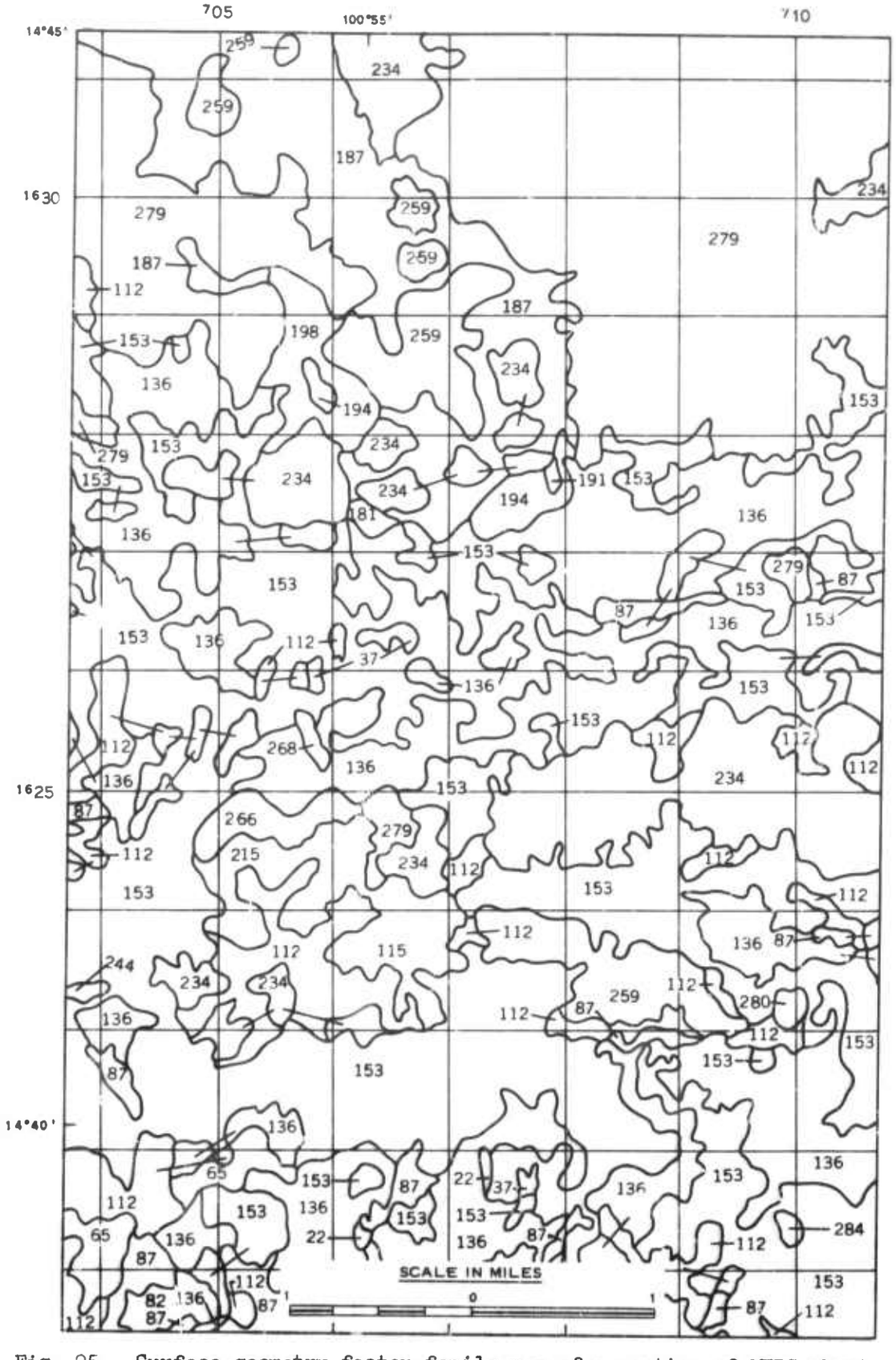


Fig. 25. Surface geometry factor-family map of a portion of MERS sheet LB III in the Lop Buri study area (sheet 1 of 2)

LEGEND

Map Unit*	SLP	OS	AA	SH
1	1	2	3/3	1/3
2	1	2	5/5	1/1
3	1	3	2/2	1/1
4	1	3	2/2	2/2
5	1	3	2/2	1/3
6	1	3	2/3	1/1
7	1	3	2/3	2/2
8	1	3	2/3	3/2
9	1	3	2/3	3/3
10	1	3	2/3	4/2
11	1	3	2/3	4/3
12	1	3	2/3	4/4
13	1	3	3/1	1/1
14	1	3	3/1	2/2
15	1	3	3/1	3/2
16	1	3	3/2	2/2
17	1	3	3/2	3/3
18	1	3	3/3	1/3
19	1	3	3/3	1/1
20	1	3	3/3	2/3
21	1	3	3/3	2/2
22	1	3	3/3	3/2
23	1	3	3/3	3/3
24	1	3	3/3	4/3
25	1	3	3/3	4/4
26	1	3	3/3	5/4
27	1	3	3/3	6/3
28	1	3	3/3	6/4
29	1	3	3/4	1/1
30	1	3	3/4	1/2
31	1	3	3/4	3/3
32	1	3	3/4	3/4
33	1	3	4/2	3/3
34	1	3	4/4	1/1
35	1	3	4/4	2/2
36	1	3	4/4	3/3
37	1	3	5/3	3/2
38	1	3	5/3	3/3
39	1	3	5/5	1/1
40	1	3	5/5	2/2
41	1	3	5/5	3/3
42	1	4	1/1	1/1
43	1	4	1/1	2/2
44	1	4	1/2	1/1
45	1	4	1/2	2/2
46	1	4	1/2	3/3
47	1	4	1/3	1/1
48	1	4	1/3	2/2
49	1	4	1/3	2/3
50	1	4	1/3	2/5
51	1	4	1/3	3/3
52	1	4	2/1	1/1
53	1	4	2/1	2/2
54	1	4	2/2	1/1
55	1	4	2/2	2/2
56	1	4	2/2	2/3
57	1	4	2/2	3/2
58	1	4	2/2	3/3
59	1	4	2/2	3/4
60	1	4	2/2	4/3
61	1	4	2/2	4/4
62	1	4	2/3	1/1
63	1	4	2/3	2/2
64	1	4	2/3	2/3
65	1	4	2/3	3/2
66	1	4	2/3	3/3
67	1	4	2/3	4/2
68	1	4	2/3	4/3
69	1	4	2/3	4/4
70	1	4	2/4	2/2
71	1	4	2/4	3/3
72	1	4	3/1	2/2
73	1	4	3/2	1/1
74	1	4	3/2	2/2
75	1	4	3/2	2/3
76	1	4	3/2	2/5
77	1	4	3/2	3/2
78	1	4	3/2	3/3
79	1	4	3/2	3/4
80	1	4	3/2	4/3
81	1	4	3/2	4/4
82	1	4	3/3	1/1
83	1	4	3/3	2/2
84	1	4	3/3	2/3
85	1	4	3/3	2/4
86	1	4	3/3	3/2
87	1	4	3/3	3/3
88	1	4	3/3	3/4
89	1	4	3/3	4/2
90	1	4	3/3	4/3
91	1	4	3/3	4/4
92	1	4	3/3	5/4
93	1	4	3/3	5/5
94	1	4	3/3	6/6
95	1	4	3/4	1/1
96	1	4	3/4	2/2
97	1	4	3/4	2/3
98	1	4	3/4	3/2
99	1	4	3/4	3/3
100	1	4	3/4	3/4
101	1	4	3/4	5/5
102	1	4	4/2	3/3
103	1	4	4/3	3/3
104	1	4	4/3	3/4
105	1	4	4/3	4/3
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108	1	4	4/4	3/2
109	1	4	4/4	3/3
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113	1	4	5/5	2/3
114	1	4	5/5	3/2
115	1	4	5/5	3/3
116	1	4	5/5	3/3
117	1	4	5/5	5/5
118	1	4	6/6	1/1
119	1	5	1/1	1/3
120	1	5	2/1	2/2
121	1	5	2/2	1/1
122	1	5	2/2	3/2
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137	1	5	3/3	4/3
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139	1	5	3/4	3/3
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150	1	5	4/6	5/4
151	1	5	5/3	1/3
152	1	5	5/4	3/7
153	1	5	5/5	1/1
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273	6	4	4/4	2/2
274	6	4	4/4	3/3
275	6	4	5/5	1/1
276	6	4	5/5	3/3
277	6	5	3/3	3/3
278	6	5	4/4	3/3
279	6	5	5/5	1/1
280	6	5	5/5	2/2
281	6	5	5/5	3/3

Note: Blank areas are water bodies.

* Each map unit represents an array of four symbols (i.e. 1, 2, 3/3, 3/3) indicating mapping classes of slope SL (see diagram below), vertical obstacle spacing OS, approach angle AA, and step height SH. Fractional designations indicate that dual classes were mapped. The numerator of the fraction indicates class range that will be encountered while traversing an area in an easterly direction (i.e. azimuth from > 0 to 180 deg) and the denominator refers to a westerly direction (i.e. azimuth from > 180 to 360 deg) assuming that the vehicle intersects the obstacle at a right angle.

† Mapping class ranges of each surface geometry factor are:

Slope (SL)

Mapping Class	Range deg
1	0-1.5
2	> 1.5-4.5
3	> 4.5-9
4	> 9-18
5	> 18-30
6	> 30-45
7	> 45

Vertical Obstacle Spacing (OS)

Mapping Class	Range ft	Range m
1	0-7	0-2.13
2	> 7-12	> 2.13-3.66
3	> 12-50	> 3.66-15.24
4	> 50-150	> 15.24-45.72
5	> 150	> 45.72

Approach Angle (AA)

Mapping Class	Range deg
1	< 100
2	100-< 125
3	125-< 150
4	150-< 165
5	165-< 180
6	180-< 200
7	200-< 210
8	210-< 220
9	≥ 220

Step Height (SH)

Mapping Class	Range in.	Range cm
1	0-4	0-10.16
2	> 4-10	> 10.16-25.40
3	> 10-18	> 25.40-45.72
4	> 18-30	> 45.72-76.20
5	> 30-48	> 76.20-121.92
6	> 48-66	> 121.92-167.64
7	> 66-84	> 167.64-213.36
8	> 84	> 213.36

⊠ Units do not occur on thie map.

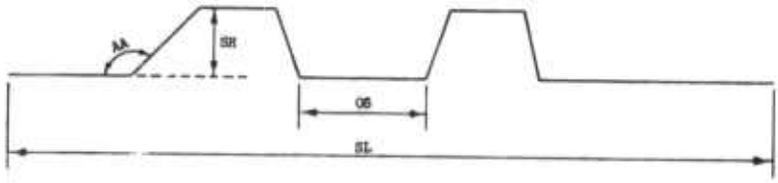


Fig. 25 (sheet 2 of 2)

PART V: CONCLUSIONS AND RECOMMENDATIONS

Conclusions

115. Predicting and mapping of the geometric attributes of terrain in quantitative terms utilizing photo-interpretation techniques were accomplished. The degree of accuracy that was achieved varied with each factor. As a general rule, slope and spacing of vertical obstacles were predicted (in areas with no field data) with greater reliability than TAA and SH.

116. The accuracy of factor value estimation was influenced strongly by the scale and quality of the air photos. New, medium-scale (1:15,000) photography of the Lop Buri and Pran Buri areas permitted greater accuracy than could be achieved in Nakhon Sawan, Khon Kaen, Chiang Mai, and Chanthaburi.

117. It was found that topographic slope could not be measured with sufficient accuracy, nor could the dip of such slopes be reliably estimated, from existing topographic maps, chiefly because the 20-m contour interval was far too large to reveal significant surface variations.

Recommendations

118. Extrapolation of terrain data by air-photo patterns is a useful tool in factor map preparation. Additional effort should be directed at improving and simplifying the pattern description system now employed. Although it definitely establishes the similarity or dissimilarity of the patterns, application of the system in its present state is time-consuming and presents a major problem in large mapping projects. Studies exploring the relevance of pattern description factors to surface geometry characteristic variations should be continued.

119. Studies to determine the distribution of surface geometry features described in the six primary study areas in the remainder of Thailand and Southeast Asia as a whole are necessary to prove the applicability of the photo-interpretation techniques and classification systems

used in this study. Current surface geometry classifications are directed toward rice-field bund configurations, and modification may be necessary for areas characterized by a predominance of other feature types.

120. Future surface geometry factor map arrays should include a map showing the distributions of areas of similar topographic slope direction, as well as one showing topographic slope angle. It is probable that about eight classes would be adequate, as follows:

Unit	Class Limits (Azimuth Clockwise)
1	>0-45°
2	>45-90°
3	>90-135°
4	>135-180°
5	>180-225°
6	>225-270°
7	>270-315°
8	>315-360°

Incorporation of this information will permit simple and direct identification of the angle at which a vehicle will approach a slope while following any specified course.

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5. Vanderbilt University, Department of Civil Engineering, Application of Terrain Descriptive Techniques to Fort Knox, Kentucky. Contract Report No. 3-94, prepared under Contract DA-22-079-eng-300 for the U. S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Miss., 30 April 1962.

Table 1

Summarized Classification Key for Air-Photo Patterns

Grain: The smallest definable entity on air photo

Tone: Density of image
- a. White
- b. Light gray
- c. Medium gray
- d. Dark gray
- e. Black

Size: Average short dimension
- a. Very fine: No distinguishable grains
- b. Fine: 0.0-0.3 mm (0.01 in.)
- c. Intermediate: 0.3-0.5 mm (0.01-0.02 in.)
- d. Coarse: 0.5-1.0 mm (0.02-0.04 in.)

Note: If >1.0 mm, classify as component

Spacing: Average minimum distance from center to center
- a. Small: <0.5 mm (0.02 in.)
- b. Medium: 0.5-1.0 mm (0.02-0.04 in.)
- c. Large: >1.0 mm (>0.04 in.)
- d. Indeterminate: Use only when only one grain is present

Proportion: Average length to width ratio
- a. Linear: >10
- b. Elongate: 2-10
- c. Equidimensional: <2

Shape: Configuration of line through long dimension
- a. Straight: No curves
- b. Arcuate: Curve in only one sense
- c. Sinuous: Curves in two or more senses

Margin: Character of edge
- a. Sharp: One tone covers entire grain
- b. Blurred: Tone at edges is gradational
- c. Indistinct: Tone is gradational over entire grain

Component: Combination of grain and groundmass, or two or more grain types

Size: Average short dimension
- a. Fine: <0.5 mm (<0.02 in.)
- b. Medium: 0.5-1.5 mm (0.02-0.06 in.)
- c. Coarse: >1.5 mm (>0.06 in.)

Spacing: Average minimum distance between grains
- a. Small: <1.0 mm (0.04 in.)
- b. Moderate: 1.0-2.0 mm (0.04-0.08 in.)
- c. Large: >2.0 mm (0.08 in.)

(Continued)

Table 1 (Concluded)

Component (Continued):

Shape: Presence of angles and length to width ratio
- a. Square: Four right angles, <1.5
- b. Rectangular: Four right angles, 1.5-6.0
- c. Circular: No angles, <1.5
- d. Oval: No angles, 1.5-6.0
- e. Linear: Angle not considered, >6.0
- f. Irregular: Shapes indeterminate

Unit cell: Shape of polygon formed by centers of four neighbors
- a. Rectangular: Four right angles
- b. Trapezoidal: Two opposite acute angles
- c. Irregular: Angles random

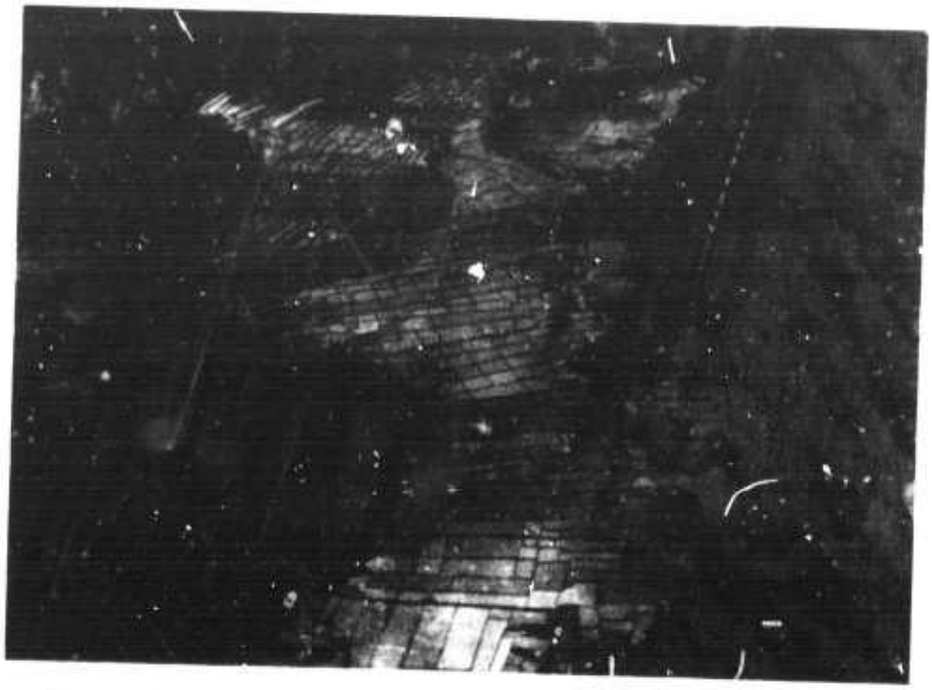
Orientation: Arrangement of long axes with respect to each other
- a. Parallel: Neighboring axes parallel
- b. Concentric: Axes curved and "parallel"
- c. Reticulate: Axes in two or more sets, axes in each set parallel
- d. Random: No obvious ordering of axes

Symmetry: Relative position of shadow
- a. Symmetric: No shadow
- b. Negative asymmetry: Shadow on same side as sun direction
- c. Positive asymmetry: Shadow on opposite side from sun direction

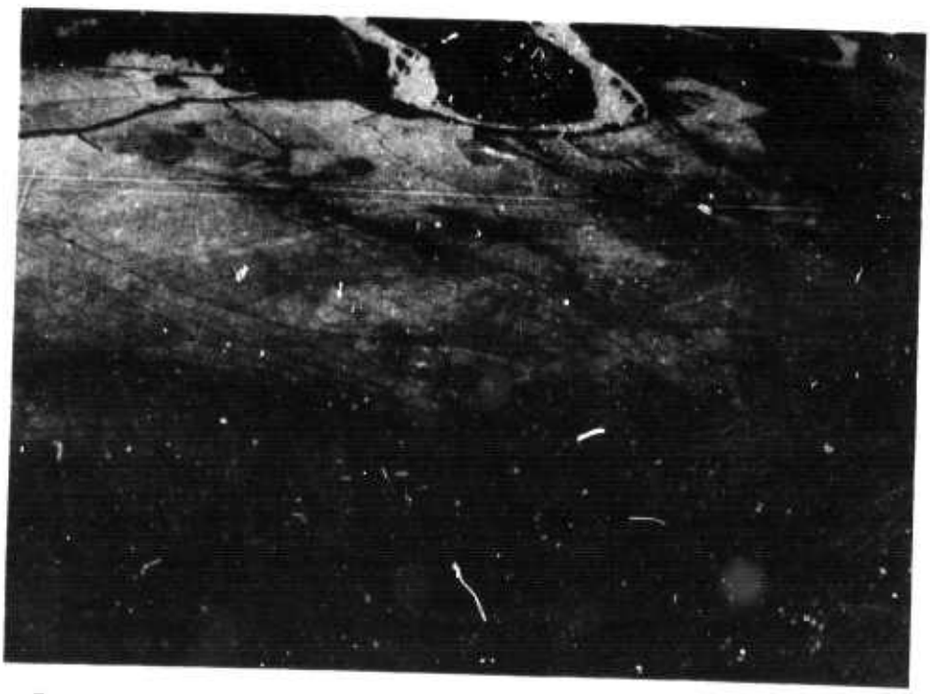
Curvature: Inflection of long dimension in degrees per centimeter
- a. Straight: $<5^{\circ}$
- b. Simply curved: 5°-30°, curve in one sense only
- c. Simply bent: 30°-80°, bend in one sense only
- d. Multiply curved: 5°-30°, curves in two or more senses
- e. Multiply bent: 30°-80°, bends in two or more senses

Note: Bends of $>80^{\circ}$ per centimeter regarded as discontinuities; treat as two components.

Pattern: Combination of two or more components in repetitious array
- a. Linear: Extended band or zone
- b. Areal: Approximately equidimensional and compact
- c. Interrupted: Many marginal reentrants and/or enclaves
- d. Amorphous: Exact boundary indeterminate



Photograph 1. Aerial oblique showing adjustment to the configuration of former drainage channel; Chiang Mai study area



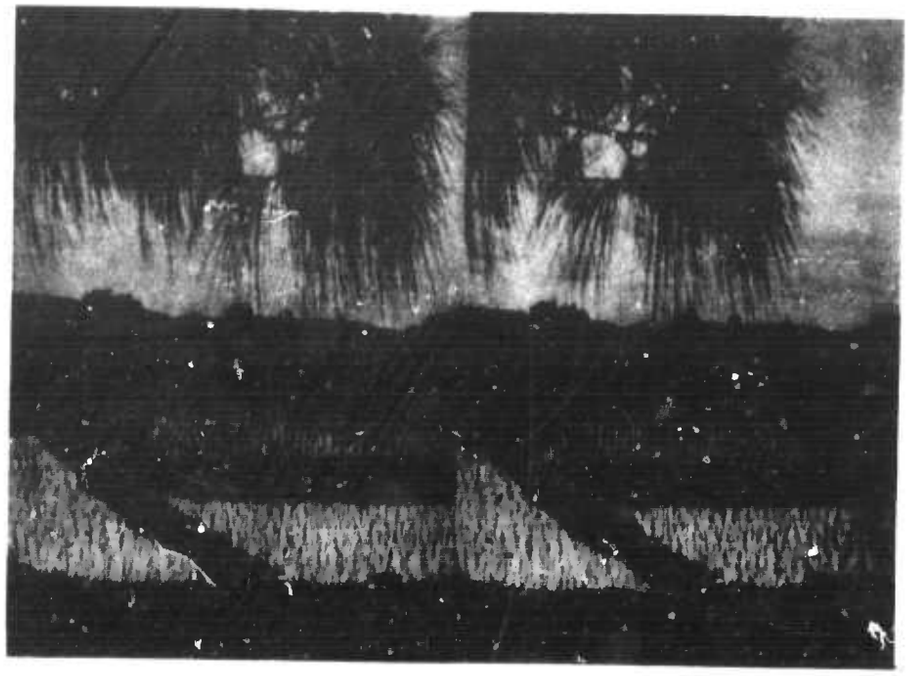
Photograph 2. Aerial oblique showing irregularly shaped rice paddies in Chiang Mai study area. Former drainage pattern has been converted into irrigation network



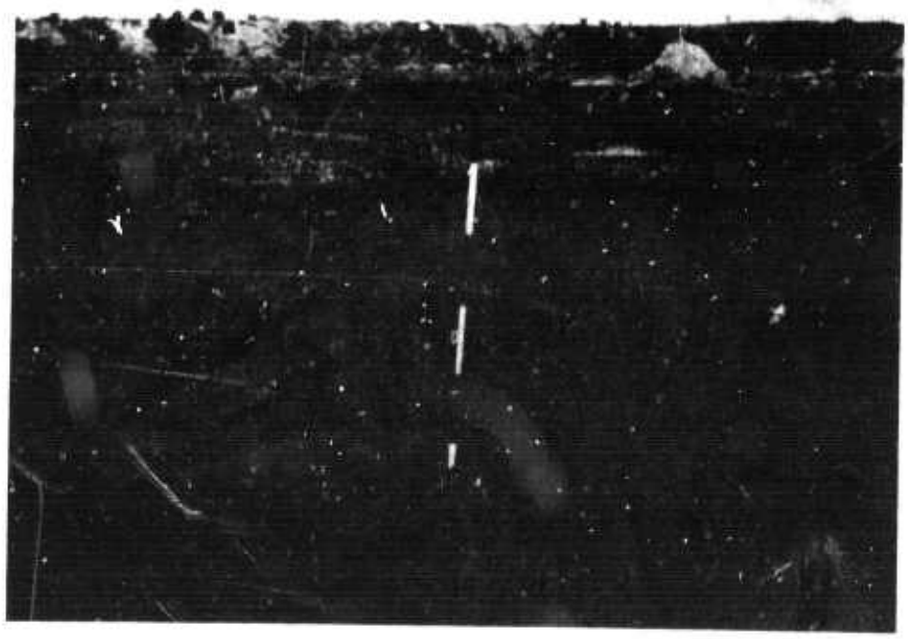
Photograph 3. Uniform, parallel rice bunds erected for vehicle testing near Khok Kathiem; Lop Buri study area



Photograph 4. Stereogram of rice bund at site SG-106, Pran Buri study area



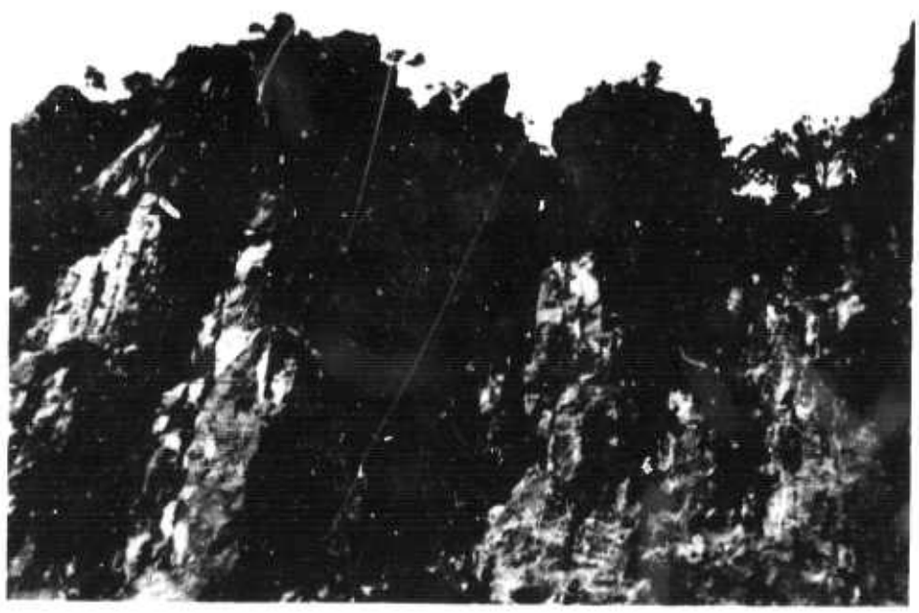
Photograph 5. Stereogram showing rice paddy cultivation with trees on termite mounds in background; Nakhon Sawan study area



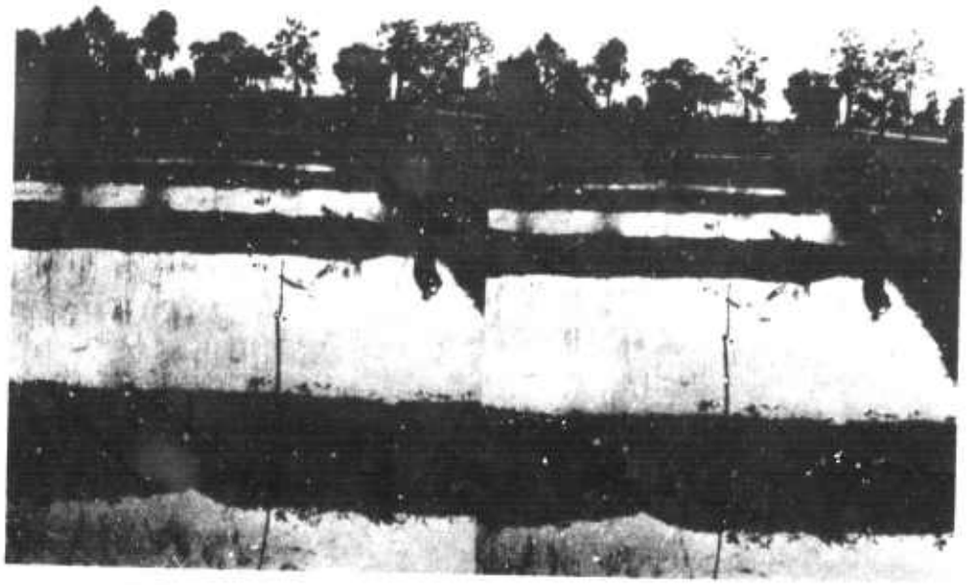
Photograph 6. Buffalo wallow about 1 ft deep near Khok Kathiem; Lop Buri study area. Although these wallows are common throughout Thailand, they rarely achieve a density that would retard vehicular movement



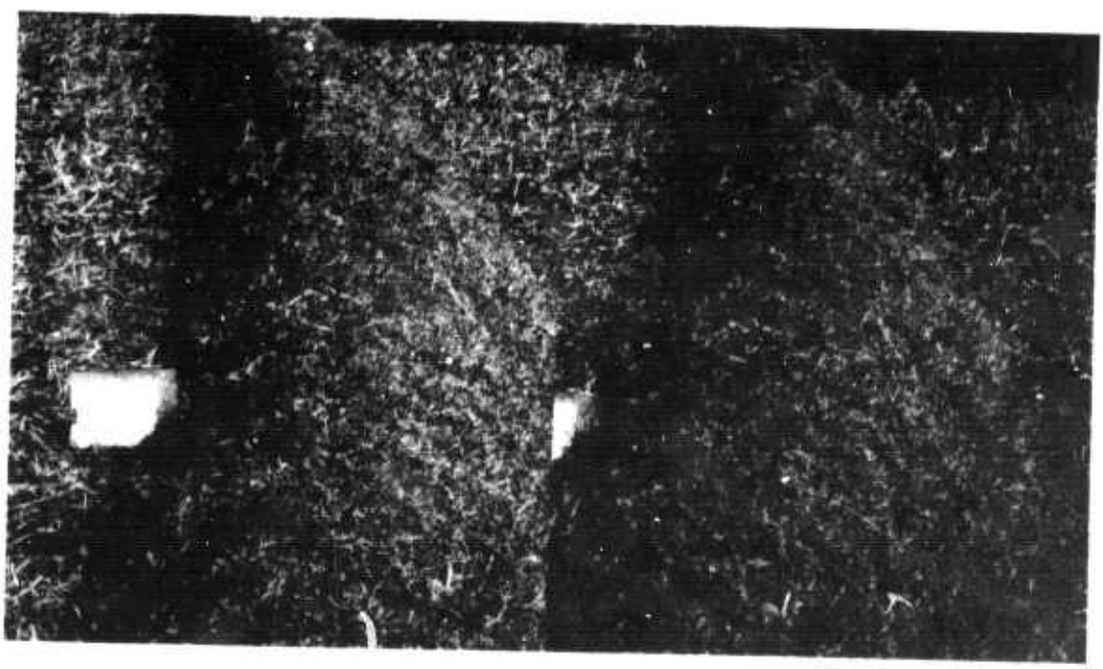
Photograph 7. Air photo of widely spaced rice-field bunds (more than 150 ft apart) in Nakhon Sawan study area. Irregularly spaced, dark, circular areas are vegetated termite mounds



Photograph 8. Typical face of a limestone ridge in Nakhon Sawan study area. Slope here exceeds 75 deg and would deny passage to either man or machine



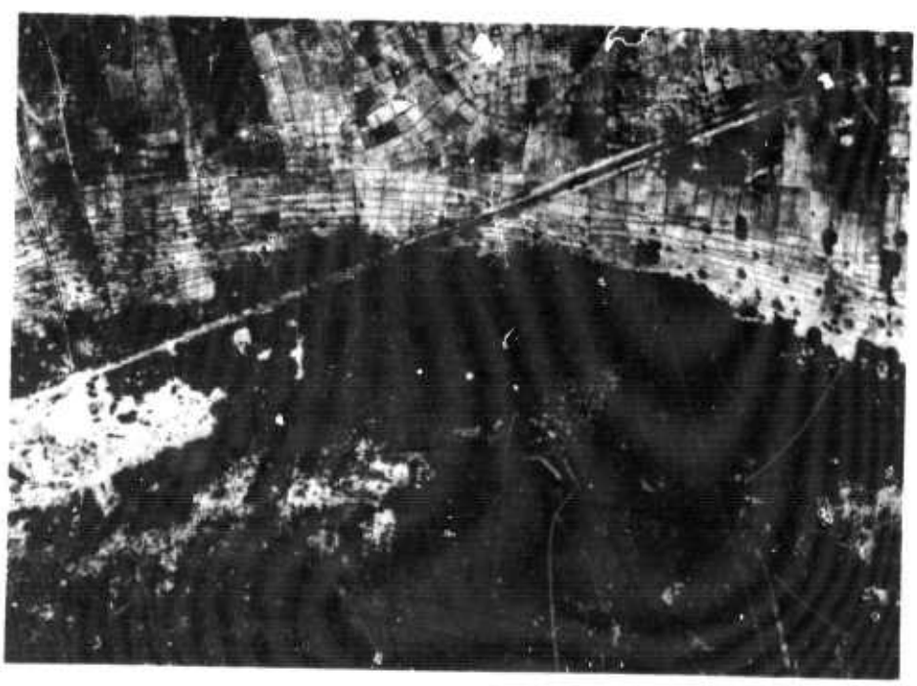
Photograph 9. Stereogram of terraced rice bunds on sloping terrain; Khon Kaen study area



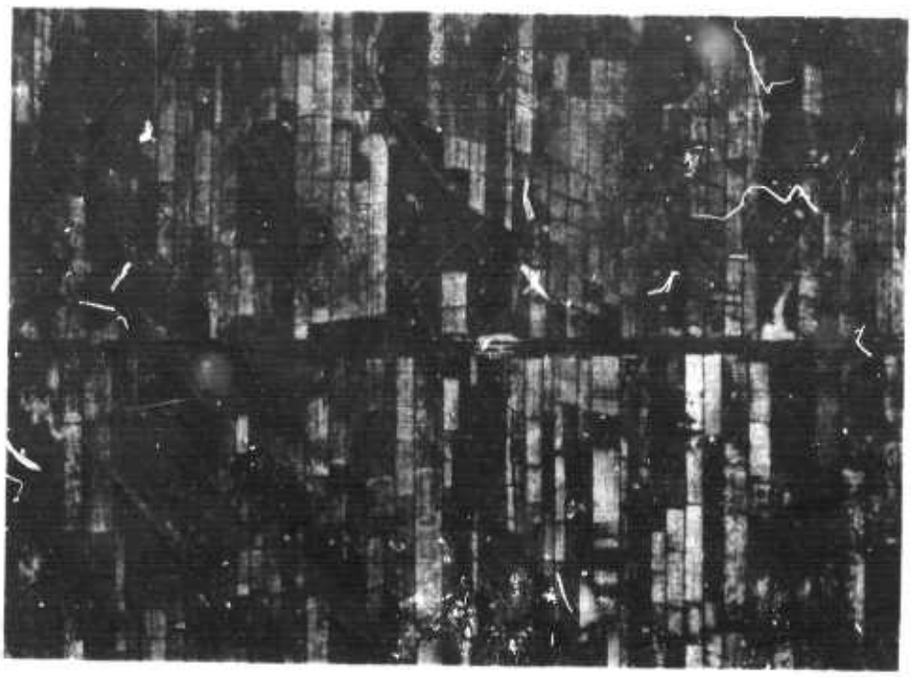
Photograph 10. Stereogram showing close-up of terraced rice bund; Khon Kaen study area. Note difference in elevation between opposite sides



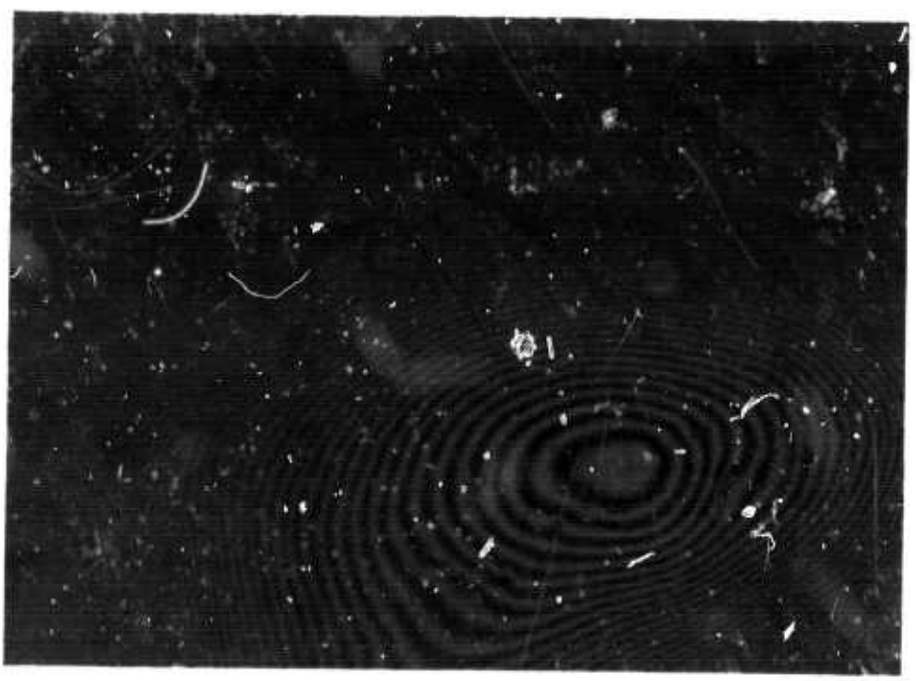
Photograph 11. Air photo of a sinuous abandoned stream channel in rice cultivation; Lop Buri study area. Bund linearity perpendicular to stream gradient is indicative of gentle terracing



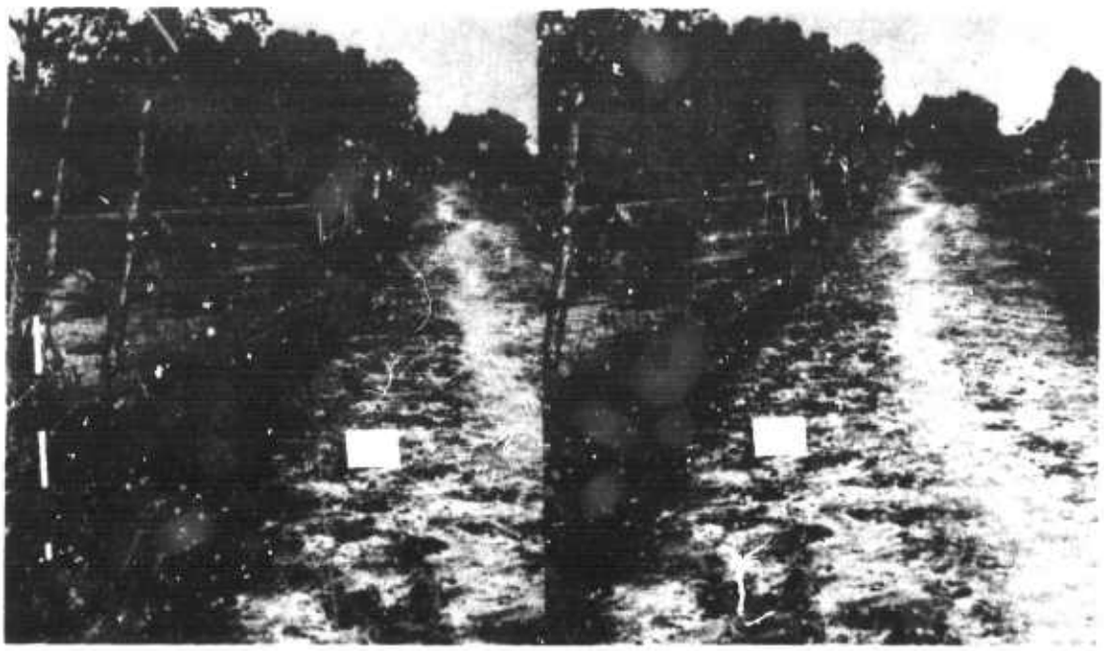
Photograph 12. Closely spaced, terraced rice paddies with parallel system of bunds perpendicular to transitional slope; Lop Buri study area



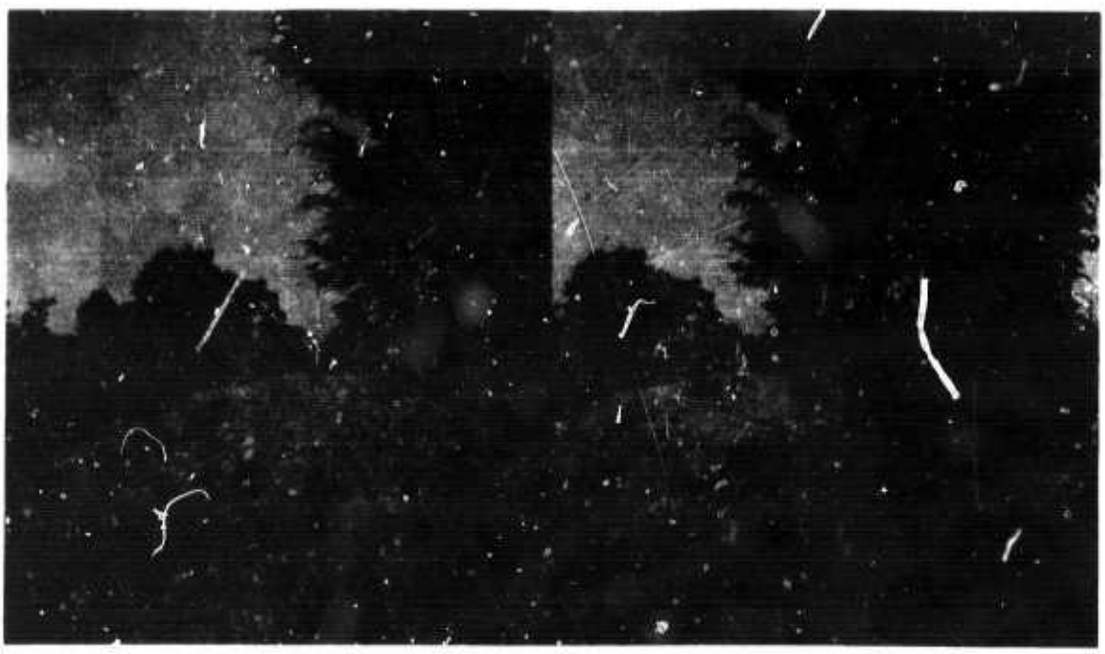
Photograph 13. Air photo of regular, parallel rice-field bunds, indicative of modern irrigation practices; Lop Buri study area. Rice dikes in such areas display only minor variation in their structural configurations



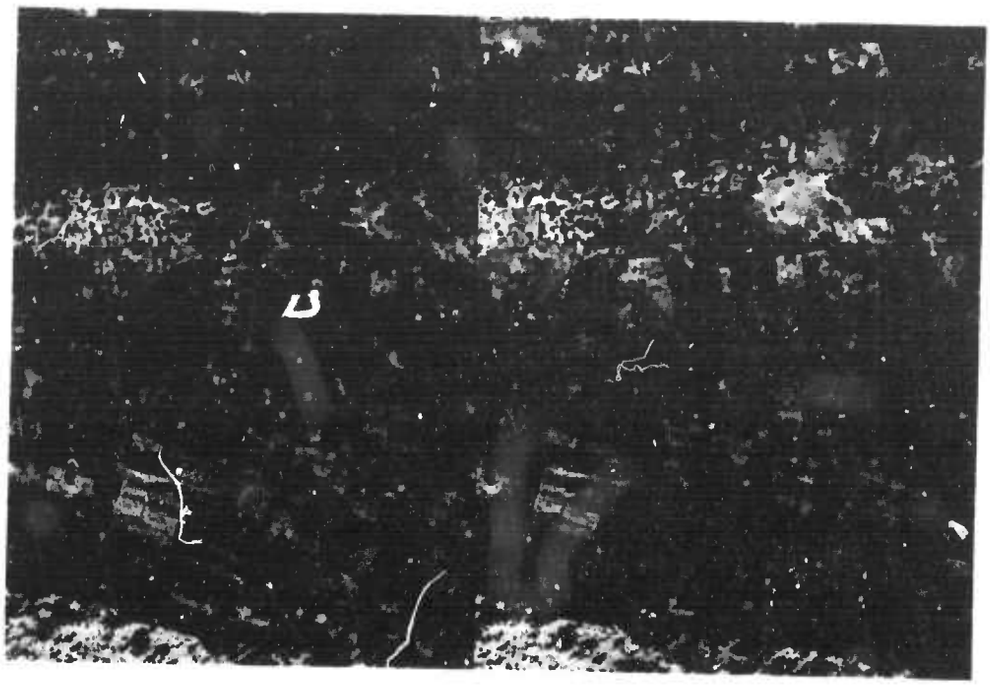
Photograph 14. Aerial view of rice cultivation in the Lop Buri study area. Irregular paddy configuration and dike orientation are suggestive of individual, traditional farming practices



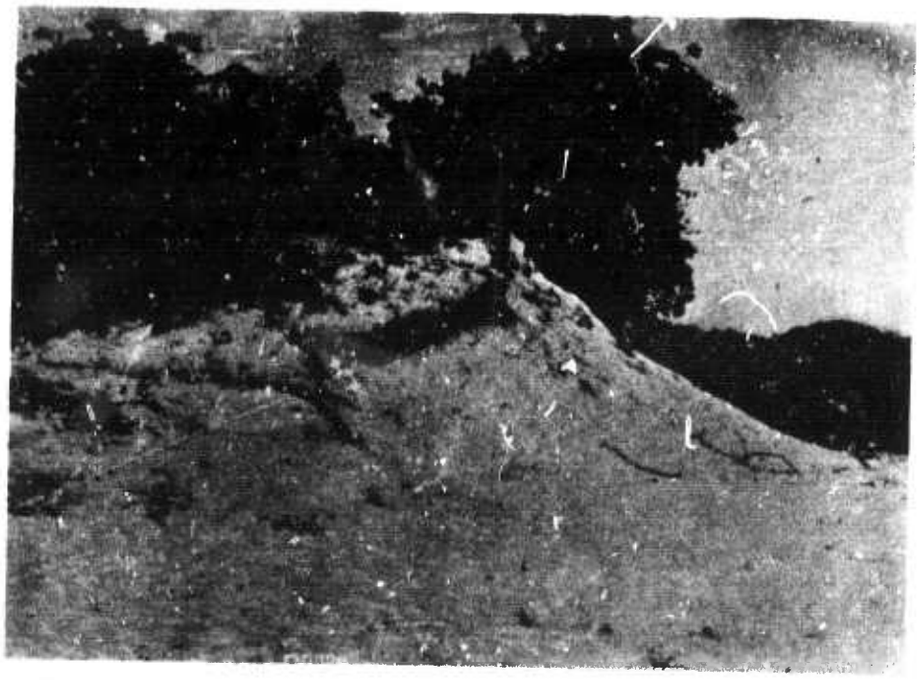
Photograph 15. Stereogram of road embankment built up over adjacent marsh near the coast; Chanthaburi study area. Palm vegetation is nipa



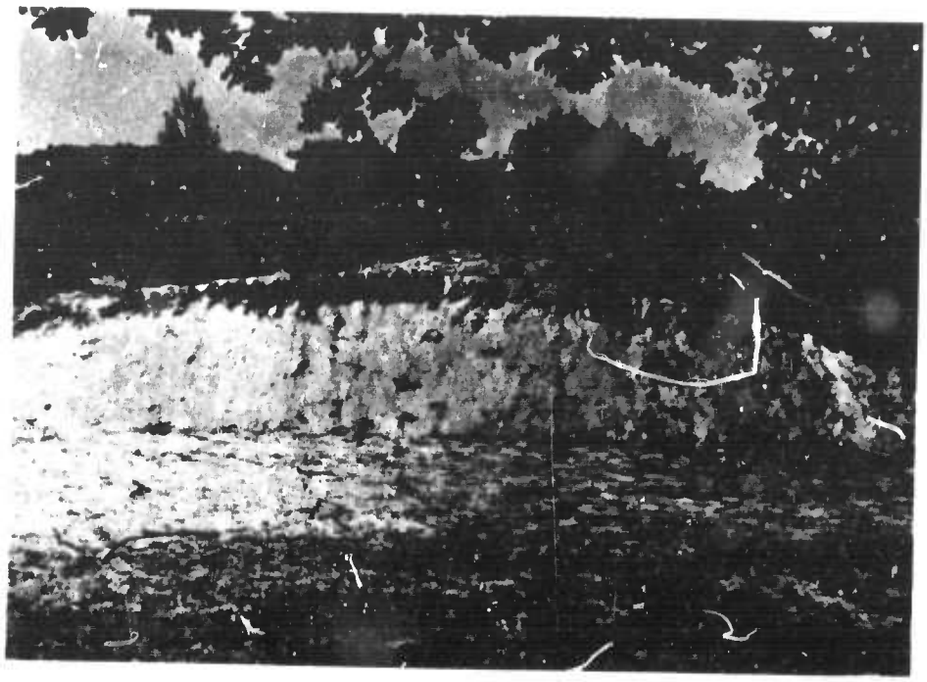
Photograph 16. Stereogram of termite mound surmounted by large tree in rice paddy area at site SG-11A; Khon Kaen study area



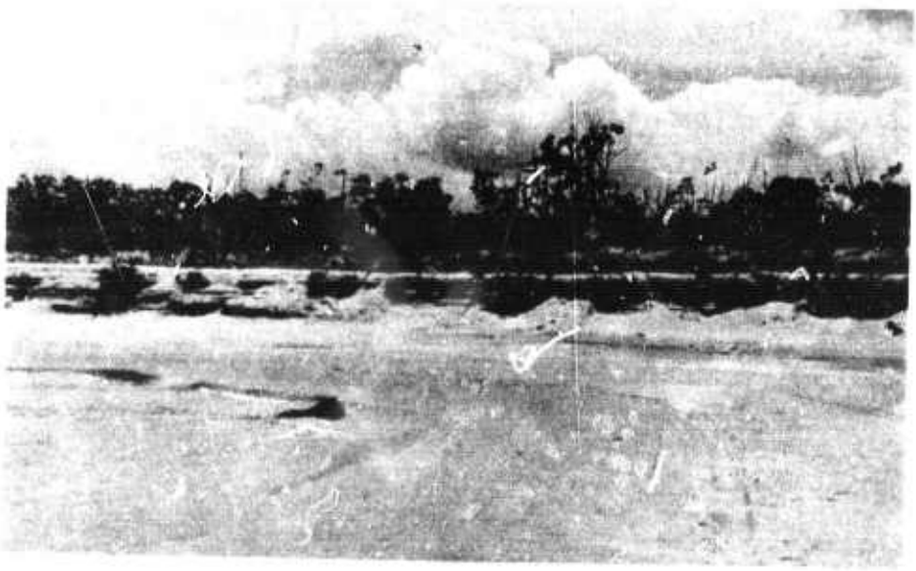
Photograph 17. Stereogram showing echeloned beach ridges paralleling shoreline; Pran Buri study area



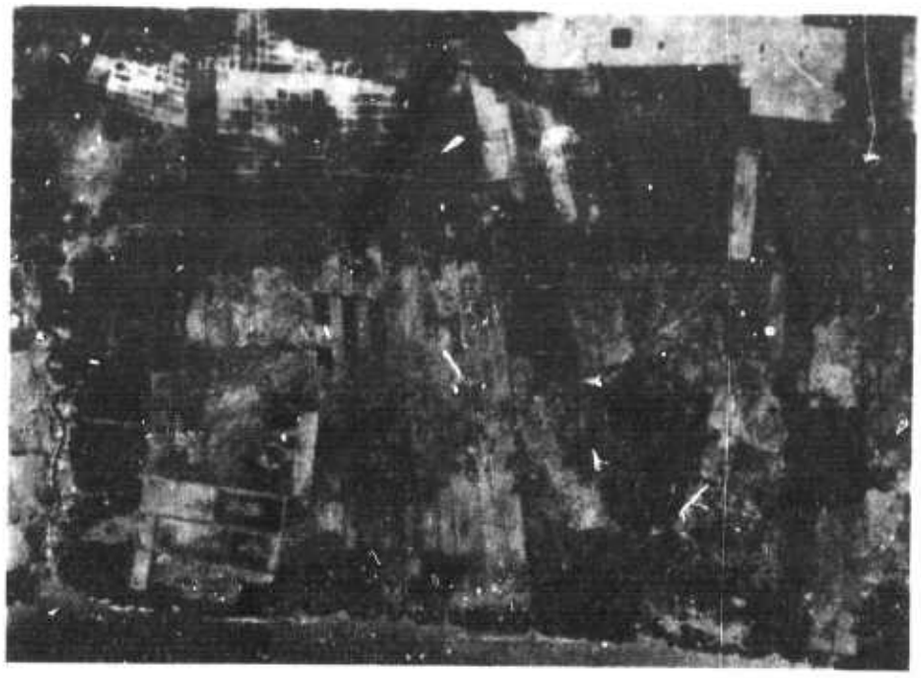
Photograph 18. Excavated portion of a transverse beach ridge; Pran Buri study area. Note comparative size of truck near right margin



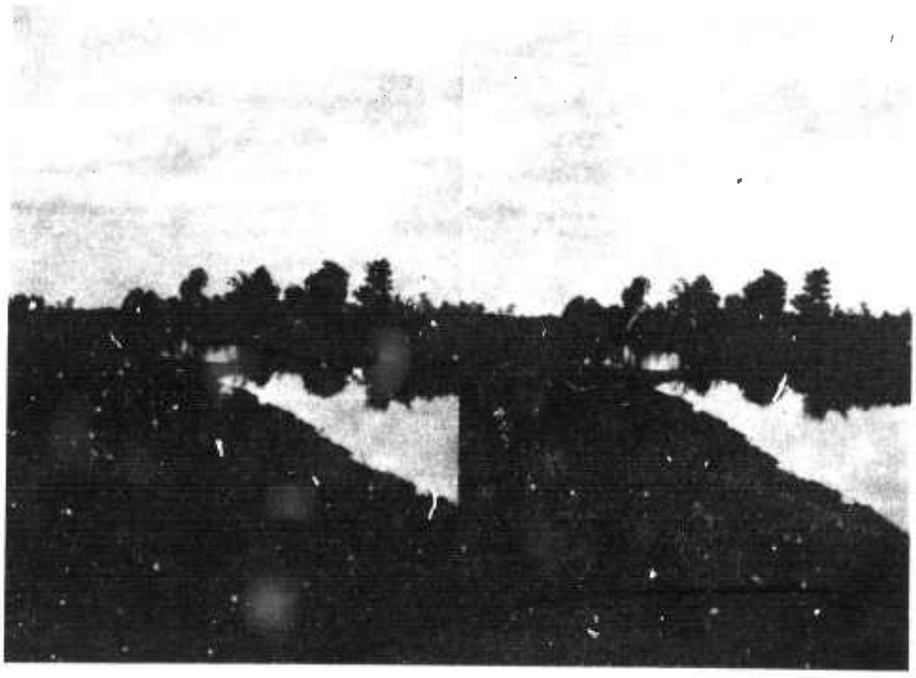
Photograph 19. Front view of a large transverse beach ridge; Pran Buri study area. The leeward side has become stabilized by scrub vegetation



Photograph 20. Series of beach terraces that frequent the sandy shorelines in the Pran Buri study area



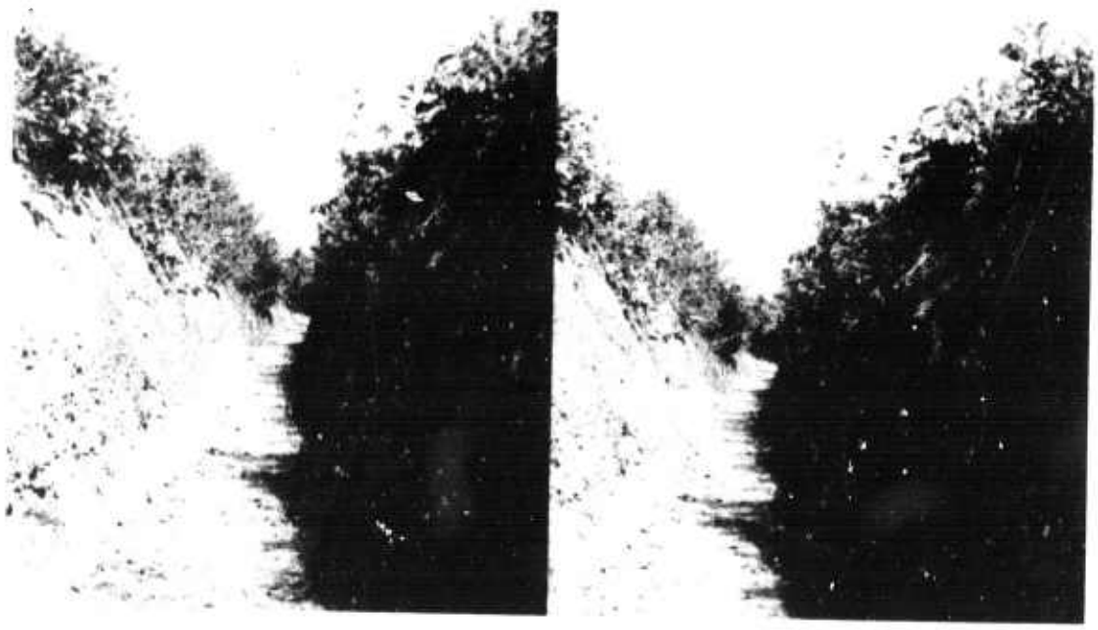
Photograph 21. Shrimp ponds along coast in Chanthaburi study area. These ponds are in many ways structurally similar to rice paddies and are inundated periodically by the sea



Photograph 22. Stereogram of typical road embankment-borrow pit complex at site SG-31, Khon Kaen study area



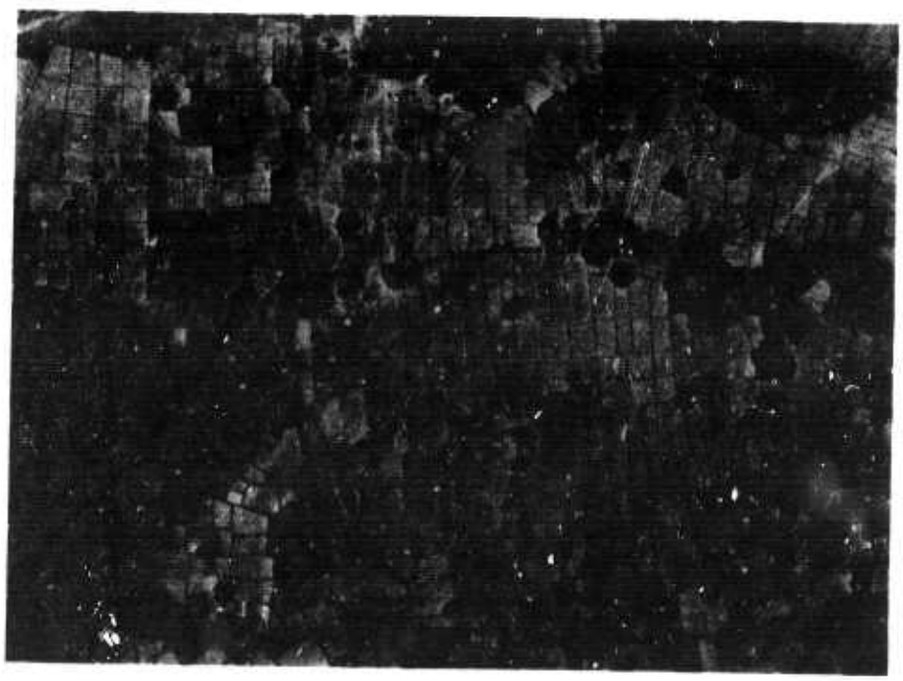
Photograph 23. Dry bed of an irrigation canal; Chiang Mai study area. Low confining dikes parallel both sides of the canal for control purposes



Photograph 24. Stereogram of the dry bed of an irrigation canal in the Chiang Mai study area. The almost vertical banks are approximately 6 ft high



Photograph 25. Youthful termite mound evidenced by fresh, steep slopes and absence of vegetation; Nakhon Sawan study area



Photograph 26. Air photo of uniform rice paddies exhibiting two-dimensional periodicity; Nakhon Sawan study area. Bunds here are characteristically 50 to 150 ft apart (map unit 4)

APPENDIX A: SURFACE GEOMETRY SUMMARY DATA AND SITE LOCATION MAPS

APPENDIX A: SURFACE GEOMETRY SUMMARY DATA AND SITE LOCATION MAPS

1. This appendix is subdivided into six sections, one for each of the study areas (Nakhon Sawan, Lop Buri, Chiang Mai, Pran Buri, Khon Kaen, and Chanthaburi). Each section contains (a) a table listing the location of each site in the study area and the date it was sampled, and (b) a table summarizing the surface geometry data collected at each site. In addition, each section contains a series of figures showing the location of each site by grid coordinates.

2. Symbols used in the tables and figures are listed below. Approach angle and step height measurements for typical borrow pits, road embankments, drainage ditches, and rice-field bunds are illustrated on the following page.

Symbol	Type of Feature
RB	Rice-field bunds
RE	Road embankment
BP	Borrow pit
TM	Termite mound
DD	Drainage ditch
RP	Random profile
LV	Levee
DP	Depression

Symbol	Type of Feature
SD	Sand dune
OR	Orchard or plantation
RV	Ravine
RRE	Railroad embankment
SCS	Stream cross section
EM	Unclassified mounds
TF	Vegetable garden

ANGLES 1, 4, 5, AND 8 SHOULD BE MEASURED AT THESE POINTS
ANGLES 2, 3, 6, AND 7 INDICATE AREAS WHERE CRITICAL ANGLE MEASUREMENTS SHOULD BE TAKEN.



ROADSIDE EXCAVATION (BORROW PIT) BP

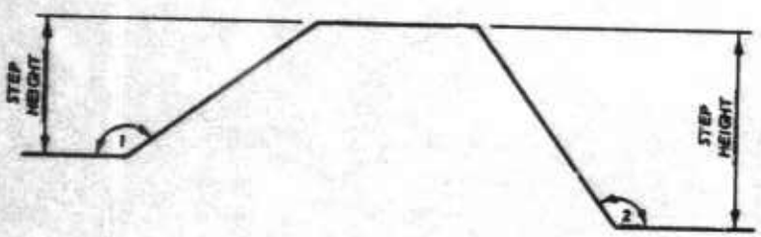


DRAINAGE DITCH DD

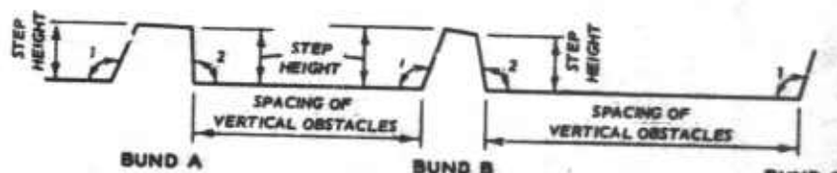


RICE BUNDS (SINGLE) RB (S)

A2



ROAD EMBANKMENT RE



RICE BUNDS (MULTIPLE) RB (M)

THE TERRAIN APPROACH ANGLE IS THE MOST CRITICAL ANGLE FORMED BY THE SLOPES BOUNDING A VERTICAL OBSTACLE AND THE VEHICLE CONTACT PLANE.

STEP HEIGHT IS THE VERTICAL DIMENSION OF THE MOST CRITICAL SLOPE SEGMENT BOUNDING A SURFACE GEOMETRY FEATURE.

Typical approach angle and step height measurements

NAKHON SAWAN STUDY AREA

Table A1

Surface Geometry Site Summation

Nakhon Sawan

Site No.	Location: Map Sheet*	Location: Grid Coordinates**	Fig. No.	Date Sampled
1-SG-1, 1A-1E	5058III	100396	A2	4 Aug 1964
1-SG-2, 2A-2C	4958II	018481	A1	23 July 1964
1-SG-3, 3A-3C	4958I	993585	†	23 July 1964
1-SG-4, 4A-4D	4958I	884667	†	23 July 1964
1-SG-5, 5A-5C	5057IV	254314	A5	22 July 1964
1-SG-6, 6A-6E	5057IV	253311	A5	22 July 1964
1-SG-7, 7A-7C	5057I	403285	A4	22 July 1964
1-SG-8, 8A-8D	5057I	525248	A4	22 July 1964
1-SG-9, 9A-9D	5057I	570223	A4	21 July 1964
1-SG-10, 10A-10C	5057I	576207	A4	21 July 1964
1-SG-11, 11A-11E	5057IV	239317	A5	7 Aug 1964
1-SG-12, 12A-12D	5057IV	207257	A5	1 Aug 1964
1-SG-13, 13A-13B	5057IV	207235	A5	1 Aug 1964
1-SG-14, 14A-14C	5057IV	209220	A5	7 Aug 1964
1-SG-15, 15A-15F	5057IV	214184	A5	7 Aug 1964
1-SG-16, 16B1-16B2	5057IV	213139	A5	5 Aug 1964
1-SG-17, 17A-17E	5057IV	245310	A5	5 Aug 1964
1-SG-18, 18A1-18A6	5057IV	235208	A5	3 Aug 1964
1-SG-18, 18B1-18B6	5057IV	234206	A5	3 Aug 1964
1-SG-19, 19A-19E	5057IV	248206	A5	4 Aug 1964
1-SG-20, 20A-20E	4958I	992522	†	18 Aug 1964
1-SG-21, 21A-21B	4958II	059430	A1	9 Aug 1964
1-SG-22, 22A-22E	4958II	038435	A1	9 Aug 1964
1-SG-23, 23A-23F	4958II	900426	A1	18 Aug 1964
1-SG-24, 24A-24E	4958II	866445	A1	8 Aug 1964
1-SG-25, 25A-25E	4958II	859431	A1	8 Aug 1964
1-SG-26, 26A-26C	4958II	860428	A1	8 Aug 1964
1-SG-27, 27A-27D	4958II	996446	A1	18 Aug 1964
1-SG-28, 28A-28E	5057IV	207251	A5	7 Aug 1964
1-SG-29, 29A-29H	5057IV	340288	A4	25 Aug 1964
1-SG-30, 30A-30H	5057IV	233145	A5	19 Aug 1964
1-SG-31	5057I	340288	A4	25 Aug 1964
1-SG-32	5057I	353287	A4	22 Aug 1964
1-SG-33, 33A-33B	5057I	353288	A4	21 Aug 1964
1-SG-34	5057I	403285	A4	21 Aug 1964
1-SG-35, 35A-35C	5057IV	337288	A5	25 Aug 1964
1-SG-36	5057I	386286	A4	22 Aug 1964
1-SG-38	5057I	399286	A4	22 Aug 1964
1-SG-39	5057I	473239	A4	22 Aug 1964
1-SG-40	5057I	492243	A4	22 Aug 1964
1-SG-41	5057I	498244	A4	22 Aug 1964
1-SG-42	5057I	517248	A4	22 Aug 1964
1-SG-43	4958II	010490	A1	26 Aug 1964
1-SG-44	4958II	008495	A1	26 Aug 1964
1-SG-45	4958II	003502	A1	26 Aug 1964
1-SG-46	4958II	003503	A1	25 Aug 1964
1-SG-47	4958I	996515	†	25 Aug 1964
1-SG-48, 48A-48E	4958I	966535	†	29 Aug 1964
1-SG-49, 49A-49E	4958I	989529	†	29 Aug 1964
1-SG-50, 50A-50E	4958I	988532	†	29 Aug 1964
1-SG-51, 51A-51D	4958I	982540	†	28 Aug 1964
1-SG-52, 52A-52D	4958I	980547	†	27 Aug 1964
1-SG-53, 53A-53C	4958I	958584	†	29 Aug 1964
1-SG-54, 54A-54C	4958I	950594	†	29 Aug 1964
1-SG-55, 55A-55C	4958I	926621	†	27 Aug 1964
1-SG-56, 56A-56D	4958I	901649	†	27 Aug 1964
1-SG-57	4958I	89[illegible]60	†	27 Aug 1964
1-SG-58	4958I	1[illegible]484	A2	29 Aug 1964
1-SG-59	5058III	152369	A2	29 Aug 1964
1-SG-60	5057I	408284	A4	30 Aug 1964
1-SG-61	5057I	411281	A4	30 Aug 1964

Note: Missing site numbers are the result of sites having been preselected and numbered but not sampled.

* AMS, L708, 1:50,000.

** Coordinates are set up according to the Military Grid System. The first three coordinate numbers represent longitude, and the second three numbers represent latitude.

† Site outside limits of figure.

Table A2

Summary of Surface Geometry Field Data

Bakhon Sawan

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type*	Critical Approach Angle (AA) and Step Height (SH)** 1† AA	1† SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
1-SG-1A	5058III	100396	1	RB	132	112	139	112												
			2		138	104	144	107												
			3		143	122	142	124												
1-SG-1B	5058III	100396	1	RB	119	84	110	77												
			2		111	86	112	89												
			3		120	96	115	94												
1-SG-1C	5058III	100396	1	RB	118	104	154	66												
			2		126	102	156	58												
			3		124	117	156	81												
1-SG-1D	5058III	100396	1	RB	146	119	119	86												
			2		130	122	112	84												
			3		122	122	125	81												
1-SG-1E	5058III	100396	1	RB	115	81	137	51												
			2		110	89	127	56												
			3		120	76	126	46												
1-SG-2A	4958II	018481	1	RB	109	46	114	53												
			2		135	43	118	56												
			3		128	53	123	56												
1-SG-2B	4958II	018481	1	RB	120	74	139	69												
			2		116	66	129	64												
			3		120	66	126	61												
1-SG-2C	4958II	018481	1	RB	136	53	117	46												
			2		125	53	141	48												
			3		127	51	135	38												
1-SG-3A	4958I	993585	1	RB	140	28	152	23												
			2		137	28	141	30												
			3		137	28	164	23												
1-SG-3B	4958I	993585	1	RB	114	28	150	23												
			2		142	20	143	25												
			3		134	23	135	25												
1-SG-3C	4958I	993585	1	RB	135	15	147	23												
			2		144	13	144	15												
			3		134	18	141	18												
1-SG-4A	4958I	884667	1	RB	142	36	130	38												
			2		140	41	138	41												
			3		120	38	127	36												
1-SG-4B	4958I	884667	1	RB	120	51	147	46												
			2		124	48	131	46												
			3		119	48	122	46												
1-SG-4C	4958I	884667	1	RB	137	33	137	33												
			2		118	28	129	28												
			3		133	38	137	38												
1-SG-4D	4958I	884667	1	RB	137	15	117	20												
			2		126	23	134	20												
			3		135	13	145	13												
1-SG-4-1††	4958I	884667	1	RB	147	36	107	38												
			2		141	36	113	36												
			3		140	41	147	53												
1-SG-4-2††	4958I	884667	1	RB	133	30	133	30												
			2		152	30	113	28												
			3		132	36	125	38												
1-SG-4-3††	4958I	884667	1	RB	127	38	132	43												
			2		127	36	108	46												
			3		125	36	115	41												

(Continued)

* Abbreviations used for feature types are defined on page A1.
** Approach angles (AA) are given in degrees and step heights (SH) are given in centimeters.
† For position of numerically designated approach angles and step heights see diagram on page A2.
†† Second visit to Site 4.

Table A2 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
1-SG-5A	5057IV	254314	1	RB	138	41	145	36												
			2		130	43	137	38												
			3		126	48	126	43												
1-SG-5B	5057IV	254314	1	RB	128	36	125	41												
			2		105	36	102	36												
			3		130	36	[illegible]	43												
1-SG-5C	5057IV	254314	1	RB	141	39	132	48												
			2		112	41	113	51												
			3		128	43	127	53												
1-SG-6A	5057IV	253311	1	RB	135	36	134	53												
			2		140	25	130	43												
			3		147	25	134	43												
1-SG-6B	5057IV	253311	1	RB	131	51	128	25												
			2		120	51	147	25												
			3		116	61	144	30												
1-SG-6C	5057IV	253311	1	RB	130	41	132	36												
			2		146	30	140	25												
			3		142	30	137	25												
1-SG-6D	5057IV	253311	1	RB	147	66	114	61												
			2		148	64	147	58												
			3		147	61	150	51												
1-SG-6E	5057IV	253311	1	RB	140	81	137	43												
			2		122	71	139	43												
			3		103	74	146	30												
1-SG-7A	5057I	403285	1	RB	140	20	152	20												
			2		142	20	129	20												
			3		145	20	151	20												
1-SG-7B	5057I	403285	1	RB	138	41	118	38												
			2		129	36	141	36												
			3		142	38	125	38												
1-SG-7C	5057I	403285	1	RB	130	36	141	30												
			2		134	36	132	30												
			3		141	30	134	25												
1-SG-8A	5057I	525248	1	RB	137	51	141	43												
			2		133	51	128	41												
			3		131	56	123	41												
1-SG-8B	5057I	525248	1	RB	136	46	134	58												
			2		135	46	139	60												
			3		135	46	131	56												
1-SG-8C	5057I	525248	1	RB	165	25	140	25												
			2		138	25	132	25												
			3		136	25	146	30												
1-SG-8D	5057I	525248	1	RB	124	48	138	64												
			2		138	41	140	[illegible]												
			3		141	46	134	[illegible]												
1-SG-9A	5057I	570223	1	RB	132	71	134	71												
			2		131	66	128	72												
			3		126	79	130	89												
1-SG-9B	5057I	570223	1	RB	145	46	124	46												
			2		125	48	146	46												
			3		129	53	140	56												
1-SG-9C	5057I	570223	1	RB	151	51	149	64												
			2		156	53	155	69												
			3		146	53	148	61												
1-SG-9D	5057I	570223	1	RB	[illegible]	56	144	61												
			2		39	56	141	56												
			3		140	53	141	58												

(Continued)

(2 of 10 sheets)

Table A2 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
1-SG-10A	5057I	576207	1	RB	123	48	144	46												
			2		136	51	140	51												
			3		120	46	95	48												
1-SG-10B	5057I	576207	1	RB	111	91	141	91												
			2		136	89	146	81												
			3		118	91	140	86												
1-SG-10C	5057I	576207	1	RB	162	30	156	25												
			2		149	25	148	36												
			3		155	30	152	30												
1-SG-11A	5057IV	239317	1	RB	134	61	133	36												
			2		144	51	146	30												
			3		139	51	148	30												
1-SG-11B	5057IV	239317	1	RB	144	51	144	48												
			2		143	58	140	48												
			3		144	61	139	51												
1-SG-11C	5057IV	239317	1	RB	137	51	146	41												
			2		117	56	146	36												
			3		146	43	137	33												
1-SG-11D	5057IV	239317	1	RB	144	46	126	41												
			2		133	53	121	46												
			3		146	51	121	46												
1-SG-11E	5057IV	239317	1	RB	137	41	143	25												
			2		151	28	140	20												
			3		142	41	155	30												
1-SG-12A	5057IV	207257	1	RB	148	46	152	30												
			2		146	43	130	30												
			3		137	38	150	33												
1-SG-12B	5057IV	207257	1	RB	156	36	133	36												
			2		124	41	123	43												
			3		135	43	141	41												
1-SG-12C	5057IV	207257	1	RB	131	41	143	48												
			2		126	46	137	66												
			3		120	48	120	48												
1-SG-12D	5057IV	207257	1	RB	131	43	142	41												
			2		152	51	136	56												
			3		155	51	140	51												
1-SG-13A	5057IV	207235	1	RB	152	36	150	30												
			2		140	38	142	28												
			3		130	36	137	28												
1-SG-13B	5057IV	207235	1	RB	152	30	134	30												
			2		134	25	155	36												
			3		133	36	147	41												
1-SG-14A	5057IV	209220	1	RB	144	102	145	134												
			2		148	97	142	107												
			3		136	102	142	122												
1-SG-14B	5057IV	209220	1	RB	142	102	144	117												
			2		135	99	141	107												
			3		136	107	131	117												
1-SG-14C	5057IV	209220	1	RB	147	117	161	43												
			2		149	119	153	53												
			3		150	119	155	56												
1-SG-15A	5057IV	214184	1	RB	116	30	132	30												
			2		112	25	145	30												
			3		130	38	167	20												
1-SG-15B	5057IV	214184	1	RB	131	41	132	33												
			2		135	41	149	25												
			3		125	38	143	30												

(Continued)

Table A2 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
1-SG-15C	5057IV	214184	1	RB	139	46	151	25												
			2		149	41	153	20												
			3		137	41	142	25												
1-SG-15D	5057IV	214184	1	RB	142	41	125	30												
			2		140	41	134	30												
			3		132	41	116	30												
1-SG-15E	5057IV	214184	1	RB	115	61	107	36												
			2		124	61	136	41												
			3		133	66	104	36												
1-SG-15F	5057IV	214184	1	RB	120	56	146	36												
			2		113	61	133	36												
			3		122	66	148	38												
1-SG-16B1*	5057IV	213139	1	RB	143	36	153	25												
			2		142	33	146	28												
			3		134	28	154	28												
1-SG-16B2*	5057IV	213139	1	RB	140	33	150	36												
			2		146	30	153	38												
			3		140	36	140	46												
1-SG-17A	5057IV	245310	1	RB	163	38	153	33												
			2		161	36	150	25												
			3		164	30	162	22												
1-SG-17B	5057IV	245310	1	RB	114	33	139	30												
			2		130	30	136	33												
			3		121	33	148	36												
1-SG-17C	5057IV	245310	1	RB	132	30	145	23												
			2		130	41	143	33												
			3		141	48	121	43												
1-SG-17D	5057IV	245310	1	RB	132	36	134	33												
			2		146	30	145	36												
			3		134	36	128	30												
1-SG-17E	5057IV	245310	1	RB	132	30	158	30												
			2		144	30	156	30												
			3		136	20	149	20												
1-SG-18A-1	5057IV	235208	1	RB	114	109	136	61												
			2		127	114	146	61												
			3		134	109	142	66												
1-SG-18A-2	5057IV	235208	1	RB	143	33	105	46												
			2		131	36	109	58												
			3		134	43	117	61												
1-SG-18A-3	5057IV	235208	1	RB	115	71	147	33												
			2		113	61	123	36												
			3		130	61	134	31												
1-SG-18A-4	5057IV	235208	1	RB	137	36	149	20												
			2		135	51	121	20												
			3		130	56	118	25												
1-SG-18A-5	5057IV	235208	1	RB	140	41	140	36												
			2		142	41	140	30												
			3		131	41	130	30												
1-SG-18A-6	5057IV	235208	1	RB	136	66	115	53												
			2		133	58	126	41												
			3		133	56	120	46												
1-SG-18B-1	5057IV	234206	1	RB	140	61	132	36												
			2		120	66	123	46												
			3		116	71	131	46												
1-SG-18B-2	5057IV	234206	1	RB	152	46	137	66												
			2		122	53	136	74												
			3		134	46	127	66												

(Continued)

* This area is directly across highway from area 6.

(4 of 10 sheets)

Table A2 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
1-SG-18B-3	5057IV	234206	1	RB	111	53	120	51												
			2		116	48	126	46												
			3		140	51	124	41												
1-SG-18B-4	5057IV	234206	1	RB	130	58	120	41												
			2		125	56	116	41												
			3		137	61	121	36												
1-SG-18B-5	5057IV	234206	1	RB	135	66	124	46												
			2		137	61	133	41												
			3		132	61	135	56												
1-SG-18B-6	5057IV	234206	1	RB	135	51	143	38												
			2		131	46	150	41												
			3		129	46	134	41												
1-SG-19A	5057IV	248206	1	RB	125	33	119	61												
			2		136	30	123	43												
			3		135	30	134	48												
1-SG-19B	5057IV	248206	1	RB	145	25	141	46												
			2		140	20	140	41												
			3		144	25	128	46												
1-SG-19C	5057IV	248206	1	RB	137	48	136	28												
			2		144	51	133	30												
			3		149	51	139	30												
1-SG-19D	5057IV	248206	1	RB	137	51	138	30												
			2		118	41	121	30												
			3		120	38	157	20												
1-SG-19E	5057IV	248206	1	RB	138	30	135	41												
			2		134	36	141	38												
			3		137	30	131	41												
1-SG-20A	4958I	992522	1	RB	129	20	149	20												
			2		121	36	121	36												
			3		124	38	145	30												
1-SG-20B	4958I	992522	1	RB	121	36	111	36												
			2		126	36	123	25												
			3		138	25	130	30												
1-SG-20C	4958I	9925?	1	RB	111	25	137	30												
			2		130	33	141	20												
			3		130	30	130	20												
1-SG-20D	4958I	992522	1	RB	133	25	127	25												
			2		149	25	130	25												
			3		117	25	112	33												
1-SG-20E	4958I	992522	1	RB	141	30	141	30												
			2		143	23	137	33												
			3		152	25	136	36												
1-SG-21A	4958II	059430	1	RB	133	41	147	30												
			2		133	36	158	30												
			3		113	41	157	41												
1-SG-21B	4958II	059430	1	RB	136	20	138	20												
			2		127	20	127	25												
			3		130	20	145	23												
1-SG-22A	4958II	038435	1	RB	114	38	135	30												
			2		113	36	143	20												
			3		117	30	144	23												
1-SG-22B	4958II	038435	1	RB	125	20	136	30												
			2		133	20	144	25												
			3		142	25	140	20												
1-SG-22C	4958II	038435	1	RB	105	33	116	36												
			2		99	33	105	36												
			3		100	33	121	36												

(Continued)

Table A2 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
1-SG-22D	4958II	038435	1	RB	132	56	110	71												
			2		127	53	112	69												
			3		123	51	118	69												
1-SG-22E	4958II	038435	1	RB	117	41	113	51												
			2		125	41	124	46												
			3		129	36	116	41												
1-SG-23A	4958II	900426	1	RB	110	41	112	38												
			2		111	38	132	36												
			3		105	41	105	33												
1-SG-23B	4958II	900426	1	RB	119	48	121	46												
			2		116	46	127	41												
			3		124	41	117	41												
1-SG-23C	4958II	900426	1	RB	121	41	128	38												
			2		122	43	134	38												
			3		128	43	100	36												
1-SG-23D	4958II	900426	1	RB	129	41	113	48												
			2		135	38	105	56												
			3		121	36	103	43												
1-SG-23E	4958II	900426	1	RB	116	86	113	86												
			2		117	79	116	64												
			3		110	66	115	66												
1-SG-23F	4958II	900426	1	RB	130	38	130	41												
			2		124	41	125	41												
			3		133	53	121	51												
1-SG-24A	4958II	866445	1	RB	113	27	124	31												
			2		119	36	120	36												
			3		115	38	128	33												
1-SG-24B	4958II	866445	1	RB	130	30	135	36												
			2		121	30	132	30												
			3		122	33	139	28												
1-SG-24C	4958II	866445	1	RB & DD	125	25	115	51	110	46	145	25								
			2		136	23	120	48	111	41	142	23								
			3		132	30	137	51	111	38	137	28								
1-SG-24D	4958II	866445	1	RB	127	36	127	38												
			2		124	33	123	33												
			3		122	36	133	33												
1-SG-24E	4958II	866445	1	RB	132	23	131	23												
			2		133	20	137	20												
			3		136	23	148	20												
1-SG-25A	4958II	859431	1	RB	137	43	125	38												
			2		136	41	135	36												
			3		138	41	120	36												
1-SG-25B	4958II	859431	1	RB	147	20	156	20												
			2		136	20	152	28												
			3		156	25	132	30												
1-SG-25C	4958II	859431	1	RB	122	76	127	76												
			2		135	91	129	71												
			3		133	69	126	69												
1-SG-25D	4958II	859431	1	RB	132	71	110	74												
			2		131	74	125	79												
			3		144	69	142	76												
1-SG-25E	4958II	859431	1	RB	142	76	126	81												
			2		126	76	103	89												
			3		130	81	132	81												
1-SG-26A	4958II	860428	1	RB	117	38	122	20												
			2		126	25	141	15												
			3		109	25	136	23												

(Continued)

Table A2 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
1-SG-26B	4958II	860428	1	RB	120	33	144	30												
			2		106	41	121	25												
			3		107	41	118	28												
1-SG-26C	4958II	860428	1	RB	118	25	118	28												
			2		128	23	131	20												
			3		134	28	137	30												
1-SG-27A	4958II	996446	1	RB	148	36	129	36												
			2		148	33	149	33												
			3		142	30	142	30												
1-SG-27B	4958II	996446	1	RB	11[illegible]	33	134	30												
			2		140	28	140	28												
			3		121	30	148	25												
1-SG-27C	4958II	996446	1	RB	134	20	148	25												
			2		143	25	164	28												
			3		146	20	132	25												
1-SG-27D	4958II	996446	1	RB	136	25	151	36												
			2		135	28	157	25												
			3		135	23	136	36												
1-SG-28A	5057IV	207251	1	RB	129	25	141	76												
			2		130	25	152	76												
			3		142	25	132	71												
1-SG-28B	5057IV	207251	1	RB	146	36	144	86												
			2		142	36	131	81												
			3		146	36	133	76												
1-SG-28C	5057IV	207251	1	RB	132	41	137	56												
			2		128	41	137	51												
			3		133	36	132	56												
1-SG-28D	5057IV	207251	1	RB	135	33	134	56												
			2		144	36	119	46												
			3		131	36	124	51												
1-SG-28E	5057IV	207251	1	RB	146	53	133	43												
			2		119	51	149	46												
			3		142	51	152	48												
1-SG-29A	5057IV	340288	1	RB	139	53	144	66												
			2		148	61	132	66												
1-SG-29B	5057IV	340288	1	RB	122	69	113	69												
			2		130	53	120	53												
1-SG-29C	5057IV	340288	1	RB	140	38	137	38												
			2		151	23	141	33												
1-SG-29D	5057IV	340288	1	RB	152	53	155	46												
			2		167	58	130	48												
1-SG-29E	5057IV	340288	1	RB	142	38	131	46												
			2		132	25	135	36												
1-SG-29F	5057IV	340288	1	TM	154	86	168	102												
			2		135	86	143	102												
			3		134	61	164	76												
1-SG-29G	5057IV	340288	1	TM	138	61	152	61												
			2		129	142	129	132												
			3		130	84	140	91												
1-SG-29H	5057IV	340288	1	TM	149	145	174	130												
			2		152	198	164	152												
			3		152	152	167	132												
1-SG-30A	5057IV	233145	1	RB	137	76	135	56												
			2		122	81	135	61												
			3		136	84	137	61												

(Continued)

Table A2 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
1-SG-30B	5057IV	233145	1	RB	140	36	128	46												
			2		132	30	148	46												
			3		138	30	128	46												
1-SG-30C	5057IV	233145	1	RB	137	56	138	71												
			2		133	56	140	71												
			3		144	51	143	66												
1-SG-30D	5057IV	233145	1	RB	160	51	136	66												
			2		151	53	133	66												
			3		136	53	135	61												
1-SG-30E	5057IV	233145	1	RB	128	38	127	51												
			2		133	30	117	51												
			3		147	36	128	30												
1-SG-30F	5057IV	233145	1	RB	130	66	133	38												
			2		122	71	140	46												
			3		129	66	118	30												
1-SG-30G	5057IV	233145	1	RB	138	76	138	66												
			2		138	61	130	66												
			3		126	56	144	58												
1-SG-30H	5057IV	233145	1	RB	167	41	125	58												
			2		150	38	130	46												
			3		167	30	128	46												
1-SG-31	5057I	340288	1	RE	163	147	163	147												
			2		163	157	163	132												
1-SG-32	5057I	353287	1	RE	167	122	158	107												
			2		169	147	168	102												
1-SG-33A	5057I	353288	1	TM	167	122	171	81												
			2		166	152	168	142												
			3		162	137	157	147												
1-SG-33B	5057I	353288	1	TM	171	122	173	117												
			2		165	193	170	183												
			3		170	168	166	163												
1-SG-34	5057I	403285	1	RE	165	188	163	127												
			2		164	183	150	172												
1-SG-35A	5057IV	337288	1	TM	152	86	163	91												
			2		156	117	160	117												
			3		155	112	167	112												
1-SG-35B	5057IV	337288	1	TM	163	91	168	91												
			2		115	119	165	109												
			3		165	117	168	91												
1-SG-35C	5057IV	337288	1	TM	167	109	165	91												
			2		163	173	164	91												
			3		166	152	158	175												
1-SG-36	5057I	386286	1	BP	201	76	160		156		204	102								
			2		193	51	162		153		200	102								
1-SG-38	5057I	399286	1	BP	212	142	161		159		204	284								
			2		199	127	159		155		205	244								
1-SG-39	5057I	473239	1	BP	232	193	157		158		206	183	214	132	154		153		227	102
			2		237	173	131		153		193	183	202	122	171		150		217	107
1-SG-40	5057I	492243	1	RE	173	173	180	102												
			2		166	152	173	97												
1-SG-41	5057I	498244	1	RE	172	137	165	102												
			2		169	127	169	97												
1-SG-42	5057I	517248	1	RE	170	127	168	94												
			2		165	127	159	91												

(Continued)

Table A2 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
1-SG-43	4958II	010490	1	BP	200	178	164		151		206	132								
			2		194	173	175		171		192	107								
1-SG-44	4958II	008495	1	BP	187	69	169		172		195	137	189	137	155		170		168	53
			2		170	61	173		169		191	137	193	147	169		170		193	46
1-SG-45	4958II	003502	1	BP	152		143	53	168		194	114	190	145	172		148	84	156	
			2		143		153	51	169		194	114	189	130	172		154	76	153	
1-SG-46	4958II	003503	1	BP	145		132	53	163		193	84	204	107	158		155	69	149	
			2		164		142		171		187	99	196	100	170		155	53	123	
1-SG-47	4958I	996515	1	BP	184	38	175		164		194	107	188	168	168		163		197	61
			2		188	30	173		163		195	122	193	123	164		163		195	18
1-SG-48A	4958I	986535	1	RB	146	64	134	71												
			2		130	61	148	64												
1-SG-48B	4958I	986535	1	RB	141	48	134	48												
			2		143	58	154	61												
1-SG-48C	4958I	986535	1	RB	137	58	142	58												
			2		123	56	116	56												
1-SG-48D	4958I	986535	1	RB	149	51	119	48												
			2		135	61	133	58												
1-SG-48E	4958I	986535	1	RB	127	66	124	66												
			2		126	61	139	64												
1-SG-49A	4958I	989529	1	RB	160	46	143	43												
			2		176	64	142	43												
1-SG-49B	4958I	989529	1	RB	129	46	125	43												
			2		140	41	140	43												
1-SG-49C	4958I	989529	1	RB	139	46	140	56												
			2		136	48	145	64												
1-SG-49D	4958I	989529	1	RB	135	56	140	46												
			2		143	46	105	64												
1-SG-49E	4958I	989529	1	RB	134	56	124	46												
			2		137	46	130	46												
1-SG-50A	4958I	988532	1	RB	140	48	140	56												
			2		137	46	121	66												
1-SG-50B	4958I	988532	1	RB	120	51	135	51												
			2		129	46	121	48												
1-SG-50C	4958I	988532	1	RB	126	43	112	46												
			2		113	41	138	43												
1-SG-50D	4958I	988532	1	RB	134	51	115	46												
			2		135	43	137	43												
1-SG-50E	4958I	988532	1	RB	121	51	123	48												
			2		128	51	128	56												
1-SG-51A	4958I	982540	1	RB	125	91	137	71												
			2		120	107	122	76												
1-SG-51B	4958I	982540	1	RB	135	36	130	33												
			2		138	41	127	48												
1-SG-51C	4958I	982540	1	RB	136	58	128	36												
			2		131	64	120	48												
1-SG-51D	4958I	982540	1	RB	128	61	126	48												
			2		113	41	129	36												
1-SG-52A	4958I	980547	1	RB	152	79	144	81												
			2		153	66	129	58												
1-SG-52B	4958I	980547	1	RB	142	64	125	[illegible]												
			2		137	66	131	71												

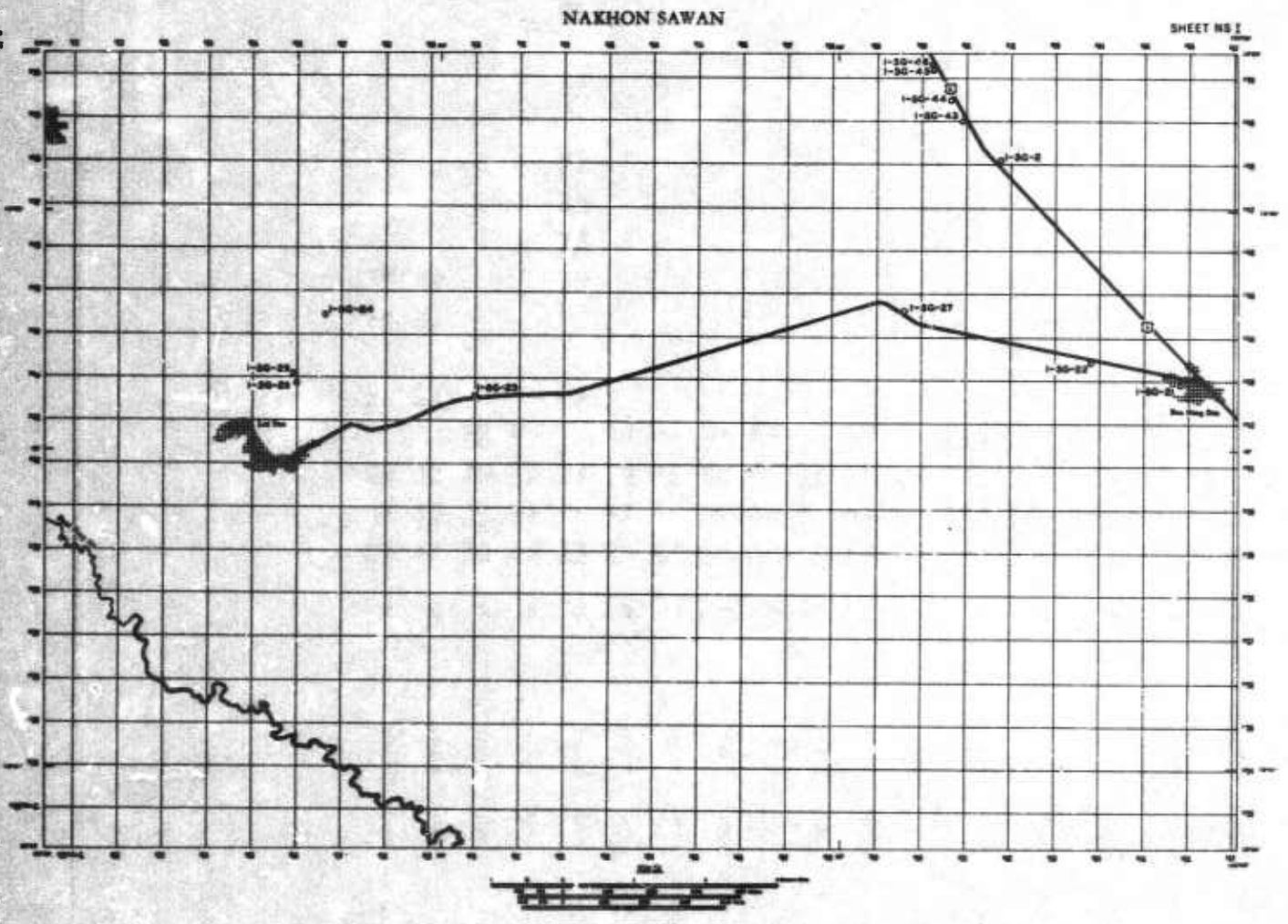
(Continued)

Table A2 (Concluded)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
1-SG-52C	4958I	980547	1	RB	110	48	117	56												
			2		135	46	116	51												
1-SG-52D	4958I	980547	1	RB	125	51	136	56												
			2		123	51	122	56												
1-SG-53A	4958I	958584	1	RB	170	153	170	168												
			2		170	183	170	196												
			3		172	198	154	239												
			4		162	193	172	178												
1-SG-53B	4958I	958584	1	TM	154	137	172	173												
			2		170	198	165	236												
			3		176	152	164	206												
1-SG-53C	4958I	958584	1	TM	169	213	173	193												
			2		173	234	163	260												
			3		159	239	170	249												
1-SG-54A	4958I	950594	1	TM	174	251	166	267												
			2		168	267	172	282												
			3		172	249	173	254												
1-SG-54B	4958I	950594	1	TM	172	287	170	305												
			2		160	282	153	290												
			3		168	152	172	167												
1-SG-54C	4958I	950594	1	TM	163	274	171	287												
			2		175	259	174	259												
			3		171	191	169	196												
1-SG-55A	4958I	926621	1	TM	142	51	130	46												
			2		137	56	127	56												
1-SG-55B	4958I	926621	1	RB	135	41	131	43												
			2		132	36	141	46												
1-SG-55C	4958I	926621	1	RB	123	36	130	28												
			2		132	36	150	41												
1-SG-56A	4958I	901649	1	RB	148	28	126	33												
			2		123	25	133	25												
1-SG-56B	4958I	901649	1	RB	137	28	133	36												
			2		140	20	142	25												
1-SG-56C	4958I	901649	1	RB	117	30	135	36												
			2		115	30	137	36												
1-SG-56D	4958I	901649	1	RB	137	25	122	25												
			2		120	25	123	25												
1-SG-57	4958I	891660	1	BP	185	46	174		167		193	168	188	191	164		157		200	91
			2		185	48	175		165		185	175	197	193	160		164		195	84
1-SG-58	4958II	014484	1	RE	160	160	163	137												
			2		160	168	165	99												
1-SG-59	5058III	152369	1	RE	165	290	165	328												
			2		173	236	165	320												
1-SG-60	5057I	408284	1	BP	190	183	176		173		192	168								
			2		190	157	176		173		192	152								
1-SG-61	5057I	411261	1	BP	200	51	152		164		190	86								
			2		204	71	142		157		183	76								

(10 of 10 sheets)

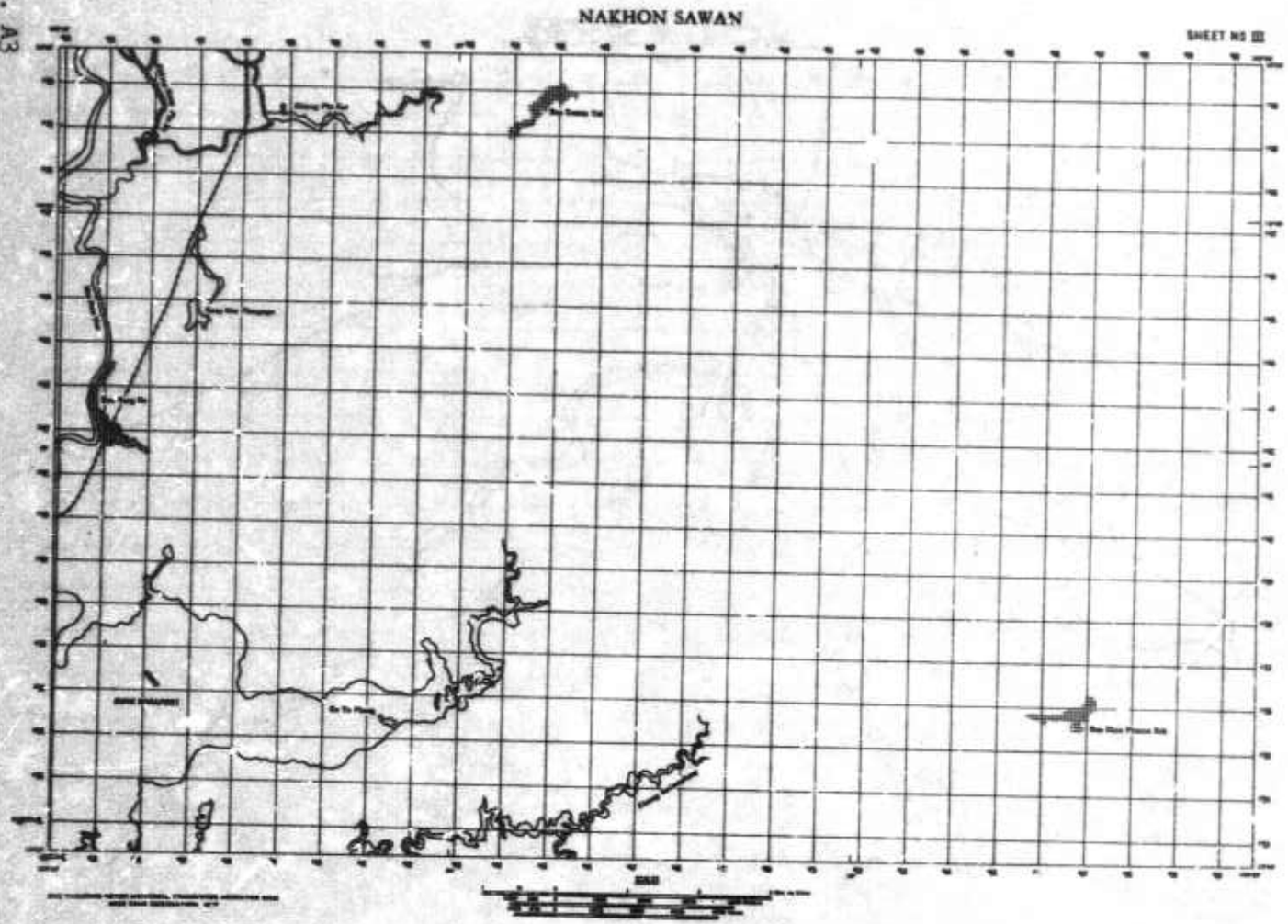
FIG. A1



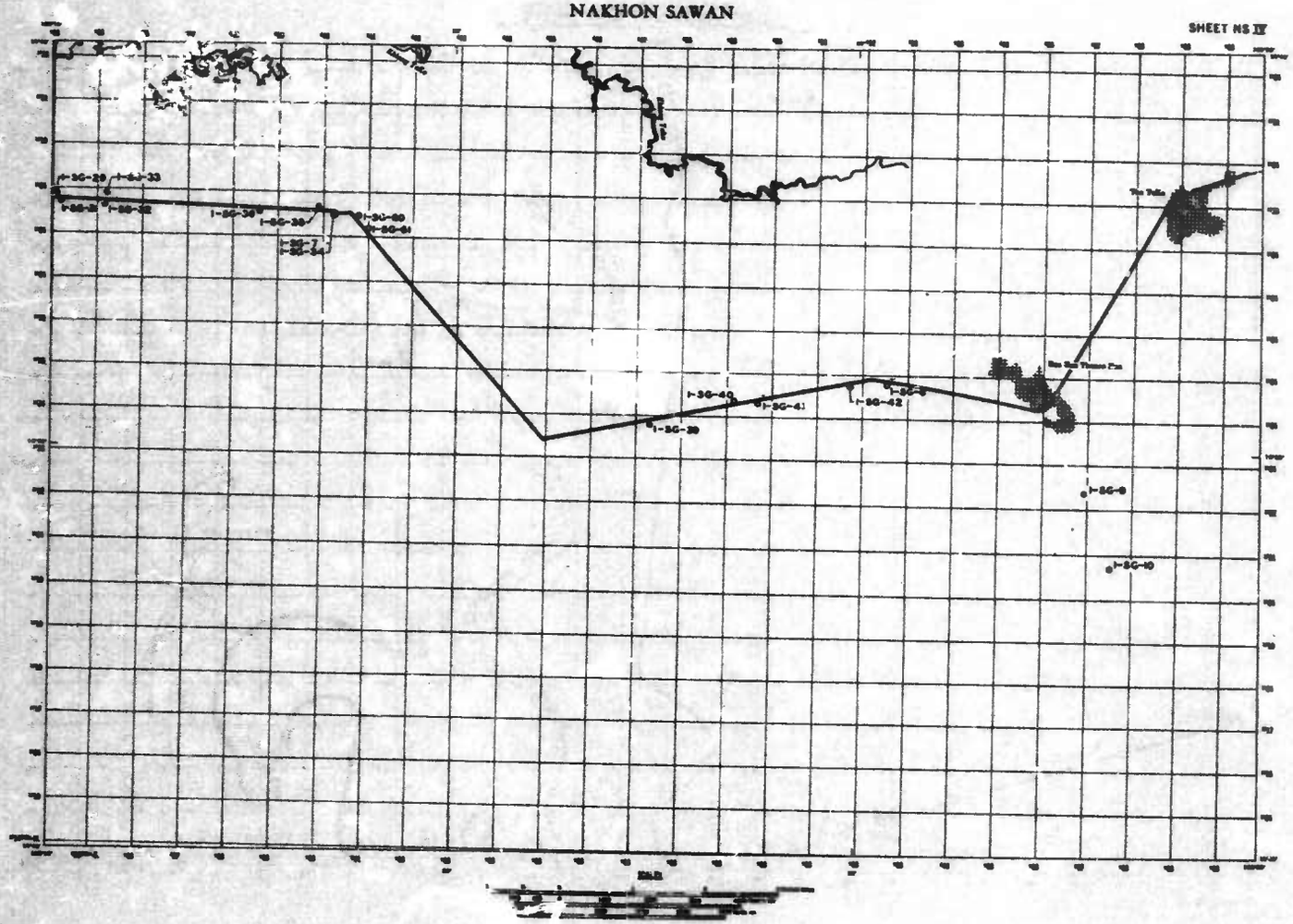
SURFACE GEOMETRY SETUP
NAKHON SAWAN STUDY AREA
SHEET NO 1

FIG. A2

FIG. A3



SURFACE GEOMETRY - SITES
NAKHON SAWAN STUDY AREA
SHEET NO III



SURFACE GEOMETRY SITES
NAKHON SAWAN STUDY AREA
SHEET NS IV

FIG. A4

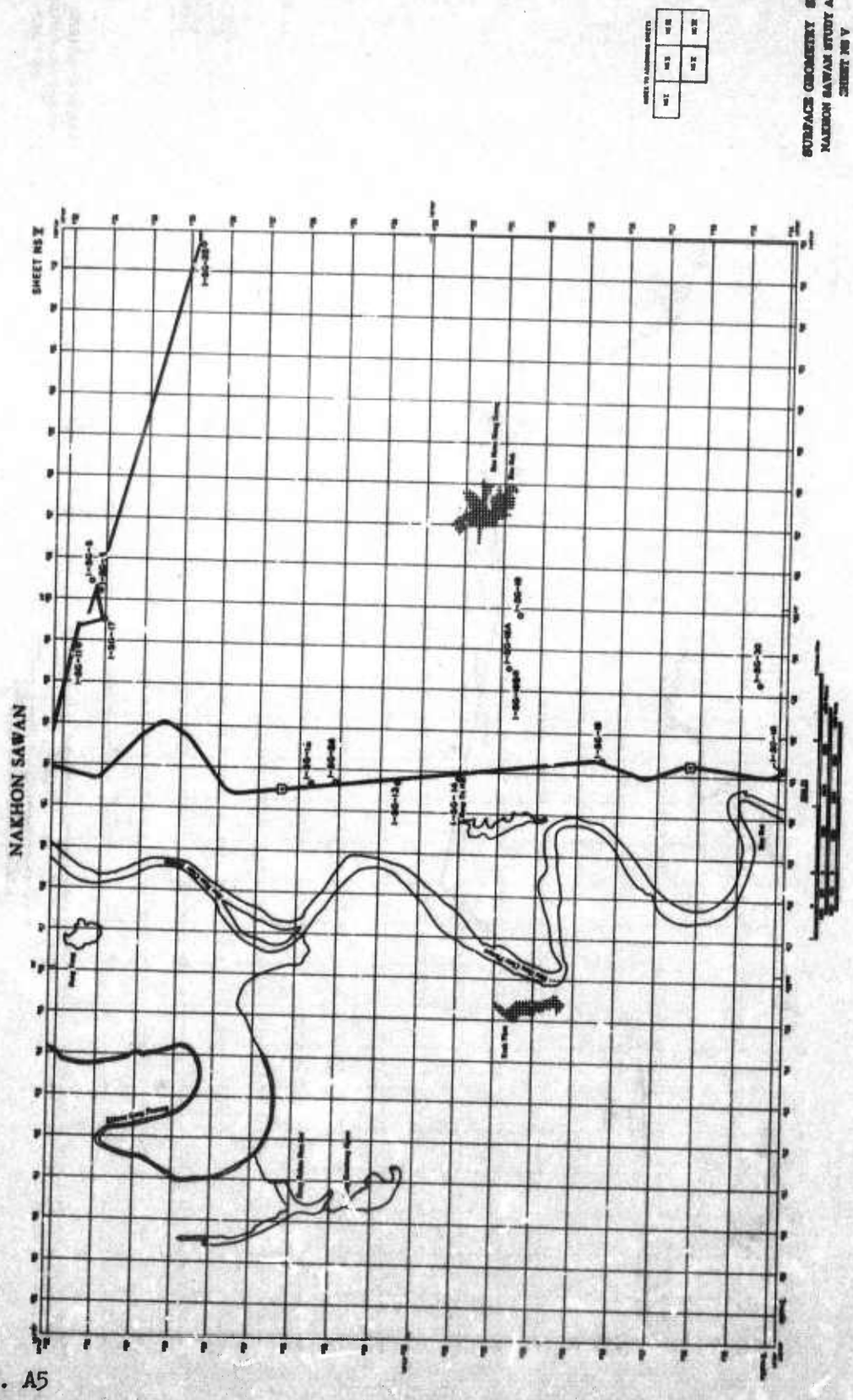

SURFACE GEOMETRY SYSTEM
NAKHON SAWAN STUDY AREA
SHEET NO V
SHEET NO 2
NAKHON SAWAN

FIG. A5

LOP BURI STUDY AREA

Table A3

Surface Geometry Site Summation

Lop Buri

Site No.	Location: Map Sheet*	Location: Grid Coordinates**	Fig. No.	Date Sampled
2-SG-1	5154I	058093	A9	5 Feb 1965
2-SG-2	5155II	032229	A8	8 Feb 1965
2-SG-4	5155II	017244	A8	8 Feb 1965
2-SG-7	5155IV	787517	A6	6 Feb 1965
2-SG-9	5154II	112979	A9	19 Jan 1965
2-SG-10	5154II	108996	A9	19 Jan 1965
2-SG-11	5154II	085007	A9	19 Jan 1965
2-SG-12	5154III	733867	A11	27 Jan 1965
2-SG-13	5153IV	814789	A11	24 Jan 1965
2-SG-17	5154I	909099	A9	4 Feb 1965
2-SG-18	5154I	154123	A9	4 Feb 1965
2-SG-19	5154I	118092	A9	4 Feb 1965
2-SG-20	5154I	095071	A9	4 Feb 1965
2-SG-21	5154I	078059	A9	4 Feb 1965
2-SG-22	5154I	029130	A8	5 Feb 1965
2-SG-23	5154I	014133	A8	5 Feb 1965
2-SG-24	5154I	906129	A8	22 Jan 1965
2-SG-25	5154I	900134	A8	22 Jan 1965
2-SG-26	5155II	915240	A8	9 Feb 1965
2-SG-31	5155III	846236	A7	7 Feb 1965
2-SG-32	5155II	948314	†	7 Feb 1965
2-SG-35	5155II	910374	†	7 Jan 1965
2-SG-47	5154I	931118	A9	5 Feb 1965
2-SG-48	5154I	950126	A9	5 Feb 1965
2-SG-49	5154I	982133	A8	5 Feb 1965
2-SG-50	5154I	017132	A8	5 Feb 1965
2-SG-51	5154I	053116	A9	5 Feb 1965
2-SG-52	5154I	055106	A9	5 Feb 1965
2-SG-53	5154I	140126	A9	4 Feb 1965
2-SG-54	5154I	135112	A9	4 Feb 1965
2-SG-55	5154I	131106	A9	4 Feb 1965
2-SG-56	5154I	123112	A9	4 Feb 1965
2-SG-57	5154I	125128	A9	4 Feb 1965
2-SG-58	5154I	036078	A9	4 Feb 1965
2-SG-59	5154I	031081	A9	26 Jan 1965
2-SG-60	5154II	081879	A10	21 Jan 1965
2-SG-61	5154II	130887	A10	21 Jan 1965
2-SG-62	5154II	127891	A10	21 Jan 1965
2-SG-63	5154II	093921	A10	21 Jan 1965
2-SG-65	5154II	072926	A10	20 Jan 1965
2-SG-67	5154II	055928	A10	20 Jan 1965
2-SG-68	5154II	016933	A10	20 Jan 1965
2-SG-69	5154II	003935	A10	20 Jan 1965
2-SG-70	5154II	963945	A9	20 Jan 1965
2-SG-71	5154II	933945	A9	20 Jan 1965
2-SG-72	5155II	981260	A8	9 Feb 1965
2-SG-77	5154I	034212	A8	8 Feb 1965
2-SG-78	5154I	013203	A8	8 Feb 1965
2-SG-79	5154I	034197	A8	8 Feb 1965
2-SG-80	5154I	041168	A8	8 Feb 1965
2-SG-81	5154I	043158	A8	5 Feb 1965
2-SG-82	5155IV	727549	A6	23 Jan 1965
2-SG-83	5155IV	729536	A6	23 Jan 1965
2-SG-85	5155IV	745527	A6	6 Feb 1965
2-SG-86	5155IV	734512	A6	6 Feb 1965
2-SG-87	5155IV	731488	A6	6 Feb 1965
2-SG-88	5155III	776291	A7	10 Feb 1965
2-SG-89	5155IV	769424	A6	6 Feb 1965
2-SG-90	5155III	757382	A7	7 Feb 1965
2-SG-91	5155IV	753462	A6	6 Feb 1965
2-SG-92	5155IV	772412	A6	6 Feb 1965
2-SG-93	5155III	725372	A7	23 Jan 1965
2-SG-94	5155III	656374	A7	23 Jan 1965
2-SG-96	5155III	825338	A7	10 Feb 1965
2-SG-101	5154III	644929	A11	27 Jan 1965
2-SG-102	5154III	623943	†	24 Jan 1965
2-SG-103	5154III	657916	A11	27 Jan 1965
2-SG-104	5154III	676889	A11	27 Jan 1965
2-SG-105, 105A	5154II	025876	A10	20 Jan 1965
2-SG-106	5154II	031892	A10	20 Jan 1965
2-SG-107	5154II	038914	A10	20 Jan 1965
2-SG-108	5154II	037933	A10	19 Jan 1965
2-SG-109	5154II	044946	A9	19 Jan 1965
2-SG-110	5154II	053982	A9	19 Jan 1965
2-SG-111	5154II	058011	A9	19 Jan 1965
2-SG-112	5154II	066025	A9	19 Jan 1965
2-SG-113	5154II	079012	A9	19 Jan 1965
2-SG-114	5154I	002091	A9	4 Feb 1965
2-SG-115	5154I	956097	A9	4 Feb 1965
2-SG-116	5154I	933097	A9	4 Feb 1965
2-SG-117	5154I	907098	A9	4 Feb 1965
2-SG-119A, 119B	5155III	855365	A7	7 Feb 1965
2-SG-120	5155III	843357	A7	7 Feb 1965
2-SG-121	5155III	776320	A7	7 Feb 1965
2-SG-122	5155III	767343	A7	7 Feb 1965
2-SG-123	5155IV	734410	A6	6 Feb 1965
2-SG-124	5155II	956276	A8	9 Feb 1965
2-T-1, 1A	5154I	946123	A9	22 Jan 1965
2-T-2	5153IV	820785	A11	22 Jan 1965
2-T-17, 17A	5154I	023087	A9	26 Jan 1965
2-T-19, 19A	5154I	045089	A9	26 Jan 1965
2-T-20	5154I	084093	A9	26 Jan 1965
2-T-21, 21A	5154I	021130	A8	22 Jan 1965
2-T-23A, 23B	5155II	053164	†	22 Jan 1965
2-T-2[illegible]	5154III	623946	†	24 Jan 1965
2-T-31	5153I	948788	A10	24 Jan 1965
2-T-37, 37A	5154II	040917	A10	21 Jan 1965
2-T-50, 50A	5154I	116087	A9	26 Jan 1965
2-T-54, 54A	5154I	011092	A9	26 Jan 1965
2-T-65, 65A	5155III	791363	A7	25 Jan 1965

(Continued)

Note: Missing site numbers are the result of sites having been preselected and numbered but not sampled. Sites prefixed with T and TA are surface composition sites where surface geometry data were collected.

* AMS, L708, 1:50,000.

** Coordinates are set up according to the Military Grid System. The first three coordinate numbers represent longitude, and the second three numbers represent latitude.

† Site outside limits of figure.

Table A3 (Concluded)

Site No.	Location: Map Sheet	Location: Grid Coordinates	Fig. No.	Date Sampled
2-T-66	5155II	028252	A8	25 Jan 1965
2-T-68	5155II	945303	A8	25 Jan 1965
2-T-88	5154I	908135	A8	22 Jan 1965
2-T-89A, 89B	5154II	025884	A10	21 Jan 1965
2-T91A	5154II	038907	A10	21 Jan 1965
2-T-92, 92A	5154I	107078	A9	26 Jan 1965
2-T-93, 93A	5154I	080120	A9	22 Jan 1965
2-T-X	5153I	041827	A10	21 Jan 1965
2-TA-3	5153IV	750830	A11	24 Jan 1965
2-TA-6, 6A	5154I	100135	A8	26 Jan 1965
2-TA-7, 7A	5154I	080117	A9	22 Jan 1965
2-TA-25	5155III	680380	A7	23 Jan 1965
2-TA-29, 29A-29C	5155IV	780420	A6	23 Jan 1965
2-TA-32	5155IV	720550	A6	23 Jan 1965

Table A4

Summary of Surface Geometry Field Data

Lop Buri

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type*	Critical Approach Angle (AA) and Step Height (SH)** 1† AA	1† SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
2-SG-1	5154I	058093	1	RE	164	203	165	211												
			2		164	241	165	213												
2-SG-2	5155II	032229	1	RE	163	198														
			2		165	203														
2-SG-4	5155II	017244	1	BP	163	142	159	163												
			2		162	137	160	173												
2-SG-7	5155IV	787517	1	RE	168	91	161	122												
			2		170	91	160	117												
2-SG-9	5154II	112979	1	RB	142	36	123	28												
					116	30	140	25												
					130	36	145	20												
			2		144	30	140	25												
					138	41	124	25												
					156	28	132	15												
2-SG-10	5154II	108996	1	DD	129	97	126	79												
			2		142	117	152	71												
2-SG-11	5154II	085007	1	RB	120	25	159	30												
					144	23	155	30												
			2		160	20	145	25												
					150	20	159	20												
2-SG-12	5154III	733867	1	BP	158	102	159	81	163	71	160	155	170	117	165	208				
			2		158	89	157	86	168	89	161	157	165	97	158	170				
2-SG-13	5153IV	814789	1	BP	172	178														
			2		169	193														
2-SG-17	5154I	909099	1	RB	121	36	141	25												
					119	25	150	36												
					127	20	154	41												
			2		112	36	141	25												
					118	28	154	30												
					137	20	131	41												
2-SG-18	5154I	154123	1	RB	125	36	137	30												
					122	25	128	20												
					121	51	128	41												
			2		132	36	139	28												
					120	28	122	25												
					120	53	155	46												
2-SG-19	5154I	118092	1	RB	125	48	132	36												
					140	25	144	23												
					115	33	133	33												
			2		125	46	128	38												
					140	25	127	20												
					115	33	137	30												
2-SG-20	5154I	095071	1	BP	159	218														
			2		154	208														
2-SG-21	5154I	078059	1	RE	174	152	173	137												
			2		175	142	173	142												
2-SG-22	5154I	029130	1	RE	167	132	161	152												
			2		171	132	161	152												
2-SG-23	5154I	014133	1	RB	125	66	128	61												
					146	51	140	58												
			2		123	69	132	69												
					135	64	141	64												
2-SG-24	5154I	905129	1	TM	165	91	158	91												
			2		157	112	159	102												
			3		161	107	160	102												

(Continued)

* Abbreviations used for feature types are defined on page A1.
** Approach angles (AA) are given in degrees and step heights (SH) are given in centimeters.
† For position of numerically designated approach angles and step heights see diagram on page A2.

Table A4 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
2-SG-25	5154I	900134	1	TM	150	132	157	142												
			2		158	147	160	142												
			3		158	117	153	112												
2-SG-26	5155II	915240	1	RB	144	25	143	43												
					153	41	152	41												
			2		129	18	138	30												
					124	36	160	33												
2-SG-31	5155III	846236	1	RM	156	66	149	61												
					146	53	155	71												
					160	43	165	43												
			2		155	81	150	64												
					121	51	160	61												
					160	51	164	66												
2-SG-32	5155II	948314	1	RE	158	224	157	224												
			2		158	203	154	244												
2-SG-35	5155II	910374	1	RE	158	94	171	61												
			2		172	71	174	18												
2-SG-47	5154I	931118	1	TM	123	48	144	48												
			2		122	46	126	56												
			3		126	71	125	66												
2-SG-48	5154I	950126	1	RB	137	36	136	30												
					131	36	116	36												
			2		128	41	131	36												
					125	48	133	48												
2-SG-49	5154I	982133	1	BP	162	81	154	74												
			2		160	79	159	86												
2-SG-50	5154I	017132	1	BP	132	91	168	91												
			2		143	81	168	81												
2-SG-51	5154I	053116	1	BP	160	97	170	168												
			2		160	99	173	193												
2-SG-52	5154I	055106	1	BP	149	46	126	94	171	183										
			2		154	46	122	94	164	198										
2-SG-53	5154I	140116	1	RE	172	132														
			2		165	132														
2-SG-54	5154I	135112	1	RB	128	36	132	36												
					116	36	172	36												
			2		126	43	130	41												
					128	38	120	36												
2-SG-55	5154I	131106	1	RE	165	157	164	142												
			2		165	157	169	152												
2-SG-56	5154I	123112	1	RB	128	41	125	41												
					112	41	115	38												
					140	25	117	36												
			2		128	41	110	46												
					150	38	158	38												
					138	28	133	41												
2-SG-57	5154I	125128	1	RB	108	46	149	38												
					159	20	166	25												
					164	30	118	58												
			2		109	43	153	36												
					163	23	149	33												
					168	30	123	48												
2-SG-58	5154I	036078	1	RE	137	119	150	81												
			2		134	117	151	81												
2-SG-59	5154I	032081	1	RB	127	48	140	38												
					146	41	157	38												
			2		123	46	143	36												
					141	33	137	33												
2-SG-60	5154II	084879	1	RB	123	48	134	36												
					126	38	113	46												
					140	28	116	28												
			2		126	41	144	46												
					127	43	113	53												
					121	30	126	36												

(Continued)

Table A4 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
2-SG-61	5154II	130887	1	RB	127	41	126	41												
					131	18	139	15												
			2		110	36	110	36												
					133	18	129	20												
2-SG-62	5154II	127891	1	RB	111	33	133	30												
					142	25	125	20												
					154	28	154	23												
			2		115	28	135	33												
					123	33	129	25												
					123	28	140	25												
2-SG-63	5154II	093921	1	RB	125	46	164	30												
					153	30	147	20												
					160	51	168	20												
			2		125	64	118	43												
					138	30	153	36												
					161	56	167	20												
2-SG-65	5154II	072926	1	RB	149	38	169	18												
					150	46	166	20												
					140	51	153	25												
			2		147	41	167	23												
					122	46	143	18												
					153	48	114	33												
2-SG-67	5154II	055928	1	RB	128	56	141	41												
					134	48	133	41												
					120	23	125	23												
			2		126	61	123	46												
					134	33	122	33												
					134	30	140	25												
2-SG-68	5154II	016933	1	RB	124	56	133	51												
					132	36	131	36												
			2		131	51	127	48												
					143	25	115	25												
2-SG-69	5154II	003935	1	TM	134	127	138	127												
			2		143	119	140	119												
			3		152	117	154	117												
2-SG-70	5154II	963945	1	RB	142	51	138	56												
					140	30	119	41												
					135	30	153	56												
			2		140	46	140	51												
					143	41	126	51												
					153	25	141	51												
2-SG-71	5154II	933945	1	RB	156	107	163	86												
			2		152	112	161	86												
2-SG-72	5155II	891260	1	RB	157	25	161	28												
					136	20	160	18												
					153	36	136	20												
			2		128	25	139	23												
					117	38	90	20												
					134	41	125	28												
2-SG-77	5154I	034212	1	RB	112	58	120	36												
					134	36	140	25												
					151	28	155	25												
			2		110	58	135	33												
					129	38	140	25												
					152	46	131	41												
2-SG-78	5154I	033203	1	RB	125	48	119	25												
					133	38	137	18												
			2		128	48	128	25												
					128	41	142	20												
2-SG-79	5154I	034197	1	BP	158	58	150	183												
			2		169	58	154	170												
2-SG-80	5154I	041168	1	BP	151	112	160	180												
			2		153	102	157	170												
2-SG-81	5154I	043158	1	BP	140	168	140	122												
			2		145	145	140	122												

(Continued)

Table A4 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
2-SG-82	5155IV	727549	1	BP	162	71	169	173	162	152										
			2		172	38	169	142	162	152										
2-SG-83	5155IV	729536	1	TM	160	66	160	66												
			2		163	76	163	66												
			3		160	66	142	66												
2-SG-85	5155IV	745527	1	BP	155	25	163	41	165	66										
			2		141	25	163	46	162	66										
2-SG-86	5155IV	734512	1	BP	170	64	153	71												
			2		162	25	159	71												
2-SG-87	5155IV	731486	1	RE	174	173														
			2		159	170														
2-SG-88	5155III	776391	1	BP	155	81	168	76												
			2		153	102	160	107												
2-SG-89	5155IV	769424	1	BP	154	71	156	119												
			2		148	102	158	102												
2-SG-90††	5155III	757382	1	RB	142	20	143	25												
			2		154	15	128	20												
2-SG-91*	5155IV	753462	1	RE	175	86														
			2		171	86														
2-SG-92	5155IV	772412	1	BP	159	112	167	91												
			2		159	106	159	112												
2-SG-93	5155III	725372	1	RP	153	137	153	112	171	56										
			2		150	137	159	104	173	51										
			3		168	163	156	112	172	53										
2-SG-94	5155III	656374	1A-A§	RB	123	25	136	30												
			2A-A§		172	25	142	25												
			1B-B§		145	28	172	13												
			2B-B§		116	30	173	13												
			1C-C§		135	69	143	46												
			2C-C§		151	56	135	36												
2-SG-96	5155III	825338	1	RB	147	43	140	30												
					140	25	138	28												
					106	25	161	15												
			2		154	33	145	20												
					133	33	134	36												
					127	25	142	30												
2-SG-101	5154III	644929	1	BP	207		151	84	175	305	190									
			2		201		163	91	136	295	213									
2-SG-102	5154III	623943	1	BP	202		158	69	168	312	193									
			2		203		158	66	166	310	192									
2-SG-103	5154III	657916	1	RB	165	13	160	25												
					167	30	162	20												
			2		170	46	159	46												
					160	25	162	25												
2-SG-104	5154III	678889	1	RE	161	284	152	295												
			2		161	290	155	295												
2-SG-105	5154II	025876	1	TM	172	84	171	104												
			2		169	99	162	112												
			3		157	71	167	81												
2-SG-105A	5154II	025876	1	RB	129	18	139	53												
					144	23	147	81												
			2		125	18	143	61												
					138	28	149	81												
2-SG-106	5154II	031892	1	RB	139	38	139	43												
					162	157														
			2		140	46	139	51												
					163	157														

(Continued)

†† Field data sheet called this Land Profile but it was so flat only Rice Bunds were used.
* Field data sheet called this Barrow Pit but it was too shallow to consider as such.
§ Letter designation refers to multiple bund measurements along the same profile.

(4 of 8 sheets)

Table A4 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
2-SG-107	5154II	038914	1	RB	140	43	151	41												
					115	38	136	33												
					130	38	132	36												
			2		134	56	140	38												
					142	41	149	36												
					136	30	127	23												
2-SG-108	5154II	037933	1	BP	210		163	163	157	264	218									
			2		207		158	147	123	274	238									
			3		207		160	107	123	234	225									
2-SG-109	5154II	044046	1	RB & RE	167	25	130	46												
					171	102	190													
			2		144	25	130	51												
					172	102	190													
2-SG-110	5154II	053982	1	BP	203		162	61	162	264	195									
			2		194		168	61	167	264	194									
2-SG-111	5154II	058011	1	RB	137	28	126	48												
					130	20	131	36												
			2		143	33	128	46												
					147	20	153	30												
2-SG-112	5154II	066025	1	RB	124	43	135	48												
					142	38	124	46												
			2		134	46	136	46												
					136	43	125	51												
2-SG-113	5154II	079012	1	BP	138	36	93	97	171	51										
			2		143	46	113	91	174	61										
2-SG-114	5154I	002091	1	RB	144	46	137	43												
					139	46	119	36												
					142	46	150	41												
			2		145	51	131	43												
					140	41	118	30												
					143	48	147	41												
2-SG-115	5154I	956097	1	RE	171	170	174	66												
					169	165	174	66												
2-SG-116	5154I	933097	1	RE	156	160	169	99												
			2		154	168	169	109												
2-SG-117	5154I	907098	1	RB	134	38	135	30												
					127	43	120	33												
					153	25	133	36												
			2		119	36	119	30												
					117	30	148	25												
					122	25	120	28												
2-SG-119A	5155III	855365	1	BP	217		143	213	143	244	218									
			2		208		146	234	140	239	221									
			3		213		127	234	127	218	205									
2-SG-119B	5155III	855365	1	RB	128	30	128	20												
					127	20	148	20												
			2		120	28	119	25												
					134	15	130	20												
2-SG-120	5155III	843357	1	RB	136	36	133	48												
					130	38	140	51												
			2		117	28	112	38												
					142	36	116	48												
					124	23	119	28												
2-SG-121	5155III	776320	1	LV	160	112	156	201	142	150	155	86	159	43	171	41				
			2		156	132	162	221	145	178	145	94	160	36	163	142				
2-SG-122	5155III	767343	1	LV	160	112	162	274	151	447										
			2		161	97	154	290	160	455										
2-SG-123	5155IV	734410	1	RE	155	213	165	244												
			2		158	213	165	244												
2-SG-124	5155II	956276	1	BP	147	193	206													
			2		118	183	240													

(Continued)

Table A4 (Continued)

Site No.	ANS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
2-T-1	5154I	946123	1	TM	137	102	107	102												
			2		130	147	109	152												
			3		144	112	119	117												
2-T-1A	5154I	946123	1	RB	163	30	124	25												
					152	43	140	41												
					140	48	112	53												
			2		146	30	136	30												
					129	41	140	41												
					118	36	112	41												
2-T-2	5153IV	820785	1	TM	140	157	135	305	136	312	137	157								
			2		140	157	139	284	136	305	137	168								
2-T-17	5154I	023087	1	TM	170	97	132	107												
			2		178	132	139	147												
			3		174	127	140	140												
2-T-17A	5154I	023087	1	RB	1[illegible]	48	153	53												
					123	46	129	43												
			2		138	51	153	56												
					120	51	128	51												
2-T-19	5154I	045089	1	TM	127	102	137	112												
			2		129	109	134	112												
			3		136	97	116	102												
2-T-19A	5154I	045089	1	RB	126	41	128	25												
					124	43	114	30												
2-T-20	5154I	084093	1	TM	139	119	160	132												
			2		135	147	167	173												
			3		141	157	156	183												
2-T-21	5154I	021130	1	TM	125	163	90	152												
			2		116	203	120	211												
			3		133	104	90	114												
2-T-21A	5154I	021130	1	RB	133	51	140	53												
					127	43	140	43												
			2		130	53	139	53												
					125	43	138	43												
2-T-23A	5155II	053164	1	TM	162	157	142	163												
			2		154	203	135	208												
			3		155	175	136	178												
2-T-23B	5155II	053164	1	RB	131	43	110	71												
					118	48	132	66												
			2		117	41	131	69												
					120	51	135	69												
2-T-27	5154III	623946	1	RP	166	112	173	112												
			2		166	117	160	127												
			3		146	99	166	102												
2-T-31	5153I	948788	1	RE	162	89	170	86												
			2		168	89	169	97												
2-T-37	5154II	040917	1	TM	157	69	158	89												
			2		124	94	142	102												
			3		113	97	133	97												
2-T-37A	5154II	040917	1	RB	130	25	144	23												
					147	25	153	25												
			2		116	25	142	23												
					135	30	154	33												
2-T-50	5154I	116087	1	TM	162	61	133	69												
			2		123	112	145	107												
			3		130	117	135	117												
2-T-50A	5154I	116087	1	RB	150	20	150	18												
					134	30	140	36												
2-T-54	5154I	011092	1	TM	158	61	142	74												
			2		151	71	133	76												
			3		118	79	138	76												

(Continued)

(6 of 8 sheets)

Table A4 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
2-T-54A	5154I	011092	1	RB	159	41	143	36												
					117	28	195	25												
			2		158	36	143	33												
					117	28	120	28												
2-T-65	5155III	791363	1	TM	1	56	141	56												
			2		146	59	157	59												
			3		164	46	158	51												
2-T-65A	5155III	791363	1	RB	124	25	150	38												
					154	36	165	38												
			2		161	25	144	36												
					147	30	169	36												
2-T-66	5155II	028252	1	RE	150	137	158	152												
			2		148	137	161	140												
2-T-83	5155II	945303	1	RE	159	132	158	91												
			2		168	132	153	91												
2-T-88	5154I	908135	1	TM	141	90	157	91												
			2		156	102	160	97												
			3		155	97	146	91												
2-T-89A	5154II	025884	1	TM	165	147	150	122												
					165	157	148	134												
			3		164	132	148	114												
2-T-89B	5154II	025884	1	RB	128	25	128	41												
					123	25	129	38												
			2		128	20	131	37												
					115	30	128	43												
2-T-91A	5154II	038907	1	RB	138	20	129	20												
					133	30	138	30												
			2		130	18	123	23												
					145	30	139	28												
2-T-92	5154I	107078	1	BP	251		168	84	163	81	235									
			2		249		161	81	166	81	235									
			3		241		165	81	159	76	244									
2-T-92A	5154I	107078	1	RB	113	25	133	15												
					145	46	138	41												
			2		116	30	135	20												
					130	46	147	33												
2-T-93	5154I	080120	1	TM	132	122	132	142												
			2		142	124	132	135												
			3		157	97	145	117												
2-T-93A	5154I	080120	1	RB	162	28	150	38												
					141	28	148	30												
			2		157	28	134	36												
					154	20	148	15												
2-T-X	5153I	041827	1	RB	167	20	130	20												
					157	25	126	23												
					154	33	136	30												
			2		128	30	120	30												
					121	20	126	20												
					112	28	127	28												
2-TA-3	5153IV	750830	1	DD	165	56	195		197		142§§	163	142§§	163	200		200		162	81
			2		165	56	193		200		140§§	160	140§§	170	200		192		158	97
2-TA-6	5154I	100135	1	TM	141	66	155	56												
			2		129	66	157	71												
			3		160	71	149	71												
2-TA-6A	5154I	100135	1	RB	149	43	119	38												
					138	30	143	36												
			2		127	51	132	36												
					131	36	122	25												
2-TA-7	5154I	090117	1	TM	148	89	136	84												
			2		162	130	155	130												
			3		158	91	127	86												

(Continued)

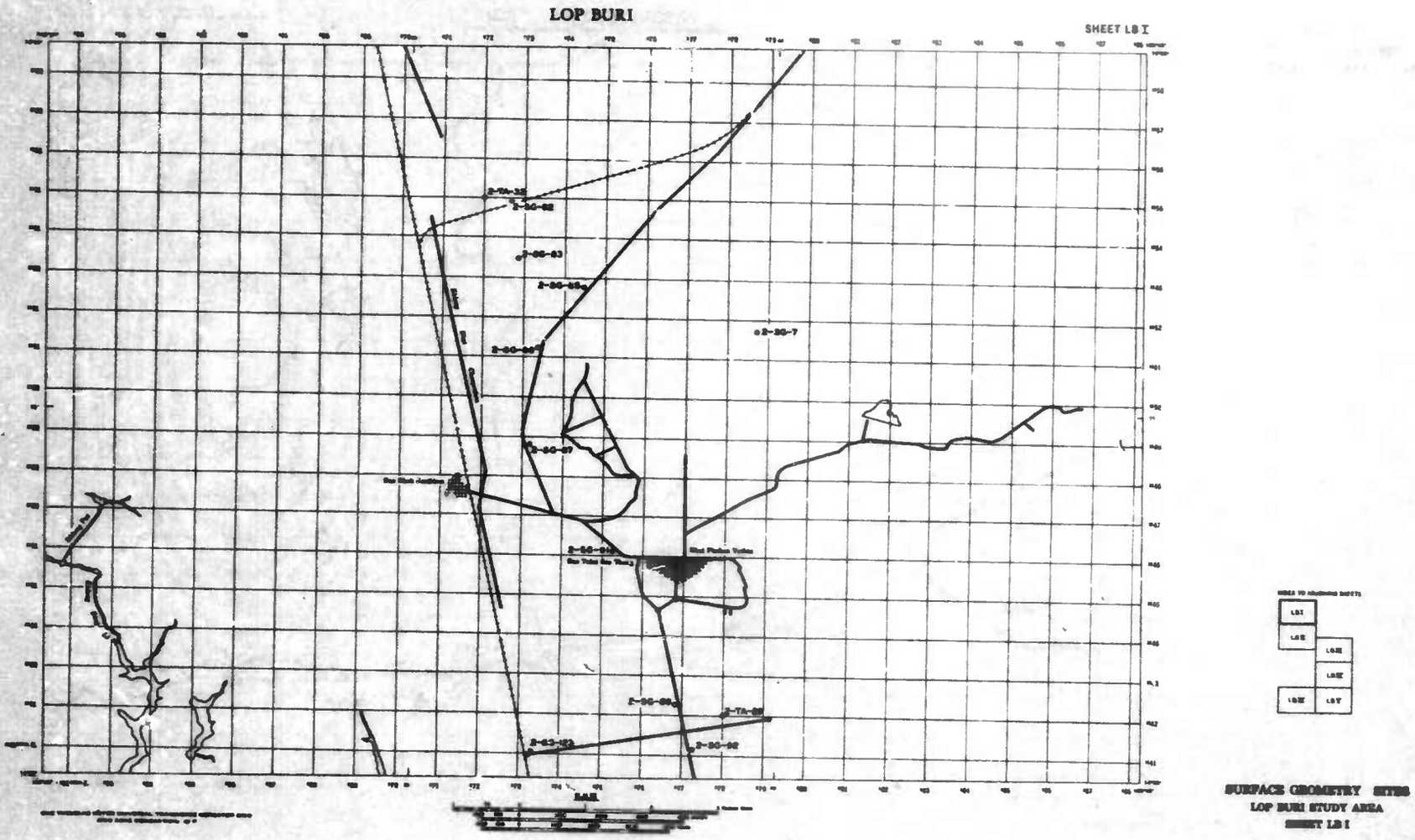
§§ The angle is the same for the approach from either side.

(7 of 8 sheets)

Table A4 (Concluded)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
2-TA-7A	5154I	080117	1	RB	129	58	134	69												
					146	46	130	58												
			2		127	46	130	48												
					153	48	135	64												
2-TA-25	5155III	680380	1	BM	167	192	154	170												
			2		169	168	154	183												
			3		166	167	150	183												
			4		166	172	157	183												
			5		167	168	154	172												
2-TA-29A	5155IV	780420	1	DP	152	56	159	81	166	112	135	79								
			2		150	56	161	64	155	122	157	104								
			3		150	64	163	97	148	114	137	66								
2-TA-29B	5155IV	780420	1	TM	171	84	143	94												
			2		152	107	146	112												
			3		156	107	148	114												
2-TA-29C	5155IV	780420	1	RB	146	33	152	25												
					146	28	132	25												
					143	30	159	23												
			2		141	28	148	20												
					155	30	132	20												
					142	30	158	25												
2-TA-32	5155IV	720550	1	DP	210		155	119	163	119	208									
			2		201		162	122	170	132	204									
			3		195		145	124	174	127	199									

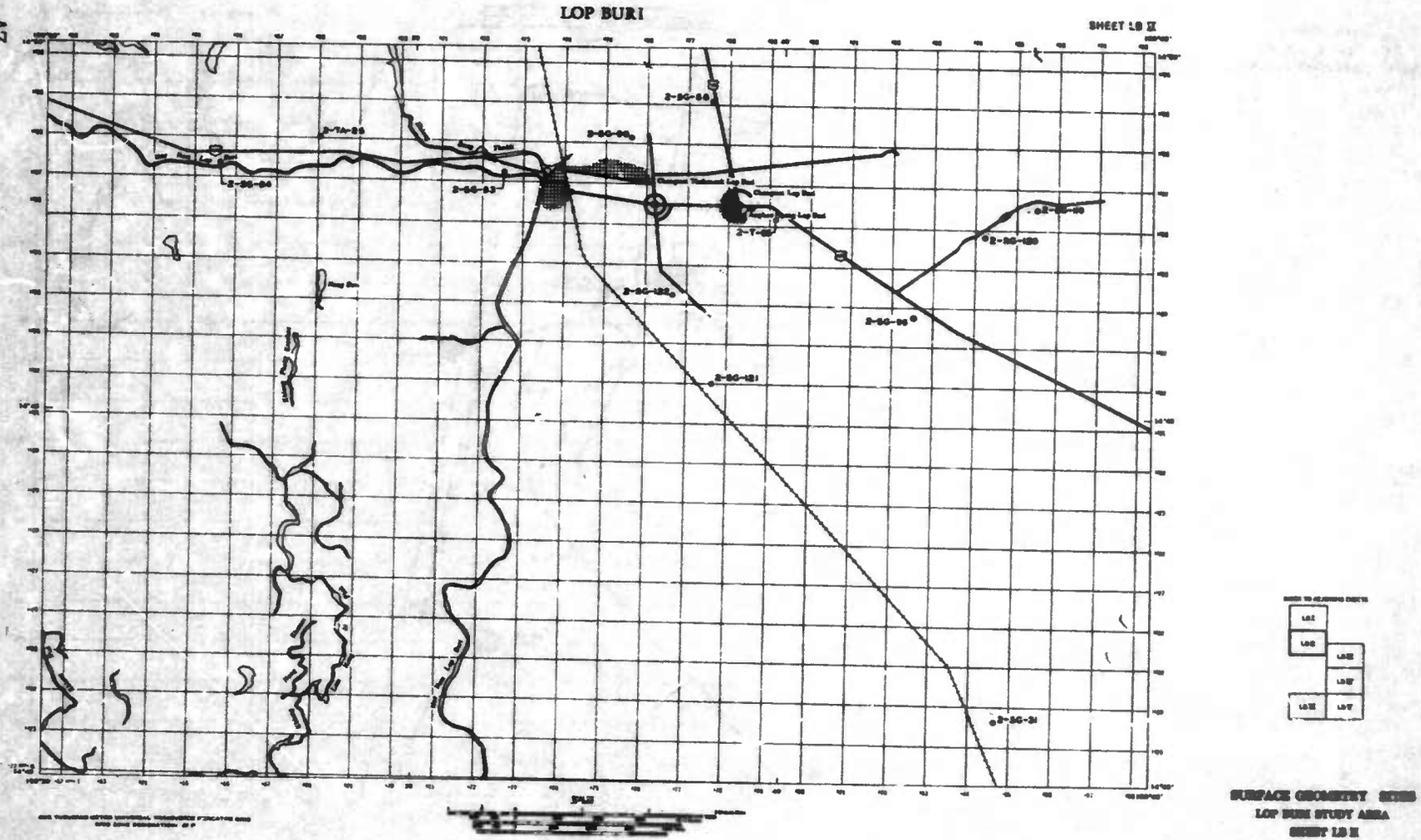
(8 of 8 sheets)



SURFACE GEOMETRY SITES
LOP BURI STUDY AREA
SHEET LB I

FIG. A6

FIG. A7



SURFACE GEOMETRY MAPS
LOP BURI STUDY AREA
SHEET LB II

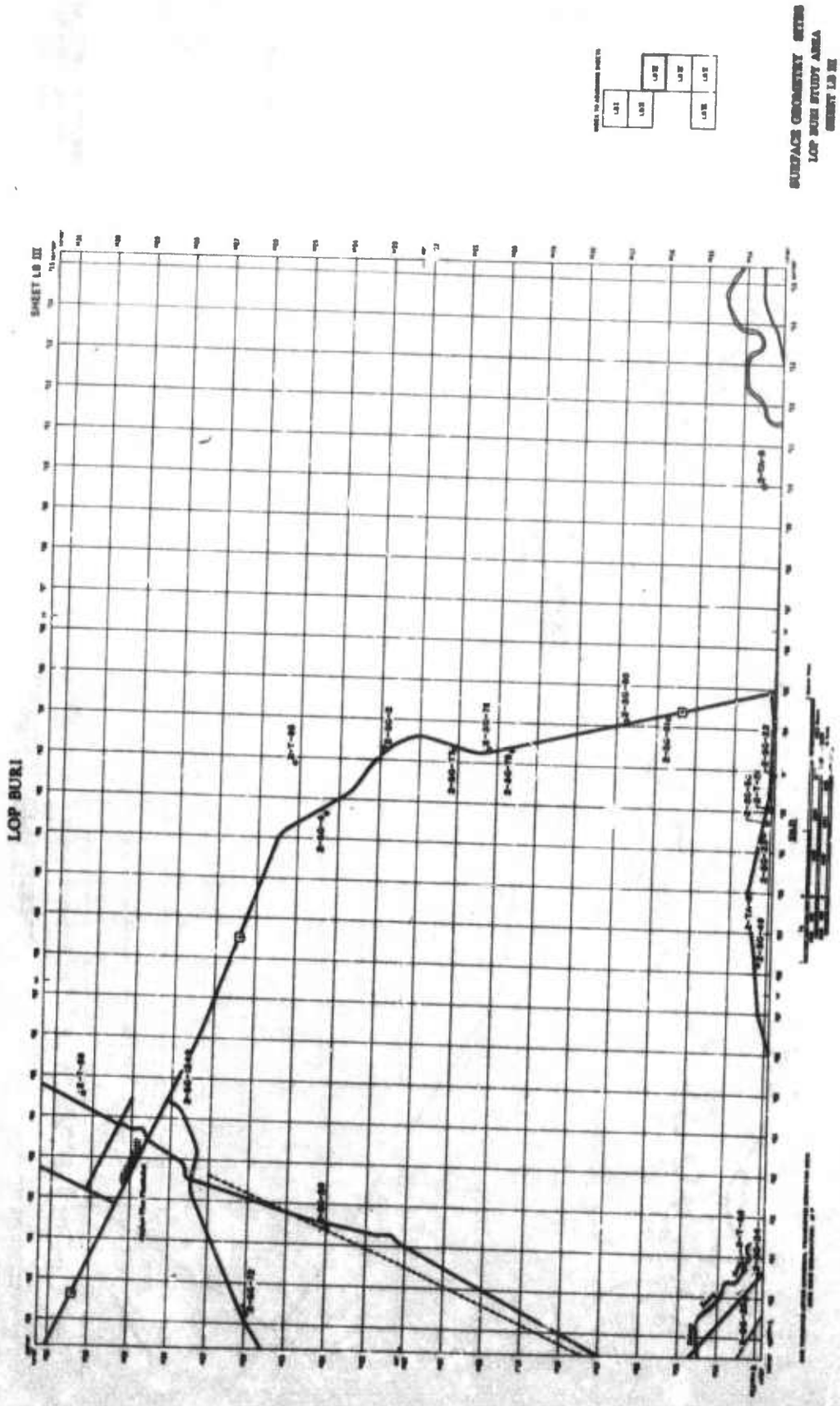


FIG. A8

FIG. A9

FIG. A10

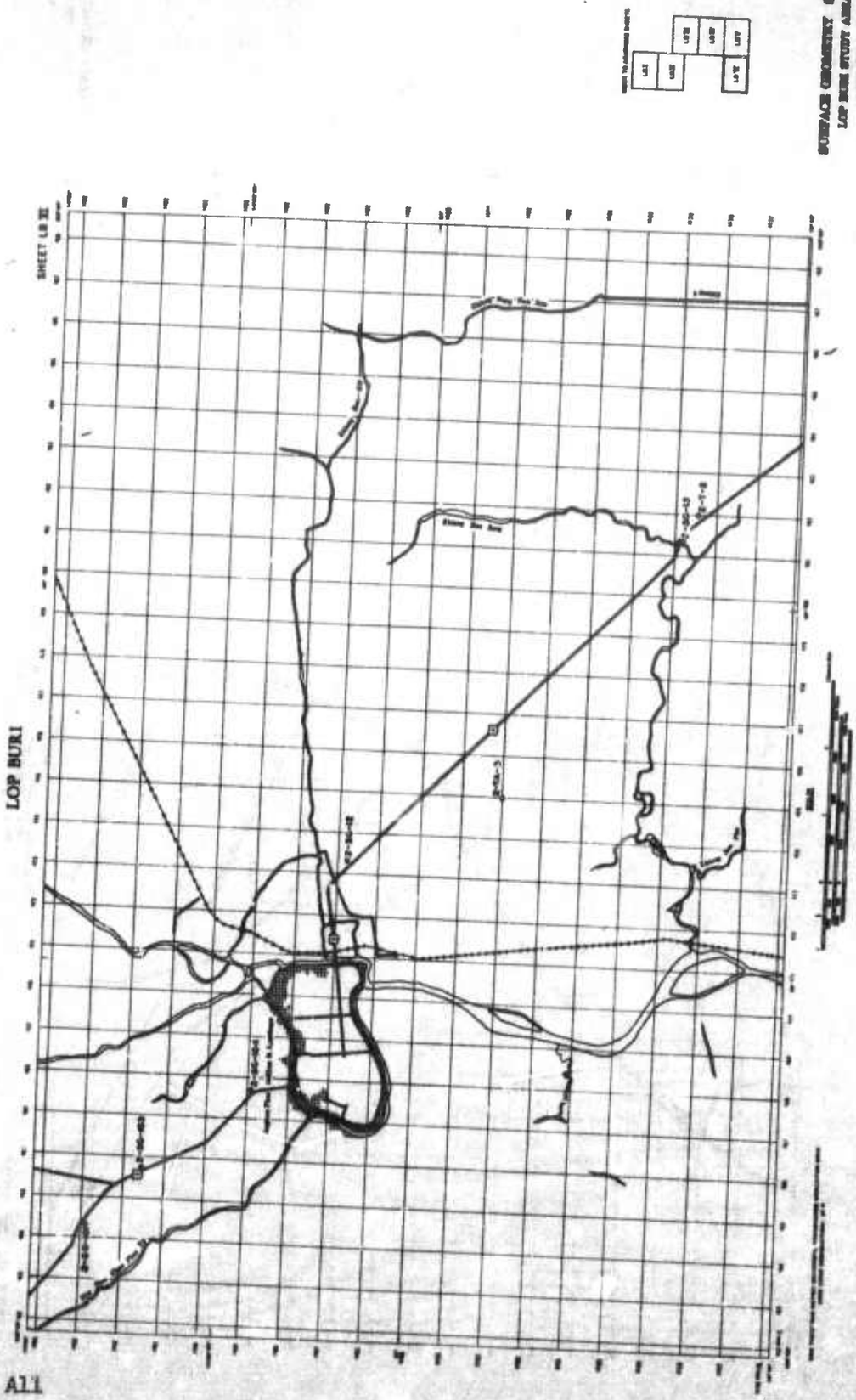


FIG. A11

CHIANG MAI STUDY AREA

Table A5

Surface Geometry Site Summation

Chiang Mai

Site No.	Location: Map Sheet*	Location: Grid Coordinates**	Location: Fig. No.	Date Sampled
3-SG-1	4765IV	595120	†	9 Sept 1964
3-SG-2	4767II	975744	A12	10 Sept 1964
3-SG-3	4767II	971735	A12	10 Sept 1964
3-SG-4	4767II	957719	A15	10 Sept 1964
3-SG-5, 5A-5B	4767II	949701	A15	10 Sept 1964
3-SG-6	4767II	937685	A15	10 Sept 1964
3-SG-7, 7A-7B	4766I	909631	A15	10 Sept 1964
3-SG-8	4767II	913642	A15	11 Sept 1964
3-SG-9	4766I	891618	A15	11 Sept 1964
3-SG-10	4766I	881612	A15	12 Sept 1964
3-SG-11	4767II	923664	A15	12 Sept 1964
3-SG-12, 12A-12B	4767II	926661	A15	12 Sept 1964
3-SG-13	4767II	964660	A15	12 Sept 1964
3-SG-14, 14A-14C	4767II	955661	A15	12 Sept 1964
3-SG-15	4767II	945663	A15	12 Sept 1964
3-SG-16	4766I	905627	A15	12 Sept 1964
3-SG-17, 17A-17C	4766I	885589	A15	13 Sept 1964
3-SG-18	4766I	859581	A15	13 Sept 1964
3-SG-19, 19A-19C	4766I	818564	A15	13 Sept 1964
3-SG-20	4766I	816564	A15	13 Sept 1964
3-SG-21	4766I	889567	A15	14 Sept 1964
3-SG-22, 22A-22D	4766I	884549	A15	14 Sept 1964
3-SG-23	4766I	865515	†	14 Sept 1964
3-SG-24	4766I	861500	†	14 Sept 1964
3-SG-25, 25A-25B	4766I	845477	†	14 Sept 1964
3-SG-26, 26A-26B	4766I	836470	†	14 Sept 1964
3-SG-27, 27B-27C	4766I	825462	†	14 Sept 1964
3-SG-28, 28A-28C	4766III	698396	†	23 Sept 1964
3-SG-29	4766III	698397	†	23 Sept 1964
3-SG-30, 30A-30D	4766III	697398	†	23 Sept 1964
3-SG-31, 31A-31C	4766III	700398	†	24 Sept 1964
3-SG-32, 32A-32B	4766III	691393	†	24 Sept 1964
3-SG-33, 33A-33C	4766III	681389	†	23 Sept 1964
3-SG-34, 34A-34D	4766III	667376	†	23 Sept 1964
3-SG-35, 35A-35C	4766III	674385	†	24 Sept 1964
3-SG-36	4766III	654434	†	25 Sept 1964
3-SG-37	4766III	658440	†	25 Sept 1964
3-SG-38, 38B-38C	4867III	064759	A13	26 Sept 1964
3-SG-39, 39A-39C	4867III	067759	A13	26 Sept 1964
3-SG-40, 40A	4867III	077751	A13	26 Sept 1964
3-SG-41, 41A-41D	4867III	079749	A13	26 Sept 1964
3-SG-42, 42A-42B	4867III	085754	A13	26 Sept 1964
3-SG-43	4867III	136742	A13	26 Sept 1964
3-SG-44	4867III	125724	A14	26 Sept 1964
3-SG-45, 45A-45B	4867III	149703	A14	27 Sept 1964
3-SG-46, 46B-46C	4867III	162694	A14	27 Sept 1964
3-SG-47, 47A-47B	4867III	165701	A14	27 Sept 1964
3-SG-48, 48A-48C	4867III	220699	A14	27 Sept 1964
3-SG-49, 49A-49C	4867III	140718	A14	27 Sept 1964
3-SG-50, 50A-50B	4867III	187719	A14	27 Sept 1964
3-SG-51	4867III	038807	A13	28 Sept 1964
3-SG-52	4867IV	058859	A13	28 Sept 1964
3-SG-54	4867IV	019886	A13	28 Sept 1964
3-SG-55	4867IV	019886	A13	28 Sept 1964
3-SG-56	4867IV	082833	A13	28 Sept 1964
3-SG-57	4867IV	088835	A13	28 Sept 1964
3-SG-58	4767I	990937	†	29 Sept 1964
3-SG-59, 59A-59B	4767I	990937	†	29 Sept 1964
3-SG-60	4867IV	036880	A13	29 Sept 1964
3-SG-61	4867IV	049828	A13	30 Sept 1964
3-SG-62, 62A-62B	4867IV	073872	A13	30 Sept 1964
3-SG-63	4867IV	083873	A13	30 Sept 1964
3-SG-64	4867IV	091878	A13	30 Sept 1964
3-SG-65	4867IV	140910	A13	1 Oct 1964
3-SG-66	4867IV	147895	A13	1 Oct 1964
3-SG-67	4867IV	150891	A13	1 Oct 1964
3-SG-68	4867IV	151888	A13	1 Oct 1964
3-SG-69	4867III	010736	A13	2 Oct 1964
3-SG-70	4766I	939489	†	10 Oct 1964
3-SG-71	4867III	046646	A14	7 Oct 1964
3-SG-72	4867III	047643	A14	10 Oct 1964
3-SG-73	4866IV	045602	A14	7 Oct 1964
3-SG-74	4866IV	035525	†	9 Oct 1964
3-SG-75	4866IV	040519	†	9 Oct 1964
3-SG-76	4866IV	040519	†	9 Oct 1964
3-SG-77	4866IV	051512	†	9 Oct 1964
3-SG-78	4866IV	070500	†	9 Oct 1964
3-SG-79	4866IV	081482	†	9 Oct 1964
3-SG-80	4767I	970842	A12	8 Oct 1964
3-SG-81	4767I	950897	A12	8 Oct 1964
3-SG-82	4767I	910915	†	8 Oct 1964
3-SG-83	4767I	903911	A12	8 Oct 1964
3-SG-84	4767I	931908	A12	8 Oct 1964
3-SG-85	4767I	903907	A12	8 Oct 1964
3-SG-86	4766I	941470	†	10 Oct 1964
3-SG-87	4766I	902596	A15	11 Oct 1964
3-SG-88	4766I	915595	A15	11 Oct 1964
3-SG-89	4766I	956580	A15	11 Oct 1964
3-SG-90	4766I	973559	A15	11 Oct 1964
3-SG-91	4766I	973559	A15	11 Oct 1964
3-SG-92	4866IV	001531	†	11 Oct 1964
3-SG-93	4866IV	001531	†	11 Oct 1964
3-SG-94	4767I	974837	A12	12 Oct 1964
3-SG-95	4767I	974837	†	12 Oct 1964
3-SG-96	4767I	947976	†	12 Oct 1964
3-SG-97	4767I	942926	†	12 Oct 1964
3-SG-98	4767I	918964	†	12 Oct 1964
3-SG-99	4767I	932937	†	12 Oct 1964
3-SG-100	4867III	065763	A13	13 Oct 1964
3-SG-101	4867III	066786	A13	13 Oct 1964

(Continued)

Note: Missing site numbers are the result of sites having been preselected and numbered but not sampled.

* AMS, L708, 1:50,000.

** Coordinates are set up according to the Military Grid System. The first three coordinate numbers represent longitude, and the second three numbers represent latitude.

† Site outside limits of figure.

Table A5 (Concluded)

Site No.	Location: Map Sheet	Location: Grid Coordinates	Fig. No.	Date Sampled
3-SG-102	4867III	088818	A13	13 Oct 1964
3-SG-103	4867IV	090823	A13	13 Oct 1964
3-SG-104	4867IV	141838	A13	13 Oct 1964
3-SG-105	4867III	138814	A13	13 Oct 1964
3-SG-106	4867III	148796	A13	14 Oct 1964
3-SG-107	4867III	179805	A13	14 Oct 1964
3-SG-108	4867III	119786	A13	14 Oct 1964
3-SG-109	4867III	091745	A13	14 Oct 1964
3-SG-110	4867III	116683	A14	15 Oct 1964
3-SG-111	4867III	111661	A14	15 Oct 1964
3-SG-112	4867III	107643	A14	15 Oct 1964
3-SG-113	4867III	179683	A14	15 Oct 1964
3-SG-114	4867III	164657	A14	15 Oct 1964
3-SG-115	4866IV	123619	A14	15 Oct 1964
3-SG-116	4866IV	118613	A14	16 Oct 1964
3-SG-117	4866IV	095583	A14	17 Oct 1964
3-SG-118	4866IV	079553	A14	16 Oct 1964
3-SG-119	4866IV	063513	†	16 Oct 1964
3-SG-120	4867III	142729	A14	24 Oct 1964
3-SG-121	4867III	165717	A14	24 Oct 1964
3-SG-122	4867III	180719	A14	24 Oct 1964
3-SG-123	4867III	216722	A14	24 Oct 1964
3-SG-124	4867III	261738	A13	24 Oct 1964
3-SG-125	4867III	042762	A13	25 Oct 1964
3-SG-126	4867III	109735	A13	25 Oct 1964
3-SG-127	4867III	179701	A14	25 Oct 1964
3-SG-128	4867III	153704	A14	25 Oct 1964
3-SG-129	4867III	177675	A14	25 Oct 1964
3-SG-130	4867III	177675	A14	25 Oct 1964
3-SG-131	4867III	160648	A14	25 Oct 1964
3-SG-132	4866IV	023625	A14	26 Oct 1964
3-SG-133	4866IV	040559	A14	26 Oct 1964
3-SG-134	4866IV	059551	A14	26 Oct 1964
3-SG-135	4866IV	069542	†	26 Oct 1964
3-SG-136	4866IV	082539	†	26 Oct 1964
3-SG-137	4866IV	096541	†	26 Oct 1964
3-SG-138	4866IV	103532	†	26 Oct 1964
3-SG-139	4866IV	089547	A14	26 Oct 1964
3-SG-140	4866IV	105552	A14	28 Oct 1964
3-SG-141	4866IV	115555	A14	28 Oct 1964
3-SG-142	4866IV	092556	A14	28 Oct 1964
3-SG-143	4866IV	094566	A14	28 Oct 1964
3-SG-144	4866IV	127571	A14	28 Oct 1964
3-SG-146	4766III	664361	†	29 Oct 1964
3-SG-147	4766III	683352	†	29 Oct 1964
3-SG-148	4766III	674357	†	29 Oct 1964
3-SG-149	4766III	660352	†	29 Oct 1964
3-SG-150	4766III	660352	†	29 Oct 1964
3-SG-151	4766III	663333	†	29 Oct 1964
3-SG-152	4766III	666297	†	30 Oct 1964
3-SG-153	4765IV	602186	†	30 Oct 1964
3-SG-154	4765IV	621211	†	30 Oct 1964
3-SG-155	4766III	664274	†	30 Oct 1964
3-SG-156	4766III	665284	†	30 Oct 1964
3-SG-157	4766I	826468	†	31 Oct 1964
3-SG-158	4766I	844484	†	31 Oct 1964
3-SG-159	4766I	832497	†	31 Oct 1964
3-SG-160	4766I	832497	†	31 Oct 1964
3-SG-161	4766I	823518	†	31 Oct 1964
3-SG-162	4766I	848470	†	1 Nov 1964
3-SG-163	4766I	860482	†	1 Nov 1964
3-SG-164	4766I	853579	A15	1 Nov 1964
3-SG-165	4766I	809564	A15	1 Nov 1964
3-SG-166	4867III	035682	A14	2 Nov 1964
3-SG-167	4867III	005663	A14	2 Nov 1964

† Site outside limits of figure.

Table A6

Summary of Surface Geometry Field Data

Chiang Mai

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type*	Critical Approach Angle (AA) and Step Height (SH)** 1† AA	1† SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-BG-1	4765IV	595120	1	RB	160	15	158	30												
					157	20	111	43												
					138	20	155	81												
					169	15	192	81												
			2		170	18	148	30												
					157	20	116	41												
					141	20	158	71												
					175	13	131	84												
3-BG-2	4767II	975744	1	RB	135	25	124	18												
					134	23	135	20												
					156	25	163	18												
			2		143	23	136	18												
					155	20	131	15												
					123	28	127	18												
3-BG-3	4767II	971735	1	RB	127	25	157	30												
					104	38	124	46												
					119	33	136	33												
			2		139	25	153	30												
					136	28	146	18												
					117	30	116	30												
3-BG-4	4767II	957719	1	RP	145		145	36	158		202	46	210	51	152		145	41	164	
			2		143	30	149	41	150		213	61	215	71	147		139	51	152	
3-BG-5A	4767II	949701	1	RB	113	20	138	20												
			2		138	15	138	15												
3-BG-5B	4767II	949701	1	RB	134	28	126	20												
			2		117	15	148	28												
3-BG-6	4767II	937685	1	RP	130		141	36	165		203	102	193	91	140		160	56	140	
			2		141		146	33	165		204	112	233	107	123		137	46	160	
3-BG-7A	4766I	909631	1	TM	115	173	135	163												
			2		120	107	128	137												
3-BG-7B	4766I	909631	1	TM	104	137	162	178												
			2		107	86	160	86												
3-BG-8	4767II	913642	1	RP	155		145	41	156	66	200		210		153	66	136	46	132	
			2		161		148	41	157	51	198		198		160	74	165	41	165	
3-BG-9	4766I	891618	1	RB	144	51	131	74												
			2		127	66	141	91												
3-BG-10	4766I	881612	1	RB	151	51	155	51												
			2		136	41	150	36												
3-BG-11	4767II	923664	1	RP	147	79	211		205		146	91	159	76	208		227		125	71
			2		158	69	199		202		167	66	100	61	217		197		137	61
3-BG-12A	4767II	926661	1	RB	136	33	128	25												
			2		129	41	161	20												
3-BG-12B	4767II	926661	1	RB	127	25	149	43												
			2		134	20	151	43												
3-BG-13	4767II	964660	1	DD	204		136	84	140	94	207									
			2		206		132	94	134	89	206									
3-BG-14A	4767II	959661	1	RB	131	36	160	28												
			2		159	30	147	20												
3-BG-14B	4767II	959661	1	RB	161	30	143	23												
			2		156	25	126	18												
3-BG-14C	4767II	959661	1	RB	156	71	130	81	130	91										
			2		152	56	128	79	131	81										
3-BG-15	4767II	945663	1	RP	154	23	151	56	150	84	210		211		145	71	132	28	157	20
			2		157	33	146	51	157	86	206		220		140	84	123	30	134	18

(Continued)

* Abbreviations used for feature types are defined on page A1.
** Approach angles (AA) are given in degrees and step heights (SH) are given in centimeters.
† For position of numerically designated approach angles and step heights see diagram on page A2.

Table A6 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-SG-16	4766I	905627	1	RE	167	97	193		185		171	97								
			2		164	107	190		188		168	97								
3-SG-17A	4766I	885589	1	RB	139	33	143	43	140	43	124	23								
			2		90	28	132	43	135	48	153	25								
3-SG-17B	4766I	885589	1	RB	134	41	130	56	118	58	144	36								
			2		135	30	136	46	129	41	90	23								
3-SG-17C	4766I	885589	1	RB	90	25	139	41	143	41	125	43	106	48	151	25				
			2		107	30	125	51	113	41	125	43	105	51	150	25				
3-SG-18	4766I	859581	1	BP	147		138	56	148	97	205		203		162	117				
			2		135		155	61	120	41	193		204		156	127				
3-SG-19A	4766I	818564	1	RB	146	41	140	10												
			2		131	53	127	15												
3-SG-19B	4766I	818564	1	RB	150	46	137	30												
			2		142	41	115	30												
3-SG-19C	4766I	818564	1	RB	125	51	117	30												
			2		126	41	117	23												
3-SG-20	4766I	816564	1	DD	128	15	130	66	135	66	154	85								
			2		126	20	130	64	116	81	156	71								
3-SG-21	4766I	889567	1	DD	243		100	122	112	127	220		141	25	131	66	223			
			2		209		120	112	108	112	227		140	20	142	82	220			
3-SG-22A	4766I	884549	1	RB	147	30	139	69												
			2		154	30	147	71												
3-SG-22B	4766I	884549	1	RB	160	23	137	41												
			2		169	15	126	41												
3-SG-22C	4766I	884549	1	RB	173	15	123	46												
			2		169	23	120	51												
3-SG-22D	4766I	884549	1	RB	170	25	130	51												
			2		144	15	125	41												
3-SG-23	4766I	865515	1	BP	164	56	168	147	195		198		163	86	125	41				
			2		165	81	171	142	188		196		161	91	144	36				
3-SG-24	4766I	861500	1	BP	150	46	119	51	231		245		121	91	111	91	259			
			2		128	48	134	46	224		238		117	74	135	79	225			
3-SG-25A	4766I	845477	1	RB	137	66	121	56	110	76	126	91								
			2		145	61	122	61	141	76	140	86								
3-SG-25B	4766I	845477	1	RB	136	53	142	51												
			2		143	46	151	56												
2-SG-26A	4766I	836470	1	RB	118	76	131	20												
			2		123	81	163	18												
3-SG-26B	4766I	836470	1	RB	127	25	152	18												
			2		132	25	137	15												
3-SG-27B	4766I	825462	1	RB	90	61	125	20												
			2		122	51	158	46												
3-SG-27C	4766I	825462	1	RB	125	61	127	18												
			2		132	71	130	20												
3-SG-28A	4766III	698396	1	RB	141	25	138	64												
			2		163	25	138	56												
3-SG-28B	4766III	698396	1	RB	168	25	133	33												
			2		125	25	139	28												
3-SG-28C	4766III	698396	1	RB	122	33	151	30												
			2		133	30	140	36												

(Continued)

Table A6 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-SG-29	4766III	698397	1	RB	113	97	141		207		204		170	66						
			2		101	89	152		215		206		139	61						
3-SG-30A	4766III	697398	1	RB	153	74	133	15												
			2		152	56	170	8												
3-SG-30B	4766III	697398	1	RB	165	25	161	15												
			2		140	25	157	15												
3-SG-30C	4766III	697398	1	RB	138	36	172	20												
			2		138	30	170	25												
3-SG-30D	4766III	697398	1	RB	145	30	151	15												
			2		148	30	164	15												
3-SG-31A	4766III	700398	1	RB	141	36	168	30												
			2		117	33	173	20												
3-SG-31B	4766III	700398	1	RB	104	64	138	28												
			2		116	76	161	20												
3-SG-31C	4766III	700398	1	RB	110	46	146	30												
			2		155	43	150	25												
3-SG-32A	4766III	691393	1	RB	153	30	169	20												
			2		165	28	170	18												
3-SG-32B	4766III	691393	1	RB	114	56	165	13												
			2		107	58	163	20												
3-SG-33A	4766III	681389	1	RB	160	15	148	61	150	41	166	20								
			2		150	10	158	48	153	33	168									
3-SG-33B	4766III	681389	1	RB	127	51	132	18												
			2		123	46	175	18												
3-SG-33C	4766III	681389	1	RB	125	56	127	20												
			2		120	56	173	13												
3-SG-34A	4766III	667376	1	RB	168	56	167	18												
			2		164	38	172	18												
3-SG-34B	4766III	667376	1	RB	119	64	165	20												
			2		107	53	165	15												
3-SG-34C	4766III	667376	1	RB	127	66	165	15												
			2		141	97	104	49												
3-SG-34D	4766III	667376	1	RB	138	107	156	15												
			2		130	109	155	15												
3-SG-35A	4766III	674385	1	RB	142	18	128	20												
			2		154	33	144	23												
3-SG-35B	4766III	674385	1	RB	112	71	131	20												
			2		104	71	127	20												
3-SG-35C	4766III	674385	1	RB	123	30	120	30												
			2		136	28	155	33												
3-SG-36	4766III	654434	1	RB	115	23	113	28	126	30	118	41	135	51	128	41	132	48		
			2		158	25	128	28	105	38	122	41	140	51	117	41	130	51		
3-SG-37	4766III	658440	1	RB	116	30	132	15												
					138	30	130	23												
					115	38	152	23												
					125	26	157	20												
					129	38														
			2		119	30	126	18												
					140	28	147	20												
					115	33	153	23												
					116	33	156	20												
					128	38														

(Continued)

Table A6 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-SG-38	4867III	064759	1	RB	118	28	124	23												
			2		109	30	120	25												
3-SG-38B	4867III	064759	1	RB	157	20	135	20												
			2		123	20	145	13												
3-SG-38C	4867III	064759	1	RB	135	36	138	43	108	58	147	51								
			2		118	51	112	74	101	66	134	56								
3-SG-39A	4867III	067759	1	RB	130	36	124	36												
			2		128	25	122	20												
3-SG-39B	4867III	067759	1	RB	114	33	117	30												
			2		118	33	114	30												
3-SG-39C	4867III	067759	1	RB	128	23	132	18												
			2		135	18	153	18												
3-SG-40A	4867III	077751	1	RB	125	46	162	20												
			2		127	41	163	25												
3-SG-41A	4867III	079749	1	RB	123	28	141	33												
			2		117	25	140	25												
3-SG-41B	4867III	079749	1	RB	130	20	125	20												
			2		127	20	135	15												
3-SG-41C	4867III	079749	1	RB	125	23	137	30												
			2		114	36	145	36												
3-SG-41D	4867III	079749	1	RB	131	20	128	20												
			2		120	25	127	23												
3-SG-42A	4867III	085754	-	RB	117	41	122	58	127	51										
			?		120	30	106	46	117	41										
3-SG-42B	4867III	085754	1	RB	131	41	120	56	148	51	110	51								
			2		110	36	147	46	136	43	110	43								
3-SG-43	4867III	136742	1	RB	127	23	90	18												
					130	23	155	23												
					133	20	130	20												
			2		132	20	155	20												
					134	18	134	18												
					132	18	131	20												
3-SG-44	4867III	125724	1	RB	120	23	125	23												
					123	23	131	20												
					128	23	170	23												
			2		130	18	136	15												
					113	25	113	30												
					126	18	173	15												
3-SG-45A	4867III	149703	1	RB	127	25	118	28												
			2		122	23	125	28												
3-SG-45B	4867III	149703	1	RB	118	33	125	25												
			2		118	25	126	23												
3-SG-46B	4867III	162694	1	RB	116	30	125	25												
			2		118	30	140	28												
3-SG-46C	4867III	162694	1	RB	124	28	120	33												
			2		116	33	118	28												
3-SG-47A	4867III	165701	1	RB	112	38	122	28												
			2		128	38	123	28												
3-SG-47B	4867III	165701	1	RB	116	33	113	36												
			2		122	25	120	28												
3-SG-48A	4867III	220699	1	RB	126	25	123	48												
			2		123	25	123	48												

(Continued)

Table A6 (Continued)

Site No.	AME Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-SG-48B	4867III	220699	1	RB	126	23	131	56												
			2		127	28	105	58												
3-SG-48C	4867III	220699	1	RB	128	25	112	51												
			2		131	20	107	43												
3-SG-49A	4867III	140718	1	RB	118	30	128	20												
			2		117	25	131	18												
3-SG-49B	4867III	140718	1	RB	116	30	122	20												
			2		110	36	129	18												
3-SG-49C	4867III	140718	1	RB	118	28	123	20												
			2		140	25	130	20												
3-SG-50A	4867III	187719	1	RB	122	28	115	33												
			2		115	28	116	33												
3-SG-50B	4867III	187719	1	RB	118	28	119	30												
			2		123	23	139	28												
3-SG-51	4867III	038807	1	RB	140	51	132	66												
					126	41	124	20												
					119	33	136	28												
			2		140	53	138	71												
					132	41	120	28												
					136	33	115	25												
3-SG-52	4867IV	058859	1	RB	120	28	140	25												
					118	25	121	28												
			2		120	30	119	28												
					143	20	108	20												
3-SG-54	4867IV	019886	1	RB	128	41	135	30												
					140	33	144	25												
					139	28	144	20												
			2		135	41	125	23												
					149	25	156	18												
					130	36	120	25												
3-SG-55	4867IV	019886	1	DD	148	53	132	84	151	102	114	107	117	104						
			2		143	56	124	91	153	107	118	112	118	107						
3-SG-56	4867IV	082833	1	RB	135	33	133	36												
					138	30	130	18												
					123	23	141	25												
			2		116	36	126	20												
					117	30	158	25												
					130	20	154	23												
3-SG-57	4867IV	088835	1	RB	133	20	145	15												
					130	20	133	20												
					151	15	160	15												
					136	28	150	56	146	51	171	30								
			2		147	20	137	15												
					132	15	138	18												
					130	15	133	15												
					120	61	136	61	153	51	151	15								
3-SG-58	4767I	990937	1	RB	123	51	125	23												
					112	41	131	25												
					110	41	127	20												
			2		127	41	140	15												
					112	36	151	18												
					111	36	134	15												
3-SG-59A	4767I	990937	1	TM	138	71	166	84												
			2		137	51	147	102												
			3		161	102	130	76												
3-SG-59B	4767I	990937	1	TM	160	142	165	137												
			2		112	203	160	203												
			3		151	157	157	142												

(Continued)

Table A6 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-SG-60	4867IV	036880	1	RB	112	36	150	15												
					113	48	90	15												
					122	53	90	15												
					128	28	162	15												
					130	38	132	18												
					112	36	130	18												
			2		132	30	90	10												
					108	36	138	15												
					108	71	175	30												
					120	25	156	10												
					112	41	140	15												
					140	36	146	15												
3-SG-61	4867IV	049828	1	RB	130	20	90	13												
					131	18	133	18												
					125	23	128	23												
			2		130	20	126	20												
					125	20	137	15												
					123	23	132	23												
3-SG-62A	4867IV	073872	1	RB	117	28	125	25												
			2		116	33	90	30												
3-SG-62B	4867IV	073872	1	RB	130	51														
					90	20	160	10												
					90	20	109	20												
			2		130	46														
					90	18	125	20												
					135	15	132	18												
3-SG-63	4867IV	083873	1	RB	128	23	129	23												
					90	23	121	25												
					125	23	137	30												
			2		125	20	136	18												
					90	23	132	20												
					138	18	120	25												
3-SG-64	4867IV	091878	1	RB	90	23	133	15												
					139	15	90	20												
			2		90	28	123	20												
					90	18	133	20												
3-SG-65	4867IV	140910	1	DD	163	117	195		210		156	315	146	315	225					
			2		158	112	199		217		152	366	132	20	207					
3-SG-66	4867IV	147990	1	RB	153	25	117	20												
					161	18	120	25												
					90	20	132	18												
			2		153	25	90	30												
					158	20	90	25												
					90	23	130	25												
3-SG-67	4867IV	150891	1	RB	132	18	118	28												
					138	28	128	23												
					136	15	125	25												
			2		149	18	147	20												
					133	15	127	23												
					137	18	127	25												
3-SG-68	4867IV	151888	1	RB	130	20	133	64												
					125	20	144	13												
					126	23	118	28												
					117	30	90	28												
			2		149	25	140	74												
					125	20	90	41												
					119	25	150	33												
					139	25	119	25												
3-SG-69	4867III	010736	1	RB	167	23	128	41												
					125	20	126	25												
					121	20	128	25												
			2		132	18	125	23												
					129	20	125	28												
					144	20	124	25												

(Continued)

Table A6 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-BG-70	4766I	933489	1	RB	141	25	122	25												
					140	30	130	20												
					144	25	90	20												
			2		117	33	114	30												
					121	25	112	25												
					121	25	123	28												
3-BG-71	4867III	046646	1	RB	110	41	108	41												
					136	15	133	18												
					90	15	90	23												
					140	15	132	20												
			2		105	43	90	43												
					136	15	128	18												
					90	13	136	15												
					90	18	90	15												
3-BG-72	4867III	047643	1	RB	157	18	137	15												
					135	15	137	15												
			2		146	15	122	20												
					90	10	122	25												
3-BG-73	4866IV	045602	1	RB	138	13	90	10												
					90	10	90	15												
					90	20	116	25												
					142	15	147	15												
			2		90	15	130	20												
					90	13	135	18												
					90	18	90	20												
					90	18	140	15												
3-BG-74	4866IV	035525	1	RB	136	15	130	20												
					138	15	137	25												
					137	18	124	25												
			2		126	18	135	18												
					127	20	126	20												
					134	15	130	23												
3-BG-75	4866IV	040519	1	RB	140	20	142	15												
					120	25	138	18												
					127	20	130	20												
			2		90	15	90	18												
					130	20	134	18												
					128	20	129	20												
3-BG-76	4866IV	040519	1	RE	163	81	162	112												
			2		163	86	154	127												
3-BG-77	4866IV	051512	1	RE	170	112	170	102												
			2		170	117	170	102												
3-BG-78	4866IV	070500	1	RB	122	28	132	33												
					127	23	117	30												
					129	20	128	28												
			2		142	25	125	30												
					120	28	109	41												
					134	15	143	23												
3-BG-79	4866IV	081482	1	BD	143	30	156	61	166	94	189									
			2		170	38	143	71	164	102	196									
3-BG-80	4767I	970842	1	RB	90	20	135	18												
					119	20	137	18												
					122	25	164	20												
			2		128	18	130	18												
					137	30	155	15												
					124	25	170	15												
3-BG-81	4767I	950897	1	RB	142	28	140	41												
					140	15	115	66												
			2		138	18	104	51												
					132	20	123	76												

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(7 of 14 sheets)

Table A6 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-SG-82	4767I	910915	1	RB	122	23	115	69												
					140	15	108	46												
					146	18	123	53												
					133	18	123	46												
			2		140	15	122	53												
					140	15	110	43												
					143	15	110	56												
					145	18	110	56												
3-SG-83	4767I	903911	1	RB	100	97	131	20												
					105	114	136	20												
					114	104	128	18												
					118	117	130	25												
					120	135	124	25												
			2		110	91	90	18												
					113	109	163	18												
					107	107	133	15												
					112	114	141	28												
					109	130	125	25												
3-SG-84	4767I	931908	1	RB	90	20	117	61												
					144	15	112	71												
					148	20	108	51												
					132	25	106	51												
					141	20	114	41												
			2		138	18	117	56												
					122	25	120	61												
					134	15	125	41												
					130	23	108	56												
					90	10	110	46												
3-SG-85	4767I	903907	1	RB	110	112	158	20												
					120	76	90	20												
					118	61	134	15												
			2		120	81	163	20												
					112	79	158	20												
					127	61	156	20												
3-SG-86	4766I	941470	1	RB	134	15	145	13												
					137	13	136	15												
					143	18	135	15												
			2		131	15	139	13												
					135	15	152	15												
					135	18	150	18												
3-SG-87	4766I	902596	1	RB	128	18	132	18												
					146	13	90	13												
					90	15	127	30												
			2		127	15	90	18												
					142	15	136	15												
					147	15	147	23												
3-SG-88	4766I	915595	1	RB	130	20	145	18												
					90	15	131	18												
			2		136	23	125	18												
					135	15	133	15												
3-SG-89	4766I	956580	1	RB	141	76	122	71												
					155	25	139	28												
			2		136	71	124	66												
					174	20	122	23												
3-SG-90	4766I	973559	1	TF	152	33	140	23												
					135	20	154	20												
					144	20	132	20												
					162	30	143	38												
					126	30	141	20												
					172	36	151	33												
			2		161	33	128	23												
					157	36	135	30												
					149	33	142	33												
					154	33	149	36												
					155	30	144	23												

(Continued)

Table A6 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-SG-91	4766I	973559	1	DD	232		128	91	128	94	230		204							
			2		235		125	97	126	97	233		209							
3-SG-92	4866IV	001531	1	DD	240		120	61	114	71	245									
			2		238		120	58	110	69	250									
3-SG-93	4866IV	001531	1	RB	115	28	120	25												
					117	30	129	20												
			2		124	25	125	23												
					122	30	118	30												
3-SG-94	4767I	974837	1	RB	135	25	130	18												
					130	20	142	18												
					90	20	160	15												
			2		137	20	136	15												
					134	15	134	15												
					129	20	169	15												
3-SG-95	4767I	974837	1	RB	143	25	128	41												
					133	18	125	23												
					130	20	130	41												
			2		148	30	148	36												
					137	15	129	20												
					133	18	136	25												
3-SG-96	4767I	947976	1	RB	122	25	161	38												
					121	25	130	41												
			2		122	28	157	46												
					122	33	125	51												
3-SG-97	4767I	942926	1	RB	123	25	90	18												
					157	30	126	25												
			2		125	25	90	18												
					130	25	155	20												
3-SG-98	4767I	918964	1	RB	124	25	136	18												
					135	38	129	18												
			2		117	38	128	20												
					118	38	140	15												
3-SG-99	4767I	932937	1	RB	116	30	145	25												
					110	30	140	15												
			2		122	28	130	20												
					115	33	123	20												
3-SG-100	4867III	065763	1	RB	110	33	133	18												
					135	20	150	10												
					121	25	90	20												
			2		109	36	140	15												
					134	18	90	10												
					134	25	90	20												
3-SG-101	4867III	066786	1	RB	135	18	120	28												
					125	18	141	18												
					126	20	115	30												
			2		128	20	133	33												
					128	18	124	23												
					121	25	119	28												
3-SG-102	4867III	088818	1	RB	109	25	127	20												
					127	20	129	20												
			2		124	25	125	20												
					145	15	142	15												
3-SG-103	4867IV	090823	1	RB	128	25	147	15												
					168	18	128	51												
					124	20	125	28												
					121	58	137	28												
			2		90	30	153	25												
					164	23	125	46												
					129	25	141	28												
					156	46	130	20												
3-SG-104	4867IV	141838	1	RB	124	20	128	18												
					145	15	133	18												
					165	15	130	20												
			2		124	20	125	23												
					124	25	153	30												
					124	20	127	20												

(Continued)

(9 of 14 sheets)

Table A6 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-SG-105	4867III	138814	1	RB	127	20	123	25												
					125	25	122	25												
			2		143	15	130	20												
					123	25	131	18												
3-SG-106	4867III	148796	1	RB	90	20	121	23												
					121	23	90	30												
					90	18	90	28												
			2		127	20	128	20												
					126	23	117	33												
					130	23	122	25												
3-SG-107	4867III	179805	1	RB	107	53	90	36												
					90	25	119	48												
					90	25	113	25												
			2		110	41	115	30												
					120	25	109	48												
					132	20	90	33												
3-SG-108	4867III	119786	1	RB	136	20	128	20												
					90	15	90	18												
					90	23	127	25												
			2		125	23	90	20												
					90	15	90	15												
					125	23	125	25												
3-SG-109	4867III	091745	1	RB	135	15	90	15												
					134	15	90	23												
					123	25	90	28												
			2		90	20	90	15												
					90	15	90	15												
					90	20	90	15												
3-SG-110	4867III	116683	1	RB	90	20	161	20												
					130	20	128	20												
					124	23	138	15												
			2		134	18	134	18												
					90	18	131	20												
					90	18	132	18												
3-SG-111	4867III	111661	1	RB	110	36	130	20												
					90	20	124	20												
					118	30	90	20												
			2		133	33	124	20												
					128	20	131	20												
					119	28	128	20												
3-SG-112	4867III	107643	1	RB	135	18	136	15												
					146	15	130	20												
					136	15	141	15												
			2		130	15	140	15												
					132	18	124	25												
					136	18	90	18												
3-SG-113	4867III	179683	1	RB	140	28	125	20												
					123	20	130	18												
					131	15	130	18												
			2		122	28	130	25												
					121	28	131	20												
					129	20	130	20												
3-SG-114	4867III	164657	1	RB	118	25	140	30												
					130	20	142	25												
					130	20	141	25												
			2		115	30	129	36												
					142	15	124	23												
					135	15	131	20												
3-SG-115	4866IV	123619	1	RB	138	28	122	28												
					145	15	139	15												
			2		122	28	126	25												
					142	15	126	20												

(Continued)

Table A6 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-SG-116	4866IV	118613	1	RB	90	18	125	20												
					126	20	123	25												
					125	25	90	25												
			2		90	20	127	23												
					122	23	90	23												
					90	25	90	18												
3-SG-117	4866IV	095583	1	RB	133	20	120	28												
					148	33	131	30												
					130	18	93	25												
			2		130	18	121	28												
					122	25	135	30												
					130	18	123	25												
3-SG-118	4866IV	079593	1	RB	150	20	155	20												
					145	15	137	15												
					123	25	114	30												
			2		146	15	132	20												
					90	15	140	15												
					125	23	145	25												
3-SG-119	4866IV	063513	1	RB	143	41	142	36												
					113	41	122	30												
			2		149	38	139	33												
					150	36	146	33												
					148	30	147	25												
3-SG-120	4867III	142729	1	RB	128	20	126	20												
					140	15	130	18												
					134	18	123	22												
			2		120	25	124	20												
					126	20	136	20												
					139	15	130	18												
3-SG-121	4867III	165717	1	RB	145	15	138	15												
					134	18	120	23												
			2		146	15	141	15												
					130	20	90	15												
3-SG-122	4867III	180719	1	TF	125	38	132	18												
					151	18	148	15												
					127	18	131	15												
					140	20	142	23												
			2		127	38	142	20												
					127	18	138	15												
					131	30	143	30												
3-SG-123	4867III	216722	1	RB	114	30	133	20												
					138	15	110	36												
					134	20	117	58												
			2		126	20	128	20												
					145	15	131	33												
					130	20	118	56												
3-SG-124	4867III	261738	1	RB	127	28	127	23												
					118	25	123	25												
					135	15	90	20												
			2		90	20	123	25												
					136	15	120	25												
					130	20	90	20												
3-SG-125	4867III	042762	1	RB	90	15	90	15												
					130	20	155	25												
			2		143	15	135	15												
					130	20	155	25												
3-SG-126	4867III	109735	1	BP	216		136	97	135	173	217									
			2		210		145	102	143	178	212									
3-SG-127	4867III	179701	1	RB	128	25	123	25												
					138	15	120	30												
			2		129	25	141	25												
					147	23	130	36												

(Continued)

Table A6 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-SG-128	4867III	153704	1	RB	122	25	121	30												
					129	20	126	23												
			2		131	20	125	20												
					90	23	90	23												
3-SG-129	4867III	177675	1	RB	130	20	140	28												
					90	15	130	18												
			2		144	20	139	25												
					90	15	131	18												
3-SG-130	4867III	177675	1	DD	236		124	142	120	94	235									
			2		248		110	132	132	102	227									
3-SG-131	4867III	160648	1	RB	151	33	141	15												
					127	23	90	15												
					144	30	90	23												
					129	20	127	20												
			2		149	38	143	15												
					130	20	150	15												
					115	28	132	20												
					130	18	90	15												
3-SG-132	4866IV	023625	1	RB	158	36	135	30												
					116	36	121	28												
			2		170	20	131	20												
					90	23	130	18												
3-SG-133	4866IV	040559	1	RB	90	15	145	15												
					155	15	90	15												
			2		133	18	136	18												
					157	15	142	15												
3-SG-134	4866IV	059551	1	RB	123	28	129	18												
					115	33	139	18												
			2		113	33	147	18												
					129	38	152	28												
3-SG-135	4866IV	069542	1	RB	134	15	126	20												
					131	18	128	20												
			2		125	20	133	18												
					135	15	132	18												
3-SG-136	4866IV	082539	1	RB	110	53	134	33												
					90	25	129	20												
					126	20	90	15												
					90	30	125	25												
			2		126	96	150	25												
					90	15	90	15												
					90	15	133	15												
					114	36	126	23												
3-SG-137	4866IV	096541	1	RB	17	30	151	23												
					120	28	160	28												
			2		120	28	158	18												
					117	30	163	30												
3-SG-138	4866IV	103532	1	RB	163	18	123	23												
					132	15	130	30												
			2		159	18	120	25												
					143	15	142	30												
3-SG-139	4866IV	089547	1	RB	142	18	140	15												
					137	15	145	15												
			2		155	15	136	15												
					146	15	135	15												
3-SG-140	4866IV	105552	1	RB	128	20	140	38												
					137	20	137	43												
					90	15	132	66												
			2		90	15	112	36												
					90	18	145	46												
					125	20	118	61												
3-SG-141	4866IV	115555	1	RB	163	25	140	66												
					90	23	123	23												
			2		135	30	139	79												
					133	20	119	28												

(Continued)

(12 of 14 sheets)

Table A6 (Continued)

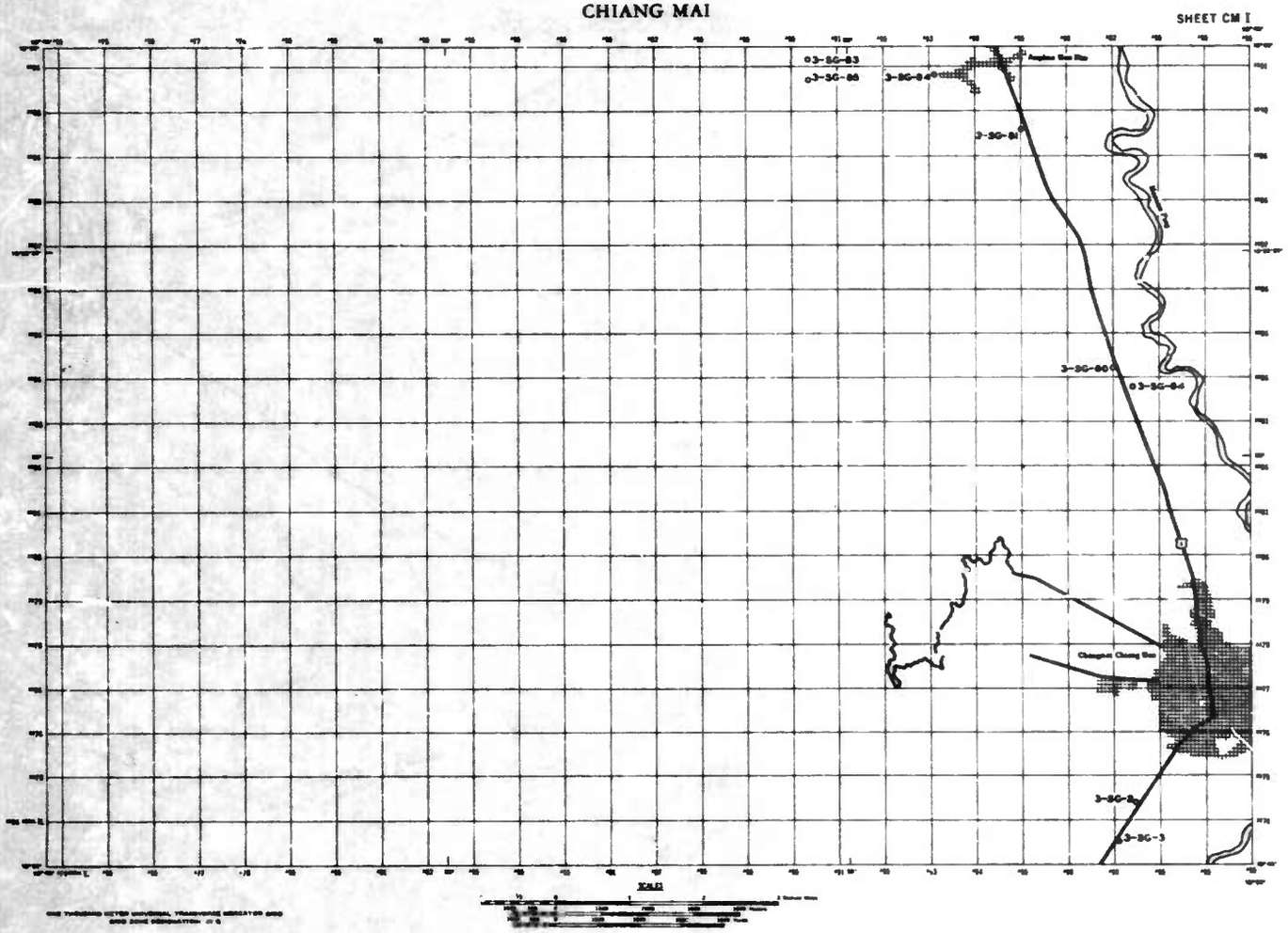
Site No.	Map Reference Sheet No.	Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-80-142	4866IV	092556	1	RB	125	25	90	15												
					124	25	138	15												
			2		125	28	90	15												
					121	25	148	20												
3-80-143	4866IV	094566	1	RB	123	25	90	15												
					90	25	130	18												
			2		123	20	90	15												
					120	28	127	23												
3-80-144	4866IV	127571	1	RB	145	25	137	41												
					137	30	149	30												
			2		90	18	242	25												
					144	36	158	25												
3-80-146	4766III	664361	1	RB	143	25	135	15												
					114	41	129	18												
			2		127	30	133	15												
					120	36	143	15												
3-80-147	4766III	683352	1	RB	128	20	90	15												
					135	18	128	23												
					138	15	135	18												
			2		122	20	138	15												
					131	15	131	15												
					139	15	90	15												
3-80-148	4766III	674357	1	RB	122	25	123	30												
					134	15	90	20												
			2		134	20	120	28												
					130	20	90	23												
3-80-149	4766III	660352	1	RB	166	15	131	71												
					154	23	143	61												
			2		161	18	136	71												
					163	25	128	66												
3-80-150	4766III	660352	1	RE	162	267	162	203												
			2		162	267	165	208												
3-80-151	4766III	663343	1	RB	130	23	90	18												
					131	30	126	25												
			2		137	20	138	20												
					135	20	136	20												
3-80-152	4766III	666297	1	RB	142	15	148	33												
					133	97	155	15												
					120	56	170	15												
			2		164	15	121	36												
					132	89	148	15												
					107	56	160	20												
3-80-153	4765IV	602186	1	RE	172	15	120	163												
					90	15	107	51												
					140	15	115	56												
			2		170	18	116	163												
					90	15	115	41												
					90	15	110	86												
3-80-154	4765IV	621211	1	RB	130	25	90	28												
					125	28	117	38												
			2		118	26	90	33												
					90	20	120	33												
3-80-155	4766III	664274	1	RB	140	15	90	36												
					90	18	114	38												
					138	18	90	25												
			2		135	20	90	38												
					143	15	90	43												
					90	15	90	25												
3-80-156	4766III	665284	1	RB	151	15	131	20												
					90	15	118	28												
			2		90	15	90	25												
					140	15	117	23												

(Continued)

Table A6 (Concluded)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
3-SG-157	4766I	826468	1	DD	237		124	315	107	305	256									
			2		230		112	335	123	305	245									
3-SG-158	4766I	844484	1	RB	137	15	142	18												
					135	20	90	20												
			2		135	15	125	20												
					134	18	90	15												
3-SG-159	4766I	832497	1	DD	126	71	119	69	112	41	107	61	90	30	128	66	120	43	118	36
			2		120	76	121	58	114	48	90	53	125	30	118	36	125	30	123	36
3-SG-160	4766I	832497	1	RB	90	20	123	25												
					90	15	129	20												
			2		137	15	130	20												
					90	15	90	20												
3-SG-161	4766I	823518	1	DD & RB	113	86	136	69												
					136	58	166	15												
					136	43	167	15												
					120	30	163	15												
			2		134	91	137	81												
					130	53	169	15												
					125	46	172	15												
					123	30	174	15												
3-SG-162	4766I	848470	1	RB	137	28	131	15												
					124	25	132	18												
			2		125	25	165	15												
					129	25	164	15												
3-SG-163	4766I	860482	1	RB	90	15	144	15												
					90	15	131	18												
			2		90	15	143	15												
					90	15	146	15												
3-SG-164	4766I	853569	1	RB	90	20	90	15												
					90	15	90	20												
			2		90	15	90	15												
					90	15	90	15												
3-SG-165	4766I	809564	1	DD	227		110	267	111	251	236									
			2		230		115	251	113	244	235									
3-SG-166	4867III	035682	1	RB	120	25	90	15												
					118	28	137	25												
			2		90	18	90	15												
					134	23	146	25												
3-SG-167	4867III	005663	1	RB	131	15	170	15												
					133	15	160	15												
			2		150	15	90	15												
					143	15	90	15												

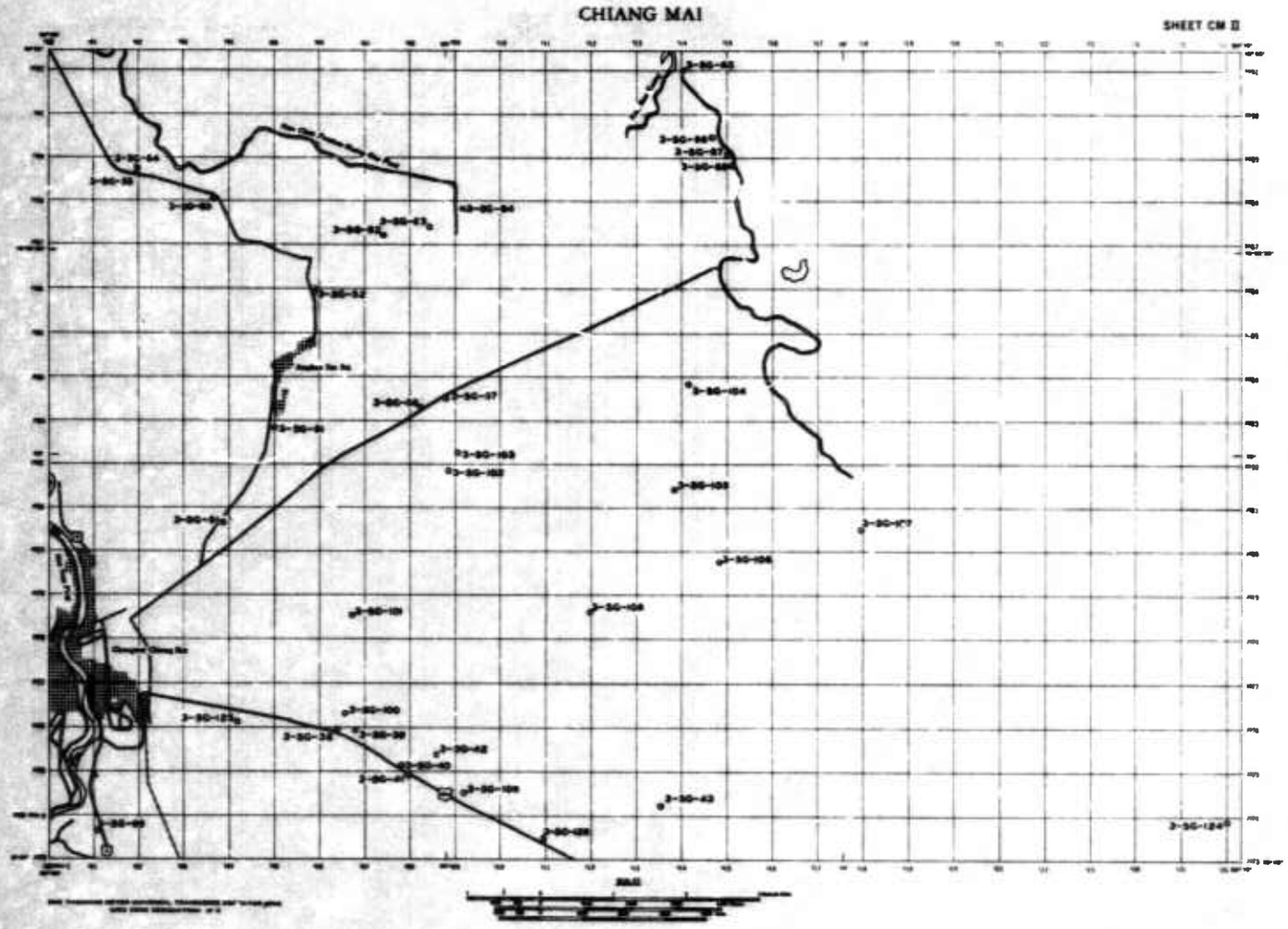
(14 of 14 sheets)



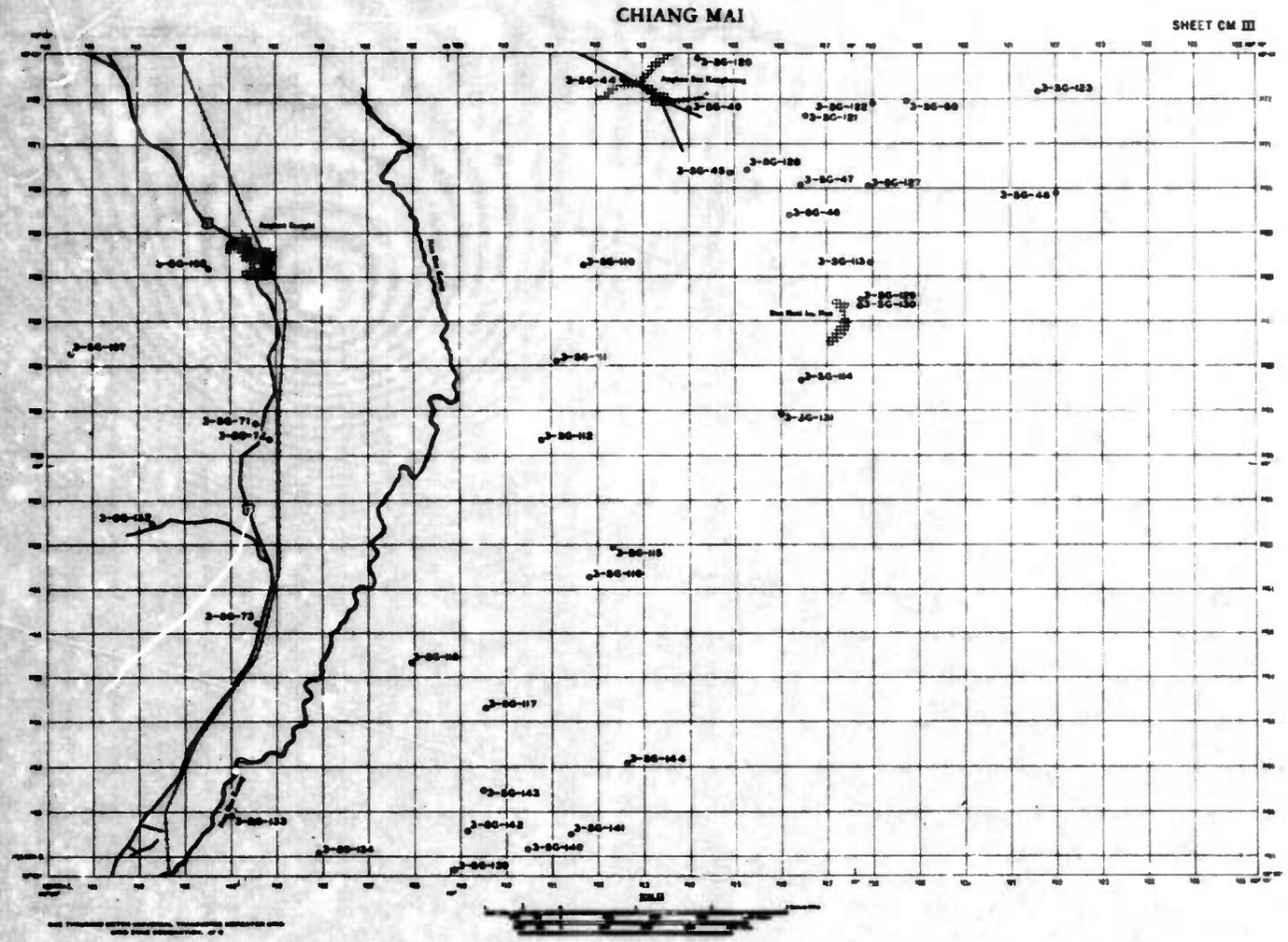
SURFACE GEOMETRY SITES
CHIANG MAI STUDY AREA
SHEET CM I

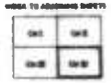
FIG. A12

FIG. A13



SURFACE GEOMETRY SITES
CHIANG MAI STUDY AREA
SHEET CM II





SURFACE GEOMETRY SITES
CHIANG MAI STUDY AREA
SHEET CM III

FIG. A14

SURFACE GEOMETRY SITES
CHIANG MAI STUDY AREA
SHEET CM IV
CHIANG MAI

FIG. A15

PRAN BURI STUDY AREA

Table A7

Surface Geometry Site Summation

Pran Buri

Site No.	Location: Map Sheet*	Location: Grid Coordinates**	Fig. No.	Date Sampled
4-SG-1	4948II	064788	A16	29 Mar 1965
4-SG-2	4948II	073729	A16	30 Mar 1965
4-SG-3	4947I	069591	A17	6 Apr 1965
4-SG-4	4947I	077617	A17	6 Apr 1965
4-SG-5	4947I	083629	A17	6 Apr 1965
4-SG-6	4947I	081626	A17	6 Apr 1965
4-SG-7	4948II	084706	A17	27 Mar 1965
4-SG-8	4948II	089664	A17	27 Mar 1965
4-SG-9	4948I	051889	A16	28 Mar 1965
4-SG-10	4948I	052876	A16	29 Mar 1965
4-SG-12	4947I	063570	A17	10 Apr 1965
4-SG-13	4948II	089642	A17	27 Mar 1965
4-SG-14	4948II	063796	A16	29 Mar 1965
4-SG-15	4948II	063813	A16	29 Mar 1965
4-SG-16	4948I	062842	A16	28 Mar 1965
4-SG-17A, 17B	4948I	053874	A16	28 Mar 1965
4-SG-18	4948I	046858	A16	30 Mar 1965
4-SG-19A, 19B	4948I	043868	A16	30 Mar 1965
4-SG-20	4948I	057859	A16	30 Mar 1965
4-SG-20A	4948II	074650	A17	10 Apr 1965
4-SG-21	4947I	964588	A17	12 Apr 1965
4-SG-22	4947I	982596	A17	11 Apr 1965
4-SG-23	4947I	964585	A17	12 Apr 1965
4-SG-26	4947I	003610	A17	11 Apr 1965
4-SG-27	4947I	016525	A18	13 Apr 1965
4-SG-31	4947I	045614	A17	8 Apr 1965
4-SG-32	4947I	044620	A17	7 Apr 1965
4-SG-33	4947I	049607	A17	7 Apr 1965
4-SG-34	4947I	038592	A17	7 Apr 1965
4-SG-35	4947I	056578	A17	9 Apr 1965
4-SG-36	4947I	050566	A17	9 Apr 1965
4-SG-37	4947I	053550	A17	9 Apr 1965
4-SG-38	4947I	050548	A17	9 Apr 1965
4-SG-39	4947I	049549	A17	9 Apr 1965
4-SG-40	4948II	077639	A17	10 Apr 1965
4-SG-41	4947I	063519	A18	10 Apr 1965
4-SG-42	4947I	995632	A17	11 Apr 1965
4-SG-44	4947I	974603	A17	11 Apr 1965
4-SG-45	4947I	041593	A17	7 Apr 1965
4-SG-46	4947I	978500	A18	14 Apr 1965
4-SG-47	4947I	993611	A17	11 Apr 1965
4-SG-48	4948II	907724	A17	8 Apr 1965
4-SG-50	4948II	897775	A16	8 Apr 1965
4-SG-51	4948II	925732	A16	8 Apr 1965
4-SG-52	4947I	987508	A18	14 Apr 1965
4-SG-53	4947I	961496	A18	14 Apr 1965
4-SG-54	4947I	934487	A18	14 Apr 1965
4-SG-56	4948I	984853	A16	20 Apr 1965
4-SG-57	4948I	975863	A16	20 Apr 1965
4-SG-58	4948I	968855	A16	20 Apr 1965
4-SG-59A, 59B	4948I	979845	A16	20 Apr 1965
4-SG-60	4948I	054844	A16	21 Apr 1965
4-SG-64	4948II	877784	A16	21 Apr 1965
4-SG-65	4948II	877780	A16	21 Apr 1965
4-SG-66	4948II	872774	A16	21 Apr 1965
4-SG-69	4948II	906803	A16	22 Apr 1965
4-SG-70	4947I	035626	A17	23 Apr 1965
4-SG-71	4947I	034630	A17	23 Apr 1965
4-SG-72	4947I	037618	A17	23 Apr 1965
4-SG-74	4947I	032599	A17	23 Apr 1965
4-SG-75	4948II	017645	A17	23 Apr 1965
4-SG-76	4948II	017639	A17	23 Apr 1965
4-SG-77	4947I	003621	A17	24 Apr 1965
4-SG-79	4947I	002602	A17	24 Apr 1965
4-SG-80	4947I	996596	A17	24 Apr 1965
4-SG-81	4947I	008585	A17	24 Apr 1965
4-SG-82	4947I	015588	A17	24 Apr 1965
4-SG-83	4947I	007597	A17	24 Apr 1965
4-SG-85	4947I	977562	A17	25 Apr 1965
4-SG-86	4947I	971555	A17	25 Apr 1965
4-SG-88	4947I	967535	A18	25 Apr 1965
4-SG-89	4947I	966518	A18	25 Apr 1965
4-SG-90	4947I	962506	A18	25 Apr 1965
4-SG-96	4947I	018506	A18	26 Apr 1965
4-SG-97	4947I	018536	A18	26 Apr 1965
4-SG-99	4947I	050531	A18	27 Apr 1965
4-SG-101	4947I	078513	A18	27 Apr 1965
4-SG-103	4947I	075496	A18	28 Apr 1965
4-SG-104	4947I	066493	A18	28 Apr 1965
4-SG-105	4947I	066478	A18	28 Apr 1965
4-SG-106	4947II	943444	A18	28 Apr 1965
4-SG-107	4947I	951459	A18	28 Apr 1965
4-SG-108A, 108B	4947I	963475	A18	28 Apr 1965
4-SG-109	4947I	019598	A17	29 Apr 1965
4-SG-110	4947I	024595	A17	29 Apr 1965
4-SG-111	4947I	040589	A17	29 Apr 1965

Note: Missing site numbers are the result of sites having been preselected and numbered but not sampled.

* AMS, L708, 1:50,000.

** Coordinates are set up according to the Military Grid System. The first three coordinate numbers represent longitude, and the second three numbers represent latitude.

Table A8

Summary of Surface Geometry Field Data

Pran Buri

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type*	Critical Approach Angle (AA) and Step Height (SH)** 1† AA	SH	2 AA	SH	3 AA	SH	4 AA	SH	5 AA	SH	6 AA	SH	7 AA	SH	8 AA	SH
4-SG-1	4948II	064788	1	SD	171	6[illegible]	163	168	201		192		164	97	167	203				
			2		173	107	164	147	200		190		166	61	160	193				
			3		171	91	167	91	193		192		164	66	161	188				
4-SG-2	4948II	073729	1	SD	163	81	200		196		164	61	162	41	195					
			2		163	91	197		194		163	56	163	61	194					
			3		157	102	205		195		162	66	162	71	194					
4-SG-3	4947I	069591	1	SD	173	107	161	66												
					124	61	165	30												
					152	25	167	46												
			2		172	107	165	91												
					162	77	143	46												
					149	25	167	36												
			3		174	91	164	61												
					127	38	159	30												
					161	25	136	51												
4-SG-4	4947I	077617	1	SD	169	76	164	51												
					116	23														
			2		168	76	168	56												
					110	20														
			3		153	25	120	25												
					113	28														
4-SG-5	4947I	083629	1	SD	158	20	158	20												
			2		170	91	153	23												
			3		128	20	155	15												
4-SG-6	4947I	08162[illegible]	1	SD	169	51	167	15												
					169	51	174	41												
			2		169	56	148	15												
					158	15	176	45												
			3		168	46	166	10												
					167	30	172	46												
4-SG-7	4948II	084706	1	SD	190		170	58	189		128	46	189		193		170	71		
			2		185		173	61	191		130	46	186		195		170	56		
			3		185		171	56	189		146	33	185		187		173	61		
4-SG-8	4948II	089664	1	SD	133	142	230		197		165	66	165	91						
			2		160	132	204		202		168	117	140	112	150	87				
			3		160	168	197		198		156	117	161	97	192		192		172	107
4-SG-9	4948I	051889	1	SD	162	51	162	51	167	71										
			2		141	66	169	76	166	64										
			3		166	41	165	46	170	61										
4-SG-10	4948I	052876	1	SD	159	71	149	259	209											
			2		160	127	157	224	204											
			3		159	140	157	203	204											
4-SG-12	4947I	063570	1	SD	90	51														
			2		120	51														
4-SG-13	4948II	089642	1	SD	158	229	208		165	43	164	53	171	112	187					
			2		167	157	198		155	36	165	64	167	25	120	118	157	41	164	46
			3		159	157	200		190		143	36	160	56	164	38	164	132		
4-SG-14	4948II	063796	1	SD	103	46	152	315	195		194		174	99						
			2		158	66	103	46	152	310	196		190							
			3		167	112	199		198		149	61	153	325	195					
4-SG-15	4948II	063813	1	SD	149	254	209		214		148	84	153	91						
			2		158	198	222		204		150	81								
			3		149	203	215		225		153	71								
4-SG-16	4948I	062842	1	TF	154	79	134	152	137	97	128	107	132	107	127	117	132	102		
			2		157	71	135	155	135	97	129	99	132	107	132	117	130	99		

(Continued)

* Abbreviations used for feature types are defined on page A1.
** Approach angles (AA) are given in degrees and step heights (SH) are given in centimeters.
† For position of numerical designated approach angle and step height see diagram on page A2.

Table A8 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
4-SG-17A	4948I	053874	1	SD	152	71	150	269	202				156	81	154	56	199		202	
			2		145	71	155	269	199		203									
			3		134	76	152	244	206		206									
4-SG-17B	4948I	053874	1	SD	157	132	165	43	168	41	144	91	151	188	215					
			2				159	36			153	91	162	188	208					
			3				161	33			142	97	138	173	225					
4-SG-18	4948I	046858	1	RE	164	56	162	279	204		162	107	153	56	167	36				
			2		144	51	160	218	202		160	112	152	56	146	61				
4-SG-19A	4948I	043868	1	TM	164	112	202		210		147	102								
			2		155	147	207		215		148	152								
			3		165	122	200		208		156	142								
4-SG-19B	4948I	043868	1	TM	166	91	205		207		164	69								
			2		162	142	219		218		160	137								
			3		167	97	215		218		162	137								
4-SG-20	4948I	057859	1	SD	155	137	205													
			2		150	122	209													
			3		142	132	125													
4-SG-20A	4948II	074630	1	RB			162	61												
					145	15	147	15												
			2				154	36												
					146	20	149	15												
4-SG-21	4947I	964588	1	RB	158	25	137	30												
					159	46	146	61												
					147	38	124	28												
			2		144	15	117	20												
					155	51	128	51												
					150	51	147	41												
4-SG-22	4947I	982596	1	RB & TM	152	36	150	38												
					150	25	164	20												
			2		165	46	144	46												
					145	38	87	25												
4-SG-23	4947I	964585	1	RB	143	15	115	15												
					140	30	147	38												
					151	61	142	41												
					136	61														
			2		149	28	154	20												
					140	46	150	46												
					142	56	145	25												
					121	51														
4-SG-26††	4947I	003610	1	RP	155	25														
			2		110	20														
			3		127	25														
4-SG-27	4947I	016525	1	OR	146	28	150	25												
4-SG-31	4947I	045614	1	RP	161	20	155	20												
					112	30	160	10												
					137	13														
			2				118	23												
					146	28	147	25												
			3				116	23												
							121	13												
4-SG-32	4947I	044620	1	RB	145	41	148	41												
					166	36	139	46												
					148	33	141	41												
			2		156	43	145	46												
					134	81	130	71												
					156	38	132	38												
4-SG-33	4947I	049607	1	RP	188	20	171	20	175	15	185	15								
			2		210	25	152	25	162	30	202	30								
4-SG-34	4947I	038592	1	DP	165		192	30	173	38	189									
			2		195		169	36	168	51	194									
4-SG-35	4947I	056578	1	RB	112	20	158	20												
			2		161	30	153	23												

(Continued)

†† Profiles not suitable for classification.

(2 of 7 sheets)

Table A8 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
4-SG-36	4947I	050566	-	RB	153	25	164	15												
					166	30	167	30												
					116	25	177	3												
			2		155	30	155	25												
					171	20	148	25												
4-SG-37	4947I	053550	1	RB	158	25														
			2		149	23														
4-SG-38	4947I	050548	1	RB	142	25	125	30												
					172	76														
			2		158	20	169	30												
					145	51														
4-SG-39	4947I	049549	1	RB	161	30	150	51												
					153	56	156	53												
					148	61	150	69												
			2		148	46	149	61												
					149	41	148	38												
					148	61	143	56												
4-SG-40	4948II	077639	1	RB			162	2.												
					160	30	167	41												
					165	15	160	15												
			2		172	15	168	30												
					160	20	130	36												
					175	20	173	20												
4-SG-41	4947I	063519	1	TF	155	30	162	10												
			2		203	41	209	30												
					160	15														
4-SG-42	4947I	995632	1	TF	200	15	218	15												
			2		188	10	205	15												
4-SG-44††	4947I	974603	1	RB	135	41	125	41												
					136	56	138	56												
					118	30	154	30												
			2		125	51	135	46												
					124	51	137	51												
					144	46	146	36												
4-SG-45	4947I	041593	1	RB	149	61	140	61												
					130	71	134	56												
					139	66	125	46												
			2		135	38	141	61												
					134	61	130	56												
					135	71	158	46												
4-SG-46	4947I	978500	1	RB			159	36												
					157	41	153	30												
					157	25	159	20												
			2				171	15												
					145	36	155	25												
					140	30	153	25												
4-SG-47	4947I	993611	1	RB	151	56	154	36												
					135	51	142	46												
					135	36														
			2		122	46	150	30												
					97	51	140	38												
					168	66	172	56												
4-SG-48	4948II	907724	1	RB	270	102	225	61			232	38								
			2		260	91	262	76												
4-SG-50	4948II	897775	1	RP	206	46	160	46	147	82	196	82								
			2		193	61	158	61	154	91	196	91								
			3		193	76	168	76	165	91	195	91								
			4		204	61	156	61	168	51	189	91								
			5		187	25	190	86												
			6		206	30	154	30	150	51	210	51								
4-SG-51	4948II	925732	1	RP	147	15	142	15												
					120	15	154	51												
					172	61	168	30												
					170	30														
			2		162	36	146	61												
					173	71	170	30												
					174	66														

(Continued)

†† Profiles not suitable for classification.

(3 of 7 sheets)

Table A8 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
4-80-51	4948II	925732	3	RP	165	25	166	25												
					172	61	173	36												
					170	46														
4-80-52	4947II	987508	1	RB	160	36	132	30												
					155	25	137	20												
					157	25	156	30												
			2		154	25	145	30												
					135	15	163	15												
					154	36	151	30												
4-80-53	4947I	961496	1	RB	174	15	165	30												
					102	51	150	51												
					163	46	148	46												
			2		154	30	154	30												
					130	38	154	46												
					158	46	141	51												
4-80-54	4947I	934487	1	TF	138	41	135	36			200	46								
					218	30			142	30	245	30								
					212	56	226	38												
					238	56	218	51												
					236	38	225	46												
			2		168	51	90	30			300	61								
					230	30	222	46												
					220	46	214	46												
					228	38	232	38												
					231	30	228	38												
4-80-56	4948I	984853	1	RB	162	51	166	43												
					140	51	153	48												
					160	36	171	46												
			2		153	51	164	48												
					154	61	157	61												
					158	36	171	51												
4-80-57	4948I	975863	1	RP	220		137	112	156	71	133	51	215	366	16	541				
			2		210		152	61	120	46	155	52	206							
			3		218		166	86	108	51	162	86	200							
4-80-58	4948I	968855	1	RP	173	81	123	51	220		144	91	213							
			2		150	157	142	91	162	127	195									
			3		103	71	107	43	154	91										
4-80-59A	4948I	979845	1	TM	173	152	167	142	145	51										
			2		170	173	166	185	160	71										
			3		175	167	170	152	147	69										
4-80-59B	4948I	979845	1	TM	156	196	160	112												
			2		159	209	166	178												
			3		164	188	162	142												
4-80-60	4948I	054844	1	TB	132	102	152	76												
					157	46	150	53												
			2		154	109	135	69												
					134	59	143	81												
4-80-64	4948II	877784	1	LV	144	175														
			2		146	127														
4-80-65	4948II	877780	1	RV	161	124														
					152	109														
			2		162	128														
					155	145														
4-80-66	4948II	872774	1	RV	202	168	148		153		204	160								
4-80-69	4948II	906803	1	TM	168	122														
					165	152														
			2		165	137														
					165	160														
			3		164	69														
					173	137														
4-80-70	4947I	035626	1	RB	147	43	157	41												
					155	43	143	38												
					145	41	149	33												
			2		143	38	150	46												
					144	43	149	38												
					123	41	155	41												

(Continued)

(4 of 7 sheets)

Table A8 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
4-SG-71	4947I	034630	1	RB	150	41	150	41												
					146	33	146	43												
					146	46	120	46												
			2		132	43	140	30												
					120	18	150	38												
					142	49	135	49												
4-SG-72	4947I	037618	1	RB	113	46	144	48												
					131	43	139	61												
					144	48	125	33												
			2		141	41	155	48												
					138	48	140	43												
					147	61	159	30												
4-SG-74	4947I	032599	1	DP	201	48	154	43	128	61	221	61								
			2		207	48	155	48	165	74	195	74								
			3		197	51	165	51	167	71	191	71								
4-SG-75	4948II	017645	1	RB	141	71	146	69												
					135	71	140	51												
					134	66	164	43												
			2		130	51	144	64												
					130	74	139	61												
					152	76	163	41												
4-SG-76	4948II	017639	1	RB	145	36	159	15												
					154	36	152	30												
					165	30	147	38												
			2		163	36	164	10												
					165	41	143	51												
					147	53	143	48												
4-SG-77	4947I	003621	1	RB	153	46	134	122												
					150	41	146	42												
						48	146	41												
			2		1	51	154	48												
					147	36	148	38												
					127	46	151	20												
4-SG-79	4947I	002602	1	RB	153	43	157	43												
					162	30	171	30												
					170	30	170	15												
			2		151	48	151	38												
					168	43	156	36												
					173	13	175	13												
4-SG-80	4947I	996596	1	RB	163	33	157	33												
					140	41	157	36												
					157	15	173	8												
			2		161	43	163	36												
					143	38	145	30												
					174	13	165	10												
4-SG-81	4947I	008585	1	RB	159	20	154	30												
					160	23	163	23												
					165	20	172	20												
			2		163	30	156	38												
					153	36	162	41												
					166	33	165	20												
4-SG-82	4947I	015588	1	RB	225	69	120	51	132	48	218	36								
					170	41	195	36	143	20	134	13	165	36						
			2		293	41	123	36	134	51	215	51								
					166	20	202	97	115	107	119	51	241	51						
4-SG-83	4947I	007597	1	RB	137	15	144	20												
					161	36	157	43												
					146	38	157	38												
			2		138	20	168	13												
					122	51	149	53												
					147	30	126	41												
4-SG-85	4947I	977562	1	RB	163	13	166	20												
					173	23	170	35												
					166	25	163	33												
			2		175	13	169	18												
					167	15	151	18												
					168	23	144	30												

(Continued)

Table A8 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
4-SG-86	4947I	971555	1	RB	138	69	150	74												
					146	61	133	64												
					130	61	136	69												
			2		138	51	140	66												
					143	74	137	76												
					143	71	132	122												
4-SG-88	4947I	967535	1	RB	154	43	144	46												
					139	38	150	41												
					145	36	158	38												
			2		149	36	151	43												
					137	20	158	33												
					146	43	147	38												
4-SG-89	4947I	966518	1	RRE	133	282	146	384												
			2		144	282	148	384												
4-SG-90	4947I	962506	1	RB	137	41	160	36												
					153	51	148	51												
					143	64	132	64												
			2		152	36	148	38												
					146	41	142	61												
					148	61	137	46												
4-SG-96	4947I	018506	1	RP	242	41	211	5												
4-SG-97	4947I	018536	1	DD	158	38	223	64	139	41	114	33	210	48	170	18				
			2		165	41	235	71	159	36	114	38	199	86	168	41				
4-SG-99	4947I	050531	1	RB	168	18	165	18												
					164	33	161	23												
					132	38	168	30												
			2		158	41	164	18												
					166	36	163	23												
					131	38	168	30												
4-SG-101	4947I	076513	1	RB	120	18	151	20												
					160	20	155	20												
					147	43	134	30												
			2		152	13	147	23												
					154	23	161	30												
					153	46	157	25												
4-SG-103	4947I	075496	1	RB	157	43	153	36												
					170	30	168	30												
					164	38	162	38												
			2		159	46	165	43												
					169	41	162	38												
					164	41	157	48												
4-SG-104	4947I	066493	1	RB	138	33	145	30												
					152	30	158	33												
					153	20	154	36												
			2		143	36	142	23												
					157	30	165	33												
					164	23	160	33												
4-SG-105	4947I	066478	1	RB	117	36	141	46												
					134	43	148	38												
					130	38	136	30												
			2		114	41	129	48												
					117	53	140	48												
					145	46	145	41												
4-SG-106	4947II	943444	1	RB	141	53	156	43												
					149	48	153	46												
					137	51	153	48												
			2		134	51	157	43												
					151	43	158	43												
					146	41	145	43												
4-SG-107	4947I	951459	1	RB	155	41	140	69												
					153	30	151	53												
					147	38	152	61												
			2		162	41	140	51												
					158	46	142	48												
					145	36	150	46												

(Continued)

Table A8 (Concluded)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
4-SG-108A	4947I	963475	1	DP	207	51	170	8	152	20	182	36								
			2		190	51	144	20	144	33	195	43								
			3		197	30					187	64								
4-SG-108B	4947I	963475	1	DP					168	48	202	48								
			2		225	30	120	15	170	48	192	33								
			3		195	48	161	8	168	18	193	33								
4-SG-109	4947I	019598	1	RB	136	13	161	23												
			2		167	18	142	30												
4-SG-110	4947I	024555	1	RB	164	18	157	5												
					167	23	154	23												
					149	10	152	43												
			2		162	30	151	33												
					152	23	160	20												
					150	23	167	36												
4-SG-111	4947I	040589	1	RB	162	41	156	51												
					158	61	137	46												
			2		164	30	165	41												
					138	51	140	53												

(7 of 7 sheets)

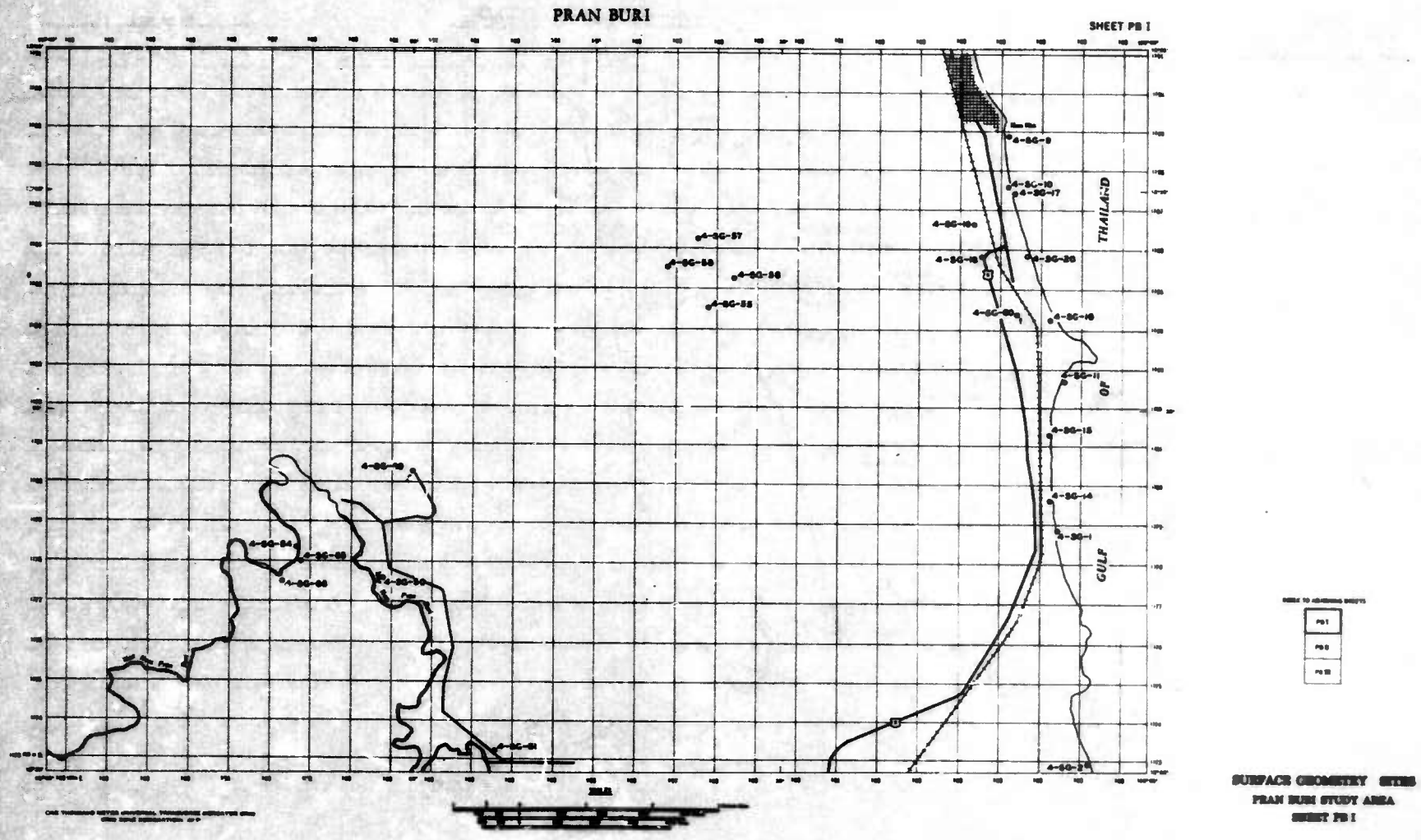
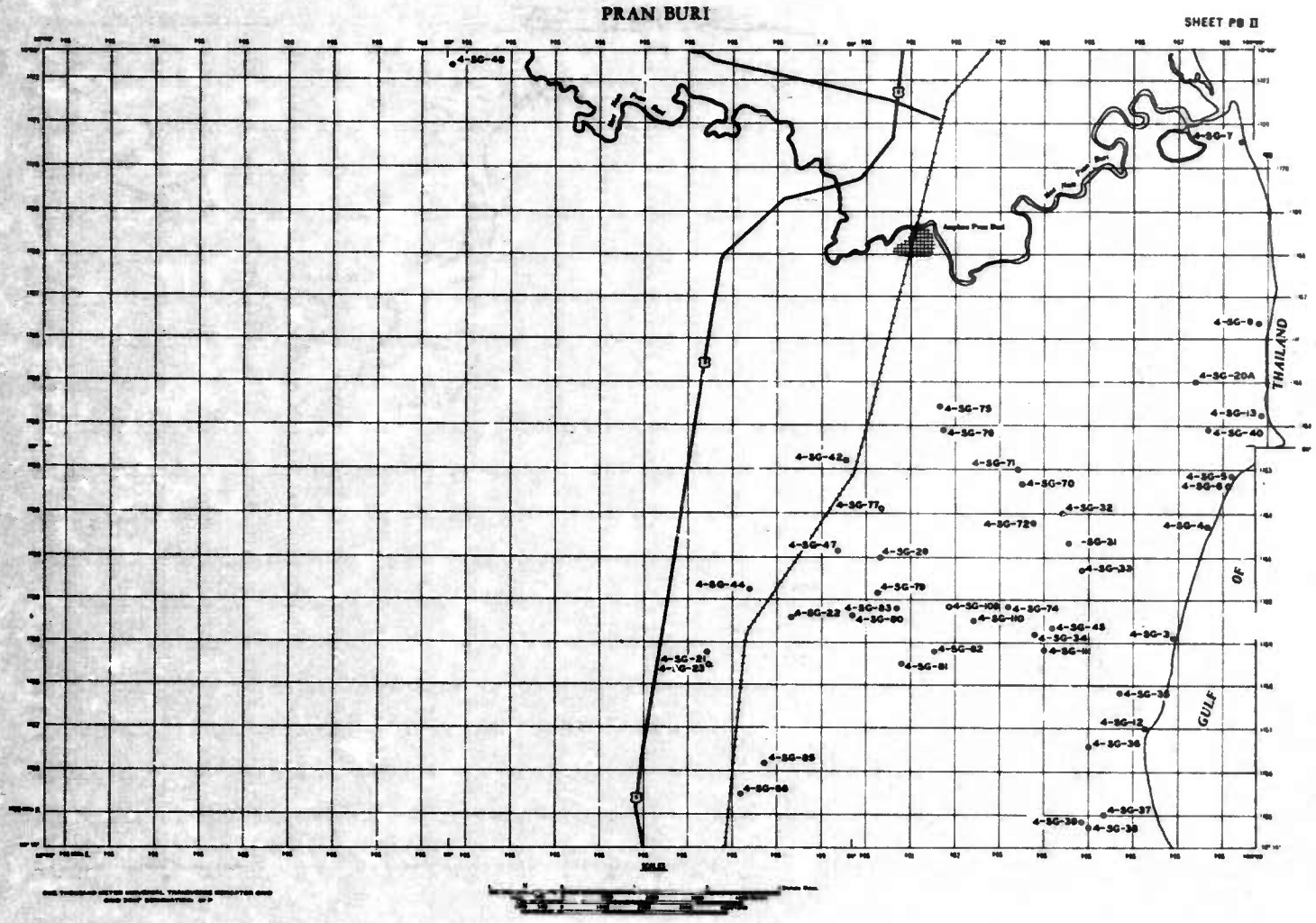

PRAN BURI
SHEET PB I
THAILAND
GULF
OF
4-SC-9
4-SC-10
4-SC-17
4-SC-16a
4-SC-16
4-SC-20
4-SC-19
4-SC-18
4-SC-11
4-SC-15
4-SC-14
4-SC-1
4-SC-57
4-SC-56
4-SC-55
4-SC-54
4-SC-53
4-SC-52
4-SC-51
4-SC-50
4-SC-49
4-SC-48
4-SC-47
SURFACE GEOMETRY SITES
PRAN BURI STUDY AREA
SHEET PB I

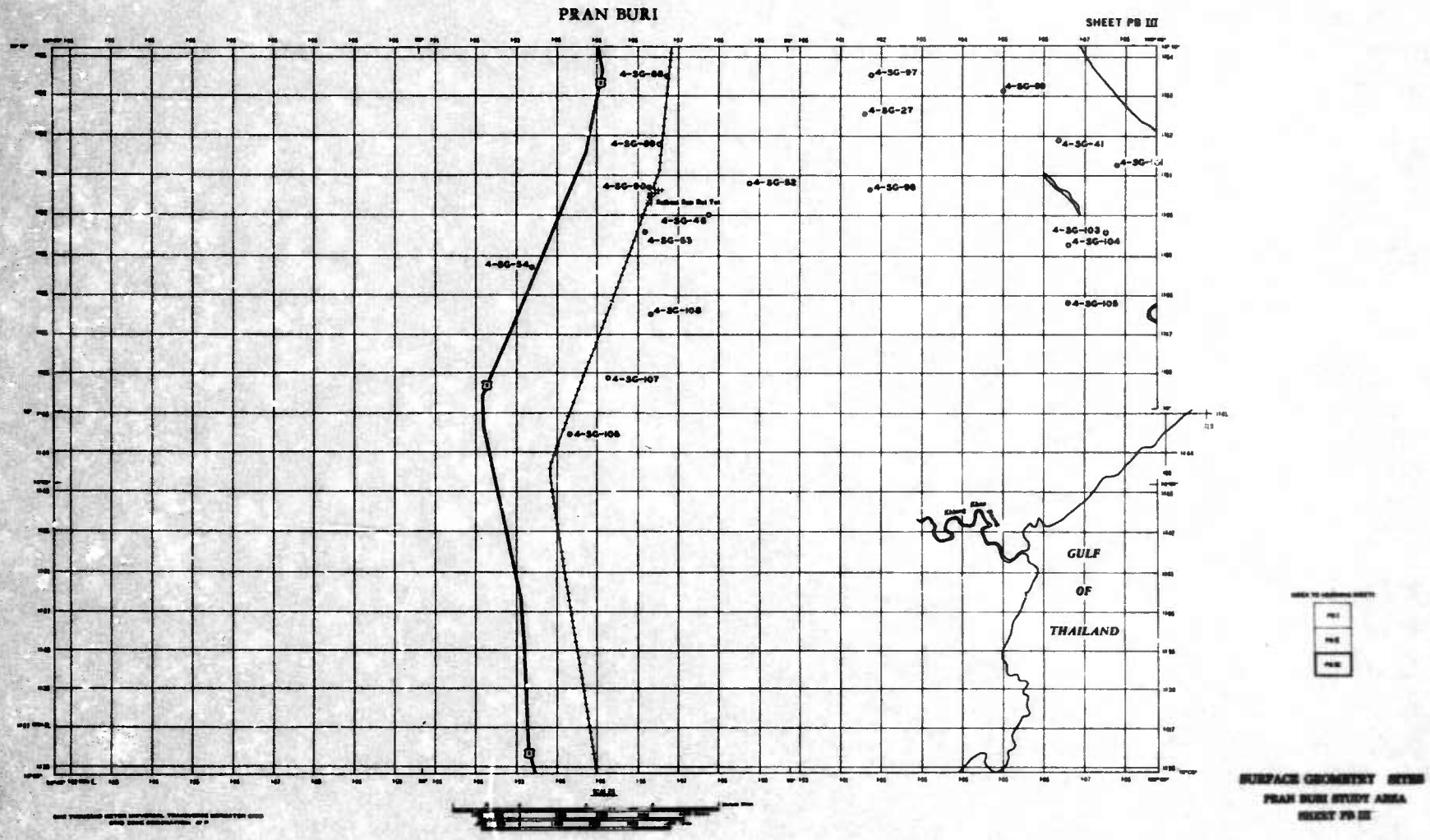
FIG. A16

FIG. A17

A72



SURFACE GEOMETRY SITES
PRAN BURI STUDY AREA
SHEET PB II



SURFACE GEOMETRY SITES
PRAN BURI STUDY AREA
SHEET PB III

FIG. A18

KHON KAEN STUDY AREA

Table A9

Surface Geometry Site Summation

Khon Kaen

Site No.	Location: Map Sheet*	Location: Grid Coordinates**	Fig. No.	Date Sampled
5-SG-1	5560II	660188	A20	11 Nov 1964
5-SG-2	5560II	660188	A20	11 Nov 1964
5-SG-3	5560II	631193	A20	11 Nov 1964
5-SG-4	5560II	622196	A20	11 Nov 1964
5-SG-5A, 5B	5560III	597197	A20	11 Nov 1964
5-SG-7	5560III	587197	A20	12 Nov 1964
5-SG-8	5560III	587197	A20	12 Nov 1964
5-SG-9	5560III	569198	A20	12 Nov 1964
5-SG-10	5560III	541196	A20	12 Nov 1964
5-SG-11, 11B	5560III	541196	A20	11 Nov 1964
5-SG-12	5560III	539189	A20	11 Nov 1964
5-SG-13	5560III	536184	A20	11 Nov 1964
5-SG-14B	5560III	533181	A20	13 Nov 1964
5-SG-15	5560III	527162	A20	13 Nov 1964
5-SG-16	5560III	527162	A20	13 Nov 1964
5-SG-17	5560II	661174	A20	14 Nov 1964
5-SG-18	5560II	654165	A20	14 Nov 1964
5-SG-19	5560II	662154	A20	14 Nov 1964
5-SG-20	5560II	642150	A20	14 Nov 1964
5-SG-21	5560II	643128	A20	14 Nov 1964
5-SG-23	5560II	636147	A20	15 Nov 1964
5-SG-24	5560II	616157	A20	15 Nov 1964
5-SG-25	5560II	628143	A20	15 Nov 1964
5-SG-26	5560II	642161	A20	15 Nov 1964
5-SG-27	5560II	749169	A20	15 Nov 1964
5-SG-28	5560II	761154	A20	15 Nov 1964
5-SG-29	5560II	712174	A20	16 Nov 1964
5-SG-30	5560II	770181	A20	16 Nov 1964
5-SG-31	5560II	798182	†	16 Nov 1964
5-SG-32	5560II	816192	A21	16 Nov 1964
5-SG-33	5560II	854188	A21	16 Nov 1964
5-SG-34	5660III	879187	A21	16 Nov 1964
5-SG-35	5660III	949163	A21	17 Nov 1964
5-SG-36	5660III	923178	A21	17 Nov 1964
5-SG-37	5660III	907189	A21	17 Nov 1964
5-SG-38	5560I	688243	A20	17 Nov 1964
5-SG-39	5560I	689273	†	17 Nov 1964
5-SG-40	5560II	689198	A20	18 Nov 1964
5-SG-41	5560II	690198	A20	18 Nov 1964
5-SG-42	5560I	688299	†	18 Nov 1964
5-SG-43	5560I	681335	†	18 Nov 1964
5-SG-44	5560II	709251	A20	18 Nov 1964
5-SG-46	5560II	672236	A20	19 Nov 1964
5-SG-47	5560I	652255	†	19 Nov 1964
5-SG-48	5560I	640274	†	19 Nov 1964
5-SG-49	5560I	629288	†	19 Nov 1964
5-SG-50	5560I	645293	†	19 Nov 1964
5-SG-51	5560I	637292	†	20 Nov 1964
5-SG-52	5560I	612305	†	20 Nov 1964
5-SG-53	5560III	556199	A20	20 Nov 1964
5-SG-54	5560III	517198	A20	20 Nov 1964
5-SG-55	5560III	502196	A19	20 Nov 1964
5-SG-56	5560III	480204	A19	20 Nov 1964
5-SG-57	5560III	450221	A19	20 Nov 1964
5-SG-58	5560III	533196	A20	27 Nov 1964
5-SG-59	5560III	533196	A20	27 Nov 1964
5-SG-60	5560III	374238	A19	27 Nov 1964
5-SG-61	5560III	347237	A19	27 Nov 1964
5-SG-62	5560III	390239	A19	27 Nov 1964
5-SG-63	5560III	418234	A19	27 Nov 1964
5-SG-64A, 64B	5560III	466213	A19	28 Nov 1964
5-SG-65	5560III	434229	A19	28 Nov 1964
5-SG-66A, 66B	5460II	318241	A19	28 Nov 1964
5-SG-67	5460II	302243	A19	28 Nov 1964
5-SG-68	5460II	259248	A19	28 Nov 1964
5-SG-69	5460I	240346	†	29 Nov 1964
5-SG-70	5460I	240331	†	29 Nov 1964
5-SG-71	5460I	239311	†	29 Nov 1964
5-SG-72	5460I	239295	†	29 Nov 1964
5-SG-73	5460II	219246	†	29 Nov 1964
5-SG-74	5560I	691322	†	30 Nov 1964
5-SG-75	5560I	722308	†	30 Nov 1964
5-SG-76	5560I	718312	†	30 Nov 1964
5-SG-77	5560I	711295	†	30 Nov 1964
5-SG-78	5560I	727285	†	30 Nov 1964
5-SG-79	5560I	723283	†	30 Nov 1964
5-SG-80	5560I	700338	†	1 Dec 1964
5-SG-81	5560I	711333	†	1 Dec 1964
5-SG-82	5560I	715326	†	1 Dec 1964
5-SG-83	5560I	717307	†	1 Dec 1964
5-SG-84	5560I	694333	†	1 Dec 1964
5-SG-85	5560II	725182	A20	1 Dec 1964
5-SG-86	5560II	716203	A20	1 Dec 1964
5-SG-87	5560II	725232	A20	2 Dec 1964
5-SG-88	5560II	728246	A20	2 Dec 1964
5-SG-89	5560I	722263	†	2 Dec 1964
5-SG-90	5560III	578213	A20	2 Dec 1964
5-SG-91	5560III	586246	A20	2 Dec 1964
5-SG-92	5560III	564227	A20	2 Dec 1964
5-SG-93	5560III	557209	A20	2 Dec 1964
5-SG-94	5560II	815196	A21	3 Dec 1964
5-SG-95	5560II	810221	A21	3 Dec 1964
5-SG-96	5560I	818253	†	3 Dec 1964
5-SG-97	5560I	833269	†	3 Dec 1964
5-SG-98	5560I	849291	†	3 Dec 1964
5-SG-99	5560I	839311	†	3 Dec 1964
5-SG-100	5560I	859311	†	3 Dec 1964
5-SG-101	5460I	199409	†	4 Dec 1964
5-SG-102	5460I	185391	†	4 Dec 1964
5-SG-103	5460I	158381	†	4 Dec 1964

(Continued)

Note: Missing site numbers are the result of sites having been preselected and numbered but not sampled.

* AMS, L708, 1:50,000.

** Coordinates are set up according to the Military Grid System. The first three coordinate numbers represent longitude, and the second three numbers represent latitude.

† Site outside limits of figure.

(1 of 3 sheets)

Table A9 (Continued)

Site No.	Location: Map Sheet	Location: Grid Coordinates	Fig. No.	Date Sampled
5-SG-104	5460I	141390	†	4 Dec 1964
5-SG-105	5460I	126383	†	4 Dec 1964
5-SG-106	5460I	111360	†	4 Dec 1964
5-SG-107	5460I	124358	†	4 Dec 1964
5-SG-108	5660III	871191	A21	5 Dec 1964
5-SG-109	5660III	881204	A21	5 Dec 1964
5-SG-110	5660III	904214	A21	5 Dec 1964
5-SG-111	5660III	920218	A21	5 Dec 1964
5-SG-112	5660III	942233	A21	5 Dec 1964
5-SG-113	5660III	945246	A21	5 Dec 1964
5-SG-114	5660III	908209	A21	5 Dec 1964
5-SG-115	5560II	731164	A20	6 Dec 1964
5-SG-116	5560II	734151	A20	6 Dec 1964
5-SG-117	5560II	737154	A20	6 Dec 1964
5-SG-118	5560II	724162	A20	6 Dec 1964
5-SG-119	5560II	763147	A20	6 Dec 1964
5-SG-120	5560II	811167	A21	6 Dec 1964
5-SG-121	5560II	816161	A21	6 Dec 1964
5-SG-123	5460II	148256	†	7 Dec 1964
5-SG-124	5460II	1822?8	†	7 Dec 1964
5-SG-125	5460I	169271	†	7 Dec 1964
5-SG-126	5460II	179247	†	7 Dec 1964
5-SG-127	5460II	206253	†	7 Dec 1964
5-SG-128	5560II	652091	A20	8 Dec 1964
5-SG-129	5560II	671117	A20	8 Dec 1964
5-SG-130	5560II	685132	A20	8 Dec 1964
5-SG-131	5560II	689145	A20	8 Dec 1964
5-SG-132	5560II	730137	A20	8 Dec 1964
5-SG-133	5560II	721148	A20	8 Dec 1964
5-SG-134	5560II	703123	A20	13 Dec 1964
5-SG-135	5560II	714118	A20	13 Dec 1964
5-SG-136	5560II	698135	A20	13 Dec 1964
5-SG-137	5560II	698143	A20	13 Dec 1964
5-SG-138	5560II	6081?4	A20	14 Dec 1964
5-SG-139	5560II	604167	A20	14 Dec 1964
5-SG-140	5560III	593156	A20	14 Dec 1964
5-SG-141	5560III	579151	A20	14 Dec 1964
5-SG-142	5560III	556128	A20	14 Dec 1964
5-SG-143	5560III	539110	A20	14 Dec 1964
5-SG-144	5560III	524090	A20	14 Dec 1964
5-SG-145	5560III	508076	A20	14 Dec 1964
5-SG-146	5560III	482191	A19	14 Dec 1964
5-SG-147	5560II	666117	A20	15 Dec 1964
5-SG-148	5560II	668139	A20	15 Dec 1964
5-SG-149	5560II	679157	A20	15 Dec 1964
5-SG-150	5560II	677169	A20	15 Dec 1964
5-SG-151	5560II	659098	A20	15 Dec 1964
5-SG-152	5560II	687073	A20	15 Dec 1964
5-SG-153	5560II	699081	A20	15 Dec 1964
5-SG-154	5560II	713074	A20	15 Dec 1964
5-SG-155	5560III	471182	A19	16 Dec 1964
5-SG-156	5560III	469167	A19	16 Dec 1964
5-SG-157	5560III	469149	A19	16 Dec 1964
5-SG-158	5560III	486138	A19	16 Dec 1964
5-SG-159	5560III	487119	A19	16 Dec 1964
5-SG-160	5560III	493102	A19	16 Dec 1964
5-SG-161	5560III	499080	A19	16 Dec 1964
5-SG-162	5560III	558151	A20	16 Dec 1964
5-SG-163	5560III	559180	A20	16 Dec 1964
5-SG-164	5560III	380229	A19	17 Dec 1964
5-SG-165	5560III	376212	A19	17 Dec 1964
5-SG-166	5560III	379189	A19	17 Dec 1964
5-SG-167	5560III	373148	A19	17 Dec 1964
5-SG-168	5560III	364125	A19	17 Dec 1964
5-SG-169	5560III	357162	A19	17 Dec 1964
5-SG-170	5460III	327181	A19	17 Dec 1964
5-SG-171	5460II	302198	A19	17 Dec 1964
5-SG-172	5460I	252347	†	18 Dec 1964
5-SG-173	5560IV	362349	†	18 Dec 1964
5-SG-174	5460I	332337	†	18 Dec 1964
5-SG-175	5460I	314345	†	18 Dec 1964
5-SG-176	5460I	295333	†	18 Dec 1964
5-SG-177	5460I	292317	†	18 Dec 1964
5-SG-178	5460I	283311	†	18 Dec 1964
5-SG-179	5460I	271338	†	18 Dec 1964
5-SG-180	5460I	253329	†	18 Dec 1964
5-SG-181	5460II	271232	A19	19 Dec 1964
5-SG-182	5460II	273212	A19	19 Dec 1964
5-SG-183	5460II	269187	A19	19 Dec 1964
5-SG-184	5460II	246173	A19	19 Dec 1964
5-SG-185	5460II	218160	†	19 Dec 1964
5-SG-186	5460II	163147	†	19 Dec 1964
5-SG-187	5460II	192158	†	19 Dec 1964
5-SG-188	5460II	271158	A19	19 Dec 1964
5-SG-189	5460II	259171	A19	19 Dec 1964
5-SG-190	5560III	537223	A20	20 Dec 1964
5-SG-191	5560III	521229	A20	20 Dec 1964
5-SG-192	5560III	516243	A20	20 Dec 1964
5-SG-193	5560III	509247	A20	20 Dec 1964
5-SG-194	5560IV	483264	†	20 Dec 1964
5-SG-195	5560IV	472282	†	20 Dec 1964
5-SG-196	5560IV	473288	†	20 Dec 1964
5-SG-197	5560IV	470298	†	20 Dec 1964
5-SG-198	5560IV	465309	†	20 Dec 1964
5-SG-199	5560IV	465309	†	20 Dec 1964
5-SG-200	5560IV	456325	†	20 Dec 1964
5-SG-201	5560IV	454343	†	20 Dec 1964
5-SG-202	5560III	526214	A20	28 Dec 1964
5-SG-203	5560III	514217	A20	28 Dec 1964
5-SG-204	5560III	495221	A19	28 Dec 1964
5-SG-205	5560III	472206	A19	29 Dec 1964
5-SG-206	5560I	624313	†	29 Dec 1964
5-SG-207	5560I	639308	†	29 Dec 1964
5-SG-208	5560IV	599321	†	29 Dec 1964
5-SG-209	5560IV	590332	†	29 Dec 1964
5-SG-210	5560IV	581341	†	29 Dec 1964
5-SG-211	5560IV	558340	†	29 Dec 1964
5-SG-212	5560IV	548331	†	29 Dec 1964
5-SG-213	5560IV	540307	†	29 Dec 1964
5-SG-214	5560IV	536298	†	30 Dec 1964

(Continued)

† Site outside limits of figure.

Table A9 (Concluded)

Site No.	Location: Map Sheet	Location: Grid Coordinates	Location: Fig. No.	Date Sampled
5-SG-215	5560IV	535286	†	30 Dec 1964
5-SG-216	5560IV	537275	†	30 Dec 1964
5-SG-217	5560IV	546255	†	30 Dec 1964
5-SG-218	5560III	545236	A20	30 Dec 1964
5-SG-219	5560III	552218	A20	30 Dec 1964
5-SG-220	5560IV	532266	†	30 Dec 1964
5-SG-221	5560IV	517265	†	30 Dec 1964
5-SG-222	5560IV	556264	†	30 Dec 1964
5-SG-223	5560IV	565269	†	30 Dec 1964
5-SG-224	5560IV	562288	†	31 Dec 1964
5-SG-225	5560IV	554295	†	31 Dec 1964
5-SG-226	5560IV	541301	†	31 Dec 1964
5-SG-227	5560IV	529304	†	31 Dec 1964
5-SG-228	5560IV	513313	†	31 Dec 1964
5-SG-229	5560IV	489331	†	31 Dec 1964
5-SG-230	5560IV	478334	†	31 Dec 1964
5-SG-231	5560IV	467333	†	31 Dec 1964
5-SG-232	5560IV	435309	†	31 Dec 1964
5-SG-233	5560IV	429278	†	31 Dec 1964
5-SG-234	5560IV	421257	†	31 Dec 1964
5-SG-235	5660III	899092	A21	1 Jan 1965
5-SG-236	5660III	891093	A21	1 Jan 1965
5-SG-237	5660III	883108	A21	1 Jan 1965
5-SG-238	5660III	867123	A21	1 Jan 1965
5-SG-239	5660III	883122	A21	1 Jan 1965
5-SG-240	5660III	906119	A21	1 Jan 1965
5-SG-241	5660III	878139	A21	1 Jan 1965
5-SG-242	5660III	875163	A21	1 Jan 1965
5-SG-243	5660III	878154	A21	1 Jan 1965
5-SG-244	5660III	902154	A21	1 Jan 1965
5-SG-245	5660III	901165	A21	1 Jan 1965
5-SG-246	5560III	382254	A19	2 Jan 1965
5-SG-247	5560IV	361277	†	2 Jan 1965
5-SG-248	5560IV	376272	†	2 Jan 1965
5-SG-249	5560IV	384278	†	2 Jan 1965
5-SG-250	5560IV	391298	†	2 Jan 1965
5-SG-251	5560IV	405273	†	2 Jan 1965
5-SG-252	5560IV	411288	†	2 Jan 1965
5-SG-253	5560IV	406314	†	2 Jan 1965
5-SG-254	5560IV	409337	†	2 Jan 1965
5-SG-255	5560I	854281	†	3 Jan 1965
5-SG-256	5660IV	915282	†	3 Jan 1965
5-SG-257	5660IV	887299	†	3 Jan 1965
5-SG-258	5660IV	901297	†	3 Jan 1965
5-SG-259	5660IV	888271	†	3 Jan 1965
5-SG-260	5560I	829328	†	3 Jan 1965
5-SG-261	5560I	793332	†	3 Jan 1965
5-SG-262	5560I	808327	†	3 Jan 1965
5-SG-263	5560I	819323	†	3 Jan 1965
5-SG-264	5560I	809289	†	3 Jan 1965
5-SG-265	5560I	801276	†	3 Jan 1965
5-SG-266	5560I	784265	†	3 Jan 1965
5-SG-267	5560I	810260	†	3 Jan 1965
5-SG-268	5461II	186447	†	4 Jan 1965
5-SG-269	5461II	148452	†	4 Jan 1965
5-SG-270	5460I	125440	†	4 Jan 1965
5-SG-271	5461II	122465	†	4 Jan 1965
5-SG-272	5461II	122486	†	4 Jan 1965
5-SG-273	5461II	144468	†	4 Jan 1965
5-SG-274	5460I	147362	†	4 Jan 1965
5-SG-275	5460I	173398	†	4 Jan 1965
5-SG-276	5660III	954158	A21	5 Jan 1965
5-SG-277	5660III	941159	A21	5 Jan 1965
5-SG-278	5660III	891179	A21	5 Jan 1965
5-SG-279	5560II	860199	A21	5 Jan 1965
5-SG-280	5560II	846167	A21	5 Jan 1965
5-SG-281	5560II	861156	A21	6 Jan 1965
5-SG-282	5560III	369226	A19	6 Jan 1965
5-SG-283	5560III	449213	A19	6 Jan 1965
5-SG-284	5560III	439192	A19	6 Jan 1965
5-SG-285	5560III	432173	A19	6 Jan 1965
5-SG-286	5560III	431154	A19	6 Jan 1965
5-SG-287	5560III	432125	A19	6 Jan 1965
5-SG-288	5560III	443121	A19	6 Jan 1965
5-SG-289	5560III	457121	A19	6 Jan 1965
5-SG-290	5560III	471121	A19	6 Jan 1965
5-SG-291	5560III	501122	A19	6 Jan 1965
5-SG-292	5560III	515127	A20	6 Jan 1965
5-SG-293	5560III	521138	A20	6 Jan 1965
5-SG-294	5560III	525146	A20	6 Jan 1965
5-SG-295	5560II	801225	A21	7 Jan 1965
5-SG-296	5560II	816209	A21	7 Jan 1965
5-SG-297	5560II	794178	A21	7 Jan 1965
5-SG-298	5560II	663124	A20	7 Jan 1965
5-SG-299	5560II	658111	A20	7 Jan 1965
5-SG-300	5560II	651077	A20	7 Jan 1965

(3 of 3 sheets)

† Site outside limits of figure.

Table A10

Summary of Surface Geometry Field Data

Khon Kaen

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type*	Critical Approach Angle (AA) and Step Height (SH)** 1† AA	1† SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-BG-1	5560II	660188	1	RB	145	41	138	30												
					139	23	121	23												
					133	33	141	20												
			2		144	38	134	36												
					124	23	158	18												
					145	18	133	30												
5-BG-2	5560II	660188	1	TM	174	99	137	79												
			2		174	127	163	175												
			3		175	94	142	94												
5-BG-3	5560II	631193	1	RB	142	25	139	33												
					128	36	134	30												
					130	36	144	36												
			2		135	20	158	20												
					129	38	115	36												
					125	36	139	38												
5-BG-4	5560II	622196	1	RB	145	38	114	36												
					141	46	128	38												
					136	43	135	30												
			2		143	38	121	33												
					137	41	122	41												
					143	53	107	48												
5-BG-5A	5560III	597197	1	RB	141	18	138	23												
					134	23	152	23												
					142	18	144	23												
			2		148	18	138	30												
					143	20	156	20												
					143	20	135	33												
5-BG-5B	5560III	597197	1	RB	114	20	130	36												
					140	38	148	36												
					117	18	132	23												
			2		119	20	132	36												
					153	46	151	46												
					124	18	148	15												
5-BG-7	5560III	587197	1	RF	140	23	127	64	126	61	215	160	204	114	157	97	118	64	227	64
			2		149	8	141	69	164	69	124	15	157	173	171	226	149	142	141	20
5-BG-8	5560III	587197	1	RB	126	53	140	41												
					150	36	133	25												
			2		129	53	131	41												
					165	23	124	30												
5-BG-9	5560III	569198	1	RB	138	33	133	30												
					141	46	127	41												
					135	58	155	33												
					143	46	132	38												
			2		136	33	131	36												
					135	61	132	43												
					143	43	145	23												
					136	46	141	30												
5-BG-10	5560III	541196	1	RB	150	18	136	20												
					133	15	127	38												
					139	38	109	46												
			2		139	23	145	33												
					124	23	133	38												
					137	41	121	46												
5-BG-11	5560III	541196	1	TM	176	51	155	99												
			2		155	69	171	64												
5-BG-11B	5560III	541196	1	TM	164	109	173	102												
					166	91	175	74												
5-BG-12	5560III	539189	1	RB	133	51	126	38												
					129	54	134	33												
					133	46	136	33												
			2		121	61	122	43												
					119	51	136	25												
					122	48	132	36												

(Continued)

* Abbreviations used for feature types are defined on page A1.

** Approach angles (AA) are given in degrees and step heights (SH) are given in centimeters.

† For position of numerically designated approach angles and step heights see diagram on page A2.

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-13	5560III	536184	1	RB	133	64	135	38												
					141	51	127	36												
					132	66	144	38												
					142	53	142	38												
			2		133	64	123	43												
					138	51	129	33												
					137	64	126	46												
					135	53	143	41												
5-SG-14B	5560III	535181	1	RB	119	33	144	38												
					125	43	147	41												
					130	48	123	43												
			2		131	33	130	38												
					129	33	125	43												
					151	33	131	41												
5-SG-15	5560III	527162	1	RB	144	48	135	43												
					145	33	157	23												
			2		142	46	143	46												
					124	43	150	38												
5-SG-16	5560III	527162	1	TM	116	48	127	104												
			2		134	163	129	124												
			3		135	41	142	43												
5-SG-17	5560II	661174	1	RB	139	41	144	33												
					147	23	146	30												
			2		127	36	136	30												
					153	30	141	38												
5-SG-18	5560II	654165	1	RB	136	41	125	38												
					129	48	140	30												
					126	46	135	30												
			2		129	46	124	38												
					152	23	117	30												
					134	33	149	23												
5-SG-19	5560II	662154	1	RB	152	23	146	48												
					160	18	137	30												
					135	33	148	36												
			2		141	30	141	46												
					153	33	133	33												
					136	23	142	38												
5-SG-20	5560II	642150	1	RB	144	23	127	38												
					177	10	129	13												
					116	33	128	36												
			2		148	15	129	36												
					170	8	129	15												
					160	30	133	30												
5-SG-21	5560II	643128	1	TM	125	20	155	84												
			2		128	43	141	33												
			3		145	20	168	76												
5-SG-23	5560II	636147	1	RB	136	38	143	20												
					143	33	128	36												
					140	41	138	41												
					128	28	129	51												
			2		148	38	128	18												
					150	36	137	41												
					140	36	130	36												
					139	38	145	30												
5-SG-24	5560II	616157	1	RP	170	213	175	36												
			2		167	135	172	66												
			3		167	152	159	81												
5-SG-25	5560II	628143	1	RB	136	48	137	23												
					114	33	143	46												
					141	36	132	30												
					128	36	112	36												
			2		129	38	143	20												
					131	33	136	53												
					127	38	130	33												
					130	51	108	43												
5-SG-26	5560II	642161	1	RB	132	33	131	38												
					113	30	128	38												
			2		123	30	123	51												
					124	30	111	38												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-27	5560II	749169	1	RB	14[illegible]	33	133	30												
					124	20	137	23												
			2		136	30	144	33												
					125	18	137	23												
5-SG-28	5560II	761154	1	RB	144	48	133	33												
					137	41	143	33												
			2		150	53	163	38												
					129	33	135	23												
5-SG-29	5560II	712174	1	RB	135	15	129	15												
					147	33	116	36												
			2		117	23	135	23												
					149	36	131	36												
5-SG-30	5560II	770181	1	RB	123	43	133	46												
					134	[illegible]	137	43												
			2		123	[illegible]	120	48												
					124	+3	127	36												
5-SG-31	5560IV	798182	1	RE	170	170	164	282												
			2		169	198	167	234												
5-SG-32	5560II	816192	1	RB	139	38	134	33												
					136	48	142	33												
					140	23	141	20												
			2		133	38	139	30												
					135	41	162	30												
					144	20	144	20												
5-SG-33	5560II	854188	1	TM	131	38	158	122												
			2		161	99	156	102												
			3		167	84	154	104												
5-SG-34	5660III	879187	1	RB	139	41	118	48												
					116	61	141	51												
					131	66	123	48												
			2		133	46	120	46												
					134	64	106	46												
					133	69	124	53												
5-SG-35	5660III	949163	1	RB	96	20	136	41												
					118	30	140	41												
			2		119	23	138	38												
					147	38	139	38												
5-SG-36	5660III	923178	1	RB	129	61	131	46												
					133	43	143	61												
					136	38	152	41												
			2		130	53	131	43												
					143	48	132	64												
					146	33	132	38												
5-SG-37	5660III	907189	1	RB	135	18	134	30												
					139	20	145	15												
			2		139	30	139	30												
					152	20	147	18												
5-SG-38	5560II	688243	1	RB	148	36	136	36												
					134	64	144	38												
					137	41	141	30												
			2		144	38	150	30												
					142	48	134	38												
					117	23	139	20												
5-SG-39	5560I	689273	1	RB	128	66	135	23												
					144	43	142	36												
					133	36	142	20												
					138	36	120	23												
			2		127	66	127	38												
					139	34	134	38												
					142	23	143	18												
					139	38	115	33												
5-SG-40	5560II	689198	1	RB	114	33	130	36												
					117	41	131	43												
					114	23	129	43												
			2		116	20	126	41												
					137	48	119	48												
					138	23	122	51												

(Continued)

(3 of 25 sheets)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-41	5560II	690198	1	RRE	162	249	164	373												
			2		164	246	163	325												
5-SG-42	5560I	688299	1	RB	125	18	105	33												
					126	18	130	18												
					112	41	122	48												
			2		130	15	120	30												
					140	18	128	18												
					125	38	150	43												
5-SG-43	5560I	681335	1	RB	134	51	130	38												
					158	81	121	51												
			2		149	66	130	33												
					150	71	118	51												
5-SG-44	5560II	708251	1	RB	122	38	123	43												
					127	48	135	46												
					134	51	127	61												
			2		103	48	120	48												
					119	48	119	48												
					134	48	132	48												
5-SG-46	5560II	672236	1	RB	142	53	150	23												
					155	61	133	33												
					137	46	142	15												
					146	69	141	38												
					143	43	152	13												
			2		144	53	149	23												
					133	64	135	30												
					143	43	153	18												
					141	46	143	30												
					145	61	145	28												
5-SG-47	5560I	652255	1	RB	153	38	136	30												
					142	43	133	30												
					132	51	119	38												
					141	41	132	30												
			2		153	38	142	30												
					143	41	121	30												
					140	38	116	33												
					139	41	151	20												
5-SG-48	5560I	640274	1	RB	117	30	133	18												
					130	38	142	33												
					124	43	138	13												
			2		123	23	142	13												
					109	36	138	30												
					130	36	148	15												
5-SG-49	5560I	629288	1	RB	148	46	155	30												
					155	30	170	15												
					150	30	118	30												
			2		138	61	165	18												
					150	33	160	13												
					158	15	166	10												
5-SG-50	5560I	645293	1	RB	124	46	112	36												
					136	30	147	33												
					131	38	128	33												
			2		150	38	141	30												
					132	41	124	15												
					112	36	137	33												
5-SG-51	5560I	637292	1	RB	134	33	129	23												
					136	38	140	23												
					127	38	132	36												
			2		132	38	132	30												
					142	36	139	30												
					126	36	132	41												
5-SG-52	5560I	612305	1	RB	128	51	115	18												
					140	69	142	38												
					132	69	125	46												
			2		140	51	110	30												
					137	66	121	46												
					133	66	151	43												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-BG-53	5560III	556199	1	RB	132	66	153	46												
					136	71	123	74												
					121	53	122	69												
			2		139	66	134	51												
					136	71	112	51												
					109	61	152	15												
5-BG-54	5560III	517190	1	RB	140	46	127	46												
					138	38	134	43												
					133	48	128	48												
			2		144	48	158	38												
					132	43	142	46												
					134	33	148	36												
5-BG-55	5560III	502196	1	RB	148	38	158	43												
					153	38	134	46												
			2		136	48	151	46												
					147	38	146	41												
5-BG-56	5560III	480204	1	RB	150	23	157	13												
					149	30	146	41												
			2		168	18	157	15												
					136	33	148	46												
5-BG-57	5560III	450221	1	RB	149	48	146	48												
					153	43	160	43												
			2		149	38	157	43												
					148	41	146	48												
5-BG-58	5560III	533196	1	RB	124	46	123	46												
					136	38	109	41												
					131	46	120	48												
					132	33	124	43												
			2		126	46	121	48												
					113	36	132	33												
					132	38	121	48												
					133	36	125	43												
5-BG-59	5560III	533196	1	TM	155	74	165	61												
			2		162	109	155	69												
5-BG-60	5560III	374238	1	RB	141	76	144	36												
					135	61	135	30												
			2		135	71	136	33												
					134	41	125	38												
5-BG-61	5560III	347237	1	RB	127	20	154	23												
					138	20	144	33												
			2		138	20	154	23												
					145	18	152	18												
5-BG-62	5560III	390239	1	RB	138	48	136	51												
					161	18	134	33												
					154	18	137	43												
			2		150	46	145	51												
					164	18	143	38												
					144	33	129	51												
5-BG-63	5560III	418234	1	RB	133	61	144	33												
					144	71	126	38												
					139	71	124	43												
			2		116	61	142	33												
					142	71	125	38												
					140	71	123	43												
5-BG-64A	5560III	466213	1	RB	144	41	125	64												
					137	41	127	66												
			2		143	38	122	66												
					144	33	123	69												
5-BG-64B	5560III	466213	1	RB	138	61	132	51												
					138	38	132	51												
			2		136	53	152	53												
					143	41	131	48												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-65	5560III	434229	1	RB	150	48	129	36												
					152	53	136	41												
					139	76	136	41												
			2		146	51	151	33												
					139	53	133	41												
					141	74	137	41												
5-SG-66A	5460II	318241	1	RB	150	48	146	41												
					154	30	149	18												
			2		157	48	151	36												
					153	33	146	30												
5-SG-66B	5460II	318241	1	RB	152	38	148	43												
					148	30	147	46												
					148	43	147	61												
			2		162	30	149	41												
					148	30	151	38												
					150	36	152	53												
5-SG-67	5460II	302243	1	RB	137	53	146	30												
					155	46	152	33												
					145	10	150	8												
					145	53	150	36												
			2		140	51	150	30												
					156	43	159	20												
					151	13	149	8												
					152	53	151	36												
5-SG-68	5460II	259248	1	RB	157	41	150	20												
					147	41	123	18												
					142	48	138	20												
			2		156	38	154	18												
					148	38	114	30												
					139	48	135	23												
5-SG-69	5460I	240346	1	RB	144	36	150	41												
					139	41	139	64												
					137	36	144	51												
			2		143	36	150	41												
					138	38	140	61												
					130	36	143	53												
5-SG-70	5460I	240331	1	RB	140	46	133	30												
					149	18	136	15												
					151	46	143	33												
			2		148	46	133	30												
					157	13	130	15												
					139	38	151	30												
5-SG-71	5460I	239311	1	RB	140	61	149	43												
					150	64	146	48												
					150	48	157	30												
			2		136	61	147	38												
					157	53	150	43												
					146	74	153	61												
5-SG-72	5460I	239295	1	RB	149	38	150	20												
					147	30	158	23												
					164	23	158	18												
					157	36	159	38												
			2		147	36	155	18												
					145	30	139	20												
					144	20	157	20												
					153	38	152	38												
5-SG-73	5460II	219246	1	RB	147	51	137	13												
					146	48	163	23												
			2		156	46	152	15												
					151	51	157	20												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-BG-74	5560I	691322	1	RB	147	15	165	18												
					158	18	135	30												
					148	15	157	23												
					154	20	159	33												
					165	18	137	30												
					138	13	133	33												
					125	15	143	18												
			2		148	15	158	20												
					145	23	147	18												
					148	15	133	30												
					136	33	158	33												
					121	18	140	30												
					146	15	135	33												
					154	15	130	18												
5-BG-75	5560I	722308	1	RB	144	20	143	51												
					140	23	136	43												
			2		137	23	134	43												
					125	23	136	43												
5-BG-76	5560I	718312	1	RB	141	69	133	61												
					148	23	118	51												
					146	69	122	66												
			2		132	33	140	46												
					127	33	126	64												
					144	13	139	43												
5-BG-77	5560I	711295	1	RB	138	38	145	41												
					160	23	149	48												
					152	30	153	51												
			2		144	38	152	30												
					174	18	166	18												
					130	33	124	41												
5-BG-78	5560I	727285	1	RB	147	15	143	30												
					139	23	146	33												
					157	13	176	10												
			2		142	18	145	33												
					175	8	168	5												
					170	10	174	8												
5-BG-79	5560I	723283	1	RB	165	15	161	30												
					146	18	122	23												
					141	20	123	18												
			2		152	18	152	23												
					135	18	127	33												
					133	23	144	18												
5-BG-80	5560I	700338	1	RB	144	51	149	43												
					145	53	133	33												
					115	30	153	36												
					145	51	156	33												
			2		160	36	136	43												
					151	51	147	36												
					132	33	146	33												
					140	51	157	61												
5-BG-81	5560I	711333	1	RB	154	53	121	18												
					155	36	141	10												
					154	43	145	30												
			2		153	51	134	13												
					156	38	131	13												
					149	46	137	23												
5-BG-82	5560I	715326	1	RB	142	10	136	30												
					135	41	140	64												
			2		145	18	147	30												
					139	36	147	48												
5-BG-83	5560I	717307	1	RB	154	69	140	38												
					149	71	145	36												
					163	66	145	18												
			2		144	74	124	41												
					143	69	152	38												
					150	76	132	33												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-84	5560I	694333	1	RB	135	15	157	20												
					133	15	123	15												
					168	15	148	20												
			2		136	13	135	30												
					159	10	149	20												
					132	13	131	30												
5-SG-85	5560II	725182	1	RB	133	30	137	23												
					152	13	124	18												
			2		124	33	127	33												
					152	13	117	23												
5-SG-86	5560II	716203	1	RB	136	61	140	20												
					147	43	123	46												
			2		131	91	138	36												
					127	38	128	43												
5-SG-87	5560II	725232	1	RB	139	53	145	41												
					132	69	130	38												
					131	66	124	46												
			2		112	69	123	41												
					140	51	136	38												
					135	53	154	30												
5-SG-88	5560II	728246	1	RB	124	20	142	20												
					134	33	120	33												
					142	20	140	36												
			2		132	13	140	20												
					133	33	148	38												
					149	20	127	41												
5-SG-89	5560I	722263	1	RB	146	13	143	46												
					136	30	128	53												
					133	33	133	51												
			2		145	13	124	41												
					124	23	129	41												
					139	23	138	51												
5-SG-90	5560III	578213	1	RB	134	51	115	33												
					160	18	147	41												
					148	33	153	30												
			2		140	38	156	18												
					138	61	141	48												
					162	30	133	30												
5-SG-91	5560III	586246	1	RB	137	18	153	33												
					135	10	159	30												
					143	23	162	51												
			2		150	20	153	38												
					136	13	162	10												
					156	23	166	48												
5-SG-92	5560III	564227	1	RB	138	38	116	53												
					122	23	142	46												
					144	32	131	48												
			2		147	38	147	48												
					136	23	135	30												
					136	30	136	41												
5-SG-93	5560III	557209	1	RB	140	51	139	38												
					141	48	138	23												
					127	43	142	36												
			2		134	41	151	38												
					139	36	157	18												
					140	46	128	38												
5-SG-94	5560II	815196	1	RB	132	33	124	43												
					128	38	125	38												
					123	20	107	43												
					106	43	104	48												
			2		132	36	123	46												
					134	30	110	38												
					121	20	117	48												
					134	30	112	36												
5-SG-95	5560II	810221	1	RB	147	8	160	23												
					160	10	154	20												
					158	10	137	23												
			2		161	8	155	23												
					148	15	149	15												
					138	23	138	26												

(Continued)

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Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-96	5560I	818253	1	RB	140	43	139	48												
					155	10	150	13												
					141	38	131	41												
			2		133	46	130	48												
					145	18	148	13												
					135	23	134	46												
5-SG-97	5560I	833269	1	RB	129	20	140	20												
					155	36	139	46												
			2		136	30	136	18												
					144	30	148	43												
5-SG-98	5560I	849291	1	RB	116	33	136	15												
					148	23	141	41												
					127	41	144	41												
			2		132	33	168	13												
					151	30	139	38												
					143	46	136	46												
5-SG-99	5560I	839311	1	RB	143	33	146	30												
					138	43	152	30												
			2		145	38	144	41												
					145	43	145	38												
5-SG-100	5560I	859311	1	RB	151	76	135	43												
					143	74	157	79												
					138	112	158	142												
			2		150	76	151	51												
					158	53	163	71												
					153	91	154	137												
5-SG-101	5460I	199409	1	RB	145	20	128	38												
					149	41	146	46												
					143	33	146	46												
			2		133	33	126	41												
					144	43	143	51												
					157	23	134	43												
5-SG-102	5460I	185391	1	RB	149	30	145	30												
					143	38	149	30												
					147	46	150	36												
			2		149	30	138	30												
					147	23	146	23												
					174	38	144	20												
5-SG-103	5460I	158381	1	RB	145	43	144	30												
					152	30	128	20												
			2		134	41	147	23												
					155	38	121	18												
5-SG-104	5460I	141390	1	RB	143	36	149	8												
					139	53	147	38												
			2		155	33	163	13												
					132	53	139	53												
5-SG-105	5460I	126383	1	RB	145	38	163	33												
					149	61	146	36												
			2		134	48	141	48												
					148	61	134	46												
5-SG-106	5460I	111360	1	RB	125	61	130	51												
					145	43	140	51												
			2		137	69	129	69												
					141	46	131	66												
5-SG-107	5460I	124358	1	RB	143	33	139	30												
					146	23	139	23												
					141	46	139	48												
			2		149	30	148	15												
					147	30	142	33												
					156	43	136	53												
5-SG-108	5660III	871191	1	RB	124	30	113	30												
					144	15	137	23												
					137	23	144	30												
			2		114	36	128	33												
					158	38	164	51												
					123	41	140	48												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference: Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-109	5660III	881204	1	RB	151	46	145	38												
					147	41	155	18												
					130	38	160	41												
			2		154	41	153	38												
					142	30	147	33												
					157	43	152	43												
5-SG-110	5660III	904214	1	RB	150	71	153	41												
					139	66	153	43												
					159	53	139	20												
			2		163	69	144	41												
					145	69	150	43												
					149	48	140	36												
5-SG-111	5660III	920218	1	RB	136	64	141	38												
					145	41	139	41												
					152	48	141	36												
			2		141	48	127	38												
					138	61	130	38												
					156	53	138	43												
5-SG-112	5660III	942233	1	RB	146	36	154	33												
					128	15	148	36												
			2		132	36	152	36												
					152	18	146	33												
5-SG-113	5660III	945246	1	RB	146	18	149	30												
					149	23	138	13												
					131	36	157	53												
			2		116	23	142	20												
					168	15	125	18												
					152	33	159	53												
5-SG-114	5660III	908209	1	RB	154	36	151	69												
					149	38	164	48												
			2		143	46	134	64												
					142	36	150	41												
5-SG-115	5560II	731164	1	RB	153	53	135	46												
					161	33	146	43												
					152	51	157	76												
			2		138	53	146	53												
					148	41	156	51												
					137	46	158	81												
5-SG-116	5560II	734151	1	RB	116	23	157	36												
					143	61	131	41												
					163	41	154	18												
			2		126	46	128	38												
					130	51	132	33												
					137	43	124	36												
5-SG-117	5560II	737154	1	RB	130	23	134	30												
					148	15	136	23												
					123	18	135	43												
			2		151	18	128	33												
					148	15	130	33												
					118	43	113	66												
5-SG-118	5560II	724162	1	RB	138	36	151	30												
					145	18	142	43												
					133	30	174	30												
			2		129	36	127	36												
					164	15	131	38												
					144	30	136	33												
5-SG-119	5560II	763147	1	RB	166	20	147	38												
					134	36	158	38												
					135	15	146	15												
			2		162	15	171	8												
					145	46	123	41												
					148	15	147	15												
5-SG-120	5560II	811167	1	RB	148	18	137	23												
					169	18	122	18												
					132	30	137	23												
			2		149	15	142	23												
					157	13	144	18												
					171	8	136	23												

(Continued)

(10 of 25 sheets)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-BG-121	5560II	816161	1	RB	135	36	132	46												
					132	36	129	36												
			2		134	23	142	46												
					135	30	141	36												
					132	36	135	46												
					153	13	145	30												
5-BG-123	5460II	148256	1	RB	145	20	137	13												
					144	18	122	20												
					153	23	137	23												
			2		161	15	126	10												
					126	18	119	20												
					148	15	126	13												
5-BG-124	5460II	182258	1	RB	139	23	174	8												
					158	10	174	8												
			2		147	15	170	8												
					162	18	169	18												
5-BG-125	5460I	169271	1	RB	122	30	110	23												
					138	30	162	15												
			2		144	33	132	15												
					130	20	163	10												
5-BG-126	5460II	179247	1	RB	153	23	124	18												
					144	30	123	18												
					151	23	172	13												
			2		131	18	130	15												
					158	33	124	15												
					136	38	159	20												
5-BG-127	5460II	206253	1	RB	151	18	132	20												
					152	13	153	15												
					154	10	175	13												
			2		159	20	149	18												
					156	13	150	13												
					150	18	142	20												
5-BG-128	5560II	652091	1	RB	129	36	127	23												
					135	30	167	18												
					133	30	136	23												
			2		126	41	141	20												
					134	30	176	13												
					155	41	137	30												
5-BG-129	5560II	671117	1	RB	169	15	145	15												
					109	20	129	43												
					130	36	153	13												
			2		151	20	161	13												
					142	15	132	41												
					130	41	150	13												
5-BG-130	5560II	685132	1	RB	133	18	142	23												
					123	48	113	51												
					117	53	128	61												
			2		123	33	135	33												
					154	51	127	61												
					125	61	118	66												
5-BG-131	5560II	689145	1	RB	104	33	144	20												
					105	53	135	41												
			2		155	18	143	18												
					135	43	144	41												
5-BG-132	5560II	730137	1	RB	130	18	162	20												
					161	33	139	23												
			2		171	10	173	10												
					155	18	122	18												
5-BG-133	5560II	721143	1	RB	92	18	142	18												
					167	18	155	18												
					153	13	127	18												
			2		133	10	143	13												
					141	10	144	10												
					143	20	136	30												
5-BG-134	5560II	703123	1	RB	150	33	147	33												
					133	41	136	41												
			2		140	30	139	36												
					147	33	120	43												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-135	5560II	714118	1	RB	143	38	145	61												
					157	36	138	41												
					140	20	136	51												
			2		143	38	150	61												
					111	20	154	30												
					122	30	128	38												
5-SG-136	5560II	698135	1	RB	138	30	122	41												
					132	30	132	30												
					153	13	123	36												
			2		120	41	114	36												
					138	30	151	33												
					128	18	123	48												
5-SG-137	5560II	698143	1	RB	158	48	129	71												
					128	13	120	18												
			2		124	43	136	43												
					120	20	124	13												
5-SG-138	5560II	608194	1	RB	130	33	125	41												
					135	41	136	94												
					135	20	126	23												
			2		130	36	142	41												
					130	23	129	43												
					107	38	145	38												
5-SG-139	5560II	604167	1	RB	132	43	116	30												
					147	30	149	36												
					147	30	128	30												
			2		161	30	156	30												
					145	13	142	30												
					130	33	147	33												
5-SG-140	5560III	593156	1	RB	135	43	154	30												
					130	66	164	30												
			2		138	38	135	33												
					149	61	126	33												
5-SG-141	5560III	579151	1	RB	142	61	130	10												
					142	46	110	36												
					120	43	161	13												
			2		153	66	133	38												
					128	69	121	48												
					138	48	132	38												
5-SG-142	5560III	556128	1	RB	142	74	138	74												
					125	46	115	66												
					130	107	159	71												
			2		133	66	132	69												
					134	51	142	76												
					118	107	168	74												
5-SG-143	5560III	539110	1	RB	137	51	133	46												
					142	36	143	20												
			2		129	33	141	23												
					147	53	153	48												
5-SG-144	5560III	524090	1	RB	139	30	136	33												
					151	46	146	41												
					135	30	133	30												
			2		137	38	147	36												
					143	46	148	41												
					137	33	134	33												
5-SG-145	5560III	508076	1	RB	141	38	144	23												
					163	36	145	30												
					123	43	120	48												
			2		143	23	161	18												
					138	43	139	18												
					150	30	148	30												
5-SG-146	5560III	482191	1	RB	150	48	151	69												
					140	43	168	48												
					157	30	145	48												
			2		145	53	149	69												
					152	48	144	51												
					149	43	144	46												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-147	5560II	666117	1	RB	144	18	115	20												
					161	15	134	36												
					113	23	106	46												
			2		124	15	128	18												
					132	20	130	36												
					135	30	129	41												
5-SG-148	5560II	668139	1	RB	131	30	126	38												
					129	43	140	20												
					129	18	137	30												
			2		116	36	125	43												
					131	33	114	33												
					126	20	122	23												
5-SG-149	5560II	673157	1	RB	124	30	126	36												
					137	38	130	38												
			2		140	30	133	30												
					135	38	110	33												
5-SG-150	5560II	677169	1	RB	159	23	132	33												
					134	15	145	13												
					122	20	137	30												
					136	23	119	30												
			2		134	18	145	15												
					148	18	139	15												
					152	23	154	23												
					137	43	149	38												
5-SG-151	5560II	639098	1	RB	136	46	129	36												
					120	51	124	41												
					113	51	121	48												
			2		130	46	129	38												
					159	46	128	38												
					130	53	126	41												
5-SG-152	5560II	687073	1	RB	149	20	136	30												
					113	23	143	30												
					115	41	143	46												
			2		160	15	136	23												
					121	33	140	33												
					131	38	132	69												
5-SG-153	5560II	699081	1	RB	134	76	132	69												
					132	94	122	74												
					127	69	132	64												
			2		145	76	125	66												
					138	109	117	74												
					131	76	129	69												
5-SG-154	5560II	713074	1	RB	130	18	125	43												
					124	23	132	33												
			2		140	30	128	38												
					139	18	126	38												
5-SG-155	5560III	471182	1	RB	140	53	130	46												
					118	61	145	38												
					136	51	142	36												
			2		120	46	147	38												
					160	51	141	33												
					143	43	141	38												
5-SG-156	5560III	469167	1	RB	143	30	136	33												
					157	41	142	46												
					153	41	161	23												
			2		149	36	147	38												
					144	41	146	38												
					153	41	144	23												
5-SG-157	5560III	469149	1	RB	144	30	152	36												
					160	20	133	33												
					155	20	151	38												
			2		167	23	154	36												
					155	20	156	36												
					155	20	149	41												
5-SG-158	5560III	486138	1	RB	149	20	164	20												
					127	33	122	33												
			2		148	30	142	36												
					132	23	119	23												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-159	5560III	487119	1	RB	144	20	132	33												
					161	30	146	43												
					141	23	156	33												
			2		144	20	134	33												
					131	38	136	38												
					130	3[illegible]	132	43												
5-SG-160	5560III	493102	1	RB	153	38	136	48												
					160	20	140	18												
					130	2[illegible]	149	38												
			2		148	3[illegible]	150	46												
					156	18	170	30												
					144	36	156	33												
5-SG-161	5560III	499080	1	RB	140	38	135	41												
					134	30	137	30												
					139	46	152	53												
			2		109	43	156	36												
					142	33	136	23												
					112	43	140	23												
5-SG-162	5560III	558151	1	RB	120	64	155	38												
					113	66	141	46												
			2		114	48	129	38												
					142	64	119	48												
5-SG-163	5560III	559180	1	RB	153	38	129	43												
					111	30	132	53												
			2		128	48	125	43												
					142	43	117	48												
5-SG-164	5560III	380229	1	RB	145	41	146	30												
					147	46	122	30												
					142	69	137	41												
			2		135	38	155	30												
					153	20	144	30												
					132	69	144	41												
5-SG-165	5560III	376212	1	RB	138	53	128	48												
					135	64	130	38												
			2		114	48	130	30												
					146	61	131	30												
5-SG-166	5560III	379189	1	RB	141	20	151	33												
					147	64	155	41												
					143	23	135	38												
			2		154	41	147	30												
					150	66	130	41												
					135	61	138	43												
5-SG-167	5560III	373148	1	RB	125	23	144	64												
					146	36	141	46												
					138	61	142	81												
			2		135	46	140	61												
					124	38	141	64												
					127	38	145	63												
5-SG-168	5560III	364125	1	RB	143	74	135	79												
					137	36	137	53												
					157	36	150	61												
			2		140	61	155	48												
					132	33	133	43												
					136	36	110	48												
5-SG-169	5560III	357162	1	RB	144	38	144	36												
					143	43	148	38												
					124	46	147	38												
			2		126	43	130	36												
					140	53	141	46												
					126	48	114	46												
5-SG-170	5560III	327181	1	RB	158	36	157	33												
					160	43	147	46												
			2		157	38	164	23												
					148	38	151	48												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
S-SG-171	5460II	302198	1	RB	160	38	158	36												
					165	10	152	33												
					134	33	153	38												
			2		155	36	151	41												
					135	33	140	30												
					130	30	144	33												
S-SG-172	5460I	252347	1	RB	149	36	146	41												
					143	18	159	36												
					145	23	144	41												
			2		133	33	148	41												
					143	23	148	23												
					152	30	150	36												
S-SG-173	5560IV	362349	1	RB	147	53	150	64												
					145	43	153	30												
			2		140	43	131	33												
					136	43	134	66												
S-SG-174	5460I	332337	1	RB	154	23	143	38												
					146	15	167	18												
					135	23	162	33												
			2		139	20	147	30												
					143	18	117	30												
					125	15	158	23												
S-SG-175	5460I	314345	1	RB	175	30	174	18												
					142	46	153	30												
			2		147	33	132	33												
					134	43	141	20												
S-SG-176	5460I	295333	1	RB	120	18	143	38												
					136	30	132	33												
					110	38	114	66												
			2		157	13	139	20												
					143	18	162	18												
					143	46	156	38												
S-SG-177	5460I	292317	1	RB	136	33	142	18												
					148	38	145	43												
			2		131	33	142	43												
					129	30	149	41												
S-SG-178	5460I	281311	1	RB	134	30	137	66												
					175	18	139	38												
					175	18	152	33												
			2		157	13	150	18												
					164	10	147	18												
					151	1	170	23												
S-SG-179	5460I	271338	1	RB	165	36	152	30												
					175	30	142	18												
					170	33	137	23												
			2		160	30	140	20												
					167	10	160	10												
					168	18	141	18												
S-SG-180	5460I	253329	1	RB	158	8	170	15												
					149	15	141	18												
			2		156	8	146	13												
					158	20	136	20												
S-SG-181	5460II	271232	1	RB	148	43	124	30												
					135	46	157	30												
					144	33	144	43												
			2		136	41	134	23												
					108	43	142	20												
					132	48	109	43												
S-SG-182	5460II	271212	1	RB	155	38	157	20												
					139	38	158	30												
			2		145	48	147	36												
					135	30	132	66												
S-SG-183	5460II	261187	1	RB	136	66	143	46												
					153	51	158	33												
			2		137	53	147	38												
					142	64	160	46												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
S-SG-184	5460II	246173	1	RB	113	23	157	23												
					143	41	160	33												
			2		117	20	150	13												
					152	38	161	36												
S-SG-185	5460II	218160	1	RB	159	15	146	18												
					143	30	144	33												
					143	41	157	30												
			2		148	23	146	30												
					145	23	134	30												
					149	30	168	38												
S-SG-186	5460II	163147	1	RB	136	23	149	23												
					145	15	151	36												
					133	30	144	46												
			2		137	23	130	38												
					168	18	116	61												
					154	13	148	41												
S-SG-187	5460II	192158	1	RB	142	46	129	51												
					166	30	145	53												
			2		153	41	150	61												
					135	38	136	53												
S-SG-188	5460II	271158	1	RB	129	23	145	41												
					137	20	137	23												
					153	36	146	41												
			2		147	38	142	38												
					151	23	146	30												
					147	30	126	43												
S-SG-189	5460II	259171	1	RB	123	46	138	41												
					150	36	125	41												
					126	41	155	43												
			2		123	43	132	33												
					113	36	120	43												
					144	41	132	38												
S-SG-190	5560III	537223	1	RB	145	36	141	30												
					134	30	135	74												
					111	23	144	33												
			2		147	33	128	41												
					150	48	144	69												
					120	51	165	64												
S-SG-191	5560III	521229	1	RB	139	66	138	79												
					137	48	147	61												
					138	20	142	61												
			2		139	71	143	79												
					146	36	146	69												
					147	48	145	66												
S-SG-192	5560III	516243	1	RB	145	61	147	48												
					164	10	135	33												
					127	46	135	43												
			2		130	20	142	41												
					145	38	134	33												
					150	51	141	48												
S-SG-193	5560III	509247	1	RB	126	61	132	43												
					149	43	136	43												
			2		143	53	142	20												
					149	41	144	30												
S-SG-194	5560IV	483264	1	RB	157	23	146	15												
					124	43	146	20												
					[illegible]	48	136	20												
			2		154	53	142	36												
					129	66	142	46												
					136	48	143	43												
S-SG-195	5560IV	472282	1	RB	138	30	148	15												
					129	36	156	18												
					144	18	122	46												
			2		157	13	140	23												
					113	20	143	23												
					147	18	123	48												

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Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-196	5560IV	473288	1	RB	170	20	161	33												
					171	36	144	33												
					141	41	175	41												
			2		155		144													
					166	51	156	18												
					155	36	176	48												
5-SG-197	5560IV	470298	1	RB	126	18	158	33												
					135	48	168	33												
			2		159	43	156	30												
					153	48	108	23												
5-SG-198	5560IV	465309	1	RB	145	36	143	33												
					160	30	143	18												
					129	46	121	20												
			2		148	41	134	33												
					130	38	116	38												
					126	38	153	30												
5-SG-199	5560IV	465309	1	RB	136	20	154	43												
					147	30	129	38												
					142	33	124	53												
			2		130	36	136	43												
					137	38	144	51												
					142	33	149	43												
5-SG-200	5560IV	456325	1	RB	146	51	140	20												
					137	30	137	20												
			2		142	48	144	20												
					148	33	141	23												
5-SG-201	5560IV	454343	1	RB	126	51	152	23												
					148	36	163	20												
					149	61	165	43												
			2		163	48	135	30												
					146	36	145	18												
					147	53	160	48												
5-SG-202	5560III	526214	1	RB	148	23	124	20												
					162	15	126	38												
					113	20	143	46												
			2		152	30	151	41												
					150	15	134	43												
					140	46	146	41												
5-SG-203	5560III	514217	1	RB	145	51	135	61												
					163	15	145	46												
					147	38	129	53												
			2		134	53	138	64												
					149	18	138	48												
					145	43	150	53												
5-SG-204	5560III	495221	1	RB	122	61	148	46												
					130	48	146	36												
			2		144	53	138	38												
					138	51	141	38												
5-SG-205	5560III	472206	1	RB	126	38	150	41												
					139	38	120	43												
			2		124	36	132	36												
					137	38	135	41												
5-SG-206	5560I	624313	1	RB	123	20	137	25												
					135	15	142	30												
					146	20	102	25												
			2		124	28	123	33												
					134	20	153	28												
					130	15	121	25												
5-SG-207	5560I	639308	1	RB	150	38	147	20												
					157	66	144	36												
					134	43	141	30												
			2		145	33	140	18												
					150	48	139	23												
					152	43	140	38												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-208	5560IV	599321	1	RB	159	20	155	18												
					142	30	147	30												
					160	46	133	23												
			2		143	18	166	15												
					137	38	148	30												
					147	43	167	36												
5-SG-209	5560IV	590332	1	RB	130	20	141	20												
					140	30	119	20												
					123	18	130	20												
			2		127	33	153	48												
					165	28	147	38												
					129	15	153	33												
5-SG-210	5560IV	581341	1	RB	174	15	170	30												
					146	15	166	30												
					142	10	161	20												
			2		160	18	135	30												
					153	8	155	30												
					150	8	155	23												
5-SG-211	5560IV	558340	1	RB	166	23	142	20												
					137	20	133	23												
			2		141	30	144	20												
					151	38	155	23												
5-SG-212	5560IV	548331	1	RB	151	30	139	23												
					143	13	144	18												
					149	46	145	18												
			2		165	18	120	30												
					122	38	137	20												
					151	46	138	23												
5-SG-213	5560IV	540307	1	RB	157	30	152	38												
					141	23	131	36												
			2		149	36	153	30												
					141	38	125	33												
5-SG-214	5560IV	536298	1	RB	164	38	146	15												
					132	43	139	20												
					155	41	160	23												
			2		138	48	146	20												
					152	38	153	20												
					153	43	146	36												
5-SG-215	5560IV	535286	1	RB	168	33	160	20												
					157	23	132	18												
					138	41	156	15												
			2		155	18	145	18												
					167	18	112	41												
					168	36	129	15												
5-SG-216	5560IV	537275	1	RB	152	30	150	38												
					155	20	137	41												
					143	36	98	41												
			2		136	38	152	43												
					133	20	162	20												
					150	38	104	43												
5-SG-217	5560IV	546255	1	RB	139	30	144	38												
					152	38	139	38												
			2		143	30	142	33												
					142	38	140	38												
5-SG-218	5560III	545236	1	RB	113	20	146	33												
					138	46	142	46												
			2		119	20	144	43												
					137	41	141	48												
5-SG-219	5560III	552218	1	RB	134	41	139	66												
					132	33	147	61												
			2		130	46	144	66												
					117	23	147	66												
5-SG-220	5560IV	532266	1	RB	139	91	145	66												
					148	66	137	51												
			2		142	81	142	71												
					152	61	125	38												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-221	5560IV	517265	1	RB	141	43	142	36												
					131	30	146	51												
			2		146	30	144	41												
					150	33	141	20												
5-SG-222	5560IV	556264	1	RB	164	18	155	23												
					131	10	133	15												
					154	38	147	38												
			2		16[illegible]	13	152	15												
					151	15	157	18												
					158	23	145	20												
5-SG-223	5560IV	565269	1	RB	148	41	144	38												
					123	38	141	48												
			2		140	38	140	53												
					152	38	166	41												
5-SG-224	5560IV	562288	1	RB	119	46	151	61												
					152	18	154	30												
			2		112	38	161	48												
					145	18	134	36												
5-SG-[illegible]	5560IV	554295	1	RB	126	48	139	64												
					152	30	145	41												
					118	33	141	38												
			2		136	41	137	71												
					131	33	121	51												
					116	33	113	38												
5-SG-226	5560IV	541301	1	RB	152	30	132	23												
					138	23	154	15												
			2		136	30	161	20												
					148	30	157	15												
5-SG-227	5560IV	529304	1	RB	153	13	149	46												
					158	10	154	30												
					144	18	148	18												
			2		147	13	152	41												
					158	10	143	23												
					145	15	142	20												
5-SG-228	5560IV	513313	1	RB	151	36	145	66												
					134	30	130	36												
					156	30	148	43												
			2		158	41	150	64												
					136	36	123	46												
					135	36	154	46												
5-SG-229	5560IV	489331	1	RB	149	43	154	23												
					150	38	149	15												
			2		158	41	164	10												
					160	41	165	30												
5-SG-230	5560IV	478334	1	RB	144	31	138	51												
					144	15	153	20												
					154	51	148	76												
			2		136	41	133	41												
					146	13	131	23												
					170	41	155	53												
5-SG-231	5560IV	467333	1	RB	144	20	134	36												
					141	30	143	48												
					139	23	145	46												
			2		121	20	145	41												
					154	30	150	30												
					164	30	160	30												
5-SG-232	5560IV	435309	1	RB	133	30	142	51												
					155	36	145	46												
					144	38	152	36												
			2		140	33	148	41												
					158	20	140	48												
					151	33	151	41												
5-SG-233	5560IV	429278	1	RB	145	38	144	41												
					144	18	174	38												
			2		150	61	162	36												
					155	23	174	23												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-234	5560IV	421257	1	RB	138	20	150	36												
					149	33	148	30												
			2		155	13	148	38												
					154	15	156	13												
					168	10	140	20												
					145	18	151	18												
5-SG-235	5660III	899092	1	RB	143	38	159	38												
					137	38	135	38												
					122	18	127	18												
			2		152	33	157	33												
					143	30	138	43												
					127	15	150	15												
5-SG-236	5660III	891093	1	RB	141	40	148	33												
					137	38	141	30												
					136	23	143	18												
			2		130	64	143	41												
					132	36	153	23												
					146	30	144	13												
5-SG-237	5660III	883108	1	RB	164	23	143	18												
					146	41	139	36												
			2		144	15	150	15												
					144	36	149	36												
5-SG-238	5660III	867123	1	RB	148	18	145	23												
					136	23	138	33												
			2		150	15	157	18												
					137	30	140	38												
5-SG-239	5660III	883122	1	RB	170	13	168	13												
					136	30	149	18												
			2		168	15	164	18												
					111	33	127	33												
5-SG-240	5660III	906119	1	RB	127	18	144	36												
					135	23	129	38												
					129	33	132	33												
			2		157	23	144	43												
					136	30	156	46												
					138	23	131	36												
5-SG-241	5660III	878139	1	RB	136	61	144	53												
					153	43	159	33												
					160	30	150	36												
			2		140	76	137	53												
					151	61	145	64												
					148	36	160	23												
5-SG-242	5660III	875163	1	RB	119	18	105	38												
					149	15	143	23												
			2		141	20	127	38												
					130	20	142	38												
5-SG-243	5660III	878154	1	RB	111	33	134	33												
					116	33	145	33												
			2		137	33	117	30												
					120	20	145	23												
5-SG-244	5660III	902154	1	RB	139	38	138	43												
					146	46	141	61												
			2		135	38	143	51												
					150	41	147	61												
5-SG-245	5660III	901165	1	RB	123	48	134	43												
					131	33	133	43												
			2		128	48	143	48												
					134	48	132	71												
5-SG-246	5560III	382254	1	RB	133	38	128	18												
					142	33	145	33												
					147	38	146	30												
			2		116	38	152	23												
					151	30	143	33												
					153	38	154	30												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-247	5560IV	361277	1	RB	134	48	136	41												
					132	51	133	30												
			2		122	43	127	36												
					130	48	142	20												
5-SG-248	5560IV	376272	1	RB	136	43	157	30												
					131	46	133	33												
					124	43	131	30												
			2		142	43	153	33												
					147	43	144	33												
					142	46	135	30												
5-SG-249	5560IV	384278	1	RB	148	40	134	30												
					159	38	127	20												
					141	48	124	61												
			2		147	48	134	30												
					148	41	129	33												
					147	53	133	18												
5-SG-250	5560IV	391298	1	RB	152	23	157	18												
					166	23	153	18												
			2		135	20	159	15												
					156	20	125	15												
5-SG-251	5560IV	405273	1	RB	137	64	128	51												
					147	41	146	38												
			2		132	64	143	43												
					148	36	129	33												
5-SG-252	5560IV	411288	1	RB	126	18	146	33												
					157	10	135	36												
					127	38	153	46												
			2		139	15	128	15												
					150	13	142	23												
					123	18	122	41												
5-SG-253	5560IV	406314	1	RB	129	30	138	23												
					152	8	126	15												
					123	20	149	23												
			2		149	20	157	30												
					116	33	132	23												
					125	20	148	23												
5-SG-254	5560IV	409337	1	RB	143	53	125	53												
					156	38	146	30												
					123	30	147	36												
			2		125	53	135	41												
					150	41	153	46												
					145	38	141	43												
5-SG-255	5560I	854281	1	RB	149	43	143	64												
					143	36	156	36												
			2		146	46	158	48												
					149	46	155	41												
5-SG-256	5660IV	915282	1	RB	139	38	142	53												
					145	33	145	43												
			2		140	41	144	64												
					147	30	146	51												
5-SG-257	5660IV	887299	1	RB	155	48	162	53												
					147	18	141	23												
			2		137	48	171	53												
					154	18	117	23												
5-SG-258	5660IV	901297	1	RB	145	36	161	30												
					116	41	140	36												
			2		124	51	144	23												
					158	33	162	20												
					149	36	147	23												
					154	33	162	13												
5-SG-259	5660IV	888271	1	RB	155	33	161	48												
					144	20	156	51												
					143	43	121	48												
			2		149	20	161	48												
					153	20	130	48												
					145	41	122	71												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angles (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-260	5560I	829368	1	RB	164	48	163	48												
					151	33	149	23												
					159	38	113	30												
			2		165	46	158	43												
					154	23	148	30												
					156	41	115	33												
5-SG-261	5560I	793332	1	RB	147	30	130	36												
					169	13	151	8												
			2		144	36	140	38												
					169	18	128	15												
5-SG-262	5560I	808327	1	RB	146	53	145	46												
					144	23	138	30												
					145	41	152	30												
			2		134	36	132	36												
					147	23	148	23												
					146	41	147	38												
5-SG-263	5560I	819323	1	RB	149	36	154	46												
					149	30	150	38												
			2		151	30	150	51												
					133	23	132	38												
5-SG-264	5560I	809289	1	RB	154	15	154	15												
					163	30	146	36												
			2		154	13	146	15												
					149	23	140	30												
5-SG-265	5560I	801276	1	RB	144	46	138	51												
					143	53	143	46												
			2		150	61	144	43												
					139	54	153	46												
5-SG-266	5560I	781...65	1	RB	118	43	141	51												
					131	36	141	36												
			2		123	41	121	46												
					130	38	147	38												
5-SG-267	5560I	810260	1	RB	128	36	113	23												
					134	15	143	10												
					150	36	138	20												
			2		130	33	123	30												
					146	8	136	13												
					147	38	160	30												
5-SG-268	5461II	186447	1	RB	148	38	141	48												
					142	30	143	43												
			2		134	30	169	15												
					128	38	143	61												
5-SG-269	5461II	148452	1	RB	145	36	128	30												
					148	36	143	18												
					144	33	142	41												
			2		143	43	169	30												
					158	38	148	10												
					146	20	159	38												
5-SG-270	5460I	125440	1	RB	158	30	147	33												
					117	23	127	36												
			2		168	10	169	8												
					162	13	148	20												
5-SG-271	5461II	122465	1	RB	135	33	139	48												
					137	30	127	36												
					142	43	150	70												
			2		147	36	140	48												
					155	20	129	36												
					155	41	154	48												
5-SG-272	5461II	122486	1	RB	132	18	146	13												
					128	38	143	36												
			2		142	20	142	23												
					134	33	154	36												
5-SG-273	5461II	144468	1	RB	149	43	148	36												
					145	30	148	30												
			2		133	38	140	23												
					127	23	123	23												

(Continued)

Table A10 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angles (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-274	5460I	147362	1	RB	133	35	133	46												
					149	13	143	13												
					114	54	128	66												
			2		130	36	116	46												
					143	18	90	15												
					124	61	132	64												
5-SG-275	5460I	173398	1	RB	156	30	163	20												
					153	41	156	33												
			2		147	46	153	20												
					149	38	142	33												
5-SG-276	5660III	954158	1	RB	138	33	130	43												
					150	41	129	33												
					136	23	151	43												
			2		138	36	135	41												
					145	41	127	36												
					128	38	154	41												
5-SG-277	5660III	941159	1	RB	143	51	154	64												
					147	41	150	30												
			2		137	38	147	51												
					156	36	156	23												
5-SG-278	5660III	891179	1	RB	146	41	142	38												
					143	30	142	38												
					160	30	148	38												
			2		148	43	137	43												
					133	23	127	38												
					158	23	157	33												
5-SG-279	5560II	860199	1	RB	160	53	139	71												
					149	48	135	64												
					147	66	155	84												
			2		158	48	141	66												
					144	48	118	64												
					135	61	154	91												
5-SG-280	5560II	846167	1	RB	134	23	145	41												
					134	33	128	36												
			2		119	23	145	41												
					141	23	127	38												
5-SG-281	5560II	861156	1	RB	137	41	146	53												
					143	43	145	48												
			2		131	43	146	51												
					142	41	148	38												
5-SG-282	5560III	369226	1	RB	144	43	149	46												
					161	10	153	13												
			2		148	46	146	51												
					150	30	155	18												
5-SG-283	5560III	449213	1	RB	142	38	125	64												
					143	41	124	38												
			2		134	36	139	61												
					133	33	127	41												
5-SG-284	5560III	439192	1	RB	138	51	123	18												
					148	43	157	33												
					133	53	154	41												
			2		147	48	90	18												
					134	38	163	23												
					133	61	152	43												
5-SG-285	5560III	432173	1	RB	131	36	143	41												
					127	23	156	20												
			2		115	33	116	41												
					125	20	152	23												
5-SG-286	5560III	431154	1	RB	131	38	127	48												
					147	30	145	38												
			2		143	38	145	43												
					155	38	137	38												

(Continued)

Table A10 (Continued)

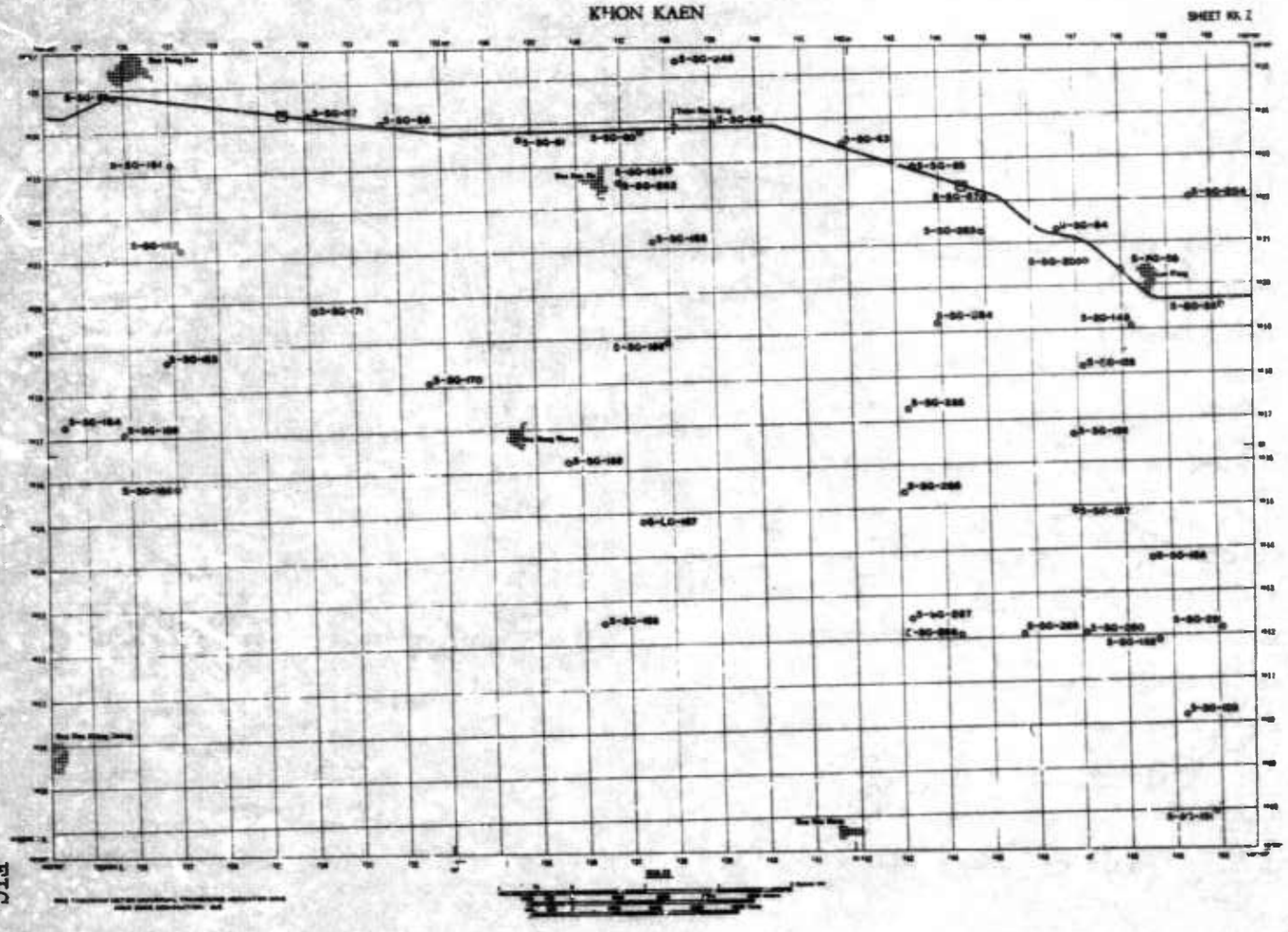
Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angles (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-287	5560III	432125	1	RB	128	41	147	18												
					148	41	151	18												
					120	30	146	18												
			2		118		149													
					146	38	145	18												
					146	33	146	18												
5-SG-288	5560III	443121	1	RB	146	20	131	15												
					136	41	138	30												
					129	53	132	38												
			2		137	23	130	13												
					132	46	134	33												
					133	46	133	33												
5-SG-289	5560III	457121	1	RB	144	36	142	33												
					133	33	148	38												
			2		145	30	148	23												
					126	38	144	43												
5-SG-290	5560III	471121	1	RB	152	48	147	36												
					144	53	136	36												
					148	53	123	38												
			2		144	48	154	33												
					151	48	126	46												
					146	60	154	41												
5-SG-291	5560III	501122	1	RB	144	23	154	20												
					102	20	156	20												
			2		118	18	159	15												
					137	20	141	33												
5-SG-292	5560III	515127	1	RB	139	81	143	71												
					145	41	141	48												
			2		144	81	143	69												
					140	43	144	46												
5-SG-293	5560III	521138	1	RB	159	18	158	13												
					145	23	152	15												
					153	46	142	36												
			2		158	15	153	15												
					144	10	156	15												
					148	43	138	36												
5-SG-294	5560III	525146	1	RB	150	53	127	41												
					144	41	131	23												
					138	48	138	33												
			2		151	48	128	33												
					146	38	151	20												
					141	48	140	33												
5-SG-295	5560II	801225	1	RB	144	33	108	43												
					147	30	144	43												
					154	30	148	36												
			2		147	30	142	38												
					146	23	112	23												
					152	23	118	30												
5-SG-296	5560II	816209	1	RB	142	64	149	64												
					131	74	146	94												
					127	36	122	41												
			2		142	66	138	51												
					145	48	139	84												
					117	46	122	46												
5-SG-297	5560II	794178	1	RB	142	8	136	15												
					148	15	141	23												
					153	30	127	41												
			2		127	13	123	23												
					144	18	113	30												
					154	30	126	41												
5-SG-298	5560II	663124	1	RB	155	18	147	15												
					147	23	148	18												
					136	30	142	20												
			2		149	20	158	10												
					145	30	144	18												
					137	38	130	33												

(Continued)

Table A10 (Concluded)

Site No.	AMS Map References: Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH): 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
5-SG-299	5560II	658111	1	RB	124	41	135	30												
					145	30	144	20												
			2		125	36	135	21												
					148	33	133	30												
5-SG-300	5560II	651077	1	RB	115	69	112	69												
					135	43	134	43												
					118	30	120	46												
			2		128	41	124	69												
					138	43	135	41												
					115	30	126	38												

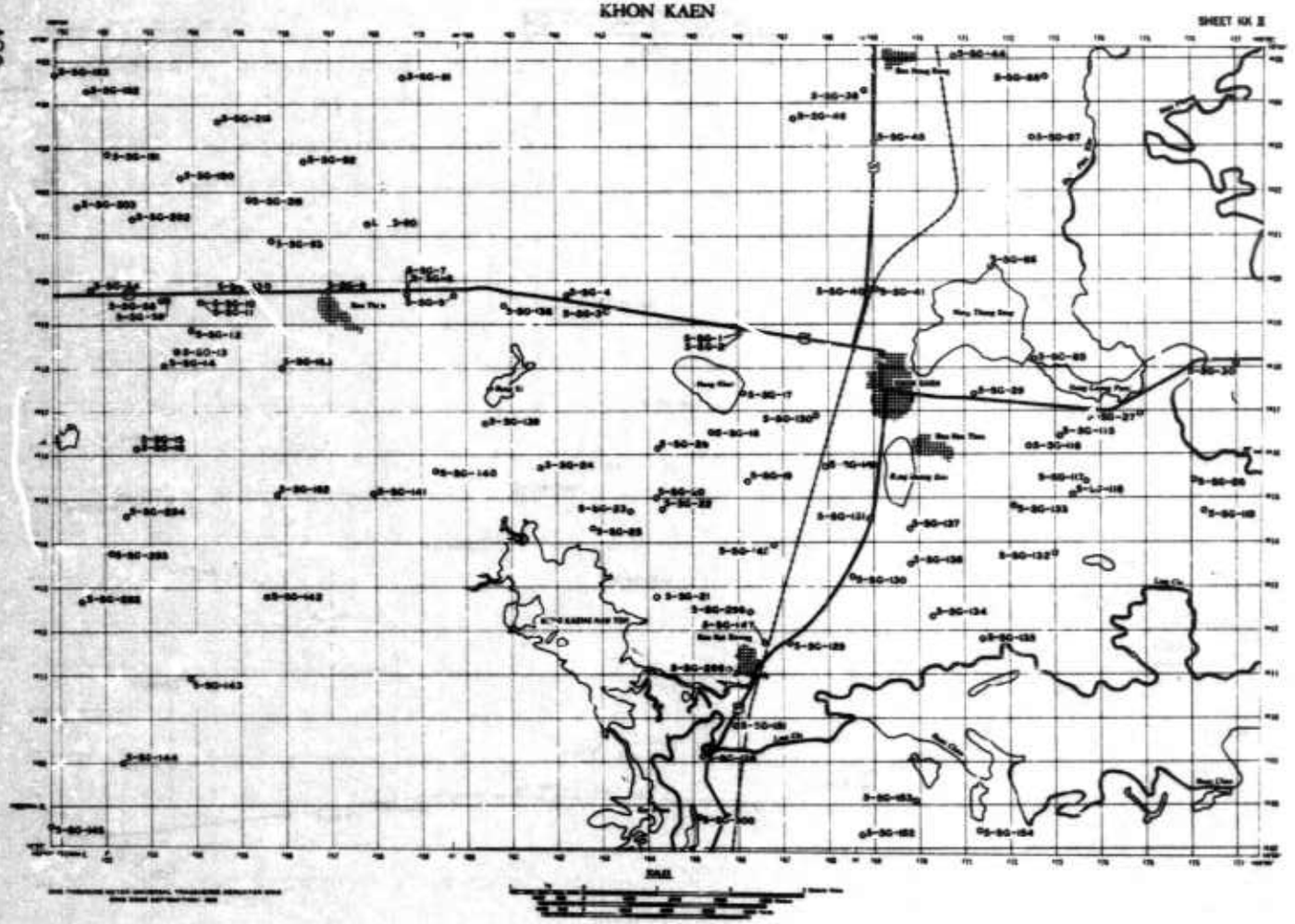
(25 of 25 sheets)



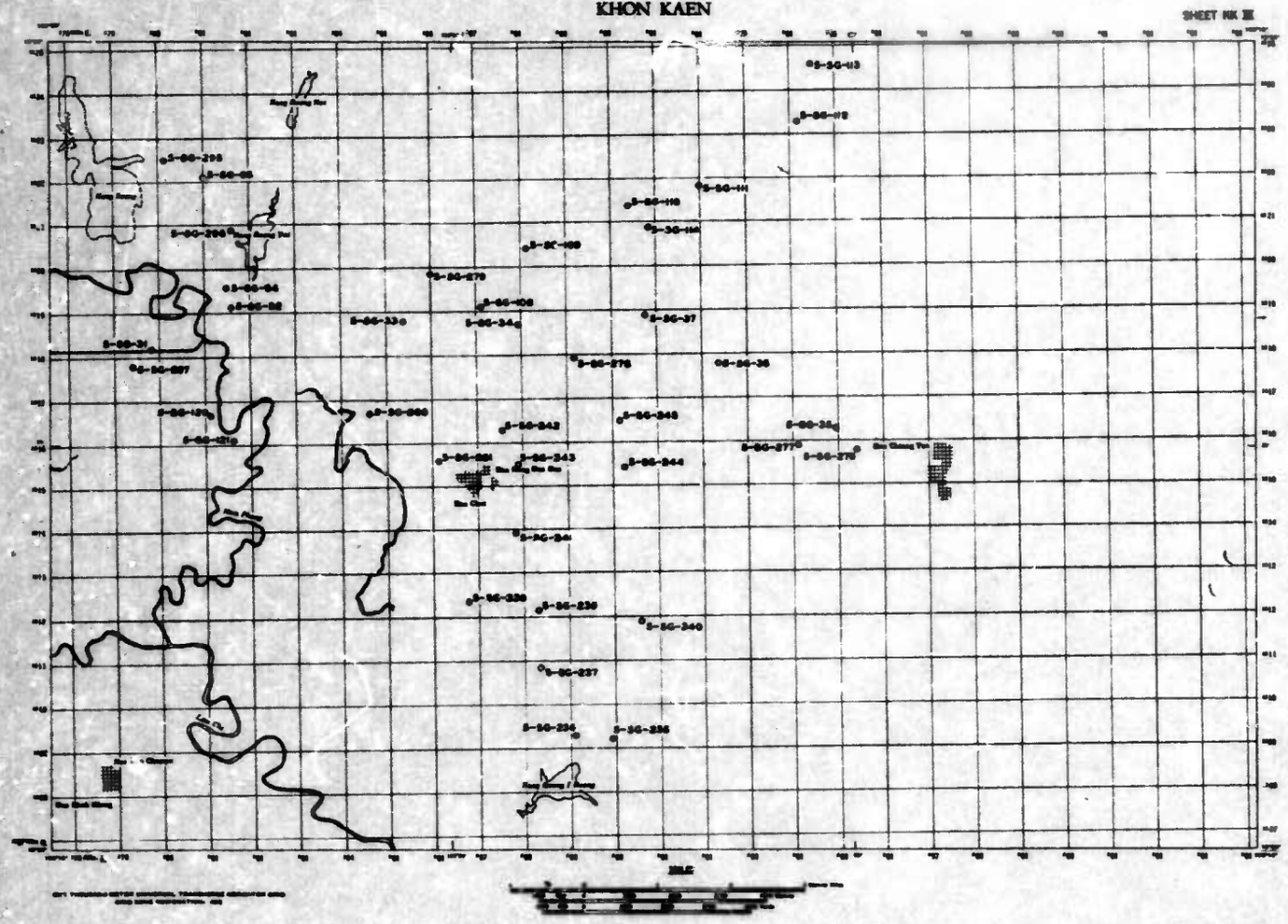
SURFACE GEOMETRY SITES
KHON KAEN STUDY AREA
SHEET NO 1

FIG. A19

FIG. A20



SURFACE GEOMETRY SITES
KHON KAEN STUDY AREA
SHEET KK II



SURFACE GEOMETRY SITES
KHON KAEN STUDY AREA
SHEET NK 3E

FIG. A21

CHANTHABURI STUDY AREA

Table A11

Surface Geometry Site Summation

Chanthaburi

Site No.	Location Map Sheet*	Location Grid Coordinates**	Fig. No.	Date Sampled
6-SG-1	5348I	134997	A23	22 Feb 1965
6-SG-2	5348I	134996	A23	22 Feb 1965
6-SG-3	5448IV	880958	A24	16 Feb 1965
6-SG-4	5448IV	881958	A24	16 Feb 1965
6-SG-5	5448IV	900940	A24	18 Feb 1965
6-SG-6	5448IV	866875	A24	17 Feb 1965
6-SG-9	5448IV	839933	A24	16 Feb 1965
6-SG-10	5448IV	811879	A24	16 Feb 1965
6-SG-11	5448IV	809879	A24	16 Feb 1965
6-SG-12	5448IV	818895	A24	16 Feb 1965
6-SG-14	5448IV	861018	A24	18 Feb 1965
6-SG-15	5448IV	893986	A24	18 Feb 1965
6-SG-16	5448IV	893985	A24	18 Feb 1965
6-SG-18	5448III	898821	A25	17 Feb 1965
6-SG-19	5448III	897823	A25	17 Feb 1965
6-SG-20	5448III	908833	A25	17 Feb 1965
6-SG-21	5448III	907834	A25	17 Feb 1965
6-SG-22	5448III	880790	A25	17 Feb 1965
6-SG-23	5448III	849793	A25	17 Feb 1965
6-SG-24	5448III	848794	A25	17 Feb 1965
6-SG-25	5448III	849785	A25	17 Feb 1965
6-SG-26	5448IV	826840	A24	19 Feb 1965
6-SG-27	5448IV	825929	A24	18 Feb 1965
6-SG-28	5448IV	888937	A24	18 Feb 1965
6-SG-29	5448IV	926983	A24	18 Feb 1965
6-SG-30	5449III	954019	†	18 Feb 1965
6-SG-32	5349II	143043	A22	22 Feb 1965
6-SG-34	5348I	135994	A23	22 Feb 1965
6-SG-35	5348I	147976	A23	22 Feb 1965
6-SG-36	5348I	145972	A23	22 Feb 1965
6-SG-38	5448IV	752972	A24	23 Feb 1965
6-SG-39	5448IV	756992	A24	23 Feb 1965
6-SG-40	5448IV	745981	A24	23 Feb 1965
6-SG-41	5349II	251024	A22	24 Feb 1965
6-SG-42	5349II	247027	A22	24 Feb 1965
6-SG-43, 43A-43C	5349II	241030	A22	24 Feb 1965
6-SG-44	5349II	238034	A22	24 Feb 1965
6-SG-45	5349II	235039	A22	24 Feb 1965
6-SG-46	5349II	220059	A22	24 Feb 1965
6-SG-47	5448IV	780957	A24	24 Feb 1965
6-SG-48	5448IV	817927	A24	24 Feb 1965
6-SG-49	5448IV	916975	A24	5 Mar 1965
6-SG-50	5448III	966028	†	5 Mar 1965
6-SG-52	5449III	001107	†	5 Mar 1965
6-SG-54	5449III	984073	†	5 Mar 1965
6-SG-56	5448IV	981999	A24	5 Mar 1965
6-SG-57	5349II	202047	A22	5 Mar 1965
6-SG-58	5349II	204038	A22	6 Mar 1965
6-SG-59	5348I	209019	A23	6 Mar 1965
6-SG-60	5348I	206001	A23	6 Mar 1965
6-SG-61	5348I	208001	A23	6 Mar 1965
6-SG-62	5348I	212999	A23	6 Mar 1965
6-SG-63	5348I	200997	A23	6 Mar 1965
6-SG-64	5348I	195983	A23	6 Mar 1965
6-SG-65	5348I	189979	A23	6 Mar 1965
6-SG-66	5349II	097031	A22	7 Mar 1965
6-SG-67	5349II	092033	A22	7 Mar 1965
6-SG-68	5349II	082036	A22	7 Mar 1965
6-SG-69	5349II	075032	A22	7 Mar 1965
6-SG-70	5349II	216078	A22	7 Mar 1965
6-SG-71	5448IV	787999	A24	7 Mar 1965
6-SG-72	5448IV	915926	A24	7 Mar 1965
6-SG-73	5448III	891807	A25	8 Mar 1965
6-SG-74	5448III	849787	A25	8 Mar 1965
6-SG-75	5448III	820811	A25	8 Mar 1965
6-SG-76	5448IV	918840	A24	8 Mar 1965
6-SG-77	5448IV	936861	A24	8 Mar 1965
6-SG-78	5448IV	933858	A24	8 Mar 1965
6-SG-79	5448IV	894943	A24	8 Mar 1965
6-SG-85	5449III	827080	†	9 Mar 1965
6-SG-86	5449III	822079	†	9 Mar 1965
6-SG-87	5449III	806056	†	9 Mar 1965
6-SG-89	5349II	019121	A22	10 Mar 1965
6-SG-90	5349II	011104	A22	10 Mar 1965
6-SG-91	5349II	013098	A22	10 Mar 1965
6-SG-92	5349II	994079	A22	10 Mar 1965
6-SG-93	5349II	002074	A22	10 Mar 1965
6-SG-94	5349II	014064	A22	10 Mar 1965
6-SG-95	5349II	020056	A22	10 Mar 1965
6-SG-96	5349II	025051	A22	10 Mar 1965
6-SG-97	5349II	045061	A22	10 Mar 1965
6-SG-98	5349II	044051	A22	10 Mar 1965
6-SG-99	5349II	053068	A22	10 Mar 1965
6-SG-100	5348I	152010	A23	11 Mar 1965
6-SG-103	5348I	158999	A23	11 Mar 1965
6-TS-35	5149II	058028	†	14 Mar 1965
6-TS-36	5149II	060010	†	13 Mar 1965
6-TS-38	5249III	385046	†	13 Mar 1965
6-TS-39	5249II	483093	†	12 Mar 1965
6-SG(TS)-41	5448IV	930844	A24	19 Feb 1965
6-SG(TS)-42	5448IV	934847	A24	21 Feb 1965
6-SG(PD)-259	5448IV	806931	A24	20 Feb 1965

Note: Missing site numbers are the result of sites having been preselected and numbered but not sampled. Sites prefixed with TS and PD are surface composition sites where surface geometry data were collected.

* AMS, L708, 1:50,000.

** Coordinates are set up according to the Military Grid System. The first three coordinate numbers represent longitude, and the second three numbers represent latitude.

† Site outside limits of figure.

Table A12

Summary of Surface Geometry Field Data

Chanthaburi

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type*	Critical Approach Angle (AA) and Step Height (SH)** 1† AA	1† SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
6-SG-1	5348I	134997	1	RB	90	30	90	30												
					145	20	126	20												
					90	30	90	25												
			2		90	25	90	30												
					125	20	133	20												
					90	20	90	15												
6-SG-2	5348I	134996	1	RB	113	30	153	36												
					155	41														
					133	38														
					122	30	122	25												
			2		123	25	170	41												
					123	48														
					145	33														
					135	30	125	25												
6-SG-3	5448IV	880958	1	SCS	158	56	127	168	144	94	153	56								
			2		176	53	137	188	153	109	154	56								
6-SG-4	5448IV	881958	1	RB	165	41	163	15												
					114	41	154	23												
					131	53	138	43												
			2		128	43	149	20												
					126	41	148	25												
					145	48	110	41												
6-SG-5	5448IV	900940	1	RB	152	18	117	36												
					141	30	126	20												
					130	36	133	30												
			2		130	18	126	43												
					116	41	142	36												
					123	33	114	36												
6-SG-6	5448IV	866875	1	RB	138	58	139	56												
					118	61	137	71												
					122	51	140	56												
			2		135	61	140	56												
					122	51	142	66												
	/				123	48	144	53												
6-SG-9	5448IV	839933	1	RE	154	140	159	132												
			2		155	147	163	132												
6-SG-10	5448IV	811879	1	RB	167	46	151	28												
					157	25	140	23												
					114	20	136	33												
			2		167	30	162	23												
					141	20	156	20												
					163	30	133	28												
6-SG-11	5448IV	809879	1	RB	117	30	130	25												
					138	18	149	18												
					155	15	128	20												
			2		144	20	139	23												
					140	23	152	18												
					161	18	142	23												
6-SG-12	5448IV	818895	1	TF	164	30	141	86	141	91	136	107	136	102	148	79	148	86	161	91
			2		173	30	133	91	133	102	142	112	142	97	155	84	150	94	159	97
6-SG-14	5448IV	861018	1	BP	260		110	218	115	163	254		254		107	213	100	241	260	
					262		96	224	105	152	255		270		90	203	90	239	270	
6-SG-15	5448IV	893986	1	RB	90	30	90	20												
					90	36	136	18												
					114	38	90	18												
			2		90	25	90	15												
					90	36	128	18												
					114	36	90	15												
6-SG-16	5448IV	893985	1	DD & BP	218		157	183	146	183	218		162	122	203		203		158	127
			2		210		155	183	118	183	241		163	122	202		203		158	127

(Continued)

* Abbreviations used for feature types are defined on page A1.

** Approach angles (AA) are given in degrees and step heights (SH) are given in centimeters.

† For position of numerically designated approach angles and step heights see diagram on page A2.

Table A12 (Continued)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
6-SG-18	5448III	898821	1	RB	139	28	109	30												
					149	51	151	51												
			2		155	28	90	28												
					153	46	158	48												
6-SG-19	5448III	897823	1	DD	164	23	121	30	163	102										
			2		167	25	150	46	154	97										
6-SG-20	5448III	908833	1	RB	90	25	90	38												
					108	43	115	41												
					113	38	110	48												
			2		90	20	90	38												
					115	36	117	33												
					113	41	107	51												
6-SG-21	5448III	907834	1	RE & RB	158	76	155	107												
					154	74	139	18												
			2		167	66	164	91												
					120	58	131	18												
6-SG-22	5448III	880790	1	RE & RB	110	30	157	20												
					146	13	123	41												
					167	81														
			2		132	23	134	20												
					153	18	147	48												
					167	81														
6-SG-23	5448III	849793	1	RB	107	46	120	41												
					119	28	131	33												
					129	18	151	28												
			2		133	36	116	36												
					137	28	122	28												
					117	36	136	33												
6-SG-24	5448III	848794	1	RE	167	61	163	86												
			2		167	61	162	91												
6-SG-25	5448III	849785	1	RE	144	71	166	102	159	147										
			2		143	71	164	107	163	157										
6-SG-26	5448IV	826840	1	RB	141	117	143	71												
					160	18	172	15												
					130	20	133	20												
					132	15	148	20												
			2		142	112	133	66												
					149	20	170	15												
					157	20	150	20												
					147	20	145	20												
6-SG-27	5448IV	825929	1	RB	90	30	90	36												
					93	30	90	25												
					90	25	90	20												
			2		90	25	90	33												
					90	30	90	25												
					90	30	90	25												
6-SG-28	5448IV	888937	1	RE	255		114	132	90	137	270									
					160	91														
			2		258		111	132	110	155	260									
					164	86														
6-SG-29	5448IV	926983	1	RB	120	36	124	25												
					142	41	90	36												
					90	46	90	41												
			2		133	41	117	30												
					90	30	90	30												
					90	41	90	41												
6-SG-30	5449III	954019	1	RE & BP	258		103	340	124	183	248		240		116	173	103	117	103	86
			2		259		102	307	120	180	251		231		128	168	110	112	110	79
6-SG-32	5349II	143043	1	RE	158	51	158	122	193											
6-SG-34	5348I	135994	1	RB	137	20	114	30												
					127	23	108	38												
			2		120	20	117	33												
					125	28	106	41												

(Continued)

Table A2 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
6-SG-35	5348I	147976	1	RB	130	28	141	18												
					120	25	130	20												
					152	20	116	30												
			2		125	25	114	30												
					133	36	111	36												
					124	23	123	25												
6-SG-36	5348I	145972	1	BP	115	46	163	71	168	48	104	56	198	66						
			2		139	48	162	76	195	76	172	36	153	25	173	30	168	56		
6-SG-38	5448IV	752972	1	RB	105	38	107	41												
					121	43	121	51												
					116	51	123	51												
			2		111	30	102	36												
					167	20	105	51												
					114	43	115	41												
6-SG-39	5448IV	756992	1	RB	138	41	153	33												
					153	48	156	36												
					130	20	156	20												
			2		134	41	114	25												
					130	51	122	25												
					132	25	111	23												
6-SG-40	5448IV	745981	1	RB	130	51	107	41												
					152	36	122	36												
			2		139	48	118	41												
					131	41	103	41												
6-SG-41	5349II	251024	1	DD	270	152	134	152	134	102	154	122	225		227		132	81		
			2		265	152	132	152	163	163	138	127	240		216		141	76		
6-SG-42	5349II	247027	1	RB	131	20	142	30												
					140	23	140	33												
					126	38	133	46												
			2		140	18	121	28												
					126	18	151	25												
					124	30	130	36												
6-SG-43A	5349II	241030	1	DP	129	36	126	41												
					136	33	110	36												
6-SG-43B	5349II	241030	1	DP	120	46	110	53												
			2		118	46	130	36												
6-SG-43C	5349II	241030	1	DP	135	41	163	46												
			2		145	43	167	15												
6-SG-44	5349II	238034	1	RB & BP	198		160	76	157	157	202		192		162	152	147	132	130	36
			2		247		113	81	160	163	198		198		160	163	131	142	96	38
6-SG-45	5349II	235039	1	DD	152	79	150	41												
			2		150	84	130	36												
6-SG-46	5349II	220059	1	TM	157	25	162	112												
			2		155	251	161	84												
			3		161	183	164	30												
6-SG-47	5448IV	788957	1	RE	209		150	218	148	325	200									
			2		205		154	218	158	254	207									
6-SG-48	5448IV	817927	1	BS	167	216	153	269												
			2		163	211	161	295												
6-SG-49	5448IV	916975	1	RE	163	213	166	203												
					165	216	165	213												
6-SG-50	5449III	966028	1	RE	161	152	155	168												
			2		161	142	151	178												
6-SG-52	5449III	001107	1	RP	122	38	138	33												
			2		101	46	139	58												
6-SG-54	5449III	984073	1	RB	163	30	142	13												
					145	38														
					162	29	160	25												
			2		165	28	137	10												
					155	41	134	10												
					172	25	160	23												
6-SG-56	5448IV	981999	1	LV	115	117	161	91												
			2		112	81	161	137												

(Continued)

Table A12 (Continued)

Site No.	AMS Map Reference Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
6-SG-57	5349II	202047	1	MP	145	61	110	51	140	74	160	66	131	89	104	76				
			2		108	61	130	56	163	81	162	56	150	89	100	81				
6-SG-58	5349II	204038	1	RB	140	43	135	30												
					152	48														
			2		137	46	126	30												
					150	46	153	30												
					142	53	148	36												
6-SG-59	5348I	209019	1	RB	121	33	125	36												
					123	20	130	25												
					126	30	135	30												
			2		122	30	124	30												
					107	30	105	38												
					124	33	129	38												
6-SG-60	5348I	206001	1	DP	218		133	56	142	46	210									
			2		207		148	66	166	66	198									
			3		248		115	61	160	58	201									
6-SG-61	5348I	208001	1	RB	124	41	129	28												
					113	51	129	30												
					140	56	126	30												
					143	48	148	25												
			2		131	36	134	25												
					120	51	122	30												
					140	56	115	30												
					126	46	147	25												
6-SG-62	5348I	212999	1	RB	110	41	135	15												
					127	41	103	30												
					138	41	125	25												
			2		125	51	138	23												
					122	38	132	28												
6-SG-63	5348I	200997	1	RB	106	30	112	28												
					113	25	117	23												
					122	25	153	20												
			2		105	28	107	25												
					131	23	123	18												
					122	30	140	25												
6-SG-64	5348I	195983	1	DP	164	38	156	41												
			2		152	38	142	28	168	36										
			3		166	36	163	20	166	36										
6-SG-65	5348I	189979	1	DP	113	30	120	30												
					121	30	116	38												
			2		125	25	134	38												
					131	30	130	36												
6-SG-66	5349II	097031	1	DP	143	41	120	25												
					137	36	135	41												
					130	25	150	36												
			2		142	46	127	25												
					133	30	126	38												
					146	15	164	25												
6-SG-67	5349II	092033	1	BS	175	650														
			2		176	660														
6-SG-68	5349II	082036	1	RE	166	71	134	20	168	51	162	36	162	66	165	46	138	61	150	30
			2		168	72	119	25	172	51	167	23	167	53	163	41	148	56	141	30
6-SG-69	5349II	075032	1	RB	115	36	145	46												
					135	43	106	58												
					149	51	158	36												
			2		127	36	138	48												
					120	43	145	58												
					132	51	152	41												
6-SG-70	5349II	216078	1	RE	155	325	157	66	173	56										
			2		157	325	147	71	163	76										
6-SG-71	5448IV	787999	1	MP	258		101	188	140	66	148	112	203							
			2		266		153	99	131	107	222									
6-SG-72	5448IV	915926	1	MP	255		120	132	162	163	151	132	130	173	244					
			2		263		154	132	172	46	123	163	262							

(Continued)

Table A12 (Continued)

Site No.	MS Map Reference: Sheet No.	Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH)													
					1		2		3		4		5		6		7		8	
					AA	SH	AA	SH	AA	SH	AA	SH	AA	SH	AA	SH	AA	SH
6-SG-73	5448III	891807	1	RB	138	36	146	25										
					126	41	103	38										
			2		125	38	120	30										
					103	25	130	36										
6-SG-74	5448III	849787	1	RB	152	36	132	36										
					144	20	125	25										
					148	20	129	18										
			2		150	36	129	30										
					143	20	126	23										
					145	23	133	23										
6-SG-75	5448III	820811	1	RB	125	51	115	56										
					128	25	113	23										
			2		118	56	117	58										
					124	30	120	23										
6-SG-76	5448IV	918840	1	DD	260		135	107	129	107	244							
			2		253		128	122	120	107	250							
6-SG-77	5448IV	936861	1	RE	165	102	165	109										
			2		158	102	172	86										
6-SG-78	5448IV	933858	1	RE	140	163	128	99										
			2		110	173	120	122										
6-SG-79	5448IV	894943	1	RP	142	56	119	41										
			2		140	51	132	46										
6-SG-85	5449III	827080	1	RP	141	198												
			2		135	168												
6-SG-86	5449III	822079	1	RP	122	94	137	71	175	51	163	147						
			2		142	76	150	36	158	51	158	56	163	147				
6-SG-87	5449III	806056	1	RE	262		96	422										
			2		261		101	173										
6-SG-89	5349II	019121	1	RB	116	30	118	25										
					124	18	120	20										
					127	18	128	30										
			2		121	38	116	46										
					140	20	144	20										
					103	20	130	20										
6-SG-90	5349II	011104	1	RB	138	71	134	43										
					134	56	133	28										
					124	61	125	36										
			2		135	71	133	43										
					141	66	131	30										
					130	58	130	36										
6-SG-91	5349II	013098	1	RB	136	76	136	43										
					122	46	113	23										
					136	23	115	20										
			2		142	66	134	38										
					120	61	125	36										
					116	25	135	20										
6-SG-92	5349II	994079	1	RB	122	20	145	30										
					120	33	133	46										
					115	36	115	30										
			2		118	25	123	36										
					112	33	135	33										
					120	36	133	36										
6-SG-93	5349II	002074	1	RB	115	36	126	23										
					120	30	133	20										
					137	15	133	15										
			2		141	41	150	25										
					128	20	133	15										
					121	18	133	18										
6-SG-94	5349II	014064	1	RB	160	76	156	51										
					138	28	143	20										
					125	20	133	23										
			2		160	81	150	64										
					138	28	141	25										

(Continued)

Table A12 (Concluded)

Site No.	AMS Map Reference Sheet No.	AMS Map Reference Grid Coordinates	Profile No.	Feature Type	Critical Approach Angle (AA) and Step Height (SH) 1 AA	1 SH	2 AA	2 SH	3 AA	3 SH	4 AA	4 SH	5 AA	5 SH	6 AA	6 SH	7 AA	7 SH	8 AA	8 SH
6-SG-95	5349II	020056	1	RB	123	43	117	18												
					125	23	117	25												
					139	28	135	20												
			2		124	41	122	25												
					112	25	166	20												
					134	28	130	20												
6-SG-96	5349II	025051	1	RB	107	56	127	36				56		36						
					133	41	135	38				41		38						
			2		138	36	132	30				36		30						
					124	36	142	38				36		38						
6-SG-97	5349II	045061	1	RE	144	51	122	71	152	86	124	51								
			2		137	56	148	86	135	107	136	71								
6-SG-98	5349II	044051	1	RB	146	28	132	15												
					134	23	123	23												
					127	23	120	23												
			2		137	36	129	15												
					112	23	127	25												
					131	15	127	15												
6-SG-99	5349II	053068	1	RB	135	25	128	20												
					132	30	120	25												
					117	41	120	28												
			2		131	41	124	38												
					132	38	124	20												
					117	41	129	30												
6-SG-100	5348I	152010	1	RP	130	30	148	46	153	46	146	30	150	30						
			2		166	33	136	51	150	46										
6-SG-103	5348I	158999	1	RP	143	81														
			2		164	142														
6-TS-35	5149II	058028	1	RP	200		159	71	155	81	200									
			2		155	48														
					199		161	81	171	66										
					199		160	81	157	102	228		153	51						
					168	38	199		162	58										
6-TS-38	5249III	385046	2	RP	155	66	197													
			4		120	76	160	69	166	102	192									
6-TS-39	5249II	483093	4	RE	158	81	158	97												
			5		149	51	110	56												
					150	64	148	46												
6-TS-41	5448IV	930844	1	RP	227		134	168	121	224	228									
			2		203		127	91	127	107	197									
6-TS-42	5448IV	934847	2	RP	232		133	201	155		133	579	216							
			3		123	25	138	9	148	23	140	64								
6-PD-259	5448IV	806931	2	RP	158	91	170	51												
					147	81	158	66												
			3		160	30	164	51	132	61	203		155	51	126	112	250		138	66
					152	30	167	43	161	20	199		159	38	137	122	255		139	64
					198		146	41	145	61	205		156	23	194		106	69	106	132
					189		143	71	144	76	201		152	20	200		158	41	141	84
			4		163	64	210		158	41	159	41	134	112	140	61				
			5		149	41	142	56	150	94	218		145	41						
					163	51	128	43	130	38	115	56	134	94	230					

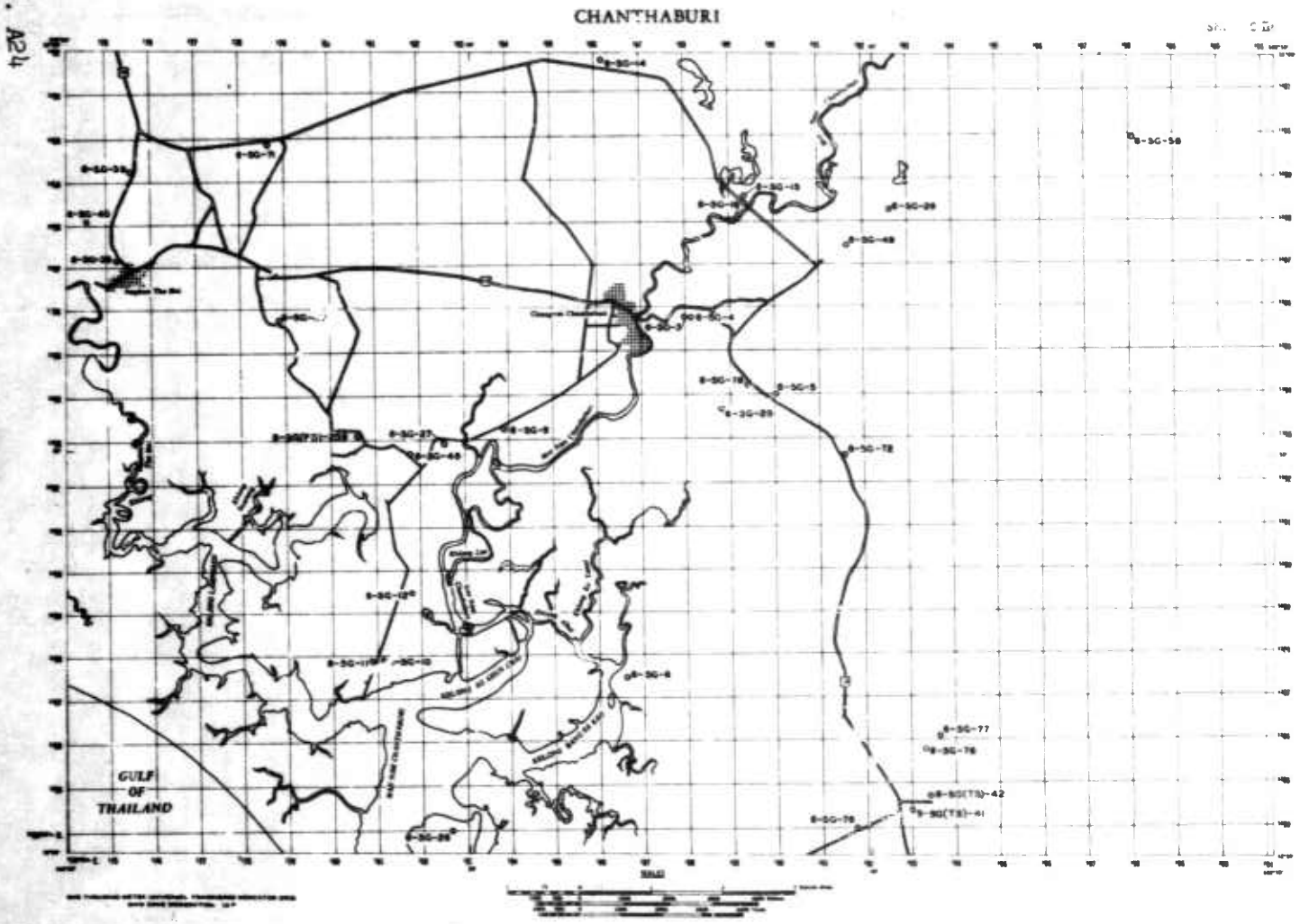
(6 of 6 sheets)

FIG. A22

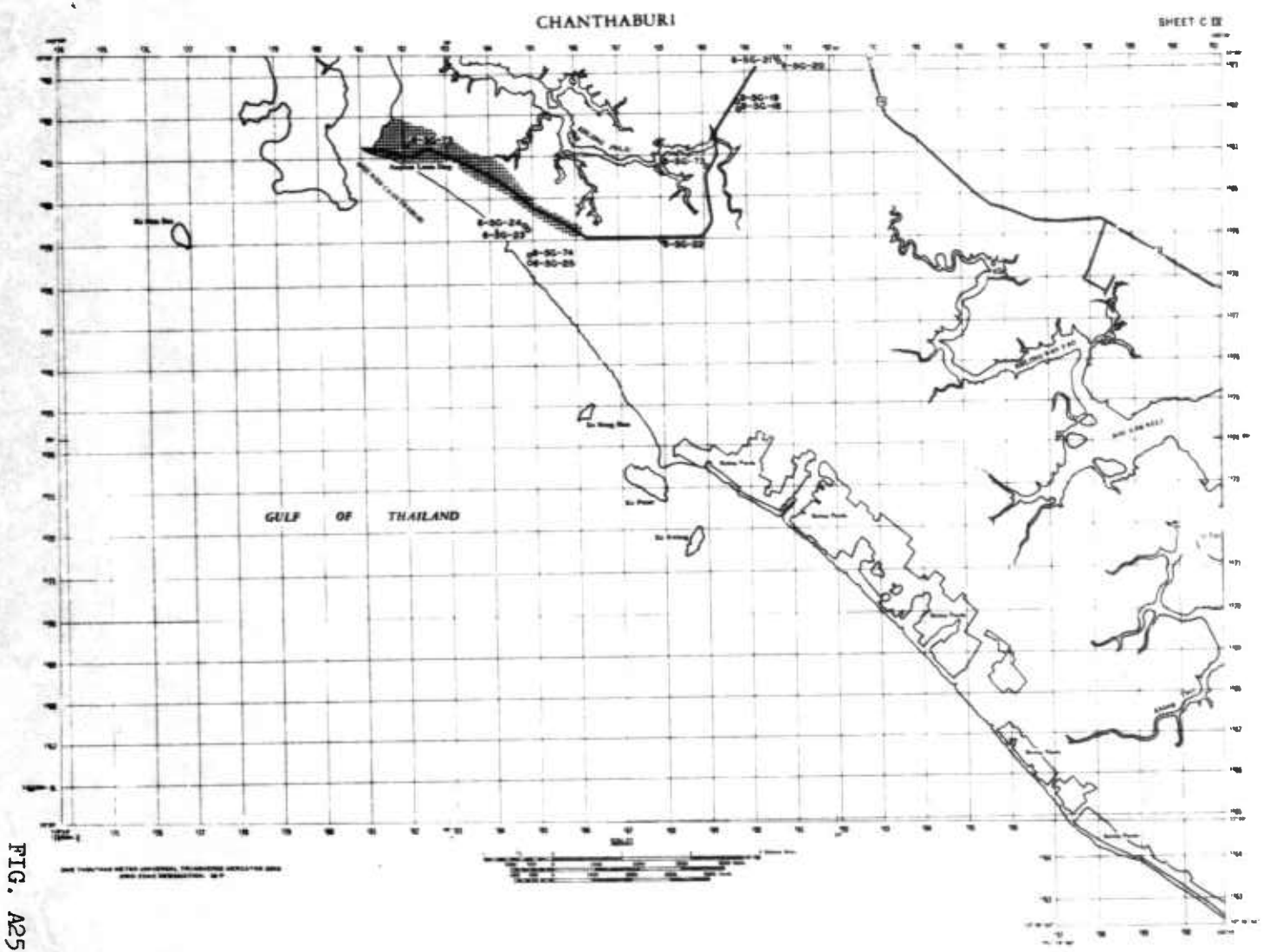
SURFACE GEOMETRY SITES
CHANTHABURI STUDY AREA
CHANTHABURI
GULF OF THAILAND

FIG. A23

FIG. A24



SURFACE GEOMETRY SITES
CHANTHABURI STUDY AREA
SHEET C III



SURFACE GEOMETRY SITES
CHANTHABURI STUDY AREA
SHEET C IV

FIG. A25