Ground-Water Resources of Cambodia

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1608–P

Prepared in cooperation with the Government of Cambodia under the auspices of the United States Agency for International Development

Ground-Water Resources of Cambodia

By W. C. RASMUSSEN *and* G. M. BRADFORD

CONTRIBUTIONS TO THE HYDROLOGY OF ASIA AND OCEANIA

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1608–P

Prepared in cooperation with the Government of Cambodia under the auspices of the United States Agency for International Development

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1977

UNITED STATES DEPARTMENT OF THE INTERIOR

CECIL D. ANDRUS, *Secretary*

GEOLOGICAL SURVEY

V. E. McKelvey, *Director*

Library of Congress Cataloging in Publication Data

Rasmussen, William Charles, 1917-73 Ground-water resources of Cambodia.

(Geological Survey water-supply paper; 1608-P: Contributions to the hydrology of Asia and Oceania) "Prepared in cooperation with the Government of Cambodia under the auspices of the United States Agency for International Development."

1. Water, Underground—Cambodia. I. Bradford, G. M., joint author. II. Cambodia. III. United States. Agency for International Development. IV. Title. V. Series: United States. Geological Survey.

Water-supply paper ; 1608-P. VI. Series: Contributions to the hydrology of Asia and Oceania.

TC801.U2 no. 1608-P [GB1144.C3] 627'.08s [553'.79'09596] 74–20781

For sale by the Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, VA 22202

CONTENTS

ILLUSTRATIONS

TABLES

CONTRIBUTIONS TO THE HYDROLOGY OF ASIA AND OCEANIA

GROUND-WATER RESOURCES OF CAMBODIA

By W. C. RASMUSSEN and G. M. BRADFORD

ABSTRACT

Cambodia (now the Khmer Republic), in tropical, humid southeast Asia, has an area of 175,630 km^2 and a population of about 5 million. [1]The Mekong River, one of the world's largest rivers, flows through Cambodia. Also, the Tonle Sap (Grand Lac), a highly productive fresh-water lake, functions as a huge off-channel storage reservoir for flood flow of the Mekong River. Surface-water discharge in streams and rivers of Cambodia is abundant during the wet season, mid-May through mid-November, when 85 percent of the precipitation falls, but is frequently deficient during the remainder of the year. Annual rainfall ranges from 1,370 mm in the central lowlands to more than 5,000 mm in the mountainous highlands. The mean annual temperature for the country is 27.5°C and the evaporation rate is high.

During 1960–63, 1,103 holes were drilled in 16 of the 18 khêts (provinces), of which 795 or approximately 72 percent, were productive wells at rates ranging from 1.1 to 2,967 l/min. The productive wells ranged in depth from 2 to 209.4 m and were 23.2 m deep on the average.

Mr. Rasmussen [2] studied the subsurface geology of Cambodia in considerable detail by examining drillers' logs and constructing nine geologic cross sections. The principal aquifer tapped by drilled wells in Cambodia is the Old Alluvium. In many places, however, dug wells and a few shallow drilled wells obtain water from the Young Alluvium. Sandstone of the Indosinias Formation yields moderate to small quantities of water to wells in a number of places. Also, wells tapping water-bearing basalt have a small to moderate yield.

The quality of water is recorded in only a few analyses. The dissolved-solids concentrations appear to be generally low so that the water is usable for most purposes without treatment. Some well waters, however, are high in iron and would have to be aerated and filtered before use.

In this report, well records are tabulated, and the geology and hydrology is discussed by khêts. The bulk of the available information is on the central lowlands and contiguous low plateaus, as the mountainous areas on the west

[1] Geographic names in this report have been verified by the Board on Geographic Names (BGN) of the Geographic Names Division, Defense Mapping Agency, Topographic Command, Washington, D.C. Names not verified by BGN are shown on the illustrations, and indicated in the text and tables, preceded by a asterisk (*).

[2] Mr. Rasmussen was killed in the explosion of a land mine near Saigon, South Vietnam, in May 1973.

and the high plateaus on the east are relatively unexplored with respect to their ground-water availability.

No persistent artesian aquifer has been identified nor have any large-potential ground-water sources been found although much of the country yet remains to be explored by test drilling. Well irrigation for garden produce is feasible on a modest scale in many localities throughout Cambodia. It does not seem likely, however, that large-scale irrigation from wells will come about in the future. Ground water may be regarded as a widely available supplemental source to surface water for domestic, small-scale industrial, and irrigation use.

INTRODUCTION

PURPOSE AND SCOPE OF REPORT

The purpose of this report is to describe and evaluate the availability of ground water in Cambodia (now the Khmer Republic). The description and evaluation are based on test-drilling data and well records obtained by the Public Health Division of the United States Agency for International Development (US AID) Mission to Cambodia during a rural water-well development program in 1960–63. Mr. Rasmussen, while on assignment from the U.S. Geological Survey to Cambodia under the auspices of US AID, studied the well records and also the lithologic samples from eight deep wells. He also spent 5 weeks in the field in Cambodia in late 1963 and 2¼ years in adjacent South Vietnam during 1964–66. The data were assembled, analyzed, and synthesized by Mr. Rasmussen during his tour in South Vietnam. The report may, therefore, be considered a base in the future for more intensive investigation and development of Cambodia's ground-water resources.

Following completion of the first draft of this report by Mr. Rasmussen and during its preparation at the headquarters of the U.S. Geological Survey, Cambodia experienced a complete turnover in its governmental structure. Former internal political boundaries were realined, new geographic names were added or old names changed, and new administrative units were created. These changes markedly affected the organization of the draft report. Consequently, Mr. Rasmussen requested Mr. Bradford to undertake the detailed research that would be necessary to update the geographic terminology and boundaries described in the report and, for continuity, to adjust the former boundaries and terminology.

MAPS AND NOMENCLATURE

BASE MAPS

The base map originally used in preparing this report and for the arrangement of the well tables was published in 1963 or 1964

at a scale of 1:500,000. The base map used in compilation, however, was an updated version, at a scale of 1:500,000 (Margat and Montion, 1967). A new administrative division, Khêt Otdâr Méanchey, and other new geographic additions are shown on this map. Map sources of adequate scale and control were not available for fieldwork.

Available geologic maps and their bases, scale 1:500,000, are highly generalized and cannot be considered sufficiently accurate or reliable for precise usage. Therefore, the geology was transferred from available geologic maps, scale 1:500,000, to the compilation base, scale 1:500,000, and then reduced to final publication scale, 1:1,000,000. Base maps at 1:250,000 scale were used occasionally for control in compiling the geology.

NATIONAL AND ADMINISTRATIVE DIVISION BOUNDARIES

The national boundary of Cambodia has not changed, although several administrative divisions have been created since 1966. These include Khêt Otdâr Méanchey (first-order administrative division) and the autonomous municipality of Kêb. The boundary of Kêb is unknown, and its status was doubtful as of December 1971. Through March 1974 new srŏks (second-order administrative divisions) have been created; some srŏks in the report had their boundaries realined. The new srŏks necessitated a change of boundary delineation between Khêts Otdâr Méanchey and Siĕmréab. The addition of these new khêt and srŏk boundaries to the existing report maps could confuse the reader and geographically relate text information and data to the wrong administrative division.

New boundary delineations resulted in the incorporation of several populated areas within new administrative divisions. One major change was the town of Kirirôm (also wells KSo–5 to 8), formerly in Khêt Kaôh Kŏng, now in Khêt Kâmpóng Spoe. A minor change was Khŭm Chikhâ (Khum Chikka, also well KSo–13), formerly in Khŭm Trâpeang. These changes are shown editorially in the text and well tables to relate the familiar or former geographic name to the current geographic name.

ACKNOWLEDGMENTS

The senior author is especially indebted to Mr. Bruce T. Wood, sanitarian, who directed the rural water program under the supervision of Dr. John E. Kennedy, chief of the US AID Public Health Division during most of the period 1960–63. Mr. Marvin E. Miller and Mr. Ocie O. Sager were well-drilling advisors dur-

ing most of that time. The senior author arrived in Cambodia the fall of 1963 to begin a 2-year tour to study and appraise the ground-water resources. This tour was cut short, however, in late December 1963 with the closing of the US AID Mission. Hundreds of well samples, accumulated during the drilling program and left with the Cambodian Government in the water-supply warehouse, were not available for study. The driller's logs, however, kept on 3- by 5-inch cards provided the basic data for this report.

The US AID well-drilling program began late in 1960, accelerated slowly to a high rate in April 1963, and then declined abruptly. The high rate was attained by the use of the rapid and inexpensive hydrojet method of drilling shallow wells in soft alluvial sediments. Drilling statistics tabulated by Mr. Bruce T. Wood are summarized in table 1. This record compares approximately with the bar graph presented in the US AID yearbook for Cambodia for 1963 (Aide Americaine au Cambodge, 1963, p. 16) where completed production wells as of April 1, 1963, are shown as a total of 762. It also compares approximately with the summary of records of wells (table 26) prepared by Rasmussen. A total of 1,065 holes were drilled (including 21 soil tests), and of these 760 were completed as production wells. Thus, 72.7 percent of the holes put down resulted in productive wells.

TABLE 1.—*Summary of wells drilled, 1960–63*

Drilling method	Year	Total holes drilled	Productive wells	Average depth (meters)
Cable tool and rotary	1960	36	19	69
	1961	114	70	48
	1962	133	88	43
	1963	84	58	32
Hydrojet	1961	98	67	20
	1962	235	161	13
	1963	403	332	19
Total		1,103	795	
Percent productive			72.1	

PREVIOUS INVESTIGATIONS

The most extensive investigations of the geology of Cambodia have been made by the French geologists in the former Service Geologique de l'Indochine. Their work is summarized on four geological maps (Gubler, 1938; Saurin, 1937, 1939, 1964)[3] at a scale of 1:50,000 and in four brochures (Gubler, 1962; Saurin, 1962a, b, c). The writer used these extensively to support subsur-

[3] Republished by the National Geographic Service of Vietnam, Dà Lat (Dalat), South Vietnam.

face geohydrologic interpretations in those khêts where a few wells, or none, have been drilled. Although the mapping was at a small scale and the more inaccessible areas are generalized, the information is sufficiently detailed for the present level of development. Each of the brochures cites the principal references relative to the quadrangle involved.

Robert V. Cushman (1958), a ground-water geologist of the U.S. Geological Survey made a 6-week reconnaissance of the ground-water conditions in Cambodia in 1958 and proposed a program of ground-water exploration and development. The current study is based on the Cushman proposal. Unfortunately, however, only a few of the recommendations made in the original program could be realized by late 1963 when the US AID Mission to Cambodia was terminated.

During the first 4 months of 1959, Leonard J. Snell, a surface-water hydrologist of the U.S. Geological Survey, spent two 30-day periods in Cambodia on a reconnaissance of surface-water conditions and proposed a country-wide program of surface-water investigations.

In 1961, three Russian geologists made a 1-month reconnaissance of the geological conditions in Cambodia for petroleum possibilities and mineral development. They investigated sites of placer and vein gold, molybdenite, and polymetals. They recommended completion of the geologic map and organization of an exploration group consisting of geologists, geophysicists, geochemists, cartographers, photogeologists, drillers, and supporting technicians totaling 162 men. Because they recognized that proper exploration would be arduous and costly, they proposed a 4-year survey.

The Russians mentioned geological prospecting since 1958 by geologists of the People's Republic of China for iron ore near Kâmpóng Thum (Kompong Thom). They referred also to the work of R. Belinko, a French geologist, who, in 1960, described beds of phosphate in the Khêts of Kâmpôt and Bătdâmbâng. Also Polish geologists made a 3-month reconnaissance for oil exploration in 1960 and concluded that marine and estuarine beds of pre-Cretaceous age in western Cambodia warranted test drilling.

There are a number of separate scientific papers on the paleontology, petrology, and general geology of Cambodia. A paper by Saurin and Carbonnel (1964) on laterites is typical of these.

DESCRIPTION OF AREA

Cambodia, located on the peninsula of Indochina in southeast Asia, covers an area of 175,630 km^2 and has a population of about

5 million. It lies within the tropical monsoon belt, between lat 10°30′ and 14°30′N and long 102°30′ and 107°30′E. and is roughly equant in shape. Drainage and khêt administrative divisions are shown in figure 1.

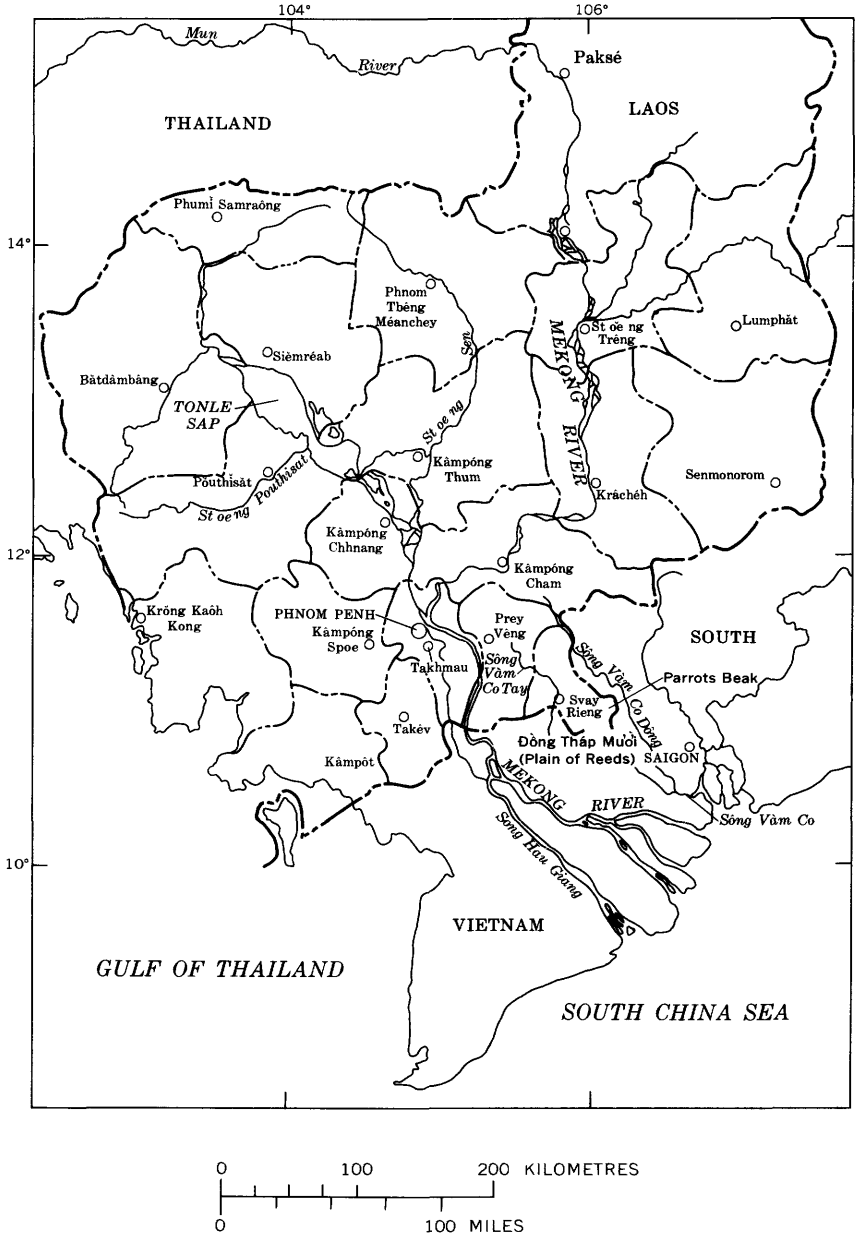

FIGURE 1.—Khêt map of Cambodia.

Topographically, the country includes a part of a vast lowland plain of the Mekong River, bordered by mountains on the west, an escarpment on the north, and hilly plateaus on the east. It is bounded by Thailand on the west and north, Laos on the northeast, Vietnam on the east and south and the Gulf of Thailand (Gulf of Siam) on the southwest. Elevations range from sea level on the gulf to 1,771 m on a peak on the Chuŏr Phnum Dâmrei (Chaine de l'Elephant) in the southwestern part of the country (pl. 1).

The dominant water features of Cambodia are the lower reaches and tributaries of the Mekong River, which provide the double function of annual flood in the wet season and drainage in the dry season. The Mekong River is classified as the 11th longest river in the world, and is among the first 10 in annual volume of flow. The Mekong River enters Cambodia at the northeast from Laos, first forming rapids over ledges of rock and then further downstream flowing across the large interior plain of central Cambodia where it is joined by numerous lesser tributaries. At Phnom Penh, the capital city, the Mekong has four arms, the "Quatre-Bras", where the Tônlé Sab, the Tônlé Basak (Bassac) and the inflowing and outflowing branches of the Mekong River join. The Tônlé Sab is the recharge and discharge stream of a large western basin, which contains the Tonle Sap (Grand Lac), a great lake of 2,500 km^2. The Tonle Sap is a huge natural storage reservoir for flood flows of the Mekong River, which rises gradually in June to full flood in October, then declines to low flow in March, April, and May. When the stage of the Mekong River rises, water backs up the Tônlé Sab 200 km into the Tonle Sap, raises the lake level more than 8 m, and inundates large areas of adjacent low-lying land.

The Mekong River is influenced by tides at Phnom Penh, and its sediments have formed a vast delta that covers a broad expanse extending southward across South Vietnam to the South China Sea. The annual flood and the fertile flatland contribute to make the delta area the rice bowl of the lower Mekong. The Tonle Sap and the Tônlé Sab abound in fresh-water fish, so that central Cambodia has a good fish-rice economy.

Geologically, the western mountains are eroded sandstones of the Chuŏr Phnum Krâvanh (Cardoman Chain), and folded, intruded, schists and limestones of the Chuor Phnum Dâmrei. The basin of the Tonle Sap is a downwarp or a fault block. The plateaus of eastern Cambodia are underlain by sandstone, siltstone, and red shale, covered in places by sheets of basalt. Numerous hard rock hills protrude through the alluvium of the lowland plain. A few hills are relatively young volcanic cones, but most

are the summits of an older mountainous terrain buried by alluvium. Some of the geologic features are described briefly in the following pages, and the general geology of Cambodia is shown on plate 1.

Figure 2 shows an approximate west-east profile of Cambodia at the 13th parallel north. The western mountain chains lie south of this latitude.

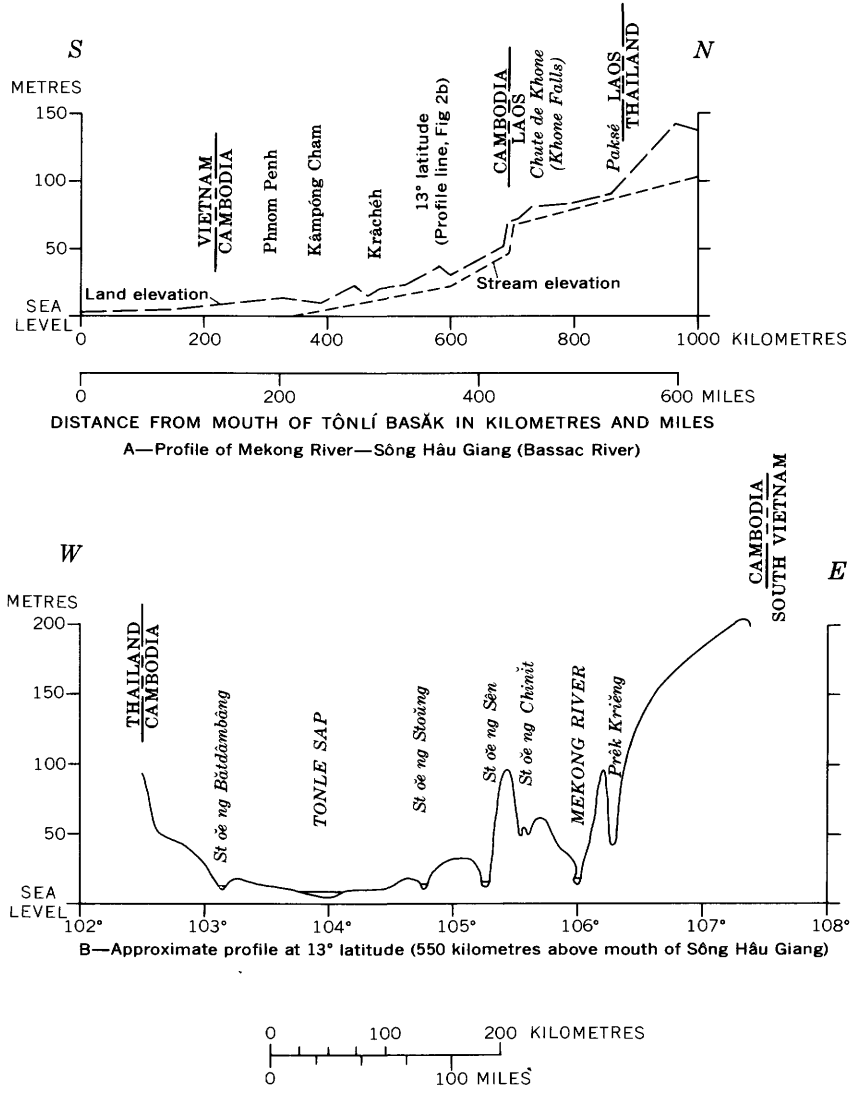

FIGURE 2.—Physiographic profiles.

CLIMATE

Cambodia has a tropical monsoon climate characterized by a hot summer, heavy summer and autumn rainfall, and a moderately dry winter and spring. Moisture-laden air from the Indian Ocean and the South China Sea blows across Cambodia from the southwest, from mid-May to mid-November, bringing abundant precipitation. During the other 6 months, cool, dry air from the Asian landmass flows from the northeast, and precipitation is light.

Table 2 gives the average monthly precipitation and the total annual average for eight stations (Snell, 1959, p. 11). Figure 3*A* shows the variations in annual rainfall at Phnom Penh. Cyclical drought patterns are not apparent; in fact there are no annual droughts, if the definition of an annual drought can be taken as

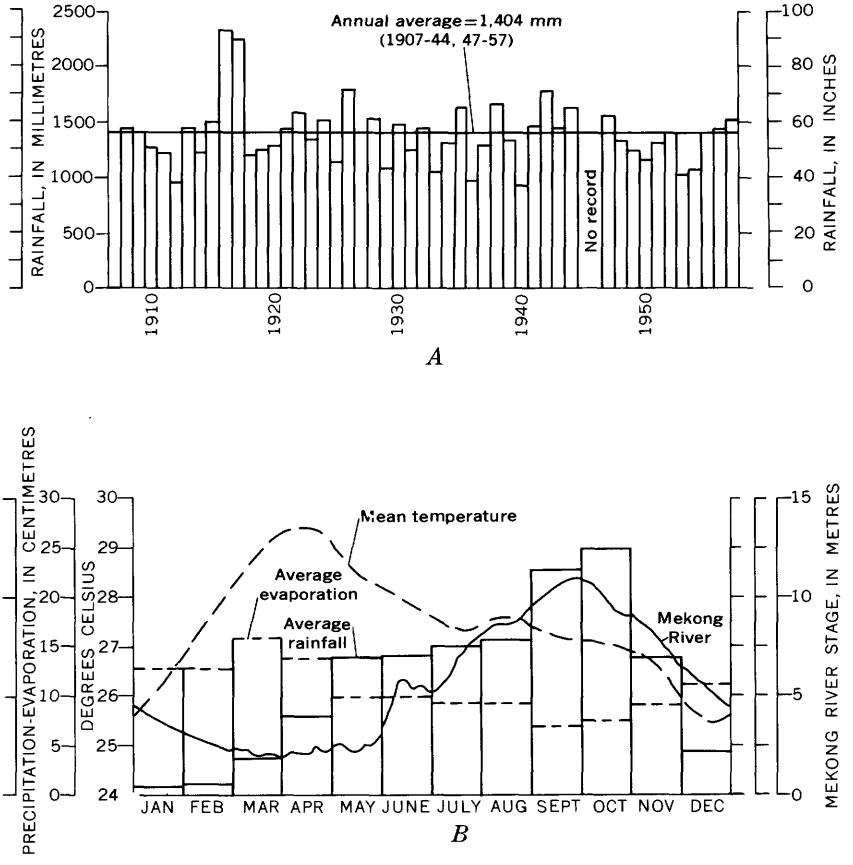

FIGURE 3.—*A*, Variations in annual rainfall, and *B*, Hydrometeorologic features at Phnom Penh.

TABLE 2.—*Average monthly precipitation (millimeters) for eight stations in Cambodia (from Snell, 1959)*

	Virôchey (Voeune Sai)	Stoĕng Trêng	Krâchéh (Kratie)	Phnom Penh	Kâmpóng Thum	Kâmpôt	Bok Koŭ (Bokor)	Phsar Réam (Ream)
January	2.0	2.3	11.2	8.6	3.0	18.0	23.0	42.0
February	5.0	12.3	10.0	9.4	17.0	26.0	58.0	71.0
March	20.5	29.9	24.0	36.4	50.0	87.0	137.0	98.0
April	96.3	82.9	105.7	78.9	71.4	107.0	166.0	151.0
May	250.3	199.3	241.9	141.0	180.5	205.0	416.0	386.0
June	382.4	275.6	247.4	143.1	114.8	204.0	606.0	533.0
July	556.9	347.9	332.3	153.4	224.8	330.0	919.0	539.0
August	509.5	314.9	279.9	157.1	188.2	354.0	902.0	491.0
September	463.8	323.9	329.0	227.0	319.5	234.0	779.0	515.0
October	201.2	191.8	166.7	252.5	210.0	218.0	404.0	221.0
November	45.1	60.5	85.5	137.2	66.0	151.0	151.0	103.0
December	16.8	13.5	22.0	42.8	20.0	49.0	63.0	34.0
Total annual	2,549.8	1,854.8	1,855.6	1,387.4	1,465.2	1,983.0	4,624.0	3,184.0

a year in which less than 50 percent of the average precipitation occurred.

Figure 3*B* shows graphically several hydrometeorologic features at Phnom Penh. The mean temperature by month reaches a high of 29.5°C in April and a low of 25.5°C in December. Average pan evaporation is not a function of temperature alone, because it also is affected by the degree of cloud cover. At Phnom Penh, evaporation reaches a maximum in March and a minimum in September.

The average seasonal rainfall in Cambodia reaches a minimum in January and a maximum in October. The Mekong River flow, however, reaches a peak in Cambodia just before the maximum rainfall. The flow represents runoff from the rainfall over the upper and middle Mekong River drainage basin, where maximum rainfalls come in September, earlier than at Phnom Penh. Moreover, the delayed discharge, through ground storage, sustains the flow of the Mekong River during the onset of the dry season, and low flow does not occur until March, April, or May.

GROUND-WATER TERMS AND CONCEPTS

The following newly defined terms and concepts, excerpted from Lohman and others (1972), are presented here for the benefit of readers who may not be familiar with current ground-water terminology in Geological Survey reports. The reader is referred to the Lohman report for a fuller discussion of recent redefinitions of ground-water terms.

Aquifer: An aquifer is a formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs. The term aquifer was defined by O. E. Meinzer from a geological concept in which water bodies are classified in accordance with stratigraphy or rock types. Meinzer clearly intended that an aquifer include the unsaturated part of the permeable unit.

Artesian: Artesian is synonymous with confined. Artesian water and artesian water body are equivalent, respectively, to confined ground water and confined water body. An artesian well (fig. 4) is a well deriving its water from an artesian or confined aquifer. The water level in an artesian well stands above the top of the artesian aquifer it taps.

If the water level in an artesian well stands above the land surface the well is a flowing artesian well. If the water level

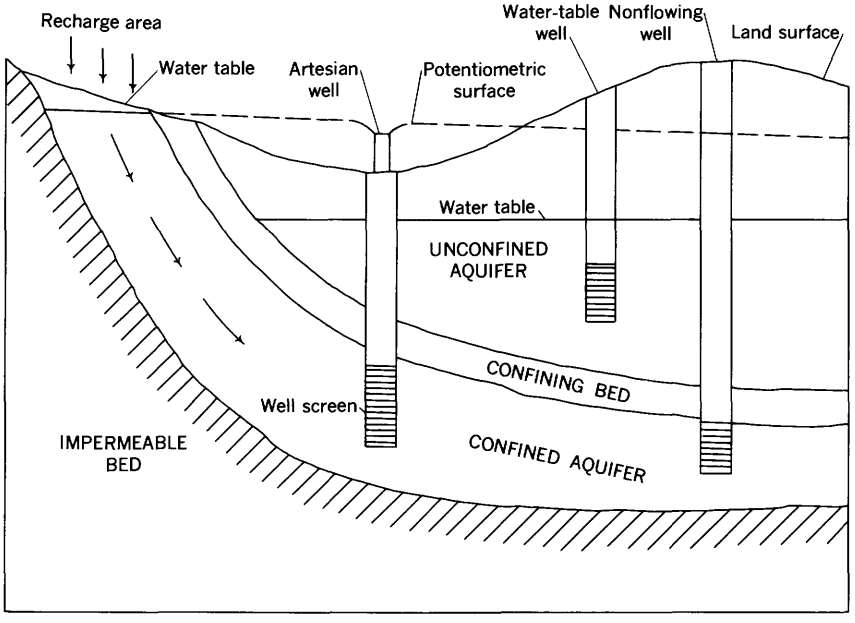

FIGURE 4.—Diagram of water table and artesian wells.

in the well stands above the water table, it indicates that the artesian water can and probably does discharge to the unconfined water body. It should be noted also that, in discharge areas, wells having heads higher than the water table, or even flowing wells, may exist without confinement of the water body, owing to vertical components of gradients in the flow field.

Capillary fringe: The capillary fringe is the zone immediately above the water table in which all or some of the interstices are filled with water that is under less than atmospheric pressure and that is continuous with the water below the water table. The water is held above the water table by interfacial forces (surface tension). The capillary fringe is typically saturated to some distance above its base at the water table; upward from the saturated part, only progressively smaller pores are filled and the upper limit is indistinct. In some quantitative studies, it is convenient to define the upper limit as the level at which 50 percent of the pore space is filled with water.

Some lateral flow generally occurs throughout the capillary fringe, but because the effective hydraulic conductivity decreases rapidly with moisture content, the lateral flow in the

capillary fringe generally is negligible compared with that in the saturated zone.

The thickness of the capillary fringe is greater in fine-grained material than in coarse-grained material. Consequently, where the water table intersects materials of different particle size, vertical components of movement are superimposed on lateral movement of water through the capillary fringe.

Hydraulic conductivity: Hydraulic conductivity replaces the term "field coefficient of permeability." If a porous medium is isotropic and the fluid is homogeneous, the hydraulic conductivity of the medium is the volume of water at the existing kinematic viscosity that will move in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow.

Hydraulic conductivity can have any consistent units suitable to the problem involved. In data tabulations of the Geological Survey, hydraulic conductivity may be expressed in feet per day and, so that the work of the Geological Survey may be readily interpreted in other countries, also in metres per day.

Confining bed: Confining bed is a term which supplants the former terms "aquiclude," "aquitard," and "aquifuge" in reports of the Geological Survey and is defined as a body of "impermeable" material stratigraphically adjacent to one or more aquifers. In nature, however, its hydraulic conductivity may range from nearly zero to some value distinctly lower than that of the aquifer. Its conductivity relative to that of the aquifer it confines should be specified or indicated by a suitable modifier such as slightly permeable or moderately permeable.

Ground water, confined: Confined ground water is under pressure significantly greater than atmospheric, and its upper limit is the bottom of a bed of distinctly lower hydraulic conductivity than that of the material in which the confined water occurs.

Ground water, perched: Perched water is unconfined ground water separated from an underlying body of ground water by an unsaturated zone. Its water table is a perched water table. It is held up by a perching bed whose permeability is so low that water percolating downward through it is not able to bring water in the underlying unsaturated zone above atmospheric pressure.

Perched ground water may be either permanent, where recharge is frequent enough to maintain a saturated zone above the perching bed, or temporary, where intermittent recharge

is not great or frequent enough to prevent the perched water from disappearing from time to time as a result of drainage over the edge of or through the perching bed.

Ground water, unconfined: Unconfined ground water is water in an aquifer that has a water table.

Head, static: The static head is the height above a standard datum of the surface of a column of water (or other liquid) that can be supported by the static pressure at a given point. The static head is the sum of the elevation head and the pressure head. Head, when used alone, is understood to mean static head.

Potentiometric surface: The potentiometric surface, which replaces the term "piezometric surface," is a surface which represents the static head. As related to an aquifer, it is defined by the levels to which water will rise in tightly cased wells. Where the head varies appreciably with depth in the aquifer, a potentiometric surface is meaningful only if it describes the static head along a particular specified surface or stratum in that aquifer. More than one potentiometric surface is then required to describe the distribution of head. The water table is a particular potentiometric surface.

Pressure, static: Static pressure is the pressure exerted by the fluid. It is the mean normal compressive stress on the surface of a small sphere around a given point. The static pressure does not include the dynamic pressure and therefore is distinguished from the total pressure. The velocity of ground water ordinarily is so small that the dynamic pressure is negligible. Pressure, when used alone, is understood to mean static pressure.

Specific capacity: The specific capacity of a well is the rate of discharge of water from the well divided by the drawdown of water level within the well. It varies slowly with duration of discharge, which should be stated when known. If the specific capacity is constant except for the time variation, it is roughly proportional to the transmissivity of the aquifer.

The relation between discharge and drawdown is affected by the construction of the well, its development, the character of the screen or casing perforation, and the velocity and length of flow up the casing. If the well losses are significant, the ratio between discharge and drawdown decreases with increasing discharge; it is generally possible roughly to separate the effects of the aquifer from those of the well by step drawdown tests.

In aquifers with large tubular openings, the ratio between discharge and drawdown may also decrease with increasing discharge because of a departure from laminar flow near the well, or, in other words, a departure from Darcy's law.

Specific yield: The specific yield of a rock or soil is the ratio of (1) the volume of water which the rock or soil, after being saturated, will yield by gravity to (2) the volume of the rock or soil. The definition implies that gravity drainage is complete. In the natural environment, specific yield is generally observed as the change that occurs in the amount of water in storage per unit area of unconfined aquifer as the result of a unit change in head. Such a change in storage is produced by the draining or filling of pore space and is therefore dependent upon particle size, rate of change of the water table, time, and other variables. Hence, specific yield is only an approximate measure of the relation between storage and head in unconfined aquifers. It is equal to porosity minus specific retention.

Storage coefficient: The storage coefficient is the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head. In a confined water body, the water derived from storage with decline in head comes from expansion of the water and compression of the aquifer; similarly, water added to storage with a rise in head is accommodated partly by compression of the water and partly by expansion of the aquifer. In an unconfined water body, the amount of water derived from or added to the aquifer by these processes generally is negligible compared to that involved in gravity drainage or filling of pores; hence, in an unconfined water body, the storage coefficient is virtually equal to the specific yield.

Transmissivity: Transmissivity is the rate at which water of the prevailing kinematic viscosity is transmitted through a unit width of the aquifer under a unit hydraulic gradient. It replaces the term "coefficient of transmissibility" because, by convention, it is considered a property of the aquifer, which is transmissive, whereas the contained liquid is transmissible. However, though spoken of as a property of the aquifer, it embodies also the saturated thickness of the aquifer and the properties of the contained liquid. It is equal to an integration of the hydraulic conductivities across the saturated part of the aquifer perpendicular to the flow paths.

Water table: The water table is that surface in an unconfined water body at which the pressure is atmospheric. It is defined by the levels at which water stands in wells that penetrate the water body just far enough to hold standing water. In wells which penetrate to greater depths, the water level will stand above or below the water table if an upyard or downward component of ground-water flow exists.

GROUND-WATER RESOURCES BY KHETS

With a few exceptions, the ground-water resources of Cambodia described and evaluated by khêt, starting with the Environs of Phnom Penh (Ville de Phnom Penh) and proceeding southward, eastward, northward, and westward; that is, counterclockwise. For each khêt, general characteristics of well yields, depths, water levels, water quality, and subsurface geology are described, and well tables, selected well logs, and geologic cross sections are presented.

The well locations must be considered approximate, usually within a kilometre of the point given. The wells are numbered consecutively with each srŏk (district), and one to three letters are used to designate the srŏk. For example, in Khêt Kandal, Kândál Stŏeng is designated KSt, Kiĕn Svay is KSv, Phnom Penh is PP, and so on. Wells in the separate Environs of Phnum Penh (Ville de Phnom Penh), however, are recorded as VP. Wells are identified in two ways in this report. In the text and illustrations, wells are identified by srŏk letter(s) and number. On the well location map (pl. 2), however, only the number is shown by the well symbol and the srŏk letter(s) is shown below the srŏk and centered in parentheses. Logs of the wells are recorded in a card file, in the Office of International Activities, U.S. Geological Survey, Washington, D.C.

ENVIRONS OF PHNOM PENH

Phnom Penh, the capital of Cambodia, is a political entity separate from the khêts and designated the Ville de Phnom Penh, as shown on plate 2, The population of the Ville in October 1962 was given as 430,500.

Phnom Penh lies at the junction of two tributaries, and the outlet of two distributaries: these four water courses are known in French as the Quatre-Bras meaning the four arms. From the northeast, the mighty Mekong River comes in full flow to pass by the river port and flow out to the southeast. From the north the Tonle Sap carries the discharge of the Cambodian basin, to

blend with the waters of the Mekong River. Part of the combined discharge flows out to the south via the Tônlé Basak.

To study the ground-water geology and hydrology of the Environs of Phnom Penh, an analysis was made of all the available records of wells within a circle of 7-km radius, centered at the west edge of the Ville. The well locations are shown on plate 2, and the records are summarized in table 3.

Records of 26 wells were available. Of these, drillers' logs are available for 21, for 1 there is a partial log, and for the other 4, no log. Eighteen sediment samples taken from the uppermost 58 m of VP 8 were studied with binocular microscope. The logs of 8 wells are graphically interpreted in geologic cross section *I–I′* on plate 3. Only 8 wells were productive, 2 were foundation test holes, and the other 16 were dry or nonproductive.

Of the 15 wells located in the western environs of Srŏk Phnom Penh, only 2 were successful. One successful well, PP 2, at the Caserne Militaire (Military Barracks), Khŭm Chaômchau (Chom Chau village), produced 100 l/min when tested in 1962. The log of this well shows 39 m of alternate sand and yellow clay, bottomed on 2 m of black rock. The water level is reported to be 11 m below land surface. The elevation of the well is about 12 m above sea level, so if the reported level is correct, the water level is about 1 m above sea level. A second successful well, PP 15, produced 200 l/min at Stœ̆ng Méan Chey, near the west edge of the Ville.

Six wells drilled in Poŭthĭchĕntŏng (Pochentrong Village) were all reported nonproductive. PP 6 and 7 at the hamlet Phumĭ Chrés are shown on the geologic section (Plate 3). Considerable thicknesses of sand are logged in each of these wells to a depth of 34 m, so the reason the wells were not productive is open to question. Four wells at Poŭthĭchĕntŏng, PP 6, 7, 8, 9 were all reported failures. Wells PP 10, and 11 at the Caserne de Transport (Transport Barracks) logged only clay to total depths of 22 m and 18 m respectively. The logs of PP 8 and 9, however, indicated 33 m and 40 m, respectively, of sand with some gravel. The reason these wells were not productive is not apparent.

Three productive wells were drilled in Srŏk Kiĕn Svay in the Khŭm Chbar Âmpŏu (Svai Ampou suburb) of Phnom Penh just across the Spéan Mônivôngs (Monivong bridge) over the Tônlé Basăk. (See table 3, wells KSv 1, 2, 3.) No logs are available, but the wells are shallow (17 m, 17 m, and 13 m, respectively) and all are moderately productive (45, 50, and 60 l/m).

TABLE 3.—*Records of wells in the Environs of Phnom Penh*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Yield: D, dry and P, poor. Remarks: AB, abandoned; EP, electric pump; FT, foundation test hole; HJ, drilled by hydrojet; L, log available]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Yield (litres per minute)	Remarks
Ville de Phnom Penh						
VP 1	5th Quarter	Tuŏl Tumpung	7–31–61	34.12	80	HJ.
VP 2	do	do	8– 8–61	29.2	25	HJ, L.
VP 3	Tuŏl Kôk	Sangkum College	7– 7–61	62	---	L, FT, AB.
VP 4	do	do	7–15–61	70	---	Do.
VP 5	do	?	12–11–61	13	200	L.
VP 6	do	Police Academy	7– 7–60	296.7	D	Bedrock at 80 m; black and white rock from 178.4 to 296.7 m. TH, AB.
VP 7	do	Atelier CEE	1–20–63	23	D	L, AB.
VP 8	Pouchentrong Boulevard.	Pouchentrong apartment.	5–15–61	73	D	Do.
Srŏk Kiĕn Svay						
KSv 1	Khŭm Chbar Âmpŏu Svai.	Pagoda 800 m. east of Spéan Mônivôngs (Pont Monivong).	7–10–61	17	45	HJ.
KSv 2	do	do	7–15–61	17	50	Do.
KSv 3	do	do	7–17–61	13	60	Do.
Srŏk Phnum Pénh						
PP 1	Khŭm Chaômchau (Khum Chom Chau).	Caserne Militaire (Military Barracks).	1–27–62	60	P	L, AB.
PP 2	do	do	2– 8–62	41	100	L.

TABLE 3.—*Records of wells in the Environs of Phnom Penh*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Yield (litres per minute)	Remarks
		Srŏk Phnum Pénh—Continued				
PP 3	do	?	2–21–62	62	D	L, AB.
PP 4	do	?	2–20–62	26	P	L, AB.
PP 5	do	?	2–22–62	14.7	P	Do.
PP 6	Pŏuthichĕntŏng (Khum Pochentrong).	Phumi Chrés	8–19–61	70	D	L, AB.
PP 7	do	do	8–26–61	51	D	Do.
PP 8	do	Pŏuthichĕntŏng	9– 6–61	42	P	L, AB.
PP 9	do	do	9–16–61	53	P	Do.
PP 10	do	Caserne de Transport (Transport Barracks).	3–15–63	22	D	Do.
PP 11	do	do	3–19–63	18	D	Do.
PP 12	do	*Bonteay Sao Pan	4–12–61	58	D	Do.
PP 13	Pŏuthichĕntŏng	*Bonteay Sao Pan	----------	62	D	L; AB.
PP 14	Khŭm Chaômchau	Stoeng Méan Chey	3– 7–62	42	D	Do.
PP 15	do	do	3–14–62	41	200	EP, L.

Two wells were drilled at Tuŏl Tumpung at the south end of Phnom Penh. Well VP 1 is 34.12 m deep. On November 15, 1963, Rasmussen obtained water-utilization data on this well by tallying the use from sunup to sundown, as shown in figure 5. A total of 3,600 l was drawn by 113 persons during the day. Many of those drawing water used a yoke with a 20-l can hanging from each end to carry the water. It is estimated that this well provides water for about 360 persons, an average of 10 l per person per day.

Wells in the Tuŏl Kôk sector of Phnom Penh are numbered VP 3 to 7. VP 3 and 4 were drilled at Sangkum College for soil samples. VP 5 yielded 200 l/m from a well 13 m deep. VP 6 was a deep test hole in which bedrock was encountered at 80 m, although no log was kept on the upper part of the hole down to a depth of 178.4 m. At this depth a new rig was moved in on the hole and a black and white rock, presumed to be granite, was logged from 178.4 to 296.7 m, the total depth. In the geologic section this same rock has been interpreted as the bedrock encountered at 80 m. The hole at Pochentrong Apartment, VP 8, was a dry hole. The samples show considerable silt and clay intermixed with sand and gravel.

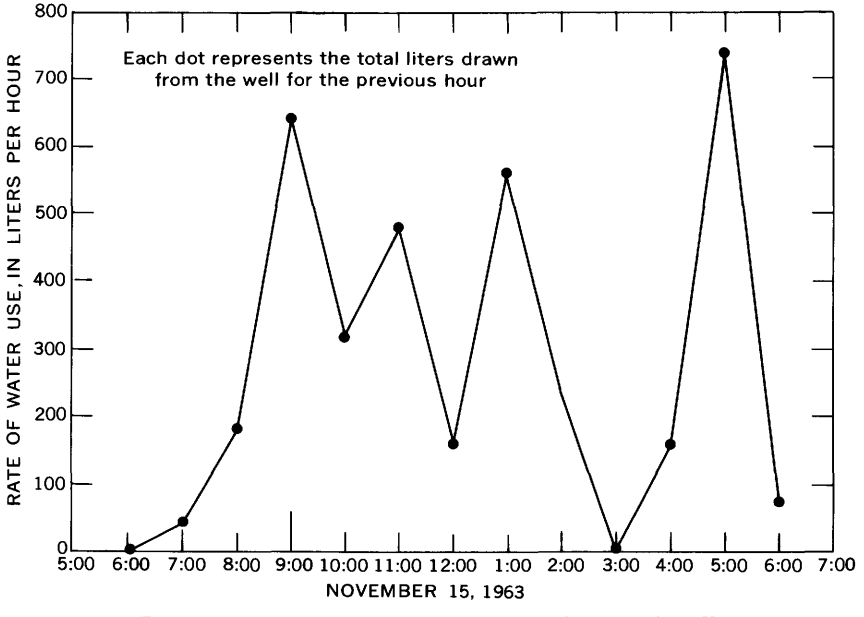

FIGURE 5.—Water utilization of a hand-pumped well.

The geologic section *I–I'* on plate 3 is an interpretation of the data available. Four units are recognized: Young Alluvium, Old Alluvium, weathered rock and clay, and hard crystalline rock. The Young Alluvium is composed of red and yellow clay, silt, and fine sand. The Old Alluvium has yellow-brown laterite, and considerable coarse sand and fine gravel, with smaller amounts of silt and clay. The weathered rock is composed of layers of basalt and basalt tuff interlaminated with alluvial sand, gravel, silt, and clay. The hard crystalline rock is basalt and granite. The Bassac fault is hypothetical and was deduced from topographic lineation and from hard rock found stratigraphically higher in VP 7 than in VP 3, 4, and 6.

In conclusion, it is apparent that a low ratio of success, about 30 percent, was obtained in the Environs of Phnom Penh. No artesian aquifers were found, the area being underlain at depths ranging from 18 to 80 m by hard crystalline rock. The best well yielded 200 l/min, and the average of seven productive wells was 80 l/min. The average depth of the productive wells was 23.5 m with a range from 13 to 41 m. The nonproductive holes averaged 63 m deep, the median was 51 m, and the range was from 15 to 297 m. No report on the quality of water is available, but the water is used for a variety of purposes.

KHET KANDAL

Khêt Kândal is the heart of Cambodia. Surrounding Phnom Penh, 706,439 people live on 370,000 hectares in the khêt with the greatest density of population in Cambodia. Khêt Kândal lies in an extensive plain at the juncture of the Mekong Delta and the Cambodian basin. Elevations on the plain range from 4 m, on the paddies between the Mekong River and the Tônlé Sap and in the south along the border with Vietnam, to 21 m on the western border with the Khêt Kâmpóng Spoe. Three hill masses, however, rise above the plain in the northern part of the khêt: Phnum Chettâris, 110 m high composed of sandy shale; Phnum Basĕt, 138 m high, of granite; and Phnum Tmat Pông, 78 m high, of rhyolite.

Ninety-seven wells were drilled under the US AID program in 5 srŏks of Khêt Kândal. No wells were drilled in Srŏk Mŭkh Kâmpul, Srŏk Prêk Ta Meăk, Srŏk Lvéa Êm, Srŏk S'ang, or Srŏk Kaôh Thum. Eighteen wells have been previously described in the section on Environs of Phnom Penh. The other wells in the khêt are discussed by srŏks. The well locations are shown on plate 2 and hydrologic data for the wells are summarized in table 4.

TABLE 4.—*Records of wells in Khêt Kândal*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: D, dry; P, poor; NP, nonproductive. Remarks: AB, abandoned; EP, electric pump; FT, foundation test hole; HP, hand pump; L, log available; MP, motor pump; S 20, screen with slot size]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Pônhéa Loe					
PL 1	*Khum Vilhear Luong	Pagoda Prakdar	10– 5–61	18	10	150	HP, L, well ends in bed rock.
PL 2	do	do	10–16–61	21	6	150	Do.
PL 3	do	Phumi Prák Kda (Phum Prakdar).	11– 2–61	23	7	150	Do.
PL 4	do	Phumi Ampil Dăm Toek.	11–30–61	22	7	60	Do.
PL 5	do	Pagoda Sala Kou	9–15–61	20	3	150	Do.
PL 6	do	Phumĭ Tép Prânâmm (Wat Tep Pronom).	8– 9–61	23	---	38	Do.
PL 7	do	do	8–14–61	12	---	---	AB, L.
PL 8	do	do	8–29–61	23	5	200	HP, L, well ends in bed rock.
PL 9	Khŭm Phsar Dêk	Phumĭ Mlu Moem (Malou Moeum).	7–15–63	24	8	90	Do.
PL 10	do	*Wat Mohareach-Than	9–26–61	31	16	150	Do.
PL 11	do	*Wat Preah Sokun	11–12–61	23	1.2	350	Do.
PL 12	do	*Wat Thomatrail	11–16–61	22	4.5	180	Do.
PL 13	do	Sch. Thomatrail	11–21–61	26	1.5	400	HP, L, well ends in bed rock.
PL 14	do	*Samreth Thicock	2– 7–62	43	---	D	L.
PL 15	do	do	3–20–62	63	---	190	HP, L, well ends in bed rock.
PL 16	do	*Preah Reachtrap	3–26–62	28	---	150	Do.
PL 17	do	do	3–30–62	30	---	200	Do.
PL 18	Khŭm Phnum Bat	Phumi Srăh Pouthi (Sras Po).	4–30–62	30	10	130	Do.

TABLE 4.—*Records of wells in Khêt Kândal*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Pônhéa Loe—Continued					
PL 19	Khŭm Phnum Bat	*Trapeang Sleng	4–10–63	38	18	50	Do.
PL 20	do	do	4–30–63	23	10	100	Do.
PL 21	do	Phumĭ Thmei(s) (Phum Thmey).	5– 9–63	30	10	10	Do.
PL 22(?)	do	Phumi Véal	5–24–63	24	10	90	Do.
PL 23	do	*Arey Kasap Krom	6–17–63	22	---	NP	Do.
PL 24	do	do	6–26–63	23	9	70	Do.
PL 25	Khŭm Chrey Loăs	School Chrei-Leas	3–31–63	34	13	90	L, well ends in fine sandstone.
		Srŏk Phnum Pénh					
PP 16	*Khum Snor	*Trapeang Phlong	5–12–63	21	---	NP	L; well ends in chalk, AB.
PP 17	do	*Phum Snor	4–12–63	21	5	25	HP, L, S 60.
PP 18	do	do	4–20–63	20	---	NP	L, AB.
PP 19	do	*Trapeang Phlong	5– 6–63	19	14	30	L, S 60.
PP 20	*Khum Kambau	Center Protestant Children.	12– 5–63	35	3.2	200	HP, L, well ends in bed rock.
PP 21	do	*Damnak Sathareth	3–12–63	31.5	4	80	L, S 60.
PP 22	do	Radio Station	11–29–63	56	---	---	L, well ends in bed rock.
PP 23	Kâmpóng Kântuŏt	Work Camp	8–13–60	22.8	---	114	EP, L, S 40.
PP 24	Khŭm Bêk Chan	Phumĭ Snguon Péch	8–20–61	17.7	10	20	HP, L.
PP 25	Kâmpóng Kântuŏt	O.D.E.M.	4– 8–62	38	---	70	L.
PP 26	do	do	2–12–62	28	---	250	L.
PP 27	Phumĭ Prêteăh Lang		1–19–62	38	4	100	HP, L, S 35.
PP 28	do		3–17–62	11.5	4.5	20	L, AB.
PP 29	do		2–20–61	41	---	D	L, well ends in bed rock.

TABLE 4.—*Records of wells in Khêt Kândal*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Phnum Pénh—Continued					
PP 30	Phumĭ Prêteah Lang		2–16–62	30	---	250	L, well ends n bed rock.
PP 31	do		2–22–62	31	---	200	L.
PP 32	do		3– 3–62	31	---	200	L.
PP 33	Phumĭ Pông Tŏek	*Trapeang Kor	2–28–62	11.2	7	20	HP, L, S 25.
PP 34	do	do	3– 6–62	11.5	7	20	Do.
PP 35	Ângk Snuŏl	Material Transmission	12–15–61	30	4	200	HP, L, well ends in bed rock.
PP 36	do	do	1–27–62	37	6	150	Do.
PP 37	Khŭm Lumhach	*Pro Proeung	9–60	47.3	---	D	L.
PP 38	Khŭm Bêk Chan	*Prince Sisowath	5–13–63	28	---	NP	Sand and clay 7 m; sand 15 m, rock 6 m, AB.
PP 39	do	do	5–21–63	27	3	40	Sand and clay 7 m, sand 15 m, rock 5 m, L.
PP 40	Khŭm Kantuk	Km P. 15–16	4–29–63	39	4	40	Clay and sand 19 m, gray rock 20 m, L.
		Srŏk Kândal Stŏeng					
KSt 1	Khŭm Phumĭ Daeum Rŏes.	Stŏeng Toch (Bridge Stung Toch).	3–10–62	22	---	---	FT, L, AB.
KSt 2	do	do	3–14–62	20	---	---	Do.
KSt 3	do	Bridge Stung Thom	4–24–62	10	---	---	Do.
KSt 4	do	do	4–25–62	9	---	---	Do.
KSt 5	do	do	4–27–62	10	---	---	Do.
KSt 6	do	do	4–28–62	10	---	---	Do.
KSt 7	Phumi Anlóng Rômiĕt	900 m. from Route 3	11– 2–61	38	---	P	L, AB.
KSt 8	do	do	11–15–61	58	---	P	Do.
KSt 9	do	*Ânlong Rômiet	12–15–61	41	---	90	HP, L.

TABLE 4.—*Records of wells in Khêt Kândal*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Kândal Stŏeng—Continued					
KSt 10	*Khum Prek Roka	Bŏeng Tônlé Bati (Tonle Bati Educational Base).	11–60	83	---	7.6	AB.
KSt 11	do	do	---do--	22	---	D	AB.
KSt 12	do	do	12– 6–60	21	---	D	L, AB.
KSt 13	do	do	1– 1–61	10	---	38	MP, L, S 60.
KSt 14	do	do	1–12–61	15	---	D	L.
KSt 15	do	do	2–21–61	11	---	76	A, HP, L, S 60.
KSt 16	Ta Khmau (Takhmau).	Psychiatric Hospital	8–60	80	---	D	AB.
KSt 17	do	do	8–60	25	---	D	Do.
KSt 18	do	do	9–60	18	---	D	Methane gas.
KSt 19	do	Water Plant	5–26–61	61	---	D	L, AB.
KSt 20	do	*Sala Preah Kampi	8–26–62	39.4	---	D	Do.
KSt 21	do	do	9– 6–62	34.4	---	D	L, AB.
KSt 22	do	do	9–13–62	45	2.5	70	EP, L, S 35.
		Srŏk Kiĕn Svay (KSv 1 to KSv 3 are in table 3)					
KSv 4	*Khum Veal Sbau	Km 9–10, E. P. P.	9– 7–62	29	4	80	HP, L, S 10.
KSv 5	Khŭm Kbal Kaôh	Phumi Chroŭy Ampil Phumi Chrouy Ampil	5–30–63	9	5	40	HP, L, S 60.
KSv 6	do	do	4– 8–63	8	6	30	L, S, 60.
KSv 7	Phumĭ Dei Edth (Khum Dei Et).	College Jayavarman VII.	12–31–62	90		50	HP, L, S 20.
KSv 8	do	Pagoda Day Eth	7–10–63	39	9	50	HP, L, S 50.
KSv 9	do	do	6– 3–63	16		NP	L, AB.
		Srŏk Leuk Dêk					
LD 1	Phumĭ Kâmpóng Phnum.	Pak Sim School	11–20–62	50	3	24	L, S 20.

Plate 3 shows a geologic section (*D–D'*) of the khêt along a line roughly north-south from Ŏdŏngk (Oudong) to Bŏeng Tônlé Bati. The Phnum Chéttâris is a hill of metamorphosed sedimentary rock which is present in the subsurface of Srŏk Pônhéa Loe. Phnum Basĕt has subsurface expression in Srŏk Phnum Pénh in a buried granite massif.

The Old Alluvium forms a mantle of sand, clay, silt, and laterite ranging from about 10 m to more than 58 m thick along this line. It contains the principal aquifers, both unconfined and artesian.

SROK PONHEA LOE

Wells of moderate to small capacity drilled into rock have been highly successful in Srŏk Pônhéa Loe. Out of 25 wells, 22 were productive (table 4). The average well yielded 143 l/min, and the range in yield was from 10 to 400 l/min. The average depth was 27 m, and the depth ranged from 12 to 63 m. The depth to water was an average 8.4 m below land surface with a range from 1.2 to 20 m.

Bedrock was encountered in all the wells, and ranged from 3 to 29 m and averaged 10.8 m below land surface. The rock is described as gray, white, and black. Intermediate sections of some of the logs indicate clay and sand interlayered with rock. These are interpreted as alluvial deposits and weathered soil interbedded with rhyolite or basalt flows. In well PL 4 laterite was logged from 6 to 9 m below the surface, and in other wells gray, yellow, and red clay. In well PL 5, 5 m of limestone(?) was logged.

SROK PHNUM PENH

Forty wells were drilled under the US AID program in Srŏk Phnum Pénh. Only 2 of the first 15 wells drilled were productive. They are described in the preceding section on the Environs of Phnom Penh. Of the remaining 25 wells drilled, 20 were productive. The average yield of the productive wells was 108 l/min, and the range was from 20 to 250 l/min. The 25 wells ranged in depth from 11.5 to 56 m and were 28.9 m deep on the average. Water levels were reported in 13 wells, ranging from 3.2 to 14 m below land surface and averaging 5.8 m.

The geology of Srŏk Phnum Pénh is relatively simple: alluvium overlying rock. Logs of 18 wells show a range in thickness of the alluvium from 15 to 36 m, with an average of 23.2 m. The alluvium is sand and clay, with clay predominant. The sand

ranges from fine to coarse grained. In four wells, laterite was reported; however, gravel was identified.

The bedrock was encountered at depths below land surface of 15 to 36 m, and at elevations ranging from +1 m to −18 m. In two wells the bedrock was reported to be "chalk," but in the other wells the bedrock was simply described as gray, white, or black.

SROK KANDAL STOENG

Twenty-two holes were drilled in Srŏk Kândal Stŏeng. Six of the holes were foundation tests for bridges on National Route 201. The other 16 were efforts to drill wells, but only 4 were successful.

The log of KSt 1 at the bridge over Stŏeng Toch (elevation about 9 m) is as follows:

Material	*Depth (metres)*	*Thickness (metres)*
Clay, black	3	3
Sand, yellow and white	10	7
Clay, yellow	14	4
Sand, yellow and clay, white	15	1
Clay, red	22	7

The 4 tests at the bridge over *Stung Thom (KSt 3 to 6) penetrated 3 to 4 m of clay and sand, and 5 to 7 m of soft rock.

Three wells were put down at Phumĭ Ânlóng Rômiĕt. KSt 9, which produced 90 l/min, has the following reported log:

Material	*Depth (metres)*	*Thickness (metres)*
Sand, red and white	8	8
Earth, white and red sand	11	3
Earth, black	16	5
Sand, red	20	4
Earth, black and red sand	22	2
Clay, yellow	33	11
Sand, red	36	3
Stone, white and black	41	5

The approximate elevation of the land surface at this well is 12 m.

Six wells (KSt 10 to 15) were drilled at Bŏeng Tônlé Bati (Tonle Bati Education Base), *Prek Roka, but only two were successful. Of these, well KSt 15 (elevation 9 m), which yielded 7.6 l/min, had the following log and water analysis:

Material	*Depth (metres)*	*Thickness (metres)*
Clay, gray	2	2
Clay, white and sand, fine	3	1
Clay, white and sand, coarse	11	8

Water analysis

Chloride, 25 mg/l.

Temporary hardness, 150 mg/l.
Nitrite, 0.01 mg/l.
Dissolved iron, 0.45 mg/l.

pH, 4.1.
Some iron present.

Seven wells were put down at Ta Khmau (Takhmau). Only one of these, KSt 22, was successful, producing 70 l/min. The elevation of the land surface at this site is estimated at 8 m, and the log is as follows:

Material	*Depth (metres)*	*Thickness (metres)*
Earth, black	6	6
Clay, yellow and blue	16.3	10.3
Sand, fine, black	23.2	6.9
Mud, black and sand with water	32.0	8.8
Clay, calcareous and sand	38.1	6.1
Sand, white and yellow	45	6.9

At the water treatment plant in Ta Khmau, bedrock was encountered at a depth of 66 m (58 m below sea level). The well is described as "dry." In summary, much further prospecting is warranted in Khêt Kândal Stoeng in spite of the rather difficult conditions reported.

SROK KIEN SVAY AND SROK LEUK DEK

Nine wells were drilled under the US AID program in Srŏk Kiĕn Svay and one well in Srŏk Leuk Dêk. All the wells except one (KSv 9) were considered productive. KSv 1 to 3 have already been described in the section on Environs of Phnom Penh. The other seven wells are described briefly here. Yields were moderate, ranging from 24 to 80 l/min and averaging 46 l/min. Depths range from 8 to 90 m, and water levels from 3 to 9 m below land surface. The logs of KSv 7 and LD 1 are shown in the geologic cross section (*F–F'*) of Khêt Prey Vêng on plate 3.

KHET TAKEV

Khêt Takêv is a densely populated khêt in the flood plain of the Tônlé Basăk, along the southern margin of Cambodia near its border with Vietnam. In October 1962, a population of 467,155 lived on an area of 345,000 hectares.

The general elevation of the plain ranges from 3 m above sea level near the Vietnam border at the southeast to 40 m above sea level at the base of several rocky hill masses. A hill mass composed of granite, sandstone, and shale lies in the southwestern corner of the khêt and has peaks rising to elevations of 300 m or more above the plain. A ridge with a peak having an elevation of 438 m forms part of the western boundary of the khêt and is made up of resistant sandstone and shale of Late Paleozoic age.

A broad quartzite upland with a peak 125 m above sea level lies within the khêt near its northern boundary. Several small masses of Triassic sedimentary rocks rise above the plain; one, about 32 km east of Takêv (Takeo) has a peak 170 m above sea level (Phnum Ângkôr Borei). All these hill masses suggest that bedrock throughout the khêt lies close to the surface of the plain.

Twenty-nine holes have been drilled in five of the seven sroks (see table 5 and pl. 2) of the khêt. Five of the holes were foundation soil tests for a bridge on National Route 2 over the Stŏeng Slaku (Sa 3 to 7). Seventeen of the wells were reported successful, and seven were dry or poor producers. Of the 17 productive wells, the range in depth was 20 to 63 m and the average depth was 31. 8 m. The range in yield was 6 to 200 l/min, and the average yield was 126 l/m. The average water level of the 12 wells was 4.0 m below land surface, with a range from 2.2 to 6 m. The water level, however, has a seasonal variation, and the 12 measurements were taken over 9 months in a 24-month period (6 of the 9 months were in the wet season). The wells are concentrated in six areas, and the test holes in one area. Little difficulty was encountered in developing wells of moderate capacity in Srŏk Bati, Srŏk Sâmraông, or Srŏk Treăng, but in Srŏk Kaôh Ândêt five out of six wells were nonproductive (Ko 1, 2, 4, 6). These five wells logged sections of clay, fine sand, and bedrock, with little coarse sand. The productive well, Ko 3 encountered 3.9 m of sand, some of it coarse, beneath 9 m of bedrock. The rock may be a volcanic flow, but no samples were taken of well cuttings in the entire khêt.

The subsurface geology of the khêt is shown by the cross section (*J–J'*) plate 3. At the northwest in Sa 2 is the subsurface projection of limestone and other rocks which were mapped by J. Gubler on the surface 12 km to the northwest as rocks of Triassic age. This rock contact slopes to the southeast as the alluvium thickens to more than 32 m. The alluvium is probably both Old and Young, but the driller's descriptions are not sufficiently precise to distinguish between them. Clay predominates over sand, and gravel is described only in Tg 1 at Takêv, where the driller mentions "black and white rock mixed with gravel" from 27 to 30 m. Coarse sand is described in only 5 of the 27 logs. Laterite is logged for 4 m below land surface at two wells, TK 7 and 8.

TABLE 5.—*Records of wells in Khêt Takêv*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: D, dry P, poor; NP, nonproductive; NR, not reported. Remarks: AB, abandoned; FT, foundation test hole; HP, hand pump; L, log available; NS, no screen; S 20, screen with slot size; TH test hole or exploratory well]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Bati					
Bi 1	Khŭm Chambak	Phumĭ Châmbák	9–60	30.4	---	5.7	HP.
Bi 2	Phumĭ Pŭtth Sâr (Khum Put Sâr).	do	9–26–61	21	---	170	L.
Bi 3	do	do	9–12–61	21	---	D	L, AB.
Bi 4	do	Pagoda Chambak	9–20–61	20	---	200	L.
Bi 5	Trăm Khnar	Trăm Khnar (GRK)	4– 5–63	31	6	30	HP, L.
		Srŏk Sâmraông					
Sa 1	Phumĭ Chumreăh Pén	*Phum Tayeng	6–13–61	26	2.5	150	HP, L, NS.
Sa 2	do	do	6–20–63	31	4	100	HP, L, NS.
Sa 3	*Khum Lomchang	Stŏeng Slaku, Route 2	5–30–62	20	---	---	FT, L, TH.
Sa 4	do	do	6–13–62	20	---	---	Do.
Sa 5	do	do	6–25–62	21	---	---	Do.
Sa 6	do	do	6–29–62	21	---	---	Do.
Sa 7	do	do	7– 5–62	20	---	---	Do.
		Srŏk Treăng					
Tg 1	Phumĭ Kbal Pŏuthĭ (Khum Kbal-Po).	Water Tower Takêv (Takeo).	11– 4–61	63	---	76	L, NS.
Tg 2	do	New Marker Takêv	9–11–62	32	3.5	150	L, S 10 and 20.
Tg 3	do	Water Tower Takêv	2–26–62	32	---	D	L, AB.
		Srŏk Trăm Kák					
TKa 1	Ângk Tasaôm	Model School	1–27–62	30.2	2.2	150	HP, L.
TKa 2	do?	College Preah Outey	2–10–62	38	6	60	Do.

TABLE 5.—*Records of wells in Khêt Takêv*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Trăm Kák—Continued					
TKa 3	do?	College Preah Koo Din	2–16–62	32	---	200	Do.
TKa 4	do	*Samdech Ao	12– 4–62	36	4	180	L, NS.
TKa 5	*Khum Nheng Nhang	*Wat Ŏdum Mean Chey	11–16–62	30	3	150	Do.
TKa 6	do	Phumi Trăm Kák (Market Trambak).	11–28–62	36	4	160	Do.
TKa 7	do	*Phum Sokha Phyrum	10–27–62	30	4	180	L, S 20.
TKa 8	do	*Phum Keo Vichea	11– 6–62	30	4.5	80	L, NS.
		Srŏk Kaôh Ândêt					
Ko 1	Phumĭ Rôménh (Khum Rominh).	15 Km from Phumĭ Kâmpóng Chrey (Kompong Chrey).	6–20–62	32.5	---	D	L, AB.
Ko 2	do	do	6–25–62	27	---	P	L, AB.
Ko 3	do	14 Km from Phumĭ Kâmpóng Chrey.	6–30–62	23.9	3.9	100	L, S 30, AB.
Ko 4	do	15 Km from Phumi Kâmpóng Chrey.	5–19–62	24	---	D	L, AB.
Ko 5	do	do	8–16–62	29.3	---	P	L, AB.
Ko 6	do	do	8–31–62	29.5	---	P	L, AB.

Partial water analyses were made for two wells, Tg 1 at Takêv and TKa 7 at *Phum Sokha Phyrum. The results are given in the following list:

	Tg1	*TKa7*
Conductivity at 26°C ---------micromhos----	600	500
Turbidity ----------	0	0
pH ----------	8.8	8.7
Iron (Fe) ----------mg/l----	0	0
Nitrite (NO_2) ----------mg/l----	0	0
Chloride (Cl) ----------mg/l----	111	10
Total hardness ----------mg/l----	120	120

The alkaline water, hard and iron free, is notable. Both waters are fresh, but the chloride content (111 mg/1) in Tg 1 is high for freshwater and may indicate some contamination.

From the available data, it may tentatively be concluded that water usable for many purposes can be obtained from wells at depths generally less than 40 m, and with low to moderate capacities (5 to 200 l/min). High-capacity wells (more than 36,000 l/min) have not been developed in the khêt because of the relatively shallow depth to the hard rock.

KHET KAMPOT AND KEB

Khêt Kâmpôt is one of the two khêts of Cambodia that border on the sea. Much of the khêt is hilly and mountainous. Nevertheless, Khêt Kâmpôt has a population reported at 337,079 in an area of 577,877 hectares, but most of the people live in the valleys and along the coast. The mountains are heavily forested, because the khêt is the most humid in Cambodia.

A new deepwater port has been constructed at Kâmpông Saôm (Sihanoukville), the name given in 1958 to the complex at Phumĭ Phnum Srâlau (Kompong Som) near the western tip of the khêt. The port is connected to Phnom Penh by National Route 4, the Friendship Highway.

Wells were drilled under the US AID program in three of the five districts as shown in table 6. As of the end of 1963, 23 wells had been drilled in the khêt and 16 of these were successful. Of 13 wells for which yields were reported, the lowest was 30 l/min, the highest 900 l/min, and the average 228 l/min. Four wells, KT 4 to 7, of moderately high yield were put down around Kâmpóng Trach. These yielded 480, 900, 500, and 400 l/min, respectively. The average depth of the productive wells was 32.6 m. The reported depth to water in 11 wells ranged from 4 to 10 m, and was 6.2 m on the average.

A south-central promontory of the khêt designated Kêb, is a separate political subdivision of royal prerogative. Four wells

TABLE 6.—*Records of wells in Khêt Kâmpôt and Kêb*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water; referred to land surface. Yield: NP, nonproductive; NR, not reported. Remarks: AB, abandoned; DW, dug well; HP, hand pump; MP, motor pumps; NS, no screen; TH test hole or exploratory well]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srôk Kâmpôt					
Ka 1	*Khum Sengkoul	L'enceinte d'elevage	4–25–62	49	---	NP	Gray earth and rock.
Ka 2	do	do	5–11–62	30	10	250	HP; Clay, rock, fine sand.
		Srôk Kâmpóng Trach					
KT 1	Phumĭ Dâmnák Kântuŏt.	Phumĭ Ângkôr Chey	7–23–61	15	---	NR	Black rock.
KT 2	Kâmpóng Trach	Cambodian-American Hospital.	12–15–62	10.7	---	NP	Yellow clay and black rock.
KT 3	do	do	1–14–62	13.2	---	NP	Do.
KT 4	do	do	2– 7–62	20	6	480	Yellow clay and "basalt".
KT 5	do	Pumping Station	3–28–63	28	4	900	MP; clay and hard rock.
KT 6	*Khum Kanthor	Ang Sophy School	10–21–61	50.8	---	500	See log table 7.
KT 7	do	Phumĭ Kânthaôr	9–27–61	34.7	---	400	---
KT 8	Phumĭ Rŏessei Srŏk (Khum Russei Srok).	*Phum Rum Chak	6–10–61	50.7	---	NR	Salty water reported at 41 m, see log table 7.
KT 9	do	Phumĭ Lôk	6–24–61	14.3	---	NP	Red and yellow clay with rock.
KT 10	do	do	6–16–61	21	---	NR	See log table 7.
KT 11	Phumĭ Phnum Léav (Khum Phnom Leav).	Phumĭ Kândal Tuol	9–11–61	24	---	NR	Sand and rock.

TABLE 6.—*Records of wells in Khêt Kâmpôt and Kêb*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Prey Nób					
PN 1	*Khum Sre-Cham	Prey Nób (Field of Prey Nop).	3–10–62	5.7	---	NP	Yellow clay, laterite and rock.
PN 2	Khum Samrong	*Field of Khum Samrong.	3–13–62	12	---	NP	Clay, laterite and rock.
PN 3	Phumĭ Véal Rénh (Khum Veal Renh)	Phumĭ Trapeang Kéa (Chamear Mavich).	10–17–62	70	5	64	NS.
PN 4	do	do	10–30–62	100	5	128	See log table 7.
PN 5	*Khum Tuk Laak	*Pagoda Keo Oudam	3– 3–62	9	5	30	Clay and sand.
PN 6	do	*Phum Tuk Laak	1–25–63	10	6	30	AB, DW.
PN 7	do	do	1–31–63	10	6	35	HP, S 60.
PN 8	do	do	2–18–63	10	6	35	Do.
PN 9	Kâmpóng Saôm (Sihanoukville).	Km P–214–215	5– 5–63	36	8	60	Clay and sand, 17.2 m, gray rock 18.8 m.
PN 10	do	do	5–29–63	20	7	50	Clay, laterite, sand 14 m, rock 6 m.
		Kêb					
Kp 1	Krŏng Kêb (Kep)	100 m N. of Restaurant	6– 6–61	296.7	---	NP	TH, see log table 7.
Kp 2	do	General's house	6–15–60	22.2	---	19	HP, rock, and clay.
Kp 3	do	House Phlok Chhat	3– 7–63	5	---	NP	Pebbles 3 m, rock 2 m.
Kp 4	do	do	3–24–63	40	7	50	Laterite, clay, and rock.

were drilled at Krŏng Kêb (Kep), and two of these were successful in obtaining 19 and 50 l/min, respectively, from rock.

Because the wells are widely scattered and because the locations are only approximate (pl. 2), it was not practical to make a subsurface geological interpretation. Selected well logs are given in table 7. In most wells, bedrock was encountered within 20 m. The deepest well was Kp 1, an exploratory test at Krŏng Kêb, and drilled 296.7 m deep in bedrock. In PN 3 and 4, sections of laterite 47 m and 50 m thick were reported. Screens were used in only two wells (PN 7, 8) and slotted pipe in one (Ka 2). No generalizations can be made from so little data.

KHET PREY VENG

Khêt Prey Vêng is a delta khêt with an area of 473,200 hectares, and a population of 491,601 in 1962. Of the 18 khêts, it is fourth from the smallest in area, yet it has the fourth largest population.

The land surface is a low-lying plain, on which the elevations range from 2 m above sea level at the south to 13 m above sea level at the north. Phnum Baphnum, an isolated hill mass, rises to 145 m above sea level near the center of the khêt. The southwestern boundary of the khêt is the Mekong River, which receives drainage from the western part of the khêt. The eastern part of the khêt is drained by the headwaters of the Stŏeng Svay Riĕng (Vaico Occidental). The Stŏeng Chéas (Sông Vàm Cỏ Đong, formerly Vaico Oriental–South Vietnam) drains from a divide whose elevation starts at 13 m. Most of the plain is cultivated rice paddies.

Only six wells were drilled under the US AID program in Khêt Prey Vêng. These are shown in table 8, on the khêt map (pl. 2), and in the geologic cross section (*F–F′* on pl. 3). Three of the wells were productive, and two wells at Prey Vêng each produced 570 l/min. Both wells appear to tap water in the Old Alluvium, but at two different depths. The screen in one is set at a depth of 50 m and in the other at about 30 m.

Two wells that were drilled at Baphnum College, at the base of Phnum Baphnum, (Baphnum hill) ended in bedrock at depths varying between 9 and 10 m and were nonproductive.

In the Srŏk Kâmpóng Trâbék two wells were drilled. One was nonproductive, and the other yielded 120 l/min with a drawdown of 3 m, for a specific capacity of 40 (l/min)/m (3.2 (gal/min)/ft). The geologic cross section (pl. 3) indicates 20 or more metres of Old Alluvium resting on hard bedrock, overlain by 10 to 47 m of Young Alluvium.

TABLE 7.—*Selected well logs in Khêt Kâmpôt and Kêb*

Material	Depth (metres)	*Thickness (metres)*
Kp 1		
Clay, yellow and red	4	4
Gravel	7	3
Clay, red	8	1
Rock	10	2
Clay, red	15	5
Clay, with gravel	21	6
Rock	22	2
Clay, red with gravel	22.5	0.5
Rock, black with clay	27	5.5
Rock, black, hard	106	79
Rock, breakable	137	31
Rock, black, hard	153.5	16.5
Gravel and sand	162.5	9
Rock, green with sand	175	12.5
Rock, hard	204.3	29.3
Rock, black with sand	215.4	11.1
Rock, soft	296.7	81.3
KT 6		
Sand, fine, white	4	4
Clay, yellow	15	11
Sand, coarse, yellow with gravel	20	5
Clay, maroon; sand coarse	22	2
Gravel, yellow	23	1
Clay, green	28	5
Clay; sand, coarse	35	7
Gravel, slate	39.5	4.5
Limestone and mud	50.8	11.3
KT 8		
Clay, dark, yellow	6	6
Clay, red	10	4
Clay, yellow	20	10
Sand, fine	24	4
Clay, yellow	26	2
Sand, fine	32	6
Clay, yellow	37	5
Sand, fine	40	3
Clay, rock (salty water)	42.5	2.5
Not logged	50.7	8.2
KT 10		
Clay, black	3	3
Clay, yellow	7	4
Clay, red	11	4
Clay, yellow	16	5
Sand, fine	20	4
Sand, with gravel water	21	1
PN 4		
Laterite, white	7	7
Laterite, yellow	22	15
Laterite, green	50	28
Laterite, red with sand	60	10
Stone, soft, black	100	40

TABLE 8.—*Records of wells in Khêt Prey Vêng*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: NP, nonproductive. Remarks: AB, abandoned; L, log available; S 20, screen with slot size]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Prey Vêng					
Pv 1	Prey Vêng	Near Electric Plant	7–28–60	55	---	570	L, S 40.
Pv 2	do	Near Transformer Base.	8–24–60	31	---	570	Do.
		Srŏk Ba Phnum					
Ba 1	Phumĭ Chheu Kăch (Khum Chhea Kach).	Baphnom College	2–21–63	10	---	NP	L, ended in bed rock, AB.
Ba 2	do	do	3– 3–63	12.8	---	NP	Do.
		Srŏk Kâmpóng Trâbêk					
Kt 1	Phumĭ Prasat (Khum Prasat).	*Khbal Thnal	5–29–63	51.1	4	120	S 18; specific capacity 40 (l/min)/m, L.
Kt 2	Khŭm Thkov (Khum Thkau).	Vôtt Poŭthĭvôngs	5–31–63	39	---	NP	L, AB.

It is concluded that relatively moderate quantities of ground water can be derived from artesian sands in the Old Alluvium at depths ranging from 20 to 70 m below the land surface throughout much of the khêt. Most of the khêt, however, remains yet to be explored. There is no report on the quality of water, although it is inferred that the water is usable for most purposes.

KHET SVAY RIENG

Khêt Svay Riĕng is the southeastern khêt of Cambodia, with a pronounced salient that extends into South Vietnam. The khêt was reported in 1962 to have 287,020 inhabitants living in 237,394 hectares, the smallest in area of the 18 khêts. The southeastern tip (Parrots Beak) of the khêt (fig. 1) crosses the margin of the barren, swampy Đồng Thâp Mu'ò'i (Plain of Reeds), the overflow basin of the Mekong River in Vietnam. Elevations in this area are 1 to 3 m above sea level, and the land surface is underlain by Young Alluvium. Most of the khêt, however, is a plain ranging in elevation from 3 to 15 m above sea level, with a general elevation of about 5 m. This plain underlain by Old Alluvium has soils which are predominantly silt and clay. In some places surficial laterite is found that makes cultivation difficult. In general, however, the surface soils are soft, and infiltration rates are low.

The khêt is drained by tributaries of the Stŏeng Svay Riĕng, which flows through Svay Riĕng, the khêt capital. Drainage is sluggish, however, and overflow from the river seasonally floods thousands of hectares of wetland rice paddies in the southern two-thirds of the khêt. Dense and open forests are scattered over the northern one-third of the khêt at elevations generally above 8 m.

Fifteen wells were drilled and 154 wells were jetted in the khêt from August 1961 to June 1963 under the US AID program. Hydrologic data for these wells are summarized in table 9. Eleven of the drilled wells and 136 of the jetted wells were productive, for an overall productive ratio of 87 percent. The drilled wells range from 30.5 to 78 m deep and average 51 m for 15 wells. The yields of productive drilled wells range from 4.2 to 90.8 m^3/h and averaged 23.8 m^3/h. The jetted wells range from 9.5 to 54.7 m deep and average 32.9 m for 153 wells. Productive jetted wells range in yield from 1.1 to 12.0 m^3/h and average 5.7 m^3/h. Static water levels ranged from 1.5 to 5.3 m and averaged 2.7 m below land surface in 135 wells. Most of these are potentiometric levels and do not represent the water table. The quality of ground water

TABLE 9.—*Records of wells in Khêt Svay Rieng*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: NP, nonproductive. Remarks: AB, abandoned; HP, hand pump; L, log available; S 20, screen with slot size]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Rômĕas Hêk					
RH 1	Phumĭ Mŭk Da (Khum Mukda).	*Wat Pohtida	10–19–62	36.5	2.0	110	L, S 60.
		Srŏk Rumduŏl					
RD 1	Phumĭ Sângkê	Elementary School	11–20–61	28.8	1.8	20	HP, L, S 18.
RD 2	Khum Chrong Popel	Phumi Kroch (Wat Krauch).	12–10–61	29.0	3.5	20	Do.
RD 3	Phumĭ Meunchey (Khum Mean Chey).	Phumi Chŏng Prêk	12–15–61	24	---	D	L.
RD 4	Phumi Kâmpóng Âmpĭl (Khum Kompong Ampil).	Phumĭ Svay Rôlum	8–21–62	30.5	---	NP	L.
RD 5	do	do	9– 9–62	64	---	NP	L.
RD 6	Khŭm Svay Chék	Phumi Roŭng Dâmrei	3–22–62	19	---	28	HP, L.
RD 7	Khŭm Sângkhôr? (Khum Sang-Khour).	Rumduŏl (Infirmary Romduol).	4–10–62	36	---	18	L.
RD 8	Phumĭ Meunchey Khum Mean Chei).	Vôtt Tuŏl Prâsrei	12–19–61	11.8	3.3	20	HP, L.
RD 9	Phumĭ Sray Chék (Khum Svay Chek).	Phumĭ Roŭng Dâmrei	3–29–63	26.1	2	200	L, S 18.
		Srŏk Svay Téab					
ST 1	Phumĭ Prâsotr (Khum Prasaut).	Model School	11–25–62	78	2	140	HP, L, S 40.
ST 2?	*Khum Svay Tayean	*Trapeang Tasek	6– 2–63	9.5	2.8	40	L, S 10.
ST 3	Phumĭ Bavĕt (Khum Bavet).		12–12–61	78	---	200	L.

TABLE 9.—*Records of wells in Khêt Svay Rieng*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Kâmpóng Roŭ					
KR 1	Khŭm Preăh Pônléa	*Wat Preah Ponlea	9–20–61	55	---	200	L.
		Srŏk Svay Riĕng					
SR 1	Khŭm Chék, Svay Rieng.	N. Side Water Tower	1–60	37	---	1,510	S 60.
SR 2	do	S. Side Water Tower	do	42	1.5	1,510	Do.
SR 3	do	Svay Rieng (Svay Rieng cinema).	1–10–61	42	---	200	L, S 60.
SR 4	*Khum Svay Rieng	Phumi Prey Chhlak	4–23–63	38.3	2.5	55	L, S 10.
SR 5	do	Phumi Châmbák Kaông	5–11–63	36	2.5	35	L, S 18.
SR 6	do	Phumi Thmól	6– 1–63	22	2.5	120	L, S 10.
SR 7	*Khum Kok Pring	Phumi Koŭk Trâb (Agriculture Kok Trap).	3–21–63	35.7	1.7	45	Do.
SR 8	do	Agriculture Kok Trap	1–17–63	35.6	3	150	L, S 10.
SR 9	do	*Phum Kanthuot Prong.	5– 7–63	45.4	3	100	L, S 18.
SR 10	do	Agriculture Kok Trap	6– 8–62	54	---	NP	L, AB.
SR 11	do	do	6–18–62	44	---	NP	Do.
SR 12	*Khum Krol Kau	Phumi Bânla S'ĕt	2–15–63	21.5	2.5	85	L, S 10.
SR 13	do	do	2–15–63	13.6	2	50	Do.
SR 14	do	Phumi Boeng Rai Khang Cheung (Boeng Ray Nord).	3– 8–63	32.5	2.4	120	Do.
SR 15	do	do	3– 9–63	28.3	2.8	120	Do.
SR 16	do	do	3–12–63	35.6	2.4	130	L, S 18.
SR 17	do	do	3–13–63	36.0	2.6	130	Do.
SR 18	do	Phumi Boĕng Rai Khang Tbong (Boeng Ray Sud).	3– 5–63	26.3	2	100	Do.
SR 19	do	do	3– 6–63	29.6	2	120	Do.
SR 20	do	do	3– 8–63	32.9	2.5	100	Do.

TABLE 9.—*Records of wells in Khêt Svay Rieng*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Svay Riĕng—Continued					
SR 21	*Khum Krol	Phumĭ Bŏeng Rai Khang Tbong.	3–10–63	29.6	2.5	100	L, S 18.
SR 22	do	Phumĭ Châmbák Thum.	1–30–63	19	---	NP	L.
SR 23	do	do	1–31–63	10.0	2	40	L, S 10.
SR 24	do	do	1–31–63	35.9	4.5	30	Do.
SR 25	do	do	2– 6–63	18	2.5	85	Do.
SR 26	do	do	2– 4–63	38	2.5	120	L, S 18.
SR 27	do	Phumĭ Khuŏch	3–11–63	36.2	2.5	120	Do.
SR 28	do	do	3–13–63	29.3	2.5	100	Do.
SR 29	do	do	3–16–63	39.2	2	100	Do.
SR 30	do	do	3–13–63	32.7	2.5	200	L, S 10.
SR 31	do	do	3–14–63	32.4	3	200	Do.
SR 32	do	Phumĭ Kraôl Koŭ Kândal (Phum Krol Kou).	2– 6–63	20.1	1.5	70	Do.
SR 33	do	do	2– 6–63	39.6	---	NP	L.
SR 34	do	do	2– 7–63	35.6	2.5	90	L, S 10.
SR 35	do	do	2– 6–63	37.4	2.6	120	L, S 18.
SR 36	do	do	2–10–63	18.5	2.4	75	L, S 10.
SR 37	do	do	2– 8–63	33.0	2.5	100	L, S 18.
SR 38	do	Phumĭ Kraôl Kou Khang Kaeut (rol Kau Est).	2–10–63	32.3	2	120	Do.
SR 39	do	do	2–10–63	29.9	2.5	120	L, S 25.
SR 40	do	do	2–11–63	32.8	2.5	90	L, S 18.
SR 41	do	do	2–11–63	33.6	2	120	L, S 10.
SR 42	do	do	2–13–63	32.8	2	85	L, S 18.
SR 43	do	do	2–10–63	33.9	2.5	110	Do.
SR 44	do	*Phum Prey Khla	2–27–63	32.7	3	45	L, S 10.

TABLE 9.—*Records of wells in Khêt Svay Rieng*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Svay Riĕng—Continued					
SR 45	*Khum Krol Kau	*Phum Prey Khla	3– 1–63	34.8	2.5	45	L, S 10.
SR 46	do	do	3– 3–63	32.8	2.3	85	Do.
SR 47	do	do	3– 9–63	39.3	3	100	L, S 18.
SR 48	do	do	3–11–63	39.7	2.5	100	L, S 10.
SR 49	do	do	3–14–63	45.5	---	NP	L.
SR 50	do	Prey Nhây (Phum Prey Nay).	1–30–63	22.9	1.5	30	L, S 10.
SR 51	do	do	1–31–63	35.6	3.5	120	L, S 25.
SR 52	do	do	2– 2–63	35.7	2.5	120	Do.
SR 53	do	do	1–31–63	13.5	1.5	35	L, S 10.
SR 54	do	do	2– 2–63	35.9	2.5	65	L, S 18.
SR 55	do	do	2– 3–63	25	---	NP	L.
SR 56	do	do	2– 3–63	36	3.2	100	L, S 18.
SR 57	do	do	2– 5–63	32.5	1.5	100	Do.
SR 58	do	do	1–30–63	20.5	---	NP	L.
SR 59	do	do	2– 5–63	32.8	2.5	100	L, S 18.
SR 60	do	Prey Nhây	2– 9–63	32.5	2.3	120	L, S 10.
SR 61	do	Infirmary Prey Nay	2– 4–63	18.8	1.5	120	L, S 25.
SR 62	do	do	2– 5–63	18	2.5	120	Do.
SR 63	do	Phumi Prey Thnóng	2–22–63	33.1	3	120	L, S 18.
SR 64	do	do	2–20–63	27.5	3	100	L, S 10.
SR 65	do	do	2–22–63	28.4	3	100	Do.
SR 66	do	do	2–27–63	42	---	NP	L.
SR 67	do	do	2–28–63	36.0	2.5	90	L, S 10.
SR 68	do	do	3– 3–63	26.1	2	90	Do.
SR 69	do	Phumi Ândong Phum Rumdinh [Andong?].	3– 3–63	52.2	2.5	120	L, S 18.
SR 70	do	do	3–15–63	30.1	3	200	L, S 10.
SR 71	do	do	3–11–63	40.5	2.5	100	Do.
SR 72	do	do	3–15–63	52.4	2.2	120	L, S 18.

TABLE 9.—*Records of wells in Khêt Svay Rieng*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Svay Riĕng—Continued					
SR 73	*Khum Krol Kau	Phumĭ Ândong	3–18–63	54.7	---	NP	L.
SR 74	do	Phumĭ Roessei Chuor	2–26–63	32.0	3	160	L, S 10.
SR 75	do	do	2–28–63	33	---	200	L, S 18.
SR 76	do	do	3– 1–63	36	3	160	L, S 10.
SR 77	do	do	3– 3–63	32.4	3	150	Do.
SR 78	do	do	3– 7–63	32.8	3	170	L, S 18.
SR 79	do	do	3– 6–63	48.5	2.4	140	Do.
SR 80	do	do	3– 8–63	36	2.5	200	Do.
SR 81	do	do	3–11–63	33	2.1	150	L, S 10.
SR 82	do	Phumĭ Roessei Tôtoĕng	2–14–63	30.2	2.5	65	Do.
SR 83	do	do	2–14–63	33.0	1.5	120	L, S 18.
SR 84	do	do	3– 7–63	45.5	---	NP	L.
SR 85	do	Phumĭ Thlôk	2–16–63	29.6	2.5	80	L, S 18.
SR 86	do	do	2–18–63	26.3	2.5	95	L, S 10.
SR 87	do	do	2–20–63	29.5	2.5	120	L, S 18.
SR 88	do	do	2–25–63	42.7	2.5	100	L, S 10.
SR 89	do	*Wat Krol Kau	2– 8–63	40.0	2	120	L, S 18.
SR 90	do	*Wat Boeng Rai	2–20–63	32.9	3	120	Do.
SR 91	Khŭm Pouthĭ Réach	Phumĭ Sâmdei	5– 8–63	39.2	2	35	Do.
SR 92	do	Primary School	11–12–61	17.2	---	NP	L.
SR 93	do	Phumĭ Ta Mŏm	12–18–62	38	---	27	HP, L.
SR 94	do	do	2–27–62	40	---	26	L; water not potable.
SR 95	do	Primary School	9–18–62	62	4	70	L, S 60.
SR 96	do	Phumĭ Sâmdei	3–23–63	42.2	2.5	110	L, S 10.
SR 97	do	Phumĭ Prasat	3–30–63	38.9	2.5	120	L, S 18.
SR 98	do	Phumĭ Ta Mom	4– 1–63	45.0	3	100	Do.
SR 99	do	do	4– 4–63	42.3	3	100	L, S 10.
SR 100	do	do	4–22–63	38	2.7	70	Do.

TABLE 9.—*Records of wells in Khêt Svay Rieng*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Svay Riĕng—Continued					
SR 101	Khŭm Pouthi Réach	Phumĭ Ta Mŏm	4–24–63	45.3	3.5	50	L, S 10.
SR 102	do	do	4– 3–63	48.6	---	NP	L.
SR 103	do	do	4– 5–63	41.2	5	120	L, S 18.
SR 104	do	do	4– 7–63	41.2	3	120	Do.
SR 105	do	do	4–10–63	39.2	2.5	120	Do.
SR 106	do	do	4–21–63	38.9	2.5	80	L, S 10.
SR 107	do	Phumĭ Prasat	4–24–63	40.3	3	120	L, S 18.
SR 108	do	Phumi Chĕn Sâ	4–29–63	23.5	3	100	Do.
SR 109	do	do	4–30–63	29.3	3	120	L, S 10.
SR 110	do	do	5– 1–63	46.2	---	NP	L.
SR 111	Khŭm Svay Ângk	Phumĭ Svay Ângk	4–21–63	49	---	NP	Do.
SR 112	Khŭm Svay Chrŭm	Agriculture Experiment Station.	12– 8–61	35	---	200	L, S 60.
SR 113	do	Phumi Trâbêk Prâhaông (Trabeh Prahuong).	2–15–63	39.6	2.3	120	L, S 18.
SR 114	do	do	2–11–63	35.9	2	90	L, S 10.
SR 115	do	do	3–17–63	32.6	2.7	140	Do.
SR 116	do	Phumi Tathêt (Phum Tatheth).	5– 5–63	16.5	---	120	Do.
SR 117	do	Direction Agriculture?	5–21–63	45.9	2.5	100	Do.
SR 118	do	*Phum Boeung Veng	6– 3–63	29.3	4	120	Do.
SR 119	do	Pagoda Svay Chrum	8– 6–63	35.3	---	NP	L.
SR 120	Svay Riĕng?	Svay Riĕng damsite	2– 3–63	32.9	3	120	L, S 25.
SR 121	do?	L'enceinte de Sala	5– 4–63	39.1	3	120	Do.
SR 122	Khŭm Svay Yéa	Phumi Rôbaôh Pring	3–20–63	52.7	---	NP	L.
SR 123	do	do	3–22–63	32.6	---	NP	Do.
SR 124	do	*Phum Kean Ta Siv	3–19–63	45.6	---	NP	L.
SR 125	do	do	3–20–63	11.3	2	40	L, S 10.
SR 126	Khŭm Thlôk	Phumi Sâmdei (Phum O. Samdei).	11– 7–61	14.3	2.3	20	Do.
SR 127	do	do	4–24–63	42.0	2.5	120	L, S 18.

TABLE 9.—*Records of wells in Khêt Svay Rieng*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Svay Riĕng—Continued					
SR 128	Khŭm Thlôk	do	4–26–63	39.9	2.5	120	Do.
SR 129	do	do	4–29–63	37.4	3.2	120	Do.
SR 130	do	do	4–27–63	39	2.5	35	L, S 10.
SR 131	do	do	4–30–63	42.5	5.3	25	Do.
SR 132	do	Phumi Preăh Teyya (Preah Tey Ya).	5–10–63	38	2.5	40	Do.
SR 133	do	do	5–10–63	30	3.5	35	Do.
SR 134	do	do	6– 3–63	35	2.5	35	Do.
SR 135	do	do	6– 5–63	30	4	35	L, S 25.
SR 136	do	do	6– 7–63	30.7	3.5	35	Do.
SR 137	do	do	6– 9–63	38.0	4.3	28	L, S 25.
SR 138	do	Phumi Thum	4–25–63	38.9	3	50	L, S 10.
SR 139	do	do	5– 8–63	29.4	4	50	Do.
SR 140	do	do	5–10–63	32.2	2.5	200	L, S 18.
SR 141	do	do	5–12–63	39.1	3	50	L, S 10.
SR 142	do	do	5–16–63	32.8	2.7	150	L, S 18.
SR 143	do	do	5–18–63	46.0	2.5	120	L, S 10.
SR 144	do	do	5–25–63	10.1	2.5	120	Do.
SR 145	do	do	5–27–63	13.2	3	50	L, S 35.
SR 146	do	do	6– 2–63	39.4	3.5	120	L, S 10.
SR 147	do	do	6– 5–63	19.6	3.5	120	Do.
SR 148	*Khum Ang Ta Sau (Phumi Angkôr Sâ).	Phumi Snay Kréang	10–10–62	64.1	2	80	L, S 60.
SR 149	do	do	4–22–63	26.7	3	120	L, S 10.
SR 150	do	do	4–23–63	16.5	3	110	L, S 10.
SR 151	do	do	4–26–63	32	3	120	L, S 18.
SR 152	do	Khŭm Thlôk	4–10–63	35.2	3.5	70	L, S -0.
SR 153	do	do	5–14–63	33.0	2.5	120	L, S 18.
SR 154	do	do	6– 5–63	30	3.5	120	L, S 10.
SR 155	do	do	6– 2–63	22.8	---	NP	L.

in the khêt was not recorded, but one well was described as producing nonpotable water. Wells have been drilled in all 5 sroks (now 6) in Khêt Svay Riĕng as shown on plate 2 and in table 9. Only one well, however, was drilled in Srŏk Rômeas Hêk, one in Srŏk Kâmpóng Roŭ, three in Srŏk Svay Téab and nine in Srŏk Rumduŏl. In Srŏk Svay Riĕng, 155 wells were drilled, and most of these are concentrated in the shaded area shown on the enlarged detail map on plate 2.

Typical well logs are shown on the geologic cross sections (*E–E′* and *H–H′* on pl. 3). These indicate the variability of alluvial materials and the difficulty in correlation. The interpretations must be regarded as tentative because samples were not available for study. As shown in section *E–E′* on plate 3, the upper 15 to 30 m in all the wells is a slightly sandy, silty clay that forms a fairly effective confining bed for an artesian aquifer that was penetrated in the five productive wells shown (RD 3 was reported dry). There is no water table in the accepted sense of the word (a free surface in unconfined materials), because the uppermost unit is a confining red or yellow clay. A potentiometric surface is indicated 2 to 4 m below land surface in three of the wells. In four of the wells the lowermost unit is a sand that is somewhat coarser than the fine sand reported in the upper parts of each hole. In two of these holes, sand and gravel made up the lower unit.

The western half of the section (*H–H′* on pl. 3) shows the lateral gradation of alluvium sediments exemplified by wells only 1 to 3 km apart. In this section an attempt has been made to distinguish two units: an upper unit of clay, silt, and fine sand and a lower unit of gravel and coarse sand. The logs of two wells (ST 1 and 3) in the eastern half of section *H–H′* (pl. 3) indicate that the upper unit thickens by some 30 m toward the east-southeast, possibly representing the filling of an ancestral valley of a tributary of the Stŏeng Svay Riĕng (Sông Vàm Cỏ Tây–South Vietnam). Both the upper and lower units are considered part of the Old Alluvium, although it is possible that the upper unit is Young Alluvium. There are no samples available for study in order to confirm this correlation.

In summary, usable quantities of ground water were found in Khêt Svay Riĕng from an artesian aquifer 20 to 60 m below the land surface. Little is known about the quality of the ground water, and no records of well or aquifer capacity tests are available. Also, well records do not show evidence of unconfined ground water. During the US AID program the northern 15 per-

cent of the khêt was not prospected nor has the eastern half been explored adequately. There is no log of a well more than 78 m deep, and the likelihood of deeper aquifers remains yet undetermined.

KHET KAMPONG CHAM

Khêt Kâmpóng Cham, in east-central Cambodia, is divided into two parts by the Mekong River. In 1962, the khêt had a reported population of 819,546, the greatest of any khêt in the country. Khêt Kâmpóng Cham has an area of 949,135 hectares, slightly less than the average for the 18 khêts of Cambodia. It is divided into 11 srŏks (pl. 2).

Elevations in the khêt range from 202 m on the summit of an extinct volcanic cone in Srŏk Châmcar Leu to less than 3 m on the Mekong River at Kâmpóng Cham, and khêt capital. About two-thirds of the khêt is a low-lying alluvial plain with elevations ranging from 3 to 30 m above sea level. The remainder consists principally of a broad plateau, ranging from 30 to 120 m above sea level. There are numerous small hill masses with local relief of several tens of metres. The drainage of most of the khêt is poorly integrated, for even though the area is transected by the Mekong River the flat alluvial plain is dotted with numerous lakes and ponds, which are interconnected only during flood periods. On the other hand, the surface drainage of the hills and plateaus is well integrated.

The surface geology is surprisingly varied, as shown on the geologic map (pl. 1). The largest area is covered by the Young Alluvium, a surface of silt and clay with a few sandy areas, at elevations ranging from 25 m to sea level. The second largest geologic formation is composed of plateau basalt, which is overlapped by the Young Alluvium at elevation up to 25 m, and which in places rests on what is presumed to be Old Alluvium or, at the latest, early Young Alluvium. The basalt is a hard, microscopically fine grained black volcanic rock that within the last few thousand years has welled up from fissures, craters, and volcanic vents and poured out across the plain as a viscous lava flow.

The geologic map (pl. 1). shows three areas of plateau basalt in the khêt. One area on the west side of the Mekong River extends north and west from Kâmpóng Cham. A second basalt area is on the east side of the khêt, in the vicnity of the rubber plantation at Châmkar Kausu Chŭb (Chup), and is separated from the western area by Young Alluvium, which appears to have filled a channel between them. The third large basalt plateau is east of

the second one in the area of Mémót and is separated from the second one by a gap about 3 km wide filled with Old Alluvium. On the topographic map this does not appear to be a former channel, but rather a gap where two separate flow sheets, from east and west vents, failed to meet.

There are scattered hill masses protruding through the alluvium at seven places in the khêt. On the western side are two masses of light-colored very fine grained rhyolite and one ridge of sandstone and conglomerate of the Indosinias Formation. In the eastern part of the khêt are two hill masses of the Indosinias Formation and two small hills of chlorite schist, mica schist, and quartzite, reported as Cambrian-Silurian in age. The rocks in these hills contain little usable ground water, but they indicate the nature of the basement rock beneath the alluvium.

Records of wells in Khêt Kâmpóng Cham are given in table 10. Of the 83 wells, 13 were bored or dug and 70 were drilled. The 13 bored or dug wells were scheduled by Robert V. Cushman, a geologist of the U.S. Geological Survey who reconnoitered the area in 1958. Of the 70 drilled wells, 3 were put in by Layne Wells International, and the other 67 were put in by the Cambodian Government. Of the 83 wells, 52 were productive, a ratio of 63 percent. Two of the wells drilled by the Layne company on rubber plantations were of high productivity: M 2 produced 2,367 l/min at Mémót, and TK 7 produced 2,967 l/min at Châmkar Kausu Chŭb. On the other productive wells, the recorded range in yield was from 18 to 800 l/min, and the average was 168 l/min.

The wells ranged in depth from 2 m for CL 32, a bored well, to 274 m for TK 3, a nonproductive hole, at Châmkar Kausu Chŭb. The average depth of the 83 wells was 36.3 m. However, the average depth of the 9 dug wells was 6.1 m, while the average of the 4 bored wells was 13.3 m, and that of the 70 drilled wells was 41.6 m. The water level ranged from 0 to 35 m below land surface and averaged 10.8 m among the 36 wells for which it was recorded. The water level has a seasonal variation as indicated in the two dug wells for which a seasonal change was recorded: the level in CL 15 varied from 1.4 m below land surface in the wet season to 9.3 m in the dry season; likewise the level in KS 1 varied from 0 to 8.7 m. Because the drilled wells were constructed at different times of the year, the simple average of 10.8 m for 36 wells is not a reliable index. The greatest number of wells were drilled in the west central part of the khêt on the plateau basalt. The remainder of the wells were drilled into or through Young Alluvium. No wells were drilled on Old Alluvium, possibly because

TABLE 10.—*Records of wells in Khêt Kâmpóng Cham*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: NP, nonproductive; NR, not reported; G, good. Remarks: AB, abandoned; B, bored; DW, dug well; EP, electric pump; HP, hand pump; L, log available; NS, no screen; S 20, screen with slot size]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Châmcar Leu					
CL 1	Phumĭ Bântéay Chey (Khum Banteay Chei).	Sala Srok	11– 8–61	15	13.5	32	HP, L, S 18.
CL 2	Bŏs Chék Prey	Barracks, Province Guard.	11– 9–61	15	13.5	32	Do.
CL 3	do	Infirmary	3–25–63	20	16	90	L, S 20.
CL 4	do	School	3–20–63	29	25	90	L, S 10.
CL 5	do	Kindergarten	4– 1–63	20.8	15.8	60	L, S 60.
CL 6	*Khum Chamcar Andong.		12–17–61	32	---	NP	L, bed rock at 30 m, AB.
CL 7	do		12–21–61	35	---	NP	L, bed rock at 33 m, AB.
CL 8	do		1–26–62	17	---	NP	L, bed rock at 13 m, AB.
CL 9	do		2– 6–62	21	---	NP	L, bed rock at 20 m, AB.
CL 10	do		2–14–62	18	---	250	HP, L.
CL 11	do		2–18–62	15	---	280	L.
CL 12	do	Sala	6– 3–63	34	22	70	L, basalt at 18 m.
CL 13	*Khum Chamcar Krauch.	Agriculture Station	8– 8–61	94	28.9	190	Sand.
CL 14	do	do	1958	18.7	---	NP	B, L.
CL 15	do	Phumĭ Bŏs Khnŏr (Bos Khnaor Public Works).	---do---	9.4	1.4–9.3	G	DW, L.
CL 16	do	Bŏs Khnŏr (Model School Bos Khnaor).	2–14–62	46	2	300	L, basalt.

TABLE 10.—*Records of wells in Khêt Kâmpóng Cham*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Châmcar Leu—Continued					
CL 17	*Khum Chamcar Kranch.	Phumĭ Ta Ong (School ta Ong).	6–26–63	37.5	18.5	60	L, NS.
CL 18	do	Phumi Châmkar Kroch (Phum Chamcar Kroch).	1958	5.4	5.2	---	Not used; DW, L.
CL 19	do	do	---do---	20	14	G	B, L.
CL 20	*Khum Chamcar Svay	Phumi Chamcar Svay?	1–11–62	15	---	NP	L, bed rock at 12 m, AB.
CL 21	do	do	2–25–62	39.5	---	500	HP, L.
CL 22	do	Phumĭ Thmâ Pun (Pagoda Thma Pun).	3– 5–62	15	---	NP	Iron fell in well, L.
CL 23	do	do	3–13–62	27.8	---	300	HP, L.
CL 24	*Khum Lovea Leu	Phumĭ Trâlêng Kêng (Wat Kraleng Keng).	5–28–63	30	21	60	----------
CL 25	do	*Phum Spong Apas South.	1–15–62	24	---	NP	L, rock at 21 m, AB.
CL 26	do	*Phum Spong Apas North.	1–12–62	12	---	NP	L, rock at 9 m, AB.
CL 27	*Khum Speu	Monastery	1958	6.1	3.5	G	L, Decomposed basalt, DW.
CL 28	do	Phumĭ Pâpréng (Pagoda Papreng).	11– 6–61	14	1	30	HP, L.
CL 29	do	Phumi Prey Chey Yŏu (School Chey You).	11–11–61	16	1		L, S 10.
CL 30	do	School Thmar	11–15–61	16	1.5	25	HP, L.
CL 31	Phumĭ Svay Téab (Khum Svay Teap).	Phumĭ Ta Ŏng	1958	124	4.0	G	L, Bored rock at 11 m.
CL 32	do	Charity House Salade	1958	2	1.5	G	B, L.

TABLE 10.—*Records of wells in Khêt Kâmpóng Cham*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
Srŏk Châmcar Leu—Continued							
CL 33	Phumĭ Svay Téab (Khum Svay Teap). Krang?).	Svay Téab (School Svay Teap).	2–10–63	30	4	90	
CL 34	do	Svay Téab (Pagoda Svay Teap).	4–10–63	26	6	60	L, NS.
CL 35	do	Roadside Km Post 28	5–31–63	24	18	60	Do.
CL 36	*Khum Chamcar Krauch.	Volcanic cone Phnŭm Tèt Srei (Ch. Loeu).	---	149	---	NR	Layne well, L.
CL 37	*Khum Lovea Leu		5–20–63	25.1	19	70	Clay, laterite, and sand, L.
Srŏk Cheung Prey							
CP 1	Taing Krasaing(?) (Khum Tang Krang?)	Cheung Chhnok College	1–31–62	82.3	8	45	L, hard rock.
CP 2	*Khum So Tip (Skoun).	Sala Srok	10– 6–62	26.1	---	NP	L, sand, laterite, and clay, AB.
CP 3	Skón (Skoun)	Km Post 79	10– 6–62	40.1	---	NP	L, soil, clay, and gravel, AB.
CP 4	do	Km Post 77–79	10– 6–62	27	---	NP	L, clay, sand, and gravel, AB.
Srŏk Kâng Méas							
KM 1	Phumĭ Péam Chikâng	Pagoda Monisaravorn	1–19–62	42	---	NP	L, AB.
KM 2	do	Kâng Méas (College Kang Meas).	1–22–62	40	---	NP	Do.
KM 3	do	Elementary School	1–25–62	9	4.5	20	L.
KM 4	do	College Kâg Méas	1–28–62	9	5	18	Do.
Srŏk Kâmpóng Siĕm							
KS 1	*Khum Krala	Phumĭ Trâpeang Chrey	1954	8.8	0–8.7	G	Dug in basalt, L.
KS 2	do	do	1958	6.0	5.0	G	Dug in basalt, L.

TABLE 10.—*Records of wells in Khêt Kâmpong Cham*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
Srŏk Kâmpóng Siĕm—Continued							
KS 3	Phumĭ Vihéar Thum (Khum Vihea Thom).	Phumĭ Khêl Chey	---do---	7.0	6.9	---	L, clay plus boulders, DW.
KS 4	do	do	1948	5.9	3.8	G	L, sand, DW.
KS 5	*Khum Ampil? (Khum Sambour Meas).	Veterinary Service	1–31–63	30.3	21	150	L, NS.
KS 6	Kâmpóng Cham	Water Tower	4–16–62	15	---	NP	L, black rock, AB.
KS 7	do	Public Works	4–26–62	34	---	NP	Do.
KS 8	do	do	5–16–62	54	---	800	EP, L, AB.
KS 9	do	Hospital	7–18–62	67	---	NP	L, S 60, AB.
KS 10	do	Reconnaissance Battalion.	8–24–62	45	35	200	HP, L.
KS 11	do	Hospital	1–22–63	66	---	NP	L, AB.
Srŏk Kroch Chhmar							
KC 1	Phumĭ Krâbei Krĭek (Khum Kriek).	Phumĭ Chhuk (Pl. Tapeo).	12–21–61	27	---	50	HP, L, AB.
KC 2	do	do	12–25–61	102	---	NP	L, AB.
Srŏk Mémót							
M 1	Mémót	Sala Srok	11– 3–61	36	---	NP	L, AB.
M 2	do	Rubber Plantation	---------	28.4	0.5	2,367	Layne well, L.
Srŏk Prey Chhôr							
PC 1	Phumĭ Miĕn (Khum Mien).	Trong Leprosarium	7–26–62	70	---	NP	L.
PC 2	do	do	8– 5–62	218	---	NP	Do.
PC 3	*Khum Chrei Viem	Pagoda Trapang Ampil	3–26–62	24	---	300	Do.
PC 4	*Khum Krauch	Pagoda Srong Sralao	3–20–62	29	---	250	Do.
PC 5	Phumĭ Tŏng Rŏng (Khum Tong Rong).	Phumĭ Prâsat (Pagoda Prasat).	4– 3–62	50	---	NP	L, AB.

TABLE 10.—*Records of wells in Khêt Kâmpong Cham*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
Srŏk Prey Chhôr—Continued							
PC 6	Phumĭ Tŏng Rŏng (Khum Tong Rong).	Phumĭ Prâsat (Pagoda Prasat).	4– 7–62	34	---	350	HP, L.
PC 7	*Khum Kor	Pagoda Mony Raing Say.	6– 7–63	33	7.5	50	Clay and gray sand, L.
Srŏk Stŏeng Tráng							
St 1	*Khum So Pheas	Phumĭ Sophéas	---	3.9	3.5	G	DW, L.
St 2	*Khum Mésar Chrey		---	2.4	2.1	G	Dug in laterite, L.
St 3	do	*Phum Osmach	12–16–61	15	---	150	HP, L.
St 4	do	do	1–10–62	11.5	---	200	Do.
St 5	do	do	1–13–62	15	---	180	Do.
St 6	do	do	1–16–62	16	---	150	Do.
St 7	do	do	1–19–62	17	---	200	Do.
St 8	*Khum Dang Kda	*Phum Anlong Sralao	3– 1–62	20	---	200	L.
St 9	do	do	3– 1–62	20	---	200	Do.
Srŏk Tbong Khmŭm							
TK 1	Phumĭ Chub (Khum Chup).	Vôtt Tuŏl Tréa (Pagoda Toul Trea).	10–28–61	3	---	NP	L, basalt at 2 m, AB.
TK 2	do	Phumĭ Mréam Téak (Phum Maream Teak).	10–30–61	41	---	NP	L, AB.
TK 3	do	Tapao Plantation	10–24–61	274	---	NP	Do.
TK 4	do	do	10–29–61	104	---	NP	Do.
TK 5	Phumĭ Rôkar Pôpram (Khum Roka Popram).	do	11– 8–61	27	---	NP	L, basalt at 2 m, AB.
TK 6	do	do	12–16–61	37	---	NP	L, basalt at 18 m, AB.
TK 7	Châmkar Kansu Chŭb (Chup).	Rubber Plantation	Before 1964	45.1	8.5	2,967	Layne well, L.

it is relatively easy to obtain a productive dug well in areas of Old Alluvium.

The geologic section (*G–G'* on pl. 3) shows several interesting logs but raises some questions about interpretation. Good wells have been obtained in the basalt, as shown by CL 12, 33, 17, and 16 and KS 5. Evidence that the basalt rests on alluvium is found in CL 36, the well drilled by Layne Wells International, on the edge of the volcanic cone, at Phnum Têt Srei (Chamcar Leu). About 102 m of basalt was logged from the land surface (114 m) to 12 m above sea level. Silt and clay were penetrated for the next 33 m, then a water-bearing sand was encountered for 10 m, and the hole ended in 4 m of clay (total depth 149 m).

Two deep holes in the khêt were nonproductive: PC 2, which went down to a depth of 218 m, and TK 3, down to 274 m. PC 2 encountered only clay, sandy clay, and gravelly clay. TK 3 passed through some long sections of sand, but why it did not produce water is not recorded. The logs for these holes raise further questions. They indicate clay and sand, not shale and sandstone. It is implied, therefore, that alluvial sediments persist to more than 200 m below sea level. It is possible that these deep alluvial sections mark an ancestral valley of the Mekong River, but until more data are available, such a channel cannot be defined.

Large quantities of lava poured out of a now-extinct volcano at Phnum Têt Srei and built up a huge mass of basalt whose weight compresses the underlying alluvial sediments. If the lava reservoir was near the surface, the overlying sediments may have foundered into the reservoir. On the other hand, the huge basin of the Tonle Sap may represent a subsidence area over a lava reservoir, from which the surrounding plateau basalts were derived.

By interpretation, the Young Alluvium shown in plate 3 is limited to the modern course of the Mekong River. It should be noted, however, that the Young Alluvium may be much more extensive, and that the volcano may rest at least in part, on Young Alluvium and its lava flows may be interbedded with the alluvium. The logs of wells on the flanks of the volcanic mass show some interbedded laterite (well CL 33, section *G–G'*, pl. 3). Since the laterite is part of the Old Alluvium and not part of the Young Alluvium, it can be assumed that the basalt flow occurred in the late stages of deposition of the Old Alluvium. There are also ash deposits interbedded with the basalt flows. It is possible that these represent mud flows derived from rainfall saturated with volcanic ash.

Nine of the eleven srŏks have drilled wells, but in 2, Srŏks Srei Sânthôr and Kaôh Sotĭn, no wells are recorded. Thirty-six wells were drilled in Srŏk Châmcar Leu, and 26 of these are productive. One well drilled in Srŏk Cheung Prey has a small yield (45 l/min) from rhyolite. Six of the eleven wells drilled in Srŏk Kâmpóng Siĕm were successful. One of these yields 800 l/min from an electric pump. One of the two wells in Srŏk Kroch Chhmar has a modest yield of 50 l/min. In Srŏk Mémót, M 2, a very high capacity well that yielded 2,367 l/min was developed for a rubber plantation. In Srŏk Prey Chhor, three wells were nonproductive, and three were productive. The productive wells tap water in alluvial sand and clay beneath a layer of basalt which is altered to clay. In Srŏk Stŏeng Tráng all nine wells, seven drilled, and two dug, are productive. In Srŏk Tbong Khmŭm, on the contrary, only one well in seven is productive. That well, TK 7, has the largest yield in the khêt, 2,967 l/min.

In Srŏk Kâng Méas, four hydrojet wells were drilled entirely in alluvium. Two of them, KM 1 and 2, penetrated the Young Alluvium and passed into the Old Alluvium as shown by a bed of laterite logged in KM 1 between 15 and 21 m. Only clay and gravelly clay were encountered below, however, and so the wells were not productive. Two shallow wells, KM 3 and 4, each 9 m deep and each with 3 m of white earth, 3 m of yellow clay, and 3 m of sand, were low producers at 18 and 20 l/min respectively, in the Young Alluvium.

Only two water analyses are available from wells in the khêt. Water from the high capacity well at Mémót, M 2, has a pH of 5.4, a trace of chloride and 0.67 mg/l of iron as Fe_2O_3. Water from the high-capacity well at Châmkar Kausu Chŭb, TB 7, has a pH of 6.2, 10 mg/l of chloride as NaCl, and no iron. It is probable that most of the ground water in the basalt of the plateaus will be somewhat high in iron, but the waters are usable for many purposes with little or no treatment.

In summary, about two-thirds of Khêt Kâmpóng Cham remains to be explored by drilling. Much more ground water can be developed in areas already tested, and wells of higher capacity can be obtained with proper construction. The success ratio of 64 percent should be improved by further development.

KHET KRACHEH

Khêt Krâchéh is located in eastern Cambodia and is bisected by the Mekong River, as shown on plate 2. In 1962, the population was recorded at 136,338, and the surface area was 1,075,236

hectares. The khêt is well drained by the Mekong River and its tributaries. Elevations range from about 5 m on the river, where it leaves the southwest corner of the khêt, to 687 m at the peak of a granite mass along the northwest edge. In general the khêt is a gently rolling plain interrupted by some 12 isolated peaks scattered over the surface.

Geologically, the khêt is underlain principally by the Indosinias Formation, which is composed chiefly of red and green sandstone and siltstone of continental and lagoonal origin (nonmarine). In most places these rocks are weathered to a reddish soil, but in a few places there are outcrops of the unweathered rock. Lava flows of andesite, rhyolite, and basalt mantle the Indosinias rocks in several scattered localities. Along the central braided streamway of the Mekong is a deposit of fine sand and silt that is Young Alluvium. In the central and southern parts of the khêt, west of the Mekong River, is a terrace of Old Alluvium composed of sand, gravel, silt, and clay, and in places it has weathered to a lateritic soil.

Only 18 wells have been recorded in Khêt Krâchéh as shown in table 11. Fifteen wells have been drilled in Srŏk Krâchéh, and 12 of these are in the immediate vicinity of the khêt capital, Krâchéh (Kratie), as shown on the inset map of plate 2. Three wells have been drilled in Srŏk Snuŏl, around the town of Snuŏl. No wells have been drilled in Srŏk Sâmbor, nor in Srŏk Chhlong.

Wells Kr 1 to 12 were drilled in the town of Krâchéh or within 5 km of it. Nine of these wells were productive (Kr 6, 7, and 8 were nonproductive). Yields ranged from 114 to 1,520 l/min, and the average yield was 836 l/min. Water levels, in the four wells observed, ranged from 1.5 to 14.8 m below land surface. The wells ranged from 32 to 209.4 m deep and averaged 77.4 m.

The subsurface geology is shown in cross sections *A–A′* and *B–B′* on plate 3, which were constructed by studying the well cuttings. The principal rock is fractured red sandstone with layers of siltstone as logged in seven of the wells. The log for Kr 11, at the north end of cross section *A–A′* and the west end of cross section *B–B′*, differs considerably from the other logs in that it reveals intrusive gabbro and basalt in its lower section. The interpretation favored here is that this well is on the opposite side from the other wells of a northward-trending fault. This fault is indicated also by the straight reach of the river and is not in conflict with the surface geology (Saigon east sheet). It is also inferred that the downthrown side of the fault is to the west, although the lithologic logs are inconclusive for such an interpreta-

TABLE 11.—*Records of wells in Khêt Krâchéh*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: NP, nonproductive; NR, not reported. Remarks: AB, abandoned; HP, hand pump; L, log available]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Krâchéh					
Kr 1	Phumĭ Trâpeăng Pring (Tra Peang Pring.)	3 km East of Krâchéh (Kdratie).	10–14–60	32	1.50	570	L.
Kr 2	do	do	10–24–60	44.4	6.5	1,140	Do.
Kr 3	do	do	11– 7–60	47	NR	380	Sample log.
Kr 4	Krâchéh (Kratie)	Water Tower, South side.	11–17–60	102	14.3	1,330	Sample log; pump test, specific capacity 52.2 l/min min^{-1}, L.
Kr 5	do	Water Tower, North side.	12– 8–60	209.4	14.8	1,710	L.
Kr 6	do	Army Camp, 6.5 km east of Krâchéh.	12–16–60	80.7	NR	NP	L, AB.
Kr 7	do	do	-------	67	NR	NP	Do.
Kr 8	do	do	1–13–61	100	NR	NP	Do.
Kr 9	do	4.5 m East of Krâchéh	1–27–61	100	NR	114	HP, L.
Kr 10	do	Veterinary Hospital 1 km East of Krâchéh.	2– 9–61	36	NR	285	Do.
Kr 11	Srŏk Krâchéh	500 m. South of bridge, North end of city.	2–25–61	40	NR	475	Do.
Kr 12	do	Vott Rôka Kândal (pagoda).	3–10–61	72	NR	1,520	L.
Kr 13	*Phum San Kum	30 km. North of Krâchéh.	3–21–61	25	NR	NP	AB.
Kr 14	do	do	3–24–61	22	NR	NP	Do.
Kr 15	do	do	3–27–61	20	4.5	76	L.
		Srŏk Snuŏl					
Sn 1	Snuŏl		1–29–62	65	NR	400	HP.
Sn 2	do	Rural Estate of Preah Sihanouk.	2–28–62	85	NR	400	Do.
Sn 3	do	5th Military Region	3–26–62	65	NR	400	Do.

tion. It is possible also that this is the eastward terminal fault of the Tonle Sap graben.

Moderately high yields are obtained from wells along the river. A well-field test was run on Kr 4 and 5 at the water tower on January 17, 1961. Kr 4 was pumped for 5 hours at 228 l/min, and drawdowns in water levels were observed in both wells, which are reported to be 18 m apart. Water levels in both wells stabilized at the end of 50 minutes of pumping, indicating that the Mekong River is the recharge source. A transmissivity of about 162 m^3/d m^{-1} and a storage coefficient of about 1.5×10^{-5} were computed from this data for the decline record from 4 to 40 min and before the equilibrium recharge reached the wells. The drillers' log shows that Kr 4, the pumped well, is 102 m deep with an open hole in rock from 42 m to 102 m. The upper 29 m is logged as a yellow and black clay, although the samples from well Kr 5 indicate a grayish-brown silty fine sand. Kr 4 drewdown 4.35 m at 230 l/min, 7.25 m at 380 l/min, and 14.6 m at 760 l/min. It therefore had a fairly constant specific capacity of 52.2 l/min per metre of drawdown. This well has an available drawdown of about 60 m, so it has a large potential yield that would be sustained by recharge from the river about 300 m to the west.

Thirty kilometres north of Krâchéh at *Phum San Kum, two wells (Kr 13 and 14) were nonproductive, and another well, apparently in fractured andesite (very fine grained volcanic rock), produced 76 l/min.

Eighty kilometres by road southeast of Krâchéh, at Snuŏl, three productive wells (Sn 1, 2, and 3) each produced 400 l/min from hard rock at total depths between 65 and 85 m.

No water analyses have been reported from wells in Khêt Krâchéh, but indications are that the water is fresh, is usable for most purposes, and has a somewhat high iron content and a slightly acid pH.

KHET MONDOL KIRI

Khêt Môndól Kiri is a large sparsely inhabited plateau khêt in eastern Cambodia. It has the smallest population, 14,325 (1962), of any khêt in the country and one of the largest areas, 1,384,764 hectares. The plateau ranges in elevation from 70 m on the southwest to 1,078 m on the crest of Phnum Năm Léa (Nam Lyr mountain) in the southeast. The general elevation of the plateau is 100 to 400 m above sea level, but there is an isolated mountain along the southern boundary with Vietnam and several interior hill

masses. The Tônlé Srêpôk and its tributaries drain the eastern and northern segments of the plateau, and the headwaters of small tributaries to the Mekong River drain the western part. The southern highland area is covered with dense forest, but most of the plateau is covered with open forest.

No wells were recorded in Khêt Môndól Kiri. Plate 1 shows the geology of the khêt. Large areas of the khêt are underlain by sandstone and siltstone of the Indosinias Formation. In the southern part are large areas of basalt flows. In both these rock types, moderate to small yields of water should be obtainable from properly developed wells.

KHET ROTANOKIRI

Khêt Rôtânôkiri is the northeastern khêt of Cambolia, bordering on Vietnam and Laos. It has an area of 1,045,000 hectares, about average for the 18 khêts, and a population of 49,350 in 1962.

The khêt is a well-drained, maturely dissected plateau ranging in altitude from about 60 m on the Tônlé Srêpôk in the southwest corner to 1,360 m in the mountainous border area with Laos in the northeast. The Tônlé San drains the northern half of the khêt and the Tônlé Srêpôk drains the southern half.

No wells are recorded in Khêt Rôtânôkiri. The general water-bearing characteristics of the rocks however, can be interpreted from the geologic map (pl. 1). The three major rock groups are present—igneous, sedimentary, and metamorphic. Except for a small area of unconsolidated alluvium in the Tônlé San valley (Se San Valley), the sedimentary rocks are well-cemented sandstone, siltstone, and shale of the Indosinias Formation. Wells having low to moderate yield may be obtained from these rocks in the interfluve areas, and along the major streams, high-capacity wells may be realized through induced recharge via fracture joints. The igneous rocks consist of one basalt plateau, two knobs of granite, and small patches of rhyolite and andesite. If experience elsewhere in Cambodia is borne out, adequate wells may be obtained in the basalt, which is often scoriaceous and in places interbedded with volcanic ash and gravel. The granite is tight, and will provide meager yield to wells. The eastern side of the khêt is underlain by schist, pyroxenite, and amphibolite. The schist will yield moderate quantities of water to properly developed wells, but the pyroxenite and amphibolite are poor aquifers.

KHET STOENG TRENG

Khêt Stŏeng Trêng is a well-drained khêt in north-central Cambodia astride the Mekong River and the confluence of three large tributaries, the Tônlé Kŏng (Se Kong), the Tônlé San (Se San), and the Tônlé Srêpôk. The khêt contains 1,075,000 hectares, about median among the 18 khêts. Its population was 34,472 in 1962, making it the second least populous khêt in the country. Elevations range from about 10 m on the rapids of the Mekong at the south to 968 m in the hills of the northeast. Most of the khêt is a plateau with an average elevation of about 100 m above sea level.

As shown on plate 1, the geology of Khêt Stŏeng Trêng is highly varied. Large areas of the khêt are underlain by continental red sandstone and shale of the Indosinias Formation. Small areas of marine shale and sandstone of Triassic and Jurassic age also have been mapped. In the southern part of the khêt limestone and silicified limestone of Paleozoic age are mapped. The western plain is mapped as Old Alluvium, and there is a small area of Young Alluvium along the Mekong River near the Laotian border. Also along the northeastern border with Laos is a band of rhyolite, a light-colored volcanic rock. Small scattered areas of andesite flow rocks are found around the city of Stŏeng Trêng (Stung Treng). A granite intrusive mass crops out near the northeast corner of the khêt.

Records from six wells are available, four at Stŏeng Trêng and two at the bridge over the Tônlé Srêpôk. All these wells were drilled in areas mapped as andesite and are listed in table 12. Only two of the wells were productive, at modest rates of 76 to 95 l/min.

Among the rock types in the khêt, the Old Alluvium would probably provide the best yields to wells. Water-bearing zones in sandstone and limestone should sustain moderately productive wells. The rhyolite, andesite, and granite would probably provide only meager to low yields to wells. More definite conclusions are not possible until further drilling and aquifer testing is carried out in the khêt.

KHET KAMPONG THUM

Khêt Kâmpóng Thum is in central Cambodia, part of the interior low plain of the Tonle Sap depression. Elevations range from 9 m above sea level on the surface of the Tonle Sap to 100 m above sea level in the northeastern plain, with one peak rising to 273 m. In 1963 Kâmpóng Thum was the largest khêt, but with the creation of Khêt Preăh Vĭhear in 1964, from the north-

TABLE 12.—*Logs and records of wells in Khêt Stŏeng Trêng*

Well no.	Town or village	Locality	Date well drilled	Yield (l/min)	Log		Remarks
					Lithology	Depth (metres)	
STg 1	Stŏeng Trêng	Fundamental Education Bldg.	4–20 to 4–26–61	76–95	Soil, red with rock.	8	Casing, 12 m; hand pump.
					Rock, red and black.	32	
					Rock, blue	53	
STg 2	do	Public Works Bldg.	5–23 to 5–27–61	-----	Clay, red	5	Dry hole.
					Sand	12	
					Rock, white black, and green.	45	
STg 3	do	Stadium	6– 1 to 6– 6–61	76	Soil, red	4	----------
					Sand, yellow	10	
					Rock, yellow, black, and red.	41	
STg 4	do	Police Station	6–20–61	-----	Clay with gravel	3	Abandoned.
					Rock, gray, hard	6	
STg 5	Pagoda Preah Sihanouk.	Reported near bridge, Tônlé Srêpôk.	4–19 to 4–22–62	None	Earth, red	6	----------
					Clay	13	
					Earth, black	18	
					Rock, hard	22	
STg 6	do	----do	5–12 to 5–16–62	None	Laterite	5	----------
					Rock and black stone.	25	

ern srŏks of Kâmpóng Thum, the surface area was reduced to 1,277,000 hectares, about fourth in size of the 18 khêts. By this separation the population was also reduced to an estimated 250,000.

The surface of Khêt Kâmpông Thum is mantled chiefly by alluvium. Around the Tonlé Sap depression and in the broad valley of the Stŏeng Sên, a principal tributary, the surface materials are predominantly silt and clay of the Young Alluvium. In general the Young Alluvium mantles the plain at surface elevations below 20 m. The higher plain is mantled by Old Alluvium, a deposit of sand, silt, and clay with beds of laterite, and a few layers of gravel. In the northeastern corner of the khêt, the Indosinias Formation has been mapped, but not differentiated by lithology. About 15 km southeast of Kâmpóng Thum is an eroded hill mass of the Upper Indosinias Formation, which is composed of sandstone of preserved Cretaceous age. Two small outcrops of granite, and two small inliers of undifferentiated Paleozoic rock in the eastern part of the khêt, complete the surface geologic features.

More wells were drilled by the US AID in Khêt Kâmpóng Thum than in any other khêt in Cambodia. Most of these were put down by the rapid (1 to 2 days drilling time for each well) and inexpensive hydrojet method to depths of less than 15 m in the soft alluvial deposits along National Route 6. A total of 404 wells were completed in four districts. In one srŏk, Srŏk Sândăn, no wells were drilled. Because the wells are shallow, the logs reveal only the surficial alluvial deposits, and no attempts to correlate geologic formations by means of cross sections are warranted.

A few deeper wells however, did penetrate to bedrock. For example, in Srŏk Barayn, well B 1 encountered bedrock at 20.6 m below land surface (at 9 m below sea level). At the Telephone Post at Barayn, well B 11 encountered bedrock at 40.2 m below land surface (28 m below sea level). In well B 19, bedrock was found at 42.2 m below land surface (32 m below sea level), and in B 23 at 36.4 m below land surface (25 m below sea level).

In Srŏk Sântuk, bedrock is reported in only one well, SK 121, at a depth of 10 m. No well went deeper than 36 m, however, only alluvial sediments are described in the other 156 wells.

In Srôk Kâmpông Svay at well KSy 2, rock was logged from 8 to 10 m, underlain by 1.15 m of white sand. As volcanic rocks are not recognized in the khêt, it is possible that this rock is a ledge of hard laterite. However, the local drillers identify laterite easily, and no description of this rock is given. At the Pagnachi-

reach School, well KSy 9 logged bedrock from 18 to 21 m below land surface in a nonproductive hole. At Phumĭ Poŭthĭ Khav (Po Khao hamlet), the driller found bedrock at a depth of 27 m.

Three fairly deep wells at the khêt capital, Kâmpóng Thum (Kompong Thom) recorded bedrock at 61, 86, and 30 m in wells KSy 48, 49, and 50. In KSy 48 the bedrock was found from 61 to 66 m and described as "red and white". In KSy 49, 86 m of alluvium is recorded, with bedrock at the bottom. In KSy 50, bedrock is logged from 30 to 80 m depth, yet no description is available for this entire 50 m.

No bedrock is logged in Srŏk Stoŭng, although the deepest well is 41.5 m.

In summary, the record indicates that the alluvium beneath National Route 6 in Khêt Kâmpóng Thum ranges in thickness from 7 to 86 m. Because bedrock was drilled only at scattered sites, no average thickness of the alluvium can be determined. The average thickness, however, is probably not less than 40 m.

In tables 13, 15, 16, and 17 the wells are described by srok, from south to north, and the locations are given with respect to kilometre posts on National Route 6, at the right and left sides of the road.

SROK BARAYN

Table 13 describes 74 wells drilled in Srŏk Barayn and these are located by clusters on plate 2. Fifty-nine of the wells were productive at rates ranging from 10 to 150 l/min. The average yield was 56 l/min. The wells range in depth from 4.5 to 42.2 m, with an average depth of 14.4 m. Water levels range from 0.3 to 5 m with an average of 0.9 m below land surface.

Four partial chemical analyses made from water samples taken from wells in Srŏk Barayn are summarized in table 14.

The conductivity of water from wells B 12, B 14, and B 21 indicates moderately high dissolved solids, whereas the sample from well B 28 approaches the purity of rain water. The turbidities indicate that the wells were not adequately developed, possibly a result of the rapid hydrojet method of drilling. The pH of water from well B 12 indicates a slightly alkaline condition, whereas the other waters are almost neutral, pH 7.0 It is surprising that no trace of iron is recorded in an area where laterites are present. This may indicate the local stability of iron con- is presumptive of no fecal contamination. The low chloride indicates no concentration of undesirable salts. The total hardness centrated by the tropical weathering process. The lack of nitrogen

TABLE 13.—*Records of wells in Srŏk Barayn, Khêt Kâmpóng Thum*

[Well no.: see text for explanation of well numbering system. Locality: Kilometre posts from Phnom Penh to Angkor Wat on National Route 6: R, right side; L, left side. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: NP, nonproductive; NR, not reported]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
B 1	Phumĭ Chi Aôk	Km 115, R	10–11–62	20.6	---	NP	Clay ends in bed rock at 20.6 m.
B 2	do	Km 115–116, L	10–11–62	16.8	1.5	25	Clay and sand.
B 3	do	Km 115–116, R	10–10–62	9.8	0.5	45	Do.
B 4	do	Km 115–116, R	10–13–62	32.6	---	NP	Clay.
B 5	do	Km 115–116, R, *Wat Sevann Pothiram.	11–30–62	40	---	NR	Sand, laterite, and clay.
B 6	*Khum Baray	Km 116–117, R	10– 8–62	9.8	0.5	85	Clay and sand.
B 7	do	Km 116–117, R	10– 7–62	12	0.5	85	Do.
B 8	do	Km 116–117, R	10– 8–62	10.2	0.5	80	Do.
B 9	do	Km 116–117, R	10– 9–62	9.4	0.5	150	Do.
B 10	do	Km 116–117, R	10– 8–62	10.2	---	NP	Do.
B 11	do	Km 117, R, Post Telephone.	10–10–62	40.2	---	NP	Clay, sand, and bed rock at 40.2 m.
B 12	do	Km 117–118, L	10–12–62	17	1.2	30	Clay and sand, analysis.
B 13	do	Km 117–118, R	10– 8–62	9.5	0.5	80	Do.
B 14	do	Km 117–118, R	10–12–62	10.8	0.5	80	Do.
B 15	do	Km 117–118, R	10–10–62	18	---	NP	Clay and sand.
B 16	do	Km 117–118, L	10–22–62	20	---	NP	Clay, laterite, and sand.
B 17	do	Km 117–118, R	10–23–62	11.5	0.5	80	Do.
B 18	do	Km 118, R	10–10–62	15.5	---	NP	Do.
B 19	do	Km 118, L	10– 9–62	42.2	---	NP	Clay, laterite, and bed rock at 42.2 m.
B 20	do	Km 118–119, L	10– 7–62	18.8	1.5	70	Clay and sand, analysis.
B 21	do	Km 118–119, L	10– 9–62	9.8	1.0	80	Do.
B 22	do	Km 118–119, R	10–11–62	12.3	---	NP	Clay and sand.

TABLE 13.—*Records of wells in Srŏk Barayn, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
B 23	*Khum Baray	Km 118–119, L	10–15–62	36.4	---	NP	Clay, laterite, and bed rock at 36.4 m.
B 24	do	Km 118–119, R, Barayn.	3– 4–63	17	5.0	25	Clay, sand, and laterite.
B 25	Phumĭ Sâmraông	KM 120, R	10–19–62	10.3	0.2	150	Clay, sand, and laterite.
B 26	do	Km 120, R	10–12–62	13	0.6	80	Clay and sand.
B 27	do	KM 120, L	---do---	11.0	0.6	85	Do.
B 28	do	Km 120–121, L, Pagoda.	10–13–62	9.5	1.0	70	Clay and sand, analysis.
B 29	do	Km 122–123, R	10–14–62	8.8	0.5	30	Clay, laterite, and sand.
B 30	Phumĭ Trâpeăng Chhuk.	Km 120–121, R	10–13–62	10.3	0.2	30	Clay and sand.
B 31	do	Km 122–123, R	---do---	11	0.2	25	Clay, lime, pebbles, and sand.
B 32	do	Km 122–123, L	---do---	9.7	0.3	30	Clay and sand.
B 33	do	Km 122–123, R	10–18–62	8.9	0.5	60	Clay, laterite, and sand.
B 34	do	Km 122–123, R	10–19–62	10.5	0.6	40	Clay and sand.
B 35	do	Km 123–123, L	10–18–62	12.8	0.5	150	Clay, laterite, and sand.
B 36	do	Km 122–123, R	10–20–62	11.5	0.3	80	Do.
B 37	do	Km 122–123, L	10–19–62	11.5	0.6	25	Do.
B 38	do	Km 122–123, R	10–20–62	11.1	0.6	40	Clay and sand.
B 39	do	Km 122–123, L	---do---	13.3	0.5	20	Do.
B 40	do	Km 122–123, L	---do---	15.5	0.5	20	Clay, laterite, and sand.
B 41	do	Km 122–123, R	---do---	12	0.5	40	Do.
B 42	do	Km 122–123, L	10–21–62	12.5	0.5	40	Do.
B 43	do	Km 122–123, R, Phumĭ Trâpeăng Chhuk (Trap. Chhouk).	12– 1–62	10.3	0.6	55	Clay and sand.

TABLE 13.—*Records of wells in Srok Barayn, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
B 44	Phumĭ Trâpeăng Chhuk.	Km 122–123, R	10–19–62	10.3	0.5	65	Clay, laterite, and sand.
B 45	Phumĭ Bŏeng	Km 122–123, L, Pagoda.	2–26–63	24.4	3.0	35	Clay and sand.
B 46	do	Km 122–123, R. Vôtt Sĕri Môngkólaram (pagoda) (Meang Koularam).	3– 2–63	26.4	3.0	35	Do.
B 47	Phumĭ Trâpeăng Chhuk.	Km 122–123, L, Primary School.	3– 3–63	36	3.2	25	Clay, sand, and laterite.
B 48	do	Km 123, L, School	10–18–62	9.5	0.8	25	Clay and sand.
B 49	*Khum Chong Daung	Km 123–124, L, Model School.	10–21–62	10.2	0.5	40	Clay, laterite, and sand.
B 50	do	Km 123–124, R, Phum	10–23–62	9.5	0.5	40	Clay, laterite, and sand.
B 51	do	Km 124, L	---do---	8.5	0.5	40	Do.
B 52	do	Km 124, R	10–21–62	10.6	0.5	40	Do.
B 53	do	Km 124–125, L, Model School.	10–22–62	9.6	---	NP	Do.
B 54	do	Km 124–125, L, Model School.	---do---	7.6	0.5	50	Do.
B 55	do	Km 124–125, L, Model School.	10–21–62	12.1	0.5	70	Do.
B 56	do	Km 124–125, R, Prapie	10–22–62	24	---	NP	Clay and laterite.
B 57	do	Km 124–125, L, Pagoda.	2– 5–63	18.6	2.8	60	Do.
B 58	do	Km 125, L, Model School.	2– 4–63	9.6	1.0	40	Do.
B 59	do	Km 125–126, R, Pagoda.	11–28–62	10.4	0.6	60	Clay and sand.
B 60	do	Km 125–126, L	10–20–62	7.1	0.5	50	Clay and laterite.

TABLE 13.—*Records of wells in Srŏk Barayn, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
B 61	do	Km 125–126, R, Pagoda Kdeythlok.	11–27–62	11	2.0	30	Clay, laterite, and sand.
B 62	do	Km 125–126, R, Pagoda Kdeythlok.	11–28–62	11	2.0	40	Do.
B 63	do	Km 126–127, R, Phumĭ Tuŏl Sala.	10–22–62	28.6	---	NP	Earth, marl, clay, and sand.
B 64	do	Km 127–128, L, Chong Dong.	10–23–62	15.4	---	NP	Clay and laterite.
B 65	do	Km 129, L, Military Camp.	11–26–62	17.5	---	NP	Do.
B 66	*Khum Balang?	Km 129–130, R, Phumĭ Kâmpóng Thmâ (Kg. Thma).	10–23–62	6.5	0.5	80	Do.
B 67	do	Km 129–130, R	---do---	7.	0.5	70	Clay, laterite, and sand.
B 68	do	Km 129–130, L	---do---	7.5	0.5	80	Do.
B 69	do	Km 129–130, R, Phumĭ Dong (Phum Dong).	11–26–62	10.3	0.5	45	Do.
B 70	do	Km 129–130, R Phumi Dong.	11–26–62	6.7	0.5	45	Clay and sand.
B 71	*Khum Chong Daung	Km 129–130, L, Phum Thmey.	11–25–62	11.1	---	40	Do.
B 72	*Khum Balang?	Km 129–130, R, Phumĭ Kâmpaeuy (Phum Kampoy).	11–25–62	13.5	0.5	80	Clay, laterite, and sand.
B 73	do	Km 129–130, L, Phumĭ Kâmpaeuy.	11–27–62	4.5	0.5	80	Do.
B 74	*Khum Chong Daung	Km 129–130, L, Phumĭ Chaeung Daeung (Phum Chong Daung).	11–25–62	10	2.0	10	Do.

TABLE 14.—*Analyses of water from four wells in Srŏk Barayn*

	Well number			
	B 12	B 14	B 21	B 28
Conductivity (micromhos at 25° C)	400	500	280	40
Turbidity (mg/l)	20	30	40	30
pH	8.1	6.8	6.9	7.4
Iron (mg/l)	0	0	0	0
Nitrogen dioxide (mg/l)	0	0	0	0
Chloride (mg/l)	25	60	40	0
Total hardness (as mg/l $CaCO_3$)	120	180	80	0

of samples from wells B 12 and B 14 indicate moderately hard water. Water from well B 21 is slightly hard. The zero hardness of water from well B 28 is questionable.

In conclusion, it may be observed that success was attained about 80 percent of the time by using the hydrojet method in developing small-capacity freshwater wells in soft alluvial deposits of Srŏk Barayn. Drilling was limited to sites along National Route 6, but similar conditions are likely to be encountered elsewhere in the srŏk, which yet remains to be explored.

SROK SANTUK

Records of 157 wells drilled in Srŏk Sântŭk are described in table 15, and these are shown by clusters on plate 2. One hundred thirty-five, or 86 percent of the wells were productive. The productive wells range in yield from 15 to 200 l/min, and have an average of 47 l/min. The wells range in depth from 4 m to 35.9 m and average 11.3 m. Depth to water ranges from 0.2 to 5 m and averages 1.6 m below land surface. The wells are all located along the right-of-way of National Route 6; however, the surface geology indicates that subsurface conditions in the rest of the srŏk are similar. There is no information on which to predicate high-capacity wells, other than to suggest that where 10 or more metres of clean gravelly, medium to coarse saturated sand is logged, a well capable of producing 400 l/min or more can usually be developed.

Only one water analysis, is available from Srŏk Sântŭk from well SK 73.

Conductivity (micromhos at 25° C)	80
pH	5.6
Turbidity (mg/l)	30
Iron (mg/l)	.25
Nitrogen dioxide (mg/l)	.02
Chloride (mg/l)	17.5
Total hardness (as mg/l $CaCO_3$)	10

TABLE 15.—*Records of wells in Srŏk Sântŭk, Khêt Kâmpóng Thum*

[Well no.: see text for explanation of well numbering system. Locality: kilometer posts from Phnom Penh to Angkor Wat on National Route 6; R, right side; L, left side. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: NP, nonproductive; NR, not reported]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
SK 1	*Khum Kompong Thmar.	Km 129–130, R, *Wat Prey Tatrac.	11–27–62	6.5	1.0	60	Clay, laterite, and sand.
SK 2	do	Km 129–130, L, College.	11–25–62	6.5	1.2	30	Do.
SK 3	do	Km 130, L, Phumĭ Kâmpóng Thmâ (Kâmpông Thmar).	10–24–62	8.2	0.2	60	Clay and laterite.
SK 4	do	do	---do---	7.3	0.6	60	Clay and sand.
SK 5	do	*Km 130–131, R, Chum Dy.	11–27–62	8.6	0.5	50	Clay, laterite, and sand.
SK 6	do	Km 130–131, R, Phumĭ Kâmpóng Thmâ.	10–23–62	6.5	0.5	80	Clay and laterite.
SK 7	do	do	10–24–62	7.3	0.2	60	Clay and sand.
SK 8	do	do	---do---	7.5	0.2	50	Clay, sand, and gravel.
SK 9	do	do	---do---	6.5	0.5	50	Clay and laterite.
SK 10	do	do	10–23–62	8.8	1.0	35	Clay, laterite, and sand.
SK 11	do	Km 130–131, L, *Prey, Phlon.	10–24–62	8.1	0.8	35	Do.
SK 12	do	do	11–26–62	6.5	1.2	40	Do.
SK 13	do	Km 130–131, L, Phumĭ Kâmpóng Thmâ.	---do---	6.5	4	30	Clay and laterite.
SK 14	do	Km 131–132, R, Phumĭ Kâmpóng Thmâ.	11–28–62	7	0.5	55	Clay, laterite, and sand.
SK 15	do	Km 131–132, R, Phumĭ L'ák.	2– 4–63	9.7	1.2	60	Do.
SK 16	do	Km 131–132, L, College Vimean Akas.	3– 7–63	16.8	---	NP	Do.

TABLE 15.—*Records of wells in Srŏk Sântŭk, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
SK 17	do	Km 131–132, R, Primary School.	3– 9–63	19	2.3	40	Clay and sand.
SK 18	do	Km 131–132, R, Primary Comple.	3–10–63	19	2.5	40	Do.
SK 19	do	Km 131–132, R	11–26–62	35.9	---	NP	Clay, laterite, and sand.
SK 20	do	Km 131–132, L	---do---	10.2	2.5	60	Do.
SK 21	do	Km 131–132, R, Pagoda.	11–30–62	16.7	---	NP	Sand and clay.
SK 22	do	Km 133–134, L, Phumĭ Prey Phlu.	10–27–62	9.5	0.8	50	Clay, laterite, and sand.
SK 23	do	do	---do---	9.9	0.5	50	Do.
SK 24	do	do	---do---	9.5	0.8	40	Clay and sand.
SK 25	do	Km 135, L, *Banteay Yumreach.	---do---	7.5	0.3	60	Clay and laterite.
SK 26	do	Km 135, R, *Banteay Yumreach.	10–28–62	6.5	0.6	30	Do.
SK 27	do	do	---do---	6.3	0.4	40	Laterite and sand.
SK 28	do	do	---do---	7.5	0.3	50	Laterite and clay.
SK 29	do	Km 135–136, L, Banteay Yumreach.	10–28–62	21	---	NP	Clay and laterite.
SK 30	do	Km 135–136, L, *Tan Hok Prasat.	10–31–62	7.2	0.5	50	Clay and sand.
SK 31	do	Km 135–136, L, Banteay Yumreach.	2– 3–63	15.5	2.5	38	Clay and laterite.
SK 32	do	Km 135–136, R, Banteay Yumreach.	2– 4–63	15.5	2.5	30	Do.
SK 33	do	Km 135–136, L, Banteay Yumreach.	2– 5–63	10.5	2.9	18	Do.
SK 34	do	do	2– 6–63	4.0	1.5	60	Do.
SK 35	Phumĭ Prâsat(1) Khum Prasat).	Km 135–136, L, *Phum Ta Nok.	2– 7–63	5.1	3.0	50	Do.

TABLE 15.—*Records of wells in Srŏk Sântŭk, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
SK 36	Khŭm Kompong Thmar.	Km 136, L, Banteay Yumreach.	10–28–62	7.2	---	NP	Do.
SK 37	Phumĭ Prâsat(1)	Km 136–137, L, *Phum Tankok.	10–30–62	13.5	0.8	80	Clay and sand.
SK 38	Khŭm Kompong Thmar.	Km 136–137, R, Phum Tankok.	2– 7–63	3.9	1.6	80	Clay and laterite.
SK 39	do	Km 136–137, L, Phum Ta Nhok.	---do---	3.9	1.2	60	Do.
SK 40	Phumĭ Prasat(1)	Km 137–138, R, *Trim Yiem.	---do---	4.7	2.5	20	Laterite.
SK 41	do	Km 137–138, R	2– 8–63	3.9	1.6	70	Clay and laterite.
SK 42	do	Km 137–138, R	---do---	3.9	1.5	60	Do.
SK 43	do	Km 138–139, L, Police Post.	10–29–62	10.2	0.2	40	Clay, laterite, and sand.
SK 44	do	Km 138–139, R, Trim Yiem.	2– 7–63	10.5	3.0	30	Clay.
SK 45	do	Km 138–139, R	2– 9–63	5.1	1.6	75	Laterite and clay.
SK 46	do	Km 138–139, R	---do---	5	2.9	30	Clay, laterite, and sand.
SK 47	do	Km 138–139, L	2–10–63	4	2.2	50	Earth and laterite.
SK 48	do	Km 139, L	10–29–62	10.1	0.8	50	Clay and sand.
SK 49	do	Km 139–140, R	10–29–62	10.2	0.8	50	Clay, laterite, and sand.
SK 50	do	Km 139–140, L	---do---	13.5	0.2	80	Do.
SK 51	do	Km 139–140, L, *Trapeang Te.	10–30–62	13.5	0.8	70	Do.
SK 52	do	Km 139–140, R, *Lopeang Te.	10–31–62	13.4	0.6	150	Do.
SK 53	do	Km 139–140, R, Phumĭ Prasat(1) (Prasat).	11–21–62	16.5	0.5	65	Do.

TABLE 15.—*Records of wells in Srŏk Sântŭk, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
SK 54	do	Km 139–140, L, Pagoda.	2– 8–62	11	5.0	35	Do.
SK 55	do	Km 139–140, L	2– 8–63	10.2	2.0	30	Clay, gravel, and sand.
SK 56	do	Km 139–140, R, *Lapeang Te.	2– 9–63	10.5	4.5	35	Clay and sand.
SK 57	do	Km 139–140, R, Phumĭ Prasat(1).	2–10–63	5.5	3.0	30	Do.
SK 58	do	Km 140, School	10– 6–62	15	---	28	Do.
SK 59	*Khum Tang Krasang.	Km 140–141, L, *Sal	10–30–62	10.1	1.0	20	Clay, laterite, and sand.
SK 60	do	Km 140–141, R, Market.	10–31–62	10.1	0.8	35	Clay and sand.
SK 61	do	Km 140–141, R	---do---	19	---	NP	Laterite and clay.
SK 62	do	do	---do---	10.5	0.3	40	Laterite, clay, and sand.
SK 63	Phumĭ Prâsat (Khum Prasat).	Km 140–141, L, Prasat.	11–20–62	11.0	1.0	30	Clay and sand.
SK 64	*Khum Tang Krasang.	Km 141, R, Tăng Krâsang.	---do---	10.4	0.5	25	Clay and sand.
SK 65	do	Km 141–142, L, Tăng Krâsang.	---do---	11.8	0.5	35	Do.
SK 66	do	Km 141–142, R, School.	---do---	7.5	1.5	40	Do.
SK 67	do	Km 141–142, L, Tăng Krâsang.	---do---	8.5	1.0	25	Clay and laterite.
SK 68	do	Km 141–142, L	11–21–62	9.0	2.0	50	Clay and sand.
SK 69	do	Km 141–142, R, Market.	---do---	11.4	2.0	50	Do.
SK 70	do	Km 141–142, L, *Sala Srok Santuk.	11–23–62	13.3	.5	60	Clay, laterite, and sand.

TABLE 15.—*Records of wells in Srŏk Sântŭk, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
SK 71	----------do	----------Km 141–142, L, Market.	---do---	10.1	2.0	80	Clay and laterite.
SK 72	----------do	----------Km 142, School ------	9–25–61	12	---	32	Sand and clay.
SK 73	----------do	----------Km 142, Pagoda Pothivong.	9–28–61	12.5	---	32	Sand and clay; analysis.
SK 74	----------do	----------Km 142, R, Tăng Krâsang.	11–21–62	16.9	0.4	60	Clay, laterite, and sand.
SK 75	----------do	----------Km 142, R ----------	11–23–62	23	1.9	108	Do.
SK 76	----------do	----------Km 142–143, L ------	11–21–62	7.5	6.5	50	Clay and sand.
SK 77	----------do	----------Km 142–143, L, Pagoda.	11–22–62	7.5	3.5	50	Do.
SK 78	----------do	----------Km 142–143, L, Tăng Krâsang.	---do---	13.8	3.0	60	Clay, laterite, and sand.
SK 79	----------do	----------Km 142–143, R, Tăng Krâsang.	11–23–62	10.5	1.0	35	Clay and laterite.
SK 80	----------do	----------Km 142–143, R, Tăng Krâsáng.	11–23–62	11	3.0	40	Clay, laterite, and sand.
SK 81	----------do	----------Km 142–143, L, Tăng Krâsáng.	---do---	8.5	0.5	50	Clay and sand.
SK 82	----------do	----------Km 142–143, L ------	11–24–62	23	2.5	NR	Clay, sand, and laterite.
SK 83	----------do	----------Km 142–143, L, *Wat Sang Khleang.	---do---	7.3	1.5	60	Clay and sand.
SK 84	----------do	----------Km 142–143, R, Tăng Krâsáng.	2–10–63	12	1.8	60	Laterite, sand, and clay.
SK 85	----------do	----------Km 143–144, R, Vŏtt Thômméa Neang (Wat Theam Maneat).	11–22–62	8.9	1.0	40	Clay and laterite.
SK 86	----------do	----------Km 143–144, L, Tăng Krâsáng.	11–23–62	26.8	0.5	70	Sand, clay, and laterite.

TABLE 15.—*Records of wells in Srŏk Sântŭk, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
SK 87	---do---	Km 143–144, R, Tăng Krâsáng.	11–24–62	10.0	1.0	35	Clay and sand.
SK 88	*Khum Chreap	Km 143–144, L, Phumĭ Tuŏl Vihéar (Tuol Vihen).	2–10–63	6	3.5	35	Clay, sand, and laterite.
SK 89	---do---	Km 144–145, L, Phumĭ Tuŏl Vihéar (Tuol Vihen).	2–11–63	5.5	2.0	40	Clay, sand, and laterite.
SK 90	---do---	Km 144–145, R, *Phum Chirot.	2– 9–63	6	2.0	50	Clay and laterite.
SK 91	---do---	---do---	---do---	5.5	1.5	50	Do.
SK 92	---do---	Km 144–145, L, Phumĭ Tuol Vihéar (Wat Tuol Vihea).	2–10–63	12.2	---	NP	Clay and gravel.
SK 93	---do---	Km 146–147, L, Phumĭ Sdŏk Sdâmph (Sdok Sdam).	11–24–62	28.4	0.5	80	Clay, laterite, and sand.
SK 94	---do---	Km 146–147, R, *Phum Chirot.	2–10–63	4	1.2	60	Clay and laterite.
SK 95	---do---	Km 146–147, L, *Phum Chirot.	---do---	7	2.5	28	Clay, sand, and laterite.
SK 96	---do---	Km 146–147, R, *Phum Chirot.	2–11–63	4	2.0	20	Laterite and sand.
SK 97	---do---	Km 146–147, L, *Phum Chirot.	2–12–63	5.5	2.0	30	Clay, laterite, and sand.
SK 98	---do---	Km 146–147, R, *Wat *Chey Mongkol.	2–13–63	5.5	2.0	30	Clay.
SK 99	---do---	Km 147–148, L, Phumĭ Sdŏk Sdâmph.	11–24–62	11.3	1.0	50	Clay, laterite, and sand.
SK 100	---do---	Km 147–148, L	11–23–62	26.1	---	NP	Do.
SK 101	---do---	Km 147–148, R, School Chey Mongkol.	11–25–62	16.6	2.0	30	Do.

TABLE 15.—*Records of wells in Srŏk Sântŭk, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
SK 102	---do---	Km 147–148, R, Phumĭ Sdŏk Sdâmph.	---do---	10.5	0.5	70	Do.
SK 103	---do---	---do---	11–27–62	7.2	0.5	85	Do.
SK 104	---do---	Km 147–148, L, Phumĭ Sdŏk Sdâmph.	11–28–62	6.3	1.2	40	Do.
SK 105	---do---	Km 147–148, L, *Phum Chirot.	2–11–63	10.2	---	NP	Clay.
SK 106	---do---	---do---	---do---	5	2.0	30	Clay and laterite.
SK 107	---do---	Km 147–148, R, *Phum Chirot.	2–11–63	4	2.0	28	Clay.
SK 108	---do---	Km 147–148, L, *Phum Chirot.	---do---	25	---	NP	Do.
SK 109	---do---	Km 147–148, L, Sala _	2–12–63	6.2	2.0	30	Clay, laterite, and sand.
SK 110	---do---	Km 148–149, R, Phumĭ Sdŏk Sdâmph.	11–25–62	12	---	NP	Clay.
SK 111	---do---	---do---	2–12–63	4	2.0	NP	Clay and sand.
SK 112	---do---	Km 148–149, R, *Phum Chirot.	---do---	7	2.2	50	Clay and laterite.
SK 113	---do---	---do---	---do---	4.5	2.0	60	Laterite.
SK 114	-----*Khum Kra Koh -----	Km 149–150, R, *Trapeang Rovieng.	11–29–62	16	---	NP	Clay and laterite.
SK 115	---do---	---do---	2–12–63	4.2	2.0	40	Sand and clay.
SK 116	---do---	Km 149–150, L, *Trapeang Rovieng.	2–13–63	9	2.0	30	Clay and sand.
SK 117	---do---	Km 149–150, R, Phumĭ Chiméak (Chimeak).	---do---	5	1.5	50	Do.
SK 118	---do---	Km 149–150, L, Phumĭ Chiméak.	---do---	5	1.9	40	Sand and laterite.
SK 119	---do---	Km 149–150, R, Phumĭ Chiméak.	2–14–63	10.3	2.5	20	Clay and sand.
SK 120	---do---	Km 150–151, L, Phumĭ Chiméak.	---do---	4.5	2.0	30	Do.

TABLE 15.—*Records of wells in Srŏk Sântŭk, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
SK 121	---do---	---do---	---do---	10	---	NP	Clay, sand, and bed rock at 10 m.
SK 122	---do---	---do---	2–16–63	27.3	---	NP	Clay and sand.
SK 123	---do---	---do---	2–15–63	12	2.0	50	Do.
SK 124	---do---	Km 150–151, R, School Chiméak.	2–16–63	16.7	2.0	25	Sand, laterite, and clay.
SK 125	---do---	Km 150–151, L, Phumĭ Chiméak.	2–16–63	14	---	NP	Sand and clay.
SK 126	---do---	Km 150–151, R, Phumĭ Chiméak.	2–17–63	26.7	---	NP	Clay and sand.
SK 127	---do---	Km 150–151, L, Phumĭ Chiméak.	---do---	16.6	2.5	30	Do.
SK 128	---do---	Km 150–151, L, Phumĭ Sântuk Krau (Wat Santuk Krae).	2–18–63	20	---	NP	Clay, laterite, and sand.
SK 129	---do---	Km 150–151, R, Phumĭ Chiméak.	---do---	25.4	---	NP	Clay.
SK 130	---do---	Km 150–151, L, Phumĭ Sântŭk Krau.	2–19–63	17.6	---	NP	Clay, laterite, and sand.
SK 131	---do---	Km 151–152, R, *Wat Santuk Knong.	12–27–62	14	1.0	25	Clay and sand.
SK 132	---do---	Km 151–152, L, Agriculture.	1–15–63	15.5	3.0	35	Clay, laterite, and sand.
SK 133	---do---	Km 151–152, R, *Wat Peng Per.	2–17–63	10	2.5	30	Sand and clay.
SK 134	---do---	Km 151–152, R, *Panouk Sach.	2–17–63	11	6.0	60	Clay, laterite, and sand.
SK 135	---do---	Km 151–152, L, *Panouk Sach.	2–18–63	7.5	5.5	50	Sand and clay.
SK 136	---do---	Km 151–152, R, Elevator.	2–19–63	9.5	2.5	40	Do.
SK 137	---do---	Km 151–152, L, *Panouk Sach.	2–19–63	7	5.0	40	Clay.

TABLE 15.—*Records of wells in Srŏk Sântŭk, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
SK 138	---do---	Km 151–152, R, *Panouk Sach.	---do---	7	5.0	60	Sand and clay.
SK 139	---do---	Km 152–153, L, Phumi Chey Sbai (Cheay Sbay).	12–26–62	11	1.0	35	Clay and sand.
SK 140	---do---	---do---	2–19–63	25	---	NP	Clay.
SK 141	---do---	---do---	2–20–63	10.2	2.2	NR	Clay, laterite, and sand.
SK 142	---do---	---do---	---do---	12	8.5	30	Clay and sand.
SK 143	---do---	---do---	2–20–63	13	8.0	30	Clay, laterite, and sand.
SK 144	---do---	---do---	---do---	10.3	2.0	50	Clay and sand.
SK 145	---do---	Km 153–154, L, School	12–20–62	17	.5	50	Do.
SK 146	---do---	Km 153–154, L, *Samnak.	12–22–62	18	4.0	15	Do.
SK 147	---do---	Km 153–154, R, *Samnak.	12–23–62	11.5	1.0	60	Clay, laterite, and sand.
SK 148	---do---	---do---	3–18–63	10.1	3.0	50	Clay and sand.
SK 149	---do---	Km 154–155, Phumi Chey Sbai.	10–12–61	20.4	---	NP	Do.
SK 150	---do---	---do---	10–16–61	17.3	14.0	18	Do.
SK 151	---do---	Km 154–155, L, *Samnak.	11–30–62	13.1	0.	200	Sand, clay, and laterite.
SK 152	---do---	Km 154–155, R, Phumi Krâkaôh.	12–15–62	17	1.5	25	Clay and sand.
SK 153	---do---	---do---	12–17–62	15	.5	50	Do.
SK 154	---do---	---do---	12–18–62	15	0.5	45	Do.
SK 155	---do---	Km 154–155, R, *Wat Krakoh.	12–21–62	15	0.5	40	Clay and sand.
SK 156	---do---	Km 154–155, L, Phumi Krâkaôh.	12–25–62	14	0.5	55	Clay, gravel, and sand.
SK 157	---*Khum Chreap? (Khum Kra Koh).	---	10–10–61	20	---	30	Sand, clay, and laterite.

The low conductivity indicates a water low in dissolved solids. The pH shows a slightly acid condition, while the turbidity is high for well water and indicates incomplete well development. The iron content is low, below the nuisance limit (0.3 mg/l), while the chloride content is low and shows no accumulation of undesirable salts. The water is very soft, and hence may be corrosive to metals.

SROK KAMPONG SVAY

Records of 154 wells drilled in Srŏk Kâmpóng Svay given in table 16, are plotted on plate 2 by clusters. One hundred and ten, or 71.4 percent, of the wells were productive. The two highest producers, wells KSy 49 and KSy 50 at the khêt capital of Kâmpóng Thum (Kompong Thom), yielded 760 and 228 l/min, respectively, but produced milky water that failed to clear up, and hence the wells were capped. The other producing wells ranged in yield from 20 to 80 l/min with an average of 36.2 l/min. The wells range in depth from 4 to 86 m and average 11.4 m deep. Depth to water ranged from 1.5 to 9.0 m, and was 3.4 m in the average well. As indicated on plate 2, drilling was concentrated along National Route 6. In the remainder of the srok, however, the surface geology is similar to that found along the highway, so it may be anticipated that subsurface conditions would be generally the same.

No water analyses are recorded for Srŏk Kâmpóng Svay. Reference, however, may be made to the four analyses described for Srŏk Barayn and the one analysis described for Srŏk Sântuk.

SROK STOUNG

Table 17 describes characteristics of 19 wells drilled in Srŏk Stoŭng along National Route 6, shown on plate 2. Ten of the 19 wells were productive, at rates ranging from 10 to 30 l/min and averaging 18 l/min. The wells range in depth from 8.1 to 41.5 m and were 26.6 m deep on the average. Water levels were recorded in eight wells, with a range from 1.0 to 7.5 m and an average of 3.4 m below land surface. In contrast with the other three srŏks of Kâmpóng Thum, it proved most difficult to obtain satisfactory wells in Srŏk Stoŭng. The average yield was much lower, the wells are drilled deeper, the water levels are deeper, and the success ratio was only about 53 percent. However, only a few wells were drilled, and most of the srŏk has yet to be explored.

No water analyses are recorded for the 10 productive wells drilled in Srŏk Stoŭng, and the sites are too far removed from

TABLE 16.—*Records of wells in Srŏk Kâmpóng Svay, Khêt Kâmpóng Thum*

[Well no.: see text for explanation of well numbering system. Locality: kilometer posts are on National Route 6 from Phnom Penh to Angkor Wat. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: NP, nonproductive; NR, not reported]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
KSy 1	*Khum Thbaung Krapeu.	Km 156–157, L, Phumĭ Pŏuthi Khav (Phum Po Khao).	2–20–63	13.2	2.5	60	Clay and sand.
Ksy 2	do	do	2–21–63	13.2	2.5	30	Clay, laterite, rock, and sand.
Ksy 3	Phumĭ Srâyuv (Khum Srayau).	Km 157–158, L, *Wat Porthivanaram.	2–22–63	13.6	2.0	30	Sand and clay.
Ksy 4	*Khum Thbaung Krapeu.	Km 157–158, L, Phumĭ Pŏuthi Khav.	do	27.5	---	NP	Sand, clay, and rock.
Ksy 5	do	Km 157–158, R, Phumĭ Pŏuthi Khav.	2–26–63	10.4	6.0	18	Clay and sand.
Ksy 6	do	Km 157–158, L, Phumĭ Pŏuthi Khav.	2–28–63	10.5	7.5	25	Do.
Ksy 7	do	do	3– 1–63	10.5	7.5	25	Do.
Ksy 8	do	Km 157–158, R, Phumĭ Pŏuthi Khav.	do	18	4.2	30	Sand and clay.
Ksy 9	do	Km 157–158, R, Pagnachireach School.	3– 2–63	21	---	NP	Clay, sand, and rock.
Ksy 10	do	do	3– 3–63	14	9.0	40	Sand and clay.
Ksy 11	do	Km 158–159, L, Phumĭ Tbâng Krâpeu.	3– 6–63	29	---	NP	Clay and sand.
KSy 12	do	do	3– 4–63	8	4.0	20	Do.
KSy 13	Phumĭ Srâyuv	Km 159–160, L, *Wat Kdey Andeth.	2–27–63	7	4.0	26	Do.
KSy 14	do	Km 159–160, L, *School Kdey Andeth.	do	7	4.5	50	Do.
KSy 15	do	Km 159–160, R, Phumĭ Pŭtyôk (Phum Puk Yak).	2–28–63	10.2	2.0	50	Do.

TABLE 16.—*Records of wells in Srŏk Kâmpóng Svay, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
KSy 16	Phumĭ Srâyuv	Km 160, R, Phumĭ Putyôk.	2–27–63	7	5.0	30	Clay and sand.
KSy 17	do	Km 160–161, R, Phumĭ Pŭtyôk.	----do--	7	5.0	25	Do.
KSy 18	do	Km 160–161, L, Phumĭ Pŭtyôk.	2–28–63	7.1	2.0	30	Do.
KSy 19	do	Km 160–161, R, Phumĭ Pŭtyôk.	2–28–63	7	2.0	30	Do.
Ksy 20	do	do	----do--	7	2.0	50	Do.
KSy 21	do	Km 160–161, L, *Wat Srayauv.	3– 1–63	7.2	5.0	35	Do.
KSy 22	do	Km 160–161, L, Phumĭ Pŭtyôk.	----do--	7	2.0	40	Do.
KSy 23	do	Km 160–161, L	4– 2–63	8.5	2.5	40	Do.
KSy 24	do	Km 160–161, L, Srayauv School.	3–18–63	7	3.0	50	Do.
KSy 25	do	Km 161–162, R, Trâpeăng Vêng.	3– 2–63	11.2	4.5	30	Do.
KSy 26	do	Km 161–162, L, Trâpeăng Vêng.	3– 3–63	9.1	2.5	40	Do.
KSy 27	do	Km 161–162, R, Trâpeăng Vêng.	3–4 –63	10.6	2.8	35	Do.
KSy 28	do	Km 161–162, L, Trâpeăng Vêng.	----do--	7	2.5	80	Clay.
KSy 29	do	Km 161–162, R, Trâpeăng Vêng.	3– 4–63	8.2	2.5	40	Clay and sand.
KSy 30	do	Km 162–163, R, Trâpeăng Vêng.	3– 5–63	19.8	---	NP	Do.
KSy 31	do	Km 162–163, L, Trâpeăng Vêng.	3– 6–63	26	---	NP	Clay, sand, and gravel.
KSy 32		Km 163, *Bantay Gp--	2–26–63	19.5	---	NP	Clay and sand.

TABLE 16.—*Records of wells in Srŏk Kâmpóng Svay, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
KSy 33	---do---	Km 168, Primary School.	2–28–63	28.1	---	NP	Clay and sand.
KSy 34	*Khum Kompong Svay.	Km 168–169, R, Phumĭ Kdei Sĕn.	3– 6–63	11.5	4.5	35	Clay.
KSy 35	---do---	Km 168–169, L, *Wat Kompong Thom.	---do---	10.5	60	50	Clay and sand.
KSy 36	*Khum Kompong Svay.	Km 168–169, L, Phumĭ Kdei Sen (Phum Kdey).	3– 7–63	10.3	---	35	Do.
KSy 37	*Khum Kompong Thom.	Km 168–169, R, Phumĭ Achary Leăk (Phum Achaleak).	3– 8–63	25	---	NP	Do.
KSy 38	*Khum Kompong Svay.	Km 168–169, L, Phumĭ Kdei Sĕn.	3–14–63	14	5.2	35	Clay and sand.
KSy 39	*Khum Kompong Thom.	Km 169–170, L, Phumĭ Achary Leăk.	3– 7–63	7.6	3.2	30	Do.
KSy 40	---do---	---do---	---do---	8	3.0	30	Clay, laterite, and sand.
KSy 41	---do---	Km 169–170, L, Phumĭ Achary Leăk.	3– 8–63	5.3	---	35	Do.
KSy 42	---do---	---do---	---do---	8.8	2.5	50	Clay and sand.
KSy 43	---do---	Km 169–170, R, Phumĭ Achary Yeăk.	3– 9–63	6.0	2.5	NR	Clay, laterite, and sand.
KSy 44	---do---	Km 169–170, L, Kâmpóng Thum (Kampong Thom College).	---do---	8	3.0	30	Clay and sand.
KSy 45	---do---	---do---	---do---	8	2.5	60	Do.
KSy 46	---do---	Km 169–170, L, Phumĭ Achary Leăk.	3–10–63	7.9	3.2	35	Clay, laterite, and sand.

TABLE 16.—*Records of wells in Srŏk Kâmpóng Svay, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
KSy 47	*Khum Kompong Thom.	Km 169–170, R, Phumĭ Achary Leăk (Achaleak School).	3–11–63	13.2	---	NP	Clay and sand.
KSy 48	do	(Kompong Thom Water Plant).	4–21–60	66	---	NP	Sand; bedrock at 61 m.
KSy 49	do	do	1960	86	4.0	760	Clay, sand, and gravel; bedrock at 86 m; water has milky appearance, well capped.
KSy 50	do	(Kompong Thom Stadium).	----do--	80	5.0	228	Sand and clay; bedrock at 30 m; water has milky appearance, well capped.
KSy 51	do	Km 170–171, R, Phumĭ Achary Leăk.	3–10–63	8	3.0	25	Clay, laterite, and sand.
KSy 52	do	Km 170–171, L, Phumĭ Achary Leăk.	----do--	8	3.0	30	Clay and sand.
KSy 53	do	Km 170–171, R, Phumĭ Krâchăb.	----do--	13.5	---	NP	Do.
KSy 54	do	Km 170–171, L, Phumĭ Krâchăb.	3–11–63	9	---	NP	Do.
KSy 55	do	Km 171–172, R, Phumĭ Krâchăb.	3–10–63	7.1	2.5	30	Clay, laterite, and sand.
KSy 56	do	Km 171–172, R, Phumĭ Krâchăb.	3–11–63	9.5	1.5	45	Clay and sand.
KSy 57	do	Km 171–172, L, Phumĭ Krâchăb.	----do--	13.4	---	NP	Clay, laterite, and sand.
KSy 58	do	KM 171–172, R, Phumĭ Krâchăb.	----do--	7.1	5.0	35	Do.
KSy 59	do	do	----do--	15	---	NP	Do.

TABLE 16.—*Records of wells in Srŏk Kâmpóng Svay, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
KSy 60	*Khum Kompong Thom.	Km 171–172 R, Phumĭ Krâchăb.	3–11–63	4	2.0	40	Clay and laterite.
KSy 61	do	Km 171–172, R, *Wat Krachap.	do	8	3.5	40	Clay.
KSy 62	do	do	3–12–63	7.3	2.7	35	Clay and laterite.
KSy 63	do	Km 171–172, R, Phumĭ Thnál Bêk.	do	4	3.0	50	Do.
KSy 64	do	Km 171–172, L, Phumĭ Krâchăb.	do	7	---	NP	Clay, laterite, and sand.
KSy 65	do	Km 171–172, R, *Wat Grachap.	3–12–63	12	---	NP	Clay and laterite.
KSy 66	do	Km 171–172, R, Phumĭ Thnál Bêk (Thnol Bek).	3–13–63	4.8	3.0	50	Do.
KSy 67	*Khum Trapeang Russey.	Km 172–173, R, Phumĭ Thnál Bêk.	3–12–63	4	2.0	70	Laterite and sand.
KSy 68	do	Km 172–173, L, Phumĭ Thnál Bêk.	do	12.4	2.0	40	Clay, laterite, and sand.
KSy 69	do	do	do	7.2	3.0	35	Do.
KSy 70	*Khum Kompong Thom.	Km 172–173, R, *Krachap.	do	7	3.5	40	Clay and laterite.
KSy 71	*Khum Trapeang Russey.	Km 172–173, R, *Sala_	3–13–63	17.2	4.0	25	Clay, laterite, and sand.
KSy 72	do	Km 173–174, L, Phumĭ Snaôr Roes Dei (Phum Snor).	do	7	5.0	25	Clay and sand.
KSy 73	do	Km 173–174, L, Phumĭ Snaôr Roes Dei.	3–14–63	19	---	NP	Clay, laterite, and sand.
KSy 74	do	Km 173–174, R, Phumĭ Snaôr Roes Dei.	3–14–63	15	---	NP	Clay and laterite.
KSy 75	do	Km 174–175, R, Phumĭ Snaôr Roes Dei.	do	7	3.0	50	Clay, laterite, and sand.

TABLE 16.—*Records of wells in Srŏk Kâmpóng Svay, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
KSy 76	*Khum Trapeang Russey.	Km 174–175, L, Phumĭ Snaôr Roes Dei.	3–14–63	10.5	2.5	60	Clay, laterite, and sand.
KSy 77	do	do	do	15.6	---	NP	Do.
KSy 78	do	do	do	5	2.2	35	Clay and laterite.
KSy 79	do	Km 175–176, L, Phumĭ Khnar.	3–15–63	26	---	NP	Clay.
KSy 80	do	do	do	7.7	3.1	35	Clay, laterite, and sand.
KSy 81	do	Km 176–177, R, Phumĭ Khnar.	do	6	3.0	25	Laterite and clay.
KSy 82	do	Km 176–177, L, Phumĭ Khnar.	do	5	2.2	30	Do.
KSy 83	do	do	3–16–63	15	---	NP	Clay.
KSy 84	do	Km 177–178, R, Phumĭ Snaôr Roes Dei.	3–14–63	10	---	NP	Do.
KSy 85	do	Km 179–180, L, Phumĭ Khnar.	3–15–63	5.5	3	40	Clay and laterite.
KSy 86	do	Km 179–180, R, Phumĭ Prasat.	3–16–63	5	2	30	Sand and clay.
KSy 87	do	Km 179–180, L, Phumĭ Prasat.	do	10.3	2.5	30	Clay and laterite.
KSy 88	do	do	do	16.3	---	NP	Clay and sand.
KSy 89	do	Km 179–180, R, Phumĭ Khnar.	do	8	4.5	30	Sand, clay, and laterite.
KSy 90	do	Km 179–180, L, Phumĭ Prasat.	3–17–63	10.2	3.0	20	Sand and clay.
KSy 91	do	Km 180–181, L, Phumĭ Prasat.	do	10.3	2.1	40	Clay and laterite.
KSy 92	do	do	do	5.5	2.8	35	Clay and sand.
KSy 93	do	Km 181–182, R, Phumĭ Prasat (Pagoda Prasat).	do	8	3.5	50	Do.

TABLE 16.—*Records of wells in Srŏk Kâmpóng Svay, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
KSy 94	*Khum Trapeang Russey.	Km 181–182, R, Phumĭ Prey Préal.	3–17–63	15	---	NP	Clay and sand.
KSy 95	do	Km 181–182, L, Phumĭ Prey Préal.	do	15	2.3	25	Do.
KSy 96	do	Km 181–182, R, Phumĭ Prey Préal.	3–18–63	11	2.5	28	Do.
KSy 97	do	do	do	15.6	3.0	28	Clay, laterite, and sand.
KSy 98	do	Km 181–182, L, Phumĭ Prey Préal.	do	29	---	NP	Clay and sand.
KSy 99	do	Km 181–182, R. Phumĭ Prasat.	3–19–63	12.3	---	NP	Do.
KSy 100	do	do	do	5.1	2.1	30	Do.
KSy 101	do	Km 181–182, R. Phumĭ Prasat.	3–20–63	15	---	NP	Clay and sand.
KSy 102	do	Km 181–182, R, Phumĭ Prey Préal.	do	7	3.5	50	Do.
KSy 103	do	Km 181–182, R, Phumĭ Prey Préal (Prey Préal School).	do	7	3.5	70	Clay.
KSy 104	do	Km 182–183, R, Phumĭ Prey Préal.	3–18–63	9	5.0	30	Clay and sand.
KSy 105	do	Km 182–183, L, Phumĭ Prey Préal.	do	14.1	2.8	35	Clay and laterite.
KSy 106	do	do	do	8.2	2.8	35	Clay and sand.
KSy 107	do	Km 182–183, R, Phumĭ Prey Préal.	3–19–63	8	5.5	40	Do.
KSy 108	do	Km 182–183, L, Phumĭ Prey Préal.	do	8	5.5	30	Do.
KSy 109	do	do	3–20–63	15	---	NP	Do.
KSy 110	Phumĭ Tbêng (Khum Tbeng).	Km 183–184, R, Phumĭ Prey Pras.	3–18–63	8.5	2.9	30	Clay, laterite, and sand.
KSy 111	do	do	3–20–63	15.7	---	NP	Do.

TABLE 16.—*Records of wells in Srŏk Kâmpóng Svay, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
KSy 112	Phumĭ Tbêng (Khum Tbeng).	Km 186–187, R, Phumĭ Roessei Cheăh.	3–20–63	16	---	NP	Clay.
KSy 113	do	Km 187–188, L, Phumĭ Ta Réam.	do	7	---	NP	Clay and laterite.
KSy 114	do	do	do	10.3	2.2	32	Clay.
KSy 115	do	Km 187–188, R, Phumĭ Ta Réam.	do	11.5	2.2	30	Do.
KSy 116	do	do	do	5.1	2.2	35	Clay and laterite.
KSy 117	do	Km 187–188, L, Phumĭ Ta Réam.	do	6.9	3.0	35	Clay, laterite, and rock.
KSy 118	do	Km 187–188, R, Phumĭ Srángê (Srange Pagoda).	3–21–63	9	6.0	30	Sand, laterite, and clay.
KSy 119	do	Km 187–188, L, Phumĭ Ta Réam.	3–21–63	5.2	2.5	35	Clay and laterite.
KSy 120	do	do	do	5.2	---	NP	Do.
KSy 121	do	Km 188–189, L, Phumĭ Ta Réam.	do	10.2	---	NP	Clay.
KSy 122	do	Km 188–189, R, Phumĭ Ta Réam.	do	12	2.2	20	Clay and sand.
KSy 123	do	Km 189–190, R, Bakong Pagoda.	do	11.2	5	30	Do.
KSy 124	do	Km 191–192, L, Phumĭ Bakóng.	do	12.3	2.8	25	Do.
KSy 125	*Khum San Kor	Km 192–193, L, Sankôr (Phum Sankôr).	do	5.5	2.5	28	Clay and laterite.
KSy 126	do	Km 192–193, L, Sankor Pagoda.	3–22–63	5	3.0	40	Sand.
KSy 127	do	Km 192–193, R, Sankôr).	do	15	2.8	28	Clay and sand.
KSy 128	do	Km 192–193, R, Sankor Pagoda.	4– 5–63	25	---	NP	Clay and laterite.

TABLE 16.—*Records of wells in Srok Kâmpóng Svay, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
KSy 129	*Khum San Kor	Km 192–193, R, Sankôr.	4– 6–63	12	4.0	20	Clay.
KSy 130	do	do	do	12.5	---	NP	Do.
KSy 131	do	Km 192–193, L, Sankôr.	4– 7–63	18	6.3	25	Clay and sand.
KSy 132	do	Km 193–194, L, Sankôr.	3–22–63	12	2.8	25	Do.
KSy 133	do	Km 193–194, R, Sankôr.	4– 4–63	13.5	3.8	35	Do.
KSy 134	do	Km 193–194, L, Phumĭ Prâsat (Prasat-Andeth Pagoda).	4– 5–63	10.3	4.8	60	Clay, laterite, and sand.
KSy 135	do	Km 193–194, L, Sankôr.	do	13.3	4.0	25	Clay and sand.
KSy 136	do	do	4– 6–63	27	---	NP	Clay and laterite.
KSy 137	do	do	4– 7–63	12	---	NP	Clay.
KSy 138	do	do	do	10.3	---	NP	Clay and laterite.
KSy 139	do	Km 193–194, R, Sankôr.	do	9.5	3.0	50	Clay and sand.
KSy 140	do	Km 193–194, L, Sankôr.	4– 8–63	15	---	NP	Clay.
KSy 141	do	Km 193–194, R, Primary School.	do	5.5	2.0	40	Clay and sand.
KSy 142	do	Km 193–194, R, Sankôr.	do	15	---	NP	Clay.
KSy 143	do	Km 194–195, L, Sankôr.	3–22–63	8	3.0	50	Clay and sand.
KSy 144	do	Km 195–196, L, *Phum Chong Sdao.	4– 7–63	15	---	NP	Clay.
KSy 145	do	Km 198–199, L, *Phum Khel.	4– 9–63	5.3	2.0	40	Laterite and clay.

TABLE 16.—*Records of wells in Srŏk Kâmpóng Svay, Khêt Kâmpóng Thum*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
KSy 146	*Khum San Kor	Km 199–200, L, *Phum Khel.	4– 8–63	9.2	2.5	40	Clay and sand.
KSy 147	do	Km 199–200, L, Phumĭ Krâsăng.	4– 9–63	7.5	2.9	35	Clay.
KSy 148	do	Km 199–200, R, Phumĭ Krâsăng.	do	7.5	3.5	40	Clay and sand.
KSy 149	do	Km 200–201, L, Phumĭ Kbĕl.	do	16.6	---	NP	Do.
KSy 150	do	Km 200–201, L, Phumĭ Krâsăng.	do	5	2.5	30	Sand and clay.
KSy 151	do	Km 101?, L, *Phum Chong Sdao.	4– 8–63	12	---	NP	Clay and sand.
KSy 152	do	Km 201–202, L, Phumĭ Krâsang.	4–10–63	4	2.0	25	Laterite and clay.
KSy 153	do	do	do	4	2.0	25	Clay.
KSy 154	do	Km 201–202, R, Phumĭ Krâsăng.	do	10.4	---	NP	Do.

TABLE 17.—*Records of wells in Srŏk Stoŭng, Khêt Kâmpóng Thum*

[Well no.: see text for explanation of well numbering system. Locality: On Route 6 Phnom-Penh to Angkor Wat. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: NP, nonproductive]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
Sta 1	*Khum Chamna	Phumĭ Svay Ĭĕr (Svay Eir).	9–19–61	41.5	---	NP	Clay, sand, and gravel.
Sta 2	do	do	9–22–61	41.5	---	NP	Do.
Sta 3	do	*Svay Eir Pagoda	11–11–61	23.6	1.5	10	Clay and sand.
Sta 4	do	Phumi Thnal	11–14–61	10	1.0	28	Do.
Sta 5	do	Phumĭ Spéan Krŏng (Spenknong School).	9–20–61	38	---	NP	Sand, clay, and laterite.
Sta 6	do	Phumĭ Spéan Krŏng	9–22–61	36	---	NP	Sand, stone, clay, and laterite.
Sta 7	do	*Cham Na	9– 9–61	11.8	7.5	20	Clay and sand.
Sta 8	do	Km 211–212, Phumĭ Sâmpôr.	9–16–61	38.3	---	NP	Clay, sand, and gravel.
Sta 9	do	Phumi Sâmpôr	9–13–61	11.3	---	10	Clay and sand.
Sta 10	*Khum Samproch	Pagoda	11–18–61	29.2	1.5	10	Do.
Sta 11	do	*Phum Ork Bos	11–21–61	39.8	---	NP	Do.
Sta 12	do	do	12–25–61	7.1	1.0	20	Do.
Sta 13	*Khum Kâmpóng Chen.	Phumĭ Kâmpông Chĕn (Kompong Chen).	8–15–61	36.8	---	NP	Clay, sand, and gravel.
Sta 14	do	*Leap Torng	8–18–61	8.1	6.0	18	Clay.
Sta 15	*Khum Tréa	Phumi Ta Châr	12–18–61	30.5	1.6	13	Clay and sand.
Sta 16	do	*Phum Phteas Veal	12–21–61	40.5	---	NP	Do.
Sta 17	do	do	12–23–61	39.9	---	NP	Do.
Sta 18	*Khum Pralay	Pralay School	8–24–61	9.6	7	18	Do.
Sta 19	do	Km 233 Vôtt Môni Reăng Sei (Monirinsey Pagoda).	9–18–61	11	---	30	Do.

wells in Srŏks Barayn and Sântŭk to extrapolate the results obtained in the five analyses reported in those srŏks.

KHET PREAH VIHEAR

Khêt Preăh Vĭhéar was formed out of the northeastern srŏks of Khêt Siĕmréab, and the northern srŏks of Khêt Kâmpóng Thum in 1964. It has an area of 1,780,000 hectares, which makes it the second largest khêt in Cambodia. A census is not available, but it is estimated that the population is about 135,000.

Topographically, Khêt Preăh Vĭhéar includes an interior plain limited on the north by the escarpment of Chuŏr Phnum Dângrêk along the Thai border and on the south by a range of hills extending fom the Tonle Sap depression. Most of the khêt is drained by the headwaters of the Stŏeng Sên, which discharges to the Tônlé Sab (Tonle Sap Oriental). The western srŏk, Srŏk Chŏng Kal (now located in Khêt Otdâr Méanchey) is drained by headwaters of the Stŏeng Srêng. Elevations range from about 40 m on the Stŏeng Sên to 753 m on the crest of the Chuŏr Phnum Dângrêk, and 625 m on the southern hills. Most of the interior plain averages about 70 m above sea level.

The surface geology of the khêt is shown on plate 1. The southern hills are dominated by a granite mass apparently intruded into the sedimentary rocks of the Indosinias Formation. Extensive flows of andesite cover broad areas in the southern part of the khêt. There are also small areas of outcropping Paleozoic and marine Triassic rocks. The eroded surface of the Indosinias Formation forms the central part of the khêt. The northwestern srŏks are mantled by Old Alluvium in compound alluvial fans accumulated from erosion of the Chuŏr Phnum Dângrêk and the southern hills. The northeastern margin of the khêt along the boundary with Laos is also mantled with Old Alluvium in terrace deposits possibly of an ancient drainage system of the Mekong River. The Chuŏr Phnum Dângrêk along the northern boundary is mapped as Upper Indosinias Formation, and composed of sandstone with some interbedded shale.

Table 18 summarizes the wells drilled in Khêt Preăh Vihéar. Maps are not available to locate precisely the sites of these wells by use of the general descriptions given, so the numbers of wells drilled in each khŭm (township, group of villages) are shown on the geologic map (plate 1). A large number of wells, 37 out of 64, were not successful. The range in yield of the 27 successful wells was from 18 to 120 l/min, and averaged 43.3 l/min. All the wells were drilled by the hydrojet method. They range in depth from

TABLE 18.—*Records of wells in Khêt Preăh Vihéar*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: NP, nonproductive; NR, not reported]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Chŏâm Khsant					
CK 1	*Khum Cheam Khsan	Chŏâm Khsant (Phum Cheam Khsan).	12–15–62	9.6	1.5	30	Sand 3 m, clay 3 m, sand 3.6 m.
CK 2	do	do	12–16–62	13	---	NP	Clay 5 m, sand 4 m, laterite 4 m.
CK 3	do	do	12–20–62	7.3	---	NP	Clay 5 m, clay and sand 2.3 m.
CK 4	do	do	12–20–62	8	---	NP	Clay 4 m, hard rock 4 m.
CK 5	do	do	12–21–62	6	---	NP	Clay 4 m, hard rock 2 m.
CK 6	do	do	----do--	10.4	2.5	35	Clay, laterite, and sand.
CK 7	do	do	----do--	12.5	---	NP	Clay, laterite, and rock.
CK 8	do	do	12–22–62	9.5	---	NP	Clay, laterite, and sand.
CK 9	do	do	----do--	8.3	---	NP	Clay 8 m, hard rock 0.3 m.
CK 10	do	do	----do--	8.5	---	NP	Clay and peat.
CK 11	do	do	12–23–62	6	1.3	40	Clay 5 m, sand 1 m.
CK 12	do	do	12–23–62	10.4	4.0	35	Clay, sand, and rock.
CK 13	do	do	12–24–62	7.5	---	NP	Clay 4 m, peat 2 m, rock 1.5 m.
CK 14	do	do	12–26–62	10.4	3.5	40	Laterite and clay.
CK 15	do	*Phum Leav	12–24–62	6	1.5	30	Earth 2 m, sand 2.5 m, clay 1.5 m.
CK 16	do	do	12–25–62	8	1.7	20	Clay 5.5 m, peat 2 m, rock 2.5 m.

TABLE 18.—*Records of wells in Khêt Preăh Vihéar*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	(Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Chŏâm Khsant—Continued					
CK 17	*Khum Cheam Khsan	Vôtt Tuŏl Âdêt (Tuol Andeth Pâgoda).	12–21–62	9	3.0	50	Clay 6.5 m, rock 2.5 m.
CK 18	do	do	12–23–62	8.8	3.0	45	Clay 7.9 m, rock 0.9 m.
CK 19	do	Chalet	12–20–62	8.3	4.8	18	Soil 2 m, sand 6.3 m.
CK 20	do	Primary School	12–19–62	12	1.0	35	Soil 2 m, clay 6 m, sand 4 m.
CK 21	do	Directorate of Education.	12–15–62	6.2	1.6	30	Soil 2 m, sand and clay 4.2 m.
CK 22	do	Infirmary	12–17–62	10.2	1.5	45	Soil 2 m, clay 4 m, sand 4.2 m.
CK 23	do	*Damnok Samdech	12–29–62	7.0	---	NR	Red soil 3 m, laterite 2 m, sand 2 m.
CK 24	do	*Sala Srok	12–17–62	13	---	NP	Clay, sand, and rock.
CK 25	do	do	12–17–62	6	5.0	50	Soil 2 m, clay 2 m, sand 2 m.
CK 26	do	do	12–18–62	12	1.0	25	Soil 2 m, clay 7 m, sand 3 m.
CK 27	do	West of Airfield	12–22–62	5.5	---	NP	Clay, laterite, and rock.
CK 28	do	do	12–23–62	6.0	---	NP	Do.
CK 29	do	Airfield	----do--	8.5	---	NP	Clay and stone.
CK 30	do	West of Airfield	12–24–62	7.8	---	NP	Clay, rock, and laterite.
CK 31	do	Airfield	12–25–62	7	2.5	35	Soil 2 m, clay and sand 5 m.
CK 32	do	Military Camp	12–17–62	7.9	1.3	50	Clay and sand.

TABLE 18.—*Records of wells in Khêt Preăh Vihéar*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Chŏâm Khsant—Continued					
CK 33	Khum Cheam Khsan	Military Camp	12–18–62	13.4	1.5	20	Clay and sand.
CK 34	do	Military Camp by Airfield.	12–24–62	9	---	NP	Soil 2 m, clay and sand 6 m, hard rock 1 m.
CK 35	do	Phumĭ Tasék	12–26–62	10.2	0.9	40	Soil 2 m, clay and laterite 6 m, sand 2.2 m.
CK 36	*Khum Tuk-Kraham	Phumĭ Tŏek Krâhâm	12–21–62	6.5	---	NP	Soil 2 m, clay 3 m, white sand 1.5 m.
CK 37	do	*Phum Dey Kraham	12–26–62	6	2.0	60	Soil 2 m, clay 3 m, coarse sand 1 m.
CK 38	*Khum Pring-Thom	*Phum Kralapeas	12–27–62	10.5	---	NP	Soil 2 m, sand 2 m, clay 3 m, stone 3.5 m.
CK 39	do	do	12–26–62	8	---	NP	Soil 2 m, clay 5 m, peat and stone 1 m.
CK 40	Phumĭ Pramé (Khum Por Prame).	Pagoda	12–27–62	10.4	---	NP	Soil 2 m, clay 5 m, stone 3.4 m.
CK 41	do	Phumĭ Pŏuthĭ (Phum Por).	----do	8.5	---	NP	Soil 2 m, sand and clay 2.5 m, peat 1 m, stone 2 m.
CK 42	do	do	----do	15.3	---	NP	Soil 2 m, clay 8 m, hard rock 5.3 m.
CK 43	*Khum Ta Trar	*Phum Russei	12–16–62	12.7	---	NP	Red soil 2 m, clay, sand, and laterite 8 m, stone 2.7 m.
CK 44	do	Near Phnum Preăh Vihéar (mtn).	12–17–62	12.5	---	NP	Soil 4 m, peat 8 m, rock 0.5 m.
CK 45	do	Military Camp Preăh Vihéar.	----do	6.2	2.4	20	Clay 3.9 m, stone 2.3 m.

TABLE 18.—*Records of wells in Khêt Preăh Vihéar*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	(Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Chŏâm Khsant—Continued					
CK 46	*Khum Ta Trar	*Phum Russei	12–17–62	13.9	---	NP	Sand, clay, laterite 4 m, gravel 3 m, clay and stone 6.9 m.
CK 47	do	do	12–18–62	11.5	---	NP	Soil 2 m, laterite 2 m, clay 6 m, stone 1.5 m.
CK 48	do	Chalet Phum Russei	12–20–62	17	---	NP	Soil 1 m, laterite 2 m, clay 5.8 m, gravel 6.7 m, rock 1.5 m.
CK 49	do	*Phum Russei	12–31–62	6	---	NR	Red sand 3 m, laterite 2 m, fine sand 1 m.
CK 50	do?	*West of Srok	12–25–62	7.2	---	NP	Soil 2 m, clay 2 m, laterite 1 m, hard rock 2.2 m.
		Srŏk Chhêb					
CP 1	*Khum Chhep	Phumĭ Chhêb Chăs (Phum Chhep Chás).	12–28–62	7	2.0	60	Soil 2 m, peat 2 m, clay and pebbles 3 m.
CP 2	do	do	12–29–62	5.2	2.0	100	Peat 2 m, laterite 1 m, gravel 2.2 m.
CP 3	do	do	12–27–62	5	1.5	120	Soil 1.5 m, yellow clay 1.5 m, laterite 2 m.
CP 4	do	Primary School	12–29–62	8	---	NP	Laterite and clay 5.6 m, hard rock 2.4 m.

TABLE 18.—*Records of wells in Khêt Preăh Vihéar*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	(Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Chhĕb—Continued					
CP 5	*Khum Chhep	Primary School	12–29–62	8.5	---	NP	Soil 2 m, clay 2 m, laterite 2 m, peat 1 m, rock 1.5 m.
CP 6	do	*Phum Saem	----do--	7	---	NP	Red clay and stone 3 m, hard rock 4 m.
CP 7	do	do	12–30–62	7	---	NP	Soil 2 m, laterite 1 m, rock 4 m.
CP 8	*Khum Sala		12–27–62	7.2	---	NP	Soil 2 m, clay 2 m, laterite 2 m, rock 1.2 m.
CP 9	do		12–28–62	7.2	2.5	50	Soil 2 m, clay 4 m, laterite 1.2 m.
		Srŏk Roviĕng					
R 1	*Khum Preah Khleang.	Bahal (Phum Pahal)	12–28–62	5.7	---	NP	Soil 2 m, red clay 2 m, stone 1.7 m.
R 2	do	do	----do--	9.9	---	NP	Soil 2 m, clay and sand 6 m, hard rock 1.9 m.
R 3	*Khum Sré-Thom	*Sala	12–29–62	4.9	---	NP	Soil 2 m, white clay 2 m, stone 0.9 m.
R 4	do	School of Rovieng	12–29–62	9.9	---	NP	Soil 2 m, clay, sand, and laterite 6 m, rock 1.9 m.
R 5	Phumĭ Bak Kdaông (Khum Bak-Kdong).	Rovieng Pagoda	----do--	8	---	NP	Soil 2 m, clay and sand 5 m, sand and stone 1 m.

4.9 to 17.0 m, and are 8.8 m deep on the average. Water levels were recorded in 25 wells. Depth to water ranged from 0.9 m to 5.0 m, and was 2.2 m on the average below land surface.

Khêt Preăh Vĭhéar has four srŏks. No wells are recorded for the former western srŏk, Srŏk Chŏng Kal. Of the 50 wells drilled in Srŏk Choâm Khsant, the north-central srŏk, only 23 were productive. Of the nine wells drilled in the eastern srŏk, Srŏk Chhêb, four were productive. Of the five wells drilled in the south srŏk, Srŏk Rŏviĕng, none were productive. In further prospecting for ground water in Khêt Preăh Vihéar, it is recommended that the hydrojet method be used only for reconnaissance. Where bedrock is encountered, the cable-tool or percussion-type drill should be used, but where thicker unconsolidated sediments are found, the rotary drill would be preferable. It is evident that much more effective development of ground water can be accomplished with the proper drilling equipment.

KHET SIEMREAB

Khêt Siĕmréab in northwestern Cambodia is noted for the locale of Angkor Wat, the famous temple and ruins of the great Khmer civilization. Until 1964, Khêt Siĕmréab was the third largest khêt of Cambodia, but with the creation of Khêt Preăh Vĭhéar, about 382,000 hectares were transferred to the new khêt, leaving a remnant area of about 1,213,000 hectares. Now Khêt Siĕmréab is the sixth largest among the 18 khêts. It is estimated that the present population of Khêt Siemréab is about 250,000.

The great lake, the Tônle Sap, whose elevation is about 9 m above sea level, is the base level of the khét. The Stoĕng Chikrêng, Stoĕng Tanat, Stoĕng Srêng, Stoĕng Kâmpóng Krâsăng (Stung Kompong), and several smaller streams drain the plain, which rises to a central range of rugged hills, the highest of which is about 487 m above sea level. The plain skirts the western end of these hills and rises gradually to about 75 m at the foot of the Chuŏr Phnum Dângrêk along the border with Thailand. The highest point on this rugged border is 483 m above sea level. The average elevation of the plain is about 40 m above sea level.

As shown on plate 1, the most widespread geologic unit is the Old Alluvium composed of sand, silt, clay, and laterite with a few layers of gravel. On the shores of the Tonle Sap, and reaching elevations of 20 to 25 m above sea level, is the sandy silt and clay of Young Alluvium. The central range of hills and the Chuŏr Phnum Dângrêk consist of well-cemented ferruginous sandstone of the Upper Indosinias Formation. Two cones of rhyolite and

one small inlier of Permian limestone protrude above the plain to complete the geologic setting.

Wells were drilled by US AID in all five srŏks (now nine) of Khêt Siĕmréab but chiefly in the southern part of the khêt as summarized in table 19. Of the 71 wells drilled, 62 were productive.

Six wells were drilled in Srŏk Chikrêng to depths ranging from 7.9 to 27 m (average 13.6 m). Water levels in two of them were 5 and 5.5 m below land surface. Three were nonproductive; the other three each yielded 18 to 19 l/min.

Eight wells were drilled in Srŏk Sotr Nĭkom. Six were productive with an average yield of 26 l/min. Water levels reported for 3 wells were 0.9, 0.5, and 0.8 m below land surface. Depths of the wells ranged from 7.3 to 29.3 m (average 16.7 m).

In Srŏk Siĕmréab, near the khêt capital, Siĕmréab (Siem Reap), and the famous Angkor Wat, 36 wells were drilled of which 34 are productive. Yields ranged from 15 l/min to 1,330 l/min. Apart from 7 deeper wells at Siĕmréab, Angkor Wat and Phumĭ Spéan Ânkôr (Angkor village), 29 other wells had an average depth of 10.7 m, an average water level of 4.4 m below land surface, and an average yield of 48 l/min. In 18 of these wells the producing aquifer is in a nominal clay.

In Srŏk Puŏk, adjacent to Srŏk Siĕmréab, all 16 wells drilled were productive, at an average depth of 14.4 m, and an average rate of 19 l/min. The three recorded water levels averaged 1.0 m below land surface.

In Srŏk Krâlanh, on the west side of the khêt, three out of five wells were productive. The average depth of the wells was 14.8 m. The average yield of the three productive wells was 21 l/min, and the average water level was 1.1 m below land surface.

All the logs indicate alluvium, and no geologic section has been outlined because the wells are not particularly deep (the deepest, Sr 7, is 58 m) and are only approximately located. Hard rock was not reached in the bottom of any well, although red clay and stone is described in the lowest of 6 m of K 4 and K 5. Consequently, the thickness of the alluvium is not known. Most of the wells were drilled in Young Alluvium, but a few, at Angkor Wat and Phumĭ Spéan Ângkôr were drilled in Old Alluvium. Laterite is not mentioned in the logs.

A special effort was made to develop a water supply for Siĕmréab in 1960 and 1961. Four wells, Sr 2–5, of moderate to high capacity were developed at depths of 32, 30, 39, and 29 m, respectively. Specific capacity tests, run on three of these, are described in table 20.

TABLE 19.—*Records of wells in Khêt Siĕmréab*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: D, dry; P, poor; NP, nonproductive; NR, not reported. Remarks: A, chemical analysis available]

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Chikrêng					
Cg 1	Kâmpóng Kdei (Khum Kg. Klei).	Phumĭ Chikrêng	8–28–61	9.8	5.0	18	Clay 9 m, sand 0.8 m.
Cg 2	do	Kâmpóng Kdei	8–21–61	8.8	5.5	18	Clay 7.5 m, sand 1.3 m.
Cg 3	do?	*Sala	10–20–61	27	---	NP	Gray stone 3 m, sand 6 m, gravel and sand 18 m.
Cg 4	do	Vôtt Mni Sŏphŏn (Spean Thnot Pagoda).	10–23–61	18.9	---	NP	Clay 9 m, undetermined 9.9 m.
Cg 5	do	do	10–25–61	9	---	NP	Clay 9 m.
Cg 6	do	do	10–28–61	7.9	---	19	Clay 7.9 m.
		Srŏk Sotr Nĭkom					
S 1	Phumĭ Kântreăng (Khum Kan Treang).	Phumĭ Srĕt (Phum Sret School).	9–19–61	12.1	0.9	28	Sand 3 m, clay 8.6 m, sand 0.5 m.
S 2	Phumĭ Balăng Khum Balang).	*Phum Pathom	9–22–61	12.7	---	28	Sand 3 m, clay 8.7 m, sand 1.0 m.
S 3	do	Vôtt Trach (Phum Trach Pagoda).	9–20–61	7.3	---	18	Clay 6 m, white clay and sand 1.3 m.
S 4	do	Phumĭ Trâpeăng Pŏuthĭ (Phum Trapeang Po).	10– 9–61	9.5	0.5	28	Sand 3m, clay 5.5 m, sand 0.5 m.
S 5	Phumĭ Balăng	Phum Trapeang Thkao.	10–15–61	7.3	0.8	28	Sand 3 m, clay 3.9 m, sand 0.4 m.
S 6	Phumĭ Trâpeăng Thum (Khum Trâpeang Thom).	Phumĭ Yéang Tes (Phum Yeang Tes School).	9–25–61	29.3	---	NP	Sand 3 m, clay 7 m, red sand 19.3 m.

TABLE 19.—*Records of wells in Khêt Siĕmréab*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
Srŏk Sotr Nĭkom—Continued							
S 7	Phumĭ Trâpeăng Thum (Khum Trâang Thum).	----do	9–29–61	29	---	NP	Sand 3 m, clay 7 m, sand 19 m.
S 8	Phumĭ Dâmdêk (Khum Damdek).	----do	7–22–61	26	---	NR	Clay 6 m, gravel 6 m, sand 4 m, clay and sand 10 m.
Srŏk Siĕmréab							
Sr 1	*Khum Siemreap	Phumĭ Phnum Kraôm.	10–22–60	34	---	NR	Rock 10 m, clay 10 m, rock 14 m.
Sr 2	Siĕmréab	Water Plant	10–29–60	32	3.5	950	Sand 6 m, clay 14 m, red sand and gravel 12 m, A.
Sr 3	do	School	11–18–60	30	---	285	Sand 13 m, sand and clay 12 m, coarse sand 5 m.
Sr 4	do	City, by Hotel	12–16–60	39	2.7	1,330	Clay 8 m, clay with fine sand 5 m, fine sand 7 m, sand and clay 10 m, sand 9 m, A.
Sr 5	Siĕmréab	City, by Tribunal	1–27–61	29	3.2	380	Sand 3 m, clay and sand 13 m, sand 13 m.
Sr 6	*Khum Siemreap	Angkor Wat	6– 8–61	33	---	NP	Sand 3 m, yellow clay 8 m, sand 22 m.
Sr 7	do	Phumĭ Spéan Ângkôr (Angkor Village).	6–17–61	58	---	NP	Clay, gravel and sand.
Sr 8	Phumĭ Sâmbuŏr Khum Sambour).	Sala	9–26–61	8.1	---	20	Clay.

TABLE 19.—*Records of wells in Khêt Siĕmréab*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Siĕmréab—Continued					
Sr 9	Phumĭ Sâmbuŏr (Khum Sambour).	Phumĭ Prey Thum	10– 9–61	8.4	---	15	Sand 3 m, clay 3 m, clay and sand 2.4 m.
Sr 10	*Khum Kândék	Phumĭ Svay Thum (Phum Svay Thom School).	10–20–61	7.6	0.9	28	Sand 2 m, clay 4.6 m, sand 1 m.
Sr 11	do	Trapeang Tin School	10–26–61	7.5	.97	25	Sand and clay.
Sr 12	*Khum Chreav	Phumĭ Chréav	12– 8–61	7.5	---	20	Do.
Sr 13	*Khum Nokor Thom	*Phum Muk Neak	4–18–63	10	3	40	Soil 3 m, clay 7 m.
Sr 14	do	do	4–19–63	9.8	2.5	50	Red clay 3 m, clay and sand 3 m, clay 3.8 m.
Sr 15	do	do	4–20–63	7	1.5	40	Red clay 3 m, sand 4 m.
Sr 16	do	do	4–21–63	10	3.5	50	Clay 10 m.
Sr 17	do	do	4–22–63	13.5	3.5	60	Clay 13.5 m.
Sr 18	do	do	----do--	13.2	2	50	Clay and sand 13.2 m.
Sr 19	do	do	4–29–63	10.3	4	60	Soil 3 m, clay and sand 3 m, clay 1 m, sand 3.3 m.
Sr 20	do	do	4–30–63	10	3	50	Soil 3 m, clay 7 m.
Sr 21	do	do	5– 3–63	12	3	50	Red clay 3 m, sand 6 m, clay 3 m.
Sr 22	do	do	----do--	13.3	4	50	Soil and clay 10 m, clay and sand 3.3 m.
Sr 23	do	do	5– 8–63	14.5	4	60	Soil 3 m, clay 11.5 m.
Sr 24	do	do	----do--	13.5	4	60	Soil 3 m, clay 10.5 m.

TABLE 19.—*Records of wells in Khêt Siemréab*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Siĕmréab—Continued					
Sr 25	*Khum Noker Thom	*Phum Muk Neak	5– 9–63	10	3	50	Clay 10 m.
Sr 26	do	do	do	10	3	50	Do.
Sr 27	do	do	5–10–63	10.1	4	50	Clay 10 m.
Sr 28	do	do	do	10.1	4	50	Do.
Sr 29	do	do	do	10.3	4	70	Soil 3 m, clay 3 m, clay and sand 4.3 m.
Sr 30	do	do	5–11–63	10.3	3.2	60	Do.
Sr 31	do	do	do	11.2	5	60	Red soil 3 m, sand 3 m, clay 5.2 m.
Sr 32	do	do	do	10.2	5	60	Do.
Sr 33	do	do	5–13–63	15.1	6	60	Clay 15. 1 m.
Sr 34	do	do	5–15–63	14.2	6	50	Clay 14.2 m.
Sr 35	do	do	5–16–63	10.2	5	50	Clay 10.2 m.
Sr 36	do	do	5–18–63	13.5	5	60	Clay 13.5 m.
		Srŏk Puŏk					
P 1	Phumĭ Khnat (Khum Khnat).		8–29–61	16.1	---	18	Soil 3 m, clay 13.1 m.
P 2	do	Phumĭ Chrâlông	9–15–61	35.8	---	18	Soil 3 m, clay 18 m, sand 14 m.
P 3	do	do	12– 5–61	7.4	---	15	Soil 3 m, sand 4.4 m.
P 4	do	Phumĭ Chrâlông (East).	12– 7–61	9.7	---	16	Soil 3 m, clay and sand 3 m, sand 3.7 m.
P 5	do	Phumĭ Koŭk Trach (Phum Koh Trach).	9–15–61	14.5	0.7	27	Sand 3 m, clay 10.5 m, sand 1 m.
P 6	do	do	9–17–61	8.7	1.0	27	Clay 7.7 m, sand 1 m.

TABLE 19.—*Records of wells in Khêt Siĕmréab*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Puŏk—Continued					
P 7	Phumĭ Khnat (Khum Khnat).	*Phum Prey Khmeng	12–10–61	8.4	---	16	Soil 3 m, clay 3 m, clay and sand 3.4 m.
P 8	do	Phumĭ Rôluŏs (Phum Rolors).	8–22–61	14.8	---	18	Soil 3 m, clay 6 m, clay and sand 5.8 m.
P 9	do	do	8–26–61	17.5	---	16	Clay, sand, and gravel.
P 10	*Khum Tatrav	Phumĭ Tapang	9–13–61	16.9	1.2	25	Sand 3 m, clay 12.9 m, sand 1 m.
P 11	do	Vôtt Slat Rumchey (pagoda) (Wat Slat).	12–13–61	9.1	---	18	Soil 3 m, clay 3 m, clay and sand 3.1 m.
P 12	do	Phumĭ Ta Trav	12–14–61	9.1	---	18	Soil 3 m, clay and sand 3 m, sand 3.1 m.
P 13	*Khum Tatrav	Tapang	12–16–61	8.9	---	20	Soil 6 m, clay and sand 2.9 m.
P 14	do	Phumĭ Svay Chék	12–23–61	16.8	---	NR	Soil 3 m, clay, gravel and sand 9 m, sand 4.8 m.
P 15	do	Phumĭ Baôs Ta Trav	12–26–61	11.8	---	NR	Soil 3 m, mud 3 m, gravel and clay 3 m, sand 2.8 m.
P 16	do	Phumĭ Koŭk Kók (Kok Kak).	12–28–61	8.9	---	NR	Soil 3 m, clay 3 m, gravel and sand 2.9 m.

TABLE 19.—*Records of wells in Khêt Siĕmréab*—Continued

Well no.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Krâlănh					
K 1	Krâlănh (Khum Kralanh).	*Phum Taver	8–17–61	17.4	1	18	Clay 16 m, clay and sand 1.4 m.
K 2	*Khum Sranal	Phumĭ Koŭk Trom (Koh Thom School).	8–19–61	13.3	1.3	18	Clay 12.3 m, sand 1 m.
K 3	do	Phumĭ Srânăl	8–21–61	11.5	0.9	28	Sand 2 m, clay 8.5 m, sand 1 m.
K 4	*Khum Thmei	*Phum Dodantray	8–31–61	16.0	---	NP	Sand 3 m, clay 7 m, red clay and stone 6.0 m.
K 5	do	do	9– 2–61	16.0	---	NP	Do.

TABLE 20.—*Specific capacity tests at Siĕmréab*

Well	Water level (m)		Drawdown (m)	Specific Capacity (l/min per m of drawdown)
	Static	Pumping		
Sr 2	9.35	6.43	2.92	158
Sr 4	9.34	6.02	3.32	139
Sr 5	7.75	5.45	2.30	201

In these tests the rate of pumping was 462 l/min, and inasmuch as each well has more than 12 m of available drawdown, the potential yield from each of these wells is in the range of 1,700 to 2,460 l/min.

Water analyses by the Pasteur Institute at Phnom Penh of the city wells at Siĕmréab indicate mildly acid pH, slight turbidity (incomplete development), low dissolved solids, soft, low chlorides, and high iron, as shown in table 21, and no pollution.

TABLE 21.—*Water analyses of the city wells at Siemréab, 1961*

Feature	Sr 2		Sr 4	
	July 31	Aug. 10	July 31	Aug. 10
pH	5.6	5.5	5.5	5.3
Resistivity (ohm-cm at 25°C).	36,000	40,320	30,240	59,040
Turbidity (mg/l SiO_2)	2.9	.8	4.6	2.7
Hardness (as mg/l) $CaCO_3$).	14	6	20	6
Chloride (Cl) (mg/l)	12.5	14.8	10.9	8.6
Iron (mg/l)	0.8	1.3	1.9	2.5
Manganese (mg/l)	0	0	0	0
Total solids (mg/l)	41.6	30.4	45.6	32.8
Coliform bacteria per litre.	0	0	0	0

KHET BATDAMBANG

Khêt Bătdâmbâng is located in northwestern Cambodia in the headwaters of the Tonle Sap depression and along the boundary with Thailand. Khêt Bătdâmbâng, the largest khêt in Cambodia, encompasses an area of 1,855,000 hectares and contained a population reported at 551,860 in 1962.

Most of Khêt Bătdâmbâng is a vast interior plain bound on the north by the Thiu Khao Phanom Dong Rak (Dangrek Escarpment of Thailand) and on the south by the rugged Chuŏr Phnum Krâvanh. The base level of the region is at the surface of the Tônlé Sap, about 9 m above sea level. From there the plain rises gradually to 20 m above sea level at Bătdâmbâng and at

Sisŏphŏn. Along the base of the Chuŏr Phnum Dângrêk (Dangrek Escarpment) the plain is about 80 m above sea level. The escarpment towers over the plain, with a high point along the coast at 505 m above sea level. On the south the plain merges rather abruptly with the Chuŏr Phnum Krâvanh. Along the Thai border the highest peak is 1,271 m above sea level, and several ridges stand more than 1,000 m above the sea. Numerous tributaries to the Tonlé Sap drain the plain and the mountains. The Stŏeng Môngkól Borei and Stŏeng Kâmpông Krâsăng carry the greatest flow.

As shown on the geological map (pl. 1) the predominant formation, occupying the vast central plain, is the Young Alluvium. A sizable area in the northern sector of the Khêt is covered by Old Alluvium. In the Chuŏr Phnum Krâvanh mountain massif to the south is a complex of consolidated sedimentary rocks associated with intrusive and extrusive igneous rocks. No Old Alluvium is mapped in the south at the base of the Chuŏr Phnum Krâvanh. Apparently there has been subsidence, so that active erosion of the mountains has buried any Old Alluvium beneath a mantle of Young Alluvium.

The Chuŏr Phnum Krâvanh is composed of resistant Mesozoic and Paleozoic sedimentary rocks which lie around a core of crystalline rocks. The core is made up of gabbro intrusive into crystalline schists. Sandstone, conglomerate, breccia, and sandy shale of the Indosinias Formation, partly covered and partly intruded by basalt, andesite, dacite, and rhyolite, add to the complexity of the massif. Permian limestones and Devonian limestone, marl, siltstone, sandstone, and shale crop out on the fringes of the mountain massif and also in isolated hills.

Because only four wells have been drilled, very little is known about the subsurface water-bearing characteristics of the khêt. One hole (SS 1) drilled in the city of Bătdâmbâng on April 4, 1961 about 60 m north of the electric plant, was abandoned at 30 m in alluvium. The log of SS 1 is as follows:

Lithology	*Depth (metres)*	*Thickness (metres)*
Gray clay	7	7
Yellow clay	12	5
Black and white gravel	15	3
White clay with fine sand	30	15

The other three wells (PSr–1, 2, and 3) were drilled in Khŭm Srăh Chhuk (Khum Sras Chik), Srŏk Phnom Srŏk, as shown on plate 1. These wells produced water from alluvium and bedrock. Their records are as follows:

PSr–1 Primary School at *Wat Thlang. Begun March 14 and finished March 17, 1963. Yields 40 l/min. Static water level, 6 m below land surface. No screen.

Lithology	*Depth (metres)*	*Thickness (metres)*
Soil	2	2
Black and yellow clay	9.5	7.5
Clay and sand	15	5.5
Yellow and red clay	30	15
Red bedrock	50	20

PSr–2 Srăh Chhuk (school). Begun March 19 and finished March 21, 1963. Static water level, 4 m below land surface. No screen.

Lithology	*Depth (metres)*	*Thickness (metres)*
Black clay and sand	5	5
Yellow clay	7	2
Black sand	10	3
White, yellow, and red rock	15	5
Red rock	20	5
Rock and red clay	25	5
Red rock	30.5	5.5

PSr–3 *Sala Srok Phnom Srok. Begun March 25 and finished March 29, 1966. Yield 50 l/min. Water level, 5 m below land surface. No screen.

Lithology	*Depth (metres)*	*Thickness (metres)*
Red sand	1	1
Black and yellow clay	9	8
White and red rock	11.5	2.5
White and red clay	18	6.5
White clay and red stone	22	4
White clay	26	4
Red clay	47	2
White and black rock	57	10

These three logs indicate that the alluvium ranges from at least 10 m to 47 m thick.

Numerous streams draining the Chuŏr Phnum Krâvanah are ephermeral. The flow is intermittent and disappears in the apron of permeable alluvial sediments at the base of the mountains. Lower on the plain, numerous water-table lakes appear. The compound alluvial fans eventually may deserve investigation and exploration for ground water.

The ground-water resources of Khêt Batdâmbâng remain virtually unexplored.

KHET POUTHISAT

Khêt Pŏuthĭsăt is in west-central Cambodia and contains a surface area of 1,230,000 hectares with a population reported at 180,324 in 1962. About four-fifths of the Khêt consists of the rugged Chuŏr Phnom Krâvanh, and the remainder is part of the

Tonle Sap (basin). Elevations range from 9 m above sea level on the water surface of the Tonle Sap, to 1,551 m on a peak in the mountains. The Chuŏr Phnum Krâvanh is well drained. The Stŏeng Poŭthisăt (Stung Tamyong) drains about two-thirds of the chain to the Tonle Sap, and the remainder drains westward to the Gulf of Thailand.

The Chuŏr Phnum Krâvanh are composed predominantly of the Indosinias Formation of sandstone and conglomerate, underlain by shale, sandstone, limestone, and marl of Devonian and early Carboniferous age (pl. 1). Small areas are covered by basalt, dacite, and rhyolite.

There is only one well record available in the khêt, and it was of an unproductive well. The log is given below:

Subdivision of the Public Works Poŭthisăt (Pursat). Begun October 9 and completed November 21, 1962.

Lithology	*Depth (metres)*	*Thickness (metres)*
Fine sand	7	7
Fine sand and gravel	11	4
Gravel and white clay	14	3
Coarse, white sand	16	2
Sand, white and brown earth	21	5
Brown earth with stones	28	7
Sand and white stone	32	4
Earth, sand, and stone	35	3
Muddy sand and hard rock	56	21
Hard rock	59	3
Clay and rock	76	17
Pure clay	86	10
Hard, white to black rock	97	11

The material down to 21 m is interpreted as alluvium. From 21 m to 86 m the material resembles a landslide deposit, or a talus rubble. Bedrock occurs at 86 m.

The sandstone mountains probably absorb considerable infiltration from rainfall and deliver it as base flow to the main rivers. The alluvium on the plain may ultimately provide large yields to water wells, but until further drilling is done the ground-water possibilities remain undetermined.

KHET KAMPONG CHHNANG

Khêt Kâmpóng Chhnang is in central Cambodia astride the Tônlé Sab between the "Quatre Bras" and the Tonle Sap. The surface area is 535,000 hectares, fifth from the smallest of the 18 khêts. The population was 273,027 inhabitants in 1962.

Elevations range from 4 m on the backswamp behind the natural levee of the Tonle Sap to 1,771 m in the Chuŏr Phnum Krâvanh, 58 km southwest of the khêt capital, Kâmpóng

Chhnang. Three fourths of the khêt is a plain sloping away from the foot of the Chuŏr Phnum Krâvanh at about 100 m altitude, north, east, and south, with an average elevation of about 40 m. The khêt is well drained by streams tributary to the Tonle Sap.

Khêt Kâmpóng Chhang is dominated by a granite massif in the Chuŏr Phnum Krávanh. Smaller stocks and bosses of granite crop out at seven other places in the khêt. Devonian and Carboniferous shale, sandstone, limestone, and marl have been intruded by the granite, and contact metamorphic rocks occur at several places. Dacite and rhyolite form sheet-flow microcrystalline rocks in two areas. Small outcrops of the Indosinias sandstone and conglomerate also occur. The higher terrace of the plain is composed of Old Alluvium, sand, gravel, laterite, silt, and clay. In the trough bordering the Tonle Sap the silt and clay of the Young Alluvium is dominant.

Table 22 gives data on the characteristics of 22 wells drilled in Khêt Kâmpóng Chhnang. The wells are distributed in three of the five srŏks. Around the capital, Kâmpóng Chhnang, 7 of 11 wells were productive. In Srŏk Kâmpóng Trâlach, only two wells were drilled for water, and both were productive. Seven holes were drilled as foundation tests to an average depth of 11.6 m. Two successful wells were drilled at Phumĭ Rôméas in Srŏk Tŏek Phŏs. The water wells range in depth from 18 to 80 m and are 36.7 m deep on the average. The wells range in yield from 49 to 200 l/min and yield 114 l/min on the average. Approximate locations of the wells are given in plate 2.

Although much of the khêt remains to be explored by drilling, three generalities may be made. The hard rock of the western mountains yield little water to the wells. The Young Alluvium in the trough bordering the Tonle Sap will yield small quantities of water. The most productive area for ground water is probably the terrace plain of the Old Alluvium.

KHET KAMPONG SPOE

Khêt Kâmpóng Spoe is in west-central Cambodia, astride the border of the mountains and the plain. It contains 680,000 hectares and had 307,354 inhabitants in 1962. The khêt is well drained by three branches of the Prêk Tnaôt (Prek Thnot), which flows into the Tônlé Basăk below Phnom Penh. The western quarter of the khêt lies on the Khpóng Réab Kirirôm (Kirirom plateau), with elevations about 1,000 m above sea level. South of the khêt capital, Kâmpóng Spoe, is a range of rugged hills that rise to 706 m above sea level. The low point in the khêt is in

TABLE 22.—*Records of wells in Khêt Kâmpóng Chhnang*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: NP, nonproductive. Remarks: AB, abandoned; FT, foundation test hole; L, log available]

Well No.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Kâmpóng Trâlach					
KTr 1	Phumĭ Svay Pôk (Khum Svay).	Phumĭ Thmei (1) (Phum Thmey).	4– 6–62	28	7	200	Soil 4 m, black stone and clay 18 m, rock 6 m, L.
KTr 2	*Long Vek	Phumĭ Phsar Trach (Phum Psar Trach).	4–25–62	25	6	150	Soil 10 m, black rock 15 m, L.
KTr 3?	Khŭm Tbêng Khpós? (Khum Tbeng-Khpas).	*Veal Tranh	5–14–62	12	---	---	FT, sand 1 m, laterite and clay 10 m, rock 1 m, AB.
KTr 4?	do	do	5–18–62	13	---	---	FT; sand 1 m, laterite 5 m, clay 6 m, pebbles 1 m, AB.
KTr 5?	do	do	5–22–62	12	---	---	FT, sand 1 m, laterites 5 m, clay, gravel, and laterite 6 m, AB.
KTr 6?	do	do	5–23–62	13	---	---	FT, laterite 3 m, clay 6 m, soft-white rock 4 m, AB.
KTr 7?	do	do	5–26–62	10	---	---	FT, laterite 4 m, clay 5 m, rock 1 m, AB.
KTr 8?	do	do	6– 8–62	12	---	--	FT, laterite 2 m, chalk 4 m, limestone 4 m, rock 1 m, AB.

TABLE 22.—*Records of wells in Khêt Kâmpóng Chhnang*—Continued

Well No.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Kâmpóng Tralach—Continued					
KTr 9?	Khŭm Tbêng Khpós (Khum Tbeng-Khpas).	*Veal Tranh	6- 9-62	8	---	---	FT, laterite, clay and black earth 8 m, AB.
		Srŏk Rôléa P'iĕr					
RP 1	Kâmpóng Chhăng	Public Works	1-22-61	22	---	190	Clay 19 m, hard rock, 3 m, L.
RP 2	do	Director's house	2-19-61	48	---	114	Clay 19 m, soft rock 14 m, fractured rock 15 m, L.
RP 3	do	Water treatment plant.	---	---	---	NP	---
RP 4	do	Animal farm	3-13-61	30	---	114	Clay 10 m, clay and rock 12 m, rock and sand 8 m, L.
RP 5	Prey Khmêr (Khum Roléa Peir).	Phumĭ Chrey Băk (Chrey Bac School).	5-30-61	28	---	49	Red sand 5 m, clay 10 m, stone 13 m, L.
RP 6	*Khum Kampong Chhnang.	Phumĭ Khsam	6-13-61	31	---	114	Sand and red clay 5 m, white clay 5 m, rock 21 m, L.
RP 7	do	Vôtt Khsam (Wat Khsam).	7-11-61	48	---	114	Sand and clay 15 m, stone 23 m, L.
RP 8	Prey Khmêr	Phumĭ Chrey Băk (Chrey Bac).	---	41.7	---	95	Sand and clay 15 m, clay 10 m, rock 16.7 m, L.
RP 9	Phumĭ Chrey Băk	Police Academy	1- 8-63	18	---	NP	Red sand 18 m, AB.
RP 10	do	do	1-31-63	80	---	NP	Red sand 7 m, laterite 19 m, black rock 61 m, AB.

TABLE 22.—*Records of wells in Khêt Kâmpóng Chhnang*—Continued

Well No.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Rôléa P'iĕr—Continued					
RP 11	Phumĭ Chrey Bak	Police Academy	2–18–63	38	---	NP	Red sand 10 m, laterite 16 m, gray rock 12 m, AB.
		Srŏk Tŏek Phŏs					
TP 1	Khlŏng Pôpôk (Khum Khlong Popok-Barang).	Phumĭ Rômeas (Romeas Dispensary).	4– 6–61	30	20	57	Sand with clay 10 m, gravel 6 m, soft rock 14 m, L.
TP 2	do	Phumĭ Rômeas	5–20–61	46	---	57	Rock 3 m, clay and rock 17 m, stone 26 m, L.

the rice-growing area in the eastern prong, about 10 m above sea level. The plain rises gradually to the base of the hills and mountains at an elevation of about 100 m, with an average elevation approaching 50 m. The plain is dominantly Old Alluvium, with beds of sand, gravel, laterite, and clay that contain a good aquifer. The rugged hill mass south of Kâmpóng Spoe is composed chiefly of sandstone, sandy shale, and conglomerate of the Indosinias Formation. Along its northern margin however, are Devonian and Carboniferous rocks, mapped as shale, siltstone, sandstone, limestone, and marl. These rocks, intruded by massive granite, underlie most of Srŏk Thpông at the north. All these rocks contain little ground water. To the west, the plateau of Khpóng Réab Kirirôm is composed of the microcrystalline volcanic rocks, chiefly dacite and rhyolite, which are in contact with the Indosinias Formation. The water-bearing potential of the volcanic rocks is not known.

Water wells have been drilled in three of the five srŏks of Khêt Kâmpóng Spoe. Of the 39 holes, 14 were nonproductive, 1 was foundation test, and 24 produced water (see table 23 and pl. 2). Partial chemical analyses of water samples from three wells in Khêt Kâmpóng Spoe are given in table 24. The three analyses indicate neutral to alkaline waters, very hard, and iron-free. The chloride content STo–8 is high for an inland water, but not high enough to be noticed by taste. The water is usable for many purposes, but would have to be softened for laundry use, and distilled for boiler use.

In Srŏk Kŏng Pĭsei KP 2 produced 600 l/min; KP 3, 4, and 5 were also productive. KP 1 was a foundation test for a bridge. The wells ranged from 26.2 to 65 m deep, with static water levels averaging about 10 m below land surface. In Srŏk Phnŭm Sruŏch only three out of nine wells were productive. PS 2 yielded 200 l/min. Two nonproductive test holes, 300 and 421 m deep, were drilled in a vain search for water for the military barracks. In Srŏk Sâmraông Tông, 25 wells were drilled, 17 of them productive. Depths ranged from 8 to 54 m, with an average of 28.2 m. Water levels ranged from 5 to 37 m. Yields ranged up to 200 l/min and averaged 109 l/min.

Plate 3 (*C–C′*) is a geologic section along National Route 4, the Friendship Highway, which shows the lithology with little interpretation. Details of the structure and stratigraphy are not known.

TABLE 23.—*Records of wells in Khêt Kâmpóng Spoe*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: NP, nonproductive; NR, not reported. Remarks: AB, abandoned; L, log available; TH, test hole or exploratory well]

Well No.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Kŏng Pĭsei					
KP 1	*Khum Preah Nipean	Stung Tock	3–30–62	30	---	NR	FT, sand 14 m, red clay 16 m, AB.
KP 2	Khŭm Rôkar Kaôh (Khum Roka Koh).	Sophy School	11–20–62	26.2	10.0	600	Sand 4 m, clay 14 m, gray rock 8.2 m, L.
KP 3	do	Sophy Pagoda	11–29–62	48	10.0	40	Sand 2 m, clay 18 m, limestone 4 m, sand 4 m, rock 20 m, L.
KP 4	do	*Phum Kamrien	12–12–62	40	10.0	400	Sand 6 m, clay 9 m, gray rock 25 m, L.
KP 5	do	Phumĭ Prey Ta Ok (Phum Ta Ok).	1–17–63	65	10.0	30	Sand 2 m, clay 11 m, black rock 52 m, L.
		Srŏk Phnum Sruŏch					
PS 1	Tăng Srâlau (Khum Tang Syar).	Infirmary Trap. Kraloeng.	9–11–62	21.5	20	80	Clay 8 m, blue-black rock 13.5 m, water analysis, L.
PS 2	*Khum Au	Phumĭ Prey Sraông (Phum Talal).	10– 4–62	37.5	34.5	200	Fine sand 6 m, red earth 16 m, yellow clay 13 m, sand 2.5 m, L.
PS 3	Châmbák Dângkôm (Khum Chambâk).	Srê Khlong (Sre Khlong Barracks).	12–12–62	300	---	NP	Sand and clay 6 m, laterite 3 m, black earth 29.1 m, TH, AB.

TABLE 23.—*Records of wells in Khêt Kâmpóng Spoe*—Continued

Well No.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Phnum Sruŏck—Continued					
PS 4	---do---	---do---	3–19–63	421	---	NP	Sand and clay 10 m, black clay 140 m, clay and sand 271 m, TH, AB.
PS 5	---do---	---do---	3–29–63	25	---	NP	Sand 2 m, clay and sand 5 m, black earth 18 m, AB.
PS 6	*Khum Au	Khpóng Réab Kirirôm (Kirirom plateau) (Plateau de Kirirom, Damnak Samdech).	1–16–63	58	---	NP	Laterite and stone 25 m, rock 25 m, yellow soil 8 m, AB.
PS 7	---do---	---do---	1–20–63	37	---	NP	Fine sand 14 m, rock and sand 5 m, sand 4 m, earth 14 m, AB.
PS 8	---do---	---do---	1–25–63	35	---	NP	Earthy sand 14 m, earthy rock 15 m, rock 6 m, AB.
PS 9	---do---	---do---	2–15–63	41	37	NR	Earthy sand 14 m, earthy rock 8 m, rock 19 m, L.
		Srŏk Sâmraông Tôông					
STo 1	Kâmpông Spoe	Morum Pagoda	4– 6–63	15.8	11.5	35	Clay and sand 10 m, sand 3.3 m, rock 2.5 m.
STo 2	Phumĭ Prey Phdau (Prey Pdau).	Model School	1–29–63	25	21	80	Clay 6 m, sand 4 m, soft rock 5 m, sand 10 m, L.
STo 3	Khŭm Krăng Âmpil (Khum Kraing Ampil.)	*Phum Krang Tralach	3– 2–63	30	---	NP	Clay 9 m, gray rock 21 m.

TABLE 23.—*Records of wells in Khêt Kâmpóng Spoe*—Continued

Well No.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Sâmraông Tông—Continued					
STo 4	Khŭm Krăng Âmpil	*Phum Krang Tralach	3– 8–63	31	24	80	Clay 10 m, gray rock 21 m, L.
STo 5	do	Ang Po Pagoda	2–21–63	30	22	150	Sandy clay 15 m, gray rock 15 m, L.
STo 6	do	Ang Po Pagoda	2–23–63	12	---	NP	Laterite 1 m, clay 8 m, gray rock 3 m, AB.
STo 7	do	do	2–27–63	25.5	16.5	100	Laterite 1 m, clay 8 m, gray rock 16.5 m, L.
STo 8	*Khum Samrong Tong? (Khum Trapeang Kong).	Trapeang Kong Pagoda.	11– 7–63	42	34	150	Clay and sand 15 m, black rock 27 m, water analysis, L.
STo 9	do	Sugar Refinery	12–27–62	50	8	150	Clay and sand 10 m, coarse sand 6 m, rock 34 m, L.
STo 10	do	do	2– 7–63	50	7	200	Sand 7 m, clay 17 m, sand and gravel 2 m, rock 24 m, L.
STo 11	Khŭm Rôleăng Châk	Amphe Phnom School	10–14–62	49	5	120	Clay 8 m, rock 46 m, L.
STo 12	do	*Ph Tuol Chek Khpos	11– 1–62	43.7	10.3	200	Clay and laterite 4 m, rock 39.7 m, L.
STo 13	do	Sport Chek Khpos	4–10–63	30	9	50	Laterite 2 m, gray clay 8 m, gray rock 20 m, L.

TABLE 23.—*Records of wells in Khêt Kâmpóng Spoe*—Continued

Well No.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Sâmraông Tông—Continued					
STo 14	Khŭm Rôleăng Châk		5–23–61	54	---	38	Clay 10 m, rock 44 m, L.
STo 15	do		5–25–61	47	---	NR	Sand 1 m, clay 19 m, rock 27 m, L.
STo 16	Khŭm Roleăng Kreul	Ang Sragne Pagoda	6–27–61	17	---	NP	Red clay 2 m, yellow clay 10 m, rock 7 m, L.
STo 17	do	do	7– 4–61	25	---	200	Soil 1 m, clay 13 m, rock 11 m, L.
STo 18	Phumĭ Khtum Krăng (Khum Krang Khtum).	Chhbar Horn Military Shop.	7–14–63	23	8	40	Soil 1 m, clay and rock 14 m, hard rock 8 m, L.
STo 19	do	do	6–17–63	21	9	50	Black earth 10 m, rock 11 m, L.
STo 20	do	*Chhbar Horn Chamcar.	6–20–63	10	---	NP	Yellow clay 2 m, clay and rock 6 m, rock 2 m, L.
STo 21	do	do	6–22–63	10	---	NP	Do.
STo 22	Phumĭ Kahêng (Khum Kaheng).	Phumĭ Kândaôl Dom (Kandal Dom School).	11–15–61	8	---	NP	Yellow earth 5 m, white earth 3 m, L.
STo 23	do	do	11–17–61	8	---	NP	Red earth 4 m, yellow earth 1 m, black earth 3 m, AB.
STo 24	do	do	11–20–61	8	---	NP	Black earth 3 m, white earth 2 m, yellow earth 3 m, L.
STo 25	do	do	9–20–62	40.9	6	100	Sand 2 m, clay 4 m, limestone 21 m, black slate 15.9 m, water analysis, L.

TABLE 24.—*Analyses of water from 3 wells in Khêt Kâmpóng Spoe*

Feature	PS 1	STo 8	STo 25
Conductivity (micromhos at 26°C.)	900	1,000	1,000
Turbidity (mg/l)	0	0.4	0
Iron (mg/l)	0	0	0
pH	6.9	7.9	8.9
NO_2 (mg/l)	0	0	0
Cl (mg/l)	15	175	65
Total hardness (as mg/l $CaCO_3$)	420	400	400

KHET KAOH KONG

Khêt Kaôh Kŏng in southwest Cambodia, is one of the larger khêts, with a surface area of 1,081,754 hectares, but only 38,670 inhabitants in 1962, the second smallest population. Khêt Kaôh Kŏng borders the Gulf of Thailand, and much of the khêt is mountainous. Elevations range from sea level to more than 1,000 m above sea level.

The northern and central mountains of Khêt Kaôh Kŏng are part of the Chuŏr Phnum Krâvanh and are formed of dissected sandstone and conglomerate of the Indosinias Formation. The eastern border of the khêt is part of the Chuŏr Phnum Dâmrei, a mountainous area formed of lower Paleozoic metamorphosed sedimentary rocks cut by granite, rhyolite, and dacite intrusives. The plateau of Khpóng Réab Kirirôm, a scenic area, forms part of this mountain complex.

Eighteen wells drilled in the khêt are recorded in table 25 and are shown on plate 2. The three shallow wells drilled in gray sand by the hydrojet method in Khêt Kaôh Kŏng were all nonproductive. One well drilled along at Chrâk Phnum Péch Nil (Pech Nil Pass) entered bedrock at 29 m and was nonproductive. Of the three wells drilled at the *Royal Chalet in Ochoeuteal, two were productive. One yielded 34 l/min, and the other 200 l/min. At Kirirôm (now in Khêt Kâmpóng Spoe), a recreation area on the plateau, three out of four wells drilled into bedrock were productive. Of two deep wells drilled at the construction camp at kilometre 153 on National Route 4, one was productive but was eventually abandoned. At *Kompong Somloeu, two out of four wells were productive, and one yielded 240 l/min. Water levels ranged from 5 m to 46 m below the land surface, and averaged 29 m.

Future drilling in Khêt Kaôh Kŏng will probably encounter difficulties with sand and rock similar to those difficulties experienced in these wells. Most of the khêt remains to be explained, but it is expected that large yields will not be obtained from wells and that small (20–100 l/min) and moderate (100–400 l/min) yields must suffice. There is no record of the quality of water

TABLE 25.—*Records of wells in Khêt Kaôh Kŏng*

[Well no.: see text for explanation of well numbering system. Date well completed: month, day, and year. Depth: referred to land surface. Depth to water: referred to land surface. Yield: NP, nonproductive; NR, not reported. Remarks: AB, abandoned; L, log available]

Well No.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Kaôh Kŏng					
KK 1	Phumĭ Kaôh Kong (Koh Kong).	Public Works	1–31–62	12	---	NP	Gray sand, AB.
KK 2	*Khum Koh Po	Krŏng Kaôh Kŏng (Khemarak Phouminville).	2– 2–62	8	---	NP	Do.
KK 3	Phumĭ Kaôh Kong	Garden	2– 4–62	6	---	NP	Do.
		Srŏk Kâmpóng Saôn					
KSo 1	Chrâk Phnum Péch Nil (Pech Nil pass).	Km 102	7–19–60	34.5	---	NP	Soil and clay 3.5 m, rock 1 m, clay and sand 27 m, rock 5.5 m, AB.
KSo 2	Phumĭ Phnum Srâlau (Kompong Som).	*Royal Chalet, Ochoeuteal.	5–14–62	64	---	34	Sand 10 m, sand and clay 2 m, clay 5 m, rock 18 m, clay and sand 24 m, L.
KSo 3	do	do	7– 6–62	15	---	NP	Fine sand 6 m, clay 4 m, clay and gravel 5 m, AB.
KSo 4	do	do	8–18–62	40	34	200	Fine sand 11 m, clay 19 m, coarse sand 10 m, L.
KSo 5	Kirirôm (now in Khêt Kâmpóng Spoe, Srŏk Phnum Sruŏch).	Technical Quarter	4–24–63	60	---	NP	Fine sand 6 m, rock 9 m, red earth 2 m, bedrock at 42 m.
KSo 6	do	Delegation Office	5– 1–63	57	45	NR	Clay and red rock, L.

TABLE 25.—*Records of wells in Khêt Kaôh Kŏng*—Continued

Well No.	Town or village	Locality	Date well completed	Depth (metres)	Depth to water (metres)	Yield (litres per minute)	Remarks
		Srŏk Kâmpóng Saôn—Continued					
KSo 7	Kirirôm	Chalet Royal	4–27–63	51	46	NR	Sand 10 m, gray rock 41 m, L.
KSo 8	do	do		51	22	NR	Sand 12 m, earth and rock 39 m, L.
KSo 9	Stŏeng Chhay (Stung Chhay).	Camp at km 153	5–29–63	80	---	NR	Fine sand 6 m, rock 74 m, AB.
KSo 10	do	do	7–12–63	130	---	NP	Earth and sand 7 m, white, brown, red, blue, black rock, AB.
KSo 11	*Kompong Somloeu	Colonel's house	3–26–63	24	---	NP	Clay 3 m, laterite 1 m, clay and earth 11 m, rock 9.3 m, AB.
KSo 12	do	do	3–30–63	9	5	30	Black earth 1 m, clay 2 m, laterite 3 m, clay 3 m, L.
KSo 13	Khŭm Chikhâ (Khum Chikka) (now in Khum Trâpeăng).	Srê Âmbel (ODEM)	4– 6–63	125	---	NP	Clay 47 m, multi-colored rock, 78 m, AB.
KSo 14	*Kompong Somloeu	Vet Annex FARK	5–12–63	27	21	240	Sand 15 m, clay 10.5 m, granite 10 m, schist 5 m, L.
KSo 15	do	Brickworks FARK	5–26–63	50	---	NP	Sand 3 m, clay 11 m, granite 12.5 m, schist 23.5 m, AB.

from wells in the khêt, but as most of the land is well drained and well above sea level, the water is probably fresh and usable for most purposes.

FUTURE DEVELOPMENT OF GROUND WATER

Water from streams and lakes will probably always provide the dominant source of water supply in Cambodia. Ground water, however, can provide an important dry-season supplement to surface-water sources, as well as a principal source for small industry, minor irrigation, and domestic and rural needs. Where induced recharge to well fields can be obtained through alluvial aquifers from nearby streams, large supplies for municipal use are potentially available.

Table 26 summarizes the yield, depth, and number of wells on record with US AID in the khêts of Cambodia through 1963. All but 13 of these are drilled wells. The 13 dug or bored wells were scheduled by Cushman (1958). There are, of course, hundreds of other dug or bored wells in Cambodia not recorded or appraised in this investigation.

Many more wells can be drilled in Cambodia in areas now productive, and more than half the country remains to be explored by drilling. Two eastern Khêts, Môndól Kiri and Rôtânôkiri, have had no drilling as of 1963.

The largest yield on record was 2,967 l/min in well TK 7, at a rubber plantation at Châmkar Kausu Chŭb. In Khêt Kâmpóng Cham, however, a field test at Krâchéh on wells Kr 4 and 5 indicated a potential yield of 3,040 l/min with induced recharge from the nearby Mekong River. Other large-capacity wells will eventually be possible in Cambodia, with yields up to 3,800 l/min. Such wells will be rare, however, and will obtain most of their water from nearby sources of induced recharge, such as streams or lakes.

In general, because of the heavy jungle, the presence of lateritic soils, and the prevalence of silt and clay in the alluvium, infiltration rates are low in Cambodia. Also, because of the fineness of the sand and sandstone, storage coefficients and transmissivity are commonly low. Consequently, moderate to low yields of water will generally be obtained from wells. Indications are, however, that there is sufficient ground-water storage to provide sustained water yields during the dry season. Potential ground-water recharge during the wet season is more than adequate in most of Cambodia. Assuming that the average annual recharge to ground-water reservoirs is in the order of 150 mm a year, and that of

TABLE 26.—*Yield, depth, and number of wells recorded in khêts*

Location	No. of holes	Productive wells	Percent	Yield (l/min)		Productive depth (m)	
				Range	Average	Range	Average
Environs of Phnom Penh	26(2)[1]	8	31	25 –200	80	13 – 41	23.5
Kândal							
Pônhéa Loe	25	22	88	10 –400	143	12 – 63	27
Phnum Pénh	25	20	80	20 –250	108	11.5– 56	28.9
Kândal Stœng	22(6)	4	25	38 –90	68.5	10 – 45	27
KSv and LD	6	5	83	24 –80	45.7	8 – 90	37.5
Takêv	29(5)	17	59	6 –200	126	20 – 63	31.8
Kâmpôt	23	16	70	30 –900	228	9 –100	32.6
Kêb	4	2	50	19 –50	34.5	22.2– 46	34.1
Prey Vêng	6	3	50	120 –570	420	31 – 55	45.7
Svay Riĕng	169	147	87	1.1– 90.8	7.3	9.5– 78	34.5
Kâmpóng Cham	83	52	63	18 –2967	168	2 – 94	36.3
Krâchéh	18	13	72	114 –1710	836	20 –209.4	70.6
Môndól Kiri	0	---	---	---	---	---	---
Rôtânôkiri	0	---	---	---	---	---	---
Stœng Trêng	6	2	33	76 –95	85.5	41 – 53	47
Kâmpông Thum							
Barayn	74	59	80	10 –150	56	4.5– 42.2	14.4
Sântŭk	157	135	86	15 –200	47	4 – 35.9	11.3
Kâmpóng Svay	154	110	71	20 –80	36.2	4 – 86	11.4
Stoŭng	19	10	53	10 –30	18	8.1– 41.5	26.6
Preăh Vihéar	64	27	42	18 –120	43.3	4.9– 17.0	8.8
Siĕmréab	71	62	87	15 –1330	85.0	7 – 39	13.4
Bătdâmbâng	4	3	75	40 –50	45	30.5– 57	45.8
Pouthisăt	1	0	0				
Kâmpóng Chhnang	22(7)	11	50	49 –200	114	18 – 80	36.7
Kâmpóng Spoe	39(1)	24	62	30 –600	154.7	15.8– 65	36.8
Kaôh Kŏng	18	8	44	30 –240	126	9 – 80	47.4
Total	1,059(21)	760	71	1.1–2967	80.0	2 –209.4	23.2

[1] Number of holes listed in parentheses are foundation tests, not included in calculating the percent productive.

this projected recharge, 100 mm is recoverable by properly spaced and developed wells, then the ultimate recovery from 175,630 km^2 could conceivably be about 17,600 million m^3 a year. Economics will be the chief limiting factor in the development of this vast resource.

REFERENCES

Cushman, R. V., 1958, A report on a program of ground-water investigations for Cambodia: U.S. Geol. Survey open-file report, 72 p., 1 fig.

Gubler, J., 1938, Carte geologique de la feuille de Pak Nam, echelle 1:50,000: Service Geologique de l'Indochine.

——— 1962, Notice sur la feuille de Pak Nam, et complements: Vietnam Nat. Geogr. Serv., 22 p.

Lohman, S. W., and others, 1972, Definitions of selected groundwater terms-revisions and conceptual refinements: U.S. Geol. Survey Water-Supply Paper 1988, 21 p.

Margat, J., et Monition, L., 1967, Presentation d'une carte d'orientation des recherches d'eau souterraine du Cambodge, echelle 1/500,000: Bur. de Recherches Geologiques et Minères, Map + 11 p.

Saurin, Edmond, 1937, Carte geologique de la feuille de Saigon, echelle 1:50,000: Service Geologique de l'Indochine.

——— 1939, Carte geologique de Bangkok, echelle 1:50,000: Service Geologique de l'Indochine.

———1962a, Notice sur la feuille de Khong, et complements: Vietnam Nat. Geogr. Serv., 74 p.

——— 1962b, Notice sur la feuille de Bangkok, et complements, 22 p.
——— 1962c, Notice sur la feuille de Saigon, et complements: Vietnam Nat. Geogr. Serv., 78 p.
——— 1964, Carte geologique de la feuille de Khong, echelle 1:50,000: Vietnam Nat. Geogr. Serv.
Saurin, E. and Carbonnel, J. P., 1964, Les laterites sedimentaires du Cambodge Oriental: Revue de geographie physique et de geologie dynamique, vol. 6, fasc. 3, p. 241–256.
Snell, L. J., 1969, Program of surface-water investigations for Cambodia: U.S. Geol. Survey open-file report, 44 p., 5 figs.
U.S. Agency for International Development, 1963, Aide Americaine au Cambodge (US AID yearbook for Cambodia, 1963).

☆ U.S. Government Printing Office: 1977—240-961/132