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Guatemala

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NATIONAL INTELLIGENCE SURVEY

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Military Geography

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*This chapter was prepared for the NIS by the
Defense Intelligence Agency. Research was
substantially completed by October 1972.*

GUATEMALA

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Military Geography

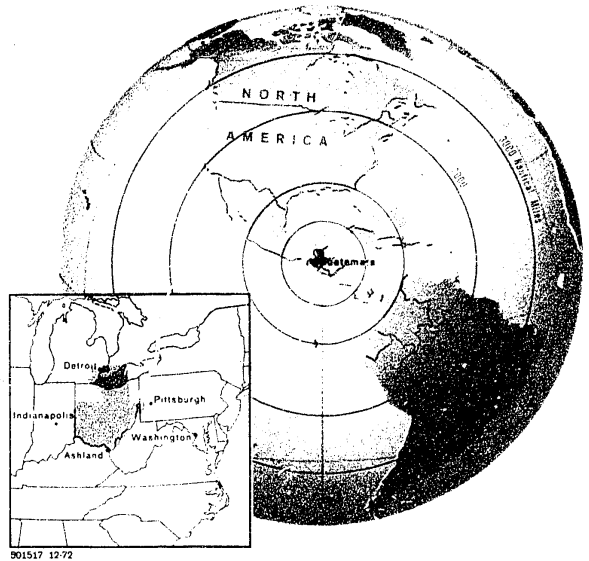


FIGURE 1. Location and comparative areas (U/OU)

A. Description (U/OU)

Guatemala is the third largest and the most populous of the Central American republics. The country, occupying an area of 42,040 square miles and having a population of 5,573,000, is nearly the same size as the state of Ohio (Figure 1) but contains slightly more than half the population. The maximum dimensions are about 250 miles¹ east-west and 280 miles north-south (Figure 15).

¹Distances are in statute miles unless nautical miles are specifically stated.

1. Topography

Guatemala has a diversity of topographic features, comprising a rugged northwest-southeast trending mountainous belt flanked by steep hills and flat to dissected plains (Figure 2). The area is covered mainly by forests and scrub and is drained by seasonally swollen streams. Volcanic activity and earthquakes are frequent.

High, mainly sharp-crested mountains, steep hills, and scattered, dissected upland plains (figure 3) and

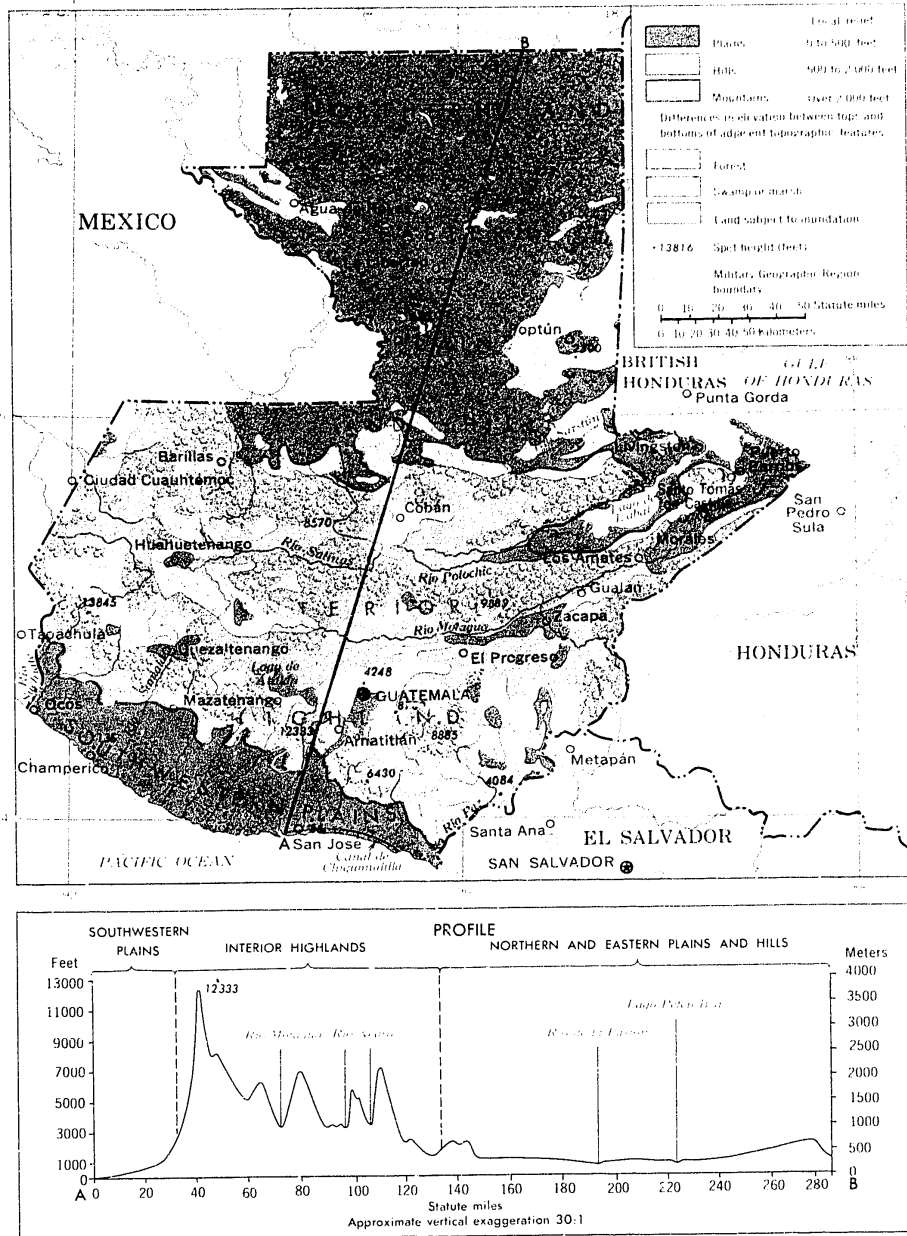


FIGURE 2. Military Geographic Regions and Terrain (C)



FIGURE 3. Highly dissected upland plains characterize large areas of the interior highlands. The flat to gently rolling surface is interrupted by numerous steep-sided valleys and gorges. Most urban settlements in Guatemala are on similar highland plains. (U/OU)

basins occupy about one-half of Guatemala. This mountainous belt separates narrow coastal plains in the southwest (Figure 4) from extensive plains in the north and constitutes the highest and most rugged part of the mountainous backbone of Central America. Elevations are generally over 5,000 feet. Many peaks in the south and west are more than 10,000 feet; the highest, in the west, is nearly 14,000 feet. Many of the peaks are of volcanic origin and are within a zone of seismic activity. Local relief (the differences in

elevation between tops and bottoms of adjacent topographic features) ranges from 2,000 to 6,500 feet in the mountains, 1,000 to 2,000 feet in the hills, and 150 to 500 feet in the upland plains and basins. Slopes are mostly 30% to over 45% in the mountains and hills and 3% to 30% in the upland basins and plains. The highland streams are mainly swift and deeply incised. Streams flowing southward have steep gradients, high velocities, great seasonal fluctuations, and are generally straight and deep. Northward, eastward, and

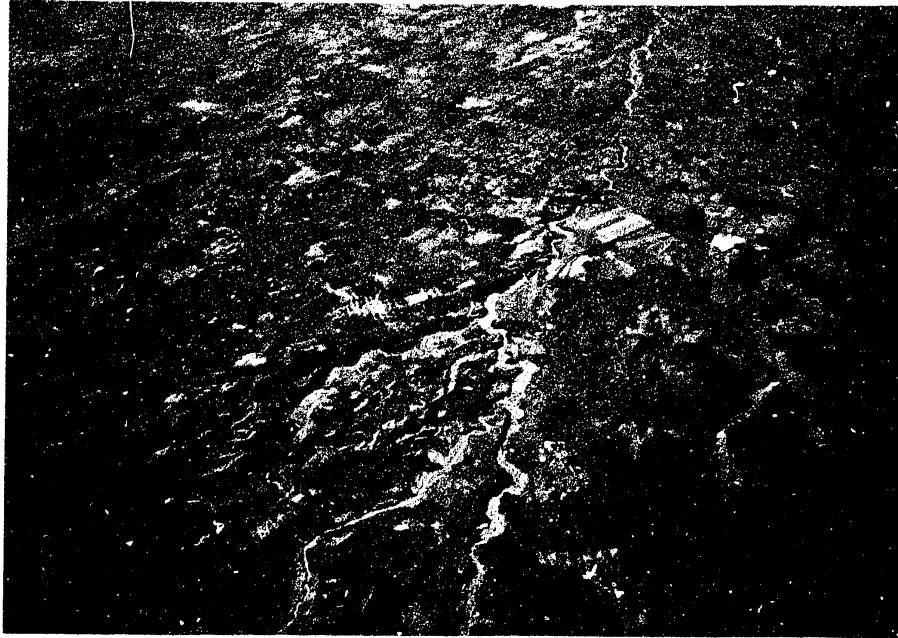


FIGURE 4. Areas of cultivation and grassland interspersed with patches of forest are characteristic of the vegetation pattern in the southwestern plains. The partly braided, meandering stream is typical of many streams that drain the area. (U/OU)

westward-flowing streams have irregular courses and moderate seasonal fluctuations in depths and discharges. Stream widths range from 15 feet near headwaters to 100 to 200 feet in the lower reaches, and depths range generally from 2 to 6 feet year round; during low water, November through April, some stream depths are less than 1 foot. The high water period is early May through October. The most prevalent vegetation type is oak scrub, interspersed with cultivated vegetation, grassland, and patches of forest (Figure 5). Broadleaf evergreen and deciduous forests occur mainly along the periphery. Needleleaf evergreen forests are predominant in the west-central part, and thorn scrub occurs around El Progreso. There is a moderate to dense distribution of culture features. The people live chiefly in small towns and villages and in a few large cities scattered on the upland plains, basins, and valleys. Urban settlements are essentially residential, and most dwellings are one

story, are constructed of adobe, stone, or wattle and daub (wooden frame plastered with clay), and have roofs of tile, tin, or straw. Small subsistence farms are numerous, and there are large plantations, mainly growing coffee, along the Pacific slopes and near Coban.² Road and railroad networks are fairly dense. Most main roads are surfaced with gravel or crushed stone; some, however, are bituminous surfaced or cobblestone. They are in fair to good condition. Railroads are single track 3'0" gage and are in fair to good condition.

Lowlands occupy the north and the Caribbean and Pacific coastal areas. The lowland in the north consists of flat to gently rolling and dissected karst plains interrupted in the south, east, and extreme west by hills. The karst areas are characterized by steep-sided

²For diacritics on place names see the list of names on the apron of the Terrain and Transportation Map, Figure 15, the map itself, and maps in the text.

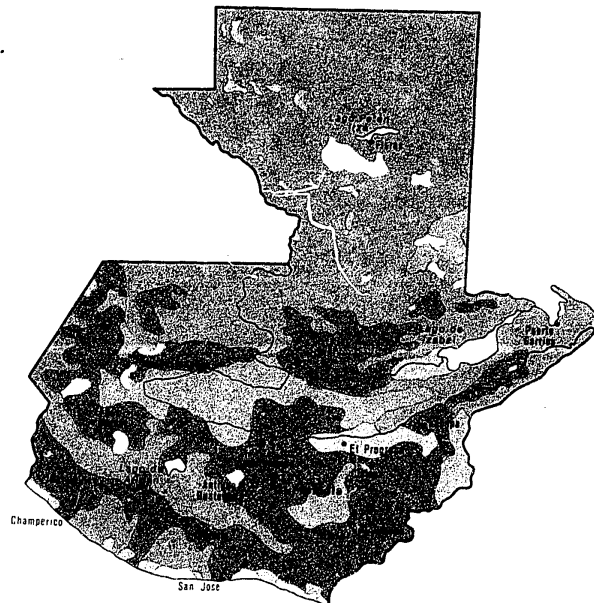


FIGURE 5. Vegetation (U/OU)

- | | | | |
|--|---|--|------------------------------------|
| | Broadleaf evergreen and deciduous forest, and scrub and grassland | | Thorn forest |
| | Needleleaf evergreen and broadleaf deciduous forest, and scrub | | Lowland savanna and upland pasture |
| | Oak scrub, with grassland and patches of forest | | Swamp or marsh |
| | | | Mangrove |

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hillocks and by sinkholes and caves. The lowland in the south west is mostly flat to gently rolling; near the highlands, however, the plain is dissected into narrow, nearly parallel north-south segments by closely spaced streams. Most elevations are less than 1,000 feet, but elevations are between 1,000 and 2,000 feet in most hilly areas and near the highlands. Local relief on the plains is less than 500 feet and in the hills ranges from 650 to 1,000 feet. Slopes are generally less than 3%. In the dissected plains, however, they are commonly 10% to 45% and in the hills, 30% to 45%. Most major streams are usually sluggish, meandering, and have gentle gradients. Streams that drain into the Pacific are short, closely spaced, and have roughly parallel courses. Many streams are 60 to 500 feet wide, perennially more than 3.5 feet deep, and frequently overflow their banks, flooding adjacent swamps and lowlands. In the north much of the drainage is underground. During the high water period, May

through October, large and small depressions are filled by water forming shallow lakes, swamps, or marches. During the remainder of the year the depressions are dry or greatly reduced in size. Lakes are common in the lowlands. Vegetation is mainly dense broadleaf evergreen and deciduous forest, scrub, grassland, and crops. Oak scrub in a mosaic of cultivated vegetation, grassland, and patches of forest occurs in large areas in the lowlands along the Pacific, and mangrove forest fringes parts of both coasts. The lowlands along the Pacific contain most of the culture features, and important population centers and agricultural areas are served by a moderately dense network of bituminous- and gravel-surfaced roads and an adequate railroad network. Relatively large commercial farms, consisting mainly of banana and cotton plantations and cattle ranges, intermingled with subsistence farms, are predominant in parts of the lowlands adjacent to the Pacific. Plantations consist of

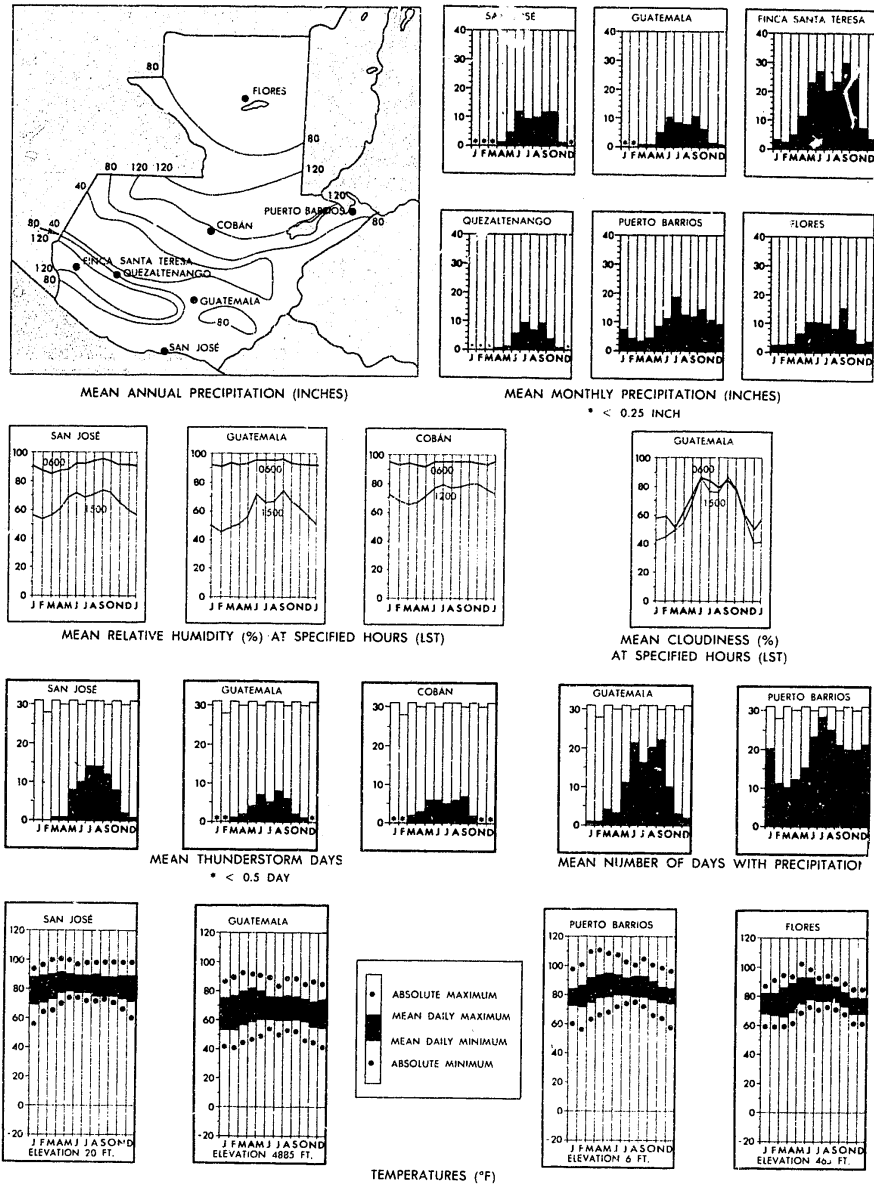


FIGURE 6. Precipitation, relative humidity, cloudiness, thunderstorm days, and temperatures (U/OU)

several large administrative office buildings, a processing plant, owner's home, and closely spaced compact rows of one-story wood or adobe dwellings having thatch or tin roofs. In the north, the population is widely scattered in small settlements. Dwellings are mostly one story and are constructed of wood. The road network is sparse, and there are no railroads.

2. Climate

The climate of Guatemala is primarily tropical, and there are pronounced wet and dry seasons in most of the country. The wet season usually lasts from early May through October but varies slightly from place to place. The dry season varies greatly in length and intensity, ranging from practically rainless during a 4-month period in some sections of the country to only a small decrease in rainfall in some months in other sections (Figure 6). Over much of the country, however, the driest period occurs during December through March.

Rainfall is heaviest in central Guatemala along the slopes that are exposed to northeast airflow from the Caribbean and in the south along the slopes exposed to southeast flow from the Pacific. Average annual rainfall in exposed parts of the highlands and in the plains near the coasts ranges from about 60 to more than 200 inches; in parts of the sheltered interior highlands and enclosed valleys, average annual amounts range from about 20 to 45 inches. In the northern plains, average annual rainfall is mostly 60 to 80 inches. Wet season rainfall is often torrential; most places average over 10 inches in the wettest months and the exposed locations usually over 20 inches per month. During the dry season, averages are mostly less than 2 inches in the driest months, usually January and February, but near the Caribbean coast and on slopes exposed to the northeast trade winds many locations receive considerable rainfall in all months. Thunderstorms are frequent in the period May through September, occurring as often as 10 days per month over the lowlands and on the northern and southern slopes of the highlands but much less frequently in the interior highlands. Maximum cloudiness probably occurs during May through October and minimum cloudiness in December through March. Cloud types generally vary from fair-weather cumulus in the dry season to predominantly cumulonimbus in the wet season. Visibility is generally good, although limited at times by smoke, morning fog, heavy showers, and by low clouds along the exposed slopes and ridges.

Seasonal temperature variations are small; regionally, however, the lowlands are hot throughout

the year and the higher elevations are cool. In the lowlands, mean daily maximum temperature are generally in the 80's (°F.) and low 90's and mean daily minimums in the 60's and 70's. In the higher elevations, temperatures are 10 to 20 degrees lower during the afternoon and 15 to 40 degrees lower at night. Freezing temperatures occasionally occur during the dry season at elevations above 6,000 feet. Relative humidity is high in all sections of the country, particularly during the wet season. Relative humidity generally ranges from about 85% to 95% in the morning to 55% to 75% in the early afternoon.

Surface winds are locally strong during thunderstorms and on the rare occasions when tropical storms reach the northern lowlands; however, speeds rarely reach 50 knots. Tropical storms, accompanied by destructive winds and widespread flooding, occasionally affect the Caribbean coast during June through November. Only on rare occasions do these storms reach Guatemala as full-scale hurricanes, and only very rarely do tropical storms affect the Pacific coast.

B. Military geographic regions (C)

There are three military geographic regions—Northern and Eastern Plains and Hills, Interior Highlands, and Southwestern Plains. The combination of environmental conditions within each region would have a relatively uniform effect on military operations, but there would be marked differences between regions.

1. Northern and Eastern Plains and Hills

This region consists of flat to gently rolling and dissected plains and a few scattered hill groups. The region is covered mostly by broadleaf evergreen and deciduous forest intermingled with scrub, grassland, and cultivated vegetation. Although most of the region is thinly populated and contains a sparse transportation network, there is a small concentration of population in and adjacent to the Puerto Barrios-Santo Tomas de Castilla area.

Conditions are generally unsuitable for conventional ground operations. There are few roads, and in most of the region trails that are usable only during dry weather are virtually the only means of land transportation. Offroad dispersal and cross-country movement would generally be infeasible except in clearings and in cultivated areas during the dry season. The dense forests covering most of the region afford limited cover from small arms fire and excellent concealment from ground and air observation. Small

patches of open forest provide some cover and concealment, but the grasslands, cultivated areas, and marshes afford little or none. Road construction would require considerable engineering effort because of dense forests, poor natural foundations, and poor drainage conditions. There are few sites that have slopes adequate for constructing tunnel-type installations or soils sufficiently thick and well-drained for constructing bunkers.

Large-scale airmobile and airborne operations would be impracticable because of the dense forests. In addition, flying conditions are poor from early May through October, when low ceilings and torrential rains severely restrict visibility. A few scattered grassland areas are suitable for parachute and helicopter landings and landings of assault-type aircraft on unprepared surfaces, but even in the dry season operations would be hindered at times by mist and early morning fog. Some of the existing airfields and landing strips could be used for airborne operations. Large airfields could be constructed in much of the region, but extensive clearing would be necessary, and access to many sites would be difficult.

The coast of this region is unsuited for large-scale amphibious operations, mainly because of limited and poor exits. Approaches are restricted to a broad channel between an extensive reef off the British Honduras and Guatemala shores and are through shallow, partly obstructed waters. The shores are narrow and are composed almost entirely of sand. The protected shore of the region is generally backed by swamp or dense forest, and the exposed shore, southeast of Puerto Barrios, is isolated seasonally by inundation. The best beach in the region is located at Livingston. This beach has mostly clear approaches and good exits, but it has no routes inland, and is virtually isolated from the rest of the country by forest and swamps.

The combination of dense vegetation, locally rugged terrain, and generally sparse population makes the region mostly suitable for irregular force operations. The dense vegetation, although a hindrance to small groups on foot, provides excellent concealment from air and ground observation. Cover from small arms and flat-trajectory fire would be provided by local depressions, hills, hillocks, steep-banked streams, caves, and Mayan ruins; some cover from small arms fire would be afforded by large, closely spaced trees. Most of the sparse population is concentrated in small villages. There are a few villages, mainly in the southeast, associated with banana plantations and cattle ranches. Wood for fuel and for building shelters is plentiful, and in the north

many caves and Mayan ruins provide good natural shelters. This region abounds with fish and edible wild plants, but game is scarce in the densely forested areas; additional food is potentially available from local farms and large plantations. There are many physiological and psychological aspects of this region that would have an adverse effect on personnel. The encroaching climate and the scarcity of water during the dry season tend to slow down physical activities. Most of the area is infested by mosquitoes, lice, fleas, ticks, and mites. Dangerous animals and poisonous insects include jaguars and wild boars, black widow and tarantula spiders, and several species of poisonous snakes. Crocodiles and caimans are widespread in sluggish streams. Clandestine entry would be possible along the unguarded and poorly marked borders in rugged forested terrain and from small isolated beaches along the Caribbean.

2. Interior Highlands

The Interior Highlands region consists of high rugged mountains, steep hills, upland plains and basins, and a few wide valleys. Vegetation is mainly oak scrub interspersed with cultivated vegetation, grassland, and patches of forest. Road and railroad networks are fairly well developed and the region contains most of the population.

The region is poorly suited for conventional ground operations, especially in the wet season, early May through October. The only area that is generally suitable for most aspects of ground operations is the valley of the Rio Motagua (Figure 7) between Morales and Los Amates. Onroad movement in most of the region would be impeded by sharp curves and steep grades and at times stopped by landslides. In addition, many roads are traversable only in the dry season. Cross-country movement would be precluded nearly everywhere all year, mainly by steep slopes and locally by dense forest. Offroad dispersal would be possible in the lower part of the valley of the Rio Motagua and locally in the upland plains and basins. The lower part of the valley of the Rio Motagua and the upland plains and basins also are the most favorable areas for road construction. In most of the region, building roads would entail extensive grading, blasting, and bridging, and alignments would be very restricted. Concealment from ground observation and cover from flat-trajectory fire would be provided by surface irregularities. Concealment from air observation and cover from small arms fire would be afforded by areas of dense forest. There are many sites suitable for the construction of tunnel-type installations, but bunker-type installations could be constructed easily only in



FIGURE 7. The Rio Motagua valley is generally flat but has small areas of rolling surfaces. The dissected, mostly forested mountains in the background afford excellent cover and concealment, particularly for irregular forces. (U/OU)

the upland basins and plains. In parts of the region, the possibility of damage by earthquakes would affect the planning and design of underground installations.

The region is poorly suited for airmobile and airborne operations and the construction of airfields because of rugged terrain and scattered dense forests. The lower part of the valley of the Rio Motagua and the upland basins and plains contain the only suitable areas of parachute operations. Sites suitable for the landing of assault-type aircraft on unprepared surfaces are generally lacking. There are about 30 airfields scattered throughout the region, but only three have runways of over 5,000 feet. Small airfields could be constructed on the upland plains and basins and in the lower part of the valley of the Rio Motagua, but air approaches and runway orientations would be locally restricted.

Conditions for irregular force operations are generally favorable. Dense scrub and forest and surface irregularities provide good concealment from ground observation and fair concealment from air observation. The numerous surface irregularities and local areas of mines and caves provide cover from small arms and flat-trajectory fire. The steep slopes and dense vegetation would generally preclude cross-country movement of vehicles and would severely slow the movement of foot troops. Most of the country's population lives in this region, mainly in urban settlements. Generally, large amounts of wood for fuel and, near urban settlements, large amounts of foodstuffs are available. Dangerous animals and insects include jaguars, black widow spiders,

bushmaster snakes, and blister beetles and assassin bugs. Covert entry across borders would be fairly easy because of dense vegetation and rugged terrain.

3. Southwestern Plains

The Southwestern Plains region consists of a narrow, flat to rolling coastal plain that is part of a long coastal lowland extending southeastward from Mexico into El Salvador. The dominant vegetation is oak scrub in a mosaic of cultivated vegetation, grassland, and patches of forest. A moderately dense network of bituminous- and gravel-surfaced roads and an adequate railroad network serve the area. Population density is not as great as in the highlands; however, there are numerous large plantations and several large inland and coastal towns.

Conditions for conventional ground operations are generally fair. Cross-country movement of tracked vehicles on the predominantly scrub-covered plains would be fair to poor but would be severely restricted in direction by numerous parallel streams. Movement of wheeled vehicles would be feasible locally when soils are firm. Conditions for the cross-country movement of foot troops generally are fair. Offroad dispersal generally would be feasible. Roads having gentle to moderate grades could be constructed throughout the lowlands. Considerable clearing would be necessary in swampy coastal areas, and roads parallel to the coast would require construction of numerous bridges and culverts. Cover from small arms fire and concealment would be available in forested and swampy areas but would be limited elsewhere.

Bunker-type installations could easily be constructed in most of the region; sites suitable for tunnel-type installations are few because bedrock generally is deeply buried.

The southwestern lowland generally is suitable for airmobile and airborne operations, although flying weather is poor in the wet season. There are numerous sites suitable for parachute operations and landings of assault-type aircraft on unprepared surfaces and for the construction of airfields having unrestricted runway orientations. In addition, there are a large number of existing airfields. Air approaches would be unrestricted except from the north.

The coast of this region is generally poorly suited for large-scale amphibious operations because of restricted approaches and difficult exits. Offshore approaches contain scattered rocks, reefs, and shoals. Nearshore approaches are partly obstructed, chiefly by shoals and banks off lagoons and streams. The shore is sandy and is interrupted by numerous streams and lagoon inlets and closely backed by swamps, lagoons, and areas of wet ground. A canal backs most of the eastern third of the shore. Numerous sandy beaches are mostly 1 mile or less in length and less than 190 yards in width. Exits generally are by cross-country movement to loose-surfaced roads. The inland terrain consists of a broad coastal plain extending 15 or more miles to hills and mountains.

Conditions for the operation of irregular forces generally are unfavorable. Although there are some areas that would support irregular force operations, most of the region lacks good cover and concealment. Concealment for foot troops and vehicles would be afforded by dense forests between Champerico and San Jose and locally by patches of scrub and forest, surface irregularities, and steep-banked streams. Most patches of scrub and forest, however, could be easily encircled. Some cover from flat-trajectory fire would be afforded by surface irregularities and steep-banked streams. Vehicular cross-country movement generally would be feasible except in forested or swampy areas. Movement of foot troops generally would be unobstructed but would be slowed locally by dense vegetation and by flooded streams and miry soils in the wet season. The population is fairly dense and is concentrated near the highlands, and most of the people live either on large commercial farms or small subsistence farms. Cultivated foods are generally abundant; small game and edible wild plants are scarce. Except in the dense forests, only small amounts of wood for shelter and fuel are available. Physiological and psychological aspects detrimental to

personnel are similar to those in the Northern and Eastern Plains and Hills Region, but dangerous animals are not as prevalent.

C. Strategic areas (C)

There are two strategic areas—Guatemala City, and Puerto Barrios-Santo Tomas de Castilla, which contains the two most important ports and the second largest oil refinery in the country (Figure 11).

1. Guatemala City

Guatemala City (Figures 8 and 9) is the national capital, the political, commercial, and industrial center of the country, the hub of the transportation and telecommunication networks, and the largest urban area (estimated 1970 population, 731,000). In addition, the strategic area contains the military academy and the most important army bases. Although the majority of industries are located here, most are small and produce mainly consumer goods. Two of the more important installations are a cement plant and a rubber tire factory. Other industries include textile mills, leather goods producers, truck body plants, and food processing plants. Guatemala City dominates the main natural corridor through the highlands, and most of the principal highways and a major railroad radiate from it. The railroad repair and

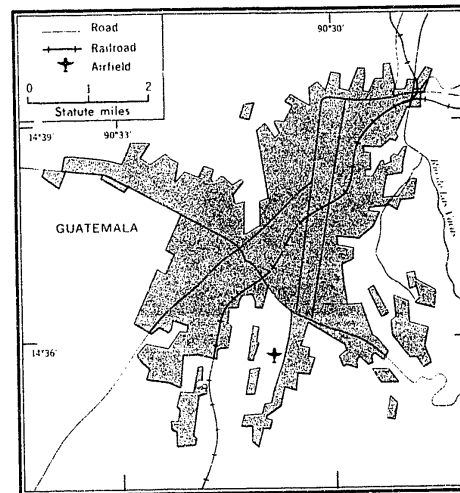


FIGURE 8. Guatemala City strategic area (C)

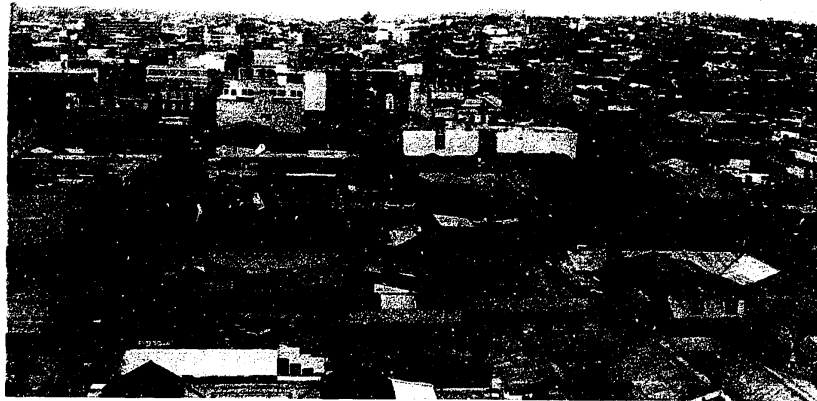


FIGURE 9. Although Guatemala City is the commercial center of the country, most businesses are small and housed in single story structures (U/OU)

assembly shops in the city are the largest in the country. Commercial and military air traffic also focus upon the capital city. The airfield is the largest in the country and is the principal military and civil facility. POL (petroleum fuels, oils, and lubricants) storage facilities in the strategic area have a capacity of more than 73,200 barrels.

2. Puerto Barrios-Santo Tomas de Castilla

This area, which had a population estimated at 38,500 in 1970, includes the two major seaports of the country (Figure 10). It is a major transportation, telecommunication, and military center and has the second largest petroleum refinery in Guatemala. Santo Tomas de Castilla, built in 1955, has surpassed Puerto Barrios in the total amount of cargo handled. It also is the country's main naval base and is within a few miles of the petroleum refinery. The refinery is located on the road to Puerto Barrios and is connected to Santo Tomas de Castilla by a 14-inch crude-oil pipeline 2.8 miles long. Its refining capacity, 12,000 barrels per day, accounts for 45% of the country's total, and POL storage facilities have a capacity of about 600,000 barrels. The port facilities at Puerto Barrios are used mainly by the United Fruit Co., largely for the export of bananas. Puerto Barrios has a direct rail link to Guatemala City, and an airfield is located at the northeastern outskirts of the city. An army installation

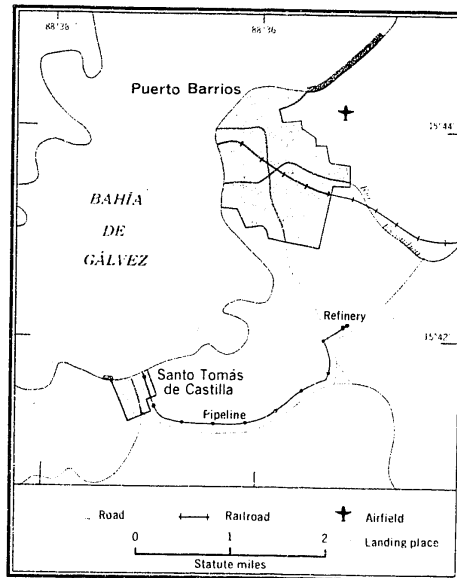


FIGURE 10. Puerto Barrios - Santo Tomas de Castilla strategic area (C)

at the airfield is the headquarters of the Barrios Infantry Battalion. Puerto Barrios has three POL storage facilities that have a total capacity of 370,500 barrels. Except for petroleum refining, industrial activity is of secondary importance. About 15 minor industries are located within the strategic area and produce or process only items for local consumption

such as soft drinks, rice and other cereal grains, furniture, lumber, and cement blocks and pipe.

D. Internal routes (C)

The internal routes (Figure 11) provide the easiest avenues of movement between strategic areas.

FIGURE 11. Strategic areas, internal routes, and approaches (C)



between land approaches and strategic areas, and between amphibious landing areas and the Guatemala City strategic area. Data on the internal routes are given in Figure 12.

E. Approaches

The perimeter of Guatemala consists of approximately 1,010 miles of land boundaries and 250 miles of coastline. All boundaries are demarcated and unfortified. Guatemala has 85 miles of coastline along the Caribbean Sea and 165 miles along the Pacific Ocean and claims territorial waters extending 12 nautical miles offshore. Guatemala also claims sovereignty over British Honduras. Figure 13 presents data on land boundaries. (U/OU)

1. Land (C)

Movement across the borders of Guatemala would be difficult. Because of the predominance of high, rugged hills and mountains in the northwest and southeast and wet or densely forested plains in the north, conditions for cross-country movement are generally unsuited and good roads are few. The approaches shown on Figure 11 are the best means of land access to Guatemala. Detailed information on land approaches is presented in Figure 14.

2. Sea (C)

Offshore approaches to the Caribbean coast are through the Gulf of Honduras. A barrier reef off the coast of British Honduras is a major restriction. This reef is separated from the Guatemala mainland by a broad channel that contains a few shoals. Nearshore approaches are slightly encumbered by shoals, rocks, and reefs. Nearshore bottoms are composed mostly of mud, and gradients are gentle to flat. Surf 4 feet or higher occurs a maximum of 25% of the time from October through December along the exposed eastern part of the coast. Tides are mixed and the diurnal range is 1 1/2 feet. There are no beaches suitable for large-scale amphibious operations; however, two landing places in the strategic area of Puerto Barrios-Santo Tomas de Castilla (Figure 10) provide access to the internal route leading to the Guatemala City strategic area.

Offshore approaches to the Pacific coast are slightly obstructed by scattered rocks, reefs, and shoals. Nearshore approaches are partly obstructed, mainly by shoals and bars off lagoons and streams. Nearshore bottoms are composed of sand with some mud. Surf 4 feet or higher occurs a maximum of 20% of the time

from July through September. Tides are semidiurnal and the spring tide is about 6 feet. Numerous sandy beaches are scattered from San Jose westward. The beaches are mostly 1 mile or less in length; the longest is about 3 miles. Beach widths range from 38 to 150 yards at low water and 14 to 82 yards at high water. Beach gradients are gentle to steep between low water and high water and are estimated to be steep in the high-water zone. The beaches are backed by a broad coastal plain containing numerous swamps, lagoons, and streams close behind the shore. Exits are mostly cross-country to loose-surfaced roads. Inland of these immediate coastal features, movement on the plain would be relatively easy, but lateral movement generally would be difficult because of numerous streams traversing the plain.

The amphibious landing areas (Figure 11) provide the best access to internal routes leading to the Guatemala City strategic area.

The landing area at San Jose has a small area of foul ground and mooring buoys in the offshore approach and a pier in the nearshore approach. The nearshore bottom is sand with some mud, and the gradients range from 1 on 27 to 1 on 34. The beach is usable for dry-ramp LST landings. Surf 4 feet or higher occurs up to 24% of the time from July through September. The beach is sand and is 1 1/2 miles long. Widths at low water range from 35 to 45 yards and at high water from 10 to 20 yards. The beach gradient ranges from 1 on 9 to 1 on 16 from low water to high water and about 1 on 3 in the high-water zone. The beach is backed by a barrier bar separated from the mainland by a partly marsh-fringed canal. The canal is backed by a broad grass- and tree-covered plain containing salt pans behind the eastern part of the beach. San Jose is behind the center part. Exit is by a road, surfaced in places, closely backing the beach and leading over a bridge to town. There is also a 3'0"-gauge railroad bridge over the canal. A surfaced road and a railroad extend inland from San Jose.

The landing area at Champerico has clear approaches except for a pier and several mooring buoys off the northwestern part. The nearshore bottom is sand with some mud, and the gradients range from 1 on 43 to 1 on 94. The beach is usable in places for dry-ramp LST landings. Surf 4 feet or higher occurs up to 29% of the time from July through September. The beach is sand and is 1,580 yards long. Widths at low water range from 35 to 45 yards and at high water from 10 to 20 yards. The average beach gradient is 1 on 13 between low water and high water, and is estimated to be 1 on 5 in the high-water zone. The beach is backed by sandy ground partly covered by

grass and brush. Behind all but the center part, the sandy ground is backed by lagoons, swamps, and salt pans. All in turn is backed by a broad, grass- and tree-covered plain. Champerico is immediately behind the northwestern part. Exit is via the streets of Champerico. A surfaced road and 3'0"-gauge railroad connect Champerico with the interior.

3. Air (U/OU)

There are three air approaches³ to Guatemala—the southern and western approach is over the Pacific Ocean, the eastern is over the Caribbean Sea, British Honduras, Honduras, El Salvador, and northwestern Nicaragua, and the northern is over Mexico and the Gulf of Mexico. The eastern and northern approaches are mainly over mountains, hills, and some plains, and maximum elevations are slightly over 9,000 feet in the east and slightly over 11,000 feet in the north.

Weather conditions in all air approaches to Guatemala are least favorable during May through October. Mean cloudiness during this period ranges from 55% to 75%, occurring primarily as cumulus or cumulonimbus. Thunderstorm activity is at a maximum; the average number of thunderstorm days per month ranges from as many as 20 to 25 along the exposed mountain slopes to 5 to 15 elsewhere. Severe turbulence is common within thunderstorms, and

³The discussion zone for air approaches extends approximately 300 nautical miles beyond the borders of Guatemala.

orographic turbulence is frequently experienced near mountainous terrain. Aircraft icing may occur above about 16,000 feet, the mean height of the freezing level, but is seldom a problem. All approaches are occasionally affected by tropical cyclones that bring strong winds, increased cloudiness, turbulence, and icing. These storms occur more often over the Caribbean Sea and the Gulf of Mexico than over the Pacific Ocean. Winds aloft are mostly light easterly to 40,000 feet in all approaches in May through October.

Weather conditions are best during November through April. Occasional incursions of cold air from the north may produce periods of increased cloudiness, turbulence, and possible aircraft icing, usually confined, however, to approaches from the Gulf of Mexico and the Caribbean. Minimum cloudiness occurs in most approaches during these months; the average cloud cover ranges from 20% to 40% except along exposed ridges and slopes, where it is greater. Thunderstorms are rare except near the mountains. Most cases of turbulence during November through April are orographically induced. Aircraft icing is infrequent but may occur in clouds above 16,000 feet, the mean height of the freezing level. In approaches from the north, the winds aloft are generally light easterly below 15,000 feet and westerly above this height, with average speeds of 30 to 45 knots at 30,000 to 40,000 feet in the extreme north. In approaches from the south, the winds are light easterly below 25,000 feet and light westerly above this height.

FIGURE 12. Internal routes (C)

ROUTE	ROAD	RAILROAD	OFFROAD DISPERSAL AND CROSS-COUNTRY MOVEMENT
Puerto Barrios-Santo Tomas de Castilla strategic area to Guatemala City strategic area. Traverses forested coastal plain, mainly scrub-covered and cultivated flat dissected plains, and hills. Most of route valley of the Rio Motagua.	Two lane, bituminous, in good condition.	Single track 3'0" gage, in good condition.	Generally poor, limited mainly by large wet areas on the coastal plain, dense forests, and steep hills.
El Salvador border via Cuilapa to Guatemala City. Traverses hills and mountains covered predominantly by scrub, cultivated vegetation, grassland, and patches of forest.	Section of Inter-American Highway; two lanes, bituminous, in good condition.	None.	Generally precluded by steep slopes and, in places, patches of dense vegetation.
El Salvador border via Escuintla to Guatemala City. Crosses dissected plains and some hills, predominantly covered by scrub, cultivated vegetation, grassland, and patches of forest.	Two lanes, bituminous, in fair to good condition. From Escuintla to Guatemala City there are many sharp curves and steep grades.	Single track 3'0" gage, in good condition. Roughly parallels road from Escuintla to Guatemala City.	From border to Escuintla, offroad dispersal possible in most places; cross-country movement generally fair to poor, slowed or precluded in wet season when soils soft. From Escuintla to Guatemala City conditions are poor.
From Mexico border to Escuintla. Traverses mostly dissected plains covered mainly by scrub intermixed with grass, forest, and crops.	Two lanes, bituminous, in good condition.	Single track 3'0" gage, in good condition from Ciudad Treun Uman to Escuintla.	Offroad dispersal possible along most of route. Cross-country movement would necessitate numerous stream crossings and would be most difficult in wet season; conditions poor at all times on dissected plains and in a few hilly areas. Possible only locally in parts of the upland plains.
From Mexico border to Guatemala City. Crosses mostly scrub-covered or forested, high rugged mountains and hills and upland plains.	Section of Inter-American Highway; two lanes, bituminous, in good condition. Many sharp curves and steep grades, some sections subject to landslides.	None.	
Amphibious landing area at Champertico to Retalhuleu. Traverses scrub-covered, cultivated, and forested plains.	Two lanes, bituminous, in good condition.	Single track 3'0" gage, in fair condition.	Generally fair to poor; unsuited on seasonally muddy soils adjacent to coast.
Amphibious landing area at San Jose to Escuintla. Crosses cultivated grassland and forested and scrub-covered plains.	Two lanes, bituminous, in fair condition.	None.	Generally fair to poor.

FIGURE 13. Boundaries (U/OU)

BOUNDARY	LENGTH	STATUS	TERRAIN
Mexico.....	<i>Miles</i> 560	Demarcated, unfortified.....	Near Pacific coast, across narrow coastal plain; inland, through scrub-covered and forested rugged hills and mountains; remainder, beyond mountains, along dissected and flat plains covered by forests, swamps, and marshes. In places, streams form parts of boundary.
British Honduras.....	165do.....	Heavily forested, flat to rolling and dissected plains. Short section in south formed by Rio Sarstun.
Honduras.....	160do.....	Mostly rugged forested mountains; plains in north, short section near Caribbean along Rio Motagua.
El Salvador.....	125do.....	Mostly scrub-covered or forested mountains and hills; flat to rolling, mostly scrub-covered plains in south and, near Pacific coast, formed by Rio Paz.

FIGURE 14. Land approaches (C)

APPROACH	ROAD	RAILROAD	OFFROAD DISPERSAL AND CROSS-COUNTRY MOVEMENT
From Santa Ana, El Salvador. Across brush-covered plains and hills having patches of cultivated vegetation, grassland, and forest.	Section of Inter-American Highway; two lanes bituminous treated, in good condition.	None.....	Difficult in dissected plains and hills in southern two-thirds; infeasible in hill in northern one-third.
From Aenjutla, El Salvador. Traverses low, predominantly cultivated coastal plains, some areas of brush and savanna.	Two lanes, bituminous, in good condition.	None.....	Fair in most places.
From Mexican port of Salina Cruz. Across nearly flat coastal plains covered mainly by dense forest and, in north, cultivated vegetation, pasture and woodlands.do.....	Single track 4'8 1/2" gage, in good condition. Transshipment to 3'0" gage necessary at border.	Difficult along forested coastal plain. Best possibilities from Salina Cruz to Tapanatepec.
From Tapanatepec, Mexico. Through high, rugged, mostly forested or cultivated mountains and rolling hills and upland plains.	Section of Inter-American Highway; two lanes, bituminous, in good condition. Numerous steep grades and sharp curves.	None.....	Generally infeasible because of mountainous terrain and dense vegetation; some possibilities on upland plains.

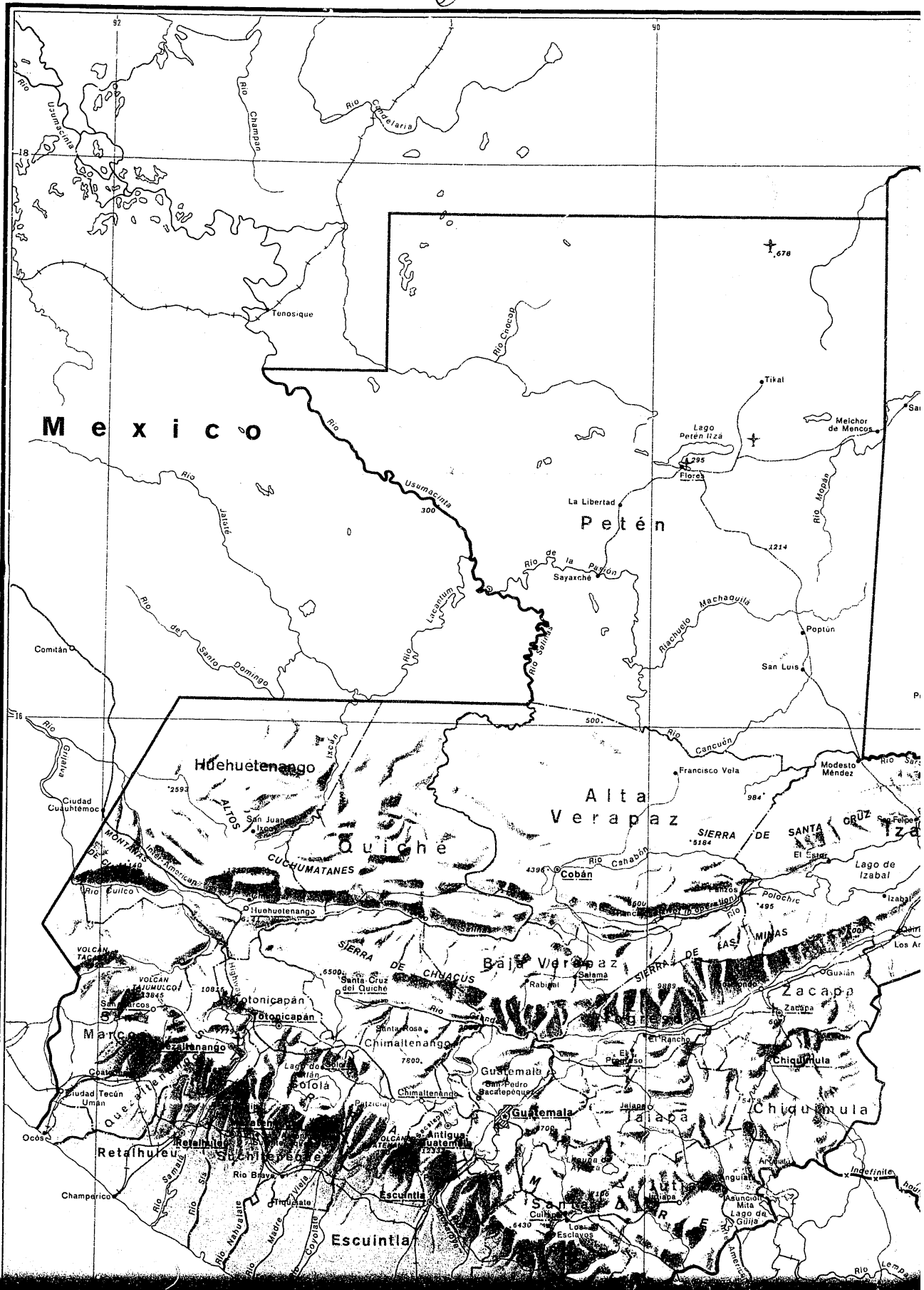
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Places and features referred to in this General Survey (U/OU)

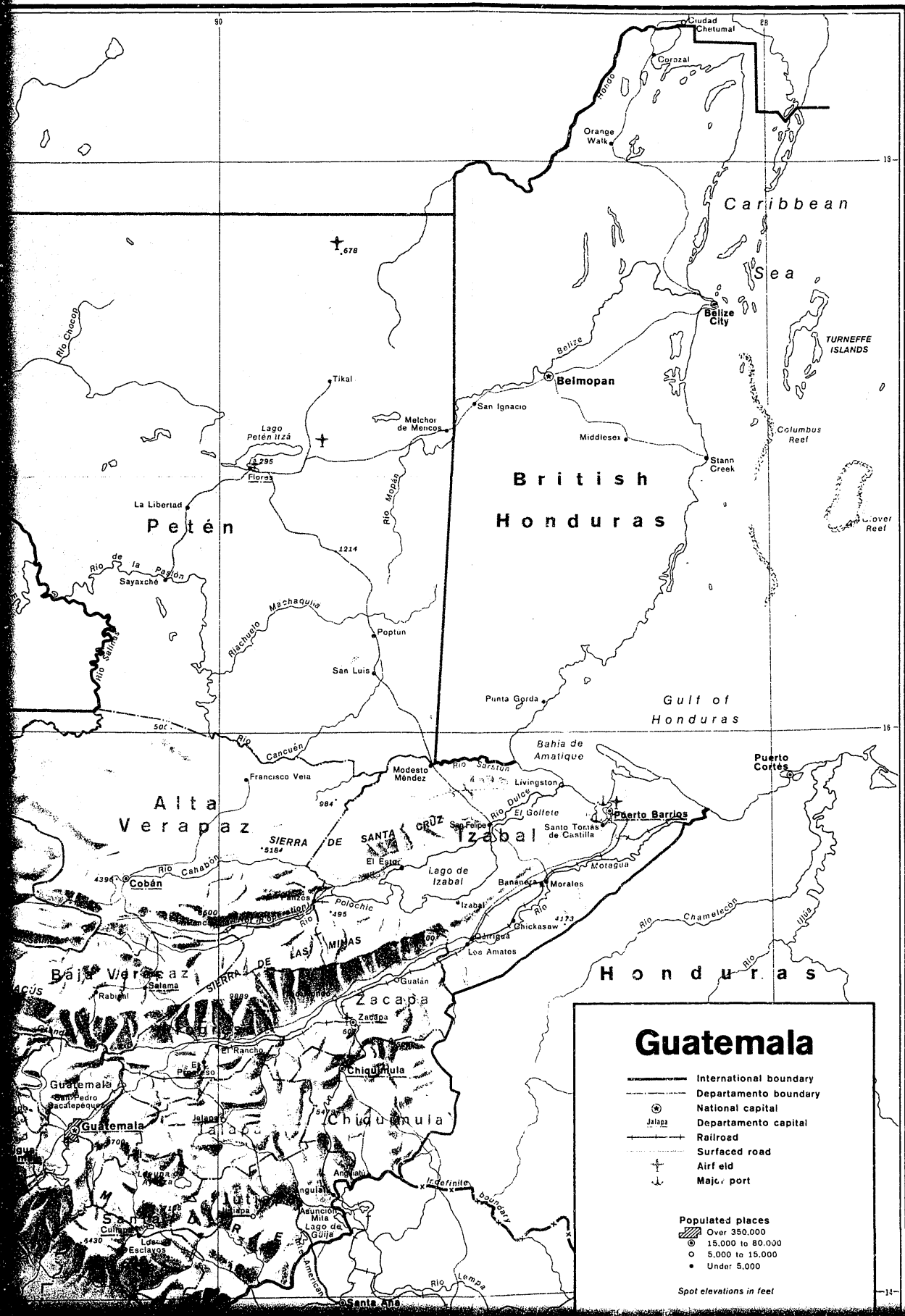
COORDINATES		COORDINATES	
	° 'N. ° 'W		° 'N. ° 'W
Anguiatú.....	14 21 89 35	Poptún.....	16 21 89 26
Antigua Guatemala.....	14 34 90 44	Puerto Barrios.....	15 43 88 36
Bahía de Amatique (bay).....	15 55 88 45	Quezaltenango.....	14 50 91 31
Bahía de Gálvez (bay).....	15 42 88 38	Quiriguá.....	15 16 89 05
Bananera.....	15 28 88 50	Retalhuleu.....	14 32 91 41
Barillas.....	15 48 91 18	Río Chixoy (stream).....	16 04 90 24
Canal de Chiquimulilla (canal).....	13 55 91 07	Río de la Pasión (stream).....	16 23 90 33
Cantel.....	14 49 91 27	Río Dulce (stream).....	15 49 88 45
Champerico.....	14 18 91 55	Río Hondo.....	15 10 91 25
Chichicastenango.....	14 56 91 07	Río Motagua (stream).....	15 44 88 14
Chickasaw (locality).....	15 20 88 56	Río Polochic (stream).....	15 28 89 22
Chimaltenango.....	14 40 90 49	Río Salinas (stream).....	16 28 90 33
Chiquimula.....	14 48 89 33	Río San Pedro (stream).....	17 46 91 26
Ciudad Tecún Umán.....	14 40 92 00	Río Sarstún (stream).....	15 54 88 54
Coatepeque.....	14 42 91 52	Río Usumacinta (stream).....	18 24 92 38
Cobán.....	15 29 90 19	San Cristóbal Verapaz.....	15 23 90 24
Cuilapa.....	14 17 90 18	San José.....	13 55 90 49
Dos Lagunas.....	17 42 89 36	San Juan Ixcay.....	15 36 91 27
El Estor.....	15 32 89 21	San Juan Sacatepéquez.....	14 43 90 39
El Progreso.....	14 51 90 04	San Marcos.....	14 58 91 48
El Rancho.....	14 55 90 00	Santa Cruz del Quiché.....	15 02 91 08
Escuintla.....	14 18 90 47	Santiago Atitlán.....	14 38 91 14
Esquipulas.....	14 34 89 21	Santo Tomás de Castilla.....	15 42 88 37
Flores.....	16 56 89 53	Sayaxché.....	16 31 90 10
Gualán.....	15 08 89 22	Sebol (archeological site).....	15 47 89 56
Guatemala City (or Guatemala).....	14 38 90 31	Siacate.....	13 56 91 09
Gulf of Honduras (gulf).....	16 10 87 50	Sol-lá.....	14 46 91 11
Huehuetenango.....	15 20 91 28	Tapachula, Mexico.....	14 54 92 17
Ixcán (locality).....	15 49 91 04	Tike.....	17 20 89 39
Izabal.....	15 24 89 08	Tiquisate.....	14 17 91 22
Jalapa.....	14 38 89 59	Totonicapán.....	14 55 91 22
Jutiapa.....	14 17 89 54	Uspantán.....	15 23 90 50
Lago de Atitlán (lake).....	14 42 91 12	Zacapa.....	14 58 89 32
Lago de Izabal (lake).....	15 30 89 10		
Las Casas.....	15 12 90 56	Selected airfields	
Livingston.....	15 50 88 45	Dos Lagunas.....	17 41 89 32
Los Cipresales.....	14 47 90 47	Flores.....	16 55 89 53
Mazatenango.....	14 32 91 30	La Aurora.....	14 35 90 32
Melchor de Mencos.....	17 04 89 10	Peten Itza.....	17 02 89 39
Miramundo.....	14 33 90 06	Puerto Barrios.....	15 44 88 35
Modesto Méndez.....	15 53 89 13	Quezaltenango.....	14 52 91 30
Momostenango.....	15 04 91 24	Retalhuleu.....	14 31 91 42
Morales.....	15 29 88 49	San Jose Nr 1.....	13 56 90 50
Panzós.....	15 24 89 40	Zacapa.....	14 58 89 32
Petén.....	14 37 90 17		

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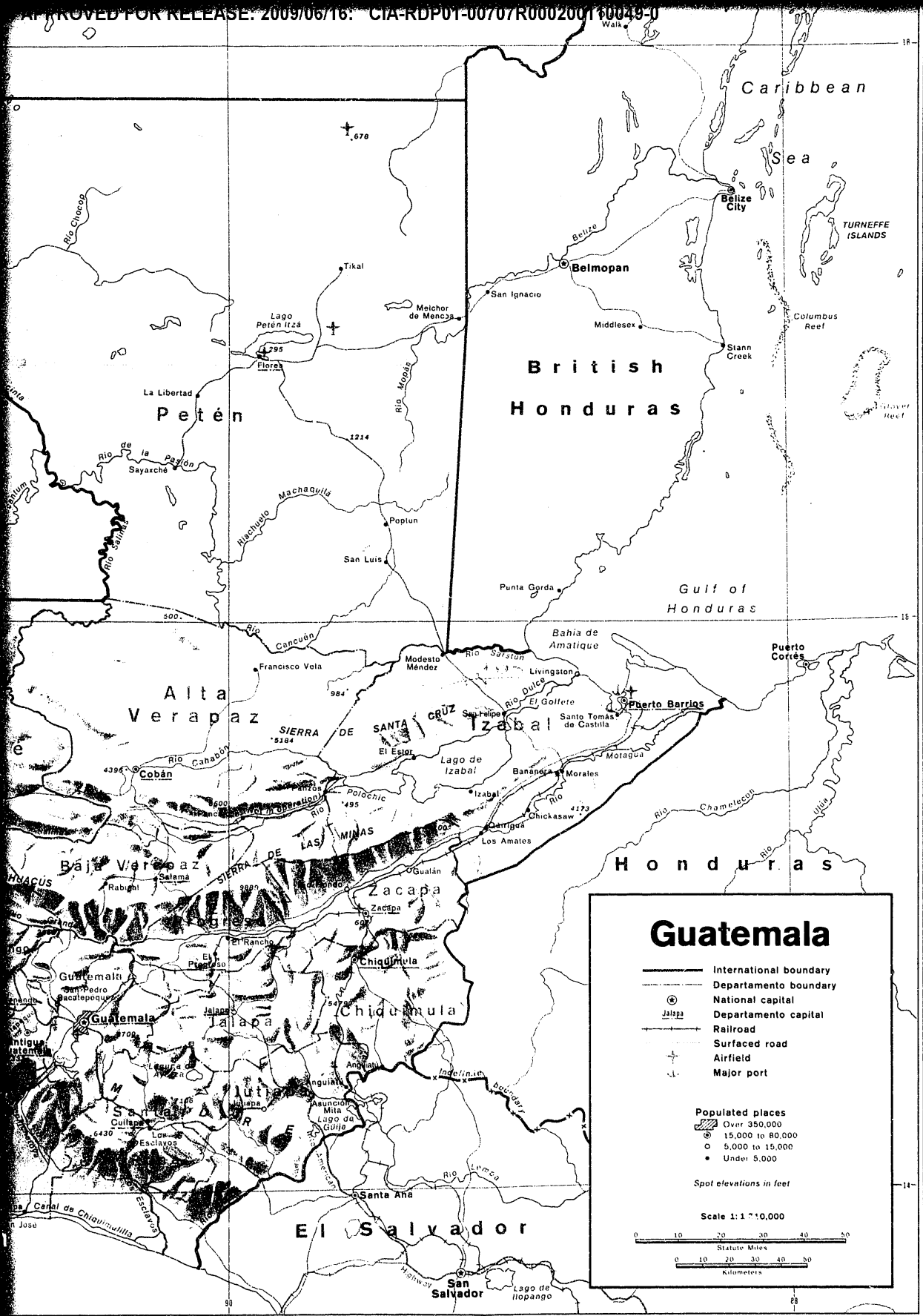
Guatemala

- International boundary
- Departamento boundary
- National capital
- Departamento capital
- Railroad
- Surfaced road
- Airfield
- Major port

Populated places

- Over 350,000
- 15,000 to 80,000
- 5,000 to 15,000
- Under 5,000

Spot elevations in feet



Terrain and Transportation Figure 15

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NO FOREIGN DISSEM

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