

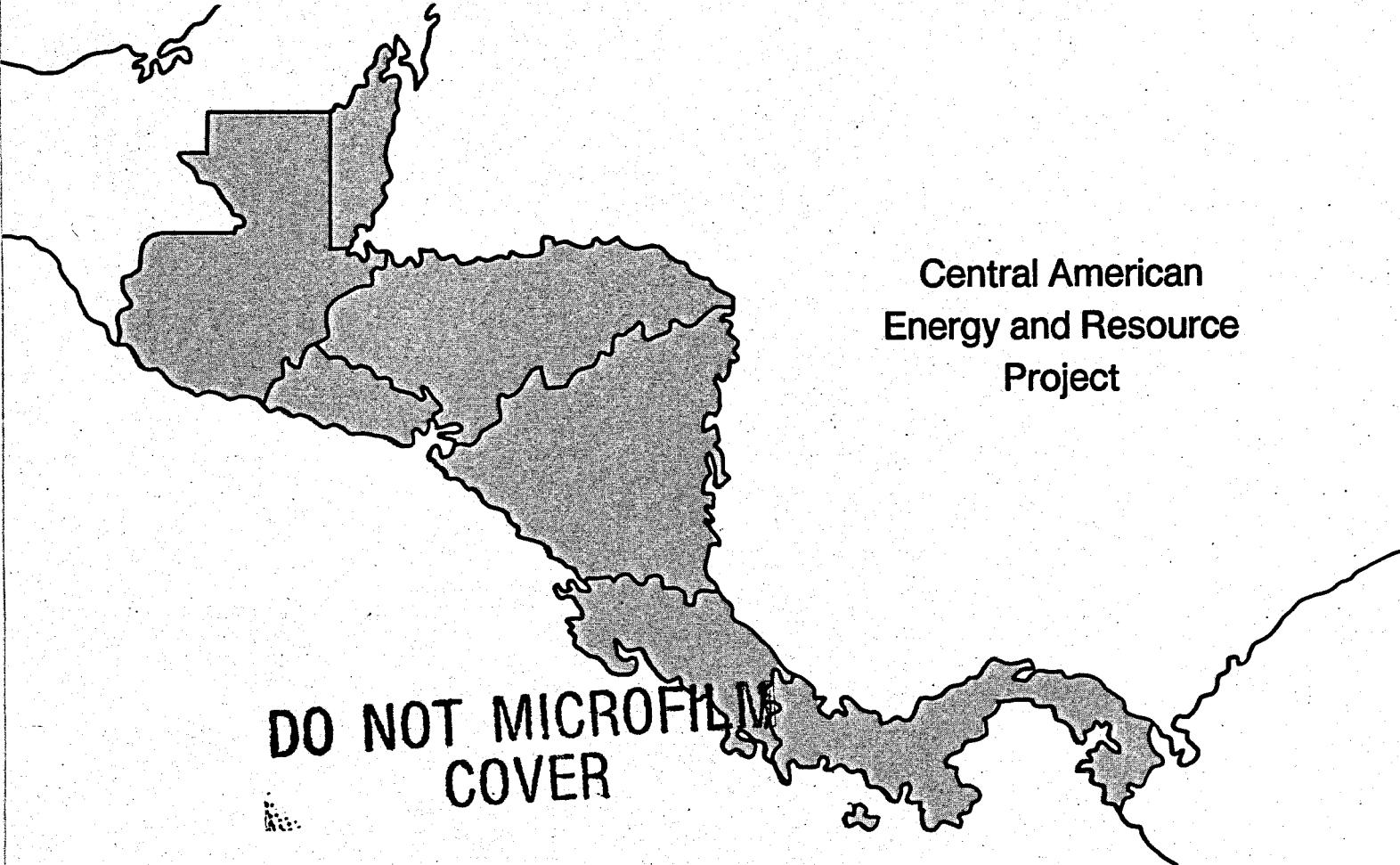
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# Central American Energy and Resource Project

# *Catalog of Known Hot Springs and Thermal Place Names for Honduras*

# MASTER

# Los Alamos

# Los Alamos National Laboratory Los Alamos, New Mexico 87545

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## **Catalog of Known Hot Springs and Thermal Place Names for Honduras**

R. C. Finch\*

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## CATALOG OF KNOWN HOT SPRINGS AND THERMAL PLACE NAMES FOR HONDURAS

by

R. C. Finch

### ABSTRACT

Thermal place names were compiled from all 1:50,000 topographic quadrangle maps for the Republic of Honduras as of July 1986, from other published maps, and from several sources of unpublished data. Known hot spring sites include those visited by Empresa Nacional de Energia Eléctrica (Honduras) geologists, sites visited by Los Alamos geologists in 1985, and other sites known to R. C. Finch. The number of known hot spring sites in Honduras with temperatures  $>30^{\circ}\text{C}$  is 125. In addition, 56 thermal sites are suspected on the basis of thermal place names. The total number of geothermal sites, known and suspected, is 181.

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## I. INTRODUCTION

Thermal place names were compiled from all 1:50,000 topographic quadrangle maps for the Republic of Honduras as of July 1986, from other published maps, and from several sources of unpublished data. Known hot spring sites include those visited by Gislason and Empresa Nacional de Energía Eléctrica (ENEE) geologists (Gislason, 1980), sites visited by Los Alamos geologists in 1985, and other sites known to R. C. Finch.

This list was compiled in March 1986 by Finch and by students working under his direction. The number of known hot spring sites in Honduras with temperatures  $>30^{\circ}\text{C}$  is 125. In addition, 56 thermal sites are suspected on the basis of thermal place names. The total number of geothermal sites, both known and suspected, is 181.

## II. METHOD OF COMPILEMENT OF HOT SPRINGS LISTED

Sites listed as known hot springs include the following: (1) Sites reported by Gislason (1980) were listed. The sites reported by Gislason were examined on the 1:50,000 topographic sheets to see if thermal place names were associated with the reported hot springs, and Gislason's site coordinates were checked against any other available data. In a number of cases Gislason's sites had been visited by Finch or members of the Los Alamos team. Where Finch's or the Los Alamos team's locations disagreed with Gislason's coordinates, Finch's were used. (2) Sites not reported by Gislason but known to Finch from previous work in Honduras were listed, as were any sites not listed by Gislason but visited by the Los Alamos-ENEE team (e.g., the Sambo Creek and Azacualpa sites). (3) Sites not listed by Gislason but reported by other authors considered reliable were listed (e.g., reports by Helbig, 1959, and Young, 1847). (4) Reliable verbal reports from scientists (e.g., K. Hirth, archaeologist at the University of Kentucky) were listed. Sites listed as suspected thermal sites are those with geothermal place names found on the 1:50,000 topographic sheets, but with the thermal spring not verified by a visit.

Maps covering the entire Republic of Honduras were examined. Finch and a group of students under his supervision examined the maps, searching for the following thermal place names:

- (1) agua caliente,
- (2) quebrada agua caliente (or any of several variants of this name),
- (3) hervideros,
- (4) agua tibia,
- (5) fuentes termales, and
- (6) agua termal (or any variant of this name).

They reported all thermal place names, along with their sites, using the UTM grid method. All names and site coordinates reported by students were verified by Finch and crosschecked with other geothermal site reports to avoid duplication of site listings. The author checked the accuracy and thoroughness of the students' data by comparing their list against the Gislason list of spring sites.

### III. HOT SPRING LISTING

Quadrangle Name	UTM Grid Coordinates	Hot Spring	Place Name	Place Name Identifier	Temperature	Comments
ARAMECINA	44/11		X	Agua Caliente		
	45/14		X	Agua Caliente		
ARENAL	100/051*	X	X	Agua Caliente Quebrada del Agua Caliente	61°-67°C	Located in the Aguán Valley, presumably related to the Aguán fault system.
AZACUALPA- RÍO GUAYABRE	99/00		X	El Agua Caliente Quebrada Agua Caliente		Probably associated with Río Guayape fault system.
	00/99	X	X	Quebrada El Agua Caliente		Warm spring, probably associated with Guayape fault system.
BAHIA CHISMUYO	394/911	X			45°C	
	433/918	X			38°C	
BALFATE	759/749*	X	X	Quebrada Agua Caliente	59°C	Possibly associated with Cordillera Nombre de Dios frontal fault.
	645/417*	X	X	Agua Caliente and Aguas Terciales	59°C	Possibly associated with Cordillera Nombre de Dios frontal fault; springs issue from Paleozoic metamorphic rocks (Pm).
	684/412	X			36°-55°C	Hot springs issue from Pm.
	759/449	X			44°C	
BARACOA	001/408*	X	X	Río Agua Caliente and Agua Caliente	58°-68°C	
	118/414	X			31°-38°C	
CAMPAMENTO	45/15		X	Quebrada Agua Caliente		The Quebrada feeds into Río Guayape, which here follows a prominent NW lineament.
	496/097	X			52°-72°C	
CEDROS	90/21 89/20 94/20		X	Quebrada Agua Tibia, Agua Tibia, and Quebrada Caliente		
CHOLOMA	034/233*	X	X	Cerro El Agua Caliente and Laguna Agua Caliente	36°-40°C	
CIFUENTES	03/55	X	X	Agua Caliente and Quebrada Agua Caliente	72°-80°C	Very near border with Nicaragua; location as reported in Gislason (1980) geothermal report is suspect.
CIUDAD DE NACAOME	66/98		X	Agua Tibia		Part of the Pavana thermal area.
	599/925	X			36°C	
	497/956	X			41°-93°C	Hot springs on east bank of Río Nacaome.
COLOMONCAGUA	42/42		X	El Agua Caliente		
COMAYAGUA	312/956	X			33°-50°C	
	233/887	X			32°-38°C	Probably associated with normal faults bounding the Comayagua graben on the west.

[An \* in the coordinates column means that this location was taken from the Gislason (1980) geothermal report.]

Quadrangle Name	UTM Grid Coordinates	Hot Spring	Place Name	Place Name Identifier	Temperature	Comments
COMAYAGUA (cont)	244/856	X			38°C	Probably associated with normal faults bounding the Comayagua graben on the west.
CONCEPCION	552/089*	X	X	Agua Caliente and Quebrada Agua Caliente	46°-48°C	On Honduras-Guatemala border.
	605/046	X			52°C	Incorrectly listed on Gislason (1980) geothermal report as on the Nueva Ocotepeque quadrangle.
CONCEPCION DEL NORTE	661/900	X			44°C	
CONFLUENCE DE RÍOS SICO Y VERDE	69/267	X				Helbig (1959) reports two hot spring sites on the Río Verde, probably around 69/26.
COPÁN-RUINAS	69/57 70/57		X	El Agua Caliente, and El Agua Caliente		
	79/52 78/50		X	Cerro El Agua Caliente and El Agua Caliente		
COROCITO	300/381	X			46°-96°C	
	185/386	X				Probably associated with a frontal fault related to the Cordillera La Esperanza.
	116/327	X			47°C	Probably associated with a frontal fault related to the Cordillera La Esperanza.
CORQUIN	00/08		X	Agua Caliente		
	873/122*	X	X	El Agua Caliente and Quebrada de Agua Caliente	38°-40°C	
	888/063	X			36°-38°C	
	893/143*	X	X	Quebrada del Agua Caliente	44°C	
CURSO MEDIO DEL RÍO PAULAYA	95/31?	X				Helbig (1959) reports hot springs on a tributary to Río Paulaya just downstream from Río Nato, probably around 95/31, which could be the same hot springs reported by Young (1847).
CURSO SUPERIOR DEL RÍO PAULAYA	68/06?	X				Helbig (1959) reports hot springs on a tributary to the Río Guayabo, probably around 68/06.
CUYAMEL-SAN PEDRO SULA	883/193*	X	X	Agua Caliente	54°-56°C	Probably related to normal faulting along the west side of the Sula Valley.
DULCE NOMBRE	06/45 06/46		X	Cerro Agua Caliente, Agua Caliente, and Quebrada Agua Caliente		
EL PARAISO	304/337*	X	X	Agua Caliente	33°-46°C	
	444/406*	X	X	Agua Caliente	30°C	Likely on a NW-trending structure, in a zone of intersecting NW and NE fractures, where the Guayape fault system appears to shift toward the Choluteca lineament.

Quadrangle Name	UTM Grid Coordinates	Hot Spring	Place Name	Place Name Identifier	Temperature	Comments
EL PORTAL DEL INFIERNO	19/92	X	X	El Agua Caliente Quebrada El Agua Caliente	70°C	This is probably the site named Hacienda Agua Caliente in Gislason (1980); if so, the location given in that report is inaccurate.
	19/94				74°-76°C	Hot spring located in Caserio Los Almendros in Gislason (1980); probably south of the Hacienda Agua Caliente site.
EL PORVENIR	92/24	X			90°-100°C	San Ignacio thermal site, large volume thermal springs with much mineralization; probably associated with the intersection of the Arenal fault with the fault bounding the Pm block; cited in Simonson (1977) and Aldrich et al. (1986).
	11/57		X	El Agua Caliente		
EL ROSARIO	224/118	X		Balneario El Chimbo	41°-45°C	
ERANDIQUE	58/79		X	Quebrada El Agua Caliente		
	64/82		X	Quebrada El Agua Caliente		
GRACIAS	318/098*	X	X	Quebrada Agua Caliente	40°C	Rather large volume spring feeds balneario.
	28/05*	X	X	Agua Caliente	56°C	
	12/16		X	Quebrada Agua Caliente		No thermal place name; local inhabitants say that there are hot springs near Oromilaca; could be on La Campa quadrangle.
	27/04?					
GUARITA	94/72		X	El Agua Caliente		
	00/69		X	Agua Caliente, Cerro		
	00/70		X	El Agua Caliente, and		
	00/71		X	Quebrada del Agua Caliente		
	05/67		X	Agua Caliente		
	05/84		X	Quebrada del Agua Caliente		
ILANGA	999/369*	X	X	Sabana Agua Caliente	52°C	In the Aguán Valley and presumably related to the Aguán fault system.
JIMIA	942/041*	X	X	El Agua Caliente and Fuente de Agua Termal	52°C	
JUTIAPA	39/44	X			85°-101°C	Sambo Creek thermal site; probably associated with Cordillera Nombre de Dios frontal fault.
	496/416*	X	X	Agua Caliente and Quebrada Agua Caliente	81°-86°C	Springs probably associated with Cordillera Nombre de Dios frontal fault.
LA BACADIA	59/34		X	Agua Caliente and Quebrada de Agua Caliente		This stream also on adjacent San Jose de Río Tinto quadrangle.
	61/37		X			

Quadrangle Name	UTM Grid Coordinates	Hot Spring	Place Name	Place Name Identifier	Temperature	Comments
LA CAMPA	28/03?					No thermal place name; local inhabitants say that there are hot springs near Oromilaca; could be on Gracias quadrangle.
LA COLONIA	67/90	X				Reported by Helbig (1959); visited by Finch and Ritchie in 1983; warm springs in flat area on east side of Río Paulaya north of Loma de Enmedio; associated with the Guayape fault zone.
LA ESPERANZA	73/83		X	Aqua Caliente		
	90/76		X	Quebrada Aqua Caliente		
LA IGUALA	63/16		X	Aqua Caliente and Río Aqua Caliente		
LA LIBERTAD	312/256*	X	X	Cerro Aqua Caliente	84°C	
	32/27		X	Quebrada Aqua Caliente		
	275/327*	X	X	Quebrada Aqua Caliente	41°C	
	19/32		X	Laguna de Aqua Caliente		
	297/275	X			38°C	
LA MASICA	794/244*	X	X	Aqua Tibia and Quebrada del Agua Tibia	45°C	Probably associated with Cordillera Nombre de Dios frontal fault.
	814/250*	X	X	Aqua Caliente	64°-80°C	
	820/249*	X	X	Quebrada de Agua Caliente	33°-80°C	Four or more springs on the west bank of creek, near highway bridge; probably associated with Cordillera Nombre de Dios frontal fault.
	914/277*	X	X	Los Hervideros and Aqua Caliente	69°-94°C	Probably associated with Cordillera Nombre de Dios frontal fault.
LANGUE	449/933	X			56°C	
	454/965	X			37°C	
LA PAZ	237/835*	X	X	Aqua Caliente	42°-45°C	Probably associated with normal faulting on west margin of Comayagua graben.
	353/813	X			39°C	Springs issue from Tertiary Padre Miguel Formation ignimbrites (Tpm).
	351/811	X			34°C	
	306/765	X			70°-85°C	
	274/746	X			51°-60°C	
LA TABLAZON	20/48		X	Quebrada de Agua Caliente		
	38/51		X	Aqua Caliente		
LA UNION	57/38	X	X	Quebrada del Agua Caliente	40°C	Probably associated with SW boundary of Santa Barbara graben.
	54/27*	X	X	El Agua Caliente	44°-50°C	Site at SW foot of Cerro Quite Gana, near Quita Gana skarn zone.

Quadrangle Name	UTM Grid Coordinates	Hot Spring	Place Name	Place Name Identifier	Temperature	Comments
LA VIRTUD	267/532*	X	X	Quebrada de Agua Caliente, Agua Caliente, and Quebrada de Agua Caliente	66°-74°C	
	238/525	X			51°-56°C	
	211/504	X			54°-98°C	On banks of Río Lempa, Honduras-El Salvador border.
LAS FLORES	unknown	X				No thermal place name; hot spring reported by University of Kentucky archaeologist Ken Hirth to be on Río Sulaco between La Conce (31/60) and the mouth of the Río Chilistagua (40/63).
	199/624	X			51°C	Located immediately downstream from El Cajón dam site.
LEPAERA	126/265	X			42°C	
	25/26	X			45°-51°C	
LEPAGUARE	636/042	X			52°-60°C	
MACUELIZO-VALLE DE QUIMISTAN	33/85		X	Agua Caliente		Possibly associated with the Chamelecon fault zone.
MANTO	555/458	X	X	Manantial de Agua Termal, Río El Agua Caliente, and Agua Caliente		Group of springs issuing from Tertiary Matagalpa Formation (Tm).
	785/484*	X	X	Cerro El Agua Caliente, El Agua Caliente, and Río El Agua Caliente	74°C	
MARCALA	77/55		X	Quebrada Agua Caliente		On possible NW lineament.
MERCEDES DE ORIENTE	98/37		X	Agua Caliente		
	06/38		X	Río del Agua Caliente		
MEZAPA	292/239	X			61°-78°C	
MINAS DE ORO	701/227*	X	X	Quebrada Agua Tibia and town of Agua Caliente	54°-70°C	
	52/37		X	Quebrada Agua Tibia		
MONTAÑA DE BOTSDEROS	80/11		X	Agua Caliente		This place name refers to a site on the adjacent Confluence de Ríos Aguán-Mame quadrangle.
MONTANUELAS	225/424*	X	X	Agua Caliente	37°-46°C	
	218/432*					
MOROCÉLI	080/533	X	X	Laguna Agua Caliente		A small, tepid laguna at the base of what is likely a fault-line scarp.
	12/57	X	X	Agua Caliente	75°C	Site no. 54 on Gislason (1980) geothermal report (in which the location of this site is incorrect); located on both banks of the Río Choluteca; issuing from Cretaceous Valle de Angeles Group (Kva) beds.

Quadrangle Name	UTM Grid Coordinates	Hot Spring	Place Name	Place Name Identifier	Temperature	Comments
MOCOCELI (cont)	241/478	X			60-73°C	8 springs on the east bank of the Río Choluteca, issuing from altered Honduras Group strata.
MOROLICA	041/962 036/960*	X X	X	Aqua Escondida	98°C	Hot spring at level of Río Choluteca on west bank, issues from vertical fracture with horizontal slickensides in Tpm; map says "Aqua Caliente," but local inhabitants say that this site is "Aqua Escondida" and that the site on the opposite side is "Aqua Caliente."
	038/960	X	X	Aqua Escondida	38°C	
	169/060	X			32°C	
NARANJITO	230/504	X			48°C	Springs issue from Cretaceous Atima Formation (Ka).
NUEVA ARMENIA	856/248*	X	X	Aqua Caliente	57°C	
	902/134*	X	X	Aqua Caliente	65°C	
	89/13		X	Quebrada Aqua Caliente		
NUEVA OCOTEPEQUE	605/943*	X	X	Quebrada de Agua Caliente, Aguas Termales, and Agua Caliente	44°C	
NUEVA OCOTEPEQUE	66/03		X	El Agua Caliente		
	71/00		X	Quebrada Agua Tibia		
OJOJONA	489/311		X	Aqua Caliente		
OPATORO	08/56		X	Aqua Caliente		
DROCUNA	744/860*	X	X	Aqua Caliente de Linaca	34°C	Tepid spring issuing from Tertiary volcanic rocks (undifferentiated) (Tv).
	893/843	X			56°C	
	890/846	X			39°C	
	912/902	X			31°C	
PARUMBLE	55/38		X	Río El Agua Caliente		This place name probably came from the site at 555/458 on the adjacent Manto quadrangle.
PIPAERA	46/59 47/58		X X	Quebrada El Agua Caliente and El Agua Caliente		
PUEBLO VIEJO	54/92		X	Quebrada Agua Caliente		
PUNTA SAL	26/53		X	Cerro Agua Caliente		An unusual site, associated with a 100-m-high knob protruding out of a coastal swamp that is the southernmost of a series of knobs forming Punta Sal (probably metamorphic or intrusive rocks; possibly some sort of fault sliver).
RÍO AGUÁN	74/79	X		Aqua Caliente		Located on a prominent NW lineament in an area noteworthy for NW lineaments that are at least in part reflections of the strike of surface rock units.

Quadrangle Name	UTM Grid Coordinates	Hot Spring	Place Name	Place Name Identifier	Temperature	Comments
RÍO LEAN	66/22		X	Quebrada de Agua Caliente		Probably associated with Cordillera Nombre de Dios frontal fault.
RÍO LINDO	977/705*	X	X	Laguna Agua Caliente (Aguas Terciales)	50°-75°C	Warm springs associated with considerable mineralization; possibly associated with graben faulting in the Sula Valley.
	04/75		X	Quebrada Agua Caliente		Part of the El Olivar site.
	060/733	X	X	Laguna El Playon	35°-71°C	The El Olivar thermal site; several hot springs associated with a small fault-line scarp.
RÍO NEGRO	89/38		X	Quebrada del Agua Caliente		
RÍO TOCOA	112/322	X			35°-44°C	
SABANA GRANDE	72/16		X	Quebrada Agua Caliente		
SABA-TOCOA	920/314*	X	X	Agua Caliente	70°C	Site in the middle of the Aguán Valley in what should be an alluviated plain; presumably associated with the Aguán fault system.
SAN ANDRES	18/69		X	Agua Caliente		
SAN ANTONIO DEL NORTE	22/35		X	Agua Caliente		
	21/47		X	Quebrada Agua Caliente		
	44/31		X	Quebrada del Agua Caliente		
SAN BUENAVENTURA	95/29		X	Quebrada Agua Tibia		
SAN ESTEBAN	22/837					No place name; fossil spring mound, exact location not recorded, seen by Finch beside road near El Ciruelo, probably in grid square 22/83; site is in broad alluviated valley.
SAN FRANCISCO	779/413*	X	X	El Agua Caliente and Quebrada de Agua Caliente	68°C	Site appears to be in coastal plain alluvium, but thermal activity could be related to Cordillera Nombre de Dios frontal fault.
SAN ISIDRO	841/212	X			65°C	El Zarzal thermal site hot springs issue from Ka on east bank of Río Ulúa at water level (inundated in wet season); cited in Finch (1972).
	753/142	X			71°-90°C	
	861/134	X			33°C	
SAN JOSE DE COLINAS	56/61		X	Quebrada de Agua Caliente		
SAN JOSE DE RÍO TINTO	58/40		X	Quebrada de Agua Caliente		This place name probably relates to the thermal site name on the adjacent La Bacadía quadrangle.

Quadrangle Name	UTM Grid Coordinates	Hot Spring	Place Name	Place Name Identifier	Temperature	Comments
SAN JUAN	44/95		X	Agua Caliente		
	51/90		X	Agua Caliente		
	542/871	X			33°C	Issues from Tpm.
SAN LORENZO	655/815*	X	X	Río Agua Caliente	63°-90°C	Springs at the Pan American Highway bridge; part of Pavana site.
	662/822	X			70°C	Part of Pavana site.
	627/813	X			80°-85°C	Part of Pavana site.
	638/814	X			70°-75°C	Part of Pavana site.
	602/851	X			30°C	Part of Pavana site.
	591/880	X			33°C	Part of Pavana site.
SAN LORENZO	594/886	X			34°C	Part of Pavana site.
	598/888	X			34°C	Part of Pavana site.
SAN LUCAS	231/291	X			37°C	
SAN MARCOS	644/881*	X	X	Agua Caliente	51°C	
SAN MARCOS DE OCOTEPEQUE	95/90		X	El Agua Caliente and Quebrada del Agua Caliente		
	931/013*	X	X	Quebrada Agua Caliente	50°C	
	905/990	X			36°-38°C	
SAN NICOLAS	606/459	X	X	Fuente de Aguas Terciales and Agua Caliente	62°C	
	600/450		X	Quebrada Agua Tibia		Probably same thermal site as 606/459.
SAN PEDRO DE TUTULE	13/72		X	El Agua Caliente		
SAN PEDRO ZACAPA	731/289	X			55°C	Hot spring at base of large silicified knob on west side of Río Gualcarque; some stibnite and fluorite mineralization cited in Finch (1972) and Eppler et al. (1986).
	777/274	X	X	Fuentes Terciales	74°C	Large-volume springs in gravel bar in the middle of Río Ulúa (bar cemented by travertine from the springs); probably associated with the Río Ulúa fault system, cited in Finch (1972) and Eppler et al. (1986).
	78/26		X	Town of Agua Caliente		Name refers to 777/274 thermal site.
	843/262	X		La Cueva	100°C	Azacualpa thermal site known locally as "La Cueva"; numerous hot springs associated with the Zacapa fault; occasional steam explosions reported by local inhabitants; see Finch (1972) and Eppler et al. (1986).

Quadrangle Name	UTM Grid Coordinates	Hot Spring	Place Name	Place Name Identifier	Temperature	Comments
SAN PEDRO ZACAPA (cont)	702/344	X			32°C	Possibly related to Ulua fault system (Finch, 1972).
	716/342	X			30°C	Cited in Finch (1972).
SANTA MARIA	865/417	X			76°-83°C	
	878/397	X			56°C	
	875/395	X			76°C	
	990/403	X			74°-84°C	
	989/404	X			75°-81°C	
	923/329*	X	X	Quebrada del Agua and El Agua Caliente	79°-101°C	The Platanares thermal site; numerous hot springs issuing from Tpm; cited in Heiken et al. (1986).
TEGUCIGALPA	779/634*	X	X	Agua Caliente	53°C	
	533/813*	X	X	El Agua Caliente	50°-81°C	Local inhabitants report that water here is sulfurous smelling and hot enough to boil eggs.
TRUJILLO	191/612	X			64°C	
VALLECILLO	66/19		X	Quebrada de Agua Caliente		
	65/19		X	Rio Grande del Agua Caliente		This stream flows near town of Agua Caliente on adjacent Minas de Oro quadrangle, and its name may refer to thermal sites there.
VALLÉ DE NACO	906/054	X			50°C	
VILLA DE SAN FRANCISCO	10/81		X	Agua Caliente and Quebrada del Agua Caliente		Located on west flank of Montaña El Chile, which is a massive plug-like body of Tv.
VILLANUEVA	09/82		X	Quebrada de Agua Caliente		
	04/77		X	Quebrada Agua Caliente		Part of the El Olivar thermal site on the adjacent Río Lindo quadrangle.
	051/803	X			40°C	
YORITO	53/59		X	El Agua Caliente		
YUSCARAN	246/314	X			80°C	Springs issue from Tpm.
ZAMBRANO	626/727	X	X	Balneario San Francisco hot springs	36°C	Associated with fault in Tpm.

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