

ESSO VENTURES INC.

LSB
51

Belize File

FIELD OPERATIONS REPORT
SOUTH BELIZE PROSPECT
TOLEDO-BELIZE-CENTRAL AMERICA
PART I SURVEY B76A



Belize File

**FIELD OPERATIONS REPORT
SOUTH BELIZE PROSPECT
TOLEDO-BELIZE-CENTRAL AMERICA
PART I SURVEY B76A**

for

ESSO VENTURES INC.

*B76A Production
246 hours*

**by
Geophysical Service Incorporated
Party 1560
Belize City, Belize
Central America
August, 1976**



LIST OF PLATES

- PLATE I - INDEX MAP
- PLATE II - CREW ORGANIZATION CHART
- PLATE III - LINE LOCATION MAP
- PLATE IV - HORIZONTAL AND VERTICAL TIES
- PLATE V - SHOOTING AND SPREAD INFORMATION
BY LINE



TABLE OF CONTENTS

	<u>Page No.</u>
INTRODUCTION	1
GENERAL INFORMATION	2
Crew Organization	2
Crew Headquarters	3
Logistics	4
PHYSICAL CONDITIONS	6
Topography	6
Vegetation	7
Culture	8
Climate	8
Working Conditions	9
EXPERIMENTAL SHOOTING	9
PRODUCTION SHOOTING	12
Surveying	16
Permitting	18
GSI Concrete Markers	18
Accuracy of Survey	19
Survey Data Submitted	19
List of Bench Marks	19
Line Descriptions	21
Drilling	24
Instrumentation	25
PERSONNEL	26



INTRODUCTION

A seismic reflection exploration program (Survey B76A) of the South Belize Area was carried out by Geophysical Service Incorporated for Esso Ventures Inc., from January 2, 1976 to August 5, 1976.

The South Belize Area is located in the south of the country of Belize, in the Toledo District, being its boundaries as follows: the Alabama road to the north, the Sarstoon river to the south, the Maya mountains to the west and the Caribbean Sea to the east. (See Plate I).

The operation was conducted by GSI Party 1560, mostly in heavy jungle, using three D-7 Caterpillars to cut the lines, two 500 Mayhew drills mounted on D-4 cats, two Ardco buggy-drills: one air and one water. During the last month, the operation was conducted entirely portable, using ^{hand} ~~had~~ drills. Both truck and boat support were used.

Six and twelve fold CDP data was recorded in most of the lines, using digital TI-DFS V instruments. Lines # 8 and 9 were shot



48 fold and line # 11 was shot 24 fold. One line, # 13, was shot with explosive cord.

A total of 15 lines were recorded in the course of the seismic survey.

Record quality is considered fair to poor throughout the prospect, although it deteriorated badly while shooting in the western part of the area and also in the swamps close to the Temash and Sarstoon rivers.

GENERAL INFORMATION

Crew Organization

The organization for crew 1560 is illustrated in Plate II. Briefly, the personnel involved in the operation was as follows: a) an operational Supervisor located in Bogotá, Colombia; b) a Party Manager located in Base Camp, attending also the GSI office in Belize City; c) a Seismologist and Party Manager relief, located in Base Camp; d) an administrator located in Base Camp; e) an administrator (local) located in Belize City; f) a team composed



by a head surveyor and two surveyors whose time was divided between the field and the base camp, at the beginning of the prospect. From March, 1976, to the end of the seismic survey, all three were located in the fly camp; g) a team of three instrument engineers located in the field. Ordinarily, two observers remained on the line at all times; h) a drill supervisor located in the field; i) a driller-mechanic whose time was divided between the field and the base camp; j) a mechanic (local) whose time was also divided between the field and the base camp; l) trocha crews, each one headed by a foreman located in the fly camp and sharing the same trocha crew kitchen; m) drill crews, located in the fly camp and sharing the same drill crew kitchen; n) a recording crew headed by a foreman located in the fly camp with their own kitchen; o) support personnel composed of two truck drivers, three boat drivers and two workers at the staging warehouse located at the mouth of the Temash river.

Crew Headquarters

Crew headquarters were always in base camp, which was located at Cattle Landing, on the road to Belize City and about one mile north of Punta Gorda town, during most of the seismic survey. The base camp was moved three times to be closer to the working lines.



On February 17th base camp was moved from Cattle Landing to a place called Medina Bank, also along the road to Belize City, on the bank of Deep River.

After two months, on April 21st, the base camp was moved ^{de nuevo} again to Blue Creek, an indian village on the bank of Blue Creek. As soon as the field work progressed along line 4, the base camp was moved back to Cattle Landing to continue supporting the field work by truck through Blue Creek or by water through Sea and the Temash River. Since May 13th, the base camp was located at Cattle Landing until August 5, 1976 when the crew was terminated temporarily by Client's orders.

Logistics

Supplying the operations was not a problem most of the time. From January through mid May supply and operations were conducted using truck mounted equipment and Ardco buggies. During the last two months it became very difficult due to heavy rains, river crossings and low areas. The field support was then handled by motor-boats using a staging area, at the mouth of the Temash river as an inter-



mediate point. The road to Belize was out of service for two-three weeks at a time.

The staging area had commodities to furnish food and lodging to the personnel passing through. The transporting of supplies, materials and personnel back and forth from the fly-camp to the river bank was done with Ardco buggies encountering difficulties already mentioned.

The wooden hull boats were rented by the Client for water support, on a monthly basis, as follows: the 20 ft. long "La Rosa" boat came from Belize City. It had a capacity of 3.500 lbs. and was equipped with a diesel 4 cylinder Ford Engine; another 20 ft. long wooden boat "Dory" was rented in Punta Gorda. It had a capacity of 2.500 lbs. and was furnished with a 40 H.P. Johnson engine by GSI.

The Maya Airlines was used to transport supplies and parts as well as staff personnel back and forth from Belize City to base camp.



14

This airline is the only one that provides flying service from Belize City to the south. It has two flights per day, six days a week.

The food and part of the supplies were purchased in Punta Gorda town or Mango Creek (when the base camp was located at Deep River). Other materials, especially engine parts, were sent from Belize City or from abroad.

Most of the laborers were contracted in Punta Gorda. Some came from the vicinities of Cattle Landing. The indian labor force was contracted right at the fly camp.

Radio contact was maintained between Belize City and the base camp. Additionally, the fly camp and the staging area at the Temash river were equipped with transceivers for communication with each other and base camp.

PHYSICAL CONDITIONS

Topography

The area surveyed is flat in 90% of the prospect with the only



exception being the western part which is located right at the foothills of the Maya mountains.

The area is low ranging from 0 mts. elevation at the coast of the Caribbean Sea to 10 mts. to the west.

About 40% of the prospect is generally swampy. There are six major rivers: Swasey Branch and Bladen Branch of Monkey River; the Deep River; Rio Grande; Moho River; Temash River and Sars-ton River within the boundaries of the prospect. There are also many small rivers and streams scattered throughout the area.

Vegetation

The area south of Deep River is covered by dense tropical rain-forest, broken by an occasional small clearing with grass. The tall trees (80-100 ft. in height) produce a heavy umbrella of tree top foliage that allows a dense bush to grow underneath. From Punta Gorda north, the road to Belize crosses several Govern-ment forest stations dedicated to the growth of pine trees. The area north of Deep River has broad grass covered savannahs inter-



spersed with dense rainforests along the waterways.

Culture

Population is sparse throughout the area surveyed. Along the main road from Punta Gorda to Belize City there are several vil-lages, specially at the major rivers. The north end of the pros-pect crosses citrus fruit, banana and mango plantations. Along the road near Punta Gorda, a few cattle ranches are present.

There are two towns within the boundaries of the prospect: Punta Gorda and Mango Creek-Independence. The indian population, mainly composed of groups of Maya and Ketchi, are scattered in several Indian Reservation areas.

Climate

The temperature in the area ranged from around 80° F during the day to 70° F at night.

The rainfall is generally quite heavy and the humidity very high. In many occasions the heavy rains slowed down production. Nine-



teen days were lost during the prospect due to bad weather.

Working Conditions

Working conditions were at best only fair. After a heavy rain, the water trapped made Line 2 a difficult place to work. The inhabitants of the area were generally friendly and cooperative.

EXPERIMENTAL SHOOTING

An experimental shooting program was carried out on the southeastern end of Line 6, from January 2nd to January 6, 1976, conducted by Esso personnel: John Davis, Lester Stephens and Jerry Suggs.

- A) On January 2nd an up-hole survey was recorded at SP 2169 on Line 6. Eight shots were taken at depths of 25, 20, 15, 11, 8, 5, 3 and 1 meter from the surface. Each shot was recorded at 3 geophone stations located on the surface at one meter, 3 meters and 5 meters from the hole. The results showed a weathering layer of around 6 meters thick with a velocity of ^{2050'/sec} 625 m/s. The sub-weathering velocity was 2200 m/s. ^{7216'/sec}



B) On January 3rd a refraction spread was prepared and recorded also on Line 6 between stakes 2172 and 2167. The group interval used was 10 mts. from stake 2172 to 2170. From stake 2170 to stake 2169, 5 meters was used as group interval. Again, from stake 2169 to stake 2167, the group interval was 10 mts.

For each recorder station a string of 12 seises was used, bunched at each station and perpendicular to the line of shot-points. Trace # 1 was located on stake 2167 being the geophone station # 31 at stake 2172. Three shots were taken, one at SP 2170 (profile) and two at SP 2169 (reverse profile).

After the data was plotted and interpreted, the T-X graph showed that:

1. No weathering layer was recorded.
2. Three layers were recorded with true velocities of 2000 m/s, 3700 m/s and 4400 m/s.
3. All three refractions are dipping to the south.

C) On January 3rd and 4th a noise spread was recorded on Line 6. For the inline shooting the noise spread was located between stakes 2073 (group # 1) and 2169 (group # 96). Each geophone



station had a string of 12 geophones bunched perpendicular to the line.

Fourteen shots were taken at SP's 2169 (8) and 2073 (6) into the inline spread using different charge, depths, hole pattern and filter settings. The group interval was 50 meters.

D) An L spread was set up between stakes 2169 and 2170 (12 groups) and in a line perpendicular to the main line, were located another 12 groups from stake 2170. Groups 1 to 24 were parallel to groups 25 to 48. So traces # 1 and 25 were located at stake 2169 and traces 24 and 48 were set up at the end of the line perpendicular to the main line of shooting. Five shots were taken at SP 2173 into the L spread using different charge, depth and hole pattern.

E) On January 5th and 6th comparison shooting was recorded. Twenty-two shots were taken to compare results between single hole and 5 hole pattern (25 m. apart) and 7 hole pattern (20 m. apart) on SP's: 2169 (8 shots), 2171 (6 shots) and 2173 (8 shots). Different charges, depths and offsets were also



tried as well as low cut filters 12 Hz and 18 Hz.

F) Comparison shooting using explosive cord (100 grain Primacord) as against drilled holes with explosives was carried out at the beginning of line B76A-006 (the first line). The energy level and data quality was considered inferior and the decision was to use drills and explosives.

G) Thirty-two experimental shots were taken along the prospect on lines 6, 10, 5, 17 and 19.

PRODUCTION SHOOTING

Finally, it was decided to use the following parameters for production shooting:

Type of spread	Offends group # 48
CDP coverage	12 Fold
Group interval	50 meters
Distance between SP's	100 meters
SP offset to group # 48	200 meters



Geophone Array	24 seises in line (3 m. appart) (maximum extension of geophone cables).
SP Array	{ Single hole 7 hole pattern (16 m. appart) 5 hole pattern (22 m. appart)
Hole Depth	{ 60 feet (single hole) 18 feet (5 and 7 hole patterns)
Charge size	20 lbs.
Field Filters	{ Low cut: 18 Hz-18 db/octave High cut: 128 Hz-72 db/octave
Sample rate	2 ms
Record length	5 sec.

Several of these parameters were changed along the prospect as Chart V illustrates. Line # 13 was shot using 1600 ft. of 100 grain Primacord as the energy source.

In working this prospect the following scheme applied:

1. The line was laid out by the surveying crew and cut by a bulldozer helped by a trocha crew.



2. The drill crews perforated and loaded the locations measured and marked by the trocha crew.
3. The center-line group locations and shot holes were located by the surveyors.
4. A recording crew worked to lay cables and seises enough to cover 96 geophone stations, to allow shooting 24 shot points from each instrument set-up, when shooting offend spread, 12 Fold. When the recorders were shooting split spread, 6-Fold, only 9 shot points could be shot from each instrument set-up. By means of a rollalong box, the proper 48 groups could be connected to the instruments and a record taken. With each succeeding shot, coverage was moved toward the head of the cable, using the rollalong box. As this procedure continued, cable sections and seises were picked up from behind and transported to the front where they were re-connected.

The average shooting production per month was 25.140 Kms. April was the best month with 60.465 Kms. shot, being July the poorest one with 12.460 Kms. shot.



Two factors affected the shooting production as follows:

1. The poor performance showed by the bulldozers was a decisive factor, that reduced the possibilities in drilling and shooting. Three D-7 Caterpillars worked during the prospect. Considering that 100% of efficiency is reached when a bulldozer works 10 hours per day during 28 days per month, the results are as follows:

Cat # 1 - 1550 - Total hrs. worked - Efficiency: 69.2%

Cat # 2 - 581 - Total hrs. worked - Efficiency: 29.6%

Cat # 3 - 1005 - Total hrs. worked - Efficiency: 51.3%

Ten days were completely lost for drilling and shooting because no line was available.

2. The second factor that slowed the production down was the persistent bad weather. Heavy rains affected the line so badly that working and even walking was difficult and the entire crew had to go portable since July 1st. Both trocha and drill crews were shut down on July 22nd by the Client. Recording crew was shut down on Aug. 5th. Nineteen full days were lost due to bad weather during the prospect, not to mention partial days when work stopped and resumed due to rain,



or days when we had a late start due to heavy rain in the morning.

Surveying

Field Procedures - The seismic line bearing, station locations and elevations were established through use of two theodolites with compasses attached. The theodolites used were the Wild TI # 42014 and the Kern DKM 2 # 9598C. Traverses were made using the compass stadia method. Stadia distances were compared to the chained distances between group stakes as a check. Vertical angles were read in both positions to the same rod reading, giving a zenith distance in face left position and a value of $360^{\circ} - Z$ in the face right position.

The two angles should therefore add up to 360° plus or minus any possible index error, supplying a check to the surveyor on the correctness of his readings. Mean values, accurate regardless of slight errors of adjustment, were used to compute the difference in elevations.



The compasses were compared with azimuth lines determined by solar or stellar observations, and also corrected for convergency of the meridian, thus giving bearings from grid north. In the northern part of the prospect compass corrections were also found by surveying between two Government Trig. Points.

North East Zone of the Prospect - From and including line B76-A-006 to the North i.e. Lines 7, 8, 9, 10, 11, 12, 13 and 14 numerous Government trigonometric points and benchmarks exist along the Punta Gorda-San Antonio and the Big Falls-Belize roads.

All of the above mentioned lines were taken off from a Trigonometric point and a benchmark nearest to the line. In the case of lines 6 and 7 these were tied on both sides, near the line extremes. Line 8 to the Northwest of the road was surveyed as a loop due to the high hills in this part. The southeast ends of lines 8 through 14 are in low land. Elevation found at these places were in the neighborhood of 1 to 0 meters above sea level insuring no gross error in the leveling work. Note: Line 11 was double run. Coordinates of station locations were tied to topo-



graphic landmarks showing on the map and recognizable in the field, like bends in streams and roads, etc. This gave a check on the accuracy of the plot.

South West Zone of the Prospect - For Lines 4, 3, 5, 2, 17 and 19 a control survey had to be made from BM-D18 near Line 6 over the road that leads from San Antonio to Blue Creek, to Line 4 shot-point 2001. This station is located alongside the road that goes from Blue Creek to Aguacate approximately 600 m. SW of the bridge.

This part of the prospect was later tied in to Triangulation Station Crique Sarco from Stake 2119 of line 17.

Permitting

Permits were obtained by GSI's surveyors. Permitting was a rather simple operation.

GSI Concrete Markers

Concrete markers were constructed at intervals of about 5 Kms. along the lines and on line and road intersections. They consist



of a cement block about 25 x 25 cm. with a 2 inch pipe in the center, sticking up about 3 ft. Some have the identification number burned or welded in the pipe and others have a bronze plaque with the number stamped in it, stuck in the cement.

Accuracy of Survey (where controlled)

Horizontal: 15 m. $\sqrt{\text{distance Km.}}$

Vertical: 10 cm. $\sqrt{\text{distance Km.}}$

Survey Data Submitted

Survey field notebooks (Original and copies). Coordinate calculation forms. List of Benchmarks. Survey data sheets (copies). Line description list. Shotpoint location map. Horizontal and vertical ties map. Line location map. Forms and maps received from Client.

LIST OF BENCH MARKS (GSI)

<u>Line</u>	<u>Station</u>	<u>Elevation</u>	<u>Coordinates</u>	
			E	N
L-4	2001	22.97	281.123.7	1.791.413.6
	2243	12.42	287.292.5	1.781.240.3
L-3	Cross L-3	17.01	282.953.4	1.778.439.3
	L-5			



<u>Line</u>	<u>Station</u>	<u>Elevation</u>	<u>Coordinates</u>	
			E	N
L-2	Cross L-2	16.79	275.897.8	1.773.266.7
	L-5			
	Cross L-2			
	L-19	2.03	277.810.4	1.766.683.6
L-17	Cross L-17	44.63	271.590.2	1.772.205.6
	L-5			
	2119	15.00	272.779.5	1.768.312.6
	Cross L-17	21.64	273.163.3	1.766.633.3
	L-19			
L-19	Cross L-19	29.61	269.474.0	1.766.567.2
	L-18			
L-6	1995	15.54	300.358.3	1.783.738.8
	2073	7.28	298.248.2	1.787.015.7
	2267	24.98	292.766.8	1.794.995.3
	2379	50.19	287.507.9	1.796.935.0
L-7	2057	2.56	302.877.6	1.788.079.3
	2125	11.78	300.652.7	1.790.609.4
	2281	24.13	295.438.8	1.796.388.9
L-8	2253	31.12	300.309.1	1.801.996.2
L-9	2222	29.52	305.476.2	1.804.698.9
L-10	2303	16.03	309.491.8	1.814.794.6
L-11	2447	3.37	330.261.3	1.805.811.8
	2300	4.65	328.776.4	1.809.171.3
	2150	10.48	327.805.0	1.811.483.5
	2000	12.47	324.118.8	1.817.998.3
L-12	1961	26.85	330.686.0	1.826.616.2
	2060	20.99	333.520.7	1.822.565.7
	2151	12.26	336.260.2	1.818.952.2
	2273	1.93	339.444.5	1.813.790.2



<u>Line</u>	<u>Station</u>	<u>Elevation</u>	<u>Coordinates</u>	
			E	N
L-13	2001	17.46	341.874.9	1.825.011.6
	2111	28.24	339.186.1	1.829.808.0
	2221	44.87	336.245.1	1.834.397.1
	2321	49.86	332.221.8	1.837.267.2
L-14	1853	71.55	336.453.6	1.843.315.5
	1997	40.46	340.202.1	1.840.004.5
	2193-2194	24.12	344.159.1	1.834.495.8
	2323	6.20	347.174.6	1.831.154.5

Line Description

Lines 5, 3, 2, 17 and 19 are located in the forest in the SW part of the prospect, between the Blue Creek, Moho and Sarstoon rivers.

Take off and tie points for vertical and horizontal control were respectively Government Benchmark D-18 near Line 6 and Trigonometric station "Crique Sarco" near Line 17.

Line 6 - This line follows the Punta Gorda-San Antonio road starting from Jacinto Creek. Base for vertical control was BM D-7 with ties to G-75 and D-18. Base for horizontal control was Trigonometric station 178 with ties to Trigonometric stations 173 and 281. The Phillips Machaca Well was tied in also.



Line 7 - This line takes off from the Phillips Punta Gorda # 1 Well site (i.e. SP 2001). It crosses the Punta Gorda-Mango Creek road near mile post 85. Base for vertical control was BM D-7 with a tie near the end to BM G-75. Base for horizontal control was Trigonometric station 178 with a tie to Trigonometric station 172 which is located † 1500 SW of before mentioned mile post 85.

Line 8 - This line is located 300 mts. Northeast of mile post 80 of the Punta Gorda-Mango Creek road, and runs NW and SE from this point. Base for vertical control was BM G-71. Base for horizontal control was Trigonometric Station 170.

Line 9 - This line takes off between mile posts 75 and 76 at the gate of the farm "Los Salvadoreños", and runs NW and SE of this point. To the Northwest this line crosses some old Maya ruins, named "Nimli Punit" by Government archeologists. Base for vertical control was BM G-74. Base for horizontal control was Trigonometric Station 168.

Line 10 - This line crosses the Punta Gorda-Mango Creek road



about 3400 mts. NE of the Golden Stream bridge between Golden Stream and Deep River and runs NW-SE. Base for horizontal and vertical control was Trigonometric Station 166.

Line 11 - Base for vertical and horizontal control for this line was Trigonometric Station 157 which is located \pm 2800 meters NW of the Bladen Branch bridge along the Punta Gorda-Mango Creek road. A traverse was run to line 11 over a Forestry road that was used as access road. (See line location map).

Line 12 - This line crosses the Punta Gorda-Mango Creek road about 2900 meters SW of the bridge across the Swasey Branch, and runs NW and SE. Going S 45° E it follows a new Forestry Service road as far as the Swasey Branch. The end of the line can be reached through the road that goes to the "Mango Farm" of the Tropical Fruit Company. Base for vertical and horizontal control was Trigonometric Station 152 which is located 400 mts. NE of the before mentioned intersection.



Line 13 - This line crosses the Punta Gorda-Mango Creek road 2 Kms. NE of the entrance to the "Mango Farm" of Tropical Fruit Co. Base for vertical control was BM G-38. Base for horizontal control was Trigonometric station 142.

Line 14 - This line crosses the Mango Creek-Stann Creek road 750 mts. SW of the intersection of this road with the Alabama road. Base for vertical control was BM G-27. Base for horizontal control was Trigonometric station 140.

Drilling

Two Mayhew 500 drills mounted on D-4 Cats and two Ardco buggy-drills were used for most of the drilling. Jacro portable drills were tried but gave poor results. During the last month, during the rainy season, hand drills were used (lines 17 and 2). Drilling conditions were fair in general. The water for drilling was usually available. The sedimentary sequence varied very often. As an average, it could be said that after a thin layer of sand on top, comes the clay, normally to the bottom of the hole (20 ft. hole).

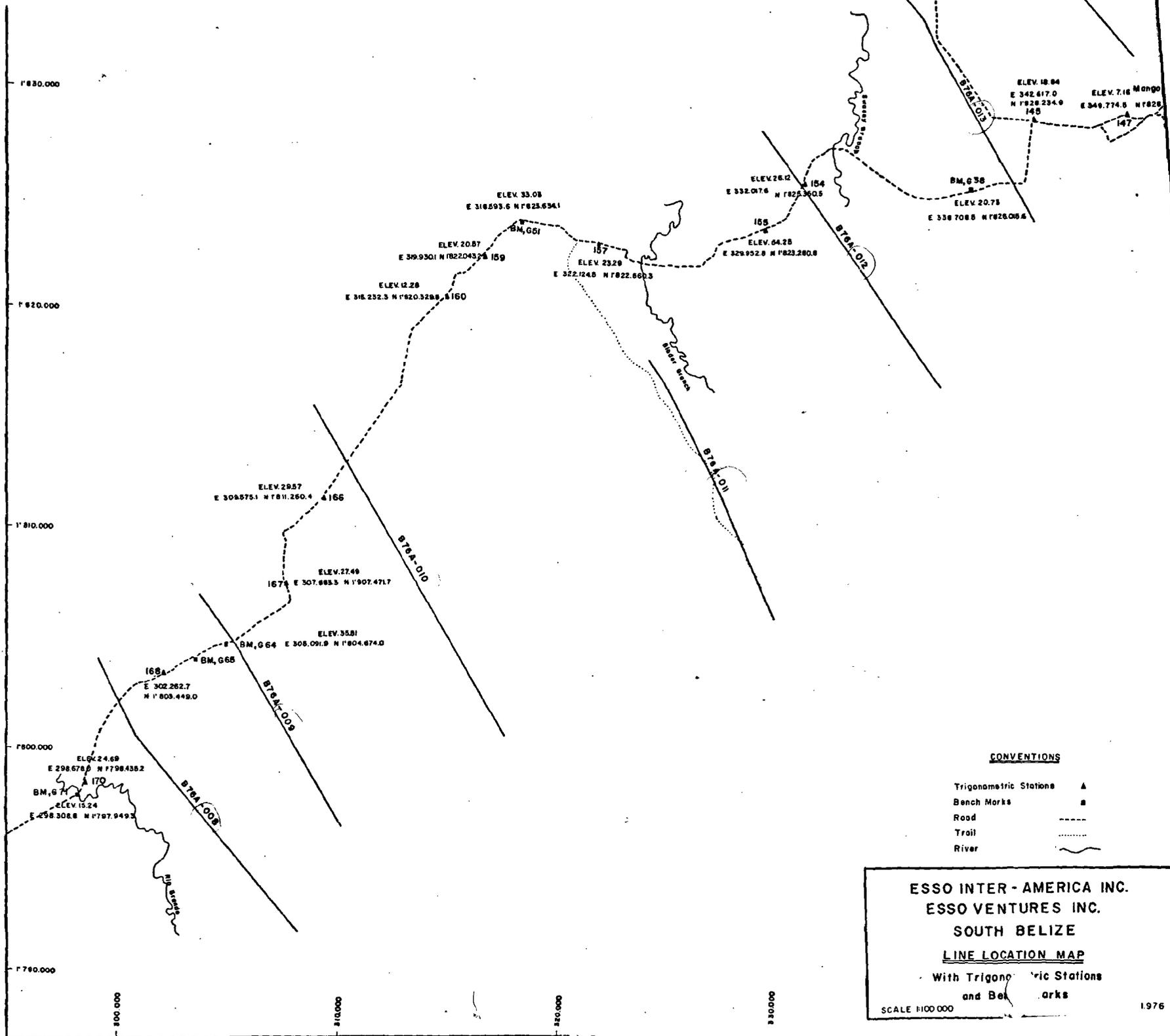


Drilling difficulties were found on Lines 3, 4, 5, 6 and 7, where the limestone was very shallow (10 ft. or less) in places. On parts of lines 4 and 5 shallow solution caverns in shallow limestone caused considerable drilling problems.

Instrumentation

System	Texas Instruments DFS V portable 48 trace capability
Amplifiers	Texas Instruments IFP
Mode	IFP
Format	SEG B
Geophones	Mark L-25 10 Hz. 12 seises per string
Cables	104 conductor portable land cables. 3 takeouts per segment.
Camera	SIE VRO-10
Sample rate	2 ms

Daily instrument tests were made. These tests included: Instrument noise test, Dynamic Range Determination (DRD), AGC oscillator test and test Time break and Pulse Test.



CONVENTIONS

- Trigonometric Stations ▲
- Bench Marks ■
- Road ———
- Trail - - - - -
- River ~~~~~

ESSO INTER - AMERICA INC.
ESSO VENTURES INC.
SOUTH BELIZE
LINE LOCATION MAP
 With Trigonometric Stations
 and Bench Marks
 SCALE 1:100,000 1976

B76A

SHOOTING INFORMATION BY LINE

SPREAD INFORMATION BY LINE



LINE No.	S.P. to S.P.	No. PROFILES	No. SHOTS	KM. SURFACE COVERAGE	No. OF HOLES PER SHOT	HOLE SPACING (M.)	CHARGE DYN, PRI, CAP	AV. TOP OF CHARGE (feet)	AV. HOLE DEPTH (feet)	AV. GEOFLEX PER SHOT (feet)	SHOOTING DATES	GROUP INT. (M.)	No. OF FOLD	LAY DOWN FILTERS	TYPE OF SPREAD	OFFSET OR CENT. GAP (M.)	RECORD LGTH. (SEC.)	SPREAD CONFIGURAT.	REMARKS
6A	2001-2283	142	157	14.200	7 5 Single	16 22 -	4-1-1 2-1-1 3-1-1 19-1-1	13 13 50	15 15 60	266	1/9/76- 1/21/76	50	12	18/18- 128/72	Off-ends	200	5	2550-200	12 Experimental Shots
6B	2271B-2441	86	87	12.200	5 Single	22 -	3-1-1 19-1-1	16 45	18 55	-	1/22/76- 1/28/76	50	12	18/18- 128/72	Off-ends	200	5	ditto	
7	2315 2001	145	145	14.500	5 Single	22 -	3-1-1 19-1-1	15 50	17 60	-	1/29/76- 2/9/76	50	12	18/18- 128/72	Off-ends	200	5	200-2550	
7	2009A-2001A	18	18	2.700	5	22	3-1-1	15	17	-	2/9/76	50	12	27/18- 128/72	Off-ends	200	5	ditto	
8	2280-1991	579	579	15.350	Single	-	3 1-1	16	18	-	2/11/76- 2/20/76	50	24	18/18- 128/72	Off-ends	200	4	ditto	
9*	2250-2030	441	441	12.275	Single	-	3-1-1	16	18	-	2/24/76- 3/11/76	50	24	18/18- 128/72	Off-ends	200	4	ditto	
10	2282-2002	71	82	17.050	9 9	25 25	3-1-1 2-1-1	18	20	-	3/4/76- 3/11/76	50	6	18/18- 128/72	Split	500	4	1400-250- 250-1400	10 Experimental Shots
11	2001-2447	447	447	12.650	Single	-	3-1-1	18	20	-	3/14/76- 3/18/76	25	24	18/18- 128/72	Off-ends	300	4	300-1475	
12	1961-2273	79	80	17.000	9	25	3-1-1	16	18	-	3/21/76- 3/29/76	50	6	18/18- 128/72	Split	500	4	1400-250- 250-1400	
4	1997-2085	23	23	5.500	9	25	3-1-1	17	19	-	3/31/76- 4/3/76	50	6	18/18- 128/72	Split	500	4	ditto	
14	1853-2321	118	118	17.465	5	35	3-1-1	17	19	-	4/5/76- 4/10/76	35	6	18/18- 128/72	Split	560	4	ditto	
13	2321-2001	81	82	17.400	-	-	-	1	-	1521	4/12/76- 4/16/76	40	6	18/18- 128/72	Split	500	4	ditto	2 Strands of Geoflex per shot.
4	2089-2365	70	70	15.000	9 5	25 50	3-1-1 3-1-1	16	18	-	4/20/76- 4/26/76	50	6	18/18- 128/72	Split	500	4	ditto	
5	1989-2149	41	43	9.400	5 9	50 25	3-1-1 1-1-1	16 9	18 10	57	4/28/76- 5/4/76	50	6	18/18- 128/72	Split	500	4	ditto	2 Experimental shots with Geoflex.
3	1949-2145	50	51	12.450	9 9	25 25	2-1-1 1-1-1	16 9	18 10	-	5/5/76- 5/18/76	50	6	18/18- 128/72	Split	500	4	ditto	

* 2 shot holes per shotpoint 25 mts. apart. Shooting each shot individually for vertical stack offset 1st shot 200 mts., second shot 225 mts.

SHOOTING INFORMATION BY LINE

SPREAD INFORMATION BY LINE



REMARKS

LINE No.	S. P. to S. P.	No. PROFILES	No. SHOTS	KM. SURFACE COVERAGE	No. OF HOLES PER SHOT	HOEE SPACING (M.)	CHARGE DYN, PRI, CAP	AV. TOP OF CHARGE(feet)	AV HOLE DEPTH (feet)	AV. GEOFLEX PER SHOT(feet)	SHOOTING DATES	GROUP INT. (M.)	No. OF FOLD	LAY DOWN FILTERS	TYPE OF SPREAD	OFFSET OR CENT.GAP(M.)	RECORD L.GTH. (SEC.)	SPREAD CONFIGURAT.	REMARKS
5	2153-2289	35	35	7.000	5 3	50 100	3-1-1 5-1-1	16 16	18 18	-	5/19/76- 5/24/76	50	6	18/18- 128/72	Splits	500	4	1400-250- 250-1400	
2	1989-2101	29	29	5.040	9	17.5	2-1-1	16	18	-	5/25/76- 5/27/76	35	6	18/18- 128/72	Splits	560	4	1085-280- 280-1085	
5	2293-2393	26	26	6.650	9	25	2-1-1	16	18	-	5/29/76- 6/3/76	50	6	18/18- 128/72	Splits	500	4	1400-250- 250-1400	
17	1921-2269	88	92	13.405	9	17.5	2-1-1	16	18	-	6/5/76- 6/25/76	35	6	12/18- 128/72	Splits	560	4	1085-280- 280-1085	4 Experimental Shots Changed lo-cut filter from 18 Hz to 12 Hz.
19	2001-2129	33	35	4.620	9	17.5	2-1-1	16	18	-	6/26/76- 7/3/76	35	6	12/18- 128/72	Splits	560	4	ditto	2 Experimental Shots
17	2273-2341	18	18	2.520	17	8	1-1	3	3.5	-	7/8/76- 7/11/76	35	6	12/18- 128/72	Splits	560	4	ditto	
19	1997-1881	30	32	5.285	9	17.5	2-1-1	16	18	-	7/15/76- 7/23/76	35	6	12/18- 128/72	Splits	560	4	ditto	2 Experimental Shots
2	2105-2281	45	45	6.300	17 9	8 17.5	1-1 1-1	3.5	4	-	7/28/76- 8/5/76	70	6	18/18- 128/72 12/18- 128/72	Splits	560	4	ditto	# 1-24 # 25-48
NOTE: No. of Seises per Group was 24, with the exception of Line 2, which was 12.																			
Se Spacing in meters was 3, with the exception of Line 2, which was 6.																			



In addition, GSI monthly tests were run. These tests were sent to the GSI's office in Dallas along with the tape and forms for TIAC evaluation. Also, Esso monthly tests were run. The tape records and forms for these tests were submitted to the Client, in Belize City.

PERSONNEL

GSI's personnel involved in this operation was as follows:

Operational Supervisor	Mladen Zlatar
Party Manager	Bill Smith
Seismologist and Party Manager Relief	Oswaldo Castorina
Instrument Engineers	{ Peter Wright Harold Young Pedro Guerrero Narciso Chiquillo
Head Surveyor	Franz VanHaaren
Surveyors	Justo Bulla Francisco Jara
Administrators	Michel Pincemfn Max Stock
Driller-Mechanic	Dieter Zahn William D'Avila



Drill Supervisor

Pedro Palencia

**Respectfully Submitted,
GEOPHYSICAL SERVICE INCORPORATED**

Mladen Zlatar

Operational Supervisor



OPERATIONAL STATISTICS

Total number of profiles	2695
Total number of shots (includes 107 geoflex shots)	2735
Reshots	8
Experimental shots (during production shooting)	32
Total number of shot points drilled	2718
Shot points drilled and loaded but not shot (Line 2) (Charges exploded)	23
Total number of holes drilled	9263
Total number of feet drilled	159.803
Total number of working days	210
Total number of shooting days	140
Moving days	13
Lost days	57
a) Bad weather	19
b) Instrument trouble	9
c) Waiting on Cats	10
d) Waiting on drills	4
e) Holidays	2
f) Picking up or laying down cables and seises (Line change)	11
g) H. Young's accident	2
Surface coverage (Kms.)	245.960



Geoflex used (ft)	136.000
Dynamite used (lbs)	23.849
Primers used (lbs)	10.061
Caps used (units)	10.359
Cat # 1 Efficiency (%)	69.2
Cat # 2 Efficiency (%)	29.6
Cat # 3 Efficiency (%)	51.3
Percentage shooting to working days	66.66
Percentage moving to working days	0.06
Shots per shooting day	19.5
lbs. per shooting day	1.76
Dynamite per shot (includes primers) - lbs.	12.90
Geoflex per shot (ft)	1.271
Percentage records obtained	99.7
Average monthly production (kms)	35.140

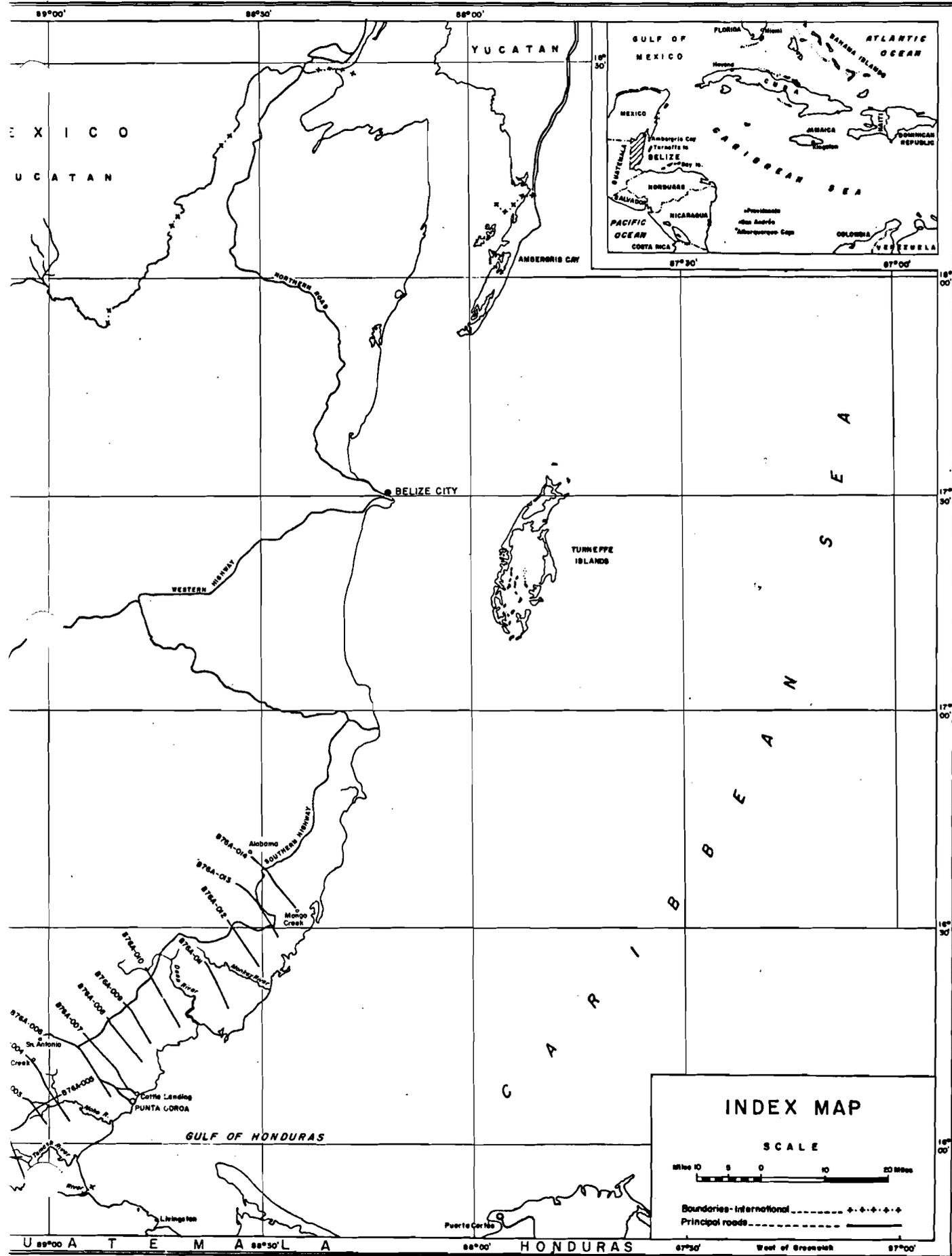
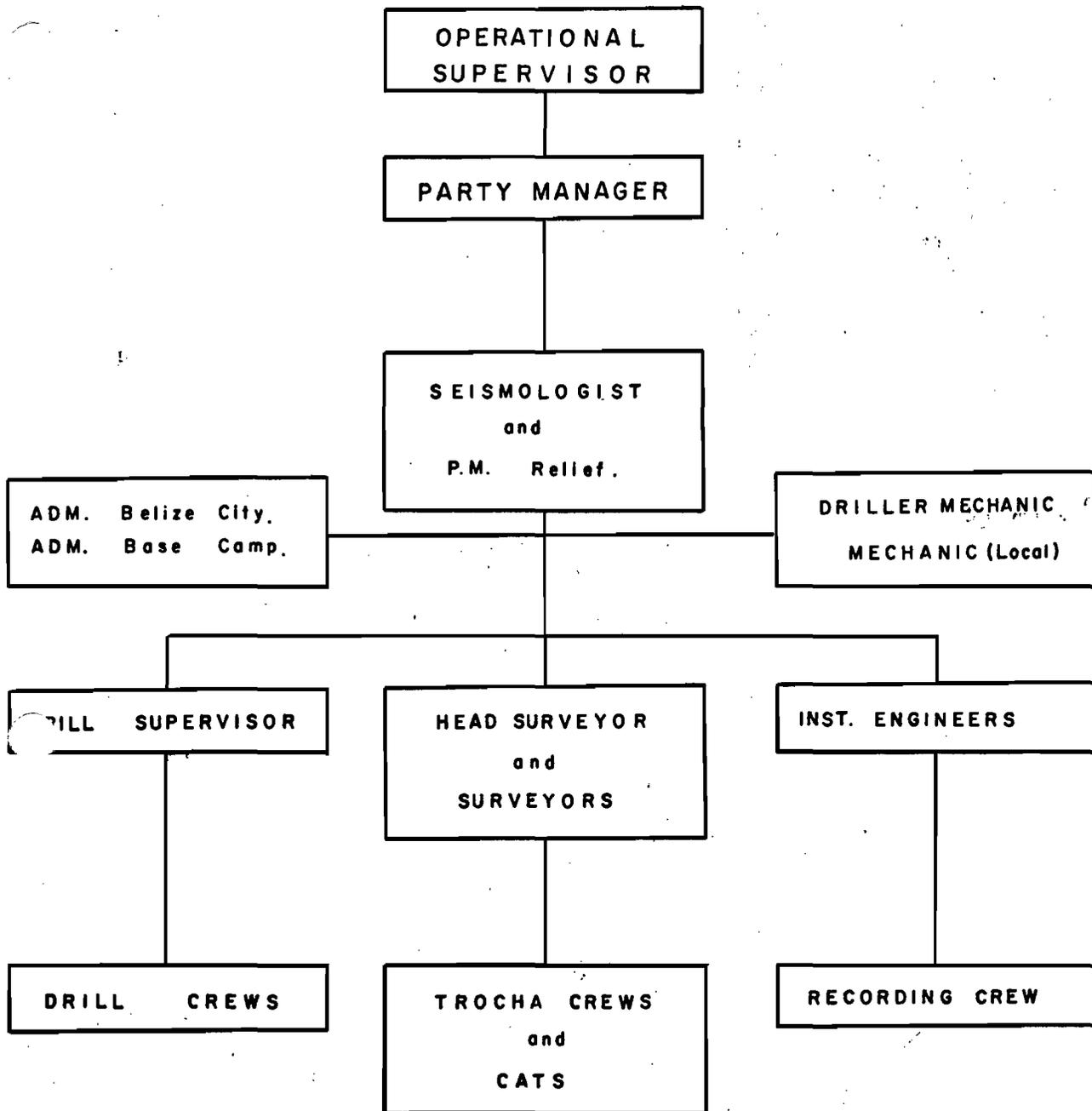


PLATE I



CREW ORGANIZATION CHART

G.S.I. Party 1560