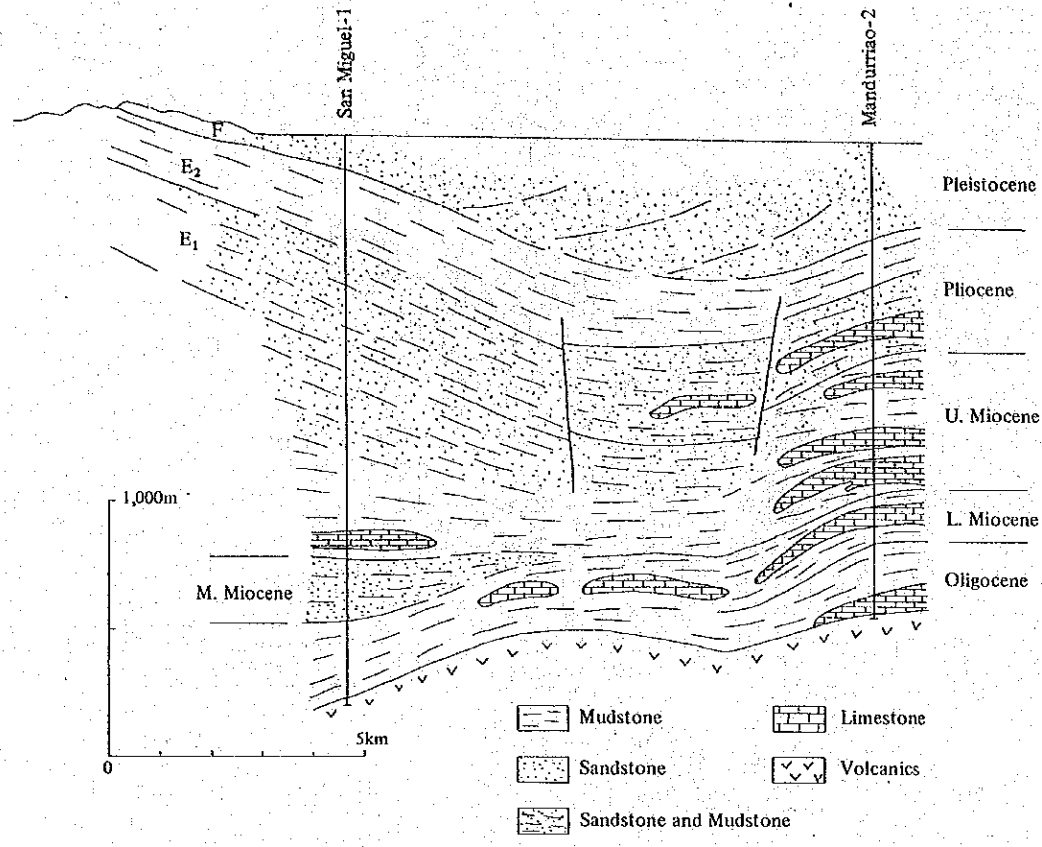
continuity of the plane is kept very well. Planes D and E incline west at a dip of 2-3°. Near the shot points 162, 210 and 288 faults are assumed to exist.

Lines 207 and 207B These are the lines with a total length of about 11.5 km running SSW-NNE from about 1.5 km west of Leganes to about 1.5 km south of Mandurriao (Text-figs. 5-1, 5). These lines are located to the east of the central part of the basin in parallel with its subsidence axis. Along these lines Mandurriao-1 (near the shot point 156) and Pavia-1 (near the shot point 56) have been drilled. In the vicinity of Pavia-1 five planes of reflections (A to E) are identified: Plane A and Plane B correspond to limestone of the Middle Miocene at a depth of about 4,800 ft (1,460 m) and limestone with a thickness of about 50 ft (15 m) at a depth of 4,000 ft (1,220 m). It is assumed that Planes C and D correspond to sandstones near 2,400 ft (732 m) and 1,700 ft (518 m), respectively, based on the electric and formation density loggings. Probably, Plane E corresponds to sandstone at a depth of about 1,300 ft (396 m). Near Mandurriao-1, three planes of reflections (F to H) are identified. It is judged that Planes F, G and H correspond to limestone of the Middle Miocene at a depth of about 700 ft (213 m), sandstones lying about 2,200 ft (671 m) depth and 1,900 ft (579 m) depth, respectively. All of these planes of reflections keep good quality of record and continuity. The depth of the limestones is 1,100 to 1,400 m and the limestones forms anticlinal structures near Pavia-1 and Mandurriao-1. The strata lying above the limestones form an anticlinal structure in the northern part of the line, a synclinal structure in the middle, and an anticlinal structure again in the south. The depth of Plane E is about 200 m near the shot point 10, deepening near Mandurriao-1 in the south to about 600 m.

2) Geological profile

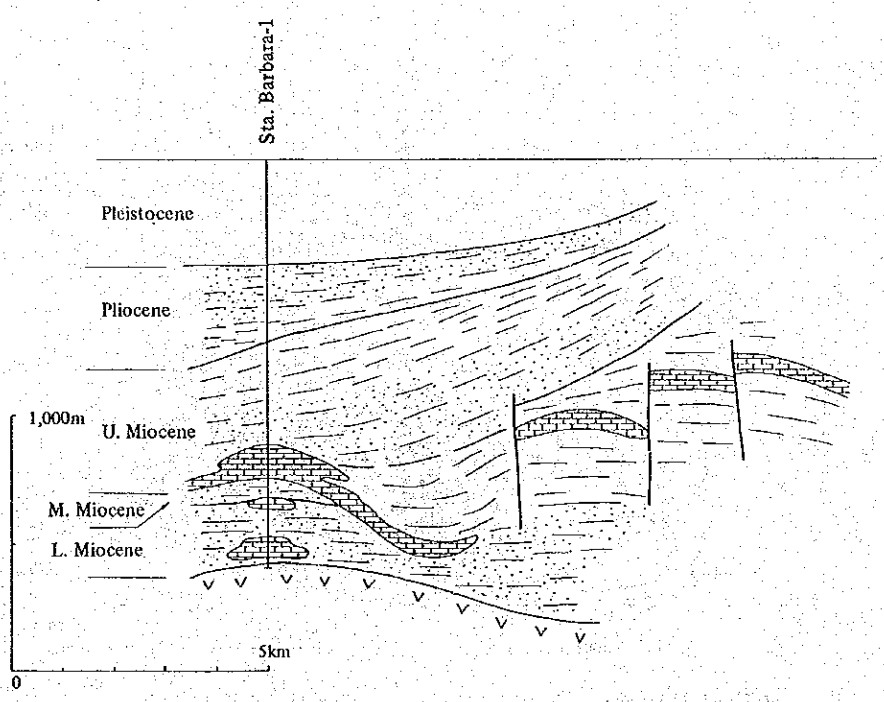
Schematic geological profiles of the underground in the Iloilo plain drew based on the seismic profile, drilling sections and gravity map (Text-fig. 5-12) are illustrated in Text-figs. 5-6 to 9. These locations of the profiles correspond to the seismic profiles' of Line-C, Q, 1 and 207-207b, respectively. The east-west schematic cross section of the southern part of the Iloilo basin, which is based on various data on the subsurface geology in the plain area and the survey results in the mountainous land west of the plain, is shown in Text-fig. 5-10.

As seen in Text-fig. 5-10, at least in the southern part of the Iloilo



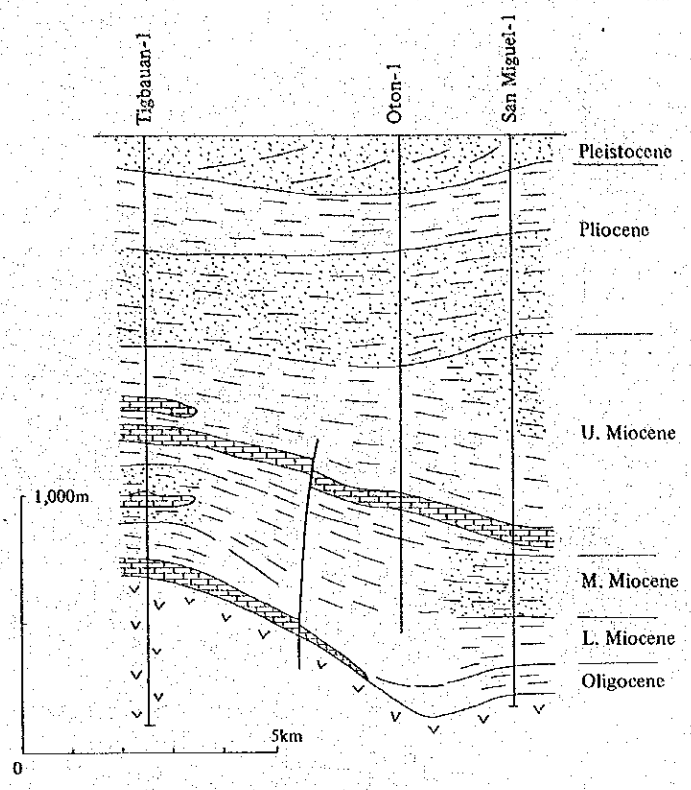
TEXT-FIGURE 5-6

Geologic section along the seismic Line-C.



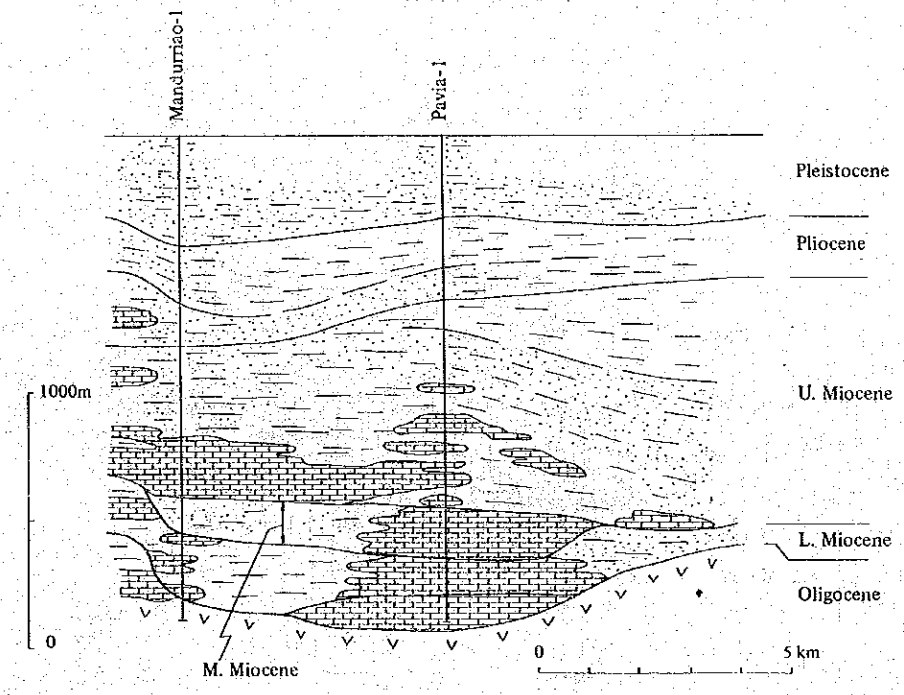
TEXT-FIGURE 5-7

Geologic section along the seismic Line-Q.



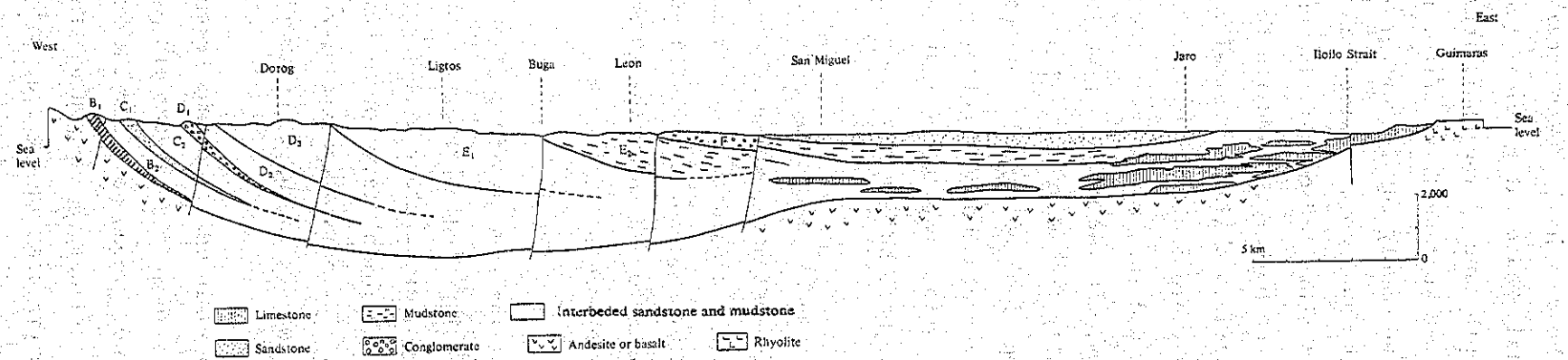
TEXT-FIGURE 5-8

Geologic section along the seismic Line-1.



TEXT-FIGURE 5-9

Geologic section along the seismic Lines-207 and 207B.



TEXT-FIGURE 5-10

East-west schematic cross section of the southern part of Iloilo basin.

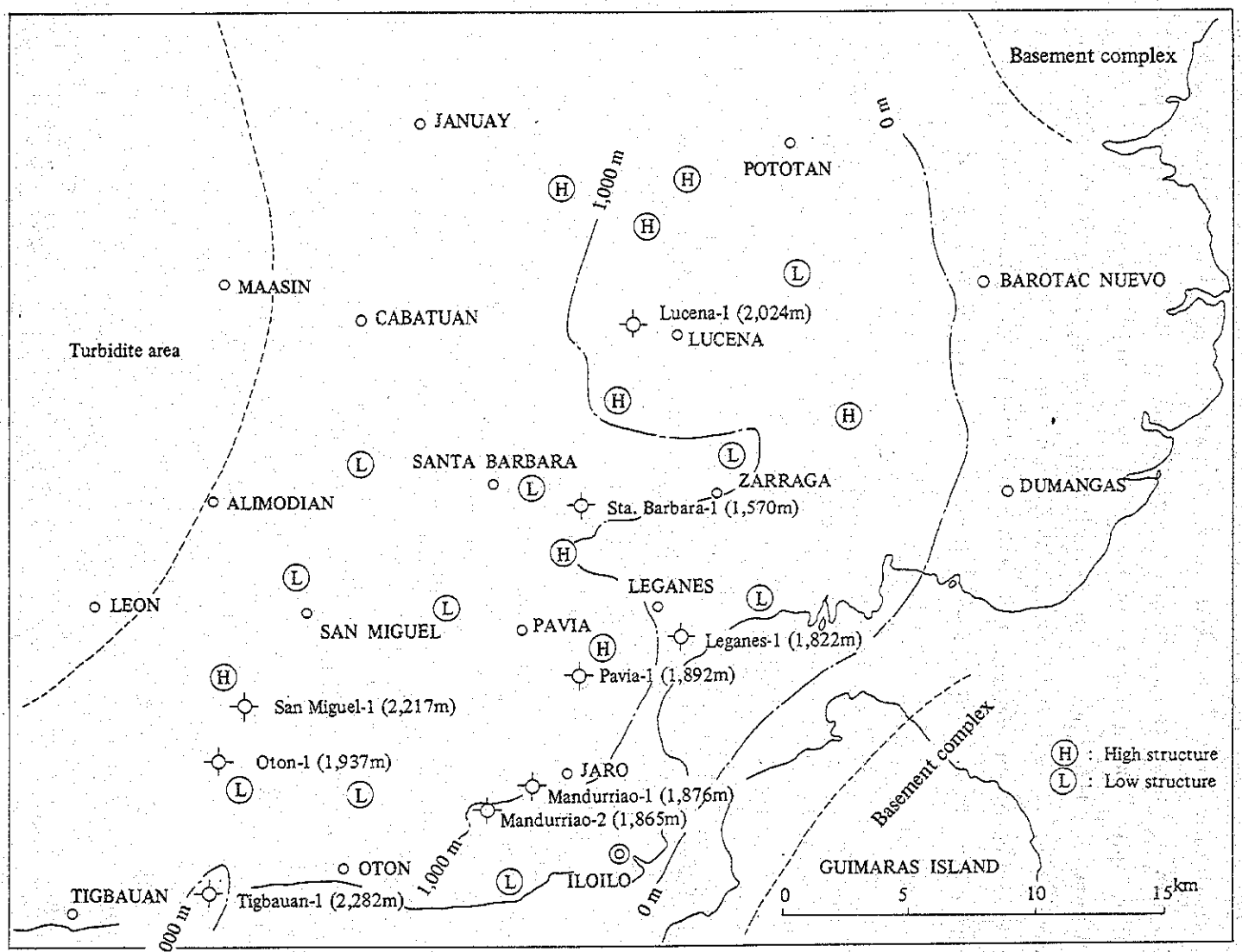
sedimentary basin the east half and the west half show a remarkable contrast in geological profile. In the east half "basement complex" (volcanics) is shallow, lying at about 2,000 m in depth, and on the whole reefal limestones develop remarkably. In contrast, in the west half the strata are very thick, amounting 5,000 m or more in total, and mostly consist of turbidite without limestone. Namely, the east half shows sedimentary facies of shelf with a little subsidence, while the west half shows sedimentary facies in a rapidly subsided area. The boundary between the both is considered to lie nearly in the west edge of the present Iloilo plain. While tectonically in the east half the strata are nearly flat and any big fault is not identified, in the west half the strata incline eastward and show a remarkable zonal arrangement bounded by NNE-SSW reverse faults. In the western area the dip of the strata becomes low in an angle gradually from west to east and anticlinal and synclinal structures appear. Comparison of porosity of the strata formed in the same time, indicates a clear tendency that the porosity in the west half is smaller than that in the east half. This shows that the magnitudes of buried depth and deformation in the west half were larger than those in the east half.

In conclusion the Iloilo basin is an assymmetrical sedimentary basin with large and rapid subsidence in the west half, while in the east half with a little subsidence, and its maximum subsiding area has moved eastward with the descending age. This characteristics of the Iloilo sedimentary basin indicates that this basin has been formed under the strong influence of the upheaval and rise of the western mountains.

3) Depth of Upper Miocene limestone

Text-fig. 5-11 shows the depth of the upper surface of the Upper Miocene limestone consisting the upper part of the Dingle Formation based on the information obtained by seismic surveys, exploratory drillings, and gravity surveys (Text-fig. 5-12). Since in the Iloilo plain, outer neritic to bathyal deposits with a high potential of iodine-type kyosui-sei-gasu have accumulated above the limestone, this map is useful in estimating the distribution of the deposits.

As shown in this figure, the Upper Miocene limestone belonging to the upper part of the Dingle Formation is exposed in the eastern part of the Iloilo plain, and is burried in the underground near Barotac Nuevo and in the west of Dumangas with a westward inclination, deepening gradually towards the west to reach a 1,000 m depth near Mandurriao, Leganes and



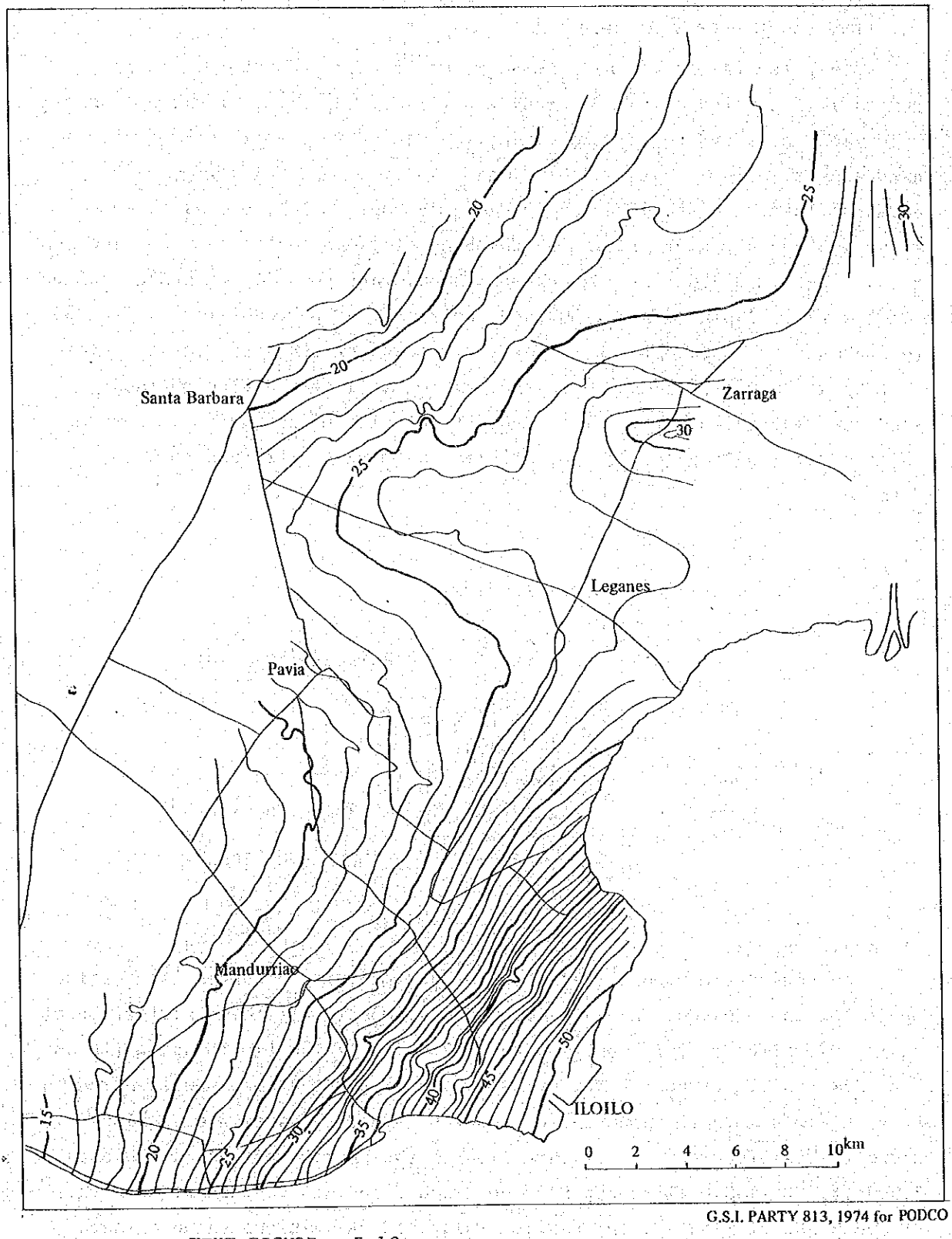
TEXT-FIGURE 5-11

Depth of the limestone in the Dingle Formation.

Zarraga. In the west side of the 1,000 m depth line this limestone becomes thinner to thin out finally and is transformed to muddy facies.

The Lower and Middle Miocene limestones constituting the lower and middle parts of the Dingle Formation distribute widely in the deeper part of the western part of the plain where the Upper Miocene muddy facies is distributed, thin out near the western edge of the plain, and assumedly change to turbidite facies which characterize the hilly area in the west.

H marks in the figure show structurally higher places which appear on the surface of limestones. It is considered that in these higher places, which are very often constituted of buildups of reefal limestones, limestones develop better than in structually lower places signed at L marks.



TEXT-FIGURE 5-12

Bouguer gravity map of the southern part of Iloilo basin.

6. Physical property of deposits

The potentiality of the reservoir rock of oil and natural gas is generally evaluated by the physical analysis of deposits. Table 6-1 shows an example of standard for the evaluation of the reservoir rock of oil and natural gas. This is referred to herein as an example, although it is doubtful that this standard can be directly applied to the evaluation of kyosui-sei-gasu reservoir from which abundant ground water can be pumped up for a long time. In this connection, the average porosity of kyosui-sei-gasu reservoirs in Japan is about 30% and their average permeability is from 30 to 3,000 md. The porosity of a reservoir rock corresponding to the permeability of 30 md is about 25% in the case of well sorted fine grained sandstone and calcarenite. If a deposit contains muddy matrix, its permeability deteriorates and its potentiality as a reservoir rock is also deteriorates.

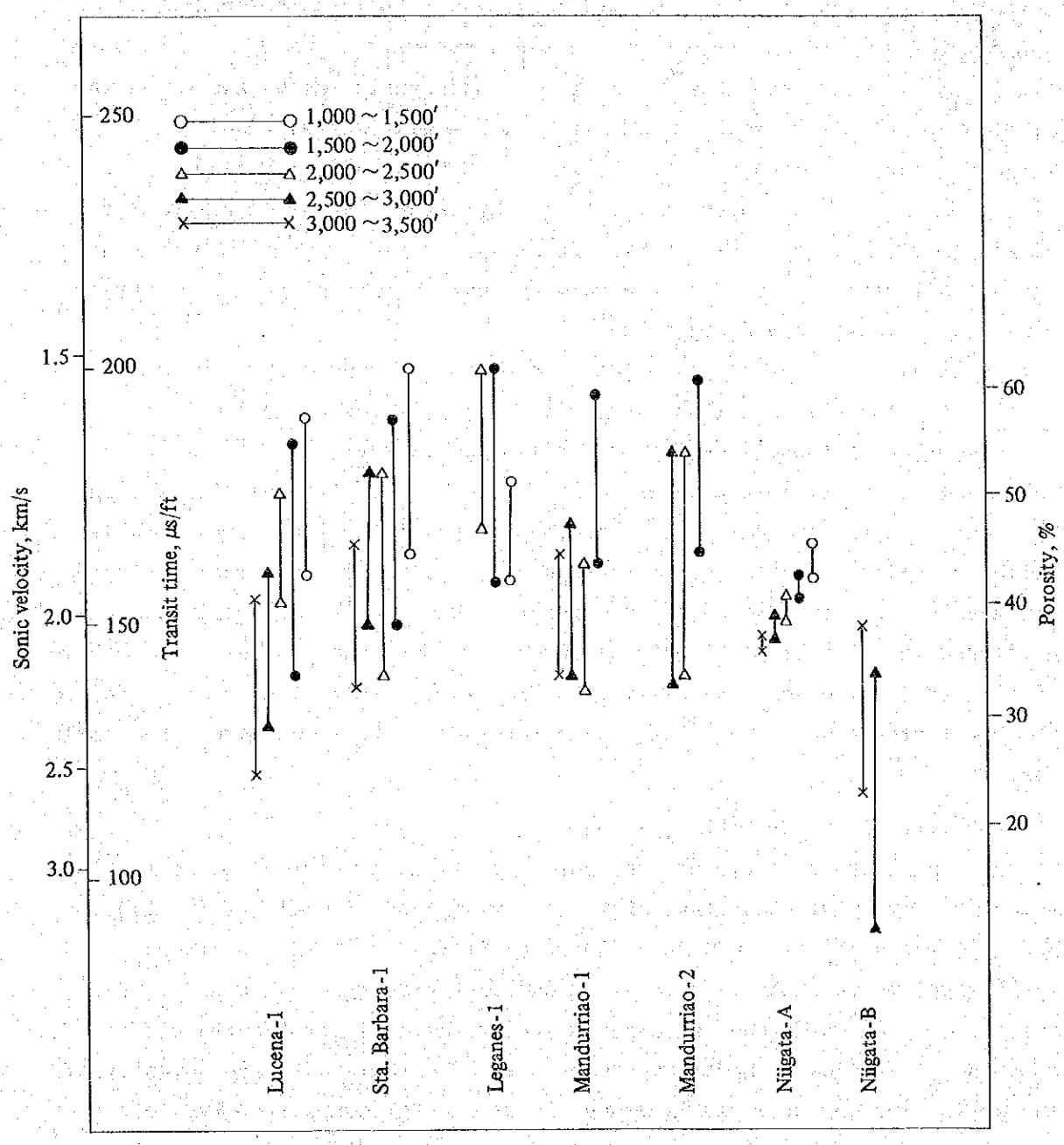
TABLE 6-1
Classification of reservoir.

	Porosity (%)	Permeability (md)
Poor	5 - 10	<1
Fair	10 - 15	1 - 10
Good	15 - 20	10 - 100
Very Good	20 - 25	100 - 1000+

(LEVORSEN, 1966)

1) Sonic velocity

The analysis of sonic velocities of sedimentary sequences is a useful means for the presumption of the degree of compaction. The distribution of sonic velocities classified by depth of 5 wells of the Iloilo basin (Lucena-1, Sta. Barbara-1, Leganes-1, Mandurriao-1 and 2) and that of 2 wells bored in Niigata Prefecture in Japan where kyosui-sei-gasu deposits are developed is shown in Text-figure 6-1. In this figure, the section between 1,000 and 3,000 ft (305-1,070 m) in depth of each sonic log was divided at intervals of every 500 ft (152 m), the maximum value and the minimum value in each subdivision were measured and plotted in the figure, and the line graphs were made by connecting those plotted points with straight lines. The figure shows sonic velocities in the mudstone or alternating sandstone and mudstone,



TEXT-FIGURE 6-1

Sonic velocities classified by depth.

and limestone was excluded.

The distribution of sonic velocities within 5 wells in the Iloilo basin is from 1.52 to 2.54 km/s (transit time is 200 to 120 μs/ft), but the patterns of velocity distribution slightly vary by well. The distribution of sonic velocities in Lucena-1 is from 1.60 to 2.54 km/s (190-120 μs/ft) and that of Leganes-1 is from 1.52 to 1.93 km/s (200-158 μs/ft) and the former is the highest of those 5 wells and the latter is the lowest. Comparing these with Niigata-A and B, the sonic velocities of Iloilo basin are slightly lower than those of Niigata-A and considerably lower than those of Niigata-B. The difference between a high and a low sonic velocities is larger than 20% for the 5 wells of the Iloilo basin and Niigata-B, while Niigata-A shows a low value of about 5%. Niigata-A is a well bored at a place almost the center of a basin and its geology is represented by mudstone. Niigata-B is bored on the marginal part of the basin and primarily consists of mudstone and sandstone.

Gradual change of sonic velocity in a kind of deposits represents the degree of compaction and fine fluctuation shows facies changes. It is presumed that of those 5 wells, Lucena-1 of which sonic velocity is relatively large is most progressed in compaction and Leganes-1 is far in the rear. It is considered that the compaction of the Iloilo basin falls slightly behind that of the Niigata basin. As a result of comparison of sonic velocity distribution, it is expected that sand layers will be developed in wells of the Iloilo basin up to almost the same degree as that of Niigata-B. The sonic velocity of Niigata-A has small fluctuation, and this indicates that it has lesser sand layers than those wells of the Iloilo basin.

2) Porosity of exploratory drillings

It is possible to presume the porosity of mudstone from its sonic velocity. It is presumed that the porosity of those 5 wells of the Iloilo basin at the depth of 1,000 to 3,500 ft (305-1,067 m) is 25 to 60% on the assumption that their facies is mudstone (Text-figs. 6-2 and 3). Since the porosity of sandstone is, experimentally, never lower than that of mudstone, the value of mudstone can be used as a representative porosity of the well. The porosity of limestone can also be presumed from its sonic velocity. The sonic velocity of limestone corresponding to the porosity of 25% has been already known by experience to be about 3.8 km/s (80 μs/ft). By the sonic velocities, limestones of which porosity is less than 25% are

recognized in such places as the depth of 5,000 ft (1,520 m) of Leganes-1; depth of 4,100 ft (1,250 m) of Mandurriao-1; depth of 3,050 ft (930 m), 3,900 ft (1,190 m), 4,450 ft (1,360 m), 5,050 ft (1,540 m) and 5,800 ft (1,770 m) of Mandurriao-2; depth of 4,300 ft (1,310 m), 4,450 ft (1,360 m), 4,800 ft (1,460 m), 5,250 ft (1,600 m), 5,500 ft (1,680 m) and near 5,750 ft (1,750 m) of Lucena-1, respectively. It is presumed that these limestones are fine grained, dense and hard.

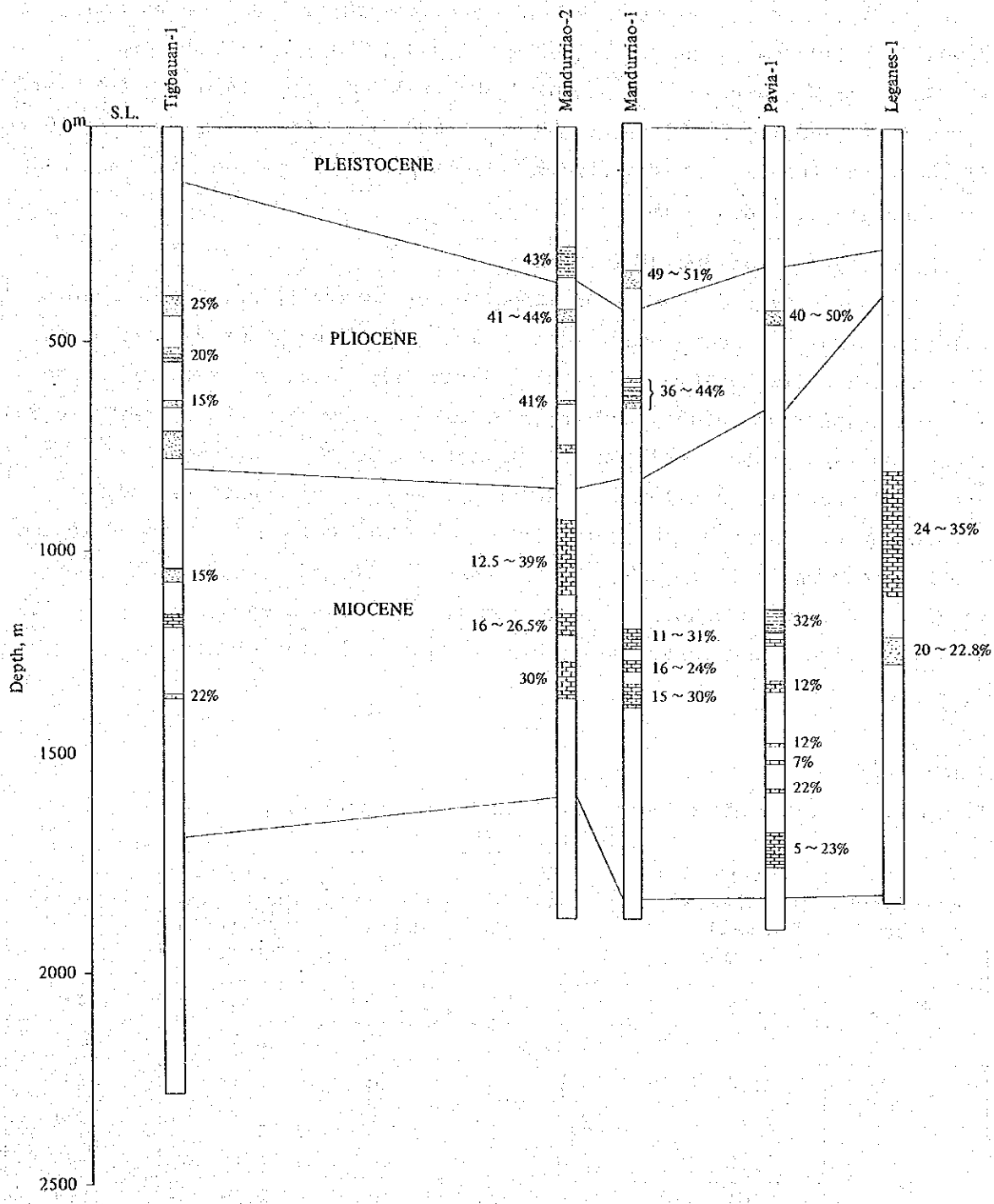
3) Porosity of Leon-Bucari section

The porosity and density of 15 pieces of naturally dried rock samples collected from the Leon-Bucari section located at southwestern part of the Iloilo basin were measured and their results are shown in Table 6-2. The localities of rock samples and their porosities are shown in Text-figure 6-4. The porosities of this section are distributed in the range between 12.1% and 49.2% and they tend to decrease as age gets older. When viewed in connection with strata, the porosity of the B and C formations is 10 to 15%, the D formation is 15 to 20%, the E_1 member is 20 to 35% and the E_2 member is 35 to 50%, and the horizon corresponding to the standard porosity of 25% of a kyosui-sei-gasu reservoir is presumed to be in the middle part of the E_1 member.

TABLE 6-2

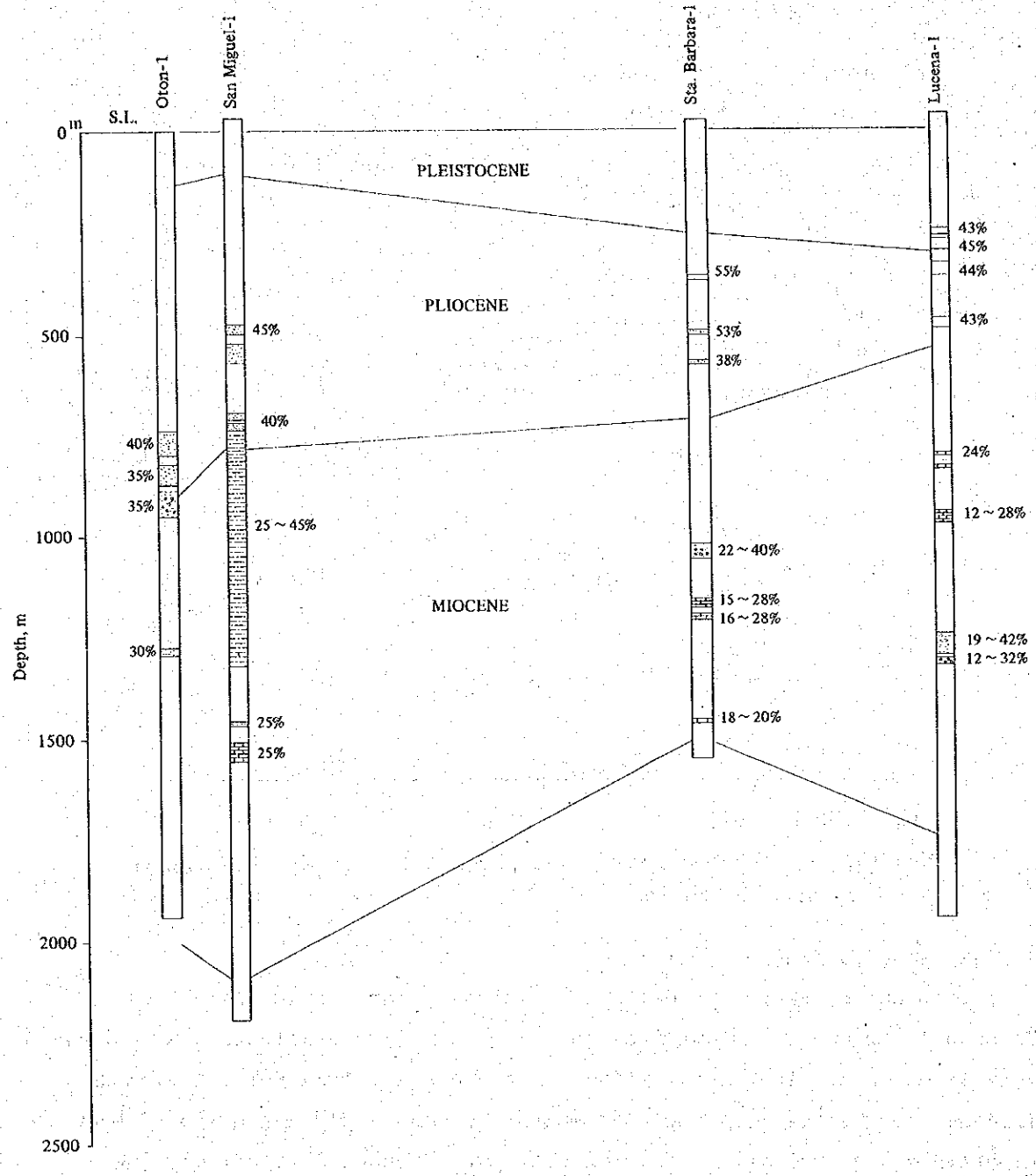
Porosity of rock samples from the Leon-Bucari section.

Locality Number	Density (naturally dried) (g/cm^3)	Porosity (%)	Locality Number	Density (naturally dried) (g/cm^3)	Porosity (%)
PS- 1	2.15	14.6	PS- 51	1.82	30.8
16	2.14	15.4	62	1.36	49.2
22	2.24	13.9	65	1.67	37.5
23	2.13	18.0	77	2.29	12.1
27	2.15	16.6	91	2.14	17.8
40	2.05	21.5	95	2.19	15.7
45	2.21	15.2	102	1.97	23.5
48	2.01	23.8			



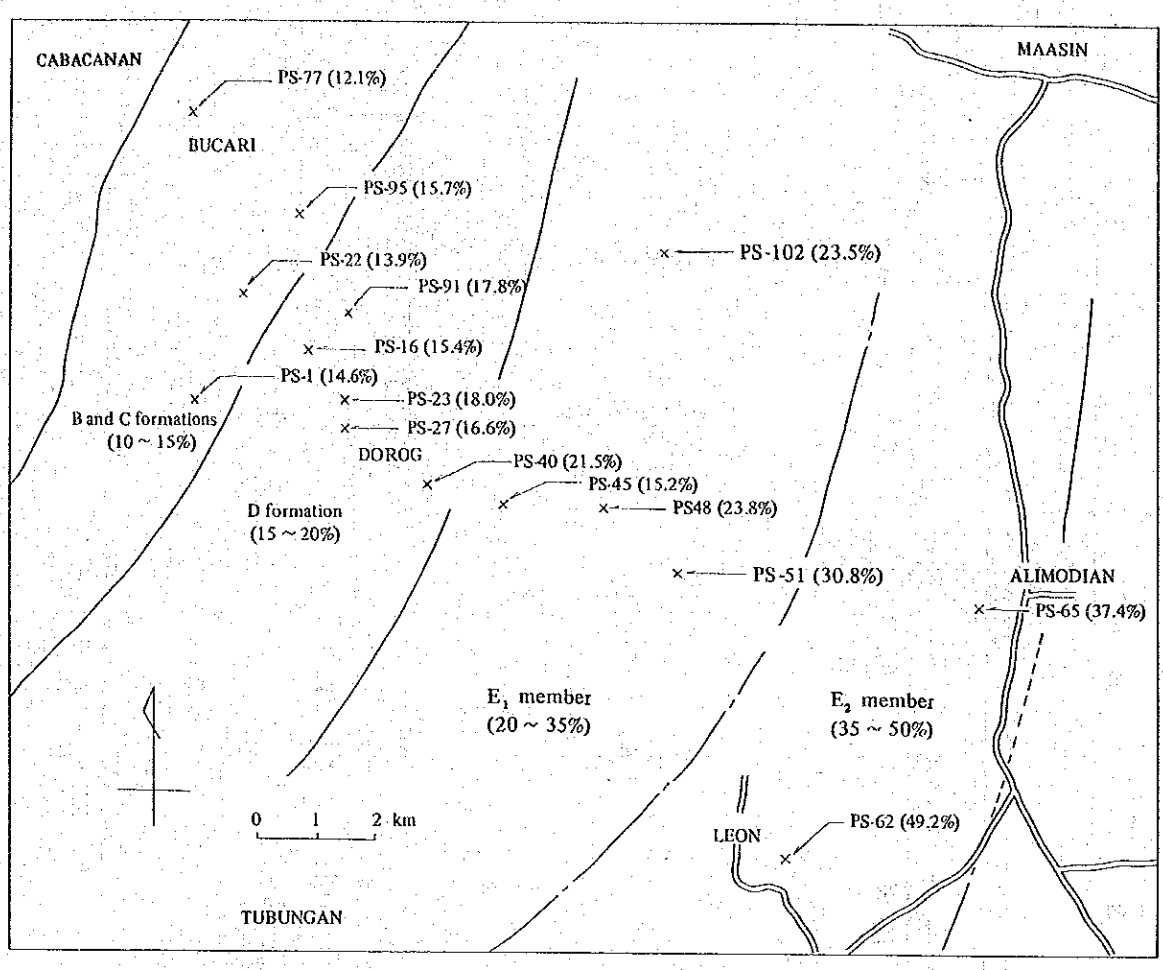
TEXT-FIGURE 6-2

Reservoirs and their porosities in the exploratory drillings in Iloilo basin (I).



TEXT-FIGURE 6-3

Reservoirs and their porosities in the exploratory drillings in Iloilo basin (II).



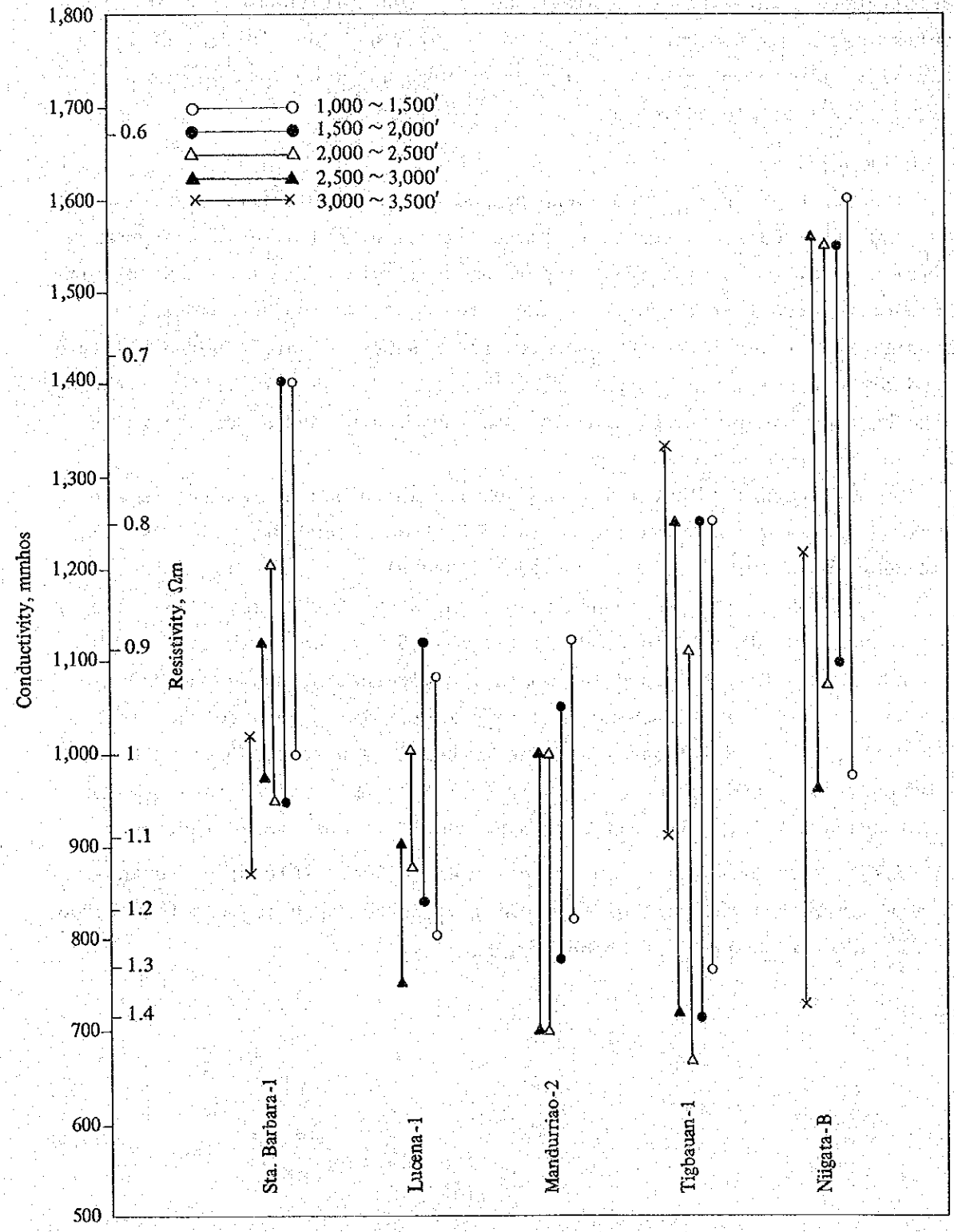
TEXT-FIGURE 6-4

Map showing the localities and porosities of rock samples in the Leon-Bucari section.

4) Resistivity (conductivity)

The conductivities by depth of 4 wells of the Iloilo basin (Sta. Barbara-1, Lucena-1, Mandurriao-2 and Tigbauan-1) and Niigata-B are shown in Text-figure 6-5. The resistivities of these wells fall between 0.63 and 1.54 Ωm (conductivity; 1,600-650 mmhos). Lucena-1 and Mandurriao-2 show relatively high resistivities, while Niigata-B shows a relatively low resistivity. Sta. Barbara-1 and Tigbauan-1 show values between the above two values.

The resistivity of a well is in proportion to that of formation water and is in inverse proportion to the square of its porosity. Assuming that the porosity of each well is about the same degree as that of others, the resistivity of each well represents the resistivity of formation water of



TEXT-FIGURE 6-5

Conductivities classified by depth.

each well. It is considered that Lucena-1 and Mandurriao-2 which are located at the marginal parts of basin are low in salinity and show high resistivities, while Sta. Barbara-1 and Tigbauan-1 which are located at the central part of the basin, are high in salinity and show low resistivities. Generally, the salinity of a well becomes high as it becomes deeper and its resistivity tends to decrease.

5) Permeability

The permeability of a well can be presumed from electric logs, sonic logs and other data. Since the permeability of a well affects the pumping efficiency, it is an especially important factor in evaluating the potentiality of reservoir of kyosui-sei-gasu. The distribution and estimated porosities of reservoirs each of which is presumed to have a permeability of 30 md or more are shown in Text-figures 6-2 and 3. Representative lithology which becomes reservoirs is limestone in the Miocene and sandstone in the Pliocene and the younger strata.

It is recognized that limestone rubbles which become reservoirs are developed in such places as the depth of 3,030 to 3,600 ft (924-1,097 m) of Mandurriao-2, 2,650 to 3,600 ft (808-1,097 m) of Leganes-1, 3,900 to 4,050 ft (1,189-1,234 m) of Mandurriao-1, 3,750 to 3,850 ft (1,143-1,173 m) of Tigbauan-1, and 5,050 to 5,200 ft (1,539-1,585 m) of San Miguel-1. As sandy reservoirs, the sand layers in the alternating sandstone and mudstone are representative and this type reservoir is seen at the depth of 2,680 to 4,420 ft (817-1,347 m) of San Miguel-1, 920 to 1,150 ft (280-351 m) of Mandurriao-2, and 3,720 to 3,900 ft (1,134-1,189 m) of Pavia-1. Muddy sandstones are relatively well developed and it is considered that such sections as part of which depth is less than 2,000 ft (610 m) of Lucena-1 and Sta. Barbara-1 and part of Tigbauan-1 of which depth is less than 3,000 ft (914 m) correspond to sandstones of this type.

7. Geochemical survey

From the experiences of natural gas investigation in many fields of Japan, it is already known that the geochemical survey of existing groundwater wells, natural springs and gas outcrops, and the analysis of organic substances contained in gas source rocks are effective means for the exploration of kyosui-sei-gasu deposits.

1) Geochemical survey of groundwater well, natural spring and gas outcrop

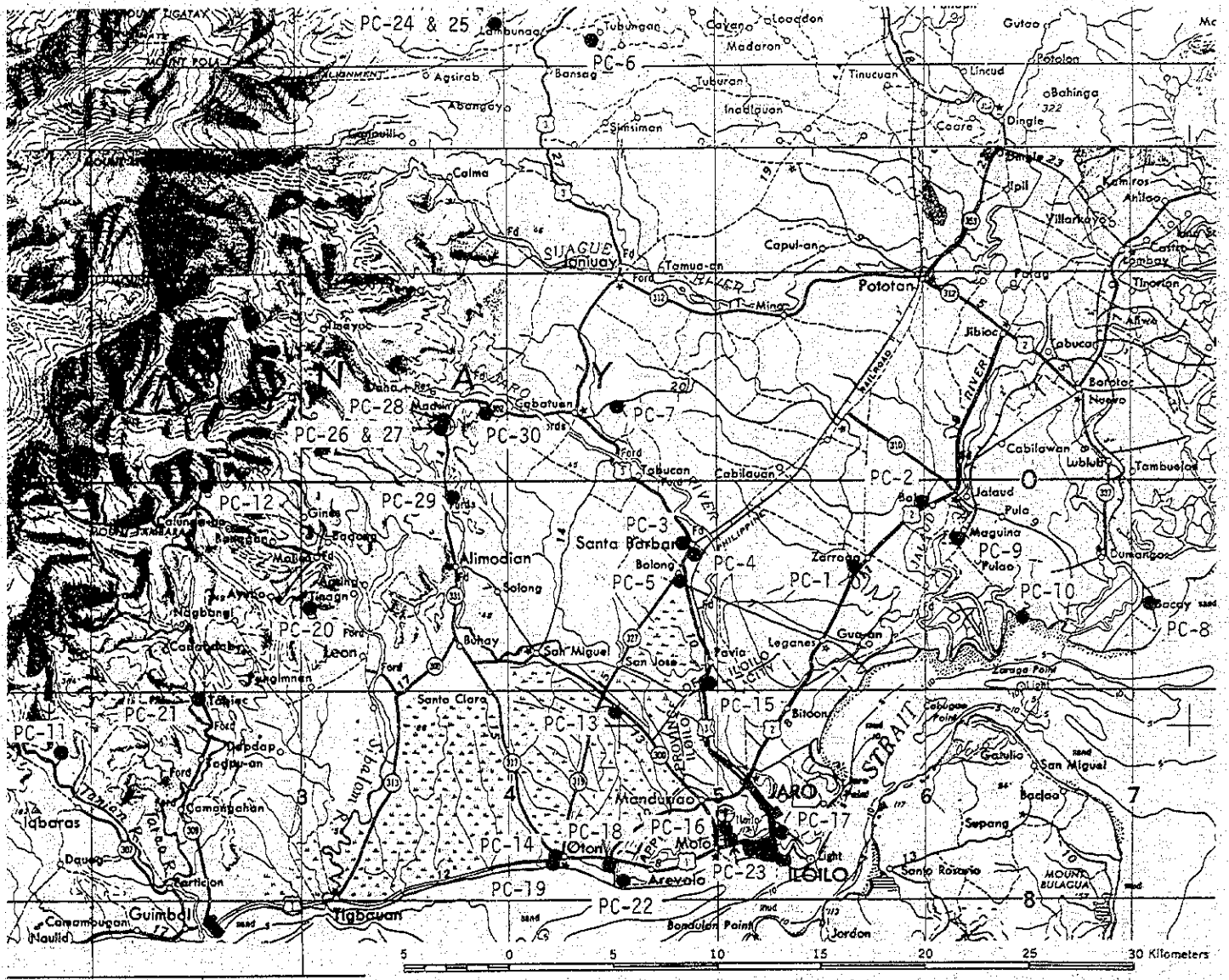
The geochemical survey of a groundwater well is a technique for exploration of kyosui-sei-gasu deposits which lies concealed at deep underground by using groundwater as a medium. Therefore, it is desirable that deep wells will be subjected to this survey since they are less influenced by meteoric water.

In the southern area of the Iloilo basin, 9 exploratory drillings ranging from 1,570.1 to 2,282.0 m in depth were bored up to the present, but they were later closed and abandoned due to no economic value although gas indications were recognized in each well. Therefore, these wells were not able to use as the direct subject of this geochemical survey. However, in this basin, a number of water wells are drilled by the Bureau of Public Works (BPW) for the purpose of supplying living water and these wells were used as the subject of this geochemical survey. These wells were useful for this survey since some of these wells had gas showing and produced saline water, but any data on deep places were not obtained because they are shallow in depth and the deepest one was only 137 m.

The BPW has a good file of boring records of these wells and data on the analysis of water quality, and the file and data were kindly allowed to use for this survey.

Of the natural springs, saline water wells are important sites for the geochemical survey together with gas outcrops. Those informations were collected from municipal halls concerned in the survey field.

In the southern part of the Iloilo basin, the geochemical survey were conducted at a total of 30 sites, namely 22 boring wells, 5 sites of natural spring (including 2 manually dug wells) and 3 gas outcrops, including the sites of geochemical survey conducted at the time of preliminary survey of 1980. The sites of geochemical survey are shown in Text-fig. 7-1 and the results of survey, measurement and analysis are shown in Tables 7-1 and 2. The result of geochemical survey of each site is as follows:



TEXT-FIGURE 7-1 Locality map of geochemical survey and sampling.

TABLE 7-1

Hydrogeochemical data in the Iloilo basin. October - November, 1981 (1)

Loc. No.	Location	Well No. of BPW	Date completed	Depth (m)	Casing	Flow rate		Gas/water ratio	Color of water	Temperature of water (°C)
						Gas (Nm^3/d)	Water (KI/d)			
PC-1	Zarraga Elem. Sch.	32-75-21	Feb. 9, 1976	112	(4 1/2"x336')	9.5	81.3	0.116	Light brown	28.9
2	Sigangao Elem. Sch., Zarraga	14607	Apr. 25, 1957	34	4 1/2" x 74'	-	-	-	Colorless	28.0
3	Sta. Barbara Municipal Hall	-	-	-	-	-	4.3	-	Light brown	29.0
4	Sta. Barbara Market	236195	Dec. 1961	132	398'	?	?	-	Brown	28.3
5	Sta. Barbara highway	32-75-26	Dec. 15, 1975	137	4 1/2"x411'	10.1	45.3	0.223	"	28.8
6	Naponglan, Lambunao	-	-	-	-	-	-	-	-	-
7	Maraguit Elem. Sch., Cabatuan	32801	Mar. 14, 1981	55	4" x 140'	-	-	-	Light brown	28.0
8	Bacay Elem. Sch., Dumangas	32-76-32	May 24, 1977	75		-	-	-	Whity	28.6
9	Maquina Plaza, Dumangas		Jul. 1977	66	4 1/2"x192'	-	-	-	Colorless	28.5
10	Pinolotan Hill, Dumangas		1981	55		-	-	-	"	29.0
11	Anilauan, Igbaras					-	-	-	"	28.0
12	Bo. Ayabang, Leon					-	-	-	"	26.5
13	San Jose highway		1980	122		-	230	-	"	27.9
14	Oton public plaza		Nov. 12, 1976		4 1/2"x166'	-	3.3	-	Light yellow	29.3
15	Aganan Elem. Sch., Pavia	32-80-11	Mar. 13, 1981	67	4" x 170'	-	-	-	"	27.9
16	San Rafael-Bolilao Elem. Sch., Mandurriao	32-77-11	Jun. 17, 1977	58	4 1/2"x177'	-	-	-	"	
17	La Paz public market	32-80-3	Jun. 12, 1980	43	4" x 120'	-	-	-	Colorless	
18	Arevalo Plaza	23-62-2	Jan. 2, 1962	102	6" x 291.7'	-	-	-	Brown	28.9
19	Oton Central Elem. Sch.	32-75-31	Apr. 29, 1976	66	4 1/2"x188'	-	21.9	0.008	Light yellow	29.2
20	Caplain Fernando, Leon	-	-	-	-	-	-	-	-	-
21	Tubungan	-	-	-	-	-	-	-	Colorless	28.5
22	E. Yusay Memorial Sch., Arevalo		Jan. 1980	52	4 1/2"x165'		17.6	0.003	Light yellow	29.0
23	Hotel Del Rio, Molo	-	-	-	-	-	-	-	"	-
24	Tampucao no. 1, Lambunao	-	-	-	-	0.22	-	-	-	25.0
25	Tampucao no. 2, Lambunao	-	-	-	-	0.04	-	-	-	
26	Magsaysay no. 1, Maasin	-	-	1.27	-	-	-	-	Yellowish green	25.2
27	Magsaysay no. 2, Maasin	-	-	0.95	-	-	-	-	Brown	26.0
28	Magsaysay no. 3, Maasin	-	1957	46	4"	-	0.3	0.044	Light brown	27.3
29	Pacuan no. 1, Maasin	-	-	49	4"	0.15	-	-	"	25.7
30	Bagacay Ext. no. 1, Maasin	-	-	91	-	0.02	0.58	0.032	"	27.3

(2)

Loc. No.	Temperature of atom. (°C)	Flowing condition	Ground water								
			pH	HCO_3^- (mg/l)	Free CO_2 (mg/l)	Cl^- (mg/l)	I^- (mg/l)	Br^- (mg/l)	SO_4^{2-} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)
PC-1	33.0	Free flowing	8.2	830	0	525	-	-	10	410	21
2	29.0	Pumping	7.6	960	20	69	-	-	0	325	3.8
3	27.5	Free flowing	8.0	780	0	373	-	-	10	395	11
4	29.0	"	8.0	793	0	152	-	-	10	375	26
5	30.5	"	8.6	1290	0	294	-	-	0	540	30
6		Gas outcrop	7.2	1450	0	4540	5.6	15.6	0	2960	98
7	29.4	Pumping	8.0	1230	0	916	1.9	3.9	20	840	15
8	29.9	Free flowing	7.0	293	16	2130	0.3	7.3	120	670	78
9	29.9	"	7.4	403	12	3790	6.3	15.9	10	1240	98
10	31.0	Pumping	7.2	525	22	3350	3.9	13.6	10	1050	78
11	30.5	Spring	7.3	476	12	9	-	-	260	93	73
12	31.0	"	7.1	464	22	20	-	-	50	32	1.3
13	30.8	Free flowing	7.6	427	16	3	-	-	0	84	10
14	30.5	"	7.3	1280	40	563	0.5	1.2	5	468	9.4
15	29.0	Pumping	8.0	525	0	564	-	-	0	624	31
16		Free flowing	7.6	1070	22	996	1.2	3.5	0	810	49
17		Pumping	7.2	836	42	2060	4.0	11.5	0	1230	35
18	33.0	Free flowing	7.7	952	12	924	1.2	3.5	5	753	56
19	29.5	"	7.6	1050	10	263	-	-	0	377	7.0
20		Gas outcrop	-	-	-	-	-	-	-	-	-
21	29.8	Pumping	7.8	647	34	355	-	-	0	430	4.8
22	29.5	Free flowing	7.6	1570	36	977	0.7	4.1	0	950	19
23		Motor-pumping	7.3	1000	40	526	-	-	0	484	9.4
24	-	Gas outcrop	-	-	-	-	-	-	-	-	-
25	-	"	-	-	-	-	-	-	-	-	-
26		Spring	8.5	590	0	11370	32.8	60.1	30	6150	188
27		"	7.6	580	0	14090	36.9	80.8	70	8140	202
28		Free flowing	8.1	1320	0	2540	5.9	11.3	5	-	-
29		"	8.6	1550	0	68			5	-	-
30		"	8.2	1100	0	1310	2.5	5.8	-	-	-

Loc. No.	Ground water							Reservoir	Age
	Ca^{2+} (mg/l)	Mg^{2+} (mg/l)	NH_4^+ (mg/l)	I^-/Cl^- x 10^{-3}	Br^-/Cl^- x 10^{-3}	I^- * (mg/l)	Ca^{2+}/Mg^{2+}		
PC-1	15	8	0.3	-	-	-	1.80	Cabatuan Formation	Pleistocene
2	21	14	0.6	-	-	-	1.50	"	"
3	10	7	0.8	-	-	-	1.53	"	"
4	6	3	26	-	-	-	1.90	"	"
5	14	7	-	-	-	-	2.06	"	"
6	195	118	95	1.23	3.44	23.9	1.65	"	"
7	33	21	55	2.07	4.26	40.1	1.57	"	"
8	264	256	7	0.14	3.43	2.7	1.42	Dingle Formation	Up. Miocene
9	231	320	32	1.66	4.19	32.2	0.72	"	"
10	240	369	18	1.16	4.06	22.5	0.65	"	"
11	75	29	-	-	-	-	2.59	Tubungan Siltstone	"
12	83	31	-	-	-	-	2.67	Barasan Sandstone	Mid. Miocene
13	35	27	-	-	-	-	1.30	Cabatuan Formation	Pleistocene
14	138	68	18	0.89	2.13	17.2	2.03	"	"
15	9	15	6	-	-	-	0.60	"	"
16	53	55	18	1.20	3.51	23.3	0.96	"	"
17	90	61	26	1.94	5.58	37.6	0.39	"	"
18	27	188	25	1.30	3.79	25.1	0.14	"	"
19	71	44	-	-	-	-	1.61	"	"
20	-	-	-	-	-	-	-	Tubungan Siltstone	Up. Miocene
21	20	12	5				1.67	"	"
22	126	74	9	0.92	4.19	13.9	1.70	Cabatuan Formation	Pleistocene
23	129	62	0.5				2.08	"	"
24	-	-	-	-	-	-	-	Ulian Formation	Low. Pleist.
25	-	-	-	-	-	-	-	"	"
26	88	305		2.88	5.29	55.8	0.29	Guimbal Mudstone	Up. Pliocene
27	148	398	60	2.62	5.73	50.7	0.37	"	"
28	-	-	-	2.32	4.45	44.9	-	"	Pliocene
29	-	-	-	-	-	-	-	"	"
30	-	-	-	1.91	4.43	36.9	-	"	"

* : Estimated I^- contents in ground water with the same Cl^- contents of sea water (19,350 mg/l).

TABLE 7-2

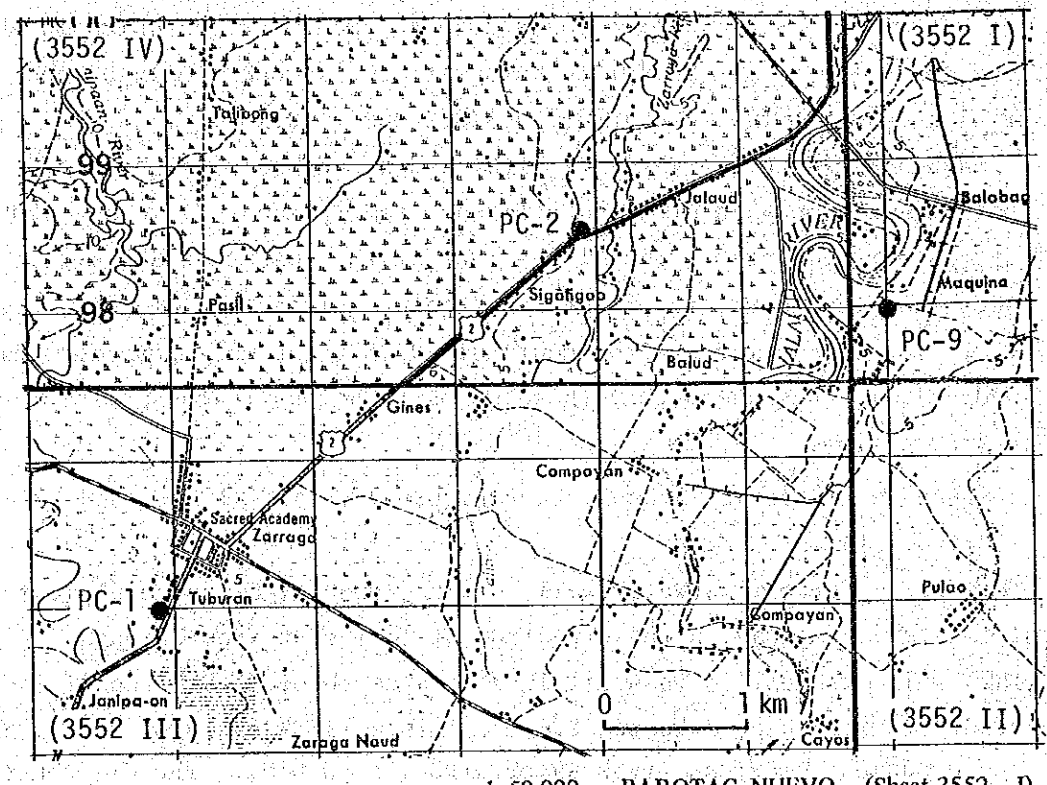
Analytical data of free gas.

Loc. No.	Location	Free gas (vol. %)							N_2/Ar
		He	H_2	O_2	N_2	CO_2	Ar	CH_4	
PC-1	Zarraga Elem. Sch.	0.000	0.000	0.47	10.29	0.15	0.26	88.83	40
4	Sta. Barbara Market	0.000 (0.000)	0.000 (0.000)	2.76 (0)	21.19 (12.55)	0.19 (0.22)	0.40 (0.28)	75.46 (86.95)	58 (45)
5	Sta. Barbara highway	0.000	0.000	0.11	8.00	0.94	0.26	90.87	31
7	Maraguit Elem. Sch., Cabatuan	0.020 (0.023)	0.000 (0.000)	3.26 (0)	19.90 (9.25)	0.37 (0.44)	0.45 (0.31)	76.00 (90.00)	44 (30)
9	Maquina Plaza, Dumangas	0.004	0.000	0.14	5.77	0.94	0.14	93.02	44
14	Oton public plaza	0.000	0.000	0.21	13.27	4.00	0.24	82.28	55
17	La Paz public market	0.000 (0.000)	0.000 (0.000)	1.42 (0)	23.47 (19.87)	3.06 (3.27)	0.41 (0.35)	71.69 (76.51)	57 (57)
18	Arevalo Plaza	0.002	0.000	0.05	18.48	1.77	0.34	79.37	54
19	Oton Central Elem. Sch.	0.000	0.001	0.15	15.14	2.46	0.28	82.03	54
20	Captain Fernando, Leon	0.000	0.001	0.68	3.18	0.60	0.06	95.51	50
22	E. Yusay Memorial Sch., Arevalo	0.000	0.002	0.13	12.06	4.01	0.26	83.54	46
24	Tampucao no. 1, Lambunao	0.000	0.002	0.20	2.22	0.09	0.06	97.43	37
28	Magsaysay no. 3, Maasin	0.000	0.001	0.16	1.45	0.31	0.04	98.03	35
29	Pucuan no. 1, Maasin	0.000	0.000	0.15	4.88	0.07	0.08	93.63	61
30	Bagacay Ext. no. 1, Maasin	0.000	0.000	0.24	3.45	0.35	0.08	95.89	43

( ): Calculated gas composition under no atmospheric contamination (O_2 = 0.00).

PC-1 Zarraga Elementary School (Text-figs. 7-1, 2; Tables 7-1, 2; Pl. 8, figs 1 - 4)

This survey site is a free flowing well of fresh water accompanied with gas having a depth of 112 m which was bored as a water well in the ground of Zarraga Elementary School located at the southwestern part of Zarraga. This well was drilled in February 1976 by the Bureau of Public Works and it was completed with casing pipes measuring $4^1/_2$ inches in diameter and total 102.4 m in length. This well is equipped with a floating gas separator and a collector and part of gas produced is utilized as cooking fuel at the kitchen of the elementary school. The water flow rate of this well could not be measured being hampered by the well-structure, but its free flow rate at the time of completion was 218 kl/day according to the BPW's record. Gas produced from this well is divided into two portions. One portion of gas is discharged



1:50,000 BAROTAC NUEVO (Sheet 3552 I)
DUMANGAS (Sheet 3552 II)
ILOILO (Sheet 3552 III)
POTOTAN (Sheet 3552 IV)

TEXT-FIGURE 7-2

Location of PC-1 (Zarraga Elementary School), PC-2 (Sigangao Elementary School, Zarraga) and PC-9 (Maquina Plaza, Dumangas).

into the air through an exhaust pipe installed at the well-head, and the other portion of gas is separated through the separator and utilized for cooking. The amount of gas discharged through the exhaust pipe was measured as 9.5 Nm^3/day, but gas to the separator is smaller than that to the exhaust pipe.

The gas is composed of 88.83 vol.% of CH_4, 10.29 vol.% of N_2 and 0.15 vol.% of CO_2. H_2S is not detected, then this gas is suitable for fuel. The total calorific value of 1 Nm^3 of methane is 9,520 Kcal/Nm^3, so the calorific value of this gas will be 8,457 Kcal/Nm^3. The total calorific value of city gas supplied by Tokyo Gas Co. before the company converted to natural gas had been 5,000 Kcal/Nm^3, therefore the total calorific value of this well's gas is higher than that by 69%. Since the amount of gas to be discharged through the exhaust pipe of this well is 9.5 Nm^3/day, its total calorific value will be 80,338 Kcal/day. The calorific value of a standard home gas burner is 2,000 Kcal/hour, and then the amount of gas discharged to the air per day from this well corresponds such an amount of gas which is able to cause 40.2 sets of gas burner to burn with their cocks fully opened for 1 hour as known from the formula of 80,338/2,000 = 40.2.

Although accompanying water is light brown and has a slight smell, it is sent to Zarraga through a pipeline after aerated in a water storage tank and utilized as service water. The Cl^- content of this water is 525 mg/l.

According to the record of BPW, the geological section of this well is blue clay from the surface to the depth of 105.8 m and molluscan fossiliferous sand. It is considered that these deposits belong to the Pleistocene Cabatuan Formation.

PC-2 Sigangao Elementary School, Zarraga (Text-figs. 7-1, 2; Tables 7-1, 2; Pl. 8, fig. 5)

This survey site is a water well in the ground of Sigangao Elementary School located 3 km away in the direction of northeast from Zarraga.

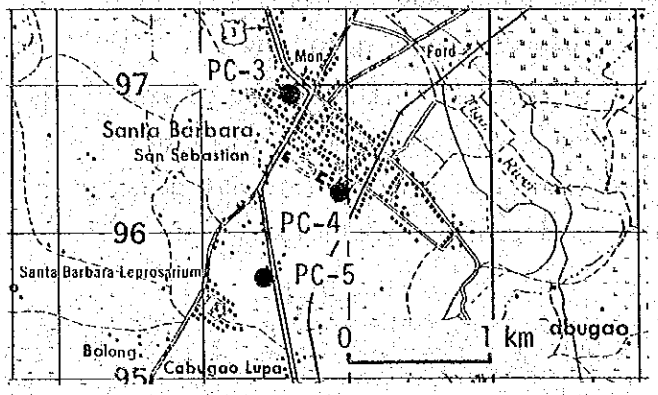
This well was drilled in April 1957 to a depth of 33.5 m and it is completed with iron pipe down to 22.6 m. This well is equipped with a hand pump and produces colorless fresh water with gas showing. The Cl^- content of the water is 69 mg/l.

vol.%; CO_2 0.22 vol.%.

PC-3 Sta. Barbara Municipal Hall (Text-figs. 7-1, 3; Tables 7-1, 2; Pl. 8, fig. 6)

This survey site is a water well bored at a corner of the front yard of Santa Barbara Municipal Hall. This well produces light brown colored water

of 4.3 kl per day. It is reported that gas showing was once recognized before, but it was not recognized through this survey. The Cl^- of water is 373 mg/l.



1:50,000 ILOILO (Sheet 3552 III)

TEXT-FIGURE 7-3

Location of PC-3 (Sta. Barbara Municipal Hall), PC-4 (Sta. Barbara Market) and PC-5 (Sta. Barbara highway).

PC-4 Sta. Barbara Market (Text-figs. 7-1, 3; Tables 7-1, 2; Pl. 9, fig. 1)

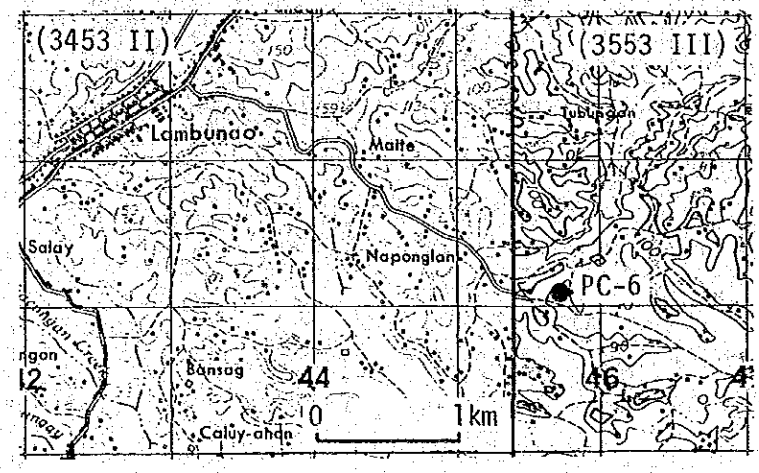
This survey site is a free flowing well with gas located at the back of Sta. Barbara Market. This well was bored to a depth of 132.3 m in Dec. 1961 and it is cased down to the depth of 121.3 m. The water flow rate could not be measured because of the unsuitable well structure, but it is said that water springs out 100 kl per day. The water of this well is brown and gives a strange taste and smell, but it is directly supplied as drinking water. Its Cl^- content is 152 mg/l and its gas component is as follows: CH_4 86.95 vol.%, N_2 12.55 vol.% and CO_2 0.22 vol.%.

PC-5 Sta. Barbara highway (Text-figs. 7-1, 3; Tables 7-1, 2; Pl. 9, fig. 2)

This survey site is a free flowing well with gas located along the highway 1 km away from Sta. Barbara in the direction of south. This well was drilled in Dec. 1975, the depth is 137.5 m and a casing pipe of $4^1/_2$ inches is inserted to the depth of 125.3 m. Its water flow rate is 45.3 kl/day and gas flow rate is 10.1 m^3/day, and gas-water ratio is 0.223. The water is brown in color and gives a strange taste and smell, but it is supplied to residents around the well as drinking water. Its Cl^- content is 294 mg/l. The gas is composed of 90.87 vol.% of CH_4, 8.00 vol.% of N_2 and 0.94 vol.% of CO_2.

PC-6 Naponglan, Lambunao (Text-figs. 7-1, 4; Tables 7-1, 2; Pl. 9, fig. 3)

This survey site is a saline water spring accompanied with weak gas showing. This spring is located at a rice paddy 3 km away in the direction of east southeast from Lambunao and it forms a small mud volcano with an outlet located in the center of dark gray mud pile which measures 2 m in diameter and 20 cm in height. The Cl^- content of the saline water is 4,540 mg/l, I^- is 5.6 mg/l, and I^-/Cl^- ratio is 1.23. The flow rates of saline water and gas were very small and those were not measurable. It is considered that the water and gas are produced from the Cabatuan Formation.



1:50,000 LAMBUNAO (Sheet 3453 II)
PASSI (Sheet 3553 III)

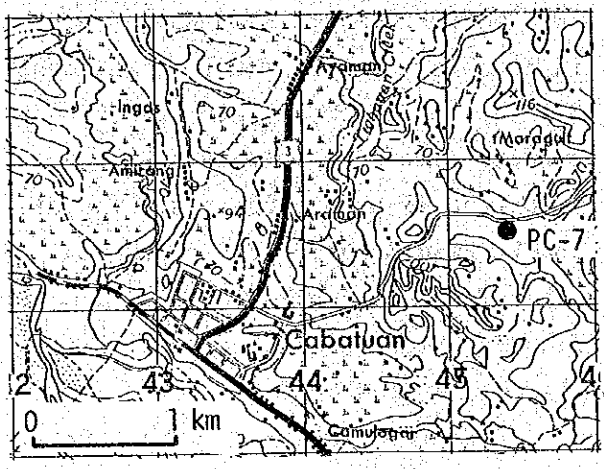
TEXT-FIGURE 7-4

Location of PC-6 (Naponglan, Lambunao).

PC-7 Maraguit Elementary School, Cabatuan (Text-figs. 7-1, 5; Tables 7-1, 2; Pl. 9, fig. 4)

This survey site is a water well located in the ground of Maraguit Elementary School located 2 km away in the direction of east northeast from Cabatuan. This well, bored in March 1981, is completed with iron pipe of 4 inches in diameter for a length of 42.7 m of its overall depth of 54.9 m. This well is equipped with a hand pump and produces light brown water accompanied with gas bubbles. The Cl^- content of the water is 916 mg/l and I^- is 1.9 mg/l. Its gas is composed of 90.00 vol.% of CH_4, 9.25 vol.% of N_2 and 0.44 vol.% of CO_2. The geological section of the well is composed of silty clay for the depth of 0 to 39.6 m, sandstone for the depth of 39.6 to 48.8 m and silty clay for the depth of 48.8 m and deeper.

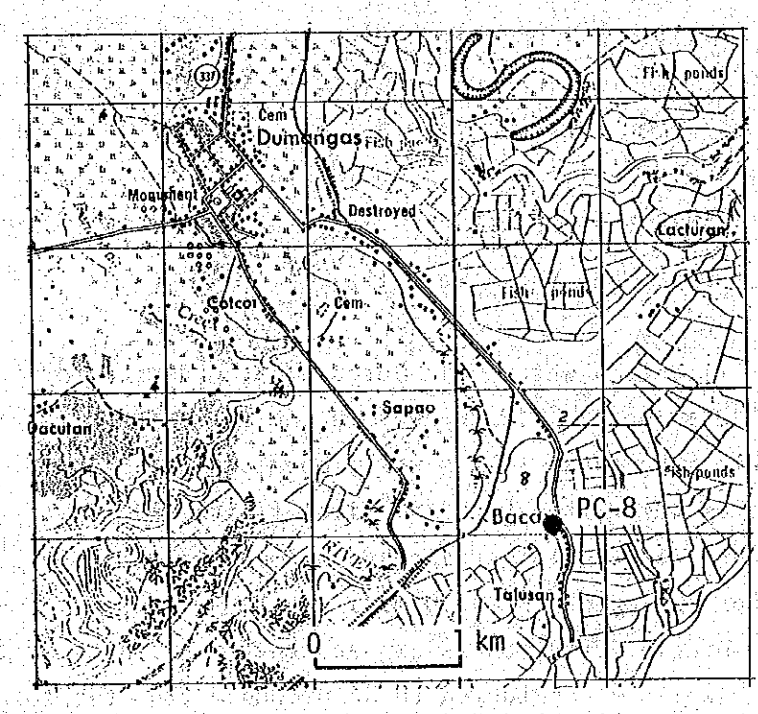
This is considered to be correlated with the Cabatuan Formation.



1:50,000 POTOTAN (Sheet 3552 IV)

TEXT-FIGURE 7-5
Location of PC-7 (Maraguit Elementary School, Cabatuan).

PC-8 Bacay Elementary School, Dumangas (Text-figs. 7-1, 6; Tables 7-1, 2; Pl. 9, fig. 5)



1:50,000 DUMANGAS (Sheet 3552 II)

TEXT-FIGURE 7-6
Location of PC-8 (Bacay Elementary School, Dumangas).

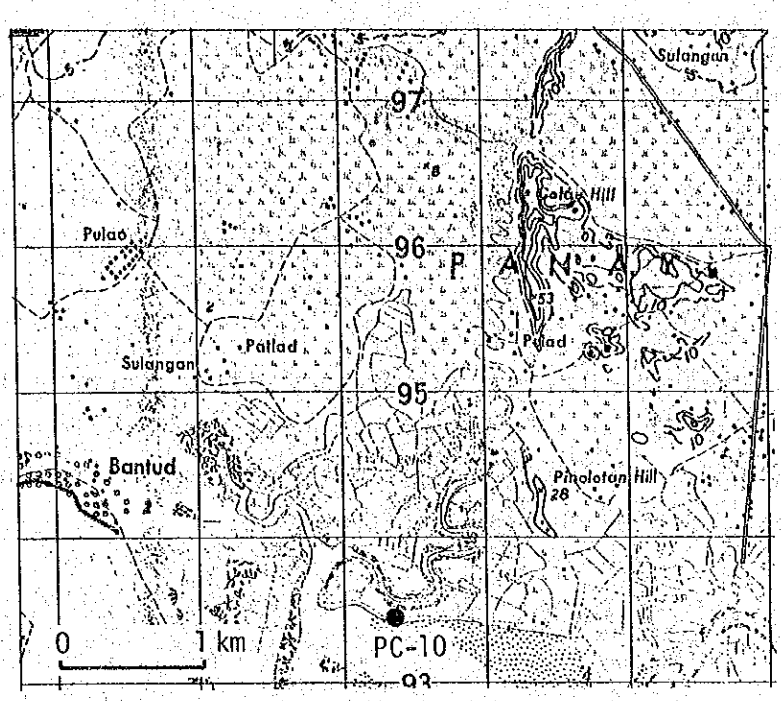
This survey site is a free flowing water well at the ground of Bacay Elementary school located 3 km away in the direction of southeast from Dumangas. This well was bored in May, 1977 and its depth is 74.7 m. An iron pipe of $4^1/_2$ inches in diameter is inserted into the depth of 0 to 58.5 m and another pipe of 3 inches is inserted into for the depth 58.5 m to the bottom. This well produces clear and colorless saline water at a rate of 5.2 kl/day and gas indication is not recognized. The Cl^- content in the water is 2,130 mg/l and I^- is 0.3 mg/l. The geological section of the well is composed of sandy clay for the depth of 0 to 10.7 m, fine grained sand for the depth of 10.7 to 21.6 m, blue clay from 21.6 to 29.0 m, yellow clay from 36.6 to 61.0 m, limestone from 61.0 to 65.5 m and fine grained sand from 65.5 m and deeper. This is considered to be correlated to the upper part of the Dingle Formation (Upper Miocene). It is presumed that saline water is produced from sand layer of 65.5 to 74.7 m.

PC-9 Maquina Plaza, Dumangas (Text-figs. 7-1, 2; Tables 7-1, 2; Pl. 9, fig. 6)

This survey site is a water well at the corner of a public plaza of Maquina, Dumangas. This well was bored down to the depth of 66.5 m in July 1977 and cased with iron pipe of $4^1/_2$ inches to the depth of 58.5 m. It produces clear colorless saline water (flow rate: 1.4 kl/day) and a small amount of gas (0.1 m^3/day). The Cl^- content of the saline water is 3,790 mg/l, I^- is 6.3 mg/l and I^-/Cl^- ratio is 1.66. The gas is composed of 93.2 vol.% of CH_4, 5.77 vol.% of N_2 and 0.94 vol.% of CO_2. It is considered that the water of this well is produced from the Dingle Formation.

PC-10 Pinolotan Hill, Dumangas (Text-figs. 7-1, 7; Tables 7-1, 2; Pl. 10. fig. 1)

This survey site is a water well bored at a corner of the public plaza of a seaside village located 1.2 km away in the direction of southwest from Pinolotan Hill, Dumangas. This well, bored in 1981, has a depth of 54.9 m and produces water freely at the time of high tide. Its water is clear and colorless, but contains salt and accompanied with gas bubbles. The Cl^- content of the water is 3,350 mg/l and I^- is 3.9 mg/l. Since limestone of the Dingle Formation is exposed in the vicinity of this well, the water of this well is considered to be produced from the formation.

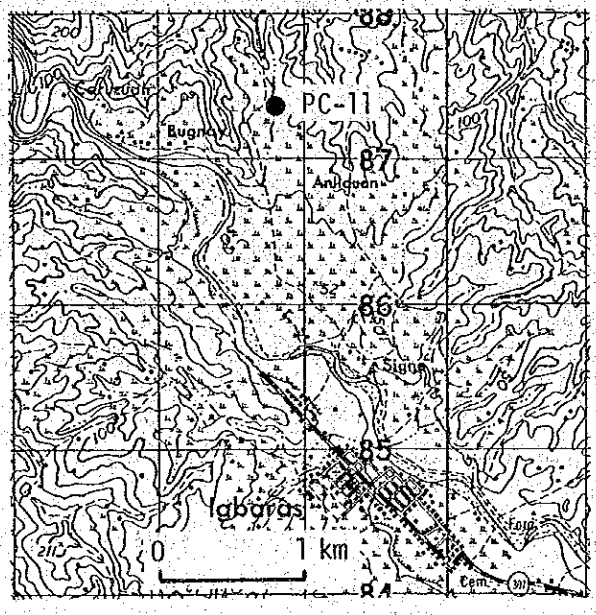


1:50,000 DUMANGAS (Sheet 3552 II)

TEXT-FIGURE 7-7

Location of PC-10 (Pinolotan Hill, Dumangas).

PC-11 Anilauan, Igbaras (Text-figs. 7-1, 8; Tables 7-1, 2; Pl. 10, fig. 2)



1:50,000 TIGBAUAN (Sheet 3452 II)

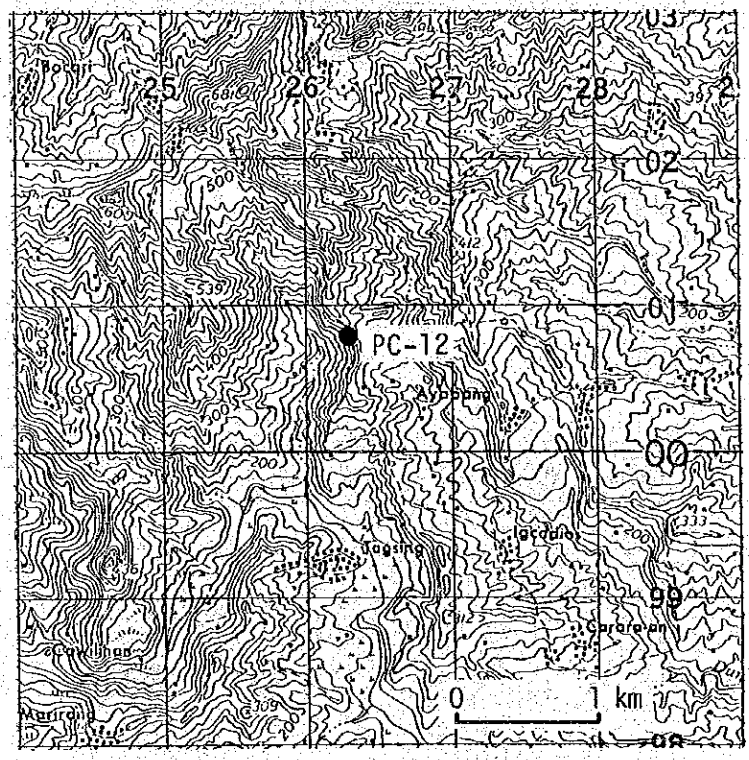
TEXT-FIGURE 7-8

Location of PC-11 (Anilauan, Igbaras).

This survey site is a natural spring on a riverside cliff located 2.5 km away in the direction of north-northwest from Igbaras. It was reported by local residents that the spring was producing saline water, but it produces fresh water of which Cl^- content is 9 mg/l. The water springs out from alternating siltstone and sandstone of the Tubungan Siltstone.

PC-12 Bo. Ayabang, Leon (Text-figs. 7-1, 9; Tables 7-1, 2)

This survey site is a natural spring along a new road 1.2 km away in the direction of west-northwest from Ayabang village which is located 10 km to the northwest of Leon. This spring produces fresh water of which Cl^- content is 20 mg/l. The water springs out from conglomerate which is considered to belong to the Barasan Sandstone.

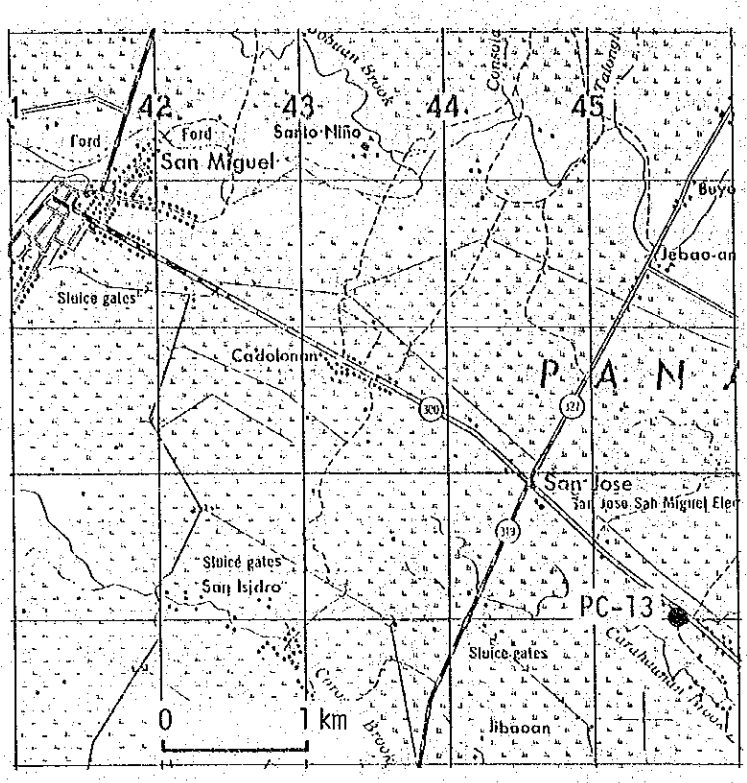


TEXT-FIGURE 7-9

Location of PC-12 (Bo. Ayabang, Leon).

PC-13 San Jose highway (Text-figs. 7-1, 10; Tables 7-1, 2; Pl. 10, fig. 3)

This survey site is a fresh water free flowing well which is located along the highway 5 km away in the direction of east-southeast from San Miguel. This well, bored in 1980, is said to be about 122 m in depth. Its flow rate is 230 kl/day and gas indication is not recognized. The water is clear and colorless and its Cl^- content is only 3 mg/l.

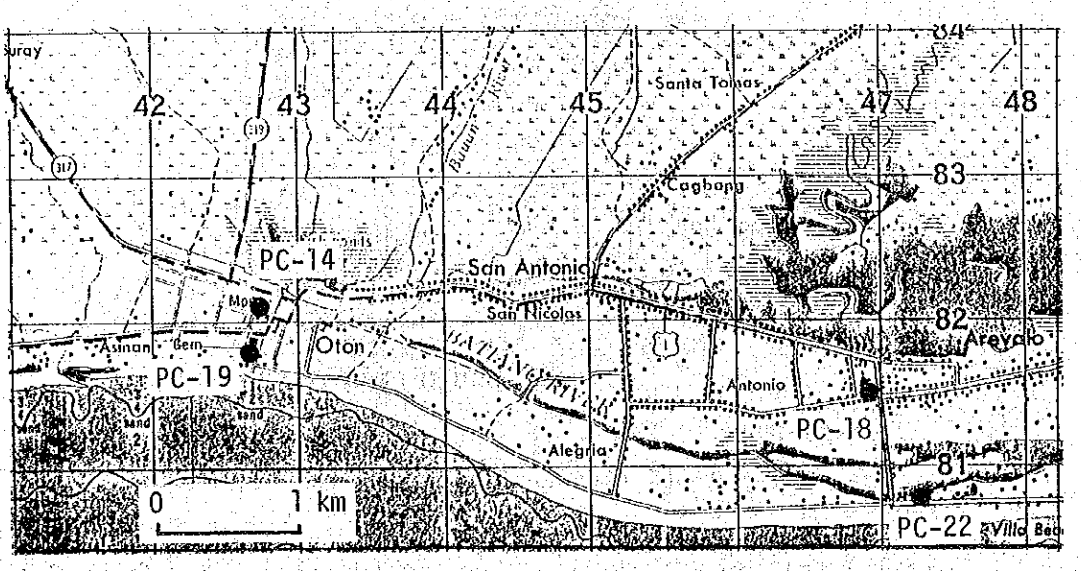


1:50,000 ILOILO (Sheet 3552 III)

TEXT-FIGURE 7-10

Location of PC-13 (San Jose highway).

PC-14 Oton Public Plaza (Text-figs. 7-1, 11; Tables 7-1, 2; Pl. 10, fig. 4)



1:50,000 ILOILO (Sheet 3552 III)

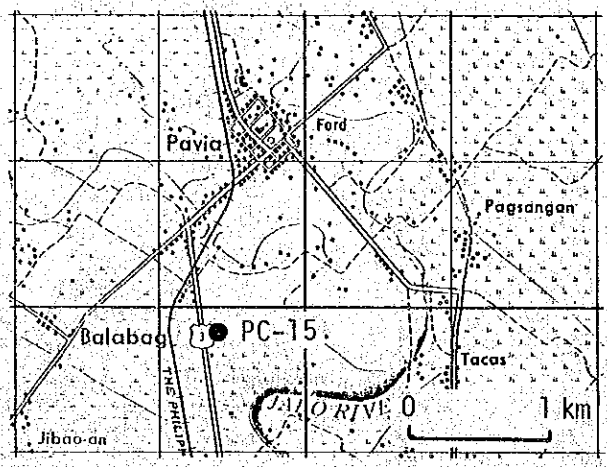
TEXT-FIGURE 7-11

Location of PC-14 (Oton public plaza), PC-18 (Arevalo Plaza), PC-19 (Oton Central Elementary School) and PC-22(E. Yusay Memorial School, Arevalo).

This survey site is a water well of 56.4 m in depth, bored in Nov., 1976 and it is completed with a casing pipe of $4^1/_2$ inches to the depth of 50.6 m. This well produces light yellow water accompanied with gas at a rate of 3.3 kl/day. The Cl^- content of the water is 563 mg/l and I^- is 0.5 mg/l. The geological section of the well is composed of sand and gravel for the depth of 0 to 6 m, blue clay for 6 to 52 m, and alternating fine to coarse grained sand and clay for 52 to 56.4 m (bottom). These are considered to be correlated with the Cabatuan Formation.

PC-15 Aganan Elementary School, Pavia (Text-figs. 7-1, 12; Tables 7-1, 2; Pl. 10, fig. 5)

This survey site is a water well in the ground of Aganan Elementary School located 1.5 km away to the south of Pavia. This well was bored in March 1981 and its depth is 67 m. A casing pipe of 4 inches in diameter is inserted to a depth of 51.8 m and a hand pump is installed. The water of this well is light yellow in color and is accompanied with small gas bubbles. The Cl^- content of the water is 564 mg/l. The geological section of the well is composed of primarily blue sandy clay accompanied with fine grained sand.



1:50,000 ILOILO (Sheet 3552 III)

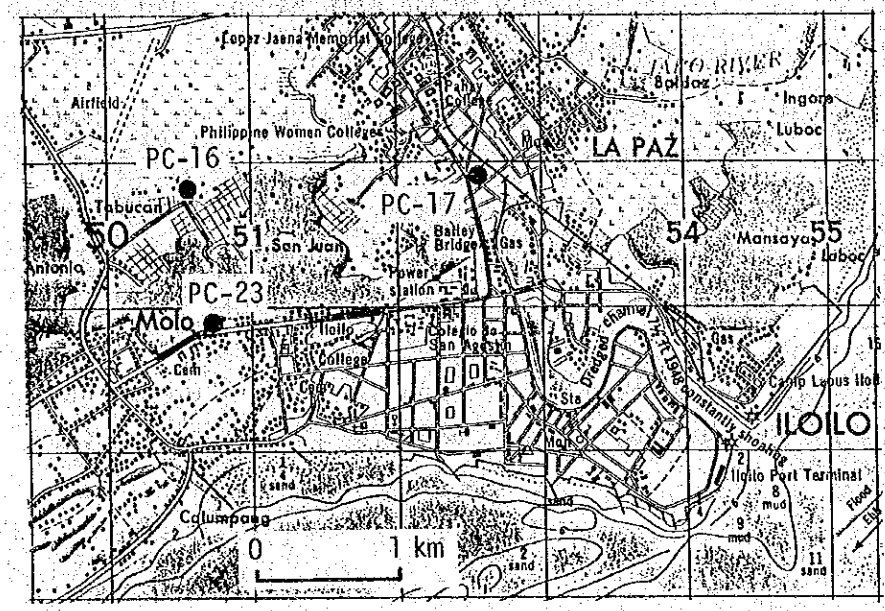
TEXT-FIGURE 7-12

Location of PC-15 (Aganan Elementary School, Pavia).

PC-16 San Rafael-Bolilao Elementary School, Mandurriao (Text-figs. 7-1, 13; Tables 7-1, 2; Pl. 10, fig. 6)

This survey site is a free flowing saline water well in the ground of San Rafael-Bolilao Elementary School located 1.7 km to the southeast of Mandurriao. This well was bored in June 1977 and its depth is 57.9 m. Its

flow rate at the time of completion was recorced as 27.3 kl/day, but it could not be measured being hampered by its structure at the time of recent survey. The water of this well is light yellow in color and its Cl^- content is 996 mg/l and I^- is 1.2 mg/l. It is unknown whether the well has gas indication or not. The geological section of the well is composed of alternating blue clay and fine grained sand with calcarenite and gravel. Parts of the sands contain molluscan fossils. These deposits can be correlated with the Cabatuan Formation.



1:50,000 ILOILO (Sheet 3552 III)

TEXT-FIGURE 7-13

Location of PC-16 (San Rafael-Bolilao Elementary School, Mandurriao), PC-17 (La Paz public market) and PC-23 (Hotel Del Rio, Molo).

PC-17 La Paz Public Market (Text-figs. 7-1, 13; Tables 7-1, 2; Pl. 11, fig. 1)

This survey site is a water well at a corner of La Paz Public Market in Iloilo city having a depth of 42.7 m. This well was bored in June 1980 and completed with a casing pipe of 4 inches in diameter and 36.6 m in length. It is equipped with a hand pump and produces clear and colorless saline water which contains gas composed of 76.51 vol. % of CH_4 and 3.27 vol. % of CO_2. The Cl^- content of the saline water is 3,060 mg/l and I^- is 4.0 mg/l and I^-/Cl^- ratio is 1.94. The geological section of the well is composed of sandy clay intercalated with fine and coarse grained sands.

PC-18 Arevalo Plaza (Text-figs. 7-1, 11; Tables 7-1, 2; Pl. 11, fig. 2)

This survey site is a free flowing well at a corner of Arevalo Plaza in Iloilo city. This well, bored in Jan. 1962, is 102.4 m in depth and completed with iron pipe of 6 inches in diameter down to a depth of 88.9 m. Its water flow rate at the time of completion was recorded as about 87 kl/day. The water of this well is slightly salty, accompanied with gas bubbles and brown in color. The Cl^- content is 924 mg/l and I^- is 1.2 mg/l. The geological section of this well is composed of fine grained sand for the depth of 0 to 18.3 m, clay for 18.3 to 90.2 m and alternating sand and clay intercalated with gravel beds for 90.2 m and deeper.

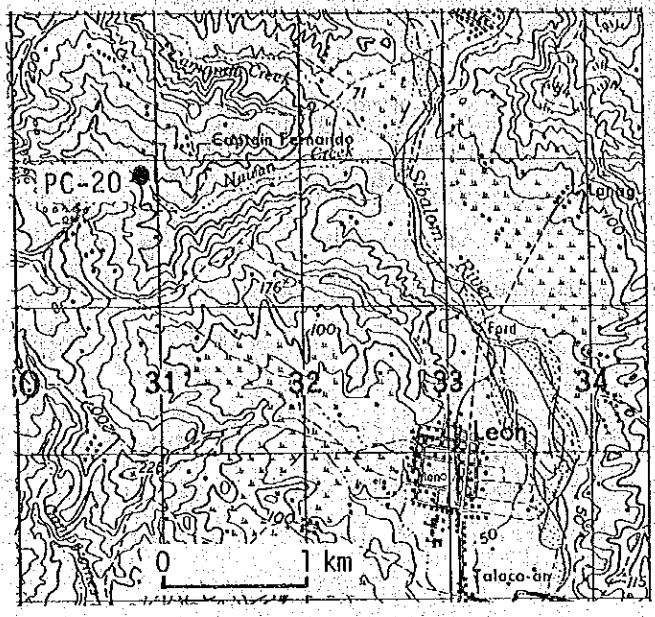
PC-19 Oton Central Elementary School (Text-figs. 7-1, 11; Tables 7-1, 2; Pl. 11, fig. 3)

This survey site is a free flowing well of 65.9 m in depth bored in April 1976. A casing pipe of $4\frac{1}{2}$ inches in diameter is inserted into the well down to a depth of 57.3 m. Water springs out at a rate of 21.9 kl/day and contains gas bubbles. The water is slightly salty and light yellow in color. Gas-water ratio is 0.008 and the Cl^- content of the water is 263 mg/l. The gas is composed of 82.03 vol.% of CH_4, 15.14 vol.% of N_2 and 2.46 vol.% of CO_2.

The geological section of the well is composed of sand for the depth of 0 to 5.5 m, sandy clay for 5.5 to 17.4 m, blue clay for 17.4 to 57.3 m and fine grained sand for 57.3 m and deeper.

PC-20 Captain Fernando, Leon (Text-figs. 7-1, 14; Tables 7-1, 2; Pl. 11, fig. 4)

This survey site is a small area including gas outcrops at the bottom of a valley of Captain Fernando village located 3 km away to the northwest of Leon. Gas outcrops are distributed along a fault trending N40°E formed in the alternating sandstone and siltstone of the Tubungan Siltstone, and 8 outcrops are recognized in the section of 5 m along the fault. Of those, 7 sites can be seen as gas bubbles on the stream and the other one can be recognized by igniting gas coming out through a hole of 1.5 cm in inner diameter bored into a concrete column built by local residents. The gas continuously burns in flames of 15 cm in length. Therefore, the flow rate of gas can be measured as about 4 m^3/day by the fire flame method. Of those gas outcrops observed as gas bubbles, the flow rate of a representative one is 0.18 m^3/day. The gas is composed of 95.51 vol.% of CH_4, 3.18 vol.% of N_2 and 0.60 vol.% of CO_2.



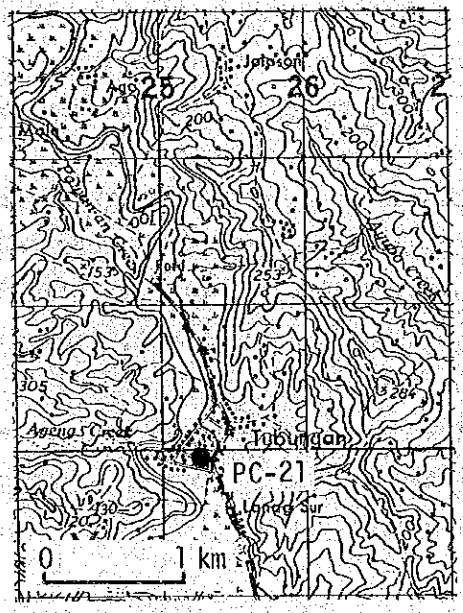
1:50,000 TIGBAUAN (Sheet 3452 II)

TEXT-FIGURE 7-14

Location of PC-20 (Captain Fernando, Leon).

PC-21 Tubungan (Text-figs. 7-1, 15; Tables 7-1, 2; Pl. 11, fig. 5)

This survey site is a hand pump well in a residential area of Tubungan. The water of this well is colorless, but it gives strange taste and slight smell of H_2S. Gas bubbles are not seen. The Cl^- content of the water is 355 mg/l.



1:50,000 TIGBAUAN (Sheet 3452 II)

TEXT-FIGURE 7-15

Location of PC-21 (Tigbauan).

PC-22 E. Yusay Memorial School, Arevalo (Text-figs. 7-1, 11; Tables 7-1, 2; Pl. 11, fig. 6)

This survey site is a free flowing well of weak saline water accompanied gas showing at Arevalo area of Iloilo city. This well was bored in Jan. 1980 and its depth is 51.8 m. A casing pipe of $4^1/_2$ inches is inserted to a depth of 50.3 m. The flow rate of saline water is 17.6 kl/day and the gas-water ratio is 0.03. The water presents light yellow color and the Cl^- content is 977 mg/l and I^- is 0.7 mg/l. The gas is composed of 83.54 vol.% of CH_4, 12.06 vol.% of N_2 and 4.01 vol.% of CO_2.

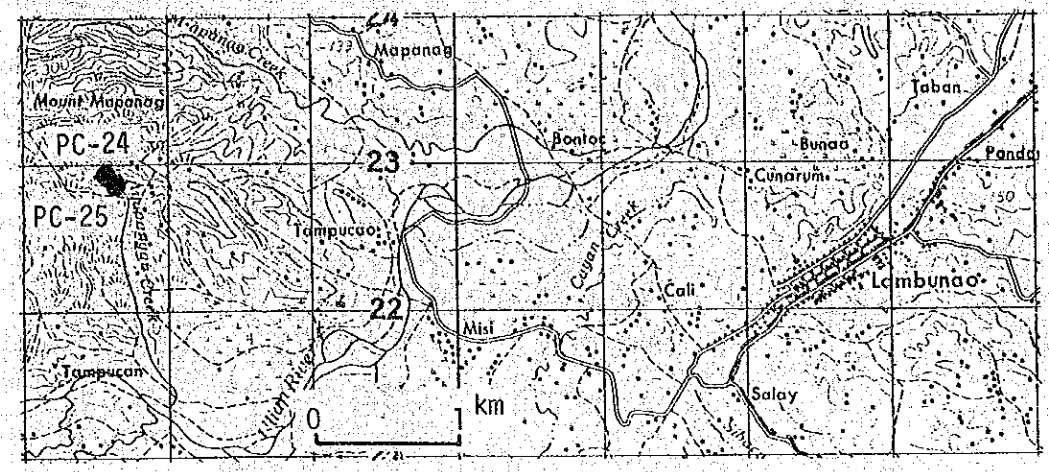
PC-23 Hotel del Rio, Molo (Text-figs. 7-1, 13; Tables 7-1, 2)

This survey site is a motor pump well of Hotel del Rio facing to the Iloilo river in Molo district of Iloilo city. The water of this well presents light yellow color and is slightly salty. The Cl^- content is 526 mg/l.

PC-24, 25 Tampucao no. 1 and no. 2, Lambunao (Text-figs. 7-1, 16; Tables 7-1, 2; Pl. 12, fig. 1)

These survey sites are small areas including gas outcrops at the bottom of a valley of Namulo Creek (this is shown as Ayapangan Creek in the topographic map of 1:50,000) 1 km away to the west from Tampucao village which is located 3 km away to the west of Lambunao.

Gas is recognized as bubbles coming out through sand and gravel on the bottom of the valley and concentrated to 2 areas which is 100 m away from each other. The flow rate of gas from one hole in the upstream area (Tampucao no. 1) is 0.22 m^3/day. This gas contains 97.43 vol.% of methane. One hole in the downstream area (Tampucao no. 2) produces gas at a rate of 0.04 m^3/day. These gases derive from bluish green carbonaceous silt under the very thin Recent gravelly riverbed. This carbonaceous silt is considered to be part of the Ulian Formation. From silt collected from the wall of valley near gas outcrops, abundant planktonic and benthonic foraminifera were detected. The benthonic fauna characterized by *Uvigerina* and *Bolivinita* may indicate outer neritic to upper bathyal sedimentary environment. The planktonic fauna contains primitive *Globorotalia truncatulinoides* and indicates the lower part of planktonic foraminiferal Zone N.22, Lower Pleistocene.



1:50,000 LAMBUNAO (Sheet 3453 II)

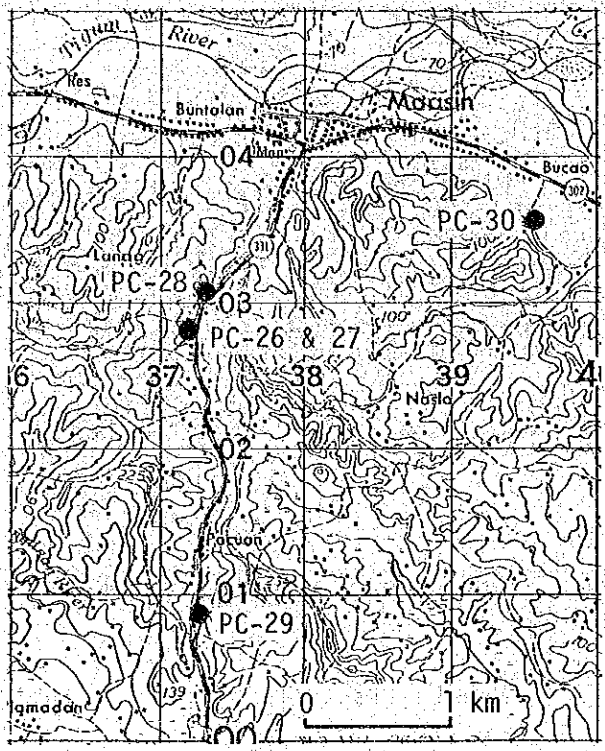
TEXT-FIGURE 7-16

Location of PC-24 (Tampucao no. 1, Lanbunao) and PC-25 (Tampucao no. 2, Lambunao).

PC-26 Magsaysay no. 1, Maasin (Text-figs. 7-1, 17; Tables 7-1, 2; Pl. 12, fig. 2)

The town name of Maasin wherein this well is located means saline water spring in the native language. This survey site is a manually dug saline water well of 1.27 m in depth in a valley along a road of Magsaysay village 1.5 km away to the southeast of Massin. A memorial panel showing the history of the place name of Maasin and names of visited geologists is set on the cliff by the well. The water of this well presents yellowish green and gives a strong smell of hydrogen sulfide, but gas is not recognized. The Cl^- content of the water is 11,370 mg/l and I^- is 32.8 mg/l, and I^-/Cl^- ratio is 2.61. Saline water may produce from carbonaceous silty sand with intercalations of granule sand which composes the surrounding cliffs. It is considered that this silty sand corresponds to part of the Guimbal Mudstone. From outcrops in the vicinity of this well, megafossils including molluscs and coral fragments, benthonic foraminiferal fauna including *Ammonia*, *Elphidium* and *Operculina*, and abundant planktonic foraminiferal fauna are found, and these fauna indicate that this silty sand is of open neritic deposits. By the presence of *Globorotalia tosaensis* and the absence of *Globorotalia truncatulinoides*, the planktonic fauna indicates Zone N.21 (*Globorotalia tosaensis* Zone) and the uppermost part of Pliocene.

The amount of organic carbon in the sample of bluish green silt collected from an outcrop in the vicinity of the well is 0.43%.



1:50,000 POTOTAN (Sheet 3552 IV)

TEXT-FIGURE 7-17

Location of PC-26 (Magsaysay no. 1, Maasin), PC-27 (Magsaysay no. 2, Maasin), PC-28 (Magsaysay no. 3, Maasin), PC-29 (Pacuan no. 1, Maasin) and PC-30 (Bagacay Ext. no. 1, Maasin).

PC-27 Magsaysay no. 2 Maasin (Text-figs. 7-1, 17; Tables 7-1, 2; Pl. 12, fig. 3)

This survey site is a manually dug well of 95 cm in depth located at the side of an outcrop 30 m away to the south of Magsaysay no. 1. The water of this well presents dark brown color and has higher content of solids and stronger in smell of hydrogen sulfide than that of Magsaysay no. 1, but gas indication is not recognized. The Cl^- content is 14,090 mg/l, I^- is 36.9 mg/l and I^-/Cl^- ratio is 2.62.

PC-28 Magsaysay no. 3, Maasin (Text-figs. 7-1, 17; Tables 7-1, 2; Pl. 12, fig. 4)

This survey site is a water well at the side of a road in Magsaysay village. This well was bored in 1957 and completed with an iron pipe of 4 inches, and its depth is said to be 46 m. The water is salty and has slight gas indication. The flow rate of saline water is 0.3 kl/day. The Cl^- content of the water is 2,540 mg/l and HCO_3^- is 1,320 mg/l. The gas contains 98.03 vol.% of methane.