GUADALCANAL PLAINS, SOLOMON ISLANDS
GROUNDWATER AVAILABILITY GUIDE

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The Guadalcanal Plains Groundwater Availability Guide

Introduction

This report outlines information about the availability of groundwater on the Guadalcanal Plains on Guadalcanal Island. It is the result of past information captured from work carried by Water Resources Division. These include geophysical surveys, drilling, well monitoring and water quality analyses.

Work carried out by the Division dates back to the 1960s. The Guadalcanal Plains is the most exploited area on Guadalcanal as far as groundwater extraction is concerned. Since more people demand groundwater, the Division sees the need to produce a guide in order to answer the frequently asked questions by those who want to have groundwater as their source of water supply.

Some of the questions asked are:

1. How deep do I need to drill a well?
2. How much groundwater can I expect to get from the well?
3. How far will I put the well from possible sources of pollution?
4. Is it safe to use groundwater from the well for drinking and cooking?
5. How will I construct the water well?
6. How much will it cost to drill a well?
7. What type of pumps do I need for the well?
8. How long will the well provide water?
9. Where can I get help concerning water well drilling?

Background Information

The importance of the Guadalcanal Plains as an area where agriculture and other commercial activities is taking place makes it vital for its assessment and control as far groundwater is concerned.
There is increasing number of farming, both domestic and commercial taking place in the area. More people will need groundwater for vegetable farms, animal farming, industry and also public water supplies for communities.

The Water Resources division has been drilling water bores in the area since the 1980s and there is increasing demand for groundwater. Out of the total number of wells drilled, about 80 percent are drilled at the

Guadalcanal Plains. Due to the increased use of major rivers for dumping of rubbish and sedimentation groundwater will play an important part in supplying water for the people in this area.

The Water Resources division, over the past years has been gathering information from bores drilled. These include borehole logs, water levels monitoring, pumping tests and geophysical investigations in areas prior to drilling. These data are stored in the division's database and are used by people who request them.

The Guadalcanal Plains is situated to the east of Honiara, capital of the Solomon Islands (Fig. 1). It covers an area of about 300 square kilometres and is drained by the five major rivers from the southern mountains.

These rivers are the Lungga, Ngalimbiu, Mbalisuna, and Mberande and Mbokokimbo rivers. The other smaller streams contributing to the river systems are the Tenaru, Tangaresso and Matepona streams.

These plains are the largest in the country, extending from Lungga to Aola. Their width varies from 2 to 13 kilometres. They are the result of coalescing of the deltas of the rivers draining the area.

Geology of Guadalcanal Plains

The majority of the Guadalcanal Plains deposits (Hallet 1990) consist of recent alluvium (Ngalimbiu alluvial formation). Layers roughly graded deposits of gravel; sand and clay are inter-bedded and inter-fingered.

Marine sand deposits are observed along the seashores. They consist of fine well-graded sand with small amounts of shell debris. Such deposits are seen to the east of Tenaru Bay.
To the south of the plains close to the foothills are scattered outcrops of the Honiara limestone and the Honiara beds. These formations consist of a mixture of sandstone and debris of reefal corals.

Grain size analyses of boreholes in the area showed two features. The well-graded deposits consist of sediments having fine sand. These are found along (marine deposits) and also close to the seashore (fine delta deposits). Running sand is normally an encountered feature at these locations and the well yield is generally low.

The poorly graded deposits have a mixture of gravel, sand and clay. These deposits could be found allover the plains and the best aquifers are located in the gravel layers of the delta sediments.

Hydrogeology of the Guadalcanal Plains

The geology of the area is such that the formations consist of irregular delta deposit. Layers of gravel, sand and clay are superposed. In some places the lithology observed from drilled wells differs a lot within short distances (e.g. 50m at Holy Name of Mary-Tenaru).

Fig. 1: Guadalcanal Island showing the Guadalcanal Plains

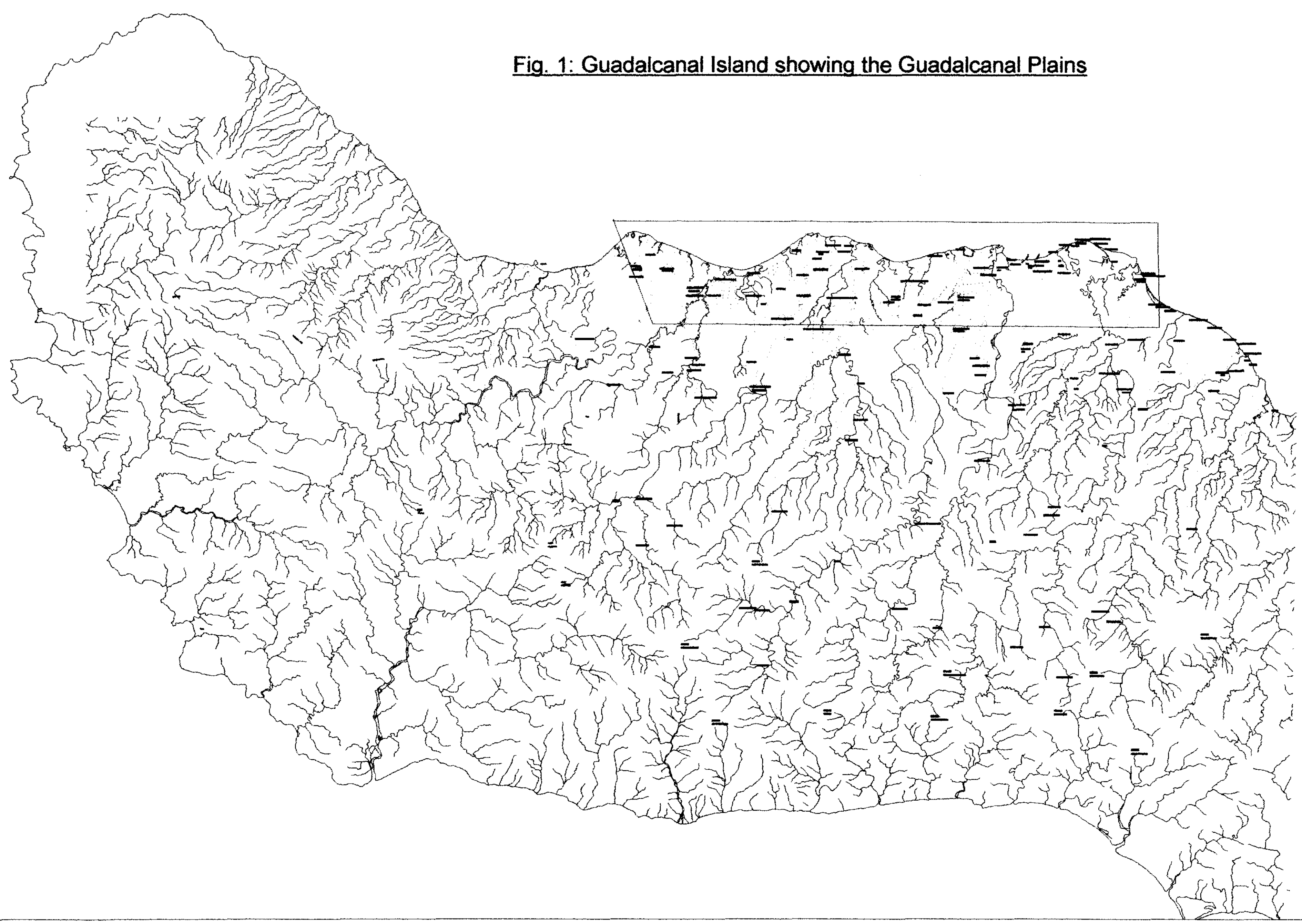
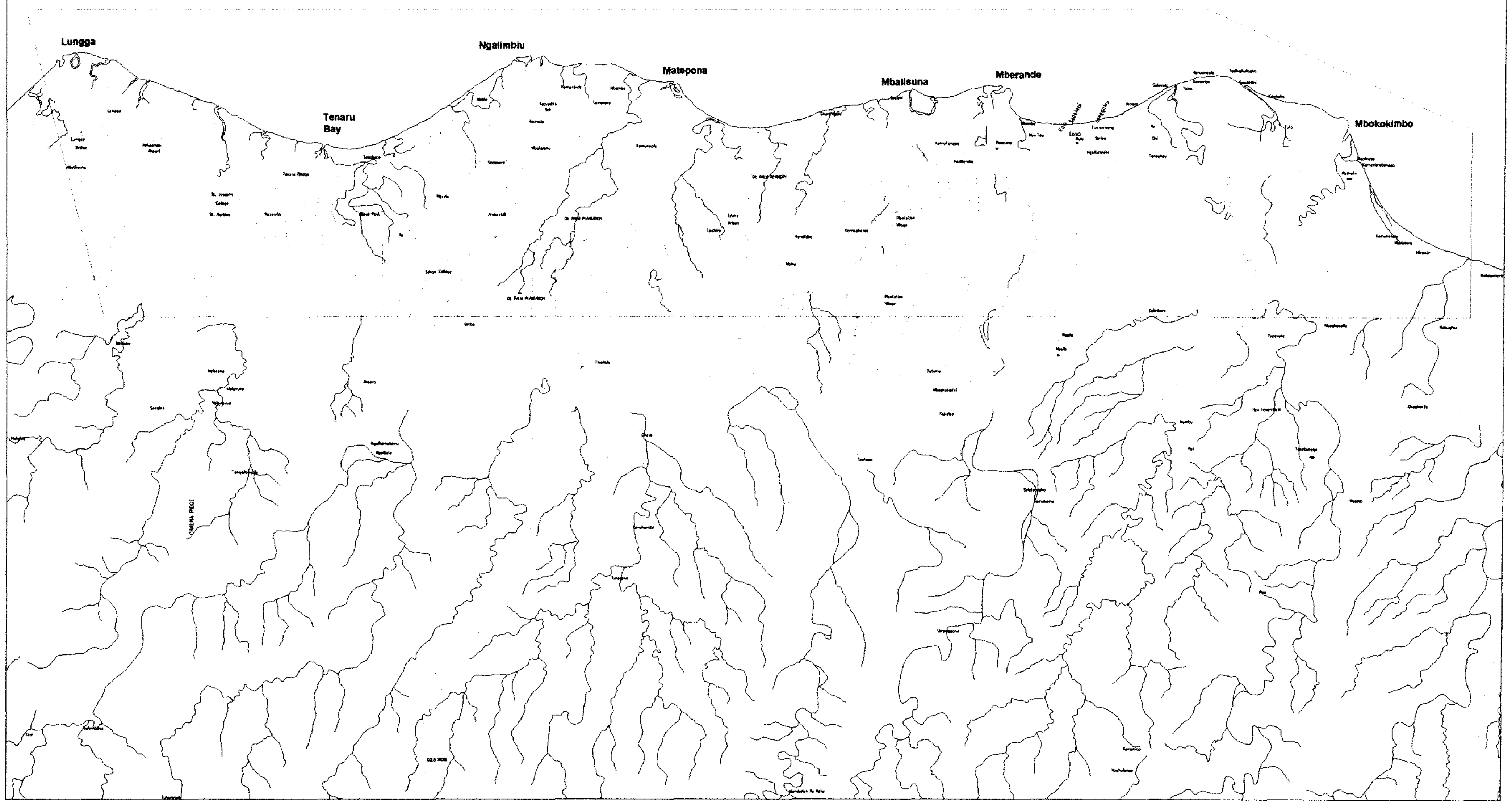


Fig. 1a: The Guadalcanal Plains



The best aquifers normally tapped at the plains are located in the gravelly and sandy layers. They are generally confined and some wells drilled are artesian (Kulu School, Makira Belle-Foxwood).

Superposition of different aquifers occurs frequently. The range of the thickness of these aquifers is large (2-15 m). Since there are no experimental pumping tests carried out in these aquifers, the interaction between them is not known.

Water Balance on Guadalcanal Plains

An estimate of the water balance on the Guadalcanal Plains (Hallet 1990) is made using the monthly average rainfall and mean temperature collected during 24 years in Honiara.

The water balance formula is:

P = EP + Re + Q +/- Sm where P - Precipitation

EP-Evapotranspiration (using Thornwaite)

Re - Aquifer recharge Q - Surface runoff

Sm - Soil moisture deficit

Due to the lack of other relevant data on the Guadalcanal Plains, some of the water balance parameters are omitted. The interception is assumed zero because the area is covered with grass and the change in water storage is also assumed zero (minimal groundwater is withdrawn).

Table 1. Water balance calculation using 24 years record from Honiara.

Months	Tm(deg C)	P (mm)	PE (mm)	ER (mm)	Sm (mm)	R + Q (mm)
January	26.9	277	145	132	0	88
February	26.8	287	148	139	0	139
March	26.7	362	146	216	0	216
April	26.8	214	139	75	0	75
May	26.8	141	139	2	0	2
June	26.4	97	133	-36	-35	0
July	26.1	100	133	-33	-68	0
August	26.3	92	123	-31	-99	0
Septeber	26.5	95	124	-29	-128	0
October	26.6	154	140	14	-114	0
November	26.7	141	140	1	-113	0
December	26.8	217	148	69	-44	0
TOTALS		2177	1657			520

Tm-monthly mean temp, P-monthly average rainfall, PE-monthly potential evapotranspiration, ER-effective rainfall, Sm-soil moisture deficit,
R + Q-available water for the aquifer recharge & runoff

The water balance shows that the amount of rainwater available for the recharge and the surface water runoff is only 520mm.

According to the Thornwaite theory, the soil moisture deficit must be zero before having groundwater recharge and the water balance shows that no recharge occurs between June and December, during the dry season.

The low value of 520mm indicates that groundwater potential may be limited on the Guadalcanal Plains. In this case large withdrawal of groundwater could lead to overexploitation.

Overexploitation could be bad for aquifers along the seashore where saltwater intrusion could occur. However, it is possible that aquifer recharge occurs by groundwater from the foothills south of the Plains where rainfall increases with altitude (up to 6000 mm per year).

Water Well Location

After carrying out a few electrical soundings close to water wells, it becomes helpful to use the geophysical method to locate water wells.

Though the results do not show the exact geology of the site, interpretations they give on the ground resistivities can be helpful.

The following general indications can be used:

(i) a resistivity value < 20 Ohm-m indicates high clay content (bad aquifer)
(ii) a resistivity value > 60 Ohm-m indicates gravel layer(good aquifer)
(iii) a resistivity value < 10 Ohm-m indicates salt water
(iv) contrasted resistivity values, even low (between 20 & 60 Ohm-m) indicate the presence of gravel layers interbedded with clay
(v) thickness of the layer with low resistivity is generally under-estimated

Bore hole Information

There are more than two hundred boreholes drilled on the Guadalcanal Plains. They are used for domestic, irrigation, village supply, public supply, industry and geotechnical investigation for bridges and roads.

In this guide the Guadalcanal Plains is divided into four zones, with each zone bounded by the major rivers and the bore holes located in each zone are matched in terms of their lithology, water quality and yield.

They are divided in the following zones:

1. Lungga-Ngalimbiu

2. Ngalimbiu-Mbalisuna

3. Mbalisuna-Mberande

4.. Mberande-Mbokokimbo

The boreholes are drilled to depth from 5 metres to about 72 metres. The deepest well was drilled at Ngalimbiu area for water supply purposes.

Wells are normally screened at the gravel layers because these give high yields for water supply purposes. There are wells that have screened placed at the sandy layers. These are done at locations where gravel layers are not encountered.

Generally, the layers of gravel, coarse sand or a mixture of both form the permeable layer which is the water bearing layer in most wells on the Guadalcanal Plains.

Correlation of Well Logs

The purpose of dividing the Guadalcanal Plains into zones is to try and match the well logs and see the depths to which aquifers, aquicludes and aquitards exist at a selected area and direction.

Cross sections of wells in each zone are plotted and soil layer information is approximately matched at these areas.

Lungga-Ngalimbiu Zone

This zone bounded by the east coordinates 614000 and 626000, is an interesting one owing to the drilling programs that had been carried out by the Americans during the Second World War (1942).

A lot of information concerning groundwater in this area was compiled by RC Baker in his report on “An occurrence of saline ground water on Guadalcanal", 1950. Since most of the military installations were located on the western end of the coastal plains, numerous wells for water supply we~ drilled here (Fig 2a).

In Baker's report it was pointed out that the coastal plains comprised of clay to medium-coarse gravel (mixed) but the fine materials are dominant. It was also hard to correlate the strata from one well to the next. However, there is a zone of permeable sand at depth from 30m to 40m in several wells.

Table. 2: Depth of well, depth to top and bottom of permeable zone and salinity of water for specified wells located between Lungga and Ngalimbiu rivers.

Well	Depth of Well (m)	Depth to top (a) & bottom of permeable zone (m)	Salinity (ppm or mg/l)
A	57.91	45.72	Salt water
B	152.4	35.1-42.7 88.4-94.5	1000 3700
C	4.572 +/-	4.752 +/-	Brackish
D	36.6	32.0-36.6	1320
E	121.9	32.0-36.6 83.8-88.4 112.8-117.3	Brackish Brackish Brackish
F	73.5	68.58-71.63	1600
G		About 39.6	Brackish
H	64.0	53.3-62.5	Brackish
I	120.4	111.2-120.4	Salt water
J		38.4	330
K	109.7	32.0-33.5 94.5-97.5	200 3600
L	79.2	About 79.2	2140

(a) Top where only one figure is given

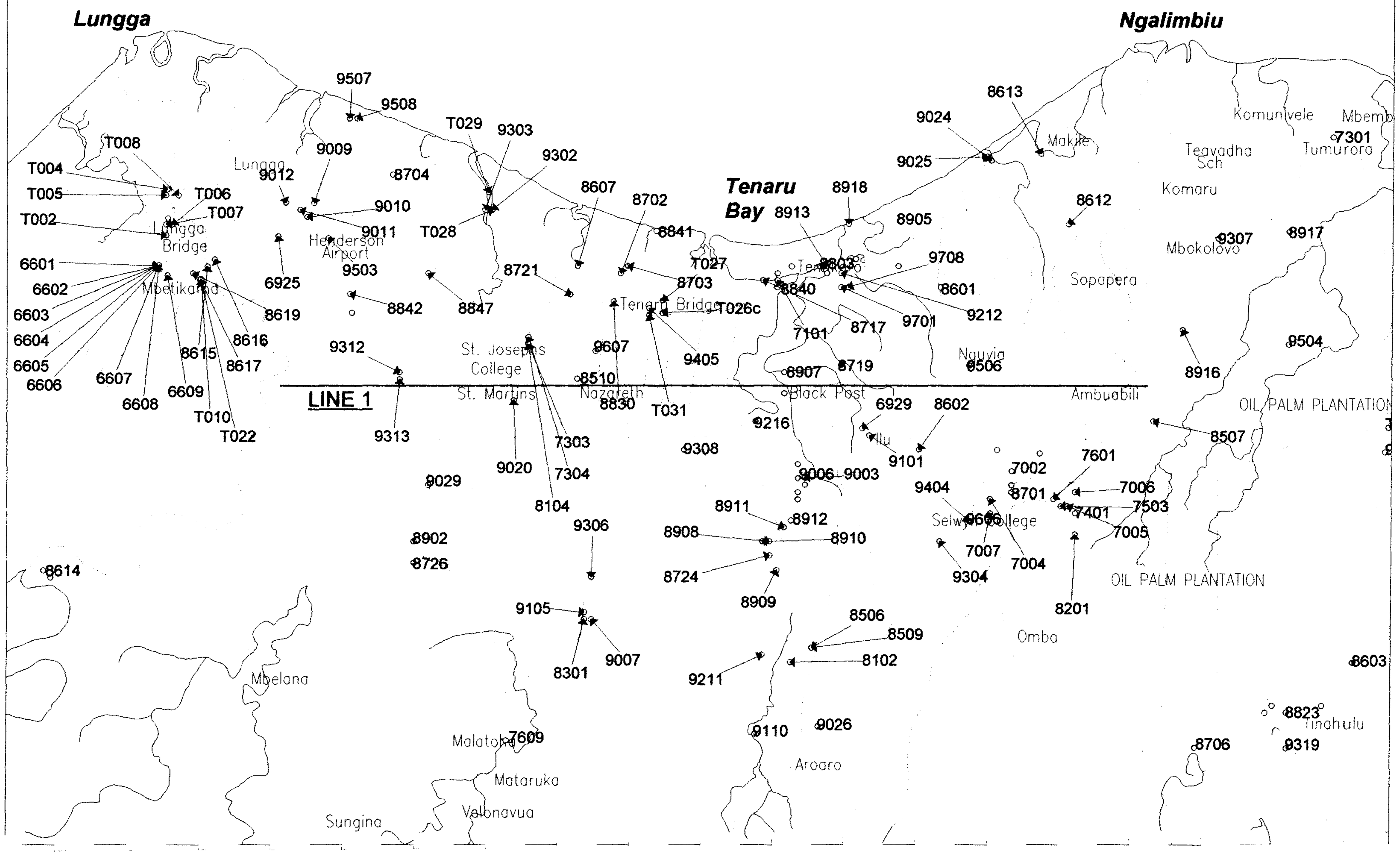
Yellow clay frequently occurs at 53.3m to 54.86m (about 50.0m below sea level) and reported hard drilling at this depth. Grass and roots were encountered in two wells at 178 feet with a maximum depth drilled to about 152.4 metres. No water wells reached the underlying basement rock.

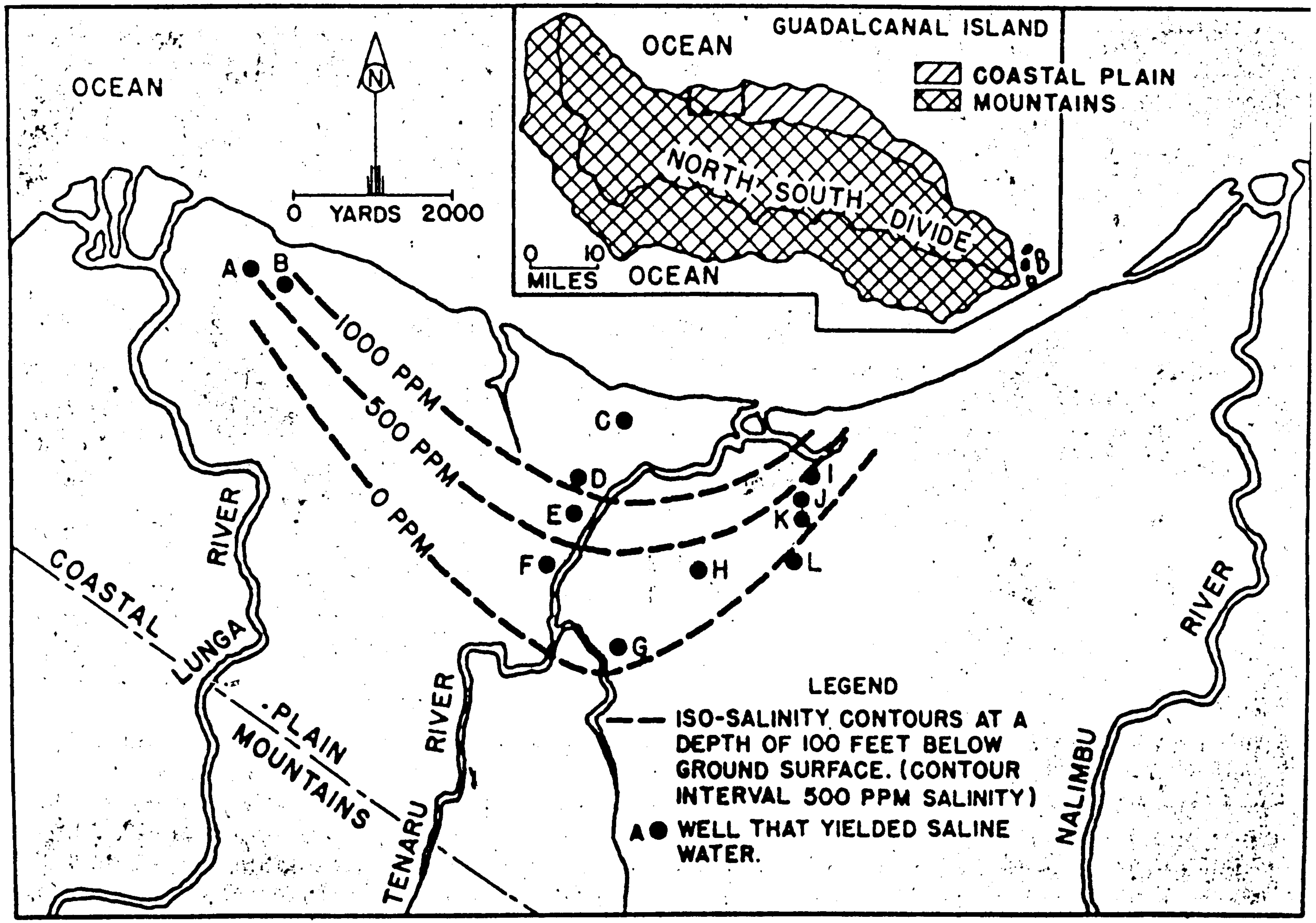
Well yield in few wells drilled during the World War II by the Americans exceeded 100 gal/min (5 l/s) and water is artesian, rising to about ground surface, about 4.572 metres above sea level.

From the data provided by Baker, most of the wells drilled have brackish or salt water to depths of more than 30 metres. Only very few wells have good water quality. Wells drilled were at the vicinity of Henderson, along Tenaru river and Dodo Creek area. It was assumed that the saline water at this area was ocean water that was incorporated into the sediments as the coastal plain was built.

Similarly, water wells drilled at the same area by the Water Resources Division are generally shallow and screened at the gravelly sandy layers. Due to the high salinity levels in the area some of the wells are not fit for drinking (Tenaru School, Levers plantation, US Navy Tenaru, Vutu). Wells near the coast and 3 kilometres inland are shallow, have high salt content and low yield. Long term pumping in wells drilled may have a risk in saltwater contamination of the aquifer (Fig.2 & 2a).

Fig. 2: Lungga-Ngalimbiu Zone of Guadalcanal Plains





OCEAN
N
0 YARDS 2000
GUADALCANAL ISLAND
OCEAN
COASTAL PLAIN
MOUNTAINS
NORTH SOUTH DIVIDE
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C
D
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G
H
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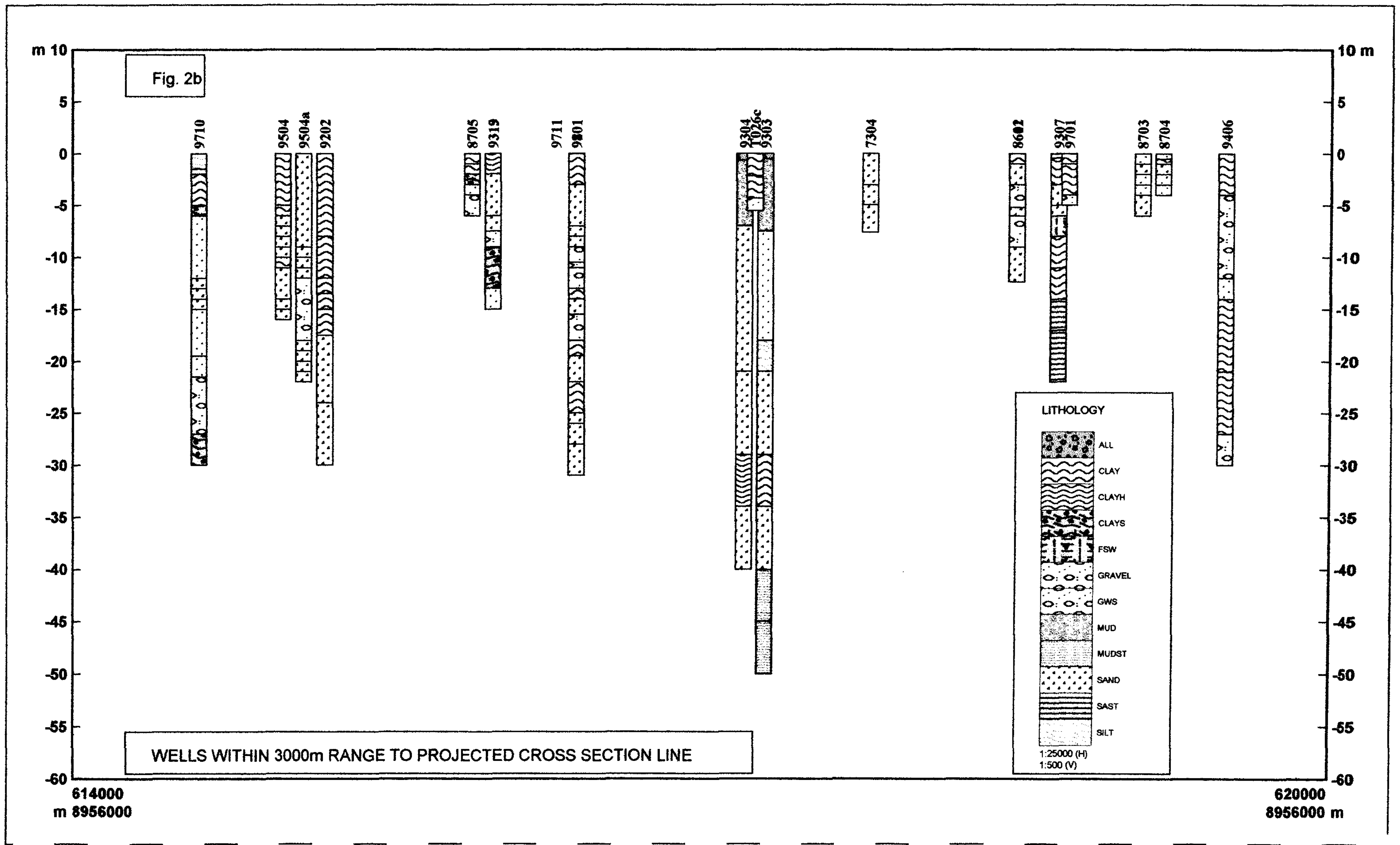
K
L
LUNGA RIVER
COASTAL PLAIN
MOUNTAINS
TENARU RIVER
NALIMBU RIVER
LEGEND
ISO-SALINITY CONTOURS AT A DEPTH OF 100 FEET BELOW GROUND SURFACE. (CONTOUR INTERVAL 500 PPM SALINITY)
A WELL THAT YIELDED SALINE WATER.

GUADALCANAL PLAINS LITHOLOGY GUIDE

Cross Section Plot	Guadalcanal Plains Availability Guide	Lungga-Ngalimbiu (Line 1)

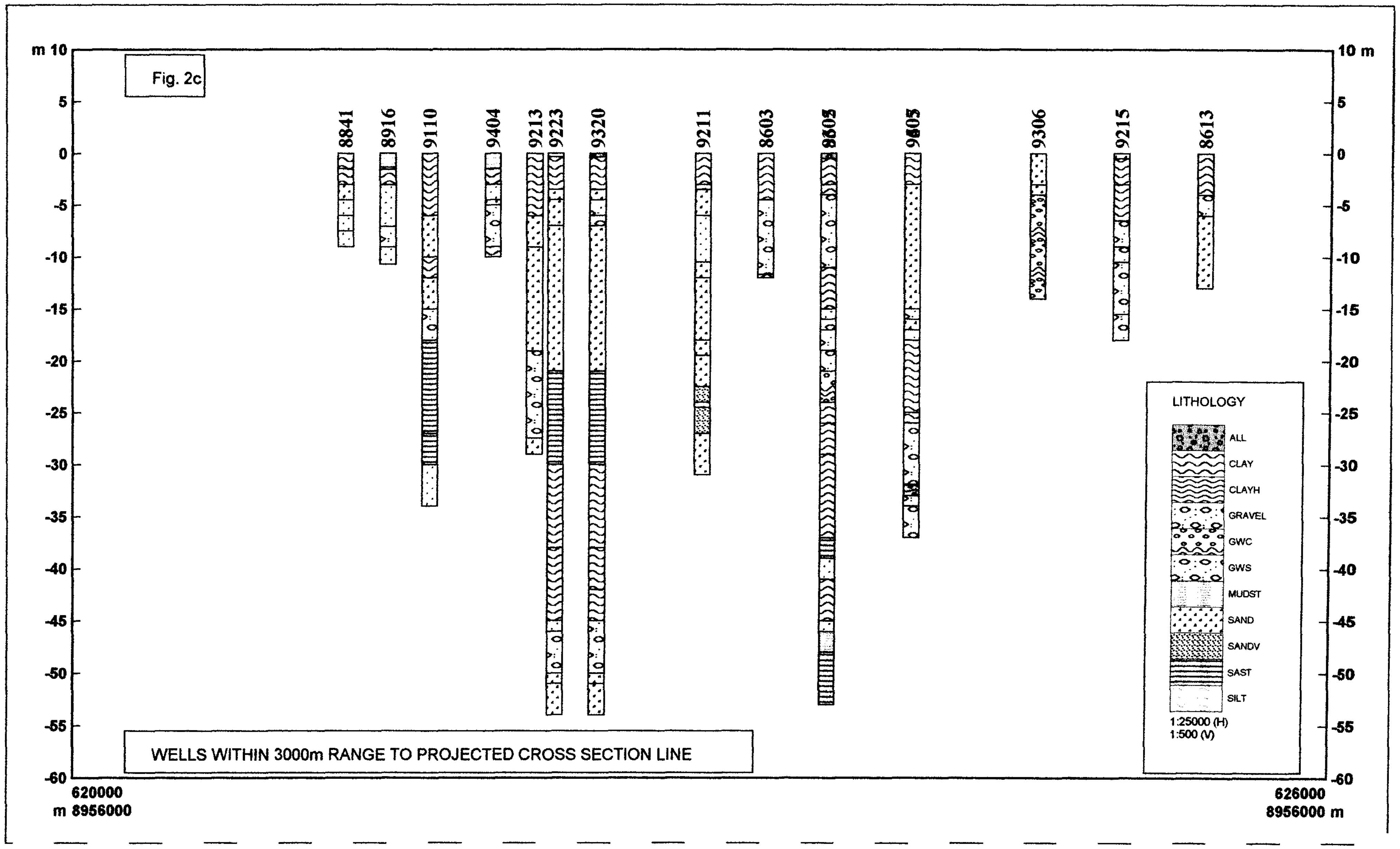


GUADALCANAL PLAINS LITHOLOGY GUIDE

Cross Section Plot

Guadalcanal Plains Availability Guide

Lungga-Ngalimbiu (Line 1)



Geophysical surveys carried out showed that the saltwater zone (very conductive) is approximately 15 metres below ground level. For water wells with an average depth of 12 metres, pumping tests and water quality showed transmissivity values from 200-600 m2/day and TDS values from 300-700 mg/l.

Shallow wells, less than 15 metres are recommended and this extends to about 3 kilometres inland. For wells very close to the seashore drilling should be limited to less than 10 metres.

Wells drilled at Kongga, New Koloula, Black Post and further east (Okea SIPL, Old Selwyn College and SIPL) area showed lower salinity levels with well depths exceeding 20 metres. These wells are close to the Ngalimbiu River and are about 4 kilometres from the coast. There is a higher rate of success of wells drilled at this area and well depths have reached 30 metres (Okea SIPL). This area is quite far from the seashore and the Ngalimbiu River acts as the groundwater recharge zone.

From the Lungga-Ngalimbiu cross section of plotted wells, the following general lithology is observed (Fig.2b & 2c):

- Clay/silt layer: ground level to about 5 metres
- Gravel/sand layer: 5-30 metres
- Clay/silt: 30-45m
- Gravel/sand layer: below 45m

Ngalimbiu-Mbalisuna Zone

The Ngalimbiu-Mbalisuna Zone, bounded by the east coordinates 626000638000 is not so exploited as far as drilling and geophysical surveys is concerned. There are few people who request water bores from this area of the Plains. Most water wells are located around Tetere and west of Mbalisuna (Fig.3 & 3a).

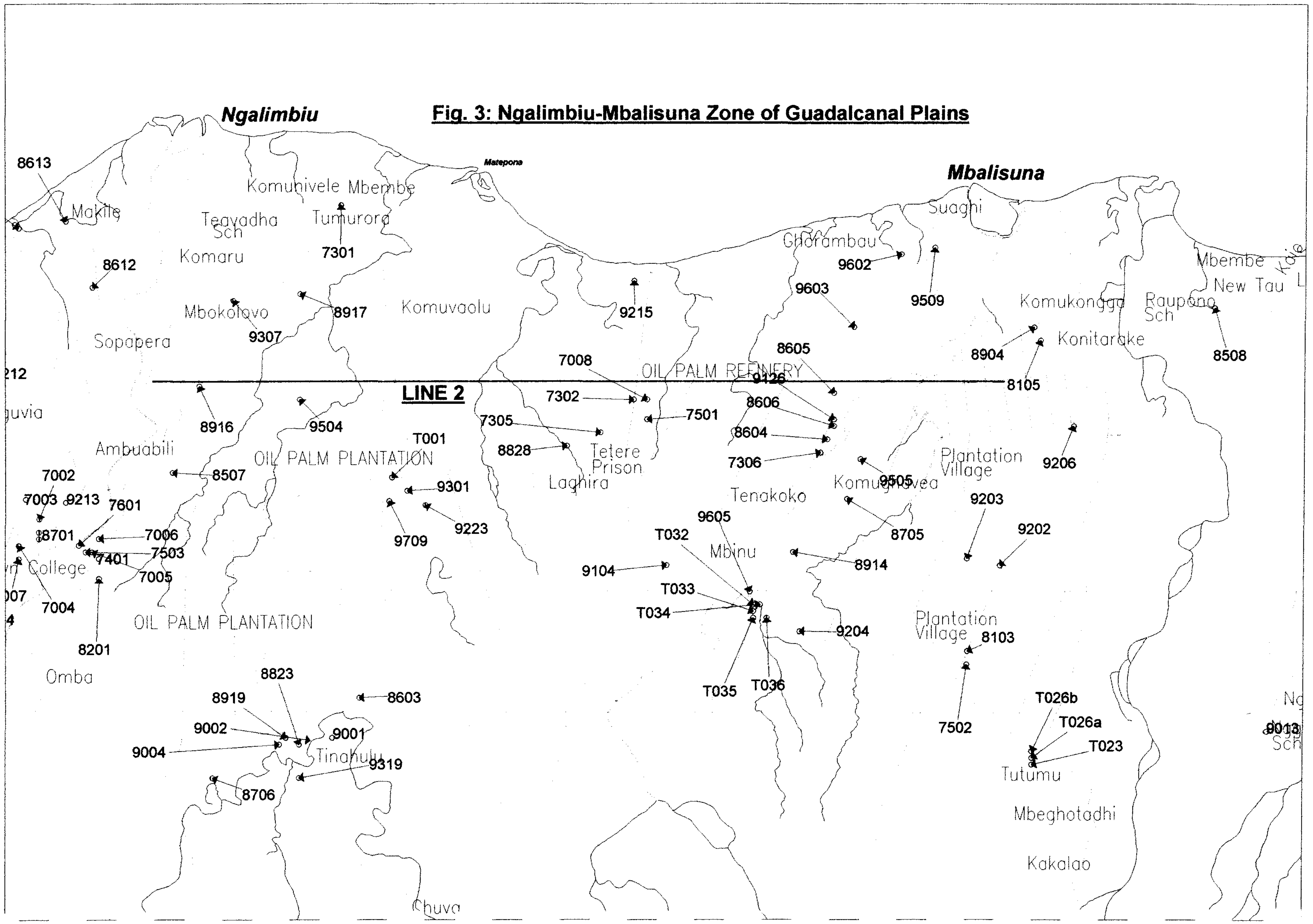
As such only few wells which include geotechnical bores and some water bores are drilled in the area. The depth of water wells are drilled here vary according to the depth to which aquifers are encountered.

Generally, the tendency being to drill a well and tap aquifers according to the amount of water needed by the client. This is only based on the number of households and the average daily consumption rate.

The water yields from these bores are determined from pumping tests carried out and since the water bores are for small users (1-2 houses) the pumping tests are carried for two hours (1 hr pumping & 1 hr recover test) .

There are a number of shallow wells drilled close to the coast, which yield water of good quality. These are Suaghi, Basikali, Ghorabau communities. Pump tests carried out showed abundant groundwater (T=1,300 m2/day) for a 12 meters well located about 1.5 km from the coast but close to a stream. Further inland, transmissivity values for two wells

Fig. 3: Ngalimbiu-Mbalisuna Zone of Guadalcanal Plains

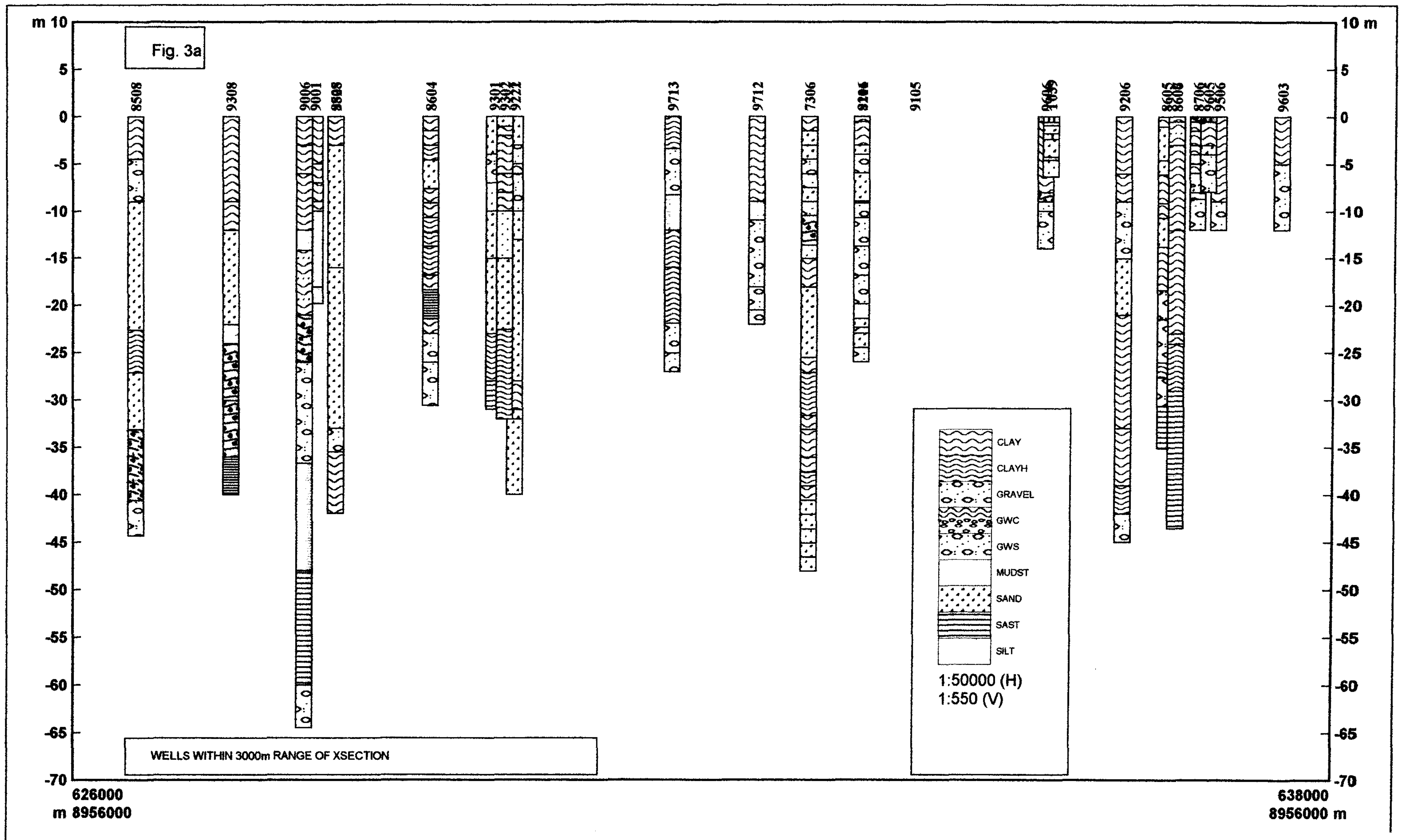


GUADALCANAL PLAINS LITHOLOGY GUIDE

Cross Section Plot

Guadalcanal Plains Availability Guide

Ngalimbiu-Mbalisuna (Line 2)



were 200 and 130 m2/day respectively. These values indicate groundwater reserves can be used for bigger water supplies if tapped.

Saltwater intrusion into wells around this area is not a very big concern, unlike the Lungga to Tenaru area. Wells are drilled to an average depth of 30 metres and aquifers of gravel and coarse sands are tapped for groundwater.

The salinity levels are low (180-360 mg/l) and due to the cost of drilling, which is expensive it is recommended that shallow wells with gravel layers can be drilled around this area with abundant groundwater obtained.

Geophysical surveys carried out at Suaghi, very close to the seashore showed brackish water below 30 metres hence wells are drilled to less than 15 metres.

From the results of wells drilled at this area, the success rates are high. It was also seen that fine/coarse sandy layers are dominant around the Matepona area while gravel layers are present close to the Mbalisuna river.

A generalized lithology make up of the area is as follows (Fig.3a):

- Clay/silt layer: ground level to about 10m
- Gravel/sand layer: 10-30m
- Clay/silt layer: 30-40m
- Gravel/sandstone: below 40m

Mbalisuna-Mberande Zone

This zone bounded by the east coordinates 638000-643000 has water wells drilled close to the coast and also along the main road linking Honiara and Aola, to the east (Fig.4).

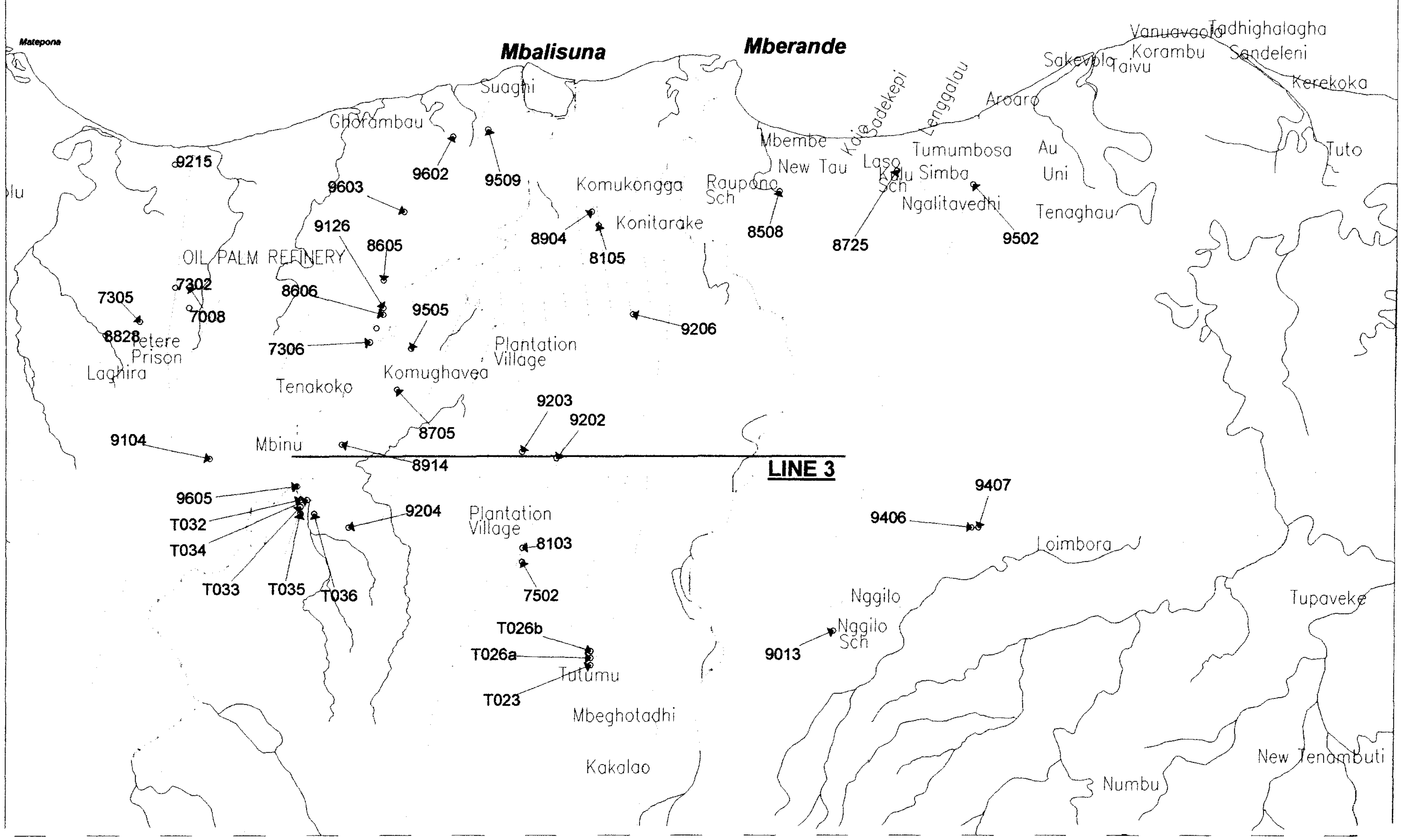
There are a number of water wells drilled that yield abundant groundwater with good water quality results. Previous geophysical soundings were carried out at this area to determine the aquifers.

Information from drilled wells around this zone showed that the majority of wells are successful and groundwater is abundant. Pumping tests results showed groundwater yields of more than 2 litres/sec (>30 gpm) and transmissivity values indicate groundwater reserves fit for larger water supplies.

From the cross section plots of well logs in the area, the likely well logs for the areas is as follows (Fig.4a):

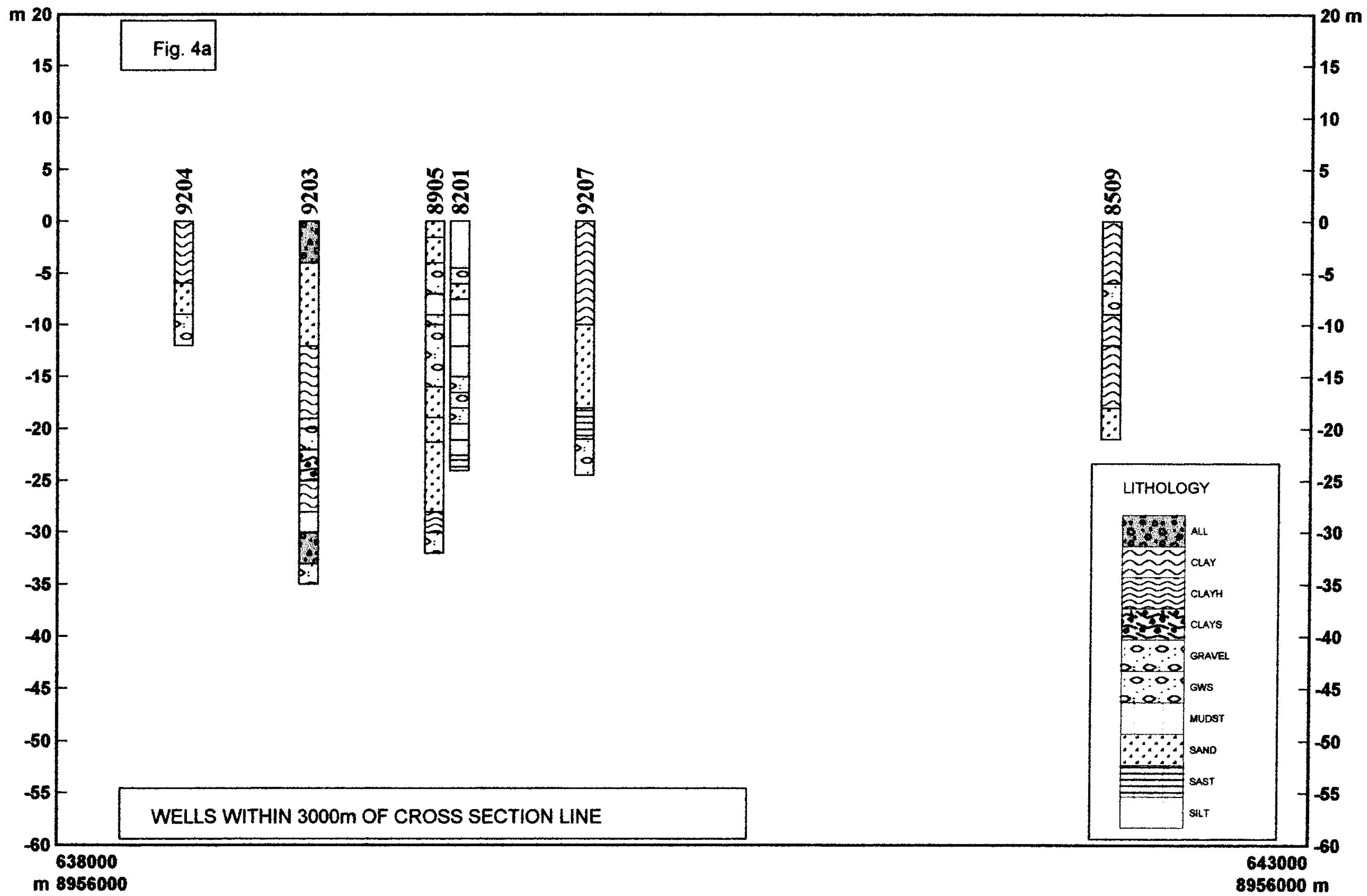
- Clay/silt layer: ground level to about 3.0m
- Gravel/sand layer: 3.0-30.0m
- Clay/silt layer: 30.0-45.0m

Fig. 4: Mbalisuna-Mberande Zone of Guadalcanal Plains



GUADALCANAL PLAINS LITHOLOGY GUIDE

Cross Section Plot	Guadalcanal Plains Availability Guide	Mbalisuna-Mberande (Line 3)



- Gravel/sand layer: below 45m

It recommended that drilling done in this zone might yield groundwater at depths of 30 metres and also below 45 metres. Furthermore water wells proposed close to the seashore should be limited to less than 20 metres deep to prevent saltwater intrusion into the aquifer during pumping.

Mberande-Mbokokimbo Zone

This zone bounded by the east coordinates 643000 to 653000 is not fully exploited for groundwater. A likely reason may be that people have access to surface water sources. However, a survey has to be carried out to confirm this (Fig.5).

A couple of geophysical surveys were carried out in this area and the estimates of drilling depths were made.

The area east of Mberande River was exploited for groundwater. These belong to people who live along the main road that links Aola and Honiara. Water wells are for domestic and commercial farming such as poultry and vegetables.

Other water wells are located near the seashore that yielded groundwater because they are shallow. It is quite difficult to correlate well logs because the water wells are far from each other.

In this case water wells drilled at Ruavatu School may not be used to correlate with those close to the Mberande River.

A very approximate lithology match for this zone is as follows (Fig.5a & 5b):

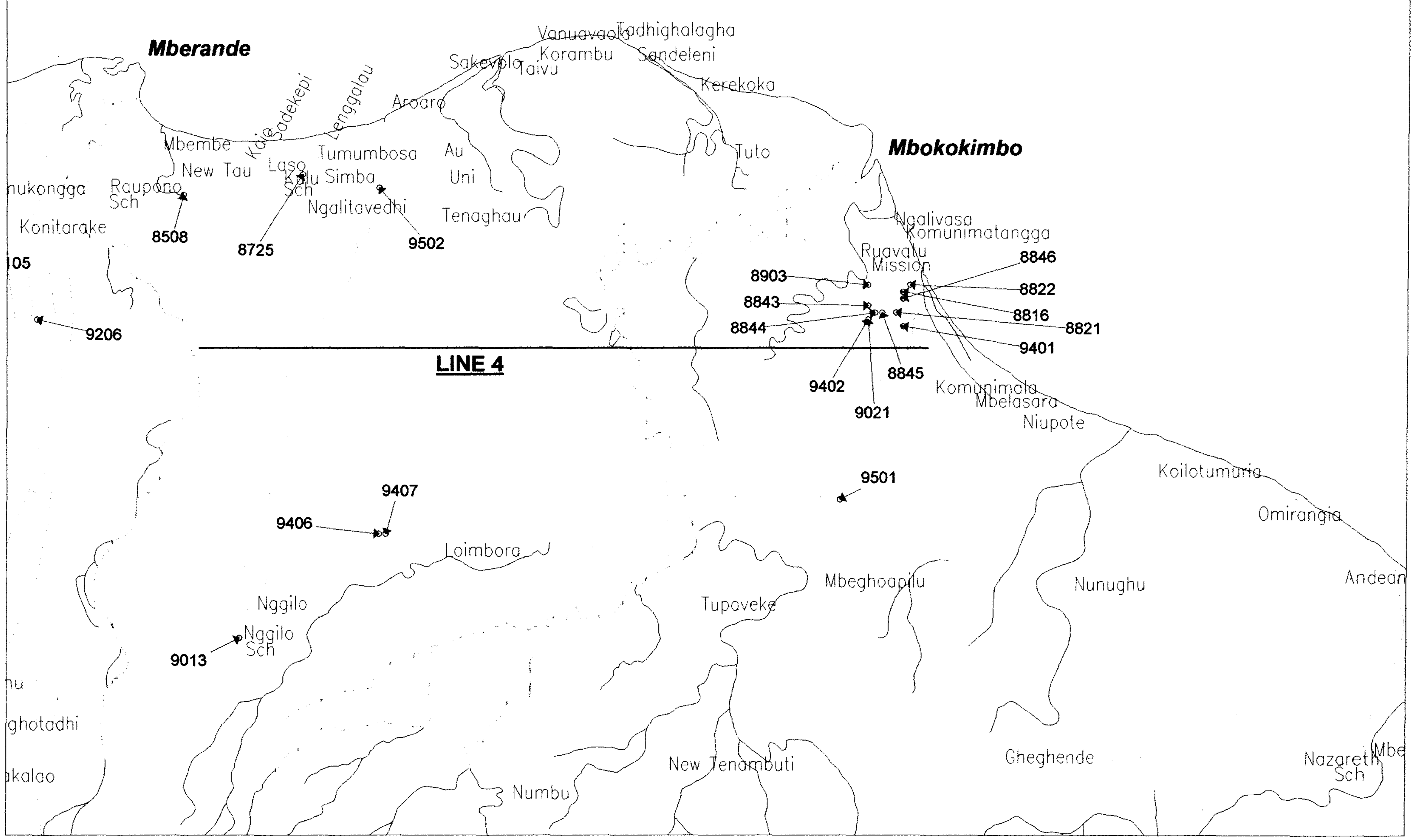
- Clay/silt layer: ground level to 35m
- Gravel/sand layer: 35-45m
- Sandstone/clay layers: below 45m

Water wells east of the Mberande are screened at 30-4 Om below ground level. For low water consumers, shallow wells drilled to 20 metres may produce groundwater. More geophysical surveys and drilling is required in this area in order to get a good idea about its water bearing and other impermeable layers.

After considering the whole area, the questions often always asked by people who want water wells drilled could be answered.

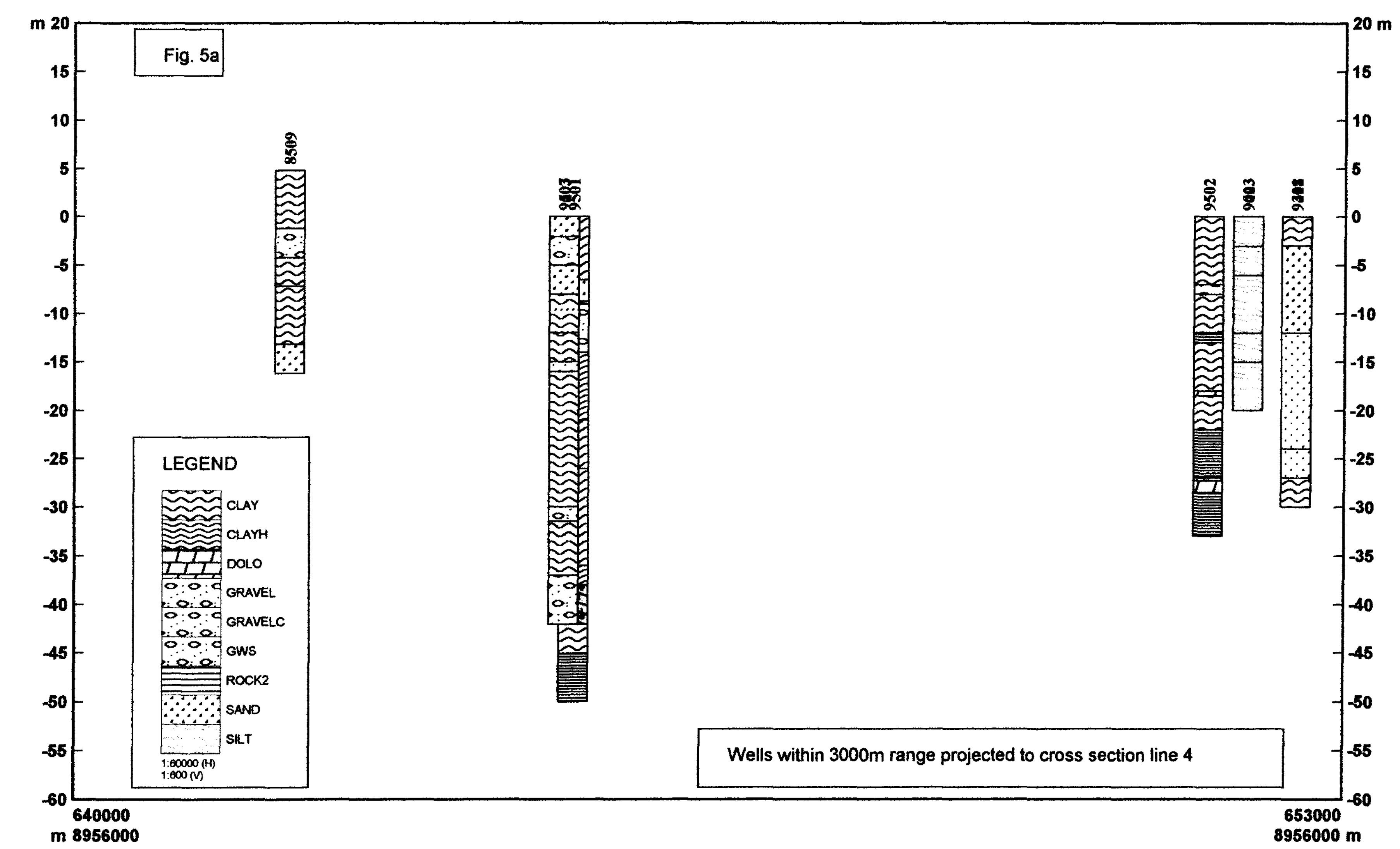
It is the purpose of this guide to provide people the information they need to know before proceeding on to request drilling a well for their water supplies.

Fig. 5: Mberande-Mbokokimbo Zone of Guadalcanal Plains



GUADALCANAL PLAINS LITHOLOGY GUIDE

Cross Section Plot	Guadalcanal Plains Availability Guide	Mberande-Mbokokimbo (Line 4)

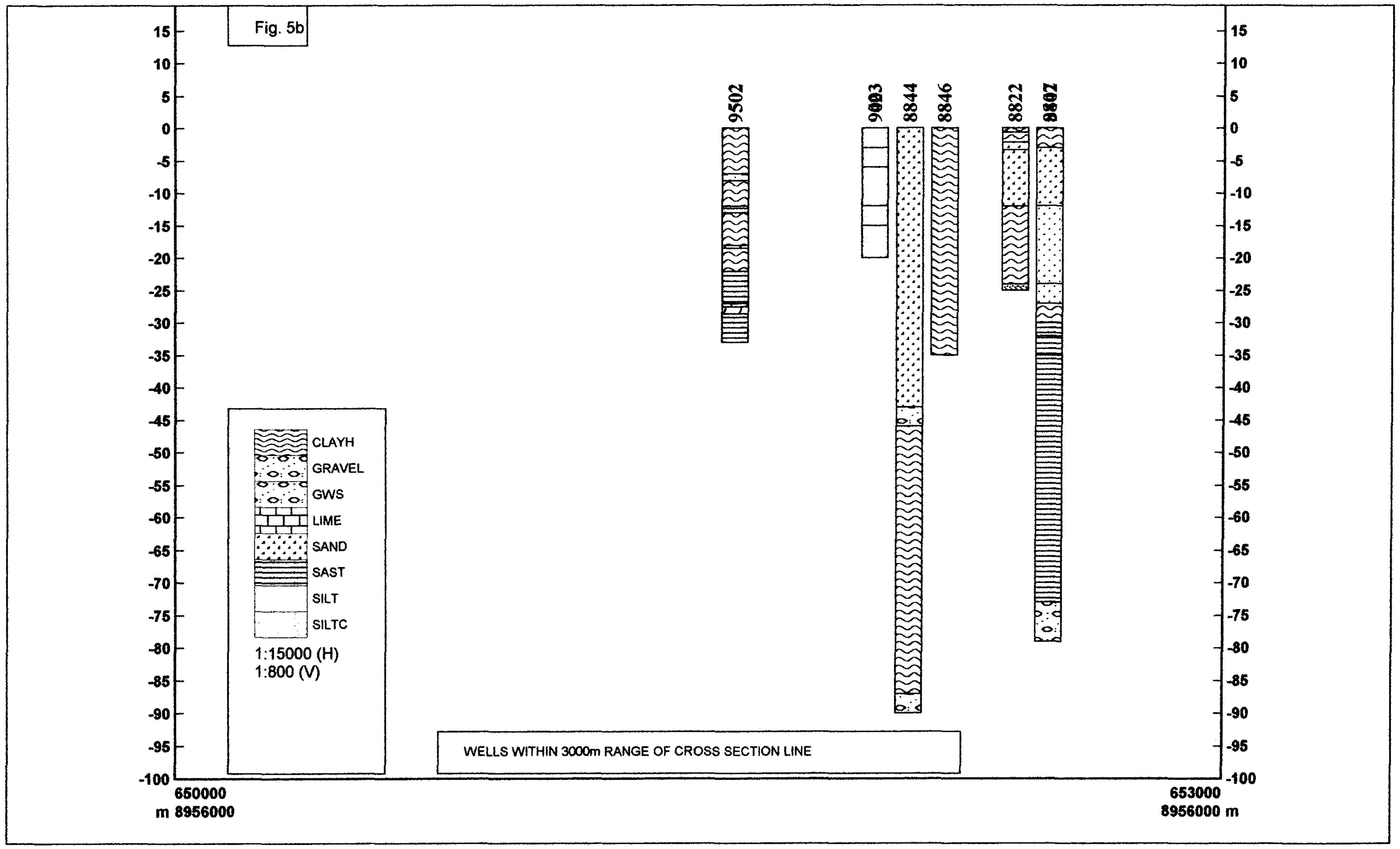


GUADALCANAL PLAINS LITHOLOGY GUIDE

Cross Section Plot

Guadalcanal Plains Availability Guide

Mberande-Mbokokimbo (Line 4)



The following questions are often asked:

1. How deep do I need to drill a well?

One of the functions of the Water Resources Division is to determine the depth to which water wells may be drilled at certain locations.

To estimate the depth of drilling a borehole, a geophysical survey is carried out. A geophysical survey involves passing an electrical current into the ground and then measuring the voltage in the ground. The resistance of different layers of the ground is recorded and then analyzed.

From the analyses of the differences in apparent resistance, the approximate depth to dry soil and rocks or those saturated with freshwater and saltwater may be determined.

It is important to carry out this survey before drilling water wells. Generally, a person who lives close to the seashore will drill a shallow well while further inland deeper wells can be drilled.

1. How much groundwater can I expect to get from the well?

A lot of water wells on the Guadalcanal Plains produce more than 30gpm (2 l/sec) of groundwater. However, a well owner must know how much water he needs so that the water bearing layers that are tapped produces the volume of water needed.

It is recommended that low water users generally tap the first good aquifer for their use. An accurate quantity of groundwater from the well is determined by carrying out a pumping test after the well is completed.

It is the one of the tasks of Water Resources Division to carry out a pumping test. The information is given to the well owner for future records and also to select the right pump for the well.

2. How far will I put the well from possible sources of pollution?

The general guideline is to select a proposed well site at least 30m (> 60 feet) from any source of pollution.

Secondly, the direction of groundwater flow must be known before drilling a well. Normally, groundwater flows from high elevations (mountains) to low elevations (sea level).

Since this is the case water wells must be positioned in such a way that groundwater from a source of pollution does not travel towards the well location.

On the Guadalcanal Plains, groundwater travels in the south to north direction hence "'-later wells must be put on the southern side while toilets, poultry, piggery, cattle farms and rubbish dumps on the seaward direction.

3. Is it safe to use groundwater from the well for drinking and cooking?

The primary reason for putting water wells far from possible sources of pollution is to have groundwater that is safe to use.

On the Guadalcanal Plains, most water wells drilled have water quality that is fit for drinking and cooking. The results of water analyses done showed that chemical constituents of groundwater are within the acceptable standards of the World Health Organization guidelines (WHO).

Most water wells on the Guadalcanal Plains, however, are not disinfected with chlorine. As such, there is a risk that some of the wells have harmful bacteria in them. There is a high possibility that shallow wells that do not have concrete slabs constructed to seal off surface runoff into the well may have this risk of pollution.

It is therefore highly recommended that water should be boiled for at least 15 minutes and cooled before drinking.

Water samples from wells drilled on the Guadalcanal Plains have the chemical contents analyzed in the Geochemical Laboratory, Ministry of Energy, Water and Mineral Resources.

Analyses to determine the number of harmful bacteria are done at Environmental Health Division, Ministry of Health and Medical Services.

Table 3. The World Health Organization (WHO) guideline for drinking Water.

Parameters	Maximum Acceptable	Maximum Allowable
pH	7.0-8.5	6.5-9.2
Total Dissolve Salts	500 mg/l	1500 mg/l
Calcium hardness (Ca)	190 mg/1_	500 mg/l
Magnesium (Mg)	175 mg/l	530 mg/l
Total Hardness	365 mg/l	1030 mg/l
Chloride (Cl)	200 mg/l	600 mg/l
Arsenic (As)	00 mg/l	0.05 mg/l
Bacteria	00 per 100ml sample	00 per 100 ml sample

4. How will I construct the water well?

It is the responsibility of the Water Resources Division to construct the well after drilling_is completed. Most water wells on the Guadalcanal Plains are screened with high-pressure PVC pipes. There are few places where galvanized steel pipes are used (Fig.6).

The PVC pipe or steel pipes are used as linings and screens for the wells. Normally the screens are slotted and then lowered to the water-bearing layer. The screens act as opening for groundwater to travel from every directions underground and up to ground level when water is pumped. For most water wells screen slots should have sizes of 1.0 to 1.5mm.

At locations where water is absent, blank casings are lowered and they prevent collapse of soil around the well.

After the casings are put in place, gravel is then poured into the outer sides of the casing. In the water-bearing layer the gravel acts as a filter between the surroundings and the screen. The purpose of the gravel is to prevent excess fine sediments passing through the screen and into the supply system during pumping.

Finally, at the top of the well (ground level), a concrete pad (2m by 2m) is constructed to seal off surface run-off from entering the well. A sketch of the technique used is shown in Fig 6.

5. What type of pumps do I need for the well?

There are three (3) types of pumps that can be used:

(i) Hand pumps
(ii) Surface pumps
(iii) Submersible pumps

Hand pumps are recommended for shallow wells (< 10 metres) and people who do not use a lot of water everyday. Furthermore, they are recommended for wells that are very close to the seashore. Since a thin freshwater layer floats on top of saltwater near the sea, this type of pump is used otherwise pumping using stronger pumps will bring in seawater.

Surface pumps have a power to pump water up to a height of 10 metres only. They are recommended for shallow wells that have low elevated storage tanks. The total height from the suction to the top of the storage tank must not be more than 10 metres if maximum pump capacity is required.

For supply to irrigation farms, surface pumps are highly recommended because water is pumped to ground level.

Submersible pumps are powerful and can be used to pump water from deep wells to high storage tanks. The motor and the impeller are lowered into the well and it uses electricity to operate and are expensive to run.

Hand pumps are cheaper to use while surface and submersible pumps are expensive because they use fuel and electricity.

Well Log: Lithology & Construction

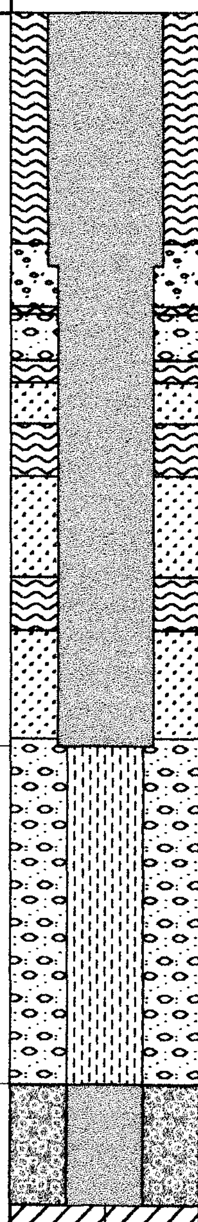
Well Ident	Name
6801	SIWA

Drill. Method		Drill. Dates	
PERCUSSION		680000	

X	Y	Z	Meas. Pt. Elev.
605500	8955000		

All measurements are in meters. Hole and casing diameters in inches. *Scales (1: xxx)*

Water Level (AMSL)	Vertical	Horizontal
	300.0	



Depth [m]	Hole	Annulus	Casing	Screen		Lithology	Elev. [m]
5	12	Bentonite seal	12			Clayey alluvium	-5
					9.1		
10	10	10	10			Fine gravel	-10
					11.6 / 11.9	Gravel and sand	
					13.7	CLAY	
					14.6	Sand	
15							-15
					16.2	Bluish clay with wood fragments	
					18.3		
20	10	CLAY	10			Sandy alluvium with pebbles and cobbles	-20
					22.3	Clay and few cobbles	
					24.4		
25						Sand and clay	-25
					28.7		
	29	29	29	29			
30							-30
35	8	Gravel Pack	8			Sand,gravel and pebbles of volcanic rocks	-35
40							-40
	42.4	43		42.4	42.4		
45		Bentonite seal				Black mud and fragments of shell and coral	-45
		47.2	47.2		47.2		
					48.2	Hard black siltstone bedrock	
50							-50

6. How long will the well provide water?

This depends on whether or not the well is properly constructed. For properly constructed water wells the average production life is five (5) years. It is necessary to clean the well by blowing the screen in the water-bearing layer.

The common problem with declining yield of water in a well is that fine sediments and iron bacteria clog the screen openings thereby preventing water to pass. Water well rehabilitation needs to be done if people pump less water than before from their wells. The Water Resources Division should be informed in this case.

8. **How much will it cost to drill a well?**

The following rates and charges are applied as from 1998. Commercial rates refer to water wells drilled for purpose of generating income while non commercial rate refers to domestic use such community or private water supplies for households.

Table 3. Drilling and related charges for water & geotechnical bores.

Tasks	Commercial Rate ($)	Non-Commercial Rate ($)
Survey Fees	250.00	185.00
Water Quality Analyses	516.00/sample	516.00/sample
Demolition/Blast hole	300.00/m	150.00/m
Site Investigation	360.00/m	180.00/m
Drilling (Percussion)	240.00/m	180.00/m
Drilling (Rotary	250.00/m	200.00/m
Air Compressor	170.00/hr	170.00/hr
Pumping Test	$60.00/hr	$60.00/hr

7. Where can I get help concerning water well drilling?

The Water Resources Division in the Ministry of Energy, Water and Mineral Resources carries out drilling for water wells. People who would like to enquire about drilling should come and see the Chief Water Resources Officer in this Division.

Conclusion

Aquifers on the Guadalcanal Plains consist of poorly graded gravel, sand and clay layers that have a thickness from 2 to 15 metres. The aquifer permeability is very irregular from one well to another (0.7 to 106 m/day).

Groundwater quality is generally good from a chemical point of view (conductivity = 200 to 700 μS). However, some areas are contaminated with seawater (>1200 μS). In areas where water wells are drilled the amount of water taken is not big enough to cause saltwater intrusion.

The Guadalcanal Plains is the only source of groundwater for communities, agriculture, industries and perhaps municipal supplies in the future. Since most large rivers present increased sediment loads and contamination from human activities they cannot be used for human consumption without disinfection and purification.

Groundwater may be the only alternative if other sources are not protected from contamination. It is also equally important to protect and control the Guadalcanal Plains from contaminating the underground aquifers with pollutants.

As such, proposed dumping site, agricultural chemicals and human pollutants must be dumped or located in areas that will not threaten the water bearing zones on the Plains.

References

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(10) Hallet V. Hydrogeological Survey of Matepona area, Internal Report SOL/59, January 1990

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Appendices

Guadalcanal Plains Borehole Catalogue in EXCEL

Typical water well construction

Example of grain size analyses

Guadalcanal Plains Borehole Catalogue
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Bore No	Location	Owner	Easting	Northing	Date
6601	Lungga Power Station	SIEA	612600	8957600	660000
6602	Lungga Power Station	SIEA	612610	8957610	660000
6603	Lungga Power Station	SIEA	612611	8957611	660000
6604	Lungga Power Station	SIEA	612612	8957612	660000
6605	Lungga Power Station	SIEA	612613	8957613	660000
6606	Lungga Power Station	SIEA	612614	8957614	660000
6607	Lungga Power Station	SIEA	612615	8957615	660000
6608	Lungga Power Station	SIEA	612616	8957616	660000
6609	Lungga Power Station	SIEA	612617	8957617	660000
6925	Mbetikama Cattle	Mbetikama High School	612740	8957474	690000
6929	Henderson (Tower)	Henderson	614000	8958100	690000
7002	Ilu Farm	Ilu Farm	622500	8955300	700000
7003	Ngalimbiu	Billy Dudley	624600	8954700	700000
7004	Ngalimbiu(CDC) BH-3	SIPL	624400	8955000	700000
7005	Selwyn College(Old)	Selwyn College	624300	8954300	700000
7006	Ngalimbiu(CDC) BH-1	SIPL	625400	8954200	700000
7007	Ngalimbiu(CDC) BH-2	SIPL	625500	8954400	700000
7008	Nganjilaggu	Nganjilanggu	624300	8954100	700000
7101	Tetere Factory Site (CDC 2)	SIPL (BH-3)	633700	8956500	730924
7301	Dodo CreeK	MTWU	621300	8957400	730419
7302	Koli Point	Koli Village	629600	8960300	730626
7303	Tetere Factory Site (CDC 2)	SIPL (BH-1)	633500	8956500	730827
7304	Tenaru School	Tenaru School	617800	8956500	730000
7305	Tenaru School	Tenaru School	617800	8956600	730000
7306	Tetere Hospital	Tetere Police	633000	8956000	730717
7401	Roroni Health Clinic	Guadalcanal Province	636300	8955700	740000
7501	Ngalimbiu Div.(CDC)	SIPL (BH 3)	625500	8954100	750624
7502	Tetere Div.(CDC Factory)	SIPL (BH-5)	633700	8956200	750600
7503	Mbalasuna(Nursery)	SIPL	638500	8952500	750000
7601	Ngalimbiu Bridge	MTWU	625300	8954200	760600
7602	Ngalimbiu Bridge	MTWU	625200	8954300	760403
7609	Ngalimbiu Bridge(BH-2)	MTWU	625300	8954200	760000
8001	Malatoha	Malatoha Sub-Station	617500	8950900	N/A
8101	Tetere Cocoa Plant	SIPL (Residential)	633500	8953700	810810
8102	Mbalasuna Div.(CDC 3)	SIPL	638500	8952600	810630
8103	Kongga Village	Obed Olofia	621500	8952000	810617
8104	Mbalasuna	Danny Philips	638510	8952700	810630
8105	Tenaru (Agriculture Station)	MAL	617800	8956500	810731
8201	Mberande Div.(CDC5)	SIPL	639600	8957400	820900
8301	Ngalimbiu Div. (CDC 1)	SIPL	625500	8953800	830914
8506	New Koloula	New Koloula Village	618600	8952600	850925
8507	Grass Hill	Grass Hill	621800	8952200	
8508	Samuel Saki's Place	Samuel Saki	626600	8955400	851106
8509	Tau School(Tasimboko)	Tau School	642200	8957900	850225
8510	Kongga Vlg NB	Kongga Vlg	621800	8952200	851030
8601	Nazareth A/Centre	Nazareth Apostolic	618500	8956000	860204
8602	Okea Garden	ROC	623600	8957300	860126
8603	Okea Garden	ROC	623300	8955000	860304
8604	Horokiki	Horokiki Dev. Authority	629400	8952000	860304
8605	Carlifornia	Carlifornia Village	636400	8955700	860417
8606	Gono	Gono Village	636500	8956600	860428
8607	Kaotave B/School	Kaotave T/Centre	636500	8956100	860507
8612	Tenaru Lvrs Plant	Levers Solomons Ltd	618500	8957600	860910
8613	Votahombu Village	Votahombu Village	625400	8958200	860925

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8614	Makile	Galebaza Village	625000	8959200	861007
8615	Veradua (BH-1)	Veradua Village	611000	8953300	861021
8616	Mbetikama High School	Mbetikama High School	613300	8957600	
8617	Mbetikama High School	Mbetikama High School	613400	8957700	
8618	Mbetikama High School	Mbetikama High School	613200	8957400	861215
8619	Veradua (BH-2)	Veradua Village	611100	8953200	861014
8701	Mbetikama High School	Mbetikama High School	613100	8957500	870109
8702	Selwyn College(Old)	ROC	624600	8954400	870212
8703	Tenaru Lvrs Plant	Levers Solomons Ltd	619100	8957500	870327
8704	Tenaru Lvrs Plant	Levers Solomons Ltd	619200	8957600	870324
8705	Lungga Plantation	Eskelly Solo	615900	8958900	870407
8706	Mbalisuna (Komunimala)	Philip Dereni	636700	8955000	870413
8717	Saora	SSEC	627200	8950800	870818
8719	Dodo Creek	SIWA	621100	8957400	870903
8721	Tenavatu B/Post	MAL	622200	8956200	871116
8724	Tenaru Mala	Joe & Sons	616300	8955000	871214
8725	Tenaru Mala	Joe & Sons	616200	8955000	871222
8726	Kulu School	Kulu School	643900	8958200	870813
8803	Tenaru Mala	Joe & Sons	616200	8953400	880111
8816	Red Beach(Sikaina Stlmt)	MHMS	621900	8957600	880823
8821	Ruavatu PSS SPT #1	MET	652500	8956500	880314
8822	Ruavatu PSS SPT #3	MET	652400	8956200	880628
8823	Ruavatu PSS SPT #2	MET	652600	8956600	880506
8828	Suva Bible school	SSEC	628500	8951300	881104
8830	Tetere Prison Farm	SIWA	632500	8955800	881110
8840	Tenaru Bridge	Levers Solomons	619000	8957100	881129
8841	Tenavatu Club	SIWA	621300	8957300	881026
8842	Red Beach (Sikaiana Slmt)	MHMS	619600	8958100	881014
8843	Windy Ridge	Levers Solomons	615300	8957200	890120
8844	Ruavatu PSS	MET	652000	8956300	881204
8845	Ruavatu PSS	MET	652100	8956200	881206
8846	Ruavatu PSS BH-5	MET	652200	8956200	881208
8847	Ruavatu PSS	MET	652500	8956400	881101
8902	Alligator Creek Village	Levers Solomons(Tenaru)	616400	8957500	890119
8903	Tenaru Mala	John Iro Funding Ltd	616200	8953700	890302
8904	Ruavatu PSS	MET	652000	8956600	890530
8905	Mberande Plantation	FSP	639500	8957600	890501
8907	Red Beach	Sir B.Devesi	622400	8957700	890804
8908	Foxwood	LDA	621400	8956100	890925
8909	Grass Hill	Ramosi	621200	8953700	890928
8910	Grass Hill	Joel Kalani	621300	8953300	
8911	Grass Hill	Apollos Freeman	621100	8953700	891121
8912	Grass Hill	Joash Waiko	621400	8953900	891114
8913	Grass Hill	Leslie Kereila	621500	8954000	891107
8914	Foxwood Labour Line	Pacific Timbers	622000	8957600	891213
8915	Mbalasuna	Daniel Buto	635900	8954200	891227
8916	Foxwood Workshop	Pacific Timbers	621500	8957600	891127
8917	Koli Point	LDA	627000	8956700	891127
8918	Koli Point	JIFCO	628500	8958100	890524
8919	Maluka	Maluka Village	622300	8958200	890807
9001	New Birao(Horokiki)	Horokiki Dev. Authority	628300	8951400	900212
9002	Sali	Horokiki Dev. Authority	629000	8951400	900221
9003	Horikiki(Sali)	Horokiki Dev. Authority	628500	8951300	900228
9004	Grass Hill	Lemuel Maealatha	621700	8954600	900423
9006	Horokiki (New Birao)	Horokik Dev. Authority	628200	8951300	900522

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9007	Grass Hill (BH-1)	Haniel Miniti	621600	8954600	900326
9008	New Koloula	Albert Limia	618700	8952600	900426
9009	Grass Hill	Obed Olofia	621600	8954300	900320
9010	Henderson Airport	SIG	614800	8958500	901022
9011	Henderson Airport	SIG	614700	8958300	901023
9012	Henderson Airport	SIG	614600	8958400	901020
9013	Henderson Airport	SIG	614400	8958500	901016
9020	Gilo School	Guadalcanal Province	643000	8951500	900626
9021	St. Martins	St. Martin T/Centre	617600	8955700	900718
9024	Ruavatu PSS	MET	652000	8956100	900712
9025	Ngilutae Village	M.Fakaia	624300	8959100	900625
9026	Ngilutae School	Ngilutae School	624200	8959200	900625
9028	Horokiki (New Birao)	The Manager	621900	8951100	900319
9029	Grasshill (BH-2)	Haniel Miniti	621600	8954400	900514
9101	Tenaru Mala	Reginald	616400	8954500	910121
9104	Ilu Farm	Telekom	622600	8955200	910402
9105	Cocoa Division	SIPL	634000	8954000	910809
9109	New Koloula	Tom Chasi	618600	8952700	910913
9110	Grass Hill	T.Ladomea	621700	8954500	910829
9111	Kongga	S.Sese	621000	8951000	911104
9126	Black Post	Dodo Creek	621400	8955800	910000
9127	Kaotave Bible School	Kaotave (SSEC)	636500	8956200	910701
9202	New Zealand Camp	M.Devesi	615200	8957200	920327
9203	Mbalasuna	J.Kabuere	639000	8954000	920209
9204	Binu	P.Naitoro	638500	8954100	920512
9206	Roroni Village	D.Tolia	636000	8953000	920618
9207	Berande (CDC 3)	Francis Waleilia	640100	8956100	920709
9208	Aola River SPT #1	MTWU	661000	8948000	920917
9209	Aola River SPT #2	MTWU	661100	8948000	920917
9210	Aola River SPT #3	MTWU	661200	8948000	920923
9211	Foxwood	Makira Belle Co.	623000	8957600	921002
9212	Kongga	D.Bunga	621100	8952100	920314
9213	Foxwood	Jackson Hou	622200	8957500	920721
9215	Bemuta	Primo Amosaea	625000	8954950	921002
9216	Tetere	Ngenomea Kabui	633500	8958300	921103
9223	Vuvula Farm	Vuvula Farm	621000	8955400	921101
9301	Matepona(W)	Kinhill Kramer	630000	8955300	930103
9302	Matepona(E)	Kinhill Kramer	630100	8955250	920108
9303	Alligator Bridge(E)	MTWU	617300	8958400	930114
9304	Alligator Bridge(W)	MTWU	617200	8958400	930119
9305	Okea Division	SIPL	623600	8953700	930202
9306	Okea	You I Maw	624600	8954500	930000
9307	New Koloula	W.Kaota	618700	8953200	930504
9308	Bubulu (CDC1)	M.Voli	627500	8958000	930000
9311	Tetete Ni Kolivuti	Church of Melanesia	620000	8955000	930829
9312	Grass Hill	Maeta	621600	8954800	930504
9313	Henderson	C.Dausabea	616000	8956100	931119
9319	Henderson	C.Dausabea	616000	8956000	940504
9401	Horokiki	Ollie Pokana	628500	8950800	940315
9402	Ruavatu PSS (SPT 1)	Murray North	652500	8956000	940505
9403	Ruavatu PSS (SPT 2)	Murray North	652000	8956100	940506
9404	Foxwood	Pacific Timbers Ltd	622000	8957500	940915
9405	Selwyn College (Old)	SIPL	624000	8954000	940712
9406	Red Beach	Edward Saeara	619500	8957000	941011
9407	Mberande (E)	Samson Suluka	645000	8953000	941128

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9501	Mberande (E)	M.Maetoloa	645100	8953000	950123
9502	Komuniboli	Komuniboli T/Centre	651600	8953500	950228
9503	Mberande E/Tasimboko	David Kausimae	645000	8958000	950320
9504	Henderson Airport	Kinhill Kramer	615000	8958100	950424
9504a	Henderson Airport	Kinhill Kramer	615000	8958000	950501
9505	Koli	John Selwyn	628500	8956500	950601
9506	Mbalasuna (CDC 3)	Vincent Fiuta	636900	8955600	950621
9507	Okea (CDC 1)	GDA	624000	8956200	950823
9508	Henderson	John Lee	615300	8959700	950000
9509	Henderson	John Lee	615400	8959700	950919
9602	Suaghi	Suaghi Community	638000	8958800	960429
9603	Busikali	Busikali Community	637500	8958700	960401
9605	Ghorabau	Ghorabau Community	636800	8957600	960903
9606	Dadave	Dadave Community	635250	8953600	960000
9607	Okea	SIPL	624000	8954000	961107
9701	Tenaru	Holy Name of Mary	618750	8956400	970416
9708	Foxwood	Pacific Timbers Ltd	622200	8957300	970600
9709	Foxwood	Jeffrey Holo	622300	8957300	970700
9710	Henderson	Kitano Construction Corp	614600	8958400	971231
9711	Tenaru	Allan Arafoa	616300	8954200	970000
9712	Tetere	Nguvia School	632500	8955500	971008
9713	Matepona Rcie Farm	MAF	631700	8954000	971124
9801	Henderson	Ephraim Kelesi	616400	8958600	980416
T001	Matepona Bridge	MTWU	630100	8955100	N/A
T002	Matepona Bridge	MTWU	630100	8955150	N/A
T004	Lungga Bridge	MTWU	612810	8958400	N/A
T005	Lungga Bridge	MTWU	612810	8958450	N/A
T006	Lungga Bridge	MTWU	612900	8958350	N/A
T007	Lungga Bridge	MTWU	612900	8958300	N/A
T008	Lungga Bridge	MTWU	612800	8958350	N/A
T009	Lungga Bridge	MTWU	612800	8958300	N/A
T010	Lungga Bridge	MTWU	612800	8958400	N/A
T022	Mbetikama	MTWU	613210	8957410	N/A
T023	Mbetikama	MTWU	613211	8957420	N/A
T026a	Tutumu Creek (BH-1)	MTWU	639500	8951000	N/A
T026b	Tutumu Creek (BH-2)	MTWU	639500	8951100	N/A
T026c	Tutumu Creek (BH-3)	MTWU	639500	8951200	N/A
T027	Tenaru Bridge	MTWU	619000	8950600	N/A
T028	Tenaru Bridge	MTWU	619100	8950600	N/A
T029	Aligator Creek	MTWU	617300	8958400	890123
T030	Aligator Creek	MTWU	617250	8958650	890123
T031	Dodo Creek	MTWU	621300	8957500	N/A
T032	Tenaru Bridge(small)	MTWU	619500	8956900	N/A
T033	Mbalasuna Bridge	MTWU	635300	8953400	N/A
T034	Mbalasuna Bridge	MTWU	635300	8953300	N/A
T035	Mbalasuna Bridge	MTWU	635400	8953400	N/A
T036	Mbalasuna Bridge	MTWU	635300	8953200	N/A
T037	Mbalasuna Bridge	MTWU	635500	8953200	N/A
KEYS	PS- Public Supply	GU- Guadalcanal			
	IN- Industrial Supply	MA- Malaita			
	DO- Domestic Supply	TE- Temotu			
	XX- Unsuccessful Bore	RE/BE- Rennell/Belllona			
	VI- Village Supply	WE- Western Province			

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SW- Stockwater	IR- Irrigation
SI- Site Investigations	AB- Abandoned Borehole
	N/A- Not Available

Master Data

Identification	Type	Aquifer
MW-1	MW	Unconfined

Name			
Monitoring well in Corozo Pando			
Region		District	
Easting (m)	Northing (m)	Gr. Surf. El. (m amsl)	Meas. Pt. El. (m amsl)
150	150	85.00	86.00

Well Log: Lithology & Construction

Well Ident	Name
MW-1	Monitoring well in Corozo Pando

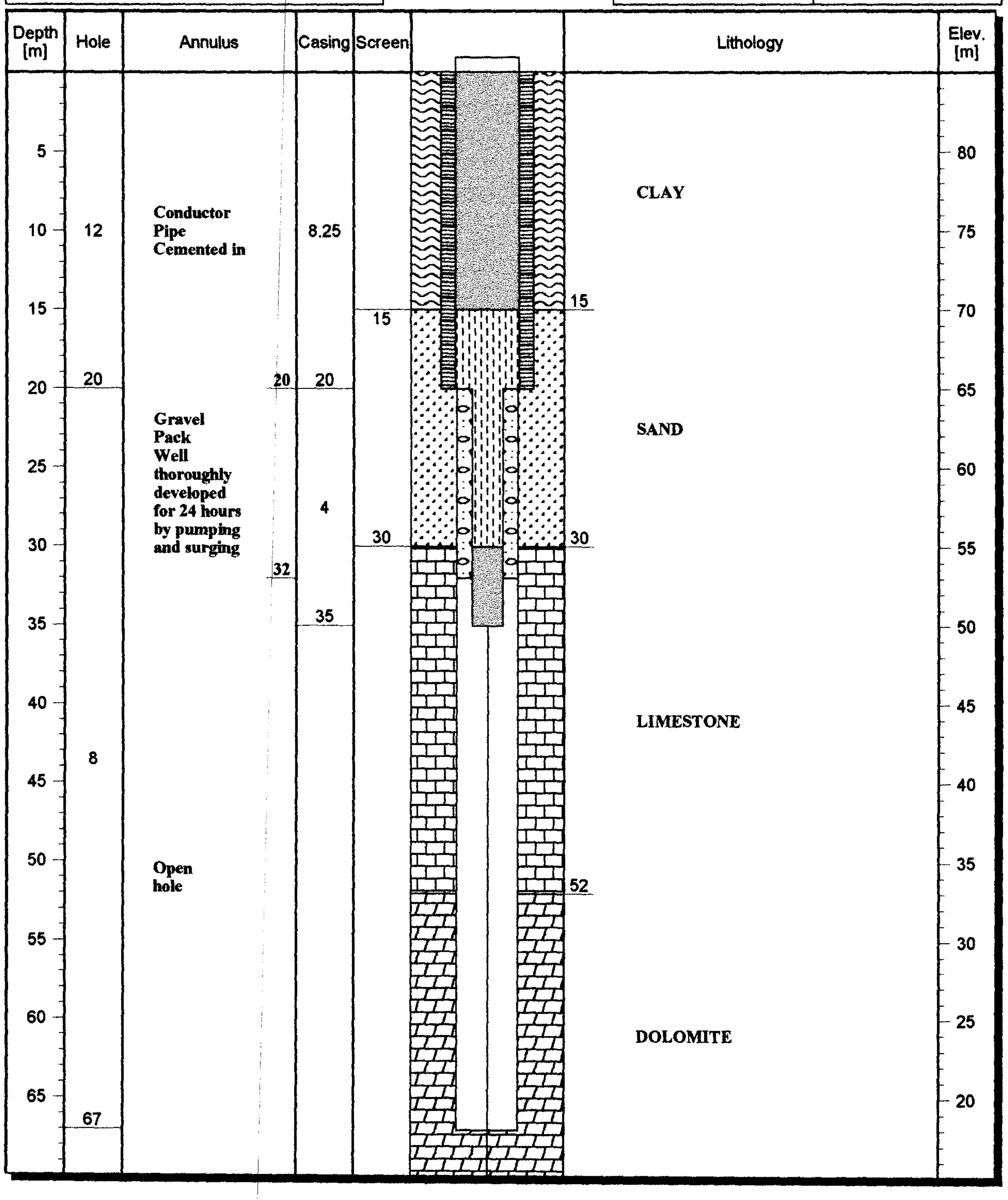
Drill. Method	Drill. Dates

X	Y	Z	Meas. Pt. Elev.
150	150	85.00	86.00

All measurements are in meters. Hole and casing diameters in inches.

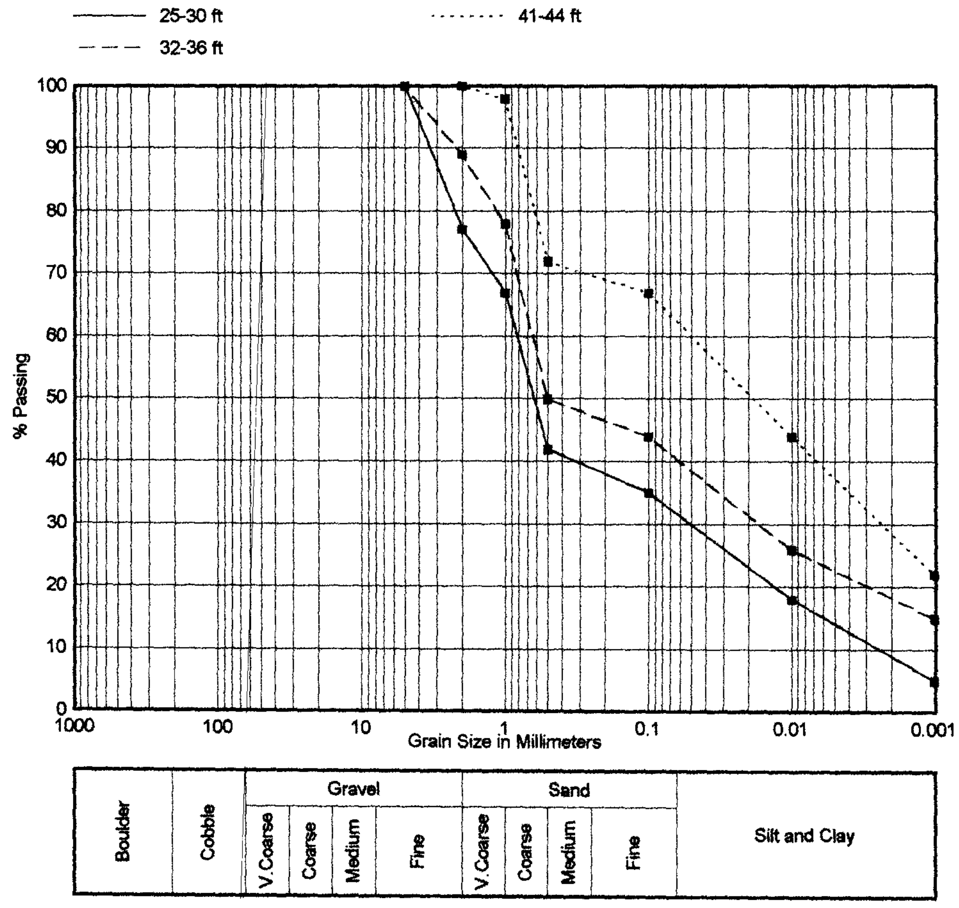
Scales (1: xxx)

Water Level (m AMSL)	Vertical	Horizontal



Well Ident
MW-1

Name
Monitoring well in Corozo Pando



Sieve Sizes [mm]	25-30 ft	32-36 ft	41-44 ft
0.001	5.00	15.00	22.00
0.010	18.00	26.00	44.00
0.100	35.00	44.00	67.00
0.500	42.00	50.00	72.00
1.000	67.00	78.00	98.00
2.000	77.00	89.00	100.00
5.000	100.00	100.00	

Pumping Test

Well Ident 9801	Name Ephraim Kelesi		
Obs. Well Distance 0.10	Average Pump. Rate 1.7164	Duration [min] 60.000	Initial Sat. Thickness 12.50
Results			
Transmissivity 158	Storage Coefficient	Leakance [1/day]	Estimation Error 3.19
Fit Method			Jacob Method