3-2 Operation and Maintenance Plan

3-2-1 Facility Operation and Maintenance Plan

(1) Buildings

For a maintenance and control plan of buildings, the following 3 points are main subjects:

① Daily cleaning

② Repair against wearing down, damages, and aging

③ Guards, which aim at security and prevention of crimes

Daily cleaning will be a good influence on facility customers and it is assumeded that they will thus treat facilities and equipment more carefully. In addition, cleaning is important for equipment for radio materials production and video materials production to keep good in condition. Also, it can detect damages and disorders in an early stage so that repairs can be done as early as possible. These actions will elongate the life of apparatus and equipment for producing radio materials/video materials.

As for repair, mending and repairing the interior and the exterior materials which protect the structure are main subjects. In addition, (judging from the Japanese case), the necessity of repair and renovation, due to changes of activities and the increase of staff, will be executed every 10 years. The details of the periodical check and repair, which decide the life of buildings, are submitted at the time of turning over buildings by the contractor as "Maintenance Manual". And at this time, the method of checking and periodical cleaning will be described. The outline of them is as follows:

Table 3-3 Outline of regular building inspections

Exterior	
- Repair or repainting of exterior finishes	every 5 years
- Inspection or repair of metal roof	inspection: every year
- Periodical cleaning of downspouts and drains, etc.	every month
- Inspection and repair of sealing of doors/windows	every 5 year
- Periodical inspection and cleaning of drainage	every year
Interior	
- Changes in interior finishes	as required
- Repair and repainting of interior walls	as required
- Repairing of ceiling	as required
- Retightening or changing of fittings	every year

Note: Guards must check the entering and exiting of facility customers.

(2) Building Service Equipment

As for building service equipment such as mechanical and electrical equipment, daily "preventive maintenance " is neccessary before repairing disorders and changing parts. Mechanical equipment life can definitely be elongated by adequate operation, daily check, supplying oil, adjustment, cleaning and repairing, as well as operating time. These daily checks can prevent disorder and accident and expansion of accidents.

With the periodical check, exchange of consumable and cleaning of filters are executed according to the maintenance manual.

In this plan, there are no mechanical equipment which have complicated systems, but it is important to organize maintenance and control systems when employing full-time maintenance and control staff, and it is also important when we make a contract with an outside company to commit a periodical check.

Operating and control manuals are submitted at the time of handing over, and the general definition of life for the main mechanical equipment is as follows:

Table 3-4 Lives of major building service equipment

Electrical equipment	
Generator	15 to 20 years
Panel boards	20 to 30 years
Fluorescent lamps	5,000 to 10,000 hours
Incandescent lamps	1,000 to 1,500 hours
Plumbing equipment	
Pumps, Pipes and valves	10 to 15 years
Tanks	15 to 20 years
Sanitary fixtures	20 years
Infiltration pit	10 to 20 years
Air-conditioning and ventilation	
Pipes	10 to 15 years
Fans	10 to 15 years
Air conditioners	10 years

(3) Audio Equipment

Maintenance and control for audio equipment is important for the activities of the planned facilities to be well functioned. The climate of Port Moresby is hot and humid, and in terms of maintenance and control of equipment for producing radio educational materials, the condition is not so good.

Generally, maintenance and control of equipment contains two items. One is daily check done by the operator, and the other is both detection and repair done by experts through 1-2 periodical checks per year.

These planned equipment contain audio apparatuses which require high and special repair knowledge. In order to improve the knowledge of the radio staff, it is necessary for radio staff and a local agent to work together for the periodical check and repairing.

Table 3-5 shows the outline of maintenance and control for each of the equipment.

Table 3-5 Outline of required equipment maintenance

	Self check	Service agent (recommended)
Studio equipment	Once / Month	Once / Year
Post-Production, Duplication equipment	Once / Month	Once / Year
Field recording equipment	Once / Month	Once / Year
Other equipment	Daily	Once / Year (Domestic apparatus)

3-2-2 Estimation of Operation and Maintenance Cost

The following sections describe trial calculations of the annual operating expenses and maintenance cost of Project facilities following commencement of operation.

(1) Facilities Operation Expenses

The operating expenses of Project facilities and equipment have been calculated in the following manner according to ① electricity charge, ② water supply charge, ③ sewer charge, ④ fuel for generator.

The maintenance expenses of building and mechanical equipment have been calculated in the following manner according to ① building maintenance , ② mechanical equipment maintenance charge, ③ audio equipment maintenance charge.

The operating expenses and maintenance of Project facilities and equipment estimated as condition of following Table 3-6.

The power charge has been calculated based on the quantity and usage of fixtures and equipment as shown in the following Table 3-7.

Table 3-6 Trial calculation of facilities operating exponses (Kina/year)

	Annual cost (Kina)
1) Operating expenses	26,728
① Electricity	19,240
② Water supply	2,340
③ Sewer	468
④ Diesel Oil	4,680
2) Maintenance expenses	9,700
① Building	1,700
② Mechanical equipment	2,000
③ Audio equipment	6,000
Total	36,428

Table 3-7 Estimation of power consumption/ charges (Kina/month)

	Power load (KVA)	Power consumption (Kwh/year)
Lighting fixtures	10.4	13,286
Socket outlets	6.1	1,575
Air conditioner	40.5	61,334
Audio equipment	10.8	19,983
sub-total	165.0	96,178

1) Building operation expenses

Maximum operation hours of one day of each room is assumed 7.5 hours. The frequency of power failure is assumed twice a week and each time is about half of the day according to the research. Therefore, supply by commercial electrical power is assumed 4 days a week and 208 days in a year. Supply by the generator is one day a week.

① Electric charge :

Power load × Demand of each Room × Consumption hours of each Room/year = Power Consumption / year

96,200 Kw/year × 0.2 Kina / Kw 19,240 Kina / year

② Water charge :

300 litter / man·day × 15 man × 260 days / year = 1,170,000 litter / year

→ 1,170 m^3 / year × 2.0 Kina / m^3 2,340 Kina / year

③ Sewerage charge :

Follow the above ②. 1,170 m^3 / year

1,170 m^3 / year × 0.4 Kina / m^3 468 Kina / year

④ Diesel charge :

20 litter / hour × 390 hours / year = 7,800 litter / year

7,800 litter / year × 0.6 Kina / litter 4,680 Kina / year

As a building operation expenses, Electric charge, Water charge, Sewerage charge and Diesel charge for generator will be needed. Based on the above calculation estimated operation expenses are 27,000 Kina in one year.

2) Facilities and equipment maintenance cost

Based on the aforementioned maintenance plan, expenses presumed to be necessary over the long term have been calculated 9,700 Kina on an annual average basis.

Since these figures are annual averages, they are cumulative and will arise from year 2001, when the facilities are due to commence service. The calculated cost are as follows.

① Building

The level of the building maintenance cost considerably changes with the passage of time. The estimation is conducted based on contents of maintenance of Table 3-3, an assumed average annual repair cost of 2.0 Kina / ㎡ / year for 30 year span. (2 Kina / ㎡ is 0.07% of the direct construction cost in accordance with the past similar experiences.)

850㎡ × 2 Kina 1,700Kina／year

② Building service equipment

The repair cost for building service equipment remains low for the first five years or so of use. Thereafter, parts replacement and equipment renewal due to ageing are gradually required. Average life of building service equipment is refer to Table 3-4. The average annual repair cost for a 10 year span is estimated to be 0.2 % of mechanical and electrical work of the construction cost.

1,000,000 Kina × 0.2% 2,000Kina／year

③ Audio equipment maintenance cost

・Equipment

While this cost varies depending on the frequency of equipment use, according to the past similar experiences it is estimated to be 0.2 % of the total equipment cost.

2,000,000 Kina × 0.2% 4,000Kina／year

・Consumable

While this cost also considerably varies depending on the frequency of use, according to the past similar experiences it is estimated to be 0.1 % of the total equipment cost.

2,000,000 Kina × 0.1% 2,000Kina／year

The total calculated cost in one year is 36,500 Kina which is equal to 7.9% of recurrent budget of Media Section in 1999.

Considering that the total area of the MSU Building (which has been in operation since 1998) is about 500㎡, calculated maintenance costs of the facilities in this plan is reasonable since total area is twice or less, compared with that of the MSU Building.

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATIONS

4-1 Project Effect

4-1-1 Examination of Project Suitability

(1) Necessity of radio education material

Radio education programmes have been a part of basic education teaching in PNG since 1966, and in view of the geographical layout of the country, they have proven to be an effective means of providing uniform basic education. Especially, English programmes for lower primary school has been using as compulsory in English education. According to survey for practical use of Radio education programmes by Evaluation Section of DOE in 1993, 97.2% of primary schools in PNG had a or more Radio and about 80% of primary schools in PNG had used the Radio education programmes in teaching.

Most programmes, however, were produced in the 1970s, so they no longer accurately reflect modern-day PNG life and conditions, and this hinders their more active use in the classroom. The renewal of this material has therefore become an issue for PNG educational authorities.

In line with its National Education Plan, the PNG government is implementing educational reform to provide at least nine years of basic education to all people so that it can achieve the human resource development needed for the nation's socioeconomic growth. Included in this are plans to update radio education material. It is judged that the basic design for building and equipment that would support radio education material production and modification so that it is more in tune with current conditions in PNG is highly appropriate.

(2) Operation structure

The CDD radio and video production units were combined into the media section under CDD's Curriculum Division in March 1999. In the media section, there are seven radio production staff members, including the section director, the minimum number required to form the two production teams to undertake the necessary material production in line with the reformed curriculum. The technical level of the radio production staff is entirely adequate for producing the yearly teaching material and teaching material covering PNG culture and society (Community Life),

such as regional society and traditional arts (Papa Mai). The organization is structured so that production staff are assisted by staff from other sections in CDD, including curriculum officers, editor, and graphic section, so it is judged that there will be no problems in the management structure when this plan is being implemented.

(3) Finance

Radio education material is scheduled to be updated as a part of curriculum reform, and it is likely that PNG will obtain a loan from the World Bank, which is providing assistance for the curriculum reform, for radio material production, and assistance from AusAID's CRIP for programme production costs from year 2000. Annual production expenditure is expected to be about K34,300, and even without assistance, this amount can be paid within recurrent costs of the media section.

To reduce air-conditioning costs, the largest part of operation costs for the planned facility, air-conditioners will be installed in every production room, and will be operated only when the room is being used. This has cut the forecast annual facility operation and maintenance cost to K36,500, which is about 20% of the annual K180,000 utilities bill of all CDD facilities. Assistant Secretary as CDD's head have stated that budgets of K15,000 in 1998 and K18,000 in 1999 were secured for operation and maintenance of the uniform MSU building, which was completed in 1998, so it is possible to secure a operation and maintenance budget for the planned facility in the same way.

The media section operates its own trust account for its profits, and the funds in this account can be appropriated for operation and maintenance, equipment repair, and consumables.

(4) Maintenance and operation structure

Maintenance is contracted through NBC, so there is only one person to maintain the radio programme production equipment; however with amalgamation into the media section, support from video technicians is now available. There is an agreement that NBC technicians who can maintain digital equipment will provide any necessary support until the media section staff are able to maintain the equipment themselves, so there does not seem to be any problems with equipment maintenance and management.

CDD does not have any full-time facility maintenance personnel, so if there is a breakdown, repair work will have to be contracted out to private companies. The facility plans to use air-conditioners and electrical equipment that can be obtained locally, so maintenance can be carried out by local private companies. The air-conditioner in the audio studio, however, has to be operated from the machine room, so there will be a need to give clear guidance on simple operation and maintenance work, such as turning the equipment on and off and cleaning the filter, when the facility is handed over.

4-1-2 Effect of Project Implementation

(1) Effect

The following direct and indirect effects can be expected from the implementation of the plan.

1) Direct effects

(i) Production

- The plan will make a two production teams possible, and the two teams will be able to produce about 280 radio programmes a year (about 180 programmes can be renew and about 100 programmes can be produce in every year). Replacement of the current 1,089 programmes with new programmes can therefore be completed in about six years.
- It will facilitate the production of radio education material that is in line with the reformed curriculum and modern-day PNG life and conditions.
- Production of educational video programmes can be continued.

(ii) Education

Radio

- All of children in 2,910 primary schools and teachers and others interested in education throughout the country will be able to use radio material that is in line with the curriculum, so the teaching material will be uniform, and this in turn will help provide a standard level of education.
- Suitable educational information can be provided to teachers and others interested in education throughout the country through educational news.

Video

- Teaching material can be provided for teacher training.
- Study material can be provided for secondary schools.

2) Indirect effects

- Students will be more interested in radio education programmes that are in line with current conditions in PNG and easy to understand, so they will be more enthusiastic about study, and this will help PNG achieve its educational reform goals of higher school attendance and more students advancing to higher grades, fewer students not to promote to next grade and fewer students leaving school before graduation.
  - Increase in school attendance
  - Increase in percentage of students advancing to higher grades (50% of students advancing from primary to secondary school)
  - Decrease student not to promote next grade

    Student study in vernacular at elementary school and then study English with radio programmes at primary school, so their understanding will be more and almost of them will promote to next grade easily.
- With more students advancing to higher grades and fewer leaving school before graduation, the general level of education will improve, and this will promote the human resource development necessary for sustainable socioeconomic development in PNG.

(2) Beneficiaries

All primary school children and teachers will benefit from implementation of the plan, and according to 1996 education statistics, their numbers are as follows.

Table 4-1 Primary school

Age	9	10	11	12	13	14	Total
Grade	G-3	G-4	G-5	G-6	G-7	G-8	
School age population	191,150	119,205	88,517	110,839	90,136	94,158	694,005
Number of students	89,580	80,074	67,574	60,631	36,808	27,984	362,651
Number of teachers	2,572	2,515	2,290	2,209	603	341	10,530

Source: School Age Population Statistics 1997, Education Statistics PNG 1996

Note : The number of students in G-7 and G-8 is the total of students in primary school under the new system, in provincial high schools (PHS) under the old system, in correspondence schools (CODE), and in vocational training centers.

As well as the 694,005 children of primary school age, the entire nation can be regarded as indirect beneficiaries as, ultimately, it will contribute to PNG's sustainable socioeconomic development.

The numbers of secondary school students who will benefit from the video material are as follows.

Table 4-2 Secondary school

Age	15	16	17	18	Total
Grade	G-9	G-10	G-11	G-12	
School age population	98,552	104,730	82,864	106,944	393,090
Number of students	20,374	17,343	3,480	3,088	44,258

Source: School Age Population Statistics 1997, Education Statistics PNG 1996

Note : The number of students in G-9 and G-10 is the total of students in provincial high schools (PHS) under the old system, in correspondence schools (CODE), and in vocational training centers.
The number in G-11 and G-12 is the total in provincial high schools (PHS) and national high schools (NHS) under the old system, and in teacher's colleges.

There are 4,155 teachers at educational institutions of secondary school level and above.

4-2 Recommendations

As well as the various beneficial effects mentioned above, this plan will help raise the BHN of the PNG people, so it is judged that it is indeed significant. The operation and management of the plan is not considered to be a problem as PNG has secured the minimum level of personnel and funds. Nonetheless, the plan will run more smoothly and effectively if the following improvements can be made.

(1) Expanding the area of reception and subsidies for radio receivers

Radio education programmes are broadcast throughout the country over the NBC Karai Service channel. Broadcasts are over short and medium wave from the NBC central station and six regional stations, so theoretically, broadcasts can be received anywhere in PNG. In reality, though, this is not the case because of geographical conditions and a lack of broadcasting capacity in NBC. Primary schools in areas with no or poor reception are sent cassette tapes of the programmes by the media section.

Enabling all schools in PNG to receive the programme broadcasts will expand the opportunities for uniform education throughout the country, but considering geographical conditions, there are financial and investment limitations on how far the area of reception can be expanded. There are also many schools that do not have sufficient funds to buy radio receivers.

The DOE therefore should request NBC to expand the area of broadcast reception, and it should provide subsidies to schools that do not have the funds to buy or maintain radio receivers so that the programmes reach all schools in PNG.

(2) Meeting NBC broadcasting fees and distribution of programme copies

Broadcasting fees in 1999, which have been paid to NBC since 1998, accounted for 45% of the media section budget in 1999, and could be an obstacle to the future production of radio education material. Like many other public organizations in PNG, NBC is being restructured, and is heading toward privatization, so it is unlikely that these broadcasting fees will be removed. Options in case NBC's fees become too high include the private broadcasters (NAUFM, YUMIFM, etc.), but in any of these options, fees will still have to be paid, so it is conceivable that radio education programmes could stop if broadcasting fees rise sharply. The DOE should

therefore negotiate broadcasting fees with NBC, and ensure that radio education programmes can continue without interruption.

As for the current method of holding lessons when the programmes are being broadcast, many schools have expressed their desire to use the radio material freely according to their own individual timetables. So in view of the costs in expanding the area of reception, NBC broadcasting fees, and the above-mentioned desire by schools, taping the programmes and using these tapes according to individual school timetables would seem to be more suited to PNG conditions than having to organize lessons around the broadcast times. So after considering the financial state of the PNG government and comparing the educational effect, there is a need to examine which method is more suited to PNG conditions.

(3) Guidance to teaching staff

The effectiveness of radio education material will depend on how the material is used in lessons. The survey found that some teachers have a good understanding of the broadcast content, and are well prepared to incorporate the programmes seamlessly into their lessons, while others separate the broadcast from the previous lesson. To raise student interest in the programmes and improve their educational effect, teachers should prepare their lessons based on the programme guide for teachers, however, the survey revealed that in many cases this is not being done.

Media section staff are holding workshops on how to use and maintain the radio equipment mainly at teacher's colleges, but nothing is being done to show teachers and future teachers how to gain the maximum effect from the radio programmes, so there is a need to address this deficiency. This can be done effectively at PNG Education Institute, which retrains in-service teachers, and at teacher's colleges.

(4) Monitoring, assessment and feedback

The 1993 survey by the Evaluation Section of the DOE revealed that while it was recognized that there is a need for radio education material, many respondents indicated that they found the programmes difficult to use because they were old and not in line with current conditions, so there was a strong demand for the material to be updated. Programmes are to be renewed in accordance with the reformed curriculum, but the effectiveness and suitability of the updated material can only be confirmed through monitoring and evaluation at the schools where it is used. To this end, CDD should establish a system for monitoring and assessing radio programme

use, and a system through which feedback can be incorporated into subsequent radio material production.

(5) Cooperation with related divisions

In March 1999 the educational radio and video units were combined to form the media section, and it, together with the radio programme production organizations of the Curriculum unit, Curriculum section, Editorial section, and the Media section, but excluding the graphic section, were grouped under the Material unit. Through this, production of teaching material that conforms to the reformed curriculum has become simpler, and cooperation within CDD is now much easier to achieve. Cooperation within CDD in the production of teaching material has to date been poor, so there is a need for CDD to make every effort to ensure that the sections responsible for radio education material, including the graphic section, give each other their fullest cooperation.

APPENDICES

1. Member List of the Survey Team

1-1 Basic Design Study Team (April 10 ~ May 9, 1999)

(1)Team Leader	Mr. Daini TSUKAHARA Director, First Project Management Division, Grant Aid Project Management Department, Japan International Cooperation Agency (JICA)
(2) Technical Advisor	Mr. Seiji UTSUMI Professor, Osaka University
(3) Project Manager / Architecture Planer	Mr. Shigeru YASUMATSU Kume Sekkei Co., Ltd.
(4) Education Planner	Mr. Hajime NIWA NHK Integrated Technology Inc.
(5) Facility·Mechanical Planner	Mr. Hiroyuki TSUCHIYA Kume Sekkei Co., Ltd.
(6) Equipment Planner	Mr. Takeshi SATO NHK Integrated Technology Inc.
(7) Procurement / Cost Planner	Mr. Tadashi MATSUBARA Kume Sekkei Co., Ltd.

1-2 Draft Report Explanation Team (July 24 ～ August 5, 1999)

(1) Team Leader	Mr. Masahiro KOBAYASHI Resident Representative JICA Papua New Guinea Office
(2) Project Manager / Architecture Planer	Mr. Shigeru YASUMATSU Kume Sekkei Co., Ltd.
(3) Facility・Mechanical Planner	Mr. Hiroyuki TSUCHIYA Kume Sekkei Co., Ltd.
(6) Equipment Planner	Mr. Takeshi SATO NHK Integrated Technology Inc.

2. Survey Schedule

2-1 Basic Design Study (April 10 ～ May 9, 1999 : 30days)

No.	Date (Day)	Activities
1	April. 10 (Sat)	20:15Left Tokyo by JL-767 Officials(Mr.Tsukahara, Mr.Utsumi), Consultant (Mr.Yasumatsu Mr. Niwa, Mr. Tsuchiya, Mr. Sato)
2	11 (Sun)	4:30 Arrive. Cairns
		12:00 Left Cairns 13:25 Arrive. Port Moresby 15:00 Check in Hotel, Team Meeting for Schedule
3	12 (Mon)	8:30 EOJ Courtesy Call 10:00 JICA PNG Courtesy Call
		14:30 NPO Courtesy Call 15:30 DOE Courtesy Call 16:30 Team Meeting
4	13 (Tue)	9:00 Meeting with CDD (Exp. of Inception Report, Facility Inspection)
		17:00 Team Meeting
5	14 (Wed)	8:00 Meeting with CDD 10:00 Meeting with AusAID 11:00 Meeting with CDD (Activity Check)
		17:00 Team Meeting
6	15 (Thu)	8:30 Observation of practical use of Radio Programme at Wardstrip Primary School 9:30 Meeting with CDD(Activities) 10:00 Meeting with DOE 11:30 Meeting with CDD(Contents of Request)
		15:00 Discussion on Minutes Draft at CDD
7	16 (Fri)	9:30 Signing on Minutes at NPO 10:30 Report to JICA 11:30 Observation of Port Moresby National High School
		13:30 Report to EOJ 14:30 Discussion on Questionnaire at CDD 16:30 Team Meting
8	17 (Sat)	10:00 City Observation, Observation of University of PNG
		14:00 Data Filing/Input
9	18 (Sun)	9:00 Team Meeting, Data Filing/Input
		15:30 Left Port Moresby by QF-096, Officials
10	19 (Mon)	8:30 Mr. Matsubara arrive at Port Moresby 9:00 Team Meeting 10:30 Meeting with Local Consul. on Geological Survey
		13:30 Discussion on Questionnaire at CDD, Observation of Existing Facility and Equipment 15:30 Contract Signing on Geological Survey with Local Consul. 17:00 Data Filing
11	20 (Tue)	8:30 Observation of Pacific View Production Video Co. 9:30 Observation of NAU/YUMI FM Private Radio Broadcast Station 11:00 Observation of EMTV
		13:30 Meeting with UNESCO, Observation of Existing Facility, Equipment 15:00 Discussion with World Bank

No.	Date (Day)	Activities-1 (Background Survey)	Activities-2 (Technical Survey)
12	21 (Wed)	10:30 Meeting with CODE at CDD	9:00 Observation of NBC Studio
		14:00 Discussion on Questionnaire at CDD	13:00 Meeting with Local Consul (SMEC) on Geological Survey Observation of Existing Equipment of Radio Unit
13	22 (Thu)	10:00 Data Filing/Input at JICA PNG Office	9:00 Meeting with Department of Works on Building Regulation Observation of Radio Receiving Area and Equipment at NBC
		15:00 Interim Report to JICA PNG Office	14:00 Data Collection at National Statistic Office
14	23 (Fri)	9:00 Discussion with CDD on Questionnaire Observation of Activities of Curriculum Unit	9:00 Observation of Infrastructure of CDD Facility
		13:00 Observation of Activities of CDD's each Unit	13:00 Observation of Existing Facility and Equipment of CDD
15	24 (Sat)	9:30 Team Meeting 10:00 Data Filing/Input	← ←
		14:00 Data Analysis	←
16	25 (Sun)	9:30 City Finding	←
		14:00 Preparation of Survey Sheet for Rural Area	14:00 Data Analysis
17	26 (Mon)	9:30 Discussion Survey Sheet for Rural Area at CDD Observation of Past Record of Material Production	9:30 Meeting with Department of Works Draw up Concept Plan
		13:30 Observation of Activities of Curriculum Unit	13:30 Site and Infrastructure Survey
18	27 (Tue)	8:00 Observation of practical use of School Radio Programme at Lae,Goroka	9:00 Survey of Unit Price
		13:00 Observation of practical use of School Radio Programme at Lae,Goroka	13:00 Survey of Unit Price
19	28 (Wed)	9:00 Observation of In-Service College 10:30 Discussion with CDD	9:00 Draw up Concept Plan Observation of Condition of Local Construction
		13:30 Discussion with CDD	14:30 Discussion with EDA-RANU 15:30 Discussion with ELCOM
20	29 (Thu)	8:30 Discussion with ONP	9:00 Discussion with Department of Works on Building Regulation
		13:30 Discussion with CDD	13:30 Discussion with TELIKOM 16:30 Discussion with NCD Town Planning Office
21	30 (Fri)	8:30 Interim Report to JICA PNG Office 11:00 Discussion with MOE	8:30 Draw up Concept Plan of Facility and Equipment
		13:30 Explanation and Discussion of Concept Plan to CDD	←

No.	Date (Day)	Activities-1 (Background Survey)	Activities-2 (Technical Survey)
22	May. 01 (Sat)	9:00 Data Filing/Input/Analysis	←
		14:00 Team Meeting	←
23	02 (Sun)	9:00 Data Analysis 9:30 Mr. Niwa left Port Moresby by QF-384	9:00 Draw up Draft of Basic Design Drawing
		14:00 Data Analysis	14:00 Draw up Draft of Basic Design Drawing
24	03 (Mon)	8:30 Supplementary Survey CDD 9:30 Supplementary Survey DOE 10:30 Data Collection at NPO	9:00 Survey of Construction Market 11:00 Data Collection at National Statistical Office
		13:30 Observation of Port Moresby National High School 15:00 Discussion with CDD	← ←
25	04 (Tue)	9:00 Data Collection at Bank of PNG 10:00 Data Collection at DOW	9:00 Survey of Construction Market 11:00 Meeting with Local Consultant (SMEC)
		13:00 Supplementary Survey CDD 15:00 Data Collection at NPO	← 15:00 Collection of Questionnaire for Cost Estimation
26	05 (Wed)	9:00 Discussion with CDD Preparation of Survey Report	9:00 Supplementary Survey for Facility Survey of Maintenance for Equipment
		13:00 Supplementary Survey DOE 14:00 Meeting with CDD	13:00 Preparation of Draft Basic Design
27	06 (Thu)	9:00 Report to JICA	←
		13:00 Supplementary Survey CDD	←
28	07 (Fri)	9:00 Report to JICA, EOJ 9:30 Mr. Tsuchiya, Mr. Matsubara left Port Moresby by QF-384	←
		13:00 Supplementary Discussion with CDD	←
29	08 (Sat)	9:00 Collection of Supplementary Data	←
		14:00 Data Filing	←
30	09 (Sun)	9:30 Mr. Yasumatsu, Mr. Sato left Port Moresby by QF-384	

2-2 Explanation on Draft Report (July 24 ～ August 5, 1999 : 13 days)

No.	Date (Day)	Activities
1	July. 24 (Sat)	20:15 Left Tokyo by JL767 Consultant (Mr. Yasumatsu, Mr. Sato)
2	25 (Sun)	04:30 Arrive. Cairns 13:10 Left Cairns 14:40 Arrive. Port Moresby 15:30 Check in Hotel, Team Meeting for Schedule
3	26 (Mon)	09:00 EOJ Courtesy Call/Meeting 10:00 Meeting with JICA 13:30 Meeting with CDD Media Section 15:30 Meeting with JICA
4	27 (Tue)	13:30 DOE Courtesy Call 14:00 Discussion with CDD Media Section on Contents of Building 15:30 National Planning Office Call/Meeting
5	28 (Wed)	09:00 Discussion with CDD Media Section on Contents of Building 11:00 Explanation/Discussion of Draft Basic Design to CDD 14:00 Explanation/Discussion of Contents of Equipment to CDD Media Section 15:20 Mr. Tsuchiya Arrive Port Moresby
6	29 (Thu)	09:00 Explanation/Discussion of Contents of Equipment to CDD Media Section Confirmation of Location of Trees within the Site 10:00 Confirmation of Power Intake and Method to ELCOM 11:00 Supplementary Questionnaire to the Superintendent Media Section 13:30 Supplementary Questionnaire to the Superintendent Media Section 15:00 Supplementary Survey to NBC about Maintenance 16:00 Meeting with JICA
7	30 (Fri)	08:30 Discussion on Minutes Draft 09:00 Discussion with CDD Media Section 15:00 Discussion with AusAID
8	31 (Sat)	09:00 Data Filling/Input
9	Aug.01 (Sun)	09:00 Data Filling/Input Data Analysis
10	02 (Mon)	09:00 Discussion/Supplementary Survey to CDD Media Section 10:00 Confirmation of Water Intake to EDA-RANU 11:00 Supplementary Questionnaire to the Superintendent Curriculum Section 14:00 Discussion with Local Consultant (ETS) 16:00 Meeting with JICA
11	03 (Tue)	10:00 Explanation of Draft Minutes at NPO 11:00 Supplementary Survey to CDD Media Section 14:00 Explanation of Draft Minutes to CDD Assistant Secretary 16:00 Meeting with JICA
12	04 (Wed)	11:00 Signing on Minutes at NPO 14:30 Report to EOJ 18:25 Left Port Moresby by PX098 19:55 Arrive. Cairns
13	05 (Thu)	12:45 Left Cairns by JL768 19:00 Arrive. Tokyo

3. List of Party Concerned in the Recipient Country

3. List of Party Concerned in the Recipient Country

<PNG Side>

1.Office of National Planning, Department of Treasure and Planning (ONP)

Mr. Joe Demas	Acting Director
Mr. Karl Sopol	Acting Assistant Secretary
Mr. John Kol	Programme Officer, Japan Desk
Ms. Yasap Popoitani	Senior Planner
Mr. Masayoshi Ohno	JICA Expert

2.Department of Education

Mr. Peter Baki	Secretary
Mr. L. Taita	Deputy Secretary
Mr. W. Penias	Deputy Secretary, Professional
Mr. A. Hanasby	First Assistant Secretary
Mr. Don Archibal	Education Reform
Mr. Joe D. Lagha	Senior Project Programmer, Project Implementation Unit

3.Curriculam Development Division (CDD)

Mr. Gogfrey Yerua	Assistant Secretary CDD
Mr. Madako Suari	Superintendent Curriculum Unit
Mr. Julius Natera	Superintendent Materials Unit
Mr. Peter Bridger	Superintendent Measurement Service Unit
Mr. H.T. Nauna	Superintendent Operation
Mr. William Mollomd	Project Coordinator, Population
Mr. Cain Ketoma	Manager, NLAS
Mr. Paul Mungle	Director, Media Section
Mr. Mark W. Sisson	TV/Radio Advisor, Media Section
Mr. Gomara Tarube	Media Section
Mr. Sumeo Kakarere	Media Section
Mr. Marlon Kuelinad	Media Section
Mrs. Bernadette Aihi	Assistant Superintendent, Curriculum Unit
Mrs. Ruth Ray	Editor, Literacy and Awareness Unit
Mr. Jamas Jacob	Assessment Officer MSU
Mr. Akinori Ito	JOCV Senior Member

4.Wardstrip Demonstration Primary School

Mr. Bossin	Deputy Principal

5.CODE (College of Distance Education)

Mr. Dikana	Principal

6.PNG Education Institute

Mr. Fred Bago	Deputy Principal, Academic
Mr. Kumi Kispe	Programme Coordinator Vocational Education
Ms. Denia Reyes	Coordinator Certificate Elementary Trainer Training

7.AusAID PNG Office

Mr. Mark Paul	Councellor
Ms. Heather Dornoch	Second Secretary

8.World Bank

Mr. Neil Murray	Project Coordinator

9.SMEC PNG Ltd.

Mr. Robert Goldsmith	Resident Director
Mr. Joe Vracar	Senior Geotechnical Engineer

10.NBC (National Broadcast Corporation)

Mr. Issac Marinjemb	Engineering Controller
Mr. Joseph Ealedona	News Editor
Mr. John Honavi	Senior Programmer
Mr. Joe Wafewa	Head, Technical Service
Mr. Daniel Tambari	Supervisor, Maintenance

11.NAU/YUMI FM

Mr. Peter John Aitsi	General Manager

12.EM TV

Mr. Steve Moorhouse	Chief Executive

13.Pacific View Production

Mr. Andrew Johnston	Managing Director

14.Fire Service

Mr. Lua Roa	Superintendent Hazard Safety
Mr. Alexman Kiwa	Technical Officer Hazard Safety

15.Department Transport & Works

Mr. Duncan Stemp	Senior Architect, Architectural & Building Branch
Mr. Gabe Konio	First Assistant Director, Design & Major Project Division

16.EDA RANU

Mr. Camilo Ekari	Planning Engineer

17.TELIKOM

Mr. Joseph Ivarature	Executive Manager Billing & Revenue Dept.
Mr. Ron Anderson	Supervisor External Plant Design Section

18.ELCOM (PNG Electricity Commission)

Mr. Isikel Tovia	Planning Engineer

<Japanese Side>

1.Embassy of Japan

HE. Tatsuo Tanaka	Ambassador
Mr. Hideki Shimazaki	Minister-Counsellor
Mr. Takahito Matuo	First Secretary
Mr. Mitsushi Edakawa	Second Secretary

2.JICA PNG Office

Mr. Masahiro Kobayashi	Resident Representative
Mr. Kenzo Iwakami	Assistant Resident Representative
Mr. Kei Jinnai	Assistant Resident Representative

4. Minutes of Discussions

MINUTES OF DISCUSSIONS
ON
BASIC DESIGN STUDY ON THE PROJECT FOR
DEVELOPMENT OF THE FACILITIES FOR SCHOOL RADIO PROGRAMME
IN
PAPUA NEW GUINEA

Based on the results of the Preparatory Study, the Government of Japan decided to conduct a Basic Design Study on the Project for Development of the Facilities for School Radio Programme (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent a Basic Design Study Team (hereinafter referred to as "the Team") to Papua New Guinea headed by Mr. Daini TSUKAHARA, Director of First Project Management Division, Grant Aid Project Management Dept, JICA, and is scheduled to stay in the country from 11 April to 9 May, 1999.

The Team held a series of discussions with the officials concerned of the Government of Papua New Guinea (hereinafter referred to as "GPNG") and conducted a field survey at the study area.

In the course of discussions and a field survey, both parties have confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Port Moresby, 16 April, 1999

Mr. Peter M Baki
Secretary
Department of Education

Mr. TSUKAHARA Daini
Leader
Basic Design Study Team
Japan International Cooperation Agency
(JICA)

Mr. Joe Demas
Acting Director
Office of National Planning
Department of Treasury and Planning

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve the education in Papua New Guinea through strengthening the capacity for the production of School Radio Programmes for Basic Education.

2. Project Site

The Project site is located in the Department of Education, Curriculum Development Division, Wardstrip, Port Moresby as shown in ANNEX 1, regardless of future temporary moving plan and relocation of CDD.

3. Responsible and Executing Agencies

(1) The Department of Education (hereinafter referred to as "DOE") is the responsible agency of the Project.
(2) Curriculum Development Division (hereinafter referred to as "CDD"), DOE is the executing body of the Project.
The organization chart of both agencies are shown in ANNEX2.

4. Items requested by GPNG

After discussions with the Team, following items are requested by GPNG. The final components of the Project will be decided by the Japanese side at its discretion.
(1) Procurement of the equipment necessary for the production of school radio programme.
(2) Construction of the physical facilities necessary for the production of school radio programme and television programme.
The items of equipment and facilities are shown in ANNEX 3.

5. Japan's Grant Aid System

(1) GPNG has understood the system of the Japan's grant aid explained by the Team; the main feature is described in ANNEX 4.
(2) GPNG will take necessary measures, described in ANNEX 5. for the smooth implementation of the Project, on condition that Japan's grant aid is extended to the Project.

6. Coordination with Other Donors

GPNG should be responsible for the coordination with other donors related with CDD for the smooth implementation of the Project in a timely manner.

7. Technical Cooperation

GPNG and the team have recognized the needs of further technical cooperation by JICA to assist the activities of the production of School Radio Programme.

8. Schedule of the Study

(1) The consultants will proceed with further studies in Papua New Guinea until 9 May 1999.
(2) JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around July, 1999.
(3) In case that the contents of the report is accepted in principle by GPNG , JICA will complete the final report and send it to GPNG by the end of October.

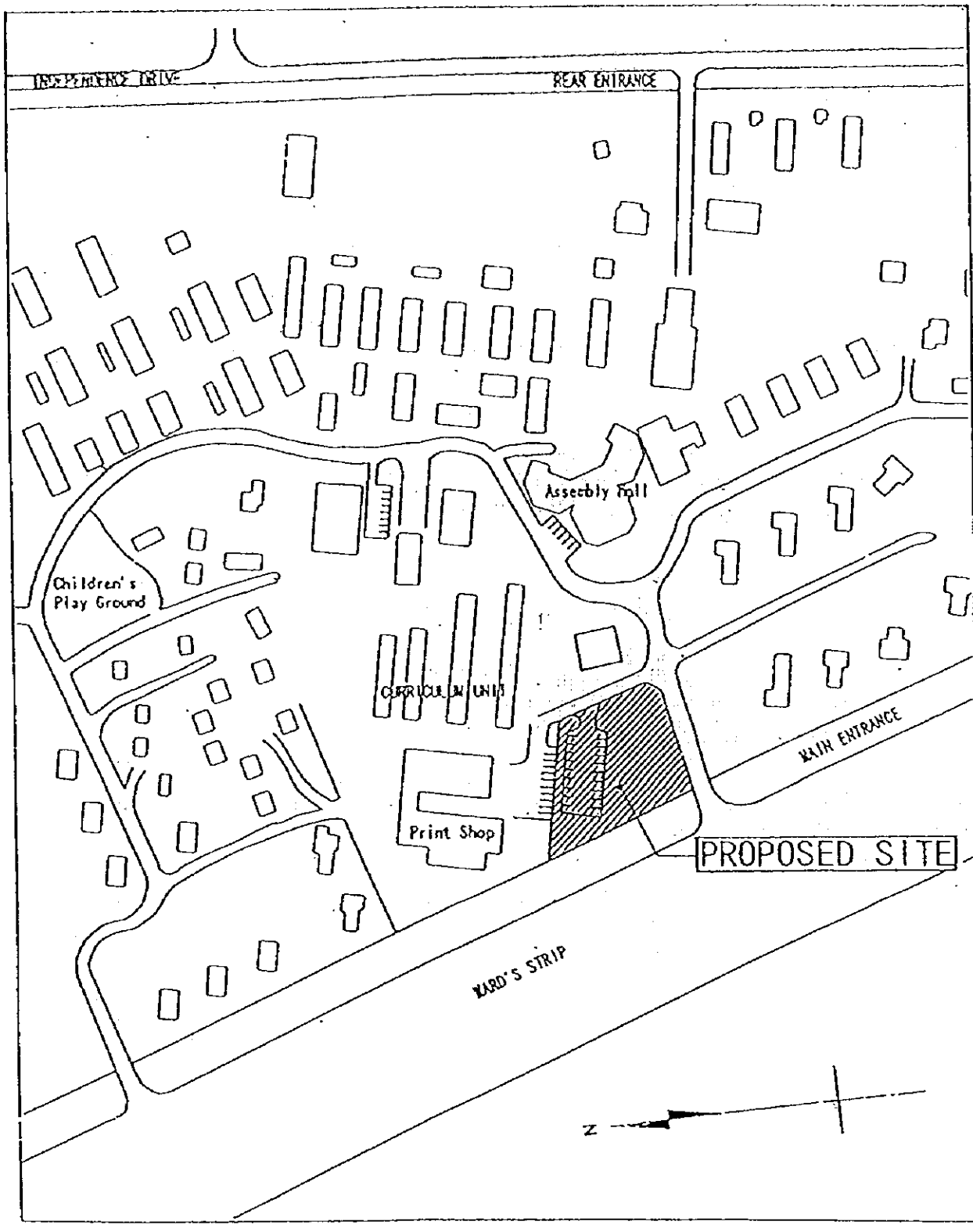
9. Other relevant items

(1) GPNG side assured the team that the Department remains committed to the use of School Radio Programme as an integral part of the Basic Education curriculum regardless of the current education and curriculum reform.

(2) The team requested GPNG side to inform the team of the moving plan and relocation plan of CDD as soon as possible.

(3) The team explained to the GPNG side about the difficulties to examine to include the construction of physical facilities of TV Unit into the Japanese Grant Aid at this stage.

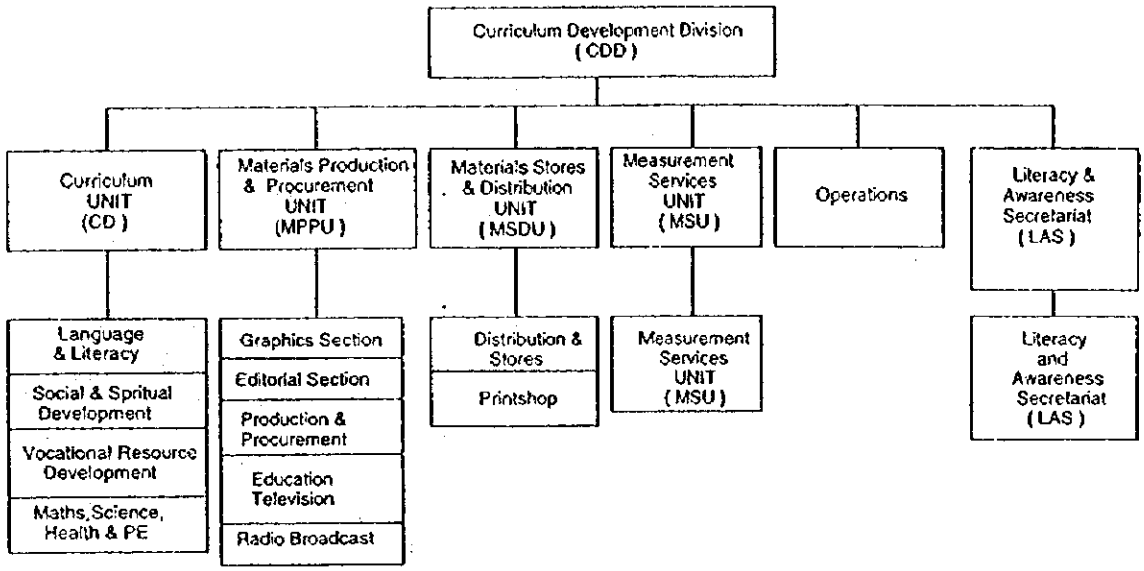
ANNEX 1 : PROJECT SITE



ANNEX 2 : ORGANIZATION CHART OF RESPONSIBLE AND EXECUTING AGENCIES

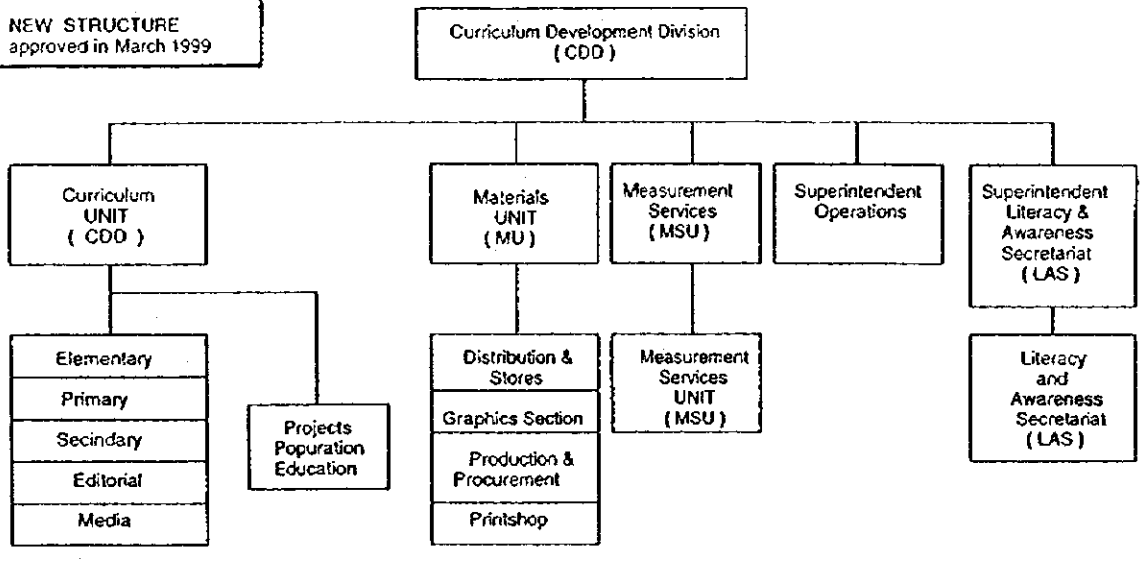
CURRENT STRUCTRE

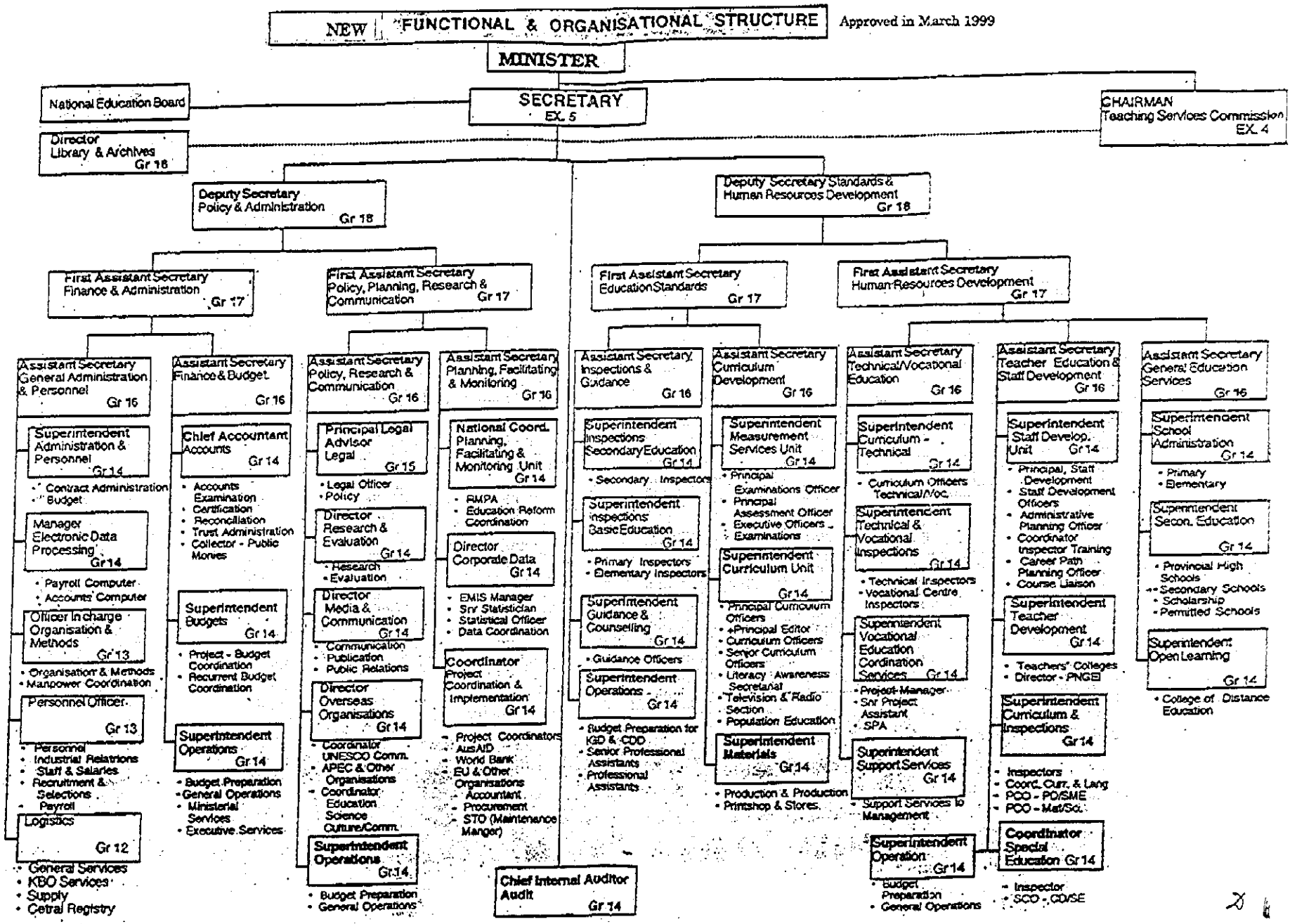
CURRICULUM DEVELOPMENT DIVIDION
(CDD)



CURRICULUM DEVELOPMENT DIVIDION
(CDD)

NEW STRUCTURE
approved in March 1999




NEW FUNCTIONAL & ORGANISATIONAL STRUCTURE
Approved in March 1999
MINISTER
National Education Board
SECRETARY
EX. 5
CHAIRMAN
Teaching Services Commission
EX. 4
Director
Library & Archives
Gr 18
Deputy Secretary
Policy & Administration
Gr 18
Deputy Secretary Standards &
Human Resources Development
Gr 18
First Assistant Secretary
Finance & Administration
Gr 17
First Assistant Secretary
Policy, Planning, Research &
Communication
Gr 17
First Assistant Secretary
Education Standards
Gr 17
First Assistant Secretary
Human Resources Development
Gr 17
Assistant Secretary
General Administration
& Personnel
Gr 16
Superintendent
Administration &
Personnel
Gr 14
• Contract Administration
• Budget
Manager
Electronic Data
Processing
Gr 14
• Payroll Computer
• Accounts Computer
Officer In charge
Organisation &
Methods
Gr 13
• Organisation & Methods
• Manpower Coordination
Personnel Officer
Gr 13
• Personnel
• Industrial Relations
• Staff & Salaries
• Recruitment &
Selections
• Payroll
Logistics
Gr 12
• General Services
• KBO Services
• Supply
• Cetral Registry
Assistant Secretary
Finance & Budget
Gr 16
Chief Accountant
Accounts
Gr 14
• Accounts
Examination
• Certification
• Reconciliation
• Trust Administration
• Collector - Public
Monies
Superintendent
Budgets
Gr 14
• Project - Budget
Coordination
• Recurrent Budget
Coordination
Superintendent
Operations
Gr 14
• Budget Preparation
• General Operations
• Ministerial
Services
• Executive Services
Assistant Secretary
Policy, Research &
Communication
Gr 16
Principal Legal
Advisor
Legal
Gr 15
• Legal Officer
• Policy
Director
Research &
Evaluation
Gr 14
• Research
• Evaluation
Director
Media &
Communication
Gr 14
• Communication
• Publication
• Public Relations
Director
Overseas
Organisations
Gr 14
• Coordinator
UNESCO Comm.
• APEC & Other
Organisations
• Coordinator
Education
Science
Culture/Comm.
Superintendent
Operations
Gr 14
• Budget Preparation
• General Operations
Assistant Secretary
Planning, Facilitating
& Monitoring
Gr 16
National Coord.
Planning,
Facilitating &
Monitoring Unit
Gr 14
• RMPA
• Education Reform
Coordination
Director
Corporate Data
Gr 14
• EMIS Manager
• Snr Statistician
• Statistical Officer
• Data Coordination
Coordinator
Project
Coordination &
Implementation
Gr 14
• Project Coordinators
• AusAID
• World Bank
• EU & Other
Organisations
• Accountant
• Procurement
• STO (Maintenance
Manger)
Chief Internal Auditor
Audit
Gr 14
Assistant Secretary
Inspections &
Guidance
Gr 16
Superintendent
Inspections
Secondary Education
Gr 14
• Secondary Inspectors
Superintendent
Inspections
Basic Education
Gr 14
• Primary Inspectors
• Elementary Inspectors
Superintendent
Guidance &
Counselling
Gr 14
• Guidance Officers
Superintendent
Operations
Gr 14
• Budget Preparation for
IGD & CDD
• Senior Professional
Assistants
• Professional
Assistants
Assistant Secretary
Curriculum
Development
Gr 16
Superintendent
Measurement
Services Unit
Gr 14
• Principal
Examinations Officer
• Principal
Assessment Officer
• Executive Officers -
Examinations
Superintendent
Curriculum Unit
Gr 14
• Principal Curriculum
Officers
• +Principal Editor
• Curriculum Officers
• Senior Curriculum
Officers
• Literacy Awareness
Secretariat
• Television & Radio
Section
• Population Education
Superintendent
Materials
Gr 14
• Production & Production
• Printshop & Stores
Assistant Secretary
Technical/Vocational
Education
Gr 16
Superintendent
Curriculum -
Technical
Gr 14
• Curriculum Officers
Technical/Voc.
Superintendent
Technical &
Vocational
Inspections
Gr 14
• Technical Inspectors
• Vocational Centre
Inspectors
Superintendent
Vocational
Education
Cordination
Services
Gr 14
• Project Manager
• Snr Project
Assistant
• SPA
Superintendent
Support Services
Gr 14
• Support Services to
Management
Superintendent
Operation
Gr 14
• Budget
Preparation
• General Operations
Assistant Secretary
Teacher Education &
Staff Development
Gr 16
Superintendent
Staff Develop.
Unit
Gr 14
• Principal, Staff
Development
• Staff Development
Officers
• Administrative
Planning Officer
• Coordinator
Inspector Training
• Career Path
Planning Officer
• Course Liaison
Superintendent
Teacher
Development
Gr 14
• Teachers' Colleges
• Director - PNGEI
Superintendent
Curriculum &
Inspections
Gr 14
• Inspectors
• Coord. Curr. & Lang
• PCO - PD/SME
• PCO - Mat/Sci.
Coordinator
Special
Education Gr 14
• Inspector
• SCO - CD/SE
Assistant Secretary
General Education
Services
Gr 16
Superintendent
School
Administration
Gr 14
• Primary
• Elementary
Superintendent
Secon. Education
Gr 14
• Provincial High
Schools
• Secondary Schools
• Scholarship
• Permitted Schools
Superintendent
Open Learning
Gr 14
• College of Distance
Education

ANNEX 3 : ITEMS REQUESTED BY GPNG

(1) Equipment for production of School Radio Programme
  (a) Audio Studio Equipment
  (b) Post Production Equipment
  (c) Duplication Equipment
  (d) Dubbing Equipment
  (e) Field Recording Equipment
  (f) Maintenance Equipment
  (g) Sound Effect Equipment

(2) Facilities for production of School Radio Programme
  (a) Audio Studio
  (b) Post Production Room
  (c) Duplication Room
  (d) Dubbing Room
  (e) Library
  (f) Maintenance Room
  (g) Office
  (h) Meeting Room

(3) Following items have not been discussed with the team, but requested by GPNG side.
  (a) Room for the existing TV equipment
  (b) TV Studio

ANNEX 4 : JAPAN'S GRANT AID SCHEME

1. Grant Aid Procedure

1) Japan's Grant Aid Program is executed through the following procedures.
Application (Request made by a recipient country)
Study (Basic Design Study conducted by JICA)
Appraisal & Approval (Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation (The Notes exchanged between the Governments of Japan and the recipient country)

2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA to conduct a study on the request. If necessary, JICA send a Preparatory Study Team to the recipient country to confirm the contents of the request.
Secondly, JICA conducts the study (Basic Design Study), using Japanese consulting firms.

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Programme, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the Study
The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project"), is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows:

a) confirmation of the background, objectives and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation;
b) evaluation of the appropriateness of the Project to be implemented under the

Grant Aid Scheme from the technical, social and economic points of view;

c) confirmation of items agreed on by both parties concerning the basic concept of the Project;
d) preparation of a basic design of the Project; and
e) estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Ai d Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even through they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For the smooth implementation of the Study, JICA uses a consulting firm selected through its own procedure (competitive proposal). The selected firm participates the Study and prepares a report based upon the terms of reference set by JICA.

At the beginning of implementation after the Exchange of Notes, for the services of the Detailed Design and Construction Supervision of the Project, JICA recommends the same consulting firm which participated in the Stud y to the recipient country, in order to maintain the technical consistency between the Basic Design and Detailed Design as well as to avoid any undue de lay caused by the selection of a new consulting firm.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant law s and regulations of Japan. Grant Aid is not supplied through the donation o f materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

3) "The period of the Grant" means the one fiscal year which the Cabinet approves the

project for. Within the fiscal year, all procedure such as exchanging of the Notes, concluding contracts with consulting firms and contractors and final payment to them must be completed.
However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can b e further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be use d for the purchase of the products or services of a third country.

However, the prime contractors, namely consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations con trolled by persons of Japanese nationality.)

5) Necessity of "Verification"
The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability of Japanese taxpayers.

6) Undertakings required to the Government of the recipient country
   a) to secure a lot of land necessary for the construction of the Project and to clear the site;
   b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities outside the site; c) to ensure prompt unloading and customs clearance at ports of disembarkation in the recipient country and internal transportation therein of the products purchased under the Grant Aid;
   c) to exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts;
   d) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work;
   e) to ensure that the facilities constructed and products purchased under the Grant Aid be maintained and used properly and effectively for the Project; and
   f) to bear all the expenses, other than those covered by the Grant Aid, necessary for the Project.

7) "Proper Use"
The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for operation and maintenance of them as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"
The products purchased under the Grant Aid shall not be re-exported from the recipient country.

9) Banking Arrangement (B/A)
   a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.
   b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay (A/P) issued by the Government of recipient country or its designated authority.

ANNEX 5 : NECESSARY MAJOR UNDERTAKINGS BY GPNG

Following necessary measures should be taken by Papua New Guinea side on condition that the Grant Aid by the Government of Japan is extended to the Project:

1. Following items should be secured for the Project site for construction.
   a) To prepare the land for the Project and secure the rights to build a building.
   b) To secure reasonably leveled site for the Project prior to the project implementation.
   c) To provide proper access road to the project site. d) To undertake incidental outdoor works, such as landscaping, fencing, exterior lighting, and other incidental facilities in and around the Project site, if necessary;
   d) To provide facilities for distribution of electricity, water supply, telephone trunk line and drainage and other incidental facilities outside the site;

2. To ensure prompt unloading and customs clearance of the products purchased under the Japan's Grant Aid at ports of disembarkation in Papua New Guinea;

3. To exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in Papua New Guinea with respect to the supply of the products and services under the verified contracts;

4. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such facilities as may be necessary for their entry into Papua New Guinea and stay therein for the performance of their work;

5. To bear commissions, namely advising commissions of an Authorization to Pay (A/P) and payment commissions, to the Japanese bank for the banking services based upon the Banking Arrangement (B/A);

6. To provide necessary permissions, licenses, and other authorization for implementing the Project, if necessary;

7. To ensure that the facilities constructed and equipment purchased under the Japan's Grant Aid be maintained and used properly and effectively for the Project with adequate budget allocation.

8. To bear all the expenses, other than those covered by the Japan's Grant Aid, necessary for the Project; and

9. To secure sufficient number of radio production staff to form 2 programme production teams.

MINUTES OF DISCUSSIONS
ON
BASIC DESIGN STUDY ON THE PROJECT FOR DEVELOPMENT OF THE FACILITIES FOR SCHOOL RADIO PROGRAMME
IN
PAPUA NEW GUINEA
(Explanation on Draft Report)

In April 1999, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched Basic Design Study Team on the Project for Development of the Facilities for School Radio Programme (hereinafter referred to as "the Project") to Papua New Guinea, and through discussion, field survey, and technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and consult the officials concerned of the Government of Papua New Guinea (hereinafter referred to as "GPNG") on the components of the draft report, JICA sent to Papua New Guinea the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Masahiro KOBAYASHI, Resident Representative, JICA Papua New Guinea Office from 25 July to 4 August, 1999.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Port Moresby, 4 August, 1999

Mr. Peter M Baki
Secretary
Department of Education

Mr. Masahiro KOBAYASHI
Leader
Draft Report Explanation Team
Japan International Cooperation Agency
(JICA)

Mr. Joe Demas
Acting Director
Office of National Planning
Department of Treasury and Planning

ATTACHMENT

1. Components of the Project

GPNG agreed and accepted in principle the contents of the draft report explained by the Team.

2. Japan's Grant Aid Programme

GPNG understands the system and characteristics of Japan's Grant Aid Programme and the necessary measures to be taken by GPNG as explained by the Team and described in Annex-4 and Annex-5 of the Minutes of Discussions signed by both parties on 16 April, 1999.

3. Further Schedule of the Study

JICA will complete the final report of the Study in accordance with the confirmed item and send it to GPNG by the end of October, 1999.

4. Technical Cooperation

GPNG and the study team have recognized the needs of further technical cooperation by JICA to assist the activities of Media Section, Curriculum Development Division (hereinafter referred to as "CDD"). GPNG will make a request for technical expert (or training) necessary for Media Section, CDD.

5. Other relevant items

GPNG requested the team to change the Project name to "the Project for Development of the Facilities for Education Media Programmes".

5. Cost Estimation Borne by the Recipient Country

5. Cost Estimation Borne by the Recipient Country

Estimation of Construction Related Cost

	(Kina)
1) Water Connection Charge 2,010 Kina/100㎥ x 8.5 = 17,085 → 17,000 Kina	17,000
2) Power Connection Charge Relocation of existing power incoming line	200
3) Felling of trees within the Construction Area	1,000
4) Banking Arrangement Approx. 0.1% of total E/N amount	8,660
5) Application for Building Permit Occupancy Classifications I (Multiple dwelling-building): 850 ㎡ x 1.8 Kina/㎡ = 1,530 → 1,600 Kina Erection of building related items : 40 Kina/item x 10 items = 400 Kina	2,000
6) Curtain and Fixtures	6,000
7) Furniture and Office Equipment	Use Existing One
8) Move Existing Equipment Video and Radio Material Production Equipment	It will be done by the Staff of Media Section
Tota	34,860 (Kina)

6. Other Relevant Data

GEOTECHNICAL REPORT FOR NATIONAL MEDIA CENTRE, WARD'S STRIP, GORDON, N.C.D.

GEOTECHNICAL REPORT

1. INTRODUCTION

The construction of the Centre for School Radio Programme in Port Moresby by the Government of Japan, Kume Sekkei Co. Ltd, and Local Government is proposed at Ward's Strip, Gordon. At the request of Mr. Shigeru Yasumatsu of Kume Sekkei Co. Ltd the project Architects, SMEC PNG Limited have undertaken an investigation for the project.

The project will generally comprise two storey buildings with cavity brick walls to the lower floors and timber framed, brick veneer walls to the upper floors. The roof is to be of timber trussed, steel clad construction. A suspended concrete floor at first level and concrete slab-on-ground is proposed. It is believed that shallow strip and pad footing system have been nominated by the project Engineers as the preferred footing options.

Associated works include the construction of parking areas, site profiling, and provision of services to the building and general site landscaping.

The objectives of this investigation were as follows:

- To determine the engineering properties of the subsoil profile over the construction area;
- To classify the construction area in accordance with AS 2870-1996, "Residential Slabs and Footings";
- To present recommendations on the suitable footing types for the proposed construction;
- To provide general construction recommendations relevant to the site;
- To comment on earthquake rating and liquefaction potential characteristics;
- To comment on groundwater conditions;
- To assess of the safe bearing pressure at the founding level of the proposed building.

A plan of the site was provided by Kume Sekkei Co. Ltd. to assist with the sub-surface site investigation.

The fieldwork described in this report was carried out during April and May 1999.

2. SITE DESCRIPTION

The proposed construction site is located on the northern side of Gordon suburb. The location is shown on Figure 1. (Location plan). The site comprises a rectangular shaped block, which has been partly paved and currently used as a car park. The maximum dimensions of the block are approximately 100 m wide (east west) by 170 m long (north south). On the south side the site is bounded by undeveloped land. The block to the north and east sides is bounded by existing school buildings. To the west the block is bounded by Ward's Strip Road. The allotment is fully fenced.

The site topography is close to flat with an estimated cross fall of approximately 0.5 m towards the northern (right front) property boundary. A visual inspection across the site revealed that there is poor drainage at the front boundary, due to recent heavy rain periods.

Vegetation over the site comprises a poorly to well established grass cover with some medium to large sized trees. It is understood that a number of these trees are to remain as part of the final landscaping.

From the drawing provided, the new building is to be situated at the front side of the proposed site. The schematic design, showing borehole locations, is presented in Figure 2.

3. METHOD OF INVESTIGATION

3.1 Field Investigation

The field investigation was undertaken from 27 April to 3 May 1999. All aspects of this investigation were conducted in accordance with AS 1726-1996, *"Geotechnical Site Investigations"*.

During the field investigation two (2) boreholes, labelled BH-1 and BH-2 were advanced at the proposed building area, shown on Figure 2. The boreholes were drilled to the depth ranging from 13.0 to 13.6 m and were advanced using open augering techniques in the upper part and wash boring and coring in the lower part of boreholes. Coring was not possible due to the low -medium strength and degree of weathering of the rock profile encountered. Drilling operations were carried out using a "Gemco 17601" trailer mounted drilling rig operated by a driller from Central Drilling Pty Ltd. Kume Sekkei Co. Ltd nominated borehole locations.

Standard Penetration Tests (SPT) were carried out in the boreholes at depth intervals of 1 m. The results of these tests are presented on the borelogs. The SPT tests were carried out in order to assess the insitu strength of the subsurface soil profile.

Field operations were carried out under the direction and supervision of a Geotechnical Engineer from SMEC PNG Ltd, who maintained a continuous log record of each borehole, recovered representative soil samples, recorded field test results and groundwater levels.

The boreholes are located as shown on Figure 2, Site plan. Engineering logs and test results are presented in Appendix A of this report.

3.2 Sampling and Laboratory Testing

Soil samples were recovered for visual classification and laboratory testing purposes. Undisturbed soil samples were recovered from BH-1 to BH-2 at depths ranging from 2.0 m to 8.0 m, respectively by pushing thin walled tube samplers (U-50's) with the drill rig. Disturbed soil samples were recovered from both boreholes in a depth range of 1.0 to 9.0 m respectively.

Laboratory testing for engineering properties was performed in the laboratory of SMEC-PNG Ltd and Earthtech Laboratories Brisbane, Australia. The laboratory program comprised the following tests:

- Undisturbed Samples
  - Unconfined Compressive Strength (UCS)
  - Quick Multistage Triaxial (UU)
  - One Dimensional Consolidations.
- Disturbed Samples
  - Atterberg Limits
  - Particle Size Distributions (Grading)
  - Natural Moisture Content
  - Density Test

All physical testing was undertaken in accordance with AS 1289, *Methods of Testing Soils for Engineering Purposes*. The results of the work are presented in Appendix B.

4. SUBSOIL PROFILE

The 1:50,000 scale Geological Map and Port Moresby Urban Geology (Reference 1) indicates that the site is underlain by Holocene deposits, comprising alluvial and colluvial silty clay with sand and gravel, overlying extremely weathered Dokuna tuff above slightly weathered tuff. The consistency of the clay grades from firm near the surface to stiff and hard at depth. The site investigation revealed a subsoil profile consistent with the mapped information.

In summary soil profile encountered comprises Topsoil, Alluvium and Colluvium overlying extremely weathered tuff above slightly weathered tuff.

A brief summary of the soil strata encountered is provided below in Table 1:

Table . 1 Soil strata in boreholes

Soil Type	BH – 1 (m)	BH – 2 (m)
Silty clay (Top soil)	0.00 – 1.70	0.00 - 1.10
Silty clay (Alluvium)	1.70 – 2.70	1.10 – 2.20
Silty-clayey gravel (Colluvium)	2.70 – 5.10	2.20 – 4.30
Sandy clay (Highly Weathered Tuff)	5.10 – 9.00	4.30 – 9.00
Tuff (Slightly Weathered Tuff)	9.00 – 13.0	9.00 – 13.6
Water level	7.20	7.80

Groundwater was encountered in BH1 and BH2 at depths ranging from 7.20 to 7.80 m.

5. GEOTECHNICAL EVALUATION

The engineering properties of the soil strata penetrated have been assessed through visual description, drilling penetration rates and the results of field and laboratory testing. A description of each significant soil strata encountered is presented below:

TOP SOILS

The surface soil comprises silty clay overlying alluvial soils to a depth ranging from 1.1 to 1.7m The soils were generally black in colour, high plasticity, firm consistency, with some rounded gravel with a maximum diameter of 10 mm.

Standard Penetrometer Tests carried out produced variability in results between 8 and 20 blows, per 300 mm (N values) partly due to the presence of gravel and roots in the topsoils.

ALLUVIUM

The alluvial soil comprises silty clay with some gravel overlying colluvial soils to depths ranging from 2.2 to 2.7 m. The soils were generally gray-brown in color with high plasticity (e.g.LL = 72 %), reactive and ranged in consistency from stiff to very stiff.

In situ Standard Penetrometer Tests produced N values of 15 and 28 blows, due to presence of gravel.

COLLUVIUM

Silty-clayey gravel was encountered immediately below the alluvium to the depth ranging from 4.3 to 5.1 m. is poorly graded and ranged in consistency from medium dense to dense. These materials were gray-brown in color and high plasticity (e.g. LL = 55 %).

SPT results produced N values of 23 blows, indicate that the silty-clayey gravel in BH2 is medium dense and possesses relative density of 35 – 65 % at this depth.

HIGHLY WEATHERED TUFF

Encountered in both boreholes to the depth of 9.0 m. The weathered rock in borehole BH1 and BH2 has been logged as Highly Weathered Dokuna tuff. The rock strength as defined in AS 1726 –1996, Table A8 is low to medium. The material is generally sandy clay grey-brown in colour medium to high plasticity, stiff to hard consistency.

The SPT test > 50 blow confirm that the material is well compacted.

SLIGHTLY WEATHERED DOKUNA TUFF

The tuff is generally gray-brown in color and can be described as weak to medium strong. Results of SPT tests confirmed that the rock is fine to medium grained and intensely fractured. Auger (TC Bit) refusal occurred on the weathered tuff layer in both boreholes at depth of 9.0 m.

Engineering and soil strength properties are presented below:

Table. 2 Laboratory Test Results

Borehole/ Depth (m)	Material	MC %	LL %	PI %	LS %	Fi%	BD t/m³	Triaxial UU C kN/m²	Triaxial UU ϕ (°)	Cc
BH-1(2.0-2.5)	Silty clay									0.11
BH-1(2.3-2.5)	Silty clay							70.0	0	0.24
BH-1(3.0-3.2)	Silty-clayey gravel									0.23
BH-1(6.0-6.3)	Sandy clay									
BH-2(1.0-1.5)	Silty clay	15.0	72	50	17	2.0	2.07			
BH-2(2.0-2.5)	Silty clay	11.0				32.2				
BH-2(3.0-3.5)	Silty-clayey gravel		51	33	14	2.0	2.31			
BH-2(3.6-3.8)	Silty-clayey gravel					42.6	2.10			
BH-2(4.0-4.3)	Silty-clayey gravel									
BH-2(4.6-4.8)	Sandy clay					33.0	2.07			
BH-2(5.5-5.7)	Sandy clay	13.3	N/P	-	-	33.2	2.23			
BH-2(7.5-7.8)	Sandy clay							102.0	0	

MC - Moisture Content (%), **LL** - Liquid Limit (%), **PI** - Plasticity Index (%), **LS** - Linear Shrinkage (%), **Grading/ Fi** - Fines 75 microns (%), **N/P** - Non-plastic, **BD** – Bulk Density of soil t/m³, **USC** - Unconfined Compressive Strength (q_u = kN/m²), **UU** - Quick Multistage Triaxial Test C (kN/m2), ϕ (degrees), **Cc** – One Dimensional Consolidations – Compression Index Cc.

5.1 Summary of Soil Properties

The SPT data provide the best available means of estimating soil shear strength and various correlations have been proposed using $N1_{(60)}$ values derived from field N values (Skempton, Ref. 2). The SPT N and $N1_{(60)}$ values obtained in the granular materials have been used to estimate the peak angle of internal friction, ϕ′, following the general relationship given by Peck, Hanson and Thornburn (Ref. 3), where soils were considered to be normally consolidated.

Correction factors put forward by Skempton for calculating the $N1_{(60)}$ value also include; the test depth, age and degree of over-consolidation of the soil tested. Table 3 indicates the calculations of $N1_{(60)}$.

The undrained shear strength of cohesive deposits, where considered to be over consolidated, has been estimated from the relationship;
$C_u = 5 \times N1_{(60)}$ (Stroud, Ref. 4), which is applicable to clay of intermediate plasticity.

The stiffness of the soils was not measured directly. Consequently, values of the vertical shear modulus have also been derived from $N1_{(60)}$ values in granular deposits, and from estimated undrained shear strengths in cohesive materials. The relationship proposed by Bowles (Ref. 5) of $G_s = E_s/4$ where $E_s = 600 * (N + 6) + 2000$ has been adopted for the silty sandy and silty sandy gravely units. For cohesive materials, deformations have been determined (Ref. 5) taking shear moduli of:

$G = 250 * C_u$ under axial loading

$G = 150 * C_u$ under lateral loadings,

The SPT $N1_{(60)}$, estimated friction angle in granular soils, estimated undrained shear strength and estimated shear moduli for all materials are presented in Table 4.

Table 3. Calculation of SPT results and correlations

Material Type	NATIONAL MEDIA CENTRE SITE BH	DEPTH 1	DEPTH 2	N	N60	Effective Overburden Pressure (kPa)	C_N	$N(1)_{60}$ BH-1	$N(1)_{60}$ BH-2
Silty clay (Top soil)	BH-1	1.00	1.45	8	6.8	18	1.35	9	
Silty clay (Alluvium)	BH-1	2.00	2.45	15	12.75	36	1.14	15	
Silty-clayey gravel (Colluvium)	BH-1	3.00	3.45	30	28.5	54	1.00	29	
Silty-clayey gravel (Colluvium)	BH-1	4.00	4.45	36	34.2	72	0.90	31	
Silty-clayey gravel (Colluvium)	BH-1	5.00	5.45	38	38	90	0.80	30	
Sandy clay (Weathered tuff)	BH-1	6.00	6.45	85	85	108	0.75	64	
Sandy clay (Weathered tuff)	BH-1	7.00	7.45	65	65	126	0.75	49	
Sandy clay (Weathered tuff)	BH-1	8.00	8.15	52	52	144	0.70	36	
Diorite (Slightly weathered tuff)	BH-1	9.00	9.30	100	100	162	0.65	65	
Diorite (Slightly weathered tuff)	BH-1	10.00	10.15	100	100	180	0.65	65	
Diorite (Slightly weathered tuff)	BH-1	11.00	11.15	100	100	198	0.60	60	
Diorite (Slightly weathered tuff)	BH-1	12.00	12.15	100	100	216	0.60	60	
Diorite (Slightly weathered tuff)	BH-1	13.00	13.00	100	100	234	0.55	55	
Silty clay (Top soil)	BH-2	1.00	1.45	20	17	18	1.35		23
Silty clay (Alluvium)	BH-2	2.00	2.45	28	23.8	36	1.14		27
Silty-clayey gravel (Colluvium)	BH-2	3.00	3.45	23	21.85	54	1.00		22
Silty-clayey gravel (Colluvium)	BH-2	4.00	4.45		PUSH	TUBE			
Sandy clay (Weathered tuff)	BH-2	5.00	5.45	41	41	90	0.80		33
Sandy clay (Weathered tuff)	BH-2	6.00	6.45	47	47	108	0.75		35
Sandy clay (Weathered tuff)	BH-2	7.00	7.45	55	55	126	0.75		41
Sandy clay (Weathered tuff)	BH-2	8.00	8.00	55	55	144	0.70		39
Sandy clay (Weathered tuff)	BH-2	9.00	9.45	29	29	162	0.65		19
Diorite (Slightly weathered tuff)	BH-2	10.00	10.30	100	100	180	0.65		65
Diorite (Slightly weathered tuff)	BH-2	11.00	11.15	100	100	198	0.60		60
Diorite (Slightly weathered tuff)	BH-2	12.00	12.15	100	100	216	0.60		60
Diorite (Slightly weathered tuff)	BH-2	13.00	13.00	100	100	234	0.55		55

FOR ROD LENGTH (N60) AND OVERBURDEN (N(1) 60)

***N60** corrections: 0.75 to 3m; 0.85 to 5m; 0.95 to 9m; 1 below 9m. Skempton 1986 (GT008)*
- assuming 1m of rods above GL.
C_N Values:adjustment for effective overburden pressure Based on Peck, Hanson & Thornburn (1974) and Liao and Whitman (1986).
***N(1)60:** Adjusted N using the subscript for the Standard Energy Ratio.*

Standing Water Levels

BH-1	7.20 m
BH-2	7.80 m

Table. 4 ENGINEERING PROPERTIES OF SUB-SURFACE SOILS IN BOREHOLES

BH No.	Depth (m)		Field SPT N Value (Blows/ 300mm)	SPT N_{60} Value	Soil Classification	Assigned		Cons. Status	Estimated Angle of Friction (deg)	Estimated Shear Modulus (MN/m^2) (G_{horiz})
	From	To				PI	D'v			
bh 1	1.00	1.45	8	9.0	Silty clay (Top Soil)	50	18.0	normal	29	3
	2.00	2.45	15	15.0	Silty clay (Alluvium)	50	36.0	normal	31	4
	3.00	3.45	30	29.0	Silty-clayey gravel(Colluviu	32	54.0	normal	36	6
	4.00	4.45	36	31.0	Silty-clayey gravel(Colluviu	32	72.0	normal	36	6
	5.00	5.45	38	30.0	Silty-clayey gravel(Colluviu	32	90.0	normal	36	6
	6.00	6.45	85	64.0	Sandy clay (Weathered tuff	0	108.0	normal	41	11
	7.00	7.45	65	49.0	Sandy clay (Weathered tuff	0	126.0	normal	41	9
	8.00	8.15	52	36.0	Sandy clay (Weathered tuff	0	144.0	normal	41	7
	9.00	9.30	100	65.0	Tuff (Slightly weathered)	0	162.0	normal	41	11
	10.00	10.15	100	65.0	Tuff (Slightly weathered)	0	180.0	normal	37	11
	11.00	11.15	100	60.0	Tuff (Slightly weathered)	0	198.0	normal	37	10
	12.00	12.15	100	60.0	Tuff (Slightly weathered)	0	216.0	normal	37	10
	13.00	13.00	100	55.0	Tuff (Slightly weathered)	0	234.0	normal	37	10
bh2	1.00	1.45	20	23	Silty clay (Top Soil)	50	18	normal	34	5
	2.00	2.45	28	27	Silty clay (Alluvium)	50	36	normal	35	5
	3.00	3.45	23	22	Silty-clayey gravel(Colluviu	32	54	normal	34	5
	4.00	4.45	-	-	Silty-clayey gravel(Colluviu	32	-	normal	push tube	
	5.00	5.45	41	33	Sandy clay (Weathered tuff	0	90	normal	31	6
	6.00	6.45	47	35	Sandy clay (Weathered tuff	0	108	normal	32	7
	7.00	7.45	55	41	Sandy clay (Weathered tuff	0	126	normal	31	8
	8.00	8.00	55	39	Sandy clay (Weathered tuff	0	144	normal	35	7
	9.00	9.45	29	19	Sandy clay (Weathered tuff	0	162	normal	33	4
	10.00	10.30	100	65	Tuff (Slightly weathered)	0	180	normal	31	11
	11.00	11.15	100	60	Tuff (Slightly weathered)	0	198	normal	31	10
	12.00	12.15	100	60	Tuff (Slightly weathered)	0	216	normal	30	10
	13.00	13.00	100	55	Tuff (Slightly weathered)	0	234	normal	31	10

0 non plastic

6.0 SEISMICITY

According to the PNG Standard 1001-1982, Part 4 Earthquake Loading (Ref. 6), Port Moresby is within Zone 4, which covers the area with low occurrences of earthquakes in PNG. In this area, it is expected that there would be an average return period of about 75 years for an earthquake of Modified Mercalli Intensity 7, which is the lowest intensity likely to cause extensive damage.

It is apparent from Clause 3.4.2 that the subsoils beneath the site can be classified as '*firm*'. The potential for liquefaction at this site is low, as the soil is generally cohesive within 1 m to 9 m of the ground surface. The soil density is sufficiently high to withstand the intensity of shaking in the silty clay deposit.

7.0 LIQUEFACTION POTENTIAL

7.1 Theory

One of the problems associated with construction in regions of seismic activity is the potential for liquefaction of the subsoils during an earthquake event. The region of Port Moresby forming the study area in Zone 4 of the PNG seismic risk classification system (Ref. 7) *i.e.* in a low to low moderate risk area. The recommended design ground acceleration for the proposed building within Zone 4 is 0.24g.

The most important of the controlling factors for liquefaction are as follows:
(i) Particle Size: medium silt and medium sand are more susceptible to liquefaction than well-graded materials or principally fine or very coarse materials. The most susceptible particle size ranges are indicated on the relevant PSD plots, Figures 4 to 6, after Lee and Fitton (Ref. 8) and are proposed as design indicators by the Japanese Ministry of Works.
(ii) Groundwater: within uniform materials, as the depth to the water table increases, so too does the depth at which liquefaction is likely to occur.
(iii) Relative density: loose materials liquefy more easily than dense materials, requiring shorter duration and lower magnitude vibrations. The potential risk in terms of relative density can be assessed from reference to the SPT $N1_{(60)}$ value, as identified in Figure 7 to 8 (After Seed, Ref. 9).
(iv) Confining pressure: liquefaction potential is reduced as confining pressure increases, i.e. susceptibility generally reduces with depth below ground level.
(v) Intensity of ground acceleration: liquefaction is more likely to occur with larger ground accelerations. Larger ground accelerations will also effect denser soils and soils at greater depths.
(vi) Duration of event: increasing stress cycles related to the magnitude of the event increase the likelihood of liquefaction, particularly within denser soils under higher confining pressures.
(vii) Age of Soil: increasing soil age reduces the probability of liquefaction for several reasons. These include densification from previous earthquakes and over consolidation, degrees of cementation or interlocking of sand particles. Generally, such modifications to soil structure would be reflected in SPT N values.

The particle size distribution of soils has been taken into account by reference to limits derived from the work of Lee and Fitton (Ref. 8). The susceptibility to liquefaction of a soil on the basis of grading has been assessed from the following classification:

>50% Sand + Silt - High Risk
30 - 50% Sand + Silt - Moderate Risk
<30% Sand + Silt - Low Risk

Particle size distribution curves are plotted in Figures 4, 5 and 6.

Simplified procedures exist for evaluating stresses induced by ground accelerations and these can be related to the stresses required to cause liquefaction if the above variables are known. These relationships have been developed on the basis of stress conditions, which either caused or were insufficient to cause liquefaction in known earthquake events. Reference has been made to the manual, "Earthquake Engineering for Bridges in Papua New Guinea, (Ref. 7)", which describes procedures for determining liquefaction potential. Both of the procedures outlined in this manual (Chinese Code and Cyclic Stress Ratio methods) have been carried out. The soil susceptibility to liquefaction has been classified as high, moderate or low according to whether the data points plotted above, close to, or below the threshold values applicable to each method, as indicated in Figures 7 and 8.

7.2 Results

The alluvial sequence under the proposed building varying in consistency from firm to stiff below 1.7 m depth. Although the grading curves indicate a potential for liquefaction, the density of the soils reduces the hazard. Reference to Figures 4 to 7 supports this assessment. For purposes of determining the seismic coefficient C value, the site can be regarded as *"firm"* because competent material occurs below depth of 9.0 m in both boreholes. This is in accordance with PNGS 1001 - 1982: Part 4, Section 3.4.2 (Ref. 6).

7.3 Summary of Liquefaction Potential

Potential for liquefaction of the soils under the construction area has been assessed on the basis of grading (Figures 4 to 6), depth, Chinese Code and Cyclic Stress Ratio analyses (Figures 7 and 8). These assessments are summarised in Table 5 below.

Table. 5 Summary of Liquefaction Potential

Borehole/ Depth (m)	Material	Liquefaction Potential
BH-1 (0.0-1.7)	Silty clay	Low Risk
BH-1 (1.7-2.7)	Silty clay	Low Risk
BH-1 (2.7-5.1)	Silty-clayey gravel	Moderate Risk
BH-1 (5.1-9.0)	Sandy clay	Low Risk
BH-1 (9.0-13.0)	Dokuna Tuff	V. Low Risk
BH-2 (0.0-1.1)	Silty clay	Low Risk
BH-2 (1.1-2.2)	Silty clay	Low Risk
BH-2 (2.2-4.3)	Silty-clayey gravel	Moderate Risk
BH-2 (4.3-9.0)	Sandy clay	Low Risk
BH-2 (9.0-13.6)	Dokuna Tuff	V. Low Risk

8.0 GROUNDWATER CONSIDERATIONS

As noted in Section 4.0 groundwater was encountered during the investigation at approximate depths of 7.2 m and 7.8 m below the existing ground level. These levels remained consistent to the completion of the site investigation. The investigations were completed at the end of a long wet season and it is considered that this level is at a seasonal high. Thus the base groundwater level is expected to be below foundation levels. It is however possible that perched water tables could occur within the gravelly colluvium unit between 2.2 m and 5.1 m depths and consideration should be given to the possibility of water ingress from these levels.

9.0 FOUNDATION DESIGN PARAMETERS

On the basis of the borehole and laboratory test data it is clear that suitable founding depths can be achieved between about 1.2 m and 5.5 m depending upon the proposed building loads. The layered sequence of alluvium overlying colluvium, and in turn overlying a weathered bedrock unit is used as a basis for the recommended allowable bearing pressures, based on a combination of SPT data, triaxial shear tests, consolidation tests and general observations of the ground conditions. Alternative footing systems for this depth range are:

- Strip and pad footings and shallow depths
- Piled footings at greater depths

Strip and Pad Footings.

The following Table 6 provides this information for both strip and pad footings. It is expected that for lightly loaded areas that a founding depth of about 1.5 m to 2.5 m is applicable. Intermediate loads are expected to be founded in the colluvial layer below 2.2 to 2.7 m depth. It should be noted that the depths to each layer varies between boreholes, there being a deepening of the bedrock from BH2 towards BH1. The design depths of foundations within each layer should be adjusted depending upon proximity to each borehole.

Table 6. Recommended Allowable Bearing Pressures for Shallow Footings

Depth Range (m)		Material Description	Allowable Bearing Pressure (kPa)	
BH 1	BH 2		Strip Footings	Pad Footings
1.0 – 1.7	1.0 – 1.2	Black Silty CLAY, high plasticity TOPSOIL	50	40
1.7 – 2.7	1.2 – 2.2	Grey silty CLAY, low plasticity ALLUVIUM	120	95
2.7 – 5.1	2.2 – 4.3	Silty-clayey GRAVEL COLLUVIUM	250	200
5.1 +	4.3 +	Completely to highly weathered TUFF BEDROCK	400	325

The uppermost topsoil layer is reactive to changes in moisture contents and any footings located within this layer should be designed on the basis of an H (Unstable) classification in accordance with Australian Standard AS2870.1 *Residential Slabs and Footings*. Standard drawings provided by the PNG Department of Transport and Works provide the typical dimensions and reinforcing for concrete footings (refer attached Appendix D).

For the recommended allowable bearing pressures, settlements are expected to be limited to 20 mm. The laboratory test data indicate low consolidation coefficients for the silty clay alluvium layer and long term settlements should be minimal, provided the bearing pressures (applied by both live and dead loads) are limited to the recommended values in Table 6.

All spread footing excavations should be backfilled with suitable granular fill, compacted in layers not exceeding 200 mm in accordance with standard practices.

Any concrete raft or slab footings should be designed for allowable bearing pressures equivalent to strip footings and the slab should be placed on a compacted granular fill material at least 200 mm in thickness, with a sub-grade reaction modulus of at least 20 MPa/m.

Piled Footings.

For major column loads a piled foundation is recommended. Either driven steel pile or bored cast in-situ reinforced concrete piles can be the adopted design, depending upon available equipment, cost and the optimum design with respect to applied loads and depths to founding levels. Whichever system is adopted all piles should be extended to at least 5.5 m depth across the site to minimise the risk of differential settlement and to withstand the lateral loadings imposed by an earthquake of magnitude MM7.

For driven piles the recommendations for foundation bearing capacity are based on steel square or H Section piles. The attached Tables 7a and 7b provide the relevant design parameters for driven piles with a width of either 0.3 m or 0.4 m for data from both BH-1 and BH-2. It is expected that pile driving conditions will be relatively easy for this site.

For bored piles the profile is a circular section and the attached Tables 7c and 7d provide the relevant design parameters for piles with a diameter of either 0.5 m or 0.75 m. It is unlikely that support will be required for the pre-drilled pile holes, provided that the reinforcing and concrete are placed on the same day that the holes are completed.

Table 8 provides a summary of Tables 7a to 7d for the recommended depth of 5.5 m. The designs have been based on a single pile action, although for the number of piles required to withstand horizontal loadings these piles may behave as a group. However, despite the reduction factors for group action, it is our opinion that the vertical capacity for the recommended piles will likely be well in excess of the design loadings.

Table 8. Recommended Allowable Loads for Piles

Borehole	Pile Width (m)	Allowable End Bearing Load (kN)	Allowable Skin Friction (kN)
BH-1 Driven Piles	0.3	580	85
	0.4	1,000	110
BH-1 Bored Piles	0.5	1,600	55
	0.75	3,600	125
BH-2 Driven Piles	0.3	390	60
	0.4	690	80
BH-2 Bored Piles	0.5	1,000	35
	0.75	2,400	85

10.0 GENERAL CONSTRUCTION RECOMMENDATIONS

A positive drainage gradient should be ensured away from the building and slab areas at all times. Paving, surface drainage and underground piping will assist in achieving this.

As directed by AS 2870.1, limitations on vegetation and gardens along the perimeter of the building should be specified, to avoid damage and blocking of surface drainage and weephole drainage systems. Trees should be located no closer to the building than a distance of ¾ times the mature height of that species. This condition should be maintained throughout the life of the structure.

During landscaping operations, gravel filled drainage cut-off trenches may be employed where required to prevent surface water ponding or draining towards the perimeter footings. Trenches should be located on the high side of the proposed building and drain away from the building area.

Garden beds adjacent to the building should be avoided, and care should be taken not to over water these areas. Leaks in plumbing, including stormwater, sewerage and drainage should be repaired promptly.

11.0 SUMMARY

1. Fieldwork described in this report was carried out from 27 April to 3 May 1999;

2. Two boreholes, BH-1 and BH-2, were drilled, to depths of 13.0 m and 13.6 m respectively, at the proposed building site at Ward's Strip;

3. The site is underlain by Recent sediments, comprising alluvial silty clay and colluvial silty-clayey gravel to depths of 4.3 m to 5.1 m, overlying completely to highly weathered tuff of the Dokuna Tuff unit. Below 9 m depth the rock becomes slightly weathered;

4. According to PNG Standards 1001-1982, Part 4 the site is located within Zone 4 , with respect to Earthquake risk in PNG. This is a low risk zone and the site can be regarded as

"firm", in accordance with the definition in the Code;

5. The liquefaction potential has been classified as low risk;

6. Groundwater was encountered in both boreholes at depths of 7.2 m and 7.8 m;

7. Foundation designs are recommended for both shallow footing systems (strip and pad footings) and deeper piled footings. The shallow systems should be located in the alluvial and colluvial soils, with recommended allowable bearing pressures of between 50 kPa and 400 kPa for strip footings and 80% of these values for pad footings. Table 6 presents the detailed recommended allowable bearing pressures;

8. Piled footings can be either driven piles or cast in-situ bored piles. The recommended depth for each alternative is 5.5 m to allow for some socketing into the weathered rock to withstand lateral loads which may be applied by a magnitude MM7 earthquake. Allowable loads for driven piles of 0.3 m to 0.4 m width range between 400 kN and 1,000 kN. The allowable loads are considerable higher for bored piles, being 1,000 kN to 3,600 kN for piles of diameter 0.5 m to 0.75 m;

9. General construction recommendations emphasis the need for drainage, minimising the effects of large trees on the foundations and an awareness of ongoing maintenance.

12.0 REFERENCES

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Table 7a: NATIONAL MEDIA CENTRE SITE - FOUNDATION ALLOWABLE BEARING CAPACITY, DRIVEN PILES

BH -1

Pile Width = 0.3 m

Depth Range (m)	Level at base of layer	SPT N'_{60} (mean)	Bearing Capacity Factor Nq: Berentsev Note 1	Bearing Capacity Factor Nq: Meyerhof Note 2	Overburden Pressure sigma kN/m²	Friction Angle Tan phi	Ultimate Bearing Pressure q_f (kN/m²): Note 1	Ultimate Bearing Pressure q_f (kN/m²): Note 2 (not used)	Allowable End Bearing Load $A_b q_f$ (kN)	Allowable Friction Load $A_s f_s$ (kN)	Allowable Total Load (Ref 2) $A_b q_f + A_s f_s$ (kN)
0.0-1.7	1.7	9.0	20	80	18.00	0.5543	342	1,422	22	9	31
1.7-2.7	2.7	15.0	25	86	36.00	0.6008	864	3,060	54	19	74
2.7-5.1	5.1	31.0	60	250	72.00	0.7265	4,248	17,928	268	47	315
5.1-9.0	9	36.0	75	800	126.00	0.7536	9,324	100,674	587	85	673
9.0-13.0	13	33.0	75	320	180.00	0.7535	13,320	57,420	839	41	880

Pile Width = 0.4 m

Depth (m)	Level at base of layer	SPT N'_{60} (mean)	Bearing Capacity Factor Nq: Berentsev Note 1	Bearing Capacity Factor Nq: Meyerhof Note 2	Overburden Pressure sigma kN/m²	Friction Angle Tan phi	Ultimate Bearing Pressure q_f (kN/m²): Note 1	Ultimate Bearing Pressure q_f (kN/m²): Note 2 (not used)	Allowable End Bearing Load $A_b q_f$ (kN)	Allowable Friction Load $A_s f_s$ (kN)	Allowable Total Load (Ref 2) $A_b q_f + A_s f_s$ (kN)
0.0-1.7	1.7	9.0	20	80	18.00	0.5543	342	1,422	38	12	50
1.7-2.7	2.7	15.0	25	86	36.00	0.6008	864	3,060	97	26	123
2.7-5.1	5.1	31.0	60	250	72.00	0.7265	4,248	17,928	476	63	539
5.1-9.0	9	36.0	75	800	126.00	0.7535	9,324	100,674	1,044	114	1,158
9.0-13.0	13	33.0	75	320	180.00	0.7535	13,320	57,420	1,492	54	1,546

Notes:
1 Tomlinson (Ref 10)
2 Meyerhof (Ref 11)

Table 7b: NATIONAL MEDIA CENTRE SITE - FOUNDATION ALLOWABLE BEARING CAPACIT, DRIVEN PILES

BH - 2

Pile Width = 0.3 m

Depth Range	Level at base of layer	SPT	Bearing Capacity Factor Nq		Overburden Pressure	Friction Angle	Ultimate Bearing Pressure		Allowable End Bearing Load	Allowable Friction Load	Allowable Total Load (Ref 2)
(m)		N'_{60} (mean)	Berentsev Note 1	Meyerhof Note 2	sigma kN/m^2	Tan phi	q_f (kN/m^2) Note 1	Note 2 (not used)	$A_b q_f$ (kN)	$A_s f_s$ (kN)	$A_b q_f + A_s f_s$ (kN)
0.0-1.1	1.1	23	40	200	18	0.6745	702	3,582	44	11	55
1.1-2.2	2.2	27	58	250	36	0.7000	2,052	8,964	129	23	152
2.2-4.3	4.3	22	40	200	54	0.6494	2,106	10,746	133	32	164
4.3-9.0	9	33	70	300	90	0.74	6,210	26,910	391	60	451
9.0-13.6	13.6	36	75	300	180	0.7535	13,320	53,820	839	122	961

Pile Width = 0.4 m

Depth	Level at base of layer	SPT	Bearing Capacity Factor Nq		Overburden Pressure	Friction Angle	Ultimate Bearing Pressure		Allowable End Bearing Load	Allowable Friction Load	Allowable Total Load (Ref 2)
(m)		N'_{60} (mean)	Berentsev Note 1	Meyerhof Note 2	sigma kN/m^2	Tan phi	q_f (kN/m^2) Note 1	Note 2 (not used)	$A_b q_f$ (kN)	$A_s f_s$ (kN)	$A_b q_f + A_s f_s$ (kN)
0.0-1.1	1.1	23	40	200	18	0.6745	702	3,582	79	15	93
1.1-2.2	2.2	27	58	250	36	0.7000	2,052	8,964	230	30	260
2.2-4.3	4.3	22	40	200	54	0.6494	2,106	10,746	236	42	278
4.3-9.0	9	33	70	300	90	0.74	6,210	26,910	696	80	775
9.0-13.6	13.6	36	75	300	180	0.7535	13,320	53,820	1,492	163	1,655

Notes: 1 Tomlinson (Ref 10)
2 Meyerhof (Ref 11)

Table 7c: NATIONAL MEDIA CENTRE SITE - FOUNDATION ALLOWABLE BEARING CAPACIT, BORED PILES

BH -1

Pile Width = **0.5** m

Depth Range (m)	Level at base of layer	SPT N'_{60} (mean)	Bearing Capacity Factor Nq: Berentsev Note 1	Bearing Capacity Factor Nq: Meyerhof Note 2	Overburden Pressure sigma kN/m²	Friction Angle Tan phi	Ultimate Bearing Pressure q_f (kN/m²): Note 1	Ultimate Bearing Pressure q_f (kN/m²): Note 2 (not used)	Allowable End Bearing Load $A_b q_f$ (kN)	Allowable Friction Load $A_s f_s$ (kN)	Allowable Total Load (Ref 2) $A_b q_f + A_s f_s$ (kN)
0.0-1.7	1.7	9.0	20	80	18.00	0.5543	342	1,422	60	6	66
1.7-2.7	2.7	15.0	25	86	36.00	0.6008	864	3,060	151	13	164
2.7-5.1	5.1	31.0	60	250	72.00	0.7265	4,248	17,928	743	31	774
5.1-9.0	9	36.0	75	800	126.00	0.7536	9,324	100,674	1,632	56	1,688
9.0-13.0	13	33.0	75	320	180.00	0.7535	13,320	57,420	2,331	80	2,411

Pile Width = **0.75** m

Depth (m)	Level at base of layer	SPT N'_{60} (mean)	Bearing Capacity Factor Nq: Berentsev Note 1	Bearing Capacity Factor Nq: Meyerhof Note 2	Overburden Pressure sigma kN/m²	Friction Angle Tan phi	Ultimate Bearing Pressure q_f (kN/m²): Note 1	Ultimate Bearing Pressure q_f (kN/m²): Note 2 (not used)	Allowable End Bearing Load $A_b q_f$ (kN)	Allowable Friction Load $A_s f_s$ (kN)	Allowable Total Load (Ref 2) $A_b q_f + A_s f_s$ (kN)
0.0-1.7	1.7	9.0	20	80	18.00	0.5543	342	1,422	135	13	148
1.7-2.7	2.7	15.0	25	86	36.00	0.6008	864	3,060	340	29	369
2.7-5.1	5.1	31.0	60	250	72.00	0.7265	4,248	17,928	1,673	69	1,742
5.1-9.0	9	36.0	75	800	126.00	0.7535	9,324	100,674	3,671	126	3,797
9.0-13.0	13	33.0	75	320	180.00	0.7535	13,320	57,420	5,245	180	5,425

Notes:
1 Tomlinson (Ref 10)
2 Meyerhof (Ref 11)

Table 7d: NATIONAL MEDIA CENTRE SITE - FOUNDATION ALLOWABLE BEARING CAPACIT, BORED PILES

BH - 2

Pile Width = **0.5** m

Depth Range (m)	Level at base of layer	SPT N'_{60} (mean)	Bearing Capacity Factor Nq: Berentsev Note 1	Bearing Capacity Factor Nq: Meyerhof Note 2	Overburden Pressure sigma kN/m²	Friction Angle Tan phi	Ultimate Bearing Pressure q_f (kN/m²): Note 1	Ultimate Bearing Pressure q_f (kN/m²): Note 2 (not used)	Allowable End Bearing Load $A_b q_f$ (kN)	Allowable Friction Load $A_s f_s$ (kN)	Allowable Total Load (Ref 2) $A_b q_f + A_s f_s$ (kN)
0.0-1.1	1.1	23	40	200	18	0.6745	702	3,582	123	7	130
1.1-2.2	2.2	27	58	250	36	0.7000	2,052	8,964	359	15	374
2.2-4.3	4.3	22	40	200	54	0.6494	2,106	10,746	369	21	389
4.3-9.0	9	33	70	300	90	0.74	6,210	26,910	1,087	39	1,126
9.0-13.6	13.6	36	75	300	180	0.7535	13,320	53,820	2,331	80	2,411

Pile Width = **0.75** m

Depth (m)	Level at base of layer	SPT N'_{60} (mean)	Bearing Capacity Factor Nq: Berentsev Note 1	Bearing Capacity Factor Nq: Meyerhof Note 2	Overburden Pressure sigma kN/m²	Friction Angle Tan phi	Ultimate Bearing Pressure q_f (kN/m²): Note 1	Ultimate Bearing Pressure q_f (kN/m²): Note 2 (not used)	Allowable End Bearing Load $A_b q_f$ (kN)	Allowable Friction Load $A_s f_s$ (kN)	Allowable Total Load (Ref 2) $A_b q_f + A_s f_s$ (kN)
0.0-1.1	1.1	23	40	200	18	0.6745	702	3,582	276	16	293
1.1-2.2	2.2	27	58	250	36	0.7000	2,052	8,964	808	33	841
2.2-4.3	4.3	22	40	200	54	0.6494	2,106	10,746	829	46	876
4.3-9.0	9	33	70	300	90	0.74	6,210	26,910	2,445	88	2,533
9.0-13.6	13.6	36	75	300	180	0.7535	13,320	53,820	5,245	180	5,425

Notes: 1 Tomlinson (Ref 10)
2 Meyerhof (Ref 11)

SMEC

SMEC-PNG LTD

PROJECT: The Centre for School Radio Programme in PNG
LOCATION: Wards Strip, Gordon, N.C.D.
CLIENT: Kume Sekkei Co, Ltd

No: J - 147

Date: April 1999

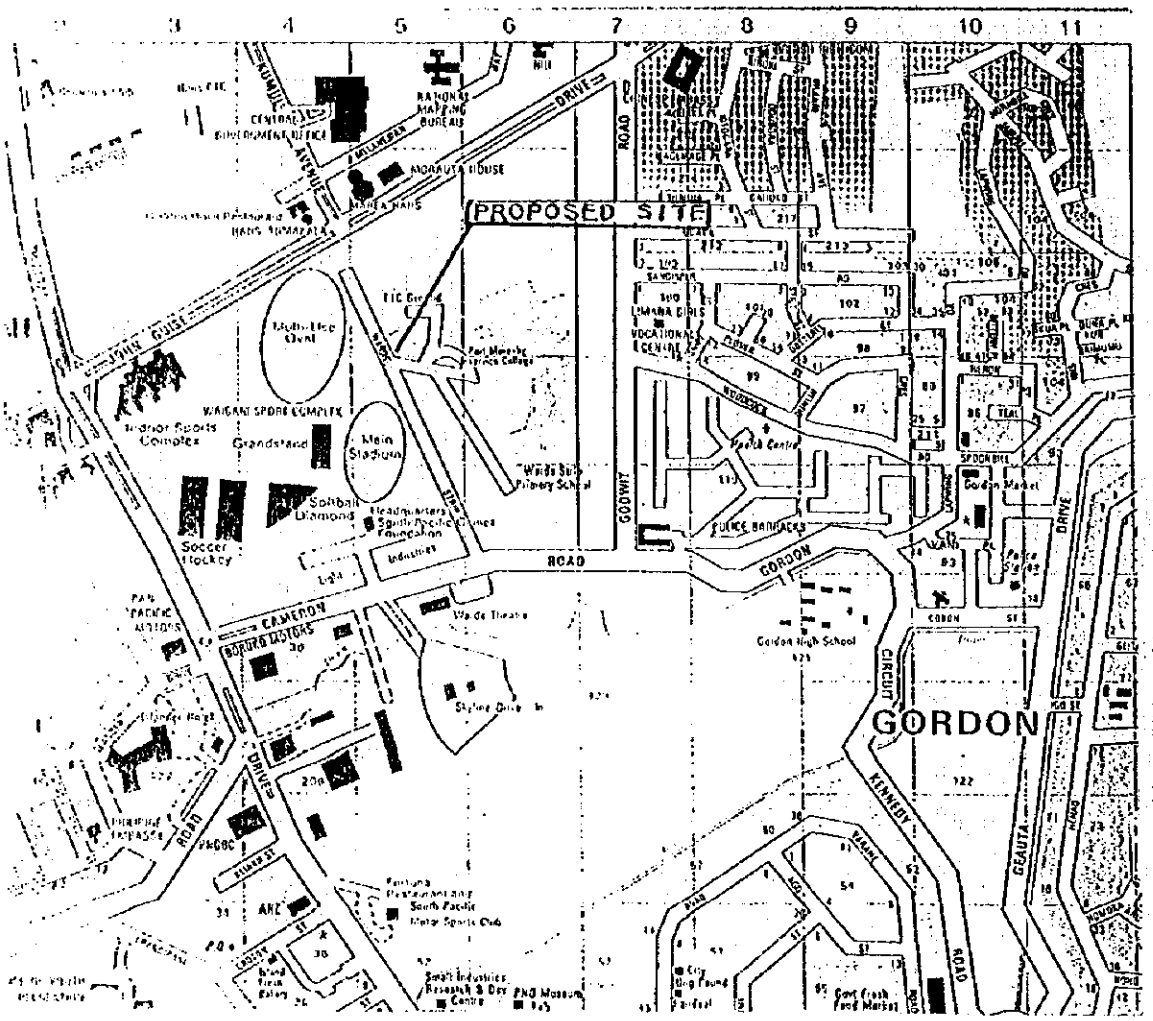


Figure 1 Location plan

SMEC

SMEC-PNG LTD

PROJECT:	The Centre for School Radio Programme in PNG	No:	J - 147
LOCATION:	Wards Strip, Gordon, N.C.D.		
CLIENT:	Kume sekkei Co, Ltd	Date:	April 1999

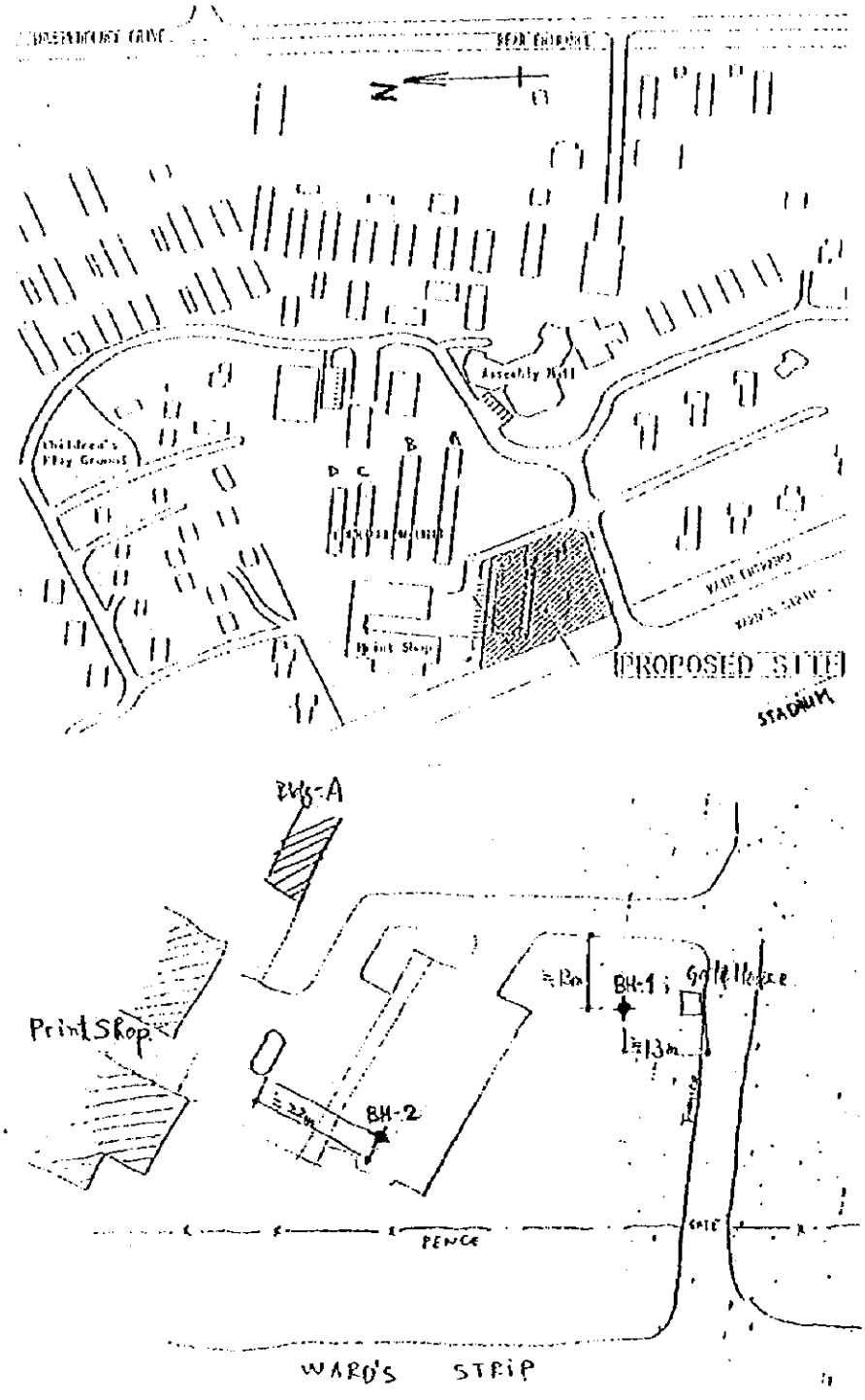


Figure 2 **Site Geomorphology Plan Showing Test Locations**

SMEC

SMEC-PNG LTD

PROJECT: The Centre for School Radio Programme in PNG No: J - 147
LOCATION: Wards Strip, Gordon, N.C.D.
CLIENT: Kume Sekkei Co, Ltd Date: April 1999

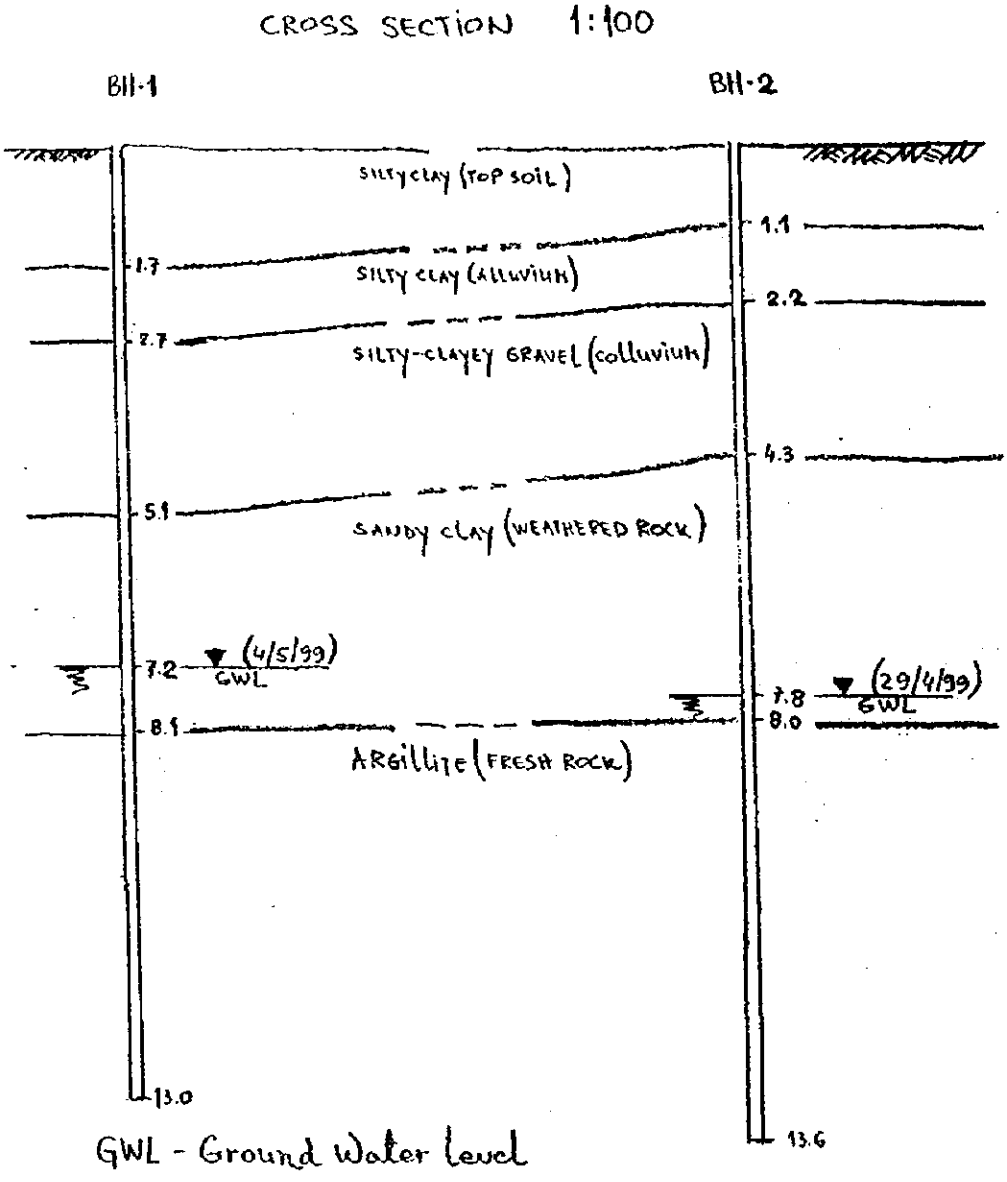
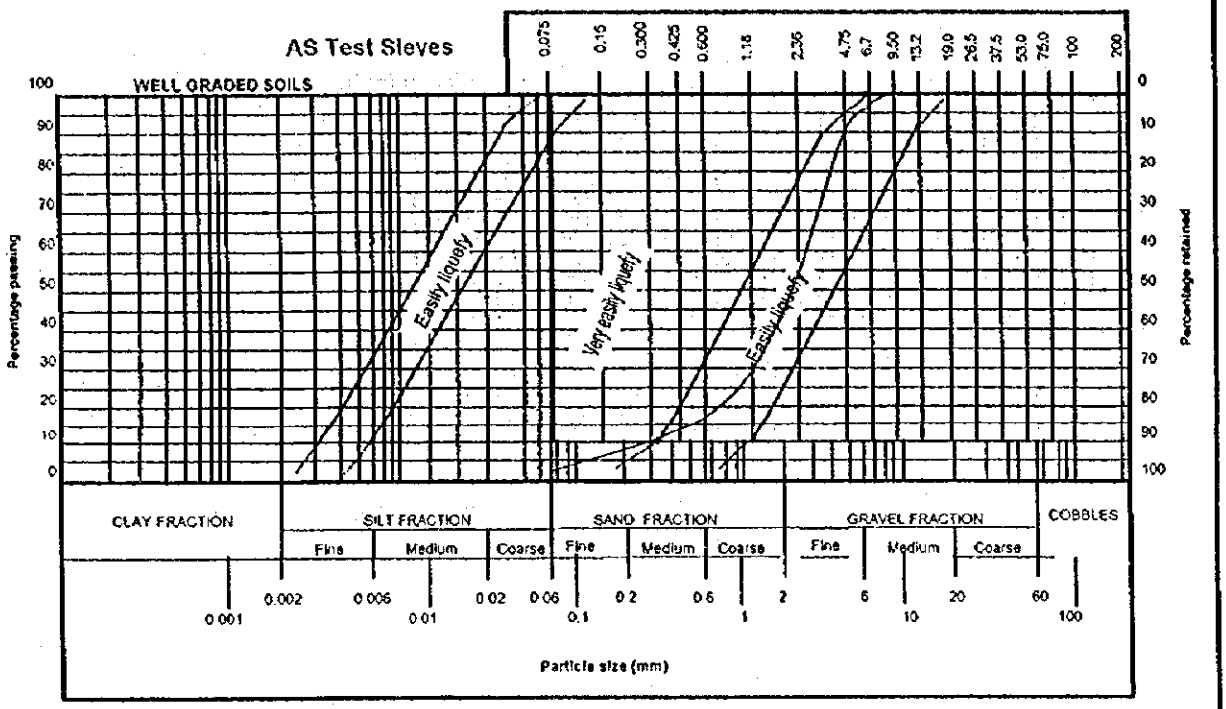


Figure 3 Borehole Site Profile

SMEC - Engineering Geology
Unit 5, Section 58, Lot 3, Waigani Drive, Gordons, NCD
PO Box 4468, BOROKO, NCD, Papua New Guinea
Phone: +675 325 1822 Fax: +675 325 3700
Email: smecpom@datec.com.pg

SOIL LIQUEFACTION POTENTIAL

Client: Kume Sekkei Co, Ltd.	Project number: J - 147
Project: The Centre for School Radio Programme	Location: Ward's Strip, Gordon, N.C.D. BH-2 (1.0-1.45 m)



Client: Kume Sekkei Co, Ltd.	Project number: J - 147
Project: The Centre for School Radio Programme	Location: Ward's Strip, Gordon, N.C.D. BH-2 (2.0-2.5 m)

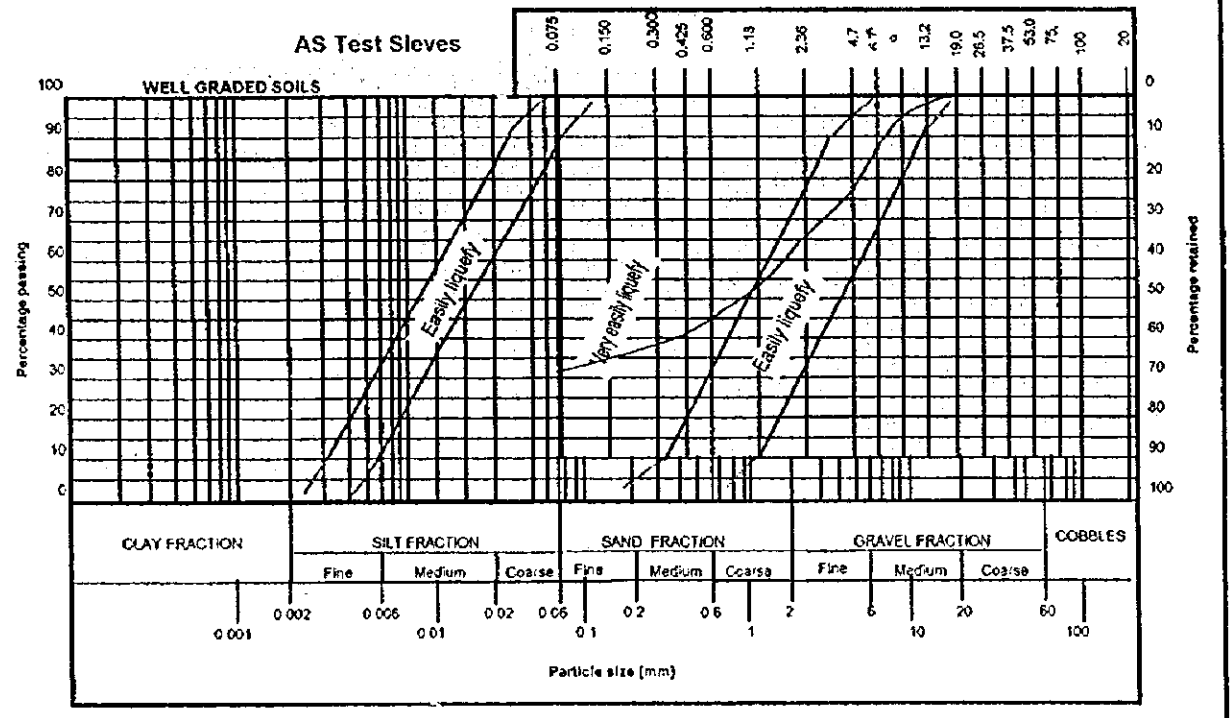


Figure 4 Iliquefaction Assessment, PSD Plots: Borehole No: 2

SMEC - Engineering Geology
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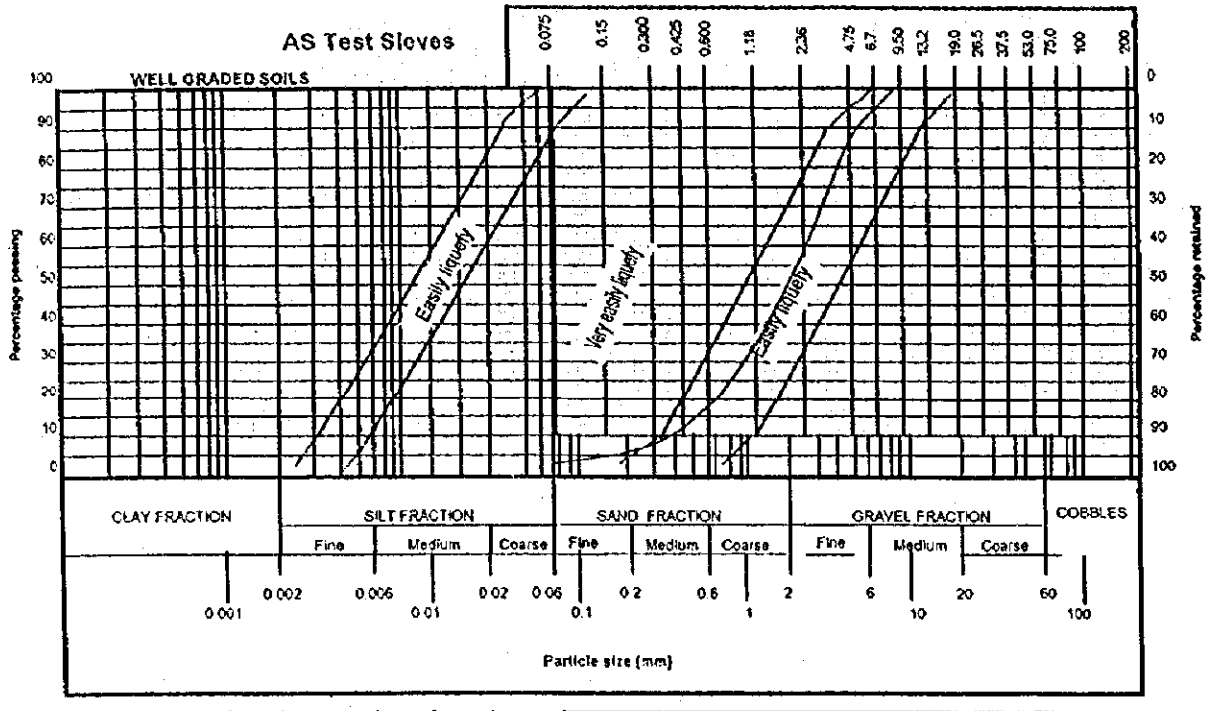
Email: smecpom@datec.com.pg

SOIL LIQUEFACTION POTENTIAL

Client: Kumo Sekkei Co, Ltd.	Project number: J - 147
Project: The Centre for School Radio Programme	Location: Ward's Strip, Gordon, N.C.D. BH-2 (3.0-3.45 m)



Client: Kume Sekkei Co, Ltd.	Project number: J - 147
Project: The Centre for School Radio Programme	Location: Ward's Strip, Gordon, N.C.D. BH-2 (3.6-3.8 m)

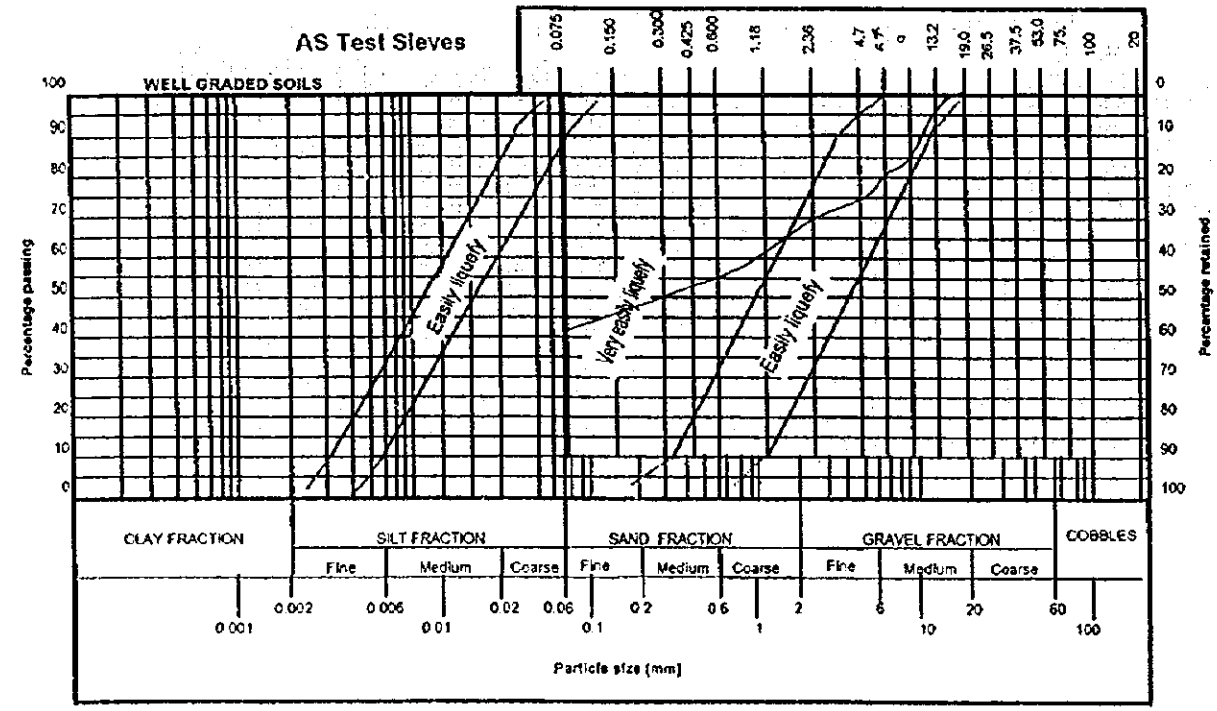


Figure 5 Iliquefaction Assessment, PSD Plots: Borehole No: 2

SMEC - Engineering Geology
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PO Box 4468, BOROKO, NCD, Papua New Guinea
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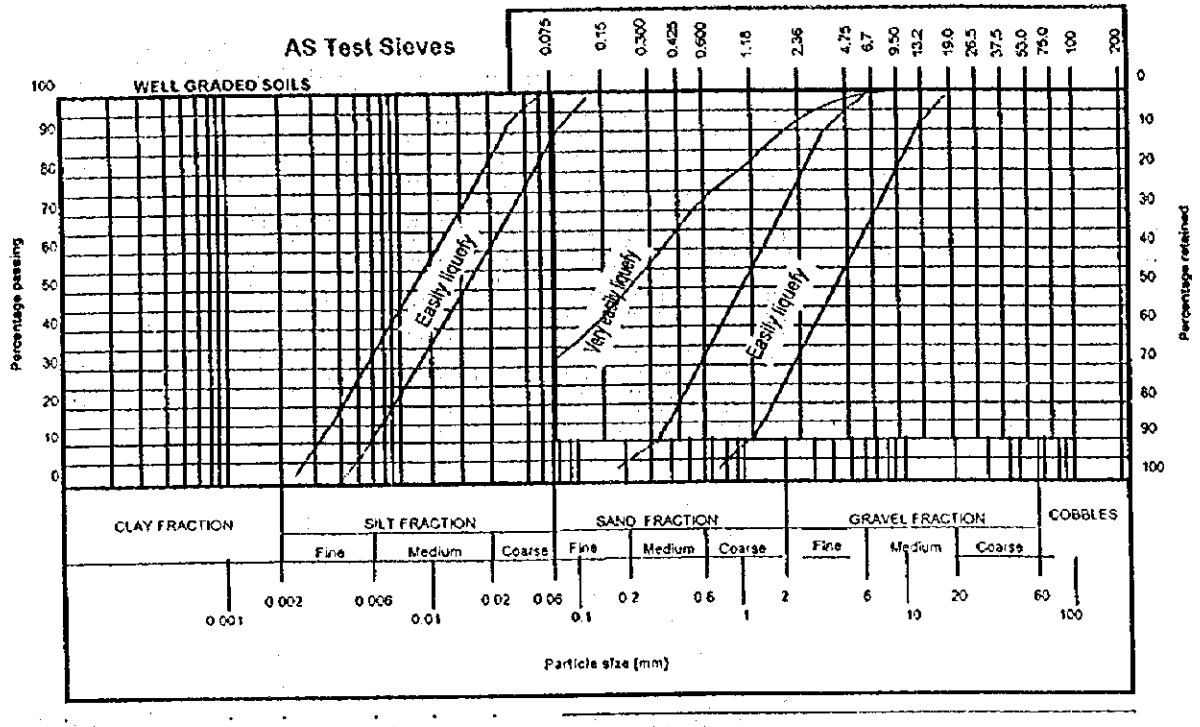
Email: smecpom@datec.com.pg

SOIL LIQUEFACTION POTENTIAL

Client: Kume Sekkei Co, Ltd.	Project number: J - 147
Project: The Centre for School Radio Programme	Location: Ward's Strip, Gordon, N.C.D. BH-2 (4.6-4.8 m)



Client: Kume Sekkei Co, Ltd.	Project number: J - 147
Project: The Centre for School Radio Programme	Location: Ward's Strip, Gordon, N.C.D. BH-2 (5.5-5.7 m)

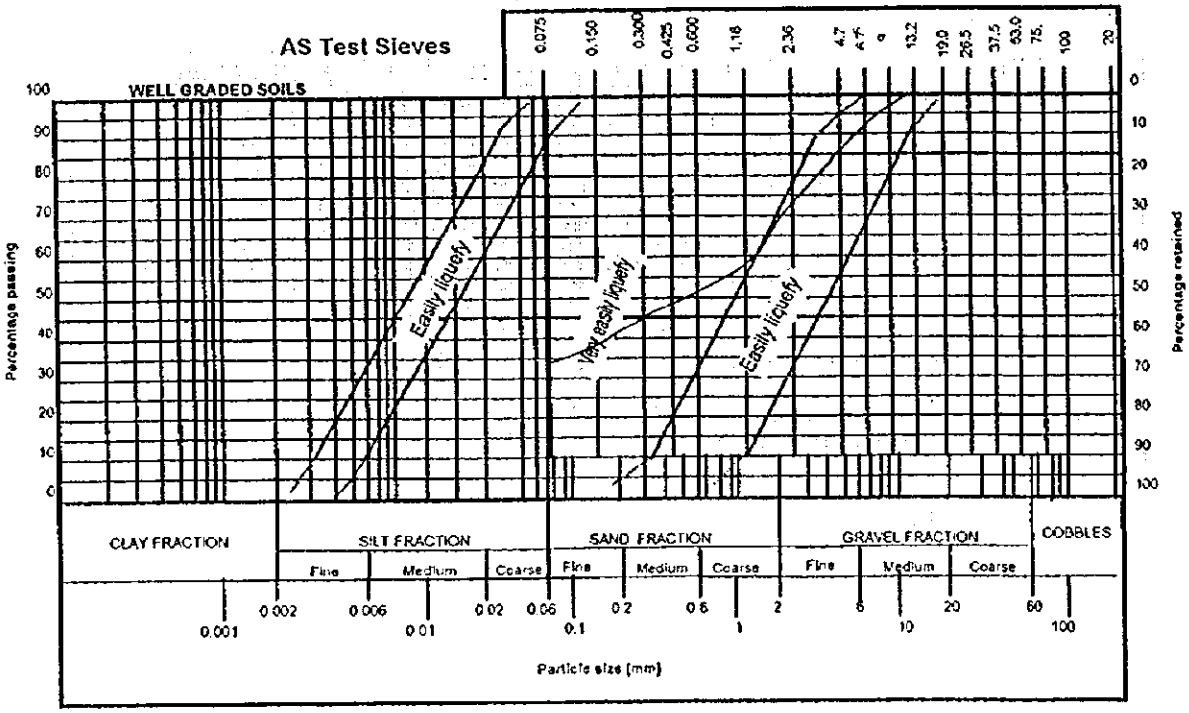


Figure 6 liquefaction Assessment, PSD Plots: Borehole No: 2

SMEC - Engineering Geology
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Email: smecpom@datec.com.pg

PROJECT:	The Centre for School Radio Programme in PNG	No:	J - 147
LOCATION:	Ward's Strip, Gordon, N. C. D.	BOREHOLE:	BH - 1
CLIENT:	Kume Sekkei Co, Ltd	DATE:	May '99

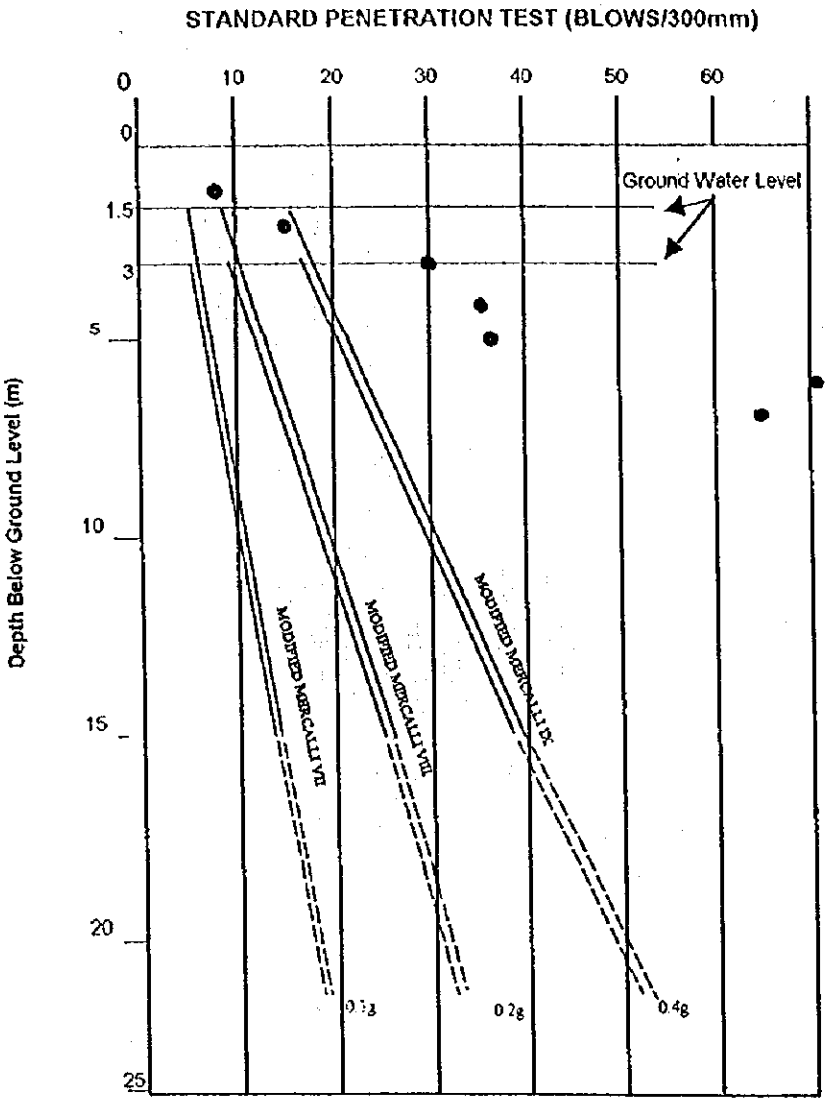

Figure 7 Liquefaction Assessment, SPT N(1)60 Plots - Borehole No: 1

SMEC - Engineering Geology
Unit 5, Section 63, Lot 3, Walgani Drive, Gordon, NCD
PO Box 4468, BOROKO, NCD, Papua New Guinea
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Email: smecpom@datec.com.pg

PROJECT: The Centre for School Radio Programme in PNG
LOCATION: Ward's Strip, Gordon, N. C. D.
CLIENT: Kume Sekkei Co, Ltd

No: J - 147
BOREHOLE: BH - 2
DATE: May '99

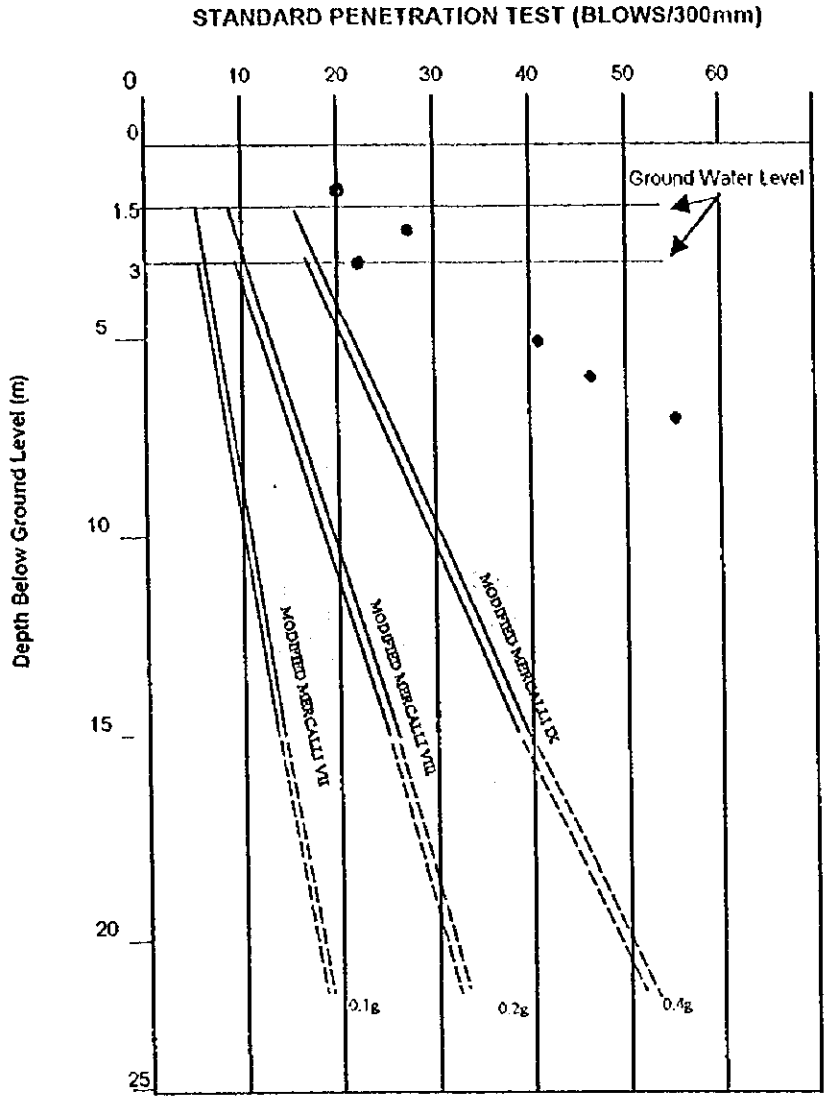


Figure 8 Liquefaction Assessment, SPT N(1)60 Plots - Borehole No: 2

APPENDIX A

ENGINEERING BOREHOLE LOGS

SMEC ENGINEERING GEOLOGY — BOREHOLE LOG

NATIONAL MEDIA CENTRE

BOREHOLE NO: BH - 1

PROJECT: NATIONAL MEDIA CENTRE
CLIENT: KUME SEKKEI CO. LIMITED
LOCATION: Ward's Strip, Port Moresby, N.C.D.
CONTRACTOR: CENTRAL DRILLING P/L

DRILL METHOD: Auger
DRILL MODEL: Gemko 17601
HOLE SIZE: 150 mm
DEPTH: 13.0 m
CASING SIZE:
CASING DEPTH:

DATE COMMENCED: 01/05/1999
DATE COMPLETED: 03/05/1999
CO-ORDINATES:
ELEVATION: DATUM:

JOB NO: PNG 3-147
LOGGED: S S D
CHECKED: J B V
APPROVED: R C G

Laboratory test results				field test						
% fines -75um	Atterberg limits LL (%)	Atterberg limits PI(%)	moisture (%)	SPT results	water level	samples	depth (m)	log	USC	SOIL DESCRIPTION
				1.0 m (2, 3, 5) N = 8		D1 1.0-1.45 B1 1.4-1.6	1.00		CH	SILTY CLAY: Black, firm consistency, medium to high plasticity, wet, clay some rounded max. dia. 10mm SiO2 gravels, with approx. 10-15% silty fraction. TOP SOIL
				2.0 m (2, 6, 9) N = 15		D2 2.0-2.45 U-50 2.0-2.3	1.70 2.00		CL	SILTY CLAY: Grey brown firm to stiff consistency, high plasticity, wet, calcareous clay, with some angular limestone fragments max. dia. 15mm, 5-10% and approx. 15% silty fraction. ALLUVIUM
				3.0 m (8,11, 19) N = 30		U-50 2.3 - 2.5 B2 2.2-2.3 B3	2.70 3.00		GM	SILTY-CLAYEY GRAVEL: Grey brown dense consistency medium to coarse (max. dia. 20mm) calcareous angular gravel, with approximately 10-15% silt and wet high plasticity clay. Gravel fragments comprise argilite and chert derived from Port Moresby Beds. COLLUVIUM
				4.0 m (9,13,23) N = 36		2.7-3.0 U-50 3.0-3.20 D3 3.0-3.42	4.00			
				5.0 m (5,14,24) N = 38		D4 4.0-4.45 B4 4.45-5.0	5.10 6.00			SANDY CLAY: Grey brown, stiff to hard consistency, high plasticity, wet, clay, with approximately 15% fine to coarse, angular sand and <5% fine angular (max. dia. 20mm) gravel. COMPLETELY TO HIGHY WEATHERED BEDROCK POSSIBLY FROM DOKUNA TUFF
				6.0 m (20,35,50) N = 85		D5 5.0-5.45 U-50 5.0-6.25 D6	6.00			
				7.0 m (14,29,36) N = 65	water ▼ 4/5/99	6.0-6.45 B5 7.0-8.0	7.00			
				8.0 m (52,bounce)		D7 8.0-8.15	8.00			

sampling
B bulk sample
D disturbed sample (sample number in brackets)
T tube sample (sample number in brackets)
D*, T* no recovery

field tests
permeability (cons=constant head, fall=falling head, rise=rising head test)
SPT N VALUE (blows per three lengths of 150 mm in brackets)
R= sample recovery
▼ = Water level in borehole, and date

notes

Remarks:

SHEET 1 OF 2

SMEC ENGINEERING GEOLOGY — BOREHOLE LOG

NATIONAL MEDIA CENTRE

BOREHOLE NO: BH - 1

PROJECT: NATIONAL MEDIA CENTRE
CLIENT : KUME SEKKEI CO, LIMITED
LOCATION: Ward's Strip, Port Moresby, N.C.D.
CONTRACTOR: CENTRAL DRILLING P/L

DRILL METHOD: Auger
DRILL MODEL: Gemko 17601
HOLE SIZE: 150 mm
DEPTH: 13.0 m
CASING
SIZE:
DEPTH:

DATE COMMENCED: 01/05/1999
DATE COMPLETED: 03/05/1999
CO ORDINATES:
ELEVATION DATUM

JOB NO. PNG 3-147
LOGGED: S & D
CHECKED: J B V.
APPROVED: R.C.G.

Laboratory test results				Field test			depth (m)	log	USC	SOIL DESCRIPTION
% fines -75um	Atterberg limits LL (%)	Atterberg limits PI(%)	moisture (%)	SPT results	water level	samples				
				8.0 m (52,bounce)		B6 8.0-9.0	8.10		CH	SANDY CLAY: Grey brown, stiff to hard consistency, high plasticity, wet, clat with approximately 15% fine to coarse, angular sand and < 5 % fine angular (max. dia. 20m) gravel. WEATHERED BEDROCK POSSIBLY DOKUNA TUFF
				9.0 m (24,50,Bounce)		B7 9.0-10.0	9.00		SW	BEDROCK: Grey-brown, slighlly weathered rock, high strenght, fine grained, possible intrusive , intensely fractured and contained high moisture. SLIGHTLY WEATHERED BEDROCK POSSIBLY DOKUNA TUFF
				10.0 m (26,bounce)		B8 10.0-11.0	10.00			
				11.0 m (23, bounce)			11.00			
				12.0 m (66,bounce)			12.00			
				13.0 m (bounce)			13.00			Hole terminated @ 13.0 metres, Mon 3 May 1999
							14.00			
							15.00			
							16.00			

sampling
B bulk sample
D disturbed sample (sample number in brackets)
T tube sample (sample number in brackets)
D*, T* no recovery

field tests
permeability
cons=constant head
fall=falling head
rise=rising head test
▼ = Water level in borehole, and date.

SPT N VALUE (blows per three lengths of 150 mm in brackets)
R=sample recovery

notes

Remarks:

SHEET 2 OF 2

SMEC ENGINEERING GEOLOGY — BOREHOLE LOG

NATIONAL MEDIA CENTRE

BOREHOLE NO: BH2

PROJECT: NATIONAL MEDIA CENTRE
CLIENT: KUWE SEKKEI CO, LIMITED
LOCATION: Ward's Strip, Port Moresby, N.C.D.
CONTRACTOR: CENTRAL DRILLING P/L

DRILL METHOD: Auger
DRILL MODEL: Gemko 17001
HOLE SIZE: 150 mm
DEPTH: 13.6 m
CASING
SIZE: HQ
DEPTH: 6.5 m

DATE COMMENCED: 27/05/99
DATE COMPLETED: 30/05/99
CO-ORDINATES:
ELEVATION: DATUM

JOB NO.: PNG J-147
LOGGED: S.S.D.
CHECKED: J.B.V.
APPROVED: R.C.G.

Laboratory test results				field test		depth (m)	log	USC	SOIL DESCRIPTION
% fines -75um	Atterberg limits LL (%)	Atterberg limits PI(%)	moisture (%)	SPT results	water level	samples			
			Bulk Density t/m3						
1.4	72.3	21.6	14.80% bulk den 2.07	1.0 m (6, 6, 14) N = 20	0D2.07	D1 1.0-1.45	1.00	CH	SILTY CLAY: Black, firm consistency, medium to high plasticity, wet clay some rounded max. dia. 10mm quartz gravel, with approx. 10-15% silty fraction. TOP SOIL
							1.10	CL	SILTY CLAY: Grey brown, firm to stiff consistency, high plasticity, wet, calcareous clay, with some angular limestone fragments max. dia. 15mm, 5-10% and approx. 15% silty fraction. ALLUVIUM
32.2			11%	2.0 m (8, 13, 15) N = 28		D2 2.0-2.45	2.00 2.20		
1.3	50.5	18	bulk den 2.31	3.0 m (4, 7, 16) N = 23	BD2.31	D3 3.0-3.45	3.00	GM	SILTY-CLAYEY GRAVEL: Grey brown dense consistency medium to coarse (max. dia. 20 mm) calcareous angular gravel, with approximately 10-15% silt and wet, high plasticity clay. COLLUVIUM
	42.6		21		BD2.10	B1 3.6-3.85			
				4.0 m push tube		U-50 4.0-4.30	4.00 4.30		
			bulk den			B2		CH	SANDY CLAY: Grey brown, stiff to hard consistency, high plasticity, wet, clay with approximately 15% fine to coarse, angular sand and <5% angular (max. dia. 20 mm) gravel. Gravel fragments comprise argillite and chert derived from Port Moresby Beds.
	33		2.07	5.0 m (8, 17,24) N = 41	BD2.07	4.6-4.8 D4 5.0-5.45	5.00		
			bulk den 2.23	6.0 m		B3			HIGHLY WEATHERED BEDROCK POSSIBLY DOKUNA TUFF
	33.2	NP	13.30%	(12,19,28) N = 47	BD2.23	5.5-5.70 D5 6.0-6.45	6.00		
				7.0 m (40,25,30) N = 55		B4 6.5-6.85	7.00		
				8.0 m	water ▼	D6 7.0-7.45			
				bounce	29/4/99		8.00		

sampling
B bulk sample
D disturbed sample (sample number in brackets)
T tube sample (sample number in brackets)
D*, T* no recovery

field tests
permeability
cons=constant head
fall=falling head
rise=rising head test
▼ = Water level in borehole, and date

SPT N VALUE (blows per three lengths of 150 mm in brackets)
R=sample recovery

notes
BD = Bulk Density of soil in t/m3

Remarks:
1 150mm bore auger from 0.0-8m.
2 8.0-13.0m rotary drill.

SHEET 1 OF 2

SMEC ENGINEERING GEOLOGY — BOREHOLE LOG

NATIONAL MEDIA CENTRE

BOREHOLE NO: BH2

PROJECT: NATIONAL MEDIA CENTRE	DRILL METHOD: Auger	DATE COMMENCED: 27/04/1999	JOB NO: PNG J-147
CLIENT: KUME SEKKEI CO, LIMITED	DRILL MODEL: Gemko 17601	DATE COMPLETED: 30/04/1999	LOGGED: S S D
LOCATION: Ward's Strip, Port Moresby, N.C.D.	HOLE SIZE: 150 mm DEPTH: 13.6 m	CASING SIZE: HQ DEPTH: 8.5 m	CO-ORDINATES	CHECKED: J.B.V.
CONTRACTOR: CENTRAL DRILLING P/L			ELEVATION: DATUM	APPROVED: R.C.G.

Laboratory test results				field test						
% fines -75um	Atterberg limits LL (%)	Atterberg limits PI(%)	moisture (%)	SPT results	water level	samples	depth (m)	log	USC	SOIL DESCRIPTION
				8.0 m bounce		U-50 7.5-7.80	8.00		CH	SANDY CLAY: Grey brown, stiff to hard consistency, high plasticity, wet, clay with approximately 15% fine to coarse, angular sand and <5% angular (max. dia. 20 mm) gravel. HIGHLY WEATHERED BEDROCK POSSIBLY DOKUNA TUFF
				9.0 m (5, 8, 21) N = 29		B5 7.80-7.95	9.00		SW	BEDROCK: Grey-brown, slightly weathered rock, high strenght, fine grained, possible intrusive , intensely fracturedand contained high moisture content. SLIGHTLY WEATHERED BEDROCK POSSIBLY DOKUNA TUFF
				10.0 m (4,41, b) bounce		B6 9.0-9.30 B7 10.0-10.30	10.00			
				11.0 m (40,bounce bounce		B8 11.0-11.1	11.00			
				12.0 m (66,bounce bounce		B9 12.0-12.1	12.00			
				13.0 m bounce		B10 no sample	13.00			
							13.60			Hole terminated @ 13.6 metres, Fri. 30 April 1999
							14.00			
							15.00			
							16.00			

sampling
B bulk sample
D disturbed sample (sample number in brackets)
T tube sample (sample number in brackets)
D*, T* no recovery

field tests — SPT N VALUE
permeability — (blows per three
cons=constant head — lengths of 150 mm
fal=falling head — in brackets)
rise=rising head test — R=sample recovery

▼ = Water level in borehole, and date

notes

Remarks:

SHEET 2 OF 2

APPENDIX B

LABORATORY TEST RESULTS

SMEC - Engineering Geology
Unit 5, Section 68, Lot 3, Walgani Drive, Gordon, NCD
PO Box 4468, BOROKO, NCD, Papua New Guinea
Phone: +675 325 1822 Fax: +675 325 3780
Email: smecpom@datec.com.pg

SUMMARY OF LABORATORY TEST RESULTS

CLIENT: KUME SEKKEI Co, LTD DATE: 08 May 1999

PROJECT: The Centre for School Radio Programme In PNG PROJECT NO.: J 147

LOCATION: Ward's Strip, Gordon, N.C.D.

LOCATION		BH - 2	BH - 2	BH - 2	BH - 2
DEPTH (metres)		1.0 - 1.45	2.0 - 2.5	3.0 - 3.45	3.6 - 3.8
DESCRIPTION					
NATURAL MOISTURE CONTENT %		14.8	11.0		
PARTICLE SIZE DISTRIBUTION					
Percent passing A.S. sieve	75 mm				
	53 mm				
	37 mm				
	26 mm				
	19 mm		100.0		100.0
	13.2 mm		96.9		91.1
	9.5 mm	100	93.5	100.0	85.6
	6.7 mm	96.6	86.1	93.5	82.2
	4.75 mm	88.8	79.8	85.5	77.8
	2.36 mm	52.9	66.5	55.8	70.1
	0.600 µm	17.5	46.0	17.7	57.2
	0.425 µm	13.1	42.5	12.3	54.5
	0.300 µm	10.2	40.1	9.2	52.4
	0.150 µm	5.2	36.2	4.5	48.1
	0.075 µm	1.4	32.2	1.3	42.6
ATTERBERG LIMITS %					
Liquid Limit		72.3		50.5	
Plastic Limit		21.6		18.0	
LINEAR SHRINKAGE %		17.3		13.5	
MAXIMUM DRY DENSITY t/m^3					
OPTIMUM MOISTURE CONTENT %					
SOAKED C.B.R. %					
ESTIMATED C.B.R. %					
* MR 76 G.R.					
Bulk Density t/ m^3		2.07		2.31	2.10
Soil pH					

* Department of Main Roads, N.S.W. Form MR 76
ø Road Construction Authority of Victoria, Bulletin No. 31

DATE CHECKED:	REPORT NO.:	CHECKED BY:
13 May 1999	J - 147	J.Vracar

SMEC - Engineering Geology
Unit 6, Section 68, Lot 3, Walgani Drive, Gordon, NCD
PO Box 4468, BOROKO, NCD, Papua New Guinea
Phone: +675 325 1822 Fax: +675 325 3780
Email: smecpom@datec.com.pg

SUMMARY OF LABORATORY TEST RESULTS

CLIENT: KUME SEKKEI Co, LTD DATE: 08 May 1999

PROJECT: The Centre for School Radio Programme in PNG PROJECT NO.: J 147

LOCATION: Ward's Strip, Gordon, N.C.D.

LOCATION		BH - 2	BH - 2		
DEPTH (metres)		4.6 - 4.8	5.5 - 5.7		
DESCRIPTION					
NATURAL MOISTURE CONTENT %			13.3		
PARTICLE SIZE DISTRIBUTION					
	75 mm				
	53 mm				
	37 mm				
	26 mm				
	19 mm				
	13.2 mm		100.0		
Percent	9.5 mm	100.0	96.6		
passing	6.7 mm	99.7	90.7		
A.S. sieve	4.75 mm	98.8	83.5		
	2.36 mm	93.4	70.4		
	0.600 µm	72.1	51.2		
	0.425 µm	64.2	47.7		
	0.300 µm	56.9	44.9		
	0.150 µm	42.8	36.4		
	0.075 µm	33.0	33.2		
ATTERBERG LIMITS %					
Liquid Limit			Non Plastic		
Plastic Limit					
LINEAR SHRINKAGE %					
MAXIMUM DRY DENSITY t/m^3					
OPTIMUM MOISTURE CONTENT %					
SOAKED C.B.R. %					
Electrical conductivity (nS/cm)					
Bulk Density t/ m^3		2.07	2.23		
water pH					

* Department of Main Roads, N.S.W. Form MR 76
ø Road Construction Authority of Victoria, Bulletin No. 31

DATE CHECKED:	REPORT NO.:	CHECKED BY:
13 May 1999	J - 147	J.Vracar

AUSTRALIAN SOIL TESTING PTY LTD.

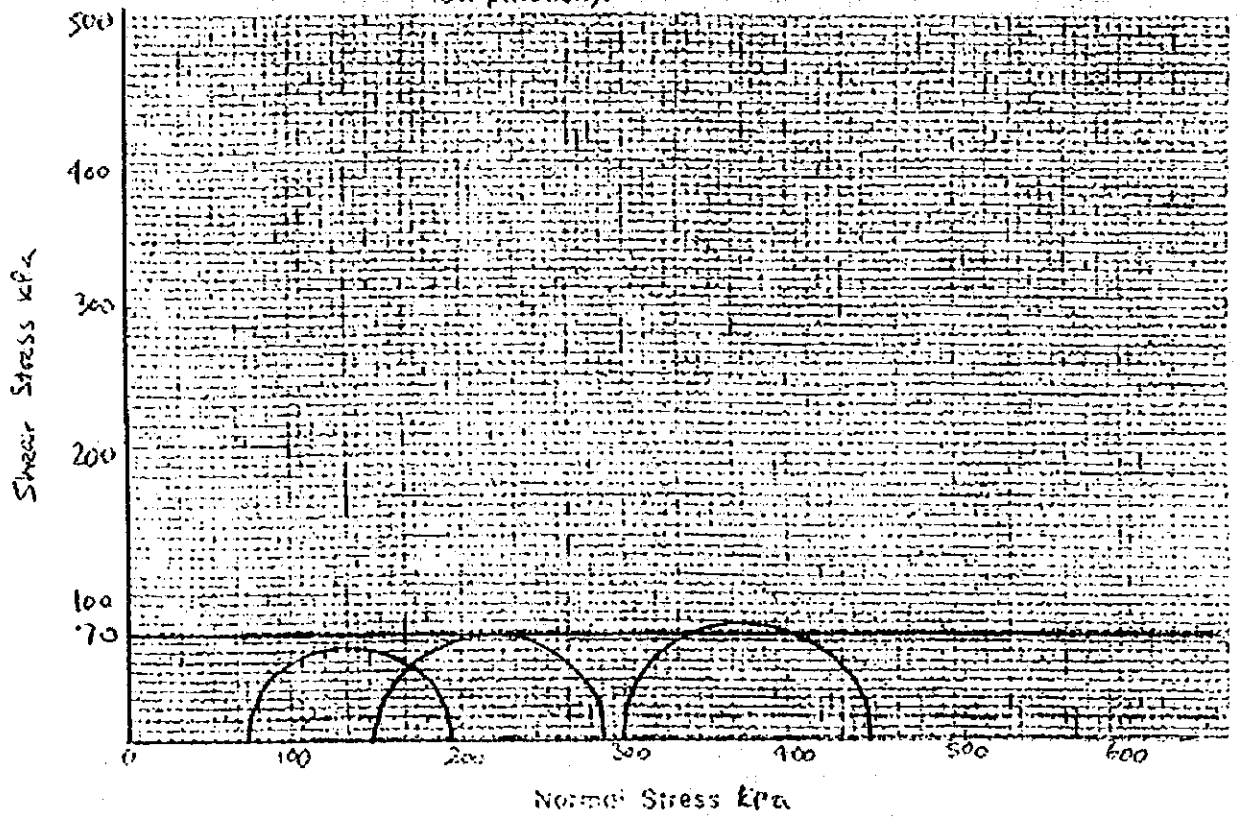
SATURATED UNDRAINED TRIAXIAL TEST REPORT

CLIENT: EARTHTECH LABORATORIES

PROJECT: SMEC - PNG LTD. National Media Centre Project PNG

SAMPLE SOURCE: 134/99, BH 1: 2.30 -2.50m LABORATORY NO: 20986

SAMPLE DESCRIPTION: CLAYEY SILTY SAND: grey, fine to medium sand, low plasticity.



COHESION (kPa)	70	FRICTION (deg)			0.0
MOISTURE CONTENT (%)	N/A	DRY DENSITY (t / c.m.)			N/A
SAMPLE DIMENSIONS	Diameter(mm)	47.7		Length (mm)	99.5
CONFINING PRESSURE (kPa)	75	150	200		
PRINCIPAL DEVIATOR STRESS (kPa)	316	335	350		
STRAIN AT FAILURE (%)	4.5	7.0	9.0		
FAILURE MODE	Plastic		Rate of strain (mm/min)		1.0
DESCRIPTION OF FAILURE	-				
DATE SAMPLED	Unknown	DATE TESTED		26/5/99	
TESTING METHOD	U50 Push Tube				
FAILURE CRITERIA	Drop in max principle stress / less than 1% increase over 0.5% strain				

TEST METHOD: AS1289 6.4.1

Form: TX01.1: Issue 2: Nov 1996

SIGNED

DATE 26/5/99

AUSTRALIAN SOIL TESTING PTY LTD. ACN 003 480 813
[illegible] Street Rocklea NSW 2216 Tel 9597 5599, 9597 3236 Fax 9597 2442
Email: [illegible]@bigpond.com

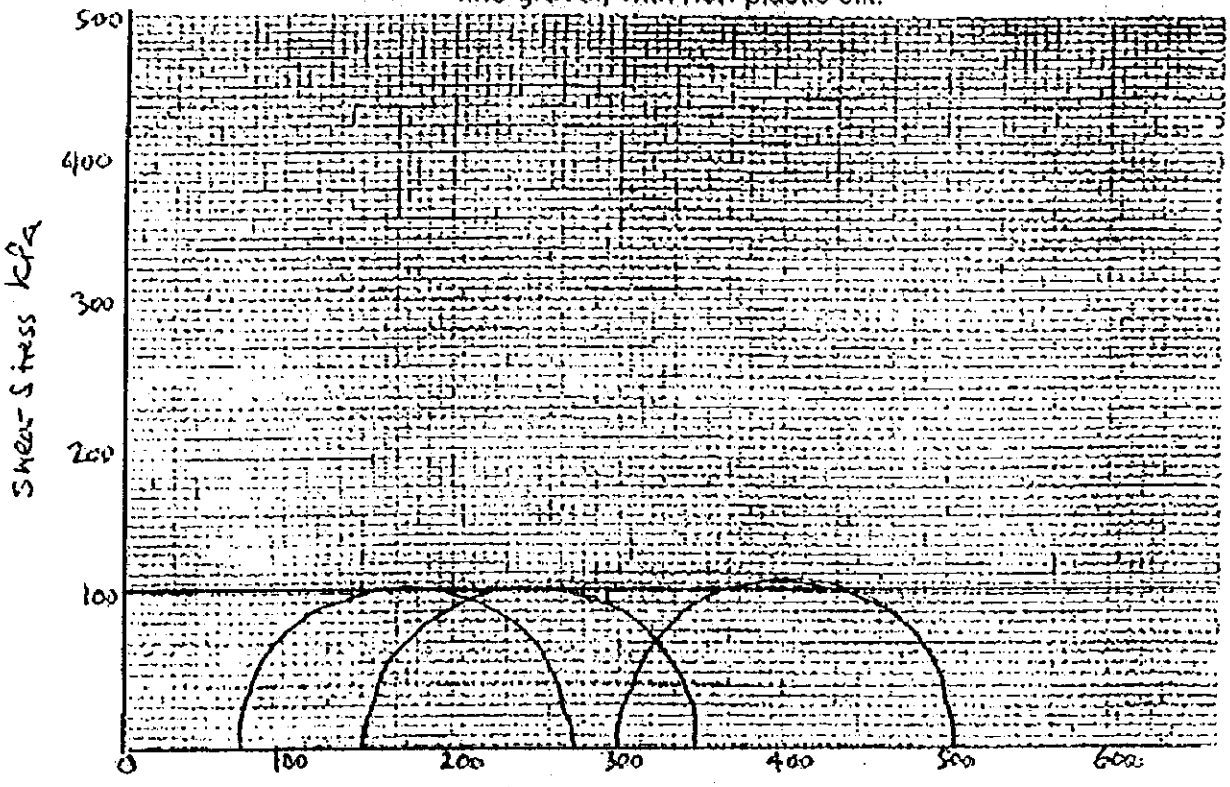
SATURATED UNDRAINED TRIAXIAL TEST REPORT

CLIENT: EARTHTECH LABORATORIES

PROJECT: SMEC - PNG LTD, National Media Centre Project PNG

SAMPLE SOURCE: 138/99, BH 2: 8.00 - 8.50m LABORATORY NO: 20987

SAMPLE DESCRIPTION: GRAVELLY SAND, brown, fine to coarse sand, fine gravel, with non-plastic silt.



COHESION (kPa)	102	FRICTION (deg)		0.0
MOISTURE CONTENT (%)	33.1	DRY DENSITY (t / c.m.)		1.53
SAMPLE DIMENSIONS	Diameter (mm) 46.0		Length (mm)	100.0
CONFINING PRESSURE (kPa)	75	150	300	
PEAK DEVIATOR STRESS (kPa)	288	202	311	
STRAIN AT FAILURE (%)	17.5	16.5	22	
FAILURE MODE	Plastic		Rate of strain (mm/min)	1.0
DESCRIPTION OF FAILURE	-			
DATE SAMPLED	Unknown	DATE TESTED	20/5/99	
SAMPLING METHOD	U50 Push Tube			
FAILURE CRITERIA	Drop in max principle stress / less than 1% increase over 0.5% strain.			

Test Method: AS1289 6.4.1

Form TX01-1 Issue 2: Nov 1998

SIGNED

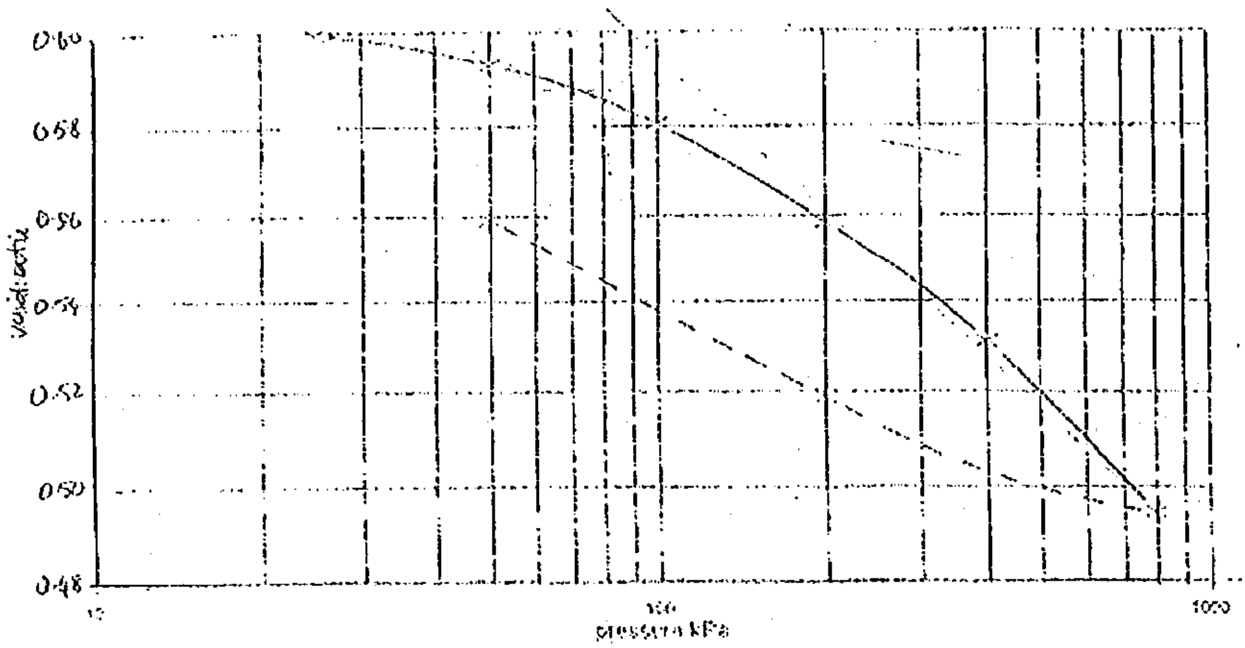
20/5/99
DATE

EARTHTECH LABORATORIES (NQ)
Soils and Engineering Materials Testing

t/a Earthtech Laboratories (NQ)
P.O. Box 7759
Cairns, Q. 4870
Telephone: (07) 4035 2190
Facsimile: (07) 4035 2174

Client	SMEC - PNG	Report No:	DU
Project	National Media Centre PNG	Job No:	1(4)
Date sampled:	delivered 6/5/99	Date tested:	8/5/99
Sampled by	client	Tested by:	AF
		Checked by:	AF

ONE DIMENSIONAL CONSOLIDATION TEST REPORT AS 1289 6.6.1 - 1998



Sample No:	133/99	Source:	BH 1 2.00 to 2.25 m			
Description	CLAY (CH): dark grey, high plasticity, trace of fine sand, some fine gravel					
Initial Moisture Content	21.2 %	Initial Dry Density:	1.654 t/m3			
Assumed Particle Density	2.65 g/cc	Initial Voids Ratio:	0.602			
Initial Degree of Saturation	68 %	Sample Condition:	inundated			
Load at Inundation	12.5 kPa					
Pressure kPa	25	50	100	200	400	800
Void Ratio e	0.600	0.593	0.581	0.558	0.531	0.494
Cv m2/yr	1.69	2.10	1.85	0.81	0.41	0.26
Mv m2/kN	5.76E-05	1.13E-04	1.33E-04	1.36E-04	1.11E-04	8.39E-05
K m/y	9.56E-04	2.33E-03	2.41E-03	1.08E-03	4.51E-04	2.14E-04

Remarks: Sample swelled at 12.5kPa loading.

Preliminary results issued: 19/5/99 $C_c = 0.11$ Page 1 of 7

REF: QPRGFRPT1233651 issue 11/93

Date: 19.5.99

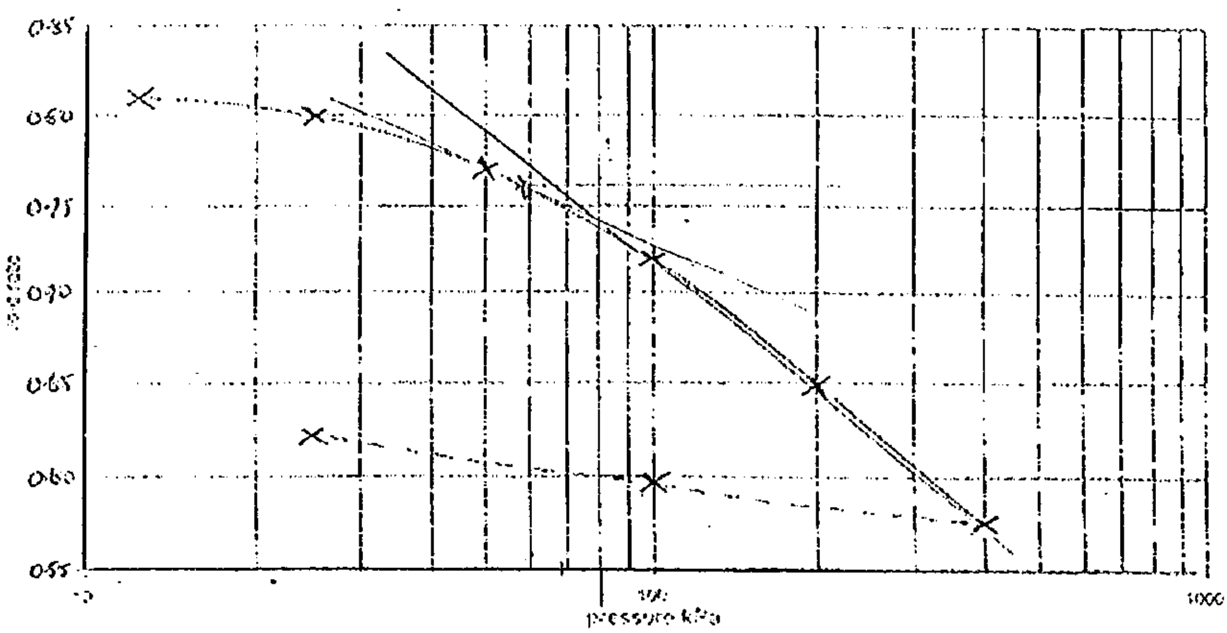
Authorised Signature: [signature]

EARTHTECH LABORATORIES (NQ)
Soils and Engineering Materials Testing

via Earthtech Laboratories (NQ)
P.O. Box 7759
Cairns, Q. 4870
Telephone: (07) 4035 2190
Facsimile: (07) 4035 2174

Client	SMEC - PNG	Report No:	DV
Project	National Media Centre PNG	Job No:	1(4)
Date sampled	delivered 6/5/99	Date tested:	8/5/99
Sampled by	client	Tested by:	AF
		Checked by:	AF

ONE DIMENSIONAL CONSOLIDATION TEST REPORT AS 1289 6.6.1 - 1998



Sample No: 134/99 Source: BH 1 (2.30 to 2.50 m)

Description: Gravely sandy CLAY (CH) yellow brown, high plasticity, fine to coarse sand, some fine to medium sub angular gravel.

Initial Moisture Content:	31.6 %	Initial Dry Density	1.458 t/m3
Assumed Particle Density	2.65 g/cc	Initial Voids Ratio	0.817
Initial Degree of Saturation:	66 %	Sample Condition:	inundated
Load at Inundation	12.5 kPa		

Pressure kPa	12.5	25	50	100	200	400
Void Ratio e	0.809	0.798	0.770	0.720	0.549	0.575
Cv m²/yr	0.89	2.22	0.43	0.60	0.43	0.27
Mv m²/kN	3.55E-04	4.08E-04	5.14E-04	5.32E-04	4.63E-04	3.33E-04
k (insitu) m/sec [illegible]	3.09E-03	8.90E-03	2.17E-03	3.13E-03	1.94E-03	8.70E-04

Remarks:

Preliminary results issued

$C_c = 0.24$

FILE: [illegible]

issue 11/98

Date: 17.5.99

Authorised Signature:

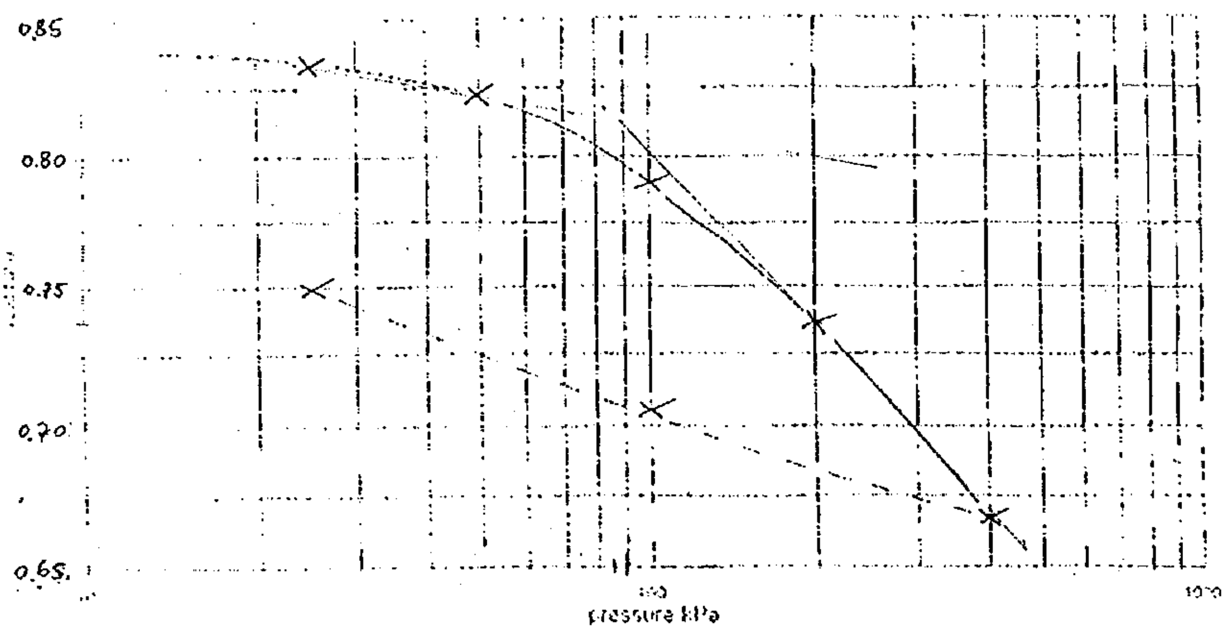
A.S.T. (Qld) Pty. Ltd.
t/a Earthtech Laboratories (NQ)
P.O. Box 7759
Cairns, Q. 4870
Telephone: (07) 4035 2190
Facsimile: (07) 4035 2174

EARTHTECH LABORATORIES (NQ)

Soils and Engineering Materials Testing

Client	SMEC - PNG	Report No:	DX
Project	National Media Centre PNG	Job No	1(4)
Date sampled	delivered 6/5/99	Date tested	18/5/99
Sampled by	client	Tested by	AF
		Checked by	AF

ONE DIMENSIONAL CONSOLIDATION TEST REPORT AS 1289 6.6.1 - 1998



Sample No	155/99	Source	BH 1 3.00 to 3.20 m
Description	CLAY (CH) dark grey brown and grey mottled, high plasticity, some fine to coarse sand, some fine gravel		

Initial Moisture Content:	29.2 %	Initial Dry Density:	1.436 t/m3
Assumed Particle Density:	2.65 g/cc	Initial Voids Ratio.	0.845
Initial Degree of Saturation:	58 %	Sample Condition:	inundated
Load at Inundation	12.5 kPa		

Pressure kPa	12.5	25	50	100	200	40
Void Ratio	0.839	0.834	0.822	0.790	0.737	0.66
Cv m2/yr	2.41	0.42	3.33	1.16	0.37	0.1
Mv m2/kN	2.66E-04	2.48E-04	2.50E-04	3.00E-04	2.94E-04	2.40E-0
K m/yr	6.29E-03	1.01E-03	8.17E-03	3.41E-03	1.06E-03	3.62E-0

Remarks:

Preliminary results issued:

$C_c = 0.23$

Page 1 of 7

issue 1.19

Date: 27/5/99

Authorised Signature

The Measurement proof book

No. W-91066
Date : 24, May 1999

Messrs. The stock company
The design office KUME

We report the result of the measurement on the following street.

Tokyo Technical Service Corp.
6-7-6 Nakakasai Edogawa-ku
Tokyo
Tel: 03-3688-3284

The environment measurement man :
Tsutomu Masuko

The analysis taking charge person :
Yuzou Fujii

The gathering taking charge :
The receipt

Sample Name	The water supply bureau in Port-Moresby of PAPUA NEW GUINEA
Sampling Date	13. May 1999
Examination purpose	Propriety of a water quality standard in water supply law at JAPAN
The examination classification	Drink water

No	The object of the measurement	The unit	Results	The way of measuring	Regulative Standard
1	The hydrogen ion concentration (pH)	--	7.3	JIS K 0101-11.1	5.8～8.6
2	Turbidity Standard Solution	°	Below 1°	JIS K 0101-9.1	2 Below
3	The electricity's transmission	μS/cm	76	JIS K 0101-12.	--
4	All the hardness (CaCO3)	mg/l	31	JIS K 0101-15. 1	300 Below
5	The calcium hardness	mg/l	16	JIS K 0101-15. 2	--
6	Iron	mg/l	0.03 Under	JIS K 0101-60. 2	0.3 Below
7	Manganese	mg/l	0.005 Under	JIS K 0101-58. 2	0.05 Below
8	The acid consumption quantity	mg/l	26	JIS K 0101-13. 1	--
9	The chlorination ion	mg/l	1.7	JIS K 0101-32. 5	200 Below
10	Nitric acid ion	mg/l	7.0	JIS K 0101-37. 2	10 Below
11	Silica (SiO2)	mg/l	14	JIS K 0101-44. 3	--
12	Color Standard Solution	°	Below 1°	JIS K 0101-10. 1	5 Below

Method of Analysis are based on The Ministry of Health and Welfare Oder No.69

7. References

7. References

	Issue	Name of Document	Publish Year
1	DOE	School Broadcast Schedule 1999	1998
2	DOE	National Education Plan Volume A 1995-2004	1995
3	DOE	A Handbook for Elementary Education	1997
4	DOE	The Primary Curriculum in Papua New Guinea	1997
5	World Bank	Papua New Guinea Education Project World Bank Review Mission , March - April 1998	1998
6	DOE	Let's Use English English Radio Magazine Teachers Notes	1983
7	DOE	English Radio Time Teachers Guide Grade One	1997
8	DOE	English Radio Magazine Grade Six Teachers' Book	1983
9	DOE	The State of Education in PNG	1999
10	DOE	The Education Reform	1990
11	DOE	School Age Population Statistics	1997
12	DOE	Enrolment and Staffing Statistics	1996
13	DOE	The National Education Plan and Implementation of The Education Reform	1998
14	DOE	Radio Science Grade Four - Six	1996
15	DOE	KIPA The Dreamer Teachers Notes for Grade 6	1983
16	DOE	Listening Time Standard Two	
17	DOE	School Broadcasts Health Education for Grade 5 Teachers Notes	1985
18	DOE	School Broadcasts Let's Use English Grade 5 Teachers Notes	1983
19	DOE	Christian Education Grade 6 Teachers Notes	1989
20	DOE	Radio Magazine for Standard III Teachers' Notes	
21	DOE	Community Life Teaching Notes Grade Four - Six Term One - Three	1994
22	DOE	Community Life Handbook Grade 4 Terms 3 & 4	1990
23	DOE	School Broadcasts Dr. Kanini Health Education for Grade 5, Teachers Notes	
24	DOE	Radio Science Grade Four Children's Science Book	1996
25	DOE	Curriculum Materials Handbook Education Television 1998-1999	1998
26	DOE	Teachers' Notes Science Series I,II, Kisim Save	1997
27	DOE	Lower Primary Grade 3-5, Language Syllabus	1998
28	DOE	Lower Primary Grade 3-5, Mathematics Syllabus	1998
29	DOE	Lower Primary Grade 3-5, Community Living Syllabus	1998
30	DOE	Lower Primary Grade 3-5, Environmental Studies Syllabus	1998
31	National Statistical Office	Report on the 1990 National Population and Housing Census in Papua New Guinea	1994
32	National Statistical Office	Consumer Price Index December Quarter 1998	1998