CHAPTER 5 PROJECT EVALUATION AND CONCLUSION

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5-1 Expected Effects of the Project

The Division of Biomedical Engineering Services (BES) currently performs medical equipment maintenance and management tasks, ranging from the purchase to the disposal of medical equipment, under the control of the Laboratory Services of the Ministry of Health and Women's Affairs. However, BES is presently confronted with an absolute shortage of facilities and repair equipment, and it is unable to expand its staff in order to cope with repair needs. Therefore, BES finds it difficult to expand the scope of its work, or to meet the ever-increasing demand for its medical equipment repair services. This project is aimed at remodeling part of BES's existing facilities and providing BES with necessary repair equipment, thereby helping the Government of Sri Lanka complete its plan to improve BES's facilities and equipment. As such, this project can be expected to have the following effects:

(1) Improvement of BES's Repair Workshops

In 1990, 4,355 pieces of medical equipment were repaired at BES Colombo Centre's repair workshops. However, that figure accounts for only about 34 percent of the total number of pieces which needed It often takes a long time to repair medical equipment, and repair. BES's workshops are unable to efficiently handle the hospital's requests for repairs. As a result, much medical equipment is left unused, while some is used despite being considered out of order. This obviously damages efficiency, reliability, and safety. The total floor area of BES's repair workshops is 1,015m², which is very small, and the existing facilities, which used to serve as coconut fibre warehouses, are quite outdated. Therefore it is impossible to increase the number of repair workers, or to repair sophisticated electronic equipment and precision components. When new workshops

with a total floor area of 1,211m² are constructed, and the number of repair workers is increased from 73 to 105 persons under this project, as many as 4,000 pieces of middle level medical equipment, which requires high level repair technologies, such as X-ray machines and ultrasonic devices, will be repaired at BES's repair workshops every year. On the other hand, up to 2,700 pieces of basic level medical equipment which do not require high level repair technologies, such as sphygmomanometers, suction units and instrument sterilisers, will be repaired at the workshops every year. In other words, about 93 percent more than the 4,300 pieces of middle level equipment which needed repair at public medical institutions in 1990, and about 32 percent more of the total amount of damaged basic level equipment for the same year will be repaired at the workshop annually.

With regard to basic level medical equipment, about 2,500 pieces will be repaired through BES's two mobile workshops, and together with about 3,500 pieces of in-house repair, 6,000 repairs will be handled by BES's repair workshops. This means that BES will be able to meet about 70 percent of the total demand for repair of basic medical equipment in 1990. As a result, BES's repair workshop's repair capabilities, which have so far been able to meet only about 23 percent of the total demand for repair of basic level medical equipment and about 55 percent of the total demand for repair of middle level medical equipment, will be drastically increased. Moreover, it will become possible for these workshops to confirm the safety of the medical equipment repaired. This will contribute directly to an improvement in the quality of the health services where such equipment is used.

(2) Improvement of the Provincial Repair Workshops

The Government of Sri Lanka's written request included the establishment of eight provincial workshops as regional bases for

repairs of basic level medical equipment. As a result of the basic design study team's discussions with representatives of the Government of Sri Lanka, it was concluded that as the first step of such a project, a provincial workshop should be set up as a test case in the Galle Teaching Hospital, Southern Province.

At the proposed provincial workshop, about 800 pieces of basic level medical equipment will be repaired per year. In addition, the scope of work will be gradually expanded to include maintenance and inspection of medical equipment, adjustment of middle level medical equipment, and troubleshooting. The establishment of this provincial workshop is expected to greatly contribute to the improvement in the quality of the regional health services.

(3) Improvement of the Handling Facilities

In principle, medical equipment purchased by the Government of Sri Lanka for use at the country's public medical institutions is first transported to BES from ports of disembarkation. However, large-sized equipment is transported directly to hospitals where it is to be Unfortunately, BES's existing warehouses have a total installed. floor area of only 348m². This shortage of area has caused a part (floor space: 35m²) of the administration building to be used as a storage to store purchased medical equipment, and, even garages are being used for storage. Relatively heavy medical equipment is handled manually, which is very likely to damage this equipment. In this project, therefore, the floor area of the proposed warehouse to store purchased medical equipment is set at 432m², which is equivalent to the largest space occupied by medical equipment purchased in 1990. As the city of Colombo is situated in an environment of high temperatures and high humidity, with relative humidity often reaching 80 percent to 100 percent, dehumidifying work will be carried out at night when

relative humidity is higher. This will minimise the cost for operating the warehouse.

Inspection of medical equipment should be conducted for quantity, compliance with specifications, and performance, as soon as it arrives Approved equipment should be immediately delivered to the warehouse. to the hospitals. However, such inspection has never been conducted at BES due to lack of necessary facilities and equipment. As a result, there have been many reports of inefficient handling of equipment, breakdown after its delivery to hospitals, and of poor complaint handling during the term of warranty. For this reason, a handling space, an inspection/testing room, and a packing room are included in this project. This arrangement will result in establishment of an efficient handling system -- from acquisition to Thus, these facilities are expected to inspection and delivery. greatly contribute to an improvement in BES's medical equipment maintenance and management capabilities. If administration and record management systems are developed through technical cooperation, the improvement will be ever greater.

(4) Improvement of the Facilities Required for Management of Spare Parts

Spare parts are all purchased and managed by BES. As of March 1991, BES had 300,000 spare parts of 3,200 items in stock. As BES's current record management system is not efficient enough, it takes a great deal of time to retrieve specific items. There have also been cases where "not in stock" was reported despite the fact that the parts were in stock. It is therefore essential to establish a viable inventory management system. The existing spare parts storage has a floor area of 635m². Its maximum storage capacity is 308m³. If this project is implemented, the amount of middle level medical equipment repaired will be increased by 1.7 times, and basic level medical equipment by 3.1 times. As the required number of spare parts will increase by 20

to 25 percent for every doubling of the total amount of equipment repaired, a maximum storing volume will be 400m³ for the projected total number of about 10,000 items of medical equipment repaired. The floor area for the storage will be $648m^2$ - the minimum permissible space for a repair staff of 105 persons. Both the warehouse and the storage will be equipped with dehumidifiers. Those reagents and parts which are likely to deteriorate in an environment of high temperature will be stored in a large-size refrigerator.

In working out the ground plan for the facilities, special attention was paid to the possibility of integrating the spare parts management operations (now carried out in three different sections) by developing a comprehensive component management system through the technical cooperation. These arrangements are expected to reduce the time required for retrieving necessary parts and to optimise the level of inventory, which in turn will increase operational and economic efficiency.

5-2 Appropriateness of the Implementation of the Project

Appropriateness of the implementation of this project was examined in terms of the operation system, budgetary appropriations, and the maintenance and management system. It was concluded that this project can be implemented smoothly.

(1) Operation System

Presently, BES's operation system consists of Director's Office, Administration Section, Accountant Section, Technical Section No.1, Technical Section No.2, and Technical Section No.3. The director and three engineers manage nine subsections consisting of seven Workshops, a Storage Sub-section, and a Training Sub-section. A Storage Subsection operates under the control of the Accountant Section. There are no sections or sub-sections to take charge of inventory control for spare parts, acquisition and inspection for purchased medical equipment, and management of the records of medical equipment owned and its repairs. These facts are not in line with the functions BES However BES will restructure itself, before is supposed to fulfill. the implementation of this project, in order to take charge of the medical equipment's purchase through their disposal. The existing technical sections will be divided into three departments: Maintenance/Repair, Training, and Procurement/Supply. Six workshops will be under the control of the Maintenance/Repair Department. The size of BES Colombo Centre's staff will be increased to 164 persons. Furthermore, the number of staff members at the provincial workshops will be increased to 6 persons since the provincial workshop to be established in the Southern Province will employ 4 repair workers. This staffing plan places utmost emphasis on increasing the number of technicians to take charge of inspection and repair, and is therefore considered rational and necessary. As the operations to be carried out in the new facilities will be almost the same as those now being

carried out at BES's existing facilities, there will be no problem with BES's operation system.

(2) Budgetary Appropriations

The cost for the implementation of this project is to be paid out of the annual budget of the Ministry of Health and Women's Affairs following its approval in a Cabinet meeting. The government of Sri Lanka stands ready to take necessary measures immediately after the signing of the Exchange of Notes. The budgeted annual total cost for the operation and management of the projected facilities for the first year is 8.33 million rupees, of which about 5.61 million rupees is for personnel expenses and 2.72 million rupees is for facility maintenance There will be no particular problem with the personnel expenses. expenses since they will be budgeted after the project is approved in a Cabinet meeting. As for the maintenance expenses, which make up only a fraction of a percent of the Ministry of Health and Women's Affairs' annual budget, it is considered possible to include them in the Ministry's annual budget judging from similar facilities which operate under the jurisdiction of the Ministry.

(3) Maintenance and Management

This project is designed to make it easy to maintain and manage the facilities. Highly durable building materials will be used in the construction of the facilities, and priority will be given to the use of locally available materials. Also, in the selection and procurement of the equipment utmost emphasis will be placed on the availability of manufacturer's local maintenance services. In addition, the facilities are designed to make effective use of natural lighting and ventilation to save energy costs. Thus, it is concluded that maintenance and management of both the facilities and the equipment will be not be difficult.

Furthermore, the Ministry of Health and Women's Affairs has a department to maintain and manage the facilities that operate under its control, and BES is essentially an organisation of engineers and technicians. Therefore, it will be possible for BES to manage its incidental facilities on its own.

5-3 Conclusion and Recommendations

(1) Conclusion

The strengthening of the country's system for maintenance and management of medical equipment through the implementation of this project is expected to improve the country's support services for the engineering aspects of the country's health services. This will contribute to an improvement in the quality of the country's health services. Moreover, it will also contribute to the people's recovery and good health. The Sri Lankan system for the operation and management of the proposed facilities is not yet satisfactory in terms of the size of staff and financial resources, but this will not pose any serious problem to the implementation of this project.

(2) Recommendations

The following recommendations are made to ensure the quick implementation of the project and the smooth and effective operation of the proposed facilities.

- 1) Implementation of the Project
 - a) As this project is to be implemented within the framework of the grant aid programme from the Government of Japan, there are time limitations on the implementation of the project. It must be completed before the expiration of the term as set forth in the Exchange of Notes, or the end of the fiscal year of the Government of Japan. For this reason, prompt action is required in certain necessary procedures, such as conclusion of an agreement for consultant services, and construction and equipment procurement/ installation work.

- b) It will be necessary for the Government of Sri Lanka to secure the funds necessary for procedures such as customs clearance, tax exemption, and transportation to insure the smooth implementation of the construction and equipment work.
- 2) Operation, Maintenance, and Management

In order to operate the proposed facilities effectively, it will be essential for the Government of Sri Lanka to secure the necessary number of staff members as set forth in the staff plan. Also, budgetary appropriations for the maintenance and management of the facilities and equipment should be planned carefully.

3) Technical Cooperation of the Government of Japan

The Government of Sri Lanka is in need of a transfer of technology and experience from Japan through the implementation of this project, and they hope to obtain technical cooperation from the Government of Japan. In order to support the improvement of the country's medical equipment maintenance and management technologies, it is strongly desirable that technical cooperation be implemented by the Government of Japan in conjunction with this project. ANNEX

1. Member List of the Field Study Team

(1) Basic Design Study Team (March 17~April 20, 1991)

Dr. Hiroshi Amemiya	Team Leader	Director, Department of Surgical Research, National Cardiovascular Center Research Institute
Mr. Satoru Watanabe	Project Coordinator	Second Basic Design Study Division, Grant Aid Study and Design Dept., JICA
Mr. Jun Sakuma	Technical Cooperation	Multilateral Cooperation Division, Experts Assignment Dept., JICA
Mr. Ken Majima	Project Manager, Architect	Yamashita Sekkei Inc.
Mr. Hiroyuki Kimura	Medical Equipment Specialist, Operation Management	Yamashita Sekkei Inc.
Mr. Satoshi Okamoto	Architectural Design, Architect	Yamashita Sekkei Inc.
Mr. Norio Ishioka	Facility Engineer	Yamashita Sekkei Inc.
Mr. Kazuhiro Ajiki	Medical Equipment Specialist, Repair	Yamashita Sekkei Inc.

Mr. Hideo Yasuki	Team Leader	Resident Representative JICA
Mr. Mitsuyoshi Kawasaki	Project Coordinator	Sri Lanka Office, JICA
Mr. Ken Majima	Project Manager, Architect	Yamashita Sekkei Inc.
Mr. Hiroyuki Kimura	Medical Equipment Specialist, Operation Management	Yamashita Sekkei Inc.
Mr. Satoshi Okamoto	Architectural Design, Architect	Yamashita Sekkei Inc.
Mr. Kazuhiro Ajiki	Medical Equipment	Yamashita Sekkei Inc.

(2) Explanation of Draft Final Report (July 21~August 1, 1991)

lesident Representative, Sri Lanka Office, ICA

Specialist, Repair

2. Survey Schedule

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(1) Basic Design Study (March 17 ~April 20, 1991)

No.	Date	Schedule
1	March 17 (Sun)	 Lv. Tokyo (Messrs. Watanabe, Sakuram) Survey on HMS in Manila
2	March 18 (Mon)	 Lv. Tokyo (Dr. Amemiya, Mr. Majima)
3	March 19 (Tue)	 Ar. Colombo (Dr. Amemiya, Merrs. Watanabe, Sakuma, Majima)
4	March 20 (Wed)	 Meeting at JICA Courtesy call on Embassy of Japan Meeting at Department of External Resources Meeting at MOH and BES
5	March 21 (Thu)	Meeting at BESSurvey on MRI
6	March 22 (Fri)	 Survey on Colombo General Hospital Lv. Tokyo (Messrs. Kimura, Okamoto, Ishioka, Ajiki)
7	March 23 (Sat)	 Arrangement of survey data Ar. Colombo
8	March 24 (Sun)	 Lv. Colombo Survey on Batapala Peripheral Unit Survey on Matara Base Hospital
9	March 25 (Mon)	 Survey on Galle Teaching Hospital Ar. Colombo
10	March 26 (Tue)	 Discussion on the Minutes Survey on BES Survey on Sri Jayawardenapura General Hospital
11	March 27 (Wed)	 Survey on Homagama Hospital Discussion on the Minutes
12	March 28 (Thu)	 Signing of Minutes of Discussions at MOH Reporting to JICA
13	March 29 (Fri)	 Survey on Peradeniya Teaching Hospital Lv. Colombo for Tokyo (Dr. Amemiya, Messrs. Watanabe, Sakuma)
14	March 30 (Sat)	 Survey on Kandy Teaching Hospital Survey on construction industry (Mr. Ishioka)

No. Date Schedule 15 March 31 (Sun) Lv. Kandy Ar. Anuradhapura 16 April 1 (Mon) Survey on Anuradhapura Provincial Hospital 16 April 1 (Mon) Survey on Anuradhapura 17 April 2 (Tue) Lv. Anuradhapura 17 April 2 (Tue) Lv. Anuradhapura 18 April 3 (Wed) Survey on Kandy Teaching Hospital 18 April 3 (Wed) Survey on onstruction industry (Mr. Ishioka) 18 April 4 (Thu) Survey on Badulla Provincial Hospital 19 April 4 (Thu) Survey on construction industry (Mr. Ishioka) 20 April 5 (Fri) Survey on construction industry 21 April 6 (Sat) Survey on construction industry 22 April 6 (Sat) Survey on construction industry 23 April 7 (Sun) Arragenent of survey data 24 April 9 (Tue) Survey on Colombo General Hospital 25 Survey on C	N-	T	D-4-	Schedule
 Survey on the existing facilities at BES (Mr. Ishioka) April 2 (Tue) Lv. Anuradhapura Survey on Kurunegala Provincial Hospital Ar. Kandy Survey on the existing facilities at BES (Mr. Ishioka) April 3 (Wed) Survey on Kandy Teaching Hospital Survey on construction industry (Mr. Ishioka) Lv. Kandy Lv. Bandarawela April 4 (Thu) Survey on Badulla Provincial Hospital Lv. Badulla Ar. Rathapura Survey on construction industry (Mr. Ishioka) Lv. Badulla Ar. Rathapura Survey on construction industry (Mr. Ishioka) Lv. Ratnapura Ar. Colombo Survey on construction industry April 5 (Fri) Survey on construction industry (Mr. Ishioka) Lv. Ratnapura Ar. Colombo Survey on construction industry April 6 (Sat) Survey on construction industry Arragement of survey data Lv. Colombo for Tokyo (Mr. Ishioka) April 8 (Mon) Meeting at BES Survey on MSD Central storage April 9 (Tue) Survey on the existing facilities at BES (Mr. Okamoto) Preparation of additional questionnaire (Mr. Majima) April 10 (Wed) Meeting at BES Survey on activities of BES April 11 (Thu) Meeting at BES Meeting at BES Survey on activities of BES 				• Lv. Kandy
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 Survey on construction industry (Mr. Ishioka) Lv. Kandy Lv. Bandarawela April 4 (Thu) Survey on Badulla Provincial Hospital Lv. Badulla Ar. Rathapura Survey on construction industry (Mr. Ishioka) April 5 (Fri) Survey on Ratnapura Provincial Hospital Lv. Ratnapura Ar. Colombo Survey on construction industry (Mr. Ishioka) April 6 (Sat) Survey on construction industry Arragenemt of survey data Lv. Colombo for Tokyo (Mr. Ishioka) April 7 (Sun) Arrangement of survey data Team meeting April 8 (Mon) Meeting at BES Survey on Colombo General Hospital Survey on the existing facilities at BES (Mr. Okamoto) Preparation of additional questionnaire (Mr. Majima) April 10 (Wed) Meeting at BES Survey on activities of BES April 11 (Thu) Meeting at BES Meeting at BES Survey on activities of BES 	17	April	2 (Tue)	 Survey on Kurunegala Provincial Hospital Ar. Kandy
 Lv. Badulla Ar. Rathapura Survey on construction industry (Mr. Ishioka) April 5 (Fri) Survey on Ratnapura Provincial Hospital Lv. Ratnapura Ar. Colombo Survey on construction industry (Mr. Ishioka) April 6 (Sat) Survey on construction industry Arragenemt of survey data Lv. Colombo for Tokyo (Mr. Ishioka) April 7 (Sun) Arrangement of survey data Team meeting April 8 (Mon) Meeting at BES Survey on Colombo General Hospital Survey on the existing facilities at BES (Mr. Okamoto) Preparation of additional questionnaire (Mr. Majima) April 10 (Wed) Meeting at BES Survey on activities of BES Meeting at BES Meeting at BES Meeting at BES Survey on colombo General Hospital Survey on the existing facilities at BES (Mr. Okamoto) Preparation of additional questionnaire (Mr. Majima) 	18	April	3 (Wed)	• Survey on construction industry (Mr. Ishioka)
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 Arragenemt of survey data Lv. Colombo for Tokyo (Mr. Ishioka) April 7 (Sun) Arrangement of survey data Team meeting April 8 (Mon) Meeting at BES Survey on MSD Central storage April 9 (Tue) Survey on Colombo General Hospital Survey on the existing facilities at BES (Mr. Okamoto) Preparation of additional questionnaire (Mr. Majima) April 10 (Wed) Meeting at BES Survey on activities of BES April 11 (Thu) Meeting at BES Meeting at Colombo Municipal Council 	20	April	5 (Fri)	• Lv. Ratnapura Ar. Colombo
 23 April 8 (Mon) 24 April 9 (Tue) 25 April 10 (Wed) 26 April 11 (Thu) 26 April 11 (Thu) 27 Team meeting 28 Team meeting 29 Team meeting 20 Meeting at BES 21 Meeting at BES 22 Meeting at BES 23 Meeting at BES 24 Meeting at BES 25 Meeting at BES 26 Meeting at BES 27 Meeting at BES 28 Meeting at Colombo Municipal Council 	21	April	6 (Sat)	• Arragenemt of survey data
 24 April 9 (Tue) Survey on MSD Central storage 24 April 9 (Tue) Survey on Colombo General Hospital Survey on the existing facilities at BES (Mr. Okamoto) Preparation of additional questionnaire (Mr. Majima) 25 April 10 (Wed) Meeting at BES Survey on activities of BES 26 April 11 (Thu) Meeting at BES Meeting at Colombo Municipal Council 	22	April	7 (Sun)	
 Survey on the existing facilities at BES (Mr. Okamoto) Preparation of additional questionnaire (Mr. Majima) April 10 (Wed) Meeting at BES Survey on activities of BES April 11 (Thu) Meeting at BES Meeting at Colombo Municipal Council 	23	April	8 (Mon)	
 26 April 11 (Thu) Survey on activities of BES Meeting at BES Meeting at Colombo Municipal Council 	24	April	9 (Tue)	• Survey on the existing facilities at BES (Mr. Okamoto)
Meeting at Colombo Municipal Council	25	April	10 (Wed)	
	26	April	11 (Thu)	• Meeting at Colombo Municipal Council
 27 April 12 (Fri) Meeting at BES Survey on construction industry (Mr. Okamoto) 	27	April	12 (Fri)	-

No.]	Date	Schedule
29	April	14 (Sun)	Arrangement of survey dataTeam meeting
30	April	15 (Mon)	 Survey on construction industry (Mr. Okamoto) Survey on medical equipment suppliers (Messrs. Kimura, Ajiki)
31	April	16 (Tue)	Meeting at BESSurvey on Japanese grant aid projects
32	April	17 (Wed)	Meeting at BESSurvey on Nawaloka Hospital
 33	April	18 (Thu)	 Meeting at BES Meeting at CMC (Mr. Okamoto) Meeting at CECB (Mr. Okamoto) Meeting at MRI (Messrs. Kimura, Ajiki)
34	April	19 (Fri)	 Meeting at BES Reporting to JICA Lv. Colombo for Tokyo (Messrs. Kimura, Okamoto, Ajiki)
35	April	20 (Sat)	• Ar. Tokyo

(2) Explanation of Draft Final Report (July 21~August 1, 1991)

No.	Date	Schedule
1	July 21 (Sun) • Lv. Tekyo • Ar. Colombo
2	July 22 (1	 Mon) Meeting at JICA Courtesy call on Embassy of Japan Meeting at Department of External Resources Meeting at BES (submission of Draft Final Report)
3	July 23 (Tue) • Meeting at BES • Meeting at MOH
4	July 24 (Wed) • Meeting at BES
5	July 25 (Thu) • Meeting at BES
6	July 26	 (Fri) Lv. Colombo Ar. Galle (Messrs. Majima, Okamoto) Survey on medical equipment agencies (Messrs. Kimura, Ajiki)
7	July 27	 (Sat) Survey on the construction site in Galle Teaching Hospital Lv. Galle Ar. Colombo (Messrs. Majima, Okamoto) Survey on mechanical equipment agencies (Messrs. Kumura, Ajiki)
8	July 28 (Sun) • Team meeting
9	July 29 (I	 Mon) Meeting at BES Meeting at CMC Meeting with the Follow-up Survey Team
10	July 30 (Tue) • Meeting with the Follow-up Survey Team at BES • Signing of Minutes of Discussions at MOH
11	July 31 (\	 Ned) Survey on Automobile Engineering Training Institute Reporting to JICA and Embassy of Japan Lv. Colombo
12	Aug 1 ('	Thu) • Ar. Tokyo

3. Member List of Governing Party

Department of External Resources, Ministry of Finance

Mr. S. Weerapana Deputy Director, Dep. of External Resources

Ministry of Health and Women's Affairs

Dr. Joe Fernando	Secretary
Dr. George Fernando	Director General
Dr. Sanath Goonesekera	Deputy Director General
Dr. Lalith Mendis	Deputy Director General of Health Services

Biomedical Engineering Services

Ms. Indira JayawardenaDirectorMr. J. L. M. K. JayatilakaEngineerMr. J. L. M. K. JayatilakaEngineerMr. P. M. J. T. FernandoEngineerMr. J. M. WickramarachchiEngineerMr. R. D. LiyanageTechnologist (Electronics)Mr. T. A. L. FonsekaTechnologist (Dental)Ms. A. M. HerathForeman (Electronics)Mr. C. D. KhemadasaForeman (Operation)	
Mr. P. M. J. T. FernandoEngineerMr. J. M. WickramarachchiEngineerMr. R. D. LiyanageTechnologist (ElectroMr. T. A. L. FonsekaTechnologist (DentalMs. A. M. HerathForeman (Electronics)	
Mr. J. M. WickramarachchiEngineerMr. R. D. LiyanageTechnologist (ElectroMr. T. A. L. FonsekaTechnologist (DentalMs. A. M. HerathForeman (Electronics)	
Mr. R. D. LiyanageTechnologist (ElectroMr. T. A. L. FonsekaTechnologist (DentalMs. A. M. HerathForeman (Electronics)	
Mr. T. A. L. Fonseka Technologist (Dental Ms. A. M. Herath Foreman (Electronics	
Ms. A. M. Herath Foreman (Electronics)
Mr. C. D. Khemadasa Foreman (Operation	3)
-	Theatre)
Mr. P. L. Perera Foreman (Operation	Theatre)
Mr. A. G. A. De. Silva Foreman (Operation	Theatre)
Mr. K. D. N. Perera Foreman (Operation	Theatre)
Mr. W. L. T. Fernando Mechanic (Workshop))
Mr. S. A. Vipulasena Foreman (Sterilisatio	on)
Mr. C. Nimal Foreman (Sterilisation	on)
Mr. K. K. D. Premedasa Foreman (Sterilisation	on)
Mr. W. D. Gunasiri Foreman (Dental)	
Mr. J. Pathiratna Foreman (Dental)	
Mr. K. P. Gunaratna Foreman (Dental)	
Mr. E. L. Wickramaratna Foreman (X-ray)	
Mr. Nimal Hendavitharana Foreman (X-ray)	
Mr. K. D. Wilbert Foreman (X-ray)	
Mr. W. A. A. Weerakkody Foreman (X-ray)	
Mr. PA. Wiratunga Foreman (Lab)	
Mr. H. D. Reginold Foreman (Lab)	
Mr. S. Kuladevan Foreman (Lab)	
Matara Base Hospital	

Mr. P. D. Yapa Galle Teaching Hospital

Dr. Nimal Edirisinghe

District Medical Officer

Director

Dr. P. L. Gunawardene	Acting Director
Mr. N. Devarajan	Chief Engineer, Dept. of Housing Construction
Mr. M. G. B. Amarasens	Administrative Officer
Mr. M. Wimalasend	Administrative Officer
Mr. J. L. Athula Wijesinghe	Senior Medical Laboratory Technologist
Ms. G. Hevavidhamana	Matron
Ms. Y. G. Palliysguvu	Matron
Sri Jayawardenapura General Hosp	ital
Dr. J. Nalin Radrigo	Chairman
Dr. R. C. Rajapakse	Director
Peradeniya Teaching Hospital	
Dr. J. Jayawardana	Director
Ms. L. S. Weerakkody	Matron
Kandy Teaching Hospital	
Dr. Nihal Karunaratne	Chairman, Hospital Committee
Dr. A. W. L. Beligaswatte	Director
Dr. H. S. B. Tennakoon	Deputy Director
Mr. A. T. Bandusena	Administrative Officer
Anuradhapura Provincial Hospital	
Dr. S. A. Udatenne	Medical Superintendent
Dr. W. L. K. Caldera	
Kurunegala Provincial Hospital	
Dr. Jupiter Moonamile	Medical Superintendent
Ms. Somasena	Matron
Mr. P. M. Podirathna	Pharmacist
Badulla Provincial Hospital	
Dr. W. Karaudagoda	Principal Director of Health Services
Dr. Neil Fernando	Medical Superintendent
Ms. Ahara Desilva Ma A M N Surjushandana	Matron
Mr. A. M. N. Suriyakavdara Mr. V. C. Jinadaia	Pharmacist
Mr. Y. G. Jinadaic	Administrative Officer
Mr. W. D. Aleysinaaden	Engineer of Provincial Construction Services
Ratnapura Provincial Hospital	
Dr. G. Sankaranarayana	Medical Superintendent
Dr. V. P. E. Ranafune	

Administrative Officer

Mr. P. N. P. Karalasera

Colombo General Hospital Mr. Q. C. Fernando	Senior Radiographer
Mr. Y. C. Jayasinghe	Medical Physicist
Nawaloka Hospital	
Mr. Tosith Silva	Paramedical Officer
Medical Supplies Division (MSD)	
Mr. K. Kanagratwam	Assistant Director
Mr. Wasantha Abensekava	System Analyst
Colombo Municipal Council (CMC)	
Mr. Raja Samadwickrama	Architect (Town Planning)
Central Engineering Consultancy	Bureadu (CECB)
Mr. D. S. Withanage	Project Manager
Mr. A. W. G. Kasrunaratra	Project Manager
Ceylon Electricity Board	
Mr. J. K. B. Ekamayake	Electrical Engineer (Colombo City Off
Colombo Gas and Water Co., Ltd.	
Mr. Rohan Amarasinghe	Chief Engineer
National Water Supply and Drana	ge Board
Mr. A. Hemapala C. Silva	Assistant Manager
Mr. Visaka Dias	Engineer (House Connection)
Department of Telecommunication	
Mr. Dunstan Fernando	Engineer
Embassy of Japan to Sri Lanka	
Mr. Ei Kubota	First Secretary
Mr. Hiroyuki Kinomoto	Third Secretary
JICA Sri Lanka Office	
Mr. Hideo Yasuki	Resident Representative
Mr. Kiichiro Kuno	Deputy Director
Mr. Mitsuyoshi Kawasaki	
Mr. Toshiro Yamashita	
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4. Minutes of Discussions

(1) Basic Design Study

MINUTES OF DISCUSSIONS ON THE BASIC DESIGN STUDY ON THE PROJECT FOR REHABILITATION OF BIOMEDICAL ENGINEERING SERVICES IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

In response to the request made by the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan decided to conduct a Basic Design Study on the Project for Rehabilitation of Biomedical Engineering Services. (hereinafter referred to as "the Project") and Japan International Cooperation Agency (JICA) has sent the Basic Design Study Team headed by Dr.Hiroshi Amemiya, Director, Department of Surgical Research, Research Institute, National Cardiovascular Center, from March 18th to April 20th, 1991. The Team had a series of discussions with the authorities concerned of the Government of the Democratic Socialist Republic of Sri Lanka and conducted a field survey.

As the result of the discussions and the field survey, both parties confirmed the main articles described on the attached sheets. The Team will proceed the works and prepare the Basic Design Study Report on the Project based on the articles.

Colombo, March 28, 1991.

Dr. Hiroshi Anemiya Leader, Basic Disign Study Team JICA

Dr. Joe Fernando Secretary, Min. of Health & Women's Affairs Sri Lanka

WITHOWENT

· 1. Jbjective of the Project

The objective of the Project is to assist strengthening the capability of the Division of Biomedical Engineering Services (BES) of the Ministry of Health and Women's Affairs. The achievement of the objective will contribute to strengthen the system of supply and maintenance of biomedical equipment in Sri Lanka, to support the plublic medical facilities and to promote the medical services for Sri Lanka.

2. Executing Agency

Ministry of Health and Women's Affairs is responsible for execution and administration of the Project.

3. Items requested for the Implementation of the Project

The necessary items for realization of the Project will be determined in the Basic Design by the Team as first step to strengthen the capability of BES, based on the request made by the Government of Sri Lanka, after the field study conducted by the Team.

Major items tentatively selected are shown in Annex I, reflecting on priority .

However, the final list of items to be provided may differ from the above items, if modifications are judged necessary after determined analysis back in Japan and further discussions with the Sri Lankan representatives.

4. Site of the Project

The site of the Project is located in Colombo as shown in Annex II and the site for the Provincial Workshop is located at new Galle Teaching Hospital.

Sri Lankan side promised Japanese side that a part of function of BES will remove to the Storage of Medical Supply for the period of construction.

5. Grant Aid Programme

- (1) The Government of Sri Lanka has understood the Japan's Grant Aid System explained by the Team including principle of use of a Japanese Consultant Firm and a Japanese Contractor for the implementation of the Project.
- (2) The Government of Sri Lanka will take necessary measures as listed in Annex III on condition that the Grant Aid by the Government of Japan would be extended to the Project.

6.01

A-11

5. Schedule of the Study

- (1) JICA will prepare the draft report and dispatch a mission in order to finalize the contents of the report around June 1991.
- (2) In case that the contents of the report is accepted in principle by the Government of Sri Lanka, JICA will complete the Basic Design Study Report and submit it to the Government of Sri Lanka by September, 1991.

7. Technical Cooperation

Sri Lankan side requested technical cooperation in order to upgrade the ability of management and technique of BES.

Japanese side recognized the significance of the technical cooperation and promised Sri Lankan side to convey the requirement to related organizations and to make necessary effort for realization.

Annex I

1. Workshop in Colombo.

1) Radiology Equipment Section

2) Electronic Equipment Section

3) Sterilisation Section

4) Laboratory Equipment Section

5) Operation Room Equipment Section

6) Refrigeration Section

7) Dental Equipment Section

3) Mechanical Workshop Section

2. Marehouse in Colombo for:

1) Spareparts for Biomedical Equipment

2) New Equipment before installation

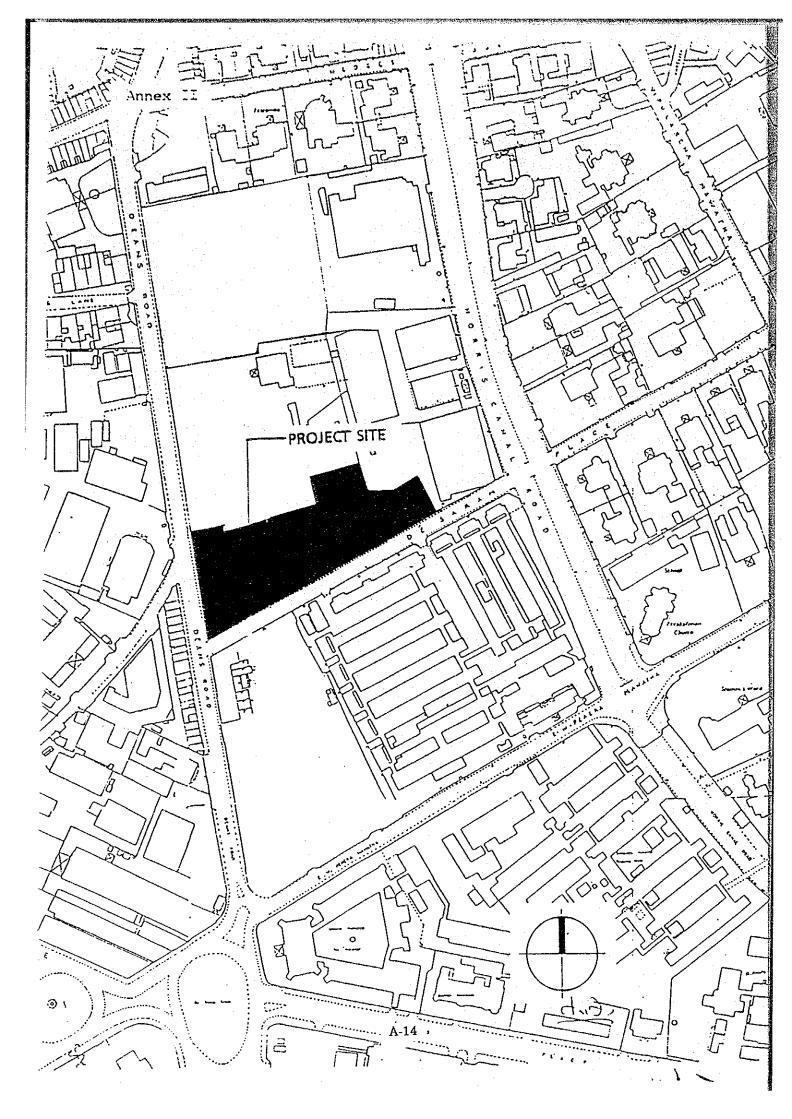
3. Equipment for Maintenance and Repairment of Biomedical Equipment

4. Provincial Workshop

Provincial Workshop at Galle Teaching Hospital as model (The Provincial Workshop will be managed by BES directly.)

5. Vehicle

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Annex III

1. To secure the site.

2. To clear the existing building(s) which would hinder to construct the Project facilities before the commencement of the construction.

- 3. To undertake incidental works such as planting, fencing and constructing gates in and around the site.
- 4. To provide facilities for the distribution of electricity, water suply, drainage, telephone and other incidental facilities before the commencement of the Project.
 - 1) Electricity distribution line to the site
 - 2) City water distribution main to the site
 - 3) Drainage city main to the site
 - 4) Telephone trunk line to the main distribution panel in the facilities.
- 5. To provide general furniture.
- 3. To obtain the building permit prior to the connencement of the construction.
- 7. To ensure prompt unloading, tax exemption, customs clearance at ports of disembarkation and prompt internal transportation of the equipment purchased under the Grant Aid.
- d. To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
 - (i) Advising commission of authorization to pay (A/P) (about ¥3,300 for each A/P)
 - (2) Payment Commission

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9. To exempt Japanese Nationals involved in the Project from custom duties, internal taxes and other fiscal levies which may be imposed in the Democratic Socialist Republic of Sri Lanka with respect to the supply of the products and services under the Verified Contractors.

- 10. To accord Japanese Nationals whose services may be required in connection with the supply of the products and the services under the Verified Contracts such facilities as may be necessary for their entry into the Democratic Socialist Republic of Sri Lanka and stay therein for the performance of their work.
- 11. To bear all the expenses, other than those to be born by the Grant, necessary for the execution of the Project.
- 12. To ensure the proper and effective operation and maintenance of facilities and biomedical equipment improved under the Grant.

H.A.

(2) Explanation of Draft Final Report.

MINUTES OF DISCUSSIONS

ON

THE BASIC DESIGN STUDY ON THE PROJECT

FOR .

REHABILITATION OF BIOMEDICAL ENGINEERING SERVICES

IN

THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA (CONSULTATION ON DRAFT REPORT)

In January 1991, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team on the Project for Rehabilitation of Biomedical Engineering Services (hereinafter referred to as "Project") to the Democratic Socialist Republic of Sri Lanka and has prepared the draft report of study, through discussions with the officials concerned of the Government of Sri Lanka, the field survey on the Project site, and technical examination on the results in Japan.

In order to explain the components of the draft report to the Government of Sri Lanka as well as to consult with Sri Lanka side on the contents of the report, JICA sent a study team to Sri Lanka which is headed by Mr.Hideo Yasuki, Resident Representative, JICA Sri Lanka Office.

The team commenced its study in Colombo from July 21,1991 and will terminate it on July 31.

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

Mr. Hideo Yasuki (/ Leader Draft Report Explanation Team JICA

Colombo, July 30, 1991

Dr. Joe Férnando Secretary, Min.of Health & Women's Affairs Sri Lanka

A-17

ATTACHMENT

1. Components of Draft Report

The Government of Sri Lanka has agreed and accepted in principle the components of the Draft Report proposed by the team.

2. Japan's Grant Aid system

- (1) The Government of Sri Lanka has understood the system of Japan's Grant Aid explained by the team.
- (2) The Government of Sri Lanka will take the necessary measures, described in Annex I, for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. Technical Cooperation

Both parties confirmed that it is necessary to extend the technical cooperation being composed of, especially assignment of Japanese long-term and short-term experts for upgrading the ability of management techniques and repair technologies of BES.

4. Further schedule

The team will make the Final report in accordance with the confirmed items, and send it to the Government of Sri Lanka by the end of September 1991.

A-18

- Annex I : Necessary measures to be taken by the Government of Sri Lanka in case Japan's Grant Aid is executed.
- 1. To secure the site.
- 2. To clear the existing buildings which would hinder to construct the Project facilities before the commencement of the construction.
- 3. To undertake incidental works such as planting, fencing and constructing gates in and around the site.
- 4. To provide facilities for the distribution of electricity, water supply, drainage, telephone and other incidental facilities before the commencement of the Project.
- 1) Electricity distribution line to the site.
 - 2) City water distribution main to the site.
 - 3) Drainage city main to the site.
- 4) Telephone trunk line to the main distribution panel in the facilities.
- 5. To provide general furniture.
- 6. To obtain the building permit prior to the commencement of the construction.
- 7. To ensure prompt unloading, tax exemption, customs clearance at ports of disembakation and prompt internal transportation of the equipment purchased under the Grant Aid.
- 8. To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement:
 - 1) Advising commission of Authorization to Pay (A/P).
 - 2) Payment commission.
- 9. To exempt Japanese Nationals involved in the Project from custom duties, internal taxes and other fiscal levies which may be imposed in the Democratic Socialist Republic of Sri Lanka with respect to the supply of the products and services under the Verified Contracts.
- 10. To accord Japanese Nationals whose services may be required in connection with the supply of the products and services under the Verified Contacts such facilities as may be necessary for their entry into the Democratic Socialist of Sri Lanka and stay therein for the performance of their work.
- 11. To bear all expenses, other than those to be borne by the Grant, necessary for the execution of the Project.
- 12. To ensure the proper and effective operation and maintenance of facilities and biomedical equipment improved under the Grant.

5. Letter Regarding Staff Employment

நைமு(ச மே28வ அஞ்சல் பெட்டி P. O. Box மைக் சுவை எமக் இல். My No. இலி சூவை சுமக்க இல். Your No.



க்கூரை லூ பெலிலா கூடுப்பில் கூலை சுகாதார, மகளிர் விவகார அமைச்சு MINISTRY OF HEALTH & WOMEN'S AFFAIRS දේශීය ආදයම ගොඩනැගිල්ල, ගුමත් වන්තමපලම ඒ. ගාඩනාර මාවත, කොළඹ 02.

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Inland Revenue Building, Sir Chittampalam A. Gardiner Mawatha, Colombo 02.

දිනය ඉදුම Date }

24 July 1991

Mr. Hideo Yasuki, Resident Representativé, Japan International Cooperation Agency, 175, New Bullers Road, Colombo 3.

Dear Mr. Yasuki,

Project for Rehabilitation of Biomedical Engineering Services

I am pleased to note that the Japanese Government has given priority for the project of Biomedical Engineering Services and appreciate very much the cooperation extended by you for this project.

the Sri Lankan Government has accepted the above project as necessary to ensure patient care services, and therefore when the approval of the Committee of Secretaries was granted for a new building complex to be funded by a donour agency the treasury accepted that there would have to be an increase in the technical staff and a budget for same would have to be provided.

Budget for recruiting staff for existing vacancies has already been granted by the treasury for 1992 and this Ministry has made plans to recruit sixteen technical staff members in early 1992 and twenty three technical staff members by 1993. The Ministry is confident that the additional staff of three senior engineers and twelve mechanics and night recruits of other categories required by Biomedical Engineering Services for this project would also be approved by the treasury and the funds for their salaries provided in 1993. The Ministry would be able to recruit the engineers from graduates of the University of Moratuwa and University of Peradeniya the Foremen from the Diploma Holders of University of Moratuwa and the Open University and the mechanics from the Graft Apprentices from the National Apprenticeship Board.

Therefore I do not foresce any constraints in recruiting the staff and budgetary provision for them by the time the project is completed in 1993 to ensure that optinum use is made of the facilities provided by the Japanese Government.

Thanking you for your cooperation.

Dr. Joe Fernando, Secretáry/Health & Women's Affairs.

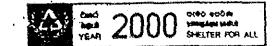
cc - Dr. Kubota, Second Secretary Embassy of Japan Director, External Besources

6 Soil Investigation Data

NATIONAL BUILDING RESEARCH ORGANISATION

99/1, JAWATTA ROAD. COLOMBO - 5. SRI LANKA. TELEPHONE: 588946

OUF- REF. + 30 20437



YOUR REF :

Director-General of Health Services Ministry of Health & Women's Affairs Inland Revenue Building Sir Chittampalam A.Gardiner Mawatha Colombo 2.

5th June, 1991

Dear Sir,

INVESTIGATION AT THE DIVISION OF SOIL BIOMEDICAL ENGINEERING SERVICES

Field work in connection with the above project is now completed. Laboratory testing and analysis of test data are currently in progress. In the meantime, we are pleased to submit preliminary recommendations on foundation design for your initial planning.

A total of 5 boreholes were advanced at the site at locations shown in Fig.1. Of these, 3 boreholes (8H1, BH2 and BH3) were advanced in the area allocated for three storeyed building while the remaining two boreholes were done in the area allocated for the two storeyed building. These boreholes were terminated after encountering a hard stratum of weathered rock found at depths varying from 16.65m to 23.0m depths.

Borehole investigation reveals that the subsoils at this site are predominantly sandy down to termination depths. However, layers of compressible peaty-soils and clays are generally found at depths varying from 6.5m to 11.45m. SPT N-values of the sand layers are considerably high and in the range of 15 to values exceeding 50., SPT N-values of the peaty soils and clay layers are considerably low and in the range of 0-9. Structural details of the proposed buildings were not available at the time of preparation of this preliminary recommendations. Therefore, for the purpose of analysis, it is assumed that the columns are spaced at 5m intervals and accordingly the maximum column loads for three storeyed and two storeyed structures are in the order of 1200 kN and 700 kN respectively.

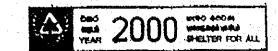


MINISTRY OF POLICY PLANNING AND IMPLEMENTATION

NATIONAL BUILDING RESEARCH ORGANISATION

99/1, JAWATTA ROAD, COLOMBO - 5. SRI LANKA. TELEPHONE: 588946

OUR REF :



YOUR REF :

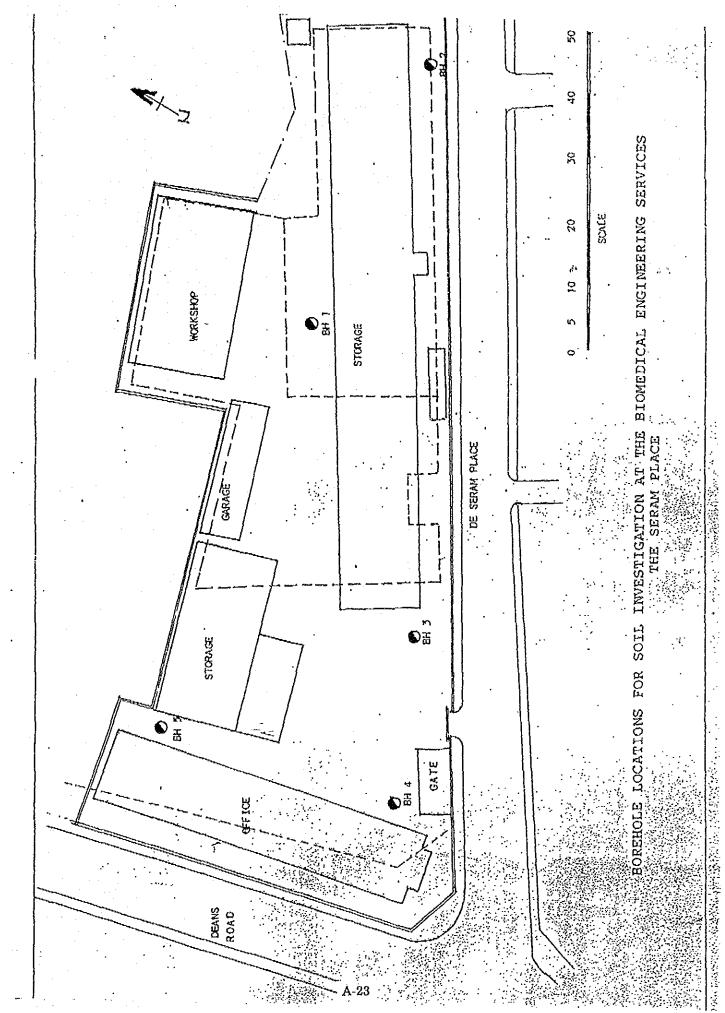
Considering the type of structures proposed and the subspill conditions at the site, it is recommended to support the building on Pad foundations located at 1.5m below the existing ground level. For three storeyed structure, allowable bearing capacity for a footing (width not more than 2.5m) placed at this depth can be taken as 200kN/m^2 for a tolerable settlement of 25 mm. Similarly, for the two storeyed structure, allowable bearing capacity for a footing of width not more than 2m can be taken as 175kN/m^2 for a tolerable settlement of 25 mm.

Thanking you.

Yours faithfully,

moun

Nimal W.Herath Head, Geotechnical Engineering Division for Director-General,NBRO.



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7.00 SM silty sand with plastic fines. DS 7.00 7.00 8 5 3 8 7.75 7.45 7.45 7.45 7.45 100	6.50	\	Loose, grey medium to fin	orained		0.45]		••••••	/
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7.75						7,45							
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9.00 9.00 Second Control Con		00	Loose, orey, medium to fit		יין		•				} .		· · · · · · ·
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	9.00	ļ			DS	9,00	9.00	5	2	6	8		
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NAME	OF F	PROJECT : Soil Investigati	on at the Div	isio	n of Bio		80	re H	ole	BH 1	Contd.
		Medical Engineer					gro	วบทฮ่	elev	ation	ويستخذر ومستودي فللمنبع فيستار تتريني
Locati	on :	De Seram Place					dep	th of	bore	hole	21,38 h
_		nod: Wash boring	commenced				Hat	er st	ruck	et GL	- m
drilli	ng m	ud : Bontonito	completed	on:	30.04.19		GWL	on c of b	omole ore h	tion ble	GL_2.20m
Depth	-			\`		S	TAND/	ARD P	_		TEST DATA
below		Classification & Descriptio	n of Soil		e and	depth		·····	يستعلقون بالتكريب	er of	
GLm			н — н -		th of pling m	GL m	<u> </u>	<u>er 15</u> 2	3	for	N-value graphicai
10,00				DS	10.00	10,00	2	}	<u> </u>		presentatio
10,50	sc		•		10.00	10,00	1	2	3	5 9	.20. 4
10120				1	10.45						
11.00	ଫ	Solt, grey high plastici	ty clay.	UDS	11.00	11.00			Ì		
					11,45			{	ĺ		
11-50			······						ļ		· · · · · · ·
12,00	· .			DŞ	12.00	12.00	1	0	1		·
					-		Ì				· · · · · · · · · · · · · · · · · · ·
	04	Very soft, blackish, org	enic cley.		12.68			Ì			
-13.00		* .		DS	13.00	13.00	1	0	1	,	• .
12.00					-						····· ·
					13,52						
14.00		•		UDS	14,00						
			•		14.45						•
14,50		Medium stiff, blackish, o	rganic clay								
· - · · ·	<u>94</u> 19	with pockets of partiall vegetation.	y decomposed	DS	15.00	15.00	2		5	9	
-15.00		(recovery nil)			15,45		-		-		
1				UDS	15,50						
		•			15.90				_		·· [. ·.
-15.00				US	16,00 -	16.00	١	2	5	7	
	Ì		•		16.45						
16.76					17.00	17.00					
17.00	SM	Medium dense coarse tomg grained silty sand,	9dium	05	17.00	17.00	3	8	6	14	
)	(recovery nil)			17.45]			
					1		~				
-18,00				US	18,00	18,00	2	4	10	14	
		•	•		18.45						
18.95		Medium dense, to very dens	a blackist								
_19,00	SM	with bands of white, mediu	m to fine	DS	19.00	19,00	3	<u>ò</u>	16	25	
		grained silty sand, ??. (Highly weathered biotite	,	•	19.45						
		and a second to	SHOLDS I QUK								
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AHE	OF P	ROJECT ;	Soil I Medica	nvestigati 1 Engineer	on at the	Divis	io	n of Bio		h	e Ho		معمصت	Contd.
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		nod : Wash			Commen	iced on		25.04.1	991				at GL	21.38 m
171115		Dant	onite	••••••••••••••••••••••••••••••••••••••			*****	30.04.1			on co			- m GL_Z·ZCm
														TEST DATA
epth		•						eand	depth	<u> </u>		numb	er of	blows
elow		Classifica	tion & I	Description	n of Soil	C	юр	th of	tested	. Þ	er 15	Cm		N-value
L		· · · · · · ·				S	ion.	pling m	GLm	1	2	3	tor 30cm	graphical presentation
0.00			•		•	D	s	20,00	20.00	5	11	16	27	20
	SM							20,45						
						. D) S	21,00	21.00	5	23	33	> 50	
1.00								-		e de la	eral	10	1	***
1.38	1	D			×0-			21,38		;	etrat			• • • • • •
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NAME	OF F	ROJECT : Soil Investigati			on of Bie	>		e H		BH 2	
		Medical Engineer	ing Services							stion	
Locati		De Scram Place				· · · · · · · · · · · · · · · · · · ·	dep	th of	bore	e hole	22,40
	a contraction of the local division of the l	nod : Wash boring	commenced		30,04,1			and the second se	-	at GL	
drilli	កព្វ ពេរ	ud : Bentonite	completed	00 : T	05.05.1					ation nole	GL 2.35
Deoth				1	•	\$	TANDA	RD F	All and a real sectors of the sector		TEST DATA
below		Clessification & Description	of Spil		bne ə	depth			the Color and Division in which the Color and the Color an	per of	
GLm	•		· -· - · -		th of pling m	tested GL m		or 15	1	for	N-value graphic
					r		1	2	3		presentet
0,00	SM	Loose, blackish grey medi grained silty sand.	um to fine								20
0.75.					ĺ		ļ	.			
-1.00				DS	1.00	1.00	6	12	9	21	
	SM	Medium dense, brownish to grey, medium to fine grai			1.45]	Ì	}] [
		sand,									
- 2,00				DS	2.00	2,00	5	10	12	22	
					-		.				
					2,45			.			•]
				205	5.00	3.00	4	9	1.0	19	·]
97.5				03	-	2.00	, ч ,	9	10	17	• • • • • • • • • • • • • • • • • • •
					3.45				.		
-4.00				DS	4.00	4.00	7	9	12	21	
					- 4.45						
4,50	SM	Medium dense, blackisn gr	ey, fine		7.72				{		• • • •
-5.00		grained silty sand,	•	DS	5.00	5.00	2	7	15	22	······································
					-						
5.50		Very dense, blackish grey	y, medium to		5,45						
4.60	SW	fine grained sand.		DS	6,00	6.00	4	31	22	>50	
L6.00		•		03	~	4100		51	22 10		
					6.37		Ref	isal	20		
6.75		Very soft-blackish grey,	organic clay				pen	tret	lion		
-7.00	0H		- ganav vav je	DS	7.00	7.00	1	0	D	0	د و معیمینید. جیدہ ات میں
7,50					- 7,45	•			•		
		· · · · · · · · · · · · · · · · · · ·		ĺÌ		:					
_3.00	SC	Loose gray, medium to fin	e grained	UDS	8.00						
	<u>_</u> 00	cleyey sand.			-						
· ·					8,45						
0.00				DS	9.00	9.00		_	~		
-9.00		·····			- J	y.VV	1	2	3	5	
· _			· · . ·		9.45						
9,90						-		•		ľ	X
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LOG OF BOREHOLE

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iAric .	OF P	ROJECT : Soil Investigation Medical Engineeri	on at the D	ivis:	ion of B	lo		e H	-		Contd.	
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poring	مدهم بستندم	Do Serem Place od; Wash boring					1	_			22,40	n.
irilli:	, , , , , , , , , , , , , , , , , , ,		commenced	and the	30.04.1					at G	and the second secon	ħ
1111			completed		06.05.1					tion ole	GL 2.35	
epth				1								A
elow	, c	Classification & Description	of Soil	1 1 1 1 1 1	e end	depth.		ər 15		er of		
L m					th of : pling m	tested GL m	1	2	3	for	N-yalue graph	ical
0.00										30cm	present	
0.00		•••		DS	10.00	10.00	. В	14	19	33	20	::: \ 4!
.	sc	Dense grey, coarse to med	lium		10.45						•••••	
1-/00		grained cleyey sand.	•	DS	11.00	11.00	20	26	34	50	•	
				1	-				~			•.
ļ	\$P	Very dense, grey, medium t grained sand.	o fine		11.45							./
1.85	1		• •								/	* • • •
2.90	сн	Very soft, blackish grey.	organic '	DS	12.00	12.00	1	۱ ·	1	2		•
		clay,			-	an a					.	
	ļ				14147						1 • :	
7.00				UDS	13.00							
^.00					~							• • •
3.50	}	Medium stift, blackish gre	ev. organic		13.45						1	
1	어 만	clay with pockets of pest.				:						
4.00				DS	14.00	14.00	3	2	5	7		
ĺ					14,45							•
4.50	İ										· · · ·	
5.00		 Medium dense, to very dense fine grained silty sand way 		DS	15.00	15.00	2	5	7	12	·	
	SM	plestic fines.			-							•
1					15.45						• •	
(10										.	•	
6.90				DS	16.00 -	16.00	19	<u>×</u>	<u>17</u> 5	> 50		
					16.35			sal	to		• · · · · · ·	
6,95							pen	etrat	ion			•••
7.00	SM	Very dense, grey, medium to	o fine	bş	17,00	17.00	38	52	-	> 50	···· ···	
	90	grained silty sand.			17,30			vsal			···· · · · · · · · · · · · · ·	· · · · · ·
7.55 		Loose, dark grey, clayey	\$800					etra	ion			
8.00	ଟ୍ଟ	(Recovery.nil)	aduu r	DS	18.00	18.00	1	3	5	8		سير. بريسية
		· · ·		~	-			-	`	U .	· · · · · · · · · · · · · · · · · · ·	
					18.45							
5.90	1	· · · · · · · · · · · · · · · · · · ·				{					;;;;) ;;;;)	
9.00	†	Medium dense, grey, with white clayey silt.	bands of	DS	19.00	19.00	2	7	14	21	<u> </u>	
l	50	. (Highly weathered garnet	biotite		-	•						
.	ML	'gneiss tock),	•••••		19.45			· [<u></u>
			а 1							• •		

A-28

LOG	OF	BOREHO	LE					· ·		AN	NEXE I	L · · ·
NAME OF	PROJE	CT : Soil inve			Jivisi	on of Bi	.ò	Bor	re Ho	ole	BH	2 Contd
		Medical 5	ngineer	ing			······	- <u> </u>			vation	
Location		s Séram Plece						-				22.40 0
)		Wesh boring	t	commence complete		30.04.1	the second second second second second second second second second second second second second second second s				at G	· · · · · · · · · · · · · · · · · · ·
OLTITUR	MUC .	Bentonite		COMPTERS	<u>3 6n ;</u>			GHL STAND/	of br	ore t	etion hole RATION	GL-2.35 m
Depth					1			<u> </u>				blows
POTOM	Classi	ification & Desc	cription	of Soil	Dep	pe and pth of	depth tested	. p	er 15		Ι	N-value
GLm			· · ·		Sam	apling m	GL m	1	2	3	tor 30cm	graphical presentation
20.00 Si	M Me	edium dense, to 1th thin bonds o	very der of white	nse, gréy clayay si	DS	20,00	20.00	4	9	15	24	Q
					DS	1	21.00	4	10	19	20	
- 21.00	go	ighly woathered neiss rock).	garner	biotite		-	21,00		10	¥1	29	
						21.45			ł			
					DS	22.00	22.00	20	25		>50	
22.00						22.40	22144			10		••••••
22.40						44.1-2			usal ptrat	÷		
		orehole terminat ator dapth.	tod at 2	22,40				100	Briay	100		• • • • •
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BMAN	OF. F	ROJECT : Soil Investigatio	n at the DI	visi	OD OF B		Boi	re H	ole	BKH	03
		Medical Engineeri	ng Servicos	632			gre	ound	ejev	ation	
Lotati	lon :	The Seram Place		20			dep	th of	bore	hole	19.45 m
boring	mett		commenced	on ;	07.05,	1991	Kat	er st	ruck	at G	the second second second second second second second second second second second second second second second s
drilli	ing mu	_{Jd i} Bentonite	completed	on :			GWL	on c	omple ore t	etion nole	GL_2.15 m
F1			•	ŀ		S	TANDA				TEST DATA
Depth	1.1		2 . • • • • •	Tvi	bne oc	depth			ոստե	er of	blows
below		Classification & Description (of Soil	Dei	oth of	tested	D	er 15	cm		N-volue
ĢL m				San	npling m	GL m	1	2	3	for 30cm	graphical presentation
0.00		Dark brown, fine grained s	ilty sand.	Ì	1		·		1	(
0.55	SM	with building debris. (Fil	•				-				
-1.00	SW	Loose grey modium to fine	•	DS	1.00	1.00	1	1	4	5	
		grained sand,					•	¦ '	[
1.50	511	Loose yellow, medium to fi	ne]]	1.55			7	Į	ľ	
	5n	grained sand.					1				
-2.00				DS	2.00	2.00	Z ·	3	4	7	
2.50		Medium dense to dense, bro	· · · · · · · · · · · · · · · · · · ·	[.	2.45						(X + Y)
	Sh	medium to fine grained sen							} .		= 1
-3.00				DS	3.00	3.00	4	8	14	22	····\
				İ	-			Ĩ.			
				ļ	3.45			į			
					i 				j. • •		·
-2.00				DS	4.00	4.00	9	14	20	34	
4.50		•			4,45			}			· · · /
	1	Medium dense, grey fine gr	ðineg -						İ		
-5.00	Shi	silty sand.		DS	5.00	5.00	5	9	14	23	
					5.45						· · · ·
5,50		Dense to very dense grey,	ກອງເບລ					Į			
	SW	to fine grained sand.									·
-6,00				DŞ	6.00	6.00	7	20 *	25	45	·
					6,45			ĺ			
-7.00		<u>.</u>		D\$	7.00	7.00	15	28	<u>24</u> 10	>50	
					7.40				10	İ	
7.60		Loose to very loose grey m	edium to								
-8.00	sc	fine grained clayey sand.		De	8.00	8.00	1	2	6	8	
		•				0.00		4	0	°	
					8.45						
-9.00				DS	9.00	9.00	2	1	`1	2	
					- 9.45						
					¥.47				· · .	;	
_									·.	· ·	
	D BY		SEQTECHNI			·1	لبعد				

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NAME	OF P	ROJECT : Soil Investigatio		-Med	ical		Bor	e H	ole	BH 0	3 Contd.
		Enginéering Servi	lces				910	ound	oley	ation	survey of the local division of the local di
Locati	on :	The Seram Place					dep	th of	bore	hole	19.45 m
boring	meth	od : Wash boring	commenced	on :	07.05.1	991 .	Kate	er st	ruck	st G	fi
drill	lng mu	d : Bentonite	completed	on :	09.05.1	991	GHL	on c of b	omple	tion b)e	GL 2.15 m
			•	•		\$					TEST DATA
Dopth -			·	Typ	e and	depth			numb	er of	blows
pelow	.0	Clossification & Description	of Soil	Dep	oth of	tested	. 0	<u>er 15</u>) сл		N-value
GLm				Sar	n grila	GLm	1	2	3	tor 30cm	graphical presentation
10.00	SC:			1 DUS	10.00	,	-	-		- (. : 20. 40
10,50	30			Ļ	10.45	(}	{	{		
		Medium dense, grey medium	to fine		ļ.						
11.00	SM	grained silty sand with p	lastic	DS	11.00	11.00	2	9	12	21	
		tines.		1	- 11.45	}					· · : / 2
		-			11142						· / ···· ·
11.90		Nedium stiff. blockish gr		DS	12.00	12.00	5	4	3	7	. /
12.00	년 1년	clay with thin layers of	peət.		-		-				
					12.45				ĺ '		
12.70		Soft, black, fully decomp	osed) }	i -					
13.00		DODt,		DS	15.00	13.00	1	1	2 .	3	
					- 13:45						
					12142	ĺ			i		
	Į			bos.	14.00				{ .		······
14.00					14.40						
			•								
					10 00				} .		
13.00		Very dense, grey medium	to fine	DS	15.00	15,00	30	<u>53</u> 10	-	-	, , , , , , , , , , , , , , , , , , ,
	SM	grained silty sand.			15,25				{		
15.50	+		- • · · · · · · · · · · · · · · · · · ·	1	l						
-16.00			•	DS	16,00	16.00	36	30	9	39	··· · · · · · · · · · · · · · · · · ·
		· · · · ·			-						· · · · · / ·
		Medium dense to dense, g	ręy,		16.45			[
	ISM	medium to fine grained s		-	471.00	4 44	_				····· /····
-17.00		with occasional subangula quartz and traces of play		uş	17,00	17.00	3	7	9	16	
					- 17,45				ĺ		
		•	•]		······································
-16.00	!			DS	18.00	15.00	7	14	22	36	
			•		- 18.45						
18,55	 }	Very dense, grey with thi									
	\$M ⁻	yellowish and bleckish si		ne	10 00		,,	07	76	<u> </u>	
-19,00]]	(Highly weathered feldsph gneiss rock).	NALIC DIOTITE	συ	19,00	19.00	11	27	36	63	
19.45	┝──┤			.•	19.45						
	{ }	Borehole terminated at 19	45m depth								

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OG NAME		DF BOREHOLE ROJECT : Soil Investigation	n at the Div	1010	n	میں میں میں میں میں میں میں میں میں میں	80	e Ha		VEXE I BH 4	
-		Medical Engineeri	ng Services	, - 1 Q			-	4.A		ation	
Locati	on :	The Serem Place					dep	th of	bore	hole	14,30 m
boring	meth	od: Wash boring	commenced	on ;	09.05.1	991 .	1			ət GL	
drilli	ດຣູ ຫນ	d : Bentonite	completed	on :	13.05.1	991	_	and the second se	in the second second	tion ole	GL_2.20 m
Depth				· •		s					TEST DATA
		· · · · · · · · · · · · · · · · · · ·		τýp	e and	depth			ពបាង	er of	blows
below	•••(Classification & Description	01 2011	Dep	nth of	tested	P P	er 15	¢m I		N-value
ចុំក				Sett	pling m	GL m	1	2 C	3	for 30cm	graphical presentation
0.00		Looza brown; fine grained with building debris (Fil	silty sand	 	{					ġ	
0.40	SM	Loose, greyish brown media]					· · · · · · · · · · · · · · · · · · ·
1 00		grained silty sand.	•		2 00		~				
1,00			· · ·	DS	1.00	1.00	3	2	2	4	J
1.50					1,45						
	SW	Medium dense, yellow med	ium to fine								
2.00	on I	grained <u>silly</u> sand.		DS	2.00	2.00	6	6	10	16	
2.50		·			2,45]					··· · <u>\</u>
	Sh	Medium dense, prown mediu fine grained sond.	n CO								······
I.C.		The grathed sond.		DS	3.00	3.00	5	11	15	26	···· / ···
		4 2		}	- 3.45						
3,50		Medium dense to dense, da	rk brown	1							
	\$M	time grained silty sand.					į		j		
4,00				: D\$	4.00	4.00	8	10	18	28	·····
					4.45						• • •
5.00			•	DS	5.00	5.00	7.	13	17	30	
5 =0					5.45						·····
5.50	SY.	Dense, grey, medium to fi	ກອ	.			l				
é.00		grained sand.		DS	6,00	6,00	6	14	21	35	
					-						
					6,45						
7.00				DS	7.00	7.00	7	.15	20	35	
1.00				03		7.00	'		20		
					7.45						
7,85						-					
8.00	₽t	Soft, black, fully decomp	posed pest.	DS	8.00	8.00	١	1	3	4	
					- 8,45						
8.95											
9.00	SC	Loose, gray, meddum to fi	ine grainad	DS	9,00	9.00	1	2	4	6	
		clayey sand.	:	ŀ.	-						
					9,45			:			
			• :					.			
LOGGE	ייידים רים ח		GEOTECHNI		ENgruene				-	l	
	~ 01		NATIONAL	BUT	DING DEG	THE DIT.	T2TON			DATE	:

NAME	00 0	DA17AT		4 ve 4 - 4			R.	re H	N1 - 1	······································	
NAME	VF P	ROJECT : Soil Investigat Medical Engineer			on or Bi	0-	f			BH etion	6 Contd.
Locati	on :	The Seran Place	· · · · · · · · · · · · · · · · · · ·					·			
boring	moth	od : Wash boring	connenced	on :	09.05.1	991		·		st G	
drilli			completed		13.05.1			the same state of the same sta	-		GL 2.20
		₩₩₩ <u>₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩</u>		1.		S	TAND	NRD F	ENETR	ATION	TEST DATA
D≘pth _				Tvr	e and	depth	<u> </u>		ոստե	er of	blows
below	C	Dessification & Description	of Soil	Dep	th of	tested	0	er 15	cm		N-value
GL na				Sam	pling m	GLm	1	2	3	tor 30cm	graphica presentati
0.00	sc		· · ·	DS	10.00	10.00	2	2	4	6 (
10.50					10,45						
			•								
1.00		Nadžina skižki se v kiželi s		DS	11.00	31,00	2	4	4	8	
	СН	Medium stiff, grey high p cloy.	Tasticità	UDS	11.45		 				
1.90					11.90					ļ	
12,00		Medium dense to very dens		TD\$		12.00	7	11	18	29	ļ
	SP	coarse to meldum grained occesional sub angular gr		ļ	12.45					(.)	
:		size quartz,	049113								· · .
13.00		•		DS	13.00	13.00	17	40	1 <u>8</u> 5	>50	
					- 13.35	}		{	2		·
								Į			• • • • • • • • • • • • •
14 .00				DS	14.00	14.00	29	51	-	> 50	,
32.00					- 14,30				}		
14.50		Borehole terminated at 14	.30m depth.								
15.00									}		· · · · · · · · · · · · · · · · · · ·
						Ì			Ì		· · · · · · · · · · · · · · · · · · ·
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<i></i>											·····
16.02											
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NAME	OF F	ROJECT : Soil Investigati	on at the Di	visl	on of Bi	0-	Во	re H	ole	BH 5	and the second second second second second second second second second second second second second second secon
		Medical Engineor	ing Services,	•			gra	bund	elev	ation	
Locati	lon :	The Serem Place					dep	th of	bore	hole	19,35 1
boring	; matl		commenced	on :	14.05.1	991	Wati	er st	ruck	at G	It.
drilli	ing m	ud : Bentonite	completed	<u>оп</u> :	16.05.1					tion ole	GL 2.05 m
Depth						S	TANDA	NO F	NETR	ATION	TEST DATA
below		Classification & Description		Tyr	e and	depth			ทบชอ	to ne	blows
		Classification & Description	OT 5011	Dep	th of	tested	P	<u>er 15</u>	¢in I	405	N-Value
GLa				San	pling m	GLM	1	2	3	for 30cm	Graphical presentation
0.00	SM	Loose blackish fine.r.tar. With aggregates (fill).	r' silty sand							(
1.00	5.P	Very loose to dense, greyi	sh medium	DS	1.00	1.00	1	1	2	3	· · ·
	•	to tine grained sand.			1.45						
2.00				DS	2.00	2.00	3	11	26	37	
2,50					2.45						
· •	(SK	Dense, brown, medium to fi	en	: : !					 		
1.00	1	grained send.		US I	3,00	3.00	10	17	25	42	
	;										
a .or			· · · ·	DS	4.00	4.00	8	13	19	32	
4.50	 	} }			4.45						/
-5,00	SM	Medium, dense, brownish gre fine grained silty sand,	y	DS	5,00	5.00	4	6	15	21	
5.50		Medium dense, to dense, gr medium to fine grained sil	eyish brown ty sand.		5.45						
. 5.90	SM		•	DS	6,00	6.00	5	13	16	29	
	•				- 6,45						
7.00			. • •	DS	7.00	7,00	14	19	25	44	
7,65					7,45			:			
2.05	сн	Soft, light grey, high pl with traces of sand.	osticity cla	, DS	8,00	8.00	1	1	3	4	
					8.45						
9.00				DS	9,00 9,45	\$. 5°	Rec	overy	nil		
			. ⁻		_						
LOGGE	D BY	<u>.</u>	SEQTECHNI NATIONAL	(CAL	ENGINEE	RING DIV	ISION	 		DATE	:

							Bo	กฏ ไม	01e	PH 5	Contd.
NAME	OF PF	OJECT : Soil Investigatio Medical Engineeri		isia	n of Bio					ation	
Locati	on :	The Serom Place	••••••••••••••••••••••••••••••••••••••				<u> </u>	-			19.35 m
boring	metho	xd: Wash boring	commenced	on :	14.05.1	991	<u> </u>			at G	
drilli	Võ mno	; Bentonite	completed	on :	16,05,1	991	GWL	on e	comple ore	tion	GL_2.05 m
				•		\$	TAND	ARD F	ENETR	ATION	TEST DATA
Apth	· -	lassification & Description	04 5021	Typ	e end	depth	· .			er of	blows
SL m		TERRITCACTON & Description	01 0011	1 · · ·	oth of pling m	tested GL m		<u>er 1</u>	1	for	N-value graphica:
10.00		 «ماهنور <u>سی بر الفارنسوار امر مرور می از استور بر الفارسور امر از مرور می ا</u> مراک است.	·····				1	2	3	30cm	presentatio
	•			DS	10,00 10,45 10,55	10:00	1	0	2	2	20
11.00	ci	Soft, light grey, high pla clay with traces of sand,	esticity	DS	10.95	11.00	1	1	2	3	
11.95				1	11.45						
12.00	Pt	Black, peat.		DS	12.00	12,00	2	3	14	17	
12.60	сн	Medium stiff, grey, high plasticity clay.		DS	13,00	13.00		2	4	6	
					13.45	7 y 2		-			
4.00				50	14.00	14.00	1	١	3	4	
14,50				- - -	14.45						
13.00		Medium stiff, light grey		DS	15.00 15.45	15.00	1	2	3	5	
16.00	CI	with thin bands of yellow yrwy slity clay with trace	ish and derk es of sand.	DS	-	16.00	1	2	4	ō	
1					16.45					-	
₹.00 7.25	ML	Medium donse, light gray b bands of yellowish and bl clayay silt. (Highly weat)	eckish h≘red	D\$	17.00 - 17.45	17.00	1	5	10	ן יייי יייי	
8.00		feldsphatic, biotite gnei:	ss rijcki	DS	18.00	18,00	3	5	11	16	
ô,95	/	Very dense, dark grey wit	h thin		10,42						
9.00	SM	bands of whitish, meidum grained silty sand with m	idum to fine D ith mica、	D\$	19.00	19.00	17	45	<u>20</u> 5	>50	
9.35	$\left \right $	(Highly weathered feldsph oneiss rock). Borehole terminated at 19		≥ 11	19,35			səl trat	to		

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