APPENDICES

1. Member List of the Survey Team

1-1. Member List (Field Survey)

FUNCTION	NAME	ORGANIZATION
Team Leader	Hiroshi KITANI	Development Specialist, Japan International Cooperation Agency (JICA)
Technical Advisor	Hiromoto WATANABE	Deputy Director, Office of Overseas Fisheries Cooperation, Fisheries Agency
Grant Aid Project Planning	Katsutoshi ISHIDA	Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs
Chief Consultant cum Fisheries Education Planner	Takafumi TOSHIHARA	Fisheries Engineering Co., Ltd.
Facility Planner	Taizo KANEKO	Fisheries Engineering Co., Ltd.
Aquaculture Equipment Planner	Michio TORII	Fisheries Engineering Co., Ltd.
Civil Engineering Planner	Toshio YANO	Yachiyo Engineering Co., Ltd.

1-2 Member List (Consultation on Draft Report).

FUNCTION	NAME	ORGANIZATION
Team Leader	Hiromoto WATANABE	Deputy Director, Office of Overseas Fisheries Cooperation, Fisheries Agency, Ministry of Agriculture
Chief Consultant cum Fisheries Education Planner	Takafumi TOSHIHARA	Fisheries Engineering Co., Ltd.
Facility Planner	Taizo KANEKO	Fisheries Engineering Co., Ltd.

2. Survey Itinerary

2-1. Survey Itinerary (Field Survey)

Day	DATE		ACTIVITIES	
1	Aug. 9	Sat	Lv. Tokyo →	
2	10	Sun	→Ar. Lilongwe	
3	11	Mon	Visit to JICA Office Courtesy call on Ministry of Finance	
4	12	Tue	Courtesy call on Bunda College of Agriculture, University of Malawi Discussion with Bunda College of Agriculture : Discussion on the implementing frame work of the Project	
5	13	Wed	Information and Data Collection from Bunda College of Agriculture	
6	14	Thu	Site Survey	
7	15	Fri	Discussion with Bunda College of Agriculture	
8	16	Sat	Lv. Lilongwe → Ar. Domasi Visit to Domasi National Aquaculture Center Lv. Domasi → Ar. Zomba	
9	17	Sun	Visit to Vinari fish farm Lv. Domasi → Ar. Lilongwe	
10	18	Mon	Discussion with Bunda College of Agriculture : Drafting of Minutes of Discussion	
11	19	Tue	Signing in Minutes of Discussion	
			Mr. TOSHIHARA, Mr. KANEKO Mr. TORII, Mr. YABE	Mr. KIYA, Mr. WATANABE Mr. ISHIDA
12	Aug. 20	Wed	Report to JICA office Site survey	Report to JICA office Lv. Lilongwe→Ar. Lusaka
13	21	Thu	Site survey	Report to Embassy of Japan & JICA office in ZAMBIA Lv. Lusaka→
14	22	Fri	Discussion with Bunda College of Agriculture	→Via London→
15	23	Sat	Review collected data	→Ar. Tokyo
16	24	Sun	Team meeting	
17	25	Mon	Discussion with Bunda College of Agriculture, Site of survey	
18	26	Tue	Discussion with Bunda College of Agriculture, Site of survey	
19	27	Wed	Discussion with Bunda College of Agriculture, Site of survey	
			Mr. TOSHIHARA, Mr. KANEKO	Mr. TORII, Mr. YABE
20	Aug. 28	Thu	Report to JICA office Collection of construction data	Report to JICA office Lv. Lilongwe→Ar. Johannesburg
21	29	Fri	Discussion with Bunda College of Agriculture, Site of survey	Lv.. Johannesburg→
22	30	Sat	Review collected data	→Ar. Tokyo
23	31	Sun	Team meeting	
			Mr. TOSHIHARA	Mr. KANEKO
24	Sept. 1	Mon	Report to JICA office Collection of data	Report to JICA office Lv. Lilongwe→Ar. Johannesburg
25	2	Tue	Discussion with Bunda College of Agriculture, Site of survey	Lv.. Johannesburg→
26	3	Wed	Discussion with Bunda College of Agriculture, Collection of data	→Ar. Tokyo
27	4	Thu	Report to JICA office Lv. Lilongwe→Ar. Lusaka	
28	5	Fri	Report to Embassy of Japan & JICA office in ZAMBIA Lv. Lusaka→ Ar. Johannesburg	
29	6	Sat	Lv.. Johannesburg→	
30	7	Sun	→Ar. Tokyo	

2-2. Survey Itinerary (Consultation on Draft Report)

Day	DATE		ACTIVITIES	
1	Oct. 22	Wed	Lv. Tokyo →	
2	23	Thu	→Ar. Lilongwe, Visit to JICA Office	
3	24	Fri	Courtesy call on Ministry of Finance & NEC Discussion with Bunda College of Agriculture : Drafting of Basic Study Report Collection of data	
4	25	Sat	Team meeting	
5	26	Sun	Team meeting, Visit to Salima in Lake Malawi	
6	27	Mon	Discussion with Bunda College of Agriculture : Drafting of Minutes of Discussion	
7	28	Tue	Signing in Minutes of Discussion, Site survey	
			Mr. TOSHIHARA, Mr. KANEKO	Mr. WATANABE
8	Oct. 29	Wed	Report to JICA office, Discussion with Bunda College of Agriculture	Report to JICA office Lv. Lilongwe→
9	30	Thu	Report to JICA office Lv. Lilongwe→Ar. Johannesburg	→Via London→
10	31	Fri	Lv.. Johannesburg→	→Ar. Tokyo
11	Nov. 1	Sat	→Ar. Tokyo	

3. List of Person Met

3-1 Field Survey

Name	Title / Organization
Mr. J. C. T. NTHANI	Deputy Secretary (Bilateral), Ministry of Finance
Mr. A. MZOMA	Senior Assistance Secretary, Ministry of Finance
Prof. Z. KASOMEKERA	Principal, Bunda College of Agriculture (BCA), University of Malawi (UOM)
Prof. L. A. KAMWANJA	Vice Principal, BCA, UOM
Dr. G.Y. KANYAMA-PHILI	Dean of Faculty of Agriculture, BCA, UOM
Dr. R.K.D. PHOYA	Head of Animal Science Department, BCA, UOM
Dr. J.S. LIKONGWE	Head, Aquaculture Section, Animal Science Department, BCA, UOM
Mr. E.K.KAUNDA	Lecturer, Animal Science Department, BCA, UOM
Mr. L.K. MWALE	Acting Estates Development Officer, UOM
Mr. J.R. KAFOTOKOZA	Senior Works Supervisor, UOM
Dr. Hiroki EDA	JICA Expert, Animal Science Department, BCA, UOM
Mr. Yusuke KITAMURA	Resident Representative, Japan International Cooperation Agency (JICA)
Mr. Ryosuke KOJIMA	Deputy Resident Representative, JICA
Mr. Tetsuo SEKI	Assistant Resident Representative, JICA
Mr. Akio KAGAWA	Assistant Resident Representative, JICA

3-2 Consultation of Draft Report

Name	Title / Organization
Mr. J. C. T. NTHANI	Deputy Secretary (Bilateral), Ministry of Finance
Mr. A. MZOMA	Senior Assistance Secretary, Ministry of Finance
Mr. G. S. Z. JERE	Deputy Chief Economist and Director of Development Cooperation and SADAC Affairs
Prof. Z. KASOMEKERA	Principal, Bunda College of Agriculture (BCA), University of Malawi (UOM)
Mr. J. A. KAZANJA	Register, BCA, UOM
Dr. R. K. D. PHOYA	Head of Animal Science Department, BCA, UOM
Dr. J. S. LIKONGWE	Head, Aquaculture Section, Animal Science Department, BCA, UOM
Mr. E. K. KAUNDA	Lecturer, Animal Science Department, BCA, UOM
Dr. Hiroki EDA	JICA Expert, Associate Professor, Animal Science Department, BCA, UOM
Mr. Yusuke KITAMURA	Resident Representative, Japan International Cooperation Agency (JICA)
Mr. Ryosuke KOJIMA	Deputy Resident Representative, JICA
Mr. Tetsuo SEKI	Assistant Resident Representative, JICA
Mr. Akio KAGAWA	Assistant Resident Representative, JICA

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY
ON
THE PROJECT
FOR
THE BSC. AQUACULTURE OPTION INFRASTRUCTURE DEVELOPMENT
AT
BUNDA COLLEGE OF AGRICULTURE
UNIVERSITY OF MALAWI
IN
THE REPUBLIC OF MALAWI

In response to a request from the Government of the Republic of Malawi (hereinafter referred to as "GOM"), the Government of Japan (hereinafter referred to as "GOJ") has decided to conduct a Basic Design Study on the Project for the BSc. Aquaculture Option Infrastructure Development at Bunda College of Agriculture (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Malawi a Basic Design Study Team (hereinafter referred to as "the study team") headed by Mr. Hiroshi KITANI, Development Specialist, JICA. The study team is scheduled to stay in the country from August 10 to September 3, 1997.

The study team held a series of discussions with the officials concerned of the Bunda College of Agriculture and Government of the Republic of Malawi and conducted a field study at the study area.

In the course of discussions and field study, both sides have confirmed the main items described on the attached sheets. The study team will proceed with further works and prepare the Draft Basic Design of the Project.

19 August 1997, Bunda, Lilongwe

Mr. Hiroshi KITANI
Leader
Basic Design Study Team
JICA

Prof. Z. KASOMEKERA
Principal
Bunda College of Agriculture
The Republic of Malawi

Mr. J.C.T. NTHANI
Deputy Secretary (Bilateral)
Ministry of Finance
The Republic of Malawi

ATTACHMENT

1. Participants in the Discussions

List of participants in the discussions is shown in ANNEX-I.

2. Objective of the Project

The objectives of the Project are to construct more physical facilities at Bunda College of Agriculture to develop human resources who will teach aquaculture to rural communities, to carry out more research programmes in the field of aquaculture and to provide a sustainable and academically attractive aquaculture option.

3. Project Site

The Project site is in the Bunda College of Agriculture, as shown in ANNEX-II.

4. Responsible & Executing Agencies

The Ministry of Finance of the Republic of Malawi is the responsible agency and the Bunda College of Agriculture is the executing agency of the Project.

5. Items requested by the Government of the Republic of Malawi

The items requested by GOM with their priority are listed in ANNEX-III.
GOM expressed that the item requested would be primarily utilized for Aquaculture course, which is now in process for up-grading to the Department of Aquaculture and Fisheries Science.

6. Japan's Grant Aid Scheme

1) GOM has understood the system of the Japan's Grant Aid explained by the Team; the main feature is described in ANNEX-IV.
2) GOM will take necessary measures, described in ANNEX-V, for smooth implementation of the Project if the Grant Aid by GOJ is extended to the Project.

7. Management & Operation

1) Bunda College of Agriculture is responsible for the allocation of sufficient budget, assignment of necessary personnel, coordination with other donors, in communication with JICA, and will take necessary measures to ensure proper operation and maintenance of facilities and equipment procured under the Project.
2) The importance of fulfillment of teaching staff was recognized as an essential prerequisite for successful operation of the Project. GOM will make utmost efforts, such as allocating available staff and coordinating other donor's assistance, to fulfil the need of staffing. The study team will also seek possibility of coordination with technical assistance by GOJ and other donors as well.

8. Further Schedule

1) JICA Study Team will proceed with further studies in Malawi until September 3, 1997.
2) On the basis of the Minutes of Discussions and technical examinations of the study results, JICA will prepare the Draft Basic Design and dispatch a team to Malawi around October 1997 in order to inform the outline of the Draft Basic Design.
3) Upon acceptance of the Draft Basic Design by GOM, JICA will complete the Basic Design Study Report, and forward it in its final form to GOM by January 1998.

ANNEX-I: LIST OF PARTICIPANTS IN THE DISCUSSIONS

1. FOR GOM SIDE

Ministry of Finance

Mr. J. C. T. NTHANI	Deputy Secretary (Bilateral)
Mr. A. MZOMA	Senior Assistance Secretary

Bunda College of Agriculture

Prof. Z. KASOMEKERA	Principal
Prof. L. A. KAMWANJA	Vice Principal
Dr. G. Y. KANYAMA-PHIRI	Dean of Faculty of Agriculture
Dr. R. K. D. PHOYA	Head of Animal Science Department
Dr. J. S. LIKONGWE	Head, Aquaculture Section, Animal Science Department
Mr. E. K. KAUNDA	Lecturer, Animal Science Department
Mr. L. K. MWALE	Acting Estates Development Officer, University of Malawi
Mr. J. R. KAFOTOKOZA	Senior Works Supervisor
Dr. Hiroki EDA	JICA Expert, Animal Science Department

2. FOR GOJ SIDE

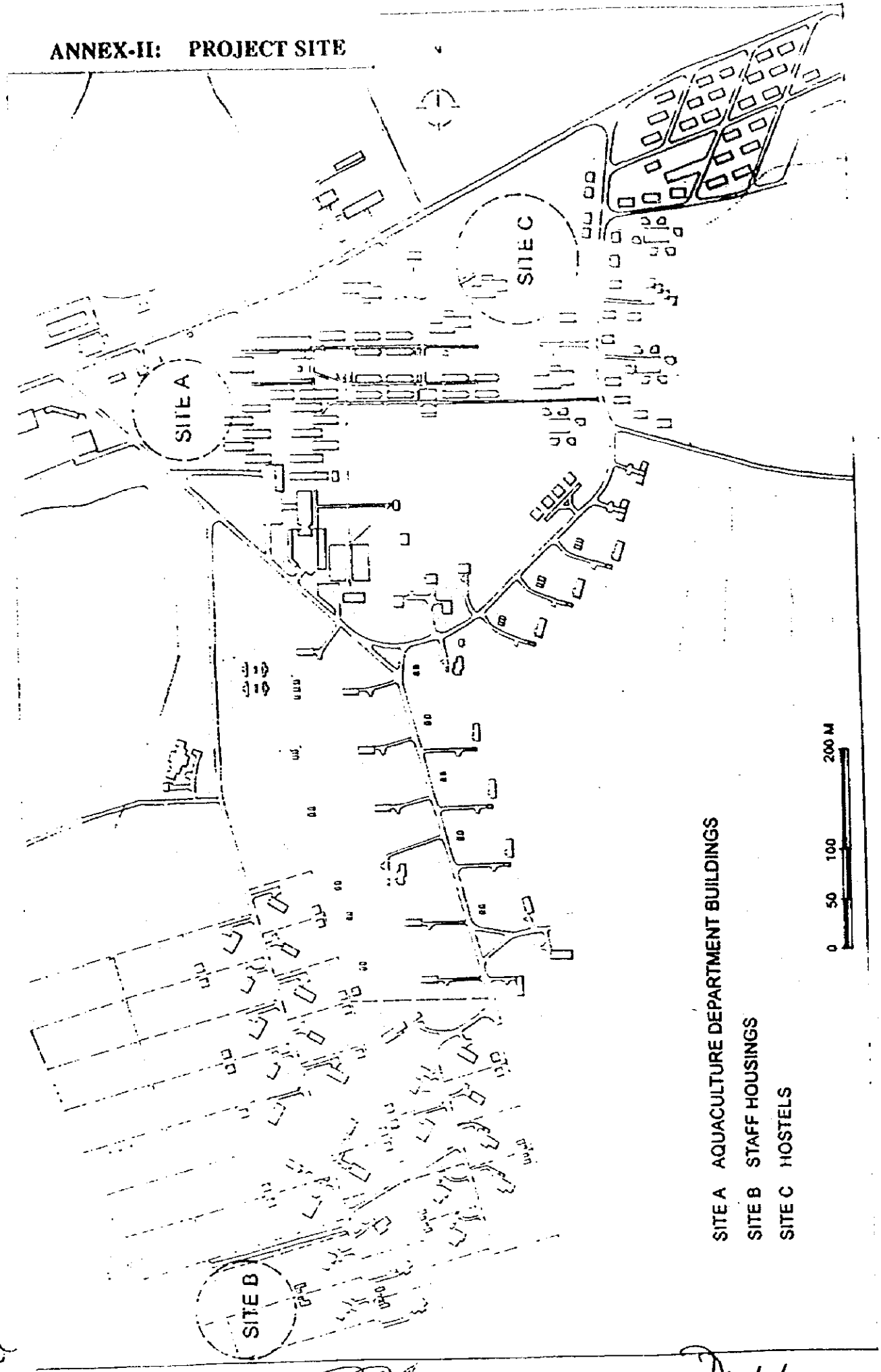
The Study Team

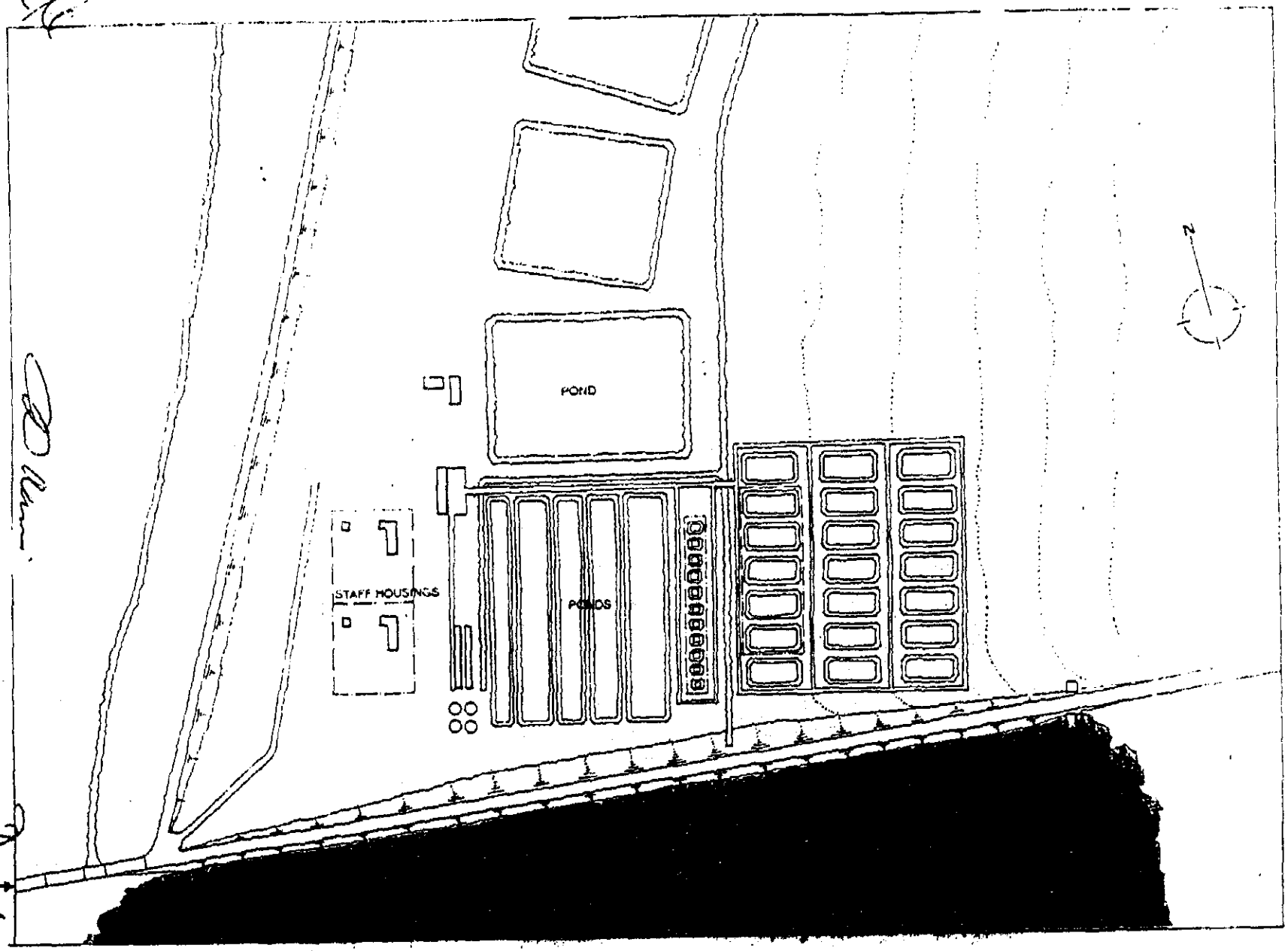
Mr. Hiroshi KITANI	Team Leader	Development Specialist, JICA
Mr. Hiromoto WATANABE	Technical Adviser	Deputy Director, Office of Overseas Fisheries Cooperation, Fisheries Agency, Ministry of Agriculture
Mr. Katsutoshi ISHIDA	Grant Aid Project Planning	Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs
Mr. Takafumi TOSHIHARA	Chief Consultant cum Fisheries Education Planner	Fisheries Engineering Co., Ltd.
Mr. Taizou KANEKO	Facilities Planner	Fisheries Engineering Co., Ltd.
Mr. Michio TORII	Aquaculture Equipment Planner	Fisheries Engineering Co., Ltd.
Mr. Toshio YANO	Fisheries Engineer	Fisheries Engineering Co., Ltd.

JICA Malawi Office

Mr. Akio KAGAWA	Assistant Resident Representative

ANNEX-II: PROJECT SITE





SITE D FIELD ACADEMIC BUILDINGS

ANNEX-III: ITEMS REQUESTED BY THE GOVERNMENT OF THE REPUBLIC OF MALAWI

		Priority
1. FACILITIES		
1)	Wet and dry laboratories	A
2)	Computer room	A
3)	Lecture rooms	A
4)	Office, research laboratories and store block	A
5)	Seminar room	B
6)	Field laboratory	A
7)	Academic block	A
8)	Fish hatchery with related facilities	A
9)	Fish pond	B
10)	Renovation of water supply and drainage system for fish pond	A
11)	Dam renovation	A
12)	Guest housing	A
13)	Hostel(s)	B

2. EQUIPMENT

1) Training equipment
2) Research equipment
3) Audio visual equipment
4) Computers and incidental equipment
5) Vehicle(s)

ANNEX-IV: 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 (the 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.

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 Program, 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 Aid 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 in 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 Study 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 delay 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 laws and regulations of Japan. Grant Aid is not supplied through the donation of 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 be 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 used 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 controlled 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;
d) 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;
e) 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;
f) to ensure that the facilities constructed and products purchased under the Grant Aid be maintained and used properly and effectively for the Project; and
g) 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 an authorized foreign exchange 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-V: UNDERTAKINGS BY THE GOM

1. to secure a lot of land necessary for the Project;

2. to clear and level the site for the Project prior to the commencement of the construction;

3. to provide a proper access road to the Project site;

4. to provide facilities for distribution of electricity, water supply, telephone trunk line and drainage and other incidental facilities outside the site;

5. to undertake incidental outdoor works, such as gardening, fencing, exterior lighting, and other incidental facilities in and around the Project site, if necessary;

6. to ensure prompt unloading and customs clearance of the products purchased under the Japan's Grant Aid at ports of disembarkation in Malawi;

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

8. 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 Malawi and stay therein for the performance of their work;

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

10. to provide necessary permissions, licenses, and other authorization for implementing the Project, if necessary;

11. 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; and

12. to bear all the expenses, other than those covered by the Japan's Grant Aid, necessary for the Project.

MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY ON
THE PROJECT FOR THE BSC. AQUACULUTURE OPTION
INFRASTRUCTURE DEVELOPMENT AT
BUNDA COLLEGE OF AGRICULTURE
UNIVERSITY OF MALAWI
THE REPUBLIC OF MALAWI
(Consultation on Draft Report)

The Japan International Cooperation Agency (JICA) dispatched a basic design study team on the Project for the BSc. Aquaculture Option Infrastructure Development at Bunda College of Agriculture, University of Malawi (hereinafter referred to as "the Project") to the Republic of Malawi in August 1997. As a result of a series of discussions, field survey in Malawi, and technical examination of the results in Japan, JICA prepared the Draft Basic Design of the Project.

In order to inform the Malawi Government (University of Malawi, Bunda College of Agriculture) of the components of the Draft Basic Design, JICA sent to Malawi a study team headed by Mr. WATANABE Hiromoto, Fisheries Agency, Government of Japan. The team is scheduled to stay in Malawi from October 23 to 29, 1997.

As a result of discussions, both sides have confirmed the main items, quantity and specifications described on the attached sheets. The team will proceed to further works and finalize the Basic Design Study Report.

28 October 1997, Bunda, Lilongwe

WATANABE Hiromoto
Leader
Study Team
JICA

for Prof. Zachary M. KASOMEKERA
Principal
Bunda College of Agriculture
University of Malawi

J. C. T. NTHANI
Deputy Secretary (Bilateral)
Ministry of Finance
Republic of Malawi

ATTACHMENT

1. Participants in the Discussions

A list of participants in the discussions is attached as Annex Ⅰ.

2. Title of the Project

The Government of the Republic of Malawi has proposed a new title of the Project as "The Project for Development of Aquaculture and Fisheries Science Department at Bunda College of Agriculture, University of Malawi, the Republic of Malawi".

3. Components of the Draft Report

The Government of the Republic of Malawi has in principle accepted the components of the Draft Basic Design proposed by the team, with inclusion of another emergency generator for a wet laboratory at the Campus site.

4. Responsible Organization and Implementing Agency

Responsible Ministry: Ministry of Finance

Implementing Agency: Bunda College of Agriculture

5. Management and Maintenance

Bunda College of Agriculture will maintain and use the facilities and the equipment purchased under the Grant Aid properly and effectively for the Project, and to assign the necessary staff members for operation and maintenance of them as well as to bear all the expenses, other than those to be borne by the Grant Aid, necessary for the Project.

6. Japan's Grant Aid System

a. The Government of Malawi has understood the system of the Japan's Grant Aid explained by the team; the main feature is described in Annex Ⅱ.

b. The Government of Malawi will take the necessary measures, described in Annex Ⅲ, for the smooth implementation of the Project on condition that the Grant Aid by the Government of Japan is extended to the Project.

7. Further Schedule

JICA will complete the Basic Design Study Report in accordance with the confirmed items, and forward it in its final form to the Government of Malawi around January, 1998.

H.W.

ANNEX I

List of Participants in the Discussions

Malawi Side	
Ministry of Finance	
Mr. J. C. T. NTHANI	Deputy Secretary (Bilateral)
Mr. A. MZOMA	Senior Assistant Secretary
National Economic Council	
Mr. G. S. Z. JERE	Deputy Chief Economist and Director of Development Cooperation and SADC Affairs
Bunda College of Agriculture	
Prof. Z. M. KASOMEKERA	Principal
Prof. L. A. KAMWANJA	Vice Principal
Mr. J. A. KADZANJA	Registrar
Dr. R. K. D. PHOYA	Head of Animal Science Department
Dr. J. S. LIKONGWE	Head of Aquaculture Section
Mr. E. KAUNDA	Lecturer in Aquaculture
Dr. H. EDA	JICA Expert, Associate Professor in Aquaculture
Japan Side	
The Study Team	
Mr. Hiromoto WATANABE	Team Leader, Deputy Director, Office of Overseas Fisheries Cooperation, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries
Mr. Takafumi TOSHIHARA	Chief Consultant, Fisheries Engineering Co., Ltd.
Mr. Taizo KANEKO	Facility Planner, Fisheries Engineering Co., Ltd.
JICA Malawi Office	
Mr. Yusuke KITAMURA	Resident Representative
Mr. Akio KAGAWA	Assistant Resident Representative

ANNEX II

Japan's Grant Aid Scheme

1. Grant Aid Procedures

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 (the 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 (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, 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 (hereafter referred to as "the Study"), conducted by JICA on a requested project (hereafter referred to as "the Project") is to provide a

basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

a) Confirmation of the background, objectives, and benefits of the requested 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 a technical, social and economic point 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
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 Aid 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 though 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 smooth implementation of the Study, JICA uses a registered consulting firm. JICA select a firm based on proposals submitted by interested firms. The selected firm participate the Study and prepare a report based upon terms of reference set by JICA.

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

H.W.

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 laws and regulations of Japan. Grant Aid is not supplied through donation of 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 Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with a consultant firm and a contractor 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 be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant Aid, 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 used for the purchase of the products or services of a third country.

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

5) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts

H.W.

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 an authorized foreign exchange 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 the recipient country or its designated authority.

shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following.

a) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
b) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
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.
d) To exempt Japanese nationals from customs duties, internal taxes and fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
e) 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 the recipient country and stay therein for the performance of their work.
f) To ensure that the facilities constructed and products under the Grant Aid be maintained and used properly and effectively for the Project.
g) 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 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 should not be re-exported from the recipient country.

(9)Banking Arrangements (B/A)

H.W.

ANNEX III

Necessary Measures to be taken by the Government of Malawi

1. To secure a lot of land, at the respective sites, necessary for the Project.

2. To clear, level and reclaim the site for the Project prior to the commencement of the Project.

3. To secure yard for stocking materials and constructing temporary facilities at the respective Project site.

4. To provide necessary permissions, licenses and other authorization for smooth implementation of the Project.

5. To undertake incidental outdoor works, such as gardening, fencing and other incidental facilities in and around the Project site, if necessary.

6. To provide the following incidental facilities in connection with the site.
   a. Electricity distributing line to the site,
   b. City water distribution main to the site,
   c. Drainage main to the site,
   d. Telephone trunk line to the site

7. To ensure prompt unloading, tax exemption, customs clearance at the place of disembarkation in Malawi and prompt internal transportation therein of the products purchased under the Grant Aid.

8. To exempt Japanese juridical and physical nationals engaged in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in Malawi with respect to the supply of the products and services under the verified contracts.

9. To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into Malawi and stay therein for the performance of their work.

10. To bear commissions to the Japanese foreign exchange bank for its banking services based upon the Banking Arrangement, namely, the advising commission of the "Authorization to Pay" and payment commission.

11. To ensure the facilities constructed and equipment purchased under the Japan's Grant Aid be maintained and used properly and effectively for the Project.

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

H.W.

WATER QUALITY TEST RESULTS

Sampling Date: August 29, 1997

Sampling Points / Test Items		CWL / Point 1 / Z 1244 / Bunda Reservoir	CWL / Point 2 / Z 1245 / Fish Pond (middle)	CWL / Point 3 / Z 1247 / Fish Pond (large)	CWL / Point 5 / Z 1249 / Pond Drainage	CWL / Point 4 / Z 1248 / Existing Well	CWL / Point 6 / Z 1250 / Sewage Works
	MBS	Z 1244	Z 1245	Z 1247	Z 1249	Z 1248	Z 1250
Test Items	**Tested by**	**Bunda Reservoir**	**Fish Pond (middle)**	**Fish Pond (large)**	**Pond Drainage**	**Existing Well**	**Sewage Works**
Dissolved oxygen : DO (mg/l)	CWL	9.10	7.95	8.00	3.00	2.00	80
Chemical oxygen demand : COD (mg/l)	CWL	22	41	55	66	6.30	63
Biochemical oxygen demand : BOD (mg/l)	CWL	4.30	0.90	4.20	1.20	0.20	24
pH	MBS	6.9	7.0	7.6	6.7	6.8	7.0
Suspended solids : SS (mg/l)	CWL	42	30	18	29	12	77
- Ditto -	MBS	40.0	20.0	nil	20.0	nil	60.0
Total nitrogen (mg/l)	CWL	0.50	0.40	0.40	0.30	0.40	3.50
- Ditto -	MBS	nil	nil	nil	nil	nil	nil
Total phosphorus (mg/l)	CWL	0.02	0.03	0.02	0.02	0.03	0.09
- Ditto -	MBS	0.18	0.04	0.23	0.30	0.13	3.23
Total coliform (count/100 ml)	CWL	50	1,500	12	320	0	9,400
General coliform (CFU/100 ml)	MBS	2.4×10^2	2.2×10^2	7.4×10^2	2.5×10^2	9.3×10^2	4.5×10^4
Faecal coliform (count/100 ml)	CWL	30	130	8	240	0	7,200
Presence of faecal E. coliform	MBS	Present	Present	Present	Present	Absent	Present
Feacal streptococci (count/100 ml)	CWL	20	20	8	570	6	1,120
Hepane extract (%)	MBS	0.01	0.02	nil	0.04	nil	nil
Total organic carbon : TOC (mg/l)	CWL	3.78	4.56	3.70	3.50	1.53	5.83
Particulate organic carbon : POC (mg/l)	CWL	3.57	1.95	3.40	2.41	1.12	4.94
Copper (mg/l)	MBS	nil	0.1	nil	nil	0.1	nil
Iron (mg/)	MBS	0.1	nil	nil	0.3	0.1	0.2
Lead (mg/l)	MBS	1.5	nil	nil	0.3	nil	0.7
Cadmium (mg/l)	MBS	0.1	0.1	nil	nil	0.1	0.1
Zinc (mg/l)	MBS	nil	nil	nil	nil	0.4	nil
Fluoride (mg/l)	CWL	0.85	1.48	1.42	1.49	1.42	12.5
Calcium (mg/l)	MBS	73.0	85.0	56.0	84.0	171.0	34.0
Sodium (mg/l)	MBS	25.0	48.0	29.0	30.0	69.0	31.0
Odour	MBS	Normal	Normal	Normal	Normal	Normal	Bad smell

CWL: Central Water Laboratory, Lilongwe
MBS: Malawi Bureau of Standards, Blantyre

Ref No. WQPC 5/3

Central Water Laboratory,
P.O. Box 458,
Lilongwe.

11th September, 1997.

The Project Manager,
KIER International Limited (Malawi Branch),
P.O. Box 30085,
Lilongwe 3.

Dear Sir,

RE: LABORATORY TEST RESULTS FOR SAMPLES FROM BUNDA COLLEGE PROJECT - LILONGWE DISTRICT

Find attached Table of chemical and bacteriological test results of samples from Bunda college of Agriculture, Lilongwe district. Samples were collected on 29th August, 1997 from six points as directed. Assignment given to this office was to analyse most of the parameters in category A of your list.

1.0 CHEMICAL ANLAYSIS

1.1 BIOCHEMICAL OXYGEN DEMAND(BOD)

Classifying these sampling points basing on the Biochemical Oxygen Demand (BOD_5) results, point 2,4 & 5 can be said to be excellent sources, point 1 & 3 as poor sources whereas point 6 can be a rejectable source. BOD_5 content in the effluent sample was well above ***Royal Commission and WHO guideline standard*** (BOD_5 24 mg/l instead of 20 mg/l). Unpolluted waters typically have BOD values of 2.0 mg/l or less whereas those receiving wastewaters may have values up to 10 mg/l (***Chapman & Hall, 1992***).

1.2. DISSOLVED OXYGEN (DO)

Dissolved Oxygen (DO) levels observed in four of the six points are well above 5.0 mg/l. High DO content in the effluent sample may be due to low requirements of the few bacteria present or activity because of the presence of toxic substances. Concentrations below 5.0 mg/l observed in the Borehole and drainage samples may adversely affect the functioning and survival of biological communities and below 2.0 mg/l may lead to the death of most fish. Please note that DO is of much more limited use as an indicator of pollution in groundwater, and is not useful for evaluating the use of groundwater for normal purposes.

1.3 CHEMICAL OXYGEN DEMAND (COD)

Chemical Oxygen Demand (COD) levels observed in the Borehole water (6.30 mg/l) indicate that this water in not polluted. Concentrations observed in the other sampling points indicate that they are receiving effluent. COD is widely used as a measure of the susceptibility to oxidation of the organic and inorganic materials in water bodies and in the effluents.

1.4 FLUORIDE

Fluoride content is well above the ***WHO guideline standard*** level of 1.5 mg/l for drinking water sources in the effluent sample. At higher concentrations fluoride is toxic to humans and animals.

1.5 SUSPENDED SOLIDS

Suspended solids level is very high in samples from the effluent (77 mg/l) and reservoir (42 mg/l). This parameter usually encourages the growth of microorganisms which in itself is not desirable. The Royal Commission on sewage disposal recommend suspended solid content of less than 30 mg/l.

1.6 TOTAL ORGANIC CARBON (TOC) AND PARTICULATE ORGANIC CARBONE (POC)

Total Organic Carbon (TOC) and Particulate Organic Carbon (POC) concentrations observed in all sampling points are less than 10 mg/l. Surface waters which does not or receive well treated wastewater generally contain less than 10 mg/l organic carbon. Organic carbon in fresh water arises from living materials (directly from plant photosynthesis or directly from terrestrial organic matter) and also as a constituent of many waste materials and effluent.

1.7 TOTAL NITROGEN

Total nitrogen concentrations in all points is bellow the acceptable ***WHO guideline standard*** of 10 mg/l for drinking water. Nitrate concentration in fresh waters are usually very, rarely above 1.0 mg/l. However, seasonal change may be there due to both human and animal activities. In lakes, possibly in reservoirs as well, levels in excess of 0.20 mg/l are believed to stimulate algae growth and indicate possible eutrophic conditions.

(1) Laboratory Test Result of Water Quality (tested by Central Water Laboratory)

1.8 TOTAL PHOSPHORUS

Total phosphorus levels in all samples are low, less than 1.0 mg/l. Like nitrate, higher concentrations of phosphorus can indicate the presence of pollution and are largely responsible for eutrophic conditions.

2.0 BACTERIOLOGICAL ANALYSIS

Tests to detect three types of bacteria were performed on site. All the samples except one from the Boreholes registered all the three types of bacteria tested for. The presence of these faecal bacteria signals the presence of disease causing microorganisms.

Ideally, a drinking water supply should be free of any type of faecal bacteria according to *WHO guideline standards* for drinking water. Since this may not be practical for unchlorinated water supplies, they may (not usually) contain 10 *Faecal coliform* (Thermotolerant) per 100 ml (*WHO, 1984*). The Malawi Government temporally guideline value is less than 50 *Faecal coliform* per 100 ml of water.

Basing on the present set of results of bacteriological test I would not hesitate to recommend the use of Borehole water for drinking purpose.

It is my hope that the information provided will be of much help for you to plan for your project. I also hope you are aware that this set of results is only providing a snapshot of the situation, there is no any other set of results of these points to compare with.

Yours faithfully,

JAMES PEACHES. PHIRI
LABOARTORY LEADER

cc The Deputy Controller (WR), Ministry of Water Development Private Bag 390, Lilongwe 3

TEST RESULTS OF WATER AND SEWAGE EFFLUENT SAMPLES FROM BUNDA COLLEGE OF AGRICULTURE

SAMPLE SOURCE	PARAMETERS (CONCENTRATION IN mg/l)									BACTERIA TYPE AND COUNT/100 ml		
	DO	COD	BOD_5	SS	Total Nitrogen	Total Phosphorus	TOC	POC	Phenols	Total coli.	Faecal Coli.	Faecal strep
1. BUNDA COLLEGE RESERVOIR/DAM	9.10	22	4.30	42	0.02	0.50	3.78	3.57	0.85	50	30	20
2. SECOND FISH POND	7.95	41	0.90	30	0.03	0.40	4.56	1.95	1.48	1,500	130	20
3. LARGE PONDS (MIDDLE ONE)	8.00	55	4.20	18	0.02	0.40	3.70	3.40	1.42	12	8	8
4. BUNDA COLLEGE BH DP3	2.00	6.30	0.20	12	0.03	0.40	1.53	1.12	1.42	0	0	6
5. BUNDA COLLEGE DRAINAGE	3.00	66	1.20	29	0.02	0.30	3.50	2.41	1.49	320	240	570
6. SEWAGE WORKS (EFFLUENT)	80	63	24	77	0.09	3.50	5.83	4.94	12.5	9,400	7,200	1,120

Total coliform count, at 37°C

Faecal coliform (i.e. *Esch. coli*, or Bacteria coli. 1) of those fermenting lactose and giving gas at 44oC. These indicate recent faecal pollution.

Feacal streptococci count: it is useful for assisting interpretation of coliform counts in doubtful cases.

1.8 TOTAL PHOSPHORUS

Total phosphorus levels in all samples are low, less than 1.0 mg/l. Like nitrate, higher concentrations of phosphorus can indicate the presence of pollution and are largely responsible for eutrophic conditions

2.0 BACTERIOLOGICAL ANALYSIS

Tests to detect three types of bacteria were performed on site. All the samples except one from the Boreholes registered all the three types of bacteria tested for. The presence of these faecal bacteria signals the presence of disease causing microorganisms

Ideally, a drinking water supply should be free of any type of faecal bacteria according to *WHO guideline standards* for drinking water. Since this may not be practical for unchlorinated water supplies, they may (not usually) contain 10 *Faecal coliform* (Thermotolerant) per 100 ml (*WHO, 1984*). The Malawi Government temporally guideline value is less than 50 *Faecal coliform* per 100 ml of water.

Basing on the present set of results of bacteriological test I would not hesitate to recommend the use of Borehole water for drinking purpose

It is my hope that the information provided will be of much help for you to plan for your project. I also hope you are aware that this set of results is only providing a snapshot of the situation, there is no any other set of results of these points to compare with.

Yours faithfully,

JAMES PEACHES PHIRI
LABOARTORY LEADER

cc: The Deputy Controller (WR), Ministry of Water Development Private Bag 390, Lilongwe 3.

TEST RESULTS OF WATER AND SEWAGE EFFLUENT SAMPLES FROM BUNDA COLLEGE OF AGRICULTURE

SAMPLE SOURCE	PARAMETERS (CONCENTRATION IN mg/l)									BACTERIA TYPE AND COUNT/100 ml		
	DO	COD	BOD_5	SS	Total Nitrogen	Total Phosphorus	TOC	POC	Fluoride	Total coli.	*Faecal coli.*	*Faecal strep*
1. BUNDA COLLEGE RESERVOIR/DAM	9.10	22	4.30	42	0.02	0.50	3.78	3.57	0.85	50	30	20
2. SECOND FISH POND	7.95	41	0.90	30	0.03	0.40	4.56	1.95	1.48	1,500	130	29
3. LARGE PONDS (MIDDLE ONE)	8.00	55	4.20	18	0.02	0.40	3.70	3.40	1.42	12	8	8
4. BUNDA COLLEGE BH DP2	2.00	6.30	0.20	12	0.03	0.40	1.53	1.12	1.42	0	0	6
5. BUNDA COLLEGE DRAINAGE	3.00	66	1.20	29	0.02	0.30	3.50	2.41	1.49	329	240	570
6. SEWAGE WORKS (EFFLUENT)	80	63	24	77	0.09	3.50	5.83	4.94	12.5	9,400	7,200	1,120

Total coliform count, at 37°C

Faecal coliform (i.e. *Esch. coli*, or Bacteria coli. 1) of those fermenting lactose and giving gas at 44oC. These indicate recent faecal pollution.

Faecal streptococci count: it is useful for assisting interpretation of coliform counts in doubtful cases.

MALAWI BUREAU OF STANDARDS

Our file code: BS/LAB/27/3 Our date: 1997/09/12

Your file code: Your date:

Address Correspondence to the Director - General

Kier International Ltd
Malawi Branch
P O Box 30085
Lilongwe 3

Report No. : 273/Z 738

MBS No. : Z 1244 to Z 1250

Sample : Water

Identification :
- Z 1244 - Reservoir dam point 1
- Z 1245 - Fish pond 2
- Z 1246 - BH DP2 point 4
- Z 1247 - Middle pond point 3
- Z 1248 - Well DP2 point 4
- Z 1249 - Drainage point 5
- Z 1250 - Sewage works point 6

Conditions : See overleaf

1. **Tests required**

Microbiological examination and chemical analysis

2. **Test method**

Microbiological examination	:	Plate count
pH	:	pH meter
Suspended solids	:	Evaporation
Total nitrogen	:	Colorimetric
Total phosphorous	:	Colorimetric
N-hexane extraction	:	Extraction
Trace metals	:	Atomic absorption spectrophotometer

3. **Results**

3.1 **Microbiological**

Sample Z1244(Reservoir dam point 1)

General coliform bacteria count, CFU/100ml: $2,4x10^4$
Presence of faecal E.coli, CFU/100ml : Present in 100ml of sample

2/

Sample Z1245(Fish pond 2)

General coliform bacteria count, CFU/100ml: $2,2x10^3$
Presence of faecal E.coli, CFU/100ml : Present in 100ml of sample

Sample Z1246(BH DP2 point 4)

General coliform bacteria count, CFU/100ml: 0
Presence of faecal E.coli, CFU/100ml : Absent in 100ml of sample

Sample Z1247(Middle pond point 3)

General coliform bacteria count, CFU/100ml: $7,4x10^4$
Presence of faecal E.coli, CFU/100ml : Present in 100ml of sample

Sample Z1248(Well DP2 point 4)

General coliform bacteria count, CFU/100ml: $9,3x10^3$
Presence of faecal E.coli, CFU/100ml : Absent in 100ml of sample

Sample Z1249(Drainage point 5)

General coliform bacteria count, CFU/100ml: $2,5x10^4$
Presence of faecal E.coli, CFU/100ml : Present in 100ml of sample

Sample Z1250(Sewage works point 6)

General coliform bacteria count, CFU/100ml: $4,6x10^4$
Presence of faecal E.coli, CFU/100ml : Present in 100ml of sample

3.2 **Chemical Analysis**

	Z1244	Z1245	Z1246	Z1247	Z1248	Z1249	Z1250
Copper mg/l	nil	0,1	0,2	nil	0,1	nil	nil
Iron, mg/l	0,1	nil	1,5	nil	0,1	0,3	0,2
Lead, mg/l	1,5	nil	0,2	nil	nil	0,3	8,7
Cadmium "	0,1	0,1	0,1	nil	0,1	nil	0,1
Zinc "	nil	nil	1,5	nil	0,4	nil	nil
Calcium "	73,0	85,0	152,0	56,0	171,0	84,0	34,0
Sodium "	25,0	48,0	65,0	29,0	69,0	30,0	31,0
Suspended solids "	40,0	20,0	nil	nil	nil	20,0	60,0
pH	6,9	7,0	1,4	7,6	6,8	6,7	7,0

4. **Remarks**

4.1 The microbiological quality of samples Z1244 to Z1245 and Z1247 to Z1250 renders the water not fit for human consumption due to the presence of high coliform bacteria count and faecal E.coli.

4.2 Sample Z1246(BH DP2 point 4) complies with microbiological specification for potable water.

E G Chinangwa
Scientific Officer
for: DIRECTOR GENERAL

A STATUTORY BODY ESTABLISHED IN 1972

Postal Address P.O. Box 946 Blantyre | Office Address Moira Road Blantyre | National Tel: (+265) 670 488 International Tel: (+265) 670 488 E-mail: MBS@Unima.wn.apc.org | Telex: 44325 "MSD" MI Telegrams: "Standards" Fax: 670 766

(2) Laboratory Test Result of Water Quality (tested by Malawi Bureau of Standards)

MALAWI BUREAU OF STANDARDS

Our file code: Our date: 1997/09/17

Your file code: Your date:

Address Correspondence to the Director - General

ADDITIONAL TESTS FOR REPORT NR. 273/Z-738

	Z-1244	Z-1245	Z-1246	Z-1247	Z-1248	Z-1249	Z-1250
Phosphorous, mg/l;	0,18	0,04	0,07	0,23	0,13	0,30	3,23
Hepane extract, % m/v;	0,01	0,02	0,01	nil	nil	0,04	0,02
Total nitrogen, mg/l;	nil	nil	nil	nil	nil	nil	nil
Odour :	normal	normal	normal	normal	normal	normal	Bad smell

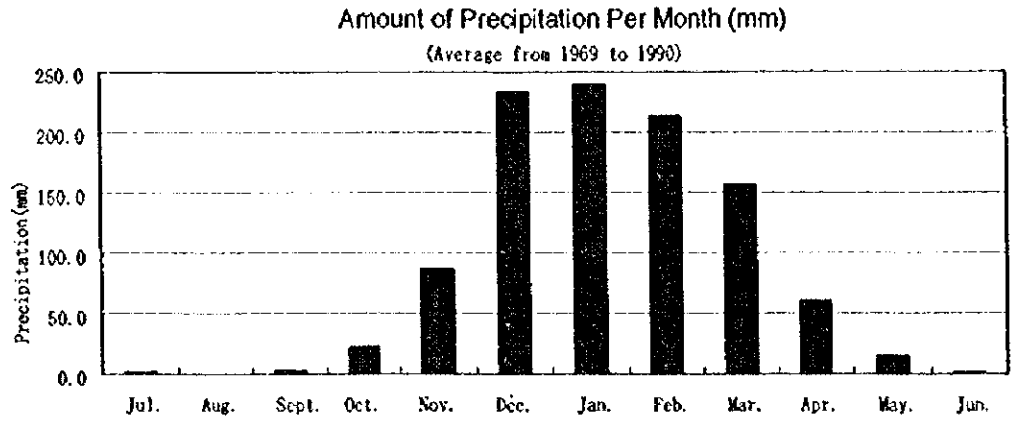
E G Chimangwa
Scientific Officer
for DIRECTOR-GENERAL

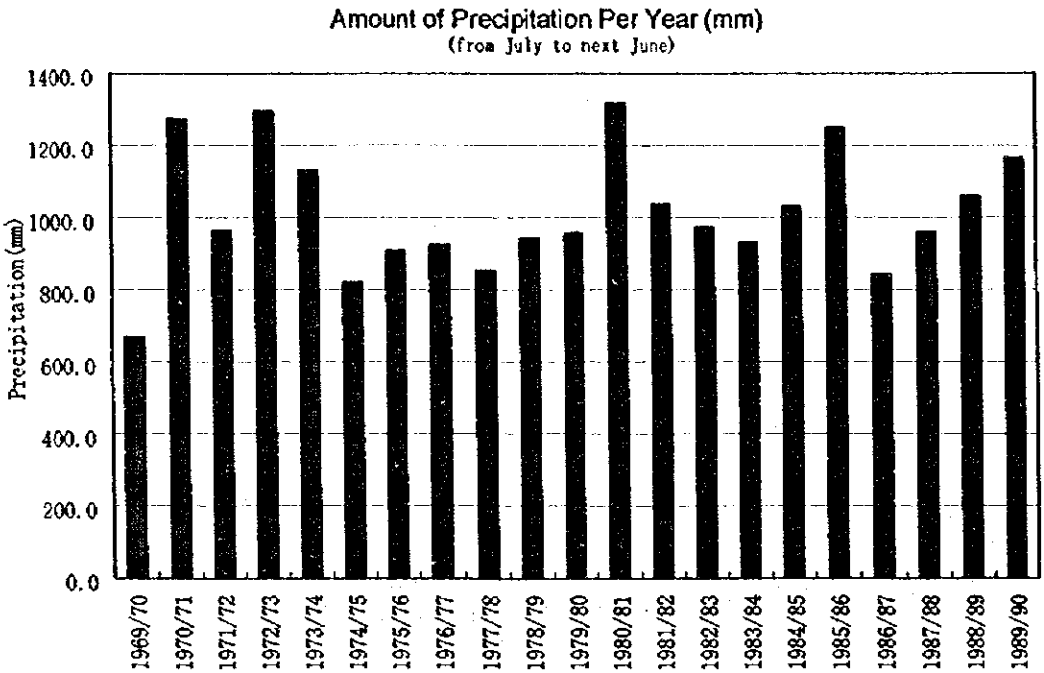
KIER INTERNATIONAL (MALAWI BRANCH)
DATE RECEIVED
17 SEP 1997
FILE:

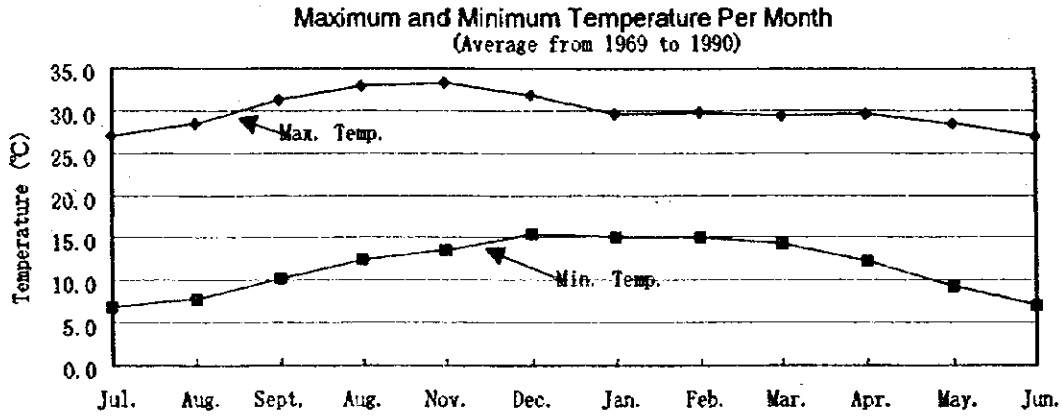
SEE	COPY	ACTION

Postal Address: P.O. Box 946, Blantyre
Office Address: Mpira Road, Blantyre
National Tel: (+265) 670 488
International Tel: (+265) 670 488
Email: MBS@Unima.wn.apc.org
Telex: 44225 "MOD" MI
Telegrams: "Standards"
Fax: 670 756

5-2. Meteorological Data







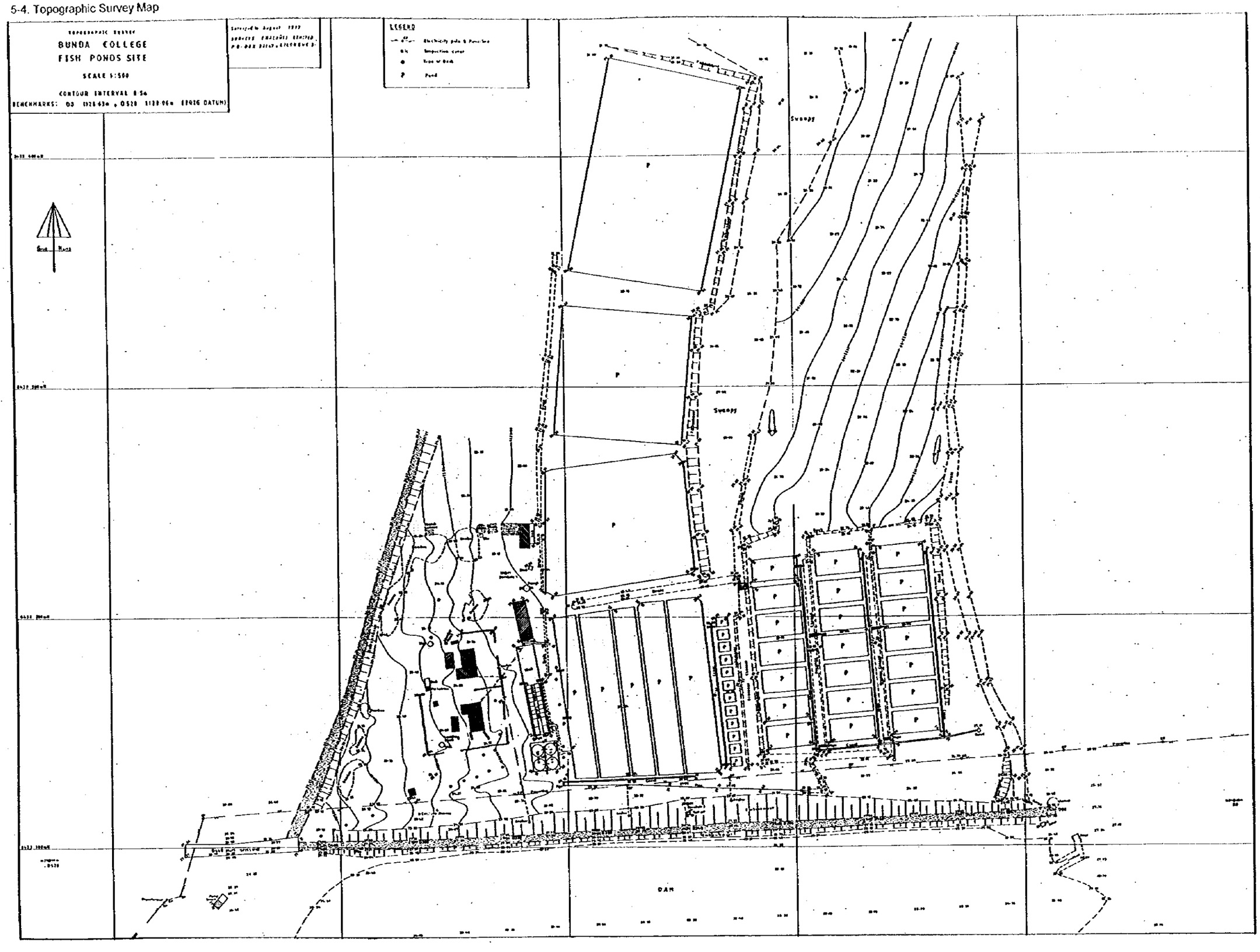
5-3. Equipment List

Item	Description	Quantity
1 Aquaculture Equipment for Training and Research		
Square FRP tank	200 liters	10
	1000 liters	5
Round FRP tank	2000 liters	4
	5000 liters	2
Raceway FRP tank	6000 liters	1
FRP / Acrylic tank	1000 liters	2
Acrylic tank	35 liters	10
	57 liters	10
	85 liters	5
Polycarbonate tank	30 liters	20
	100 liters, 200 liters	10
	500 liters, 1000 liters, with basement	5
Altemia hatching tank	50 liters, 100 liters	3
Tank with heating/cooling unit	3000 liters with filtration system	2
Hatching jar	6 liters, 20 liters	5
Vertical type incubation tank	420W x 2220D x 400H mm	1
Atokins incubator cum feeding tank	530W x 3650D x 560H mm	4
Sand filter unit for circulation	1510W x 710D x 590H mm	2
Cartridge filter housing	For 1 - 10 micron	10
Aerator, submersible	Venturi tube type with pump	2
Air pump	7 liters/min, 13 liters/min	5
	30 liters/min, 12DCV	2
Submersible pump	35 liters/min	3
	70 liters/min, 12DCV	1
Materials for air supply	Air stones, valves, tubes, etc.	1
Materials for water supply	Hoses, pipes, joint fittings, valves, etc.	1
Tank for fish transportation	250 liters	1
Nylon mesh netting	37 - 4000 micron, assorted	1
Polyethylene mesh netting	114 - 1572 micron, assorted	1
High density polyethylene net	7.5 mm mesh, 21 mm mesh	1
Minnow net (Moji net)	2 mm, 3 mm, 6 mm mesh	1
Shield net	Shielding rate: 75%	1
Scoop net	Assorted	1
Cast net	20 mm mesh, 3 m height	2
Cage net 2 m x 2 m x 1 m	5 x 5 mm mesh, 8 x 8 mm mesh	12
4 m x 4 m x 1 m	10 x 10 mm mesh, 15 x 15 mm mesh	12
Seine net	Float line length: 110 m, center depth: 4 m	1
Bird protection net	30 mm mesh, 20 m x 20 m	1
Rope	2.5 mm, 4 mm, 8 mm, 12 mm	1
Fish carrying box	25 liters	20
	75 liters, 105 liters	10
Fish basket	35 liters	20
	70 liters, 150 liters	10
Insulated fish box	120 liters	5
Bucket	15 liters	10
Barrel	50 liters	5
Drain board	1800 mm x 600 mm	20
Heat insulating board	1800 mm x 900 mm, 25 mm thickness	20
Bio - chemical products	Anti-infective agents, regents, etc.	1
Repair tools	Hand drill, grinder, saw, hand tools, etc.	1

Item	Description	Quantity
2 Laboratory Equipment for Training and Research		
Drying oven	160 liters, 250°C	1
Oven, drying vacuum	Cold trap -45°C, 1 liter/batch, 4 ports	1
Hot plate	50 - 250°C, 500 x 300 mm	5
Muffle furnace	10 liters, 1100°C	1
Incubator	3 - 45°C, 200 liters	1
Shaking water bath	9 liters, 20 - 160 rpm, up to 70°C	1
Ultra cold freezer, upright	300 liters, -80°C	1
Refrigerator, upright	2-door, 300 liters	4
Freezer, chest type	350 liters, -15°C	2
Water bath	250 mm dia., 7 liters, up to 90°C	5
Blender	0.9 liters, 1800 rpm, 22000 rpm	2
Ultrasonic disperser	28 kHz, 50 W, 5 mm dia. tip	1
Tissue homogenizer	0 - 30000 rpm, 20 mm dia. generator	1
Test tube mixer	60 mm dia., 2500 rpm	1
Magnetic stirrer with hot plate	200 mm dia., 100 - 1200 rpm, up to 300°C	1
Water still	1.8 liters/hour	1
Water purifier	0.5 liters/min	2
Rotary evaporator	20 - 180 rpm, 7 liters bath, up to 180°C	2
Centrifuge	5000 rpm, capacity 600 ml	2
High speed centrifuge	20000 rpm, capacity 600 ml, 0 - 30°C	1
Autoclave	80 liters, 1.6 kg/cm^2, 40 - 120°C	1
Ultrasonic pipette washer	28 kHz, 50 W, length 500 mm	1
Ultrasonic bath	47 kHz, 180W, tank 9 liters	1
Dissecting microscope	Trinocular, zoom 1x - 6x, for research	2
Dissecting microscope	Binocular, zoom 0.7x - 4x, for training	10
Biological microscope	Trinocular, with DIC, RLF, etc. for research	1
Biological microscope	Binocular, 40x - 1000x, for training	10
Inverted microscope	40x - 400x, with DIC, RLF, etc.	1
Slide warmer	200W, 100 mm x 70 mm	1
Was heater/dispenser	4 liters, up to 70°C	1
Rotary microtome	1 - 25 μm, opening 38 mm x 48 mm	1
Sieve set	100 mm dia., 0.25, 0.5, 1, 2, 4 mm	2
Ice maker	45 kg/24 hours, 20 kg storage	1
Analytical balance	0 - 200g, 0.1mg	2
Electric balance	0 - 300g, 1mg	2
Electric balance	0 - 3000g, 0.01g	2
Electric balance	0 - 20kg, 0.1g	2
Table balance	0 - 100g, 0.1g	10
pH meter, bench top	0 - 14pH, 0.001pH	2
DO meter, bench top	0 - 20.00 mg/liter, 0 - 200.0%	1
Ammonium ion meter	0.1 -1000 mg/liter (NH_3)	1
COD meter	0 - 500 mg/liter, 0.1 mg	1
Chlorine comparator	0.05 - 2 mg/liter	1
Colorimeter	0 - 100T%, 0 - 2.0 Abs	2
Spectrophotometer, UV-VIS	190 - 900 nm, 0.1 nm, BW: 0.1 - 5 nm	1
Spectrofluorophotometer	220 - 750 nm, BW: 1.5 - 20 nm	1
Calorimeter	4000 - 33000 J, 10 J	1
Soxhlet apparatus	150 ml x 6 flasks, with water bath for 6 flasks	1
Kjeldahl distillation apparatus	150 ml x 6 flasks, with 1.2 kW water bath	1
Fume cupboard	1500W x 750D x 2200H mm	2
Clean bench	1600W x 900D x 1800H mm	2
Anti-vibration stand	560W x 450D x 60H mm	2

Item	Description	Quantity
Cabinet, sterilized apparatus	1200W x 450D x 1700H mm	1
Desiccator	250W x 330D x 450H mm, automatic dry	3
Drying rack	800W x 500D x 1600H mm	3
Mesh shelves	1500W x 300D x 1900H mm	6
Culture shelves	1300W x 550D x 1800H mm, 40 W x 8	2
Thermometers	Standard, red liquid-filled, U-tube max and min, etc.	1
Fish measuring plate	0 - 500 mm x 2, 0 - 1000 mm x 1	1
Caliper	200 mm, min reading 0.05 mm	10
Other measuring apparatus	Timer, stopwatch, tally counter, etc.	1
Dissection set	Scissors, scalpels, forceps, plates	20
Membrane filtration set	47 mm, 90 mm filtration set, vacuum pump, etc.	1
Glassware and others	Beakers, flasks, timers, containers, counters, etc.	1
Laboratory wagon	Stainless steel, 600W x 900D x 950H mm	3
Hand cart	500 kg loading, 1200 x 750 mm	2
Fish smoker	20 kg/time, 250 liters	1
Photo processing apparatus	Enlarger, processor, dryer, etc.	1
3 Field Research Equipment		
Plankton net	Simple net, Kitahara net, juvenile net	1
Plankton sample divider	100 ml, 200 ml	1
Water sampler	Kitahara type, 1 liter	2
Grab sampler	Ekman-Berge type, 150 x 150 mm	1
Visibility disc	200 mm dia., rope 30 m	2
Portable centrifuge	Manual, 10 ml x 2-place	1
Field microscope	Inverted type, monocular, 20x - 800x	1
Digital salinometer	0 - 80 ppt, 0.1 ppt	1
Water quality analyzer	pH, conductivity, turbidity, temperature, etc.	2
Digital illuminance meter	0.1 - 200000 Lx	1
Meteorological instruments	Handheld anemometer, thermo-hygro-barograph, etc.	1
4 Audiovisual Equipment		
Screen	1800 mm x 1800 mm	4
OHP	250W, stage: 280 mm x 280 mm	2
Slide projector	250W, lens: 100 mm	2
Video projector	1 lens, direct projection, 100"	1
Video camera	Digital, 10x power zoom	1
Video edit gear	VHS editing system	1
TV and video set	VHS multi-system, monitor 29"	2
PA system	Power amplifier, mixer, speakers, microphones, etc.	1
5 Computer for Staff and Students		
Desk top computer	200MHz, 32MB RAM, 1.6G HDD, 15" monitor, UPS, L	15
Printer	Laser, 600 x 600 dpi, 2MB RAM	1
Laptop computer	150MHz, 32MB RAM, 1.6G HDD, 12" LCD	1
6 Vehicles		
Pick-up	4WD, diesel, 5-seating, 500 kg loading	1

5-4. Topographic Survey Map



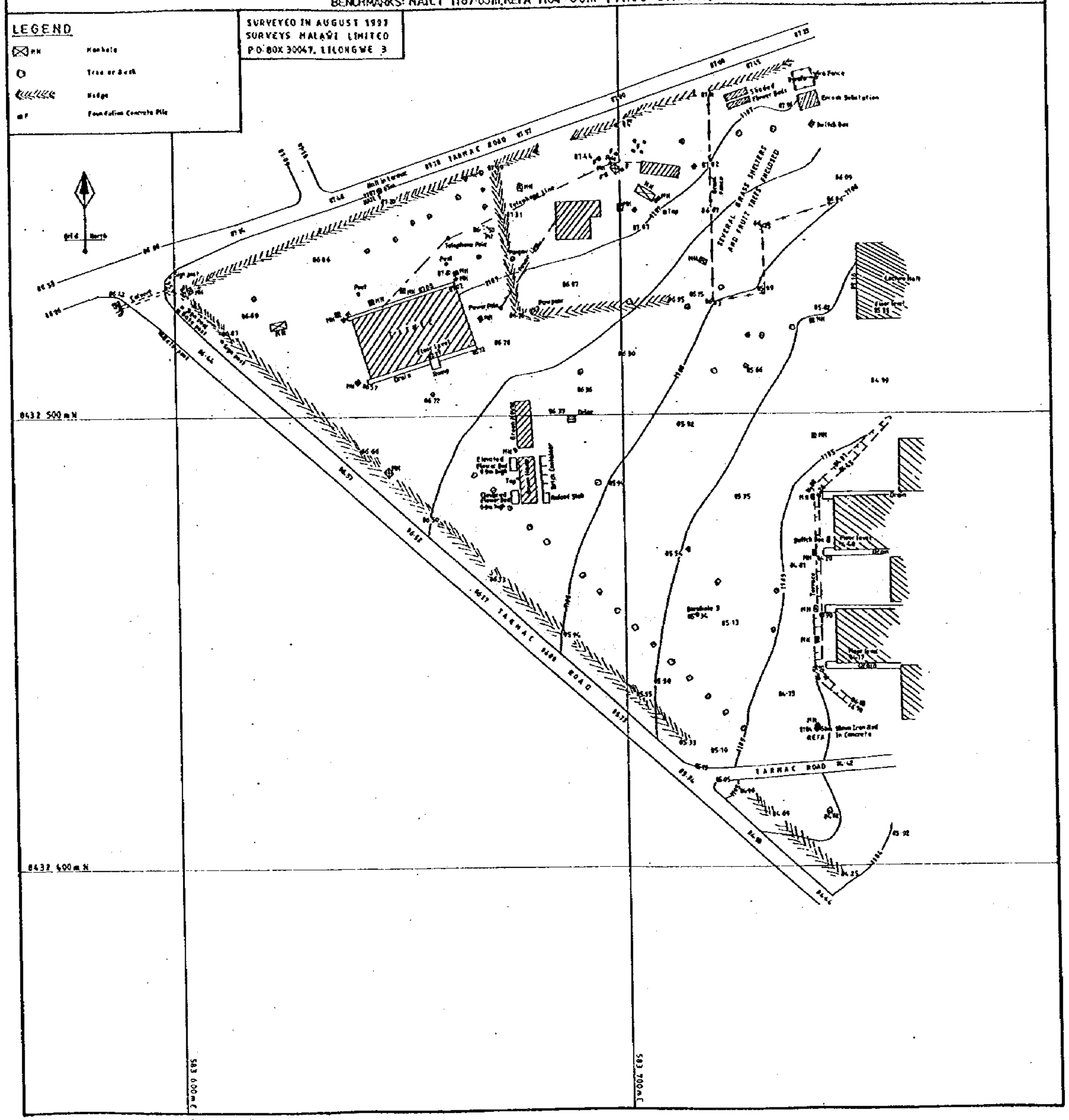
TOPOGRAPHIC SURVEY

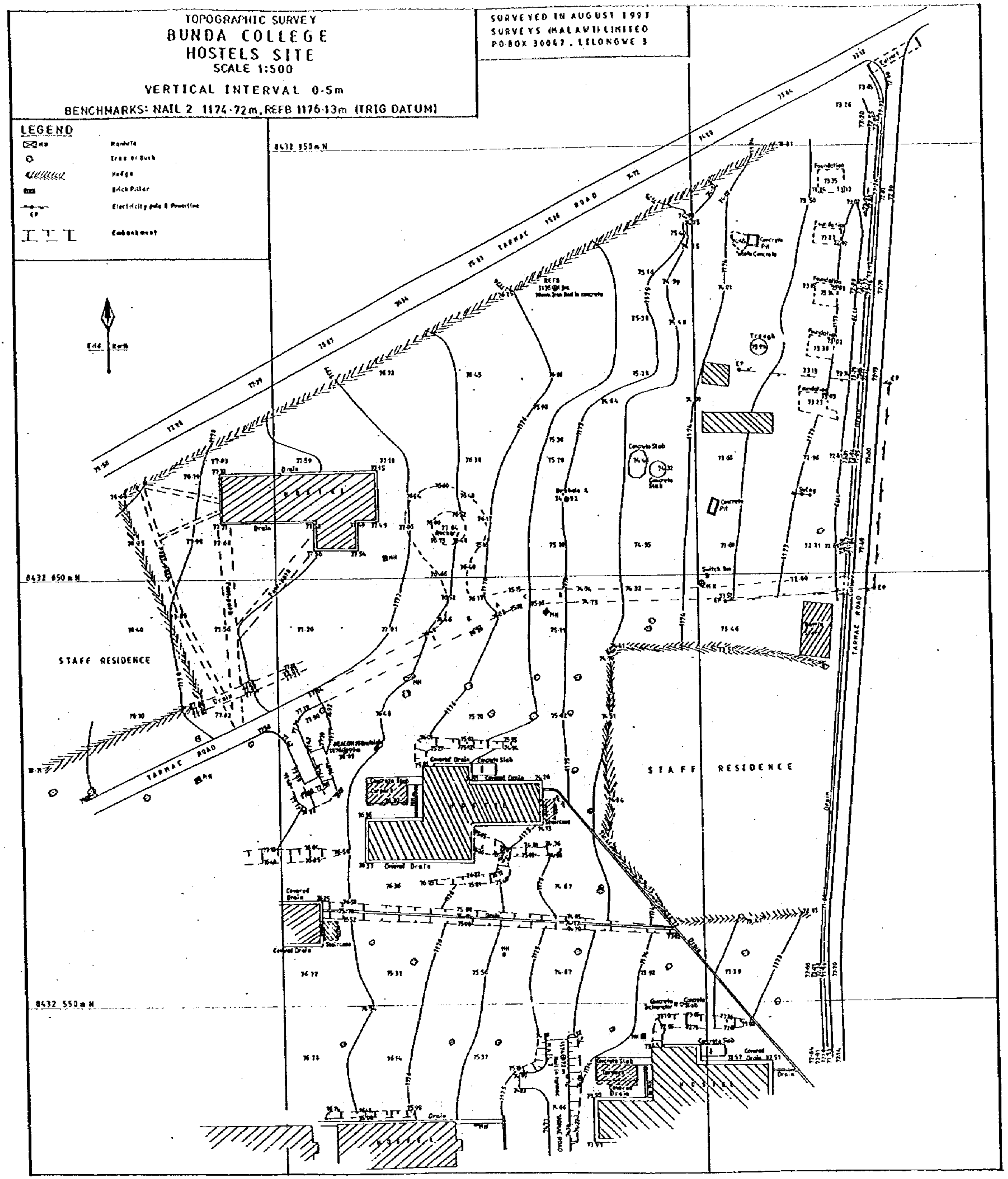
BUNDA COLLEGE
LECTURE HALL SITE

SCALE 1:500

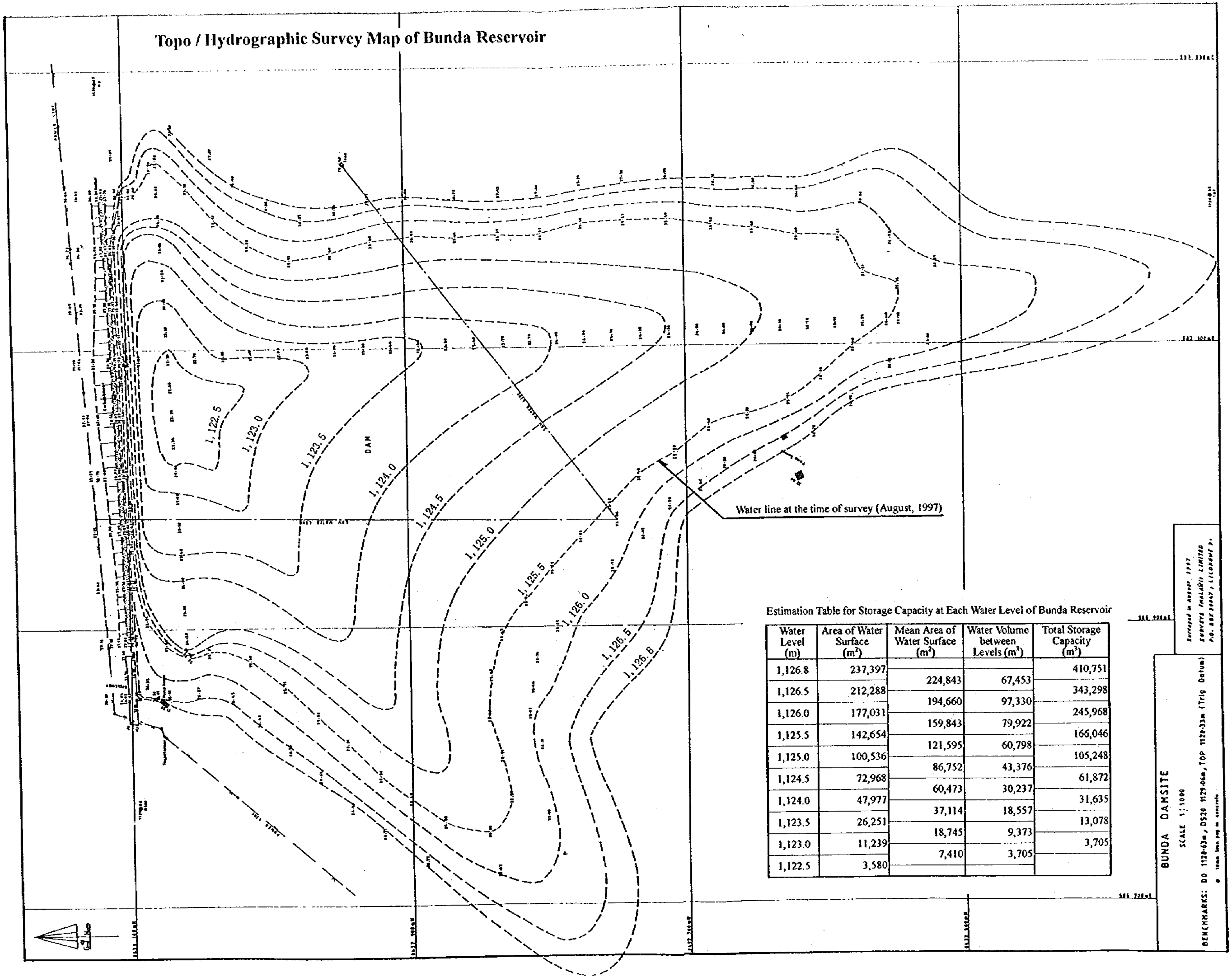
VERTICAL INTERVAL 0·5m

BENCHMARKS: NAIL1 1187·65m, REFA 1184·60m (TRIG DATUM)



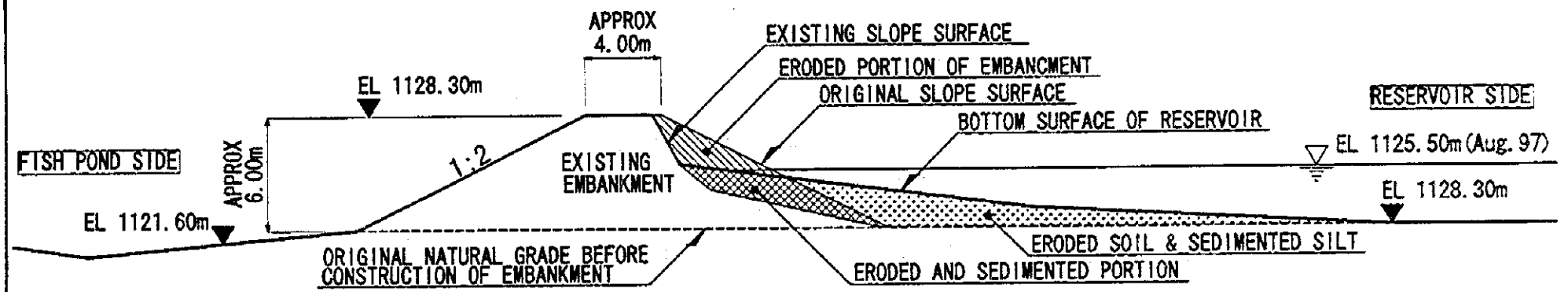

TOPOGRAPHIC SURVEY
BUNDA COLLEGE
HOSTELS SITE
SCALE 1:500
VERTICAL INTERVAL 0·5m
BENCHMARKS: NAIL 2 1174·72m, REFB 1176·13m (TRIG DATUM)
SURVEYED IN AUGUST 1997
SURVEYS (MALAWI) LIMITED
P.O BOX 30047, LILONGWE 3
LEGEND
Hedge
Brick Pillar
Electricity pole & Powerline
Embankment
8432 750m N
8432 650m N
8432 550m N
TARMAC ROAD
STAFF RESIDENCE
STAFF RESIDENCE
TARMAC ROAD

Topo / Hydrographic Survey Map of Bunda Reservoir

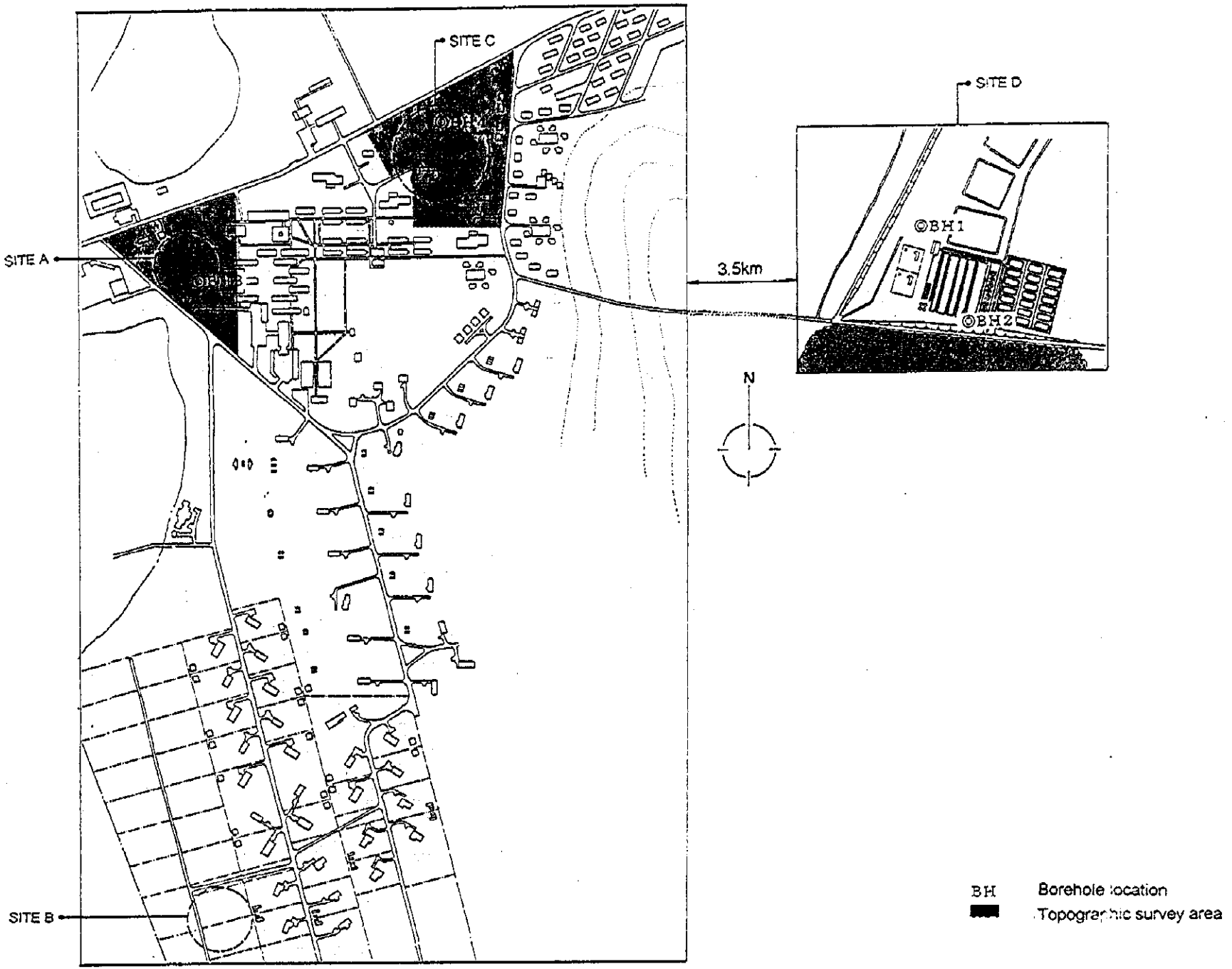


Estimation Table for Storage Capacity at Each Water Level of Bunda Reservoir

Water Level (m)	Area of Water Surface (m^2)	Mean Area of Water Surface (m^2)	Water Volume between Levels (m^3)	Total Storage Capacity (m^3)
1,126.8	237,397			410,751
		224,843	67,453	
1,126.5	212,288			343,298
		194,660	97,330	
1,126.0	177,031			245,968
		159,843	79,922	
1,125.5	142,654			166,046
		121,595	60,798	
1,125.0	100,536			105,248
		86,752	43,376	
1,124.5	72,968			61,872
		60,473	30,237	
1,124.0	47,977			31,635
		37,114	18,557	
1,123.5	26,251			13,078
		18,745	9,373	
1,123.0	11,239			3,705
		7,410	3,705	
1,122.5	3,580			



Section of existing embankment and reservoir SCALE 1:300


SITE A
SITE B
SITE C
SITE D
3.5km
BH1
BH2
N
BH Borehole location
Topographic survey area

Borehole location
Topographic survey area
3.5km
SITE C
SITE A
SITE B

BUNDA COLLEGE OF AGRICULTURE
AQUACULTURE PROJECT

BORE HOLE NO.3 (AT THE SITE OF MAIN LABORATORIES)
Eastings:
Northings:
Elevation:

description	date	reduced level	legend	depth & layer thickness	SAMPLES AND TESTS TYPE	NO.	SPT	N-value	
0	25/8/97								
sandy clay topsoil									
							5,5,6	11	
firm brown sandy silty									
CLAY with quartz									
pebbles.				(2.15)	D	1			
2							3,3,4	7	
				(2.44)					
highly weathered,				(0.45)	D	1			
micaceous sandstone				2.85			4,6,9	15	
weathered sandstone									
getting hard with depth									
4							5,8,14	22	
					U	1			
							18,55**		Pen - 135mm
					D	1			
6							31,55**		
	25/8/97								
	27/8/97								Pen - 80 mm
hard weathered					very weak sandstone				& bouncing
SANDSTONE					no core was				boring ceased
8					recovered - advance				at 6.33 m &
				8.21	was 35 min/metre				coring started
					yellowish grey hard				no water was
					weathered SANDSTONE				encountered
					highly fractured with				
10					fragmented 150mm cores.				
				10.21	advance - 28 min/ metre				
					very hard fractured grey bluish				
					SANDSTONE. 550 mm				
					fragmented cores were				
12					recovered, advance 48 min/metre				
					total core recovery 9.2%				

BUNDA COLLEGE OF AGRICULTURE
AQUACULTURE PROJECT

BORE HOLE NO. 4 (HOTELS SITE)
Eastings:
Northings:
Elevation:

description	date	reduced level	legend	depth & layer thickness	SAMPLES AND TESTS type	no	SPT	N-value	
0									
sand cly topsoil	28/8/97			(0.19)					
red to brown laterite					D	1			
gravel slightly cemented							15,19,15		
2					U	1			
completely weathered					D	1	8,6,6		
friable laterite							2,3,6		
4					D	1			
yellowish brown highly							2,3,4		
weathered micaceous									
sandstone with isolated							3,4,8		water level had
pebbles					D	1			risen from 8.52 m
6							4,8,11		as recorded on
									29/8/97 to 6.35 m
							4,8,12		below the casing
									on 30/8/97
8							5,9,12		
	29/8/97								
water at 8.52 metres									
							8,14,21		
10							18,31,45		
							13,31,55**		
highly weathered	30/8/97								
medium to fine grained 12									
light brown SANDSTONE									
Advance was 5.2 min/m									
no cre was recovered									
				14					dark grey coarse grained
									sandstone; no recovery;
									advance 4.2 min/metre.
									very hard, highly weathered
									bluish grey micaceous biotite
				18					gnessis in a highly fractured
									state; 16 cores ranging
									10 - 60 mm recovered.
total rock recovery is 5.6%									
advance was 8 min/metre				21.25					

BUNDA COLLEGE OF AGRICULTURE
AQUACULTURE PROJECT

SOILS REPORT

BOREHOLE NO. 1.

Eastings:
Northings:
Elevation:

Description	Date	Reduced level	Legend	Depth & layer thickness	SAMPLES AND TESTS type	no	test SPT	remarks N value	
0									
dark grey silty CLAY	21/8/97			(1.25) 1.25	D	1	SPT 2,2,2	4	water @ 1.85 m
dark brown gravelly sandy silty CLAY with patches of decomposed rock 2				(0.85) 2.1	U D	1 1	SPT 3,29	11	
completely weathered brown micaceous rock				(1.15) 3.25	D	1	21,55**		Pen - 100mm
hard brown micaceous weathered rock 4				(1.32) 4.57	D	1	55** 46,50,55** 55**		Pen - 95mm Pen - 130mm Bouncing
	22/8/97						ROCK CORING		
hard brown, medium grained moderately weak fractured and fragmented 6 weathered micaceous rock				(6.56)			Advance 16.1'/m	Rock recovered 320 mm of fragments	% rock core recovery
8							28'/m	rock recovered 380 mm of fragments	10.7%
10									
end of borehole	22/8/97			11.13					

BUNDA COLLEGE OF AGRICULTURE
AQUACULTURE PROJECT

SOILS REPORT

BOREHOLE NO. 2

Eastings:
Northing:
Elevation:

description	date	reduced level	legend	depth & layer thickness	SAMPLES AND TESTS type	no	test SPT	remarks N-value	
0	23/8/97						(3,3,4)	7	
					U	1	2,2,3	5	
dark grey silty CLAY 2				(3.88)					
					D	1	2,3,2	5	
				3.88	D	1			water
stiff mottled silty CLAY 4				(0.32)					@ 3.88 m
				4.20			7,19,41	60	
saturated clayey silty SAND				(0.40) 4.60	D	1			
light brown micaceous weathered rock 6				(1.61) 6.21			7,17,52 44,55*	69	Pen-60 mm
							ROCK CORING		
hard light brown micaceous weathered and fragmented SANDSTONE 8							advance 10.7'/m		
				(6.00)			recovery 5%	recovered 150 mm of very fractured week to completely weathered brown SANDSTONE	
REMARKS: 10							advance 16.3'/m		
water encountered at 3.88 m below top of hole; water level was 0.7 m below top of wall on 24/8/97 12							recovery 5%		
				(12.21)