

## 資料

1. 調査団員・氏名
2. 調査行程
3. 関係者（面会者）リスト
4. 討議議事録（M/D）
5. 参考資料
6. その他資料・情報
  - 6-1 環境チェックリスト
  - 6-2 モニタリングフォーム案
  - 6-3 地盤調査結果



## 1. 調査団員・氏名

### 1-1 現地調査 1 (2011年1月8日～2月4日)

担当	氏名	所属
総括	加藤正明	JICA ケニア事務所所長
計画管理	菅原美奈子	JICA 人間開発部基礎教育グループ基礎教育2課
業務主任/建築計画	川添 健治	(株)マツダコンサルタンツ
建築設計	井口 博之	(株)マツダコンサルタンツ
設備計画/環境社会配慮 1	兵藤 要	(株)マツダコンサルタンツ
施工計画/積算	高木 政一	(株)マツダコンサルタンツ
教育計画	伊藤 美保	インテムコンサルティング(株)
機材・調達計画	玉木 智宏	インテムコンサルティング(株)

### 1-2 現地調査 2 (2011年5月21日～6月1日)

担当	氏名	所属
総括	加藤正明	JICA ケニア事務所所長
計画管理	菅原美奈子	JICA 人間開発部基礎教育グループ基礎教育2課
業務主任/建築計画	川添 健治	(株)マツダコンサルタンツ
建築設計	井口 博之	(株)マツダコンサルタンツ
設備計画/環境社会配慮 1	兵藤 要	(株)マツダコンサルタンツ

## 2. 調査日程

### 2-2 現地調査 1

			官団員		コンサルタント団員						
			総括	計画管理	業務主任/ 建築計画(PM)	設備設計 環境社会配慮	建築設計	施工計画/ 積算	教育計画	機材・調達計画	
1	1月8日	土			・成田-ドバイ(EK319)						
2	1月9日	日			・ドバイ-ナイロビ(EK719) ・調査準備						
3	1月10日	月			・QS打合せ			・PMと同行			
					・JICA打合せ ・CEMASTEА打合せ(インセプション説明、要請内容確認、資料回収)						
4	1月11日	火			・MOE打合せ		・地質調査会社、面談・打合せ	・PMと同行			
					・JICA打合せ	・NEMA打合せ		・資料整理			
5	1月12日	水			・MOPW打合せ		・再委託契約の準備	・PMと同行	・資料整理		
					・建設業者ヒアリング	・Biobox打合せ		・PMと同行	・CEMASTEА(教育事情)		
					・CEMASTEА打合せ(敷地状況)			・建材店調査			
6	1月13日	木			・CEMASTEА打合せ(研修・運営計画)		・簡易水質検査	・単価調査票調整	・PMと同行		
					・水道会社ヒアリング		・地質調査、現場指示				
7	1月14日	金			・測量会社打合せ	・MOPW(資料回収)	・既存施設・設備状況	・QS打合せ	・VOBB		
					・CEMASTEА打合せ(資料回収)			・単価調査票調整	・CEMASTEА		
8	1月15日	土		・成田発	・資料整理					・成田-ドバイ	
9	1月16日	日			・団内打合せ(コンサルのみ、1週間のまとめと確認)						・ドバイ-ナイロビ
				・ナイロビ着	・測量会社契約	・資料整理	・PMと同行	・資料整理			
					・団内打合せ(官団員への報告と翌週の協議ポイントについて)						
10	1月17日	月		・JICA打合せ	・水質調査会社		・測量、現場指示	・単価調査票調整	・CEMASTEА(機材協議)		
				・MOE/PSとの打合せ	・CEMASTEА			・建材店調査			
11	1月18日	火			・CEMASTEА打合せ(要請内容、背景)	・MOPW(消防協議)	・水質、現場指示	・設備と同行	・PMと同行		
						・GIBBIヒアリング	・設計事務所打合せ	・排水プラント視察			
12	1月19日	水			・類似施設調査(Thogoto PTTC)			・単価調査票配布	・PMと同行		
					・CEMASTEА打合せ(妥当性に係る協議)	・設備材調査	・施工計画に同行	・建材店調査			
13	1月20日	木		・JICA打合せ			・KPLCヒアリング		・CEMASTEА打合せ(厨房機材)		
				・MOE打合せ(ミニツ協議)			・地質調査、中間打合				
14	1月21日	金		・ミニツ署名	・GIBBIほか		・既存設備調査		・CEMASTEА打合せ(研修支援機材)		
					・排水処理プラント視察		・KPLC協議	・PMと同行			
15	1月22日	土			・資料整理					・代理店(厨房機材)	
				・ナイロビ発							
16	1月23日	日			・団内会議						
				・成田着	・資料整理						
17	1月24日	月			・CEMASTEА打合せ(研修内容、施設)	・建材店調査	・既存設備調査	・建材店調査	・CEMASTEА打合せ(数学教材)		
18	1月25日	火			・類似施設調査(KEMRI)				・CEMASTEА(生物)		
					・CEMASTEА打合せ(インフラ、設備関係)		・KPLC協議	・MOPW、KEBS	・CEMASTEА打合せ(化学教材)		
19	1月26日	水			・CEMASTEА打合せ(事業工程、環境関連、施設コンポーネント)		・建材店調査	・MOPW		・代理店調査	
								・建材店調査		・単価調査	
20	1月27日	木			・CEMASTEА打合せ(先方負担行為、設備仕様、インフラ)				・ナイロビ-ドバイ(EK720)		
21	1月28日	金			・計画案作成	・建材店調査			・ドバイ-成田(EK318)		
22	1月29日	土			・CEMASTEА施設・周辺状況						
23	1月30日	日			・計画案作成						
					・団内会議						
24	1月31日	月			・CEMASTEА打合せ(計画案、環境配慮、設備計画)		・KPLC協議	・KEBS		・代理店調査	
						・建材店調査	・建材店調査	・建材店調査		・単価調査	
25	2月1日	火			・計画案修正	・NEMA打合せ		・建設現場視察			
					・テクニカルノートなど	・建材店調査					
26	2月2日	水			・MOPW打合せ(建築基準について)						
					・CEMASTEА/MOE最終協議(テクニカルノート)						
27	2月3日	木			・JICA報告						
					・建材調査(木製品、鉄骨、ほか)						
					・ナイロビ-ドバイ(EK720)						
28	2月4日	金			・ドバイ-成田(EK318)						

## 2-2 現地調査 2

				官団員		コンサルタント団員		
				総括	計画管理	業務主任/ 建築計画(PM)	設備設計 環境社会配慮	建築設計
1	5月21日	土				・成田-ドバイ(EK319)		
2	5月22日	日				・ドバイ-ナイロビ(EK719) ・調査準備		
3	5月23日	月				・CEMASTEA打合せ(調査日程の確認、施設計画、環境配慮の説明)		・資材調査 ・地質調査会社
4	5月24日	火		・ナイロビ着		・CEMASTEA打合せ(機材仕様の確認、給水事情) ・ステークホルダー協議		・資材調査
5	5月25日	水			・CEMASTEA打合せ(事業実施、先方負担事項)	・EMP協議		・資材調査 ・通信会社
6	5月26日	木		SMASE専門家との 打合せ	・MOPW打合せ	・EMP協議		←PMと同行 ・水会社
7	5月27日	金			・CEMASTEA打合せ(環境管理計画、運営費、先方負担事項)			・機材調査
8	5月28日	土			・書類整理			
9	5月29日	日			・書類整理			
10	5月30日	月	・MOE打合せ(ミニッツ協議) ・ミニッツ署名			・環境関連補足調査		・建材調査
11	5月31日	火		・報告書作成	・AICAD視察			
12	6月1日	水		・ナイロビ-ドバイ(EK720) ・ドバイ-関空(EK316) ・関空-羽田(EK6253)				

□略号

Biobox=排水処理プラント会社

GIBB=総合コンサルタント会社

KEBS=ケニア基準局

KEMRI=ケニア医療研究所

KPLC=ケニア電力公社

MOE=教育省

MOPW=公共事業省

NEMA=環境庁

PTTC=教員養成校

QS=積算士

VOBB=ベルギー援助機関

### 3. 関係者（面談者）リスト

#### 教育省

Prof. James L. Ole Kiyiapi 次官

#### フィールドサービス局

Mr. Kimathi M'nyanata 局長

Mr. Garise B. Omara 副局長

Mr. Nyamai Musyoka 副局長

Mr. Charles Kanja 副局長代行

#### 財務局

Mr. Patrick k. Njagt 副事務局長

Mr. Pete Odurdo チーフ

#### CEMASTEА (アフリカ理数科・技術教育センター)

Prof. S. K. Katia 理事会会長

Ms. Cecilia Ng'etich 所長

Mr. Kithaka Njogu 副所長代行

Mr. Patrick Kogolla プログラムコーディネーター

Mr. Kihara Mwai 事務管理官

Mr. Samuel U. Gachuhi 化学科事務長

Mr. Mathenge J. K. 化学科教科長

Mr. Chesire Beregge 物理学科事務長

Mr. Ernest N'geny 物理学科教科長

Ms. Nancy Nui 数学科事務長

Mr. Matembo Lukongo 数学科教科長

Ms. Mary W. Kariuki 生物学科事務長

Mr. George Kiruja Kiria 生物学科教科長

#### 公共事業省

Ms. Aidah N. Munano 上級監理建築家

Mr. Patrick S. Wasike 上級監理建築家

Mr. Fiki Mbiti 電気エンジニア

Mr. H. Mwangi 機械エンジニア

Mr. Wandolo Edward 建築家

Mr. S. Kagwanja シビルエンジニア

Mr. Mbui J. M. 電気エンジニア

Mr. F. M. Wambua チーフ監理積算士

Mr. Ro Ochieng チーフ監理建築家

#### 地方政府省

Mr. Dominic N. Muchemi 建築家

#### NEMA (環境管理庁)

Ms. Maria EIA 担当

Mr. Mwai 水質担当

#### VVOB (開発協力・技術支援フランドル協会)

Ms. Lut Laenen Fox カントリープログラム管理者

ソゴト教員養成校

Ms. Roselinda Njokah	副校長
Ms. Withaka Titus	カリキュラム事務長
Mr. Matsigulu Marsyden	カリキュラム副事務長
Mr. Francis Muthua	SMASE 地域コーディネーター
Mr. Joy Mulunda	地域トレーナー

GIBB International (環境コンサルタント)

Mr. Elizabeth Ndinya	環境部部長
Mr. Alex M. Mutiso	環境コンサルタント
Ms. Joyce Kirui	アシスタントコンサルタント

KEMRI (ケニア医学研究所)

Mr. Japhet Mutegi	主席エンジニア
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ナイロビ市上下水道会社

Mr. Kananda	管理者 (技術部)
Mr. Godfrey Masiude	地域管理者代行

JICA ケニア事務所

加藤正明	所長
河澄恭輔	次長
前川倫子	所員
Mr. S. K. Kibe	教育コンサルタント

SMASE (理数科教育強化計画) プロジェクトチーム

長沼啓一	チーフアドバイザー
又地淳	アカデミックアドバイザー
田中規明	業務調整
内山葉月	理科教育
田口晋平	数学教育

AICAD (アフリカ人づくり拠点)

野坂治郎	チーフアドバイザー
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#### 4. 協議議事録 (M/D)

##### 4-1 現地調査 1

MINUTES OF DISCUSSIONS  
ON  
PREPARATORY SURVEY  
ON  
THE PROJECT  
FOR  
THE UPGRADING AND REFURBISHMENT  
OF  
THE CENTRE FOR MATHEMATICS, SCIENCE, TECHNOLOGY EDUCATION IN  
AFRICA (CEMASTE) TRAINING FACILITIES  
IN  
THE REPUBLIC OF KENYA

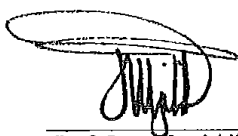
In response to the request from the Government of the Republic of Kenya (hereinafter referred to as "Kenya"), the Government of Japan decided to conduct a Preparatory Survey on the Project for the Upgrading and Refurbishment of CEMASTE Training Facilities in the Republic of Kenya (hereinafter referred to as "the Project") and entrusted the survey to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Kenya the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Mr. Masaaki Kato, Chief Representative, JICA Kenya Office and is scheduled to stay in the country from 9<sup>th</sup> January, 2011 to 3<sup>rd</sup> February, 2011.

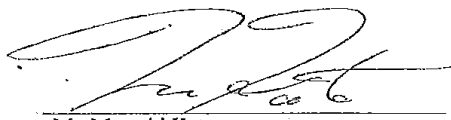
The Team had a series of discussions with officials concerned of the Government of Kenya and conducted a field survey.

In the course of discussions and field survey, both parties confirmed the main items described on the attached documents.

Nairobi, Kenya  
21<sup>st</sup> January, 2011



Prof. James Legishilo Ole Kiyiapi, CBS  
Permanent Secretary,  
Ministry of Education,  
Republic of Kenya



Mr. Masaaki Kato  
Leader  
Preparatory Survey Team  
Japan International Cooperation Agency



## ATTACHMENT

### 1. Objective of the Project

The objective of the Project is to increase, enlarge, and enhance the institutional capacity of the Center for Mathematics, Science and Technology Education in Africa (CEMASTEA) in providing trainings for capacity development of science and mathematics educators in Kenya and African countries, particularly SMASE-WECSA (Strengthening of Mathematics and Science Education – Western, Eastern, Central and Southern Africa) member countries.

Through the achievement of the above-mentioned objective, it is expected that the Project contributes to the improvement of the quality of mathematics and science education for technological and industrial development of the beneficiary countries. Particularly, Kenya's national development policy "Vision 2030" envisages the industrial development based upon a strong science, technology and innovation base. In addition to such a core function as contributing to the improvement of science and mathematics education, CEMASTEAs is expected to extend its training programs for in-service teachers of other relevant subjects (ICT, language for sciences, TVET and an aspect of pedagogical research). Therefore, the Project also contributes to the establishment of national In-Service Training and Education (INSET) centre in the long run. At the same time, this Project promotes support to education sector in Africa under TICAD IV process.

### 2. Purpose of the Preparatory Survey

The Kenyan side understands that the purposes of this preparatory survey are to explain the Japan's Grant Aid Scheme to Kenyan side and to examine the scope of the Project to satisfy the conditions of the Japan's Grant Aid, as explained by the Team in the Inception Report.

The Kenyan side further understands that the implementation of the Project will be finally determined by the Government of Japan based on the result of this survey.

### 3. Responsible and Implementing Organization

The responsible organization of the Project is the Government of Kenya through the Ministry of Education (hereinafter referred to as "GOK/MOE") and the implementing agency of the Project is CEMASTEAs. The organization chart of MOE and CEMASTEAs is shown in ANNEX 1 and 2 respectively.

### 4. Project Site

Both sides confirmed that the site for the Project is the site where CEMASTEAs is currently situated (Karen L.R. 1160/224).

#### **5. Items requested by the Government of Kenya**

After discussions with the Team, the items indicated in ANNEX 3 (buildings and facilities) and in ANNEX 4 (equipment) were finally requested by the Kenyan side. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval. Both sides agreed that the requested facilities and equipment will be examined by the Japanese side from the viewpoint whether those facilities and equipment are indispensable for the achievement of the purpose of the Project, will be utilized frequently throughout the year, and cannot be substituted with existing facilities or equipment.

#### **6. Japan's Grant Aid Scheme**

- 6-1. The Kenyan side understands the Japan's Grant Aid scheme described in ANNEX 5 and ANNEX 6, which were explained by the Team.
- 6-2. The Kenyan side assured to take the necessary measures, as described in ANNEX 7, for the smooth implementation of the Project. The detailed items that Kenyan side needs to cover and their dues are also indicated in ANNEX 7. The Kenyan side agreed to implement all indicated items in ANNEX 7 with its own budget.
- 6-3. The Japanese side explained that the Team would inform the rough estimation of the cost of works to be borne by the Kenyan side by the end of February 2011. The Kenyan side assured to secure sufficient budget for preparation works in the next fiscal year (2011/2012) and operational and maintenance cost in the subsequent years (2012/2013 and onwards).

#### **7. Schedule of the Survey**

The consultants will proceed to further studies in Kenya until 3<sup>rd</sup> February, 2011. Based on the results of a field survey in Kenya and information to be provided by Kenyan side, the Team will prepare the draft report in English. The draft report explanation mission to Kenya will be dispatched around late May, 2011.

In case that the contents of the report are accepted in principle by the Government of Kenya, JICA will complete the final report and send it to the Government of Kenya by the end of August 2011.

#### **8. Other Relevant Issues**

##### **8-1. Environment Management Issues**

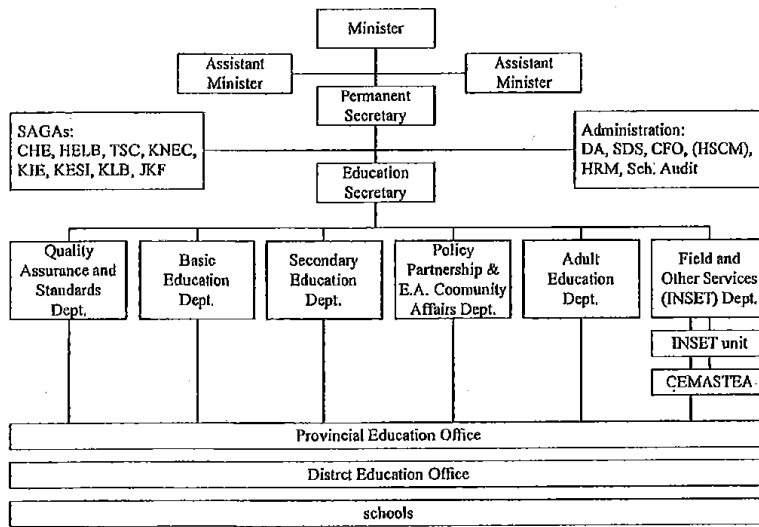
- (1) Kenyan side agreed to develop and implement Environment Management Plan (EMP), which is stipulated in the Environment Impact Assessment License issued by the National Environment Management Authority, with its own cost.
- (2) Kenyan side agreed to take full responsibility to explain the draft plan of the Project to relevant stakeholders including neighbors of the site.

END

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- ANNEX 1: Organizational Chart of MOE
  - ANNEX 2: Organizational Chart of CEMASTE A
  - ANNEX 3: Buildings and Facilities Requested by the Kenyan Side
  - ANNEX 4: Equipment List Requested by the Kenyan Side
  - ANNEX 5: Japan's Grant Aid
  - ANNEX 6: Flow Chart of Japan's Grant Aid Procedures
  - ANNEX 7: Major Undertakings to be Taken by Each Government



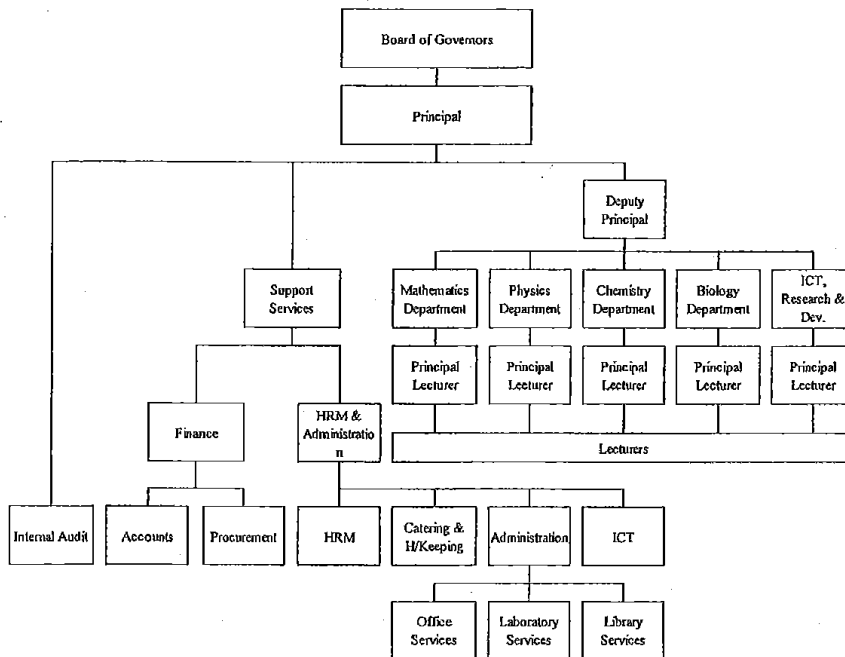
ANNEX I: Organizational Chart of MOE



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ANNEX 2: Organizational Chart of CEMASTE A



*JAD*

*P*

## ANNEX 3: Buildings and Facilities Requested by the Kenyan Side

Necessary rooms	Nos. of Rm	Pax	Remarks
<b>A Administration building (With furnished reception area)</b>			
Office	5	20	For physics, chemistry, biology, mathematics, ICT with desks and chairs, cabinets
Director's Rm.	1	1	With official desk, chairs; easy seats, low-flush toilet
Board Rm. / Meeting rm.	1	30	With conference table, furniture, projector screen, 2 low-flush WC (Ladies and gents), adjoining office room with office table, chair and drawers
Depty Directors'Rms.	1	1	With desk, chairs, easy seats, low-flush toilet
Registry Rm.	1	1	With document stores; with desk and chairs
Finance Officer's Rm.	1	1	With desk and chairs
Accountant's Rm.	1	2	With desk and chairs
HRM & Administration Officer's Rm.	1	1	With desk and chairs
Procurement Officer's Rm.	1	1	With desk and chairs
Internal Audit Officer's Rm.	1	1	With desk and chairs
Pantry	2		With sink counter + sideboards (one at administration and at each of the offices)
Printing Rm.	1	5	With necessary equipment
<b>B Labs &amp; Lecture building</b>			
Conference Hall	1	200	With stage, stores, audio visual equipment, translation equipment, chairs
Lecture Rms.	4	50	With writing board, Lecture chairs
Physics Lab.	1	50	With dark room, dark curtains, preparation room; writing board; tuition equipment, tables and chairs
Chemistry Lab.	1	50	With preparation room; tuition equipment, writing board; tables and chairs
Biology Lab.	1	50	With preparation room; tuition equipment, writing board; tables and chairs
General Workshop Rm.	1	50	Preparation room; writing board; tool kits (electrical; glass, wood and metal work); tables and chairs
Pedagogy study Rm.	2	25	With Lecture chairs, closed circuit TV, Teacher's table, writing board
ICT Laboratory	1	50	Computers, desks, chairs
Library	1	50	Open style shelves for 5,000 books, work desks and chairs, librarian desk and chair, internet connectivity
Toilet Facilities	2		Ladies facility and Men's low-flush toilet facilities with four units each

C. Dining Building			
Dining Hall	1	120	With chairs + tables
Kitchen	1		With Equipment
*Common space for the above (low-flush toilets, stores, corridor, etc)			
D. Pavement + Storm Drainage			Septic and neutralization tanks
E. Power supply + Backup			Generator room for backup with distribution panels
G. Water supply system + Backups			Water harvesters, Reservoir, Pumps, Elevated tanks

\* NOTE:

- i) Common space for the above (low-flush toilets, stores, corridor, etc)
- ii) An buildings should support special needs for physically impaired participants (with ramps on buildings and one special toilet in an toilet rooms).
- iii) An buildings should be cabled for internet

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ANNEX 4 Equipment List Requested by the Kenyan Side

Class	No.	Code No.	Equipment Name	Q'ty
Physics	1	PH-1	Electronic Precision Balance	5
	2	PH-2	Free Fall Experimental Apparatus	5
	3	PH-3	Spectrometer	5
	4	PH-4	Table balance with weights	5
	5	PH-5	Vernier callipers	10
	6	PH-6	Micrometer	10
	7	PH-7	Spherometer	5
	8	PH-8	Alarm stop clock	5
	9	PH-9	Stroboscope	5
	10	PH-10	Compact digital thermometer	10
	11	PH-11	DC voltmeter	7
	12	PH-12	AC voltmeter	10
	13	PH-13	DC Ammeter	10
	14	PH-14	DC Ammeter (centre meter)	10
	15	PH-15	AC Ammeter	10
	16	PH-16	Micro Ammeter	10
	17	PH-17	Galvanometer	8
	18	PH-18	Demonstration galvanometer	1
	19	PH-19	Circuit tester	25
	20	PH-20	Meter bridge	10
	21	PH-21	Variable resistor	10
	22	PH-22	Potable Wheatstone bridge	10
	23	PH-23	Resistance box	10
	24	PH-24	Signal generator	3
	25	PH-25	AC circuit apparatus	5
	26	PH-26	Oscilloscope 20MHz	5
	27	PH-27	Oscilloscope 100MHz	5
	28	PH-28	Experimental lever	5
	29	PH-29	Set of pulleys	10
	30	PH-30	Wheel and axle	5
	31	PH-31	Inclined plane	10
	32	PH-32	Friction experimental apparatus	10
	33	PH-33	Spring scales	10
	34	PH-34	Experimental steel spring	1
	35	PH-35	Equilibrium apparatus for demonstration	1
	36	PH-36	Equilibrium apparatus	5
	37	PH-37	Assorted weights for dynamics experiments	5
	38	PH-38	Recording timers	5
	39	PH-39	Cart acceleration apparatus	5
	40	PH-40	Linear air track	5
	41	PH-41	Uniform circular motion apparatus	5
	42	PH-42	Ballistic cart apparatus	5
	43	PH-43	Experimental vacuum drop tube	5
	44	PH-44	Falling body accelerating apparatus	5
	45	PH-45	Electric rotation platform	5
	46	PH-46	Collision balls	5
	47	PH-47	Gyroscope	5
	48	PH-48	Archimedes's principle demonstration device	5
	49	PH-49	Pascal's principle apparatus	5

JN

J



Class	No.	Code No.	Equipment Name	Qty
Physics	50	PH-50	Hydraulic pressure pump	5
	51	PH-51	Buoyancy measurement set	5
	52	PH-52	Water pressure apparatus	5
	53	PH-53	Magdeburg hemispheres	5
	54	PH-54	Torricelli's law apparatus	5
	55	PH-55	Vacuum bell	5
	56	PH-56	Rotary vacuum pump	1
	57	PH-57	Gas law experiment apparatus	10
	58	PH-58	Experiment Cylinder	10
	59	PH-59	Water calorimeter	10
	60	PH-60	Specific heat measurement set	10
	61	PH-61	Thermal conduction apparatus	5
	62	PH-62	Convection apparatus for demonstration	1
	63	PH-63	Linear expansion tester	5
	64	PH-64	Heat expansion ball and ring	5
	65	PH-65	Dew point measurement device	5
	66	PH-66	Brownian motion observation device	5
	67	PH-67	Mechanical gas model apparatus	5
	68	PH-68	Light source apparatus	10
	69	PH-69	Light source apparatus for teacher	1
	70	PH-70	Optical water tank	5
	71	PH-71	Optical bench	5
	72	PH-72	Experimental lenses for refraction of light	5
	73	PH-73	Experimental set of solar battery	5
	74	PH-74	He-Ne Gas laser	5
	75	PH-75	Laser experiment equipment set	5
	76	PH-76	Michelson interferometer	5
	77	PH-77	Light source for young's experiment	5
	78	PH-78	Slit set for young's experiment	5
	79	PH-79	Line spectrum light source	1
	80	PH-80	Spectroscope	5
	81	PH-81	Newton's ring apparatus	5
	82	PH-82	Interference plates	10
	83	PH-83	Optical slit	5
	84	PH-84	Polarizing plate sheets	5
	85	PH-85	Sympathetic tuning forks	5
	86	PH-86	Standard tuning forks	5
	87	PH-87	Resonance drum	5
	88	PH-88	Sound experimentation kit	5
	89	PH-89	Cathode air resonance apparatus	1
	90	PH-90	Air column resonance apparatus	10
	91	PH-91	Doppler effect apparatus	5
	92	PH-92	Sonometer	5
	93	PH-93	Neodymium magnets	5
	94	PH-94	Magnetic pole detector	1
	95	PH-95	Magnetising apparatus	1
	96	PH-96	Magnetising coil	5
	97	PH-97	Electromagnet high power	1
	98	PH-98	Electromagnet	1
	99	PH-99	Dip needle	1
	100	PH-100	Electrophorus	5

JN

J

Class	No.	Code No.	Equipment Name	Qty
Physics	101	PH-101	Apparatus for coulomb's law	5
	102	PH-102	Electroscope	10
	103	PH-103	Electrostatic generator	5
	104	PH-104	Hamilton rotator	5
	105	PH-105	Leyden jar	5
	106	PH-106	Discharge rod	5
	107	PH-107	Insulation platform	5
	108	PH-108	Capacitance apparatus	5
	109	PH-109	Condenser apparatus	5
	110	PH-110	Capacitive charge meter	5
	111	PH-111	Hand generator	5
	112	PH-112	Electricity experiment board	5
	113	PH-113	Electrical experiment kit	5
	114	PH-114	Slide rheostat	5
	115	PH-115	ACDC comparison demonstrator	1
	116	PH-116	Potential demonstrator	1
	117	PH-117	Black box for electric circuitry	5
	118	PH-118	Fleming's law demonstrator	5
	119	PH-119	Magnetic field experiment equipment	5
	120	PH-120	One reel' motor	1
	121	PH-121	Magnets experimentation set	5
	122	PH-122	Primary and secondary coils	5
	123	PH-123	Electromagnetic strength measuring equipment	1
	124	PH-124	Induction coil	5
	125	PH-125	Vacuum discharge tube	5
	126	PH-126	Crooke's tube set	5
	127	PH-127	Photoelectric effect apparatus	5
	128	PH-128	Frank Hertz apparatus	1
	129	PH-129	Regulated D.C. power supply	5
	130	PH-130	Power supply	5
	131	PH-131	Hand centrifuge	1
	132	PH-132	Stop watch	22
	133	PH-133	telescope	1
	134	PH-134	Franklin's motor	5
	135	PH-135	Bunsen burner	10
Chemistry	136	CH-1	Analytical Balance	5
	137	CH-2	Drying Oven	2
	138	CH-3	Mantle Heater	5
	139	CH-4	Power Source	5
	140	CH-5	Molecular motion demonstrator	2
	141	CH-6	Kinetic theory model kit	10
	142	CH-7	Hot Plate	5
	143	CH-8	Ultrasonic washer	2
	144	CH-9	Test tube washer	2
	145	CH-10	Melting Point Apparatus	5
	146	CH-11	Mechanical Stirrer	5
	147	CH-12	Magnetic Stirrer with hot plate	10
	148	CH-13	Water Bath with Shaker	10
	149	CH-14	Radiation detector	5
	150	CH-15	Vacuum pump	2
	151	CH-16	Ice maker	2

Class	No.	Code No.	Equipment Name	Qty
Chemistry	152	CH-17	Abbe refractometer	2
	153	CH-18	Food Calorimeter	1
	154	CH-19	Polarimeter	2
	155	CH-20	Conductivity meter	10
	156	CH-21	Potentiometer	10
	157	CH-22	Joule meter	5
	158	CH-23	Galvanometer	15
	159	CH-24	High voltage power supply	5
	160	CH-25	Digital Microscope	1
	161	CH-26	Table Balance	10
	162	CH-27	Molecular structure model	10
	163	CH-28	Molecular structure model organic	10
	164	CH-29	Battery and charger	10
	165	CH-30	Retort stand set	50
	166	CH-31	Bunsen burner	25
	167	CH-32	Tripod stand set	25
	168	CH-33	Alcohol lamp	25
	169	CH-34	Laboratory gas burner for gas cartridge	10
	170	CH-35	Centrifuge	2
	171	CH-36	Voltaic cell	10
	172	CH-37	Cell plates	10
	173	CH-38	DC voltmeter	25
	174	CH-39	DC millivoltmeter	25
	175	CH-40	DC ammeter	25
	176	CH-41	DC milliammeter	25
	177	CH-42	AC Ammeter	25
	178	CH-43	AC Voltmeter	25
	179	CH-44	PH bench meter	10
	180	CH-45	Desiccator	10
	181	CH-46	Glass tube cutter	10
	182	CH-47	Glass cutter	10
	183	CH-48	Digital stop watch	25
	184	CH-49	Analogue stop watch	25
	185	CH-50	Water deionizer	2
186	CH-51	Water distillation apparatus	2	
187	CH-52	Suction bottle and funnel	25	
188	CH-53	Hoffmann's voltmeter	5	
189	CH-54	Kipps apparatus	5	
190	CH-55	Sample of ores	2	
191	CH-56	Refrigerator	2	
192	CH-57	Graphic calculator	25	
193	CH-58	Draft chamber	1	
194	CH-59	Waste water apparatus	1	
Biology	195	BI-1	pH Meter	5
	196	BI-2	Do Meter	5
	197	BI-3	Hygrometer	5
	198	BI-4	Salinity Conductivity Meter	5
	199	BI-5	Refractometer	5
	200	BI-6	Soil Acid humidity meter	5
	201	BI-7	Thermostat Water Bath	5
	202	BI-8	Desiccator	5

Class	No.	Code No.	Equipment Name	Qty
Biology	203	BI-9	Electric Balance	5
	204	BI-10	Magnetic Stirrer with hot plate	5
	205	BI-11	Stereo Microscope	25
	206	BI-12	Colony Counter	1
	207	BI-13	Incubator	2
	208	BI-14	Shaker	1
	209	BI-15	Draft chamber	1
	210	BI-16	Homogenizer	5
	211	BI-17	Adjustable Pipette	5
	212	BI-18	Food calorimeter	10
	213	BI-19	Respirometer	10
	214	BI-20	Autoclave	1
	215	BI-21	Aquarium	5
	216	BI-22	Microtome	5
	217	BI-23	Centrifuge	5
	218	BI-24	Prepared slide set	10
	219	BI-25	Photometer	10
	220	BI-26	Stethoscope	25
	221	BI-27	Clinostat	10
	222	BI-28	Biological Microscope	26
	223	BI-29	Digital Microscope	1
	224	BI-30	Binoculars	10
	225	BI-31	Weight balance	2
	226	BI-32	Bunsen burner	25
	227	BI-33	Tripod stands for Bunsen burner	25
	228	BI-34	Model set	10
	229	BI-35	Dissecting kit	30
	230	BI-36	Refrigerator	1
	231	BI-37	Scientific calculator	10
	232	BI-38	Drying oven	1
233	BI-39	Human Skeleton	5	
234	BI-40	Hot plate	4	
235	BI-41	Stop watch	25	
236	BI-42	Sand bath	10	
237	BI-43	Preserved Marine organism set	10	
238	BI-44	Spring balance	10	
239	BI-45	Laboratory trolley	5	
240	BI-46	Water distiller	1	
241	BI-47	Deep freezer	1	
242	BI-48	Cage for small animal	2	
243	BI-49	Cage for rabbit	2	
244	BI-50	Cage for insect	2	
Mathematics	245	MA-1	Programmable Calculator	51
	246	MA-2	Bells	30
	247	MA-3	Stop watch	20
	248	MA-4	Vernier calliper	10
	249	MA-5	Micrometer screw gauge	10
	250	MA-6	Table balance	10
	251	MA-7	Overflow can	10
	252	MA-8	Geometric model	10
	253	MA-9	Polygonal shape	10

Class	No.	Code No.	Equipment Name	Q'ty
Mathematics	254	MA-10	Clinometer	10
	255	MA-11	Blackboard instrument	10
	256	MA-12	Scientific calculator	10
	257	MA-13	Ticker-tape timer	10
	258	MA-14	Dynamic trolley set	10
	259	MA-15	Trundle wheel	10
	260	MA-16	Wire models	10
	261	MA-17	Wall clocks	10
	262	MA-18	Geoboard with plastic pegs	10
	263	MA-19	Unit circle model (wooden)	10
	264	MA-20	Soma cubes	1
	265	MA-21	1 m <sup>3</sup> wooden model	2
	266	MA-22	3 dimensional solids	10
	Lecture support equipment	267	LS-1	Graphics tablet
268		LS-2	Scanner	5
269		LS-3	Projector	10
270		LS-4	Visual presenter	4
271		LS-5	VTR	5
272		LS-6	Video camera	5
273		LS-7	DVD/ VCD player	5
274		LS-8	TV set	5
275		LS-9	Digital camera	5
276		LS-10	Bus	2
Research and Development	277	RD-1	Scanner	4
	278	RD-2	Laptop computer	15
	279	RD-3	Video camera	5
	280	RD-4	Digital camera	5
	281	RD-5	Voice recorder	10
Computer room	282	PC-1-1	Computer	51
	283	PC-1-2	Network material	1
	284	PC-2	Printer	1
	285	PC-3	Computer table	50
	286	PC-4	Chair	51
	287	PC-5	Desk for lecturer	1
	288	PC-6	Projector	1
	289	PC-7	Screen	1
	Primary school	290	PS-1	Spring balance
291		PS-2	Refrigerator which has freezer	1
292		PS-3	Human skeleton	1
293		PS-4	Biological systems charts(Digestive)	2
294		PS-5	Biological systems charts(Respiratory)	2
295		PS-6	Biological systems charts(Circulatory)	2
296		PS-7	Biological systems charts(Excretory)	2
297		PS-8	Biological systems charts(Nervous)	2
Lecture hall	298	LH-1	Sound equipment	1
	299	LH-2	Projector with projector table	1
	300	LH-3	Screen	1
	301	LH-4	Lecture chair	200
	302	LH-5	Table	5
	303	LH-6	Chair	15
	304	LH-7	Lecturer table	1

Class	No.	Code No.	Equipment Name	Qty
Lecture room	305	LR-1	Teacher's Desk	4
	306	LR-2	Teacher's Chair	4
	307	LR-3	Lecture chair	200
	308	LR-4	White board portable	4
	309	LR-5	Screen	4
Laboratory furniture	310	LF-1-1	Laboratory central experimental table for Physics	5
	311	LF-1-2	Laboratory central experimental table for Chemistry	5
	312	LF-1-3	Laboratory central experimental table for Biology	5
	313	LF-2-1	Laboratory table for Physics Lecturer	1
	314	LF-2-2	Laboratory table for Chemistry Lecturer	1
	315	LF-2-3	Laboratory table for Biology Lecturer	1
	316	LF-3-1	Experimental table for Physics preparation room	1
	317	LF-3-2	Experimental table for Chemistry preparation room	1
	318	LF-3-3	Experimental table for Biology preparation room	1
	319	LF-4	Long type side table with sink	6
	320	LF-5	Stool	153
	321	LF-6	Shelf	12
	322	LF-7	Desk	3
	323	LF-8	Chair	3
Office block	324	OB-1	Shelf for Library	10
	325	OB-2	Reading desk	12
	326	OB-3	Reading chair	48
	327	OB-4	Desk set for library staff	2
	328	OB-5	Chair for library staff	2
	329	OB-6	Bed for sick bay	2
	330	OB-7	Desk for nurse	1
	331	OB-8	Chair for nurse	1
	332	OB-9	Chair for patient	1
	333	OB-10	Shelf for medicine	1
Board room	334	BR-1	Table	6
	335	BR-2	Chair	30
	336	BR-3	Projector	1
	337	BR-4	Screen	1
	338	BR-5	Teleconferencing facilities	1
	339	BR-6	Public address system	1
Hostel block	340	HB-1	Washing machine	2
	341	HB-2	Drying Machine	2
	342	HB-3	Ironing Roller	1
	343	HB-4	Iron	10
	344	HB-5	Iron table	8
	345	HB-6	Desk for hostel staff	2
	346	HB-7	Chair for hostel staff	3
Kitchen and Dinning hall	347	KD-1	Desk for office	1
	348	KD-2	Chair for office	1
	349	KD-3	Table for kitchen staff	2
	350	KD-4	Chair for kitchen staff	9
	351	KD-5	Dinning table	20
	352	KD-6	Dinning chair	120
	353	KD-7	Deep fat fryer	1
	354	KD-8	Boiling pan	1
	355	KD-9	Stock pot stove	1

90

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Class	No.	Code No.	Equipment Name	Q'ty
Kitchen and Dinning hall	356	KD-10	Gas cooking range	2
	357	KD-11	Potato peeler	2
	358	KD-12	Table for Potato peeler	2
	359	KD-13	D.B.D.D. Sink unit	1
	360	KD-14	Potato chipper	2
	361	KD-15	Table for Potato chipper	2
	362	KD-16	Mixing machine	1
	363	KD-17	Refrigerator	2
	364	KD-18	SS Dump table	1
	365	KD-19	S.B.S.D. Sink unit	1
	366	KD-20	Cutlery rack	2
	367	KD-21	SS Work top	2
	368	KD-22	Meat slicing machine	1
	369	KD-23	Table for meat slicer	1
	370	KD-24	D.B.D.D. Sink unit	1
	371	KD-25	Meat chopping block	1
	372	KD-26	Chicken grill	1
	373	KD-27	Bain-marie(Single)	4
	374	KD-28	Bain-marie(Dual)	3
	375	KD-29	Bain-marie(Triple)	3
	376	KD-30	Hot cupboard	1
	377	KD-31	Chest type freezer cabinet	2
	378	KD-32	Platform weight scale	1
	379	KD-33	Food trolley	4
	380	KD-34	Tea urn	2
	381	KD-35	Coffee urn	1
	382	KD-36	Milk urn	1
	383	KD-37	Coffee making machine	1
	384	KD-38	Dial indicator bench scale	2
	385	KD-39	Microwave oven	1
	386	KD-40	Serving table	2
	387	KD-41	High pressure cooker	1
	388	KD-42	Gas baking oven	1
	389	KD-43	Sink with worktop x3	1
	390	KD-44	Worktop with partition	1
	391	KD-45	Automatic dishwasher	1
	392	KD-46	Beverage refrigerator	3
	393	KD-47	Food mixer	1
	394	KD-48	Meat mincer	1
	395	KD-49	Blender	2
396	KD-50	Pratt pan	1	

## ANNEX 5

### JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

#### 1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures:

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal & Approval
  - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

#### 2. Preparatory Survey

##### (1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.



The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve 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 of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

**3. Japan's Grant Aid Scheme**

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority 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, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) 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 JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by 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 Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA 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 JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

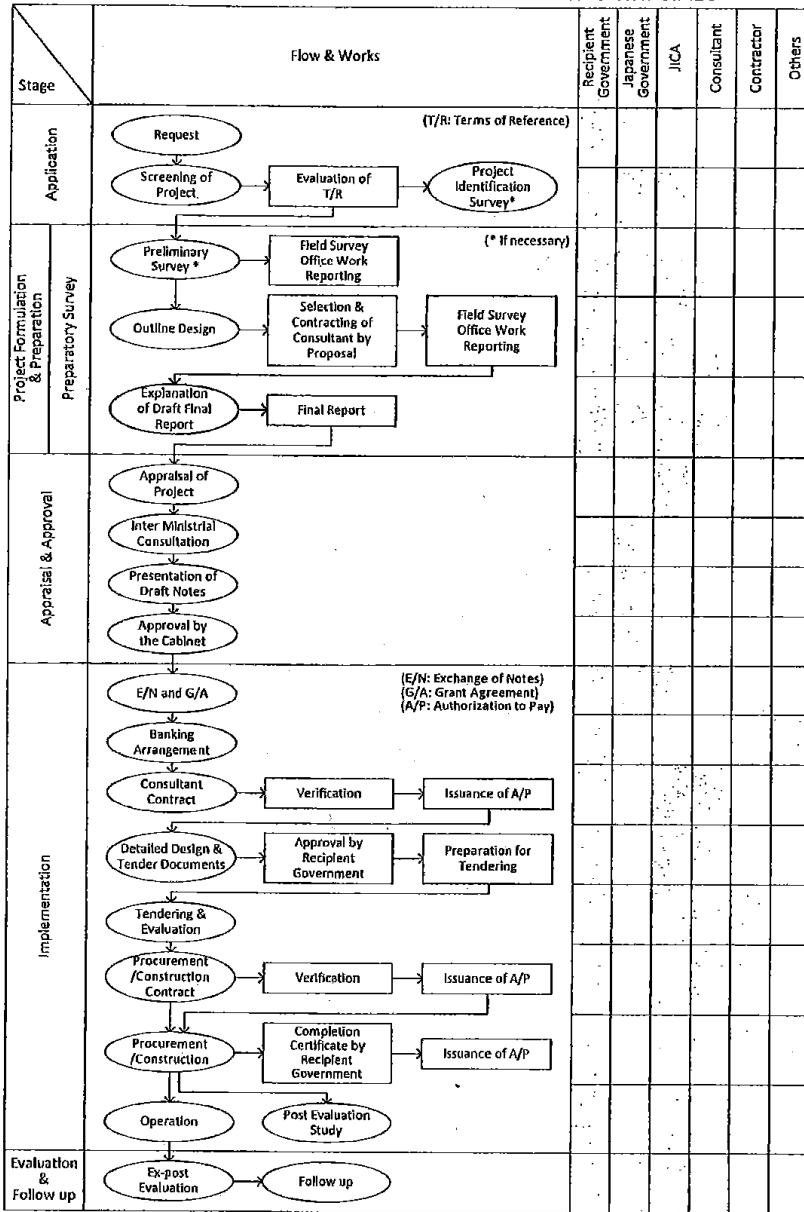
(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.



ANNEX 6

FLOW CHART OF JAPAN'S GRANT AID PROCEDURES





	3) Internal transportation from the port of disembarkation to the project site	●	
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		● during the Project implementation
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		● during the Project implementation
7	To ensure that the Facilities and the products be maintained and used properly and effectively for the implementation of the Project *Repair work of damaged furniture, doors, windows and water and electrical services. *Exchange of light bulbs *Paint work on wall by five to seven years. *To bear necessary power, water, drainage, telephone, gas charge *To purchase of spare parts and consumables for the provided equipment *To bear necessary fuel charge and driver wage (in case of provision of bus) *Gardening around the proposed buildings		● during the Project implementation
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project *Charge for the Project approval		● during the Project implementation
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A 1) Advising commission of A/P 2) Payment commission		● A/P will be issued during the Project implementation. ● B/A will be contracted after G/A as soon as possible.
10	To give due environmental and social consideration in the implementation of the Project. *Preparation of Environmental Management Plan (EPM) and implementation of the monitoring program *Coordination of relationship among stakeholders *Acquisition of drainage permit		● from the survey period until the completion of the Project

(A/P : Authorization to pay, B/A : Banking Arrangement, GoK : Government of Kenya)

Note:

- 1 The necessity of constructing parking lot will be examined further based on the number/size of buses to be provided by the Project. The result of assessment will be informed to Kenyan side at the end of the field survey.
- 2 It will be unnecessary for Kenyan side to construct access road to the site as there are existing access roads.

## 4-2 現地調査 2

**MINUTES OF DISCUSSIONS  
ON  
PREPARATORY SURVEY  
ON  
THE PROJECT  
FOR  
THE UPGRADING AND REFURBISHMENT  
OF  
THE CENTRE FOR MATHEMATICS, SCIENCE, TECHNOLOGY EDUCATION IN  
AFRICA (CEMASTE A) TRAINING FACILITIES  
IN  
THE REPUBLIC OF KENYA**

From January 2011 to February 2011, the Japan International Cooperation Agency (hereinafter referred to as "JICA") had conducted a field survey as a part of the Preparatory Survey on the Project for the Upgrading and Refurbishment of CEMASTE A Training Facilities in the Republic of Kenya (hereinafter referred to as "the Project"). Based on the results of the survey and subsequent technical examinations conducted in Japan, JICA prepared the Draft Preparatory Survey Report.

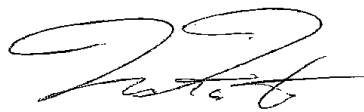
In order to explain the contents of the report and discuss issues related to the Project with the officials concerned of the Government of the Republic of Kenya (hereinafter referred to as "Kenya"), JICA sent the Survey Team (hereinafter referred to as "the Team"), headed by Mr. Masaaki Kato, Chief Representative, JICA Kenya Office, from 22<sup>nd</sup> May to 31<sup>st</sup> May 2011.

As a result of discussions, both sides have confirmed the main items described in the attachment.

Nairobi, Kenya  
30<sup>th</sup> May 2011



Prof. James Legishilo Ole Kiyiapi, CBS  
Permanent Secretary,  
Ministry of Education,  
Republic of Kenya



Mr. Masaaki Kato  
Leader  
Preparatory Survey Team  
Japan International Cooperation Agency

## ATTACHMENT

### 1. Contents of the Draft Report

Kenyan side agreed and accepted in principle the contents of the draft report as explained by the Team.

### 2. Components and Equipment to be covered by the Project

Both sides agreed on the components of the facilities and the list of equipment to be covered by the Project as shown in ANNEX 1 and ANNEX 2. Kenyan side agreed that Japanese side would make a final decision on this matter through further study in Japan and appraisal by the Government of Japan and JICA.

### 3. Japan's Grant Aid Scheme and Major Undertakings

3-1. Kenyan side understood the Japan's Grant Aid scheme as described in ANNEX 3 (Japan's Grant Aid Scheme) and ANNEX 4 (Flow Chart of Japan's Grant Aid Procedures). These two documents are exactly same with the ones attached to the Minutes of Discussion signed by both parties on 21<sup>st</sup> January 2011.

3-2. The Government of Kenya assured that it shall take necessary measures in order for the smooth implementation of the Project as well as proper maintenance and utilization of the facilities and equipment provided by the Project as described in ANNEX 5 (Major Undertakings to be taken by Each Government).

3-3. Furthermore, the Government of Kenya agreed to take a full responsibility to complete the items indicated in ANNEX 6 (Obligations to be covered by the Government of Kenya) by the set deadlines and at appropriate timing of each stage of the Project. The timeframe for the obligations to be covered by the Government of Kenya is shown in ANNEX 7 (The Timeframe for the Obligations to be covered by the Government of Kenya). The major items that need to be completed before the commencement of the work are highlighted below.

1) Environmental Management Plan (EMP)

EMP should be developed by the end of August 2011. The Ministry of Education and CEMASTEAs need to explain the contents of EMP to stakeholders including neighbours at the time of finalizing EMP and report the results to JICA immediately.

2) Site clearance

CEMASTEAs should clear the site by the end of December 2011 by demolishing the former administration building, removing some of the existing trees and structures (fences, sheds, rainwater drainage ditches and concrete structures), and relocating cables and structures (aerial wiring and pole, buried power cables, rainwater drainage ditches and pits) that are located in the planned construction site. These works should be done before the expiration date of EIA license (23<sup>rd</sup> April 2012). The Ministry of Education shall take a responsibility to facilitate the work by organizing stakeholder meeting involving neighbours to explain the work plan, acquiring necessary permit for

the demolishing work, and notifying its commencement to Nairobi City Council (NCC).

3) Banking arrangement and payment of commission

Banking Arrangement (B/A) should be done promptly after the signing on the Grant Agreement (G/A) between the Government of Kenya and JICA. The Ministry of Education shall take a full responsibility to facilitate the process with the close communication with the Ministry of Finance.

4) Acquisition of building permit and excessive noise permit

The Ministry of Education shall acquire the building permit by March 2012 and make a notification of the work to NCC before its commencement.

3-4. The Ministry of Education and CEMASTEА shall be responsible for complying with collateral conditions stipulated in EIA license and related regulations of the Government of Kenya at each stage of the Project, from demolishing work to operation stage. The measures to be taken by the Ministry of Education and CEMASTEА will be as follows:

1) CEMASTEА will establish a committee fully in charge of environmental issues in related to the implementation of the Project and operation of the facilities. The composition of the committee is shown below.

Chairperson: Director, CEMASTEА

Members:

- Two Deans (or relevant academic staff) of CEMASTEА
- Senior Gender and Social Development Officer (Administration), CEMASTEА
- Clerk of Works (to be appointed)
- Environmental consultant(s)

2) The committee will be responsible for ensuring that all works, particularly done by Kenyan side (demolishing work), would comply with EMP, collateral conditions stipulated in EIA license and related regulations of the Government of Kenya.

3) In particular, the committee should ensure that the tender documents and the contract with Kenyan contractors for demolishing work fully reflect the items stipulated in EMP. In order to ensure this, CEMASTEА shall review the service contract with the environmental consulting firm and revise it as necessary so that the environmental consultants can fully engage in monitoring and giving proper advice to Kenyan contractors of demolishing work and operation of the facilities.

3-5. The Ministry of Education is responsible for supervising and facilitating all works indicated above and in ANNEX 6 in cooperation with the Ministry of Public Works.

**4. Final Report of the Preparatory Survey**

JICA will finalize the report in accordance with the result of discussions and forward it to the Government of Kenya by the middle of September 2011.



## **5. Project Cost Estimation**

Kenyan side understood that the Project cost estimation described in ANNEX 8 was not final at this stage and would be set and approved by the Government of Japan after thorough examinations.

## **6. Confidentiality of the Information Related to the Project**

Both sides confirmed that all information related to the Project including design documents of facilities and equipment shall not be released to any outside parties before concluding all contracts for the Project. Furthermore, both sides agreed that the estimated cost of the Project as described in ANNEX 8 shall never be duplicated or released to any outside parties before concluding all contracts for the Project.

## **7. Other Relevant Issues**

### **7-1. Proper Use and Maintenance of the Facilities of CEMASTE A**

- 1) Kenyan side understood that the Government of Kenya and CEMASTE A had the obligations to use the facilities to be provided by the Project fully and properly and maintain them appropriately.
- 2) Regarding to the operation of the facilities of CEMASTE A, including existing ones, both sides confirmed that CEMASTE A would take a full responsibility to run the annual training program after the completion of the work according to the plan shown in ANNEX 9 (Planned Annual Training Program by CEMASTE A). The Team confirmed that CEMASTE A would continue to provide Secondary and Primary In-Service Training and Education (INSET) in cascading mode and utilize the facilities at CEMASTE A for national INSET regularly.
- 3) Both sides further agreed that all facilities including the existing laboratories, lecture rooms, ICT room, and hostels at CEMASTE A shall be fully utilized throughout the year for the purpose of fulfilling the core mandate of CEMASTE A, which is providing the quality training in order to enhance the quality of mathematics and science education in Kenya and African countries as well.
- 4) The Government of Kenya agreed to monitor the progress of the implementation of training program at CEMASTE A and report the monitoring results to JICA regularly. JICA will provide the format for effective and efficient monitoring. Both sides understood that substantial effort would be necessary by the Ministry of Education and CEMASTE A in order to fulfill their commitment.

### **7-2. Allocation of Necessary Budget and Personnel**

Kenyan side agreed to allocate necessary budget and personnel for the proper operation and maintenance of the facilities to be covered by the Project as described in ANNEX 10 (Summary of Annual Cost of Operation and Maintenance) and ANNEX 11 (Required

Numbers of Staff of CEMASTEAs) respectively. Moreover, the Ministry of Education agreed that it should take a full responsibility to bear full cost that were not covered by the Project as well as the increasing cost due to the unforeseeable circumstances in relation to the implementation of the Project.

**7-3. Things need to be followed-up**

- 1) The Ministry of Education shall collect the technical report for extending high voltage lines from Kenya Power and Lighting Company (KPLC), which has been requested by the Team, and submit it to JICA Kenya Office by 3<sup>rd</sup> June 2011.
- 2) The Ministry of Education shall collect the Title Deed of the site and submit it to JICA Kenya Office by 3<sup>rd</sup> June 2011.
- 3) CEMASTEAs, with the professional support from environmental consultants, shall communicate with the representative of Karen and Langata District Association (KLDA) to hear their responses to the plan of the Project by 3<sup>rd</sup> June 2011. The Ministry of Education and CEMASTEAs shall take a full responsibility that their concerns would be addressed in an appropriate manner.

**END**

**ANNEX 1 Components of the Facility**

<b>Block</b>	<b>Room</b> (Note: The number in parenthesis shows the numbers of rooms.)
A. Administration building 1	Director's room (1) Deputy Director's room (1) Other supervisory officer's room (5) Printing room (1) Toilet, Hall, Storage, Staircase, etc.
B. Administration building 2	Office (5) Meeting room/boardroom (1) Toilet, Entrance hall, Storage, Corridor, Staircase, etc.
C. Lecture hall	Hall Foyer, Toilet, Storage, etc.
D. Lecture building	Lecture room (4) Corridor, Staircase
E. Laboratory building	Laboratory (3) [physics, biology, chemistry] Preparation room (3) Library (1) ICT laboratory (1) Toilet, Corridor, Staircase, Storage, etc.
F. Dining hall	Dining hall Toilet, Serving space, etc.
G. Connecting hall	
H. Kitchen	
I. Transformer building	
J. Generator building	
X. Connecting corridor and slope (between B, C, D, E)	

ANNEX 2 List of Equipment

Category	No.	Code No.	Equipment name	Quantity	Unit	
Mathematics and Science Education	Physics	1	PH-1	Electronic precision balance	1	unit
		2	PH-18	Demonstration galvanometer	2	units
		3	PH-23	Resistance box	2	units
		4	PH-26	Oscilloscope	2	units
		5	PH-43	Experimental vacuum drop tube	1	set
		6	PH-45	Electric rotation platform	1	unit
		7	PH-53	Magdeburg hemispheres	1	unit
		8	PH-56	Rotary vacuum pump	1	unit
		9	PH-70	Optical water tank	1	unit
		10	PH-93	Magnet set	1	set
		11	PH-96	Magnetising coil	1	unit
		12	PH-103	Electrostatic generator	1	unit
		13	PH-119	Magnetic field experiment equipment	2	units
	Chemistry	14	CH-15	Vacuum pump	1	unit
		15	CH-26	Electronic table balance	10	units
		16	CH-27	Molecular structure model inorganic	1	set
		17	CH-28	Molecular structure model organic	1	set
		18	CH-31	Bunsen burner	10	units
		19	CH-41	DC milliammeter	5	units
		20	CH-45	Desiccator	3	units
		21	CH-51	Water distillation apparatus	2	units
		22	CH-53	Hoffman's apparatus	1	unit
		23	CH-54	Kipps apparatus	1	unit
		24	CH-55	Sample of ores	1	set
		Biology	25	BI-22	Microtome	5
	26		BI-24	Prepared slide set	3	sets
	27		BI-29	Digital microscope	1	unit
	28		BI-34	Model set	10	sets
	29		BI-39	Human skeleton	1	unit
	30		BI-47	Deep freezer	1	unit
	Mathematics	31	MA-8	Geometric model set	2	sets
		32	MA-11	Blackboard instrument	5	units
		33	MA-18	Geoboard with plastic pegs	10	units
Lecture support	34	LS-3	Projector	6	units	
	35	LS-4	Visual presenter	4	units	
	36	LS-6	Video camera	2	units	
	37	LS-7	DVD/VCD player	4	units	
	38	LS-10	Bus	1	unit	
	39	LS-11	Screen	6	units	
ICT	40	PC-1	Computer	51	units	
	41	PC-2	Printer	1	unit	
	42	PC-9	Switching hub	5	units	
Lecture hall	43	LH-1	Sound equipment	1	unit	
	44	LH-2	Projector	1	unit	
	45	LH-3	Screen	1	unit	

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Education furniture	Lecture room	46	LR-4	White board portable	4	units
	Laboratory	47	LF-1-1	Laboratory central experimental table for Physics	3	units
		48	LF-1-2	Laboratory central experimental table for Chemistry	3	units
		49	LF-1-3	Laboratory central experimental table for Biology	3	units
		50	LF-2	Laboratory table for lecturer	3	units
		51	LF-9	Draft chamber	2	units
	Library	52	OB-1	Shelf for library	8	sets
	Boardroom	54	BR-1	Table set	1	set
		55	BR-2	Chair	30	units
	Accommodation building, kitchen & dining hall equipment	Accommodation building	56	HB-3	Ironing roller	1
57			HB-8	Trolley for dry linen	1	unit
Kitchen & dining hall		58	HB-9	Trolley for wet linen	1	unit
		59	KD-9	Stock pot stove	1	unit
		60	KD-11	Potato peeler	1	unit
		61	KD-14	Potato chipper	2	units
		62	KD-15	Table for potato chipper	2	units
		63	KD-16	Mixing machine	1	unit
		64	KD-17	Refrigerator	1	unit
		65	KD-19	S.B.S.D. sink unit	1	unit
		66	KD-20	Cutlery rack	1	set
		67	KD-21	SS work top	1	unit
		68	KD-22	Meat slicing machine	1	unit
		69	KD-25	Meat chopping block	1	unit
		70	KD-26	Chicken grill	1	unit
		71	KD-31	Chest type freezer cabinet	1	unit
		72	KD-32	Platform weight scale	1	unit
73	KD-34	Tea urn	2	units		
74	KD-35	Coffee urn	1	unit		
75	KD-36	Milk urn	1	unit		
76	KD-37	Coffee making machine	1	unit		
77	KD-38	Bench scale	2	units		
78	KD-41	High pressure cooker	1	unit		
79	KD-42	Gas baking oven	1	unit		
80	KD-44	Worktop with partition	1	unit		
81	KD-45	Automatic dishwasher	1	unit		
82	KD-46	Beverage refrigerator	3	units		
83	KD-48	Meat mincer	1	unit		
84	KD-49	Blender	2	units		
85	KD-50	Tilting brat pan	1	unit		
86	KD-51	Dough proofer	1	unit		

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## ANNEX 3 Japan's Grant Aid Scheme

### JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

#### 1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures:

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal & Approval
  - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

#### 2. Preparatory Survey

##### (1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.

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The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve 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 of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

**3. Japan's Grant Aid Scheme**

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority 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, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

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(4) 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 JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by 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 Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

- a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA 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 JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

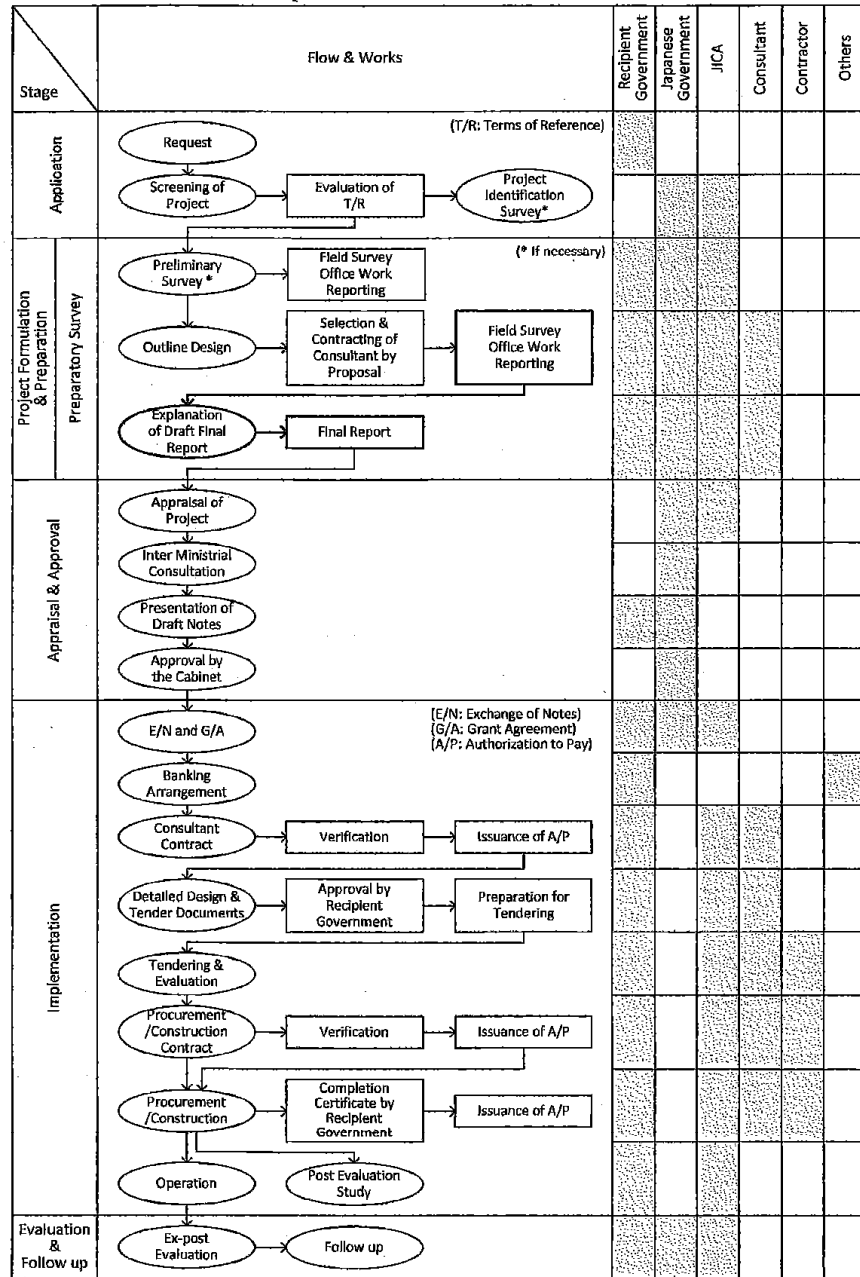
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.



**ANNEX 4 Flow Chart of Japan's Grant Aid Procedures**



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**ANNEX 5 Major Undertakings to be taken by Each Government**

No.	Items	To be covered by Grant Aid	To be covered by GoK
1	To secure a lot of land necessary for the implementation of the Project and to clear the site;		•
2	To construct the following facilities		
	1) The building	•	
	2) The gates and fences in and around the site		•
	3) The parking lot		•
	4) The road within the site	•	
	5) The road outside the site		•
3	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site		
	1) Electricity		
	a. The distributing power line to the site		•
	b. The drop wiring and internal wiring within the site	•	
	c. The main circuit breaker and transformer	•	
	2) Water Supply		
	a. The city water distribution main to the site	-	-
	b. The supply system within the site (receiving and elevated tanks)	•	
	3) Drainage		
	a. The city drainage main (for storm sewer and others to the site)		•
	b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	•	
	4) Gas Supply		
	a. The city gas main to the site	-	-
	b. The gas supply system within the site	•	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		•
	b. The MDF and the extension after the frame/panel	•	
	6) Furniture and Equipment		
	a. General furniture		•
	b. Project equipment	•	
4	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	•	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		•
	3) Internal transportation from the port of disembarkation to the project site	•	
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		•
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be		•

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	necessary for their entry into the recipient country and stay therein for the performance of their work		
7	To ensure that the Facilities and the products be maintained and used properly and effectively for the implementation of the Project		•
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		•
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•
10	To give due environmental and social consideration in the implementation of the Project.		•

(A/P: Authorization to pay, B/A: Banking Arrangement, GoK: the Government of Kenya)

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**ANNEX 6 Obligations to be covered by the Government of Kenya**

**(1) Preparatory Phase of the Construction**

No.	Item	Timing/ Deadlines	Responsible organization
1)	Development of Environmental Management Plan (EMP) according to the clause 1.8 of EIA License dated on 23rd April, 2010 and report to JICA	by the end of August, 2011	CEMASTEА
2)-1	Organizing a stakeholder meeting involving the neighbours for the explanation of the outline design of the project	by the end of May (Done on 24 <sup>th</sup> May 2011)	CEMASTEА MOE FS Dept.
2)-2	Organizing a stakeholder meeting involving the neighbours for the explanation of the EMP (The consultant drafting EMP should attend as well.)	by the end of August, 2011	CEMASTEА MOE FS Dept.
2)-3	Organizing a stakeholder meeting involving the neighbours for the explanation of the demolishing work program (The contractor of demolishing work should attend the meeting as well.)	by the end of November, 2011	CEMASTEА MOE FS Dept.
2)-4	Organizing a stakeholder meeting involving the neighbours for the explanation of the construction program (The contractor of the construction work should attend the meeting as well.)	within half a month after signing of the contract	CEMASTEА MOE FS Dept.
3)-1	Acquisition of demolishing permit (from NEMA) according to the article 14, 2nd schedule of EMCA (Environmental Management & Coordination Act) (Noise and Excessive Vibration)	by the end of November, 2011	MOE FS Dept.
3)-2	Registration of workplace (to NCC) according to the article 44 of OSHA (Occupational Safety and Health Act), 2007, and Acquisition of certificate of plans of workplace premises (from NCC) according to the article 125 of OSHA	before the commencement of demolition work	MOE FS Dept.
3)-3	Notification of the commencement of demolishing work (to NCC) according to the article 9 (1)(b) of Building Code	before the demolition work	MOE FS Dept.
3)-4	Demolition of the former administration building	by the end of December, 2011	CEMASTEА
4)-1	Acquisition of removal permit for indigenous tress (from NEMA or the Ministry of Natural Resources)	by the end of November, 2011	MOE FS Dept. / CEMASTEА
4)-2	Removal of existing trees in relation to the construction of the training and administration complex	by the end of December, 2011	CEMASTEА
4)-3	Preservation of saplings (young trees) to be transplanted after construction (or prepare the plan to plant indigenous trees after the completion of the work)	by the end of November, 2011	CEMASTEА
5)	Removal of existing fences, sheds, rainwater drainage ditches and concrete structures in relation to the construction of the training and administration complex	by the end of December, 2011	CEMASTEА

6)	Relocation of aerial wiring and pole, buried power cables, rainwater drainage ditches, pits in relation to the construction of the dining hall	by the end of December, 2011	CEMASTEА
7)	Acquisition of building permit (from NCC) according to the article 9 of Building Code	by the end of January, 2012	MOE FS Dept. MOPW
8)-1	Registration of workplace (to NCC) according to the article 44 of OSHA (Occupational Safety and Health Act), 2007, and Acquisition of certificate of plans of workplace premises (from NCC) according to the article 125 of OSHA	before the commencement of the work	MOE FS Dept.
8)-2	Notification of the commencement of work (to NCC) according to the article 9 (1)(b) of Building Code	before the commencement of the work	MOE FS Dept.
9)	Employment of a clerk of work (who will be a maintenance staff in future)	before the commencement of the work	CEMASTEА

**(2) Construction Phase**

No.	Item	Timing/ Deadlines	Responsible organization
1)	Implementation of EMP and report to JICA	at the necessary point	CEMASTEА
2)	Organizing a regular meeting involving the neighbours for the explanation of the progress of the work	at the necessary point	CEMASTEА
3)	Acquisition of excessive noise permit generated by the construction work (from NEMA) according to the article 18 of EMCA (Noise and Excessive Vibration)	at the necessary point	CEMASTEА
4)	Setting up of Kei Apple hedge along the property boundary	by the end of the completion of construction work	CEMASTEА
5)	Extension and connection of high voltage power line and additional city water to the proposed service equipment	three months prior to the completion of construction work	CEMASTEА
6)	Reconnection of city water to the proposed tank (including change of the pipe diameter)	three months prior to the completion of construction work	CEMASTEА
7)	Installation of communication aerial and establishment of an account with an internet service provider (for internet connection and IP phone)	three months prior to the completion of construction work	CEMASTEА

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8)	Relocation of the existing LAN (local area network system within the facilities)	within one month after the completion	CEMASTEА
9)	Refurnishing of the existing ICT room including of expansion of PCs, refurnishing of the water and power supply on the existing kitchen for the installation of the equipment of the Project	by the end of the completion of construction work	CEMASTEА
10)	Subscription to CATV (or extension of existing cables) and preparation of necessary equipment (if necessary)	(at appropriate time)	CEMASTEА

**(3) General Tasks before and during Construction**

No.	Item	Timing/ Deadlines	Responsible organization
1)	Establishment of Banking Arrangement (B/A) and payment of commissions to the bank (in Japan)	promptly after E/N	MOE FS Dept. MOF
2)	Issuance of Authorization to Pay (A/P) and payment of commissions to the bank (in Japan)	at the necessary point	MOE FS Dept. MOF
3)	Exemption of taxes including VAT, local taxes and various duties by the Government of Kenya on purchases of products and services under the verified contract, for Japanese nationals and third-country workers	at the necessary point	MOE FS Dept. MOF
4)	Ensuring of prompt unloading and customs clearance of the materials and equipment imported from Japan and other countries at the port of disembarkation, and assisting internal transportation of the materials and equipment	at the necessary point	MOE FS Dept. MOF
5)	To accord Japanese nationals and persons from any third country, whose services may be required in connection with the supply of the products and the services, such facilities as may be necessary for their entry into Kenya and stay therein for the performance of their work	at the necessary point	MOE FS Dept.

**(4) Preparation for Operation Phase**

No.	Item	Timing/ Deadlines	Responsible organization
1)	Acquisition of an effluent discharge license (from NEMA) according to the article 16 of EMCA (water), and signing of maintenance contract for wastewater treatment plant (with wastewater treatment service company)	Within one month after the completion of the work	CEMASTEА
2)	Procurement and relocation of the general furniture and office stationery that are not covered by the Project	Within one month after the completion of the work	CEMASTEА

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3)	Transplanting of saplings and other planting work	Within one month after the completion of the work	CEMASTEА
4)	Provision of gas containers used in laboratories and connecting gas regulator to the main pipe of the building	Within one month after the completion of the work	CEMASTEА

**(5) Operation Phase**

No.	Item	Timing/ Deadlines	Responsible organization
1)	Implementation of EMP according to the clause 1.8 of EIA License dated on 23rd April, 2010 and report to JICA		CEMASTEА
2)	Purchase of consumables and replacement parts necessary for maintenance of the facilities and equipment	at the necessary point	CEMASTEА
3)	Proper and effective utilization and maintenance of the facilities and equipment	at the necessary point	MOE FS Dept. CEMASTEА
4)	Implementation of environment audit according to the clause 1.7 of EIA License dated on 23rd April, 2010 and report to NEMA and JICA	within one year after the completion of the construction work	CEMASTEА

Note

MOE FS Dept.: Field Service Department, the Ministry of Education

MOPW: the Ministry of Public Works

MOF: the Ministry of Finance

NEMA: National Environmental Management Authority

NCC: Nairobi City Council

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**ANNEX 8 Cost Estimation**

**Confidential**

The Project cost estimation described below is not final at this stage and will be set and approved by the Government of Japan after thorough examinations.

**Table 1: Costs to be borne by the Japanese Side**

**Estimated project cost: approx. 597 million JPY**

Item		Estimated cost (million JPY)		
Facility	Administration block	112	450	501
	Training block	188		
	Dining & Kitchen	40		
	Main Power services and Exterior service	110		
Equipment			51	
Design and Supervision				96

**Table 2: Costs to be borne by the Kenyan Side**

**Estimated project cost: approx. 23.75 million Ksh**

Item	Estimated cost (million Ksh)
<b>1. Clearance work</b>	<b>4.64</b>
*demolishing of former administration building (including foundation), embedded piping and wire, temporary sheds, concrete slabs and stairs, drainage gutters, and metal fence, on the construction area of main proposed building	3.14
*removal of power post on the construction area of dining hall	0.50
*tree felling on the construction area of main proposed building	1.00
<b>2. Hedge with Key Apple along property boundary</b>	<b>2.94</b>
<b>3. Utility and Furniture</b>	<b>10.82</b>
<b>3a. Extension of high voltage power line and additional city water to facilities</b>	<b>1.80</b>
<b>3b. Communication</b>	<b>2.85</b>
* Internet service charges, underground wiring, antenna, relocation of existing network apparatus	
<b>3c. Furniture and equipment</b>	<b>3.70</b>
<b>3d. Additional civil work</b>	<b>2.47</b>
* Refurbishing of the existing ICT laboratory, extension of power line and water pipe for the proposed kitchen equipment	
<b>4. Service charges regarding construction</b>	<b>0.25</b>
*Charge for building permit and excessive noise permit	
<b>5. Commissions paid to bank</b>	<b>1.00</b>
*Commission for banking arrangement and authorization to pay	
<b>6. EIA Issue</b>	<b>4.10</b>
*Service Contract with Environmental Consultant for establishment of EMP and implementation of monitoring program and meetings with neighbors	
*Commission for acquisition of effluent permit	
<b>Total</b>	<b>23.75</b>

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**ANNEX9 Planned Annual Training Program by CEMASTE A**

No. of annual trainees	No. of Districts	No. of Cohorts	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
<b>1. Primary INSET</b>														
84	5 days	1	84											
National w/s for PTTC Principals, Deans and HOD (maths & science)														
320	2 weeks	2	160	160										
National INSET														
<b>2. Diploma INSET</b>														
200	2 weeks	1									200			
Diploma teacher training program (ICT)														
<b>3. Secondary INSET</b>														
1,600	2 weeks	8												
National INSET														
600	2 weeks	3												
ICT program (TOT)														
<b>4. Workshop</b>														
285	3 days	2												
DECO W/S (1 week)														
285	1 week	2												
QASO W/S Secondary (1 week)														
285	1 week	2												
QASO W/S Primary (1 week)														
320	3 days	2												
National Stakeholders workshop														
1,400	3 days	7												
Principals Workshop for District neighbouring CEMASTE A														
<b>5. WDCSA /CTCP</b>														
80	4 weeks	1												
WDCSA /CTCP (Regular)														
50	3 weeks	1												
WDCSA/CTCP (Anglophone Primary)														
30	2 weeks	1												
WDCSA/CTCP (Francophone Primary)														
Kenyan educational calendar (39 weeks)														
5,539														
Occupation rate			84	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Occupation rate			42%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: The annual training plan by CEMASTE A shown above is tentative plan at the time of survey. In order to modify the plan, both sides shall consult with each other in order to have mutual understanding on the relevance and justification for the modifications.

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ANNEX10 Summary of Annual Cost of Operation and Maintenance

(Thousand Ksh)

Item	Additional Annual Expenses after the Expansion of Facilities at CEMASTE A	Annual Budget, FY 2010/11 (Approved)*	Estimated Annual Cost (Total)	Estimated Annual Cost (Considering Inflation)
	[A]	[B]	[C]=[A]+[B]	[C]*1.113
Personnel Emolument	13,668	7,912	21,580	24,019
Water Charges	1,237			
Power Charges	787	6,500	8,524	9,487
Communication Charges	1,849	1,849	3,698	4,116
Travel & Subsistence Allowance		6,863	6,863	7,639
Printing & Advertising		4,400	4,400	4,897
Training Expenses (travel allowances for Staff, training venue, etc.)		34,558	34,558	38,463
Hospitality Supplies & Services		2,950	2,950	3,283
Insurance Cost		5,800	5,800	6,455
Specialized Materials & Supplies	600	19,750	20,350	22,650
Other Operating Expenses		11,239	11,239	12,509
Office & General Supplies		1,400	1,400	1,558
Maintenance Expenses				
Facilities	3,517			
Equipment	532	4,956	9,644	10,734
Vehicles	639			
Purchase of Office Furniture		1,400	1,400	1,558
Research & Feasibility Study		3,614	3,614	4,022
<b>Total Recurrent Expenditure</b>	<b>22,829</b>	<b>113,191</b>	<b>136,020</b>	<b>151,390</b>
Training Expenditure (Development)**	150,252	200,000	350,252	389,830
Human Resource Development (TCIP)		20,000	20,000	22,260
Human Resource Development (for CEMASTE A Staff)		5,300	5,300	5,899
Minor Alterations on Building Work, Purchase of PC		5,000	5,000	5,565
<b>Total Development Expenditure***</b>	<b>150,252</b>	<b>230,300</b>	<b>380,552</b>	<b>423,554</b>
<b>Grand Total Expenditure</b>	<b>173,081</b>	<b>343,491</b>	<b>516,572</b>	<b>574,944</b>

\* The figures of annual budget for 2010/2011 (approved) are based on "CEMASTE A Proposed Budget for Financial Year 2011/2012", dated as 31<sup>st</sup> January 2011.

\*\* Training Expenditure was calculated based on the annual training program in 2013/2014, including accommodation expenses for outside hostels, which was prepared by CEMASTE A.

\*\*\* Total Development Expenditure excludes the amount "Training Materials by JICA", which were directly disbursed by JICA, and the cost for land purchase, which was not duly sanctioned by the Ministry of Education according to the letter of the Ministry of Education dated on the 20<sup>th</sup> January 2011.

**ANNEX 11 Required Numbers of Staff of CEMASTE A**

Department & Rank		Current Nos.	Vacancies	Required Nos.
<b>Academic staff</b>		<b>51</b>	<b>9</b>	<b>60</b>
<b>Administrative Staff</b>	Director	1		1
	Deputy Director	1		1
	Program coordinator	1		1
<b>Biology</b>	Dean	1		1
	Head of Department	1		1
	Lecturer	8	4	12
<b>Chemistry</b>	Dean	1		1
	Head of Department	1		1
	Lecturer	11	1	12
<b>Mathematics</b>	Dean	1		1
	Head of Department	1		1
	Lecturer	11	2	13
<b>Physics</b>	Dean	1		1
	Head of Department	1		1
	Lecturer	10	2	12
<b>Non-academic staff</b>		<b>23</b>	<b>34</b>	<b>57</b>
<b>Administration</b>	Chief Human Resource Mgt Officer		1	1
	Assistant Secretary III	1		1
	Human Resource Mgt Officer I	1		1
	Secretarial Assistant III/I		3	3
	Documentation Assistant III/II		1	1
	Driver III/II/I/Senior	6		5
	Reception Assistant I	1		1
	Artisan II	1		1
	ICT Officer I	1		1
	Personal Secretary II		1	1
	Security Officer		1	1
	Laboratory Technician III/II/I		4	4
	Library Assistant III/II	1		1
	Clerical Officer II/I/Senior	1	1	2
	Nurse III		1	1
	Assistant Security Officer		1	1
	Records Management Officer III		1	1
<b>Catering</b>	House Keeper/Cateress III /I	1	2	3
	Cook II/I	2	2	4
	Assistant Cook III/II/I		6	6
	Assistant Waiter I	1		1
	Waiter Assistant III/II/I	1	3	4
	Laundry Assistant III/II/I	1	3	4
<b>Accounts</b>	Senior Finance Officer	1		1
	Accountant II/I	1		1
	Accounts Assistant	1		1
<b>Procurement</b>	Procurement Officer I	1		1
	Procurement Assistant		1	1
	Senior Storekeeper		1	1
	Storekeeper II/I		1	1
<b>Audit</b>	Internal Auditor I		1	1
<b>Total</b>		<b>74</b>	<b>43</b>	<b>117</b>

Note: The cited organisation along the four departments are in accordance with what the DPM approved in 2007 based on the then activities of CEMASTE A. Due to re-organisation necessitated by the need to make CEMASTE A function more effectively; the academic staff currently work in five programme areas: Primary INSET; Secondary INSET; ICT; R&D; and SMASE-WECSA. Staff in these programmes are drawn from the four subject departments. However, in future, CEMASTE A is planning to reorganize the structure that will have five programmatic departments as follows: Primary INSET; Secondary INSET; ICT; R&D; and SMASE-WECSA.

## 5. 参考資料

番号	名称	形態	オリジナル・コピー	発行機関	発行年
国家予算書					
1	2008/2009 Estimates of Recurrent Expenditure 2008/2009 Estimates of Development Expenditure	プリント	コピー	GoK	2008/06
2	2009/2010 Estimates of Recurrent Expenditure 2009/2010 Estimates of Development Expenditure	プリント	コピー	GoK	2009/06
3	2010/2011 Estimates of Recurrent Expenditure 2010/2011 Estimates of Development Expenditure	プリント	コピー	GoK	2010/06
教育統計関連					
4	Education Statistical Booklet 2003-2007	書籍	オリジナル	MoE	
5	Education Facts and Figures 2002-2008	ブックレット	オリジナル	MoE	2009/06
6	EMIS DATA	プリント	コピー	MoE	
7	2009 Kenya Population and Housing Census Volume II	プリント	コピー	Kenya National Bureau of Statistics	2010/08
8	The Year 2008 KCPE Examination Report	書籍	オリジナル	Kenya National Examination Council	
9	The Year 2009 KCPE Examination Report	書籍	オリジナル	Kenya National Examination Council	
10	The Year 2008 KCSE Examination Report	書籍	オリジナル	Kenya National Examination Council	
政策					
11	KESSP II 2011-2015 (Draft)	プリント/ 電子データ	コピー	MoE	
12	KESSP 2005-2010	本	オリジナル	MoEST	2005/07
13	Sessional Paper No.1 of 2005 on A Policy Framework for Education, Training and Research	本	オリジナル	MoEST	
14	Directorate of Policy, Partnerships and East African Community Affairs	プリント	コピー		
15	JFA (Joint Financial Agreement) Matters	プリント	コピー		
16	National ICT Innovation & Integration Center (NI3C), (Concept Paper)	電子データ	コピー	MoE/VVOB	2010/05
17	Kenya Multi Annual Plan 2011-2013	電子データ	コピー	VVOB	2010/12
18	教育省教職員給与表	プリント	コピー	TSC	2010/04
CEMASTEА 関連					
19	Organisation Structure and Staffing for the CEMASTEА	プリント	コピー	Office of the Prime Minister	2009/02
20	CEMASTEА Proposed Budget for FY 2011/12	電子データ	コピー	BOG, CEMASTEА	2011/01
21	CEMASTEА からのプレゼンテーション資料	プリント/ 電子データ	コピー	CEMASTEА	
22	CEMASTEА の Performance Contract	電子データ	コピー	CEMASTEА	
23	プロジェクト実施後の CEMASTEА 活動予定と時間割	電子データ	コピー	CEMASTEА	2011/01
24	Training/Workshop Manuals	電子データ	コピー	CEMASTEА	
25	Activity Reports	電子データ	コピー	CEMASTEА	
26	M/E Reports	電子データ	コピー	CEMASTEА	
27	新研修プログラム向けのカリキュラム(トピックリスト)	電子データ	コピー	CEMASTEА	2011/01
28	CEMASTEА Strategic Plan	電子データ	コピー	CEMASTEА	
29	Handbook on Management of District SMASSE Programmes	本	オリジナル	CEMASTEА	2008/11
法規					
30	The Building Code, 1968	冊子	コピー	GoK	1968
31	The Local Government Act	冊子	コピー	GoK	1998(1986)
32	The Physical Planning Act	冊子	コピー	GoK	1996

33	The Public Health Act	冊子	コピー	GoK	1986(1972)
34	The Penal Code	冊子	コピー	GoK	1985(1970)
35	The Traffic Act	冊子	コピー	GoK	1993(1988)
36	The Work Injury Benefits Act	冊子	コピー	GoK	2007
37	The Public Service Commission Regulations,1984 (The Service Commissions Act)	冊子	コピー	GoK	1984
38	The Factories and Other Places of Work (Building Operations and Works of Engineering Construction) Rules, 1984	冊子	コピー	GoK	1984
39	The Factories and Other Places of Work (Fire Risk Reduction ) Rules, 2007	冊子	コピー	GoK	2007
40	KLDP: Karengata Local Physical Development Plan	プリント	コピー	KLDA	
建築技術仕様・標準仕様					
41	General Specification For Building Works	書籍	オリジナル	MoPW	1976
42	BS8110:Structural use of concrete	プリント	コピー	BSI	1997
43	BS6399-1,2,3: Loading for Buildings ( Dead and Imposed Load, Wind Load, Imposed Roof Load )	プリント	コピー	BSI	
44	KS02-26 現地風荷重の基準データ	プリント	コピー	KEBS	1977
45	KS966:Code of practice for anti-termite measures in new buildings -Constructional measures	冊子	オリジナル	KEBS	1999
46	KS1002:Code of practice for anti-termite measures in buildings - Pre constructional chemical treatment	冊子	オリジナル	KEBS	1999
47	General specifications for structured cabling installation (1st edition 2008)	プリント	コピー	MoPW	2008
48	General specifications for lightning protection	プリント	コピー		
49	Technical Instruction No.31 Protection of Buildings Against Lightning Strokes	プリント	コピー	Nairobi City Council	
50	General specifications for wastewater treatment plant	プリント	コピー	MoPW	
51	General specifications for plumbing, drainage, portable fire extinguishers and hose reel system (1st edition 2008)	プリント	コピー	MoPW	2008
52	General and Particular specifications for generator sets (1st edition 2008)	プリント	コピー	MoPW	2008
53	General specifications for PABX Installation works (1st edition 2008)	プリント	コピー	MoPW	2008
54	Standard specifications for mechanical ventilation and air conditioning systems (1st edition 2008)	プリント	コピー	MoPW	
55	General electrical specifications (1st edition 2008)	プリント	コピー	MoPW	2008
建築積算					
56	Current Construction Costs Handbook 2008/2009	プリント	コピー	MoPW	
57	Tender Document of "Proposed Erection and Completion of A New Hostel Building at Alliance Girls High School, Kikuyu"	プリント	コピー	GoK	2008/02
58	J.B.C. Price List	プリント	コピー	The Joint Building Council	2010/12
59	Current Construction Costs in Kenya	プリント	コピー	The Institute of Quantity Surveyors	2010/12
気象データ					
60	Readings of Monthly Rainfall in Millimetres - Station: Dagoretti Corner(2004-2010)	プリント	コピー	Kenya Meteorological Department	
61	Extreme 24 hrly Wind Speed - Dagoretti Corner Met. Station (2007-2009)	電子データ	コピー	Kenya Meteorological Department	

## 6. その他資料・情報

### 6-1 環境チェックリスト

分類	環境項目	主なチェック事項	Yes: Y No: N	具体的な環境社会配慮 (Yes/Noの理由・根拠、緩和策等)
1 許認可・説明	(1) EIAおよび環境許認可	(a) 環境アセスメント報告書 (EIAレポート) 等は作成済みか。 (b) EIAレポート等は当該国政府により承認されているか。 (c) EIAレポート等の承認は付帯条件を伴うか。付帯条件がある場合は、その条件は満たされるか。 (d) 上記以外に、必要な場合には現地の所管官庁からの環境に関する許認可は取得済みか。	(a) Y (b) Y (c) Y (d) N	(a) 2010年2月提出済み (b) 2010年4月23日取得済み (c) 前項ライセンスに記載がある。 (d) 今後、既存建物の解体許可、建設許可、工事中の超過騒音許可、使用開始前の排水許可などが必要となる。
	(2) 現地ステークホルダーへの説明	(a) プロジェクトの内容および影響について、情報公開を含めて現地ステークホルダーに適切な説明を行い、理解を得ているか。 (b) 住民等からのコメントを、プロジェクト内容に反映させたか。	(a) Y (b) Y	(a) (b) 本計画は周辺住民が参加したステークホルダー協議結果を反映したEIAライセンスの付帯条件に従っている。このため、周辺住民からのコメントは反映されていると理解できる。また、今後もステークホルダー協議を予定している。
	(3) 代替案の検討	(a) プロジェクト計画の複数の代替案は (検討の際、環境・社会に係る項目も含めて) 検討されているか。	(a) Y	初期設計は2006年のものがベースとなっており、本調査の中で、EIAライセンスの条件を受け、前提条件の見直しも含めて代替案の検討がなされた。
2 汚染対策	(1) 大気質	(a) 対象となるインフラ施設及び付帯設備等から排出される大気汚染物質 (硫黄酸化物 (SOx)、窒素酸化物 (NOx)、煤じん等) は当該国の排出基準、環境基準等と整合するか。大気質に対する対策は取られるか。 (b) 宿泊施設等での電源・熱源は排出係数 (二酸化炭素、窒素酸化物、硫黄酸化物等) が小さい燃料を採用しているか。	(a) Y (b) Y	(a) 計画施設は常時、汚染物質を排出する施設・設備内容と仕様ではない。 (b) 協力対象事業に宿泊施設は含まれない。厨房ではガス、電気を主な熱源としており、チャコールと比べ燃焼効率が良く、排出係数は相対的に低い。
	(2) 水質	(a) インフラ施設及び付帯設備等からの排水または浸出水は当該国の排出基準、環境基準等と整合するか。	(a) Y	(a) 施設からの排水は国の規準を満たすように高度処理設備により処理される計画となっている。
	(3) 廃棄物	(a) インフラ施設及び付帯設備からの廃棄物は当該国の規定に従って適切に処理・処分されるか。	(a) Y	(a) 外部委託業者とごみ処理契約を結び場外にて適切に処理する計画となっている。回収するまで間、適切に保管されるよう計画する。
	(4) 土壌汚染	(a) インフラ施設及び付帯設備からの排水、浸出水等により、土壌・地下水を汚染しない対策がなされるか。	(a) Y	(a) 実験室からの排水には薬品等が含まれるが、使用量が微量であるため水で十分希釈した上で砂利を詰めた滞留槽に導き、中和を促した後一般汚水排水と合流する計画とする。ただし、金属イオンについてはアルカリ処理等で沈殿させ、上澄み液を放流した上で残渣は別の容器に保管し場外処理とする。
	(5) 騒音・振動	(a) 騒音、振動は当該国の基準等と整合するか。	(a) Y	(a) 発電気室及び排水処理プラントは防音設備を付帯させる。また音響設備を使用する講堂の屋根と外壁は防音仕様となっている。
	(6) 地盤沈下	(a) 大量の地下水汲み上げを行う場合、地盤沈下が生じる恐れがあるか。	(a) N	(a) 地下水の汲み上げは、不透水層の下、地下120-310mの帯水層から行っているため、地盤沈下の可能性は低い。また、市水の併用、再生水の活用、水量のモニタリングなどにより利用者の意識を高め地下水揚水量の低減を目指す。



	(7) 悪臭	(a) 悪臭源はあるか。悪臭防止の対策はとられるか。	(a) Y	(a) 厨房施設があるが、通常の清掃状況は良好であり、生ゴミ処理も外部委託業者とごみ処理契約を結び、適切に処理される。トイレは水洗式であり、汚水も高度処理され臭気は発生しない。
3 自然環境	(1) 保護区	(a) サイトは当該国の法律・国際条約等に定められた保護区内に立地するか。プロジェクトが保護区に影響を与えるか。	(a) N	(a) 計画地は野生保護区 (Nairobi National Park) に近いものの、区域外にある。また、動植物への影響は少ない施設活動内容と考えられる。
	(2) 生態系	(a) サイトは原生林、熱帯の自然林、生態学的に重要な生息地 (珊瑚礁、マングローブ湿地、干潟等) を含むか。 (b) サイトは当該国の法律・国際条約等で保護が必要とされる貴重種の生息地を含むか。 (c) 生態系への重大な影響が懸念される場合、生態系への影響を減らす対策はなされるか。 (d) プロジェクトによる水利用 (地表水、地下水) が、河川等の水域環境に影響を及ぼすか。水生生物等への影響を減らす対策はなされるか。	(a) N (b) N (c) N (d) N	本計画はいずれにも該当しない。
	(3) 水象	(a) プロジェクトによる水系の変化に伴い、地表水・地下水の流れに悪影響を及ぼすか。	(a) N	建築案件であり、計画実施による水系の変化はない。
	(4) 地形・地質	(a) プロジェクトにより、サイト及び周辺の地形・地質構造が大規模に改変されるか。	(a) N	現状の地形を活かした施設計画、工事仮設計画である。
4 社会環境	(1) 住民移転	(a) プロジェクトの実施に伴い非自発的住民移転は生じるか。生じる場合は、移転による影響を最小限とする努力がなされるか。 (b) 移転する住民に対し、移転前に補償・生活再建対策に関する適切な説明が行われるか。 (c) 住民移転のための調査がなされ、再取得価格による補償、移転後の生活基盤の回復を含む移転計画が立てられるか。 (d) 補償金の支払いは移転前に行われるか。 (e) 補償方針は文書で策定されているか。 (f) 移転住民のうち特に女性、子供、老人、貧困層、少数民族・先住民族等の社会的弱者に適切な配慮がなされた計画か。 (g) 移転住民について移転前の合意は得られるか。 (h) 住民移転を適切に実施するための体制は整えられるか。十分な実施能力と予算措置が講じられるか。 (i) 移転による影響のモニタリングが計画されるか。 (j) 苦情処理の仕組みが構築されているか。	(a) N (b) N (c) N (d) N (e) N (f) N (g) N (h) N (i) N (j) N	既存施設への増築であり、住民移転は伴わない。
	(2) 生活・生計	(a) プロジェクトによる住民の生活への悪影響が生じるか。必要な場合は影響を緩和する配慮が行われるか。	(a) N	(a) 計画実施による周辺住民の生活への影響緩和は、既にEIAライセンスの条件に含まれており計画内容にも反映されている。
	(3) 文化遺産	(a) プロジェクトにより、考古学的、歴史的、文化的、宗教的に貴重な遺産、史跡等を損なう恐れはあるか。また、当該国の国内法上定められた措置が考慮されるか。	(a) Y	(a) 植民地時代初期の入植地に位置しており、このため住環境悪化について周辺住民からの懸念が強いが、前項で記述したとおり、影響が最小限となる計画内容となっている。

	(4) 景観	(a) 特に配慮すべき景観が存在する場合、それに対し悪影響を及ぼすか。影響がある場合には必要な対策は取られるか。 (b) 大規模な宿泊施設や建築物の高層化によって景観が損なわれる恐れがあるか。	(a) Y (b) Y	(a) (b) 最大2階建までに建物の高さを抑え、豊富な既存樹木にとけ込む施設計画となっており、景観への影響は無い。
	(5) 少数民族、先住民族	(a) 少数民族、先住民族の文化、生活様式への影響を軽減する配慮がなされているか。 (b) 少数民族、先住民族の土地及び資源に関する諸権利は尊重されるか。	(a) Y (b) Y	該当無し
	(6) 労働環境	(a) プロジェクトにおいて遵守すべき当該国の労働環境に関する法律が守られるか。 (b) 労働災害防止に係る安全設備の設置、有害物質の管理等、プロジェクト関係者へのハード面での安全配慮が措置されるか。 (c) 安全衛生計画の策定や作業員等に対する安全教育（交通安全や公衆衛生を含む）の実施等、プロジェクト関係者へのソフト面での対応が計画・実施されるか。 (d) プロジェクトに関する警備要員が、プロジェクト関係者・地域住民の安全を侵害することのないよう、適切な措置が講じられるか。	(a) Y (b) Y (c) Y (d) Y	(a) (b) 労働関連法規（Occupational Safety and Health Act: OSHA等）を遵守するようEIAライセンスで規定されており、本計画もこれを遵守する。 (c) 安全に関する指導、また装備の徹底は一般無償プロジェクトでは必須となっており、本計画もこれに倣う。 (d) 危険行為に及ばない限り、警備要員がプロジェクト関係者や地域住民に危害を加えることは考えにくい。また、当然そのように指導する。
5 その他	(1) 工事中的の影響	(a) 工事中の汚染（騒音、振動、濁水、粉じん、排ガス、廃棄物等）に対して緩和策が用意されるか。 (b) 工事により自然環境（生態系）に悪影響を及ぼすか。また、影響に対する緩和策が用意されるか。 (c) 工事により社会環境に悪影響を及ぼすか。また、影響に対する緩和策が用意されるか。	(a) Y (b) N (c) Y	(a) 工事期間中の騒音については、作業時間の制約（8:00-17:00）、主要な工事範囲を防音シートで囲む、また騒音が発生する工種については事前に通知する、等の配慮をする。建機に関する排ガスについては建機の整備と不要なアイドリングをしないような指導などに努める。 (b) 敷地内の既存樹木は可能な範囲で保存するため、影響の度合いは少ない。また、工事終了後に補完的措置として苗木の植樹などを計画する。 (c) 4- (2) で記述済み
	(2) モニタリング	(a) 上記の環境項目のうち、影響が考えられる項目に対して、事業者のモニタリングが計画・実施されるか。 (b) 当該計画の項目、方法、頻度等はどのように定められているか。 (c) 事業者のモニタリング体制（組織、人員、機材、予算等とそれらの継続性）は確立されるか。 (d) 事業者から所管官庁等への報告の方法、頻度等は規定されているか。	(a) Y (b) Y (c) Y (d) Y	上記項目も含めて、外部のコンサルタントに委託し、方法や頻度などの詳細を含む環境管理計画（EMP）が策定される予定である。EMPの実施も外部委託が予定されており、予算措置も進められている。NEMAへの報告もEMPの中で規定される。
6 留意点	他の環境チェックリストの参照	(a) 必要な場合、道路、鉄道、橋梁に係るチェックリストの該当チェック事項も追加して評価すること（インフラ施設に関連して、アクセス道路等が設置される場合等）。 (b) 電話線敷設、鉄塔、海底ケーブル等については、必要に応じて、送変電・配電に係るチェックリストの該当チェック事項も追加して評価すること。	(a) N (b) N	該当無し
	環境チェックリスト使用上の注意	(a) 必要な場合には、越境または地球規模の環境問題への影響も確認する（廃棄物の越境処理、酸性雨、オゾン層破壊、地球温暖化の問題に係る要素が考えられる場合等）。	(a) N	該当無し

## 6-2 モニタリングフォーム

### 1. 許認可・住民説明

モニタリング項目					報告期間中の状況
項目	提出先	審査期間	期限	期間・頻度	
住民説明会		—	—	EMP策定時 解体工事前 本工事前 工事中は四半期 毎	
工事サイトの登録・許可	NCC	—	解体工事 着手前	12ヵ月	
工事用仮設物の建設・設置許可	NCC	—	解体工事 着手前	—	
解体許可	NEMA	—	解体工事着手前	3ヵ月	
建設許可	NCC	40日	本工事着工前	12ヵ月	
着工届の提出	NCC	30時間前 までに通知	本工事着工前	—	
定期検査の実施状況	NCC		本工事着工前	—	
超過騒音許可	NEMA	2日	騒音を伴う工種 着手前	7日	
完了検査の実施状況	NCC		施設供用 開始前	—	
排水排出許可	NEMA	21日	施設供用 開始前	12ヵ月	
環境監査の実施状況の確認		45日	着工後 1年以内	—	

NCC=ナイロビ市役所

NEMA=環境庁

### 2. 汚染対策

#### -水質汚濁

モニタリング項目	報告期間中の状況
排水処理プラント・腐敗槽のメンテナンス計画、同定期保守契約	
処理水の水質(次表)	

(排水の水質)

項目(*1)	測定値	現地基準(単位)	参照した国際的基準(単位)WB(*2)	備考:
大腸菌		30/100ml	400/100ml	1. 測定場所:着工前は既存浄化槽の最終柵から、また完工後は新設排水処理プラント最終柵から取水する。
BOD5		30(mg/L)	30(mg/L)	
pH		6.5-8.5	6.0-9.0	
水温		±3	N/A	
色		15	N/A	

浮遊物質		30 (mg/L)	50 (mg/L)	2. 頻度: 四半期毎 (NEMA に要確認)  3. 期間: 着工から完工後 1 年後  4. 方法: NEMA 公認試験機関における検査
全燐		2 (mg/L)	2 (mg/L)	
全窒素		200 (mg/L)	10 (mg/L)	
アンモニア態窒素		100 (mg/L) (*3)	100 (mg/L) (同左)	
有機窒素				
界面活性剤		Nil	N/A	
炭化水素/ 鉱油		Nil	10mg	

出典

\* 1: "Approval conditions for effluent discharge license, Institution STP\_01" NEMAにより本計画施設(教育施設からの排水)には、上記の項目に対して基準値が示された。

\*2: Environmental, Health, and Safety (EHS) Guidelines, General EHS Guidelines Environmental Wastewater and Ambient water quality" p30, International Finance Corporation, Worldbank Group, (2007)

\*3: (0.4xアンモニア態窒素)+硝酸態窒素+亜硝酸態窒素)

### -廃棄物

モニタリング項目	報告期間中の状況
(事業者(CEMASTE)が作成する)廃棄物管理計画の内容と実施状況	
収集廃棄物の保管状態、適切な保管施設・コンテナが設置されているか? また分別は適切か?	
敷地内で不法な埋設、焼却処理されていないか?	

## 3 自然環境

### -水象(使用水量の管理)

モニタリング項目	報告期間中の状況
週ごとの、水源ごとの給水量、利用者数の記録(次表)	
雨水利用、再生水利用の状況	

月日	井戸水		市水		給水車		前週の消費量合計	前週の利用者数	単位水使用量	備考
	測定値	前週の消費(*1)	測定値	前週の消費(*1)	給水回数	給水量				
	(L)	(L)	(L)	(L)	(回)	(L)				
	[a]	[b]	[c]	[d]	[e]	[f]= [e]* 10,000	[g]= [b]+ [d]+[f]	[h]	[i]=[g]/ [h]/7	
										1. 測定場所: 既存揚水メーター
										2. 頻度: 毎週月曜日
										3. 期間: 着工から完工後 1 年後
										4. 方法: 既存揚水メーター読み取り

注記

\*1:前週の測定値との差

#### 4. 社会環境

##### -景観

モニタリング項目	報告期間中の状況
地域の品位に適った水準の植栽 (landscape) がされているか？	

##### -労働環境

モニタリング項目	報告期間中の状況
(工事業者が作成する)安全管理計画 (Comprehensive Safety Action Plan) の内容と実施状況	
安全装具 (PPE) の支給状況	
危険物取り扱いが適切に行われているか？	
健康安全環境 (HSE) 体制、点検記録など	
仮設トイレの設置	
事故・対応の記録、集計データ	

#### 5. その他

##### -工事中的影響

モニタリング項目	報告期間中の状況
工事中的防音対策 (防音シートによる仮囲い、作業時間) が実施されているか？	
工事中的防塵対策 (防塵シートによる仮囲い、散水) が実施されているか？	
(工事業者が作成する) 廃棄物管理計画の内容と実施状況	
工事中的雨水対策、侵食防止策は取られているか？	
建材の搬入は定められた時間 (off-peak time) に行われているか？	
工事作業員による地域品位の低下が無いのか？ (キオスクの乱立、通勤する作業員による)	

6-3 地盤調査報告書（主なもの）

**GEOTECHNICAL INVESTIGATION REPORT**

**THE PROJECT FOR THE UPGRADING AND  
REFURBISHMENT OF CEMASTEAM TRAINING  
FACILITIES IN KAREN, NAIROBI, KENYA.**

**DRILLING BY:**

**TESTING AND REPORTED BY:**

BPC & ENGINEERING SERVICES LTD  
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**Table of Contents**

1.	INTRODUCTION.....	1
2.	LOCATION .....	1
3.	THE WORKS.....	1
4.	EQUIPMENT.....	1
6.	FIELDWORK .....	2
8.	GEOLOGY.....	3
	8.1.2. Nairobi Trachyte .....	3
	8.1.3. Upper Ngong Basalts. ....	3
	8.1.4. Upper Athi Series .....	4
	8.1.5. Mbagathi Trachyte .....	4
9.	SAMPLING .....	4
	9.1 Disturbed Bag Samples .....	4
	9.2 Undisturbed U100 Sampling.....	4
10.	STANDARD PENETRATION TESTS.....	4
11.	DYNAMIC CONE PENETROMETER TESTS .....	5
12.	LABORATORY TESTING.....	5
	12.1 General .....	5
	12.2 Unconfined Compression Tests on Rock Cores.....	5
	12.3 Classification Tests on Soils .....	7
	12.3.1 Quick Undrained Shear Box Test.....	7
	12.3.2 Consolidation Test.....	7
13.	WATER LEVELS IN BOREHOLES .....	7
14.	PERMIABILITY TEST (Laboratory Falling Head).....	7
15.	PERCALOTION .....	7
16.	CHEMICAL TEST.....	8
17.	ANALYSIS AND CONCLUSIONS .....	8
	17.1 Rock analysis:- .....	8
	17.2 Soil Bearing Pressure from Laboratory Shear strength.....	9
17.3.	Bearing capacity from SPT .....	10
18	RECOMEDATIONS .....	13

**APPEDIX I**

Field work

- Bore hole logs and Daily reports
- Trial pits logs
- Percolation test
- 

**APPEDIX II**

Laboratory test results

- Unconfined compressive strength

- 
- Classification tests
  - Permeability test
  - Specific Gravity
  - Consolidation test
  - Tri-axial test
  - Chemical Test

**APPEDIX III**

- I. Site Map
- II. Plates



## **1. INTRODUCTION**

BPC & Engineering Services Ltd (BPC) were commissioned, to conduct a geotechnical investigation into the subsoil conditions for a proposed upgrading and refurbishment of Centre for Mathematics, Science and Technology Education in Africa, (CEMASTEА) in Karen, Nairobi Kenya. BPC carried out the laboratory testing on the soils and prepared this engineering report.

Investigations were carried out to determine possible Geological formations and establish whether there is a water table or and pervious ground formations. In addition in-situ Engineering parameter was to be determined by determining the individual layer density by Standard penetration test. These field tests were to be augmented by Driller Logs and Pictorial depictions of the same.

A total of 5 boreholes and 4 trial pits were explored. The field team arrived on site on 12<sup>th</sup> January 2011 and completed on 16<sup>th</sup> January 2011.

This Report gives a description of the site and how the work was conducted. All the field data collected in the investigation, the laboratory test results and the borehole and trial pit logs are presented. An analysis is carried out of the information from the boreholes, trial pits, field tests and the results of the laboratory tests. Conclusions are presented on the bearing capacities and associated settlements that can be expected.

## **2. LOCATION**

The site is located on Karen CEMASTEА grounds, Nairobi, as shown on appendix III on the Site Plan.

## **3. THE WORKS**

Five boreholes were explored to depths of 9.4m, 5.8m, 5.8m, 8.3m, 10.0m for boreholes 1,2,3,4, and 5 respectfully, the locations of bore holes were as selected by the client.

Four trial pits were excavated down to predetermined depths as follows TP1-4.0m, TP2-5.0m, TP3 and TP4-3.0m deep each. They were put down at the locations selected by Client.

## **4. EQUIPMENT**

The boreholes were put down using a rotary rig. Continuous flight augers were used through the overburden and diamond core drilling, with double tube core barrels, through the rock.

Auguring was carried out using 137mm diameter augers. Core drilling was carried

out using 66mm diameter equipment. The depths where changes from auguring to core drilling occurred are given on the borehole logs. No casing was used.

The trial pits were excavated by hand using picks and shovels.

## **6. FIELDWORK**

The fieldwork was carried out between 12<sup>th</sup> January 2010 and 16<sup>th</sup> January 2010.

## **7. THE BORINGS AND TRIAL PITS**

Borehole BH1 encountered 5.0m of reddish brown silty CLAY with grid sand, on weathered yellowish BASALT rocks and washed cuttings, 1.0m thick over black yellowish grey BASALT rock to a depth of 7.1m. Below was fissured hard grey BASALT rock which extended to the base of the hole at a depth of 9.4m.

Borehole BH2 encountered 3.4m red silty CLAY overlaying a weathered TUFF rock which extended to the base of the hole at a depth of 5.8m.

Borehole BH3 encountered 2.5m of red silty clay over 1.25m thick layer of red silty CLAY with iron stained LATERITIC gravel overlaying a weathered TUFF rock and fragments of PHONOLITE rocks to a depth of 5.2m. The final layer exhibited a PHONOLITE rock which extends to the base of the hole at a depth of 5.8m.

Borehole BH4 encountered 2.2m of reddish brown silty CLAY over 2.0m thick layer of reddish brown silty SAND with iron stained LATERITIC gravel overlaying a weathered TUFF to a depth of 5.5m. The final layer found a fresh grey PHONOLITE rock which extended to the base of the hole at a depth of 8.3m.

Borehole BH5 encountered 5.3m of brown silty CLAY overlaying brown silty SANDY CLAY which extended to the base of the hole at a depth of 10.0m.

Twenty one U100 sampling that were attempted, out of these only ten were recovered while the rest were not recovered due to the hardness of the ground. Twenty one numbers of Standard Penetration Tests were carried out and their results are as indicated in the Logs.

The logs of the boreholes are given in appendix I; Field work bore whole Logs and dairy reports. Photographs of the cores are given in appendix III; Plates.

The Four trial pits were numbered TP1, TP2, TP3 and TP4. TP1 encountered 3.0m of reddish brown dense sandy silty CLAY overlaying yellowish soft extremely weathered TUFF rock which extended to the base of the pit at a depth of 4.0m.

TP2 encountered 3.0m of reddish brown dense sandy silty CLAY over 1.0m thick layer of dark red dense silty CLAY overlaying a red medium surrounded LATERITIC GRAVEL

which extended to the base of the pit at depth of 5.0m.

TP3 and TP4 found reddish brown dense sandy silty CLAY to a depth of 3.0m each.

Several bulk disturbed samples was collected from various depths from each of the trial pit to facilitate the classification of each layer encountered within the trial pit.

The logs of the trial pits are given in appendix I; Field work, TP Logs

## **8. GEOLOGY**

### **8.1 Project Geology**

The CEMESTEVA project area is on a localized gentle sloping terrain on the slope of Ngong hill. The Geology is characterized by about 3m of graded to extremely weathered Tuff (Grade VI Weathering) overlaying welded Tuff to highly weathered fractured Trachyte (Grade IV Weathering). On BH5 the soils are loosely consolidated clays possibly a reclaimed area.

### **8.2 General Geology of Karen and the surrounding**

Geologically the area is characterized by Ceinozoic volcanic. The approximate volcanic stratification in a downward succession is as follows:

- Tuffs
- Nairobi Trachyte
- Upper Ngong Basalts
- Upper Athi Series
- Mbagathi Trachyte
- Upper Athi Series

#### **8.1.1 Tuffs**

These are brown, welded and slightly weathered. They are the top most layers the volcanic pyroclasts that characterize the region. The tuffs are approximately 20 meters thick. All the five boreholes drilled in the area did not go deeper than 10 meters and were thus terminated within the tuffaceous deposits.

#### **8.1.2. Nairobi Trachyte**

The dark grey porphyritic lava containing feldspar and biotite insets, the Nairobi Trachyte occurs as a number of distinct flows with sands intercalated between the various lava units. The thickness of this formation at the project area is about 60 meters

#### **8.1.3. Upper Ngong Basalts.**

These are dark grey lavas of basalt and nephelinite. Their thickness including interbedded sands is about 30 meters.

#### 8.1.4. Upper Athi Series

The Upper Athi Series mainly consists of sandy sediments and welded tuffs, clays being subordinate. The thickness of this formation in the project area is about 30 meters above the Mbagathi Trachyte and more than 120 meters below the Mbagathi Trachyte.

#### 8.1.5. Mbagathi Trachyte

These rocks are in or near Mbagathi River and Karen area where they are observed in boreholes underlying the Nairobi Trachyte. The thicknesses of these rocks indicate more than one flow. Boreholes in Langata, Karen and Nairobi Hill have penetrated this lava at depths ranging between 150- 220 meters. The rocks are vesicular with feldspars in a grey brown matrix.

### 9. SAMPLING

#### 9.1 Disturbed Bag Samples

Several bulk disturbed samples were collected from various depths from each of the trial pits and put in polythene bags then secured by double tying the mouth. A label was inserted between the two string knots.

#### 9.2 Undisturbed U100 Sampling

Twenty one U-100 undisturbed sampling were attempted and ten were successfully recovered.

### 10. STANDARD PENETRATION TESTS

Twenty one Standard Penetration Tests, (SPT) were attempted and yielded the values as shown in the table 1 below:-

*Table 1: The following stratum was tested for SPT and recorded the following N-value:-*

BORE HOLE	DEPTH (m)	N – VALUE ATTAINED	TYPE AND STRENGTH OF CLAY (BASED ON N-VALUE)
BH1	1.0-1.45	21	Thinly and closely bedded consolidated medium dense silty sandy clay
	2.0-2.5	20	
	4.0-4.45	15	Weathered basalt rock
	5.0-5.1	>50(REFUSAL)	
BH2	1.3-1.75	26	Thinly and closely bedded consolidated medium dense silty sandy

	2.0-2.85	21	clay
	3.4-3.45	>50(REFUSAL)	Weathered tuffs
BH3	1.5-1.95	20	Thinly and closely bedded consolidated medium dense silty sandy clay
	2.55-3.0	33	Very thinly and closely bedded dense consolidated silty sandy clay
	3.55-3.65	>50(REFUSAL)	Weathered tuffs
BH4	1.2-1.65	24	Thinly and closely bedded consolidated medium dense silty sandy clay
	2.3-2.75	27	clay
	3.0-3.75	43	Very thinly and closely bedded dense consolidated silty sandy clay
	4.2-4.3	>50(REFUSAL)	Weathered tuffs
BH5	1.5-1.95	10	Medium bedded and consolidated loose silty sandy clay
	3.0-3.45	15	Thinly and closely bedded consolidated medium dense silty sandy clay
	4.3-4.75	21	
	5.3-5.75	26	
	6.3-6.75	15	
	7.3-7.75	15	
	8.3-8.75	17	

## 11. DYNAMIC CONE PENETROMETER TESTS

No Dynamic Cone Penetrometer tests (DCP) were carried out.

## 12. LABORATORY TESTING

### 12.1 General

Nine pieces of core from the boreholes were selected for unconfined compression testing and twenty eight bag samples from the bore holes and fourteen from the trial pits were selected and were tested to determine their classification including their specific gravities.

### 12.2 Unconfined Compression Tests on Rock Cores

Out of twenty five rock specimens, nine pieces of rock core, five from BH1, one from BH2 and BH4 each and two from BH3, were selected for unconfined compression testing in accordance with BS1881.

Each piece of core was cut with a diamond saw to produce a right cylinder. The ends were ground flat in accordance with the standard. All the specimens were tested without soaking. The results of the tests are given in appendix II, Laboratory test results (unconfined compressive strength).

Nine pieces of rock cores were selected to be representative of all the grades of rock present but with an emphasis on the weaker rock as this controls the allowable bearing pressure. The test requires the specimens to have a height to diameter ratio

of approximately 2; this means that the longer lengths of solid core tended to be selected for testing. This will have resulted in an overestimate of the strength of the layer. The results are given below in table 2.

*Table 2: The following stratum was tested for UCS and recorded the following strengths:-*

BORE HOLE	DEPTH (m)	STRENGTH ACHIVED (N/MM <sup>2</sup> )	WEATHERING GRADE	TYPICAL CHARACTERISTICS OF THE ROCK
BH1	5.8-6.0	1.3	IV- Tuff	*yellowish grey, highly weathered highly fractured tuffs with traces of basalt rock
	6.49-6.58	1.89	IV- Tuff	
	7.25-7.5	0.71	IV- Tuff	*black yellowish grey, highly weathered highly fractured tuffs with traces of basalt rock
	8.79-8.94	2.83	IV- Tuff	*Grey, highly weathered highly fractured tuffs with traces of basalt rock
	9.3-9.4	2.83	IV- Tuff	
BH2	5.15-5.27	3.56	IV- Tuff	*Grey, highly weathered highly fractured tuffs
BH3	4.5-4.7	15.91	IV- Tuff	*Brownish Grey, highly weathered highly fractured tuffs
	5.2-5.45	8.84	IV- Tuff	
BH4	7.2-7.51	19.58	IV- Tuff	*Grayish brown, highly to extremely weathered highly fractured consolidated tuffs
BH5	NONE (No core sample were recovered)			
<p><i>*Typical common characteristics of weathering grades:-</i></p> <p><b>Grade IV:</b>  <i>Highly weathered with large pieces that cannot be broken by hand, does not readily disaggregate (slake) when dry sample is immersed in water.</i></p>				

In BH1 three samples of highly weathered and fractured TUFF rocks between a depth of 5.8m and 7.5m were tested and they had strengths ranging between 0.71MPa and 1.89MPa. The next stratum, from 8.79m to 9.4m had higher strengths of 2.83MPa.

In BH2, one piece of highly weathered and fractured TUFF rocks was selected for testing at a depth range of 5.15-5.27m and recorded strengths of 3.56MPa. The cores in the upper section were too broken to test.

In BH3 two samples of highly weathered and fractured TUFF rocks between a depth of 5.15m and 5.45m were tested and they had strengths ranging between 8.84MPa and 15.94MPa. The cores in the upper section were too broken to test.

In BH4, one piece of highly weathered and fractured TUFF rocks was selected for testing at a depth range of 7.2-7.51m and recorded strengths of 19.58MPa. The cores in the upper section were too broken to test.

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In BH5, no core samples were recovered.

### **12.3 Classification Tests on Soils**

Forty two bulk samples from various depths of each bore hole and test pits, were tested to determine their Liquid and Plastic Limits, plasticity index, natural moisture content, specific gravities, and particle size distribution. These tests were carried out in accordance with BS1377. The results of these tests, given in appendix II, Laboratory test results, were used to classify the samples in accordance with BS5930.

The soil samples classifies as silty sandy CLAYS of medium to high plasticity.

#### **12.3.1 Quick Undrained Shear Box Test**

The undrained shear strength of the soil was determined by the quick undrained shear box test. The undrained cohesion intercept and the undrained angle of shearing resistance were determined and tested in accordance with BS 1377.

#### **12.3.2 Consolidation Test**

The soil's consolidation properties were determined using the one dimensional consolidation press in accordance with BS1377. The results are given on Table 3. To determine the soil's potential for collapse settlement, the test was carried out without water surrounding the specimen until the load reached 100kPa. Water was then added to surround the specimen, the collapse settlement recorded and the test completed.

### **13. WATER LEVELS IN BOREHOLES**

No ground water was recorded as being encountered during drilling however it can be expected that a temporary perched water table will exist on top of the rock during the rains.

### **14. PERMIABILITY TEST (Laboratory Falling Head)**

Laboratory determination of Coefficient of permeability were conducted on remolded soil samples collected at depth ranges 2.0-2.25m and 3.0-3.25m on Trial pit 3 and 4 respectfully. The results indicate that the soils are practically impermeable (Coefficient of less than 0.0000059 cm/sec.)

### **15. PERCALOTION**

Water percolation was carried out on two bore holes to determine the in situ

hydrological condition. The tests were done at depth of 2.0m and 3.0m on two separate test hole. A test hole measuring 300mm squared hole by a depth of 250mm was made in accordance with the requirements for this test. The rates at each of the two test pits are given in table in the appendix. The soil percolation rate indicates how quickly water moves through soil and helps evaluate the ability of the soil to absorb and treat effluent. This is important for evaluating the residential site's suitability for an onsite wastewater treatment system. Soils with very slow percolation rates may be unsuitable for drain fields.

## 16. CHEMICAL TEST

Five samples of soil, one each from BH1, BH2, BH3, BH4 and TP5, were tested, in accordance with BS1377, to determine their sulphate and chloride content and pH. These tests are required to assess the soil's aggressiveness to buried concrete. The results are given in Table 5. They show that the sulphate content is in the range of 0.012% to 0.033%, the chloride content is in the range of 0.0019% to 0.082% and the pH ranged from 6.7 to 7.9.

The sulphate and chloride contents results are not high and the pH shows, in two cases, that the soil is mildly acidic.

On the basis of these data and in terms of the BRE Special Digest on Concrete in Aggressive Ground no special precautions are required for buried concrete. It is good practice however to use a well compacted concrete in order to enhance the durability of the concrete. Note that Ngong area (CEMESTEVA) receives a high precipitation (rainfall) and chemical weathering is anticipated to occur and the Re bar should be adequately be protected against these weathering product.

## 17. ANALYSIS AND CONCLUSIONS

A two storey building development is planned for this site.

Five boreholes were put down to various depths with varying overburden thicknesses as shown on the table 3 below:-

### 17.1 Rock analysis:-

Table 3: The following rock beds were encountered during the explorations:-

BORE HOLE	DEPTH TO ROCK (m) (overburden layer of clay)	TOTAL DEPTH (m)	ROCK THICKNESS (m)
BH1	0.0 – 5.0	9.4	4.4
BH2	0.0 – 3.4	5.8	2.4



BH3	0.0 – 3.55	5.8	2.25
BH4	0.0 – 4.2	8.3	4.1
BH5	No rock were encountered		

The minimum strength recorded from the unconfined compressive strength was 0.71MPa in BH1 at a depth of 7.5m. An allowable bearing pressure on rock with this strength can be taken to be 120kPa on a strip or pad foundation. This bearing pressure was calculated to be five times the unconfined compressive strength divided by a factor of safety. A factor of safety of three has been used.

Equally it can be assumed that the strength of this highly weathered tuff is relatively close to that of medium dense clay found in BH5 at a depth below 3.0m with a N value of 21,(which would have undrained shear strength in excess of 160kPa.

Volcanic rocks are notoriously variable, as can be seen from the results of the five boreholes. It is therefore possible that in other parts of the site, not investigated by the boreholes, that the depth of rock could be in more weathered or weaker rock. If more weathered soils or weaker rock is encountered during foundation excavation then the foundations will need to be taken deeper to harder material or the weaker material will have to be excavated and replaced with selected suitable material before mass concrete is placed.

It is important to note, weathering products from the Nairobi volcanic soils are generally highly expansive and when exposed in an excavation in the presence of water can swell and soften. Should any such materials be encountered in the excavations they need to be removed and replaced with mass concrete or the foundations need to be taken to a lower depth to avoid them.

## 17.2 Soil Bearing Pressure from Laboratory Shear strength

The allowable bearing pressure, were also derived from Triaxial and Consolidation test data. The shear strength was calculated using Meyerhof's bearing capacity factor theory on the assumption that approximately 1.5m square pad footings will be used and these will be founded at a depth of 1.5m below existing ground level. Using the strength parameters determined from the quick undrained shear box test the allowable bearing pressure that will resist shear failure was determined (*see table below*). However settlements under such a pressure are likely to be excessive.

The results of the consolidation test were carried out and used to calculate the applied load that would cause a settlement of the order of 25mm. Without allowance for collapse settlement and after collapse potential is considered, and then the bearing pressure to cause that settlement was worked out. The Meyerhof's shear strength and settlement findings are as indicated below.

Bore hole	Depth	Shear parameters			Collapse potential	
		Angle of shear	Cohesion intercept	Shear Resistance	Load to cause 25mm settlement before Soak	Load to cause 25mm settling-After soak
BH1	1.5 -2.0M	31	0	200Kpa	100Kpa	75Kpa
BH1	2.0-2.5M	35	22	300Kpa	85Kpa	75Kpa
BH1	2.5-2.95M	21	13	130Kpa		
BH2	1.0-1.5M	26	0	-		
BH2	1.3 -1.8M	44	0	250Kpa		
BH3	1.0-1.45M	20	49	380		
BH3	1.45-2.0M	44	0	300Kpa	40Kpa	30Kpa
BH5	1.45-2.0M	31	0	200	100	75
BH5	2.0M-2.45	16	66	370Kpa	85Kpa	65Kpa
BH5	2.5-2.95M	28	0	-		

The allowable bearing pressure of the stiff clay, encountered in the upper layers of BH5, is 65kPa on a pad or strip foundation. This bearing pressure is recommended for all the foundations found on depths less than 2.0m below the ground level. Their associated settlements are expected to be less than 25mm.

In event that heavy loading are expected, the foundations should be taken to a minimum depth of 3.5m below ground level unless solid un-weathered Tuff/phonolite is exposed, as a large mass, in the excavations at a higher level. TP1 is located on extremely weathered TUFF rock at a depth of 3.0m running down to the base of the pit at a depth of 4.0m. Trial pits TP2, TP3 and TP4 were dominated by silty clay.

### 17.3. Bearing capacity from SPT

One of most commonly method for determining allowable soil bearing capacity is from standard penetration test (SPT) numbers. It is simply because SPT numbers are readily available from soil boring. The equations that are commonly used were proposed by Meyerhof based on one inches of foundation settlement. Bowles revised Meyerhof's equations because he believed that Meyerhof's equation might be conservative. For CEMESTEVA project the Meyerhof Equation was to give the Bearing capacity to be adopted.

The allowable bearing capacity ( $q_a$ ), which is the maximum bearing stress that can be applied to the foundation such that it is safe against instability due to shear failure and the maximum tolerable settlement is not exceeded were determined. These are normally calculated from the ultimate bearing capacity using a factor of safety ( $F_s$ ).

The equations that were used, as stated above, were those proposed by Meyerhof based on twenty five millimeter of foundation settlement. Bowles equations were also referred to for comparative analysis. Their equations are as follows:-

### 17.3.1 Meyerhof's equations:

For footing width, 4feet (1.219m) or less:

$$Q_a = (N/4) / K \quad [1.12]$$

For footing width, greater than 4 ft: assume 1.5m x 1.5m

$$Q_a = (N/6) [(B+1)/B]^2 / K \quad [1.13]$$

We have worked out the bearing pressure based on the conservative Meyerhof method which gave the following:-

BORE HOLE	DEPTH (m)	N – VALUE ATTAINED	ALLOWABLE BEARING CAPACITY (KN/M2)	TYPE AND STRENGTH OF CLAY (BASED ON N-VALUE)
BH1	1.0-1.45	21	116.67	Thinly and closely bedded consolidated medium dense silty sandy clay
	2.0-2.5	20	111.12	
	4.0-4.45	15	83.34	
	5.0-5.1	>50(REFUSAL)	277.79	
BH2	1.3-1.75	26	144.45	Thinly and closely bedded consolidated medium dense silty sandy clay
	2.0-2.85	21	116.67	
	3.4-3.45	>50(REFUSAL)	277.79	
BH3	1.5-1.95	20	111.12	Thinly and closely bedded consolidated medium dense silty sandy clay
	2.55-3.0	33	183.34	
	3.55-3.65	>50(REFUSAL)	277.79	
BH4	1.2-1.65	24	133.34	Thinly and closely bedded consolidated medium dense silty sandy clay
	2.3-2.75	27	150.01	
	3.0-3.75	43	238.90	
	4.2-4.3	>50(REFUSAL)	277.79	
BH5	1.5-1.95	10	55.56	Medium bedded and consolidated loose silty sandy clay
	3.0-3.45	15	83.34	Thinly and closely bedded consolidated medium dense silty sandy clay
	4.3-4.75	21	116.67	
	5.3-5.75	26	144.45	
	6.3-6.75	15	83.34	
	7.3-7.75	15	83.34	
	8.3-8.75	17	94.45	

### 17.3.2 Bowles' equations:

For footing width, 4 feet (1.5M X1.5M) or less:

$$Q_a = (N/2.5) / K \quad [1.14]$$

For footing width, greater than 4 ft:

$$Q_a = (N/4) [(B+1)/B]^2 / K \quad [1.15]$$

Where:-

*Q<sub>a</sub>*: Allowable soil bearing capacity, in kips/ft<sup>2</sup>.

*N*: SPT numbers below the footing.

*B*: Footing width, in feet

$K = 1 + 0.33(D/B) \leq 1.33$

*D*: Depth from ground level to the bottom of footing, in feet.

BORE HOLE	DEPTH (m)	N - VALUE ATTAINED	ALLOWABLE BEARING CAPACITY (KN/M2)	TYPE AND STRENGTH OF CLAY (BASED ON N-VALUE)	
BH1	1.0-1.45	21	175.01	Thinly and closely bedded consolidated medium dense silty sandy clay	
	2.0-2.5	20	166.67		
	4.0-4.45	15	<b>125.00</b>		
	5.0-5.1	>50(REFUSAL)	416.68		Weathered basalt rock
BH2	1.3-1.75	26	216.67	Thinly and closely bedded consolidated medium dense silty sandy clay	
	2.0-2.85	21	<b>175.01</b>		
	3.4-3.45	>50(REFUSAL)	416.68		Weathered tuffs
BH3	1.5-1.95	20	<b>166.67</b>	Thinly and closely bedded consolidated medium dense silty sandy clay	
	2.55-3.0	33	275.01		Very thinly and closely bedded dense consolidated silty sandy clay
	3.55-3.65	>50(REFUSAL)	416.68		Weathered tuffs
BH4	1.2-1.65	24	200.01	Thinly and closely bedded consolidated medium dense silty sandy clay	
	2.3-2.75	27	<b>225.01</b>		
	3.0-3.75	43	358.35		Very thinly and closely bedded dense consolidated silty sandy clay
	4.2-4.3	>50(REFUSAL)	416.68		Weathered tuffs
BH5	1.5-1.95	10	83.34	Medium bedded and consolidated loose silty sandy clay	
	3.0-3.45	15	125.00	Thinly and closely bedded consolidated medium dense silty sandy clay	
	4.3-4.75	21	175.01		
	5.3-5.75	26	216.67		
	6.3-6.75	15	125.00		
	7.3-7.75	15	125.00		
8.3-8.75	17	141.67			

**NOTE:** We have worked out the bearing pressure based on the conservative Meyerhof method.

## 18 RECOMEDATIONS

### 1- Soil Bearing capacity

The soil bearing capacity is as follows:

- BH 1 and BH2, at a depths of 1.0 to 1.5m -115Kpa (no water into the foundation)
- BH 3 at a depth of 1.3 to 2.0m -110Kpa (no water into the foundation)
- BH 4 at a depth of 1.2 to 2.5m -150Kpa (no water into the foundation)
- BH 5 at a depth of 1.5 to 2.0m -60Kpa (no water into the foundation)

In summary a bearing pressure of 110 Kpa should be adopted across the site, with an exception of BH5 where the bearing pressure should be limited to 60Kpa. But in event that the foundation will be subjected to soaking (ingress of water) then it has to be taken to a depth of 2.0m and a bearing pressure of 65Kpa be adopted. Alternatively the layers below the foundation can be compacted in layer not exceeding 200mm and compacted to a maximum Dry Density of 95% ASSHTO T99 and 85-100% optimum moisture content.

### 2 -Settlement

Differential settlement is estimated to be less than 25 mm for the strip / pad footings. However all water from the roof canopy or from the adjacent surrounding should not be allowed into the foundation. *See comment on 1 above on compaction.*

### 3 -Foundation Depth

The foundation depth to be adopted for BH1, BH2, BH3, and BH4 is 1.5m below ground level. On BH5 and its surrounding, the foundation is to be designed to accommodate the low bearing pressures of 60Kpa envisaged at a depth of 2m.

### 4 -Chemical reactivation

The results of the Chloride and sulphate content tests showed that the soils are not aggressive to concrete. It is important, however, that dense cement well compacted concrete be used.

### 5 -Drainage

The soils at 2m and 3m are practically impermeable.

### 6 -Vegetation (Trees)

All live trees should be removed or should be a way from the foundation by a distance greater than or equal to its height.

### 7 -Earth Movement

Tectonic activity of low order can be considered at present time.

**8 -Seismicity**

Seismic shocks of up to 8 on the richer scale can be anticipated.

**9 -Climate**

Ngong and the surrounding area (CEMASTEA site) are characterized by a high rainfall and moderate temperature with high likelihood of chemical weathering and water runoff.

**For BPC & Engineering Services Ltd**



**G.K WAMBUGU, Technical Director**

PROJECT: THE UPGRADING AND REFURBISHMENT OF CEMASTE A TRAINING FACILITIES IN KAREN										CLIENT: MATSUDA CONSULTANT INTERNATIONAL CO., Ltd						
TYPE OF RIG		JOY 12B		AUGER SIZE		150MM		Dates:		From: 11-Jan-11						
CORE BARREL		76MM TUBE TYPE		CASING		NIL				TO: 12-Jan-11						
BH 1										Sheet 1 of 1						
Depth Scale	Depth Water (m)	SAMPLING AND INSITU DATA					Change of strat		Sample	SPT	COR E RUN	CORE RCOV	p. Legem	remark	PIZOM ETER	DESCRIPTION OF STRATA
		Depth (m)	N (Blows)	From	To	N VALUE	Depth (m)	Level (m)								
		0.00														
1M	NILL	0.00	1.00						B1							Reddish brown silty clay
		1.00	1.45	4	4	5	6	6	D2							
2M		1.00	2.00						B3							
	DRY	2.00	2.50	6	5	5	5	5	D4							
		2.00	2.50	6	5	5	5	5	B5							
3									U6&D7							Reddish brown clay mixed with grid sand
		2.50	4.00						B8							
4		4.00	4.45	5	4	4	3	4	D9							
5		4.00	5.00						B10							Weathered yellowish basalt rock & washed cuttings
		5.10	5.00	reusal					B11							
6	DRY	5.00	6.00								1.00	0.60				Black yellowish grey basalt rock
7		6.00	7.10								1.10	0.80				
8																Fissured hard grey basalt rock
9	DRY	7.10	9.40								2.30	2.15				
10	END OF BORE HOLE 1															

CONSULTANTS	MATSUDA CONSULTANT INTERNATIONAL CO., Ltd	Borehole depth :9.4m
	GEOTECHNICAL CONT	BPC & ENGINEER SERVICES LTD
		Checked by : H. G.
		Approved by : G. K
		Fig. (8.1)

<b>PROJECT:</b>		<b>THE UPGRADING AND REFURBISHMENT OF CEMASTEVA TRAINING FACILITIES IN KAREN</b>				<b>CLIENT:</b>		<b>MATSUDA CONSULTANT INTERNATIONAL CO., Ltd</b>									
<b>TYPE OF RIG</b>		JOY 12B		<b>AUGER SIZE</b>		150MM		<b>Dates:</b>		From: 16-Jan-11							
<b>CORE BARREL</b>		76MM TUBE TYPE		<b>CASING</b>		NIL				TO: 16-Jan-11							
<b>BH 2</b>										Sheet 1 of 1							
Depth Scale	Depth Water (m)	SAMPLING AND INSITU DATA					Change of strat		Sample	SPT	COR E RUN	CORE RCOV	p. Legend	remark	PIZOM	ETER	DESCRIPTION OF STRATA
		Depth (m)	N (Blows)	N VALUE			Depth (m)	Level (m)									
		0.00															
1M	NILL	0.00	1.00						B1								Red silty clay
		1.30	1.75	8	6	6	7	26	J2&D3 D4								
2M	DRY	1.00	2.30						B5 D6								
3		2.00	2.85	9	7	4	5	21	D7								Weathered tuff rock
		2.30	3.40						B8 D9								
4				3.45 50-REFUSAL													
5		3.40	5.20														END OF BORE HOLE 2
		5.20	5.80														
6																	
7																	
8																	
9																	
10																	
		<b>CONSULTANTS</b>				<b>MATSUDA CONSULTANT INTERNATIONAL CO., Ltd</b>				Borehole depth : 5.8m							
		<b>GEOTECHNICAL CONT</b>				<b>BPC &amp; ENGINEER SERVICES LTD</b>				Logged by : F. O							
										Checked by : H. G							
										Approved by : G.K							
										Fig (81)							



PROJECT:		THE UPGRADING AND REFURBISHMENT OF CEMASTEPA TRAINING FACILITIES IN KAREN				CLIENT:		MATSUDA CONSULTANT INTERNATIONAL CO., Ltd									
TYPE OF RIG		JOY 12B		AUGER SIZE		150MM		Dates:		From: 14-Jan-11							
CORE BARREL		76MM TUBE TYPE		CASING		NIL		TO:		14-Jan-11							
<b>BH 3</b>																	
Sheet 1 of 1																	
Depth Scale	Depth (m)	SAMPLING AND INSITU DATA					Change of strata		Sample	SPT	COR E RUN	CORE RCOV	p. Legend	remark	PIZOM	ETER	DESCRIPTION OF STRATA
		Depth (m)	N (Blows)	N VALUE				Depth (m)									
	0.00																
1M	0.00	1.00							B1								Red silty clay
									J2&D3 D4								
2M	1.50	1.95	8	5	5	5	20										
	0.00	2.40															
3	2.55	3.00	8	6	8	9	10	33									Red silty clay with iron stained lateritic grave
	3.55	3.65	50-REFUSA							B5 D6 D7							
4																	Weathered Tuff rock and flagments of phonolites
5	3.65	5.20									1.65	1.35					Phonolite rock
6	END OF BORE HOLE 1																
7																	
8																	
9																	
10																	

CONSULTANTS	MATSUDA CONSULTANT INTERNATIONAL CO., Ltd	Borehole depth :5.8m	
	GEOTECHNICAL CONTR	BPC & ENGINEER SERVICES LTD	Logged by : F. O.
			Checked by : H. G.
			Approved by : G. K.
			Fig. (8.1)

<b>PROJECT:</b>		<b>THE UPGRADING AND REFURBISHMENT OF CEMASTEVA TRAINING FACILITIES IN KAREN</b>				<b>CLIENT:</b>		<b>MATSUDA CONSULTANT INTERNATIONAL CO., Ltd</b>								
<b>TYPE OF RIG</b>		JOY 12B		<b>AUGER SIZE</b>		150MM		<b>Dates:</b>		From: 12-Jan-11						
<b>CORE BARREL</b>		76MM TUBE TYPE		<b>CASING</b>		NIL				TO: 12-Jan-11						
<b>BH 4</b>																
Sheet 1 of 1																
Depth Scale	Depth Water (m)	SAMPLING AND INSITU DATA					Change of strat		Sample	SPT	COR E RUN	CORE RCOV	p. Legend	remark	PIZOM ETER	DESCRIPTION OF STRATA
		Depth (m)	To	N (Blows)												
		0.00														
1M	NILL	0.00	1.00							B1						Reddish brown silty clay
		1.20	1.65	6	5	6	6	7	24	D2						
2M	DRY	1.00	2.20							B4						Reddish brown silty sandy with iron stain laterite gravel
		2.30	2.75	7	6	7	7	7	27	D5						
3		2.20	3.30							B7						Weathered Tuff
		3.00	3.75	#	19	9	12	13	43	D6						
4		3.30	4.20							D8						Greyish fresh Phonolite
		4.20	4.30							B9						
5										D10						Grey phonolite
		4.20	5.50								1.30	1.00				
6																Grey phonolite
		5.50	7.20								1.70	0.60				
7																END OF BORE HOLE 1
		7.20	8.30								1.10	0.75				
8																
9																
10																
		<b>CONSULTANTS</b>				<b>MATSUDA CONSULTANT INTERNATIONAL CO., Ltd</b>				Borehole depth :8.3m						
		<b>GEOTECHNICAL CONTRA</b>				<b>BPC &amp; ENGINEER SERVICES LTD</b>				Logged by : F. O						
										Checked by : H. G.						
										Approved by : G.K						
										Fig. (8.1)						

PROJECT:		THE UPGRADING AND REFURBISHMENT OF CEMASTEVA TRAINING FACILITIES IN KAREN				CLIENT:		MATSUDA CONSULTANT INTERNATIONAL CO., Ltd									
TYPE OF RIG		JOY 12B		AUGER SIZE		150MM		Dates:		From: 15-Jan-11							
CORE BARREL		76MM TUBE TYPE		CASING		NIL		TO:		16-Jan-11							
<b>BH 5</b>											Sheet 1 of 1						
Depth Scale	Depth Water (m)	SAMPLING AND INSITU DATA						change of strat Depth (m)	Level (m)	Sample	SPT	COR E RUN	CORE RCOV	p. Legend	remark	PIZOM ETER	DESCRIPTION OF STRATA
		Depth (m) From	Depth (m) To	N (Blows) N VALUE													
		0.00															
1M	NULL	0.00	1.00														
										B1							
										J2&D3							
2M	DRY	1.50	1.95	6	2	2	3	3	10								
		1.00	2.50							D4							
										B5							
3										J6&D7							Reddish brown silty clay
		3.00	3.45	6	3	4	4	4	15								
4		2.50	4.00							D8							
										B9							
										U10&D1							
5		4.30	4.75	8	4	5	6	6	21								
		4.00	5.30							D9							
		5.30	5.75	6	5	5	7	9	26								
6										B12							
		5.30	6.30							D14							
		6.30	6.75	5	3	4	4	4	15								
7										B15							
		6.30	7.30							D16							
		7.30	7.75	6	3	3	5	4	15								
8										B17							
		7.30	7.75	6	3	3	5	4	15								
										D18							BROWN CLAY
		7.30	8.30							B19							
9		8.30	8.75	5	4	4	4	5	17								
										D20							
		8.30	9.30							B21							
10										D21							
										B22							
		END OF BORE HOLE 5															

CONSULTANTS		MATSUDA CONSULTANT INTERNATIONAL CO., Ltd		Borehole depth :10.0m	
GEOTECHNICAL CONTR		BPC & ENGINEER SERVICES LTD		Logged by : F. O	
				Checked by : H. G	
				Approved by : G. K	
				Fig (8.11)	