GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF WATER RESOURCES

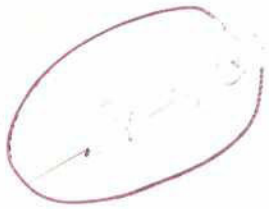
BANGLADESH WATER DEVELOPMENT BOARD

ASIAN DEVELOPMENT BANK

DHAKA INTEGRATED FLOOD PROTECTION PROJECT
PROJECT MANAGEMENT CONSULTING SERVICES
ADB LOAN NO. 1124- BAN (SF)

INCEPTION REPORT

DECEMBER 1994



MORRISON KNUDSEN CORPORATION/
Transportation and Water Resources Group (MK)
in association with
SHELADIA ASSOCIATES, INCORPORATED (SA)
and
DEVELOPMENT DESIGN CONSULTANTS LTD (DDC)

371/A, Outer Circular Road (2nd & 3rd Floor)
Rajarbagh, Dhaka.

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DHAKA INTEGRATED FLOOD PROTECTION PROJECT

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Morrison Knudsen Corporation
in association with
Sheladia Associates, Inc.
Development Design Consultants Limited

Project Office :
371/A Outer Circular Road
Rajarbagh, Dhaka-1217
Tlx : 671120 DDC BJ, Fax : 880 2 832907

Ref : DIFPP-38/95

January 15, 1995

The Project Director
Project Management Office
Dhaka Integrated Flood Protection Project (BWDB)
960/1, Outer Circular Road, Rajarbagh,
Dhaka-1217.

Sub : **Inception Report for Project Management Consulting Services for Dhaka Integrated Flood Protection Project**

Dear Sir,

As per clause VIII of the Terms of Reference, Appendix A of the contract for the above mentioned project, we are pleased to submit herewith 15 (fifteen) copies of the Inception Report.

Preparation of this Inception Report represents a step forward in the effort to provide our consulting services effectively and facilitate the successful management of the project.

Thanking you and assuring best of our services.

Encl: Inception Report 15 (fifteen) Copies.

Yours faithfully

Dr. Majid Ghaboosi
Team Leader
Project Management Consulting
Services for DIFPP.

T-26/01-95/comp-1/1

ABBREVIATIONS

ADB	-	Asian Development Bank
ADP	-	Annual Development Program
BIWTA	-	Bangladesh Inland Water Transport Authority
BWDB	-	Bangladesh Water Development Board
DCC	-	Dhaka City Corporation
DDC	-	Development Design Consultants Ltd.
DIFPP	-	Dhaka Integrated Flood Protection Project
DMA	-	Dhaka Metropolitan Area
DOE	-	Department of Environment
DPHE	-	Department of Public Health Engineering
DWASA	-	Dhaka Water Supply and Sewarage Authority
FAP	-	Flood Action Plan
FPCO	-	Flood Plan Coordinator Organisation
GOB	-	Government of Bangladesh
HSD	-	Housing and Settlement Directorate
IDA	-	International Development Association (the World Bank)
IEMP	-	Integrated Environmental Management Plan
JICA	-	Japanese International Cooperation Agency
LGD	-	Local Government Division
LGED	-	Local Government Engineering Department
MEF	-	Ministry of Environment and Forests
MK	-	Morrison and Knudsen Corporation
MLGRDC	-	Ministry of Local Government, Rural Development and Cooperatives
MOW	-	Ministry of Works
MOWR	-	Ministry of Water Resources
NGO	-	Non Government Organization
OJT	-	On the Job Training
O&M	-	Operation and Maintenance
PBME	-	Project Benifit Monitoring and Evaluation
PC	-	Planning Commission
PMC	-	Project Management Consultants
PSC	-	Project Steering Committee
PTC	-	Project Technical Committee
PWD	-	Public Works Department
RAJUK	-	Rajdhani Unnayan Katripakka (Capital Development Authority)
RHD	-	Roads and Highways Department
SA	-	Sheladia Associate, Incorporated
TCIL	-	Technoconsult International Ltd.
TOR	-	Terms of Reference
UDD	-	Urban Development Directorate
UNCHS	-	United Nations Centre for Human Settlements
UNDP	-	United Nations Development Program
UNICEF	-	United Nations International Childrens Emergency Fund
USAID	-	United States Agency for International Development.

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I. INTRODUCTION

I. INTRODUCTION

The Inception Report presented, is a planning document that the Project Management Consultants (PMC) will use as a guidline to assist the Project Management Office (PMO) in managing the implementation of the Dhaka Integrated Flood Protection Project (DIFPP). The DIFPP is a part of the Bangladesh Flood Action Plan (FAP) and a priority project of the Government of Bangladesh (GOB). The area considered for DIFPP includes the western part of the Dhaka City covering an area of approximately 136 Sq. Km. This area is identified on the Project Area Map.

The DIFPP began in 1991-92 under the GOB loan agreement with Asian Development Bank (ADB) and is scheduled for completion in 1996-97. The lead executing Agency for the DIFPP is Bangladesh Water Development Board (BWDB). A Project Management Office (PMO) has been established to provide overall coordination, technical assistance and quality assurance/control during the project period. The PMO is staffed with full time representatives from the Bangladesh Water Development Board (BWDB), Dhaka Water Supply and Sewerage Authority (DWASA) and Dhaka City Corporation (DCC), and Part time representative from Rajdhani Uunnayan Katripakka (RAJUK), the Department of Environment (DOE), and Flood Plan Coordination Organization (FPCO).

Two consulting engineering consortiums are engaged in the project for providing consultancy services; one for the detailed engineering design and construction supervision and the other for project management services. The Project Management Consultants have been appointed to assist, support and advise the PMO in the overall coordination, planning, implementation, supervision and monitoring project activities with the objective of achieving the physical, financial and scheduling targets of the DIFPP. Monitoring of the project activities will include cost recovery measures, financial management, Project Benefit Monitoring and Evaluation (PBME) system activities, community development programs, standards and procedures for O&M and on-the-job training of the counterpart staff.

The Project Management consultants team consisting of Morrison Knudsen Corporation (MK), Sheladia Associates, Inc. (SA) and Development Design Consultants Limited (DDC), is submitting this Inception Report indicating the services to be provided to the PMO towards effective implementation of the various activities of the DIFPP.

Prior to the appointment of the Project Management Consultants, the implementation of some tasks of the project have either been completed or are in the process of implementation. The timing of the inception phase requires that this Inception Report highlights the following :

- What was the Project (Original Plan)
- What is the Project (Current Status)
- What will be the Project (Work Plan).

The primary objectives of this report are to :

i) Present a brief explanation of the project as planned Originally.

ii) Describe the Present Status of the Project and identify the project activities and their progress stage.

iii) Provide a work plan considering the Project physical, financial and scheduled targets according to the priorities as to be adhered to throughout the consultancy period.

The structure of the Inception Report has been designed to meet the above requirements. It comprises five sections, Section I present the introduction of the Inception Report. Section II provides a brief background of the project (Original Plan). Section III portrays the Current Status of the project. Section IV describes the inception phase of the Project Management Consultants (PMC). Finally, Section V represents the Work Plan of the PMC.

There are also two appendices to this report. These are the Appendix-A detailing the Terms of References for PMC and Appendix-B presenting the Technical Notes of the PMC during the inception phase.

II. BACKGROUND

II. BACKGROUND

II.1. The Project

Bangladesh experienced two of the most severe floods on record during 1987 and 1988. Dhaka City (200 sq km out of 260 sq km) was submerged to varying depths for periods of upto four weeks. In the wake of the catastrophic flood in October, 1988, the Government of Bangladesh (GOB) constituted a Committee for Flood Control and Drainage of Greater Dhaka area headed by the then Planning Minister.

The GOB initiated phase-I of the recommended works as a crash program, using its own resources. These works were designed to provide protection to about 136 sq km area in the highly urbanized westerly part of the City, including additional works of flood protection wall around Dhaka-Narayanganj-Demra Zone (southern part) and a flood protection bund around Zia International Airport.

Implementation of the program was a coordinated effort involving the BWDB, DCC, DWASA, RAJUK, R&H and the Army. The crash program was initiated in March, 1989 and was declared complete in June, 1991. The works were done without a proper feasibility study and site investigation under extreme-tight time constraints without adequate quality control and scheduling. As a result, there had been some failures and erosion of sections of the embankment and also drainage congestions due to blocking of the natural drainage paths. In order to provide a minimum acceptable level of protection for the western part of Dhaka and for the benefits to be realized and the system to be made secure it was decided that construction deficiencies must be rectified and additional works on flood protection and drainage and improvement to internal drainage system be carried out.

A Flood Action Plan (FAP) for Bangladesh was therefore formulated at the London Conference of donors under the co-ordination of the World Bank in December, 1989. The Government of Japan and Asian Development Bank agreed to provide assistance for Dhaka City protection component FAP-8. Under FAP-8A, JICA was engaged to develop Master Drainage and Flood Control Plan for Greater Dhaka area of 850 sq km (Dhaka, Tongi, Savar, Keraniganj and Narayanganj) and the study was scheduled to be completed in February, 1992. ADB study (FAP-8B) was concentrated on phase-I area of Greater Dhaka ie., the westerly part titled Dhaka Integrated Flood Protection Project with the objective of identifying flood protection, drainage and complementary environmental improvement. The study was completed in September, 1991 and an ADB appraisal mission submitted an aide memoire, 14 September, 1991 offering loan for implementation of the project and the offer was accepted by the GOB.

The project was taken up for execution during 1991. Some remedial works of embankment, construction of sluices and construction and rehabilitation of drainage works were of emergent nature. Consultants for mid-term period (January 1992 to July 1992) had been engaged to carry on concurrently the consultancy services of

(a) Project Management and (b) Detailed Engineering and Construction Supervision before the recruitment process for the proposed consultancy service was completed.

The Project Management Consultants (PMC) team was proposed to support and assist the Project Management Office (PMO) in planning, implementing and evaluating the project activities, with overall technical monitoring and supervision, monitoring of action plan including cost recovery measures, financial management, project benefit monitoring and evaluation (PBME) activities, community development programs, standards and procedures for O & M and on the job training of counterpart staff. Detailed Engineering and Construction Supervision will be the responsibility of a separate consultants team engaged under another contract. The consultancy service cost (both local and foreign exchange) will be financed from the ADB loan.

Concurrently with the execution of the emergency works in 1991-92 a Feasibility Study was carried out. The final report of the Feasibility Study was presented in September 1991 which included a program of works and activities for FAP-8B. The project area covering approximately 260 sq km was well suited for incremental development and it was determined that the required construction activities would be designed and completed as funding is available. Consequently, the Dhaka Integrated Flood Protection Project (FAP-8B) was divided into two phases i.e. phase-I and phase-II.

The GOB has obtained the funds for the implementation of the first phase of the program (FAP-8B, Phase-I) which focuses on the highest priority area of Dhaka City i.e., the western part as shown in the Project Area Map. The Project area measures about 136 sq km and includes about 87% of the total urban population and some 95% of the commercial and industrial properties in the city, including the international airport. The major components of the Project are:

- Part A: Flood protection;
- Part B: Drainage;
- Part C: Environmental improvement.

The implementation period of the FAP-8B, Phase-I, the current project, is estimated to last until June 1997. Construction of some of the works initiated during the crash programme phase following the 1988 floods continued after the completion of the feasibility study. To bridge the period until the appointment was made for full time consultants (1994) consultancy services for Project Management and Detailed Engineering Design and Construction Supervision were provided by an association of domestic consultants, Technoconsult International Ltd (TCIL), and a foreign consultant, Luis Berger International (LBI) with TCIL as the lead consultant.

II.2. Project Area

The FAP-8B, Phase-I Project includes the Greater Dhaka with an area of about 260 sq km. The northern boundary of the area is formed by the Tongi khal, the western boundary by the river Turag and Buri

Ganga and the southern boundary by the river Buri Ganga upto Friendship Bridge and by the road from Friendship Bridge to Demra via Jatrabari and the eastern boundary by the river Balu. The area considered for the Phase-I of the Project includes the western part of the Dhaka City covering an area of approximately 136 sq km; the eastern boundary of this area is constituted by a sequence of main roads and railway embankments, referred to as Central Spine Road in the Project documents.

The Project covers the most densely populated western part of the Dhaka City which accommodates a population of 4.2 million or 87 percent of the City population. The central parts of the City are high enough to remain generally free from flooding, but fringe areas are extensively inundated by 2-4 meters for several months each year by overflows of the surrounding rivers. Major floods affect even the central parts of the City. Heavy rainfall, high surrounding water levels and an inadequate and unsatisfactorily maintained drainage system all contribute to flooding in the City. Heavy rainfall aggravates flooding when it is late in the monsoon period and adds to the overflow of the rivers and damage to city infrastructure is usually severe. During the floods of 1987 and 1988, two of the most serious on record, 200 sq km or about 80 percent of Dhaka City was submerged for periods up to four weeks. Some 2.5 million people, constituting about 60 percent of the city population, were affected; flood damages were estimated at about $20 million.

Since 1981, the population of Dhaka has been growing at a high rate of 5.5 percent per annum. While the contribution of Dhaka in the national economy is substantial, the living conditions in Dhaka have progressively deteriorated. About 60 percent of the households in Dhaka are estimated to have incomes below the poverty level. Some 25 percent of the population is living in slums. Poor drainage affects 65 percent of the slum and squatter dwellers (800,000 people), and 22 percent (265,000 people) are regularly flooded during minor rainfalls. As the population has increased, severe strains on municipal facilities such as water supply, sanitation, drainage and solid waste management have emerged.

II.3. Project Objectives and Scope

The overall scope of the Project is to provide a relatively flood-free and secure living environment within the framework of a longer term flood protection program for Dhaka and to improve environmental conditions in Dhaka City for the promotion of a sustainable long term development. The Project constitutes the first Asian Development Bank investment in urban flood protection in Bangladesh and has been formulated in an integrated framework of flood protection, drainage and environmental improvements. The objective of working within this framework is to target the benefits of the Project towards the urban poor and thus maximize equity related benefits to optimize the cost effectiveness of the associated investments and maximize developmental impact of the Project.

The Project has been designed in the context of the Integrated Environmental Management Plan (IEMP) which was prepared during the course of the feasibility study and which provides guidelines for land use management, flood control and drainage, water quality and sewerage management and slum and squatter area improvement together with institutional controls and responsibilities. The scope of the project has been formulated based on the following consideration :

(i) the Project should provide an adequate and realistic foundation for the implementation of a longer term program for the comprehensive flood protection of Dhaka in a period of 10 to 15 years;

(ii) the proposed investments should be cost effective and should include only the high priority flood protection and drainage investment; this priority being based on the need to provide security to the densely populated areas of the City and

(iii) the Project should enhance the environmental health conditions in the City and contribute to the alleviation of poverty, through complementary environmental improvement programs targeted at the low-income population groups.

II.4. **Project Components**

Part A : Flood Protection

The flood protection works encompass approximately 136 sq.km. of the westerly portion of Dhaka City and cover those activities necessary to complete the works in this area initiated by GOB following the 1988 floods as well as the first stage of Pumping Station No. 3. The boundary between the western and eastern areas is provided by a sequence of main roads and railway embankments, referred to as the Central Road. This boundary forms the eastern boundary of the Project works.

The level of flood protection offered by the western boundary, which will consist of a combination of earth embankment and concrete flood wall, will correspond to the 100 year level of occurrence, and is about 0.14 meter higher than the maximum water elevation sustained during the 1988 floods, with freeboard added to the elevation of the structures. The return period of the 1988 flood has been estimated at a minimum of 70 years. Following the 1988 flood the GOB also initiated the raising of the Central Road to an elevation corresponding to a 50 year flood. Preliminary survey data indicates that this elevation has not been reached over the entire length of the Central Road. Therefore, the Project includes a component to raise the elevation of the Central Road to match the 50-year flood where survey indicates this is required and to provide gated control for all drainages crossing the roadway.

The scope of Part A covers the following :

(i) Intensive and moderate remedial works over a total 7.8 Km length of existing embankment on the western side of the Project area. These areas are located where the embankment crosses redundant river channels and the principal reason for the present serious instability of these parts of the embankment is the weakness of the underlying soils. Effective completion of the works will require stabilisation of the embankment foundation which in turn will require installation of extensive foundation drainage works (to permit rapid consolidation and strengthening of the foundation soils) and use of Geotextile or a similar (a close substitute) material to distribute and support the embankment load while consolidation is taking place.

(ii) Minor remedial works consisting of filling of borrow area at river side toe of embankment by dredge (6.50 Km) and restoration of 17.7 Km of eroded areas on river side of embankment and placing Jute/Sod protection with plantation of Dholkolmi or Doncha bushes at riverside toe or berm.

(iii) Slope protection against wave action on 11.5 Km of exposed length of the western embankment involving provision of cement-concrete blocks on Geotextile or a similar material in areas of severe wave action. The cement concrete blocks will augment the normal Jute mesh and Turf protection that will be installed throughout the total length of embankment.

(iv) Remedial works over approximately 5.3 Km of existing reinforced concrete flood wall. Details of these works will be determined following detailed surveys and preparation of detailed designs. Works will include closure of openings in the existing flood wall by means of installation of steel gates, which can be securely fastened both at time of flooding as well as when open during non-flood periods.

(v) Construction of 1.6 Km new flood wall/embankment.

(vi) Construction of five remaining drainage sluices in the area from Satmasjid to Mitford Hospital at intervals along the embankment alignment as indicated in the JICA Drainage Master Plan.

(vii) Construction of the first stage of Pumping Station No. 3 with a capacity of 22 cubic meters per second at Goran Chatbari on the north-western side of the embankment to alleviate flooding near the embankment.

(viii) Central Road involving (a) provision of a median in the center of the existing road to protect the 50 year overtopping level together with road raising in the area

around the Jatrabari turn about, and (b) provision of structures at each of the 13 drainage crossings with gated structures including Begunbari Khal.

(ix) Implementation of a rigorous operation and maintenance program for the flood embankments, flood walls, and related structures over the project implementation period, as the project construction works are completed, that will ensure the long term effectiveness of the Project works and preclude the necessity of future rehabilitation works.

(x) Construction of a functional building.

Part B : Drainage

The proposed drainage works are a necessary complement to the flood protection works. The Project will cover the drainage requirements of the flood protection area including those drainage facilities which lie outside the area but are connected to the Project area drainage networks. **The scope of Part B includes:**

(i) Rehabilitation of 21 major existing open drains (khals). of total length 78 Km. The rehabilitation works will consist of dredging and reprofiling to restore the khals to their original (design) capacity.

(ii) Rehabilitation and construction of 51 km of piped drainage facilities to relieve drainage congestion in built-up areas of the City.

(iii) Completion of drainage works commenced under the GOB crash program designed after the heavy pre-monsoon rainfalls of 1991. This work consists mainly of cleaning and unblocking of existing covered and open drains in the more densely populated parts of the City, together with a limited program of construction of small capacity new drains.

(iv) implementation of rigorous operation and maintenance program for the drainage works over the Project implementation period as the Project construction works are completed.

Part C : Environmental Improvement Program

The urban infrastructure and services in Dhaka have severe deficiencies. The slum dwellers/squatters which form more than 25% of the City population do not have access to most services that are available to others. Local flooding is an annual event for these areas. Garbage collection services are not extensive in the City generally and not available in the slum area; sanitation, water supply, and access facilities are also poor.

The Environmental Improvement Program will encompass three components: (i) slum and squatter area improvement, (ii) solid waste management, and (iii) sanitation, water supply and local drainage. These components are aimed specifically at the urban poor and will complement the works of part A: Flood Protection and part B: Drainage, and thereby enhance the overall impact of the Project over the Project area. **The scope of Part C: includes.**

(i) Slum and Squatter Area Improvement: over the 5-year Project period, approximately 8,000 families will benefit through modest provision of water supply, sanitation, footpaths, street lighting, roadside drainage and solid waste storage (similar to the UNICEF- supported slum improvement schemes currently underway in the country). A further 725 families, presently squatting along khals and contributing to drainage system deterioration, will be resettled under the project.

(ii) Solid Waste Management: improvement and upgrading of solid waste collection, to enhance the impact of the project in particular the works of Part B: Drainage, is proposed system recently introduced in Dhaka an additional 30 collection trucks and 120 containers will be procured under the Project, which will enable DCC to extend collection services to about 10% of the Dhaka City area. To complement the new system and to extend collection services within the parts of slum areas inaccessible to trucks, supporting facilities such as handcarts (2,000 nos.) and collection bins (3,000 nos.) are also to be provided.

(iii) Sanitation, Water Supply and Local Drainage: only a few public toilets are available in Dhaka, which are inadequate to meet current demand. Some 30 public toilets are to be provided under the Project to cope with the problem. Bathing and washing facilities will be extended as needed. The proposed Project also includes 2,500 twin pit, 3,000 single pit latrines and 2,500 latrine shelters with a view to improving public hygine and to cater to the sanitation needs. To supplement these facilities, 1,000 public water supply standpipes are to be installed. DCC currently maintains about 120 Km of drain pipes plus 60 Km of surface/roadside drains and most of these are damaged, blocked or broken, causing a deteriorated living environment. A renovation program of these pipes is also proposed, together with provision of mechanical cleaning equipment and vehicles.

II.5. Project Implementation Arrangement

It was envisaged that the overall technical supervision and execution of the Project would be the responsibility of Bangladesh Water Development Board (BWDB), which would be the Project Executing Agency, and directly implement Parts A of the Project. Parts B and C of the Project would be implemented by DWASA and DCC

respectively. DOE and RAJUK would be involved in Project Implementation supporting role : the former in overall monitoring of environmental impacts of the Project, and the latter in improvement of the Central Road and in land development planning and control.

It was also envisioned that a Project Management Office (PMO) headed by a Project Director of the rank of a Senior Superintending Engineer would be established by BWDB within one month of loan effectiveness. The PMO, which would incorporate all consultancy services under the Project, would be involved in coordination and management of Project facilities, programming, financial planning, detailed engineering design, tendering and construction supervision, design and implementation of Project, project benefit monitoring and evaluation (PBME) activities, socioeconomic and engineering surveys, environmental assessment and protection, community/NGO participation and public information campaigns. The PMO would be staffed by full-time staff from the Project implementing agencies (as well as part time staff from DOE and RAJUK), and would include Deputy Project Directors from BWDB, DCC and DWASA, with the status of Executive Engineer, who would be responsible for liaison with their respective agencies. The staffing of PMO would include seconded staff from respective agencies as well as new staff recruitment. The PMO would maintain records of the progress of all Project activities and be responsible for ensuring timely Project implementation.

The overall coordination, monitoring and supervision of the Project would be provided by the Ministry of Water Resources (MOWR) through FPCO, under procedures that have been established under FAP. The existing Project Steering Committee (PSC) chaired by the Minister in charge of MOWR and consisting of Ministers in charge of the Ministries of Finance, Works, LGD, Land, and Environment and Forests, and Secretaries of the concerned Ministries/Members of the Planning Commission (PC), with the Secretary MOWR acting as the Member Secretary that has provided policy guidance during Project formulation and coordinated Project activities with other FAP components would continue during Project implementation and would meet ordinarily once in every six months. Similarly, the existing Project Technical Committee (PTC), chaired by the Secretary, MOWR and having representatives from the agencies included in the PSC at the technical level, including FPCO, BWDB, DWASA, DCC, RAJUK, DOE, Economic Resources Division, Ministry of Finance and the PC, that has been operative during the Project formulation phase, would continue during Project implementation and would meet ordinarily once every quarter for Project implementation coordination; it would also prepare working papers for consideration of policy-related matters by the PSC. The Organization Chart of Dhaka Integrated Flood Protection Project Organization is shown in **Figure II.1.**

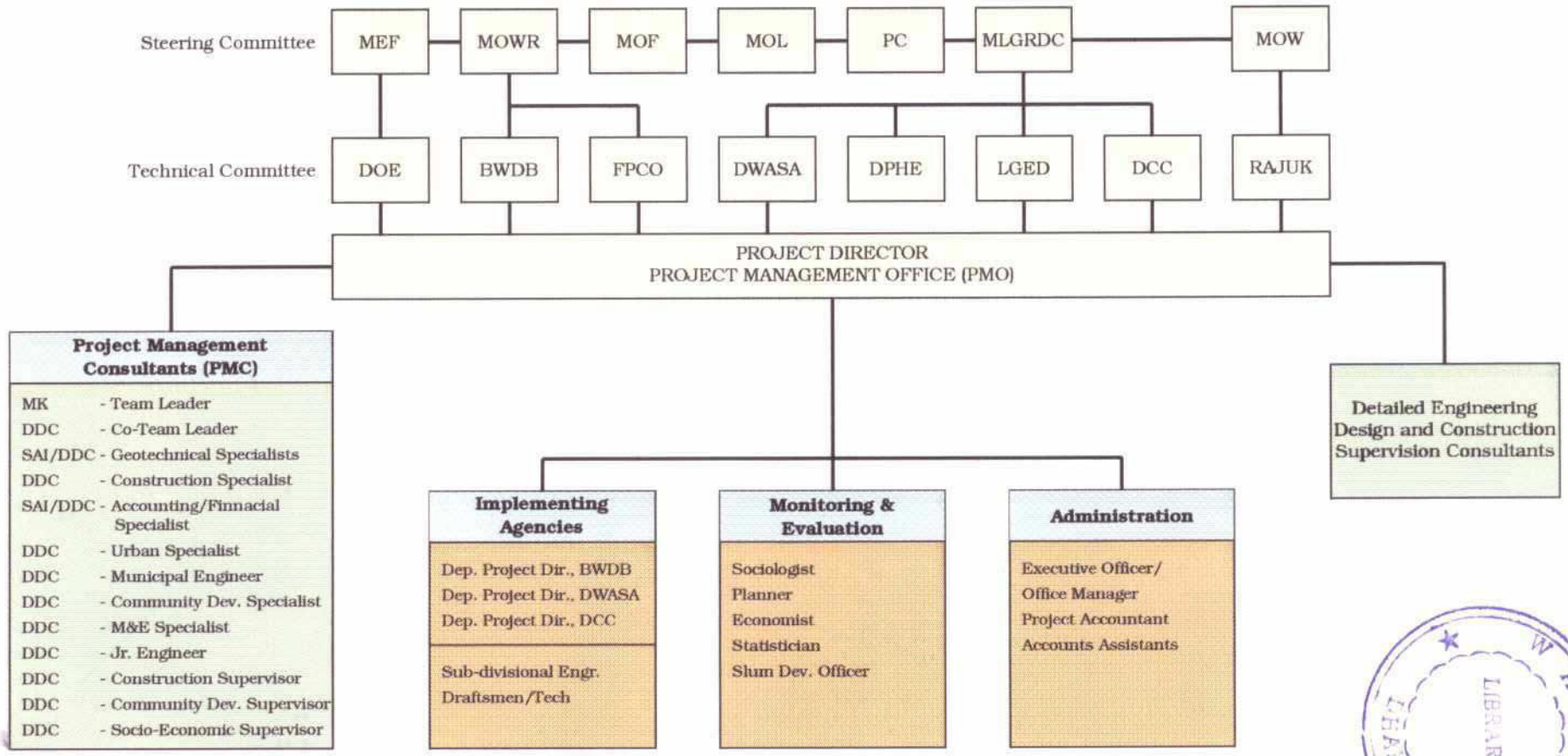
II.6. Consulting Services

Consulting services will be provided to strengthen project management and implementation capabilities including engineering

DHAKA INTEGRATED FLOOD PROTECTION PROJECT

Figure II.1

PROJECT ORGANIZATION CHART



design and construction supervision, financial and management information systems, and PBME activities. In addition, consulting services will be utilized to promote public participation and acceptance of project facilities including greater beneficiary and NGO participation in the operation and maintenance programs, public health and sanitation practices.

Therefore, two consulting engineering consortium have been appointed for: (1) detailed engineering design and construction supervision; and (2) providing advisory services to the PMO in the management of the project. These consultants have been engaged in accordance with the Asian Development Bank's Guidelines on the use of Consultants.

II.7. Terms of References for Project Management Consultants

The Project Management Consultants (PMC) to be engaged should be an international firm in association with national consultants. According to the contract agreement, the PMC are to provide consultancy services necessary for the effective implementation of the project, such services to constitute assistance to the Project Management Office (PMO) to control, supervise, monitor and evaluate the work of the Detailed Design and Construction Supervision Consultants. The consultants will support and advise the PMO in planning, implementing, and evaluation activities, with the Project's overall objective of achieving the physical, financial, and scheduling targets established under the project. Responsibility of the individual professionals to carry out their consultancy services are explained in **Appendix-A.**

II.8. Proposal and Tasks with Project Management Consultants (PMC)

Morrison Knudsen Corporation (MK), formerly known as International Engineering Company (IECO), submitted proposal for providing project management consulting services for Dhaka Integrated Flood Protection Project (DIFPP), on December 11, 1992. As associate consultants, the team included two additional highly experienced professional firms as follows :

- Sheladia Associates, Inc. (SA)
- Development Design Consultants Ltd. (DDC)

According to the proposal, the MK Team will be organized to provide the services described in the Scope of Work of the TOR. The MK Team will be directly responsible to the PMO's Project Director and indirectly to the ADB, through the MK Team's Project Implementation Advisor (PIA)/Team Leader.

This team will comprise international consultants (MK) and (SA) in the areas of geotechnics and accounting/financial /MIS. The remainder of the team will comprise domestic specialists, from our local associates (DDC), in civil/hydraulic engineering, geotechnics, accounting/financial, municipal engineering, urban

planning, monitoring and evaluation, community development, and construction.

The MK Team's PIA/Team Leader will have overall responsibility for the team. However, each team member will interact with his or her counterpart(s).

The comprehensive project task sequences as proposed by MK Team are:

Planning Phase

During initial project formulation and planning, the PMC will assist the PMO to prepare or finalize economic and market analysis, environmental assessments, alternative site selection analysis, long-range budget financial planning studies and forecasts, coordinate preliminary design and provide support for public involvement and media meetings and briefings. The assistance during this initial phase will allow the staff of the PMO to focus their attention on the key physical and financial issues central to obtaining popular support for the project.

The PMC will assist the PMO to develop a comprehensive Project Benefit Monitoring and Evaluation (PBME) system. The PBME activities will be coordinated by the PMO with active involvement of the DOE. The actual carrying out of PBME activities, including the establishment of base line information, data collection, and analysis will be the responsibility of the respective implementing agencies. It is planned that the PBME system will become a part of the Management Information System (MIS) of the implementing agencies.

The PMC will assist the PMO and implementing agencies in cost recovery measures and financial management and will emphasize on-the-job training (OJT) for counterpart personnel who will be responsible for performing these functions after the project has terminated. At the beginning of the project, the MK Team will develop a Comprehensive Training Programme for beneficiaries of the project effort and all specialists will participate in the training activities during their tenure on the project.

The tasks of the PMC's financial specialist are described more fully in the TOR. Briefly, the task will include :

- Review existing procedures and design a simplified accounting, budgetary control and management information system.
- Monitoring the introduction of cost recovery mechanism and determine progress in revenue generation and financial management.
- With counterpart staff, provide necessary interface on financial matters between Government agencies and ADB.

- Facilitate production and audit of required project accounts, records, and reports.
- Monitor financial recovery measures.
- Provide advisory support and assistance to the Project Financial Manager.

Implementation Phase

As Project Management Consultants (PMC), the involvement in assisting the staff of PMO during the implementation phase will have a substantial and beneficial influence on the project. The PMC will assist and train PMO Personnel in the following overall task during design phase :

- Review the technical design and implementation programme for project components and advise on modification where appropriate.
- Liaise closely with counterpart project Implementation Office staff on preparation of contracts, specification and cost estimates for Project components.
- Coordinate design interfaces between design firms and major equipment suppliers.
- Ensure uniformity of specification between each designer by providing common criteria definition and parameters.
- Monitor and expedite as necessary progress on design packages.
- Represent user O&M requirements in the preparation of design.

Typical operations to be performed by the PMC during Implementation phase would be :

- Establish detailed design programme and schedule in conjunction with project controls.
- Prepare engineering design cost estimate within overall budget.
- Provide reports on progress of design efforts and furnish to PMO, ADB and others.
- Coordinate design preparation activities with construction schedule.
- Assist the design and construction managers during check-out quality control and startup.
- Determine design concepts consistent with construction requirements and FPCO guidelines.

For the PMO, the PMC team involvement during this phase may include:

- **Prepare Master Schedule** - Assist in preparing a master project schedule using milestones established in the overall construction programme to ensure that the work can be performed in the allotted time. Identify points of coordination with the work of others and check for practicality.

- **Establishing Interface with Operations/Maintenance** - Identify the GOB's operations/maintenance representatives for early participation in design reviews. This interaction will be essential to maximize the reliability, operability and maintainability of the project, and will substantially reduce life cycle cost.

- **Review Constructibility** - Assist the PMO with review of designs and specifications periodically and prepare reports identifying revisions or enhancements to simplify construction, accelerate the schedule, minimize costs and reduce the possibility of claims and extra work.

- **Construction Contract Planning** - Assist the PMO in its performing detailed studies to coordinate the proposed work with that of ongoing operations, tenants, other contractors and with existing facilities and utilities. Identify access and storage areas & utility connections. Define special working hours and other constraints. Identify special provisions for construction documents.

Bidding and Award Phase

The PMO's and PMC's involvement in every aspect of the construction contract bidding and award phase is vital to the efficient management of the project because it will provide continuity from planning and engineering design to potential contractor's first inquiries through final acceptance of the work. In addition to those tasks required for control of the contractor(s), the inspection staff will be assembled and procedures, documentation, check list and other aids will be finalized. With advice, assistance and training, as required from the PMC, the PMO will:

- **Review Contract Documents** - Review bid drawings and specifications, special provisions and the design engineers scope of work to develop complete familiarity with project requirements.

- **Finalize Procedures** - Finalize procedures for administering the project. Inspection procedures, testing programs and reporting requirements will be checked with contract requirements.

- **Assist in Administration of Bidding and Award Procedures** - In accordance with the BWDB's policies and direction: coordinate and distribute bid documents including addenda; conduct pre-bid conferences and distribute questions and answers to all participants; attend the bid opening; prepare bid evaluation documents and recommendation in conjunction with the PMO, conduct a pre-construction meeting with the successful bidder; coordinate and expedite the submittal of all preconstruction documentation; and establish a complete written record of all such activities.

Construction Phase

The construction objective of each project executed with plans and specifications or procurement documents by the design engineer is to complete the project or procure the item on schedule, within budget, and to operate or function as the design engineer intended. Successful achievement of the PMO's construction objectives requires that either the PMO or the Design Consultant (DC) perform the following functions with advice, assistance and training from the PMC during the construction phase:

- **Procurement and Logistics Functions** - In particularly complex, multi-facetted, and geographically widespread project, such as the DIFPP, it may be advantageous to have the PMO assume some procurement and logistics responsibilities. As the project may require the arrival of long-lead time material prior to commencement of construction, the PMO can: provide procurement and logistics element which take specifications from the design engineer; order equipment on behalf of the GOB; arrange (or coordinate) shipment, receive, inventory, and arrange for stores (as necessary), and then issue to performing contractors, the owner supplied equipment.

- **Provide Inspection Overview** - Inspection is a critical element of construction management. The PMO will provide overview functions to see that the Design Consultant's inspection plan provides a program to ensure that the right inspectors, in the right numbers, are at the right places at the critical times.

- **Coordinate Contractors** - Multiple contractors require effective coordination to ensure that the work is understood, that interference is anticipated and that the potential for claims in minimized. The PMO may provide a single point of contact for each contractor to ensure the necessary coordination and communication.

- **Administer Contract(s)** - The PMO will provide contract administration (including progress verification and payment certification) for assigned project in accordance with the policies and direction of the GOB. Effective contract administration emphasizes enforcement of

contract provisions and change control. Enforcement of contract provisions is based on fair and impartial interpretation of the documents. The PMO change control system will provide the GOB with a mechanism to analyze each change in terms of impact on cost and schedule, effect on interfaces and need, and then to decide whether or not to incorporate the change.

- **Control Schedule and Cost** - The complexity of DIFPP require responsive reporting based on accurate input to provide quick/perceptive and timely progress reporting. Construction contract provision for both schedule updates and progress payment requests ensured uniformity of data and results in reports which provide the basis for informed decision making. The PMO project control system will emphasize forecasts-to-completion, and should have the capability to look at individual project segments and overall program.

- **Quality Control** - The DIFPP will require an overall quality control program which specifies the role of all participants. Typically, the PMO will provide and coordinate this program including : contractual provision for contractor's quality control; materials testing program; training of local staff in appropriate laboratory methods and testing procedures, coordination of inspections by the design engineer and PMO off-site inspections (for example, precast yards); source inspections (for engineered equipment items); and quality program documentation.

- **Document Control** - Tracking and accounting of the large number of documents related to a construction program generally requires the application of a numbering system and continual status updates. Example of documents with which the PMO will formally control project implementation/construction, include shop drawing submittal, as-built plans, procedures, and startup and precommissioning plans.

- **Safety Engineering** - The PMO with the assistance of PMC, will coordinate the GOB safety program by writing the safety plan, providing appropriate language in contracts, attending safety meetings, and documenting inspection results.

- **Planning for Operation and Maintenance** - The PMO, with assistance from the PMC, will assemble all as-built information, manufacturer's documentation and other materials into manuals for use by the GOB maintenance team. The PMC will assist the PMO tailor the O&M standards and procedures to ensure they are appropriate for works completed.

- **Recommissioning and Startup** - The PMO with assistance from PMC will prepare the acceptance testing plan

procedures necessary for the orderly startup of the facilities.

- **Improve Urban Environment** - The PMO is responsible for the upgrading of slum and sqatter areas through the improvement of khals and drains and disposing of noxious deposits.

- **Improve Solid Waste Collection** - The PMO is responsible for the improvement of the collection of solid waste by increasing waste collection equipment vehicles and facilities.

- **Upgrade Sanitation Facilities** - The PMO will be responsible for the upgrade of public health and quality of the urban poor by providing additional public toilets, **washing** areas and drians.

- **Training** - The PMO, with assistance from all the Consultants, will engage in OJT and short formal training exercises directed at improving the knowledge and skills of PMO and urban populations.

Post Construction & Operation Phase

The PMO will also be responsible for the post-construction and operation phase of each part. The PMC will assist the PMO in this activity. The most important feature of this phase is the establishment of a maintenance program, supply of maintenance equipment and formal training of personnel to safeguard the drainage improvement investment. Also included in this phase are the check-out/start-up of systems and final completion documentation of constructed features. The PMC involvement during this phase should include the following:

- **Maintenance Program -** Assist in preparing a maintenance plan for the features designed or rehabilitated. The maintenance program will include schedules, manpower and equipment requirements. After the plan is approved, the PMC will assist the PMO in the requirement and training of the maintenance personnel. The PMC will also assist in obtaining the proper equipment and the location for storage of equipment, maintenance of the equipment and storage of offices where the workers will meet and obtain their direction for work activities. A management system will be established so that the maintenance work can be monitored. This will help ensure that the investment in the drainage system can be safeguarded.

- **Post-Construction Activities** - The PMO with, the assistance of the PMC, will prepare punch lists for incomplete work, follow-up to determine when the work was completed, and to ensure that as-built drawings are provided by the Design Consultant before final acceptance of DIFPP components.

II.9. Contract Requirements

A Contract was made on the 31 date of July 1994 between the Bangladesh Water Development Board and Morrison Knudsen Corporation/Transportation and Water Resources Group (MK) in association with Sheladia Associates Inc. (SA) and Development Design Consultants Ltd. (DDC). According to this contract MK will retain full obligations for the satisfactory completion of the consulting services to be performed hereunder.

WHEREAS

(A) by an Agreement dated 19 January 1992 (hereinafter called the Loan Agreement) between the Bangladesh Water Development Board (hereinafter called the Client) and the Asian Development Bank (hereinafter called the Bank), the Bank has agreed to make a loan to Bangladesh for the purpose of financing the Dhaka Integrated Flood Protection Project (hereinafter called the Project) :

(B) the Client's obligations to the Bank are being guaranteed by the Government of Bangladesh (hereinafter called the Government) pursuant to a Guarantee Agreement dated 19 January, 1992 between the Government of Bangladesh and the Bank;

(C) the Client has requested the Consultant to provide consulting services (hereinafter called the services) necessary for the effective implementation of the Project, such services to constitute assistance to the Project Management Office (Hereinafter called the PMO) to control, supervise, monitor and evaluate the work of the detailed design and construction supervision consultants. The Consultant will support and advise the PMO in planning, implementing, and evaluation activities, with the Project's overall objective of achieving the physical, financial, and scheduling targets established under the Project, as detailed in the Terms of Reference in Appendix A of this contract. These targets include flood protection works, drainage and sanitation works, and the relocation of squatters now settled in project areas.

The following major requirements are highlighted from the contract:

II.9.1. Staff Requirements

It is estimated that the above consulting services will require about 288 mm of consulting services 56 mm international, 232 mm domestic) for Project management with the following expertise :

Project Implementation Advisor/Team Leader (International)
Civil/Hydraulic Engineer/Co-Team Leader (Domestic)
Geotechnical Specialist (International)
Accounting Financial and MIS Specialist (International)
Municipal Engineer (Domestic)

Urban Planner (Domestic)
Monitoring and Evaluation Specialist (Domestic)
Community Development Specialist (2 Nos.)(Domestic)
Construction Specialist (Domestic)

II.9.2. **Consultant's accommodation**

It would be the responsibility of the domestic consultants to arrange the office accommodation for the international consultant staff.

II.9.3. **Duration of Consultancy**

The consultancy was expected to start in February, 1993 and continue upto June, 1997 (domestic consultants will take the lead at the end of international consultants period)

II.9.4. **Reporting Requirements**

The consultants will review the progress of the work and revise the overall plan as necessary; identify problems and issues which may negatively affect the Project in it's implementation and delivery of the benefits, and submit the findings and recommendations to the Executing Agencies and PMO through : (a) an Inception Report (15 copies) at the end of eight weeks following mobilizations; and (b) regular Quarterly Progress Reports (15 copies) as required by BWDB/Ministry and ADB. The consultants will prepare at the end of the consultant services, a draft project completion report (15 copies) summarizing the detailed Project Implementation Record (status of physical facilities, milestones, disbursements, etc), issues and problems encountered, results of the Project impact monitoring, recommendations for follow up actions and considerations for similar project, etc. as per requirement of BWDB/Ministry and ADB. Final Report (15 copies) is to be submitted after modifying the draft report as per comments of technical committee and Steering committee which will be communicated within a month of the receipt of the draft report.

II.9.5. **Counterpart Facilities**

BWDB through PMO would assist to

(i) collect available data, maps, reports and all such relevant materials:

(ii) work in close co-operation and harmony with the consultants for detailed Engineering design and construction supervision of the Project:

(iii) keep close liaison with the Implementing Agencies of the Government and collect necessary information for the project: and

(iv) maintain contact with the Government agencies, NGOs' ADB etc to effectively carry out the assigned job.

II.10. Manning Schedule

The duration and schedule of the MK team assignments as anticipated in the contract is presented in **Figure II.2.**

II.11. Project Activities

In the proposal by Morrison Knudsen (MK) to carry out the Project Management Consultant's/Network Schedule, two type of the project activities have been identified. Indeed, the administrative and managerial tasks are classified as the General Activities and the Physical and Technical tasks of the three components of the project are listed as the Specific Activities. The principal activities of these two classes are listed as below:

II.11.1. General Activities

Coordinate Implementation of Project Activities
Interface with Agencies
Review Designs and Plans
Establish Quality Assurance and Controls
Train Local Staff and Urban Communities
Estimate Embankment Rehabilitation Works
Establish Testing Procedures
Monitor Activities
Review and Update Financial and Cost Recovery Procedures
Modernize Municipal Operation and Maintenance Procedures
Establish and Management Information System
Establish Environmental Improvement Program
Coordinate Urban Planning
Monitor and Evaluate Project Impact
Establish Benchmark Data (Allow two complete seasons)
Improve Community Relations and Communications

II.11.2. Specific Activities

Part A - Flood Protection

A-1 Complete Remedial Works
A-2 Construct Flood Walls
A-3 Construct Drainage Sluices
A-4 Construct Pump Station
A-5 Improve Road
A-6 Implement Operation & Maintenance Program
A-7 Construct Building

Part B - Drainage

B-1 Rehabilitate Drains
B-2 Complete In-progress Drain Work
B-3 Maintain Drains

DHAKA INTEGRATED FLOOD PRTECTION PROJECT

PERSONNEL LIST AND MANNING SCHEDULE

Figure II.2

Firm	Name	Position	1993 JFM	1993 AMJ	1993 JAS	1993 OND	1994 JFM	1994 AMJ	1994 JAS	1994 OND	1995 JFM	1995 AMJ	1995 JAS	1995 OND	1996 JFM	1996 AMJ	1996 JAS	1996 OND	1997 JFM	1997 AMJ	Man–Months Field	Home	Total	Local
FIELD STAFF																								
MK	G. Roy Elmore	Team Leader					—	—	—	—	—	—	—	—	—	—				—	31.5		31.5	
DDC	Mabinuddin Chaudhury	Co–Team Leader					—																	41.5
SAI	Brain A. Chappell	Geotechnical Specialist					—	—	—												6		6	
DDC	Mollah Mohammad Ali	Geotechnical Specialist					—								—	—	—	—	—	—				22
SAI	Issac S. Massoud	Accounting/Financial Specialist					—	—	—												9		9	
DDC	Shamsuddin A. Bhuiyan	Accounting/Financial Specialist					—				—	—	—	—	—	—	—	—	—	—				36
DDC	A.J.M. Alamgir	Municipal Engineer					—						—	—	—	—	—	—	—	—				24
DDC	Abdul Faraz Khan	Urban Planner					—	—	—	—														12
DDC	Mizanur Rahman	Monitoring & Evaluation Specialist					—	—	—	—	—	—	—	—	—	—	—	—	—	—				16
DDC	Rakhi–Das Purkayastha	Community Development Specialist						—	—	—	—	—	—	—	—	—	—							6
DDC	A.F.M. Mafizul Islam	Community Development Specialist					—	—	—	—	—	—	—	—	—	—	—	—	—	—				20
DDC	Md. Mustafizur Rahman	Construction Specialist					—																	41
																			Field Total:		46.5	0	46.5	218.5
HOME OFFICES STAFF																								
MK	Harry Blohm	Project Sponsor					—	—	—	—	—	—	—	—	—	—	—	—	—	—		0	0	
SAI	Paul J. Theurer	Project Sponsor					—	—	—	—	—	—	—	—	—	—	—	—	—	—		0	0	
MK	Fred Schantz	Home Office Coordinator					—	—	—	—	—	—	—	—	—	—	—	—	—	—		0	0	
SAI	Robert Nothstein	Home Office Coordinator					—	—	—	—	—	—	—	—	—	—	—	—				0	0	
																			Home Office Total:			0	0	

* Co–Team leader for duration of assignment only

Part C - Environmental Improvement

C-1 Resettle Urban Poor
C-2 Improve Slum Conditions
C-3 Upgrade Solid Waste Management Practices
C-4 Modernize Sanitation & Water Supply Facilities

II.12. Project Cost and Financing Arrangements

The total cost of the Project is estimated at $119.8 million equivalent, including duties and taxes, of which $38.5 million or about 32% is the foreign exchange cost, including a service charge of $3.2 million on Bank loan during construction. Local currency costs are $81.3 million equivalent or about 68%. Since more detailed engineering surveys are yet to be carried out, physical contingencies for civil works and equipment and materials have been estimated between 8-10% for various components. A summery of cost estimates is given in **Table I.1.** The allocation of costs to the three components of the project is also summarized in **Table I.2.**

It is proposed that the Bank provide, from its Special Fund resources, a loan of $91.5 million, which will represent 76.4 per cent of the total Project cost. The loan will finance the entire foreign exchange cost of $38.5 million (including the service charges of $3.2 million on the Bank's loan during construction), and $53.0 million equivalent of the local currency costs. Local cost financing will cover civil works and equipment and materials, consulting services and Project Management costs, all excluding duties and taxes, and 50 percent of the incremental operations and maintenance costs on a gradually declining basis. The Government of Bangladesh and its agencies will meet the balance costs of $28.3 million not covered under the Bank loan, including $9.2 million for land acquisition, $16.4 million for duties and taxes, and $2.7 million for incremental staff and O&M. The proposed Bank loan will have a term of 40 years, including a grace period of 10 years. The Borrower will be the People's Republic of Bangladesh. The proposed financing plan is presented in **Table I.3.**

The Government will be responsible for repayment of the loan and will bear the foreign exchange risk. Under the proposed financing plan, the financing of the drainage component (Part B) to be implemented by DWASA will be on the basis of 95% grant and 5% loan while the financing of the environmental improvement component (Part C) to be implemented by DCC will be on the basis 90% grant and 10% loan. Interest on the subsidiary loans will be repayable at the rate of 12.5% per annum. The term of the subsidiary loan will be 20 years, including a grace period of 5 years.

Table I.1 : Summary of Project Costs
($ Million)

		Foreign Exchange	Local Currency	Total
I.	**Base Costs a/**			
	Land	-	8.91	8.91
	Civil Works	18.09	40.39	58.48
	Equipment & Materials b/	9.00	12.23	21.23
	Incremental Staff/O&M	1.08	3.16	4.24
	Project Management c/	0.22	1.34	1.56
	Consulting Services	1.41	2.90	4.31
	Sub total :	**29.80**	**68.93**	**98.73**
II.	**Contingencies**			
	Physical d/	3.05	6.21	9.26
	Price e/	2.45	6.16	8.61
	Sub total :	**5.50**	**12.37**	**17.87**
III.	**Interest During Construction**			
	Service charge on Bank loan	3.20	-	3.20
	Sub total :	3.20	-	3.20
	Total Project Cost f/	**38.50**	**81.30**	**119.80**

a/ June 1991 Prices
b/ Includes O&M equipment and materials
c/ Includes office costs, staff, support vehicles, and equipment for the Project Management Office.
d/ 15 percent for consultants, and 8-10 percent for various items of civil works and materials and equipment.
e/ Price escalation includes (a) for foreign costs, 4.9 percent per annum during 1992-1994 and 3.7 percent per annum thereafter; and (b) for local costs, 6 percent per annum throughout.
f/ The local cost includes duties and taxes estimated at $ 16.4 million equivalent.

Table I.2. PROJECT COST ESTIMATES
(Base Cost in $ Million)

	Foreign	Local	Total
I. Cost Estimates by Parts			
Part A : Flood Protection	16.27	29.83	46.10
Part B : Drainage	8.98	27.95	36.93
Part C : Environmental Improvements :	2.92	6.91	9.83
i) Slum Improvements	0.47	1.39	1.86
ii) Solid Waste Management	1.40	2.43	3.83
iii) San/WS/Local Drainage	1.05	3.09	4.14
Part D : Project Implementation Asst.	1.63	4.24	5.87
i) Incremental Administration	0.22	1.34	1.56
ii) Consulting Services	1.41	2.90	4.31
Total :	29.80	68.93	98.73

Table I.3: Proposed Financing Plan
($ Million)

	Foreign Exchange	Local Currency	Total	Percent
External Sources				
Bank Financing	38.5	53.0	91.5	76.4
Domestic Sources				
Government	-	26.9	26.9	22.4
DCC	-	0.6	0.6	0.5
DWASA	-	0.8	0.8	0.7
Total	**38.5**	**81.3**	**119.8**	**100.0**

III. CURRENT STATUS

III. CURRENT STATUS

III.1. The Project.

Prior to the involvement of the Project Management Consultants, the implementation of some of the tasks of the three components of the project have either been partially completed and/or are on-going. These progresses have been reviewed and identified by a Loan Review Mission from the Asian Development Bank. This Mission visited the project from 10 to 30 October 1994 and their findings which can be the best representative of the current status of the project are summarized as below:

III.1.1. Part A : Completed Flood Protection Tasks

1. As of 15 October 1994, the condition, level and cross-section surveys (of intensive and remedial works) have been completed.

2. Some savings are anticipated in areas where crest broadening alone without the installation of wick drains will serve the purpose.

3. All minor remedial works of embankment have been completed except for some dredging.

4. Design work for protection against wave action on 2.5 km section embankment has been completed.

5. Construction on three of the sluices under the Central Spine Road has been completed.

6. Design work on eight of the sluices under the Central Spine Road has been completed.

7. 10 no. of Sluices on the Western Embankment have been completed.

8. Prequalification and tendering for one package which covers about 50 percent of the raising of 10.4 km of the Central Spine Road have been completed.

9. The survey of the 1.82 km Section of new flood wall has been completed.

10. The field survey and some of the required concrete testing have been completed on 7.8 km of flood wall.

11. The design of the Goran Chatbari Pump Station No. 3 has been partially completed.

12. A Contract agreement for raising the Central Spine Road is in the process of finalization.

III.1.2. **Part A : On-Going Flood Protection Tasks**

1. The remaining embankment remedial work will be tendered through ICB procedures. Implementation schedule for the intensive and moderate remedial works are as follows :

Design, Estimation, ICB Document Preparation	Oct.-Nov. 1994
Pre-qualification, tendering, award of contract	Dec.94-March 95
Mobilization of Contractor	April 95
Construction Period	May 95-Oct. 96
Settlement Monitoring	Jan. 95-Oct. 96

2. Dredging works have not been completed.

3. Embankment slope protection works are on-going, 4.08 Km scheduled for construction during FY 94/95.

4. It is expected that all of the eight sluices under the Central Spine Road will be tendered for construction during the upcoming dry season.

5. Designs of one large and one small sluices are still under review by BWDB.

6. Sluice No. 11 is to be located with a 2.2 Km section of flood wall protection. The consultant provided BWDB with a number of alternative designs. There is a potential for a major cost overrun for this section of the flood protection wall. The PMO was urged to carefully review the Consultant's proposals and communicate its decision to the Bank as soon a possible.

7. Tendering of the second package for raising 10.4 Km of the Central Spine Road should be given high priority.

8. Two alternative alignments of the new flood wall were presented by the consultant. Design is to be completed by 31 December 1994. Pre-qualification, tendering and award of contract are expected to be completed by June 1995. Constructions is scheduled to begin, weather permitting, by November 1995, in two phases.

9. Design work and additional testing of the strength and integrity of the existing concrete wall is in progress.

10. The final design of Pump Station No. 3 will be prepared as soon as the design minimum and maximum water levels have been decided upon by BWDB.

11. Design of the Functional Building has not yet been taken up, but is expected to commence during FY 94/95.

12. The requirement for mobile dewatering pumps to be used to evacuate ponded water from the west side of the Spine Road

needs to be addressed. Comprehensive proposals for Bank consideration needs to be developed.

13. Dholai Khal Pumping Station must be completed.

14. BWDB to finalize the FY 94/95 Work Plan and report it in the December 1994 quarterly progress report.

15. Preparation of more realistic financial projections for the 94/95 fiscal expenditure in line with 94/96 Work Plan by Consultants for Engineering Design and Construction.

16. A detailed Work Plan and revised budget will be prepared in consultation with MOWR, the Planning Commission and the Project Management Consultants in December 1994.

17. The Mission urged PMO to forward to the Bank the unaudited financial statement for FY 92/93 to comply with the provision of the Covenants.

18. A detailed schedule of Civil works and procurement planned for FY 1994/95, on a monthly basis and a copy of awarded contracts should be sent to the Bank.

III.1.3. **Part B : Completed Drainage Tasks**

12. Minor remedial works on rehabilitation of existing drainage systems are completed and that the remaining contracts designed by the Consultants for Detailed Engineering Design were to be tendered before Oct. 1994.

13. The main Khal rehabilitation and upgrading have been completed.

14. Designs of rehabilitation for the following Khals have been completed :

Paribagh (0.767 Km)
Khilgaon Bashaboo (3.035 Km)
Katashur (1.64 Km)
Ramchandrapur (3.37 Km)
Begunbari (0.25 Km)
Raja Bazar (0.32 Km)
Kallyanpur Branch (10.1 Km)

15. Tenders for the following pipe drain rehabilitations have been invited :

M.P. Check Post- Ibrahim Road Crossing (0.9 Km)
Chandkhar Pool- Paribagh Khal (2.545 Km)
Nazimuddin Road/Bakshi Bazar- Buriganga River (3.39 Km)
Chock Bazar along Champatoli lane - Soarighat (0.78 Km)
Magh Bazar WLC- Madhubagh Outfall (1.085 Km)
Sayedabad Bus term- Dholai Khal (1.06 Km)
Mirpur No.10- Ibrahim Khal (2.21 Km)

Magh Bazar Railway Culvert- Tongi Div. Rd. (0.425 Km)
K.M. Das Lane- Segunbagicha (1.66 Km)

16. Recommendations on Land Development Permission Fee prepared by TA Consultant are being reviewed by RAJUK.

17. A Separate account is being setup in which 5 percent of the rate increase on water fees is being deposited. DWASA is receiving funds for O&M of drainage facilities.

III.1.4. **Part B : On-Going Drainage Tasks**

1. Remaining contracts for minor remedial works on rehabilitation of existing drainage systems, designed by the Consultants for Detailed Engineering Design are to be tendered before December 1994.

2. DWASA is requested to conduct a detailed review of the budget requirement for FY 1994/95 in consultation with the Project Management Consultant Team Leader. Approval of the designs that are currently under review is necessary for the budget review. DWASA is urged to make an extra effort to get their designs approved and to take action to initiate land acquisition to make the best use of the upcoming construction season.

3. RAJUK shall take measures to levy a lump sum development fee from private land developers when granting permission for land development projects.

4. DWASA shall introduce a drainage surcharge on the water bills as is required to cover the O&M costs of the Drainage Components as well as debt servicing, equivalent to 5 percent of the capital costs of Part B of the project.

III.1.5. **Part C : Completed Environmental Management Tasks**

1. Designs/Tenders and Contract Awards of the following Civil Works have been completed and their implementations have already started:

Rehabilitation of 2000 Collection Bins
Construction of 1000 Collection Bins
Construction of 30 Public Toilets
2500 TPS Latrines
3000 SPS Latrines
2500 SAN Latrines Sheds
1000 Tubewells S/Pipes
Rehabilitation 120 Km Storm Drains
71 Km Minor Drain Extn.
Rehabilitation 60 Km Surface Drains
Slum Improvement

2. Designs/Tenders and Contract Awards of the following Machinery and Equipment have been completed and their implementation has already been started :

   5 Mobile Public Toilets
   Drain Gully Sweeper
   2 Septic Desludging Trucks
   2000 Hand Wheelbarrows
   30 Det. Body Garbage Trucks
   120 Demountable Containers
   Hand Tools/Health Equipment
   Health/Training Equipment

3. Tenders and Contract Awards of the following vehicles have been completed :

   Procurement of 25 Motorbikes
   Procurement of 1 Jeep

4. Schemes for 72 of the total of 2500 toilets in the City Pally have been finalized.

5. Schemes for 72 locations of Sanitary Latrine Sheds have been finalized.

6. Location of 3 public toilet sites have been selected.

7. An operational plan for survey work for Dhaka City has been submitted to the Ministry of Land.

8. The proposed amendments to the conservency tax rate have been sent to the Local Government for approval.

III.1.6. **Part C : On-Going Environmental Management Tasks**

1. The Mission suggested that DCC ask the Consultant to review the Project cost estimates for the DCC component.

2. The consultant is now working on the design of planning for City Pally.

3. The consultant has reviewed the DCC work, and DCC is now incorporating the consultant's recommendations into the design.

4. The consultant has prepared necessary drawings and estimates regarding the Single Pit Latrines and sent them to the PMO for its approval.

5. 2428 locations for Sanitary Latrine Sheds still need to be finalized.

6. DCC is currently reviewing the proposed locations for 22 additional public toilets.

7. In the area of encouraging local participation, meetings with Mayor's office should be organized.

8. Intensive Community work to activate local community leadership in slum improvement is recommended.

9. The cadastral survey exercise should begin as scheduled by Nov. 1994.

10. DCC is reminded to continue its efforts to enlist local participation in the O&M activities.

11. DCC shall take all necessary measures to increase the charges for Solid Waste/conservancy services which may be required to cover the incremental O&M costs and debt servicing for the solid waste component of the project.

III.2. **Consulting Services**

To provide assistance to the Project Management Office, two consulting engineering consortiums have been appointed to provide the following services :

1. Detailed Engineering Design and Construction Supervision.

2. Project Management Consultantancy

Prior to the involvement of the Project Management Consultants, the consultancy services for the Detailed Engineering Design and Construction Supervision have been started. Their current status as briefly extracted from their Quarterly Progress Report, July-September 1994 is as follows:

III.2.1. **Detailed Engineering Design and Construction Supervision.**

The Contract for Detailed Engineering Design and Construction Supervision Consultancy of Dhaka Integrated Flood Protection Project was awarded to Technoconsult International Limited (TCIL) as the Lead Firm in Association with Louis Berger International INC., USA (LBIL). The contract was signed on 22 March 1994. Technoconsult mobilized its personnel and logistics support on 24 March 1994 and Consultancy services commenced from the same date.
The consultancy services to be rendered for the Project covers the period from 24 March 1994 to 30 June 1997.

III.2.2. **Project Management Consultants**

The contract for Project Management Consultancy of Dhaka Integrated Flood Protection Project was signed with Morrison Knudsen Corporation (MK) as the lead firm in association with Sheladia Associates, Incorporated (SA) and Development Design Consultants Ltd. (DDC), on 31 July 1994. As reported in the

Aide Memorie of the Loan Review Mission, dated 29 October 94, due to the long time elapsed since the proposal, the original Team Leader was not available, and first replacement candidate was not approved by the Ministry. A suitable candidate, Dr. Majid Ghaboosi, was approved by the Ministry and the Team Leader arrived in Dhaka on 26 October 1994. Dr. Ghaboosi and MK's International Operations Manager, Mr. Frederick F. Schentz, attended a PMC/PMO start-up meeting on the day of arrival.

III.3. **Cost Estimate**

The financial progress of the project has been reflected by the Project Management Office in its Progress Report for the month of October, 1994. This financial progress which represents the current budgetary status of the project is summarized in **Table III.1.**

*SAB-2/COMP-1/2

Table - III.1

DHAKA INTEGRATED FLOOD PROTECTION PROJECT

Financial and Physical Projections

(In Lac. Taka)

1.	Project Implementation Period	1991-92 to 1996-97			
2.	Financial Progress upto October 94				
		Estimated Cost	Actual Exp.	Progress	
	B.W.D.B	23,966.40	5,003.71	20.88%	
	DWASA	15,897.87	7,239.83	45.54%	
	DCC	4,719.00	279.23	5.92%	
3.	Work Program & Progress for (July to Oct.'94)	Work Program 1994-95	Work Program July to Oct.'94	Exp. July to Oct.'94	Progress
	B.W.D.B	9,702.00	867.00	158.17	18.24%
	DWASA	3,898.00	460.00	216.97	47.17%
	DCC	2,400.00	185.00	Nil	Nil
4.	Physical Progress and Program 94	B.W.D.B	DWASA	DCC	
	Physical Progress upto 31 October 1994	15.90%	39.24%	16.17%	
	Physical Program for 1994-95	23.13%	22.71%	50.80%	

Source : Physical and Financial Progress Report by PMO, October 1994

IV. INCEPTION PHASE

IV. INCEPTION PHASE

IV.1. Manning Schedule

In order to provide the degree of flexibility required to achieve the overall work plan some variation in the Manning Schedule has been made. Substitution of some personnel has become unavoidable due to the delay in signing the contract. The revised manning schedule is presented in **Figure IV.1.**

IV.2. Staff Mobilization

The particulars of the staff members so far joined the project to carryout their assigned tasks are as follows:

Name	Position	Date of Commencement.
Dr. Majid Ghaboosi	Team Leader	October 26, 1994
Mr. Mabinuddin Chaudhury	Co-Team Leader	October 26, 1994
Dr. Brian A. Chappell	Geotechnical Specialist	October 26, 1994
Mr. Md. Mustafizur Rahman	Construction Specialist	October 26, 1994
Mr. Shamsuddin A. Bhuiyan	Accounting/Financial Specialist	November 19, 1994

IV.3. Office Accommodation

It was recommended, in the contract agreement, that the Project Management Consultants (PMC) will preferably be accommodated in a common office building with the Project Management Office (PMO). However, due to the lack of availability of the required space in Project Management Office Building and also due to the non-availability of a single space to accommodate both the offices of the Project Director and Project Management Consultants, a separate office space was selected on the third and fourth floors of a building adjacent to the existing Project Management Office. The selected office with about 316.00 Sq.m. is located at the following address :

371/A, Outer Circular Road,
Rajarbagh
Dhaka-1217.

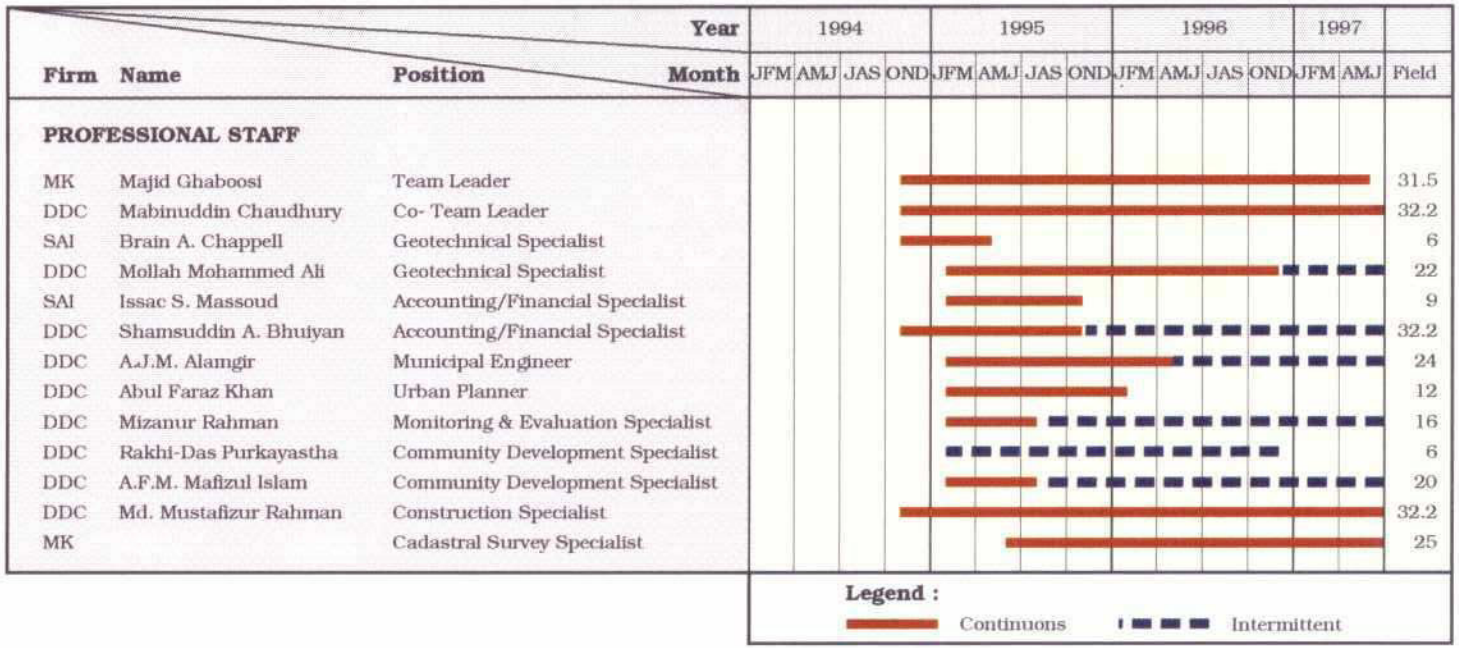
To make this space ready for office use, a major remodelling work was necessary. Therefore, a temporary office with the basic office equipment was established at :

House No. 17, Road No. 4
Dhanmondi R/A
Dhaka-1205.

DHAKA INTEGRATED FLOOD PROTECTION PROJECT

Figure IV.1

PERSONNEL LIST AND MANNING SCHEDULE



Firm	Name	Position	Field
PROFESSIONAL STAFF			
MK	Majid Ghaboosi	Team Leader	31.5
DDC	Mabinuddin Chaudhury	Co- Team Leader	32.2
SAI	Brain A. Chappell	Geotechnical Specialist	6
DDC	Mollah Mohammed Ali	Geotechnical Specialist	22
SAI	Issac S. Massoud	Accounting/Financial Specialist	9
DDC	Shamsuddin A. Bhuiyan	Accounting/Financial Specialist	32.2
DDC	A.J.M. Alamgir	Municipal Engineer	24
DDC	Abul Faraz Khan	Urban Planner	12
DDC	Mizanur Rahman	Monitoring & Evaluation Specialist	16
DDC	Rakhi-Das Purkayastha	Community Development Specialist	6
DDC	A.F.M. Mafizul Islam	Community Development Specialist	20
DDC	Md. Mustafizur Rahman	Construction Specialist	32.2
MK		Cadastral Survey Specialist	25

The Project Management Consultants team started functioning, at the temporary office from 26 October, 1994 and continued until they moved to the permanent office on 3 December 1994.

At this point the Project Management Consultants would like to appreciate the efforts of the Development Design Consultants, Ltd. in providing logistic support during PMC's work at the temporary office and for enabling smooth transfer to the permanent office.

Currently, the permanent office has the following :

IV.4. Support Staff

To assist the PMC team in carrying out their assigned tasks, the following administrative and technical support staff have so far been engaged in the PMC Office from the dates shown against each.

Name	Position	Date of Commencement.
1. Mr. Syed Akber Reza	System Analyst	21.11.1994
2. Mr. Quazi Mohammad Ferdous	Junior Engineer	10.12.1994
3. Mr. Abu Boker Siddique	Estimator	13.12.1994
4. Mr. Rafiqul Islam	Estimator	15.12.1994
5. Mr. Mostafizur Rahman	Computer Operator	03.11.1994
6. Mr. Prolay Kumar Maitra	Computer Operator	01.11.1994
7. Mr. Quazi Sufiur Rahman	Accounts/Office Assistant	01.11.1994
8. Mr. Shafiur Rahman	Photo Machine Operator	09.11.1994
9. Mr. Hanif Sarder	Messenger/Peon	01.11.1994
10.Mr. Abul Kalam	Messenger/Peon	01.11.1994
11.Mr. Md.Minhajuddin	Messenger/Peon	01.11.1994

IV.5. Transport

The following vehicles with drivers have been provided to the project for the use of the Consultant's Team from the dates shown against them.

Vehicle Dhaka Metro Ka-03-2174 (Car)	27.10.1994
Vehicle Dhaka Metro Cha-02-6585 (Pajero Jeep)	02.11.1994
Vehicle Dhaka Metro Cha-02-4249 (Microbus)	30.10.1994

Office facilities, equipment and operation

Photo Copy Machine	26.10.1994
Word Processor (2)	26.10.1994
Telephone (1) 402640	26.10.1994
Fax 880-2-832907	26.10.1994

IV.6. Meetings

During the inception phase, the Project Management Consultants team have maintained close contact with the Project Director and their counterparts at PMO as well as the experts of the D&S Consultants. A meeting with the Project Director, Mr. A.M. Sadeque Ahmed, the Asian Development Bank's Mission Leader, Mr. David Boggs, and representatives from DWASA and DDC was held on Oct. 27, 1994. During this meeting the status of the project was reviewed and plans for future activities were discussed. Members of the PMC team have also met the concerned officials of the executing agencies (BWDB, DWASA, and DCC) for detailed discussion on the project activities. The PMC Team expresses appreciation and thanks to the officials concerned for extending their full cooperation, guidance and assistance. Special mention in this connection may be made of the Chief Engineer Central Zone, BWDB and Chief Engineer, DCC. The Project Management Consultants are thankful to the Project Director and his staff for extending their full support and cooperation to the PMC in carrying out the tasks assigned to them.

IV.7. Site Visits

The PMC Team members accompanied with the BWDB officials made the following field visits for familiarizing themselves with the field activities.

15.11.94	Dr. Majid Ghaboosi Dr. Brian A. Chappell Mr. M. Chaudhury Mr. Md. M. Rahman	Team Leader Geotechnical Specialist Co-Team Leader Construction Specialist	Inspected western embankment from 0.00 Km to 17.00 Km and the structures therein along with the Executive Engineer BWDB.
17.11.94	Dr. Majid Ghaboosi Dr. Brian A. Chappell Mr. M. Chaudhury Mr. Md. M. Rahman	Team Leader Geotechnical Specialist Co-Team Leader Construction Specialist	Inspected western embankment from about 20 Km to Mitford Hospital and the structures. Also inspected the on-going slope protection work by Cement Concrete Blocks and the site for the proposed sluice no. II and the alignment of the embankment . The concerned Sub-divisional Engineers accompanied.
22.11.94	Dr. Brian A. Chappell Mr. Md. M. Rahman	Geotechnical Specialist Construction Specialist	Inspected the western embankment from 0.00 to 18.00 Km with special attention to the location of extensive and moderate remedial works. The Sub-divisional Engineer PMO accompanied.
24.11.94	Dr. Brian A. Chappell Mr. Md. M. Rahman	Geotechnical Specialist Construction Specialist	Inspected the existing flood wall from Jatrabari to Mitford Hospital. The Sub-divisional Engineer PMO accompanied.

The technical notes in connection with this site visits and literature reviews are presented in **Appendix-B**

V. WORK PLAN

AND

STAFFING

V. WORK PLAN AND STAFFING

V.1. Work Plan

The Project Management Consultant's work plan in providing the services required for the Project Management Office (PMO) is based on the following guideline. This guideline as depicted in the contract agreement states that:

> "The Client has requested the Consultant to provide consulting services necessary for the effective implementation of the Project, such services to constitute assistance to the PMO to control, supervise, monitor and evaluate the work of the Detailed Design and Construction Supervision Consultants. The Consultant will support and advise the PMO in planning, implementing , and evaluation activities, with the Project's overall objective of achieving the physical , financial , and scheduling targets established under the Project, as detailed in the Terms of Reference."

In order to Plan PMC's work strategy on the basis of the above guideline, it is necessary to adopt the above statement to the following stepwise procedure :

Step 1: Identify the Project Activities.

Step 2: Define the Physical, Financial, and Scheduling Targets of the Project Activities.

Step 3: Schedule the Project Management Consultants manpower for the project period.

Step 4: Allocate the PMC's manpower to the project activities.

Step 5: Schedule the Consultants Overall Activities.

The following sections represent the description of each step.

V.1.1. Step 1: Identification of the Project Activities

In application of the Project Management Consultant's Services to the Dhaka Integrated Flood Protection Project two main classes of activities can be identified:

Class 1. Which includes the technical activities, represents the physical targets of the three components of the project. These activities which were originally envisaged by the Terms of Reference and some of them have been subjected to revision during the project implementation which may be further divided into three categories on the basis of the three components of the project.

Class 2. Represents the range of managerial and administrative activities which are necessary in controlling, supervising, monitoring, and evaluating the activities in respect of Class 1 during all of the project phases. These activities can be also divided into three categories as:

Preliminary, General and Training activities. Due to the importance of the PMC's Training Program during the project implementation, this task is explained separately in Section V.2. The classification and lists of the identified project activities are displayed in **Table V.1.**

V.1.2. Step 2: Defining the Physical, Financial and Scheduling Targets of the Project Activities.

The physical, financial, and temporal progresses of the project activities have been regularly monitored by the Project management Office (PMO) and reported through their progress reports. On the basis of the current progress status of the project, a plan to set up the physical and financial targets for the Fiscal Year of 1994-95 has been prepared by the PMO. The summary of this plan in the tabular forms of Activities and Expenditure Schedules for the FY 1994-95 are displayed in **Tables V.2 and V.3** respectively.

V.1.3. Step 3: Staff Scheduling :

The work program of the Project Management Consultants for implementation of Dhaka Integrated Flood Protection Project was originally phased for completion over a duration of 41.5 months. Since the date for loan closing was initially scheduled for June 30, 1997, therefore it was anticipated, in the contract agreement, that the consultancy would start in February, 1993 and continue upto June 1997. But, due to considerable delay in signing the contract as well as finalization of the proposal for replacement of the Team Leader, the manning schedule was not followed as originally anticipated in **Figure II.2**. The updated manning schedule which accounts for delay and adjusts the consultancy period to a shorter duration of 32.2 is therefore presented in **Figure IV.1**. This figure also presents assignment of an additional professional staff, Cadestral Surveying Expert, to the PMC team. This additional position is recommended in the Aide Memoire of the Asian Development Bank's Loan Review Mission, dated 29 October 1994. According to this memoire :

> "An additional input of a cadastral surveying expert should be added to the team of the Project Management Consultant to monitor progress of the work and advise on the introduction of new technologies, method and procedures."

The manmonths for the recommended Cadastral Surveying Expert has been included in the updated manning schedule, however deployment of this position requires an amendment to the Contract Agreement

Table - V.I
Consultants Activities In Relation to Dhaka Integrated Flood Protection Project.

Preliminary Activities	General Activities	Part A. Flood Protection	Part B. Drainage	Part C. Environmental Improvement
	Assist the PMO to control, supervise, monitor and evaluate & to prepare reports, as follows.			**A. Civil Works**
1. Mobilization of Consultant's team and meeting with Project Officials. 2. Roconnesence visit by consultant's team and familiarization with field activities. 3. Collection of reports, maps, and data from executive agencies 4. Review of project activities. 5. Preparation and submission of Inception Report.	1. Coordinate Implementation of Project Activities (On-going) 2. Interface with Agencies (On-going) 3. Review Designs and Plans 4. Establish Quality Assurance & Controls 5. Train Local Staff & Urban Communities (On-going) 6. Estimate Embankment Rehabilitation Works 7. Establish Testing Procedures 8. Monitor Activities (On-going) 9. Review and Update Financial and Cost Recovery Procedures 10. Modernize Municipal Operation and Maintenance Procedures 11. Establish & Management Information System 12. Establish Environmental Improvement Program 13. Coordinate Urban Planning (On-going) 14. Monitor and Evaluate Project Impact (On-going) 15. Establish Benchmark Data (Allow two complete seasons) 16. Improve Community Relations and Communications	1. Land Acquisition 2. Intensive Remedial works of embankment. 3. Moderate Remedial works of embankment. 4. Minor Remedial works/borrow pit back filling. 5. Minor Remedial works/ Jute & Sod. 6. Slope protection (Concrete Block) 7. Sluices (including operator sheds) 8. New Flood Wall/Embankment 9. Remediation of the existing flood wall. 10. Central road improvement and raising. 11. Central road (Flood proofing 13 location) 12. Pump Station 13. Functional Building. 14. Machinery and equipment a) Drainage pump b) Dewatering Pump c) Geotextile and wick drains d) Steel Sheet pile e) Steel gates 15. Transport and Vehicles i) Jeep/Car/Minibus/Truck ii) Motor Cycles	1. Land Acquisition i) Construction & Rehabilitation Main Khal ii) Construction & Rehabilitation Secondary Khal iii) Construction & Rehabilitation Tertiary Khal iv) Pipe drain Construction & rehabilitation. Machinery & Equipment a) Office furnishing and equipment (L.S) b) Dewatering pump and equipment Transport a) Jeep b) Truck with Mechanical Clearing Unit c) Sludge Remover Truck d) Motor Cycle	1. Completion of City Pally 2. Integrated Slum Improvement 3. Rehab. of existing Collection Bins 4. Construction of new Collection Bins 5. Construction of Public Toilets and Wash Houses 6. Twin Pit Sanitary Latrines 7. Single Pit sanitary Latrines 8. Single Latrine Shelters 9. Instalation of Public Stand Pipes. 10. Cleaning and Rehabilitation local storm drains 11. Minor drain extension 12. Surface drain rehabilitation. **B. Machinery & Equipment** Mobile Public Toilet Drain Gully Sweeper Safety tank desludging truck Detachable body garbage trucks Hand Wheel Burrows Demountable Containers Hand tools of health equipment Health training Aids **C.Transport Vehicles** Motor Cycle Supervision Jeep

*ASF/COMP-1/1

Table V.2
ACTIVITY SCHEDULE FOR FISCAL YEAR 1994-95

PROJECT COMPONENTS	TASKS		1994						1995						TOTAL
			JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	
PART A FLOOD PROTECTION	PHYSICAL PROGRESS	TARGET	0.10	0.12	0.15	1.25	1.26	1.27	3.12	3.13	3.14	2.85	2.86	2.87	22.12
		ACHIEV.	--	0.2	0.3	9.29									
	DESIGN	TARGET	--	--	7	8	--	1	--	--	--	--	--	--	16
		COMP.	--	--	5	1									6
	TENDER	TARGET	--	--	--	15	--	--	--	1	--	--	--	--	16
		FLOAT	--	--	--	13									13
		AWARD	--	--	--										
	LAND	PLAN SUBMIT	11.49	--	9.02										20.51
		CLEARED	7.16	--	--										7.16
		EST RCE.	6.99	--	--										6.99
PART B DRAINAGE	PHYSICAL PROGRESS	TARGET	0.50	0.5	0.5	0.5	1.35	3.31	3.32	3.32	3.32	3.32	1.39	1.38	22.71
		ACHIEV.	0.31	0.02	0.02	0.02									
	DESIGN	TARGET	10	10	--	--	--	--	--	--	--	--	--	--	20
		COMP.	--	5	5	10									20
	TENDER	TARGET	--	5	5	10	--	--	--	--	--	--	--	--	20
		FLOAT	--	--	--	10									10
		AWARD	--	--	--										
	LAND	PLAN SUBMIT	8.73	6.46											15.19
		CLEARED	--	1.7											1.7
		EST RCE.	--	--											--
PART C ENVIRONMENTAL IMPROVEMENT	PHYSICAL PROGRESS	TARGET	--	0.11	1.19	1.19	1.19	2.12	10.6	10.6	6.50	6.35	6.35	2.50	48.70
		ACHIEV.	--	--	10.26										
	DESIGN	TARGET	--	5	20	10	5	5	--	--	-	-	-	-	45
		COMP.	--	2	6										8
	TENDER	TARGET	--	30	35	30	15	10	10	10	5	-	-	-	105
		FLOAT	--	35	40										75
		AWARD	--	30	30										60
	LAND	PLAN SUBMIT	N/A												
		CLEARED	N/A												
		EST RCE.	N/A												

Table V.3
EXPENDITURE SCHEDULE FOR FISCAL YEAR 1994-95

PROJECT COMPONENTS		1994						1995						TOTAL
		JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	
PART A	TARGET	149.50	156.00	160.00	401.50	402.50	435.36	1323.00	1347.50	1434.80	1262.50	1273.40	1336.44	9682.50
FLOOD PROTECTION	ACHIEV.	24.28	104.06	29.83	75.19									158.17
PART B	TARGET	100.00	100.00	160.00	200.00	333.80	467.32	467.32	467.32	467.32	467.32	333.80	333.80	3898.00
DRAINAGE	ACHIEV.	96.17	95.50	24.44	39.97									216.11
PART C	TARGET	--	5.00	90.00	90.00	90.00	100.00	500.00	500.00	307.00	300.00	300.00	118.00	2400.00
ENVIRONMENTAL IMPROVEMENT	ACHIEV.	--	--	--	--									

including increases in the work scope and budget allocation. An amendment is under preparation and will be presented to the PMO during the first quarter of 1995.

Furthermore, a review of the project's progress will be made to determine if it will be necessary to reinstate some or all of the reduced man months in order to adequately support the project.

V.1.4. Step 4 : Allocation of the Project Management Consultants Team to the Project Activity.

To achieve the physical, financial, and scheduling targets of the project activities, it is necessary to lead each of the key activities through a sequence of predetermined phases of the project. The main tasks of the Dhaka Integrated Flood Protection Project may be sequenced as below:

- Planning Phase
- Implementation Phase
- Bidding and Award Phase
- Construction Phase
- Post Construction & Operation Phase

For each of the key activities, during the each of these phases, the services of one or more members of the PMC Team are required. Therefore, the allocation of PMC's manpower to the project activities are planned in such a manner that the maximum requirements for the consultant services can be achieved. The matrix form of this allocation and involvement level of each specialist in the project activities are shown in **Figures V.1** and **V.2.**

V.1.5. Step 5 : Scheduling the Consultants Overall Activities

On the basis of the preceeding steps an activity schedule is prepared to represent the Project Management Consultants overall work program considering the project targets and accomplishments. The graphical presentation of this work program is shown in **Figure V.2.**

V.2. TRAINING PLAN

V.2.1 Introduction

AS required in Amendment A of the MK-BWDB Contract (TOR, Section 1.5) and detailed in the MK Team's Proposal for the project, the project training effort will be one of the major efforts of all consulting staff. While the focus of the training effort will be on On-the-Job-Training (OJT) of all project staff, formal training sessions as required will also be conducted by specialists. The objective of the training sessions is to transfer the up-to-date knowledge and skills of the expert staff to their counterparts and to the personnel with agencies working on the project effort.

DHAKA INTEGRATED FLOOD PROTECTION PROJECT

MANPOWER ALLOCATION AND RESPONSIBILITIES

Figure V.1.1/3

Item	Quantity		Design and Implementation Schedule 1993-94 / 1994-95 / 1995-96 / 1996-97	Responsibility of Consultants: Team Leader	Co-Team Leader	Geotechnical Specialist	Construction Specialist	Ac./Fl. Specialist	Urban Planner	Municipal Engineer	Community Dev. Specialist	M. & E. Specialist	Junior Engineer	Construction Supervisor	Community Dev. Supervisor	Socio-economic Supervisor	
Intensive Remedial works of embankment	0.85 km	Design		●	○	●	○	○				○	●	○			
		Implementation		○	○	●	●	○				○		●			
Moderate Remedial works of embankment	1.70 km	Design		●	○	●	○	○				○	●	○			
		Implementation		○	○	●	●	○				○		●			
Minor Remedial works/ borrow pit Back filling	2.48 km	Design		●	○	●	○	○				○	●	○			
		Implementation		○	○	●	●	○				○		●			Complete
Minor Remedial works/ Jute and Sod	17.70 km	Design															
		Implementation															
Sluice Protection (Concrete Blocks)	11.50 km	Design		●	○	●	○	○				○	●	○			
		Implementation		○	○	●	●	○				○		●			
Sluice Including Operation Sheds	5 Nos.	Design		●	○	●	○	○				○	●	○			4 nos. stru. already comp only 1 is for impl.
		Implementation		○	○	●	●	○				○		●			
New flood wall/ embankment	1.60 km	Design		●	○	●	○	○			●	○	●	○			
		Implementation		○	○	●	●	○		○	○	○		●	○	○	
Redemption of the existing flood wall	7.80 km	Design		●	○	●	○	○		○	○	○	●	○	○	○	
		Implementation		○	○	●	●	○				○		●			
Central Road Improvement and raising	10.80 km	Design		●	○	●	○	○	●			○	●	○			
		Implementation		○	○	●	●	○	○	○	○	○		●	○	○	
Central Road Flood Proofing	12 Locations	Design		●	○	●	○	○				○	●	○			Sluice at 1 location is dropped
		Implementation		○	○	●	●	○	○	○	○	○		●	○	○	
Pump Station	1 No.	Design		●	○	●	○	○				○	●	○			
		Implementation		○	○	●	●	○	○	○	○	○		●	○	○	
Functional Building	L. S.	Design		●	○	●	○	○				○	●	○			
		Implementation		○	○	○	●	○	○			○		●			
Land Acquisition																	
				○	○			○	○	○	○	○			○	○	

NOTE : 1. Design includes survey, soil investigation, preparation of drawings, specifications, tender documents and contract award as per the program of the D & S consultants.
2. The Design and Implementation schedule has been prepared as per the program of D & S consultants.
3. ● Direct responsibility ; ○ Indirect responsibility

Figure V.1.2/3

DHAKA INTEGRATED FLOOD PROTECTION PROJECT
MANPOWER ALLOCATION AND RESPONSIBILITIES

Item	Quantity		Design and Implementation Schedule 1993-94 / 1994-95 / 1995-96 / 1996-97	Responsibility of Consultants: Team Leader	Co-Team Leader	Geotechnical Specialist	Construction Specialist	Ac./Fl. Specialist	Urban Planner	Municipal Engineer	Community Dev. Specialist	M. & E. Specialist	Junior Engineer	Construction Supervisor	Community Dev. Supervisor	Socio-economic Supervisor	
Rehabilition & development of main khal	7.80 Km.	Design		○	○		●	○		○	○	○		●	●		Design was done by bridging consultant
		Implementation		●	○			○		●	●	○	●				
Rehabilitation & development of Secd. khal	19.60 Km.	Design		○	○		●	○		○	○	○		●	●		
		Implementation		●	○			○		●	●	○	●				
Rehabilitation & development of tertiary khal	51.20 Km.	Design		○	○		●	○		○	○	○		●	●		
		Implementation		●	○			○	○	●	●	○	●			○	
Construction & Rehab. of pipe drain	50.70 Km.	Design		○	○		●	○	○	○	○	○		●	●	○	
		Implementation		○	○			○		●	●	○					
Dewatering pump & equipment	3 Set	Design		○	○			○	○	●	○	○				○	
		Implementation		○	○			○		●	●	○					
Truck with Mechanical cleaning Unit	3 Nos	Design		○	○			○	○	●	○	○				○	
		Implementation		○	○			○		●	●	○					
Sludge Removal Truck	1 No	Design		○	○			○	○	●	○	○				○	
		Implementation															
Land Acquisition	77.30 Ha.			○	○			○	○		○	○			○	○	

NOTE : 1. Design includes survey, soil investigation, preparation of drawings, specifications, tender documents and contract award as per the program of the D & S consultants.
2. The Design and Implementation schedule has been prepared as per the program of D & S consultants.
3. ● Direct responsibility ; ○ Indirect responsibility

DHAKA INTEGRATED FLOOD PROTECTION PROJECT

MANPOWER ALLOCATION AND RESPONSIBILITIES

Figure V.1.3/3

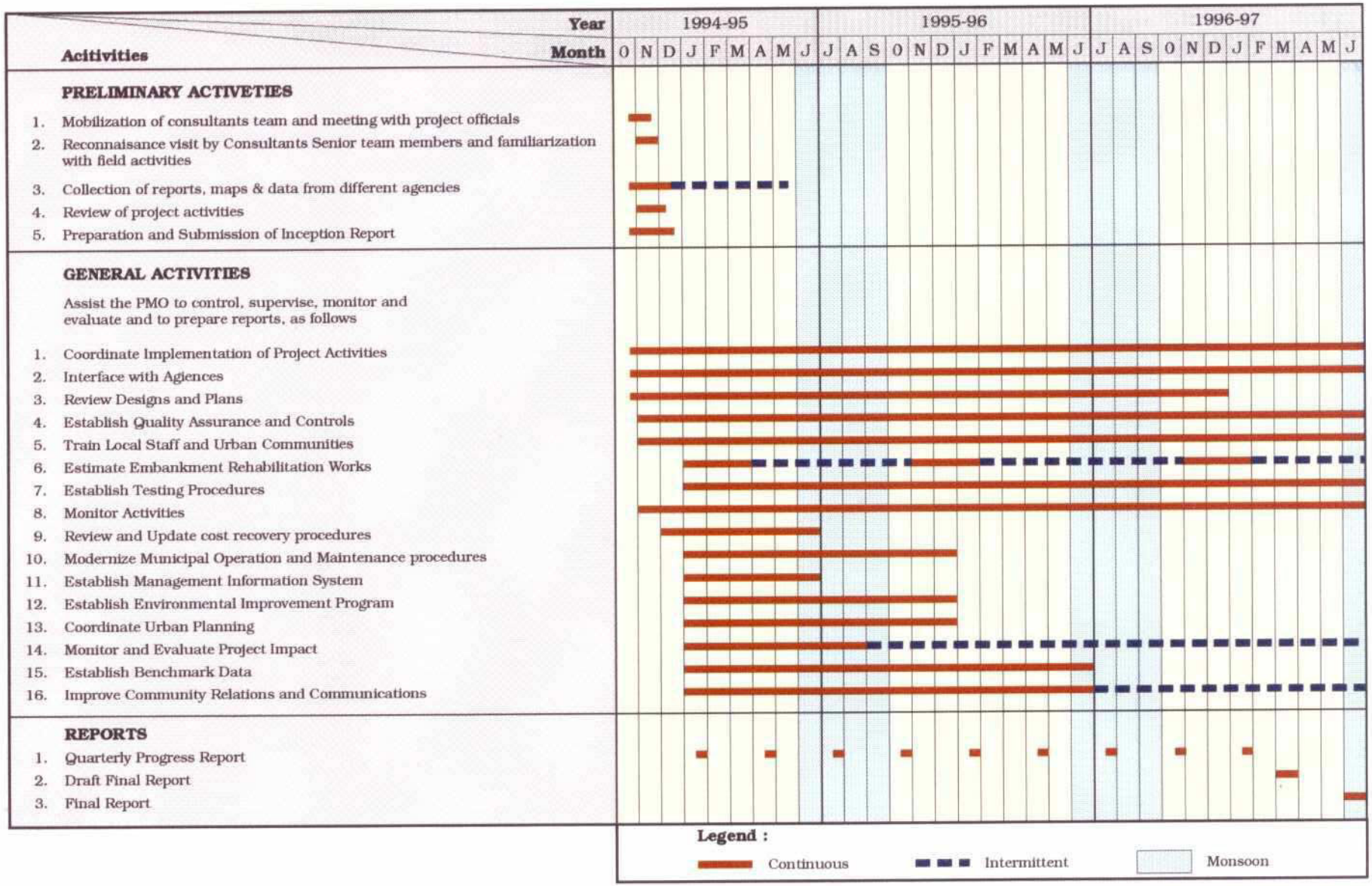
Item	Quantity		Design and Implementation Schedule 1993-94 / 1994-95 / 1995-96 / 1996-97	Responsibility of Consultants: Team Leader	Co-Team Leader	Geotechnical Specialist	Construction Specialist	Ac./Fl. Specialist	Urban Planner	Municipal Engineer	Community Dev. Specialist	M. & E. Specialist	Junior Engineer	Construction Supervisor	Community Dev. Supervisor	Socio-economic Supervisor
Completion of City path	1 Item	Design		○	○			○	●	●	●	○	●			○
		Implementation		○	○		●	○	○	●	○	○		●	●	○
Integrated Slum Improvement	8000 Nos.	Design		○	○		○	○	○	●	●	○	●			
		Implementation		○	○		●	○	○	●	○	○		●	●	
Rehabilitation of existing coll. bin.	2000 Nos.	Design		○	○			○	○	●	○	○	●			○
		Implementation		○	○		●	○	○	●	○	○		●	●	○
Construction of new coll. bin.	1000 Nos.	Design		○	○			○	○	●	●	○	●			
		Implementation		○	○		●	○	○	○	●	○		●	●	○
Construction of public Toilet	30 Nos.	Design		○	○		○	○	○	●	●	○	●			
		Implementation		○	○		●	○	○	○	●	○		●	●	○
Twin pit sanitary latrin	2500 Nos.	Design		○	○		○	○	○	●	●	○	●			
		Implementation		○	○		●	○	○	○	●	○		●	●	○
Single pit sanitary latrin	3000 Nos.	Design		○	○		○	○	○	●	●	○	●			
		Implementation		○	○		●	○	○	○	●	○		●	●	○
Sanitary latrin shed	2500 Nos.	Design		○	○		○	○	○	●	●	○	●			
		Implementation		○	○		●	○	○	○	●	○		●	●	○
Installation of public stand pipe/tubewell	1000 Nos.	Design			○			○	○	●	●	○	●			
		Implementation			○		●	○	○	○	●	○		●	●	○
Cleaning and reha. of local storm sewer	120 km	Design			○			○		●	●	○	●			
		Implementation			○		●	○		○	●	○		●	●	○
Minor drain Extension	71 km	Design			○			○		●	●	○	●			
		Implementation			○		●	○	○	○	●	○		●	●	○
Surface drain rehabilitation	60 km	Design			○			○		●	●	○	●			
		Implementation			○		●	○	○	○	●	○		●	●	○

NOTE : 1. Design includes survey, soil investigation, preparation of drawings, specifications, tender documents and contract award as per the program of the D & S consultants.
2. The Design and Implementation schedule has been prepared as per the program of D & S consultants.
3. ● Direct responsibility ; ○ Indirect responsibility

DHAKA INTEGRATED FLOOD PROTECTION PROJECT

Figure V.2

PROJECT WORK PLAN



V.2.2. Types of Training to be conducted

It is anticipated that the following types of training will be conducted during the life of the project. On-the-Job training began when the project started up and will continue throughout the life of the project.

V.2.2.1 On-the-Job Training (OJT)

As mentioned in V.2.1 above, all specialist, will continually provide project, BWDB, DWASA, DCC, beneficiaries, and other concerned parties with information and skills appropriate to their areas of expertise. This will entail open communication with counterpart staff to ensure an effective transfer of technology during the project. The specialists will discuss the various topics and the tasks with the counter part staff and encourage them to demonstrate that they understand the new concepts, methodology and skills, as appropriate to the conditions involved.

V.2.2.2 In-Country Training (INCT)

Organized, formal In-Country Training sessions will be planned and conducted by project specialists, as conditions require and time allows. The duration of the sessions will normally be 2-4 hours and will be conducted at the work location, whenever possible. Subjects will include but not be limited to periodic explanations of the project's goals and status of the tasks to be implemented, how the project designs are developed, modern methods used in Geotechnical Engineering, modern Financial/ Accounting systems and how they are used, project management implementation procedures, and other subjects as determined by the periodic Training Needs Assessments.

V.2.2.3 Off-Shore Training Programs

If the TNA shows a need for training in other countries, and if funding is made available by the project, Off-shore training programs (degree and non-degree) will be planned and conducted for project staff nominated and approved by the Project Director. The programs can include observation tours to the USA and other countries with similar conditions and problems as those found on the project.

APPENDIX - A

TERMS OF REFERENCES

APPENDIX-A

1. **Project Implementation Advisor/Team Leader (International)**

Terms of References for Project Management Consultants (PMC).

As the Consultant Team Leader, the Project Implementation Advisor will be responsible for the overall coordination of the Consultant Team, and his/her responsibilities shall include but not necessary be limited to the following.

(i) assist the Project Director PMO, in the overall management of all Project activities and in initiating action where required to maintain progress;

(ii) coordinate implementation of the various project activities and ensure that all activities are carried out in manner that optimizes their individual and mutual impact;

(iii) Liaise with the various implementing agencies, including the Asian Development Bank, and arrange for the provision of data on Project Planning and progress as is satisfactory to these agencies; and

(iv) manage the activities of the Consulting team members and ensure that the scheduling of Consultants inputs matches Project requirements as closely as practicable.

2. **Civil/Hydraulic Engineer/Co-Team Leader (Domestic)**

As the Co-Team Leader, he will be responsible to coordinate the activities of the local consultant staff, and to assist the Team Leader in overall management of the Project. His/her responsibilities shall include but not necessarily be limited to the following:

(i) review the technical designs and implementation plans for project components prepared by local consultants, and advise on modification where appropriate;

(ii) liaise closely with counterpart project Implementation Office staff on preparation of contracts and specifications for implementation of Project components; and

(iii) assist with establishment of a quality assurance and control regime for implementation of the Project works, including assisting with the establishment of the materials testing program and the training of local staff in the appropriate laboratory methods and testing procedures.

The Co-Team Leader will be responsible for taking over the Team Leader's responsibilities after completion of the Team Leader's assignment.

3. **Geotechnical Specialist (International & Domestic)**

The Geotechnical Specialist (s) should be a graduate Engineer with an advanced Master degree in Soils Engineering, and at least 12 years experience in his field. A Doctorate degree would be an advantage. His/her responsibilities shall include but not necessarily, be limited to the following;

(i) advise and assist the designers (local consultants and/or GOB departments) in the preparation of designs and quantity and cost estimates for the embankment rehabilitation works:

(ii) in conjunction with the Construction Engineer, determine and establish the earthworks testing procedures, ensure these are clearly understood by the contractors and by the responsible Project Office staff, and maintain the testing and earthworks quality control program; and

(iii) through a structured program of tuition, assist in training GOB and local consultants and contractors staff in any new earthworks design and construction procedures introduced through the Project.

4. **Accounting, Financial Analyst and MIS Specialist (International & Domestic)**

The Accounting, Financial Analyst and MIS Specialist should be a university graduate with a degree in accounting or, equivalent discipline, with at least 10 years practical work experience of which 3 years should have been at a senior level position in the private sector or consulting field. He should be experienced in the establishment and maintenance of accounts, budgeting and financial control procedures. Previous experience with, and knowledge of, Government procedures and previous experience with computerized control systems would be an asset. He will work closely with the PMO and implementing agency counterparts, and his/her responsibilities shall include but not necessarily be limited to the following:

(i) review existing Government financial and physical monitoring and reporting procedures and design a set of simplified accounting. budgetary control and management information systems for the Project;

(ii) in consultation with the Municipal Financial Advisor for DCC (provided under a UNDP project) and any future financial management advisor assigned to DWASA, monitor the introduction of cost recovery mechanisms agreed as part of the project and determine progress in the overall improvements related to revenue generation and financial management of these agencies;

(iii) in conjunction with counterpart staff, provide the necessary interface upon financial matters between the Project Implementation officer, the participating agencies, other departments and ministries of Government and ADB;

(iv) facilitate the production and audit of required project Accounts, records and other reports in a timely and acceptable fashion;

(v) monitor implementation of financial aspects of the Action Plan, particularly the cost recovery measures;

(vi) conduct on the-job training for financial and accounting personnel in all relevant techniques and procedures including the designed sub-systems; and

(vii) provide advisory support and assistance to the Project finance manager in order to secure the efficient discharge of his functions and the finance units contribution to an effective project Implementation office.

5. **Municipal Engineer (Domestic)**

The Municipal Engineer should be a graduate Civil/Sanitary Engineer with a minimum of 15 years experience of which at least 5 years should have been in multi-purpose urban development projects. He will be responsible to assist the Team Leader and his/her responsibilities shall include but not necessarily be limited to the following :

(i) advise on the planning, design and implementation of projects carried our under the authority of the Project Municipal and associated agencies (DCC, DWASA, RAJUK);

(ii) advise on streamlining of municipal management and operation procedures were appropriate, including the establishment of management information systems; and

(iii) oversee the technical aspects of the works carried out under the Environment Improvement Program, and to advise on modifications where appropriate.

6. **Urban Planner (Domestic)**

The Urban Planner should be a graduate planner with at least 10 years practical experience. His/her responsibilities shall include but not necessarily be limited to the following :

(i) review the Project Implementation Proposals and ensure that each component of the project conforms with existing City and Municipal development plans and standards;

(ii) advise City and Municipal authorities on the scope for possible improvement of existing plans and standards, based on standards developed for specific Project components, where these are appropriate for more general adoption; and

(iii) coordinate the urban planning activities of the Project office with the respective GOB authorities.

7. **Monitoring and Evaluation Specialist (Domestic)**

The Monitoring and Evaluation Specialist should be a university graduate preferably post-graduate with a minimum of 10 years practical works experience, of which at least 3 years should have been directly involved with the preparation and implementation of multi-discipline monitoring and evaluation procedures. He should have a wide range of multi-discipline skills, and advanced training in M&E procedures would be preferable. His/her responsibilities shall include but not necessarily be limited to the following :

(i) define the methodology for monitoring and evaluating the impact of the Project with particular reference to targets agreed at the time of Project appraisal and as may be incorporated as loan covenants;

(ii) as a part of the definition of M&E methodology, establish the benchmark data relating to pre-project conditions, in conjucation with the relevant GOB agencies; and

(iii) implement the M&E methodology, furnish required M&E data to concern authorities and train GOB staff in application of Project M&E procedures.

8. **Community Development Specialist (Domestic)**

The Community Development Specialist should be a university graduate preferably post-graduate with a minimum of 10 ten years practical work experience in the fields of public relations, advertising, marketing or similar related discipline. Prior experience with a recognized NGO working with low income groups with disadvantage persons, and/or on slum improvement programmes would be advantage. His/her responsibilities shall include but not necessarily be limited to the following :

(i) through a program of meetings and discussions with concerned agencies, municipal and public official and community representatives in the Project areas, ensure public awareness of the Project and Project works, and record and report viewpoints and opinions of these body that may be significant with respect to Project implementation;

(ii) liaise between the Project Office and local people, and mediate and explain to all concerned parties in those cases where clarification of Project activities with respect to local needs and aspirations is required; and

(iii) establish procedures for dissemination of Project publicity and public awareness materials;

9. **Construction Specialist (Domestic)**

The Construction Specialist will be graduate Civil Engineer with a minimum of 15 years experience, of which at least 5 years should have been directly related to construction supervision and/or quality control of civil works. His/her responsibilities shall include but not necessarily be limited to the following :

(i) review contractors proposed work plans and methods, and recommend any appropriate changes to meet Project scheduling and quality objectives;

(ii) establish inspection and quality control procedures for all Project construction works;

(iii) ensure these procedures are understood by all concerned parties, including contractors and local consultants;

(iv) implement these procedures and maintain full records of all matters relating to contractor/consultant/Project Implementation Office relations with respect to the construction works; and

(v) train GOB and contractors/consultants staff in the efficient implementation of the quality control and quality assurance measures adopted for the project.

VI. LIST OF FIGURES AND REFERENCES

VI.1. LIST OF FIGURES

VI.2 REFERENCES

1. "Aide Memoire of the Appraisal Mission, Dhaka Integrated Flood Protection Project", Asian Development Bank, 14 September 1991.

2. "Appraisal of the Dhaka Integrated Flood Protection Project in Bangladesh", Asian Development Bank, October 1991.

3. "Loan Agreement (Special Operations, Dhaka Integrated Flood Protection Project) between People's Republic of Bangladesh and Asian Development Bank", 19 January 1992.

4. "Bangladesh Water Development Board, Dhaka Integrated Flood Protection Project", Morrison Knudsen Corporation, December, 1992.

5. "Contract for Consulting Services, between the Bangladesh Water Development Board (BWDB) and Morrison Knudsen Corporation, Transportation and Water Resources Group (MK)", 31 July 1994.

6. "Aide Memoire, Loan 1124-BAN(SF) : Dhaka Integrated Flood Protection Project" Asian Development Bank, 29 October 1994.

7. "Project Check List 1 is for Part - A, B, C, D, Physical and Financial Progress", Project Management Office, Bangladesh Water Development Board, October 1994.

8. "Quarterly Progress Report July-September 1994", Technoconsult International Limited, Bangladesh, October 1994.

APPENDIX - B

TECHNICAL NOTES

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Technical Memo No.1

To : The Project Director
Project Management Office
Dhaka Integrated Flood Protection Project (BWDB)
Outer Circular Road, Rajarbagh,
Dhaka.

From: Dr. Majid Ghaboosi
Team Leader
Project Management Consulting
Services for DIFPP.

Sub : Notes on Site Visits to the Western Embankment of DIFPP

To observe present conditions on the Western Embankment, two field trips to the area were organized and conducted on November 15 and 17, 1994. The detailed direction and sites of visit are described in the attached Inspection Report by Mr. M. Chaudhury, Co-Team Leader and other team members. However, I have added the following comments on the technical aspects of the levee stability for your consideration:

1. The embankment is in the post construction stage and the settlements which have occurred from unequal consolidation of the foundation are normally associated with earth levees at this stage. The evaluation and remedial works of the post construction settlements are important because the settlements would result in loss of free boards along the levee and damage to the embankment. At this stage the levee must be fully accessible for the operational activities of inspection, maintenance, and flood fighting.

2. The road on top of the levee, which normally referred to as Patrol Road, should be all-weather road that will allow access for the purpose of inspection, maintenance and flood-fighting operations. The patrol road should be surfaced with a suitable gravel or crushed stone base that will permit vehicle access during monsoon season without causing detrimental effects to the levee inspection and flood-fighting personnel.

3. Ramps should be provided at sufficient locations to permit inspection, maintenance and flood fighting vehicles to access onto and from the levee.

4. Turnouts and turnarounds should be at some suitable intervals to allow vehicles to pass and to reverse their direction, surprisingly, in the available design and rehabilitation reports this important structural component of the levee is ignored. However, it will become very important particularly during the flood-fight operation.

5. The existing bridge abutments, gate structures, and drainage outlets may constrict flow during the high stage and cause turbulence with resultant local scours. Therefore, protection around the structures riverside of the levee is needed.

6. One case of pipeline crossing through the levee was noticed along the structure. This pipe must be properly constructed to prevent scouring or erosion of the embankment from leakage and damage from debris carried by high flow.

7. A reserve supply of materials needed during a flood emergency for a flood-fight operation should be kept on hand at all time.

8. No encroachment and human activities which would adversely affect the efficient operation of inspection, maintenance and flood fighting shall be permitted.

Inspection Report

The observations of the Team consisting of the Co-Team Leader, Geotechnical Specialist, and Construction Specialist of Project Management Consultant (DIFPP) during their recent visit to the Western Embankment Sites on 15.11.94 & 17.11.94 are as follows:

15.11.94.

The Team inspected the Western Embankment from zero point to about 17 Km. Mr. M.A. Bari Talukder, Executive Engineer and concerned supervising engineers of BWDB accompanied the Team during inspection.

The inspection covered Sluices 1, 2, 3, 4 and the embankment slope protection work by CC block already constructed. The problem areas where intensive and moderate remedial works are required to be carried were also seen during the inspection. This inspection in fact was a visual one and relevant data, information and design of the structures built were not available during inspection.

17.11.94

The Team started their inspection at 8.45 hrs. from about 20 Km of the western embankment. The Team was accompanied by Mr. S. M. Feroz, SDE, City Sub-Division 2.

During the inspection it was observed that the construction work of Drainage Sluice no. 6 (3 Vents) has been completed but drainage inlet has been completely blocked because of land raising by a Housing Estate for construction of housing complex. This has completely frustrated the purpose of drainage through Sluice no. 6 constructed at a cost of about 1.9 core under the project. The S.D.E. reported that the sluice was constructed after acquiring necessary land for the purpose. It is felt that necessary steps be taken immediately so that the sluice can be operated to fulfil its desired purpose.

The Team during their inspection observed with great concern that squatters have constructed kutcha houses for dwelling purposes and have started living on the country side slope of the embankment. The no of squatters living on the slopes of embankment would be more than 5000 as reported.

It was interesting to see a primary school has also been established by some NGO in a kutcha shed and the children of the squatters were attending classes.

In some portion of the embankment it was noted with great concern that due to lack of maintenance because of the squatters living mainly on the country side slope of the embankment the slope and crest have been badly affected and the section as appeared has been reduced to a great extent endangering the safety of the embankment. In some areas the squatter have started living on houses constructed on the river side also.

It is reported by Mr. Feroz, SDE, that the matter had been duly reported to the police for necessary actions but without any tangible result.

The Team is of the opinion that effective measures should be taken without loss of time to remove the squatters from the embankment designed and constructed for the purpose of protecting the city dwellers from the damages of flood.

The Team also visited sluices numbered 7, 8, 9 and 10 and the slope protection work by C.C blocks. The contractor's staff were seen engaged in the curing of the C.C blocks already constructed. Preparation work of further C.C blocks were seen in progress. The Team also inspected the proposed alignment for construction of 0.3 Km of embankment at Kellar Mohr.

During the inspection Mr. Masud Ahmed SDE and the concerned engineers of both BWDB and the contractor were present.

- x -

Dhaka Integrated Flood Protection Project
DIFPP
Geotechnical assessment by Brian A. Chappell

INTRODUCTION

At this stage of the project those aspects related to part A, namely the earthwork embankments, concrete retaining wall, embankment extension, and road elevation earthworks are in an advanced stage of construction. There are , however, specific geotechnical and consequential engineering problems that need to be addressed and remedial measures implemented.

Between stations 9+750 to 10+950 the design requires that vertical wick drains be installed at 2m centres.While between stations 13+000 to 14+350 the design requires that the embankment be excavated to an elevation of 5.0m and wick drains then be installed. Subsequent to 90% consolidation the embankment is then built to elevation 7.5m and then again subsequent to 90% consolidation the embankment is raised to an elevation of 9.8m. In addition to this specific zones have been designated for monitoring and further scrutiny.

In this report specific aspects related to the design of the flood exclusion structures as in the above paragraph will be addressed. Details on which the viability of these remarks and recommendations are based are given in the appendices.

As the earthwork structures were constructed multiple failures occurred. (Mid-Term Consultancy Services Final Report Vol-1). Since then a period of time has elapsed varying from 1½. to 3 years. This period of time is very important to the project because the permeability characteristics of the foundations have altered the respective strength and stability characteristics of the resultant embankment. However, it is still very important to consider the embankment response to flood conditions and consider the effects of earthquake forces on the embankments stability.

Reasons for the embankment and foundation failures that have occurred up until now are given as:

1) poor choice of embankment material with excessive silt, clay, organic material and water,

2) poor subgrade conditions, especially where drainage paths intersect the alignment of the embankment,

3) inadequate to no compaction of embankment material,

4) prevalence of piping conditions,

5) excessive settlement of embankments.

It is with the above aspects in mind that this report addresses the following criteria:

a) general geology and foundation conditions and the remedial measures for consolidating the foundations hence reducing the water content,

b) consideration of earthquake forces in the design of subgrade (foundation) conditions for the earth embankments and concrete structures,

c) compaction of earth embankments in dry and wet conditions. Examination and correlation of soil strengths with relative and dry densities achieved by dewatering and compaction,

d) compaction quality control from field and laboratory testing, and requirement and importance of transfering this information to the construction and design engineers.

GENERAL GEOLOGY AND MATERIALS

Bangladesh lies at the base of the Himalayan Front and is the delta outlet of the Ganges and Brahmaputra rivers. This means the deposition of deltaic type soil deposits such as sand, silt, and clay (plus organic materials) associated with a braided (river changing alignment) alluvium type river outlet systems. The nature of Deltaic sediments around Dhaka have been confirmed by the soil types encountered, namely the layering of clay silt and sand with the interspersion of organic material.

This layering effect of the resultant soil profile imparts anisotropic characteristics on the soil's strength and permeability. The top surface soil varies in thickness from 1m to 30m and is designated as a soft clayey silt interlayered with seams of silt and sand. This would impart anisotropic permeability characteristics on the insitu soil. With this soil profile the horizontal permeability is generally 5 to 20 (sometimes a lot more for insitu conditions) times as large as the the vertical permeability. This means that if only the vertical permeability has been determined an assessment on the time required for a certain consoli-dation to take place would be an overestimate. This character-istic of quicker consolidation of the Dhaka soft surface clayey silts has been reported by Hossain (1993). This phenomenon has important implications on the DIFPP as will be shown when considering remedial design for repair of the western embankment.

Underlying these Deltaic sediments of Bangladesh is an attenuated (tension type) continental and oceanic subduction crust. On the Eastern border of Bangladesh a Major fault (the Kaladan fault) occurs. This major fault is associated with a detached crustal block in the eastern region of Bangladesh that has moved 300 km north in the last 11 million years (approximately, on average, 3cm per year). On the northern boundary of Bangladesh there is the major Dauki fault. In addition, there are many other major tectonic features that underly Bangladesh's deltaic deposits. All these

tectonic features plus others in Assam and India have a major influence on the earthquake characteristics of the whole Dhaka region. An enlightening assessment of earthquake occurrences and potential are given in a recent seminar held at the Bangladesh Institute of Engineers on Dec 6, 1994 entitled "Recent Developments in Earthquake Disaster Mitigation."

Earthworks and associated foundations (subgrades) are structures that are greatly affected by imposed dynamic forces generated by earthquakes. Liquifaction of the foundation soil is not the only problem criterion associated with the dynamic forces of earthquakes. In addition, the stability and integrity (continuing stability) of the embankment must be ensured against the dynamic forces of earthquakes. Design criteria related to embankments are well known and available. In addition, much of the subgrade material on which the embankments are founded, is defined as a soft clayey silt which liquifies when disturbed. This description alone would make one experienced with earthquakes a bit wary of the subgrade material being considered.

The main criteria relating to the Geology and earth materials that effect the construction of the flood protection embankment and walls are;

1) type and condition of foundation and embankment materials,

2) prevalence of water and its interaction with the behaviour of the foundations and embankment,

3) static and dynamic earthquake forces imposed on the subgrade, embankments, and reinforced concrete retaining walls,

4) methods of constructing and compacting the embankments,

5) remedial techniques and options for rehabilitating failed embankments and retaining walls,

6) quality control assurance processes and monitoring requirements for completion of project.

INVESTIGATIONS

A number of field and laboratory investigations have been performed , as noted from the feasibility, mid term consultancy services, and final design investigations. An important recent investigation is that reported on in the "REPORT ON REMEDIAL DESIGN FOR REPAIR OF WESTERN EMBANKMENT TONGI TO MIRPUR"

More than 150 drill holes have been bored along the embankment alignment between Tongi and Mirpur bridges. From these bore holes disturbed and undisturbed (thin tube split and shelby tube samplers) samples have been retrieved and tested. In addition, Vane Shear Tests and Standerd Penetration Tests (SPT) were also performed.

In general the laboratory tests have been extensive. However, because of the anisotropic soil profile that exists, namely soft clayey silt interspersed with seams of fine sand and sand, the following additional tests are recommended.

a) some anisotropic permeability testing with the Rowe cell would help define the anisotropic permeability characteristics,

b) some direct shear box testing would better help define the shear strength of a shear plane along which there is continued movement,

c) consideration of relative densities in silty soils especially when subject to seepage forces with subsequent piping (subsurface erosion) is very important,

d) the sieve tests characterise the important surface soils (1m to 30 depth) as clayey silts, while the Atterberg tests characterise these same surface soils as a fat clay. The engineering response difference between a silt and clay, especially when dynamic earthquake force are being considered, is very important. The resolution of this will require further sieve testing with deflocculents and/or microscopic examination,

e) the type of clay should be defined. Is it an illite, kaolinite, halloysite, smectite, allophane, etc,

f) standard compaction information is required and with this the field densities are compared. This will enable the state of the present embankments to be assessed, in relation to strength and stability, and also enable Quality Control criteria to be estabilished.

PROBLEM ZONES (and Remedial Works)

During construction of the western embankment, instabilities of the embankment occurred due to various reasons such as;

1) difficult subgrade conditions; soft clayey silt (with a high to saturated moisture content) which liquifies when disturbed, and has a high consolidation potential and low initial strength (prior to consolidation);

2) embankment compaction was not performed or inadequately performed hence the embankment material does not have the required density to remain intact when water forces are imposed (rutting, rilling and slope erosion). Wet conditions make compaction difficult but techniques are available to minimize this problem;

3) water forces due to waves and currents erode the embankment especially if there is no vegetation. In addition portions of the embankment are constructed with non-plastic silts which are very susceptible to erosion;

4) the requirement to use foundation improvement techniques become evident when the foundation materials are investigated (classified and tested). From this it is determined that there is a requirement to reduce the water content and hence increase the densities and strengths of the foundation (subgrade) materials;

Damage surveys conducted by geosyntec consultants in August 1991, near the end of the Monsoon season defined three classes of damage namely;

Class I areas "in danger of imminent failure/could fail catastrophically/ immediate remedial action required",

Class II areas "failure not imminent or catastrophic/additional remediation required",

Class III "erosive potential areas of embankments require medium to long term action".

Remedial Measures

As stated previously a period of 1 ½ to 3 years has transpired since the western embankments were constructed and the major failures and instabilities occurred.

Because the subgrade soil has anisotropic characteristics, the horizontal permeability is more than likely larger (10 to 26 times if the difference between laboratory and field conditions are considered) than the vertical permeability. This means that the consolidation rate (hence moisture content reduction and densification) considerably increases as has been experienced on this project and others as well (Hossain 1993).

In October-November 1994 24 insitu vane shear and 8 SPT tests where performed along the problem areas of the western embankment. Higher undrained shear strengths than were obtained from the feasibility tests (1991) and mid-term consultancy tests (1993) resulted. The SPT results were inconclusive but the nature of the SPT tests are such (index testing) that fundamental definition or correlation of strength is impracticable.

If in the field horizontal permeability is greater than the laboratory measured vertical permeability (material layering and experience show this to be most likely) then the consolidation (reduction in moisture content and densification) is such that this increase in strength is realistic and extant, and the conditions relevant to the stability analysis are viable.

With these aspects in mind the following remedial measure programme has been recommended,

Chainage 9+750 to 10+100 (class I), the subgrade is a soft clayey silt from El+2m to El-23m. The remedial method is to install vertical wick drains through the undisturbed existing embankment at 2m centres.

Chainage 13+850 to 14+350 (class I); the subgrade is soft high plasticity silt from El+1m to El-3m. The remedial method is to excavate 2.5m from the crest of the embankment to El +5.0m. At this level sand filled drains are constructed for the drainage of the subsequently installed vertical wick drains at 2m centres. After 90% consolidation has taken place the crest is rebuilt to its full height (El 9.8m).

Chainage 10+100 to 10+950 (class II); the subgrade material is a soft to medium, highly plastic silt. The remedial method here is to install the vertical wick drains at 2m centres through the existing undisturbed embankment.

Chainage 13+000 to 13+850 (class II); the subgrade material is a soft to medium, highly plastic silt. The remedial method here (As above) is to install the vertical wick drains at 2m centres through the existing undisturbed embankment.

The above remedial measures cover at distance of 0.85 km for class I areas and 1.7 km for class II areas.

Those areas which require Monitoring and Inspection cover a distance of 4.5 km and are defined as;

chainage	6+750	to	7+450,
chainage	7+550	to	8+000,
chainage	9+250	to	9+750,
chainage	11+200	to	12+500,
chainage	14+350	to	15+900,

In these areas the remediation process is to construct toe berms and flatten slopes before increasing the embankment crest to the required design elevation.

Besides the above there is approximately 975m of embankment where 1.5 to 2.0m of compacted fill is required to bring the embankment up to design crest level.

Information not available

At this stage no soil investigation results have been sited for the embankment area between chainage 17+400 to 19+200. The embankment in this area has been visually inspected. This area has been extensively built on in that whole communities pligh their daily lives on this part of the embankment. It is estimated that there are at least 6000 people living on this section of the embankment.

It appears that in sections of the embankment the cross sections of the embankment has been altered (excavated) to suit the instalation of dwellings, shops, etc. There are numerous signs of surface erosion on the crest of the embankment. Considerable block surfacing of the river side of the embankment has taken and is taking place, to prevent embankment erosion.

It also appears that the material making up this part of the western embankment is a clayey silt. Of consequence it is very important to ensure that piping in this area does not take place.

Consideration of Earthquake forces

It is evident that Bangladesh is susceptible to earthquake forces and is considered in the building code requirements of Dhaka city. Embankments and their associated foundations are structures and are subjected to the dynamic forces imposed by earthquakes. It is not just the matter of considering liquifaction of the foundations. If there is a flocculated clay which collapses on disturbance (compare the soft saturated clayey silt which liquefies when worked) then this material should be examined for its response to dynamic loading.

As the embankments and their foundations have drained over the last two years, the soil material has gained strength. In addition, because the structures are subjected to dynamic (fleeting moments) loading the Factors of Safety in the earthquake analyses are acceptable to the minimum of 1.0 to 1.1. With these factors in mind it would be prudent to consider the effects of dynamic earthquake forces.

Embankment Quality Control

In the construction of embankments the basic criterion defining the quality of the resultant embankment is the relative density of the soil material used to construct the embankment. This criterion of attaining the optimum compacted relative density is a function of;

1) moisture content of the soil material being compacted,

2) laying out the soil material in layers to a specific thickness before compaction is performed,

3) applying a certain amount of compaction energy through a specific compaction machine running over the soil layers a number of times,

4) by obtaining a soil material with a specific grading and texture, the compaction and resultant relative densities are more easily achieved for the specific compacting machine or compacting effort.

If the optimum densities are achieved the soil's strengths are increased and permeabilities reduced.

In designing (analysing) the embankment certain values (obtained from the investigations) were used to design the embankment and assess the characteristics of the foundation.

These values or parameters, for the design to be viable, must be achieved in the resultant construction of the embankment. Consequently, when the embankment is being constructed the

contractor must be aware of density requirements and ensure the quality (relative densities) of the embankment by producing the requisite relative densities (design parameters) required by the designer and construction engineer.

To ensure that the above requirements of density are achieved and that the designer and construction engineer are continuously informed a field laboratory is required. This geotechnical field laboratory should be equipped and manned so that the required quality control of the embankment is achieved.

Field Laboratory

The laboratory should be so located that there is easy access to the construction site.

Basic soil characterization tests should be performed by the laboratory and this coupled with compaction tests and density determinations are the main tests performed by the laboratory. Besides this, a few index tests are also generally needed.

Equipment

1 off 2-4 cubic metre oven 100-105° C ± 0.1° C over 24 hrs control and fan driven.
1 off 0-2 kgm balance; accuracy 0.005 gm.
1 off 0-500kgm balance; accuracy 0.5gm.
1 off hand compaction set, normal proctor including cimpaction cylinder
1 off hand compaction set, modified proctor including compaction cylinder
1 off automatic compaction test machine
1 off nuclear densometer
4 off field density equipment related furnishing such as glasses & dishes etc.
1 hydrometer and associated glass ware
1 vanette or land cruiser for field and laboratory testing

Personnel

1 laboratory manager (engineer)
2 field technicians
2 laboratory technicians

The laboratory manager would ensure that field and laboratory tests were expeditiously performed. In addition, he would make sure that the design and construction engineer received the results of the laboratory and field tests.

When the situation requires it, quick field tests are readily performed and the results are used to assess whether further compaction is required. In other instances quick moisture content tests can help in assessing whether the soil material to be compacted is too wet or dry to achieve the optimum dry densities required. For speedy density tests determinations a nuclear densometer is of tremendous use based on good correlation work.

Work Time Table

This work time table is arranged to deal with the following aspects of the DIFP project;

1) Assessment of present project and submission of proposals

2) Installation and functioning of field laboratory for quality control,

3) Performance of remedial measures

4) Implementation and performance assessment of proposed jute wick preloading embankment project.

It is anticipated that reviewing of the present project and submission of proposals will be completed by the end of January, 1995.

The setting up (determining location of laboratory, purchasing and acquirement of equipment) of the field laboratory and choice of personnel will take at least 3.5 to 4.5 months before the laboratory would be operational.

The performance of remedial measures still requires, acceptance of proposals, writing of specifications, production of tender documents, letting of tenders, acceptance of submissions of tenders, and contract mobilization. This will take at least 3.5 to 4.5 months before construction.

Acceptance and implementation of the proposed Jute wick preloading embankment project would take at least 3 to 4 months to bring on line.

From the above assessment it is evident that the best programme to utilize the skills of a geotechnical specialist would be to end the present commitment at the end of January 1994 and then at the beginning of June the geotechnical specialist would return when all the above programs are begining to function. The magnitude of the tasks would be such that the geotechnical specialist could contribute to many aspects (interaction with colleagues, aiding in problem solving, reviewing and assessing the work that has been and is being performed and trouble shooting) This latter work would be optimally performed for a period of at least six months.

Recommendations and Conclusions

From the various information reviewed and assessed in relation to site conditions the following is recommended,

1) Between Tongi and Mirpur bridges the remedial measures for the western embankment as set down above for class I, II and III conditions should be performed.

   There is a strong possibility that jute wick drains as opposed to synthetic wick drains could be used in the

remediation process. BUET has submitted a proposal on testing the viability of using jute wicks instead of the more expensive synthetic ones. This proposal merits favourable consideration.

2) In relation to further testing it is recommended that;

a) the effect of sample disturbance on determining the consolidated undrained (with pore pressure measurements) triaxial test strengths and unconfined compression tests be assessed, (Takashi 1993) .

b) Determine the horizontal permeability of undistrubed layered samples in order to compare with the vertical permeability and assess the increased consolidation rate as experienced in the field. To do this the Rowe cell held at BUET could well accommodate box undisturbed samples and provide the necessary information.

c) In many instances the field permeability is greater than the laboratory determined permeabilities. Consequently it is recommended a field well test be performed to assess the difference and resolve the question "Why are the field draining conditions so much better than those determined from laboratory testing".

d) A series of laboratory compaction tests are required on various field soils and relevant field density tests performed so that the relative densities of the soils extant in the field can be determined. The densities and moisture contents of the soils that were used to determine strengths and permeabilities could than be compared with the densities (hence strengths and permeabilities) of the material in the field. In adition to this, these relative densities are used in the quality control assurance of the embankment.

e) The dynamic effects of Earthquake forces should be considered in the stability analyses of the embankment and the foundations. In this instance the improved values of strength (due to consolidation?) should be considered with the generally allowed for reduction of Factors of Safety for dynamic forces, namely 1.0-1.1.

f) When the embankment soil becomes excessively wet, there are wet weather compaction techniques which minimise the effects of excessive water.

g) Determine what type of clays are in the various designated materials. Are they kaolinites, illites, smectites etc? Knowledge of the type of clays present can inform one of the water holding capabilities and characteristics of the clay, its vulnerability to change, especially in an organic environment, and its bonding potential.

h) Consideration of permeability forces (piping) due to the prevalence of silt, and the use of graded drains in susceptible zones should be examined especially in the Reinforced Concrete Wall zone.

I) When performing laboratory tests on organic clays the test process often causes irreversible changes in the samples. 64 percent organics is high and makes the material a clayey peat? This material could disappear in as short time under the right conditions of periodic wetting and drying.

j) It is important to install a monitoring system to evaluate the embankments behaviour (Anticipated instabilities under flood conditions) and performance. In addition the information retrieved would be invaluable for further design (eastern embankment etc.) and building up that bank of knowledge required in every development.

k) Some finite element analyses work should be performed so that a model exists which can be up dated when further knowledge and/or information is retrieved. This model enables a quick response to be made especially in the case of emergencies, for example flooding and breakdowns.

l) Geotechnical information as to the foundation conditions between chainages 17+400 to 19+200 should be retrieved (especially if the material is silty in character). This information should be used to assess the stability of the embankments (with their present cross-sectional profiles).

There are geotechnical techniques available (eg. electro reinforcing) where the embankments can be strengthened and stabilised with a minimal to no disturbance of the people presently occupying the embankment.

m) The embankment extension between Mitford and Keller Morh still requires the alignment to be defined. It does appear, however, that major foundation problems are likely and techniques of mud (soil) displacement or electro reinforcing will be required. This however requires further information and consideration.

n) The geotechnical information for the reinforced concrete wall has still to be seen. On visual inspection it is apparent that there are some instabilities and failures (piping, sliding, overturning, cracking and man made openings).