APPENDIX 8.4-1

EXAMPLE OF CORPORATE PLANNING PROCEDURES

Fig. 1 General Cycle of Corporate Planning for an Airline

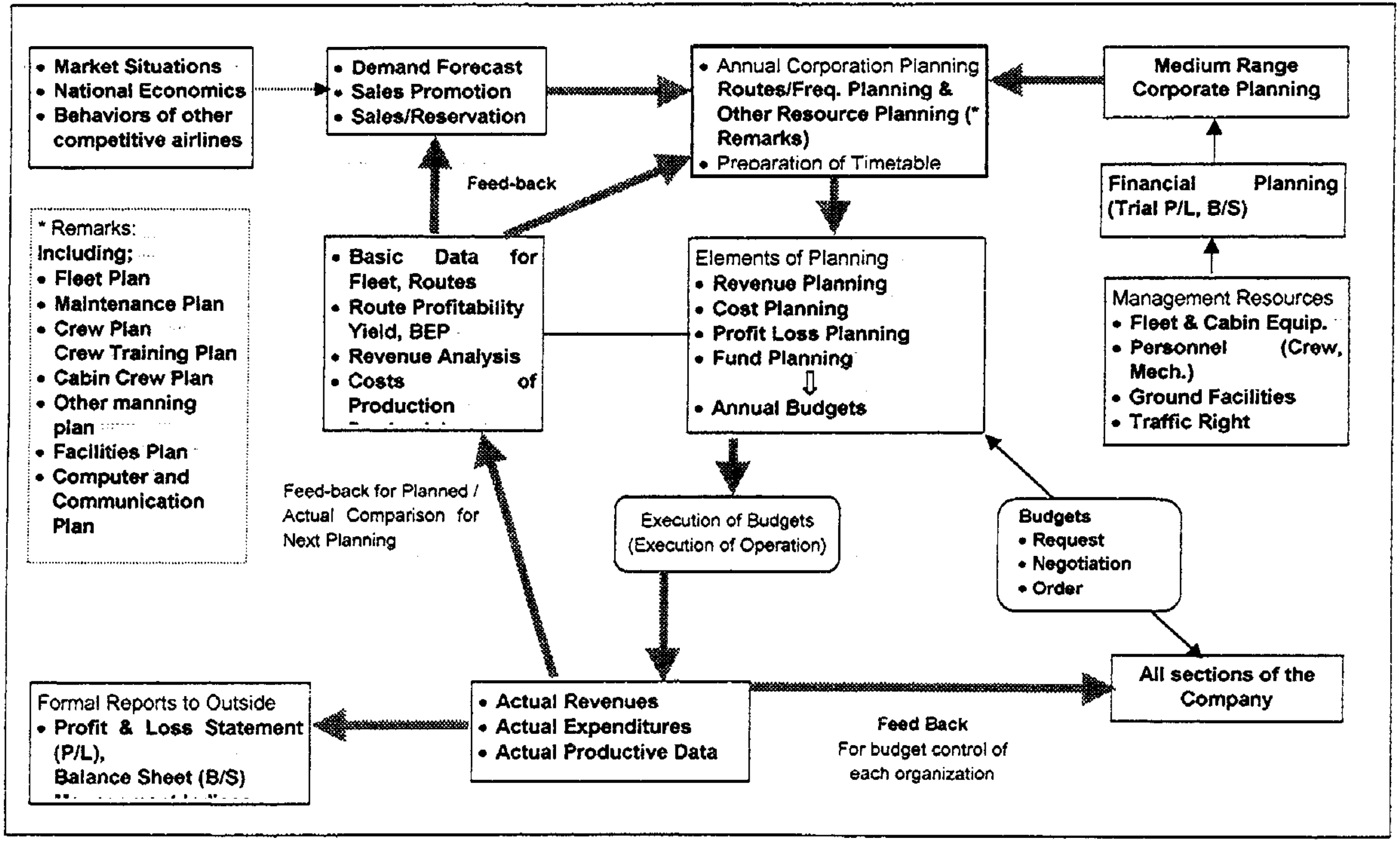


Fig. 2 Medium-Range and Annual Planning

The purposes of medium range planning

1. Scanning the general situation surrounding management, to fix the company's objectives and prospects for management for the coming 3~5 years.
2. Planning in advance of the items below which need longer preparation periods or big finance.
   - New Aircraft
   - Crew Recruiting / Training
   - New Facilities
   - Review Bilateral Agreements
3. The planning must be reviewed annually to meet changes in social and economic conditions both at home and in the destination countries.
4. The annual planning must be based on medium range planning and the fixing of the following two items.
   - Routes and Frequencies Planning
   - Revenues and Expenditures Planning and Practical Annual Budgets.

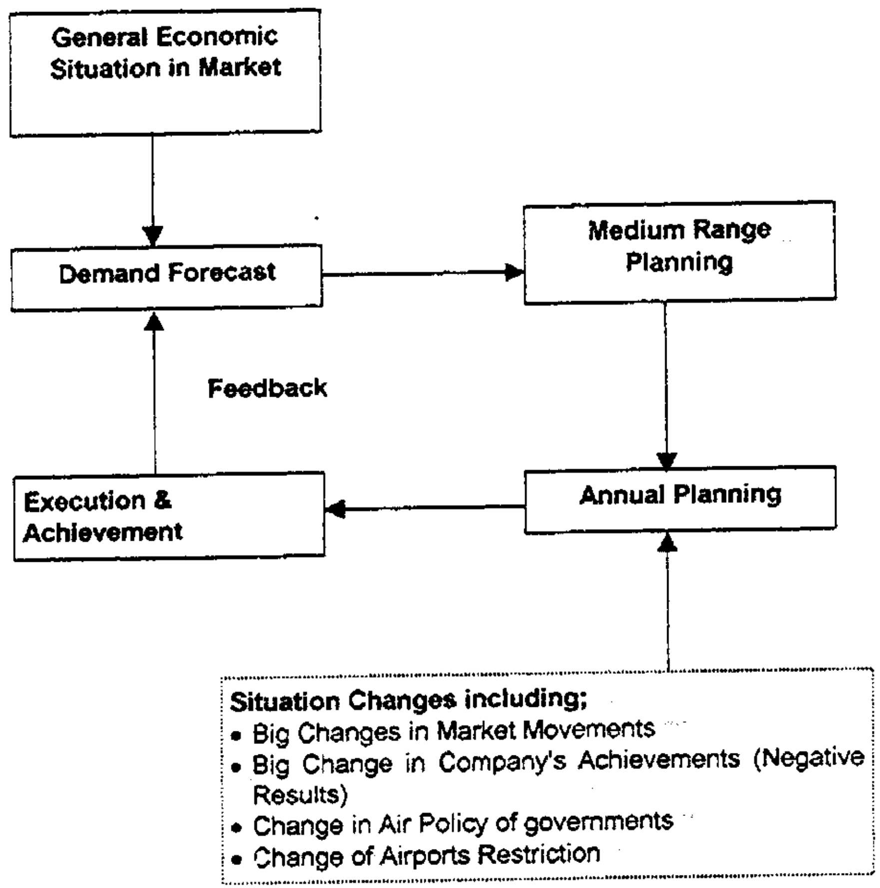


Fig. 3 Structure of Corporate Planning

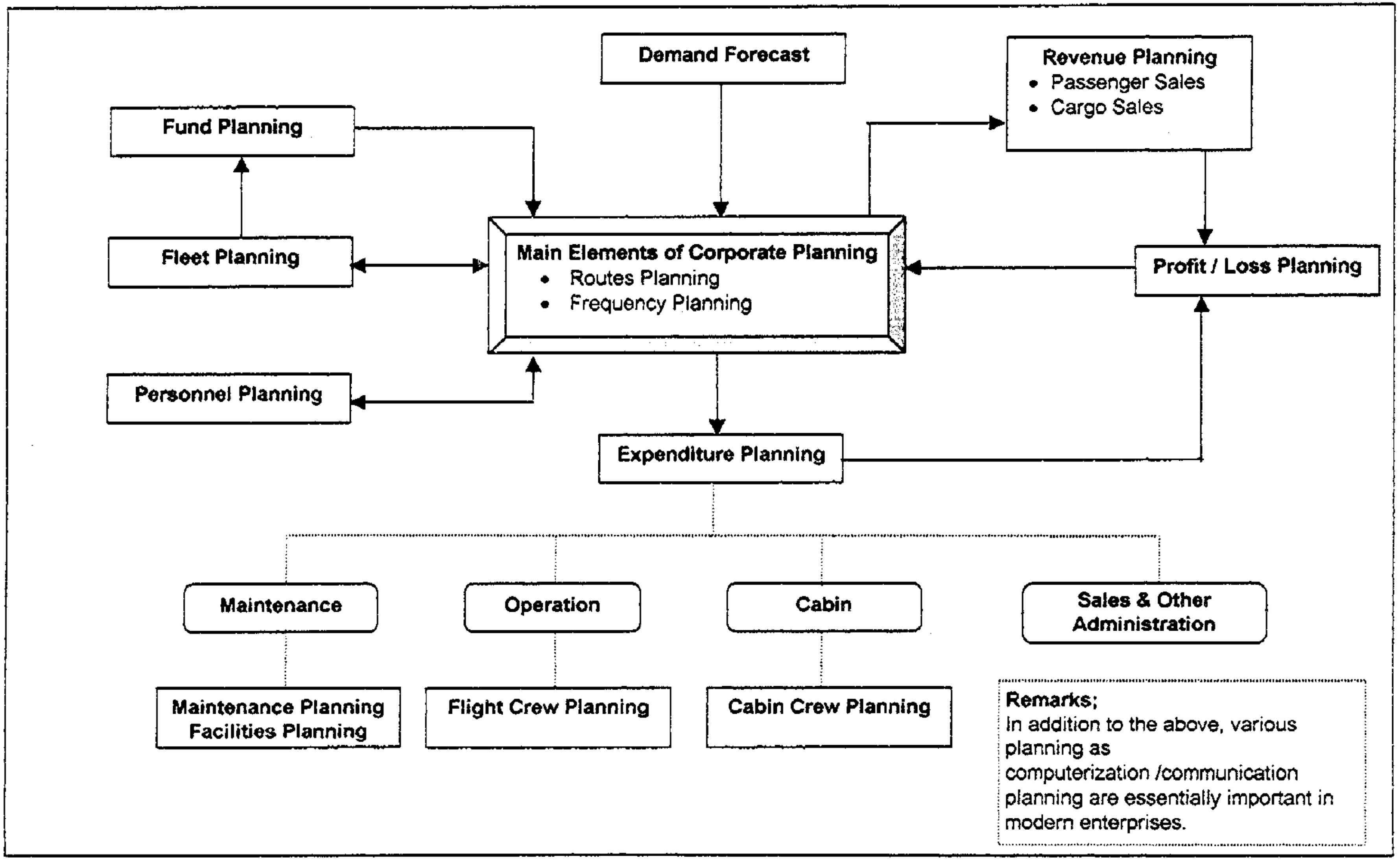


Fig. 4 Calculation of Routes Profitability

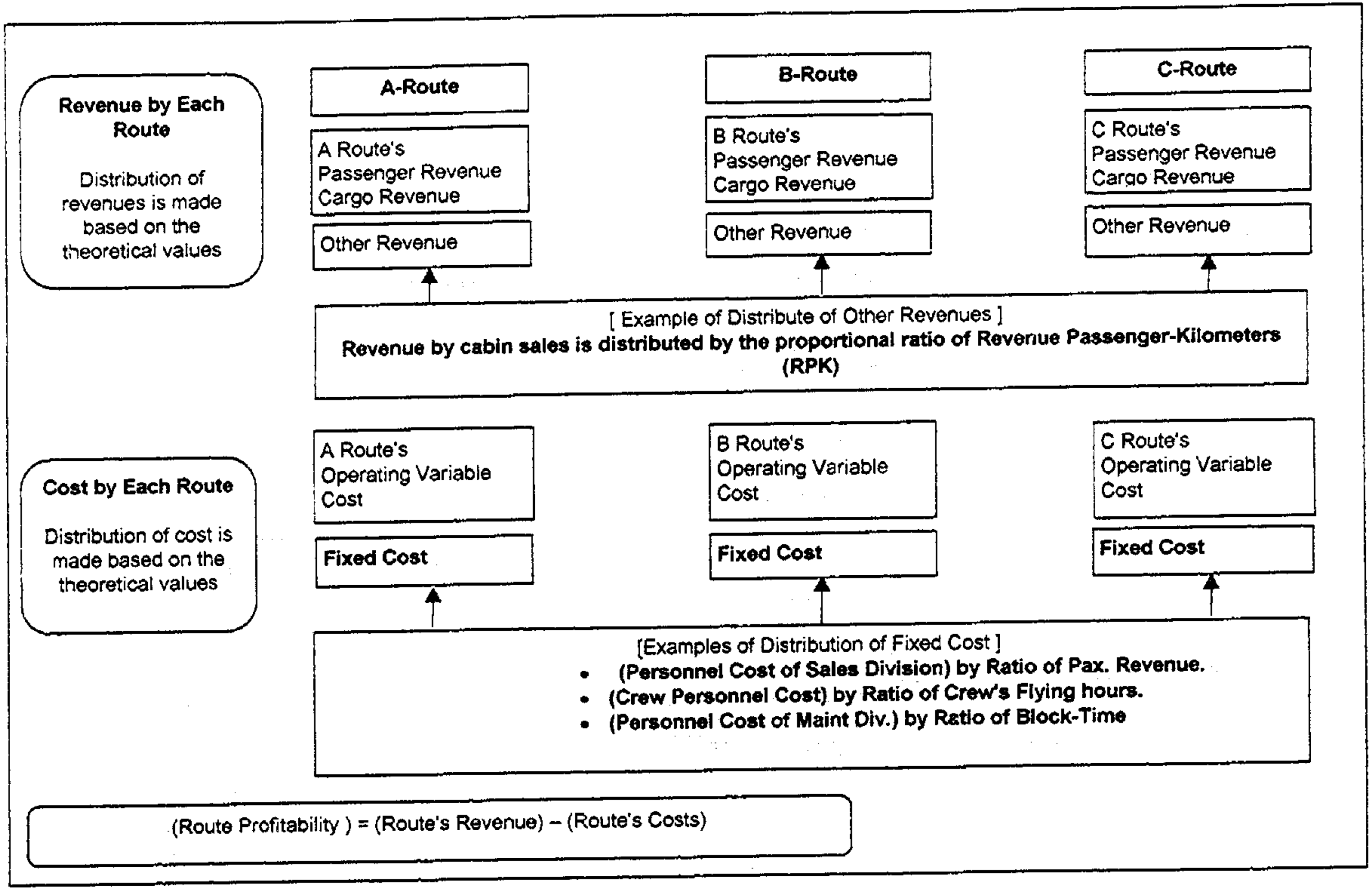
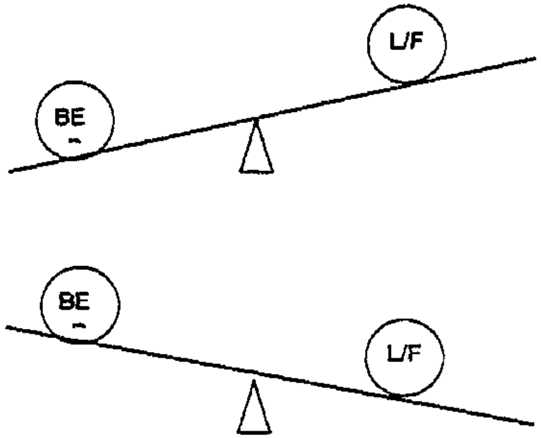


Fig. 5 Analysis of Route Profitability

Analysis of route profitability is made by comparing Break - Even - Point (B.E.P)and Load Factor (L/F)



Profitable Route

Non-Profitable Route

$$BEP = \frac{\text{Cost per unit seat or unit tonnage}}{\text{Revenues per unit passenger or unit tonnage}}$$

$$= \frac{\text{Cost per ASK}}{\text{Revenues per RPK}} \text{ or } \frac{\text{Cost per ATK}}{\text{Revenues per RTK}}$$

$$L/F = \frac{RPK}{ASK} \text{ or } \frac{RTK}{ATK}$$

- **RPK:** Revenue Passenger-Kilometer (Numbers of revenue passenger multiple flight kilometers)
- **ASK:** Available Seat-Kilometer (Numbers of seats supplied multiple flight kilometers)
- **RTK:** Revenue Ton-Kilometer (Revenue tonnage multiple flight kilometers)
- **ATK:** Available Ton-Kilometer (Available tonnage (= weight capacity) multiple flight kilometers)

Example Measures for improving a route profitability

These measure are to not easy ones, because they conflict with each other

A. **Lower BEP**

= Lower Cost Per ASK →
- Enlarge size of aircraft
- Increase utilization of aircraft
- Cost down

= Increase Revenue Per RPK
- Price-up
- Increase high-yield Passenger

B. **Raise L/F**

= Increase RPK
- Develop demands
- Strengthen competitive factor

Fig. 6 Planning and Execution of Budgets

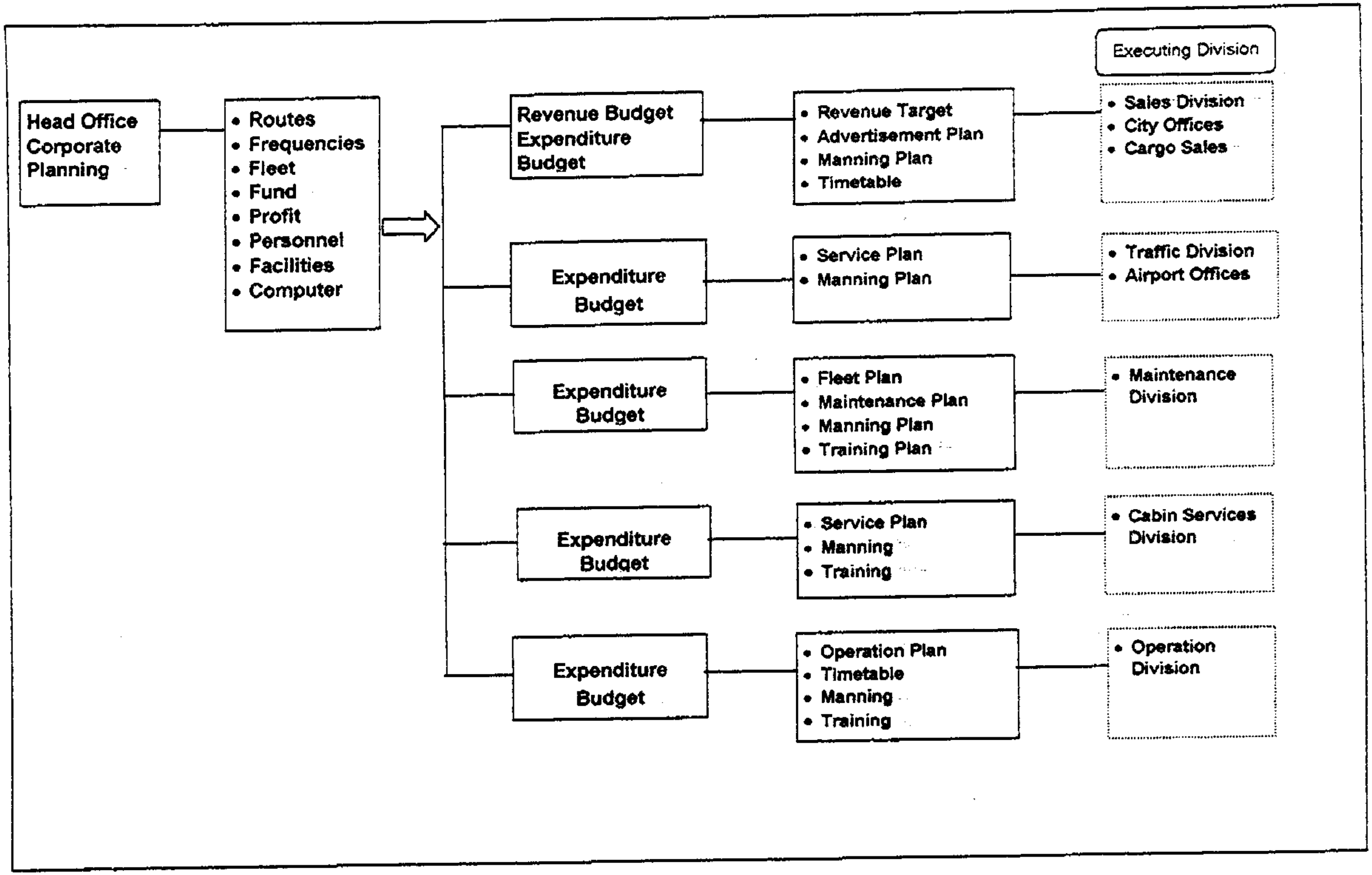
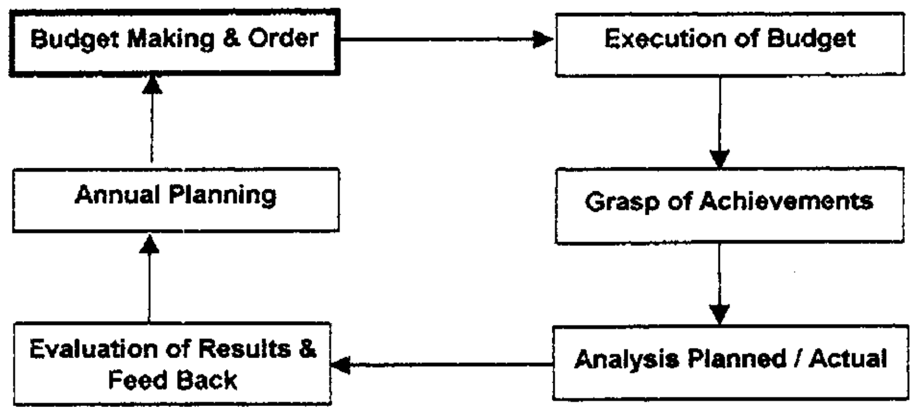


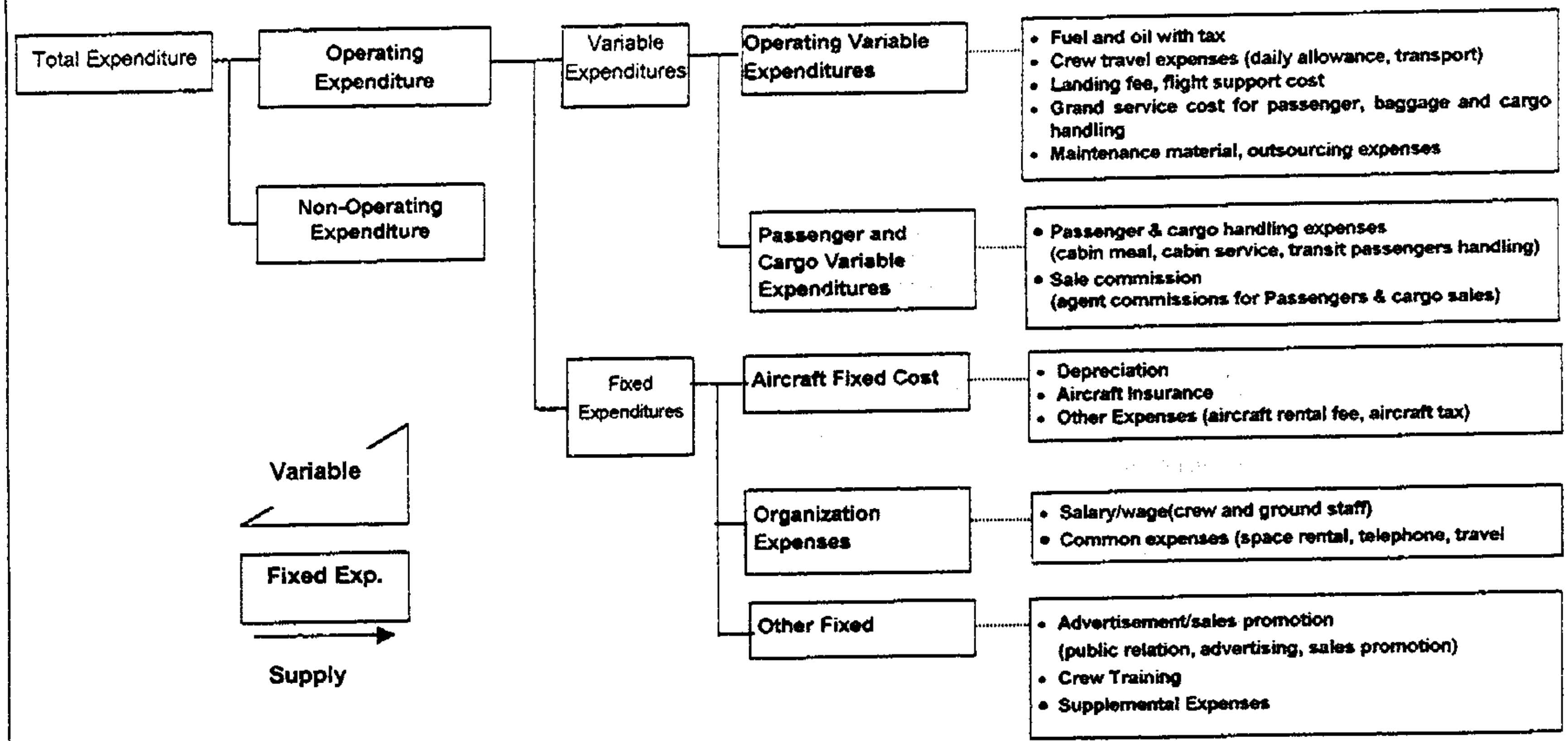
Fig. 7 Budget Control System



Procedures

1. Notification of Company's Policies
   Corporate Planning Div. to All Organizations
   (Around December)
2. Demands / Requests from Each Organization and Negotiation and Adjust between Planning Div. and Organizations (Around March)
3. Determination of annual planning (Execution of Budget)
4. Collect Results and Analyze Them (Quarterly)
5. Utilize Results for Control of Each Organization and for Next Planning

Fig. 8 Classification of Expenditures



(These Classifications may differ a little by Airlines.)

Fig. 9 Demand Forecast for Airlines

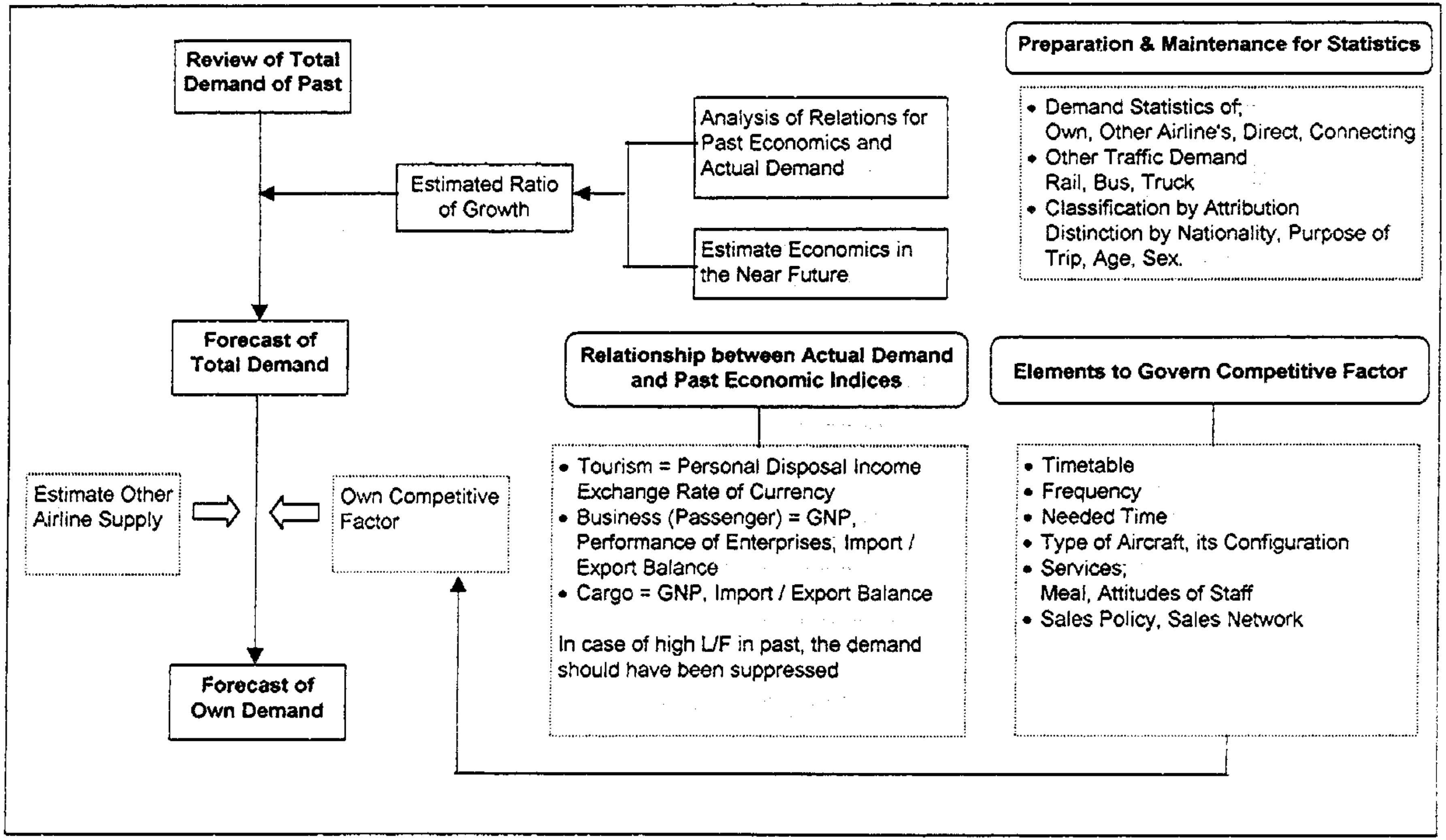


Fig. 10 Revenue Estimation

[Revenue Estimation Formula]

Revenues = (Own Demand) x (Yield)

Where:

[Own Demand] = (Total Demand) x (Share of Supply) x (Competitive Factor)

[Share of Supply] = (Own Supply) / (Own Supply + Other Airlines' Supply)

* Other airlines' supply will be estimated from bilateral agreements.

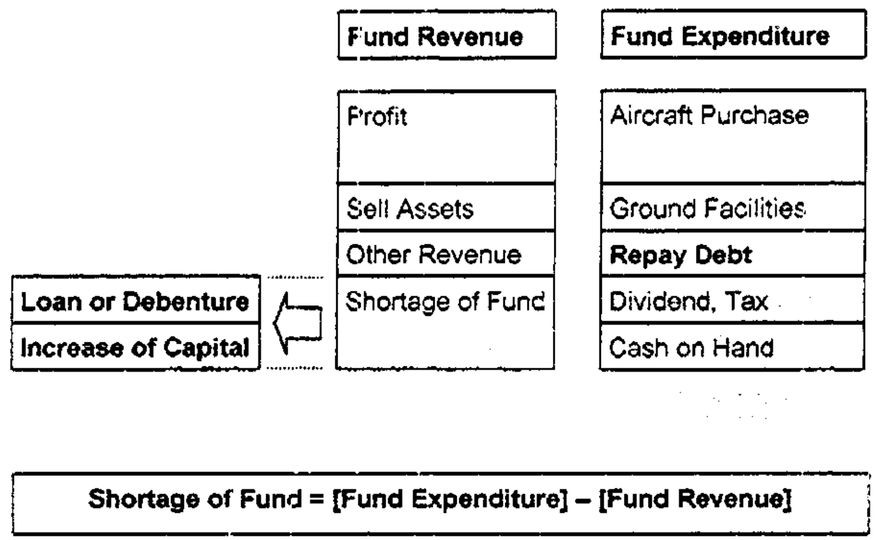
[Competitive Factor] = (Own Load Factor) / (Average Load Factor of all airlines)
= (Own Demand/Own Supply) / (Total Demand/Total Supply)
= (Own Demand / Total Demand) / (Own Supply/Total Supply)
= (Share of Demand)/(Share of Supply)

[Yield] = Average unit revenue per passenger for each route
= {(Normal airfare x its passengers) + (Group airfare x its passengers) + (Specific airfare x its passengers) }/ (Total passengers)

Note: Improvement of these factors is not easy because they require an increase of expenditures to airlines.
For example;

- To increase Share of Supply — Need to increase number of seats to be supplied
- To increase Competitive Factor — Need to improve passenger services
- To increase Yield — Need to increase number of high-yield passengers or need to raise the airfare level.

Fig. 11 Fund Planning (No.1)



[Fund Expenditure]

- Purchasing aircraft and investments for ground facilities are planned by corporate planning.
- Repayment of Debts and Debentures
  Repayment deal lines are defined by contracts. These amounts are to be included in annual planning.
- Payment of Dividend/Tax.
  Payment of dividend and tax are not included in profit-loss calculations as expenditures (in the west).
  There are to be conceded in fund planning.

[Fund Revenue]

- Profit in fund planning and that in profit-loss is different
  Example: Deprecations are regarded as Exp. in profit-loss but no actual flow-out of cash. These are to be included in fund planning as a part of fund revenues.

[Sell Assets]

- If planned, these are to be included in annual fund planning.

Fig. 12 Fund Planning (No.2)

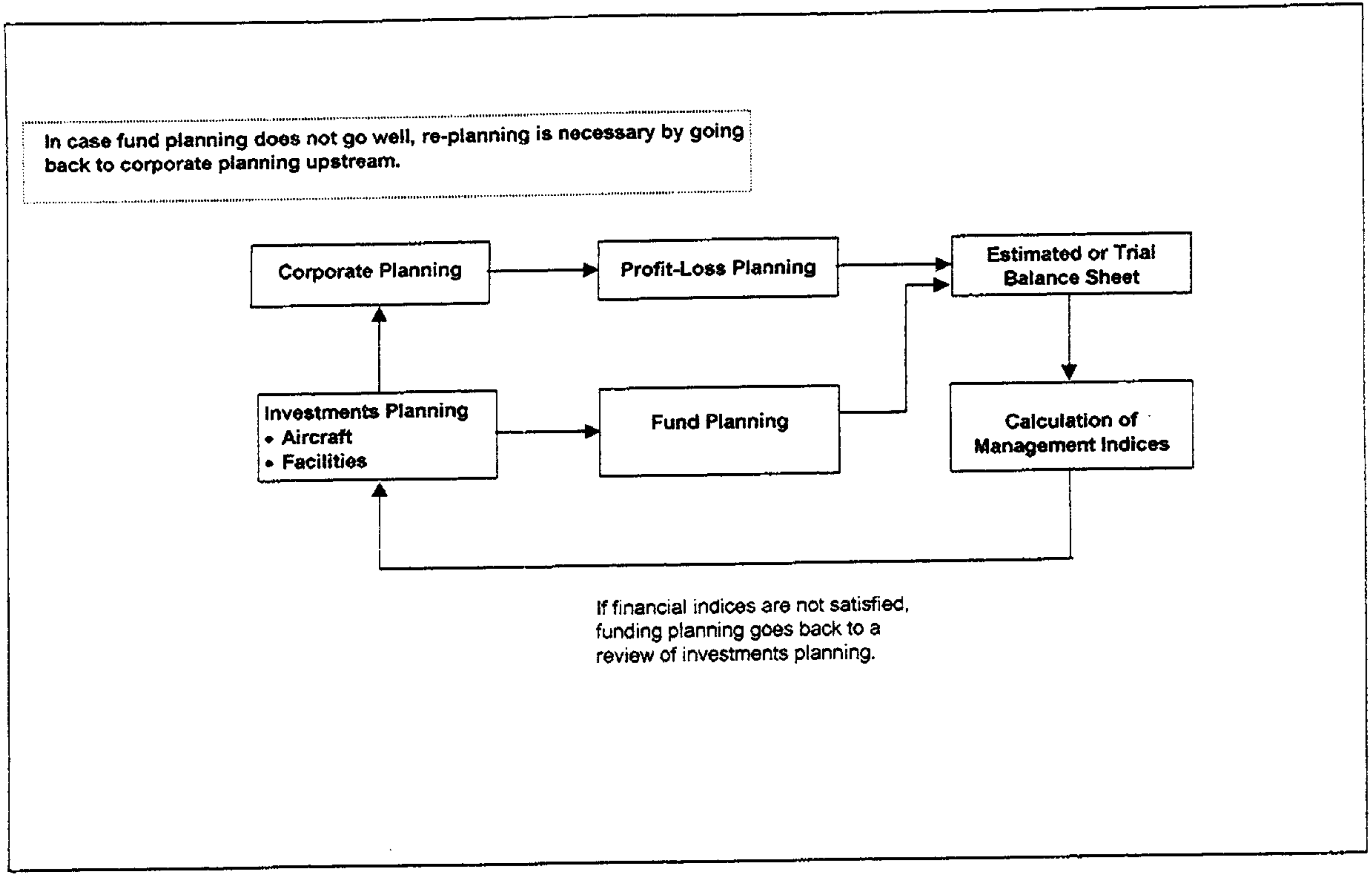


Fig. 13 Profit and Loss (P/L) of ICAO Base

Revenues

- **Scheduled Flight**

  Operating Revenue: Passenger, Baggage, Cargo, Mail } Scheduled Total

- **Non-Scheduled Flight**

  Operating Revenue

- **Non-Traffic Revenue**
- **Revenue Total**

Expenditures

- **Operating Cost**
  - Flight Operation (Note.1)
  - Maintenance
  - Depreciation (Note.2)
  - Ground Service (Note.3)
  - Passenger Service (Note.4)
  - Selling Cost
  - General and Administrative Cost
  - Other
- **Operating Cost Total**
- **Operating Profit and Loss**

- **Other Income and Expense**
- **Ordinary Profit and Loss** (including special profit and loss)
- **Tax.**
- **Net Profit and Loss**

Note 1 :
Including
1. Crew Salary and Travel Expenses
2. Fuel and Oil
3. Aircraft Insurance
4. Aircraft Lease
5. Crew Training
6. Other Aircraft Related Cost

Note 2
Including
1. Aircraft, Parts
2. Ground Equipment
3. Special Depreciation
4. Research/Development/ Pre-operating Cost
5. Deferred Training Cost

Note 3
Including
1. Landing Fee
2. Flight Safety Support in Flight
3. All Cost Concerning to Ground Handling (passengers, cargo and aircraft)

Note 4
Including
1. Cabin Crew Salary and Travel Expenses
2. Meal
3. All Cost concerning to Passenger Handling

Fig. 14 Balance Sheet Structure of ICAO Base

Current Assets

Fixed Assets
- Tangible
  - Aircraft
    - Acquisition Cost
    - Accumulated Depreciation
    - Closing Balance
  - Land & Building
  - Others
- in-Tangible
- Investment
- Deferred

Total Assets

Current Liability
- Advances Received & Deposits Received
- Current Liability
- Deferred (Provision for liabilities and charges) Liability

Fixed Liability
- Long Term Liabilities
- Loans Payable of Subsidiary Companies
- Other Fixed Liabilities
- Special Provision and Provision for Liabilities and Charges

Equity
- Capital
- Capital Reserve
- Legal Reserve and Other Retained Earnings

Total Liabilities and Equity

Fig. 15 Management Indices of ICAO Base

1. **Return of Assets**

$$\frac{\text{Net Earnings}}{\text{Total Assets}} \times 100$$

2. **Gross Profit Margin**

$$\frac{\text{Operating Profit}}{\text{Operating Revenue}} \times 100$$

3. **Net Profit Margin**

$$\frac{\text{Net Profit}}{\text{Operating Revenue}} \times 100$$

4. **Current Ratio**

$$\frac{\text{Current Assets}}{\text{Current Liabilities}} \times 100$$

5. **Equity Ratio**

$$\frac{\text{Equity}}{\text{Total Assets}} \times 100$$

6. **Turnover Ratio (round)**

$$\frac{\text{Operating Revenue}}{\text{Total Assets}}$$

7. **Turnover of Aircraft Investment (round)**

$$\frac{\text{Operating Revenue}}{\text{Aircraft Acquisition Cost}}$$

8. **Ratio of Depreciation to Operating Revenue**

$$\frac{\text{Depreciation (yearly cost)}}{\text{Operating Revenue}} \times 100$$

9. **Progressive Ratio of Aircraft Depreciation**

$$\frac{\text{Accumulated Aircraft Depreciation}}{\text{Aircraft Acquisition Cost}} \times 100$$

10. **Labor Productivity (Revenue ton-kilos per personnel)**

$$\frac{\text{R.T.K}}{\text{No. of Personnel}}$$

11. **Actual Weight Load Factor**

$$\frac{\text{RTK}}{\text{ATK}} \times 100$$

12. **Break Even Point Load Factor**

$$\frac{\text{Unit Cost}}{\text{Unit Revenue}} \times 100$$

13. **Unit Cost = Total Cost/ATK (Available Tonne Kilometer)**
14. **Unit Revenue = Total Revenue / RTK (Revenue Tonne Kilometer)**

Fig. 16 Example of Cost Distribution Logic for the Route Profitability Analysis

Cost Items	*Distribution Logic*
1. Crew Travel Expenses/Salary	*Crew duty flight hour*
2. Fuel/Oil	*Consumption rate (cost) by aircraft by route multiple block time*
3. Depreciation and Insurance of Aircraft	*Block Time*
4. Crew Training Cost	*Aircraft ton multiple block time (ton hours)*
5. Passenger Handling Cost	*RPK*
6. Cargo Handling Cost	*RCTK (Revenue Cargo Ton-Kilometer)*
7. Aircraft Handling	*Landing Times*
8. Meal	*RPK*
9. Sales Expenses	*Revenue*
10. Head Office General Administration Cost	*Ton-Hour*
11. Maintenance Cost	*Block Time*
12. Salary of Maintenance Mechanic	*Block Time*

Fig. 17 Example of Revenue and Expenditure Structure in Airline Accounting

Items Group		Detailed Items	Amount					
REVENUE	Passenger Revenue	Passenger Revenue	583,838		583,838			
	Non-Passenger Revenue	Cargo	168,167					
		Mail	16,591					
		Baggage	4,012					
		Other	8,913					
		Incidental	45,696		243,379	827,217		
VARIABLE EXPENSE	Passenger & Cargo	Passenger Sales Commission	52,394					
		Passenger Handling Cost	27,750					
		Cargo Handling Commission	9,950					
		Cargo Handling Cost	530	90,624				
	Operation Cost	Crew Expenses	5,549					
		Cabin Crew Expenses	14,436					
		Fuel and Oil	191,156					
		Maintenance Materials	17,342					
		Maintenance Outsource Labor	4,024					
		Landing Fee	33,056					
		Navaids Fee	18,995					
		Ground Handling Charge	34,475	319,033	409,657		417,560	(A) Marginal Profit
FIXED EXPENSE	Category 1	Aircraft Cost	69,003					
		Crew Salary	31,739					
		Cabin Crew Salary	31,217		131,959		285,601	(B) First Contributing Profit
	Category 2	Airport Staff Salary	30,986					
		Airport Expense	18,666					
		City Office Staff Salary	23,832					
		City Office Staff Salary	9,793		83,277		202,324	(C) Second Contributing Profit
	Category 3	Advertising/Sales Promotion	11,849					
		Maintenance Staff Salary	11,605					
		Other Staff Salary	55,590					
		Other Expense	52,617					
		Incidental Cost	32,482		164,143	789,036	38,181	(D) Operating Profit
OPERATING PROFIT			38,181					
NON-OPERATING PROFIT			-15,667					
ORDINARY PROFIT AND LOSS			22,514					

REPUBLIC OF UZBEKISTAN

NATIONAL AIR COMPANY
"UZBEKISTAN HAVO YULLARI"

JAPAN INTERNATIONAL
COOPERATION AGENCY

THE STUDY
FOR
THE AIR TRANSPORTATION DEVELOPMENT
IN THE REPUBLIC OF UZBEKISTAN

SOIL INVESTIGATION REPORT
FOR
NEW TASHKENT AIRPORT

AUGUST 1998

JAPAN AIRPORT CONSULTANTS, INC.

CONTENTS OF FIGURE

TABLE OF CONTENTS

ATTACHMENT

TABLE OF CONTENTS

1.0 INTRODUCTION

This report presents the results of a soil investigation for New Tashkent Airport Project.

A field investigation was performed by JVC UZGIITI from December 1997 to February 1998.

This report contains information as follows:

1) Results of 18 borings, 5 test pits, and laboratory tests,
2) Soil characteristics,
3) Evaluation of soil bearing capacity, and
4) Estimation of soil settlements, especially for settlements of soil under water saturated condition.

2.0 SCOPE OF WORK

The purpose of this soil investigation was to investigate the subsurface condition of the proposed site, to evaluate the engineering characteristics of the soils.

The scope of work conducted was as follows:

Field Works

1) 8 borings down to 25m in the Terminal area and 10 borings down to 7m in the Runway area (Total Depths: 270m).
2) 2 test pits by manual excavation with an area of 1.25m^2 down to 7.6m and 11.5m in the Terminal area, and 3 test pits of 3.5m, 5.2m and 15.0m in the Runway area (Total Depths: 33.2m).
3) 2 test pits by manual excavation with an area of 0.75x1.5m down to 2m in the Terminal area and 3 same test pits in the Runway area (Total Depths : 10m).

4) Undisturbed sampling from boreholes	: 49 samples
5) Undisturbed sampling from the test pits	: 63 samples
6) SPT testing performed every 1.0m depth in boreholes	: 269 points
7) CBR testing	: 15 points

Laboratory Tests

Physical properties	: 14
Direct shear test	: 30
Consolidation test	: 90
Compaction	: 12
Gradation analysis	: 91
Chemical analysis of soil water extraction	: 19
Chemical analysis of groundwater	: 4
Laboratory permeability test	: 5

The field works were conducted as follows:

· Boring was performed by a URB-2.5A rig, coring type boring with washing out operations below groundwater level, 127mm diameter.

· SPT testing was performed under ASTM D-1586-84 with 1m intervals using the URB-2.5A rig equipped with a 50.8mm split sampler in diameters and a 63.5 kg hammer.

· Undisturbed samples were obtained by a 127 mm sampler with subsequent placing the pasteboard cylinders and coating with paraffin, height of undisturbed samples is 150mm. Undisturbed block samples (200x200x200 mm) were obtained from the test pits by hand.

· CBR test was performed in the test pits at a depth of 2m under ASTM D-4429-93 using URB-2.5A rig equipped with 50.8 mm stamp, 31 kg ring load and screw jack with constant pressing rate to the soil to a depth of 7.62mm. Force of a stamp pressing to a soil was measured with a DASM 8-1 dynamometer having measuring limit 1000kg. Stamp setting was measured by deflectometer of MI 36 PAO type with scale division 0.01 mm fixed in inflexible system.

Laboratory testing was conducted in accordance with the following standards:

· GOST (State Standard) 5180-84 "Soils. Methods of laboratory testing of physical properties".

· GOST 12536-79 "Soils. Methods of laboratory testing for gradation and microagregate analysis".

· GOST 25584-83 "Soils. Methods of laboratory permeability testing".

· GOST 12248-78 "Soils. Methods of laboratory shear box testing".

· GOST 23908-79 "Soils. Method of laboratory sear box testing".

· GOST 26423-85 - GOST 26428-85 "Soils. Methods of cation-anion composition testing in soil water extraction".

· Direct shear test was performed in a Gydroprogect type device with a ring area of 40 cm^2, following a method of consolidated shearing under water saturated conditions and normal load 1-2-3 kg/cm^2.

· Consolidation test was conducted in a Gydroprogect type device with a ring -25mm height and 87mm diameter under loads of 0.5, 1.0, 2.0, 3.0 kg/cm^2.

The field investigation was performed by UZGIITI geotechnical department under general supervision of Sava V.N. Laboratory testing was performed by UZGIITI geotechnical lab under general supervision of Vostrikova V.I.

3.0 GEOTECHNICAL CONDITION

The proposed New Tashkent Airport site is located on irrigated lands of 2 collective farm in Chinaz district of Tashkent region at a distance 40 km from Tashkent city. Tashkent-Samarkand highway runs along the site (See Figure 3.1). The investigation plan is shown in Figure 3.2.

3.1 Topographical Condition

Geomorphologically the site is located at IV terrace of the Chirchik river, having a slight slope from the North-east to the South-west. An Absolute elevation is ranging from 331.2 to 347.3m, and lowest and highest elevations are situated in the south-south-east and in the north-north-east, respectively.

Grass and bushy are typical found at the proposed site. Roots of grass penetrate to a depth of 0.3m. Small surface water objects exist within the site.

3.2 Subsurface Condition

Geologically the area is composed mainly with alluvial middle Quaternary deposits of Tashkent complex (pQ^{s}_{II}), represented by silty and clayey soils with a thickness of 52 to 70m, underlain by gravel. Within the investigated area down to 25m, alluvial middle Quaternary deposits consist of loess (sandy silt) with a 0.3m thick organic topsoil on the surface.

From the results of 18 borings and 5 test pits, the subsurface conditions are summarized as follows:

a) Topsoil : First layer from the existing ground surface to 0.3m depth is organic topsoil with grass roots.

b) Loess - like sandy SILT : The second layer from 0.3m to 25m depth is light - brown colored, slightly moist to water saturated, plastic to hard loess. N value ranges from 1 to 50.

Taking soil properties and hydrogeological situation into consideration, the second layer within Terminal and Runway areas could be separated into two geotechnical elements (GE):

GE-1: Light-brown, high porous, from slightly moist to water saturated from plastic to hard sandy SILT bedded with occasional silt layers. Found above groundwater level. Soil of GE-1 type found from ground surface down to 1.5-15.0m.

GE-2: Light-brown, low porous, water saturated, flow consistency. This type of soil exists below groundwater level. Investigated thickness ranges from 2 to 20.0m.

The soil profiles are shown in Figure 3.3.

3.3 Groundwater

Groundwater level within the site encountered in a wide range from 1.5 to 15.5m below ground surface (bgs). Groundwater is characterized as an irrigation type. For the investigated area, it could be monitored with wells GHS-7 and 1^b belonging to JSC UzbekHydrogeology.

Fluctuations of the groundwater level in both wells are generally similar, having low level during winter and spring (from November till February to March) and high level during summer and autumn when the irrigated lands are watered intensively and the amount of the Chirchik river flow becomes large.

Due to this reasons the amplitude of seasonal groundwater fluctuation could significantly vary in different years. Long term amplitude of groundwater fluctuation reaches 2.0m. The field investigation was carried out during the period of low groundwater level and the level in summer and autumn would be higher.

In spite of the land use change at the site, the area is still situated within a zone of irrigation and groundwater condition mentioned above will last.

4.0 SOIL COMPOSITION AND PHYSICAL-MECHANICAL PROPERTIES

4.1 Terminal Area

Within the Terminal area the soil condition was investigated by boreholes C1 - C8 and test pits 4 and 5 to depth ranging from 7.6 to 25.0m. Two GEs defined in Section 3.2 were encountered are within the drilled depth.

4.1.1 Soil of GE-1

1) Physical - mechanical properties

Soil GE-1 is characterized with high porosity, mainly slightly moist, hard consistency. It is classified as sandy silt which exists above groundwater level. SPT results vary from 4 to 19, and the average N value is 10.8. General soil characteristics are shown in Table 4.1(1).

2) Result of compaction test

Maximal dry density of GE-1, varies from 1.52 to 1.62 ton/m^3, under optimal water content from 14.7 to 15.5 %. The details of compaction result are shown in Table 4.4. A coefficient of permeability varies from 2.2 x 10^{-5} to 2.9 x 10^{-5} cm/s.

3) Result of CBR test

CBR test was performed for GE-1 soil at 2 points at 2.0m bgs. Values of CBR-test vary from 4.35% to 6.27% (see Table 4.5(1)). The soil physical parameters at the test points are shown in Table 4.5(2).

4.1.2 Soil of GE-2

Soil GE-2 is characterized with low porosity, water saturation and flow consistency. It is classified as sandy silt which exist below groundwater level. General characteristics are shown in Table 4.1(2).

The SPT results show that N values vary within range of 6 to >50 with an average value of 13.1. N value tends to increase with depth. The distribution of N values is shown in Figure 4.1.

4.2 Runway Area

Within the Runway area the soil was investigated by boreholes R1-R10 and test pits 1 to 3 to depth ranging from 3.5 to 15.0m. Two GE were encountered within the drilled depth.

4.2.1 Soil of GE-1

1) Physical - mechanical properties

Soil GE-1 are characterized with high porosity, slightly moist, hard consistency. It is classified as sandy silt which exists above groundwater level. SPT results vary from 5 to 12, and the average N value is 8.8. General soil characteristics are shown in Table 4.2(1).

2) Result of compaction test

Maximal dry density of GE-1 varies from 1.52 to 1.60 ton/m^3, under optimal water content from 14.6 to 16.5 %. The details of compaction results are given in Table 4.4. A coefficient of permeability varies from 2.3 x 10^{-5} to 2.7 x 10^{-5} cm/s.

3) Result of CBR test

CBR test was performed for GE-1 soil at 3 points at 2.0m bgs. Values of CBR test vary from 2.10% to 6.28% (see Table 4.5(1)). The soil physical parameters are presented in Table 4.5(2).

4.2.2 Soil of GE-2

Soil GE-2 is characterized with low porosity, water saturation and flow consistency. It is classified as sandy silt which exists below groundwater level. General soil characteristics are shown in Table 4.2(2).

SPT test results show that N values vary within range of 1 to 13 with an average value of

7.4. The distribution of N values is shown in Figure 4.2.

4.3 Soil Settlement under Saturated Condition

Loess soil, such as Q_4^1 and Q_4^2, appears to have in hard consistency with low compressibility at relatively low water content. When it become saturated, however, soil structure, bonded by soluble salts, is collapsed without any additional load, and consequently a large settlement occurs. This settlement is called " saturating settlement ".

The coefficient of saturating settlement is defined as below:

$$\delta s = (hp - hs) / ho$$

where:

δ s	: Coefficient of saturating settlement
ho	: Original height of soil sample
hp	: Height of soil sample under a certain pressure of P before saturating
hs	: Height of soil sample under a certain pressure of P after saturating

The coefficient of saturating settlement under overburden pressure (P_{σ}) varies from 0.001 to 0.021, under P=3 kgf/cm^2 varies from 0.012 to 0.117. Initial saturating settlement pressure varies within range 0.3 - 3.0 kgf/cm^2 (See Table 4.1).

Thickness of strata subjected to saturating settlement varies from 4.0 to 15.3m. A total amount of the saturating settlement under overburden condition varies from 4.0 to 11.5 cm.

In accordance with *paragraph 3.6 SniP 2.02.01.83* within the investigated area, two types of soil with respect to settlement are determined - Type I and Type II.

Type I: Without additional loading, saturating settlement will be less than 5cm for the entire strata of soil.

Type II: Without additional loading, saturating settlement will be more than 5cm for the entire strata of soil.

The terminal area is characterized mainly as Type II, except area where C-8 and TP-5 located, Type I is encountered in this area. Almost entire Runway area is characterized as

Type I, except the area at R-1, R-2 and TP-1, Type II is encountered in this area.

4.4 Results of Chemical Analysis

4.4.1 Groundwater Chemical Analysis

Groundwater mineralisation ranges from 770 to 3350 mg/l. HCO_3 content ranges from 198.3 to 356.8 mg/l, Cl and SO_4 content correspondingly ranges from 21.8 to 45.3mg/l and from 236.5 to 2193.0 mg/l (See Table 4.5).

In accordance with *Tables 6 and 7 SNiP 2.03.11-85* (Construction Rules and Regulations) "Protection of constructions from corrosion" groundwater properties varies from none-aggressive till very aggressive to Portland cement and slightly aggressive to rebar of reinforced concrete.

Building Research Establishment Digest (1975) introduced the classifications about water / soil corrosion to concrete and the requirements for the use of sulphate - resisting cement as referred on Table 4.6.

Based on this classification, the corrosion class of groundwater within the proposed area is classified mainly as Class 3 except TP-3 where the corrosion class belongs Class 1. The details are shown as follow:

Terminal Area

Boring & Pit No.	Sampling Depth(m)	SO_4^{2-} mg/l	Class
TP-4	10.8	2104.3	3
TP-5	7.4	2193.0	3

Runway Area

Boring & Pit No.	Sampling Depth(m)	SO_4^{2-} mg/l	Class
TP-2	4.9	1256.8	3
TP-3	3.3	236.5	1

4.4.2 Soil Chemical Analysis

The amount of soluble salts in soil GE-1 ranges from 480 to 5225 mg/kg (0.048-0.523%), content of Cl and SO_4 ions range from 39.4 to 151.0 mg/kg (0.004-0.015 %) and 113.0

to 3167.8 mg/kg (0.011-0.317 %). The details are shown in Table 4.7.

In accordance with UZRCT (Uzbekistan Standards) "Soils. Classification" GE-1 is comprised of none-saline soil.

According to *Table 4 of SniP 2.03.11-85* the degree of aggressive influence of this soil varies from none-aggressive till very aggressive to concrete of Portland cement and slightly aggressive to rebar of reinforced concrete.

Based on Building Research Establishment Digest (1975) as referred on Table 4.6, soil corrosion class is classified mainly as Class 1. Class 2 soil is encountered only within a limit area. The details of the soil corrosion class are given below:

Terminal Area

Boring & Pit No.	Sampling Depth(m)	SO_4^{2-}		Class
		mg/kg	%	
TP-4	1.0	545.1	0.055	1
TP-4	2.0	267.4	0.027	1
TP-4	2.0	143.9	0.014	1
TP-4	3.0	504.6	0.050	1
TP-4	4.0	2787.2	0.279	2
TP-5(O)	2.0	267.4	0.027	1

Runway Area

Boring & Pit No.	Sampling Depth(m)	SO_4^{2-}		Class
		mg/kg	%	
TP-4	1.0	545.1	0.055	1
TP-1	2.0	144.0	0.014	1
TP-1	3.0	113.0	0.011	1
TP-1	4.0	144.0	0.014	1
TP-1(O)	2.0	267.4	0.027	1
TP-2	1.0	3167.8	0.317	2
TP-2	2.0	1388.5	0.139	1
TP-2	3.0	2602.1	0.260	2
TP-2	4.0	143.9	0.014	1
TP-2(O)	2.0	185.1	0.019	1
TP-3	1.0	123.4	0.012	1
TP-3	2.0	154.3	0.015	1
TP-3(O)	2.0	133.7	0.013	1

5.0 ENGINEERING ANALYSIS

5.1 Earth Work

5.1.1 Site Preparation and Clearance

Prior to commencement of earthwork operations, the site should be cleared of all significant vegetation growth including all trees, bushes and their roots. The topsoil layer which is largely organic in nature should be stripped off in all earthwork areas prior to earthworks commencing.

The soft soils may exist within the area of the stream channel. The soft layers, if they exist, should be stripped and disposed of off - site.

Areas to receive fill should be proof rolled, prior to fill placement commencing.

5.1.2 Fill

The loess soil can be used as fill material for site preparation. According to the results of compaction tests, the optimum moisture content ranges from 14.6% to 16.5% with a average value of 15.5% and the maximum dry density from 1.77 to 1.85 ton/m^3 with a average value of 1.81 ton/m^3.

For areas where no future structures are planned or no load bearing capacity is required, general fill may be used. The fill material should be placed in layers not exceeding 500mm and compacted to 85% of maximum dry density.

For areas planned for general structures, facilities or other load bearing areas, structural fill should be required. In this case, the thickness of each lift should be restricted to about 250mm. The fill material should be compacted to more than 90% of maximum dry density.

For area planned for significant structures or settlement sensitive facilities, special structural should be needed. The thickness of each lift should be restricted to 250mm. The fill material should be compacted to more than 95% of maximum dry density.

Fill slope can be planned at slopes of 1 vertical to 2 horizontal.

5.1.3 Excavations

It is anticipated that the soils across the whole of the site may be excavated by means of conventional earthmoving equipment.

Based on the special characteristics of loess soil, it is recommend that temporary excavation slopes should be planned at 1 vertical to 1/2 horizontal and permanent excavation slopes at 1 vertical to 1 horizontal in the soil above groundwater level. For excavation below groundwater level, however, slope protection and drainage should be needed in order to prevent serious slope collapse.

5.1.4 Erosion Control

It is anticipated that fill slopes and cut slopes in loess soils may be adversely affected by rain. For the permanent fill and cut slopes, erosion protection in the form of a surface treatment should be considered.

5.2 Soil Bearing Capacity

5.2.1 Modified Terzaghi Equation

Modified Terzaghi's equation is given below:

$$qa=1/3(\alpha cN_c+\ \beta \gamma_1 BN_\gamma+\ \gamma_2 DN_q)$$

where

c	:Cohesion
α, β	:Shape factor
N_c, N_γ, N_q	:Bearing capacity factor
γ_1	:Unit weight of soil below foundation level
γ_2	:Unit weight of soil beneath foundation level

5.2.2 Empirical Formula for Loess Soil

Basic bearing capacity without considering foundation dimension and setting depth could be calculated as follow:

$$qo=144.8 + 7.417 (w_L / e) - 8.035 w_n$$

where

qo	:Basic bearing capacity (kPa)
w_L	:Liquid limit (%)
e	:Void ratio
w_n	:Natural water content (%)

When foundation wide B>3.0m or setting depth D>1.5m, the above formula can be modified below:

$$qa=qo + \gamma_1(B-3)\eta_B + \gamma_2(D-1.5)\eta_D$$

where

qa	:Allowable bearing capacity (kPa)
η_B, η_D	:Bearing capacity factor
γ_1	:Unit weight of soil below foundation level (kN/m³)
γ_2	:Unit weight of soil beneath foundation level (kN/m³)

* When foundation width B<3.0m, let B=3.0m. When B>6.0m, take B=6.0m. When foundation depth D<1.5m, let D=1.5m.

η_B and η_D are given below:

Soil Type	Physical Indices	η_B	η_D
Q_3, Q^1_4 Loess - Like Soil	$w_n \leq 24\%$	0.2	1.25
	$w_n > 24\%$	0	1.10
Saturated Loess - Like Soil	$e < 0.85$ and $w_L < 0.85$	0.2	1.25
	$e > 0.85$ or $w_L > 0.85$	0	1.10
	$e \geq 1.0$ or $w_L \geq 1.0$	0	1.00
Q^2_4 Loess - Like Soil		0	1.00

Using these formula and related soil factors, the allowable bearing capacities for each GE are calculated as follows:

		Soil Parameters							Allowable Bearing Capacity (kPa)	
Area	Soil Layer	γ_1	γ_2	ϕ	c	w_n	w_L	e	Terzaghi Equation	Empirical Formula
Terminal	GE-1	16.9	16.9	26.0	7.4	15.5	25.8	0.816	120	255
〃	GE-2	19.7	19.7			27.0	25.9	0.723		191
Runway	GE-1	17.9	17.9	26.5	9.2	21.9	25.7	0.816	138	176
〃	GE-2	19.5	19.5			28.1	26.4	0.757		178

* Foundation Shape : Square, 3.0m×3.0m

** Foundation Setting Depth : 1.5m

5.3 Soil Settlement

5.3.1 Settlement Analysis Method

1) Terzaghi's consolidation theory

To calculate the settlement for cohesive soil, a consolidation theory proposed by Terzaghi was used. The formula is as follows:

$$S = \Sigma(Cc\ \Delta H)/(1 + e_0)\log_{10}(\Delta P / P_0)$$

where: S : Soil settlement (cm).
Cc : Compression index
ΔH : Thickness of consolidation layer (cm)
e_0 : Initial void ratio
P_0 : Preconsolidation pressure (kN/m^2)
ΔP : Increment of pressure (kN/m^2)

2) De beer's formula

De beer's formula was used to estimate the settlement for sandy silt and cohesionless soil. The formula is given below:

$$S = \Sigma(P_0\ \Delta H)/(1.5\,Cr)\log_{10}[(P_0 + \Delta P)/P_0]$$

where: S : Soil settlement (cm).

ΔH : Thickness of consolidation layer (cm)

P_0 : Overburden pressure (kN/m^2)

ΔP : Increment of effective pressure (kN/m^2)

Cr : Rebound index $Cr = 10\,a\,N$

N : N value

a : Coefficient

For sandy silt	: a = 2.5
For sand	: a = 4.0
For sand with gravel	: a = 8.0

3) Saturating settlement

Saturating settlement can be computed as follows:

$$S_s = \Sigma \delta_s H$$

where S_s : Saturating settlement (cm)

δ_s : Coefficient of saturating settlement

H : Thickness of soil layer of which δ_s is equal or larger than 0.010

5.3.2 Settlement Due to Additional Load

1) Settlement due to fill load

The local loess soil within the proposed area will be used for the site preparation as fill material. Entire fill stratum with a maximum height of 10m will be compacted layer by layer. Referring to the results of compaction test, the fill parameters used for settlement calculation are estimated as below:

Compression index	: 0.010
Void ratio	: 0.704
Unit weight	: 1.8 ton/m^3
Maximum fill height	: 10 m
Maximum fill load	: 18 ton/m^2
Average N value	: 10 blows/30cm

The settlement of the existing subsoil due to maximum fill load are shown below:

Load (ton/m²)	Settlement Type	Layer	Settlement (cm)	
			Runway Area (TP-1)	Terminal Area (TP-4/C-4)
Fill Load : 18 (Thickness : 10m)	Consolidation Settlement	GE1	27.2	21.7
		GE2	4.9	30.0
		Total	32.1	51.7
	Saturating Settlement		39.6	47.8

Two methods of settlement analysis stated above are used to estimate compressive settlement in fill stratum due to self load. The settlements of fill stratum are 4.8cm and 5.2cm corresponding to De Beer's Method and Terzaghi Theory, respectively. The details of the results are shown in Table 6.1.

2) Settlement of Runway Area

The average pressure on subgrade surface are given below:

Thickness of asphalt pavement : 1.56 m
Pressure due to asphalt pavement : 2.9 ton/m²
Pressure due to airplane load : 7.3 ton/m²

The settlements of subgrade surface due to pavement load and airplane load are shown as follow:

Load (ton/m²)	Settlement Type	Layer	Settlement (cm)	
			Runway Area(TP-1)	
			Pavement Load	Pavement & Airplane Load
Pavement Load: 2.9 Airplane Load : 7.3	Consolidation Settlement	GE1	8.8	21.5
		GE2	1.2	3.6
		Total	10.0	25.1
	Saturating Settlement		18.6	28.9

3) Settlement of Apron Area

The average pressure on subgrade surface of Apron Area are shown as follow:

Thickness of concrete pavement	: 0.87 m
Pressure due to asphalt pavement	: 1.9 ton/m^2
Pressure due to airplane load	: 19.4 ton/m^2

The settlements of subgrade surface due to pavement load and airplane load are shown as follow:

Load (ton/m^2)	Settlement Type	Layer	Settlement (cm)			
			Runway Area(TP-1)		Terminal Area(TP-4/C-4)	
			Pavement Load	Pavement & Airplane Load	Pavement Load	Pavement & Airplane Load
Pavement Load : 1.9 Airplane Load : 19.4	Consolidation Settlement	GE1	6.4	33.2	5.8	30.0
		GE2	0.7	6.5	4.5	34.7
		Total	7.1	39.7	10.3	64.7
	Saturating Settlement		17.0	42.6	12.2	51.6

4) Settlement of Control Tower

Control Tower weights about 1,000 ton with a base of 10m x 10m. The settlements due to Control Tower load is shown as follow:

Load (ton/m^2)	Settlement Type	Layer	Settlement (cm)	
			Runway Area (TP-1)	Terminal Area (TP-4/C-4)
P = 10 (Area : 100 m^2)	Consolidation Settlement	GE1	15.2	15.5
		GE2	0.7	5.4
		Total	15.9	20.9
	Saturating Settlement		28.5	31.5

5.3.3 Settlement Time

Settlement time for consolidation can be estimated by following formula:

$$t = T H^2 / c_v$$

where t : Settlement time (sec)

T : Time factor

H : Thickness of consolidation soil (cm)

c_v : Coefficient of consolidation

Coefficient of consolidation was calculated based on the results of consolidation test. The parameters related to calculation of settlement time are shown as follow:

Soil Layer	Soil Condition	Coefficient of Permeability k (x 10^{-5}cm/sec)	Coefficient of Volume Compressibility m_v (cm^2/kg)	Coefficient of Consolidation c_v (x $10^{-4}cm^2$/sec)	Thickness of Compressible soil H (m)
Terminal Area					
GE1	Natural Moisture	2.2~2.9	0.014	15.7~20.7	7.0
GE2	Saturated	2.2~2.9	0.035	6.29~8.29	20.0
Runway Area					
GE1	Natural Moisture	2.3~2.7	0.013	17.7~20.8	7.0
GE2	Saturated	2.3~2.7	0.027	8.5~10.0	20.0

The settlement times related to 90% degree of consolidation are given below:

Soil Layer	Soil Condition	Coefficient of Consolidation c_v (x $10^{-4}cm^2$/sec)	Thickness of Compressible soil H (m)	Settlement Time (years)	
				Double Drainage	Single Drainage
Terminal Area					
GE1	Natural Moisture	15.7~20.7	7.0	1.6~2.1	6.4~8.5
GE2	Saturated	6.29~8.29	20.0	32.9~43.4	131.6~173.4
Runway Area					
GE1	Natural Moisture	17.7~20.8	7.0	1.6~1.9	6.4~7.6
GE2	Saturated	8.5~10.0	20.0	27.3~32.1	109.1~128.3

6.0 CONCLUSION

1) The loess soil above groundwater level (GE-1) within the site is characterized with high porosity, slightly moist and hard consistency. In natural condition, it appears to have low compressibility with a high preconsolidation pressure. But when it become saturated, the soil structure, bonded by soluble salts, may collapsed without any additional load, and consequently a large settlement called " saturating settlement " may occur. The thickness of strata subjected to saturation settlement varies from 4.0 to 15.3m, and a total amount of the saturating settlement under overburden condition varies from 4.0 to 11.5cm.

The soil below groundwater level (GE-2) is characterized with low porosity and flow consistency. The SPT results show that N value tends to increase with depth. The N values below the elevation of 318m at boring C-8 are over 50.

5) The loess soil can be used as fill material for site preparation. General fill with a 85% of degree of compaction may be used for areas where no load bearing capacity is required. Structural fill with a range from 90% to 95% of degree of compaction should be required for areas planned for structures or other load bearing areas.

Fill slope can be planned at slopes of 1 vertical to 2 horizontal. Temporary cut slopes can be planned at 1 vertical to 1/2 horizontal and permanent cut slopes at 1 vertical to 1 horizontal in the soil above groundwater level. For excavation below groundwater level, slope protection and drainage should be needed. All permanent fill and cut slopes should require erosion protection treatment.

6) Soils of GE-1 and GE-2 can be used as bearing strata for foundations. The bearing capacities are analyzed in Section 5.2. However, it must be noted that both consolidation and saturating settlements should be considered into foundation design unless water proofing or soil improving will be performed.

7) According to the results of settlement analysis, 10m thickness of fill load will produces approximately 30 to 50cm of consolidation settlement and about the same amount of saturating settlement at the areas of TP-1 and TP-4.

Generally, for areas of high groundwater level, consolidation settlement will be chief settlement. The settlement time to reach 90% of degree of consolidation will be approximately 30 to 40 years under double drainage condition, and more than a hundred years for single drainage condition. For areas of low groundwater level, saturating settlement will become larger than or equivalent to consolidation settlement. In this case, it is considered that consolidation settlement time which is governed mainly by GE-1 layer will last a few years under double drainage condition and 30 to 40 years under single drainage condition.

To reduce consolidation and saturating settlement, soil improvement and waterproofing methods are available. For significant or settlement sensitive structures, deep foundation such as pile should be required.

8) Considering the fluctuation of groundwater level, it is recommended that soil erosion class should be classified as Class 3, and sulphate - resisting Portland cement should be required for construction of foundations or underground structures.

9) In accordance with *paragraph 2.27 SNiP 2.02.01-83 and KMK 2.01.01-94*, mean depth of seasonal soil freezing is 0.27m.

FIGURE

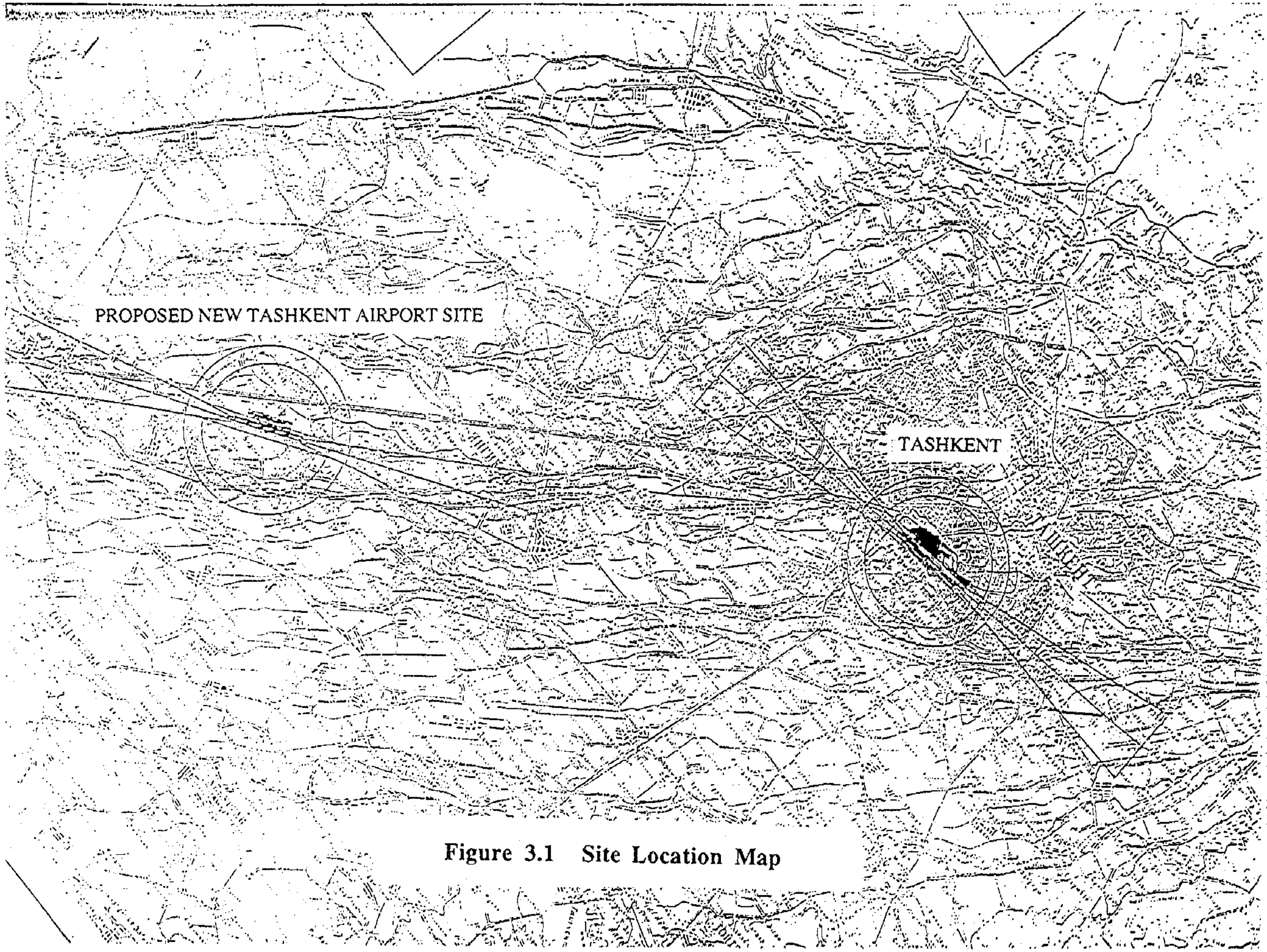


Figure 3.1 Site Location Map

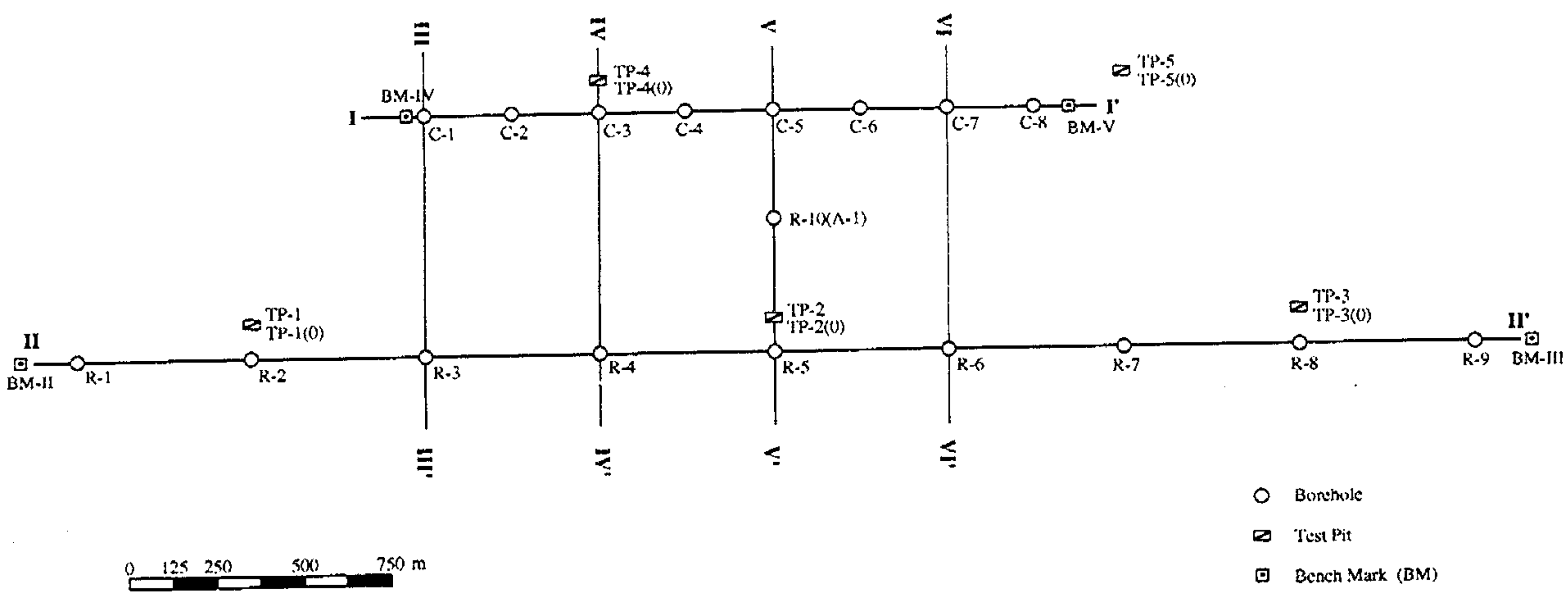


Figure 3.2 Exploration Location Plan

Figure 3.3 (1) Section I ~ I'

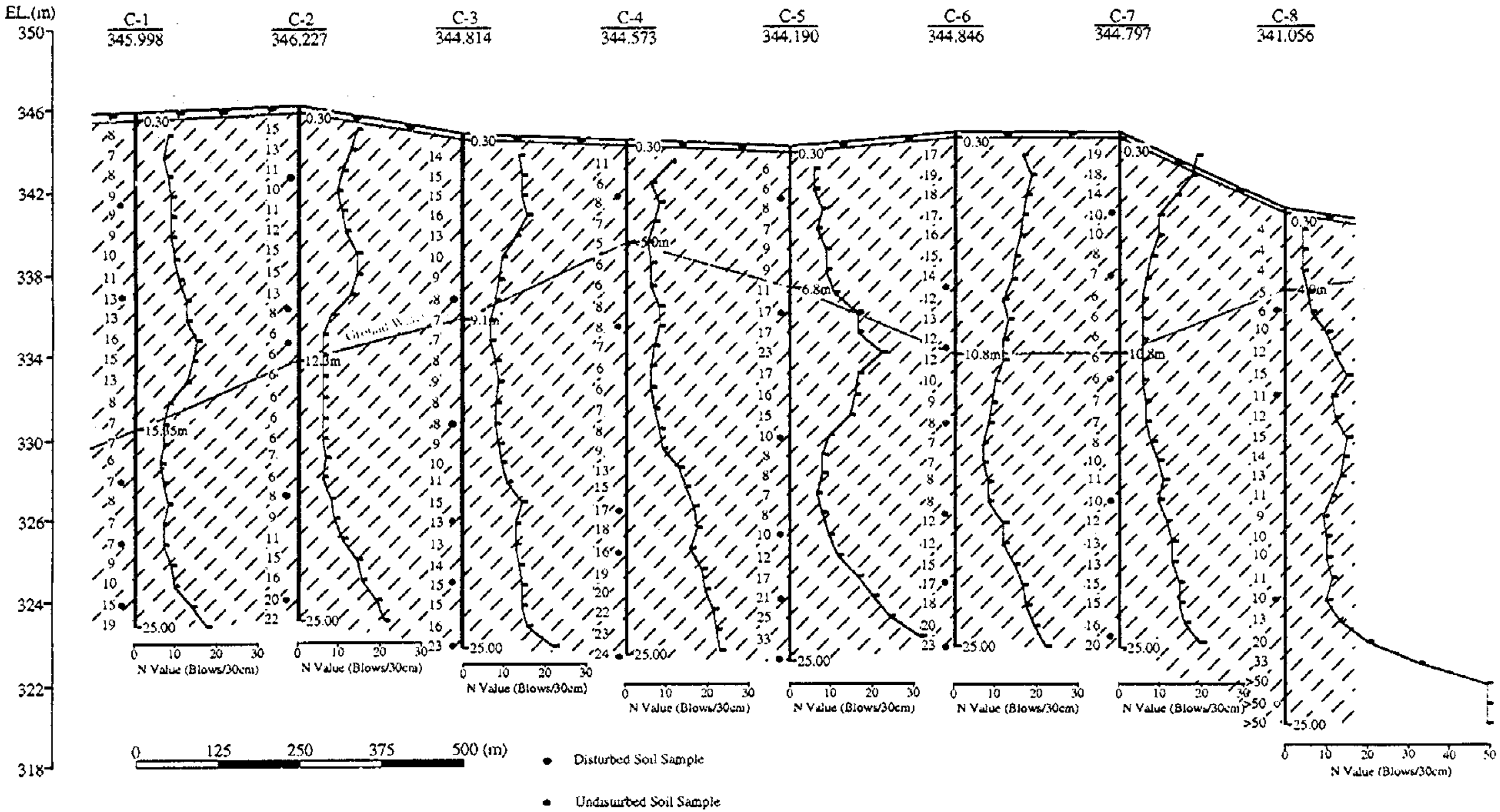


Figure 3.3 (2-1) Section II ~ II'

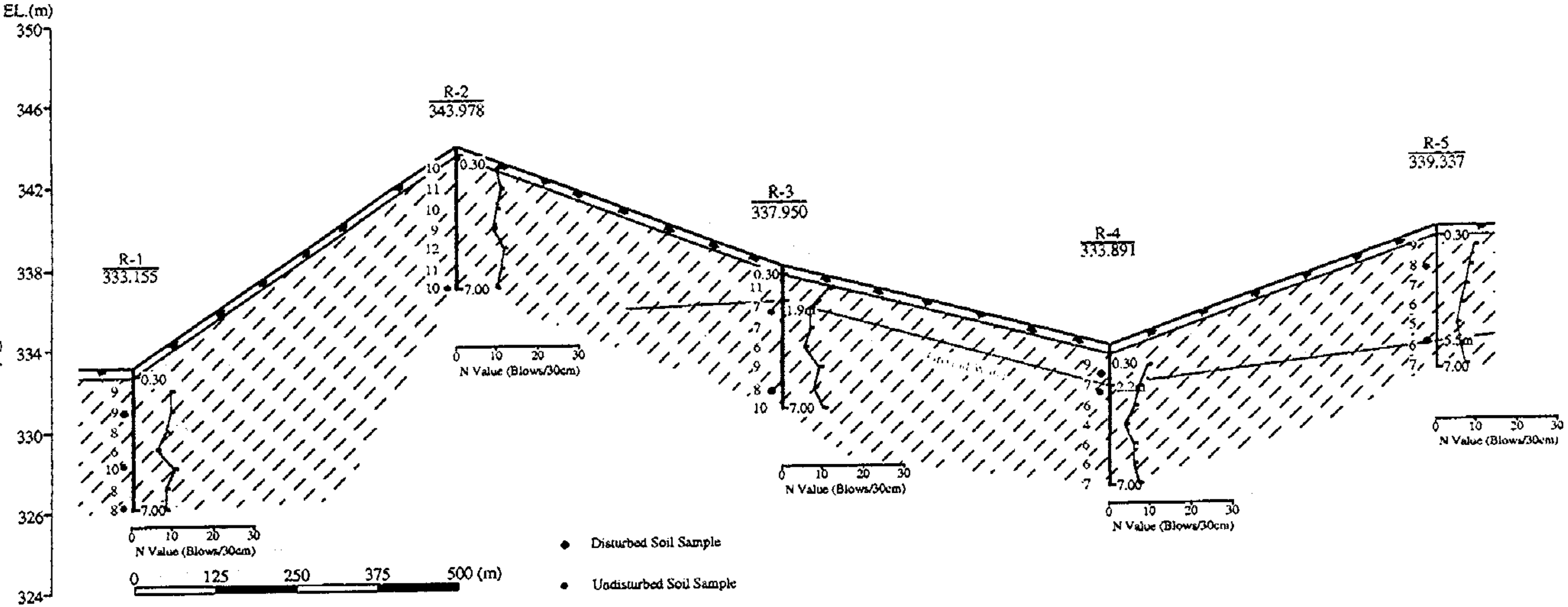


Figure 3.3 (2-2) SECTION II ~ II'

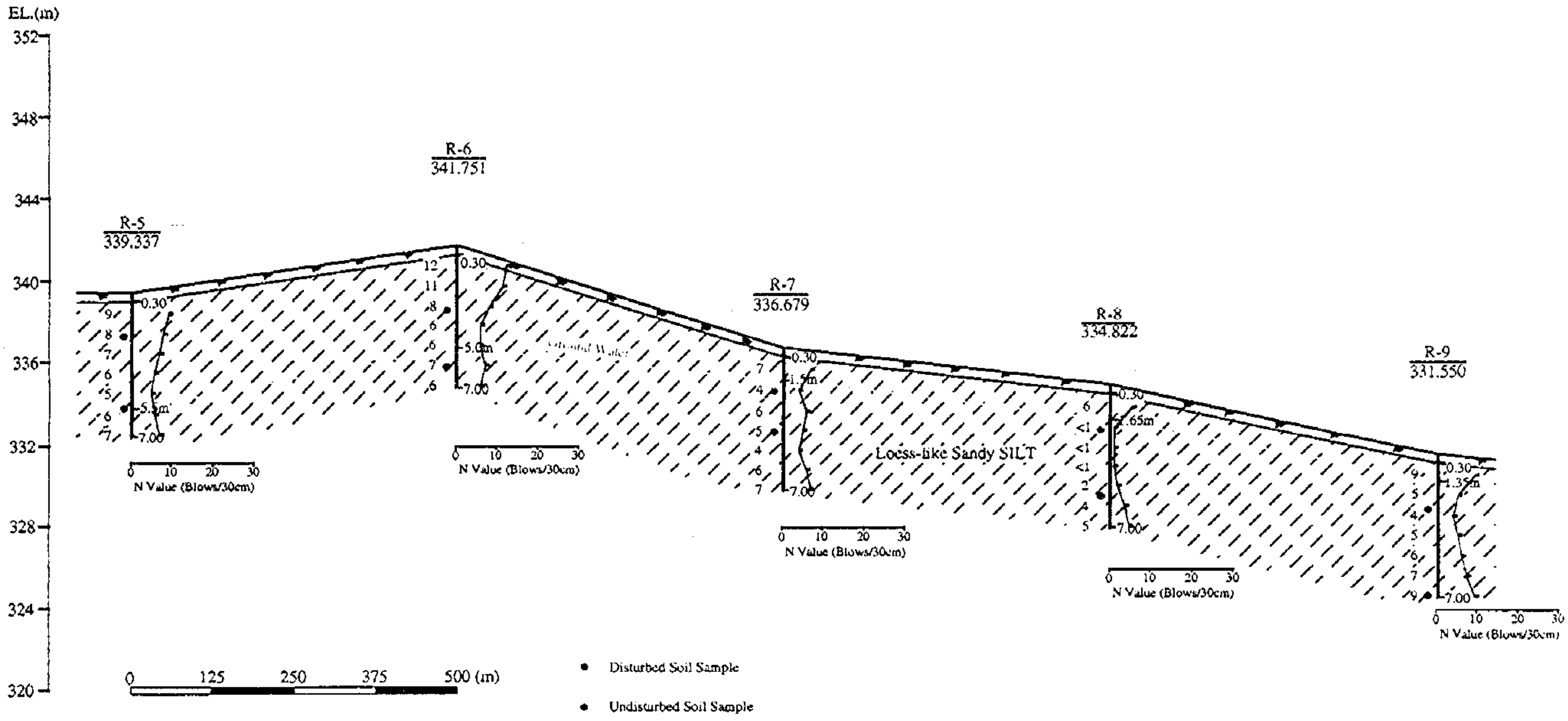


Figure 3.3 (3) Section III ~ III'

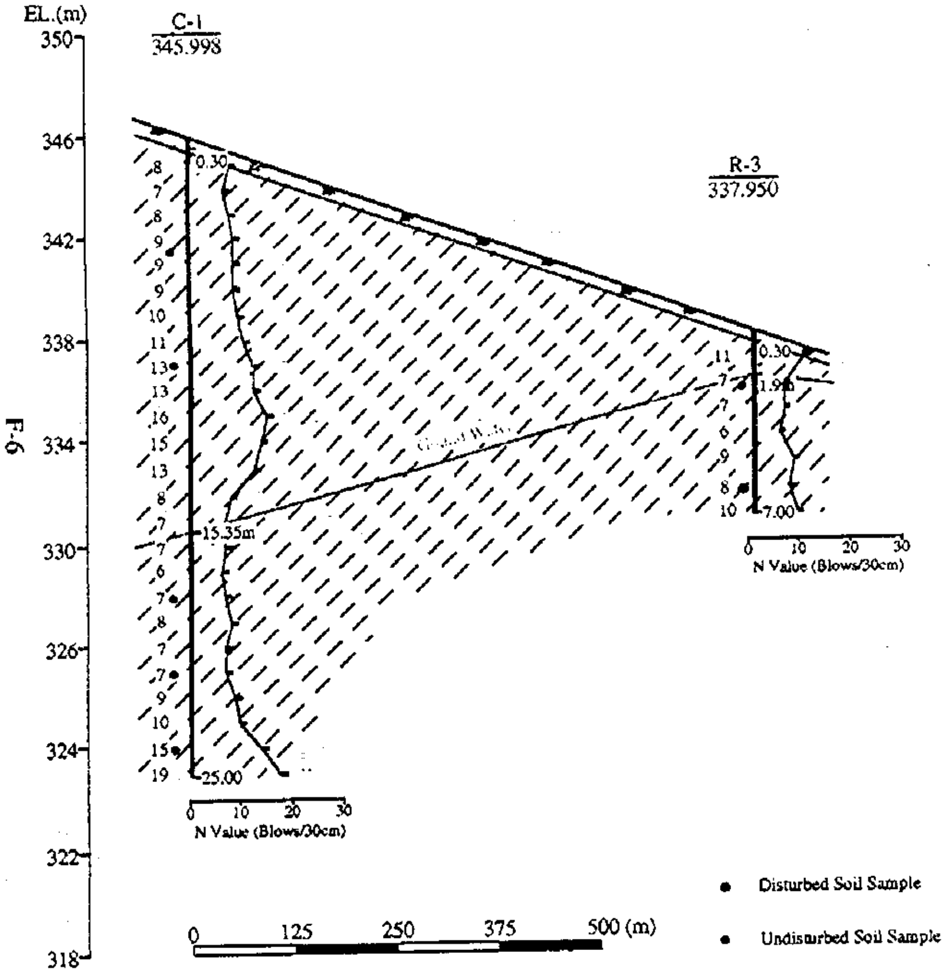


Figure 3.3 (4) Section IV ~ IV'

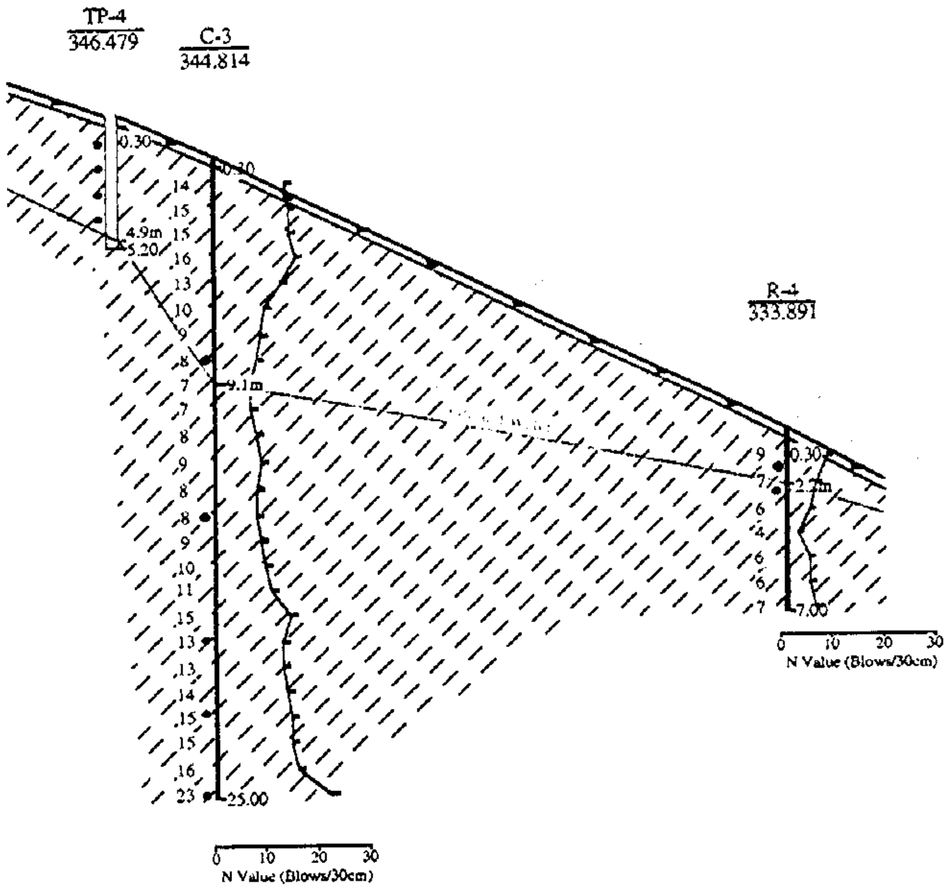


Figure 3.3 (5) Section V ~ V'

Figure 3.3 (6) Section VI ~ VI'

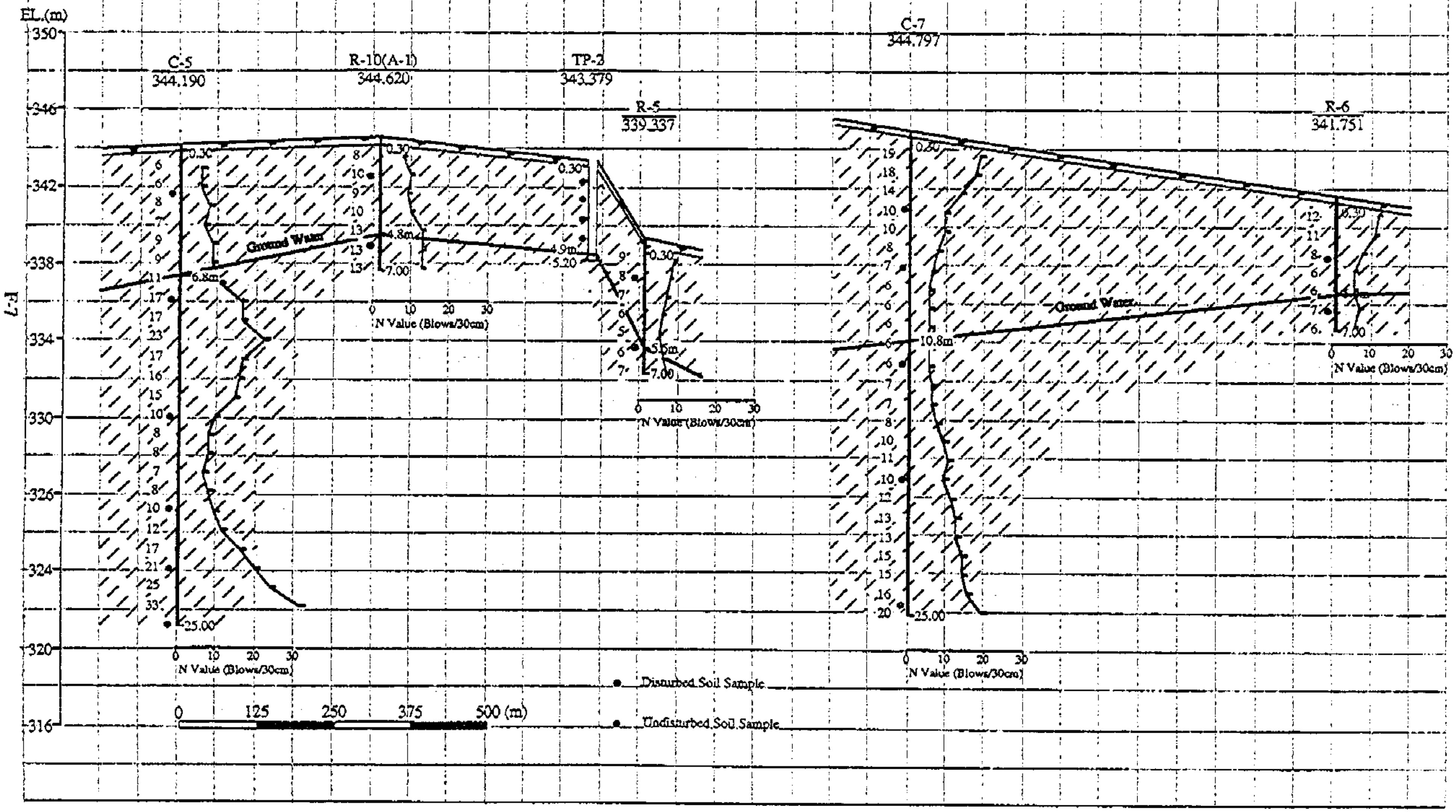
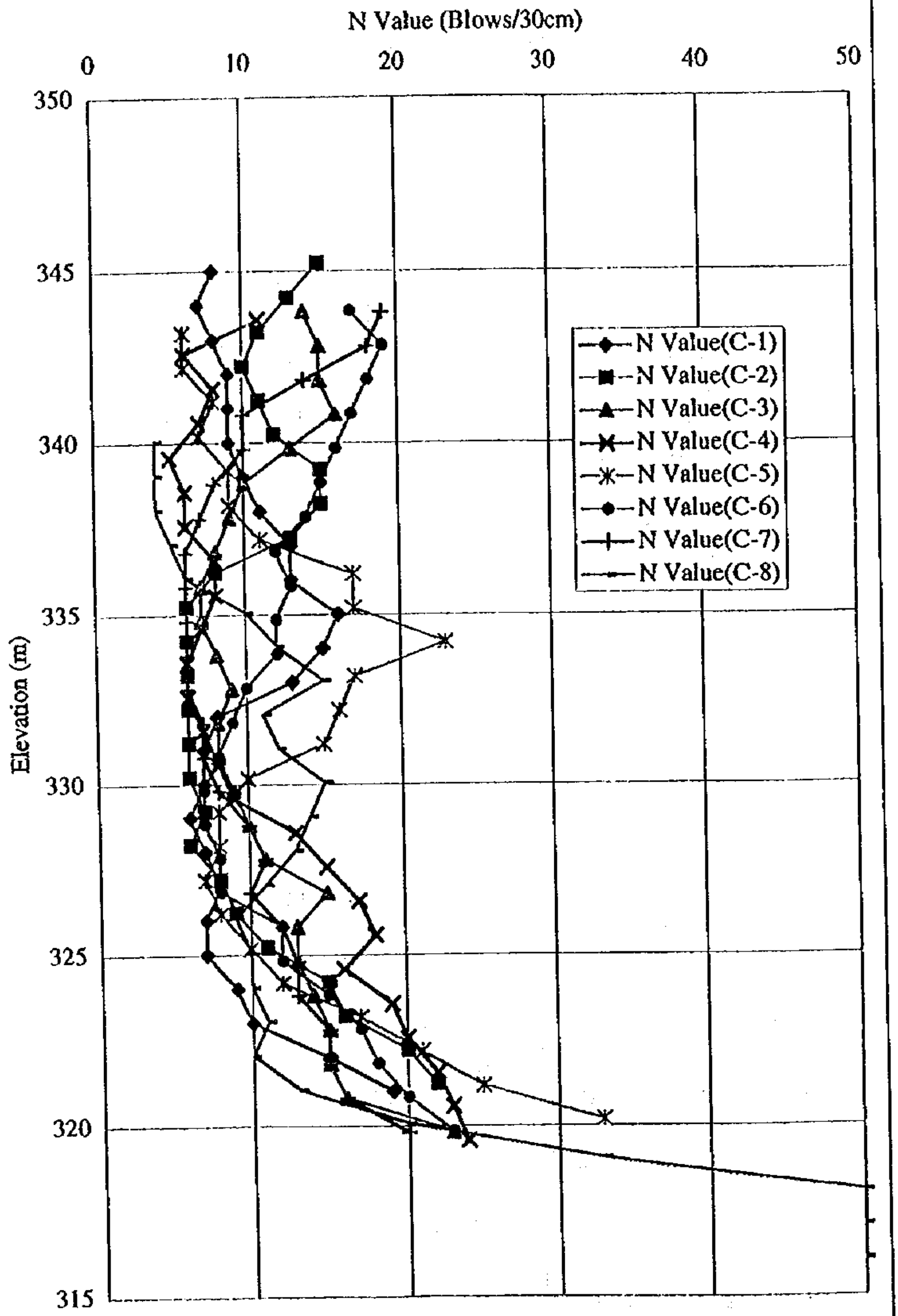


Figure 4.1 Distrobution N Values Along Depth (Terminal Area)



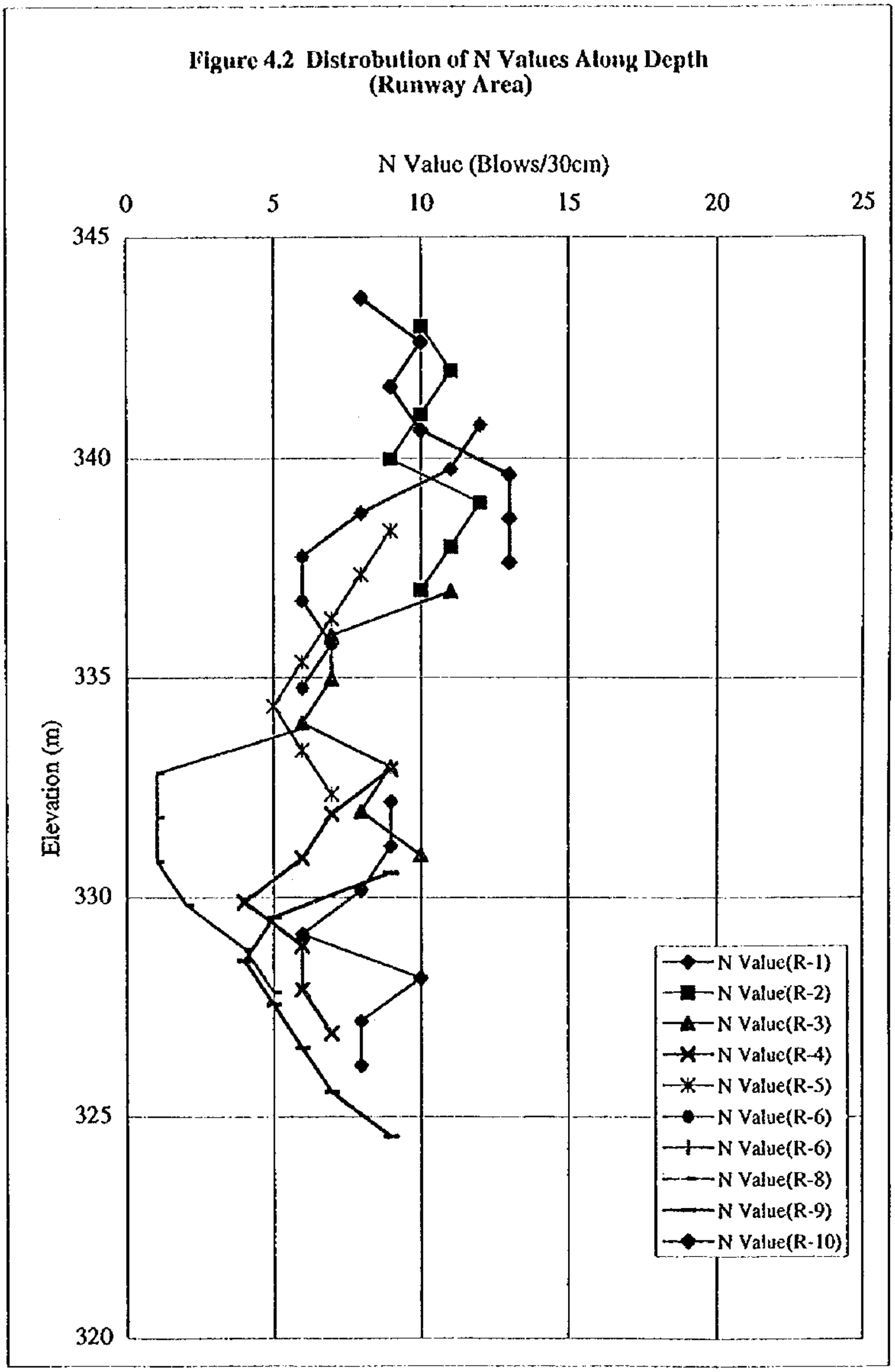


Figure 4.2 Distrobution of N Values Along Depth
(Runway Area)
N Value (Blows/30cm)
0
5
10
15
20
25
345
340
335
330
325
320
Elevation (m)
N Value(R-1)
N Value(R-2)
N Value(R-3)
N Value(R-4)
N Value(R-5)
N Value(R-6)
N Value(R-6)
N Value(R-8)
N Value(R-9)
N Value(R-10)

TABLE

New Tashkent Airport

Terminal Area (GE-1)

Table 4.1 (1) SUMMARY OF LABORATORY TEST DATA

Boring No.	Sample Depth	Unit weight of density (kg/cm³)			n	e	wn	Atterberg limits(%)			IL	Direct Shear		Eo(kg/cm²)		Initial subsidence pressure	Coefficient of Saturating Settlement (%)			
	(m)	γs	γm	γd	(%)		(%)	wL	wP	Ip		φ (°)	c (kg/cm²)	natural wetness	saturated	(kg/cm²)	Presure (kg/cm²)			
																	P_σ	1.000	2.000	3.000
C-1	4.5	2.67	1.73	1.48	44.6	0.804	16.7	25.3	19.8	5.5	<0			80	74					
〃	9.0	2.68	1.76	1.54	42.5	0.740	14.4	25.6	18.2	7.4	<0			56	36					
C-2	3.5	2.68	1.42	1.34	50.0	1.000	5.8	25.4	18.7	6.7	<0									
〃	9.8	2.68	1.60	1.40	47.8	0.914	14.1	26.0	18.0	8.0	<0			50	46					
〃	11.5	2.67	1.82	1.50	43.8	0.780	21.5	25.6	19.6	6.0	0.32			66	60					
C-3	8.0	2.67	1.89	1.52	43.1	0.757	24.0	27.6	22.5	5.1	0.29									
TP-4	1.0	2.68	1.42	1.34	50.0	1.000	6.0	27.5	20.5	7.0	<0	28	0.018	155	16	0.25	0.008	0.059	0.096	0.117
〃	2.0	2.68	1.50	1.40	47.8	0.916	7.4	26.9	19.8	7.1	<0	28	0.030	95	12	0.90	0.001	0.012	0.063	0.093
〃	3.0	2.67	1.56	1.42	46.8	0.880	9.9	25.5	19.9	5.6	<0			69	25	0.70	0.008	0.018	0.035	0.049
〃	4.0	2.67	1.60	1.44	46.1	0.855	10.8	26.6	20.5	6.1	<0			76	32	1.20	0.008	0.009	0.017	0.034
〃	5.0	2.67	1.60	1.44	46.1	0.855	11.0	26.6	21.3	5.3	<0	26	0.050	81	27	0.70	0.016	0.016	0.035	0.052
〃	6.0	2.67	1.67	1.48	44.6	0.808	12.5	25.5	21.4	4.1	<0	28	0.050	78	24	0.70	0.016	0.013	0.028	0.057
〃	7.0	2.67	1.75	1.51	43.5	0.770	16.1	25.4	20.3	5.1	<0	26	0.075	65	31	1.10	0.014	0.009	0.022	0.038
〃	8.0	2.67	1.79	1.50	43.8	0.779	19.0	25.4	20.0	5.4	<0	27	0.125	73	44	1.50	0.011	0.007	0.013	0.022
〃	9.0	2.67	1.88	1.51	43.5	0.770	24.4	25.5	20.5	5.0	0.78	27	0.107	62	47	2.10	0.008	0.006	0.009	0.017
〃	10.0	2.67	1.72	1.42	46.8	0.880	21.0	26.1	20.7	5.3	0.06				54					
TP-4(0)	3.0	2.67	1.54	1.39	47.9	0.919	10.3	25.3	19.1	6.2	<0	26	0.025							
〃	4.0	2.67	1.60	1.45	45.7	0.842	10.5	25.9	19.7	6.2	<0	27	0.054							
〃	2.0	2.67	1.63	1.42	46.8	0.880	14.8	26.3	20.2	6.1	<0			40	18	0.30	0.030	0.039	0.063	0.067
C-4	2.5	2.68	1.71	1.42	47.0	0.887	20.2	25.8	19.2	6.6	0.15			68	66					
TP-5	1.0	2.67	1.54	1.37	48.7	0.949	12.2	27.5	22.1	5.4	<0	26	0.050	26	15	0.15	0.013	0.068	0.085	0.085
〃	2.0	2.67	1.59	1.41	47.2	0.894	12.9	25.4	19.8	5.6	<0	27	0.030	60	20	0.35	0.014	0.050	0.070	0.077
〃	3.0	2.67	1.71	1.43	46.4	0.866	19.8	25.2	20.1	5.1	<0	26	0.040	59	22	1.00	0.003	0.010	0.027	0.045
〃	4.0	2.67	1.81	1.47	44.9	0.815	23.5	26.3	21.2	5.1	0.45	26	0.080	42	23	1.00	0.008	0.010	0.033	0.042
〃	5.0	2.67	1.89	1.51	43.5	0.770	25.3	26.8	21.2	5.6	0.73	26	0.045	31	28	2.00	0.005	0.005	0.011	0.012
〃	6.0	2.67	1.81	1.41	47.2	0.894	28.2	28.2	22.8	5.4	1	26	0.050	32	27	1.00	0.012	0.010	0.019	0.020
TP-5(0)	2.0	2.67	1.63	1.42	46.8	0.880	14.7	25.4	20.2	5.2	<0			48	20	0.40	0.010	0.032	0.059	0.610
C-5	2.5	2.67	1.63	1.43	46.4	0.867	13.7	24.8	18.2	6.6	<0			68	54					
C-6	7.4	2.67	1.64	1.41	47.7	0.894	16.5	24.5	18.4	6.1	<0			69	33					
〃	10.4	2.67	1.82	1.50	43.8	0.780	21.6	25.4	20.6	5.4	0.19			37	36					
C-7	4.0	2.68	1.70	1.50	44.0	0.786	13.1	25.3	17.7	7.6	<0			21	16					
Average		2.67	1.68	1.44	45.96	0.85	15.87	25.95	20.07	5.90	0.44	26.67	0.06	61.81	33.56					

New Tashkent Airport

Terminal Area (GE-2)

Table 4.1 (2) SUMMARY OF LABORATORY TEST DATA

Boring No.	Sample Depth	Unit weight of density (kg/cm³)			n	e	wn	Atterberg limits(%)			IL	Direct Shear		Eo(kg/cm²)		Initial subsidence pressure	Coefficient of Saturating Settlement (%)			
																	Presure (kg/cm²)			
	(m)	γ s	γ m	γ d	(%)		(%)	wL	wP	Ip		φ (°)	c (kg/cm²)	natural wetness	saturated	(kg/cm²)	P_a	1.000	2.000	3.000
C-1	18.0	2.67	1.97	1.55	42.0	0.723	27.1	26.2	21.2	5.0	>1				53					
〃	23.0	2.67	1.97	1.56	41.6	0.711	26.7	26.3	21.0	5.3	>1				45					
〃	25.0	2.67	1.99	1.59	40.4	0.679	25.4	25.6	20.6	5.0	>1				43					
C-2	19.0	2.67	1.96	1.51	42.3	0.734	27.4	25.6	20.6	5.0	>1									
〃	24.0	2.68	1.98	1.57	41.4	0.707	26.4	26.4	20.0	6.4	>1				48					
C3	14.0	2.67	1.96	1.53	42.7	0.745	27.9	26.0	20.6	5.4	>1									
〃	19.0	2.67	1.96	1.54	42.2	0.734	27.4	27.0	20.8	6.2	>1				39					
〃	22.0	2.68	1.94	1.50	44.0	0.787	29.3	27.5	21.0	6.5	>1				41					
〃	25.0	2.67	1.99	1.59	40.4	0.679	25.4	26.2	20.0	6.2	0.9				42					
C-4	9.0	2.68	1.95	1.52	43.3	0.763	28.4	26.9	20.4	6.5	>1				49					
〃	15.0	2.67	1.95	1.53	42.7	0.745	27.9	26.1	20.6	6.5	>1				48					
〃	18.0	2.67	1.96	1.54	42.3	0.733	27.5	25.3	18.6	6.7	>1				48					
〃	20.0	2.67	1.98	1.57	41.2	0.701	26.2	25.5	19.5	6.0	>1				36					
〃	25.0	2.67	1.98	1.58	40.8	0.690	25.8	24.4	17.4	7.0	>1				37					
C-5	8.0	2.67	1.99	1.59	40.7	0.679	25.4	26.7	21.7	5.0	0.74				34					
〃	14.0	2.67	1.96	1.53	42.7	0.745	27.9	24.6	18.4	6.2	>1				44					
〃	19.0	2.66	1.96	1.54	42.1	0.727	27.3	23.8	19.8	4.0	>1				49					
〃	22.0	2.66	1.99	1.59	40.2	0.673	25.3	24.5	19.4	5.1	>1				53					
〃	25.0	2.66	1.94	1.51	43.2	0.762	28.6	26.5	21.8	4.7	>1				47					
C-6	14.0	2.67	1.96	1.53	42.7	0.745	27.9	25.6	19.6	6.0	>1				40					
〃	18.5	2.67	1.98	1.56	41.6	0.712	26.7	26.7	20.9	5.8	1				41					
〃	22.0	2.68	1.98	1.57	41.4	0.707	26.4	27.1	20.4	6.7	0.9				34					
〃	25.0	2.67	1.94	1.51	43.4	0.763	28.7	26.9	21.0	5.4	>1				38					
C-7	7.0	2.67	1.95	1.52	43.1	0.756	28.4	25.7	20.3	5.4	>1				28					
〃	12.0	2.67	1.98	1.56	41.6	0.712	26.7	26.0	20.6	5.4	>1				38					
〃	18.0	2.68	1.96	1.54	42.5	0.740	27.6	27.6	21.2	6.4	1				39					
〃	24.5	2.68	1.98	1.53	41.0	0.696	25.9	27.8	21.5	6.3	0.7				39					
C-8	5.0	2.67	1.97	1.56	41.6	0.712	26.7	25.3	20.0	5.3	>1				47					
〃	9.0	2.67	1.97	1.55	41.9	0.723	27.0	24.6	18.7	5.9	>1				47					
〃	19.0	2.67	1.97	1.56	41.6	0.712	26.7	25.2	20.0	5.2	>1				49					
〃	24.0	2.67	1.98	1.57	41.2	0.701	26.7	25.1	19.3	5.8	>1				50					

New Tashkent Airport

Runway Area (GE-1)

Table 4.2 (1-1) SUMMARY OF LABORATORY TEST DATA

Boring No.	Sample Depth	Unit weight of density (kg/cm^3)			n	e	wn	Atterberg limits(%)			IL	Direct Shear		$Eo(kg/cm^2)$		Initial subsidence pressure	Coefficient of Saturating Settlement (%)			
	(m)	γs	γm	γd	(%)		(%)	wL	wP	Ip		φ (°)	c (kg/cm^2)	natural wetness	saturated	(kg/cm^2)	Presure (kg/cm^2)			
																	P_σ	1.000	2.000	3.000
TP-1	1.0	2.66	1.46	1.40	47.4	0.901	4.5	26.2	22.1	4.1	<0	29	0.050							
″	2.0	2.68	1.44	1.37	48.9	0.957	5.2	26.3	19.8	6.5	<0	26	0.100	97	23	0.40	0.012	0.020	0.040	0.052
″	3.0	2.68	1.51	1.39	48.1	0.927	8.3	25.6	19.3	6.3	<0	28	0.037	75	20	0.40	0.013	0.026	0.058	0.078
″	4.0	2.67	1.65	1.45	45.7	0.842	13.4	25.2	19.4	5.8	<0	27	0.100	71	29	2.00	0.002	0.004	0.011	0.037
″	5.0	2.68	1.66	1.46	45.5	0.835	13.6	26.6	19.8	6.8	<0	26	0.062	67	30	1.40	0.006	0.006	0.018	0.036
″	6.0	2.66	1.80	1.59	40.2	0.672	13.5	25.0	20.3	4.7	<0	26	0.125	68	37	1.00	0.013	0.011	0.016	0.024
″	7.0	2.66	1.78	1.57	41.0	0.695	13.7	25.1	20.7	4.4	<0	26	0.110	56	38	0.40	0.018	0.018	0.016	0.026
″	8.0	2.66	1.71	1.52	42.9	0.751	12.7	24.9	20.3	4.6	<0	25	0.104	64	50	2.00	0.009	0.008	0.010	0.014
″	9.0	2.68	1.79	1.55	42.2	0.730	15.2	26.8	20.3	6.5	<0	26	0.100	120	70	2.50	0.008	0.005	0.008	0.013
″	10.0	2.66	1.75	1.51	43.2	0.761	15.7	24.3	19.5	4.8	<0	26	0.110	94	36	1.00	0.021	0.010	0.021	0.036
″	11.0	2.68	1.70	1.49	44.4	0.799	13.8	27.6	21.1	6.5	<0			57	37	2.00	0.014	0.008	0.010	0.021
″	12.0	2.66	1.85	1.60	39.9	0.664	15.9	24.1	19.6	4.5	<0			52	44	2.80	0.008	0.002	0.006	0.011
″	13.0	2.66	1.76	1.52	42.9	0.751	16.1	24.2	19.4	4.8	<0			110	81	3.00	0.008	0.005	0.006	0.010
″	14.0	2.67	1.78	1.52	43.1	0.757	17.2	24.5	19.1	5.4	<0			94	55	2.00	0.014	0.009	0.010	0.015
″	15.0	2.67	1.82	1.52	43.1	0.757	20.0	24.8	19.2	5.6	0.14			111	93	>3.0	0.009	0.005	0.006	0.009
TP-1(0)	2.0	2.66	1.62	1.42	46.6	0.873	14.1	25.3	20.8	4.5	<0			59	22	0.40	0.010	0.035	0.056	0.064
TP-2	1.0	2.67	1.57	1.33	50.2	1.007	17.9	23.2	17.9	5.3	<0	27	0.030		17					
″	2.0	2.68	1.79	1.47	45.2	0.825	21.5	25.6	19.2	6.4	0.36	27	0.032	28	21	0.35	0.015	0.031	0.040	0.043
″	3.0	2.68	1.88	1.47	45.2	0.825	27.4	25.4	18.6	6.8	>1	26	0.130	41	37	2.00	0.005	0.007	0.010	0.012
″	4.0	2.67	1.84	1.43	46.4	0.867	29.1	25.9	20.8	5.1	>1	26	0.175		30					
TP-2(0)	2.0	2.67	1.72	1.46	45.3	0.828	17.7	26.5	20.5	6.0	<0			44	23	0.40	0.010	0.029	0.042	0.047
TP-3	1.0	2.68	1.87	1.48	44.8	0.812	26.7	27.4	21.0	6.4	0.89			20	20					0.006
″	2.0	2.67	2.00	1.55	42.0	0.724	28.7	26.8	20.7	6.1	>1			40	26		0.001	0.002	0.022	0.027
TP-3(0)	2.0	2.67	2.12	1.68	37.1	0.520	26.4	26.7	21.1	5.6	0.9			5.1						0.001
Average		2.67	1.87	1.52	42.93	0.75	22.67	25.79	20.13	5.67	0.75	26.50	0.09	65.39	40.88					

New Tashkent Airport

Runway Area (GE-1)

Table 4.2 (1-2) SUMMARY OF LABORATORY TEST DATA

Boring No.	Sample Depth	Unit weight of density (kg/cm³)			n	e	wn	Atterberg limits(%)			IL	Direct Shear		Eo(kg/cm²)		Initial subsidence pressure	Coefficient of Saturating Settlement (%)			
																	Presure (kg/cm²)			
	(m)	γ s	γ m	γ d	(%)		(%)	wL	wP	Ip		φ (°)	c (kg/cm²)	natural wetness	saturated	(kg/cm²)	P_{a}	1.000	2.000	3.000
R-1	4.8	2.67	1.79	1.58	40.8	0.690	13.4	25.3	18.5	6.8	<0			84	44					
〃	7.0	2.67	1.75	1.55	41.9	0.723	12.9	25.1	17.0	8.1	<0			67	40					
R-2	7.0	2.67	1.64	1.48	44.6	0.829	10.9	25.0	17.7	7.3	<0			80	21					
R-3	2.4	2.67	1.75	1.42	46.8	0.880	23.2	25.5	20.5	5.0	0.54			48	38					
R-4	2.4	2.67	1.83	1.45	45.7	0.841	26.5	25.4	20.3	5.1	>1			45	38					
R-5	2.0	2.67	1.84	1.53	42.7	0.745	20.0	25.8	18.2	7.6	0.24			51	35					
R-6	3.1	2.67	1.86	1.51	43.4	0.768	23.0	25.8	20.2	5.6	0.5			43	34					
R-7	1.8	2.68	1.75	1.41	47.2	0.894	24.0	25.6	19.8	5.8	0.72			42	40					
R-8	2.0	2.68	1.76	1.45	45.9	0.848	21.7	26.3	19.4	6.9	0.33			43	44					
R-9	2.6	2.67	1.83	1.49	44.4	0.799	23.1	26.3	19.5	6.8	0.53			55	48					
R-10	5.7	2.67	1.75	1.42	46.8	0.880	23.0	25.8	21.1	4.7	0.4			37	35					
Average		2.67	1.79	1.47	45.0	0.816	21.9	25.7	19.4	6.3	0.4			48	33					

New Tashkent Airport

Runway Area (GE-2)

Table 4.2 (2) SUMMARY OF LABORATORY TEST DATA

Boring No.	Sample Depth	Unit weight of density (kg/cm^3)			n	e	wn	Atterberg limits(%)			IL	Direct Shear		$Eo(kg/cm^2)$		Initial subsidence pressure	Coefficient of Saturating Settlement (%)			
	(m)	γ s	γ m	γ d	(%)		(%)	wL	wP	Ip		ϕ (°)	c (kg/cm^2)	natural wetness	saturated	(kg/cm^2)	Presure (kg/cm^2)			
																	P_a	1.000	2.000	3.000
R-3	6.0	2.66	1.90	1.52	42.9	0.750	28.2	25.9	21.1	4.8	>1									
R-4	2.5	2.67	1.94	1.51	43.4	0.768	28.7	26.4	21.4	5.0	>1									
〃	6.0	2.66	1.92	1.40	44.4	0.797	30.0	26.6	21.9	4.7	>1									
R-5	5.5	2.67	1.94	1.50	43.8	0.780	29.3	26.4	21.0	5.4	>1									
R-6	6.0	2.67	1.96	1.53	42.7	0.745	27.9	26.4	21.0	5.4	>1									
R-7	4.0	2.67	1.95	1.52	43.1	0.756	28.3	26.2	21.1	5.1	>1									
〃	7.0	2.67	1.97	1.55	41.9	0.723	27.0	26.7	21.2	5.5	>1									
R-8	5.5	2.67	1.96	1.54	42.3	0.734	27.5	26.6	20.6	6.0	>1									
R-9	7.0	2.66	1.97	1.56	41.4	0.705	26.5	26.1	21.2	4.9	>1									
Average		2.67	1.95	1.52	43.1	0.757	28.1	26.4	21.1	5.3	>1									

Table 4.3 SUMMARY OF LABORATORY TEST DATA AFTER COMPACTION TEST

Boring No.	Sample Depth	Unit weight of density (kg/cm3)			n	e	wn	Atterberg limits(%)			IL
	(m)	γ_s	γ_{mmax}	γ_{dmax}	(%)		(%)	wL	wP	Ip	
Runway Area											
TP-1	1.0	2.66	1.79	1.55	41.7	0.716	15.6	26.2	22.1	4.1	<0
〃	2.0	2.68	1.77	1.52	43.2	0.763	16.5	26.3	19.8	6.5	<0
〃	3.0	2.68	1.82	1.58	41.0	0.696	15.2	25.6	19.3	6.3	<0
〃	4.0	2.67	1.81	1.56	41.5	0.711	15.9	25.2	19.4	5.8	<0
TP-2	1.0	2.67	1.85	1.60	40.0	0.668	15.7	23.3	17.9	5.3	<0
〃	2.0	2.68	1.80	1.56	41.7	0.717	15.0	25.6	19.2	6.4	<0
TP-3	1.0	2.68	1.81	1.58	41.0	0.696	14.6	27.8	21.9	5.9	<0
〃	2.0	2.67	1.79	1.55	41.9	0.722	15.6	25.6	20.7	5.1	<0
Terminal Area											
TP-4	1.0	2.68	1.83	1.58	41.0	0.696	15.5	27.2	20.7	6.5	<0
〃	2.0	2.68	1.85	1.61	39.9	0.664	14.7	26.5	19.8	6.7	<0
TP-5	1.0	2.67	1.83	1.58	40.8	0.689	15.5	27.5	22.1	5.4	<0
〃	2.0	2.67	1.80	1.50	41.5	0.711	15.5	25.4	19.8	5.6	<0

Tabel 4.4 (1) SUMMARY OF THE RESULTS OF CBR TEST

Test Pit No.	Test No.	Test Date	Elevation (m)	Test Depth (m)	Value of CBR	
					2.54 mm	5.08 mm
TP-1(0)	1	2/6/98	343.502	2	6.28%	5.02%
	2	〃	〃	2	5.84%	5.02%
	3	〃	〃	2	6.11%	5.47%
TP-2(0)	1	2/6/98	343.397	2	4.48%	3.80%
	2	〃	〃	2	3.59%	3.22%
	3	〃	〃	2	3.79%	3.00%
TP-3(0)	1	2/7/98	335.977	2	2.70%	2.31%
	2	〃	〃	2	3.30%	2.59%
	3	〃	〃	2	2.70%	1.92%
TP-4(0)	1	2/7/98	346.479	2	4.35%	3.70%
	2	〃	〃	2	4.48%	3.80%
	3	〃	〃	2	5.03%	5.10%
TP-5(0)	1	2/10/98	345.326	2	5.09%	4.20%
	2	〃	〃	2	5.98%	4.69%
	3	〃	〃	2	5.18%	3.91%

Table 4.4 (2) SUMMARY OF LABORATORY TEST DATA AT THE LOCATIONS OF CBR TEST

Boring No.	Sample Depth	Unit weight of density (kg/cm^3)			n	e	wn	Atterberg limits(%)			IL	Eo(kg/cm^2)		Initial subsidence pressure	Coefficient of Saturating Settlement(%)				Coefficient of Permeability
															Presure (kg/cm^2)				$\times 10^{-5}$
	(m)	γs	γm	γd	(%)		(%)	wL	wP	Ip		natural wetness	saturated		P_σ	1.000	2.000	3.000	(cm/s)
Runway Area																			
TP-1(0)	2.0	2.66	1.62	1.42	46.6	0.873	14.1	25.3	20.8	4.5	<0	59	22	0.40	0.010	0.035	0.056	0.064	3.12
TP-2(0)	2.0	2.67	1.72	1.46	45.3	0.828	17.7	26.5	20.5	6.0	<0	44	23	0.40	0.010	0.029	0.042	0.047	2.31
TP-3(0)	2.0	2.67	2.12	1.68	37.1	0.590	26.4	26.7	21.1	5.6	0.9	51	-	-	-	-	-	0.001	3.24
Terminal Area																			
TP-4(0)	2.0	2.67	1.63	1.42	46.8	0.880	14.8	26.3	20.2	6.1	<0	40	18	0.30	0.030	0.039	0.063	0.067	2.19
TP-5(0)	2.0	2.67	16.30	1.42	46.8	0.880	14.7	25.4	20.2	5.2	<0	48	20	0.40	0.010	0.032	0.059	0.061	2.89

Table 4.5 THE RESULTS OF CHEMICAL ANALYSIS OF GROUNDWATER

Terminal Area

Boring & Pit No.	Sampling Depth(m)	Dry Remainder (mg/kg)	Ion Content in mg/l						pH	Rigidity in mg-equiv.		
			HCO_3^-	Cl^-	SO_4^{2-}	Ca^{2+}	Mg^{2+}	Na^++K^+		Total	Removable	Constant
TP-4	10.8	3085.0	198.3/3 245.0	32.8	2104.3	603.2	119.8	182.4	7.3	112.20	6.31	105.80
TP-5	7.4	3350.0	329.4/5 392.0	21.8	2193.0	515.8	214.6	188.1	8.0	121.70	15.11	106.50

Runway Area

Boring & Pit No.	Sampling Depth(m)	Dry Remainder (mg/kg)	Ion Content in mg/l						pH	Rigidity in mg-equiv.		
			HCO_3^-	Cl^-	SO_4^{2-}	Ca^{2+}	Mg^{2+}	Na^++K^+		Total	Removable	Constant
TP-2	4.9	2175.0	244.0/3 999.0	45.3	1256.8	353.6	134.8	62.9	8.3	80.50	11.18	69.32
TP-3	3.3	770.0	356.8/8 851.0	45.3	236.5	171.6	26.5	29.4	8.4	30.30	15.40	14.90

Table 4.6 REQUIREMENT OF SULPHATE-RESISTING CEMENT APPLICATION

Requirements for concrete exposed to sulphate attack — Sulphate - resisting cement

Class	Concentration of sulphates expressed as SO3: In Soil: Total SO3	In Soil: SO3 in 2 / 1 water / soil extract	In Ground - Water	Type of cement	Requirements for dense, fully compacted concrete made with aggregates meeting the requirements of BS 882 or BS 1047: Minimum cement content, Nominal maximum size of aggregate: 40mm	20mm	10mm	Maximum free water / cement ratio
	%	g / l	mg / l		kg/m³	kg/m³	kg/m³	
1	<0.2	-	<300	Ordinary Portland or Portland - Blastfurnace	240	280	330	0.55
2	0.2 - 0.5	-	300 - 1200	Rodinary Portland or Portland - Blastfurnace	290	330	380	0.5
				Sulphate - resisting Portland	240	280	330	0.55
				Supersulphated	270	310	360	0.5
3	0.5 - 1.0	1.9 - 3.1	1200 - 2500	Sulphate - resisting Portland or supersulphated	290	330	380	0.5
4	1.0 - 2.0	3.1 - 5.6	2500 - 5000	Sulphate - resisting Portland or supersulphated	330	370	420	0.45
5	>2.0	>5.6	>5000	As for Class 4, but with the addition of adequate protective coatings of inert material such as asphalt or bituminous emulsions reinforced with fiberglass membranes				

Table 4.7 THE RESULTS OF CHEMICAL ANALYSIS OF AQUEOUS EXTRACT FROM SOIL

Terminal Area

Boring & Pit No.	Sampling Depth(m)		Duration of Extnact(min)	Dry Remainder (mg/kg)	Ion Content in mg/kg Off the Dry Soil Weight						Humus	pH
					HCO_3^-	Cl^-	SO_4^{2-}	Ca^{2+}	Mg^{2+}	Na^++K^+		
TP-4	1.0	1;5	5	875.0	183.0	62.4	545.1	130.0	15.6	191.7	0.158	8.3
TP-4	2.0	1;5	5	625.0	320.3	78.0	267.4	67.6	59.3	109.4	0.128	8.9
TP-4	2.0	1;5	5	4750.0	259.2	39.0	143.9	83.2	15.6	66.9		9.2
TP-4	3.0	1;5	5	975.0	274.5	78.0	504.6	109.2	74.9	128.6	0.083	8.8
TP-4	4.0	1;5	5	4050.0	198.3	78.0	2787.2	221.2	187.2	853.9	0.098	8.0
TP-5(O)	2.0	1;5	5	775.0	457.5	54.6	267.4	130.0	3.1	180.5		9.3

Runway Area

No of pit	Sampling Depth(m)		Duration of Extnact(min)	Dry Remainder (mg/kg)	Ion Content in mg/kg Off the Dry Soil Weight						Humus	pH
					HCO_3^-	Cl^-	SO_4^{2-}	Ca^{2+}	Mg^{2+}	Na^++K^+		
TP-1	1.0	1;5	5	500.0	305.0	70.2	113.0	72.8	15.6	113.1	0.098	9.3
TP-1	2.0	1;5	5	500.0	320.3	54.6	144.0	67.6	15.6	117.9	0.098	9.4
TP-1	3.0	1;5	5	480.0	320.0	62.4	113.0	88.4	15.6	83.8	0.143	9.4
TP-1	4.0	1;5	5	675.0	320.0	62.4	144.0	88.4	15.6	99.1	0.038	9.5
TP-1(O)	2.0	1;5	5	650.0	259.2	54.6	267.4	67.6	18.7	147.9		9.3
TP-2	1.0	1;5	5	5225.0	320.2	151.0	3167.8	582.0	174.7	738.3	0.432	8.1
TP-2	2.0	1;5	5	2200.0	335.5	98.2	1388.5	198.0	184.1	304.2	0.183	8.0
TP-2	3.0	1;5	5	4325.0	198.2	75.5	2602.1	946.7	78.0	133.6	0.183	8.0
TP-2	4.0	1;5	5	575.0	320.2	60.4	143.9	83.2	21.8	92.8	0.216	8.4
TP-2(O)	2.0	1;5	5	575.0	274.5	46.8	185.1	62.4	28.1	97.5		9.1
TP-3	1.0	1;5	5	625.0	320.2	60.4	123.4	131.2	9.4	40.1	0.149	8.0
TP-3	2.0	1;5	5	575.0	320.2	45.3	154.3	109.2	18.7	64.0	0.232	8.3
TP-3(O)	2.0	1;5	5	500.0	244.0	54.6	133.7	88.4	3.1	84.2		9.4

Table 5.1 COMPRESSIVE SETTLEMENT OF FILL LAYER DUE TO SELF LOAD

Depth (m)	Layers	Thickness (m)	Parameters e0	Cc	γ m (ton/m³)	N Value (blows/30cm)	P (ton/m²)	As Cohesive soil Settlement (cm)	As Sandy soil Settlement (cm)
1.0 - 2.0	Layer 1	1.0	0.704	0.01	1.80	10	1.80	0.3	0.3
2.0 - 3.0	Layer 2	1.0	0.704	0.01	1.80	10	3.60	0.4	0.4
3.0 - 4.0	Layer 3	1.0	0.704	0.01	1.80	10	5.40	0.5	0.5
4.0 - 5.0	Layer 4	1.0	0.704	0.01	1.80	10	7.20	0.6	0.5
5.0 - 6.0	Layer 5	1.0	0.704	0.01	1.80	10	9.00	0.6	0.6
6.0 - 7.0	Layer 6	1.0	0.704	0.01	1.80	10	10.80	0.7	0.6
7.0 - 8.0	Layer 7	1.0	0.704	0.01	1.80	10	12.60	0.7	0.7
8.0 - 9.0	Layer 8	1.0	0.704	0.01	1.80	10	14.40	0.7	0.7
9.0 - 10.0	Layer 9	1.0	0.704	0.01	1.80	10	16.20	0.8	0.7
							Total	5.2	4.9

* The fill layer is assumed to be compacted to 85 - 90% of maximum dry density.
* The settlement from 0.0m to 1.0m is neglected.

JICA