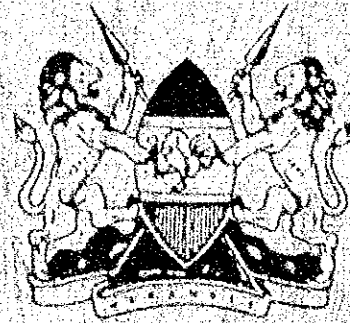


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DETAILED DESIGN STUDY  
ON  
THE NAIROBI BYPASS PROJECT

MATERIALS REPORT  
(APPENDIXES)

MATERIALS INVESTIGATIONS  
AND  
PAVEMENT DESIGN

SEPTEMBER 1992

JAPAN INTERNATIONAL COOPERATION AGENCY

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DETAILED DESIGN STUDY

ON

THE NAIROBI BYPASS PROJECT

MATERIALS REPORT

(APPENDIXES)

MATERIALS INVESTIGATIONS

AND

PAVEMENT DESIGN

SEPTEMBER 1992

Japan International  
Cooperation Agency

The Permanent Secretary  
Ministry of Public Works  
P.O.Box 30260  
NAIROBI

The Chief Engineer (Roads)  
Ministry of Public Works  
P.O.Box 30260  
NAIROBI

国際協力事業団  
24835

マイクロ  
フィルム

## CONTENTS

1	DETAILED LOCATION MAP OF GEOLOGICAL SURVEY ON ALIGNMENT	A-1
2	GEOLOGICAL SECTION OF ALIGNMENT	A-48
3	GEOLOGICAL SECTION FOR FOUNDATION OF BRIDGES AND CUT SLOPES	A-69
	(1) MOMBASA ROAD JUNCTION BRIDGE(KM. 0+369.1 - KM. 0+426.1)	A-70
	(2) OVER BRIDGE (KM. 29+952)	A-71
	(3) BOX CULVERT OF UGONG ROAD JUNCTION(KM. 15+516)	A-72
	(4) CUT SLOPE (KM. 9+125)	A-73
	(5) CUT SLOPE (KM. 10+840)	A-74
	(6) CUT SLOPE (KM. 14+380)	A-75
	(7) CUT SLOPE (KM. 18+820)	A-76
	(8) CUT SLOPE (KM. 19+835)	A-77
	(9) CUT SLOPE (KM. 21+485)	A-78
	(10) CUT SLOPE (KM. 21+952)	A-79
	(11) CUT SLOPE (KM. 24+713)	A-80
	(12) CUT SLOPE (KM. 26+150)	A-81
	(13) CUT SLOPE (KM. 10+000)	A-82
4	LOG SHEET ALONG THE ALIGNMENT	A-83
5	SLOP INVESTIGATION RESULTS	A-153
6	GRAVEL MATERIAL SITE INVESTIGATION RESULTS	A-174
	(1) KIRIBA SITE	A-175
	(2) THANDI SITE	A-180
	(3) DAGORETTI SITE	A-185
	(4) CHURCH SITE	A-189
	(5) GALSHEET SITE	A-193
	(6) FOREST GUARD	A-195
	(7) KAREN	A-200





7	HARD STONE MATERIAL SITE INVESTIGATION RESULTS	A-203
	(1) MUTHIGA	A-204
	(2) KITENGELA	A-209
8	LABORATORY TEST RESULTS OF EMBANKMENT MATERIAL AND SUBGRADE	A-215
9	LABORATORY TEST RESULTS OF BLACK COTTON SOIL	A-243
10	LABORATORY TEST RESULTS OF GRAVEL MATERIAL SITE	A-272
11	LABORATORY TEST RESULTS OF HARD STONE MATERIAL SITE	A-283
12	EXISTING HARD STONE QUARRY QUESTIONNAIRE	A-286
13	SOAK PIT SURVEY RESULTS	A-293
14	PAVEMENT DESIGN CHARTS	A-300





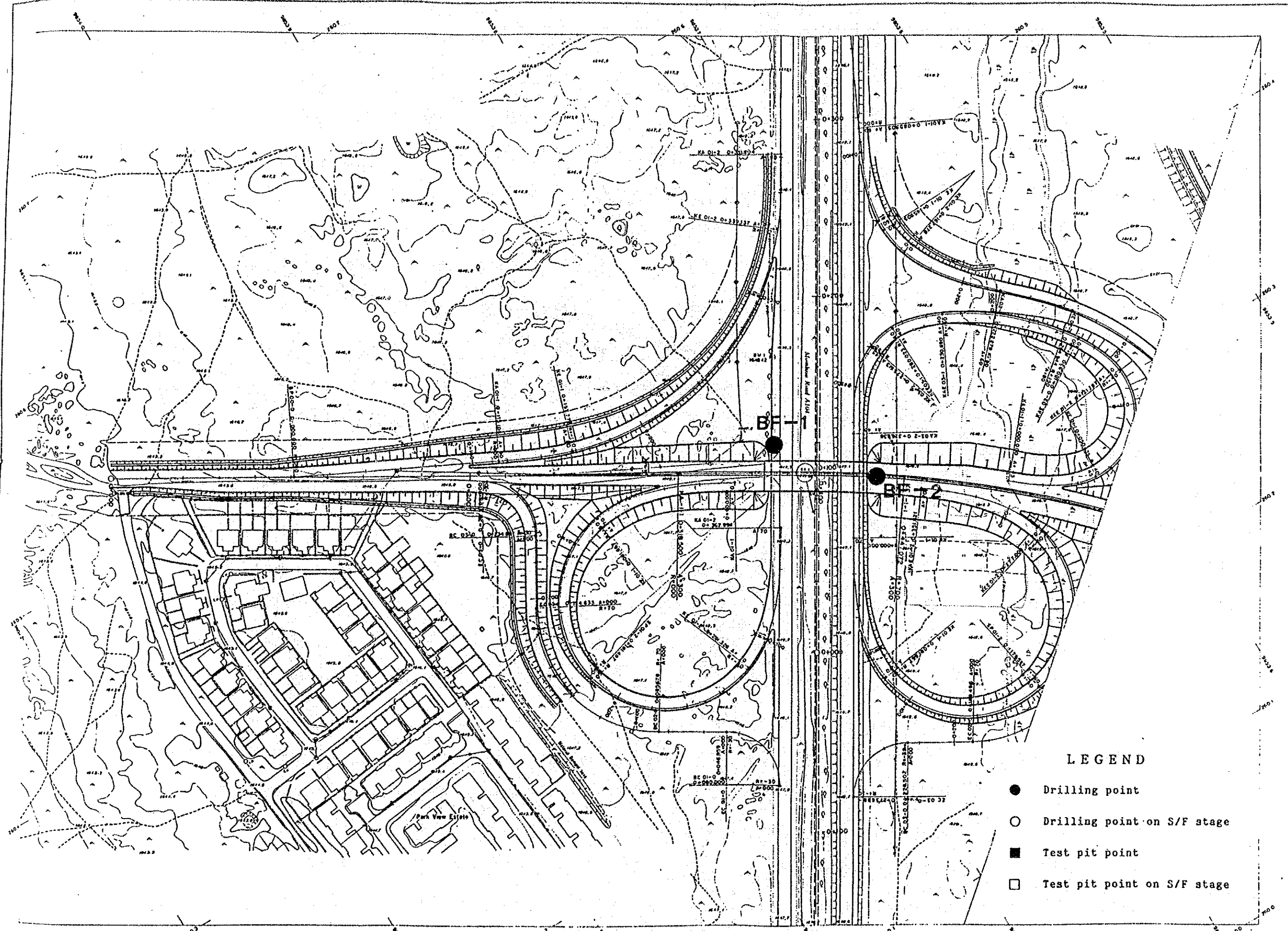
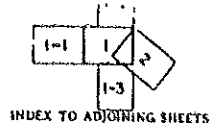


1. DETAILED LOCATION MAP OF GEOLOGICAL SURVEY ON ALIGNMENT



# THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

SHEET NO. 1



Scale 1:12,000  
HEIGHTS IN METERS

**LEGEND**

- △ GPS Point
- ⊙ Traverse Point
- ⊕ Bench Mark
- 1234.5 Direct Leveling Height
- 222.8 Spot Height
- Contours (V.L. Line)
- ⊞ Outcrop (Rock)
- ▭ Building, Permanent
- ▭ Building, Others
- ▭ Bituminous Road
- ▭ Road
- ▭ Track
- ▭ Railway
- ▭ Bridge, Culvert
- ▭ River
- ▭ Stream
- ▭ Dam
- ▭ Pond
- ▭ Water Tank
- ▭ Power Line
- ▭ Telephone Line
- ▭ Fence, Gate
- ▭ Hedge
- ▭ Stone Wall
- ▭ Dump or Mound
- ▭ Quarry, Pit
- ▭ Cutting
- ▭ Embankment
- ▭ Cultivated Land
- ▭ Orchard or Permanent Crop
- ▭ Pastureland
- ▭ Grassland
- ▭ Bush
- ▭ Forest
- ▭ Swamp
- ▭ Vegetation Boundary
- ▭ Planting Partition

HORIZONTAL DATUM: UTM ZONE 31  
CLARKE 1866 SPHEROID

VERTICAL DATUM: MEAN SEA LEVEL

AERIAL PHOTOGRAPHY BY: JICA  
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December 1989

GROUND CONTROL SURVEYED BY: JICA  
December 1989

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MARCH 1990

CARTOGRAPHY BY: JICA  
JULY 1990

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

CHECKED BY:	CHIEF ENGINEER (DESIGN)	DATE: / /
	CHIEF SUPT. ENG. (DESIGN)	DATE: / /
SUIT. ENGINEER (DESIGN)	CHIEF ENGINEER (CONSTRUCTION)	DATE: / /
	CHIEF SUPT. ENG. (CONSTRUCTION)	DATE: / /
PROJECT ENGINEER		DATE: / /

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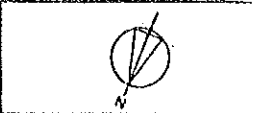
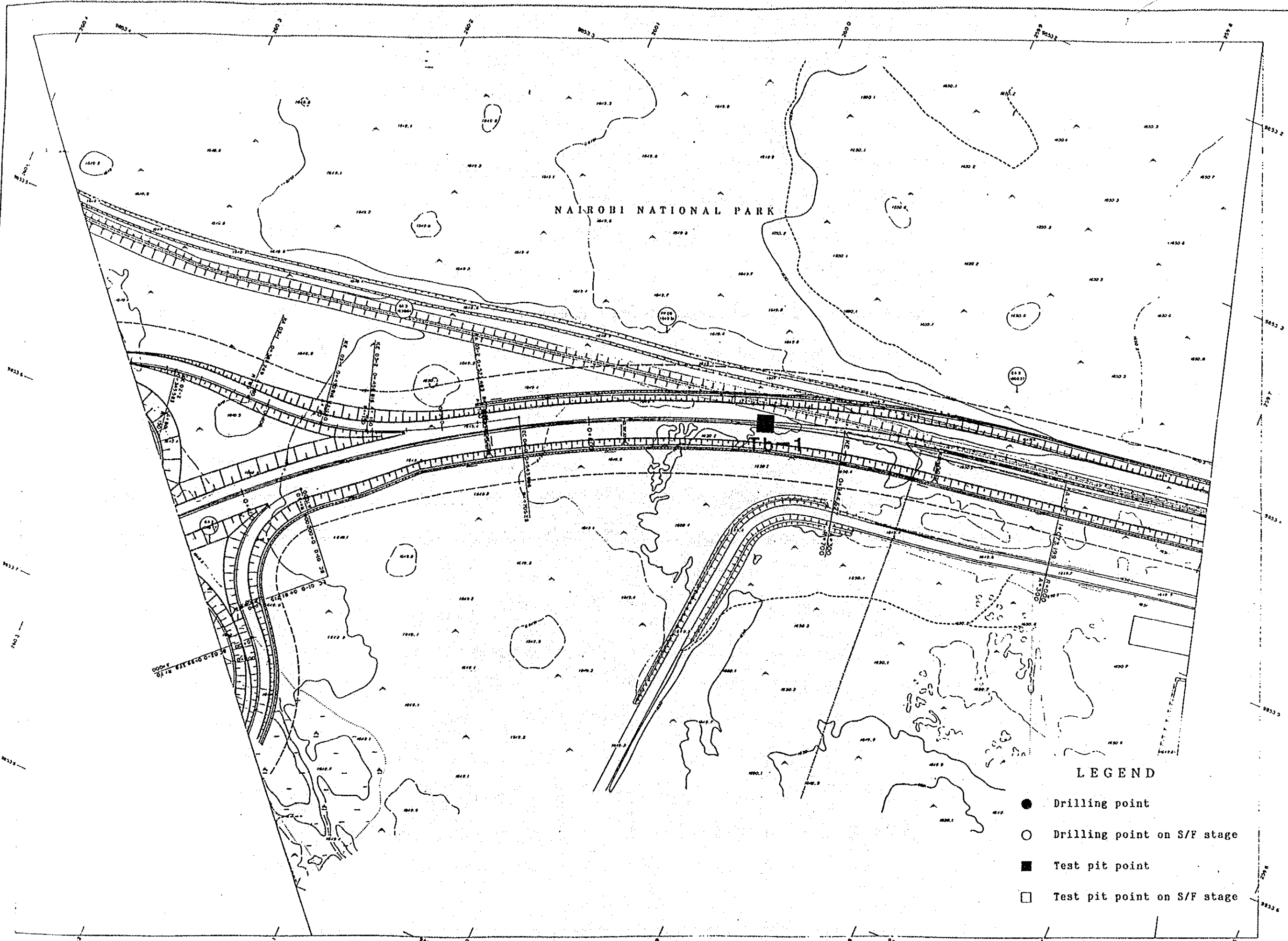
SHEET 1 OF 46

DETAILED LOCATION MAP OF GEOLOGICAL SURVEY

# THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

SHEET NO. 2

INDEX TO ADJOINING SHEETS



Scale 1:12,000  
HEIGHTS IN METERS

**LEGEND**

△	GIS Point
○	Traverse Point
⊙	Bench Mark
1234.5	Direct Leveling Height
1234.5	Spot Height
1234.5	Contours (V.Lim)
⊠	Outcrop (Rock)
⊠	Building (Farmhouse)
⊠	Building (Others)
⊠	Discontinued Road
⊠	Road
⊠	Track
⊠	Railway
⊠	Ridge, Culvert
⊠	River
⊠	Stream
⊠	Dam
⊠	Fund
⊠	Water Tank
⊠	Power Line
⊠	Telephone Line
⊠	Fence, Gate
⊠	Hedge
⊠	Stone Wall
⊠	Dump or Mound
⊠	Quarry, Pit
⊠	Cutting
⊠	Embankment
⊠	Cultivated Lands
⊠	Orchard or Permanent Cr.
⊠	Plantation
⊠	Grassland
⊠	Bush
⊠	Forest
⊠	Swamp
⊠	Vegetation Boundary
⊠	Planting Particuo

HORIZONTAL DATUM: UTM ZONE 37  
CLARKE 1866 SPHEROID

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**LEGEND**

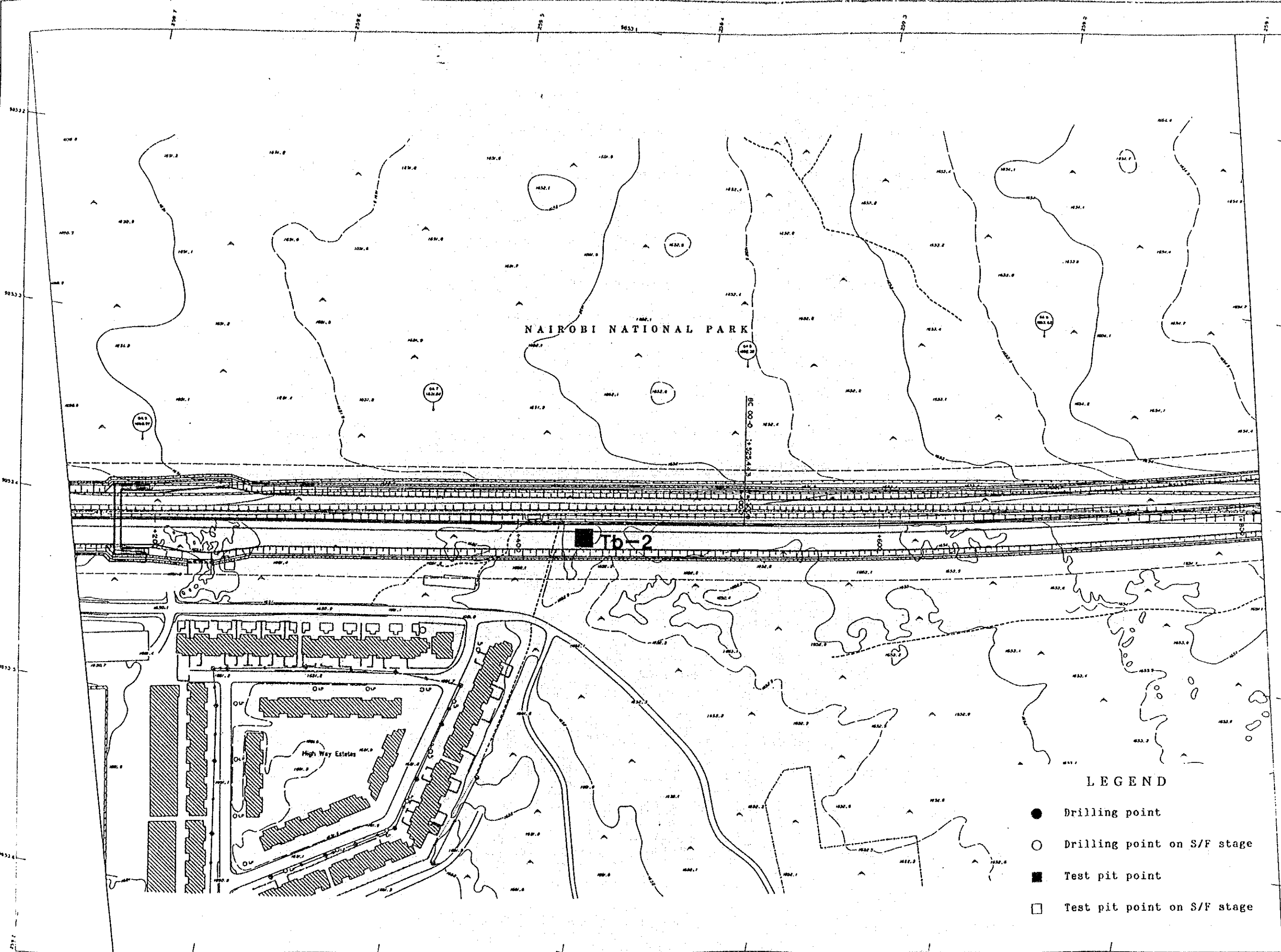
●	Drilling point
○	Drilling point on S/F stage
■	Test pit point
□	Test pit point on S/F stage

CHIEF ENGINEER	DATE
CHIEF SUPT. ENG.	DATE
SUPT. ENGINEER	DATE
PROJECT ENGINEER	DATE

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DETAILED LOCATION MAP OF GEOLOGICAL SURVEY





Scale 1:2,000  
HEIGHTS IN METERS

LEGEND

- GPS Point
- ⊙ Traverse Point
- ⊕ Bench Mark
- 1234.5 Direct Leveling Height
- Spot Height
- Contours (V.L.Im)
- Outcrop (Rock)
- ▨ Building, Permanent
- ▩ Building, Others
- ▬ Bituminous Road
- ▬ Road
- ▬ Track
- ▬ Railway
- ▬ Bridge, Culvert
- ▬ River
- ▬ Stream
- ▬ Dam
- Pond
- Water Tank
- Power Line
- Telephone Line
- Fence, Gate
- ▬ Hedge
- ▬ Stone Wall
- ▬ Dump or Mound
- ▬ Quarry Pit
- ▬ Cutting
- ▬ Embankment
- ▬ Cultivated Lands
- ▬ Orchard or Permanent Cr.
- Plantation
- ▬ Grassland
- Bush
- Forest
- ▬ Swamp
- ▬ Vegetation Boundary
- ▬ Planting Partition

LEGEND

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

HORIZONTAL DATUM: UTM ZONE 34  
CLARKE 1850 SPHER

VERTICAL DATUM: MEAN SEA LEVEL

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DATE: / /

SEN. SUPT. ENG. (JICA)  
DATE: / /

SUPT. ENGINEER (JICA)  
DATE: / /

PROJECT ENGINEER (JICA)  
DATE: / /

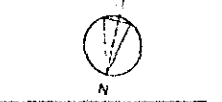
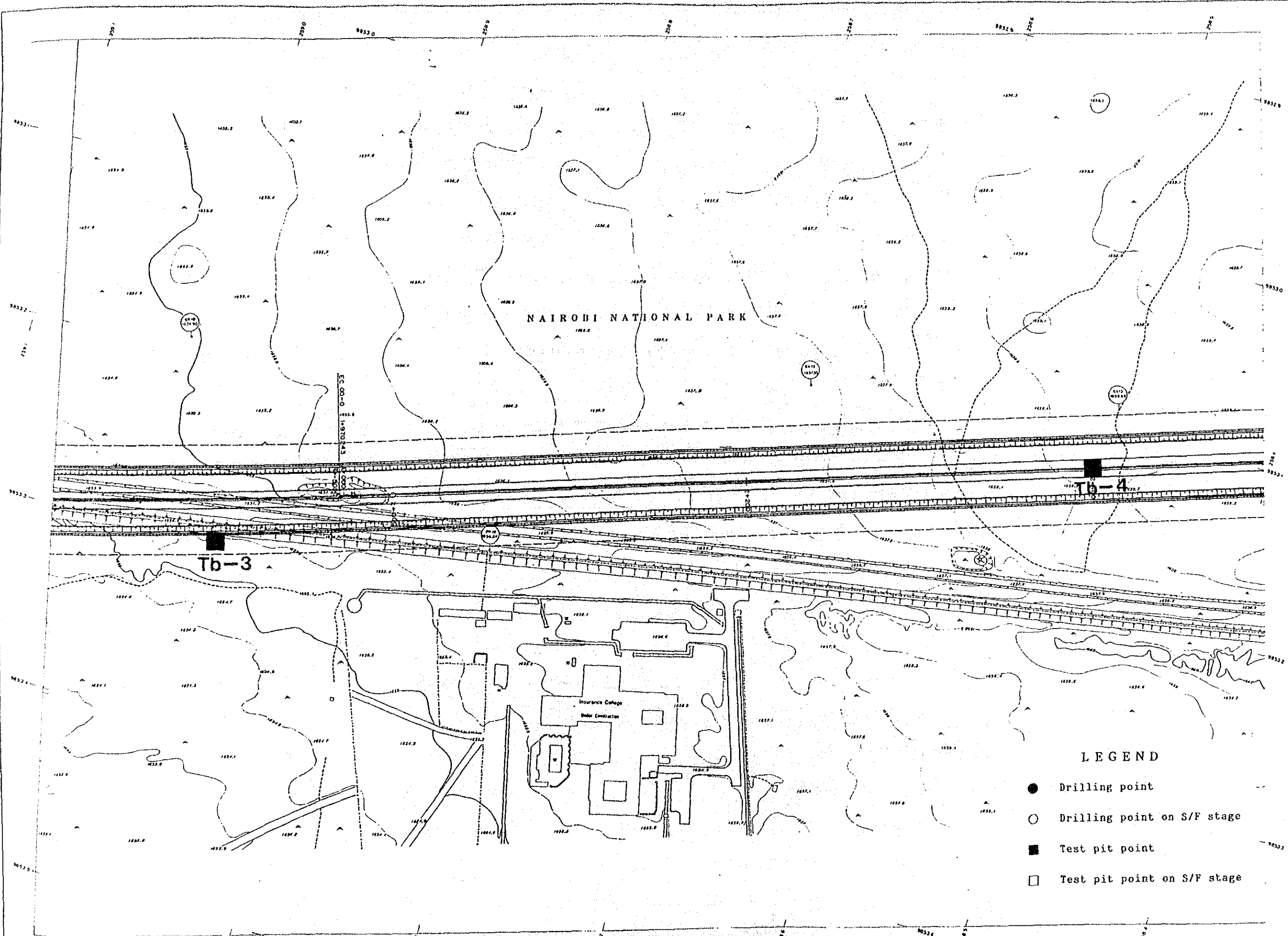
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SHEET 3 OF 46

DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



Scale 1:112,000  
HEIGHTS IN METERS

- LEGEND**
- △ GPS Point
  - ⊕ Traverse Point
  - ⊙ Bench Mark
  - 1234.5 Direct Leveling Hgt
  - 1234.5 Spot Height
  - Contours (V.L.M)
  - Outcrop (Rock)
  - ▨ Building Permanent
  - ▨ Building Others
  - ▨ Bituminous Road
  - ▨ Road
  - ▨ Track
  - ▨ Railway
  - ▨ Bridge Culvert
  - ▨ River
  - ▨ Stream
  - ▨ Dam
  - ▨ Flood
  - ▨ Water Tank
  - ▨ Power Line
  - ▨ Telephone Line
  - ▨ Fence Gate
  - ▨ Hedge
  - ▨ Stone Wall
  - ▨ Dump or Mound
  - ▨ Quarry Pit
  - ▨ Cutline
  - ▨ Embankment
  - ▨ Cultivated Land
  - ▨ Orchard or Permanent
  - ▨ Plantation
  - ▨ Grassland
  - ▨ Bush
  - ▨ Forest
  - ▨ Swamp
  - ▨ Vegetation Boundary
  - ▨ Planning Partition

HORIZONTAL DATUM: UTM ZONE 37  
KILGORE 1960 SPIRIT

VERTICAL DATUM: MEAN SEA LEVEL

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December

GROUND CONTROL SURVEYED BY: December

STEREO PLOTTED BY: MARIU

CARTOGRAPHY BY: MARIU

- LEGEND**
- Drilling point
  - Drilling point on S/F stage
  - Test pit point
  - Test pit point on S/F stage

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CHIEF SUPT. ENG.	DATE: / /
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SUPT. ENGINEER	DATE: / /
PROJECT ENGINEER	DATE: / /

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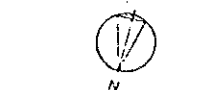
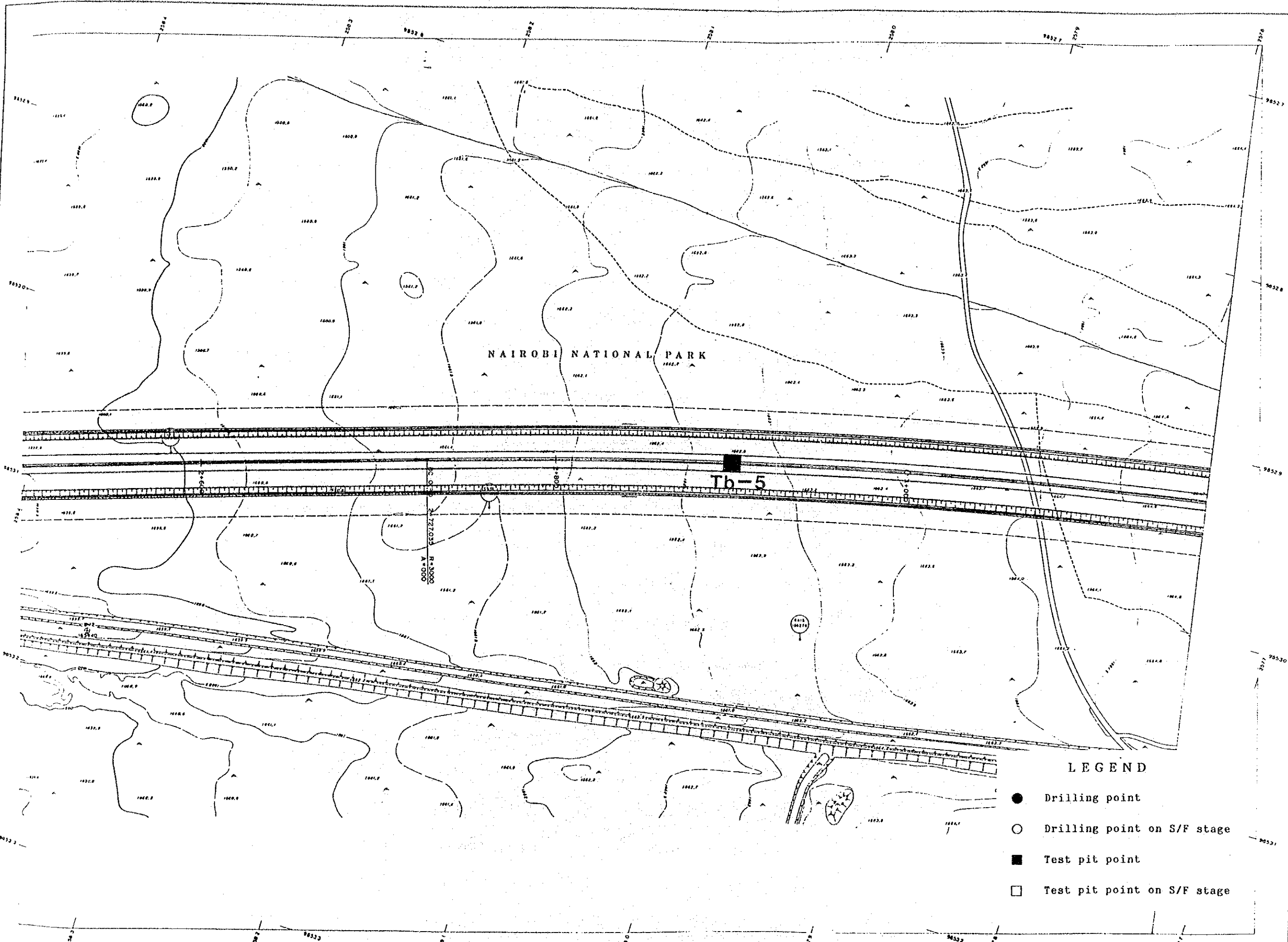
DETAILED LOCATION MAP OF GEOLOGICAL SURVEY

# THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

SHEET NO. 5

4 5 6

INDEX TO ADJOINING SHEETS



Scale 1:12,000  
HEIGHTS IN METERS

- LEGEND**
- △ GPS Point
  - Traverse Point
  - ⊕ Bench Mark
  - 1224.5 Direct Leveling Height
  - 1224.5 Spot Height
  - Contours (V.I. 1m)
  - Outcrop Rock
  - Building Permanent
  - Building Others
  - Bituminous Road
  - Road
  - Track
  - Railway
  - Bridge Culvert
  - River
  - Stream
  - Dam
  - Flood
  - Water Tank
  - Power Line
  - Telephone Line
  - Fence Gate
  - Hedge
  - Stone Wall
  - Dump or Mound
  - Quarry Pit
  - Cutting
  - Embankment
  - Cultivated Lands
  - Ditch or Permanent
  - Plantation
  - Grassland
  - Bush
  - Forest
  - Swamp
  - Vegetation Boundary
  - Planting Partition

HORIZONTAL DATUM: UTM ZONE 35  
CLARKE 1866 SPIII

VERTICAL DATUM: MEAN SEA LEVEL

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December

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CARTOGRAPHED BY: H.I.

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CHIEF SUPT. ENG.: [Signature]  
DATE: / /

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SUPT. ENGINEER: [Signature]  
DATE: / /

PROJECT ENGINEER: [Signature]  
DATE: / /

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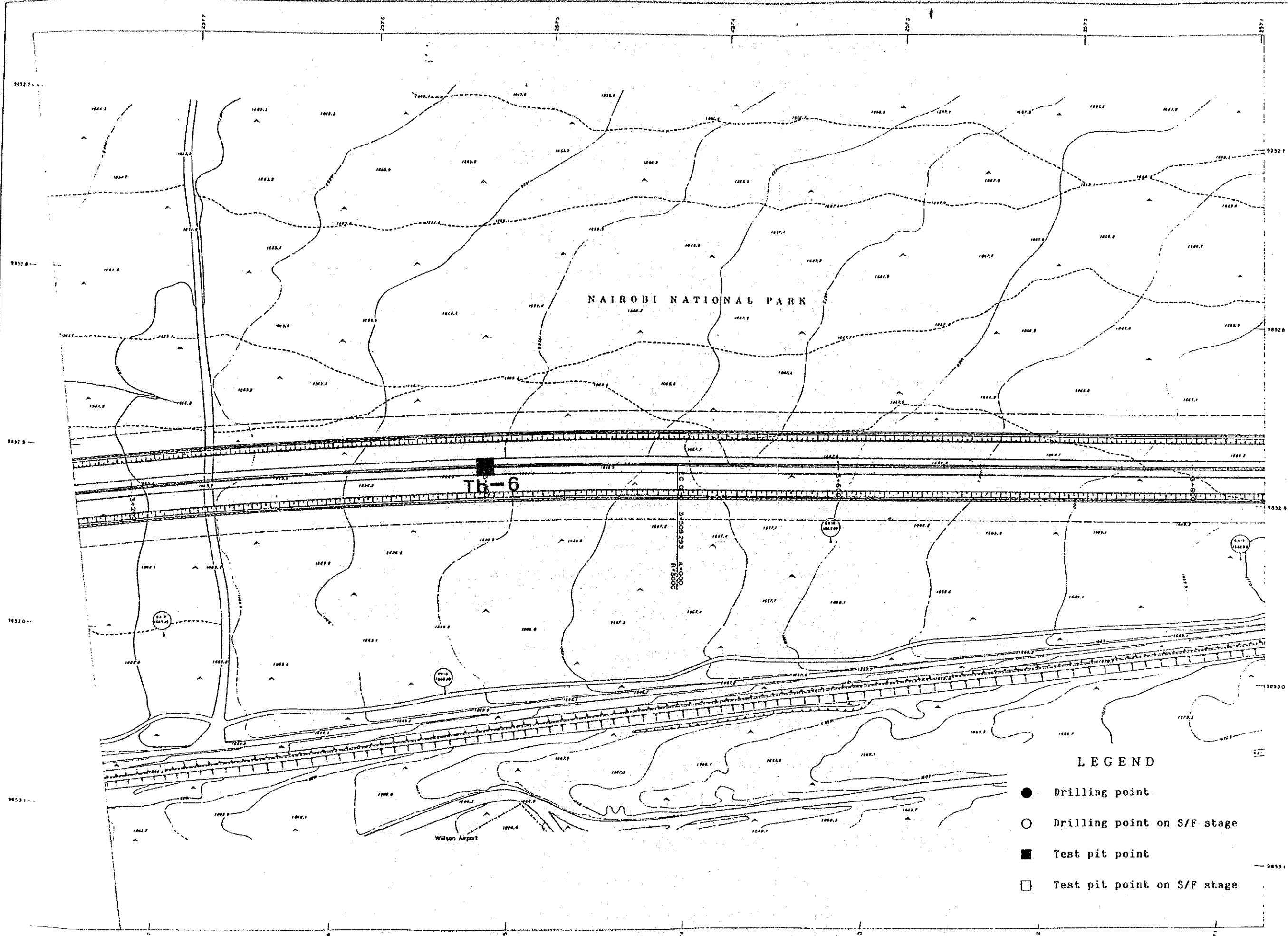
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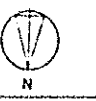
SHEET 5 OF 16

- LEGEND**
- Drilling point
  - Drilling point on S/F stage
  - Test pit point
  - Test pit point on S/F stage

DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



Scale 1:2,000  
HEIGHTS IN METERS

LEGEND

- ▲ GIS Point
- Traverse Point
- ⊙ Bench Mark
- ⊕ Direct Leveling Heap
- ⊙ Spot Height
- Contours (V.I. line)
- ⊕ Outcrop (Block)
- ▨ Building Farmhouse
- ▨ Building Others
- ▨ Bituminous Road
- ▨ Road
- ▨ Track
- ▨ Railway
- ▨ Bridge, Culvert
- ▨ River
- ▨ Stream
- ▨ Dam
- ▨ Pond
- ▨ Water Tank
- ▨ Power Line
- ▨ Telephone Line
- ▨ Fence, Gate
- ▨ Holed
- ▨ Street Wall
- ▨ Dump or Mound
- ▨ Quarry, Pit
- ▨ Cutting
- ▨ Embankment
- ▨ Cultivated Lands
- ▨ Orchard or Permanent Plantation
- ▨ Plantation
- ▨ Grassland
- ▨ Bush
- ▨ Forest
- ▨ Swamp
- ▨ Vegetation Boundary
- ▨ Planning Partition

LEGEND

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

HORIZONTAL DATUM: UTM ZONE 1, CLARKE 1866 SPHD

VERTICAL DATUM: MEAN SEA LEVEL

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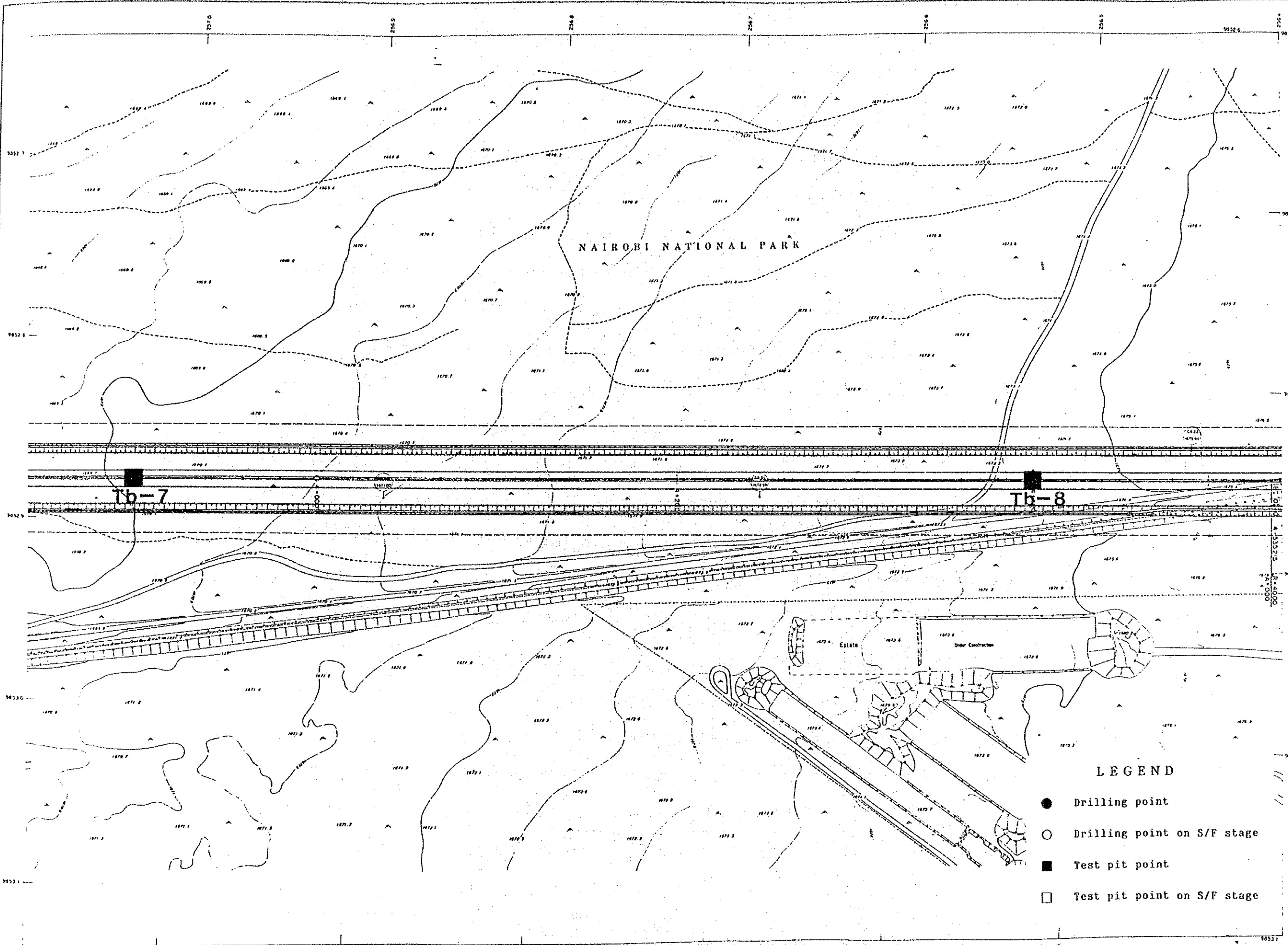
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CARTOGRAPHY BY: [Name]

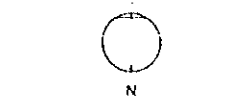
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SPT. ENGINEER	DATE
PROJECT ENGINEER	DATE

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DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



Scale 1:27,000  
HEIGHTS IN METERS

- LEGEND**
- △ GPS Point
  - Traverse Point
  - ⊙ Bench Mark
  - 1224.5 Direct Leveling Height
  - 1224.2 Spot Height
  - Contours 1V 1m
  - ⊠ Outer track
  - ▭ Building Permanent
  - ▭ Building Others
  - Bituminous Road
  - Road
  - Track
  - Railway
  - Bridge, Culvert
  - River
  - Stream
  - Dam
  - Pond
  - Water Tank
  - Power Line
  - Telephone Line
  - Fence, Gate
  - Hedge
  - Stone Wall
  - Dump or Mound
  - Quarry Pit
  - Cutting
  - Embankment
  - Cultivated Land
  - Orchard or Permanent
  - Plantation
  - Grassland
  - Bush
  - Forest
  - Swamp
  - Vegetation Boundary
  - Planting Partition

HORIZONTAL DATUM UTM ZONE 36  
KILAKKE 1980 SPH

VERTICAL DATUM MEAN SEA LEVEL

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MAK

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CHIEF Supt. Eng.  
DATE

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SEN. Supt. Eng.  
DATE

Supt. Engineer  
DATE

PROJECT ENGINEER  
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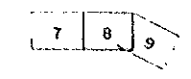
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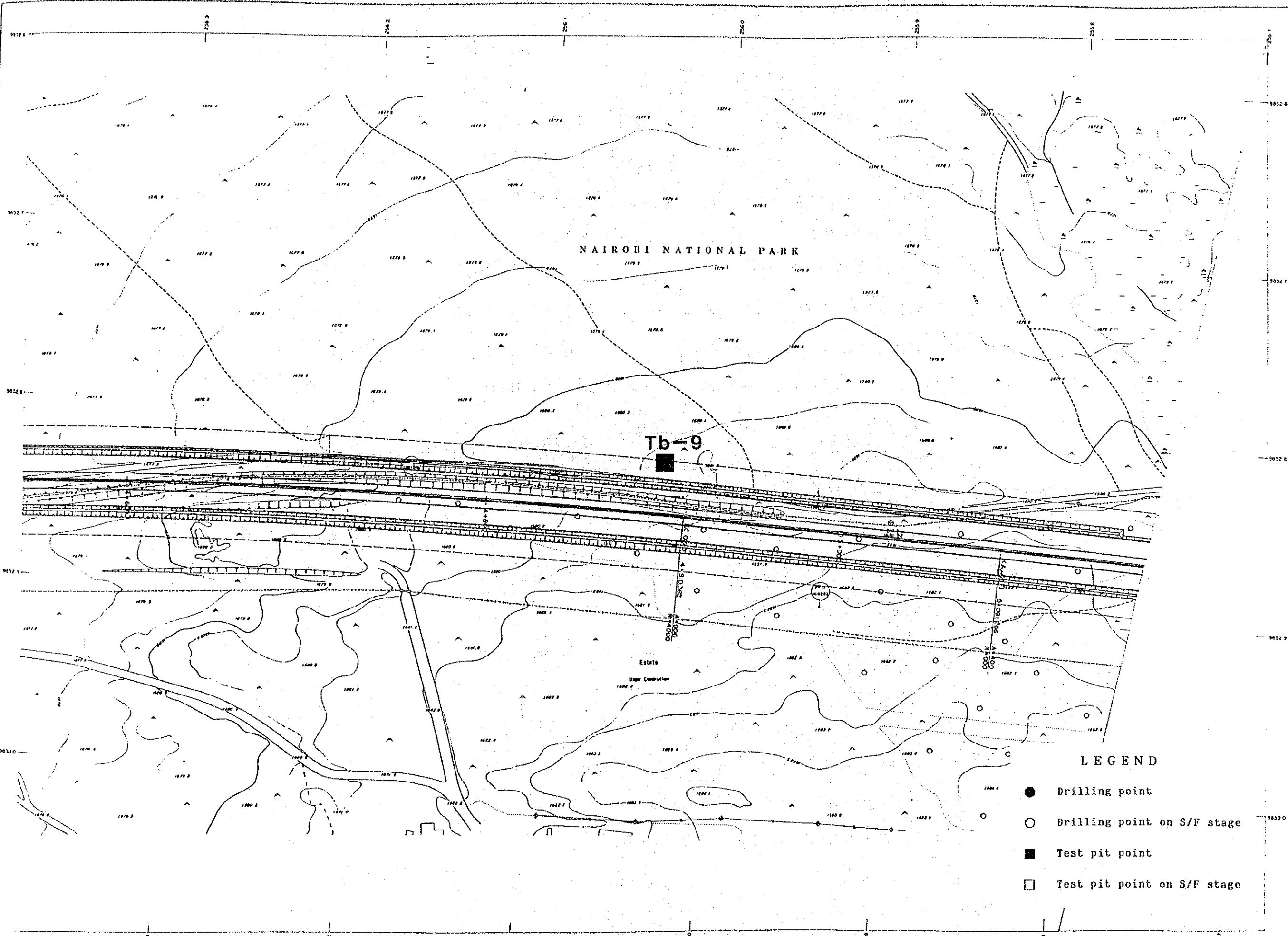
SHEET 7 OF 16

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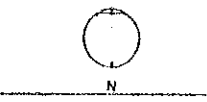
SHEET NO. 8



INDEX TO ADJOINING SHEETS



DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



Scale 1:2,000  
HEIGHTS IN METERS

### LEGEND

- △ GIS Point
- Traversé Point
- ⊕ Bench Mark
- 1234.5 Direct Leveling Height
- 234.5 Spot Height
- Contours (1:1 m)
- Outcrop (Rock)
- ▨ Building Permanent
- ▩ Building Others
- ▬ Bituminous Road
- ▬ Road
- ▬ Track
- ▬ Railway
- ▬ Bridge, Culvert
- ▬ River
- ▬ Stream
- ▬ Dam
- ▬ Pond
- ▬ Water Tank
- ▬ Power Line
- ▬ Telephone Line
- ▬ Fence, Gate
- ▬ Hedge
- ▬ Stone Wall
- ▬ Dump or Mound
- ▬ Quarry Pit
- ▬ Cutting
- ▬ Embankment
- ▬ Cultivated Land
- ▬ Orchard or Permanent
- ▬ Plantation
- ▬ Grassland
- ▬ Bush
- ▬ Forest
- ▬ Swamp
- ▬ Vegetation Boundary
- ▬ Planting Partition

HORIZONTAL DATUM UTM ZONE 1  
CLARKE 1866 S.P.D.

VERTICAL DATUM MEAN SEA LEVEL

AERIAL PHOTOGRAPHY BY  
Japan International Cooperation Agency

GROUND CONTROL SURVEYED BY  
Desert

STEREO PLOTTED BY  
MARA

CARTOGRAPHY BY  
JICA

CHIEF ENGINEER  
DATE

CHIEF Supt. Eng.  
DATE

CHECKED BY  
Supt. Eng.  
DATE

Supt. Engineer  
DATE

PROJECT ENGINEER  
DATE

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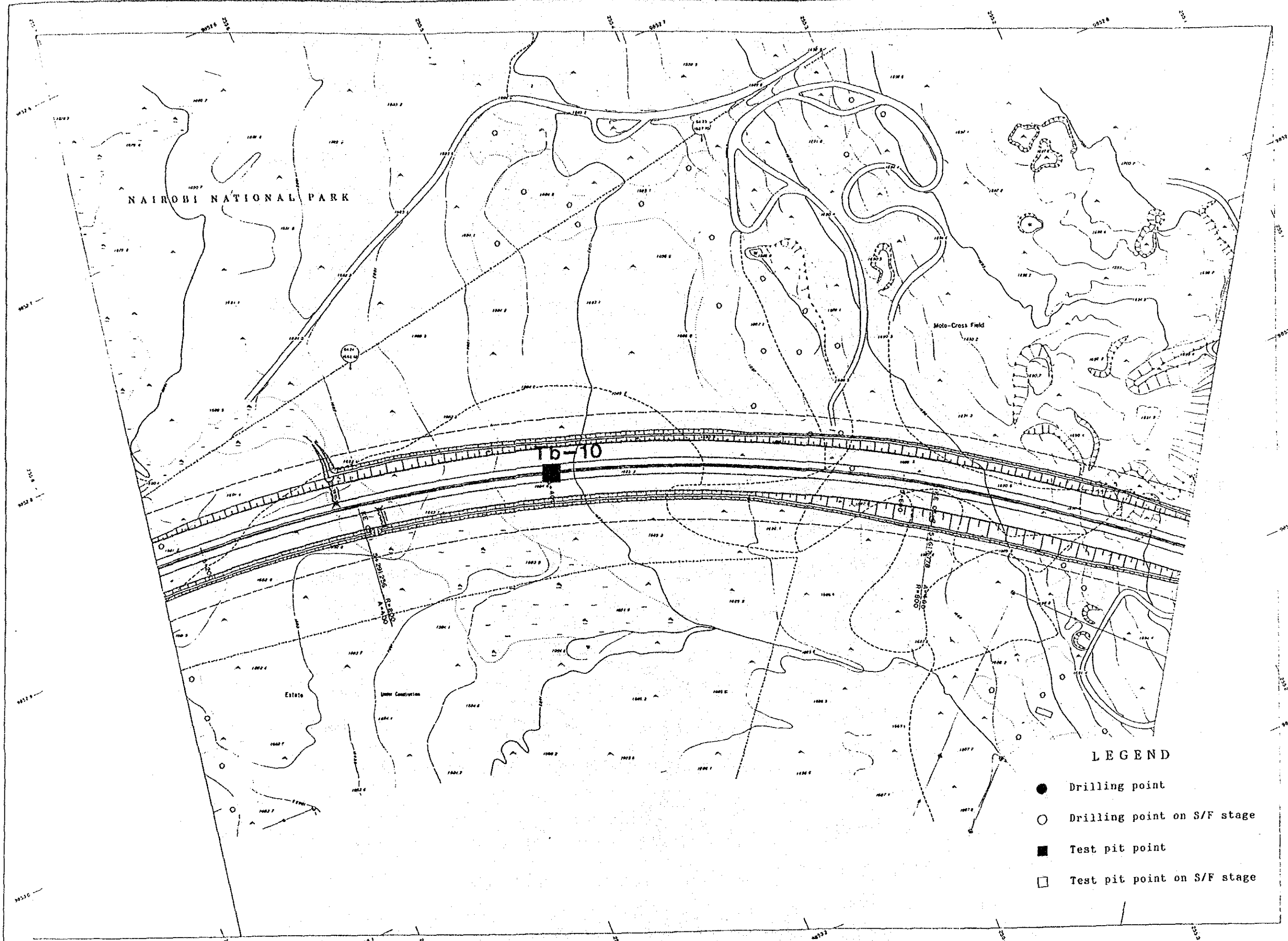
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SHEET 8 OF 46

- ### LEGEND
- Drilling point
  - Drilling point on S/F stage
  - Test pit point
  - Test pit point on S/F stage

# THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

SHEET NO. 9



Scale 1:27,000  
HEIGHTS IN METERS

**LEGEND**

- △ GIS Point
- ⊕ Traversa Post
- ⊙ Bench Mark
- 1234.5 Direct Leveling Height
- 1234.5 Spot Height
- Contours (V.I. Int)
- ⊠ Outerop (Drick)
- ▭ Building (Permanent)
- ▭ Building (Others)
- ▭ Bituminous Road
- ▭ Road
- ▭ Track
- ▭ Railway
- ▭ Bridge, Culvert
- ▭ River
- ▭ Stream
- ▭ Dam
- ▭ Pond
- ▭ Water Tank
- ▭ Power Line
- ▭ Telephone Line
- ▭ Fence, Gate
- ▭ Hedge
- ▭ Stone Wall
- ▭ Dump or Mound
- ▭ Quarry, Pit
- ▭ Cutting
- ▭ Embankment
- ▭ Cultivated Land
- Orchard or Permanent
- Plantation
- Grassland
- Bush
- Forest
- Swamp
- Vegetation Boundary
- Planting Partition

HORIZONTAL DATUM UTM ZONE 37  
(CLARKE 1866 SPHER)

VERTICAL DATUM MEAN SEA LEVEL

AERIAL PHOTOGRAPHY BY  
Japan International Cooperation Agency  
December

GROUND CONTROL SURVEYED BY  
December

STEREO PLOTTED BY  
MARCH

CARTOGRAPHED BY  
JULY

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

CHEF ENGINEER / /  
DATE / /

CHEF SUPT. ENG. / /  
DATE / /

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DATE / /

SUPT. ENGINEER / /  
DATE / /

PROJECT ENGINEER / /  
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SHEET 9 OF 46

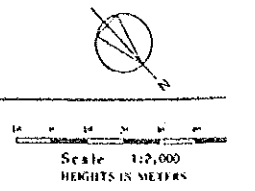
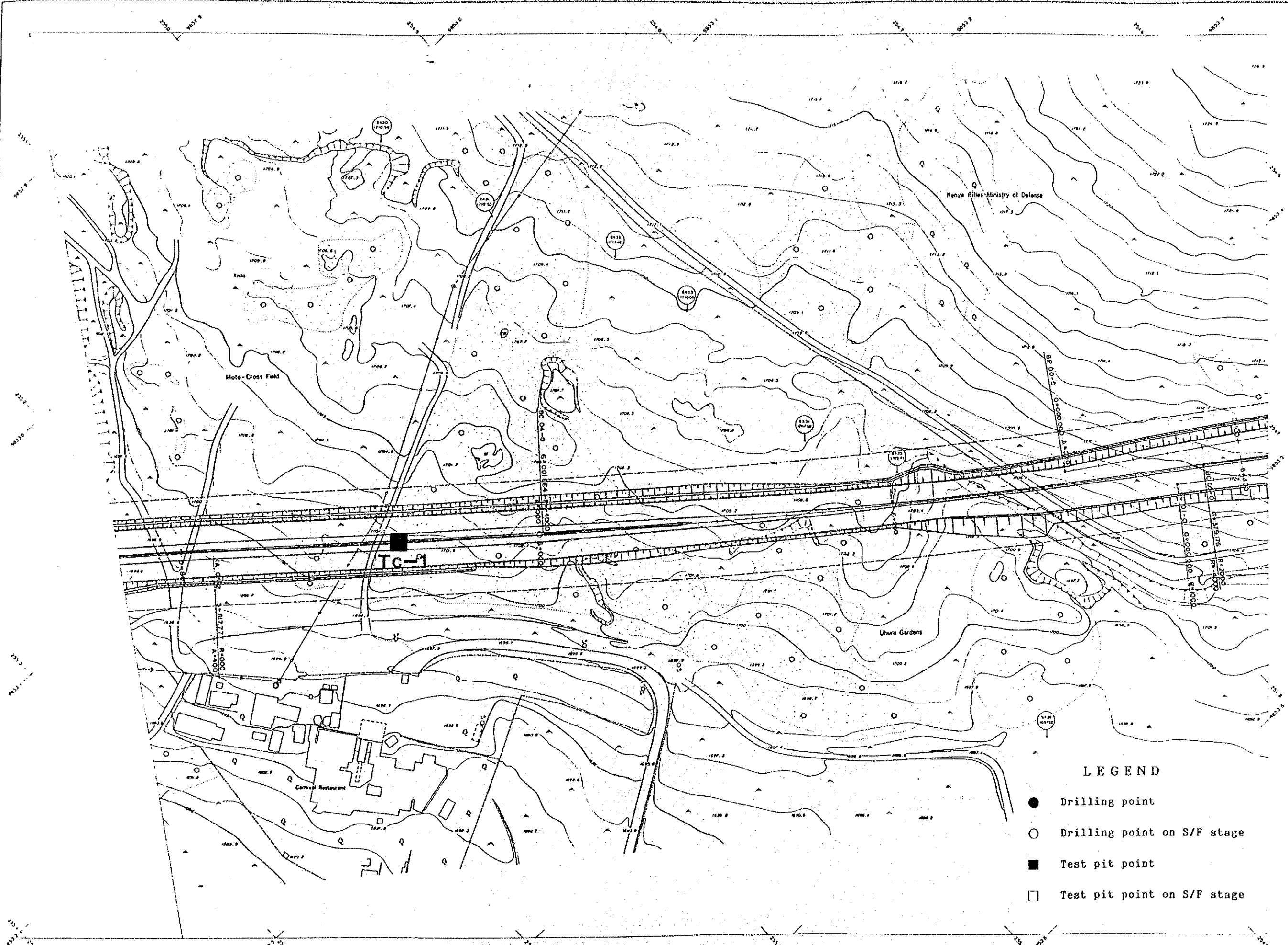
DETAILED LOCATION MAP OF GEOLOGICAL SURVEY

# THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

SHEET NO. 10

9	10	11
		11-2

INDEX TO ADJOINING SHEETS



**LEGEND**

- GPS Point
- Traverse Point
- Bench Mark
- Direct Levelling Height
- Spot Height
- Contours 4.1 Int
- Outcrop (Rock)
- Building (Parliament)
- Building (Others)
- Bituminous Road
- Road
- Track
- Railway
- Bridge, Culvert
- River
- Stream
- Dam
- Pond
- Water Tank
- Power Line
- Telephone Line
- Fence, Gate
- Hedge
- Stone Wall
- Dump or Mound
- Quarry Pit
- Cutting
- Embankment
- Cultivated Land
- Orchard or Permanent Plantation
- Plantation
- Grassland
- Bush
- Forest
- Swamp
- Vegetation Boundary
- Planting Particular

HORIZONTAL DATUM: UTM ZONE 34  
 CLARKE 1866 SPIRE  
 VERTICAL DATUM: MEAN SEA LEVEL  
 AERIAL PHOTOGRAPHY BY:  
 Japan International Cooperation Agency  
 GROUND CONTROL SURVEYED BY:  
 M.P.W.  
 STEREO PLOTTED BY:  
 M.P.W.  
 CARTOGRAPHY BY:  
 M.P.W.

CHECKED BY:

CHIEF ENGINEER	DATE
CHIEF SUPT. ENG.	DATE
SEN. SUPT. ENG.	DATE
SUPT. ENGINEER	DATE

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

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 JICA TOKYO, JAPAN  
 SHEET 10 OF 16

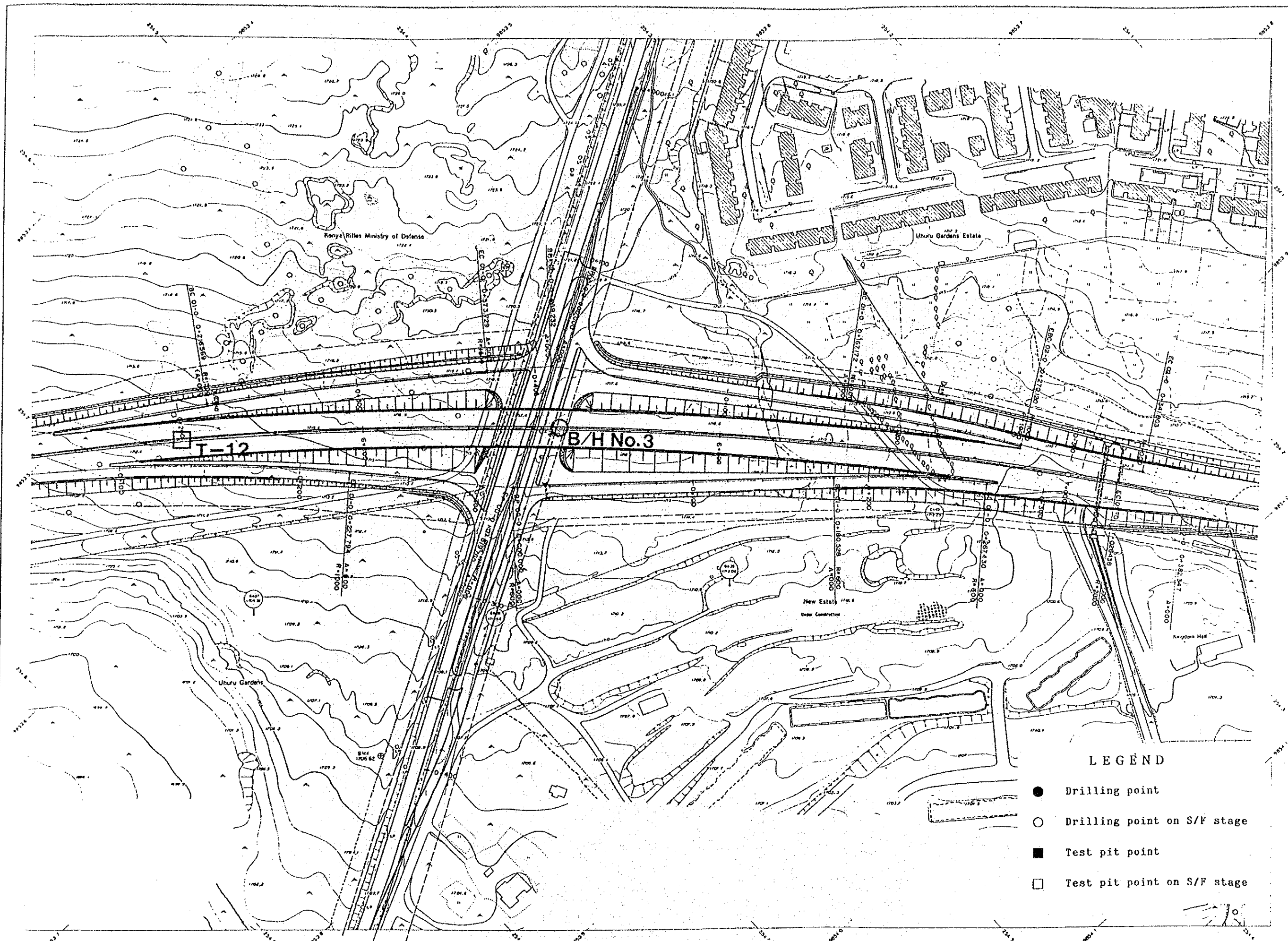
DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



# THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

SHEET NO. 11

10 11 12  
11-2  
INDEX TO ADJOINING SHEETS



DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



Scale 1:27,000  
HEIGHTS IN METERS

**LEGEND**

- △ GTS Point
- Traverse Point
- Bench Mark
- 1234.5 Direct Leveling Height
- 1234.5 Spot Height
- Contours (V.I. Int.)
- Outcrop (Rock)
- ▨ Building, Permanent
- ▨ Building, Others
- ▨ Bituminous Road
- ▨ Road
- ▨ Track
- ▨ Railway
- ▨ Bridge, Culvert
- ▨ River
- ▨ Stream
- ▨ Dam
- ▨ Pond
- Water Tank
- ▨ Power Line
- ▨ Telephone Line
- ▨ Fence, Gate
- ▨ Hedge
- ▨ Stone Wall
- ▨ Dump or Mound
- ▨ Quarry, Pit
- ▨ Cutting
- ▨ Embankment
- ▨ Cultivated Land
- ▨ Orchard or Permanent
- ▨ Plantation
- ▨ Grassland
- Bush
- Forest
- ▨ Swamp
- ▨ Vegetation Boundary
- ▨ Planning Partition

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

HORIZONTAL DATUM UTM ZONE 37  
CLARKE 1866 SPHEROID

VERTICAL DATUM MEAN SEA LEVEL

AERIAL PHOTOGRAPHY BY  
Japan International Cooperation Agency

GROUND CONTROL SURVEY BY  
JICA

STEREO PLOTTED BY  
M.A.P.

CARTOGRAPHY BY  
JICA

CHEF ENGINEER  
DATE

CHIEF SUFF. ENG.  
DATE

CHECKED BY  
SEN. SUFF. ENG.  
DATE

PROJECT ENGINEER  
DATE

MINISTRY OF PUBLIC WORKS

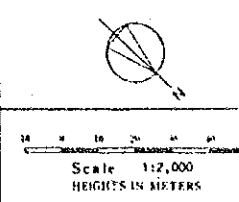
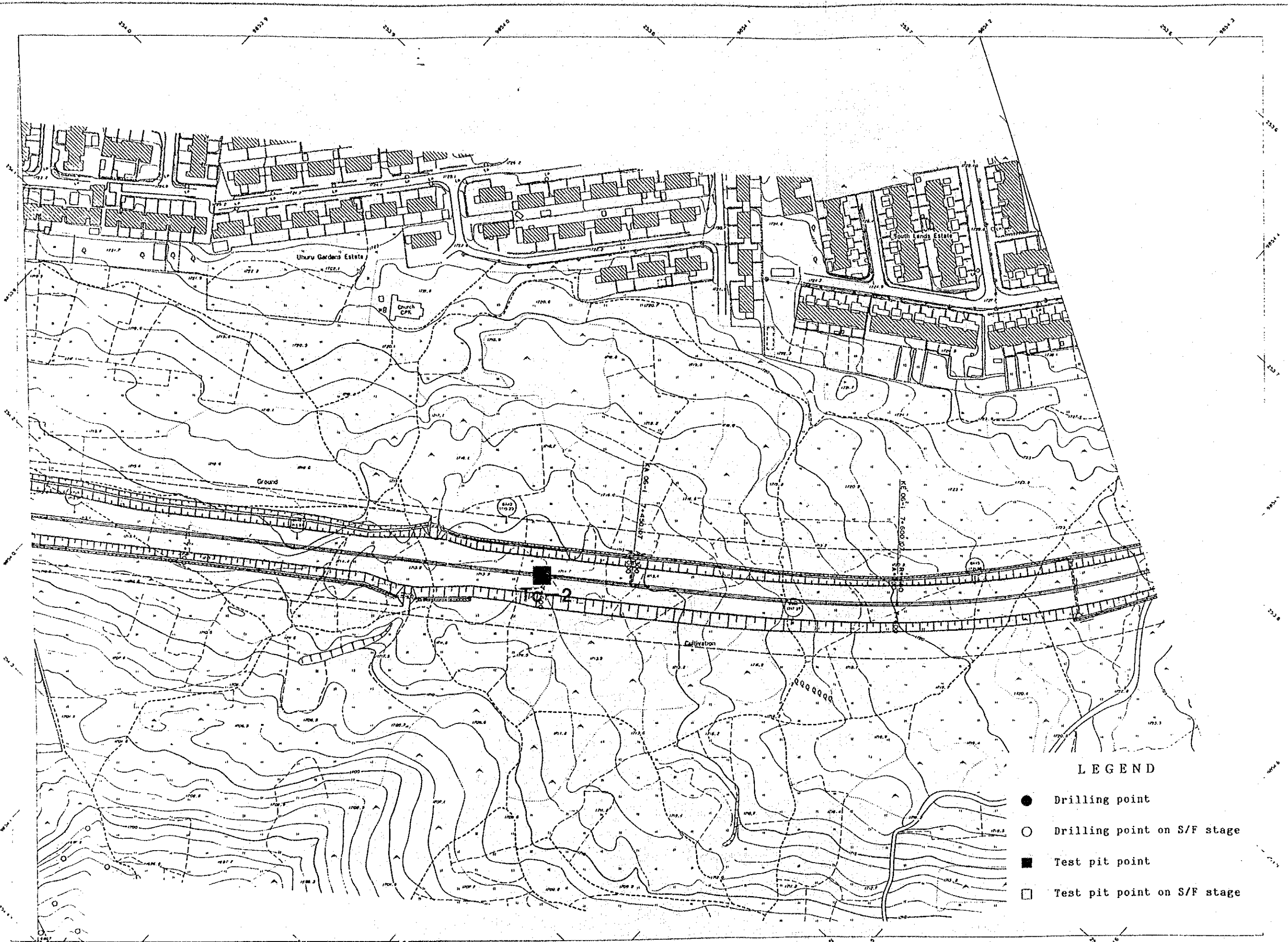
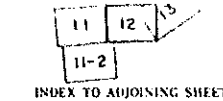
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JICA TOKYO, JAPAN

SHEET 11 OF 16

# THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

SHEET NO. 12



**LEGEND**

- △ GPS Point
- Traverse Point
- ⊙ Bench Mark
- 1234.5 Direct Levelling Height
- 123.4 Spot Height
- 123.4 Contours (V.I. 1m)
- Outcrop (Rock)
- ▨ Building, Permanent
- ▨ Building, Others
- ▨ Unimproved Road
- ▨ Road
- ▨ Track
- ▨ Railway
- ▨ Bridge, Culvert
- ▨ River
- ▨ Stream
- ▨ Dam
- ▨ Pond
- ▨ Water Tank
- ▨ Power Line
- ▨ Telephone Line
- ▨ Fence, Gate
- ▨ Hedge
- ▨ Stone Wall
- ▨ Ramp or Mound
- ▨ Quarry Pit
- ▨ Cutting
- ▨ Embankment
- ▨ Cultivated Lands
- ▨ Orchard or Permanent
- ▨ Plantation
- ▨ Grassland
- ▨ Bush
- ▨ Forest
- ▨ Swamp
- ▨ Vegetation Boundary
- ▨ Planning Partition

HORIZONTAL DATUM: U.T.M. ZONE 37  
CLARKE 1866 SPHEROID

VERTICAL DATUM: MEAN SEA LEVEL

AERIAL PHOTOGRAPHY BY: Japan International Cooperation Agency  
December 1962

GROUND CONTROL SURVEYED BY: December 1962

STEREO PLOTTED BY: MARCO

CARTOGRAPHY BY: JICA

CHIEF ENGINEER: [Signature]  
DATE: [Blank]

CHECKED BY: SEN. SUPT. ENG. [Signature]  
DATE: [Blank]

SUPT. ENGINEER: [Signature]  
DATE: [Blank]

PROJECT ENGINEER: [Signature]  
DATE: [Blank]

MINISTRY OF PUBLIC WORKS

**M.O.P.W.**

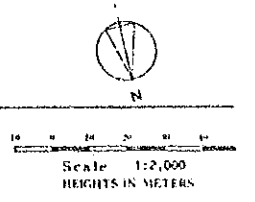
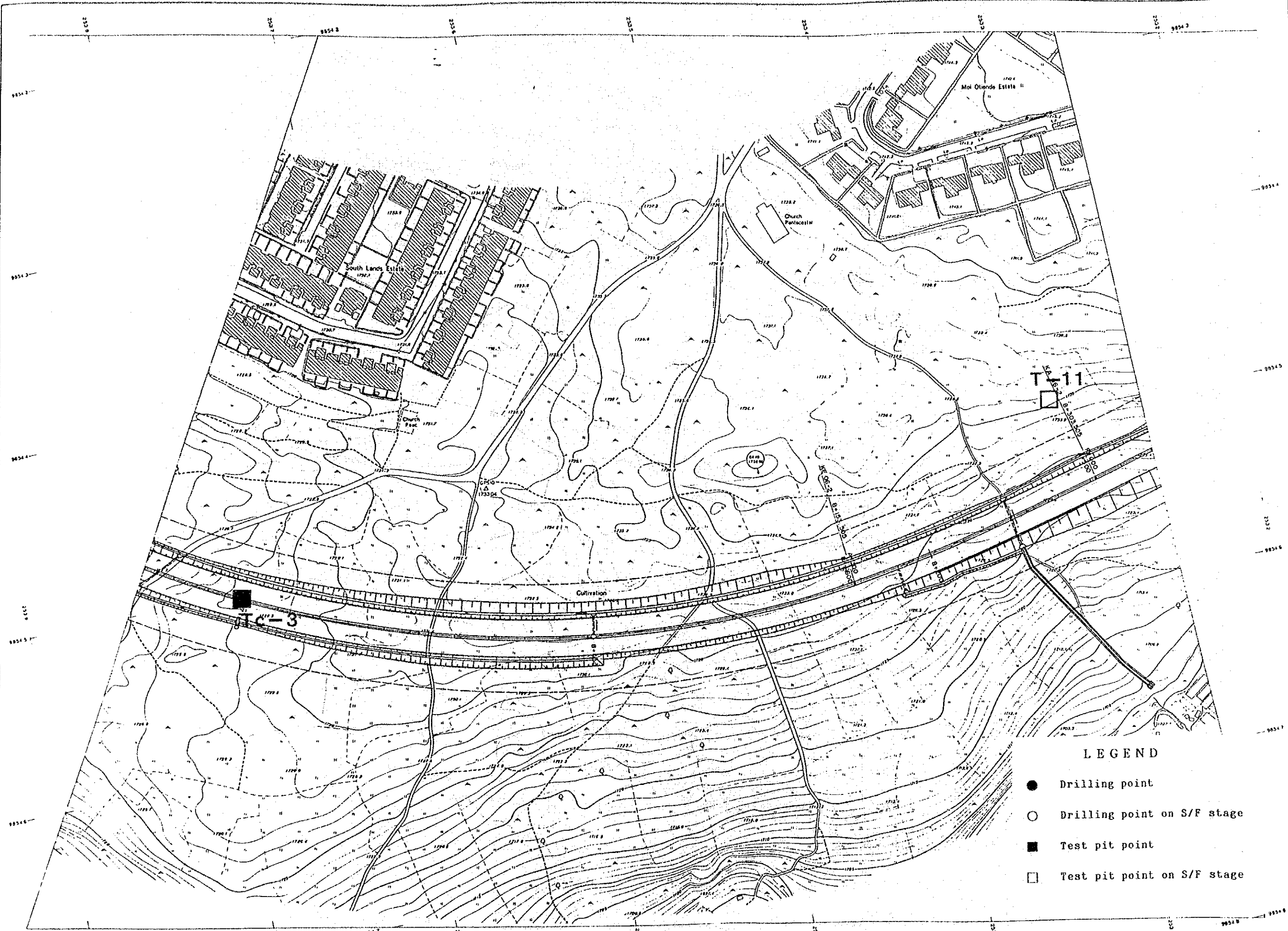
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JICA TOKYO, JAPAN

SHEET 12 OF 46

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



**LEGEND**

- GPS Point
- ⊙ Traverse Point
- ⊕ Bench Mark
- 1234.5 Direct Leveling Height
- 1232.2 Spot Height
- Contours (V.I. 1m)
- ⊕ Outcrop (Rock)
- ▨ Building (Farmhouse)
- ▨ Building (Others)
- ▨ Bituminous Road
- ▨ Road
- ▨ Track
- ▨ Railway
- ▨ Bridge, Culvert
- ▨ River
- ▨ Stream
- ⊕ Dam
- ⊕ Pond
- ⊕ Water Tank
- ⊕ Power Line
- ⊕ Telephone Line
- ▨ Fence, Gate
- ▨ Hedge
- ▨ Stone Wall
- ▨ Dump or Mound
- ▨ Quarry, Pit
- ▨ Cutting
- ▨ Embankment
- ▨ Cultivated Land
- ▨ Orchard or Permanent A
- Plantation
- Grassland
- Bush
- Forest
- ▨ Swamp
- ▨ Vegetation Boundary
- ▨ Planning Partition

HORIZONTAL DATUM: UTM ZONE V, CLARKE (IND. SPH.)  
 VERTICAL DATUM: MEAN SEA LEVEL  
 AERIAL PHOTOGRAPHY BY: Japan International Cooperation Agency  
 GROUND CONTROL SURVEY BY: [Name]  
 STEREO PLOTTED BY: [Name]  
 CARTOGRAPHED BY: [Name]

CHECKED BY: SEN. SPT. ENG. [Name] [Date]  
 SPT. ENGINEER [Name] [Date]  
 PROJECT ENGINEER [Name] [Date]

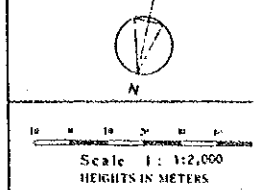
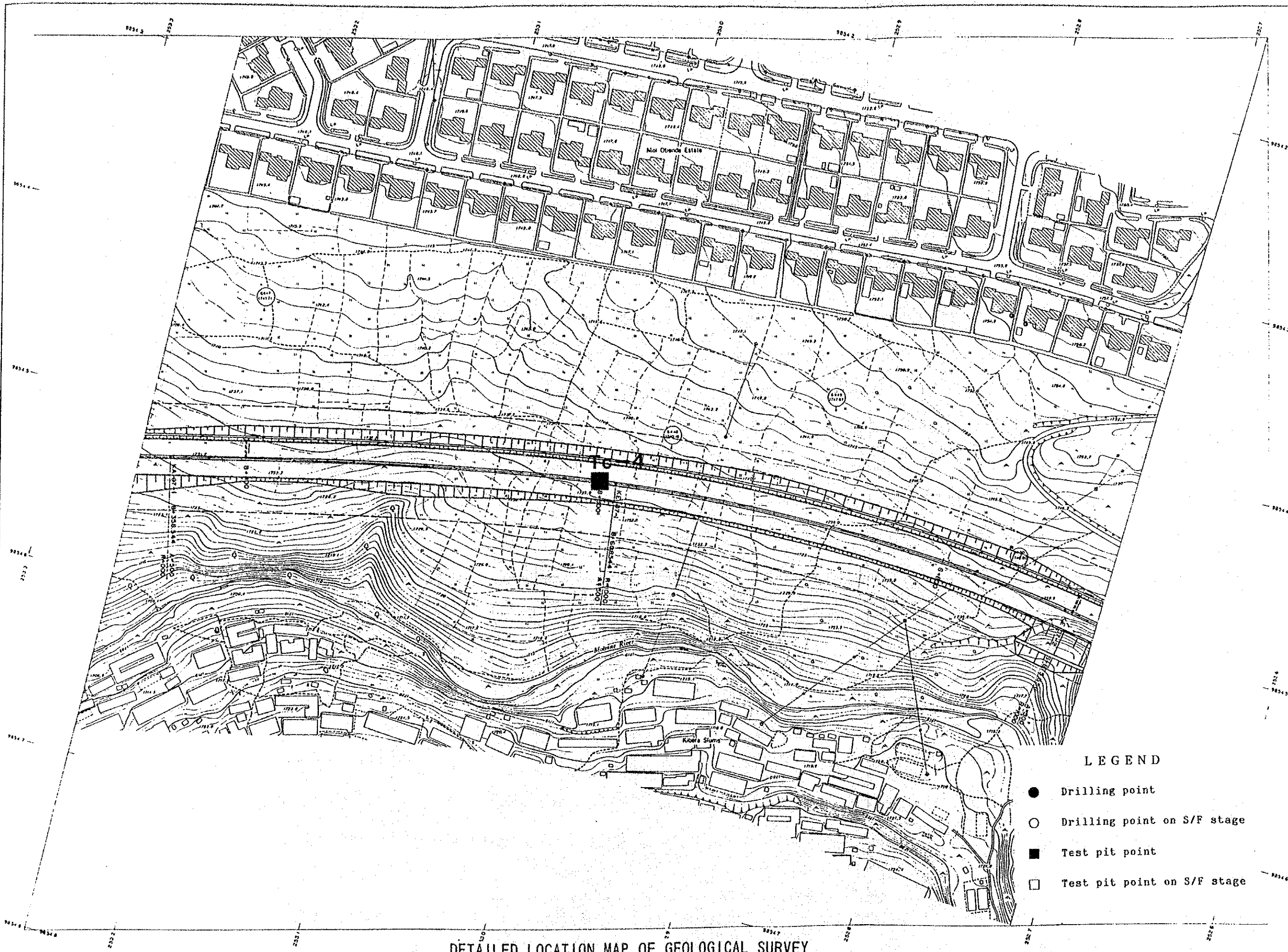
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SHEET 13 OF 46

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



**LEGEND**

- GPS Point
- Traverse Point
- Bench Mark
- Direct Leveling Height
- Spot Height
- Contours (V.L. Int.)
- Outcrop (Rock)
- Building (Permanent)
- Building (Others)
- Paved Road
- Road
- Track
- Railway
- Bridge/Culvert
- River
- Stream
- Dam
- Pond
- Water Tank
- Power Line
- Telephone Line
- Fence Gate
- Hedge
- Stone Wall
- Ditch/Wood
- Embankment
- Cultivated Land
- Orchard/Permanent Crop
- Plantation
- Grassland
- Bush
- Forest
- Swamp
- Vegetation Boundary
- Planning Pattern

HORIZONTAL DATUM UTM ZONE 37  
CLARKE 1866 SPHEROID

VERTICAL DATUM MEAN SEA LEVEL

AERIAL PHOTOGRAPHED BY JICA  
Japan International Cooperation Agency  
December

GROUND CONTROL SURVEYED BY JICA  
December

STEREO PLOTTED BY JICA  
MARCH

CARTOGRAPHED BY JICA  
JICA

CHECKED BY: \_\_\_\_\_  
 CHIEF ENGINEER \_\_\_\_\_  
 DATE \_\_\_\_\_  
 SEN. SUPT. ENG. \_\_\_\_\_  
 DATE \_\_\_\_\_  
 SUPT. ENGINEER \_\_\_\_\_  
 DATE \_\_\_\_\_  
 PROJECT ENGINEER \_\_\_\_\_  
 DATE \_\_\_\_\_

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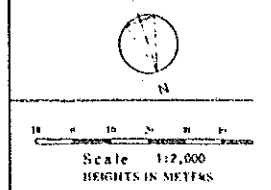
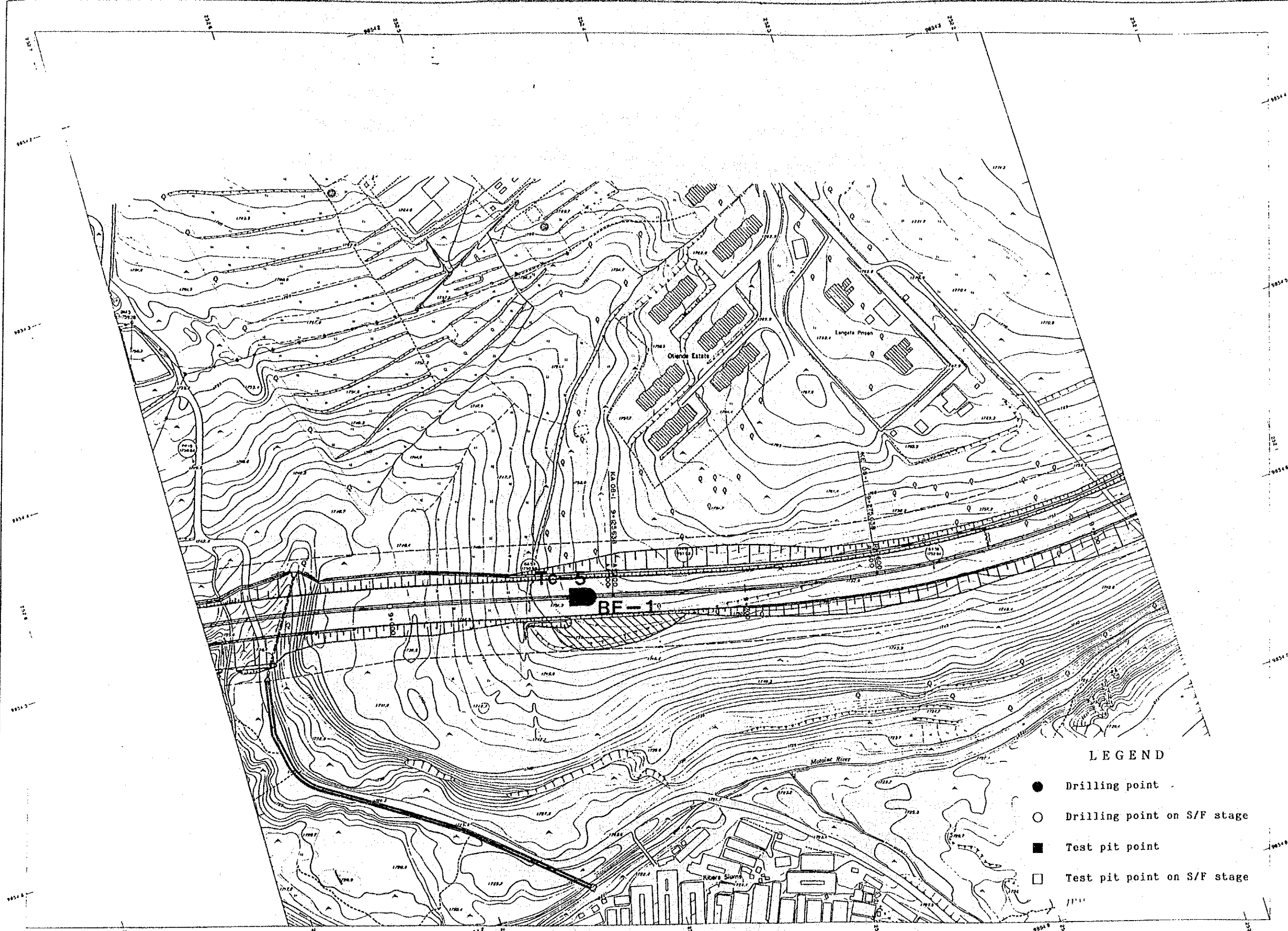
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JICA TOKYO, JAPAN

SHEET 14 OF 16

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



**LEGEND**

- △ GIS Point
- ⊙ Traverse Point
- ⊙ Bench Mark
- 1234.5 Direct Leveling Height
- 1234.5 Spot Height
- Contours (V.L.Ms)
- Outcrop (Rocks)
- Building Permanent
- Building Others
- Bituminous Road
- Road
- Track
- Railway
- Bridge, Culvert
- River
- Stream
- Dam
- Pond
- Water Tank
- Power Line
- Telephone Line
- Fence, Gate
- Hedge
- Stone Well
- Dump or Mound
- Quarry Pit
- Cutting
- Embankment
- Cultivated Lands
- Orchard or Permanent
- Plantation
- Grassland
- Bush
- Forest
- Swamp
- Vegetation Boundary
- Planning Partition

HORIZONTAL DATUM: UTM ZONE V, CLARKE 1880 SPHEROID  
 VERTICAL DATUM: MEAN SEA LEVEL  
 AERIAL PHOTOGRAPHY BY: Japan International Cooperation Agency  
 GROUND CONTROL SURVEYED BY: December  
 STEREO PLOTTED BY: MARI  
 CARTOGRAPHED BY: J.T.S.

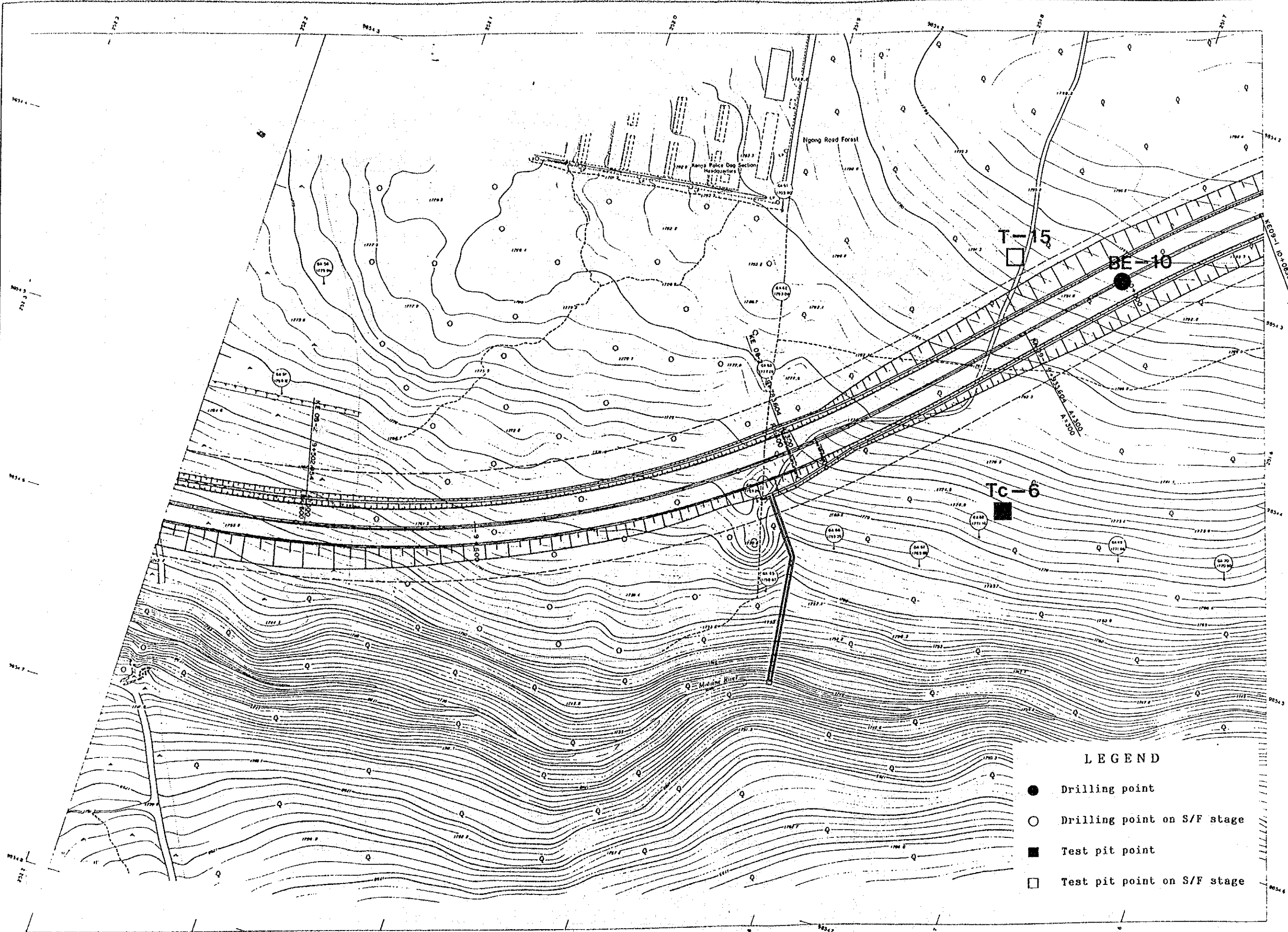
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 CHIEF SUPT. ENG. (09) DATE / /  
 SEN. SUPT. ENG. (04) DATE / /  
 SUPT. ENGINEER (04) DATE / /  
 PROJECT ENGINEER DATE / /

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**M.O.P.W.**  
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 JICA TOKYO, JAPAN  
 SHEET 15 OF 46

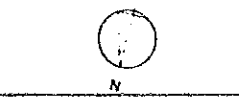
**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



Scale 1:12,000  
HEIGHTS IN METERS

**LEGEND**

- ▲ GPS Point
- Traverse Point
- Bench Mark
- 1234.5 Direct Leveling Height
- 1234.2 Spot Height
- Contours (V.L. Int)
- Outcrop (Rock)
- ▭ Building Permanent
- ▭ Building Others
- ▭ Bituminous Road
- ▭ Road
- ▭ Track
- ▭ Railway
- ▭ Bridge, Culvert
- ▭ River
- ▭ Stream
- ▭ Dam
- ▭ Pond
- ▭ Water Tank
- ▭ Power Line
- ▭ Telephone Line
- ▭ Fence, Gate
- ▭ Hedge
- ▭ Stone Wall
- ▭ Dump or Mound
- ▭ Quarry Pit
- ▭ Cutting
- ▭ Embankment
- ▭ Cultivated Land
- ▭ Orchard or Permanent
- ▭ Plantation
- ▭ Grassland
- ▭ Bush
- ▭ Forest
- ▭ Swamp
- ▭ Vegetation Boundary
- ▭ Planting Partition

HORIZONTAL DATUM UTM ZONE 1  
CLARKE 1866 SPHER

VERTICAL DATUM MEAN SEA LEVEL

AERIAL PHOTOGRAPHY BY  
Japan International Cooperation Agency

GROUND CONTROL SURVEYED BY  
December

STEREO PLOTTED BY  
MARK

CARTOGRAPHY BY  
B.I.

CHIEF ENGINEER  
DATE

CHIEF SUPT. ENG.  
DATE

SEN. SUPT. ENG.  
DATE

SUPT. ENGINEER  
DATE

PROJECT ENGINEER  
DATE

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M.O.P.W.

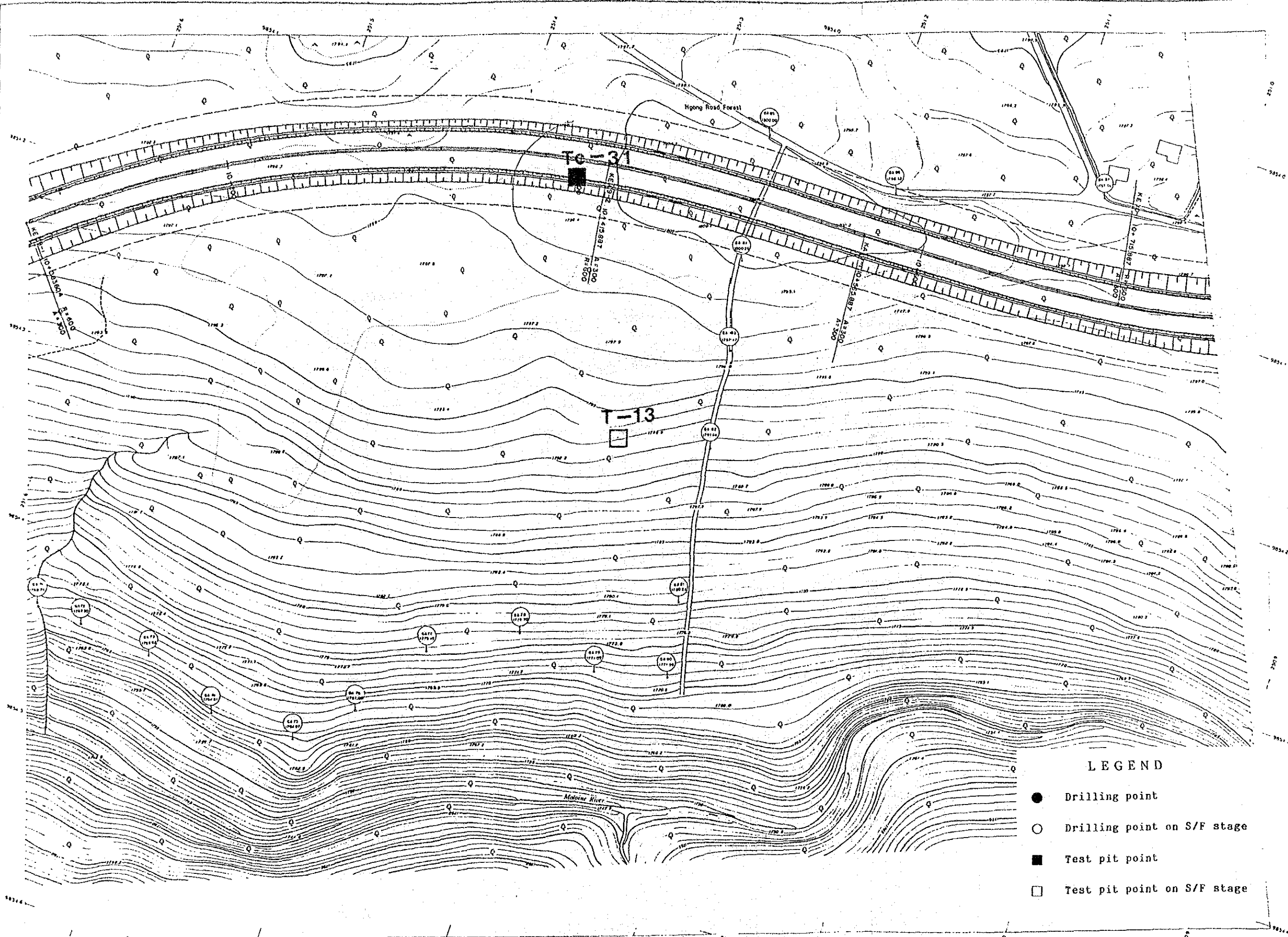
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JICA TOKYO, JAPAN

SHEET 16 OF 40

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

INDEX TO ADJOINING SHEETS



Scale 1:2,000  
HEIGHTS IN METERS

**LEGEND**

- ⊙ GIS Point
- ⊕ Traverse Point
- ⊙ Bench Mark
- 1224.5 Direct Leveling Height
- 1224.5 Spot Height
- 1224.5 Contours (V.L.M.)
- ⊙ Outcrop (Rock)
- ▭ Building Footprint
- ▭ Building Others
- ▭ Bituminous Road
- ▭ Road
- ▭ Track
- ▭ Railway
- ▭ Hedge, Culvert
- ▭ River
- ▭ Stream
- ▭ Dam
- ▭ Pond
- ▭ Water Tank
- ▭ Power Line
- ▭ Telephone Line
- ▭ Fence, Gate
- ▭ Hedge
- ▭ Stone Wall
- ▭ Dump or Mound
- ▭ Quarry Pit
- ▭ Cutbank
- ▭ Embankment
- ▭ Cultivated Land
- ▭ Orchard or Permanent Crop
- ▭ Pastureland
- ▭ Grassland
- ▭ Bush
- ▭ Forest
- ▭ Swamp
- ▭ Vegetation Boundary
- ▭ Fluvial Partition

HORIZONTAL DATUM: UTM ZONE 18  
CLARKE 1866 SPHEROID

VERTICAL DATUM: MEAN SEA LEVEL

AERIAL PHOTOGRAPHED BY: JICA  
(Japan International Cooperation Agency)

GROUND CONTROL SURVEYED BY: JICA

STEREO PLOTTED BY: JICA

CARTOGRAPHED BY: JICA

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

CHECKED BY: SEN SEPT ENG. 1985  
DATE: \_\_\_\_\_

PROJECT ENGINEER: \_\_\_\_\_  
DATE: \_\_\_\_\_

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JICA TOKYO, JAPAN

SHEET 17 OF 46

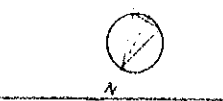
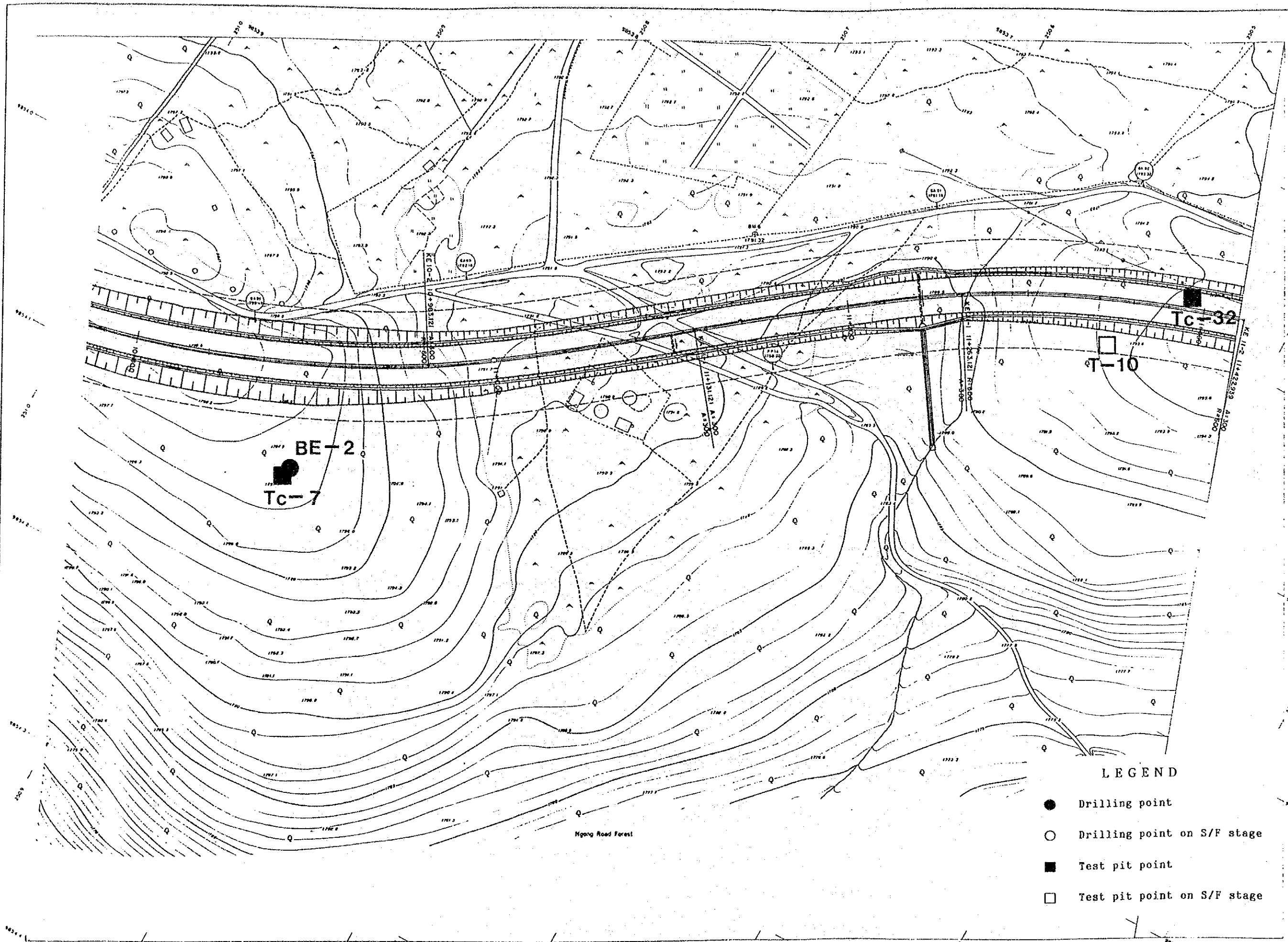
DETAILED LOCATION MAP OF GEOLOGICAL SURVEY

# THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

SHEET NO. 18

17 18 19

INDEX TO ADJOINING SHEETS



Scale 1:2,000  
HEIGHTS IN METERS

LEGEND	
	G.P. Point
	Traverse Point
	Bench Mark
	Direct Leveling Height
	Spot Height
	Contours (V.L. 1.0m)
	Outcrop (Rocks)
	Holdings (Permanent)
	Buildings (Others)
	Bituminous Road
	Road
	Track
	Railway
	Bridge/Culvert
	River
	Stream
	Dam
	Pond
	Water Tank
	Power Line
	Telephone Line
	Fence/Gate
	Hedge
	Stone Wall
	Dump or Mound
	Quarry, Pit
	Cutting
	Embankment
	Cultivated Land
	Orchard or Permanent
	Plantation
	Grassland
	Bush
	Forest
	Swamp
	Vegetation Boundary
	Planting Partition

HORIZONTAL DATUM: UTM ZONE 36  
CLARKE 1880 S.P.H.

VERTICAL DATUM: MEAN S.E.A. L.V.

AERIAL PHOTOGRAPHY BY:  
Japan International Cooperation Agency

GROUND CONTROL SURVEYED BY:  
Diverse

STEREO PLOTTED BY:  
M.A.S.

CARTOGRAPHED BY:  
M.A.S.

CHIEF ENGINEER  
DATE

CHIEF SURVEY ENGINEER  
DATE

CHIEF SURVEY ENGINEER  
DATE

SURVEY ENGINEER  
DATE

PROJECT ENGINEER  
DATE

MINISTRY OF PUBLIC WORKS

M.O.P.W.

OFFICE OF ORIGIN  
JICA TOKYO, JAPAN

SHEET 18 OF 46

LEGEND	
	Drilling point
	Drilling point on S/F stage
	Test pit point
	Test pit point on S/F stage

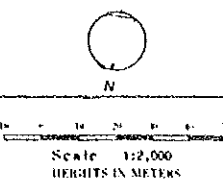
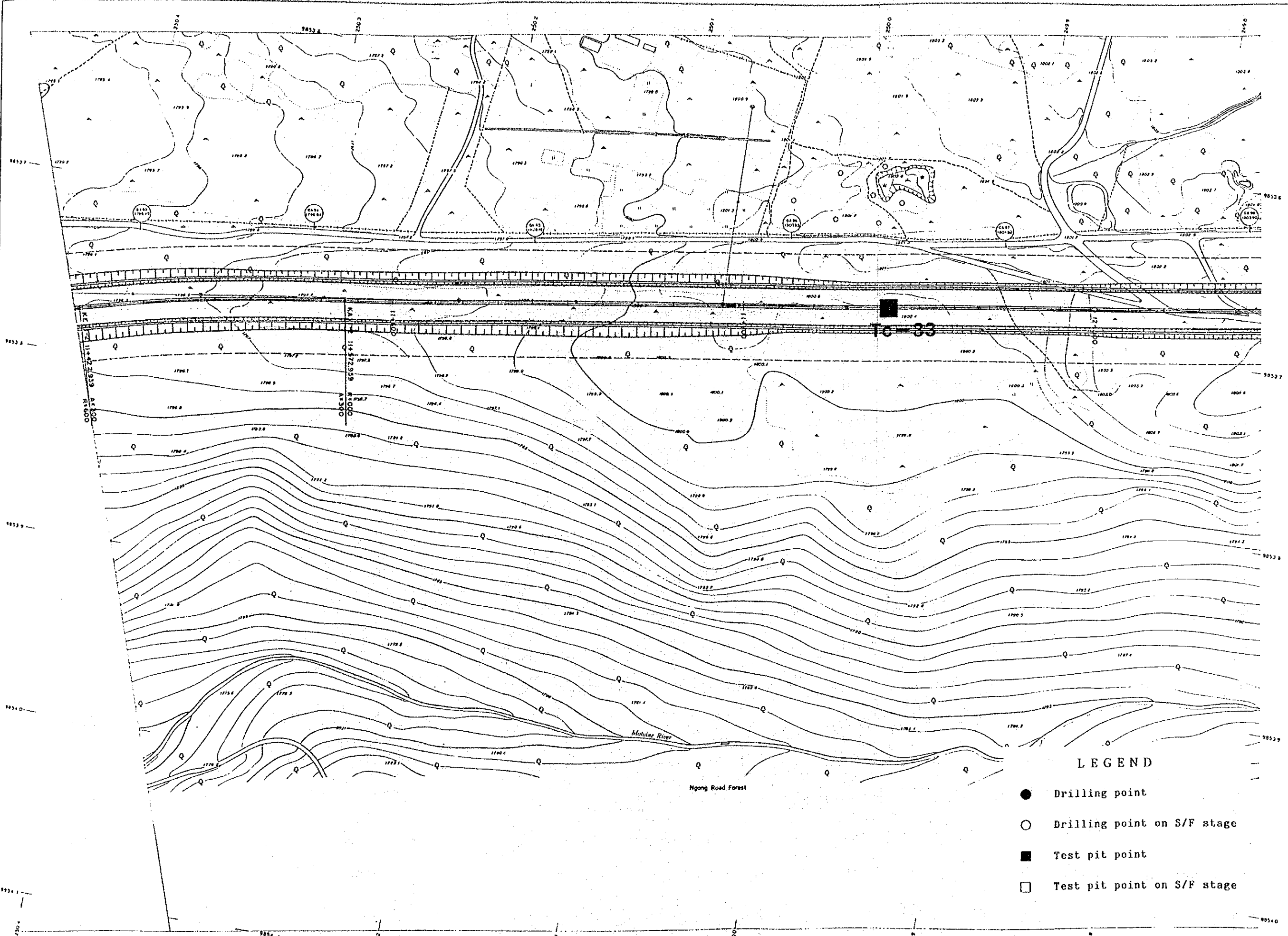
DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



# THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

SHEET NO. 19

INDEX TO ADJOINING SHEETS



**LEGEND**

- GIS Point
- Traverse Point
- Bench Mark
- Direct Leveling Height
- Spot Height
- Contours (V.Lim)
- Outcrop (Rock)
- Building (Farm)
- Building (Other)
- International Road
- Road
- Track
- Railway
- Bridge/Culvert
- River
- Stream
- Dam
- Well
- Water Tank
- Power Line
- Telephone Line
- Fence Gate
- Hedge
- Stone Wall
- Dump or Mound
- Quarry Pit
- Cutting
- Embankment
- Cultivated Land
- Orchard or Permanent Crop
- Plantation
- Grassland
- Bush
- Forest
- Swamp
- Vegetation Boundary
- Planting Partition

HORIZONTAL DATUM: UTM ZONE 17  
CLARKE 1866 SPHEROID

VERTICAL DATUM: MEAN SEA LEVEL

AERIAL PHOTOGRAPHY BY: JICA  
Japan International Co-operative Agency  
December

GROUND CONTROL SURVEYED BY: JICA  
December

STEREO PLOTTED BY: JICA  
MAMAD

CARTOGRAPHY BY: JICA

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

CHIEF ENGINEER: [Signature] DATE: [ ]

CHIEF Supt. Eng: [Signature] DATE: [ ]

CHUCKED BY: SEN Supt. Eng: [Signature] DATE: [ ]

Supt. Engineer: [Signature] DATE: [ ]

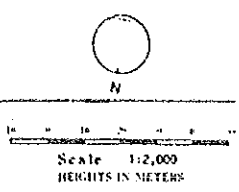
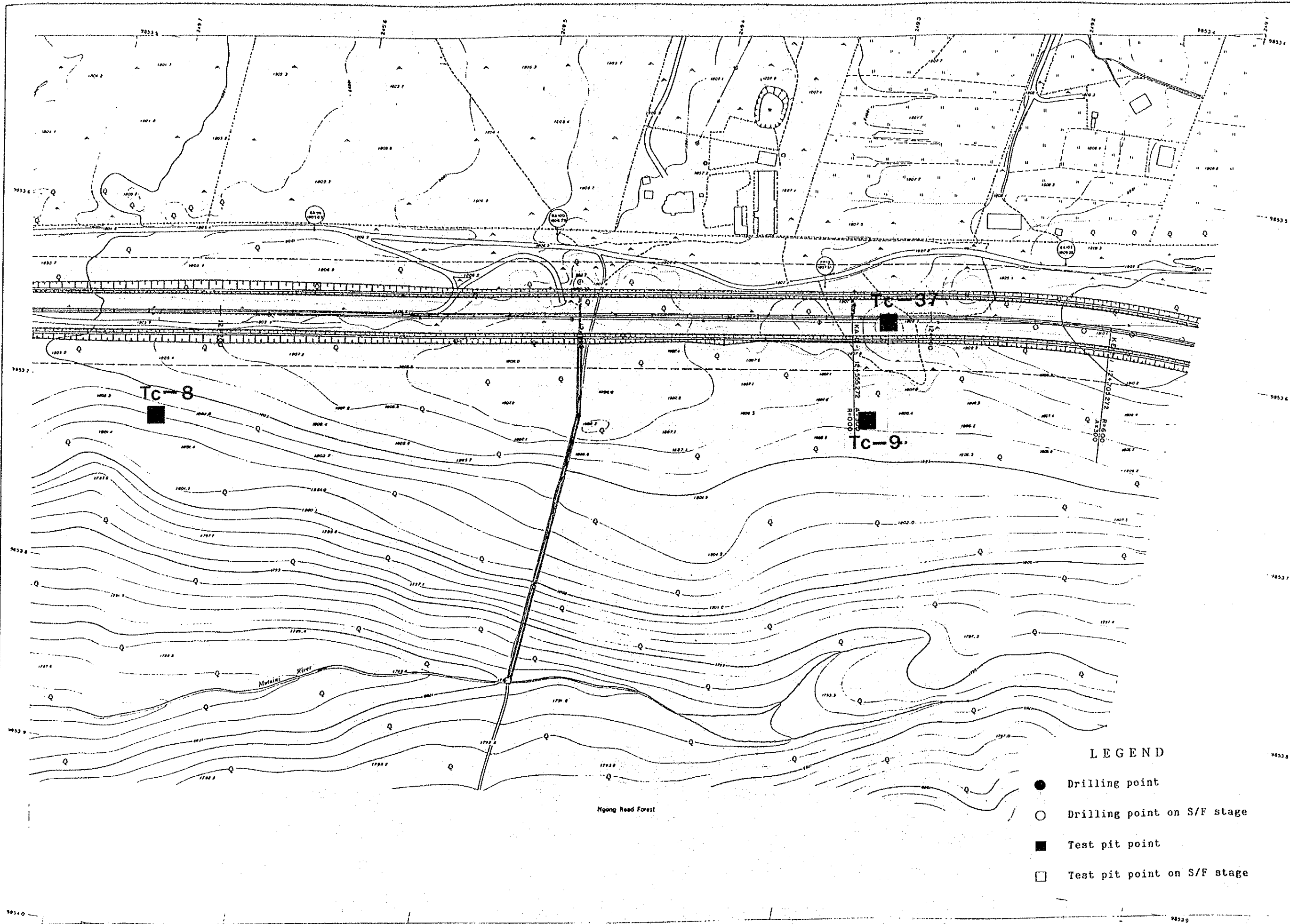
PROJECT ENGINEER: [Signature] DATE: [ ]

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JICA TOKYO, JAPAN

DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



**LEGEND**

- GPS Point
- Traverse Point
- Bench Mark
- Direct Leveling Height
- Spot Height
- Contours (1:1 Int)
- Outcrop (Rocks)
- Building (Permanent)
- Building (Others)
- Bituminous Road
- Road
- Track
- Railway
- Bridge, Culvert
- River
- Stream
- Dam
- Well
- Water Tank
- Power Line
- Telephone Line
- Fence, Gate
- Hedge
- Stone Wall
- Mound or Mound
- Quarry Pit
- Cutting
- Embankment
- Cultivated Land
- Orchard or Permanent
- Plantation
- Grassland
- Rush
- Forest
- Swamp
- Vegetation Boundary
- Planting Partition

HORIZONTAL DATUM: U.T.M. ZONE  
CLARK 1866 SPHEROID

VERTICAL DATUM: MEAN SEA LEVEL

AERIAL PHOTOGRAPHED BY:  
Japan International Cooperation Agency

GROUND CONTROL SURVEYED BY:  
JICA

STEREO PLOTTED BY:  
MAKFI

CARTOGRAPHED BY:  
JICA

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

CHIEF ENGINEER: \_\_\_\_\_  
DATE: \_\_\_\_\_

CHIEF SURVEY ENGINEER: \_\_\_\_\_  
DATE: \_\_\_\_\_

CHECKED BY: SEN. SUPT. ENG. \_\_\_\_\_  
DATE: \_\_\_\_\_

SUPT. ENGINEER: \_\_\_\_\_  
DATE: \_\_\_\_\_

PROJECT ENGINEER: \_\_\_\_\_  
DATE: \_\_\_\_\_

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**M.O.P.W.**

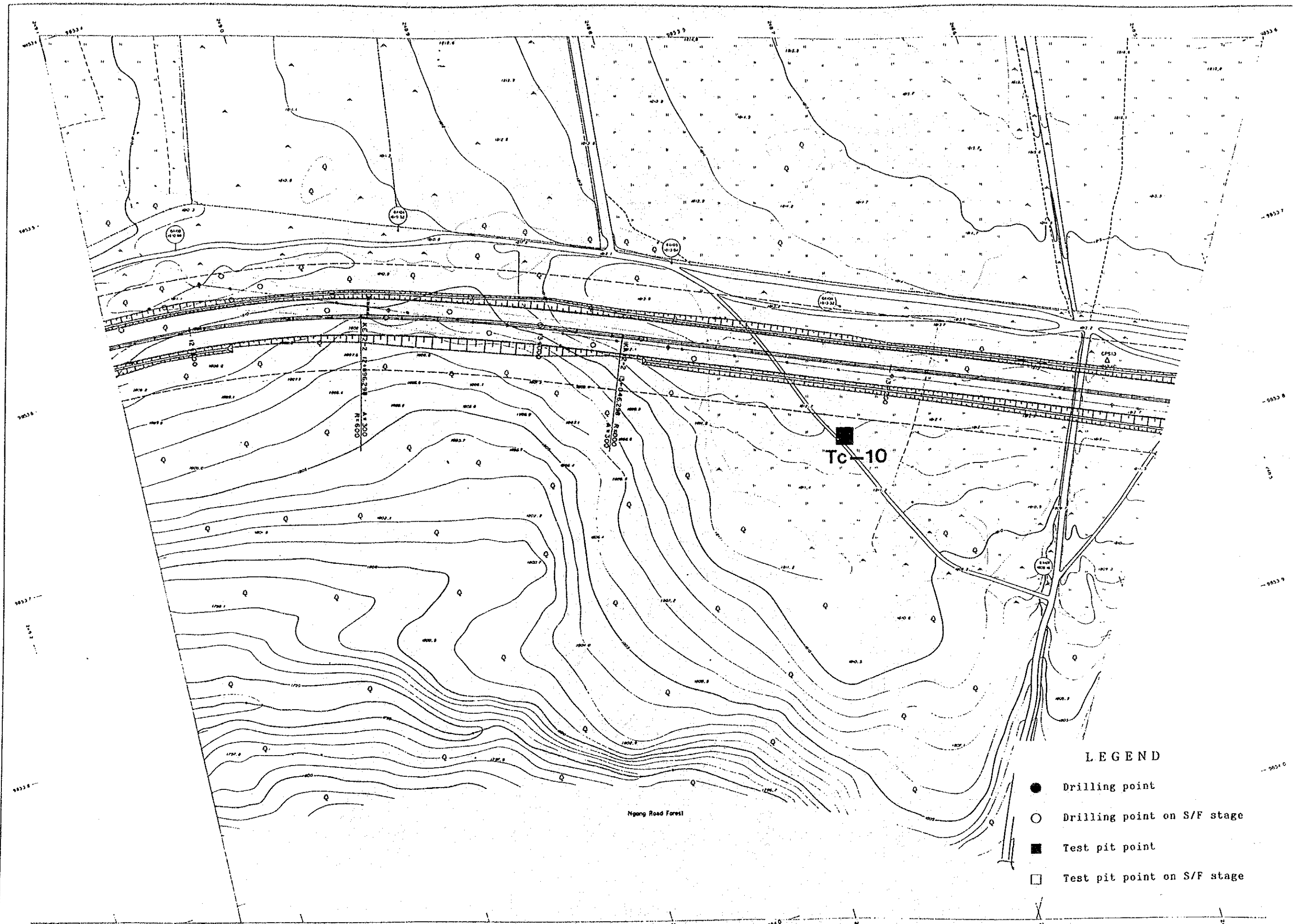
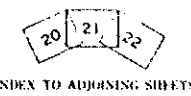
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JICA TOKYO JAPAN

SHEET 20 OF 16

DETAILED LOCATION MAP OF GEOLOGICAL SURVEY

# THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

SHEET NO. 21



Scale 1:2,000  
HEIGHTS IN METERS

**LEGEND**

- △ GPS Point
- ⊙ Traverse Point
- ⊕ Bench Mark
- 1234.5 Direct Leveling Height
- 1234.5 Spot Height
- Contours (1:1 Int)
- Outcrop (Rock)
- Building Footprint
- Building Fibres
- Bituminous Road
- Road
- Track
- Railway
- Bridge, Culvert
- River
- Stream
- Dam
- Island
- Water Tank
- Power Line
- Telephone Line
- Fence Gate
- Fence
- Steep Wall
- Dump or Mound
- Quarry Pit
- Cutting
- Embankment
- Cultivated Land
- Orchard or Permanent Crop
- Plantation
- Grassland
- Brush
- Forest
- Swamp
- Vegetation Boundary
- Planting Partition

HORIZONTAL DATUM UTM ZONE 18  
CLARKE 1866 SPHEROID

VERTICAL DATUM MEAN SEA LEVEL

AERIAL PHOTOGRAPHY BY JICA  
December

GROUND CONTROL SURVEYED BY JICA  
December

STEREO PLOTTED BY MAPCO

ARTICULATED BY JICA  
11/11

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

CHIEF ENGINEER \_\_\_\_\_  
DATE \_\_\_\_\_

CHIEF SUPT. ENG. \_\_\_\_\_  
DATE \_\_\_\_\_

CHECKED BY SEN. SUPT. ENG. \_\_\_\_\_  
DATE \_\_\_\_\_

SUPT. ENGINEER \_\_\_\_\_  
DATE \_\_\_\_\_

PROJECT ENGINEER \_\_\_\_\_  
DATE \_\_\_\_\_

MINISTRY OF PUBLIC WORKS

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JICA TOKYO, JAPAN

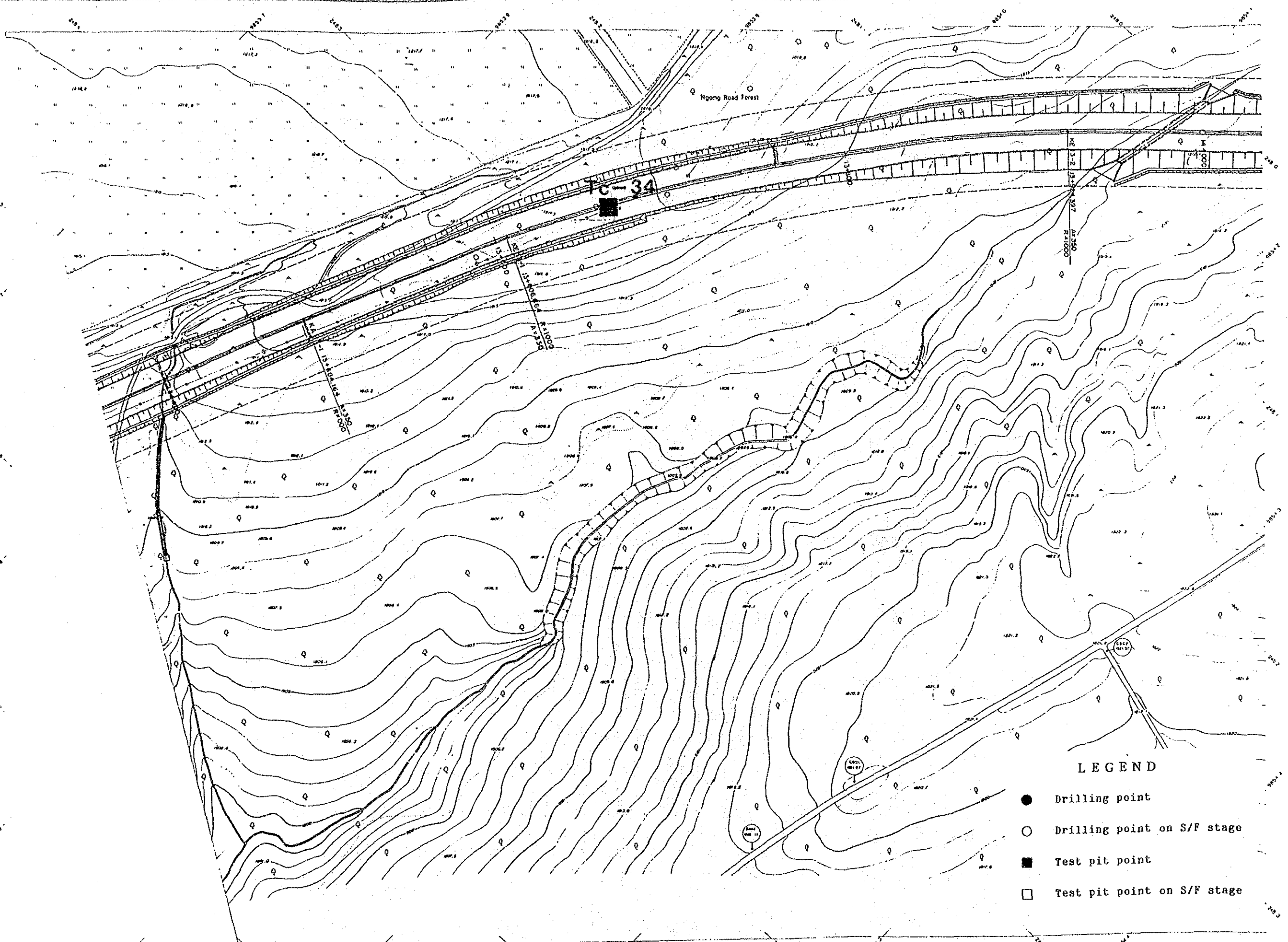
DETAILED LOCATION MAP OF GEOLOGICAL SURVEY

# THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

SHEET NO. 22

21 22 23

INDEX TO ADJOINING SHEETS



Scale 1:2,000  
HEIGHTS IN METERS

**LEGEND**

- GPS Point
- ⊙ Traverse Point
- ⊙ Bench Mark
- 1234.5 Direct Leveling Height
- 1234.7 Spot Height
- Contours (1.0m)
- Outcrop (flocks)
- Building (Permanent)
- Building (Other)
- Unsurfaced Road
- Road
- Track
- Railway
- Bridge, Culvert
- River
- Stream
- Dam
- Well
- Water Tank
- Power Line
- Telephone Line
- Fence, Gate
- Hedge
- Stone Wall
- Dump or Mound
- Quarry, Pit
- Cutting
- Embankment
- Cultivated Land
- Orchard or Permanent
- Plantation
- Grassland
- Bush
- Forest
- Swamp
- Vegetation Boundary
- Planting Partition

HORIZONTAL DATUM: U.T.M. ZONE 32  
CLARKE 1866 SPHEROID

VERTICAL DATUM: MEAN SEA LEVEL

AERIAL PHOTOGRAPHED BY: JICA  
Japan International Cooperation Agency  
December 1985

GROUND CONTROL SURVEYED BY: JICA  
December 1985

STEREO PLOTTED BY: MAKU

CARTOGRAPHED BY: JICA

CHIEF ENGINEER: [Signature] DATE: [ ]

CHIEF SURVEYING ENGINEER: [Signature] DATE: [ ]

CHECKED BY: SEN. SURVEYING ENGINEER: [Signature] DATE: [ ]

SURVEYING ENGINEER: [Signature] DATE: [ ]

PROJECT ENGINEER: [Signature] DATE: [ ]

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JICA TOKYO, JAPAN

**LEGEND**

- Drilling point
- Drilling point on S/F stage
- Test pit point
- Test pit point on S/F stage

DETAILED LOCATION MAP OF GEOLOGICAL SURVEY