

THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

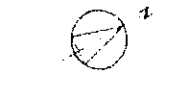
SHEET NO. 46

45 46

INDEX TO ADJOINING SHEET



DETAILED LOCATION MAP OF GEOLOGICAL SURVEY



Scale 1:2,000
HEIGHTS IN METERS

LEGEND

- GNS Point
- Traverse Point
- Bench Mark
- Direct Levelling Height
- Spot Height
- Contours (1:1 m)
- Outcrop (Rock)
- Building Foundation
- Building Other
- Paved Road
- Road
- Track
- Railway
- Broken Culvert
- River
- Stream
- Pan
- Pond
- Water Tank
- Power Line
- Telephone Line
- Fence Gate
- Hedge
- Stone Wall
- Dump or Mound
- Quarry Pit
- Culture
- Embankment
- Cultivated Land
- Orchard or Plantation 1
- 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: U.T.M. ZONE 37
SCALE: 1:50,000

VERTICAL DATUM: MEAN SEA LEVEL

AERIAL PHOTOGRAPHY BY: JICA
Japan International Cooperation Agency

GROUND CONTROL SURVEYED BY: JICA
December

STEREO PLOTTED BY: MARUKI

CAMERAGRAPHY BY: JICA

CHIEF ENGINEER: 1980
DATE

CHIEF SURV. ENG.: 1980
DATE

CHECKED BY: SEN. SURV. ENG.: 1980
DATE

SUPV. ENGINEER: 1980
DATE

PROJECT ENGINEER: 1980
DATE

MINISTRY OF PUBLIC WORKS

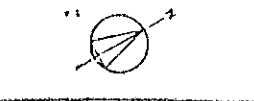
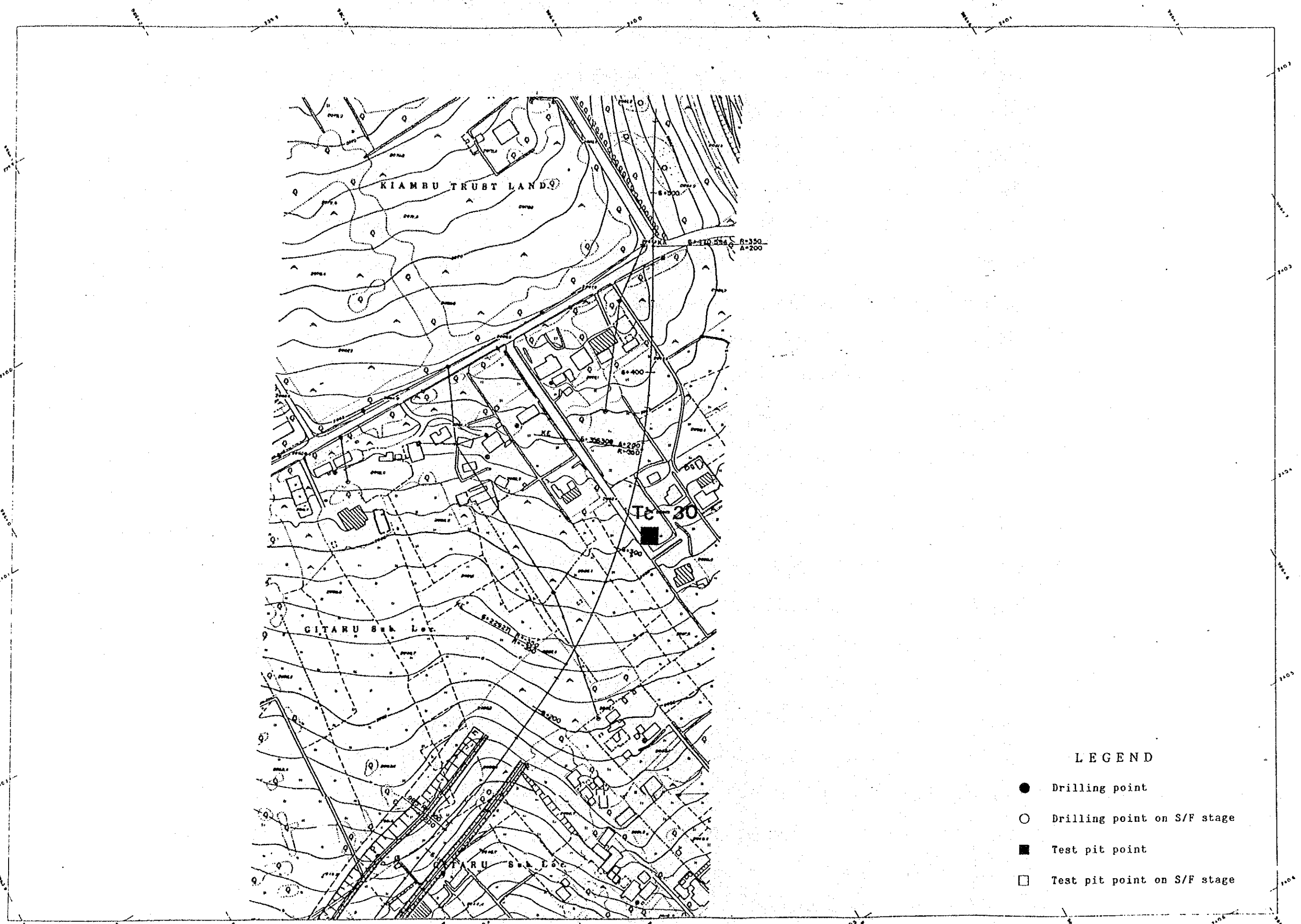
M.O.P.W.

OFFICE OF ORIGIN
JICA TOKYO, JAPAN

SHEET 46 OF 46

THE DETAILED DESIGN STUDY ON THE NAIROBI BYPASS PROJECT

INDEX TO ADJOINING SHEETS



Scale 1:2,000
HEIGHTS IN METERS

LEGEND

	GPS Point
	Traverse Point
	Bench Mark
	Direct Leveling Height
	Spot Height
	Contours (V.I. Int.)
	Outcrop (Ricks)
	Holding Partition
	Holding Drain
	Burroughed Road
	Road
	Track
	Railway
	Bridge, Culvert
	River
	Stream
	Dam
	Well
	Water Tank
	Power Line
	Telephone Line
	Fence, Gate
	Hinder
	Stone Wall
	Dump or Mound
	Quarry Pit
	Cutting
	Embankment
	Cultivated Land
	Orchard or Permanent Crop
	Pasture
	Grassland
	Bush
	Furrow
	Swamp
	Vegetation Boundary
	Planning Partition

HORIZONTAL DATUM: UTM ZONE 37
CLARK 1866 SPHEROID

VERTICAL DATUM: MEAN SEA LEVEL

AERIAL PHOTOGRAPHY BY: JICA
Japan International Cooperation Agency
Location: 1971

GROUND CONTROL SURVEY BY: JICA
Location: 1971

STEREO PLOTTED BY: JICA
MARCH 1971

CARTOGRAPHY BY: JICA
JULY 1971

LEGEND

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

CHECKED BY	CHIEF ENGINEER	DATE
	CHIEF SUPT. ENGR.	DATE
	SEN. SUPT. ENGR.	DATE
	SUPT. ENGINEER	DATE
	PROJECT ENGINEER	DATE

MINISTRY OF PUBLIC WORKS
M.O.P.W.
OFFICE OF ORIGIN
JICA TOKYO, JAPAN

DETAILED LOCATION MAP OF GEOLOGICAL SURVEY

2. GEOLOGICAL SECTION OF ALIGNMENT

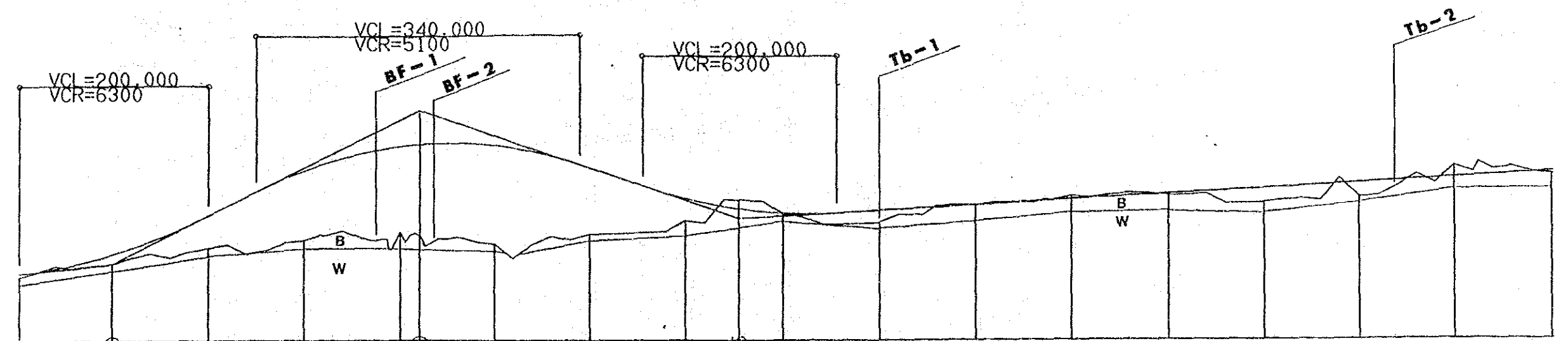
SCALE
H = 1 : 5000
V = 1 : 400

LEGEND

- B Black Cotton Soil
- E Red Soil and High Weathered Rock
- W Weathered Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate
- H Slightly weathered or Fresh Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate

1690,000

DL = 1640,000



STATION	ACCDIST	GROUND LEVEL	ROAD LEVEL	GRADIENTS
0 + 0	0.000	1645.30	1645.600	I = 0.800%
+ 100	100.000	1646.40	1647.200	L = 320.000
+ 200	200.000	1647.72	1650.400	
+ 300	300.000	1648.37	1654.153	
+ 318.500	318.500	1648.84	1654.677	
+ 400	400.000	1649.01	1656.181	
+ 420.000	420.000	1648.73	1656.360	
+ 447.071	447.071	1648.46	1656.463	
+ 500	500.000	1648.01	1656.236	
+ 600	600.000	1648.83	1654.329	
+ 700	700.000	1649.94	1651.783	
+ 755.000	755.000	1651.65	1650.924	
+ 800	800.000	1650.51	1650.576	
+ 900	900.000	1649.76	1650.787	
+ 944.627	944.627	1650.34	1650.988	
1 + 0	1000.000	1651.22	1651.237	
+ 1073.199	1073.199	1651.68	1651.567	
+ 1100.000	1100.000	1651.94	1651.687	
+ 1200.000	1200.000	1651.97	1652.137	
+ 1300.000	1300.000	1651.40	1652.587	
+ 1400.000	1400.000	1651.83	1653.037	
+ 1500.000	1500.000	1654.43	1653.487	
+ 1525.443	1525.443	1654.73	1653.602	
+ 1600	1600.000	1653.69	1653.937	

GEOLOGICAL SECTION

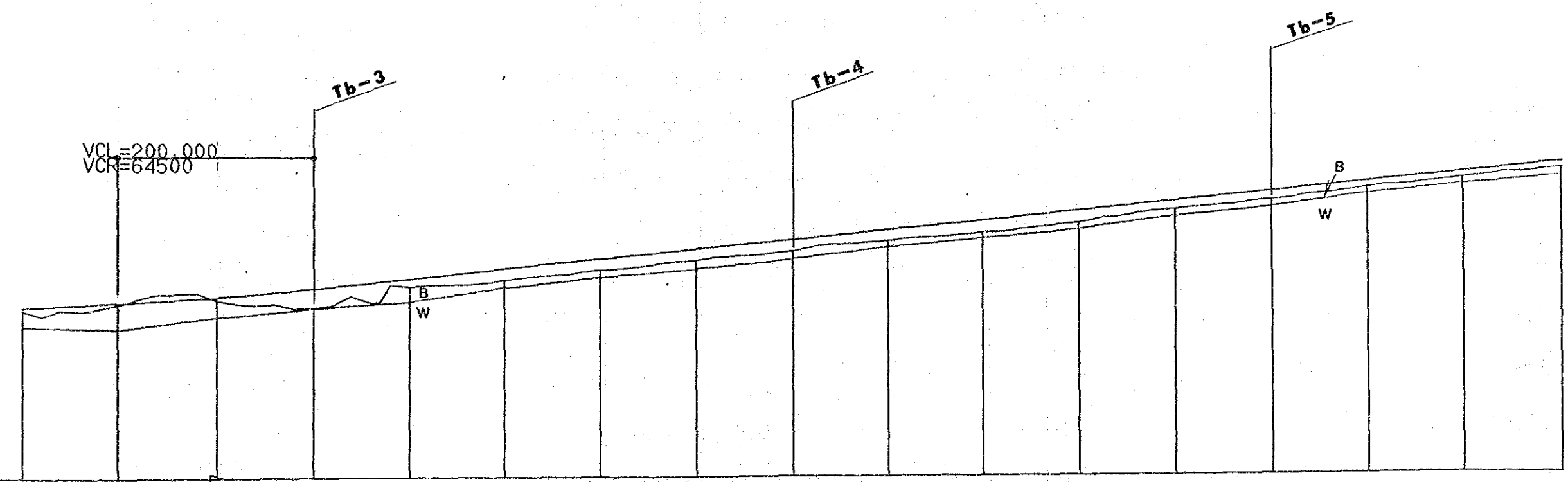
SCALE
 H= 1: 5000
 V= 1: 400

LEGEND

- B Black Cotton Soil
- E Red Soil and High Weathered Rock
- W Weathered Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate
- H Slightly weathered or Fresh Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate

1690,000

DL= 1640,000



GRADIENTS

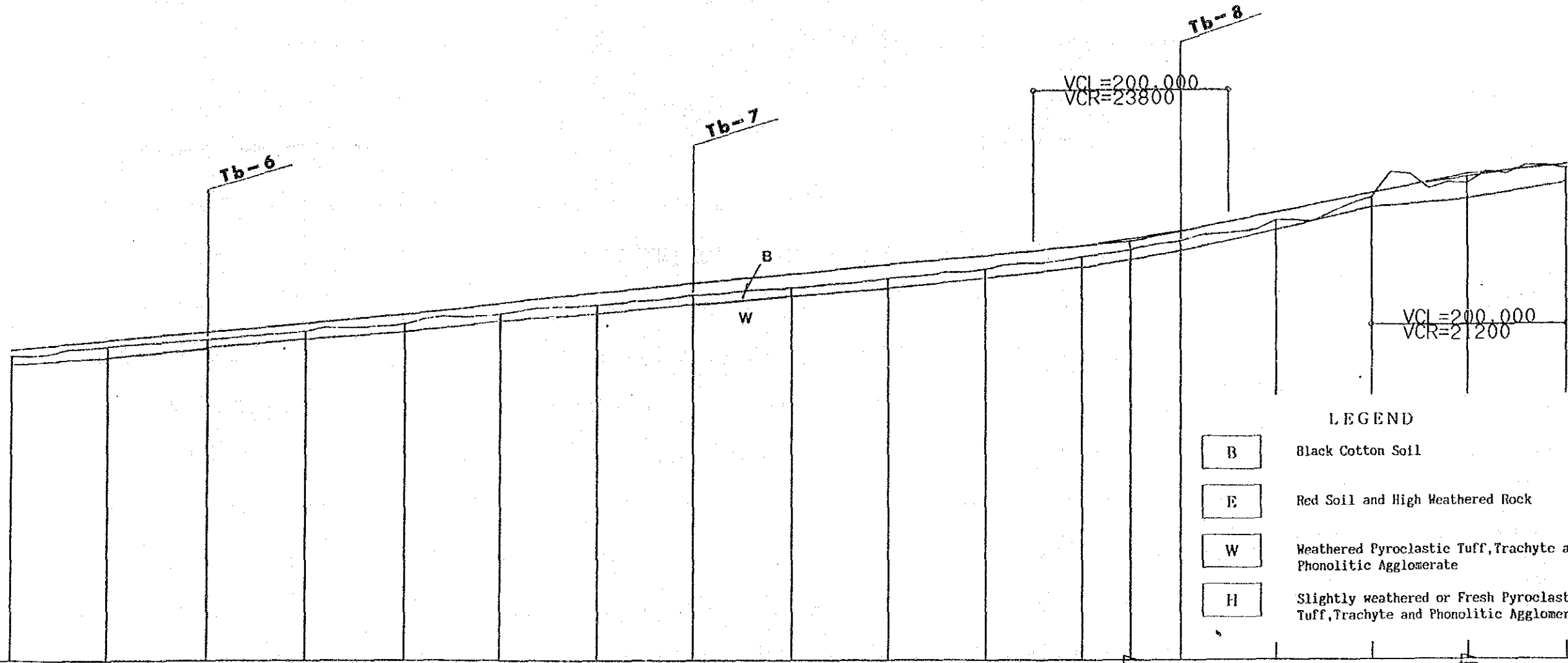
STATION	ACCDIST	GROUND LEVEL	ROAD LEVEL
1+600	1600.000	1653.69	1653.937
+700	1700.000	1654.24	1654.387
+800	1800.000	1654.58	1654.915
+900	1900.000	1653.98	1655.597
2+0	1970.243	1654.42	1656.131
2+100	2000.000	1655.69	1656.357
+200	2100.000	1656.17	1657.117
+300	2200.000	1656.98	1657.877
+400	2300.000	1657.69	1658.637
+500	2400.000	1658.46	1659.397
+600	2500.000	1659.25	1660.157
+700	2600.000	1659.94	1660.917
+800	2700.000	1660.67	1661.677
+900	2727.035	1661.07	1661.882
3+0	2800.000	1661.74	1662.437
+100	2900.000	1662.47	1663.197
+200	3000.000	1663.45	1663.957
+300	3100.000	1664.22	1664.717
+400	3200.000	1664.98	1665.477

GEOLOGICAL SECTION

SCALE
H = 1 : 5000
V = 1 : 400

1690,000

DL = 1640,000



LEGEND

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VCL = 200.000
VCR = 23800

VCL = 200.000
VCR = 21200

GRADIENTS

I = 0.760%
L = 2550.000

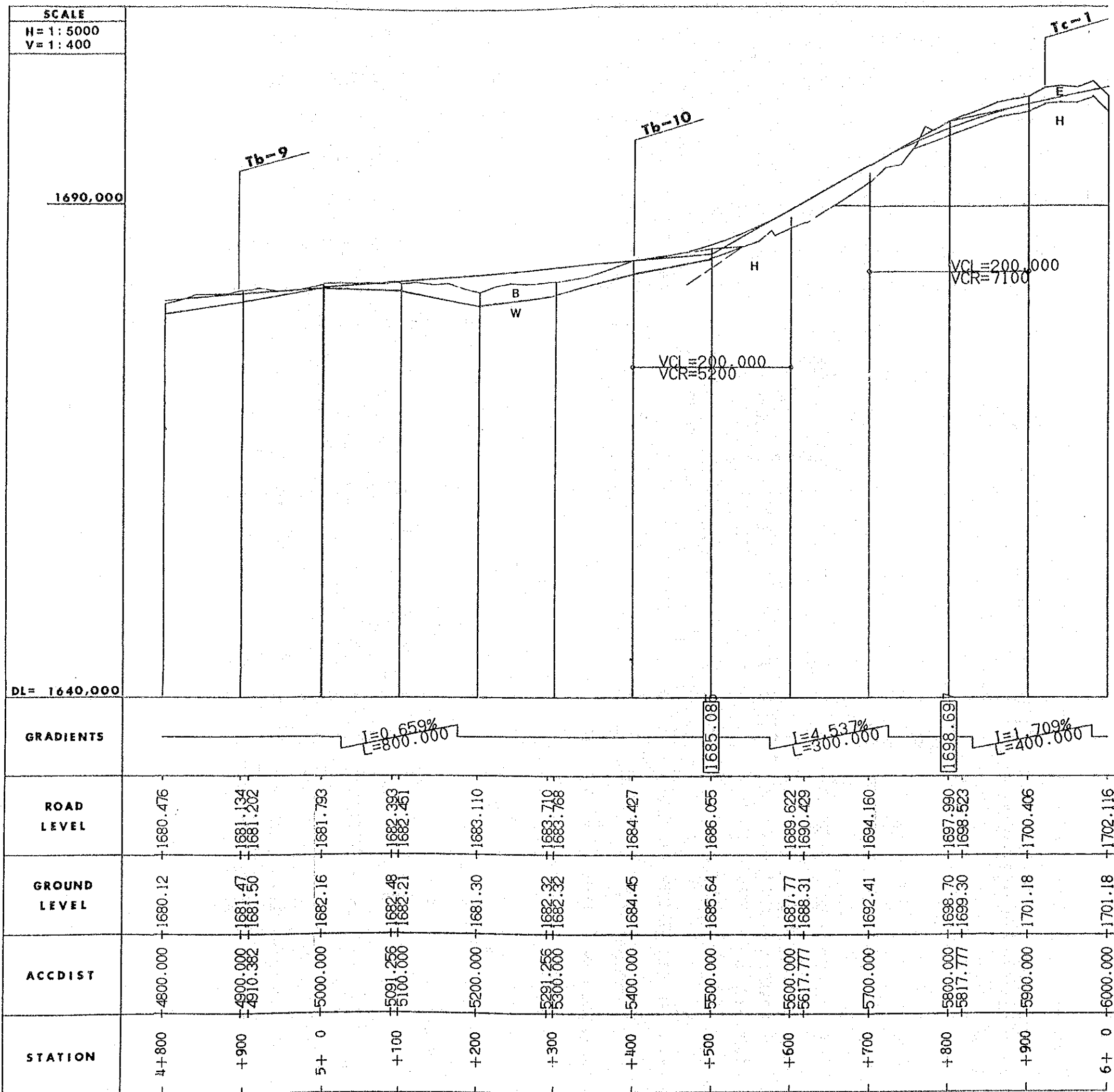
I = 1.600%
L = 350.000

1674.21

1679.81

ROAD LEVEL	GROUND LEVEL	ACCDIST	STATION
1665.477	1664.98	3200.000	3+200
1666.237	1665.72	3300.000	+300
1666.997	1666.37	3400.000	+400
1667.757	1667.10	3500.000	+500
1667.828	1667.28	3509.293	
1668.517	1667.73	3600.000	+600
1669.277	1668.40	3700.000	+700
1670.037	1669.03	3800.000	+800
1670.797	1669.81	3900.000	+900
1671.557	1670.41	4000.000	4+0
1672.317	1671.19	4100.000	+100
1673.077	1671.98	4200.000	+200
1673.890	1672.95	4300.000	+300
1674.427	1673.56	4350.000	
1675.070	1674.21	4400.000	+400
1676.617	1675.97	4500.000	+500
1677.180	1675.85	4535.215	
1678.217	1677.86	4600.000	+600
1679.582	1679.02	4700.000	+700
1680.476	1680.12	4800.000	+800

GEOLOGICAL SECTION



- LEGEND**
- B Black Cotton Soil
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 - W Weathered Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate
 - H Slightly weathered or Fresh Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate

GEOLOGICAL SECTION

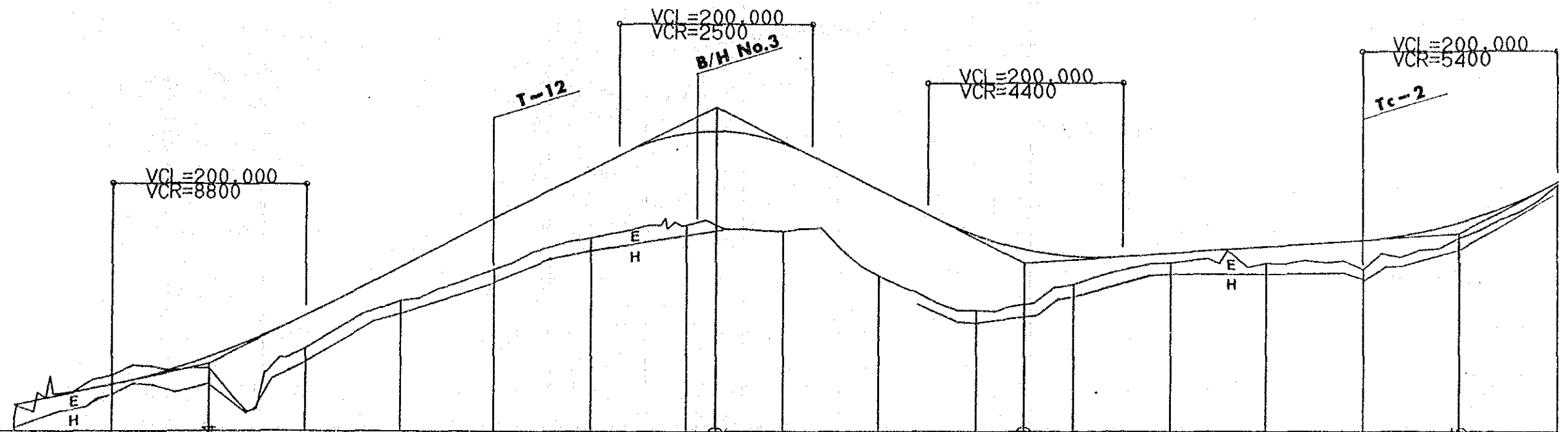
SCALE
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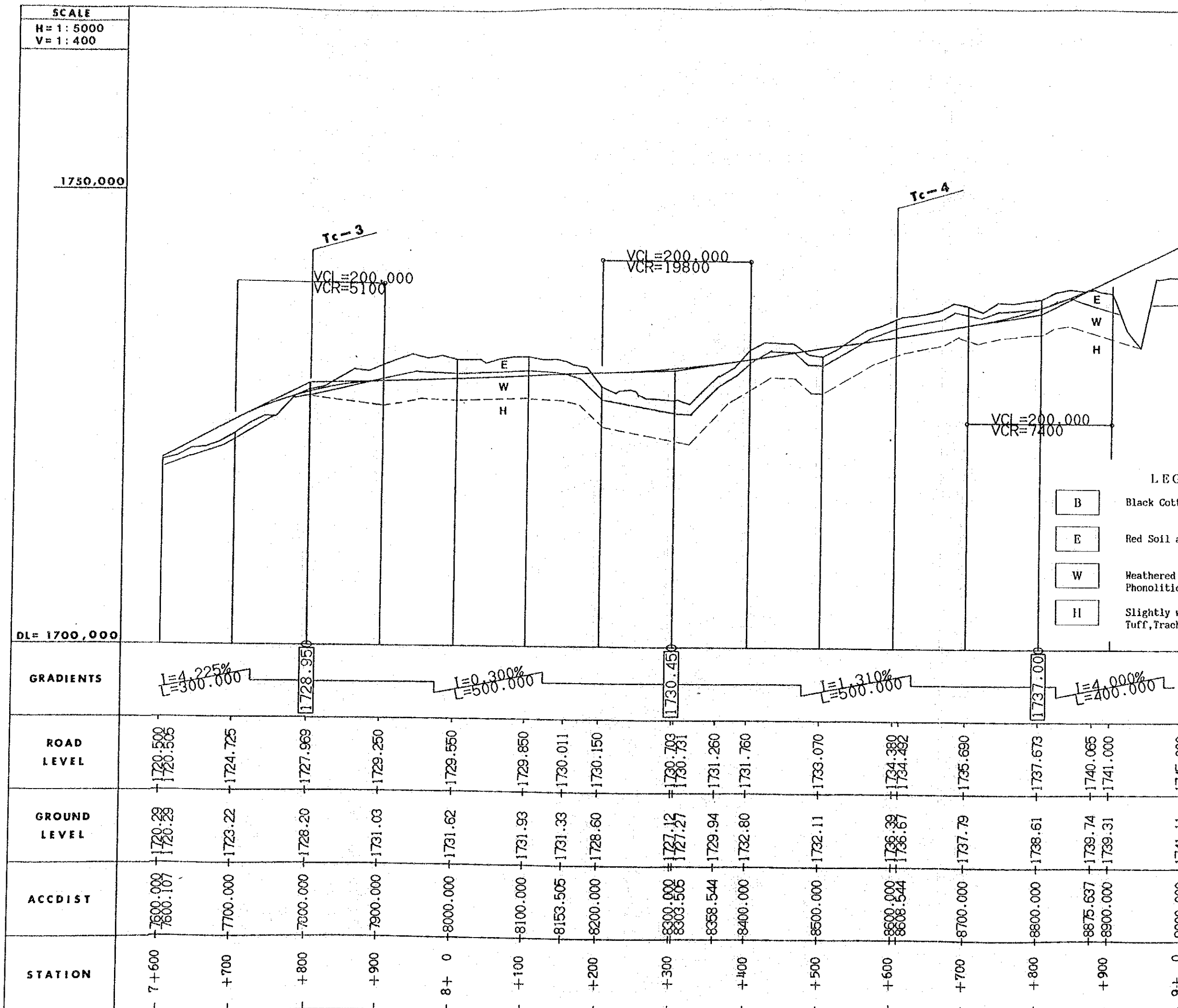
1750,000

DL= 1700,000



STATION	ACCDIST	GROUND LEVEL	ROAD LEVEL	GRADIENTS
6+ 0	6000.000	1701.18	1702.116	I=1.709% L=400.000
	6001.864	1702.06	1702.147	
+ 100	6100.000	1704.57	1703.825	VCI=200.000 VCR=8800
+ 200	6200.000	1705.13	1706.100	
+ 300	6300.000	1706.79	1709.509	I=3.975% L=330.000
+ 400	6379.176	1710.19	1712.656	
	6400.000	1710.72	1713.483	T-12
+ 500	6500.000	1713.26	1717.458	
+ 600	6600.000	1715.85	1721.433	VCI=200.000 VCR=2500 B/H No.3
+ 700	6700.000	1716.89	1724.431	
	6730.000	1716.95	1724.606	I=4.000% L=320.000
+ 800	6800.000	1716.41	1723.621	
+ 900	6900.000	1712.73	1719.800	VCI=200.000 VCR=4400
7+ 0	7000.000	1709.91	1716.084	
	7028.438	1710.10	1715.362	I=0.550% L=450.000
	7050.000	1710.42	1714.938	
+ 100	7100.000	1712.05	1714.359	Tc-2
+ 200	7200.000	1713.83	1714.625	
+ 300	7300.000	1713.82	1715.175	VCI=200.000 VCR=5400
+ 400	7400.000	1713.32	1715.725	
	7450.107	1714.57	1716.231	I=1716.275
+ 500	7500.000	1715.94	1717.194	
+ 600	7600.000	1720.28	1720.500	
	7600.107	1720.29	1720.505	

GEOLOGICAL SECTION

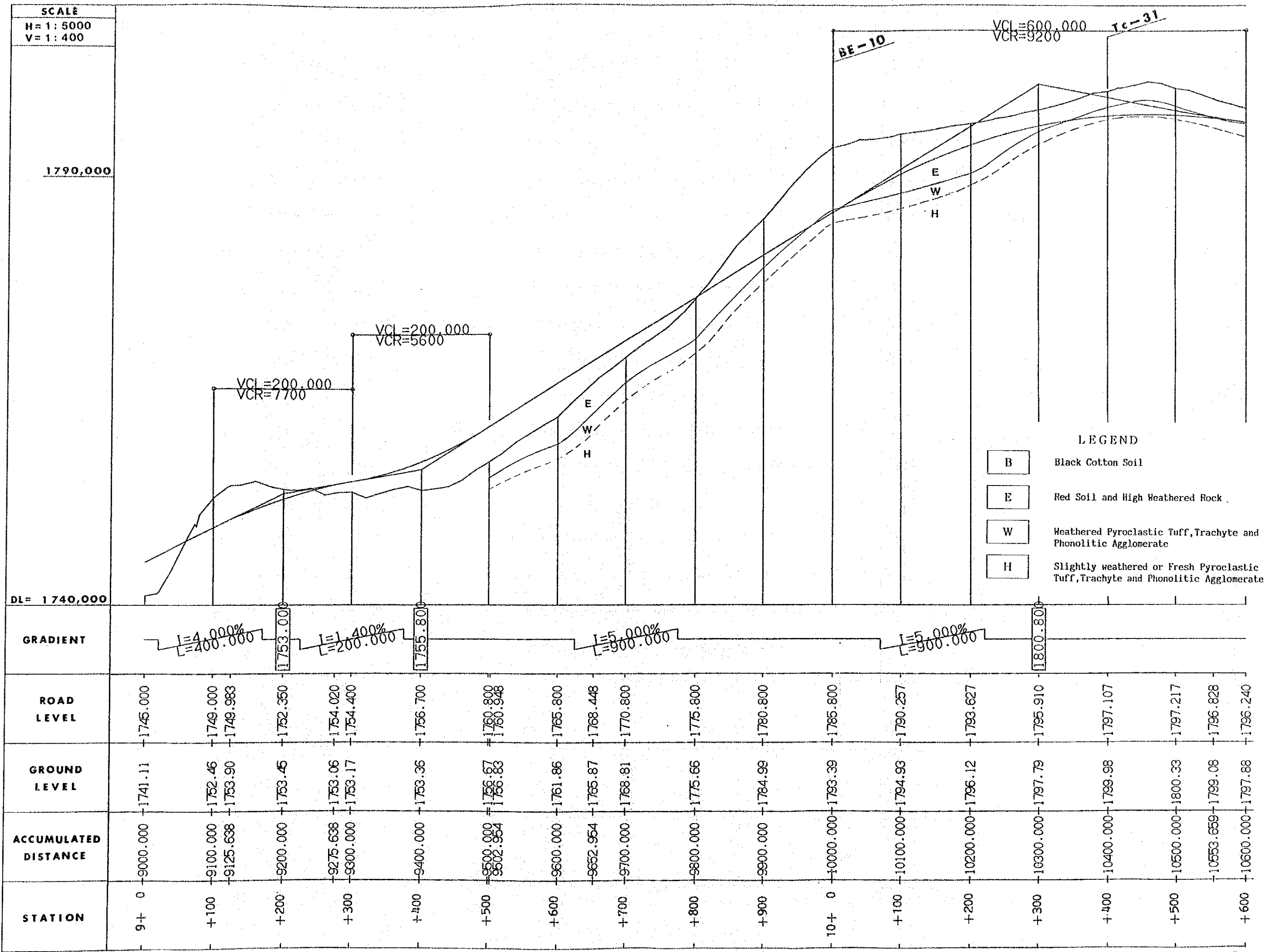


LEGEND

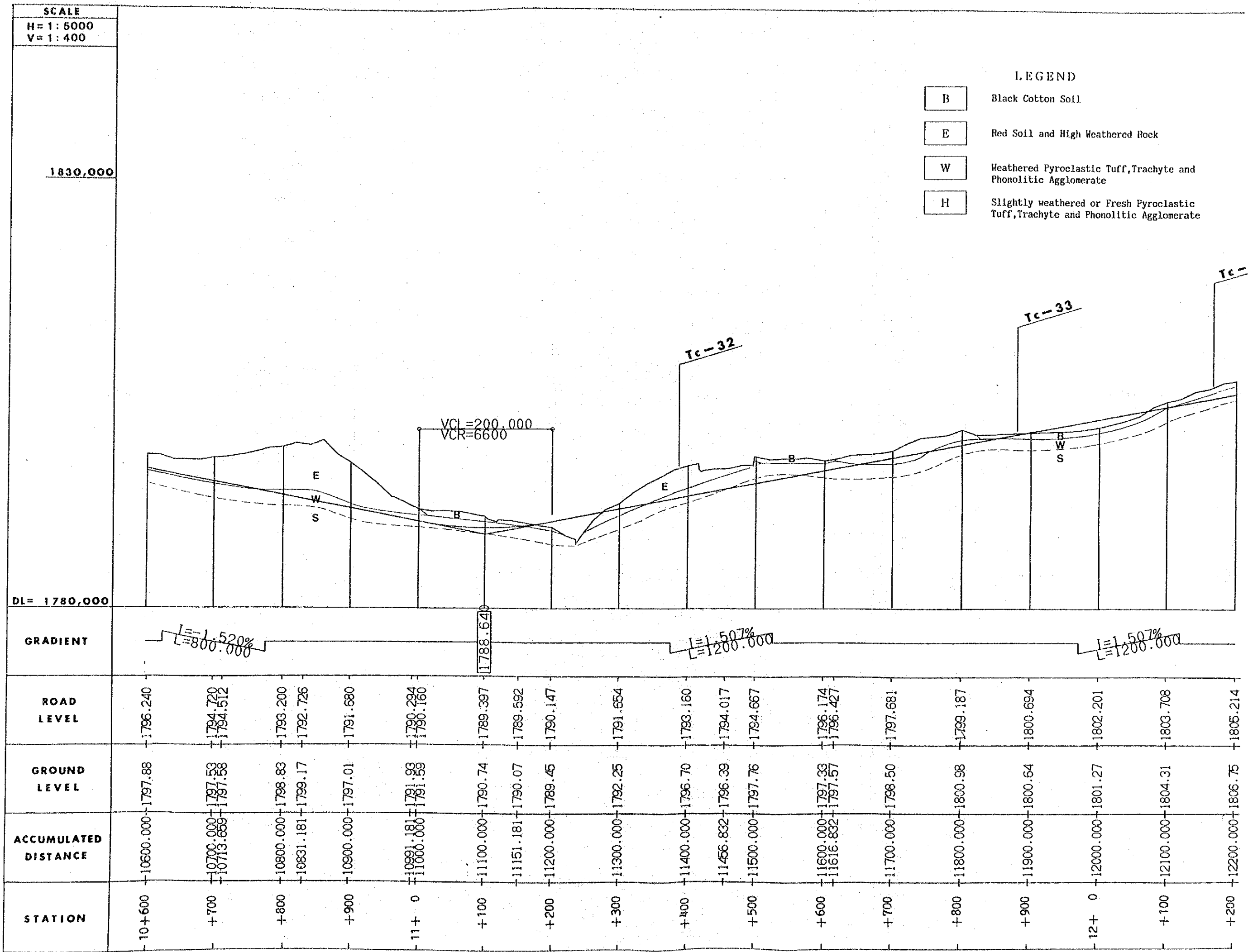
B	Black Cotton Soil
E	Red Soil and High Weathered Rock.
W	Weathered Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate
H	Slightly weathered or Fresh Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate

STATION	ACCDIST	GROUND LEVEL	ROAD LEVEL	GRADIENTS
7+600	7600.000 7600.107	1720.28 1720.28	1720.500 1720.506	I=4.225% L=300.000
+700	7700.000	1723.22	1724.725	
+800	7800.000	1728.20	1727.969	VCI=200.000 VCR=5100 1728.950
+900	7900.000	1731.03	1729.250	
8+0	8000.000	1731.62	1729.550	I=0.300% L=500.000
+100	8100.000	1731.93	1729.850	
+200	8153.505 8200.000	1731.33 1728.60	1730.011 1730.150	
+300	8300.000 8303.505	1727.12 1727.27	1730.703 1730.731	VCI=200.000 VCR=19800 1730.450
+400	8358.544 8400.000	1729.94 1732.80	1731.260 1731.760	
+500	8500.000	1732.11	1733.070	I=1.310% L=500.000
+600	8600.000 8608.544	1736.39 1736.67	1734.380 1734.492	
+700	8700.000	1737.79	1735.690	
+800	8800.000	1738.61	1737.673	VCI=200.000 VCR=7400 1737.000
+900	8875.637 8900.000	1739.74 1739.31	1740.065 1741.000	I=4.000% L=400.000
9+0	9000.000	1741.11	1745.000	

GEOLOGICAL SECTION



GEOLOGICAL SECTION

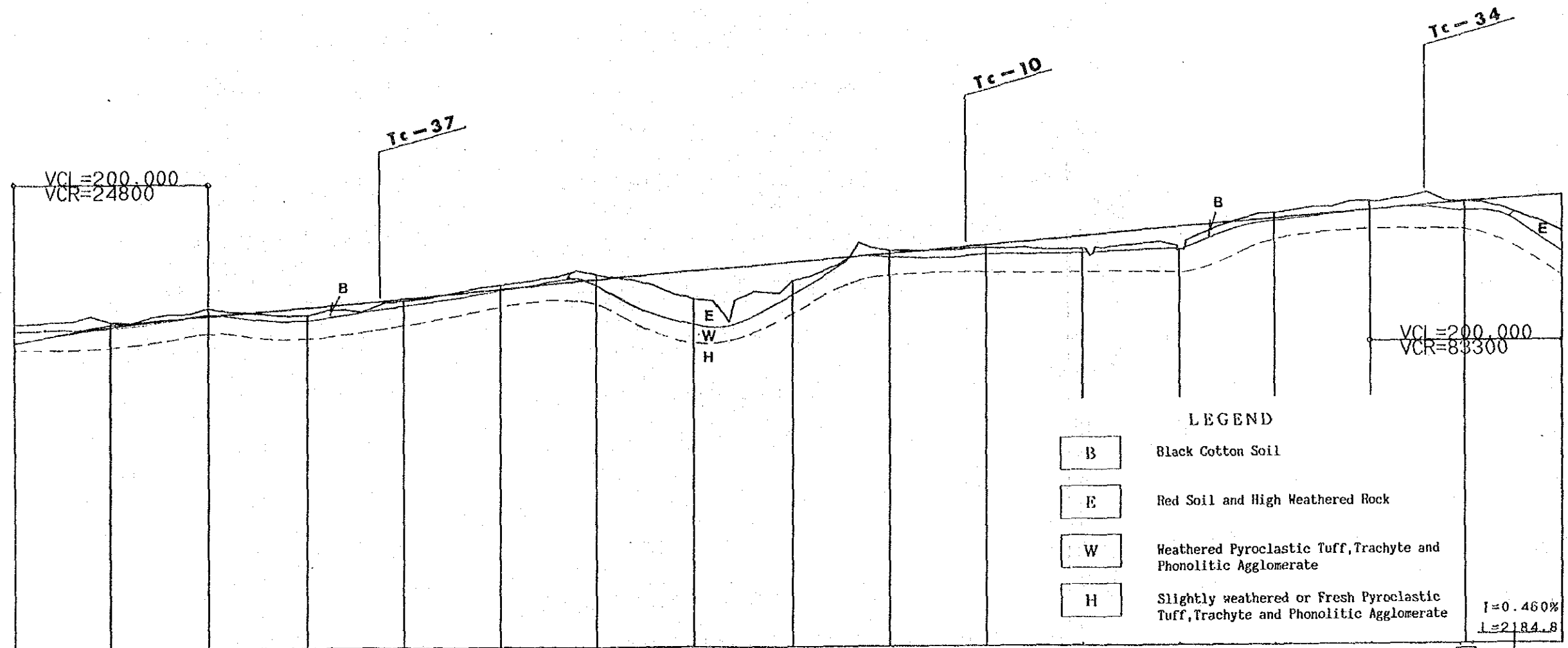


GEOLOGICAL SECTION

SCALE
 H= 1: 5000
 V= 1: 400

1830,000

DL= 1780,000

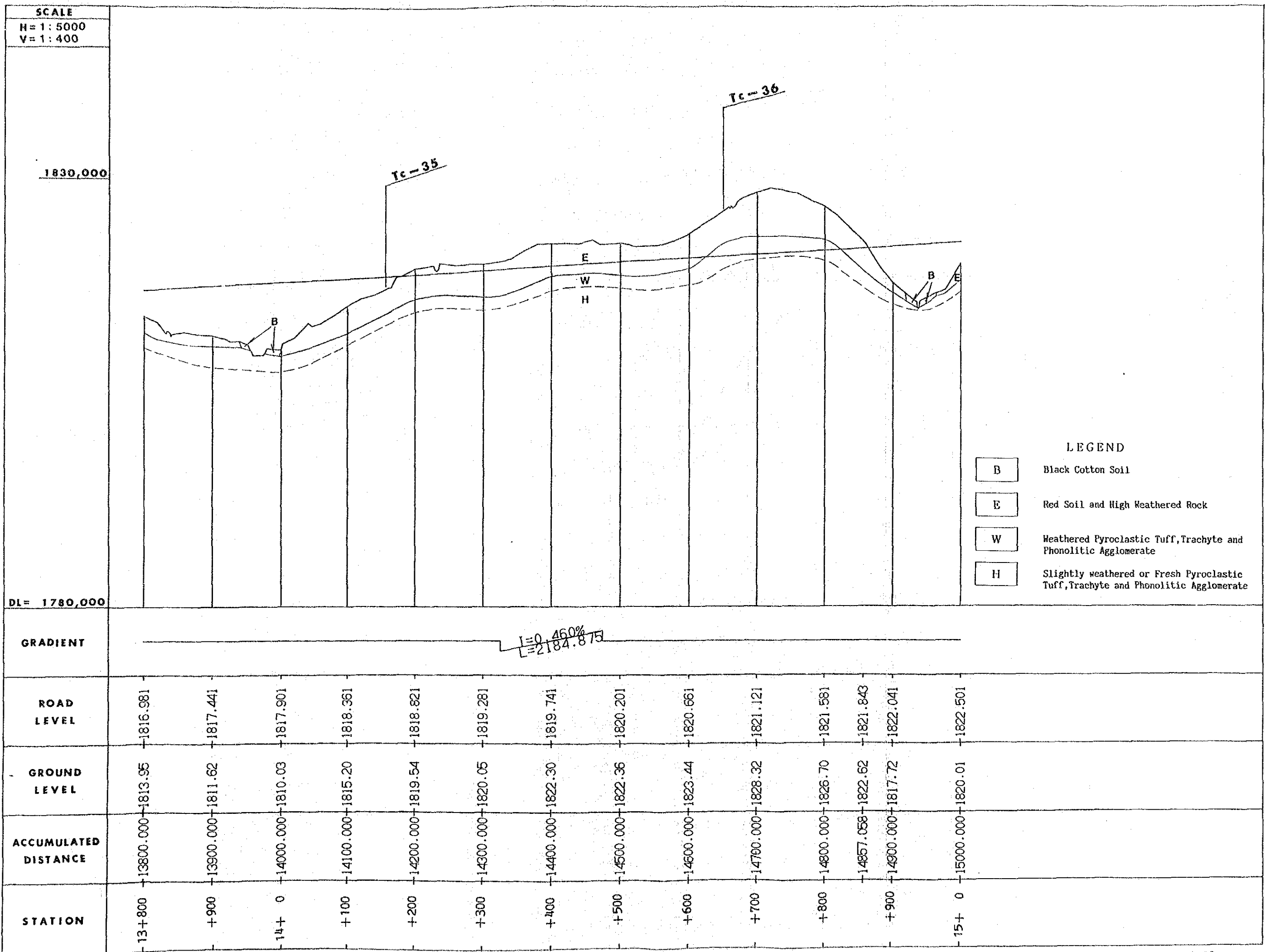


GRADIENT

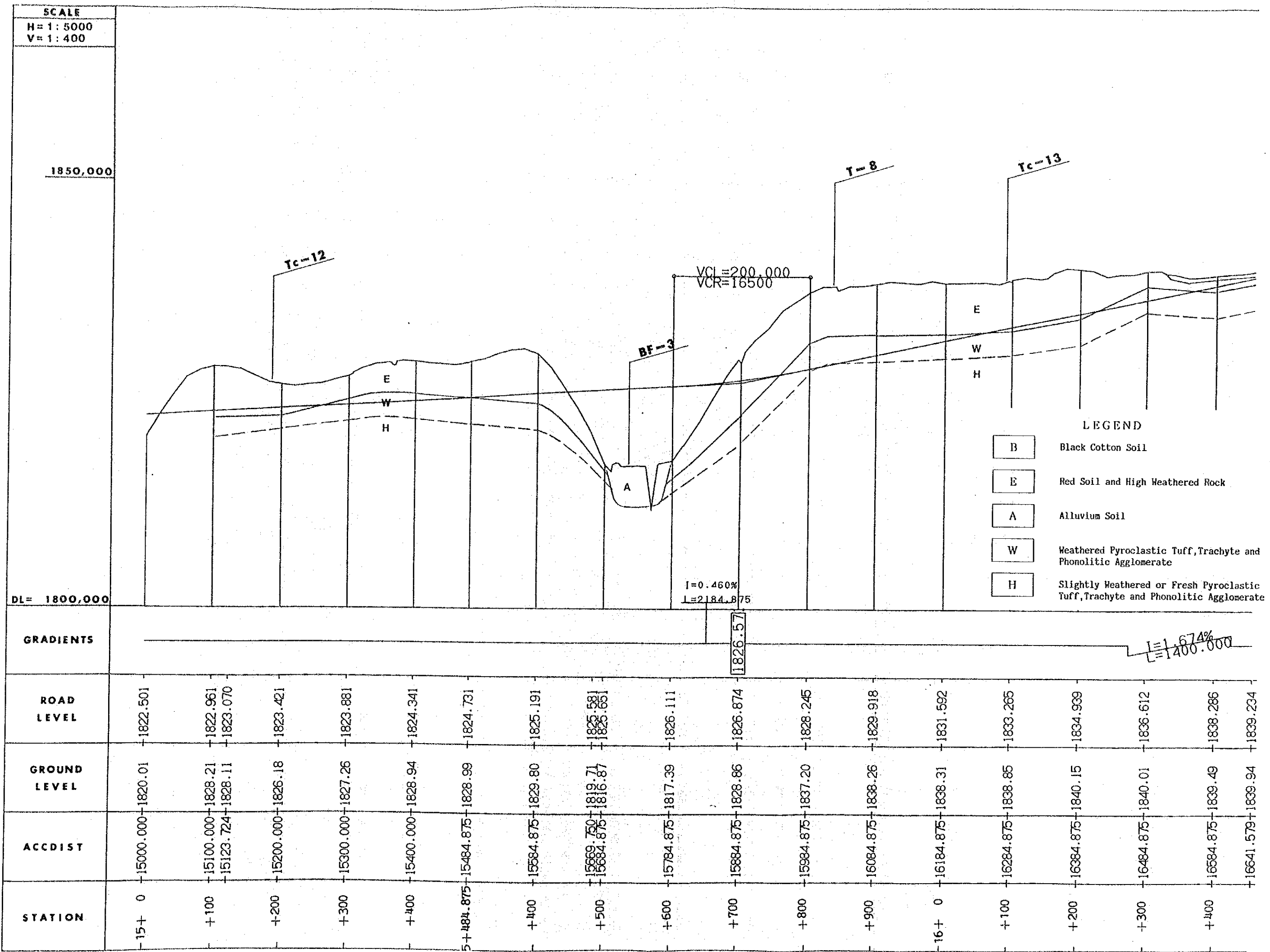
$I=0.700\%$
 $L=1400.000$

STATION	ACCUMULATED DISTANCE	GROUND LEVEL	ROAD LEVEL
12+200	12200.000	1806.75	1805.214
+300	12300.000	1806.91	1806.519
+400	12385.732 12400.000	1807.71 1808.07	1807.317 1807.421
+500	12500.000	1807.47	1808.121
+600	12545.732	1807.90	1808.441
+700	12600.000	1808.64	1808.821
+800	12700.000	1809.88	1809.521
+900	12800.000	1810.63	1810.221
+900	12900.000	1808.57	1810.921
13+0	13000.000	1810.08	1811.621
+100	13100.000	1812.55	1812.321
+200	13200.000	1812.79	1813.021
+300	13300.000	1812.65	1813.721
+400	13387.914 13400.000	1813.02 1812.54	1814.336 1814.221
+500	13500.000	1815.55	1815.121
+600	13547.914	1816.06	1815.456
+700	13600.000	1816.53	1815.821
+800	13700.000	1816.46	1816.461
+800	13800.000	1813.95	1816.981

GEOLOGICAL SECTION



GEOLOGICAL SECTION

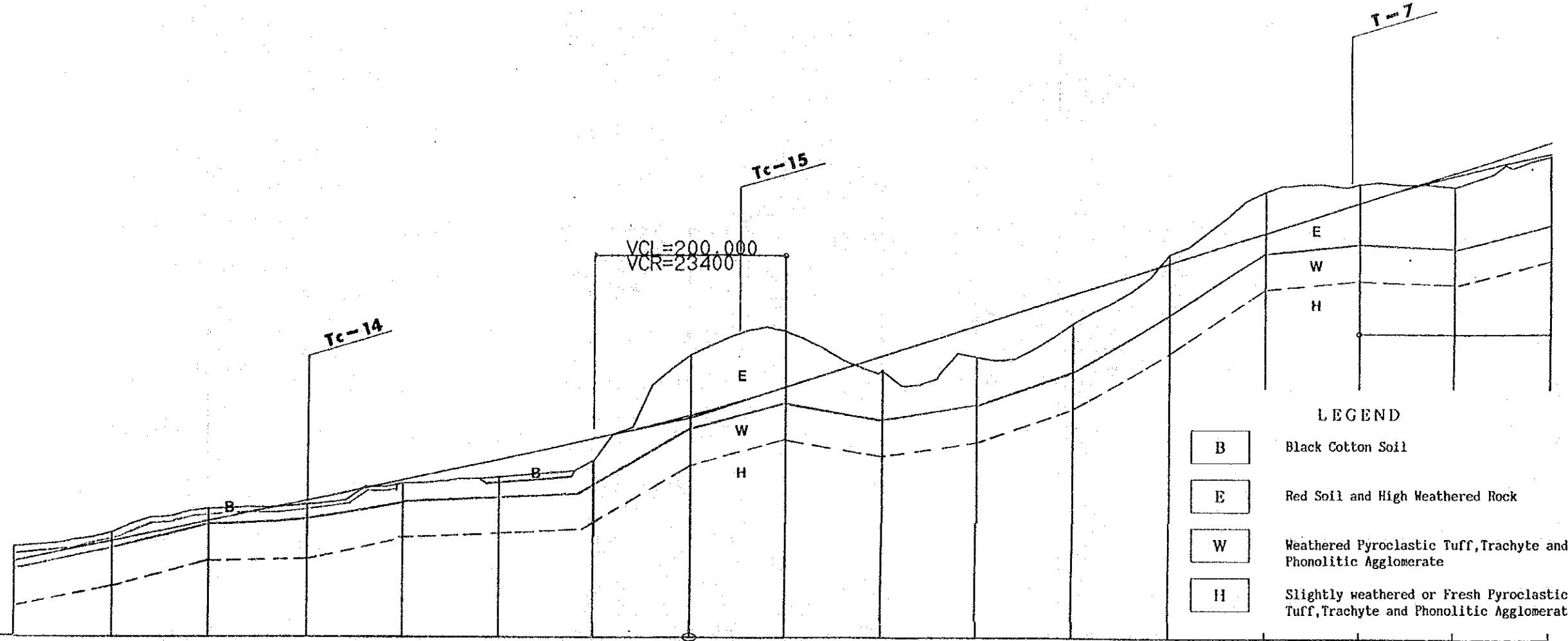


GEOLOGICAL SECTION

SCALE
 H = 1 : 5000
 V = 1 : 400

1880,000

DL = 1830,000



- LEGEND
- B Black Cotton Soil
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 - W Weathered Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate
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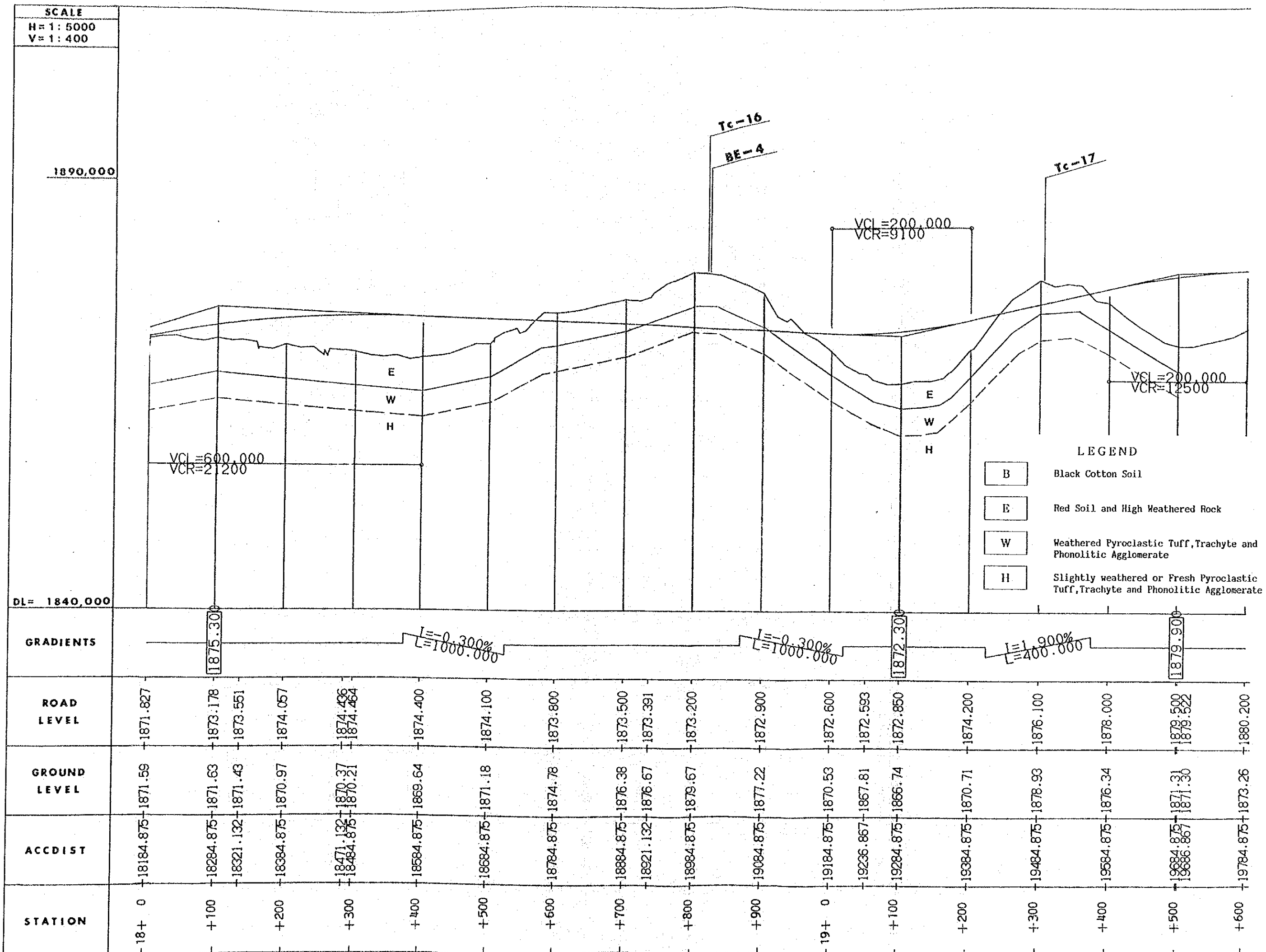
GRADIENTS

$I = 1.674\%$
 $L = 1400.00$

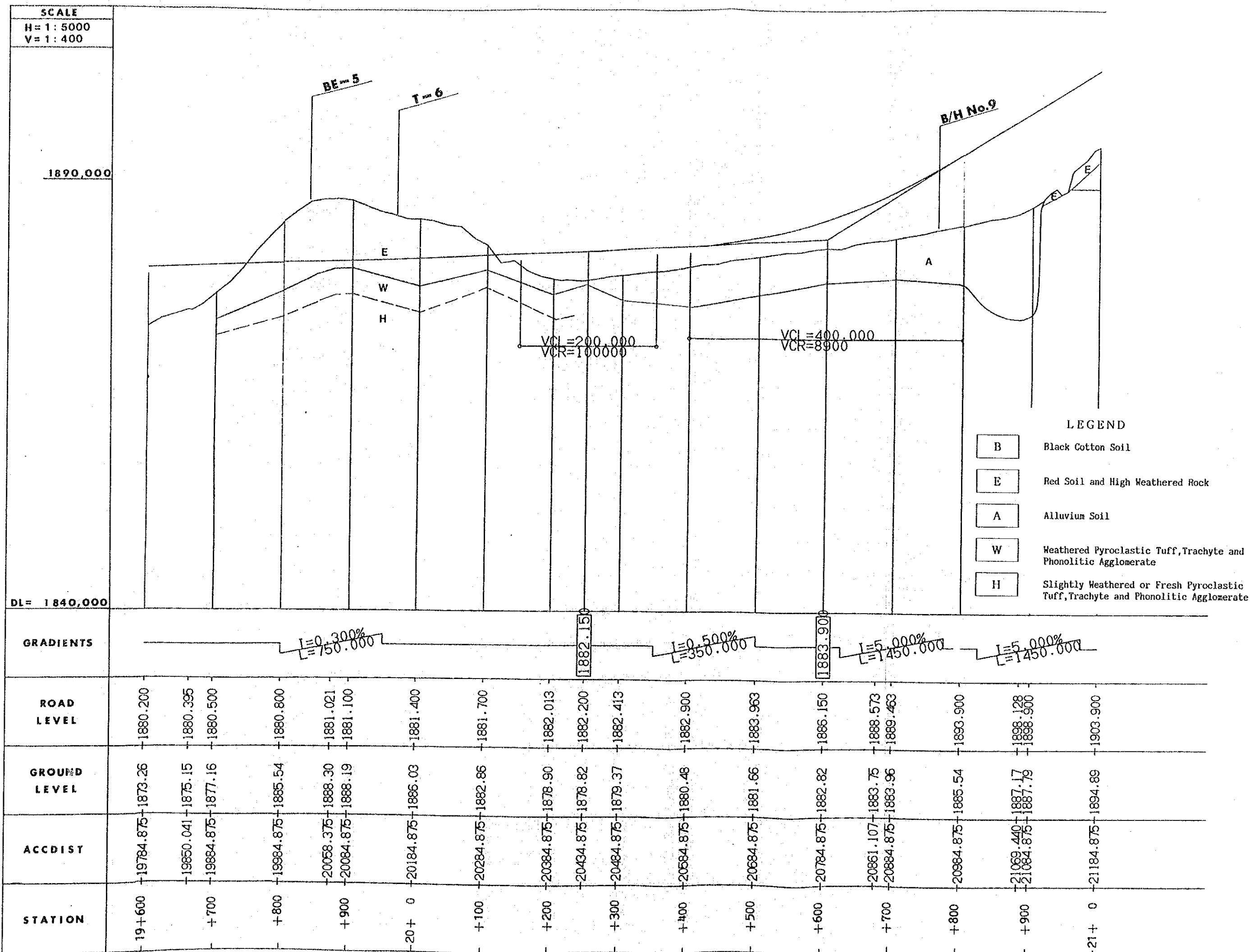
$I = 2.530\%$
 $L = 1000.000$

ROAD LEVEL	GROUND LEVEL	ACCDIST	STATION
1838.286	1839.49	16584.875	-16 + 400
1839.234	1839.94	16641.579	
1839.959	1840.67	16698.875	+ 500
1841.633	1842.64	16784.875	+ 600
1843.306	1842.99	16884.875	+ 700
1843.697	1843.17	16908.246	
1844.980	1844.72	16984.875	+ 800
1846.653	1845.21	17084.875	+ 900
1848.327	1846.54	17184.875	17 + 0
1848.353	1846.69	17186.459	
1850.214	1855.16	17284.875	+ 100
1852.530	1857.11	17384.875	+ 200
1855.060	1853.87	17484.875	+ 300
1856.109	1852.79	17526.337	
1857.590	1854.98	17584.875	+ 400
1860.120	1857.71	17684.875	+ 500
1862.650	1863.39	17784.875	+ 600
1865.180	1868.60	17884.875	+ 700
1865.623	1869.09	17902.368	
1867.710	1869.26	17984.875	+ 800
1869.310	1869.27	18052.368	+ 900
1870.004	1869.06	18084.875	
1871.827	1871.59	18184.875	18 + 0

GEOLOGICAL SECTION



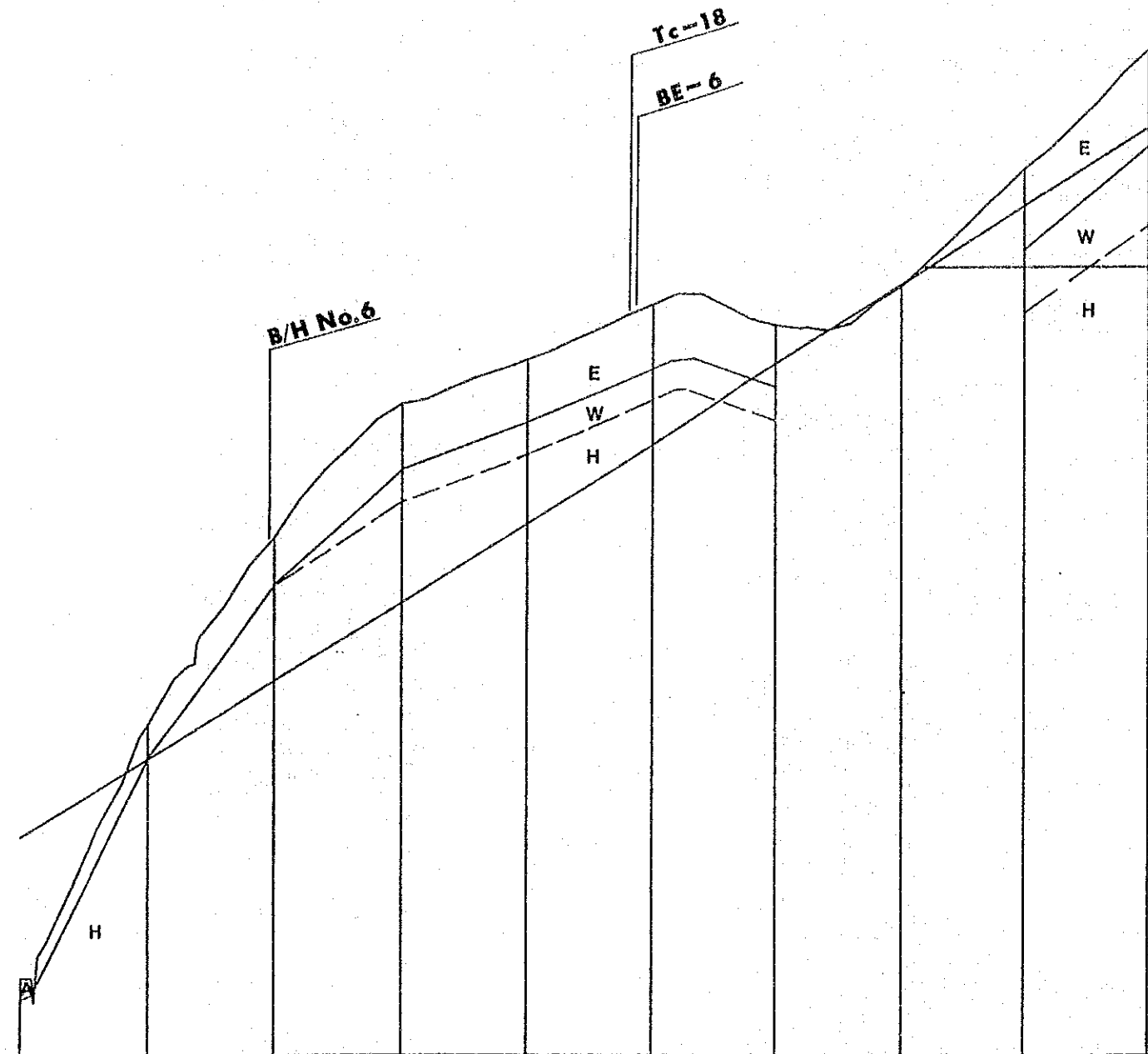
GEOLOGICAL SECTION



GEOLOGICAL SECTION

SCALE
 H = 1 : 5000
 V = 1 : 400

1940,000



LEGEND

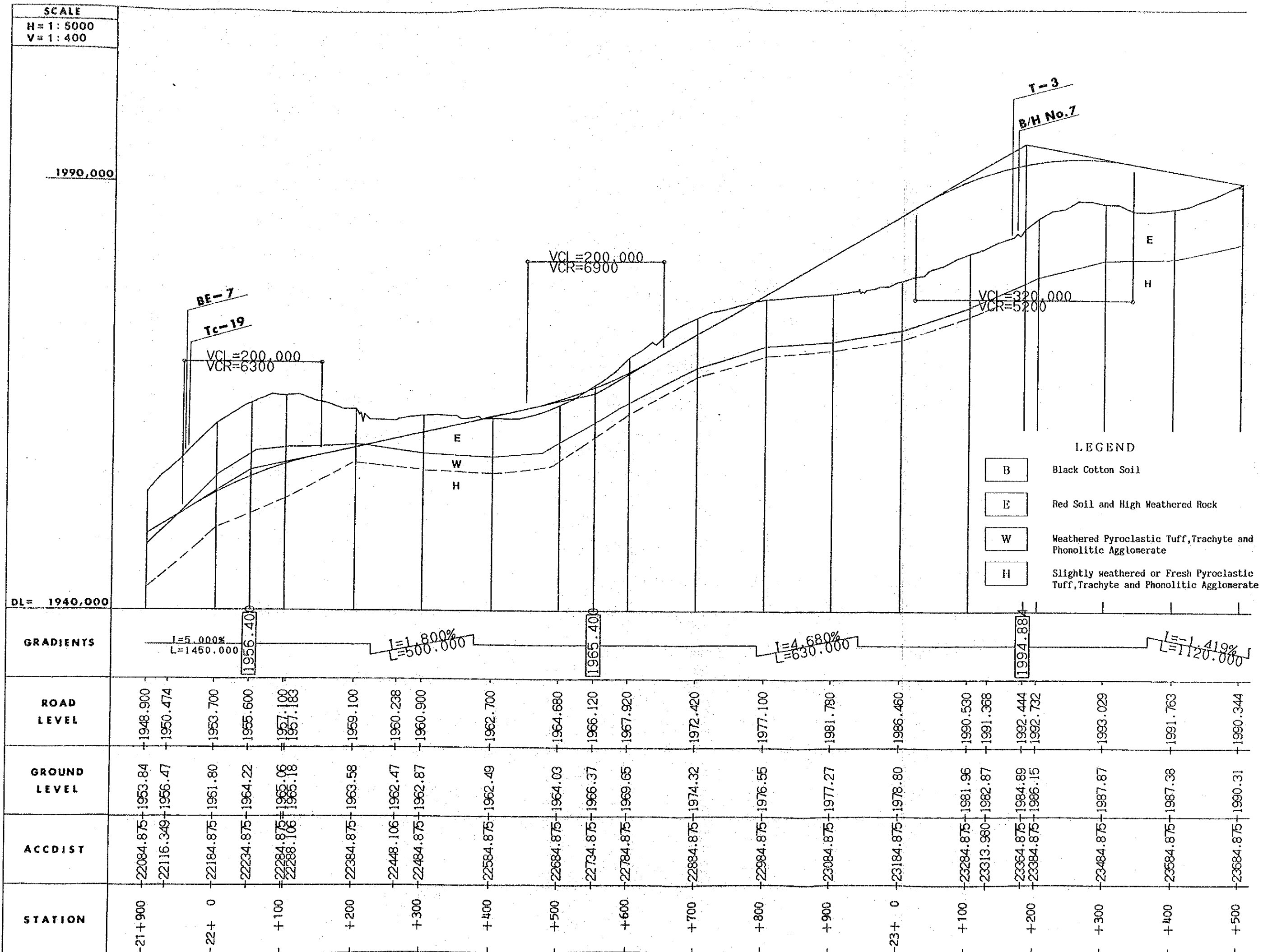
- B Black Cotton Soil
- E Red Soil and High Weathered Rock
- A Alluvium Soil
- W Weathered Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate
- H Slightly Weathered or Fresh Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate

GRADIENTS

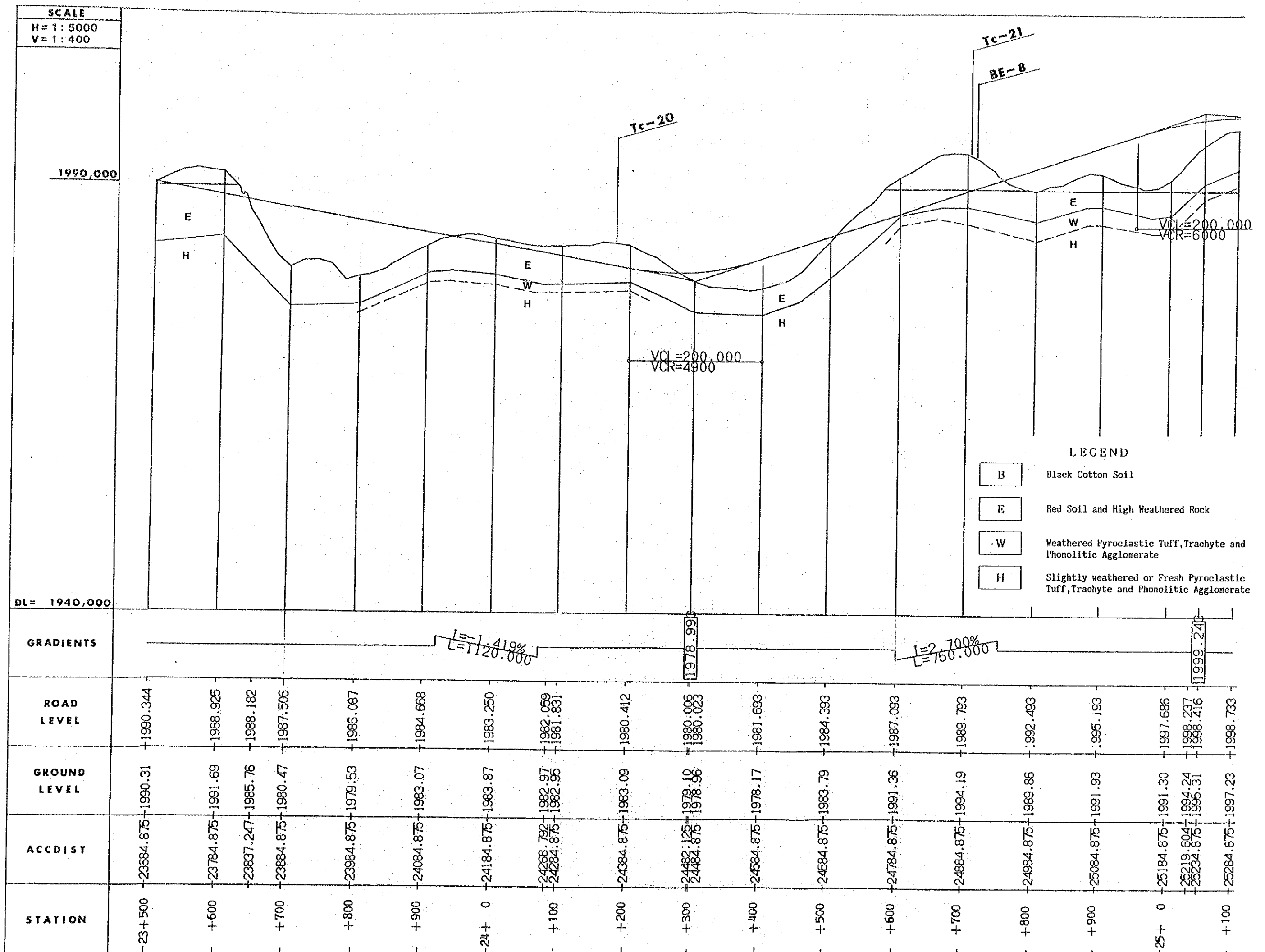
$I = 5.000\%$
 $L = 1450.000$

ROAD LEVEL	GROUND LEVEL	ACCDIST	STATION
1903.900	1894.89	21184.875	-21+ 0
1908.545 1908.900	1910.23 1911.68	21277.73 21284.875	+ 100
1913.900	1922.93	21384.875	+ 200
1918.900	1931.50	21484.875	+ 300
1923.900	1934.30	21584.875	+ 400
1928.900	1937.77	21684.875	+ 500
1932.057	1937.41	21748.016	+ 600
1933.900	1936.31	21784.875	+ 600
1938.900	1938.77	21884.875	+ 700
1942.474	1944.19	21956.349	+ 800
1943.900	1946.27	21984.875	+ 800
1948.900	1953.84	22084.875	+ 900

GEOLOGICAL SECTION



GEOLOGICAL SECTION



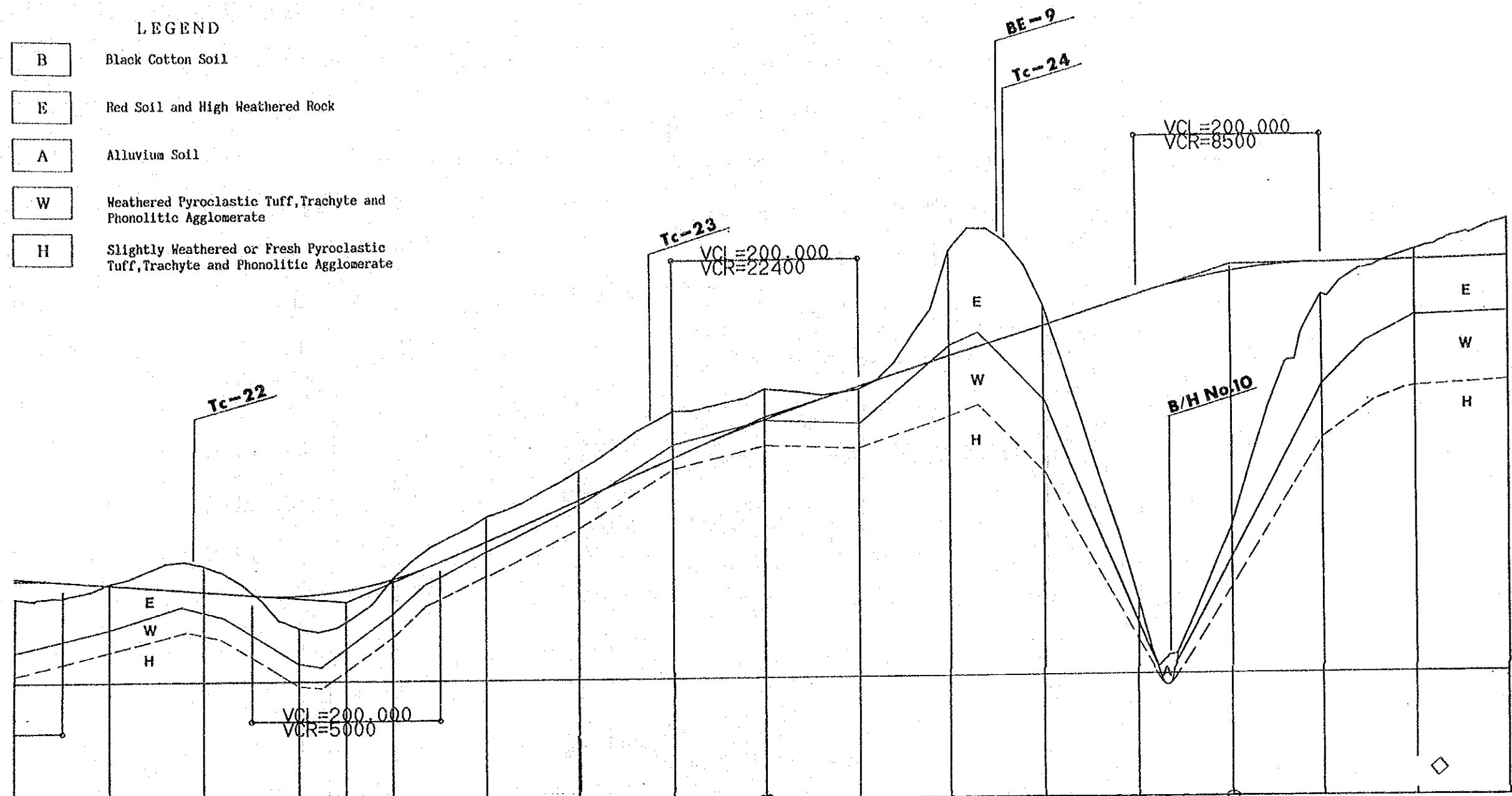
GEOLOGICAL SECTION

SCALE
H = 1 : 5000
V = 1 : 400

LEGEND

- B Black Cotton Soil
- E Red Soil and High Weathered Rock
- A Alluvium Soil
- W Weathered Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate
- H Slightly Weathered or Fresh Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate

2030,000



DL = 1980,000

STATION	ACCDIST	GROUND LEVEL	ROAD LEVEL	GRADIENTS
-25 + 100	-25284.875	-1997.23	-1998.733	I = 0.606% L = 400.000
+ 200	-25384.875	-1998.47	-1998.334	
+ 300	-25432.937	-1999.75	-1998.042	I = 3.400% L = 450.000
+ 400	-25484.875	-1999.93	-1997.727	
+ 500	-25584.875	-1998.83	-1998.768	I = 3.400% L = 450.000
+ 600	-25784.875	-2004.07	-2001.918	
+ 700	-25884.875	-2007.82	-2005.318	I = 2.506% L = 500.000
+ 800	-25984.875	-2012.70	-2008.718	
+ 900	-26084.875	-2014.49	-2011.895	I = 0.151% L = 630.000
-26 + 0	-26162.036	-2014.10	-2014.040	
+ 100	-26184.875	-2014.39	-2014.624	
+ 200	-26284.875	-2021.38	-2019.637	
+ 300	-26384.875	-1996.29	-2022.144	
+ 400	-26484.875	-2002.47	-2024.061	
+ 500	-26584.875	-2022.08	-2024.801	
+ 600	-26684.875	-2025.82	-2024.952	
+ 700	-26884.875	-2028.24	-2025.102	

GEOLOGICAL SECTION

SCALE
H = 1 : 5000
V = 1 : 400

2040,000

Tc-25

B/H No.8

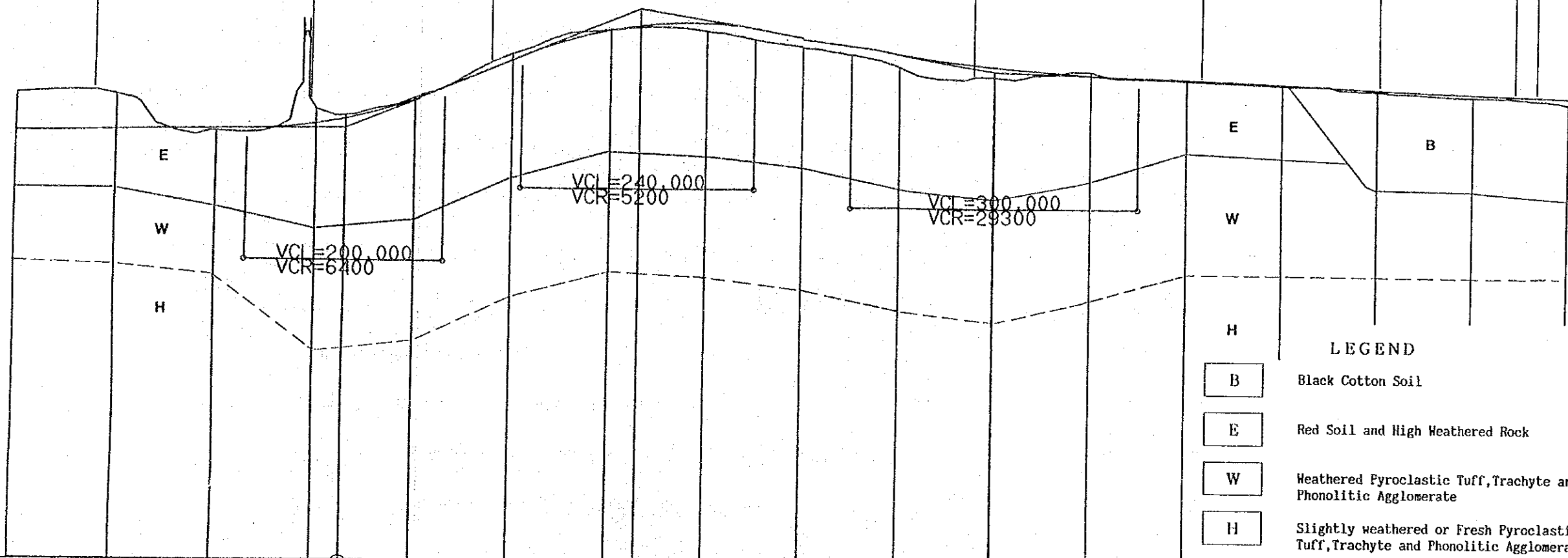
Tc-26

Tc-27

BE-4

Tc-28

T-1
B/H No.11



DL = 1990,000

LEGEND

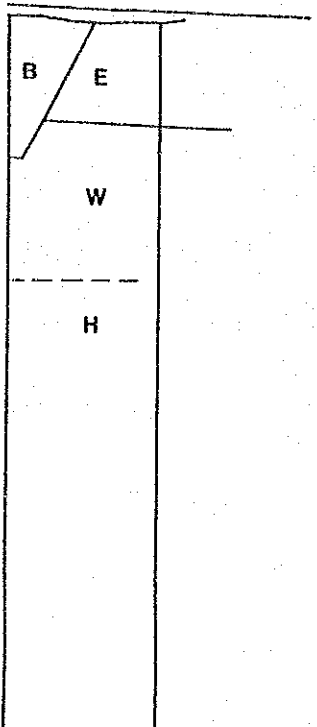
B	Black Cotton Soil
E	Red Soil and High Weathered Rock
W	Weathered Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate
H	Slightly weathered or Fresh Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate

STATION	ACCDIST	GROUND LEVEL	ROAD LEVEL	GRADIENTS
-26+700	26884.875	2028.24	2025.102	I = 0.151% L = 630.000
+800	26984.875	2028.17	2025.253	
+900	27084.875	2025.24	2025.404	I = 3.300% L = 300.000
-27+0	27130.032	2025.24	2025.490	
+100	27184.875	2027.15	2025.941	I = 1.324% L = 370.000
+200	27214.875	2026.67	2026.387	
+100	27284.875	2028.17	2027.981	I = 1.324% L = 370.000
+200	27384.875	2031.73	2031.210	
+300	27484.875	2033.76	2033.730	I = -0.300% L = 300.000
+400	27514.875	2033.98	2034.113	
+400	27584.875	2033.67	2034.332	I = -0.300% L = 300.000
+500	27684.875	2032.54	2033.249	
+600	27784.875	2030.92	2031.967	I = -0.300% L = 300.000
+700	27854.675	2029.95	2031.245	
+700	27884.875	2030.17	2030.984	I = -0.300% L = 300.000
+800	27984.875	2030.63	2030.343	
+800	28014.675	2030.12	2030.218	I = -0.300% L = 300.000
+900	28084.875	2029.92	2030.000	
-28+0	28184.875	2029.59	2029.700	I = -0.300% L = 300.000
+100	28284.875	2029.28	2029.400	
+200	28384.875	2028.86	2029.100	I = -0.300% L = 300.000
+300	28474.384	2028.47	2028.832	
+300	28484.875	2028.26	2028.806	

GEOLOGICAL SECTION

SCALE
H = 1 : 5000
V = 1 : 400

2040,000



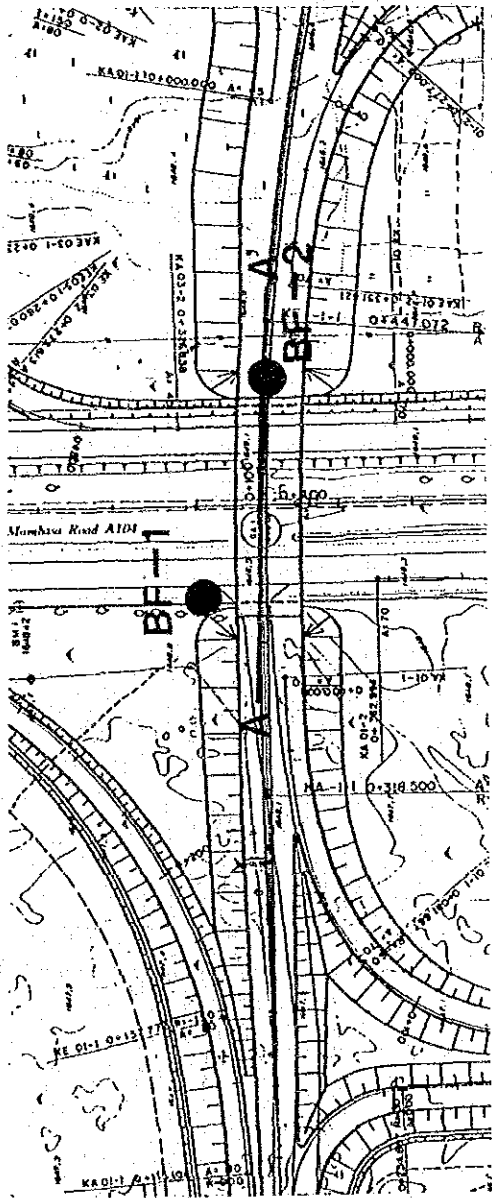
- LEGEND**
- B Black Cotton Soil
 - E Red Soil and High Weathered Rock
 - W Weathered Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate
 - H Slightly weathered or Fresh Pyroclastic Tuff, Trachyte and Phonolitic Agglomerate

DL = 1990,000

GRADIENTS	_____		
ROAD LEVEL	+2028.800	+2028.500	+2028.200
GROUND LEVEL	+2028.26	+2027.89	
ACCDIST	+28484.875	+28584.875	+28684.875
STATION	+300	+400	+500

GEOLOGICAL SECTION

3. GEOLOGICAL SECTION FOR FOUNDATION OF BRIDGES AND CUT SLOPES



LEGEND

- B Bank
- Ab Black Cotton Soil
- Tvp3 Phonolitic Agglomerate

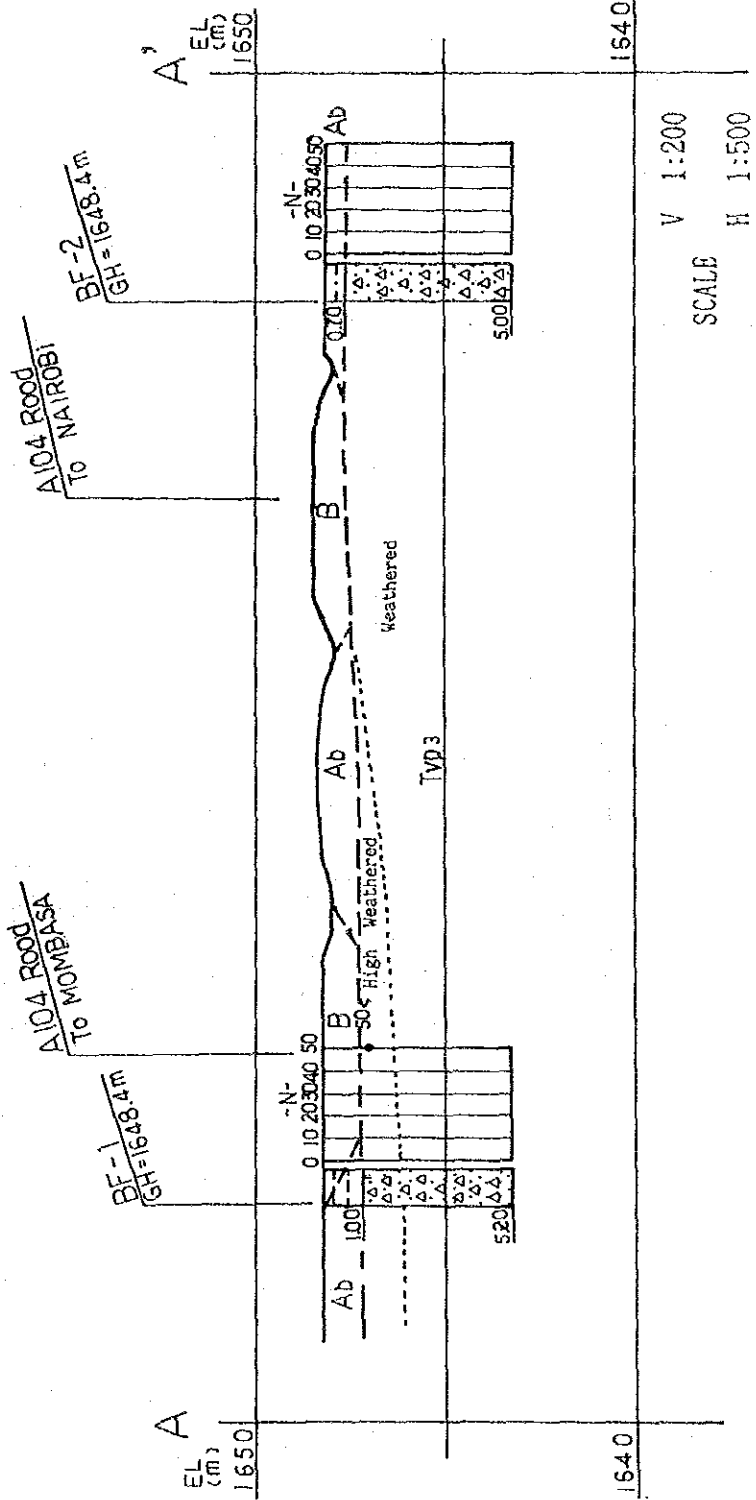
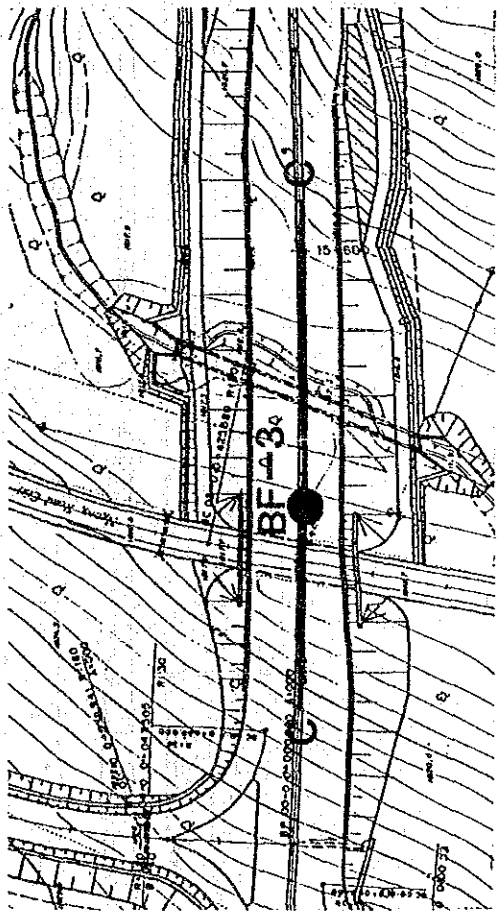


Fig. GEOLOGICAL SECTION (1)



LEGEND

- Ab Black Cotton Soil or Alluvium
- S Red Soil
- Tvtf₂ Pyroclastic Tuff

V 1:200
SCALE H 1:500

SCALE 1:2000

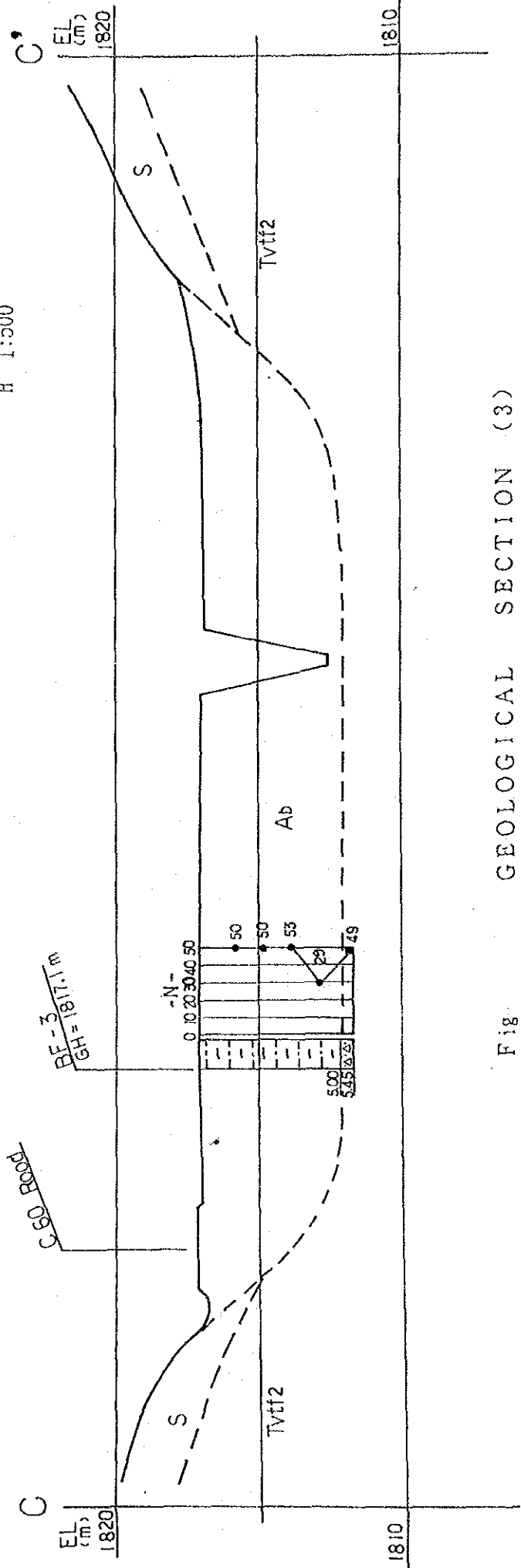


Fig. GEOLOGICAL SECTION (3)

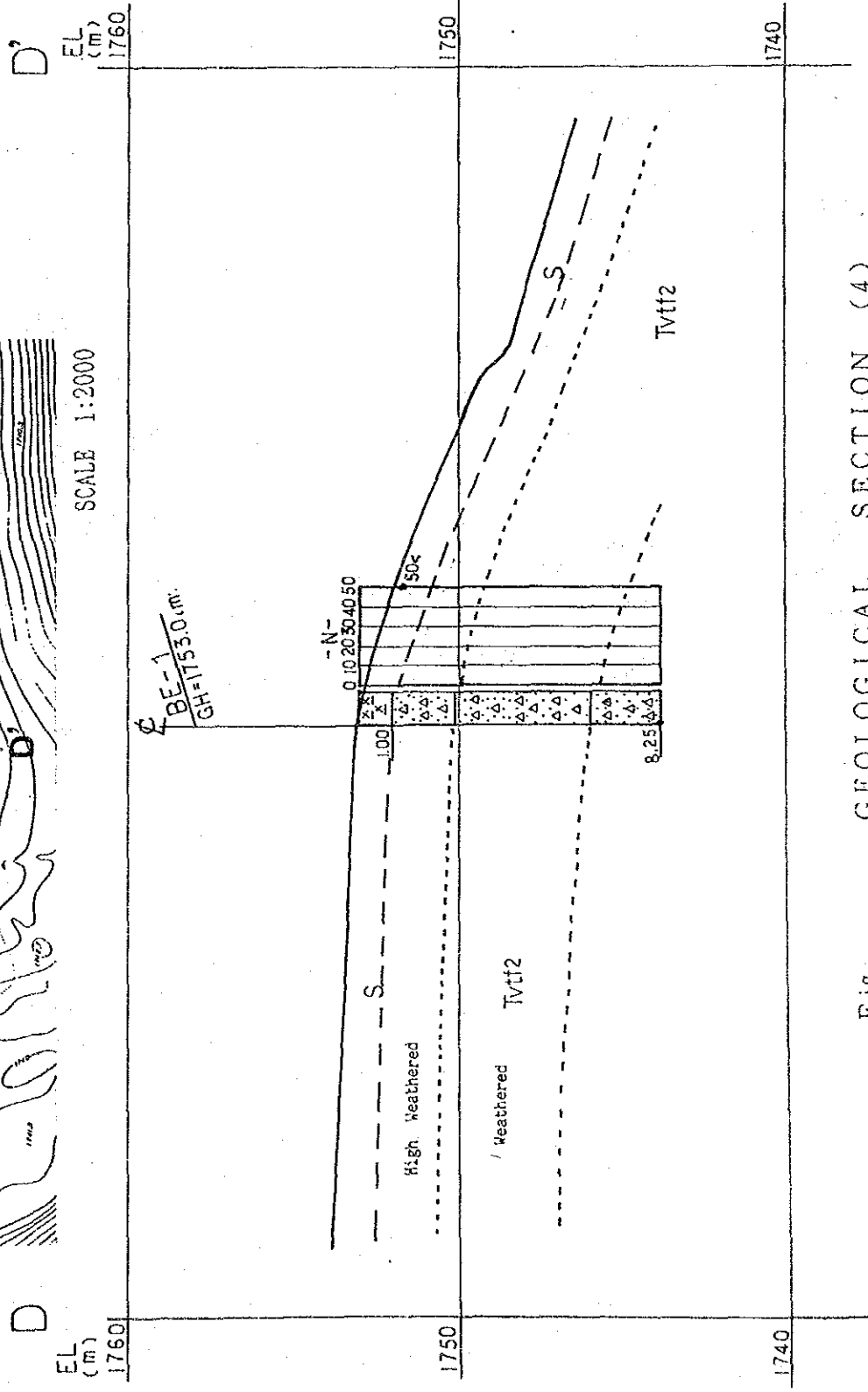
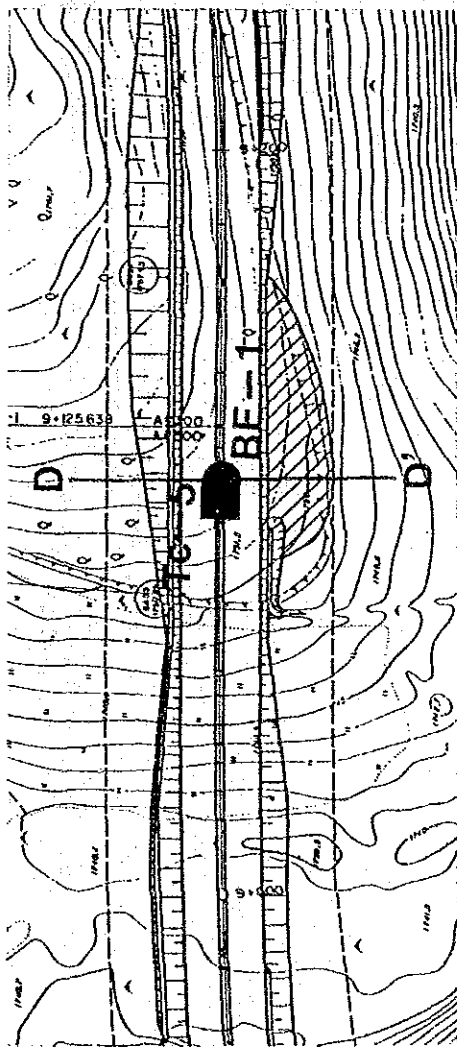
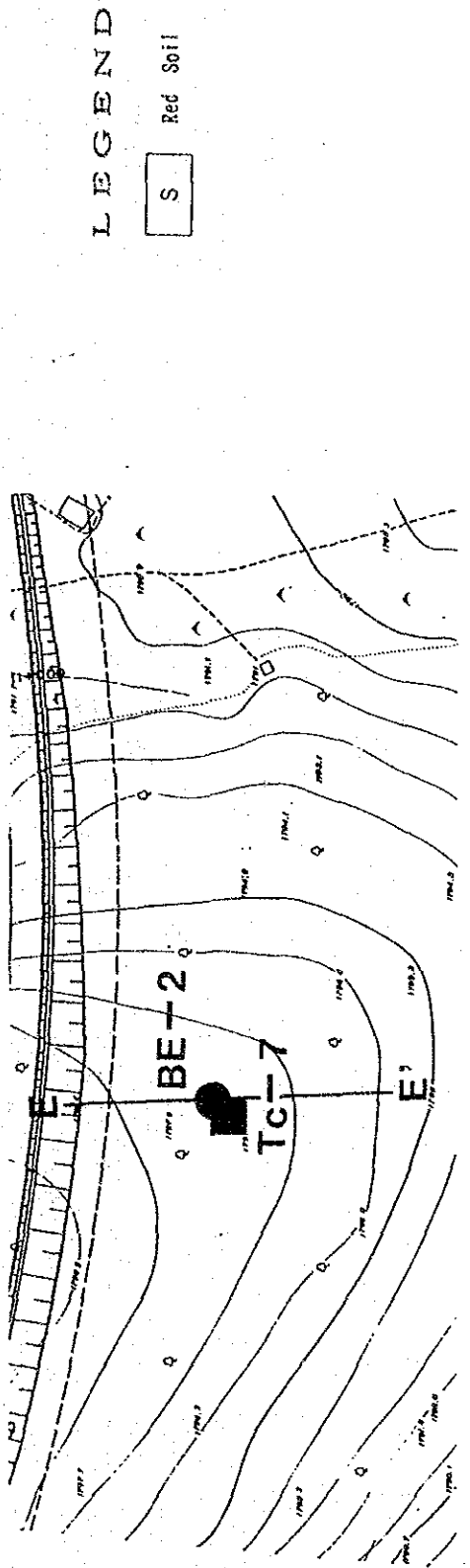


Fig GEOLOGICAL SECTION (4)



SCALE 1:2000

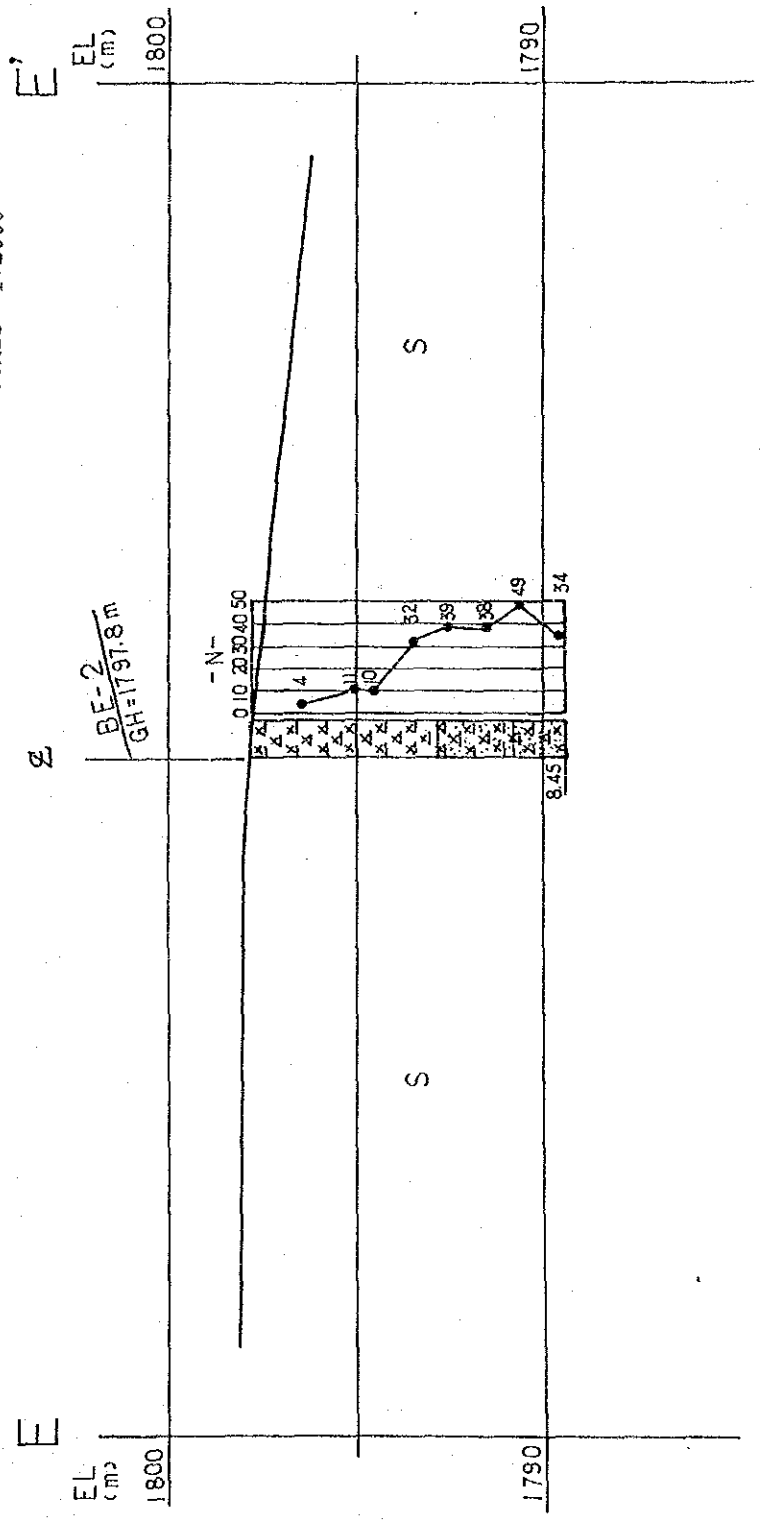
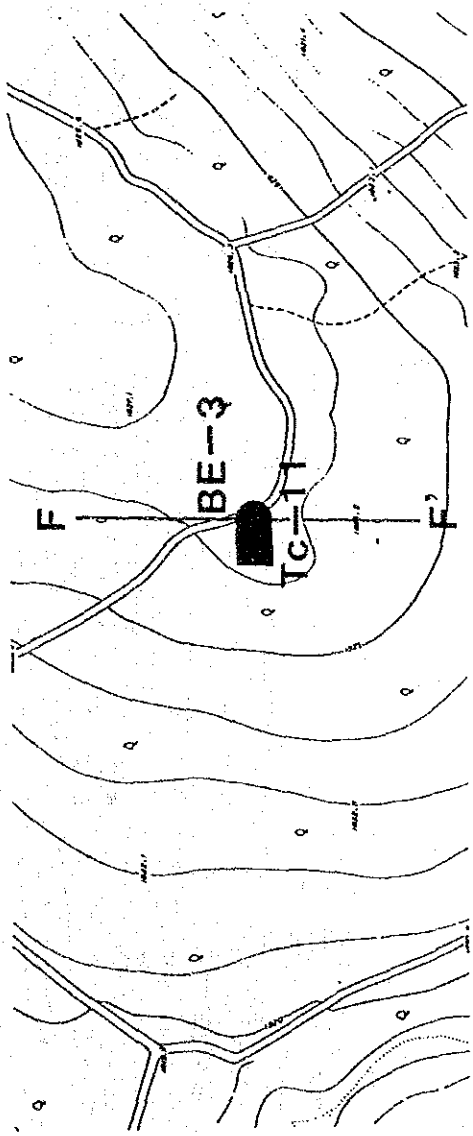


Fig GEOLOGICAL SECTION (5)



SCALE 1:2000

LEGEND

- S Red Soil
- Tvt12 Pyroclastic Tuff

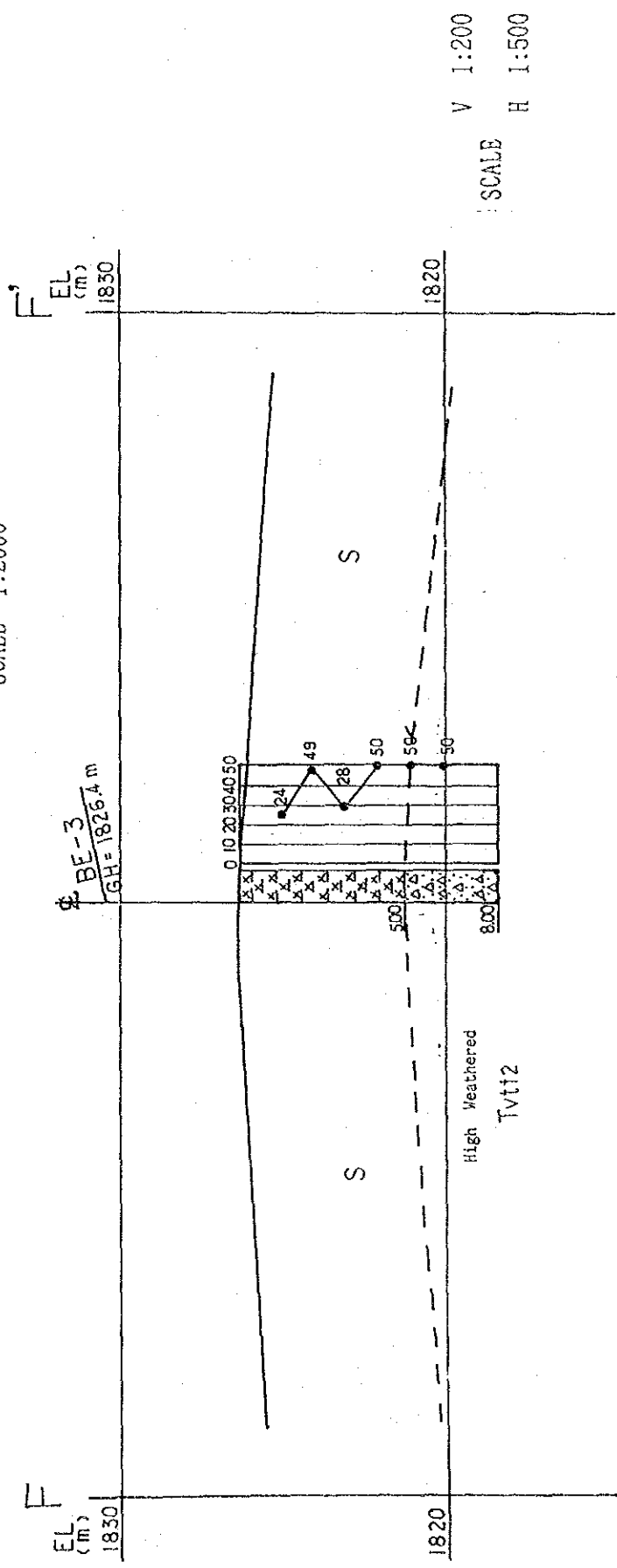
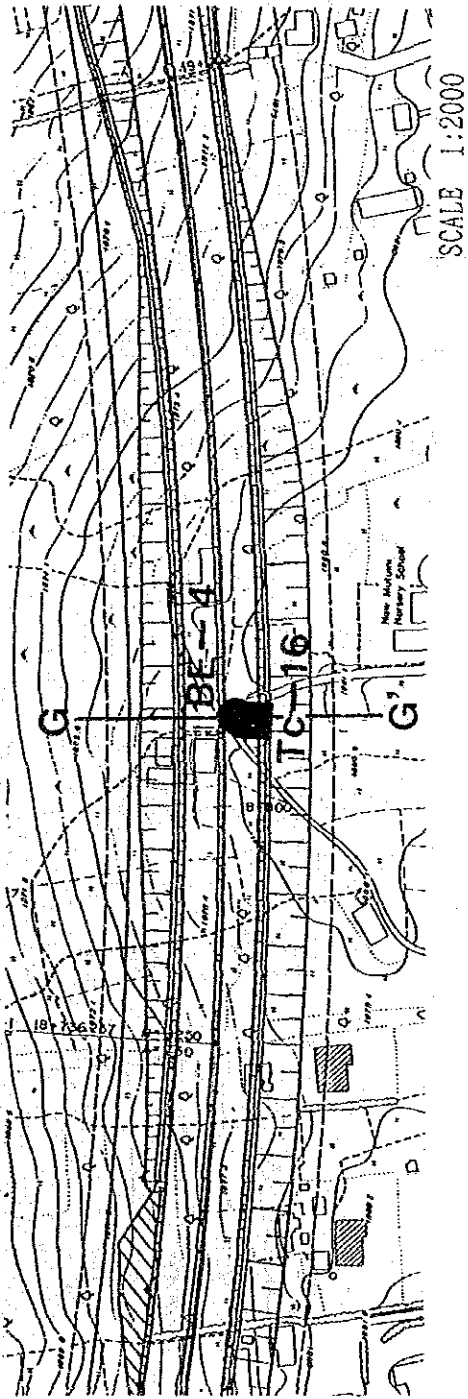


FIG GEOLOGICAL SECTION (6)



LEGEND

- S Red Soil
- Tvtf₂ High Weathered Pyroclastic Tuff
- Pih₁ Weathered Trachyte

V 1:200
H 1:500
SCALE

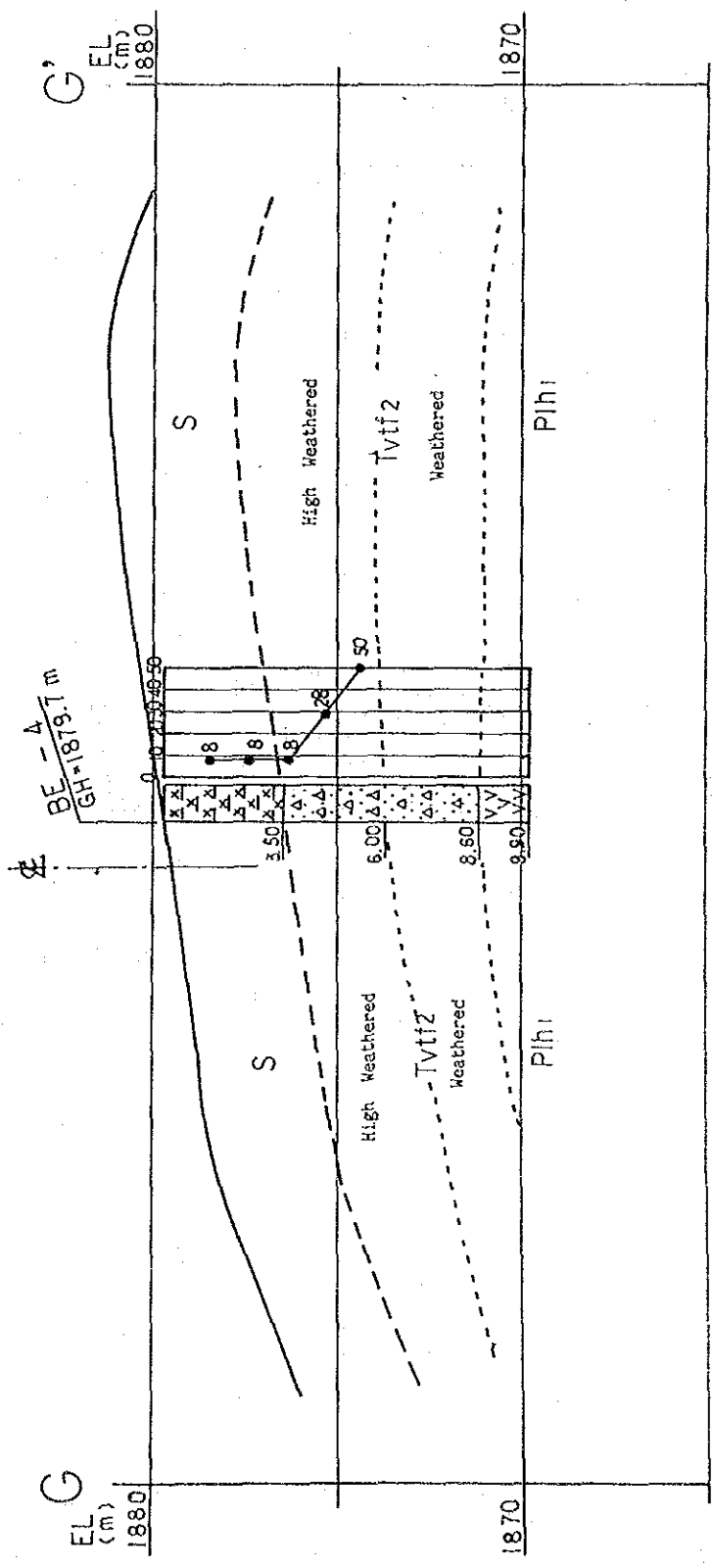
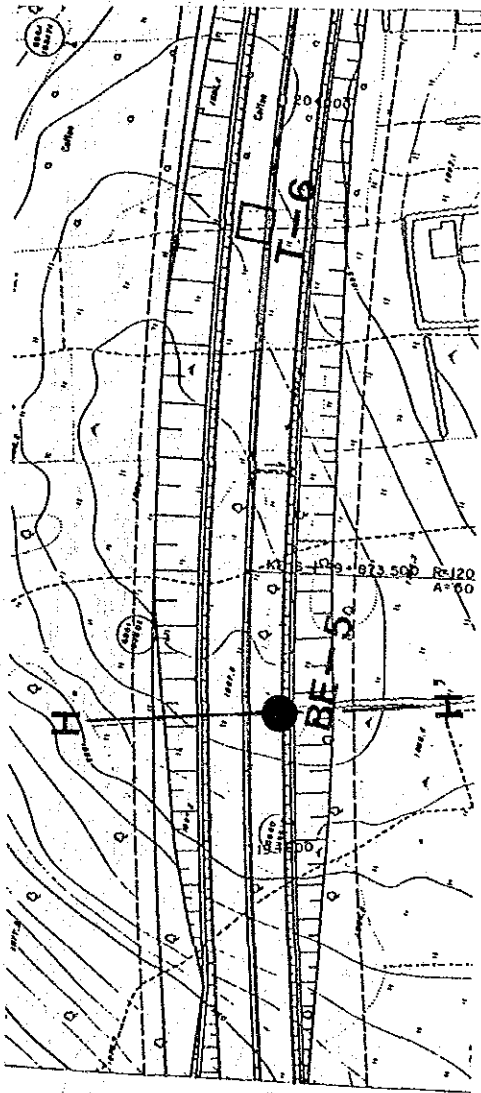


Fig GEOLOGICAL SECTION (7)



LEGEND

- S Red Soil
- Tvtf2 High Weathered and Weathered Pyroclastic Tuff

SCALE 1:2000

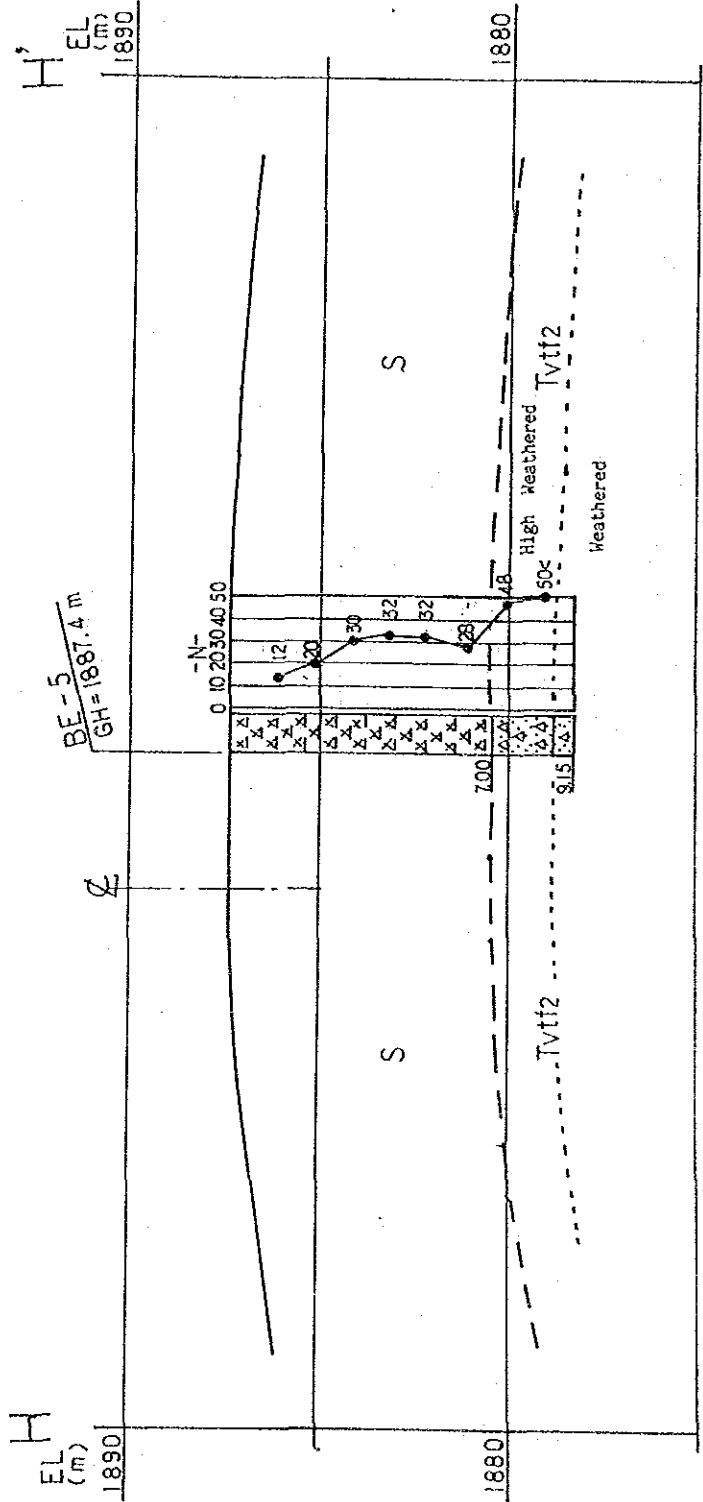
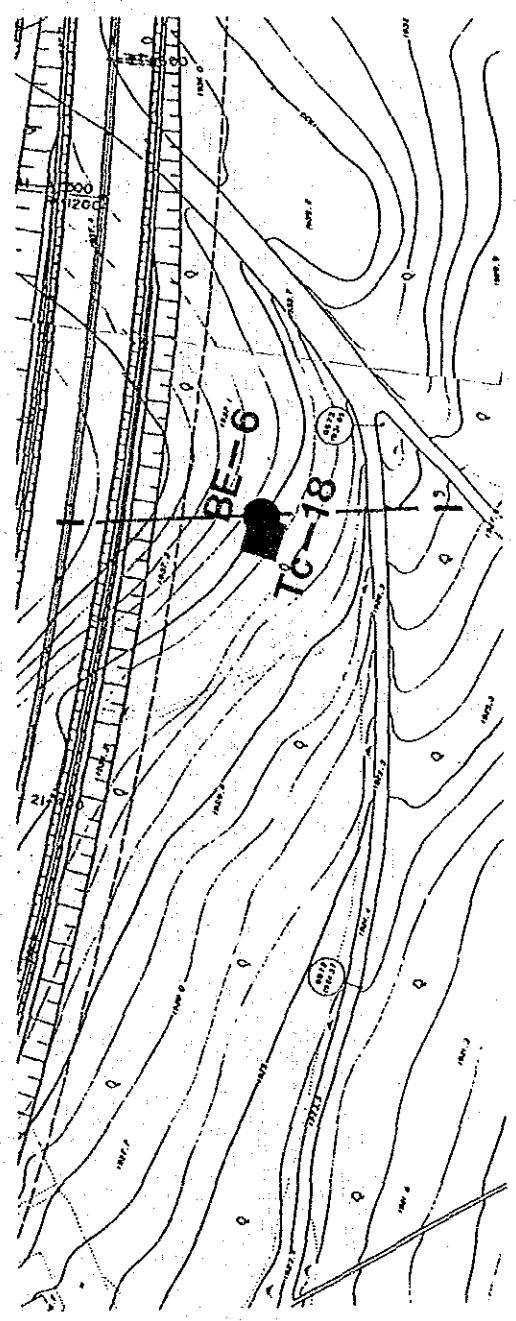


FIG 8 GEOLOGICAL SECTION (8)

LEGEND

- S Red Soil
- Plh: High Weathered to Sound Trachyte

V 1:200
SCALE H 1:500



SCALE 1:2000

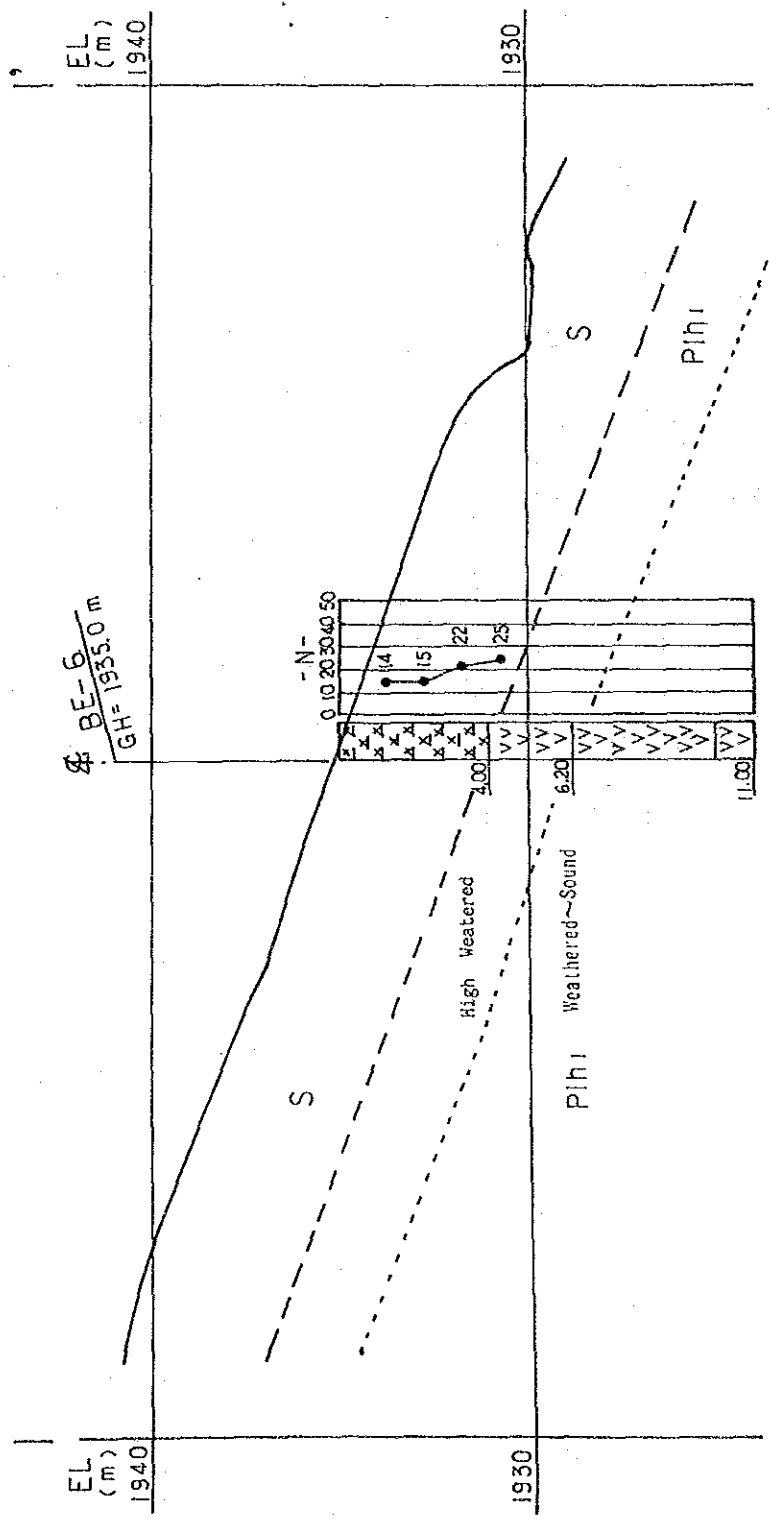
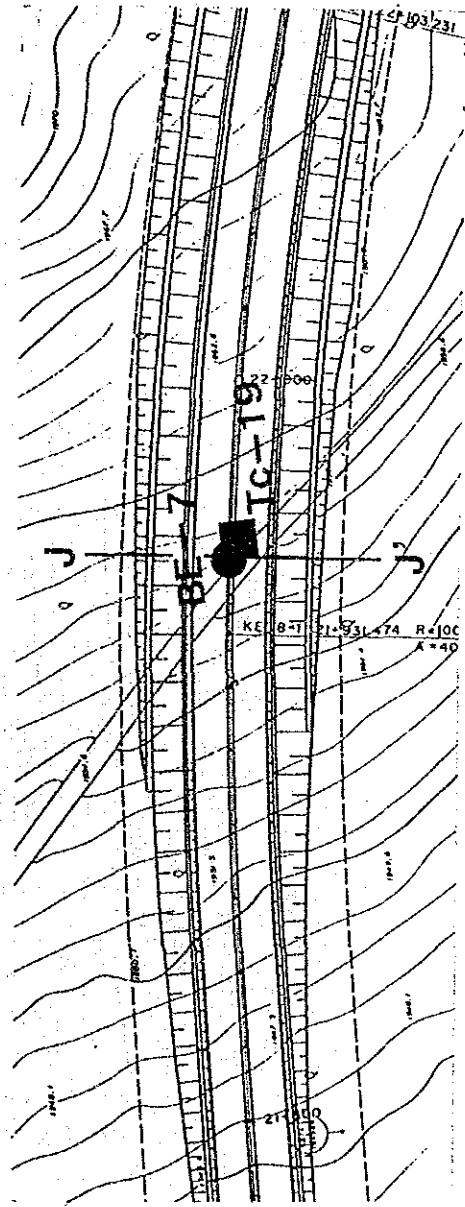
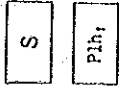


FIG 8 GEOLOGICAL SECTION (8)

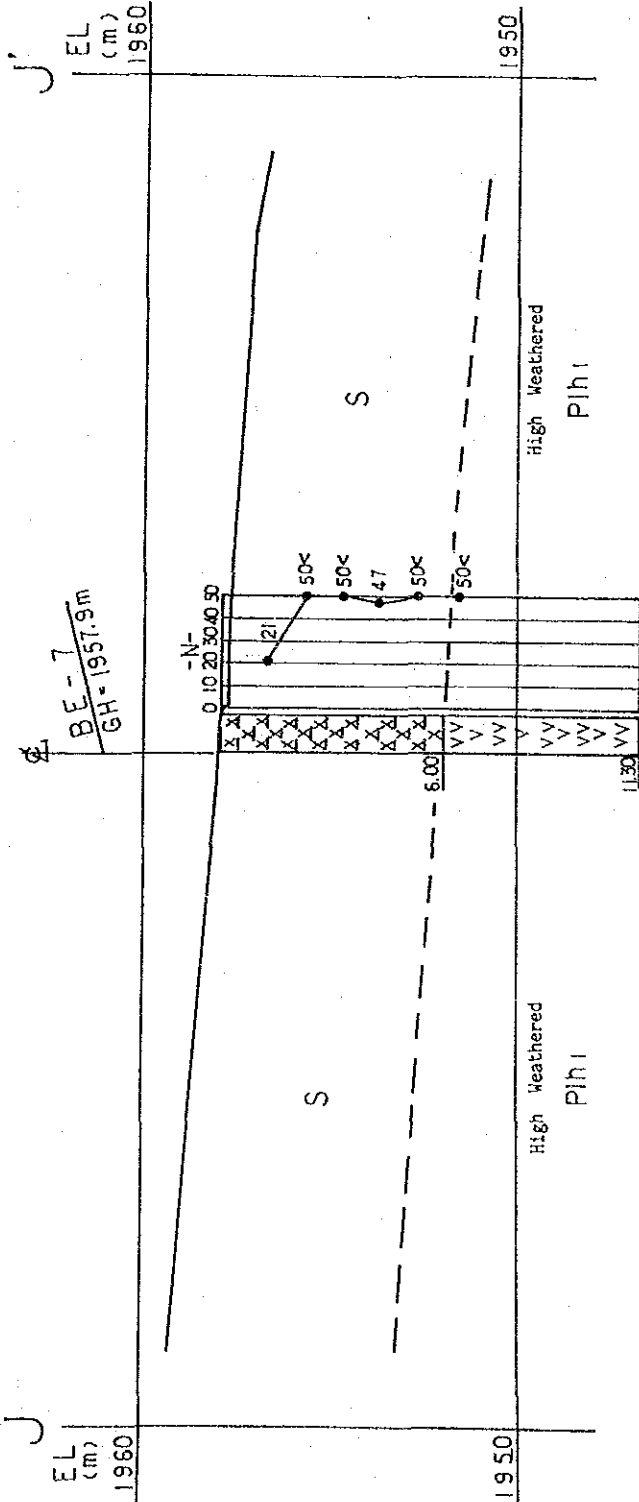


LEGEND



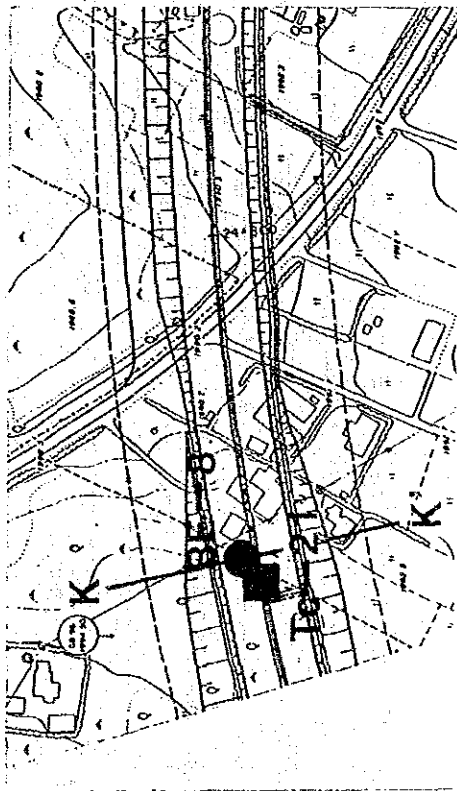
Red Soil
High Weathered Trachyte

SCALE 1:2000



V 1:200
SCALE H 1:500

Fig GEOLOGICAL SECTION (10)



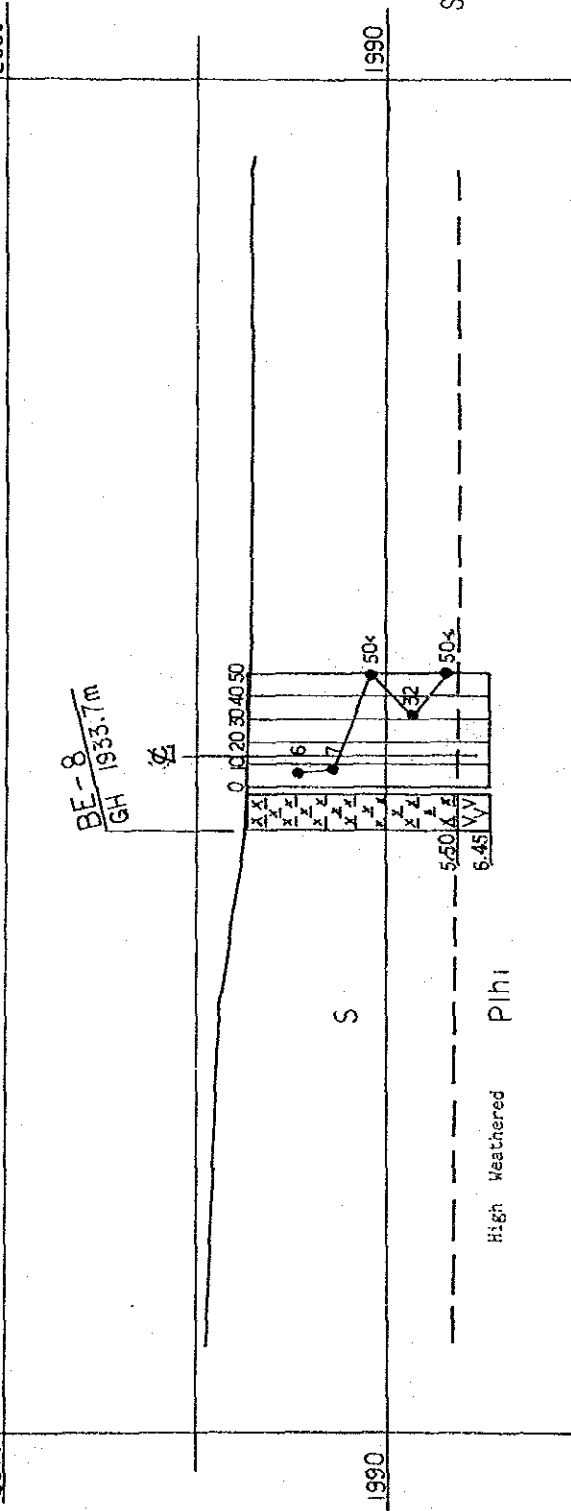
LEGEND

- S Red Soil
- Plh₁ High Weathered Trachyte

ELK
(m)
2000

SCALE 1:2000

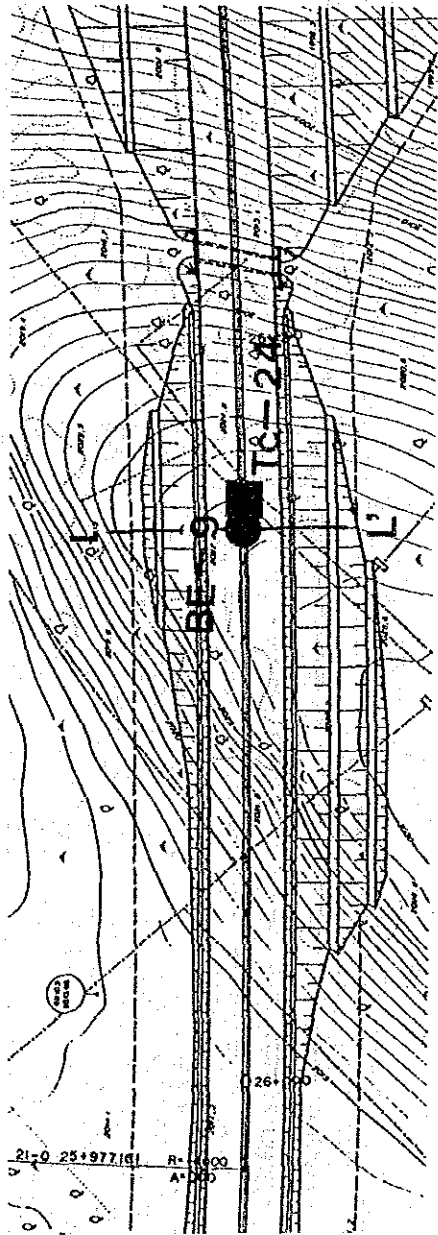
K'
EL
(m)
2000



V 1:200
H 1:500

SCALE

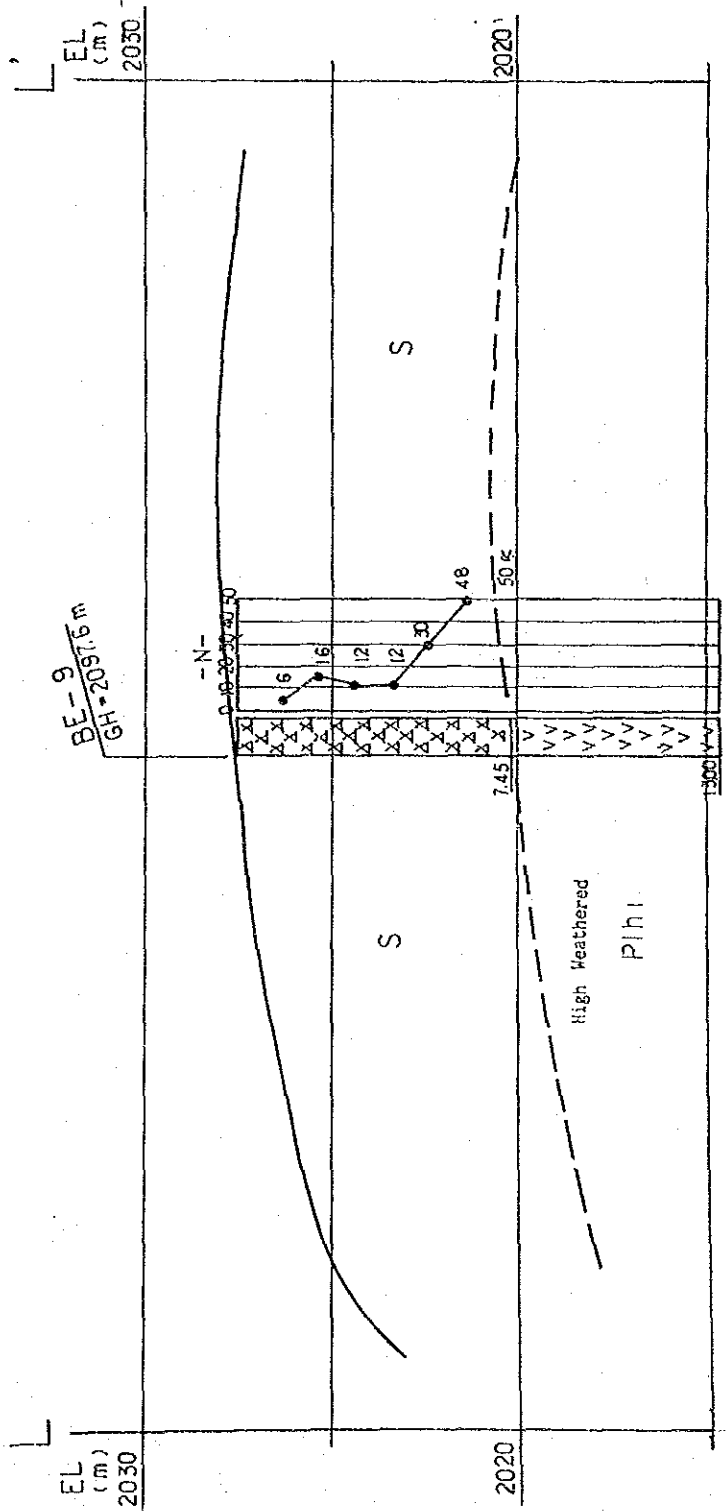
FIG GEOLOGICAL SECTION (11)



LEGEND

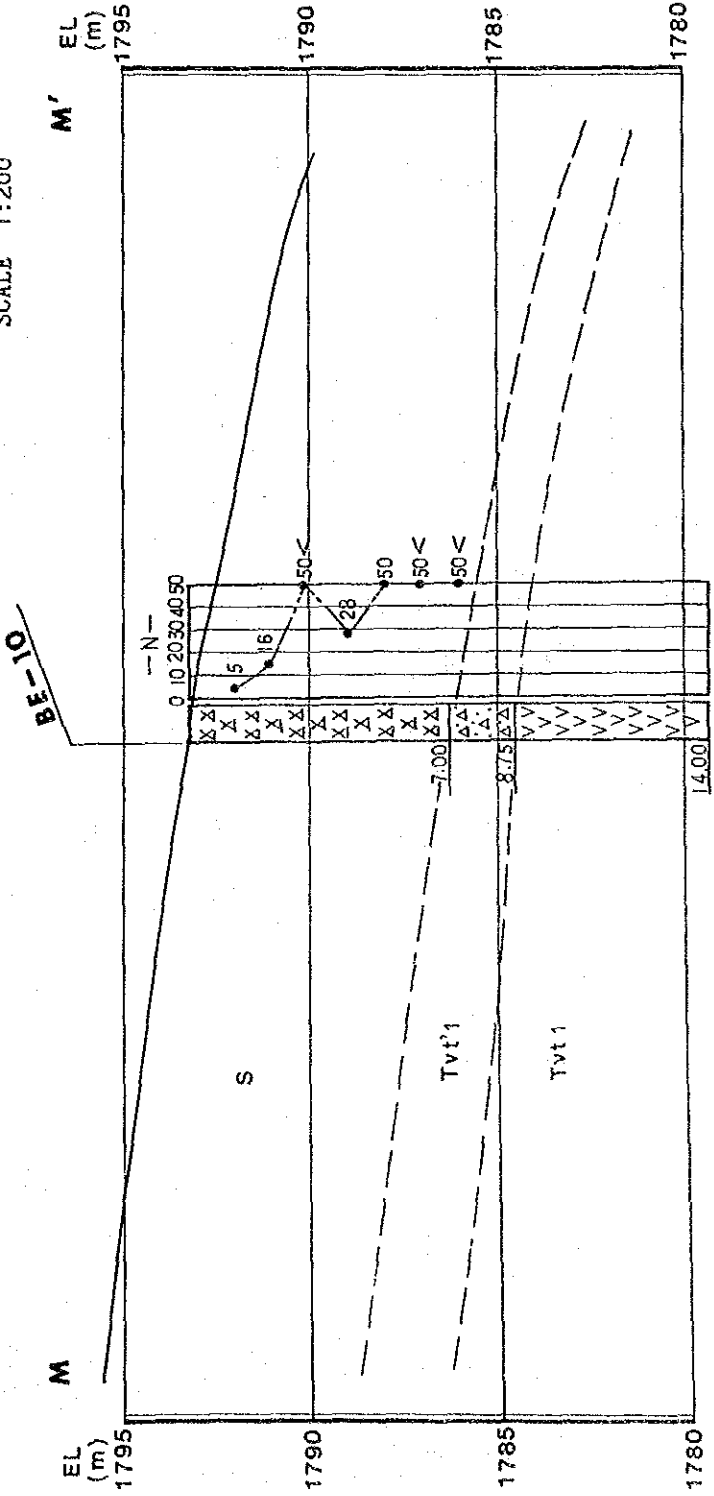
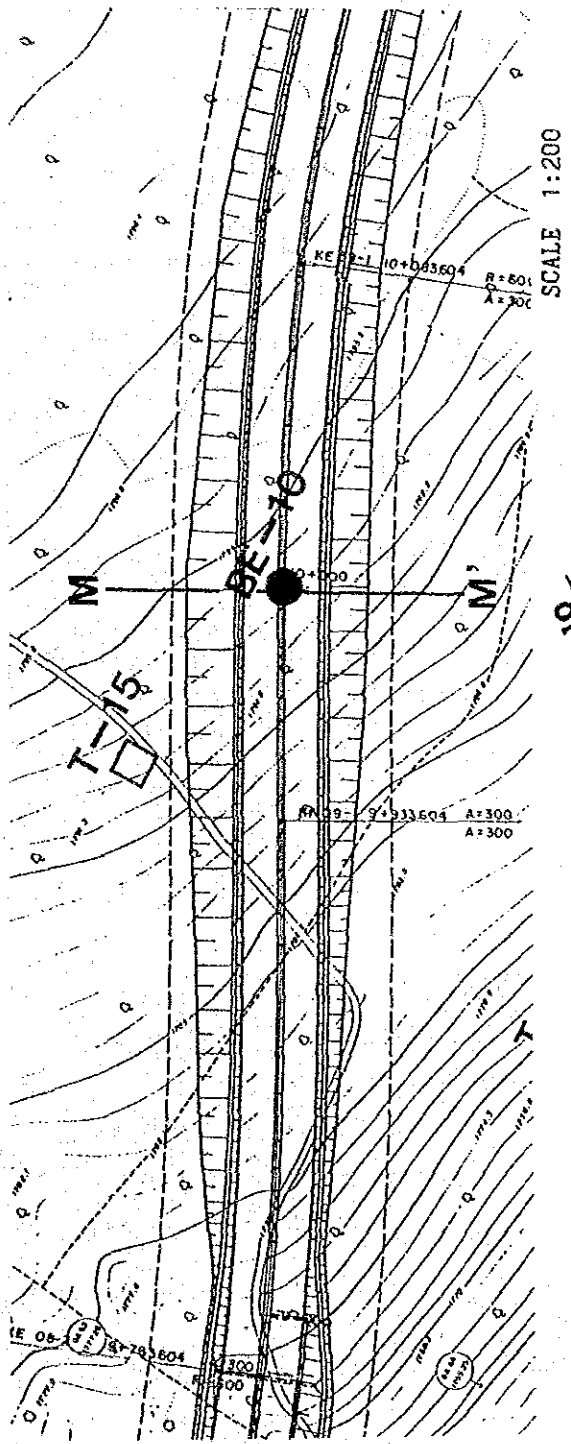
- S Red Soil
- Plh: High Weathered Trachyte

SCALE 1:2000



SCALE
V 1:200
H 1:500

Fig GEOLOGICAL SECTION (12)



LEGEND

- S Red soil
- Tvt'1 Trachyte agglomerate
- Tvt 1 Trachyte (High weathered)

V = 1:200

SCALE

H = 1:500

Fig GEOLOGICAL SECTION (13)

