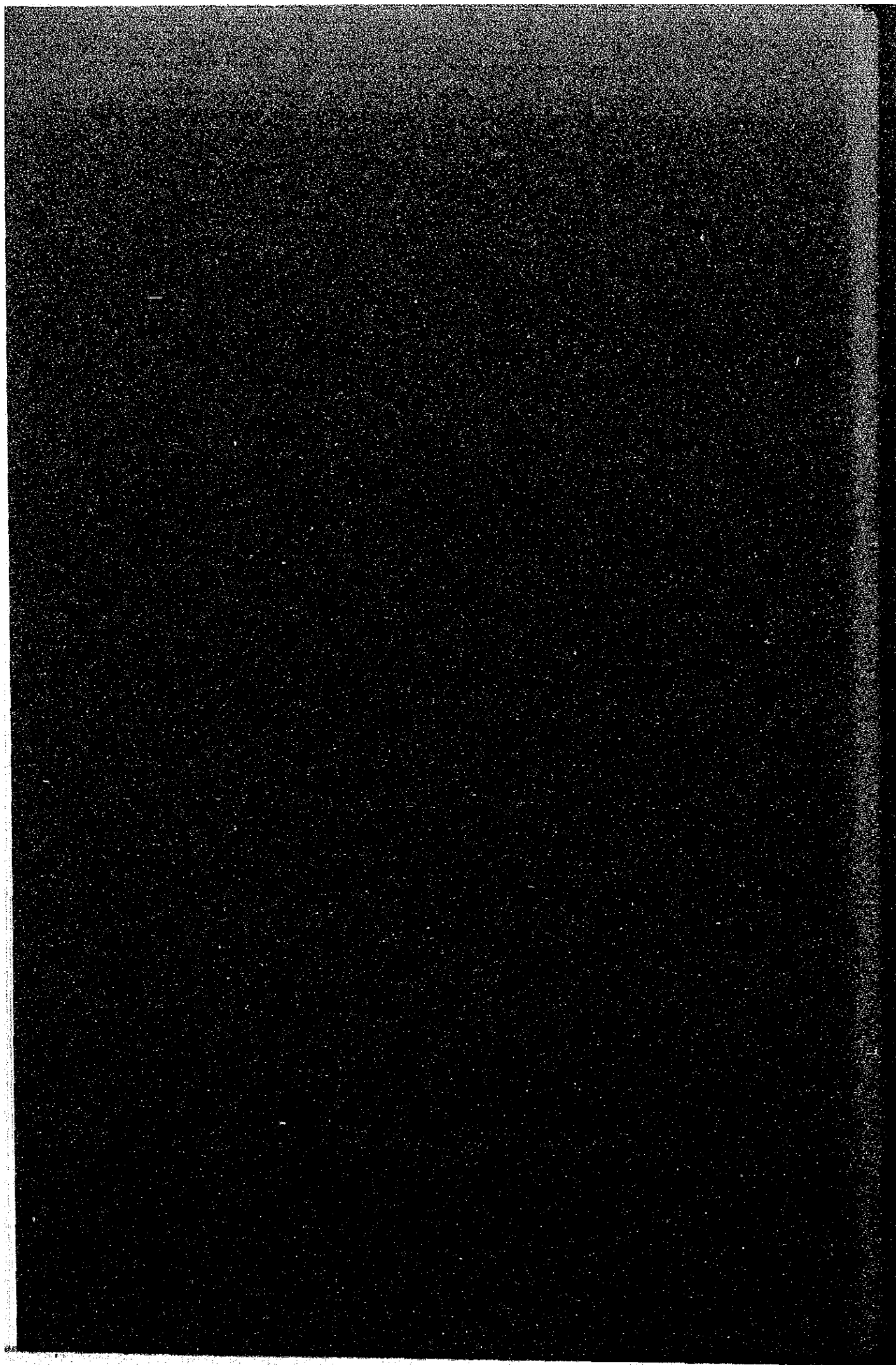


APPENDIXES FOR CHAPTER 8



APPENDIX NOTE 8.2 GEOLOGIC FORMATION OF THE ROADS AND EARTHWORK MATERIALS

8.2.1 Parañaque-Sucat Road (A-Route)

The geologic formation of the route consists of tuffaceous shale, silt stone and sand stone of the Neogen-Tertiary Quarternary, which is covered with silty clay and silty clayey sand in the hilly region and with sand, silty sand and silty clay in the coastal region. In the stretch between STA. 0+00 and STA. 5+400 the ground surface is covered with silty clayey sand and light brown silty clay mingled with some weathered shale and silt rock fragments, the standard penetration value N thereof being in the range of 11 - 40. The thickness of such a stratum is comparatively thin and is in the range of 1.5 - 3.0 m, which is adjacent to tuffaceous shale and silt stone of basal part. The ground water level in this area is about 3.0 m below the ground surface. Alluvium stratum (Fluvial beach deposit) distributes in the stretch between STA. 5+400 and STA. 8+600, the thickness thereof increases abruptly from the STA. 7+800 and beyond.

Alluvium deposit here consists of light or dark gray coarse to fine sand with a little fine gravel and olive brownish gray silty clay with some fine sand, the standard penetration value of N thereof being in the range of 1 - 15 in silty clay and 2 - 24 in the coarse of fine sand with gravel. The thickness of such stratum is in the range of 6.0 - 7.0 m in the stretch of STA. 5+400 to STA. 7+800 and 10.0 m - 11.5 m in the sea bottom in the stretch of STA. 7+800 to STA. 8+600.

The ground water level in this area is 0.5 - 1.5 m from the ground surface on the land side where the ground elevation is 0.7 m above sea level. Beneath such a soft stratum lies tuffaceous siltstone and sand stone as basal part. In such a stratum lies a thin stratum of corallian limestone of about 1.0 m in thickness, the standard penetration value of this thin stratum is in the range of 45/30 - 73/30 on its upper surface.

8.2.2 Zapote-Alabang Road (B-Route)

The geologic formation of this route consists of tuffaceous shale silt stone and sand stone of the Neogen-Tertiary Quarternary, which is covered thickly with silty clay in the hilly region and with coarse to fine sand and silty clay in the coastal region of the Bay. Namely, in the stretch between the starting point of the route and STA. 9+00, which is the hilly region, is covered with light dark brown silty clay with a little fine sand, where the standard penetration value N is in the range of 8 - 25. Its thickness is in the range of 3.5 - 6.0 m and is adjacently in contact with tuffaceous shale, silt stone and sand stone of basal part. The ground water level in this route is in the depth of the range of 4.5 - 10.0 m below the ground surface.

In the stretch STA. 9+00 to STA. 11+600 of this route Alluvial

stratum (River Alluvial and Sea Alluvial) distributes, where the stratum thickness abruptly increase from STA. 11+400 and beyond. Such Alluvial stratum consists of light to dark gray coarse to fine sand with fine gravel and brown to olive gray silty clay with some fine sand, the standard penetration value N thereof remains in the range of 1.0 - 12.0 in silty clay and in the range of 4 - 47 in coarse to fine sand. The thickness of such stratum is in the range of 5.0 - 6.0 m in the stretch STA. 11+200 on the land side and in the thickness of about 11.0 m in the stretch STA. 11+200 to STA. 11+600 on the sea side.

Underneath of such soft stratum there lies the distribution of tuffaceous shale, silt stone and sand stone as the basal part, the standard penetration value N thereof is in the range of 58/30 - 60/5 on the upper surface of the basal part.

8.2.3 Taguig-Las Piñas-Muntinlupa Loop Road (C-Route)

The geologic formation of this route consists of tuffaceous shale, silt stone and sand stone of Neogen-Tertiary Quarternary Pliocene Pleistocene Period as its basal part and soft stratum covering thereon. Tuffaceous shale, silt stone and sand stone here belong to soft rock, the standard penetration value N thereof remains in the range of 70/30 - 60/3, and its uni-axial compressive strength q_u is in the range of 20 - 63 kg/cm³.

The soft rock stratum covering such a basal part is brownish gray clayey silt and light gray silty clay with some fine sand and also light brown silty clayey sand, its standard penetration value N remains in the range of 8 - 30, and its thickness is in the range of 2.30 - 7.00 m.

In the river beds and valleys, where usually the thickness of such coverings are thin, the basal part exposes on the ground surface directly and such characteristics are commonly observed on the whole length of the route.

The ground water level along this route is 3.0 - 10.0 m below the ground surface, comparatively deep compared with those on other routes.

Such geologic characteristic of this route gives a merit to structures to be built to enable economizing the type of their foundations resting footings directly on the exposed basal part of the ground without using any piles.

8.2.4 Fill Earthwork Materials

The following three locations were selected to test filling materials for the earthwork. Samples were tested with Compaction Test and CBR Test.

TP-1, 2, 3, sampled at Susana Height, Alabang, Muntinlupa.
TP-4, 5, 6, sampled at South Luzon Expressway, at San Pedro,
Laguna.
TP7, 8, 9, sampled at South Luzon Expressway, at Patatan,
Muntinlupa.

The results of these tests are presented in Appendix Table 8.2-2. According to Appendix Table the optimum moisture content is in the range of 16.0 - 40.5%, the maximum dry density in the range of 1.301 - 1.710 tons/m³, the CBR value in the range of 4.6 - 19.7% in the case of 10 blows and if the maximum and minimum ones (TP 6 and 7) are excluded it is in the range of 5.4 - 12.7%, the average being 8.4%.

The results of Atterberg Limit Test conducted only for fine particles of soils show the Liquid Limit of 34% and the Plastic Index of 12%.

Based on these test results the filling materials sampled at the aforementioned locations are evaluated to be favorable for filling purpose in the earthwork.

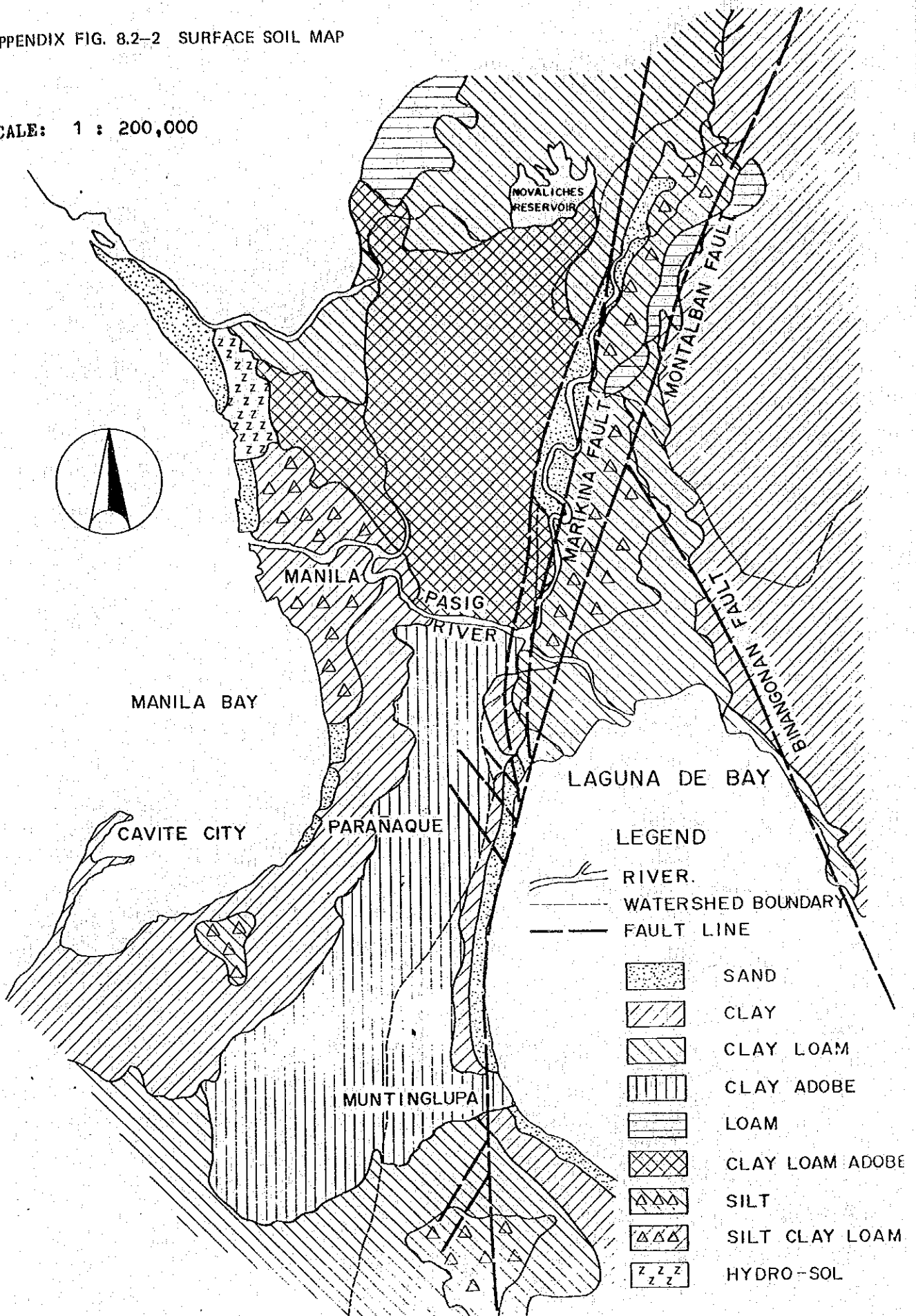
SCALE: 1:1,000,000

APPENDIX FIG. 8.2-1 GENERAL GEOLOGIC MAP

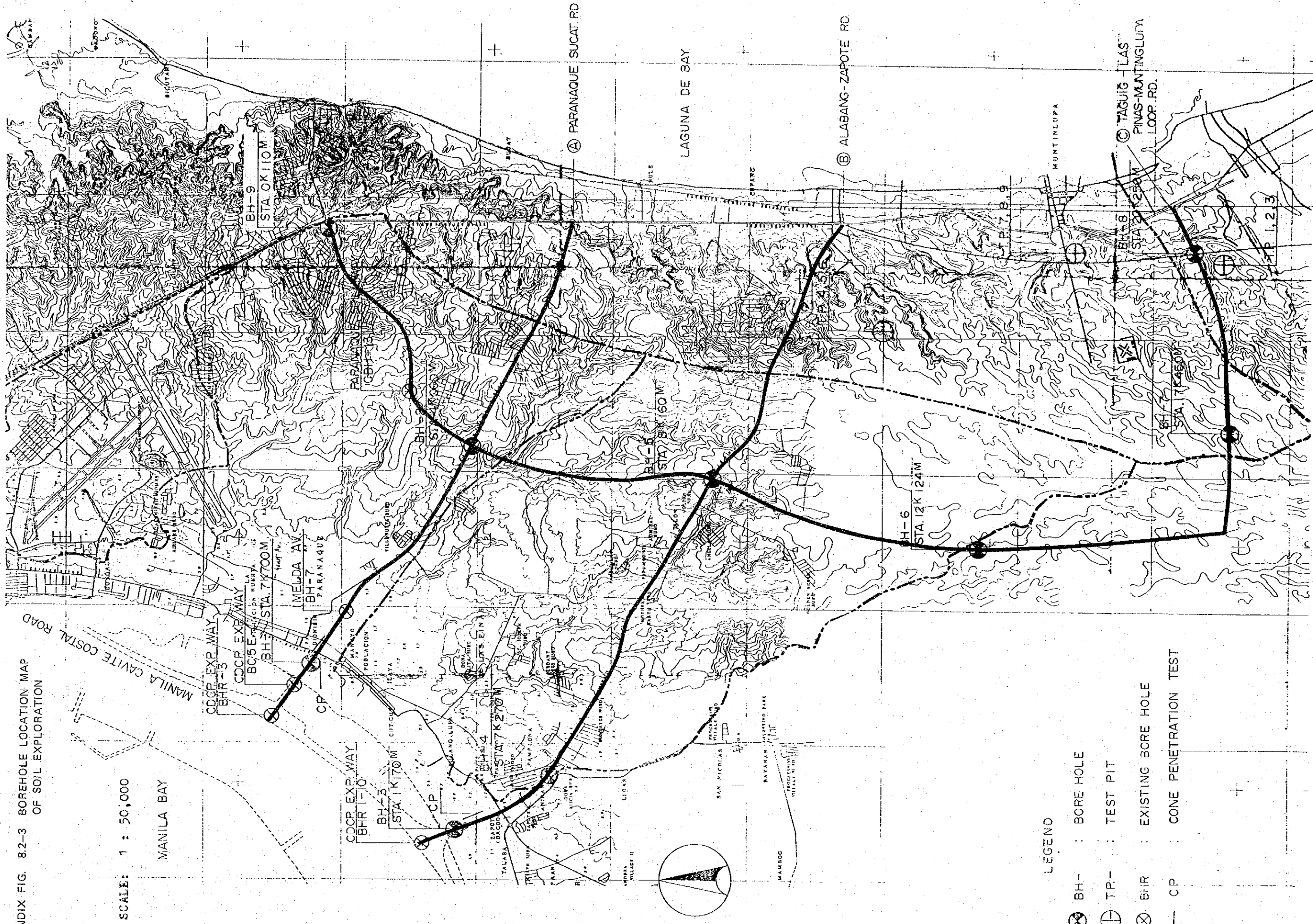


APPENDIX FIG. 8.2-2 SURFACE SOIL MAP

SCALE: 1 : 200,000



APPENDIX FIG. 8.2-3 BOREHOLE LOCATION MAP OF SOIL EXPLORATION



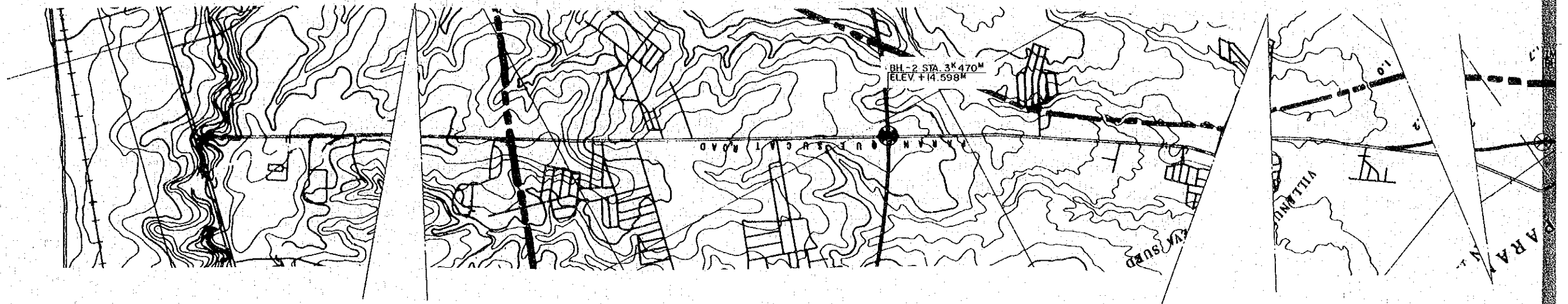
SCALE: 1 : 50,000

MANILA BAY

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- ⊗ BH- : BORE HOLE
- ⊕ T.P.- : TEST PIT
- ⊗ BH-R : EXISTING BORE HOLE
- CP : CONE PENETRATION TEST

APPENDIX FIG. 8.2-4 SOIL PROFILE OF A-ROUTE

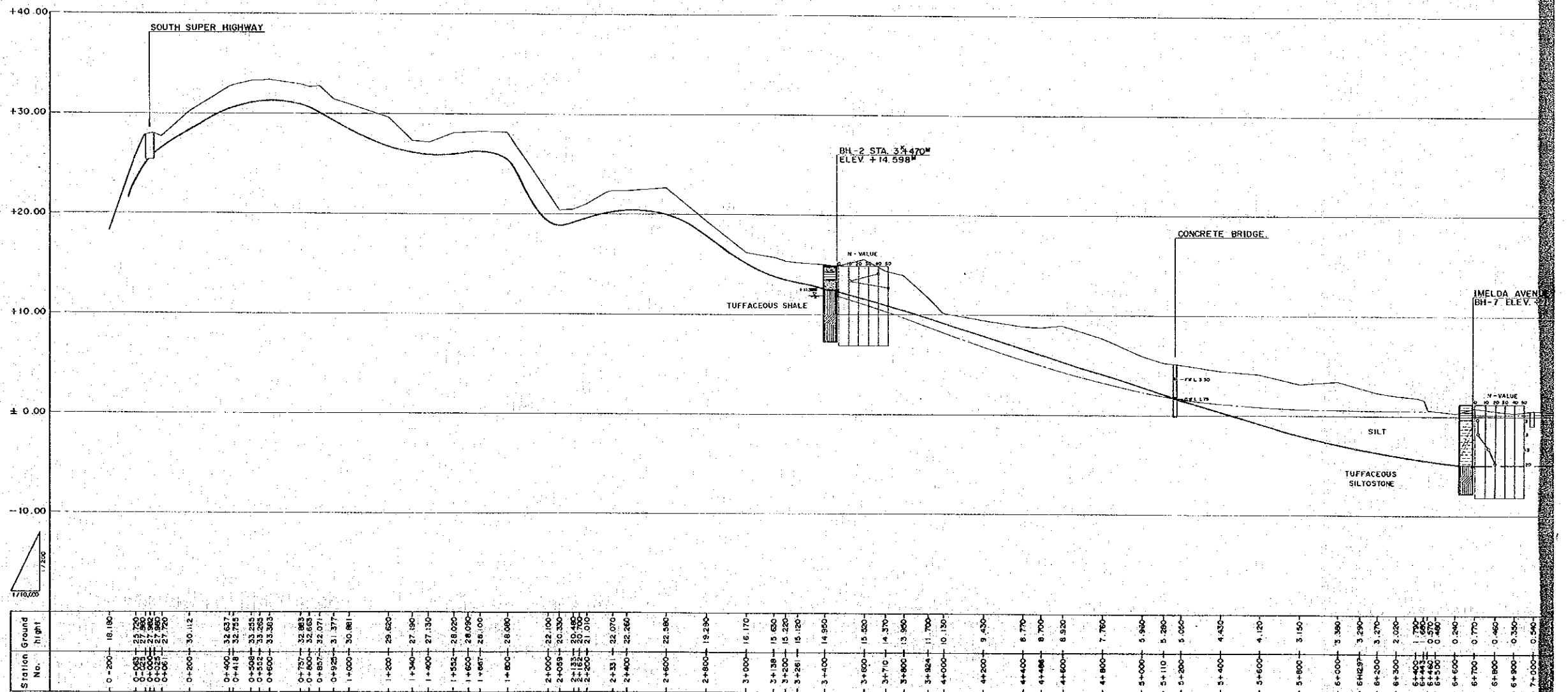


Ⓐ PARANAQUE - SUCAT ROAD

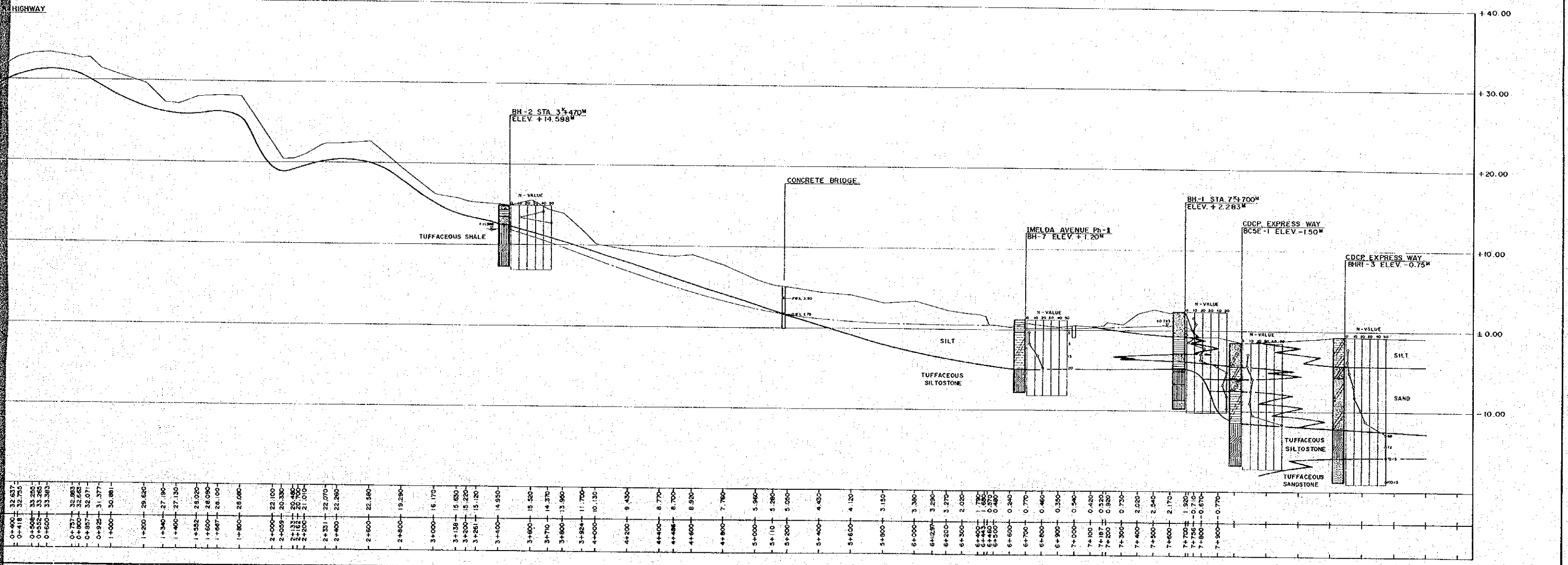
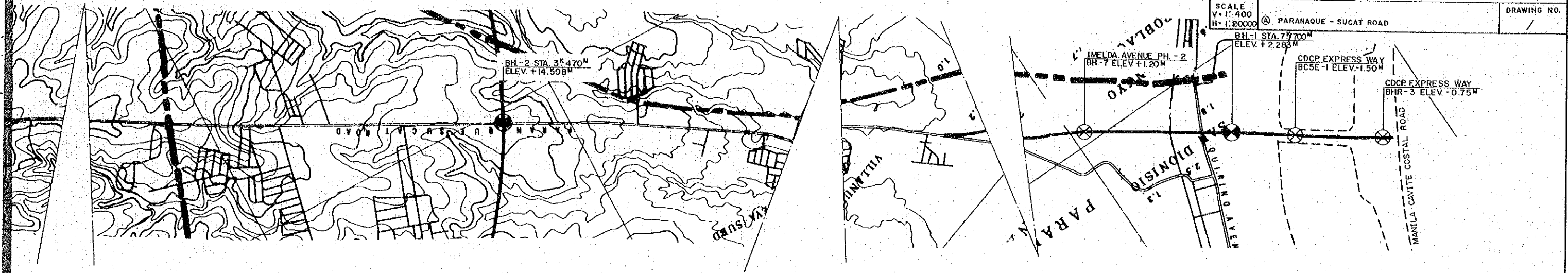
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- ⊗ BH - BORE HOLE.
- ⊗ BHR - EXISTING BORE HOLE.

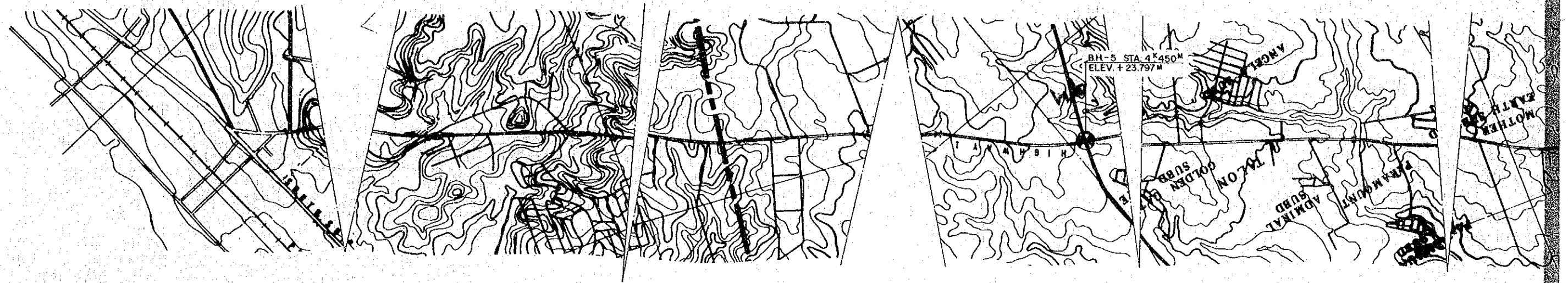
PERIOD	STRATA	DESCRIPTION
QUATERNARY	RECENT	SILTY AND CLAYEY COURSE TO FINE SAND WITH TRACES OF FINE GRAVEL. PENETRATION RESISTANCE RANGING FROM 8 TO 18 BLOWS PER 30cm.
	CLAY AND SILT	MOIST SILTY CLAY AND CLAYEY SILT WITH COURSE TO FINE SAND AND TRACE OF FINE GRAVEL. PENETRATION RESISTANCE RANGING FROM 2 TO 22 BLOWS PER 30cm. IN THE RELATIVELY HIGH GROUND ELEVATION AREA, CLAY ADOBE WITH SOME WEATHERED TUFF FRAGMENT. PENETRATION RESISTANCE RANGING FROM 8 TO 40 BLOWS PER 30cm.
TERTIARY ~ QUATERNARY	PLIOCENE ~ PLEISTOCENE	COMPOSED PRINCIPALLY OF TUFFACEOUS SEDIMENTARY, TUFFACEOUS SHALE, SILTSTONE AND SANDSTONE.



Station No.	Height
0+200	18.180
0+250	21.700
0+300	23.580
0+350	24.580
0+400	24.720
0+450	30.112
0+500	32.637
0+550	32.755
0+600	33.225
0+650	33.283
0+700	32.883
0+750	32.071
0+800	31.377
0+850	30.981
0+900	29.620
0+950	27.190
1+000	27.130
1+050	28.020
1+100	28.090
1+150	28.100
1+200	28.080
1+250	26.100
1+300	25.620
1+350	25.290
1+400	19.290
1+450	16.170
1+500	15.620
1+550	15.220
1+600	15.120
1+650	14.950
1+700	15.520
1+750	14.370
1+800	13.900
1+850	11.700
1+900	10.130
1+950	9.430
2+000	6.770
2+050	6.700
2+100	6.520
2+150	7.780
2+200	5.960
2+250	5.280
2+300	5.020
2+350	4.430
2+400	4.120
2+450	3.150
2+500	3.390
2+550	3.290
2+600	3.270
2+650	2.020
2+700	1.720
2+750	0.680
2+800	0.580
2+850	0.240
2+900	0.170
2+950	0.460
3+000	0.330
3+050	0.540



APPENDIX FIG. 8.2 - 5 SOIL PROFILE OF B-ROUTE

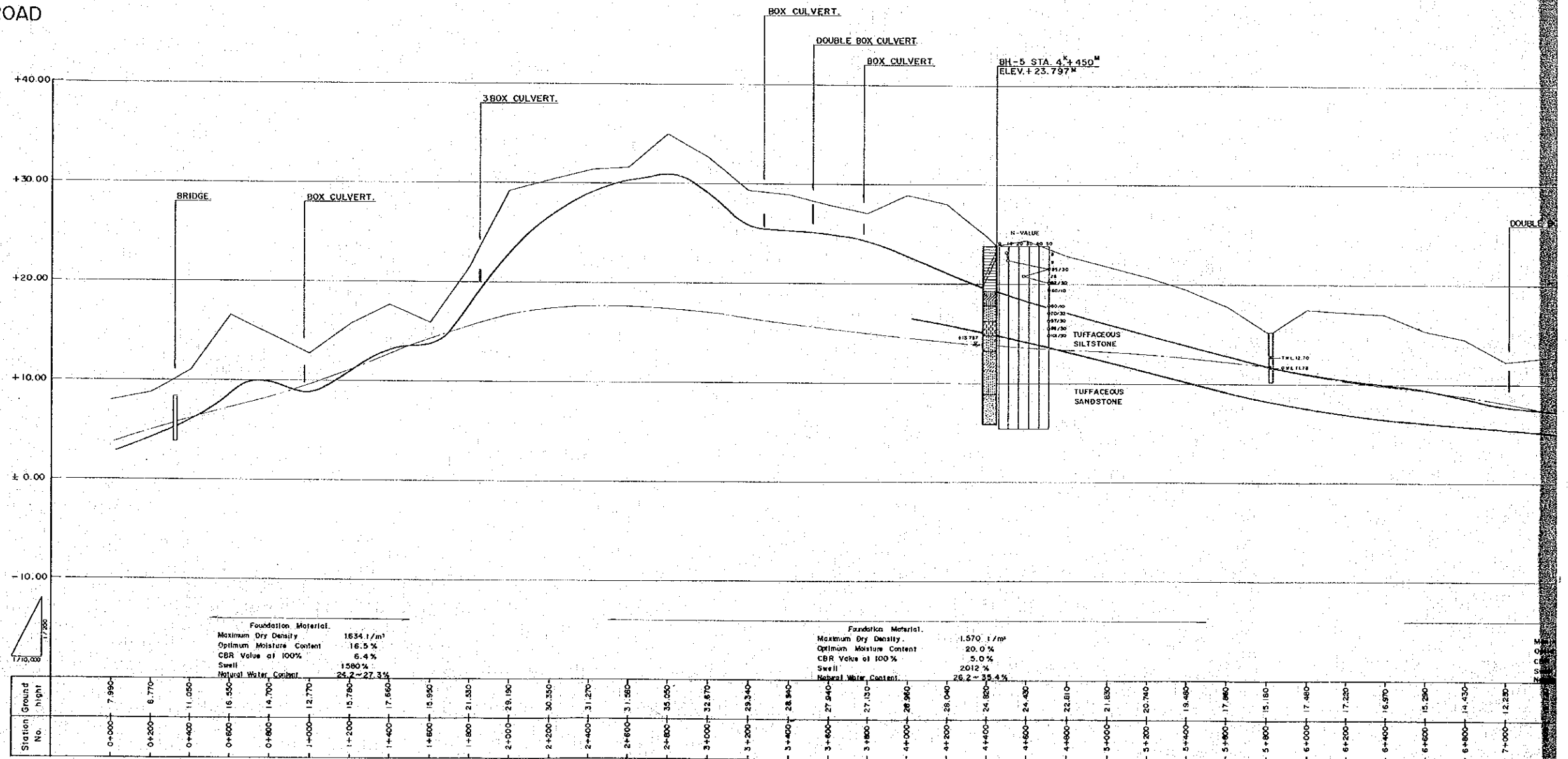


Ⓑ ALABANG - ZAPOTE ROAD

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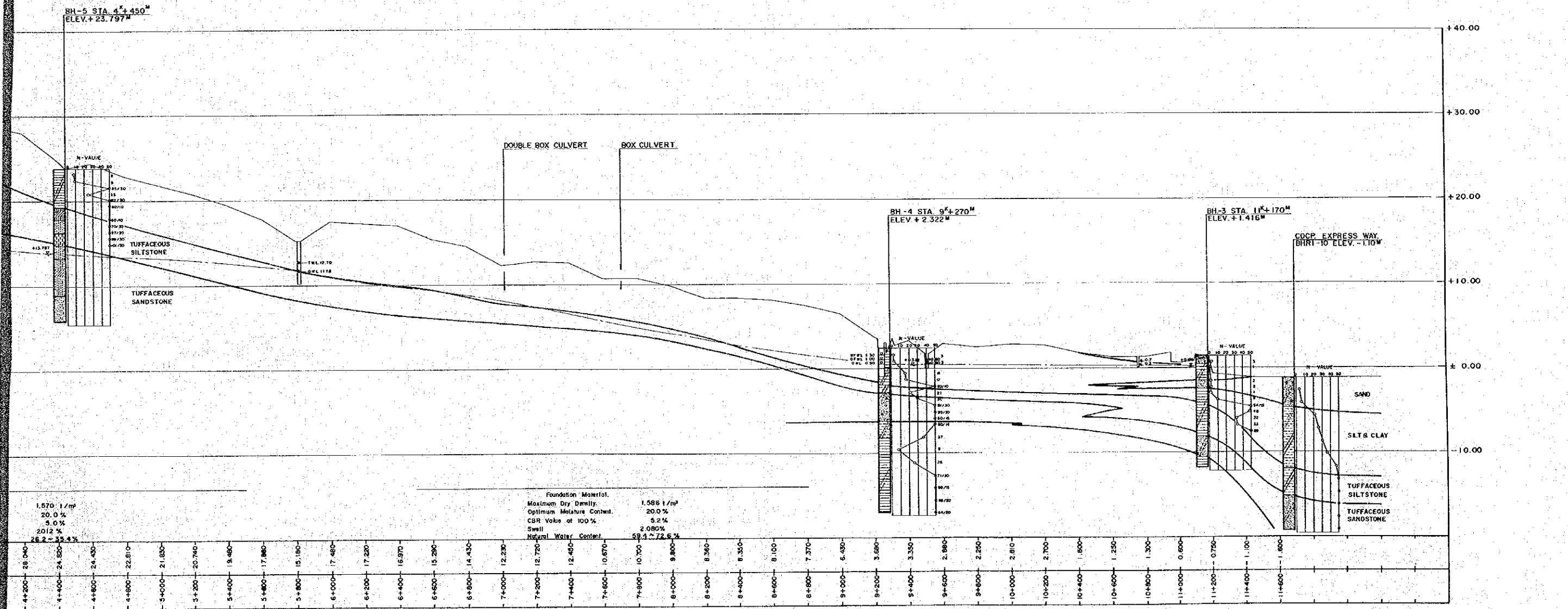
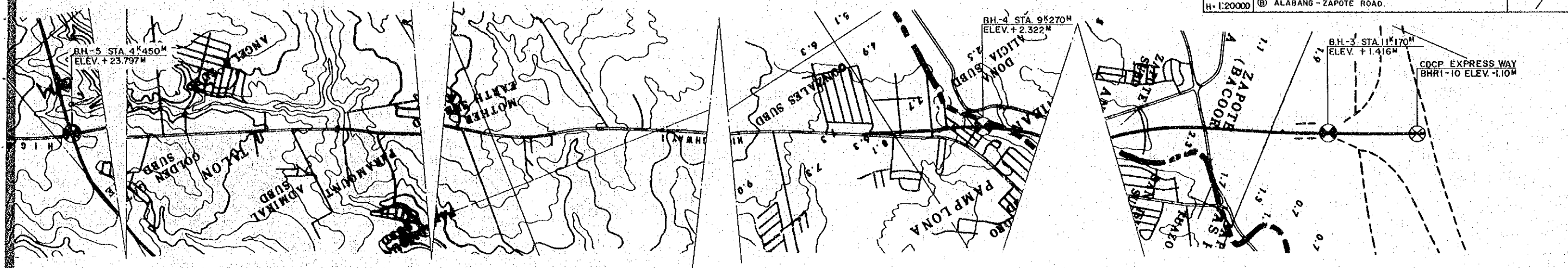
- ⊗ BH - BORE HOLE.
- ⊗ BHR - EXISTING BORE HOLE.

PERIOD	STRATA	DESCRIPTION
QUATERNARY	RECENT	SILTY AND CLAYEY COURSE TO FINE SAND WITH TRACES OF FINE GRAVEL, PENETRATION RESISTANCE RANGING FROM 8 TO 16 BLOWS PER 30cm.
	CLAY AND SILT	MOIST SILTY CLAY AND CLAYEY SILT WITH COURSE TO FINE SAND AND TRACE OF FINE GRAVEL, PENETRATION RESISTANCE RANGING FROM 2 TO 22 BLOWS PER 30cm, IN THE RELATIVELY HIGH GROUND ELEVATION AREA, CLAY ADHORE WITH SOME WEATHERED TUFF FRAGMENT, PENETRATION RESISTANCE RANGING FROM 8 TO 40 BLOWS PER 30cm.
TERTIARY ~ QUATERNARY	PLIOCENE ~ PLEISTOCENE	TUFF (GUADALUPE FORMATION) COMPOSED PRINCIPALLY OF TUFFACEOUS SEDIMENTARY, TUFFACEOUS SHALE, SILTSTONE AND SANDSTONE, TUFFACEOUS SHALE AND SILT STONE



Station No.	Ground height
0+000	7.990
0+200	6.770
0+400	11.050
0+600	16.550
0+800	14.700
1+000	12.770
1+200	15.780
1+400	17.860
1+600	15.950
1+800	21.330
2+000	29.180
2+200	30.350
2+400	31.270
2+600	31.380
2+800	35.050
3+000	32.870
3+200	29.340
3+400	28.840
3+600	27.940
3+800	27.150
4+000	26.960
4+200	28.040
4+400	24.820
4+600	24.430
4+800	22.810
5+000	21.850
5+200	20.740
5+400	19.480
5+600	17.880
5+800	15.180
6+000	17.480
6+200	17.220
6+400	16.570
6+600	15.290
6+800	14.430
7+000	12.230

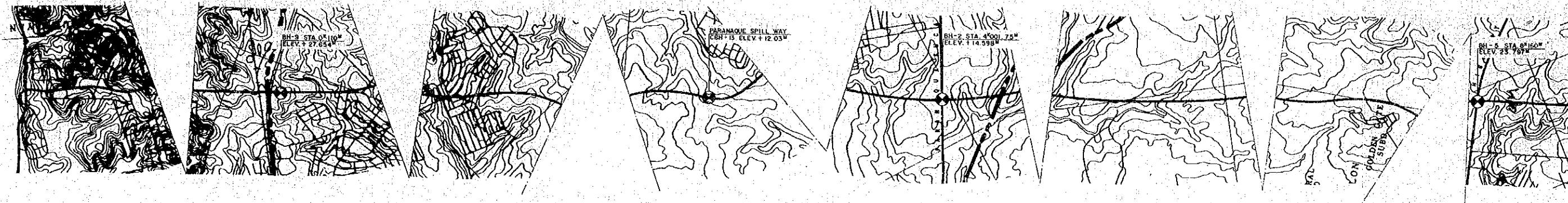
Foundation Material	Maximum Dry Density	Optimum Moisture Content	CBR Value at 100%	Swell	Natural Water Content
Foundation Material	1634 t/m ³	16.5 %	6.4 %	1580 %	25.2 - 27.3 %
Foundation Material	1570 t/m ³	20.0 %	5.0 %	2012 %	25.2 - 35.4 %



Foundation Material:
 Maximum Dry Density: 1.585 t/m³
 Optimum Moisture Content: 20.0%
 CSR Value at 100%: 5.2%
 Swell: 2.080%
 Natural Water Content: 59.1 ~ 72.6%

1.570 t/m³
 20.0%
 5.0%
 20.12%
 26.2 ~ 33.4%

APPENDIX FIG. 8.2 - 6 SOIL PROFILE OF C-ROUTE

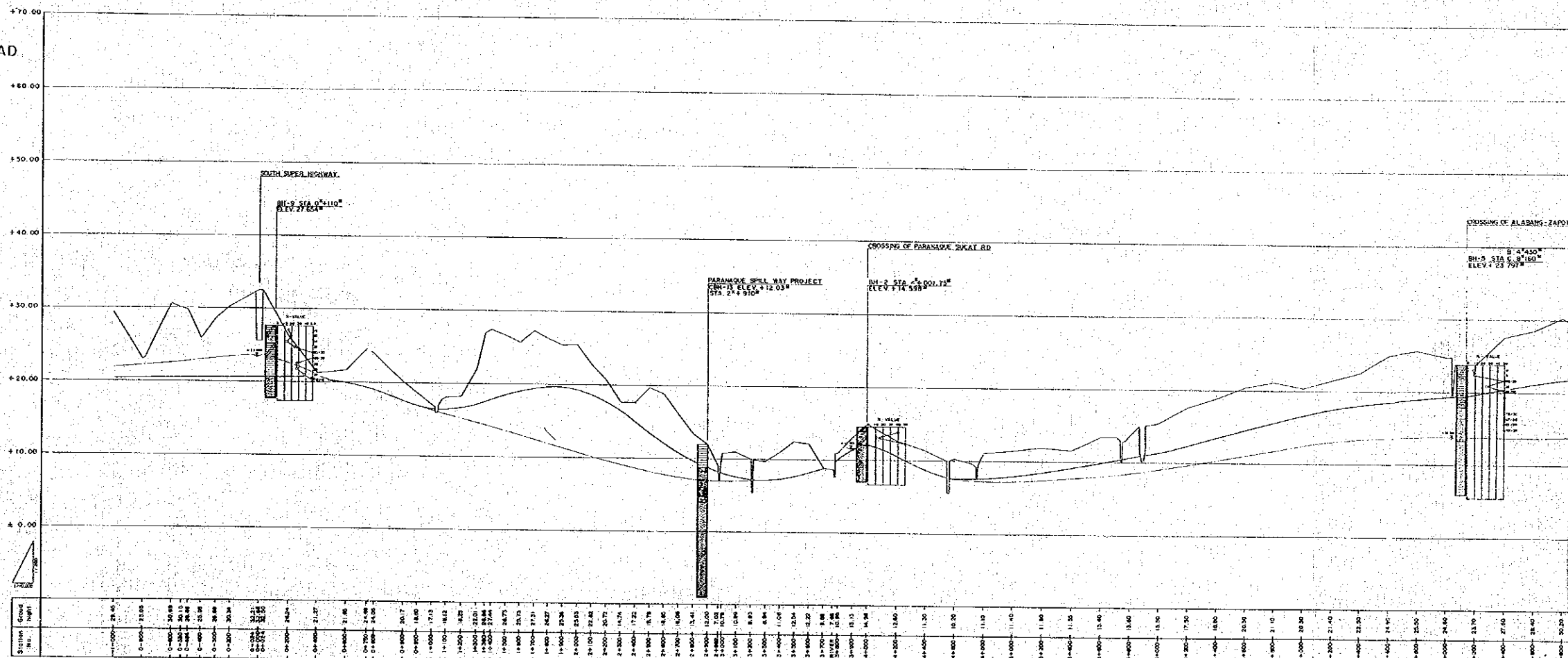


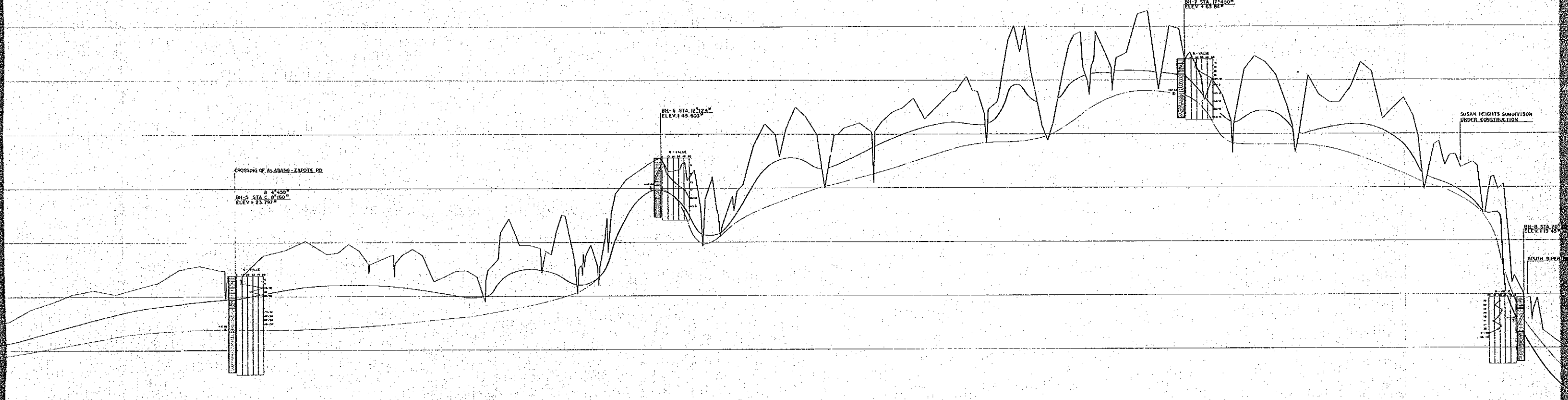
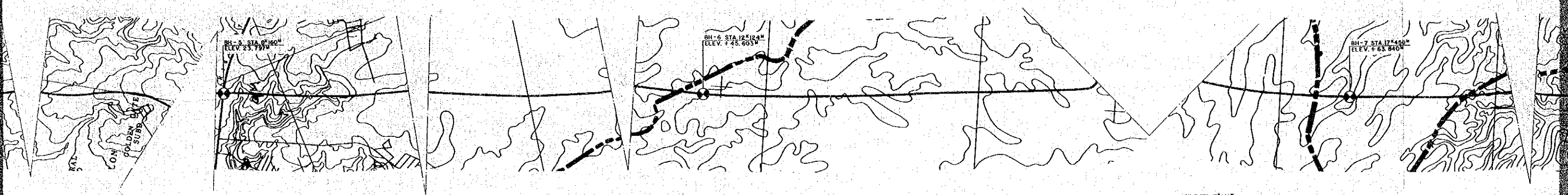
© TAGUIG-LAS PINAS -MUNTINGLUPA LOOP ROAD

LEGEND

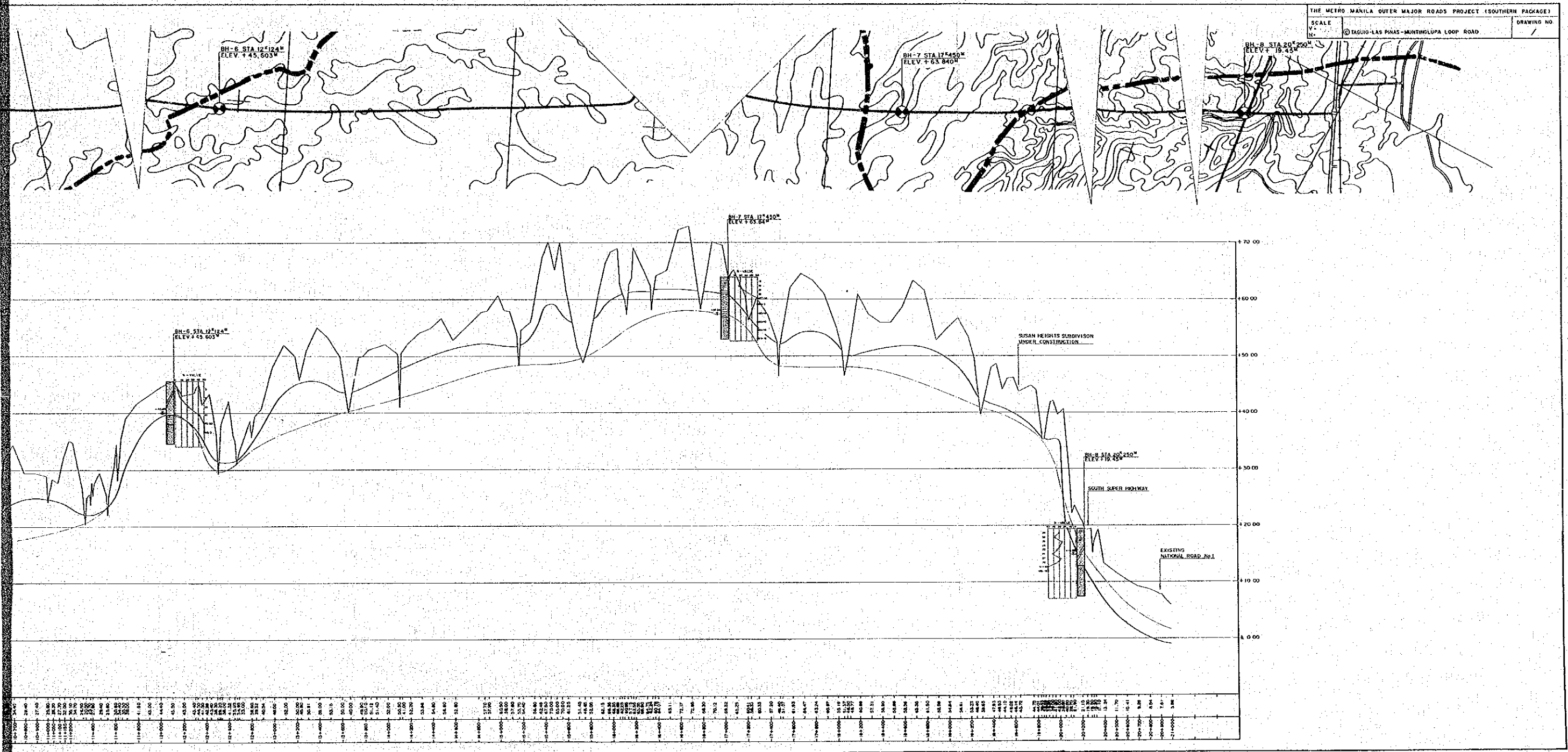
- BH - BORE HOLE
- ⊗ BHR - EXISTING BORE HOLE

PERIOD	STRATA	DESCRIPTION
QUATERNARY	RECENT	SILTY AND CLAYEY COARSE TO FINE SAND WITH TRACES OF FINE GRAVEL. PENETRATION RESISTANCE RANGING FROM 8 TO 18 BLOWS PER 30cm.
	CLAY AND SILT	MOIST SILTY CLAY AND CLAYEY SILT WITH COARSE TO FINE SAND AND TRACE OF FINE GRAVEL. PENETRATION RESISTANCE RANGING FROM 2 TO 22 BLOWS PER 30cm. IN THE RELATIVELY HIGH GROUND ELEVATION AREA, CLAY SOILS WITH SOME WEATHERED TUFF FRAGMENT. PENETRATION RESISTANCE RANGING FROM 8 TO 40 BLOWS PER 30cm.
TERTIARY	PLIOCENE	TUFF BRINDALPE FORMATION COMPOSED PRINCIPALLY OF EFFUSIVE SANDSTONE, SILTSTONE AND SHALE.
QUATERNARY	PLEISTOCENE	EFFUSIVE SANDSTONE AND SILTSTONE.





0+000	17.70	0+200	17.50	0+400	16.80	0+600	15.50	0+800	14.60	1+000	13.70	1+200	12.50	1+400	11.40	1+600	10.30	1+800	9.20	2+000	8.10	2+200	7.00	2+400	5.90	2+600	4.80	2+800	3.70	3+000	2.60	3+200	1.50	3+400	0.40	3+600	-0.70	3+800	-1.80	4+000	-2.90	4+200	-4.00	4+400	-5.10	4+600	-6.20	4+800	-7.30	5+000	-8.40	5+200	-9.50	5+400	-10.60	5+600	-11.70	5+800	-12.80	6+000	-13.90	6+200	-15.00	6+400	-16.10	6+600	-17.20	6+800	-18.30	7+000	-19.40	7+200	-20.50	7+400	-21.60	7+600	-22.70	7+800	-23.80	8+000	-24.90	8+200	-26.00	8+400	-27.10	8+600	-28.20	8+800	-29.30	9+000	-30.40	9+200	-31.50	9+400	-32.60	9+600	-33.70	9+800	-34.80	10+000	-35.90	10+200	-37.00	10+400	-38.10	10+600	-39.20	10+800	-40.30	11+000	-41.40	11+200	-42.50	11+400	-43.60	11+600	-44.70	11+800	-45.80	12+000	-46.90	12+200	-48.00	12+400	-49.10	12+600	-50.20	12+800	-51.30	13+000	-52.40	13+200	-53.50	13+400	-54.60	13+600	-55.70	13+800	-56.80	14+000	-57.90	14+200	-59.00	14+400	-60.10	14+600	-61.20	14+800	-62.30	15+000	-63.40	15+200	-64.50	15+400	-65.60	15+600	-66.70	15+800	-67.80	16+000	-68.90	16+200	-70.00	16+400	-71.10	16+600	-72.20	16+800	-73.30	17+000	-74.40	17+200	-75.50	17+400	-76.60	17+600	-77.70	17+800	-78.80	18+000	-79.90	18+200	-81.00	18+400	-82.10	18+600	-83.20	18+800	-84.30	19+000	-85.40	19+200	-86.50	19+400	-87.60	19+600	-88.70	19+800	-89.80	20+000	-90.90	20+200	-92.00	20+400	-93.10	20+600	-94.20	20+800	-95.30	21+000	-96.40	21+200	-97.50	21+400	-98.60	21+600	-99.70	21+800	-100.80	22+000	-101.90	22+200	-103.00	22+400	-104.10	22+600	-105.20	22+800	-106.30	23+000	-107.40	23+200	-108.50	23+400	-109.60	23+600	-110.70	23+800	-111.80	24+000	-112.90	24+200	-114.00	24+400	-115.10	24+600	-116.20	24+800	-117.30	25+000	-118.40	25+200	-119.50	25+400	-120.60	25+600	-121.70	25+800	-122.80	26+000	-123.90	26+200	-125.00	26+400	-126.10	26+600	-127.20	26+800	-128.30	27+000	-129.40	27+200	-130.50	27+400	-131.60	27+600	-132.70	27+800	-133.80	28+000	-134.90	28+200	-136.00	28+400	-137.10	28+600	-138.20	28+800	-139.30	29+000	-140.40	29+200	-141.50	29+400	-142.60	29+600	-143.70	29+800	-144.80	30+000	-145.90	30+200	-147.00	30+400	-148.10	30+600	-149.20	30+800	-150.30	31+000	-151.40	31+200	-152.50	31+400	-153.60	31+600	-154.70	31+800	-155.80	32+000	-156.90	32+200	-158.00	32+400	-159.10	32+600	-160.20	32+800	-161.30	33+000	-162.40	33+200	-163.50	33+400	-164.60	33+600	-165.70	33+800	-166.80	34+000	-167.90	34+200	-169.00	34+400	-170.10	34+600	-171.20	34+800	-172.30	35+000	-173.40	35+200	-174.50	35+400	-175.60	35+600	-176.70	35+800	-177.80	36+000	-178.90	36+200	-180.00	36+400	-181.10	36+600	-182.20	36+800	-183.30	37+000	-184.40	37+200	-185.50	37+400	-186.60	37+600	-187.70	37+800	-188.80	38+000	-189.90	38+200	-191.00	38+400	-192.10	38+600	-193.20	38+800	-194.30	39+000	-195.40	39+200	-196.50	39+400	-197.60	39+600	-198.70	39+800	-199.80	40+000	-200.90	40+200	-202.00	40+400	-203.10	40+600	-204.20	40+800	-205.30	41+000	-206.40	41+200	-207.50	41+400	-208.60	41+600	-209.70	41+800	-210.80	42+000	-211.90	42+200	-213.00	42+400	-214.10	42+600	-215.20	42+800	-216.30	43+000	-217.40	43+200	-218.50	43+400	-219.60	43+600	-220.70	43+800	-221.80	44+000	-222.90	44+200	-224.00	44+400	-225.10	44+600	-226.20	44+800	-227.30	45+000	-228.40	45+200	-229.50	45+400	-230.60	45+600	-231.70	45+800	-232.80	46+000	-233.90	46+200	-235.00	46+400	-236.10	46+600	-237.20	46+800	-238.30	47+000	-239.40	47+200	-240.50	47+400	-241.60	47+600	-242.70	47+800	-243.80	48+000	-244.90	48+200	-246.00	48+400	-247.10	48+600	-248.20	48+800	-249.30	49+000	-250.40	49+200	-251.50	49+400	-252.60	49+600	-253.70	49+800	-254.80	50+000	-255.90	50+200	-257.00	50+400	-258.10	50+600	-259.20	50+800	-260.30	51+000	-261.40	51+200	-262.50	51+400	-263.60	51+600	-264.70	51+800	-265.80	52+000	-266.90	52+200	-268.00	52+400	-269.10	52+600	-270.20	52+800	-271.30	53+000	-272.40	53+200	-273.50	53+400	-274.60	53+600	-275.70	53+800	-276.80	54+000	-277.90	54+200	-279.00	54+400	-280.10	54+600	-281.20	54+800	-282.30	55+000	-283.40	55+200	-284.50	55+400	-285.60	55+600	-286.70	55+800	-287.80	56+000	-288.90	56+200	-290.00	56+400	-291.10	56+600	-292.20	56+800	-293.30	57+000	-294.40	57+200	-295.50	57+400	-296.60	57+600	-297.70	57+800	-298.80	58+000	-299.90	58+200	-301.00	58+400	-302.10	58+600	-303.20	58+800	-304.30	59+000	-305.40	59+200	-306.50	59+400	-307.60	59+600	-308.70	59+800	-309.80	60+000	-310.90	60+200	-312.00	60+400	-313.10	60+600	-314.20	60+800	-315.30	61+000	-316.40	61+200	-317.50	61+400	-318.60	61+600	-319.70	61+800	-320.80	62+000	-321.90	62+200	-323.00	62+400	-324.10	62+600	-325.20	62+800	-326.30	63+000	-327.40	63+200	-328.50	63+400	-329.60	63+600	-330.70	63+800	-331.80	64+000	-332.90	64+200	-334.00	64+400	-335.10	64+600	-336.20	64+800	-337.30	65+000	-338.40	65+200	-339.50	65+400	-340.60	65+600	-341.70	65+800	-342.80	66+000	-343.90	66+200	-345.00	66+400	-346.10	66+600	-347.20	66+800	-348.30	67+000	-349.40	67+200	-350.50	67+400	-351.60	67+600	-352.70	67+800	-353.80	68+000	-354.90	68+200	-356.00	68+400	-357.10	68+600	-358.20	68+800	-359.30	69+000	-360.40	69+200	-361.50	69+400	-362.60	69+600	-363.70	69+800	-364.80	70+000	-365.90	70+200	-367.00	70+400	-368.10	70+600	-369.20	70+800	-370.30	71+000	-371.40	71+200	-372.50	71+400	-373.60	71+600	-374.70	71+800	-375.80	72+000	-376.90	72+200	-378.00	72+400	-379.10	72+600	-380.20	72+800	-381.30	73+000	-382.40	73+200	-383.50	73+400	-384.60	73+600	-385.70	73+800	-386.80	74+000	-387.90	74+200	-389.00	74+400	-390.10	74+600	-391.20	74+800	-392.30	75+000	-393.40	75+200	-394.50	75+400	-395.60	75+600	-396.70	75+800	-397.80	76+000	-398.90	76+200	-400.00	76+400	-401.10	76+600	-402.20	76+800	-403.30	77+000	-404.40	77+200	-405.50	77+400	-406.60	77+600	-407.70	77+800	-408.80	78+000	-409.90	78+200	-411.00	78+400	-412.10	78+600	-413.20	78+800	-414.30	79+000	-415.40	79+200	-416.50	79+400	-417.60	79+600	-418.70	79+800	-419.80	80+000	-420.90	80+200	-422.00	80+400	-423.10	80+600	-424.20	80+800	-425.30	81+000	-426.40	81+200	-427.50	81+400	-428.60	81+600	-429.70	81+800	-430.80	82+000	-431.90	82+200	-433.00	82+400	-434.10	82+600	-435.20	82+800	-436.30	83+000	-437.40	83+200	-438.50	83+400	-439.60	83+600	-440.70	83+800	-441.80	84+000	-442.90	84+200	-444.00	84+400	-445.10	84+600	-446.20	84+800	-447.30	85+000	-448.40	85+200	-449.50	85+400	-450.60	85+600	-451.70	85+800	-452.80	86+000	-453.90	86+200	-455.00	86+400	-456.10	86+600	-457.20	86+800	-458.30	87+000	-459.40	87+200	-460.50	87+400	-461.60	87+600	-462.70	87+800	-463.80	88+000	-464.90	88+200	-466.00	88+400	-467.10	88+600	-468.20	88+800	-469.30	89+000	-470.40	89+200	-471.50	89+400	-472.60	89+600	-473.70	89+800	-474.80	90+000	-475.90	90+200	-477.00	90+400	-478.10	90+600	-479.20	90+800	-480.30	91+000	-481.40	91+200	-482.50	91+400	-483.60	91+600	-484.70	91+800	-485.80	92+000	-486.90	92+200	-488.00	92+400	-489.10	92+600	-490.20	92+800	-491.30	93+000	-492.40	93+200	-493.50	93+400	-494.60	93+600	-495.70	93+800	-496.80	94+000	-497.90	94+200	-499.00	94+400	-500.10	94+600	-501.20	94+800	-502.30	95+000	-503.40	95+200	-504.50	95+400	-505.60	95+600	-506.70	95+800	-507.80	96+000	-508.90	96+200	-510.00	96+400	-511.10	96+600	-512.20	96+800	-513.30	97+000	-514.40	97+200	-515.50	97+400	-516.60	97+600	-517.70	97+800	-518.80	98+000	-519.90	98+200	-521.00	98+400	-522.10	98+600	-523.20	98+800	-524.30	99+000	-525.40	99+200	-526.50	99+400	-527.60	99+600	-528.70	99+800	-529.80	100+000	-530.90
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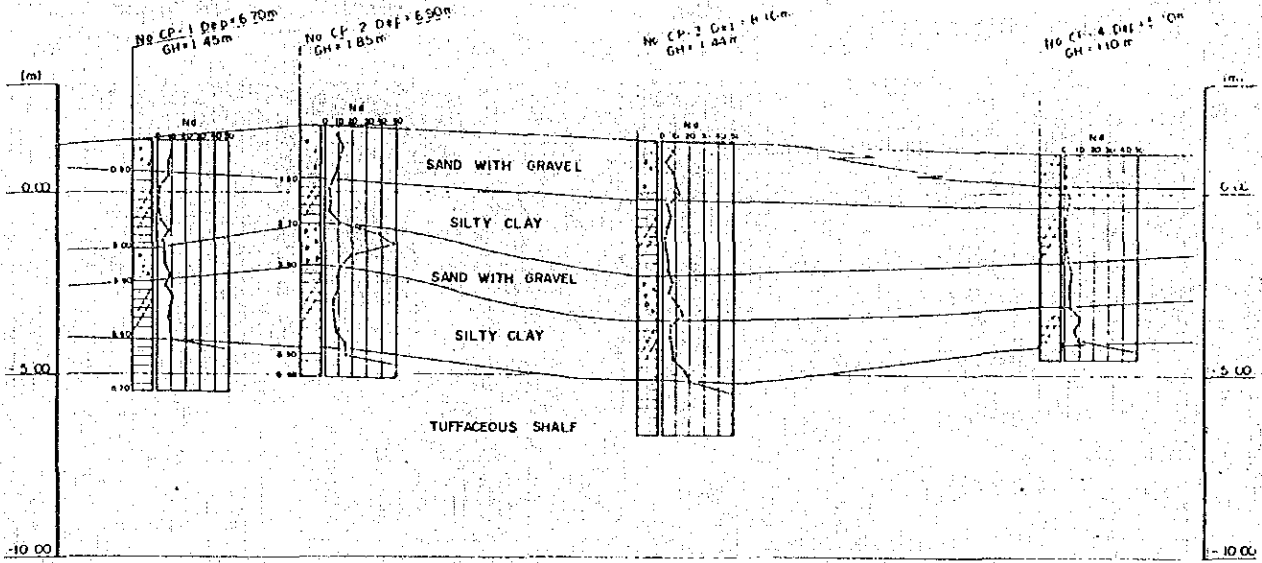


APPENDIX FIG. 8.2-7 GEOLOGIC PROFILE OF CONE PENETRATIONS

- LONGOS (BH-3) AREA -

SCALE: V = 1:200

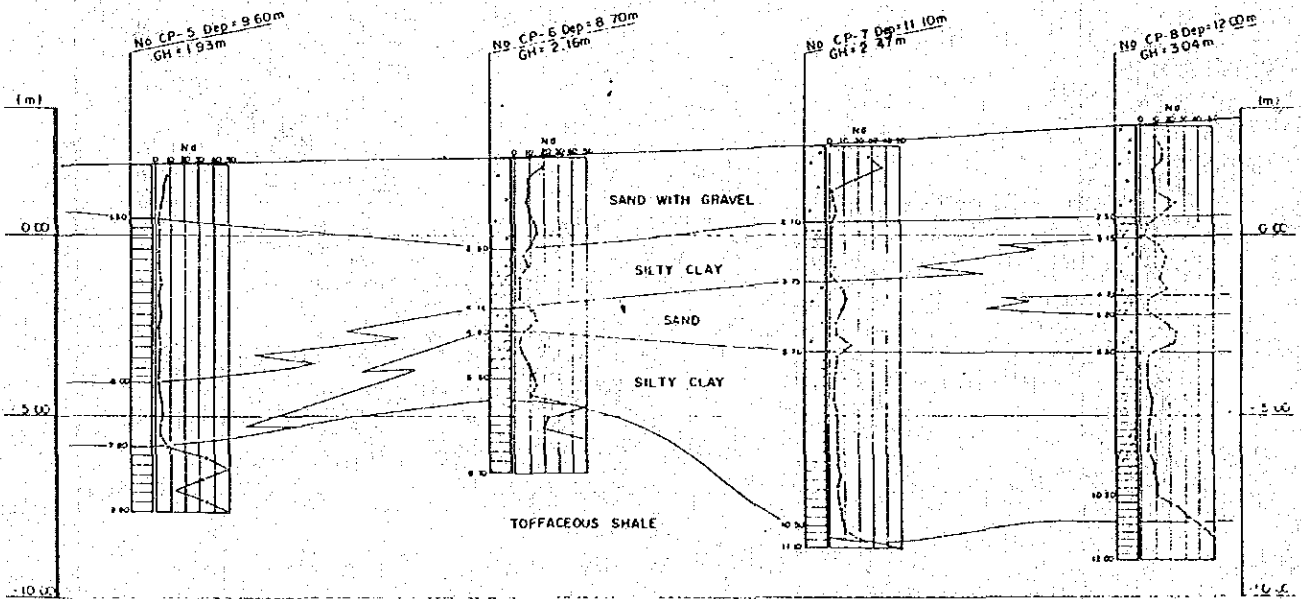
H = 1:800
N d N



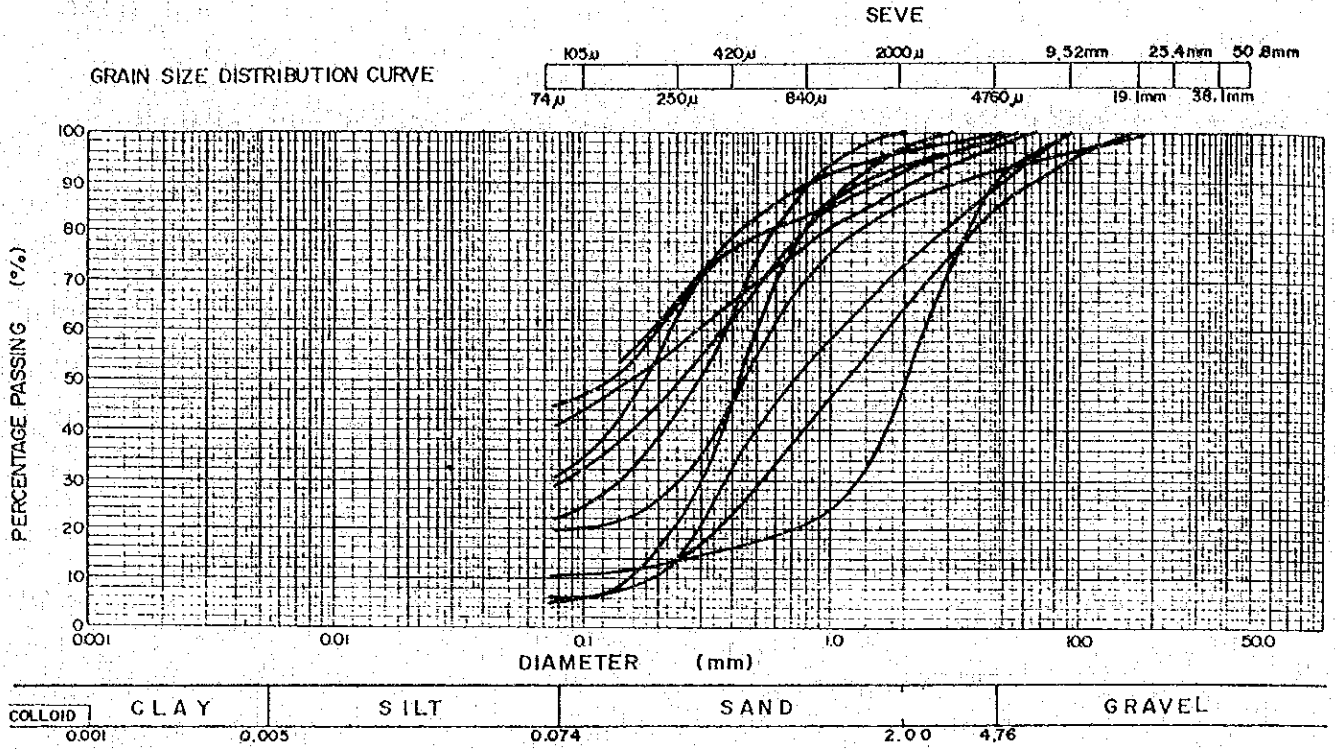
- CES CRAFT BEACH (BH-1) AREA

SCALE: V = 1:200

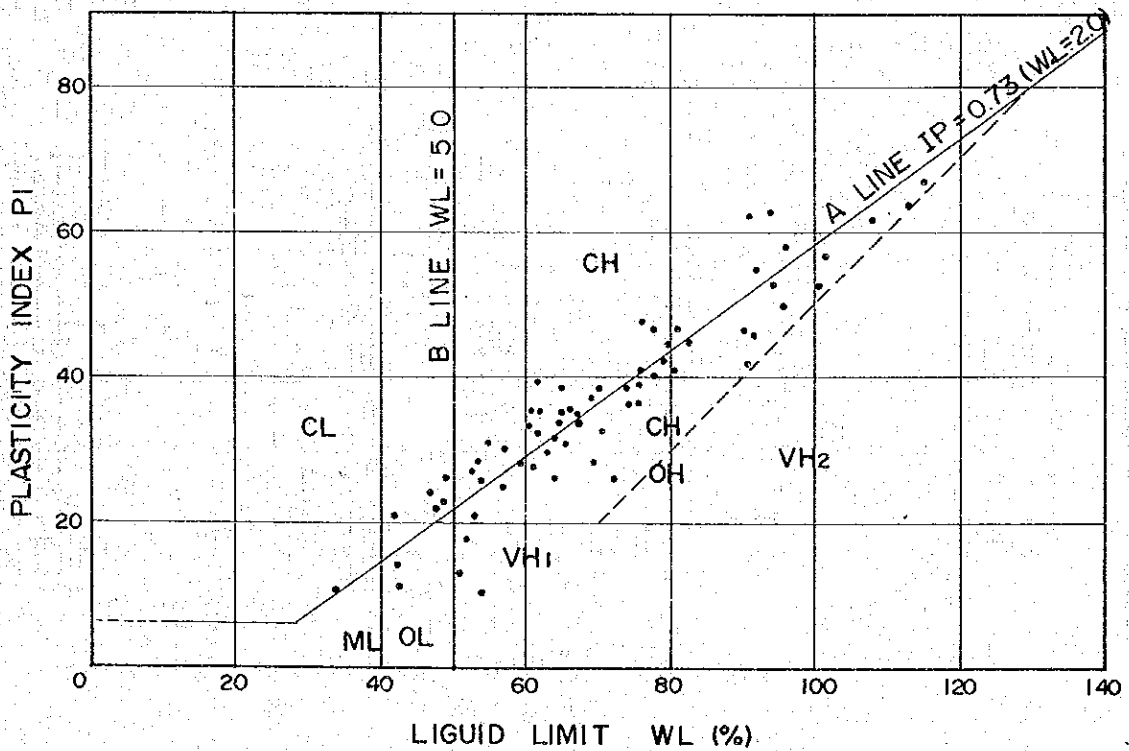
H = 1:800
N d N



A. SIEVE ANALYSIS

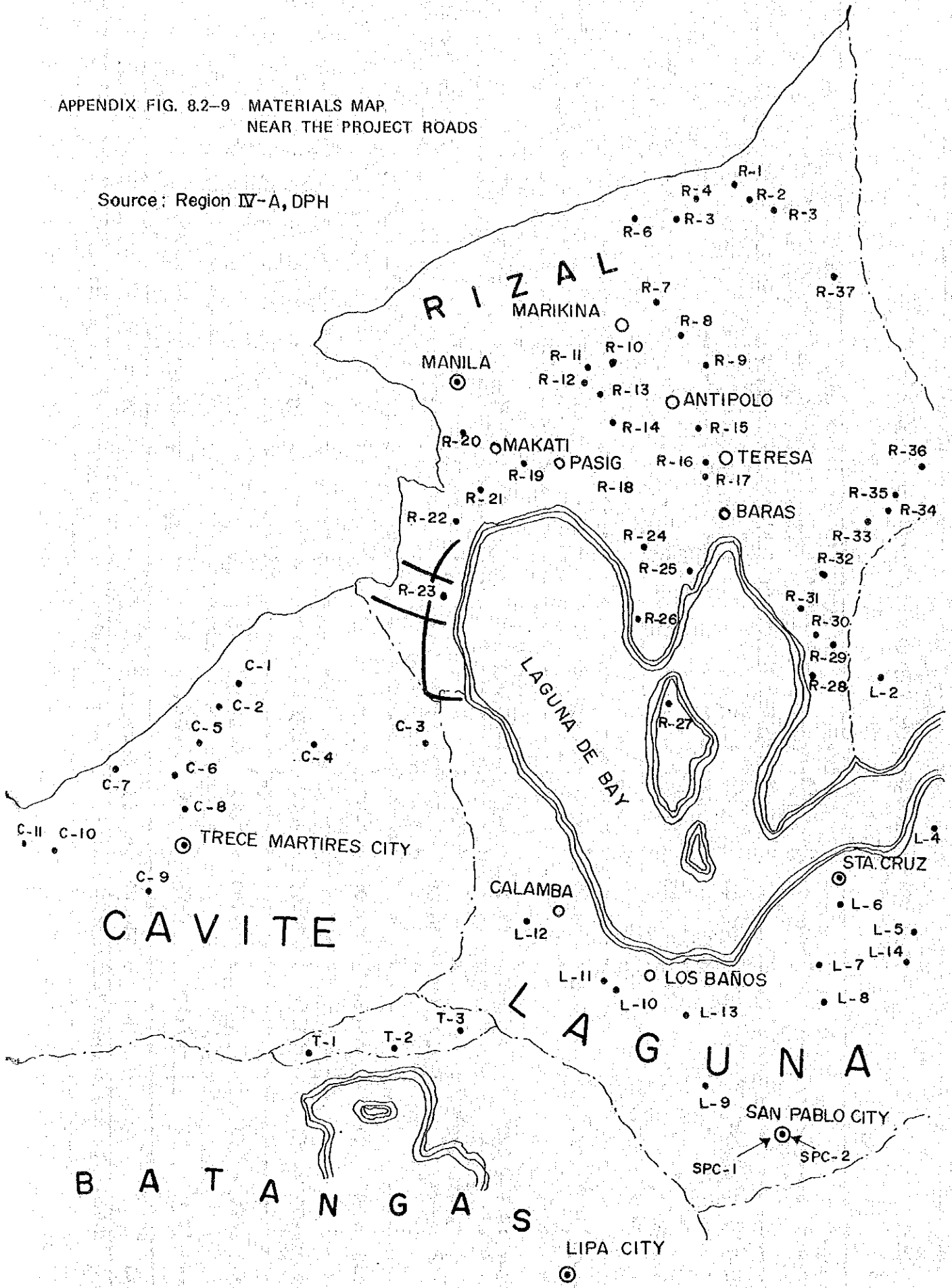


B. PLASTICITY CHART



APPENDIX FIG. 8.2-9 MATERIALS MAP
NEAR THE PROJECT ROADS

Source: Region IV-A, DPH



APPENDIX TABLE 8.2-1 BORING LOGS OF PROJECT ROADS

Bore Hole No.	Station	Ground Elevation (m)	Depth of Bore Hole (m)	Thickness of Strata (m)		Standard Penetration Test (N-value)	Number of Soil Samplings		Depth (m) of Ground Water Level from Ground Surface	Remarks
				Soft	Hard		Undisturb	Disturb		
BH-1	A 7 ^K + 700 ^M	+2.283	12.00	6.30	5.70	13	-	13	1.50	At the Crossing of A and C Roads
BH-2	B 3 ^K + 470 ^M C 4 ^K + 001.75 ^M	+14.598	7.55	2.50	5.05	5	-	5	3.00	
BH-3	B 11 ^K + 170 ^M	+1.416	13.25	5.55	7.70	14	1	14	1.25	Undisturb Sampl. 1.50-1.95 in De
BH-4	B 9 ^K + 270 ^M	+2.322	19.50	6.00	13.50	18	-	18	2.00	
BH-5	B 4 ^K + 450 ^M C 8 ^K + 160 ^M	+23.797	18.00	4.50	13.50	13	-	11	10.00	At the Crossing of B and C Road
BH-6	C 12 ^K + 124 ^M	+45.603	11.00	6.00	5.00	6	-	4	5.50	
BH-7	C 17 ^K + 450 ^M	+63.84	10.75	3.00	7.75	10	-	9	6.50	
BH-8	C 20 ^K + 250 ^M	+19.45	12.00	7.00	5.00	12	-	12	4.50	
BH-9	C 0 ^K + 110 ^M	+27.654	10.00	7.00	3.00	11	-	11	4.00	
Total			114.05	47.85	66.20	Total No. of Strokes	1	97		

Note: In the column "Station", A, B and C mean A Route, B Route and C Route respectively.

APPENDIX TABLE 8.2-2 RESULTS OF COMPACTION AND C. B. R. TESTS

TEST PIT NO.	LOCATION	DEPTH (m)	DESCRIPTION	COMPACTION TEST			C. B. R. TEST (%)		
				Optimum Moisture Content (%)	Maximum Dry Density (g/cm ³)	Optimum Moisture Content (%)	10 BLOWS	30 BLOWS	65 BLOWS
TP-1	Susana Heights : Alabang, Muntinlupa : M.M.	0 - 1.5	Creamish brown sandy : shale fragments	20.2	1.560	7.7	11.6	17.0	
TP-2	"	0 - 1.5	Grayish brown clayey : silty sand and gra- vel mixture	19.7	1.601	7.3	10.0	12.9	
TP-3	"	0 - 1.5	Grayish Creamish : brown clayey silt with some sand and gravel	19.3	1.628	8.5	10.0	13.9	
TP-4	South Luzon Express : way San Pedro, : Laguna	0 - 1.5	Rust brown silty clay : Sand and gravel mix- ture	40.5	1.301	7.1	8.3	10.1	
TP-5	"	0 - 1.5	Rust brown silty : clay, with sand, and gravel	36.6	1.312	5.4	6.3	7.4	
TP-6	"	0 - 1.5	Brown silty clay with : sand, gravel and shale fragments	28.5	1.444	4.6	5.7	7.1	
TP-7	South Luzon Express : way BO. Patatan : Muntinlupa, M.M.	0 - 1.5	Brownish gray silty : sand with some gra- vel	19.6	1.650	19.7	27.6	33.1	
TP-8	"	0 - 1.5	Brownish gray clayey : silty sand with gra- vel	16.0	1.710	10.1	15.2	16.1	
TP-9	"	0 - 1.5	Brownish gray clay : silty and with gravel	27.5	1.461	12.7	14.0	15.4	

APPENDIX TABLE 8.2-3 MATERIAL SOURCES NEAR THE PROJECT ROADS

Source: Regions II & IV-A, DPH

Map Designation Number	Brief of Material Sources
<u>Cavite Province</u>	
C-1	Noveleta Source, Km. 26.60 near Bailey Bridge Materials: Screened Sand Quantity: 10 cu.m./day very limited Spec's. Item No.: Item 305 Type "C", Item 308 Grading "B"
C-2	Bacao Source, Km. 29.20, 80 m. left going to Gen. Trias Transpassing private properties Materials: Sand, Quantity: Unlimited Spec's. Item No. Item 108, Item 308 "B"
C-3	Carmona Source, 800 m. left of Km. 47.75 going to Carmona Materials: Sand, Quantity: Unlimited Spec's. Item No.: Item 108, Item 308 "B"
C-4	Salitran Source, Approx. 500 m. right of Km. 29.00, Salitran-Molino Road. Transpassing private properties. Passable only during dry season Material: Sand, Quantity: Unlimited Spec's. Item No.: Item 108, Item 308 "B"
C-5	Santol Source, End of Santol Feeder Road. Passable only during dry season Materials: Sand, Quantity: Unlimited Spec's. Item No.: Item 108
C-6	Prinsang Matanda Source, Approx. 700 m. left of Km. 42.30 going to Capitol Materials: Sand, Quantity: Unlimited Spec's. Item No.: Item 108, Item 308 "B"
C-7	Naic Source, Km. 47.90 near Santolan Culvert Materials: Sand, Quantity: Limited Approx. 400 cu.m. Spec's. Item No.: Item 108
C-8	Quintana Source, 90 m. left of Km. 45.79 Tanza-Trece Martires National Road Materials: Sand, Quantity: Unlimited Spec's. Item No.: Item 108, Item 308 "B"

- C-9 Calumpang Source, 250 m. right of Km. 59.08 going to Indang
Transpassing private properties. Passable only during dry season
Materials: Sand, Quantity: Unlimited
Spec's. Item No.: Item 108
- C-10 Maragondon Source, Materials: Sand and gravel
& Quantity: Unlimited, Item: All items
- C-11

Laguna Province

- L-6 Sta. Cruz River, Item 316 - Fine Aggregate
- L-7 Laguna Quarry,
Item 108 - Aggregate sub-base, Item 200 - Aggregate base course
Item 316 - Fine aggregate, Coarse aggregate
- L-8 Calumpang River
Item 316 - Fine aggregate, Coarse aggregate, Boulders
- L-9 San Pablo-Calauan Boundary Black Cinder
- L-10 Los Baños Quarry, Item 200 - Aggregate base course
Item 316 - Fine aggregate, Coarse aggregate
- L-11 Banaag Quarry, Item 108 - Aggregate sub-base
Item 200 - Aggregate base course
- L-12 Calamba San Cristobal River, Item 316 - Fine Aggregate
- L-13 Calauan (Paliparan), Item 108 - Aggregate sub-base
- L-14 Dingin Quarry, Item 108 - Aggregate sub-base
Item 200 - Aggregate base course, Item 316 - Fine aggregate, Coarse aggregate

Rizal Province

- R-1 San Jose, Montalban, Km. 28+200
Aggregate for Items: 108, 200
- R-2 Phil Rock Prods., Inc., Km. 29+000
Aggregate for Items: 108, 200, 308 or 312
Fine aggregate - Coarse aggregate for Items: 310, 316 or 405
- R-3 Wawa, Montalban
Aggregate for Items: 108, 200, 308 or 312
Fine aggregate - Coarse aggregate for Items: 310, 316 or 405
- R-4 Burgos, Montalban, Km. 26+500
Aggregate for Items: 108, 200
- R-5 Rizal Consolidated Investments, Km. 25+850
Aggregate for Items: 108, 200, 308 or 312
Fine aggregate - Coarse aggregate for Items: 310, 316 or 405
- R-6 Dulong Bayan, San Mateo, Km. 24
Aggregate for Items: 108, 200
- R-7 Philstress, Marikina
Item 405-A Pre-fab. concrete products
- R-8 Mayamot, Antipolo
& Adobe stone spalls, Aggregate for Items: 107, 108
- R-9
- R-10 Pag-asa Steel Corp., Pasig
Item 406 Reinf. steel bars
- R-11 Concrete Aggregates Inc., Longos, Q. C.
Fine aggregate - Coarse aggregate for Items: 308, 309,
310, 316 or 405
- R-12 Phil. Blooming Mills, Pasig
Item for 406 - Reinf. steel bars
- R-13 Asphalttrade & Rizcon, Items: 309, 310 or 413
- R-14 Constress, Pasig, Item 405-A Pre-fab. Concrete Products

- R-15 Island Cements, Portland Cement
- R-16 Filipinas Cement, Portland Cement
- R-17 Teresa Quarry, Aggregate for Items: 107, 108, 200
- R-18 Elirol, Pasig
Item 406 Reing. steel bars, G.I. sheets
- R-19 Puyat Steel, Item 406 Reinf. steel bars
- R-20 Phil. Rock Products, Mandaluyong
Fine aggregate - Coarse aggregate for Items: 308, 309, 310
316 or 405
- R-21 Supreme Aggregates, Inc., Taguig
Fine aggregate - Coarse aggregate for Item: 316 or 405
- R-22 Betonval Ready Cement, Km. 16
Item: 316 or 405
- R-23 Pecorp. Muntinlupa
Aggregate for Items : 107, 108, 200
- R-24 Concrete Aggregates, Inc., Angono
Aggregate for Items: 108, 200, 308 or 312
Fine aggregate - Coarse aggregate for Items: 310, 316 or 405
- R-25 Cardona, Aggregate for Items: 107, 108
- R-26 Rizal Cement, Binangonan, Portland Cement
- R-27 Navotas, Talim Island, Cardona
For all items involving crush rock and by-products
- R-28 Quisao, Pililla, Aggregate for Items: 107, 108
- R-29 Bugarin, Pililla, Rizal
&
Aggregate for Items: 108, 200
- R-30

- R-31 Bukal, Tanay, Aggregate for Items: 108, 200
- R-32 Genrock, Tanay
Fine aggregates for Items: 310, 316 or 405
Item: 316 or 405, Item: 201 (CTB)
- R-33 Midland Cement, Tanay, Portland Cement
- R-34 A.P. Sacramento, Tanay, Aggregate for Items: 108, 200
- R-35 Supreme Aggregates Asphalt Plant, Tanay
Items: 302, 310
- R-36 Rivas, Tanay, Aggregate for Items: 108, 200
- R-37 Sta. Inez, Tanay, Aggregate for Items: 107, 108

San Pablo City

- SPC-1 Km. 79+800, Materials: Volcanic cinder good for
Items: 107, 108
Distance from National Road - 150 m.
Quantity: Abundant
- SPC-2 Km. 95+100, Materials: Item 200, Distance from
National Road - 200 m.
Quantity: Abundant

Tagaytay City

- T-1 Proposed rock quarry for Item 316
Distance from Km. 61.71 - 1 Km.
Approx. quantity: 200,000 cu.m.
- T-2 Quarry for Item 200, Stationing Km. 62.50
Approx. quantity: 150,000 cu.m. Lab. Report No.
9-157-56: soil classification A-1-a(10)
- T-3 Proposed quarry for Item 200, Stationing Km. 63.00
Approx. quantity: 300,000 cu.m.

Bulacan Province

Sta. Maria Gravel Pit, Km. 32.85 right of Bocaue - Sta. Maria Road via Taal (Sta. Clara - Sta. Maria) Aggregate sub-base and Aggregate base course

Pulilan Quarry, Km. 44.8 left of Pulilan-Calumpit Road (Poblacion, Pulilan) 1.2 Km. Sand

Longos Quarry, Km. 43.3 left Pulilan-Calumpit Road + 0.8 Km. Longos, Pulilan. Common borrow and Aggregate base course

Angat River, Km. 38.84 right of CVR + 0.15 Km., Sto. Cristo, Pulilan. Washed sand

Makinabang Gravel Pit, Km. 46.43 right of CVR + 0.64 Km., Makinabang Baliwag. Aggregate sub-base, Aggregate base course Type "A" & "B" to concrete aggregate

Tiaong Gravel Pit, Km. 48.42 right of CVR + 0.15 Km. (Sto. Cristo, Pulilan) Aggregate sub-base, Aggregate base course Type "A" & "B" & G-1, S-1 & 3/4"

San Pedro Gravel Pit, Km. 53.30 left of Plaridel-Bustos Old Road + 1.2 Km. (San Pedro, Bustos) washed sand & washed gravel, Aggregate sub-base & base course, Type "A" & "B"

Sabang Gravel Pit, Km. 53.05 right of CVR + 0.70 Km. (Sabang, Baliwag) aggregate sub-base, Aggregate base course, Type "A" & "B" to Concrete Aggregate.

Tanawan Gravel Pit, Km. 53.6 left of Plaridel - Bustos Road + 2.5 Km. (Tanawan, Bustos) Aggregate sub-base and Aggregate base course, Type "A" & "B"

Caingin Gravel Pit, Km. 54.50 right of Baliwag - San Rafael + 0.90 Km. (Caingin, San Rafael) Aggregate sub-base, Aggregate base course, Type "A" & "B" to concrete aggregate

Luzon Aggregate Inc., Km. 72.15 + 1.6 Km. left of Norzagaray - Bigte Road (Norzagaray) Concrete Aggregate G-1, S-1 & 2/3" Dense graded aggregate

Pulo Gravel Pit, Km. 64.84 right of Baliwag - San Rafael Road + 0.4 Km. (Pulo, San Rafael) Aggregate sub-base and Aggregate base course, Type "A" & "B"

Guiller Aggregate Co. Inc., Km. 55.83 left of Plaridel-Bustos-Norzagaray Road (Bonga Menor, Bustos) Concrete Aggregate G-1, S-1, & 2/3" Dense graded aggregate

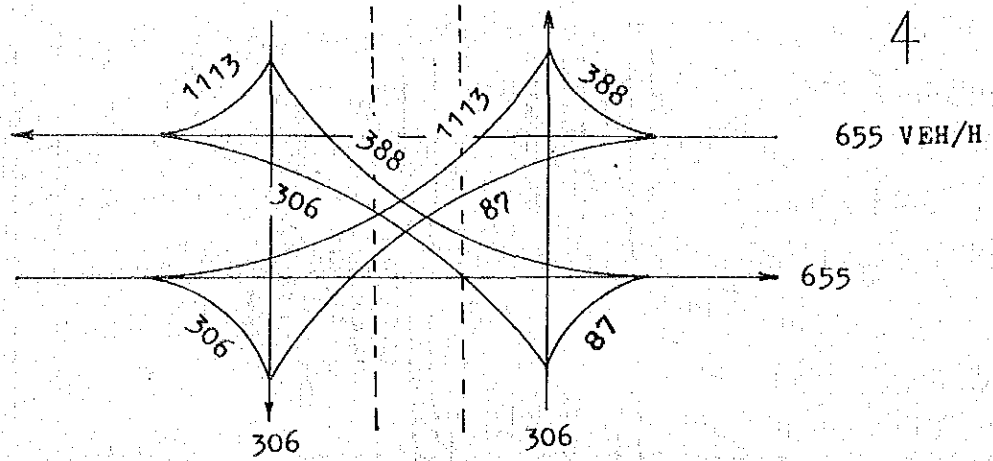
Tartaro Gravel Pit, Km. 85.45 right of San Miguel-Sibul Road + 0.80 Km. (Tartaro, San Miguel) Aggregate base course Type "A" & "B" to Concrete Aggregate & Boulders

Sta. Ines Gravel Pit, Km. 84.650, 1.20 Km. right of San Miguel-Sibul Road, Aggregate base course to concrete aggregate

Batuhan Gravel Pit, Km. 82.90 right of San Miguel-Sibul Road 2.0 Km. (Labne, San Miguel, Bulacan) Aggregate base course, Type "A" & "B" & Boulders

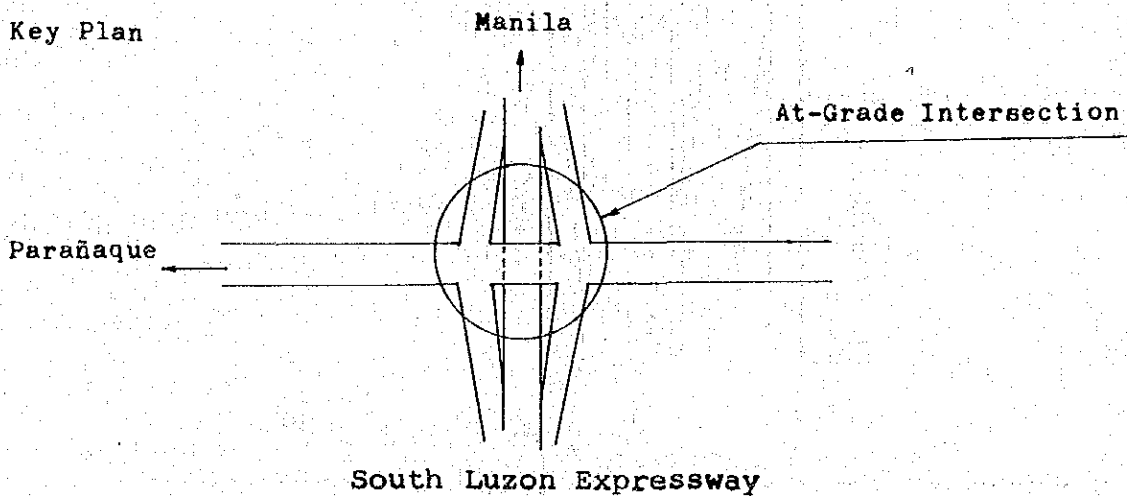
APPENDIX FIG. 8.5-1 CAPACITY ANALYSIS OF INTERSECTION

(SUCAT)

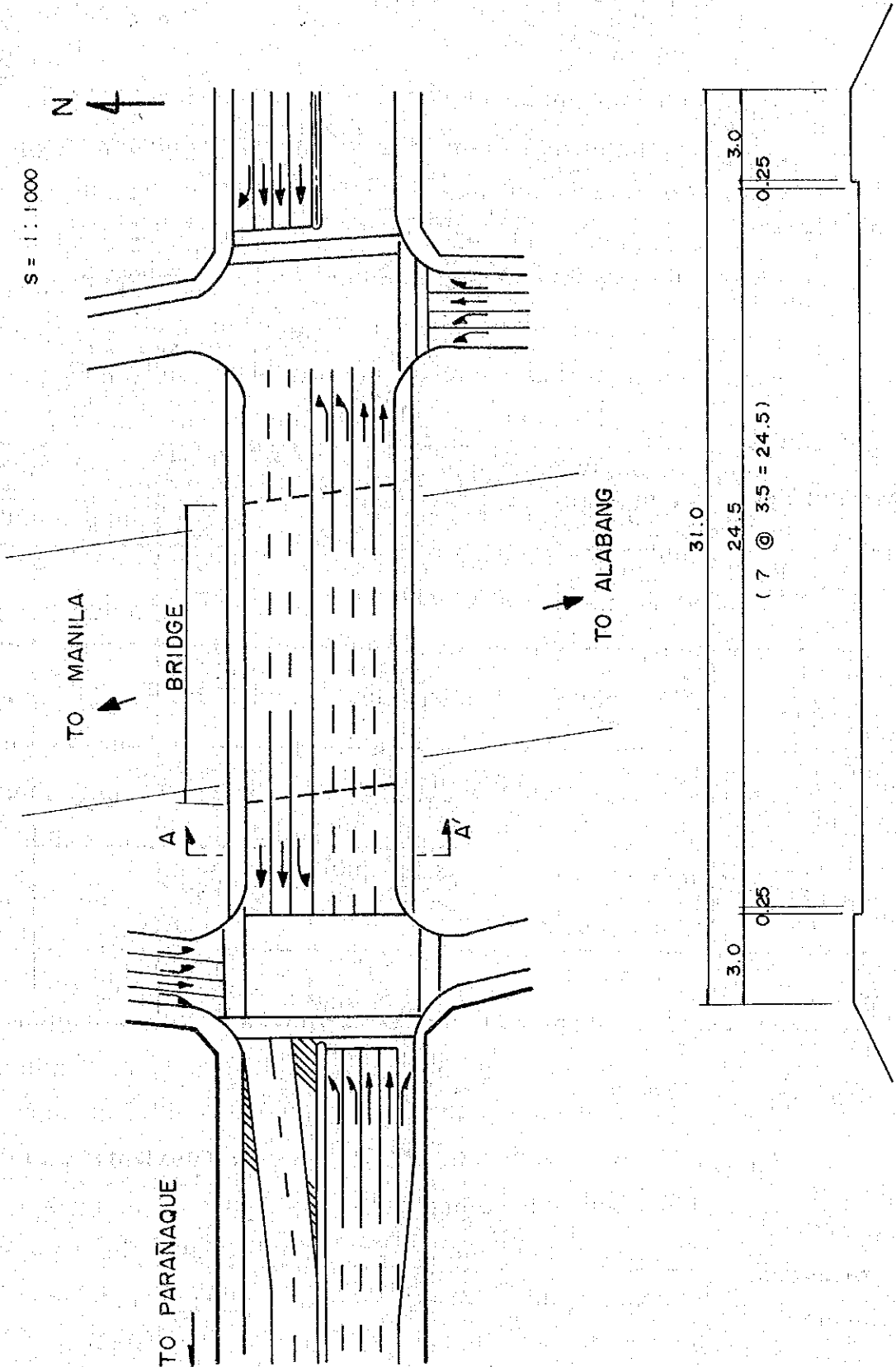


TRAFFIC PHASE	TRAFFIC VOLUME V (PCU/H)	POSSIBLE CAPACITY Cp (PCU/H)	INTEGRATED CONGESTION RATIO Y = V/Cp	MODIFIED	PHASE TIME (SEC)
1	VL = 1336 VT = 786 VR = 367	2 x 2000=4000 2 x 2250=4500	0.334* 0.175	39%	36 + 3
2	VL = 104 VT = 786 VR = 467	1 x 2000=2000 2 x 2250=4500	0.052 0.175*	21%	18 + 3
3	VL = 367 VT = 367 VR = 104	2 x 2000=4000 1 x 2250=2250	0.092 0.163*	20%	17 + 3
4	VL = 467 VT = 367 VR = 1336	2 x 2000=4000 1 x 2250=2250	0.117 0.163*	20%	17 + 3
TOTAL			0.835	100%	100

Key Plan

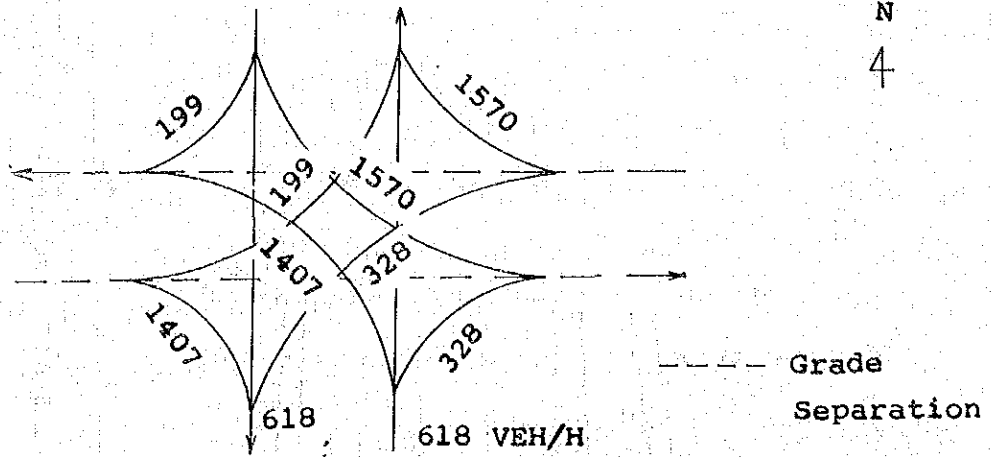


APPENDIX FIG. 8.5-2 SCHEMATIC PLAN OF SUCAT INTERCHANGE



SECTION A - A' $S = 1 : 200$

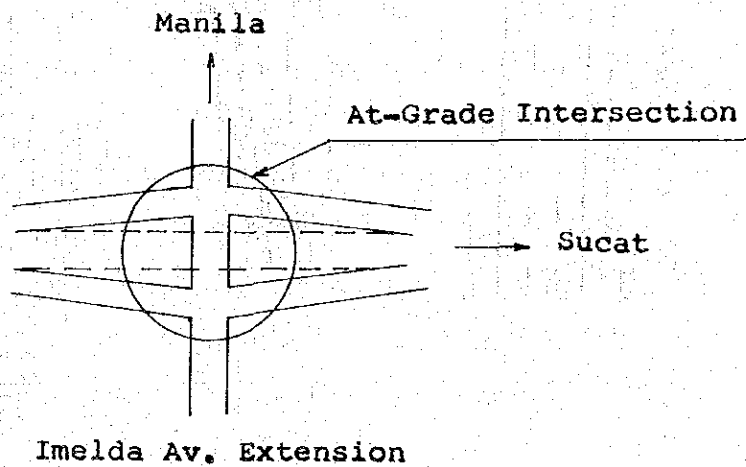
APPENDIX FIG. 8.5-3 CAPACITY ANALYSIS OF INTERSECTION
(A-ROUTE/IMELDA AVE. EXT.)



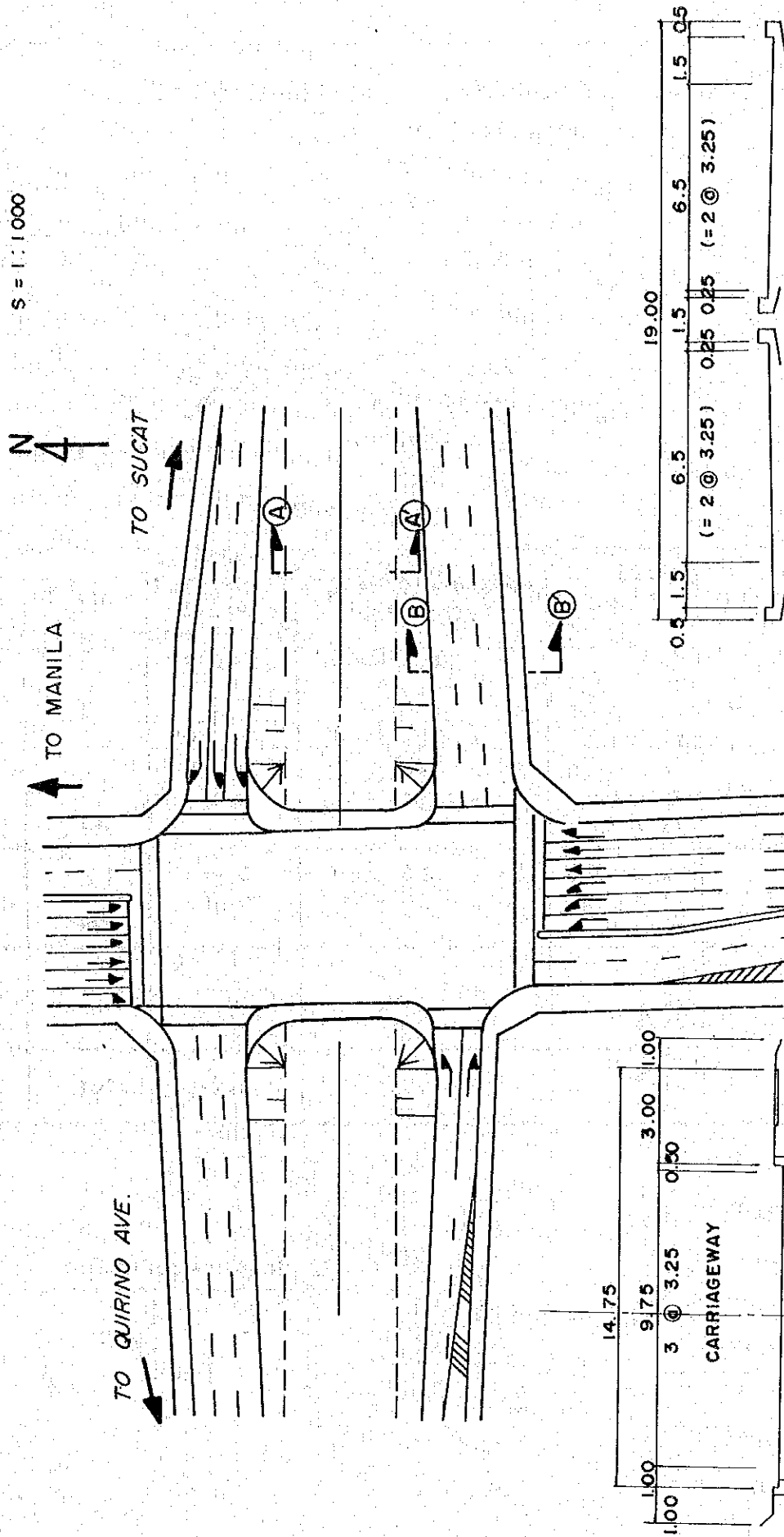
N
4

TRAFFIC PHASE	TRAFFIC VOLUME V (PCU/H)	POSSIBLE CAPACITY Cp (PCU/H)	INTEGRATED CONGESTION RATIO $Y = V/Cp$	MODIFIED	PHASE TIME (SEC)
1	VL = 394 VR = 1184 VR = 1688 VL = 239	2 x 2000=4000 1 x 2000=2000	0.099 0.120*	17%	14 + 3
2	VL = 1884 VT = 742 VR = 239	3 x 2000=6000 2 x 2250=4500	0.314* 0.165	44%	41 + 3
3	VL = 1688 VT = 742 VR = 394	3 x 2000=6000 2 x 2250=4500	0.283* 0.165	39%	36 + 3
4	VL = VT = VR =				
TOTAL			0.717	100%	100

Key Plan

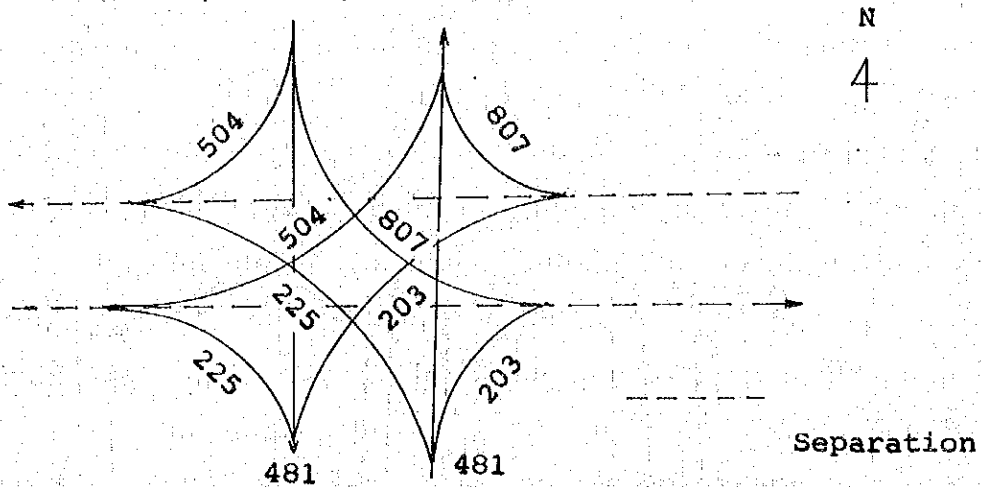


APPENDIX FIG. 8.5-4 SCHEMATIC PLAN OF A - ROUTE / IMELDA AVE. EXT.



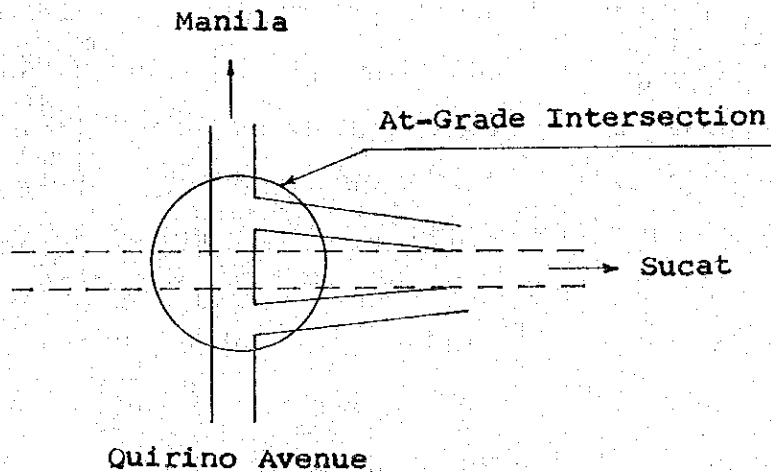
APPENDIX FIG. 8.5-5 CAPACITY ANALYSIS OF INTERSECTION

(A-ROUTE/QUIRINO AVE.)



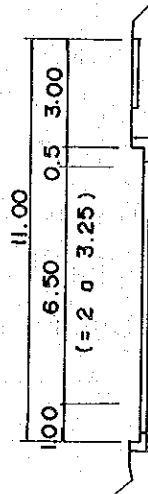
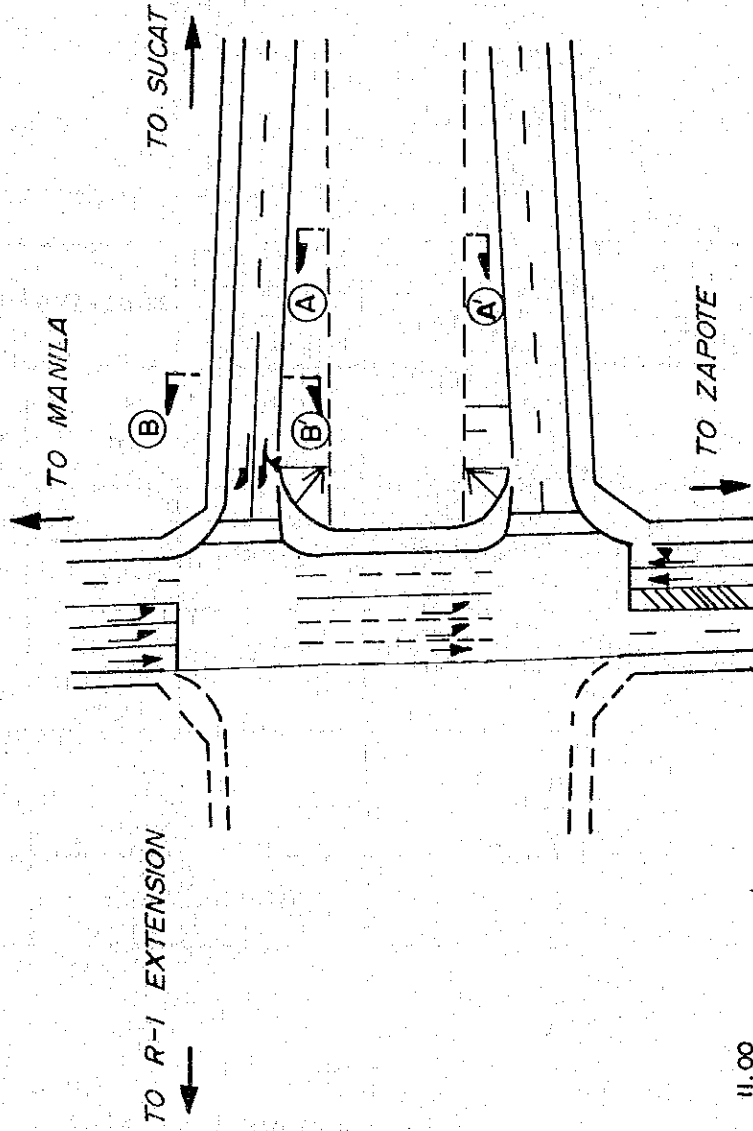
TRAFFIC PHASE	TRAFFIC VOLUME V (PCU/H)	POSSIBLE CAPACITY Cp (PCU/H)	INTEGRATED CONGESTION RATIO $Y = V/Cp$	MODIFIED	PHASE TIME (SEC)
1	VL = 244 VR = 968 VT = 270 VB = 605	1 x 2000=2000	0.122	37%	34 + 3
2	VL = 968 VT = 577 VR = 605	2 x 2000=4000 1 x 2250=2250	0.242 0.256*	31%	28 + 3
3	VL = 270 VT = 577 VR = 244	1 x 2000=4000 1 x 2250=2250	0.068 0.256*	32%	29 + 3
4					
TOTAL			0.815	100%	100

Key Plan



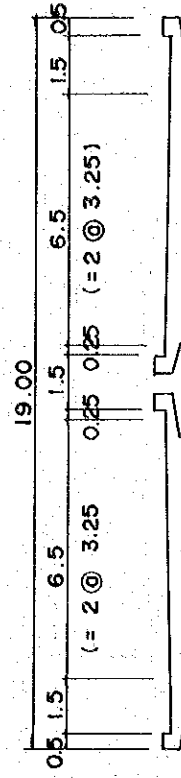
APPENDIX FIG. 8.5-6 SCHEMATIC PLAN OF A-ROUTE / QUIRINO AVE.

S = 1 : 1000



SECTION B-B

S = 1 : 200

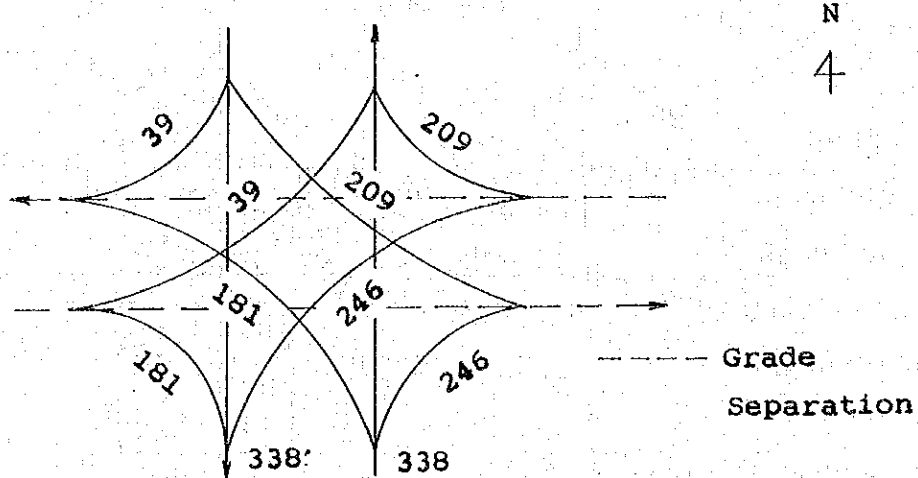


SECTION A-A

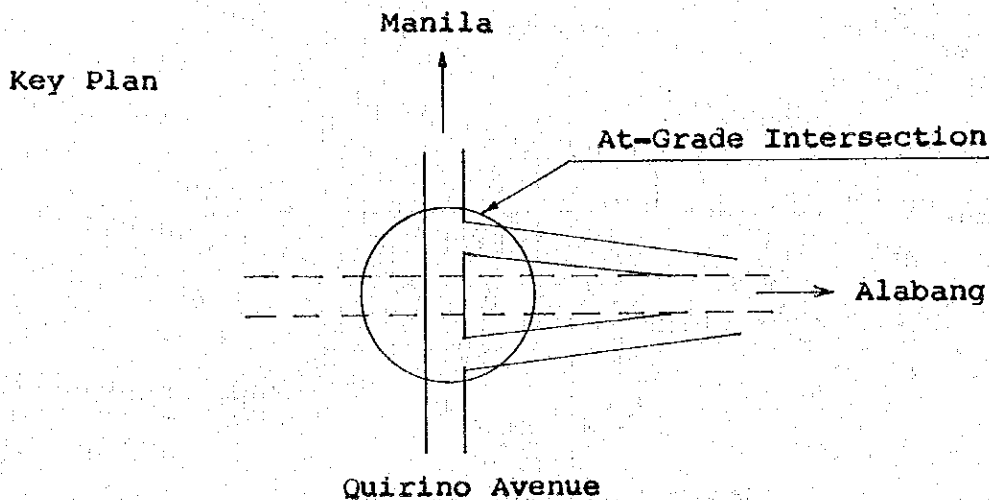
S = 1 : 200

APPENDIX FIG. 8.5-7 CAPACITY ANALYSIS OF INTERSECTION

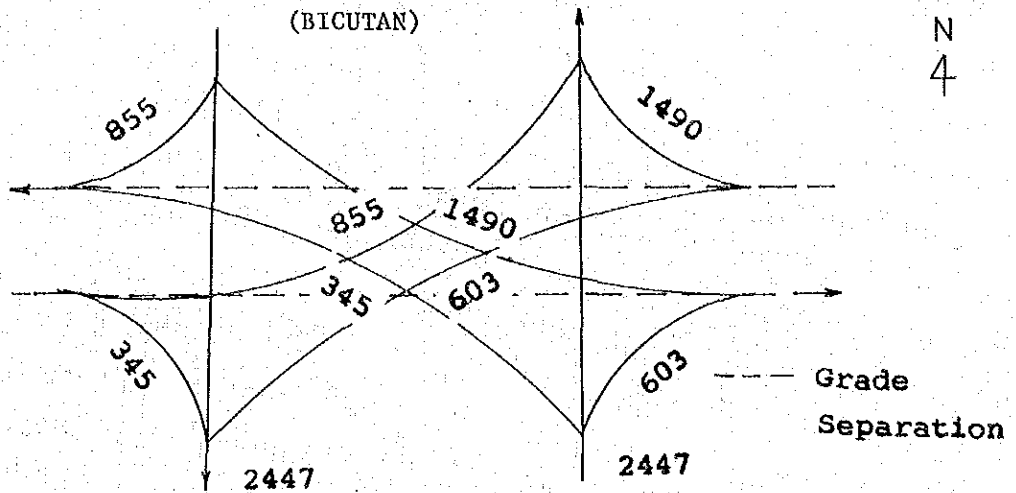
(B-ROUTE/QUIRINO AVE.)



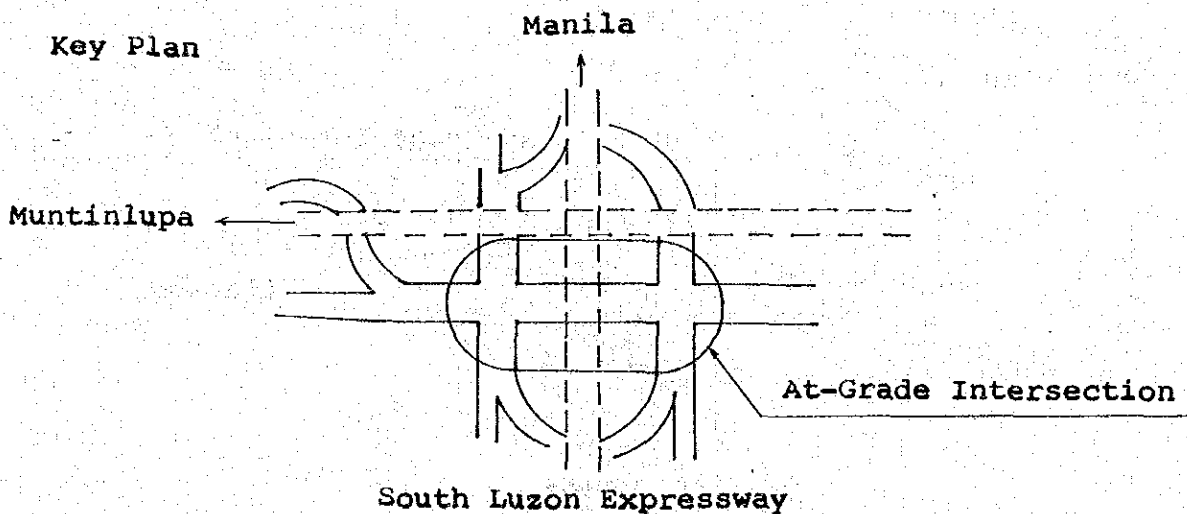
TRAFFIC PHASE	TRAFFIC VOLUME V (PCU/H)	POSSIBLE CAPACITY C _p (PCU/H)	INTEGRATED CONGESTION RATIO Y = V/C _p	MODIFIED	PHASE TIME (SEC)
1	VL = 295 VR = 251 VR = 217 VL = 47	1 x 2000=2000 1 x 2000=2000	0.148* 0.024	29%	26 + 3
2	VL = 251 VT = 406 VR = 47	1 x 2000=2000 1 x 2250=2250	0.126 0.180*	35%	32 + 3
3	VL = 217 VT = 406 VR = 295	1 x 2000=2000 1 x 2250=2250	0.109 0.180*	36%	33 + 3
4					
		TOTAL	0.508	100%	100



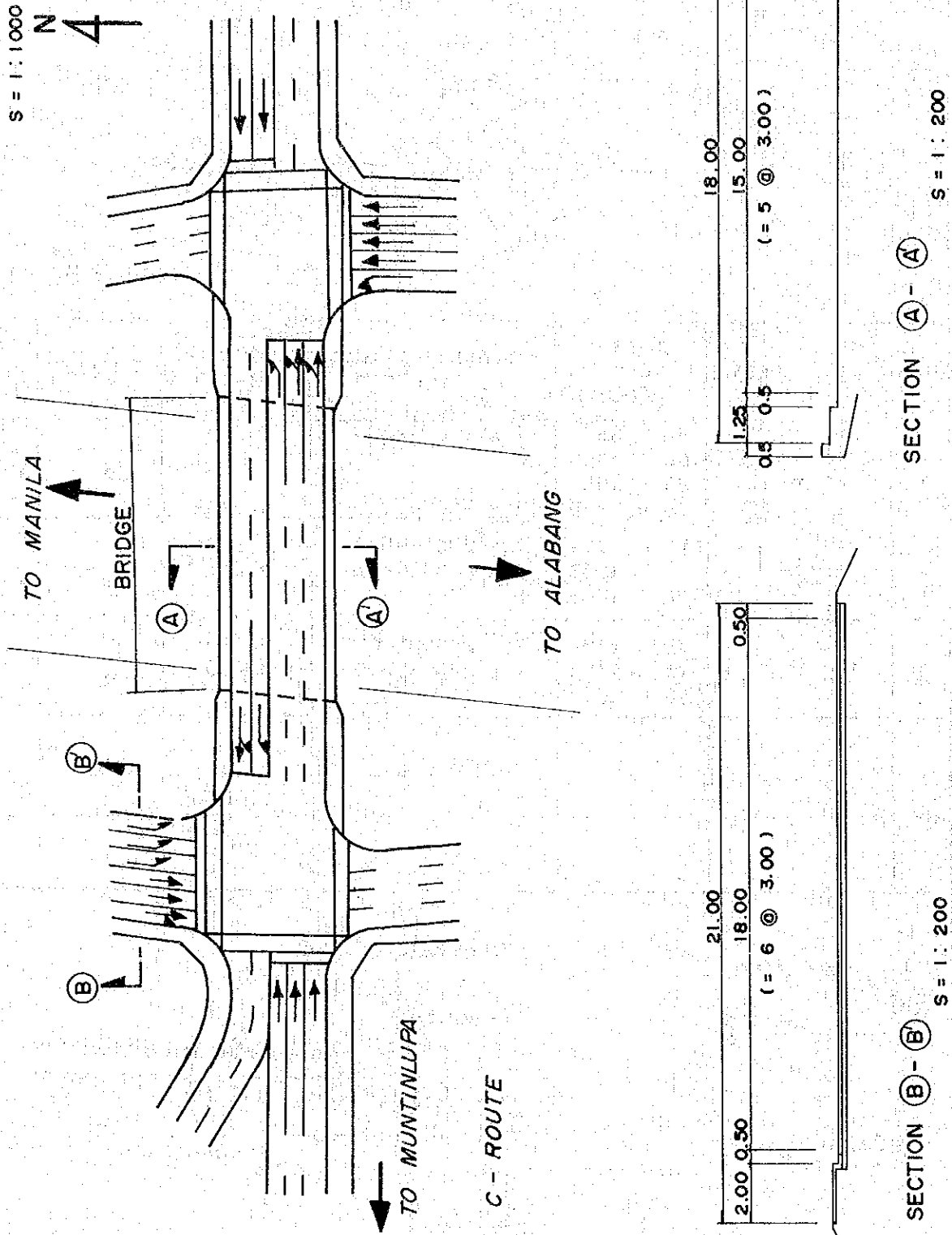
APPENDIX FIG. 8.5-8 CAPACITY ANALYSIS OF INTERSECTION



TRAFFIC PHASE	TRAFFIC VOLUME V (PCU/H)	POSSIBLE CAPACITY Cp (PCU/H)	INTEGRATED CONGESTION RATIO $\gamma = V/Cp$	MODIFIED	PHASE TIME (SEC)
1	VL = 724 VR = 1788 VR = 414 VL = 1026	2 x 2000=4000 3 x 2000=6000	0.181* 0.171	22%	19 + 3
2	VL = 414 VT = 2936 VR = 724	1 x 2000=2000 4 x 2250=9000	0.207 0.326*	39%	36 + 3
3	VL = 1788 VT = 2936 VR = 1026	3 x 2000=6000 4 x 2250=9000	0.298 0.326*	39%	36 + 3
4					
TOTAL			0.833	100%	100

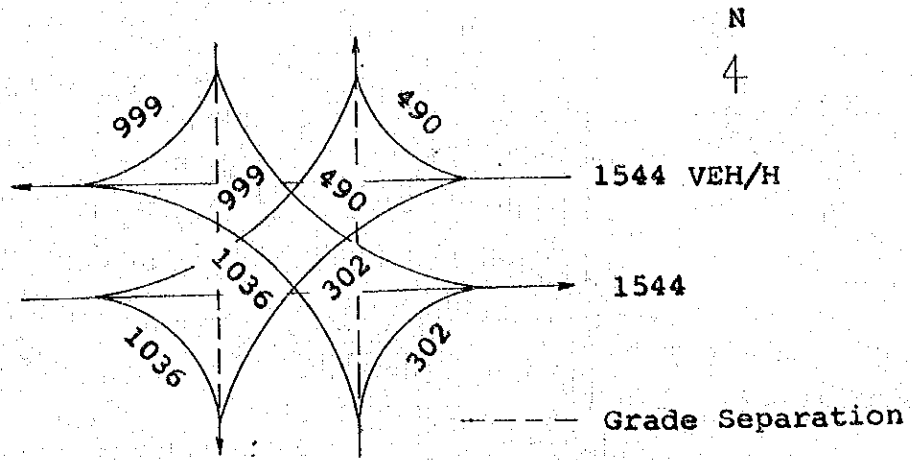


APPENDIX FIG. 8.5-9 SCHEMATIC PLAN OF BICUTAN INTERCHANGE



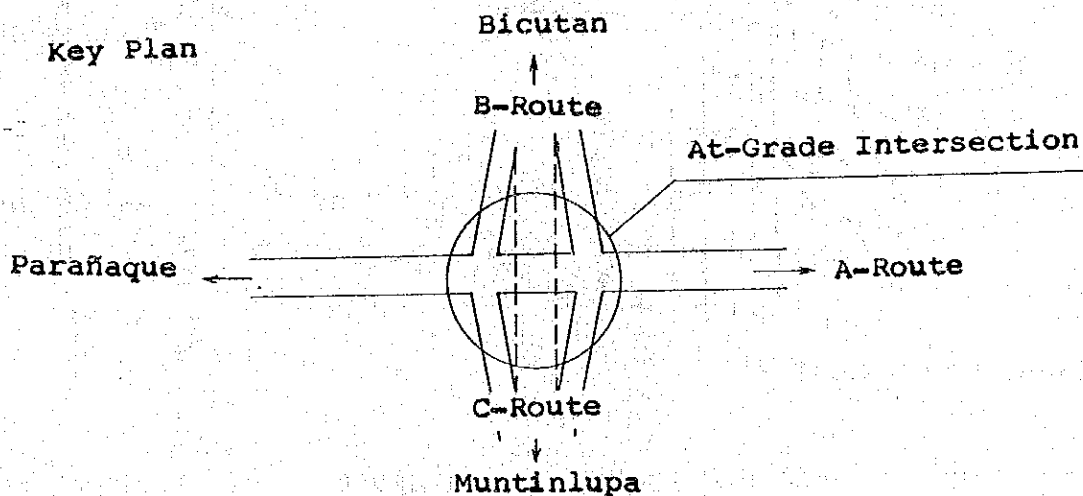
APPENDIX FIG. 8.5-10 CAPACITY ANALYSIS OF INTERSECTION

(A-ROUTE/C-ROUTE)

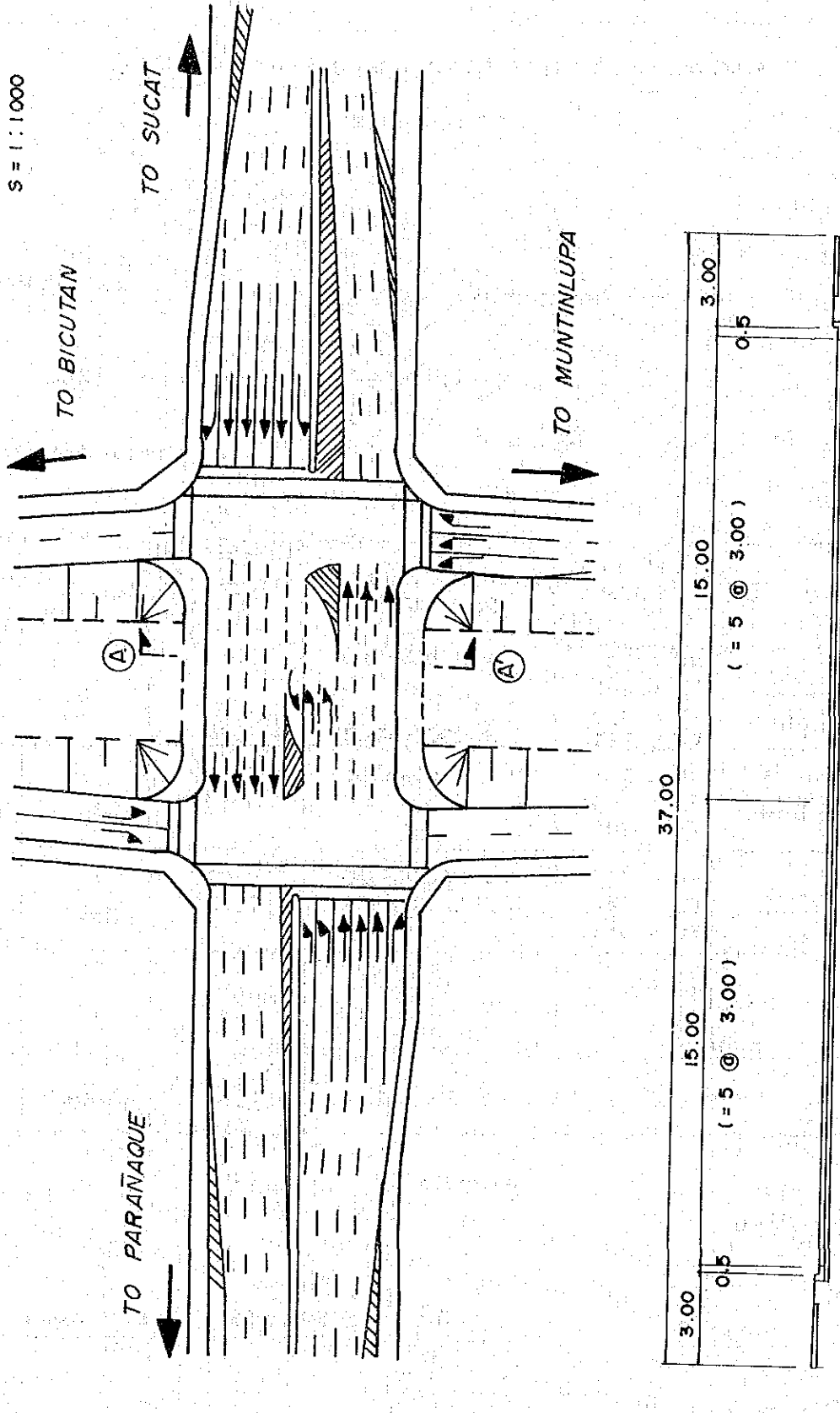


TRAFFIC PHASE	TRAFFIC VOLUME V (PCU/H)	POSSIBLE CAPACITY Cp (PCU/H)	INTEGRATED CONGESTION RATIO $Y = V/Cp$	MODIFIED	PHASE TIME (SEC)
1	VL = 588 VR = 1199 VR = 458 VL = 1243	1 x 2000=2000 2 x 2000=4000	0.294 0.311*	37%	41 + 3
2	VL = 1199 VT = 1853 VR = 1243	2 x 2000=4000 3 x 2250=6,750	0.300* 0.275	36%	40 + 3
3	VL = 458 VT = 1853 VR = 588	1 x 2000=2000 4 x 2250=9000	0.229* 0.206	27%	29 + 3
4		TOTAL	0.84	100%	120

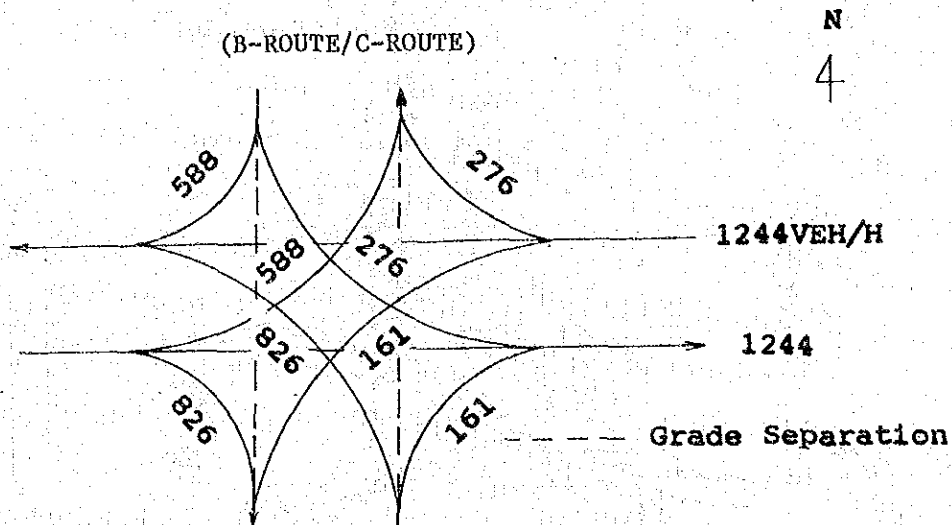
Key Plan



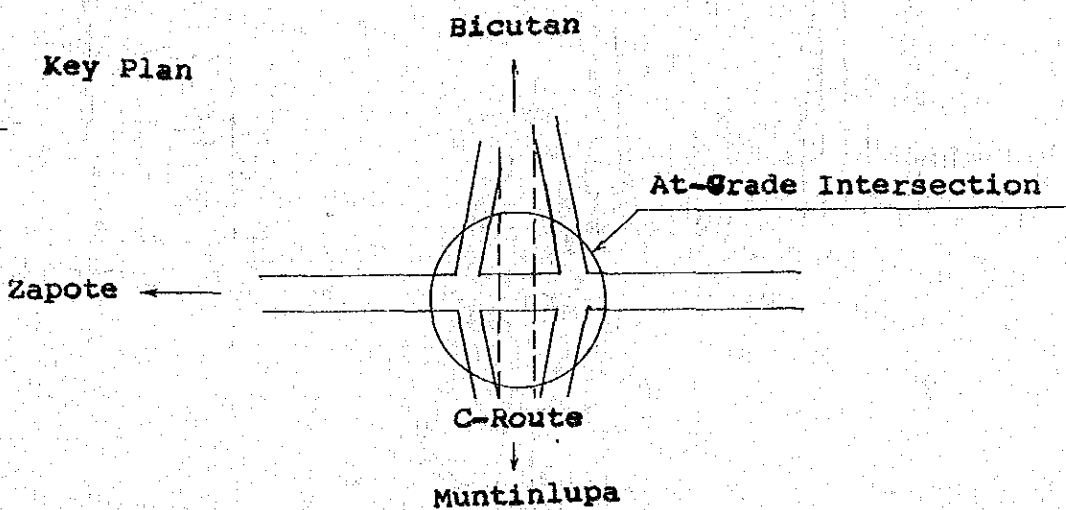
APPENDIX FIG. 8.5-11 SCHEMATIC PLAN OF A-ROUTE / C-ROUTE INTERCHANGE



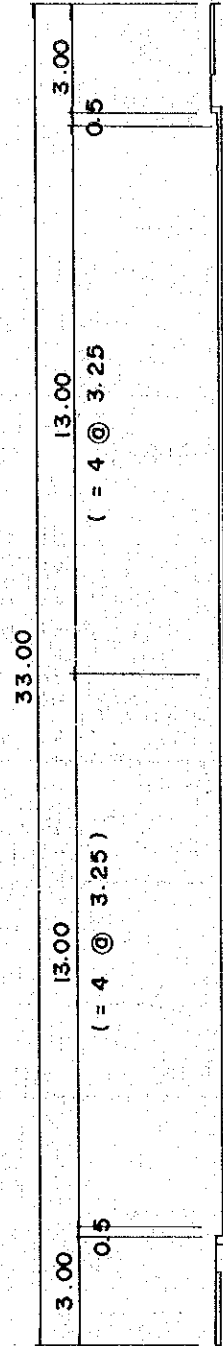
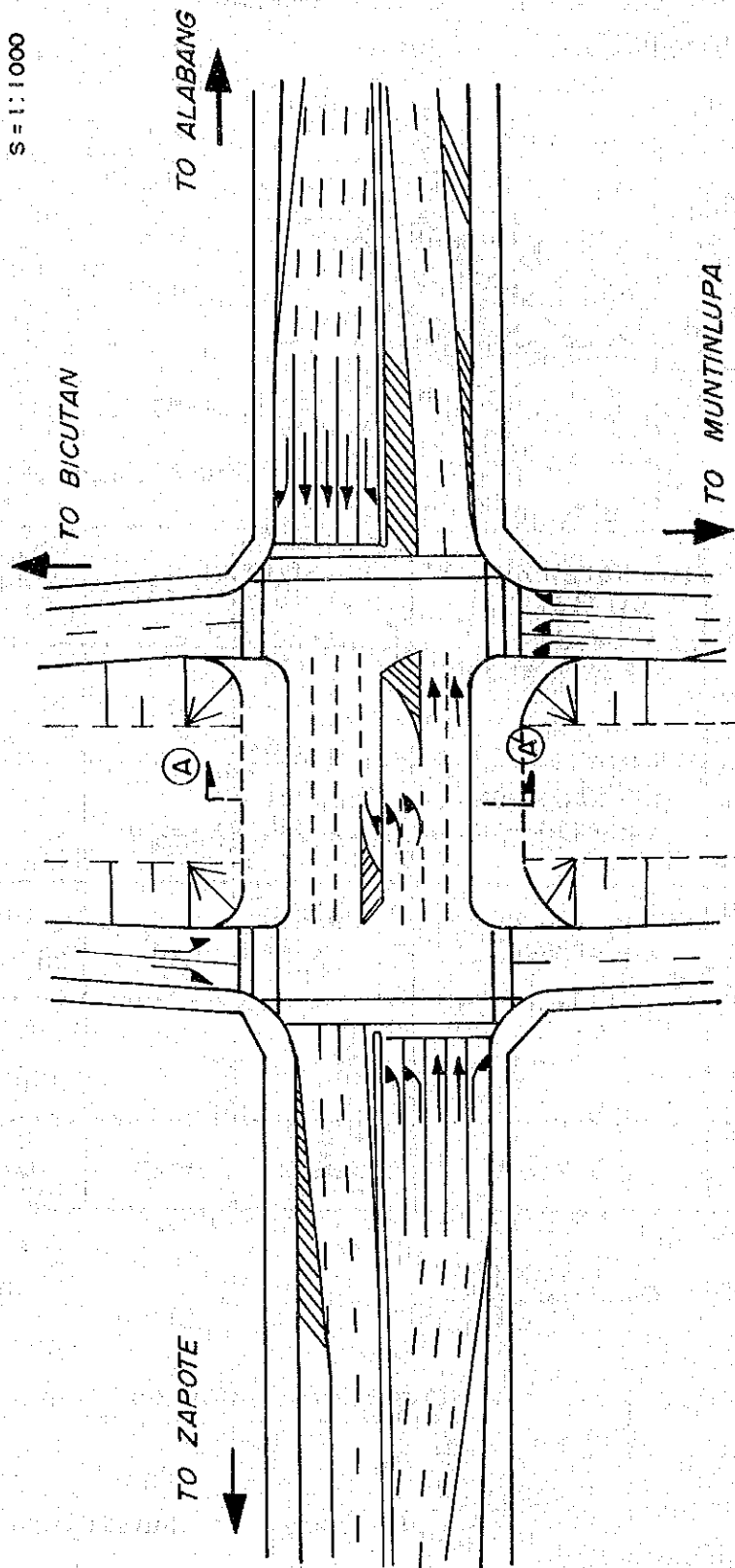
APPENDIX FIG. 8.5-12 CAPACITY ANALYSIS OF INTERSECTION



TRAFFIC PHASE	TRAFFIC VOLUME V (PCU/H)	POSSIBLE CAPACITY C _p (PCU/H)	INTEGRATED CONGESTION RATIO Y = V/C _p	MODIFIED	PHASE TIME (SEC)
1	VL = 331 VR = 706 VR = 193 VL = 991	1 x 2000=2000 2 x 2000=4000	0.166 0.248*	31%	34 + 3
2	VL = 706 VT = 1493 VR = 991	2 x 2000=4000 2 x 2250=4500	0.177 0.332*	41%	46 + 3
3	VL = 193 VT = 1493 VR = 331	1 x 2000=2000 3 x 2250=6750	0.097 0.221*	28%	31 + 3
4					
TOTAL			0.801	100%	10

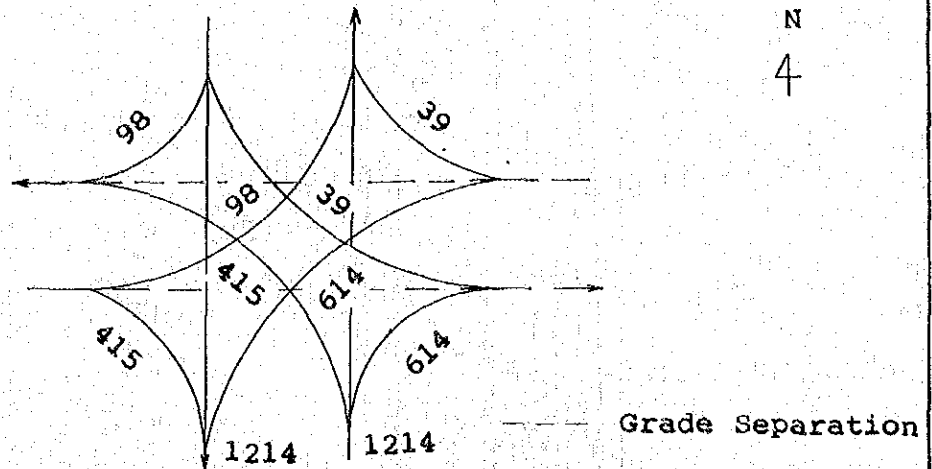


APPENDIX FIG. 8.5-13 SCHEMATIC PLAN OF B-ROUTE / C-ROUTE INTERCHANGE



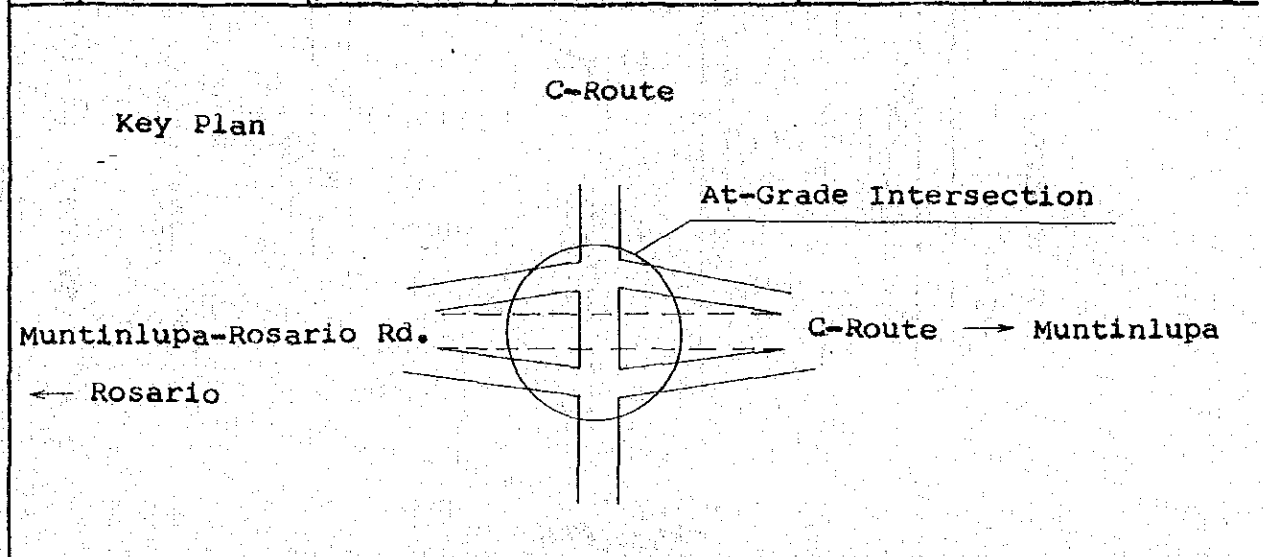
SECTION A-A' S = 1:200

APPENDIX FIG. 8.5-14 CAPACITY ANALYSIS OF INTERSECTION
(C-ROUTE/MUNTINLUPA-ROSARIO ROAD)

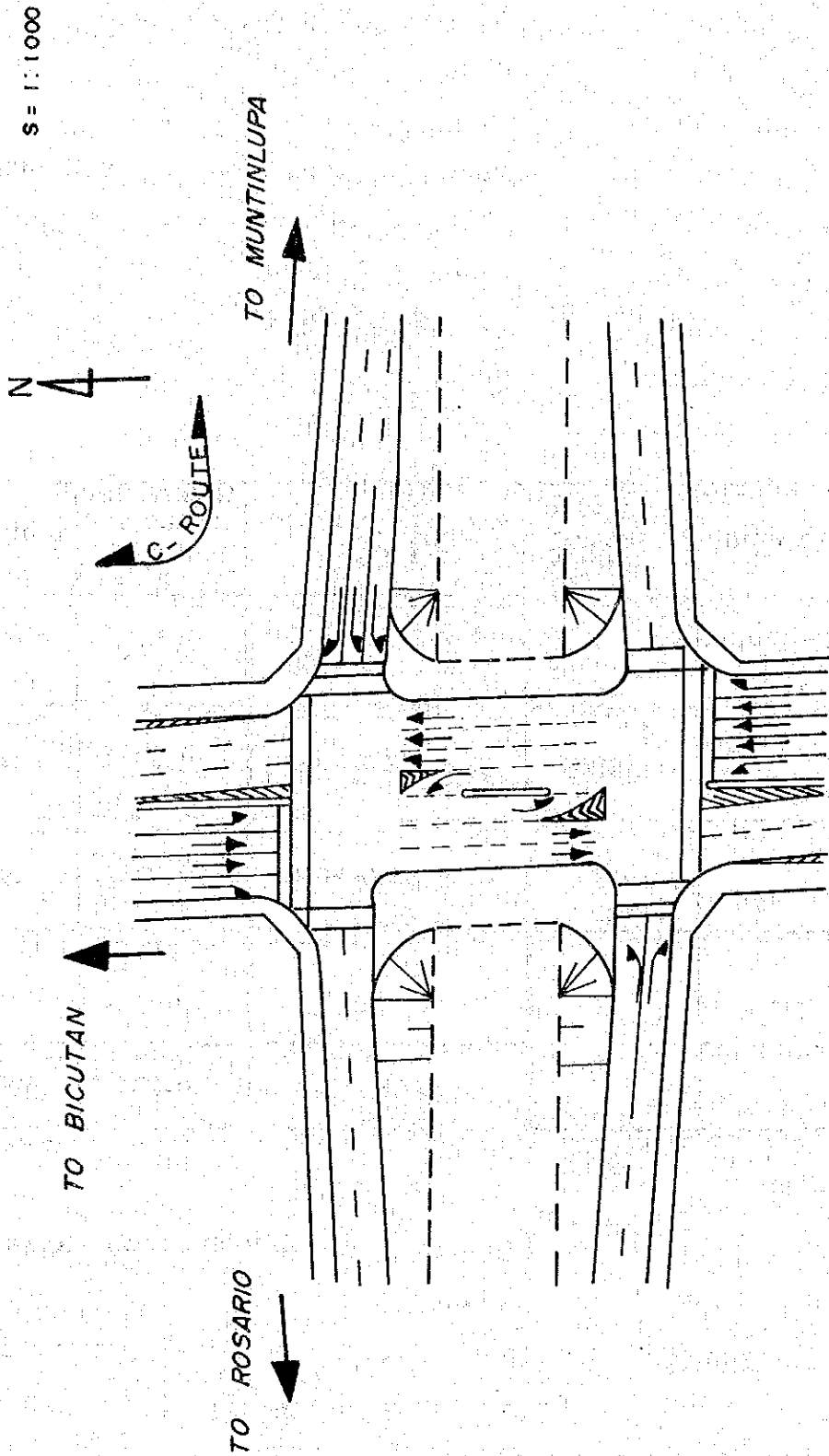


N
4

TRAFFIC PHASE	TRAFFIC VOLUME V (PCU/H)	POSSIBLE CAPACITY C_p (PCU/H)	INTEGRATED CONGESTION RATIO $Y = V/C_p$	MODIFIED	PHASE TIME (SEC)
1	VL = 737 VR = 47 VR = 118 VL = 498	2 x 2000 = 4000 1 x 2000 = 2000	0.184 0.249*	30%	27 + 3
2	VL = 47 VT = 1457 VR = 118	1 x 2000 = 2000 2 x 2250 = 4500	0.024 0.324*	39%	36 + 3
3	VL = 498 VT = 1457 VR = 737	1 x 2000 = 2000 3 x 2250 = 6750	0.249* 0.216	31%	28 + 3
4					
		TOTAL	0.822	100%	100



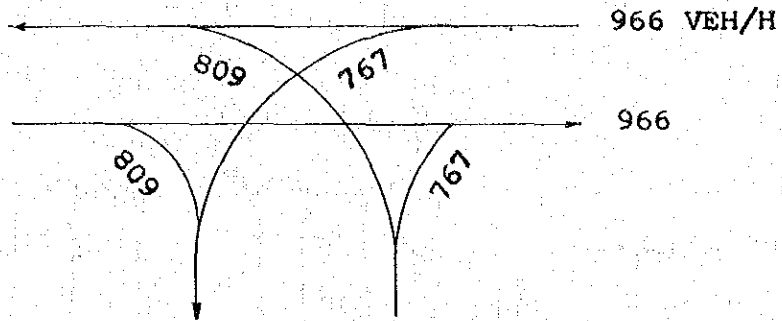
APPENDIX FIG. 8.5-15 SCHEMATIC PLAN OF C-ROUTE/MUNTINLUPA-ROSARIO ROAD



APPENDIX FIG. 8.5-16 CAPACITY ANALYSIS OF INTERSECTION

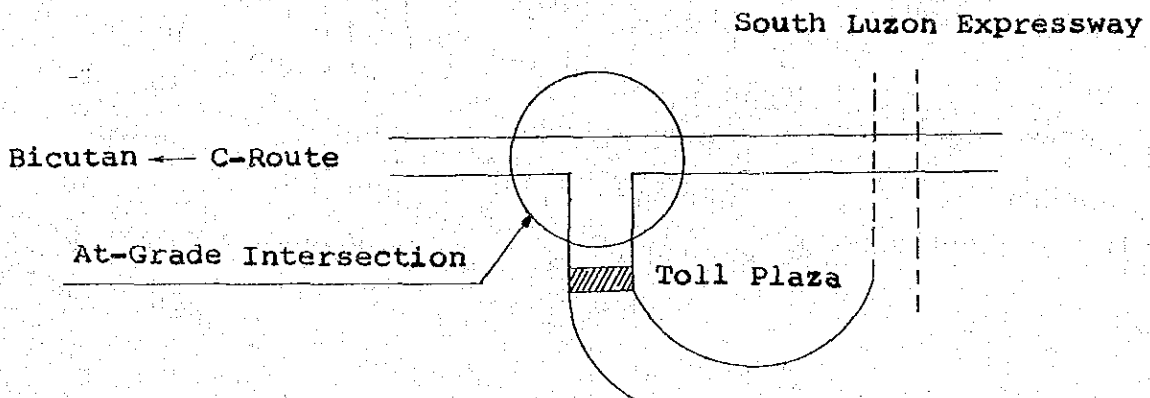
(C-ROUTE/SOUTH LUZON EXPRESSWAY)

N
4



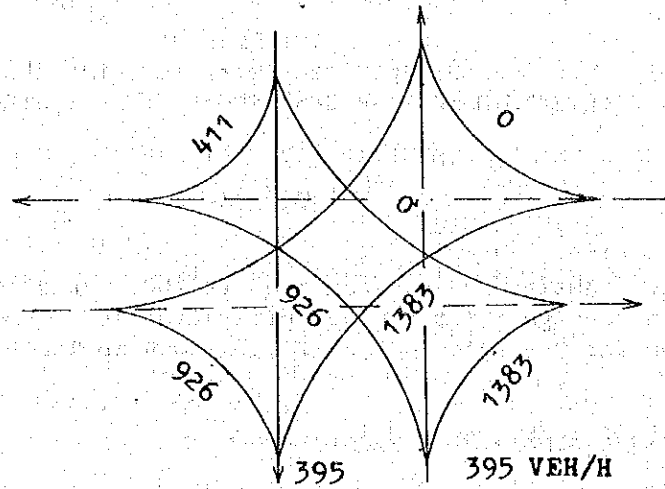
TRAFFIC PHASE	TRAFFIC VOLUME V (PCU/H)	POSSIBLE CAPACITY Cp (PCU/H)	INTEGRATED CONGESTION RATIO Y = V/Cp	MODIFIED	PHASE TIME (SEC)
1	V VT = 1159 VR = 1159	2 x 2250=4500 2 x 2250=4500	0.258 0.258	35%	32 + 3
2	V = 920	2 x 2000=4000	0.23	32%	29 + 3
3	V = 971	2 x 2000=4000	0.243	33%	30 + 3
4					
		TOTAL	0.731	100%	100

Key Plan



APPENDIX FIG. 8.5-17 CAPACITY ANALYSIS OF INTERSECTION

(C-ROUTE/NATIONAL ROAD NO. 1)



TRAFFIC PHASE	TRAFFIC VOLUME V (PCU/H)	POSSIBLE CAPACITY Cp (PCU/H)	INTEGRATED CONGESTION RATIO $\gamma = V/Cp$	MODIFIED	PHASE TIME (SEC)
1	VL = 1660 VR = 0 VR = 1111 VL = 493	2 x 2000=4000 1 x 2000=2000	0.415* 0.247	52%	49 + 3
2	VL = 0 VT = 474 VR = 493	2 x 2250=4500	0.105*	13%	10 + 3
3	VL = 1111 VT = 474 VR = 1660	2 x 2000=4000 1 x 2250=2250	0.278* 0.211	35%	32 + 3
4					
TOTAL			0.798	100%	100

Key Plan

National Road No. 1

