

Table 20. UNIT COST FOR RIVER CHANNEL IMPROVEMENT

| Item | Unit | Rate |
|---|--------------------------|----------|
| I. Construction Cost | | |
| (1) Site Clearance | M\$/ha | 6,000.0 |
| (2) Excavation : Under water | M\$/m ³ | 4.4 |
| On land | M\$/m ³ | 2.0 |
| (3) Embankment : Use borrowed materials | M\$/m ³ | 8.8 |
| Use excavated materials | M\$/m ³ | 2.9 |
| (4) Sod Facing | M\$/m ² | 3.7 |
| (5) Levee Pavement | M\$/m ² | 11.8 |
| (6) Bridge : With temporary bridge | M\$/m | 10,000.0 |
| Without temporary bridge | M\$/m | 5,000.0 |
| (7) Weir | M\$/m ² | 25,000.0 |
| II. Compensation Cost | | |
| (1) House | M\$/house | 44,000.0 |
| (2) Farm Land | M\$/ha | 35,000.0 |
| III. On-Cost Percentage | | |
| (1) Engineering Service Cost | 10% of I | |
| (2) Contingencies | 30% of [I + II + III(1)] | |

NOTE: Estimated on the price level as of 1985.

Table 21. FINANCIAL COST FOR RIVER CHANNEL IMPROVEMENT
WITHOUT FLOOD CONTROL DAM

| (Unit : 10 ⁶ M\$) | | | | | | |
|------------------------------|-------------|---------------------|----------------------|----------------------|----------------------|----------------------|
| River Basin | Stretch No. | 5-Year Design Flood | 10-Year Design Flood | 20-Year Design Flood | 30-Year Design Flood | 50-Year Design Flood |
| Johor | 1 | 5.6 | 6.0 | 6.8 | 7.7 | 9.6 |
| | 2 | 3.0 | 3.9 | 5.7 | 5.7 | 6.9 |
| | 3 | 2.3 | 2.9 | 4.3 | 4.3 | 5.1 |
| | 4 | 5.2 | 6.6 | 10.3 | 12.4 | 12.7 |
| | 5 | 2.9 | 3.7 | 4.6 | 6.7 | 6.7 |
| | 6 | 3.3 | 4.1 | 5.0 | 6.1 | 7.3 |
| | 7 | 2.4 | 2.9 | 4.1 | 4.9 | 6.3 |
| Skudai | 1 | 0 | 0 | 0 | 3.0 | 4.7 |
| | 2 | 4.0 | 5.0 | 6.6 | 7.2 | 8.1 |
| | 3 | 4.1 | 5.1 | 7.0 | 7.9 | 9.5 |
| | 4 | 2.5 | 2.9 | 4.7 | 5.8 | 6.9 |
| Tebrau | 1 | 0 | 0 | 2.7 | 4.1 | 5.7 |
| | 2 | 2.9 | 3.5 | 4.3 | 5.2 | 6.1 |
| | 3 | 1.9 | 2.1 | 2.7 | 3.1 | 3.8 |
| Benut | 1 | 0 | 2.7 | 4.2 | 5.3 | 6.8 |
| | 2 | 0 | 2.3 | 4.1 | 5.6 | 6.9 |
| | 3 | 0 | 1.0 | 1.7 | 2.1 | 2.9 |
| Pontian Besar | 1 | 0 | 3.7 | 6.7 | 9.0 | 12.2 |
| | 2 | 0 | 2.8 | 5.6 | 8.3 | 11.4 |
| | 3 | 0 | 1.1 | 1.1 | 1.7 | 2.1 |
| | 4 | 0 | 1.1 | 1.3 | 1.5 | 3.1 |
| Pontian Kechil | 1 | 0 | 0 | 5.8 | 7.7 | 9.2 |
| Pulai | 1 | 1.0 | 1.1 | 1.2 | 1.6 | 1.9 |
| | 2 | 1.4 | 1.4 | 1.6 | 1.9 | 2.3 |
| Sedili Besar | 1 | 3.4 | 4.1 | 5.9 | 6.9 | 7.7 |
| | 2 | 26.2 | 30.0 | 32.9 | 46.5 | 52.8 |
| | 3 | 7.2 | 8.7 | 11.7 | 13.4 | 15.2 |
| | 4 | 34.9 | 40.2 | 52.3 | 64.9 | 72.1 |
| Sedili Kechil | 1 | 2.6 | 2.9 | 6.4 | 7.3 | 8.4 |
| | 2 | 6.4 | 7.4 | 10.3 | 22.6 | 26.3 |

Table 22. FINANCIAL COST FOR RIVER CHANNEL IMPROVEMENT
WITH FLOOD CONTROL DAM

| River Basin | Stretch No. | (Unit : 10 ⁶ M\$) | | | | |
|-------------|-------------|------------------------------|----------------------|----------------------|----------------------|----------------------|
| | | 5-Year Design Flood | 10-Year Design Flood | 20-Year Design Flood | 30-Year Design Flood | 50-Year Design Flood |
| Johor | 1 | 5.2 | 5.4 | 5.8 | 6.2 | 6.6 |
| | 2 | 2.2 | 2.3 | 3.3 | 4.1 | 4.9 |
| | 3 | 1.4 | 1.8 | 2.4 | 3.0 | 3.4 |
| | 4 | 2.5 | 3.5 | 4.5 | 5.2 | 5.9 |

Table 23. EFFECTIVE STORAGE VOLUME REQUIRED FOR FLOOD CONTROL DAM

| River Basin | Dam | Catchment Area (km ²) | Storage Volume (10 ⁶ m ³) | | | | |
|-------------|---------|-----------------------------------|--|----------------------|----------------------|----------------------|----------------------|
| | | | 5-Year Design Flood | 10-Year Design Flood | 20-Year Design Flood | 30-Year Design Flood | 50-Year Design Flood |
| Johor | Sayon | 662 | 24.3 | 33.6 | 45.3 | 54.5 | 65.5 |
| | Linggiu | 206 | 3.5 | 7.2 | 10.7 | 13.7 | 16.1 |
| Total | | 868 | 27.8 | 40.8 | 56.0 | 68.2 | 81.6 |

Table 24. FINANCIAL COST ALLOCATION FOR FLOOD CONTROL DAM

| River Basin | Dam | (Unit : 10 ⁶ M\$) | | | | |
|-------------|---------|------------------------------|----------------------|----------------------|----------------------|----------------------|
| | | 5-Year Design Flood | 10-Year Design Flood | 20-Year Design Flood | 30-Year Design Flood | 50-Year Design Flood |
| Johor | Sayon | 14.7 | 20.3 | 27.3 | 32.9 | 39.5 |
| | Linggiu | 2.5 | 5.1 | 7.5 | 9.6 | 11.3 |
| Total | | 17.2 | 25.4 | 34.8 | 42.5 | 50.8 |

Table 25. ANNUAL AVERAGE OF COST FOR RIVER CHANNEL IMPROVEMENT
WITHOUT FLOOD CONTROL DAM

| (Unit : 10 ⁶ M\$/yr) | | | | | | |
|---------------------------------|-------------|---------------------|----------------------|----------------------|----------------------|----------------------|
| River Basin | Stretch No. | 5-Year Design Flood | 10-Year Design Flood | 20-Year Design Flood | 30-Year Design Flood | 50-Year Design Flood |
| Johor | 1 | 0.44 | 0.47 | 0.54 | 0.61 | 0.76 |
| | 2 | 0.24 | 0.31 | 0.45 | 0.45 | 0.54 |
| | 3 | 0.18 | 0.23 | 0.34 | 0.34 | 0.40 |
| | 4 | 0.41 | 0.52 | 0.81 | 0.98 | 1.00 |
| | 5 | 0.23 | 0.29 | 0.36 | 0.53 | 0.55 |
| | 6 | 0.26 | 0.32 | 0.39 | 0.48 | 0.57 |
| | 7 | 0.19 | 0.23 | 0.32 | 0.39 | 0.50 |
| Skudai | 1 | 0.00 | 0.00 | 0.00 | 0.24 | 0.37 |
| | 2 | 0.31 | 0.39 | 0.52 | 0.57 | 0.64 |
| | 3 | 0.32 | 0.40 | 0.55 | 0.62 | 0.75 |
| | 4 | 0.20 | 0.23 | 0.37 | 0.46 | 0.54 |
| Tebrau | 1 | 0.00 | 0.00 | 0.21 | 0.32 | 0.45 |
| | 2 | 0.23 | 0.28 | 0.34 | 0.41 | 0.48 |
| | 3 | 0.15 | 0.17 | 0.21 | 0.24 | 0.30 |
| Benut | 1 | 0.00 | 0.21 | 0.33 | 0.42 | 0.54 |
| | 2 | 0.00 | 0.18 | 0.32 | 0.44 | 0.54 |
| | 3 | 0.00 | 0.08 | 0.13 | 0.17 | 0.23 |
| Pontian Besar | 1 | 0.00 | 0.29 | 0.53 | 0.71 | 0.96 |
| | 2 | 0.00 | 0.22 | 0.44 | 0.65 | 0.90 |
| | 3 | 0.00 | 0.09 | 0.09 | 0.13 | 0.17 |
| | 4 | 0.00 | 0.09 | 0.10 | 0.12 | 0.24 |
| Pontian Kechil | 1 | 0.00 | 0.00 | 0.46 | 0.61 | 0.72 |
| Pulai | 1 | 0.08 | 0.09 | 0.09 | 0.13 | 0.15 |
| | 2 | 0.11 | 0.11 | 0.13 | 0.15 | 0.18 |
| Sedili Besar | 1 | 0.27 | 0.32 | 0.46 | 0.54 | 0.61 |
| | 2 | 2.06 | 2.36 | 2.59 | 3.66 | 4.16 |
| | 3 | 0.57 | 0.69 | 0.92 | 1.06 | 1.20 |
| | 4 | 2.75 | 3.17 | 4.12 | 5.11 | 5.68 |
| Sedili Kechil | 1 | 0.20 | 0.23 | 0.50 | 0.57 | 0.66 |
| | 2 | 0.50 | 0.58 | 0.81 | 1.78 | 2.07 |

Table 26. ANNUAL AVERAGE OF COST FOR RIVER CHANNEL IMPROVEMENT WITH FLOOD CONTROL DAM

| | | (Unit : 10 ⁶ M\$/yr) | | | | |
|-------------|-------------|---------------------------------|----------------------|----------------------|----------------------|----------------------|
| River Basin | Stretch No. | 5-Year Design Flood | 10-Year Design Flood | 20-Year Design Flood | 30-Year Design Flood | 50-Year Design Flood |
| Johor | 1 | 0.41 | 0.43 | 0.46 | 0.49 | 0.52 |
| | 2 | 0.17 | 0.18 | 0.26 | 0.32 | 0.39 |
| | 3 | 0.11 | 0.14 | 0.19 | 0.24 | 0.27 |
| | 4 | 0.20 | 0.28 | 0.35 | 0.41 | 0.46 |

Table 27. ANNUAL AVERAGE OF COST ALLOCATED FOR FLOOD CONTROL DAM

| | | (Unit : 10 ⁶ M\$/yr) | | | | |
|-------------|---------|---------------------------------|----------------------|----------------------|----------------------|----------------------|
| River Basin | Dam | 5-Year Design Flood | 10-Year Design Flood | 20-Year Design Flood | 30-Year Design Flood | 50-Year Design Flood |
| Johor | Sayon | 1.45 | 2.01 | 2.70 | 3.26 | 3.91 |
| | Linggiu | 0.25 | 0.50 | 0.74 | 0.95 | 1.12 |
| Total | | 1.70 | 2.51 | 3.44 | 4.21 | 5.03 |

Table 28. ANNUAL AVERAGE OF FLOOD DAMAGE

| River Basin | Stretch No. | Without Project | (Unit : 10 ³ M\$/yr) | | | | |
|---------------|-------------|-----------------|---------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | | | With Flood Mitigation Project | | | | |
| | | | Design for 5-Year Flood | Design for 10-Year Flood | Design for 20-Year Flood | Design for 30-Year Flood | Design for 50-Year Flood |
| Johor | 1 | 1,363 | 989 | 597 | 299 | 182 | 81 |
| | 2 | 146 | (1,166) | (914) | (843) | (822) | (813) |
| | 3 | 333 | 94 | 53 | 26 | 16 | 7 |
| | 4 | 187 | (126) | (111) | (106) | (104) | (104) |
| | 5 | 0 | 200 | 105 | 50 | 30 | 13 |
| | 6 | 0 | (279) | (270) | (263) | (261) | (259) |
| | 7 | 200 | 115 | 62 | 30 | 18 | 8 |
| Total | 2,228 | (155) | (146) | (141) | (138) | (137) | |
| | | 0 | 0 | 0 | 0 | 0 | |
| | | 0 | 0 | 0 | 0 | 0 | |
| | | 171 | 111 | 55 | 34 | 15 | |
| | | 1,570 | 928 | 461 | 280 | 125 | |
| | | (1,726) | (1,441) | (1,353) | (1,325) | (1,313) | |
| Skudai | 1 | 113 | 113 | 113 | 113 | 80 | 37 |
| | 2 | 726 | 473 | 272 | 139 | 86 | 39 |
| | 3 | 1,938 | 1,258 | 718 | 367 | 226 | 102 |
| | 4 | 234 | 158 | 94 | 49 | 31 | 14 |
| Total | 3,011 | 2,002 | 1,198 | 669 | 423 | 191 | |
| Tebrau | 1 | 295 | 295 | 295 | 188 | 120 | 55 |
| | 2 | 86 | 60 | 37 | 20 | 12 | 6 |
| | 3 | 32 | 20 | 11 | 6 | 3 | 2 |
| Total | 414 | 376 | 343 | 213 | 136 | 63 | |
| Benut | 1 | 117 | 117 | 117 | 79 | 53 | 26 |
| | 2 | 27 | 27 | 19 | 10 | 6 | 3 |
| | 3 | 70 | 70 | 70 | 70 | 63 | 30 |
| Total | 215 | 215 | 206 | 160 | 123 | 59 | |
| Pontian Besar | 1 | 24 | 24 | 24 | 24 | 24 | 18 |
| | 2 | 28 | 28 | 28 | 28 | 28 | 20 |
| | 3 | 15 | 15 | 10 | 6 | 3 | 1 |
| | 4 | 66 | 66 | 47 | 24 | 14 | 6 |
| Total | 132 | 132 | 109 | 81 | 69 | 44 | |
| Pontian Kecil | 1 | 128 | 128 | 128 | 80 | 51 | 24 |
| Pulai | 1 | 2 | 1 | 1 | 1 | 1 | 0 |
| | 2 | 31 | 23 | 15 | 8 | 6 | 3 |
| Total | 33 | 24 | 16 | 9 | 6 | 3 | |
| Sedili Besar | 1 | 6 | 4 | 3 | 1 | 1 | 0 |
| | 2 | 25 | 17 | 11 | 5 | 3 | 2 |
| | 3 | 10 | 7 | 4 | 2 | 1 | 1 |
| | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 41 | 29 | 17 | 9 | 5 | 3 | |
| Sedili Kecil | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 0 | 0 | 0 | 0 | 0 | 0 | |
| Grand Total | 6,202 | 4,475 | 2,946 | 1,681 | 1,093 | 511 | |

NOTE: Figures in parenthesis are annual average of flood damage only with flood control dams.

Table 29. PROBABLE DAMAGE REDUCTION IN MONETARY TERMS

| (Unit : 10 ³ M\$/yr) | | | | | | |
|---------------------------------|-------------|-----------------------|------------------------|------------------------|------------------------|------------------------|
| River Basin | Stretch No. | Design for 5-Yr Flood | Design for 10-Yr Flood | Design for 20-Yr Flood | Design for 30-Yr Flood | Design for 50-Yr Flood |
| Johor | 1 | 374 (197) | 766 (449) | 1,064 (520) | 1,181 (541) | 1,282 (550) |
| | 2 | 52 (20) | 93 (35) | 120 (40) | 130 (42) | 139 (42) |
| | 3 | 133 (54) | 228 (63) | 282 (70) | 302 (72) | 319 (74) |
| | 4 | 71 (32) | 124 (41) | 156 (46) | 168 (49) | 179 (50) |
| | 5 | 0 | 0 | 0 | 0 | 0 |
| | 6 | 0 | 0 | 0 | 0 | 0 |
| | 7 | 29 | | 89 | 144 | 166 |
| | Total | 659 (303) | 1,300 (588) | 1,768 (676) | 1,949 (704) | 2,104 (716) |
| Skudai | 1 | 0 | 0 | 0 | 33 | 76 |
| | 2 | 252 | 454 | 586 | 640 | 687 |
| | 3 | 681 | 1,220 | 1,572 | 1,712 | 1,837 |
| | 4 | 76 | 140 | 185 | 203 | 220 |
| | Total | 1,009 | 1,813 | 2,342 | 2,588 | 2,820 |
| Tebrau | 1 | 0 | 0 | 107 | 175 | 240 |
| | 2 | 26 | 49 | 67 | 74 | 81 |
| | 3 | 12 | 21 | 27 | 29 | 31 |
| | Total | 38 | 70 | 200 | 278 | 351 |
| Benut | 1 | 0 | 0 | 37 | 63 | 91 |
| | 2 | 0 | 8 | 17 | 21 | 25 |
| | 3 | 0 | 0 | 0 | 7 | 40 |
| | Total | 0 | 8 | 55 | 92 | 156 |
| Pontian Besar | 1 | 0 | 0 | 0 | 0 | 7 |
| | 2 | 0 | 0 | 0 | 0 | 8 |
| | 3 | 0 | 4 | 9 | 11 | 13 |
| | 4 | 0 | 19 | 42 | 52 | 60 |
| | Total | 0 | 23 | 51 | 63 | 88 |
| Pontian Kechil | 1 | 0 | 0 | 48 | 77 | 104 |
| Pulai | 1 | 0 | 1 | 1 | 1 | 1 |
| | 2 | 9 | 17 | 23 | 26 | 29 |
| | Total | 9 | 18 | 24 | 27 | 30 |
| Sedili Besar | 1 | 2 | 4 | 5 | 5 | 6 |
| | 2 | 8 | 14 | 20 | 22 | 23 |
| | 3 | 3 | 6 | 8 | 9 | 10 |
| | 4 | 0 | 0 | 0 | 0 | 0 |
| | Total | 12 | 24 | 33 | 36 | 39 |
| Sedili Kechil | 1 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 0 | 0 | 0 | 0 | 0 |
| | Total | 0 | 0 | 0 | 0 | 0 |
| Grand Total | | 1,727 | 3,257 | 4,521 | 5,109 | 5,692 |

NOTE: Figures in parenthesis are probable damage reduction only with flood control dams.

Table 30. ANNUAL AVERAGE OF POPULATION TO BE AFFECTED BY FLOODS

| | | (Unit : person/yr) | | | | | | | | | | | | |
|----------------|-------------|---------------------|-------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-----------------|-------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|
| River Basin | Stretch No. | In the Year of 1985 | | | | | | | In the Year of 2005 | | | | | |
| | | Without Project | With Flood Mitigation Project | | | | | Without Project | With Flood Mitigation Project | | | | | |
| | | | Design for 5-Year Flood | Design for 10-Year Flood | Design for 20-Year Flood | Design for 30-Year Flood | Design for 50-Year Flood | | Design for 5-Year Flood | Design for 10-Year Flood | Design for 20-Year Flood | Design for 30-Year Flood | Design for 50-Year Flood | |
| Johor | 1 | 2,484 | 1,592 | 842 | 383 | 225 | 97 | 4,592 | 3,127 | 1,737 | 804 | 476 | 207 | |
| | 2 | 500 | 308 | 162 | 76 | 45 | 20 | 523 | 322 | 169 | 79 | 47 | 20 | |
| | 3 | 1,224 | 697 | 338 | 153 | 90 | 39 | 1,279 | 728 | 353 | 159 | 94 | 40 | |
| | 4 | 658 | 376 | 184 | 84 | 49 | 21 | 687 | 393 | 192 | 87 | 51 | 22 | |
| | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 7 | 324 | 270 | 166 | 77 | 46 | 20 | 597 | 496 | 304 | 141 | 83 | 36 | |
| | Total | 5,191 | 3,244 | 1,692 | 771 | 454 | 197 | 7,678 | 5,067 | 2,755 | 1,270 | 751 | 327 | |
| Skudal | 1 | 189 | 189 | 189 | 189 | 134 | 61 | 451 | 451 | 451 | 451 | 318 | 146 | |
| | 2 | 1,819 | 1,079 | 556 | 264 | 158 | 70 | 2,847 | 1,674 | 852 | 401 | 240 | 105 | |
| | 3 | 4,156 | 2,502 | 1,312 | 632 | 381 | 168 | 9,445 | 5,913 | 3,247 | 1,616 | 987 | 440 | |
| | 4 | 298 | 193 | 110 | 56 | 35 | 15 | 1,048 | 678 | 386 | 197 | 121 | 54 | |
| | Total | 6,463 | 3,964 | 2,166 | 1,141 | 708 | 315 | 13,790 | 8,716 | 4,936 | 2,665 | 1,667 | 745 | |
| Tebrau | 1 | 679 | 679 | 679 | 433 | 276 | 127 | 1,616 | 1,616 | 1,616 | 1,029 | 658 | 303 | |
| | 2 | 236 | 170 | 108 | 58 | 37 | 17 | 99 | 71 | 45 | 24 | 15 | 7 | |
| | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Total | 915 | 849 | 787 | 491 | 313 | 144 | 1,715 | 1,687 | 1,661 | 1,054 | 673 | 310 | |
| Benut | 1 | 40 | 40 | 40 | 28 | 18 | 9 | 25 | 25 | 25 | 17 | 11 | 6 | |
| | 2 | 119 | 119 | 81 | 40 | 25 | 11 | 74 | 74 | 50 | 25 | 15 | 7 | |
| | 3 | 172 | 172 | 172 | 172 | 154 | 72 | 342 | 342 | 342 | 342 | 307 | 146 | |
| | Total | 332 | 332 | 294 | 240 | 197 | 92 | 441 | 441 | 417 | 384 | 333 | 159 | |
| Pontian Besar | 1 | 93 | 93 | 93 | 93 | 93 | 67 | 57 | 57 | 57 | 57 | 57 | 41 | |
| | 2 | 42 | 42 | 42 | 42 | 42 | 30 | 26 | 26 | 26 | 26 | 26 | 19 | |
| | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 4 | 309 | 309 | 224 | 121 | 76 | 35 | 192 | 192 | 139 | 75 | 47 | 22 | |
| | Total | 444 | 444 | 358 | 256 | 211 | 132 | 276 | 276 | 222 | 159 | 131 | 82 | |
| Pontian Kechil | 1 | 85 | 85 | 85 | 53 | 34 | 16 | 53 | 53 | 53 | 33 | 21 | 10 | |
| Pulai | 1 | 11 | 8 | 5 | 3 | 2 | 1 | 7 | 5 | 3 | 2 | 1 | 1 | |
| | 2 | 14 | 10 | 7 | 4 | 3 | 2 | 9 | 6 | 4 | 3 | 2 | 1 | |
| | Total | 25 | 18 | 12 | 7 | 5 | 3 | 15 | 11 | 7 | 4 | 3 | 2 | |
| Sedili Besar | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 2 | 104 | 73 | 44 | 22 | 14 | 6 | 109 | 76 | 46 | 23 | 14 | 7 | |
| | 3 | 40 | 28 | 17 | 9 | 5 | 2 | 42 | 29 | 18 | 9 | 6 | 3 | |
| | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Total | 144 | 101 | 61 | 31 | 19 | 9 | 151 | 105 | 63 | 32 | 20 | 9 | |
| Sedili Kechil | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Total | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Grand Total | 13,599 | 9,037 | 5,456 | 2,990 | 1,942 | 907 | 24,119 | 16,356 | 10,115 | 5,601 | 3,599 | 1,644 | | |

Table 31. PROBABLE DAMAGE REDUCTION IN POPULATION TERMS

(Unit : person/yr)

| River Basin | Stretch No. | In the Year of 1985 | | | | | In the Year of 2005 | | | | |
|----------------|-------------|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | | Design for 5-Year Flood | Design for 10-Year Flood | Design for 20-Year Flood | Design for 30-Year Flood | Design for 50-Year Flood | Design for 5-Year Flood | Design for 10-Year Flood | Design for 20-Year Flood | Design for 30-Year Flood | Design for 50-Year Flood |
| Johor | 1 | 892 | 1,642 | 2,101 | 2,259 | 2,387 | 1,465 | 2,855 | 3,788 | 4,116 | 4,385 |
| | 2 | 192 | 338 | 424 | 455 | 480 | 201 | 354 | 444 | 476 | 503 |
| | 3 | 527 | 886 | 1,071 | 1,134 | 1,185 | 551 | 926 | 1,120 | 1,185 | 1,239 |
| | 4 | 282 | 474 | 574 | 609 | 637 | 294 | 495 | 600 | 636 | 665 |
| | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 7 | 54 | 158 | 247 | 278 | 304 | 101 | 293 | 456 | 514 | 561 |
| | Total | 1,947 | 3,499 | 4,419 | 4,737 | 4,994 | 2,612 | 4,924 | 6,408 | 6,927 | 7,352 |
| Skudal | 1 | 0 | 0 | 0 | 55 | 128 | 0 | 0 | 0 | 133 | 305 |
| | 2 | 740 | 1,263 | 1,555 | 1,661 | 1,749 | 1,173 | 1,995 | 2,446 | 2,607 | 2,742 |
| | 3 | 1,654 | 2,844 | 3,524 | 3,775 | 3,988 | 3,532 | 6,198 | 7,829 | 8,458 | 9,005 |
| | 4 | 105 | 188 | 242 | 263 | 283 | 370 | 662 | 851 | 927 | 994 |
| | Total | 2,499 | 4,297 | 5,322 | 5,755 | 6,148 | 5,074 | 8,854 | 11,125 | 12,123 | 13,044 |
| Tebrau | 1 | 0 | 0 | 246 | 403 | 552 | 0 | 0 | 587 | 958 | 1,313 |
| | 2 | 66 | 128 | 178 | 199 | 219 | 28 | 54 | 75 | 84 | 92 |
| | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 66 | 128 | 424 | 602 | 771 | 28 | 54 | 661 | 1,042 | 1,404 |
| Benut | 1 | 0 | 0 | 12 | 22 | 31 | 0 | 0 | 8 | 14 | 19 |
| | 2 | 0 | 38 | 79 | 94 | 108 | 0 | 24 | 49 | 59 | 67 |
| | 3 | 0 | 0 | 0 | 18 | 100 | 0 | 0 | 0 | 35 | 196 |
| | Total | 0 | 38 | 91 | 134 | 239 | 0 | 23 | 57 | 107 | 282 |
| Pontian Besar | 1 | 0 | 0 | 0 | 0 | 26 | 0 | 0 | 0 | 0 | 16 |
| | 2 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 7 |
| | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 4 | 0 | 85 | 188 | 233 | 274 | 0 | 53 | 117 | 145 | 170 |
| | Total | 0 | 86 | 189 | 233 | 312 | 0 | 53 | 117 | 145 | 194 |
| Pontian Kechil | 1 | 0 | 0 | 32 | 51 | 69 | 0 | 0 | 20 | 32 | 43 |
| Pulai | 1 | 3 | 6 | 8 | 8 | 9 | 2 | 4 | 5 | 6 | 6 |
| | 2 | 4 | 7 | 10 | 11 | 12 | 3 | 5 | 6 | 7 | 8 |
| | Total | 7 | 13 | 18 | 20 | 22 | 4 | 8 | 11 | 12 | 14 |
| Sedili Besar | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 31 | 60 | 82 | 90 | 98 | 33 | 63 | 86 | 95 | 102 |
| | 3 | 12 | 23 | 31 | 35 | 38 | 13 | 24 | 33 | 36 | 39 |
| | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 44 | 83 | 113 | 125 | 136 | 45 | 87 | 118 | 131 | 142 |
| Sedili Kechil | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Grand Total | | 4,562 | 8,143 | 10,608 | 11,657 | 12,692 | 7,763 | 14,003 | 18,518 | 20,519 | 22,474 |

Table 32. NET ECONOMIC BENEFIT OF RIVER CHANNEL IMPROVEMENT
WITHOUT FLOOD CONTROL DAM

| | | (Unit : 10 ⁶ M\$/yr) | | | | |
|----------------|------------------------|---------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| River Basin | Stretch to be Improved | Design for 5-Year Flood | Design for 10-Year Flood | Design for 20-Year Flood | Design for 30-Year Flood | Design for 50-Year Flood |
| Johor | 1 | -0.07 | 0.30 | 0.52 | 0.57 | 0.52 |
| | 1 - 2 | -0.25 | 0.08 | 0.19 | 0.28 | 0.12 |
| | 1 - 3 | -0.30 | 0.08 | 0.14 | 0.24 | 0.04 |
| | 1 - 4 | -0.64 | -0.32 | -0.52 | -0.57 | -0.78 |
| | 1 - 5 | -0.87 | -0.61 | -0.88 | -1.10 | -1.33 |
| | 1 - 6 | -1.13 | -0.93 | -1.27 | -1.58 | -1.90 |
| | 1 - 7 | -1.29 | -1.07 | -1.44 | -1.80 | -2.22 |
| Skudai | 1 | 0.00 | 0.00 | 0.00 | -0.21 | -0.29 |
| | 1 - 2 | -0.06 | 0.06 | 0.07 | -0.14 | -0.25 |
| | 1 - 3 | 0.30 | 0.88 | 1.09 | 0.95 | 0.84 |
| | 1 - 4 | 0.18 | 0.79 | 0.90 | 0.70 | 0.52 |
| Tebrau | 1 | 0.00 | 0.00 | -0.10 | -0.14 | -0.21 |
| | 1 - 2 | -0.20 | -0.23 | -0.38 | -0.48 | -0.61 |
| | 1 - 3 | -0.34 | -0.38 | -0.56 | -0.69 | -0.88 |
| Benut | 1 | 0.00 | -0.21 | -0.29 | -0.36 | -0.45 |
| | 1 - 2 | 0.00 | -0.38 | -0.60 | -0.78 | -0.96 |
| | 1 - 3 | 0.00 | -0.46 | -0.73 | -0.94 | -1.15 |
| Pontian Besar | 1 | 0.00 | -0.29 | -0.53 | -0.71 | -0.95 |
| | 1 - 2 | 0.00 | -0.51 | -0.97 | -1.36 | -1.85 |
| | 1 - 3 | 0.00 | -0.60 | -1.05 | -1.48 | -2.00 |
| | 1 - 4 | 0.00 | -0.67 | -1.11 | -1.55 | -2.18 |
| Pontian Kechil | 1 | 0.00 | 0.00 | -0.41 | -0.53 | -0.62 |
| Pulai | 1 | -0.08 | -0.09 | -0.09 | -0.13 | -0.15 |
| | 1 - 2 | -0.18 | -0.18 | -0.20 | -0.25 | -0.30 |
| Sedili Besar | 1 | -0.27 | -0.32 | -0.46 | -0.53 | -0.60 |
| | 1 - 2 | -2.32 | -2.66 | -3.03 | -4.17 | -4.74 |
| | 1 - 3 | -2.89 | -3.35 | -3.94 | -5.22 | -5.93 |
| | 1 - 4 | -5.64 | -6.52 | -8.06 | -10.33 | -11.61 |
| Sedili Kechil | 1 | -0.20 | -0.23 | -0.50 | -0.57 | -0.66 |
| | 1 - 2 | -0.70 | -0.81 | -1.31 | -2.35 | -2.73 |

Table 33. NET ECONOMIC BENEFIT OF RIVER CHANNEL IMPROVEMENT WITH FLOOD CONTROL DAM (JOHOR RIVER BASIN)

| | | (Unit : 10 ⁶ M\$/yr) | | | | |
|----------------------|------------------------|---------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | Stretch to be Improved | Design for 5-Year Flood | Design for 10-Year Flood | Design for 20-Year Flood | Design for 30-Year Flood | Design for 50-Year Flood |
| Benefit | non | 0.30 | 0.59 | 0.68 | 0.70 | 0.72 |
| | 1 | 0.48 | 0.91 | 1.22 | 1.34 | 1.45 |
| | 1 - 2 | 0.51 | 0.96 | 1.30 | 1.43 | 1.55 |
| | 1 - 3 | 0.59 | 1.13 | 1.51 | 1.66 | 1.79 |
| | 1 - 4 | 0.63 | 1.21 | 1.62 | 1.78 | 1.92 |
| Cost | non | 1.70 | 2.51 | 3.44 | 4.21 | 5.03 |
| | 1 | 2.11 | 2.94 | 3.90 | 4.70 | 5.55 |
| | 1 - 2 | 2.28 | 3.12 | 4.16 | 5.02 | 5.94 |
| | 1 - 3 | 2.39 | 3.26 | 4.35 | 5.26 | 6.21 |
| | 1 - 4 | 2.59 | 3.54 | 4.70 | 5.67 | 6.67 |
| Net Economic Benefit | non | -1.40 | -1.92 | -2.76 | -3.51 | -4.31 |
| | 1 | -1.63 | -2.03 | -2.68 | -3.36 | -4.10 |
| | 1 - 2 | -1.77 | -2.16 | -2.86 | -3.59 | -4.39 |
| | 1 - 3 | -1.80 | -2.13 | -2.84 | -3.60 | -4.42 |
| | 1 - 4 | -1.96 | -2.33 | -3.08 | -3.89 | -4.75 |

Table 34. PRINCIPAL FEATURES OF RECOMMENDED FLOOD MITIGATION SCHEME

| Description | Johor River Basin | Skudai River Basin | Total |
|---|---|--|--------|
| 1. Project Component | | | |
| 1.1 Major Target Area | Kota Tinggi | Senai and Kulai | |
| 1.2 Design Flood Level | 30-Year Return Period | 20-Year Return Period | |
| 1.3 Flood Mitigation Measure | Channel Improvement (Length: 6.7 km) | Channel Improvement (Length: 15.0 km) | |
| 1.4 Project Cost (M\$10 ⁶) | 7.7 | 13.6 | 21.3 |
| 2. Economic Effect | | | |
| 2.1 Flood Damage Without Scheme (M\$10 ⁶ /yr) | 1.36 | 2.66 | 4.03 |
| 2.2 Flood Damage Reduction With Scheme (M\$10 ⁶ /yr) | 1.18 | 2.16 | 3.34 |
| 2.3 Net Economic Benefit (M\$10 ⁶ /yr) | 0.57 | 1.16 | 1.73 |
| 2.4 EIRR (%) | 10.7 | 11.0 | 10.9 |
| 2.5 Ratio Between 2.1 and Total Damage in the Region* (%) | 22.4 | 43.0 | 64.9 |
| 2.6 Ratio Between 2.2 and Total Damage in the Region* (%) | 19.0 | 34.8 | 53.8 |
| 3. Social Effect (As of 2005) | | | |
| 3.1 Population Damage Without Scheme (person/yr) | 4,952 | 12,292 | 17,244 |
| 3.2 Population Damage Reduction With Scheme (person/yr) | 4,116 | 10,275 | 14,391 |
| 3.3 Ratio Between 3.1 and Total Damage in the Region** (%) | 20.5 | 51.0 | 71.5 |
| 3.4 Ratio Between 3.2 and Total Damage in the Region** (%) | 17.1 | 42.6 | 60.0 |

NOTE; *: Total damage in the Region amounts to M\$6,202, considering that there is no future flood mitigation work.

** : A total of 24,119 people in the Region will be affected by a flood in the year 2005, considering that there is no flood mitigation work.

Table 35. PROBABLE PEAK DISCHARGES AT MODEL RIVER
STRETCH OF JOHOR RIVER

| Return Period (year) | Probable Peak Discharge | | | Model River Stretch (m ³ /s) |
|---|---|---|---|---|
| | Stretch No. 4 (m ³ /s) | Stretch No. 3 (m ³ /s) | Stretch No. 2 (m ³ /s) | |
| <u>Estimated from Runoff Study</u> | | | | |
| 5 | 300 | 370 | 440 | 460 |
| 10 | 400 | 460 | 500 | 530 |
| 20 | 490 | 580 | 630 | 660 |
| 30 | 580 | 680 | 740 | 770 |
| 50 | 650 | 770 | 840 | 870 |
| <u>Estimated from Envelop Curve</u> | | | | |
| 5 | 380 | 420 | 460 | 480 |
| 10 | 440 | 480 | 520 | 540 |
| 20 | 580 | 630 | 670 | 690 |
| 30 | 680 | 730 | 770 | 790 |
| 50 | 780 | 830 | 860 | 890 |

Table 36. SUM OF COST FOR RIVER CHANNEL IMPROVEMENT

| Design Discharge (m ³ /s) | Cost for Alternative A (M\$106) | Cost for Alternative B (M\$106) | Cost for Alternative C (M\$106) | Cost for Alternative D (M\$106) |
|--------------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| 300 | 4.58 | 5.32 | 7.07 | 9.16 |
| 500 | 5.84 | 5.81 | 7.44 | 9.45 |
| 700 | 8.56 | 6.98 | 8.47 | 10.35 |
| 900 | 10.71 | 10.11 | 11.20 | 12.90 |
| 1000 | 12.38 | 12.09 | 13.09 | 14.70 |

Table 37. SUM OF COST FOR COMBINATION OF RIVER CHANNEL IMPROVEMENT AND DIVERSION CHANNEL

| Design Discharge (m ³ /s) | Size of Diversion Channel | | Possible Diverting Discharge | | C o s t | | |
|--------------------------------------|---------------------------|-------------------|---------------------------------|---|------------------------------|------------------------------|----------------|
| | Bed Width (m) | Channel Depth (m) | Johor River (m ³ /s) | Diver- sion Channel (m ³ /s) | River Improve- ment (M\$106) | Diver- sion Channel (M\$106) | Total (M\$106) |
| 600 | 10 | 3 | 536 | 64 | 5.98 | 2.15 | 8.13 |
| 700 | 10 | 4 | 587 | 113 | 6.27 | 2.33 | 8.60 |
| 800 | 10 | 5 | 613 | 187 | 6.45 | 2.68 | 9.13 |
| 900 | 10 | 5 | 702 | 198 | 6.99 | 2.68 | 9.67 |
| 1000 | 20 | 5 | 703 | 297 | 7.00 | 3.39 | 10.39 |

Note: River improvement for the main channel is assumed to be done by the manner of Alternative B.

Table 38. MINIMUM CONSTRUCTION COST REQUIRED FOR EACH DESIGN FLOOD LEVEL

| Design Level (R.P. year) | Design Discharge (m ³ /s) | Flood Mitigation Measure* | Minimum Construction Cost (M\$106) |
|-----------------------------|---|---------------------------|---------------------------------------|
| 5 | 460 | I | 5.3 |
| 10 | 530 | I | 6.1 |
| 20 | 660 | I | 6.8 |
| 30 | 770 | I | 7.7 |
| 40 | 820 | I | 8.7 |
| 50 | 870 | II | 9.5 |
| 100 | 1080 | II | 11.0 |

Note; *: I = River channel improvement only
 II = River channel improvement and flood diversion channel

Table 39. COMPARISON OF ANNUAL AVERAGE OF CONSTRUCTION COST AND FLOOD DAMAGE REDUCTION

| Design Level (R.P. year) | Annual Average Construction Cost (M\$106/yr) | Annual Average Damage Reduction (M\$106/yr) | Net Economic Benefit (M\$106/yr) |
|-----------------------------|---|--|-------------------------------------|
| 5 | 0.42 | 0.37 | -0.05 |
| 10 | 0.48 | 0.77 | 0.29 |
| 20 | 0.54 | 1.06 | 0.52 |
| 30 | 0.61 | 1.18 | 0.57 |
| 50 | 0.75 | 1.28 | 0.53 |

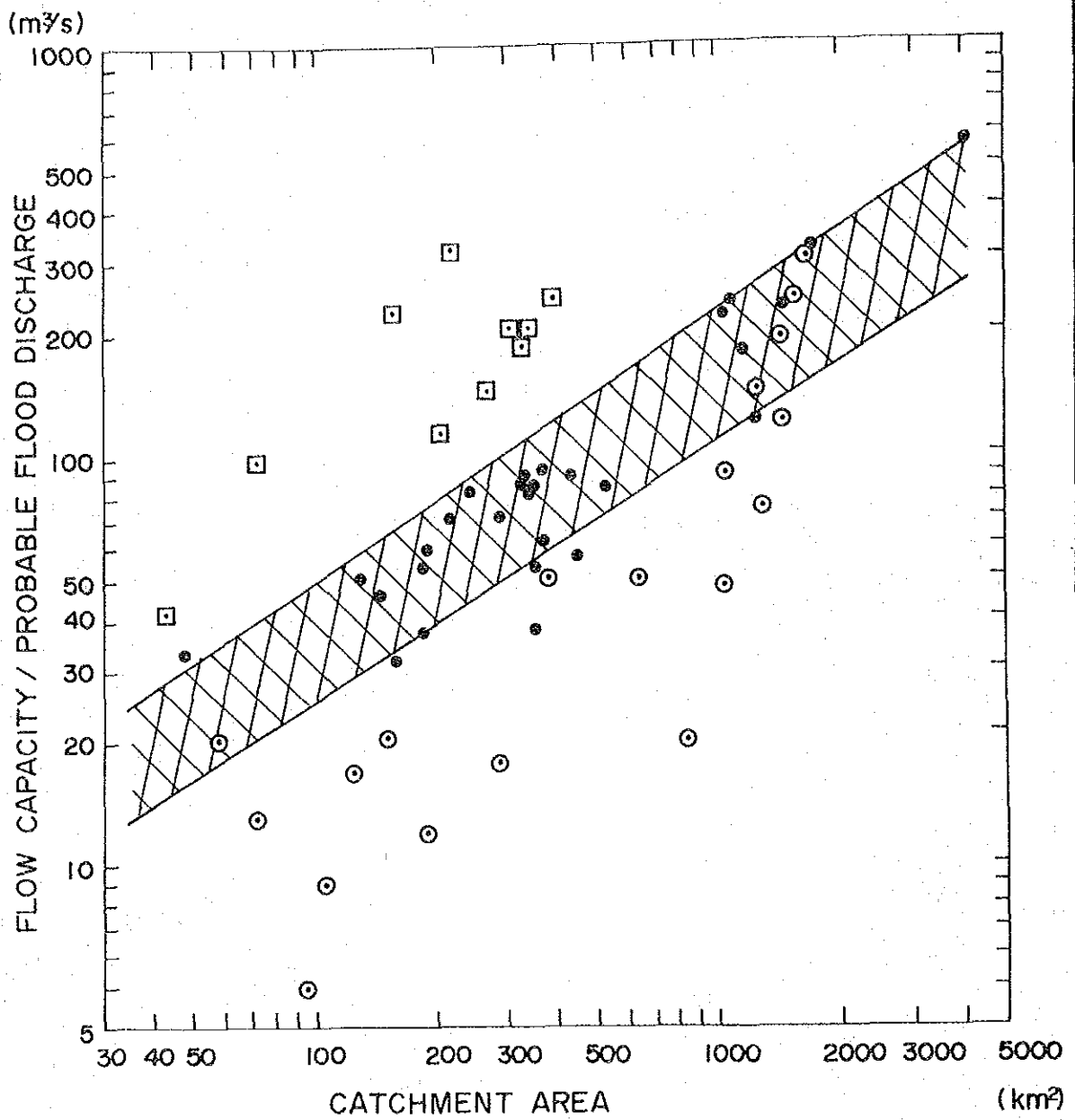
Table 40. COST OF RIVER CHANNEL IMPROVEMENT
FOR MODEL RIVER STRETCH

| Work Item | Unit Rate | Volume | Amount |
|--|--------------------------|------------------------|---------------------|
| I. Construction | | | |
| (1) Site Clearance | M\$6,000/ha | 1.9 ha | M\$ 11,400 |
| (2) Excavation | M\$4.4/m ³ | 257,000 m ³ | 1,130,800 |
| (3) Embankment | M\$8.8/m ³ | 138,000 m ³ | 1,214,400 |
| (4) Sod Facing | M\$3.7/m ² | 104,000 m ² | 384,800 |
| (5) Levee Pavement | M\$11.8/m ² | 40,000 m ² | 472,000 |
| (6) Reconstruction of Bridge | M\$10,000/m | 120 m | 1,200,000 |
| (7) Weir | M\$25,000/m ² | 30 m ² | 750,000 |
| Total | | | M\$5,163,400 |
| II. Compensation | | | |
| (1) Resettlement of House | M\$44,000/house | 4 houses | M\$ 176,000 |
| (2) Procurement of Agricultural Land | M\$35,000/ha | 1.5 ha | 52,500 |
| Total | | | M\$ 228,500 |
| III. Engineering Services (10% of I) | | | M\$ 516,300 |
| IV. Physical Contingencies (30% of I, II & III) | | | M\$1,772,500 |
| Grand Total | | | M\$7,680,700 |

Table 41. REQUIRED NUMBER OF MAJOR CONSTRUCTION EQUIPMENT FOR RIVER CHANNEL IMPROVEMENT OF MODEL RIVER STRETCH

| Equipment Item | Work for Excavation | Work for Embankment | Total |
|------------------------|---------------------|---------------------|-------|
| Dredger | 1 | - | 1 |
| Anchor Barge | 1 | - | 1 |
| Buckhoe | 2 | - | 2 |
| Wheel Loader | 2 | 1 | 3 |
| Dump Truck | 10 | 6 | 16 |
| Bulldozer | 2 | 1 | 3 |
| Asphalt Engine Sprayer | - | 1 | 1 |
| Asphalt Finisher | - | 1 | 1 |
| Road Roller | - | 1 | 1 |
| Tire Roller | - | 1 | 1 |
| Soil Compactor | - | 5 | 5 |

FIGURES



LEGEND

- : Flow Capacity on Non-Improved River Stretch in the Region
- : Flow Capacity on Improved River Stretch in the Region
- : 2-year Return Period Flood Estimated by Flood Records of Available Stations in Malaysia
- ▨ : Approximate Extent of 2-year Return Period Flood

Fig. 2 Flow Capacity Versus Catchment Area

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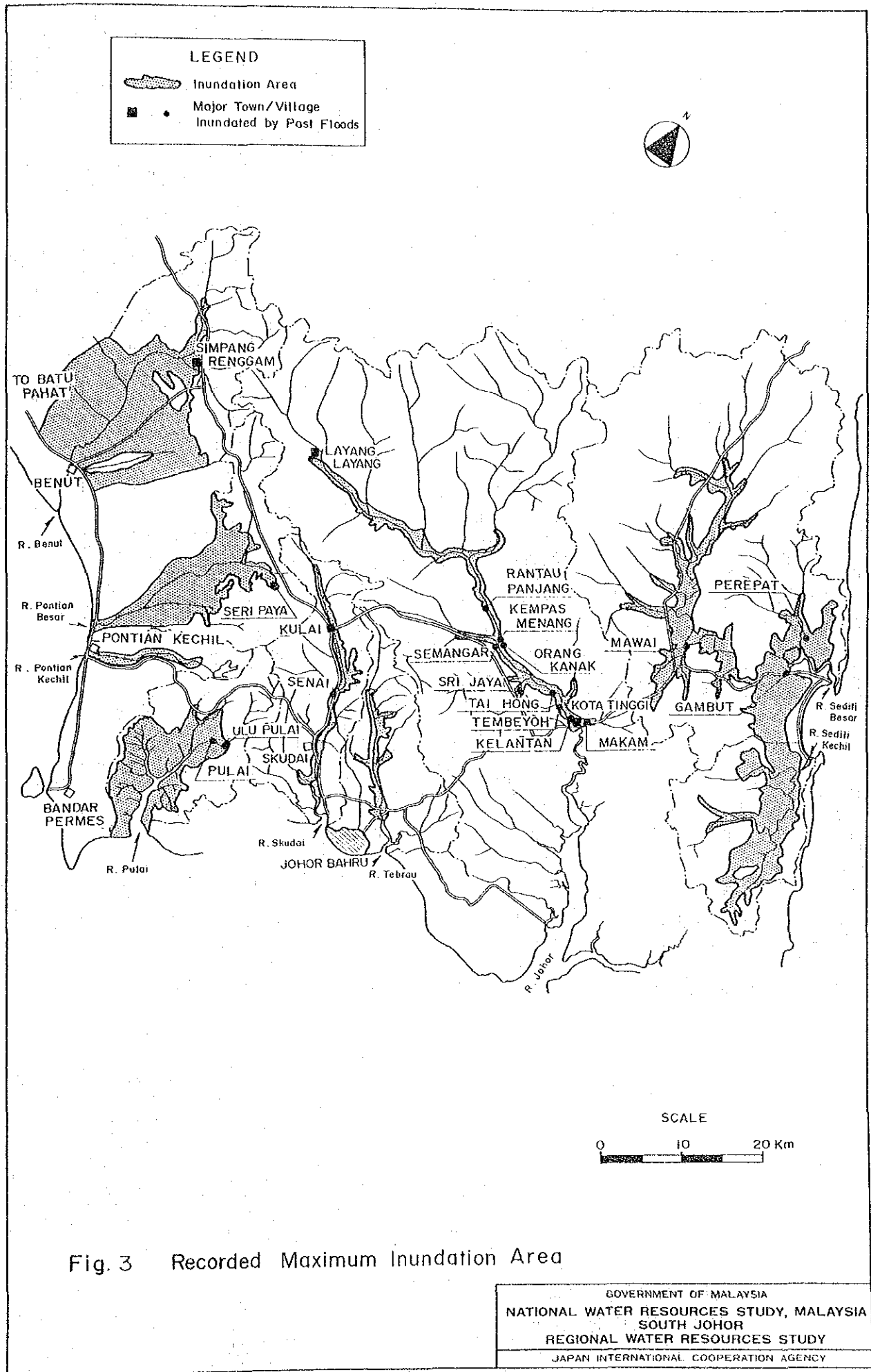


Fig. 3 Recorded Maximum Inundation Area

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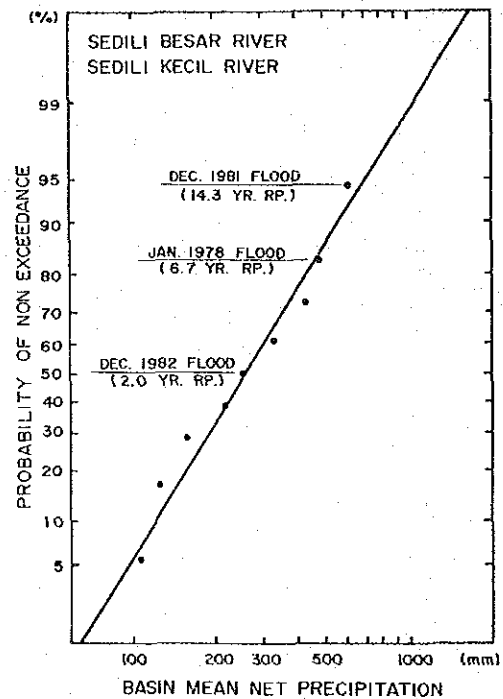
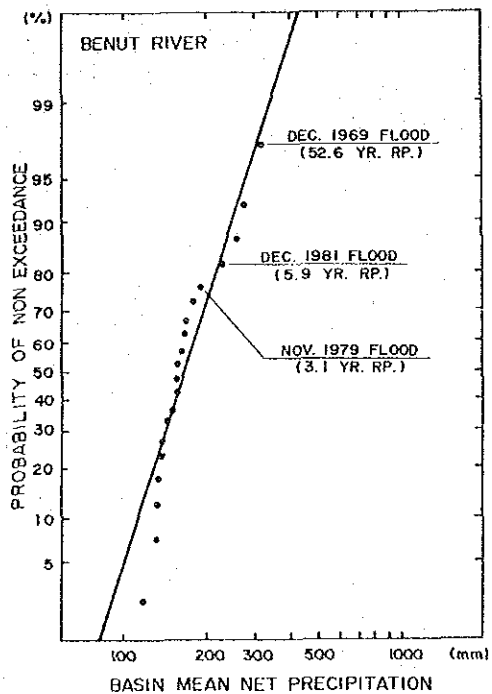
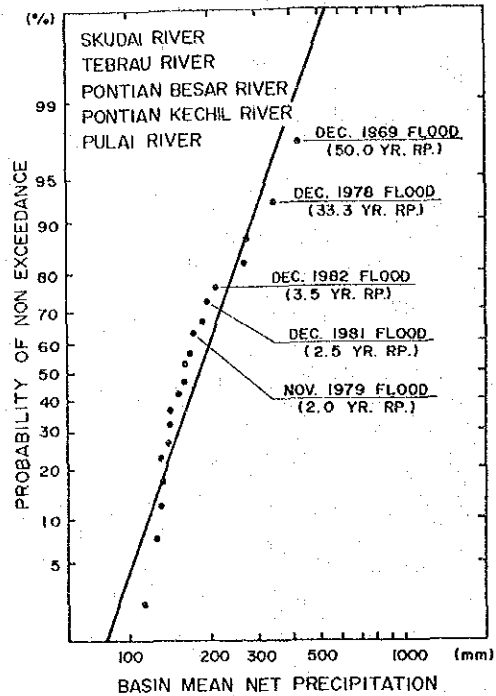
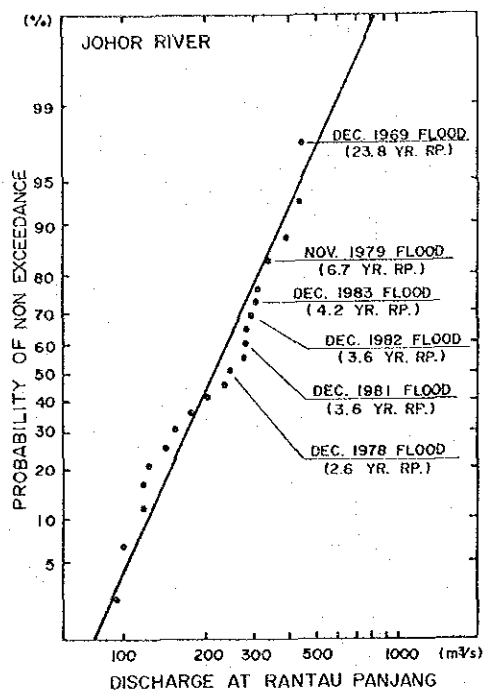


Fig. 4 Occurrence Probability of Past Major Flood

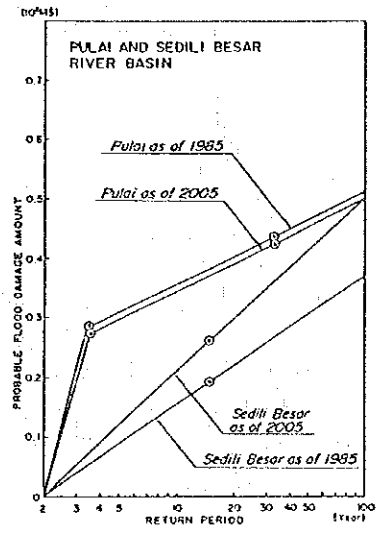
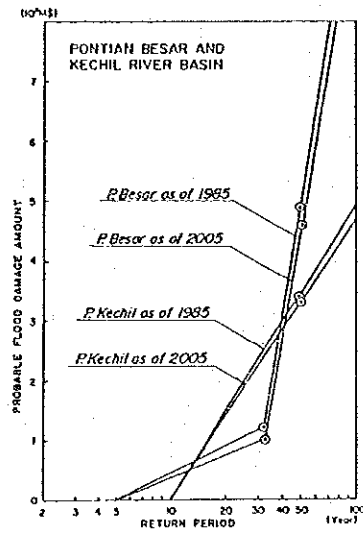
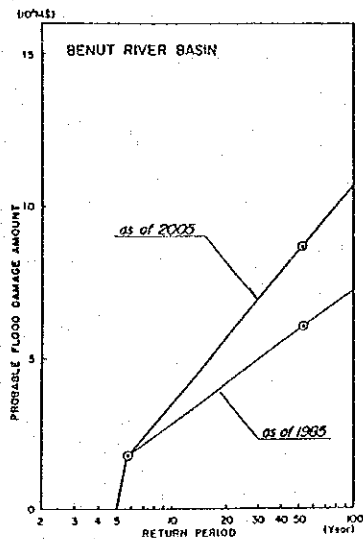
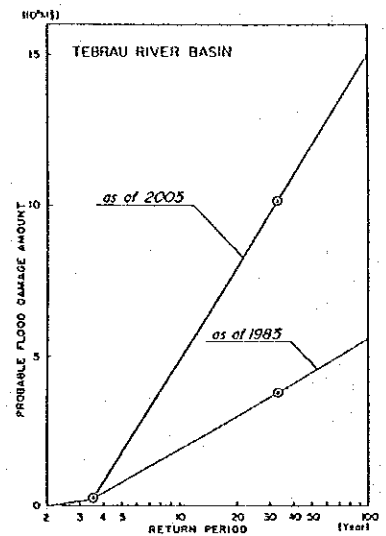
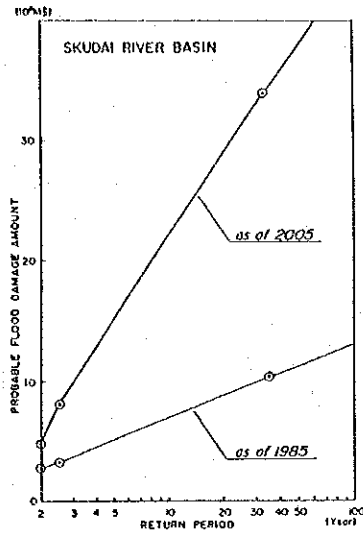
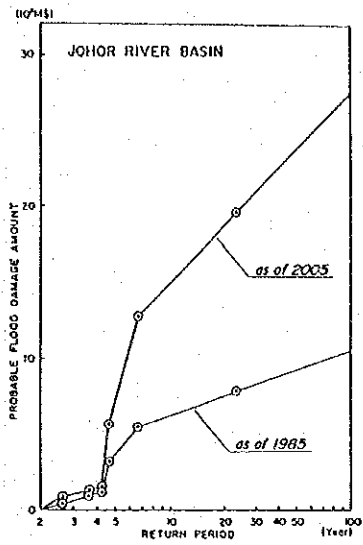


Fig. 5 Flood Damage Amount Frequency Curve

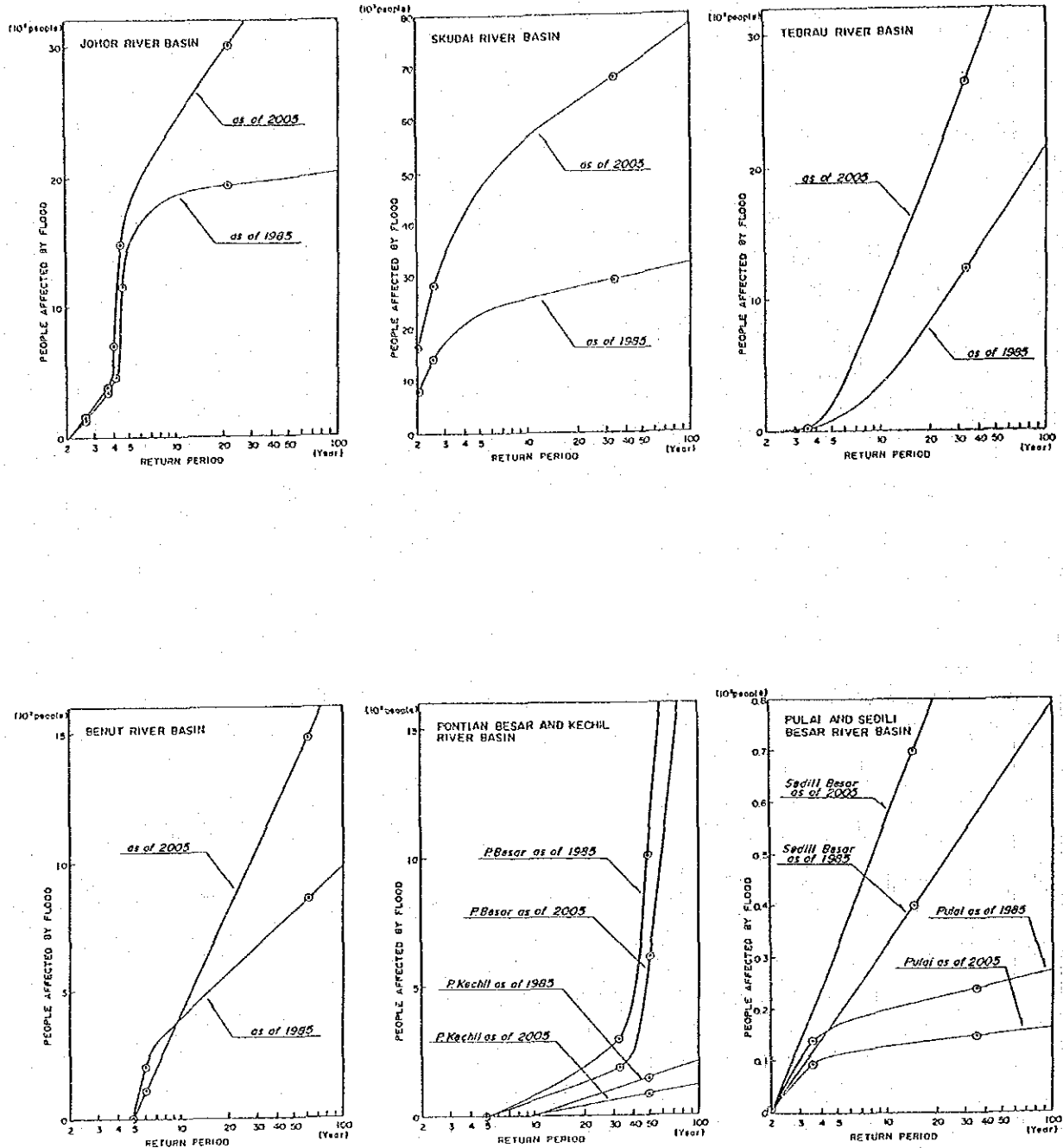


Fig. 6 People Affected by Flood Frequency Curve

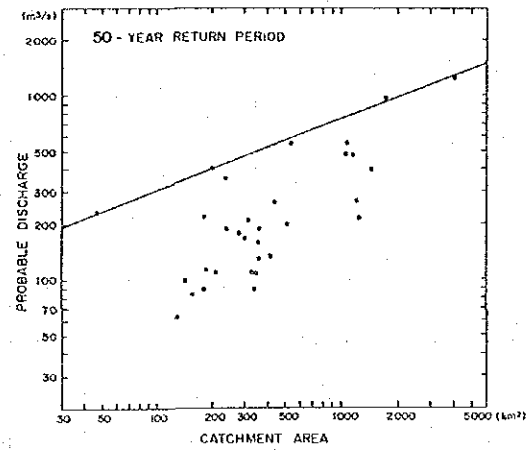
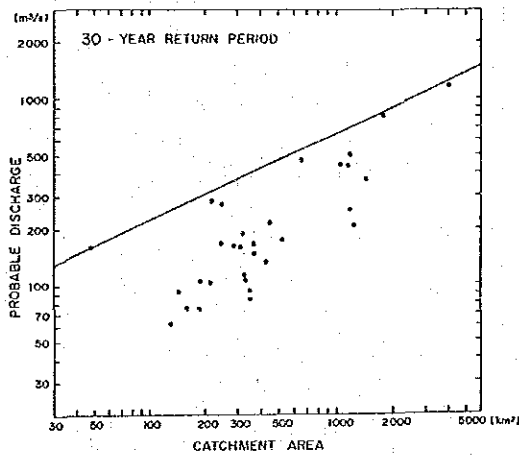
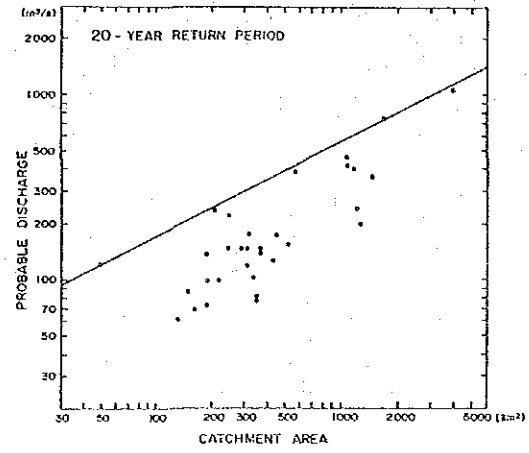
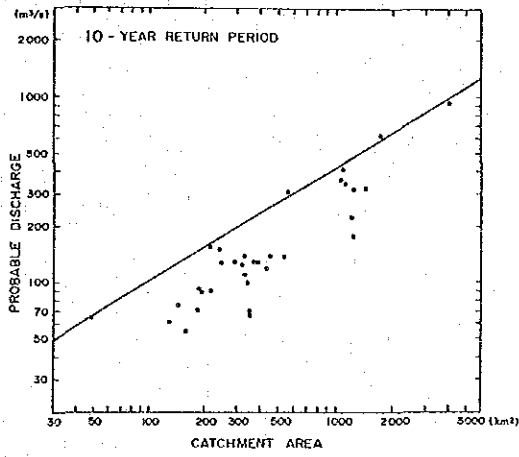
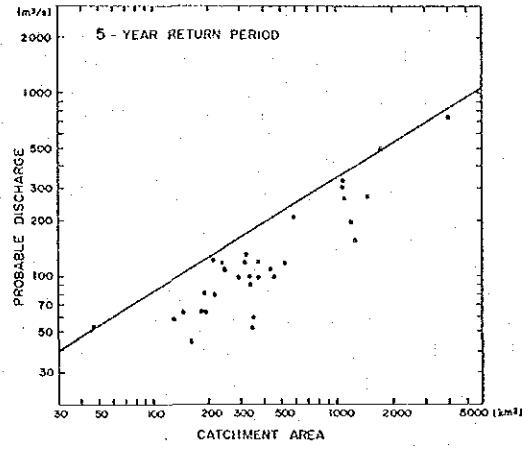
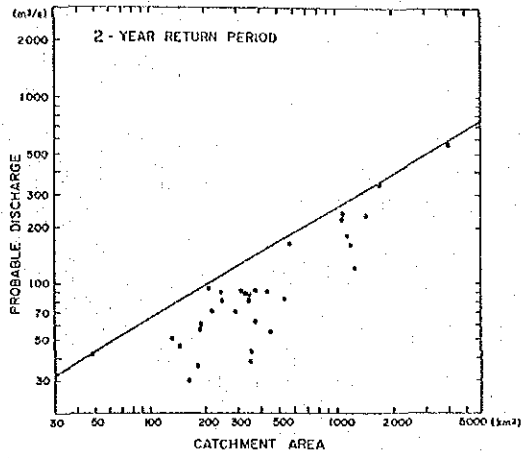


Fig. 7 Relationship between Catchment Area and Probable Discharge

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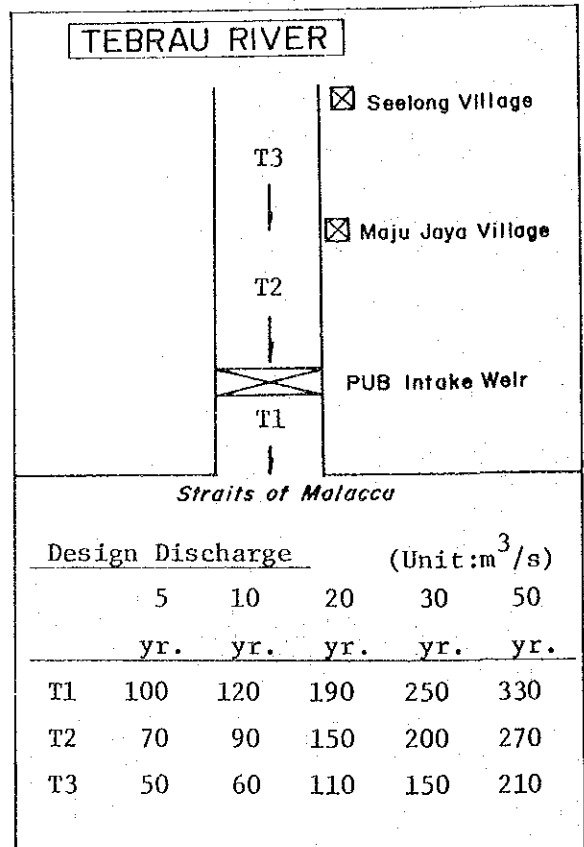
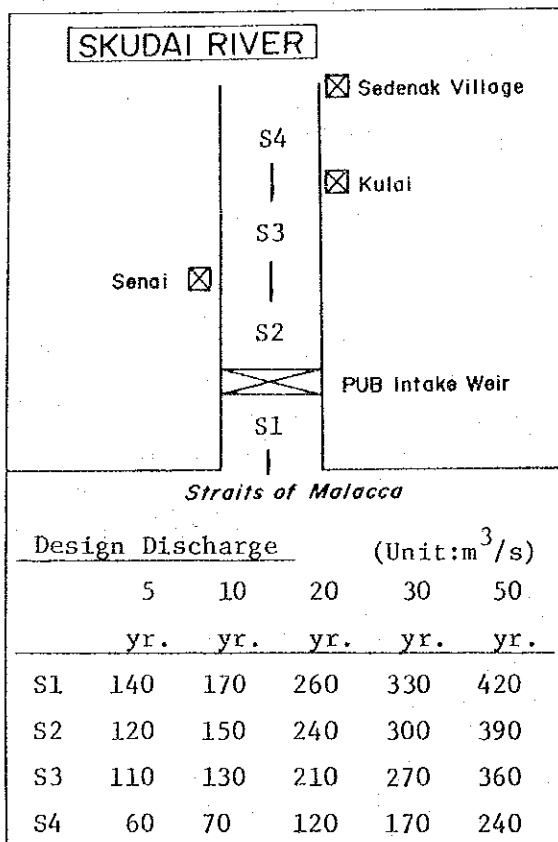
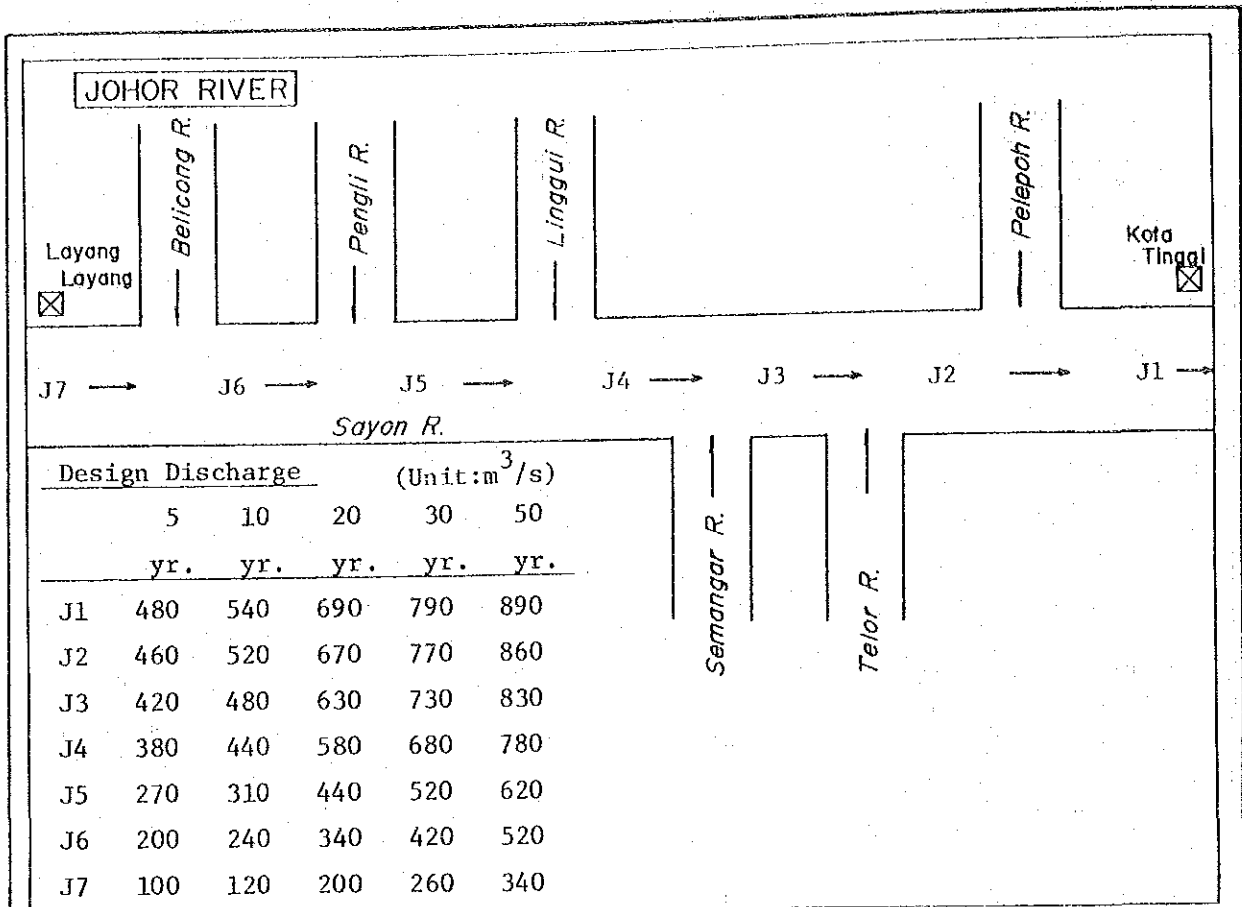


Fig. 8 Design Flood Discharge Without Flood Dam Control (1/4)

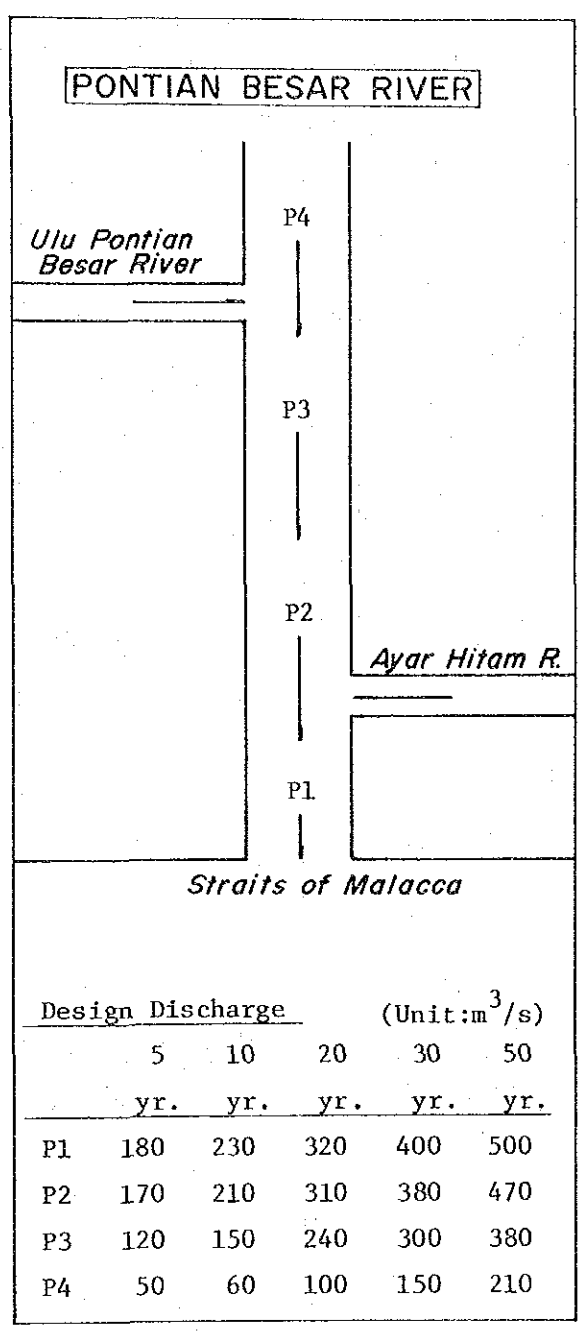
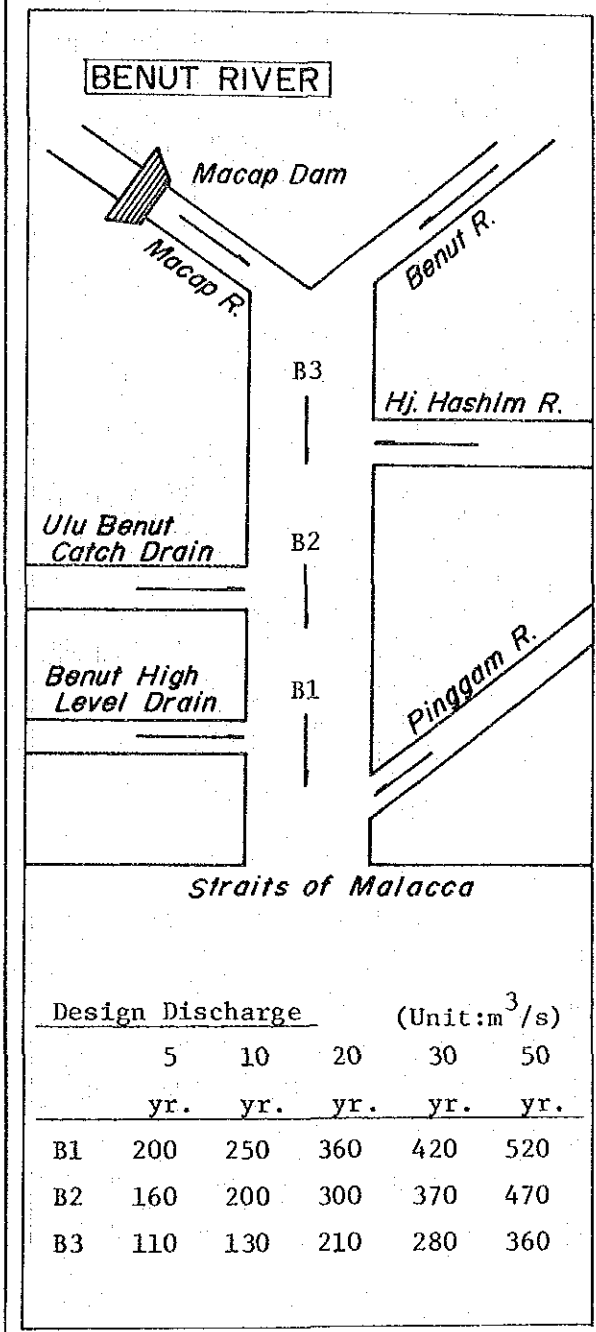
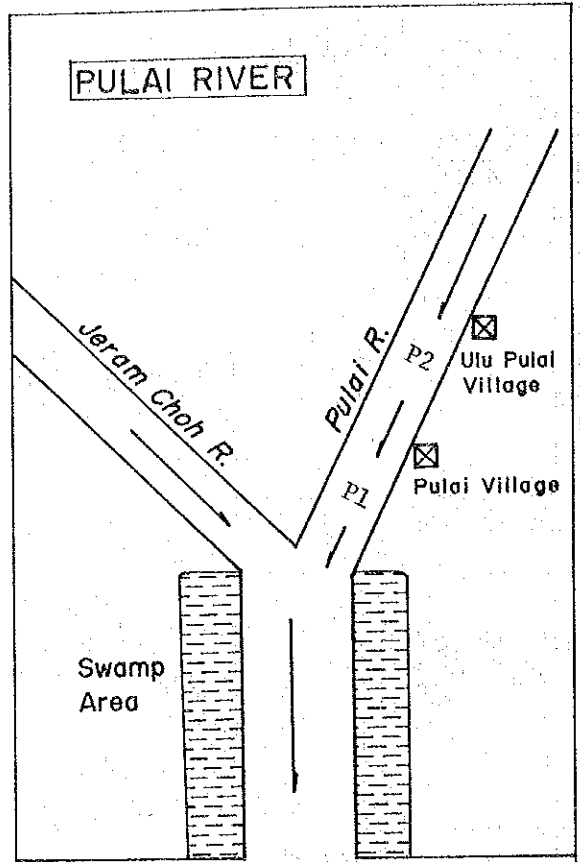
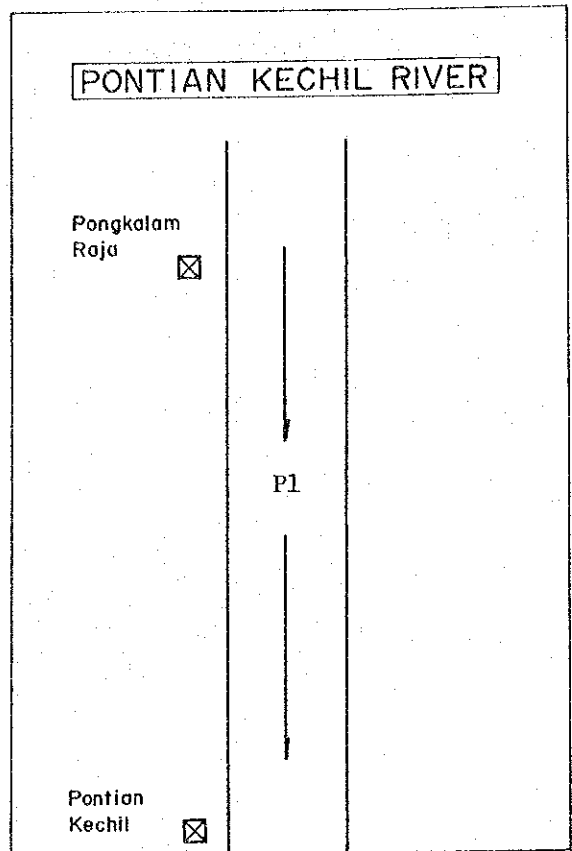


Fig. 9 Design Flood Discharge Without Flood Dam Control (2/4)



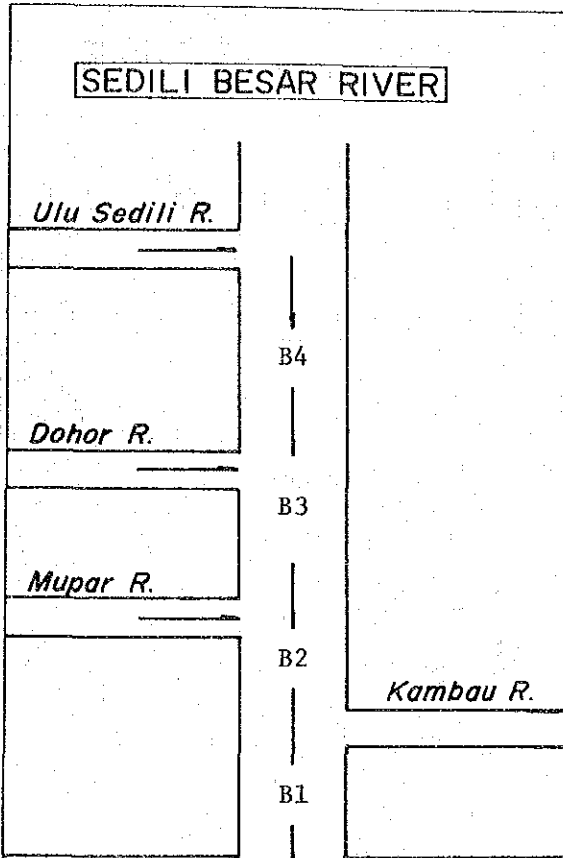
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| | Design Discharge (Unit: m ³ /s) | | | | |
|----|--|--------|--------|--------|--------|
| | 5 yr. | 10 yr. | 20 yr. | 30 yr. | 50 yr. |
| P1 | 70 | 100 | 150 | 200 | 270 |

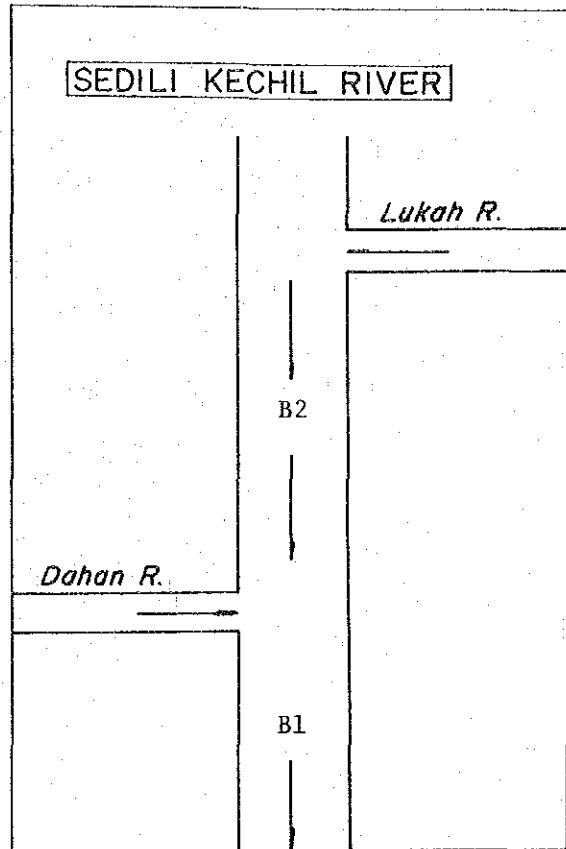
| | Design Discharge (Unit: m ³ /s) | | | | |
|----|--|--------|--------|--------|--------|
| | 5 yr. | 10 yr. | 20 yr. | 30 yr. | 50 yr. |
| P1 | 80 | 100 | 170 | 230 | 300 |
| P2 | 80 | 100 | 170 | 220 | 290 |

Fig. 10 Design Flood Discharge Without Flood Dam Control (3/4)



South China Sea

| | Design Discharge (Unit: m ³ /s) | | | | |
|----|--|--------|--------|--------|--------|
| | 5 yr. | 10 yr. | 20 yr. | 30 yr. | 50 yr. |
| B1 | 420 | 480 | 630 | 730 | 830 |
| B2 | 370 | 420 | 560 | 660 | 760 |
| B3 | 340 | 390 | 530 | 620 | 720 |
| B4 | 250 | 300 | 420 | 500 | 600 |



South China Sea

| | Design Discharge (Unit: m ³ /s) | | | | |
|----|--|--------|--------|--------|--------|
| | 5 yr. | 10 yr. | 20 yr. | 30 yr. | 50 yr. |
| B1 | 130 | 150 | 240 | 300 | 390 |
| B2 | 80 | 100 | 170 | 220 | 300 |

Fig. 11 Design Flood Discharge Without Flood Dam Control (4/4)

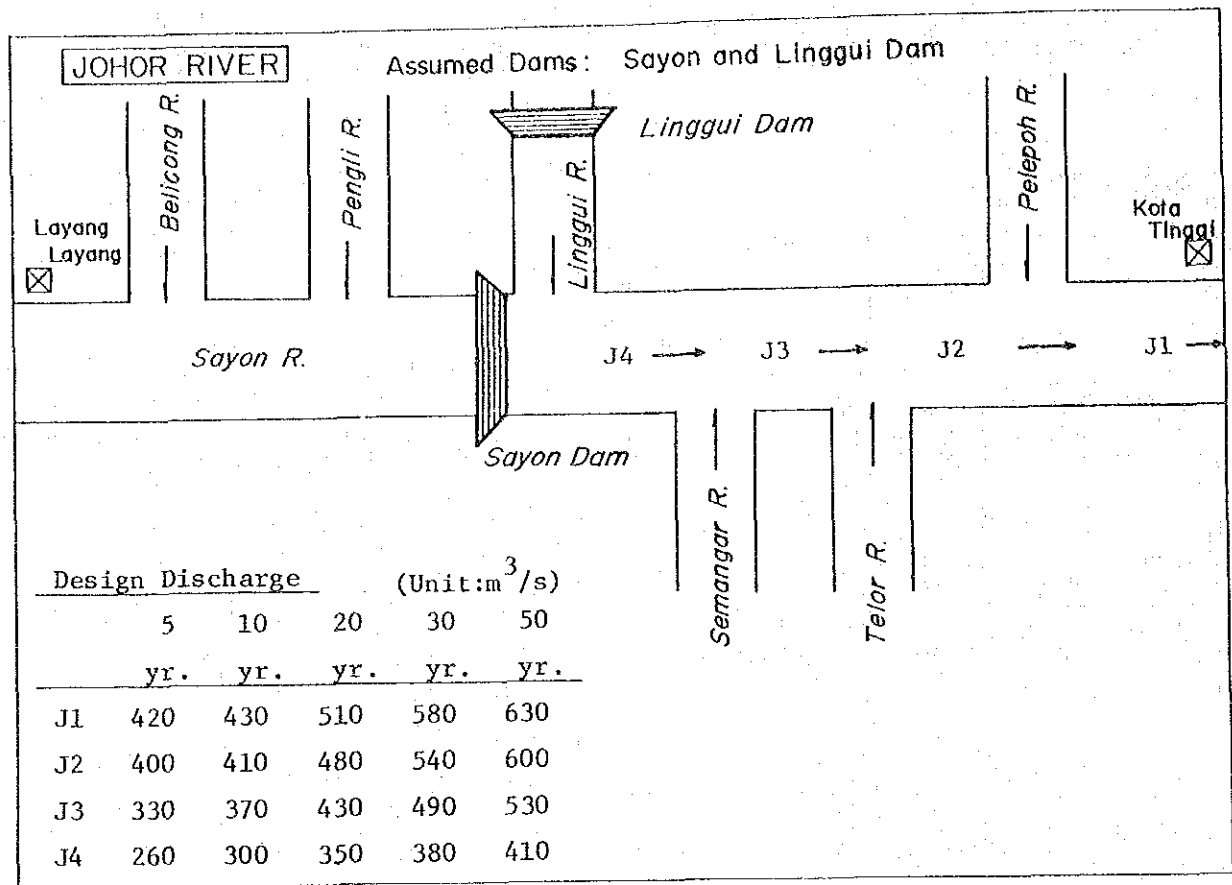


Fig.12 Design Flood Discharge With Flood Dam Control

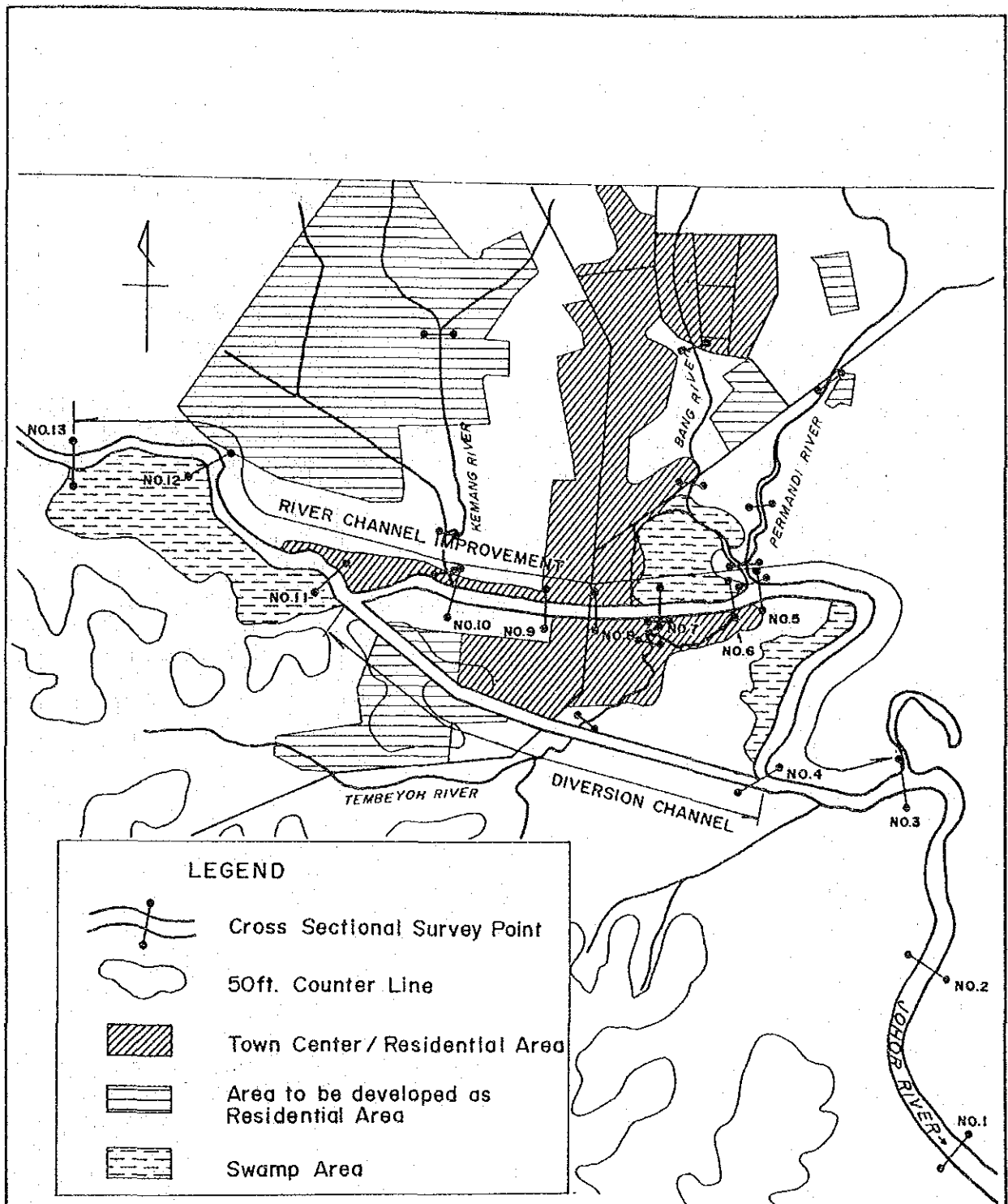


Fig. 13 General Map of Model River Stretch

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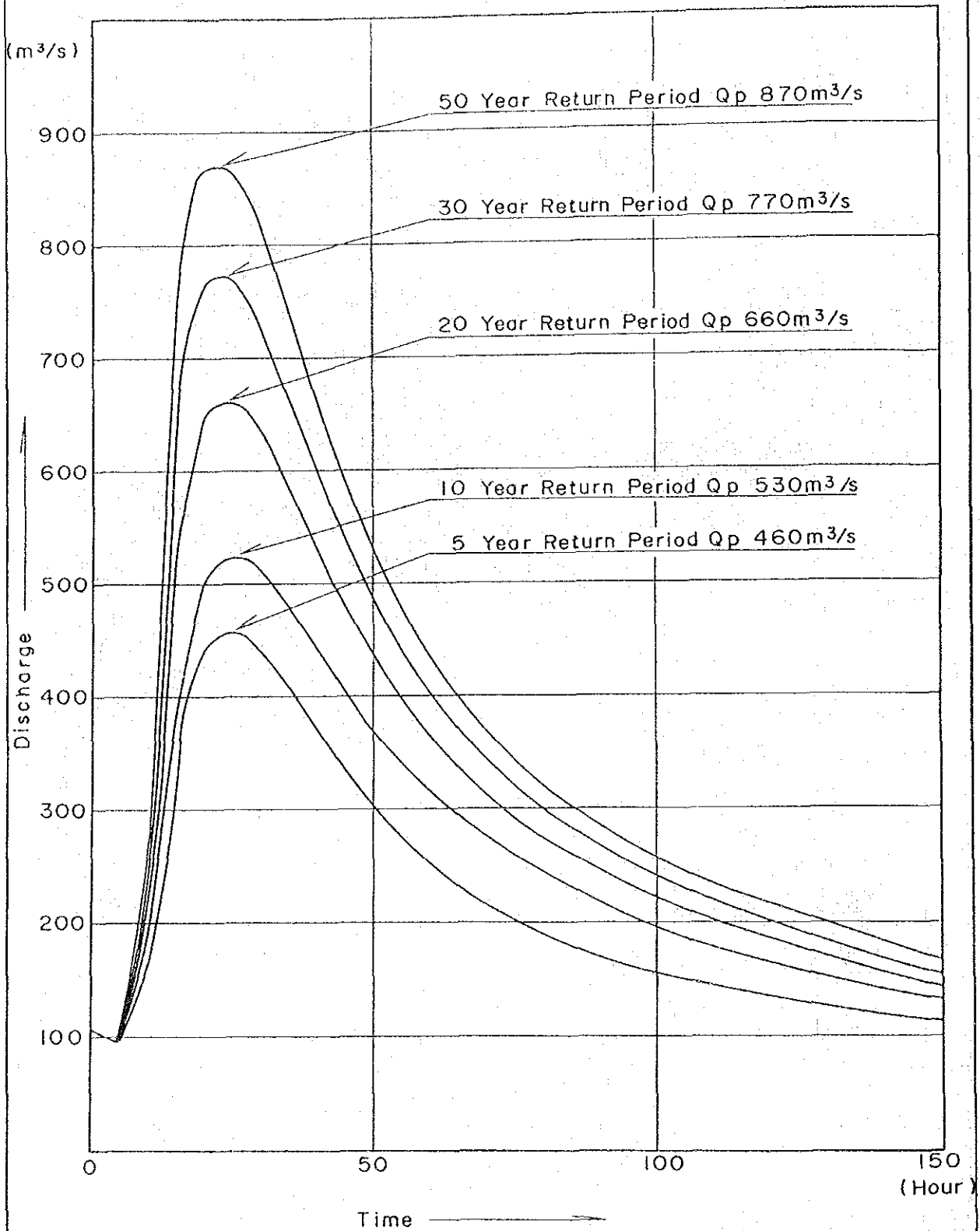
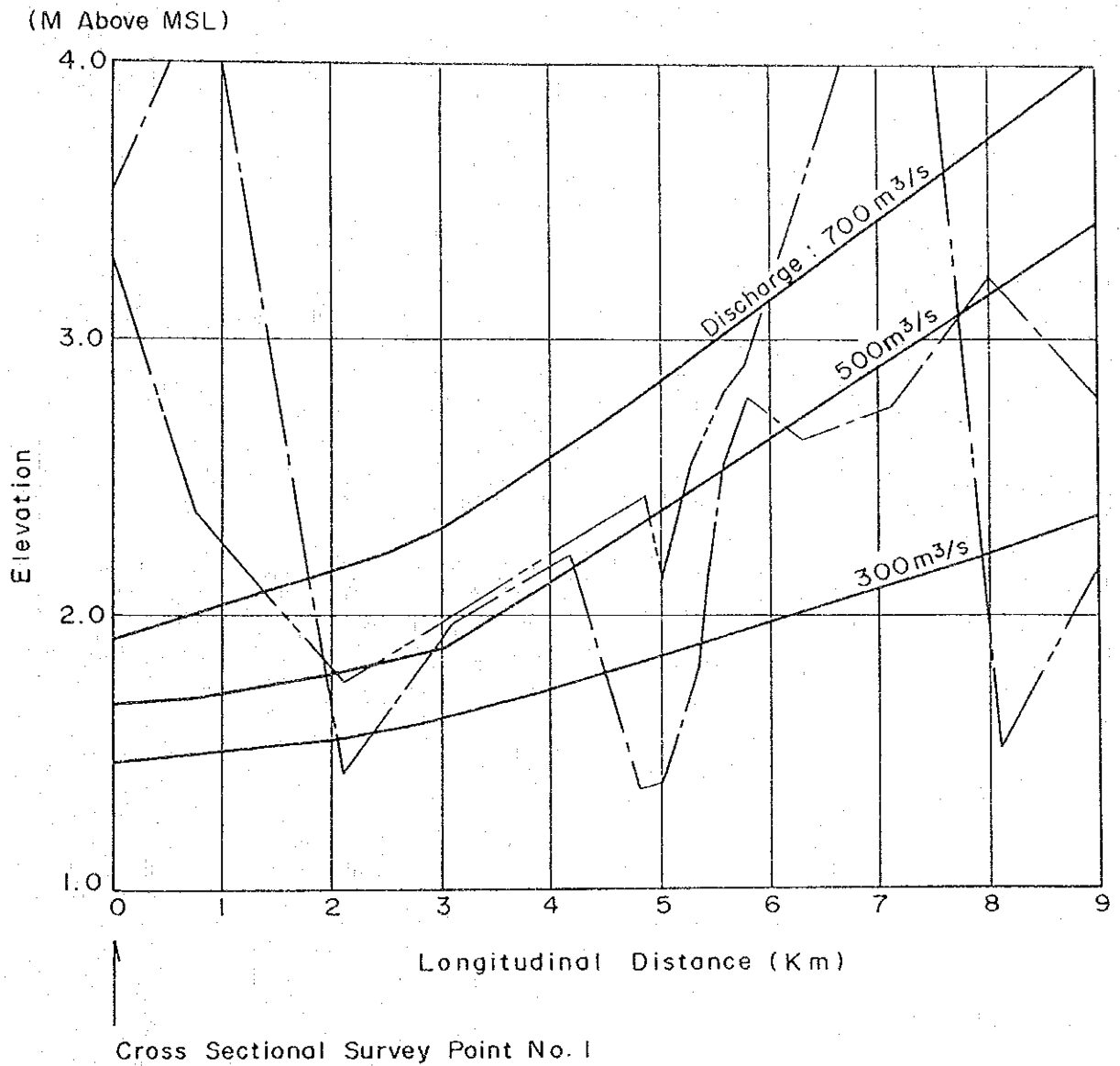


Fig.14 Probable Flood Hydrographs at Model River Stretch



| LEGEND | |
|--------|-------------------------------|
| ————— | : Water Surface Profile |
| ----- | : Existing Left Bank Profile |
| ----- | : Existing Right Bank Profile |

Fig. 15 Water Surface Profile of Model River Stretch

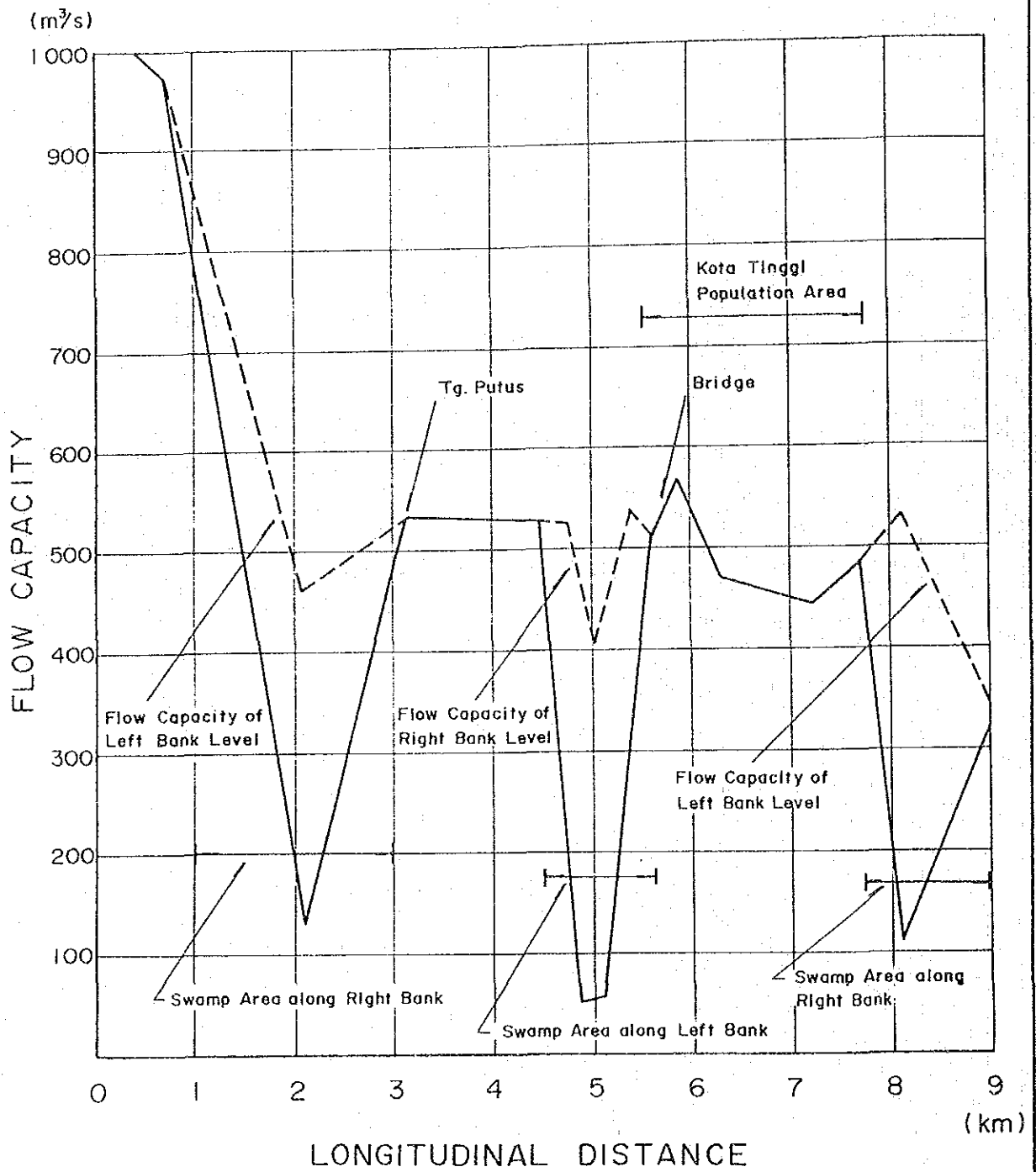


Fig. 16 Present Flow Capacity of Model River Stretch

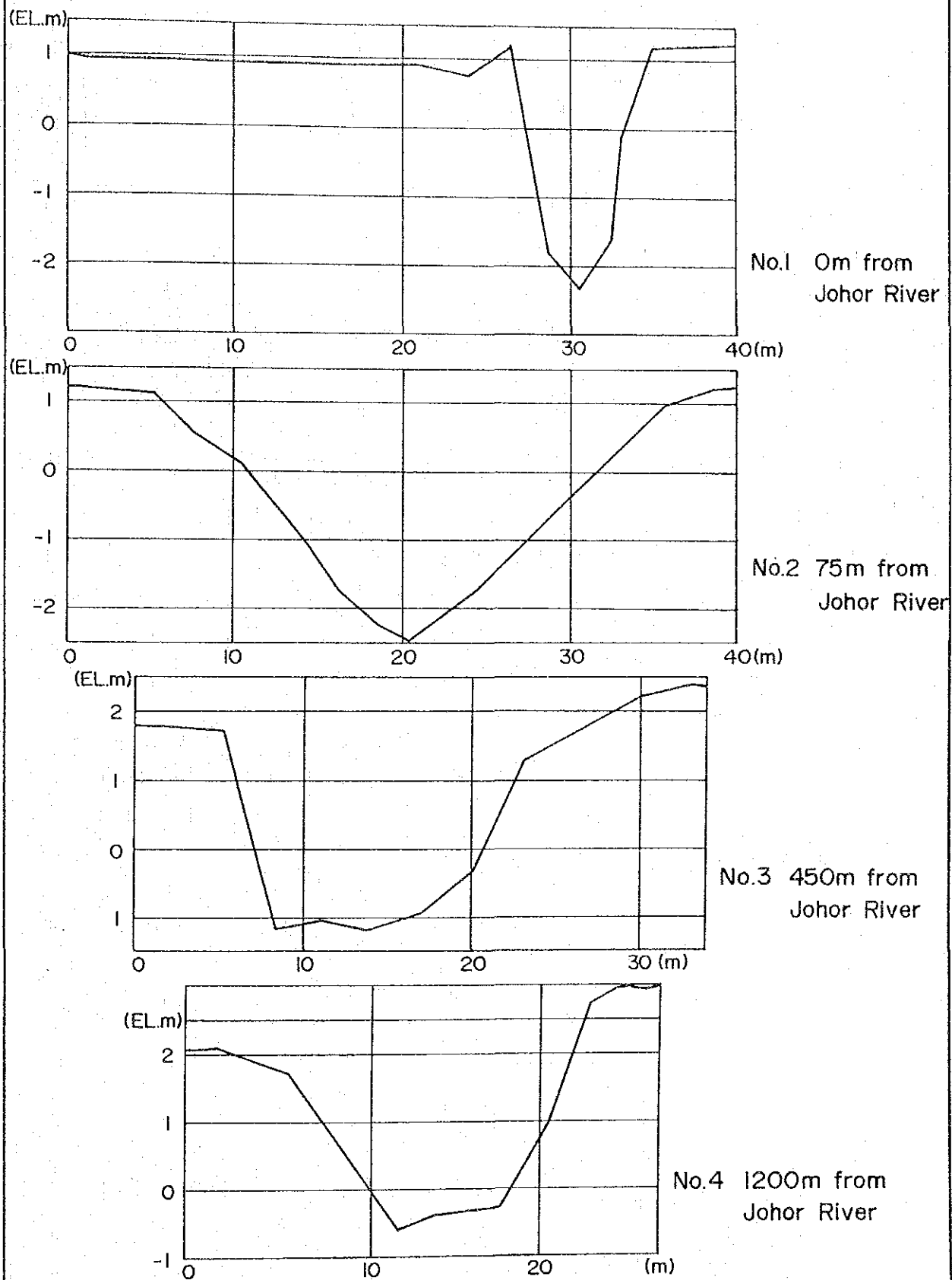


Fig.17 Existing Cross Section of Permandi River

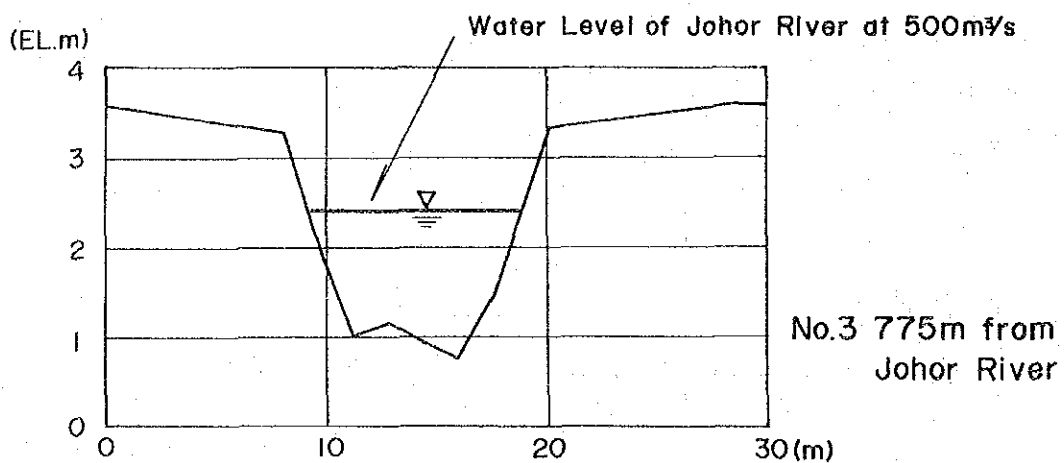
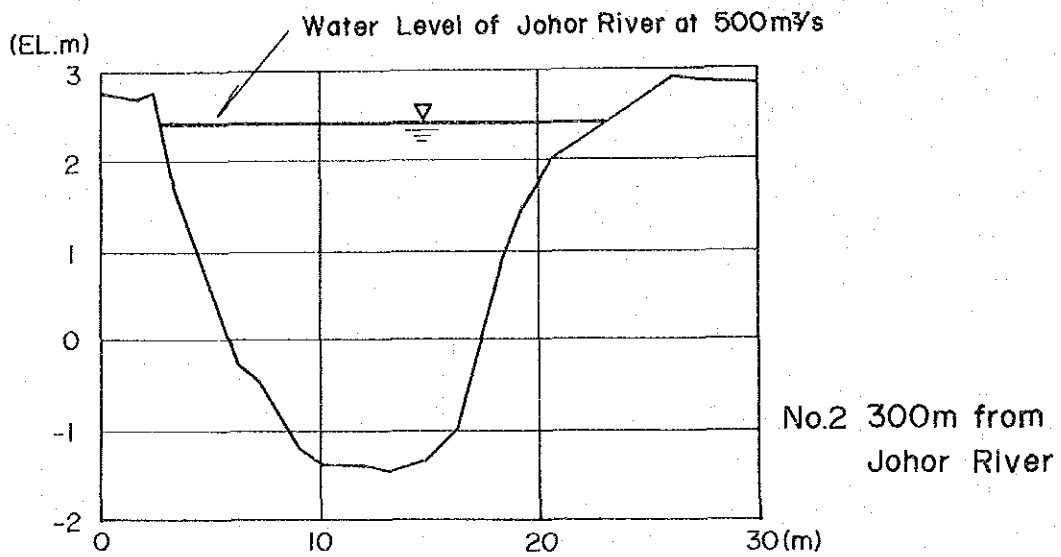
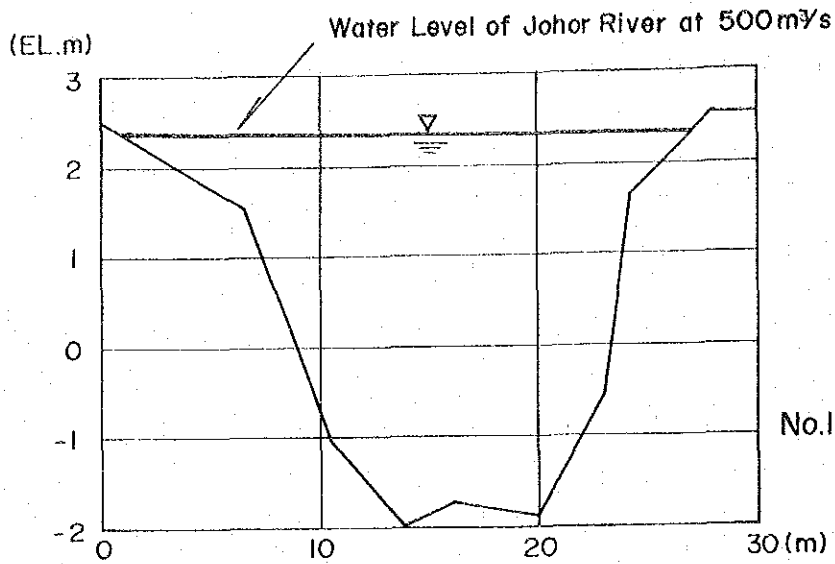


Fig.18 Existing Cross Section of
Tembeyoh River

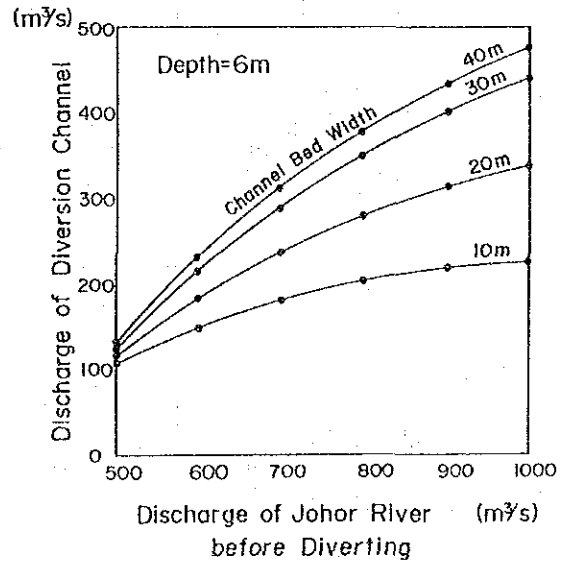
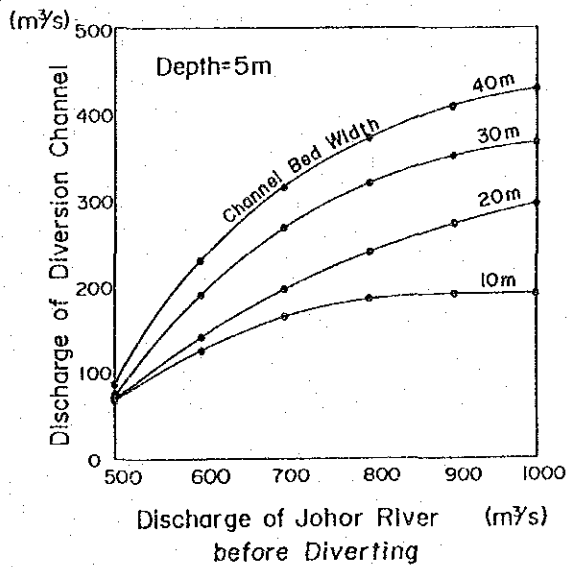
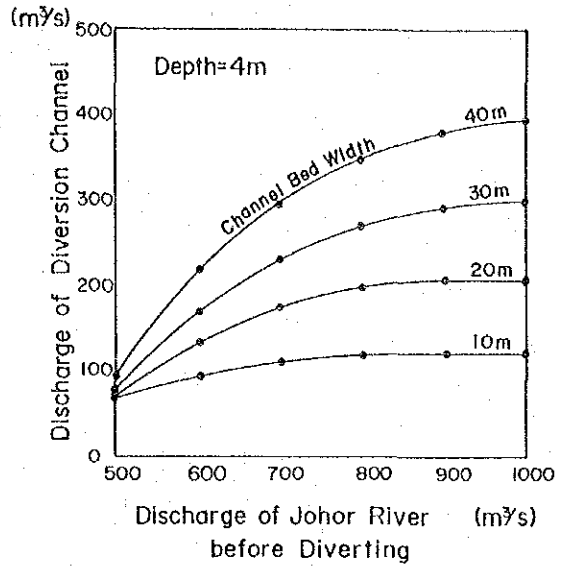
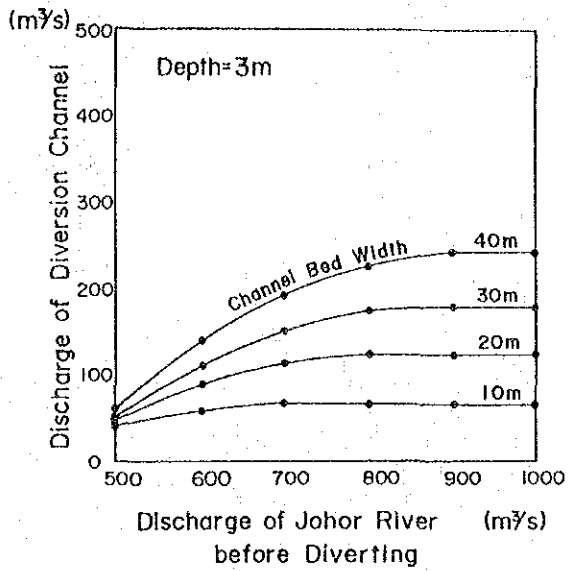


Fig. 19 Discharge of Diversion Channel

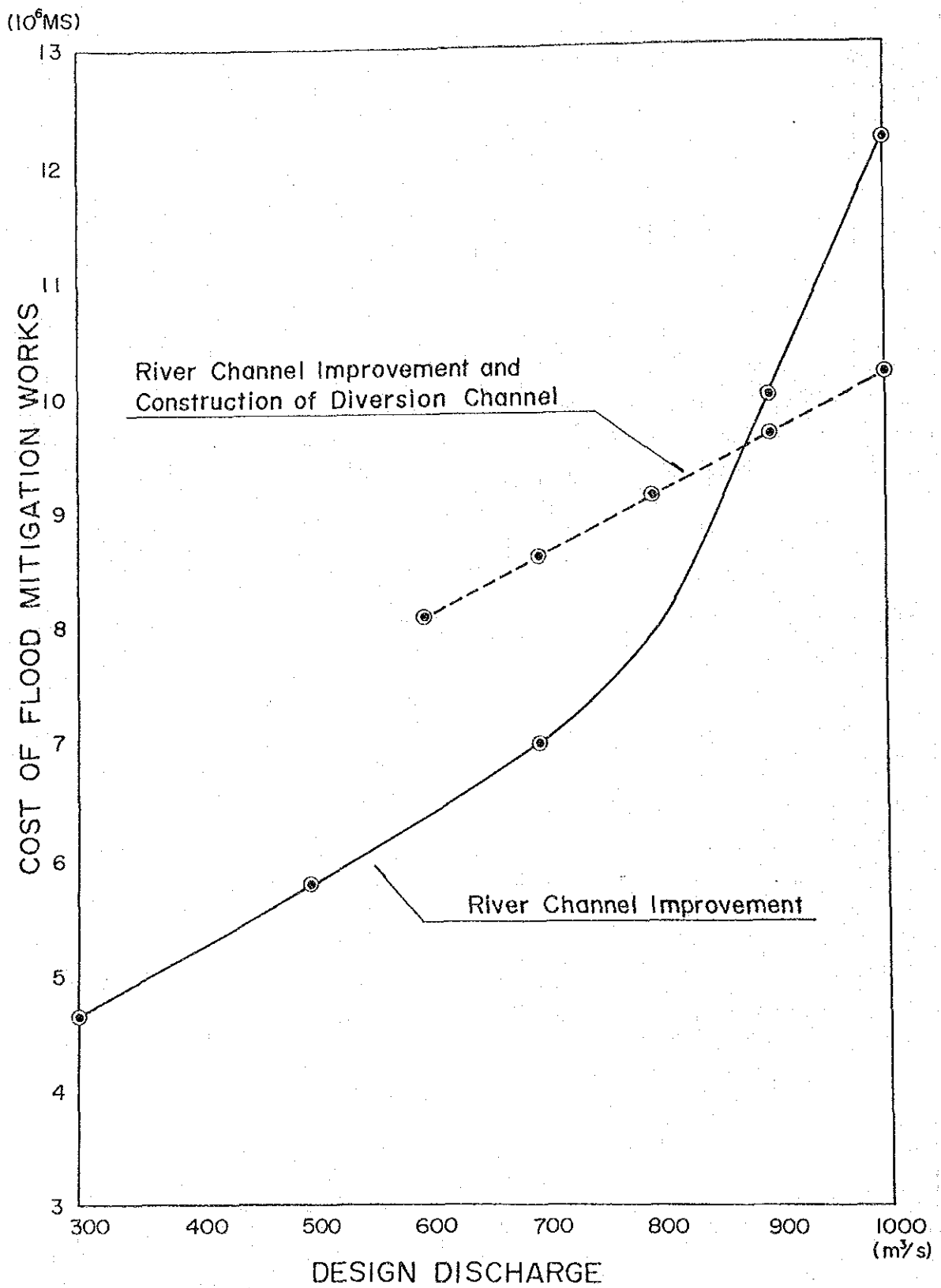
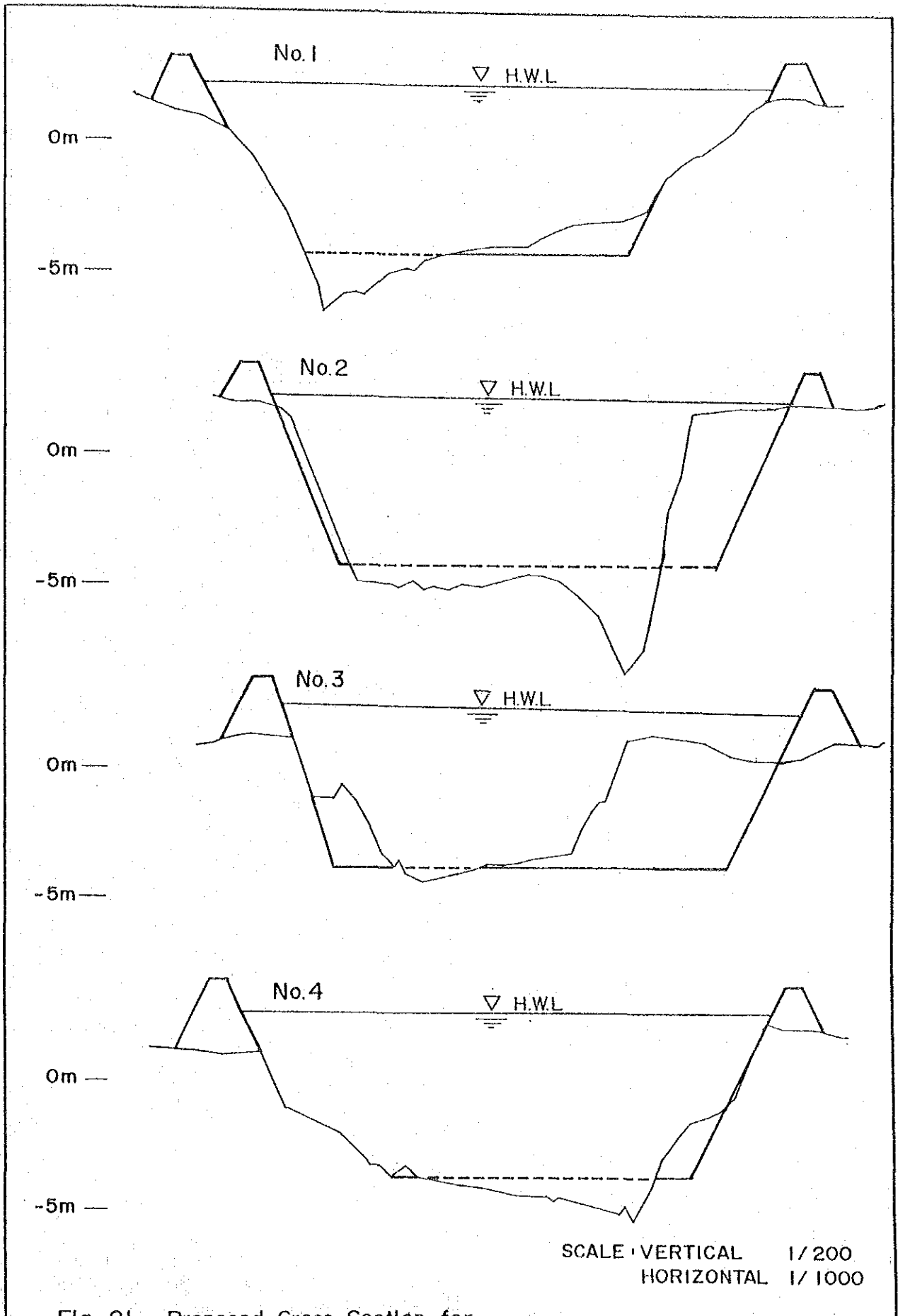


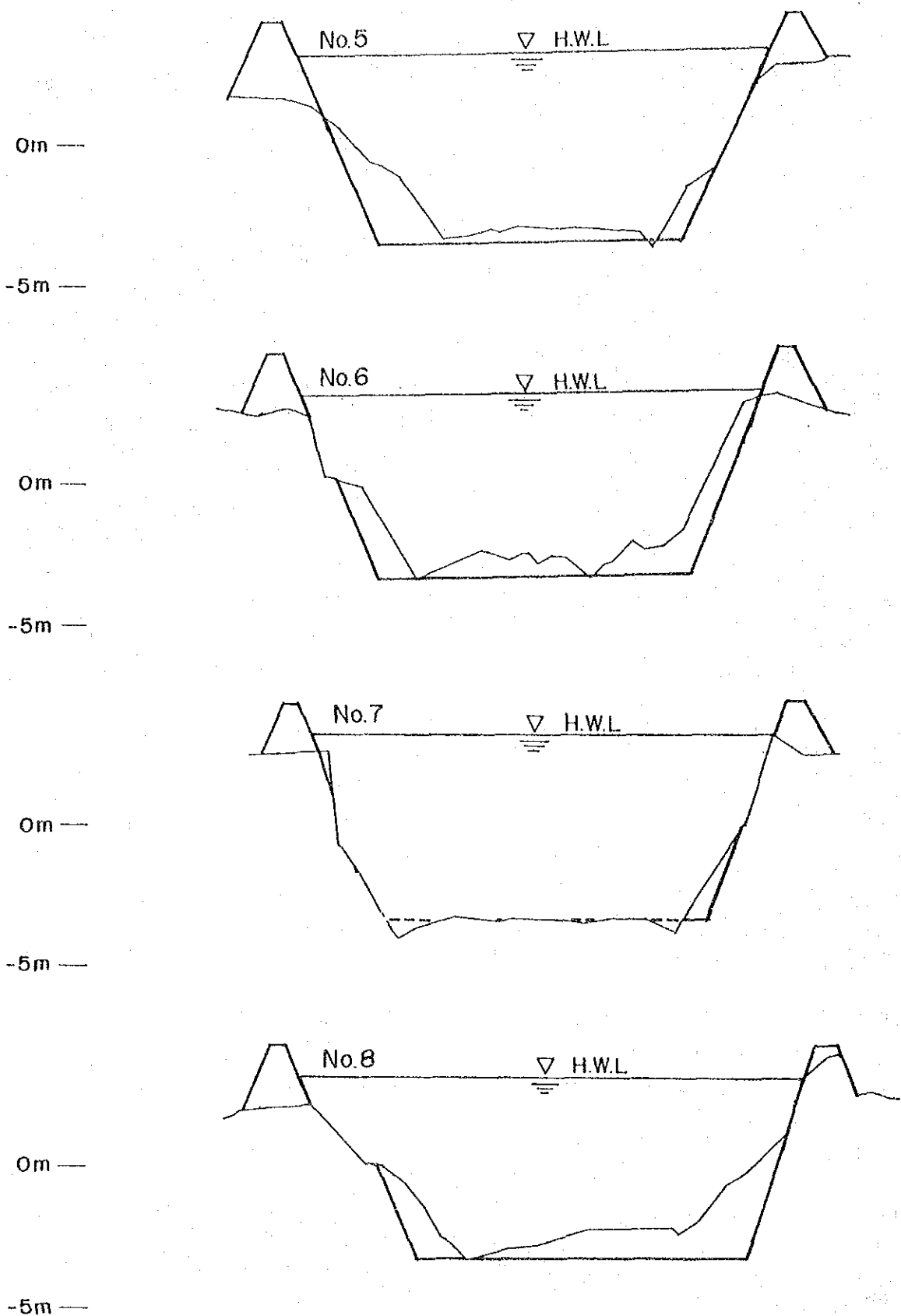
Fig.20 Cost of Flood Mitigation Works
vs. Design Discharge



SCALE VERTICAL 1/200
 HORIZONTAL 1/1000

Fig. 21 Proposed Cross Section for Model River Stretch of Johor River (1/3)

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SCALE VERTICAL 1/200
 HORIZONTAL 1/1000

Fig. 22 Proposed Cross Section for Model River Stretch of Johor River (2/3)

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 NATIONAL WATER RESOURCES STUDY, MALAYSIA
 SOUTH JOHOR
 REGIONAL WATER RESOURCES STUDY
 JAPAN INTERNATIONAL COOPERATION AGENCY

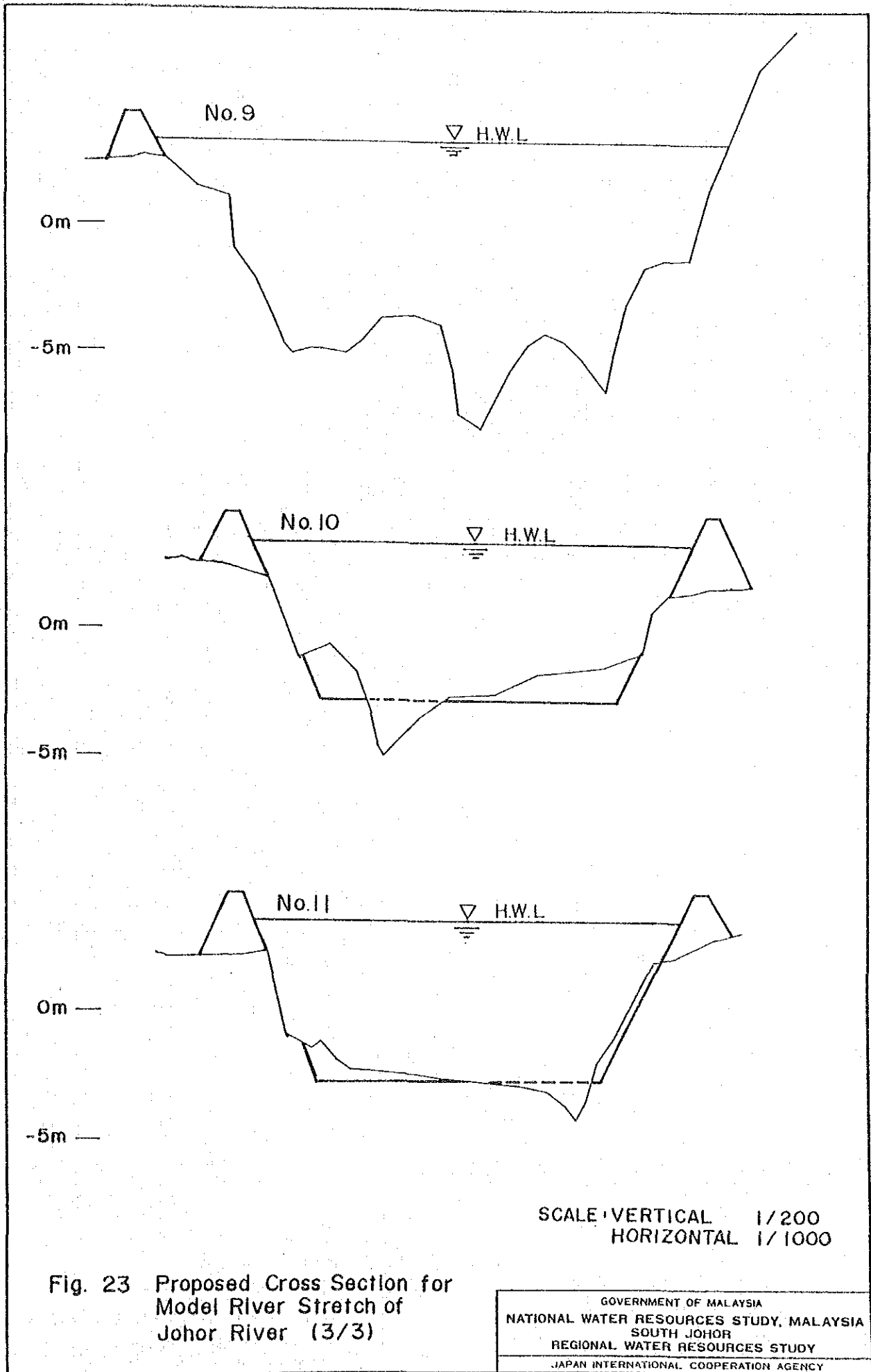


Fig. 23 Proposed Cross Section for Model River Stretch of Johor River (3/3)

GOVERNMENT OF MALAYSIA
NATIONAL WATER RESOURCES STUDY, MALAYSIA
SOUTH JOHOR
REGIONAL WATER RESOURCES STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY

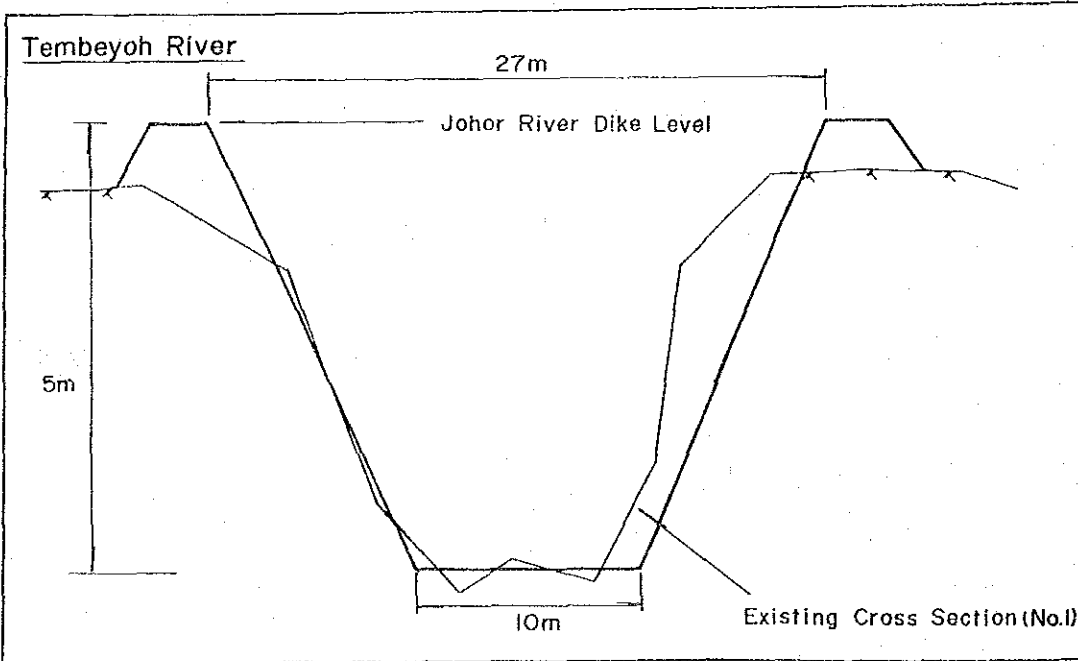
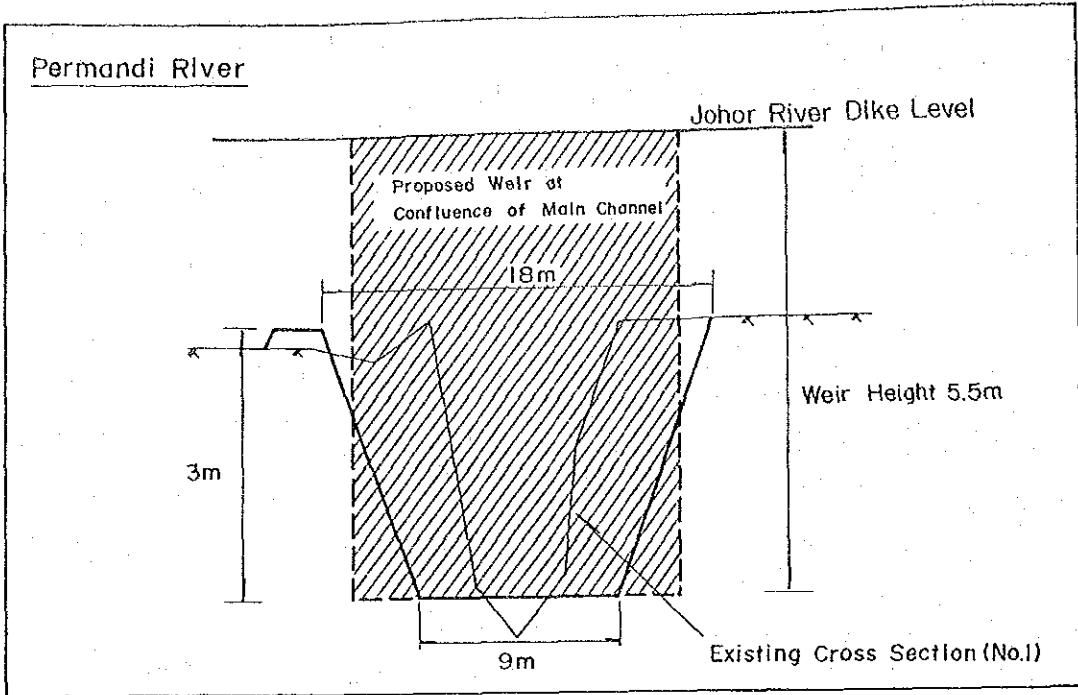
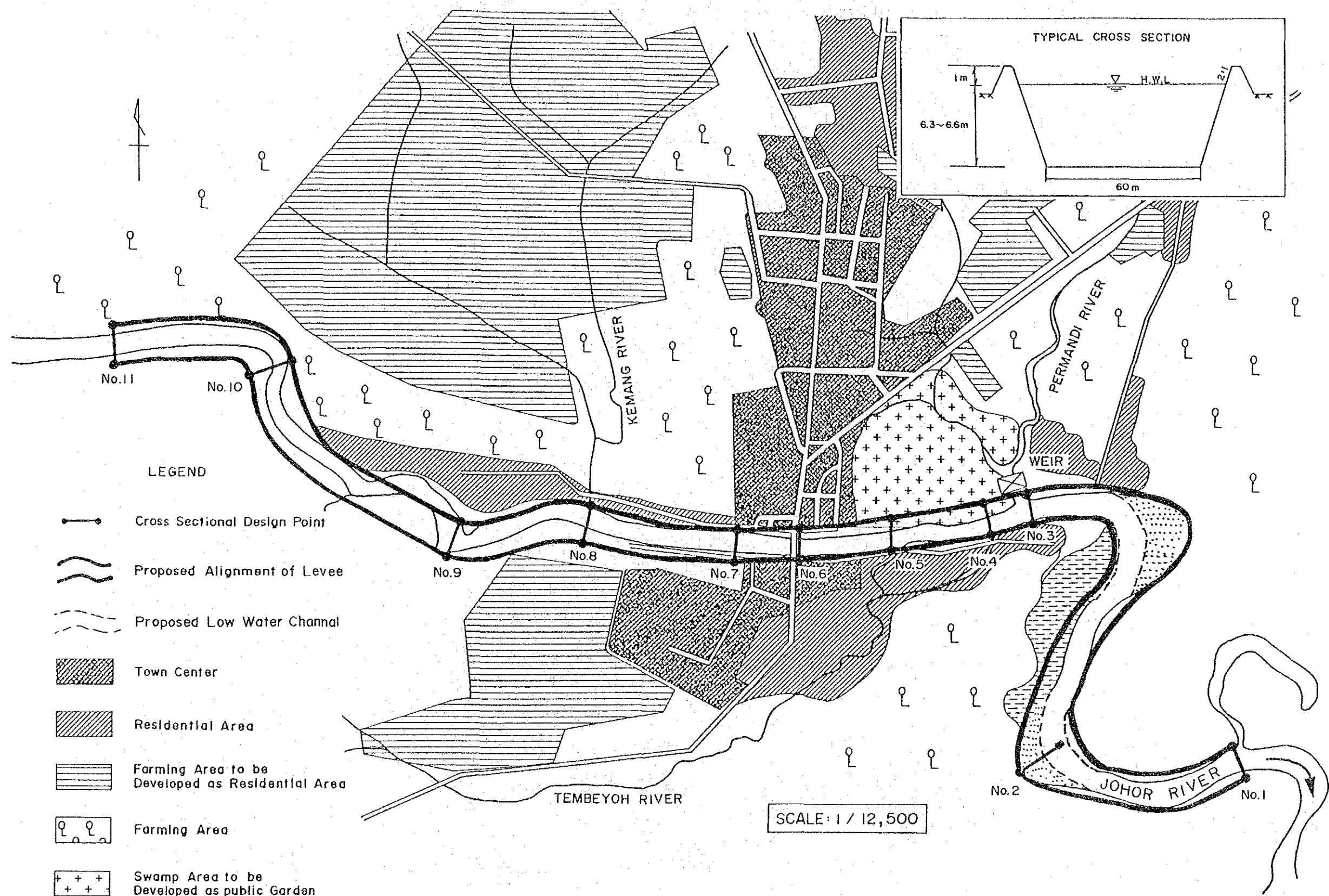


Fig.24 Typical Cross Section
of Permandi and Tembeyoh River

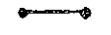




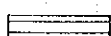

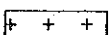
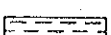
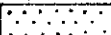
| I T E M | | P E R I O D | | | | |
|---|---|----------------|----------------|----------------|----------------|----------------|
| | | 1st Y E A R | 2nd Y E A R | 3rd Y E A R | 4th Y E A R | 5th Y E A R |
| W O R K S C H E D U L E | PREPARATION • D/D | | | | | |
| | MAIN CHANNEL IMPROVEMENT (IMPROVED LENGTH) | | | | | |
| | TRIBUTARIES IMPROVEMENT PERMANDI RIVER TEMBEYOH RIVER | | | | | |
| | RE-CONSTRUCTION OF BRIDGE | | | | | |
| | CONSTRUCTION OF WEIR | | | | | |
| | EXCAVATION (10 ³ m ³) | | 6 0 | 6 5 | 6 7 | 6 5 |
| | EMBANKMENT (10 ³ m ³) | | 3 0 | 4 0 | 4 0 | 2 8 |
| SOD FACING (10 ³ m ²) | | 2 3 | 3 0 | 3 0 | 2 1 | |
| ROAD PAVEMENT (10 ³ m ²) | | 4 | 1 6 | 6 | 1 4 | |

Fig.25 Construction Schedule of River Channel Improvement for Model River Stretch of Johor River

PLATES



LEGEND

-  Cross Sectional Design Point
-  Proposed Alignment of Levee
-  Proposed Low Water Channel
-  Town Center
-  Residential Area
-  Farming Area to be Developed as Residential Area
-  Farming Area
-  Swamp Area to be Developed as public Garden
-  Swamp Area
-  Proposed Spoilbank of Dredged Material

Plan of River Channel Improvement

SCALE: 1 / 12,500

