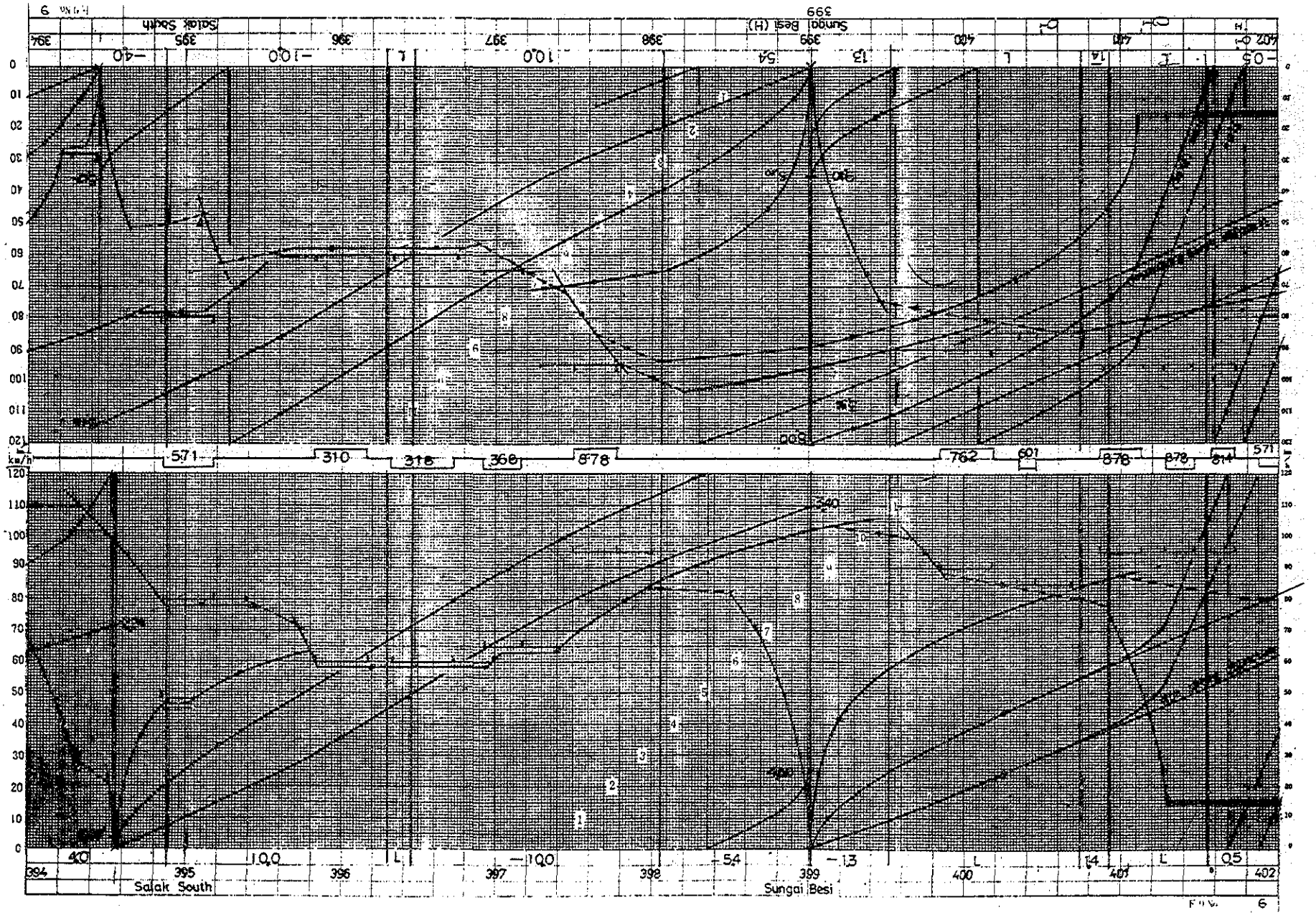
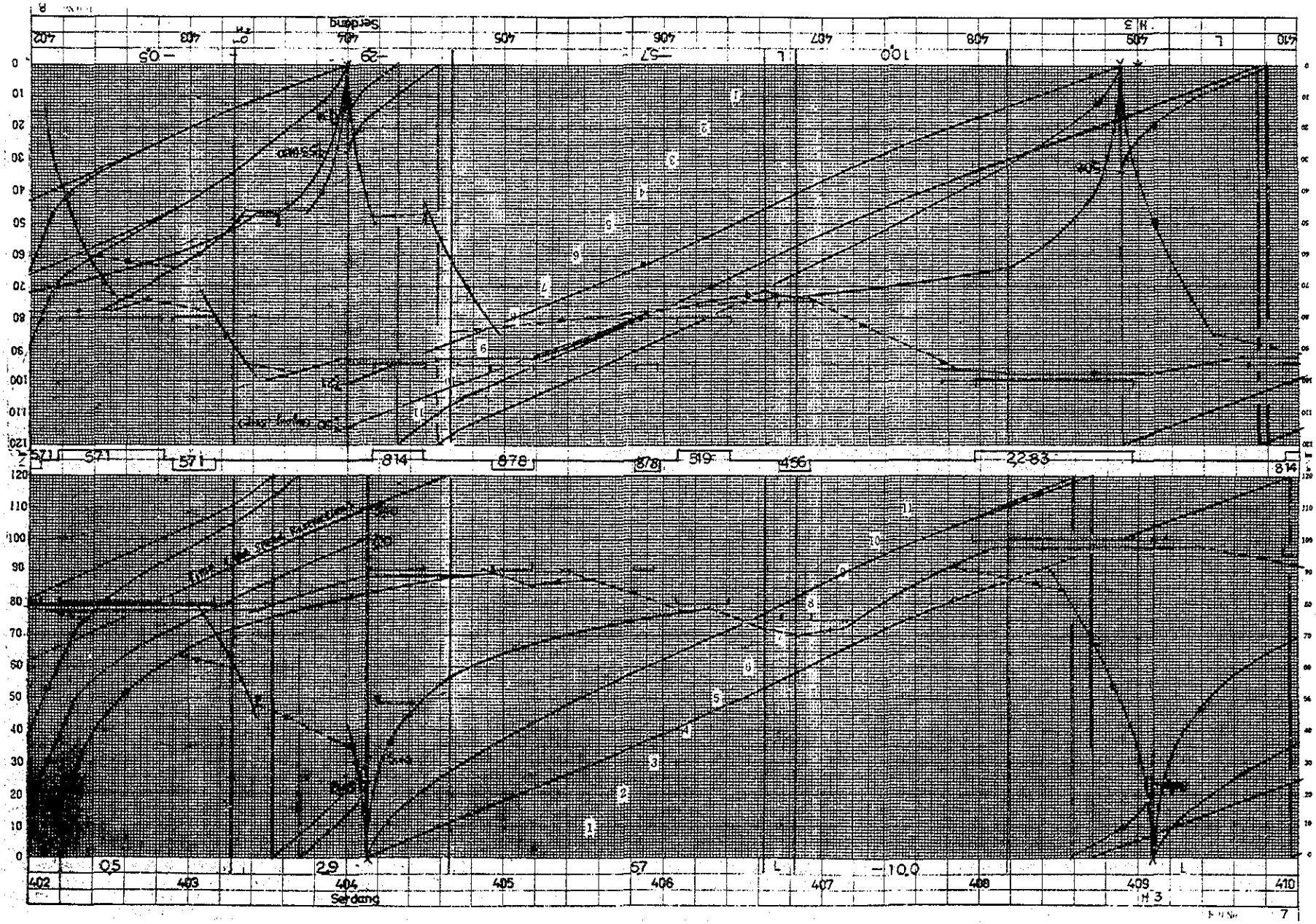
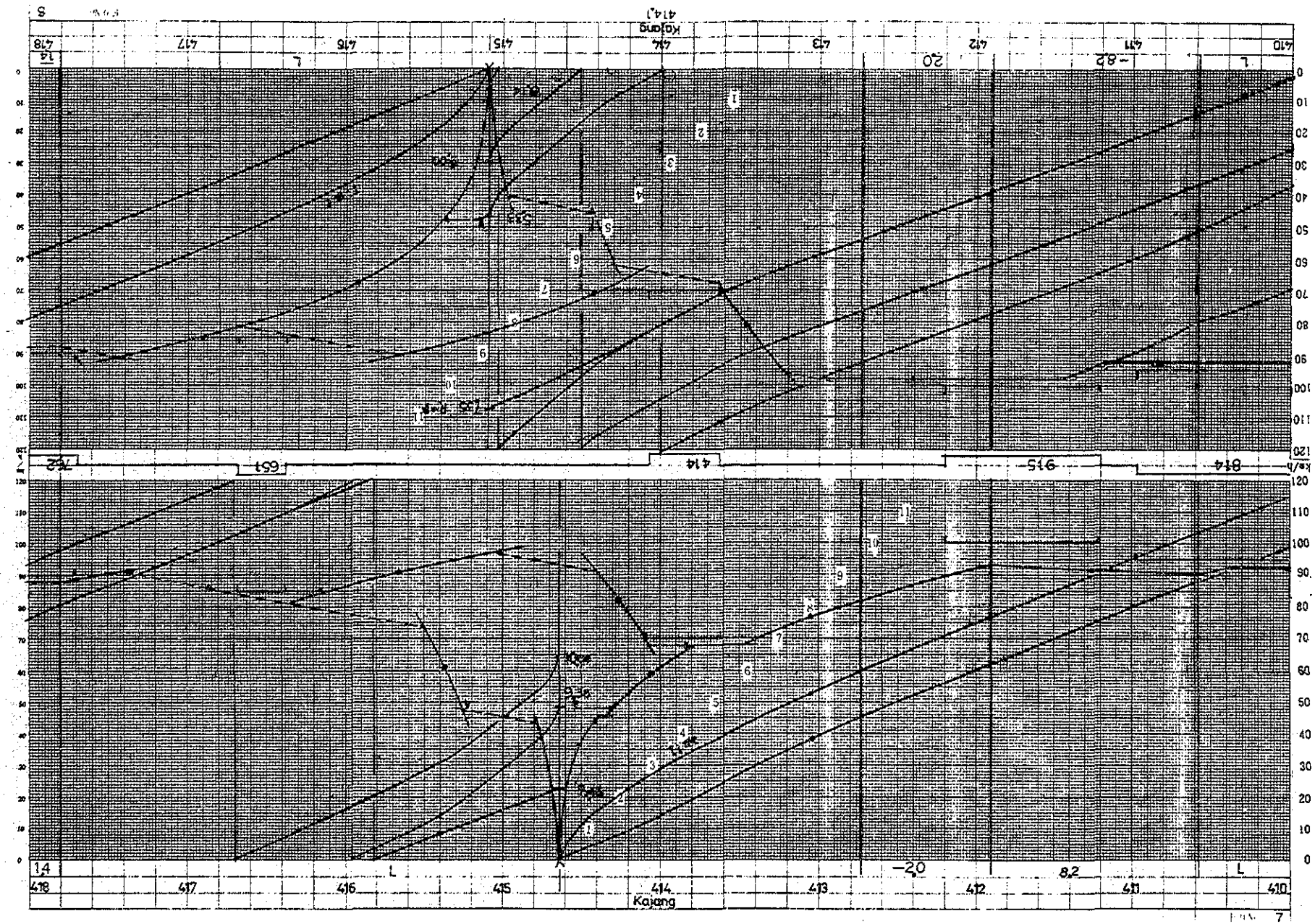
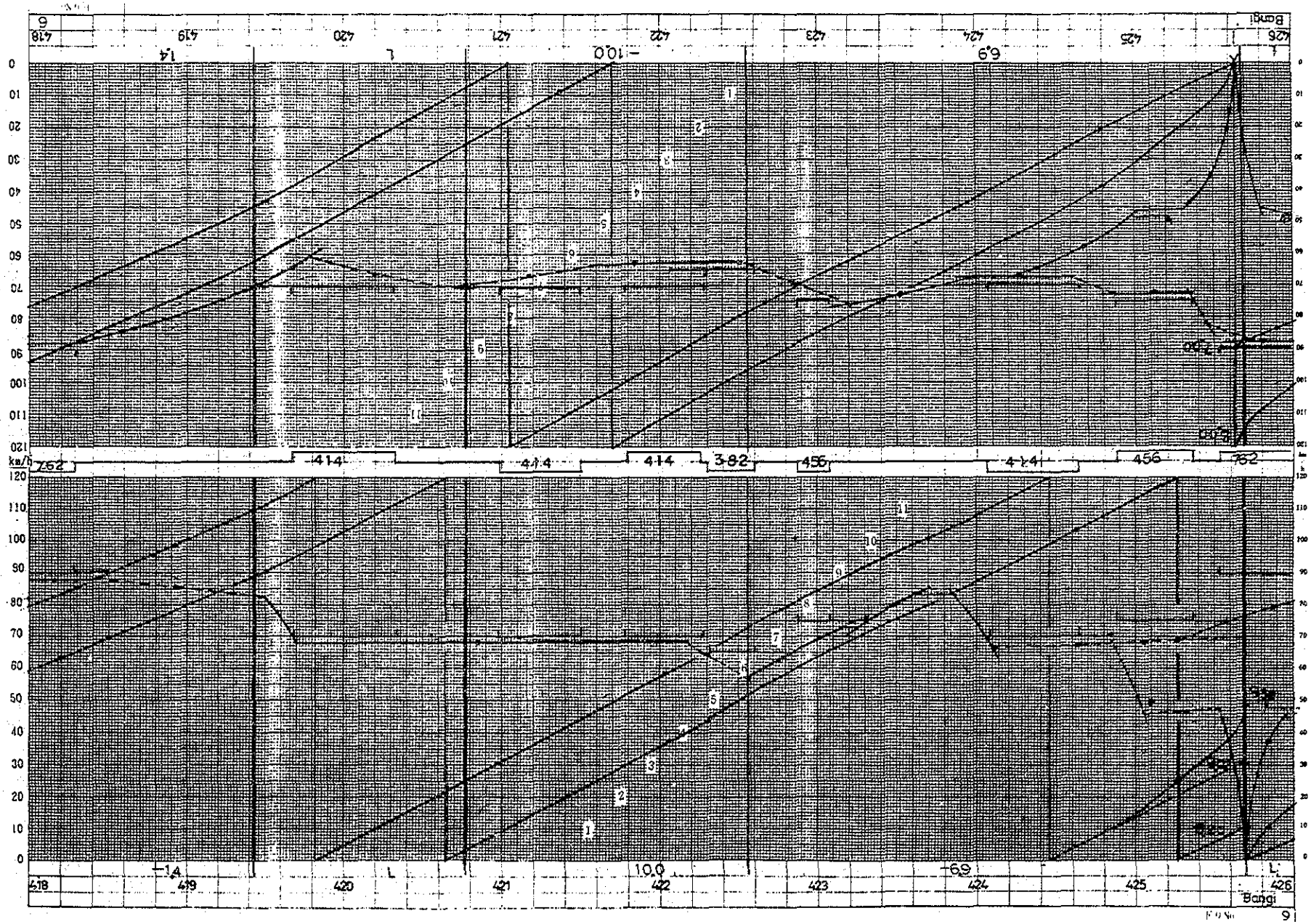
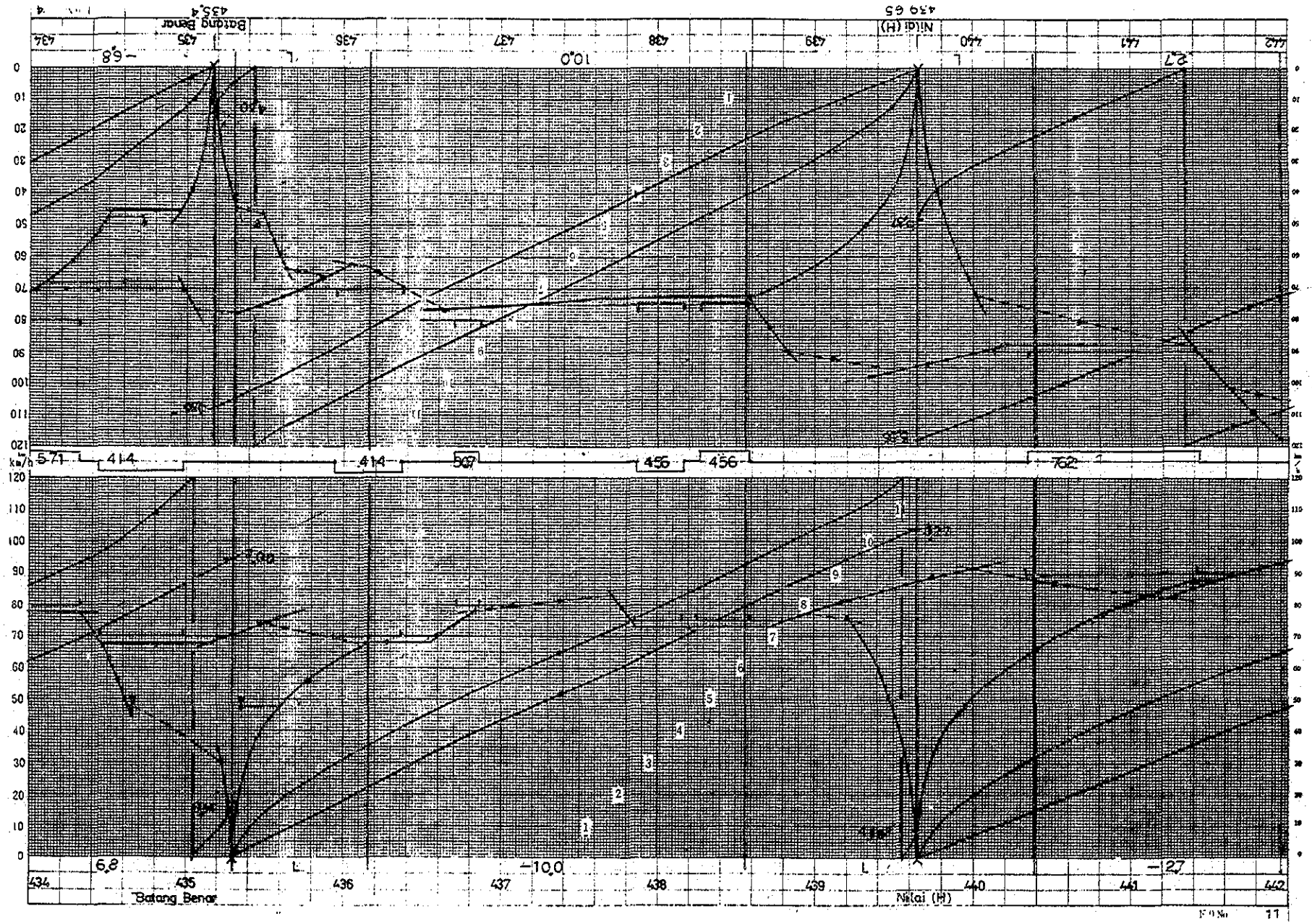

km/h
394
395
Salak South
396
397
398
399
Sungai Besi
400
401
402
571
310
318
368
878
762
601
878
878
814
571
40
100
100
54
13
14
05

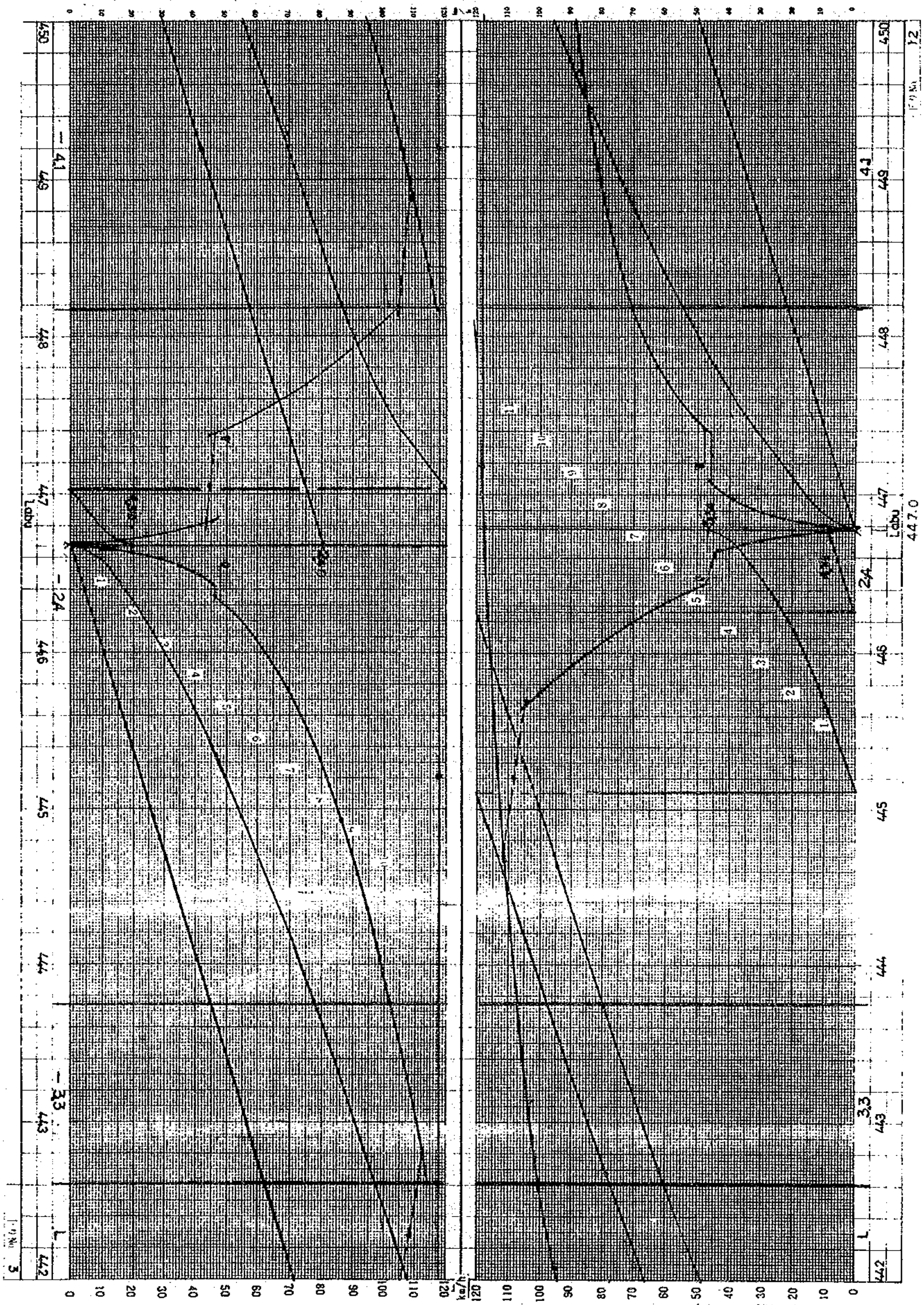

402
403
404
Serdang
405
406
407
408
409
410
814
878
519
456
2283
571

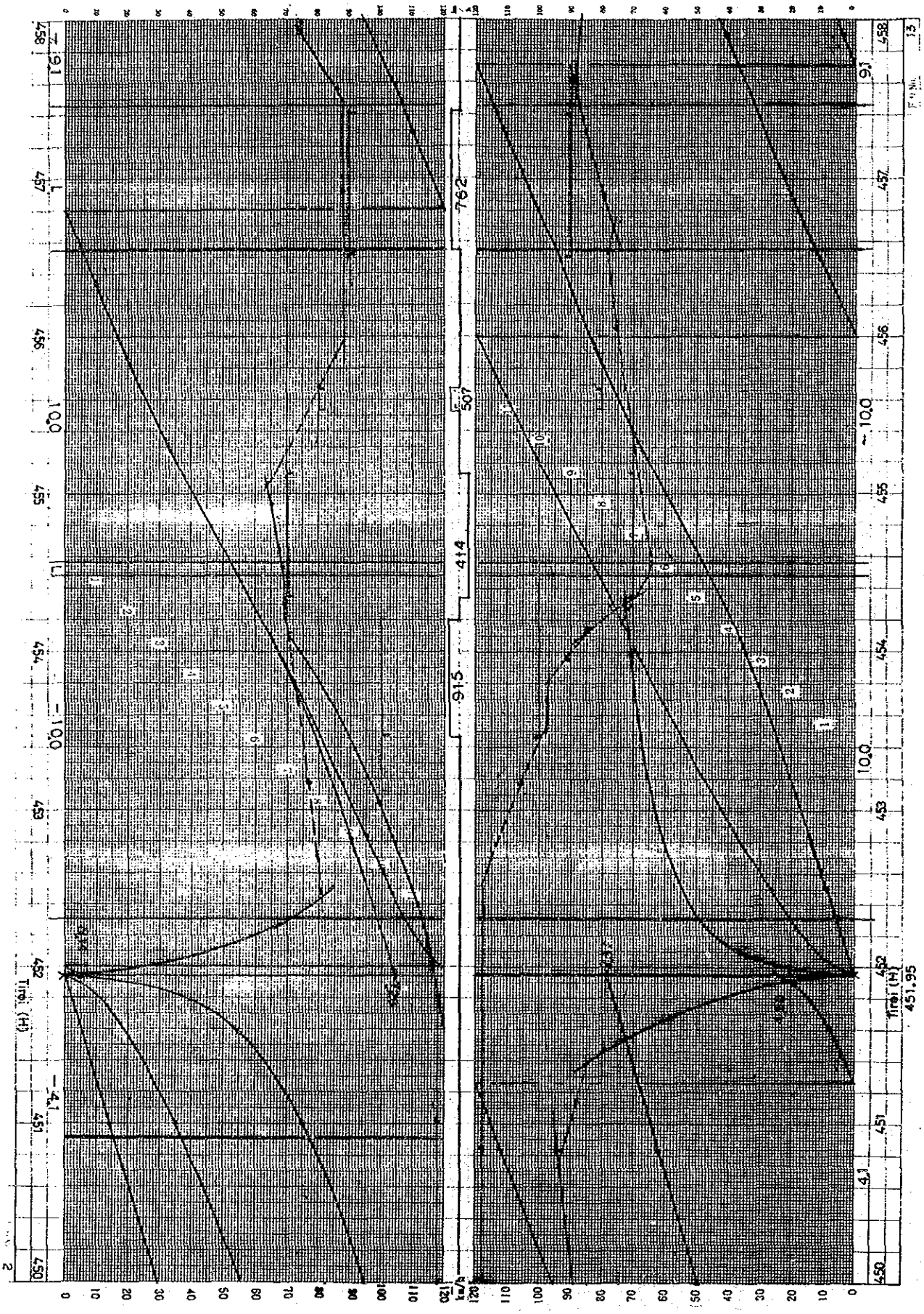

Kajang
414
415
416
417
418
410
411
412
413
-20
8,2
L
1,4
7

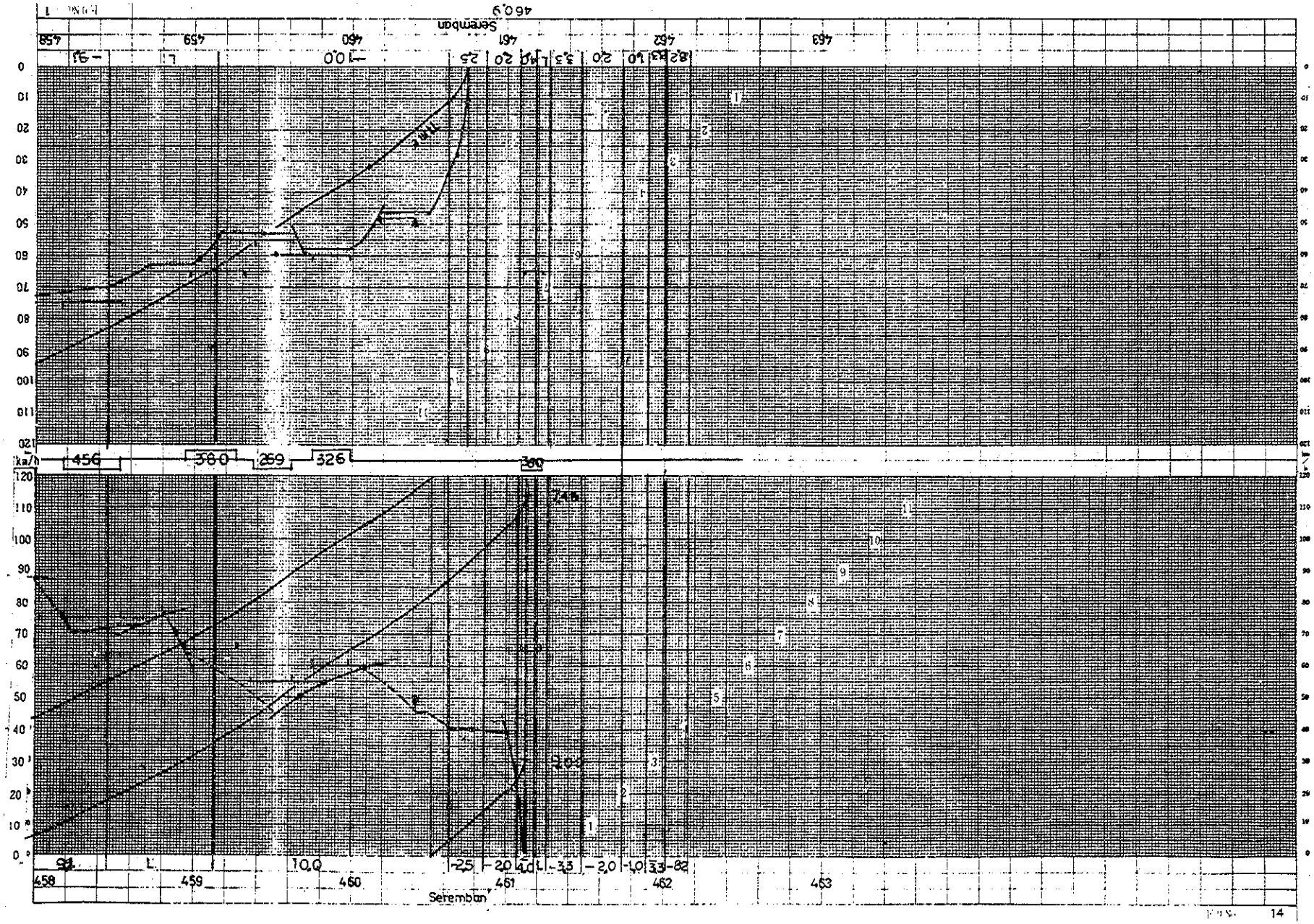

km/h
762
414
414
414
382
456
414
456
762
418
419
420
421
422
423
424
425
426
Bangi

-6.8
10.0
-10.0
1142
456
571
521
434
433
432
431
430
429
428
427
426
0
10
20
30
40
50
60
70
80
90
100
110
120


Batang Benar
Nilai (H)
km/h
434
435
436
437
438
439
440
441
442
Batang Benar
Nilai (H)




762
507
414
915
Time (H)
451.95


km/h
456
380
269
326
380
458
459
460
461
462
463
Seremban
14

Appendix 5-3-1 Train Handling Capacity of Kuala Lumpur Station

(1) Current situation

The station has 4 arrival/departure tracks, 2 parcel handling tracks, and 2 mail car handling tracks.

Adjacent to the station, there is a parcel handling facility, a wagon yard, a coach depot, and a locomotive depot. (Refer to Fig. 1)

As of February 1990, the station handled 32 passenger trains and 29 freight trains per day, including departure, arrival and passing. (Not including departure from or arrival at the freight yard.

Freight trains use arrival/departure tracks for passenger trains because there is no track for passing of freight trains.

Long-distance passenger trains, excepting 2 (1 in each direction) passing trains, originate from or terminate at the station. Coaches of the trains are hauled by shunting locomotives between the coach depot and the station.

2 freight trains arrive from Rawang, and after changing the locomotive at a platform, are operated to Batu Caves as shuttle service.

In addition, rail buses are operated to and from Ipoh (2 round trips), P.Klang (4 round trips), and Sentul (3 round trips).

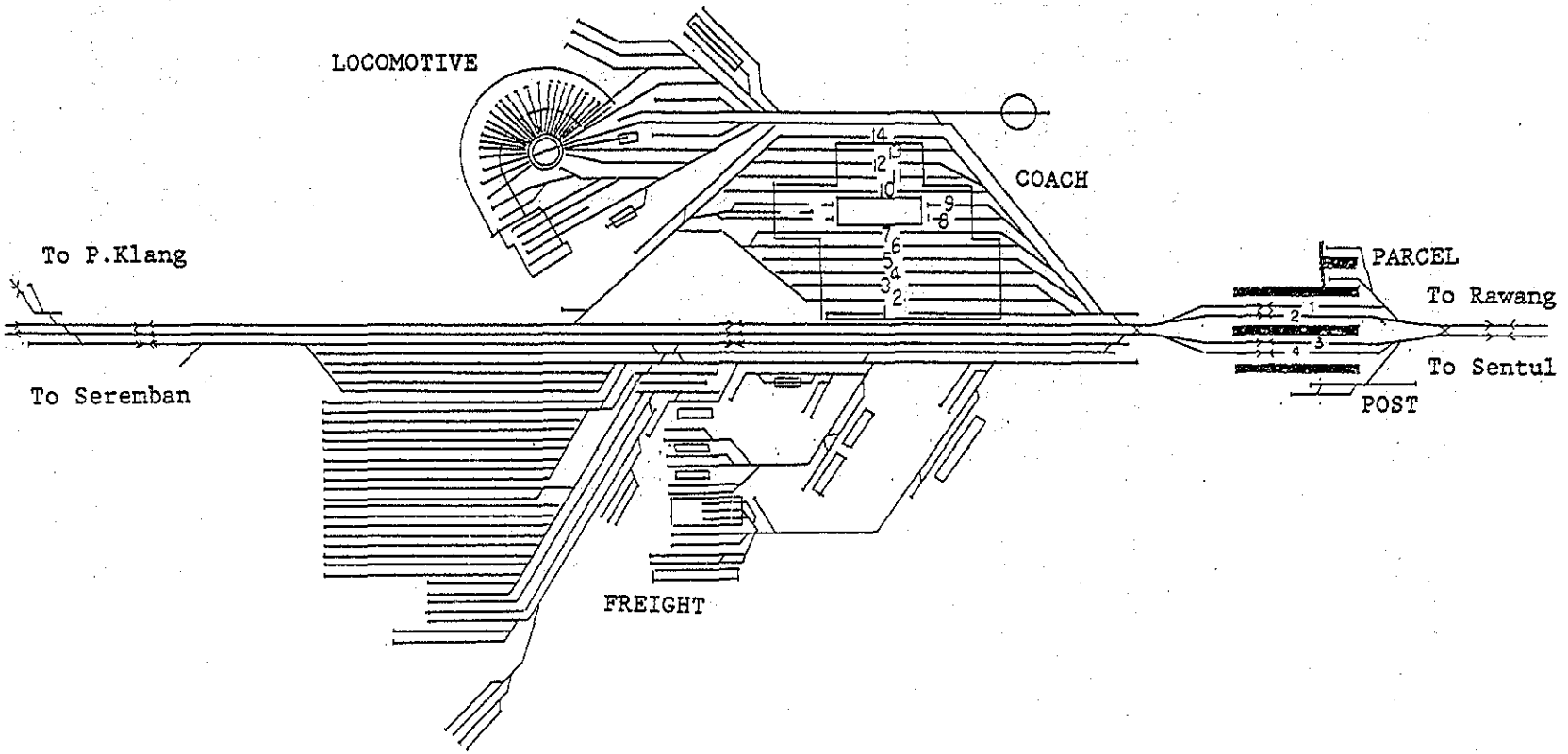


Fig. 1 Existing Track Layout of Kuala Lumpur Station

(2) Problems

The station has the following problems in order to facilitate commuter service.

a. Shortage of arrival/departure track capacity during commuting hours

During commuting hours between 6:00 a.m. and 8:30 a.m. and between 4:00 p.m. and 7:00 p.m., arrival and departure tracks are used at relatively high rates of 67% and 57% on average, leaving little room for DMU train operation. (Refer to Table 1)

Table 1 Use of Platforms at Kuala Lumpur Station

Platform No.		Time zone						Total
		0-3	3-6	6-8:30	8:30-16	16-19	19-24	
1	A	0	0.5	1.5	3	4.5	4.5	14
	B	0	99	129	74	120	155	577
	C	0	28	86	16	67	52	40
2	A	3	2	4	3	2.5	4.5	19
	B	35	28	64	49	83	104	363
	C	19	16	43	11	46	35	25
3	A	2	2	6	5	3	8	26
	B	12	13	111	75	68	168	447
	C	7	7	74	17	38	56	31
4	A	0	0	3	5	1	3	12
	B	0	0	97	86	135	184	502
	C	0	0	65	19	75	61	35
Total	A	5	4.5	14.5	16	11	20	71
	B	47	140	401	284	406	611	1,889
	C	7	19	67	16	56	51	33

(Note) A : The number of trains (including the number of cars shunted)

B : Using time (minutes) (including 6 minutes required for entering or leaving the platform)

C : Occupation rate (%)

b. Long-distance passenger trains are operated during commuting hours

8 long-distance passenger trains are operated between 6:00 a.m. and 8:30 a.m., and 2 trains between 4:00 p.m. and 7:00 p.m., which hampers the additional introduction of DMU trains.

c. Marshalling of coaches for long-distance passenger trains which originate from or terminate at the station is carried out by shunting locomotives. However, because of lack of exclusive tracks for locomotive running and shunting operation, arrival/departure tracks are used for these purposes.

This causes long-time ocupation of arrival/departure tracks by the coaches, restricting capacities of these tracks.

d. Parcel and mail cars for long-distance passenger trains are coupled or uncoupled at this station, causing the increase in stopping time, also restricting the arrival/departure track capacity.

e. Freight trains are operated on arrival/departure tracks for passenger trains, because of lack of exclusive tracks.

(3) Proposed solutions

a. Changing operation time of long-distance passenger trains

As pointed out in the previous section, shortage of arrival/departure track capacity during commuting hours is partly caused by operation of long-distance passenger trains.

To increase time zone for DMU train operation, long-distance passenger trains terminating in the morning should be scheduled to arrive before 6:30 a.m., and originating trains should be scheduled after 8:30 a.m.

Similarly, operation of long-distance passenger trains during commuting hours in the evening should be avoided.

The above schedule changes will require special studies on effective measures to reduce travelling time of long-distance passenger trains, including the increase in train speed through improvement of running performance as well as track facilities, and the decrease in waiting time through the addition of interchange stations on single track sections, partial double tracking, and introduction of the automatic block system.

In this connection, the operation of long-distance passenger trains during morning rush hours can entail some problems : (i) the delay of a long-distance train can cause large disruptions in the normal operation of DMUs; (ii) the number of DMUs operable will decrease; and (iii) the use of platforms by direction will not be possible. (Refer to Fig. 2 "Model Diagram for Morning Peak Hours (In Case Long Distance Trains are Operated During Morning Peak Hours)."

As for the K.L. - Seremban section, it will worth studying the operation of long - distance passenger trains and DMUs diverting from S.South to Pudu into the Ampan Line, so as to relief the shortage of line capacity between S.South and K.L. and train handling capacity of the K.L. station envisaged in the future.

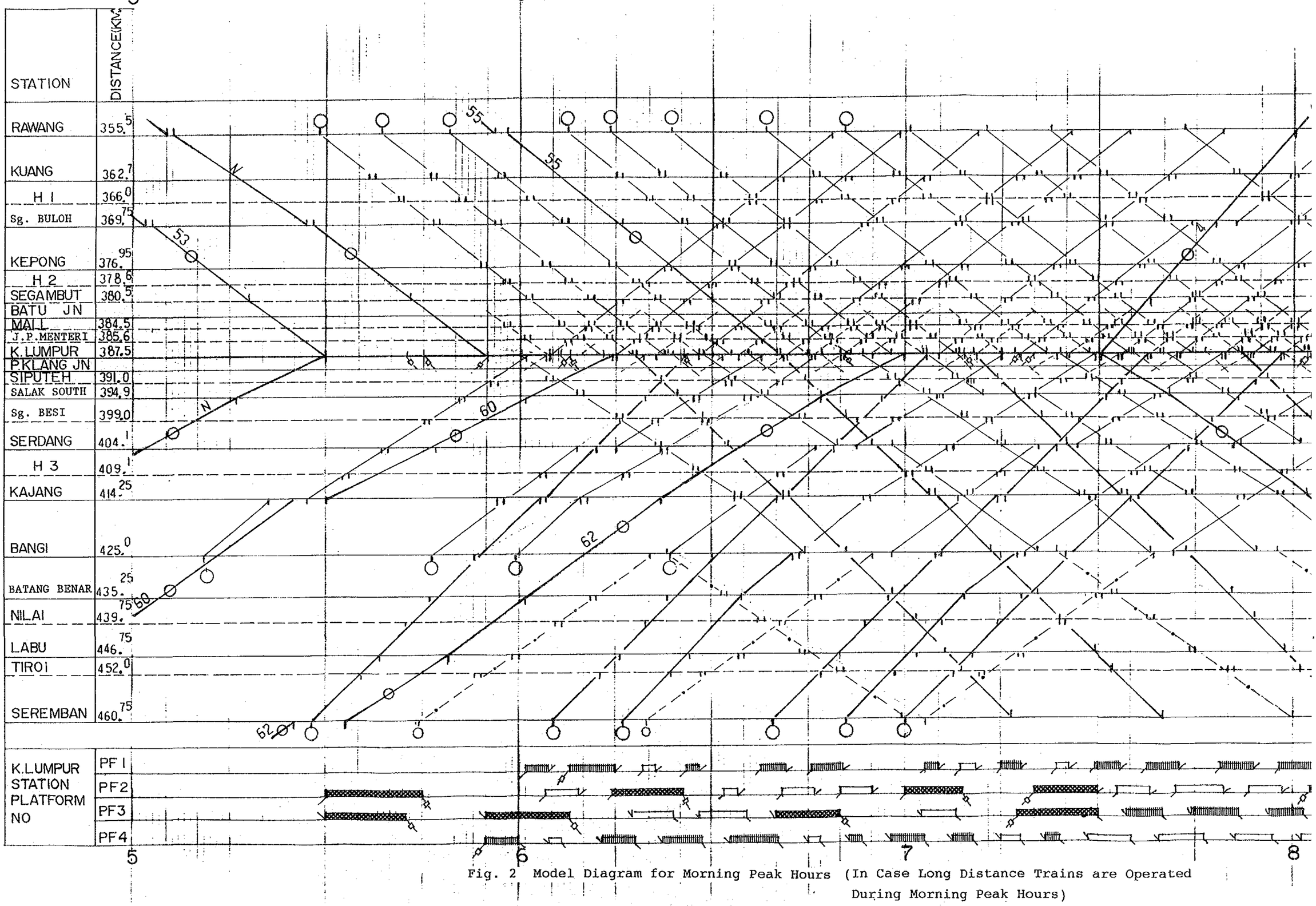
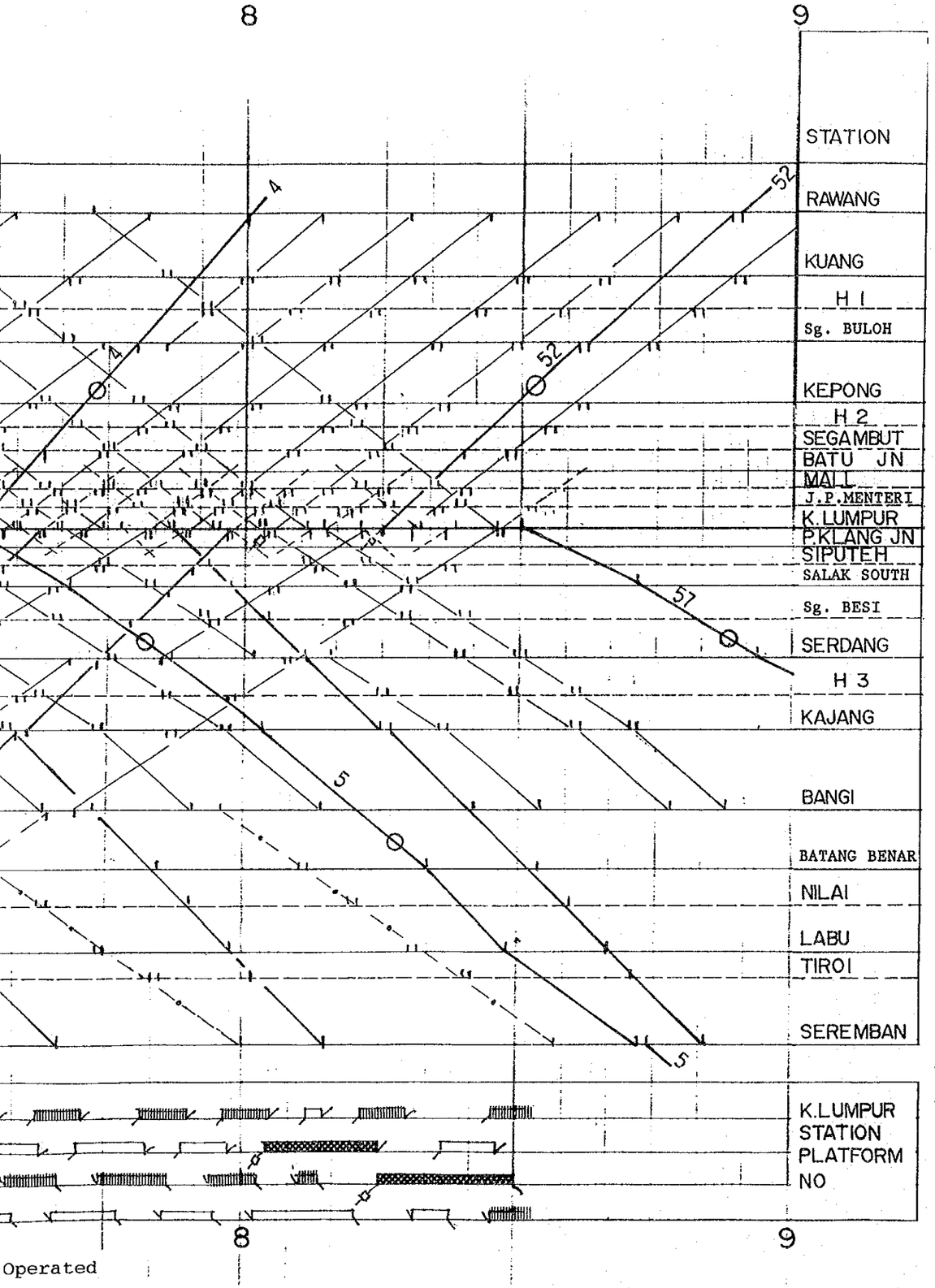
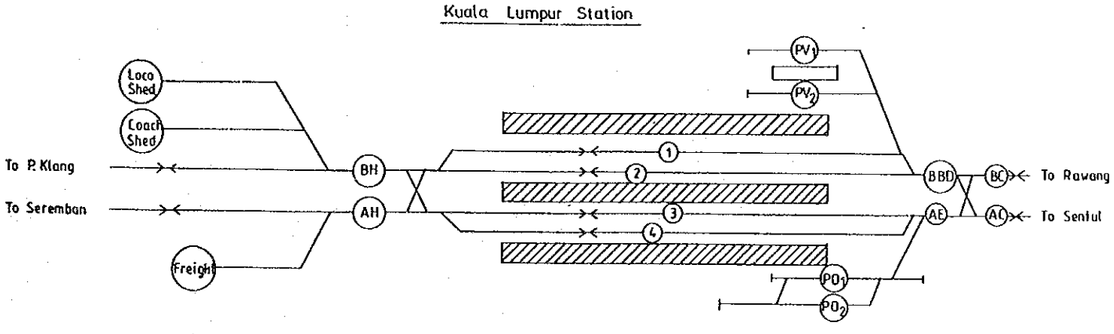


Fig. 2 Model Diagram for Morning Peak Hours (In Case Long Distance Trains are Operated During Morning Peak Hours)



Operated

	DMU (Rapid)
	DMU (Local)
	DMU (P.Klang Line)
	DMU (Shuttle Service)
	Long Distance Passenger
	Deadhead



b. Improvement of the marshalling system for long-distance passenger trains

Long-distance passenger coaches terminating at or originating from the station are moved between the station and the coach depot by shunting locomotives.

When a long-distance passenger train terminates at the station, the locomotive of the train is uncoupled and returns alone to the locomotive depot. For a long-distance passenger train to originate from the station, coaches are hauled by a shunting locomotive to departure track, and a locomotive for main track operation starts from the locomotive depot and is coupled with the coaches. To streamline these operations, it is proposed to use the main-track locomotive also for the shunting operation; the passenger train terminating at the station will be operated to the coach depot within 15 minutes after its arrival, while the coaches of the originating train will be coupled at the coach depot with a main-track locomotive. The coaches then will be operated by the same locomotive to departure track at the station shortly - within 15 minutes - before the departure time. This will result in decrease in the frequency of use of arrival/departure tracks by locomotives, and reduction in idling time for coaches, thus boosting the arrival/departure track capacity.

To accomplish this, the following measures should be taken.

Table 2 Staying Time of Long-distance Passenger Trains on Arrival and Departure Tracks (February 1990)

Departure			Arrival		
Name of train	Occupancy time (min.)	Reduced time (min.)	Name of train	Occupancy time (min.)	Reduced time (min.)
4	186	171	3	30	15
8	31	16	7	15	0
52	30	15	51	12	- 3
54	70	55	53	7	- 8
56	53	38	55	27	12
5	54	39	6	25	10
57	40	25	58	34	19
59	80	65	60	17	2
61	85	70	62	21	6
Total(9)	629	494	Total(9)	188	53
Average	70	55	Average	21	6

Note : Reduced time is calculated when the staying time is assumed to be 15 minutes.

(a) Improvement of the coach depot

To operate main track locomotives with heavy axle load to the coach depot, tracks need to be reinforced. Also, to permit shunting operation by these locomotives, arrival/departure tracks, draw-out tracks, locomotive waiting tracks, and shunting signals need to be constructed or improved.

(b) Introduction of radio equipment for shunting operation

When a main track locomotive is used for shunting operation, it is difficult for the train driver to identify a hand signal or light in the case of push operation - operation of the

locomotive by coupling it on an opposite side of running direction. Thus, radio equipment needs to be used for communication between the locomotive driver and the yardman, and for signaling to move the coaches.

(c) Change of places where coupling and uncoupling of parcel and mail cars for long-distance passenger trains is conducted

As mentioned earlier, the coupling and uncoupling of parcel and mail cars of some long-distance passenger trains is one factor of restricting the arrival/departure track capacity. MRA intends to shift this work to Brickfield, and it is recommended to effectuate it before starting operation of DMU trains.

Appendix 5-4-1 Number of Train (Rawang - Seremban)

Table 1 Current Status of Train Operation
(Passenger, 1.1. 1990)

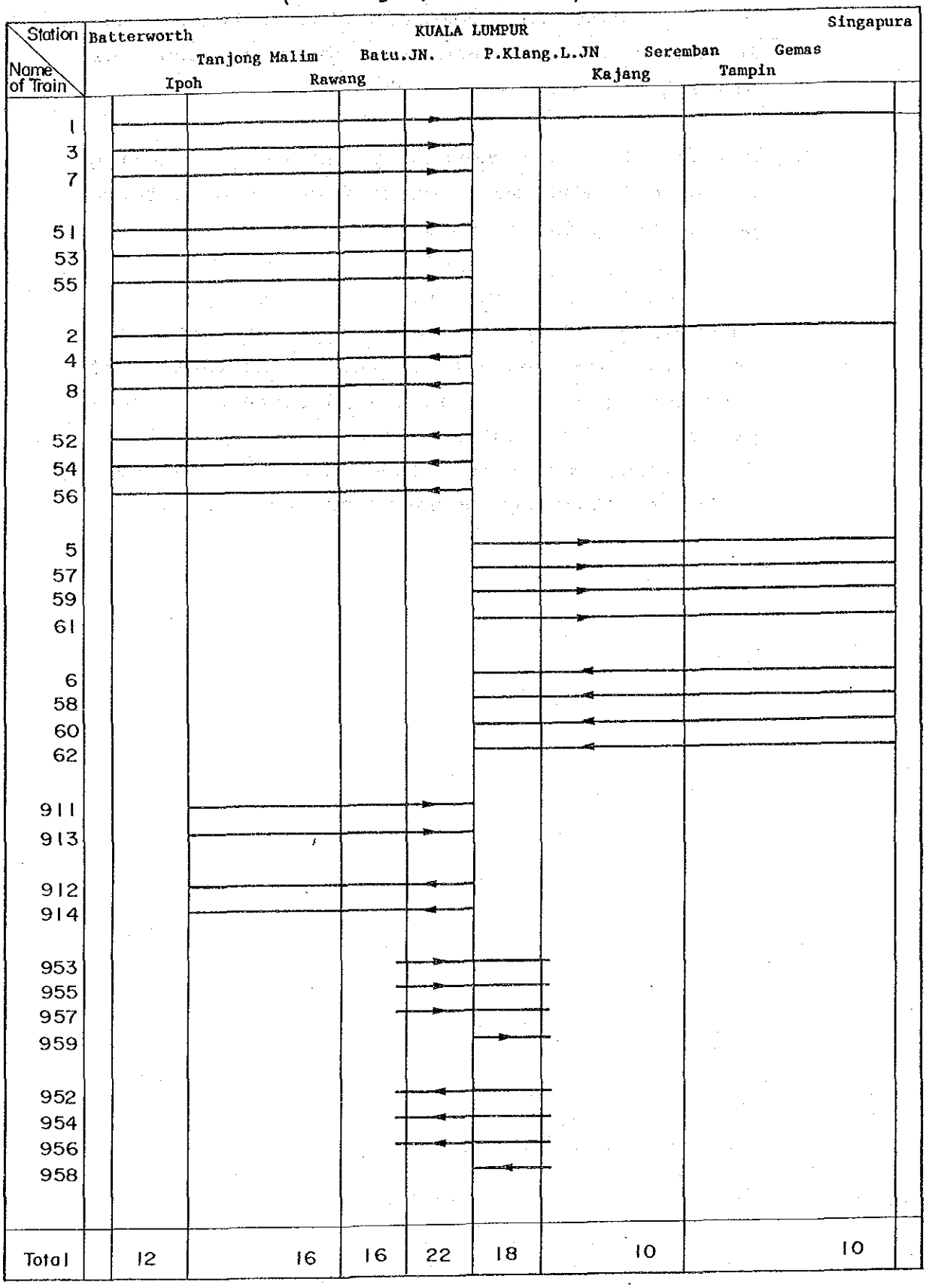


Table 2 Current Status of Train Operation
(Freight, 1.1. 1990)

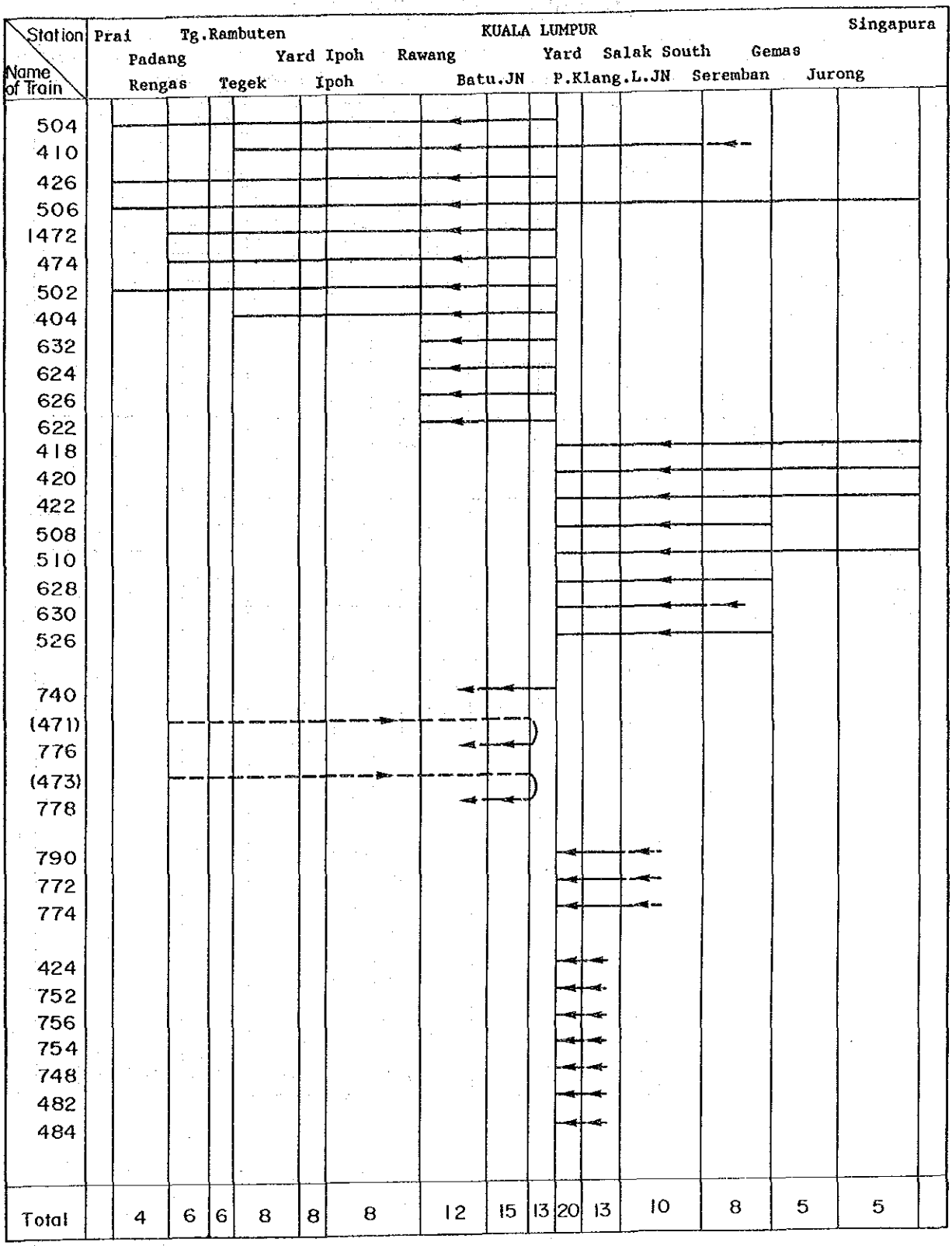
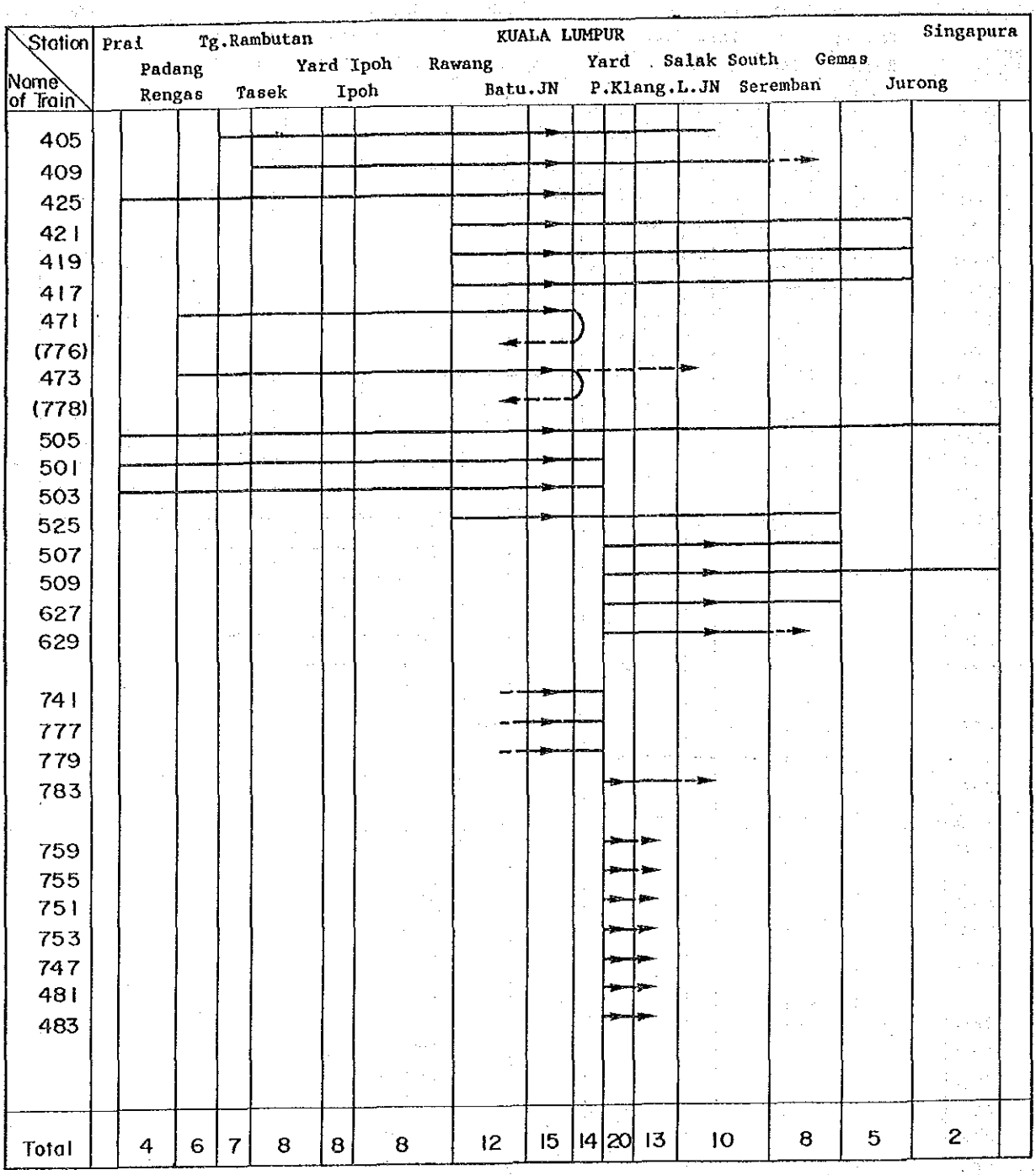
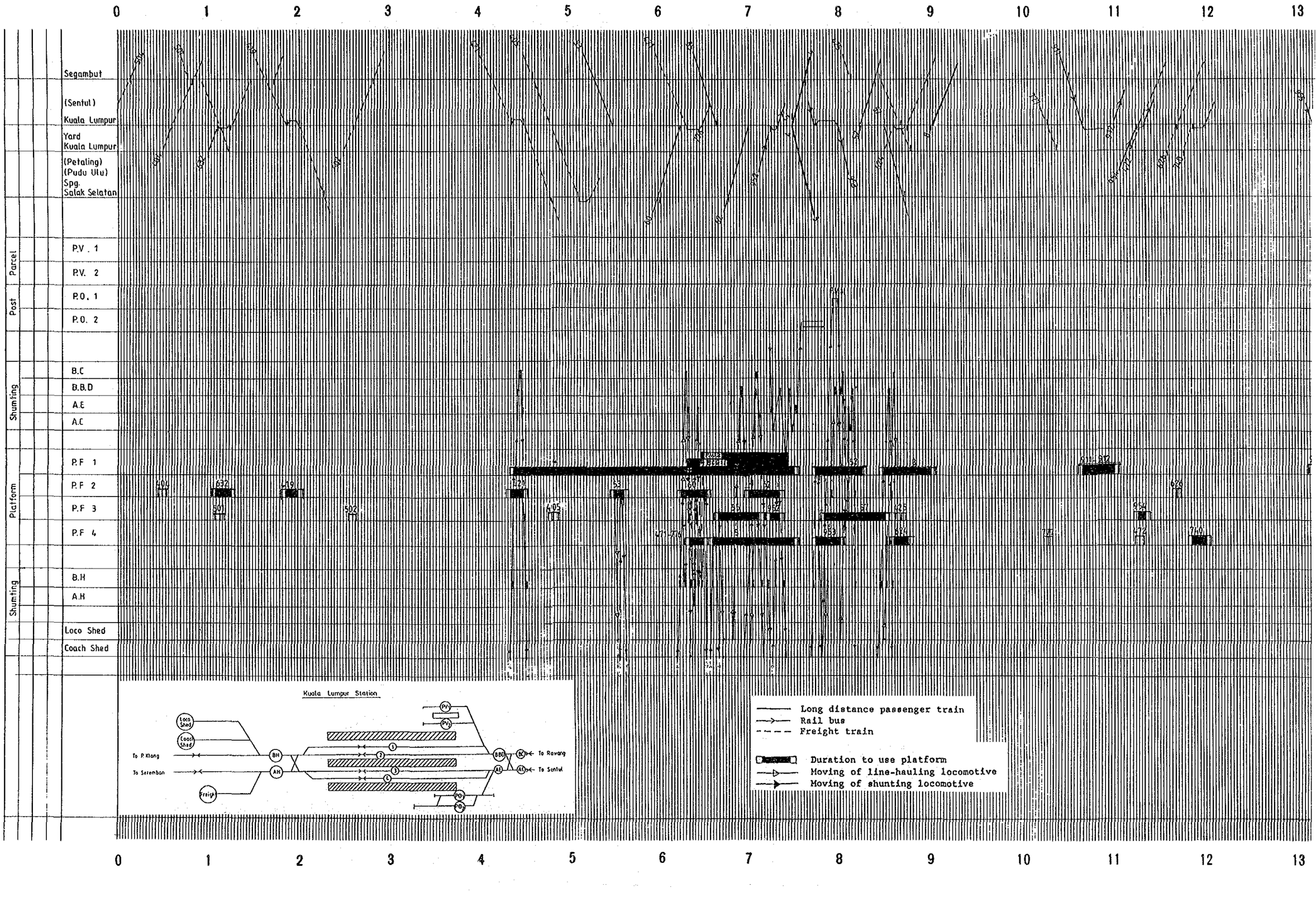


Table 3 Current Status of Train Operation
(Freight, 1.1. 1990)



Appendix 5-5-1 Chart Showing Occupation of Tracks
(Kuala Lumpur Station Feb, 1990)



12 13 14 15 16 17 18 19 20 21 22 23 24

Segambut

Kuala Lumpur

Yard
Kuala Lumpur

Spg.
Salak Selatan

P.V. 1

P.V. 2

P.O. 1

P.O. 2

B.C

B.B.D

A.E

A.C

P.F 1

P.F 2

P.F 3

P.F 4

B.H

A.H

Loco Shed

Coach Shed

12 13 14 15 16 17 18 19 20 21 22 23 24