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Handling Of Unsignalized Intersections (Haji Rais Intersections) In South Tangerang City

Heris Cahya Kusuma[1*], AR Indra Tjahjani[2], Pio Ranap Tua Naibaho[3]
[1,2,3]*Faculty of Engineering, Tama Jagakarsa University.*
Email : [1*]*heris.cahya@gmail.com* [2]*arindratjahjani@univpancasila.ac.id*
[3]*Piorthanaibaho@gmail.com*

A R T I C L E I N F O

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A B S T R A C T

The H. Rais intersection in South Tangerang City has an intersection with three arms without traffic signals. H. Rais Intersections is a meeting of three roads, namely H. Jamat Street, Puspitek Road Segment 1, and Puspitek Road Segment 2. This intersection often experiences long queues due to inadequate intersection capacity so that it cannot accommodate the volume of vehicles during morning and evening rush hours. From the research results, the average length of the queue before handling during peak hours on weekdays is 168.52 m and delays are 35,471 with a level of service (LOS) D, while the average length of the queue before handling during peak hours on Weekend is 119 .82 m and a delay of 33.52 with a level of service (LOS) D. Handling is being carried out at H. Rais Intersections in short-term scenario 1 is by fulfilling road equipment facilities and assigning traffic officers, and in short-term scenario 2 by widening the bend radius to a minimum of 7.8 m and widening the H. Jamat Street. Rais becomes 6 m, while the treatment carried out at H. Rais Intersections in the long term is to change the Puspitek road type to 4/2-T with a width per direction of 6 m.

1. Introduction

Haji Rais Intersections in South Tangerang City from year to year of course there will be an increase in traffic volume and there will be new generating and attracting traffic areas which will result in additional traffic loading [1], [2], [3]. The traffic volume due to the growth of vehicles in South Tangerang City will directly impact the road network's performance [4], [5]. From this background, analysis is needed to measure and evaluate the current condition of the

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H [6], [7]. Rais unsignalized intersection 4 20. Therefore, it is necessary to handle the H. Rais unsignalized intersection with Traffic Management and Engineering to obtain problem identification and mitigate traffic handling to improve traffic performance [8], [9].

The purpose of carrying out a study on handling unsignalized intersections (Haji Rais Intersections) in South Tangerang City is to improve traffic performance at H. Rais Intersections. The objectives of carrying out the study are as follows:

a. Analyze the traffic performance at H. Rais Intersections currently (existing) and in the planning year (forecasting).
b. Analyzing Traffic Management and Engineering that will be carried out to overcome congestion at H. Rais Intersections.

2. Research Method

1. Normative Aspect

The legal basis for preparing this research is Law of the Republic of Indonesia Number 22 of 2009 concerning Road Traffic and Transportation Article 93, it states that Traffic Engineering Management is implemented to optimize the use of the Road network and Traffic movement to ensure Security, Safety, Order and Smoothness of Road Traffic and Transportation [10]–[12].

2. Theoretical Aspects

An intersection can be defined as a meeting of two or more roads, it can be an intersection or intersection or a roundabout or non-level intersection [1], [13], [8]. To assess traffic performance, the design criterion commonly used is DJ with a common value of DJ ≤0.85 [14], [15].

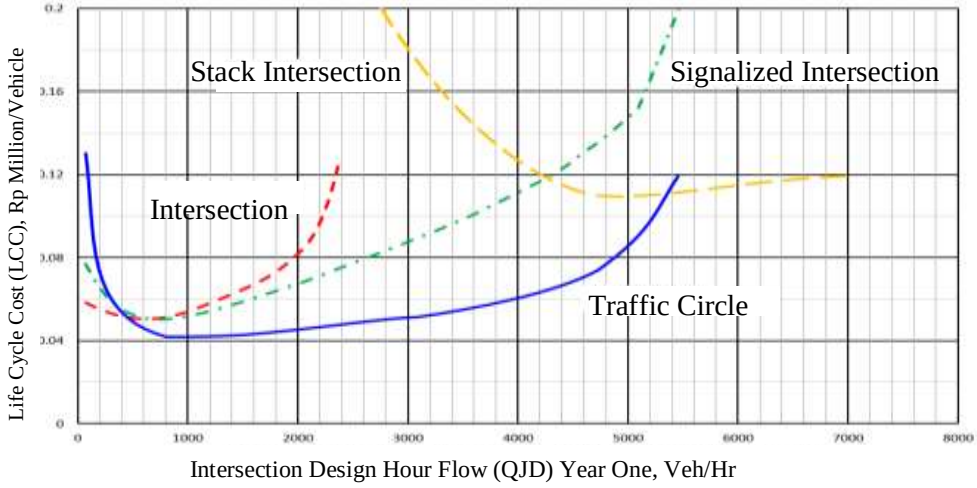

Figure 1. BSH graph for selecting intersection types
Source: PKJI (2023)

Table 1. Basic capacity of intersection type

Intersection Type	Co (PCU/Hour)
322	2700
324	3200
344	3200
422	2900
424	3400

Source: PKJI, 2023

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Table 2. Intersection type code

Intersection type code	Number of intersection branch	Number of minor lanes	Number of mayor lanes
322	3	2	2
324	3	2	4
422	4	2	2
424	4	2	4

Source: PKJI, 2023

3. Description and Technical

In this case, we are more concerned with examining the condition of the movement patterns of the people of South Tangerang City which occur directly in the field for the objects studied regarding the control management of H1 [16], [17]. Rais Intersections which is located in Pamulang District, South Tangerang City by providing appropriate recommendations to the MRLL handlers in H. Rais Intersections for the short and long term [18], [19], [20].

For this research, the design used was as follows:

1. Descriptive Design
2. Experimental Design

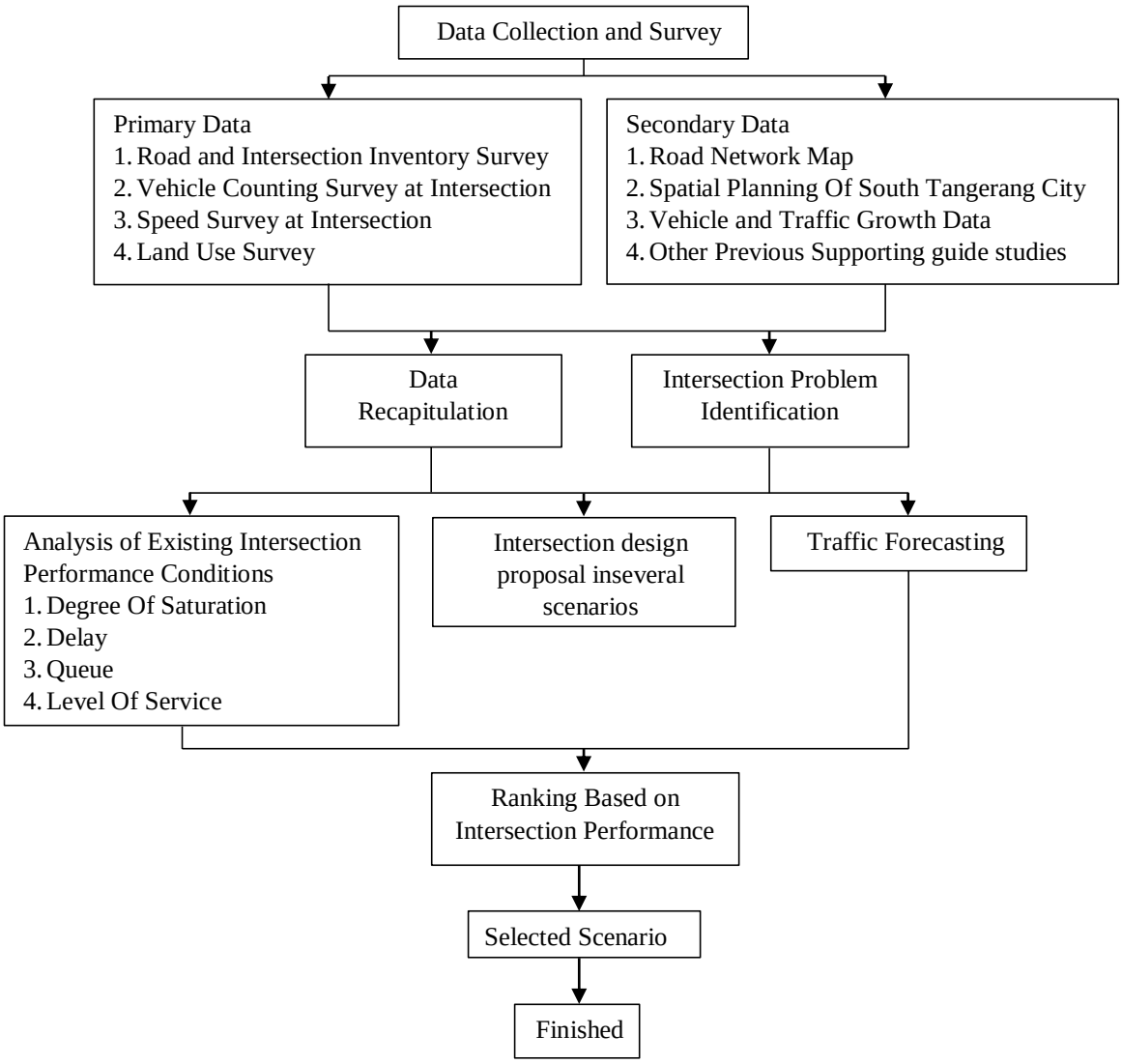

Figure 2. Flow diagram

Source : Analysis Result, 2024

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Results and Discussions

4.1 Study Location

The study was carried out at the Haji Rais Intersections location, Setu District, South Tangerang City (where the road meets H. Jamat Street and Puspitek Road).

Figure 3. Study Location
Source : Google Maps, 2024

4.2 Traffic Equipment Condition

b. H. Rais Intersections

Based on the results of the intersection inventory survey, the following data was obtained:

- Intersection Type: 322 (No Signal)
- Road Condition: Good
- Pavement Type: Asphalt
- Side Obstacles: Medium

The following is a visualization of the intersection.

Figure 4. Visualization of the H. Rais intersection, bottom view and top view
Source : Researcher's document, 2024

In general, vehicles passing through Haji Rais Intersections can be seen in the diagram below.

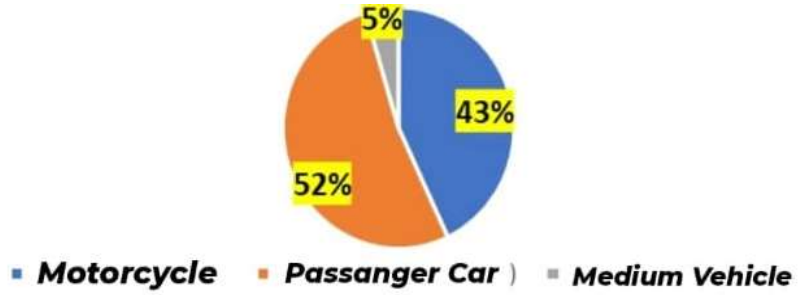

Figure 5. Percentage of Vehicles at H. Rais Intersections Weekdays
Source : Analysis Result, 2024

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Figure 6. Percentage of Vehicles at H. Rais Intersections on Weekend
Source : Analysis Result, 2024

From the vehicle percentage diagram, it can be seen the percentage of vehicles passing through the intersection. The largest percentage of vehicles used on weekdays are Passenger Cars (MP) with a percentage reaching 52%, followed by vehicles from the Motorcycle (SM) category with a percentage of 43% and the Medium Vehicle (KS) category at 5%. For the percentage of vehicles used during Weekend, the majority of vehicles used are Passenger Cars (MP) with a percentage reaching 53% followed by the percentage of vehicles in the Motorcycle (SM) category which has a percentage of 43% medium vehicles (KS) with a percentage of 4 %.

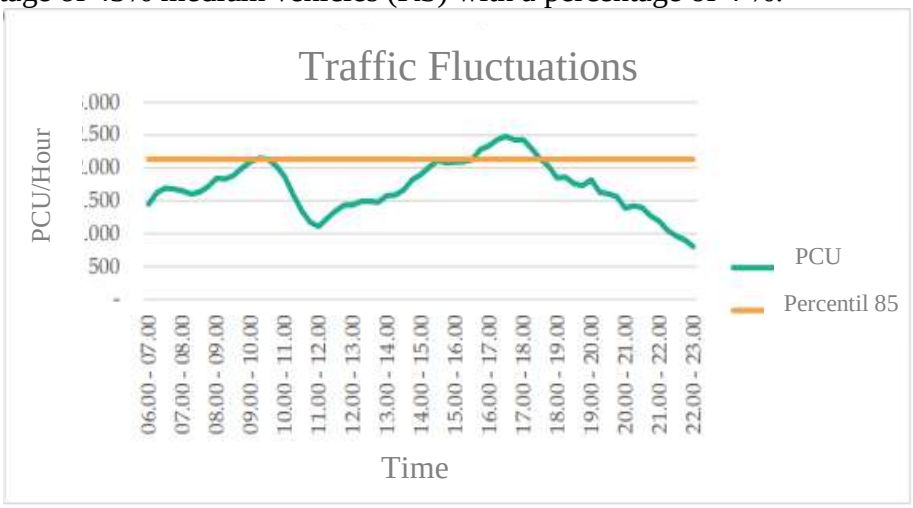

Figure 7. Traffic fluctuations Puspitek Road Weekend
Source : Analysis Result, 2024

From the time slice diagram of holiday traffic fluctuations, it can be seen that the peak point of rush hour in the morning is at 09.15 - 10.15 WIB with a total traffic volume reaching 2,148 pcu/hour. The afternoon rush hour is 16.30 – 17.30 WIB with a total traffic volume reaching 2,480 pcu/hour.

c. H. Jamat Street

Detailed details of the data from the results of the inventory survey that have been carried out are as follows:

- Road Type: 2/2-TT
- Road Status: City Road
- Road Class: Road Class III
- Road width: 3.4 meters
- Number of Lanes: 2
- Number of Lanes: 2
- Road Condition: Good
- Pavement Type: Asphalt
- Side Obstacles: Medium

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Figure 8. Visualization and Cross Section of H. Jamat Street
Source : Researcher's document, 2024

d. Road Puspitek Segment 1
Detailed details of the data from the results of the inventory survey that have been carried out are as follows:
- Road Type: 2/2-TT
- Road Status: Provincial Road
- Road Class: Road Class II
- Road width: 9 meters
- Number of Lanes: 2
- Number of Lanes: 2
- Road Condition: Good
- Pavement Type: Asphalt
- Side Obstacles: Medium

Figure 9. Visualization and Cross Section of Puspitek Road Segment 1
Source : Researcher's document, 2024

e. Puspitek Road Segment 2
Detailed details of the data from the results of the inventory survey that have been carried out are as follows:
- Road Type: 2/2-TT
- Road Status: City Road
- Road Class: Road Class II
- Road width: 9 meters
- Number of Lanes: 2
- Number of Lanes: 2
- Road Condition: Good
- Pavement Type: Asphalt
- Side Obstacles: Medium

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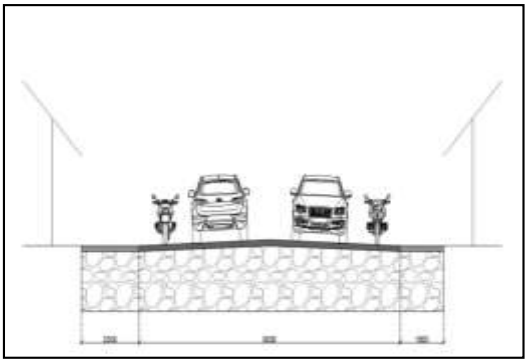

Figure 10. Visualization and Cross Section of Puspitek Road Segment 2
Source : Researcher's document, 2024

4.3 Travel Distribution

Based on observations in the field and after analysis, it is possible to determine the performance of Haji Rais Intersections. Ease of travel is a performance of traffic on that section, which is used in this study using a measure of the degree of saturation (Dj) which is then grouped into the level of service (LOS), apart from that it also uses speed indicators which are also grouped into the level of service (Level of Service/LOS).

4.4 Traffic Performance

In carrying out intersection calculation analysis, calculations are also carried out using an analysis method, namely based on calculations of the Pedoman Kapasitas Jalan Indonesia (PKJI). In the calculation table, the analysis includes calculations for the existing period without treatment or with treatment as follows:

1. Short Term
   a. Scenario 1 involves fulfilling road equipment facilities and assigning traffic control officers.
   b. Scenario 2 involves widening the corner radius along with widening the H. Jamat Streete to 6 m.
2. Long term (next 5 years)

   Making changes to the type of road section on Puspitek Road becomes 4/2-T with a width per direction of 6 m along with widening of the H. Jamat Street became 6. The following is the distribution of the H. Rais Intersections trip as outlined in the flow diagram as follows:

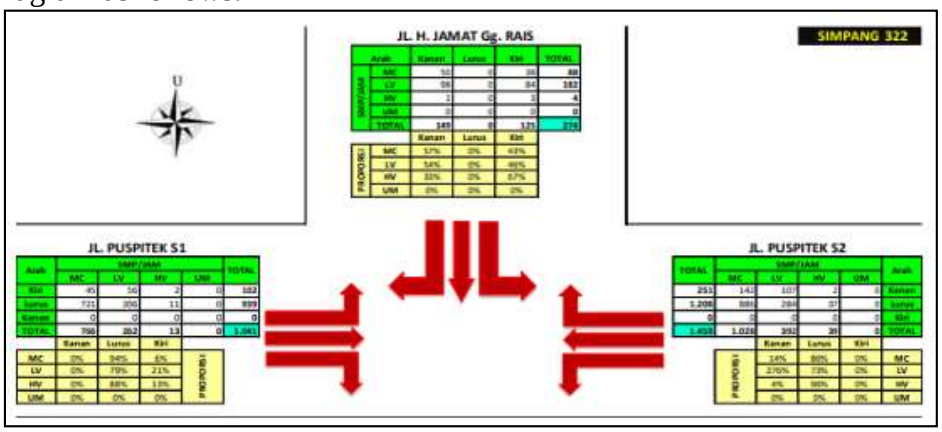

Figure 11. Weekday Flow Diagram
Source : Analysis Results, 2024

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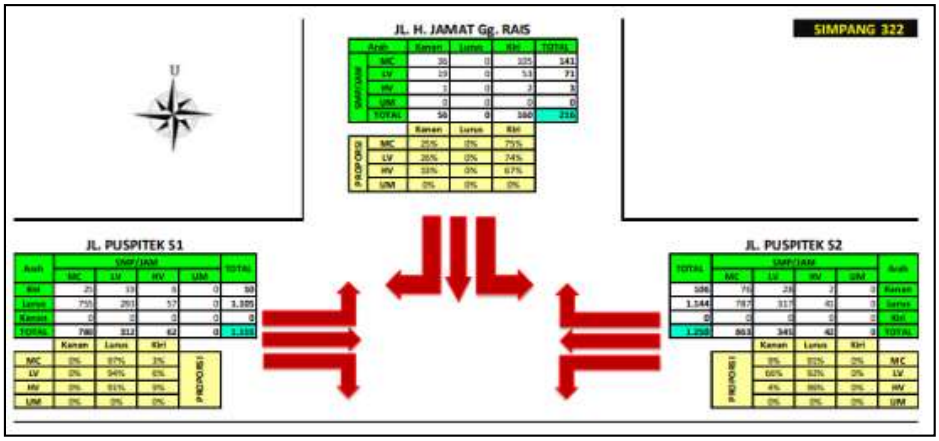

Figure 12. Weekend Flow Diagram

Source : Analysis Results, 2024

In the flow diagram presented, the classification of vehicles passing through the intersection can be seen along with the origin and direction of the vehicle. From the diagram, it can be seen that many vehicles come from Puspitek Road Segment 2 (East Mouth Simpang) with a total of 1,953 pcu/hour with the majority of vehicles moving straight towards Puspitek Road Segment 1 (West Mouth Simpang) is 92% and 8% for vehicles turning right onto H. Jamat Street. The road with the least number of vehicles comes from H. Jamat Street with a total of 254 pcu/hour vehicles with the majority of vehicles turning left, namely 74%, and turning right, 26%.

4.5 Interception Performance Analysis

Calculations are also carried out using an analysis method based on the calculations of the Pedoman Kapasitas Jalan Indonesia (PKJI) when analyzing intersections.

Table 3. Intersection Analysis

1. Capacity									
Option	Basic Capacity (C) pcu/hour	Approach Width Ratio (Fw)	Median Factor (Fm)	City Size Factor (Fu)	Side Friction Factor (Fs)	Left Turn Factor (Flt)	Right Turn Factor (Frt)	Flow Ratio Factor (Fp)	Capacity (C) Pcu/hour
1	2.700	0,97	1,00	1,05	0,94	1,02	0,94	1,08	2.675
2	3.400	0,89	1,05	1,05	0,94	1,02	0,94	1,08	3.238
3	2.900	0,89	1,00	1,05	0,94	1,02	0,94	1,08	2.638
4	3.400	0,94	1,05	1,05	0,94	1,02	0,94	1,08	3.441
2. Traffic Performance									
Option	Traffic Flow (pcu/hour)	Degree of Saturation (D)	Total Delay (TLL)	Major Road Delay (TLLm)	Minor Road Delay (TLLmi)	Geometric Delay (TG)	Traffic Conflict Delay (TC)	Queue Probability (Pa)	Target
1	2.153	0,80	9,17	6,74	25,82	3,97	13,14	26 - 52	DS < 0,85
2	2.153	0,66	6,92	5,15	19,01	3,94	10,86	18 - 37	DS < 0,85
3	2.908	1,10	21,63	14,24	72,31	4,00	25,63	49 - 98	DS > 0,85
4	2.908	0,85	10,03	7,33	28,55	3,97	14,00	29 - 57	DS < 0,85

Source : Analysis Results, 2024

4.6 Road Performance Analysis

The road section studied is the road section that forms Haji Rais Intersections. There are 2 roads that form this intersection, namely:

1) H. Jamat Street
2) Puspitek Road

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Table 4. Performance Analysis of Existing Road Sections

Number	Road Segment	Type	Capacity (pcu/hour)	Volume (pcu/hour)	Dj	LOS	Speed (km/hour	LOS PM 96 TH. 2015	Density (vehicle/ Hour
1	H. Jamat Street	2/2-TT	1.014	335	0,33	B	33,49	E	10
2	Puspitek Road Seg.1	2/2-TT	3.045	2.495	0,82	D	25,89	E	96,38
3	Puspitek Road Seg.2	2/2-TT	3.045	2.287	0,75	C	30,3	E	75,49

Source : Analysis Results, 2024

Table 5. Road Performance Analysis for the Next 5 Years

Number	Road Segment	Type	Capacity (pcu/hour)	Volume (pcu/hour)	Dj	LOS	Speed (km/hour	LOS PM 96 TH. 2015	Density (vehicle/ Hour
1	H. Jamat Street	2/2-TT	1.014	444	0,44	B	33,23	E	13,77
2	Puspitek Road Seg.1	2/2-TT	3.045	3.305	1,09	F	16,47	E	200,68
3	Puspitek Road Seg.2	2/2-TT	3.045	3.030	1,00	E	21,62	E	140,19

Source: Analysis Results, 2024

4.7 Performance Comparison of Internship

Based on calculations with the Pedoman Kapasitas Jalan Indonesia (PKJI) as well as handling simulations with PTV. Vissim obtained a comparison of the performance of the intersection before and after handling the existing and 5 year plans, namely as follows:

Table 6. Comparison of Weekday Intersection Performance

Time Frame	Scenario	Traffic Delay (seconds)	LOS
Existing	No Treatment	33,52	D
Existing	Short-Term Treatment Scenario 1	28,26	D
Existing	Short-Term Treatment Scenario 1	26,51	D
5 Year Plan	No Treatment	43,64	E
5 Year Plan	Long Term Treatment	16,72	C

Source : Analysis Results, 2024

Table 7. Comparison of Weekend Intersection Performance

Time Frame	Scenario	Traffic Delay (seconds)	LOS
Existing	No Treatment	35,47	D
Existing	Short-Term Treatment Scenario 1	33,04	D
Existing	Short-Term Treatment Scenario 1	27,65	D
5 Year Plan	No Treatment	49,13	E
5 Year Plan	Long Term Treatment	17,48	C

Source : Analysis Results, 2024

4. Conclusion and Suggestion

5.1 Conclusion

The conclusions that can be drawn based on the results of the traffic management and engineering analysis that have been carried out are as follows:

1. The modes most widely used by people are as follows;
   a. Weekdays: Car 52%, Motorbike 43%
   b. Weekend: Car 55%, Motorbike 42%

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2. From the results of the management and engineering analysis of Haji Rais Intersections in its existing condition, namely:
   a. On weekdays, the average vehicle queue length is 168.52 m and the delay is 35.471 seconds/pcu with LOS D.
   b. On Weekend, the average vehicle queue length is 119.82 m and the delay is 33.52 seconds/pcu with LOS D
3. From the results of the management and engineering analysis of Haji Rais Intersections in the conditions of the next 5 years, namely:
   a. On weekdays, the average vehicle queue length is 219.64 m and the delay is 49.137 seconds/pcu with LOS E.
   b. On Weekend, the average vehicle queue length is 218.28 m and the delay is 43.635 seconds/smp with LOS E.
4. Short-term handling by fulfilling road equipment facilities and assigning traffic control personnel with the results:
   a. Weekdays reduce queues to 163.68 m and delays to 35.47 seconds/pcu.
   b. Weekend reduce queues to 106.30 and delays to 28.26 seconds/pcu. Use separate subsections in Conclusions and Suggestions. The conclusion answers the objective, states concisely the results of the study but not figures or sentences statistical.
5. Short-term handling by widening the corner radius to a minimum of 7.8 m and widening the Jalan H. Jamat Gg section. Raise to 6 m with results:
   a. Weekdays reduce queue length to 108.52 m and vehicle delays to 27.65 seconds/pcu.
   b. Weekend reduce queue length to 105.09 m and vehicle delays to 26.51 seconds/pcu.
6. Long-term handling by changing the type of Puspitek Roadto 4/2-T with a width per direction of 6 m and widening H. Jamat Street with a width of 6 m with results:
   a. Weekdays reduce queue length to 91.63 m and vehicle delays to 17.48 seconds/pcu.
   b. Weekend reduce queue length to 85.50 m and vehicle delays to 16.72 seconds/pcu.
7. In a study of the road sections that form Haji Rais Intersections, it was found that the capacity of the H. Jamat Street of 1,014 pcu/hour, Puspitek Road S1 amounting to 3,045 pcu/hour, Puspitek Road S2 is 3,045 pcu/hour. The performance analysis obtained for each section in existing conditions and in the next 5 years is as follows:
   a. Existing Conditions
   1) Section H. Jamat Street has a LOS (Level of Service) of 0.33 and LOS B.
   2) Section Puspitek Road S1 has a LOS (Level of Service) of 0.82 and LOS D.
   3) Section Puspitek Road S2 has a LOS (Level of Service) of 0.75 and LOS C.
   b. Conditions for the Next 5 Years
   1) Section H. Jamat Street has a LOS (Level of Service) of 0.44 and LOS B.
   2) Section Puspitek Road S1 has a LOS (Level of Service) of 1.09 and LOS F.
   3) Section Puspitek Road S2 has a LOS (Level of Service) of 1.00 and LOS E.

5.2 Suggestion

In looking at the results of the analysis that has been carried out, several steps can be taken to anticipate the increase in traffic flow that will occur, including:

1. Fulfilling the need for road equipment facilities simultaneously with assigning traffic control personnel for short-term mitigation.
2. Widening the corner radius and H. Jamat Street can be carried out if coordination with the community, related agencies, or stakeholders has been carried out.

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Study of Groin Structure Planning On a River Bend In Padang Mancang Village