

Office of the City Manager

City of Richland Hills, Texas

## Memorandum

To: Honorable Mayor Bill Agan and members of the Richland Hills City Council  
From: Eric Strong, City Manager  
Date: September 20, 2016  
Subject: Traffic Study

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### **Council Action Requested:**

No Action – Discussion Only

### **Background Information:**

Approximately two months ago staff had a discussion with the City Council regarding traffic speeds at various locations in town. Specifically, we had received complaints of excessive speed on Popplewell – and to a lesser degree Vance.

At that time staff had done a few things to monitor and try to mitigate any problems. The steps we had taken at the time included:

1. Measured data using our internal vehicle counters
2. Increased patrols in the area, including issuing warnings and citations

Following our last meeting, we also went ahead and hired a professional traffic engineer to study the speeds on Popplewell and evaluate any possible solutions.

I have attached the engineers report to this memo. The summary of the memo is as follows:

1. The data collected does support the ability to raise the speed limit from 30 to 35. If the speed limit is raised, then stop signs would be justified, but it would also allow for higher speeds on Popplewell.

2. Due to other issues (sight lines, negative impacts of higher speed, and existing conditions), the recommendation is to leave the speed limit at 30. At this speed, there is no justification to install the stop signs.
3. There is a recommendation to install an "Intersection Ahead" warning sign approaching some of the intersections due to visibility issues.

**Board/Citizen Input:** N/A

**Financial Impact:** N/A

**Staff Contacts:**

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City Manager  
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**Attachments:** Engineer Study



ARIZONA  
TEXAS  
NEW MEXICO  
OKLAHOMA

October 17, 2016

Ms. Barbara J. Childress  
Chief of Police  
Richland Hills Police Department  
6700 Baker Boulevard  
Richland Hills, Texas 76118

Re: *Speed Study and Multiway Stop-Control Studies along Popplewell Street*

Dear Chief Childress:

Lee Engineering has conducted a speed study and two multiway stop control studies along Popplewell Street within the City of Richland Hills. This letter report presents the results of our study.

**SPEED ZONE STUDY**

Popplewell Street is a two-lane undivided road way and serves as a north-south route between SH 26 and US 183. Popplewell Street is formally designated as a collector street on the City of Richland Hills 2014 *Comprehensive Plan*. The existing posted speed limit along Popplewell Street is 30 miles per hour.

**24 Hour Automated Speed Data**

Lee Engineering collected automated speed data using pneumatic tubes on Wednesday, August 31, 2016. Speed data was gathered over a 24-hour period and then filtered to eliminate vehicles traveling less than four seconds apart in order to better represent free flowing vehicles. The raw speed data for the study is provided as an attachment. The filtered speed data is summarized in Table 1.

**Table 1: 24 Hour Automated Speed Data Summary**

Direction	Location	Total Vehicles	15 <sup>th</sup> Percentile	50 <sup>th</sup> Percentile	85 <sup>th</sup> Percentile
NB	Between Bridges Avenue and Hovenkamp Avenue	1049	27	32	36
SB		1053	27	32	37
NB	Between Dover Lane and Richland Road	1153	25	30	35
SB		1111	26	31	35
NB	Between Glen Hills Road and Richlynn Terrace	1203	23	29	33
SB		1194	25	30	34

**Spot Speed Data**

A spot speed study was also performed along Popplewell Street within the existing posted 30 mph speed zone in order to verify the automated speed data. Lee Engineering operated one spot speed check station.

The location was operated just south of Brooks Avenue. The date, time, and location of spot speeds check stations along Popplewell Street is presented in Table 2.

**Table 2: Spot Speed Check Locations**

Date	Start Time	Stop Time	Existing Limit	Location
08/29/2016	1435	1635	30	Just south of Brooks Avenue

Spot speeds for Popplewell Street were measured using a handheld LIDAR speed measurement device and speed data was recorded at the location until two hours of data collection was performed or the sample size exceeded 125 vehicles. Only free-flowing vehicle speeds were measured, and all measurements were performed during day light and good weather. Table 3 presents the spot speed results.

**Table 3: Spot Speed Study Results**

Direction	Location	Total Vehicles	15 <sup>th</sup> Percentile	50 <sup>th</sup> Percentile	85 <sup>th</sup> Percentile	Mode
NB	Just south of Brooks Avenue	111	28	31	35	30
SB		98	28	33	37	30,32 <sup>1</sup>

<sup>1</sup> two speed values were noted with same number of observations

TxDOT *Procedures for Establishing Speed Zones* indicate that the speed limit for a section of roadway should be set based upon the 85<sup>th</sup> percentile spot speed rounded to the nearest 5 mph increment. Other factors such as the roadway geometric constraints, driveway density, pedestrian activity, development density and crash history should be considered and may be used to establish a speed limit lower than the rounded 85<sup>th</sup> percentile value.

**Field Observations**

The following observations were made during the field visits

- Popplewell Street forms a T-Intersection with US 183 (Baker Boulevard). A stop bar was not marked on the southbound approach of this intersection. Vehicles were observed stopping beyond the stop sign.
- Popplewell Street is a collector roadway through an area or predominantly residential land uses. Houses do have driveway access to Popplewell Street in multiple locations.
- Sidewalks are present on one side of the street from Hardisty to Bridges. There are no sidewalks on either side of the roadway north of Hardisty or south of Bridges.
- A horizontal curve is present on Popplewell Street between Richlynn Terrace and Richland Road.
- During multiple field visits to the site, vehicular traffic did not appear heavy or congested. Little pedestrian activity was observed during field visits.
- Advance school crossing assemblies (S1-1, SW 16-9P) were present along Popplewell Street upstream of Hovenkamp avenue and Dover Lane. School crossing assemblies (S1-1, SW16-7P) were present at the southern crosswalks of Popplewell Street Intersections at Hovenkamp Avenue and Dover Lane.

**TRAFFIC VOLUMES**

Lee Engineering collected automated vehicle counts using pneumatic tubes on Wednesday, August 31, 2016. This data was gathered over a 24 hour period at the following locations along Popplewell Street.

1. Between Bridges Avenue and Hovenkamp Avenue
2. Between Dover Lane and Richland Road
3. Between Glen Hills and Richlynn Terrace

Eastbound and westbound approach volumes were collected at the following intersections

4. Hovenkamp Avenue at Popplewell Street
5. Richlynn Terrace at Popplewell Street

Table 5 provides daily counts summary with total 24 hour volumes, heavy vehicles (3 or more axle) counts and percentage of heavy vehicles. Vehicles with three axle or more average 3% of the traffic stream along Popplewell Street.

Table 5 provides the hourly counts at these locations. The highest eight hours from the data collection are highlighted in Table 5. The raw count data is provided with the attachment.

**Table 4: 24-Hour Count and Vehicle Classification Summary**

POPPELWELL ST BETWEEN BRIDGES AVE & HOVENKAMP AVE								
Northbound			Southbound			Total of NB and SB		
Total (Veh)	Number of 3-Axle or more	Percent 3-Axle or more	Total (Veh)	Number of 3-Axle or more	Percent 3-Axle or more	Total (Veh)	Number of 3-Axle or more	Percent 3-Axle or more
1197	21	2%	1187	31	3%	2384	52	2%
POPPELWELL ST BETWEEN DOVER LN & RICHLAND RD								
Northbound			Southbound			Total of NB and SB		
Total (Veh)	Number of 3-Axle or more	Percent 3-Axle or more	Total (Veh)	Number of 3-Axle or more	Percent 3-Axle or more	Total (Veh)	Number of 3-Axle or more	Percent 3-Axle or more
1308	24	2%	1276	30	2%	2584	54	2%
POPPELWELL ST BETWEEN GLEN HILLS RD & RICHLYNN TERRACE								
Northbound			Southbound			Total of NB and SB		
Total (Veh)	Number of 3-Axle or more	Percent 3-Axle or more	Total (Veh)	Number of 3-Axle or more	Percent 3-Axle or more	Total (Veh)	Number of 3-Axle or more	Percent 3-Axle or more
1379	51	4%	1370	52	4%	2749	103	4%

**Table 5: Hourly Count Summary**

Hour Ending	Between Bridges and Hovenkamp			Between Dover and Richland			Between Glen Hills and Richlynn			Hovenkamp approaching Popplewell			Richlynn approaching Popplewell		
	NB	SB	SUM	NB	SB	SUM	NB	SB	SUM	EB	WB	SUM	EB	WB	SUM
12:00 AM	5	4	9	5	6	11	10	5	15	1	0	1	0	0	0
1:00 AM	5	1	6	6	2	8	5	4	9	0	4	4	0	2	2
2:00 AM	3	0	3	3	1	4	5	2	7	0	1	1	0	0	0
3:00 AM	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
4:00 AM	0	3	3	2	1	3	3	4	7	0	1	1	1	2	3
5:00 AM	2	4	6	2	3	5	3	2	5	0	2	2	0	1	1
6:00 AM	18	24	42	24	25	49	26	19	45	3	3	6	3	0	3
7:00 AM	46	68	114	58	66	124	70	74	144	15	16	31	3	6	9
8:00 AM	77	154	231	89	150	239	93	117	210	37	21	58	12	27	39
9:00 AM	78	66	144	85	56	141	90	78	168	25	19	44	4	12	16
10:00 AM	47	52	99	52	54	106	64	60	124	10	14	24	2	5	7
11:00 AM	46	61	107	48	56	104	70	55	125	10	9	19	3	8	11
12:00 PM	65	53	118	72	56	128	76	66	142	18	12	30	5	9	14
1:00 PM	51	60	111	57	66	123	92	73	165	17	19	36	7	10	17
2:00 PM	72	53	125	67	65	132	76	57	133	19	15	34	4	6	10
3:00 PM	61	64	125	68	61	129	79	80	159	22	17	39	5	14	19
4:00 PM	113	130	243	113	135	248	113	117	230	36	37	73	12	46	58
5:00 PM	148	118	266	150	132	282	154	193	347	20	26	46	10	13	23
6:00 PM	152	88	240	174	101	275	141	115	256	32	31	63	8	14	22
7:00 PM	83	79	162	89	89	178	82	94	176	17	16	33	6	9	15
8:00 PM	51	38	89	60	58	118	52	66	118	13	12	25	6	5	11
9:00 PM	41	35	76	47	44	91	39	44	83	17	8	25	4	9	13
10:00 PM	14	15	29	19	30	49	23	27	50	5	3	8	2	2	4
11:00 PM	19	17	36	18	18	36	13	18	31	2	2	4	0	5	5
<b>Total</b>	<b>1197</b>	<b>1187</b>	<b>2384</b>	<b>1308</b>	<b>1276</b>	<b>2584</b>	<b>1379</b>	<b>1370</b>	<b>2749</b>	<b>319</b>	<b>288</b>	<b>607</b>	<b>97</b>	<b>205</b>	<b>302</b>

**Crash Data**

Historical crash data for Popplewell Street was provided by the City of Richland Hill Police Department. Calendar year 2013 through August 2016 (3.7 years) of data were available for analysis. Seven crashes occurred in the 3.7 year period along Popplewell Street within the study area. The crash data is summarized in the list below and in Table 6.

- Three crashes occurred at the intersection of Hovenkamp Avenue and Popplewell Street
- Two crashes occurred at the intersection of Dover Lane and Popplewell Street
- One crash occurred at the intersection of Bridges Avenue and Popplewell Street
- One crash occurred at/near the intersection of Richlynn Terrace and Popplewell Street

**Table 6: Crash Data Summary**

Segment	Segment Length	Two Way Volume	Crashes (2013 – 2016)	Crash Rate (crashes per hundred million vehicle miles)
Between SH 26 and US 183	1.0 mile	2572	7	201.52

The 2016 statewide average crash rate for 2 lane 2 way roads was 100.60 for rural roads and 250.50 for urban roads. Because Popplewell Street is located within an incorporated city it is considered an urban roadway. The study segment has a crash rate below the statewide average crash rates for urban two lane two way roadways.

**MULTIWAY STOP CONTROL WARRANT ANALYSIS**

The City requested that an analysis be conducted to determine if all-way stop control is warranted at the following intersections:

1. Popplewell Street at Hovenkamp Avenue; and
2. Popplewell Street at Richlynn Terrace.

The multiway stop control analysis was performed using traffic in Table 4 and Table 5.

The analysis is based on the multiway stop control warrants contained in Chapter 2B, "Regulatory Signs", of the 2011 Texas Manual on Uniform Traffic Control Devices (TMUTCD). Three warrants are included in the manual for evaluating the need for multiway stop sign installation. These warrants are:

1. Installing multiway stop control as an interim measure while arrangements are being made for traffic signal installation;
2. A crash warrant; and
3. Minimum traffic volumes.

Other criteria that may be considered in a multiway stop control analysis include:

- A. The need to control left-turn conflicts;
- B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;
- C. Locations where a road user, after, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and
- D. An intersection of two residential neighborhood collector (thorough) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.

### **Intersection 1: Popplewell Street at Hovenkamp Avenue**

#### *Warrant 1*

The first warrant allows for multiway stop control as an interim measure to control traffic while arrangements are being made for a traffic signal installation, if the traffic signal is warranted and urgently needed. Since a traffic signal has not been warranted for this intersection and it does not appear that volumes would satisfy signal warrants, Warrant 1 is NOT met for the intersection of Popplewell Street and Hovenkamp Avenue.

#### *Warrant 2*

Warrant 2 is satisfied when five or more reported crashes, of the type susceptible to correction by a multiway stop control installation, have occurred within a 12-month period. Crash data obtained from the Richland Hills Police Department notes that three (3) crashes occurred at or near the intersection of Popplewell Street and Hovenkamp Avenue from January 2013 through August 2016. Since fewer than five crashes occurred at this intersection during a 12 months period. The criteria for this warrant is NOT met.

#### *Warrant 3*

Warrant 3 is based on minimum traffic volumes and delays. It is satisfied when both of the following conditions are met:

- A. The total vehicular volume entering the intersection from the major street approaches (total of both approaches) must average at least 300 vehicles per hour (vph) for any eight (8) hours of an average day, and
- B. The combined vehicular and pedestrian volume from the minor street must average at least 200 units per hour for the same eight hours, with an average delay to minor street vehicular traffic of at least 30 seconds per vehicle during the maximum hour.

These criteria may be reduced to 70 percent of the above requirements when the 85th percentile speed exceeds 40 mph on the major street. The 85<sup>th</sup> percentile speed is below 40 mph; therefore, the minimum vehicular volumes were not altered.

The eight- (8) hourly periods with the highest number of vehicles entering the intersection were identified and noted in Table 4. The average major street vehicular volume entering the intersection was calculated and compared to the criteria contained in part "A" of Warrant 3. Table 7 summarizes the peak hour and average major street vehicular volume entering the intersection and compares these values to the criteria in part "A" of Warrant 3.

**Table 7: Major Street Traffic Volumes**

Intersection	Volumes (vph)			
	Peak Hour	8 Hour Average	Part A of Warrant 3 Requirement	Met?
Popplewell Street and Hovenkamp Avenue	266	192	300	NO

The average minor street entering volumes were also determined for the same eight (8) hours and compared to the criteria contained in part “B” of Warrant 3. Table 8 summarizes the average hourly volume entering the intersection from the minor street and compares the values to the criteria in part “B” of this warrant.

**Table 8: Minor Street Traffic Volumes**

Intersection	Volumes (vph)			
	Peak Hour	8 Hour Average	Part B of Warrant 3 Requirement	Met?
Popplewell Street and Hovenkamp Avenue	73	48	200	NO

Given the existing traffic volumes at the study intersections, Warrant 3 is NOT satisfied for the intersection of Popplewell Street and Hovenkamp Avenue.

*Sight Distance Evaluation*

As part of this traffic analysis, the available and required intersection sight distances for motorists entering the intersection from Hovenkamp Avenue was evaluated. The intersection sight distance required was estimated using the procedures developed by the American Association of State Highway and Transportation Officials (AASHTO) and published in the 2011 edition of A Policy on Geometric Design of Highways and Streets. At this intersection, the motorist should be able to see if and when adequate gaps exist to perform their desired maneuver. Table 9 presents the required and available sight distances for the intersection of Hovenkamp Avenue and Popplewell Street.

**Table 9. Intersection Sight Distance**

Major Roadway	Popplewell Street	Popplewell Street
Minor Roadway	EB Hovenkamp Avenue	WB Hovenkamp Avenue
Posted Speed Limit	30 mph	30 mph
Design Vehicle	Passenger Car	Passenger Car
Desired Intersection Sight Distance	335'	335'
Available Sight Distance to the Left	275'	475'
Available Sight Distance to the Right	507'	458'
Sight Distance Available > Desired:		
To the Left	NO	YES
To the Right	YES	YES

Comparison of the field investigation results of the available sight distance to the desired sight distance indicates that the available sight distance is not adequate for vehicles on the eastbound approach of Hovenkamp Avenue. The sight obstruction was posed by vegetation and fence on the property on the northwest corner of the intersection.

**Figure 1. Sight Distance Obstruction on Eastbound Hovenkamp**



**Conclusion – Intersection 1: Popplewell Street at Hovenkamp Avenue**

Using the data gathered on August 31, 2016 and the criteria stated in the Texas MUTCD, multi-way stop control is not warranted at this time at this location.

The vegetation on the northwest corner of the intersection should be trimmed if possible to increase available sight distance.

**Intersection 2: Popplewell Street at Richlynn Terrace**

*Warrant 1*

Since a traffic signal has not been warranted for this intersection and it does not appear that volumes would satisfy signal warrants, Warrant 1 is NOT met for the intersection of Popplewell Street and Richlynn Terrace.

*Warrant 2*

Warrant 2 is satisfied when five or more reported crashes, of the type susceptible to correction by a multiway stop control installation, have occurred within a 12-month period. Crash data obtained from the Richland Hills Police Department notes that One (1) crashes occurred at or near the intersection of

Popplewell Street and Richlynn Terrace from January 2013 through August 2016. Fewer than five crashes occurred at this intersection during a 12 month period. The criteria for Warrant 2 is NOT met.

*Warrant 3*

Warrant 3 is based on minimum traffic volumes and delays. The criteria were discussed fully earlier in the evaluation of Intersection 1.

The eight (8) hourly periods with the highest number of vehicles entering the intersection were identified and noted in Table 4. The average major street vehicular volume entering the intersection was calculated and compared to the criteria contained in part "A" of Warrant 3. Table 10 summarizes the peak hour and average major street vehicular volume entering the intersection and compares these values to the criteria in part "A" of Warrant 3.

**Table 10: Major Street Traffic Volumes**

Intersection	Volumes (vph)			
	Peak Hour	8 Hour Average	Part A of Warrant 3 Requirement	Met?
Popplewell Street and Richlynn Terrace	347	214	300	NO

The average minor street entering volumes were also determined for the same eight (8) hours and compared to the criteria contained in part "B" of Warrant 3. Table 11 summarizes the average hourly volume entering the intersection from the minor street and compares the values to the criteria in part "B" of this warrant.

**Table 11: Minor Street Traffic Volumes**

Intersection	Volumes (vph)			
	Peak Hour	8 Hour Average	Part B of Warrant 3 Requirement	Met?
Popplewell Street and Richlynn Terrace	58	26	200	NO

Given the existing traffic volumes at the study intersections, Warrant 3 is NOT satisfied for the intersection of Popplewell Street and Richlynn Terrace.

*Sight Distance Evaluation*

As part of this traffic analysis, the available and required intersection sight distances for motorists entering the intersection from Richlynn Terrace was evaluated. The intersection sight distance required was estimated using the procedures developed by the American Association of State Highway and Transportation Officials (AASHTO) and published in the 2011 edition of A Policy on Geometric Design of Highways and Streets. At this intersection, the motorist should be able to see if and when adequate gaps exist to perform their desired maneuver. Table 12 presents the required and available sight distance for the intersection of Richlynn Terrace and Popplewell Street.

**Table 12. Intersection Sight Distance**

Major Roadway	Popplewell Street	Popplewell Street
Minor Roadway	EB Richlynn Terrace	WB Richlynn Terrace
Posted Speed Limit	30 mph	30 mph
Design Vehicle	Passenger Car	Passenger Car
Desired Intersection Sight Distance	335'	335'
Available Sight Distance to the Left	245'	503'
Available Sight Distance to the Right	256'	408'
Sight Distance Available > Desired:		
To the Left	NO	YES
To the Right	NO	YES

Comparison of the field measured available sight distance to the desired sight distance indicates that the available sight distance is not adequate for vehicles on the eastbound approach of Richlynn Terrace. The intersection sight distance was obstructed by a fence on the northwest corner of the intersection and the large trees on the southeast corner.

**Figure 2. Sight Distance Obstruction on WB Richlynn Terrace: To Right and To Left**



**Conclusion – Intersection 2: Popplewell Street at Richlynn Terrace**

Using the data gathered on August 31, 2016 and the criteria stated in the Texas MUTCD, multi-way stop control is not warranted at this time at this location.

**DISCUSSION**

Lee Engineering offers the following discussion of the study results including the data collected along Popplewell Street, the field visits to the study area, traffic observations and the warrant analyses conducted along Popplewell Street.

Based strictly on the raw speed data collected in the field, raising the speed limit from the posted 30 MPH to 35 MPH may be considered. The 85<sup>th</sup> percentile speeds collected were higher than 35 MPH and there was minimal crash data to indicate the need for posting the speed limit lower than the 85<sup>th</sup> percentile speed. However, other factors should be considered when determining a speed limit, including the presence of frequent driveways or cross-street turning movements, and the presence or potential for pedestrian crossings.

Popplewell Street has frequent intersection conflicts with 11 intersections present in the study area – approximately one intersection every 480 feet on average. Additionally, there are approximately 30 driveways in the study area. Pedestrian activity is likely in the area due to the residential nature of the surrounding land uses. Additionally, at two locations presented in this study, and at least one additional location, available intersection sight distance was less than the desired amount for a 30 MPH design speed. Based on the crash histories, the sight distance obstructions do not appear to be causing operational issues when combined with the posted 30 MPH limit. The sight distance obstructions at multiple intersections along the corridor would likely be more impactful if travel speeds in the corridor increased as a result of a higher posted speed limit.

If a 35 MPH posted speed limit were pursued, it may result in even higher operational speeds along Popplewell Street. Lee Engineering would likely recommend the installation of multiway stop control at multiple intersections in the study area in order to mitigate the intersection sight distance restrictions. The installation of multiple unwarranted stop signs in close proximity to one another may lead to increased acceleration/deceleration noise, higher speeds between the stop signs, and decreased compliance for stop signs due to the low cross street traffic volumes. Any benefit of the higher speed limit would be offset by the negative impacts of the installation of unwarranted stop signs along the corridor.

**RECOMMENDATIONS** (Numbering is for reference purposes and not for ranking)

1. The speed limit on Popplewell Street between SH 26 and US 183 should remain at the existing 30 mph limit. A higher speed limit should not be installed at this time due to the number of intersections along the corridor and the multiple intersection sight distance obstructions along the corridor.
2. Multiway stop-sign should not be installed at either of the two locations studied at this time. Crash data should be monitored to determine if any changes are necessary in the future.
3. Due to the minor intersection sight distance obstructions, installation of intersection warning sign assembly (W2-1) along northbound and southbound Popplewell Street upstream of the intersection of Popplewell Street and Rychlynn Terrace is recommended.

If you have any questions about this letter, please feel free to call me at your convenience at 972.248.3006.

Sincerely,



John Denholm, P.E., PTOE  
Project Manager  
Lee Engineering  
TBPE Firm F-450