CivilTech
Engineering, Inc.

Civil Engineering
Water Resources
Transportation
Structures
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GIS

October 31, 2016

Roel Huerta, PE
Project Manager
Storm Water Engineering
AECOM

Re: Nottingham Area Drainage and Paving Improvements
Median Opening/Traffic Count Assessment & Alternative Roadway Cross-Sections for Kirkwood Road
WBS M-000247-0001-4

Mr. Huerta:

As a result of numerous comments received from the public and Nottingham Task Force regarding the reconstruction of the Kirkwood Corridor, CivilTech Engineering (CEI) was contracted to provide left turn traffic counts in order to evaluate and recommend reducing the number of median openings to preserve the established trees within the existing medians. In addition, alternative roadway cross-sections are considered based on comments and recommendations from the public. This letter presents our findings and recommendations for consideration by the City.

Median Opening/Traffic Count Assessment
(CEI) conducted traffic counts along the Kirkwood corridor between Memorial Drive and IH-10 on Tuesday, October 4, 2016 from 4 PM to 6 PM. Specifically, traffic counts were collected for vehicles passing through median openings at the following intersections:

- **St. Mary's Ln.**
- **Kingsride Ln.**
- **Queensbury Ln.**
- **Perthshire Rd.**
- **Taylorcrest Rd.**

The purpose of these traffic counts was to obtain a general understanding of the number of vehicles utilizing the median openings to assist CEI and the City of Houston in determining roadway design options that minimize tree removal within the existing median. Alternative roadway cross-sections considered to date remove a substantial number of trees from within the median to widen the existing roadway and to add left turn lanes at each median opening. Public meetings held for this project identified a strong public opposition to the removal of these trees.

The City of Houston's Infrastructure Design Manual indicates left turn lanes are required at all median openings. However, because existing median lengths along the corridor measure between a maximum of 550 ft. to a minimum of 250 ft., removal of median openings could be considered, which would comply with the current IDM's minimum median length of 660 ft. Removal of existing median openings would eliminate the need to construct left turn lanes at these locations and reduce the number of trees require to be removed.

Traffic counts at each of the above median openings consisted of NB, SB and THRU traffic as indicated in the **Table 1** below. (NB – North Bound Kirkwood traffic turning left through the median opening; SB – South Bound Kirkwood traffic turning left through the median opening; THRU – Traffic from side streets that traveled through the median opening. NB and SB counts would utilize left turn lanes along Kirkwood at the median openings, THRU counts would not.) Kimberley Ln., a signalized intersection, and Pebblebrook Dr., a median opening serving only one small cul-de-sac, were not included in this survey.

Table 1: Median Opening Traffic Count

Time		Left Turn Traffic Count Off Kirkwood Road (No. of Vehicles)																			
From	To	Taylorcrest Road				Perthshire Road				Queensbury Lane				Kingsride Lane				St. Mary's Lane			
		NB	SB	THRU	TOTAL	NB	SB	THRU	TOTAL	NB	SB	THRU	TOTAL	NB	SB	THRU	TOTAL	NB	SB	THRU	TOTAL
4:00	4:15	2	2	5	9	1	3	1	5		2	7	9		4	4	8	4	12	3	19
4:15	4:30		1	4	5		3	1	4	1	9	14	24	2	2	6	10	1	12	5	18
4:30	4:45		2	5	7		2	1	3		5	5	10	1	3	7	11		4	3	7
4:45	5:00		4	4	8		9	2	11		4	8	12	3	7	3	13		5	2	7
5:00	5:15		4	4	8		14	4	18	3	2	8	13	2	4	4	10	4	8	5	17
5:15	5:30		3	5	8		5	5	10	3	6	9	18	2	4	11	17	1	6	5	12
5:30	5:45			6	6		11	1	12	3	7	7	17	4	11	7	22	2	6	3	11
5:45	6:00	1	1	4	6		11	4	15	1	5	5	11	1	7	3	11	3	5	4	12
Total		**3**	**17**	**37**	**57**	**1**	**58**	**19**	**78**	**11**	**40**	**63**	**114**	**15**	**42**	**45**	**102**	**15**	**58**	**30**	**103**

Table 1 shows that the intersections north of Kimberley (Queensbury, Kingsride, and St. Mary's) had an average of 106 total vehicles utilize the median opening while the intersections south of Kimberley (Taylorcrest and Perthshire) had an average of 68 vehicles utilize the median opening. Although the table shows an overall higher use of the north median opening, the lower usage of the south median opening can be attributed to the street configurations adjacent to these openings. A closer look shows that the number of vehicles passing through the median opening per residential unit served to the east and west is generally consistent at all locations.

CEI has also evaluated a reduction in median openings and considered the traffic counts reported above, traffic patterns within the surrounding neighborhood, trees saved by removing median openings and required left turn lanes, and median opening locations relative to traffic signals. At this time, we are recommending eliminating existing median openings at Kingsride, Pebblebrook, and Taylorcrest as shown in the attached **Exhibit 3. Table 2** below quantifies the trees that are saved by eliminating left turn lanes and median openings at the indicated locations. Removing Kingsride saves 11 trees (excluding Crepe Myrtles), elimination of Taylorcrest saves 6 trees and the elimination of Pebblebrook saves 2 trees. This represents a savings of approximately 23% of the total number of existing trees. Additionally, our

recommended Alternative 2-B cross-section, discussed later in this letter, maintains a wider median over the originally considered Alternative 2. This will save additional trees that will be quantified by our arborist at a later date.

Table 2: Trees Effected by Addition of Left Turn Lanes

Street	Taylorcrest	Pebblebrook	Perthshire	Queensbury	Kingsride	St. Mary's
Trees Within Left Turn Lanes	28" Live Oak	28" Live Oak	16" Pine	22" Live Oak	20" Live Oak	6" Crepe
	20" Live Oak	20" Pine	20" Pine	24" Live Oak	25" Live Oak	21" Pine
	22" Pine	15" Crepe	18" Pine	15" Crepe	18" Pine	15" Pine
			20" Pine	12" Crepe	19" Pine	19" Pine
	15" Pine		10" Crepe	10" Crepe	18" Pine	22" Pine
	16" Pine		14" Crepe		21" Pine	8" Crepe
	21" Pine			10" Crepe	12" Crepe	8" Crepe
			23" Live Oak	6" Crepe		8" Crepe
			24" Live Oak	22" Pine	8" Crepe	
			8" Crepe	20" Pear	8" Crepe	6" Crepe
			8" Crepe	19" Pine	20" Pine	6" Crepe
			20" Pine	12" Crepe	23" Pine	8" Crepe
				12" Crepe	17" Pear	8" Crepe
					32" Live Oak	8" Crepe
					9" Magnolia	19" Pine
					6" Crepe	17" Live Oak

Alternative Cross-Sections

Three alternative roadway cross-sections were presented to the public during public meetings. These are presented in **Exhibit 1** and summarized below:

Alternative 1

- 2 – 10 ft. travel lanes in each direction
- 1 – 4 ft. bike lane in each direction (street level)
- 31 ft. median

(The above is identical to the existing roadway cross-section)

- Addition of left turn lanes at median openings

Alternative 2

- 2 – 11 ft. travel lanes in each direction
- 1 – 6 ft. bike lane in each direction (street level)
- 23 ft. median
- Left turn lanes at each median opening

Alternative 3

- 2 – 11 ft. travel lanes in each direction
- 1 – 5 ft. bike lane with a 3 ft. buffer (8 total feet, street level)
- 19 ft. median
- Left turn lanes at each median opening

After obtaining public comments and discussing alternatives with the City of Houston, two additional alternative roadway cross-sections were developed. The two additional alternatives are included in **Exhibit 2** and are variations of Alternative 2 presented above. They include:

Alternative 2-A

- 2 – 11 ft. travel lanes in each direction
- 1 – 6 ft. bike lane in each direction (behind outside back of curb, level with top of curb)
- 23 ft. median
- Left turn lanes at each remaining median opening (includes removal of median openings at Taylorcrest, Pebblebrook and Kingsride)

(Outside curb is moved inward 6 feet allowing bike lane to be constructed behind the curb)

Alternative 2-B

- 2 – 11 ft. travel lanes in each direction
- 1 – 6 ft. bike lane in each direction (behind outside back of curb, level with top of curb)
- 27 ft. median
- Left turn lanes at each remaining median opening (includes removal of median openings at Taylorcrest, Pebblebrook and Kingsride)

(Alternative 2-B is identical to 2-A except the outside curb is moved in only 4 feet providing a 27 ft. wide median. This wider median assists in reducing negative effects to existing trees.)

The bike lane in Alternative 2-A and 2-B is located behind the back of curb at top of curb level. A separate sidewalk would also be constructed for pedestrians. Therefore, a 6 ft. bike lane and a 5 ft. sidewalk would be constructed in the pedestrian realm. Typically, these would be separated by a 2 ft. buffer of grass or other treatment. In areas of conflicts with utility poles, trees, landscaping, encroachments along the ROW, the bike lane and sidewalk can be combined into one eliminating the 2 ft. buffer between. Additionally, we recommend that the pedestrian sidewalk be allowed to be reduced to a minimum of 4 ft. and the bike lane be reduced to a minimum of 5 ft. for limited distances to avoid more restrictive conflicts. Alternatives 2-A and 2-B show the typical bike lane and sidewalk configuration on the right side of the cross-section while the alternative combined bike lane and sidewalk are shown on the left side of the cross-section. The combined bike lane and sidewalk are only proposed in areas of limited pedestrian realm or where conflicts exist.

Alternative 2-B is our recommended cross-section which minimizes effects to the existing median and median trees. Additional design is required to develop configurations at intersecting streets and transition to Memorial Drive.

Costs

The estimated costs of 4.5-inch thick sidewalk and 11-inch thick reinforced concrete pavement were compared between each alternative as shown in Table 3 below.

Table 3: Estimated Quantity and Costs Comparison

Spec No.	02775		02751		Total Estimated Cost
Item Description	Sidewalk 4-1/2-inch thick		Reinforced Concrete Pavement 11-inch thick		
	Quantity	Cost	Quantity	Cost	
	SF	$5.50	SY	$71.00	
Original (No LTL)	36,263	$199,447	24,157	$1,715,147	**$1,914,594**
Alternative 1	36,263	$199,447	24,774	$1,758,947	**$1,958,394**
Alternative 2	36,263	$199,447	27,923	$1,982,509	**$2,181,955**
Alternative 3	36,263	$199,447	28,891	$2,051,285	**$2,250,731**
Alternative 2-A	79,779	$438,782	21,729	$1,542,794	**$1,981,576**
Alternative 2-B	79,779	$438,782	21,729	$1,542,794	**$1,981,576**

The cost of the recommended Alternative 2-B would increase the cost of the project (Original) by an estimated $66,983 while minimizing effects to the median and the median trees.

We appreciate this opportunity to provide this review to the City of Houston and AECOM and welcome any questions or comments you may have.

Respectfully,
CIVILTECH ENGINEERING, INC.

Darrell L. Kaderka, P.E.
Vice President