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*December 7, 2015*

**To:** Robin D Nelson, P.E.
PACE Engineers

**C/o:** Andrea Flower
City of Lake Forest Park

**From:** William Popp Jr.,
Senior Transportation Engineer
William Popp Associates

William Popp, Sr. P.E.
Principal
William Popp Associates

**Subject:** **Lake Forest Condominiums**
**14727 35th Ave NE**

**Re:** **Traffic Study – Response to City comments**

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The following is our response to DN Traffic Consultants review and comment regarding the subject project's traffic impact analysis dated May 21, 2015. Items are identified numerically including trip generation, trip distribution and assignment, and level of service.

## 1. Trip Generation

At issue here is use of the average rate versus the linear regression equation for use in estimating project trips.

The Lake Forest Condominium's (LFC) TIA used the average trip rate for Land Use Code (LUC) 230 Condominium/Townhome in estimating project trip ends for daily, AM and PM peak hour conditions. The average rate was selected for use in this TIA primarily due to the fact that the small size of this development is outside the limits of the data set represented by the regression equations. Also in general, most regression equations in the ITE charts tend to be unreliable near the low end. It is important to note that High-Rise Residential Condominium/Townhouse (LUC 232) would be the most applicable category for the subject project based on the definition which is 3 or more stories – the proposed project is a four story structure. More discussion regarding LUC 232 application is discussed near the end of this section.

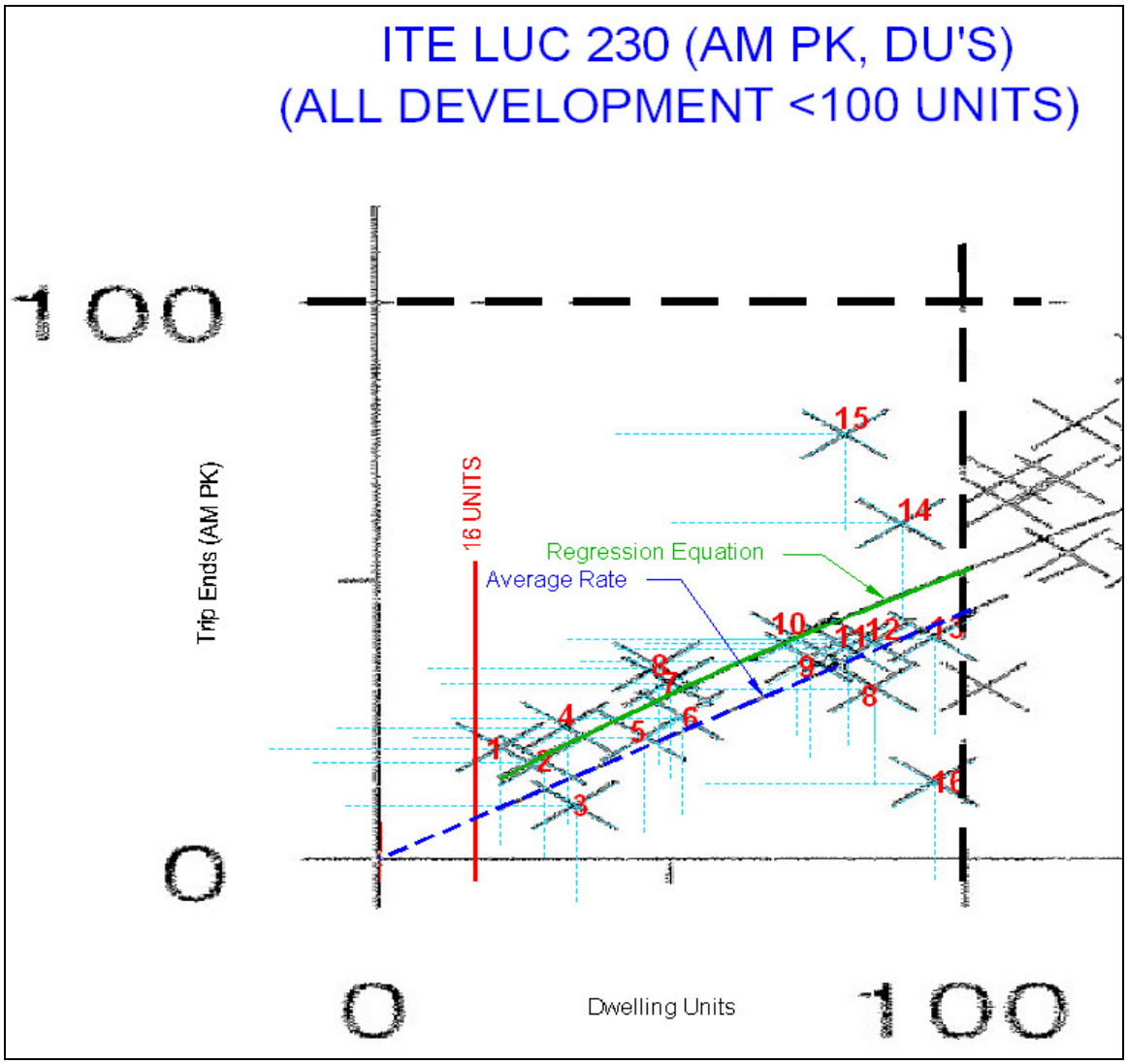
DN Traffic Consultant's (DN) noted that using LUC 230 is appropriate however suggested that application of the linear regression equation would be more appropriate for this land use given its size rather than application of the average rate.

DN notes that "*the average rate is based on developments which average between 179 units (for daily) and 213 units (for AM peak), and that the expected trip generation estimate for a 16-unit condo development would be different, and that the regression equation would support this*." However, that regression equation is also based on the very same development data set.

To keep all this in context, it is generally understood by both parties here that whether the trip estimates are based on an average rate or a regression equation, the project impact on the surrounding street system is insignificant.

Nonetheless to explore this equation issue farther, the ITE Trip Generation Handbook provides recommended procedures for selecting between trip rates and equations. If one were to follow the procedure exactly as structured, this development (as noted above) does not fall within the data extremes of the ITE charts for either AM or PM peak hour conditions (Step 2 of that chart). The smallest data point is a 21-unit development, the largest is 1,250 units. In this case, collection of local data (presumably at least 2 sites that are smaller than 16 units and the results are then added to the ITE data) is recommended per ITE to establish a local rate. However, given that a condominium development is a very common type of development and that there are approximately 60 sites surveyed in the ITE database, conducting a local study of two sites (if one could find comparables) would result in very little change in the trip rate or equation. Thus, proceeding through the ITE flow chart to Step 7, it asks if there are 20 or more data points distributed over the range of the independent variable. In this case the answer is "No" due to the fact there are no sites surveyed with fewer than 16 units, only sites above 21 units. As a result, the flow chart moves to Step 8A where in our case the answer is "yes" to $R^2 \geq 0.75$ and "yes" for standard deviation $\leq$ 110% and within cluster. Hence, the next step is to choose whichever line (equation or rate) best fits the data points at the size of the independent variable. In this case the site is an outlier, so to continue this discussion we have identified all sites up to a maximum of 100 units and have established an average rate from that data set for both peak hours.

For the AM condition, there are 16 sites in the AM chart for developments with fewer than 100 units. The ITE chart for the area between 0 and 100 units is shown (clarity as best possible) in Attachment 1a.

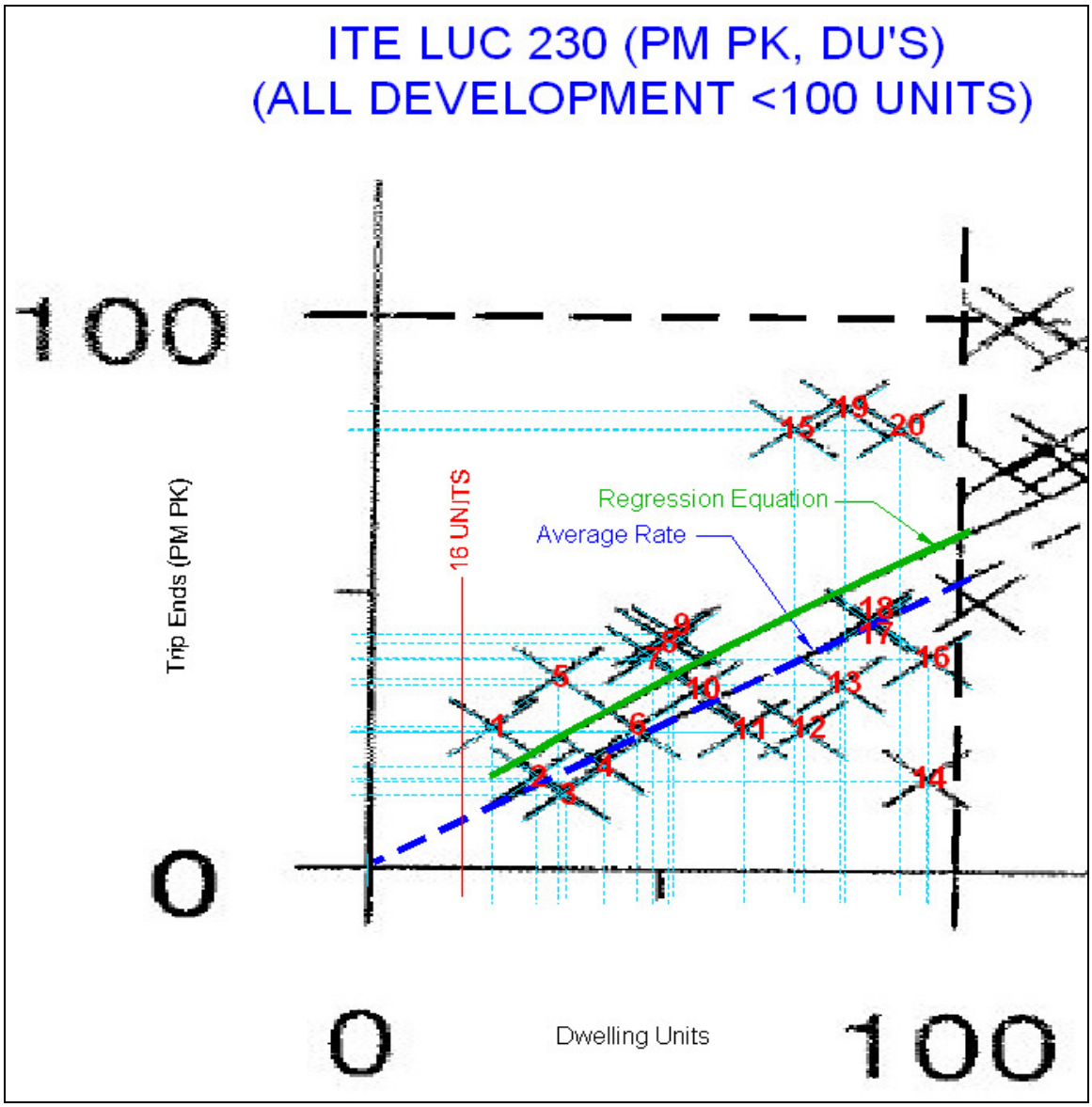



Attachment 1a

The weighted average trip rate based on all these sites is 0.55 (based on 16 sites; 971 units and 532 trips). The rate used in the TIA is 0.44.

The trip generation estimate in the TIA based on 16 units was 7 trips. Per the rate noted above (0.55) it would be 9 trips. Per the regression equation it would be 12 trips (an equivalent rate of 0.74).

For the PM condition, there are 20 sites in the PM chart for developments with fewer than 100 units. The ITE chart for the area between 0 and 100 units is shown (again clarify as best possible) in Attachment 1b.




Attachment 1b

The weighted average trip rate for all sites under 100 units is 0.61 (based on a total of 20 sites; 1,235 units and 756 trips). The rate used in the TIA is 0.52.

The trip generation estimate in the TIA based on 16 units was 8 trips. Per the rate noted above (0.61) it would be 10 trips. Per the equation it would be 13 trips (an equivalent rate of 0.84).

An important point to note is the existing site has a vacated single family home which represents a potential of 1 AM and 1 PM peak hour trip. This was not recognized in the

TIA for the future analyses due to the already very small trip estimate for the development. If this existing use trip were included as a future credit, the net new trips from the site using the modified average trip rate above would be nearly identical to what was originally presented in the TIA.

But perhaps the most important point to make with respect to trip generation is the rates assigned in the TIA are from the general condominium ITE category (LUC 230) when the project per ITE definitions is actually a high rise (with 3 or more stories) thus fits LUC 232 High-Rise Residential Condominium/Townhouse. The high rise average trip rate for the PM peak hour is 0.38 (vs. 0.61 noted above in Attachment 1b) and the AM is 0.34 (vs. 0.55 noted above in Attachment 1a). Thus the most categorically appropriate PM and AM peak hour trip estimates for the project are 6 and 5 respectively. The average trip rate is used in lieu of the regression equation for this project as the curve does not intercept the zero axis, thus small projects start out with the equivalent of 13 or so units added to the independent variable.

But the High-Rise ITE category was not chosen for use in estimating project trips for the analysis because of two factors: (a) the relatively low number of observations and the dominance of much larger structures; and, b) since the project trip generation is quite small it was not considered a client disservice to utilize a conservative or worst case analysis by using the LUC 230 data set. However the most categorically defensible position is to use the high rise category for this project. And in that light, all of the foregoing discussion of average rate versus equation and its impact on the analysis is moot as the TIA trip generation is clearly worst case using a technically appropriate application of the ITE methodology.

## 2. Trip Distribution and Traffic Assignment

The trip distribution percentages as noted in the TIA were based in part on traffic volume on major roadways and professional judgment regarding significant land use types in the outlying areas. They are also very similar to what was presented in the Southern Gateway Subarea Plan Draft EIS.

A future travel time evaluation was conducted as part of the original TIA in order to assist in project traffic assignment through the local area including existing neighborhoods.

The results of that detailed analysis was only summarized in the TIA in Section C.5. The detailed analysis supporting the summary findings in the TIA is presented below.

There were three different project assignment paths analyzed (all for PM peak hour). These include:

A. Exiting the site to the south with destinations on SR 522 or NE 145th St; Route 1 through neighborhood roadways including NE 147th St, 37th Ave NE, and NE 145th St, and Route 2 using SR 522 northbound to NE 153rd St, u-turn at the signal and south on SR 522 to NE 145th St. Based on future intersection delay per the LOS calcs and average link speed between intersections, Route 1 is approximately 140 seconds faster than Route 2. The route depictions are shown in Attachment 2a.

B. Exiting the site to the north on SR 522 north of NE 153rd St. Route 1 is using SR 522 from NE 147th St. Route 2 is traversing north along the neighborhood roadways including NE 148th St, NE 150th St, 37th Ave NE, and NE 153rd St. Route 1 was calculated to be approximately 50 seconds faster than Route 2. The route depictions are shown in Attachment 2b.

C. Entering the site from the north on SR 522 north of NE 153rd St. Route 1 is using SR 522 to NE 147th St. Route 2 is traversing south along the neighborhood roadways including NE 153rd St, 37th Ave NE, NE 150th St, and NE 148th St. Route 1 was calculated to be approximately 110 seconds faster than Route 2. The route depictions are shown in Attachment 2c.

Attachment 2 shows the travel time calculations for each of these routes. All trips from the south on SR 522 or from the west on NE 145th St are assumed to use SR 522 and turn right on NE 147th St to enter the project.

DN Traffic Consultants requested that an AM peak period traffic count be conducted at the SR 522/NE 147th St intersection. However, in our scoping work with the City and their primary consultant (PACE), it was concluded that only a PM peak period traffic count would be conducted at this intersection. As such, that was what was conducted.

## 3. Level of Service Analysis

Because of extreme congestion in the SR 522 corridor DN is requesting elevating the planning level LOS analysis approach to an operational review meaning incorporation of current traffic signal timing parameters and operational characteristics. A new development traffic impact analysis is by nature is essentially a planning level analysis due to the fact its primary focus is on evaluating future traffic operations at project horizon year. For this a rounding or smoothing of operations parameters is considered more appropriate. And while we have incorporated some of the current operations the focus is on maintaining consistency with the planning assumptions associated with the City's subarea planning work as explained below.

The City prepared a Southern Gateway Subarea Plan Draft EIS January 2013. In that analysis, the EIS identified 2012 LOS and the same intersections identified in the TIA as well as 2030 conditions for a No Action land use plan and a Proposed Land Use plan.

The LFC TIA traffic forecasts were intended to fit within the 2030 forecasts presented in the DEIS. Likewise the future roadway geometry and signal operations were intended to match those in the DEIS. Nonetheless, a field review of signal phasing sequence and cycle lengths was observed for PM peak hour conditions. The signal phasing is the same as what is presented in the DEIS, however, the cycle lengths are different. In this instance, WPA used the observed cycle lengths (which are longer) than those presented in the DEIS, since this is a relatively short term horizon year, 2017 versus 2030.

A few items to address from the DN memo as it relates to LOS analysis are:

a. Peak Hour Factors

For the SR 522/NE 145th St signalized intersection, the PHF used for each of the analysis conditions (AM, PM, existing, future with and without project) was for the overall intersection, not by approach direction. For this intersection for both AM and PM conditions, the east and west legs peak in either the first and second 15 minute period whereas the northbound and southbound approaches peak in the last 15 minute period, thus, using PHF's by direction can artificially and negatively skew LOS results due to the fact that the analysis would adjust peak flow by approach to the same peak period. Thus, for this type of analysis, it is our opinion that using an overall intersection PHF is more appropriate.

However, for the signalized intersection of SR 522/NE 153rd St, the overall intersection based PHF was applied only to the major through movements plus the northbound u-turn. Given the relatively low volume to and from NE 153rd St, a PHF of 0.80 was used for all side street entering and exiting movements, which is in close proximity to the PHF's observed. As we know, PHF's on low volume streets can vary significantly from day to day.

For the SR 522/147th St intersection, the PHF's for the major through movements northbound and southbound were based on the PHF at the SR 522/NE 153rd St intersection. The side street movements, including northbound right, southbound left and westbound right were based on the PM count which indicated a PHF of 0.83 for all these movements, however, for the analysis a PHF of 0.80 was used.

b. Clearance Time

To be consistent with the Southern Gateway Subarea Plan DEIS LOS analysis as well as the SGV development (which was consistent with the DEIS), the LFP Condo's

TIA used the same 4 second clearance time as what was presented in those documents.

c. Level of Service Results

It is generally recognized with a very high volume major arterial such as SR 522 that lower volume movements and low volume approaches will often operate at LOS F conditions in order to maintain some level of progression for the major movements. The SR 522/NE 145th St intersection is operated by WSDOT/SDOT and operates at LOS E for both existing and near term conditions for PM peak and LOS D for AM peak. In the City's EIS, this intersection is estimated to operate at LOS E in 2030 for PM peak hour conditions.

The SR 522/NE 153rd St intersection is also operated by WSDOT/SDOT and is estimated to operate at LOS B for existing and near term conditions. Per the City's EIS, this intersection is estimated to operate at LOS C in 2030 (Proposed Land Use).

d. Queuing

The queue outputs shown in the appendix are directly from Synchro and the footer notations are no different than those in the City's EIS, as well as the SGV development traffic study in our possession. In this particular SR 522 analysis, including other typical heavily traveled major corridors, low volume side street approaches and turn pockets often will get lower than desirable green allocations to give highest priority to the regional demand and thus cannot be adjusted to balance side street queues.

For the LFC TIA, the focus of queue impacts as shown in Table 5 of the report are for movements impacted by project traffic. These include selected movement(s) at the SR 522/NE 153rd St intersection, SR 522/NE 147th St intersection, and the SR 522/NE 145th St intersection. As shown in Table 5, the queue results with project in 2017 (for the critical PM peak hour conditions) indicate queues at these selected movements have an insignificant increase in estimated queue lengths; in most cases the calculated queues are estimated to increase between 1 to 3 feet with project traffic.

**Summary**

The following address the recommendations as suggested by DN Traffic Consultants.

- *Trip generation based on the linear regression equation*
  Utilizing the regression equation is not appropriate given that the size of the development is not within the data set on which the equation is based.

- *Traffic assignment based on actual travel times*
  A detailed travel time evaluation was conducted as part of the original TIA. However, only the summary finding was reported in the conclusions of the report. The travel times are based on free flow link speeds plus intersection delay as estimated per the 2017 LOS calculations, or as predicted at minor neighborhood intersections. All of the data is presented above in Item 2.

- *Evaluation of the AM condition at the NE 147$^{th}$ St intersection*
  In the scoping effort, it was concluded by PACE that this intersection would not be required for inclusion in the AM analysis.

- *Update the level of service analysis to address the identified issues*
  A response to the questions raised regarding the assumptions used in the LOS analysis was discussed in Item 3 above. Also, the LOS for this traffic study is a planning level effort, as is typical for TIA's (similar to the SGV TIA), and quantifies the magnitude of project impacts on identified intersections in the project horizon year.

- *Identify low cost traffic mitigation measures which can at a minimum eliminate incremental impact of the Condo project*
  The incremental impact if possible to quantify and define would be so low as to be described as miniscule. It is difficult to imagine a proportionately scaled needed mitigation measure.

- *Identify minor widening to provide adequate roadway width on substandard streets impacted by the project*
  Substandard streets are an existing condition that may or may not be substandard in the view of the residents along the street. Residents of the nearby apartment building on NE 147$^{th}$ St were observed playing Lacrosse on the street (adults and children, during the PM peak hour) and that would suggest a certain level of comfort and safety for the local populace due to the low traffic volumes. As we know wide local streets are no longer necessarily considered desirable streets. In any event the magnitude of the project's impacts on the local streets are as stated above, miniscule, whereas identification of widening (or narrowing) needs would typically include of course the engineering plus community involvement with

plan alternatives and that can be a drawn out and relatively costly process. While the desire to "clean up" the local road system is understandable the requested action is considered a disproportionate request for such a small development. If the City is collecting the GMA authorized 0.25% excise tax on real property transactions for capital facilities, that would be an appropriate funding mechanism for defining and addressing these types of issues.

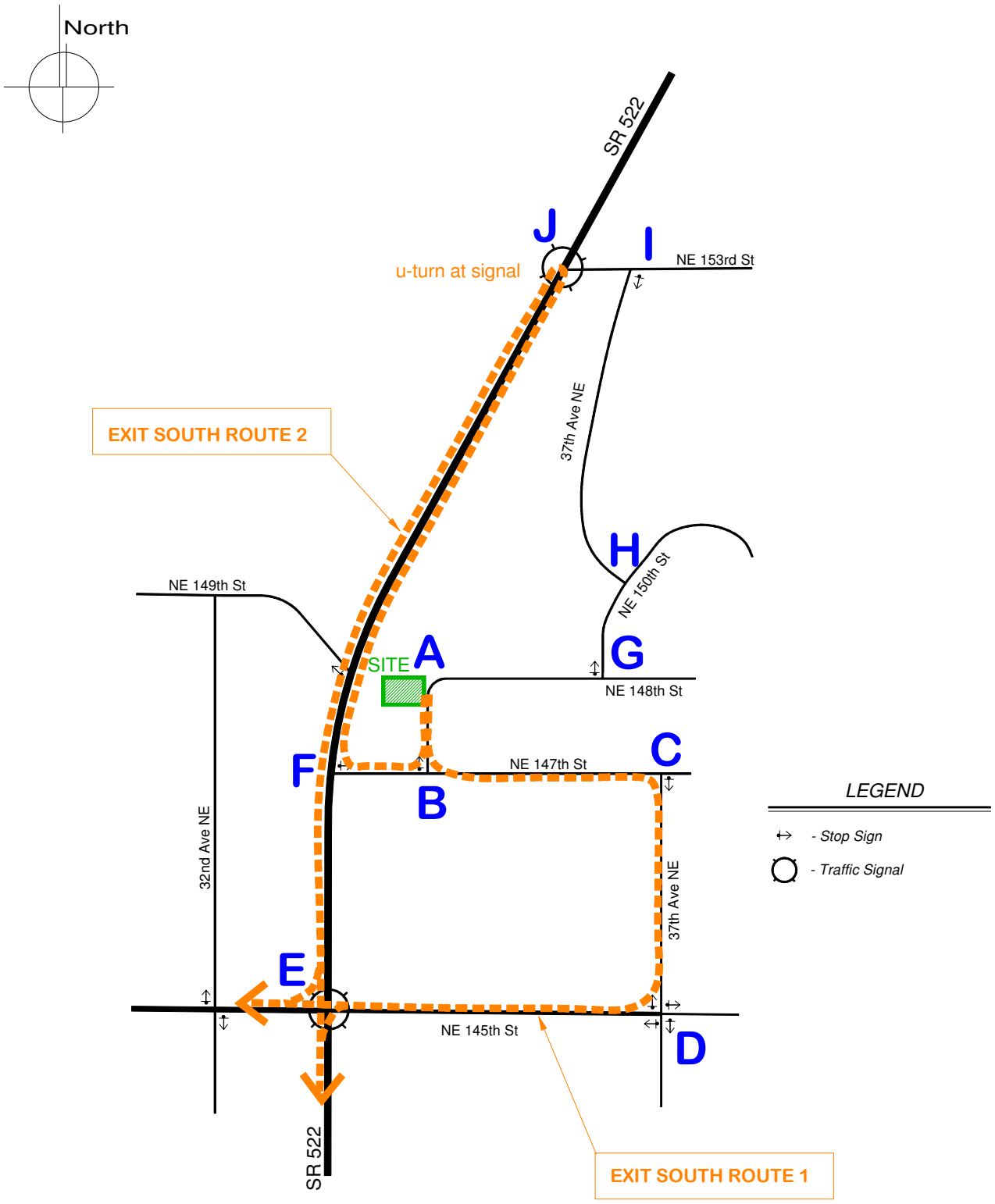
- *Identify and provide pedestrian facilities which can provide connectivity from the site to the pedestrian network in the vicinity of the site to provide safe and efficient access to transit shopping and schools.*
  The project will provide code required sidewalk improvements along its frontage. Construction of these improvements on other portions of the system should not be the responsibility of the developer unless there are significant impacts or safety issues, which is not the case. As discussed above these are low volume streets which residents even use for recreation so to the extent that pedestrian facilities are a concern these could be defined and built through area wide improvement assessments or other modalities such as the 0.25% real estate excise tax.

To summarize, this is a 16 unit multi-family condominium development that is consistent with the City's land use plan and subarea EIS and consistent with the land use assumptions used for the model that estimated future year LOS at the City's critical intersections on SR 522. Ergo, the project's traffic impacts are theoretically anticipated in the City's planning policies and programs. The magnitude of the projects traffic volume impacts will be undetectable.

TRAVEL TIME EVALUATION
for
LAKE FOREST CONDO'S

PM PEAK 2017 WITH PROJECT

| from node | to node | link distance (feet) | estimated link speed (mph) | estimated link speed (fps) | link time (sec) | intersection movement type | intersection delay (sec) (per Synchro at analysis intersections | total travel time and intersection delay (sec) | time difference (sec) | time difference (min) |
|---|---|---|---|---|---|---|---|---|---|---|
| see Attachment 2a | | | | | | | | | | |
| EXIT TO SOUTH VIA NEIGHBORHOOD (ROUTE 1) | | | | | | | | | | |
| A | B | 270 | 25 | 36.8 | 7.3 | left turn stop | 5 | 12.3 | | |
| B | C | 680 | 25 | 36.8 | 18.5 | free right turn | 0 | 18.5 | | |
| C | D | 710 | 25 | 36.8 | 19.3 | right turn stop | 5 | 24.3 | | |
| D | E | 965 | 25 | 36.8 | 26.3 | thru or left at 145th | 80 | 106.3 | | |
| | | | | | | | total time> | 161 | | |
| EXIT TO SOUTH VIA U-TURN AT 153RD (ROUTE 2) | | | | | | | | | | |
| A | B | 270 | 20 | 29.4 | 9.2 | right turn stop | 5 | 14.2 | | |
| B | F | 250 | 25 | 36.8 | 6.8 | right turn stop | 40 | 46.8 | | |
| F | J | 1655 | 40 | 58.8 | 28.1 | u-turn at signal | 114 | 142.1 | | |
| J | F | 1655 | 40 | 58.8 | 28.1 | sb thru at 147th | 0 | 28.1 | | |
| F | E | 705 | 40 | 58.8 | 12.0 | sb thru at 145th | 56 | 68 | | |
| | | | | | | | total time> | 299 | 138 | 2.3 |
| see Attachment 2b | | | | | | | | | | |
| EXIT TO NORTH VIA SR 522 (ROUTE 1) | | | | | | | | | | |
| A | B | 270 | 20 | 29.4 | 9.2 | right turn stop | 5 | 14.2 | | |
| B | F | 250 | 25 | 36.8 | 6.8 | right turn stop | 40 | 46.8 | | |
| F | J | 1655 | 40 | 58.8 | 28.1 | thru at 153rd | 15 | 43.1 | | |
| | | | | | | | total time> | 104 | | |
| EXIT TO NORTH VIA NEIGHBORHOOD (ROUTE 2) | | | | | | | | | | |
| A | G | 515 | 25 | 36.8 | 14.0 | left turn yield | 3 | 17.0 | | |
| G | H | 280 | 20 | 29.4 | 9.5 | left turn yield | 3 | 12.5 | | |
| H | I | 975 | 25 | 36.8 | 26.5 | left turn stop | 5 | 31.5 | | |
| I | J | 150 | 20 | 29.4 | 5.1 | right turn at 153rd | 91 | 96.1 | | |
| | | | | | | | total time> | 157 | 53 | 0.9 |
| see Attachment 2c | | | | | | | | | | |
| ENTER FROM NORTH VIA SR 522 (ROUTE 1) | | | | | | | | | | |
| J | F | 1655 | 45 | 66.2 | 25.0 | sb thru at 153rd | 5 | 30.0 | | |
| F | B | 250 | 25 | 36.8 | 6.8 | left turn yield | 33 | 39.8 | | |
| B | A | 270 | 25 | 36.8 | 7.3 | left turn yield | 5 | 12.3 | | |
| | | | | | | | total time> | 82 | | |
| ENTER FROM NORTH VIA NEIGHBORHOOD (ROUTE 2) | | | | | | | | | | |
| J | I | 150 | 25 | 36.8 | 4.1 | left at signal | 131 | 135.1 | | |
| I | H | 975 | 25 | 36.8 | 26.5 | free right turn | 0 | 26.5 | | |
| H | G | 280 | 25 | 36.8 | 7.6 | right turn stop | 5 | 12.6 | | |
| G | A | 515 | 25 | 36.8 | 14.0 | right turn stop | 5 | 19.0 | | |
| | | | | | | | total time> | 193 | 111 | 1.9 |
| no attachment shown | | | | | | | | | | |
| ENTER FROM SOUTH | | | | | | | | | | |
| E | F | 705 | 45 | 66.2 | 10.7 | thru at signal | 40 | 50.7 | | |
| F | B | 250 | 25 | 36.8 | 6.8 | free right turn | 0 | 6.8 | | |
| B | A | 270 | 25 | 36.8 | 7.3 | left turn yield | 3 | 10.3 | | |
| | | | | | | | total time> | 68 | n/a | n/a |

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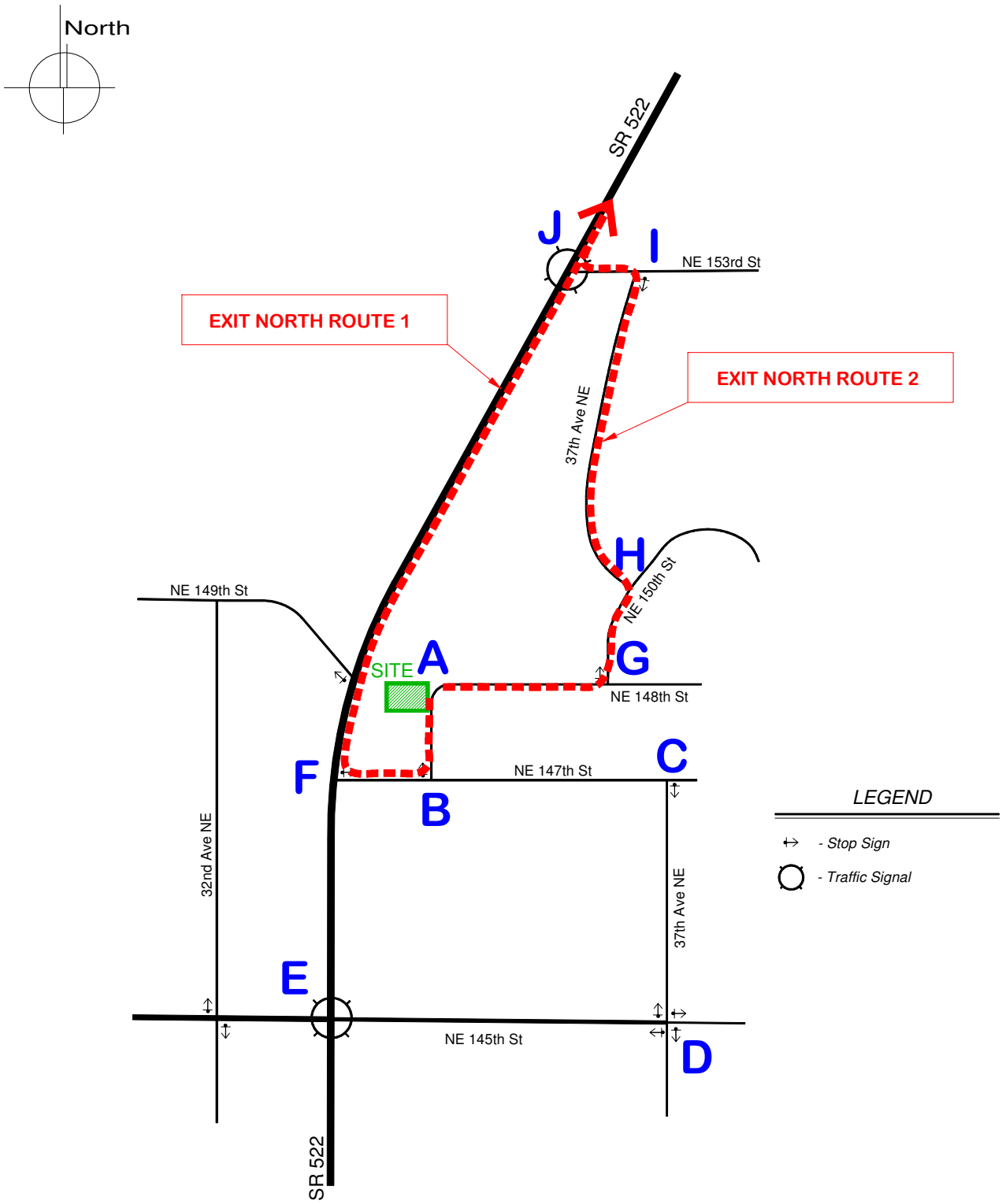
**TRAVEL TIME ROUTES**

Attachment 2a

**Lake Forest Condos**
14727 35th Ave NE
16 Units

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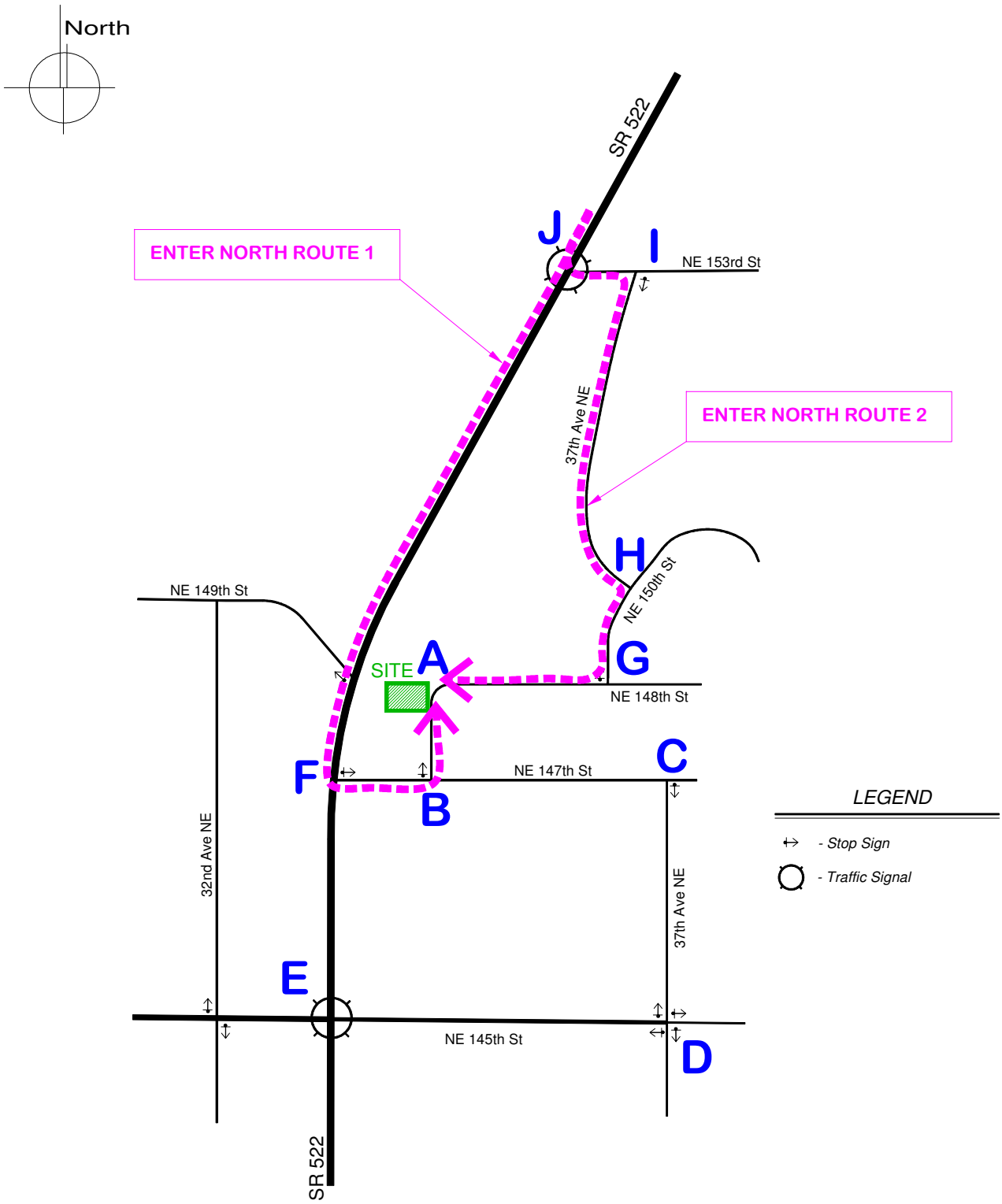
**TRAVEL TIME ROUTES**

Attachment 2b

**Lake Forest Condos**
14727 35th Ave NE
16 Units

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**TRAVEL TIME ROUTES**

Attachment 2c

**Lake Forest Condos**
14727 35th Ave NE
16 Units