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# Technical Memorandum

**June 21, 2023**

Project# 21900

To: John Wanger, Principal
Coastland Civil Engineering
1400 Neotomas Avenue
Santa Rosa, CA 95405

From: Aaron Elias, P.E.

RE: Beach Field Pickleball Courts

The City of Piedmont's recreation department has implemented a trial program at the Beach Tennis Courts to transform the combination tennis/pickleball courts to exclusively pickleball. There has been some concern from the community with this transformation with one of the concerns related to increased traffic volume on Linda Avenue and associated impacts to traffic safety. This technical memorandum documents the findings of an assessment of how the transformation will affect traffic volumes in the vicinity.

## Available Data

The city of Piedmont provided data that included both traffic counts on Linda Avenue and information on the use of the pickleball courts during the trial period. Details of the data provided include:

- 24-hour vehicle counts on Linda Avenue:
  - Northbound: 5/22/2023 – 5/25/2023, 5/31/2023, and 6/1/2023.
  - Southbound: 4/28/2023 – 5/14/2023
- Information on pickleball players (3/1/2023 – 6/14/2023) including:
  - Arrival times
  - Number of players
  - Transportation mode of arrival (walk, bike, car, etc.)
  - Estimated time of play

These data were analyzed and summarized to assess how the transformation could affect traffic volumes on Linda Avenue.

## Linda Avenue Volume Data

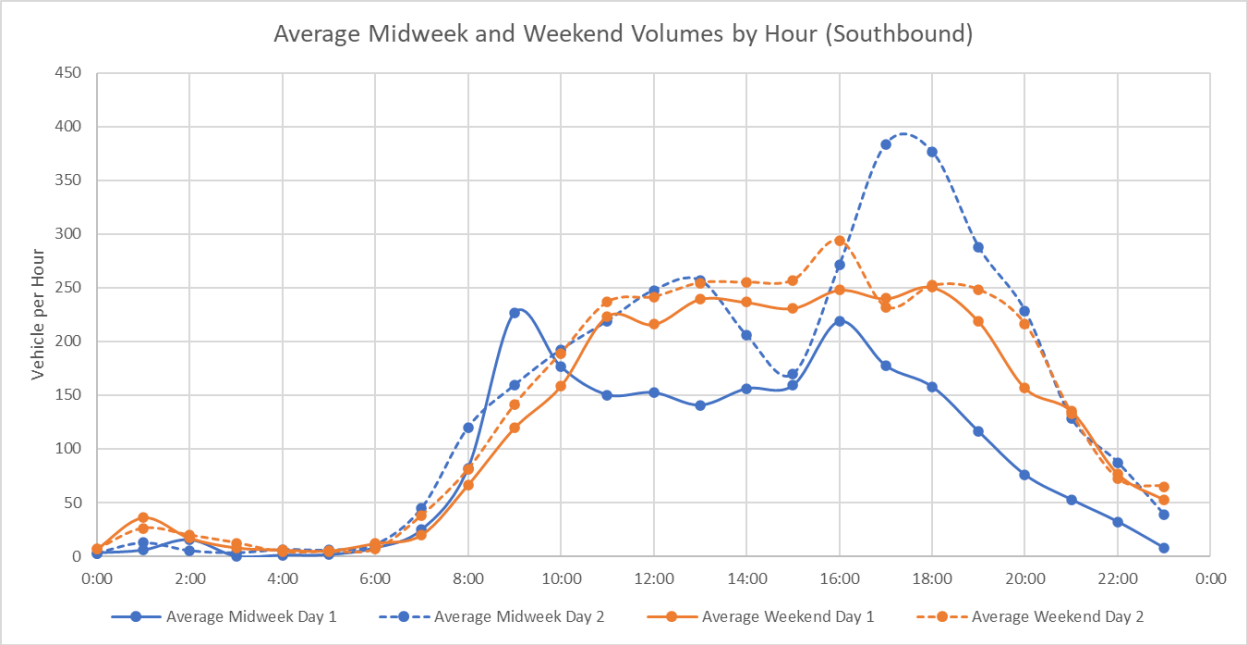
Volume data were collected in both the northbound and southbound directions on Linda Avenue. The dataset provided for southbound Linda Avenue is more robust covering a two week period providing two data days for each day of the week. Therefore, only the southbound data is used for comparison purposes in this memorandum. The fluctuations in northbound vehicles should be similar to what is happening for southbound vehicles.

Detailed comparisons of hourly volumes from one week to another for the same day and hour of the week are provided in Appendix A to illustrate how southbound vehicle volume fluctuates on different days. To

summarize these data, Figure 1 was created which compares the averages for day one and day two of midweek days (Tuesday – Thursday) and weekend days (Saturday & Sunday) for the southbound data collection period. This figure illustrates that volumes by hour can vary significantly from day to day.

Based on these midweek and weekend day averages, the hourly volume variation averages a difference between the two days of about 62 vehicles per hour and up to 219 vehicles per hour on midweek days. Weekend days average an hourly difference of about 15 vehicles per hour and up to a difference of 60 vehicles per hour. This shows that variation in traffic volume is normal, even when comparing similar days of the week at the same time.

**Figure 1: Vehicle Variation by Hour for Midweek and Weekend Days**




# Pickleball Players

Data provided by the City also included detailed information on over 6,000 pickleball players who used the courts between March 1st and June 14th which allowed Kittelson to understand arrival and usage information. Data summarized from this dataset included:

- Duration of play
- Transportation mode choice
- Day of week
- Hour of day
- Patrons per hour

## Duration of Play

Table 1 shows the duration of play for the pickleball players using the Beach Field Courts summarized into four time periods. The majority of players usually spend between 1 and 2 hours at the courts with the second most popular time being more than two hours. Only about 17% stay less than an hour indicating the four pickleball courts turn over less frequently than once per hour.

**Table 1: Duration of Play for Pickleball Players**

| Duration | # of Players | Percentage |
|---|---|---|
| 15 - 30 Minutes | 151 | 2.4% |
| 30 - 60 Minutes | 924 | 14.5% |
| 1 - 2 Hours | 3,431 | 54.0% |
| 2+ Hours | 1,845 | 29.1% |

## Transportation Mode Choice

Pickleball players were also asked how they arrived at the pickleball courts. Table 2 shows how players responded with about 75% driving to the courts and 25% using an alternative mode such as walking (17%). These findings indicate that the overall vehicle trip generation is about 75% of the number of players arriving at the court.

**Table 2: Mode Choice for Pickleball Players**

| Mode | # of Players | Percentage |
|---|---|---|
| Drive | 4,721 | 74.3% |
| Carpool | 62 | 1.0% |
| Bike | 368 | 5.8% |
| Walk | 1,088 | 17.1% |
| Ride | 12 | 0.2% |
| Transit | 11 | 0.2% |
| Unknown | 89 | 1.4% |

## Day of the Week and Hour of the Day

Time stamps for the pickleball courts show the most popular days of the week (Table 3) and hours of the day (Table 4) for pickleball. Distribution of players by day of the week is relatively consistent across all seven days with Friday and Saturday being a little more popular. Time of day usage usually peaks between about 10 AM and noon and 4 – 6 PM. Since the pickleball courts do not open until 9 AM, they would not conflict with the AM peak hour but the afternoon peak for the courts is during the traditional commute peak period (4 – 6 PM).

**Table 3: Day of the Week for Pickleball Play**

| Day of Week | # of Players | Percentage |
|---|---|---|
| Monday | 961 | 15.1% |
| Tuesday | 888 | 14.0% |
| Wednesday | 730 | 11.5% |
| Thursday | 943 | 14.8% |
| Friday | 975 | 15.4% |
| Saturday | 1005 | 15.8% |
| Sunday | 849 | 13.4% |

**Table 4: Time of Day for Pickleball Play**

| Hour of Day | # of Players | Percentage |
|---|---|---|
| 9 | 502 | 8.1% |
| 10 | 766 | 12.3% |
| 11 | 663 | 10.7% |
| 12 | 468 | 7.5% |
| 13 | 500 | 8.0% |
| 14 | 478 | 7.7% |
| 15 | 480 | 7.7% |
| 16 | 596 | 9.6% |
| 17 | 680 | 10.9% |
| 18 | 461 | 7.4% |
| 19 | 484 | 7.8% |
| 20 | 138 | 2.2% |

## Vehicles Per Hour

Based on the information provided by the city and summarized in Table 1 through Table 4, Kittelson was able to estimate the vehicle trip generation of the pickleball courts by time of day (Table 5) for each day of the week. As shown, the number of vehicles arriving to play pickleball averages about four cars per hour with a maximum of seven cars per hour.

**Table 5: Vehicle Trip Generation by Time of Day for Pickleball Courts**

| | Vehicle Trip Generation | | | | | | |
|---|---|---|---|---|---|---|---|
| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
| 9 | 2 | 4 | 2 | 4 | 3 | 5 | 4 |
| 10 | 6 | 5 | 3 | 6 | 6 | 7 | 5 |
| 11 | 4 | 5 | 4 | 5 | 5 | 6 | 5 |
| 12 | 4 | 2 | 3 | 3 | 5 | 3 | 3 |
| 13 | 5 | 2 | 3 | 3 | 3 | 4 | 5 |
| 14 | 3 | 2 | 2 | 3 | 4 | 5 | 4 |
| 15 | 4 | 2 | 3 | 3 | 4 | 4 | 4 |
| 16 | 4 | 4 | 2 | 5 | 5 | 5 | 4 |
| 17 | 5 | 6 | 3 | 4 | 5 | 6 | 4 |
| 18 | 4 | 3 | 3 | 3 | 4 | 3 | 3 |
| 19 | 5 | 6 | 4 | 4 | 3 | 1 | 1 |
| 20 | 1 | 1 | 1 | 2 | 2 | 0 | 0 |
| **Total** | **47** | **42** | **33** | **45** | **49** | **49** | **42** |

# Trip Generation Vs. Linda Volume Variation

Kittelson performed a comparison between the vehicle trip generation for the pickleball courts documented in Table 5 and the variation in vehicle volumes observed on southbound Linda Avenue between the same weekday but on different weeks. Appendix B shows the detailed comparison for each day of the week while Figure 2 and Figure 3 show a simplified version comparing the average of the midweek days and the average of the weekend days, respectively. As shown, the variation in traffic on Linda Avenue from one week to another is significantly higher than the trip generation for the pickleball courts. This indicates that the resulting vehicle trip generation from the pickleball courts is indistinguishable from normal variation in traffic on Linda Avenue.

**Figure 2: Average Midweek Day Vehicle Variation on Linda Vs. Pickleball Vehicle Trip Generation**

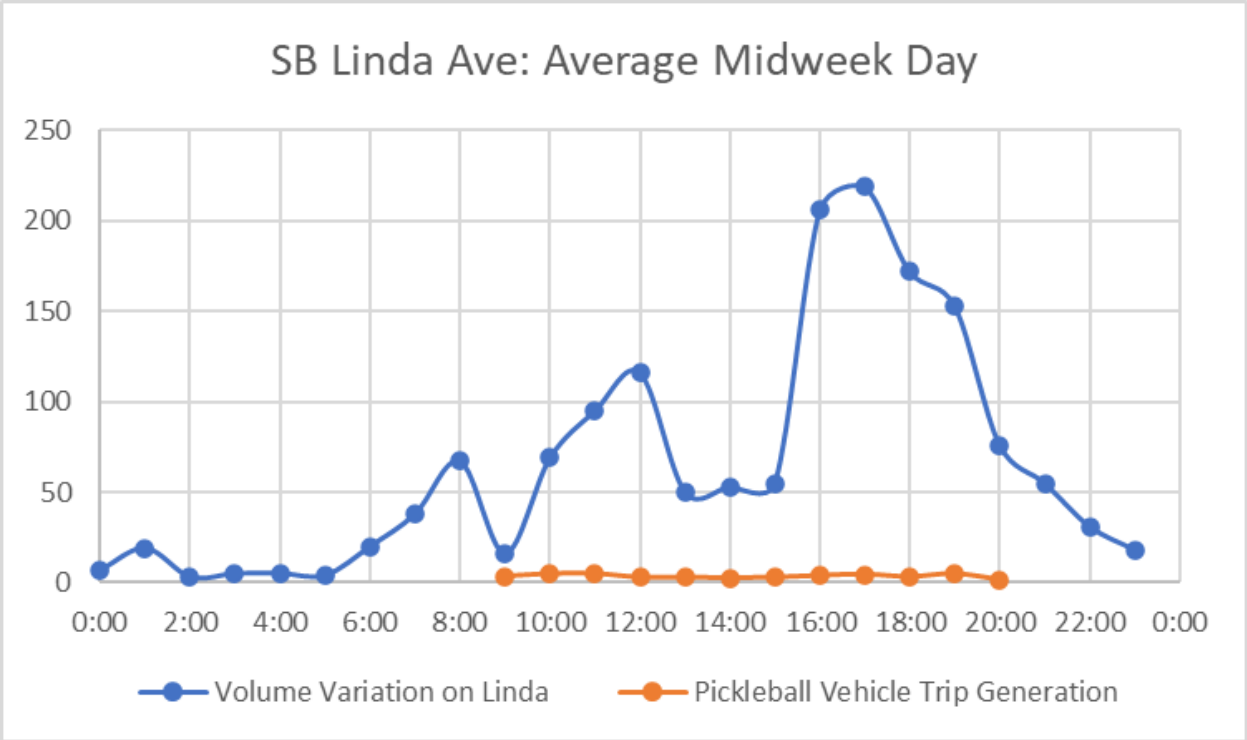
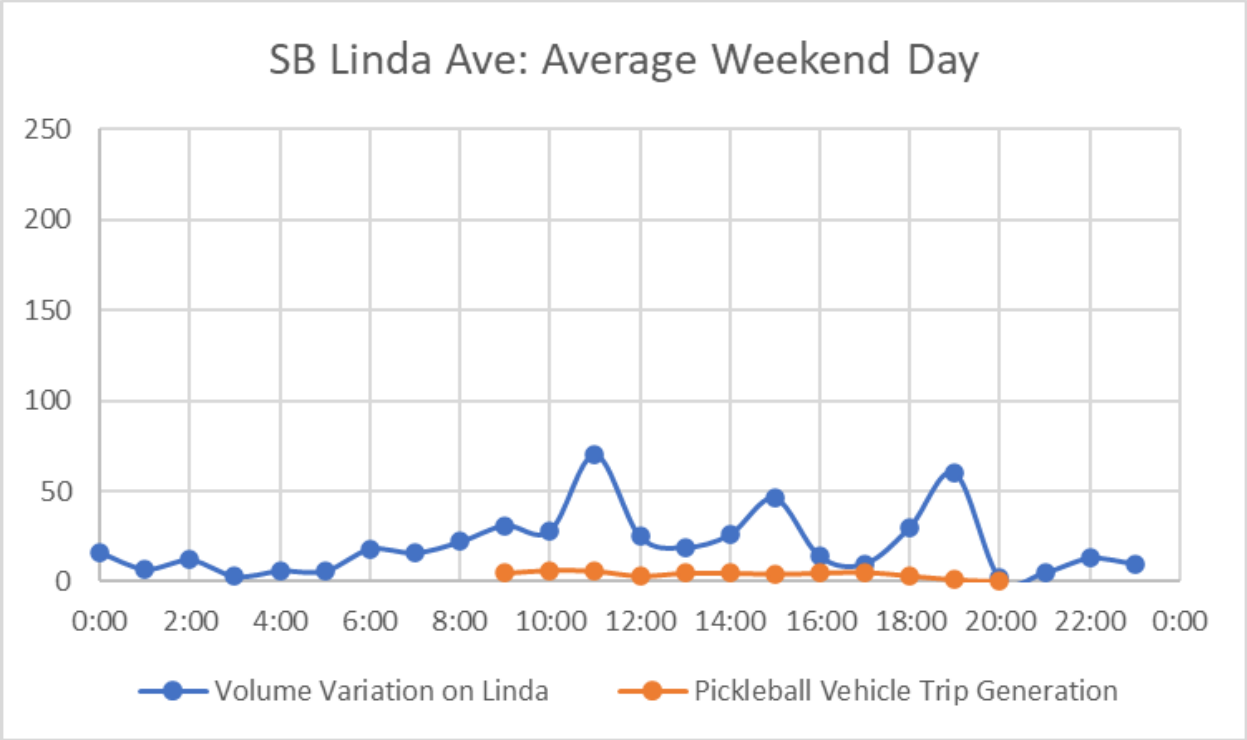


**Figure 3: Average Weekend Day Vehicle Variation on Linda Vs. Pickleball Vehicle Trip Generation**



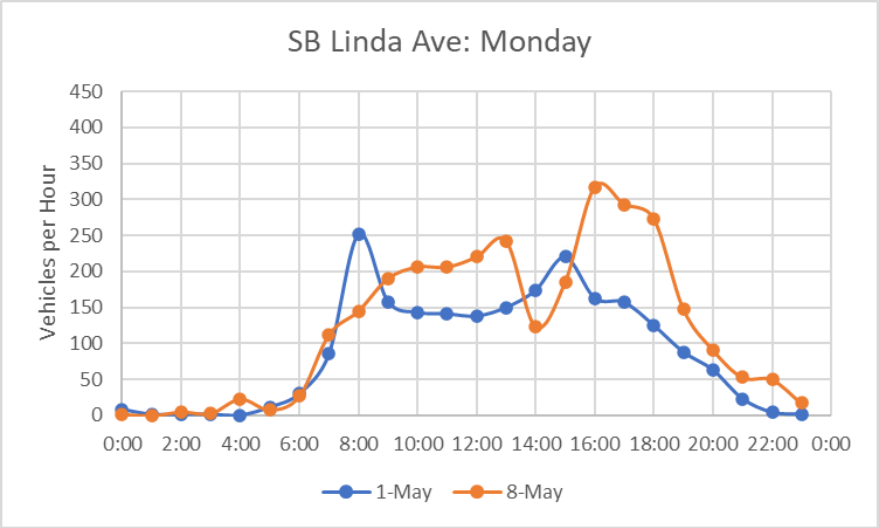

# Summary

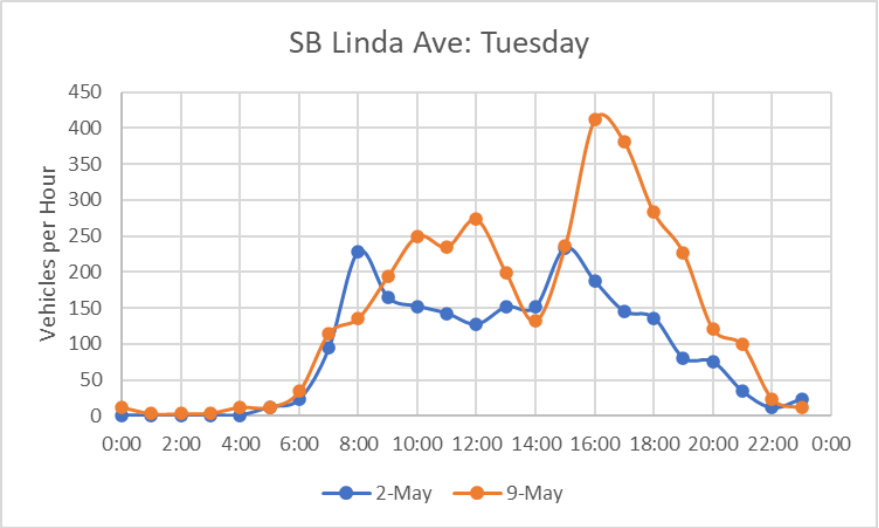
This technical memorandum documented the potential increase in vehicle traffic as a result of the permanent installation of four pickleball courts at Beach Field. Key findings from this analysis include:

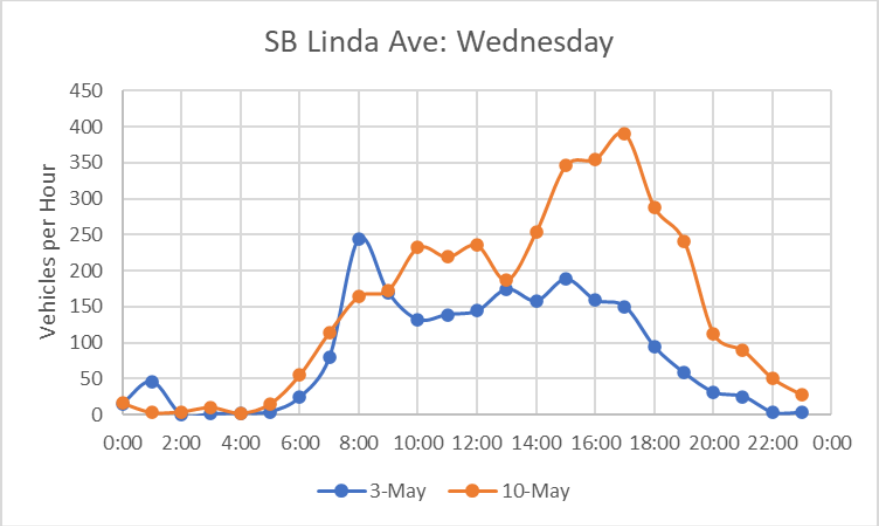
- Traffic on Linda Avenue was found to vary for similar midweek days by an average of 62 vehicles per hour and up to 219 vehicles per hour.
- About 83% of pickleball players play for an hour or more and 25% arrive at the courts via a non-auto mode. Based on the provided data, Kittelson estimates the pickleball courts generate about four cars per hour on average with a maximum of seven cars per hour during their hours of operation (9 AM to 9 PM).
- A comparison between the variation in traffic volumes on Linda Avenue and the estimated trip generation for the pickleball courts show the courts generate substantially less vehicle volume than the typical variation in the number of vehicles traveling along Linda Avenue.

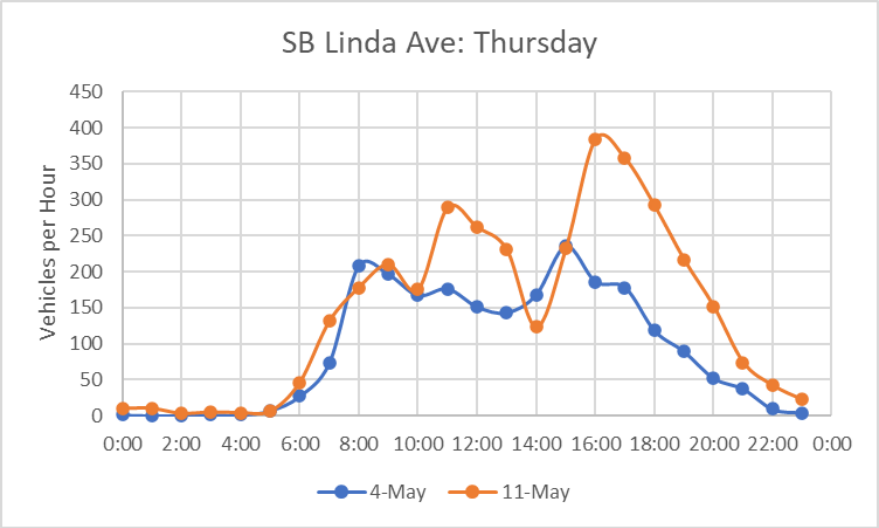
Based on our analysis, Kittelson concludes that the conversion of the two tennis courts to four pickleball courts at Beach Field on Linda Avenue generate vehicle traffic that would be indistinguishable from the natural variation in traffic along Linda Avenue. Therefore, no adverse effect on traffic operations is anticipated.

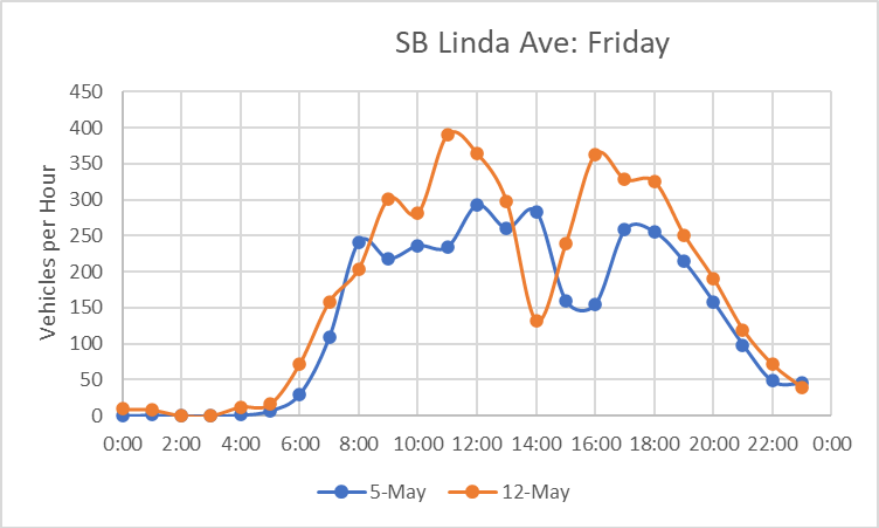
# Appendix A: Volume Data

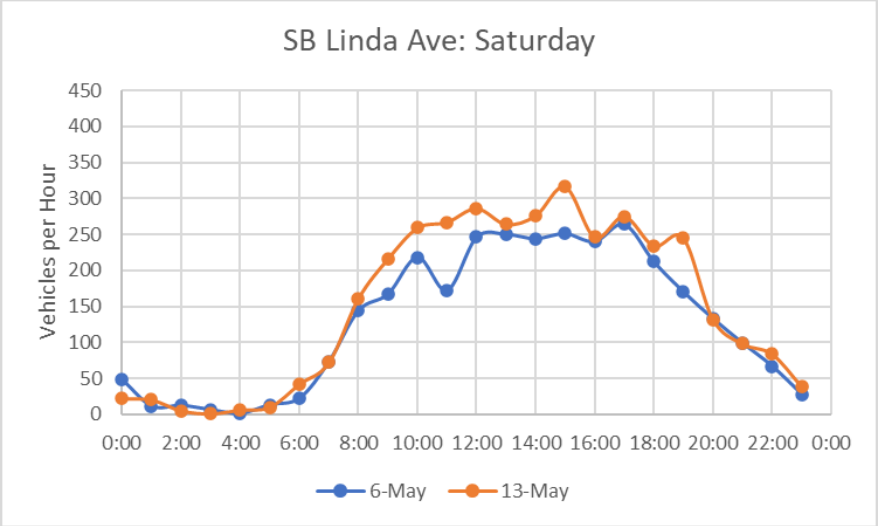

SB Linda Ave: Monday
Vehicles per Hour
450
400
350
300
250
200
150
100
50
0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
1-May
8-May

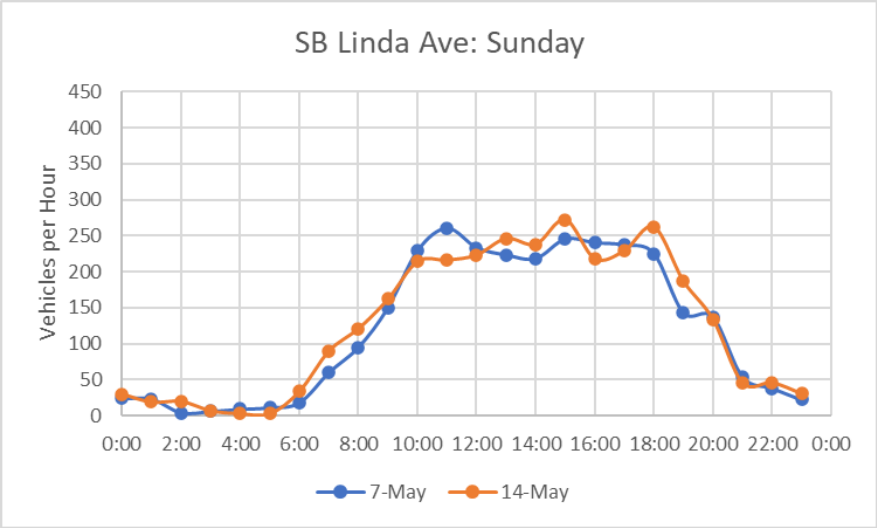

SB Linda Ave: Tuesday
Vehicles per Hour
450
400
350
300
250
200
150
100
50
0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
2-May
9-May


SB Linda Ave: Wednesday
Vehicles per Hour
450
400
350
300
250
200
150
100
50
0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
3-May
10-May

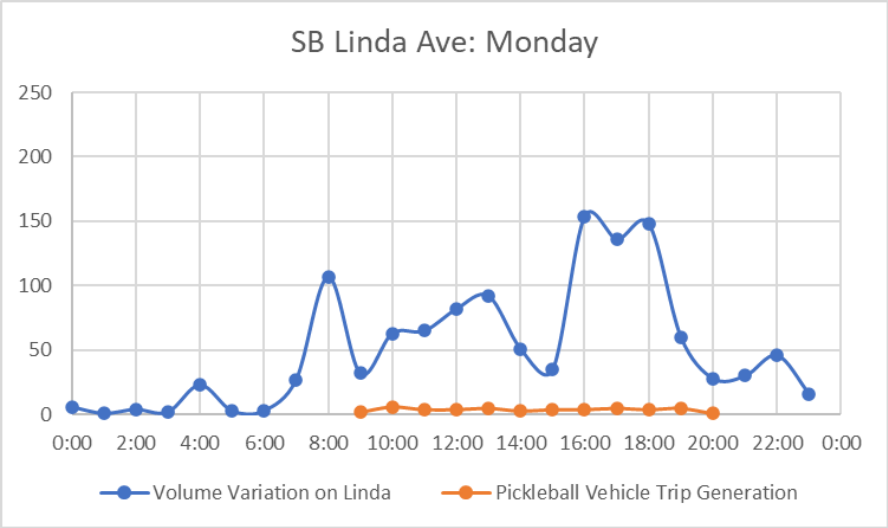

SB Linda Ave: Thursday
Vehicles per Hour
450
400
350
300
250
200
150
100
50
0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
4-May
11-May

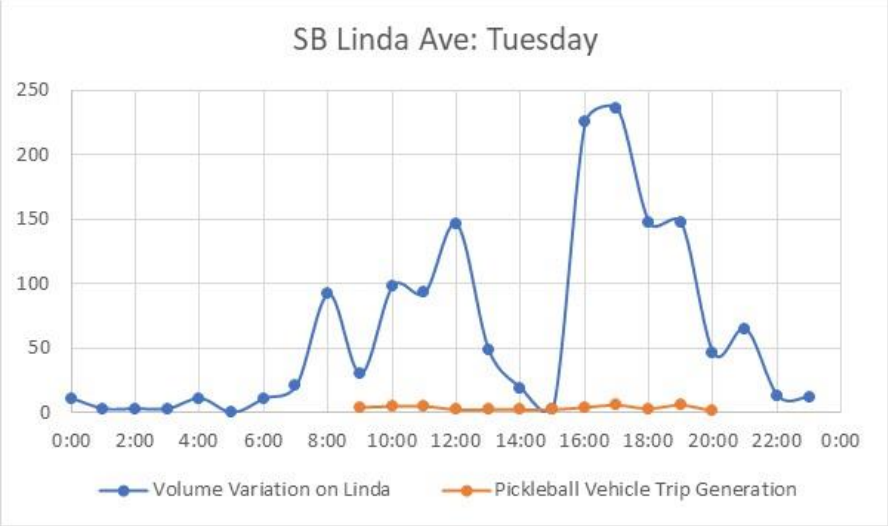

SB Linda Ave: Friday
Vehicles per Hour
450
400
350
300
250
200
150
100
50
0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
5-May
12-May

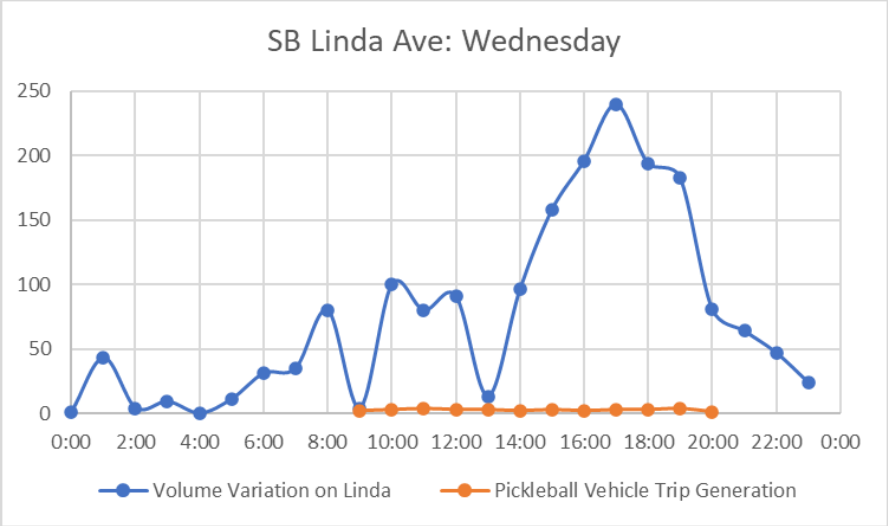

SB Linda Ave: Saturday
Vehicles per Hour
450
400
350
300
250
200
150
100
50
0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
6-May
13-May

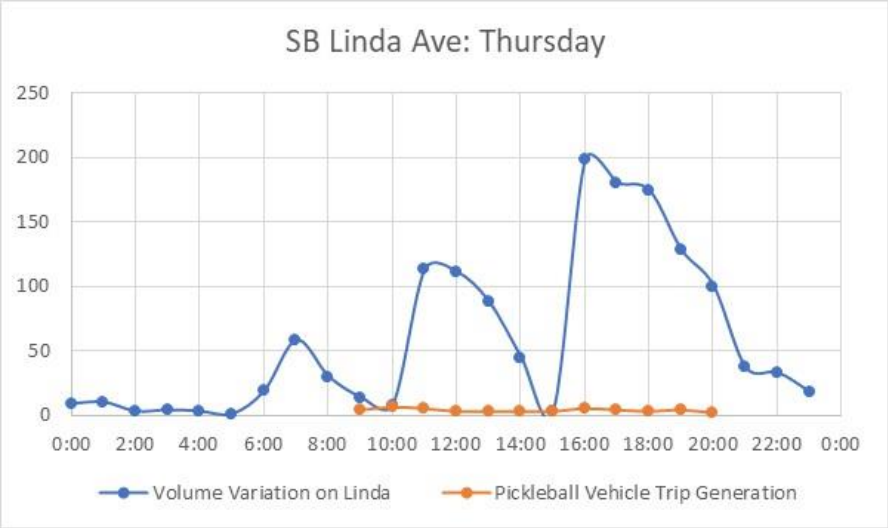

SB Linda Ave: Sunday
Vehicles per Hour
450
400
350
300
250
200
150
100
50
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
7-May
14-May

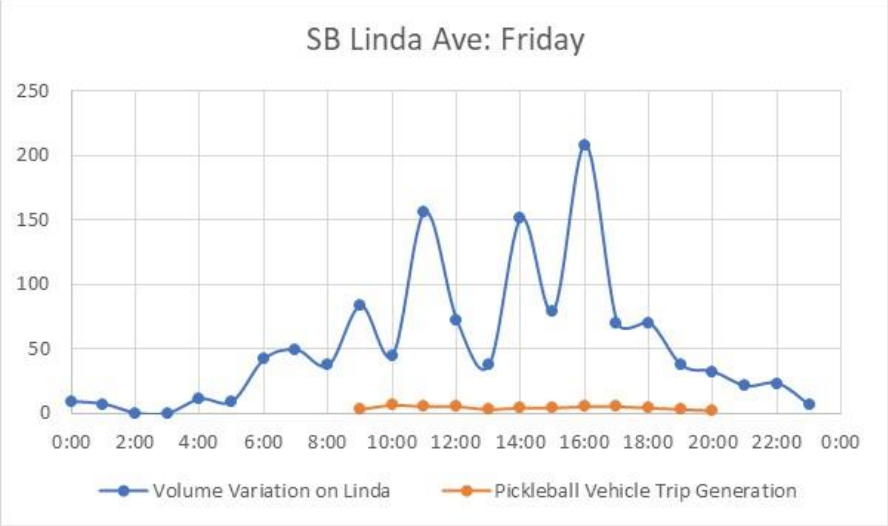
# Appendix B: Volume Variation vs. Pickleball

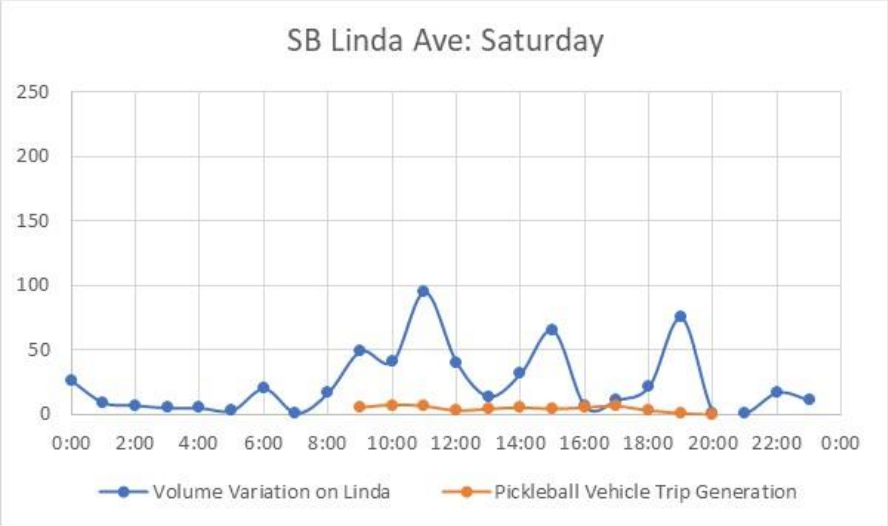

SB Linda Ave: Monday
250
200
150
100
50
0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
Volume Variation on Linda
Pickleball Vehicle Trip Generation

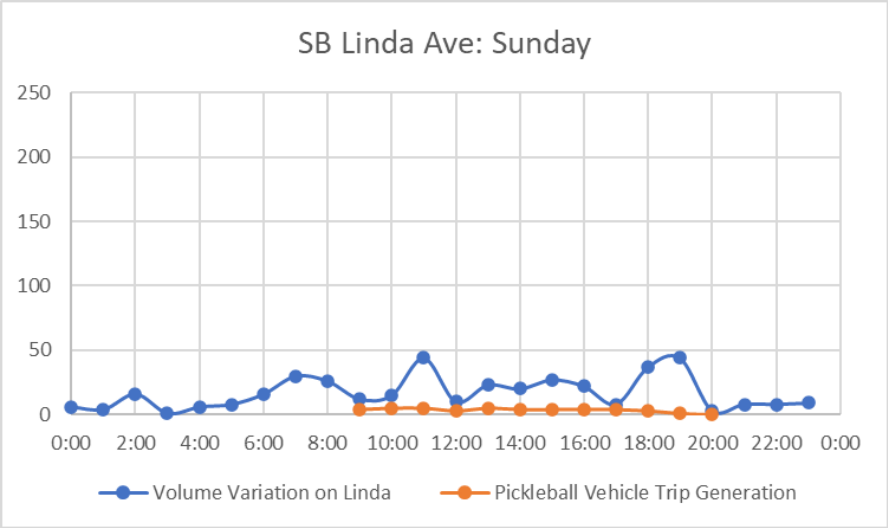

SB Linda Ave: Tuesday
250
200
150
100
50
0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
Volume Variation on Linda
Pickleball Vehicle Trip Generation


SB Linda Ave: Wednesday
250
200
150
100
50
0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
Volume Variation on Linda
Pickleball Vehicle Trip Generation


SB Linda Ave: Thursday
250
200
150
100
50
0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
Volume Variation on Linda
Pickleball Vehicle Trip Generation


SB Linda Ave: Friday
250
200
150
100
50
0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
Volume Variation on Linda
Pickleball Vehicle Trip Generation


SB Linda Ave: Saturday
250
200
150
100
50
0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
Volume Variation on Linda
Pickleball Vehicle Trip Generation


SB Linda Ave: Sunday
250
200
150
100
50
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Volume Variation on Linda
Pickleball Vehicle Trip Generation