FROG POND EAST & SOUTH MASTER PLAN

TECHNICAL APPENDIX

DRAFT - NOVEMBER 2022

WILSONVILLE
OREGON

LIST OF APPENDICES

APPENDIX A: COMMUNITY ENGAGEMENT SUMMARIES

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EAST & SOUTH
MASTER PLAN

ENGAGEMENT SUMMARY: APRIL-MAY 2022

Overview

This document is a summary of community engagement activities conducted between April 30 and June 1, 2022, for the Frog Pond East and South Master Plan. The project and engagement was focused on issues and ideas to inform the development of the plan alternatives. Key themes from each engagement meeting or activity are summarized below. Attached are summaries for each of the meetings.

Meetings and Activities

Meetings and engagement activities are summarized below. In addition, City staff had (and continues to have) on-going informational and coordination meetings with individual property owners, community members and developers.

- Community Focus Group #1 (April 30, 2022)
- Affordable Housing Focus Group #1 (May 11, 2022)
- Community Design Workshop (May 12, 2022)
- Affordable Housing Focus Group #2 (May 13, 2022)
- Community Focus Group #2 (May 14, 2022)
- Online survey on Let's Talk Wilsonville! (May 12 – May 30, 2022)

Project information and meeting notices were provided through a variety of ways including: *Let's Talk Wilsonville!*, the Boones Ferry Messenger; the project Interested Parties email list; and social media postings.

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Meeting Summary – Community Focus Group #1

When: April 30, 2022; 3:30 – 5:30 p.m.

Where: Zoom

Participants:

Project team: Dan Pauly, Georgia McAlister (City of Wilsonville); Joe Dills (MIG|APG); Mariana Valenzuela (Centro Cultural)

Attendees: 18 community members pre-registered through recruitment via Zoom. However, only 4 participants were confirmed as legitimate participants.

Meeting purpose: To share information, and receive feedback, regarding the Frog Pond East and South Master Plan project. The feedback will inform project alternatives. This focus group was intended to broaden the engagement to include community members who do not typically participate in planning processes and are part of underrepresented communities.

Welcome and project overview

Mariana welcomed participants and Zoom start-up was finalized for all participants.

Dan welcomed the group on behalf of the City. Dan described: Frog Pond location, focus group agenda-overview-relevance, why planning is occurring, planning to date and vision. Joe presented slides addressing working ideas for: affordable housing, a range/typology of housing choices, a neighborhood center, community gathering places, connections, and the BPA power line corridor.

Breakout groups

The participants then broke into groups for discussion of the issues described in the overview. The questions and summary of feedback is below.

Neighborhood Center: What do you think of the idea to locate a "Main Street" commercial area along SW Brisband Street at SW Stafford Road? What would make it somewhere you and your family would go?

- Coffee or "refreshment spot"
- Cinema
- Positive attractions, things that are fun
- Places to exercise
- Spa
- Restaurants
- Security is important

Housing Choices: For the range of housing choices that was presented – which ones should go where?

- Range of homes on the larger parcels
- Type 1 near the grange
- Type 1 near the Community Park

- Type 1 away from the Community Park – in a location where there is less noise and activity
- Housing away from traffic
- Type 2 in a quiet location
- Mix of home throughout
- Overall general preference for Type 2

Community Gathering Places: What are the potential uses for the Grange? What ideas do you have for the East Neighborhood Park? What other community gathering places should there be?

- Grange: history, library, small museum, environmental education, community center for occasions, place to vote,
- Park: a fun place, kiddies corner, visibility, drinking fountains, outdoor gym

Connecting Destinations – Regarding the design concept map that shows connections: Do these make sense to you? Are there other important destinations to connect? Where should trails be located?

- Trails: the red lines make sense, connect to Brisband Street

BPA Power Line Corridor: What would you like to see in this area?

- Sports courts, parking, trails, concern about safety, could be dangerous

Other comments/questions of interest:

- Is there security (e.g. a police station) nearby?
- Where is the closest healthcare?
- There should be access to food and personal needs. A small grocery would be good.

Reports, Next Steps and Adjourn

The participants reconvened and provided highlights from the discussions. Dan thanked everyone for the participation, described next steps, and adjourned the meeting.

Meeting Summary – Affordable Housing Focus Groups #1&2 With Renters

When: May 11th, 2022; 5:30-7 p.m. and May 13th, 2022; 12-1:30 p.m.

Where: Zoom

Participants:

Project team: Georgia McAlister (City of Wilsonville); Becky Hewitt (ECONorthwest); Virginia Wiltshire-Gordon (ECONorthwest)

Attendees: 11 renters living in Wilsonville (8 on May 11th and 3 on May 13th who pre-registered through recruitment via social media and posted flyers)

Meeting purpose: Seek the perspectives of renters about their preferences for housing.

Welcome and project overview

Georgia welcomed participants and Zoom start-up was finalized for all participants. She welcomed the group on behalf of the City and described the Frog Pond location, focus group relevance, and why planning is occurring. Becky gave an introduction to the focus group agenda.

Breakout Groups - Questions

Discussed the following questions:

Current housing
- What do you like about where you live now? What don't you like?
- What were the most important factors in deciding to live there?

- Future neighborhood
  - Is anyone thinking about moving in the next few years? If so, would you be interested in living in a new neighborhood in Wilsonville at the edge of town?
  - What would factor into your decision about whether that was a good place to live?
    - Prompt about both the unit itself and the neighborhood / surrounding amenities / location, ask about access to transit

Housing types
- What type or style of housing would be most appealing to you?
- Show different housing types and ask what they would think. If your ideal situation is unaffordable, what kind of housing would you be open to?

- Buying
  - If not already covered, ask whether they are hoping to buy a home in the next few years or continue renting
  - What challenges are you facing in buying a home?

- Anything else you want to share?

Breakout rooms closed when all questions had been discussed.

Comments and Key Themes from Participants

Wilsonville Community

- Positive experiences:
  - Many participants love Wilsonville and love living in Wilsonville
  - Family: living close to aging parents, living within driving distance to family, living with family
  - Safety: participants expressed appreciating the safety they felt personally, for their property and for their children
  - Access to work: living close to work, easy drive as a commute
  - Character of neighborhoods: architecture, access to nature and open space, layout of the city

- Amenities: convenient to get around town, bike paths, access to shopping center, access to the highway, activities and play areas for children
- Schools

- Challenges
    - Displaced multiple times due to landlords wanting to sell, more applicable in units with smaller scale owners
    - Rent increases pricing people out
    - Participants recognized the need to build more units and the reality of a region-wide housing shortage
    - Transit is not well connected to other parts of the metro region
    - High levels of growth, people moving into the community and increasing demand. Some of those moving to the area have higher incomes or more access to resources.

Future Neighborhoods

- Everywhere in Wilsonville is nice
- Make sure traffic is addressed, public transportation within town was not as much of a priority at present but becomes more relevant as people age

Future Housing Types

- Middle income 55+ community: desire for communities reserved for older and retirement age people. Interest in amenities that would create recreation opportunities for people to gather.
- Housing appropriate for aging in place: single story, some interest in master on ground flood, smaller size units (less than 1,200 sqft)
- Detached housing: general preference for housing that doesn't share walls, some preference for detached with a shared yard relative to attached housing with a small individual yard
- Design: Interest in duets or duplexes that may not be as obvious, such as different door orientations for each unit and interest in units that have an individual feel. Interest in variety of styles and more individuality still with a consistent character. Some interest in ADU, preference for detached style.
- Unit amenities: Yard and privacy, parking, balconies, high ceilings
- Apartments/Condos: less interest, less attractive. Concerned about privacy, fees, space for younger children

Future Home Ownership

- Many expressed interest in owning a home in Wilsonville. Some people felt they were not yet at the stage of life to own a home.
- Prices were the key limiting factor. Some expressed willingness to compromise on features they wanted in order to afford a home in this location but some would prefer to continue renting unless or until the right home they could afford became available. For some, owning is price prohibitive in Wilsonville regardless.
- Concerns about HOA fees though some expressed appreciating the benefits they provide

Meeting Summary – Community Design Workshop

When: Thursday, May 12, 6-8 p.m.

Where: Zoom virtual meeting

Participants:

Project team: Miranda Bateschell, Georgia McAlister, Cindy Luxhoj, Joe Dills, Andrew Parish, Saumya Kini, Betty Lou Poston, Ken Pirie, Ryan Mottau, Mariana Valenzuela

Attendees: 10 participants

Meeting purpose:

- Share project information
- Obtain feedback to be used in preparing master plan alternatives

Welcome and Meeting Overview

Georgia convened the workshop, welcomed the group, and explained Zoom features

Project and Workshop overview

Georgia gave a short presentation, covering: why this project, why now; where is Frog Pond; 2015 vision and some new priorities; what will happen in the breakout groups; what we will do with your input

Breakout Groups

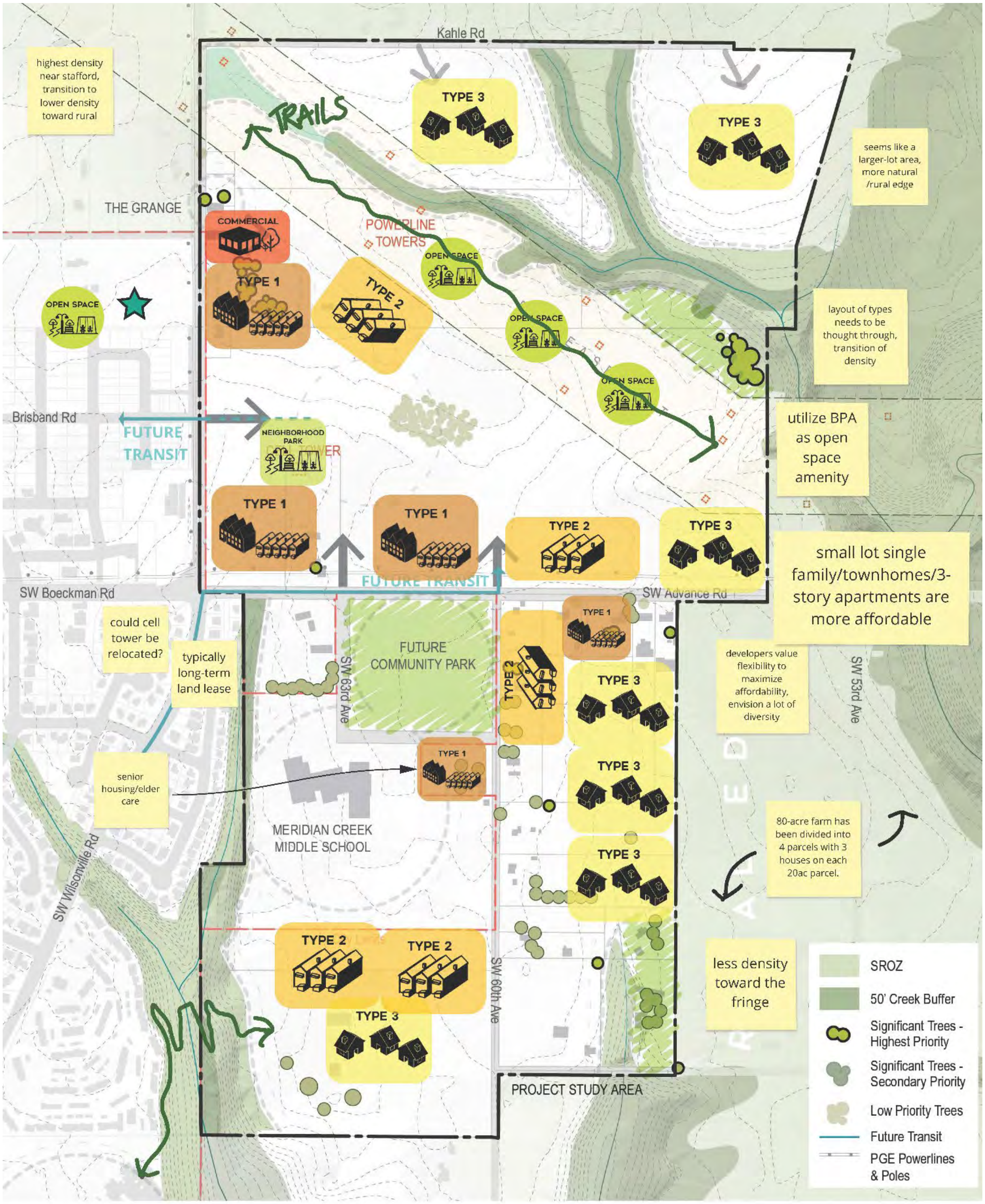
The attendees were divided into two discussion groups. After introductions, each group discussed:

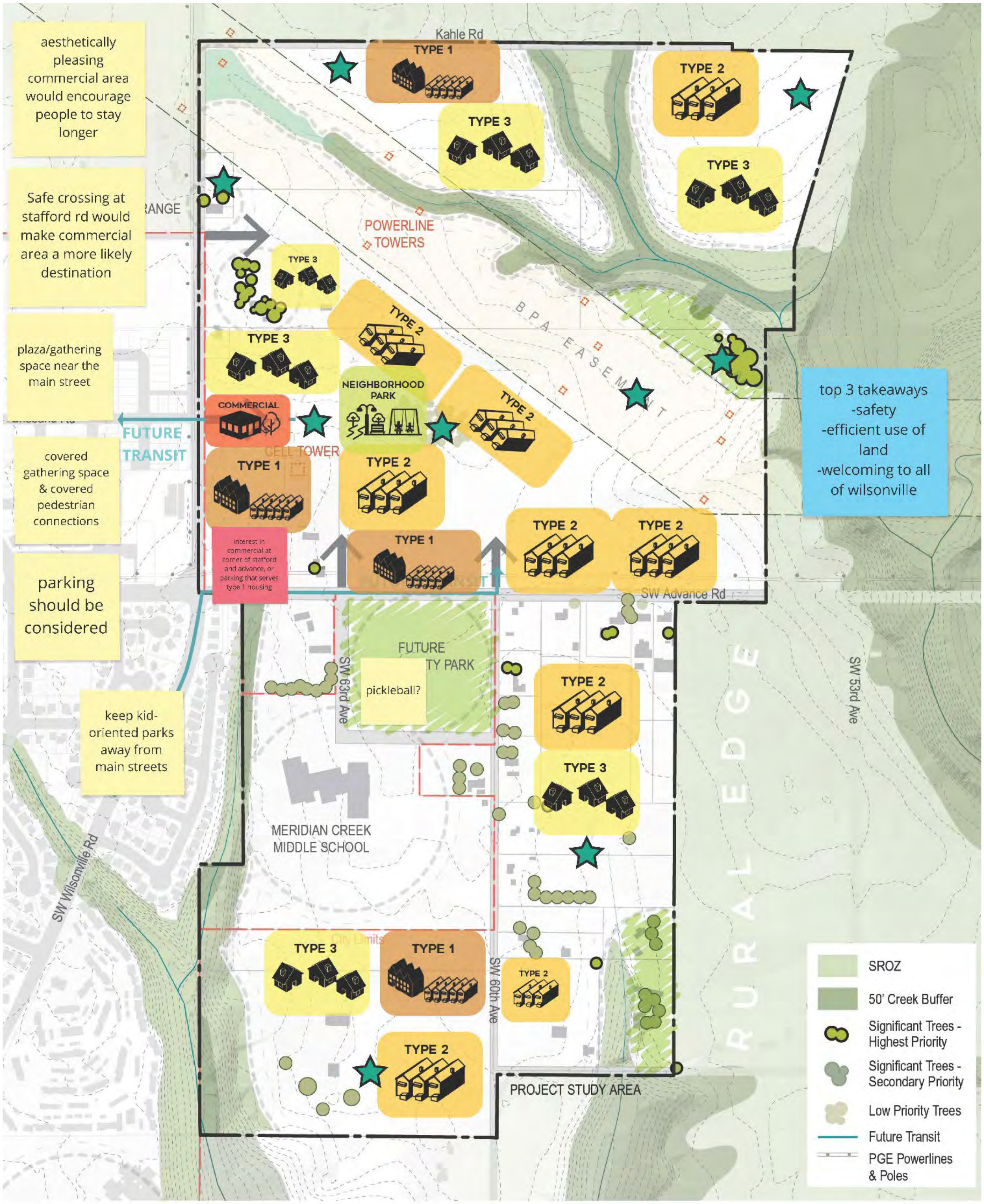
1. Location and context – Where at the destinations for community gathering in southeast Wilsonville?
2. Connections – Based on a conceptual map of how to connect local destinations, the groups discussed ideas about places to connect and added ideas for additional connections.
3. Neighborhood commercial center – Following background information about a market study and discussions with the Planning Commission, the groups addressed:
    a. What do you think of the idea to locate a "Main Street" commercial area at SW Brisband Street at SW Stafford Road?
    b. What would make it somewhere you and your family would go?
    c. For our work today, can we proceed with Brisband Main Street as the location for our discussions? (One group supported and moved forward with the Brisband Street location. The other group placed their commercial "chip" on the Frog Pond Lane location)
4. Housing types – Background information was provided regarding the City's focus on providing a range of housing types. Housing Types 1, 2, and 3 were explained, along with principles for their placement on the maps. The groups then proceeded to place housing chips on their maps. See below

5. Parks and neighborhood destinations – The groups then placed chips for the East Neighborhood Park and small neighborhood destinations distributed around the map.

Breakout Group Feedback

Comments and ideas from workshop participants were recorded on maps – see below.


Kahle Rd
highest density near stafford, transition to lower density toward rural
TRAILS
TYPE 3
TYPE 3
seems like a larger-lot area, more natural /rural edge
THE GRANGE
COMMERCIAL
POWERLINE TOWERS
OPEN SPACE
TYPE 1
TYPE 2
OPEN SPACE
OPEN SPACE
OPEN SPACE
layout of types needs to be thought through, transition of density
Brisband Rd
FUTURE TRANSIT
NEIGHBORHOOD PARK
utilize BPA as open space amenity
TYPE 1
TYPE 1
TYPE 2
TYPE 3
small lot single family/townhomes/3-story apartments are more affordable
FUTURE TRANSIT
SW Boeckman Rd
SW Advance Rd
could cell tower be relocated?
typically long-term land lease
FUTURE COMMUNITY PARK
SW 63rd Ave
TYPE 2
TYPE 1
TYPE 3
developers value flexibility to maximize affordability, envision a lot of diversity
SW 53rd Ave
senior housing/elder care
TYPE 1
TYPE 3
MERIDIAN CREEK MIDDLE SCHOOL
TYPE 3
80-acre farm has been divided into 4 parcels with 3 houses on each 20ac parcel.
SW Wilsonville Rd
TYPE 2
TYPE 2
SW 60th Ave
TYPE 3
less density toward the fringe
PROJECT STUDY AREA
SROZ
50' Creek Buffer
Significant Trees - Highest Priority
Significant Trees - Secondary Priority
Low Priority Trees
Future Transit
PGE Powerlines & Poles



Report backs

Attendees returned from their groups and summarized highlights from their discussions:

Group 1:

- Type 1 housing should be focused towards the center with Type 3 towards the edge
- Make efficient use of the Frog Pond land supply including the BPA corridor and potential commercial area
- The neighborhood should include opportunities for affordable home ownership

Group 2:

- Pedestrian routes and should provide for safe walking and connectivity
- Make efficient use of the Frog Pond land supply
- Make these neighborhoods welcoming places

At 8:00 p.m., Georgia thanked everyone and the meeting was adjourned.

Community Focus Group 2

Overview

This event was delivered in English and Spanish using consecutive interpretation services to serve members of the Latinx Community in the area. Georgia presented the Frog Pond East & West Master Plan in the following sequence:

1. Description of the Frog Pond area
2. Goals of the development for the City of Wilsonville
3. Objective of focus group
4. Project update
5. Vision of Frog Pond – It is important to mention that this vision was built on feedback received during focus group events related to HB 2001 which took place last year.
6. Description and potential location of three home types
7. “Main Street” at Frog Pond-location and potential use
8. Community gathering places
9. Options to connect the neighborhood destinations
10. What to do at the BPA Corridor?
11. Group discussion
12. Next steps-Stay connected

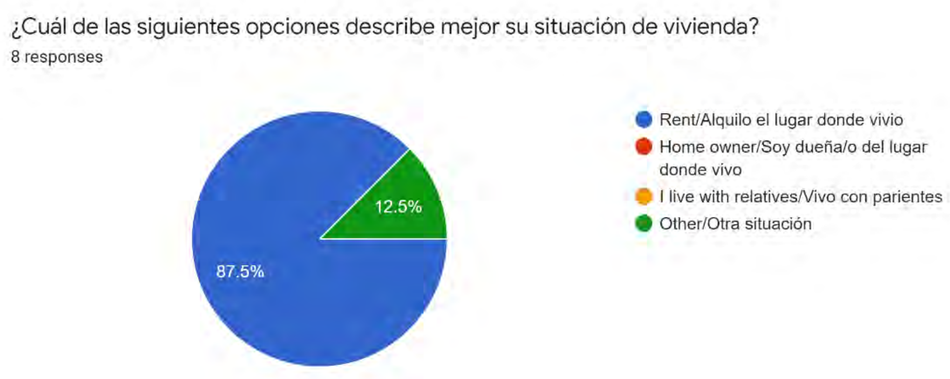
There were seven participants who provided valuable input regarding the potential features and components of the future Frog Pond Neighborhood.

Most of the participants had already heard about Frog Pond since they had attended earlier community engagement events organized by the City of Wilsonville to provide information and gather feedback on HB 2001. They were very excited to have the opportunity to return and continue to be part of the urban planning process.

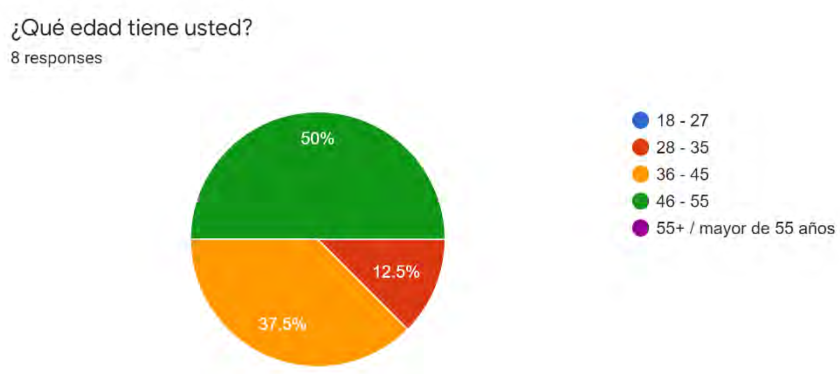
Pre-Meeting Survey

Participants completed a survey prior to the focus group event. These are the findings from that survey:

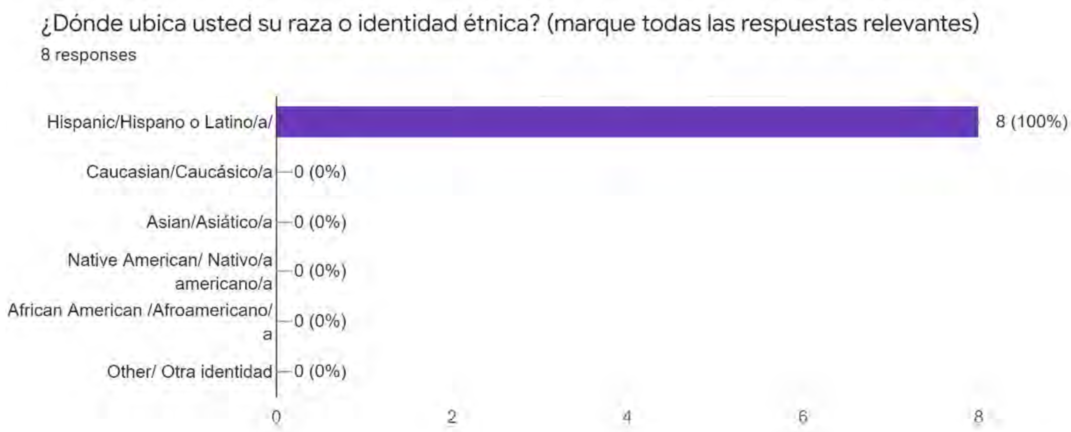
1. Living situation



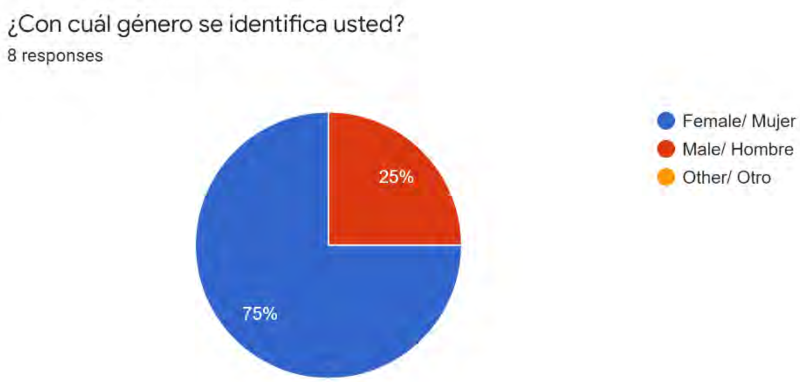
2. Age group



3. Ethnicity



4. Gender



5. Annual Income

Group Discussion

During the discussion, participants responded to the following questions:

1. ***Neighborhood Center-*** *What do you think of the idea to locate a "Main Street" commercial area along SW Brisband Street at SW Stafford Road? What would make it somewhere you and your family would go?*

Responses and comments:

- Ethnic food restaurants
- Family-owned small businesses
- Services: Beauty salon, Coffee shops, small market, ice cream shop
- Affordable rent for small businesses
- "Main Street" idea is good for the family, places you can walk to
- I really like the idea, but for small businesses rental is challenging. It would be important to know who the owner is. These businesses are small. For a business to be successful, rent needs to be affordable.
- Yes, a commercial area is a great idea, particularly if there is a focus on cultural exchange with arts & crafts, diversity of ethnic foods.
- Cultural exchange, as the gentleman mentioned, is very important. This space, if affordable, could be the place for that exchange. Great idea for families to connect.
- Spectacular idea. It would be wonderful. We don't have such a place. A Colombian food restaurant would be great.
- It would be great to have a grocery store, so you can go to do the shopping for the week, and then stop at an ice cream shop.
- I love this idea of returning to a place where you can create community, connect with others.

2. ***Housing Choices-*** *For the range of housing choices that was presented – which ones should go where?*

Responses and comments:

- There were many questions about home affordability. How will they make these homes more affordable? Andrew responded to this concern. He explained that the City is thinking that a percentage of the homes will be subsidized. The same participant asked what is the percentage of subsidized homes. Georgia explained that there are three models. The most optimistic is a 15% of homes will be subsidized. Then the participant asked if 15% is the most optimistic, what is the most realistic or lowest? Georgia explained that they do not have the exact percent, that it all depends on the support of the community, but that affordable housing is a goal for the City so they are optimistic.
- **Type 1-**Participants agree that these homes should be near schools for safety since there are more children. Least focus should be on building Type 3 homes. Most houses in Wilsonville are single-family homes and are less affordable.
- **Type 2-**Near retail stores- Near "Main Street"
- **Type 3** closer to the Grange, more isolated- Again, participants concur with that opinion. Focus the least on building this type of home.
- The tallest buildings should be placed far away from power lines, and whatever is built, make sure there is a lot of parking space.

3. ***Community Gathering Places:*** *Which are the potential uses for the Grange? What ideas do you have for the East Neighborhood Park? What other community gathering places should there be?*

- A Community Center near the park; Park and community center should be located away from traffic for safety
- Picnic tables
- Place to barbecue
- Swimming Pool
- Sports fields- soccer, tennis
- Walking and biking trails
- A road so we could drive and carry food to barbecue
- A covered space due to rainy days, so families can celebrate birthdays

4. ***Connecting Destinations:*** *Regarding the design concept map that shows connections, do these make sense to you? Are there other important destinations to connect? Where should trails be located?*

- Biking trails
- Walking trails
- Consider those who have mobility issues
- These trails
- Connecting path should have the shape of an "S" instead of a "C"

After the discussion, Georgia and Andrew thanked participants for their meaningful contributions.

Online Survey

Overview

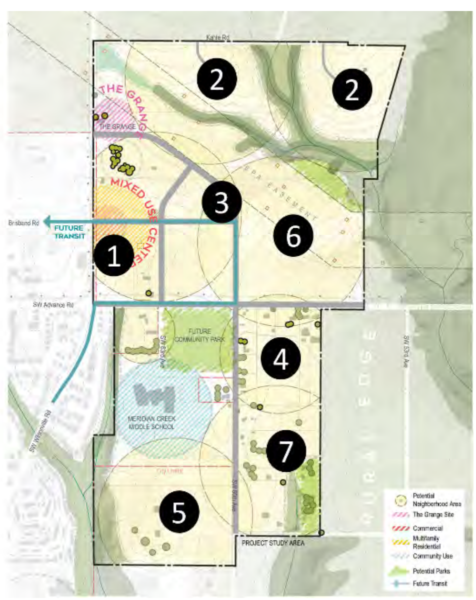
A survey was posted to *Let's Talk Wilsonville!* on May 17 and ran through May 31. The survey had three components: housing history and preference, location of housing types in Frog Pond East and South, and feedback on proposed amenities such as use of the historic grange and park programming. Through May 31 the survey had 46 respondents. More information on responses to individual questions can be found in attached summary.

Of the 46 respondents, 40 currently live in a detached single-family home. A preference for detached single-family homes from this group remained consistent throughout the survey. Detached single-family was by far the predominant preference for respondents if they were to seek a different home in the coming years. In addition, the overall preference for the Type 3 Housing Form was clear. Only 5 respondents indicated they did not prefer Type 3, compared to 14 for Type 2 and 25 for Type 1. It was not unexpected existing single-family homeowners would have this type of response.

Other survey questions brought additional insights about preferences and potential future needs. As can be seen in some of the other outreach results, generally there is a preference for detached units. The ideal of the detached home runs strong. A particularly interesting survey question was if respondents could not afford a detached single-family home what other type of housing they would consider. Half of respondents (23) said a townhouse, the next most frequently selected options were cottage cluster (19), plexes (16), cluster housing (13), and apartment or condo (11).

Respondents were also asked best and preferred location for different housing forms in Frog Pond East and South, referencing the map below.

1. Adjacent to the neighborhood retail and next to Stafford road
2. Outer area of East Neighborhood between creek corridors
3. Central area of East Neighborhood, near power line easement areas
4. South Neighborhood near future community park
5. Southern portion of South Neighborhood area near middle school
6. Central East Neighborhood
7. Southeastern corner of South Neighborhood near natural area and rural residences



Locations 1 and 3 were the only locations were a majority of respondents did not indicate a preference for the Type 3 housing form. A majority of respondents indicated Type 1 housing form as the appropriate housing form for Location 1. Type 2 housing form had the most respondents feeling it is most appropriate for Location 3.

Respondents were also asked to rank all seven locations in order of preference for each Type of housing form. The results indicated as follows:

- For Type 1 housing form, Location 1 was most preferred, followed by Location 3, with locations 7 and 2 being the least preferred
- For Type 2 housing form, Location 3 was most preferred, followed by Location 4, with locations 6 and 7 being the least preferred
- For Type 3 housing form, Location 7 was most preferred, followed by Location 5, with Location 1 being by far the least preferred, followed by Location 3.

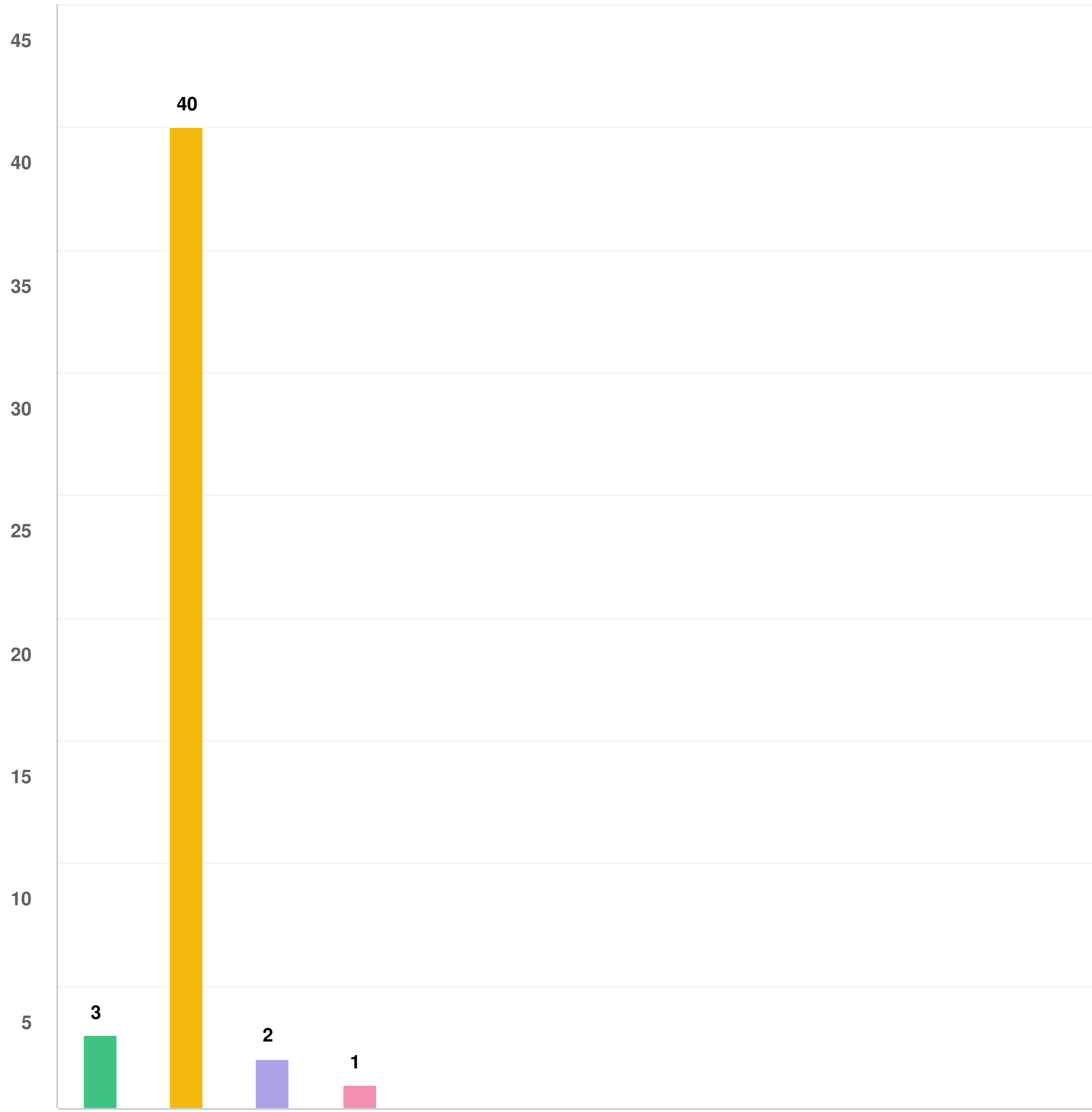
Detailed responses to use of the grange and parks will be retained for reference during further work on designing and programming these areas in the coming months.

May 2022 Community Survey

SURVEY RESPONSE REPORT
01 May 2022 - 30 May 2022

PROJECT NAME:
Frog Pond East and South Master Plan

Q1 Which of the following types of housing do you currently live in?

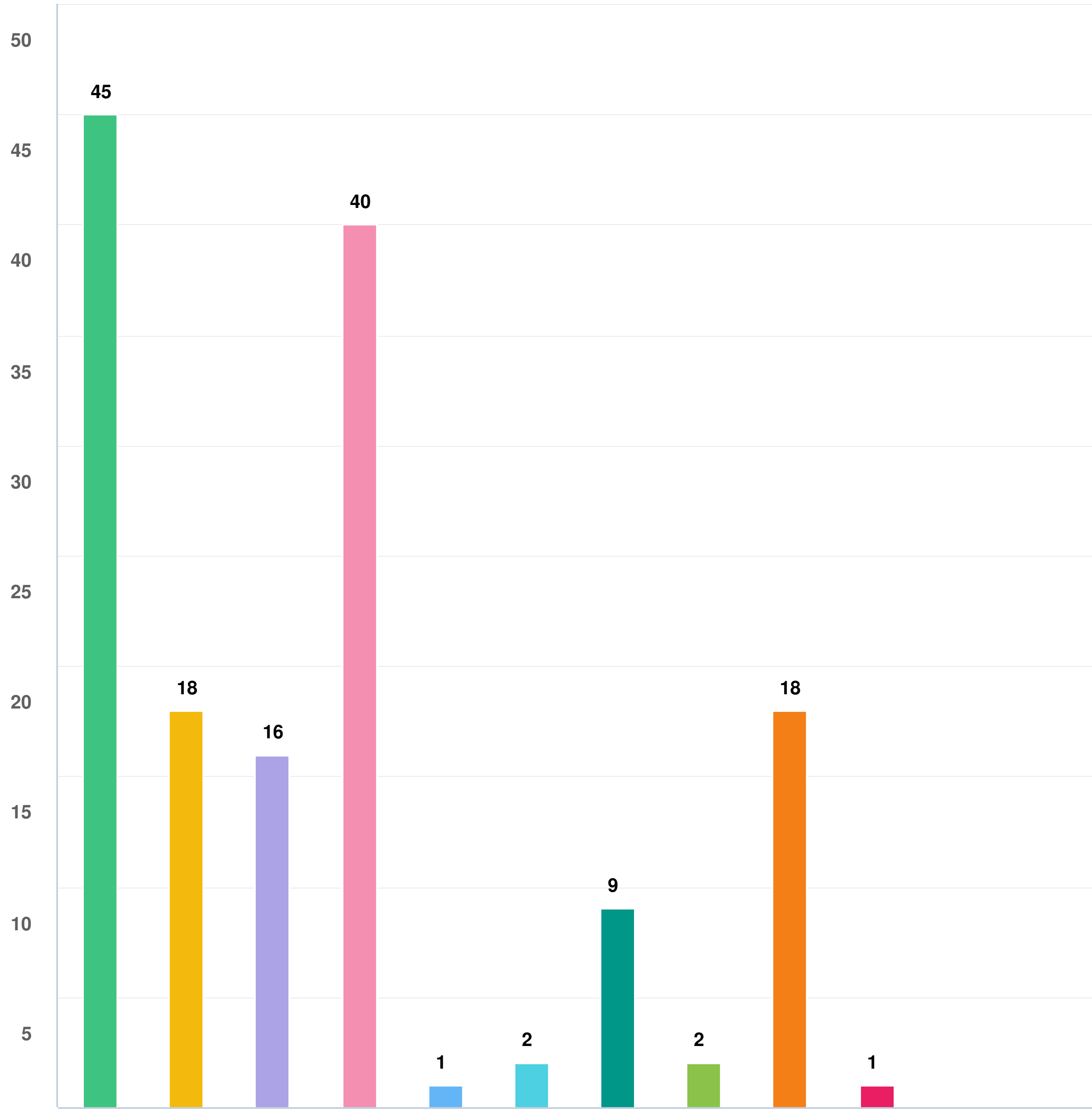


Question options

- Townhouse
- Detached single-family home
- Apartment or Condo
- Accessory Dwelling Unit "ADU"
- Duplex, triplex, quadplex
- Manufactured Home or Mobile Home
- Cluster Housing
- Cottage Cluster
- Congregate housing (i.e. dorms, etc.)
- RV (more than 30 days in a row without another home)
- I am currently houseless
- Other (please specify)

Mandatory Question (46 response(s))
Question type: Checkbox Question

Q2 Which of the following types of housing have you lived in during your life? (select all that apply)

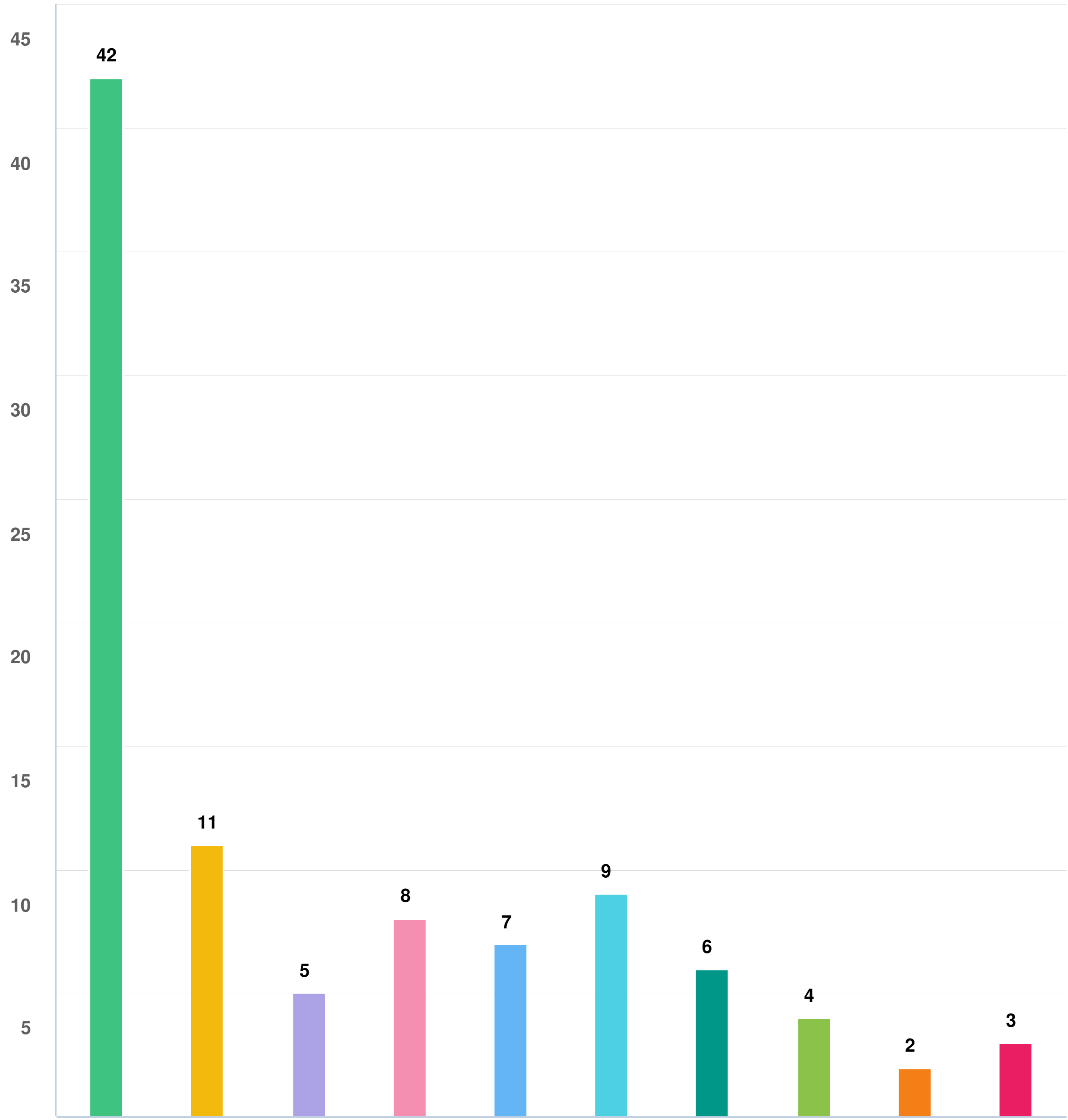


Question options

- Detached single-family home
- Duplex, triplex, quadplex
- Townhouse
- Apartment or Condo
- Cottage Cluster
- Accessory Dwelling Unit "ADU"
- Manufactured Home or Mobile Home
- RV (more than 30 days in a row without another home)
- Congregate housing (i.e. dorms, etc.)
- I have experienced being houseless
- Cluster Housing
- Other (please specify)

Mandatory Question (46 response(s))
Question type: Checkbox Question

Q3 Which of the following types of housing do you think you may live in in the future? (select all that apply)

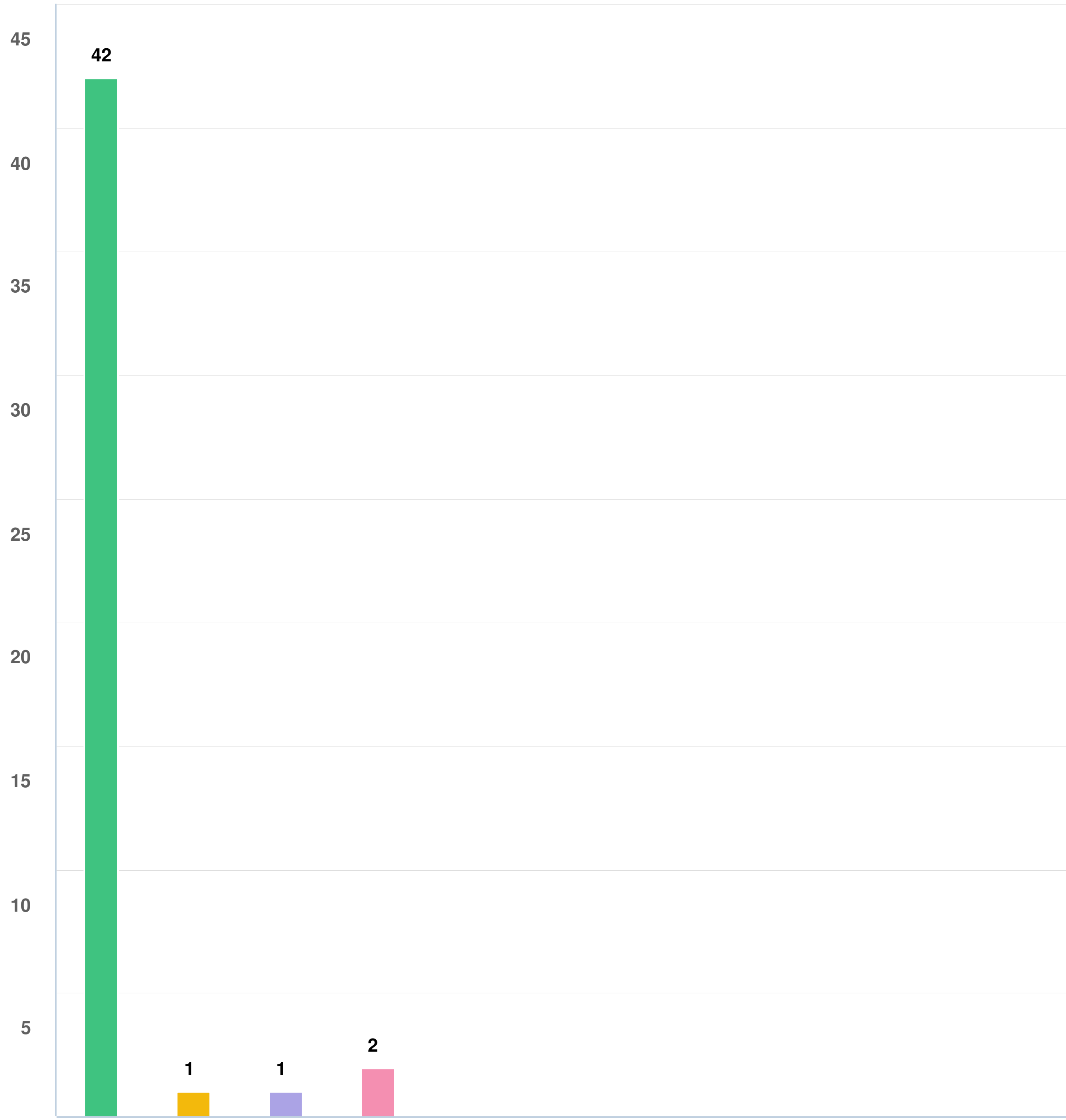


Question options

- Detached single-family home
- Apartment or Condo
- Duplex, triplex, quadplex
- Townhouse
- Cluster Housing
- Cottage Cluster
- Accessory Dwelling Unit "ADU"
- Manufactured Home or Mobile Home
- RV (more than 30 days in a row without another home)
- Congregate housing (i.e. dorms, etc.)

Mandatory Question (46 response(s))
Question type: Checkbox Question

Q4 If you were searching for a home in Wilsonville today or in the next few years, and cost was not a consideration, which of ...

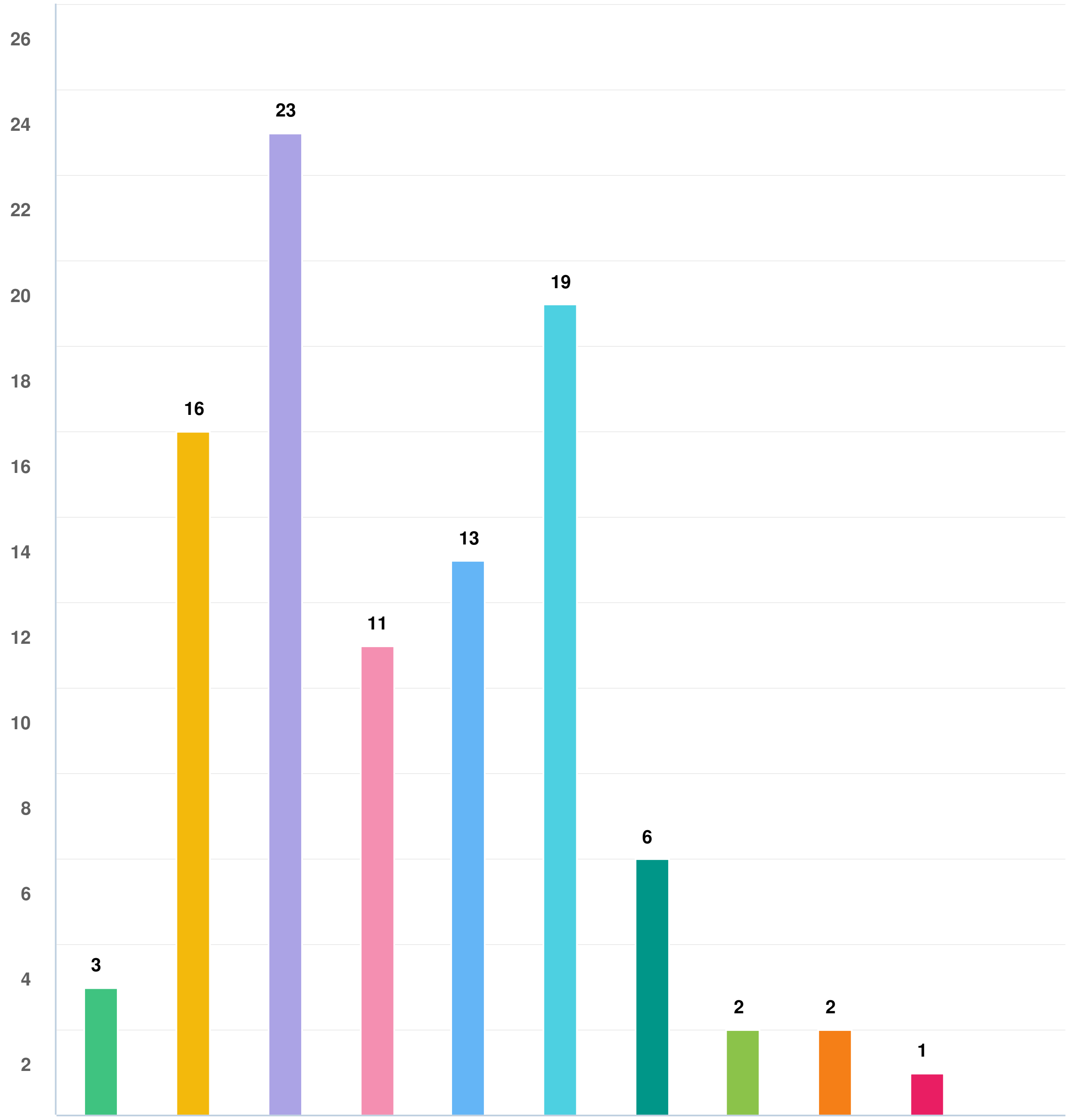


Question options

- Detached single-family home
- Townhouse
- Cluster Housing
- Cottage Cluster
- Duplex, triplex, quadplex
- Apartment or Condo
- Accessory Dwelling Unit "ADU"
- Manufactured Home or Mobile Home
- RV
- Congregate housing (i.e. dorms, etc.)
- Other (please specify)

Mandatory Question (46 response(s))
Question type: Checkbox Question

Q5 **If you could not afford the preferred type of housing indicated in Question 5, which of the following types of housing woul...**

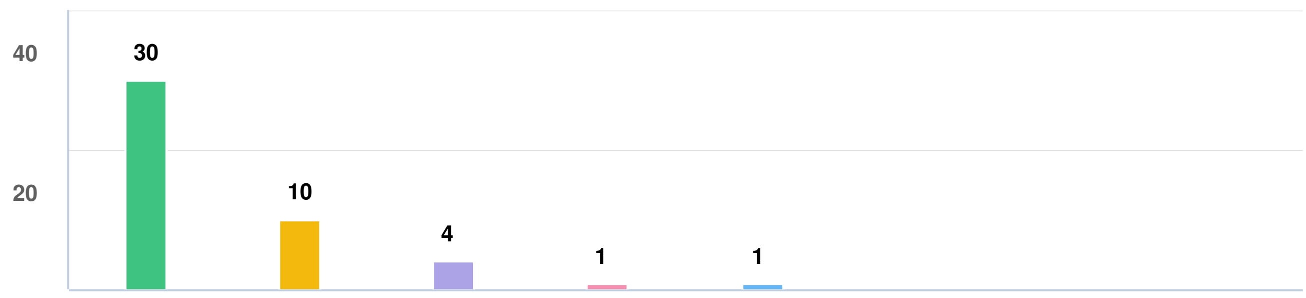


Question options

- Detached single-family home
- Duplex, triplex, or quadplex
- Townhouse
- Apartment or Condo
- Cluster Housing
- Cottage Cluster
- Accessory Dwelling Unit "ADU"
- Manufactured Home or Mobile Home
- RV
- Congregate housing (i.e. dorms, etc.)
- Other (please specify)

Mandatory Question (46 response(s))
Question type: Checkbox Question

Q6 Which of the following best describes your current living situation?

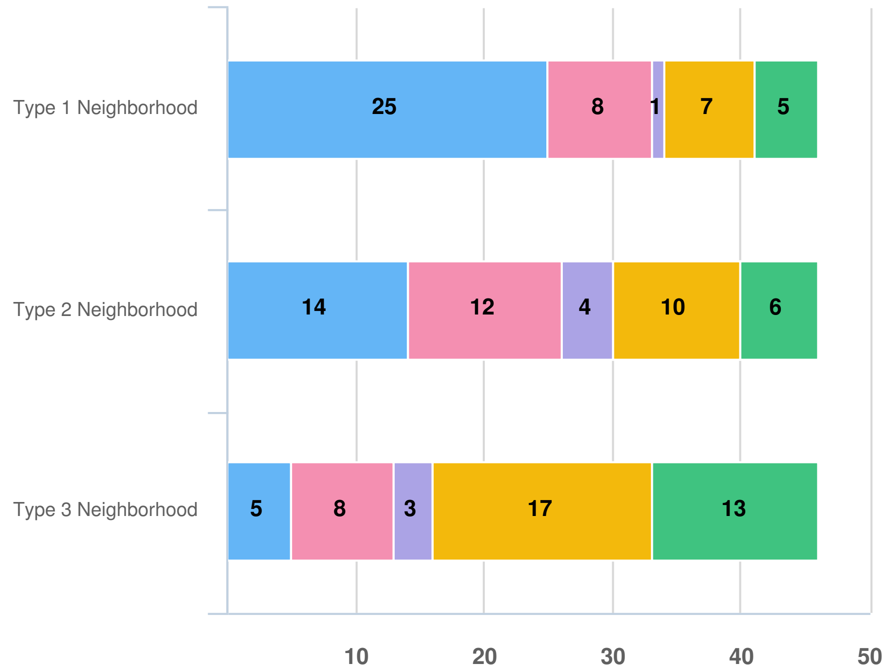


Question options

- I own my home and have or share primary responsibility for the mortgage
- I own my home and it is paid off
- I rent my home and have or share primary responsibility for the rent
- I live in a home owned by family or friends but do not help pay the mortgage
- I live in a home rented by family or friends but do not help pay the rent
- I do not have secure housing or I am currently houseless
- Unsure
- Other (please specify)

Mandatory Question (46 response(s))
Question type: Checkbox Question

Q7 How do you generally feel about the different neighborhood design types

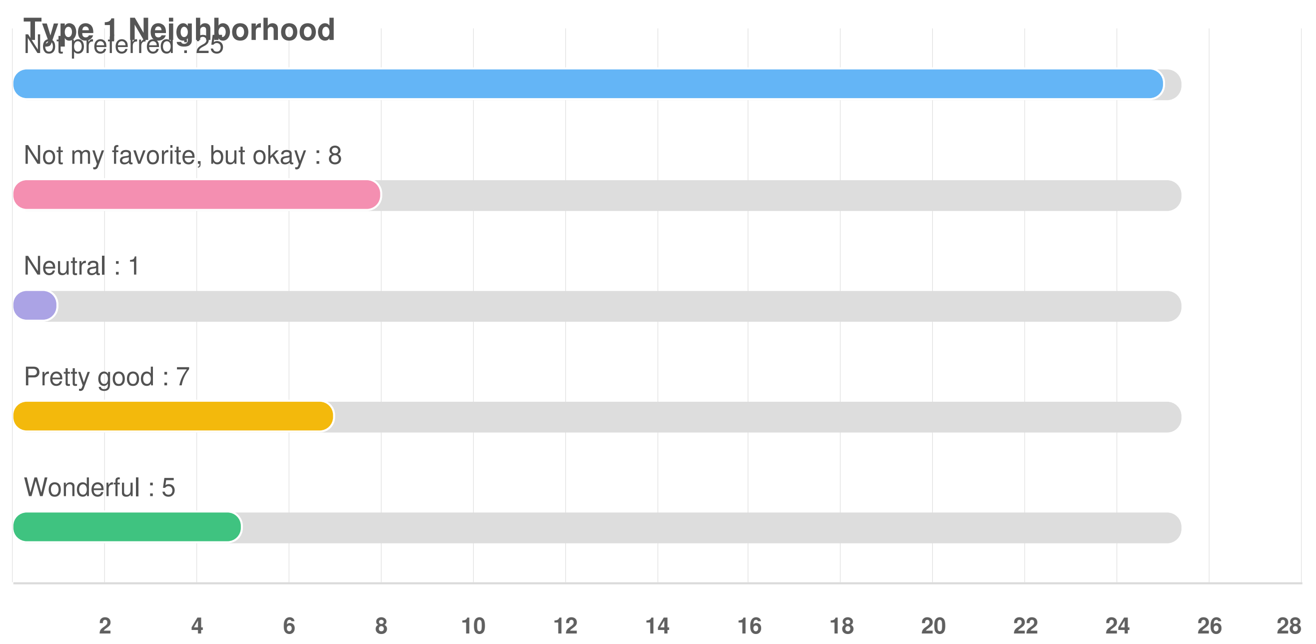


Question options

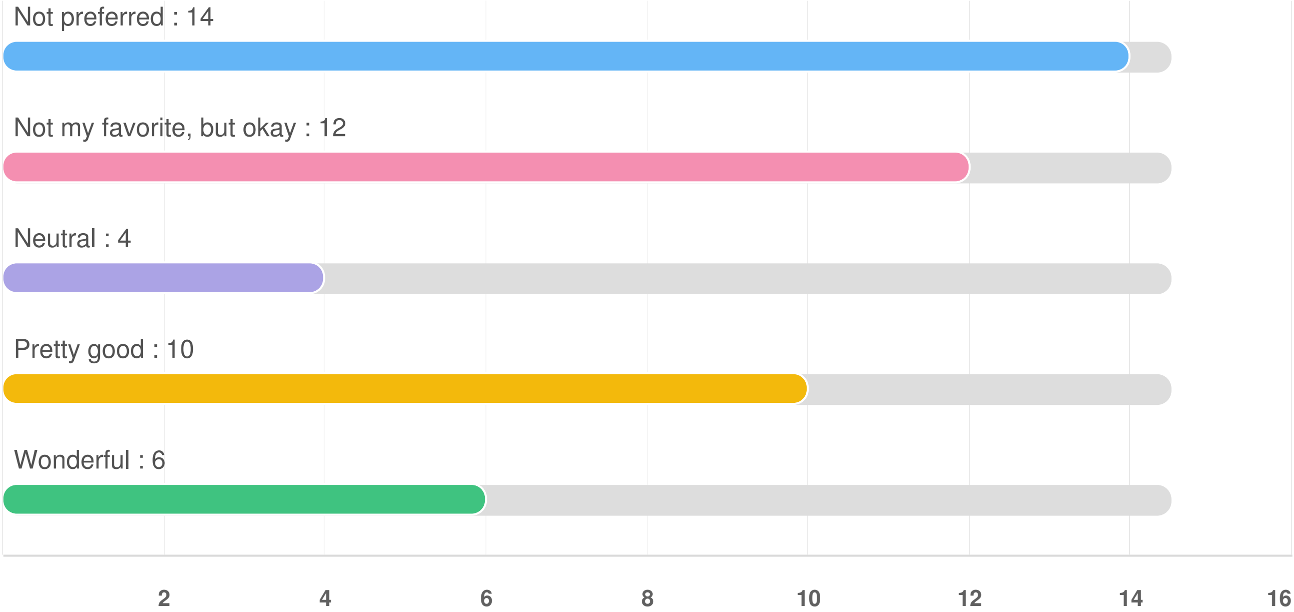
- Not preferred
- Not my favorite, but okay
- Neutral
- Pretty good
- Wonderful

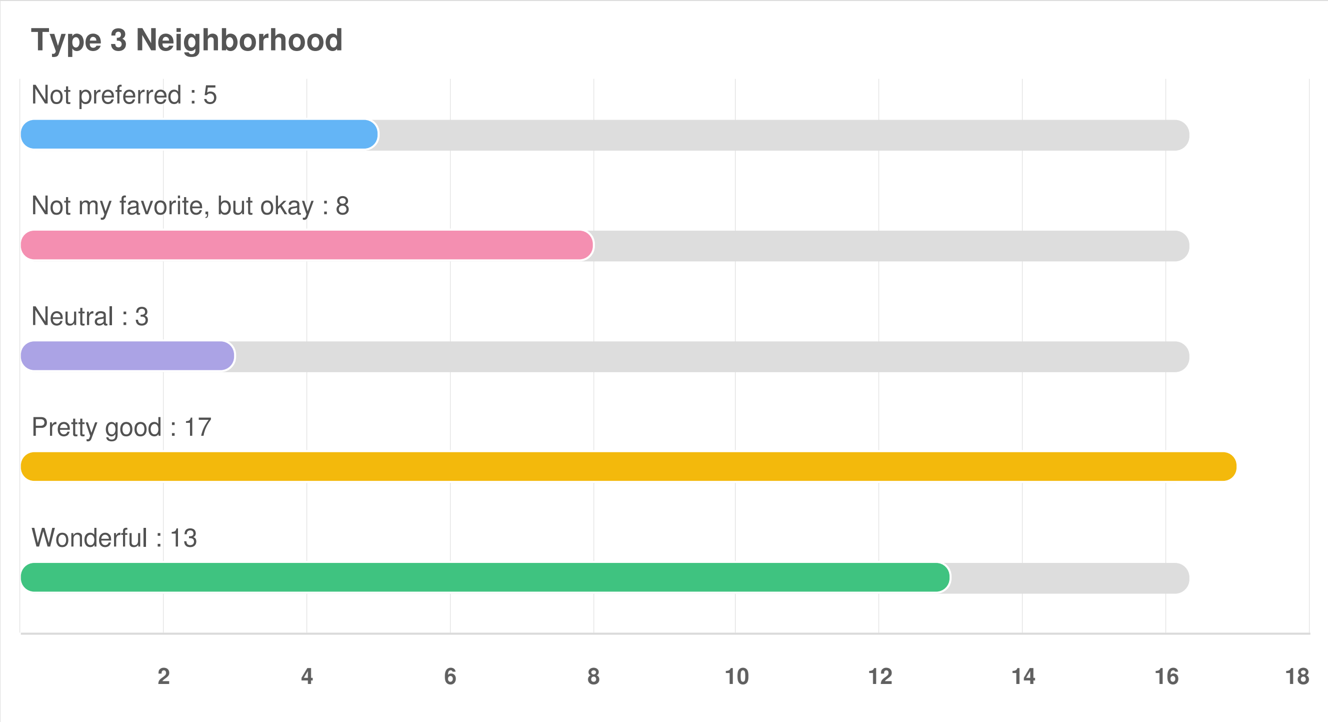
Optional question (46 response(s), 0 skipped)
Question type: Likert Question

Q7 How do you generally feel about the different neighborhood design types

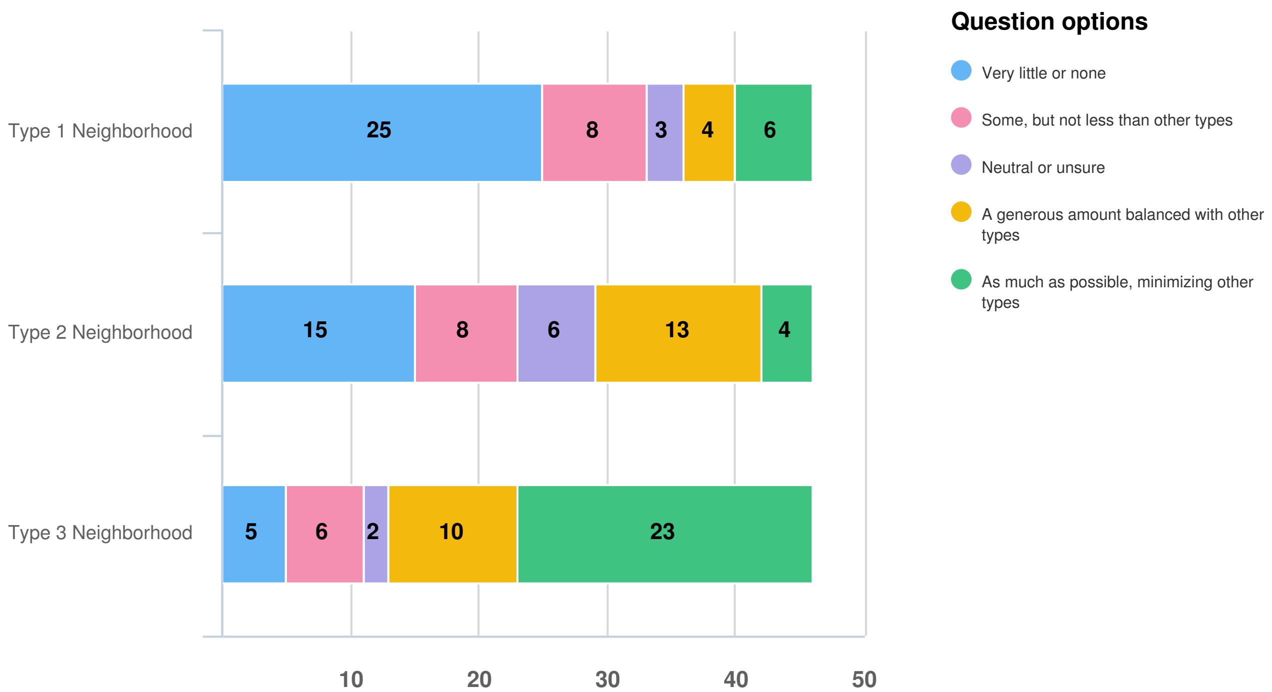


Type 2 Neighborhood



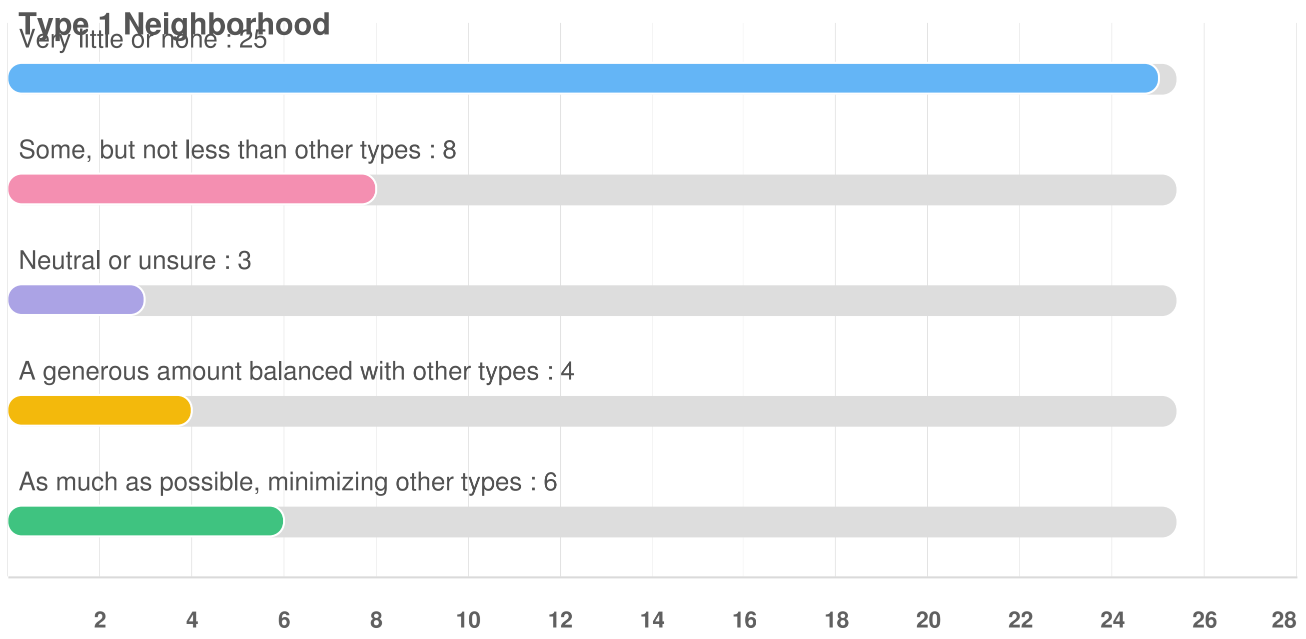


Q8 In your opinion, how much of each neighborhood type should be planned for in the Frog Pond East and South neighborhoods (sh...

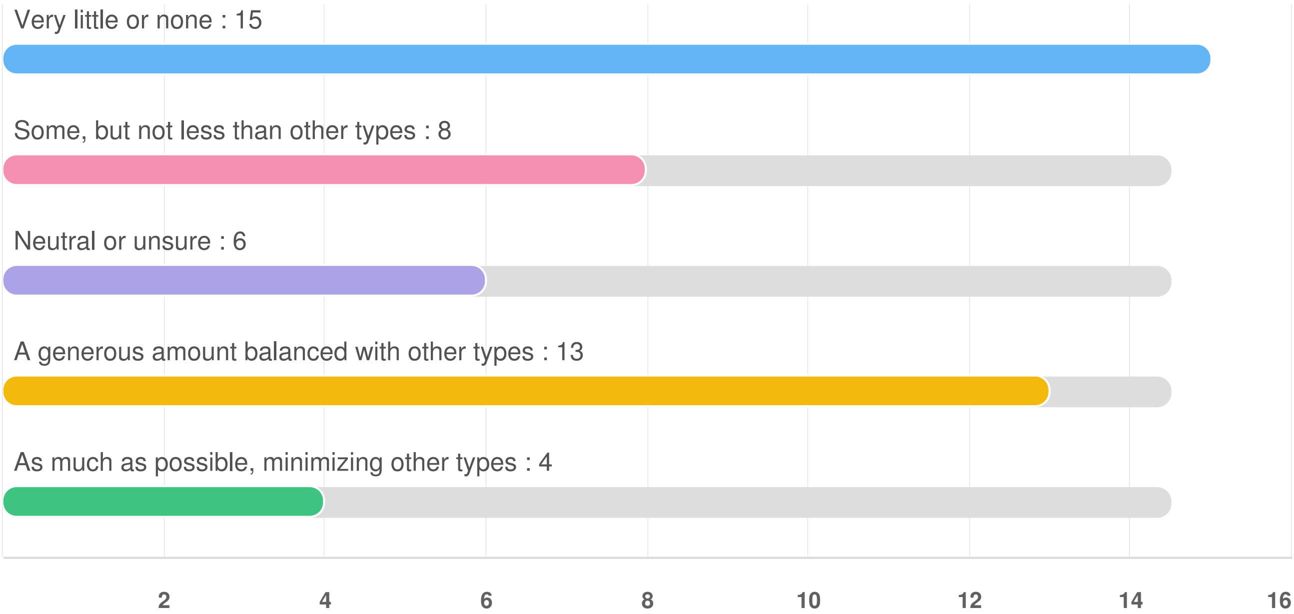


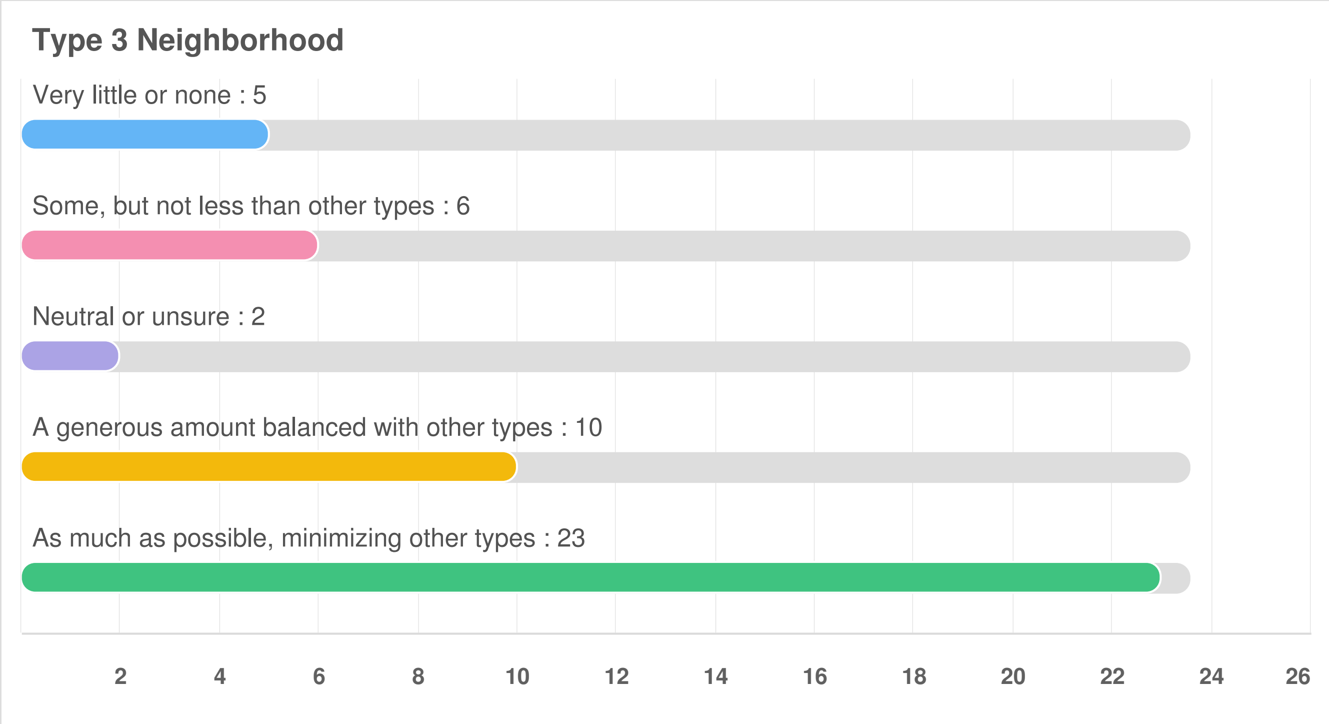
Mandatory Question (46 response(s))
Question type: Likert Question

Q8 **In your opinion, how much of each neighborhood type should be planned for in the Frog Pond East and South neighborhoods (sh...**



Type 2 Neighborhood

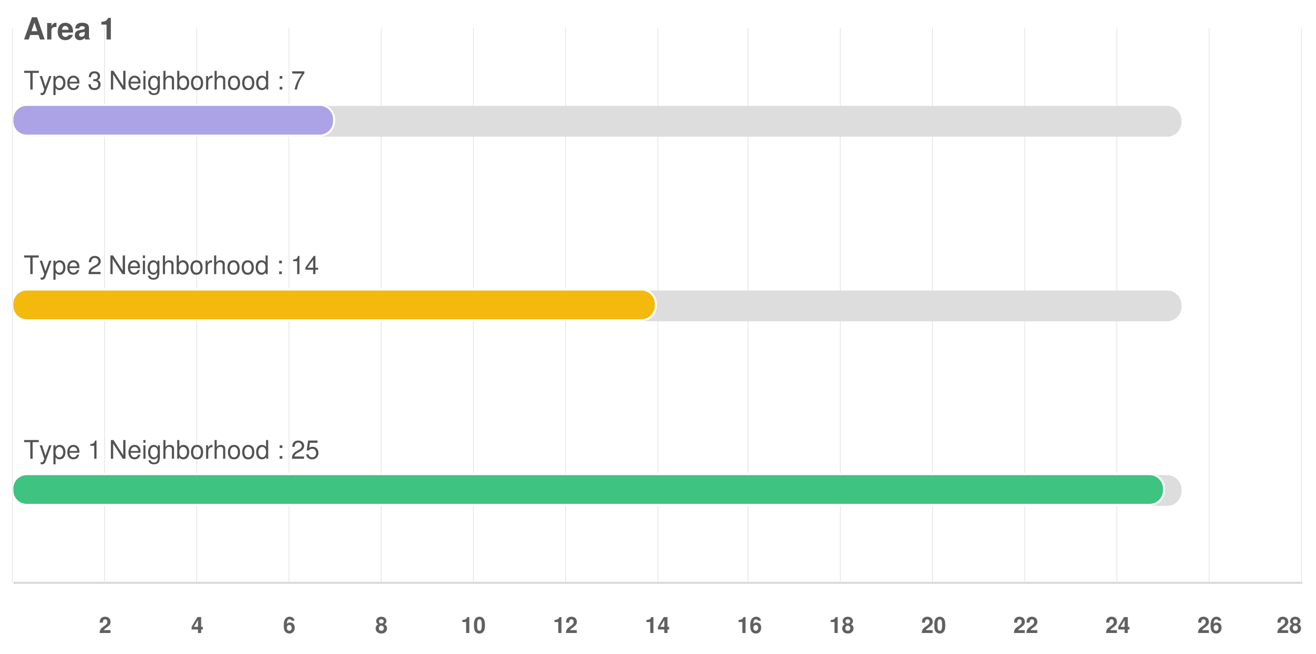



Type 3 Neighborhood
Very little or none : 5
Some, but not less than other types : 6
Neutral or unsure : 2
A generous amount balanced with other types : 10
As much as possible, minimizing other types : 23
2
4
6
8
10
12
14
16
18
20
22
24
26

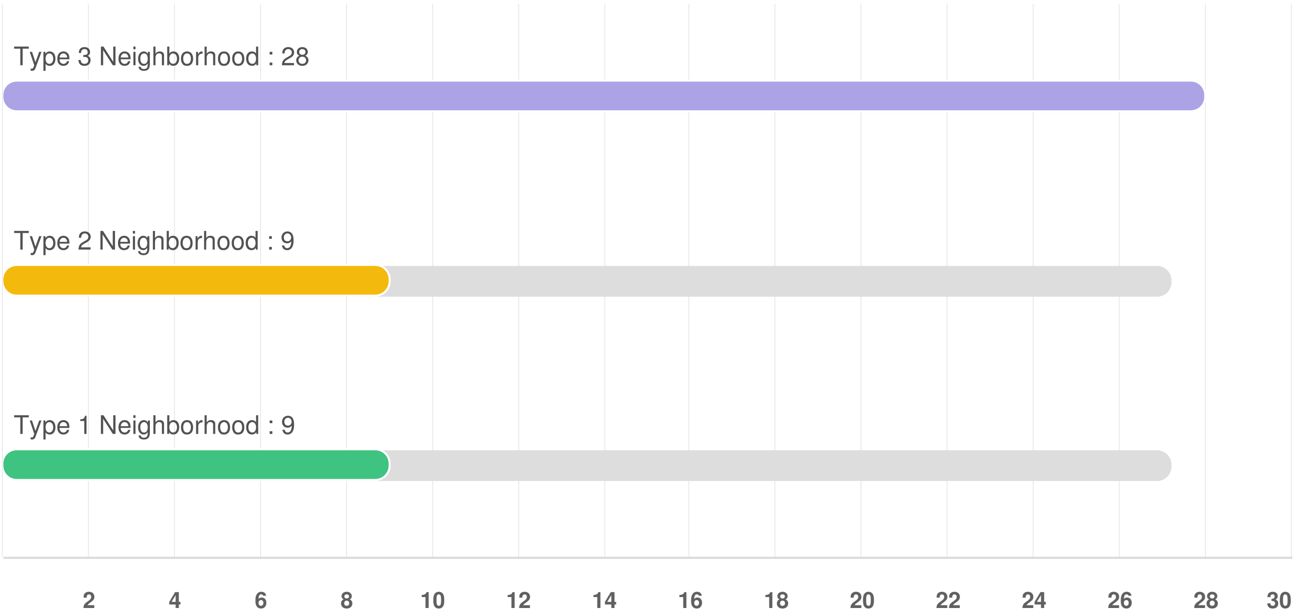
Q9 **In your opinion, what neighborhood design type is most appropriate for each location in the map above**

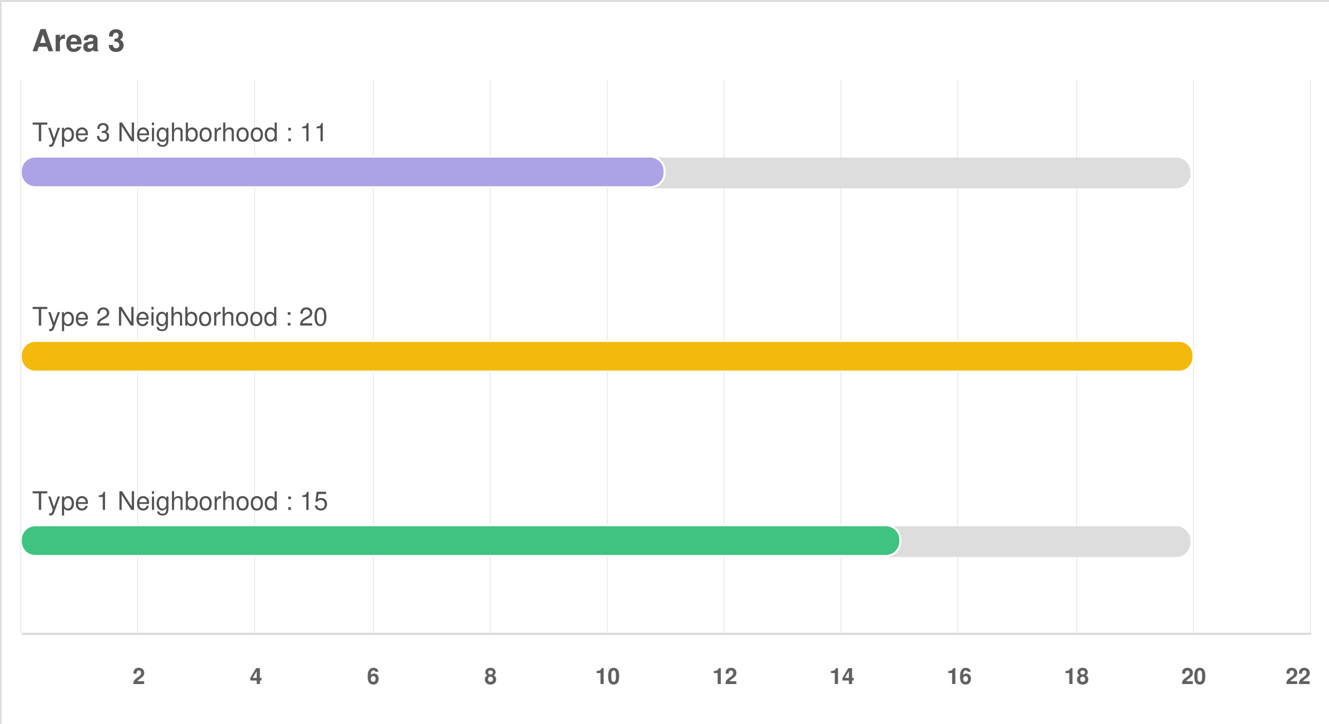
Mandatory Question (46 response(s))
Question type: Likert Question

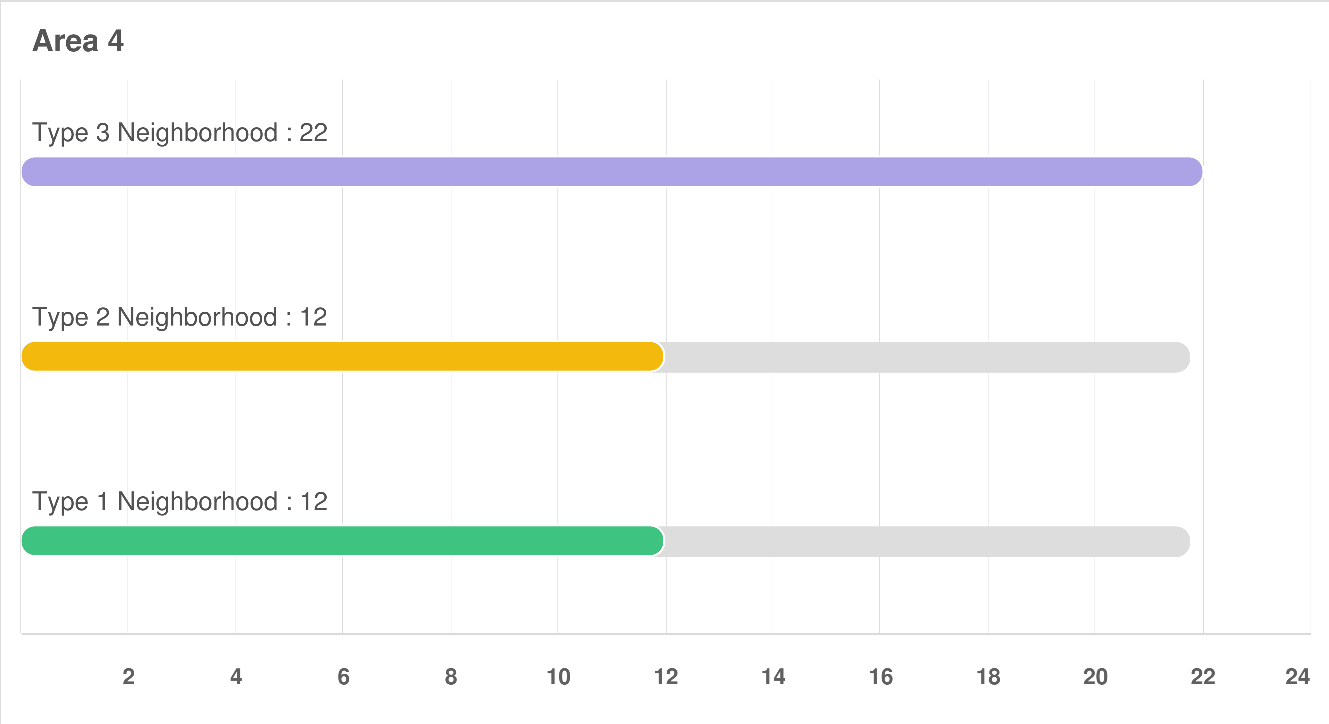
Q9 In your opinion, what neighborhood design type is most appropriate for each location in the map above



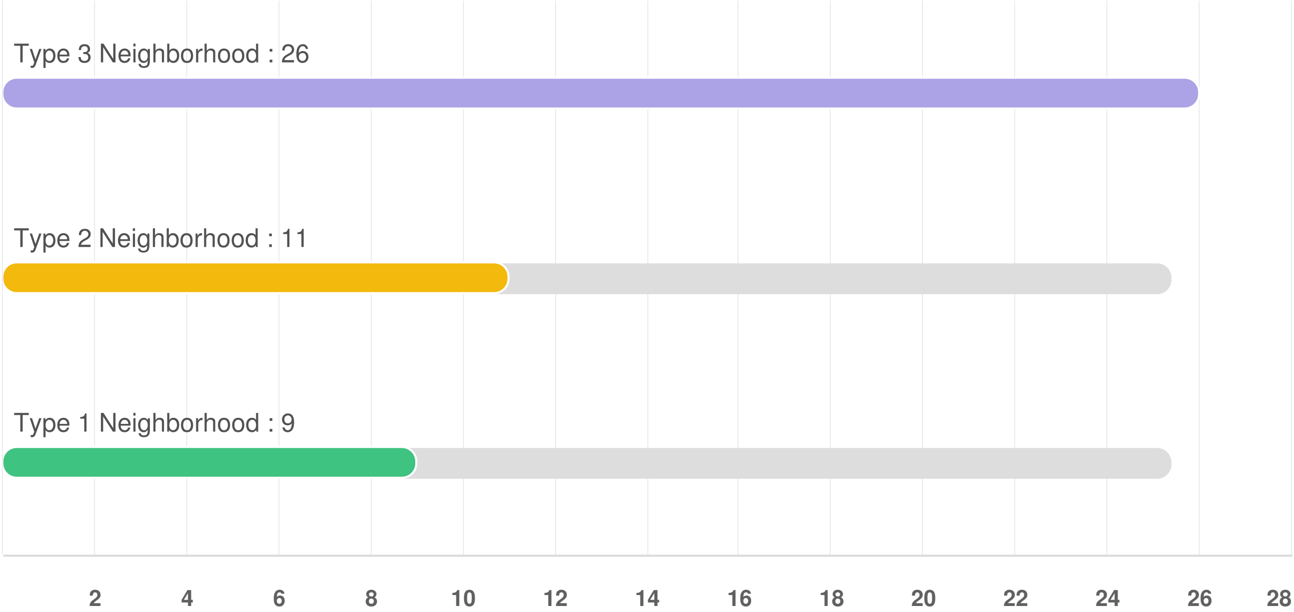
Area 2


Type 3 Neighborhood : 28
Type 2 Neighborhood : 9
Type 1 Neighborhood : 9
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30

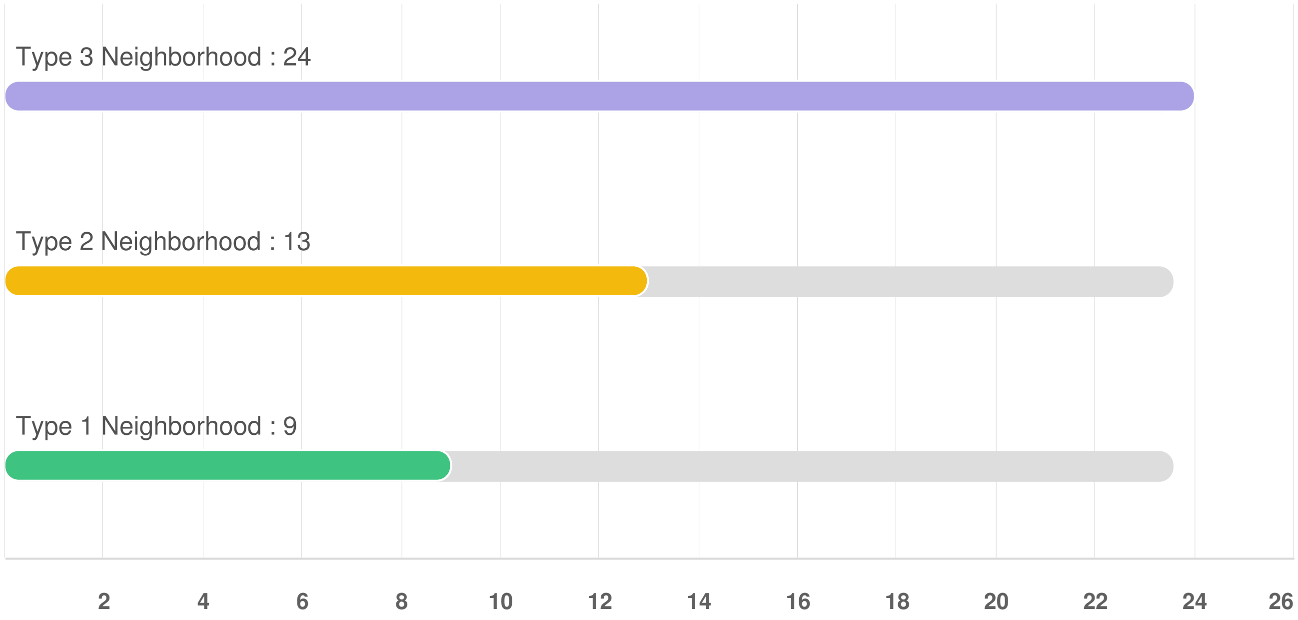

Area 3
Type 3 Neighborhood : 11
Type 2 Neighborhood : 20
Type 1 Neighborhood : 15
2
4
6
8
10
12
14
16
18
20
22


Area 4
Type 3 Neighborhood : 22
Type 2 Neighborhood : 12
Type 1 Neighborhood : 12
2
4
6
8
10
12
14
16
18
20
22
24

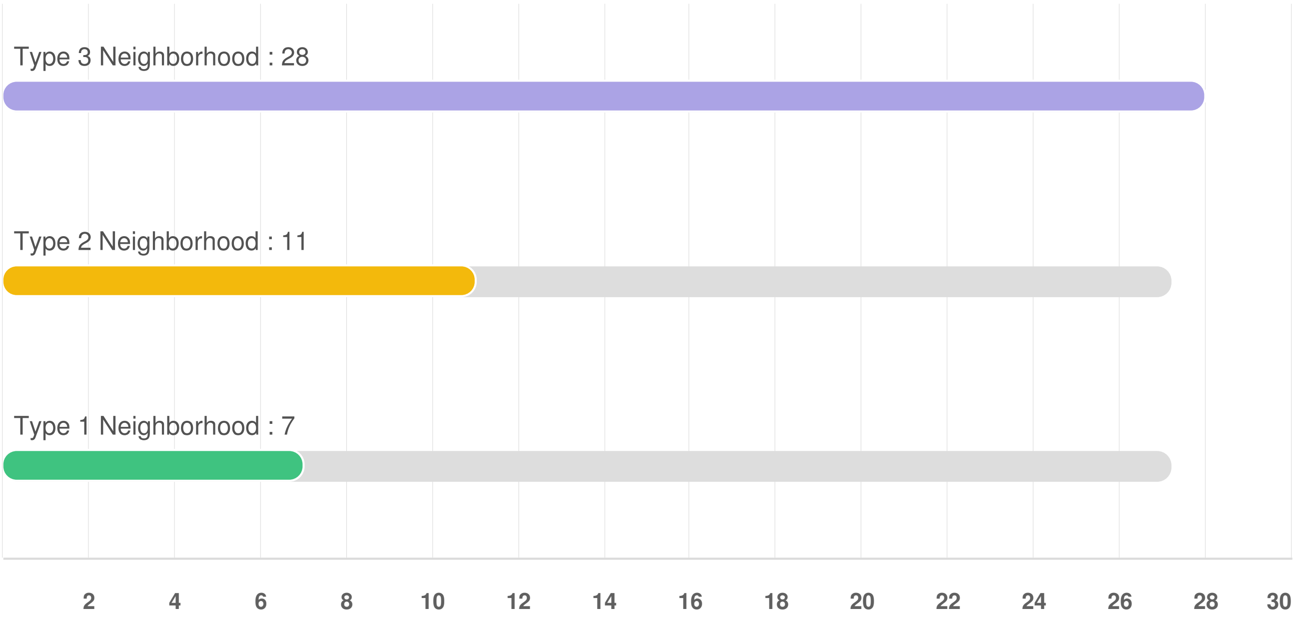
Area 5


Type 3 Neighborhood : 26
Type 2 Neighborhood : 11
Type 1 Neighborhood : 9
2
4
6
8
10
12
14
16
18
20
22
24
26
28

Area 6


Type 3 Neighborhood : 24
Type 2 Neighborhood : 13
Type 1 Neighborhood : 9
2
4
6
8
10
12
14
16
18
20
22
24
26

Area 7



Q10 Rank the locations in the neighborhoods from most preferred location (1) to least preferred location (7) for the Type 1 Nei...

OPTIONS	AVG. RANK
Area 1	2.46
Area 3	3.40
Area 4	3.71
Area 6	4.36
Area 2	4.60
Area 5	4.62
Area 7	4.82

Optional question (46 response(s), 0 skipped)
Question type: Ranking Question

Q11 Rank the locations in the neighborhoods from most preferred location (1) to least preferred location (7) for the Type 2 Neighborhood design type. (optional)

OPTIONS	AVG. RANK
Area 3	3.23
Area 4	3.44
Area 1	3.58
Area 2	4.16
Area 5	4.44
Area 6	4.56
Area 7	4.58

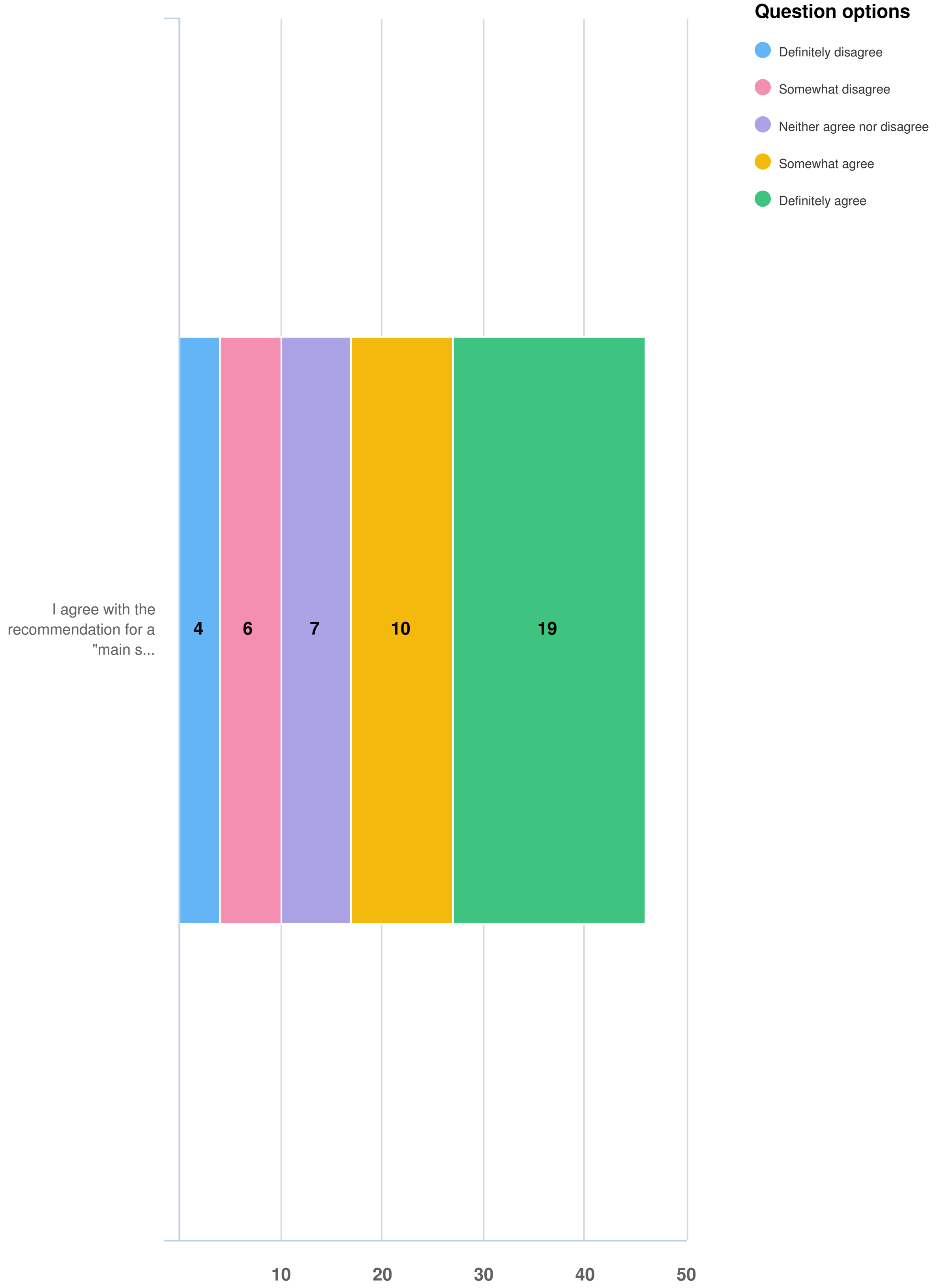
Optional question (43 response(s), 3 skipped)
Question type: Ranking Question

Q12 Rank the locations in the neighborhoods from most preferred location (1) to least preferred location (7) for the Type 3 Neighborhood design type. (optional)

OPTIONS	AVG. RANK
Area 7	3.21
Area 5	3.48
Area 2	3.81
Area 6	3.81
Area 4	4.02
Area 3	4.62
Area 1	5.05

Optional question (42 response(s), 4 skipped)
Question type: Ranking Question

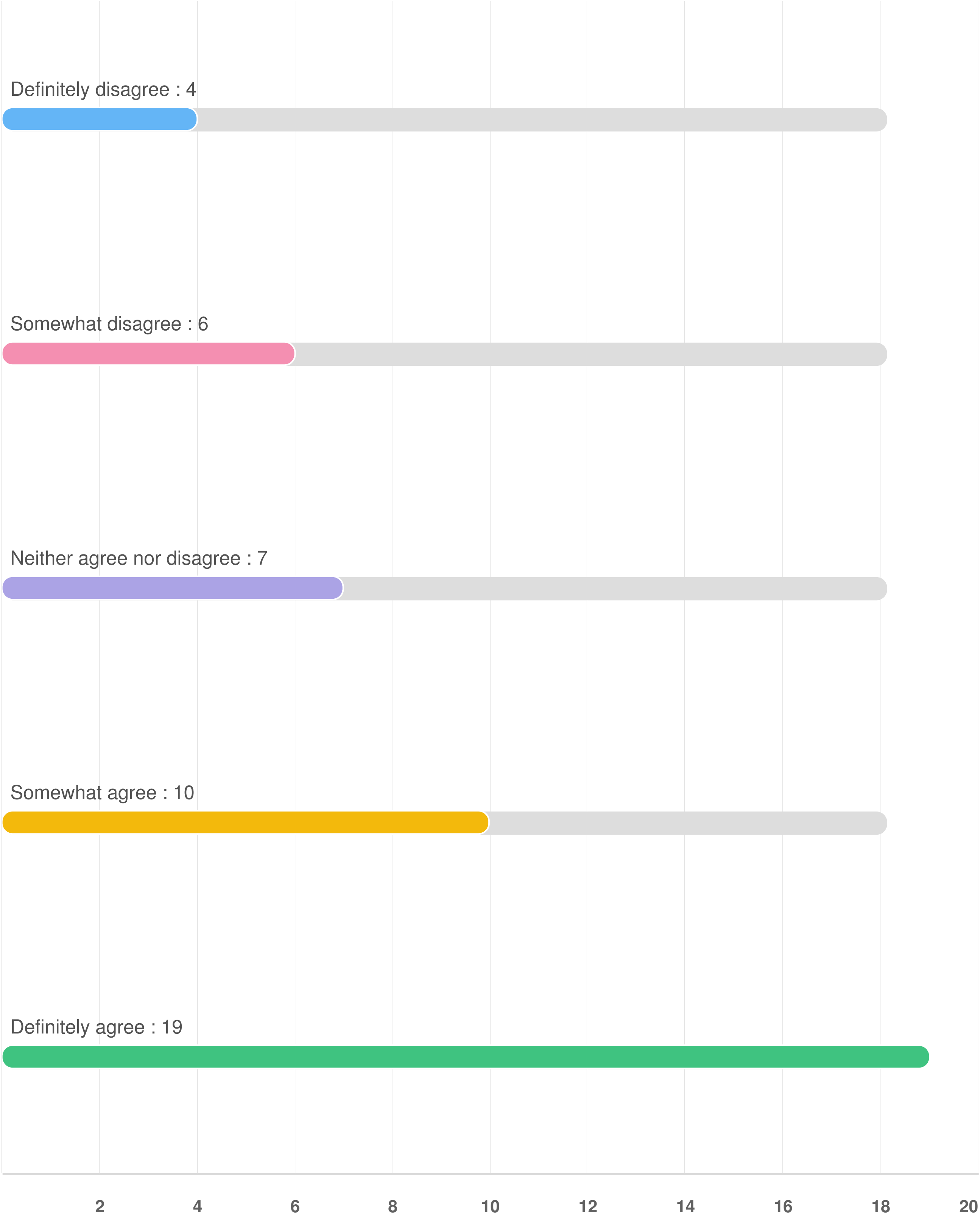
Q13 Indicate the degree to which you agree with the following statement:



Mandatory Question (46 response(s))
Question type: Likert Question

Q13 Indicate the degree to which you agree with the following statement:

I agree with the recommendation for a "main street style" neighborhood commercial center on Brisband Street off Stafford Road.



Housing Survey

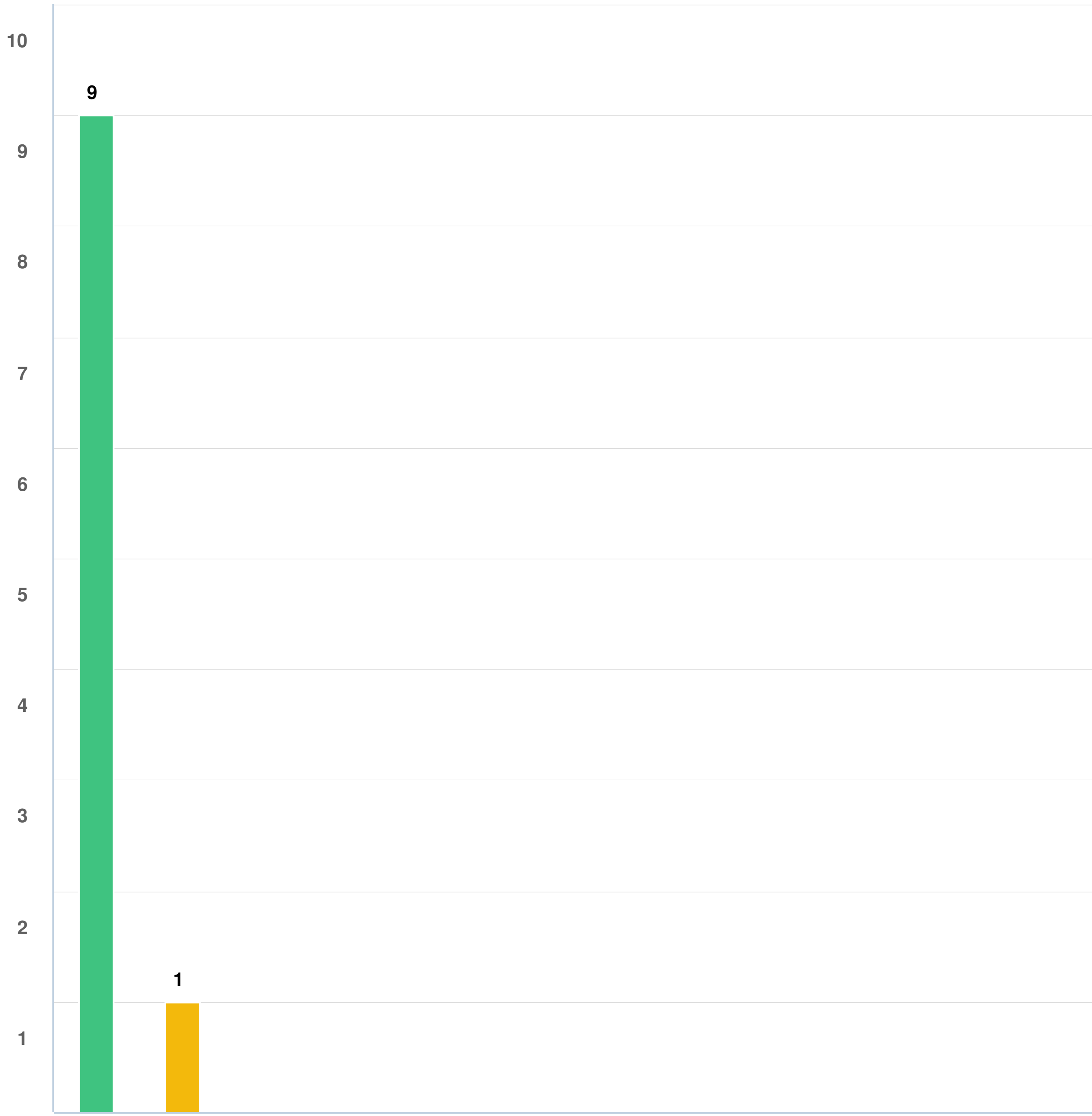
SURVEY RESPONSE REPORT
19 July 2019 - 27 October 2022

PROJECT NAME:
Frog Pond East and South Master Plan

BANG THE TABLE engagementHQ

SURVEY QUESTIONS

Q1 Which of the following types of housing do you currently live in?

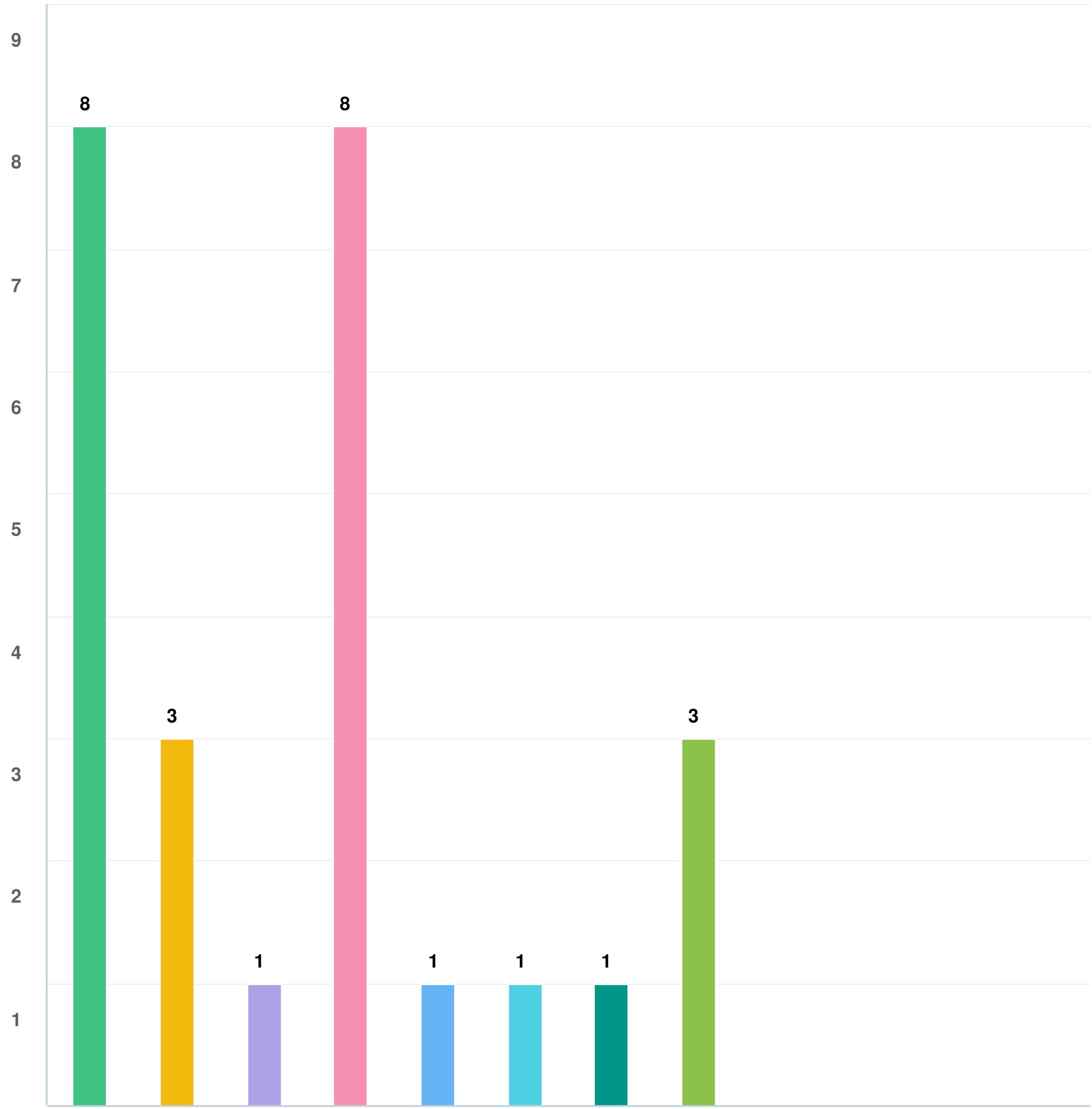


Question options

- Detached single-family home
- Apartment or Condo
- Duplex, triplex, quadplex
- Townhouse
- Manufactured Home or Mobile Home
- Cluster Housing
- Cottage Cluster
- Congregate housing (i.e. dorms, etc.)
- Accessory Dwelling Unit "ADU"
- RV (more than 30 days in a row without another home)
- I am currently houseless
- Other (please specify)

Mandatory Question (10 response(s))
Question type: Checkbox Question

Q2 Which of the following types of housing have you lived in during your life? (select all that apply)

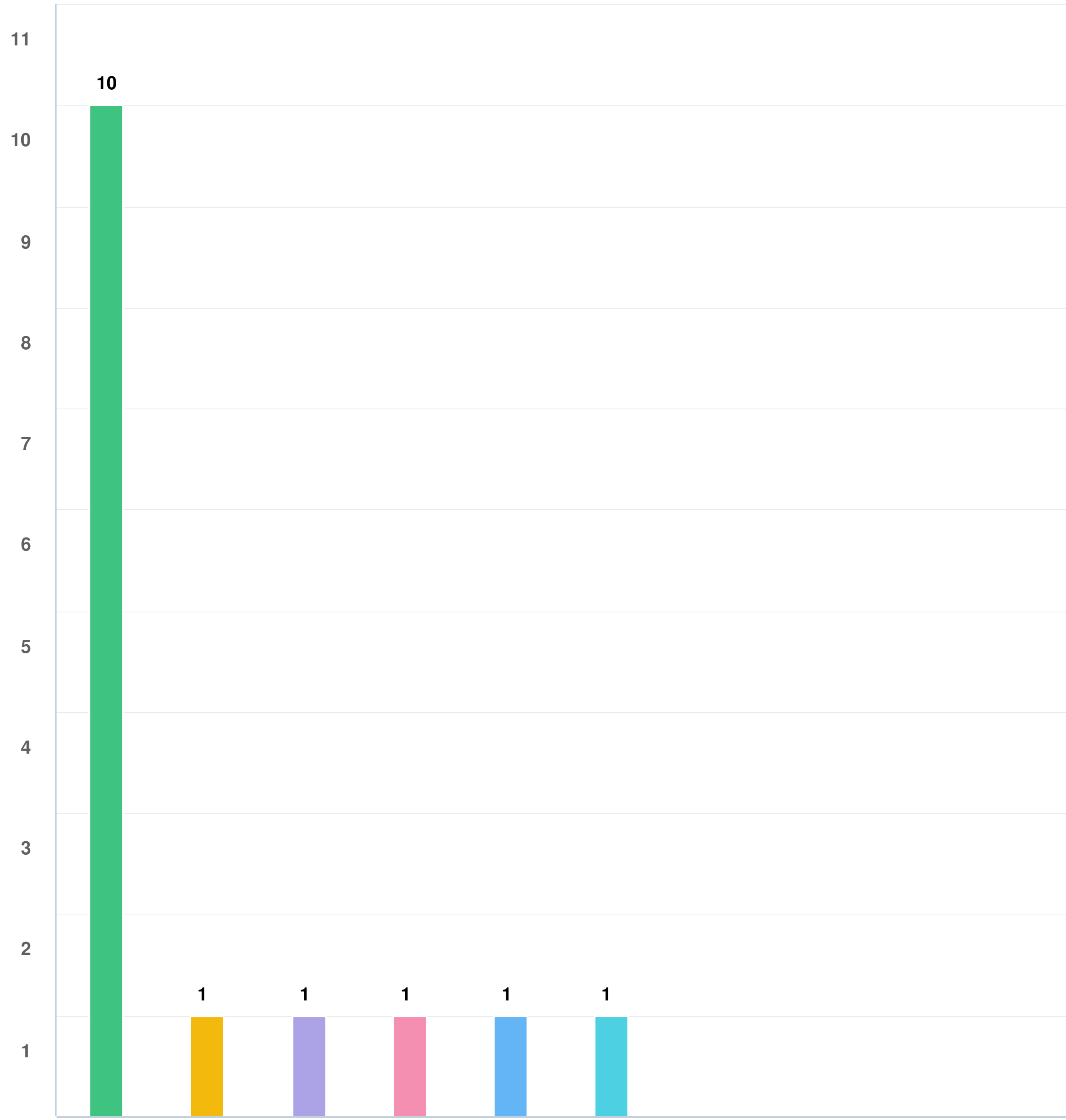


Question options

- Detached single-family home
- Duplex, triplex, quadplex
- Townhouse
- Apartment or Condo
- Cluster Housing
- Accessory Dwelling Unit "ADU"
- Manufactured Home or Mobile Home
- Congregate housing (i.e. dorms, etc.)
- Cottage Cluster
- RV (more than 30 days in a row without another home)
- I have experienced being houseless
- Other (please specify)

Mandatory Question (10 response(s))
Question type: Checkbox Question

Q3 Which of the following types of housing do you think you may live in in the future? (select all that apply)

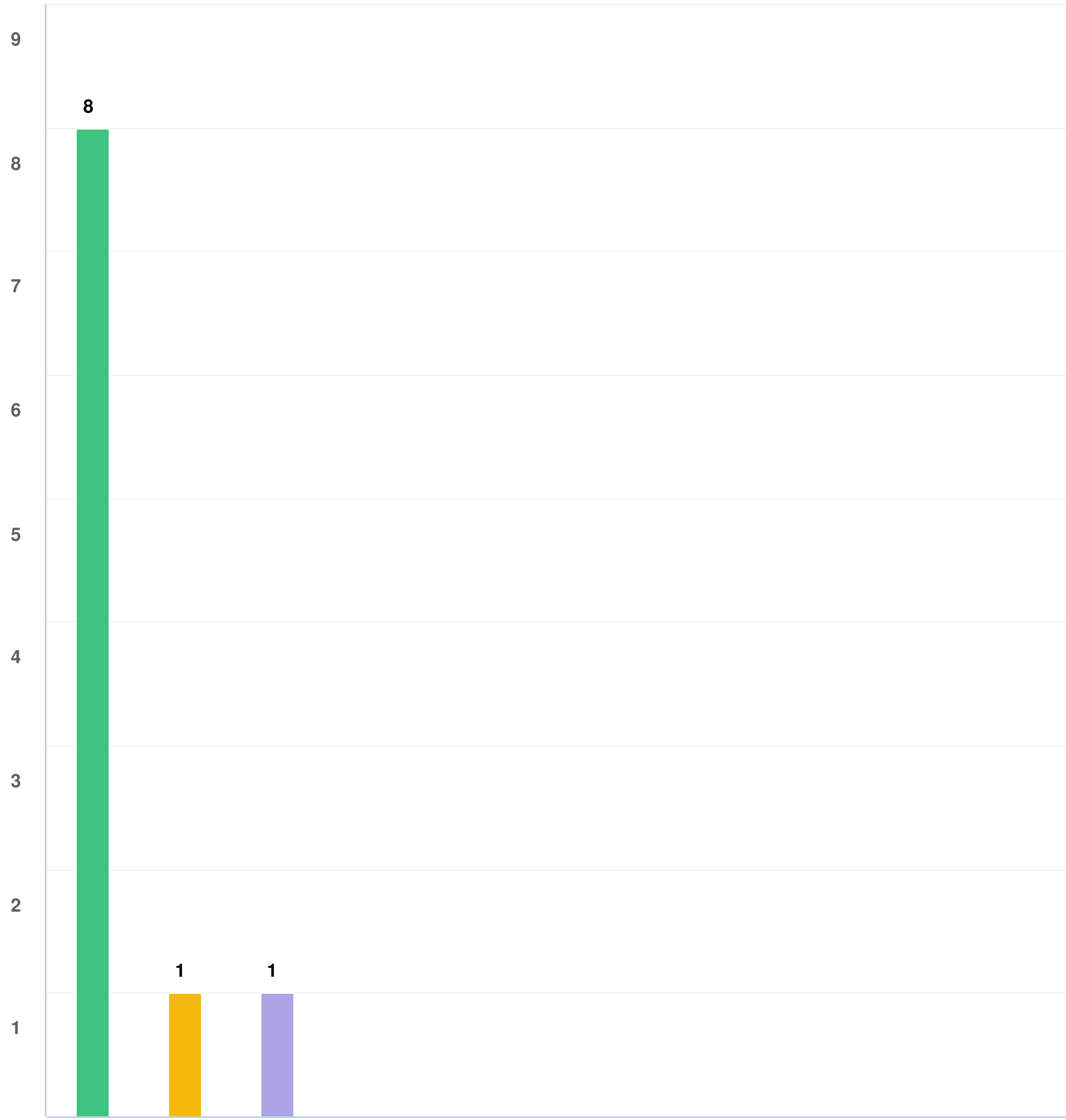


Question options

- Detached single-family home
- Duplex, triplex, quadplex
- Townhouse
- Cluster Housing
- Cottage Cluster
- Accessory Dwelling Unit "ADU"
- Apartment or Condo
- Manufactured Home or Mobile Home
- RV (more than 30 days in a row without another home)
- Congregate housing (i.e. dorms, etc.)

Mandatory Question (10 response(s))
Question type: Checkbox Question

Q4 If you were searching for a home in Wilsonville today or in the next few years, and cost was not a consideration, which of ...

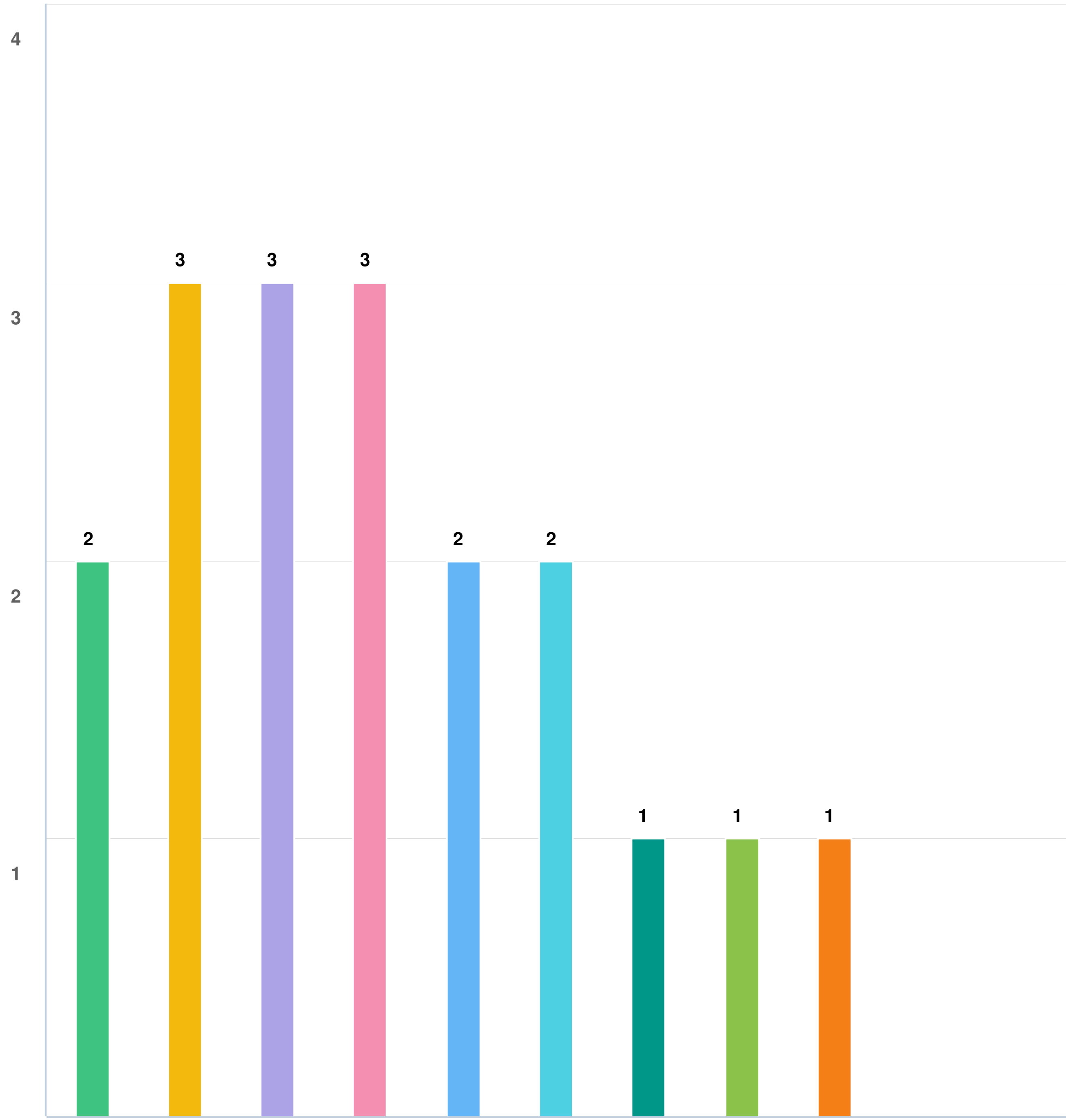


Question options

- Detached single-family home
- Townhouse
- Cottage Cluster
- Duplex, triplex, quadplex
- Apartment or Condo
- Cluster Housing
- Manufactured Home or Mobile Home
- Accessory Dwelling Unit "ADU"
- RV
- Congregate housing (i.e. dorms, etc.)
- Other (please specify)

Mandatory Question (10 response(s))
Question type: Checkbox Question

Q5 If you could not afford the preferred type of housing indicated in Question 5, which of the following types of housing woul...

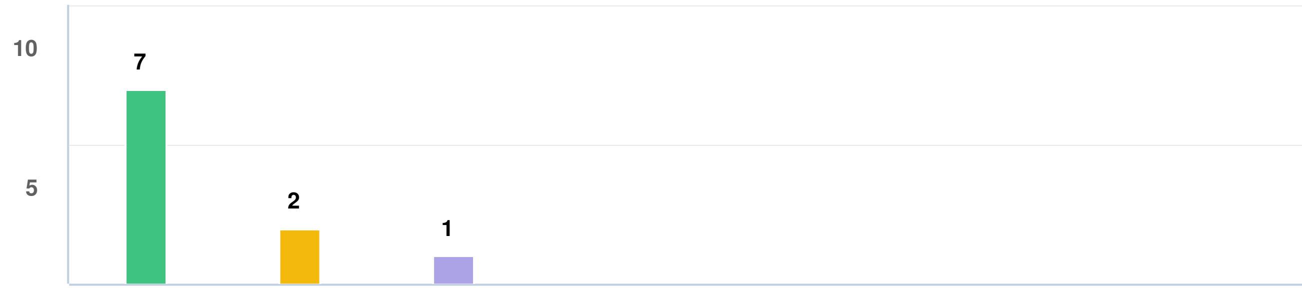


Question options

- Detached single-family home
- Duplex, triplex, or quadplex
- Townhouse
- Apartment or Condo
- Cluster Housing
- Cottage Cluster
- Accessory Dwelling Unit "ADU"
- Manufactured Home or Mobile Home
- RV
- Congregate housing (i.e. dorms, etc.)
- Other (please specify)

Mandatory Question (10 response(s))
Question type: Checkbox Question

Q6 Which of the following best describes your current living situation?



Question options

- I own my home and have or share primary responsibility for the mortgage
- I own my home and it is paid off
- I rent my home and have or share primary responsibility for the rent
- I live in a home owned by family or friends but do not help pay the mortgage
- I live in a home rented by family or friends but do not help pay the rent
- I do not have secure housing or I am currently houseless
- Unsure
- Other (please specify)

Mandatory Question (10 response(s))
Question type: Checkbox Question

Encuesta Comunitaria

SURVEY RESPONSE REPORT
19 July 2019 - 27 October 2022

PROJECT NAME:
Frog Pond East and South Master Plan

BANG THE TABLE engagementHQ

SURVEY QUESTIONS

Q1 ¿Cuál es su nombre?

Anonymous 8/25/2022 07:04 PM	Araceli Modesto

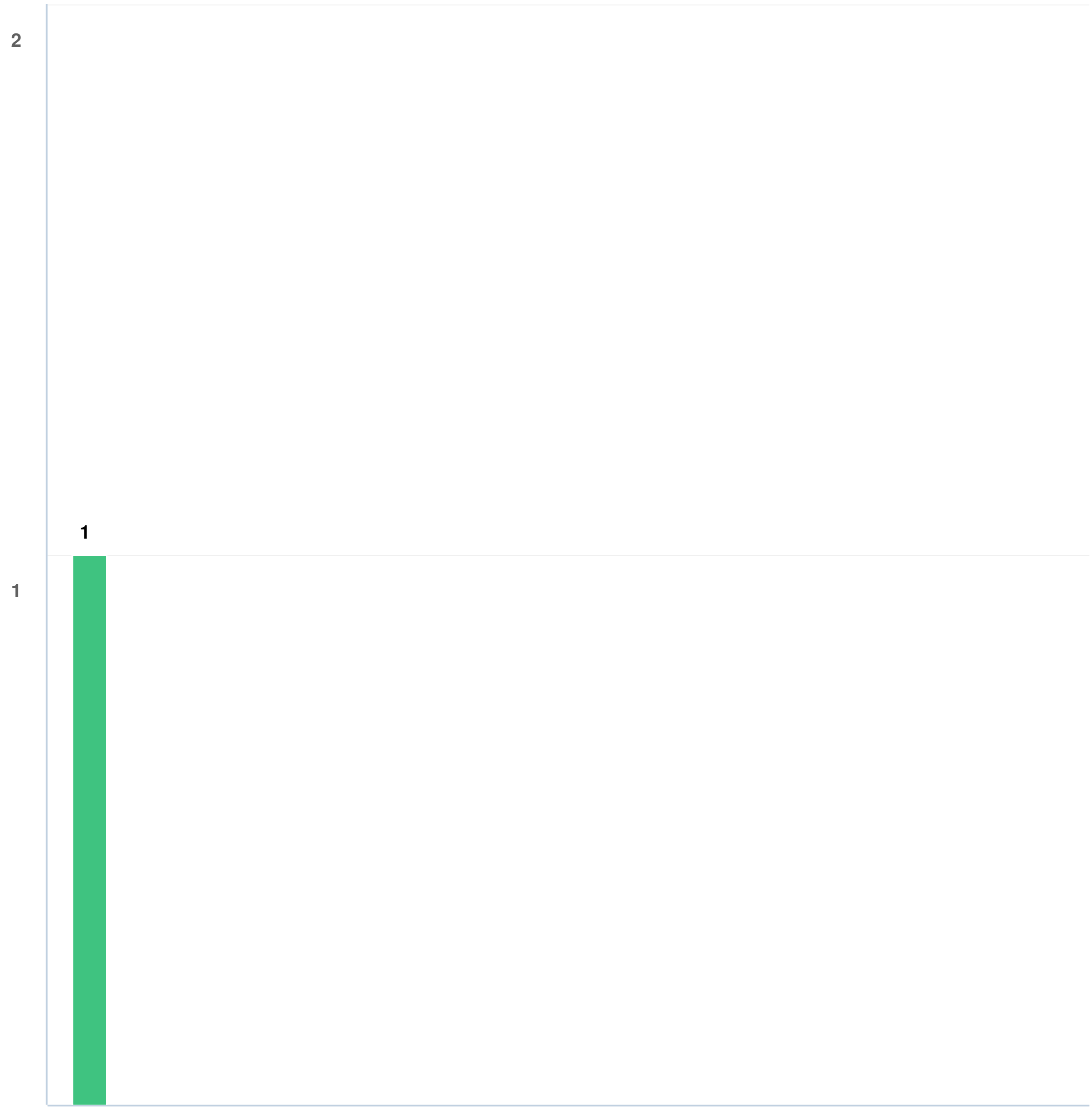
Mandatory Question (1 response(s))
Question type: Single Line Question

Q2 ¿Cuál es su correo electrónico o número de teléfono?

Anonymous 8/25/2022 07:04 PM	Aracelimodesto14@gmail.com

Mandatory Question (1 response(s))
Question type: Single Line Question

Q3 ¿En cuál de los tipos siguientes de vivienda vive actualmente?

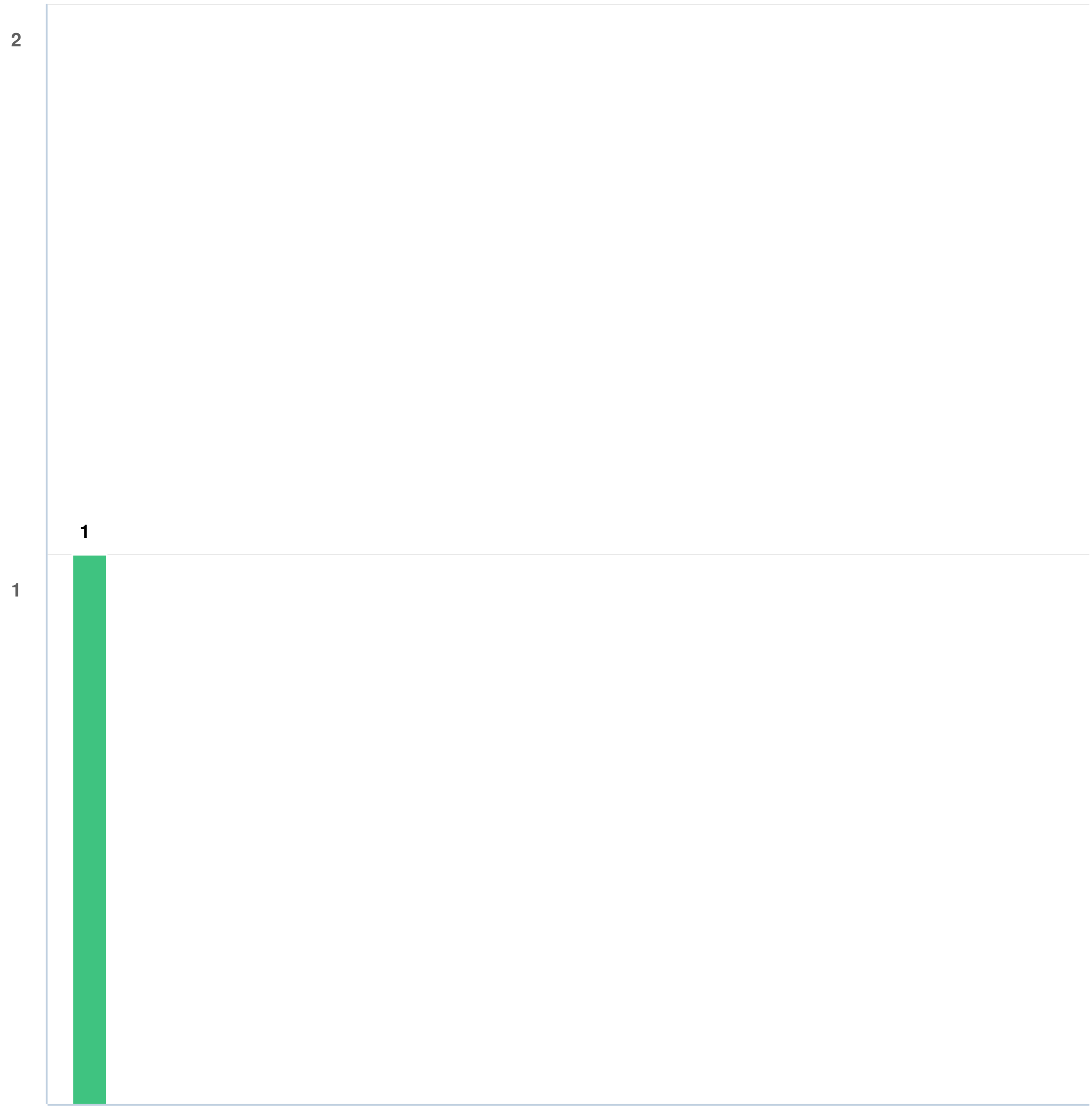


Question options

- Casa prefabricada o casa móvil
- Vivienda unifamiliar separada
- Dos unidades, tres unidades, cuatro unidades
- Casa adosada
- Apartamento o Condominio
- Vivienda en racimo
- Unidad de Vivienda Accesoria (ADU)
- Casas estilo cabaña
- Vivienda colectiva (es decir, dormitorios, etc.)
- RV (más de 30 días seguidos sin otra vivienda)
- Estoy sin casa ahorita
- Otro (por favor especifique)

Mandatory Question (1 response(s))
Question type: Checkbox Question

Q4 ¿En cuál de los tipos siguientes de vivienda ha vivido durante su vida (seleccione todas las que correspondan)

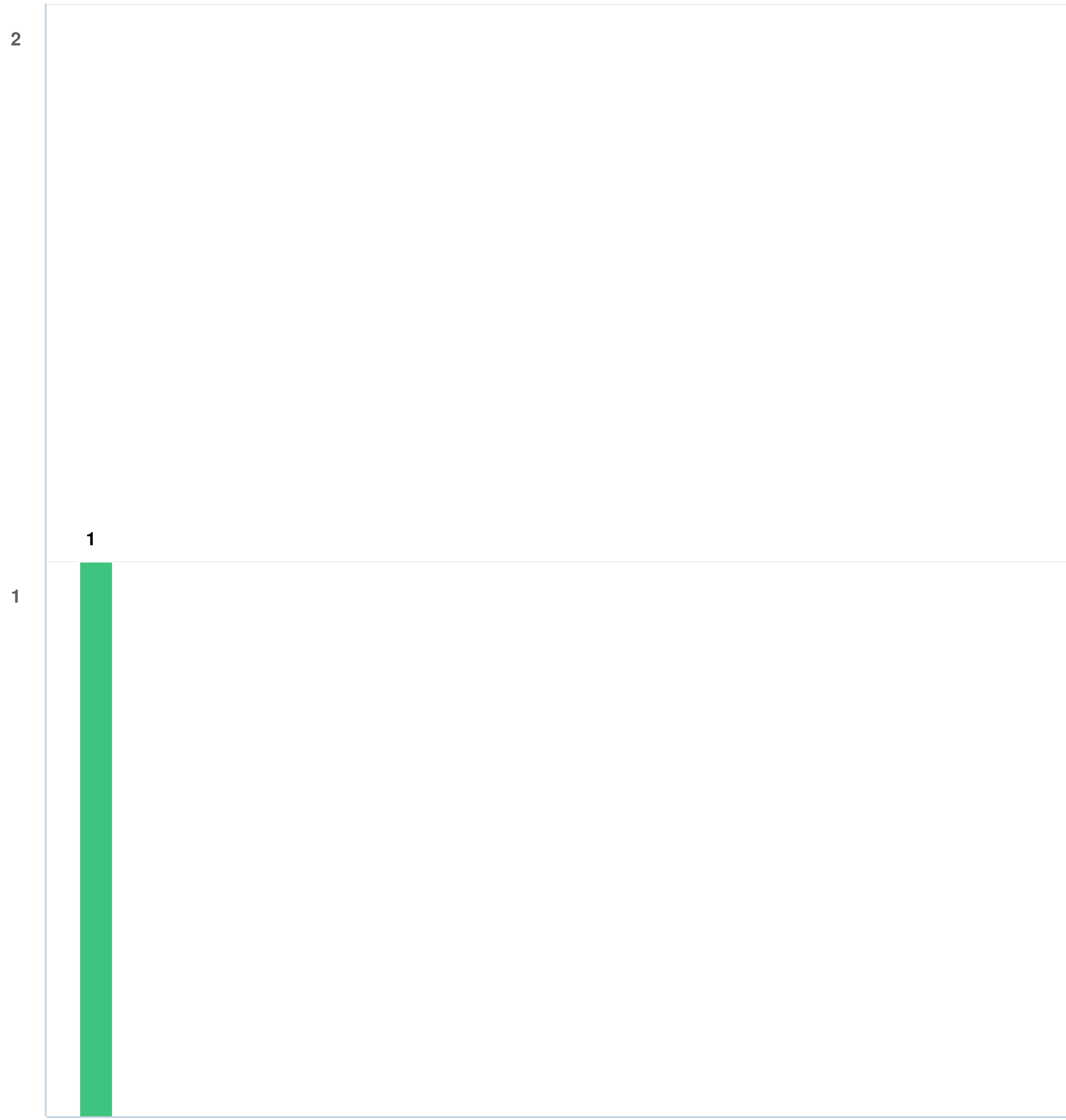


Question options

- Apartamento o Condomínio
- Vivienda unifamiliar separada
- Dos unidades, tres unidades, cuatro unidades
- Casa adosada
- Casa prefabricada o casa móvil
- Vivienda en racimo
- Unidad de Vivienda Accesoria (ADU)
- Casas estilo cabaña
- Vivienda colectiva (es decir, dormitorios, etc.)
- RV (más de 30 días seguidos sin otra vivienda)
- He experimentado estar sin hogar
- Otro (por favor especifique)

Mandatory Question (1 response(s))
Question type: Checkbox Question

Q5 ¿En cuál de los tipos siguientes de vivienda cree que podría vivir en el futuro? (seleccione todas las que correspondan)

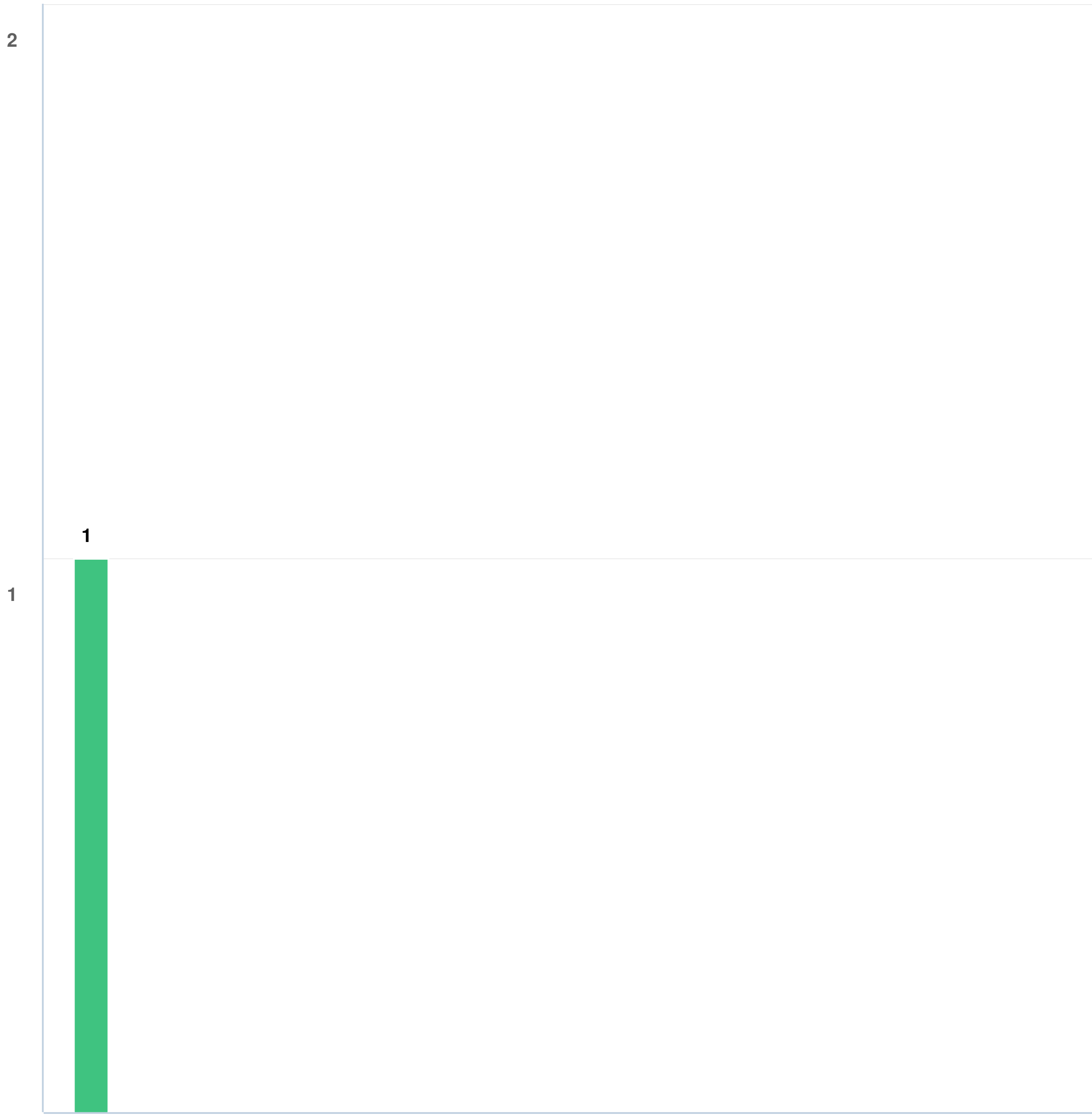


Question options

- Unidad de Vivienda Accesoria (ADU)
- Vivienda unifamiliar separada
- Dos unidades, tres unidades, cuatro unidades
- Casa adosada
- Apartamento o Condomínio
- Casa prefabricada o casa móvil
- Vivienda en racimo
- Casas estilo cabaña
- Vivienda colectiva (es decir, dormitorios, etc.)
- RV (más de 30 días seguidos sin otra vivienda)

Mandatory Question (1 response(s))
Question type: Checkbox Question

Q6 Si estuviera buscando una casa en Wilsonville hoy o en los próximos años, y el costo no fuera una consideración, ¿cuál de l...

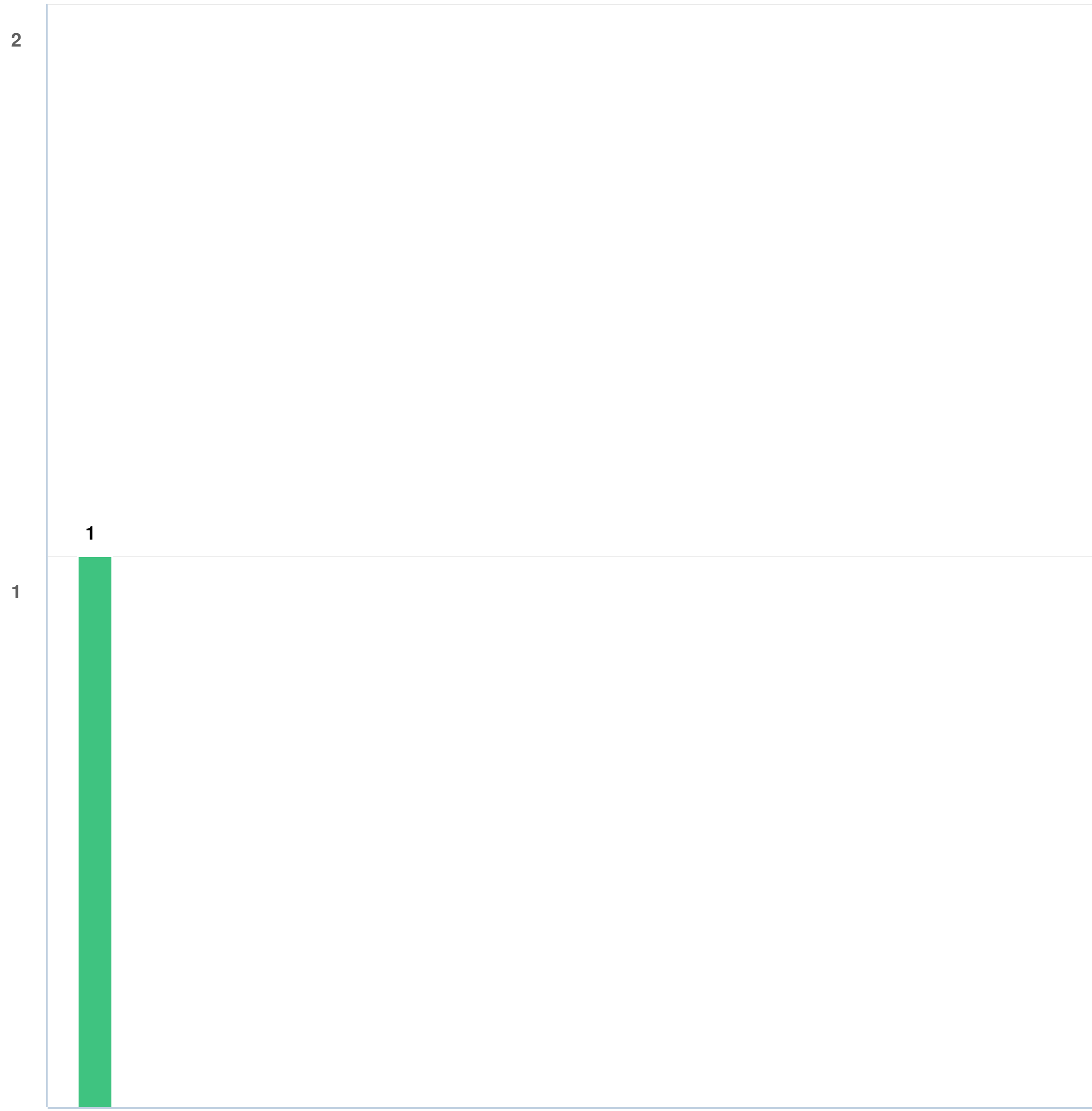


Question options

- Unidad de Vivienda Accesoria (ADU)
- Vivienda unifamiliar separada
- Dos unidades, tres unidades, cuatro unidades
- Casa adosada
- Apartamento o Condomínio
- Casa prefabricada o casa móvil
- Vivienda en racimo
- Casas estilo cabaña
- Vivienda colectiva (es decir, dormitorios, etc.)
- RV (más de 30 días seguidos sin otra vivienda)
- Otro (por favor especifique)

Mandatory Question (1 response(s))
Question type: Checkbox Question

Q7 Si no pudiera pagar el tipo de vivienda preferido indicado en la Pregunta 4, ¿cuál de los tipos siguientes de vivienda cons...

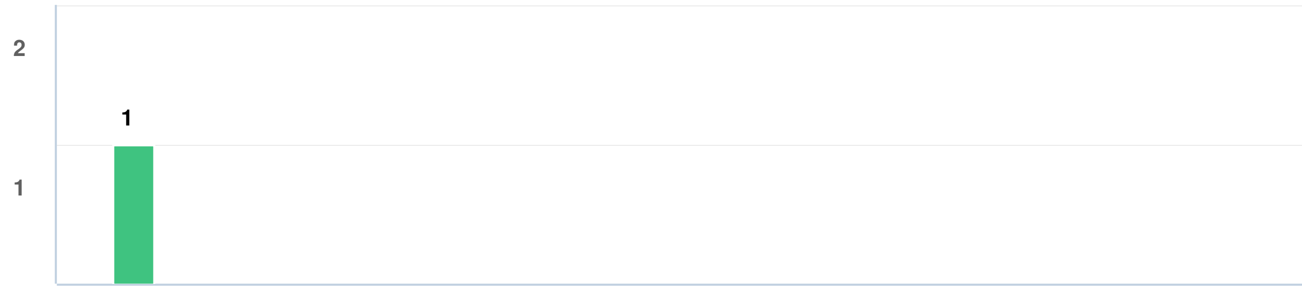


Question options

- Casa prefabricada o casa móvil
- Vivienda unifamiliar separada
- Dos unidades, tres unidades, cuatro unidades
- Casa adosada
- Apartamento o Condomínio
- Vivienda en racimo
- Unidad de Vivienda Accesoria (ADU)
- Casas estilo cabaña
- Vivienda colectiva (es decir, dormitorios, etc.)
- RV (más de 30 días seguidos sin otra vivienda)
- Otro (por favor especifique)

Mandatory Question (1 response(s))
Question type: Checkbox Question

Q8 ¿Cuál de las siguientes describe mejor su situación de vida ahorita?



Question options

- Soy dueño de mi casa y está pagada
- Soy dueño de mi casa y tengo o comparto la responsabilidad principal de la hipoteca
- Alquilo mi casa y tengo o comparto la responsabilidad principal por el alquiler
- Vivo en una casa propiedad de familiares o amigos pero no ayudo a pagar la hipoteca
- Vivo en una casa alquilada por familiares o amigos pero no ayudo a pagar el alquiler
- No tengo una vivienda segura o estoy sin hogar ahorita
- Inseguro
- Otro (por favor especifique)

Mandatory Question (1 response(s))
Question type: Checkbox Question

Meeting Summary – Affordable Housing Focus Group with First-Time Homebuyers

When: June 6th, 2022; 5:30-7 p.m.
Where: Zoom
Participants:
Project team: Georgia McAlister (City of Wilsonville); Dan Pauly (City of Wilsonville); Becky Hewitt (ECONorthwest); Virginia Wiltshire-Gordon (ECONorthwest)
Attendees: 5 first-time homebuyers living in the Portland metro regions, recruited primarily via Proud Ground
Meeting purpose: Seek the perspectives of about their preferences for housing.

Welcome and project overview

Georgia welcomed participants and Zoom start-up was finalized for all participants. She welcomed the group on behalf of the City and described the Frog Pond location, focus group relevance, and why planning is occurring. Becky gave an introduction to the focus group agenda.

Questions

Discussed the following questions:

- Home buying criteria
  - **Price range**
    - Poll question: What is your approximate price range as you are looking for homes?
      - <$350k
      - $350-400k
      - $400-450k
      - $450-500k
      - $500-600k
      - >$600k
    - Poll question: Are you expecting to receive financial support for your home purchase?
      - Yes, nonprofit (e.g. Proud Ground) or public support
      - Yes, family support
      - Yes, employer support
      - No support
    - Have you seen homes in your price range that you think would meet your needs?
  - **Home type and size:**
    - What type of homes are you looking at or willing to consider and why?
    - What size of home do you need for your household?
    - What characteristics of the home itself are most important to you (e.g., condition, size, attached vs. detached, private outdoor space, particular features or design)?
    - An “accessory dwelling unit” or ADU is a second small unit on the same property with a larger home. They can be attached to the main home or separate. If you could afford to buy a home that had an ADU, would that appeal to you? Why or why not? What about an ADU sold separately?
  - **Location & Neighborhood amenities generally:**

- Where have you been looking in the region so far (e.g. neighborhoods, cities)?
- What places are most important for you to have easy access to (e.g., job, daycare/school, family, transit, etc.)?
- What is most important to you about a future neighborhood (e.g., safety, access to parks/recreation, community, school ratings, being near certain types of businesses)?

  - **Wilsonville:**
    - Have you considered buying a home in Wilsonville specifically? Why or why not?
    - If you could afford an attached or small detached home with a small yard in a new neighborhood in Wilsonville, do you think that would be a good fit for your household's needs and priorities?

- Anything else you want to share?

The session ended when all questions had been discussed.

Comments and Key Themes from Participants

Price Range and Financial support:

- Most looking for homes under the approximate median home price in Wilsonville of $600,000, with two looking between $350k-$450k, two looking around $300k and one with the potential for lower or higher values.
- Multiple participants were receiving support from Proud Ground or a similar organization and the others had considered or pursued support previously.
- All participants commented on the high prices of housing and that this created barriers to being able to purchase their ideal home though a few had seen some options around the region that would fit their needs in their price range.

Home types and size:

- All participants expressed that their ideal housing type would be a single-family detached home with a yard though other options were acceptable to some if this type of housing was not available in their price range.
- Families with children were looking for housing with more than two bedrooms, those without children would consider a one or two bedroom. A few participants had found single-family detached housing potentially in their price range with a combination of small footprint housing (such as a small bungalow), older homes or homes outside the city.
- Yards were particularly important to families with children however participants without children were also interested in private outdoor spaces.
- ADA access was important for some, including for multi-generational households and those hoping to accommodate aging parents.
- Additional desires included for good parking, not having a driveway on a busy street, having a garage, space for gardening.

Home-buying choices and trade offs

- Generally, the more space and privacy from neighbors the better.

- Cottage clusters were the most desirable option if a single-family detached home was not available. However, most participants expressed concerned with having a shared yard based on potential difficulty dealing with neighbors or feeling concerned about their children in a shared area.
- Some participants were open to ADUs, especially to provide housing within a family such as for a sibling with their own family, an adult child or aging parents. Fewer participants were interested in an ADU shared outside of family but a some were open to it.
- Home-buying process itself described as difficult or intimidating, steep learning curve. Multiple participants indicated that they were seeking out resources to better understand the process, but not with universal success.
- Multiple participants expressed willingness to sacrifice the size (of housing, of the yard) for more privacy.
- In a few cases, participants expressed that they would be more likely to wait to purchase until they found the right fit while others were open to or actively pursuing a home purchase that was not their ideal as a 'starter home' with the expectation of selling in the future to be able to purchase something closer to what they were looking for.

Location and Neighborhood Amenities:

- Most consistent interests were for neighborhood safety and access to shopping such as grocery stores and the mall. Being close to family and/or childcare was also important for most.
- Additional Interest in: schools, quietness, walkability and ADA access, public transportation, access to work, access to the freeway
- Many people liked the idea of staying close to where they are already located, especially in terms of maintaining family and school access. Those who were more willing to move to a new neighborhood included those without children and those with connections to many areas in the region.

Wilsonville

- Generally positive associations but multiple participants knew very little about Wilsonville, including where in the region it was located.
- Factors when considering moving to Wilsonville
    - Price of housing
    - Maintaining access to school and family
- Positives
    - Perception of safety
    - Access to the freeway
    - Access to jobs
- Negatives
    - One person noted they had noticed that housing being close together with small yards in Wilsonville which was off-putting.

EAST & SOUTH
MASTER PLAN

ENGAGEMENT SUMMARY: AUGUST-SEPTEMBER 2022

Overview

This document summarizes community engagement activities conducted between in August and September 2022 for the Frog Pond East & South Master Plan. The project and engagement were focused on:

- Sharing ideas and obtaining feedback regarding public realm designs
- Updates on the Preferred Alternative

Key themes from each engagement meeting or activity are summarized below. Engagement is ongoing and this summary will be updated in the future. Future updates will also include additional explanation of how the various engagement activities are impacting decisions.

Meetings and Activities

Meetings and engagement activities are summarized below. In addition, City staff had (and continues to have) on-going informational and coordination meetings with individual property owners, community members and developers.

- Tabling Events
    - Popsicles in the Park (August 9, 2022)
    - Back to School Resource Event (August 17, 2022)
    - Wilsonville Block Party (August 25, 2002)
- Open House for Frog Pond Projects (August 23, 2022)
- Online survey on Let's Talk Wilsonville! (entire month of August 2022)
- Grupo de Enfoque en Espanol (Focus Group in Spanish, September 17, 2022)

Project information and meeting notices were provided through a variety of ways including: *Let's Talk Wilsonville!*, the Boones Ferry Messenger; the project Interested Parties email list; and social media postings.

Tabling Events

Summary

Popsicles in the Park was held on August 9, 2022 in two sessions: Noon to 2 p.m. and 4:30 to 6:30 p.m.. Tables were set up at the shelter area of the Murase Plaza in Memorial Park. Notice and event announcements were published in the online and print sources noted on page 1 of this report.

Displays and table-top information was provided for:

- The Frog Pond East and South Master Plan
- The Boeckman Bridge Replacement Project
- Frog Pond West Neighborhood Park
- Kids activities: a "draw your park" table, "catch and ask a question beach ball", and raffle for arts supplies

The event was informal and emphasized chatting with attendees and answering their questions. Over the course of the two sessions, staff spoke with about 40 participants who viewed Frog Pond materials. Spanish speaking project team members were present to engage Spanish speakers. A significant portion of the engagement was playing the "beach ball game" with children visiting the park. Feedback regarding the parks was generally positive with existing parks in Wilsonville often used as examples of what participants would like to see in future parks.

The **Back to School Resource Event** was held on August 17, 2022 from 5:00-6:30pm at the Boeckman Creek Middle School. One table and two easels were set up to the right of the events entrance near other City and Public Service related outreach booths.

Displays and table-top information included:

- The Frog Pond East and South Master Plan
- Kids activities "catch and ask a question beach ball", and raffle for arts supplies

The event was very well attended, with an estimated 400 (parents and children) people. At the Frog Pond station, staff spoke to approximately 50 people during the evening. The majority of conversations centered around the proposed land use map and housing type. Many residents expressed excitement regarding the proposed housing variety in the neighborhood. Some residents referenced Villebois as an example of a successful neighborhood that they would like to see reflected in the Frog Pond Development, especially regarding the parks and neighborhood connectivity. Several residents expressed their excitement to be included in the planning process and an appreciation of the transparency. A few residents expressed their concerns regarding potential traffic and the impact of more housing development within the City. Most questions surrounded the timeline for the construction of the neighborhood as well as the expected amenities including the future school.

The City of Wilsonville's **Community Block Party** was held on August 25, 2022, at Town Center Park from 5:30 to 8:30pm. The event included live music, games, and activities hosted by numerous City departments. Members of the Wilsonville planning department and planning commissioners were on hand to discuss the Frog Pond East and South Master Plan and ask questions about elements of the public realm. Activities included a community chalk board and dot preference exercise, as well as a game aimed at children to answer preference questions in exchange for popsicles.


A PERFECT STREET TO BIKE ON HAS...
OTHER BIKES
pickle's
MY DREAM PARK has...
MORE CAT PARKS
LESS DOG PARKS
more dog park
1000 CATS IN EACH PARK
HORSES
Forested walking trai
pickle's

Frog Pond Feedback At the Tabling Events

The following is a summary of questions and feedback heard at the tabling events.

Questions

- Where will development begin?
    - Generally, in areas close to utilities. The Azar property north of Advance Road has a project developer and will likely be one of the first areas to develop.
- Will improvements be made east of the project area on Kruse Road?
    - No. The City requires improvements along developing properties within the Urban Growth Boundary.
- Why is Type 1 housing planned for south of the school property?
    - That element of the Preferred Alternative is part of the plan's strategies for "variety of housing throughout" and to plan housing choices that may be more affordable than lower density options.
- We farm the area north of Kahle Road. We are concerned about trespassing and moving our farm equipment in the future when those areas develop and we have urban neighbors. Can we work with the City in the future on those issues?
    - Yes. The City welcomes working with property owners.

- What intersection improvements are expected at SW Brisband and SW Stafford?
- What is the plan for parks in the West, East, and South neighborhoods?
- How much are new homes in Frog Pond expected to cost?

Feedback

- Bikers feel most comfortable riding bikes in designated bike lanes that allow separation from cars with protective features such as physical barriers and bike specific traffic signals.
- Event attendees expressed interest in parks with areas focused on natural resources, foraging and "managed wilderness"
- Residents expressed concerns about population growth within Wilsonville.
- Participants consistently acknowledged housing affordability issues in Wilsonville and expressed interest regarding the City's current effort in planning a neighborhood with housing options and opportunities for diverse groups.
- Participants expressed interest in spaces formally dedicated to certain activities such as an amphitheater, splash pad, snack shack, disc golf course, bike park, and tennis courts.

Game Feedback

Games with the intention to spark discussion and help increase the participation of Wilsonville's younger population were played at both the **Popsicles in the Park** event as well as the **Block Party.** Questions asked of children and adults during the beach ball and lily pad games at **Popsicles in the Park** and the **Block Party** along with a summary of responses are below:

Which Park in Wilsonville is your favorite?
Where do you feel unsafe riding your bike? Why?
How do you get to your favorite park? Walk, drive, bike?
Where do you like to ride your bike? Why?
What is a unique park feature you would like to see in a new park?
What is your favorite activity to do alone at the park? With friends?
Do you prefer natural trails or paved trails?
When you go for a walk or a hike is it about the destination or the journey?

Response Summary from **Popsicles in the Park**

- The most popular park mentioned was the Splash pad area of Murase Plaza followed by the lower Memorial Park trails.
- The majority of participants asked the above question drive to the park. Those who walked, biked or scootered to the park most often lived in close proximity to the park.
- Participants like to ride their bikes in areas separated from major roadways including in the park, on trails, at a bike park, or designated bike lanes.
- Participants feel unsafe riding their bikes both due to both the surrounding environment (cars) and physical conditions. Regarding the surrounding environment, people did not feel safe riding near or on busy streets or in apartment parking lots. Regarding physical conditions, participants do not feel unsafe on bumpy or very steep surfaces.

- Participants expressed interest in the following features for a new park; monkey bars, covered playground for rain/sun, paved path for scooters, interactive water features/splash pad, climbing wall, quite place to walk, snack shack, jungle in the park, jungle gym, a zip line.
- Most participants enjoy playing games with friends or on playground equipment such as slides, swings, monkey bars, etc. Other less mentioned activities included soccer, hiking and biking.
- Participants expressed a preference for natural trails.
- The majority of participants like to go on a walk for the experience of the walk or "the journey"

Response Summary from the **Block Party**

- The most popular parks among participants were Town Center Park and Memorial Park .
- The majority of participants asked the above question drive to the park. Those who walked, biked or scootered to the park most often lived in close proximity to the park.
- Participants like to ride their bikes in areas separated from major roadways including in the park, on trails, at a bike park, or designated bike lanes.
- Participants expressed a preference to walk within known areas such as their neighborhoods or parks.
- Participants expressed interest in the following features for a new park; a place to draw with chalk, a splash pad, slides, a zip line, swing sets, a climbing wall, a place to run.
- Participants like to "enjoy" the park. They expressed liking to walk on the trails, play in grass and talk with friends.
- There was a general preference among participants for natural trails with some preferences changing depending on the activity. Paved trail preferred
- Participants did not indicate an overall preference regarding whether they enjoy walking to get to destination or for the experience of the walk or "the journey".

Chalk Board Feedback

A four sided chalk board was set up at the **Block Party** with the prompts **"A perfect street to bike on has…"** and **"My dream park has…"** for participants to respond to. A summary of responses are below:

- Participants expressed interest in parks that accommodate a wide variety of activities. Specifically participants indicated interest in including areas for pets, managed wilderness, forested trails, fruit bearing or edible vegetation and space for parties and food carts. Unique features mentioned on the chalk board includes amphitheater, poker table, concession stands, a playground within the forest, disk gold, trees to climb, indoor heated space, and waterslide.
- Safety was a priority when discussing the perfect street to bike on. Some of the mentioned safety measures were slower traffic, separation from cars, signals at walkways and traffic lights with bike lane sensors, and open space with clear site line.


A PERFECT STREET TO BIKE ON HAS...
OTHER BIKES
Safe bike Lanes
Slow traffic or no cars at all
Signals with special bike lane sensors
pickles


MY DREAM PARK
has...
a tree house
a geocache
MORE CAT PARKS
LESS DOG PARKS
more dog park
1000 CATS IN EACH PARK
HORSES
Forested walking trails
INDOOR
HEATED
SPACE
Trees
climbing trees
Playgrounds
A forest with a magical
unicorns.
Kaylee


MY DREAM
PARK HAS...
Ice cream stand
Managed
Waterfalls
"Wilderness"
fruit & nut-bearing
trees
Ampitheatre
food carts
Party
Everyday
Dogsteats
roler-
costers
Soda machines
water
slide


A perfect street
to bike on has ...
Second disk golr
Coures
Another disc
golf course
A lot of
space
WaterFALLS
open space
candy

Frog Pond Projects Open House

The City partnered with the West Linn-Wilsonville School District to co-host an open-house style meeting on August 23, 6-8 p.m. at the Meridian Creek Middle School. Information was shared about three significant projects taking place along Boeckman Road:

- A new primary school
- The Boeckman Road Corridor Improvements
- Frog Pond East & South Master Plan

The event was a drop-in/open house format and emphasized chatting with attendees and answering their questions. It was attended by approximately 100 people. Staff spoke with about 30 participants who viewed Frog Pond materials.

Frog Pond Feedback at the Open House

- General acknowledgement of and support for a variety of housing, and preferred alternative overall
- Limited feedback on public realm design

Spanish Public Realm Focus Group

The Spanish Public Realm Focus Group was held on September 17, 2022 at 1:30pm and ended at 2:30pm. The meeting was conducted in Spanish and English using live translation. The meeting began with a short presentation on the project background and current status of the Frog Pond East and South Master Plan. Prior to asking questions brief descriptions of the public realm elements were described to the group, allowing the opportunity for clarifying questions. Two sets of questions were asked of the group, one set focusing on walking path, trails, and bike lanes and the other focused on parks and gather spaces. The questions and key themes from the meeting are below.

Questions Asked

Parks

1. What types of larger amenities or areas (sports fields, trails, shelters, natural areas) would you like to see? Why do you like them?
2. What types of smaller amenities or areas (benches, sitting areas, picnic covers, playgrounds) would you like to see? Why do you like them?
3. What is the most important thing that should be considered for Frog Pond's neighborhood park?

Walking

1. What makes a street crossing or sidewalk comfortable for you?
2. Describe your favorite neighborhood or area to walk? What do you enjoy about it?

Biking

1. What is your favorite place to ride a bicycle?
2. What are the most important things that should be considered in designing bicycle lanes and paths in Frog Pond East and South?

Key Themes

Holistic Function- There was an emphasis on the importance of creating a space that serves everyone's needs in a cohesive way. Focus group members mentioned the need for active and passive spaces functioning together. For example, sports fields with adjacent gathering areas.

Recreation verse Transportation- There was discussion regarding how walking path, sidewalks, and bike path need to be designed differently depending on needs. They spoke to the differences in what would be needed for recreation verse transportation. There was a preference for natural walking and biking trails that allow the freedom to interact with the surrounding environment for trails intended for recreation. For bike paths and walkways intended for transportation there was a preference for protected areas that are physically separated from traffic and potential hazards.

Safety- Safety was emphasized repeatedly in the focus group conversation. This was the main concern regarding pedestrian connections and trails as well as visibility throughout the park. For this reason bike lanes and sidewalks with physical barriers were consistently the preferred design.

Family and Community Gathering- The function main function of parks, according to focus group members, is creating a space for gathering with friends and family. For that reason it is important to think about how the space allows groups to gather as well as provide a wide range of activities that facilitate group play.

Exercise and Outdoor Education – Parents in the focus group discussed the role the parks and trails can play in their children's and families lives. They emphasized the importance of creating the opportunity for exercise and exposing children to the outdoors. There was also significant discussion regarding screen usage among children and how the parks can counter the current screen focused culture among our youth.

Public Realm Survey (English and Spanish)

Key takeaways from Surveys:

- Respondents really like Memorial Park and especially value trails. Frog Pond East and South should keep design of large park consistent with other large City parks and include substantial opportunities for walking
- Playgrounds are a common request for small to medium amenities in parks and like the type of playgrounds in existing Wilsonville parks.
- In setting priorities for parks one respondent summarized other common responses well by stating the priorities should be safety, shade, and fun.
- When asked to rank amenities in order of importance, respondents most prioritized trees and shade, covered areas for gatherings, and playground structures. The lowest ranked amenities were pet exercise areas and a community garden.
- Other park features respondents would like to see include water features and restrooms
- Respondents feel key things that make a pedestrian street crossing comfortable are high visibility and crossing lights/signals.
- Respondents feel design of trails and paths should prioritize safety and connectivity

- Respondents feel Villebois is a great example of a neighborhood with good bicycle infrastructure and connectivity
- Input on bicycle facilities include request for separated and protected facilities especially for children and youth and these types of facilities were indicated, by a wide margin, as those that a very comfortable and safe.

Public Space Design

SURVEY RESPONSE REPORT

19 July 2019 - 27 October 2022

PROJECT NAME:
Frog Pond East and South Master Plan

BANG THE TABLE engagementHQ

SURVEY QUESTIONS

Q1 What are your favorite large amenities or areas (i.e. sports fields, trails, shelters for large gatherings, natural areas, etc.) in Wilsonville's City parks? What do you like about these amenities or areas?

MOH 8/01/2022 11:31 AM	Trails for walking. I like being out in nature.
The Gannon Family 8/01/2022 11:29 AM	parks. good quality.
diagnosis_coder 8/01/2022 07:50 PM	Sports fields, trails and natural areas. I like that natural areas allow the wildlife a shelter as well.
michele 8/03/2022 09:42 AM	Sports fields-critical to the growing number of families in wilsonville
Francie 8/09/2022 05:10 PM	Wisonville memorial park water feature
ACurry3 8/09/2022 06:20 PM	Murase plaza park. I love the splash pad and lots of seating. I don’t love how close the play area is tot he busy street though.
Natalie79 8/17/2022 06:34 PM	I love walking and biking trails and fun parks for the kids.
elee 8/23/2022 12:31 PM	Playgrounds for all ages, large gathering spaces, space for outdoor events, dog parks, community gardens. I like that they can offer larger programming opportunities closer to home.
swell23 8/25/2022 07:07 PM	Disc golf, water features and memorial park
Screenname 8/25/2022 07:11 PM	Disc golf, water features in memorial park. I like playing disc golf and cooling off in the water features.
Dolly44 8/27/2022 12:04 AM	Trails, shelters, natural areas. I like being able to get out and enjoy walks and nature.

Jgreenfi
8/27/2022 03:04 PM

We like to use the trails at Memorial Park, Graham Oaks Park, and the Boeckman Creek Crossing Trail

Breanna D
8/31/2022 01:08 PM

Memorial Park/Murase Plaza and Town Center splash park: My 4-year-old son loves to play in the water. Town Center Park is my favorite because it is not near busy roads and I can easily watch my son while taking care of my baby as well. It feels safer than the Murase Plaza splash park (especially with the busy road and no fence for running toddlers).

Optional question (13 response(s), 1 skipped)
Question type: Essay Question

Q2 What are your favorite small to medium amenities or areas (i.e. benches, sitting areas, picnic covers, playgrounds, etc.) in Wilsonville's City parks? What do you like about these amenities or areas?

MOH
8/01/2022 11:31 AM

I don't use what is mentioned above.

diagnosis_coder
8/01/2022 07:50 PM

Playgrounds. What I like is the thoughtfully planned parks that allow the kids to play and be active, but also have a connection to nature.

michele
8/03/2022 09:42 AM

Playgrounds

Francie
8/09/2022 05:10 PM

Sitting areas and playground wilsonville memorial

ACurry3
8/09/2022 06:20 PM

Grove shelter, and town center park. Lots of covered areas for party's.

Natalie79
8/17/2022 06:34 PM

Villebois parks and play grounds.

elee
8/23/2022 12:31 PM

playground with swings / slides, covered areas to sit and eat lunch. A place to enjoy as a family without getting too crowded.

swell23

Playgrounds, water features and covered shelters

8/25/2022 07:07 PM

Screenname 8/25/2022 07:11 PM	Benches, playgrounds. I like sitting on the benches and playing in the playing in the playgrounds.
Dolly44 8/27/2022 12:04 AM	Sitting areas, picnic covers, benches and playgrounds. I like to have a place to picnic and enjoy the outdoors and to sit and relax and take in fresh air and the beauty.
Jgreenfi 8/27/2022 03:04 PM	We have used picnic tables at Memorial Park, both upper and near the river and would like to see more locations available for family use.
Breanna D 8/31/2022 01:08 PM	The parks and playgrounds in Wilsonville are great. Villebois has lots of very nice smaller parks.

Optional question (12 response(s), 2 skipped)
Question type: Essay Question

Q3 Is there an area or feature of in one or more of Wilsonville's City parks you avoid? If so, where? Please explain why.

diagnosis_coder 8/01/2022 07:50 PM	No, we like all the parks.
michele 8/03/2022 09:42 AM	Grass in the winter. We need more turfed spaces for people to enjoy throughout the year.
Francie 8/09/2022 05:10 PM	No
ACurry3 8/09/2022 06:20 PM	Splash area close to busy street.
Natalie79 8/17/2022 06:34 PM	No
swell23 8/25/2022 07:07 PM	No
Screenname 8/25/2022 07:11 PM	No
Jgreenfi 8/27/2022 03:04 PM	No problems at all
Breanna D 8/31/2022 01:08 PM	The upper area of Murase Plaza water feature (near the busy road) is challenging when managing multiple kids safely.

Optional question (9 response(s), 5 skipped)
Question type: Essay Question

Q4 What is the most important thing that should be considered in designing a City park in Frog Pond East and South?

MOH 8/01/2022 11:31 AM	walking paths, water feature, public art, clean, community garden, and big open space for public gatherings, ie concerts or farmers'

market

The Gannon Family
8/01/2022 11:29 AM

community pool please add

diagnosis_coder
8/01/2022 07:50 PM

Most important thing is to preserve all tree on the property. Second, have a good mix of natural preserve and play structures, sports amenities etc.

michele
8/03/2022 09:42 AM

Safe spaces for children to play. Areas for people to walk and perhaps spaces for dogs.

Francie
8/09/2022 05:10 PM

Picnic areas

ACurry3
8/09/2022 06:20 PM

Covered areas and plenty of seating. I'm a mom of three and it's the only time I sit down. It's so wonderful to have a shady place to watch the kids play

Natalie79
8/17/2022 06:34 PM

Safe & fun places for families, kids and dogs.

elee
8/23/2022 12:31 PM

I think a community garden that includes perennials shrubs and fruit trees along the perimeter would be fantastic. Something that can be shared and that inspires collaboration and sustainability.

swell23
8/25/2022 07:07 PM

Cool playground and water features and playinf areas for kids

Screenname
8/25/2022 07:11 PM

Homeless people

Jgreenfi
8/27/2022 03:04 PM

Accessibility, restrooms, and pleasant landscaping all equally important

Breanna D
8/31/2022 01:08 PM

safety, shade, fun

Optional question (12 response(s), 2 skipped)

Question type: Essay Question

Q5 Please rank the following in order of importance for inclusion in neighborhood parks and green spaces

OPTIONS	AVG. RANK
Trees and shade	3.31
Covered area for gatherings	3.73
Playground structure	3.85
Trails for walking/biking	3.92
Open grass areas	4.46
Benches	5.00
Community Garden	5.23
Pet Exercise Area	5.75

Optional question (13 response(s), 1 skipped)
Question type: Ranking Question

Q6 What other amenities not included in Question 5 are important to include in neighborhood parks and greenspaces?

MOH 8/01/2022 11:31 AM	water feature, public art
diagnosis_coder 8/01/2022 07:50 PM	Sports amenities like basketball hoop, tennis court etc.
Francie 8/09/2022 05:10 PM	Restrooms
ACurry3 8/09/2022 06:20 PM	Teatrooms

Natalie79
8/17/2022 06:34 PM

Community pool

elee
8/23/2022 12:31 PM

If doing a grassy area, making it not a monoculture, but a mix of micro clover as well. It's more sustainable, can be cut short just like grass, more drought tolerant and stays green longer, and doesn't burn from pet urination. It's also a nitrogen fixer, so the grass would not need fertilization to maintain it long term. I also think having a lot of tree canopy would be great for carbon reduction and lowering overall temperatures. The summers will only get hotter, so establishing good tree cover early will help keep everyone cooler.

swell23
8/25/2022 07:07 PM

Event space

Screenname
8/25/2022 07:11 PM

Deterring homeless people

Dolly44
8/27/2022 12:04 AM

Pools or water features that are fun for all.

Jgreenfi
8/27/2022 03:04 PM

restrooms, picnic tables

Breanna D
8/31/2022 01:08 PM

water features to play in, although Wilsonville already has great parks, so a bathroom

Optional question (11 response(s), 3 skipped)
Question type: Essay Question

Q7 What makes a street crossing or sidewalk comfortable for you?

MOH
8/01/2022 11:31 AM

pedestrian crossing light

diagnosis_coder
8/01/2022 07:50 PM

For a sidewalk - lots of trees. For a street crossing - pedestrian crossing lights (if it is a busy intersection)

michele
8/03/2022 09:42 AM

The freedom to cross in many places. Pedestrians need to take responsibility for their own safety when crossing in neighborhoods.

Francie 8/09/2022 05:10 PM	Good signage and a walk signal
ACurry3 8/09/2022 06:20 PM	High visibility
Natalie79 8/17/2022 06:34 PM	Good visibility
elee 8/23/2022 12:31 PM	Widely paved, not just a shoulder with a ditch (as is currently on Boeckman). Clearly marked crossings with a flashing sign for actively crossing busy streets.
swell23 8/25/2022 07:07 PM	Trees, flowers and grass
Screenname 8/25/2022 07:11 PM	No cars nearby at the time of crossing
Dolly44 8/27/2022 12:04 AM	To have a clear path and crosswalks
Jgreenfi 8/27/2022 03:04 PM	Well marked, on-demand signals, unobstructed view of traffic
Breanna D 8/31/2022 01:08 PM	standard safety features

Optional question (12 response(s), 2 skipped)
Question type: Essay Question

Q8 Not including parks, what is your favorite neighborhood or area to walk in Wilsonville? What do you enjoy about the neighborhood or area?

MOH 8/01/2022 11:31 AM	Memorial Park
diagnosis_coder 8/01/2022 07:50 PM	Villebois - lots of trees on the side walk, integrated parks, good lighting.
Francie 8/09/2022 05:10 PM	Parks close to coffee shops
ACurry3 8/09/2022 06:20 PM	Graham oaks park.. love the wide trails.
Natalie79 8/17/2022 06:34 PM	Villebois. Beautiful. Quiet. Safe.
elee 8/23/2022 12:31 PM	Morgan Farm has a path near the ravine that is quite lovely to walk on.
swell23 8/25/2022 07:07 PM	I don’t have a favorite location. A true downtown with trees, walking space and activities
Screenname 8/25/2022 07:11 PM	I have not visited anything besides a park in Wilsonville
Jgreenfi 8/27/2022 03:04 PM	Canyon Creek road and Siemens-Xerox vicinity
Breanna D 8/31/2022 01:08 PM	Villebois, Meadows, Jory Trail bc family lives there

Optional question (10 response(s), 4 skipped)
Question type: Essay Question

Q9 Is there a certain neighborhood or area you avoid walking in Wilsonville? If yes, please explain why.

MOH 8/01/2022 11:31 AM	Wilsonville Road
diagnosis_coder 8/01/2022 07:50 PM	Wilsonville road because of too much traffic noise.
Francie 8/09/2022 05:10 PM	No
Natalie79 8/17/2022 06:34 PM	No
swell23 8/25/2022 07:07 PM	No
Screenname 8/25/2022 07:11 PM	No
Jgreenfi 8/27/2022 03:04 PM	There is no residential area in town we wouldn't fee feel comfortable walking.
Breanna D 8/31/2022 01:08 PM	busy roads

Optional question (8 response(s), 6 skipped)
Question type: Essay Question

Q10 What are the most important things that should be considered in designing new sidewalks and pedestrian street crossings in Frog Pond East and South?

MOH 8/01/2022 11:31 AM	that they are all inter-connected.
diagnosis_coder 8/01/2022 07:50 PM	Make sure the sidewalk is wide enough for 2-3 people walk side-by-side. Lots of trees along the side walk.

michele
8/03/2022 09:42 AM

Wide and flat.

Francie
8/09/2022 05:10 PM

Flashing walk signal lights

ACurry3
8/09/2022 06:20 PM

Wide trails and flashing lights at crosswalks in busy areas

Natalie79
8/17/2022 06:34 PM

Wide enough

elee
8/23/2022 12:31 PM

Making everything feel intentional, and connecting all 3 neighborhoods together. Don't let Frog Pond West be separated from the connection to intentional community spaces in East and South. Make crossing Stafford safer as a cyclist or pedestrian, and have a crossing at more than just the Stafford-Boeckman intersection.

swell23
8/25/2022 07:07 PM

Grass, trees, flowerr

Screenname
8/25/2022 07:11 PM

No homeless people

Dolly44
8/27/2022 12:04 AM

Safety of all people.

Jgreenfi
8/27/2022 03:04 PM

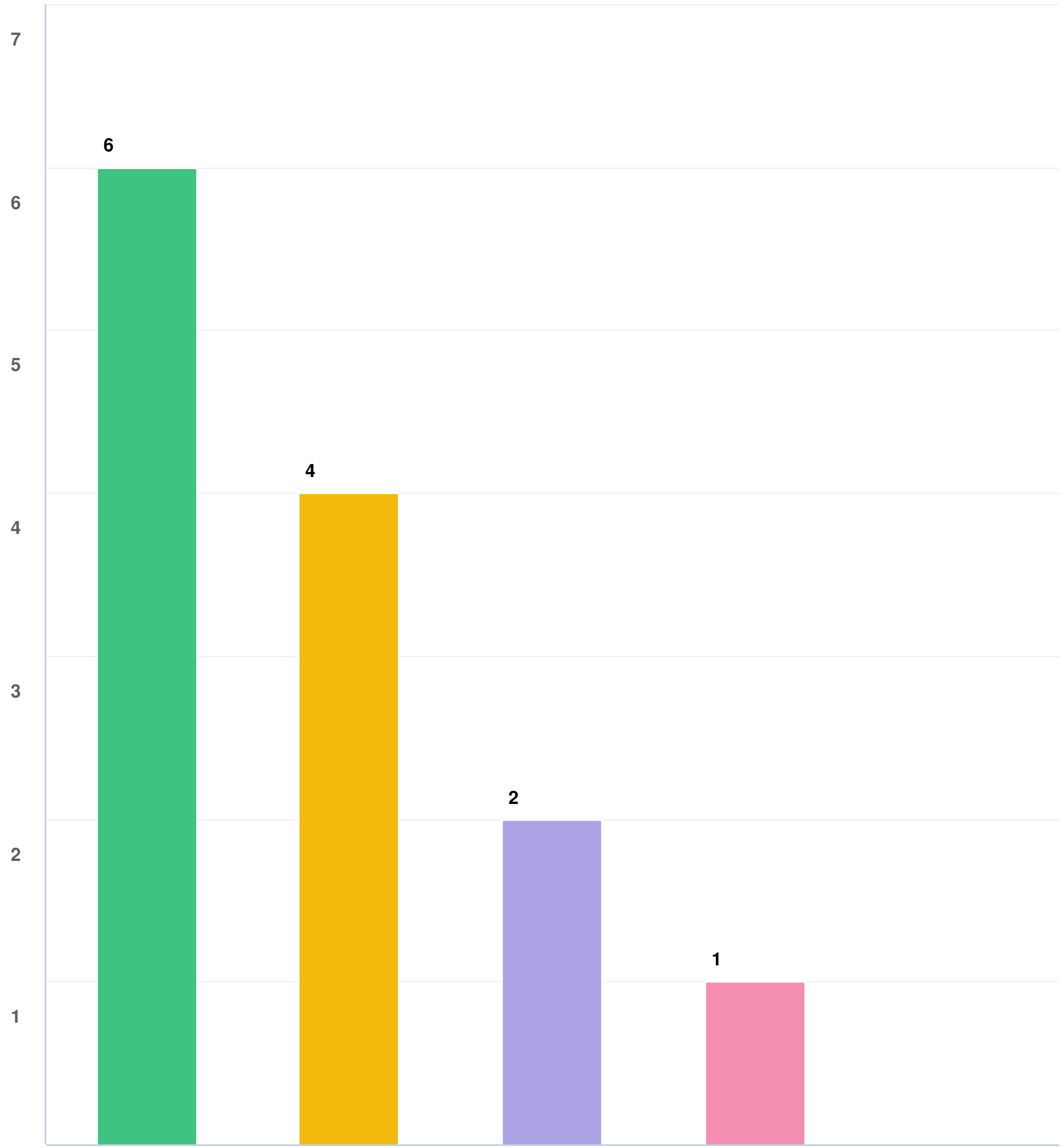
Safe routes to schools, on-demand signals on major routes between neighborhoods

Breanna D
8/31/2022 01:08 PM

sidewalks don't end randomly

Optional question (12 response(s), 2 skipped)
Question type: Essay Question

Q11 How often do you ride a bicycle in Wilsonville?



Question options

- Never
- A few times a year or less
- Multiple times a month
- Daily or multiple times a week
- At least once a month on average

Optional question (13 response(s), 1 skipped)
Question type: Checkbox Question

Q12 If you ride a bicycle in Wilsonville, where is your favorite place to ride? What do you enjoy about it?

diagnosis_coder 8/01/2022 07:50 PM	All over Wilsonville, except Wilsonville road due to too much traffic. What I enjoy as clearly marked bike lanes on most roads.
Francie 8/09/2022 05:10 PM	N/a
ACurry3 8/09/2022 06:20 PM	Villebois, lots of space for bikes
Natalie79 8/17/2022 06:34 PM	Villebois. Beautiful. Safe. Quiet.
swell23 8/25/2022 07:07 PM	N/A
Screenname 8/25/2022 07:11 PM	Memorial park. I like the trees. Also your arborist has a sweet ass.
Dolly44 8/27/2022 12:04 AM	I don’t ride
Jgreenfi 8/27/2022 03:04 PM	Through town to shops, post office, bank, etc.
Breanna D 8/31/2022 01:08 PM	I would like to ride in the future. My Mother-in-law rides in Meadows, Villebois, and Graham Oaks

Optional question (9 response(s), 5 skipped)
Question type: Essay Question

Q13 What are the most important things that should be considered in designing bicycle lanes and paths in Frog Pond East and South?

MOH 8/01/2022 11:31 AM	Don't take away space from pedestrians or cars. No bike paths, please.

diagnosis_coder 8/01/2022 07:50 PM	Good visibility, trees for shade.
michele 8/03/2022 09:42 AM	Bicycles don't own the streets. They don't pay any gas taxes or any fees to maintain the roads. Require them to follow traffic rules just like we require cars to follow traffic rules.
Francie 8/09/2022 05:10 PM	Signage
Natalie79 8/17/2022 06:34 PM	Safety.
elee 8/23/2022 12:31 PM	Children will be using them a lot for the new primary school, as well as the middle school. Try to have some barriers or separation between the bike lanes and the vehicle traffic like PBOT does.
swell23 8/25/2022 07:07 PM	Safety and no cars
Screenname 8/25/2022 07:11 PM	Smooth concrete/asphalt
Dolly44 8/27/2022 12:04 AM	A safe path where cars can’t go
Jgreenfi 8/27/2022 03:04 PM	Minimize share-the-road situations, clear Lane markings, surface and eye-level signage, enhanced major routes through and between neighborhoods
Breanna D 8/31/2022 01:08 PM	accessible for bikes, pedestrians, and strollers

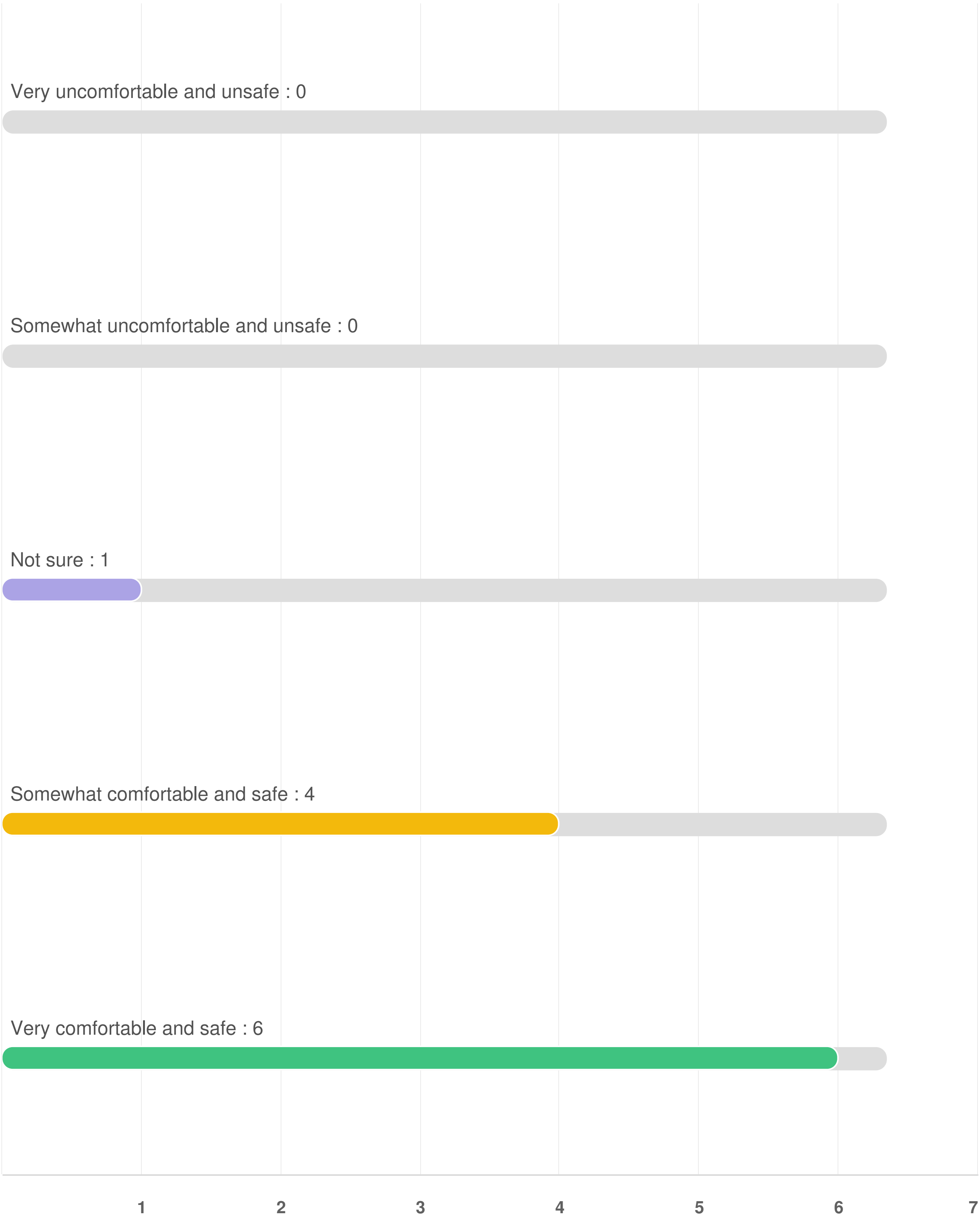
Optional question (11 response(s), 3 skipped)
Question type: Essay Question

Q14 How comfortable and safe do you feel riding a bicycle on the following paths or streets?

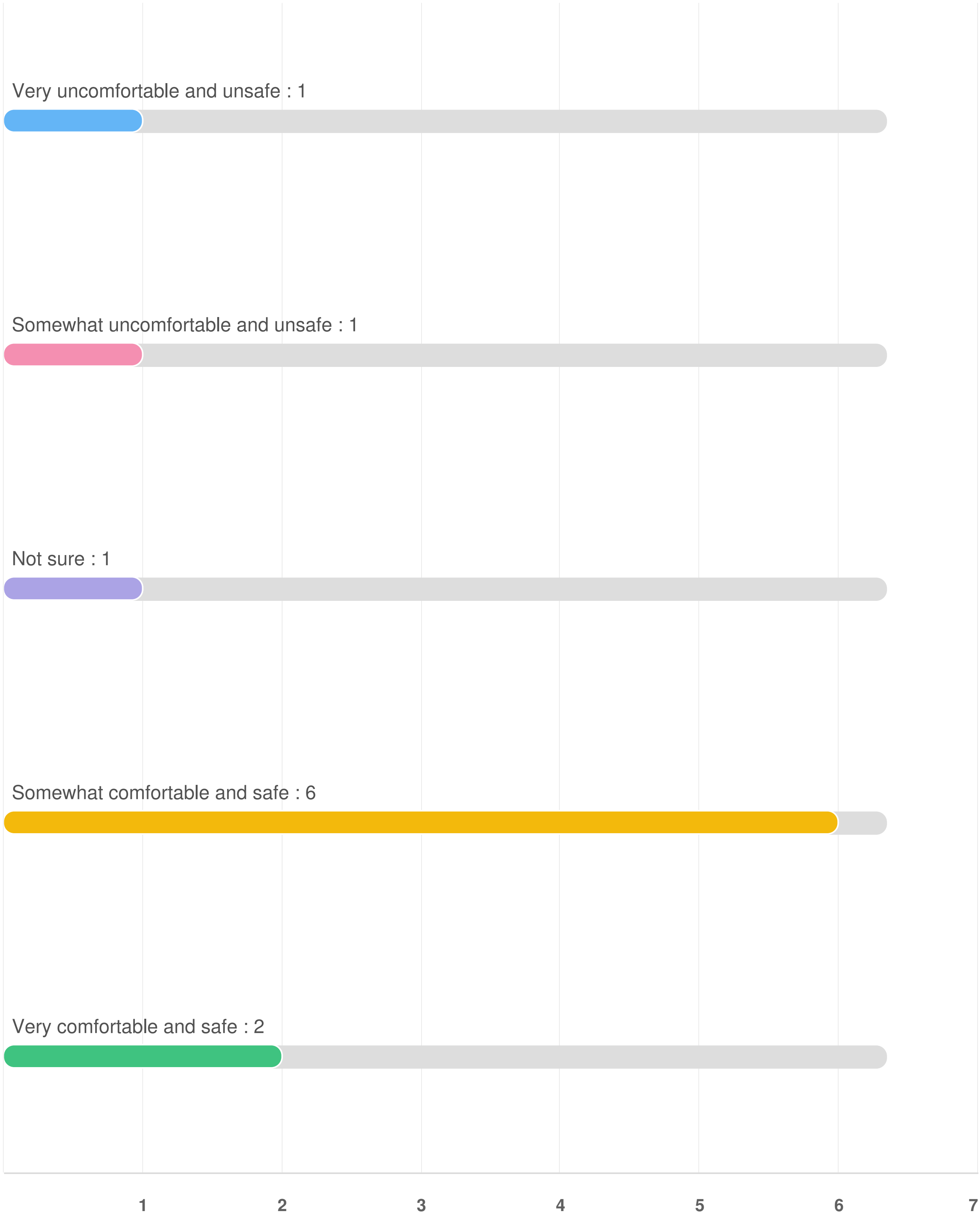
Optional question (11 response(s), 3 skipped)
Question type: Likert Question

Q14 How comfortable and safe do you feel riding a bicycle on the following paths or streets?

Dedicated bike and pedestrian path that is not along a street

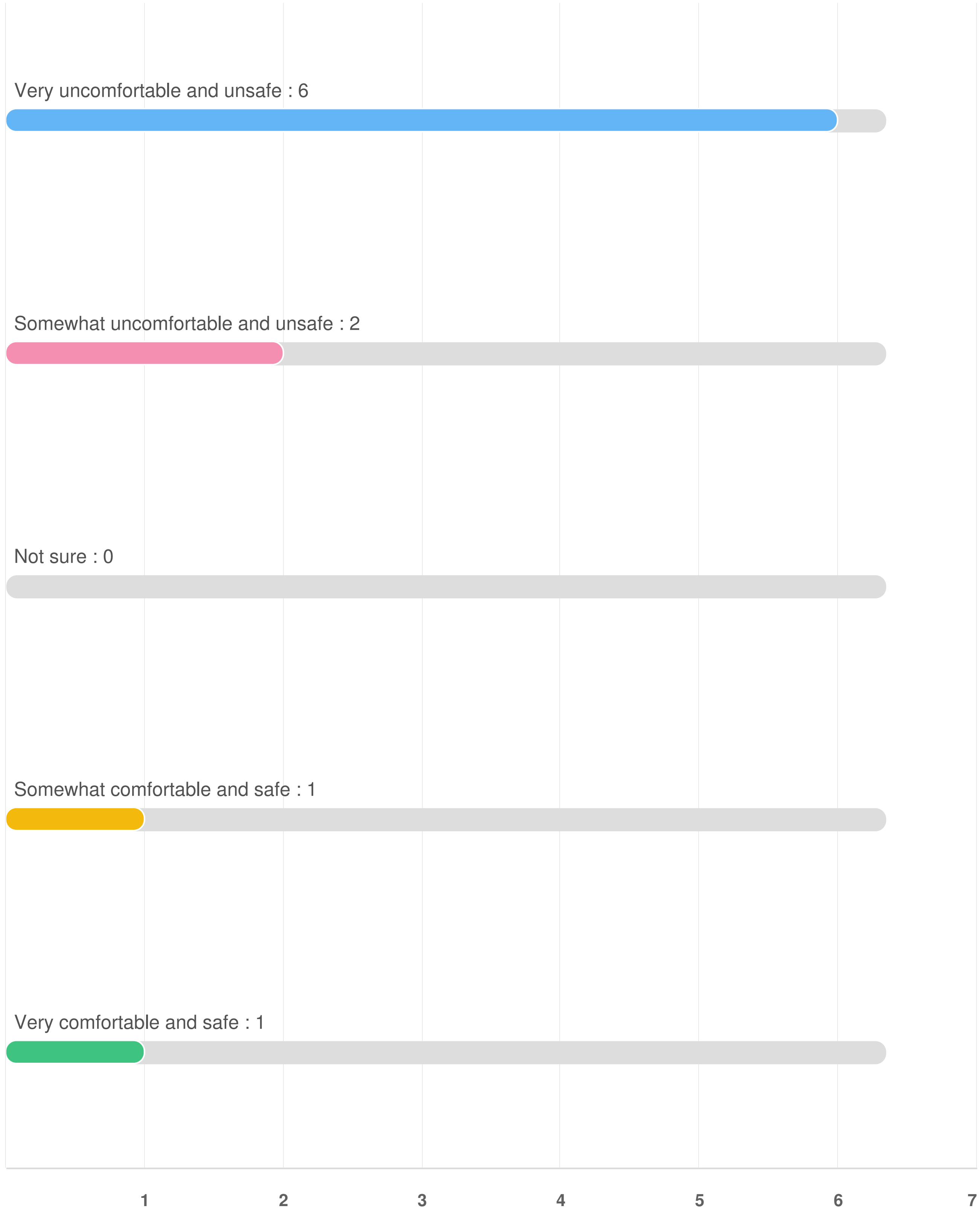


Low traffic neighborhood street without bike lanes or markings

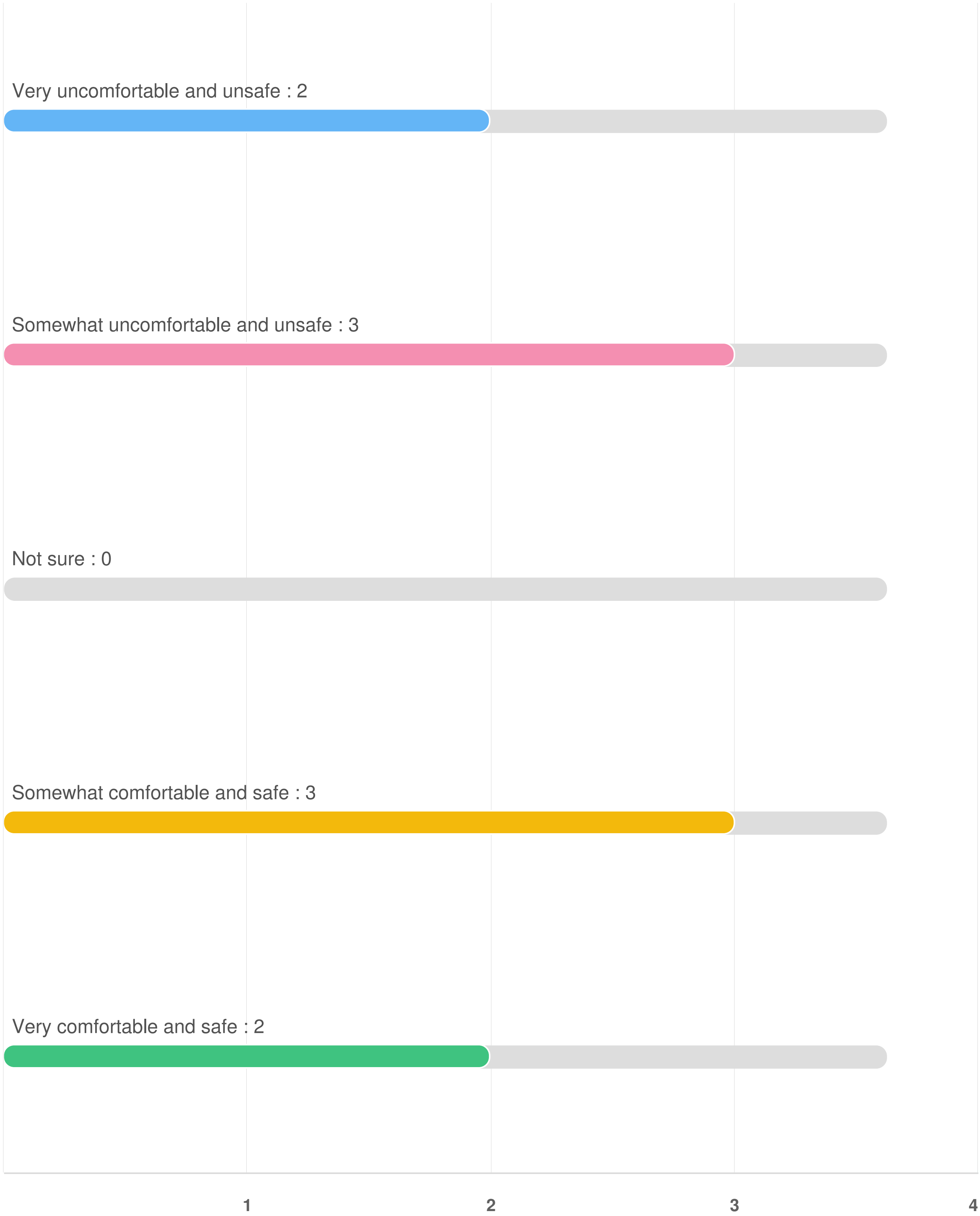


Moderate traffic neighborhood street marked for shared bicycle/vehicle use

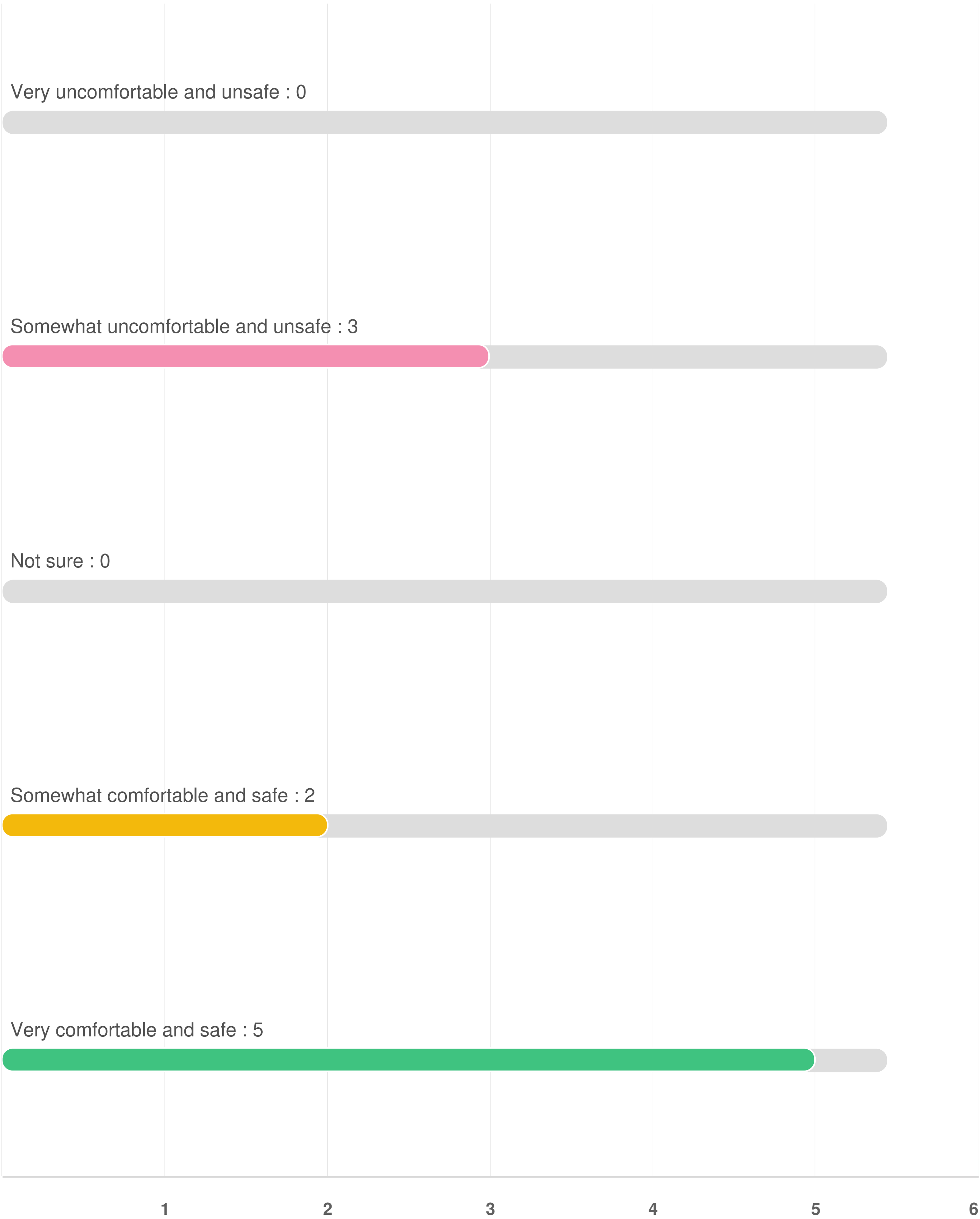
Bike lane along major street road with no barrier or buffer



Bike lane along major street or road with added painted buffer



Bike lane along major street or road with physical separation such as with a landscape strip or curb



Diseño de espacios públicos

SURVEY RESPONSE REPORT
19 July 2019 - 27 October 2022

PROJECT NAME:
Frog Pond East and South Master Plan

BANG THE TABLE engagementHQ

SURVEY QUESTIONS

Q1 ¿Cuál es su nombre?

Anonymous
8/25/2022 07:43 PM

Araceli Modesto

Anonymous
8/29/2022 03:12 PM

Johana

Mandatory Question (2 response(s))
Question type: Single Line Question

Q2 ¿Cuál es su correo electrónico o número de teléfono?

Anonymous
8/25/2022 07:43 PM

9712192421

Anonymous
8/29/2022 03:12 PM

Johanabpedreros@gmail.com

Mandatory Question (2 response(s))
Question type: Single Line Question

Q3 ¿Cuáles son sus áreas o servicios grandes favoritos (es decir, campos deportivos, senderos, refugios para grandes reuniones, áreas naturales, etc.) en los parques de la ciudad de Wilsonville? ¿Qué le gusta de estos servicios o áreas?

Anonymous
8/25/2022 07:43 PM

Campos deportivos

Anonymous
8/29/2022 03:12 PM

Senderos, áreas naturales para caminar relajarme tomar aire estar en contacto con la naturaleza pero como la condición climática de Oregón en otoño e invierno es difícil por la lluvia y frío debería haber un sitio cubierto para reuniones o hacer alguna actividad deportiva

Optional question (2 response(s), 0 skipped)
Question type: Essay Question

Q4 **¿Cuáles son sus áreas o servicios pequeños o medianos favoritos (es decir, bancos, áreas para sentarse, áreas cubiertas para picnic, áreas de juego, etc.) en los parques de la ciudad de Wilsonville? ¿Qué le gusta de estos servicios o áreas?**

Anonymous
8/25/2022 07:43 PM

Áreas para picnic y de juegos

Anonymous
8/29/2022 03:12 PM

Todos es importante porque cada uno de estos presta un servicio diferente y muy necesario para el desarrollo de la comunidad

Optional question (2 response(s), 0 skipped)
Question type: Essay Question

Q5 **¿Hay un área o alguna característica en uno o más de los parques de la ciudad de Wilsonville que usted evita? Si es así, ¿dónde? Explique por qué.**

Anonymous
8/25/2022 07:43 PM

No

Anonymous
8/29/2022 03:12 PM

Algún sitio que tenga influencia se homeless

Optional question (2 response(s), 0 skipped)
Question type: Essay Question

Q6 **¿Cuáles son las cosas más importantes que se deben considerar al diseñar un parque municipal en Frog Pond East y South?**

Anonymous
8/25/2022 07:43 PM

La seguridad, baños públicos.

Anonymous
8/29/2022 03:12 PM

Fácil acceso a personas de la tercera edad y niños y cerca a casa

Optional question (2 response(s), 0 skipped)
Question type: Essay Question

Q7 ¿Qué otros servicios no incluidos en la Pregunta 7 son importantes y se deben incluir en el diseño de los parques y espacios verdes del vecindario?

Anonymous 8/25/2022 07:43 PM	Ninguno
Anonymous 8/29/2022 03:12 PM	Si hubiera facilidad de tener una piscina para usar y poder también hacer deporte

Optional question (2 response(s), 0 skipped)
Question type: Essay Question

Q8 Clasifique lo siguiente en orden de importancia que tienen estos elementos para usted con respecto a los parques y espacios...

OPTIONS	AVG. RANK
Áreas abiertas de césped	2.50
Área de ejercicio para mascotas	2.50
Bancos	3.00
Árboles y sombra	5.00
Área cubierta para reuniones	5.00
Senderos para caminar/andar en bicicleta	5.50
Jardín comunitario	5.50
Estructura de juegos	7.00

Optional question (2 response(s), 0 skipped)
Question type: Ranking Question

Q9 ¿Qué hace que un cruce de calles o una banqueta sea cómodo para usted?

Anonymous
8/25/2022 07:43 PM

Y

Anonymous
8/29/2022 03:12 PM

La seguridad y marcación

Optional question (2 response(s), 0 skipped)
Question type: Essay Question

Q10 Sin incluir los parques, ¿Cuál es su vecindario o área favorita para caminar en Wilsonville? ¿Qué es lo que disfruta del vecindario o el área?

Anonymous
8/25/2022 07:43 PM

Crossing lights

Anonymous
8/29/2022 03:12 PM

Áreas verdes y limpias

Optional question (2 response(s), 0 skipped)
Question type: Essay Question

Q11 ¿Hay algún vecindario o área en la que evite caminar en Wilsonville? En caso afirmativo, explique por qué.

Anonymous
8/25/2022 07:43 PM

No

Anonymous
8/29/2022 03:12 PM

Ninguno

Optional question (2 response(s), 0 skipped)
Question type: Essay Question

Q12 ¿Cuáles son las cosas más importantes que se deben considerar al diseñar nuevas aceras y cruces de calles para peatones en Frog Pond East y South?

Anonymous
8/25/2022 07:43 PM

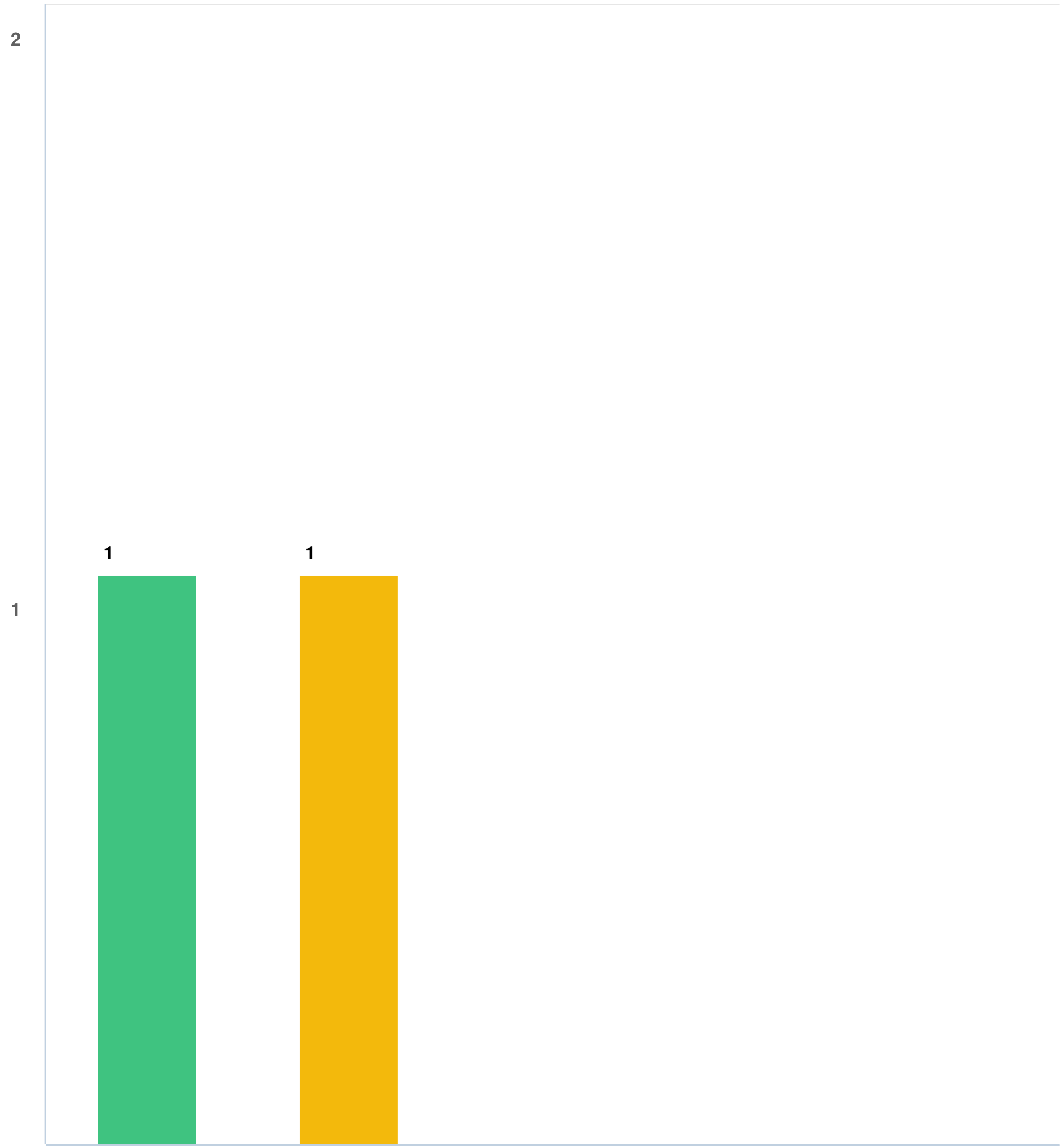
Crossing lights y luces para iluminar .

Anonymous
8/29/2022 03:12 PM

Que estén delimitadas señalizadas sería genial

Optional question (2 response(s), 0 skipped)
Question type: Essay Question

Q13 ¿Con qué frecuencia anda en bicicleta en Wilsonville?



Question options

- Nunca
- Varias veces al mes
- Algunas veces al año o menos
- Al menos una vez al mes en promedio
- Diariamente o varias veces a la semana

Optional question (2 response(s), 0 skipped)
Question type: Checkbox Question

Q14 Si andas en bicicleta en Wilsonville, ¿Cuál es tu lugar favorito para andar en bicicleta? ¿Qué disfrutas al respecto?

Anonymous
8/25/2022 07:43 PM

Parques

Anonymous
8/29/2022 03:12 PM

No

Optional question (2 response(s), 0 skipped)
Question type: Essay Question

Q15 What are the most important things that should be considered in designing bicycle lanes and paths in Frog Pond East and South?

Anonymous
8/25/2022 07:43 PM

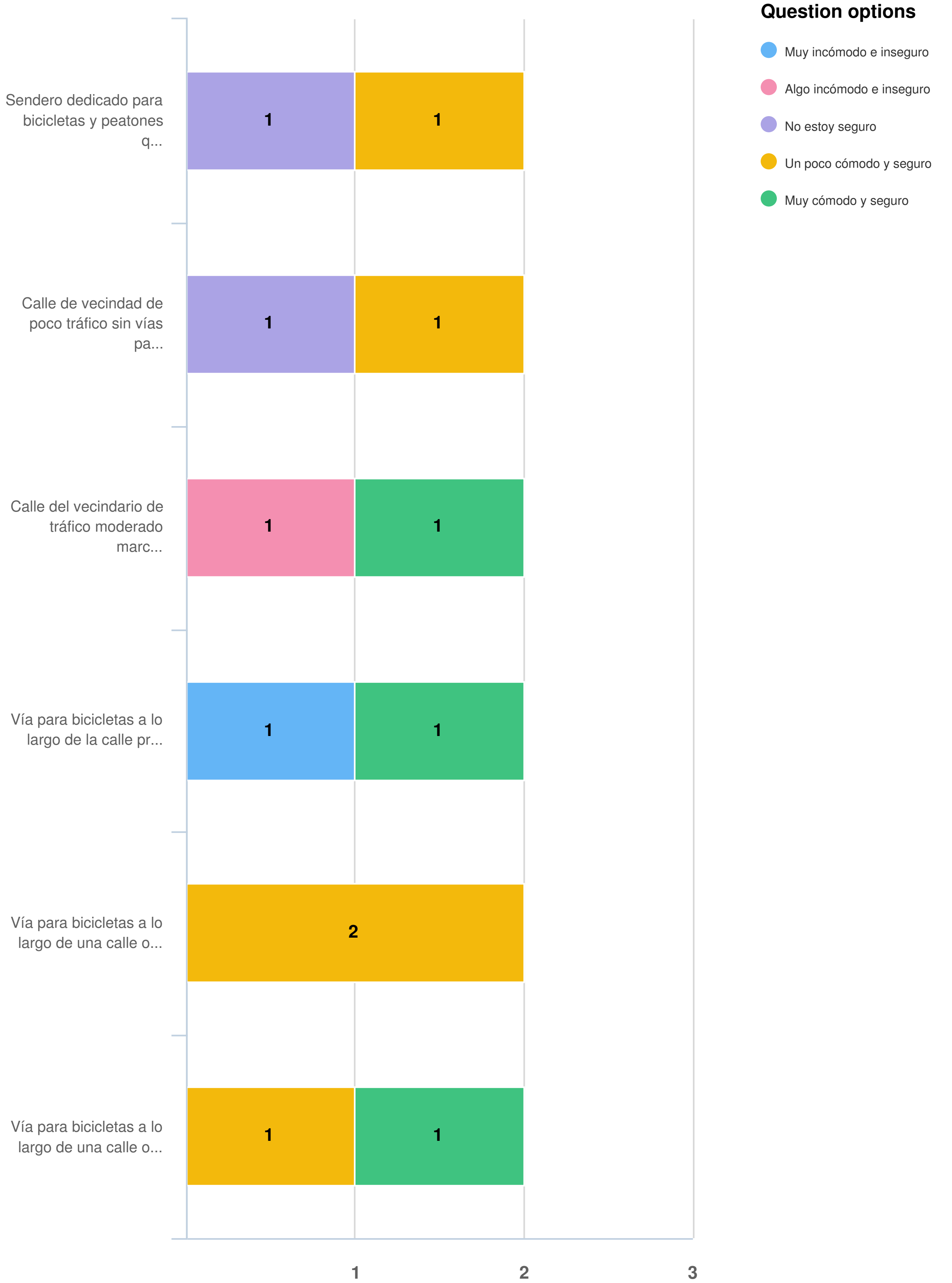
Lighting

Anonymous
8/29/2022 03:12 PM

No

Optional question (2 response(s), 0 skipped)
Question type: Essay Question

Q16 ¿Qué tan cómodo y seguro se siente usted al andar en bicicleta por los siguientes caminos o calles?



Optional question (2 response(s), 0 skipped)
Question type: Likert Question

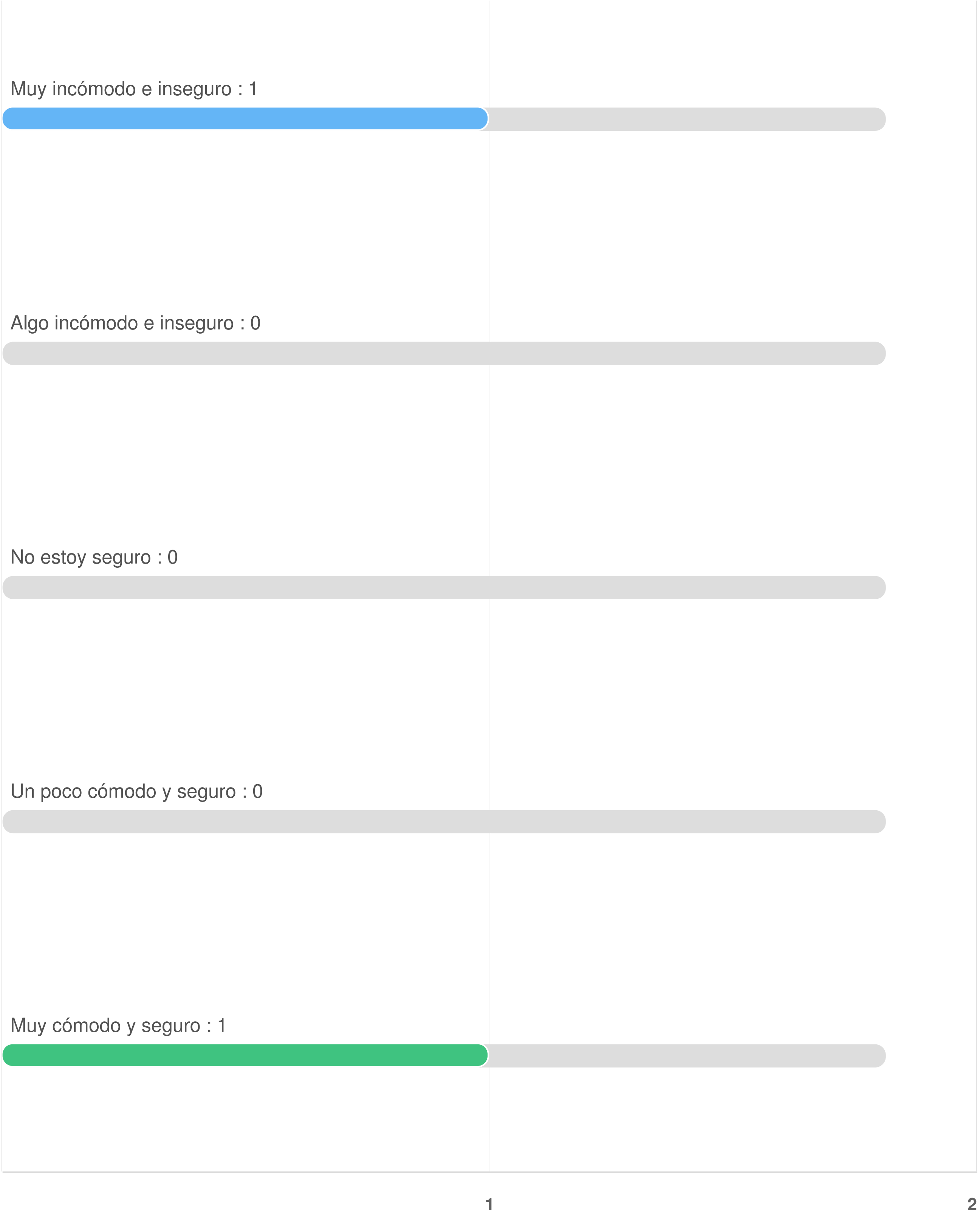
Q16 ¿Qué tan cómodo y seguro se siente usted al andar en bicicleta por los siguientes caminos o calles?

Sendero dedicado para bicicletas y peatones que no está a lo largo de una calle

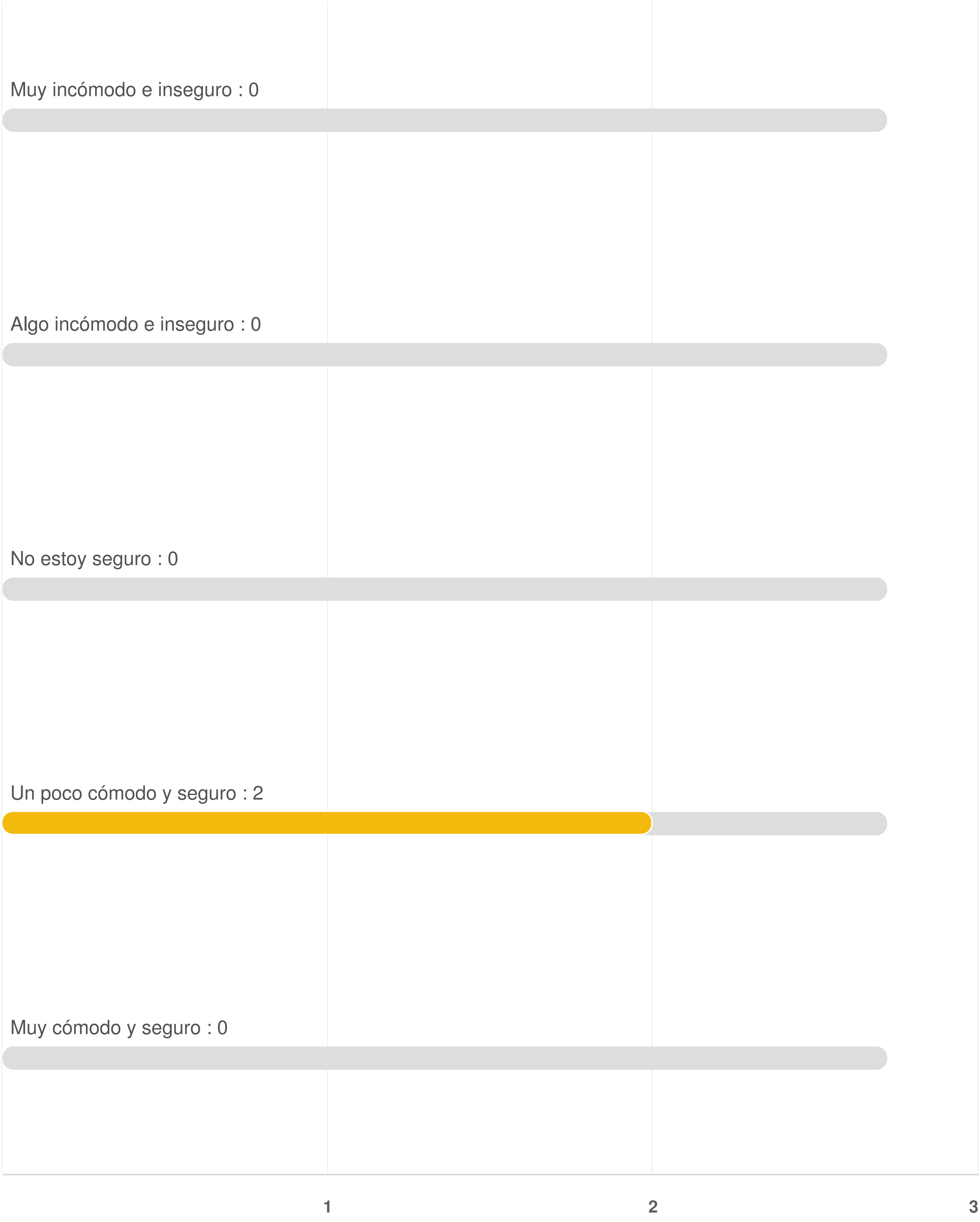
Calle de vecindad de poco tráfico sin vías para bicicletas ni marcas

Calle del vecindario de tráfico moderado marcado para uso compartido de bicicletas/vehículos

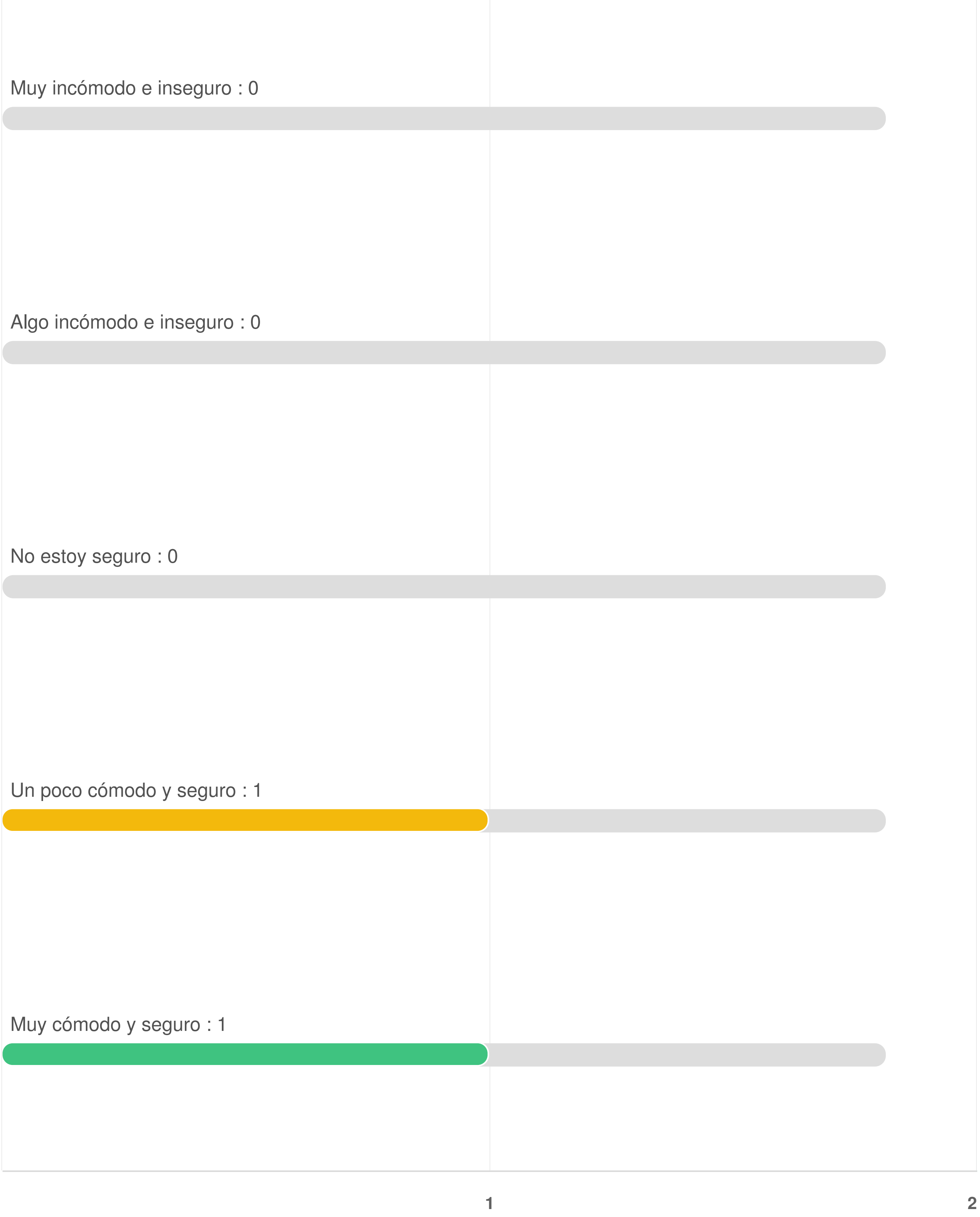
Vía para bicicletas a lo largo de la calle principal sin barrera ni amortiguador



Vía para bicicletas a lo largo de una calle o carretera principal con protección adicional pintada



Vía para bicicletas a lo largo de una calle o carretera principal con separación física, como una franja ajardinada o un bordillo



APPENDIX B: AFFORDABLE HOUSING ANALYSIS

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ECONorthwest
ECONOMICS • FINANCE • PLANNING

DATE: January 31, 2022
TO: Dan Pauly, Kim Rybold, City of Wilsonville
FROM: Becky Hewitt, Kaitlin La Bonte, and Ariel Kane, ECONorthwest
SUBJECT: Frog Pond East and South Affordable Housing Analysis

Section 1. Introduction

Purpose

The Frog Pond East and South areas are important for the City of Wilsonville's efforts to meet future housing needs and provide equitable housing options for residents. The City's 2020 Equitable Housing Strategic Plan (EHSP) recognized this, and called for the Frog Pond East and South Master Plan to establish targets for affordability, specifically:

"As part of the master planning requirements for Frog Pond East and South, the City will establish goals or targets for accessibility to services/amenities, unit types, and unit affordability levels. The targets for affordability levels (number of units and depth of affordability for those units) should be reasonably achievable, allowing for sufficient market-rate development to support key infrastructure investments. This approach will provide a methodology and framework that can be applied in other growth areas beyond Frog Pond."

This memorandum is intended to implement that direction from the EHSP and identify affordable housing targets and strategies to ensure these targets are met.

Key Term: Affordable Housing
This memo addresses "affordable housing". As used here, we are referring broadly to both market-rate housing that is economically attainable for moderate-income households as well as housing that is subsidized or otherwise supported for lower-income households. Where the memo refers to a specific sub-set of affordable housing it is indicated.

Background and Policy Direction

The EHSP also directs the Frog Pond East and South master planning effort to:

- Integrate affordable housing into the overall master plan, with access to amenities
- Identify specific properties that could help meet affordable housing targets
- Evaluate relationships to the infrastructure funding plan
- Engage affordable housing developers and other stakeholders to refine strategies

These efforts will be part of the planning process for Frog Pond East and South.

Other past policy guidance related to housing targets and mixes for this area are summarized below.

- Metro's Conditions of Approval for Wilsonville's 2018 Urban Growth Boundary expansion required the City to:
  - **Plan for at least 1,325 homes in the expansion area**.
  - **Allow townhomes, duplexes, triplexes, and fourplexes** (now referred to as "middle housing") in all zones that permit single-family housing within the expansion area. (The requirement related to allowing middle housing in zones that allow single-family housing is now also required by the state under House Bill 2001 and the implementing administrative rules. The City has already updated its zoning regulations to comply with this requirement.)
- The 2015 Frog Pond Area Plan established direction for housing mix, lot size, and where different housing types would be allowed within the expansion area. The unit distribution options from the Area Plan are shown in Exhibit 11 and Exhibit 12 on page 17. At a high level, the Area Plan sets direction that the East neighborhood should provide for single-family detached housing on small to large lots, as well as townhomes, cottage lots, and duplexes, while the South neighborhood should provide only small- to large-lot detached housing. It also states that neighborhood-scale mixed use with residential above retail in the commercial center could be considered during the Master Plan process. Other types of housing, including apartments, were not identified as part of the final plan for the Frog Pond area. Note, however, that the Area Plan's direction pre-dates and is no longer consistent with the Metro conditions of approval summarized above or with the requirements of House Bill 2001.

As of the end of 2021, the City of Wilsonville had 11,587 dwelling units with approximately 730 more planned to be built in the near future between Villebois and Frog Pond West. Frog Pond East and South will represent a 10% plus increase in the number of dwellings in Wilsonville. The City also has roughly 450 government-subsidized housing units as of 2018.[1]

Section 2. The Housing Spectrum: Meeting a Range of Housing Needs with New Housing

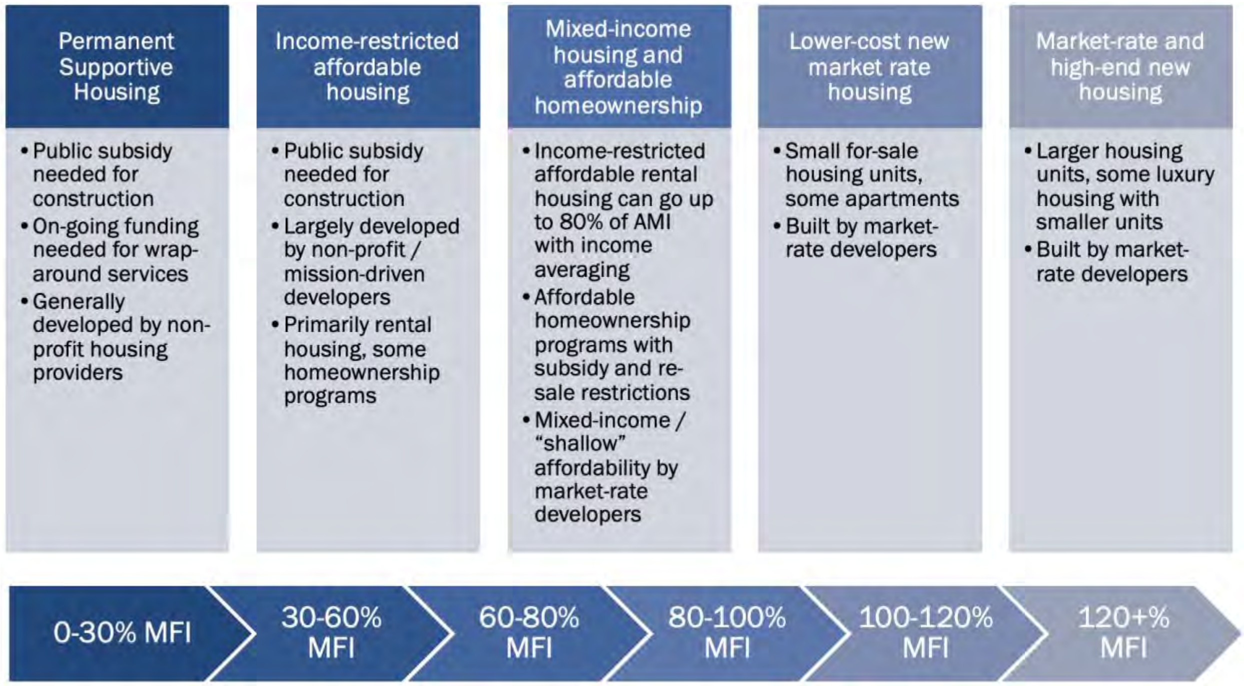
Delivering new housing affordable to a range of incomes requires a range of different approaches, as summarized in Exhibit 1.

Key Term: Median Family Income

In setting affordability targets and requirements, it is common to express them in terms of a percentage of the Median Family Income (MFI), since this is how eligibility is established for income-restricted affordable housing. MFI is typically set at a regional level. In Wilsonville, the MFI is based on the three-county Portland region. In other words, the MFI for Wilsonville and Clackamas County is the same as that for the region overall. The MFI for a family of four in the Portland region as of 2021 is $96,700. The U.S. Department of Housing and Urban Development (HUD) considers housing affordable to a given income level if housing costs (including utilities) account for no more than 30% of a household's income.

[1] Clackamas County Regional Housing Needs Analysis, ECONorthwest, 2018, page 199.

Exhibit 1: Approaches to Delivering New Housing by Income Range
Source: ECONorthwest



Housing for 60% of MFI and below

Meeting the housing needs of households earning less than 60% of MFI nearly always requires public subsidy. Development of income-restricted affordable housing typically relies on funding from the State, region, or County, in addition to any support from the City and other partners.

- **Affordable Rental Housing:** Even within publicly supported housing, most housing for this income range is rental housing. The Low Income Housing Tax Credit (LIHTC) program—the largest funding program in the US for affordable rental housing—largely serves households in the 30-60% of MFI range. While there are some for-profit developers who build income-restricted affordable housing, most is built by non-profits or Public Housing Authorities. Affordable rental housing development in suburban parts of the Portland region typically takes the form of three- to four-story apartments with surface parking.
- **Affordable homeownership:** There are some homeownership support programs (e.g., Habitat for Humanity, some Community Land Trusts, and down-payment assistance programs) that serve households earning as little as 35% of MFI ($30,000-$35,000). These programs tend to receive much less state and federal funding in aggregate than affordable rental housing.

To serve households earning less than 30% of MFI often requires additional subsidy beyond that needed to build housing for 60% of MFI due to the lower rents that are required. It also sometimes requires support to provide wrap-around services that help residents remain in their housing. Sometimes tiny homes or cottage clusters are used for housing at this income level, but apartments are more common.

Housing for 60% to 80% of MFI

Housing for households earning between 60% and 80% of MFI often comes in the form of older housing that has depreciated and become more affordable over time; however, delivering new housing in this affordability range can be challenging due to limited sources of public subsidy and the cost of building new market-rate housing. Options include:

- **Mixed-income and "shallow" affordability by market-rate developers:** Incentive programs and inclusionary zoning requirements can sometimes deliver units affordable to households earning less than 80% of MFI as part of a market-rate development if calibrated to align with market conditions. The affordability tends to be "shallow" in the sense that the private market generally cannot absorb rents or sales prices that are far below market rate without substantial incentives or subsidies. The most common form for mixed-income development by private developers is market-rate apartments that include some income-restricted affordable units.[2] However, affordability incentives for middle housing (primarily rental) may be able reach this income range in some circumstances.
- **Affordable homeownership:** Some affordable homeownership development targets this income range (e.g., Habitat for Humanity), using a mix of funding sources to subsidize costs. In the Portland region, this typically takes the form of either small detached housing or townhome-style attached housing.
- **Affordable rental housing with income averaging:** Low Income Housing Tax Credits, the largest funding program for affordable rental housing, allows developments to use income averaging to provide housing for households earning up to 80% of MFI as long as the average for the development overall remains at or below 60% of MFI. As noted above, this would typically be in the form of apartments.

Housing for 80% of MFI and above

Households earning between 80% and 120% of MFI can often afford at least some of the existing market-rate housing stock in the community, such as apartments, older homes, or townhouses, though in very tight housing markets their options may be limited. For new construction, some smaller and lower-cost market-rate housing can be affordable in the 80-120% of MFI range, but most larger housing units and high-end small housing units tend to be affordable only to those earning at least 120% of MFI. (The expected pricing for market-rate housing in the Frog Pond East and South areas is described further in Section 4.) There are some local incentives and

[2] Inclusionary Zoning can only be applied to multifamily housing (buildings with 20 or more units) under current Oregon law.

affordability programs that can support housing affordable at 80% to 100-120% of MFI, though state and federal funding is limited.

Section 3. Opportunities and Constraints for Affordable Housing

There are several considerations and challenges for building affordable housing in the Frog Pond East and South area, including:

- **Infrastructure costs:** While vacant land at the urban fringe tends to cost less than land in already developed areas, this is largely because the cost of building the infrastructure needed to serve urban development is factored into land value and land sales prices. This project will: identify the infrastructure needed to support the East and South Neighborhoods; prepare a funding plan for that infrastructure; and consider the relationship between the need to fund infrastructure and the ability to deliver affordable housing.
- **Site control / property ownerships:** Acquiring property in a competitive market can be a substantial challenge for affordable housing developers. The City does not currently own any land within the Frog Pond East and South areas. The only City-owned land is land designated for a future park. The ability to secure land could be one of the biggest challenges for delivering affordable housing in the area.
- **Past policy guidance on housing types:** The final Frog Pond Area Plan did not include apartments as part of the housing mix for Frog Pond East and South. This limits the potential housing options in several ways:
  - As noted above, most affordable rental housing, which is the primary housing that serves households earning less than 60% of MFI, is built as apartments. The Area Plan notes potential for housing above commercial space, but while some affordable housing includes community spaces on the ground floor, there are financing challenges associated with building affordable housing as true mixed-use development with ground-floor commercial space. If apartments are not allowed in the area, this will significantly constrain the options and sources of funding for building affordable housing and limit the number of income-restricted affordable units that can realistically be developed in the area.
  - Market-rate multifamily housing (apartments or condominiums) can also provide housing affordable to households earning roughly 80% to 100% of MFI. Building apartments or condominiums as part of a mixed-use building increases costs and can make development infeasible or require higher rents or sales prices to justify the additional expense.
- **Challenges for affordable and low-cost homeownership options:** Income-restricted affordable homeownership models can work within a small detached or townhouse-style development, but there is limited state and federal funding for affordable homeownership programs, which means a relatively small number of subsidized

affordable homeownership units could realistically be built in the area. Other methods of providing lower-cost homeownership options without a subsidy, such as condominiums and co-op housing, face legal and financing challenges that make them difficult for many private developers to build. Addressing these legal and financing issues would require action at the state level and is beyond the City's control. However, there are developers working in the region who are willing to build condominiums despite the challenges, some of whom may pursue development within Frog Pond East and South.

The opportunity for Frog Pond East and South is that the City is in a position to address many of these challenges in ways that can influence the outcome. At a minimum, in the short term, the City can set land use regulations that allow for a broader range of housing types so that there are more options for market-rate and subsidized affordable housing development now and into the future. The City can establish requirements associated with annexation, which could allow for more specific agreements between the City and property owners seeking to annex. The City can also establish an infrastructure funding plan that limits the infrastructure cost burden on any income-restricted affordable housing built in the area. If financial resources allow, the City can negotiate with property owners to acquire suitable land for affordable housing that can then be transferred at little or no cost to affordable housing developers, or provide funding to support affordable homeownership development by a local Community Land Trust or a provider like Habitat for Humanity. These and other strategies to help deliver affordable housing in this area are addressed further beginning on page 21.

Section 4. Expected Pricing of Market-Rate Housing

For-Sale Housing: Market Sale Prices for Single-Family Homes, Townhouses, and Condominiums

Data from recent home transactions[3] for relatively newer housing[4] in Wilsonville and surrounding areas provides an indicator of likely pricing for new housing in Frog Pond East and South. The estimated range of home prices by housing type and unit size is shown in Exhibit 2. The estimated income needed to afford these purchase prices, given standard lending assumptions,[5] is shown as a percentage of the MFI for a four-person household[6] in Exhibit 3. The relevant data is summarized in table form in Exhibit 4.

[3] Sales transaction data is from Redfin for sales between October 2020 and October 2021.

[4] Data includes detached homes and townhouses built since 2010 as well as condominiums built since 2006 (to provide a larger sample size since there are few recently-built condominiums).

[5] Assumes 20% down payment, a 30-year fixed-rate mortgage at 3.5% interest, with estimates for property taxes and homeowners' insurance. Estimated homeowners' association fees are factored into total monthly housing costs based on averages for similar housing from recent sales transactions.

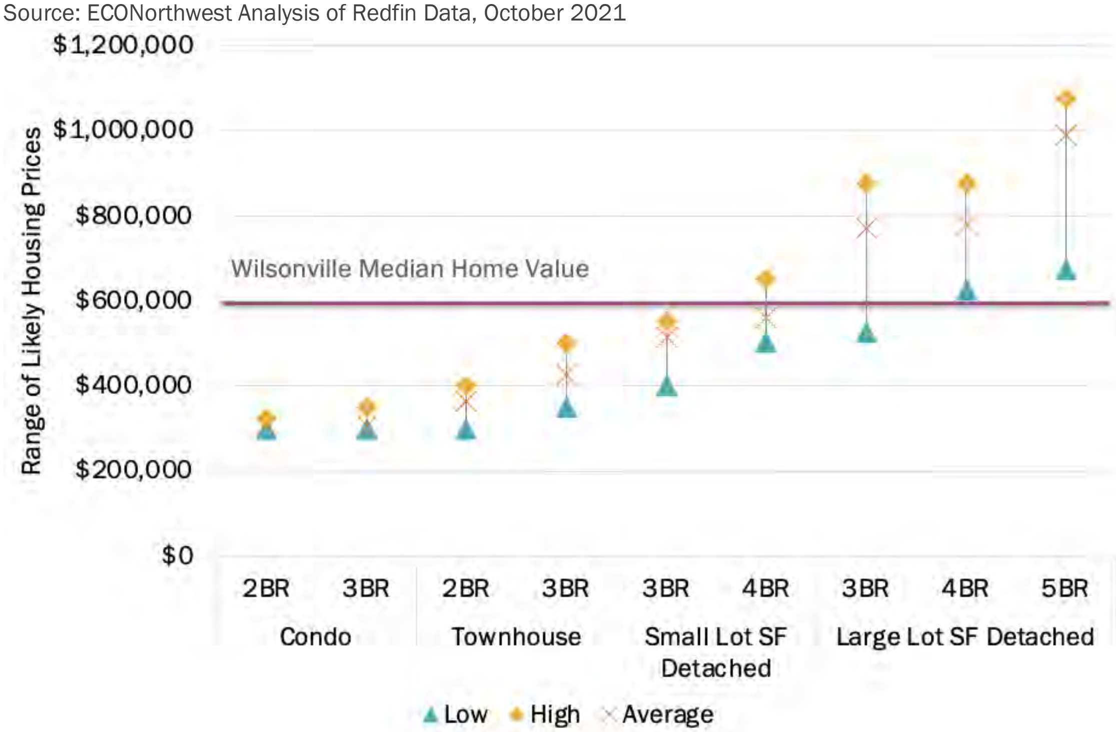
[6] In setting maximum allowed rents by unit size / bedroom count, HUD uses an assumed household size and multiplier relative to the MFI for a family of four. However, to allow for comparison to the income distributions, which are not adjusted for household size, we use the MFI for a four-person family throughout.

Given the recent escalation in home prices, new construction coming to market is likely to sell closer to the top end of the range seen among recent transactions for newer housing. Housing prices will likely continue to escalate over the coming years (though not to the extent seen in the past year), increasing the expected home values over time. However, the comparison between prices of new homes and the median price of existing homes or between new homes and regional average incomes are more likely to remain roughly consistent going forward. Based on these trends, we estimate the following ranges for affordability of new for-sale housing in Frog Pond East and South:

- New large-lot detached housing in Wilsonville will likely be affordable only to households earning more than 120% of MFI, and more expensive than most existing homes.[7]
- New small lot detached homes (on less than 4,500 SF lots) may sell for close to the median value of existing homes and are likely to be affordable mostly to households earning between 100% and 130% of MFI.
- New condominiums and townhouses will almost certainly sell for less than the median value of existing homes in Wilsonville and are likely to be affordable to households earning between roughly 70% and 100% of MFI depending on unit size.

Exhibit 2. Typical Sales Prices for Recently Built Housing by Housing Type, Wilsonville and Surrounding Area

Source: ECONorthwest Analysis of Redfin Data, October 2021



[7] The median value of existing homes in Wilsonville is around $600,000, affordable to homeowners at 122% of the area MFI for a family of four, or an annual income of $118,220.

Exhibit 3. Housing Affordability as a Percent of Median Family Income* by Housing Type for Recently Built Housing, Wilsonville and Surrounding Area
Source: ECONorthwest Analysis of Redfin Data, October 2021'
* Median family income from HUD for Clackamas County for a four-person household

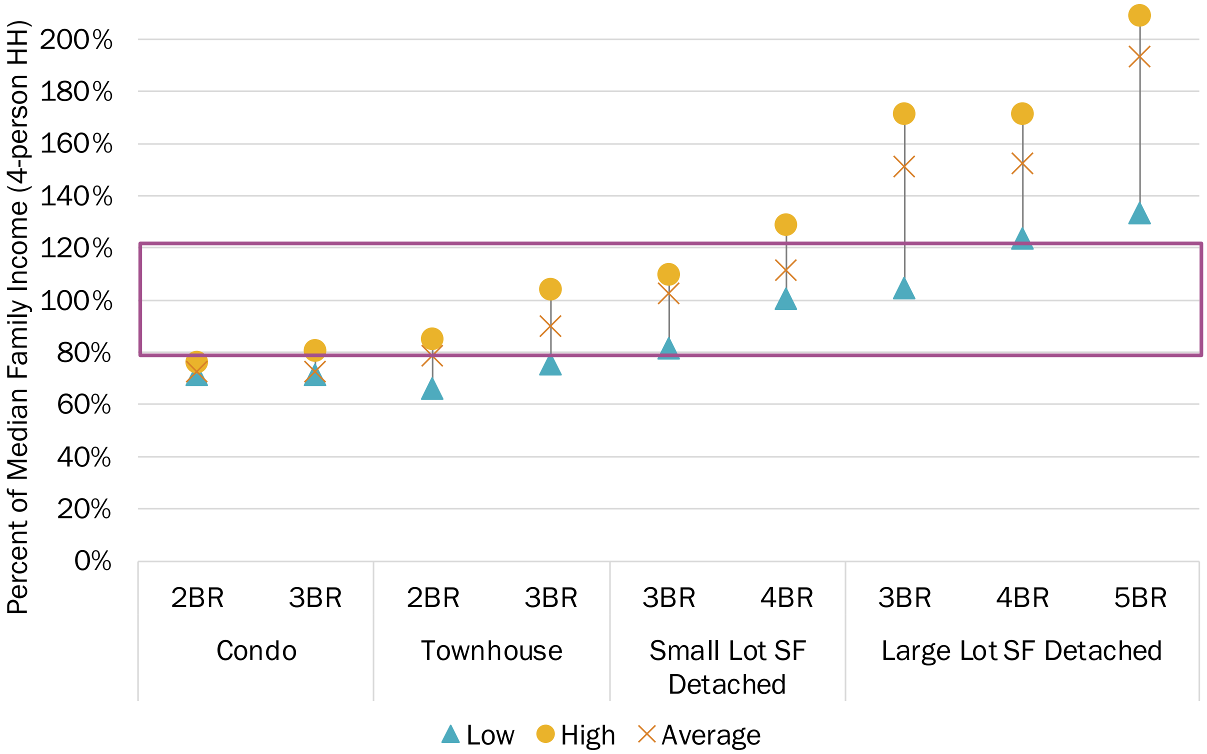


Exhibit 4: Sales Price, Income Required, and Income as a Percent of MFI for Newer Housing in and near Wilsonville, by Housing Type, 2021
Source: ECONorthwest Analysis of Redfin Data, October 2021

	Condo		Townhouse		Small Lot SF Detached		Large Lot SF Detached		
	2BR	3BR	2BR	3BR	3BR	4BR	3BR	4BR	5BR
Low Sales Price									
Sales Price	$300,000	$300,000	$300,000	$350,000	$402,500	$502,500	$525,000	$625,000	$675,000
Annual income needed to afford mortgage	$69,110	$69,110	$64,110	$73,290	$78,940	$97,310	$101,440	$119,810	$128,990
Annual income needed as a percent of MFI*	71%	71%	66%	76%	82%	101%	105%	124%	133%
High Sales Price									
Sales Price	$325,000	$350,000	$400,000	$500,000	$552,500	$652,500	$875,000	$875,000	$1,075,000
Annual income needed to afford mortgage	$73,700	$78,290	$82,480	$100,850	$106,490	$124,860	$165,730	$165,730	$202,470
Annual income needed as a percent of MFI*	76%	81%	85%	104%	110%	129%	171%	171%	209%
Average Sales Price									
Sales Price	$307,700	$307,400	$365,300	$426,700	$513,800	$560,000	$769,900	$775,800	$990,600
Annual income needed to afford mortgage	$70,520	$70,470	$76,110	$87,390	$99,380	$107,870	$146,420	$147,510	$186,970
Annual income needed as a percent of MFI*	73%	73%	79%	90%	103%	112%	151%	153%	193%

**As compared to 100% MFI for a four-person household in Clackamas County. Orange indicates less affordability; blue indicates greater affordability.*

Rental Housing: Market-Rate Apartments

Looking at the range of rents and unit sizes for apartments built in Wilsonville since 2010, there is a wide range of unit sizes and rents, as shown in Exhibit 5.

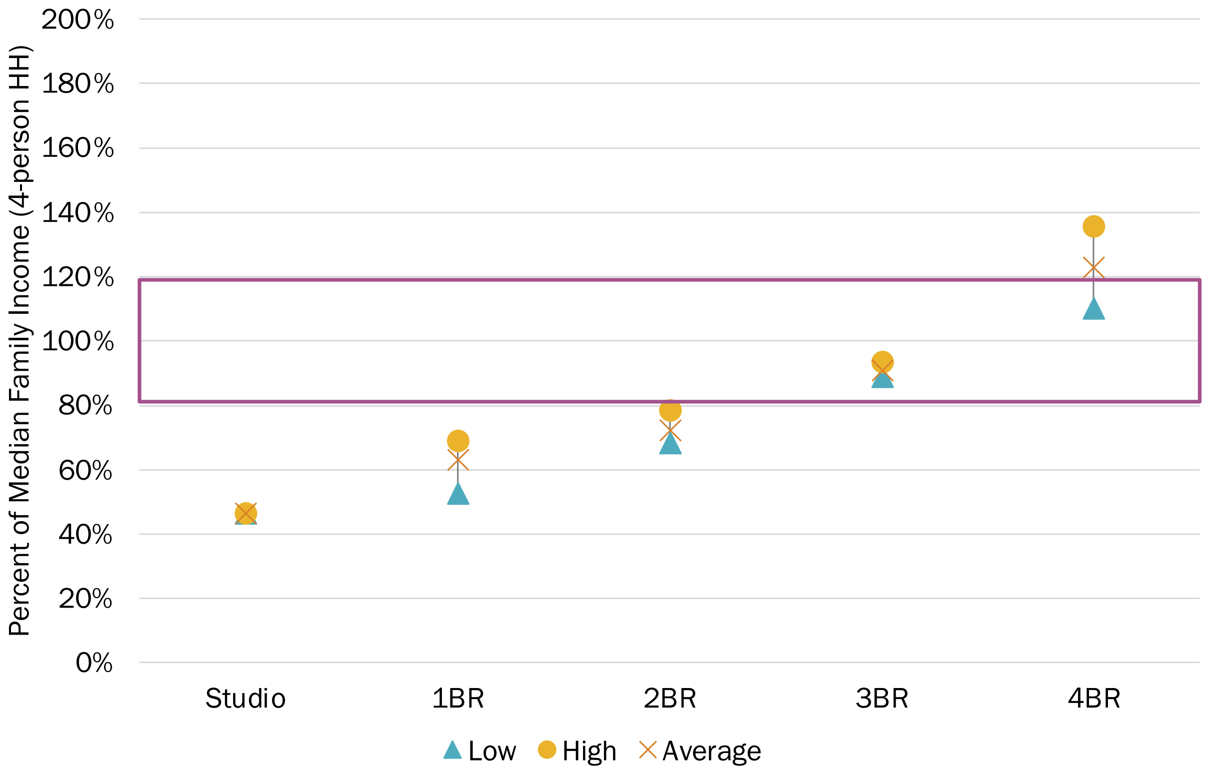
Exhibit 5: Wilsonville Apartment Unit Sizes, Mix, and Rents, Developments Built Since 2010
Source: ECONorthwest analysis of CoStar data, November 2021

Unit Type	Most rent for	Average rent is	Most units are	% of Units
Studios	$1,123	$1,123	544 SF	4%
1 bedroom	$1,277-$1,667	$1,599	1,275 - 1,630 SF	28%
2 bedrooms	$1,651-$1,902	$1,778	1,020 - 1,110 SF	57%
3 bedrooms	$2,154-$2,263	$2,203	2,150- 2,265 SF	5%
4 bedrooms	$2,664-$3,284	$2,871	2,664 – 3,284 SF	5%

Converting these rents to the percent of MFI needed to afford them[8] shows that even at the top end, apartment units in newer buildings are generally affordable at or below 80% of MFI for a four-person household, and often around 80% of MFI, as shown in Exhibit 6. Very small studio units may be even more affordable, while very large four-bedroom units may be less affordable, but the bulk of units in newer apartments in Wilsonville would be considered affordable for households earning between 65% and 90% of MFI. New apartments would typically be expected to rent for near the upper end of this range (roughly 80% to 90% of MFI), assuming they have good access to amenities.

[8] In setting maximum allowed rents by unit size / bedroom count, HUD uses an assumed household size and multiplier relative to the MFI for a family of four. However, to allow for comparison to the income distributions, which are not adjusted for household size, we use the MFI for a four-person family throughout even though it is not realistic to expect a four-person family to occupy a studio apartment.

Exhibit 6: Wilsonville Apartment Rent Affordability as a Percent of Median Family Income* by Unit Size, Developments Built Since 2010
Source: ECONorthwest Analysis of CoStar Data, November 2021
* Median family income from HUD for Clackamas County for a four-person household



Section 5. Affordable Housing Targets

The City does not control housing pricing and affordability directly, but there are many factors that the City does control that affect how much housing is likely to be produced within different affordability levels. Setting reasonably achievable affordable housing targets for the Frog Pond East and South neighborhoods is intended to guide the City's strategies and policies for this area so that the resulting neighborhoods offer housing options for households at a range of income levels.

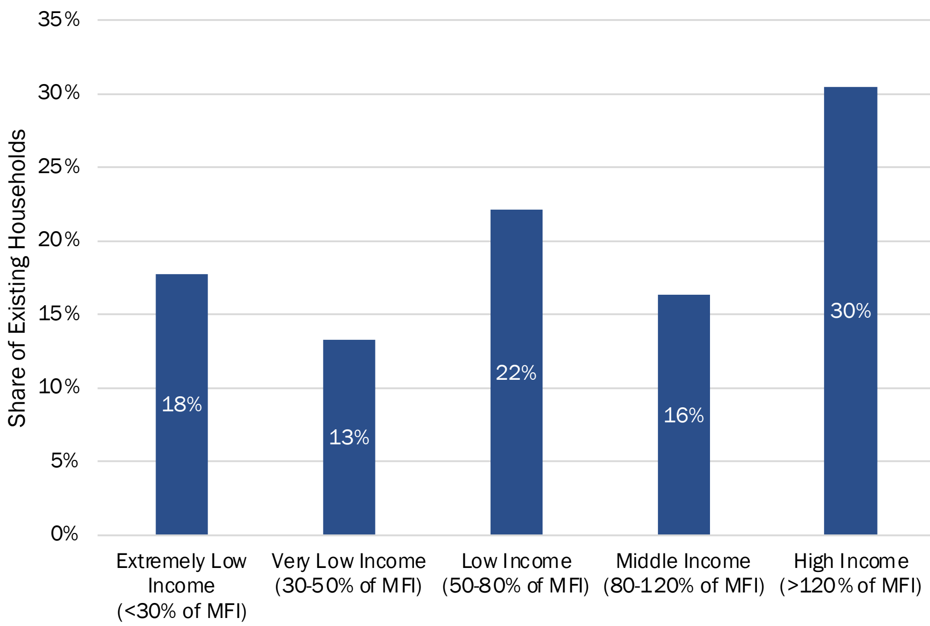
Reference Points

In setting an appropriate and achievable affordable housing target, it is helpful to consider multiple reference points that inform the distribution of housing that may be needed and that may be possible. This section outlines several reference points for housing distribution by affordability level: current income distribution in Wilsonville, current regional income distribution, existing housing gaps at the City and County scale, and the distribution expected based on prior plan policy direction and existing affordable housing tools. These reference points are intended to inform establishing achievable affordable housing targets for Frog Pond East and South, which will ultimately be determined by City Council.

City of Wilsonville Income Distribution

This reference point offers one way of understanding what it would look like for this area to contribute proportionately to meeting overall housing needs for the city. However, this approach does not consider the specific types of housing needs that may best be met in the new growth area versus other areas of the city, and it does not account for changing demographic needs or needs that are not currently met in the city. The current distribution of Wilsonville households based on how their household income compares to the MFI for Clackamas County for a four-person household is shown in Exhibit 7.

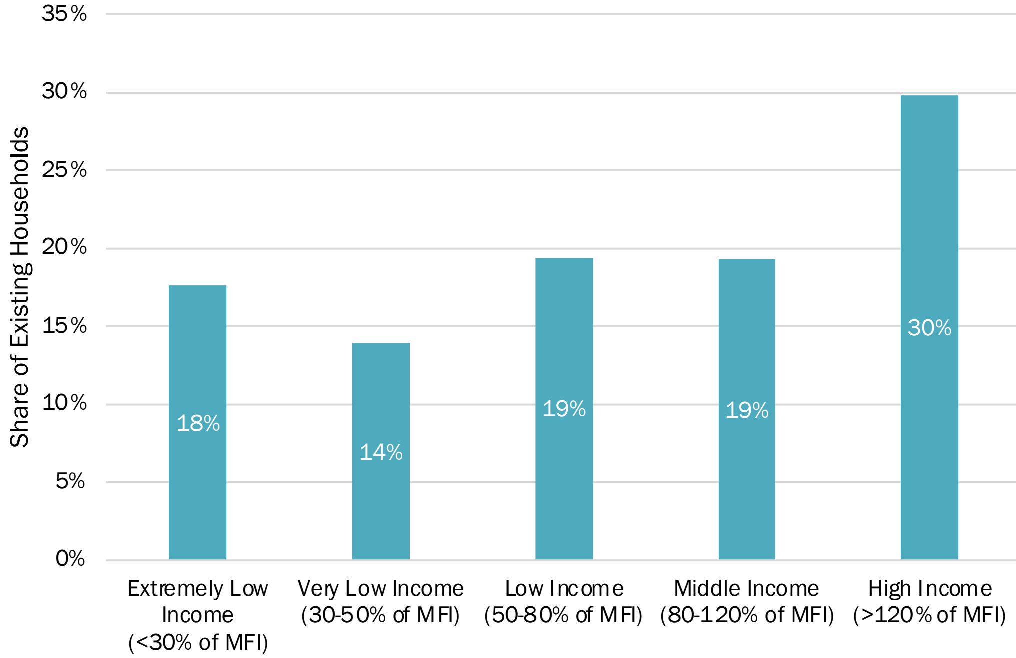
Exhibit 7. Wilsonville Households by Percentage of MFI, 2021
Source: American Community Survey, 2019, 5-year estimates



Regional Income Distribution

Looking at overall regional income distribution can be useful to highlight housing affordability levels and incomes that may be under-represented in Wilsonville compared to the region as a whole. It provides a sense of what mix of housing affordability levels would best meet the needs of people living in the region as a whole. The current distribution of households by income level in the three-county Portland region is shown in Exhibit 8. In the region overall, the share of middle-income residents is somewhat higher than in the city of Wilsonville, while the share of low-income residents is somewhat lower. The share of extremely low income and very low-income residents is similar in the City and in the region overall.

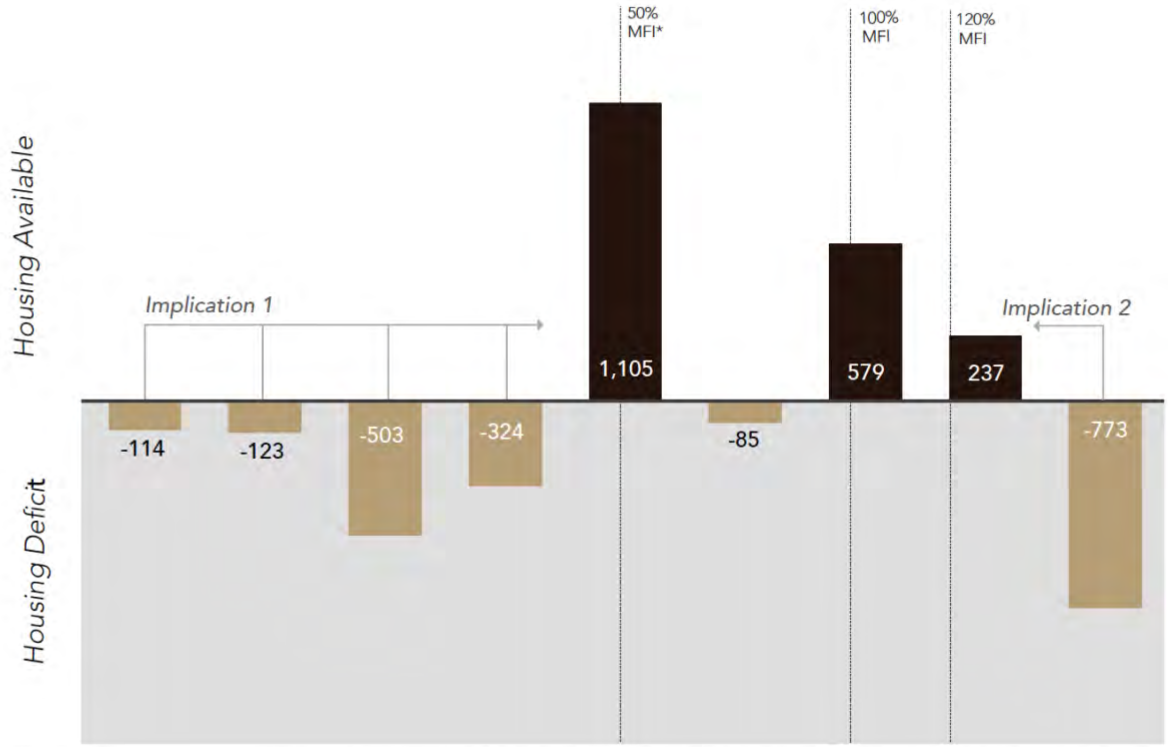
Exhibit 8. Portland Region Households by Percentage of MFI, 2021
Source: American Community Survey, 2019, 5-year estimates



Current City and County Housing Gaps

Based on the most recent Housing Needs Analysis for the City of Wilsonville (which was done as part of a county-wide Housing Needs Analysis in 2018), there is a deficit of housing units for households earning less than $35,000 per year, but also a deficit of high-amenity housing for households earning more than $150,000 per year.

Exhibit 9: Affordable Housing Costs and Units by Income Level, Wilsonville, 2018
Source: Clackamas County Regional Housing Needs Analysis, page 281



Household Income	Less than $10,000	$10,000–$14,999	$15,000–$24,999	$25,000–$34,999	$35,000–$49,999	$50,000–$74,999	$75,000–$99,999	$100,000–$149,999	$150,000 or more
# Households	380	205	619	981	1,135	1,781	1,002	1,308	1,256
# Surplus / Deficit Units	-114	-123	-503	-324	1,105	-85	579	237	-773
% Surplus / Deficit Units	-30%	-60%	-81%	-33%	97%	-5%	58%	18%	-62%

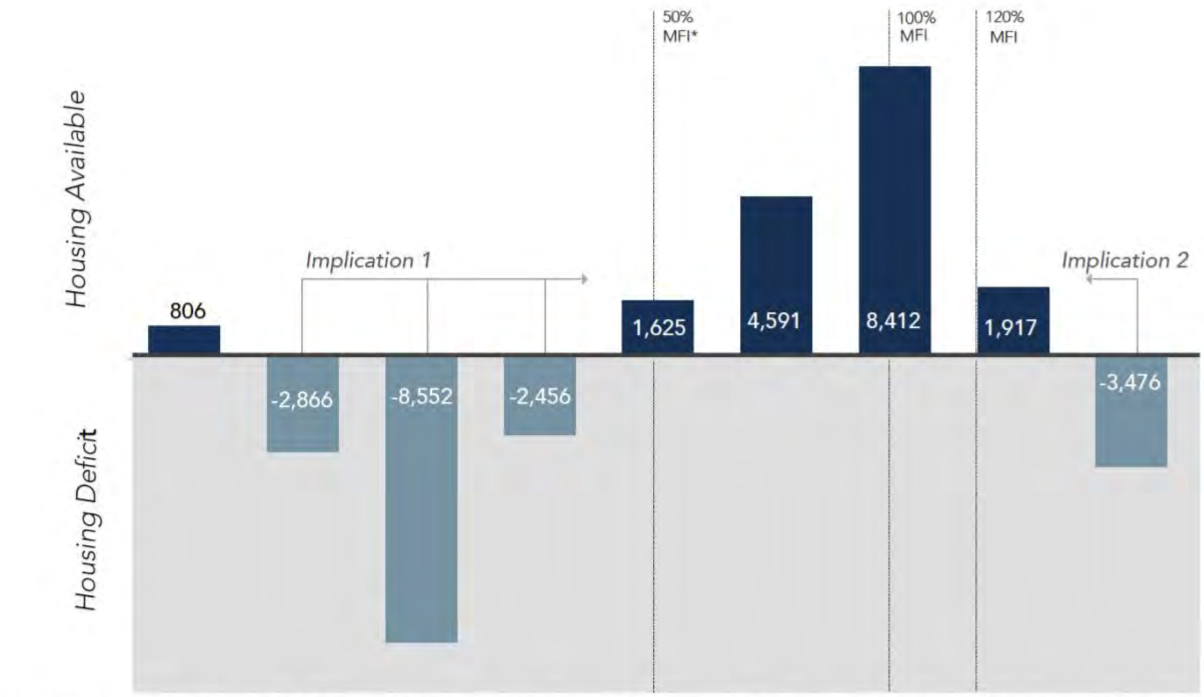
*Median Family Income for a family of four

Implication 1
Some lower-income households live in housing that is more expensive than they can afford because affordable housing is not available. These households are cost burdened.

Implication 2
Some higher-income households choose housing that costs less than they can afford. This may be the result of the household's preference or it may be the result of a lack of higher-cost and higher-amenity housing that would better suit their preferences.

The overall housing gaps for Clackamas County also show a deficit of housing for households earning less than $35,000 per year and high-amenity housing for households earning $150,000 or more.

Exhibit 10: Affordable Housing Costs and Units by Income Level, Clackamas County Overall, 2017
Source: Clackamas County Regional Housing Needs Analysis, page 74



Household Income	Less than $10,000	$10,000–$14,999	$15,000–$24,999	$25,000–$34,999	$35,000–$49,999	$50,000–$74,999	$75,000–$99,999	$100,000–$149,999	$150,000 or more
# Households	6,343	4,872	11,849	12,222	18,124	28,653	21,764	26,197	21,126
# Surplus / Deficit Units	806	-2,866	-8,552	-2,456	1,625	4,591	8,412	1,917	-3,476
% Surplus / Deficit Units	13%	-59%	-72%	-20%	9%	16%	39%	7%	-16%

*Median Family Income for a family of four

Implication 1
Some lower-income households live in housing that is more expensive than they can afford because affordable housing is not available. These households are cost burdened.

Implication 2
Some higher-income households choose housing that costs less than they can afford. This may be the result of the household's preference or it may be the result of a lack of higher-cost and higher-amenity housing that would better suit their preferences.

This reference point suggests a focus on expanding housing supply at the top and bottom of the income spectrum. Providing high-amenity housing for higher-income households can reduce upward pressure on prices for older homes that could be remodeled, while providing housing affordable to lower-income households can reduce cost-burdening and allow households more resources to meet their other needs and remain more stable in their housing.

Prior Area Plan Policy Direction & Existing Affordable Housing Tools

This reference point anticipates the outcomes that would be most likely for this area if the City maintains the policy direction from the Area Plan and does not implement any additional strategies to support affordable housing in this area. It provides a reference point for a policy baseline to see how much intervention may be required to achieve the City's equitable housing goals in this area. The distribution of housing units by type / density established in the Frog Pond Area Plan is summarized in Exhibit 11 and Exhibit 12. As described in the Area Plan:

> *At the time of adoption there were two general proposals regarding residential land use in the East and South Neighborhoods. The first proposal was the Planning Commission-recommended option (Option G), with the condition to re-examine the R2.5 densities and commercial site location at a future date of master planning. The second proposal was that there should be a minimum lot size of 4,000 square feet. The Council considered these proposals carefully, along with all of the rationale, implications and issues. Working from the premises that: (1) both points of view should be honored and represented in the Plan; (2) many years will pass before final decisions need to be made; and (3) the range of housing choices and price ranges should increase in the future when these neighborhoods are developed – the Council struck a balance. The balance was to include both options in the Plan with a commitment to revisit the densities and commercial site in the future as part of master planning. An additional idea was added to consider, during Master Planning, neighborhood scale mixed use, where residential would be allowed over the retail in the commercial center.*[9]

The primary difference for purposes of this document is that Option G included an allowance for attached / cottage single-family, with lots between 2,000 and 3,000 square feet. Neither option included an allowance for multifamily housing. As noted above, the City must provide for at least 1,325 units in this area (Option H would provide only 1,258) and must allow attached / cottage single-family and other middle housing types in any zone that allows single-family housing.[10] Thus, ECONorthwest used Option G as a starting point for this scenario, since it aligns better with recent requirements.

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[9] Frog Pond Area Plan, A Concept Plan for Three New Neighborhoods in East Wilsonville, 2015, page 24.

[10] While Option G did not assume that middle housing would be allowed throughout the East and South neighborhoods, the total percentage of middle housing and small lot detached housing, at roughly one third of all housing units, remains a reasonable estimate of the amount of middle housing and small-lot detached housing that the market might deliver in this area after accounting for HB 2001.

Exhibit 11. Land Use Metrics and Capacity "Option G"
Source: Frog Pond Area Plan, A Concept Plan for Three New Neighborhoods in East Wilsonville, 2015

Residential Designation	Average Lot Size (SF)	Max Units/ac net	East Neighborhood Units	South Neighborhood Units	East+ South Units	% of East + South Units
Future R-8 Single Family (7,000 - 9,000 SF)	8,000	5.40	120	28	148	11%
Future R-6 Single Family (5,000 - 7,000 SF)	6,000	7.30	125	162	287	22%
Future R-4 Single Family (3,000 - 5,000 SF)	4,000	10.90	165	286	451	34%
Future R-2.5 (2,000 - 3,000 SF)	2,500	17.40	436		436	33%
Total Units			**846**	**476**	**1,322**	**100%**

Exhibit 12. Land Use Metrics and Capacity ("Option H" - No R2.5 in East Neighborhood)
Source: Frog Pond Area Plan, A Concept Plan for Three New Neighborhoods in East Wilsonville, 2015

Residential Designation	Average Lot Size (SF)	Max Units/ac net	East Neighborhood Units	South Neighborhood Units	East+ South Units	% of East + South Units
Future R-8 Single Family (7,000 - 9,000 SF)	8,000	5.40	120	28	148	13%
Future R-6 Single Family (5,000 - 7,000 SF)	6,000	7.30	125	162	287	25%
Future R-4 Single Family (3,000 - 5,000 SF)	4,000	10.90	437	286	723	62%
Future R-2.5 (2,000 - 3,000 SF)	2,500	17.40				0%
Total Units			**682**	**476**	**1,158**	**100%**

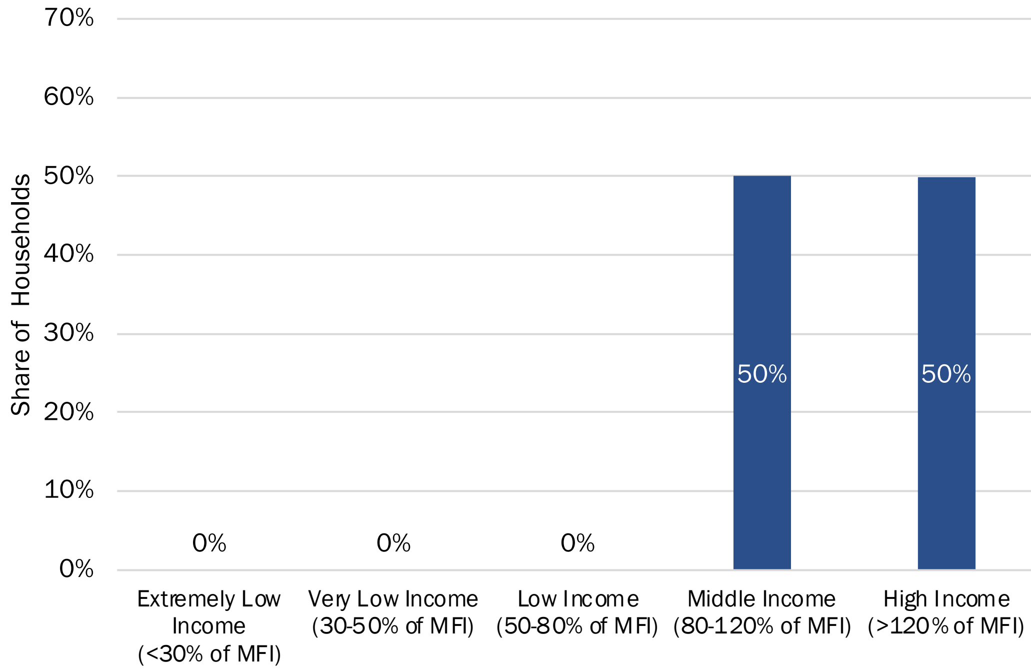
To translate this housing mix into an expected distribution by income level, ECONorthwest used the expected pricing of market-rate housing by housing type summarized in Section 4:

- The Future R-2.5 units are assumed to be primarily middle housing similar to townhouses based on the density and housing types described for this zone. Given estimated pricing, these units would generally be affordable to households between 80% and 120% of MFI.
- Small-lot detached housing ranges slightly above and below 120% of MFI. Half of the R-4 housing units are assumed to be affordable at 80-120% of MFI, while the other half are assumed to be affordable to households at 120% or more of MFI.
- Medium- to large-lot single-family is affordable only above 120% of MFI. All of the R-6 and R-8 units plus half of the R-4 units are assumed to be affordable to households earning 120% or more of MFI.

Because Option G did not include multifamily housing in the land use metrics, this reference point assumes that no regulated affordable rental housing or market-rate multifamily are built in the area. While some affordable homeownership housing is possible under existing policy guidance, the City has no existing programs in place to support this, so the assumption is that this would not occur without additional support. These factors mean that the current policy guidance and existing programs would be unlikely to deliver housing to serve households earning less than 80% of MFI.

The expected distribution of housing by income level under existing policy is shown in Exhibit 13.

Exhibit 13: Expected Distribution of Housing by Affordability Level Under Existing Policy
Source: ECONorthwest calculations based on Frog Pond Area Plan Option G and market pricing



Proposed Affordable Housing Targets

The proposed affordable housing targets are intended to provide achievable goals for this area if the City addresses the constraints noted previously and implements a set of feasible strategies to support affordable housing. The types of strategies needed to meet these proposed targets are described in Section 6.

Given the context and the scale of the area, the City could target the following for publicly supported, income-restricted affordable housing development:

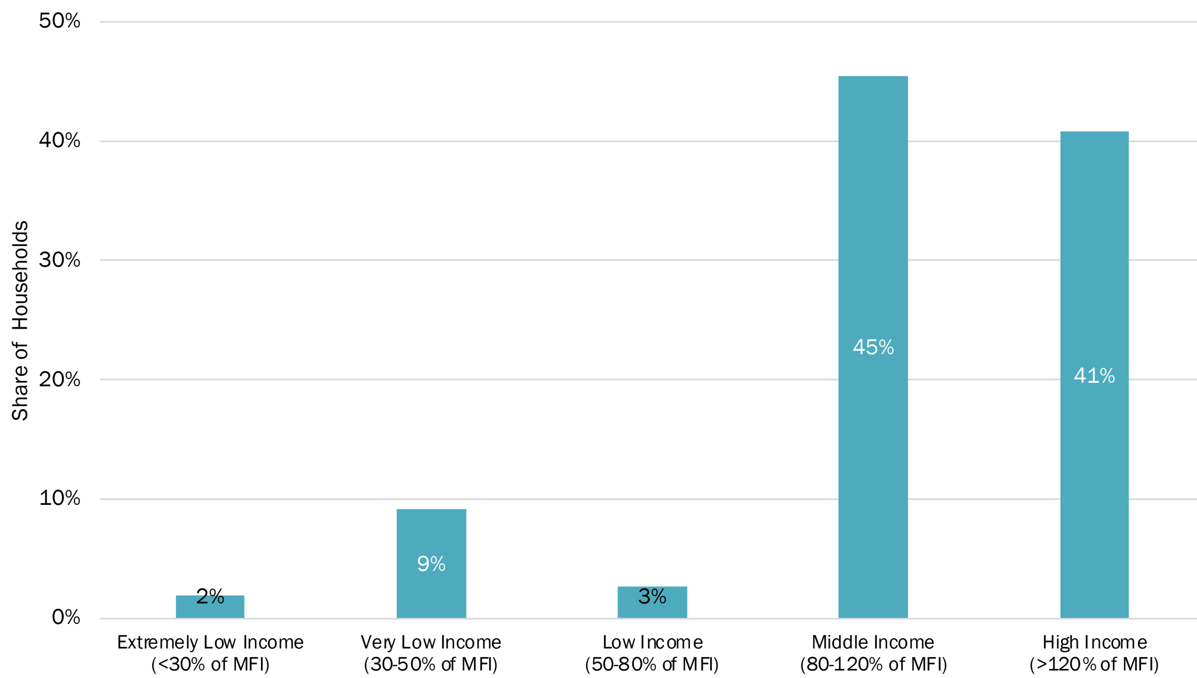
- One affordable multifamily rental development serving households earning up to 60% of MFI, or an average 60% of MFI, with income averaging that offers some units for households earning up to 80% of MFI. This would likely be between 120 and 180 units and roughly 30 units per acre based on typical development of this type, requiring four to six acres of land.

- One small cottage/tiny home/courtyard development for households earning less than 30% of MFI, low-income seniors, veterans, or people with disabilities. This could be between 5 and 50 units and might require between a quarter of an acre and two acres, depending on scale and design.
- One to two townhome or cottage cluster affordable homeownership developments for households earning 35% to 80% of MFI (e.g., Habitat for Humanity or Proud Ground). This could be between 10 and 40 units and might require between one and two acres, depending on scale and design.

In addition to these goals for income-restricted affordable housing, the City can target providing a mix of housing within the market rate development that offers roughly half of units that are likely to be affordable to households earning less than 120% of MFI. This could mean a similar mix of housing types as identified in Option G in the Area Plan (even if the locations for middle housing are no longer restricted), resulting in a roughly even split between housing for households earning 80% to 120% of MFI and households earning more than 120% of MFI for the market-rate for-sale housing. Allowing opportunities for some market-rate apartment development without ground floor commercial space to further expand the range of housing options for households earning less than 100% of MFI.

Error! Reference source not found. provides an illustrative example of the approximate distribution of housing by income level based on the ranges of units above and rough estimates of the amount of market-rate housing that could be built if the land above were dedicated to affordable housing. These estimates are preliminary and may be refined through the planning process.

Exhibit 14: Approximate Distribution of Housing by Income Level for Affordable Housing Target
Source: ECONorthwest

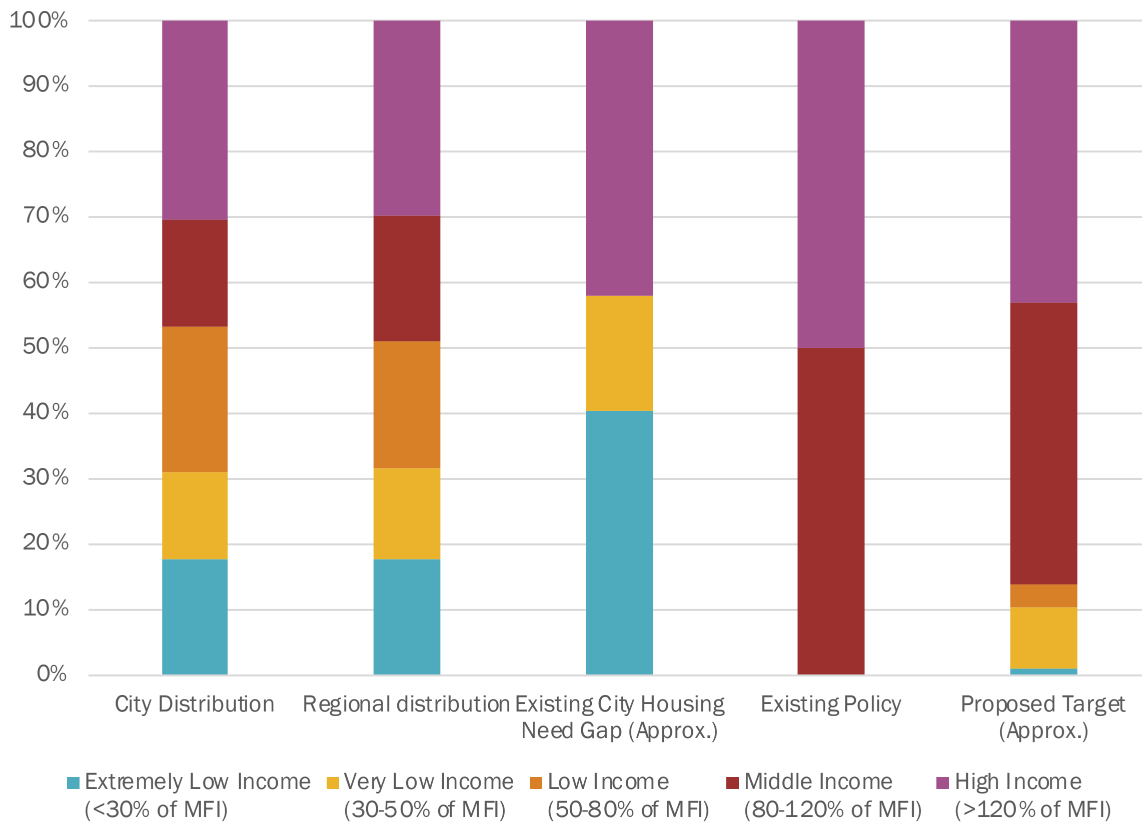


Comparison to Reference Points and Implications

Error! Reference source not found. summarizes the unit counts that would result from applying the distribution for each scenario to the 1,325 housing units required by Metro. (As noted previously, the total unit count may vary between the scenarios or be refined through the process of establishing land use scenarios—these unit counts are illustrative only at this stage.) Exhibit 15 illustrates the comparison between the scenarios in terms of the income distribution in each.

Exhibit 15: Distribution of Housing by Income Level for Housing Target Compared to Reference Points, Frog Pond East and South

Source: ECONorthwest



Implications:

- To reach the affordable housing policy directives from the Equitable Housing Strategic Plan with development in Frog Pond East and South the City will need to allow a full range of housing types and make investments to support affordable housing development.
- Even if the City does make changes to policy and takes action to dedicate funding to support affordable housing, the share of affordable housing is likely to fall short of meeting a proportionate share of overall housing needs at the City or regional level during initial build-out.

- Adding to housing supply across a range of affordability levels in Frog Pond East and South will help meet housing needs overall and would be a one step forward in a larger series of housing-related initiatives by the City, even if it does not match the overall distribution or address all the existing gaps for affordable housing.
- Middle housing and condominiums can offer homeownership opportunities to middle income households without public subsidy, making land use regulations and infrastructure funding decisions that affect the feasibility of multi-family and middle housing an important consideration for affordability.

Section 6. Affordable Housing Strategies

The City can support development of affordable and mixed-income housing in a number of ways. The EHSP lays out a range of strategies to advance the City's equitable housing goals. The City will also be required to adopt a Housing Production Strategy (HPS) soon under recent changes to state rules, and will need to identify and prioritize strategies to support housing production across a range of housing needs. This section outlines the strategies that are likely to have the greatest impact for Frog Pond East and South, building on those in the EHSP.

- **Zone for All Housing Types:** Enable a full range of housing types in Frog Pond East and South, including multifamily, to expand first time homebuyer opportunities and to make it possible to build affordable rental housing using common sources of funding. Align zoning for multifamily with areas that are suitable for affordable housing. Flexibility needs to be in place to take advantage of affordable housing opportunities both now and during the longer-term build out of Frog Pond East and South.
- **Acquire Land for Affordable Housing:** Attempt to find willing sellers for suitable properties for affordable housing within Frog Pond East and/or South, to ensure an opportunity to build affordable housing in the area. This would likely require funding, particularly if the City intends to offer the land for affordable housing development for little or no cost to make affordable housing development more viable. However, the City could consider asking the current owner to ground lease the property to the City and have the development pay for it in future, or seek an option on a property rather than acquiring it outright. It would also require staff time to manage the property owner negotiations and (if successful), the land disposition process (e.g., a Request for Proposals for development). With private developers also seeking to secure land or options to purchase property, the sooner the City acts, the better its chances. The City should prioritize sites that meet the following criteria:
  - Close proximity to existing transit (e.g., the stop at Meridian Creek Middle School), or near an area that has a high probability of future transit service upon development.
  - Close proximity to parks, schools, future commercial areas, and other amenities.

- Sites that are between four and six acres of buildable land if targeting affordable rental housing; smaller sites (e.g., half-acre to two acres) for homeownership housing.
- Sites without major development constraints or especially costly infrastructure needs. Sites should not be in the floodplain.

- **Partner with a Community Land Trust:** A community land trust (CLT) such as Proud Ground could help deliver affordable homeownership housing in Frog Pond East and South. If the City is unable to secure land for affordable housing, it could explore other ways to support a CLT in building affordable homes, such as direct subsidy (e.g., using Metro Bond money), SDC waivers, or tax abatements (see further discussion below).
- **Waive, Reduce, or Defer SDCs for Affordable Units**: The cost of SDCs and other infrastructure costs for greenfield development can become prohibitive for affordable housing. Options to reduce SDC cost impacts on affordable housing will be addressed as part of the infrastructure funding plan for Frog Pond East and South to ensure that overall infrastructure needs can be met. Waiving SDCs entirely for income-restricted affordable housing has the greatest impact, but reductions and deferral can also help reduce the funding gap for affordable housing. This requires engagement with other infrastructure providers.
- **Incentivize Smaller and Lower-Cost Middle Housing**: Middle housing will be allowed broadly in Frog Pond East and South, and some developers have expressed interest in middle housing development in the area. Because middle housing generally offers lower price-points than single-family detached housing, it offers middle-income housing options and potential for lower-cost homeownership. There are several incentives that could be effective tools to support middle housing development that is affordable to middle-income households:
    - The Multiple Unit Property Tax Exemption (MUPTE) is a flexible program that can be used to incent multiple-unit rental housing with particular features or at particular price points by offering qualifying developments a partial property tax exemption for 10 years. The City could offer MUPTE for middle housing rental developments with small units that are more likely to be affordable. (The City could also choose to offer MUPTE only in exchange for income and rent restrictions, but would need to be able to monitor compliance with these restrictions over the 10-year abatement period.) This program requires support from overlapping taxing districts.
    - The Homebuyer Opportunity Limited Tax Exemption (HOLTE) program allows cities to offer a 10-year partial property tax exemption on for-sale properties valued at no more than 120% of the median sales price that meet any additional city-imposed income and owner-occupancy requirements. Portland has paired it with an SDC exemption to incentivize new moderately-priced for-sale housing. This program requires support from overlapping taxing districts.
    - SDCs that scale with unit size can also incentivize smaller, lower-cost middle housing units by right-sizing fees to the impacts of different housing types and sizes.

This will be considered through the infrastructure funding plan and requires engagement with other infrastructure providers.

- The City could consider allowing small "multiplex" development (e.g., 6-12 units) on sites that would allow a fourplex under new middle housing rules, if the units are under a certain size limit so that the overall volume of the building is still similar to a fourplex.

- **Reduce Multifamily Parking Requirements:** If the City adopts zoning for Frog Pond East and South that allows multifamily development in portions of the area, it should also evaluate reducing parking requirements for multifamily. (This could be done citywide or applied only within the Frog Pond East and South areas.) Currently, at least one space per unit is required, even for units less than 500 sq. ft.; most units require 1.25 to 1.75 spaces per unit. If parking requirements exceed what is needed to serve affordable housing, this adds cost to build spaces that do not generate revenue and reduces the number of units that fit on site. If land and funding are available for affordable housing, reducing parking requirements can ensure that it can be built efficiently and optimize the amount of housing on the site.
- **Incentivize Housing with Accessible or Visitable Units:** With substantial new housing construction coming for Frog Pond East and South, the City can encourage units designed to be accessible or visitable to better meet the needs of individuals with mobility limitations in the community. The City can apply some of the same incentives noted above to apply to accessible or visitable units, such as tax abatements, SDC reductions, or allowances to build additional units.

Section 7. Conclusions and Next Steps

If the City does not take further action to support affordable housing and does not change course from prior policy direction on housing types for Frog Pond East and South, there will be few opportunities for affordable housing and little chance that it will get built. If the City allows a full range of housing types and implements additional affordable housing strategies, particularly related to proactive land acquisition, the chances for affordable housing increase substantially. Financial and regulatory incentives could also encourage developers to build smaller, lower-cost housing units with or without income restrictions, or to build units that are accessible or visitable for residents with mobility limitations. These strategies align with those outlined in the EHSP and provide input to a future HPS.

While meeting a proportionate share of citywide or regional housing needs by income may not be possible for greenfield development, there are important opportunities for affordable homeownership and expanding housing options across a range of incomes and housing needs. The proposed housing targets include a mix of market-rate housing at typical price-points and a few affordable housing developments of various scales and forms. These targets are intended to be achievable with implementation of the recommended housing strategies. This area can play an important role in a broader citywide effort to provide needed housing. Additional work will be needed to meet housing needs in other parts of the City that cannot feasibly be met in this greenfield area.

Next steps within this process include identifying specific properties that could help meet affordable housing targets; evaluating relationships to the infrastructure funding plan of potential SDC reductions or waivers; engaging affordable housing developers and other stakeholders to refine strategies; and subsequent work to learn more about community perspectives/preferences, which could lead to refinements in the targets and strategies laid out in this document.

APPENDIX C: BUILDABLE LANDS INVENTORY

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LAND USE PLANNING
TRANSPORTATION PLANNING
PROJECT MANAGEMENT

MEMORANDUM

Buildable Lands Inventory Methodology

Frog Pond East and South Master Plan

DATE February 25, 2022

TO City of Wilsonville, OR

FROM Brandon Crawford, Joe Dills, Andrew Parish, APG

INTRODUCTION

The purpose of this memorandum is to document the methods and results of the buildable lands inventory (BLI) conducted for the Frog Pond East and South Master Plan. This BLI is intended to provide a high-level estimate of the buildable acreage in the Master Plan study area. It is an update to the BLI prepared by the City in 2015 for the Frog Pond Area Plan.

SOURCE DATA

The source data for this analysis includes:

- Metro Regional Land Information System (RLIS)
    - Tax lots
    - Wilsonville city limits
- City of Wilsonville
    - Master Plan Study Area
    - Local Wetlands Inventory – significant wetlands
    - 50-foot stream buffer
    - Draft Significant Natural Resource Overlay Zone (SROZ)
- Bonneville Power Administration (BPA) transmission easement

METHDOLOGY

The BLI was conducted in three basic steps:

- **Step 1: Identify Constraints and Committed Areas.** Constraints include the Significant Natural Resource Overlay Zone (SROZ), including streams and a wetland, as well as the BPA Transmission Easement.

- **Step 2: Assign Development Status.** The study area tax lots were given a development status of either vacant, partially vacant, or developed, consistent with the definitions in OAR 660-038-0060.
- **Step 3: Calculate Developable Acreage.** The buildable acreage was calculated for each lot by removing constraints, a quarter acre for partially vacant lots, and 20% unconstrained area to account for right-of-way.

The remainder of this memo describes these steps in greater detail.

STEP 1 – IDENTIFY CONSTRAINTS

Most of the constraints used for this BLI were the same constraints that were used for the BLI that was conducted for the area in 2015. They include:

- Lands designated Significant Resource Overlay Zone (SROZ)
- 50-foot stream buffers
- Wetlands from the Local Wetlands Inventory
- Bonneville Power Administration easement

These constrained areas were assumed to be 100% unbuildable. Therefore, the constrained areas were fully removed from the buildable acreage calculations. The total constrained is roughly **76 acres**.

STEP 2 – ASSIGN DEVELOPMENT STATUS

The methods for determining development status followed the State BLI guidelines for Residential Land within the UGB (OAR 660-038-0060). Each tax lot was assigned a development status of vacant, partially vacant, or developed. The criteria for determining each development status is as follows:

- **Vacant.** Tax lots with an improvement (building) value less than $10,000 and at least 3,000 *unconstrained* square feet (i.e., the remaining area after the constraints were removed).[1]
- **Partially Vacant.** Tax lots with an improvement value greater than $10,000 and at least a half-acre in size with an existing single-family home. A quarter-acre was removed from each partially vacant lot to account for the existing development.
- **Developed.** Any remaining tax lots that were not identified as vacant or partially vacant.

[1] If a lot has less than 3,000 square feet of *unconstrained* land, then its development status would be considered "constrained". There were no lots in the study area that fit this criterion.

The development status results are summarized by sub-area in Table 1 below:

TABLE 1: DEVELOPMENT STATUS COUNT

Development Status	# of East Lots	# of South Lots	Total
Vacant	3	7	*10*
Partially Vacant	2	15	*17*
Developed	3	1	*4*
Total	**8**	**23**	***31***

STEP 3 – CALCULATE BUILDABLE LAND

As mentioned, the constrained areas were fully removed from the calculations for buildable land, and an additional quarter acre was removed for partially vacant lots. For the remaining unconstrained land, 20% of each lot's area was removed to account for future right-of-way. Existing public streets and roads were also removed from the buildable area analysis. The results of the buildable area are shown in Table 3 below, and the development status of the entire study area is illustrated in Figure 1.

TABLE 2: TOTAL BUILDABLE AREA

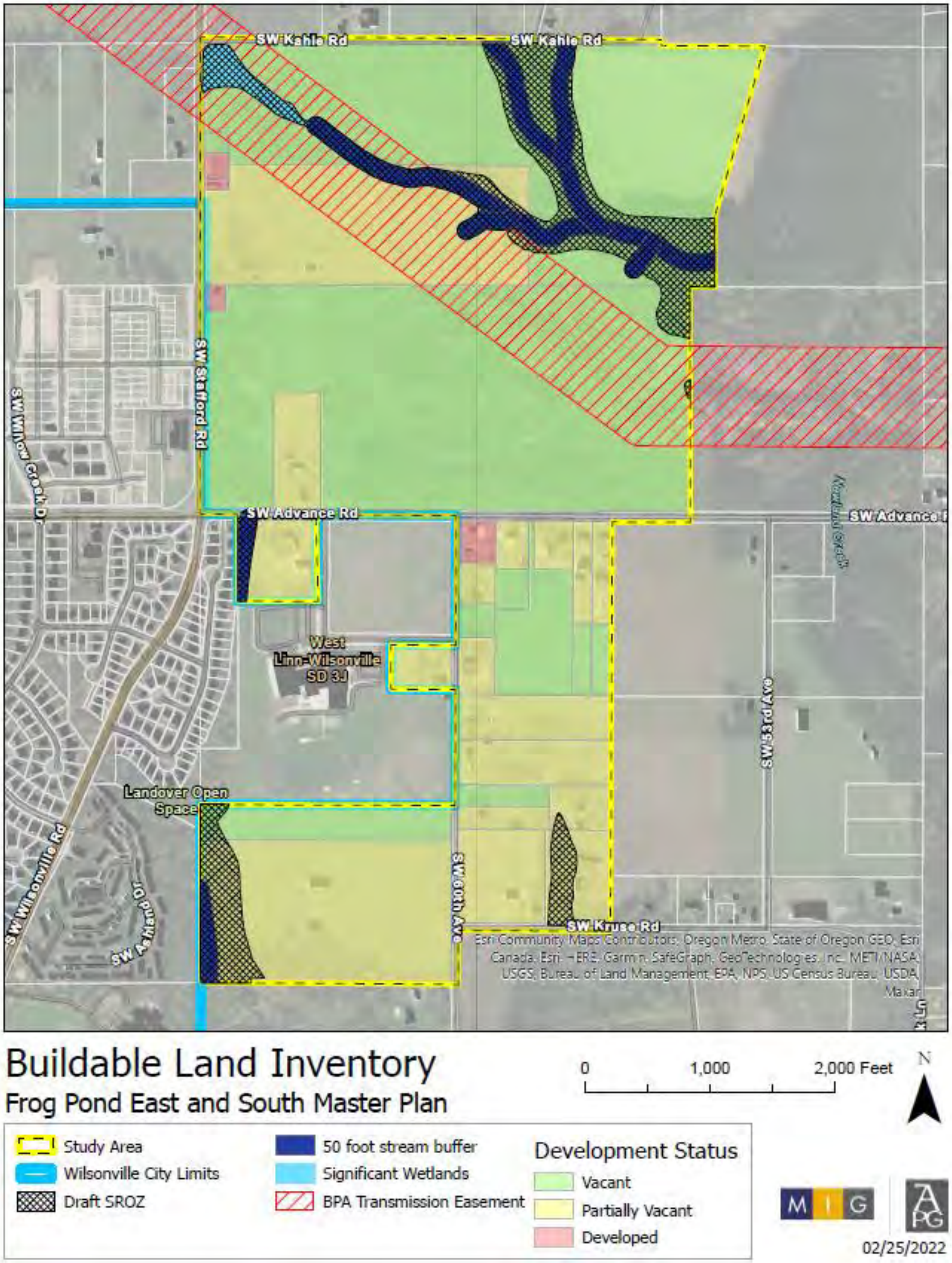
	Acres
Total (Gross) Area*	*254.9*
Constrained Area	*76.5*
20% future ROW	*39.9*
Net Buildable Area	***138.5***

**Total for all study area parcels. The total area (including existing roads) is 265 acres.*

TABLE 3: FROG POND EAST AND SOUTH BUILDABLE AREA

	East		**South**		**Entire Study Area**	
Development Status	*Total Acres*	*Net Buildable Acres*	*Total Acres*	*Net Buildable Acres*	*Total Acres*	*Net Buildable Acres*
Vacant	138.5	75.4	18.2	14.1	156.6	*89.5*
Partially Vacant	31.7	12.0	64.3	37.1	96.1	*49.0*
Grand Total	**170.2**	***87.4***	**82.5**	***51.1***	**252.7**	***138.5***

FIGURE 1: BLI DEVELOPMENT STATUS FOR FROG POND EAST AND SOUTH



APPENDIX D: MARKET ANALYSIS

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Frog Pond East Master Plan

Commercial Area Evaluation DRAFT

Date	March 28, 2022
To	APG
From	Chris Zahas and Sam Brookham, Leland Consulting Group

Introduction

This commercial area evaluation is one component of the Frog Pond East and South Master Plan, which the City of Wilsonville has initiated in order to create the regulatory framework and implementation strategies for the future development of the area.

The real estate market is of critical importance to the future of the entire Frog Pond Area since this new community will be shaped by both the private sector (e.g., landowners, developers, new residents, retail tenants) and the public sector (through planning, regulation, provision of infrastructure, annexation, and other actions).

Leland Consulting Group (LCG), the authors of this report, is part of a consultant team led by MIG | APG, which has been engaged by the City of Wilsonville to develop the Master Plan.

This memorandum includes:

- A summary of key takeaways from broker, developer, and public input
- An analysis of the commercial development market including commercial supply and demand, and opportunities for commercial tenant types, square footage, acreage, parking demands, etc.
- Summaries of case studies of comparable commercial centers with relevant comparisons to the subject site based on the surrounding population, employment, traffic counts, and other metrics that drive commercial development.
- A draft commercial land use program, including location, acres of land required, square feet of development, potential configuration, and considerations regarding visibility, access, connectivity, and the relationship to the surrounding neighborhoods.

The vision for future Frog Pond commercial is for a small commercial node that provides neighborhood amenities for local residents. It is not envisioned as a major commercial center or employment center.

Background and Trends

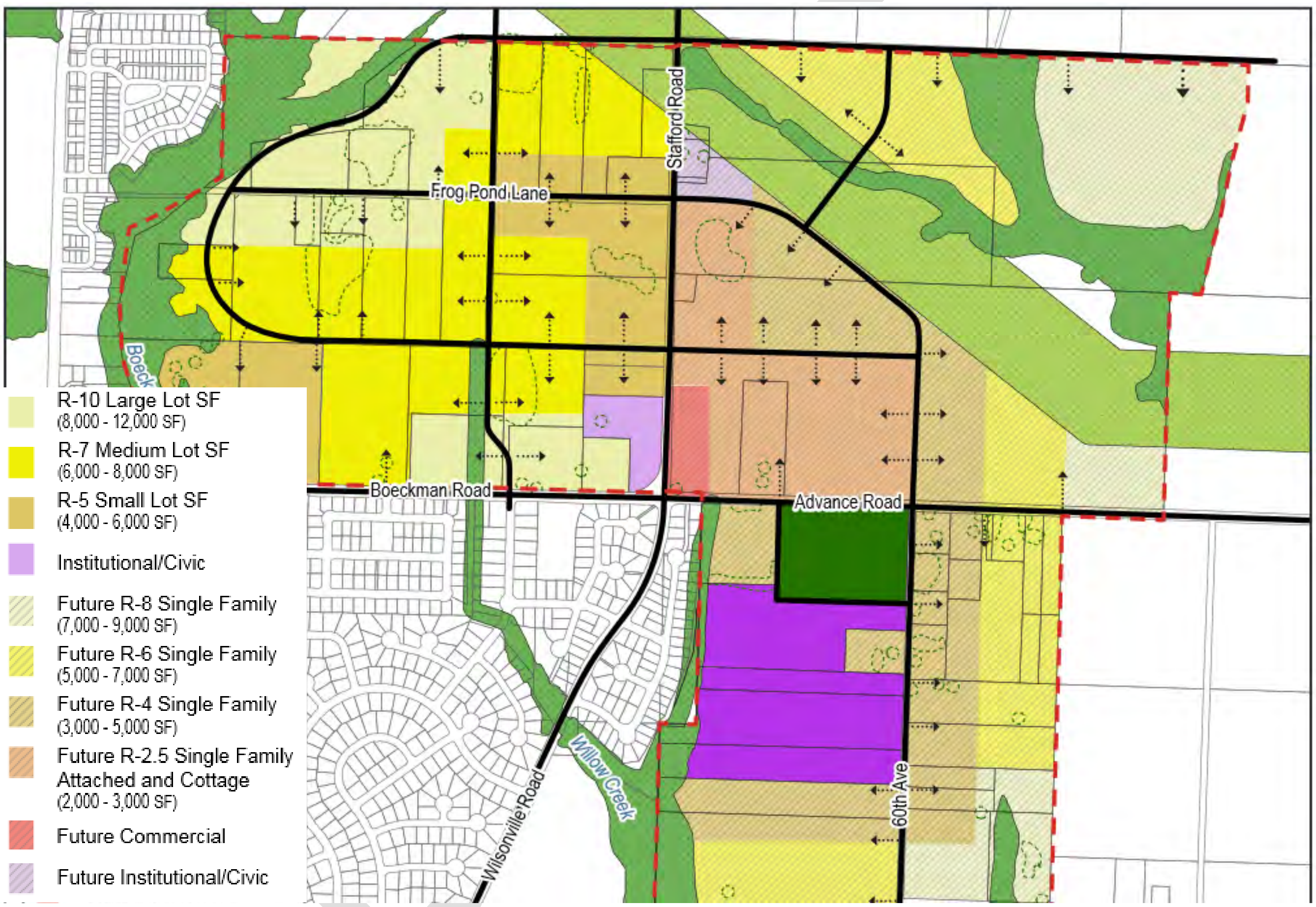
2015 Area Plan Overview

This memorandum builds on the analytical work conducted for the 2015 Frog Pond Area Plan. That plan outlines a vision for the neighborhood commercial center, describing it as a place that provides local goods and services with easy access to the local neighborhoods, with high quality and pedestrian-oriented design, and serves as a gathering place for the community. The focus should be on establishing a retail/commercial hub development that provides some goods and services for local residents, while also creating a center, sense of place, and social hub for the area.

The 2015 work included a market study to evaluate the demand and rationale for neighborhood-scale retail in Frog Pond. The study found that Frog Pond could potentially support an unanchored neighborhood retail center of approximately 38,000 square feet requiring about 3.5 acres of land at full project build-out in approximately 2035. Tenants would likely include retail, small office, and neighborhood services such as a daycare center.

The following map from the 2015 Area Plan shows the proposed location for the commercial area at the northeast corner of the Boeckman/Advance Road and Stafford/Wilsonville Road intersection. This area is central to all three new Frog Pond neighborhoods, is accessible to existing Wilsonville residents, is currently served by transit, is highly visible, has some of the highest pass-by traffic, and is complementary to the planned community park and school.

Figure 1. Frog Pond Area Plan – Land Use Framework



Source: Frog Pond Area Plan (2015)

Stakeholder Engagement

LCG conducted several interviews with retail developers and brokers to understand the opportunities and constraints of the Frog Pond location for future retail, as well as to determine any particular unmet community needs that could be satisfied in Frog Pond East and South. The takeaways and themed notes from these outreach efforts are summarized below. It is important to note that these notes reflect the developers' and brokers' opinions and are not recommendations by LCG.

Current Wilsonville Market. Developers generally agree that Wilsonville is an attractive market, primarily due to its demographics and balance of population and jobs. However, they also agree that there is limited excess demand given the saturated nature of the retail market in the region. The old rule of thumb for commercial developments: if there are full shopping centers in the area, it is time to build another; the Wilsonville retail market is currently close to fully leased up and performing well.

Project Examples. Several retail precedents were discussed to explore opportunities and recommendations for Frog Pond. These included East Padden Square in Vancouver, WA, a master-planned 200-acre greenfield development in Ridgefield, WA, and Cascade Summit in West Linn, OR.

- The Ridgefield master-planned development shares many similarities with Frog Pond in terms of its size, development program, and location on the edge of the urban growth boundary, although the retail component will be visible and accessible from I-5. Killian Pacific is planning to build a core retail center—potentially grocery-anchored—surrounded by a limited amount of mixed-use, dependent on development feasibility nearer the time of construction. This area in Ridgefield has been undergoing planning for many years and was originally conceived as big box retail, but it is indicative of market trends that the program has changed so dramatically.
- Cascade Summit Town Square in West Linn is a larger neighborhood center on the edge of the UGB anchored by a 48,000 square feet Safeway store. It was developed as part of the residential master plan, which allowed the developer and property owner to offer below-market lease rates in order to fill the retail spaces before they might otherwise have been attractive to tenants. Additionally, the center includes a substantial portion of non-retail tenants, including West Linn City Hall, USPS, an animal hospital, banks, and a Montessori daycare center.
- East Padden Square is a pharmacy-anchored neighborhood center on the urban edge of Vancouver, WA. It includes a 14,000 square foot Walgreens and a 12,000 square foot multitenant building. While nearby households and jobs were important to the developer, access, visibility, and a lack of nearby competition were the driving forces behind their decision to locate the center. Average daily traffic counts are 15,000 to 18,000—much higher than those currently and projected in Frog Pond. A grocery store was originally planned for the center, but it never took hold.

Frog Pond Locational Assessment. Two approaches were discussed with developers: a traditional retail center and a main street approach. Developers provided the following insights:

- Retail survives by having drive-by visibility; main streets need to be planned and designed in a way that maximizes visibility while being accessible and oriented to the customer base that makes up the majority. For Frog Pond, this is likely to remain an auto-oriented area, so the front door (main access) of retailers need to be oriented to the parking lot. This configuration works better for conventional retail centers.
- Average daily traffic counts (ADT) of up to 10,000 will be unlikely to attract national tenants and may not be enough to sustain long-term leases. Developers typically look for ADTs of nearer 20,000. Developers recognize that people like to shop both in their immediate neighborhood and on their way home.
- Proximity to the Frog Pond elementary school is not a determinant of success for future commercial space.
- Developing apartments and other higher-density residential uses (e.g., townhomes) next to a commercial area will improve its chances of success by creating more demand, encouraging walkability, and making it "feel larger."
- Over the next 10 to 15 years, a center no more than four acres in size appears realistic. Over a longer time frame as other UGB areas are built out, there may be opportunities for more commercial development.

Parking. Developers generally recommend a parking ratio of no less than four (4.0) parking spaces per 1,000 square feet of gross leasable space. For smaller centers and centers with a higher percentage of restaurants (that generally have higher parking demands than most retailers), the ratio should be more like five to six spaces per 1,000 square feet. This allows for necessary overflow capacity for peak parking demand. Shared parking agreements and on-street parking can help mitigate the impact that parking might have on the "neighborhood feel" of commercial areas.

Main Street Retail. Successful main street retail is difficult to successfully achieve, especially in suburban locations and where it is planned on minor streets. Jurisdictions often require the main doors fronting the street (i.e., on Stafford Road or Brisband Road/Frog Pond Lane with only on-street parking in front), which is detrimental to tenanting the commercial spaces. In suburban locations where about 90% of the customer base arrives by car, tenants want to locate where the most customers park. Creating the main street may need Wilsonville to require no more than 60% window glazing on the street frontages and permit entries oriented towards the customer parking.

Developers claim that when they are required by jurisdictions to provide doors along the street frontages, they advocate for limiting the number of doors on the structure and recommend only at either end of the structure to allow the corner tenant another option if they can take advantage of it. The reality is that the tenants create the street frontage as the back-of-house in the tenant layout plans, so the street sides contain storage rooms, bathrooms, utility rooms, etc.

A true main street would require all of the doors and 70% to 80% glazing on the street frontages, but for Frog Pond this would likely result in a situation where the developer would not be able to secure leases, and therefore not be able to obtain financing to build the structures. So the project never happens or it fails after the shell building is constructed.

Likely Development Challenges.

- A retail center below 50,000 square feet may not attract significant developer attention (especially larger developers), but a larger center will not likely be supported by demand.
- Financial conditions are currently the primary barrier to new investment. New retail construction currently requires rents near $40 per square foot per year. Developers think Frog Pond will likely achieve rents between $20 to $25 per square foot, so retail development may need to be subsidized to be feasible. Potential solutions include SDC waivers and below-market land costs (if acquired by the city). While mixed-use development will likely face similar feasibility challenges because of the higher construction costs, efforts should be made to encourage it over the long term. Additionally, ensure the retail component is protected in the mixed-use zones; otherwise, it will be cast aside by the strength of the residential market.
- Frog Pond commercial tenants will likely be convenience-based, including restaurants, convenience stores, salons, sandwich shops, and gas stations. Services and health-based offices may comprise a significant share of the tenant mix.
- A grocery store will be challenging in Frog Pond. Grocers typically want to have access to at least 10,000 people (meaning there is such excessive demand that 10,000 people could be attracted to a new store), and many will not consider building a new grocery store without 8,000 households within a one-mile radius. Further, Wilsonville is saturated with high-quality grocery tenants. A grocery store may be feasible once construction begins in the residential components in the other UGB areas to the north.
- A master-planned development where the primary homebuilder takes on the responsibility of the commercial will likely result in more commercial space in a quicker timeframe.

Retail Market Trends

This section provides an overview of retail market trends and explores the potential impact on future Frog Pond commercial development. Some trends have been gradual, like the shifting consumer focus from malls to neighborhood-centric shopping, while some have been more rapid, as with the growing market capture of eCommerce (accelerated by the COVID-19 pandemic). Specific trends and the related impacts are summarized in the table below.

Table 1. Commercial Trends and Impacts

Commercial Trend	Impact on Future Frog Pond Commercial
Growing eCommerce market share, especially for specialty products and merchandise.	Less overall demand for brick-and-mortar stores; limited opportunities for general merchandise.
The COVID-19 Pandemic is the "great retail reset," with retail experiencing years' worth of change in just months, including dramatic changes to people's daily habits and professional and personal routines and significant impacts on real estate development patterns.	The pandemic will likely accelerate the trends towards less retail and office space per capita, and boost demand for suburban residential locations. The era of unpredictability and risk (only one top 10 retailers from 1980 is still in the top 10)
The shift toward enjoying experiences more than purchasing goods (commodity vs. specialty) will continue to move retail stores toward selling experiences rather than selling goods.	Potential to provide more diverse and compelling tenant mixes, health-based retail, and food and beverage.
Growing demand for convenience-based retail (e.g., neighborhood-based grocery-anchored centers with essential services), walkability, and 20-minute neighborhoods.	Frog Pond may be able to provide walkable access to a mix of commercial goods and services, employment opportunities, and other amenities.
Shifting consumer focus from malls and high-street retail to more mixed-use centers and "neighborhood-centric" shopping	"Hyper-local" retail orientation; more diverse and compelling tenant mixes with retailers operating smaller portfolios than before
Aging demographics driving demand for smaller health-based commercial spaces.	Medical-related commercial spaces (including offices) comprise a growing share of the commercial tenant mix.

Source: LCG

Retail is typically built in a series of standard formats, and while these vary somewhat, they maintain general consistency in terms of anchor tenants, size (square footage), trade area, and other features. Several types of retail centers are summarized in the table below. The 2015 Area Plan described the most appropriate types of retail for Frog Pond as a corner store, convenience center, or neighborhood center.

Table 2. Types of Retail Centers

Retail Center Type	Gross Retail Area (sf)	Dwellings Necessary to Support	Average Trade Area	Anchor Tenants
Corner Store	1,500 – 3,000	1,000	Neighborhood	Corner store
Convenience Center	10,000 – 30,000	2,000	1 mile radius	Specialty food *or* pharmacy
Neighborhood Center	60,000 – 90,000	6,000 – 8,000	2 mile radius	Supermarket *and* pharmacy
Community Center	100,000 – 400,000	20,000 +	5 mile radius	Junior department store

Sources: Urban Land Institute, Leland Consulting Group.

Parking Trends

Parking demand and need depends on a commercial area's tenant mix, its size, its location and how people are likely to travel to it, and the surrounding uses.

The Institute of Transportation Engineers (ITE) Parking Generation Manual compiles peak parking demand rates, typically by gross leasable area (GLA), for various land uses for weekdays and Saturdays. Using data collected from more than 140 surveys at all types of shopping centers ranging in size from 25,000 to 1,400,000 square feet of GLA, ITE found that the average peak parking rate was 3.23 and 3.97 vehicles per 1,000 square feet on weekdays and Saturdays, respectively.

The Urban Land Institute (ULI) has also investigated the impact of many variables including shopping center size, types of uses (retail or non-retail), and shopping center location. The ULI recommendations for providing adequate parking at shopping centers are four (4.0) spaces per 1,000 square feet of GLA for centers between 25,000 and 400,000 square feet.

This ratio may be impacted by a higher-than-average percentage of offices or restaurants.

- Commercial areas with more food service and drinking establishments (i.e., restaurants and bars) tend to have higher parking demand. Small centers and unanchored commercial areas tend to have a greater percentage of restaurants and, therefore, tend to require more parking. Smaller centers may also need more parking to accommodate peak demand.
- Commercial areas with professional, medical, and financial offices typically have slightly lower parking demand (3/1,000 sq. ft.).

Stakeholder interviews suggest a parking ratio of 5 spaces per 1,000 square feet of gross leasable commercial space (GLA), especially for a smaller (i.e., 30,000 to 50,000 square feet) suburban center where most people are likely to drive to and from it.

It should be noted that commercial centers are notoriously overparked and more futuristic trends in automation may diminish demand for traditional parking and increase demand for pick up and drop off zones. By 2035, new technologies, changing consumer behavior, or other factors may greatly impact parking demand and needs.

Demographic Context

Demographics are fundamental to estimating the market demand for commercial real estate. The types of commercial goods forecasted to be in demand in the future in Wilsonville and Frog Pond will depend on the types of people and households who live there both today and in the future.

Some highlights from the previous demographic analysis and relevant updates based on the most recent available data are described in the table below.

Table 3. Demographic Updates to the 2015 Area Plan

	2015 Area Plan (2014 Data)	2021 Data
Age	Wilsonville has a higher percentage of young adult residents (aged 24 to 34) and older residents (aged 65+) than the market area or region. Conversely, a slightly smaller percentage of Wilsonville's population is middle-aged (aged 35 to 64) than the market area or region.	Wilsonville's age demographics have remained similar relative to the region; however, the market area has a much higher percentage of young adult residents (aged 24 to 34), a lower percentage of older residents (aged 65+) than the City and region, and a similar percentage of middle-aged residents (aged 35 to 64) than the market area and region.
Family Households	Fifty-nine percent of Wilsonville's households are "family households"—those with two or more related family members living together—compared with 68 and 64 percent in the market area and region, respectively.	Fifty-nine percent of Wilsonville's households are "family households", compared with 64 and 63 percent in the market area and region, respectively. The biggest change has occurred within the market area, where the percentage of non-family households has been increasing.
Household Size	Wilsonville has a larger share (68%) of one and two-person households than the market area or region.	Wilsonville still has a larger share (68%) of one- and two-person households than the market area (65%) or region (62%).

Source: LCG, ESRI Business Analyst

The following tables summarize demographic, economic, and socio-economic conditions for a series of comparative areas, including 0.5-, 1-, and 2- mile radii, the primary trade area, and the City of Wilsonville. Households in the immediate area are generally more renter-oriented, and younger than the broader Wilsonville market and metro region. While these conditions are generally attractive to retailers, as Frog Pond builds out, households will likely become larger, wealthier, and more owner-occupied.

Table 4. Comparative Demographic Characteristics

	0.5 miles	1 mile	2 miles	PTA	Wilsonville	Metro	USA
Household Size	3.07	2.44	2.25	2.59	2.30	2.53	2.58
% Renter	57.2%	63.8%	60.1%	60.6%	45.6%	37.2%	35.3%
Median Age	33.0	33.8	35.8	33.0	37.4	38.7	38.8
% w Bachelor's + (25+ y/o)	41.4%	47.8%	48.1%	45.0%	48.1%	41.3%	33.6%
Household Income	$69,954	$69,228	$70,246	$72,578	$73,923	$78,432	$64,730
% HHs Earning <$35K	12.5%	16.7%	19.7%	12.7%	20.9%	19.7%	26.4%
Per Capita Income	$38,458	$41,153	$41,669	$39,833	$43,928	$40,131	$35,106

Source: ESRI Business Analyst (Derived from ACS Census Data)

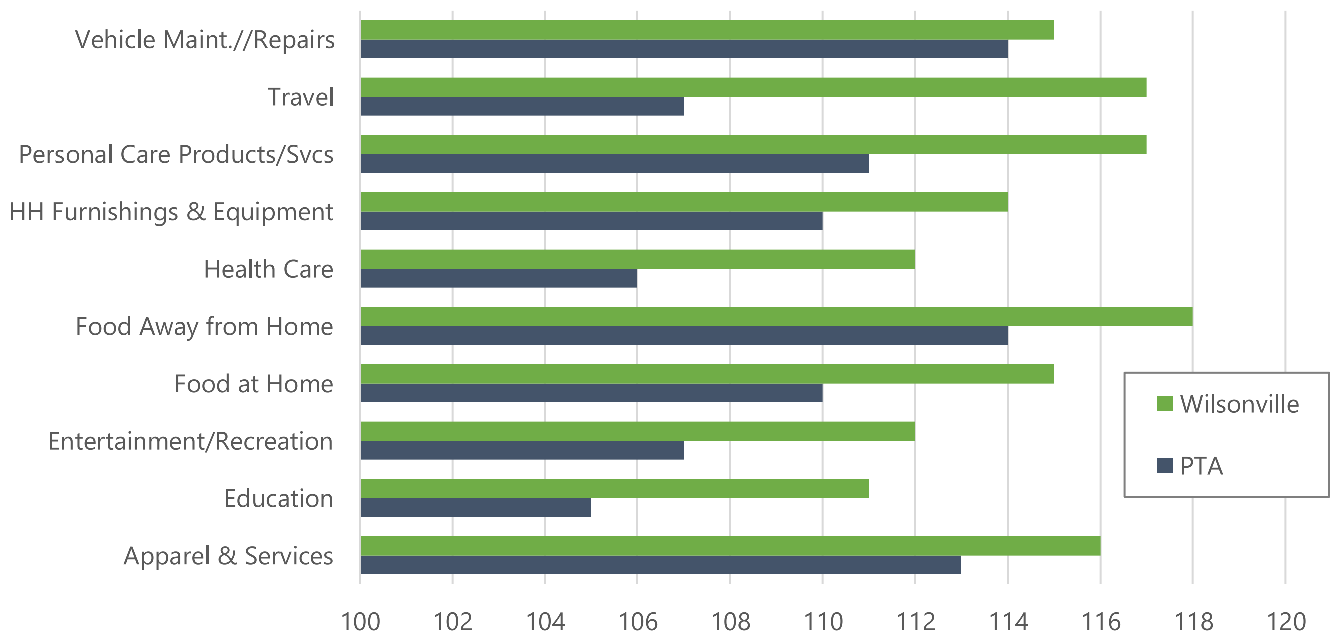
Table 5. Comparative Age Data

Age	0.5 miles	1 mile	2 miles	PTA	Wilsonville	Metro	USA
<18	22.2%	22.8%	21.6%	22.9%	20.0%	21.5%	21.7%
18-34	31.2%	29.1%	27.2%	30.4%	26.4%	23.1%	23.2%
35-44	14.1%	14.5%	14.4%	14.5%	14.1%	14.1%	12.8%
45-54	11.0%	11.7%	11.7%	11.4%	11.4%	12.5%	12.1%
55-64	11.5%	11.2%	11.6%	11.1%	11.6%	12.7%	13.0%
65+	10.0%	10.7%	13.5%	9.7%	16.5%	16.1%	17.2%

Source: ESRI Business Analyst (Derived from ACS Census Data)

Households in both the primary trade area and the City of Wilsonville have a higher spending index across all retail categories than the average U.S. household (an index of 100 indicates the average). Every index point above 100 indicates a one percent increase beyond the average. Retail categories with the highest spending index that could translate to commercial square footage include personal care projects/services, food away from home (i.e., restaurants), food at home (i.e., grocery), and apparel and services.

Figure 2. Spending Index by Retail Category



Source: ESRI Business Analyst (Derived from ACS Census Data)

Existing and Future Customer Base

Household growth is a key driver of demand for commercial development. Wilsonville is projected to continue growing quickly. The previous analysis highlighted that the number of households in Wilsonville is projected to grow at a rate of 1.8 percent annually between 2010 and 2035—faster than many of the nearby cities and the region overall. Updated forecasts from Metro (summarized below for Wilsonville and some of the neighboring cities) show slightly more conservative growth estimates through 2030 and significantly slower growth estimates through 2045.

Table 6. Updated Demographic Forecasts for Wilsonville and the Metro Region

Jurisdiction	2020	2030	2045	10-Yr Annual % Growth	25-Yr Annual % Growth
Wilsonville	25,945	29,756	30,566	1.4%	0.7%
Tualatin	27,278	27,598	27,565	0.1%	0.0%
Tigard	54,591	63,813	71,611	1.6%	1.1%
Sherwood	19,747	20,118	20,662	0.2%	0.2%
Canby	17,161	19,582	19,681	1.3%	0.5%
West Linn	26,060	26,579	26,990	0.2%	0.1%
Oregon City	36,457	42,665	49,009	1.6%	1.2%
Clackamas County	428,614	493,892	593,665	1.4%	1.3%
Washington County	622,082	718,412	809,312	1.5%	1.1%

Source: Metro 2045 distributed population and household forecasts, adopted Feb. 25, 2021, URL

Wilsonville is projected to grow by about 3,800 households between 2020 and 2030. Much of this growth is expected in peripheral growth areas like Frog Pond and will be the primary driver of commercial demand. Growth in other parts of the City is unlikely to make a significant difference to the development prospects of the future Frog Pond commercial area given the likelihood of the land use mix and program being neighborhood-serving and locally-focused. Frog Pond residential counts are described below.

As the following summary table shows, there are currently approximately 2,250 dwellings within one mile of the main intersection (Stafford, Advance, Boeckman, Wilsonville Rd) in Frog Pond, including about 1,250 single-family households and 1,000 apartments.

The 2015 Area Plan includes plans for 610 households in the West Neighborhood, about 200 of which are currently built or close to completion (including the 2,250 current units described above), and 1,322 units in the East and South Neighborhoods.

Upon the expected buildout of Frog Pond residential development in 2035, the number of households within one mile of Frog Pond (the area including the household customer base most likely to support future Frog Pond commercial development) is likely to total (and may exceed) 4,000 dwelling units. To put this number in context, retail developers will often claim 8,000 households within one mile are needed to support a grocery store.

Table 7. Estimated Household Counts

	West	South / East	One-mile Total
Currently Built	200	0	2,250
Total Projected/Planned	610	1,322+	4,000+

Source: ESRI, Frog Pond Area Plan

LCG understands that the total number of dwelling units planned for the may East and South neighborhoods may increase slightly depending on the housing density. Additional multifamily projects and/or mixed-use development may increase the planned total to 1,600 or more, enhancing commercial prospects. In addition to increasing the overall demand for new retail, residents of higher-density departments are less likely to have cars than those living in lower-density, single-family homes and more likely to walk to nearby amenities and services. LCG, therefore, recommends planning higher density residential development near commercial.

Case studies/Precedents

This section includes brief case studies summarizing different projects whose stories have some relevance to the study areas. All of the projects are greenfield projects (built on land that was mostly previously undeveloped); were built within a surrounding suburban context; were thoughtfully planned with an emphasis on quality of place and community; and were intended as neighborhood commercial centers surrounded by housing, quality streets, open spaces, and other features. While each is unique in its own way, each also has unique and context-specific takeaways for the City to consider for the implementation of commercial development in Frog Pond.

A summary table of several is provided on the following page. LCG selected six commercial developments to study based on stakeholder interview input, industry expertise, and background research. Three of these are smaller, unanchored commercial centers, one is a commercial main street, and two are larger anchored centers with main street elements (provided primarily as points of comparison). The arrows for the rows identifying the housing units and jobs within one mile of each area and the traffic counts on nearby streets indicate whether the numbers are less than (red downward arrow), roughly equal to (blue sideways arrow), or more than (green upwards arrow) the households, jobs, and traffic counts projected for Frog Pond by 2035. A full narrative case study of Northwest Crossing in Bend, Oregon is provided following the summary table.

Specific takeaways from LCG's case study research include:

- Many developers seek to build and lease commercial and employment space within several years of land acquisition; for them, having some vacant land after 20 years of development represents an opportunity cost—the land could have been zoned for another use (typically housing) and been rented or sold in earlier years. Likewise, renters and homeowners could have had homes to live in. However, from a policy point of view, if a city or other authority is seeking to ensure adequate land for commercial and employment development, and associated jobs, this can be seen as a success.
- Creating a strong sense of place is possible with a small amount of commercial development when it is carefully and deliberately built.
- A commercial main street is one important amenity that can make the rest of the community more desirable. While commercial space needs exposure to high-traffic arterials, pedestrian-oriented places should be created on main streets that are perpendicular to the arterials. It is often not comfortable for pedestrians to walk and talk or dine outside, along arterial roads, so creating a pedestrian-friendly environment is easier on perpendicular streets.
- Commercial development takes time in less traditional locations (i.e., those without large populations and traffic counts). Housing was faster to build out at NorthWest Crossing—commercial and employment followed.
- Northwest Crossing emphasizes the placemaking benefits placemaking of linking retail with open space. As a master-planned development, the developer could afford to choose this orientation and link the two spaces. Notably, none of the smaller unanchored centers documented below include a larger open space other than seating immediately outside of the storefronts. Larger commercial developments can flexibly design the site to accommodate smaller public gathering and open spaces that provide a community amenity and serves its tenants. A well-designed site that encourages the movement of people on foot between parks/open space and retail development will likely require either a master developer that sees value in this approach or a deliberate decision by the City to acquire and preserve land for these uses.

le 8. Case Study Summary

	Forest Heights	Village on Scholls	East Padden Square	Northwest Crossing	Central Village	Cascade Summit Town Square
General Location	NW Metro (UGB edge)	Tigard (SW UGB edge)	Vancouver (NE edge of City)	Bend (western edge of City)	West Linn, Highway 43	West Linn, Salamo Road (adjacent to preserved land)
Type	Unanchored convenience center	Unanchored convenience center	Pharmacy anchored n'hood center	Main Street Commercial	Grocery anchored n'hood center	Grocery anchored n'hood center
Tenant Mix	Natural Market, café, salon, cleaners, pizzeria, coffee shop	Café, restaurants, professional offices, Salon	Pharmacy, dental office, H&R Block, fast-casual and sit down restaurants	Bars, salons, restaurants, book store, medical/ prof. offices, bike shop, boutique clothing,	Retailers, restaurants, medical and professional services office space, West Linn Public Library	Safeway, offices, City Hall, banks, liquor store, gym, USPS, other misc., Montessori School
% Non-Retail	15%	50%	15%	26%	15%	30%
Year Built	1994	2008	2006	2006-2021 (ongoing)	2007	2000
1-mi Hsg. Units	4,600	6,000	4,000	2,700	3,700	4,100
1 mile Jobs	1,030	1,150	1,200	2,270	5,160	1,530
Traffic Counts	5,000	18,900	19,000	9,000	17,000	8-10,000
Site Acreage	1.6	2.9	3.2	6.0 (2 acres recently developed)	7.9	12.6
Building Sq Ft	24,000	32,000	31,000	84,600 (33,000 recently added)	104,715	131,660
Floor Area Ratio	0.34	0.25	0.22	0.28	0.30	0.24

Source: LCG

Northwest Crossing, Bend

Northwest Crossing is a 500-acre master-planned neighborhood in Bend, Oregon, located about 1.5 miles west of downtown. It is composed of a wide variety of housing types (single-family, cottages, townhomes, and apartments), over

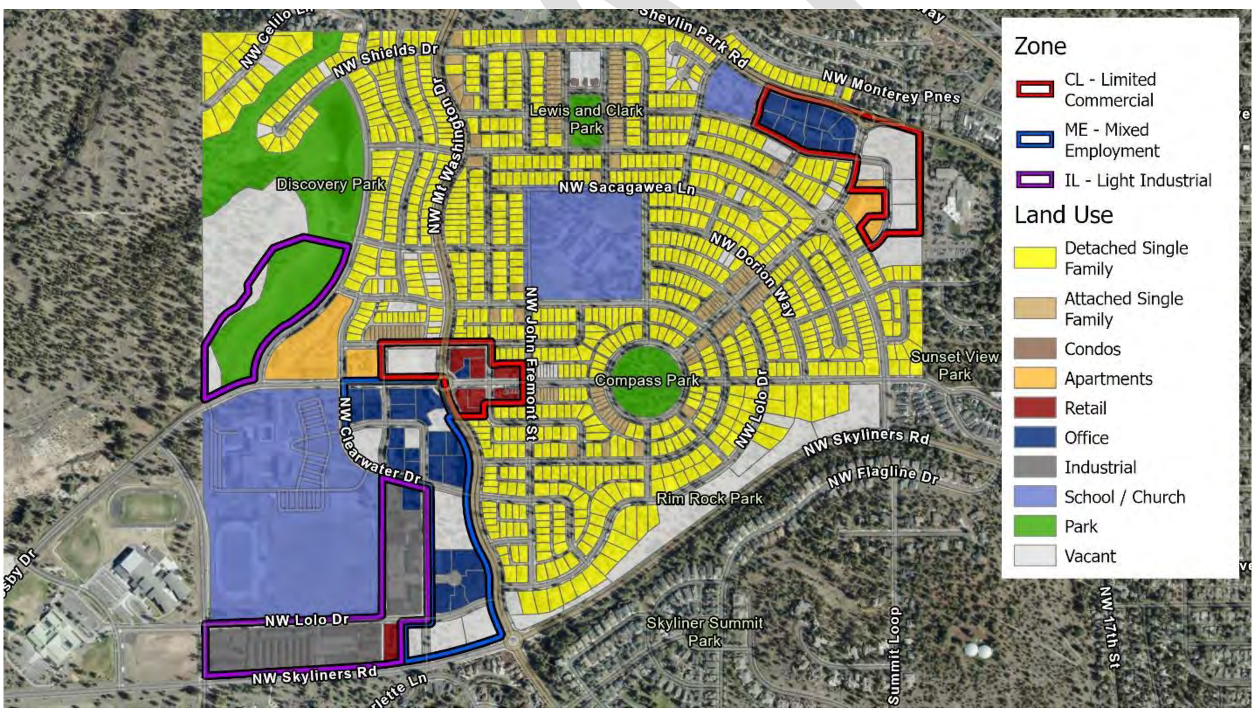
80 businesses representing a range of sectors (retail, medical, professional services, manufacturing), and a highly walkable network of streets and trails.

NorthWest Crossing is one of the best models of a successful neighborhood node or main street development within a master-planned community in the Pacific Northwest. It creates a great sense of place within a small core commercial area (less than 5 acres), and its design shows how a pedestrian-oriented main street can coexist with adjacent high traffic arterials. LCG recommends that Frog Pond consider this model of neighborhood node-scale commercial development, with an emphasis on food, lifestyle, personal and professional services, and other commercial activities that serve as an amenity to residents and create a sense of place.

Commercial uses primarily center along 400 feet of Northwest Crossing Drive (spilling east from Washington Drive). This commercial heart of the town center is approximately three to five acres, depending on the extent to which surrounding roads, sidewalks, and parking lots are included in the count. There is a small amount of retail, yet the project creates a powerful sense of place, with both residents and visitors going out of their way to gather, shop, and stroll on the "main street." The street is connected to Compass Park, 500 feet to the east.

Northwest Crossing Drive and the park both host a range of events around the year including Saturday Farmers Market, music, tree lighting, movies, and various festivals. Together, the commercial space, park, street network, range of housing, and other features create something distinctive and elusive—community and sense of place. While these attributes may seem conceptual, they drive financial returns, particularly through very strong home sales throughout the community's twenty-year history, including during the recession, when home sales in other parts of Bend suffered.

Figure 3. Northwest Crossing Land Use Map



Northwest Crossing has had relative success in attracting significant employment development. Capitalizing on Bend's quality of life characteristics, concentration in outdoor recreation and "maker" industries, and emerging start-up culture, Northwest Crossing has been able to attract several small manufacturing and mid-size headquarters to its employment area. In total, about 16 acres of office development and 15 acres of industrial development have been built. This makes it one of the most successful greenfield communities in Oregon in terms of attracting employment uses.

NorthWest Crossing was led by master developer Brooks Resources, who purchased the entire 500 acres in the 1990s, used a phased buildout approach for the residential component, and was willing to be very patient on the development of commercial and employment sites. LCG cannot say at this point whether this will be the case at Frog Pond. Most of the land, including the proposed site of the commercial center, is currently held in numerous disparate ownerships and no master developer is known. One reason that a master developer is significant is that they are more likely to "over-invest" in amenities such as commercial centers, because, at least in theory, a desirable commercial center will make the entire neighborhood more attractive and desirable and enable the master developer to "internalize" the greater revenue generated by faster home sales and more valuable homes—even if the commercial center is expensive to develop and has a low return on investment. When a property is controlled by many owners, each owner has far less incentive to view commercial and employment areas as loss leaders that drive the success of the overall community.

Market Analysis

A retail market analysis provides quantitative information about the opportunities for new retail space based on existing and future supply and demand. This section describes the competitive retail environment facing future commercial in Frog Pond and the households expected to drive most of the demand for new space.

The 2015 Area Plan described the most appropriate types of retail for Frog Pond as a corner store, convenience center, or neighborhood center. This analysis reevaluates these assumptions and identifies the most appropriate retail format and size for Frog Pond based on new data and updated information.

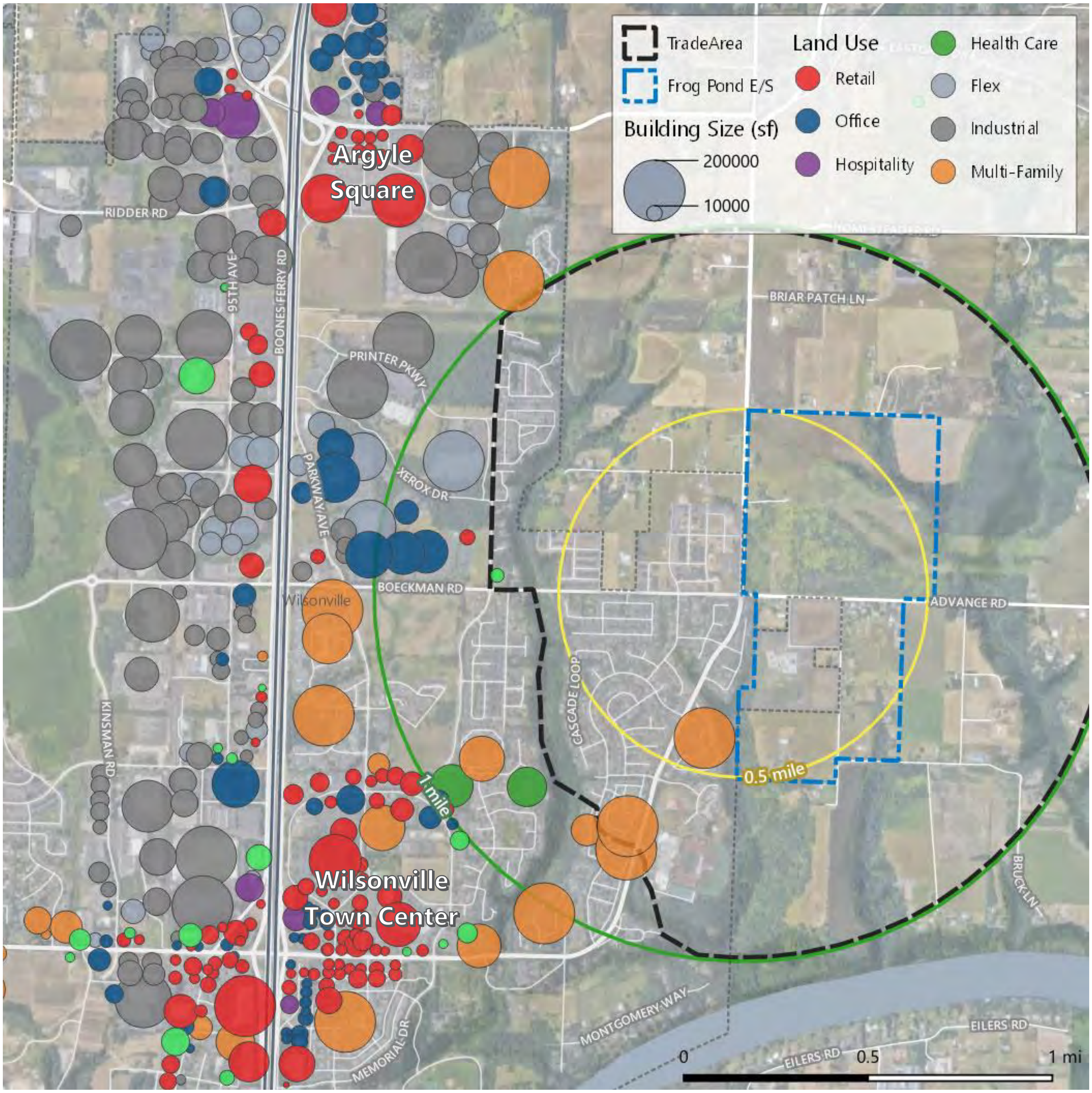
Primary Trade Area

The primary trade area is the geographic region from which 50 to 80 percent of total demand and sales are expected. Identifying and analyzing this trade area is critical to understanding the demand for retail commercial space and the potential market capture of the Frog Pond area.

The size of the trade area differs based on the type of commercial space. The size of the trade area generally correlates with the size of the commercial center or store and the total square footage occupied by its tenants. For example, tenants offering neighborhood goods and services and food and beverage are typically more locally-focused, occupy smaller store footprints, and have a much smaller trade area than general merchandisers and other larger-format stores that have a more regional draw.

The following map shows the Frog Pond primary trade area in relation to existing commercial and multifamily developments.

Figure 4. Frog Pond Primary Trade Area



Source: LCG

The primary trade area for Frog Pond will likely be within one mile of the future commercial area, consistent with the typical trade area for a convenience center. Future commercial in Frog Pond is unlikely to draw many customers from beyond one mile away unless it becomes a destination that can attract visitors with a unique retail experience. The boundary shifts inward in places that are impacted by:

- Physical and environmental barriers, particularly to the west and south along the wetland/vegetative corridor. New households west of this corridor will more likely be consumers of commercial to the west,

- The proximity of large retail centers, including Argyle Square, Wilsonville Town Center, and others, and
- Major arterials offer quick access to these well-established commercial concentrations.

This trade area excludes approximately 680 dwelling units that are within one mile of the center (330 single-family homes and 350 apartments). These households—and households further afield—will also support Future Frog Pond commercial, but proximity to more established retail in and around the Wilsonville Town Center will likely be a more significant draw.

Commercial Supply and Competition

This section summarizes the existing and future retailers that are likely to compete for customers with future Frog Pond commercial. Given its location on the eastern edge of Wilsonville, commercial demand and development prospects are most likely impacted by commercial spaces located east of I-5. These spaces include those within the Wilsonville Town Center and the Argyle Square regional shopping center at Elligsen Road; both commercial centers offer a wide variety of goods and services. One benefit that both of these centers have over Frog Pond, as shown in the table below, is the very high traffic, visibility, and access that comes with their location near I-5, and along major high volume arterial roads.

Each of the centers is relatively high-performing despite the challenges facing the retail sector due to ecommerce and the COVID-19 pandemic. Vacancies at Argyle Square continue to be very low (<5%), rents average more than $30 per square foot, and annual rent growth has exceeded three percent for the past decade. Rents at the Wilsonville Town Center are slightly lower on average at $25 per square foot, reflecting the older building stock.

The Wilsonville Town Center (WTC) is the focus of a recent master plan that envisions widespread changes over the planning horizon for the Frog Pond Master Plan. Plans include a more pedestrian-oriented environment, additional commercial development, a shift to more experiential retail, mixed-use development, and a greater intensity of uses. Frog Pond Commercial will compete with WTC for experiential retail, including neighborhood goods and services and food and beverage.

Retailers at Frog Pond will need to consider these retail centers and establish an effective role and niche to compete effectively.

Table 9. Property Characteristics of Competing Commercial Centers (East of I-5)

Average/Total	Wilsonville Town Center	Argyle Square Regional Center
Center Type	Community Center	Regional Center
Major Tenants	Safeway, Goodwill, Dollar Tree, Ace Hardware, Regal Cinema, Clackamas Community College	Target, Costco, PetSmart, Office Depot
Leasable Space (SF)	1,091,000 (664,000 sf retail buildings)	370,000
Site Area (SF)	6,332,544	1,850,267
FAR	0.17	0.20
Total Vacant SF	157,000 (includes 146,500 sf building formerly occupied by Fry's Electronics)/	10,500
Avg. Vacancy Percent	15% total / 24% retail only	<1%
Avg. Traffic Counts	27,000	15,000
Households w/in 1 mi	4,711	1,005
Planned Development	1+ million square feet	Nothing planned

Source: ESRI, LCG

Demand for New Commercial Space

The demand for commercial space, and ultimately land that needs to be planned for future development is a function of many interrelated factors. Each commercial real estate sector—including office, retail, industrial, hospitality, and healthcare—consider certain factors more important than others, as summarized below.

Table 10. Factors Influencing Demand and Development Prospects

Factor & Description	Sector Impacted	Frog Pond Considerations
Spending Leakage. Leakage occurs when locals spend a larger amount of money on goods than the number of sales reported by local businesses. Retail leakage implies that locals are traveling outside of the local market area to buy retail goods and can indicate unsatisfied demand within the PTA.	Retail, medical and professional office, lodging	There is leakage across all retail categories; Frog Pond may recapture spending leakage in neighborhood retail, goods and services. Leakage for the primary trade area is shown in the chart that follows.
Existing and Future Consumer Base. Consumers include shoppers, workers, tenants, and other users. A fast-growing area will create demand for services and development quicker than slow-growing areas because of the needs of new households. High-growth areas will attract development interest.	Retail, office, industrial, lodging	Frog Pond is impacted by household growth primarily, with at least 4,000 units expected by 2035.
Purchasing Power of Base. Households with higher incomes generally have more disposable incomes and, therefore, consume more goods and services and generate demand for more commercial development. Households with certain demographic profiles tend to spend more in certain categories than others. Retailers are interested in targeting clusters of households that fit the goods and services on offer.	Retail	The "Spending Index" for households living in Wilsonville is higher than the metro and U.S. average, indicating strong purchasing power. This index is expected to be similar for the trade area as Frog Pond builds out.
Local Demographics. Characteristics of residents and workers, such as education, household composition, age, and income, play a factor in consumer behavior, employment demands and trends, and hotel use.	Retail, office, industrial, lodging	Frog Pond and the surrounding areas appear to have attracted younger, educated, wealthy families. These demographics support neighborhood-serving retail and other specialized uses, such as daycare.
Unique Differentiators. Placemaking and walkability can create unique destinations that people want to live, work, and play in. These places pull people from outside the typical trade area and generate more development interest than traditional locations.	Retail, office, lodging	In lieu of major differentiators, Frog Pond can drive interest and pull customers to the area by encouraging higher density development near commercial uses, on-street parking, connections to open spaces, and promoting neighborhood-centric tenant mixes.
Access and Visibility. While neither of these characteristics generates demand in itself, highly accessible and visibility areas will be more likely to attract development interest because of the ability to draw from a wider market area and capture passing traffic (auto, pedestrian, tourism, etc.).	Retail, office, industrial, lodging	Stafford Road carries the most traffic, with northbound evening commuters providing opportunities for Frog Pond East. Traffic on Brisband Road and Frog Pond Lane and other east-west connections may arise later.

Source: LCG

As noted above, there is leakage in all retail categories—a positive indicator for commercial prospects. In theory, the total sum of the leakage across all categories could be met with more than 175,000 square feet of new retail development. In reality, only a small fraction of existing leakage might be recaptured within the PTA in the form of new development. This is because most of the retail "gravity" is to the west, with several large centers that draw customers from a much larger trade area because of the substantial range of goods and services on offer. New commercial in the Frog Pond area can expect to see the highest capture rates among neighborhood goods and services (e.g., the categories of food and beverage, health and personal care, and building materials/garden equipment) and low recapture rates in the categories of general merchandisers (such as Target, Walmart), clothing, sporting goods, furniture, and electronics.

Figure 5. Spending Gap Analysis, Primary Trade Area, Current Spending Leakage

Source: LCG

Demand Analysis

Commercial demand is calculated by applying the following key metrics to existing and future households within the primary trade area.

- **Expenditures by household.** Household expenditures are collected through a survey by a U.S. Bureau of Labor Statistics (BLS) and reported as average and summed expenditures by subcategory.
- **Market Capture.** Capture Rates are the percentage likelihood that the expenditures will be assumed by the development. Analysts assign capture rates as a factor of competition, location, and other market factors.
- **Leakage Recapture.** As noted above, a fraction of existing leakage might be recaptured within the PTA in the form of new development
- **Sales per Square Foot**. Sales per square foot are otherwise known as productivity and enable a calculation of supportable square footage at the product. Each region, neighborhood, and development has a different set of sales figures.

LCG evaluated retail demand using these metrics through 2035 when the Frog Pond area is expected to be near completion. Demand is driven by existing and future households within the primary trade area, as well as spending from drive-by shoppers. Taking into account the existing stock of about 2,250 households and the approximately 1,800 new households likely to ultimately reside at Frog Pond, there will likely be more than 4,000 households in the primary market area at full project build-out in 2035.

Based on these household counts, and the metrics identified above, demand for new retail space from existing and future households totals 226,000 square feet through 2035. Demand does not translate to viable square feet of development, however, and the market capture varies for each retail category. The majority of households will continue to shop in areas outside of the primary trade area and other existing and new retail developments will capture a significant share of total commercial demand. Among these areas is the Wilsonville Town Center—the closest retail concentration—that may add more than one million square feet of new development over the next 20+ years and draw customers from the Frog Pond area.

Figure 6. Primary Trade Area Retail Demand by 2035, Net New Square Feet

Source: LCG

Projected Demand and Potential Market Capture

This section outlines the possible site program for Frog Pond based on the market capture of the demand totals described above. LCG estimates the market potential for between 31,000 and 56,000 square feet of new commercial space. This would require between 2.8 and 5.1 acres of land at a standard floor area ratio (FAR) of 0.25 (consistent with the case studies documented in the following section). The higher threshold largely depends on the area's ability to attract a pharmacy or medium-sized grocer, which may not be feasible within the planning horizon.

The following table details the estimated range of gross leasable space (in square feet) for various retail types based on LCG's demand analysis. Future Frog Pond commercial is expected to comprise primarily of food and beverage stores (including grocery, specialty markets, delicatessens, butchers, etc.), health and personal care (including salons, pharmacy, fitness centers), foodservice and drinking places (restaurants, cafes, bars), and other non-retail stores ((banking, realty, financial and medical offices, educational tenants, etc.). As the case studies show, non-retail tenants typically account for between 15 and 30 percent of gross leasable space in commercial areas. This is captured in the table below in the "Other" retail category type.

Table 11. Primary Trade Area Retail Demand and Supportable Retail Area: 2035

Retail Category Type	Future Growth in Demand (Retail Potential) $	2035 New Demand from HH Growth (s.f.)	Leakage Recap-ture (s.f.)	Total New 20-yr Demand (s.f.)	Capture Rate (low)	Capture Rate (high)	Net New Demand Square Feet (low)	Net New Demand Square Feet (high)
Furniture & Home Furnishings	$2,254,435	10,020	0	10,020	0%	0%	0	0
Electronics & Appliance	$2,270,950	9,084	0	9,084	0%	0%	0	0
Bldg. Material, Garden	$4,115,742	11,759	994	12,761	10%	15%	1,300	1,900
Food/Beverage (grocery)	$11,519,008	27,104	9,837	36,941	15%	50%	5,500	18,500
Health & Personal Care	$3,969,016	10,584	3,841	14,425	35%	50%	5,000	7,200
Clothing & Accessories	$3,584,158	17,921	1,626	19,547	5%	10%	1,000	2,000
Sporting Gds, Hobby, Book, Music	$2,504,784	12,524	1,136	13,660	10%	15%	1,400	2,000
General Merchandise	$12,151,776	44,188	0	44,188	0%	0%	0	0
Misc. Store Retailers	$3,213,690	14,283	1,296	15,579	10%	15%	1,600	2,300
Foodservice & Drinking	$7,612,294	21,749	5,166	26,930	20%	28%	5,400	7,500
Other non-retail (banks, prof./med. office, etc.)	$5,319,585	35,464	12,683	48,153	20%	30%	9,600	14,400
Total	**$58,515,438**	**214,680**	**36,580**	**251,288**	**12%**	**22%**	**30,800**	**55,800**
Acreage Required							**2.8**	**5.1**

Sources: ESRI Business Analyst, LCG

The feasibility of this commercial development will also depend on what if any retail is developed in other locations. For example, a new retail center located to the west of the Frog Pond Area on Boeckman Road would absorb demand from Frog Pond and potentially preclude new development in the study area. However, this analysis assumes that no new retail is built within a one-mile radius of Frog Pond East.

With projected 4,000 households within one mile of the main intersection, Frog Pond will likely support a convenience center at the lower range (around 30,000 square feet), but a larger retail center at the upper range (around 50,000 square feet) may be challenging.

Within two miles, there are *currently* about 6,000 housing units and additional growth in this area will exceed the average number of dwellings necessary to support a neighborhood center. However, such a large trade area is unlikely in this case given this area includes more than 2.0 million square feet of existing competitive retail space.

Site Location Considerations

This section includes a discussion of potential locations for future commercial development and the advantages and disadvantages of each.

When selecting commercial development sites, several core characteristics attract commercial developers and brokers to certain locations, including access and visibility, traffic counts, and the customer base. The previous pages have described Frog Pond's general competitiveness as a commercial location; this section now provides an overview of the potential internal locations for this commercial development within Frog Pond East and South.

Potential locations are limited to the east side of Stafford Road. Stafford is and will remain the primary route through Frog Pond (with 6,000 average daily traffic counts) and is therefore visible and accessible to the greatest number of people in the area. It should be noted that retail developers typically want ADTs of more than 15,000 for most commercial centers, and while the City's Transportation System Plan forecasts that ADTs on Stafford will reach approximately 10,000 by 2035, reaching the upper 50,000 square feet threshold may not be feasible given these and other challenges. Over a long-term planning horizon (20+ years), other areas in the region will develop, including those to the immediate north, and employment will grow, driving up densities and ADTs to levels that are more likely to support a larger commercial center.

Along the Stafford Corridor, there are three potential locations for commercial development. The first, at the northeast corner of the existing main intersection of Stafford and Advance roads, has been documented in detail and remains an opportunity site. The second potential location is at the planned extension of Brisband Road along Stafford Road. This extension will likely be the primary alternative route through Frog Pond, bringing more customers and traffic past this potential location. Similarly, the third location is at the planned extension of Frog Pond Lane adjacent near the Frogpond Grange. More details about the pros and cons of each location are provided in the table below.

Table 12. Location and Development Type (Main Street Retail Versus Commercial Centers) Options: Advantages and Disadvantages

Location	Likely Commercial Type / Location	Advantages	Disadvantages
1. NE Corner of Advance/ Stafford Intersection	Commercial center with access from both Stafford and Advance roads. Large central parking lot.	Most "developer-friendly" option. Best opportunity for a pharmacy on the corner. Likely to develop the quickest. Tried and tested development type. Anchor tenant opportunity.	Least pedestrian-oriented location and development type. Few opportunities to tie into land uses to the south and west. May have the least community support. Commercial centers can age quickly and feel outdated.
2. Brisband Road	"Main Street" with commercial space on the north and south sides of Brisband Road, as well as space fronting Stafford Road. Parking is likely located on street and behind buildings.	Most balanced option (market-driven versus experience/amenity-based). May have the most traffic once Frog Pond residential is complete. Main street retail feels "fresher" for longer, maintaining vibrancy. May have the most community support. Long-term potential to develop a flexible mixed-use program that fully surrounds the commercial area: program may also increase in size with the Elligsen UGB area housing growth to the north.	Typically unanchored; may take longer to build and fill with tenants. May require public subsidy given the greater development complexity, especially if mixed-use (upper stories are not required). Challenging tenant/parking configuration. Power easement through connection may be critical to bringing more local customers to the site.
2. Frog Pond Lane Extension	"Main Street" with commercial space on one or both sides of Frog Pond Lane, as well as space fronting Stafford Road. Parking is likely located on street and behind buildings.	Opportunities to tie into existing community asset at the Frogpond Grange. Main street retail feels "fresher" for longer, maintaining vibrancy. May have the most community support. Long-term potential to develop a flexible mixed-use program that partially surrounds the commercial area: program may also increase in size with the Elligsen UGB area housing growth to the north. More central to both future Frog Pond and Elligsen UGB area households, albeit over a much longer timeframe.	Same as Option 2. North side development may be challenging given the existing location of the Grange. Not centrally location: one-sided market area (most of new residential construction will be constructed to the south) may limit customer base/tenanting opportunities.

Source: LCG

Location number two (and three, to a lesser extent) offers the opportunity to develop a main street retail development type that likely offers the greatest community benefit and experience. However, if the City of Wilsonville chooses to pursue the Main Street approach, it should be aware of the potential challenges, including parking complexities, site design, building orientation, access, and whether the development will include upper story offices or residential units. If the City and its development partners can address these challenges, a commercial main street can make the rest of the community more desirable. Main streets require slow vehicle speeds, sidewalks, street parking, retail on both sides of the streets, and the streets should ideally go somewhere rather than into an inner neighborhood. Sisters, Oregon is one such example.

Phasing

Retail development in edge locations such as Frog Pond is challenging and requires the right mix of pass-by traffic and visibility, a dearth of strong competition in the primary market area, and an adequate population. This also underscores the adage that "retail follows rooftops" and gets developed only when there is sufficient housing to support it. A larger development program may provide more neighborhood amenities, but it will also take longer to develop and land may sit vacant and undeveloped for many years.

Retailer developers may decide to wait until after 2035 to build significant retail, when additional Urban Reserve Areas such as the Elligsen Urban Reserve Area to the north may enter the UGB (although the build-out of these areas will likely take more than 20 years).

Ultimately, the City of Wilsonville will need to decide whether it wants to see commercial development in the shortest timeframe possible or hold the land until a larger program might be feasible or a master developer is interested in developing the site. Alternatively, the City could plan for commercial development in the future Elligsen Urban Reserve as it will have greater access to more households, thereby—at least theoretically—supporting a larger development program.

Recommended Development Program

The primary goal of this memo is to recommend a commercial development program that includes site acreage, development square feet, likely tenant mix, parking demands, access requirements, and other considerations.

The market analysis for the 2015 Area Plan found that Frog Pond could potentially support an unanchored neighborhood retail center of approximately 38,000 square feet requiring about 3.5 acres of land at full project build-out in approximately 2035. Tenants would likely include retail, small office, and neighborhood services such as a daycare center.

This updated market analysis finds that a slightly larger development program of **44,000 square feet on 4.0 acres of land** may be feasible. If the City can attract a pharmacy or medium-sized grocer (a full-service grocery store is not likely), this program could be 56,000 square feet on 5.1 acres of land, so flexibility should be incorporated into the plan in order for the City to be able to respond to opportunities as they arise. A summary of LCG's recommended development program is as follows.

Bldg. Square Feet	Up to 44,000 square feet
Site Acreage	Up to 4.0 acres
Tenant Mix	Commercial development today is flexible and accommodates a wide range of activities, including food and beverage, retail, general commercial, professional services/office, healthcare, fitness, daycare, banks, and more. Specific retail tenants may include cafes and restaurants, a specialty food product store, a pharmacy, and other miscellaneous stores like laundromats, salons, hobby/boutique stores, and medical, professional, and financial offices.

There are few region-wide examples of developers building commercial centers that are smaller than 30,000 square feet and may wait until a center between 30,000 and 55,000 square feet or larger is feasible, especially if the retail market again shifts dramatically in the next decade. Another approach is to encourage a greater percentage of non-retail uses to create a larger and potentially more profitable center. Some of these non-retail tenants include medical/health services (dental offices, veterinary clinics), financial services (banks, real estate brokerage, insurance offices), realtors, personal care (salons, fitness centers), and household services (childcare facilities, education, coworking spaces).

Development Type

"Hybrid" Main Street, with buildings on both sides of the planned Brisband Street or Frog Pond Lane extension on the east side of Stafford Road. Buildings can be split up (see Northwest Crossing) to address parking challenges. The corners present an opportunity to attract a pharmacy or larger anchor tenant.

The main street approach, if done correctly, creates an authentic experience that promotes placemaking, creates a community amenity, and can have a positive impact on the surrounding residential uses and other commercial spaces (e.g., driving rent premiums and increasing values, improving the attractiveness of the area for new residents and customers, etc.).

In keeping with other regional centers, initial construction is most likely to be at a 0.25 to 0.30 floor-area ratio (FAR).

Parking

Parking ratios of 4.0 to 5.0 per thousand square feet of gross leasable commercial space are common. Most parking in the near term will be at the surface level, though shared parking and on-street parking can reduce the need for large fields of surface parking. A higher percentage of food and beverage-based tenants will create more demand for parking, while a higher percentage of non-retail tenants will likely create less demand.

Location

From a pure market perspective, the northeast corner of the Stafford Road and Advance Road intersection makes the most sense. This location requires the least new infrastructure and can be built out independently of the rest of Frog Pond.

However, Main Street retail provides the greatest experience and offers an opportunity for the commercial area to be prosperous over a longer timeframe. Main street retail feels "fresher" for longer than conventional retail centers and would be more accessible to a greater number of people traveling by car, foot, and bike.

A pharmacy or similar small anchor tenant may be possible in either location but would want to locate on street corners, yet with a setback for their customer parking.

Other Recommendations

Plan for higher-density residential, including apartments, townhomes, and live/work spaces, surrounding the commercial center. Most case studies of successful commercial areas are surrounded by higher-density housing.

Many desirable communities and commercial centers are mixed-use, and allow housing, live-work, educational, and institutional, within or adjacent to the centers. In the near term, horizontal mixed-use is possible and can create a great sense of place. Opportunities for vertical mixed-use in the near term may be very limited or nonexistent, though possible in the long term (10+ years). While the market for live-work space is modest, stakeholders may want to encourage or incentivize it.

Recognize the constraints imposed by market and development economics related to height, density, and vertical mixed-use.

APPENDIX E: ARBORIST REPORT

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Frog Pond East and South Master Plan – Wilsonville, Oregon
Tree Reconnaissance
February 6, 2022

MHA21056

Purpose and Scope of Work

Morgan Holen & Associates was contracted by Angelo Planning Group to conduct a reconnaissance level tree assessment to inform the Frog Pond East and South Master Plan for the City of Wilsonville. This report provides an update to the March 19, 2014 reconnaissance report that I prepared for the Frog Pond Area Plan and Frog Pond West Master Plan.

The Frog Pond East and South Master Plan includes properties within the Urban Growth Boundary located east of Stafford Road and South of Advance Road. I visited the site on January 26, 2022 in order to identify high-quality trees and groves that could be incorporated into future site development. I generally assessed existing trees from public rights-of-way and parcels where property owners permitted access. Site access was a limiting factor in conducting the reconnaissance. Trees were evaluated up-close as feasible, but most observations were made at a distance, from the roadway or from nearby parcels that were accessible. Trees located within Sensitive Resource Overlay Zones or Habitat Conservation Areas were not included in my evaluation. The best tree features were identified and are described herein.

A site map is enclosed depicting the trees identified by map identification number, which correspond to the enclosed tabular tree data and photographs. Generally speaking, other trees observed on site would not be recommended for retention based on poor structure or condition, or would otherwise not be sustainable long-term amenities. However, additional trees may be identified for preservation given further evaluation. A complete inventory of all trees on site will provide individual tree data and definitive recommendations for tree retention and removal, and is recommended when development applications are submitted. The reconnaissance data should inform the Master Plan to help determine how the best existing trees may be preserved with future street crossings, parks, and the overall site layout based on conditions existing at the time of this assessment.

Observations

A summary of observations is provided for each parcel located within the Master Plan area:

- **31E07 00700 (Map ID No. 1; Photo 1):** One 45” diameter ponderosa pine (*Pinus ponderosa*) located in the Stafford Road right-of-way adjacent to this parcel is in generally good condition, but with moderate structure including codominant stems and western gall rust infection caused by the fungus *Endocronartium harknessii*. This infection was not noted in the 2014 assessment and may have progressed substantially since that time. Infected branches are more susceptible to failure at the gall and the tree could become increasingly hazardous adjacent to the road. Overall, this tree may be challenging to retain with future street improvements and its long-term viability may be jeopardized by the infection.

- **31E07 00800 (Map ID No. 2 and No. 3; Photos 2 and 3):** One 40” diameter catalpa (*Catalpa* spp.) and one 74” diameter Atlas cedar (*Cedrus atlantica*) are located on the site of the Frog Pond Grange. Both trees are open grown and in good condition and continue to be classified as high priorities for preservation, as they were in the 2014 assessment.
- **31E07 00601 (Map ID No. 4; Photo 4):** The 2014 assessment noted mixed species in variable condition on this parcel with some storm damaged trees and a few large trees in good condition. Many of these trees suffered significant damage during the February 2021 ice storm. Also, closer inspection of a 52” diameter ponderosa pine near the existing house revealed hazardous top structure. Still, there are numerous trees on this parcel, scattered around and near the existing house, that are suitable for long-term preservation, including: a 40” diameter open grown red oak (*Quercus* spp., exact variety unknown); one 33” diameter linden (*Tilia* spp.) with codominant stems, but generally good structure; one 41” diameter ponderosa pine in good condition; two Oregon white oaks measuring 14” and 16” diameter each (relatively small, but excellent condition and great long-term amenities); and, two 13” diameter grand firs (*Abies grandis*) that are also relatively small, but well-cared for. The variety of trees would make this parcel and ideal location for a park or open space area.
- **31E07 01200 (Map ID No. 5; Photo 5):** No site access was authorized and observations were limited by an existing fence. One open grown sycamore (*Platanus* spp.) near the existing house suffered minor storm damage, but still appears in good condition from a distance. An elm (*Ulmus* spp.) noted in the 2014 assessment suffered extensive storm damage and is no longer suitable for long-term preservation.
- **31E18 02100 (Map ID No. 6; Photo 6):** The southern boundary is lined with Douglas-firs (*Pseudotsuga menziesii*) in variable condition. The east-west row includes some dead and dying trees and the trees in the north-south row are in generally good condition. Select trees may be suitable for preservation as intact groups with removal of dead and dying trees. A row of relatively young conifers along the northern boundary identified as being in good condition in the 2014 assessment no longer exist.
- **31E18 02001 (Map ID No. 7 and No. 8; Photos 7 and 8):** A 28” scots pine (*Pinus sylvestris*) with multiple upright leaders has been well-maintained as an ornamental landscape tree and is in generally good condition; this tree appears somewhat drought-stressed relative to the 2014 assessment. This parcel also includes a dense group of mostly Douglas-firs with two western redcedars (*Thuja plicata*), one spruce (*Picea* spp.), and a tuliptree (*Liriodendron tulipifera*) on the northern edge of the group. These trees are most suitable for preservation as an intact group.
- **31E18 02700 (Map ID No. 9; Photo 9):** No site access was authorized and observations were limited to what could be seen from SW 60th Avenue. Trees identified in the 2014 assessment appear to remain standing. Notes from 2014 describe: 1) a pair of Douglas-firs in good condition, suitable for retention together as a small group; 2) one mature bigleaf maple with three codominant stems, some dead and broken branches and branches with decay; 3) one mature silver maple with multiple attachments; and, 4) one other mature bigleaf maple in moderate condition with codominant stems and some branch and stem decay. Closer examination is warranted to determine whether these trees continue to be suitable for long-term preservation.

- **31E18B 02000 (Map ID No. 10 and No. 11; Photos 10 and 11):** One 40" diameter Douglas-fir in good condition located in the SW Kruse Road right-of-way adjacent to this parcel is in good condition; it may be challenging to preserve this tree with future street improvements, but alternative designs should be considered. No access was authorized to assess trees in the interior of this parcel, which appear to be mixed species in variable condition based on observations made from the street and closer examination of individual trees is warranted.
- **31E18B 01700 (Map ID No. 12; No Photos):** Site access was not authorized and I was unable to see the trees that appear to exist in aerial photos. The 2014 assessment describe mixed species, predominately Oregon ash (*Fraxinus latifolia*) and at least one Douglas-fir, in variable condition. Closer examination is warranted.
- **31E18B 01900 (Map ID No. 13; Photo 12):** One Douglas-fir in generally good condition observed from a distance along the edge of a mapped Habitat Conservation Area. The 2014 assessment noted a long-live crown and good branch distribution. The tree now has a few broken branches, but still has a long-live crown and good vigor.
- **31E18B 01800 (Map ID No. 14; Photo 13):** Site access was not authorized, but mixed conifers noted in the 2014 assessment remain standing, including open-grown deodar cedars (*Cedrus deodara*) and a group of pines (*Pinus* spp.) trees in good. Several birches (*Betula* spp.) scattered among the conifers are in poor condition and not long-term amenities.
- **31E18B 01500 (Map ID No. 15; Photo 14):** Planted rows of red oaks (*Quercus rubra*) along the east-west fence and a mix of oaks, maples and ponderosa pines along the north-south fence are in generally good condition as intact group. These trees are relatively young, but well-established. A single black cottonwood (*Populus trichocarpa*) mixed in with the north-south row is not recommended for long-term preservation due to inherent species limitations.
- **31E18B 01400 (Map ID. No. 16, No. 17 and No. 18; Photos 15, 16 and 17):** Three trees identified during the 2014 assessment remain standing and suitable for preservation including: a 34" diameter ponderosa pine with minor crown asymmetry and some drought stress; an 18" diameter sweetgum (*Liquidambar styraciflua*) with a few small broken branches; and, an open grown semi-mature giant sequoia (*Sequoiadendron giganteum*) with a long-live crown. A group of small pine trees identified during the 2014 assessment suffered severe storm damage and are no longer identified as priorities for preservation due to diminished structure.
- **31E18B 00100 (Map ID No. 19; Photo 18):** Site access was not authorized, but one pin oak (*Quercus palustris*) in generally good condition was observed from the neighboring property.
- **31E18B 00300 (Map ID No. 20; Photo 19):** Maples, deodar cedars and Port-Orford-cedars (*Chamaecyparis lawsoniana*) observed during the 2014 assessment have either been removed or suffered storm damage and are no longer priorities for preservation. In the front of this lot, I observed a small, but mature and well-maintained Japanese maple (*Acer palmatum*) in good condition with an 8' crown radius. Although this tree is relatively small, it is an attractive amenity and might be worthwhile to transplant or incorporate into site design. A row of red oaks identified in the 2014 assessment suffered severe ice storm damage and are no longer priorities for preservation.

- **31E18B 00500 (Map ID No. 21 and No. 22; Photos 20 and 21):** Site access was not authorized, but from the neighboring property and right-of-way, I observed a row of mixed conifers in generally good condition; while several western hemlocks (*Tsuga heterophylla*) were dead or dying, three Atlas cedars and a Douglas-fir appeared suitable for preservation as an intact group. South of the existing home, a small group of deodar cedars including in the 2014 assessment remain standing and appear in generally good condition from a distance.
- **31E18B 00800 (Map ID No. 23; Photo 22):** One open grown ponderosa pine with a 24' crown radius was noted as being in good condition during the 2014 assessment. Now, the tree is in fair condition with minor crown asymmetry, dead branches on the north side of the tree, and some western gall rust infection. This tree is still identified as suitable for preservation, but is no longer a high priority due to diminished condition and disease. A small but well-maintained magnolia identified in the 2014 assessment appears to have been removed.
- **31E18B 01100 (Map ID No. 24; Photo 23):** Site access was not authorized, but one redwood (*Sequoia sempervirens*) and one giant sequoia were visible in the skyline and appear in generally good condition.
- **31E18B 01200 (Map ID No. 25; Photo 24):** A small Oregon white oak identified in the 2014 assessment no longer exists, but two semi-mature giant sequoias and two oak species trees appear in generally good condition from a distance.
- **31E18B 01300 (Map ID No. 26 and No. 27; Photos 25 and 26):** A dense row of semi-mature conifers along the northern boundary of this parcel are in fair to good condition and most suitable for preservation as an intact row. Closer to the existing house, a dense group of one mature Douglas-fir and two mature grand firs (*Abies grandis*) are in generally good condition and suitable for preservation as an intact group. Other mature conifers around the house and along the street are in fair to poor condition and with structural defects and sequoia pitch moth (*Synanthedon sequoia*) infestation.

No high-quality trees were observed on the following tax lots (not including Sensitive Resource Overlay Zones or Habitat Conservation Areas):

- 31E07 00600
- 31E07 00900
- 31E07 01000
- 31E07 01101 (ponderosa pine noted in 2014 no longer exists; no access to assess interior portions of this parcel, but appears to be predominately small black cottonwoods with no prominent high-quality trees visible in the skyline)
- 31E18 02600
- 31E18B 00200
- 31E18B 00400
- 31E18B 00700 (no access and unable to see a few trees that appear to exist in aerial photos; warrants further investigation)
- 31E18B 00900
- 31E18B 01000 (open grown spruce and redwood trees noted as being in good condition in the 2014 assessment no longer exist)
- 31E18B 01600

Summary

The Frog Pond East and South Master Plan area has a variety of tree species, sizes, and conditions. During site reconnaissance, 27 individual trees and groups of trees were identified as relatively high-quality, sustainable trees that may be suitable for long-term preservation. Of the 27 trees and groups of trees identified, the enclosed tree data classifies 10 as the highest priorities for preservation, 14 as secondary priorities for preservation, and three as lower priorities for preservation (the two diseased pines and small Japanese maple). Since site access was limited, a more thorough assessment is recommended for many of these trees and additional trees might also be identified. The information provided in this report can guide site design to include the best tree features during development based on current tree conditions and limited observations.

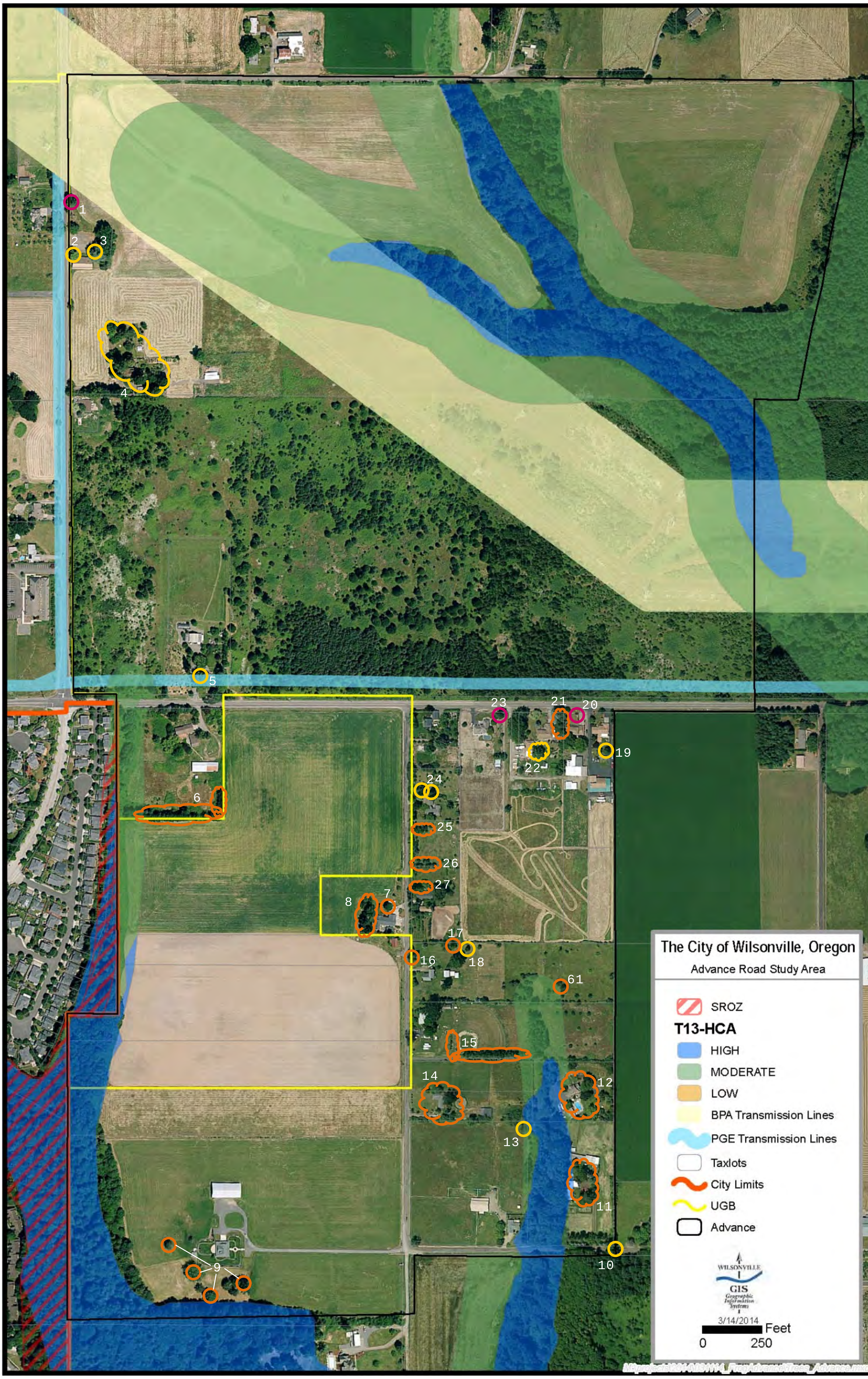
The client may choose to accept or disregard the recommendations contained herein, or seek additional advice. Neither this author nor Morgan Holen & Associates, LLC, have assumed any responsibility for liability associated with the trees on or adjacent to this site. Thank you for choosing Morgan Holen & Associates, LLC, to provide consulting arborist services for the Frog Pond East and South Master Plan. Please contact us if you have questions or need any additional information.

Thank you,
Morgan Holen & Associates, LLC

Morgan E. Holen

Morgan E. Holen, Member
ISA Board Certified Master Arborist, PN-6145B
ISA Tree Risk Assessment Qualified
Forest Biologist

Enclosures: Frog Pond East and South – Tree Reconnaissance Site Map 01-26-2022
Frog Pond East and South – Tree Data 01-26-2022
Frog Pond East and South – Tree Photos 01-26-2022



FROG POND EAST AND SOUTH - TREE RECONNAISSANCE SITE MAP 01-26-2022

Individual Tree(s) or Groups identified as highest priorities for preservation based on species, size, and general condition; some require closer examination to verify

Individual Tree(s) or Groups identified as secondary priorities for preservation based on species, size, and general condition; some require closer examination to verify

Individual Tree identified as lowest priority for preservation based on size or general condition

Morgan Holen & Associates LLC

Property Information				2022 Evaluation				
Access	**Owner**	**Address**	**Tax Lot No.**	**Map ID No.**	**Photo No.**	**Description**	**Priority***	**Recommendations Based on Preliminary Evaluation**
Yes	Anderson	None	31E07 00700	1	1	Located in Stafford Road right of way, ponderosa pine, 45" DBH, 30' crown radius, generally good condition, moderate structure with codominant stems and western gall rust infection	3	May be challenging to retain with future street improvements; structural defect and gall rust infection make it a lower priority for preservation
No	Grange	27350 SW Stafford Rd	31E07 00800	2	2	catalpa, 40" DBH, 22' crown radius, open-grown, generally good condition, unique species	1	Retain tree; will require protection if Grange relocated and existing concrete path removed
No	Grange	27350 SW Stafford Rd	31E07 00800	3	3	Atlas cedar, 74" DBH, 48' crown radius, open-grown, generally good condition, large upright scaffold leaders and multiple attachments	1	Retain tree; will require protection if Grange relocated, may require pruning to improve structure if preserved long-term
Yes	Anderson	27480 SW Stafford Rd	31E07 00601	4	4	mixed species in variable condition, substantial storm damage to several, one 52" DBH ponderosa pine closest to house has very poor crown structure and is potentially hazardous; trees most suitable for preservation include: 40" DBH red oak species with 20' crown radius 16" DBH Oregon white oak with 16' crown radius 33" DBH linden with 24' crown radius, codominant stems 41" DBH ponderosa pine with 30' crown radius Two 13" DBH grand firs with 12' crown radius each 14" DBH Oregon white oak with 12' crown radius	1	Retain seven trees
No	Connolly	6351 SW Advance Rd	31E07 01200	5	5	sycamore, open grown, some storm damage but still looks good from a distance, assessment limited due to no site access authorization and existing fence	1	Requires closer examination
No	Gyapong	6360 SW Advance Rd	31E18 02100	6	6	North-South row of Douglas-firs along sidewalk in generally good condition as intact group; East-West row of Douglas-firs along south property boundary in variable condition with some dead and some declining trees	2	Requires closer examination, select trees suitable for preservation in intact rows with dead and declining trees removed
Yes	WWSD	28355 SW 60th Ave	31E18 02001	7	7	scots pine, 28" DBH, 20' crown radius, multiple attachments with numerous leaders but well-maintained and generally good condition	2	Secondary priority for preservation

Access	Owner	Address	Tax Lot No.	Map ID No.	Photo No.	Description	Priority*	Recommendations Based on Preliminary Evaluation
Yes	WWSD	28355 SW 60th Ave	31E18 02001	8	8	Dense group of mostly Douglas-firs with two western redcedars, one spruce, and a tuliptree on the north edge	2	Suitable for retention as intact group
No	WCF	28901 SW 60th Ave	31E18 02700	9	9	No site access, limited observations from SW 60th Avenue; appears that trees identified in 2014 remain standing, change in condition unknown. Previous notes identified: 1) a pair of Douglas-firs in good condition, suitable for retention together as a small group; 2) one mature bigleaf maple with three codominant stems, some dead/broken branches and branches with decay, avoid developing target potential to minimize risk; 3) one mature silver maple with multiple attachments at ~6', avoid developing target potential to minimize risk; and, 4) one other mature bigleaf maple in moderate condition with codominant stems at ~3', some branch/stem decay, good habitat, avoid developing target	2	Requires closer examination
No	Corey	5691 SW Kruse Rd	31E18B 02000	10	10	Douglas-fir, 40" DBH, 25' crown radius, generally good condition, appears to be located in the SW Kruse Road right of way	1	Retain tree
No	Corey	5691 SW Kruse Rd	31E18B 02000	11	11	Mixed species in variable condition from a distance, no site access	2	Requires closer examination
No	Vaughn	28580 SW 60th Ave	31E18B 01700	12	none	No site access, unable to make observations; 2014 data describes mixed species in variable condition with Oregon ash being most prominent, but at least one Douglas-fir	2	Requires closer examination
Yes	Decoster	5899 SW Kruse Rd	31E18B 01900	13	12	Douglas-fir, observations made from a distance; long-live crown, broken branches but generally good condition, located on the edge of the HCA	1	Retain tree
No	Hughes	28668 SW 60th Ave	31E18B 01800	14	13	Mixed conifers including open-grown deodar cedars and group of pines in generally good condition, observations made from a distance (birch trees also observed not recommended for retention due to poor condition and structure)	2	Requires closer examination

Access	Owner	Address	Tax Lot No.	Map ID No.	Photo No.	Description	Priority*	Recommendations Based on Preliminary Evaluation
Yes	Frigaard	28500 SW 60th Ave	31E18B 01500	15	14	Planted rows of red oaks along East-West fence and oak, maple and ponderosa pines along North-South fence (black cottonwood also observed by not recommended for retention due to species limitations); generally good condition as intact rows	2	Secondary priority for preservation
Yes	Perez	28424 SW 60th Ave	31E18B 01400	16	15	ponderosa pine, 34" DBH, 28' crown radius, generally good condition though crown not as dense relative to 2014 assessment, crown asymmetry, drought stress	2	Secondary priority for preservation
Yes	Perez	28424 SW 60th Ave	31E18B 01400	17	16	sweetgum, 18" DBH, 18' crown radius, generally good condition with a few small broken branches	2	Secondary priority for preservation
Yes	Perez	28424 SW 60th Ave	31E18B 01400	18	17	giant sequoia, 16' crown radius, open-grown with a long live crown and generally good condition	1	Retain tree
No	Sprecher	5696 SW Advance Rd	31E18B 00100	19	18	pin oak in generally good condition from a distance, no site access	1	Requires closer examination
Yes	Owens	5738 SW Advance Rd	31E18B 00300	20	19	Trees identified in 2014 have either been removed or have greatly diminished structure; observed a small, but mature and well-maintained Japanese maple in good condition with an 8' crown radius	3	Lower priority for preservation due to small size
No	Brown	5780 SW Advance Rd	31E18B 00500	21	20	Row of mixed conifers including dead and dying western hemlocks and three Atlas cedars and one Douglas-fir with broken branches but in generally good condition as intact group	2	Diminished value with loss of hemlocks, but Atlas cedars and Douglas-fir still suitable for preservation as a group
No	Brown	5780 SW Advance Rd	31E18B 00500	22	21	No site access, deodar cedars identified in 2014 remain standing and appear in generally good condition from a distance	1	Requires closer examination
No	Waible	5890 SW Advance Rd	31E18B 00800	23	22	Open grown ponderosa pine, 24' crown radius, fair condition and moderate structure with multiple leaders, western gall rust infection, dead branches on north side of crown, crown asymmetry	3	Lower priority for preservation due to moderate structure and gall rust infection
No	Snell	28152 SW 60th Ave	31E18B 01100	24	23	Large redwood and giant sequoia in generally good condition from a distance; no site access	1	Requires closer examination

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Access	Owner	Address	Tax Lot No.	Map ID No.	Photo No.	Description	Priority*	Recommendations Based on Preliminary Evaluation
No	Ajami	None	31E18B 01200	25	24	Small Oregon white oak suitable for transplanting identified in 2014 is gone; Observed two semi-mature giant sequoias and two oak species trees from a distance, no site access	2	Requires closer examination
Yes	Ciz	28300 SW 60th Ave	31E18B 01300	26	25	Dense row of semi-mature conifers, ponderosa pine with 18' crown radius relatively best tree in group; spruce, shore pines and Douglas-fir in variable condition but suitable for preservation as intact group	2	Secondary priority for preservation
Yes	Ciz	28300 SW 60th Ave	31E18B 01300	27	26	Dense group of mature mixed conifers, two grand fir and one Douglas-fir closest to house are relatively best trees in this	2	Three trees closest to house are a secondary priority for preservation; others are not

Photo 1. A 45" diameter ponderosa pine with moderate structure and western gall rust infection. In the ROW adjacent to tax lot 31E07 00700 - Map ID 1.

Photo 2. A 40" diameter mature catalpa tree in generally good condition outside of the grange hall at tax lot 31E07 00800 - Map ID No. 2.

Photo 3. A 74" diameter open-grown Atlas cedar in generally good condition behind the grange hall at tax lot 31E07 00800 - Map ID No. 3.

Photo 4. Seven trees suitable for long-term preservation at tax lot 31E07 00601; note that the large ponderosa pine near the house has very poor crown structure and is potentially hazardous - Map ID No. 4.

Photo 5. A mature sycamore in good condition from a distance at tax lot 31E07 01200 - Map ID No. 5.

Photo 6. North-South row of Douglas-firs along sidewalk in generally good condition as intact group Tax lot 31E18 02100 - Map ID No. 6. East-West row of Douglas-firs along south property boundary (not pictured) in variable condition with some dead and some declining trees.

Photo 7. Scotch pine at tax lot 31E18B 02001 well maintained as an ornamental landscape tree - Map ID No. 7.

Photo 8. Dense group of mostly Douglas-firs with two western redcedars, one spruce, and a tuliptree on the north edge (to left) at tax lot 31E18B 02001 - Map ID No. 8.

Photo 9. No access authorized at tax lot 31E18B 02700; trees identified in 2014 appear to remain standing, condition unknown - Map ID No. 9.

Photo 10. 40" DBH Douglas-fir located in the SW Kruse Road right of way adjacent to tax lot 31E18 02600 - Map ID No. 10.

Photo 11. Mixed species in variable condition from a distance; no site access authorized for closer assessment at tax lot 31E18B 02000 - Map ID No. 11.

Photo 12. Open grown Douglas-fir in generally good condition with a long live crown and some broken branches at tax lot 31E18B 01900 - Map ID No. 13.

Photo 13. Mixed conifers appear in good condition from a distance at tax lot 31E18B 01800 - Map ID No. 14.

Photo 14. Rows of red oaks along east-west fence line (right) and mix of oak, maple and four ponderosa pines along north-south fence line (left) in generally good condition at tax lot 31E18B 01800; black cottonwood (identified with arrow) not recommended for retention. Map ID No. 15.

Photo 15. 34" DBH ponderosa pine in good condition at tax lot 31E18B 01400 - Map ID No. 16.

Photo 16. 18" DBH sweetgum in generally good condition at tax lot 31E18B 01400 - Map ID No. 17.

Photo 17. Open-grown giant sequoia in generally good condition at tax lot 31E18B 01400 - Map ID No. 18.

Photo 18. Pin oak in generally good condition based on observations made from a distance at tax lot 31E18B 00100 - Map ID No. 19.

Photo 19. Small but mature and well-maintained Japanese maple at tax lot 31E18B 00300 - Map ID No. 20.

Photo 20. Row of mixed conifers along eastern boundary of tax lot 31E18B 00500 include dead and dying hemlocks and Atlas cedars and a Douglas-fir in generally good condition as an intact group - Map ID No. 21.

Photo 21. Row of deodar cedars at tax lot 31E18B 00500 appear in generally good condition from a distance- Map ID No. 22.

Photo 22. Open grown ponderosa pine in fair condition and with moderate structure at tax lot 31E18B 00800 - Map ID No. 23.

Photo 23. Large redwood (left) and giant sequoia (right) appear in generally good condition from a distance at tax lot 31E18B 01100 - Map ID No. 24.

Photo 24. Two semi-mature redwoods and two oak species trees appear in generally good condition from a distance at tax lot 31E18B 01200 - Map ID No. 25.

Photo 25. Dense row of semi-mature conifers in variable condition at tax lot 31E18B 01300 - Map ID No. 26.

Photo 27. Two grand firs and one Douglas-fir in a group close to the existing house are relatively the best trees at tax lot 31E18B 01300 - Map ID No. 26.

APPENDIX F: INFRASTRUCTURE PLAN

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Technical Memorandum

Date:	November 8, 2022
Project:	Wilsonville Frog Pond East and South Master Plan
To:	Andrew Parish – APG/MIG Joe Dills – APG/MIG
From:	Mike Carr, PE – Consor Julia King, EIT – Consor Joshua Owens, PE – Consor
Re:	Proposed Infrastructure Plans - Water, Wastewater, Stormwater Systems

Introduction

This technical memorandum provides a summary of new water, wastewater, and stormwater infrastructure necessary for the development of Wilsonville Frog Pond East and South areas, to be documented in the area's Master Plan. Analyses were performed to estimate sizes and propose layouts of the proposed systems, using applicable City standards for the systems. The planned infrastructure will also be used for cost estimates and preparation of infrastructure funding strategies.

Background

In 2015, the Frog Pond Area Plan (FPAP) was adopted by the City of Wilsonville. The Frog Pond area consists of three separate neighborhoods: West, East, and South. A master plan for Frog Pond West was developed in 2017 and development in Frog Pond West began soon after. Based on current information from the City, it is estimated that 80% of the parcels in Frog Pond West are currently, or soon to be, under development.

In 2018, the Frog Pond East and South areas were brought into the regional Urban Growth Boundary (UGB). The City initiated master planning in 2020. To date, the master plan process has prepared a draft preferred land use plan. The preferred alternative identifies residential uses of varied housing types, a neighborhood commercial area, streets and trails, and parks and open space. For the purpose of this infrastructure analysis, the plan is assumed to include 1,800 total housing units in the combined East and South neighborhoods. Infrastructure plans were developed for the preferred alternative and are further described in the individual sections below.

The City has also identified a higher-density scenario which calls for 2,384 total units (20 units per net residential acre) in the combined East and South neighborhoods. This scenario represents a very robust buildout of housing, especially middle housing. Infrastructure needs for the higher-density alternative were estimated to determine the difference in needs between the two alternative plans. These are also described below.

Proposed Water System

The water purveyor for the Frog Pond area is the City of Wilsonville. The City's *Water System Master Plan* (WSMP), adopted September 6, 2012, is the current basis for domestic water and fire system planning within the Frog Pond East and South. The recommendations provided in the 2015 FPAP for water system improvements still apply for the recommended development concepts for Frog Pond East and South. These areas will be extensions of water pressure Zone B which operates in an elevation range from 100 feet to 285 feet and has a hydraulic grade of 400 feet.

Distribution System

Figure 1 shows the proposed preliminary water system layout for the East and South neighborhoods, including off-site improvements needed to serve the area. The existing 12-inch waterline in Boeckman Road is the primary backbone connection for Frog Pond East and South to the City's water supply and storage system. A looped system consisting of 12-inch and 8-inch distribution mains is proposed for supply of domestic water to Frog Pond East and South. The 12-inch main network provides a redundant capacity of 1,500 gallons per minute (gpm) for fire flow to all areas. In accordance with City Public Works Standards, 12-inch mains are also required for the commercial main street area proposed along Brisband Road in Frog Pond East. For all residential zones, 8-inch mains are required, with all lines interconnected as a network to minimize dead ends.

The plan calls for new 12-inch waterlines extending north in Stafford Road and east in Advance Road to extend the distribution system into Frog Pond East and South, connecting to the existing 12-inch waterlines in Boeckman Road and Advance Road. Additional points of connection will also be made to proposed waterlines planned to be installed in Frog Pond Lane and Brisband Road as part of the Frog Pond West development.

The northernmost neighborhoods in Frog Pond East along SW Kahle Road need to be connected to the City's existing water system with a 12-inch loop that connects to the south side of the BPA easement in two locations, one being a connection at the intersection of Stafford Road and SW Kahle Roads, and the other to the 12-inch waterline in the commercial main street. The loop could be constructed across the BPA easement either in the proposed road extending northeast from Frog Pond Lane, or it could cross the BPA easement further to the east via the proposed pedestrian bridge over the main fork of the Newland Creek. The decision on where to route the loop will depend on what areas are developed first and whether the pedestrian bridge is built. In either scenario the 12-inch mainline along SW Stafford Road and SW Kahle Road will be required.

The WSMP recommended two additional connections to the existing distribution system to reliably serve Frog Pond East and South through buildout. The first is a 12-inch connection to the Canyon Creek Road waterline via a crossing of Boeckman Creek at the west end of Frog Pond Lane, for connection to the Stafford Road waterline in conjunction with development in Frog Pond East. The second is a crossing of Meridian Creek with a 12-inch main, south of the Meridian Creek Middle School, installed in conjunction with development of Frog Pond South. Both creek crossings are assumed to be below grade directionally drilled pipelines; however, they may be installed on future pedestrian bridges where under consideration by the City.

Storage System

The WSMP identified an overall water storage deficiency in the City which will be further increased by development in Frog Pond East and South. The WSMP proposed a 3.0-million-gallon West Side Tank and 24-inch transmission main project to provide sufficient storage for the City. The City has this project budgeted in the City's current 5-Year Capital Improvement Program, with design expected to begin in FY2022/23. The project is anticipated to be completed in 2025.

The extent of the storage deficiency and its impact on development of Frog Pond East and South is unknown at this time, since the WSMP is 10 years old and significant development has occurred in the City in that period. Additional analysis may be conducted to determine what, if any, impact any development in Frog Pond East and South prior to implementation of the new water tank would have on the existing water system and its customers.

The water system layout and sizing are primarily dependent on the street network to distribute fire flow to the designated land use types. Given the higher-density scenario using the same land use pattern and street plan, it is estimated that waterline sizes and costs would remain the same as with the preferred water system layout.

Proposed Wastewater System

The City of Wilsonville will provide sanitary sewer service for the Frog Pond East and South area as an extension of the City's existing collection system. The City's *Wastewater Collection System Master Plan* (WCSMP), adopted in 2014, is the current basis for wastewater system planning within the City. The 2015 FPAP and subsequent studies provide the specific framework for wastewater system planning in the Frog Pond East and South area, along with design criteria from the 2017 Public Works Standards.

An analysis of the existing wastewater infrastructure system conducted for this Master Plan and was documented in the *Existing Conditions Analysis - Water, Wastewater, Stormwater Infrastructure Technical Memorandum* dated May 31, 2022. The analysis confirmed the Frog Pond Area Plan's conclusion that the topography of the area relative to the City's existing wastewater infrastructure necessitated four lift stations.

Figure 1 – Preliminary Water System Layout

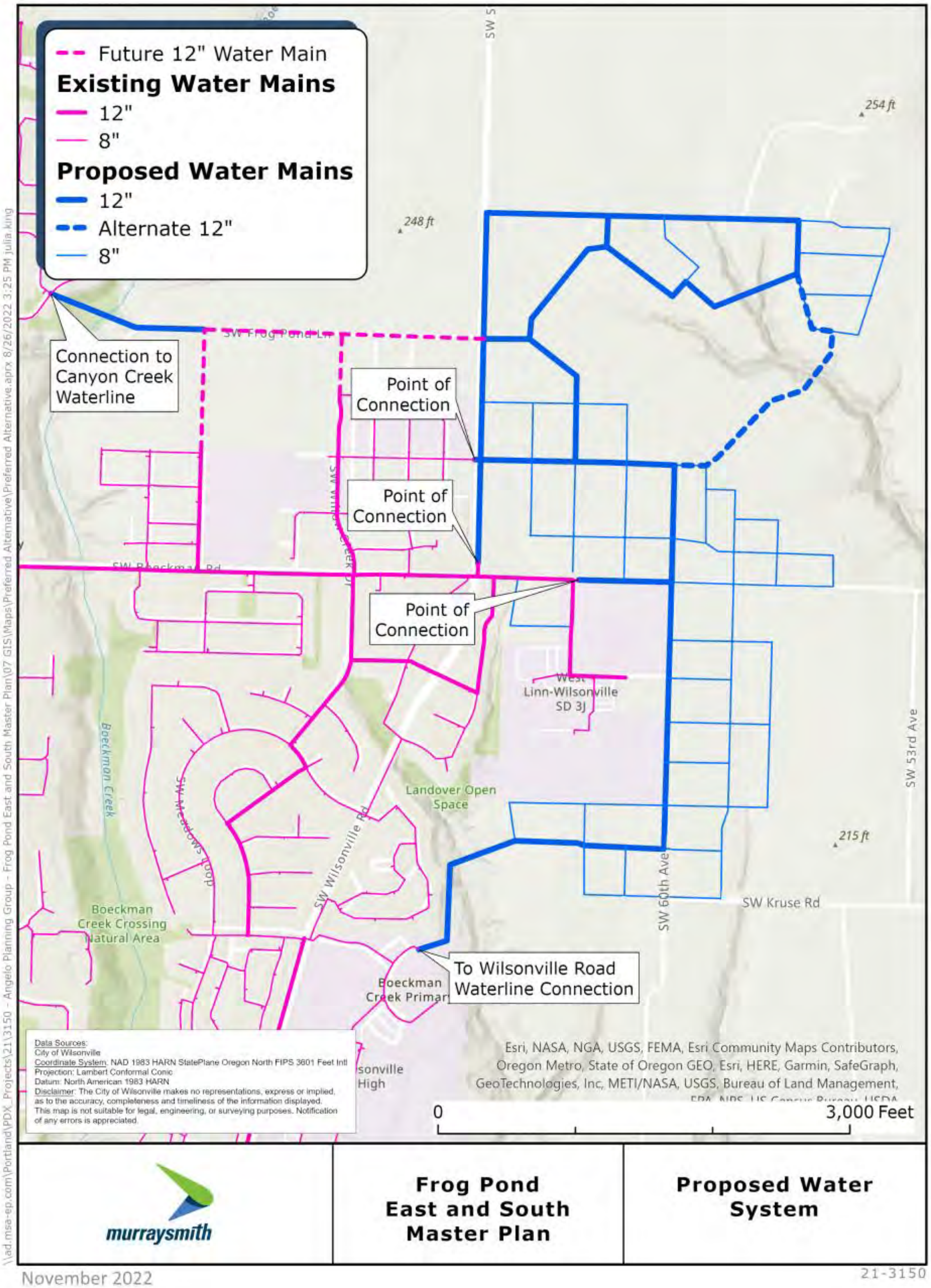
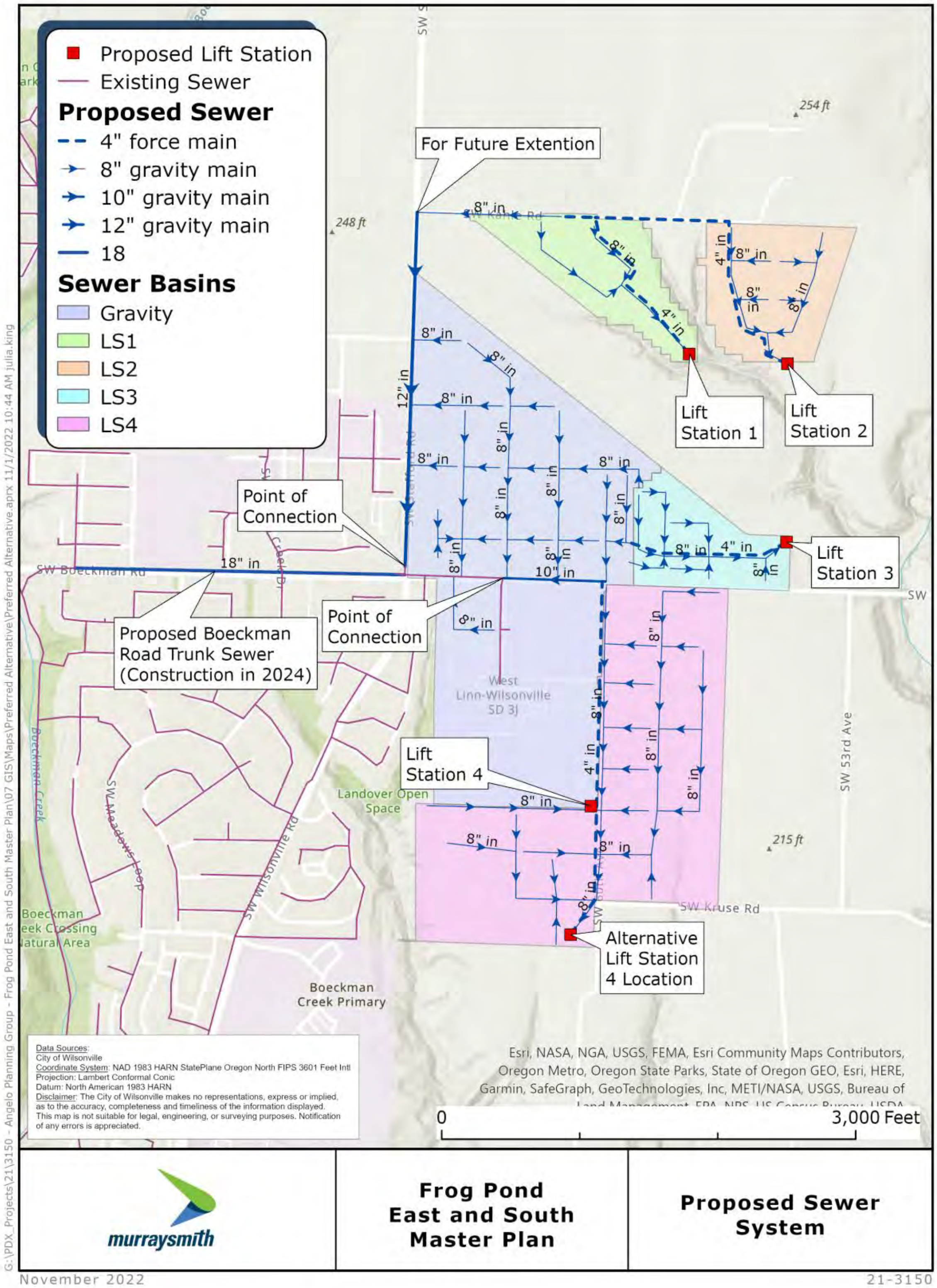


Figure 2 shows the proposed preliminary wastewater system layout for the Frog Pond East and South neighborhoods. The area was divided into five sewer basins, one for each of the four wastewater lift stations required and one that flows by gravity out of the Frog Pond area. The four lift stations are briefly described as follows:

> Lift Stations LS1 and LS2 are needed for the two Frog Pond East neighborhoods north of the BPA Easement along Kahle Road. The neighborhoods slope toward Newland Creek which also serves as a topographic barrier to connecting to the City's existing gravity sewer system. Each lift station will require a force main to convey wastewater to the gravity system in Kahle Road that would be extended east from Stafford Road. The force main for LS1 is estimated at 1,000 feet long, and 2,000 feet long for LS2.
>
> Lift Station LS3 is needed to serve the far eastern portion of Frog Pond East where topography of the neighborhood slopes easterly toward Newland Creek. The lift station will pump wastewater to an extension of the existing gravity sewer system in SW Advance Road via a 1,200-foot-long force main.
>
> Lift Station LS4 is needed in the southern portion of the Frog Pond South area due to topography, which generally runs from north to south away from the City's existing gravity wastewater sewer system in SW Advance Road. The Plan identifies two potential locations of LS4. The preferred location is along existing SW 60th Avenue in the southeast corner of the school district property. This location is advantageous because it is adjacent to the SW 60th right-of-way which is likely to be improved as part of the first phase of development, and because it can be co-located with a regional stormwater facility that is also needed for the area. An alternative lift station location was also identified further to the south, which may advantageous because it can reduce the depth, and therefore the cost, of lift station construction. However, development timing for the far south portion of Frog Pond South may not facilitate implementation at the time it is needed for the northern portion. In either case, the lift station will need to be constructed with depth sufficient to serve all properties designated within the station’s service area.

Basin peak flows were calculated using preliminary land use data provided by MIG and unit flow values determined from the WCSMP. Residences were assumed to have 2.48 people per unit and an average sewer production rate of 67 gallons per person per day. Commercial sectors were assumed to generate 1,000 gallons per acre per day and schools were estimated to generate 25 gallons per day per person. Average dry weather flows were used with a peaking factor of 2 to estimate the peak dry weather flows. Wet weather flows were estimated to have an infiltration and inflow rate of 1,800 gallons per acre per day over the entire basin. Detailed calculations can be found in Appendix A.

Figure 2 – Preliminary Wastewater System Layout



Each basin was analyzed for both the preferred housing scenario of 1,800 total units, and the higher-density scenario of 2,384 total units. The four lift station basins will each require an 8-inch gravity pipe to convey wastewater to the lift station at an assumed slope of 0.5%, and a 4-inch force main discharge to the downstream basin. These requirements are the same for both housing scenarios. **Table 1** shows the peak wet weather flow for each lift station basin and the required pipe sizes.

Table 1 - Lift Station Basins

Basin	Total Peak Flow for 1,800 Units (cfs)	Total Peak Flow for 1,800 Units (gpm)	Total Peak Flow for 2,384 Units (gpm)	Recommended Lift Station Design Capacity (gpm)	Force Main Size (in)	Gravity Sewer Size (in)
LS1	0.13	58	70	135	4	8
LS2	0.16	71	86	135	4	8
LS3	0.126	55	67	135	4	8
LS4	0.49	220	260	260	4	8

Table 1 shows that the recommended capacity for LS1, LS2 and LS3 lift stations is 135 gpm, which is the minimum pumping capacity required to meet design criteria for 4-inch sewage force mains. This is the same for both housing scenarios. Capacity of LS4 would increase somewhat, from 220 gpm in the preferred scenario, to 260 gpm in the higher-density scenario. This change is estimated to be relatively insignificant in the overall cost of constructing the wastewater facilities for LS4 basin.

The main trunk traveling north to south on SW Stafford Road conveys sewage from Lift Stations 1 and 2 and a portion of the gravity basin. This pipe has the capacity to carry both housing density scenarios at an 8-inch size; however, this pipe should be sized at 12-inch diameter as identified in the WCSMP to accommodate future extension to the north.

Extension of the Boeckman Road Trunk Sewer east on Advance Road is needed to convey sewage from both Lift Stations 3 and 4 and a portion of the gravity basin. A 10-inch size is required to provide capacity necessary for both housing density scenarios.

All wastewater from Frog Pond East and South is to be conveyed to the wastewater treatment plant through connection to the existing Boeckman Road Trunk Sewer, which flows west to the existing Boeckman Creek Interceptor Sewer and the Memorial Park Pump Station. The Boeckman Road Trunk Sewer is being upsized to 18-inch diameter as part of improvements to Boeckman Road, including Boeckman Dip Bridge, with completion anticipated for 2024.

The Boeckman Creek Interceptor Sewer is a 12-inch to 18-inch diameter pipe extending from Boeckman Road to the Memorial Park Pump Station. Capacity of the Boeckman Interceptor was determined to be sufficient for full buildout of Frog Pond West but will be insufficient to serve full build-out of Frog Pond East and South. The WCSMP recommends the Boeckman Creek Interceptor Sewer be upsized for buildout of Frog Pond East and South. The City is currently planning to upsize the Boeckman Interceptor in conjunction with a regional trail in the creek corridor. Design of the project will begin in 2022, with construction anticipated to be completed in the fall of 2025.

Though the Boeckman Creek Interceptor will not have sufficient capacity for full buildout of Frog Pond East and South, there will be some capacity available for initial development in the area, depending on how much capacity has been taken up by Frog Pond West. A specific amount has not been calculated. With the Frog Pond West area nearing full development, it is recommended the City reevaluate the remaining capacity in the downstream Boeckman Creek system to estimate how many new dwelling units in Frog Pond East and South can be reliably connected before the planned interceptor improvements are complete.

The WCSMP estimated that the sewer line on SW Kahle Road would need to be a 10-inch pipeline; however based on updated loading conditions, calculations show an 8-inch pipe provides adequate capacity to convey the flow from the areas tributary to the Kahle Road sewer line.

Proposed Stormwater System

The City of Wilsonville will be the regulatory authority for design and construction of stormwater facilities for the Frog Pond East and South area, in accordance with the City's current Phase I Multiple Separate Storm Systems (MS4) National Pollution Discharge Elimination System (NPDES) permit.

The City is currently preparing an update to their 2012 Stormwater Management Plan (SWMP) to address new post-construction stormwater permit requirements. City staff note that significant changes are not anticipated to the stormwater design standards as a result of the new permit. Therefore, the current design standards and user's guides are assumed to be valid for this proposed stormwater system plan. These include and are referenced as:

- 2015 Stormwater and Surface Water Design and Construction Standards, Section 3 – Public Works Standards, Revised December 2015 (PWS 2015)
- User's Guide for the BMP Sizing Tool, Revised December 2017 (BMPST 2015)

The intent of this proposed stormwater system plan is to provide recommendations for laying out the stormwater conveyance system and to identify potential locations for regional facilities to manage water quality treatment and flow control (Figure 3). The plan provides the City with a basis to phase and implement stormwater infrastructure needed to meet the goals and vision of the Frog Pond East & South Master Plan. The plan provides preliminary sizing for stormwater infrastructure for the entire Frog Pond East and South Area using area-wide parameters. Final design and implementation will require more detailed analyses to incorporate the following information as it becomes available:

- Variability in the physical attributes of the development site as determined with Site Assessment and Planning[1];
- Housing Variety Policy as adopted within the Frog Pond East & South Master Plan;
- Implementation of the Housing Variety Policy as determined at the time of development;
- Phasing and implementation of transportation and other infrastructure;
- Development sequencing and phasing;
- Owner willingness to provide property for off-site stormwater facilities through easement or acquisition (e.g., school district, City park, etc.);
- Updates to the City's Stormwater Management Plan; and
- Changes to the Design and Construction Standards, analysis methods, and/or permitting requirements.

Stormwater Basins

Oregon Drainage Law[2], the City's Design Standards[3], and regulatory agencies such as National Marine Fisheries Service (NMFS)[4] all require that collected stormwater runoff remain within its natural drainage basin[5]. The drainage basins for Frog Pond East are Newland Creek in the northeast portion and Meridian Creek in the southwest portion. The drainage basins for Frog Pond South are Meridian Creek in the western portion and an unnamed tributary in the eastern portion that drains south directly into the Willamette River. For the purposes of this memo this unnamed tributary is referred to as Kruse Creek.

The three drainage basins were further delineated into subbasins based on topography with each subbasin designated with a single outfall to the receiving stream. The basins and subbasins are shown in **Figure 3** and the corresponding areas are summarized in **Table 1**, and further described in the paragraphs below.

Newland Creek Basin

The 68-acre Newland Creek Basin basin includes the northeast portion in the Frog Pond East area. The basin was delineated into five subbasins, described as N1 through N5. Subbasins N1 and N2 are located to the south of the BPA easement. Stormwater from these subbasins will need to be conveyed across the Bonneville Power Administration (BPA) easement to discharge to Newland Creek. Subbasins N3 and N4 are for the two distinct neighborhoods north of the BPA easement along SW Kahle Road. They are separated by a fork of Newland Creek and require separate

[1] PWS 2015 Section 301.2.00
[2] Oregon Drainage Law is established by case law, for discussion see Oregon Department of Transportation 2014 Hydraulics Design Manual, Chapter 2 – Legal Aspects.
[3] PWS 2015 Section 301.1.10(a)
[4] NMFS SLOPES for Stormwater, Transportation, and Utilities, 2014 section 1.3.1.1.36.g.i
[5] PWS 2015 Section 301.1.09(c)

outfalls. Subbasin N5 is the northernmost portion of SW Stafford Road within the Frog Pond East and South Area that is also a tributary to Newland Creek.

Table 1: Basin and Subbasin Areas

Basin	Area (ac)
Newland Creek	**67.7**
N1	15.2
N2	15.4
N3	16.5
N4	19.6
N5	1.0
Meridian Creek	**75.4**
M1-A	4.7
M1-B	30.5
M2	5.1
M3	35.1
Kruse Creek	**69.5**
K1	60.9
K2	8.6

Meridian Creek Basin

The Meridian Creek Basin is the largest of the three drainage basins at 75 acres. It includes the southwest portion of Frog Pond East and the western portion of Frog Pond South. The basin was delineated into three separate subbasins.

Subbasin M1 is 35.2 acres in size and includes areas in Frog Pond East. It was further divided based on land use: Subbasin M1-A consists of SW Stafford Road and the westernmost portion of SW Advance Road, and Subbasin M1-B is the land north and east of the public streets. The public roadway improvements in subbasin M1-A and the private development tract in subbasin M-1B should share a combined outfall on the south side of Stafford Road.

Subbasin M2 is the area south of SW Advance Road that will require its own outfall to keep its storm system separated from the Meridian Creek Middle School property, which has already been developed and has an existing outfall to Meridian Creek.

Subbasin M3 is a 35-acre portion of Frog Pond South located on the west side of SW 60th Avenue, adjacent to and south of the middle school property. It is intended that stormwater facilities constructed for this basin will be separate from the middle school's drainage system.

Kruse Creek Basin

Kruse Creek Basin is approximately 70 acres in size, comprising the southeastern portion of the Frog Pond East and South Area. It was subdivided into two subbasins, K1 and K2.

Subbasin K1 is a 61-acre area that extends north from the creek and includes lands abutting SW 60th Avenue, the City-owned parcel along SW Advance Road designated for park use, and the southern portion of Frog Pond East. The subbasin topography features an existing shallow draw that directs water south by southeast to Kruse Creek. The shallow draw does not become channelized until about 1,800 feet south of Advance Road where the outfall is located. The City reports localized flooding at properties along SW 60th Avenue and south of SW Advance Road due to existing topography and lack of a defined drainage channel. This flooding issue will need to be addressed as part of the stormwater system needed for development within this subbasin. The basin outfall is proposed to be located at the head of the channel so that the northernmost portion of the channel is not dewatered and the riparian habitat is more fully protected.

Subbasin K2 is the remainder of the Kruse Creek Basin that is considered too far south of the K1 outfall and will therefore require a separate outfall.

Proposed Stormwater Conveyance System

Conveyance System Description

The proposed stormwater conveyance system designates a primary stormwater trunk "main" for each subbasin extending from the designated outfall into the basin, and local stormwater conveyance facilities connecting runoff-generating areas to the stormwater main.

The establishment of subbasin outfalls with stormwater mains to guide development activities has the following advantages:

- Limiting the total number of outfalls reduces impacts to the stream corridor;
- Stormwater mains provide a publicly-owned conveyance connection point for developments which would otherwise not be allowed to concentrate flow to neighboring properties[6]. This is most advantageous for subbasins that are unlikely to develop as a single large tract, such as subbasin K2;
- Stormwater mains can positively influence the location of privately-owned stormwater facilities based on locating the stormwater main within street rights-of-way. This can discourage the establishment of multiple small outfall locations with water quality and flow control facilities located at the rear of the developments, which is not acceptable to the City; and
- Stormwater mains can be constructed in conjunction with other infrastructure (transportation, water, sewer) at the time of development.

[6] PWS 2015 301.1.09.a.

The proposed stormwater conveyance system is shown in **Figure 3**. The proposed stormwater main locations for each subbasin conform with the preferred street plan and the subbasin's specific topographic characteristics. The mains should be installed at a depth that provide the hydraulic drop necessary for the connection of upstream stormwater treatment and/or flow control facilities. The hydraulic drop necessary will vary depending on the stormwater management facilities used in the subbasin, ranging from approximately four feet for a rain garden to seven feet for a detention pond to accommodate the underdrains. Given the significant change in elevation from the developable area to the creeks, ranging from 10 to 50 feet, there is minimal risk of backwater flooding expected with the installation of appropriately sized pipes.

The outfall locations shown are for illustrative purposes only and will be determined based on the development layout and presence of wetlands and stream and geomorphic corridor conditions at the time of design and development. Installation of outfalls will be at ordinary high water[7] or lower to prevent erosion of the banks. An acceptable point of discharge must be approved by the City[8]. The applicant is responsible for acquiring approval from any other agency having jurisdiction or permitting authority related to the activity[9].

Once the stormwater main and outfall are constructed, connection to the main would be provided by the developer at the time of development. Connecting to an established conveyance system generally requires less permitting than establishing a new outfall or other point of discharge for each development. Individual developments will be required to implement water quality treatment and flow control before connecting to the stormwater main.

Design of conveyance systems will need to comply with the Stormwater Systems Design Criteria[10] to resolve any existing capacity deficiencies and flooding such as the known flooding issue along SW 60th Avenue south of SW Advance Road. Detailed analyses will be required to determine final pipe locations, depths, and sizes at the time of development or as part of a further studies to determine the implementation strategy of regional facilities.

Conveyance System Sizing Analysis

The Design and Construction Standards require conveyance facilities to be sized for the 25-year[11] design storm and emergency overflow structures to be designed for the 100-year[12] storm. Post-development peak flow rates used for conveyance sizing were estimated using methodology described by the PWS. For each subbasin, peak flow rates for the 25-year and 100-year storm events were calculated using the Santa Barbara Urban Hydrograph (SBUH) method with a Type

[7] NMFS SLOPES for Stormwater, Transportation, and Utilities, 2014 section 1.3.1.1.36.g.iii
[8] PWS 2015 301.1.09.b.
[9] PWS 2015.301.1.09.e.
[10] PWS 2015 301.1.05.a
[11] PWS 2015 301.1.05.g
[12] PWS 2015 301.1.10.e

1A-24 hour storm event. The following area-wide assumptions were used to represent the proposed condition of the basins for purposes of estimating peak flow:

- Basin Impervious Percent = 70%
- Impervious Area Curve Number = 98
- Impervious Area Time of Concentration = 5 minutes
- Pervious Area Curve Number = 79
- Pervious Area Time of Concentration = 20 minutes

Pipe size calculations were developed using the Manning's equation assuming a roughness value of n=0.012 and with full-pipe flow. The topographic slope in the area ranges from 1.5 % to 10% with typical slopes in the 3% to 6% range. A typical pipe slope of 3% was used to determine recommended pipe capacity since it approximates the overall topography and will yield a relatively conservative estimate.

Storm main pipe size analysis results are presented in **Table 2**. The recommended pipe sizes were selected to convey the estimated 25-year peak flow storm event to reduce the risk of overland flow eroding the steep hillsides and streambanks during those storm events. The peak flow for the 25-year and 100-year storm events are provided in the table for reference.

Table 2: Preliminary Storm Main Pipe Size Recommendations

Basin	Area (ac)	25-yr Peak Flow (cfs)	100-yr Peak Flow (cfs)	Recommended Pipe Size (inches)	Pipe Capacity (cfs)
Newland Creek					
N1	15.2	11.1	13.1	18	19.7
N2	15.4	11.3	13.4	18	19.7
N3	16.5	12.1	14.3	18	19.7
N4	19.6	14.4	17.0	18	19.7
N5	1.0	0.8	0.9	12	6.7
Meridian Creek					
M1-A	4.7	3.9	4.5	12	6.7
M1-B	30.5	22.4	26.4	24	42.5
M2	5.1	3.8	4.4	12	6.7
M3	35.1	25.8	30.4	24	42.5
Kruse Creek					
K1	60.9	44.7	52.8	30	77.0
K2	8.6	6.3	7.5	12	6.7

Stormwater Water Quality Treatment and Flow Control

LID Implementation Strategies

The City's NPDES permit and PWS require the implementation of Low Impact Development (LID) facilities for providing stormwater management (i.e., water quality treatment and flow control) to the "maximum extent practicable". "Maximum extent practicable" is defined by the City's PWS as installing LID facilities with a surface area of at least 10% of the total new or redeveloped impervious area[13]. LID facilities are herein defined as decentralized water quality treatment and flow control facilities implemented where runoff is generated (e.g. green roofs) and/or collected (e.g. rain gardens), prior to entering the conveyance system.

To promote the use of decentralized vegetated facilities, this plan considers decentralized filtration facilities that require underdrain systems "due to limiting conditions for LID facilities"[14] to be an LID facility that counts toward the maximum extent practicable. Underdrain systems are generally recommended for locations with poor infiltration and other geotechnical concerns, which is expected to be the case in many areas of Frog Pond East and South due to existing soil characteristics. It is recommended these be permitted for use in the implementation of LID in these areas.

If when using LID to the maximum extent practicable, onsite infiltration and retention of up to the 10-year event is not possible due to limited infiltration conditions, then additional facilities must be provided to meet the flow control requirement.[15]

The City understands that there will be significant competition for space along street frontages where LID facilities are typically provided. The Frog Pond East and South Area is anticipated to develop with higher densities and a greater variety of residential types than past developments within the City, potentially leading to additional driveways, walkways, and utility connections that cross the planter strips where LID is typically implemented. Street frontages must also accommodate other necessary improvements such as on-street parallel parking, street trees, fire hydrants, etc. that may not be compatible with LID facilities.

Allowing the implementation of LID at less than the maximum extent practicable to meet competing requirements for space will be at the discretion of the City. To maximize the implementation of LID in Frog Pond East and South, the City requires LID facilities be provided in the following locations:

- Collector and arterial street planter strips where parallel on-street parking is not permitted, such as SW Stafford Road and SW Advance Road;
- Alleys, greenways, and other midblock opportunities (e.g. curb extensions);

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[13] PWS 2015 301.2.03.4
[14] PWS 2015 301.2.02.4.c
[15] 301.1.04.d

- Parks and open space buffers;
- Areas between buildings and roadways/other buildings within a development (e.g. common areas, courtyards, greenspaces, pocket parks); and
- Planters adjacent to buildings to treat roof runoff.

LID Limitations and Alternatives

The Frog Pond East and South Area predominantly consists of soils with hydrologic soil groups of C and C/D, meaning the soils have limited infiltration capacity. LID facilities installed in areas with limited infiltration capacity typically have decreased performance in meeting flow control standards because more water is conveyed to the downstream outfall after filtration. This means that the implementation of LID facilities to the "maximum extent practicable" may not be sufficient to meet water quality and flow control requirements. It is therefore anticipated that additional facilities will be required for flow control. These can be provided through larger LID facilities in tracts, or through additional LID alternatives such as impervious area reduction methods[16], or through regional facilities.

Impervious area reduction methods are permeable surfaces, such porous pavers or green roofs, that provide water quality and flow control at the point of runoff generation. These areas are subtracted from the total impervious area requiring water quality treatment and flow control, thereby reducing the overall LID footprint required.

Regional facilities are centralized water quality and flow control facilities, such as detention ponds, implemented at a downstream location to receive collected and conveyed stormwater. Regional facilities typically serve multiple properties to manage a larger catchment area than LID facilities and generally require less total area because they provide a larger storage volume per area of facility. Regional facilities may be used to meet water quality and flow control requirements, or flow control requirements only if water quality requirements are met upstream of the regional facility.

Preliminary evaluation of whether the implementation of LID to the maximum extent practicable can be performed by comparing the site-specific LID sizing factor to the maximum extent practicable, where:

LID Sizing Factor[17] = (Total LID Area / Total Contributing Impervious Area) x 100%

LID sizing factors may be determined using the City's Best Management Practice Sizing Tool[18] (BMP Sizing Tool). The tool determines the area required for LID best management practices based on

[16] PWS 2015 301.2.03.3.d
[17] BMPST 2017 9.2
[18] BMPST 2017

the contributing impervious area, the pre-developed soil and land cover, and the site infiltration capacity based on the soil type found within the facility footprint.

Implementing LID to the maximum extent practicable corresponds to an LID sizing factor of 10%. Therefore, an LID sizing factor greater than 10% may require require larger LID facilities or additional LID alternatives, such as impervious area reduction.

For the Frog Pond East and South Area analysis, the sizing factors provided in the BMP Sizing Tool User Guide in Appendix B were used. These sizing factors consider the post-developed land cover to be impervious, and the other parameters as summarized below:

- Pre-developed pervious – Forest, C
- Soil type under facility footprint - C1, C2, C3, D1, Lined

The sizing factors for providing water quality treatment and flow control facilities using rain garden filtration, planter filtration, or vegetated swale filtration range from 10% to 23%[19]. Because this range is equal to or greater than the 10% maximum extent practicable, it is recommended that additional LID or LID alternatives be anticipated and planned for in the majority of the Frog Pond East and South Area. In these cases, the strategy for meeting water quality and flow control requirements should follow the stormwater management hierarchy below, with the order of preference being from Category 1 as the most preferred to Category 3 as the least preferred:

Category 1. LID facilities are used to meet all water quality treatment and flow control requirements.

Category 2. LID facility areas are used in combination with impervious area reduction methods[20] and/or regional facilities to meet all water quality and flow control requirements. The implementation of LID at less than the maximum extent practicable is at the discretion of the City.

Category 3. Regional facilities[21] are used to meet all water quality treatment and flow control requirements.

All basins must provide stormwater management onsite using Category 1 or Category 2 of the stormwater management hierarchy, with the following exceptions considered at the discretion of the City:

Subbasins N1, N2: Regional facilities may be constructed in the BPA easement as allowed to reduce the amount of buildable land dedicated to stormwater management.

[19] BMPST 2017 Appendix B Table B-1
[20] PWS 2015 301.4.03
[21] PWS 2015 301.4.02.b

Subbasin K1: Regional facilities are an option for providing water quality treatment and flow control. Regional facilities may partially treat or fully treat the basin depending on site suitability and feasibility.

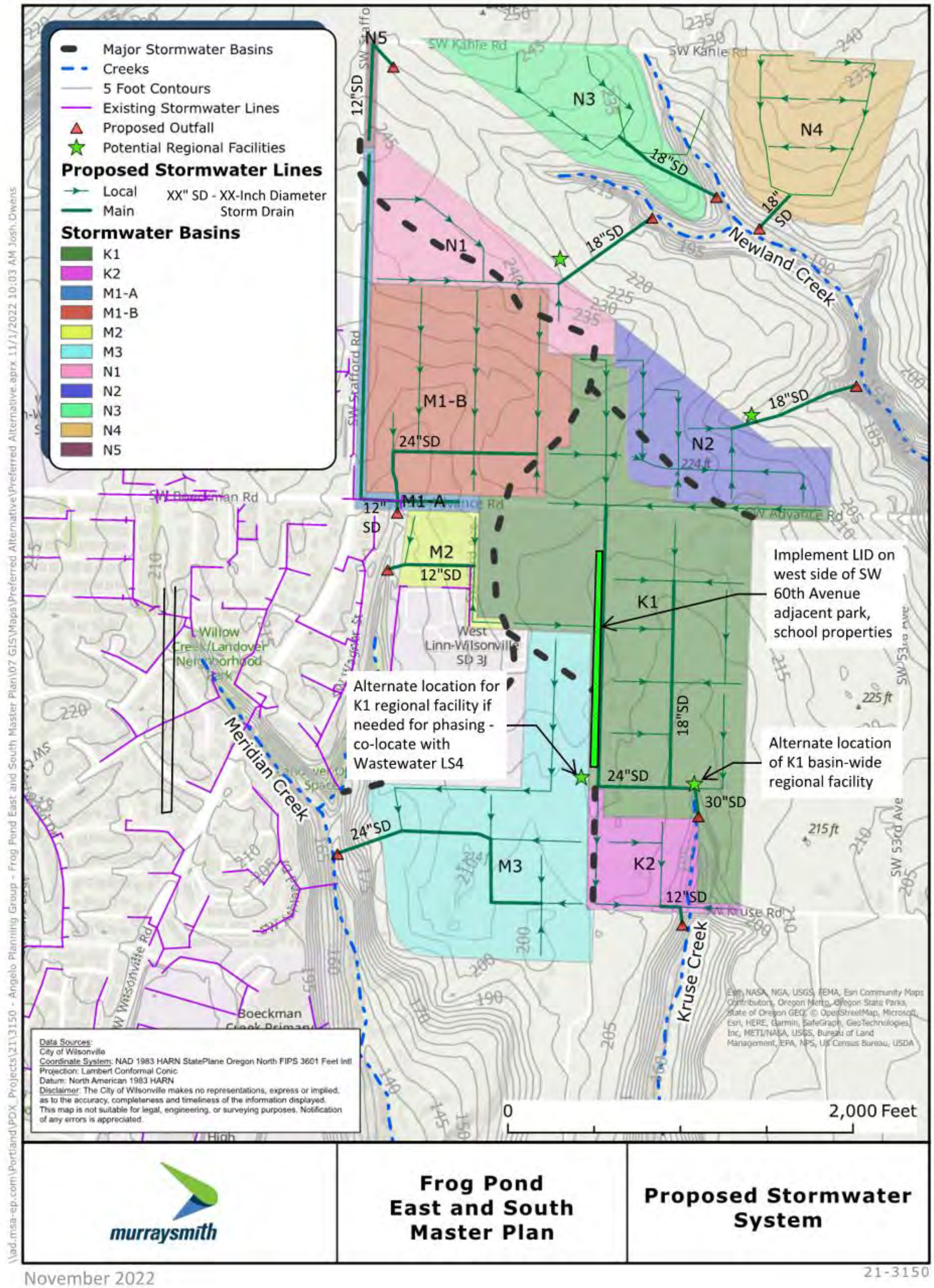
Proposed locations for the regional facilities identified above are shown in **Figure 3**.

Water quality treatment and flow control facility sizing and configuration will be determined at the time of development using the BMP Sizing Tool Method[22] or the Engineered Method[23]. Design and implementation will require further detailed site assessment and analyses to determine the final pipe and regional facility locations.

The implementation of regional facilities requires multi-stakeholder coordination. Due to this, it is often beneficial to construct regional facilities in conjunction with other infrastructure, such as roads, waterlines, and sewer infrastructure. In the case of Frog Pond South, the location proposed for a regional stormwater facility on SW 60th Avenue to serve the K1 subbasin has also been identified as a preferred site for the wastewater lift station LS4 required for Frog Pond South.

[22] PWS 2015 301.4.05.a
[23] PWS 2015.301.4.05.b

Figure 3 – Proposed Stormwater Pipe Locations and Potential Regional Facilities



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Appendix A

Project: 21-3150 Frog Pond Master Plan
Date: 8/26/2022
Author: JK
Decription: Frog Pond East and South sewer basin land use and flow calculations for 1,800 total residential units

Assumptions		
Category	Average Sewer GPD	
Person	67	gallons/person/day
Commercial	1000	gallons/acre/day
School	25	gallons/person/day
I&I	1800	gallons/acre/day

Gravity Pipe Assumptions	
Slope	0.005
Manning's n	0.013

Diameter	Max Flow in Pipe (cfs)
4	0.135
6	0.398
8	0.857
10	1.553

Basin	Total Area (ac)	MF Units	SFA Units	SFD Units	Total Residential Units	Commercial Area (ac)	School Area (ac)	School Students and Employees	Park/Street Area (ac)	Residential Area (ac)
Gravity	105.0	174	308	274	756	4.9	27.1	1305	27.9	45.0
LS1	18.1	0	63	93	155	0.0	0.0	0	0.4	17.7
LS2	20.7	0	86	111	197	0.0	0.0	0	1.0	19.7
LS3	15.4	0	72	84	156	0.0	0.0	0	1.4	14.0
LS4	76.7	48	212	276	536	0.0	0.0	0	25.1	51.6
Totals	235.9	222	740	837	1,800	4.9	27.1	1305	55.9	148.0

Basin	Average Dry Weather Flow (gpm)	Peak Average Dry Weather Flow (gpm)	Peak I&I Flow (gpm)	Total Peak Flow (gpm)	Total Peak Flow (cfs)	Force Main Size (in)	Force Main Velocity	Does Gravity Flow fit in 8in	Does Gravity Flow fit in 10 in
Gravity	96.6	193.3	131.3	324.5	0.723	N/A	N/A	Yes	Yes
LS1	17.9	35.9	22.6	58.5	0.130	4	1.49	Yes	Yes
LS2	22.7	45.4	25.8	71.2	0.159	4	1.82	Yes	Yes
LS3	18.0	36.0	19.2	55.2	0.123	4	1.41	Yes	Yes
LS4	61.8	123.6	95.9	219.5	0.489	4	5.61	Yes	Yes

Trunk	Total Peak Flow (cfs)	Does Gravity Flow fit in 8in	Does Gravity Flow fit in 10in
SW Stafford Road Trunk (cfs)	0.651	Yes	Yes
Boeckman Trunk Extension (cfs)	0.974	Pipe Overcapacity	Yes

Project: 21-3150 Frog Pond Master Plan
Date: 8/26/2022
Author: JK
Decription: Frog Pond East and South sewer basin land use and flow calculations for 2,384 total residential units

Flow Assumptions		
Category	Average Sewer GPD	
Person	67	gallons/person/day
Commercial	1000	gallons/acre/day
School	25	gallons/person/day
I&I	1800	gallons/acre/day

Pipe Assumptions	
Slope	0.005
Manning's n	0.013

Diameter	Max Flow in Pipe (cfs)
4	0.135
6	0.398
8	0.857
10	1.553

Basin	Residential Units (32% increase)	Commercial Area	School Students and Employees
Gravity	1,001	4.9	1305
LS1	206	0.0	0
LS2	261	0.0	0
LS3	207	0.0	0
LS4	709	0.0	0
Total	2,384	4.9	1305

Basin	Average Dry Weather Flow (gpm)	Peak Average Dry Weather Flow (gpm)	Peak I&I Flow (gpm)	Total Peak Flow (gpm)	Total Peak Flow (cfs)	Force Main Size (in)	Force Main Velocity	Does Gravity Flow fit in 8in	Does Gravity Flow fit in 10in
Gravity	124.9	249.9	131.3	381.1	0.849	N/A	N/A	Yes	Yes
LS1	23.7	47.5	22.6	70.1	0.156	4	1.79	Yes	Yes
LS2	30.1	60.1	25.8	86.0	0.192	4	2.19	Yes	Yes
LS3	23.8	47.7	19.2	66.9	0.149	4	1.71	Yes	Yes
LS4	81.9	163.7	95.9	259.7	0.579	4	6.63	Yes	Yes

Trunk	Total Peak Flow (cfs)	Does Gravity Flow fit in 8in	Does Gravity Flow fit in 10in
SW Stafford Road Trunk (cfs)	0.772	Yes	Yes
Boeckman Trunk Extension (cfs)	1.152	Pipe Overcapacity	Yes

APPENDIX G: DEVELOPMENT CODE UPDATES

Development code updates to be included at a later date.

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APPENDIX H: INFRASTRUCTURE FUNDING PLAN

Infrastructure funding plan to be included at a later date.

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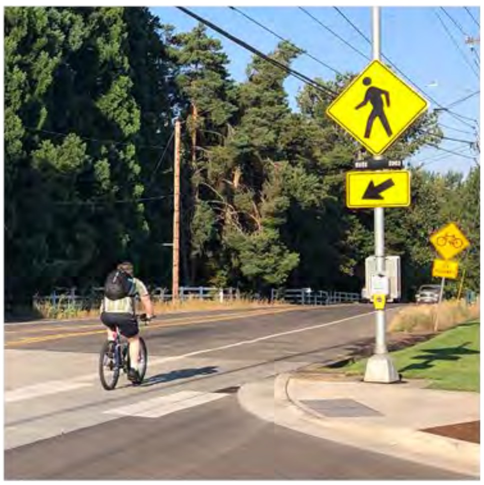
APPENDIX I: TRANSPORTATION ANALYSIS: EXISTING AND FUTURE CONDITIONS

DRAFT

FROG POND EAST & SOUTH MASTER PLAN

TRANSPORTATION ANALYSIS: EXISTING AND FUTURE CONDITIONS

NOVEMBER 2022



EAST & SOUTH
MASTER PLAN

DRAFT

PREPARED FOR THE CITY OF WILSONVILLE

WILSONVILLE OREGON

PREPARED BY DKS ASSOCIATES

DKS

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This report documents the traffic analysis performed in association with the Frog Pond East & South Master Plan in Wilsonville, Oregon. This report provides a more refined evaluation of the East and South land use as compared to the Frog Pond Area Plan,[1] which was adopted in 2015, and builds on the work of the Frog Pond West Master Plan,[2] which was adopted in 2017.

An executive summary of this transportation analysis is provided below. The following sections of this memorandum document the existing traffic conditions (2022), future baseline and build traffic conditions (2040), and a list of resulting transportation projects. The year 2040 was selected for future analysis to be consistent with the Metro Regional Transportation Plan (RTP) and Wilsonville Travel Demand Model's horizon year.

EXECUTIVE SUMMARY

To determine existing and future transportation conditions for the Frog Pond East and South neighborhoods, a comprehensive traffic analysis was performed. The analysis focused on the major intersections both within the project vicinity and within Wilsonville at large, including the two I-5 interchange areas (i.e., Wilsonville Road and Elligsen Road). The study area includes 15 total intersections, including 4 key gateway intersections to the neighborhoods.

Analysis Scenarios

The existing conditions analysis was based on recent 2021 and 2022 traffic counts and existing intersection geometries, while the future analysis was based on traffic forecasts for the 2040 horizon year and improved intersection geometries associated with all High Priority Projects included in Wilsonville's Transportation System Plan (TSP). The future analysis consisted of two scenarios: 2040 Baseline and 2040 Build. The future land use assumptions are consistent with the Metro model, which was used to update the travel demand model for the Build scenario. The 2040 Baseline scenario assumes no additional growth beyond what is currently assumed in the 2040 model and the 2040 Build scenario represents the likely build-out of the study area, which includes up to 1,800 housing units and up to 44,000 square feet of commercial space within the East and South neighborhoods.

The City has also identified a hypothetical higher-density alternative which calls for approximately 2,400 total units in the combined East and South neighborhoods. This higher dwelling unit amount reflects 20 units per net acre, which is a density prescribed in one of the compliance options in State administrative rules for new urban areas to comply with House Bill 2001 middle housing law. A separate report has been provided on the findings of the analysis of the higher-density alternative.

---

[1] Frog Pond West Master Plan, City of Wilsonville, July 17, 2017.

[2] Frog Pond Area Plan, City of Wilsonville, November 16, 2015.

Analysis Findings & Recommended Improvement Projects

Intersection traffic operations were analyzed for the weekday PM peak hour under the existing and both future scenarios to evaluate if the study intersections meet desired performance levels as required by the City of Wilsonville, Clackamas County, and Oregon Department of Transportation (ODOT). All intersections except the Stafford Road/65th Avenue intersection currently meet operating standards and targets. Additional coordination between Clackamas County and City of Wilsonville is recommended regarding the necessary improvements to that intersection to accommodate future Frog Pond development.

In the future 2040 scenarios, all but three of the study intersections are expected to continue to meet standards and targets in the future assuming the completion of the High Priority Projects identified in the TSP. Those three intersections are located along Stafford Road and are the gateway intersections to the Frog Pond East neighborhood and were analyzed as stop controlled intersections. The following transportation improvements are recommended for these intersections.

- **Stafford Road/Kahle Road:** Install a single-lane roundabout
- **Stafford Road/Frog Pond Lane:** Install a raised median to prohibit minor street through and left turns and install an enhanced pedestrian crossing with a center refuge median.
- **Stafford Road/Brisband Street:** Install a single-lane roundabout

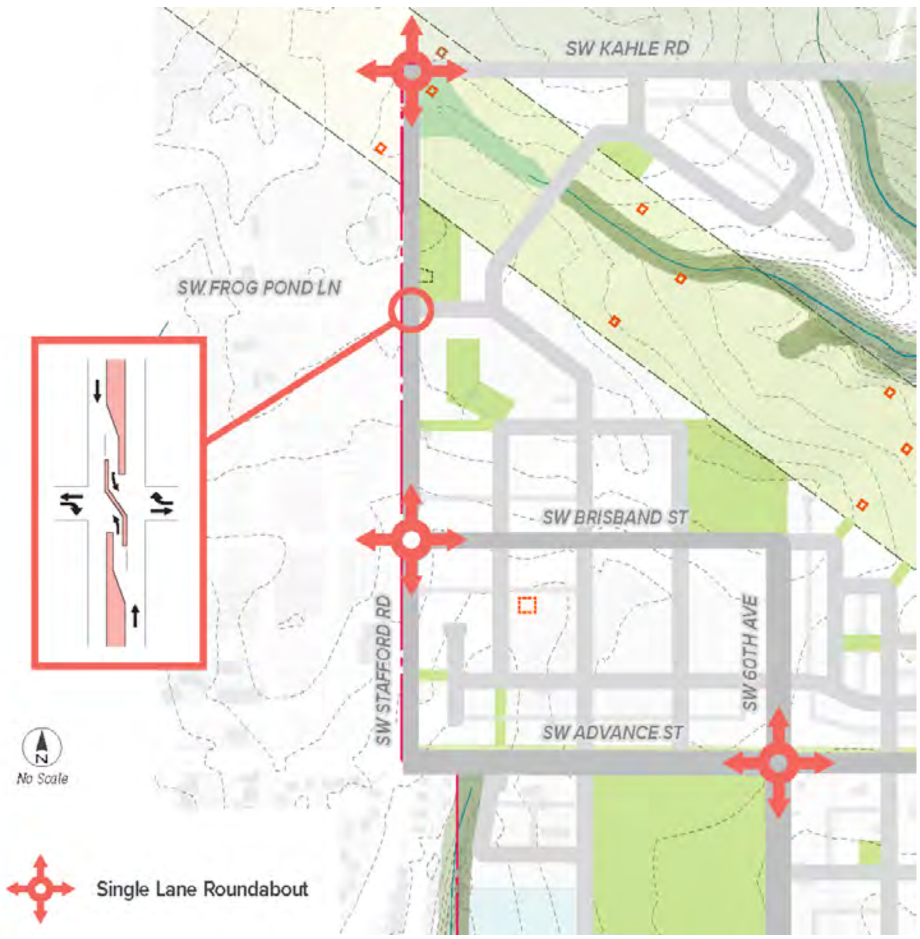

FIGURE 1: RECOMMENDED INTERSECTION IMPROVEMENTS

Additional transportation projects were identified for the East and South neighborhood to enhance safety, which are listed below and shown in Figure 2.

- **Advance Road / 60th Avenue:** Install a single-lane roundabout. The installation of a roundabout at this location will create a gateway between the high-speed rural traffic and the new desired slower urban speeds. The roundabout will also provide for slower speeds and improved access to the Frog Pond neighborhoods.

- **Frog Pond Lane / Stafford Road**: Install a crosswalk with median at this intersection. A Rectangular Rapid Flashing Beacon (RRFB) should be considered at this location.
- **Advance Road at 63rd Avenue:** Install a marked school crosswalk. An RRFB should be considered at this location.
- **Advance Road Between 60th Avenue and 63rd Avenue:** Install a mid-block crossing to facilitate safe crossings between the future park and East neighborhood. An RRFB should be considered at this location.

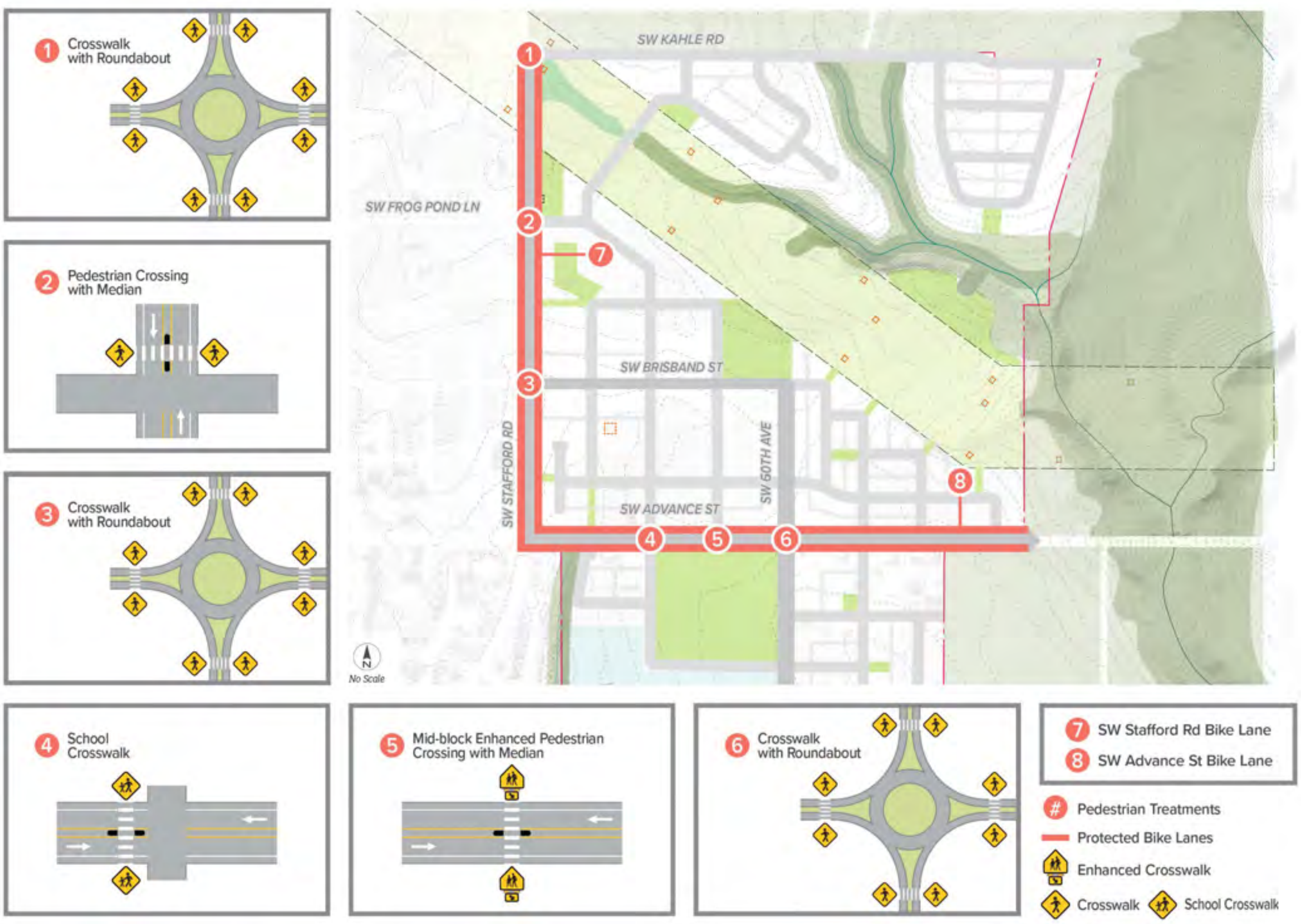

FIGURE 2: RECOMMENDED PEDESTRIAN, BICYCLE, AND TRAIL IMPROVEMENTS

EXISTING TRAFFIC CONDITIONS (2022)

Existing traffic conditions were evaluated for the study area and include traffic volumes; intersection operations; and bike, pedestrian, and trail conditions.

EXISTING TRAFFIC VOLUMES

Traffic counts were collected for the PM peak period (4:00 to 6:00 p.m.) at the following study intersections.[3] The PM peak hour traffic volumes (i.e., the highest hourly volumes during the peak period) are shown in Figure **3** and the traffic counts are provided in the appendix.

- Elligsen Road/I-5 Southbound Ramp
- Elligsen Road/I-5 Northbound Ramp
- Elligsen Road/Parkway Avenue
- Elligsen Road/Parkway Center Drive
- Stafford Road/65th Avenue
- Boeckman Road/Parkway Avenue
- Boeckman Road/Canyon Creek Road
- Boeckman Road-Advance Road/Stafford Road-Wilsonville Road
- Advance Road/60th Avenue
- Stafford Road/Brisband Street
- Stafford Road/Frog Pond Lane
- Stafford Road/Kahle Road
- Wilsonville Road/I-5 Southbound Ramp
- Wilsonville Road/I-5 Northbound Ramp
- Wilsonville Road/Town Center Loop West

INTERSECTION PERFORMANCE MEASURES

Agency mobility standards often require intersections to meet level of service (LOS) or volume-to-capacity (v/c) intersection operation thresholds. Additional operational details are provided in the appendix.

- The intersection LOS is similar to a “report card” rating based upon average vehicle delay. Level of service A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. Level of service D and E are progressively worse operating conditions. Level of service F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity. This condition is typically evident in long queues and delays.

- The volume-to-capacity (v/c) ratio represents the level of saturation of the intersection or individual movement. It is determined by dividing the peak hour traffic volume by the maximum hourly capacity of an intersection or turn movement. When the V/C ratio

[3] The counts were collected on September 22, 2021; September 30, 2021; March 30, 2022; May 18, 2022; and June 7, 2022.

approaches 0.95, operations become unstable and small disruptions can cause the traffic flow to break down, resulting in the formation of excessive queues.

The City of Wilsonville requires all intersections to meet its minimum acceptable level of service (LOS) standard of LOS D for the PM peak period.[4]

Clackamas County requires that, for intersections outside of city limits, signalized and roundabout intersections must meet the volume-to-capacity ratio (v/c) of 0.90 or less and unsignalized intersections must meet the minimum LOS standard of LOS E during the PM peak period.[5]

ODOT specifies a typical mobility target for interchange ramps of a volume-to-capacity ratio (v/c) of 0.85. However, when the interchange vicinity is fully developed and adequate storage is available on the interchange ramp to prevent queues from backing up on the main line, then the target can be increased to a 0.90 v/c ratio.[6] This is the case for both of the I-5 interchange areas in Wilsonville.

EXISTING INTERSECTION OPERATIONS

Intersection operations were analyzed for the PM peak hour to evaluate whether the transportation network currently operates within desired performance levels as required by the City of Wilsonville, Clackamas County, and ODOT. Intersections are the focus of the analysis because they are the controlling bottlenecks of traffic flow and the ability of a roadway system to carry traffic efficiently is nearly always diminished in their vicinity.

The existing PM peak hour intersection operations at the study intersection were determined based on the 6th Edition Highway Capacity Manual methodology.[7] Table 1 lists the estimated average delay (in seconds), level of service (LOS), and volume to capacity (v/c) ratio for each study intersection. As shown, all intersections currently meet operating standards and targets with exception of Stafford Road/65th Avenue, which is within Clackamas County's jurisdiction. Additional coordination between Clackamas County and City of Wilsonville is recommended regarding the necessary improvements at this intersection to accommodate future Frog Pond development.

[4] Policy 5, Wilsonville Transportation System Plan, Amended November 16, 2020.

[5] System Performance Policies, Chapter 5: Transportation System Plan, Clackamas County Comprehensive Plan, Amended January 1, 2022.

[6] Oregon Highway Plan, Action 1F.1, Oregon Department Of Transportation, Amended May 2015.

[7] Highway Capacity Manual, 6th Edition, Transportation Research Board, 2017.

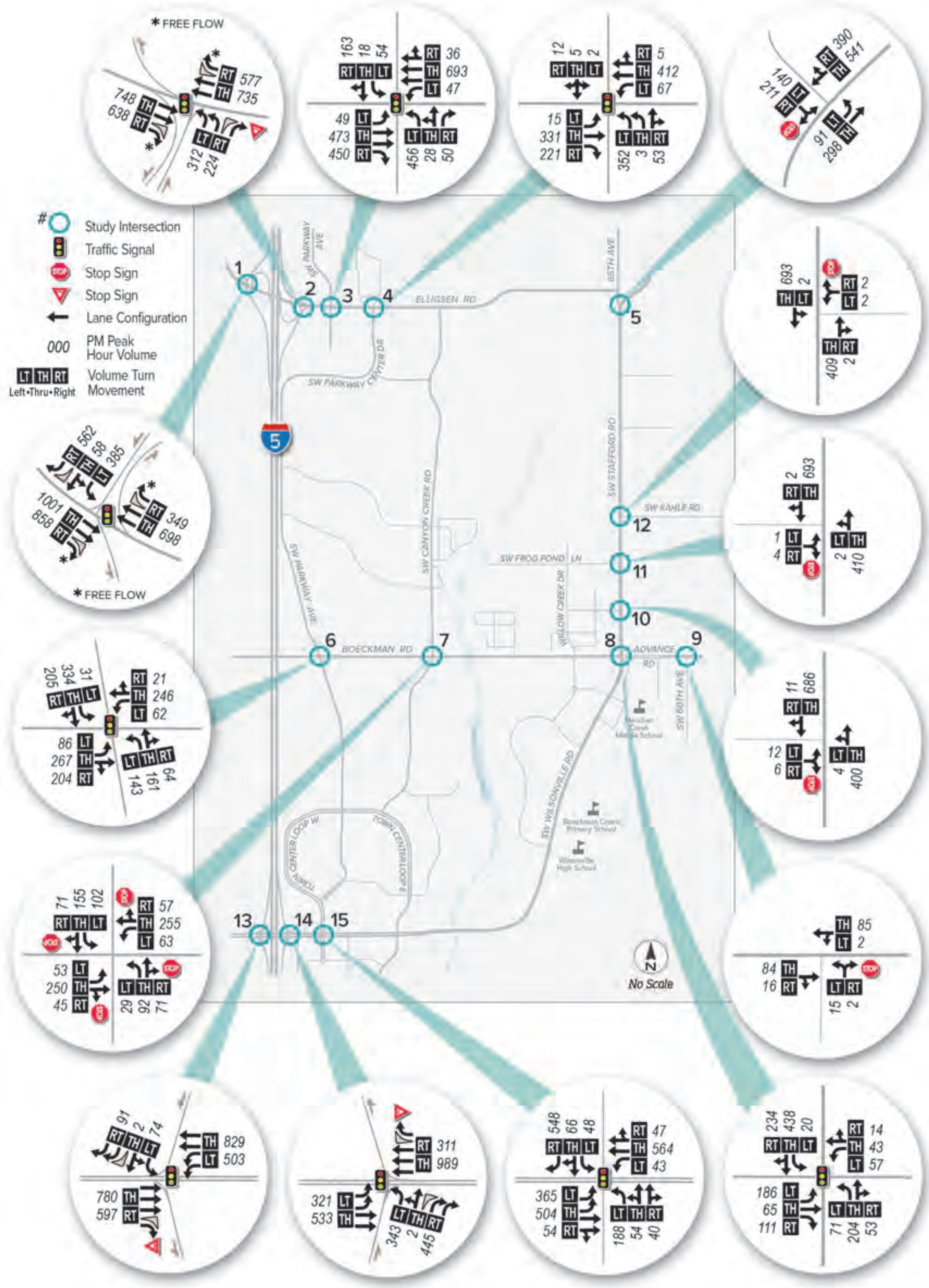

FIGURE 3: EXISTING 2022 TRAFFIC VOLUMES, LANE GEOMETRIES, AND TRAFFIC CONTROL

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TABLE 1: EXISTING (2022) INTERSECTION OPERATIONS

INTERSECTION	OPERATING STANDARD	PM PEAK HOUR		
		V/C	DELAY	LOS
SIGNALIZED				
ELLIGSEN RD / I-5 SB RAMPS	v/c ≤ 0.90	0.74	19.5	B
ELLIGSEN RD / I-5 NB RAMPS	v/c ≤ 0.90	0.34	8.4	A
ELLIGSEN RD / PARKWAY AVE	LOS D	0.32	15.9	B
ELLIGSEN RD / PARKWAY CENTER DR	LOS D	0.40	14.9	B
BOECKMAN RD / PARKWAY AVE	LOS D	0.84	25.6	C
STAFFORD RD-WILSONVILLE RD / BOECKMAN RD-ADVANCE RD	LOS D	0.65	17.0	B
WILSONVILLE RD / I-5 SB RAMPS	v/c ≤ 0.90	0.38	19.3	B
WILSONVILLE RD / I-5 NB RAMPS	v/c ≤ 0.90	0.44	16.2	B
WILSONVILLE RD / TOWN CENTER LP WEST	LOS D	0.38	28.1	C
TWO-WAY STOP-CONTROLLED				
STAFFORD RD / 65TH AVE	LOS E	>1.20	**>120**	**B/F**
ADVANCE RD / 60TH AVE	LOS D	0.03	9.8	A/A
STAFFORD RD / BRISBAND ST	LOS D	0.08	20.9	A/C
STAFFORD RD / FROG POND LN	LOS D	0.02	15.7	A/C
STAFFORD RD / KAHLE RD	LOS D	0.01	16.9	A/C
ALL-WAY STOP-CONTROLLED				
BOECKMAN RD / CANYON CREEK RD	LOS D	0.71	20.3	C

SIGNALIZED INTERSECTION:
Delay = Average Intersection Delay (secs)
v/c = Total Volume-to-Capacity Ratio
LOS = Total Level of Service

TWO-WAY STOP-CONTROLLED INTERSECTION:
Delay = Critical Movement Delay (secs)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Critical Levels of Service (Major/Minor Road)

ALL-WAY STOP CONTROLLED INTERSECTION:
Delay = Average Intersection Delay (secs)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Total Level of Service

BICYCLE, PEDESTRIAN, AND TRAIL NEEDS

Bicycle, pedestrian, transit, and trail conditions and needs were considered for the study area, with particular emphasis on connectivity to the rest of Wilsonville's neighborhoods, trails, parks, and schools.

The Wilsonville TSP identifies various multimodal improvement projects that are intended to address the deficiencies. Projects within the vicinity of the Frog Pond Area include urban upgrades to Boeckman Road and Stafford Road, which include bike lanes, sidewalks, and transit stop improvements/additions. The TSP also includes a project for new trails through the Frog Pond East and South neighborhoods.

ADVANCE ROAD NEEDS

Additional school safety improvements should be considered on Advance Road near Meridian Creek Middle School. An increase in pedestrian and bicycle traffic to and from the school can be expected with the buildout of the East and South neighborhoods, necessitating pedestrian crossing enhancements on Advance Road.

The urban upgrade improvements on Boeckman Road are currently in the design phase and a separated multi-use path, cycle track, or protected bike lanes are being considered along Boeckman Road. It is desired by the City to extend the identified multimodal improvements on Boeckman Road to the west of Stafford Road along Advance Road fronting the Frog Pond development.

STAFFORD ROAD NEEDS

Pedestrian crossing enhancements on Stafford Road will be needed as the East neighborhood is built out. A significant increase in pedestrian and bicycle trips are expected across Stafford Road between the existing Frog Pond West neighborhood and the planned primary school (in Frog Pond West) to housing and commercial uses in the East neighborhood. Key locations for crossing enhancements would be at Frog Pond Lane and Brisband Street. A signalized crossing already exists at the Stafford Road-Wilsonville Road/Boeckman Road-Advance Road intersection.

Separated pedestrian and bicycle facilities are also desired along Stafford Road since it is a higher speed, higher volume facility. A separated multi-use path, cycle track, or protected bike lanes should be considered along Stafford Road fronting the Frog Pond development on either the west or east side. Given that the majority of the west side of Stafford Road has already gone through development review, the east side of Stafford Road would be the preferred location for a separated pedestrian and bicycle facility.

Recommendations for bicycle and pedestrian projects are listed on page 18 of this memo.

FUTURE BASELINE CONDITIONS (2040)

Future baseline (2040) traffic conditions were evaluated for the study area and include the forecasted baseline traffic volumes and intersection operations. For analysis purposes, the East and South neighborhoods are assumed to experience full build-out by the year 2040.

FUTURE BASELINE TRAFFIC VOLUMES

Future traffic volumes were forecasted for the study intersections using the recently updated travel forecast models developed specifically for Wilsonville. The models apply trip generation and trip distribution data directly taken from the Metro regional travel demand forecast models but add additional detail to better represent local travel conditions and routing within Wilsonville.

Figure 4 shows the PM peak hour traffic volumes for the study intersections based on the Metro model assumptions. As the forecasts are consistent with the current Metro land use assumptions, this scenario is referred to as the 2040 Baseline scenario. This scenario already accounts for some existing homes in the West neighborhood and contains land use assumptions (housing and some employment) in the East and South neighborhoods in 2040.

It should be noted that the Metro model was used for this study because it represents the latest regionally approved land use for Wilsonville and the Region. This model was completed by Metro, in collaboration with the City, after the City's TSP was approved and includes additional land use and transportation network assumptions adopted by Metro after the TSP was adopted.

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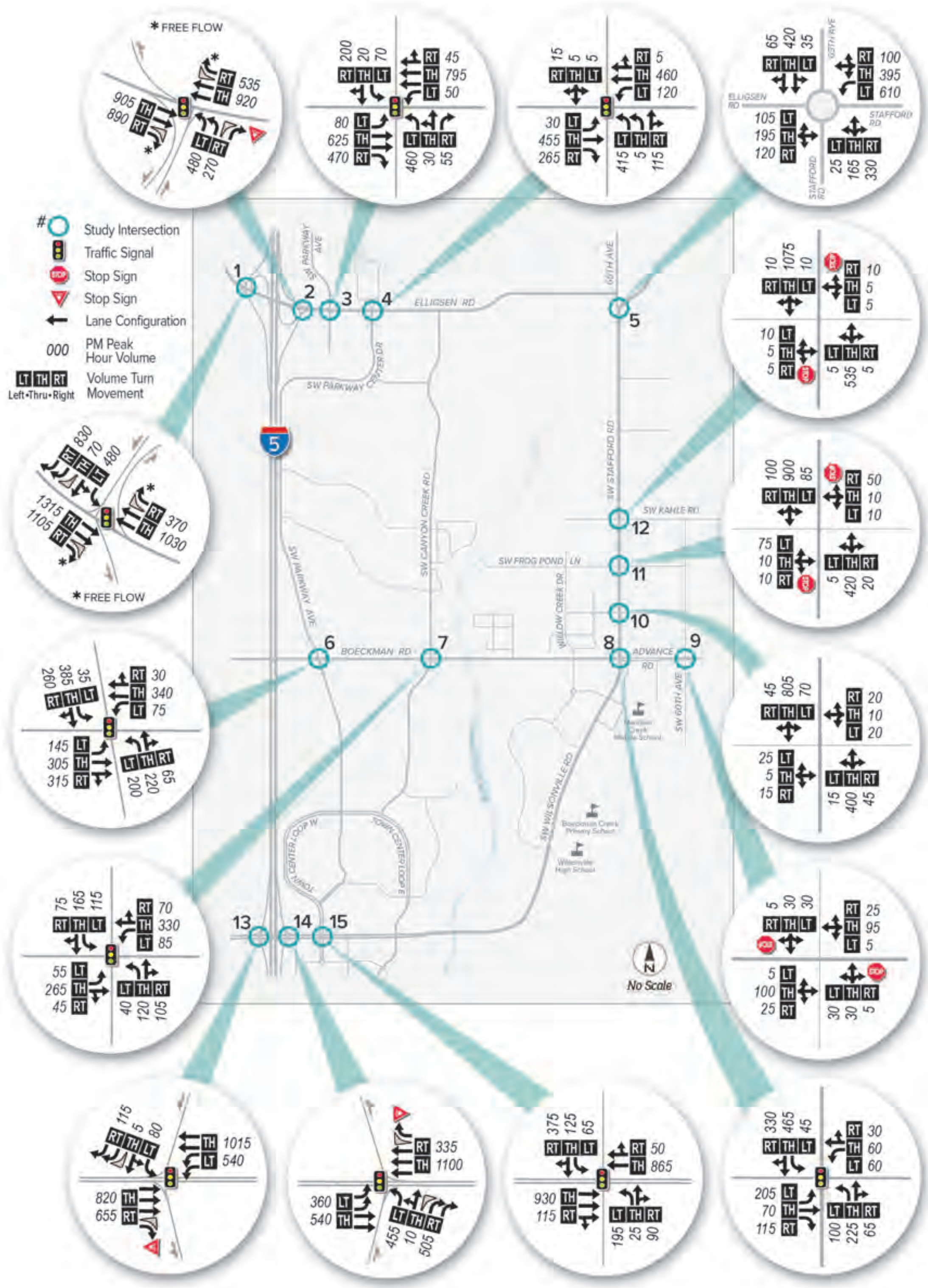

FIGURE 4: BASELINE (2040) TRAFFIC VOLUMES, LANE GEOMETRIES, AND TRAFFIC CONTROL

FUTURE HIGH-PRIORITY TSP PROJECTS

The future baseline scenario assumed improved intersection geometries associated with all High Priority Projects included in Wilsonville's TSP. The High Priority Projects applicable to the Frog Pond study area include the following:

- Addition of a second southbound right turn lane on the I-5 Southbound Off-Ramp at Elligsen Road (SI-07).
- Addition of dual eastbound and westbound through lanes at Boeckman Road/Parkway Avenue intersection (RW-01).
- Installation of traffic signal at Boeckman Road/Canyon Creek Road (UU-01). The City of Wilsonville is currently in the conceptual design phase for this intersection and a roundabout is also under consideration.
- Intersection modifications at Wilsonville Road/Town Center Loop West which including eliminating westbound and eastbound left turns, addition of an eastbound through "trap" lane, and reduction of the northbound and southbound approaches to a left turn lane and shared through-right turn lane (SI-09).
- Installation of a roundabout and combination of the existing intersections of Elligsen Road/65th Avenue and Stafford Road/65th Avenue (SI-03). This intersection is located within Clackamas County and is identified in their TSP but is also referenced in the Wilsonville TSP. For this analysis, the roundabout was evaluated as a partial dual-lane roundabout.

FUTURE BASELINE INTERSECTION OPERATIONS

Intersection traffic operations under the future 2040 Baseline scenario were analyzed for the PM peak hour to evaluate whether the transportation network is expected to remain within desired performance levels as required by the City of Wilsonville, Clackamas County, and ODOT.

Table 2 lists the estimated average delay (in seconds), level of service (LOS), and volume to capacity (v/c) ratio that each study intersection and future access is expected to experience.

As shown, all intersections are expected to meet operating standards and targets under Baseline conditions with exception of the Stafford Road/Kahle Road, Stafford Road/Frog Pond Lane, and Stafford Road/Brisband Street intersections, which were analyzed as key gateways to the Frog Pond East neighborhood.

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TABLE 2: FUTURE BASELINE (2040) INTERSECTION OPERATIONS

INTERSECTION	OPERATING STANDARD	PM PEAK HOUR		
		V/C	DELAY	LOS
SIGNALIZED				
ELLIGSEN RD / I-5 SB RAMPS	v/c ≤ 0.90	0.73	18.1	B
ELLIGSEN RD / I-5 NB RAMPS	v/c ≤ 0.90	0.45	9.3	A
ELLIGSEN RD / PARKWAY AVE	LOS D	0.52	24.4	C
ELLIGSEN RD / PARKWAY CENTER DR	LOS D	0.55	16.9	B
BOECKMAN RD / PARKWAY AVE	LOS D	0.82	23.5	C
BOECKMAN RD / CANYON CREEK RD	LOS D	0.57	15.2	B
STAFFORD RD-WILSONVILLE RD / BOECKMAN RD-ADVANCE RD	LOS D	0.79	22.5	C
WILSONVILLE RD / I-5 SB RAMPS	v/c ≤ 0.90	0.40	14.0	B
WILSONVILLE RD / I-5 NB RAMPS	v/c ≤ 0.90	0.52	22.2	C
WILSONVILLE RD / TOWN CENTER LP WEST	LOS D	0.82	44.3	D
TWO-WAY STOP-CONTROLLED				
ADVANCE RD / 60TH AVE	LOS D	0.11	11.4	A/B
STAFFORD RD / BRISBAND ST	LOS D	0.49	**72.6**	**A/F**
STAFFORD RD / FROG POND LN	LOS D	>1.20	**>120**	**B/F**
STAFFORD RD / KAHLE RD	LOS D	0.29	**70.3**	**B/F**
ROUNDABOUT				
STAFFORD RD / 65TH AVE / ELLIGSEN RD	v/c ≤ 0.90	0.84	17.9	B

SIGNALIZED INTERSECTION:
Delay = Average Intersection Delay (secs)
v/c = Total Volume-to-Capacity Ratio
LOS = Total Level of Service

TWO-WAY STOP-CONTROLLED INTERSECTION:
Delay = Critical Movement Delay (secs)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Critical Levels of Service (Major/Minor Road)

ROUNDABOUT INTERSECTION:
Delay = Average Intersection Delay (secs)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Total Level of Service

ANTICIPATED BUILD CONDITIONS (2040)

Anticipated build (2040) traffic conditions were evaluated for the study area and include the land use assumptions, anticipated build traffic volumes and intersection operations, and identified transportation improvements.

LAND USE ASSUMPTIONS AND ADJUSTMENTS

As mentioned previously, the 2040 Wilsonville Travel Demand model currently contains housing and job land use assumptions for the Frog Pond East and South neighborhoods. Now that the East and South neighborhood layouts have been further refined, the assumed quantity of housing units and commercial space have been estimated. To best analyze the impact of the estimated full buildout of the East and South neighborhoods, DKS adjusted the Wilsonville Travel Demand Model assumptions for the transportation analysis zones (TAZs) that comprise the Frog Pond East and South neighborhoods to account for a higher number of housing units than what is currently assumed.

Table 3 lists the land use adjustments that were applied to the 2040 Travel Demand Model to emulate the anticipated land use generation for Frog Pond (Build scenario). As shown below, the number of household units for both neighborhoods was increased by 136% and 0 jobs were increased.

TABLE 3: TRAVEL DEMAND MODEL ADJUSTMENTS

	HOUSEHOLDS	JOBS
EAST NEIGHBORHOOD	Increase by 103%	No Change 0%
SOUTH NEIGHBORHOOD	Increase by 225%	No Change 0%
TOTAL	**Increase by 130%**	**No Change 0%**

ANTICIPATED BUILD TRAFFIC VOLUMES

The future 2040 Build traffic volumes were forecasted for the study area using the Wilsonville travel forecast model with the adjustments as previously discussed. Intersection operations were then evaluated to determine how sufficiently the City's future transportation system would support the long-term estimated build-out of the Frog Pond East and South neighborhoods, therefore determining what improvements might be needed. The PM peak hour traffic volumes, lane geometries, and intersection operating conditions are shown in Figure 5.

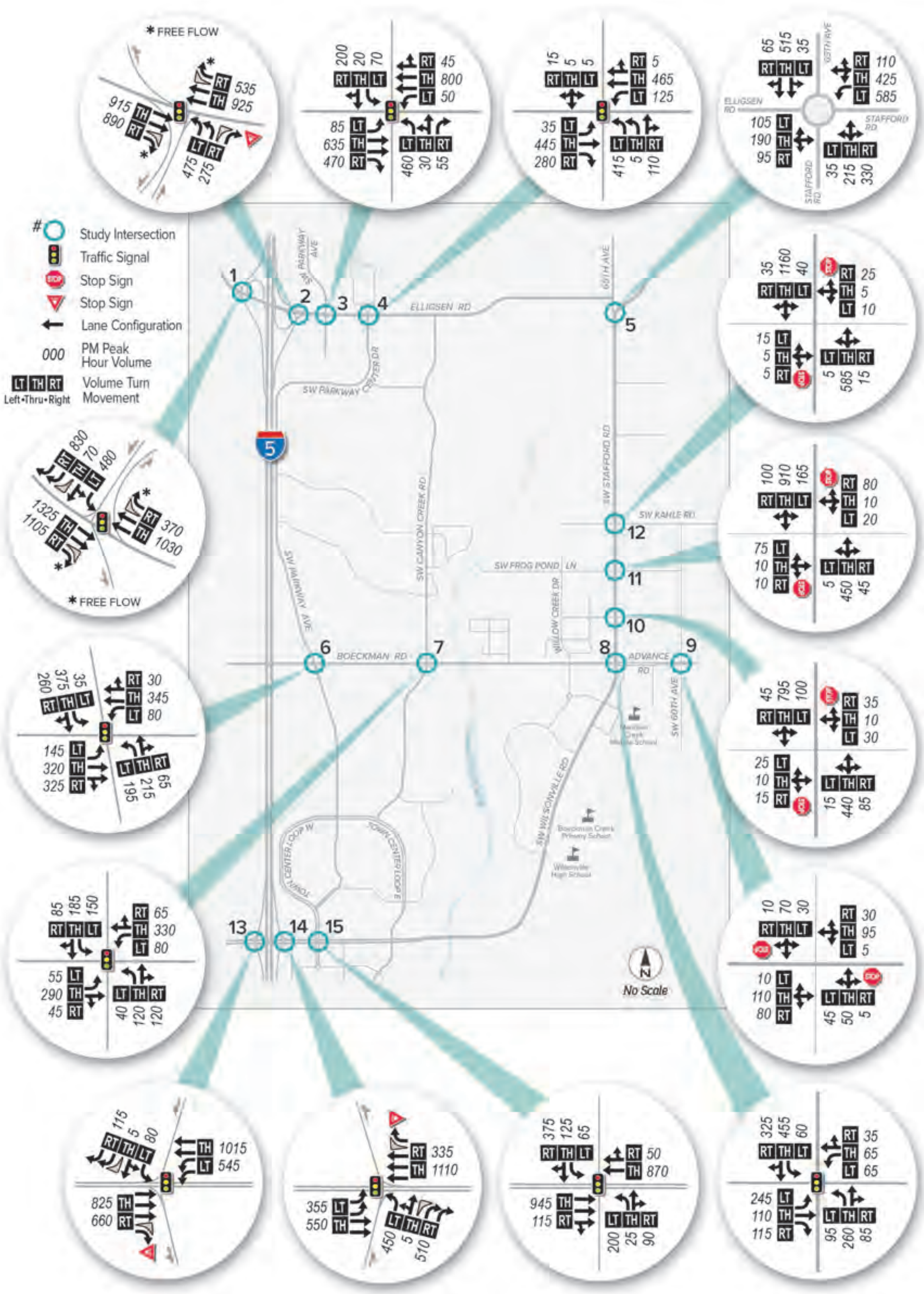

FIGURE 5: BUILD (2040) TRAFFIC VOLUMES, LANE GEOMETRIES, AND TRAFFIC CONTROL

ANTICIPATED BUILD INTERSECTION OPERATIONS

Intersection traffic operations under the future 2040 Build scenario were analyzed for the PM peak hour with the same intersection geometries that were assumed in the Baseline scenario. Table 4 the estimated average delay (in seconds), level of service (LOS), and volume to capacity (v/c) ratio for each study intersection.

TABLE 4: ANTICIPATED BUILD (2040) INTERSECTION OPERATIONS

INTERSECTION	OPERATING STANDARD	PM PEAK HOUR		
		V/C	DELAY	LOS
SIGNALIZED				
ELLIGSEN RD / I-5 SB RAMPS	v/c ≤ 0.90	0.73	18.2	B
ELLIGSEN RD / I-5 NB RAMPS	v/c ≤ 0.90	0.45	9.2	A
ELLIGSEN RD / PARKWAY AVE	LOS D	0.53	24.5	C
ELLIGSEN RD / PARKWAY CENTER DR	LOS D	0.54	16.8	B
BOECKMAN RD / PARKWAY AVE	LOS D	0.81	23.3	C
BOECKMAN RD / CANYON CREEK RD	LOS D	0.60	15.9	B
BOECKMAN RD-ADVANCE RD / STAFFORD RD-WILSONVILLE RD	LOS D	0.81	22.6	C
WILSONVILLE RD / I-5 SB RAMPS	v/c ≤ 0.90	0.40	14.0	B
WILSONVILLE RD / I-5 NB RAMPS	v/c ≤ 0.90	0.52	22.1	C
WILSONVILLE RD / TOWN CENTER LP WEST	LOS D	0.82	44.1	D
TWO-WAY STOP-CONTROLLED				
ADVANCE RD / 60^{TH} AVE	LOS D	0.20	13.2	A/B
STAFFORD RD / BRISBAND ST	LOS D	0.85	**>120**	**A/F**
STAFFORD RD / FROG POND LN	LOS D	>1.20	**>120**	**B/F**
STAFFORD RD / KAHLE RD	LOS D	0.65	**>120**	**B/F**
ROUNDABOUT				
STAFFORD RD / 65^{TH} AVE / ELLIGSEN RD	v/c ≤ 0.90	0.85	21.0	C

SIGNALIZED INTERSECTION:
Delay = Average Intersection Delay (secs)
v/c = Total Volume-to-Capacity Ratio
LOS = Total Level of Service

TWO-WAY STOP-CONTROLLED INTERSECTION:
Delay = Critical Movement Delay (secs)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Critical Levels of Service (Major/Minor Road)

ROUNDABOUT INTERSECTION:
Delay = Average Intersection Delay (secs)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Total Level of Service

As shown, the unsignalized intersections/accesses along Stafford Road (Kahle Road, Frog Pond Lane, and Brisband Street) are expected to exceed the City's LOS D performance standard. The primary reason is the high through volumes that influence delay experienced by side street vehicles attempting to turn left.

RECOMMENDED TRANSPORTATION IMPROVEMENTS

The three intersections along Stafford Road are located approximately within 800–900 feet from one another. Therefore, the interaction of all improvements at these intersections must be carefully considered due to their proximity. The following projects have therefore been identified to improve the three gateway intersections along Stafford Road to meet the City's level of service D performance standard.

Due to the planned location of the commercial uses off Brisband Street, it is desirable to allow all vehicle turning movements at the Brisband Street intersection to provide full access and connectivity to those land uses. It is also desirable to have a full-access gateway intersection at the far north end of the housing development to function as a gateway between the rural higher speed traffic and urban slower speed traffic and provide safe access to the Frog Pond development. There is a strong desire to preserve the historic Grange building on the northeast corner of Stafford Road/Frog Pond Lane intersection. Turn restrictions could be implemented at the Stafford Road/Frog Pond Lane intersection (restrict minor street through and left turns) to allow access to safe movements (left in, right in and right out). A full access roundabout at Frog Pond Lane would likely require the removal or relocation of the historic Grange building due to the required footprint of the improvement.

If two intersections are improved with roundabouts with a limited access between the two full-access locations, it is likely that many of the residents and drivers familiar with the area would choose to turn left or go through at those improved intersections during the peak periods, particularly with good Collector/Local Street connectivity. Local street connections in both the East and West neighborhoods are planned that would allow sufficient connectivity for vehicles to access the proposed roundabouts Kahle Road or Brisband Street to cross Stafford Road or turn left onto Stafford Road. A discussion on the advantages and disadvantages of roundabouts are provided in a subsequent section.

The recommended improvements are highlighted below.

KAHLE ROAD/STAFFORD ROAD

At this intersection, install a single-lane roundabout with pedestrian island. In addition to meeting capacity needs, the proposed roundabout would improve safety and provide a distinct transition between the rural and urban land use and traffic speeds in the area. The roundabout should include pedestrian medians for enhanced pedestrian crossings.

FROG POND LANE/STAFFORD ROAD

At this intersection, install a raised center median and traffic separator that allows northbound and southbound right and left turns from Stafford Road and minor street

right turns but restricts minor street eastbound and westbound through and left turn movements to and from Frog Pond West and East. The restriction is needed to facilitate safe vehicle and pedestrian/bicycle movements at the intersection and to meet the City's LOS standard. This intersection should include enhanced pedestrian crossings with median breaks for safe and improved pedestrian connectivity.

BRISBAND STREET/STAFFORD ROAD

At this intersection, install a single-lane roundabout. This will require a slight shift of Stafford Road to the east to accommodate the necessary right-of-way. The roundabout should include pedestrian medians for enhanced pedestrian crossings.

60TH AVENUE/ADVANCE ROAD

At this intersection, install a single-lane roundabout. While not a necessary improvement for traffic operating conditions, the proposed roundabout would improve safety and provide a distinct transition between the rural land use with high-speed traffic and urban land use with slower vehicle speeds and the need for multimodal safety in the area.

IMPROVED OPERATING CONDITIONS

The table below shows the intersection operations for the four intersections with the identified transportation improvements in place. As shown, all four intersections will meet the City LOS standard while providing safe multimodal improvements for pedestrian and bicycles.

TABLE 5: ANTICIPATED BUILD (2040) INTERSECTION OPERATIONS - IMPROVEMENTS

INTERSECTION	IMPROVEMENT	OPERATING STANDARD	PM PEAK HOUR		
			V/C	DELAY	LOS
ADVANCE RD / 60TH AVE	Roundabout	LOS D	0.19	4.3	A
STAFFORD RD / BRISBAND ST	Roundabout	LOS D	0.78	12.7	B
STAFFORD RD / FROG POND LN	Two-Way Stop-Controlled with Minor Street Turn Restrictions	LOS D	0.04	18.5	B/C
STAFFORD RD / KAHLE RD	Roundabout	LOS D	0.99	29.6	D

TWO-WAY STOP-CONTROLLED INTERSECTION:
Delay = Critical Movement Delay (secs)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Critical Levels of Service (Major/Minor Road)

ROUNDABOUT INTERSECTION:
Delay = Average Intersection Delay (secs)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Total Level of Service

Advantages of Installing a Roundabout

- Roundabouts can reduce delay for side street traffic because no approach is given more priority than another. Therefore, the Kahle Road and Brisband Street intersections would no longer be anticipated to operate at LOS F in the future scenarios.

- Roundabouts can help to slow traffic speeds on the roadway. Typical circulating speeds for a roundabout are 15 – 20 miles per hour (mph), which would help to calm traffic in the vicinity of the Frog Pond development area.

- Converting a stop-controlled intersection to a single-lane roundabout can reduce fatal and injury crashes by 82%.

- Roundabouts reduce the number of conflict points between vehicles and between vehicles and pedestrians/bicycles.

- Roundabouts at Stafford Road/Kahle Road and Advance Road/60th Avenue would provide clear gateways between the rural and urban environments. The Stafford Road/Kahle Road location is under the BPA power line easement and would have underutilized land available to accommodate the larger footprint that roundabouts require.

Disadvantages of Installing a Roundabout

- Because all approaches are treated the same and must yield to traffic within the roundabout, this would introduce delay for traffic on the major approaches (Stafford Road).

- Roundabouts are more difficult for large trucks and agricultural vehicles to navigate and may result in complaints from the freight community and farmers.

- Roundabouts can be difficult for school aged pedestrians and bicyclists to cross because there is no exclusive stop phase (as is provided with a traffic signal). The lack of straight paths and clear turns can also be difficult for the vision impaired.

- Roundabouts require a larger footprint, which would require additional right-of-way dedication or acquisition.

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IDENTIFIED PROJECTS

The following lists of transportation projects have been identified through the evaluation of the proposed Frog Pond East and South neighborhoods.

ROADWAY PROJECTS

- Widen Stafford Road to a three-lane cross section (two travel lanes with a center turn lane). Include curb, gutter, sidewalks, landscape strips, and bicycle facilities on both sides. Additionally, acquire the necessary right-of-way to accommodate a five-lane cross section. See sensitivity analysis in next section for explanation.
- Widen Advance Road to a three-lane cross section (two travel lanes with a center turn lane). Include curb, gutter, sidewalks, landscape strips, and bicycle facilities on both sides.
- Construct Local And Neighborhood Collector streets through the East and South neighborhoods consistent with the draft master plan to provide connections to the internal land uses.
- Consider potential traffic calming treatments along 60th Avenue south of Advance Road to control travel speeds, calm traffic, and improve pedestrian safety. Treatments could include center medians at mid-block locations and at intersections as well as speed feedback signs and school speed zones (20 mph) adjacent to the middle school.

INTERSECTION PROJECTS

- Install a single-lane roundabout at Stafford Road/Kahle Road.
- Install a median that restricts minor street left turn and through movements at Stafford Road/Frog Pond Lane.
- Install a single-lane roundabout at Stafford Road/Brisband Street.
- Install a single-lane roundabout at Advance Road/60th Avenue. Because of its proximity to a school, the crosswalk ramps at this location should be clear of vegetation to allow sufficient visibility of pedestrians.

PEDESTRIAN, BICYCLE, AND TRAIL PROJECTS

- Install a mid-block crossing on Advance Road between 60th Avenue and 63rd Avenue to facilitate safe crossings between the future park and East neighborhood. A Rectangular Rapid Flashing Beacon (RRFB) should be considered at this location once Safe Routes to School are identified.
- Install a marked school crosswalk at the intersection of Advance Road/63rd Avenue. A Rectangular Rapid Flashing Beacon (RRFB) should be considered at this location once Safe Routes to School are identified.
- Install a crosswalk with median at the Frog Pond Lane/Stafford Road. Additional safe and accessible bicycle and pedestrian crossings will be provided via the identified roundabouts at Kahle Road/Stafford Road and Brisband Street/Stafford Road as well.

- Extend the planned pedestrian and bicycle facility improvements on Boeckman Road to Advance Road east of Stafford Road. The desired cross section for Boeckman Road includes protected bike lanes on both sides of the road.
- Construct protected bike lanes along the both sides of Stafford Road.
- Construct pedestrian and bicycle trails through the East and South neighborhoods consistent with the draft master plan to provide connections to existing local and regional trails in Wilsonville

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APPENDIX

EAST & SOUTH
MASTER PLAN

EAST & SOUTH MASTER PLAN

STREET DEMONSTRATION PLAN - OPT 2

DRAFT 8.02.2022

DRAFT

CONTENTS

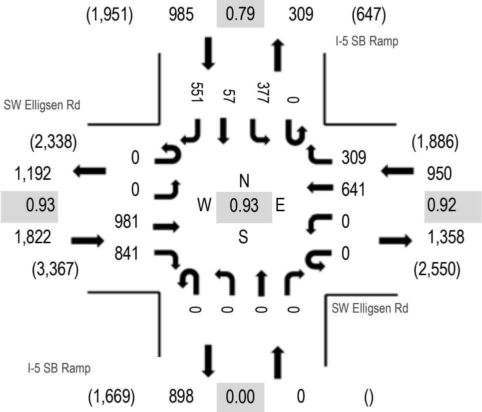
TRAFFIC COUNT DATA

(303) 216-2439
www.alltrafficdata.net

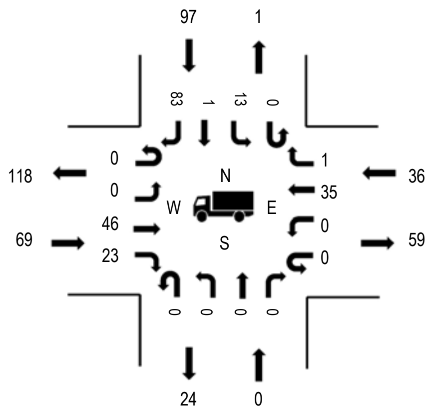
Location: 4 I-5 SB Ramp & SW Elligsen Rd PM
Date: Wednesday, September 22, 2021
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:00 PM - 04:15 PM

Peak Hour

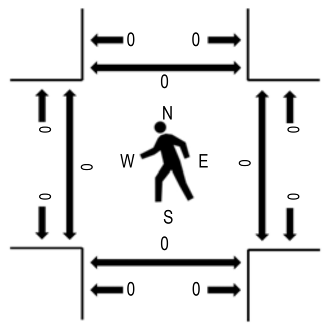
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	3.8%	0.93
WB	3.8%	0.92
NB	0.0%	0.00
SB	9.8%	0.79
All	5.4%	0.93

Traffic Counts - Motorized Vehicles

Interval Start Time	SW Elligsen Rd Eastbound				SW Elligsen Rd Westbound				I-5 SB Ramp Northbound				I-5 SB Ramp Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	0	74	72	0	0	41	26	0	0	0	0	0	47	8	53	321	3,757
4:05 PM	0	0	92	65	0	0	48	29	0	0	0	0	0	46	10	56	346	3,746
4:10 PM	0	0	97	77	0	0	55	23	0	0	0	0	0	37	13	43	345	3,709
4:15 PM	0	0	65	74	0	0	54	20	0	0	0	0	0	40	5	45	303	3,652
4:20 PM	0	0	76	71	0	0	60	31	0	0	0	0	0	24	8	50	320	3,655
4:25 PM	0	0	67	68	0	0	67	32	0	0	0	0	0	25	6	42	307	3,601
4:30 PM	0	0	108	61	0	0	50	28	0	0	0	0	0	34	0	37	318	3,622
4:35 PM	0	0	86	72	0	0	56	31	0	0	0	0	0	13	0	47	305	3,585
4:40 PM	0	0	86	78	0	0	40	31	0	0	0	0	0	25	1	54	315	3,573
4:45 PM	0	0	75	73	0	0	59	17	0	0	0	0	0	31	1	32	288	3,553
4:50 PM	0	0	71	63	0	0	53	23	0	0	0	0	0	32	3	54	299	3,538
4:55 PM	0	0	84	67	0	0	58	18	0	0	0	0	0	23	2	38	290	3,483
5:00 PM	0	0	78	75	0	0	48	31	0	0	0	0	0	26	6	46	310	3,447
5:05 PM	0	0	85	67	0	0	51	33	0	0	0	0	0	31	2	40	309	
5:10 PM	0	0	87	58	0	0	48	35	0	0	0	0	0	21	3	36	288	
5:15 PM	0	0	75	65	0	0	55	53	0	0	0	0	0	22	0	36	306	
5:20 PM	0	0	65	59	0	0	49	24	0	0	0	0	0	31	0	38	266	
5:25 PM	0	0	76	74	0	0	54	29	0	0	0	0	0	35	5	55	328	
5:30 PM	0	0	65	54	0	0	42	30	0	0	0	0	0	30	6	54	281	
5:35 PM	0	0	69	66	0	0	68	26	0	0	0	0	0	20	7	37	293	
5:40 PM	0	0	72	57	0	0	45	29	0	0	0	0	0	33	10	49	295	
5:45 PM	0	0	54	50	0	0	56	19	0	0	0	0	0	32	6	56	273	
5:50 PM	0	0	53	47	0	0	38	15	0	0	0	0	0	33	9	49	244	
5:55 PM	0	0	54	40	0	0	44	14	0	0	0	0	0	45	5	52	254	
Count Total	0	0	1,814	1,553	0	0	1,239	647	0	0	0	0	0	736	116	1,099	7,204	
Peak Hour	0	0	981	841	0	0	641	309	0	0	0	0	0	377	57	551	3,757	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	9	0	2	6	17	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:05 PM	10	0	2	6	18	4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	0	0
4:10 PM	2	0	3	8	13	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0
4:15 PM	2	0	6	10	18	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:20 PM	5	0	1	6	12	4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0
4:25 PM	6	0	3	7	16	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	6	0	4	7	17	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	1	0	1	9	11	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	10	0	4	11	25	4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0
4:45 PM	7	0	1	7	15	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
4:50 PM	5	0	2	12	19	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	6	0	7	8	21	4:55 PM	0	0	1	0	1	4:55 PM	0	0	0	1	1
5:00 PM	4	0	1	7	12	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:05 PM	2	0	3	3	8	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	4	0	2	7	13	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	0	0	2	6	8	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	3	0	4	10	17	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	7	0	2	4	13	5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0
5:30 PM	4	0	2	5	11	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	4	0	5	5	14	5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0
5:40 PM	7	0	2	2	11	5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0
5:45 PM	7	0	1	6	14	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
5:50 PM	9	0	3	7	19	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0
5:55 PM	5	0	3	7	15	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	125	0	66	166	357	Count Total	0	0	1	0	1	Count Total	0	0	0	1	1
Peak Hour	69	0	36	97	202	Peak Hour	0	0	1	0	1	Peak Hour	0	0	0	1	1

Location: 5 I-5 NB Ramp & SW Elligsen Rd PM

Date: Wednesday, September 22, 2021

Peak Hour: 04:05 PM - 05:05 PM

Peak 15-Minutes: 04:05 PM - 04:20 PM

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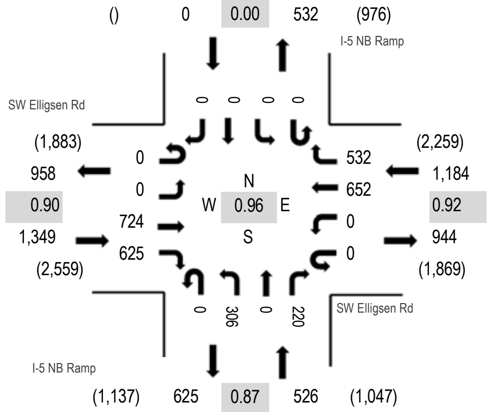
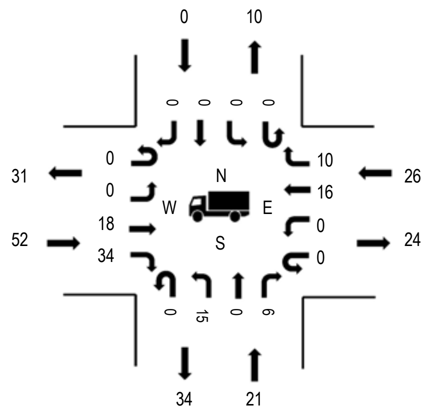
Peak Hour

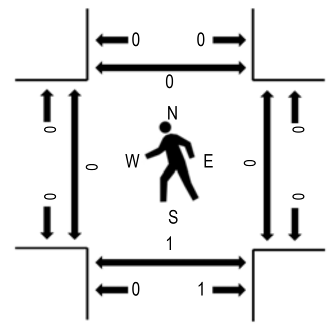
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	3.9%	0.90
WB	2.2%	0.92
NB	4.0%	0.87
SB	0.0%	0.00
All	3.2%	0.96

Traffic Counts - Motorized Vehicles

Interval Start Time	SW Elligsen Rd Eastbound				SW Elligsen Rd Westbound				I-5 NB Ramp Northbound				I-5 NB Ramp Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	0	76	41	0	0	48	36	0	18	0	18	0	0	0	0	237	3,045
4:05 PM	0	0	76	54	0	0	51	49	0	25	0	21	0	0	0	0	276	3,059
4:10 PM	0	0	58	73	0	0	58	46	0	19	0	16	0	0	0	0	270	3,051
4:15 PM	0	0	70	43	0	0	49	47	0	23	0	16	0	0	0	0	248	3,023
4:20 PM	0	0	60	51	0	0	64	44	0	29	0	16	0	0	0	0	264	3,027
4:25 PM	0	0	53	40	0	0	62	39	0	37	0	22	0	0	0	0	253	3,006
4:30 PM	0	0	64	62	0	0	51	43	0	27	0	30	0	0	0	0	277	3,015
4:35 PM	0	0	42	65	0	0	65	46	0	23	0	17	0	0	0	0	258	2,977
4:40 PM	0	0	53	57	0	0	46	37	0	25	0	13	0	0	0	0	231	2,959
4:45 PM	0	0	59	43	0	0	48	39	0	27	0	17	0	0	0	0	233	2,971
4:50 PM	0	0	74	39	0	0	50	52	0	25	0	21	0	0	0	0	261	2,936
4:55 PM	0	0	58	52	0	0	48	38	0	28	0	13	0	0	0	0	237	2,862
5:00 PM	0	0	57	46	0	0	60	52	0	18	0	18	0	0	0	0	251	2,820
5:05 PM	0	0	58	61	0	0	66	48	0	19	0	16	0	0	0	0	268	
5:10 PM	0	0	52	49	0	0	61	42	0	21	0	17	0	0	0	0	242	
5:15 PM	0	0	51	39	0	0	72	33	0	38	0	19	0	0	0	0	252	
5:20 PM	0	0	59	41	0	0	48	42	0	25	0	28	0	0	0	0	243	
5:25 PM	0	0	66	54	0	0	64	37	0	18	0	23	0	0	0	0	262	
5:30 PM	0	0	63	40	0	0	50	49	0	23	0	14	0	0	0	0	239	
5:35 PM	0	0	48	41	0	0	53	42	0	41	0	15	0	0	0	0	240	
5:40 PM	0	0	67	42	0	0	51	37	0	23	0	23	0	0	0	0	243	
5:45 PM	0	0	47	28	0	0	51	27	0	24	0	21	0	0	0	0	198	
5:50 PM	0	0	55	40	0	0	37	22	0	16	0	17	0	0	0	0	187	
5:55 PM	0	0	56	36	0	0	30	29	0	28	0	16	0	0	0	0	195	
Count Total	0	0	1,422	1,137	0	0	1,283	976	0	600	0	447	0	0	0	0	5,865	
Peak Hour	0	0	724	625	0	0	652	532	0	306	0	220	0	0	0	0	3,059	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles EB	Heavy Vehicles NB	Heavy Vehicles WB	Heavy Vehicles SB	Heavy Vehicles Total
4:00 PM	7	1	2	0	10
4:05 PM	4	2	1	0	7
4:10 PM	2	2	2	0	6
4:15 PM	3	3	1	0	7
4:20 PM	7	2	5	0	14
4:25 PM	4	2	2	0	8
4:30 PM	7	2	3	0	12
4:35 PM	2	1	2	0	5
4:40 PM	6	0	4	0	10
4:45 PM	6	0	0	0	6
4:50 PM	6	2	2	0	10
4:55 PM	4	5	2	0	11
5:00 PM	1	0	2	0	3
5:05 PM	4	3	1	0	8
5:10 PM	3	0	1	0	4
5:15 PM	1	4	1	0	6
5:20 PM	2	4	1	0	7
5:25 PM	4	2	0	0	6
5:30 PM	7	1	2	0	10
5:35 PM	5	3	3	0	11
5:40 PM	4	2	1	0	7
5:45 PM	3	1	1	0	5
5:50 PM	4	2	2	0	8
5:55 PM	3	2	5	0	10
Count Total	99	46	46	0	191
Peak Hour	52	21	26	0	99

Interval Start Time	Bicycles on Roadway EB	Bicycles on Roadway NB	Bicycles on Roadway WB	Bicycles on Roadway SB	Bicycles on Roadway Total
4:00 PM	1	0	0	0	1
4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:20 PM	0	0	0	0	0
4:25 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
4:50 PM	0	0	0	0	0
4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	0	0
5:25 PM	0	0	1	0	1
5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0
Count Total	1	0	1	0	2
Peak Hour	0	0	0	0	0

Interval Start Time	Pedestrians/Bicycles on Crosswalk EB	Pedestrians/Bicycles on Crosswalk NB	Pedestrians/Bicycles on Crosswalk WB	Pedestrians/Bicycles on Crosswalk SB	Pedestrians/Bicycles on Crosswalk Total
4:00 PM	0	0	0	0	0
4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:20 PM	0	0	0	0	0
4:25 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
4:50 PM	0	1	0	0	1
4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0
5:15 PM	0	1	0	0	1
5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0
Count Total	0	2	0	0	2
Peak Hour	0	1	0	0	1

Location: 2 SW Canyon Creek Rd & Boeckman Rd PM
Date: Thursday, September 30, 2021
Peak Hour: 04:45 PM - 05:45 PM
Peak 15-Minutes: 04:50 PM - 05:05 PM

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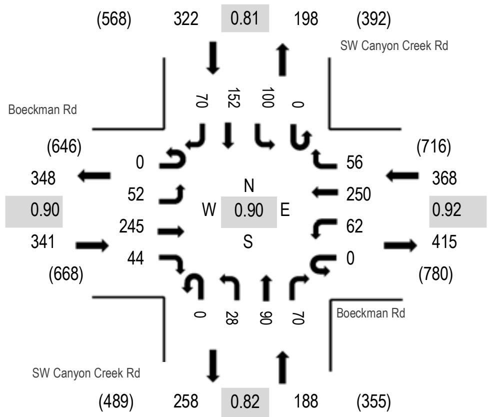
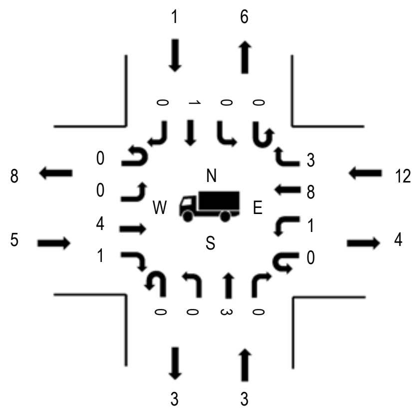
Peak Hour

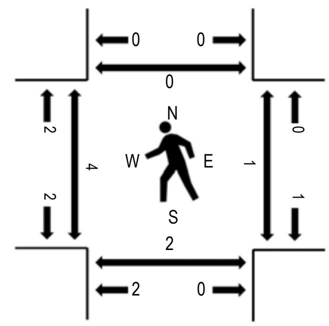
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	1.5%	0.90
WB	3.3%	0.92
NB	1.6%	0.82
SB	0.3%	0.81
All	1.7%	0.90

Traffic Counts - Motorized Vehicles

Interval Start Time	Boeckman Rd Eastbound				Boeckman Rd Westbound				SW Canyon Creek Rd Northbound				SW Canyon Creek Rd Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	6	17	8	0	11	31	4	0	4	5	2	0	5	9	4	106	1,142
4:05 PM	0	4	22	2	0	4	18	7	0	0	8	6	0	2	9	1	83	1,148
4:10 PM	0	5	21	3	0	3	20	4	0	1	5	5	0	3	15	7	92	1,172
4:15 PM	0	5	14	3	0	2	15	5	0	2	15	6	0	8	7	3	85	1,184
4:20 PM	0	2	28	2	0	4	14	6	0	2	11	4	0	5	15	3	96	1,201
4:25 PM	0	3	19	7	0	7	22	4	0	3	7	4	0	7	9	2	94	1,201
4:30 PM	0	3	23	3	0	8	21	4	0	2	4	5	0	7	5	9	94	1,202
4:35 PM	0	4	22	5	0	2	19	5	0	3	10	1	0	3	13	3	90	1,214
4:40 PM	0	3	19	2	0	6	12	3	0	3	8	4	0	11	14	7	92	1,215
4:45 PM	0	3	18	4	0	1	20	3	0	3	5	3	0	9	9	7	85	1,219
4:50 PM	0	8	12	4	0	5	31	6	0	2	9	5	0	12	16	3	113	1,214
4:55 PM	0	7	25	2	0	6	19	3	0	3	7	8	0	9	13	10	112	1,190
5:00 PM	0	5	22	0	0	2	12	6	0	5	9	11	0	16	15	9	112	1,165
5:05 PM	0	2	27	7	0	8	24	6	0	1	7	3	0	9	10	3	107	
5:10 PM	0	3	21	6	0	8	20	5	0	1	11	4	0	6	12	7	104	
5:15 PM	0	7	19	3	0	4	20	6	0	3	10	7	0	6	14	3	102	
5:20 PM	0	5	14	5	0	7	23	7	0	3	4	5	0	6	11	6	96	
5:25 PM	0	4	19	6	0	7	18	5	0	2	3	3	0	7	16	5	95	
5:30 PM	0	2	25	5	0	3	20	3	0	1	10	7	0	10	11	9	106	
5:35 PM	0	3	21	1	0	6	17	5	0	3	8	5	0	4	17	1	91	
5:40 PM	0	3	22	1	0	5	26	1	0	1	7	9	0	6	8	7	96	
5:45 PM	0	1	21	3	0	7	20	2	0	2	8	6	0	6	2	2	80	
5:50 PM	0	2	16	4	0	5	20	6	0	0	11	2	0	10	10	3	89	
5:55 PM	0	4	19	2	0	6	16	5	0	0	5	3	0	9	14	4	87	
Count Total	0	94	486	88	0	127	478	111	0	50	187	118	0	176	274	118	2,307	
Peak Hour	0	52	245	44	0	62	250	56	0	28	90	70	0	100	152	70	1,219	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles EB	NB	WB	SB	Total
4:00 PM	0	0	3	0	3
4:05 PM	0	2	2	0	4
4:10 PM	1	0	1	0	2
4:15 PM	1	1	0	1	3
4:20 PM	0	1	1	0	2
4:25 PM	1	0	2	0	3
4:30 PM	1	0	2	0	3
4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	0	0
4:45 PM	0	0	1	0	1
4:50 PM	0	0	1	0	1
4:55 PM	0	0	0	0	0
5:00 PM	1	0	0	0	1
5:05 PM	1	0	0	0	1
5:10 PM	1	0	1	0	2
5:15 PM	0	0	1	1	2
5:20 PM	2	0	2	0	4
5:25 PM	0	0	1	0	1
5:30 PM	0	1	2	0	3
5:35 PM	0	2	3	0	5
5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0
Count Total	9	7	23	2	41
Peak Hour	5	3	12	1	21

Interval Start Time	Bicycles on Roadway EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0
4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:20 PM	0	0	0	0	0
4:25 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	1	1
4:45 PM	0	0	0	0	0
4:50 PM	0	0	0	1	1
4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0
Count Total	0	0	0	2	2
Peak Hour	0	0	0	1	1

Interval Start Time	Pedestrians/Bicycles on Crosswalk EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0
4:05 PM	0	0	0	0	0
4:10 PM	0	2	0	0	2
4:15 PM	1	2	2	0	5
4:20 PM	0	0	0	0	0
4:25 PM	0	0	0	0	0
4:30 PM	0	2	0	0	2
4:35 PM	0	0	2	0	2
4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
4:50 PM	0	0	0	0	0
4:55 PM	0	0	0	0	0
5:00 PM	0	1	0	0	1
5:05 PM	1	0	0	0	1
5:10 PM	0	0	0	0	0
5:15 PM	1	0	0	0	1
5:20 PM	0	1	0	0	1
5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:35 PM	0	0	1	0	1
5:40 PM	2	0	0	0	2
5:45 PM	2	0	0	0	2
5:50 PM	0	1	0	0	1
5:55 PM	0	0	0	0	0
Count Total	7	9	5	0	21
Peak Hour	4	2	1	0	7

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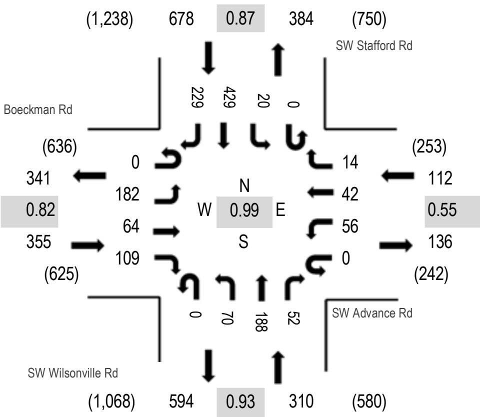
Location: 4 SW Wilsonville Rd & SW Advance Rd PM
Date: Thursday, September 30, 2021
Peak Hour: 04:45 PM - 05:45 PM
Peak 15-Minutes: 05:00 PM - 05:15 PM

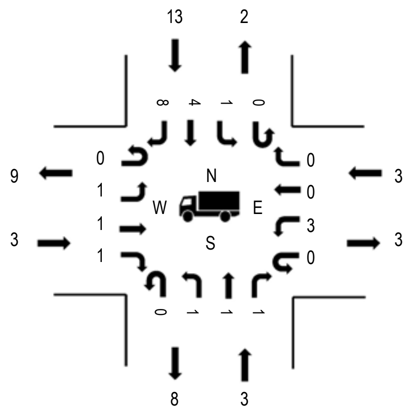
DRAFT

Peak Hour

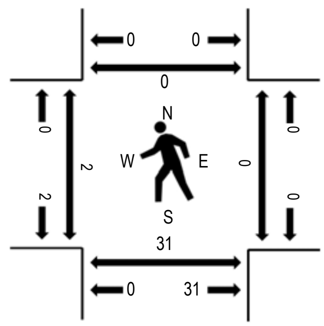
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.8%	0.82
WB	2.7%	0.55
NB	1.0%	0.93
SB	1.9%	0.87
All	1.5%	0.99

Traffic Counts - Motorized Vehicles

Interval Start Time	Boeckman Rd Eastbound U-Turn	Left	Thru	Right	SW Advance Rd Westbound U-Turn	Left	Thru	Right	SW Wilsonville Rd Northbound U-Turn	Left	Thru	Right	SW Stafford Rd Southbound U-Turn	Left	Thru	Right	Total	Rolling Hour
4:00 PM	0	11	4	8	0	16	19	12	0	4	14	1	0	5	26	16	136	1,289
4:05 PM	0	16	1	0	0	3	2	3	0	4	20	1	0	2	22	19	93	1,263
4:10 PM	0	17	6	3	0	4	2	6	0	4	16	3	0	0	31	14	106	1,294
4:15 PM	0	10	2	0	0	4	1	3	0	7	14	4	0	0	23	15	83	1,323
4:20 PM	0	20	7	6	0	9	2	5	0	5	13	1	0	0	30	12	110	1,350
4:25 PM	0	12	3	7	0	5	5	3	0	1	18	7	0	3	25	27	116	1,363
4:30 PM	0	11	5	8	0	3	2	0	0	2	10	3	0	1	24	23	92	1,376
4:35 PM	0	18	2	6	0	2	3	2	0	2	14	3	0	3	29	14	98	1,399
4:40 PM	0	11	3	8	0	3	1	4	0	3	14	5	0	1	31	13	97	1,424
4:45 PM	0	15	4	12	0	8	2	0	0	5	17	7	0	0	25	23	118	1,455
4:50 PM	0	15	6	1	0	2	6	2	0	8	15	7	0	2	35	21	120	1,435
4:55 PM	0	16	13	9	0	0	1	2	0	3	9	4	0	1	41	21	120	1,424
5:00 PM	0	19	10	6	0	6	1	0	0	6	16	6	0	2	21	17	110	1,407
5:05 PM	0	12	6	15	0	8	8	5	0	6	15	5	0	1	28	15	124	
5:10 PM	0	23	3	14	0	11	12	2	0	8	15	4	0	2	28	13	135	
5:15 PM	0	14	2	9	0	4	3	1	0	6	14	2	0	3	30	22	110	
5:20 PM	0	7	2	15	0	2	1	0	0	6	22	3	0	1	42	22	123	
5:25 PM	0	13	3	8	0	4	2	0	0	5	19	4	0	2	54	15	129	
5:30 PM	0	15	5	5	0	6	0	0	0	8	16	1	0	2	41	16	115	
5:35 PM	0	16	4	7	0	2	3	2	0	3	16	3	0	2	45	20	123	
5:40 PM	0	17	6	8	0	3	3	0	0	6	14	6	0	2	39	24	128	
5:45 PM	0	7	4	4	0	5	2	2	0	2	13	6	0	0	35	18	98	
5:50 PM	0	13	2	11	0	3	3	0	0	14	11	2	0	3	31	16	109	
5:55 PM	0	8	4	12	0	1	1	0	0	6	15	8	0	1	36	11	103	
Count Total	0	336	107	182	0	114	85	54	0	124	360	96	0	39	772	427	2,696	
Peak Hour	0	182	64	109	0	56	42	14	0	70	188	52	0	20	429	229	1,455	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	0	4	1	5	4:00 PM	0	0	0	0	0	4:00 PM	0	8	0	0	8
4:05 PM	0	0	1	0	1	4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	0	0
4:10 PM	1	2	1	0	4	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0
4:15 PM	1	1	0	0	2	4:15 PM	0	0	0	0	0	4:15 PM	0	1	0	0	1
4:20 PM	0	4	0	1	5	4:20 PM	0	0	0	0	0	4:20 PM	0	1	0	0	1
4:25 PM	0	1	0	1	2	4:25 PM	0	0	0	0	0	4:25 PM	0	44	0	0	44
4:30 PM	0	0	1	3	4	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	1	1	4:40 PM	0	0	0	0	0	4:40 PM	0	11	0	0	11
4:45 PM	0	0	0	1	1	4:45 PM	0	0	0	0	0	4:45 PM	0	9	0	0	9
4:50 PM	0	0	0	2	2	4:50 PM	0	0	0	0	0	4:50 PM	0	22	0	0	22
4:55 PM	0	1	0	1	2	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0
5:00 PM	0	0	1	0	1	5:00 PM	0	0	0	0	0	5:00 PM	0	1	0	0	1
5:05 PM	0	0	0	1	1	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	2	0	0	1	3	5:10 PM	0	0	0	0	0	5:10 PM	1	0	0	0	1
5:15 PM	0	0	1	2	3	5:15 PM	0	0	0	0	0	5:15 PM	0	3	0	0	3
5:20 PM	0	0	0	1	1	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	1	0	0	0	1	5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0
5:30 PM	0	2	1	0	3	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	3	3	5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	1	1	5:40 PM	0	0	0	0	0	5:40 PM	2	0	0	0	2
5:45 PM	0	0	1	0	1	5:45 PM	0	0	0	0	0	5:45 PM	2	0	0	0	2
5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	5	11	11	20	47	Count Total	0	0	0	0	0	Count Total	5	100	0	0	105
Peak Hour	3	3	3	13	22	Peak Hour	0	0	0	0	0	Peak Hour	3	35	0	0	38

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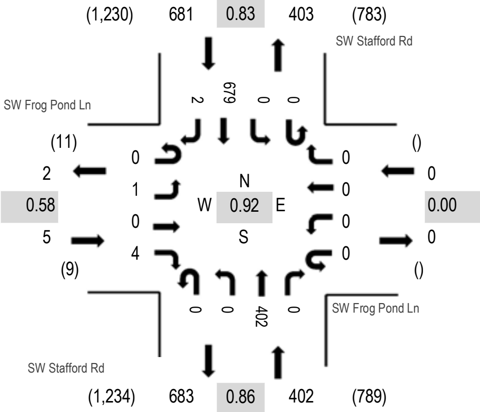
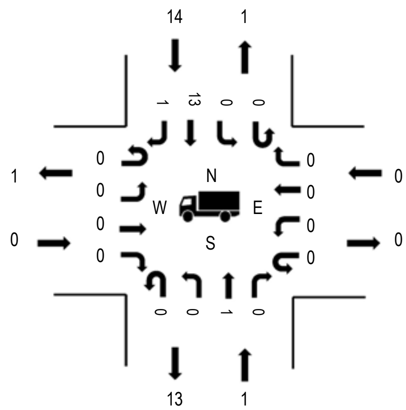
Location: 6 SW Stafford Rd & SW Frog Pond Ln PM
Date: Thursday, September 30, 2021
Peak Hour: 04:45 PM - 05:45 PM
Peak 15-Minutes: 05:20 PM - 05:35 PM

Peak Hour

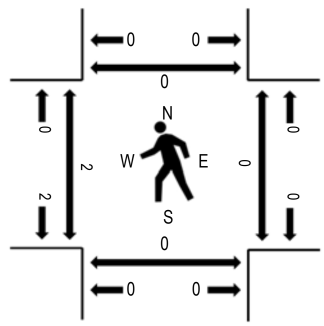
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.58
WB	0.0%	0.00
NB	0.2%	0.86
SB	2.1%	0.83
All	1.4%	0.92

Traffic Counts - Motorized Vehicles

Interval Start Time	SW Frog Pond Ln Eastbound U-Turn	Left	Thru	Right	SW Frog Pond Ln Westbound U-Turn	Left	Thru	Right	SW Stafford Rd Northbound U-Turn	Left	Thru	Right	SW Stafford Rd Southbound U-Turn	Left	Thru	Right	Total	Rolling Hour
4:00 PM	0	0	0	1	0	0	0	0	0	1	38	0	0	0	47	0	87	971
4:05 PM	0	0	0	0	0	0	0	0	0	0	39	0	0	0	31	0	70	965
4:10 PM	0	0	0	0	0	0	0	0	0	1	33	0	0	0	48	0	82	983
4:15 PM	0	0	0	0	0	0	0	0	0	1	28	0	0	0	41	0	70	988
4:20 PM	0	0	0	0	0	0	0	0	0	1	39	0	0	0	52	0	92	1,004
4:25 PM	0	0	0	1	0	0	0	0	0	0	36	0	0	0	43	0	80	1,011
4:30 PM	0	0	0	1	0	0	0	0	0	2	19	0	0	0	44	1	67	1,036
4:35 PM	0	0	0	0	0	0	0	0	0	0	36	0	0	0	47	1	84	1,060
4:40 PM	0	0	0	0	0	0	0	0	0	0	33	0	0	0	44	0	77	1,064
4:45 PM	0	0	0	0	0	0	0	0	0	0	29	0	0	0	59	0	88	1,088
4:50 PM	0	0	0	2	0	0	0	0	0	0	34	0	0	0	57	0	93	1,084
4:55 PM	0	0	0	1	0	0	0	0	0	0	31	0	0	0	49	0	81	1,066
5:00 PM	0	0	0	0	0	0	0	0	0	0	38	0	0	0	43	0	81	1,057
5:05 PM	0	0	0	1	0	0	0	0	0	0	36	0	0	0	50	1	88	
5:10 PM	0	0	0	0	0	0	0	0	0	0	46	0	0	0	41	0	87	
5:15 PM	0	0	0	0	0	0	0	0	0	0	32	0	0	0	53	1	86	
5:20 PM	0	1	0	0	0	0	0	0	0	0	28	0	0	0	70	0	99	
5:25 PM	0	0	0	0	0	0	0	0	0	0	29	0	0	0	76	0	105	
5:30 PM	0	0	0	0	0	0	0	0	0	0	31	0	0	0	60	0	91	
5:35 PM	0	0	0	0	0	0	0	0	0	0	32	0	0	0	56	0	88	
5:40 PM	0	0	0	0	0	0	0	0	0	0	36	0	0	0	65	0	101	
5:45 PM	0	0	0	0	0	0	0	0	0	1	33	0	0	0	50	0	84	
5:50 PM	0	0	0	1	0	0	0	0	0	0	24	0	0	0	50	0	75	
5:55 PM	0	0	0	0	0	0	0	0	0	0	22	0	0	0	50	0	72	
Count Total	0	1	0	8	0	0	0	0	0	7	782	0	0	0	1,226	4	2,028	
Peak Hour	0	1	0	4	0	0	0	0	0	0	402	0	0	0	679	2	1,088	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	2	0	1	3	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:05 PM	0	0	0	1	1	4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	0	0
4:10 PM	0	2	0	1	3	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0
4:15 PM	0	2	0	1	3	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:20 PM	0	2	0	2	4	4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0
4:25 PM	1	0	0	0	1	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	1	0	0	1	2	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	1	1	4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	2	2	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
4:50 PM	0	0	0	1	1	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	0	0	0	1	1	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	2	2	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	0	1	0	2	3	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	1	1	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	1	1	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	2	2	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	1	1	5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	1	1	5:40 PM	0	0	0	0	0	5:40 PM	2	0	0	0	2
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	2	0	0	0	2
5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	2	9	0	22	33	Count Total	0	0	0	0	0	Count Total	4	0	0	0	4
Peak Hour	0	1	0	14	15	Peak Hour	0	0	0	0	0	Peak Hour	2	0	0	0	2

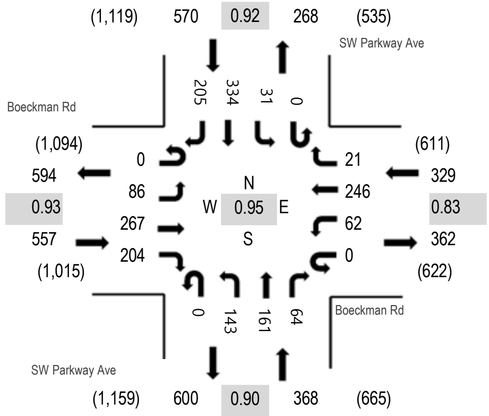
ALL TRAFFIC DATA SERVICES

(303) 216-2439
www.alltrafficdata.net

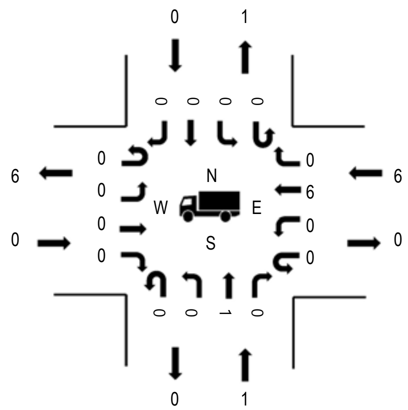
Location: 1 SW Parkway Ave & Boeckman Rd PM
Date: Wednesday, March 30, 2022
Peak Hour: 04:20 PM - 05:20 PM
Peak 15-Minutes: 05:05 PM - 05:20 PM

Peak Hour

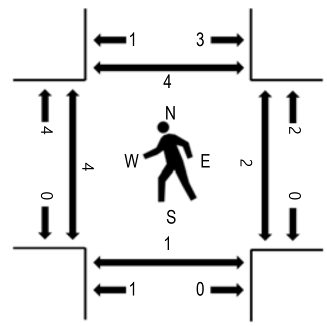
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.93
WB	1.8%	0.83
NB	0.3%	0.90
SB	0.0%	0.92
All	0.4%	0.95

Traffic Counts - Motorized Vehicles

Interval	Boeckman Rd Eastbound				Boeckman Rd Westbound				SW Parkway Ave Northbound				SW Parkway Ave Southbound					Rolling
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Hour
4:00 PM	0	8	17	21	0	4	14	3	0	8	12	7	0	4	29	22	149	1,773
4:05 PM	0	9	20	20	0	1	10	5	0	10	12	5	0	0	29	13	134	1,780
4:10 PM	0	3	19	13	0	5	22	2	0	11	10	5	0	1	30	28	149	1,811
4:15 PM	0	5	16	18	0	4	25	1	0	12	12	2	0	1	35	22	153	1,809
4:20 PM	0	10	27	18	0	4	18	2	0	9	9	4	0	3	28	15	147	1,824
4:25 PM	0	6	20	19	0	3	15	2	0	9	16	5	0	2	26	12	135	1,814
4:30 PM	0	7	13	12	0	5	13	0	0	13	15	4	0	1	37	26	146	1,822
4:35 PM	0	9	33	22	0	6	22	3	0	12	13	6	0	1	27	17	171	1,821
4:40 PM	0	4	23	20	0	1	16	0	0	14	18	9	0	2	29	17	153	1,789
4:45 PM	0	7	23	8	0	3	30	2	0	12	6	7	0	2	25	14	139	1,754
4:50 PM	0	10	22	16	0	9	17	2	0	17	18	3	0	4	24	15	157	1,726
4:55 PM	0	4	18	14	0	7	15	0	0	9	14	4	0	5	25	25	140	1,668
5:00 PM	0	11	15	16	0	5	22	1	0	14	11	5	0	1	34	21	156	1,637
5:05 PM	0	6	22	25	0	4	35	4	0	8	11	7	0	3	20	20	165	
5:10 PM	0	6	16	18	0	7	14	3	0	11	18	5	0	3	34	12	147	
5:15 PM	0	6	35	16	0	8	29	2	0	15	12	5	0	4	25	11	168	
5:20 PM	0	8	16	18	0	6	23	0	0	6	16	6	0	2	25	11	137	
5:25 PM	0	11	13	17	0	6	24	2	0	12	13	2	0	1	22	20	143	
5:30 PM	0	8	20	10	0	3	18	2	0	14	19	2	0	2	29	18	145	
5:35 PM	0	11	15	16	0	8	16	3	0	7	6	6	0	3	30	18	139	
5:40 PM	0	8	17	14	0	10	13	1	0	5	9	3	0	4	21	13	118	
5:45 PM	0	3	13	10	0	6	10	4	0	6	17	2	0	1	26	13	111	
5:50 PM	0	9	8	9	0	5	5	3	0	6	12	0	0	4	25	13	99	
5:55 PM	0	10	13	12	0	1	15	2	0	6	8	8	0	2	21	11	109	
Count Total	0	179	454	382	0	121	441	49	0	246	307	112	0	56	656	407	3,410	
Peak Hour	0	86	267	204	0	62	246	21	0	143	161	64	0	31	334	205	1,824	

Location: 1 SW Parkway Ave & Boeckman Rd PM

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM	0	0	1	1	2	4:00 PM	0	0	0	0	0
4:05 PM	2	0	0	0	2	4:05 PM	0	0	1	0	1	4:05 PM	0	1	0	0	1
4:10 PM	0	1	0	0	1	4:10 PM	1	0	0	1	2	4:10 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	1	1
4:20 PM	0	0	2	0	2	4:20 PM	0	0	1	0	1	4:20 PM	0	0	0	0	0
4:25 PM	0	0	0	0	0	4:25 PM	0	1	0	0	1	4:25 PM	0	0	0	0	0
4:30 PM	0	0	1	0	1	4:30 PM	0	0	1	0	1	4:30 PM	0	0	0	0	0
4:35 PM	0	0	1	0	1	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	0	1	1	0	2	4:40 PM	0	0	0	0	0	4:40 PM	1	0	0	0	1
4:45 PM	0	0	1	0	1	4:45 PM	0	0	0	0	0	4:45 PM	0	1	0	1	2
4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	0	0	0	0	0	4:55 PM	1	0	0	0	1	4:55 PM	1	0	0	1	2
5:00 PM	0	0	0	0	0	5:00 PM	1	0	0	0	1	5:00 PM	2	0	0	2	4
5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0	5:05 PM	0	0	2	0	2
5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0	5:15 PM	0	0	1	0	1
5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0	5:20 PM	0	2	2	0	4
5:25 PM	0	0	0	0	0	5:25 PM	1	0	1	0	2	5:25 PM	0	0	1	0	1
5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0	5:35 PM	2	0	1	2	5
5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	1	1	5:45 PM	0	0	1	1	2
5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0	5:50 PM	0	1	1	1	3
5:55 PM	0	0	2	0	2	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	2	2	8	0	12	Count Total	4	1	5	3	13	Count Total	6	5	9	9	29
Peak Hour	0	1	6	0	7	Peak Hour	2	1	2	0	5	Peak Hour	4	1	3	4	12

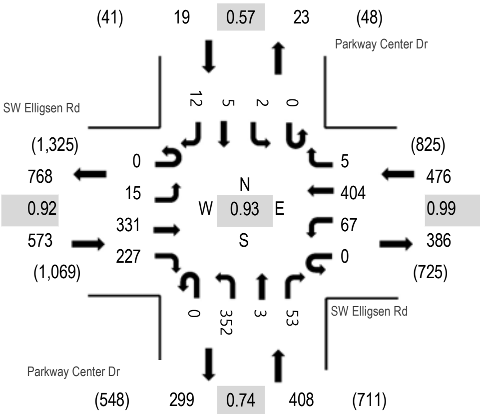
Location: 4 Parkway Center Dr & SW Elligsen Rd PM

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

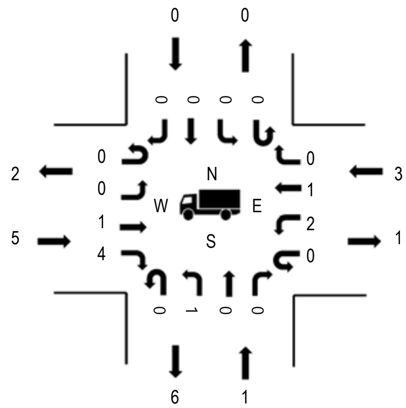
Location: 4 Parkway Center Dr & SW Elligsen Rd PM
Date: Wednesday, March 30, 2022
Peak Hour: 04:15 PM - 05:15 PM
Peak 15-Minutes: 04:30 PM - 04:45 PM

Peak Hour

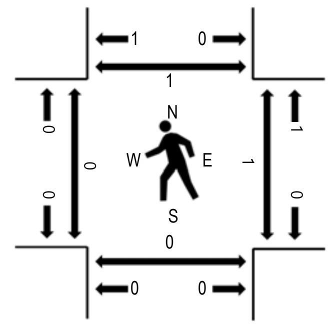
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.9%	0.92
WB	0.6%	0.99
NB	0.2%	0.74
SB	0.0%	0.57
All	0.6%	0.93

Traffic Counts - Motorized Vehicles

Interval	SW Elligsen Rd Eastbound				SW Elligsen Rd Westbound				Parkway Center Dr Northbound				Parkway Center Dr Southbound					Rolling
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Hour
4:00 PM	0	0	19	18	0	3	19	0	0	24	0	4	0	0	0	0	87	1,408
4:05 PM	0	1	33	13	0	5	26	0	0	23	0	10	0	0	1	2	114	1,455
4:10 PM	0	0	19	18	0	4	26	0	0	26	0	6	0	0	2	3	104	1,463
4:15 PM	0	0	34	23	0	9	37	0	0	18	0	5	0	0	0	3	129	1,476
4:20 PM	0	1	16	11	0	9	33	0	0	25	1	5	0	0	0	2	103	1,467
4:25 PM	0	2	34	31	0	4	28	0	0	28	0	6	0	0	1	1	135	1,472
4:30 PM	0	0	24	19	0	7	36	1	0	31	1	5	0	1	1	1	127	1,432
4:35 PM	0	0	19	14	0	4	39	1	0	45	0	5	0	0	0	1	128	1,388
4:40 PM	0	0	26	25	0	7	25	0	0	56	0	2	0	0	1	0	142	1,359
4:45 PM	0	1	32	15	0	2	31	0	0	21	1	5	0	0	0	1	109	1,316
4:50 PM	0	3	28	21	0	7	34	1	0	19	0	5	0	1	0	0	119	1,308
4:55 PM	0	0	26	16	0	6	35	0	0	24	0	3	0	0	0	1	111	1,253
5:00 PM	0	3	27	16	0	4	29	1	0	42	0	10	0	0	1	1	134	1,238
5:05 PM	0	3	34	17	0	3	40	1	0	23	0	1	0	0	0	0	122	
5:10 PM	0	2	31	19	0	5	37	0	0	20	0	1	0	0	1	1	117	
5:15 PM	0	3	30	18	0	7	27	0	0	22	1	9	0	0	1	2	120	
5:20 PM	0	1	28	10	0	3	34	1	0	25	0	4	0	0	0	2	108	
5:25 PM	0	6	24	19	0	5	26	0	0	12	1	2	0	0	0	0	95	
5:30 PM	0	0	11	18	0	5	26	0	0	19	1	3	0	0	0	0	83	
5:35 PM	0	4	31	11	0	1	23	0	0	18	0	6	0	0	0	5	99	
5:40 PM	0	1	21	22	0	5	28	0	0	17	0	3	0	0	0	2	99	
5:45 PM	0	1	23	19	0	4	23	0	0	27	0	3	0	0	1	0	101	
5:50 PM	0	1	15	14	0	4	13	0	0	13	0	3	0	0	0	1	64	
5:55 PM	0	3	26	15	0	3	28	0	0	15	0	6	0	0	0	0	96	
Count Total	0	36	611	422	0	116	703	6	0	593	6	112	0	2	10	29	2,646	
Peak Hour	0	15	331	227	0	67	404	5	0	352	3	53	0	2	5	12	1,476	

Location: 4 Parkway Center Dr & SW Elligsen Rd PM

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:05 PM	0	1	1	0	2	4:05 PM	1	0	0	0	1	4:05 PM	0	0	0	0	0
4:10 PM	0	0	1	0	1	4:10 PM	0	0	0	0	0	4:10 PM	0	1	1	0	2
4:15 PM	0	0	1	0	1	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0
4:25 PM	0	0	1	0	1	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	1	0	0	0	1	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	1	0	0	0	1	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	1	0	0	0	1	4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0	4:45 PM	0	0	1	1	2
4:50 PM	0	1	0	0	1	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0
5:00 PM	1	0	0	0	1	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:05 PM	1	0	1	0	2	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	1	0	0	0	1	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	3	0	2	0	5	5:20 PM	0	0	0	0	0	5:20 PM	0	0	1	0	1
5:25 PM	4	0	0	0	4	5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0
5:30 PM	1	0	0	0	1	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	1	0	0	0	1	5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0
5:45 PM	1	0	0	0	1	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
5:50 PM	1	0	0	0	1	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0
5:55 PM	2	0	0	0	2	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	19	2	7	0	28	Count Total	1	0	0	0	1	Count Total	0	1	3	1	5
Peak Hour	5	1	3	0	9	Peak Hour	0	0	0	0	0	Peak Hour	0	0	1	1	2

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 1 SW Parkway Ave & SW Elligsen Rd PM

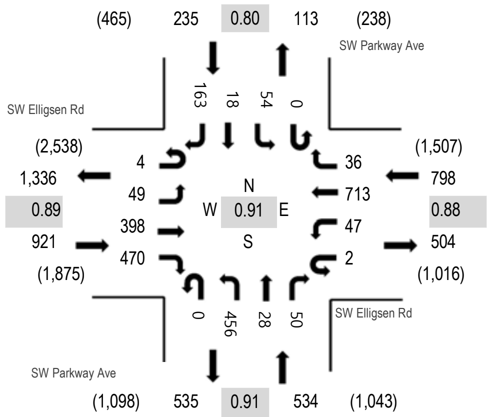
Date: Tuesday, June 7, 2022

Peak Hour: 04:00 PM - 05:00 PM

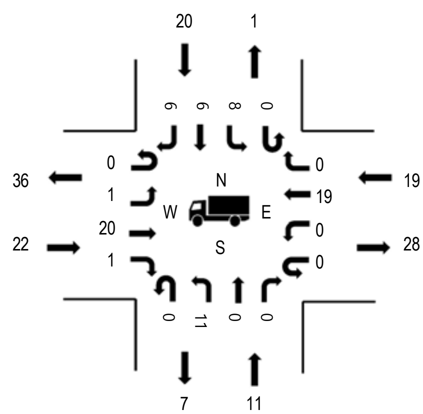
Peak 15-Minutes: 04:00 PM - 04:15 PM

Peak Hour

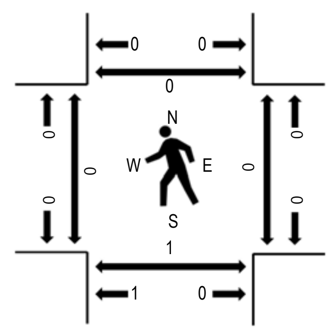
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	2.4%	0.89
WB	2.4%	0.88
NB	2.1%	0.91
SB	8.5%	0.80
All	2.9%	0.91

Traffic Counts - Motorized Vehicles

Interval Start Time	SW Elligsen Rd Eastbound				SW Elligsen Rd Westbound				SW Parkway Ave Northbound				SW Parkway Ave Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	10	44	50	0	6	52	4	0	44	4	5	0	6	0	12	237	2,488
4:05 PM	0	7	36	56	0	5	56	4	0	42	2	3	0	6	2	17	236	2,463
4:10 PM	1	5	33	42	1	4	61	3	0	40	1	5	0	3	0	15	214	2,464
4:15 PM	0	3	31	30	0	6	63	5	0	38	3	7	0	5	3	18	212	2,479
4:20 PM	1	2	18	34	0	5	63	4	0	41	4	5	0	7	0	18	202	2,487
4:25 PM	0	3	23	30	0	4	64	3	0	42	1	3	0	7	3	17	200	2,463
4:30 PM	0	4	29	32	0	4	68	2	0	38	2	4	0	3	1	12	199	2,472
4:35 PM	1	5	32	32	0	5	69	3	0	34	4	7	0	3	1	9	205	2,471
4:40 PM	0	4	28	41	0	2	54	2	0	30	2	4	0	4	1	10	182	2,454
4:45 PM	1	3	32	44	1	1	51	1	0	37	2	2	0	3	2	12	192	2,467
4:50 PM	0	2	43	42	0	2	54	2	0	36	1	3	0	4	2	10	201	2,475
4:55 PM	0	1	49	37	0	3	58	3	0	34	2	2	0	3	3	13	208	2,439
5:00 PM	0	1	24	28	0	6	71	6	0	41	4	5	0	2	2	22	212	2,402
5:05 PM	0	7	34	46	0	7	68	5	0	39	2	2	0	3	4	20	237	
5:10 PM	0	8	39	46	0	6	65	6	0	33	1	2	0	3	2	18	229	
5:15 PM	0	7	38	52	0	8	51	4	0	29	3	5	0	4	4	15	220	
5:20 PM	0	5	23	33	0	5	51	3	0	31	3	3	0	3	7	11	178	
5:25 PM	0	5	45	44	0	4	53	4	0	29	2	5	0	2	4	12	209	
5:30 PM	0	3	43	32	0	6	51	3	0	40	1	2	0	4	3	10	198	
5:35 PM	0	3	28	37	0	6	43	2	0	46	3	3	0	4	4	9	188	
5:40 PM	0	6	43	34	0	3	45	1	0	42	2	7	0	2	3	7	195	
5:45 PM	0	6	44	46	0	4	40	2	0	36	2	6	0	2	2	10	200	
5:50 PM	0	3	33	31	0	2	39	1	0	31	2	7	0	2	1	13	165	
5:55 PM	0	7	33	37	0	2	35	1	0	35	1	4	0	3	2	11	171	
Count Total	4	110	825	936	2	106	1,325	74	0	888	54	101	0	88	56	321	4,890	
Peak Hour	4	49	398	470	2	47	713	36	0	456	28	50	0	54	18	163	2,488	

Location: 1 SW Parkway Ave & SW Elligsen Rd PM

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	4	2	1	0	7	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:05 PM	1	1	1	3	6	4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	0	0
4:10 PM	2	1	2	0	5	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0
4:15 PM	2	1	2	3	8	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:20 PM	4	1	1	2	8	4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0
4:25 PM	1	1	1	3	6	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	1	0	3	2	6	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	2	1	1	1	5	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	0	0	3	2	5	4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0
4:45 PM	2	1	1	1	5	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
4:50 PM	2	1	2	1	6	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	1	1	1	2	5	4:55 PM	0	0	0	0	0	4:55 PM	0	1	0	0	1
5:00 PM	0	2	3	0	5	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	1	1
5:05 PM	0	1	2	1	4	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	0	1	3	1	5	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	0	1	1	1	3	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	0	1	2	1	4	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	0	2	1	0	3	5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0
5:30 PM	0	0	3	1	4	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	0	2	1	1	4	5:35 PM	0	0	0	0	0	5:35 PM	0	0	1	0	1
5:40 PM	0	2	4	1	7	5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0
5:45 PM	0	2	1	1	4	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
5:50 PM	0	1	2	1	4	5:50 PM	0	1	0	0	1	5:50 PM	0	0	0	0	0
5:55 PM	0	1	1	1	3	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	22	27	43	30	122	Count Total	0	1	0	0	1	Count Total	0	1	1	1	3
Peak Hour	22	11	19	20	72	Peak Hour	0	0	0	0	0	Peak Hour	0	1	0	0	1

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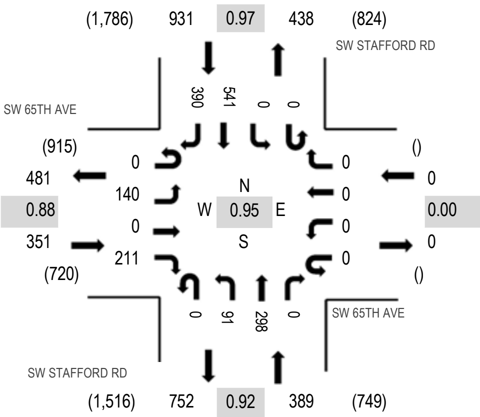
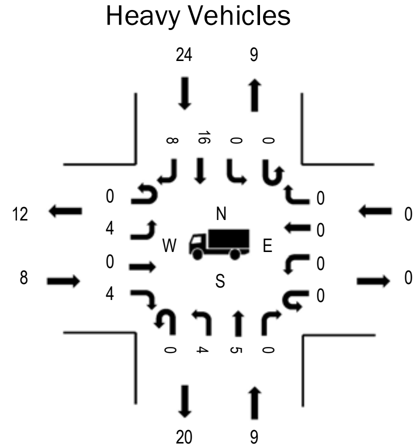
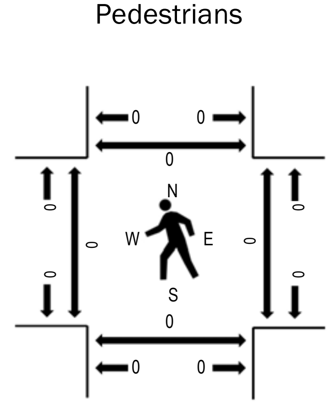
Location: 2 SW STAFFORD RD & SW 65TH AVE PM
Date: Wednesday, May 18, 2022
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:10 PM - 04:25 PM

DRAFT

Peak Hour







Note: Total study counts contained in parentheses.

	HV%	PHF
EB	2.3%	0.88
WB	0.0%	0.00
NB	2.3%	0.92
SB	2.6%	0.97
All	2.5%	0.95

Traffic Counts - Motorized Vehicles

Interval	SW 65TH AVE Eastbound				SW 65TH AVE Westbound				SW STAFFORD RD Northbound				SW STAFFORD RD Southbound					Rolling
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Hour
4:00 PM	0	9	0	9	0	0	0	0	0	13	19	0	0	0	52	37	139	1,671
4:05 PM	0	11	0	21	0	0	0	0	0	9	24	0	0	0	34	36	135	1,659
4:10 PM	0	12	0	16	0	0	0	0	0	8	30	0	0	0	48	38	152	1,666
4:15 PM	0	18	0	13	0	0	0	0	0	1	31	0	0	0	43	42	148	1,657
4:20 PM	0	17	0	13	0	0	0	0	0	12	24	0	0	0	45	31	142	1,652
4:25 PM	0	12	0	27	0	0	0	0	0	5	22	0	0	0	36	28	130	1,651
4:30 PM	0	7	0	17	0	0	0	0	0	8	22	0	0	0	49	35	138	1,652
4:35 PM	0	10	0	30	0	0	0	0	0	7	24	0	0	0	43	21	135	1,644
4:40 PM	0	11	0	13	0	0	0	0	0	4	26	0	0	0	47	34	135	1,670
4:45 PM	0	9	0	16	0	0	0	0	0	8	28	0	0	0	50	31	142	1,656
4:50 PM	0	9	0	23	0	0	0	0	0	9	26	0	0	0	48	25	140	1,622
4:55 PM	0	15	0	13	0	0	0	0	0	7	22	0	0	0	46	32	135	1,604
5:00 PM	0	11	0	18	0	0	0	0	0	8	16	0	0	0	47	27	127	1,584
5:05 PM	0	7	0	21	0	0	0	0	0	7	26	0	0	0	52	29	142	
5:10 PM	0	13	0	16	0	0	0	0	0	12	21	0	0	0	49	32	143	
5:15 PM	0	12	0	22	0	0	0	0	0	5	25	0	0	0	41	38	143	
5:20 PM	0	17	0	13	0	0	0	0	0	15	23	0	0	0	48	25	141	
5:25 PM	0	9	0	14	0	0	0	0	0	8	20	0	0	0	55	25	131	
5:30 PM	0	12	0	26	0	0	0	0	0	7	28	0	0	0	30	27	130	
5:35 PM	0	11	0	25	0	0	0	0	0	10	17	0	0	0	48	50	161	
5:40 PM	0	9	0	25	0	0	0	0	0	8	18	0	0	0	37	24	121	
5:45 PM	0	12	0	26	0	0	0	0	0	14	10	0	0	0	33	13	108	
5:50 PM	0	11	0	15	0	0	0	0	0	7	24	0	0	0	43	22	122	
5:55 PM	0	7	0	17	0	0	0	0	0	4	27	0	0	0	43	17	115	
Count Total	0	271	0	449	0	0	0	0	0	196	553	0	0	0	1,067	719	3,255	
Peak Hour	0	140	0	211	0	0	0	0	0	91	298	0	0	0	541	390	1,671	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles EB	NB	WB	SB	Total	Interval Start Time	Bicycles on Roadway EB	NB	WB	SB	Total	Interval Start Time	Pedestrians/Bicycles on Crosswalk EB	NB	WB	SB	Total
4:00 PM	1	2	0	2	5	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:05 PM	0	2	0	2	4	4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	0	0
4:10 PM	0	1	0	2	3	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0
4:15 PM	0	0	0	4	4	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0
4:25 PM	1	0	0	1	2	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	0	0	0	3	3	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	2	0	0	2	4	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	0	1	0	2	3	4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0
4:45 PM	0	1	0	1	2	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
4:50 PM	4	0	0	0	4	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	0	2	0	5	7	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	2	2	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	2	2	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	0	1	0	2	3	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	1	0	0	3	4	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	2	2	5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0
5:40 PM	0	1	0	0	1	5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	9	11	0	35	55	Count Total	0	0	0	0	0	Count Total	0	0	0	0	0
Peak Hour	8	9	0	24	41	Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0

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Location: 3 SW 60TH AVE & SW ADVANCE RD PM

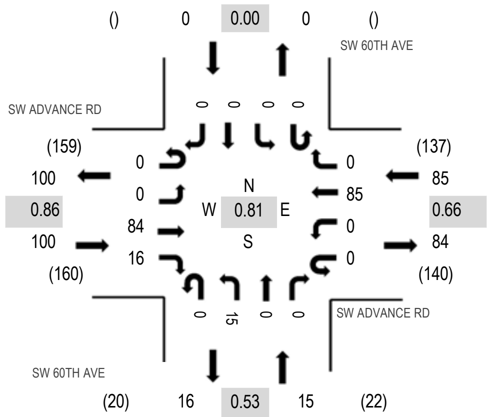
Date: Wednesday, May 18, 2022

Peak Hour: 04:20 PM - 05:20 PM

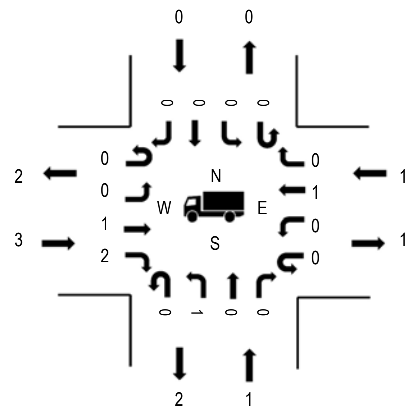
Peak 15-Minutes: 04:40 PM - 04:55 PM

Peak Hour

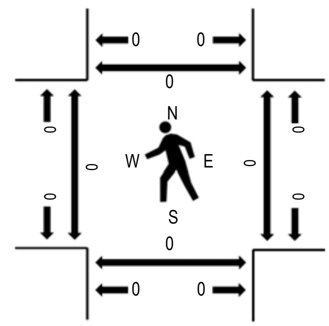
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	3.0%	0.86
WB	1.2%	0.66
NB	6.7%	0.53
SB	0.0%	0.00
All	2.5%	0.81

Traffic Counts - Motorized Vehicles

Interval	SW ADVANCE RD Eastbound				SW ADVANCE RD Westbound				SW 60TH AVE Northbound				SW 60TH AVE Southbound					Rolling
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Hour
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	158
4:05 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	179
4:10 PM	0	0	9	0	0	0	6	0	0	1	0	0	0	0	0	0	16	189
4:15 PM	0	0	4	2	0	0	3	0	0	0	0	0	0	0	0	0	9	193
4:20 PM	0	0	12	0	0	0	5	0	0	0	0	0	0	0	0	0	17	200
4:25 PM	0	0	6	2	0	0	3	0	0	3	0	0	0	0	0	0	14	196
4:30 PM	0	0	6	2	0	0	5	0	0	1	0	0	0	0	0	0	14	194
4:35 PM	0	0	5	1	0	0	6	0	0	1	0	0	0	0	0	0	13	193
4:40 PM	0	0	9	1	0	0	9	0	0	4	0	0	0	0	0	0	23	192
4:45 PM	0	0	2	1	0	0	14	0	0	3	0	0	0	0	0	0	20	180
4:50 PM	0	0	6	2	0	0	10	0	0	1	0	0	0	0	0	0	19	164
4:55 PM	0	0	6	1	0	0	6	0	0	0	0	0	0	0	0	0	13	161
5:00 PM	0	0	11	2	0	0	8	0	0	0	0	0	0	0	0	0	21	161
5:05 PM	0	0	5	1	0	0	4	0	0	0	0	0	0	0	0	0	10	
5:10 PM	0	0	10	0	0	0	9	0	0	1	0	0	0	0	0	0	20	
5:15 PM	0	0	6	3	0	0	6	0	0	1	0	0	0	0	0	0	16	
5:20 PM	0	0	6	1	0	0	4	0	0	2	0	0	0	0	0	0	13	
5:25 PM	0	0	3	0	0	0	6	0	0	3	0	0	0	0	0	0	12	
5:30 PM	0	0	8	0	0	0	4	0	0	1	0	0	0	0	0	0	13	
5:35 PM	0	0	5	0	0	0	7	0	0	0	0	0	0	0	0	0	12	
5:40 PM	0	0	5	0	0	0	6	0	0	0	0	0	0	0	0	0	11	
5:45 PM	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4	
5:50 PM	0	0	10	0	0	0	6	0	0	0	0	0	0	0	0	0	16	
5:55 PM	0	0	6	1	0	0	6	0	0	0	0	0	0	0	0	0	13	
Count Total	0	0	140	20	0	0	137	0	0	22	0	0	0	0	0	0	319	
Peak Hour	0	0	84	16	0	0	85	0	0	15	0	0	0	0	0	0	200	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0
4:15 PM	1	0	0	0	1	4:15 PM	1	0	0	0	1	4:15 PM	0	0	0	0	0
4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0
4:25 PM	0	1	0	0	1	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	1	0	0	0	1	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	0	0	1	0	1	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0
5:00 PM	1	0	0	0	1	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	1	0	0	0	1	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0	5:25 PM	1	0	0	0	1	5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	0	0	1	0	1	5:35 PM	0	1	0	0	1	5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0
5:55 PM	1	0	0	0	1	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	5	1	2	0	8	Count Total	2	1	0	0	3	Count Total	0	0	0	0	0
Peak Hour	3	1	1	0	5	Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0

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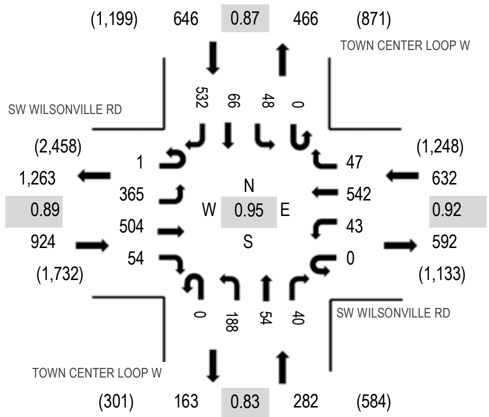
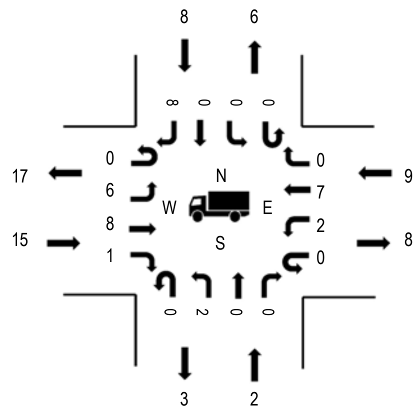
Location: 4 TOWN CENTER LOOP W & SW WILSONVILLE RD PM
Date: Wednesday, May 18, 2022
Peak Hour: 04:05 PM - 05:05 PM
Peak 15-Minutes: 04:35 PM - 04:50 PM

Peak Hour

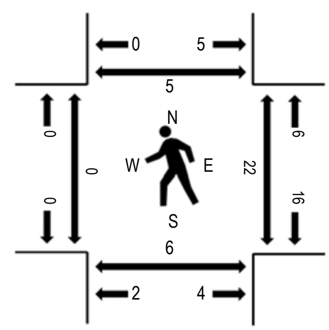
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	1.6%	0.89
WB	1.4%	0.92
NB	0.7%	0.83
SB	1.2%	0.87
All	1.4%	0.95

Traffic Counts - Motorized Vehicles

Interval Start Time	SW WILSONVILLE RD Eastbound U-Turn	Left	Thru	Right	SW WILSONVILLE RD Westbound U-Turn	Left	Thru	Right	TOWN CENTER LOOP W Northbound U-Turn	Left	Thru	Right	TOWN CENTER LOOP W Southbound U-Turn	Left	Thru	Right	Total	Rolling Hour
4:00 PM	0	27	36	3	0	0	50	0	0	15	6	1	0	1	0	27	166	2,446
4:05 PM	0	31	47	5	0	6	44	3	0	10	6	4	0	5	4	60	225	2,484
4:10 PM	0	40	40	2	0	2	24	6	0	13	7	2	0	2	7	36	181	2,468
4:15 PM	0	30	33	2	0	6	44	2	0	20	6	3	0	6	4	50	206	2,463
4:20 PM	0	32	31	2	0	4	52	3	0	16	4	5	0	2	4	39	194	2,450
4:25 PM	0	26	42	3	0	2	42	6	0	12	4	1	0	5	8	54	205	2,458
4:30 PM	0	28	40	6	0	0	38	4	0	22	4	3	0	3	6	58	212	2,454
4:35 PM	0	29	36	7	0	1	58	5	0	16	4	4	0	4	3	45	212	2,445
4:40 PM	0	45	49	2	0	4	40	3	0	17	5	2	0	2	6	35	210	2,417
4:45 PM	0	33	47	5	0	5	59	4	0	15	2	4	0	7	6	42	229	2,396
4:50 PM	0	26	46	7	0	4	38	3	0	19	4	6	0	5	8	36	202	2,386
4:55 PM	0	26	51	9	0	6	42	4	0	13	3	2	0	5	6	37	204	2,352
5:00 PM	1	19	42	4	0	3	61	4	0	15	5	4	0	2	4	40	204	2,317
5:05 PM	0	19	47	3	0	3	37	2	0	24	8	1	0	4	4	57	209	
5:10 PM	0	13	24	3	0	2	50	9	0	23	5	3	0	5	6	33	176	
5:15 PM	0	23	37	3	0	1	54	1	0	20	9	3	0	1	3	38	193	
5:20 PM	0	23	47	8	1	2	51	3	0	20	3	1	0	4	7	32	202	
5:25 PM	0	31	44	3	0	1	36	1	0	19	8	2	0	3	12	41	201	
5:30 PM	0	21	41	3	0	1	52	6	0	17	7	6	0	3	3	43	203	
5:35 PM	0	26	43	2	0	2	48	6	0	7	4	5	1	1	9	30	184	
5:40 PM	0	26	32	10	0	2	38	7	0	20	4	2	0	3	4	41	189	
5:45 PM	0	34	51	2	0	1	44	5	0	19	7	1	0	5	11	39	219	
5:50 PM	0	18	27	1	0	4	50	4	0	15	4	3	0	3	6	33	168	
5:55 PM	0	28	44	5	0	3	35	4	0	7	2	1	0	5	5	30	169	
Count Total	1	654	977	100	1	65	1,087	95	0	394	121	69	1	86	136	976	4,763	
Peak Hour	1	365	504	54	0	43	542	47	0	188	54	40	0	48	66	532	2,484	

DRAFT

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	2	0	0	0	2	4:00 PM	0	0	0	0	0	4:00 PM	0	0	1	0	1
4:05 PM	3	0	0	0	3	4:05 PM	0	0	0	0	0	4:05 PM	0	2	1	1	4
4:10 PM	2	0	0	2	4	4:10 PM	0	0	0	0	0	4:10 PM	0	1	5	0	6
4:15 PM	2	0	0	0	2	4:15 PM	0	0	0	0	0	4:15 PM	0	1	4	0	5
4:20 PM	0	0	2	1	3	4:20 PM	0	0	0	0	0	4:20 PM	0	0	2	2	4
4:25 PM	0	1	0	1	2	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	0	0	0	1	1	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	1	0	0	0	1	4:35 PM	0	0	0	0	0	4:35 PM	0	0	2	0	2
4:40 PM	5	0	2	1	8	4:40 PM	0	0	0	0	0	4:40 PM	0	1	2	1	4
4:45 PM	0	0	2	1	3	4:45 PM	0	0	0	0	0	4:45 PM	0	0	2	0	2
4:50 PM	1	0	0	0	1	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	1	1	2	0	4	4:55 PM	0	0	0	0	0	4:55 PM	0	0	3	2	5
5:00 PM	0	0	1	1	2	5:00 PM	0	0	0	0	0	5:00 PM	0	1	2	0	3
5:05 PM	2	1	2	1	6	5:05 PM	0	0	0	0	0	5:05 PM	0	1	0	0	1
5:10 PM	3	1	2	0	6	5:10 PM	0	0	0	0	0	5:10 PM	0	0	1	0	1
5:15 PM	1	0	1	2	4	5:15 PM	1	0	0	0	1	5:15 PM	0	0	2	0	2
5:20 PM	1	0	2	0	3	5:20 PM	0	0	0	0	0	5:20 PM	0	0	3	0	3
5:25 PM	1	0	1	1	3	5:25 PM	0	0	0	1	1	5:25 PM	0	2	4	0	6
5:30 PM	0	1	0	0	1	5:30 PM	0	0	0	0	0	5:30 PM	0	1	4	1	6
5:35 PM	1	0	0	0	1	5:35 PM	1	0	0	0	1	5:35 PM	0	3	0	1	4
5:40 PM	1	0	0	1	2	5:40 PM	0	0	0	0	0	5:40 PM	0	2	3	1	6
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0	5:50 PM	0	0	2	1	3
5:55 PM	0	0	1	1	2	5:55 PM	0	0	0	0	0	5:55 PM	0	0	9	3	12
Count Total	27	5	18	14	64	Count Total	2	0	0	1	3	Count Total	0	15	52	13	80
Peak Hour	15	2	9	8	34	Peak Hour	0	0	0	0	0	Peak Hour	0	6	23	6	35

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 5 I-5 NB RAMPS & SW WILSONVILLE RD PM

Date: Wednesday, May 18, 2022

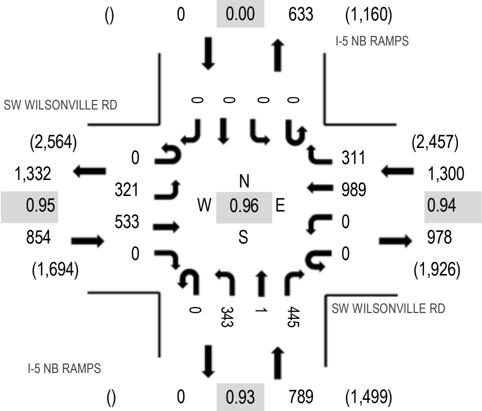
Peak Hour: 04:15 PM - 05:15 PM

Peak 15-Minutes: 04:35 PM - 04:50 PM

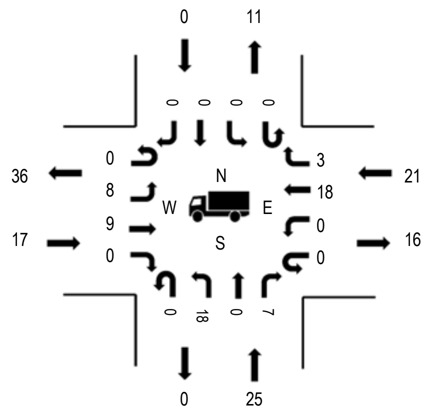
DRAFT

Peak Hour

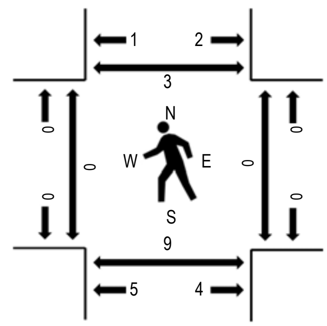
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	2.0%	0.95
WB	1.6%	0.94
NB	3.2%	0.93
SB	0.0%	0.00
All	2.1%	0.96

Traffic Counts - Motorized Vehicles

Interval Start Time	SW WILSONVILLE RD Eastbound				SW WILSONVILLE RD Westbound				I-5 NB RAMPS Northbound				I-5 NB RAMPS Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	21	40	0	0	0	72	20	0	29	0	23	0	0	0	0	205	2,877
4:05 PM	0	29	57	0	0	0	82	32	0	13	0	38	0	0	0	0	251	2,913
4:10 PM	0	19	49	0	0	0	60	12	0	36	0	31	0	0	0	0	207	2,910
4:15 PM	0	32	44	0	0	0	64	51	0	34	0	43	0	0	0	0	268	2,943
4:20 PM	0	36	28	0	0	0	79	27	0	27	0	38	0	0	0	0	235	2,906
4:25 PM	0	28	42	0	0	0	90	19	0	19	0	35	0	0	0	0	233	2,915
4:30 PM	0	18	48	0	0	0	92	26	0	25	0	35	0	0	0	0	244	2,907
4:35 PM	0	29	40	0	0	0	70	49	0	29	0	47	0	0	0	0	264	2,904
4:40 PM	0	31	53	0	0	0	83	7	0	21	0	41	0	0	0	0	236	2,855
4:45 PM	0	22	51	0	0	0	99	19	0	40	0	34	0	0	0	0	265	2,839
4:50 PM	0	21	51	0	0	0	75	18	0	31	0	39	0	0	0	0	235	2,821
4:55 PM	0	23	53	0	0	0	69	23	0	28	0	38	0	0	0	0	234	2,781
5:00 PM	0	24	45	0	0	0	86	30	0	22	0	34	0	0	0	0	241	2,773
5:05 PM	0	24	48	0	0	0	111	7	0	26	1	31	0	0	0	0	248	
5:10 PM	0	33	30	0	0	0	71	35	0	41	0	30	0	0	0	0	240	
5:15 PM	0	20	31	0	0	0	78	34	0	33	0	35	0	0	0	0	231	
5:20 PM	0	17	58	0	0	0	82	21	0	32	0	34	0	0	0	0	244	
5:25 PM	0	16	50	0	0	0	83	13	0	24	1	38	0	0	0	0	225	
5:30 PM	0	27	44	0	0	0	67	45	0	26	0	32	0	0	0	0	241	
5:35 PM	0	29	51	0	0	0	62	23	0	25	1	24	0	0	0	0	215	
5:40 PM	0	16	41	0	0	0	88	10	0	35	0	30	0	0	0	0	220	
5:45 PM	0	25	53	0	0	0	89	14	0	27	0	39	0	0	0	0	247	
5:50 PM	0	24	35	0	0	0	57	21	0	33	0	25	0	0	0	0	195	
5:55 PM	0	25	63	0	0	0	81	11	0	18	1	27	0	0	0	0	226	
Count Total	0	589	1,105	0	0	0	1,890	567	0	674	4	821	0	0	0	0	5,650	
Peak Hour	0	321	533	0	0	0	989	311	0	343	1	445	0	0	0	0	2,943	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	3	2	0	0	5	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	1	1
4:05 PM	3	1	0	0	4	4:05 PM	0	0	0	0	0	4:05 PM	0	1	0	1	2
4:10 PM	3	2	1	0	6	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	2	2
4:15 PM	2	4	1	0	7	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:20 PM	3	1	2	0	6	4:20 PM	0	0	0	0	0	4:20 PM	0	1	0	0	1
4:25 PM	1	1	3	0	5	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	0	0	1	0	1	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	0	1	0	0	1	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	5	3	0	0	8	4:40 PM	0	0	0	0	0	4:40 PM	0	3	0	1	4
4:45 PM	1	4	5	0	10	4:45 PM	0	0	0	0	0	4:45 PM	0	4	0	0	4
4:50 PM	1	3	0	0	4	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	4	4
4:55 PM	2	1	2	0	5	4:55 PM	0	0	0	0	0	4:55 PM	0	1	0	0	1
5:00 PM	0	2	2	0	4	5:00 PM	0	0	0	0	0	5:00 PM	0	2	0	0	2
5:05 PM	1	1	3	0	5	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	1	4	2	0	7	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	2	1	3	0	6	5:15 PM	0	0	0	0	0	5:15 PM	0	2	0	1	3
5:20 PM	0	3	2	0	5	5:20 PM	0	0	0	0	0	5:20 PM	0	1	0	0	1
5:25 PM	0	3	2	0	5	5:25 PM	0	0	0	0	0	5:25 PM	0	2	0	0	2
5:30 PM	1	0	1	0	2	5:30 PM	0	0	0	0	0	5:30 PM	0	1	0	2	3
5:35 PM	2	1	0	0	3	5:35 PM	1	0	0	0	1	5:35 PM	0	3	0	0	3
5:40 PM	2	3	0	0	5	5:40 PM	0	0	0	0	0	5:40 PM	0	3	0	0	3
5:45 PM	2	0	1	0	3	5:45 PM	0	0	0	0	0	5:45 PM	0	1	0	2	3
5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0
5:55 PM	0	0	2	0	2	5:55 PM	0	0	0	0	0	5:55 PM	0	1	0	2	3
Count Total	35	41	33	0	109	Count Total	1	0	0	0	1	Count Total	0	26	0	16	42
Peak Hour	17	25	21	0	63	Peak Hour	0	0	0	0	0	Peak Hour	0	11	0	5	16

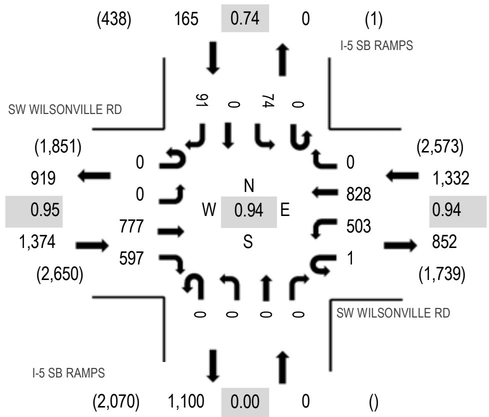
ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 6 I-5 SB RAMPS & SW WILSONVILLE RD PM
Date: Wednesday, May 18, 2022
Peak Hour: 04:15 PM - 05:15 PM
Peak 15-Minutes: 04:35 PM - 04:50 PM

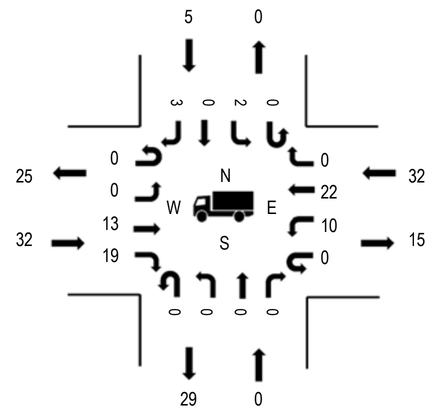
DRAFT

Peak Hour

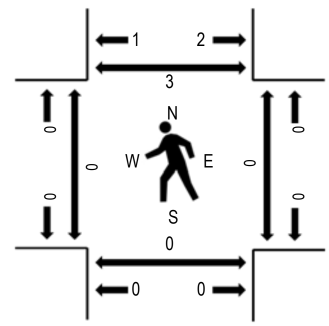
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	2.3%	0.95
WB	2.4%	0.94
NB	0.0%	0.00
SB	3.0%	0.74
All	2.4%	0.94

Traffic Counts - Motorized Vehicles

Interval	SW WILSONVILLE RD Eastbound				SW WILSONVILLE RD Westbound				I-5 SB RAMPS Northbound				I-5 SB RAMPS Southbound					Rolling
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Hour
4:00 PM	0	0	72	61	0	40	69	0	0	0	0	0	0	10	0	10	262	2,863
4:05 PM	0	0	73	49	0	38	63	0	0	0	0	0	0	7	0	5	235	2,849
4:10 PM	0	0	67	47	0	32	57	0	0	0	0	0	0	9	0	7	219	2,870
4:15 PM	0	0	65	60	0	27	77	0	0	0	0	0	0	6	0	8	243	2,871
4:20 PM	0	0	56	58	1	48	65	0	0	0	0	0	0	7	0	13	248	2,860
4:25 PM	0	0	77	36	0	51	51	0	0	0	0	0	0	3	0	8	226	2,841
4:30 PM	0	0	56	53	0	37	63	0	0	0	0	0	0	5	0	9	223	2,813
4:35 PM	0	0	71	61	0	45	86	0	0	0	0	0	0	6	0	7	276	2,870
4:40 PM	0	0	76	52	0	48	64	0	0	0	0	0	0	4	0	4	248	2,832
4:45 PM	0	0	65	40	0	47	71	0	0	0	0	0	0	8	0	7	238	2,808
4:50 PM	0	0	55	36	0	33	68	0	0	0	0	0	0	6	0	4	202	2,762
4:55 PM	0	0	77	44	0	42	69	0	0	0	0	0	0	6	0	5	243	2,811
5:00 PM	0	0	68	49	0	44	72	0	0	0	0	0	0	5	0	10	248	2,798
5:05 PM	0	0	70	50	0	44	74	0	0	0	0	0	0	9	0	9	256	
5:10 PM	0	0	41	58	0	37	68	0	0	0	0	0	0	9	0	7	220	
5:15 PM	0	0	54	38	0	52	75	0	0	0	0	0	0	3	0	10	232	
5:20 PM	0	0	66	37	0	44	55	1	0	0	0	0	0	10	0	16	229	
5:25 PM	0	0	51	36	0	38	56	0	0	0	0	0	0	8	0	9	198	
5:30 PM	0	0	88	57	0	38	71	0	0	0	0	0	0	10	0	16	280	
5:35 PM	0	0	63	42	0	33	78	0	0	0	0	0	0	6	0	16	238	
5:40 PM	0	0	60	32	0	44	60	0	0	0	0	0	0	13	0	15	224	
5:45 PM	0	0	48	31	0	27	62	0	0	0	0	0	0	9	0	15	192	
5:50 PM	0	0	70	37	0	45	72	0	0	0	0	0	0	8	0	19	251	
5:55 PM	0	0	60	37	0	35	56	0	0	0	0	0	0	22	0	20	230	
Count Total	0	0	1,549	1,101	1	969	1,602	1	0	0	0	0	0	189	0	249	5,661	
Peak Hour	0	0	777	597	1	503	828	0	0	0	0	0	0	74	0	91	2,871	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	6	0	2	3	11	4:00 PM	0	0	0	0	0	4:00 PM	1	0	0	2	3
4:05 PM	2	0	0	2	4	4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	2	2
4:10 PM	8	0	4	2	14	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0
4:15 PM	3	0	2	1	6	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:20 PM	5	0	5	0	10	4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0
4:25 PM	1	0	1	0	2	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	2	0	1	0	3	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	7	0	0	0	7	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	1	1
4:40 PM	7	0	7	1	15	4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0
4:45 PM	0	0	3	1	4	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	2	2
4:50 PM	2	0	5	1	8	4:50 PM	0	0	0	0	0	4:50 PM	1	0	0	1	2
4:55 PM	1	0	1	0	2	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0
5:00 PM	1	0	2	0	3	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:05 PM	2	0	1	1	4	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	1	0	4	0	5	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	1	1
5:15 PM	3	0	4	1	8	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	0	0	4	0	4	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	1	0	0	0	1	5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0
5:30 PM	2	0	1	3	6	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	2	2
5:35 PM	2	0	1	0	3	5:35 PM	1	0	0	0	1	5:35 PM	0	0	0	0	0
5:40 PM	6	0	3	1	10	5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	2	2
5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	1	1
5:55 PM	2	0	2	1	5	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	1	1
Count Total	64	0	53	18	135	Count Total	1	0	0	0	1	Count Total	2	0	0	15	17
Peak Hour	32	0	32	5	69	Peak Hour	0	0	0	0	0	Peak Hour	1	0	0	5	6

LOS DESCRIPTION

TRAFFIC LEVELS OF SERVICE

Analysis of traffic volumes is useful in understanding the general nature of traffic in an area, but by itself indicates neither the ability of the street network to carry additional traffic nor the quality of service afforded by the street facilities. For this, the concept of level of service has been developed to subjectively describe traffic performance. Level of service can be measured at intersections and along key roadway segments.

Levels of service categories are similar to report card ratings for traffic performance. Intersections are typically the controlling bottlenecks of traffic flow and the ability of a roadway system to carry traffic efficiently is generally diminished in their vicinities. Levels of Service A, B and C indicate conditions where traffic moves without significant delays over periods of peak travel demand. Level of service D and E are progressively worse peak hour operating conditions and F conditions represent where demand exceeds the capacity of an intersection. Most urban communities set level of service D as the minimum acceptable level of service for peak hour operation and plan for level of service C or better for all other times of the day. The Highway Capacity Manual provides level of service calculation methodology for both intersections and arterials[1]. The following two sections provide interpretations of the analysis approaches.

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[1] *2000 Highway Capacity Manual*, Transportation Research Board, Washington D.C., 2000, Chapter 16 and 17.

UNSIGNALIZED INTERSECTIONS (Two-Way Stop Controlled)

Unsignalized intersection level of service is reported for the major street and minor street (generally, left turn movements). The method assesses available and critical gaps in the traffic stream which make it possible for side street traffic to enter the main street flow. The 2010 Highway Capacity Manual describes the detailed methodology. It is not unusual for an intersection to experience level of service E or F conditions for the minor street left turn movement. It should be understood that, often, a poor level of service is experienced by only a few vehicles and the intersection as a whole operates acceptably.

Unsignalized intersection levels of service are described in the following table.

Level-of-Service Criteria: Automobile Mode

Control Delay (s/vehicle)	LOS by Volume-to-Capacity Ratio	
	$v/c \leq 1.0$	$v/c > 1.0$
0-10	A	F
>10-15	B	F
>15-25	C	F
>25-35	D	F
>35-50	E	F
>50	F	F

Note: The LOS criteria apply to each lane on a given approach and to each approach on the minor street. LOS is not calculated for major-street approaches or for the intersection as a whole

SIGNALIZED INTERSECTIONS

For signalized intersections, level of service is evaluated based upon average vehicle delay experienced by vehicles entering an intersection. Control delay (or signal delay) includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. In previous versions of this chapter of the HCM (1994 and earlier), delay included only stopped delay. As delay increases, the level of service decreases. Calculations for signalized and unsignalized intersections are different due to the variation in traffic control. The 2000 Highway Capacity Manual provides the basis for these calculations.

Level of Service	Delay (secs.)	Description
A	<10.00	**Free Flow/Insignificant Delays:** No approach phase is fully utilized by traffic and no vehicle waits longer than one red indication. Most vehicles do not stop at all. Progression is extremely favorable and most vehicles arrive during the green phase.
B	10.1-20.0	**Stable Operation/Minimal Delays:** An occasional approach phase is fully utilized. Many drivers begin to feel somewhat restricted within platoons of vehicles. This level generally occurs with good progression, short cycle lengths, or both.
C	20.1-35.0	**Stable Operation/Acceptable Delays:** Major approach phases fully utilized. Most drivers feel somewhat restricted. Higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, and the number of vehicles stopping is significant.
D	35.1-55.0	**Approaching Unstable/Tolerable Delays:** The influence of congestion becomes more noticeable. Drivers may have to wait through more than one red signal indication. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. The proportion of vehicles not stopping declines, and individual cycle failures are noticeable.
E	55.1-80.0	**Unstable Operation/Significant Delays:** Volumes at or near capacity. Vehicles may wait though several signal cycles. Long queues form upstream from intersection. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are a frequent occurrence.
F	>80.0	**Forced Flow/Excessive Delays:** Represents jammed conditions. Queues may block upstream intersections. This level occurs when arrival flow rates exceed intersection capacity, and is considered to be unacceptable to most drivers. Poor progression, long cycle lengths, and v/c ratios approaching 1.0 may contribute to these high delay levels.

Source: *2000 Highway Capacity Manual*, Transportation Research Board, Washington D.C.

EXISTING 2022 HCM REPORTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1001	858	0	698	349	0	0	0	385	58	562
Future Volume (veh/h)	0	1001	858	0	698	349	0	0	0	385	58	562
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1826	1856	0	1826	1900				1856	1870	1678
Adj Flow Rate, veh/h	0	1076	0	0	751	0				458	0	547
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93				0.93	0.93	0.93
Percent Heavy Veh, %	0	5	3	0	5	0				3	2	15
Cap, veh/h	0	1740		0	1740					1492	0	600
Arrive On Green	0.00	0.50	0.00	0.00	1.00	0.00				0.42	0.00	0.42
Sat Flow, veh/h	0	3561	1572	0	3561	1610				3534	0	1422
Grp Volume(v), veh/h	0	1076	0	0	751	0				458	0	547
Grp Sat Flow(s),veh/h/ln	0	1735	1572	0	1735	1610				1767	0	1422
Q Serve(g_s), s	0.0	23.5	0.0	0.0	0.0	0.0				9.0	0.0	37.9
Cycle Q Clear(g_c), s	0.0	23.5	0.0	0.0	0.0	0.0				9.0	0.0	37.9
Prop In Lane	0.00		1.00	0.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1740		0	1740					1492	0	600
V/C Ratio(X)	0.00	0.62		0.00	0.43					0.31	0.00	0.91
Avail Cap(c_a), veh/h	0	1740		0	1740					1818	0	731
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.93	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	18.9	0.0	0.0	0.0	0.0				20.1	0.0	28.5
Incr Delay (d2), s/veh	0.0	1.7	0.0	0.0	0.7	0.0				0.1	0.0	13.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	9.3	0.0	0.0	0.2	0.0				3.6	0.0	14.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	20.6	0.0	0.0	0.7	0.0				20.2	0.0	42.3
LnGrp LOS	A	C		A	A					C	A	D
Approach Vol, veh/h		1076			751						1005	
Approach Delay, s/veh		20.6			0.7						32.3	
Approach LOS		C			A						C	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		56.7		48.3		56.7						
Change Period (Y+Rc), s		5.0		4.0		5.0						
Max Green Setting (Gmax), s		42.0		54.0		42.0						
Max Q Clear Time (g_c+I1), s		25.5		39.9		2.0						
Green Ext Time (p_c), s		5.1		4.4		3.9						

Intersection Summary			
HCM 6th Ctrl Delay			19.5
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.
User approved changes to right turn type.
Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	748	638	0	735	577	312	0	224	0	0	0
Future Volume (veh/h)	0	748	638	0	735	577	312	0	224	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	1870	1826	0	1870	1870	1826	0	1856			
Adj Flow Rate, veh/h	0	779	0	0	766	0	325	0	0			
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96			
Percent Heavy Veh, %	0	2	5	0	2	2	5	0	3			
Cap, veh/h	0	2800		0	2800		426	0				
Arrive On Green	0.00	1.00	0.00	0.00	1.00	0.00	0.13	0.00	0.00			
Sat Flow, veh/h	0	3647	1547	0	3647	1585	3374	0	1572			
Grp Volume(v), veh/h	0	779	0	0	766	0	325	0	0			
Grp Sat Flow(s),veh/h/ln	0	1777	1547	0	1777	1585	1687	0	1572			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	9.8	0.0	0.0			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	9.8	0.0	0.0			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2800		0	2800		426	0				
V/C Ratio(X)	0.00	0.28		0.00	0.27		0.76	0.00				
Avail Cap(c_a), veh/h	0	2800		0	2800		1253	0				
HCM Platoon Ratio	1.00	2.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.78	0.00	0.00	0.89	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	44.3	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.2	0.0	2.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	0.0	0.1	0.0	4.2	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.2	0.0	0.0	0.2	0.0	47.2	0.0	0.0			
LnGrp LOS	A	A		A	A		D	A				
Approach Vol, veh/h		779			766			325				
Approach Delay, s/veh		0.2			0.2			47.2				
Approach LOS		A			A			D				

Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		87.7				87.7		17.3				
Change Period (Y+Rc), s		5.0				5.0		4.0				
Max Green Setting (Gmax), s		57.0				57.0		39.0				
Max Q Clear Time (g_c+I1), s		2.0				2.0		11.8				
Green Ext Time (p_c), s		4.1				4.0		1.5				

Intersection Summary		
HCM 6th Ctrl Delay		8.4
HCM 6th LOS		A

Notes

Unsignalized Delay for [NBR, EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	49	473	450	47	693	36	456	28	50	54	18	163
Future Volume (veh/h)	49	473	450	47	693	36	456	28	50	54	18	163
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1826	1900	1900	1856	1900	1870	1900	1900	1678	1411	1841
Adj Flow Rate, veh/h	54	520	306	52	762	35	523	0	8	59	20	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	5	0	0	3	0	2	0	0	15	33	4
Cap, veh/h	70	1894	1168	68	2702	124	640	0	289	82	68	3
Arrive On Green	0.07	0.91	0.91	0.07	1.00	1.00	0.18	0.00	0.18	0.05	0.05	0.05
Sat Flow, veh/h	1781	3469	1609	1810	4964	227	3563	0	1610	1598	1332	67
Grp Volume(v), veh/h	54	520	306	52	518	279	523	0	8	59	0	21
Grp Sat Flow(s),veh/h/ln	1781	1735	1609	1810	1689	1814	1781	0	1610	1598	0	1399
Q Serve(g_s), s	3.1	1.9	1.6	3.0	0.0	0.0	14.8	0.0	0.4	3.8	0.0	1.5
Cycle Q Clear(g_c), s	3.1	1.9	1.6	3.0	0.0	0.0	14.8	0.0	0.4	3.8	0.0	1.5
Prop In Lane	1.00		1.00	1.00		0.13	1.00		1.00	1.00		0.05
Lane Grp Cap(c), veh/h	70	1894	1168	68	1838	988	640	0	289	82	0	72
V/C Ratio(X)	0.78	0.27	0.26	0.77	0.28	0.28	0.82	0.00	0.03	0.72	0.00	0.29
Avail Cap(c_a), veh/h	161	1894	1168	267	1838	988	950	0	429	228	0	200
HCM Platoon Ratio	1.67	1.67	1.67	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.94	0.94	0.94	0.90	0.90	0.90	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	48.6	2.2	0.8	48.1	0.0	0.0	41.4	0.0	35.5	49.1	0.0	48.0
Incr Delay (d2), s/veh	15.8	0.3	0.5	15.0	0.3	0.6	3.5	0.0	0.0	11.3	0.0	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.6	0.8	1.6	0.1	0.2	6.8	0.0	0.2	1.8	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	64.4	2.5	1.3	63.1	0.3	0.6	44.9	0.0	35.5	60.4	0.0	50.2
LnGrp LOS	E	A	A	E	A	A	D	A	D	E	A	D
Approach Vol, veh/h		880			849			531			80	
Approach Delay, s/veh		5.9			4.3			44.8			57.7	
Approach LOS		A			A			D			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.4	62.3		10.4	8.6	62.2		23.9
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0
Max Green Setting (Gmax), s	15.5	27.0		15.0	9.5	33.0		28.0
Max Q Clear Time (g_c+I1), s	5.0	3.9		5.8	5.1	2.0		16.8
Green Ext Time (p_c), s	0.1	3.9		0.1	0.0	3.7		2.1

Intersection Summary	
HCM 6th Ctrl Delay	15.9
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	331	221	67	412	5	352	3	53	2	5	12
Future Volume (veh/h)	15	331	221	67	412	5	352	3	53	2	5	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1870	1856	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	16	356	171	72	443	5	378	3	4	2	5	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	2	3	0	0	0	0	0	0	0	0
Cap, veh/h	706	1158	1182	733	2396	27	480	101	134	13	33	0
Arrive On Green	0.06	1.00	1.00	0.08	0.66	0.66	0.14	0.14	0.14	0.01	0.02	0.00
Sat Flow, veh/h	1810	1900	1584	1767	3656	41	3510	737	982	535	1338	0
Grp Volume(v), veh/h	16	356	171	72	219	229	378	0	7	7	0	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1584	1767	1805	1893	1755	0	1719	1873	0	0
Q Serve(g_s), s	0.3	0.0	0.0	1.3	5.0	5.0	10.9	0.0	0.4	0.4	0.0	0.0
Cycle Q Clear(g_c), s	0.3	0.0	0.0	1.3	5.0	5.0	10.9	0.0	0.4	0.4	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.02	1.00		0.57	0.29		0.00
Lane Grp Cap(c), veh/h	706	1158	1182	733	1183	1240	480	0	235	47	0	0
V/C Ratio(X)	0.02	0.31	0.14	0.10	0.18	0.19	0.79	0.00	0.03	0.15	0.00	0.00
Avail Cap(c_a), veh/h	805	1158	1182	783	1183	1240	970	0	475	143	0	0
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.95	0.95	0.95	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	6.6	0.0	0.0	4.8	7.1	7.1	43.8	0.0	39.3	50.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.7	0.2	0.0	0.3	0.3	1.1	0.0	0.0	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.2	0.1	0.4	1.8	1.9	4.7	0.0	0.2	0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.6	0.7	0.2	4.8	7.4	7.4	45.0	0.0	39.3	50.9	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	D	A	D	D	A	A
Approach Vol, veh/h		543			520			385			7	
Approach Delay, s/veh		0.7			7.1			44.8			50.9	
Approach LOS		A			A			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	12.0	68.0		6.6	7.2	72.8		18.4
Change Period (Y+Rc), s	5.0	5.0		5.5	5.0	5.0		5.0
Max Green Setting (Gmax), s	10.0	40.0		6.5	8.0	42.0		28.0
Max Q Clear Time (g_c+I1), s	13.3	2.0		2.4	2.3	7.0		12.9
Green Ext Time (p_c), s	0.0	0.5		0.0	0.0	0.3		0.3

Intersection Summary			
HCM 6th Ctrl Delay			14.9
HCM 6th LOS			B

DRAFT

Intersection	
Int Delay, s/veh	59.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	140	211	91	298	541	390
Future Vol, veh/h	140	211	91	298	541	390
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	175	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	2	4	2	3	2
Mvmt Flow	147	222	96	314	569	411

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1281	775	980	0	-	0
Stage 1	775	-	-	-	-	-
Stage 2	506	-	-	-	-	-
Critical Hdwy	6.43	6.22	4.14	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.318	2.236	-	-	-
Pot Cap-1 Maneuver	182	398	696	-	-	-
Stage 1	453	-	-	-	-	-
Stage 2	603	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	157	398	696	-	-	-
Mov Cap-2 Maneuver	157	-	-	-	-	-
Stage 1	390	-	-	-	-	-
Stage 2	603	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	280.3	2.6	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	696	-	247	-	-
HCM Lane V/C Ratio	0.138	-	1.496	-	-
HCM Control Delay (s)	11	-	280.3	-	-
HCM Lane LOS	B	-	F	-	-
HCM 95th %tile Q(veh)	0.5	-	21.7	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	86	267	204	62	246	21	143	161	64	31	334	205
Future Volume (veh/h)	86	267	204	62	246	21	143	161	64	31	334	205
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1870	1900	1900	1885	1900	1900	1900	1900
Adj Flow Rate, veh/h	91	281	183	65	259	18	151	169	51	33	352	191
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	2	0	0	1	0	0	0	0
Cap, veh/h	372	321	209	215	499	35	299	562	170	522	415	225
Arrive On Green	0.05	0.30	0.30	0.04	0.29	0.28	0.08	0.41	0.40	0.03	0.36	0.35
Sat Flow, veh/h	1810	1061	691	1810	1724	120	1810	1381	417	1810	1156	627
Grp Volume(v), veh/h	91	0	464	65	0	277	151	0	220	33	0	543
Grp Sat Flow(s),veh/h/ln	1810	0	1751	1810	0	1844	1810	0	1797	1810	0	1783
Q Serve(g_s), s	2.5	0.0	18.0	1.8	0.0	9.0	3.6	0.0	5.9	0.8	0.0	20.2
Cycle Q Clear(g_c), s	2.5	0.0	18.0	1.8	0.0	9.0	3.6	0.0	5.9	0.8	0.0	20.2
Prop In Lane	1.00		0.39	1.00		0.06	1.00		0.23	1.00		0.35
Lane Grp Cap(c), veh/h	372	0	529	215	0	534	299	0	732	522	0	640
V/C Ratio(X)	0.24	0.00	0.88	0.30	0.00	0.52	0.51	0.00	0.30	0.06	0.00	0.85
Avail Cap(c_a), veh/h	477	0	635	343	0	669	364	0	802	675	0	796
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.3	0.0	23.8	19.2	0.0	21.3	15.9	0.0	14.4	14.1	0.0	21.3
Incr Delay (d2), s/veh	0.3	0.0	11.0	0.6	0.0	0.6	1.0	0.0	0.3	0.0	0.0	7.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	8.3	0.7	0.0	3.6	1.3	0.0	2.2	0.3	0.0	8.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.5	0.0	34.9	19.8	0.0	21.9	16.9	0.0	14.7	14.2	0.0	29.2
LnGrp LOS	B	A	C	B	A	C	B	A	B	B	A	C
Approach Vol, veh/h		555			342			371			576	
Approach Delay, s/veh		32.0			21.5			15.6			28.3	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.4	29.7	6.9	25.7	5.9	33.2	7.8	24.8
Change Period (Y+Rc), s	4.0	4.5	4.0	4.5	4.0	4.5	4.0	4.5
Max Green Setting (Gmax), s	8.0	31.5	8.0	25.5	8.0	31.5	8.0	25.5
Max Q Clear Time (g_c+I1), s	5.6	22.2	3.8	20.0	2.8	7.9	4.5	11.0
Green Ext Time (p_c), s	0.1	3.1	0.0	1.1	0.0	1.7	0.0	1.0

Intersection Summary	
HCM 6th Ctrl Delay	25.6
HCM 6th LOS	C

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Intersection	
Intersection Delay, s/veh	20.3
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	53	250	45	63	255	57	29	92	71	102	155	71
Future Vol, veh/h	53	250	45	63	255	57	29	92	71	102	155	71
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	2	2	2	3	5	0	3	0	0	1	0
Mvmt Flow	59	278	50	70	283	63	32	102	79	113	172	79
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	22.5	23.8	15.2	17
HCM LOS	C	C	C	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	56%	0%	85%	0%	82%	0%	69%
Vol Right, %	0%	44%	0%	15%	0%	18%	0%	31%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	29	163	53	295	63	312	102	226
LT Vol	29	0	53	0	63	0	102	0
Through Vol	0	92	0	250	0	255	0	155
RT Vol	0	71	0	45	0	57	0	71
Lane Flow Rate	32	181	59	328	70	347	113	251
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.077	0.395	0.131	0.675	0.155	0.708	0.26	0.525
Departure Headway (Hd)	8.627	7.847	8.004	7.415	7.982	7.355	8.257	7.533
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	414	456	446	485	448	489	434	477
Service Time	6.414	5.634	5.782	5.192	5.759	5.131	6.037	5.313
HCM Lane V/C Ratio	0.077	0.397	0.132	0.676	0.156	0.71	0.26	0.526
HCM Control Delay	12.1	15.7	12	24.4	12.2	26.2	13.9	18.4
HCM Lane LOS	B	C	B	C	B	D	B	C
HCM 95th-tile Q	0.2	1.9	0.4	5	0.5	5.5	1	3

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	186	65	111	57	43	14	71	204	53	20	438	234
Future Volume (veh/h)	186	65	111	57	43	14	71	204	53	20	438	234
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.93		0.90	0.90		0.88	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1870	1885	1826	1900	1900	1885	1885	1870	1826	1885	1856
Adj Flow Rate, veh/h	188	66	18	58	43	1	72	206	45	20	442	216
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	1	2	1	5	0	0	1	1	2	5	1	3
Cap, veh/h	483	384	297	362	246	6	271	681	149	551	512	250
Arrive On Green	0.12	0.21	0.21	0.05	0.13	0.13	0.05	0.46	0.45	0.02	0.43	0.42
Sat Flow, veh/h	1795	1870	1445	1739	1842	43	1795	1491	326	1739	1195	584
Grp Volume(v), veh/h	188	66	18	58	0	44	72	0	251	20	0	658
Grp Sat Flow(s),veh/h/ln	1795	1870	1445	1739	0	1885	1795	0	1817	1739	0	1778
Q Serve(g_s), s	4.9	1.7	0.6	1.7	0.0	1.2	1.3	0.0	5.2	0.4	0.0	20.0
Cycle Q Clear(g_c), s	4.9	1.7	0.6	1.7	0.0	1.2	1.3	0.0	5.2	0.4	0.0	20.0
Prop In Lane	1.00		1.00	1.00		0.02	1.00		0.18	1.00		0.33
Lane Grp Cap(c), veh/h	483	384	297	362	0	252	271	0	829	551	0	762
V/C Ratio(X)	0.39	0.17	0.06	0.16	0.00	0.17	0.27	0.00	0.30	0.04	0.00	0.86
Avail Cap(c_a), veh/h	555	743	574	409	0	590	308	0	1277	635	0	1251
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.9	19.4	19.0	20.5	0.0	22.8	12.5	0.0	10.2	9.6	0.0	15.5
Incr Delay (d2), s/veh	0.4	0.2	0.1	0.2	0.0	0.2	0.4	0.0	0.2	0.0	0.0	3.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.7	0.2	0.6	0.0	0.5	0.5	0.0	1.8	0.1	0.0	7.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.3	19.6	19.1	20.6	0.0	23.1	12.9	0.0	10.4	9.6	0.0	19.1
LnGrp LOS	B	B	B	C	A	C	B	A	B	A	A	B
Approach Vol, veh/h		272			102			323			678	
Approach Delay, s/veh		17.9			21.7			11.0			18.8	
Approach LOS		B			C			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.8	29.5	11.2	11.9	5.1	31.1	7.0	16.2
Change Period (Y+Rc), s	4.0	4.5	4.5	4.5	4.0	4.5	4.5	4.5
Max Green Setting (Gmax), s	4.0	41.3	9.1	18.1	4.0	41.3	4.1	23.1
Max Q Clear Time (g_c+I1), s	3.3	22.0	6.9	3.2	2.4	7.2	3.7	3.7
Green Ext Time (p_c), s	0.0	3.0	0.1	0.1	0.0	1.0	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	17.0
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	84	16	2	85	15	2
Future Vol, veh/h	84	16	2	85	15	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	1	12	0	1	7	0
Mvmt Flow	104	20	2	105	19	2

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	124	0	223	114
Stage 1	-	-	-	-	114	-
Stage 2	-	-	-	-	109	-
Critical Hdwy	-	-	4.1	-	6.47	6.2
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	-	-	2.2	-	3.563	3.3
Pot Cap-1 Maneuver	-	-	1475	-	754	944
Stage 1	-	-	-	-	899	-
Stage 2	-	-	-	-	903	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1475	-	753	944
Mov Cap-2 Maneuver	-	-	-	-	753	-
Stage 1	-	-	-	-	899	-
Stage 2	-	-	-	-	902	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	771	-	-	1475	-
HCM Lane V/C Ratio	0.027	-	-	0.002	-
HCM Control Delay (s)	9.8	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	12	6	4	400	686	11
Future Vol, veh/h	12	6	4	400	686	11
Conflicting Peds, #/hr	0	0	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	25	0	2	0
Mvmt Flow	13	7	4	435	746	12

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1197	754	760	0	-	0
Stage 1	754	-	-	-	-	-
Stage 2	443	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.35	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.425	-	-	-
Pot Cap-1 Maneuver	207	412	757	-	-	-
Stage 1	468	-	-	-	-	-
Stage 2	651	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	205	411	756	-	-	-
Mov Cap-2 Maneuver	205	-	-	-	-	-
Stage 1	464	-	-	-	-	-
Stage 2	650	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.9	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	756	-	246	-	-
HCM Lane V/C Ratio	0.006	-	0.08	-	-
HCM Control Delay (s)	9.8	0	20.9	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Intersection						
Int Delay, s/veh	0.1					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	4	2	410	693	2
Future Vol, veh/h	1	4	2	410	693	2
Conflicting Peds, #/hr	0	0	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	2	50
Mvmt Flow	1	4	2	446	753	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1206	756	757	0	-	0
Stage 1	756	-	-	-	-	-
Stage 2	450	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	205	411	863	-	-	-
Stage 1	467	-	-	-	-	-
Stage 2	647	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	204	410	862	-	-	-
Mov Cap-2 Maneuver	204	-	-	-	-	-
Stage 1	465	-	-	-	-	-
Stage 2	646	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.7	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	862	-	341	-	-
HCM Lane V/C Ratio	0.003	-	0.016	-	-
HCM Control Delay (s)	9.2	0	15.7	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	2	409	2	2	693
Future Vol, veh/h	2	2	409	2	2	693
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	2	2	445	2	2	753

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1203	446	0	0	447	0
Stage 1	446	-	-	-	-	-
Stage 2	757	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	206	617	-	-	1124	-
Stage 1	649	-	-	-	-	-
Stage 2	467	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	205	617	-	-	1124	-
Mov Cap-2 Maneuver	205	-	-	-	-	-
Stage 1	649	-	-	-	-	-
Stage 2	466	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.9	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	308	1124	-
HCM Lane V/C Ratio	-	-	0.014	0.002	-
HCM Control Delay (s)	-	-	16.9	8.2	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	780	597	503	829	0	0	0	0	74	2	91
Future Volume (veh/h)	0	780	597	503	829	0	0	0	0	74	2	91
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1856	1870	1856	0				1856	1900	1856
Adj Flow Rate, veh/h	0	830	0	535	882	0				80	0	9
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	2	3	2	3	0				3	0	3
Cap, veh/h	0	3357		631	3089	0				180	0	155
Arrive On Green	0.00	0.66	0.00	0.12	0.59	0.00				0.05	0.00	0.05
Sat Flow, veh/h	0	5274	1572	3456	3618	0				3534	0	3039
Grp Volume(v), veh/h	0	830	0	535	882	0				80	0	9
Grp Sat Flow(s),veh/h/ln	0	1702	1572	1728	1763	0				1767	0	1520
Q Serve(g_s), s	0.0	7.3	0.0	16.7	13.6	0.0				2.4	0.0	0.3
Cycle Q Clear(g_c), s	0.0	7.3	0.0	16.7	13.6	0.0				2.4	0.0	0.3
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	3357		631	3089	0				180	0	155
V/C Ratio(X)	0.00	0.25		0.85	0.29	0.00				0.44	0.00	0.06
Avail Cap(c_a), veh/h	0	3357		785	3089	0				610	0	525
HCM Platoon Ratio	1.00	1.00	1.00	0.67	0.67	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.93	0.93	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	7.7	0.0	46.8	5.6	0.0				50.7	0.0	49.7
Incr Delay (d2), s/veh	0.0	0.2	0.0	6.8	0.2	0.0				1.7	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.5	0.0	8.0	5.7	0.0				1.1	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	7.9	0.0	53.5	5.8	0.0				52.4	0.0	49.8
LnGrp LOS	A	A		D	A	A				D	A	D
Approach Vol, veh/h		830			1417						89	
Approach Delay, s/veh		7.9			23.9						52.1	
Approach LOS		A			C						D	

Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	24.1	76.3		9.6		100.4						
Change Period (Y+Rc), s	4.0	4.0		4.0		4.0						
Max Green Setting (Gmax), s	25.0	54.0		19.0		75.0						
Max Q Clear Time (g_c+I1), s	18.7	9.3		4.4		15.6						
Green Ext Time (p_c), s	1.4	4.4		0.2		4.8						

Intersection Summary		
HCM 6th Ctrl Delay		19.3
HCM 6th LOS		B

Notes
User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	321	533	0	0	989	311	343	2	445	0	0	0
Future Volume (veh/h)	321	533	0	0	989	311	343	2	445	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1885	1826	1900	1870			
Adj Flow Rate, veh/h	334	555	0	0	1030	0	358	0	180			
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96			
Percent Heavy Veh, %	2	2	0	0	2	1	5	0	2			
Cap, veh/h	407	2822	0	0	3268		463	0	412			
Arrive On Green	0.24	1.00	0.00	0.00	1.00	0.00	0.13	0.00	0.13			
Sat Flow, veh/h	3456	3647	0	0	5274	1598	3478	0	3089			
Grp Volume(v), veh/h	334	555	0	0	1030	0	358	0	180			
Grp Sat Flow(s),veh/h/ln	1728	1777	0	0	1702	1598	1739	0	1545			
Q Serve(g_s), s	10.1	0.0	0.0	0.0	0.0	0.0	10.9	0.0	5.9			
Cycle Q Clear(g_c), s	10.1	0.0	0.0	0.0	0.0	0.0	10.9	0.0	5.9			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	407	2822	0	0	3268		463	0	412			
V/C Ratio(X)	0.82	0.20	0.00	0.00	0.32		0.77	0.00	0.44			
Avail Cap(c_a), veh/h	785	2822	0	0	3268		949	0	842			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00			
Upstream Filter(I)	0.97	0.97	0.00	0.00	0.73	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	41.0	0.0	0.0	0.0	0.0	0.0	46.1	0.0	43.9			
Incr Delay (d2), s/veh	2.5	0.2	0.0	0.0	0.2	0.0	1.7	0.0	0.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	8.9	0.1	0.0	0.0	0.1	0.0	4.8	0.0	2.3			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.5	0.2	0.0	0.0	0.2	0.0	47.8	0.0	44.3			
LnGrp LOS	D	A	A	A	A		D	A	D			
Approach Vol, veh/h		889			1030			538				
Approach Delay, s/veh		16.4			0.2			46.6				
Approach LOS		B			A			D				
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		91.3			16.9	74.4		18.7				
Change Period (Y+Rc), s		4.0			4.0	4.0		4.0				
Max Green Setting (Gmax), s		53.0			25.0	43.0		30.0				
Max Q Clear Time (g_c+I1), s		2.0			12.1	2.0		12.9				
Green Ext Time (p_c), s		6.1			0.9	12.8		1.7				
Intersection Summary												
HCM 6th Ctrl Delay			16.2									
HCM 6th LOS			B									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	365	504	54	43	564	47	188	54	40	48	66	548
Future Volume (veh/h)	365	504	54	43	564	47	188	54	40	48	66	548
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.95	1.00		0.92
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1826	1885	1900	1885	1900	1900	1900	1900	1870
Adj Flow Rate, veh/h	384	531	51	45	594	44	198	57	16	51	139	116
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	5	1	0	1	0	0	0	0	2
Cap, veh/h	445	1912	183	57	1648	122	462	181	51	189	199	153
Arrive On Green	0.26	1.00	1.00	0.03	0.49	0.48	0.13	0.13	0.13	0.10	0.10	0.10
Sat Flow, veh/h	3456	3275	314	1739	3377	250	3591	1408	395	1810	1900	1465
Grp Volume(v), veh/h	384	287	295	45	315	323	198	0	73	51	139	116
Grp Sat Flow(s),veh/h/ln	1728	1777	1812	1739	1791	1835	1795	0	1804	1810	1900	1465
Q Serve(g_s), s	11.7	0.0	0.0	2.8	12.0	12.1	5.6	0.0	4.0	2.9	7.8	8.5
Cycle Q Clear(g_c), s	11.7	0.0	0.0	2.8	12.0	12.1	5.6	0.0	4.0	2.9	7.8	8.5
Prop In Lane	1.00		0.17	1.00		0.14	1.00		0.22	1.00		1.00
Lane Grp Cap(c), veh/h	445	1037	1058	57	874	896	462	0	232	189	199	153
V/C Ratio(X)	0.86	0.28	0.28	0.79	0.36	0.36	0.43	0.00	0.31	0.27	0.70	0.76
Avail Cap(c_a), veh/h	534	1037	1058	111	874	896	914	0	459	296	311	240
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.96	0.96	0.96	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.9	0.0	0.0	52.8	17.5	17.5	44.2	0.0	43.5	45.4	47.6	47.9
Incr Delay (d2), s/veh	11.0	0.6	0.6	16.0	1.2	1.1	0.5	0.0	0.6	0.6	3.3	5.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.2	0.2	1.5	5.1	5.2	2.5	0.0	1.9	1.3	3.8	3.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	51.0	0.6	0.6	68.9	18.6	18.7	44.7	0.0	44.1	45.9	50.9	53.4
LnGrp LOS	D	A	A	E	B	B	D	A	D	D	D	D
Approach Vol, veh/h		966			683			271			306	
Approach Delay, s/veh		20.6			22.0			44.5			51.0	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.6	68.2		15.5	18.1	57.7		18.7
Change Period (Y+Rc), s	4.0	4.5		4.5	4.0	4.5		4.5
Max Green Setting (Gmax), s	7.0	40.0		17.5	17.0	30.0		28.0
Max Q Clear Time (g_c+I1), s	4.8	2.0		10.5	13.7	14.1		7.6
Green Ext Time (p_c), s	0.0	3.9		0.5	0.5	3.5		0.9

Intersection Summary	
HCM 6th Ctrl Delay	28.1
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

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ID	Software/Method	Intersection	Control Type	LOS	Delay	V/C Ratio
1	Synchro HCM 6th Signal	I-5 SB Ramp & Elligsen Rd	Signal	B	19.5	0.74
2	Synchro HCM 6th Signal	I-5 NB Ramp & Elligsen Rd	Signal	A	8.4	0.34
3	Synchro HCM 6th Signal	Parkway Ave & Elligsen Rd	Signal	B	15.9	0.32
4	Synchro HCM 6th Signal	Parkway Center Dr & Elligsen Rd	Signal	B	14.9	0.40
6	Synchro HCM 6th Signal	Parkway Ave & Boeckman Rd	Signal	C	25.6	0.84
8	Synchro HCM 6th Signal	Wilsonville Rd/Stafford Rd & Boeckman Rd/	Signal	B	17.0	0.65
13	Synchro HCM 6th Signal	I-5 SB Ramp & Wilsonville Rd	Signal	B	19.3	0.38
14	Synchro HCM 6th Signal	I-5 NB Ramp & Wilsonville Rd	Signal	B	16.2	0.44
15	Synchro HCM 6th Signal	Town Center Lp West & Wilsonville Rd	Signal	C	28.1	0.38

DRAFT

FUTURE BASELINE 2040 HCM REPORTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1315	1105	0	1030	370	0	0	0	480	70	830
Future Volume (veh/h)	0	1315	1105	0	1030	370	0	0	0	480	70	830
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1826	1856	0	1826	1900				1856	1870	1678
Adj Flow Rate, veh/h	0	1384	0	0	1084	0				558	0	798
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	5	3	0	5	0				3	2	15
Cap, veh/h	0	2019		0	2019					1208	0	951
Arrive On Green	0.00	0.58	0.00	0.00	1.00	0.00				0.34	0.00	0.34
Sat Flow, veh/h	0	3561	1572	0	3561	1610				3534	0	2784
Grp Volume(v), veh/h	0	1384	0	0	1084	0				558	0	798
Grp Sat Flow(s),veh/h/ln	0	1735	1572	0	1735	1610				1767	0	1392
Q Serve(g_s), s	0.0	29.1	0.0	0.0	0.0	0.0				13.0	0.0	27.8
Cycle Q Clear(g_c), s	0.0	29.1	0.0	0.0	0.0	0.0				13.0	0.0	27.8
Prop In Lane	0.00		1.00	0.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2019		0	2019					1208	0	951
V/C Ratio(X)	0.00	0.69		0.00	0.54					0.46	0.00	0.84
Avail Cap(c_a), veh/h	0	2019		0	2019					1447	0	1140
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.86	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	15.3	0.0	0.0	0.0	0.0				27.0	0.0	31.9
Incr Delay (d2), s/veh	0.0	1.9	0.0	0.0	0.9	0.0				0.3	0.0	4.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	11.0	0.0	0.0	0.2	0.0				5.4	0.0	9.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	17.2	0.0	0.0	0.9	0.0				27.3	0.0	36.8
LnGrp LOS	A	B		A	A					C	A	D
Approach Vol, veh/h		1384			1084						1356	
Approach Delay, s/veh		17.2			0.9						32.9	
Approach LOS		B			A						C	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		65.1		39.9		65.1						
Change Period (Y+Rc), s		5.0		4.0		5.0						
Max Green Setting (Gmax), s		53.0		43.0		53.0						
Max Q Clear Time (g_c+I1), s		31.1		29.8		2.0						
Green Ext Time (p_c), s		7.8		6.1		6.4						

Intersection Summary			
HCM 6th Ctrl Delay			18.1
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

User approved changes to right turn type.

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	905	890	0	920	535	480	0	270	0	0	0
Future Volume (veh/h)	0	905	890	0	920	535	480	0	270	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	1870	1826	0	1870	1870	1826	0	1856			
Adj Flow Rate, veh/h	0	943	0	0	958	0	500	0	0			
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96			
Percent Heavy Veh, %	0	2	5	0	2	2	5	0	3			
Cap, veh/h	0	2598		0	2598		618	0				
Arrive On Green	0.00	1.00	0.00	0.00	1.00	0.00	0.18	0.00	0.00			
Sat Flow, veh/h	0	3647	1547	0	3647	1585	3374	0	1572			
Grp Volume(v), veh/h	0	943	0	0	958	0	500	0	0			
Grp Sat Flow(s),veh/h/ln	0	1777	1547	0	1777	1585	1687	0	1572			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	14.9	0.0	0.0			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	14.9	0.0	0.0			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2598		0	2598		618	0				
V/C Ratio(X)	0.00	0.36		0.00	0.37		0.81	0.00				
Avail Cap(c_a), veh/h	0	2598		0	2598		1253	0				
HCM Platoon Ratio	1.00	2.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.67	0.00	0.00	0.86	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	41.1	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.0	0.3	0.0	2.6	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	0.0	0.1	0.0	6.3	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.3	0.0	0.0	0.3	0.0	43.7	0.0	0.0			
LnGrp LOS	A	A		A	A		D	A				
Approach Vol, veh/h		943			958			500				
Approach Delay, s/veh		0.3			0.3			43.7				
Approach LOS		A			A			D				
Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		81.8				81.8		23.2				
Change Period (Y+Rc), s		5.0				5.0		4.0				
Max Green Setting (Gmax), s		57.0				57.0		39.0				
Max Q Clear Time (g_c+I1), s		2.0				2.0		16.9				
Green Ext Time (p_c), s		5.2				5.3		2.3				
Intersection Summary												
HCM 6th Ctrl Delay			9.3									
HCM 6th LOS			A									

Notes

Unsignalized Delay for [NBR, EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	625	470	50	795	45	460	30	55	70	20	200
Future Volume (veh/h)	80	625	470	50	795	45	460	30	55	70	20	200
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1826	1900	1900	1856	1900	1870	1900	1900	1678	1411	1841
Adj Flow Rate, veh/h	88	687	314	55	874	44	529	0	8	77	22	2
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	5	0	0	3	0	2	0	0	15	33	4
Cap, veh/h	111	1839	1142	72	2507	126	640	0	289	103	82	7
Arrive On Green	0.13	1.00	1.00	0.01	0.17	0.17	0.18	0.00	0.18	0.06	0.06	0.06
Sat Flow, veh/h	1781	3469	1609	1810	4940	248	3563	0	1610	1598	1274	116
Grp Volume(v), veh/h	88	687	314	55	597	321	529	0	8	77	0	24
Grp Sat Flow(s),veh/h/ln	1781	1735	1609	1810	1689	1811	1781	0	1610	1598	0	1390
Q Serve(g_s), s	5.0	0.0	0.0	3.2	16.4	16.5	15.0	0.0	0.4	5.0	0.0	1.7
Cycle Q Clear(g_c), s	5.0	0.0	0.0	3.2	16.4	16.5	15.0	0.0	0.4	5.0	0.0	1.7
Prop In Lane	1.00		1.00	1.00		0.14	1.00		1.00	1.00		0.08
Lane Grp Cap(c), veh/h	111	1839	1142	72	1714	919	640	0	289	103	0	90
V/C Ratio(X)	0.79	0.37	0.27	0.76	0.35	0.35	0.83	0.00	0.03	0.75	0.00	0.27
Avail Cap(c_a), veh/h	198	1839	1142	267	1714	919	882	0	399	228	0	199
HCM Platoon Ratio	2.00	2.00	2.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.90	0.90	0.90	0.87	0.87	0.87	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	45.3	0.0	0.0	51.3	28.4	28.4	41.5	0.0	35.5	48.3	0.0	46.8
Incr Delay (d2), s/veh	10.6	0.5	0.5	13.2	0.5	0.9	4.7	0.0	0.0	10.3	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.1	0.2	1.7	7.5	8.2	7.0	0.0	0.2	2.3	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	55.8	0.5	0.5	64.5	28.8	29.3	46.2	0.0	35.5	58.6	0.0	48.3
LnGrp LOS	E	A	A	E	C	C	D	A	D	E	A	D
Approach Vol, veh/h		1089			973			537			101	
Approach Delay, s/veh		5.0			31.0			46.0			56.2	
Approach LOS		A			C			D			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.7	60.7		11.8	11.1	58.3		23.9				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	15.5	29.0		15.0	11.7	32.8		26.0				
Max Q Clear Time (g_c+I1), s	5.2	2.0		7.0	7.0	18.5		17.0				
Green Ext Time (p_c), s	0.1	5.1		0.2	0.1	3.6		1.8				

Intersection Summary		
HCM 6th Ctrl Delay		24.4
HCM 6th LOS		C

Notes
User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	455	265	120	460	5	415	5	115	5	5	15
Future Volume (veh/h)	30	455	265	120	460	5	415	5	115	5	5	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1870	1856	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	32	489	190	129	495	5	446	5	13	5	5	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	2	3	0	0	0	0	0	0	0	0
Cap, veh/h	659	1101	1164	586	2267	23	546	72	188	27	27	0
Arrive On Green	0.06	0.77	0.77	0.08	0.62	0.62	0.16	0.16	0.16	0.01	0.03	0.00
Sat Flow, veh/h	1810	1900	1584	1767	3661	37	3510	466	1211	927	927	0
Grp Volume(v), veh/h	32	489	190	129	244	256	446	0	18	10	0	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1584	1767	1805	1893	1755	0	1677	1854	0	0
Q Serve(g_s), s	0.7	9.4	2.2	2.6	6.2	6.3	12.9	0.0	1.0	0.6	0.0	0.0
Cycle Q Clear(g_c), s	0.7	9.4	2.2	2.6	6.2	6.3	12.9	0.0	1.0	0.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.02	1.00		0.72	0.50		0.00
Lane Grp Cap(c), veh/h	659	1101	1164	586	1118	1172	546	0	261	53	0	0
V/C Ratio(X)	0.05	0.44	0.16	0.22	0.22	0.22	0.82	0.00	0.07	0.19	0.00	0.00
Avail Cap(c_a), veh/h	734	1101	1164	590	1118	1172	903	0	431	141	0	0
HCM Platoon Ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.90	0.90	0.90	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	7.5	6.1	2.2	6.5	8.8	8.8	42.9	0.0	37.8	50.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.2	0.3	0.1	0.4	0.4	1.2	0.0	0.0	0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	3.2	1.1	0.9	2.4	2.5	5.6	0.0	0.4	0.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.5	7.3	2.4	6.5	9.3	9.2	44.0	0.0	37.9	50.8	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	D	A	D	D	A	A
Approach Vol, veh/h		711			629			464			10	
Approach Delay, s/veh		6.0			8.7			43.8			50.8	
Approach LOS		A			A			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.8	64.8		7.0	8.6	69.0		20.3				
Change Period (Y+Rc), s	5.0	5.0		5.5	5.0	5.0		5.0				
Max Green Setting (Gmax), s	8.0	44.0		6.5	8.0	44.0		26.0				
Max Q Clear Time (g_c+I1), s	4.6	11.4		2.6	2.7	8.3		14.9				
Green Ext Time (p_c), s	0.0	0.6		0.0	0.0	0.4		0.3				

Intersection Summary	
HCM 6th Ctrl Delay	16.9
HCM 6th LOS	B

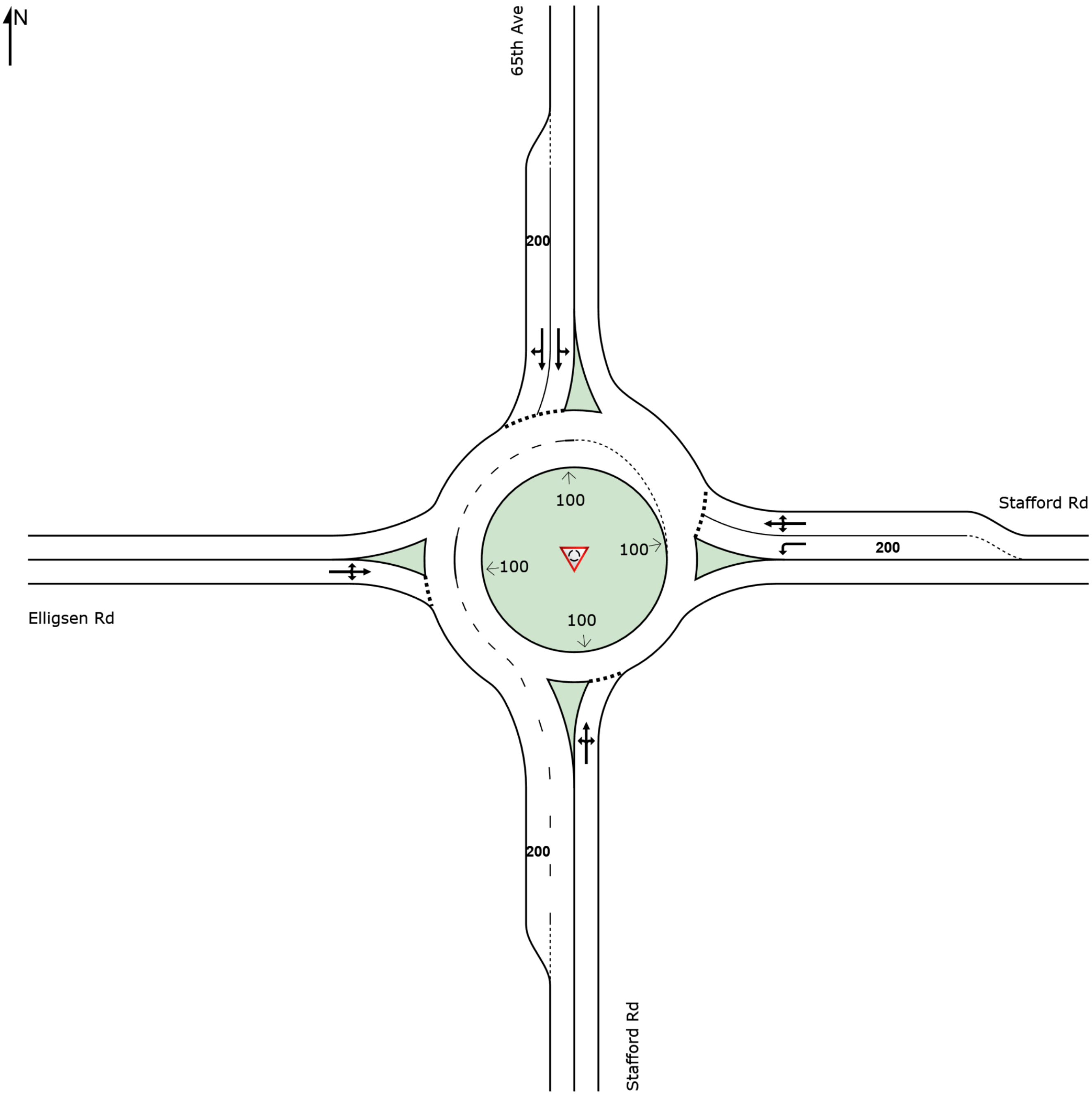
DRAFT

SITE LAYOUT

Site: [Stafford Rd/65th Ave - Baseline (Site Folder: Stafford Rd/65th Ave)]

Site Category: -
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



DRAFT

MOVEMENT SUMMARY

Site: [Stafford Rd/65th Ave - Baseline (Site Folder: Stafford Rd/65th Ave)]

Site Category: -
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Stafford Rd														
3	L2	25	2.0	26	2.0	0.584	12.0	LOS B	5.7	144.1	0.71	0.78	1.02	31.6
8	T1	165	2.0	174	2.0	0.584	12.0	LOS B	5.7	144.1	0.71	0.78	1.02	31.6
18	R2	330	2.0	347	2.0	0.584	12.0	LOS B	5.7	144.1	0.71	0.78	1.02	30.7
Approach		520	2.0	547	2.0	0.584	12.0	LOS B	5.7	144.1	0.71	0.78	1.02	31.0
East: Stafford Rd														
1	L2	610	2.0	642	2.0	0.618	12.0	LOS B	6.7	169.4	0.68	0.73	0.99	29.6
6	T1	395	2.0	416	2.0	0.502	9.4	LOS A	3.3	82.6	0.59	0.52	0.65	33.0
16	R2	100	2.0	105	2.0	0.502	9.4	LOS A	3.3	82.6	0.59	0.52	0.65	32.0
Approach		1105	2.0	1163	2.0	0.618	10.8	LOS B	6.7	169.4	0.64	0.64	0.84	30.9
North: 65th Ave														
7	L2	35	2.0	37	2.0	0.707	24.6	LOS C	5.1	128.3	0.84	1.10	1.76	27.0
4	T1	420	2.0	442	2.0	0.707	23.3	LOS C	5.1	128.3	0.81	1.03	1.57	27.7
14	R2	65	2.0	68	2.0	0.340	13.1	LOS B	1.4	34.8	0.73	0.78	0.91	30.4
Approach		520	2.0	547	2.0	0.707	22.1	LOS C	5.1	128.3	0.80	1.00	1.50	28.0
West: Elligsen Rd														
5	L2	105	2.0	111	2.0	0.839	37.2	LOS D	8.1	206.5	0.90	1.36	2.49	23.2
2	T1	195	2.0	205	2.0	0.839	37.2	LOS D	8.1	206.5	0.90	1.36	2.49	23.2
12	R2	120	2.0	126	2.0	0.839	42.9	LOS D	8.1	206.5	0.90	1.36	2.49	22.7
Approach		420	2.0	442	2.0	0.839	38.8	LOS D	8.1	206.5	0.90	1.36	2.49	23.0
All Vehicles		2565	2.0	2700	2.0	0.839	17.9	LOS B	8.1	206.5	0.73	0.86	1.28	28.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	145	305	315	75	340	30	200	220	65	35	385	260
Future Volume (veh/h)	145	305	315	75	340	30	200	220	65	35	385	260
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	0.99		0.96	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1870	1900	1900	1885	1900	1900	1900	1900
Adj Flow Rate, veh/h	153	321	105	79	358	24	211	232	57	37	405	247
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	2	0	0	1	0	0	0	0
Cap, veh/h	330	554	177	282	563	38	330	706	173	575	468	286
Arrive On Green	0.09	0.21	0.20	0.05	0.17	0.16	0.09	0.48	0.48	0.03	0.42	0.42
Sat Flow, veh/h	1810	2664	853	1810	3371	225	1810	1457	358	1810	1104	673
Grp Volume(v), veh/h	153	215	211	79	188	194	211	0	289	37	0	652
Grp Sat Flow(s),veh/h/ln	1810	1805	1712	1810	1777	1819	1810	0	1814	1810	0	1777
Q Serve(g_s), s	4.8	7.5	7.8	2.5	6.9	7.0	4.3	0.0	6.9	0.8	0.0	23.5
Cycle Q Clear(g_c), s	4.8	7.5	7.8	2.5	6.9	7.0	4.3	0.0	6.9	0.8	0.0	23.5
Prop In Lane	1.00		0.50	1.00		0.12	1.00		0.20	1.00		0.38
Lane Grp Cap(c), veh/h	330	375	356	282	297	304	330	0	879	575	0	754
V/C Ratio(X)	0.46	0.57	0.59	0.28	0.63	0.64	0.64	0.00	0.33	0.06	0.00	0.87
Avail Cap(c_a), veh/h	369	580	550	395	571	584	374	0	913	727	0	894
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.3	25.1	25.3	23.1	27.3	27.4	14.7	0.0	11.2	11.1	0.0	18.5
Incr Delay (d2), s/veh	0.8	1.0	1.2	0.4	1.7	1.7	2.6	0.0	0.3	0.0	0.0	8.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	3.1	3.0	1.0	2.9	3.0	1.6	0.0	2.4	0.3	0.0	10.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.1	26.1	26.5	23.5	29.0	29.0	17.2	0.0	11.5	11.1	0.0	26.9
LnGrp LOS	C	C	C	C	C	C	B	A	B	B	A	C
Approach Vol, veh/h		579			461			500			689	
Approach Delay, s/veh		25.2			28.1			13.9			26.1	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.3	33.9	7.6	18.6	6.1	38.1	10.5	15.8
Change Period (Y+Rc), s	4.0	4.5	4.0	4.5	4.0	4.5	4.0	4.5
Max Green Setting (Gmax), s	8.0	34.9	8.0	22.1	8.0	34.9	8.0	22.1
Max Q Clear Time (g_c+I1), s	6.3	25.5	4.5	9.8	2.8	8.9	6.8	9.0
Green Ext Time (p_c), s	0.1	3.8	0.0	1.5	0.0	2.4	0.0	1.4

Intersection Summary	
HCM 6th Ctrl Delay	23.5
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	265	45	85	330	70	40	120	105	115	165	75
Future Volume (veh/h)	55	265	45	85	330	70	40	120	105	115	165	75
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1870	1870	1870	1856	1826	1900	1856	1900	1900	1885	1900
Adj Flow Rate, veh/h	61	294	42	94	367	69	44	133	76	128	183	63
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	2	2	2	3	5	0	3	0	0	1	0
Cap, veh/h	335	481	69	414	478	90	345	205	117	390	307	106
Arrive On Green	0.05	0.30	0.29	0.06	0.32	0.30	0.04	0.19	0.17	0.08	0.23	0.22
Sat Flow, veh/h	1810	1600	229	1781	1518	285	1810	1103	630	1810	1328	457
Grp Volume(v), veh/h	61	0	336	94	0	436	44	0	209	128	0	246
Grp Sat Flow(s),veh/h/ln	1810	0	1828	1781	0	1803	1810	0	1733	1810	0	1786
Q Serve(g_s), s	1.0	0.0	6.9	1.6	0.0	9.5	0.9	0.0	4.9	2.5	0.0	5.4
Cycle Q Clear(g_c), s	1.0	0.0	6.9	1.6	0.0	9.5	0.9	0.0	4.9	2.5	0.0	5.4
Prop In Lane	1.00		0.13	1.00		0.16	1.00		0.36	1.00		0.26
Lane Grp Cap(c), veh/h	335	0	550	414	0	568	345	0	323	390	0	412
V/C Ratio(X)	0.18	0.00	0.61	0.23	0.00	0.77	0.13	0.00	0.65	0.33	0.00	0.60
Avail Cap(c_a), veh/h	581	0	1388	631	0	1369	609	0	997	573	0	1027
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.9	0.0	13.1	10.2	0.0	13.5	14.0	0.0	16.5	13.2	0.0	15.0
Incr Delay (d2), s/veh	0.3	0.0	1.1	0.3	0.0	2.2	0.2	0.0	2.2	0.5	0.0	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	2.3	0.5	0.0	3.2	0.3	0.0	1.9	0.9	0.0	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.1	0.0	14.2	10.5	0.0	15.7	14.1	0.0	18.6	13.7	0.0	16.4
LnGrp LOS	B	A	B	B	A	B	B	A	B	B	A	B
Approach Vol, veh/h		397			530			253			374	
Approach Delay, s/veh		13.7			14.8			17.9			15.4	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.6	12.1	6.7	17.1	5.6	14.0	6.1	17.7
Change Period (Y+Rc), s	4.0	4.5	4.0	4.5	4.0	4.5	4.0	4.5
Max Green Setting (Gmax), s	8.0	24.5	8.0	32.5	8.0	24.5	8.0	32.5
Max Q Clear Time (g_c+I1), s	4.5	6.9	3.6	8.9	2.9	7.4	3.0	11.5
Green Ext Time (p_c), s	0.1	0.7	0.1	1.3	0.0	0.8	0.0	1.7

Intersection Summary		
HCM 6th Ctrl Delay		15.2
HCM 6th LOS		B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	205	70	115	60	60	30	100	225	65	45	465	330
Future Volume (veh/h)	205	70	115	60	60	30	100	225	65	45	465	330
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.92		0.90	0.87		0.85	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1870	1885	1826	1900	1900	1885	1885	1870	1826	1885	1856
Adj Flow Rate, veh/h	207	71	20	61	61	8	101	227	56	45	470	308
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	1	2	1	5	0	0	1	1	2	5	1	3
Cap, veh/h	427	358	275	307	175	23	238	728	180	589	516	338
Arrive On Green	0.13	0.19	0.19	0.05	0.11	0.10	0.05	0.50	0.49	0.03	0.49	0.48
Sat Flow, veh/h	1795	1870	1436	1739	1607	211	1795	1452	358	1739	1062	696
Grp Volume(v), veh/h	207	71	20	61	0	69	101	0	283	45	0	778
Grp Sat Flow(s),veh/h/ln	1795	1870	1436	1739	0	1817	1795	0	1810	1739	0	1758
Q Serve(g_s), s	6.8	2.3	0.8	2.2	0.0	2.5	2.0	0.0	6.6	0.9	0.0	28.9
Cycle Q Clear(g_c), s	6.8	2.3	0.8	2.2	0.0	2.5	2.0	0.0	6.6	0.9	0.0	28.9
Prop In Lane	1.00		1.00	1.00		0.12	1.00		0.20	1.00		0.40
Lane Grp Cap(c), veh/h	427	358	275	307	0	198	238	0	907	589	0	854
V/C Ratio(X)	0.48	0.20	0.07	0.20	0.00	0.35	0.42	0.00	0.31	0.08	0.00	0.91
Avail Cap(c_a), veh/h	490	624	479	336	0	424	252	0	1069	629	0	1038
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.6	24.1	23.5	26.1	0.0	29.2	15.3	0.0	10.5	8.9	0.0	16.9
Incr Delay (d2), s/veh	0.6	0.2	0.1	0.2	0.0	0.8	0.9	0.0	0.2	0.0	0.0	10.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	1.0	0.3	0.9	0.0	1.1	0.7	0.0	2.3	0.3	0.0	12.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.3	24.3	23.6	26.3	0.0	30.0	16.2	0.0	10.7	8.9	0.0	27.3
LnGrp LOS	C	C	C	C	A	C	B	A	B	A	A	C
Approach Vol, veh/h		298			130			384			823	
Approach Delay, s/veh		22.8			28.3			12.1			26.3	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.5	38.4	13.2	11.7	6.3	39.5	7.4	17.5
Change Period (Y+Rc), s	4.0	4.5	4.5	4.5	4.0	4.5	4.5	4.5
Max Green Setting (Gmax), s	4.0	41.3	11.2	16.0	4.0	41.3	4.1	23.1
Max Q Clear Time (g_c+I1), s	4.0	30.9	8.8	4.5	2.9	8.6	4.2	4.3
Green Ext Time (p_c), s	0.0	3.0	0.1	0.1	0.0	1.1	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	22.5
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	100	25	5	95	25	30	30	5	30	30	5
Future Vol, veh/h	5	100	25	5	95	25	30	30	5	30	30	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	1	12	0	1	0	7	0	0	0	0	0
Mvmt Flow	6	111	28	6	106	28	33	33	6	33	33	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	134	0	0	139	0	0	289	283	125	289	283	120
Stage 1	-	-	-	-	-	-	137	137	-	132	132	-
Stage 2	-	-	-	-	-	-	152	146	-	157	151	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.17	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.563	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1463	-	-	1457	-	-	653	629	931	667	629	937
Stage 1	-	-	-	-	-	-	854	787	-	876	791	-
Stage 2	-	-	-	-	-	-	839	780	-	850	776	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1463	-	-	1457	-	-	619	624	931	632	624	937
Mov Cap-2 Maneuver	-	-	-	-	-	-	619	624	-	632	624	-
Stage 1	-	-	-	-	-	-	851	784	-	872	788	-
Stage 2	-	-	-	-	-	-	796	777	-	806	773	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	0.3	11.4	11.3
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	638	1463	-	-	1457	-	-	644
HCM Lane V/C Ratio	0.113	0.004	-	-	0.004	-	-	0.112
HCM Control Delay (s)	11.4	7.5	0	-	7.5	0	-	11.3
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	5	15	20	10	20	15	400	45	70	805	45
Future Vol, veh/h	25	5	15	20	10	20	15	400	45	70	805	45
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	0	0	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	10	0	0	0	2	0
Mvmt Flow	27	5	16	22	11	22	16	435	49	76	875	49

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1562	1570	902	1554	1570	460	926	0	0	484	0	0
Stage 1	1054	1054	-	492	492	-	-	-	-	-	-	-
Stage 2	508	516	-	1062	1078	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.2	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.29	-	-	2.2	-	-
Pot Cap-1 Maneuver	92	112	339	93	112	605	706	-	-	1089	-	-
Stage 1	276	305	-	562	551	-	-	-	-	-	-	-
Stage 2	551	538	-	273	297	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	70	93	338	74	93	605	705	-	-	1089	-	-
Mov Cap-2 Maneuver	70	93	-	74	93	-	-	-	-	-	-	-
Stage 1	267	260	-	545	534	-	-	-	-	-	-	-
Stage 2	504	521	-	218	253	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	72.6	56.3	0.3	0.7
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	705	-	-	99	122	1089	-	-
HCM Lane V/C Ratio	0.023	-	-	0.494	0.445	0.07	-	-
HCM Control Delay (s)	10.2	0	-	72.6	56.3	8.6	0	-
HCM Lane LOS	B	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	2.2	2	0.2	-	-

Intersection	
Int Delay, s/veh	36.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	75	10	10	10	10	50	5	420	20	85	900	100
Future Vol, veh/h	75	10	10	10	10	50	5	420	20	85	900	100
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	0	0	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	2	10
Mvmt Flow	82	11	11	11	11	54	5	457	22	92	978	109

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1730	1708	1035	1706	1751	468	1089	0	0	479	0	0
Stage 1	1219	1219	-	478	478	-	-	-	-	-	-	-
Stage 2	511	489	-	1228	1273	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	~ 70	92	284	73	87	599	648	-	-	1094	-	-
Stage 1	223	255	-	572	559	-	-	-	-	-	-	-
Stage 2	549	553	-	220	241	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 46	71	284	51	67	599	647	-	-	1094	-	-
Mov Cap-2 Maneuver	~ 46	71	-	51	67	-	-	-	-	-	-	-
Stage 1	220	199	-	566	553	-	-	-	-	-	-	-
Stage 2	484	547	-	156	188	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 610.5	45.1	0.1	0.7
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	647	-	-	53	163	1094	-	-
HCM Lane V/C Ratio	0.008	-	-	1.948	0.467	0.084	-	-
HCM Control Delay (s)	10.6	0	-	$ 610.5	45.1	8.6	0	-
HCM Lane LOS	B	A	-	F	E	A	A	-
HCM 95th %tile Q(veh)	0	-	-	10.1	2.2	0.3	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	5	5	5	5	10	5	535	5	10	1075	10
Future Vol, veh/h	10	5	5	5	5	10	5	535	5	10	1075	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	2	0	0	2	0
Mvmt Flow	11	5	5	5	5	11	5	582	5	11	1168	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1799	1793	1174	1796	1796	585	1179	0	0	587	0	0
Stage 1	1196	1196	-	595	595	-	-	-	-	-	-	-
Stage 2	603	597	-	1201	1201	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	63	82	236	63	81	515	600	-	-	998	-	-
Stage 1	229	262	-	494	496	-	-	-	-	-	-	-
Stage 2	489	495	-	228	260	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	56	78	236	56	77	515	600	-	-	998	-	-
Mov Cap-2 Maneuver	56	78	-	56	77	-	-	-	-	-	-	-
Stage 1	226	254	-	488	490	-	-	-	-	-	-	-
Stage 2	468	489	-	211	252	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	70.3	43.5	0.1	0.1
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	600	-	-	76	115	998	-	-
HCM Lane V/C Ratio	0.009	-	-	0.286	0.189	0.011	-	-
HCM Control Delay (s)	11.1	0	-	70.3	43.5	8.6	0	-
HCM Lane LOS	B	A	-	F	E	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1	0.7	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	820	655	540	1015	0	0	0	0	80	5	115
Future Volume (veh/h)	0	820	655	540	1015	0	0	0	0	80	5	115
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1856	1870	1856	0				1856	1900	1856
Adj Flow Rate, veh/h	0	863	0	568	1068	0				88	0	13
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	2	3	2	3	0				3	0	3
Cap, veh/h	0	3331		644	3086	0				184	0	158
Arrive On Green	0.00	0.65	0.00	0.37	1.00	0.00				0.05	0.00	0.05
Sat Flow, veh/h	0	5274	1572	3456	3618	0				3534	0	3039
Grp Volume(v), veh/h	0	863	0	568	1068	0				88	0	13
Grp Sat Flow(s),veh/h/ln	0	1702	1572	1728	1763	0				1767	0	1520
Q Serve(g_s), s	0.0	7.8	0.0	16.9	0.0	0.0				2.7	0.0	0.4
Cycle Q Clear(g_c), s	0.0	7.8	0.0	16.9	0.0	0.0				2.7	0.0	0.4
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	3331		644	3086	0				184	0	158
V/C Ratio(X)	0.00	0.26		0.88	0.35	0.00				0.48	0.00	0.08
Avail Cap(c_a), veh/h	0	3331		817	3086	0				610	0	525
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.88	0.88	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	8.0	0.0	33.4	0.0	0.0				50.7	0.0	49.6
Incr Delay (d2), s/veh	0.0	0.2	0.0	8.3	0.3	0.0				1.9	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.7	0.0	6.2	0.1	0.0				1.2	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	8.2	0.0	41.6	0.3	0.0				52.6	0.0	49.9
LnGrp LOS	A	A		D	A	A				D	A	D
Approach Vol, veh/h		863			1636						101	
Approach Delay, s/veh		8.2			14.6						52.3	
Approach LOS		A			B						D	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	24.5	75.8		9.7		100.3						
Change Period (Y+Rc), s	4.0	4.0		4.0		4.0						
Max Green Setting (Gmax), s	26.0	53.0		19.0		75.0						
Max Q Clear Time (g_c+I1), s	18.9	9.8		4.7		2.0						
Green Ext Time (p_c), s	1.6	4.6		0.3		6.3						
Intersection Summary												
HCM 6th Ctrl Delay			14.0									
HCM 6th LOS			B									
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	360	540	0	0	1100	335	455	10	505	0	0	0
Future Volume (veh/h)	360	540	0	0	1100	335	455	10	505	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1885	1826	1900	1870			
Adj Flow Rate, veh/h	375	562	0	0	1146	0	481	0	264			
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96			
Percent Heavy Veh, %	2	2	0	0	2	1	5	0	2			
Cap, veh/h	446	2680	0	0	3006		602	0	541			
Arrive On Green	0.26	1.00	0.00	0.00	0.59	0.00	0.17	0.00	0.17			
Sat Flow, veh/h	3456	3647	0	0	5274	1598	3478	0	3124			
Grp Volume(v), veh/h	375	562	0	0	1146	0	481	0	264			
Grp Sat Flow(s),veh/h/ln	1728	1777	0	0	1702	1598	1739	0	1562			
Q Serve(g_s), s	11.3	0.0	0.0	0.0	13.1	0.0	14.6	0.0	8.4			
Cycle Q Clear(g_c), s	11.3	0.0	0.0	0.0	13.1	0.0	14.6	0.0	8.4			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	446	2680	0	0	3006		602	0	541			
V/C Ratio(X)	0.84	0.21	0.00	0.00	0.38		0.80	0.00	0.49			
Avail Cap(c_a), veh/h	723	2680	0	0	3006		1043	0	937			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.97	0.97	0.00	0.00	0.23	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	39.7	0.0	0.0	0.0	12.0	0.0	43.6	0.0	41.1			
Incr Delay (d2), s/veh	3.3	0.2	0.0	0.0	0.1	0.0	1.5	0.0	0.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	4.3	0.1	0.0	0.0	4.7	0.0	6.3	0.0	3.2			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.0	0.2	0.0	0.0	12.1	0.0	45.2	0.0	41.5			
LnGrp LOS	D	A	A	A	B		D	A	D			
Approach Vol, veh/h		937			1146			745				
Approach Delay, s/veh		17.3			12.1			43.9				
Approach LOS		B			B			D				
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		87.0			18.2	68.8		23.0				
Change Period (Y+Rc), s		4.0			4.0	4.0		4.0				
Max Green Setting (Gmax), s		52.0			23.0	42.0		33.0				
Max Q Clear Time (g_c+I1), s		2.0			13.3	15.1		16.6				
Green Ext Time (p_c), s		6.1			0.9	12.3		2.4				

Intersection Summary		
HCM 6th Ctrl Delay		22.2
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	930	115	0	865	50	195	25	90	65	125	375
Future Volume (veh/h)	0	930	115	0	865	50	195	25	90	65	125	375
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	1.00		0.99	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1885	1900	1885	1900	1900	1900	1900	1870
Adj Flow Rate, veh/h	0	979	106	0	911	49	205	26	39	68	132	353
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	2	2	0	1	0	1	0	0	0	0	2
Cap, veh/h	0	1396	151	0	1031	55	237	370	555	96	208	557
Arrive On Green	0.00	0.10	0.10	0.00	0.30	0.29	0.13	0.54	0.54	0.05	0.46	0.46
Sat Flow, veh/h	0	4841	505	0	3545	186	1795	681	1021	1810	448	1198
Grp Volume(v), veh/h	0	713	372	0	473	487	205	0	65	68	0	485
Grp Sat Flow(s),veh/h/ln	0	1702	1773	0	1791	1845	1795	0	1701	1810	0	1646
Q Serve(g_s), s	0.0	22.3	22.4	0.0	27.7	27.7	12.3	0.0	2.0	4.1	0.0	24.6
Cycle Q Clear(g_c), s	0.0	22.3	22.4	0.0	27.7	27.7	12.3	0.0	2.0	4.1	0.0	24.6
Prop In Lane	0.00		0.28	0.00		0.10	1.00		0.60	1.00		0.73
Lane Grp Cap(c), veh/h	0	1017	530	0	535	551	237	0	925	96	0	765
V/C Ratio(X)	0.00	0.70	0.70	0.00	0.88	0.88	0.87	0.00	0.07	0.71	0.00	0.63
Avail Cap(c_a), veh/h	0	1331	693	0	700	721	237	0	925	156	0	765
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.95	0.95	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	44.8	44.9	0.0	36.7	36.8	46.8	0.0	12.0	51.2	0.0	22.3
Incr Delay (d2), s/veh	0.0	0.9	1.7	0.0	9.8	9.5	26.9	0.0	0.1	9.2	0.0	4.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	10.3	10.9	0.0	13.2	13.6	7.3	0.0	0.8	2.1	0.0	10.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	45.7	46.5	0.0	46.5	46.3	73.7	0.0	12.1	60.4	0.0	26.3
LnGrp LOS	A	D	D	A	D	D	E	A	B	E	A	C
Approach Vol, veh/h		1085			960			270			553	
Approach Delay, s/veh		46.0			46.4			58.9			30.5	
Approach LOS		D			D			E			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.3	63.8		36.9	18.0	55.1		36.9
Change Period (Y+Rc), s	4.0	4.5		4.5	4.0	4.5		4.5
Max Green Setting (Gmax), s	9.0	45.5		42.5	14.0	40.5		42.5
Max Q Clear Time (g_c+I1), s	6.1	4.0		24.4	14.3	26.6		29.7
Green Ext Time (p_c), s	0.0	0.2		3.8	0.0	1.5		2.7

Intersection Summary			
HCM 6th Ctrl Delay			44.3
HCM 6th LOS			D

ID	Software/Method	Intersection	Control Type	LOS	Delay	V/C Ratio
1	Synchro HCM 6th Signal	I-5 SB Ramp & Elligsen Rd	Signal	B	18.1	0.73
2	Synchro HCM 6th Signal	I-5 NB Ramp & Elligsen Rd	Signal	A	9.3	0.45
3	Synchro HCM 6th Signal	Parkway Ave & Elligsen Rd	Signal	C	24.4	0.52
4	Synchro HCM 6th Signal	Parkway Center Dr & Elligsen Rd	Signal	B	16.9	0.55
6	Synchro HCM 6th Signal	Parkway Ave & Boeckman Rd	Signal	C	23.5	0.82
7	Synchro HCM 6th Signal	Canyon Creek Rd & Boeckman Rd	Signal	B	15.2	0.57
8	Synchro HCM 6th Signal	Wilsonville Rd/Stafford Rd & Boeckman Rd/A	Signal	C	22.5	0.79
13	Synchro HCM 6th Signal	I-5 SB Ramp & Wilsonville Rd	Signal	B	14.0	0.40
14	Synchro HCM 6th Signal	I-5 NB Ramp & Wilsonville Rd	Signal	C	22.2	0.52
15	Synchro HCM 6th Signal	Town Center Lp West & Wilsonville Rd	Signal	D	44.3	0.82

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ANTICIPATED BUILD 2040 HCM REPORTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1325	1105	0	1030	370	0	0	0	480	70	830
Future Volume (veh/h)	0	1325	1105	0	1030	370	0	0	0	480	70	830
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1826	1856	0	1826	1900				1856	1870	1678
Adj Flow Rate, veh/h	0	1395	0	0	1084	0				558	0	798
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	5	3	0	5	0				3	2	15
Cap, veh/h	0	2019		0	2019					1208	0	951
Arrive On Green	0.00	0.58	0.00	0.00	1.00	0.00				0.34	0.00	0.34
Sat Flow, veh/h	0	3561	1572	0	3561	1610				3534	0	2784
Grp Volume(v), veh/h	0	1395	0	0	1084	0				558	0	798
Grp Sat Flow(s),veh/h/ln	0	1735	1572	0	1735	1610				1767	0	1392
Q Serve(g_s), s	0.0	29.5	0.0	0.0	0.0	0.0				13.0	0.0	27.8
Cycle Q Clear(g_c), s	0.0	29.5	0.0	0.0	0.0	0.0				13.0	0.0	27.8
Prop In Lane	0.00		1.00	0.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2019		0	2019					1208	0	951
V/C Ratio(X)	0.00	0.69		0.00	0.54					0.46	0.00	0.84
Avail Cap(c_a), veh/h	0	2019		0	2019					1447	0	1140
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.86	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	15.3	0.0	0.0	0.0	0.0				27.0	0.0	31.9
Incr Delay (d2), s/veh	0.0	2.0	0.0	0.0	0.9	0.0				0.3	0.0	4.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	11.1	0.0	0.0	0.2	0.0				5.4	0.0	9.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	17.3	0.0	0.0	0.9	0.0				27.3	0.0	36.8
LnGrp LOS	A	B		A	A					C	A	D
Approach Vol, veh/h		1395			1084						1356	
Approach Delay, s/veh		17.3			0.9						32.9	
Approach LOS		B			A						C	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		65.1		39.9		65.1
Change Period (Y+Rc), s		5.0		4.0		5.0
Max Green Setting (Gmax), s		53.0		43.0		53.0
Max Q Clear Time (g_c+I1), s		31.5		29.8		2.0
Green Ext Time (p_c), s		7.8		6.1		6.4

Intersection Summary	
HCM 6th Ctrl Delay	18.2
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.
User approved changes to right turn type.
Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary | WV Frog Pond East & South Master Plan
2: I-5 NB Ramp & Elligsen Rd | Future 2040 Build

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	915	890	0	925	535	475	0	275	0	0	0
Future Volume (veh/h)	0	915	890	0	925	535	475	0	275	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	1870	1826	0	1870	1870	1826	0	1856			
Adj Flow Rate, veh/h	0	953	0	0	964	0	495	0	0			
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96			
Percent Heavy Veh, %	0	2	5	0	2	2	5	0	3			
Cap, veh/h	0	2603		0	2603		613	0				
Arrive On Green	0.00	1.00	0.00	0.00	1.00	0.00	0.18	0.00	0.00			
Sat Flow, veh/h	0	3647	1547	0	3647	1585	3374	0	1572			
Grp Volume(v), veh/h	0	953	0	0	964	0	495	0	0			
Grp Sat Flow(s),veh/h/ln	0	1777	1547	0	1777	1585	1687	0	1572			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	14.8	0.0	0.0			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	14.8	0.0	0.0			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2603		0	2603		613	0				
V/C Ratio(X)	0.00	0.37		0.00	0.37		0.81	0.00				
Avail Cap(c_a), veh/h	0	2603		0	2603		1253	0				
HCM Platoon Ratio	1.00	2.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.67	0.00	0.00	0.85	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	41.2	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.0	0.3	0.0	2.6	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	0.0	0.1	0.0	6.2	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.3	0.0	0.0	0.3	0.0	43.8	0.0	0.0			
LnGrp LOS	A	A		A	A		D	A				
Approach Vol, veh/h		953			964			495				
Approach Delay, s/veh		0.3			0.3			43.8				
Approach LOS		A			A			D				
Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		81.9				81.9		23.1				
Change Period (Y+Rc), s		5.0				5.0		4.0				
Max Green Setting (Gmax), s		57.0				57.0		39.0				
Max Q Clear Time (g_c+I1), s		2.0				2.0		16.8				
Green Ext Time (p_c), s		5.3				5.4		2.3				
Intersection Summary												
HCM 6th Ctrl Delay			9.2									
HCM 6th LOS			A									

Notes

Unsignalized Delay for [NBR, EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	635	470	50	800	45	460	30	55	70	20	200
Future Volume (veh/h)	85	635	470	50	800	45	460	30	55	70	20	200
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1826	1900	1900	1856	1900	1870	1900	1900	1678	1411	1841
Adj Flow Rate, veh/h	93	698	314	55	879	44	529	0	8	77	22	2
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	5	0	0	3	0	2	0	0	15	33	4
Cap, veh/h	117	1839	1142	72	2492	124	640	0	289	103	82	7
Arrive On Green	0.13	1.00	1.00	0.01	0.17	0.17	0.18	0.00	0.18	0.06	0.06	0.06
Sat Flow, veh/h	1781	3469	1609	1810	4941	247	3563	0	1610	1598	1274	116
Grp Volume(v), veh/h	93	698	314	55	600	323	529	0	8	77	0	24
Grp Sat Flow(s),veh/h/ln	1781	1735	1609	1810	1689	1811	1781	0	1610	1598	0	1390
Q Serve(g_s), s	5.3	0.0	0.0	3.2	16.5	16.6	15.0	0.0	0.4	5.0	0.0	1.7
Cycle Q Clear(g_c), s	5.3	0.0	0.0	3.2	16.5	16.6	15.0	0.0	0.4	5.0	0.0	1.7
Prop In Lane	1.00		1.00	1.00		0.14	1.00		1.00	1.00		0.08
Lane Grp Cap(c), veh/h	117	1839	1142	72	1703	913	640	0	289	103	0	90
V/C Ratio(X)	0.79	0.38	0.27	0.76	0.35	0.35	0.83	0.00	0.03	0.75	0.00	0.27
Avail Cap(c_a), veh/h	204	1839	1142	267	1703	913	882	0	399	228	0	199
HCM Platoon Ratio	2.00	2.00	2.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.89	0.89	0.89	0.87	0.87	0.87	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	44.9	0.0	0.0	51.3	28.6	28.6	41.5	0.0	35.5	48.3	0.0	46.8
Incr Delay (d2), s/veh	10.2	0.5	0.5	13.2	0.5	0.9	4.7	0.0	0.0	10.3	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.1	0.2	1.7	7.5	8.2	7.0	0.0	0.2	2.3	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	55.1	0.5	0.5	64.5	29.1	29.5	46.2	0.0	35.5	58.6	0.0	48.3
LnGrp LOS	E	A	A	E	C	C	D	A	D	E	A	D
Approach Vol, veh/h		1105			978			537			101	
Approach Delay, s/veh		5.1			31.2			46.0			56.2	
Approach LOS		A			C			D			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.7	60.7		11.8	11.4	58.0		23.9
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0
Max Green Setting (Gmax), s	15.5	29.0		15.0	12.0	32.5		26.0
Max Q Clear Time (g_c+I1), s	7.3	2.0		7.0	7.3	18.6		17.0
Green Ext Time (p_c), s	0.1	5.1		0.2	0.1	3.6		1.8

Intersection Summary	
HCM 6th Ctrl Delay	24.5
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	445	280	125	465	5	415	5	110	5	5	15
Future Volume (veh/h)	35	445	280	125	465	5	415	5	110	5	5	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1870	1856	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	38	478	206	134	500	5	446	5	13	5	5	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	2	3	0	0	0	0	0	0	0	0
Cap, veh/h	659	1100	1164	587	2254	23	546	72	188	27	27	0
Arrive On Green	0.06	0.77	0.77	0.08	0.62	0.62	0.16	0.16	0.16	0.01	0.03	0.00
Sat Flow, veh/h	1810	1900	1584	1767	3662	37	3510	466	1211	927	927	0
Grp Volume(v), veh/h	38	478	206	134	246	259	446	0	18	10	0	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1584	1767	1805	1893	1755	0	1677	1854	0	0
Q Serve(g_s), s	0.8	9.1	2.4	2.8	6.4	6.4	12.9	0.0	1.0	0.6	0.0	0.0
Cycle Q Clear(g_c), s	0.8	9.1	2.4	2.8	6.4	6.4	12.9	0.0	1.0	0.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.02	1.00		0.72	0.50		0.00
Lane Grp Cap(c), veh/h	659	1100	1164	587	1111	1165	546	0	261	53	0	0
V/C Ratio(X)	0.06	0.43	0.18	0.23	0.22	0.22	0.82	0.00	0.07	0.19	0.00	0.00
Avail Cap(c_a), veh/h	727	1100	1164	590	1111	1165	903	0	431	141	0	0
HCM Platoon Ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.90	0.90	0.90	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	7.4	6.1	2.2	6.5	9.0	9.0	42.9	0.0	37.8	50.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.1	0.3	0.1	0.5	0.4	1.2	0.0	0.0	0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	3.1	1.2	0.9	2.5	2.6	5.6	0.0	0.4	0.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.4	7.2	2.5	6.6	9.4	9.4	44.0	0.0	37.9	50.8	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	D	A	D	D	A	A
Approach Vol, veh/h		722			639			464			10	
Approach Delay, s/veh		5.9			8.8			43.8			50.8	
Approach LOS		A			A			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.8	64.8		7.0	9.0	68.6		20.3				
Change Period (Y+Rc), s	5.0	5.0		5.5	5.0	5.0		5.0				
Max Green Setting (Gmax), s	8.0	44.0		6.5	8.0	44.0		26.0				
Max Q Clear Time (g_c+I1), s	14.8	11.1		2.6	2.8	8.4		14.9				
Green Ext Time (p_c), s	0.0	0.6		0.0	0.0	0.4		0.3				
Intersection Summary												
HCM 6th Ctrl Delay			16.8									
HCM 6th LOS			B									

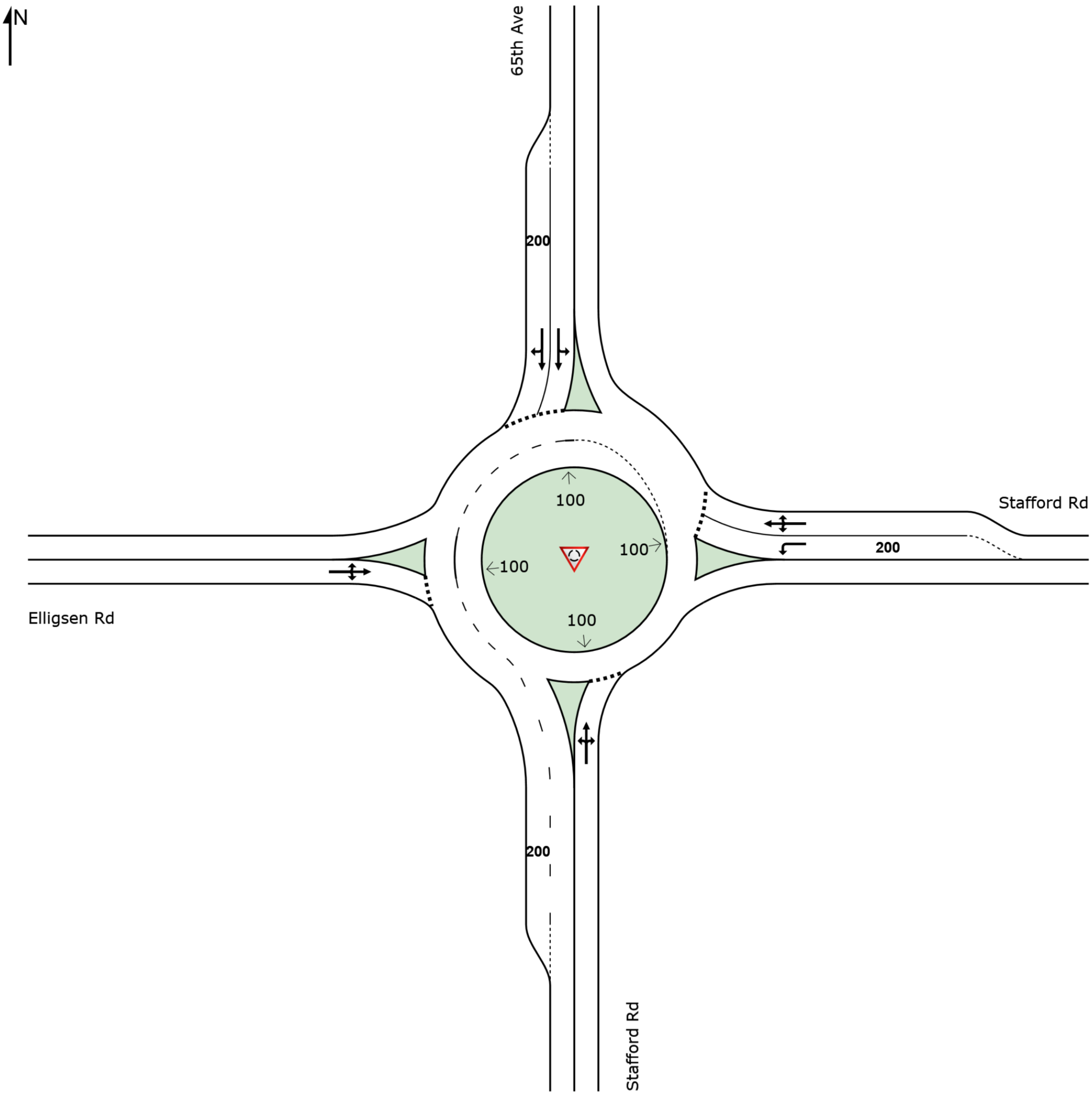
DRAFT

SITE LAYOUT

Site: [Stafford Rd/65th Ave - Build (Site Folder: Stafford Rd/65th Ave)]

Site Category: -
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



DRAFT

MOVEMENT SUMMARY

Site: [Stafford Rd/65th Ave - Build (Site Folder: Stafford Rd/65th Ave)]

Site Category: -
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Stafford Rd														
3	L2	35	2.0	37	2.0	0.648	13.8	LOS B	7.8	199.0	0.77	0.89	1.22	30.8
8	T1	215	2.0	226	2.0	0.648	13.8	LOS B	7.8	199.0	0.77	0.89	1.22	30.8
18	R2	330	2.0	347	2.0	0.648	13.8	LOS B	7.8	199.0	0.77	0.89	1.22	30.0
Approach		580	2.0	611	2.0	0.648	13.8	LOS B	7.8	199.0	0.77	0.89	1.22	30.3
East: Stafford Rd														
1	L2	585	2.0	616	2.0	0.628	12.8	LOS B	6.8	173.3	0.72	0.84	1.15	29.3
6	T1	425	2.0	447	2.0	0.575	11.4	LOS B	5.2	132.0	0.67	0.74	0.98	32.0
16	R2	110	2.0	116	2.0	0.575	11.4	LOS B	5.2	132.0	0.67	0.74	0.98	31.1
Approach		1120	2.0	1179	2.0	0.628	12.1	LOS B	6.8	173.3	0.70	0.79	1.06	30.5
North: 65th Ave														
7	L2	35	2.0	37	2.0	0.848	37.8	LOS D	8.6	218.1	0.90	1.38	2.56	23.3
4	T1	515	2.0	542	2.0	0.848	33.9	LOS C	8.6	218.1	0.87	1.26	2.21	24.6
14	R2	65	2.0	68	2.0	0.408	14.8	LOS B	1.8	45.4	0.75	0.83	1.04	29.7
Approach		615	2.0	647	2.0	0.848	32.1	LOS C	8.6	218.1	0.86	1.22	2.11	25.0
West: Elligsen Rd														
5	L2	105	2.0	111	2.0	0.831	38.0	LOS D	7.4	188.3	0.91	1.34	2.44	23.0
2	T1	190	2.0	200	2.0	0.831	38.0	LOS D	7.4	188.3	0.91	1.34	2.44	23.0
12	R2	95	2.0	100	2.0	0.831	43.8	LOS D	7.4	188.3	0.91	1.34	2.44	22.5
Approach		390	2.0	411	2.0	0.831	39.4	LOS D	7.4	188.3	0.91	1.34	2.44	22.9
All Vehicles		2705	2.0	2847	2.0	0.848	21.0	LOS C	8.6	218.1	0.78	0.99	1.53	27.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	145	320	325	80	345	30	195	215	65	35	375	260
Future Volume (veh/h)	145	320	325	80	345	30	195	215	65	35	375	260
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1870	1900	1900	1885	1900	1900	1900	1900
Adj Flow Rate, veh/h	153	337	119	84	363	24	205	226	56	37	395	246
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	2	0	0	1	0	0	0	0
Cap, veh/h	332	540	187	276	571	38	332	697	173	575	460	287
Arrive On Green	0.09	0.21	0.20	0.05	0.17	0.16	0.09	0.48	0.47	0.03	0.42	0.41
Sat Flow, veh/h	1810	2605	901	1810	3375	222	1810	1454	360	1810	1094	681
Grp Volume(v), veh/h	153	231	225	84	190	197	205	0	282	37	0	641
Grp Sat Flow(s),veh/h/ln	1810	1805	1701	1810	1777	1820	1810	0	1814	1810	0	1775
Q Serve(g_s), s	4.7	8.1	8.4	2.7	6.9	7.0	4.2	0.0	6.7	0.8	0.0	22.8
Cycle Q Clear(g_c), s	4.7	8.1	8.4	2.7	6.9	7.0	4.2	0.0	6.7	0.8	0.0	22.8
Prop In Lane	1.00		0.53	1.00		0.12	1.00		0.20	1.00		0.38
Lane Grp Cap(c), veh/h	332	374	352	276	300	308	332	0	870	575	0	747
V/C Ratio(X)	0.46	0.62	0.64	0.30	0.63	0.64	0.62	0.00	0.32	0.06	0.00	0.86
Avail Cap(c_a), veh/h	373	586	552	386	577	591	380	0	923	730	0	903
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.1	25.1	25.3	22.7	26.9	27.0	14.5	0.0	11.2	11.1	0.0	18.4
Incr Delay (d2), s/veh	0.7	1.2	1.4	0.5	1.6	1.6	2.0	0.0	0.3	0.0	0.0	7.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	3.3	3.3	1.1	2.9	3.0	1.5	0.0	2.3	0.3	0.0	9.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.9	26.3	26.8	23.1	28.5	28.6	16.4	0.0	11.5	11.1	0.0	26.2
LnGrp LOS	C	C	C	C	C	C	B	A	B	B	A	C
Approach Vol, veh/h		609			471			487			678	
Approach Delay, s/veh		25.4			27.6			13.6			25.3	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.1	33.3	7.8	18.4	6.0	37.4	10.4	15.8
Change Period (Y+Rc), s	4.0	4.5	4.0	4.5	4.0	4.5	4.0	4.5
Max Green Setting (Gmax), s	8.0	34.9	8.0	22.1	8.0	34.9	8.0	22.1
Max Q Clear Time (g_c+I1), s	6.2	24.8	4.7	10.4	2.8	8.7	6.7	9.0
Green Ext Time (p_c), s	0.1	4.0	0.0	1.6	0.0	2.3	0.0	1.4

Intersection Summary	
HCM 6th Ctrl Delay	23.3
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	290	45	80	330	65	40	120	120	150	185	85
Future Volume (veh/h)	55	290	45	80	330	65	40	120	120	150	185	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1870	1870	1870	1856	1826	1900	1856	1900	1900	1885	1900
Adj Flow Rate, veh/h	61	322	42	89	367	63	44	133	87	167	206	74
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	2	2	2	3	5	0	3	0	0	1	0
Cap, veh/h	321	478	62	375	474	81	345	198	130	418	337	121
Arrive On Green	0.05	0.30	0.28	0.06	0.31	0.30	0.04	0.19	0.18	0.10	0.26	0.25
Sat Flow, veh/h	1810	1620	211	1781	1542	265	1810	1042	682	1810	1312	471
Grp Volume(v), veh/h	61	0	364	89	0	430	44	0	220	167	0	280
Grp Sat Flow(s),veh/h/ln	1810	0	1831	1781	0	1807	1810	0	1724	1810	0	1783
Q Serve(g_s), s	1.1	0.0	8.0	1.6	0.0	9.9	0.9	0.0	5.4	3.2	0.0	6.3
Cycle Q Clear(g_c), s	1.1	0.0	8.0	1.6	0.0	9.9	0.9	0.0	5.4	3.2	0.0	6.3
Prop In Lane	1.00		0.12	1.00		0.15	1.00		0.40	1.00		0.26
Lane Grp Cap(c), veh/h	321	0	541	375	0	555	345	0	328	418	0	458
V/C Ratio(X)	0.19	0.00	0.67	0.24	0.00	0.77	0.13	0.00	0.67	0.40	0.00	0.61
Avail Cap(c_a), veh/h	553	0	1286	582	0	1269	595	0	946	587	0	1018
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.6	0.0	14.2	11.1	0.0	14.4	14.4	0.0	17.2	12.6	0.0	15.0
Incr Delay (d2), s/veh	0.3	0.0	1.5	0.3	0.0	2.4	0.2	0.0	2.4	0.6	0.0	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	2.8	0.5	0.0	3.4	0.3	0.0	2.1	1.1	0.0	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.8	0.0	15.6	11.4	0.0	16.7	14.6	0.0	19.6	13.2	0.0	16.3
LnGrp LOS	B	A	B	B	A	B	B	A	B	B	A	B
Approach Vol, veh/h		425			519			264			447	
Approach Delay, s/veh		15.1			15.8			18.8			15.2	
Approach LOS		B			B			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.7	12.7	6.7	17.4	5.7	15.7	6.2	18.0				
Change Period (Y+Rc), s	4.0	4.5	4.0	4.5	4.0	4.5	4.0	4.5				
Max Green Setting (Gmax), s	9.0	24.5	8.0	31.5	8.0	25.5	8.0	31.5				
Max Q Clear Time (g_c+I1), s	5.2	7.4	3.6	10.0	2.9	8.3	3.1	11.9				
Green Ext Time (p_c), s	0.2	0.8	0.1	1.4	0.0	1.0	0.0	1.6				
Intersection Summary												
HCM 6th Ctrl Delay			15.9									
HCM 6th LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	245	110	115	65	65	35	95	260	85	60	455	325
Future Volume (veh/h)	245	110	115	65	65	35	95	260	85	60	455	325
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.92		0.90	0.87		0.84	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1870	1885	1826	1900	1900	1885	1885	1870	1826	1885	1856
Adj Flow Rate, veh/h	247	111	24	66	66	12	96	263	74	61	460	301
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	1	2	1	5	0	0	1	1	2	5	1	3
Cap, veh/h	446	376	290	299	154	28	235	681	192	534	506	331
Arrive On Green	0.15	0.20	0.20	0.05	0.10	0.09	0.05	0.48	0.48	0.04	0.48	0.47
Sat Flow, veh/h	1795	1870	1442	1739	1512	275	1795	1406	396	1739	1063	695
Grp Volume(v), veh/h	247	111	24	66	0	78	96	0	337	61	0	761
Grp Sat Flow(s),veh/h/ln	1795	1870	1442	1739	0	1787	1795	0	1802	1739	0	1758
Q Serve(g_s), s	8.2	3.6	1.0	2.4	0.0	2.9	2.0	0.0	8.5	1.3	0.0	28.6
Cycle Q Clear(g_c), s	8.2	3.6	1.0	2.4	0.0	2.9	2.0	0.0	8.5	1.3	0.0	28.6
Prop In Lane	1.00		1.00	1.00		0.15	1.00		0.22	1.00		0.40
Lane Grp Cap(c), veh/h	446	376	290	299	0	181	235	0	873	534	0	837
V/C Ratio(X)	0.55	0.30	0.08	0.22	0.00	0.43	0.41	0.00	0.39	0.11	0.00	0.91
Avail Cap(c_a), veh/h	511	617	476	321	0	370	250	0	1053	563	0	1027
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.7	24.3	23.2	26.7	0.0	30.2	15.5	0.0	11.7	9.4	0.0	17.4
Incr Delay (d2), s/veh	0.8	0.3	0.1	0.3	0.0	1.2	0.8	0.0	0.3	0.1	0.0	10.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	1.5	0.3	1.0	0.0	1.3	0.7	0.0	3.0	0.4	0.0	12.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.5	24.6	23.3	26.9	0.0	31.4	16.3	0.0	12.0	9.5	0.0	27.7
LnGrp LOS	C	C	C	C	A	C	B	A	B	A	A	C
Approach Vol, veh/h		382			144			433			822	
Approach Delay, s/veh		23.1			29.4			13.0			26.3	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.4	38.1	14.8	11.3	6.8	38.7	7.7	18.4
Change Period (Y+Rc), s	4.0	4.5	4.5	4.5	4.0	4.5	4.5	4.5
Max Green Setting (Gmax), s	4.0	41.3	12.9	14.3	4.0	41.3	4.1	23.1
Max Q Clear Time (g_c+I1), s	4.0	30.6	10.2	4.9	3.3	10.5	4.4	5.6
Green Ext Time (p_c), s	0.0	2.9	0.2	0.1	0.0	1.4	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	22.6
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	5.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	110	80	5	95	30	45	50	5	30	70	10
Future Vol, veh/h	10	110	80	5	95	30	45	50	5	30	70	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	1	12	0	1	0	7	0	0	0	0	0
Mvmt Flow	11	122	89	6	106	33	50	56	6	33	78	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	139	0	0	211	0	0	368	340	167	355	368	123
Stage 1	-	-	-	-	-	-	189	189	-	135	135	-
Stage 2	-	-	-	-	-	-	179	151	-	220	233	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.17	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.563	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1457	-	-	1372	-	-	579	585	882	604	564	933
Stage 1	-	-	-	-	-	-	801	748	-	873	789	-
Stage 2	-	-	-	-	-	-	811	776	-	787	716	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1457	-	-	1372	-	-	505	577	882	550	556	933
Mov Cap-2 Maneuver	-	-	-	-	-	-	505	577	-	550	556	-
Stage 1	-	-	-	-	-	-	794	741	-	865	785	-
Stage 2	-	-	-	-	-	-	718	772	-	717	710	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.3	13.2	12.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	551	1457	-	-	1372	-	-	575
HCM Lane V/C Ratio	0.202	0.008	-	-	0.004	-	-	0.213
HCM Control Delay (s)	13.2	7.5	0	-	7.6	0	-	12.9
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.7	0	-	-	0	-	-	0.8

Intersection	
Int Delay, s/veh	11.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	10	15	30	10	35	15	440	85	100	795	45
Future Vol, veh/h	25	10	15	30	10	35	15	440	85	100	795	45
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	0	0	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	10	0	0	0	2	0
Mvmt Flow	27	11	16	33	11	38	16	478	92	109	864	49

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1690	1711	891	1676	1689	524	915	0	0	570	0	0
Stage 1	1109	1109	-	556	556	-	-	-	-	-	-	-
Stage 2	581	602	-	1120	1133	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.2	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.29	-	-	2.2	-	-
Pot Cap-1 Maneuver	75	92	344	76	94	557	713	-	-	1013	-	-
Stage 1	257	288	-	519	516	-	-	-	-	-	-	-
Stage 2	503	492	-	253	280	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	50	69	343	52	71	557	712	-	-	1013	-	-
Mov Cap-2 Maneuver	50	69	-	52	71	-	-	-	-	-	-	-
Stage 1	248	224	-	502	499	-	-	-	-	-	-	-
Stage 2	443	476	-	179	218	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	137.6	133	0.3	1
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	712	-	-	73	96	1013	-	-
HCM Lane V/C Ratio	0.023	-	-	0.744	0.849	0.107	-	-
HCM Control Delay (s)	10.2	0	-	137.6	133	9	0	-
HCM Lane LOS	B	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	3.5	4.7	0.4	-	-

Intersection	
Int Delay, s/veh	121.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	75	10	10	20	10	80	5	450	45	165	910	100
Future Vol, veh/h	75	10	10	20	10	80	5	450	45	165	910	100
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	0	0	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	2	10
Mvmt Flow	82	11	11	22	11	87	5	489	49	179	989	109

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1977	1952	1046	1937	1982	514	1100	0	0	538	0	0
Stage 1	1404	1404	-	524	524	-	-	-	-	-	-	-
Stage 2	573	548	-	1413	1458	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	~ 47	65	280	50	62	564	642	-	-	1040	-	-
Stage 1	175	208	-	540	533	-	-	-	-	-	-	-
Stage 2	508	520	-	173	196	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 19	35	280	24	33	564	641	-	-	1040	-	-
Mov Cap-2 Maneuver	~ 19	35	-	24	33	-	-	-	-	-	-	-
Stage 1	173	113	-	534	527	-	-	-	-	-	-	-
Stage 2	416	514	-	82	107	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 2017.7	$ 318.8	0.1	1.3
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	641	-	-	22	86	1040	-	-
HCM Lane V/C Ratio	0.008	-	-	4.694	1.39	0.172	-	-
HCM Control Delay (s)	10.7	0		$ 2017.7	$ 318.8	9.2	0	-
HCM Lane LOS	B	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0	-	-	13.1	9.1	0.6	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	5	5	10	5	25	5	585	15	40	1160	35
Future Vol, veh/h	15	5	5	10	5	25	5	585	15	40	1160	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	2	0	0	2	0
Mvmt Flow	16	5	5	11	5	27	5	636	16	43	1261	38

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2036	2028	1280	2025	2039	644	1299	0	0	652	0	0
Stage 1	1366	1366	-	654	654	-	-	-	-	-	-	-
Stage 2	670	662	-	1371	1385	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	43	58	204	43	57	476	540	-	-	944	-	-
Stage 1	184	217	-	459	466	-	-	-	-	-	-	-
Stage 2	450	462	-	182	213	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	32	48	204	33	47	476	540	-	-	944	-	-
Mov Cap-2 Maneuver	32	48	-	33	47	-	-	-	-	-	-	-
Stage 1	181	181	-	452	459	-	-	-	-	-	-	-
Stage 2	413	455	-	143	178	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	188.1			82.1			0.1			0.3		
HCM LOS	F			F								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	540	-	-	42	87	944	-	-
HCM Lane V/C Ratio	0.01	-	-	0.647	0.5	0.046	-	-
HCM Control Delay (s)	11.7	0	-	188.1	82.1	9	0	-
HCM Lane LOS	B	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0	-	-	2.4	2.1	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	825	660	545	1015	0	0	0	0	80	5	115
Future Volume (veh/h)	0	825	660	545	1015	0	0	0	0	80	5	115
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1856	1870	1856	0				1856	1900	1856
Adj Flow Rate, veh/h	0	868	0	574	1068	0				88	0	13
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	2	3	2	3	0				3	0	3
Cap, veh/h	0	3323		650	3086	0				184	0	158
Arrive On Green	0.00	0.65	0.00	0.38	1.00	0.00				0.05	0.00	0.05
Sat Flow, veh/h	0	5274	1572	3456	3618	0				3534	0	3039
Grp Volume(v), veh/h	0	868	0	574	1068	0				88	0	13
Grp Sat Flow(s),veh/h/ln	0	1702	1572	1728	1763	0				1767	0	1520
Q Serve(g_s), s	0.0	7.9	0.0	17.1	0.0	0.0				2.7	0.0	0.4
Cycle Q Clear(g_c), s	0.0	7.9	0.0	17.1	0.0	0.0				2.7	0.0	0.4
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	3323		650	3086	0				184	0	158
V/C Ratio(X)	0.00	0.26		0.88	0.35	0.00				0.48	0.00	0.08
Avail Cap(c_a), veh/h	0	3323		817	3086	0				610	0	525
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.88	0.88	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	8.1	0.0	33.2	0.0	0.0				50.7	0.0	49.6
Incr Delay (d2), s/veh	0.0	0.2	0.0	8.5	0.3	0.0				1.9	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.7	0.0	6.3	0.1	0.0				1.2	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	8.3	0.0	41.7	0.3	0.0				52.6	0.0	49.9
LnGrp LOS	A	A		D	A	A				D	A	D
Approach Vol, veh/h		868			1642						101	
Approach Delay, s/veh		8.3			14.7						52.3	
Approach LOS		A			B						D	

Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	24.7	75.6		9.7		100.3						
Change Period (Y+Rc), s	4.0	4.0		4.0		4.0						
Max Green Setting (Gmax), s	26.0	53.0		19.0		75.0						
Max Q Clear Time (g_c+I1), s	19.1	9.9		4.7		2.0						
Green Ext Time (p_c), s	1.6	4.7		0.3		6.3						

Intersection Summary			
HCM 6th Ctrl Delay			14.0
HCM 6th LOS			B

Notes
User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	355	550	0	0	1110	335	450	5	510	0	0	0
Future Volume (veh/h)	355	550	0	0	1110	335	450	5	510	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1885	1826	1900	1870			
Adj Flow Rate, veh/h	370	573	0	0	1156	0	473	0	287			
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96			
Percent Heavy Veh, %	2	2	0	0	2	1	5	0	2			
Cap, veh/h	441	2686	0	0	3022		596	0	536			
Arrive On Green	0.26	1.00	0.00	0.00	0.59	0.00	0.17	0.00	0.17			
Sat Flow, veh/h	3456	3647	0	0	5274	1598	3478	0	3124			
Grp Volume(v), veh/h	370	573	0	0	1156	0	473	0	287			
Grp Sat Flow(s),veh/h/ln	1728	1777	0	0	1702	1598	1739	0	1562			
Q Serve(g_s), s	11.2	0.0	0.0	0.0	13.1	0.0	14.3	0.0	9.2			
Cycle Q Clear(g_c), s	11.2	0.0	0.0	0.0	13.1	0.0	14.3	0.0	9.2			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	441	2686	0	0	3022		596	0	536			
V/C Ratio(X)	0.84	0.21	0.00	0.00	0.38		0.79	0.00	0.54			
Avail Cap(c_a), veh/h	723	2686	0	0	3022		1043	0	937			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.97	0.97	0.00	0.00	0.26	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	39.9	0.0	0.0	0.0	11.8	0.0	43.7	0.0	41.6			
Incr Delay (d2), s/veh	3.0	0.2	0.0	0.0	0.1	0.0	1.5	0.0	0.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	4.3	0.1	0.0	0.0	4.7	0.0	6.2	0.0	3.5			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.9	0.2	0.0	0.0	11.9	0.0	45.2	0.0	42.1			
LnGrp LOS	D	A	A	A	B		D	A	D			
Approach Vol, veh/h		943			1156			760				
Approach Delay, s/veh		17.0			11.9			44.0				
Approach LOS		B			B			D				
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		87.1			18.0	69.1		22.9				
Change Period (Y+Rc), s		4.0			4.0	4.0		4.0				
Max Green Setting (Gmax), s		51.0			23.0	42.0		33.0				
Max Q Clear Time (g_c+I1), s		2.0			13.2	15.1		16.3				
Green Ext Time (p_c), s		6.3			0.9	12.5		2.5				

Intersection Summary			
HCM 6th Ctrl Delay			22.1
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↱			↑↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	0	945	115	0	870	50	200	25	90	65	125	375
Future Volume (veh/h)	0	945	115	0	870	50	200	25	90	65	125	375
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	1.00		0.99	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1885	1900	1885	1900	1900	1900	1900	1870
Adj Flow Rate, veh/h	0	995	106	0	916	49	211	26	39	68	132	349
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	2	2	0	1	0	1	0	0	0	0	2
Cap, veh/h	0	1408	150	0	1038	56	247	369	553	96	207	546
Arrive On Green	0.00	0.10	0.10	0.00	0.30	0.30	0.14	0.54	0.54	0.05	0.46	0.46
Sat Flow, veh/h	0	4850	498	0	3546	185	1795	681	1021	1810	452	1195
Grp Volume(v), veh/h	0	723	378	0	475	490	211	0	65	68	0	481
Grp Sat Flow(s),veh/h/ln	0	1702	1775	0	1791	1845	1795	0	1701	1810	0	1646
Q Serve(g_s), s	0.0	22.6	22.7	0.0	27.8	27.8	12.6	0.0	2.0	4.1	0.0	24.6
Cycle Q Clear(g_c), s	0.0	22.6	22.7	0.0	27.8	27.8	12.6	0.0	2.0	4.1	0.0	24.6
Prop In Lane	0.00		0.28	0.00		0.10	1.00		0.60	1.00		0.73
Lane Grp Cap(c), veh/h	0	1024	534	0	538	555	247	0	922	96	0	753
V/C Ratio(X)	0.00	0.71	0.71	0.00	0.88	0.88	0.85	0.00	0.07	0.71	0.00	0.64
Avail Cap(c_a), veh/h	0	1362	710	0	716	738	253	0	922	156	0	753
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.94	0.94	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	44.8	44.9	0.0	36.6	36.6	46.3	0.0	12.1	51.2	0.0	22.9
Incr Delay (d2), s/veh	0.0	0.8	1.6	0.0	9.3	9.1	23.3	0.0	0.1	9.2	0.0	4.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	10.4	11.0	0.0	13.2	13.6	7.3	0.0	0.8	2.1	0.0	10.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	45.7	46.5	0.0	45.9	45.7	69.6	0.0	12.2	60.4	0.0	27.0
LnGrp LOS	A	D	D	A	D	D	E	A	B	E	A	C
Approach Vol, veh/h		1101			965			276			549	
Approach Delay, s/veh		46.0			45.8			56.1			31.2	
Approach LOS		D			D			E			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.3	63.6		37.1	18.6	54.3		37.1
Change Period (Y+Rc), s	4.0	4.5		4.5	4.0	4.5		4.5
Max Green Setting (Gmax), s	9.0	44.5		43.5	15.0	38.5		43.5
Max Q Clear Time (g_c+I1), s	6.1	4.0		24.7	14.6	26.6		29.8
Green Ext Time (p_c), s	0.0	0.2		3.9	0.0	1.4		2.8

Intersection Summary			
HCM 6th Ctrl Delay			44.1
HCM 6th LOS			D

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ID	Software/Method	Intersection	Control Type	LOS	Delay	V/C Ratio
1	Synchro HCM 6th Signal	I-5 SB Ramp & Elligsen Rd	Signal	B	18.2	0.73
2	Synchro HCM 6th Signal	I-5 NB Ramp & Elligsen Rd	Signal	A	9.2	0.45
3	Synchro HCM 6th Signal	Parkway Ave & Elligsen Rd	Signal	C	24.5	0.53
4	Synchro HCM 6th Signal	Parkway Center Dr & Elligsen Rd	Signal	B	16.8	0.54
6	Synchro HCM 6th Signal	Parkway Ave & Boeckman Rd	Signal	C	23.3	0.81
7	Synchro HCM 6th Signal	Canyon Creek Rd & Boeckman Rd	Signal	B	15.9	0.60
8	Synchro HCM 6th Signal	Wilsonville Rd/Stafford Rd & Boeckman Rd/	Signal	C	22.6	0.81
13	Synchro HCM 6th Signal	I-5 SB Ramp & Wilsonville Rd	Signal	B	14.0	0.40
14	Synchro HCM 6th Signal	I-5 NB Ramp & Wilsonville Rd	Signal	C	22.1	0.52
15	Synchro HCM 6th Signal	Town Center Lp West & Wilsonville Rd	Signal	D	44.1	0.82

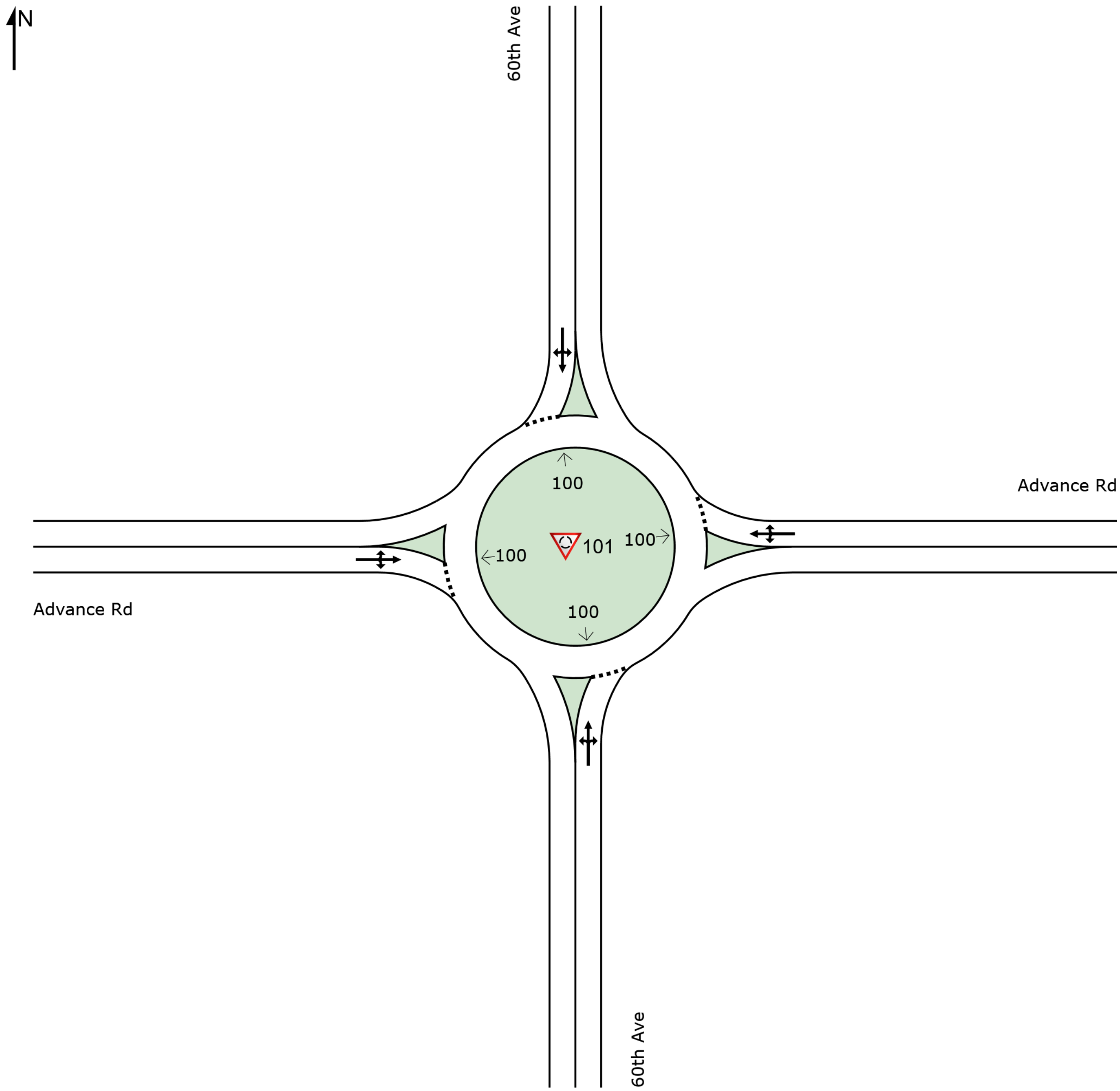
RECOMMENDED IMPROVEMENTS HCM REPORTS

SITE LAYOUT

Site: 101 [Advance Rd/60th Ave (Site Folder: East & South Master Plan - Future 2040 Mitigation)]

Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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MOVEMENT SUMMARY

Site: 101 [Advance Rd/60th Ave (Site Folder: East & South Master Plan - Future 2040 Mitigation)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: 60th Ave														
3	L2	45	7.0	50	7.0	0.099	4.2	LOS A	0.4	10.9	0.32	0.18	0.32	34.4
8	T1	50	0.0	56	0.0	0.099	3.9	LOS A	0.4	10.9	0.32	0.18	0.32	37.1
18	R2	5	0.0	6	0.0	0.099	3.9	LOS A	0.4	10.9	0.32	0.18	0.32	37.8
Approach		100	3.2	111	3.2	0.099	4.0	LOS A	0.4	10.9	0.32	0.18	0.32	35.9
East: Advance Rd														
1	L2	5	0.0	6	0.0	0.119	4.0	LOS A	0.5	13.7	0.27	0.14	0.27	40.8
6	T1	95	1.0	106	1.0	0.119	4.0	LOS A	0.5	13.7	0.27	0.14	0.27	37.2
16	R2	30	0.0	33	0.0	0.119	4.0	LOS A	0.5	13.7	0.27	0.14	0.27	39.4
Approach		130	0.7	144	0.7	0.119	4.0	LOS A	0.5	13.7	0.27	0.14	0.27	37.8
North: 60th Ave														
7	L2	30	0.0	33	0.0	0.105	4.0	LOS A	0.5	11.8	0.32	0.18	0.32	39.4
4	T1	70	0.0	78	0.0	0.105	4.0	LOS A	0.5	11.8	0.32	0.18	0.32	37.7
14	R2	10	0.0	11	0.0	0.105	4.0	LOS A	0.5	11.8	0.32	0.18	0.32	33.6
Approach		110	0.0	122	0.0	0.105	4.0	LOS A	0.5	11.8	0.32	0.18	0.32	37.7
West: Advance Rd														
5	L2	10	0.0	11	0.0	0.191	4.6	LOS A	0.9	23.3	0.28	0.15	0.28	34.8
2	T1	110	1.0	122	1.0	0.191	4.7	LOS A	0.9	23.3	0.28	0.15	0.28	36.2
12	R2	80	12.0	89	12.0	0.191	5.0	LOS A	0.9	23.3	0.28	0.15	0.28	32.3
Approach		200	5.4	222	5.4	0.191	4.8	LOS A	0.9	23.3	0.28	0.15	0.28	34.5
All Vehicles		540	2.7	600	2.7	0.191	4.3	LOS A	0.9	23.3	0.29	0.16	0.29	36.2

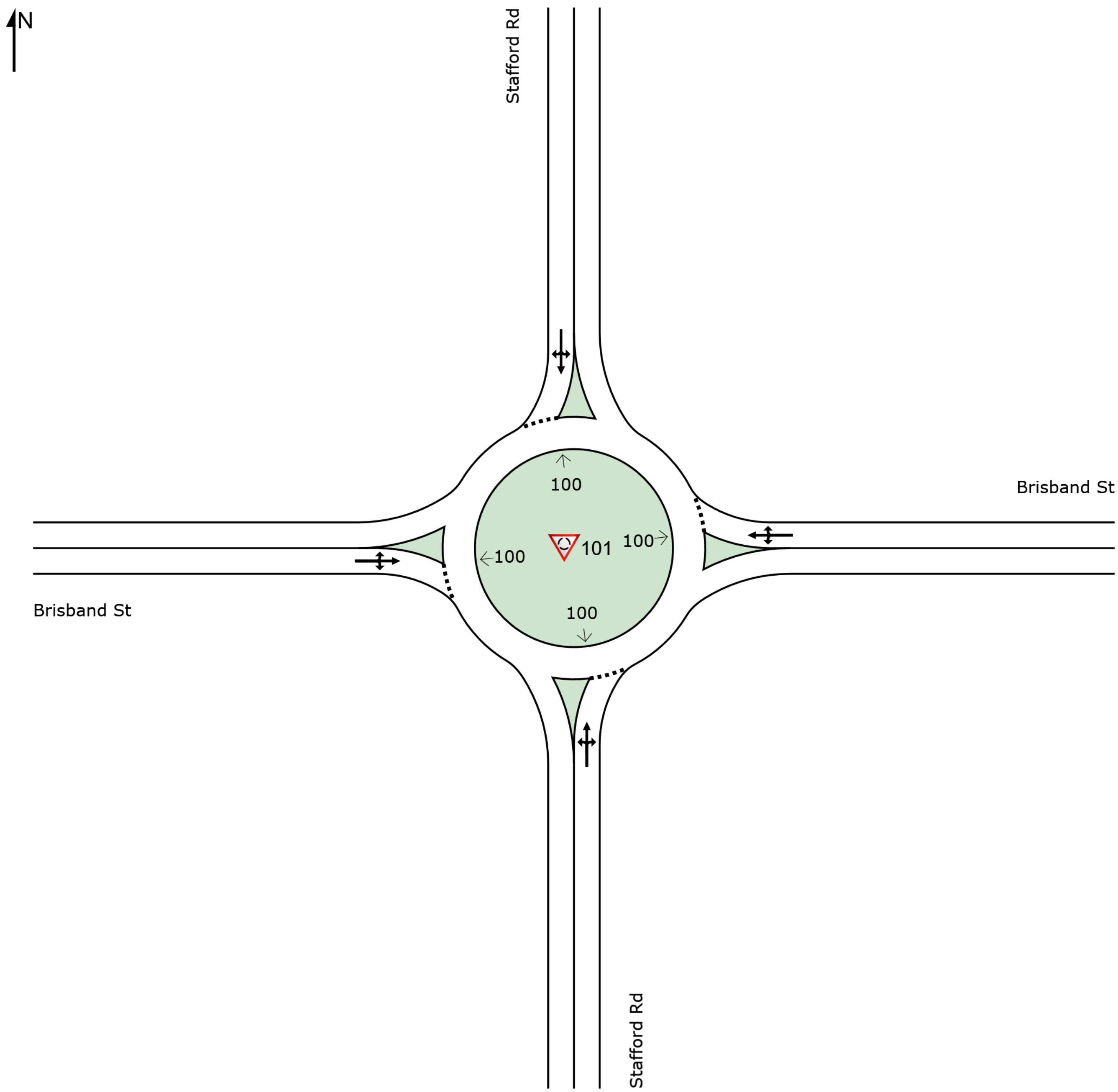
Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Stafford Rd/Brisband St (Site Folder: East & South Master Plan - Future 2040 Mitigation)]

Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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MOVEMENT SUMMARY

Site: 101 [Stafford Rd/Brisband St (Site Folder: East & South Master Plan - Future 2040 Mitigation)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Stafford Rd														
3	L2	15	10.0	16	10.0	0.494	8.9	LOS A	3.4	85.7	0.51	0.35	0.51	33.2
8	T1	440	0.0	463	0.0	0.494	8.6	LOS A	3.4	85.7	0.51	0.35	0.51	35.8
18	R2	85	0.0	89	0.0	0.494	8.6	LOS A	3.4	85.7	0.51	0.35	0.51	36.5
Approach		540	0.3	568	0.3	0.494	8.6	LOS A	3.4	85.7	0.51	0.35	0.51	35.8
East: Brisband St														
1	L2	45	0.0	47	0.0	0.125	5.8	LOS A	0.5	13.0	0.55	0.49	0.55	38.0
6	T1	15	0.0	16	0.0	0.125	5.8	LOS A	0.5	13.0	0.55	0.49	0.55	34.9
16	R2	35	0.0	37	0.0	0.125	5.8	LOS A	0.5	13.0	0.55	0.49	0.55	36.8
Approach		95	0.0	100	0.0	0.125	5.8	LOS A	0.5	13.0	0.55	0.49	0.55	37.1
North: Stafford Rd														
7	L2	100	0.0	105	0.0	0.780	16.1	LOS C	10.8	273.4	0.66	0.35	0.66	33.1
4	T1	780	2.0	821	2.0	0.780	16.1	LOS C	10.8	273.4	0.66	0.35	0.66	31.6
14	R2	45	0.0	47	0.0	0.780	16.1	LOS C	10.8	273.4	0.66	0.35	0.66	28.8
Approach		925	1.7	974	1.7	0.780	16.1	LOS C	10.8	273.4	0.66	0.35	0.66	31.6
West: Brisband St														
5	L2	50	0.0	53	0.0	0.168	9.4	LOS A	0.6	16.0	0.68	0.68	0.68	31.1
2	T1	15	0.0	16	0.0	0.168	9.4	LOS A	0.6	16.0	0.68	0.68	0.68	32.3
12	R2	15	0.0	16	0.0	0.168	9.4	LOS A	0.6	16.0	0.68	0.68	0.68	30.3
Approach		80	0.0	84	0.0	0.168	9.4	LOS A	0.6	16.0	0.68	0.68	0.68	31.2
All Vehicles		1640	1.0	1726	1.0	0.780	12.7	LOS B	10.8	273.4	0.60	0.37	0.60	33.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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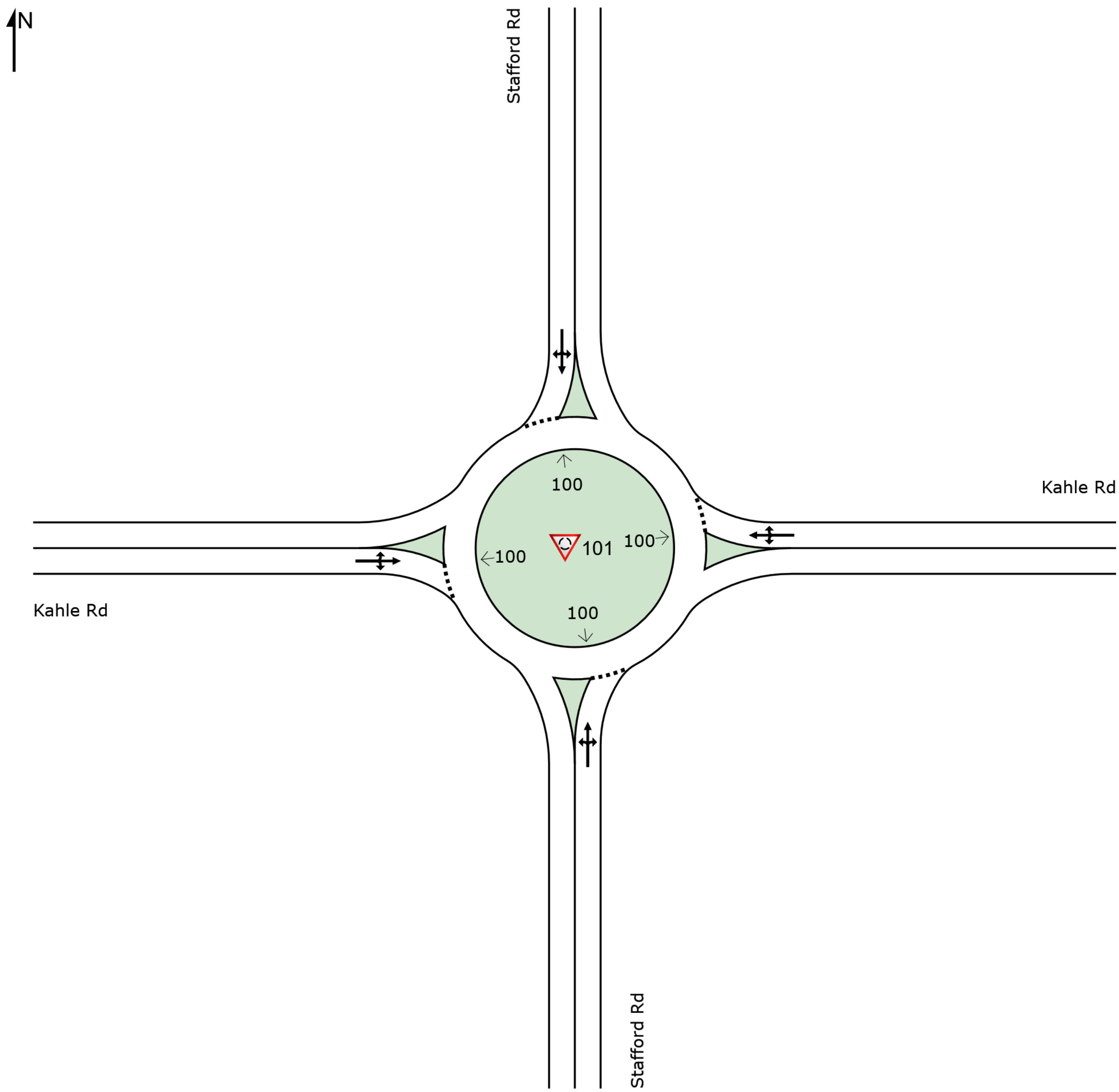
SITE LAYOUT

Site: 101 [Stafford Rd/Kahle Rd (Site Folder: East & South Master Plan - Future 2040 Mitigation)]

Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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MOVEMENT SUMMARY

Site: 101 [Stafford Rd/Kahle Rd (Site Folder: East & South Master Plan - Future 2040 Mitigation)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Stafford Rd														
3	L2	5	0.0	5	0.0	0.489	8.2	LOS A	3.4	86.9	0.42	0.25	0.42	33.6
8	T1	535	2.0	563	2.0	0.489	8.3	LOS A	3.4	86.9	0.42	0.25	0.42	35.7
18	R2	15	0.0	16	0.0	0.489	8.2	LOS A	3.4	86.9	0.42	0.25	0.42	36.7
Approach		555	1.9	584	1.9	0.489	8.3	LOS A	3.4	86.9	0.42	0.25	0.42	35.7
East: Kahle Rd														
1	L2	15	0.0	16	0.0	0.074	5.8	LOS A	0.3	7.3	0.58	0.52	0.58	38.6
6	T1	10	0.0	11	0.0	0.074	5.8	LOS A	0.3	7.3	0.58	0.52	0.58	35.4
16	R2	25	0.0	26	0.0	0.074	5.8	LOS A	0.3	7.3	0.58	0.52	0.58	37.4
Approach		50	0.0	53	0.0	0.074	5.8	LOS A	0.3	7.3	0.58	0.52	0.58	37.3
North: Stafford Rd														
7	L2	40	0.0	42	0.0	0.993	41.1	LOS E	126.9	3219.2	1.00	0.58	1.33	24.4
4	T1	1160	2.0	1221	2.0	0.993	41.1	LOS E	126.9	3219.2	1.00	0.58	1.33	23.6
14	R2	35	0.0	37	0.0	0.993	41.1	LOS E	126.9	3219.2	1.00	0.58	1.33	22.0
Approach		1235	1.9	1300	1.9	0.993	41.1	LOS E	126.9	3219.2	1.00	0.58	1.33	23.6
West: Kahle Rd														
5	L2	65	0.0	68	0.0	0.231	13.9	LOS B	0.8	21.0	0.78	0.78	0.78	29.0
2	T1	10	0.0	11	0.0	0.231	13.9	LOS B	0.8	21.0	0.78	0.78	0.78	30.0
12	R2	5	0.0	5	0.0	0.231	13.9	LOS B	0.8	21.0	0.78	0.78	0.78	28.3
Approach		80	0.0	84	0.0	0.231	13.9	LOS B	0.8	21.0	0.78	0.78	0.78	29.1
All Vehicles		1920	1.8	2021	1.8	0.993	29.6	LOS D	126.9	3219.2	0.81	0.49	1.03	26.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
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Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	10	0	0	80	5	475	45	165	915	100
Future Vol, veh/h	0	0	10	0	0	80	5	475	45	165	915	100
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	0	0	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	0	200	-	-	200	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	2	10
Mvmt Flow	0	0	11	0	0	87	5	516	49	179	995	109

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	-	-	1052	-	-	541	1106	0	0	565	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.2	-	-	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.3	-	-	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	0	0	278	0	0	545	639	-	-	1017	-	-
Stage 1	0	0	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	0	0	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	-	278	-	-	545	638	-	-	1017	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB
HCM Control Delay, s	18.5			12.9			0.1			1.3
HCM LOS	C			B						

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	638	-	-	278	545	1017	-	-
HCM Lane V/C Ratio	0.009	-	-	0.039	0.16	0.176	-	-
HCM Control Delay (s)	10.7	-	-	18.5	12.9	9.3	-	-
HCM Lane LOS	B	-	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.6	0.6	-	-

APPENDIX J: BUILDABLE LANDS INVENTORY

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APPENDIX K: ACCESSORY DWELLING UNIT ASSESSMENT

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ECONorthwest
ECONOMICS • FINANCE • PLANNING

DATE: January 31, 2022
TO: Dan Pauly, Kim Rybold, City of Wilsonville
FROM: Becky Hewitt, Kaitlin La Bonte, Ariel Kane ECONorthwest
SUBJECT: Frog Pond East and South Accessory Dwelling Units Memorandum

Section 1. Introduction

Accessory Dwelling Units (ADUs) offer an opportunity to seamlessly integrate additional, smaller units within neighborhoods while staying with traditional single-family development and financing models. There are many reasons why people may be interested in building or living in ADUs. For residents, ADUs tend to be a more affordable flexible housing option. For homeowners, ADUs provide opportunities to house family members or earn additional income. As ADUs grow in popularity and recognition, many jurisdictions are considering ways to encourage ADU development.

In bringing the Frog Pond East and South areas into the Urban Growth Boundary (UGB), Metro required that the city explore ways to encourage the construction of ADUs in the expansion area. In Frog Pond East and South, the challenges to encouraging ADU development are different from infill development scenarios. Strategies to promote ADU development in an infill context typically focus on facilitating development for homeowners. In a greenfield development context such as Frog Pond, the City's strategies should focus on ways to influence homebuilders' floorplans to encourage building ADUs at the time of construction or encouraging home and lot designs that provide opportunities for ADU additions later.

This memorandum is intended to assist the City of Wilsonville in planning for residential development in Frog Pond East and South in a way that would be supportive of ADU development in the planning area's residential neighborhoods. Using available survey data and stakeholder interviews, this memorandum provides some insight into the likely demand and market for ADUs in the region and describes ways to City could facilitate ADU development as the planning area is built out.

Section 2. Who do ADUs serve?

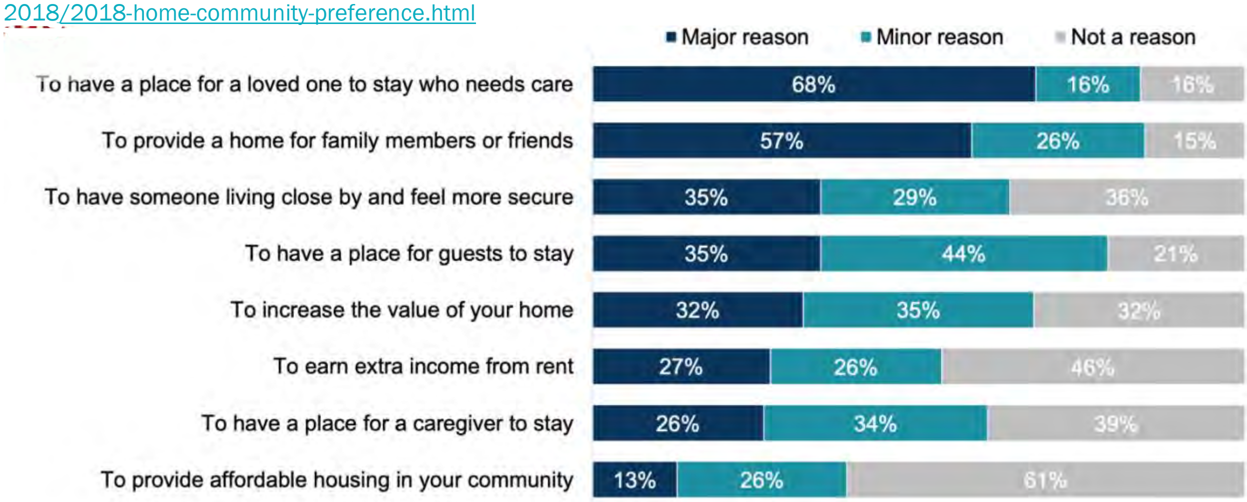
Who wants ADUs and why?

A 2018 American Association of Retired Persons (AARP) Home and Community Preferences Survey[1] found that 33% of adults aged 18 and older who did not have an ADU on their property would consider adding an ADU (27% unsure). As shown in Exhibit 1, of those who would consider adding an ADU, having a place for a loved one to stay who needs care was a major

[1] This survey was conducted by NORC at the University of Chicago with funding from AARP in March and April 2018. 2,287 participants completed the survey, the final total of the national sample was 1,947.

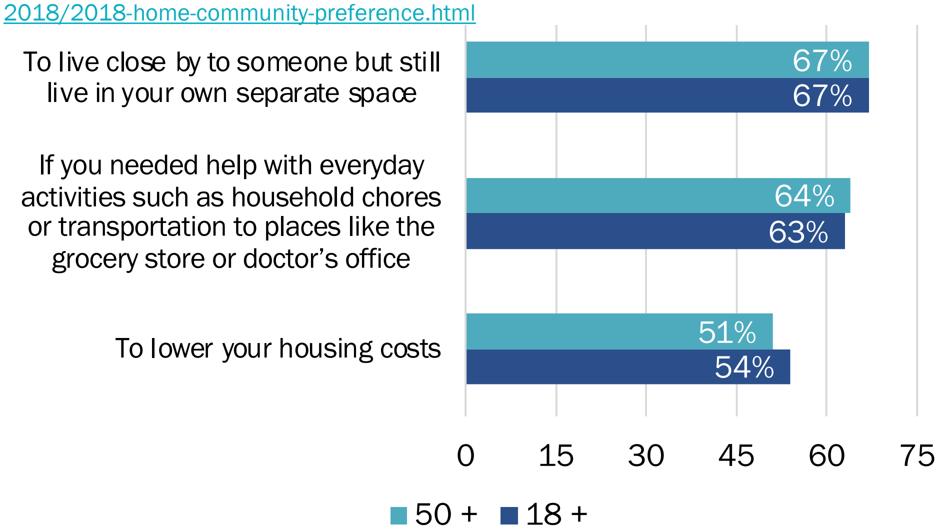
reason for 68% of respondents; providing a home for family members or friends was a major reason for 57%.

Exhibit 1. Major Reasons for Considering Building an ADU
Source: 2018 AARP Home and Community Preferences Survey, www.aarp.org/research/topics/community/info-2018/2018-home-community-preference.html



Out of the adults surveyed, 67% said they would consider living in an ADU to live close to someone but still have their own space, 63% said they would consider it if they needed help with everyday activities, and 54% said they could consider it to lower their housing costs. This is shown in Exhibit 2.

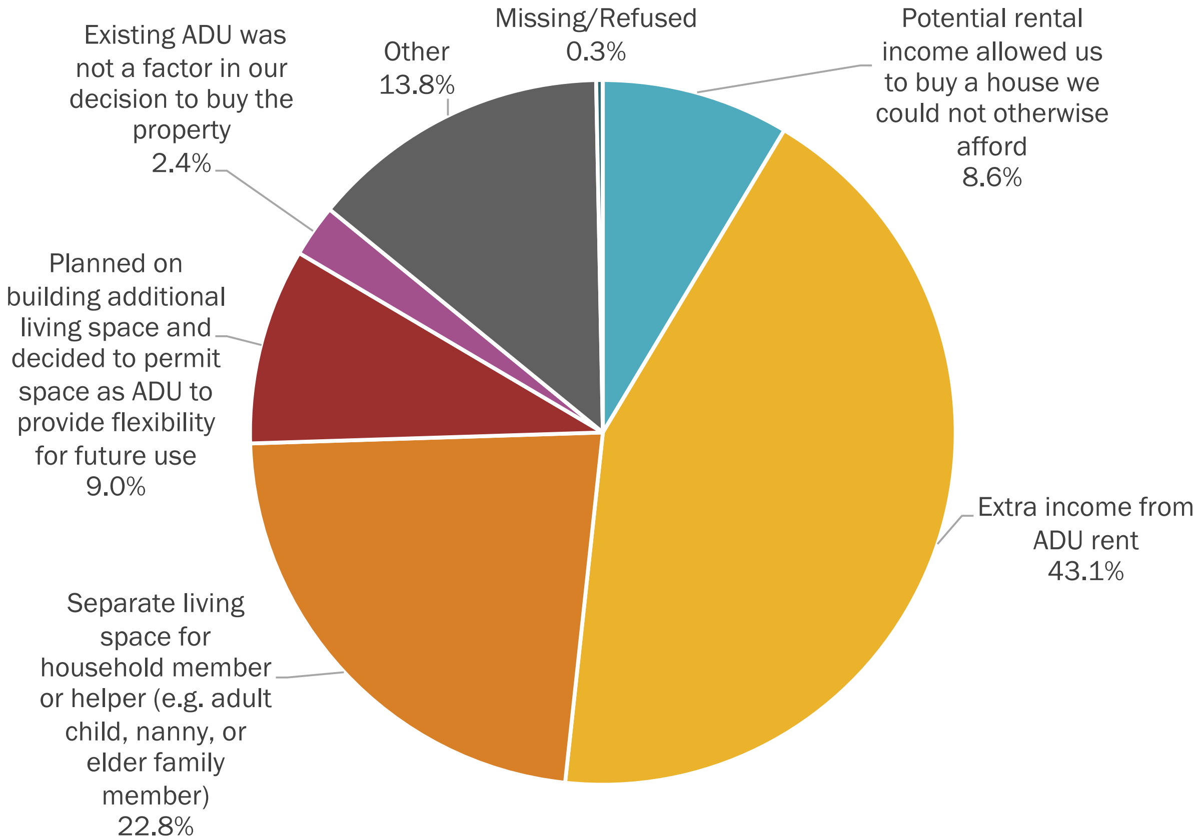
Exhibit 2. Top Three Reasons for Considering Living in an ADU by Age Group
Source: 2018 AARP Home and Community Preferences Survey, www.aarp.org/research/topics/community/info-2018/2018-home-community-preference.html



In a 2013 survey of Portland, Eugene, and Ashland homeowners with existing ADUs, 43% of Portland respondents said that the extra income from ADU rent was a primary reason for building an ADU or for purchasing a property with an existing ADU. Other reasons are shown in Exhibit 3.

Exhibit 3. Portland Homeowners primary reason for building an ADU or purchasing the property with an existing ADU.

Source: Accessory Dwelling Unit Survey for Portland, Eugene, and Ashland, Oregon Final Methodology and Data Report, 2013 https://accessorydwellings.files.wordpress.com/2013/10/adureportfrev.pdf



What might an ADU rent for in Frog Pond East and South?

In the 2013 survey of Portland property owners with ADUs, the mean rental income received was between $811 and $880 (Exhibit 4). While these rents are now well out of date, the range of rents is worth noting: from as little as $385 per month, to as much as $1,800 per month.

Exhibit 4. Portland Rent Received Monthly for ADU, 2013
Source: Accessory Dwelling Unit Survey for Portland, Eugene, and Ashland, Oregon Final Methodology and Data Report, 2013 https://accessorydwellings.files.wordpress.com/2013/10/adureportfrev.pdf

	N	Minimum	Maximum	Mean	Std. Deviation
How much rent do you receive monthly for.your ADU?	143	$385	$1,800	$880.20	$239.42
If rent includes utilities, how much is the rent without utilities?	78	$200	$1,700	$811.85	$248.09

Based on analysis of recent ADU listings in Portland, Milwaukie, Canby, Oregon City, Beaverton and Hillsboro, ADU rents were generally between $1,050 and $2,000 per month. Rents varied by structure type, number of bedrooms and unit size, with the average rent overall being $1,540. Detached ADUs tended to have higher rents, with smaller footprints. Basement ADU rents tended to be lower, at an average of $1,275 (see Exhibit 5).

Exhibit 5. ADU Rents in Portland Metro Area by Structure and Bedroom
Source: ECONorthwest Analysis of Craigslist, Apartments.com data, 2021

Structure	Bedrooms	Most rent for	Average Rent	Most units are
Attached	Studio	$1,475	$1,475	500 SF
	1 Bedroom	$1,450 - $1,625	$1,540	650 - 800 SF
	2 Bedrooms	$1,595	$1,595	610 SF
	Overall	$1,450 - $1,625	$1,540	500 - 800 SF
Basement	Studio	$1,350 - $1,450	$1,400	500 - 750 SF
	1 Bedroom	$1,050 - $1,250	$1,150	500 - 1,500 SF
	Overall	$1,050 - $1,400	$1,275	500 - 1,500 SF
Detached	Studio	$1,450	$1,450	450 SF
	2 Bedrooms	$1,500 - $2,000	$1,700	750 - 950 SF
	Overall	$1,450 - $2,000	$1,650	500 - 950 SF
Overall	Studio	$1,350 - $1,475	$1,430	500 - 600 SF
	1 Bedroom	$1,050 - $1,625	$1,350	350 - 800 SF
	2 Bedrooms	$1,500 - $2,000	$1,690	600 - 750 SF
	Overall	$1,050 - $2,000	$1,540	500 - 1,000 SF

Overall, while the variability is high due to a small set of observations spread across a wide area in many different forms and ages of homes, this suggests that ADU rents might be similar to rents for newer market-rate apartments.

What might an ADU sell for in Frog Pond East and South?

Some ADUs are sold separately from the main home as condominiums rather than being rented out or managed by the owner of the main home. These sales transactions are difficult to isolate, and there are no known examples in Wilsonville or surrounding areas. Examples of new construction small, detached condominium units in Portland have mostly sold for $300,000 to

$400,000—roughly 60-70% of the sale price of the main house on the same lot where both were new construction. Given this pattern and the estimated sale prices for new homes in the Frog Pond area with larger lots generally being between $600,000 and $800,000, the price range for ADUs in the Frog Pond area may be similar to that seen in Portland. This is also similar to the pricing for newer two- to three-bedroom condominium units in Wilsonville.

Section 3. Opportunities and Barriers for ADU development

Regulatory Barriers

The City of Wilsonville recently updated its ADU regulations to comply with state and regional requirements. ECONorthwest reviewed the current regulations to identify any requirements that could still create challenges for ADU construction in Frog Pond East and South. The primary code standards identified as potential obstacles included:

- Lot coverage and setback standards in several existing residential zones may limit the ability to build detached ADUs.
- ADUs are not allowed for townhouses (unless those townhouses meet the single-family minimum lot size). Some developers have created floor plans for townhouses with ADUs that can be sold separately and some with a flexible ground-floor space with separate entrance that can either be used as a home office or an ADU. This model is not currently allowed in Wilsonville, but could be appropriate for portions of Frog Pond East and South.

Exhibit 6: Example of townhouse with ADU / ground floor flexible space
Source: Redfin.com

Financial and Other Factors

ECONorthwest interviewed several homebuilders who are likely to develop portions of Frog Pond East and South when master planning is complete. Some indicated interest in building ADUs. They noted several factors that will influence their decision-making about whether or not to include ADUs in their floor plans:

- When building detached ADUs with single-family homes, this can require a larger lot and push the price-point for the home above what most households can afford. (Providing flexibility for ADUs on lot coverage and setback standards could help address this concern to some extent.)
- Being able to sell the ADU separately helps keep the cost down for both units. One developer's model has been to sell all units with a three-year owner occupancy requirement, including the ADUs, to ensure that they are not used as investment properties. (Another Metro requirement for Frog Pond East and South is that the City ensure that any future homeowners associations will not require owner occupancy of homes that have accessory dwelling units. This could preclude this aspect of the model, and may, ironically, discourage building ADUs for some builders.)
- Local fees are an important factor in whether developers will build ADUs. (Wilsonville does not charge SDCs for ADUs.)

Section 4. ADU Strategies

Regulatory strategies:

- Providing greater flexibility on lot coverage and setbacks for detached ADUs could make it easier to add them to a lot with less effect on the size or location of the main home.
- Allowing ADUs with townhouses (regardless of lot size) in areas where higher density is appropriate could expand opportunities to add ADUs.
- Wilsonville already allows land divisions for ADUs to be sold on a separate lot from the main home, which is mostly applicable to detached ADUs, but could be an incentive for homebuilders along with the lack of SDC fees.
- Allowing larger ADUs (the current limit is 800 square feet) could make the existing financial and regulatory incentives stronger, but would also make them even more similar to two-unit cluster housing, which is also allowed.

Financial strategies:

- The primary financial incentive that has been used to encourage ADU production is waiver of SDCs. As noted above, Wilsonville already has this option in place, and has for many years.

- Establishing a set of pre-approved building plans for homes and townhouses with ADUs, or other similar measures to streamline the review process for development, could make some difference to homebuilders. However, with a greenfield development, there are many other review and permitting processes that will tend to take longer than the building permit review, meaning that streamlining one part of the process is likely to have a minimal impact.
- A marketing approach in which the City would help direct media attention to new homes built with ADUs could provide some incentive for builders, who would benefit from the free publicity, though the City would have to approach this carefully to avoid the appearance of bias towards a particular developer.

Section 5. Conclusions and Next Steps

ADUs in Frog Pond East and South could provide additional options for small rental and/or for-sale units at price-points similar to multifamily housing but at a neighborhood scale. This makes them an important part of the mix in this area, particularly if opportunities for multifamily development in the area are limited. Past surveys suggest that people value ADUs for intergenerational households, flexible space for guests or family members, and for rental income that can help them afford their own housing costs. These factors primarily apply when ADUs are owned along with the main home and managed by the homeowner, but this may or may not be the case when ADUs can also be sold as separate units. Subsequent additional outreach will gather additional information about community perspectives and preferences which could also influence the City’s approach to ADUs.

Frog Pond East and South’s greenfield context means that encouraging ADU construction in Frog Pond East and South will require influencing large professional homebuilders rather than individual homeowners. The City already has many important incentives in place, including exempting ADUs from SDCs and allowing land divisions to split them from the main house. While the City has seen little ADU production, this may be a factor of private restrictions that prohibit ADUs in some areas of Wilsonville. These restrictions are no longer allowed, and will not constrain ADUs in Frog Pond East and South.

Removing subtler regulatory obstacles including lot coverage, setbacks, and allowing ADUs with townhouses could help address some of the considerations that homebuilders noted would affect their interest in developing homes with ADUs. Metro’s requirement that the City prevent homeowners’ associations from requiring owner occupancy for units with ADUs could inadvertently serve as a deterrent to one model of building homes with ADUs that is intended to prevent the homes from becoming investor properties. The City may want to explore with Metro whether this condition could be modified to allow a temporary restriction to owner occupancy for a certain period after initial construction.

APPENDIX L: RESIDENTIAL CAPACITY CALCULATIONS

RESIDENTIAL CAPACITY ESTIMATE

OVERVIEW

This document summarizes the methodology and results of an estimate of residential capacity in the Frog Pond East and South Master Plan Area. This report addresses the following Metro requirement for the Master Plan (Metro Code 3.07.1120):

D. The county or city responsible for comprehensive planning of an area shall submit to Metro a determination of the residential capacity of any area zoned to allow dwelling units, using a method consistent with a Goal 14 analysis, within 30 days after adoption of new land use regulations for the area.

The remainder of this report is split into the following sections:

1. Buildable Lands Inventory
2. Residential Land Uses
3. Capacity Estimate

BUILDABLE LANDS INVENTORY

The Buildable Lands Inventory (BLI) provides a high-level estimate of the buildable acreage in the Master Plan study area. This BLI is an update to the 2015 BLI prepared by the City of Wilsonville for the 2015 for the Frog Pond Area Plan.

Vacant. Tax lots with an improvement (building) value less than $10,000 and at least 3,000 *unconstrained* square feet (i.e., the remaining area after the constraints were removed).

Partially Vacant. Tax lots with an improvement value greater than $10,000 and at least a half-acre in size with an existing single-family home. A quarter-acre was removed from each partially vacant lot to account for the existing development.

Developed. Any remaining tax lots that were not identified as vacant or partially vacant.

Table 1. BLI - Development Status

Development Status	# of East Lots	# of South Lots	Total
Vacant	3	7	*10*
Partially Vacant	2	15	*17*
Developed	3	1	*4*
Total	8	23	***31***

Table 2. BLI - Buildable Area

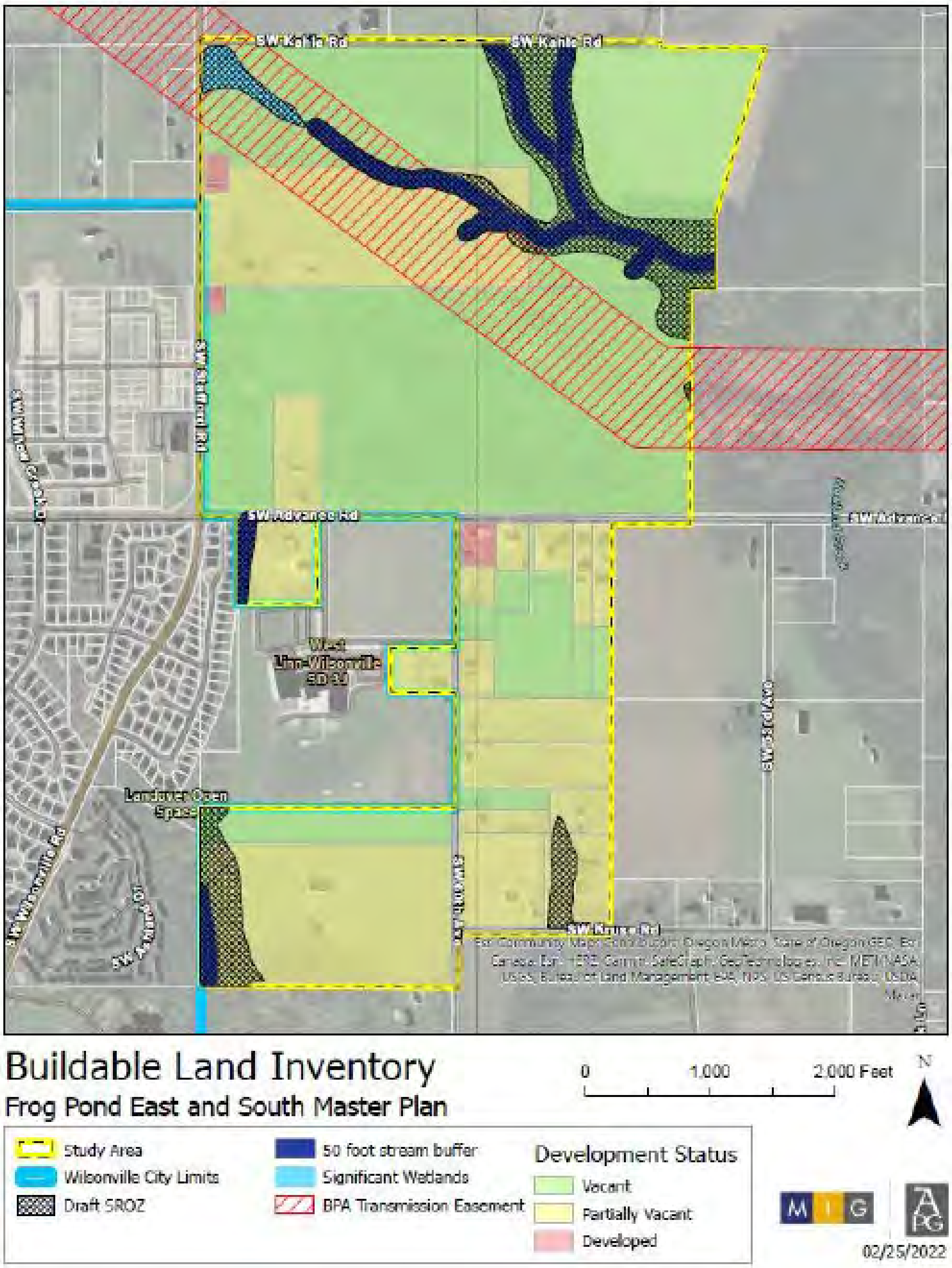
	Acres
Total (Gross) Area*	*254.9*
Constrained Area	*76.5*
20% future ROW	*39.9*
Net Buildable Area	***138.5***

**Total for all study area parcels. The total area (including existing roads) is 265 acres.*

Table 3. BLI - Buildable Area by Neighborhood

	East		South		Entire Study Area	
Development Status	*Total Acres*	*Net Buildable Acres*	*Total Acres*	*Net Buildable Acres*	*Total Acres*	*Net Buildable Acres*
Vacant	138.5	75.4	18.2	14.1	156.6	*89.5*
Partially Vacant	31.7	12.0	64.3	37.1	96.1	*49.0*
Grand Total	170.2	***87.4***	82.5	***51.1***	252.7	***138.5***

Figure 1. Buildable Lands Inventory



RESIDENTIAL LAND USES

The Frog Pond East and South Master Plan establishes three typologies of residential uses, as follows:

Type 1. Type 1 is the most compact and urban of the three forms.

- Buildings 2-4 stories tall close to the street

- Buildings are closely spaced from each other
- Townhouse, condo/apartment buildings, and similar are not limited in width allowing larger buildings that may even occupy an entire block face
- Lot area per building for detached homes will be small with less yard space than in Type 2 and Type 3
- Townhouses, closely spaced detached homes, and multi-family buildings are expected to be common housing choices provided; cottages or similar small-unit housing is also likely to be built

Type 2. Type 2 residential urban form is less compact than Type 1 but more compact than Type 3:

- Buildings are intended to be 2 stories, with 3 stories allowed under applicable State law for certain housing categories
- Moderate setbacks from the street
- Building separation is generally 10 feet
- Building width is moderately limited, to maintain a building bulk consistent among multi-family, middle housing, and single-family detached housing choices
- Detached home lot size is approximately double that of Type 1, allowing for larger home footprints and larger yards than Type 1
- Small to medium sized single-family detached homes and townhouses are expected to be common housing choices, with duplexes, triplexes, quadplexes, cottage clusters, and smaller multi-family buildings also likely to be built.

Type 3.

Type 3 is the least compact residential urban form, characteristics include:

- Buildings primarily 1-2 stories in height, with 3 stories allowed for certain housing categories consistent with applicable State law
- Buildings are set back from the street
- Width of buildings is limited to create smaller buildings, which limits the number of units in multi-family or middle housing structures
- Building separation is generally more than 10 feet
- Lot size for detached single-family homes is generally 1.5 times that of Type 2 and 3 times that of Type 1, allowing for larger homes and yards
- Medium to large single-family detached homes along with smaller townhouse and duplex buildings are expected to be common housing choices; cottage clusters would be well-suited to this Type, and triplexes, quadplexes, and small multi-family buildings may also be built

Assumptions for the density and unit mix of these residential urban form types are shown in the table below.

Table 4. Gross and Net Density with Unit Mix Assumptions

Urban Form Type	Gross Density	Net Density	Unit Mix		
			Multi-unit	Attached/Middle	Single Detached
Type 1	20	25	50%	30%	20%
Type 2	12	15	0%	50%	50%
Type 3	5.6	7	0%	30%	70%

CAPACITY ESTIMATE

Figure 2 shows the proposed locations of residential land uses in the Frog Pond East and South neighborhoods. When overlaid onto the constraints identified in the Buildable Land Inventory, the capacity of these land uses is as follows:

Table 5. Capacity Estimate for Residential Land

Urban Form Type	Gross Density	Gross Developable Acres	Unit Mix			Total
			Multi-unit	Attached / Middle	Single Detached	
Type 1	20	19.5	195	117	78	390
Type 2	12	73.8	0	443	443	885
Type 3	5.6	55.7	0	94	218	312
Non-Residential	-	28.2	-	-	-	-
Total	-	**177.2**	**195 (12%)**	**635 (41%)**	**739 (47%)**	**1587 (100%)**

Total gross density of residential land in the Frog Pond East and South neighborhoods is 10.7 units/acre, or 13.3 net units/acre assuming a 20% Right-Of-Way takeout.

For transportation planning purposes, an increased estimate of capacity was used in order to evaluate a more aggressive development scenario. This estimate used a factor of 1.134 to increase the number of units throughout the study area to reach a total of 1,800 units in Frog Pond East and South.

Figure 2. Street and Block Demonstration Plan with Land Uses