

TECHINICAL MEMORANDUM

Date:	June 16, 2023	TG:	1.22155.00
To:	Yoshihiro Monzaki, PE – City of Snohomish		
From:	Brent Turley, PE – Transpo Group Patrick Lynch, AICP – Transpo Group		
Subject:	22nd Street Extension Traffic Study		

The purpose of the traffic study is to analyze traffic impacts related to extending 22nd Street such that there would be a roadway connection between Pine Avenue and Terrace Avenue. The City already owns right-of-way in the area that could be used for this connection. The traffic study discusses the traffic implications within the City with and without this new connection, particularly as it relates to the addition of new development along the Terrace Avenue corridor. In addition, the traffic study will address corridor design needs, emergency access, and non-motorized connectivity.

Study Area

The study area is generally the 16th Street corridor, the future 22nd Avenue Extension corridor, the Terrace Avenue (and North Ridge Drive) corridor, and all parcels that access these roadways. For the purposes of understanding traffic impacts, the study intersections will be Pine Avenue/16th Street and Pine Avenue/22nd Street. The future east-west connection at 22nd Avenue is assumed to be along City-owned right-of-way but could have a different alignment or location if built. Figure 1 shows the study area, potential connection, and study intersections.

Analysis Scenarios

Four analysis scenarios were evaluated to understand impacts with and without the new 22nd Street extension. These scenarios are based on 2023 traffic counts and traffic anticipated with the Walsh Hills development as documented in the *Walsh Hills TIA* (Gibson, October 2020). The future scenarios include study area zoning buildout conditions and general background traffic growth.

- Existing without Extension. This represents 2023 existing conditions, except that the new pipeline traffic volumes from the Walsh Hills development will be included as if fully built.
- Existing with Extension. This represents the same as above scenario except the new 22nd Street extension will be included.
- Future 2035 without Extension. This represents the long-term horizon year for the study area. Future traffic growth is based on the City’s travel demand model and “buildout” conditions along Terrace Road.
- Future 2035 with Extension. This represents the same as above scenario except the new 22nd Street extension will be included.

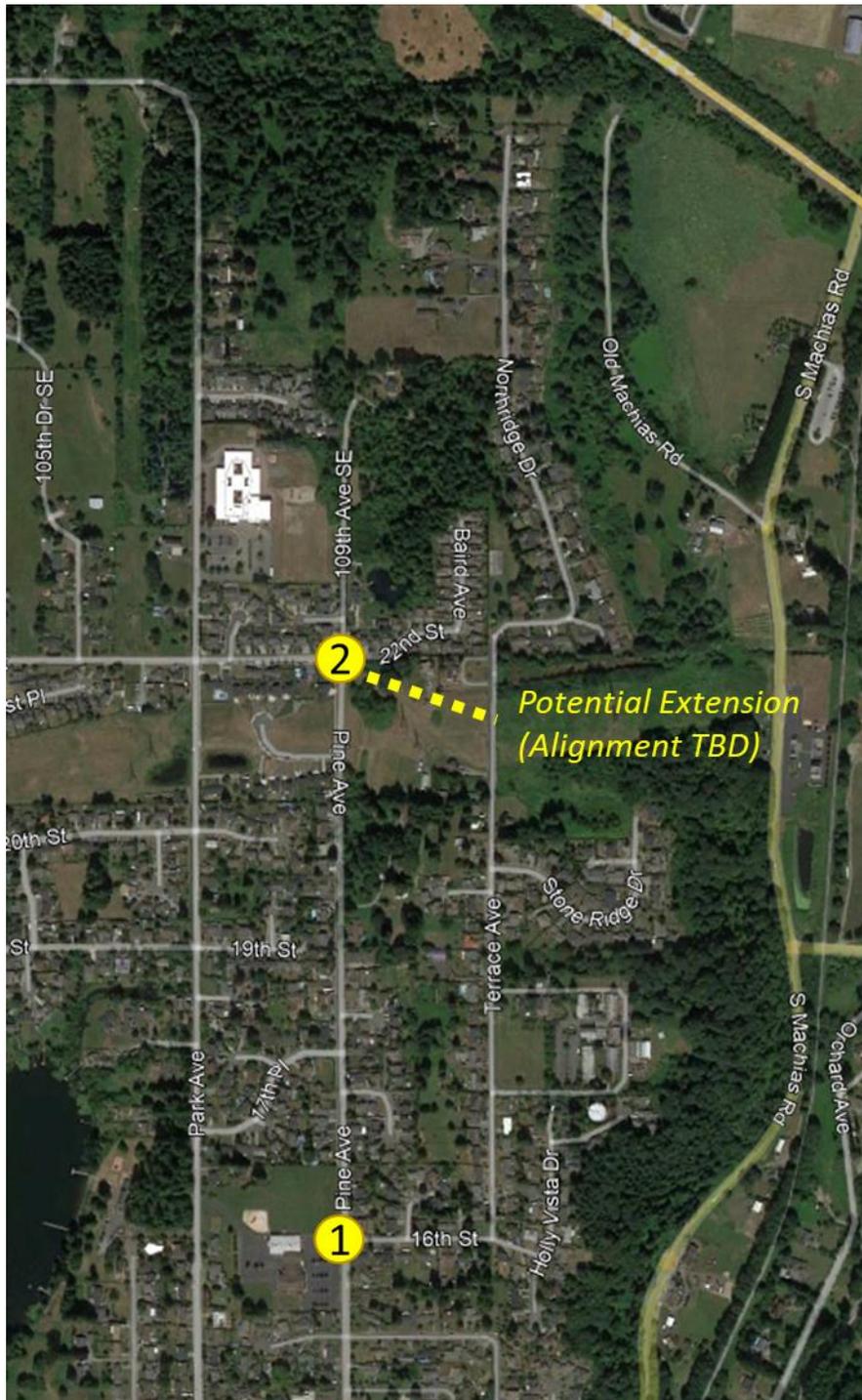


Figure 1 Study Area

Existing and Future Traffic Volumes

Existing traffic volumes are based on recent counts in the area plus traffic volumes from the Walsh Hills development that will be built soon. Counts were collected in November 2022. With no extension, existing PM peak hour trips using 16th Street just east of Pine Avenue are 110 eastbound and 65 westbound, for a total of 175 trips. In other words, this represents the number of trips generated by land uses that use 16th Street to access the rest of the City. There are 263 dwelling units within this area, which means that land uses currently generate below average number of trips in the PM peak hour compared to the national average trip rates.

Future traffic volumes were developed from consideration of current zoning and undeveloped land within the study area. Current zoning allows 6 dwelling units per acre. The following summarizes the conservatively high assumptions for build out in the area that total 174 net new units:

- 65 net new units in the powerline corridor. Developable land adjacent to the powerline easements are assumed to be about 11.3 acres with 3 existing units.
- 47 net new units of infill primarily west of Terrance Avenue. These parcels are large and could support more homes per current zoning. There are 10.3 acres with 16 existing homes.
- 62 new units north of the City along the west side of North Ridge Drive (the extension of Terrace Avenue). This is outside the city but was included as part of a conservative assumption. Assumes only 3.5 units per acre on 19.5 acres with 6 existing units.

This means that 174 new single-family dwelling units could be added to the study area. Using national average rates for new developments, these new units are anticipated to add 164 new PM peak hour trips. Under future conditions without an extension, the trips grow to 213 eastbound and 126 westbound, for a total of 339. This represents almost a doubling of PM peak hour trips with buildout of the area.

Future background growth at study intersections were based on the City's travel demand model and focused mostly on traffic growth along Pine Avenue.

Volume Shifts with the New Extension

The City's travel demand model was used to understand shifts in travel patterns with the new 22nd Street Extension. The travel demand model suggested that approximately 55 percent of study area traffic would shift to the new extension. The 22nd Street corridor provides a fairly straightforward route to access northern areas of the City as well as SR 9.

Figure 2 shows the PM peak hour traffic volumes for each scenario at the two study intersections. These volumes represent the turning movements (left-turns, right-turns, and through movements) at each respective intersection. The new extension will greatly increase volumes at the Pine Avenue/22nd Avenue intersection, compared to no extension. With the traffic shifts and land use growth, it is interesting to note that traffic at 16th Avenue just east of Pine Avenue will be about the same in 2035 with the extension compared to existing conditions without the extension.

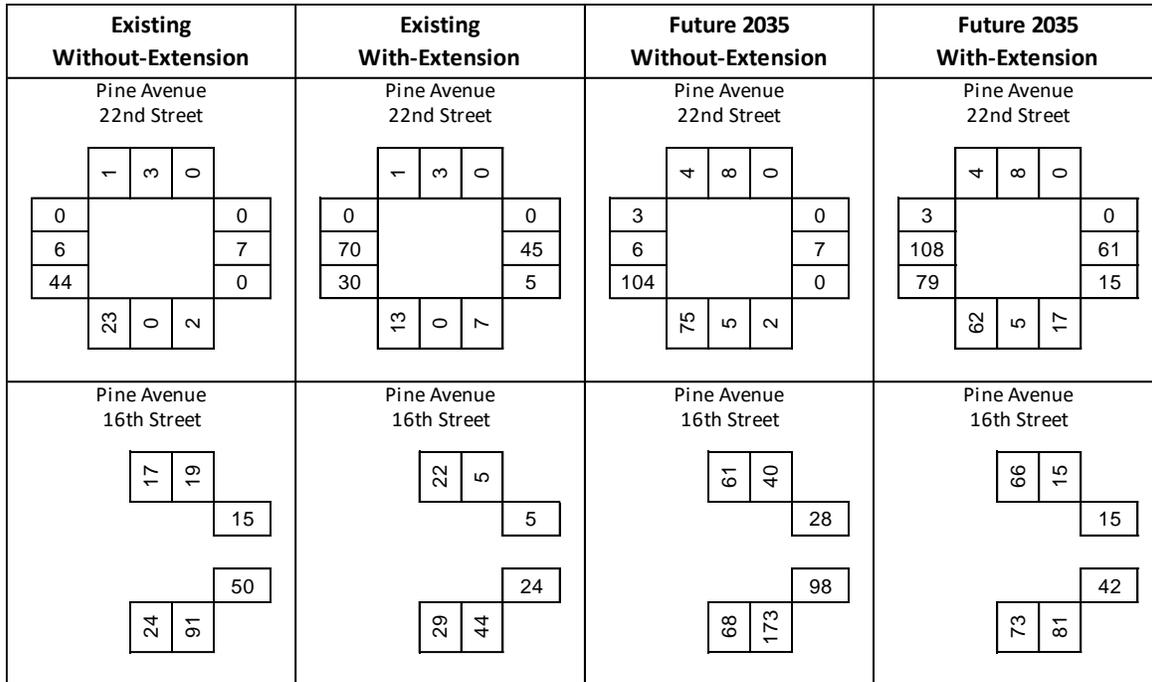


Figure 2 Existing and Future PM Peak Hour Volumes

Daily and AM Peak Hour Considerations

As part of the City’s upcoming Comprehensive Plan update, daily traffic counts were collected throughout the City in November 2022. One count location included 16th Street east of Pine Avenue. Weekday average daily traffic was 1050 daily trips. The afternoon peak hour between 3 to 4 p.m. had slightly higher volumes than the 5 to 6 p.m. peak hour, possibly indicating school-related traffic activity may have a major influence on traffic patterns. The AM peak hour traffic flows have reversed directional patterns and were lower than the 5 to 6 p.m. peak hour.

Existing and Future Traffic Operations

The operational characteristics of an intersection are determined by calculating the intersection level of service (LOS). Traffic operations and average vehicle delay can be described qualitatively with a range of levels of service (LOS A through LOS F), with LOS A indicating free-flowing traffic and LOS F indicating extreme congestion and long vehicle delays. Weekday PM peak hour traffic operations for existing and future (2035) conditions were evaluated based on the procedures identified in the *Highway Capacity Manual* (HCM 6) using *Synchro 11*. *Synchro 11* is a software program that uses HCM methodology to evaluate intersection LOS and average vehicle delay. All study intersections were assumed to operate as all-way, stop-controlled intersections.

Table 1. Without- and With-Extension Weekday PM Peak Hour LOS Summary

Intersections	Existing Without-Extension		Existing With-Extension		Future (2035) Without-Extension		Future (2035) With-Extension	
	LOS ¹	Delay ²	LOS	Delay	LOS	Delay	LOS	Delay
PM Peak Hour								
1. Pine Ave / 16th St	A	7	A	7	A	9	A	8
2. Pine Ave / 22nd St	A	7	A	7	A	7	A	8

1. Level of service (LOS), based on *Highway Capacity Manual* 6th Edition methodology.
 2. Average delay in seconds per vehicle.

As shown in Table 1, all intersections are forecast to operate at LOS A with 9 or less seconds of delay under existing and future (2035) conditions for both without- and with-extension scenarios. Considering intersection traffic operations, scenarios with or without the extension would operate with about the same traffic delays.

Non-Motorized Facilities and Connectivity

The Terrace Avenue and 16th Street corridors currently have very little pedestrian and bike facilities. Under 2035 buildout conditions, over 400 units could be using this local street and would only have the 16th Street corridor to access outside areas. In other words, non-motorized connectivity to outside areas is very poor. A new 22nd Street Extension would provide a much shorter (and walkable) connection to Cascade View Elementary School, local community churches, and northern sections of the City in general. A new formal trail connection could also be created to the east to access Machias Road and the Centennial Trail. A new 22nd Street Extension would then be a major connection for northern City areas to access the Centennial Trail.

Safety and Emergency Access

Under 2035 buildout conditions, over 400 units could be using this local street and would only have the 16th Street corridor to access outside areas. This creates a major emergency risk if the 16th Street corridor became blocked for any reason. These 400 units would then be isolated from fire, ambulance, and police support. The new 22nd Street extension would provide a secondary access point to service the people within the study area.

In addition, non-motorized facilities in the area are very limited. The current 16th Street and Terrace Avenue corridors currently operate as an informal “shared-use” facility for walking and biking traffic. As traffic volumes increase along the corridor, this increased exposure could be a safety concern. The new 22nd Street extension would provide a secondary access point to service the people within the study area and reduce traffic-related exposure along Terrace Avenue.

Design Needs

All study roadways are designated as local access streets (*Snohomish Transportation Master Plan*, 2016). The *Snohomish Engineering Design and Construction Standards* (Accessed June 2023) indicates that local access streets have the following standards:

- Maximum of 100 dwelling units
- Minimum right-of-way of 50 feet
- Minimum pavement width of 32 feet. In some situations, pavement width can be 24-28 feet if sufficient parking is provided off-street.
- Sidewalks are required on both sides of the street, or one side if pedestrian activity is expected to be low.

Terrace Avenue and 16th Street has only 20 to 25 feet of pavement with no sidewalks and no curb and gutter facilities. Any “on-street” parking is located within paved or gravel pull-outs that are outside the typical pavement width. Under 2035 buildout conditions, over 400 units could be using this local street. This roadway is below City standards with no sidewalks on either side of the street and no curb and gutter facilities. The pavement width also is too narrow compared to City standards.

Without the 22nd Street Extension, the Terrace Avenue corridor must accommodate all traffic within the study area. This suggests a need for a more standard roadway cross-section to reflect

higher traffic flows. However, this may be infeasible given the built environment along Terrace Avenue.

With the 22nd Street Extension, about 55 percent of the traffic would be diverted from the southern end of the corridor. With less traffic, context sensitive cross-sections would be more acceptable. These cross-sections would provide pedestrian facilities without too much impact on existing property owners. The following two cross-section options could be considered for the Terrace Avenue corridor.

Option A. Sidewalk on One Side

Given the overall right-of-way constraints and the built environment along Terrace Avenue, a street cross-section with a sidewalk on one side should be considered. Figure 3 shows an example of this for a similar local street in Bellingham, Washington. The Bellingham example will replace a ditch on one side of the roadway with stormwater piping, curb/gutter, and attached sidewalk. The opposite side remained as-is with no gutter or pedestrian facilities. For the Terrace Avenue example, the east side ditch could be replaced with a sidewalk and storm-drain facilities.

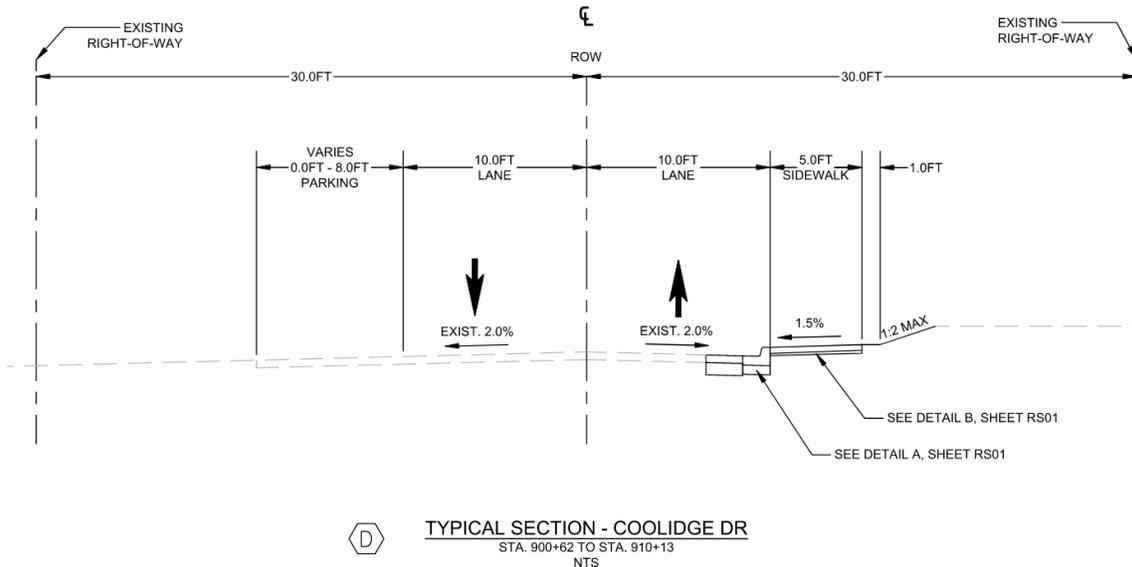
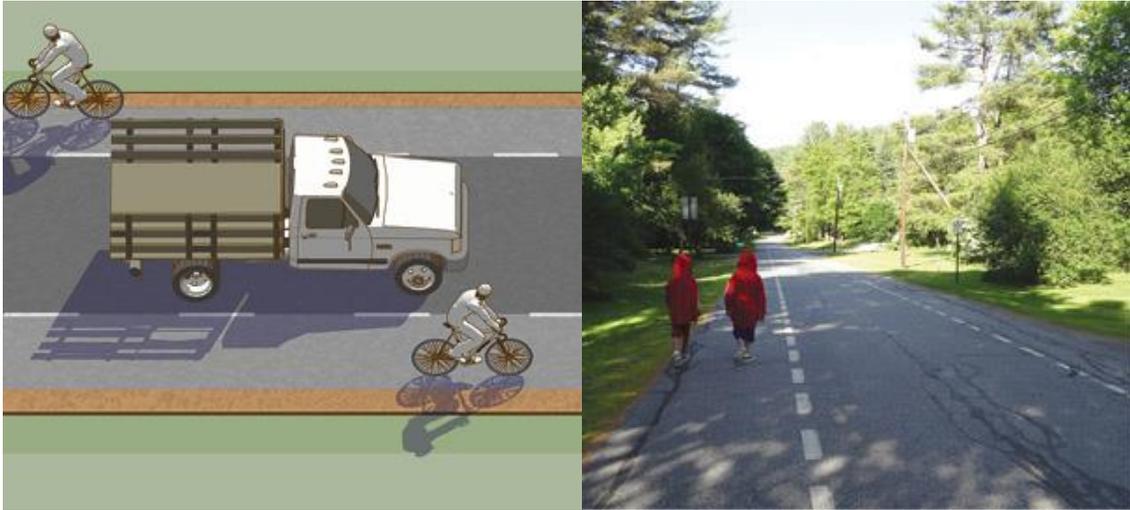


Figure 3 Example Cross-Section for Sidewalk On One Side

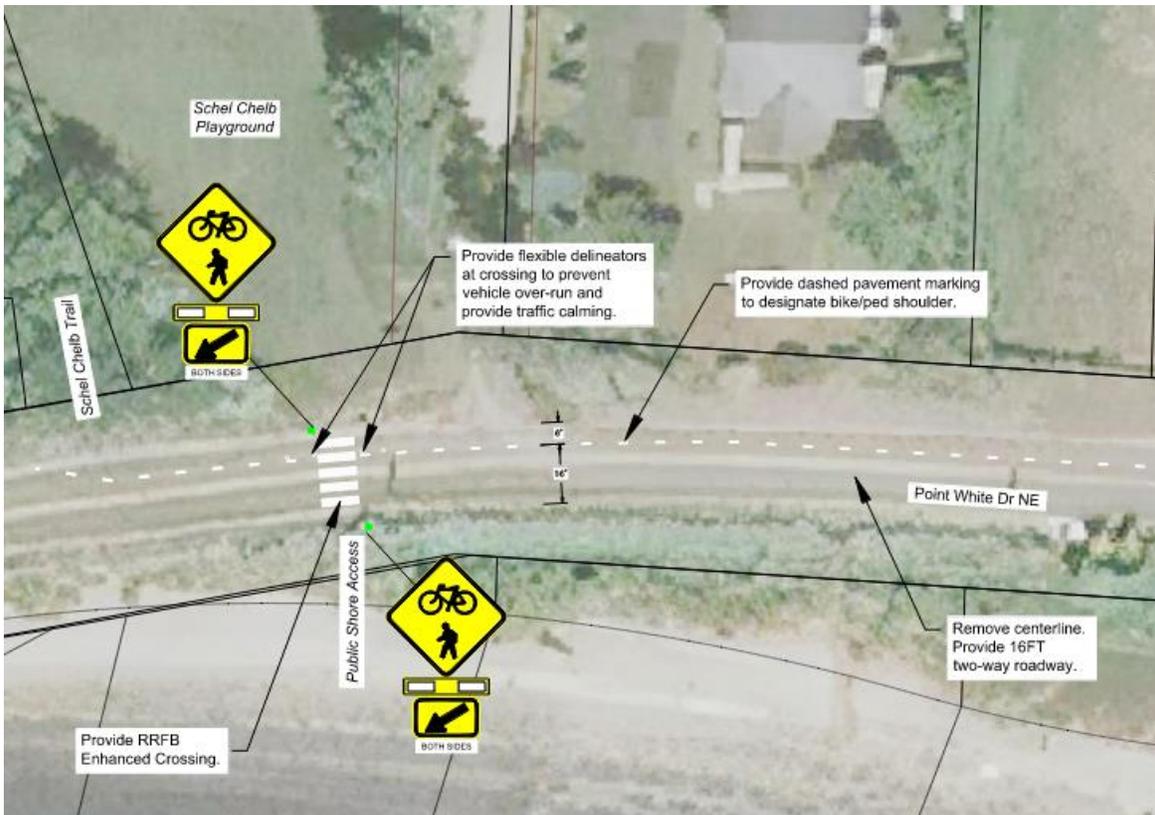
Option B. Advisory Shoulder

Another option is to create a cross-section that is called “Advisory Sholders”. Advisory shoulders create usable shoulders for pedestrians and bicyclists on a roadway that is otherwise too narrow to accommodate one. The shoulder is delineated by pavement marking and optional pavement color. Motorists may only enter the shoulder when no pedestrians/bicyclists are present and must overtake these users with caution due to potential oncoming traffic. Figure 4 shows an example of this cross-section.

This option requires only striping and signage to install on the existing corridor. In some cases, this type of treatment has also been used on one side of the roadway to create a type of two-way non-motorized pathway (see Figure 5).



Source: FHWA (fhwa.dot.gov, Accessed June 2023). Example shown is in Hanover, NH
Figure 4. Example of Advisory Shoulder Cross-Section



Source: Transpo Group, 2023 (example from Bainbridge Island)
Figure 5. Example of One-Sided Advisory Shoulder for Pathway

Summary of Findings

The following is a summary of the traffic study findings.

1. Existing volumes along 16th Street east of Pine Avenue are 175 trips during the PM peak hour, representing traffic from 263 dwelling units.
2. Using a conservatively high assumption for buildout conditions, future 2035 volumes along 16th Street east of Pine Avenue are 339 trips during the PM peak hour, representing traffic from 437 dwelling units.
3. The 22nd Street Extension is anticipated to shift about 55 percent of trips from the 16th Avenue corridor to this new northern connection.
4. Existing and future traffic operations at study intersections are expected to be about the same with or without the extension.
5. Non-motorized connectivity throughout the northeast section of the City would benefit greatly with the new 22nd Street Extension.
6. Emergency response resiliency would be greatly enhanced with the new 22nd Street Extension.
7. The new connection would reduce volumes on Terrace Avenue, which would help to mitigate safety concerns due to very limited non-motorized facilities on the corridor.
8. The 16th Street and Terrace Avenue corridors do not currently meet the City road standards.
 - a. The new 22nd Street Extension would allow more flexibility in improving the design of these corridors.
 - b. Two cross-section options are presented for consideration to improve non-motorized facilities. These options are alternatives to the City's typical cross-section and meant to be more consistent with the existing land use context along the corridor.