DRAFT Alameda Active Transportation Plan

Appendix F: Level of Traffic Stress and Trip Potential Analysis

TOOLE DESIGN

1635 BROADWAY
SUITE 200
OAKLAND, CA 94612

510.298.0740
TOOLEDESIGN.COM

To: Rochelle Wheeler and Lisa Foster, City of Alameda

From: Megan Wooley-Ousdahl and Jonathan Yuan, Toole Design

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Project: Alameda Active Transportation Plan

Subject: Level of Traffic Stress and Trip Potential Analysis

As a part of the Alameda Active Transportation Plan (ATP), Toole Design conducted an analysis to evaluate the existing bicycle and pedestrian environments in Alameda. This analysis included:

- Bicycle Level of Traffic Stress
- Pedestrian Level of Traffic Stress
- Trip Potential

This memo presents the key takeaways from these analyses.

Key Takeaways

The following are the key takeaways from the analyses:

- Arterial streets are high stress for people bicycling and for pedestrians when crossing the street.
- Local streets are generally comfortable for people when bicycling and when crossing at intersections, unless the intersection is located on an arterial street.
- High-stress streets are not concentrated in one area of the city; rather, they are dispersed throughout Alameda Island and Bay Farm Island.
- Areas with high trip potential include Park and Webster Streets, streets approaching the Fruitvale BART station and bridges, east-west corridors on Alameda Island, and the northeast area of Alameda Island.

Bicycle Level of Traffic Stress

Overall, the purpose of the Bicycle Level of Traffic Stress is to identify the areas of Alameda that are not currently well-served by a low-stress bicycle network.

What is a Low-Stress Network?

Most people in the U.S.—between 50 and 60 percent—have little tolerance for interacting with motor vehicle traffic while bicycling unless volumes and speeds are low (see Figure 1).[1] This group of riders is referred to as

[1] Source: Dill, J. McNeil, N. “Revisiting the Four Types of Cyclists: Findings from a National Survey” Transportation Research Board 95th Annual Meeting, 2016.

"Interested but Concerned," reflecting both their interest in bicycling for transportation as well as concerns about safety and comfort when interacting with motor vehicle traffic.[2]

Figure 1. Level of Traffic Stress and Bicycle Riders

Comfort Typology of Bicyclists

Design User Profile	Not Interested or Able	Interested but Concerned	Somewhat Confident	Highly Confident
Percent of General Public	31-37%	51-56%	5-9%	4-7%

This framework of rider types was used to assess the existing bicycle network and will be used to select recommended bicycle facilities for the Alameda ATP.

Methodology

The Bicycle Level of Traffic Stress (BLTS) analyzes the stressfulness of street networks for bicyclists based on a number of street characteristics. The BLTS is based on the perspective of an "Interested but Concerned" bicyclist. The BLTS analysis scores streets on a scale of 1 (low stress) to 4 (high stress), using street segment characteristics. The scoring depends both on street characteristics (such as the pavement width, traffic speed, presence of parking[3], and traffic volumes). The analysis input included the existing and planned bicycle facilities.

The purpose of the BLTS analysis is to:

- Demonstrate the need for recommended (new or upgraded) bicycle facilities
- Potentially for use as a variable in the prioritization analysis

Key Takeaways

Figures 2 and 3 illustrate the bicycle level of traffic stress on Alameda's streets. The key takeaways from this analysis include:

- **High-stress arterials** – Nearly 60 percent of Alameda's arterial streets are classified as high stress (BLTS 3 or 4) (see Figure 2). Arterials provide important north-south and east-west connections through the city, but bicycling on these streets is uncomfortable for the majority of bicyclists. While most local

[2] Studies, such as the Dill et al., referenced above, show that approximately one-third of the adult population is not currently interested in bicycling or able to bicycle.

[3] Due to the risk of dooring collisions, bike lanes adjacent to parking are considered higher stress facilities when other variables are held constant. For instance, a bike lane on a 35-mph two-lane street is scored BLTS 2 if it is not adjacent to parking, regardless of width. This score increases to BLTS 3 where the lane is adjacent to parking.

streets are low stress (BLTS 1 or 2), many people cannot reach destinations using low-stress bikeways because of the barriers presented by arterials.

- **Low-stress parallel shared-use paths** – Some of Alameda's high-stress streets, such as Atlantic Avenue on Alameda Island or Island Drive on Bay Farm Island, have parallel shared-use paths which provide low-stress alternatives to bicycling on, and walking near, the high-stress arterials. While the shared-use paths themselves are low-stress, the connections to the paths from adjacent streets may still be stressful for bicyclists or pedestrians.
- **Poor low-stress access to commercial areas –** All commercial and shopping areas in Alameda are primarily served by high-stress bikeways. Webster Street and Park Street, the city's two downtown areas, have the highest stress rating of BLTS 4.
- **No low-stress access to Oakland** – All bridges connecting the City of Alameda to the City of Oakland are high stress (BLTS 3 or 4). Also, bicycling is not allowed in the Webster Tube, and the shared-use path in the Posey Tube is narrow, uncomfortable, and difficult for people to pass one another.

Figure 2. Percentage of High-Stress Streets by Classification

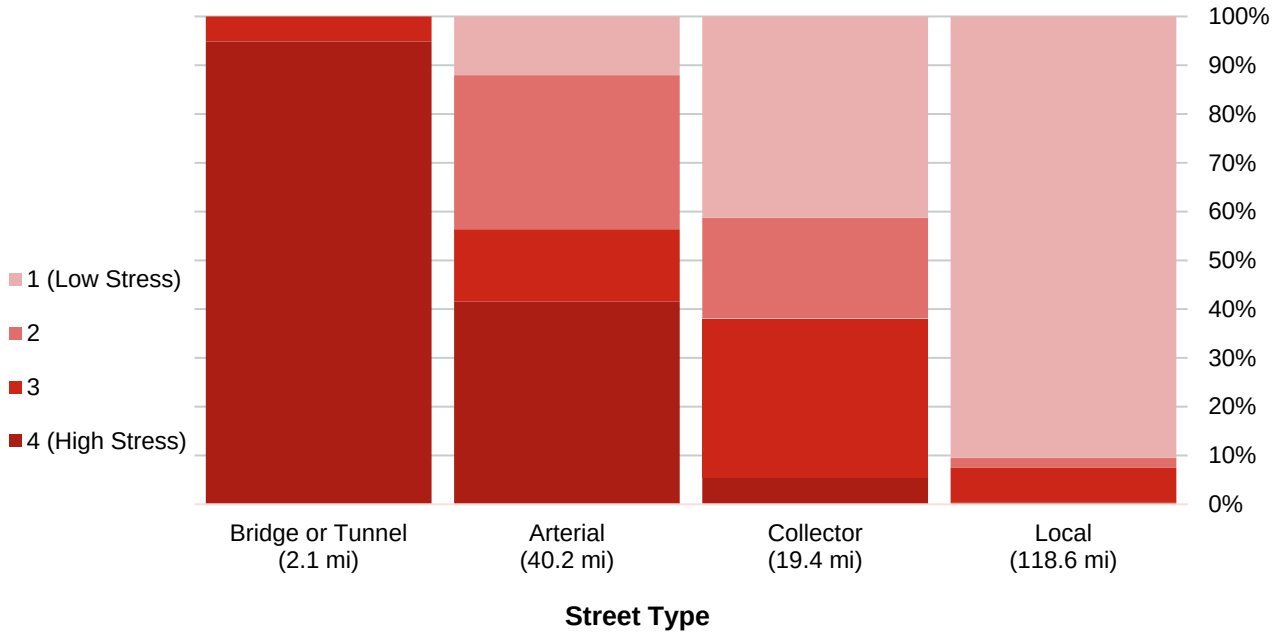

Figure 3. Bicycle Level of Traffic Stress in Alameda

Pedestrian Level of Traffic Stress

A Pedestrian Level of Traffic Stress (PLTS) analysis describes the level of comfort for pedestrians when walking along a given street or crossing an intersection. A PLTS analysis considers comfort associated with:

- Walking adjacent to traffic
- Stress when crossing a street

Since Alameda has only a handful of sidewalk gaps and pedestrian-friendly street segments are nearly universal, this PLTS analysis focused on intersections and mid-block crossings where painted crosswalks are present.

Methodology

The PLTS analysis classifies intersections based on the pedestrian level of comfort, using a scale of 1 to 4 where a "1" corresponds to the lowest stress environment and "4" corresponds to the highest stress environment. The scoring depends both on intersection characteristics (such as street widths, traffic speeds, lane configurations, and traffic volumes) and the existing pedestrian facilities (such as marked crosswalks, signalization, and sidewalks).

The purpose of the PLTS analysis is to:

- Demonstrate the need for recommended pedestrian improvements
- Potentially for use as a variable in the prioritization analysis

Key Takeaways

Figure 4 illustrates the pedestrian level of traffic stress at intersections or painted mid-block crossings. The key takeaways from this analysis include:

- **High-stress arterials** – Similarly to the bicycle level of traffic stress analysis, this analysis indicates that crossing arterials creates a high-stress experience for pedestrians. Intersections that have at least one leg that crosses an arterial are high stress (PLTS 3 or 4) because these arterial streets have multiple lanes of traffic and typically have travel speeds faster than 25 mph.
- **Signalized crossings** – The analysis found that most signalized crossings are low stress (PLTS 2).
- **Low-stress local streets** – Similarly to the bicycle level of traffic stress analysis, this analysis found that most local streets are low-stress (PLTS 1 or 2).

Figure 4. Pedestrian Level of Traffic Stress in Alameda

Trip Potential

Toole Design performed a trip potential analysis to determine where people would be most likely to bike or walk, based on development patterns and social and economic characteristics. This analysis highlighted areas where enhanced bicycle and pedestrian infrastructure may potentially serve more users. This analysis may also assist the City when prioritizing projects by identifying locations that have the greatest potential for increased walking and biking.

Note that trip potential estimates where people would walk or bike if it were convenient and comfortable to do so. Counts of existing walking or biking trips can provide insight, but these trips have already internalized the impacts of existing infrastructure for walking or biking. As a result, trip potential is calculated independent of existing facilities.

Methodology

Trip potential variables, as well as their relative weighting, are based on research and experience in similar jurisdictions. Calculated at the Census block geography, Toole Design analysts considered the factors with associated weightings, as presented in Table 1.[4] The total trip potential score is an aggregate of the individual factor scores.

Table 1. Variables for Trip Potential Analysis

Variable	Description	Weight
Intersection Density	Research into travel mode choice has shown that intersection density is highly correlated with increased bicycling.[5] Locations with a high number of intersections with three or more legs tend to have better connectivity, higher densities, and more destinations; therefore, these are locations in which utilitarian trips are more likely to occur.	50%
Population Density	Population density is another major determinant for both walking and biking trips - the more people in an area, the more people will be walking or biking. Population density is also highly related to transit ridership.	16%
Transit Routes	People walking and biking to and from transit are another important population to consider. First and last mile connections to and from transit are vital to increasing accessibility to transit. As many Alameda residents commute by ferry, BART, or bus, it is important to factor in potential walking and bicycling trips generated from transit use.	16%
Percent of Households Below the Poverty Line	Research indicates that people living in households below the poverty line are more likely to depend on transit, walking, or biking to get around.[6] The households-in-poverty	10%

[4] Schools are not included as a factor in the trip potential analysis because research does not support using destinations as an input factor because there is overlap between population and destinations. Incorporating both factors would double score many locations.

[5] Built Environment Influences on Healthy Transportation Choices: Bicycling Versus Driving. M Winters, M Brauer, E Setton, K Teschke – Journal of Urban Health, 2010.

[6] Predicting Transit Ridership at the Stop Level: The Role of Service and Urban Form. J Dill, M Schlossberg, L Ma, C Meyer - 92nd Annual Meeting of the Transportation Research Board, 2013

Variable	Description	Weight
	data is only available for Census block groups, which are larger geographic areas composed of multiple Census blocks.	
Employment Density	Employment density is another major determinant for walking and biking trips. People walk or bike to areas with high employment for a variety of reasons, including jobs, shopping, or errands. Moreover, some areas with high employment see a lot of midday walking activity. Employment density is also highly related to transit ridership. Job data is provided by the 2017 Origin-Destination Employment Statistics (LODES) dataset from the Longitudinal Employer-Household Dynamics (LEHD).	8%

Key Takeaways

Figure 5 illustrates where walking and biking trips are likely to occur. The key takeaways from this analysis include:

- **Areas of high trip potential** – Areas in Alameda where walking and biking are likely to occur are along Webster Street, Park Street, and the northeast area of Alameda Island, especially approaching the Fruitvale BART station and the bridges.
- **East-West Corridors** – East-west corridors, such as Lincoln Avenue and Buena Vista Avenue, are areas with high trip potential.
- **Dense street network** – In general, the dense street network on Alameda Island and Bay Farm Island create a high potential for walking and biking.

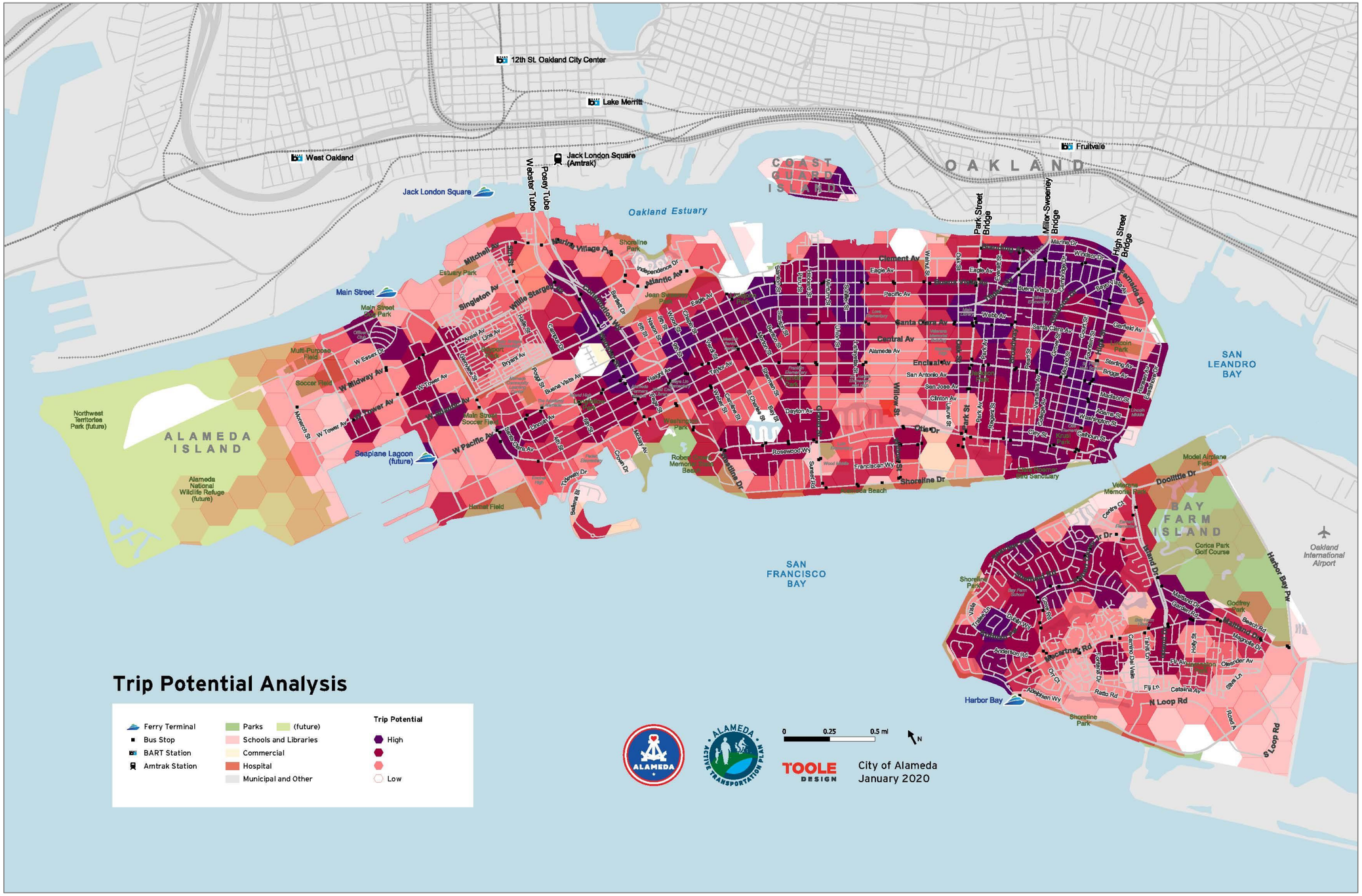

Figure 5. Trip Potential in Alameda