

## Appendix D: Bicycle Count Program Strategy

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### Background

This memo outlines recommended strategies for developing a bicycle count program as part of Task 4 - Needs Assessment. Designed as a supplement to the Countywide Bicycle Plan (“the Plan”), this memo focuses on developing counting strategies that can be implemented in the short-term and that support the Plan’s vision for Napa as a bicycle-friendly community with a world class bicycling system for all ages and abilities. The bicycle count program will assist Napa Valley Transportation Authority (NVTA) as it measures its progress towards achieving its goal of a 10 percent mode shift by 2035, as proposed by the draft Plan. This memo includes a brief review of the existing count programs in the county and provides recommendations for NVTA’s count program’s strategies and implementation.

### Bicycle Count Programs: State of the Practice

In recent years, municipal and regional planning agencies, and states throughout the United States have increased the amount of data they collect on their transportation systems. There has been a particularly large growth in bicycle and pedestrian data collection systems launched and expanded by planning agencies and states. This growth can be attributed to a combination of factors, including the development of automated data collection technologies, greater data management and processing capabilities, a broad interest in data-driven policymaking, greater interest in bicycling and walking generally, and the explicit inclusion and coverage of bicycle and pedestrian traffic volume data collection in the 2013 edition of the Federal Highway Administration’s (FHWA) Traffic Monitoring Guide (TMG) and subsequent revisions.<sup>1, 2</sup>

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<sup>1</sup> Federal Highway Administration. 2016. Traffic Monitoring Guide. <https://www.fhwa.dot.gov/policyinformation/tmguide/>

<sup>2</sup> The TMG provides guidance to State Departments of Transportation (DOTs) on how to monitor traffic on their road networks, including coverage of speed, volume, and weigh-in-motion. Traffic data collected by State DOTs and their local agency partners following the standards outlined in the TMG is submitted to FHWA for inclusion in their Travel Monitoring Analysis System (TMAS), which was recently updated to accommodate bicycle and pedestrian traffic count data. While FHWA mandates that motorized traffic volume measurements be taken on a regular basis, there is not currently a similar mandate for bicycle or pedestrian traffic monitoring.

The National Cooperative Highway Research Program (NCHRP) developed a guidebook on pedestrian and bicycle volume data collection methods and technologies.<sup>3</sup> NCHRP 797 includes chapters on count data's applications, data collection planning and implementation, count data volume estimate generation and adjustments, and a toolbox of sensor technologies. A follow-up study to NCHRP 797 was recently completed and released as NCHRP Web-Only Document 229.<sup>4</sup> This study involved additional technology tests and a revision of all the analysis from the first study to correct errors and improve the approach.

Various national efforts have developed useful guidance for institutionalizing bicycle and pedestrian traffic monitoring programs, methods to conduct counts, and approaches to analyzing the resulting data. While practices for monitoring motorized traffic are very well established, bicycle and pedestrian traffic has some important distinctions from motorized traffic that require special consideration in developing a counting program. These include:

- It is more difficult to accurately and consistently monitor bicyclists and pedestrians than motor vehicles because bicyclists and pedestrians do not always follow constrained paths, may obstruct one another from the sensors, and are more difficult to reliably detect.
- Bicycle and pedestrian traffic variability is more complicated than motorized traffic, and these patterns are not thoroughly understood.<sup>5</sup>
- Bicycle and pedestrian traffic count technologies are often different from those used for motorized traffic, and therefore may represent an additional

## National Best Practice Spotlight

**Arlington County, VA** (adjacent to Washington, DC) was one of the first agencies in the country to develop a bicycle and pedestrian count program. Their first continuous counter was installed in October 2009, and has been operational since installation. They currently have **37 permanent counter installations** at a mix of on-street and trail locations, and have **six portable counters** (five passive infrareds and one pneumatic tube counter) that are circulated around the region. Arlington has also developed a web dashboard and their own application programming interface (API) for software application developers to access the data. Arlington County's bike count data is used in *bike safety studies* and in *project periodization*. The County also uses the data to prioritize *maintenance activities* along trails, and to study *the impact of weather on trail usage*.<sup>i</sup>

<sup>i</sup> Bike Arlington. "Counter Data." *N.d.*, Accessed March 7, 2018.

<http://www.bikearlington.com/counter-data/>

<sup>3</sup> Ryus, P., E. Ferguson, K. Laustsen, R. Schneider, F. Proulx, T. Hull, L. Miranda-Moreno. 2014. Guidebook on Pedestrian and Bicycle Volume Data Collection. <http://www.trb.org/Main/Blurbs/171973.aspx>.

<sup>4</sup> Ryus, P., A. Butsick, F. Proulx, R. Schneider, T. Hull. 2016. NCHRP Web-Only Document 229: Methods and Technologies for Pedestrian and Bicycle Volume Data Collection, Phase 2. <https://www.nap.edu/download/24732#>.

<sup>5</sup> For example, it is well established that bicycle trips are less likely during precipitation, but the extent to which this varies by geography, trip purpose, and time of day is less well studied. Practically, this means that methods for extrapolating short-duration counts to annualized traffic estimates might need to be different from established practices for motorized traffic

investment in staff training, maintenance, and data management.

Bicycle count data is used by local municipalities, regional planning organizations, counties, states, and institutions to monitor bicycling behavior, evaluate design treatments, and to measure progress towards safety and ridership goals. Bicycle count data is essential for policy makers, transportation planners, and engineers in monitoring the impact of policies, plans, designs, and engagement efforts.

## Napa Countywide Bicycle Count Program: Planning and Data Support

### Data Applications

NVTA's bicycle count program can be structured to support both the development and the implementation of the Countywide Bicycle Plan. The bicycle count data can be used in a variety of applications, including:

- Tracking levels of walking and bicycling over time,
- Controlling for exposure in traffic safety studies,
- Understanding determinants of bicycle travel,
- Optimizing signal timing for all modes, and
- Calibrating travel demand models.

The Authority can use count data collected during the Plan's generation to establish performance measure baselines, to guide the Plan's goals and strategies related to bicycle mode share and bicycle safety, and to test possible permanent count locations. The Authority can also use count data in grant applications through the Caltrans Active Transportation Program (ATP), which requests current count data as a prioritization criterion. Additionally, the Authority can use bicycle count data to track its progress towards reaching the Plan's goals, and to measure the before-and-after impacts of bicycle facility improvements during the Plan's implementation.

As NVTA's count program matures, the Authority could also consider using the data as part of its open data portfolio to encourage citizen engagement and to support community data transparency efforts. Additionally, the Authority can use the count data in combination with public health and economic data to inform cross-disciplinary studies such as the impact of bicycle infrastructure on near-by shopping districts.

### Safety Focus

In addition to supporting the Plan's goals and implementation, NVTA staff identified safety as a key focus area for the count program. The bicycle count program can assist the Authority in developing a more accurate understanding of bicyclist exposure countywide and in tracking exposure rates along key safety priority corridors. Analyzing counts in conjunction with crash data can help to understand where

Figure 1. Napa Valley Vine Trail



bicycle crashes can be expected to occur even if they have not already, and where bicyclists experience the highest crash risks.

### General Program Approach

To best leverage NVTA's data collection efforts, it is recommended that NVTA consider collecting not only bicycle counts but also pedestrian counts. By selecting counting technologies that capture and identify bicycle and walking movements separately NVTA can expand the utility of the count program. Counters that collect both modes may be particularly useful along popular walking trails, in urbanized areas, and along priority safety corridors.

The count program should also build off past count efforts throughout the County and leverage the three existing permanent counters located along the Vine Trail in and near the City of Napa. NVTA's experience in collecting manual bicycle and pedestrian count data can be used to identify areas of higher bicycle and pedestrian activity, test potential automated count locations, and to calibrate automated counting devices. The Napa Valley Vine Trail Coalitions' three counters can serve as a model for additional counters along other trails in Napa County. Additionally, the Coalition's reporting signals an interest in using the count data to secure grant dollars to help fund the Vine Trail completion.<sup>6</sup>

In addition to the current counts collected by the NVTA and the Napa Valley Vine Trail Coalition, NVTA should consider count partnership opportunities with MTC as the Commission evaluates opportunities to build out an open source bicycle and pedestrian data portal, establish counting standards, and develop regional collection factors. Through close coordination with MTC, NVTA can best leverage its data collection efforts to work in tandem with other count initiatives in the region and generate a comprehensive view of bicycle and pedestrian activity in the region.

### Data Collection Strategy

To support a count program focused on safety, NVTA should invest in permanent and short-duration counters throughout the county, focused on on-street locations. As a new automated count program, NVTA is advised to select a single counter manufacturer to improve program efficiencies for system installation, counter maintenance, and data management practices. Permanent automated counter technologies such as induction loops and piezoelectric strips provide continuous flows of data and are typically used to understand the details of bicycle activity patterns at specific locations. Short-duration counts complement the permanent counter network by increasing geographic coverage. Short-duration counters are installed for anywhere between one day and one month at a given location and are circulated between locations to effectively use resources. A minimum of one week of installation is recommended to increase traffic estimation accuracy. Bicycle-specific pneumatic tube counters are easy to move between locations and are standard practice for short-duration bicycle counts at both on- and off-street locations. In general, automated count programs are recommended over manual counts

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<sup>6</sup> Eberling, Barry. Napa Valley Register, *Sensors tally cyclists, walkers and runners on Napa Valley Vine Trail*. September 12, 2017. [https://napavalleyregister.com/news/local/sensors-tally-cyclists-walkers-and-runners-on-napa-valley-vine/article\\_84ff2533-a555-5bae-95f1-53f2818774f6.html](https://napavalleyregister.com/news/local/sensors-tally-cyclists-walkers-and-runners-on-napa-valley-vine/article_84ff2533-a555-5bae-95f1-53f2818774f6.html).

because the longer monitoring periods they enable yield a more accurate overall assessment of total traffic volumes.

### Count Program Structure

Consistent with best practices for traffic monitoring programs, the NVTA bicycle count program should include a combination of permanent and short-duration counters, which can be used in conjunction with one another to develop a comprehensive understanding of bicycle traffic.

#### **Permanent Counters**

The Napa Valley Vine Trail Coalition's three permanent Vine Trail counters provide a strong launching point for NVTA to build its permanent count program. Permanent automated bike count programs require greater up-front program and technology costs than manual count programs and require ongoing maintenance. However, they provide critical information for contextualizing and standardizing short-duration counts. To help cover these costs, many agencies who conduct permanent automated counts have secured grant resources and leveraged regional coordination efforts. NVTA should consider a phased approach to grow its permanent counter program so that counter acquisition costs can be distributed, and a baseline of data can be collected soon, rather than waiting for enough money to build a robust program. Additionally, by having a plan in place for where counters are desired, NVTA can leverage a variety of funding sources when opportunities present themselves, including grants, developer contributions, partnership efforts with local jurisdictions, and as a component of larger capital improvement projects.

Permanent automated counter locations should represent a wide range of conditions and bicycling patterns. The goal of the permanent count program is to understand how temporal patterns vary throughout the county, rather than how the overall magnitude of traffic varies, so the focus should be on locating counters in multiple different contexts. In general, higher bicycle volume locations are preferred for permanent count sites, as the underlying patterns can be more readily identified at these locations.

Prior to installing additional permanent counters, the Authority should use short duration automated counters to "test" possible permanent count sites. Data from the short duration automated counts can be used to preliminarily identify hourly patterns, activity-level peaks, and weekday/weekend splits; and, to check for sufficient activity levels. With this data, the Authority can compare possible permanent count sites to assure that the right mix of permanent count locations is selected to represent a variety traffic patterns and peak activity times across the County. Data from the permanent counters will be used to contextualize and standardize short-duration count data from around the County, so it is essential that the permanent counters collect data at not only the most popular bicycling destinations, but in all settings.

As the three existing counters are in the southern portion of the County, expansion sites should focus on locations with known higher bicycle volumes within the central and northern portions of the County. The initial permanent counter program should consider adding two counters either within North county locations such as St Helena or Calistoga; or along the Silverado Trail and Highway 128 Loop. It is

expected that these locations will present different patterns than those observed along the Vine Trail, as the North county jurisdictions might have predominantly tourist-driven traffic, and the Silverado Trail/Highway 128 Loop is a known popular recreational route. Additional counters could also be installed at on-street locations within the City of Napa to complement the Vine Trail counters and to understand whether the on-street patterns are different from the trail count patterns. As the program grows, NVTAs should work to distribute counters across the county to measure a wide range of bicycling patterns. NVTAs should focus on peak-times when measuring bicycling patterns. Peak-times can be measured on a daily, weekly, and monthly basis, and can assist counting agencies in understanding larger patterns across a region. For example, data from a counter located in an on-road location in downtown Napa will show different bicycling peak-times than data from a trail-based counters on a rural section of the Silverado Trail. While both are popular bicycling routes that will show high bicycling levels, the data's peak times will likely differ based on the time of the day, day of the week, and by season.

### **Short-Duration Counters**

The Traffic Monitoring Guide recommends the combined use of permanent and short-duration automated counts to fully consider the temporal and spatial aspects of bicycle and pedestrian traffic patterns. In addition to testing out possible permanent count locations, short-duration automated counters can be rotated among locations, allowing for broader spatial coverage than permanent counters. Automated counters are preferred over manual counts because they can be left on-site for a longer length of time, and accordingly more of the variation in volumes at the site can be observed. In launching the NVTAs's short-duration counter program, it is recommended that the Authority begin with two mobile bicycle counters. Together the counters can cover both sides of a street and can be circulated among locations on a bi-weekly basis to build up the NVTAs's program database. The counters' rotation will be dependent on staff resources and will benefit from support from local municipalities in coordinating the counters' installation on local roads and trails. If counts are conducted year-round, the counters' rotational patterns should shuffle between rotations so that sites are counted at a variety of times throughout the year and not always in the same season.

The short-duration counters should also be placed in a variety of locations across the County including northern Napa County jurisdictions, along the Silverado Trail and 128 Loop, and within and around the Cities of Napa and American Canyon. As with permanent automated counters, short-duration automated counters' locations should be dispersed across the county to capture the range of bicycling traffic patterns in Napa County.

### **Data Management and Reporting**

Developing data management and reporting standards in tandem with the counting program's launch will assist NVTAs in developing regular, consistent, and accurate program reports. These program reports can assist NVTAs in tracking the level of bicycling in the County, changes in bicycling behavior, the impact of bicycle facility investments, and planning for the counting program's expansion. Additionally, high-quality data management practices are critical for making the data useful for planning and engineering

and will facilitate data sharing and program partnership opportunities with other organizations such as local municipalities and MTC.

The data management and reporting practices should track key elements of the program's scope and changes over time. In particular, the installation dates and locations for the short-duration counters should be recorded so that the observed counts can be tied to the locations where they were collected. Using equipment from a single vendor will facilitate storing data in a consistent format, either in a staff-managed spreadsheet or database system, or in vendor-provided software. Regardless of the platform used for data management, NVTA should consider best practices for quality controls checks, validity checks, and business practices as identified by the FHWA's Traffic Monitoring Guide (TMG). The FHWA recommends that nonmotorized counters be calibrated, that the data be cleaned, and that count data be shared in a consistent manner. Within this context, data cleaning refers to reviewing the data or inconsistencies or errors that may be the result of a counter's operational failure or influencing factors from the local environment. Business practices refer to processes put into place to check the data's quality as it is collected, analyzed, and shared/stored. Costs of these business practices should be accounted for when budgeting for the program, especially for short-duration counters where counters are routinely moved and rotated among sites.<sup>7</sup>

NVTA should consider opportunities to share the bicycle counts with local, regional, and national databases. National databases, such as the FHWA Traffic Monitoring and Analysis System (TMAS) provide opportunities for compiling counts from across the nation to monitor bicycling behaviors. Regionally, the MTC's Vital Signs platform is a powerful tool for reporting, visualizing, and sharing the count data across the region.<sup>8</sup> As discussed previously, MTC is currently developing data collection standards and a regional understanding of nonmotorized traffic patterns. NVTA should coordinate closely with MTC as these standards and data sharing practices are developed and identify opportunities for developing streamlined approaches for data management and sharing between NVTA and MTC.

### Program Costs

Prior to investing in a particular counting technology, NVTA should consider the total cost for a count program. Costs related to the upfront capital (or purchase) cost; staff time for training, installation, and maintenance; and, data management and reporting costs all factor into the total program costs. Estimates provided by Lane Council of Governments (LCOG) in Oregon place the overall cost per short-duration count location at an average of approximately \$295 per count location, including equipment costs, annual equipment losses, and labor costs for counter deployment and for downloading the data into the data processor.<sup>9</sup> This average cost reflects local costs from 2014 to 2017 in the Lane Council of Governments region, which includes Eugene, Oregon. From 2014 to 2017 the per count location costs

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<sup>7</sup> Nordback, K., S. Kothuri, T. Petritsch, P. McLeod, E. Rose, and H. Twaddell. 2016. Exploring Pedestrian Counting Procedures. [https://www.fhwa.dot.gov/policyinformation/travel\\_monitoring/pubs/hpl16026/](https://www.fhwa.dot.gov/policyinformation/travel_monitoring/pubs/hpl16026/).

<sup>8</sup> The Metropolitan Transportation Commission, *Vital Signs*. Accessed 06/20/2018. <http://www.vitalsigns.mtc.ca.gov/>.

<sup>9</sup> Annual losses account for counters that are damaged or lost due to street maintenance activities, tampering, or other on-road interactions.

ranged from \$150 to \$394. LCOG's count program deploys pneumatic tube counters, which are frequently circulated around the region.

Permanent bicycle counters typically cost approximately \$4,000-\$8,000 per unit, although technology vendors should be contacted for a more precise estimate. In addition to the capital cost, installation of induction loop and piezoelectric sensor systems requires pavement cuts, for which an independent contractor might need to be procured. These costs should be factored into the equipment acquisition costs.

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The most recently collected comprehensive bicycle counts in Napa County are provided on the following page in Table D.1. These manual counts were collected in 2015 as part of NVTA's ongoing data collection efforts.



Table D.1: Bicycle Volumes from September 15-19, 2015 Counts

| Location Number | N/S                | E/W                | Jurisdiction    | BICYCLISTS    |               |               |                      |               |                      |                |                |                |
|-----------------|--------------------|--------------------|-----------------|---------------|---------------|---------------|----------------------|---------------|----------------------|----------------|----------------|----------------|
|                 |                    |                    |                 | 9/15<br>7-9am | 9/15<br>4-6pm | 9/15<br>7-9am | 9/17<br>11am-<br>1pm | 9/17<br>4-6pm | 9/17<br>11am-<br>1pm | 9/19<br>9-11am | 9/19<br>12-2pm | 9/19<br>9-11am |
| Loc 1           | Jefferson St       | Lincoln Ave        | Napa            | 25            | 21            | 134           |                      | 45            |                      |                |                |                |
| Loc 2           | Soscol Ave         | Third St           | Napa            | 56            |               | 67            | 58                   |               | 107                  |                |                |                |
| Loc 3           | Commuter Path      | Vallejo St         | Napa            | 45            |               | 38            |                      |               |                      | 25             |                | 7              |
| Loc 4           | Tamarisk Dr        | Coombsville Rd     | Napa            | 18            | 6             | 106           |                      | 17            |                      |                |                |                |
| Loc 5           | Gasser Dr          | Imola Ave          | Napa            |               |               |               |                      | 12            |                      | 13             |                | 27             |
| Loc 6           | Dry Creek Rd       | Orchard Ave        | Napa/Unc        |               | 24            |               |                      |               |                      |                |                |                |
| Loc 7           | Fwy Dr/Golden Gate | Imola Ave          | Napa            |               |               |               | 18                   |               | 14                   |                |                |                |
| Loc 8           | Solano Ave         | Redwood Rd         | Napa            |               |               |               | 39                   |               | 76                   |                |                |                |
| Loc 9           | Old Sonoma Rd      | SR 121             | Napa            |               | 2             |               |                      |               |                      |                |                |                |
| Loc 10          | SR 29              | American Canyon Rd | American Canyon | 23            | 18            | 28            |                      |               |                      |                | 20             |                |
| Loc 11          | Newell Dr          | American Canyon Rd | American Canyon | 30            |               | 296           |                      | 10            |                      |                |                |                |
| Loc 12          | SR 29              | Donaldson Way      | American Canyon |               |               |               |                      |               |                      | 11             |                | 27             |
| Loc 13          | Washington St      | Yount St           | Yountville      |               |               |               |                      |               |                      |                | 58             |                |
| Loc 14          | Yount St           | Finnell Rd         | Yountville      |               |               |               |                      | 27            |                      | 70             |                | 175            |
| Loc 15          | Yount St           | Madison St         | Yountville      |               |               |               | 15                   |               | 60                   |                |                |                |
| Loc 16          | Washington St      | California Dr      | Yountville      | 22            |               | 112           |                      |               |                      |                |                |                |
| Loc 17          | Main St            | Adams St           | St. Helena      | 8             | 9             | 132           | 12                   |               | 616                  |                |                |                |
| Loc 18          | Main St            | Pope St            | St. Helena      | 8             |               | 74            |                      |               |                      |                |                |                |
| Loc 19          | Main St            | Grayson Ave        | St. Helena      |               |               |               |                      | 11            |                      |                |                |                |
| Loc 20          | Silverado Tr       | Deer Park Rd       | St. Helena/Unc  |               | 5             |               |                      |               |                      |                |                |                |
| Loc 21          | SR 29              | Oakville Grade     | Oakville/Unc    |               |               |               |                      |               |                      | 68             |                | 2              |

