

ESTIMATING TRAFFIC VOLUMES UNDER COVID-19 PANDEMIC CONDITIONS

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Introduction: There's No Traffic!

We [recently shared](#) our view that the progression of transportation projects should not be stymied by an inability to collect field data representative of normal conditions. We offered broad ideas responding to a question on the minds of many practitioners: How can important projects that rely on field-collected volume data continue?

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This white paper expands on the themes and ideas shared in that article, identifying tools, resources, and methods for practitioners to consider in developing reasonable estimates of existing and future travel demand.

While important to slow the spread of the COVID-19 pandemic, a prolonged period of social distancing gives rise to several challenges for transportation professionals:

- / Important field-based data collection activities such as road tube counts, intersection turning movement counts, and origin-destination surveys will not yield usable estimates of non-pandemic traffic conditions during this period of disruption.
- / At least some amount of permanent travel demand/pattern change seems likely to remain after the pandemic has run its course. Both individuals and institutions have opportunities and incentives to learn from the distance

learning and remote work experiences that have been forced upon them by the pandemic. Both groups can be expected to try to minimize their future risks by implementing some permanent behavioral changes with respect to when, where, why, and how they travel. Initial anecdotal commentary seems to support this prediction.

- / The pandemic has already been so disruptive to the national and world economies that a recession of some duration is expected. Recessions as well as overheated economies probably have little effect on 20-year forecasts, but they can significantly affect travel demand forecasts within the 0-5 year timeframe.

Despite these issues, compelling safety, health, and economic reasons remain for transportation agencies to continue moving forward on planning, design and operations projects to every extent possible. Even where “shelter in place” and “stay at home” orders have been issued, transportation is recognized as an essential service that must be maintained. Thus, continuing forward progress is necessary even on projects that rely on field-collected volume data and short-term volume forecasts.

Credible and reproducible methods and procedures are needed that will allow transportation professional to achieve this objective. When time is of the essence, the innovative use of already-available tools and resources is usually the most effective path to achieve such an objective. This approach is also a hallmark of how the transportation profession has addressed unexpected issues in the past. It therefore represents an opportunity to once again meet community and public needs in a timely manner.

4 Steps to Developing Proxy Volume Estimates

The following sections present guidance and some example methods for developing proxy estimates of existing and short-term future demand projections in an environment of pandemic-related disruptions.

The initial guidance provided here will result in reasonable demand projections that can be verified or fine-tuned under post-pandemic conditions. Additional modifications and enhancements to this guidance are likely to improve its veracity. [Such suggestions are encouraged](#) from every corner of the profession, because it is through this level of collaboration that the knowledge and expertise contained within the profession becomes greater than the sum of its individual parts.



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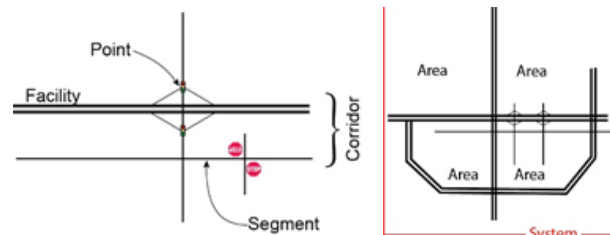
1 Establish Project Context and Data Needs

The answers to these initial questions will facilitate the identification of the most appropriate tools and resources for each individual project:

WHAT TYPE OF ANALYSIS IS BEING CONDUCTED?

The type of analysis being conducted is a critical determinant for the type of data that will be needed. Six types of roadway system elements have been defined in the *Highway Capacity Manual*, each of which is associated with its own set of data needs:

- / Points
- / Segments
- / Facilities
- / Corridors
- / Areas
- / Systems



WHAT MODAL CONSIDERATIONS NEED TO BE ADDRESSED?

Motor vehicles, transit, freight, pedestrians, and bicycles are all integral to an efficient and effective transportation system and most projects should be assessing the deficiencies and needs associated with each of these travel modes.

WHAT TYPE OF DATA IS NEEDED?

Most traffic analyses need to take account of the physical, demand, supply, and operational/control characteristics of the roadway elements being analyzed. It is the demand-related data that is most significantly affected by the current pandemic. There are several different types of demand data that could be needed for a project analysis, each of which might also be sub-stratified by travel mode:

- / Directional demand (for example, link volumes)
- / Travel patterns (for example, trip distribution characteristics)
- / Turning demand (for example, intersection turning movements by approach)
- / Traffic stream composition (for example, truck percentages as well as demand distributions across all travel modes)
- / Demand generating characteristics (for example, the trip generating characteristics of particular land use types, such as resort/holiday)

WHAT ARE THE CRITICAL ANALYSIS TIME PERIODS?

Demand characteristics are known to have important variations according to season of the year, day of the week, hour of the day, and 15-minute periods within each hour. Rules of thumb already exist for converting demand data from one time period into another but it is still important to be mindful of these differences in the context of the data resources available to a particular project.

2 Coordinate with Appropriate Agencies

Perhaps now more than ever, coordination with impacted agency partners is essential to secure acceptance of the methods to be used to develop proxy demand projections. In addition to setting up a successful project outcome, new information may be discovered through the coordination process. Up-front actions that can be taken during an early coordination phase include:

- / Develop a scope-of-work to secure agency consensus with the process before performing analyses. (case-by-case)
- / Identify example case studies or validation of other data collection efforts to establish confidence and partnership in the project review and approval process.

- / It will be important to explore all available resources with agency partners during the scoping process. Some agencies may collect and disseminate data through different staff or departments so all avenues should be explored as data sharing opportunities may not be fully understood internal to a given partner agency.

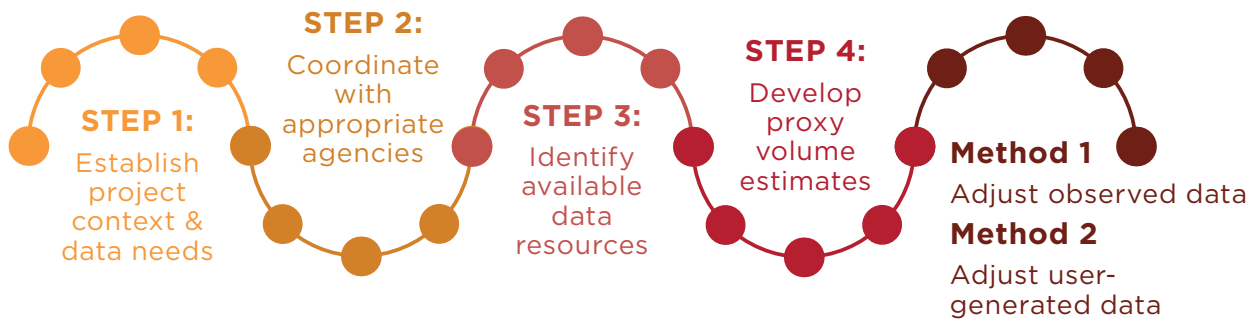
3 Identify Available Data Resources

A variety of historical data resources is potentially available to a project, some or all of which may be useful to achieving a reasonable demand projection. This includes “externally-observed” data obtained from traditional roadside data collection tools and techniques such as manual turning movement counts, embedded roadway sensors and video data analytics. It also includes “user-generated” data that is increasingly available from emerging technologies such as connected vehicles (CVs). These data sources can be used, independently or in combination, to produce reasonable traffic volume estimates under a normal design time period (i.e., non-pandemic environment). Depending on the age, type, and location of the data it can be converted into reasonable estimates of baseline traffic demand through the considered use of historic growth rates, scaling factors, seasonal adjustments, directional or peak hour splits, and turn movement and origin-destination patterns.

DISCOVERING EXTERNALLY-OBSERVED DATA

There is a wealth of historical data available from standard resources that can be used to predict demand levels and patterns under non-pandemic conditions:

- / Traffic Data Collection Companies are present or active in virtually all communities throughout the U.S. These companies collect and reduce transportation data using video surveillance cameras, road tubes, manual counters, and even drones. Traffic data is typically collected for public and



private sector projects, so discovering if data is accessible may take some consultation with these end-users. Some data providers make their historic data available through web-based formats (see an example from Quality Counts here: <https://data.qualitycounts.net/>). If you are a data provider, read to the end of this white paper for an opportunity to add your database to our online toolkit.

- / Public Agencies often operate their own independent traffic count programs with databases accessible to the public via the web. For example, the Oregon State Department of Transportation (ODOT) posts online records of annual traffic volumes and growth trends along all highways in the state, including freeways and ramp terminals, as well as vehicle classification reports and permanent automatic traffic recorder station information that can identify unique seasonal patterns: <https://www.oregon.gov/odot/Data/Pages/Traffic-Counting.aspx>.

Public transportation studies contain a wealth of traffic count data. Discovering this data may take some time and effort.

- / Other agencies like the California Department of Transportation (Caltrans) provide similar resources, plus real-time data on travel time, vehicle hours delay, and vehicle-miles-traveled (VMT) on the state system: <http://pems.dot.ca.gov/>

/ Much traffic count data is contained in published transportation studies, however, it may be sitting idly on a shelf or digital file within a public agency or private firm. Discovering this data may take some effort. Potential resources include but are not limited to:

- **Long-Range Transportation Plans (LRTP)/Transportation System Plans (TSP)** are prepared or updated about every 5 years for many large cities and counties throughout the U.S. These plans typically rely on the collection of traffic counts along roadways or at major intersections (collector level or higher) to prepare long-range travel demand forecasts and operations analyses. Raw traffic count data may even be documented in a TSP report appendix placed online, or available by request through the public agency or private consulting firm. Some agencies have integrated this data with GIS databases that can be queried (for example, see the transportation data layers available at <https://www.portlandmaps.com>).
- **Corridor Plans and Capital Improvement Design Plans** typically document the collection and analysis of traffic count data. Depending on the project, the base traffic data may or may not be readily available (technical project details may not be well publicized but perhaps can be secured through the preparing agency or project manager).

- **Transportation Impact Studies (TIS)** that accompany many land development applications often include a treasure trove of local information. These studies routinely contain traffic count data and may be kept on file at public agencies, through a web-based query search, or available by request through the study author.

/ Advanced Traffic Controllers (ATCs) are able to collect many metrics including demand-related information as detailed as lane-by-lane approach volumes. Older traffic signal controllers are not always able to provide this type of demand-related data and so the availability of such information is dependent on location.

DISCOVERING USER-GENERATED DATA

Emerging technologies are developing quickly and the data that can be accumulated from CV's, Bluetooth readers, and probes is already providing much value to practicing professionals.

Traffic data aggregators (such as [StreetLight](#), [Moonshadow](#), [Wejo](#) and [Inrix](#)) collect these types of data from numerous different sources, combine them with externally-observed data as it might be available, and then sell the results in various easy-to-use formats. When using these data sources it is important to distinguish the components that make up a particular set of observations so that it aligns appropriately with the project needs. Recent expansions have allowed this data to work in smaller areas. For example, data from probes such as cell phones is typically collected at time intervals of a minute or more; this can be quite adequate for estimating travel patterns but may not be sufficient resolution to estimate approach volumes at an intersection.

User-generated data is increasingly available from emerging technologies such as connected vehicles.

4 Develop Proxy Volume Estimates

The ability to develop proxy volume estimates will be driven by the specific project characteristics and data availability as described above. Multiple methods and tools are available to develop reasonable demand projections from these resources, two of which can be described as follows:

METHOD 1: ADJUSTMENTS TO OBSERVED DATA

/ Historical demand data that has been collected at the same location over multiple time intervals or years can be extrapolated to the desired timeframe on the basis of observed trendlines. The results can be further refined through the application of accepted and/or historically observed adjustment factors that account for seasonal, daily, and hourly variations. This approach is usually not applicable to situations where trip distribution patterns are required.

/ Reasonable demand projections can also be produced even when only a single historical observation is available. If the available historical observation is recently collected it can be used without any further modification beyond the seasonal, daily, and hourly variations noted above. When this is not the case then general trend data obtainable from nearby locations can be assumed to apply. This approach is applicable to all the types of demand data identified earlier.

METHOD 2: ADJUSTMENTS TO USER-GENERATED DATA

/ Historical data obtainable from third party aggregators can be used to estimate travel patterns and trip distributions but almost always requires the use of scaling factors when demand levels are required. This is because the aggregated data usually represents just a sampling of the underlying demand. Appropriate scaling factors can be obtained from nearby locations where observed and user-generated data were

collected at the same time (for example, at a permanent count station, in the vicinity of an ATC controller, or wherever a manual count was conducted). This approach is applicable to all types of demand data identified earlier.

There may be a need to supplement the two methods described above to reflect localized land use considerations. For example, development activities that have occurred since historic counts were completed and/or unique local land uses not in operation at the time of historic traffic counts (e.g. closed schools, churches, event centers, or other establishments) may need to be accounted for. In such instances, volume adjustments can be made following the traditional four-step modeling process and using trip generation estimates developed for the dormant land use(s) with data from resources such as the [Trip Generation Manual](#) published by the Institute of Transportation Engineers.

FURTHER CONSIDERATIONS

It was noted in the introduction that the ongoing disruptions are likely to result in long-term changes to pre-pandemic travel patterns and demand levels. Some of these changes will be temporary (for example, the effects of an anticipated recession) while others are likely to be permanent (for example, a higher proportion of distance learning and work-at-home activities). In both cases the effects are expected to have a dampening effect on pre-pandemic vehicular and transit demand levels. The estimation methods described above are therefore believed to be conservative; that is, they are more likely to overestimate than to underestimate post-pandemic and short-term demand levels. Because of this, it will be desirable wherever possible to incorporate into each project a post-pandemic data collection and assessment component so the analysis results, findings and recommendations can be adjusted and fine-tuned as appropriate.

It is still unclear what the short-term and long-term effects of the current disruption will be on pedestrian and bicycle demand levels. It is not expected that any changes will be so significant as to challenge the capacity of individual facilities or eliminate the need

for previously-identified investments. Even so, continued close monitoring of these travel modes will be an important part of any post-pandemic assessment.

Conclusion

While the current health and economic situation is in many ways unprecedented, the transportation industry has long relied on sound engineering judgment, a look to the past, and creative technology applications to chart new paths forward. Application of historic data, adjustment factors, and safety factors has proven effective in the past and, combined with availability of recent innovations in available network database information, presents a powerful tool for moving transportation projects ahead in uncertain times.

Collaborate With Us!

We're working to curate an online database of tools for others in the industry to utilize during the COVID-19 pandemic.

We have seen a number of innovative approaches and policies developed since we first published [our article](#) on this topic.

Will you collaborate with us to move the transportation industry forward during COVID-19? If you have information or examples in response to the questions below, please [share it with us here](#). We'll curate the information online for others to learn from.

- / What other tools, methods, or procedures are being used to develop proxy traffic estimates?
- / Do you have good examples of developing proxy counts over the month to complete your analysis?
- / Does your organization have historical on-line counts for people to access? If so, please send us the link to post.
- / How have public policies changed in response to COVID-19?