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Georgia Traffic Monitoring Guide

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GEORGIA TRAFFIC MONITORING GUIDE

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1 PURPOSE

Federal Regulation 23 CFR 500.202 (*1*) states, *"Traffic monitoring system* means a systematic process for the collection, analysis, summary, and retention of highway and transit related person and vehicular traffic data." Federal Regulation 23 CFR 500.203 (*1*) mandates, "Each state shall develop, establish, and implement, on a continuing basis, a TMS to be used for obtaining highway traffic data…" This document records the current procedures and practices of the Georgia Department of Transportation (GDOT)'s traffic monitoring system and provides a comprehensive analysis that fulfills the Federal regulation stated above. The study of traffic data procedures and monitoring is an extensive and broad subject with numerous publications and publicly available documentation.

The focus of this document is the current management and practices of the GDOT's Office of Transportation Data (OTD) in the traffic collection program including the collection of traffic data; quality control and assurance; data processing and statistics; and reporting. This document is not intended to be used for guidance on policy or traffic studies. The authoritative source on traffic monitoring is the Federal Highway Administration (FHWA)'s Traffic Monitoring Guide: https://www.fhwa.dot.gov/policyinformation/tmguide/

2 BACKGROUND

The FHWA requires every state to submit an annual Highway Performance Monitoring System (HPMS) report containing traffic count data, physical characteristics and other pertinent road data. Congress uses the submittal data to determine Federal transportation funding apportionment allocated to the states and for legislative decision-making. According to the *HPMS Field Manual* (*2*), “State maintenance of a comprehensive traffic monitoring data program to provide quality, timely, and complete traffic volume and vehicle classification data is important for meeting HPMS requirements.”

OTD collects traffic data for many reasons for internal offices, including the following:

- The Office of Planning uses traffic counts to determine traffic patterns and flows for modeling purposes.
- The Office of Roadway Design uses traffic counts to construct new routes or alternate designs to alleviate congestion.
- The Office of Bridge Design uses Annual Average Daily Traffic (AADT) to determine the Bridge Sufficiency Rating.
- The Office of Materials and Testing uses a combination of truck percentages and AADT to develop factors that assess the deterioration of pavement.
- The Traffic Operations Office uses the traffic volume data for safety-related purposes (e.g., calculating crash rates).

OTD also provides data to a wide range of external customers, which includes transportation planning professionals, educational institutions, design engineers, contractors, real estate agencies, private companies and other government agencies. Traffic data is important in determining which routes citizens are using for their daily commutes and leisure travel. The U.S. Department of Transportation and other customers, on both a state and national level, use this data for planning, modeling, allocation of funding and informational purposes. During emergency evacuations in inclement weather, OTD provides near real-time, critical traffic data to the Georgia Emergency Management Agency and neighboring states.

3 TRAFFIC DATA COLLECTION PROGRAM OVERVIEW

OTD maintains an extensive, quality-driven traffic count program that complies with all federal regulations and guidelines. The Statistics Management Group within OTD is responsible for managing the traffic monitoring program. Traffic count data is collected using continuous count station (CCS) sites, short-term counts and continuous weigh-in-motion (WIM) sites. OTD processes all incoming data using defined and established quality assurance and control measures.

FHWA requires all states to collect traffic data on the Federal-aid system and provide Vehicle Miles Traveled (VMT) estimates for the local Functional Classification (FC) systems, as directed by Federal regulations. OTD designed its traffic collection program to provide statistically valid data for the HPMS report, which FHWA requires annually, following the guidelines in the FHWA's *Traffic Monitoring Guide* (TMG) (*3*). The following road systems are included in the traffic collection program:

- State Routes
  - Interstates
  - U.S. Routes
- County Roads
- City Streets
- Ramps

4 TRAFFIC DATA SOURCES

OTD publishes traffic data for the public through an online, interactive map application. The website displays AADT counts collected by permanent traffic collection, portable traffic collection and WIM devices across Georgia's Public Road System. Other available information includes historical traffic counts, truck percentages and vehicle classification data, where available. The *Traffic Counts in Georgia* website can be accessed at: https://gdottrafficdata.drakewell.com/publicmultinodemap.asp

OTD also provides traffic data for customers seeking more in-depth information. A variety of data products—including statewide hourly traffic counts by site by lane by month; GIS shapefiles; and annual traffic data—are available. These files are published on GDOT's public website:
https://www.dot.ga.gov/GDOT/Pages/RoadTrafficData.aspx

Customers can navigate to the **Downloads** section (*Figure 1*) of the above-mentioned webpage. Each Georgia county has a unique FIPS code, which is useful for determining the locations of traffic counts (*Appendix A*).

DATA TYPE	DESCRIPTION	FILE TYPE
Traffic	Download available traffic data in different formats. The Georgia Department of Transportation's (GDOT) Office of Transportation Data (OTD) collects traffic data to meet the needs of Georgia's federally required traffic monitoring program. Traffic data is collected using continuous counters, short-term counters, or portable and continuous weigh-in-motion counters.	Spatial: Geodatabase (18.4 MB) Tabular: Excel (9.8 MB) Document: Rounding Rules (107 KB) Historical: 2010-2023 (563 MB)
Road Inventory	Download road inventory data in different formats for more than 125,000 centerline miles of public roads in Georgia. OTD utilizes remote sensing, Local Road Activity (LRA) reports, construction design plans, and data mining to collect road data. The road inventory data includes state routes, county roads, and city streets.	Spatial: Geodatabase (469 MB) Tabular: Excel (32.2 MB)
Data Dictionary: Road Inventory	The Data Dictionary describes the codes and methodology used for the collection of road inventory data. This file should be downloaded in conjuction with the road inventory files (in either tabular or geospatial formats).	Document: Data Dictionary (22.4 MB)

Figure 1 Traffic and Road Data Available Online

5 TRAFFIC DATA COLLECTION

5.1 Overview

The foundation of the traffic monitoring program is the collection of traffic data. Data can be collected using continuous counters, short-term counters, or continuous weigh-in-motion. Internal GDOT offices may request specific types of traffic collection at designated sites through the Office of Planning. Potential future sources of traffic data include Intelligent Transportation System (ITS) data and data-sharing partnerships.

5.2 Continuous Counts

As of November 2025, OTD maintains approximately 330 operational, permanent Continuous Count Stations (CCS) located on road systems throughout the state. These sites are operational 24 hours a day, seven days a week, 365 days a year, excluding any necessary maintenance periods. Permanent sites are polled daily, collecting both vehicle classification data and traffic volume data. Vehicle classification may also be referred to as classification or class data. The FHWA classification system consists of 13 categories, including motorcycles, passenger cars, buses and trucks (*Appendix B*).

5.3 Short-Term Counts

Short-term (also known as portable) traffic collection devices consist of one or more pneumatic tubes stretched across the roadway and secured on both sides by a field technician with the tubes connected to a counter on one side. Field technicians deploy them for 48 hours at a time, gathering short-term data at about 27,000 sites statewide on a three-year cycle or about 9,000 sites a year. Field technicians can program the devices to collect vehicle classification and volume counts.

5.4 Weigh-In-Motion (WIM)

Continuous weigh-in-motion (WIM) sensors and the related data collection equipment are used to collect truck weight data statewide. OTD maintains about 35 permanent CCSs configured to collect WIM data 24 hours a day, 7 days a week, 365 days a year, excluding any necessary maintenance periods. These continuous WIM sites also provide traffic volume and vehicle classification data.

5.5 Special Requests

The Office of Planning employs a traffic data collection consultant to collect specifically requested traffic data or special requests at site specific and project specific locations statewide. Primarily, GDOT internal offices request traffic data for project specific studies, which may include short-term vehicle classification, volume counts or turning movements at an intersection.

6 CONTINUOUS MONITORING PROGRAM

6.1 Overview

OTD installs CCSs on all types of road systems—state routes, county roads and city streets—in both asphalt and concrete. The CCSs provide traffic volume and vehicle classification data (*Appendix B*). Each station operates 24 hours a day, 7 days a week, 365 days a year, except during necessary maintenance periods. The collected data is stored onsite in a CCS controller cabinet (*Figure 2*) before being automatically polled each night using cellular modems located at each CCS site.

Figure 2 CCS Controller Cabinet

In Georgia, all CCSs are configured to collect vehicle classification in addition to traffic volume counts. Most CCSs use two inductive loop sensors and one class II piezoelectric sensor embedded in each lane (*Figure 3*), which operates in accordance with the manufacturer's specifications. Some locations use advanced camera technology.

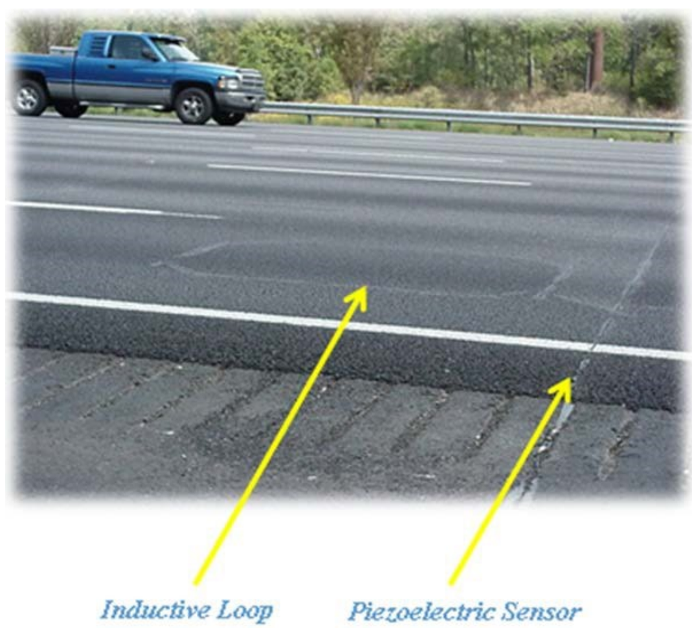

Figure 3 Installed Continuous Count Station

Each CCS system may include one of more of the following components: controller cabinet, lightning suppressors, pull boxes, conduits, grounding electrodes, poles, concrete aprons, batteries, and solar panels. OTD's contractor furnishes, installs, tests, calibrates and makes ready for operation the piezoelectric sensors, equipment cabinet, inductive loops, cables, leads, camera accessories, and electronic hardware and software. The contractor adheres to stringent calibration and setup procedures to ensure a high level of traffic data accuracy.

As of November 2025, OTD maintains about 330 operational sites managed by OTD's Statistics Management Group (*Figures 4 and 5*). This number fluctuates due to road construction and equipment failures. Traffic software transmits data electronically from permanent sites automatically on a regular basis.

CCSs provide valuable data statistics, such as:

- AADT, vehicle classification and truck percentages
- Accurate traffic volume data used to calculate high volume interstates and other freeways (*Section 11.3*)
- Daily, monthly and axle adjustment factors by traffic pattern group (*Section 11.5*)
- Design hour factors—peak hour and 30th highest hour (*Appendix D*)
- Traffic growth and patterns

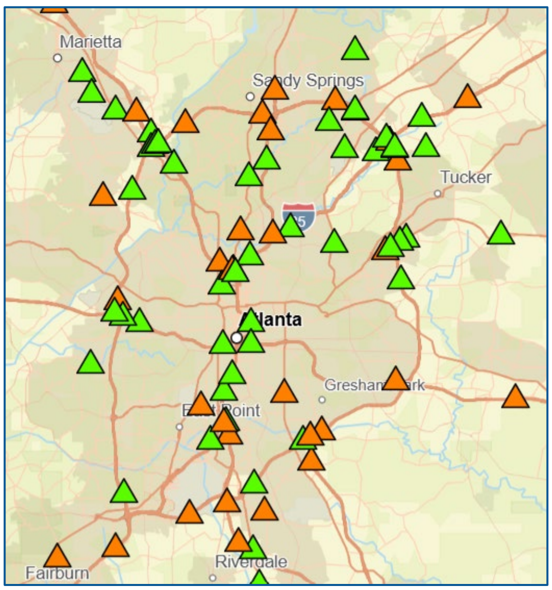

Figure 4 Atlanta CCS Locations

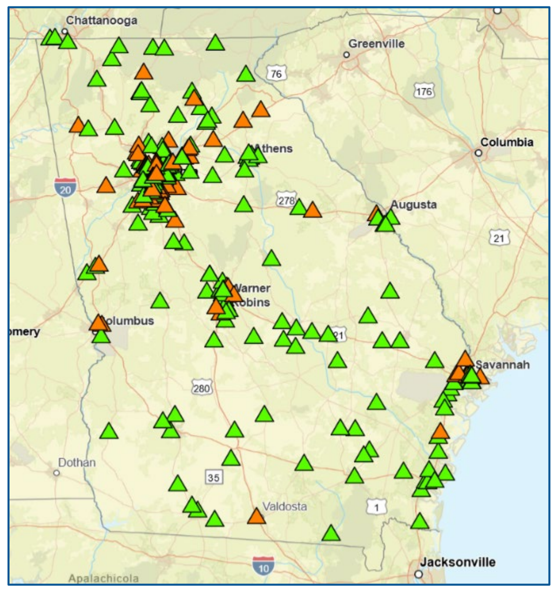

Figure 5 Georgia CCS Locations

6.2 Selection Criteria for Installation of a New CCS Site

When funding allows for the installation of a new CCS, the Statistics Management Group recommends potential locations based on defined selection criteria (*Figure 6*). OTD's contractor performs a field inspection of any potential new CCS location to ensure site feasibility and optimal placement for the physical installation of the CCS equipment within the traffic count segment. The Statistics Management Group then reviews the inspection results and approves or rejects the installation.

Figure 6 CCS Site Selection and Installation Process

The following is a list of the selection criteria:

1. Primary Selection Criteria

   Minimum of five to eight CCSs per traffic factor group depending upon the traffic patterns and precision desired.

2. Secondary Selection Criteria
   a. Critical nodes on high volume roads that are used in the Step-Down Method
   b. Replacement of CCSs that were eliminated due to construction
   c. Adequate coverage in each of the seven GDOT Districts to ensure geographic differences in travel trends are captured
   d. Minimum of one operational CCS site per interstate route
   e. Minimum of one operational CCS site on other major arterials (e.g., SR-400 and SR-316)
   f. Areas of interest to GDOT management for planning purposes or to meet specific Federal requirements [e.g., the *Mechanistic-Empirical Pavement Design Guide (4)*]

7 SHORT-TERM MONITORING PROGRAM

7.1 Overview

The short-term program (also known as the portable collection or coverage program) collects roadway segment-specific traffic count data on a scheduled cycle. Field technicians collect data for 48 hours at a time, gathering short-term data at about 27,000 sites statewide on a three-year cycle or about 9,000 sites a year. Field technicians can configure portable collection devices to collect vehicle classification and volume counts.

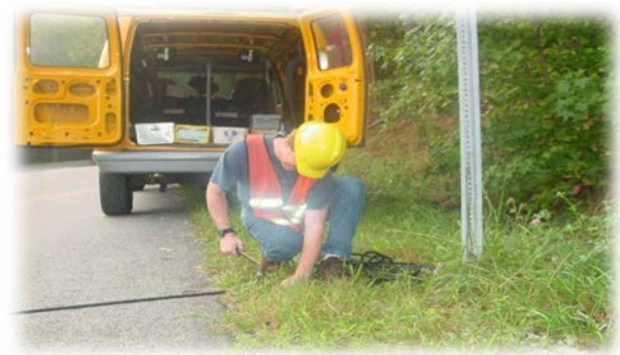

Figure 7 Portable Traffic Data Collection

A field technician stretches pneumatic tubes across the roadway and secures them on both sides. (*Figure 7*). The tubes are then connected to a counter on one side of the road where the data is stored. The counter records and processes the pulses of air created by a vehicle's axles crossing the tubes. Depending on the type of count needed, the field technician may install one of several tube configurations on the roadway.

Another collection method is the use of advanced camera technology. This method is completely non-intrusive, eliminating all in-road work, which allows the field technicians to collect data at locations that would be unsafe for portable data collection.

7.2 Number of Counts, Period of Monitoring and the Cycle of Monitoring

The *Roads and Highways* software system houses the Road Characteristics (RC) data, including AADT, used in the development of the HPMS Report. OTD defines beginning and ending mile points for each route in the *Roads & Highways* system. OTD divides routes into smaller sections designated with traffic count (TC) numbers and assigns an AADT volume to each TC number.

Georgia has approximately 27,000 TC numbers or segments. Due to practical limitations, OTD cannot collect traffic counts on every road segment statewide each year. Therefore, portable traffic counts are collected on defined roadway sections (TC segments) on an annual or cyclical basis, depending on internal and external reporting requirements. Collection intervals typically range from one to four years. In year when a segment is not counted, traffic counts are adjusted using growth factors. AADT data for each TC number and collection year is marked as either *Estimated* or *Actual*.

Federal Regulation 23 CFR 500.204 (*1*) states, "Documentation of field operations shall include the number of counts, the period of monitoring, the cycle of monitoring, and the spatial and temporal distribution of count sites." The Statistics Management Group reevaluates the portable traffic collection program annually, including the number of counts and the cycle of monitoring. The period of monitoring is a 48-hour interval with data recorded for every hour of each day. Typical collections occur Tuesday through Thursday, consistent with practices in many state Departments of Transportation.

7.3 Spatial and Temporal Distribution of Traffic Counts

Submitted portable traffic data includes information such as the time, date, and location of collection. Field technicians use Global Positioning System (GPS) units during traffic data collection to record the precise physical location of each traffic count. OTD uses GPS data to compare actual versus planned sites and to perform quality control checks.

8 WEIGH-IN-MOTION PROGRAM

“A specific subset of traffic monitoring devices is capable of weighing vehicles while they travel down the road. These devices are commonly referred to as weigh-in-motion (WIM) scales. The sensors used are designed to not only detect the presence of an axle, but to measure the force being applied by that axle during the duration of the time the axle is in contact with the axle sensor,” according to the FHWA’s *Traffic Monitoring Guide* (*3*). Software is used to analyze the signal produced by each sensor to calculate the weight of each passing axle. The sum of all axle weight provides the estimated total vehicle weight.

Each year, OTD collects WIM data at approximately 35 CCS sites throughout Georgia (*Appendix C*). The WIM data is transmitted electronically from the permanent sites to OTD on a daily basis. WIM technology measures vehicle counts, axle and gross weights, and vehicle classification data. GDOT and our data customers use WIM data for pavement and capacity studies, enforcement and inspection purposes, and analysis of truck transport practices. WIM sites are currently calibrated by OTD every other year.

9 QUALITY ASSURANCE AND CONTROL

One of OTD's primary goals for the traffic collection program is to provide an accurate portrayal of statewide traffic data and trends. With very few exceptions, OTD's collection program covers the entire State Highway System (approximately 18,000 miles) and samples traffic data during typical travel conditions, excluding holidays or weekends. One-time events, such as a county fair, do not accurately represent an "average day" and are not indicative of long-term traffic trends. In contrast, conditions that do influence long-term changes in traffic characteristics include the addition of lanes, new intersections or interchanges, new roads, new business or residential developments, economic changes, and shifts in land use.

For quality assurance, OTD has documented procedures and provides staff training for the installation and calibration of all types of equipment. OTD employs the following approaches for data quality assurance:

1. Staff training and use of guidelines
2. Data processing rules and checklists
3. Proven software and data processing methods
4. Strict control on vendor compliance with guidelines
5. Quality control checks using established algorithms
6. Stringent adherence to calibration and setup routines for equipment

Additionally, the Statistics Management Group closely reviews all contractor-installed equipment to ensure adherence to guidelines.

According to the *TMG* (*3*), "Each highway agency should have formal, documented rules and procedures for their quality control efforts." OTD has established quality control (QC) rules and procedures that evolve alongside new technologies and software enhancements that ensure accurate statewide traffic data. OTD and FHWA perform numerous quality control checks on the traffic data. For example, each month OTD submits CCSs data to the FHWA online through the Travel Monitoring Analysis System (TMAS), which includes built-in quality control checks. The Statistics Management Group also performs daily or weekly QC reviews and conducts a comprehensive review as part of the annual data processing.

10 DATA PROCESSING

The Statistics Management Group manages the data processing of incoming CCS and portable collection data through a data management system (software application). The traffic software application rejects or flags any data that fails *to* meet the quality control standards. OTD uses proven software and data processing methods to ensure all data is processed with a high level of accuracy and quality (*Figure 8*).

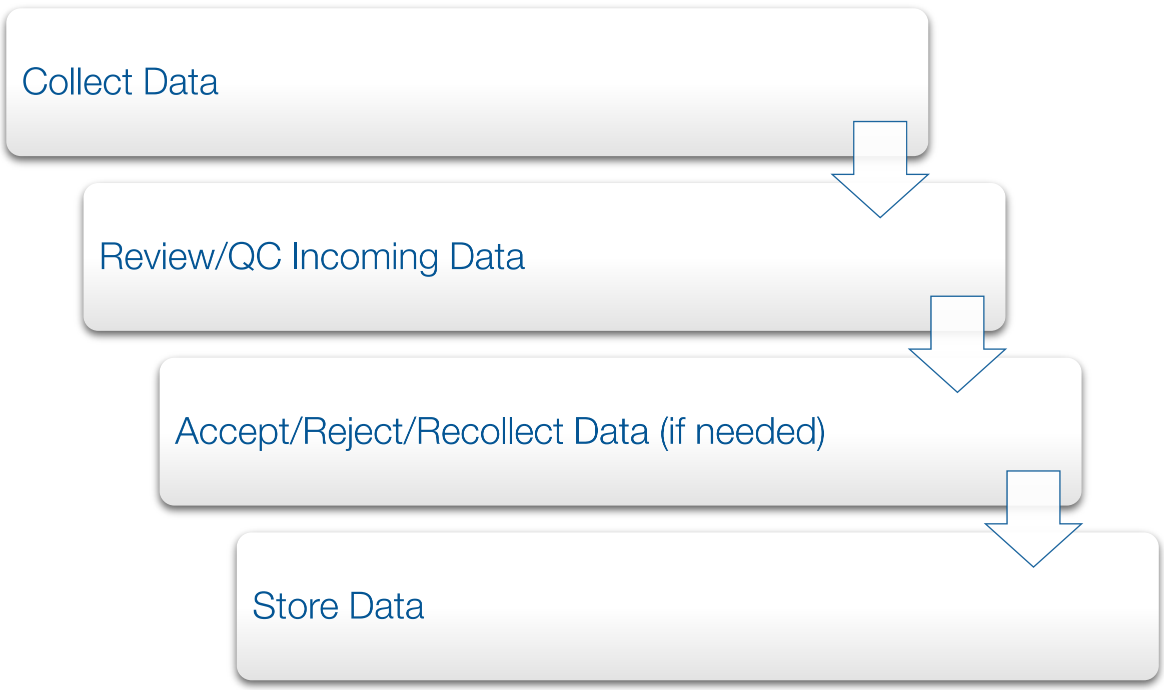

Figure 8 High-Level Overview of the QC Process

The Statistics Management Group categorizes CCSs into groups, such as interstates or low volume routes, and applies extensive QC rules (*Table 1*). The traffic software also has adjustable thresholds for certain QC parameters, when applicable. CCS QC rules check for various issues, such as incoming data format, volume minimums and maximums, and vehicle classification consistency. In addition, the application verifies that both sides of double-sided CCS stations are operational.

OTD personnel process, track, and monitor portable traffic data collected by field technicians on a daily or weekly basis. The application applies portable QC rules (*Table 2*) to detect issues, such as unusual directional traffic volume percentages and deviations from historical portable data. As discussed in Section 7. Short-Term Monitoring Program, GPS data and field notes collected at each portable site assist in ensuring the accuracy of each traffic count.

For GPS verification, office personnel compare the positional offset (in meters) between the current year's data and the previous year's data. Recorded GPS coordinates must fall within the assigned TC segment. If incoming traffic data is flagged, office personnel perform additional analyses, such as evaluating GPS data coordinates, identifying the failed QC rule, examining historical comparisons for sites, studying trend analysis graphs, and comparing traffic counts from adjacent sites.

Table 1 Quality Control Rules for Continuous Count Stations

Quality Control Rule	Description	Data Type
Error Ratio	The system will reject the day(s) that have vehicles in class 15 (the error bin) greater than X percent of the total volume.	Class
Minimum Class Hours	The system will reject data that does not provide a complete 24 hours of truck data.	Class
No Truck Data	The system will reject the day(s) if no truck data exists for the day.	Class
No Trucks Lane	The system will reject the data if there is no truck traffic in one lane for the day.	Class
Ratio of Class 1 to Class 2	The system will flag any day(s) where the volume in vehicle class 1 (motorcycles) exceeds the volume in vehicle class 2 (cars).	Class
Ratio of Class 13 to Class 9	The system will flag any day(s) where the volume in vehicle class 13 exceeds the volume in vehicle class 9.	Class
Ratio of Long Class to Short Class	The system will flag any day(s), where the total of the volumes in vehicle classes, 11, 12 and 13 (long class) exceeds the volume in vehicle class 8, 9 and 10 (short class).	Class
Trucks Last Year	The system will reject any daily truck traffic volumes that are substantially different from the previous year.	Class
Zero Long Class	The system will reject day(s) where the long truck classes had a zero volume.	Class
Zero Short Class	The system will reject day(s) where the short truck classes had a zero volume.	Class
Minimum Hours	The system will reject any day that does not have data for every hour	Volume
No Data	The system will reject a day if there is no data.	Volume
Volume Last Year	The system will reject any daily traffic volumes that are substantially different from the previous year.	Volume

Quality Control Rule	Description	Data Type
Volume Split	The system will flag the entire set of counts if volume in one direction is over X percent of the total volume. This check is not applied to non- directional data.	Volume
Volume Step	The system will reject the day(s) that show a sudden dramatic change in hourly volumes.	Volume
Volume Step Lane	The system will flag the day(s) where there is a sudden dramatic change in hourly lane volumes.	Volume
Zero Hours All Day	The system will reject any day with consecutive zero volumes for the entire day.	Volume
Zero Hours During Day	The system will reject any day with consecutive zero volumes at any time during the day.	Volume
Zero Hours During the Night	The system will reject any day with consecutive zero volumes at any time during the night.	Volume
Class 9 Average Steer Weight	The system will reject any day where the Class 9 average steer weight is outside the parameters.	WIM
Class 9 BC Spacing	The system will reject any day where the Class 9 average B-C axle spacing is outside the parameters.	WIM
Maximum Axle Count	The system will reject any day where the ratio of vehicles to axles is more than X.	WIM
Maximum Wheelbase	The system will reject any day where the wheelbase is more than X.	WIM
Minimum Axle Count	The system will reject any day where the ratio of vehicles to axles is less than X.	WIM

Note. X=Variable number.

Table 2 Quality Control Rules for Short-term Monitoring Sites

Quality Control Rule	Description	Minimum Threshold	Maximum Threshold
Blank (No Data) Check	The system will reject any blank volume in one direction.	--	--
Class 14	The system will flag the day(s) that have vehicles in vehicle class bin 14 greater than X percent of the total daily volume.	--	5%
Class 15	The system will flag the day(s) that have vehicles in vehicle class bin 15 greater than X percent of the total daily volume.	--	1%
Class 3 Greater than Class 2	The system will flag any day where the volume in vehicle class bin 3 exceeds the volume in vehicle class bin 2.	--	--
Daily Directional Volume Check	The system will calculate the directional distribution (D Factor) of the traffic. If the D Factor is greater than X percent, the counts are flagged.	--	70%
Daily Ratio of Class 1 to 2	The system will compare the ratio of vehicle class 1 bin data to vehicle class 2 bin data. If class 1 is higher, the data for the day will be flagged.	--	--
Direction Check	The system will check that the direction for the site is correct. The system will PASS a 0 (non-directional) OR a pair (1:3 or 2:4) at every TC Number. It will NOT accept a lone direction or an incorrectly matched directional pair (example: North-1 and East-2).	--	--
Factor AADT Outside Range	The system calculates the AADT based on the factor groups using daily, monthly and axle factors. Then, the system compares the computed hourly AADT to the historical AADT and flags sites that are outside the established volume group tolerance limits.	Variable	Variable
Historical Volume Check for Portable	The system averages the last 3 years of the AADT history. If 3 years of data is not available, the system will average the last 2 years of the AADT history. If 2 years of data is not available, the system will use one year of AADT history. The data is flagged if it is outside the volume group tolerance limits.	Variable	Variable
Hourly Zero Volume Check	The system will reject any hour with zero volume in one direction when the current AADT for the site is greater than 10,000.	--	10,000

Quality Control Rule	Description	Minimum Threshold	Maximum Threshold
Less Than 48 Hours of Data	The system will reject the entire set of counts if there are not at least 48 hours of data. This means one or more row(s) in a PRN file is missing. If a row has a blank PRN file, the system still counts the row.	--	--
Max Hourly Volume	The system will reject the entire set of counts with an hourly volume count of greater than X	--	5,000
Midnight/ Noon Check	The system will reject the entire set of counts, if the midnight count is higher than the noon count.	--	--
Peak Hours	The system will reject the entire set of counts with a volume count of zero between the hours of 6 a.m.-9 a.m. and 3 p.m.-6 p.m. when the functional class is not equal to 9 or 19.	--	--
Portable Truck Percent	The system will calculate the truck percent by adding vehicle class bins 4 - 14 for the day and dividing by the total daily traffic count. Incoming data will be flagged if the truck traffic is greater than X percent.	--	40%
Sum Volume Exceeds Class 9	The system will flag any day where the total of the Combination volumes in vehicle class bins 11, 12 and 13 exceeds the volume in vehicle class bin 9.	--	--
Volume Check	The system will flag any incoming data if there is an hourly volume count of greater than 9999. Allowable volumes are from 0 to 9999.	0	9,999

Note. X=Variable number.

11 ANNUAL DATA PROCESSING

11.1 Overview

Annual data processing is a cycle that involves planning, traffic data collection, quality control, traffic calculations, reporting and publishing. The Statistics Management Group performs the following tasks during annual data processing (*Figure 9*):

Figure 9 Annual Data Processing Cycle

1. Establish the Plan
   a. Review TC segmentation.
   b. Review collection cycle for portable data.
   c. Add/delete TC sites, as needed.

2. Implement the Plan
   a. Create lists of portable traffic count locations for field technicians and consultants.
   b. Provide new lists quarterly to field technicians and consultants.

3. Collect Traffic
   a. Collect and review (QC) portable data, including GPS data and traffic data files.
   b. Poll and review (QC) CCS data.

4. Review Annual Traffic
   a. Ensure all portable and continuous traffic has been collected and has passed quality control standards.

5. Complete Traffic End of Year Process (EOYP)
   a. Process CCS data and compute CCS statistics.
   b. Process portable count data and compute portable statistics.
   c. Calculate traffic adjustment factors.
   d. Calculate estimated traffic and compute statistics.
   e. Calculate AADTs using the Step-Down Method and compute statistics (*Appendix D*).
   f. Generate annual traffic report (all stations statistics report).

6. Update Systems and Report Traffic
   a. Report traffic data to the FHWA in the HPMS submittal.
   b. Provide traffic data for external public viewing [Traffic Counts in Georgia (drakewell.com)].
   c. Populate the *Roads & Highway* database with traffic data.

11.2 Management of Traffic Count Segments

The HPMS Field Manual (2) states that count station locations should be chosen to represent expected AADT volume group breakpoints across the required sample volume ranges. Additionally, selection of these locations should factor in previous traffic count experience on the section or nearby sections, recent land use developments, and the presence of segments along the route that have not yet been counted.

A traffic count (TC) segment is defined as a section of roadway with homogenous (i.e., similar traffic characteristics throughout the segment) traffic volume. TC segments are dynamic and must be updated annually to maintain their integrity. Office personnel add, delete, or adjust break points to reflect changes identified in the road inventory and observed field conditions.

OTD evaluation criteria for adding and spacing TC segments:

- **Federal-aid eligibility:** TC segments must meet Federal-aid eligibility requirements. Federal-aid roadways include any public road with a functional classification higher than a local road in an urban area or a minor collector in a rural area. Local roads and rural minor collectors are sampled randomly for traffic data reporting, meaning only select locations on these roads are assigned TC numbers.

- **Logical segment limits:** Wherever possible, TC segments should extend from one major intersection to another or to a major traffic generator. The Statistics Management Group defines a *major intersection* as one involving an arterial roadway and a *major traffic generator* as an entrance or exit to a major retail store, such as a Super Walmart.

- **Volume variation:** The Statistics Management Group evaluates road segmentation when adjacent AADT volumes differ by 20% or more. This analysis typically considers the previous three or more years of traffic history.

OTD evaluation criteria for retiring a TC segment:

- **Low variation between segments:** OTD reviews TC segments when adjacent segments have less than a 5% difference in AADT volumes. If warranted, OTD deletes the TC segment and extends the terminus of the adjacent segment.

- **Federal requirements:** Modifications in Federal requirements may affect TC segment designations.

- **Safety and feasibility:** OTD may remove TC segments when it is unsafe or impractical for field technicians to collect the traffic data.

11.3 Calculation of Traffic on High Volume Roads (Step-Down Method)

GDOT uses a ramp-counting procedure referred to as the Step-Down Method, also known in some states as Ramp Balancing, to estimate AADT volumes for Interstates and freeways. Because these facilities have multiple lanes and high traffic volumes, it is unsafe to collect data using portable devices due to risks to both the field personnel and the traveling public.

The Step-Down Method involves counting all entrance and exit ramps between two established mainline anchor points (or nodes) and then reconciling the data to calculate mainline AADT (*Figure 10*). The calculated AADTs decrease or "step down", from TC0927 to TC0446. Ramp counts are obtained using portable collection devices at most locations, though some are collected by other means. Whenever possible, OTD uses CCSs as anchor points.

OTD's traffic software calculates AADT for each uncounted mainline link by adding or subtracting ramp AADTs (multiplied by an adjustment factor) to or from mainline AADTs, beginning at one anchor point or node. The difference in traffic volume remaining at the ending control point is then proportionally distributed among the ramps. Each ramp's adjustment is computed as the ratio of the remaining volume difference to the total ramp volumes.

In the past, this process was time-consuming and labor-intensive, as office personnel performed the calculations manually. Today, the traffic software automatically applies the Step-Down Method after AADTs have been established for both the CCSs and ramps. OTD does not calculate Step-Down AADT volumes by direction of travel.

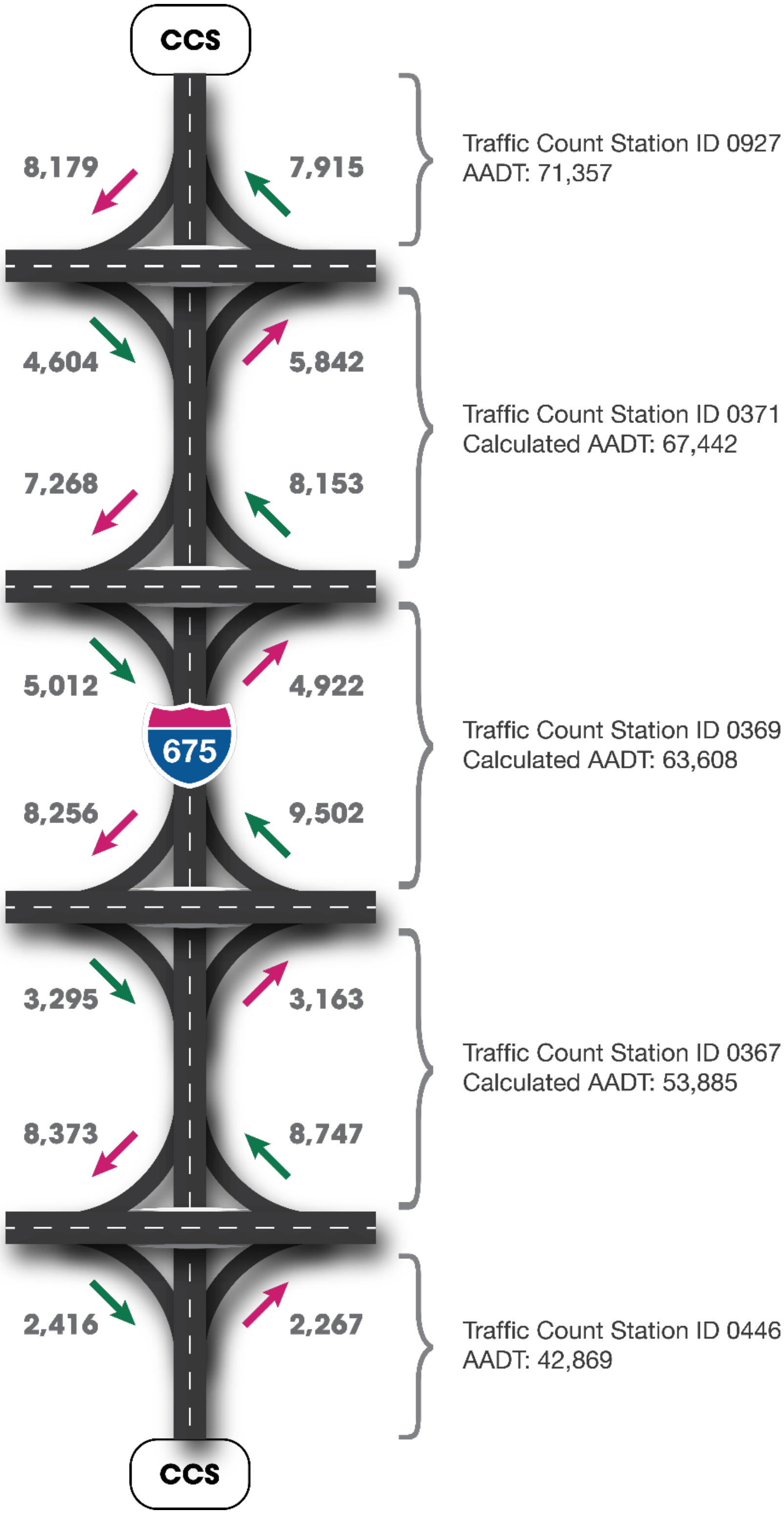

Figure 10 Example of the Step-Down Method

11.4 Traffic Count Collection and Estimation on Local Roads

The FHWA requires states to report annually to the Federal Highway Administration (FHWA) aggregate estimates of VMT on the rural minor collector and local functional systems in rural, small urban and urbanized areas. Collectively, the FHWA refers to these facilities as *local roads*, which share similar travel characteristics, such as providing direct access to adjacent land, serving short-distance travel, and linking locally important traffic generators with their rural hinterlands. Examples of local roads include subdivision streets or unpaved country roads.

Except for the local roads, OTD collects traffic data on all road types in Georgia at regular intervals. For local roads, OTD collects a small number of samples to derive and compute VMT statistics for Federal reporting purposes. As of December 2024, the total local road mileage was approximately 87,500 miles. OTD has consistently exceeded the HPMS sampling requirements with the number of local traffic counts ranging between 800 and 1,600 over the past several years.

According to the *HPMS Field Manual* (*2*), “Statistically speaking, a *universe* is a population from which a sample is taken. A *population* can be any set of sampling units, such as objects that can be observed or people who can be surveyed. A *sampling frame* is a list of all of the sampling units in a universe.” In Georgia’s case, the universe for local roads represents the total local road mileage, and the sampling unit consists of a collection of local road segments, which are collected on an evenly distributed cycle. OTD collects vehicle classification data on every local roadway with a bridge at least once every four years.

11.5 Traffic Adjustment Factors

Federal Regulation 23 CFR 500.204 (*1*) states, “The procedures used by a state to edit and adjust highway traffic data collected from short-term counts at field locations to estimates of average traffic volume shall be documented.”

Raw hourly counts collected by portable traffic collection devices over a 48-hour period are adjusted by monthly, daily and axle correction factors to determine AADT. These factors account for variations in the traffic stream and help estimate “average” conditions. They are derived from data provided by the CCSs and are recalculated annually as part of GDOT’s traffic monitoring program.

Monthly factors are calculated by dividing the AADT by the Monthly Average Daily Traffic (MADT) for each location. In Georgia, January typically experiences the lowest traffic volumes; therefore, portable traffic counts collected in January result in the highest monthly factors.

Daily (day-of-week) factors are calculated by dividing the AADT by the Average Daily Traffic (ADT). Sunday generally has the lowest traffic volumes, which produces the highest daily factors.

Axle correction factors are developed from data representing all seasons of the year. The axle correction factors are applied to raw counts taken with portable traffic counters, which register two axle impacts as one vehicle. These factors account for vehicles with more than two axles—typically trucks with three or more axles—in the traffic stream. Rural Interstates have the lowest axle factors because they experience the highest percentage of truck traffic in Georgia.

Growth factors are calculated for each factor group using historical data and linear regression analysis. These factors are used to estimate traffic volumes at locations where data was not collected during the current year.

OTD reviews our factoring approach annually, considering newly installed CCSs, emerging traffic trends or patterns, high-growth areas, and shifts in truck traffic patterns. OTD organizes the CCSs into nine traffic factor groups in accordance with the guidelines provided in the FHWA's *TMG* (3). As expected, Atlanta's traffic patterns differ significantly from those of rural areas across the state. The 2024 factors and factor groups are shown in the following tables (*Tables 3-7)*:

Table 3 2024 Daily Factors

Factor Group	Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	1.29	1.01	0.97	0.94	0.92	0.88	1.13
2	1.29	1.01	0.98	0.95	0.93	0.86	1.10
3	0.97	1.06	1.11	1.06	0.99	0.86	1.01
4	1.85	0.95	0.90	0.88	0.89	0.89	1.49
5	1.39	0.99	0.94	0.93	0.92	0.87	1.12
6	1.28	1.01	1.00	0.96	0.93	0.88	1.14
7	1.43	0.99	0.94	0.92	0.91	0.88	1.16
8	1.30	1.01	0.94	0.92	0.93	0.91	1.09
9	1.17	1.01	0.99	0.96	0.95	0.93	1.03

*Factor groups are described in *Table 7: 2024 Factor Groups*.

Table 4 2024 Monthly Factors

Factor Group*	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.13	1.04	1.00	0.98	0.97	0.97	1.00	0.95	0.97	0.91	1.02	1.08
2	1.11	1.04	1.00	0.98	0.98	0.97	1.01	1.00	0.99	0.92	0.99	1.04
3	1.18	1.09	0.99	0.99	0.97	0.93	0.93	1.02	1.02	0.92	0.97	1.02
4	1.07	1.01	0.98	0.98	0.97	1.00	1.05	0.96	0.98	0.94	1.02	1.06
5	1.06	1.00	0.97	0.97	0.99	1.00	1.05	0.99	0.98	0.96	1.01	1.03
6	1.12	1.04	0.98	0.98	0.98	0.97	0.99	1.00	0.99	0.94	1.00	1.04
7	1.07	0.99	0.97	0.97	0.99	0.99	1.03	0.98	0.99	0.96	1.03	1.06
8	1.07	1.00	0.97	0.97	0.97	0.97	1.03	0.98	0.99	0.97	1.02	1.05
9	1.07	1.01	0.99	0.99	0.98	0.97	1.00	0.99	0.99	0.97	1.02	1.04

*Factor groups are described in *Table 7: 2024 Factor Groups*.

Table 5 2024 Axle Factors

Factor Group*	Axle Factors
1	0.94
2	0.88
3	0.73
4	0.97
5	0.92
6	0.84
7	0.96
8	0.98
9	0.95

*Factor groups are described in *Table 7: 2024 Factor Groups*.

Table 6 2024 Growth Factors

Factor Group*	Growth Factors
1	1.03
2	1.02
3	1.01
4	1.00
5	1.00
6	1.00
7	1.01
8	1.01
9	1.00

*Factor groups are described in *Table 7: 2024 Factor Groups*.

Table 7 2024 Factor Groups

No.	Factor Group	Rural/Urban	Functional Classification
1	Rural Local Collectors	Rural	5, 6 and 7
2	Rural Minor and Major Arterials	Rural	3 and 4
3	Rural Interstates	Rural	1
4	Small Urban/Urban Local Collectors	Small Urban and Urban	5, 6 and 7
5	Small Urban Arterials	Small Urban	3 and 4
6	Small Urban/Urban Interstates and Freeways (Non-Atlanta)	Small Urban and Urban	1 and 2
7	Urban Minor/Major Arterials (Non-Atlanta)	Urban	3 and 4
8	Urban Minor/Major Arterials (Atlanta)	Urban	3 and 4
9	Urban Freeways and Interstates (Atlanta)	Urban	1 and 2

12 OTHER CONSIDERATIONS

A complete analysis of any program identifies and considers all relevant issues and challenges. The main program management challenge is balancing costs, resources and statistical data needs. In a world not constrained by funding or other resources, every TC segment on every road would have actual traffic data available every year. Perhaps, in a small geographical area with a large budget this is an actual possibility. However, most state Department of Transportations must continually balance budget constraints with resources (time and available staff) and needs (quantity and quality of traffic counts collected). It is the classic paradox of project management (*Figure 11*).

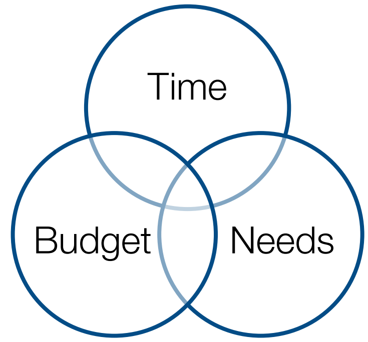

Figure 11 Project Management

Despite budget constraints, the demand for traffic data in all formats has not been reduced. For example, FHWA's most recent HPMS reassessment requires additional traffic data to be collected on ramps. Special requests for traffic counts are also a competing factor with the portable traffic count program. Often, these traffic counts revolve around a special event and are not valid for use in an AADT calculation.

Additional challenges include relational database struggles, software integration, staffing issues and making traffic data accessible to the public in an easy-to-use interface. Most of the traffic data customers want an easy-to-use, simple interface that provides traffic counts. Other customers want all types of traffic data in detail as soon as it is available to them. OTD has made significant strides towards making data more accessible to the public and is continually exploring how to better serve customers' needs.

Regarding traffic data collection, OTD's primary concern is the safety of the traffic data collection crew while collecting data on high-volume routes. Due to equipment failures, collecting traffic data in stop-and-go traffic conditions is a challenge. Increased traffic congestion increases the difficulty in obtaining reliable vehicle classification counts. Construction and incidents also affect traffic data collection activities. Data processing, quality control and assurance are challenges especially for high traffic-volume routes. Atlanta, a metropolitan area with approximately six million people, has significant traffic congestion, construction and traffic incidents.

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5. Randall, James L. (February 1, 2012). Texas Department of Transportation, *Traffic Recorder Instruction Manual*. Retrieved April 30, 2012, from http://onlinemanuals.txdot.gov/txdotmanuals/tri/images/FHWA_Classification_Chart_FINAL.png

APPENDIX A: GEORGIA COUNTIES AND FIPS IDENTIFICATION NUMBERS

Table A-1 Georgia Counties and FIPS Identification Numbers

County	Code	County	Code	County	Code	County	Code
APPLING	001	CHARLTON	049	DOUGHERTY	095	HANCOCK	141
ATKINSON	003	CHATHAM	051	DOUGLAS	097	HARALSON	143
BACON	005	CHATTAHOOCHEE	053	EARLY	099	HARRIS	145
BAKER	007	CHATTOOGA	055	ECHOLS	101	HART	147
BALDWIN	009	CHEROKEE	057	EFFINGHAM	103	HEARD	149
BANKS	011	CLARKE	059	ELBERT	105	HENRY	151
BARROW	013	CLAY	061	EMANUEL	107	HOUSTON	153
BARTOW	015	CLAYTON	063	EVANS	109	IRWIN	155
BEN-HILL	017	CLINCH	065	FANNIN	111	JACKSON	157
BERRIEN	019	COBB	067	FAYETTE	113	JASPER	159
BIBB	021	COFFEE	069	FLOYD	115	JEFF-DAVIS	161
BLECKLEY	023	COLQUITT	071	FORSYTH	117	JEFFERSON	163
BRANTLEY	025	COLUMBIA	073	FRANKLIN	119	JENKINS	165
BROOKS	027	COOK	075	FULTON	121	JOHNSON	167
BRYAN	029	COWETA	077	GILMER	123	JONES	169
BULLOCH	031	CRAWFORD	079	GLASCOCK	125	LAMAR	171
BURKE	033	CRISP	081	GLYNN	127	LANIER	173
BUTTS	035	DADE	083	GORDON	129	LAURENS	175
CALHOUN	037	DAWSON	085	GRADY	131	LEE	177
CAMDEN	039	DECATUR	087	GREENE	133	LIBERTY	179
CANDLER[1]	043	DEKALB	089	GWINNETT	135	LINCOLN	181
CARROLL	045	DODGE	091	HABERSHAM	137	LONG	183
CATOOSA	047	DOOLY	093	HALL	139	LOWNDES	185

County	Code	County	Code	County	Code	County	Code
LUMPKIN	187	PAULDING	223	STEPHENS	257	UNION	291
MCDUFFIE	189	PEACH	225	STEWART	259	UPSON	293
MCINTOSH	191	PICKENS	227	SUMTER	261	WALKER	295
MACON	193	PIERCE	229	TALBOT	263	WALTON	297
MADISON	195	PIKE	231	TALIAFERRO	265	WARE	299
MARION	197	POLK	233	TATTNALL	267	WARREN	301
MERIWETHER	199	PULASKI	235	TAYLOR	269	WASHINGTON	303
MILLER	201	PUTNAM	237	TELFAIR	271	WAYNE	305
MITCHELL[1]	205	QUITMAN	239	TERRELL	273	WEBSTER	307
MONROE	207	RABUN	241	THOMAS	275	WHEELER	309
MONTGOMERY	209	RANDOLPH	243	TIFT	277	WHITE	311
MORGAN	211	RICHMOND	245	TOOMBS	279	WHITFIELD	313
MURRAY	213	ROCKDALE	247	TOWNS	281	WILCOX	315
MUSCOGEE	215	SCHLEY	249	TREUTLEN	283	WILKES	317
NEWTON	217	SCREVEN	251	TROUP	285	WILKINSON	319
OCONEE	219	SEMINOLE	253	TURNER	287	WORTH	321
OGLETHORPE	221	SPALDING	255	TWIGGS	289		

Note. Numbers 041 and 203 have been deliberately omitted.

APPENDIX B: FHWA 13-BIN VEHICLE CLASSIFICATION SCHEME

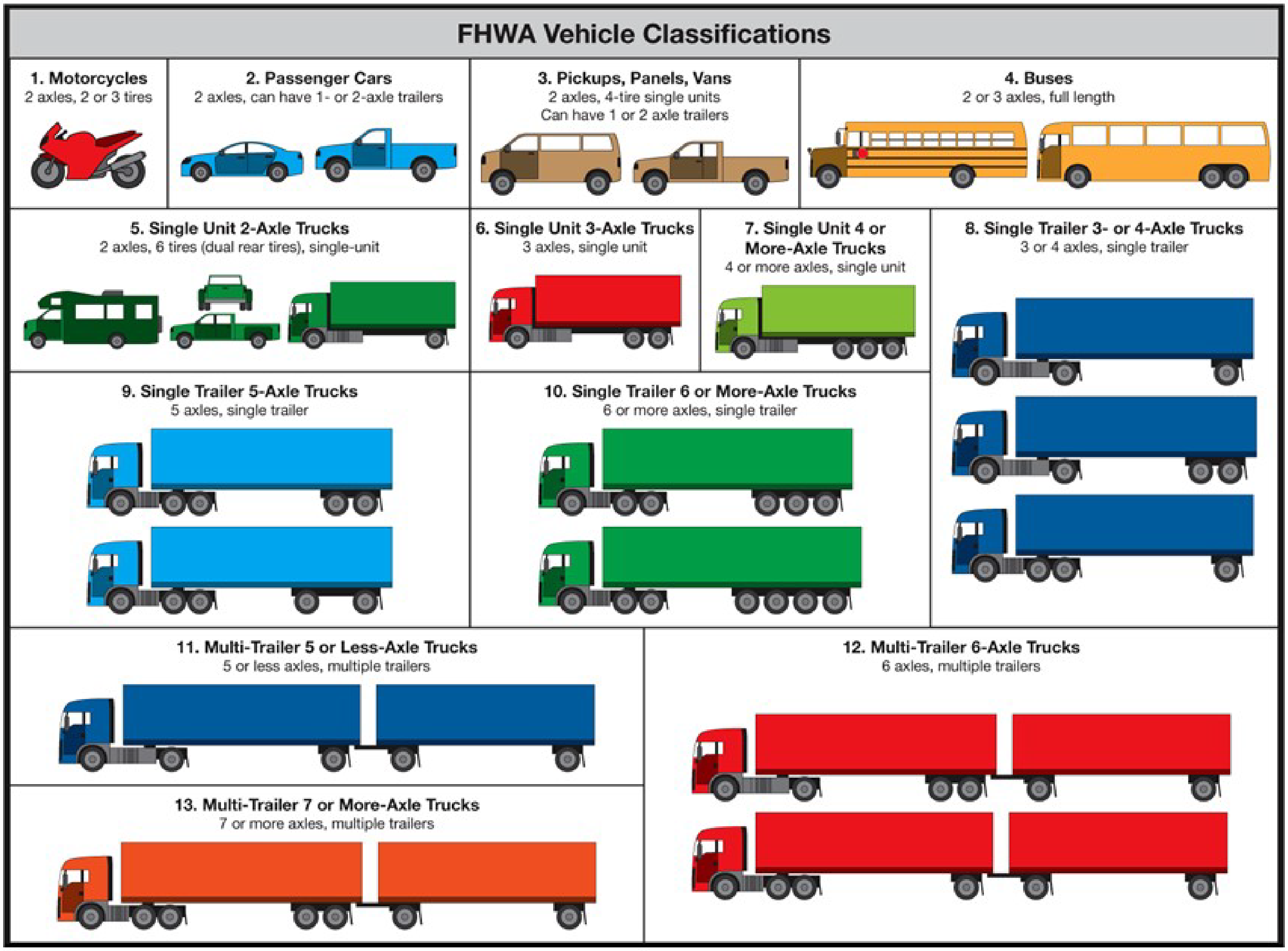

Figure B-1 FHWA 13-BIN VEHICLE CLASSIFICATION SCHEME (5)

APPENDIX C: CONTINUOUS WEIGH-IN-MOTION SITES

Table C-1 Continuous Weigh-In-Motion Sites

No.	Site ID	Location	Lanes
1	003-0132	US 82/SR 520, W of US 221/US 441	1, 3
2	015-0276A	I-75, N of SR 20, Bartow County	1, 2
3	015-0276B	I-75, N of SR 20, Bartow County	1, 2
4	021-W334A	I-75, between I-475 and SR 247 Pio Nono (Jennifer Overpass 6-PCC)	1
5	021-W334B	I-75, between I-475 and SR 247 Pio Nono (Jennifer Overpass 6-PCC)	1
6	021-0378	I-475, between I-75 and SR 22, S of SR 22	1, 2, 4, 5
7	039-0218A	I-95, N of Georgia/Florida State Line, Camden County	1, 2
8	039-0218B	I-95, N of Georgia/Florida State Line, Camden County	1, 2
9	047-0114A	I-75, between SR 146 and Georgia/Tennessee State Line	1, 2, 3
10	047-0114B	I-75, between SR 146 and Georgia/Tennessee State Line	1, 2, 3
11	051-0109	SR 21, N of I-95 and Rice Mill Rd.	1, 2, 3, 4
12	051-0169	Hutchinson Island	1
13	051-9827	Hutchinson Island - Ramp	1, 2
14	051-9828	Hutchinson Island - Ramp	1
15	051-0264	US 80/SR 26, E of I-95	1, 3
16	051-0368	I-16, 0.6-mile E of SR 307/Dean Forest Rd.	1, 2, 3, 4
17	051-0387A	I-95, N of SR 21 at Georgia/South Carolina State Line	1, 2
18	051-0387B	I-95, N of SR 21 at Georgia/South Carolina State Line	1, 2
19	051-0700A	SR 21AL/Jimmy Deloach Pkwy., N of Grange Rd.	1, 2
20	051-0700B	SR 21AL/Jimmy Deloach Pkwy., N of Grange Rd.	1, 2
21	051-1113	Grange Rd, W of Jimmy Deloach Pkwy.	1, 2
22	081-0347	SR 300, W of I-75 and US 41/SR 7	1, 3
23	083-0194	I-59, S of SR 136 (MP 8)	1, 2, 3, 4
24	083-0214	I-24, between Georgia/Tennessee State Line and SR 299	1, 2, 3, 4

25	087-0103	US 27/SR 1, S of US 27BU/SR 1BU	1, 2, 3, 4
26	087-0125	US 27/SR 1, N of SR 253, Decatur County	1, 3
27	103-0159	US 80/SR 26, W of SR 17, Effingham County	1, 2
28	115-0052	SR 20, W of SR 100 at Georgia/Alabama State Line	1, 2
29	127-0312A	I-95, N of US 25/SR 27	1, 2
30	127-0312B	I-95, N of US 25/SR 27	2
31	143-0126	I-20, between Georgia/Alabama State Line and SR 100	1, 3
32	145-0234	I-85, at Georgia/Alabama State Line, Harris County	1, 2, 3, 4
33	147-0287	I-85, between Hart/Franklin County Line and SR 77/Whitworth Rd.	1, 2, 3, 4
34	161-0189	US 23/SR 19, W of US 221/SR 135, Jeff Davis County	1, 3
35	175-0247	I-16, E of SR 338	1, 3
36	185-0227A	I-75, at Georgia/Florida State Line, Lowndes County	1
37	185-0227B	I-75, at Georgia/Florida State Line, Lowndes County	1
38	199-0312	I-85, at Sewell Rd. Bridge, Meriweather County	1, 2, 3, 4
39	217-0218A	I-20, 1 mile W of Social Circle Exit	1
40	217-0218B	I-20, 1 mile W of Social Circle Exit	1
41	235-0138	US 129ALT/SR 26, S of SR 257	1, 2
42	245-0214A	I-20, between Columbia/Richmond County Line and I-520/SR 415	1, 2, 3
43	245-0214B	I-20, between Columbia/Richmond County Line and I-520/SR 415	1, 2, 3
44	245-0218A	I-20, between SR 104 railroad and Georgia/South Carolina State Line	1
45	245-0218B	I-20, at Georgia/South Carolina State Line	1, 2, 3, 4
46	283-0201	I-16 E, 1.1-mile E of SR 15, Exit 5	4
47	285-0243A	I-185, N of SR 18, Troup County	1
48	285-0243B	I-185, N of SR 18, Troup County	1

Note. CR=County Road, N/S/E/W = North/South/East/West, MP=Milepoint, PCC=Portland Cement Concrete, SR=State Route, US=United States (US) Route.

APPENDIX D: TRAFFIC CALCULATIONS

Table D-1 Traffic Calculations

Description	Equation
Continuous Count Station AADT	Sum of Total Yearly Traffic Volume/ Total Number of Operational Days
Axle Factors	Total Vehicle Volume / (Total Axle Strikes/ 2)
D or Directional Distribution Factor	Predominate Direction of Peak Hour Volume/ Total Peak Hour Volume
Daily Factors	AADT/ Average Daily Traffic
Daily Vehicle Miles Traveled (DVMT)	Section Length (in miles) * AADT
K or Design Hour Factor	30th Highest Hour/ AADT
Monthly Factors	AADT/ Monthly Average Daily Traffic
Portable AADT (Classification)	24-hour Short-Term Volume * Daily Factor * Monthly Factor
Portable AADT (Volume Only)	24-hour Short-Term Volume * Daily Factor * Monthly Factor * Axle Factor
Truck Percentages	(Sum of Vehicles in Classes 4-13/Total Sum of Vehicles) * 100
Vehicle Miles Traveled	AADT * Section Length (in miles) * No. of Days in a Year

1. This is intended to be a basic list of equations. It should be noted that additional steps, such as summation or averaging, may be necessary before an equation listed above can be applied to the data.
2. Data not accepted based upon the established QC rules is omitted from any calculation.