State Traffic Monitoring Standards

Prepared for

New Mexico Department of Transportation

NMDOT

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Introduction

Purpose

The New Mexico State Traffic Monitoring Standards (NMSTMS) document provides comprehensive guidance that complies with federal regulation 23 CFR (Code of Federal Regulation) 500 Subpart B and the needs of the New Mexico Department of Transportation (NMDOT) Data Management Bureau Traffic Monitoring Program.

Federal regulations 23 CFR 500.202 states, *"Traffic monitoring system (TMS)* means a systematic process for the collection, analysis, summary, and retention of highway and transit related person and vehicular traffic data." Federal regulations 23 CFR 500.203 mandates, "Each state shall develop, establish, and implement, on a continuing basis, a TMS to be used for obtaining highway traffic data…" This document is intended to record the current procedures and practices of the Department's Data Management Bureau's Traffic Monitoring Program.

These Standards were first implemented on October 1st, 1988, and are continuously reviewed and refined on a three-year basis, or as deemed necessary, by the Traffic Monitoring Standards Review Committee.

Standards review meetings are convened on a three-year basis or as deemed necessary. Transportation planners, engineers, analysts, and other interested participants from various public and private organizations take part in the review. Participating organizations include the NMDOT, Metropolitan Planning Organizations (MPOs), Regional Transportation Planning Organizations (RTPOs), Tribal/Local Public Agencies, Consulting Engineering and Planning firms, and Computer Software Development firms. The recommendations from the review meetings are evaluated and finalized as standard practice by the NMDOT in cooperation with the Federal Highway Administration (FHWA).

MPOs, RTPOs, and county and municipal agencies programmed to receive state or federal funding are required to conduct Traffic Monitoring in compliance with the NMSTMS to use these funding sources.

It is the responsibility of the NMDOT, in conjunction with the FHWA, to provide the necessary resources to fulfill all requirements of the NMSTMS as approved.

For additional information, please refer to the contacts and links listed on the NMDOT Traffic Monitoring Program webpage.

Standards Review Procedures

Traffic monitoring conducted by any public or private entities required to satisfy these standards will comply with the current NMSTMS. These standards address traffic monitoring conducted for public purposes, to be submitted to a public agency, and to be presented in a proposal for state or federal funding.

The national traffic monitoring standards will be referred to by the state of New Mexico if the national standards address issues which are not covered by the NMSTMS. These include standards adopted by the American Association of State Highway and Transportation Officials (AASHTO) and the American Society for Testing and Materials (ASTM), as well as 23 CFR 500 Subpart B TMS/H requirements, Traffic Monitoring Guide (TMG), and the most current version of the Highway Performance Monitoring System (HPMS) Field Manual. Resolution of conflicts between state and national standards will be made by the New Mexico State Traffic Monitoring Review Committee upon review of the national standards or at the request of the NMDOT.

The NMSTMS will be reviewed on a three-year basis or as deemed necessary. Participation in the review will be open to all New Mexico traffic monitoring professionals in the public and private sectors. NMDOT will notify FHWA of any revisions to the standards. The standards review will be hosted, scheduled, and chaired by the NMDOT. The NMDOT will provide a recorder who is responsible for taking and maintaining meeting minutes, which will guide the NMDOT in finalizing revisions to the Standards.

Exceptions to the NMSTMS may be approved during any year by the NMDOT with the concurrence of the FHWA. Exceptions may only be based on conditions not specifically considered during the standards review process and not covered by the NMSTMS or otherwise prohibited. The requester must document all requests with justification for either an exemption or an exception to the standards. If an exception is approved, it must follow the "Truth in Data for Traffic Monitoring" principle (see ASTM Standard E2759). All data transmissions must indicate that they are based on an exception, and documentation of the exception must be shared with all parties involved in the standards review process. The exception must be specifically acted upon during the following standards review. If the exception is not supported during the standards review, the exception may not be used.

The most current edition of the TMG, the AASHTO, or ASTM Guideline should be used for any standard, definition, or calculation not specifically included in the NMSTMS. The most recent version of the Transportation Research Board's Highway Capacity Manual should be used for any road or intersection capacity standard, definition, or calculation not specifically expressed in the AASHTO, ASTM, or NMSTMS.

References:

Federal Highway Administration (FHWA)

FHWA's Traffic Monitoring Guide

FHWA's Highway Performance Monitoring System Field Manual, Associated Errata Sheets

AASHTO Guidelines for Traffic Data Programs

National Cooperative Highway Research Program (NCHRP) Report 797

Traffic Monitoring Truth In Data

The following section is paraphrased from ASTM standard E2759.

"Truth in Data for Traffic Monitoring" (Truth in Data) describes how traffic data is handled and accurately reported. The purpose of Truth in Data is to ensure that all data is collected and stored with integrity. In short, Truth in Data states that:

- Any data collected for or by the traffic monitoring program should be unmodified and reported unaltered.
- Any assumptions or adjustment factors should be disclosed.
- All processes and procedures used in any calculations associated with the collected traffic data should be disclosed.
- All summary statistics should be easily recalculated by all users.

Truth in Data practices ensure that all traffic data is accurate, accessible, and can be correctly interpreted. Truth in Data shall be practiced by all entities involved in the traffic monitoring program or using the NMSTMS.

NMDOT Truth In Data Requirements

To comply with Truth in Data standards, as quoted in the previous section, the following requirements are shown below, specific to the NMTMS:

- Precision levels for all data shall conform to HPMS reporting guidelines.
- Missing or inaccurate raw traffic data may not be completed, filled in, or replaced for any type of traffic count at any location under any circumstance. All raw data will be transmitted to the NMDOT Traffic Monitoring Program.
- Annual traffic volume summary statistics presented or reported by the NMDOT, MPOs, RTPOs, county and municipal governmental agencies, and private consulting engineering and planning firms must include a 15-minute interval. It must be one of the three standard units of annual traffic volume measurement:
    - Annual Average Daily Traffic (AADT),
    - Annual Average Weekday Traffic (AAWDT), or
    - Annual Average Weekend Traffic (AAWET)

    More details on AADT, AAWDT, and AAWET are in this document's Traffic Data Summarization section.

    Traffic summary statistics defined by the NMSTMS and presented or recorded for other periods, such as monthly average days of the week, will be clearly labeled. Unadjusted raw traffic count data to which the NMSTMS applies must be counted in compliance with the Standards and have the notation: "Unadjusted Count Data, Not for Use as Standard Traffic Volume Summary."

Traffic Monitoring Program

The NMDOT Traffic Monitoring Program supports agencies and municipalities in assessing past roadway performance, predicting future performance, and supporting business development. The following presents guidelines and requirements for managing and maintaining an effective traffic monitoring program. Subsequent sections include guidelines and requirements on traffic monitoring hardware and software, traffic flow maps, traffic monitoring training, count cycles, and local routes.

Schedule

A summary of important "no later than" deadlines is as follows:

December 1st	MPO/RTPO/ Tribal/Local Public Agencies request classification count priority meeting with NMDOT, if desired, via email/ phone/ letter addressed to the head of the Data Management Bureau. NMDOT will share their required list of counts. NMDOT will provide the required HPMS counts by December 1st.
December 31st	Agencies provide the upcoming year's traffic count schedule to NMDOT. NMDOT shall review and provide feedback within one week of receipt.
May 1st	MPO/RTPO/ Tribal/Local Public Agencies provide draft traffic flow maps to the NMDOT
June 1st	NMDOT returns traffic flow map comments to MPO/RTPO/ Tribal/Local Public Agencies
September 1st	MPO/RTPO/ Tribal/Local Public Agencies provide final traffic flow maps to the NMDOT

The above dates are to be treated as "no later than" deadlines. It is understood that agencies may have earlier deadlines than above and can submit/request/finish the above items prior to the dates listed. HPMS counts are required to be collected within the following year. Agencies may submit any additional counts.

Traffic Monitoring Hardware and Software

The devices used to monitor traffic shall accurately represent existing traffic. In addition to device type, model accuracy, and precision documentation, an operation and maintenance record will be maintained for each individual device by the device owner.

The NMDOT's Traffic Count Data System (TCDS) will handle and integrate all traffic data described in the NMSTMS, as well as electronically transmitted traffic data from other governmental agencies and private engineering consulting firms, based on a standard format identified by the department. The software will automatically produce all tables and statistics for the annual state HPMS Submittal.

Traffic Flow Maps

All traffic flow maps published by the NMDOT, MPOs, RTPOs, and other public and private organizations intended for distribution to the public or any other public or private entity shall indicate which data complies with the NMSTMS and which data does not (non-standard data).

Traffic Flow Maps containing non-standard data shall provide a legend distinguishing standard and non-standard data, along with the following statement: *"NMDOT recommends that non-standard data be used with caution."*

All entities, e.g., MPOs/RTPOs/Municipalities, that wish to publish a traffic flow map will provide a preliminary draft to the NMDOT by May 1st of each year. Comments and suggestions from the NMDOT will be returned to the entity by June 1st of each year, with final copies prepared by September 1st.

As defined by planning documents & maps, urban areas will use Annual Average Weekday Traffic (AAWDT) as the Traffic Flow Map summary statistic or as recommended in the TMG.

Rural areas, which are those areas outside of urban areas as defined above, will use AADT as the Traffic Flow Map summary statistic. In some cases, Traffic Flow Maps may be generated for rural areas using AAWDT as the Traffic Flow Map summary statistic. This exception will be reserved for those rural areas adjacent to or heavily influenced by urban traffic flows.

Highway Performance Monitoring System (HPMS) Count Cycles and Local Routes

Minimum three-year count cycle – NMDOT's traffic monitoring program shall cover all National Highway System (NHS) and Principal Arterial System (PAS) roadway sections (i.e., Interstates, Other Freeways, and Expressways, and Other Principal Arterials - functional classifications 1, 2 and 3) on a three-year cycle or better; at least one-third of these roadway sections should be counted each year. The remaining two-thirds counts must be estimated based on a documented process in accordance with the TMG and the HPMS Field Manual. NMDOT's program shall cover all roads on these systems, not just State-owned roads, so data provided by MPOs, cities, or counties shall be included in the count cycle.

Minimum six-year count cycle – NMDOT's traffic monitoring program shall also have a traffic count program on a six-year cycle or better for all non-NHS lower functional roadway sections (i.e., minor arterials, major collectors, and urban minor collectors - functional classifications 4, 5, and urban 6). Traffic data for ramps are also collected on a six-year cycle or better.

Local routes (FHWA Class 7) and rural minor collectors (FHWA Class 6 and 7) shall be counted as part of the minimum 12-year count cycle unless stated otherwise in individual MPO Unified Planning Work Programs (UPWPs), which may require all counts to be conducted on a three-year count cycle.

Compliant coverage data will be considered as standard based on the respective functional system and required three (3) or six (6) year count cycle, inclusive of the calendar year in which data collection occurred, except in the following case:

> If capacity changes occur on any traffic section (defined as the addition of one or more through lanes or any lane reductions), any previous data collected on the unique traffic section will be considered non-standard and the traffic section must be recounted. Compliant data collected on the traffic section shall be considered as standard for the calendar year in which the capacity change was completed, provided the final lane(s) were open to traffic no less than six months prior to the end of the calendar year.

Procedures

Unique Traffic Sections & Traffic Monitoring Site Identification

Traffic Section identification shall be completed as a coordinated effort between State and MPO/RTPO/ Tribal/Local Public Agencies. The NMDOT shall develop and maintain traffic section IDs to meet HPMS submittal requirements. All unique traffic sections shall be placed into the All-Road Network of Linear Referenced Data (ARNOLD) by the NMDOT. Data submitted to NMDOT must use NMDOT-provided traffic section IDs.

NMDOT shall maintain a linear reference database of roadways accompanied by unique traffic section identifiers that shall be provided to MPO/RTPO/Tribal/Local Public Agencies by request through the NMDOT Traffic Monitoring Program.

Global Positioning System (GPS) site identification devices shall be used for traffic monitoring activity and must not exceed an error of 30 feet. The NM TCDS is designed to accept counts based on latitude and longitude, using the NAD83 UTM13N Zone coordinate system reported in decimal degrees. Therefore, all agencies shall submit all GPS and Geographic Information System (GIS) information in the NAD83 UTM13N Zone coordinate system and report coordinates in decimal degrees.

Traffic Sections Segmentation

To maintain an efficient traffic section and traffic count network, it is crucial that network segmentation be maintained effectively and that excess be eliminated. The TMG provides guidance that is acceptable to the NMDOT regarding traffic section segmentation. Section 3.4.3 of the TMG encourages highway agencies to examine existing traffic volume information to determine how best to segment their roadway systems to optimize the number and spacing of short-term counts." The NMDOT shall periodically evaluate the segmentation of the roadway network according to TMG section 3.4.3.

The division and combination of traffic segments shall be performed according to the criteria set forth in TMG section 3.4.3; TMG table 3-15 is reproduced below to detail segment combination and division criteria, included here:

Table 1: TMG 2022 (Table 3-15) Estimating Spacing of Short-Duration Counts

Beginning Segment AADT	Adjoining Segment AADT Within
100,000 or more	+/- 10%
50,000 – 99,999	+/- 20%
10,000 – 49,999	+/- 30%
5,000 – 9,999	+/- 40%
1,000 – 4,999	+/- 50%
500 - 999	+/- 60%
250 - 499	+/- 80%
Less than 250	+/- 100 or 250 vehicles (whichever is greater)

New Traffic Sections & Count Locations

New traffic sections for any type of roadway may be created to improve available traffic count data where new roads are constructed, or traffic patterns change as per the provisions of the section "Unique Traffic Sections Segmentation." If a new road is constructed or a roadway meets the requirements outlined in the section "Unique Traffic Sections," agencies may request the creation of a new traffic section, a combination of two sections, or a split of an existing section. Requests shall be submitted to the NMDOT Data Management Bureau for approval and integration.

Requests to combine or split traffic sections shall include the following information for each segment included in the request:

- Location ID: 1-6 digits, in conformance with FHWA regulations/guidance; must be unique to the Agency (Obtained from the NMDOT Data Management Bureau)
- County
- Community
- Functional Class
- Rural/Urban Designation
- Located On: (Description), i.e., "From JCT NM 53, NORTH TO SOUTHSIDE RAMP OF I-40 IN GALLUP."
- Directions: NMDOT uses POS/NEG
    - For roadways that do not have assigned mileposts, the positive direction shall be assigned to the north and east directions, and the negative direction shall be assigned to the south and west directions.
- Factor Group: required to calculate AADT
- Latitude/longitude: required in decimal form for location on the Traffic Count Database System map.
- Reason for combination or split of each segment involved.
- Supporting count data for each segment (if applicable).

New Traffic IDs shall be obtained from the NMDOT Data Management Bureau. Requests for new segments shall be made directly to the Data Management Bureau. The following information, taken from Appendix A, shall be provided when making a request:

- Nearby traffic segments Location IDs.
- County
- Community
- Proposed Functional Class
- Proposed Rural/Urban Designation
- General description of the new location, i.e., "From JCT NM 53, NORTH TO SOUTHSIDE RAMP OF I-40 IN GALLUP" (Can be modified by the NMDOT)
- Reason for the creation of a new traffic section and any supporting data/information

Traffic Summary Statistics Reporting

Traffic summary statistics are to be reported by NMDOT and all other agencies & private firms by unique traffic sections, which have homogeneous traffic characteristics by unique intersection identification. Location identification for each report will be based on the NMDOT's Roadway Inventory System and modified by the NMDOT Traffic Monitoring Program to conform with the NMDOT's roadway inventory. Roadway Inventory System identification is based on Traffic Section ID, which includes:

- Route number,
- Direction,
- Cumulative mile point,
- Link,
- Termini,
- County,
- Community,
- Functional Class,
- Rural/Urban Designation,
- Location Description,
- Directions,
- Factor Group, and
- Latitude/Longitude.

Refinement of Traffic Factor Groups

Traffic factor groups shall be reviewed a minimum of every three years. The review will be in accordance with the federal guidelines related to the factor groups. The NMDOT will conduct the review of factor groups for all roads, excluding the non-interstate roads within the Urban Area Boundaries of areas with populations of 50,000 or more. The NMDOT shall be responsible for the distribution of traffic factor groups when requested by an MPO/RTPO/Municipality.

Traffic Data Analysis

Traffic Data Summarization

The three standard units of traffic volume measurement and summarization are as follows:

- Annual Average Daily Traffic (AADT), which represents traffic over a seven-day week;
- Annual Average Weekday Traffic (AAWDT), which represents traffic over the typical workday period, Monday 00:00 through Friday 24:00 (coverage counts), Monday 00:00 through Thursday 24:00 (Continuous Count Stations); and
- Annual Average Weekend Traffic (AAWET), which represents traffic over the weekend period, Saturday, 00:00 through Sunday, 24:00.

Where:

00:00 = Midnight to 12:15 A.M (Fifteen Minute Interval).

Traffic volume summary statistics for data collected by permanent traffic recording devices are as follows:

- *MADW* = Monthly Average Day of the Week = the sum of all daily volumes for each day of the week, Sunday through Saturday, over the course of a month divided by the number of days of standard-compliant data for that day during the month. This will produce an average for each day of the week for that month.
- *AADW* = Annual Average Day of the Week = the sum of MADWs for a year, for each day of the week, Sunday through Saturday/12. This will produce an annual average for each day of the week.
- *MADT* = sum of MADWs/7; AADT = sum of MADTs/12
- *MAWDT* = sum of MADT for Monday through Friday/5
- *AAWDT* = sum of MAWDTs/12
- *MAWET* = sum of MADWs for Saturday through Sunday/2; AAWET = sum of MAWETs/12
- *MTR* = the monthly traffic ratio = average traffic volume/annual average traffic volume. This ratio may be calculated for each of the volume summary statistics. The sum of the MTRs taken over the twelve months divided by 12 equals 1.00
- *MAF* = the monthly adjustment factor = 1/MTR = the adjustment factor for a given month, which will convert monthly data to annual average data

Monthly Traffic Adjustment Factors and Monthly Traffic Ratios for a factor group are calculated by NMDOT using data from the Continuous Count Stations (CCSs) within that factor group for a given count year.

The agency with jurisdiction may elect to use CCS data from additional factor groups, if necessary, due to insufficient data based on professional judgment. The requirements for included devices are:

For MADW, a minimum of 2 occurrences of each day of the week is required.
For AADW, all 12 MADWs
For MADT, all 7 MADWs
For MAWDT, all 5 MADWs
For MAWET, all 2 MADWs
For AADT, all 12 MADTs
For AAWDT, all 12 MAWDTs
For AAWET, all 12 MAWETs

The process for developing factors is as follows:

Step 1. NMDOT provides the MPO/RTPO/ Tribal/Local Public Agencies with monthly permanent counter (CCS) summary data (MAWDT) and Annual Loop Correction Factors (LCF) for all locations in the jurisdiction for the previous three years.

Step 2. The MPO/RTPO/ Tribal/Local Public Agencies will review the NMDOT-provided data and may elect to develop their own factor groups based on geographic area, local knowledge of land use, community character, travel patterns, and statistical analysis of short-term count data, etc. In this manner, the MPO/RTPO/Municipalities may develop their own Monthly Adjustment Factors (MAFs), Annual Growth Factors (AGFs), and LCFs.

Step 3. The draft factors and factor groups developed by the MPO/RTPO/ Tribal/Local Public Agencies will be reviewed by the NMDOT for final approval. Factors must be for the current year.

If a CCS is excluded from the computation of mean traffic characteristics by factor groups per the guidelines set forth above in this section, the available data will be used for all site-specific traffic volume summary statistics.

The default factor groups defined by the functional classification system of roads used in traffic monitoring, including monthly and annual traffic statistics summarized by the functional classification system, are as follows, with each having a rural/urban designation:

Table 2: 2022 Traffic Monitoring Guide Table 4-6 Functional Classification Codes

Code	Functional System Classifications
1	Interstate
2	Principal Arterial - Other Freeways and Expressways
3	Principal Arterials - Other
4	Minor Arterial
5	Major Collector
6	Minor Collector
7	Local

All agencies involved in the NMDOT traffic count program shall submit data and related roadway segment information to the NMDOT using the functional classification codes defined in the TMG and reproduced in the above table. The NMDOT factor groups, which are defined using the functional classification, are based on the functional classification in the TMG. Descriptions of the functional classifications can be found online at (https://www.fhwa.dot.gov/policy/ohpi/hpms/fchguidance.cfm). (Note: Functional classes may change by future HPMS revisions.)

The mean CCS annual traffic volume growth rate by factor groups, which are grouped by functional classification, will be used as the default annual growth rate for non-count traffic sections in the same factor groups, which are grouped by functional classification. CCSs, within a factor group, which are grouped by functional system and which have not been online for a minimum of three years, will not be used in computing growth rates. However, said CCSs may be used for computing other factors.

Automatic Traffic Recorders (ATRs) and Weigh in Motion (WIM) devices are CCSs or portable devices used to collect traffic volume and classification data. All data will be collected based on the FHWA-specified vehicle classifications. Classification data will be summarized similarly to the traffic volume summary statistics. Data will be summarized for each day, typical days of the week will be summarized by month, and monthly typical days of the week will be summarized for the annual traffic statistics. For a given site, there will be typical daily vehicle classification based on a seven-day week, the work week, and the weekend. The NMDOT Traffic Monitoring Program will prepare monthly and annual vehicle classification reports.

The variability of vehicle classifications by factor groups, which are grouped by the functional system of the roadway, will be reviewed. The review will determine if vehicle classification data may be grouped. If a grouping of data is indicated, Monthly Classification Ratios (MCRs) will be calculated and used similarly to Monthly Traffic Ratios (MTR) for adjusting coverage and project-related, special count activities.

MPOs may develop their own growth factors and loop correction factors based on historical short-term count data by factor group. The method and resulting factors MUST BE SUBMITTED to NMDOT for approval. NMDOT will review and approve/reject the methodologies and resulting factors within two weeks of receipt. NMDOT approval must be obtained in writing before the new growth factors may be used.

Weight data by vehicle classification will be summarized as per FHWA TMG. The NMDOT Traffic Monitoring Program will prepare monthly and annual reports.

The data from Automatic Weight and Classification System devices will be used to compute Monthly Weight Ratios (MWRs). MWRs will initially be standardized as unique significance only at the site at which they are collected. The weight data will be reviewed to determine if weight data can be grouped among sites. The analysis will include vehicle classification weight by factor groups, which are grouped by functional classification of road, seasonal variation, and region of the state.

Coverage and project-related special counts will be adjusted for seasonal variation using monthly adjustment factors.

Coverage and special traffic volume counts will be adjusted for multiple-axle vehicles by a loop correction factor. If a vehicle classification count was taken in the current year, the site-specific vehicle classification-based loop correction factor should be used to adjust recorded axle impulses to vehicles. Loop correction

factors for traffic sections on which vehicle classification counts were not taken in the current year shall be derived by the NMDOT.

Monthly adjustment factors will be derived from standard data by factor groups.

Vehicle classification-based seasonal loop correction factors will be derived by CCS and short-term counts. The current year average by factor groups, which are grouped by functional classification, will be used as the adjustment factors.

Vehicle Miles Traveled

Daily Vehicle Miles Traveled (DVMT) will be calculated for each traffic section by multiplying the length of each unique traffic section by Annual Average Daily Traffic.

Annual Vehicle Miles Traveled (AVMT) will be calculated for each traffic section by multiplying the DVMT by 365.

Traffic Monitoring Period

All counts taken in an urban area will have a data summarization period of 15-minute intervals. An urban area is defined as any community with a population of 50,000 persons or more.

All counts taken in a rural area will have a data summarization period of 15-minute intervals. All roads in areas of the state in which there is not a population of 50,000 persons or more are rural roads.

There will be a minimum of 48 whole consecutive hours of data collected by direction reported from each coverage and special count site. This standard will apply for volume, classification, and weight, including screen line or cordon counts and site-specific counts requested by the New Mexico State Legislature.

Section 3.6 of the TMG recommends that State highway agencies collect at least 25 to 30 percent of their entire short-duration count program with vehicle classification counting equipment. Agencies that can exceed this figure are encouraged to do so. When NMDOT provides funding for conducting short-duration counts, 30 percent of the short-duration counts shall be conducted using vehicle classification counting equipment. These counts shall be conducted for a minimum of 48 whole hours. They shall be adjusted and documented in compliance with the NMSTMS. An agency may request a meeting to determine a specific breakdown of vehicle classification counts per roadway functional classification. This meeting request may be made on or after January 1st of the calendar year.

All short-duration counts using funding provided by NMDOT collecting vehicle classification shall also collect speed data. There will be 24 CCS (48 whole short-term) consecutive hours of data collected for one direction for each speed coverage and special count site.

Interchange ramps and ramp-freeway junctions will be monitored by volume and vehicle classification procedures identified for coverage and special, project-related counts for traffic sections. Interchange ramp/street junctions will be monitored by traffic monitoring procedures identified for intersections. Interchange traffic monitoring includes analysis of traffic on the contiguous upstream and downstream Interstate unique traffic sections. If traffic counts were taken on the contiguous Interstate traffic sections in the same or prior calendar year, no additional count activity is required. If no traffic counts were taken on the contiguous upstream and downstream Interstate traffic sections, interchange traffic monitoring will include counts on the interstate traffic sections, except as provided within the "Ramp Balancing" section for ramp balancing. The interstate traffic section counts will be 48 whole hour weekday counts, conducted in the same seasonal adjustment period as the Interchange ramp monitoring.

Multilane, divided, and interstate counts shall be collected for both directions within the same 48 whole hour period for the same Traffic Section ID or Traffic Segmentation.

Special count activities designed to monitor weekend traffic for identification of recreational route traffic characteristics require data collection for the entire weekend period (00:00 Saturday - 24:00 Sunday) and can be supplemented with a full 7-day count.

Traffic Report Period and Data Transmittal

The traffic-monitoring year will follow the calendar year, from January 1st through December 31st.

Refer to "Standards Review Procedures" for Formats and Websites. For FHWA—3 Card (Volume), FHWA - C Card (Classification), and FHWA - W Card (Weight) and other traffic monitoring formats, refer to TMG Chapter 4.

Upon agreement with the NMDOT, the MPOs/RTPOs may perform a year-end load of summary statistics rather than transmitting data periodically. Minimum prerequisites for such an agreement shall include:

1. MPOs/RTPOs must maintain the capability to transmit data to TMS.
2. MPOs/RTPOs must possess and maintain software which is capable of applying all applicable state standards to the raw data, generating and storing all appropriate summary statistics, and all required reports under the same time constraints as those that apply to the NMDOT.
3. The MPO/RTPO must store and maintain all raw data in its original form.
4. The year-end load shall be done electronically and in compliance with the time, data, and format requirements specified by the NMDOT.
5. The process must be tested and approved prior to implementation.
6. Upon request, the MPO/RTPO will be required to submit hard copies of reports to the NMDOT or other interested parties within seven (7) days of the request.
7. At the end of each calendar year, both the NMDOT and the MPO/RTPO will produce Vehicle Miles Traveled (VMT) data by factor groups, which are grouped by functional classification, representing data from the area covered by the year-end load. The acceptance requirements for this process shall be VMT data by factor groups, grouped by functional classification that are within plus or minus one percent. The official VMT report (VM-2) is provided by FHWA in the Highway Statistics Reporting for each respective year in Section 5 Highway Travel Report 5.4.1 Vehicle-Miles of travel, by functional classification, located in the Highway Statistics Report
8. The coverage count reports for standard-compliant data will be transmitted no later than one month after data acceptance by the Traffic Monitoring Program.

Metropolitan and Regional Planning Organizations, NMDOT Districts, county and municipal governmental agencies, and private consulting engineering firms will transmit raw traffic data to the Traffic Monitoring Program no later than one month after the data collection. Metropolitan and Regional Planning Organizations, NMDOT Districts, and County and Municipal agencies monitoring traffic on roads that either currently or are proposed for state or federal funding will transmit the raw data to the Traffic Monitoring Program for data evaluation, data processing, and report generation. The data will be transmitted no later than one month after data collection.

Metropolitan and Regional Planning Organizations, NMDOT Districts, and County and Municipal agencies monitoring traffic on roads neither currently nor proposed for state or federal funding shall transmit the

raw data, which is in a format compatible with NM TCDS, and to the Traffic Monitoring Program for data evaluation, data processing, and report generation.

Private consulting firms collecting New Mexico traffic data for a state or federally-funded transportation project or study will transmit the raw data (roadway & turning movement counts) to the Traffic Monitoring Program for data evaluation, data processing, and report generation. The data will be transmitted no later than one month after data collection. Data should conform to the NMSTMS.

Private consulting firms collecting New Mexico traffic data for a transportation project or study not funded by the state or federal government are strongly encouraged to transmit the raw data that is in a format compatible with NM TCDS.

Traffic summary reports within the area of MPOs/RTPOs and Municipalities processed by the Traffic Monitoring Program from data not collected by the MPOs/RTPOs/Municipalities will be transmitted to the MPO/RTPO/Municipality either electronically or in hard copy format as processing capability permits. The reports will be transmitted monthly. This will ensure that the MPOs/RTPOs/Municipalities have all standard traffic data summary statistics for their metropolitan area.

Interim analysis and reporting of traffic summary statistics from special counts will be provided to the county or municipal governmental agency or private firm collecting the data by the NMDOT.

Monthly traffic summary statistics from permanent traffic recording devices located within the area of MPOs/RTPOs and Municipalities will be transmitted to the MPOs/RTPOs/Municipalities monthly. During monthly NM TCDS data processing, the monthly traffic reports transmitted for state and federal use will also be transmitted to the MPO/RTPO/Municipality.

Final reporting and analysis for all counts within an MPO/RPO/Municipality area, accepted by the Traffic Monitoring Program, will be provided to the MPO/RPO/Municipality by the NMDOT. These reports will be transmitted no later than February 15th of each year.

Types of Counts

The following section details the types of traffic counts designated by this document. These types include:

- Permanent Counts
- Short Duration Counts
- Coverage and Special Counts
- Turning Movement Counts
- Non-Motorized Counts

Each count shall conform to the requirements of the Traffic Monitoring Guide unless otherwise stated. All counting devices shall perform at a 90% accuracy level.

Continuous Count Stations (CCS)

The purpose of a CCS device is to collect data each day of the year on a unique traffic section. CCS devices must be polled on a 24-hour basis to ensure data collection and device maintenance.

The NMDOT will be responsible for all CCS data collection and summarization, including those non-interstate CCS inside the Urban Area Boundaries of areas with populations of 50,000 or more.

MPOs/RTPOs and Municipalities may directly collect CCS data within the Urban Area Boundary of their individual areas. Polling times will be coordinated between the NMDOT, MPOs/RTPO, and Municipalities, including the operating times of system clocks on PCs.

On traffic sections that do not have full access control, the CCS must measure volume at a specific point crossing all lanes of travel. On traffic sections for which there is full access control, the CCS may measure volume at any point within the unique traffic sections but must include all lanes of travel.

For the application of the mean traffic volume summary statistics by factor groups, which are grouped by functional classification, there must be a minimum of five CCSs for each factor group. If the minimum requirements are not met for a particular factor group of functional classification, then mean traffic volume summary statistics for that factor group will be generated utilizing the CCSs of the factor group plus all permanent recorders from the next higher factor groups or, if necessary, from the next lower factor group.

When a CCS malfunctions, repairs shall commence within one week of the reported malfunction after site evaluation.

The number of CCSs included in the calculation of mean traffic summary statistics will be provided by factor groups as part of the annual Traffic Monitoring Program data processing and reporting.

The NMDOT will be responsible for annually summarizing all MTR data by factor group or group of factor groups for functional classification and by MPOs and Municipalities, both individually and as a group, and will provide mean statistics to all interested governmental agencies on or before February 15th of each year.

The CCS polling software must include verification of the microcomputer date and time.

If the clock on the CCS exceeds +/- 10 minutes of the verified counter clock, then all data for that day will be excluded from summarization and reporting.

If the clock on the CCS is less than +/- 10 minutes but greater than +/- 5 minutes on the verified computer clock, a warning will be issued, and the time will be adjusted on the field clock.

When the same-recorded traffic volume occurs at a CCS other than zero for four consecutive intervals, a warning message will be displayed, and the day's data will be reviewed for optional purge.

When eight hours of recorded successive zeros occur at a CCS, a warning message will be displayed, and the day's data will be reviewed for optional purge.

If the daily directional total volume at a CCS is within the range of 60% to 80% of the total traffic for that day, a data and device review message will be displayed.

If a daily directional total volume at a CCS exceeds 80% of the total traffic for that day, the data will not be included when computing site traffic summary statistics.

If the CCS records vehicle type information and the daily percentage of unidentified vehicles exceeds 10 percent of the total, the vehicle class information will be automatically purged from the summary file and may not be used under any circumstances to generate annual or monthly loop correction factors. Volume data for the day may be retained. If the daily percentage of unidentified vehicles exceeds 20 percent of the total, the day's data, including volume summaries, will be automatically purged, and a device error message will be displayed. If the unidentified percentage exceeds 20 percent for three consecutive days, the device will temporarily be set to record volume information only until the site can be evaluated, and repairs shall be made when necessary.

To derive representative MADW volumes, when the daily directional traffic volume for a given day of the week in a month exceeds two standard deviations from the mean previous year's same day of the week directional AADW, a data device review message will be displayed. If the daily directional traffic volume for a given day of the week in a month exceeds four standard deviations from the previous year's same day of the week directional AADW, it will be considered an outlier and stored in the NM TCDS. The mean volume will be recalculated, excluding the outlier.

For CCSs that are not directly accessible to the NMDOT Data Management Bureau, agencies shall submit "PRN" or equivalent type files that are acceptable to the NM TCDS to the NMDOT Data Management Bureau.

All files shall be properly formatted for entry into the NM TCDS. Appendix A details the formatting requirements specific to the NMDOT's system. Specific to the NMDOT, data headers shall conform as follows (taken from Appendix A):

- Location ID shall be contained in the first 12-character field of the header, padded with zeros as needed.
- Short duration counts must be numbered with 0001 for POS (Positive Direction) and 0002 for NEG (Negative Direction), even if the directions are captured in separate files. The positions of these numbers can be found in Appendix A.

- The start time between separate POS and NEG PRN files must match, even if the collection start time differs. Please use the counting device manufacturer's software to synchronize the start date and time.

Each new installation of a CCS must comply with NMDOT Special Provision 730. Special Provision 730 requires that the installed device be tested and meet an accuracy level of:

A. +/- 2% of the CCS traffic count comparison to a manual traffic volume count.

B. +/- 10% of the CCS traffic classification comparison to a manual traffic classification count.

C. For weight data collection, the device must be within +/- 5% of five known vehicle weight passes.

Special Provision 730 also requires that the Contractor responsible for the installation of the device be different than the agency/company/consultant that certifies the counter's accuracy.

Special Provision 730 is available from the Data Management Bureau.

Short Duration Counts

All traffic data for HPMS shall be based on a minimum of 48 whole hours of continuous monitoring for volume and vehicle classification, which is referred to as short-term monitoring.

Multilane, Divided, and Interstate Interchange ramps will be counted for a minimum of 48 whole hours, Monday 00:00 through Friday 13:00. All ramps within the same interchange will be counted within the same seasonal adjustment period. Any recounts submitted should be for the same seasonal adjustment period and the same days of the week, if possible.

Coverage and Special Counts

The NMDOT will provide counts for all annual full-extent coverage counts on a three (3) year, six (6) year or twelve (12) year count cycle based on functional classification, other than the roads within the boundaries, which represent an MPO's/RTPO's/Municipality's planning, and data collection jurisdiction as agreed upon by the MPO/RTPO/Municipalities and the NMDOT.

The requirements of "Short Duration Counts," as detailed above, shall apply to coverage and special counts.

Interstate mainline data may be combined with Interstate ramp data to produce an upstream or downstream volume under the following conditions:

1. The data for the two locations monitored are standard.
2. The same 48 whole hours of data are used.
3. The same interval is recorded.
4. The roadways, which access the controlled facility, allow travel in only one direction.
5. The process for adding the two files is electronic.

6. Data may only be produced for the mainline links immediately upstream or downstream from the point of access.

Ramp Balancing for Estimation of Interstate Mainline Volumes

The method of ramp balancing must be approved in writing by the NMDOT before the new technique can be used. The standardized technique, to provide the best reliable estimates, needs consistent, reliable data points. Intermediate ramp volumes would be factored to make them consistent with known upstream and downstream volumes.

An example of the procedures and calculations is provided in TMG section 5.2.2.

Publication of the resulting estimates would be allowed so long as the following conditions are met pertaining to the publication of non-standard data.

Vehicle classification coverage counts will be based on electronic vehicle classification. Currently utilized classification devices in New Mexico accurately record axle impulses but do not provide a consistent, accurate interpretation of axle impulses into the classification of vehicles when vehicle travel is not free-flowing. Classification by length may also be used.

The manual Urban traffic section counts, just as electronic vehicle classification counts, will be based on FHWA-specified vehicle classification.

The vehicle classification manual count activity will follow one of the two procedures designed to collect data manually when vehicle speeds prohibit the use of an electronic device.

1. Fixed Traffic Section Manual Count Period:

   Manual counts will be conducted within a given day from 07:00 to 10:00, 11:00 to 14:00, and 15:00 to 18:00. This provides three traffic monitoring periods during the day. Each period is a three-hour duration, which totals nine hours of data collection. Missing peak hour periods can be counted within seven days of the original count.

2. Flexible Traffic Section Manual Count Period:

   Manual counts will be conducted within a given day based on observed peak traffic conditions. The typical morning, noon, and evening peak hours will each be defined using 15-minute intervals rather than the clock hour. One hour before and one hour after the anticipated peak hour will be defined. This will result in three traffic-monitoring periods during the day. Each period is a three-hour duration, which totals nine hours of data collection. Missing peak hour periods can be counted within seven days of the original count.

Intersection Turning Movement Counts

All manual turning movement counts will classify vehicles into two categories. The first category will include all vehicles in the FHWA's vehicle classification Bin 1-3, and the second Bin will include all vehicles in classes 4-13, or three Bins consisting of 1-3, 4-7, and 8-13. If more precise vehicle classification data is needed for the intersection, then the turning movement counts will be supplemented by electronic or manual vehicle classification counts.

The period of intersection manual turning movement counts will follow one of two procedures:

1) Fixed Intersection Count Period:

   Manual counts will be conducted from 07:00 to 10:00, 11:00 to 14:00, and 15:00 to 18:00. This provides three traffic-monitoring periods over a period of twenty-four hours. Each period is a three-hour duration, which totals nine hours of data collection.

2) Flexible Intersection Count Period:

   Manual counts will be conducted based on observed peak traffic conditions from a standard 48 whole hour volume count conducted on the high-volume leg of the intersection within the same seasonal adjustment period. The typical morning, noon, and evening peak hours will each be defined using fifteen-minute intervals rather than the clock hour. At a minimum, one-half hour before and one-half hour after each anticipated peak hour will be defined. This will result in three traffic-monitoring periods over a period of twenty-four hours, each of a minimum of two hours duration, for a total of a minimum of six hours of data collection.

Turning movement count shall be submitted in digital format (CSV or XLS). Submittal of turning movement counts to the NMDOT shall include details regarding the date and periods of data collection along with a site diagram.

Non-Motorized Counts

Noteworthy practices for conducting Non-Motorized Counts are provided in NCHRP Report 797: Guidebook on Pedestrian and Bicycle Volume Data Collection and Appendix H of the TMG for Non-motorized Site Selection Methods for Continuous and Short-Term Volume Counting. Agencies should refer to these two resources when determining where and how to collect Non-Motorized Counts.

The NCHRP Report 797 provides guidance on pedestrian and bicycle volume data collection and serves as the state's recommendations for the following:

- methods and technologies for counting pedestrians and bicyclists;
- guidance on developing a Non-Motorized Count program;
- suggestions on selecting appropriate counting methods and technologies; and,
- examples of how organizations have used Non-Motorized Count data to better fulfill their missions.

The report also includes details on correction factors for accuracy, factors for expanding short-term counts to longer-term volume estimates, and factors for adjusting counts to reflect environmental conditions.

The TMG details two basic location types for Non-Motorized traffic monitoring as well as some guidance on micro-mobility counts.

The two basic location types defined in the TMG for Non-Motorized traffic monitoring are:

1. Screen line counts that are taken at a mid-segment location along a micro-mobility facility (e.g., sidewalk, bike lane, cycle track, shared-use path).
2. Intersection crossing counts are taken where a micro-mobility facility crosses another facility of interest.

FHWA has provided additional guidance in the form of examples due to some micro-mobility count locations being challenging to describe. These examples can be found in the report Coding Non-Motorized Station Location Information in the 2016 Traffic Monitoring Guide Format.

Additional guidance may be found in the following locations:

> Making Bikes Count, Effective Data Collection, Metrics, & Storytelling (NACTO, March 2022)
>
> Collecting Network-wide Bicycle and Pedestrian Data: A Guidebook for When and Where to Count (WA-RD 875.1, September 2017)

Weigh-in-Motion Counters (WIMs)

A Weigh-In-Motion (WIM) is a type of CCS that is also capable of collecting vehicle weight data. The purpose of a WIM is to collect weight data each day of the year on a unique traffic section. WIMs must be polled on a 24-hour basis to ensure data collection and device maintenance. All WIMs provide accurate vehicle weight data on a per-vehicle basis.

Appendix A: MS2 Data Requirements

TDMS Requirements: NMDOT PRN Headers

PRN formats must follow the MS2 guidelines outlined in the document: MS2 PRN File Format.pdf

NMDOT specific header requirements:

- Location ID must be in the first 12 character field of the header, padded with zeros as needed.

```
000000002631 000000000007 01 0959 082917 1130 083117 0015 02 1 100      205200
0000 0000 0000 0000 0000 0000 0000 0000 0000 2000000000000000
'E37      2631P 11DH1'QUAY                    '35.173128, -103.50687
02 15        0001 0002 0003 0004 0005 0006 0007 0008 0009 0010 0011 0012 0013 0014 0015
01 01        0001
00 00
00 01 2 1030 0000 0038 0012 0001 0001 0000 0000 0007 0014 0001 0002 0001 0001 0000 0000
00 01 2 1045 0001 0034 0016 0001 0000 0000 0000 0014 0014 0000 0001 0002 0000 0000 0000
00 01 2 1100 0003 0045 0015 0001 0002 0001 0000 0005 0011 0001 0000 0000 0001 0000 0000
00 01 2 1115 0002 0040 0010 0001 0002 0000 0000 0008 0013 0001 0000 0000 0002 0000 0000
```

- Short Count Stations must be numbered with 0001 for POS direction and 0002 for NEG direction, even if the directions are captured in separate files.

POS

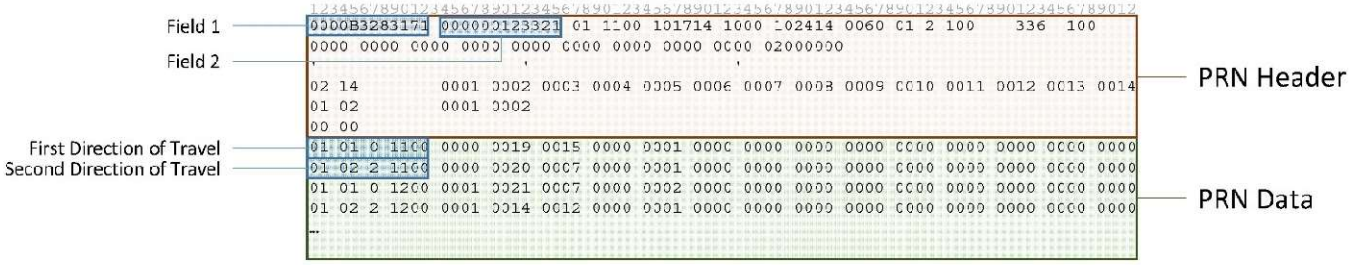
```
000000002631 000000000007 01 0959 082917 1130 083117 0015 02 1 100      205200
0000 0000 0000 0000 0000 0000 0000 0000 0000 2000000000000000
'E37      2631P 11DH1'QUAY                    '35.173128, -103.50687
02 15        0001 0002 0003 0004 0005 0006 0007 0008 0009 0010 0011 0012 0013 0014 0015
01 01        0001
00 00
00 01 2 1030 0000 0038 0012 0001 0001 0000 0000 0007 0014 0001 0002 0001 0001 0000 0000
00 01 2 1045 0001 0034 0016 0001 0000 0000 0000 0014 0014 0000 0001 0002 0000 0000 0000
00 01 2 1100 0003 0045 0015 0001 0002 0001 0000 0005 0011 0001 0000 0000 0001 0000 0000
00 01 2 1115 0002 0040 0010 0001 0002 0000 0000 0008 0013 0001 0000 0000 0002 0000 0000
```

NEG

```
000000002631 000000000008 01 1025 082917 1145 083117 0015 02 1 100      204200
0000 0000 0000 0000 0000 0000 0000 0000 0000 6000000000000000
'E37      2631M 01DH1'QUAY                    '35.173627, -103.50682
02 15        0001 0002 0003 0004 0005 0006 0007 0008 0009 0010 0011 0012 0013 0014 0015
01 01        0002
00 00
00 01 6 1030 0001 0009 0004 0000 0001 0000 0000 0000 0008 0000 0002 0000 0000 0000 0000
00 01 6 1045 0001 0023 0016 0001 0003 0000 0000 0008 0040 0000 0002 0002 0001 0000 0000
00 01 6 1100 0001 0030 0011 0002 0003 0000 0000 0006 0035 0002 0001 0001 0003 0000 0000
00 01 6 1115 0002 0024 0010 0001 0001 0001 0000 0012 0045 0000 0002 0000 0001 0000 0000
```

- Start times between separate POS and NEG PRN files must match, even if the collection start time differs. Please use the manufacturer's software to synchronize start date and time.

MS2 PRN File Format Descriptions



Field 1 Format:

12-character field:

Characters 1-8 = Zero-Filled Station ID.
Character 9 - First Direction of Travel Code
Character 10 = Number of lanes in First direction of travel
Character 11 = Second Direction of Travel Code
Character 12 = Number of lanes in Second direction of travel

Direction of Travel Codes:
0 = 2-Way
1 = NB
2 = NE
3 = EB
4 = SE
5 = SB
6 = SW
7 = WB
8 = NW

Special Cases:
1.Combined directions (2-Way): chars 9-12 should be set to 0.

2.Directional file (NB,SB or EB,WB etc.): chars 10, 12 should be set to 0. Chars 9, 11 should contain the correct Direction of Travel Code.

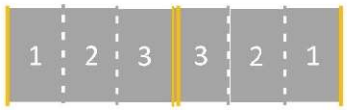
3.By lanes file: chars 10, 12 should be set to be the number of lanes for the corresponding direction. Chars 9, 11 should contain the correct Direction of Travel Code.

Field 2 Format:

12-character field:

Characters 1-6 = 0 Filled.
Characters 7-12 = 6-digit Lane Configuration Code
(Only required if more than 1 lane of data is included in the file in either direction)

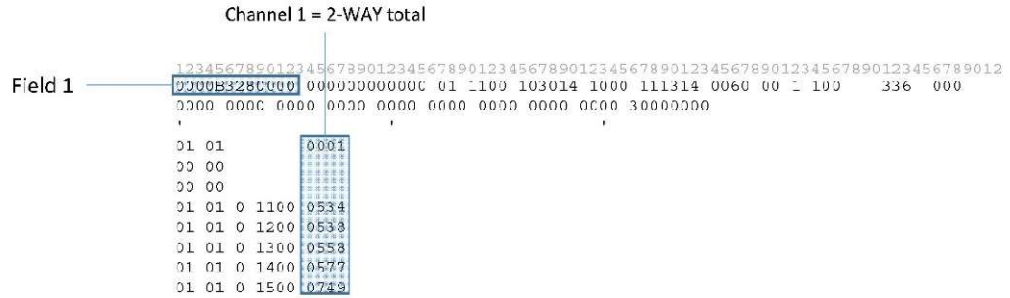
Lane Configuration Codes:
123321 = Curb Lanes at beginning and end
123123 = Curb Lanes at beginning and beginning
321321 = Curb Lanes at end and end
321123 = Curb Lanes at end and beginning



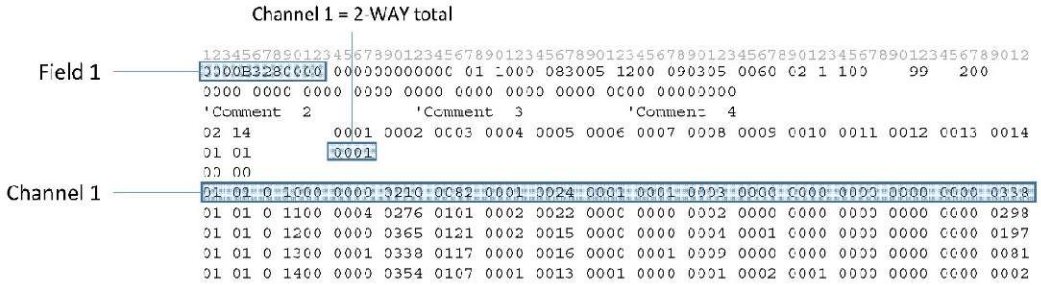
2-WAY PRN Example

Station ID = B328
2-WAY total only

Volume



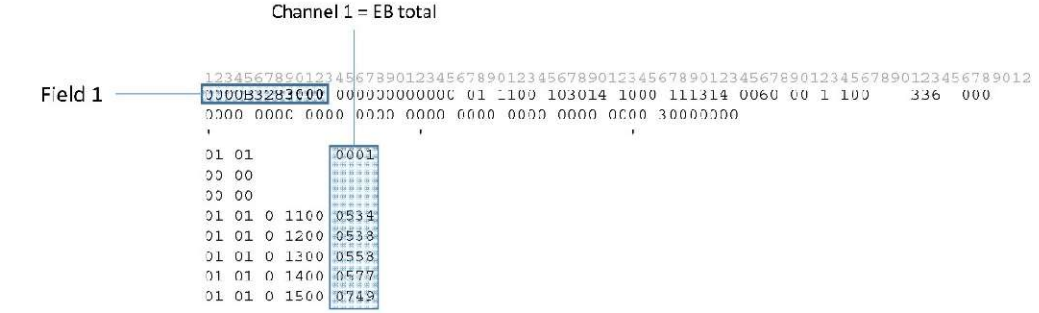
Class



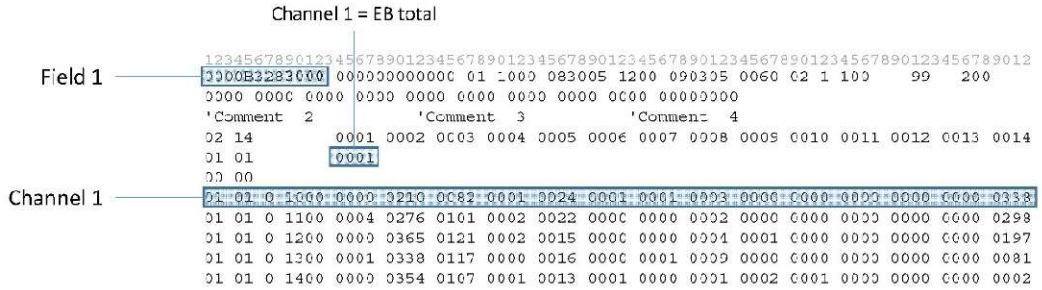
1 Direction PRN Example (Lanes Combined)

Station ID = B328
First Direction of Travel = Eastbound

Volume



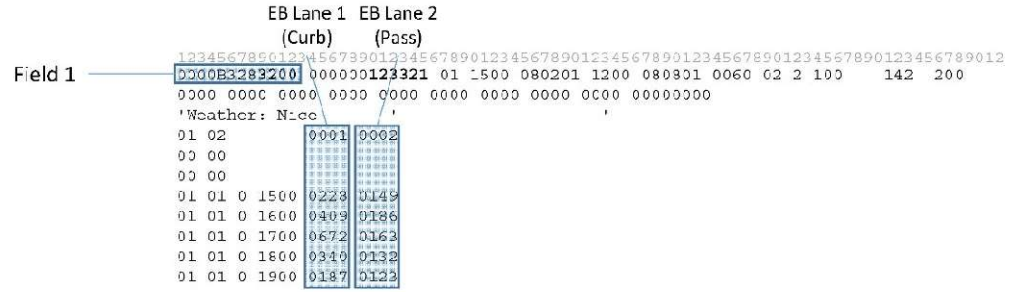
Class



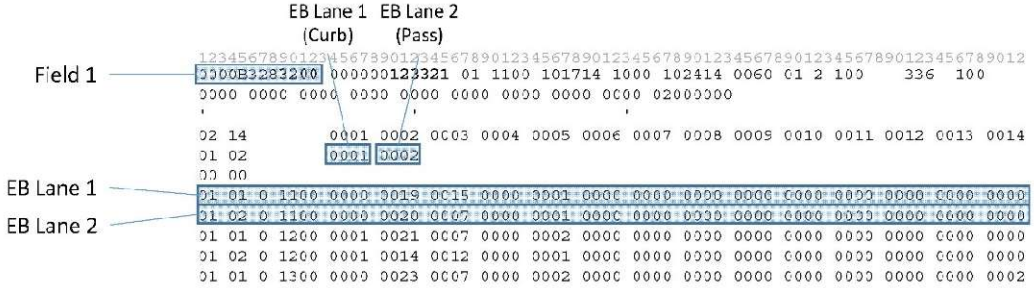
1 Direction PRN Example (Lanes Separated)

Station ID = B328
First Direction of Travel = Eastbound

Volume



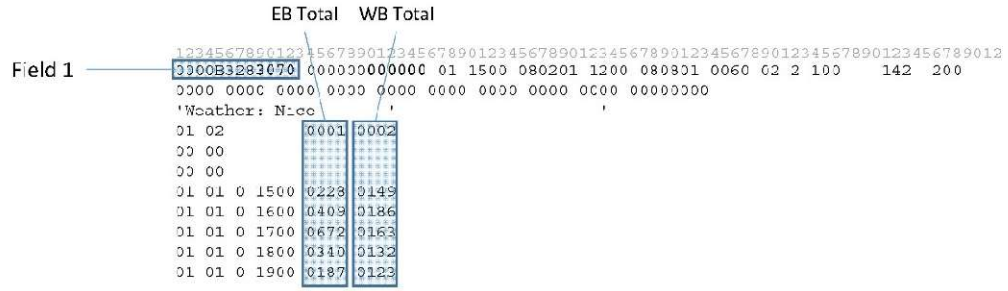
Class



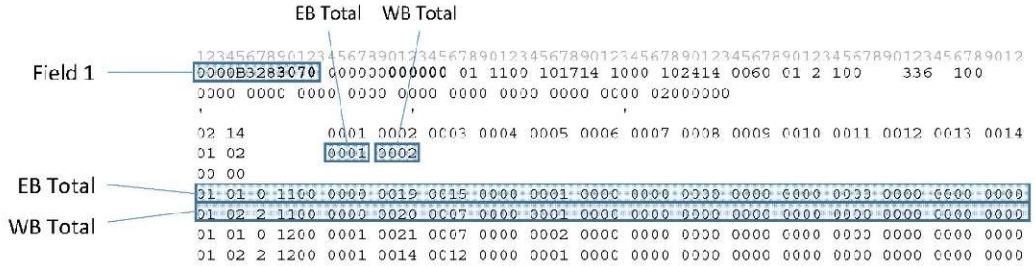
2-Direction PRN Example (Lanes Combined)

Station ID = B328
First Direction of Travel = Eastbound
Second Direction of Travel = Westbound

Volume



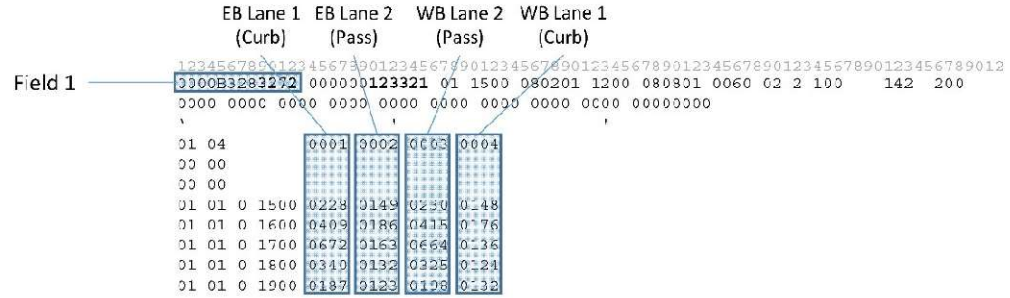
Class



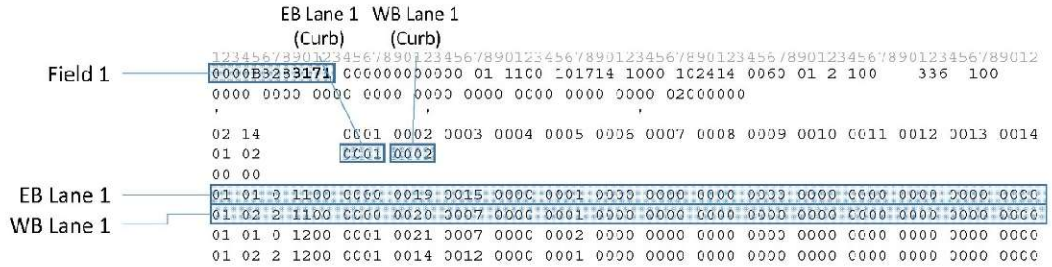
2-Direction PRN Example (Lanes Separated)

Station ID = B328
First Direction of Travel = Eastbound
Second Direction of Travel = Westbound

Volume



Class



TDMS Requirements: Creating New Count Locations

- Location ID: 1-6 digits; Must be unique to the Agency. 6 digits conforms with FHWA.
- County
- Community
- Functional Class
- Rural/Urban Designation
- Located On: (Description) ie; "*FROM JCT NM 53, NORTH TO SOUTHSIDE RAMP OF I-40 IN GALLUP*"
- Directions: NMDOT uses POS/NEG

Additional Requirements:

- Factor Group: required to calculate AADT
- Lat / Lon: required in decimal form for location on the TCDS map

A.2 PRN Output Formats

MioVision format

```
Summary
Study Name,NM260.02 NMDOT
Project,""
Project Code,""
Channel Granularity,By Direction
Bin Size,15 minutes
Time Zone,America/Denver
Start Time,2023-04-18 15:00:00 -0600
End Time,2023-04-20 16:59:37 -0600
Location,1675 Title of document must match the document, based on the traffic section
Latitude and Longitude,"35.529177,-108.668986"Location of deployment
""
AM Peak,Apr 20 2023 10AM - 11 AM (0.943)
Midday Peak (Overall Peak Hour),Apr 20 2023 12PM - 1 PM (0.942)
PM Peak,Apr 20 2023  3:15PM - 4:15 PM (0.961)
Lights Classifications (Lights, mediums, articulated trucks, etc)
Entry,n/a,n/a
Direction,Neg,Pos Need to be Negative / Positive    Off ramp is always ***
Start Time,Thru,Thru
2023-04-18 15:00:00 -0600,65,115
2023-04-18 15:15:00 -0600,57,78
2023-04-18 15:30:00 -0600,66,92
2023-04-18 15:45:00 -0600,93,93
2023-04-18 16:00:00 -0600,74,101
2023-04-18 16:15:00 -0600,70,94
2023-04-18 16:30:00 -0600,56,73
2023-04-18 16:45:00 -0600,61,100
2023-04-18 17:00:00 -0600,63,81
2023-04-18 17:15:00 -0600,55,80
```

When using MioVision count units, the required output format will include the study name and internal project number. The bin size and count start/end times and dates shall be included. The title of the document must match the document based on the traffic section. The latitude and longitude coordinates represent the unit's location of deployment. Vehicle classifications are displayed based on the settings requested, which can include lights, mediums, articulated trucks, etc. The direction will be shown following a positive (North and East) and negative (South and West) direction configuration.

Tube Counter Format