INTRODUCTION

With the advent of automation, the acquisition, transmission, storage, analysis, and presentation of traffic data has changed over the years. The Traffic Monitoring System (TMS) in DelDOT is substantially different from what it was just a short time ago. Several years ago, the Division of Planning began using Jackalope and Viper software to retrieve and analyze traffic data collected in the field more effectively. The use of these two programs ensures that this report is in compliance with the principles of 'Truth-in-Data' reporting requirements and conforms to federal reporting standards. This report contains traffic data for all roadway segments of the highway network under Del DOT's jurisdiction, which represents approximately 90% of all roadways in the State of Delaware. The details of the collection process, analysis, and reporting of traffic data, along with other features relevant to traffic monitoring, are outlined in this document.

HIGHWAY NETWORK

Highways and Streets have been grouped into functional classes or systems as required by the Federal Highway Administration. The Functional Classification Systems are based on traffic characteristics and the function that each roadway serves as part of the entire network. The Functional Classification Maps of the highway network for each county, as well as the State, are published and continually updated as required.

Within this link, links to the Functional Classification System Maps for the State and each county can also be found.

TRAFFIC COUNTS

Automatic Traffic Recorder (ATR) Stations

The ATR stations are traffic volume counter stations permanently installed throughout the Road Inventory network covering all functional classifications of highways except on Local Streets. These ATR stations, along with their identification numbers and the functional classifications of the roadway segments where they are located, have been listed on the following pages. Equipped with loop detectors, these ATR stations count the number of all vehicles passing through each location, continuously throughout the year, and transmit the recorded data to the traffic monitoring computers at the Office of Information Technology (OIT) headquarters for electronic data processing. A map of all the ATR locations has been included for ease of use.

The 2020 monthly traffic data at ATR stations are included. ADT denotes Average Daily Traffic, in this case for each month, and AADT is the Annual Average Daily Traffic for all 365 days of the year.

Wavetronix Device

Wavetronix Traffic Detection Devices are sensors used for collecting vehicle volumes with the reliability of radars and the advantages of being a non-intrusive detection system. Wavetronix are used to collect data along segments of roads where high traffic volumes make it impossible to use pneumatic tubes or prevents the installation of Automatic Traffic Recorders (ATR). Wavetronix devices are only used to collect vehicle volume and not class at this moment.

Traffic Pattern Group (TPG)

Eight groups have been established to represent the traffic characteristics of all roads on the Road Inventory network. These Traffic Pattern Groups, ranging from TPG 1 through TPG 8 along with the permanent ATR stations covered by each TPG are reflected in the Traffic Pattern Group table.

As mentioned previously, the Functional Classification Maps for the highways in Delaware, by each county as well as for the entire State, are available from the DelDOT Mapping Section. Therefore, the TPG for any roadway segment or link on the entire Road Inventory can be easily determined with the Functional Classification Maps, except for designated Recreational Routes.

Recreational Routes, which carry rather heavy traffic during summer months, constitute a special traffic group under TPG 8. Those designated Recreational Routes of TPG 8 are: SR 9 in Kent County, SR 1 in Kent and Sussex Counties, as well as US 9, SR 6, SR 16, SR 18, SR 23, SR 24, SR 26, SR 54, SR 404 in Sussex County. Also included in TPG 8 are road segments, primarily in Sussex County which are in and around the Beach area. See AADT tables for TPG on all roadway links, including those on Recreational Routes, of the Road Inventory network.

ATR DISTRIBUTION ACROSS TRAFFIC PATTERN GROUPS (TPG)

TPG	TYPE ROUTE	ATR STATION
1	Interstate, Freeways & Expressways	T8000 T8001 T8002 8004 8018 8047 8049 T8051
2	Other Urban Arterials	8015 8017 8020 8040 8056 T8052 T8055 8060 8061 8082 8096
3	Urban Collectors	8042
4	Urban Local Street	NONE
5	Rural Arterials	8023 8074 8085 8087 8088 8095
6	Rural Major Collectors	8053 8064 8068 8070 8083 8140
7	Rural minor Collectors & local Roads	8065 8066 8098
8	Recreational Routes	8075 8076 8078 8084 8089 8092 8097 8141

AUTOMATIC TRAFFIC RECORDERS (ATR)& ASSIGNMENT
Types of data collected:
Volume: Volume only
Class: Volume and Vehicle Class
WIM: Weight, Volume, Class and Speed

ID	LOCATION	GROUP_	FUNC_CLASS	TYPE
8000	I-95 Toll Plaza	Urban	Interstate	**Tolls**
8001	I-295 Delaware Memorial Bridge	Urban	Interstate	**Tolls**
8002	Biddle's Corner Toll Plaza	Urban	Interstate	**Tolls**
8004	I-495 Boulevard Body Shop	Urban	Interstate	**WIM**
8005	DE 9 Near I-295	Urban	Minor Arterial	**RETIRED**
8011	US 202 @ Widener Coll Rocky Run Pkwy	Urban	Other Princ Art	**RETIRED**
8012	Foulk & Simon Road	Urban	Minor Arterial	**RETIRED**
8013	Limestone Road & Arundel Dr.	Urban	Other Princ Art	**RETIRED**
8014	DE 2 East of Newark (Windy Hills)	Urban	Other Princ Art	**RETIRED**
8015	US 40 Pleasant Valley	Urban	Other Princ Art	**WIM**
8016	US 301 N of Hoober Equipment	Rural	Princ Arterial	**RETIRED**
8017	DE 896 & DE 71	Rural	Princ Arterial	**Volume**
8018	DE 1 N Wm. Roth Bridge	Rural	Princ Arterial	**Volume**
8019	DE 9 & Reedy Point Bridge	REC	Major Collector	**RETIRED**
8020	DE 4 Christiana Pkwy.	Urban	Other Princ Art	**Volume**
8021	DE 273 (Nottingham RD) MD Line	Urban	Minor Arterial	**RETIRED**
8022	DE 7 (Limestone Rd.) PA Line	Urban	Other Princ Art	**RETIRED**
8023	DE 52 (Kennett Pike) PA Line	Rural	Volume	**Volume**
8024	NC 427 N of NC 429	Rural	Local Road	**RETIRED**
8026	DE 7 S. OF Little Baltimore	Urban	Other Princ Art	**RETIRED**
8028	US 13 S of Old St. Georges Bridge	Rural	Minor Arterial	**RETIRED**
8030	US 202 & P.A. Line	Urban	Other Princ Art	**RETIRED**
8031	DE 92 Naamans Rd @ 202	Urban	Other Princ Art	**RETIRED**
8033	Boyd's Corner Rd. @ US 301	U R	Other Princ Art	**RETIRED**
8034	US 13 @ NC 14	U R	Princ Arterial	**RETIRED**

8035	NC 14 @ US13	U R	Princ Arterial	RETIRED
8036	US 13 & Smyrna Rest Area	Pred Rec	Minor Arterial	RETIRED
8037	DE 1 & Paddock Road	Rural	Princ Arterial	RETIRED
8038	I-95 near DE 92	Urban	Interstate	RETIRED
8039	I-495 near DE 92	Urban	Interstate	RETIRED
8040	US 13 & Dover Downs	Urban	Other Princ Art	VOLUME
8041	K 88 N of K 337	Rural	Major Collector	RETIRED
8042	K 195	Urban	Major Collector	VOLUME
8043	DE 8 West of Dover	Urban	Other Princ Art	RETIRED
8044	DE 9 & K 12	REC	Major Collector	RETIRED
8045	K 11 & DE 9	REC	Major Collector	RETIRED
8046	DE 1 & DE 6	Rural	Other Princ Art	RETIRED
8047	DE 1 & DE 42	Rural	Other Princ Art	VOLUME
8048	Scarborough Road	Urban	Minor Arterial	RETIRED
8049	Puncheon Run Connector	Urban	Other Princ Art	VOLUME
8050	DE 10 E of State Rd.	Rural	Major Collector	RETIRED
8051	Dover Toll Plaza	Urban	Other Princ Art	Tolls
8052	Denney's Road Toll Plaza	Urban	Minor Arterial	Tolls
8053	Tower Hill Rd, State Fair	Rural	Princ Arterial	VOLUME/CLASS
8054	US 13 N. of Cheswold	Rural	Minor Arterial	RETIRED
8056	MIA/POW	Urban	Minor Arterial	VOLUME
8060-61	US 13 @ Bay Rd Split	Urban	Princ Arterial	VOLUME
8062	US 113 & DE 1	Urban	Other Princ Art	RETIRED
8064	RT6 at the De/Md line	Rural	Other Princ Art	VOLUME
8065	RT330 at the De/Md line	Rural	Princ Arterial	VOLUME
8066	DE 10 Near Drapers Mill Rd.	Rural	Princ Arterial	VOLUME
8067	DE 12 Bernite Mill Rd. near Maryland Line	Rural	Princ Arterial	RETIRED
8068	DE 14 Burrswille near Knife Box Rd.	Rural	Princ Arterial	VOLUME
8069	DE 404 Wooden Hawk	Pred Rec	Other Princ Art	RETIRED

8070	DE 36 Between S 207 & S 620	Urban	Major Collector	VOLUME
8071	DE 404 West of Bridgeville	Pred Rec	Other Princ Art	RETIRED

8072	US 13 S of DE 16	Rural	Princ Arterial	RETIRED
8073	DE 18 W of Georgetown	REC	Other Princ Art	RETIRED
8074	US 113 S of Georgetown	Rural	Princ Arterial	WIM
8075	DE 1 S of DE 16	Pred Rec	Other Princ Art	WIM
8076	DE 1 N of Ocean Outlets	REC	Other Princ Art	WIM
8077	DE 1 Fenwick	Pred Rec	Other Princ Art	RETIRED
8078	DE 54 W of Fenwick	REC	Major Collector	VOLUME
8079	US 13 & SC 534	Rural	Princ Arterial	RETIRED
8080	DE 16 W of Greenwood	REC	Major Collector	RETIRED
8081	DE36 W of DE 16	REC	Major Collector	RETIRED
8082	US 113 Georgetown	Rural	Princ Arterial	VOLUME
8083	DE 16 E of S 44	Pred Rec	Major Collector	VOLUME
8084	DE 9 E of Harbeson	Pred Rec	Minor Arterial	VOLUME
8085	DE 20 E of MD Line	REC	Minor Arterial	VOLUME
8086	DE 9 Hardscrabble	REC	Major Collector	RETIRED
8087	US 13 N of DE 54 Delmar	REC	Other Princ Art	VOLUME
8088	US 113 N of Selbyville	REC	Other Princ Art	VOLUME
8089	DE 24 Love Creek Bridge	Pred Rec	Major Collector	VOLUME
8090	DE 26 Assawoman Bridge	Pred Rec	Minor Arterial	RETIRED
8091	DE 1 Barratts Chapel	Rural	Other Princ Art	RETIRED
8092	DE 1 & 10 St.	Pred Rec	Other Princ Art	WIM
8093	DE 18 E. OF MD LINE	Pred Rec	Other Princ Art	RETIRED
8094	US 113 S of 625 Lincoln	REC	Minor Arterial	RETIRED
8095	US 113 Ellendale	REC	Minor Arterial	WIM
8096	US 13 Bridgeville Police	Rural	Other Princ Art	WIM
8097	DE 1 N of Indian River	Pred Rec	Other Princ Art	VOLUME
8098	DE 54 near De/Md line	Rural	Other Princ Art	VOLUME
8099	DE 1 N Fenwick New	Pred Rec	Other Princ Art	RETIRED
8140	Sussex 26 near Maryland Line	Rural	Other Princ Art	VOLUME
8141	Sussex 24 near Maryland Line	Rural	Other Princ Art	VOLUME

Volume only Wavetronix
devices and locations

ND016	I95
ND024	I95
ND027/28	I95
ND029	I95
ND0104	I95
ND0106	I95
ND0151	I95
ND030	I95
ND032	I95
ND075	I95
ND077	I95
ND087	I95
ND090	I95
ND091	I95
ND097	I95
ND0120	I495
ND0124	I495
ND0128	I495
ND0147/148	I495
ND034	I495
ND078	I495
ND0194	US301
ND0224	US301
ND0228	US301
ND0232	US301

Growth Factors

The AADT of each ATR station for 2021 was compared with the previous year's AADT respectively, and the rate of change of AADT, was developed into a factor. Such changes at all ATR stations under each TPG, termed as Growth Factor, are presented below.

TPG:	1	2	3	4	5	6	7	8
Growth Factor:	1.305	1.221	1.154	1.21	1.302	1.143	1.208	1.11

Coverage Count Program

There were 3,527 roadway segments on the Road Inventory network of DelDOT in 2021. Of these, there are 60 segments where permanent stations were operational, accurate hour-by- hour traffic volume data were continuously recorded throughout the year, processed, and analyzed. For the remaining 3,467 links, the annual traffic data was estimated using short-term traffic count or applying growth factors. These factors are generated along with the statistical information acquired from the permanent station software logarithms.

The coverage count program in Delaware has recently been revised, allowing for complete coverage of the Road inventory network on either an annual, three or six year cycle. The advent of this schedule of traffic data collection requirements insures accurate data on all roadway segments in the Road inventory network. On average, there are approximately 900 short- duration counts performed annually. Most volume counts are performed for a one-week period. Pneumatic rubber hoses, which count axles and not vehicles, are used in the coverage count program. Since the number of axles in motor vehicles are variable, appropriate Axle Correction Factors (ACF) are applied to convert the counted axles into the number of vehicles. The Axle Correction Factors are derived from the vehicle classification program, at both short-term and permanent sites.

Furthermore, the ADT over a period of one week is obtained in the coverage count program. To estimate the AADT, Seasonal Adjustment Factors (SAF) are applied to account for weekly traffic variations over the course of the year.

$$\text{Thus, ADT} = \text{Coverage Count} * \text{ACF and,}$$
$$\text{AADT} = \text{ADT} * \text{SAF}$$

The SAF, in this case, pertains to the particular month of the year in which the coverage count is conducted. Based on the recorded data retrieved from ATR stations, the SAF for each of the 12 months of the year, computed for all Traffic Pattern Groups, is calculated and stored in the traffic-monitoring database. The applicable SAF was used in the determination of AADT at all coverage count sites for 2021. For those highway links that were not counted in 2021, the AADT data were obtained by multiplying previous year's AADT with the applicable Growth Factor.

Of particular interest is the AADT for 2021 on the Interstate Highways in Delaware. A comparison of the AADT for the years 2020 and 2021 at the operational permanent traffic counter stations on the Interstate Highway, inclusive of the Delaware Turnpike, is presented below.

LOCATION	2021AADT	2020AADT
1. JFK Memorial Highway Toll Plaza	79,581	64,585
2. Delaware Memorial Bridge	96,697	79,656
3. I-95 at the Pennsylvania state line	119,470	91,515
4. DE 1 Biddle's Corner Toll	55,420	45,441

K and D Factors

K is the proportion of AADT on a roadway segment or link during the Design Hour, i.e. the hour in which the 30th highest hourly traffic flow of the year takes place.

The Design Hourly Volume of a roadway segment or link is its 30th highest hourly traffic volume of the year in vehicles per hour and is denoted by DHV.

Thus the **K** factor is given by,

$$DHV = \textbf{K} * AADT$$

D is the proportion of DHV occurring in the heavier direction, and is called the Directional Split. Thus **D** ≥ 0.5

The Directional Design Hourly Volume, denoted by DDHV, is given by, DDHV

$$= \textbf{D} * DHV$$

From the database of ATR stations, the average values for the 30th Highest Hourly Volume as well as the corresponding Directional Split for each Traffic Pattern Group for 2020.

To determine the K and D values of a roadway segment or link, the first course of action is to obtain its TPG. Having known the TPG of the roadway segment or link, its K and D values can be determined for 2020.

Note: Both short term counts and ATR data was used to produce the factor numbers

Traffic Pattern Group	K-Factor	D-Factor	Truck % Average	
			SINGLE UNIT	COMBO UNIT
1	8.3	57	7.6	1.7
2	10.2	57.4	6.3	1.4
3	11.9	61.4	7.0	1.8
4	16.2	59.9	7.9	0.7
5	11.3	56.9	7.5	3.3
6	11.1	57.3	9.2	1.7
7	16.4	60.9	10.8	1.8
8	12.4	56.5	5.8	1.3

AADT

TRAFFIC VOLUME DATA

As explained in the foregoing, the AADT has been determined for each of the 3,527 segments of the Road Inventory network. Beginning in 2021 the Vehicle Volume Summary or Traffic Counts will no longer be available in a book format. The annual results will be available through an interactive map created by Del Dot called **Gateway**. Each segment will include 10 years of historical data, inventory road numbers, mile points and road names among other information concerning each specific segment of road.

Below is a link to Del Dot's Gateway. Instructions on how to use the map are available on the Vehicle Volume Summary home page.

Link : https://deldot.gov/Programs/gate/index.shtml

Follow the link above and click on the words "**Traffic Counts**" as shown below.

VEHICLE CLASSIFICATION
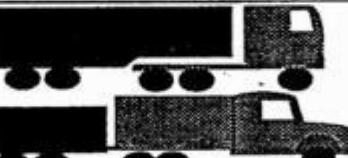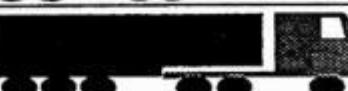
All highway vehicles are classified in accordance with the current FHWA Vehicle Classification scheme, which includes 13 vehicle classes as follows:

FHWA Vehicle Classification

1. Motorcycles

2. Passenger Cars

3. Other Two Axle, 4 Tire Single Units

4. Buses

5. Two Axle, 6 Tire Single Units

6. Three Axle Single Units

7. Four or More Axle Single Units

8. Four or Less Axle Single Trailers

9. Five Axle Single Trailers

10. Six or More Axle Single

11. Five or Less Axle Multi-Trailers

12. Six Axle Multi-Trailers

13. Seven or More Axle Multi-Trailers

The vehicle classification data pertinent to a Functional System represents the weighted average composition of vehicle classes at all sites within that Functional System. Therefore, when the vehicle classification data on a roadway segment is required, it is necessary to determine the Functional Classification or System of Highways to which the roadway segment belongs, and then obtain the percentages of vehicle composition from the vehicle classification table for that Functional System. However, such vehicle classification data should be used with caution because the Seasonal Adjustment Factors are not established and applied to the vehicle composition and the data are not supported by statistical analysis of permanent classifier stations for system adequacy.

DelDOT has installed 25 permanent Automated Vehicle Classifiers (AVC) and Weigh in Motion (WIM) stations throughout the Road Inventory network. These permanent monitoring stations are collecting classification and axle-weight data.

CLASS. GROUP		DESCRIPTION	NO. OF AXLES
1		MOTORCYCLES.	2
2		ALL CARS	2
		CARS W/ 1-AXLE TRLR	3
		CARS W/2-AXLE TRLR	4
3		PICK-UPS & VANS 1 & 2 AXLE TRLRS	2, 3, & 4
4		BUSES	2 & 3
5		2-AXLE, SINGLE UNIT	2
6		3-AXLE, SINGLE UNIT	3
7		4-AXLE, SINGLE UNIT	4
8		2-AXLE TRACTOR, 1-AXLE TRLR(2S1)	3
		2-AXLE TRACTOR, 2-AXLE TRLR(2S2)	4
		3-AXLE TRACTOR, 1-AXLE TRLR(3S1)	4
9		3-AXLE TRACTOR, 2-AXLE TRLR(3S2)	5
		3-AXLE TRUCK, W/2-AXLE TRLR	5
10		TRACTOR W/ SINGLE TRLR	6 & 7
11		5-AXLE MULTI-TRLR	5
12		6-AXLE MULTI-TRLR	6
13	ANY 7 OR MORE AXLE		7 or more