I. AVAILABLE PRODUCTS

Except where otherwise indicated, all of these products can be viewed or printed directly from the Internet at www.iowadotmaps.com.

Maps

City Traffic Flow Maps - These maps provide the calculated Annual Average Daily Traffic (AADT) for every municipal road section where actual counts were conducted (Example included). They are produced on a four year rotating schedule.

County Traffic Flow Maps -. These maps provide the calculated Annual Average Daily Traffic (AADT) for every rural road section between system traffic collectors where actual counts were conducted. They also contain the interpolated AADT for all remaining rural road segments (Example included). They are produced on a four year rotating schedule

State Flow Maps - These maps are produced biennially in even numbered years and are divided into two published maps: *vehicular traffic*, and *truck traffic*. The vehicular traffic map provides the calculated AADT for all rural primary roads. The truck traffic map is posted with the annual average daily truck traffic (Partial example included).

Interstate Flow Map - This map includes interstate truck distribution analyses by region and system (Partial example included). It is produced biennially in even numbered years and provides AADT information for each rural and municipal segment.

Iowa Transportation Map – This is the standard map of Iowa that can be picked up at rest areas, drivers' license stations, etc. Now, it can also be printed in part or as a whole, from the Internet.

Traffic Book

This annual table is produced in even numbered years and indicates traffic distributions for each primary road section in Iowa. These sections are divided by county lines, corporation lines, junctions, and high volume intersections. In addition, information on section length, AADT, and truck distribution in eight classes are included (Partial example included).

Automatic Traffic Recorder (ATR)

The ATR system consists of approximately 144 stations with sensors embedded in the road surface. These sensors detect vehicle movement and provide traffic data through nightly telemetric polling. These locations are dispersed across the state by region, road system type, and AADT. The products derived from this system include:

- ***Traffic Reports*** from a specific ATR site or combination of sites. Traffic volume and some vehicle classification and speed information can be provided by lane, direction, or full traffic, as well as by hour, day, month, or year (Examples included). To request any of these specialized reports, you must contact Brian Carlson in the Telemetrics Unit by calling 515-239-1526 or email brian.carlson@dot.iowa.gov.
- ***Expansion Factors*** for each of the system types by day of week and month.

- ***Monthly Reports*** which show total monthly traffic from each location, estimated Vehicle Miles of Travel (VMT) by system, and a percentage of increase in cumulative and monthly traffic volumes.
- ***Annual Report*** which provides graphs of hourly, day of week, and monthly traffic distributions by type of system. It also includes the 30th high hour (design hour) factor, constant, and the percentage of increase compared to the previous year.
- ***Vehicle Miles of Travel (VMT) Reports*** provide the total distance traveled by all vehicles on public roads in Iowa. This data is provided historically and broken down by system and vehicle class.
- ***Weigh-In-Motion*** equipment collects sample data of truck traffic on select primary roads. This data is gather and stored for each axle of every truck and must be requested through Andrew Short by calling 515-239-11236 or email at Andrew.short@dot.iowa.gov.
- ***Average Speeds*** are reported by quarter for specific locations on the Interstate system

II. SITE SELECTION

Four Year Cycle

The traffic monitoring process begins by selecting specific locations where traffic studies will be conducted. Each year one quarter of the state is scheduled for manual and portable traffic recorder counts (Quadrant map included). With this schedule, the department can concentrate its efforts on providing more detailed information while efficiently utilizing its resources.

Numbers

The studies performed each year are conducted using short term mechanical and manual traffic counts.

Mechanical Counts

- Use portable Automatic Traffic Counters
- Are usually set for a 24 or 48 hour period
- Approximately **11,000** recorder sets are performed each year

Manual Counts

- Executed using visual counts entered directly into a microprocessor
- Are usually done in three time periods that cover the peak traffic for the day
- Approximately **1,000** manual counts are performed each year

Interstate Counts

The interstate highway system is studied biennially in even numbered years. The study encompasses the entire state of Iowa and involves a 48 hour recorder set or eight hour manual count on every ramp. The controlled access of the interstate highway system allows the use of this information with intermittent mainline recorder locations to determine traffic.

Special Requests

To be considered for inclusion in the annual count program, special requests must be **received by January 1st** to allow adequate time for scheduling. The requirements include such items as:

- Participation with city, county, or state transportation related projects
- Safety concerns
- Resource availability

To schedule a special request count, contact your local Iowa DOT District Planner or District Engineer. Upon eligibility verification by the Office of Transportation Data, properly submitted requests will be scheduled for completion the following summer.

III. EQUIPMENT

Manual Counts

A manual count is a visual observations entered into a laptop computer (see photo). With this type of a study, we can monitor basic *turning movements* at a grade level intersection. The The laptop uses an in-house Visual Basic program with a key pad interface and is capable of storing 13 vehicle classification data for three turning movements from four different directions. Each individual vehicle movement is store in an Access database and timestamped to the nearest second. (Example included)

Portable Automatic Traffic Counters

By using pneumatic road tubes connected to an portable traffic data collector (see photo), we can mechanically record traffic volumes or class distributions. These machines are placed to determine traffic statistics at a given point, in a specific lane, or direction. The equipment is capable of performing eight simultaneous two-tier studies from the same input. The options which can be combined are:

- by lane up to two lanes wide
- by volume
- by class or type (see FHWA scheme "F" included) determined using axle spacing
- by speed in up to fifteen definable bins
- by gap in up to fifteen definable bins and measured in tenths of a foot
- by headway in up to fifteen definable bins and measured in tenths of a second

Automatic Traffic Recorder (ATR)

Although some Digital Microwave Radar equipment is used in a non-intrusive side-fire configuration, most of the permanent ATR installations are attached to piezo-electric sensors or induction loops which are permanently embedded in the road surface (see photo). They are configured to run on solar power and are contacted for data download and configuration using telephone communication links. Using the piezo-electric sensors, these installations can accomplish the same information collection as the portable units but achieve a slightly higher level of accuracy and precision. When connected to the induction loops, the control unit classes the vehicles by overall length rather than axle spacing. This allows for less precision of vehicle classification but increases the accuracy of volume because it detects true presence.

IV. FACTOR GENERATION

Expansion Factors

Because the ATR installations monitor traffic every day of the year, an Annual Average Daily Traffic (AADT) is calculated by simply summing all traffic and dividing by the number of days in the year. The portable counts, which are set for only 24 to 48 hours, lack the data to generate a concrete AADT. These counts must be *factored* to an estimated AADT. The ATR system is used to create an expansion factors table (Example included) six different road types:

- Rural Interstate
- Rural Primary
- Rural Secondary
- Municipal Interstate
- Municipal Primary
- City Streets

These factors are generated for each day of the week, by month, for each road type. This is achieved by dividing the average total traffic of each day of week for a specific month into the AADT of the same ATR group. Although the ATR sites use every day of the year for the AADT, the days when holiday traffic may skew the results are excluded from the factor calculation. No portable recorders are set during these anomalous days.

Axle Correction Factors

Due to equipment limitations, some of the short duration portable recorders set on rural secondary roads and city streets will use one pneumatic hose. This restricts the available information to axle strikes. Using thirteen class manual count information, *axle correction factors* are calculated for these two road systems and many subgroups (Example included).

V. PRODUCTION

Data Expansion

Axle Correction Factor
Because most vehicles have two axles, volume counts which detect axle strikes must be divided by two to provide a possible total if all vehicles were cars. To convert this to a traffic volume, we must redistribute the axle total for the expected number of vehicles with more than two axles. The portable counter automatically divides the axle count by two which is multiplied by the *Axle Correction Factor*.

Expansion Factor
The short duration mechanical and manual counts are set for only 24 or 48 hours and do not represent an average *annual* daily count. Because the ATR sites record traffic all year, the typical percentage of the AADT for any given period and road type can be easily calculated. This *Expansion Factor* is multiplied by the raw data from the short duration count to estimate the AADT.

Posting the Data

When all data has been analyzed, factored, and verified, it is posted on a variety of maps and tables for ease of use. To provide convenient access to these products and to facilitate their usage (see section I. Available Products), many of them are then posted on the DOT's Intranet and the World Wide Web at www.iowadotmaps.com.

VALIDATION

Traffic Monitoring Guide

The Traffic Monitoring Guide (TMG) is a publication of the Federal Highway Administration (FHWA) produced to provide guidance for improved traffic counting, vehicle classification, and truck weighing. The TMG also provides statistical procedures that allow the State Highway Agencies to determine how much monitoring is needed to achieve a desired precision level. The unifying element of the TMG is the concept of the direct relationship of volume counts, vehicle classification counts, and truck weight measurements.

Iowa's Monitoring Program

The traffic monitoring program of the Iowa Department of Transportation is approved by the FHWA and satisfies or exceeds the TMG recommendations regarding sample size and stratification to calculate traffic ±10% with 95% confidence. The statistical factors derived from the permanent Automatic Traffic Recorders continuous counts extend beyond the advised seasonality considerations and provide day of week by month accuracy on a state-wide level. The statistical and mathematical methods used to develop the system for traffic volume and vehicle classification monitoring are covered in greater detail in sections two and three of the TMG which can be found at:

http://www.fhwa.dot.gov/ohim/tmguide/index.htm.

The Office of Transportation Data appreciates the many possible uses of the data they assemble (see TMG table 1-3-1 included) and heed strict efforts to maintain the integrity of the procedures outlined in this portfolio. Questions concerning the methods, collection, or analytical procedures of the traffic monitoring program can be directed to Peggi Knight at E-mail *peggi.knight@dot.iowa.gov* or telephone (515)239-1530.

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