Research Report
KTC-95-7

EQUIVALENT SINGLE AXLELOAD COMPUTER PROGRAM ENHANCEMENTS

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Kentucky Transportation Cabinet
Commonwealth of Kentucky

and

Federal Highway Administration
U.S. Department of Transportation

May 1995
(Revised December 1995)

Technical Report Documentation Page

1. Report No. KTC-95-7	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Equivalent Single Axleload Computer Program Enhancements		5. Report Date May 1995
		6. Performing Organization Code
7. Author(s) J. Pigman, D. Allen, J. Harison, N. Tollner, D. Cain		8. Performing Organization Report No. KTC-95-7
9. Performing Organization Name and Address Kentucky Transportation Center College of Engineering University of Kentucky Lexington, KY 40506-0281		10. Work Unit No. (TRAIS)
		11. Contract or Grant No. KYHPR-94-159
		13. Type of Report and Period Covered Final
12. Sponsoring Agency Name and Address Kentucky Transportation Cabinet State Office Building Frankfort, KY 40622		14. Sponsoring Agency Code

15. Supplementary Notes
Prepared in cooperation with the Federal Highway Administration
Study Title: Calibration and Correlation of Weigh-in-Motion Systems and ESAL Program Enhancements

16. Abstract

The objectives of the study were to review and modify previously used Equivalent Single Axleload (ESAL) prediction procedures and to develop a more efficient procedure. As part of the effort to simplify the procedure, a subtask was undertaken to reduce the number of highway functional classes being used to process data for the ESAL estimation procedure. Another objective was to develop a more definitive and accurate method for reflecting the effects of coal or heavy truck movements. Results of this task were documented as Research Report KTC-95-6.

Analyses were performed and validated to reduce the twelve functional classes to six aggregate categories. The overall ESAL estimating process, which was previously accomplished using mainframe computer programs, was converted to microcomputer/PC programs and documented in detail. A procedure for processing ESAL data by aggregate classes was documented and example output was presented. An analysis was performed to determine the reliability of traffic parameter estimates used in the ESAL estimating process. Results were produced to identify the number of volume, classification and weigh-in-motion stations required to adequately define the traffic characteristics of a specific functional or aggregate class.

17. Key Words traffic characteristics volumes classification equivalent single axleloads	18. Distribution Statement Unlimited with approval of Kentucky Transportation Cabinet

19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages	22. Price

Form DOT 1700.7 (8-72) Reproduction of completed page authorized

EQUIVALENT SINGLE AXLELOAD COMPUTER PROGRAM ENHANCEMENTS

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A. INTRODUCTION

Damage to pavements caused by heavy axleloads on trucks is measured in Equivalent Single Axleloads (ESALs). An ESAL is defined as a single, four-tired axle carrying 18,000 pounds. Damage to pavements from various combinations of axles and axleloads is also referred to as Damage Factor. A Damage Factor of 1.0 is defined as one ESAL. The American Association of State Highway and Transportation Officials (AASHTO) has developed damage factors for various combinations of axles and loads based on the AASHTO Road Test of the 1960's. However, the state of Kentucky has developed its own set of damage factors based on mechanistic and theoretical studies. Those damage factors were published by Havens et al. (1) in 1981. The distribution of loads and particular combinations of axles can affect damages in a very dramatic way. Figure 1 (based on Kentucky damage factors) illustrates the relationship between damage, gross vehicle weight, and how it is distributed on various axle combinations. For example, 100,000 pounds of gross vehicle weight distributed on a single-unit, three-axle truck (Type 6) will produce damage of almost 90 ESALs, while the same 100,000 pounds distributed on a combination-unit, six-axle truck (Type 10) will produce damage of slightly less than 3 ESALs. This clearly illustrates the need for accurate measures and estimates of ESALs.

As noted, accurate data are essential in developing ESAL forecasts for the design of pavements. Due to inaccuracies in estimating ESALs, pavements can be over-designed, which results in an inefficient use of construction funds, or the pavement may be under-designed resulting in premature failure and/or increased maintenance costs.

Existing methods used to calculate ESALs within the Kentucky Transportation Cabinet's Division of Transportation Planning may have become somewhat outdated as a result of newer data processing technologies and the significant increase in data availability due to increased automatic data collection efforts. It was recognized that significant revisions to currently used ESAL processing programs were needed to include a more definitive and accurate method for reflecting effects of coal movement and a more flexible approach to accommodating evolving needs and future requirements.

The first set of thickness design curves were developed for Kentucky conditions in 1948 (2). These curves were developed from performance and materials data obtained from 185 sites located throughout Kentucky. Major revisions to those curves were issued in 1959, and were based on data obtained from an additional 57 sites that had been constructed since 1948 (3).

In 1968, a report was issued which analyzed the 1959 traffic-estimation procedure and developed an alternate procedure to reflect the effects of local conditions on the accumulation of Equivalent Wheel Loads (EWLs) (4).

An improved procedure was developed in 1983 to estimate equivalent axleloads for use in pavement design and to compare design ESALs with accumulated ESALs. Premature failures of pavements prior to the end of the 20-year design life were factors justifying an examination of the procedures for estimating traffic parameters used to estimate ESALs. The ESAL was adopted as the measure of traffic for pavement design in Kentucky in 1983.

A report was published in 1984 documenting the computer programs used to process truck weight and classification data to calculate ESALs (5). The three programs documented in the report were LOADOMTR SUMMARY, CLASS SUMMARY, and EALCALC. LOADOMTR SUMMARY was used to process truck weight data and output axleload distributions for each of several vehicle types. CLASS SUMMARY processed vehicle classification data and produced annual average number of vehicle types at each classification station. EALCALC processed the output of the other two programs and produced the parameters of interest for EALCALC calculations and average values for each traffic parameter within a cross-classification matrix.

A report documenting the procedure for estimating equivalent axleloads for the purpose of flexible pavement design was issued in 1985 (6). An estimating equation was developed with the following seven parameters and independent variables.

1) Annual daily traffic volume
2) Fraction of trucks
3) Fraction of coal trucks of total trucks
4) Axles per non-coal truck
5) Axles per coal truck
6) EALCALC's per non-coal truck axle
7) EALCALC's per coal truck axle

In addition, a cross-classification matrix of data was developed to permit estimates being made based on local conditions representative of geographic area, Federal-aid highway system, traffic volume, and percentage of coal trucks.

The FHWA Traffic Monitoring Guide was implemented in 1985 (7). This manual required a three-year monitoring cycle of vehicle weight and classification data. In addition, there was a requirement for use of automated equipment for collection of traffic data over a period of 48 consecutive hours and for the use of weigh-in-motion (WIM) equipment at 90 sites during the three-year period.

In 1990, Research Report KTC-90-11 (8) was produced as documentation of a revised procedure for estimating ESALs based on data being collected by automated equipment in conformance with the Traffic Monitoring Guide. Primary changes were development of an algorithm for identification of coal trucks based on analysis of weigh-in-motion data and a shift to use of the three-year cycle of classification and weight data. In addition, the data were summarized according to highway functional classification based on a three-year average of data for the traffic parameters of interest. These parameters remained the same as those developed during the revisions documented in 1985.

Further improvements were made to the methodology in 1993 (9). These included enhancements to the accuracy of the calibration/estimation process, improvements in the appearance and utility of the ESAL table output, and reductions in the year-to-year variations in the estimations of parameters used in the estimation process.

B. STUDY OBJECTIVES

The primary objectives of the study were to review and modify previously used ESAL prediction procedures and to develop a more efficient and streamlined procedure. ESAL computer programs have previously been processed using the mainframe computer; however, it was recognized that potential existed for simplification if the programs were revised to be processed using microcomputers or PC's. As part of the overall simplification process, a subtask was undertaken to reduce the number of functional classes of highways being used to process data for ESAL estimates. It had been recognized for some time that insufficient traffic data were being collected to adequately represent all of the 12 functional classes.

A secondary objective was to develop a more definitive and accurate method for reflecting the effects of coal or heavy truck movements. This task has been addressed and a separate report has been documented as Research Report KTC-95-6 (10). Current estimating procedures rely on manual collection of vehicle classification data and are unable to use automatic classification data to determine the extent of coal haulage. A modified procedure would enable the use of automatic classification data, with less reliance on manual data collection.

An additional objective was to develop a methodology for continuous correlation and calibration of the various weigh-in-motion systems used in Kentucky to ensure consistent and comparable results between each system.

Results from that effort are being documented as a separate report.

C. ESAL PROGRAM ENHANCEMENTS

With the evolution of the ESAL prediction process over a long period of time, the resulting product was a series of computer programs written in Fortran which are relatively complicated and difficult to process. Modifications have been made to the computer code over time and the original documentation has become somewhat obsolete. In addition, the file sizes and complexity of the computer programs once necessitated processing on the mainframe computer. Increased capabilities and capacities of recent PC's have created options for a more simplified approach for processing the traffic data used to predict ESAL's. Realizing there were opportunities for revisions and modifications to the existing computer programs, several tasks within the study were directed toward enhancing the programs previously used to process traffic data and estimate ESAL's. Implementation of program modifications were expected to permit more flexibility in addressing the needs of future ESAL forecasting.

C. 1. AGGREGATION OF FUNCTIONAL CLASSIFICATION CATEGORIES

After modifications to the computer programs were made and documented in Research Report KTC-90-11 (8), functional class (FC) has been used as the means of stratifying data for processing and producing ESAL estimates. Changes to the process were initiated with the adoption of a data collection plan based on and in conformance with the Traffic Monitoring Guide (7). The method of stratification has the disadvantage of limited data availability for some of the functional classes. Other alternatives were considered for aggregation of the 12 functional classes; the first being four categories representing rural interstates, urban interstates, other rural highways, and other urban highways. The wide range of highways which would be aggregated for other rural and urban highways suggested a need for reconsideration of the initial proposal. The result was an expansion of the "other highways" categories from two to four. Following is the resultant recommendation of functional class categories for processing traffic data and producing annual ESAL estimates.

Aggregate Class I	Rural Interstates (FC 1)
Aggregate Class II	Rural Principal Arterial (FC 2) Rural Minor Arterial (FC 6)
Aggregate Class III	Rural Major Collector (FC 7)

	Rural Minor Collector (FC 8) Rural Local (FC 9)
Aggregate Class IV	Urban Interstate (FC 11)
Aggregate Class V	Urban Other Freeways and Expressways (FC 12) Urban Other Principal Arterial (FC 14)
Aggregate Class VI	Urban Minor Arterial (FC 16) Urban Collector (FC 17) Urban Local (FC 19)

To develop a statistical basis for aggregating these functional classes, an in-depth analysis was performed on WIM data obtained on the various functional classes using data from the years of 1992 to 1994. Aggregate Classes I and IV were not analyzed since they were not combined with any other group.

Figure 2 shows the accumulative distribution functions of all tandem weights in Aggregate Class II (Functional Classes 2 and 6). The combined distribution function for the aggregation and the individual distribution function for FC 2 and FC 6 are shown in that figure. Note that FC 2 had overwhelmingly the largest amount of data (116,426 observations for FC 2 and only 6,719 for FC 6). Therefore, the combined distribution function for the aggregated class closely follows the distribution function for FC 2. To determine if FC 6 could statistically be combined with FC 2 with a 90 percent confidence level, a regression analysis was performed on the distribution functions. Because S-shaped curves, as those shown in Figure 2, are difficult to regress, the curves were transformed using a "Weibull" distribution function of the following form:

$$\text{Log}(F) = C_0 + C_1 * \text{Log}(W) + C_2 * [\text{Log}(W)]^2$$

where:

$F = 1 / (1 - f)$,
f = the accumulative percent at a particular weight, and
W = Tandem Weight in KIPS.

Figure 3 shows the resulting regression analysis on the transformed data. The "predicted" curve in that figure is the predicted transformed distribution function for Aggregate Class II. The "+10%" and "-10%" curves are the 90 percent confidence bands, and the "FC 6" curve is the transformed distribution function for Functional Class 6. It is clear that the "FC 6" curve falls within the 90 percent confidence bands for Aggregate Class II except at the very lowest weight of 5 Kips. The extremely low percentages at the very low tandem weights would not significantly affect future ESAL calculations. Therefore, it can be concluded that FC 2 and FC 6 can be combined with a 90 percent confidence level.

This same analysis was performed on Aggregate Classes III (FC 7 and FC 8), V (FC 12 and FC 14), and VI (FC 16 and FC 17). Figures 4 through 9 illustrate the results. In all three aggregations, both of the current functional classes that were combined to make up the aggregate class were within the 90 percent confidence bands. It can be recommended, from the above analysis, that the current 12 functional classes be combined into six aggregate classes as listed above.

C. 2. CONVERSION OF ESAL PROGRAMS FROM MAINFRAME TO PC

The potential benefit of converting ESAL prediction programs from mainframe processing to PC-based processing had been discussed for several years. However, the constraints of PC speed and capacity had delayed the conversion process. Recent advances in PC computer capabilities made the conversion process more attractive and the task was undertaken as part of this study. The result was a series of programs converted to PC Fortran, which can be used for the entire procedure of processing traffic data for annual ESAL estimates. Documentation was prepared which outlines the procedures used to process PC-based computer programs to estimate annual ESALs, with stratification of the data by functional classes and by aggregate classes. Additional documentation was provided to explain processing of site-specific weight and classification data to estimate ESAL's by individual station.

C.3. PROCEDURE FOR ANNUAL ESAL ESTIMATION

Traffic data in the form of vehicle classification and weigh-in-motion data are routinely collected by the Transportation Cabinet's Division of Transportation Planning. These two types of data are processed through a series of computer programs to produce the annual estimates of ESALs. Following is an explanation of the procedure to execute, sort, process, and edit data to produce an annual estimate of ESALs by functional classification category. A flow chart outlining the process is presented in Figure 10.

Prior to initiating the process for executing the programs, the requirements for data storage should be noted. A directory should be dedicated for proper execution of the ESAL processing programs. All input files and executable files should be stored in the same directory. The output files should be stored in the same directory also, since they are input files for other programs. Experience has indicated a need for a computer with a minimum of 540K conventional memory. The 1993 weight data required approximately seven megabytes of storage.

Classification data for 1993 occupied approximately two megabytes of storage. The 1992 and 1991 weight data files occupied 14 megabytes and 7 megabytes; respectively. Therefore, the total space needed for weight data input was 28 megabytes, bringing the total space needed for initial data input to 30 megabytes. The program files require 14 megabytes for storage and output. Thus, the total fixed disc space needed for producing the EALCALC estimates for 1993 was estimated to be 50 megabytes. This space may need to be expanded if the number of WIM observations increases in the future. The overall process to develop ESAL estimates is based on a three-year average of data, with the oldest year of data deleted when a new year of data becomes available. Reference is made to Figure 10 which shows the generic file names of weight and classification data received from the Division of Transportation Planning. Unsorted vehicle classification data files are referenced as VCRyy.DAT, with yy indicating the last two digits of the year data were collected. Similarly, the unprocessed weight data is referenced as KYyy.7CD, with yy also indicating the year data were collected.

C.3.a. Instructions for WIM Program

As shown in Figure 10, the first step in processing weigh-in-motion data is to initiate the WIM program, which converts dynamic weight data to static. All desired weight data should be combined into one file for a specific year and labeled uniquely to indicate the year the data were collected. It is beneficial to use a file name which indicates that the data are "raw WIM" data, as opposed to "WIM adjusted" data. Output from the WIM program, after being converted to static weights and checked for errors, is then referred to as "WIM Adjusted" data. For example, WIM input data for 1993 is named "KY93IN.CD7". This indicates the data represent the year 1993 and the "CD7" is retained from the file type of the data file received. An example of this "raw WIM" input data is presented as Figure A1 in Appendix A. The WIM processed data or output data would be named "KY93OUT.CD7." Examples of this output file and the error listing are presented in Appendix A as Figure A2. Weight data generally consist of three record types. CARD2 is a station description record, CARD4 is a vehicle classification record (from WIM data), and CARD7 is a truck weight record. These are represented by three separate files. If desired, other forms of nomenclature may be adopted, keeping in mind the number of files used and their position in the ESAL processing flow chart. To run the WIM program; type "WIM", press ENTER, and enter the appropriate input file name and output file name when prompted by the screen.

The next step is to sort the "WIM adjusted" file, KY93OUT.CD7, by functional classification designation. This can be done, using any utility program able to process large files. The SAS system, is an example of the type of software which can be used, and has excellent sorting and editing capabilities. After sorting, there should be one file for each functional classification category. Again, referring to the flow chart in Figure 10, the file name for each functional class would be F##1Yyy.CD7; with ## as the specific functional class and yy as the last two digits of the year.

The WIM program, in addition to converting dynamic data to static form, performs edit checks on the data and the results of rejected data are printed. If a rejected record summary by functional classification is desired, then the "raw" weight data must be sorted by functional class and submitted individually to the WIM program.

C.3.b. Instructions for UNITEAL Program

After processing all functional class weight files by the WIM program, the "WIM adjusted" data are then submitted to the UNITEAL program. This program produces ESALs per vehicle, which is later used as input into the EALCALC program. The UNITEAL program also performs edit checks and a report is printed. Output from this program is also by functional class. To run this program, enter "UNITEAL". The user will be prompted for input and output file names. As shown in Figure 10, the input file name is to be presented in the form F##3Yyy.CD7. The ## designation is again functional class, yy is the last two digits of the year, and the number 3 refers to three years of data. This means that processed weight data for the current year is to be combined with the two most recent years to form a three-year data set for processing by the UNITEAL program to create ESALs per vehicle. Output files created by executing the UNITEAL program are F##3Yyy.OUT; with the same designation of functional class and year as shown for the input data. Each functional class should be processed separately. Examples of the UNITEAL output and the error listing are presented in Appendix A as Figure A3.

C.3.c. Instructions for LOADOMTR Program

Next, the "WIM adjusted", individual functional class files are submitted to the LOADOMTR program. LOADOMTR processes truck weight data and outputs axleload distributions for each of the 10 truck types. The output is also by functional class. To execute the program, enter "LOADOMTR" and then enter the input file name (F##TYyy.CD7). It should be noted that only the current year of WIM data are processed by LOADOMTR. Two output files are created, one in report form (LOADFC##.REP) and the other in a form for EALCALC input (LOADFC##.EAL). Neither of these files are distinguishable by year and therefore must be converted to a file with a year designation. The form of the new file is FWTFC##.Yyy; with ## as the functional class and yy as the year of the data collection. An example of this new output file from LOADOMTR is presented in Appendix A as Figure A4. There should be one run for each functional class represented.

C.3.d. Instructions for CLASSUM Program

The second major branch of the ESAL data reduction flowchart as shown in Figure 10 is for vehicle classification data. Data are received on diskette from the Transportation Cabinet's Division of Transportation Planning by file names VCRyy.DAT (yy again represents the last two digits of the year of data collection) and are input into the CLASSUM program. An example of the input data for CLASSUM is presented in Appendix as Figure A5. CLASSUM processes vehicle classification data and outputs annual average number of vehicle types at each classification station. To run this program, enter "VCR" and respond to the file name prompts on the screen. This program outputs the following files for each of the functional classification categories represented by the data.

VCRYRxx.OUT	Seasonal and annual average daily volume for each vehicle type (Example output shown as Figure A6 in Appendix A)
VCRYRxx.REP	Seasonal and annual average daily volume for each vehicle type (Example output shown as Figures A7 and A8 in Appendix A)
VCRYRxx.ERR	error listing (Example output shown as Figure A9 in Appendix A)
VCRYRxx.EAL	annual average daily volume for each vehicle type (Example output shown as Figure A10 in Appendix A)
FC01YRxx.- FC19YRxx.	annual average daily volume for each vehicle type and each functional class (Example output shown as Figure A11 in Appendix A)

The functional classification files (F##CYyy) are used as input for EALCALC.

C.3.e. Instructions for EALCALC Program

The EALCALC program is executed for each functional class represented with classification data. EALCALC merges weight data (previously processed by LOADOMTR) with classification data (previously processed by CLASSUM) to produce the primary ESAL-model parameters (AADT, fraction of trucks, fraction of heavy/coal trucks, axles per truck, axles per heavy/coal truck, ESALs per truck axle, and ESALs per heavy/coal truck axle).

To initiate the program, type EALCALC at the DOS prompt of the directory containing the program and data files. The program will interactively request several types of information. Following is a description of the requested information.

"Specify Input File Name"

The required input at this point are the names of the other files required in order for the program to process the data. The file name for Functional Class 2 data in 1994 required as input is F02Y93.DAT. There are several additional file names that will be prompted when F02Y93.DAT is initiated. It is important to maintain the order of the additional files after F02Y93.DAT is initiated. Three years of weight data are averaged and processed as part of the EALCALC program. At this time, only one year of classification data is being processed by EALCALC; however, it is anticipated that a three-year average of classification data will be included in the future.

F##3Yyy.OUT	This file is created from the output of UNITEAL and contains ESALs per vehicle for each vehicle type with highways classified as non-coal, coal, and all roads.
F##CYyy.	This file should contain the output from the CLASSUM program.
FWTFC##.Yyy	These files should contain the latest three years of output from the LOADOMTR program. Some functional classes will not have three years of data. If that is the case, delete one or two of the filenames from the input data file. The program will request the number of weight years for the current run. The program uses this number as a loop counter to read in the correct number of weight files.
FC##MEAN.Yyy	This file is created by the current run of the EALCALC program and will contain the Current Year Mean Data. (An example of this output is presented as Figure A12 in Appendix A).

The remaining nine files are the Historic Mean Data files that have been created by previous runs of EALCALC. The file form is FC##MEAN.Yyy, where ## is the functional class and yy is the year data was collected.

"Specify Output File Name"

This output file will contain printouts with the titles "ESAL TRAFFIC PARAMETERS FOR INDIVIDUAL CLASSIFICATION STATIONS" and the "SUMMARY OF AVERAGE VALUES" for the FC being run. These are the tables that appear in the annual ESAL summary report. Example output from the 1994 ESAL tables for individual stations (Figure A12) and average values (Figure A13) are presented in Appendix A.

Following are additional user input requests which must be responded to in order to complete the processing of EALCALC.

"Input Functional Classification for This Run"

The user must input a number for the highway functional classification of data to be processed. In this case there are 12 functional classes, with the numbers ranging from 1 for rural interstates to 19 for urban local roads.

"Input Number of Weight Years for This Run"

Input the number of weight data files that are listed in the input file that was described previously.

"Input Year for This Run"

Input the last two digits of the latest data year.

C.3.f. Instructions for the SMTHW Program

The purpose of this program is to take output from EALCALC and fit a straight line through the data in order to produce a smoothed output with less variation from year to year. To run the program, type SMTHW at the DOS prompt of the directory containing the program and data files. The program will interactively request the following information.

"Specify Input File Name"

This file should contain the 10 most recent Historic Mean Data files that have been created by previous runs of EALCALC. The file names are in the form FC##MEAN.Yyy, where ## is the functional class and yy is the last two digits of the year. The files must be input in increasing chronological order by year. It should be noted that the data are weighted, with the most current data being weighted 10 times more than the oldest data.

"Specify Output File Name"

This output file will contain the printout of the SMOOTHED SUMMARY OF AVERAGE VALUES for the FC being run. These are the tables that appear in the annual reports. Example output of the smoothed data from the 1994 ESAL tables is presented as Figure A14 in Appendix A.

C.4. PROCEDURE FOR ESAL PROCESSING BY AGGREGATE CLASS

The procedure for processing of ESAL data by the six aggregate classes is presented as a flowchart in Figure 11. The overall procedure for processing aggregate class data is very similar to processing functional class data. Weight data is processed the same as for functional classes through the WIM program and Sort Utility Program; at which point the six aggregate classes are categorized for input into UNITEAL and LOADOMTR. Again the processing continues similar to the process for functional class with output from UNITEAL and LOADOMTR as input into AGGCALC rather than EALCALC. Output from AGGCALC are the standard ESAL report tables, with the individual stations shown as Figure B1 and the average values shown as Figure B2 in Appendix B. Mean data from AGGCALC are input into SMTHAG and subjected to a linear regression analysis; which eliminates some of the year-to-year variability and the results are used to produce smoothed output tables by aggregate class as shown for Aggregate Class II as Figure B3.

The processing of classification data is the same for functional class and aggregate class through the CLASSUM program. Output from CLASSUM is in two forms; combined for all 12 functional classes and with individual functional classes separate. The next step is to combine the 12 functional classes to form six aggregate classes. Output from CLASSUM in the form of aggregate classes is then used as input into AGGCALC and SMTHAG. As a separate process, historical mean classification data are accumulated by aggregate class and the results are also used as input into AGGCALC and SMTHAG.

C.5. PROCEDURE TO ESTIMATE ESALS BY INDIVIDUAL STATION

Following is an outline of a procedure to obtain ESAL estimates based on data from individual WIM stations. Three files are included in the WIM weight data package. The first file, CARD2, contains station description records, the second file, CARD4, contains vehicle classification records, and the third file, CARD7, contains truck weight records. Using data from these three files, it is possible to obtain sufficient information to estimate ESALs at each weigh station. Presented in Figure 12 is a flow chart which documents the procedure for estimating ESALs at individual WIM sites.

Certain data items are common to all three types of records. Functional classification, station identification number, direction of travel, and year, month, date, and hour of data. This information can be used to synchronize the information from all three files.

The CARD2 file contains route, county, and AADT information. Also included is the location of the station. However, the description gives the distance and direction from nearest major intersecting route. This information could be used to locate a milepoint location.

The CARD4 file contains vehicle classification records. Each record contains the number of vehicles counted during the hour based on the vehicle type. All thirteen vehicle types are coded.

Truck weight data from the CARD7 file are processed in the same manner as they are for the annual EALCALC update procedure. The data could be extracted from the output of the WIM program, thereby eliminating the need to run the WIM program again. This would insure that the same data are used both for the annual ESAL update and the ESAL estimation by station.

Output from the UNITEAL program does not normally contain specific route or station information. It only contains the year and functional classification category. This output file has to be edited manually to add a header containing route number, county, AADT, station number, and any other information that would assist in identifying the location.

The weight data are used as input to the LOADOMTR program in the same manner they are submitted for the annual EALCALC processing. The only difference is that a single station is used as input for each submission as opposed to a single functional class. The LOADOMTR output is used as input to the EALCALC program in the usual fashion.

The classification data require significant processing before they can be used as input to the CLASSUM program. The format of the data on the CARD4 records are not in the same format as the annual Vehicle Classification Records (VCR). The classification data for all stations are contained in one file. Therefore, the first step is to sort the data, by station, into separate files. The data must be processed by a utility program to arrange the data in the same column format as the VCR records. Both datasets contain the number of vehicles counted during the hour. Each record represents one hour. Additional information must be coded at the beginning of the record to match the VCR record. This includes county number, station number, direction of traffic flow, year of count, month of count, day of count, and hour of count. Two forms of header records must also be created at the end of the vehicle counts. The CLASSUM program reads columns 78-79 to identify the header records by a "98" and a "99". The form of these records is explained and shown in detail in the CLASSUM PC version documentation. All these modifications are necessary before submitting the CLASSUM program..

The CLASSUM output file is then edited to reflect the number of coal trucks. The procedure to identify coal trucks is contained in the WIM program. The algorithm uses axle spacings and gross vehicle weights to encode a commodity code of "112" on the weight record of a coal truck. Statistical software, such as SAS, can be used to calculate the percentage of coal trucks by station, based on this commodity code. This percentage is then applied to the total number of trucks observed in the CLASSUM listing to obtain the number of coal trucks. Note, the total number of trucks must be manually calculated from the CLASSUM listing as opposed to using the total number of all 13 vehicle types, which is listed. The actual number of coal trucks obtained by the statistical count from weight data cannot be used in the CLASSUM output because CLASSUM estimates the number of vehicles by season and type and then creates averages by season and vehicle type. It is this average total count to which the percentage is applied. In the CLASSUM program, coal trucks are considered vehicle type 14 for processing purposes. To enable the CLASSUM output to accurately pass this information on to the EALCALC program the output must be edited and the number of coal trucks manually entered in the appropriate columns corresponding to vehicle class 14. The number of coal trucks may be entered on the average record or all five records. The five records are one for each season and an average of the four seasons. CLASSUM must be executed for each station and each output is used for input to the EALCALC program.

There were 29 weight stations in 1993. For this number of stations, 29 executions of the WIM, UNITEAL, LOADOMTR, CLASSUM, and EALCALC programs would be required. The 29 output files of UNITEAL have to be edited, the 29 CARD4 files have to be modified, and the 29 VCR files have to be edited.

D. RELIABILITY OF TRAFFIC PARAMETER ESTIMATES

There are three parameters of the traffic stream that are necessary to quantify to adequately describe the characteristics of that stream. These are volume, distribution of vehicle types, and distribution of axle weights. It is not clear how many classification and weight stations are necessary to define these parameters for a particular functional class. To quantify the minimum number of stations necessary to define these traffic parameters, three statistical analyses were performed on volume data, classification data, and weight data.

D.1. VOLUME DATA

It was not clear how many classification stations would be necessary to adequately define the traffic characteristics of a particular functional class. To determine the number of stations necessary to predict volumes for a functional class, data from six automatic traffic recorders (ATR's) from the year of 1993 on the Interstate system were analyzed to produce a parameter identified as "ADT factor". Those six stations were ATR-22, 23, 47, 48, 51, and 46. The lower half of Table 1 lists these factors for all vehicle types for one ATR station (ATR-22, Interstate 64). These factors were obtained by dividing the average daily traffic for a specific day of the week, for a specific month of the year by the average annual daily traffic (AADT) for that station . For example, the ADT factor for Sundays in the month of November in 1993 is listed as 1.018. This was obtained by averaging the daily traffic for all the Sundays in November of 1993 and dividing that average by the AADT for that station. The upper half of Table 1 lists the average daily traffic for all Sundays in November of 1993 as 29,114. When this is divided by the AADT of 28,608 (listed in the middle of Table 1), the result is 1.018.

The question arises as to the reliability of those factors that are based on data from only one station. How do these factors change as the data from more stations are added? More importantly, how many stations are necessary to adequately define what the value of these factors should be for a particular functional class (accepting a predetermined amount of risk)? To address that question, a statistical analysis was performed on the "ADT factors" obtained from the analysis of the six previously listed ATR stations. A statistical analysis of the "ADT factor" for a particular day of the week and a particular month of the year (for example, Sunday of November, 1993) for three ATR stations was performed to determine the mean and the standard deviation of those three stations. A standard statistical test using the "t-statistic" was then performed to estimate sample size from the following equation:

$$P[|\mu - X| \leq (S/\sqrt{n}) t_{1-\alpha/2,n-1}] = 1-\alpha \qquad (1)$$

where
$P[X]$ = probability of X,
$t_{p,v}$ = t-statistic for probability p (obtained from standard probability tables),
v = degrees of freedom = n-1,
n = sample size,
α = significance level (from 0 to 1), and
$1-\alpha$ = confidence level (in this case, 95 percent), and
S = standard deviation.

Thus the 1-α confidence limits on the means are:

$$\mu = x \pm (S/\sqrt{n})t_{1-\alpha/2,n-1}$$

or

$$\mu = x\,(1 \pm \Delta)$$

where $\Delta = [(S/\sqrt{n})t_{1-\alpha/2,n-1})/x$ = acceptable level of error (in this case, ±10 percent).

Equation 1 was repeatedly solved by adding one ATR station each time until Δ reached a value of 0.1 (±10 percent error). The results of this analysis are shown in Figures 13 through 26. The vertical axis is labeled "Range of Mean (Fraction)" and is equivalent to Δ in the above analysis. For example, 0.1 on that axis is equal to ±10 percent error. The line labeled with open squares on those figures is the average error as a function of sample size for the months of January through December. However, for the purpose of reducing clutter on the figures, only the months of May through December are shown. When the average line (open squares) crosses the 0.1 line, this is the minimum number of samples required to be 95 percent confident that the errors of the mean are less than ±10 percent. Consequently, any additional samples would not significantly alter the values of the traffic factors for that particular functional class. A summary of this analysis is presented in Table 2.

D.2. WEIGH-IN-MOTION DATA

Although Table 2 indicates that an average of only four classification stations are needed to adequately describe the "ADT Factor" for Functional Class 1, this relationship may not hold for weight data. To test the reliability of the weight data, and to determine the number of weigh stations necessary to adequately describe the weight characteristics of a particular functional class, the weight results from 17 stations on Functional Class 1 were analyzed statistically. The data from these 17 stations were from years 1992, 1993 and 1994. Only tandem weights were used in the analysis.

Table 3 lists a summary of the data. Column 1 is the station number. Column 2 is the accumulated number of tandems weighed from Station 1 down through a particular station. Columns 3 and 4 are the accumulated mean and standard deviation; respectively. For example, Station 10 shows 192,761 observations or tandem weights. This is the total number of weights from Station 1 through Station 10. The mean and standard deviation listed at Station 10 is the mean and standard deviation that is based on 192,761 observations.

Figure 27 is a plot of the accumulated mean as a function of the number of stations. The data tends to converge on a single number when the number of stations is 12 or greater. A regression analysis on the last six data points yields a 90 percent confidence level of plus or minus 209 pounds. Because Stations 11, 10 and 9 are not within the 90 percent confidence band, a minimum of 12 stations are required to adequately describe the weight characteristics of Functional Class 1.

Considerably more stations are required to adequately define the functional class and the distribution of weights in that class (when using WIM data) because the weight data are more variable. The coefficient of variation (standard deviation divided by the mean) for the "ADT Factors" defined in the previous section is approximately 10 percent. However, the coefficient of variation for the weight data is over 30 percent.

The following example is given to illustrate the effect that a small change in the mean value of tandem weights in Functional Class 1 would have on ESAL calculations. If is assumed that the mean tandem weight in Functional Class 1 is 22,000 pounds, then a drift in the mean value up to 23,000 pounds would produce an additional 20,000 ESAL's per 1,000,000 tandem passes. If the mean value drifted down 1,000 pounds to 21,000 pounds, then the accumulation would be 15,000 less ESAL's per 1,000,000 tandem passes. Kentucky's damage factor equations were used in making these calculations. Because those equations are nonlinear, a slight increase in mean weight produces a disproportionate increase in ESAL's.

A similar analysis was performed on Aggregate Class II. Figure 28 shows the results. Convergence was achieved in 13 stations.

D.3. CLASSIFICATION DATA

A statistical analysis similar to that performed on WIM data was performed on classification data from Functional Class 1 and Aggregate Class II. Classification data from years 1992 and 1993 were used. Figure 29 shows the results of the analysis for Aggregate Class II (Vehicle Type 2). Fifteen stations are the minimum necessary to adequately define the distribution of vehicle types in this functional class. Figure 29 only shows the convergence of the mean for Vehicle Type 2; however, each vehicle type must be checked and must converge within the same number of stations. It should be noted, however, that if the three or four major vehicle types (most numerous) converge, then statistically, the remaining types will also converge. Although not shown, Functional Class 1 converged in 14 stations.

E. SUMMARY

The process for estimating ESALs based on traffic data collected by the Transportation Cabinet's Division of Transportation Planning is a continuously evolving process. There have been numerous revisions to the computer programs which are used to process weight and classification data. The need for additional revisions to improve the efficiency and streamline the process was the focus of this research task. This activity was undertaken as part of the research study titled "Calibration and Correlation of Weigh-in-Motion Systems and ESAL Program Enhancements". Another objective of the overall study was to develop a more definitive and accurate method for reflecting the effects of coal or heavy truck movements. The results of that activity were reported separately as Report KTC-95-6 (10). In addition, a third report is to be prepared as part of the study which documents the methodology for continuous correlation and calibration of the various weigh-in-motion systems used in Kentucky.

Following are specific tasks accomplished and documented as a result of efforts to improve the processes for estimating ESALs.

1. In an attempt to minimize the problems associated with limited availability of data within some of the functional classes, data have been aggregated within six categories. It is anticipated that future processing of traffic data to estimate ESALs will rely on aggregated data. In order to ensure the validity of this process, at least one year of ESAL estimates will be prepared using the new aggregation categories and the twelve functional classes.

2. The overall ESAL estimating process, which was previously accomplished using mainframe computer programs, was converted entirely to microcomputer/PC. Output from the mainframe and microcomputer programs were compared and the results were essentially the same, with only minor differences due to data rounding in the CLASSUM program.

3. The procedure for processing traffic data and producing annual ESAL estimates using the 12 functional classes was documented. Example output was presented in Appendix A. The entire set of data for 12 functional classes was processed and transmitted to the Division of Transportation Planning. Detailed instructions for the following programs were prepared;

   a) WIM — converts dynamic weight data to static and performs edit checks,

b) UNITEAL processes weight data to produce ESALs per vehicle,

c) LOADOMTR processes truck weight data and produces axleload distributions for each of 10 truck types,

d) CLASSUM processes vehicle classification data and produces annual average number of vehicle types at each classification station,

e) EALCALC merges weight data from LOADOMTR and classification data form CLASSUM to produce the primary ESAL parameters, and

f) SMTHW processes output form EALCALC to fit a straight-line curve through the data and produce a smoothed output of traffic parameters.

4. The procedure for processing of ESAL data by aggregate classes was documented. Example output was presented in Appendix B. The entire set of ESAL tables was processed using 1994 data and transmitted to the Division of Transportation Planning.

5. A procedure for producing ESAL estimates based on data from individual WIM stations was documented. Weight and classification data were processed to produce site-specific ESAL estimates.

6. An analysis was preformed to determine the reliability of traffic parameter estimates used in the ESAL forecasting process. Results were produced to identify the number of volume, classification, and WIM stations required to adequately define the traffic characteristics of a specific functional class. Only four stations are necessary for volume data; 12 to 13 stations are necessary for weight data, and 15 stations are necessary for distribution of vehicle types.

F. RECOMMENDATIONS FOR FUTURE RESEARCH

As part of the research effort, the following areas were identified which may justify further evaluation.

1. Development of a computer program for converting WIM data collected in the field to ESALs. This type of data would be beneficial to make a

determination in the field whether equipment is functioning properly and whether accurate representations of ESALs are being collected.

2. Additional effort is required to modify or replace the CLASSUM computer program to reflect changes in seasonal adjustment factors. It is anticipated that results from a concurrent analysis of vehicle classification data will be available to expand short-term classification data to longer periods of time.

3. Modifications should be made to processing of classification data to include a three-year average of data to replace the current process which includes only the most recent year of data. This change would correspond to the current process which processes a three-year moving average of weight data for production of the annual ESAL tables.

4. An analysis should be performed to determine if ESAL data produced from the annual processing is consistent with ESAL parameters produced from analyses in other states.

G. REFERENCES

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2. Baker, R.R. and Drake, W.B.; "Investigation of Field and Laboratory Methods for Evaluating Subgrade Support in the Design of Highway Flexible Pavements", Bulletin No. 13, Engineering Experiment Station, University of Kentucky, September 1949 and Proceedings, Highway Research Board, Vol. 28, 1948.

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8. Southgate, H.F.; "Estimation of Equivalent Axleloads Using Data Collected by Automated Vehicle Classification and Weigh-in-Motion Equipment", Research Report KTC-90-11, Kentucky Transportation Center, University of Kentucky, June 1990.

9. Deacon, J.A., J.G. Pigman, Tollner, N.W. and Cain, D.H. ; "Enhancements to Procedure for Estimating ESALs", Research Report KTC-93-7, Kentucky Transportation Center, University of Kentucky, February 1993.

10. Harison, J.A., Allen, D.A. and Pigman, J.G.; "Development of an Alternate Methodology for Identifying Heavy/Coal Trucks and Calculating ESAL's/Axle and Axles/Truck", Research Report KTC-95-6, Kentucky Transportation Center, University of Kentucky, May 1995.

Table 1. Average ADT's and ADT Factors from Six ATR Stations.

VEHICLE TYPE : 1 - 15 AVERAGE DAILY TRAFFIC												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SUN	20,912	21,021	21,755	29,047	24,258	31,115	30,796	32,997	29,086	29,604	29,114	24,451
MON	23,163	22,921	23,752	26,837	27,929	29,121	31,243	29,680	30,255	27,802	26,467	26,597
TUE	24,211	23,275	25,291	27,188	23,144	29,108	31,769	29,695	28,578	28,543	28,400	23,490
WED	24,730	25,774	26,286	28,072	24,204	31,317	31,785	31,457	28,616	29,818	31,569	27,437
THU	24,996	23,289	28,157	30,588	25,817	32,358	35,381	33,125	30,297	32,683	30,550	28,916
FRI	25,691	26,688	32,360	35,465	30,495	36,724	38,610	37,210	37,669	37,513	32,553	28,768
SAT	23,075	22,957	22,457	28,073	19,827	31,988	33,428	31,968	32,847	30,780	29,513	23,921
			VT-1 TO 15 AADT = 28607.5									

VEHICLE TYPE : 1 TO 15 ADT factors												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SUN	.731	.735	.760	1.015	.848	1.088	1.077	1.153	1.017	1.035	1.018	.855
MON	.810	.801	.830	.938	.976	1.018	1.092	1.037	1.058	.972	.925	.930
TUE	.846	.814	.884	.950	.809	1.018	1.111	1.038	.999	.998	.993	.821
WED	.864	.901	.919	.981	.846	1.095	1.111	1.100	1.000	1.042	1.104	.959
THU	.874	.814	.984	1.069	.902	1.131	1.237	1.158	1.059	1.142	1.068	1.011
FRI	.898	.933	1.131	1.240	1.066	1.284	1.350	1.301	1.317	1.311	1.138	1.006
SAT	.807	.802	.785	.981	.693	1.118	1.168	1.117	1.148	1.076	1.032	.836

Table 2. Average Required Sample Sizes.

SAMPLE SIZES REQUIRED TO OBTAIN +/- 10% ERRORs (AVERAGE)								
	(For Interstates)							
	SUN	Mon	Tue	Wed	Thu	Fri	Sat	AVG.
5 % Risk	6.5	4	4	4	4	5	6	4.8
10 % Risk	5	3	3	3.5	3	4	4	3.6

Table 3. Accumulated Mean Tandem Weight for 17 Stations in Functional Class 1 (WIM Data for Years 1992, 1993, and 1994).

NUMBER OF STATIONS	ACCUMULATIVE NUMBER OF TANDEMS WEIGHED	ACCUMULATIVE MEAN TAMDEM WEIGHT	STANDARD DEVIATION
1	16834	23173	6356
2	45780	23418	6298
3	77743	21446	7015
4	93530	21498	7043
5	114535	21714	7102
6	132779	21661	7425
7	155930	22179	7586
8	168234	22113	7590
9	176581	21685	7713
10	192761	21848	7616
11	217568	22012	7692
12	231821	22398	7857
13	245183	22413	7832
14	281042	22483	7775
15	294369	22454	7760
16	301359	22418	7760
17	322642	22608	7796

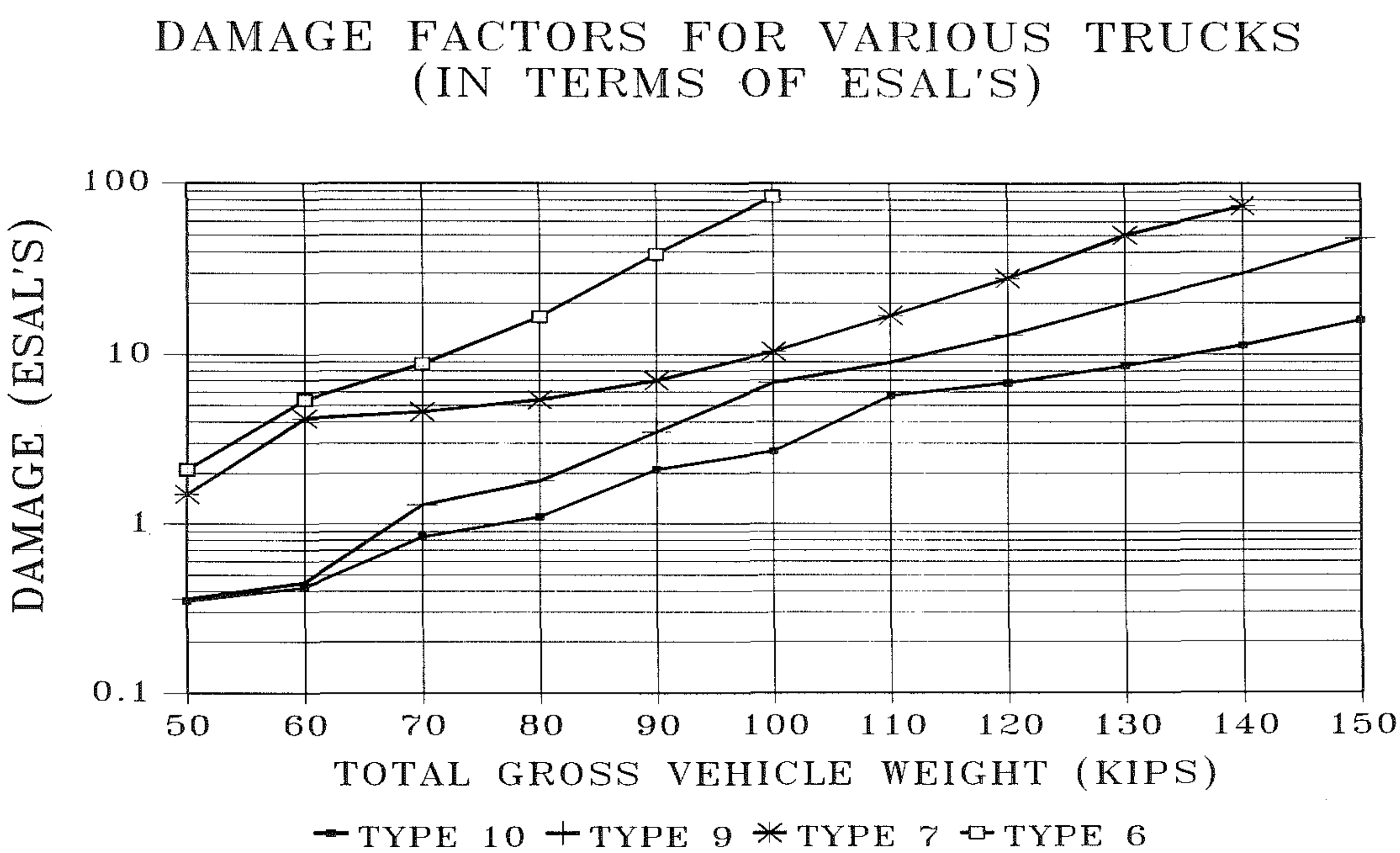


Figure 1. Damage Factors for Various Trucks and Weights

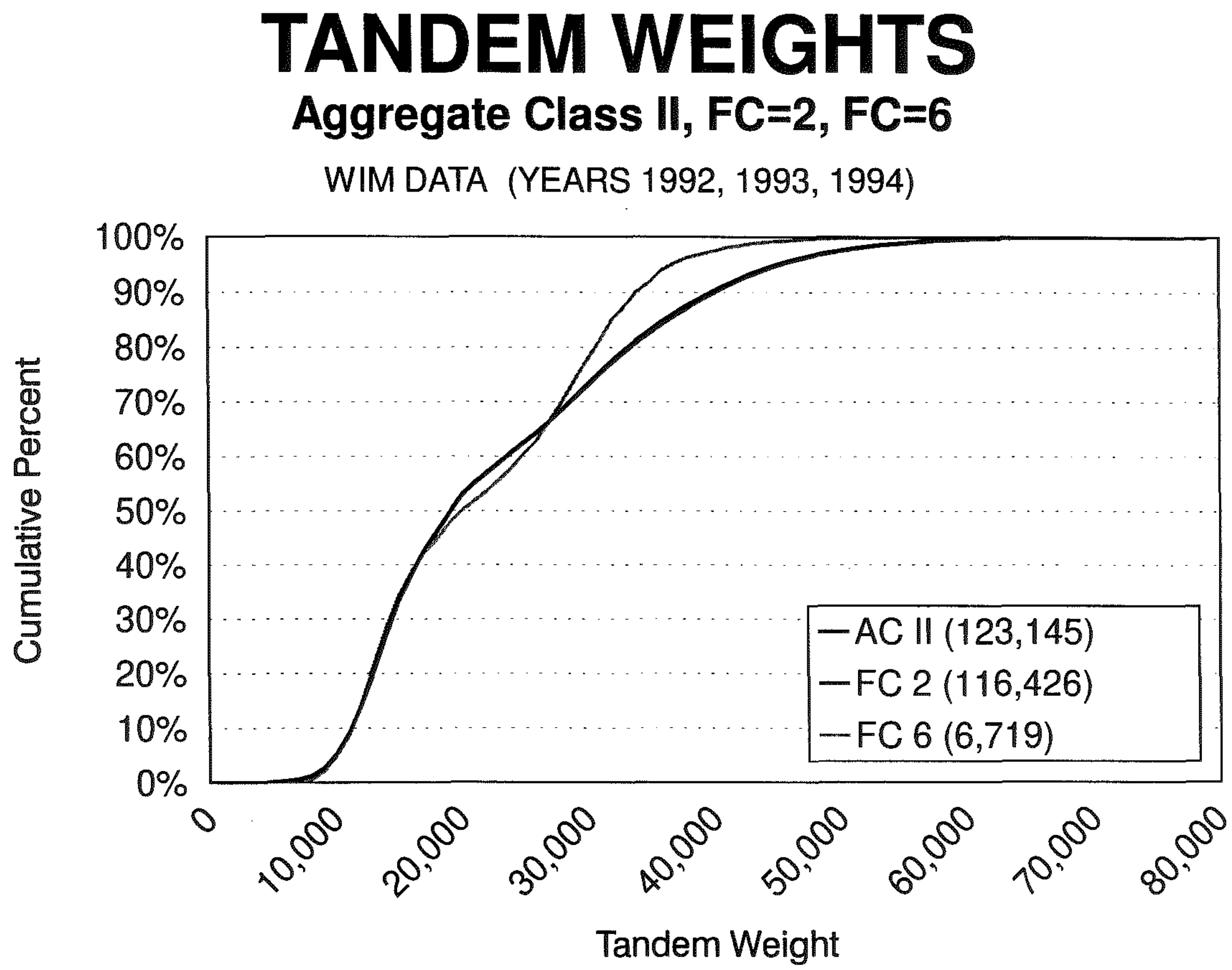


Figure 2. Accumulative Distribution of Tandem Weights (Class II).

COMPARISON OF FC 6 WITH AGGREGATE CLASS II
(COMPARED AT 90% CONFIDENCE LEVEL)

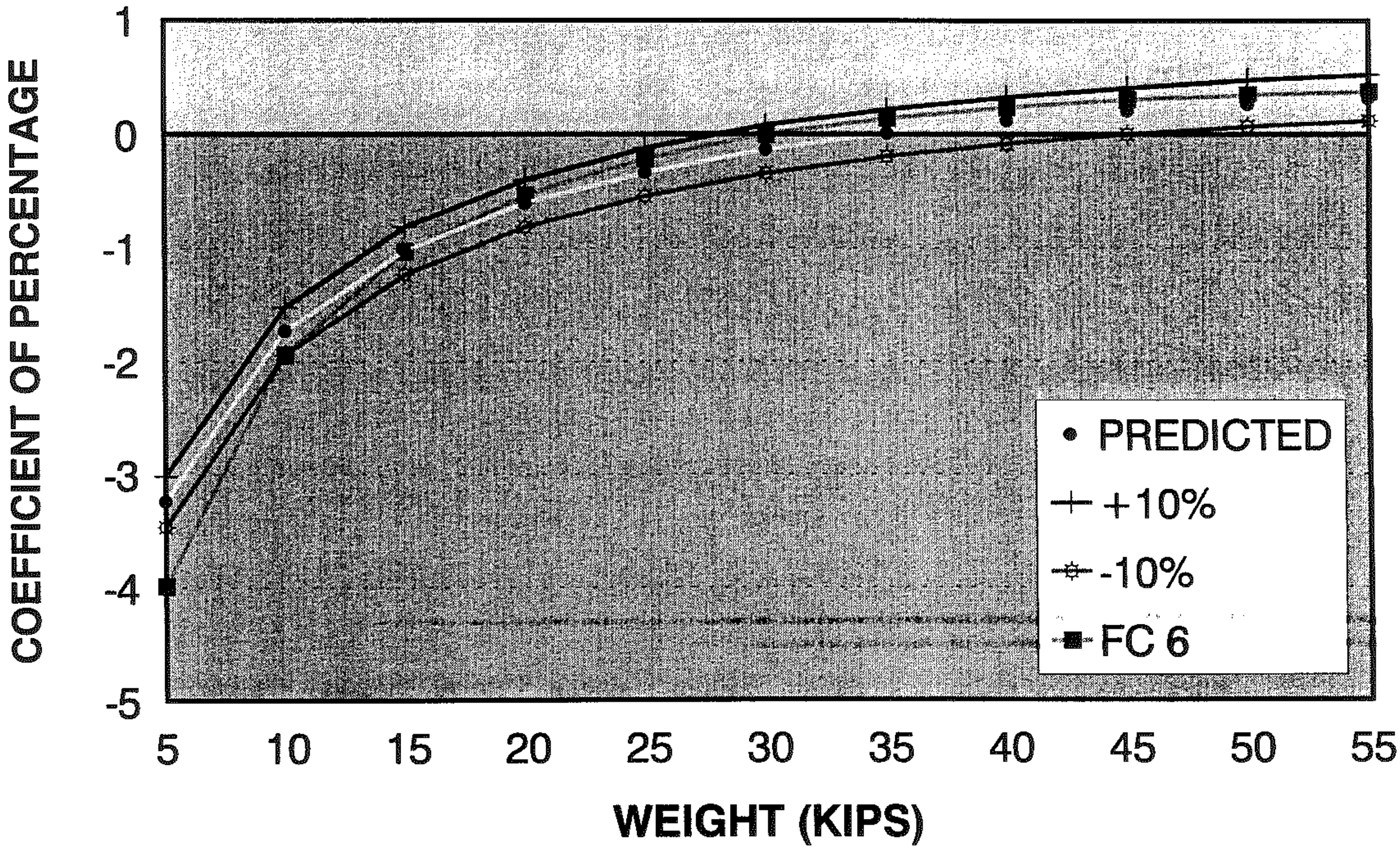


Figure 3. Transformed Distribution Functions (Class II).

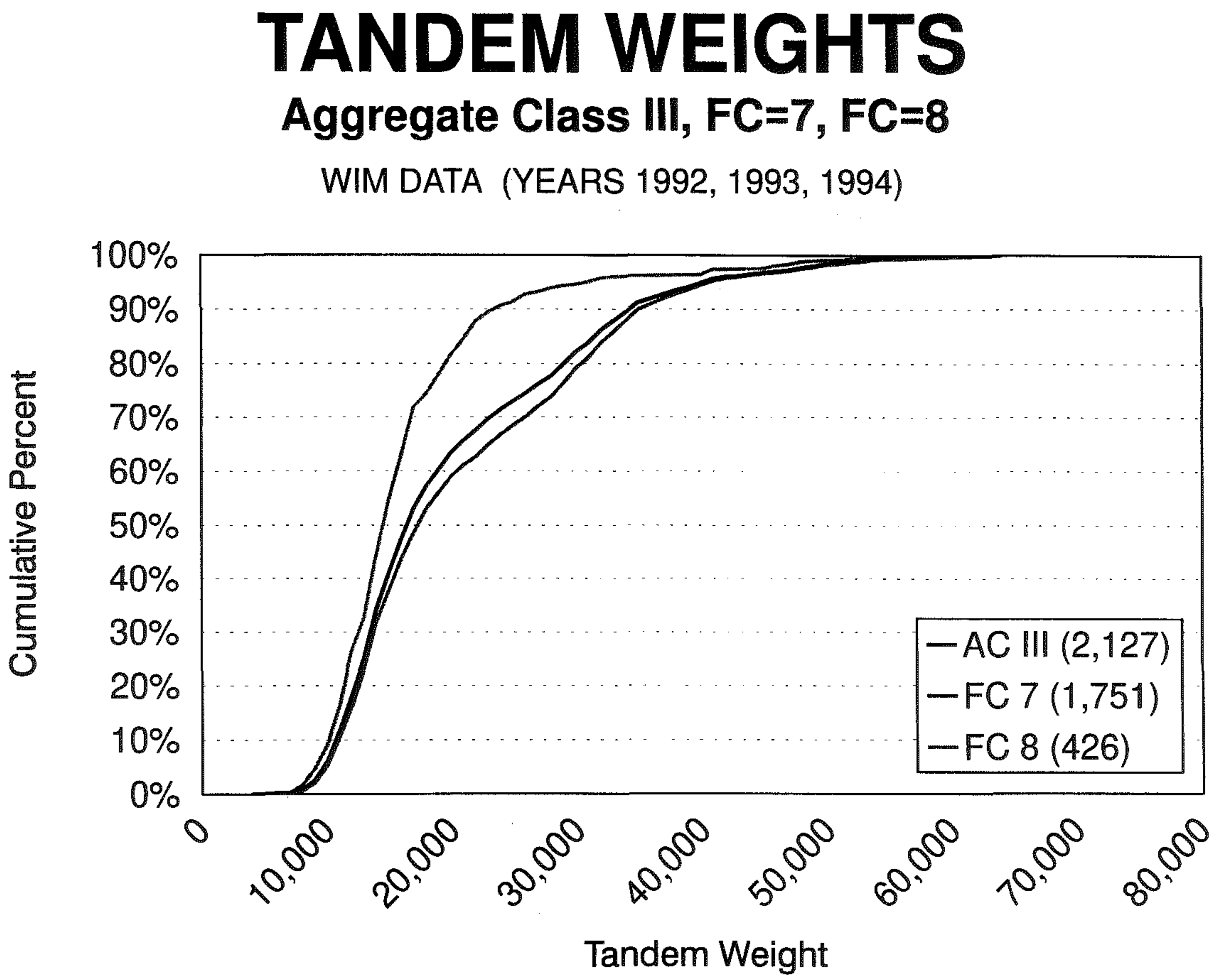


Figure 4. Accumulative Distribution of Tandem Weights (Class III).

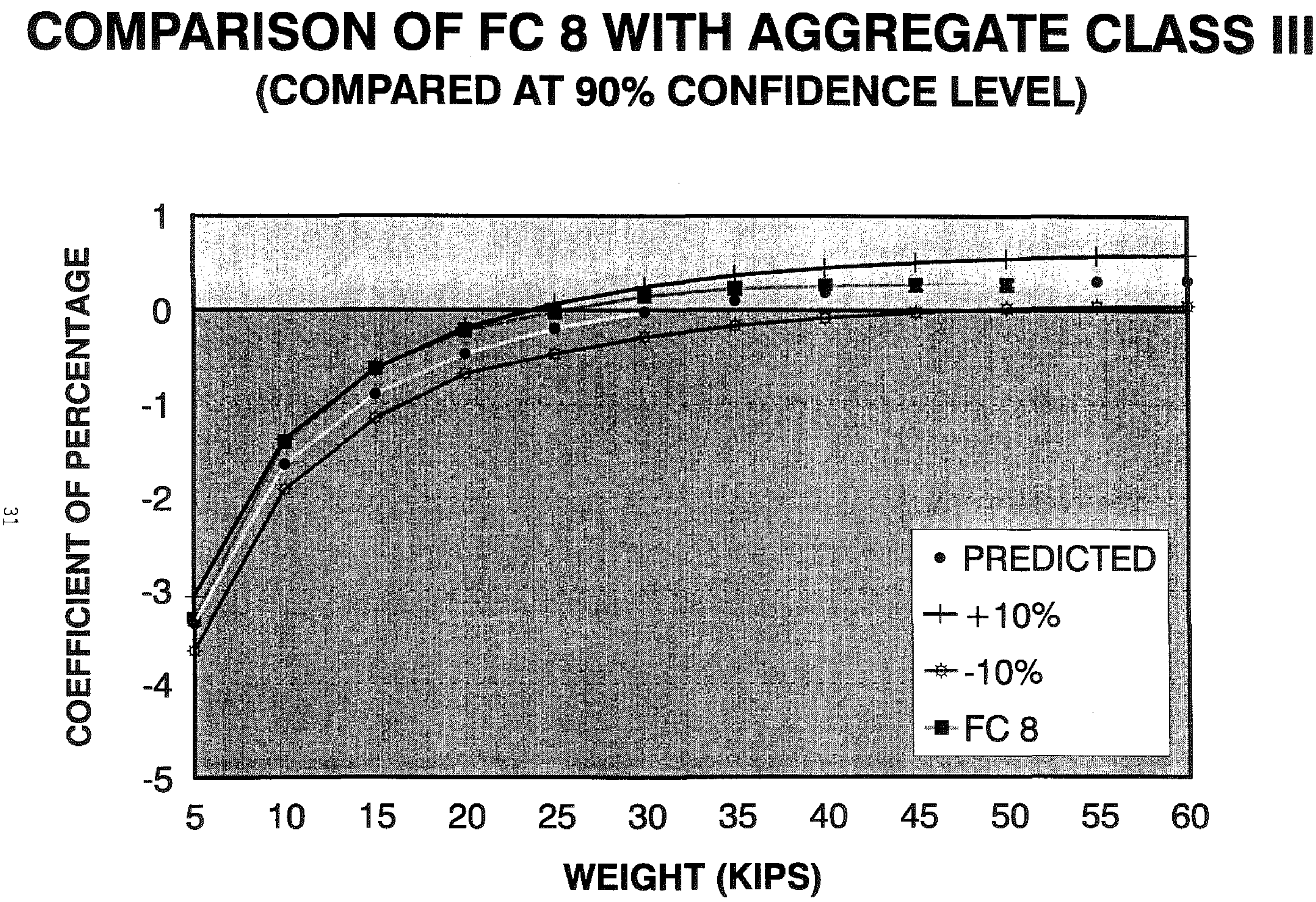


Figure 5. Transformed Distribution Functions (Class III).

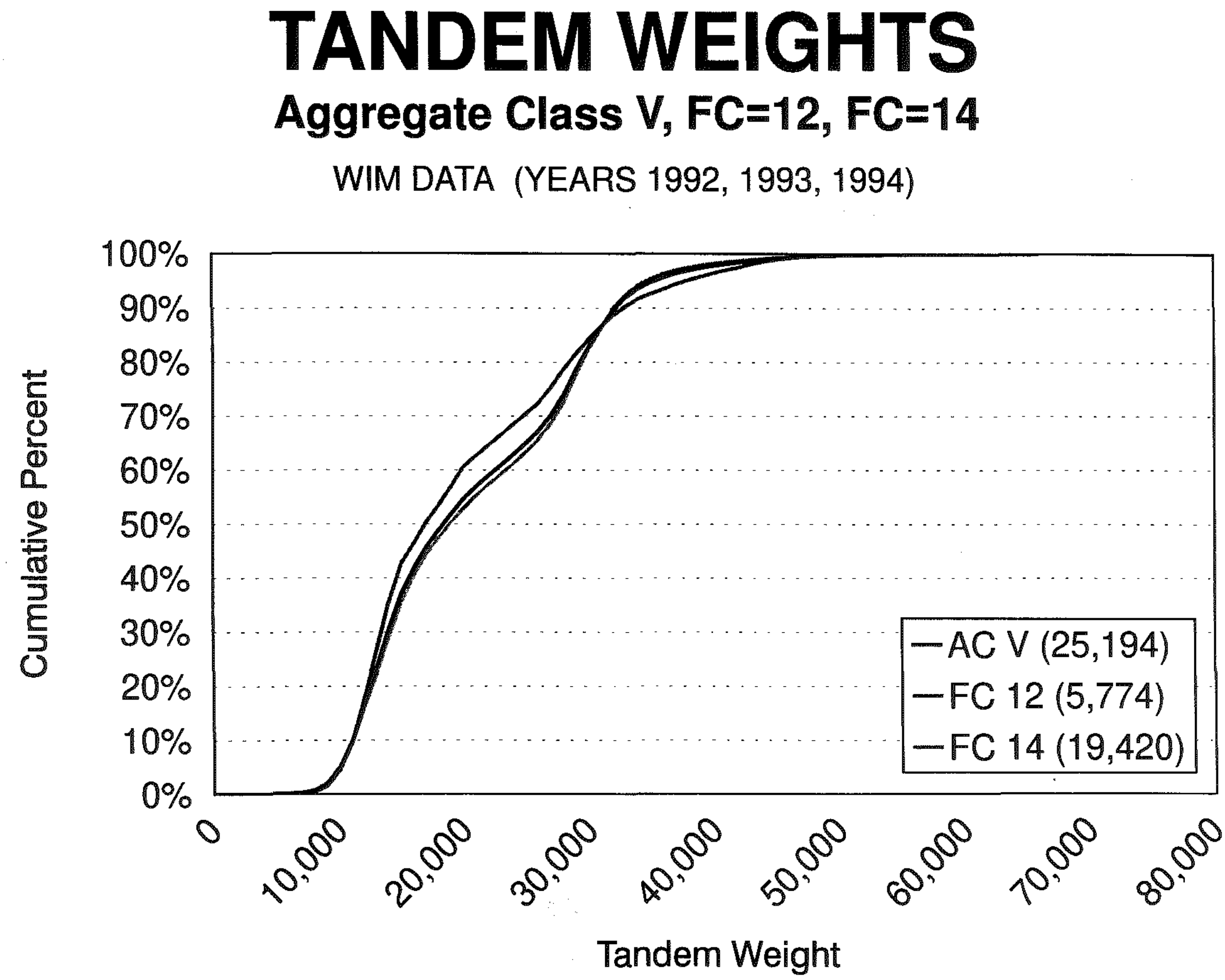


Figure 6. Accumulative Distribution of Tandem Weights (Class V).

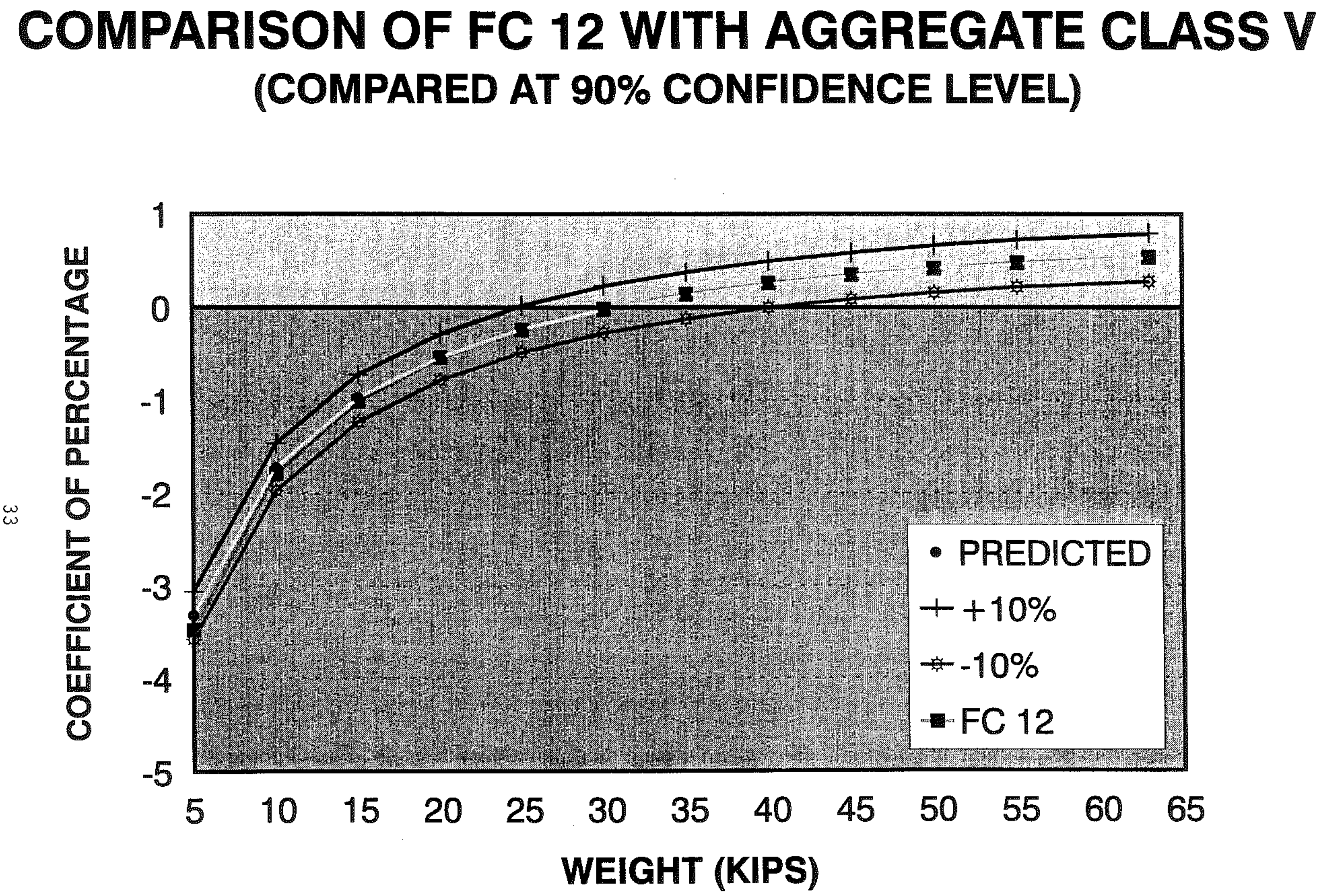


Figure 7. Transformed Distribution Functions (Class V).

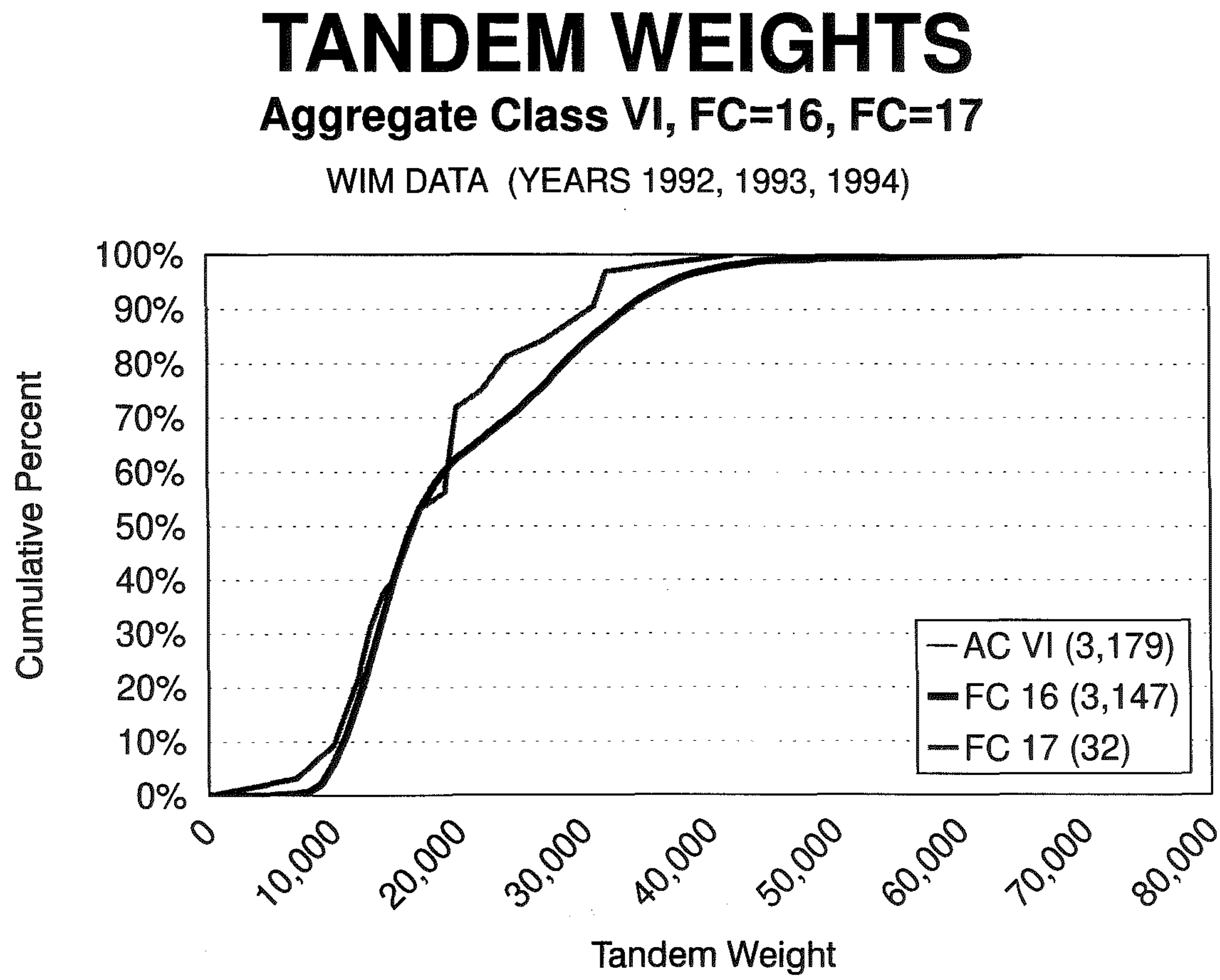


Figure 8. Accumulative Distribution of Tandem Weights (Class VI).

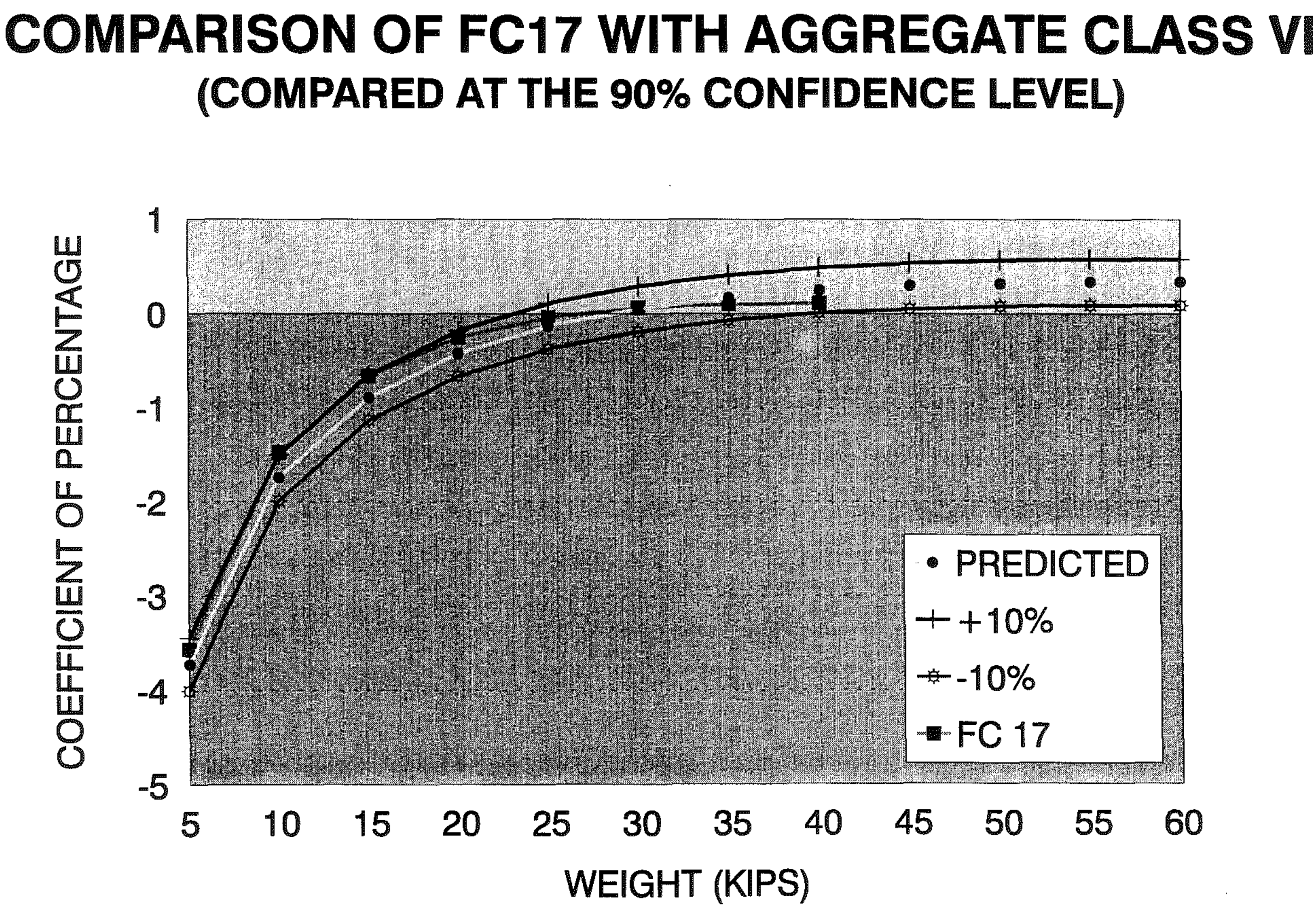
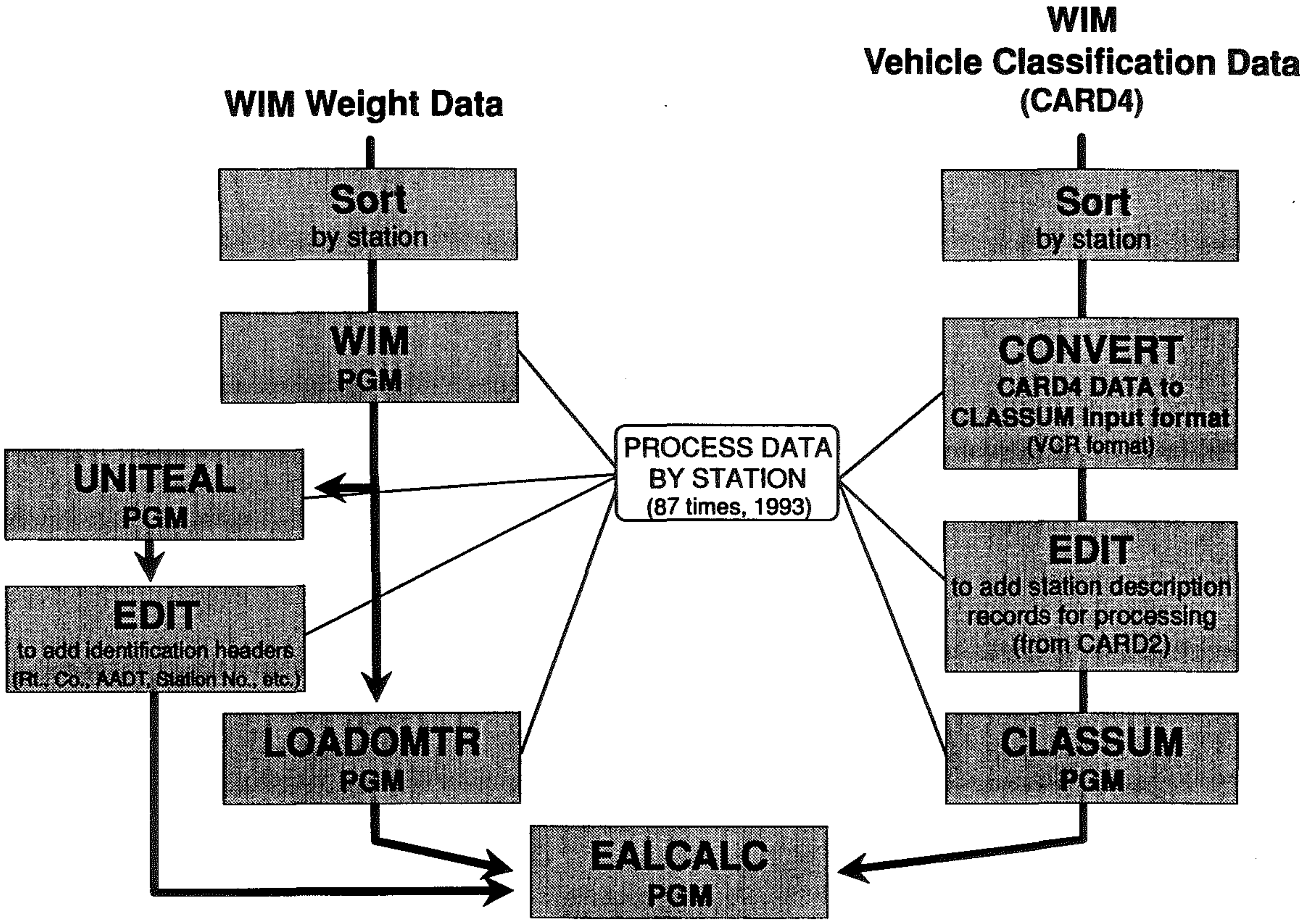


Figure 9. Transformed Distribution Functions (Class VI).

Figure 12. Procedure for Estimating ESAL's by Station



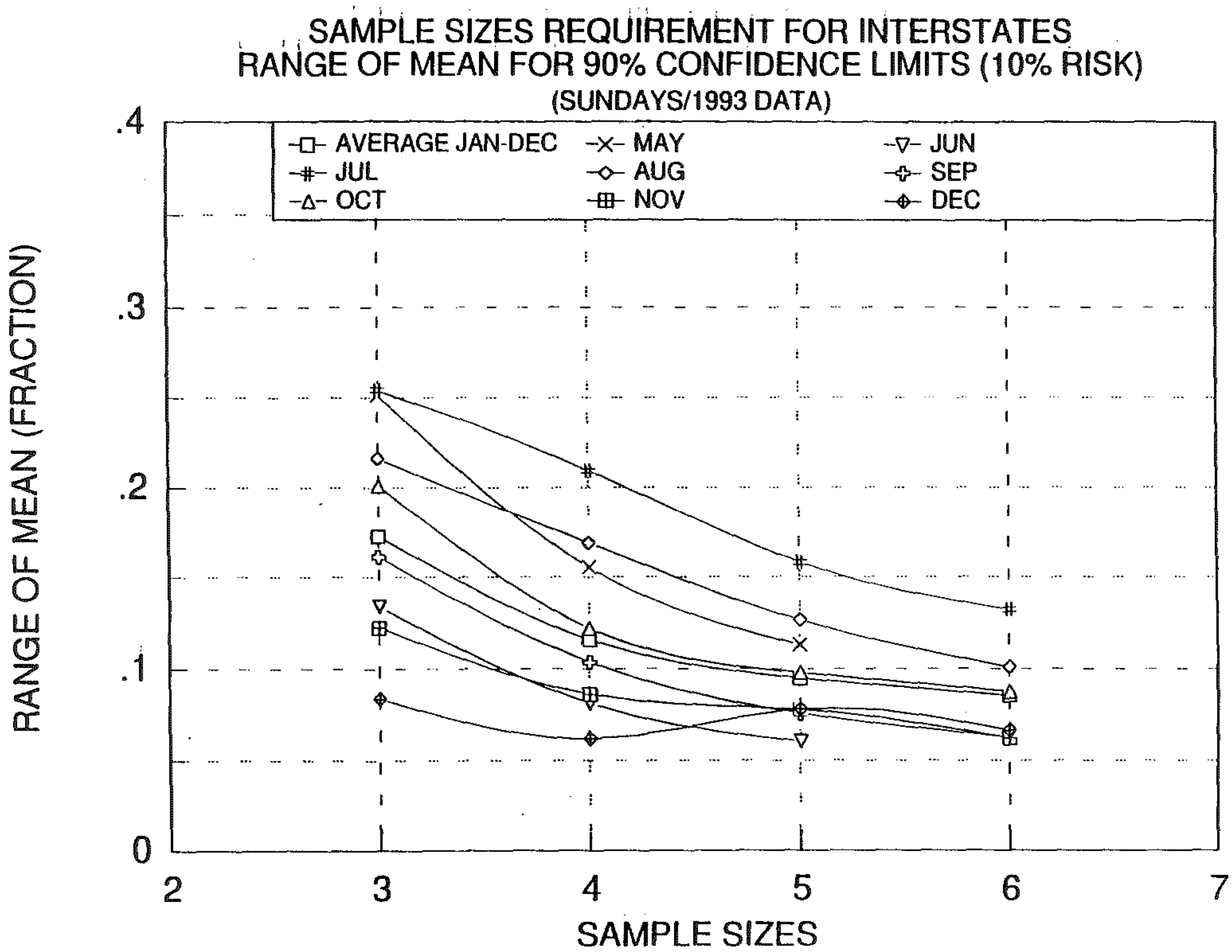


Figure 13. Sample Size Requirements (Sundays), 90 percent Confidence limits.

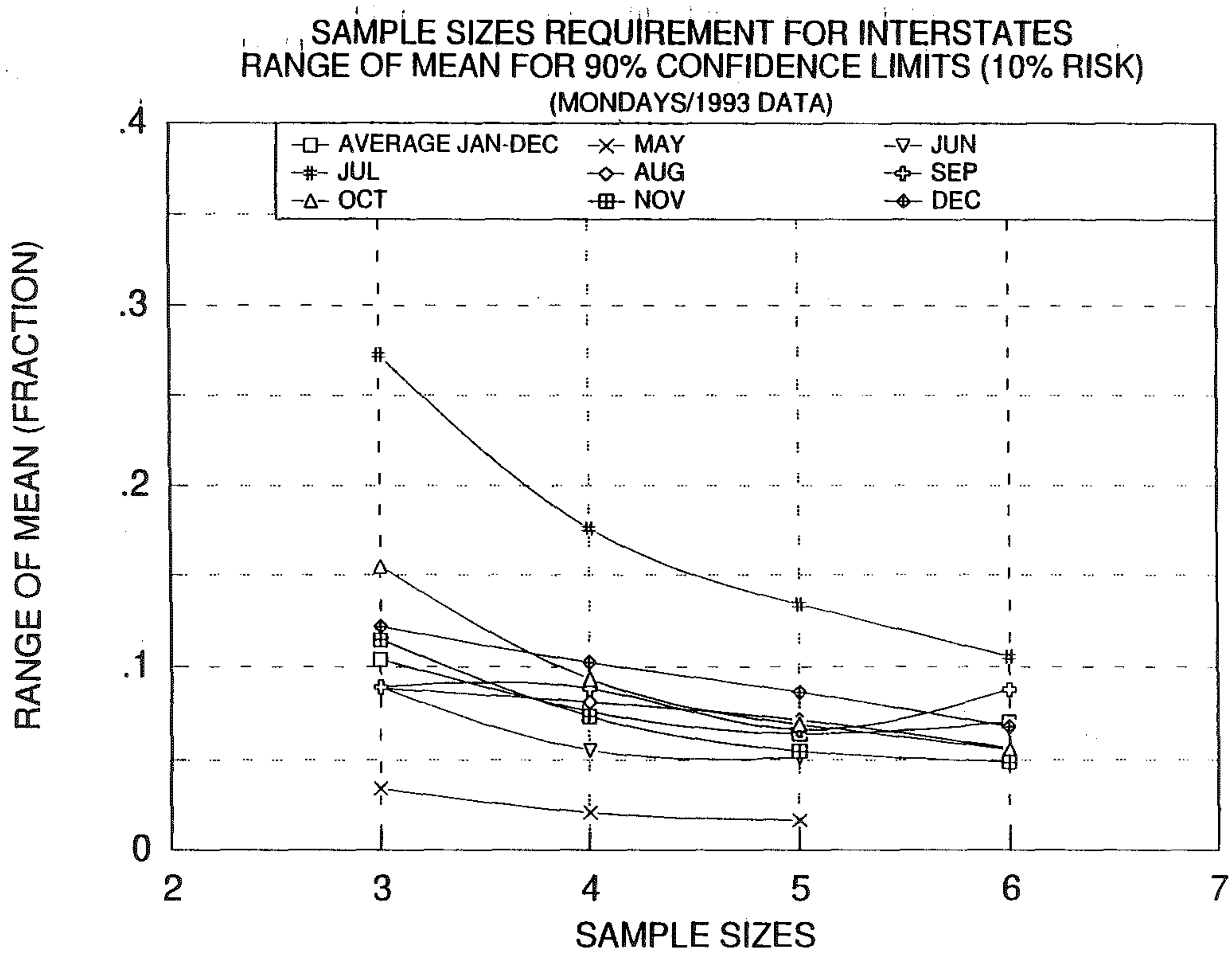


Figure 14. Sample Size Requirements (Mondays), 90 percent Confidence limits.

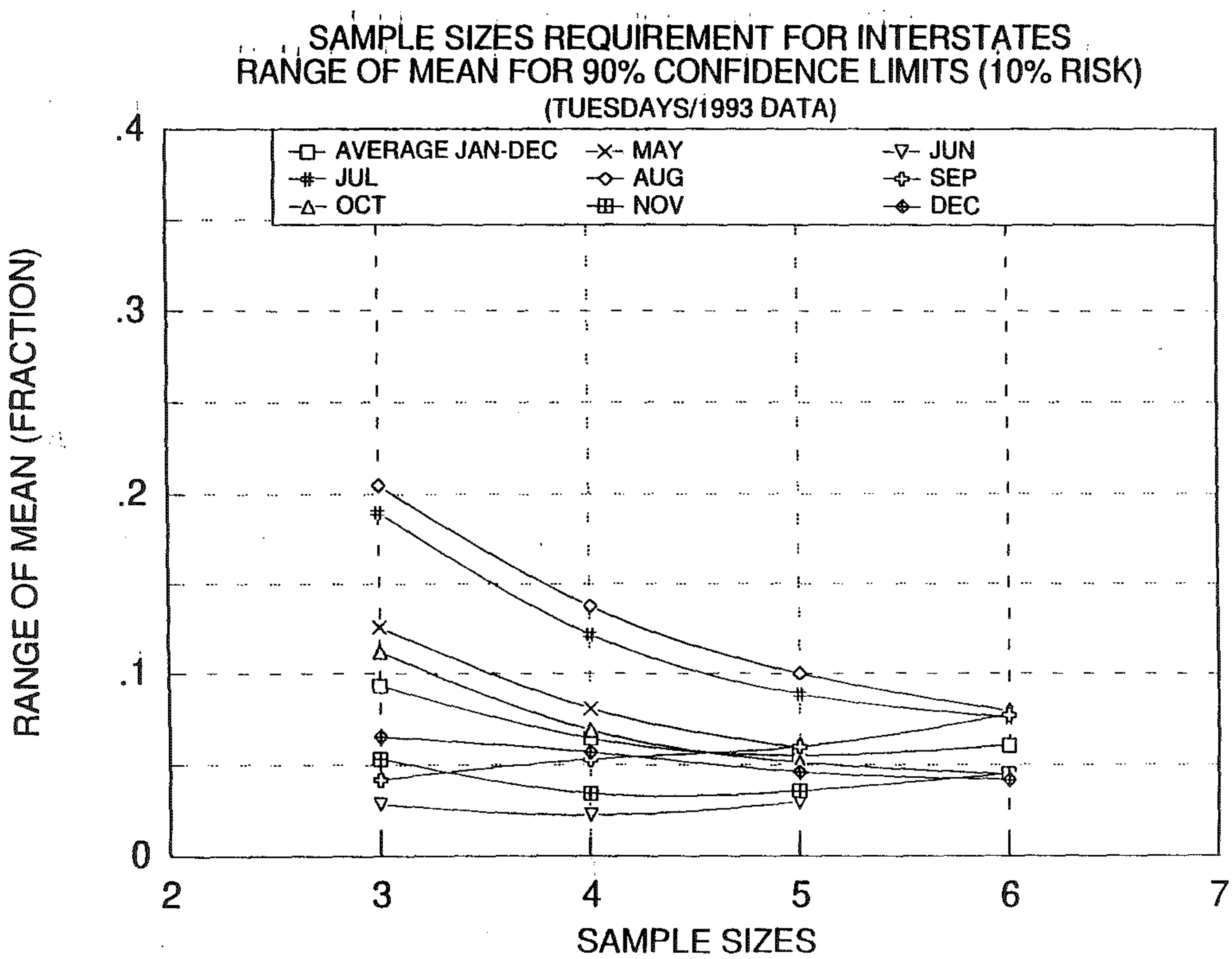


Figure 15. Sample Size Requirements (Tuesdays), 90 percent Confidence limits.

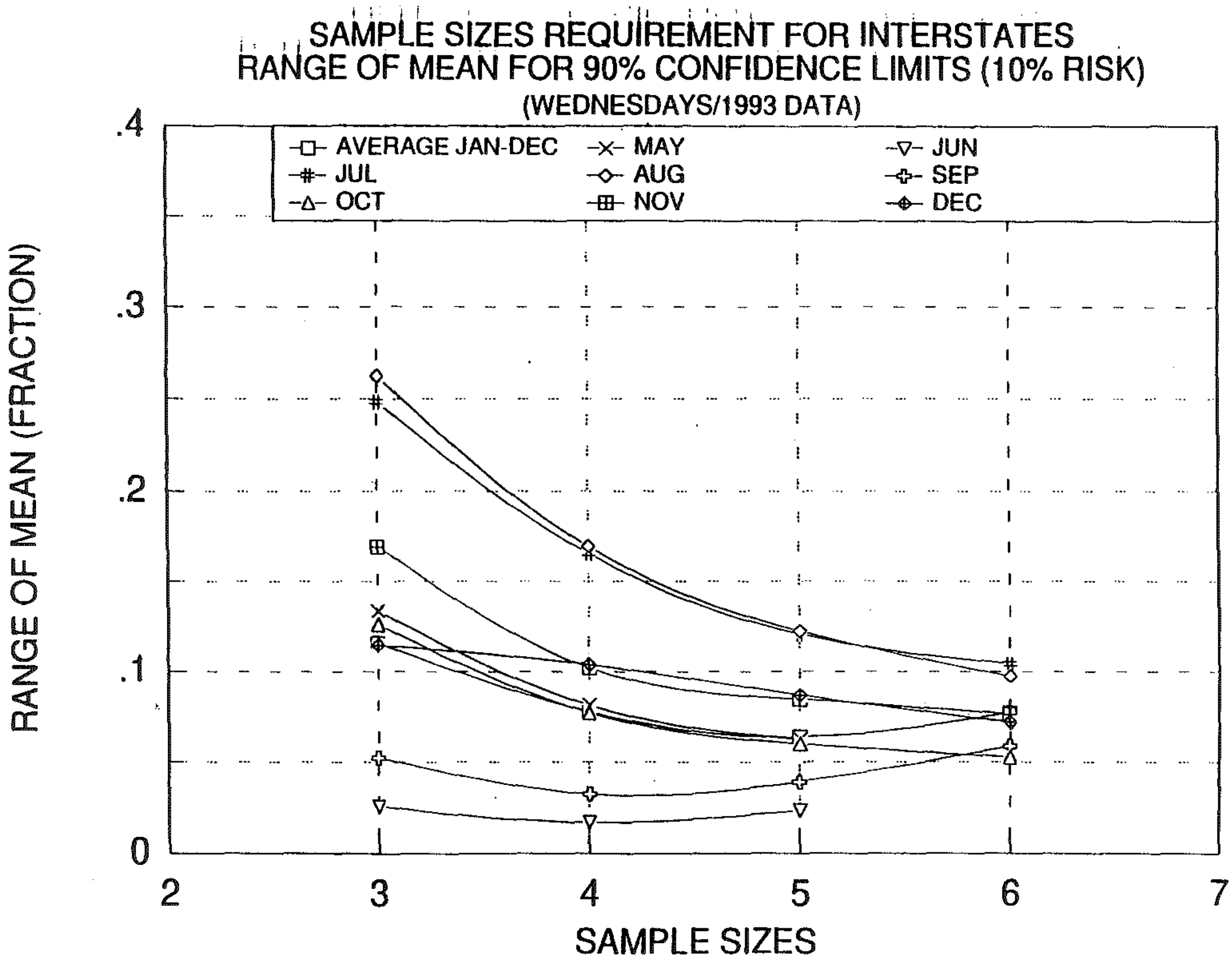


Figure 16. Sample Size Requirements (Wednesdays), 90 percent Confidence limits.

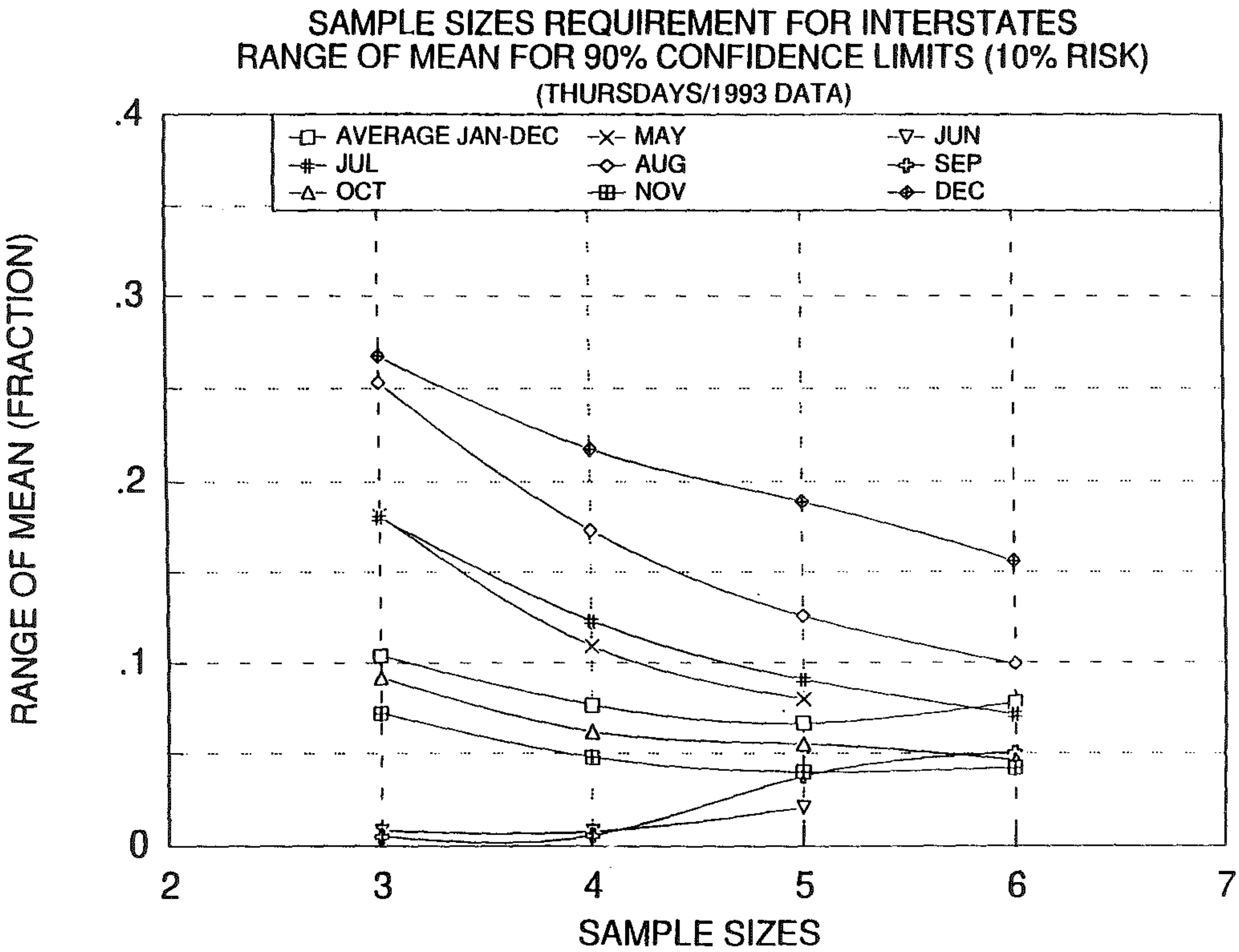


Figure 17. Sample Size Requirements (Thursdays), 90 percent Confidence limits.

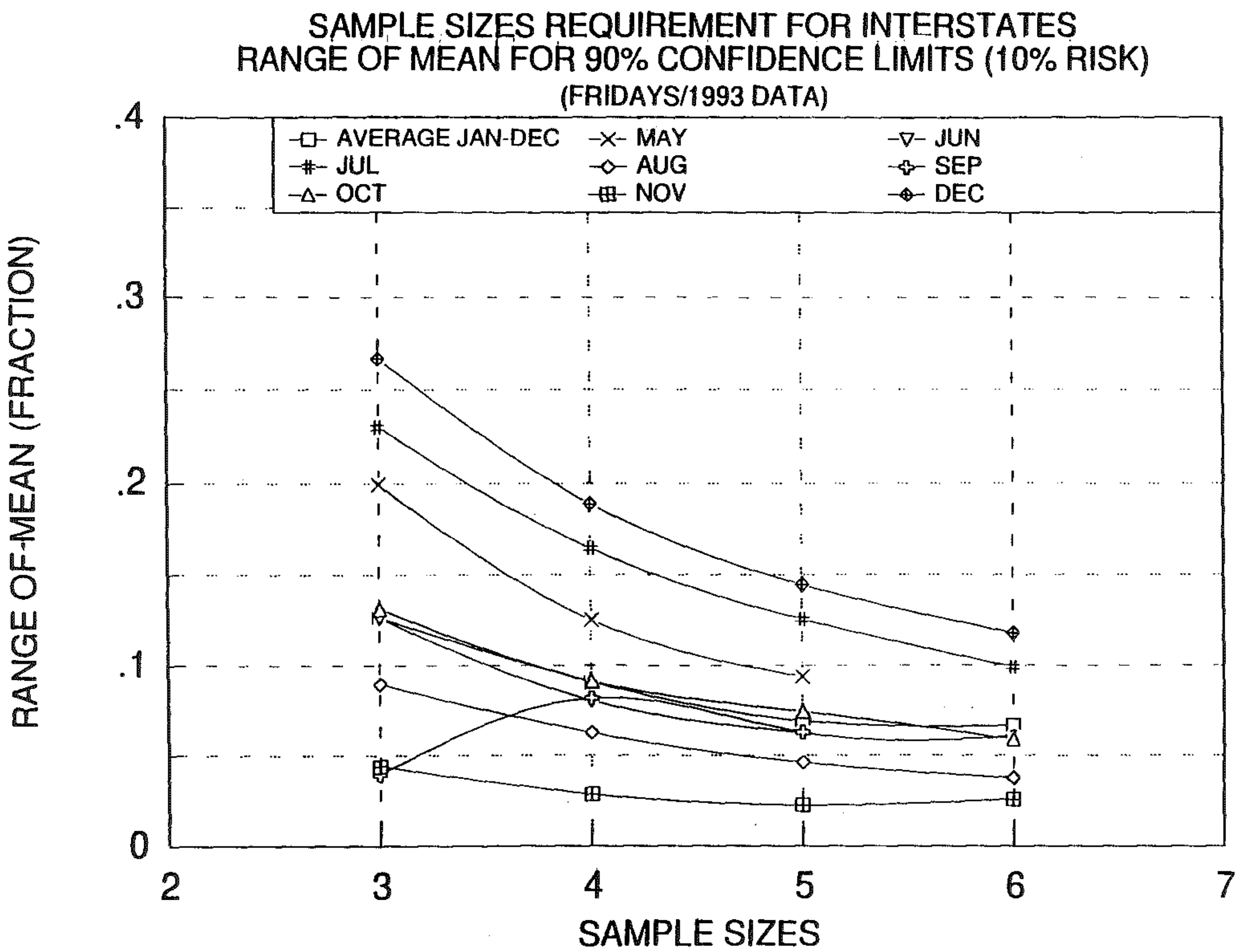


Figure 18. Sample Size Requirements (Fridays), 90 percent Confidence limits.

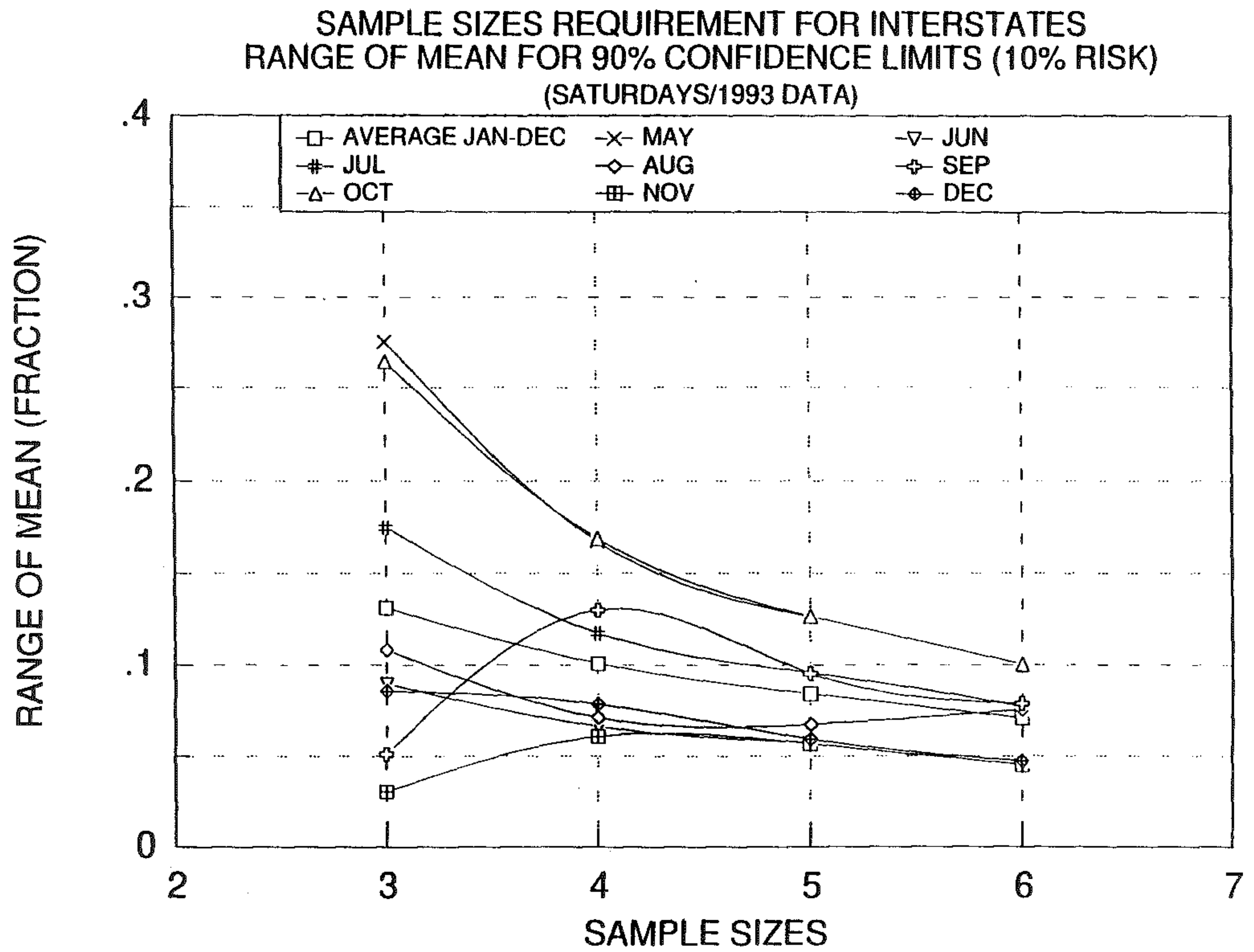


Figure 19. Sample Size Requirements (Saturdays), 90 percent Confidence limits.

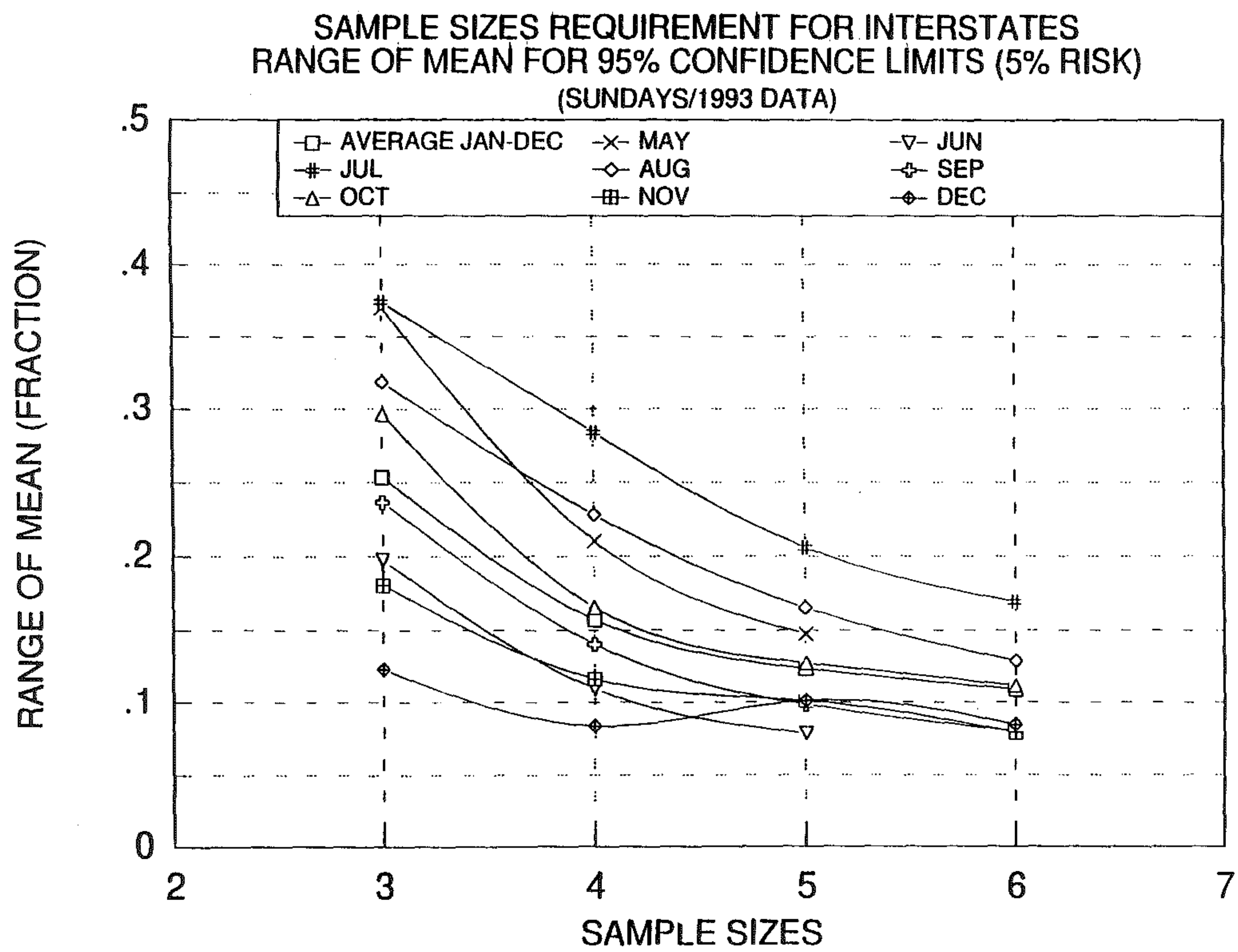


Figure 20. Sample Size Requirements (Sundays), 95 percent Confidence limits.

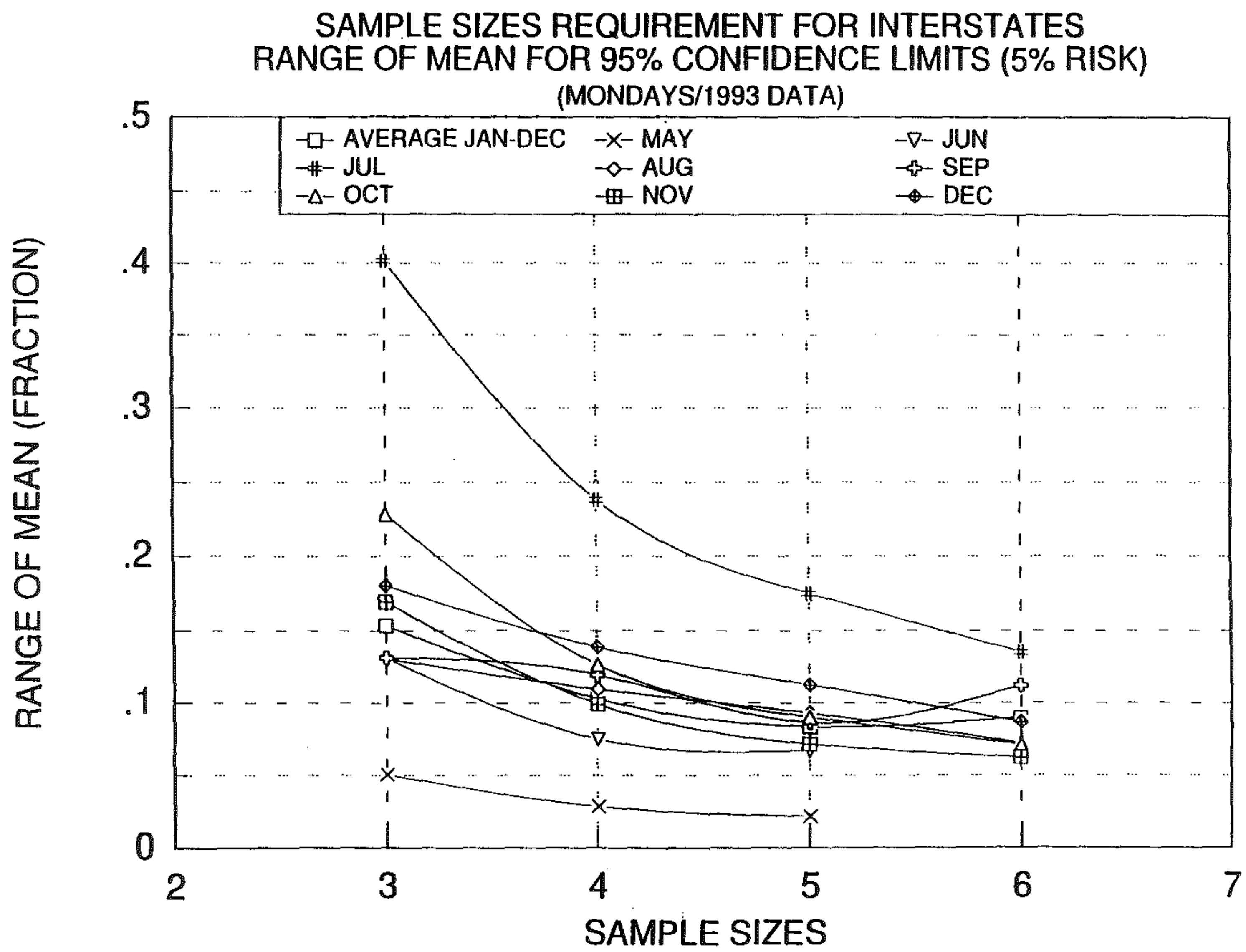


Figure 21. Sample Size Requirements (Mondays), 95 percent Confidence limits.

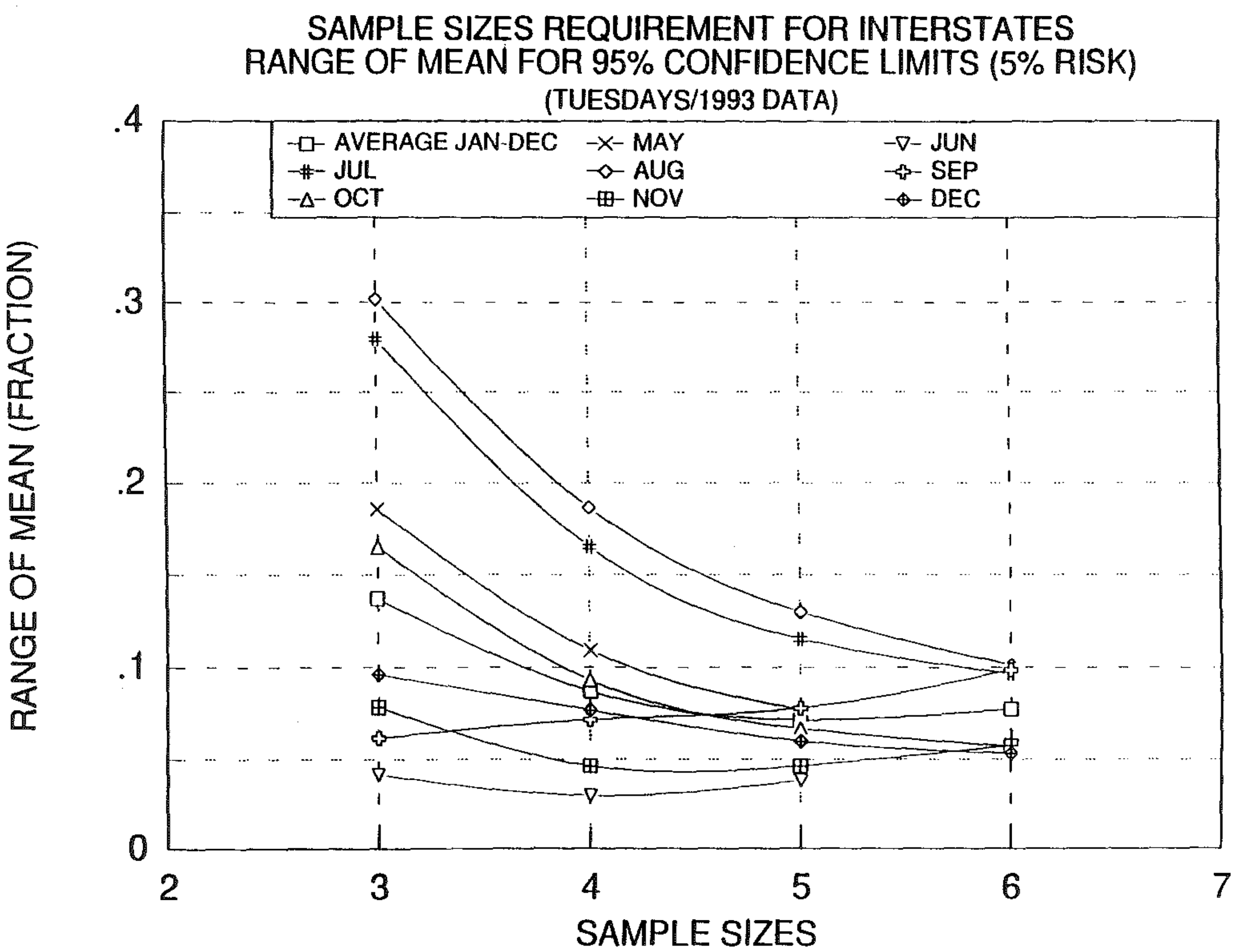


Figure 22. Sample Size Requirements (Tuesdays), 95 percent Confidence limits.

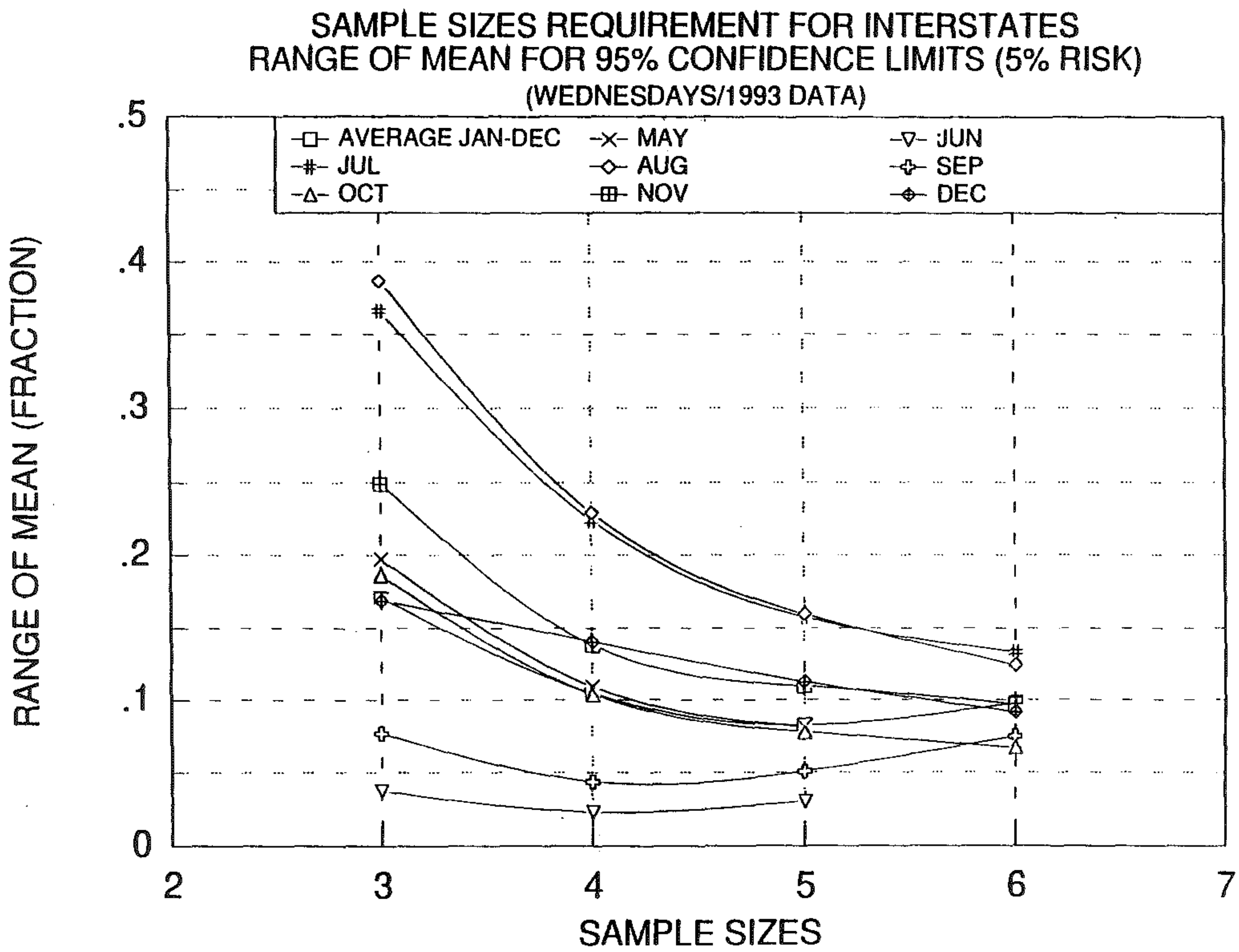


Figure 23. Sample Size Requirements (Wednesdays), 95 percent Confidence limits.

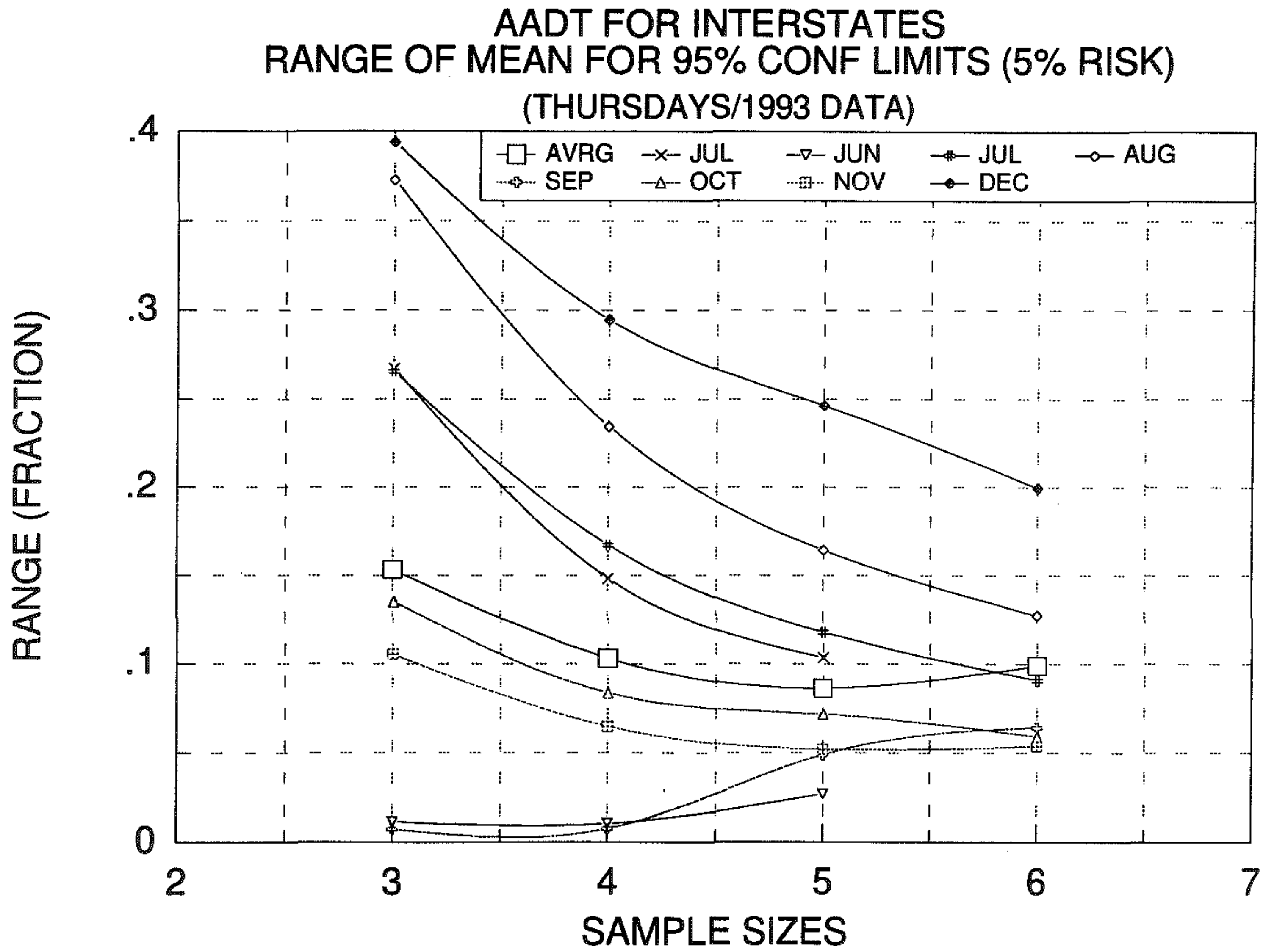


Figure 24. Sample Size Requirements (Thursdays), 95 percent Confidence limits.

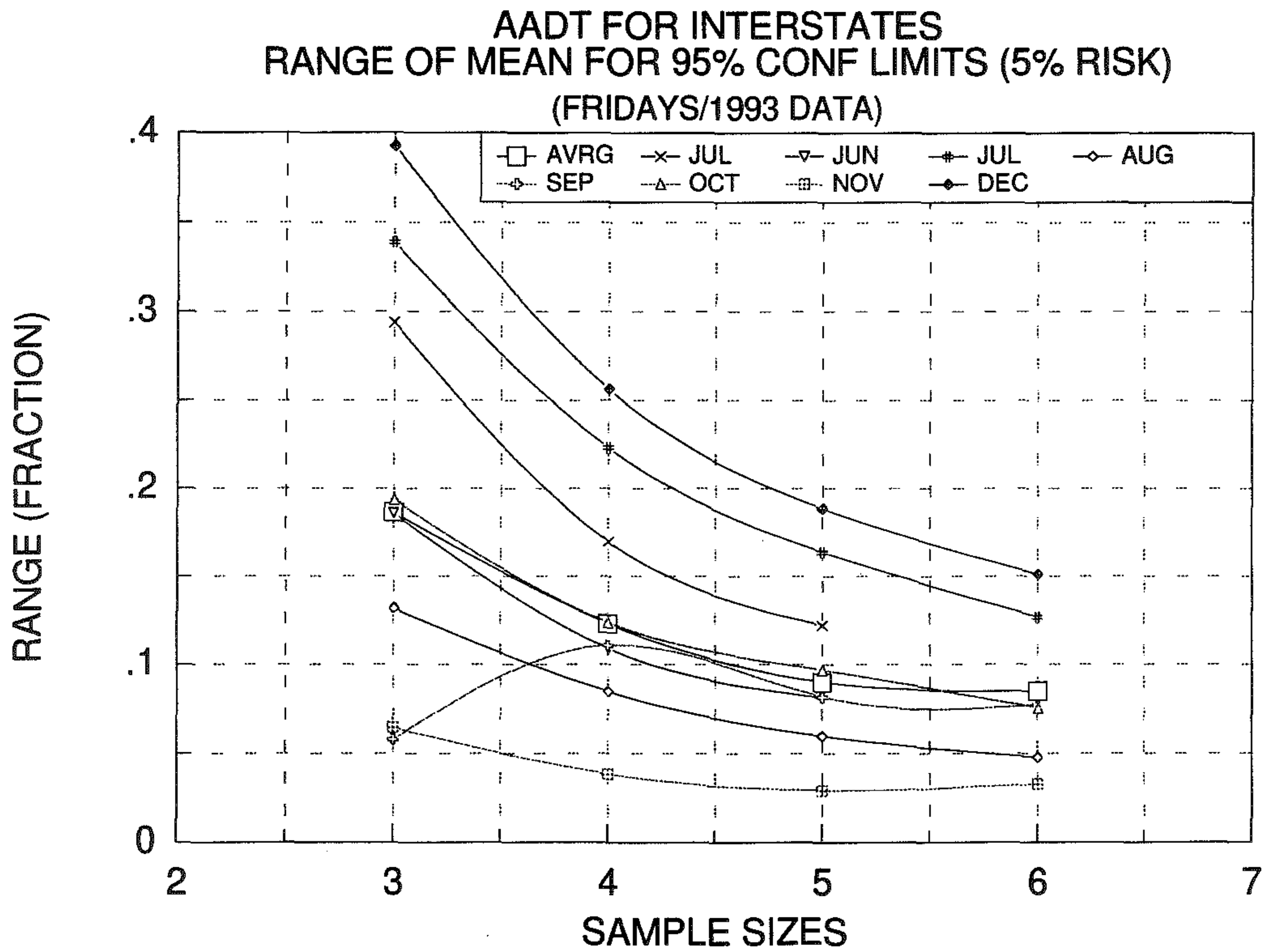


Figure 25. Sample Size Requirements (Fridays), 95 percent Confidence limits.

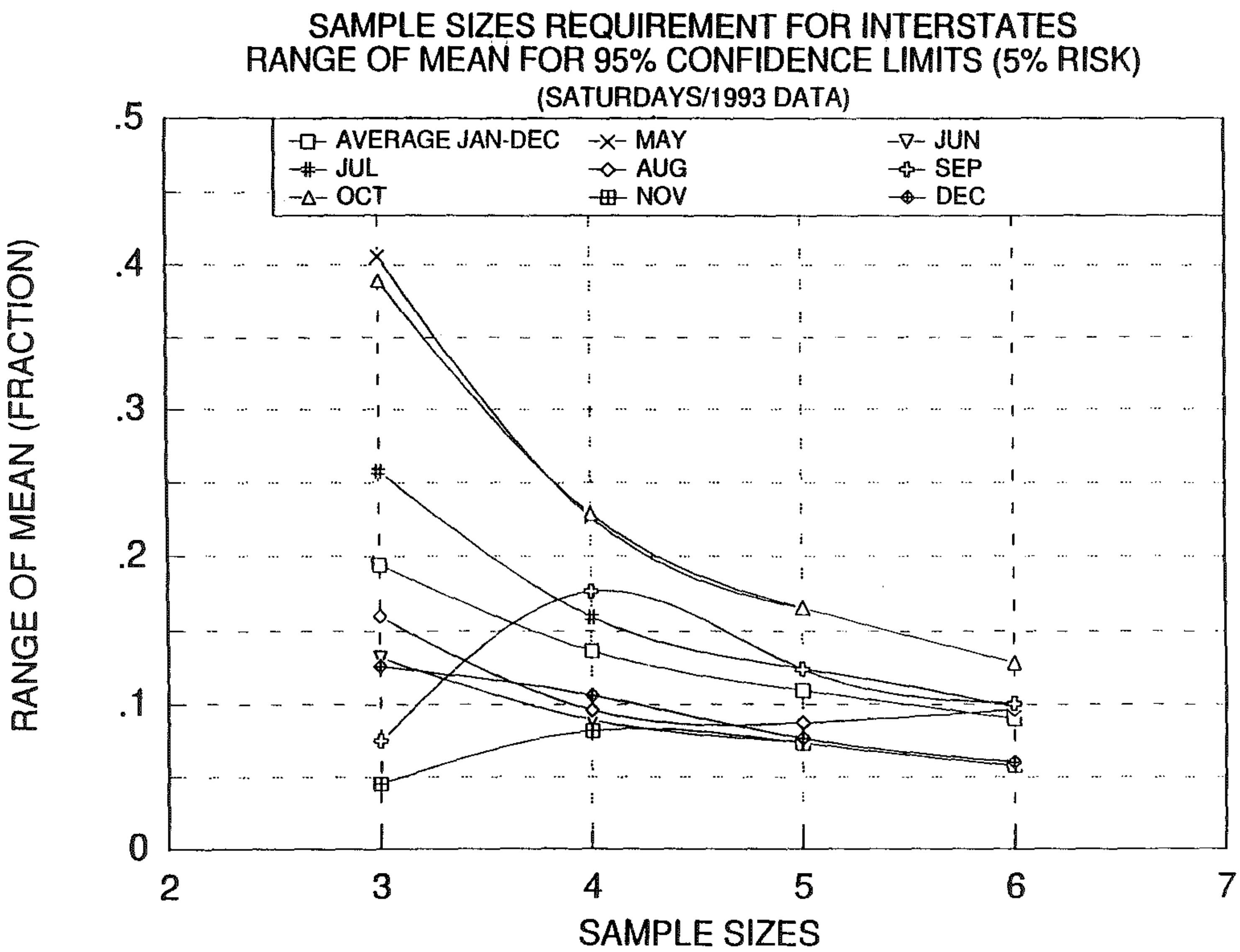


Figure 26. Sample Size Requirements (Saturdays), 95 percent Confidence limits.

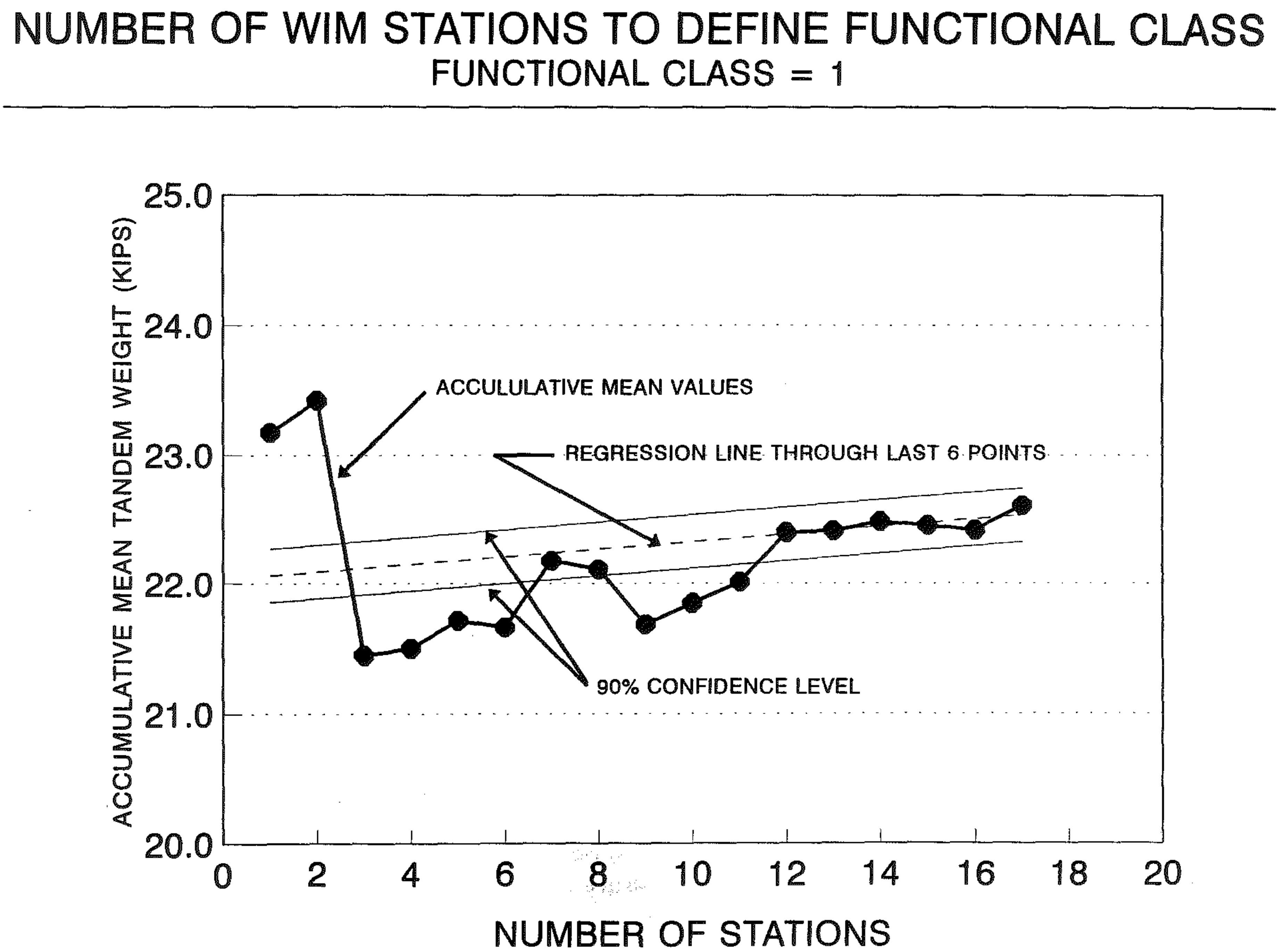


Figure 27. Relationship of Accumulative Tandem Weight Mean and Number of Stations.

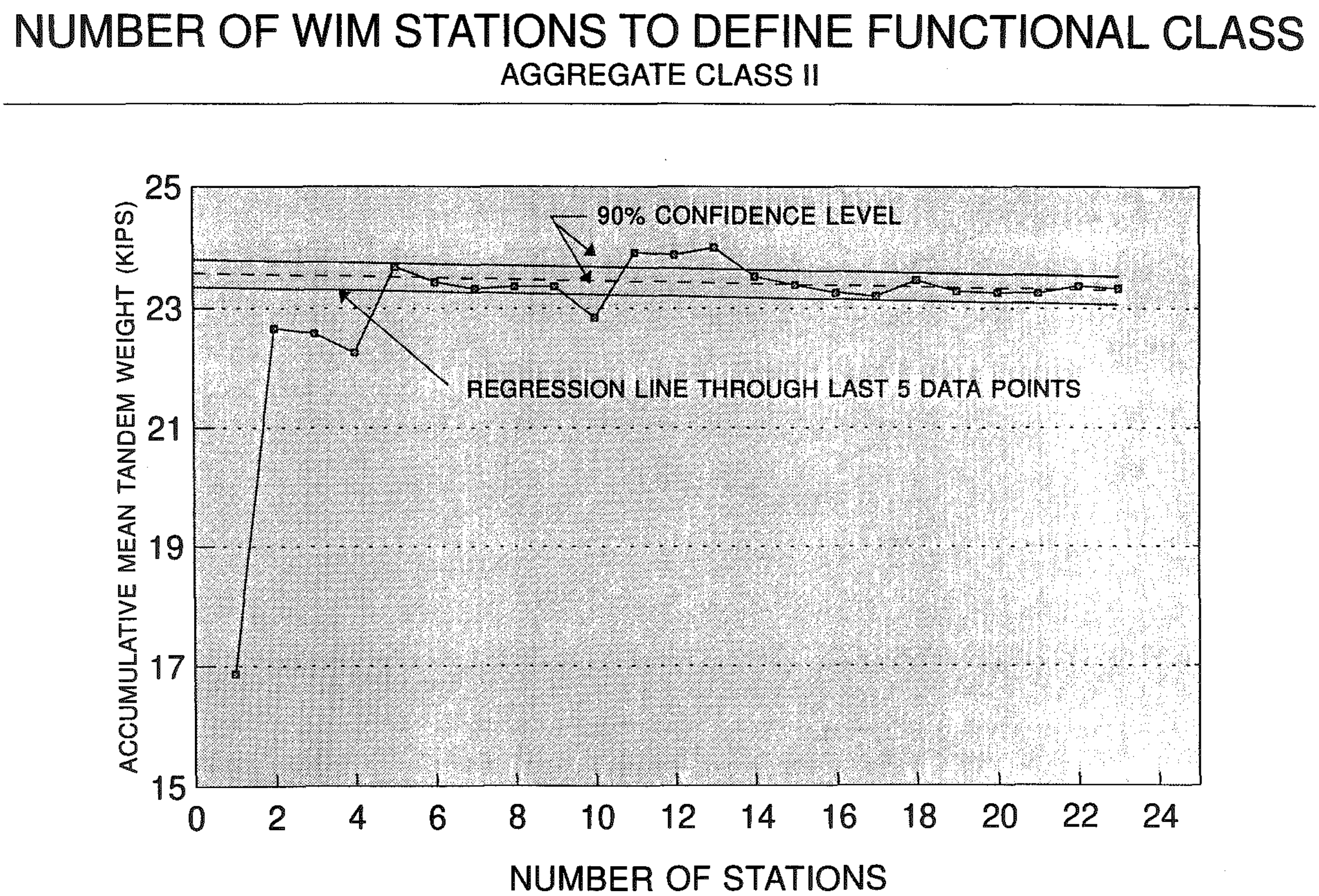


Figure 28. Relationship of Accumulative Tandem Weight Mean and Number of Stations.

NUMBER OF CLASSIFICATION STATIONS TO DEFINE DISTRIBUTION OF VEHICLE TYPES IN A FUNCTIONAL CLASS

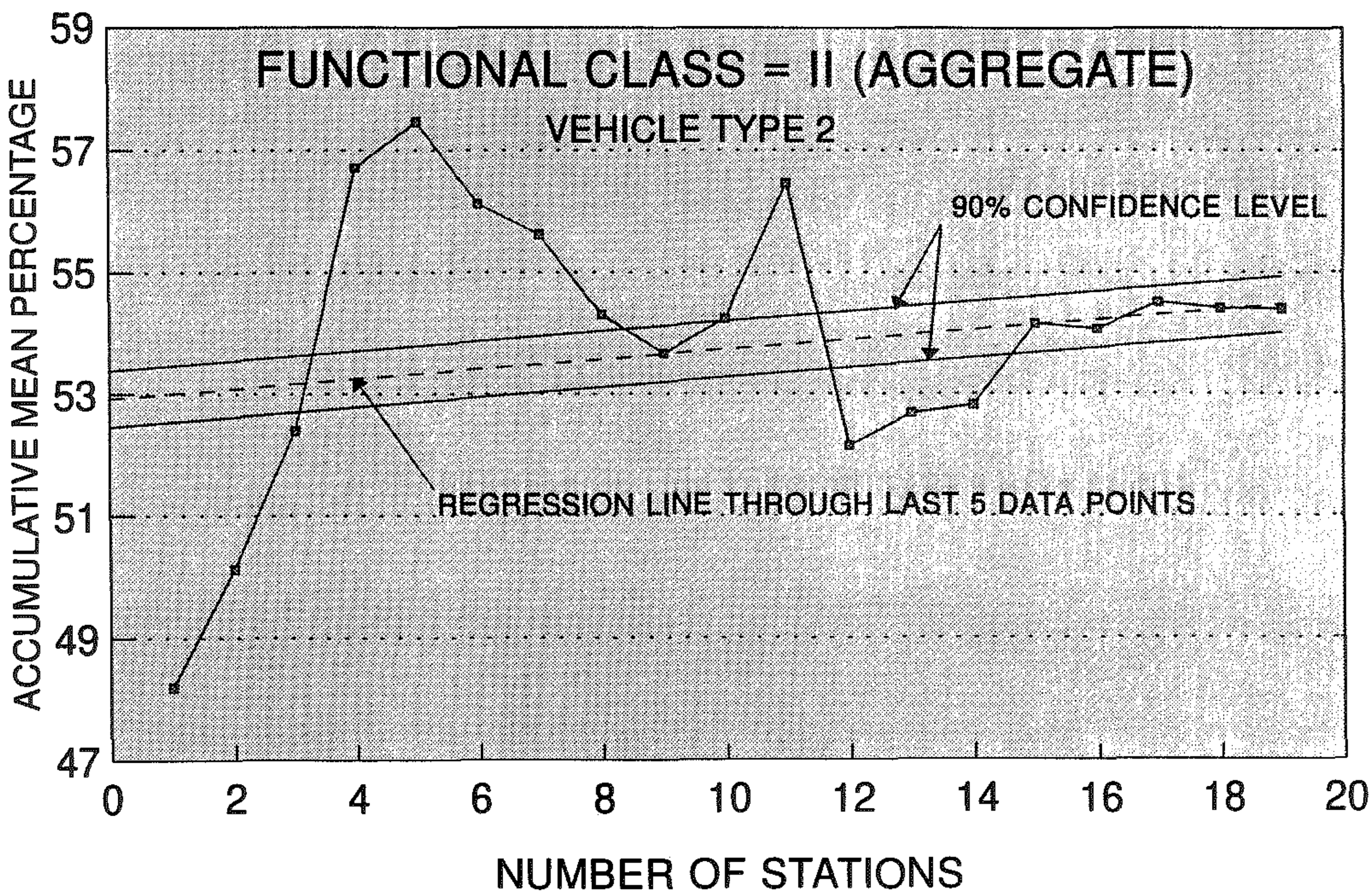


Figure 29. Relationship of Accumulative Mean Percentage and Number of Stations.

APPENDIX A

EXAMPLE OUTPUT OF DATA FROM ESAL PROCESSING
BY FUNCTIONAL CLASS

```
72102024191052113210000999   0009GM19999990091037054000000000132000000000001320160
72102024191052113210000999   0009GM19999990098037061000000000144000000000001440220
72102024191052113220000999   0009GM19999990320089231000000000150000000000001500030
72102024191052113220000999   0009GM19999990228076152000000000159000000000001590110
72102024191052113220000999   0009GM19999990374095279000000000195000000000001950190
72102024191052113220000999   0009GM19999990093032061000000000169000000000001690200
72102024191052113220000999   0009GM19999990169056113000000000142000000000001420260
72102024191052113230000999   0009GM19999990537093248196000000150047000000001970270
72102024191052113323000999   0009GM19999991252076289268316303193063284065060502100
72102024191052113332000999   0009GM19999990405071091122058063133043315047053800400
72102024191052113332000999   0009GM19999990330078071069056056144048323043055800500
72102024191052113332000999   0009GM19999990274069056054056039135048326045055400600
72102024191052113332000999   0009GM19999990783065207161152198122054391050061700700
72102024191052113332000999   0009GM19999990836065239176176180158054340052060400900
72102024191052113332000999   0009GM19999990413082102106067056149043307039053801200
72102024191052113332000999   0009GM19999990327076076067041067127049303045052401300
72102024191052113332000999   0009GM19999990443100106095071071098044273041045601700
72102024191052113332000999   0009GM19999990332067093071047054166047226045048401800
72102024191052113332000999   0009GM19999990397063089089089067110048249045045202500
72102024191052113333000999   0009GM19999991297089259222231241174049218044052700110
72102024191052113333000999   25500000000000000000000004200000000000000000000000019
72102024191052113333000999   0009GM19999991417085287231285259158046203046049400210
72102024191052113333000999   27000000000000000000000004100000000000000000000000029
72102024191052113333000999   0009GM19999991308074283239220237143045306043058000810
72102024191052113333000999   25500000000000000000000004300000000000000000000000089
72102024191052113333000999   0009GM19999991344067272200270265176068288063065501410
72102024191052113333000999   27000000000000000000000006000000000000000000000000149
72102024191052113333000999   0009GM19999991569080333294285272132046168044042901510
72102024191052113333000999   30500000000000000000000003900000000000000000000000159
72102024191052113333000999   ·0009GM19999991349078276231255250177054217048053902310
72102024191052113333000999   25900000000000000000000004300000000000000000000000239
72102024191052113333000999   0009GM19999991450078268268316279166047203045050402410
72102024191052113333000999   24100000000000000000000004300000000000000000000000249
72102024191052113344000999   0009GM19999991771106098281276283108039042302061001010
72102024191052113344000999   31131610000000000000000004003604300000000000000000109
72102024191052114190000999   0009GM19999990178063115000000000235000000000002350710
72102024191052114190000999   0009GM19999990173058115000000000238000000000002380720
72102024191052114190000999   0009GM19999990117043074000000000232000000000002320730
72102024191052114190000999   0009GM19999990195071124000000000238000000000002380740
72102024191052114190300999   0009GM19999990325069167089000000216065000000002810280
72102024191052114190300999   0009GM19999990347137104106000000268067000000003350630
72102024191052114200000999   0009GM19999990069039030000000000132000000000001320410
72102024191052114210000999   0009GM19999990082030052000000000133000000000001330290
72102024191052114210000999   0009GM19999990080030050000000000132000000000001320450
72102024191052114210000999   0009GM19999990090045045000000000133000000000001330490
72102024191052114220000999   0009GM19999990232056176000000000149000000000001490440
72102024191052114220000999   0009GM19999990206063143000000000205000000000002050510
72102024191052114220000999   0009GM19999990217069148000000000198000000000001980530
72102024191052114220000999   0009GM19999990101034067000000000190000000000001900700
72102024191052114220000999   0009GM19999990141054087000000000205000000000002050750
72102024191052114230000999   0009GM19999990196056069071000000153053000000002060430
72102024191052114230900999   0009GM19999991250069244194231244112039123036034403210
72102024191052114230900999   26800000000000000000000003400000000000000000000000329
72102024191052114323000999   0009GM19999991335082329244377303166058236061052105500
72102024191052114332000999   0009GM19999990276058078063045032119042210045041603000
72102024191052114332000999   0009GM19999990387091085085061065108044287037047603400
72102024191052114332000999   0009GM19999991133058233268285289175046248050051903500
72102024191052114332000999   0009GM19999990550074159115117085143038316038053503600
72102024191052114332000999   0009GM19999990436074100100095067156045181042042403700
```

Figure A1. Example of "Raw WIM" Input Data

Truck Weight Records - Card 7 Data
KYyyIN.CD7, KYyyOUT.CD7

Columns	Description
1	Truck Weight Record Code (7)
2-3	State Code
4-5	Functional Classification
6-8	Station Identification Number
9	Direction of Travel (1=N, 2=NE, 3=E, 4=SE, 5=S, 6=SW, 7=W, 8=NW)
10-11	Year of Data
12-13	Month of Data
14-15	Date of Month
16-17	Hour of Day
18-23	Vehicle Type Code
36-40	Commodity Code (11200=coal, 99999=non-coal)
42-45	Total Weight of Truck or Combination (x100 pounds)
46-48	A-axle Weight (x100 pounds)
49-51	B-axle Weight "
52-54	C-axle Weight "
55-57	D-axle Weight "
58-60	E-axle Weight "
61-63	(A-B) Axle Spacing {feet & tenths (F3.1)}
64-66	(B-C) Axle Spacing "
67-69	(C-D) Axle Spacing "
70-72	(D-E) Axle Spacing "
73-76	Total Wheelbase {feet & tenths (F4.1)}
77-79	Record Serial Number
80	Continuation Indicator (0 = no continuation record 1 = has a continuation record)

Note: Format of "Raw WIM" Input Data shown in Figure A1.

Truck Weight Records - Card 7 Data
KYyyIN.CD7, KYyyOUT.CD7 (contd.)

Continuation Record*

Columns	Description
1-28	Same as columns 1-28 of the face record
29-31	F-axle Weight (x100 pounds)
32-34	G-axle Weight "
35-37	H-axle Weight "
38-40	I-axle Weight "
41-43	J-axle Weight "
44-46	K-axle Weight "
47-49	L-axle Weight "
50-52	M-axle Weight "
53-55	(E-F) Axle Spacing {feet & tenths (F3.1)}
56-58	(F-G) Axle Spacing "
59-61	(G-H) Axle Spacing "
62-64	(H-I) Axle Spacing "
65-67	(I-J) Axle Spacing "
68-70	(J-K) Axle Spacing "
71-73	(K-L) Axle Spacing "
74-76	(L-M) Axle Spacing "
77-79	Record Serial Number (same as face record)
80	Continuation Indicator (2 = first continuation record for a vehicle with more than 13 axles 9 = last continuation record)

*Used only for truck combinations having six or more axles and immediately follows the face record.

Note: Format of "Raw WIM" Input Data shown in Figure A1.

```
72102024191 52113220000999000009   99999  138 68 70  0  0  0132  0  0  0 132 160
72102024191 52113220000999000009   99999  143 68 75  0  0  0144  0  0  0 144 220
72102024191 52113220000999000009   99999  315115200  0  0  0150  0  0  0 150  30
72102024191 52113220000999000009   99999  245103142  0  0  0159  0  0  0 159 110
72102024191 52113220000999000009   99999  356120236  0  0  0195  0  0  0 195 190
72102024191 52113220000999000009   99999  139 64 75  0  0  0169  0  0  0 169 200
72102024191 52113220000999000009   99999  198 85113  0  0  0142  0  0  0 142 260
72102024191 52113230000999000009   99999  497118212167  0  0150 47  0  0 197 270
72102024191 52113521200999000009   99999 107210324322257247193 63284 65 605 210
72102024191 52113332000999000009   99999  439 98 88119 64 70133 43315 47 538  40
72102024191 52113332000999000009   99999  383105 77 75 63 63144 48323 43 558  50
72102024191 52113332000999000009   99999  337 97 66 64 65 45135 48326 45 554  60
72102024191 52113332000999000009   99999  748 93182141144188122 54391 50 617  70
72102024191 52113332000999000009   99999  789 93206152167171158 54340 52 604  90
72102024191 52113332000999000009   99999  448108100104 74 62149 43307 39 538 120
72102024191 52113332000999000009   99999  379103 82 72 46 76127 49303 45 524 130
72102024191 52113332000999000009   99999  474124104 94 76 76 98 44273 41 456 170
72102024191 52113332000999000009   99999  382 95 97 74 54 62166 47226 45 484 180
72102024191 52113332000999000009   99999  435 91 90 90 94 70110 48249 45 452 250
72102024191 52113333000999000009   11200 119811521918821522417 4 49218 44 527  11
72102024191 52113333000       237  0  0  0  0  0  0  0 42  0  0  0  0  0  0  0  19
72102024191 52113333000999000009   11200 129711124119426323915 8 46203 46 494  21
72102024191 52113333000       249  0  0  0  0  0  0  0 41  0  0  0  0  0  0  0  29
72102024191 52113333000999000009   99999 120110123720020522114 3 45306 43 580  81
72102024191 52113333000       237  0  0  0  0  0  0  0 43  0  0  0  0  0  0  0  89
72102024191 52113522200999000009   99999 1205 95230186251220176 68288 63 655 141
72102024191 52113522200       223  0  0  0  0  0  0  0 60  0  0  0  0  0  0  0 149
72102024191 52113333000999000009   11200 141510727424226225013 2 46168 44 429 151
72102024191 52113333000       280  0  0  0  0  0  0  0 39  0  0  0  0  0  0  0 159
72102024191 52113333000999000009   11200 123910523219423623217 7 54217 48 539 231
72102024191 52113333000       240  0  0  0  0  0  0  0 43  0  0  0  0  0  0  0 239
72102024191 52113333000999000009   11200 132310522422429125716 6 47203 45 504 241
72102024191 52113333000       222  0  0  0  0  0  0  0 43  0  0  0  0  0  0  0 249
72102024191 52113344000999000009   99999 1575130 76220216259108 39 42302 610 101
72102024191 52113344000       285296 93  0  0  0  0  0 40 36 43  0  0  0  0  0 109
72102024191 52114190000999000009   99999  206 91115  0  0  0235  0  0  0 235 710
72102024191 52114190000999000009   99999  202 87115  0  0  0238  0  0  0 238 720
72102024191 52114190000999000009   99999  158 73 85  0  0  0232  0  0  0 232 730
72102024191 52114190000999000009   99999  220 98122  0  0  0238  0  0  0 238 740
72102024191 52114321000999000009   99999  343 97153 93  0  0216 65  0  0 221 280
72102024191 52114321000999000009   99999  369157107105  0  0268 67  0  0 335 630
72102024191 52114220000999000009   99999  122 70 52  0  0  0132  0  0  0 132 410
72102024191 52114220000999000009   99999  131 62 69  0  0  0133  0  0  0 133 290
72102024191 52114220000999000009   99999  129 62 67  0  0  0132  0  0  0 132 450
72102024191 52114220000999000009   99999  138 75 63  0  0  0133  0  0  0 133 490
72102024191 52114220000999000009   99999  245 85160  0  0  0149  0  0  0 149 440
72102024191 52114190000999000009   99999  226 91135  0  0  0205  0  0  0 205 510
72102024191 52114220000999000009   99999  236 97139  0  0  0198  0  0  0 198 530
72102024191 52114220000999000009   99999  145 65 80  0  0  0190  0  0  0 190 700
72102024191 52114190000999000009   99999  177 83 94  0  0  0205  0  0  0 205 750
72102024191 52114321000999000009   99999  246 85 81 80  0  0153 53  0  0 206 430
72102024191 52114333000999000009   11200 1161 97209166214226112 39123 36 344 321
72102024191 52114333000       249  0  0  0  0  0  0  0 34  0  0  0  0  0  0  0 329
72102024191 52114521200999000009   99999 113210827220530024716 6 58236 61 521 550
72102024191 52114332000999000009   99999  335 87 85 68 56 39119 42210 45 416 300
72102024191 52114332000999000009   99999  428116 87 87 67 71108 44287 37 476 340
72102024191 52114332000999000009   11200 1036 87196226262265175 46248 50 519 350
72102024191 52114332000999000009   99999  558101147106118 86143 38316 38 535 360
72102024191 52114332000999000009   99999  468101 99 99 99 70156 45181 42 424 370
```

Figure A2. Example of WIM Processed Output Data.
(Format of data is the same as Figure A1)

WIM Program Error Output

```
    FUNCTIONAL CLASS= 06     YEAR= 1993
72106050193 831 3200000999000009   999999 48 27 21  0  0  0110  0  0  0 110 160  E0
72106050193 831 3200000999000009   999999 46 27 19  0  0  0103  0  0  0 103 170  E0
72106050193 831 3200000999000009   999999 40 17 23  0  0  0111  0  0  0 111 200  E0
72106050193 831 3200000999000009   999999 72 38 34  0  0  0110  0  0  0 110 210  E0
72106050193 831 3210000999000009   999999 84 38 46  0  0  0104  0  0  0 104 140  E0
72106050193 831 4200000999000009   999999 50 27 23  0  0  0116  0  0  0 116 240  E0
72106050193 831 4200000999000009   999999 50 25 25  0  0  0107  0  0  0 107 290  E0
72106050193 831 4200000999000009   999999 32 19 13  0  0  0114  0  0  0 114 300  E0
72106050193 831 5200000999000009   999999 40 17 23  0  0  0110  0  0  0 110 310  E0
72106050193 831 5200000999000009   999999 46 27 19  0  0  0114  0  0  0 114 320  E0
72106050193 831 5200000999000009   999999 65 38 27  0  0  0117  0  0  0 117 350  E0
72106050193 831 5200000999000009   999999 36 19 17  0  0  0110  0  0  0 110 360  E0
72106050193 831 5200000999000009   999999 62 32 30  0  0  0110  0  0  0 110 370  E0
72106050193 831 5200000999000009   999999 36 23 13  0  0  0103  0  0  0 103 390  E0
72106050193 831 5200000999000009   999999 49 30 19  0  0  0109  0  0  0 109 410  E0
72106050193 831 5200000999000009   999999 60 32 28  0  0  0116  0  0  0 116 420  E0
72106050193 831 5200000999000009   999999 38 23 15  0  0  0108  0  0  0 108 460  E0
72106050193 831 5200000999000009   999999 50 25 25  0  0  0113  0  0  0 113 470  E0
72106050193 831 5200000999000009   999999 64 36 28  0  0  0110  0  0  0 110 480  E0
72106050193 831 5200000999000009   999999 46 23 23  0  0  0111  0  0  0 111 500  E0
72106050193 831 5200000999000009   999999 42 25 17  0  0  0112  0  0  0 112 510  E0
72106050193 831 5200000999000009   999999 42 21 21  0  0  0109  0  0  0 109 520  E0
72106050193 831 6200000999000009   999999 44 25 19  0  0  0112  0  0  0 112 550  E0
72106050193 831 6200000999000009   999999 40 23 17  0  0  0110  0  0  0 110 560  E0
72106050193 831 6200000999000009   999999 58 30 28  0  0  0109  0  0  0 109 570  E0
72106050193 831 6200000999000009   999999 50 25 25  0  0  0107  0  0  0 107 580  E0
72106050193 831 6200000999000009   999999 63 27 36  0  0  0119  0  0  0 119 590  E0
72106050193 831 6200000999000009   999999 60 30 30  0  0  0120  0  0  0 120 600  E0
72106050193 831 6200000999000009   999999 64 32 32  0  0  0109  0  0  0 109 620  E0
72106050193 831 6200000999000009   999999 44 25 19  0  0  0107  0  0  0 107 630  E0
72106050193 831 6200000999000009   999999 57 30 27  0  0  0114  0  0  0 114 650  E0
72106050193 831 6200000999000009   999999 66 32 34  0  0  0111  0  0  0 111 670  E0
72106050193 831 6200000999000009   999999 44 25 19  0  0  0118  0  0  0 118 690  E0
72106050193 831 6200000999000009   999999 50 25 25  0  0  0106  0  0  0 106 720  E0
72106050193 831 6200000999000009   999999 50 27 23  0  0  0113  0  0  0 113 740  E0
72106050193 831 6200000999000009   999999 46 23 23  0  0  0105  0  0  0 105 750  E0
72106050193 831 6210000999000009   999999 76 42 34  0  0  0113  0  0  0 113 540  E0
72106050193 831 7200000999000009   999999 44 25 19  0  0  0104  0  0  0 104 760  E0
------------------------ 1235 line(s) not displayed ------------------------
72106050593 9 12220000999000009    999999 36 23 13  0  0  0104  0  0  0 1049910  E0
72106050593 9 12220000999000009    999999 40 23 17  0  0  0113  0  0  0 1139920  E0
72106050593 9 12220000999000009    999999 53 30 23  0  0  0113  0  0  0 1139940  E0
```

Error Code (columns 83-84)

E0	1276	TWO-AXLE VEHICLES LESS THAN 12 FEET
E1	0	AXLE(S) WITHOUT WEIGHT
E2	0	AXLE SPACING(S) LESS THAT 1.5 FEET
E3	0	MISMATCHES BETWEEN NUMBERS OF AXLE WEIGHTS AND SPACINGS
E4	0	>10 PERCENT DIFFERENCE BETWEEN GROSS WEIGHT AND SUM OF AXLE WEIGHT
E5	0	>10 PERCENT DIFFERENCE BETWEEN WHEELBASE AND SUM OF AXLE SPACINGS
	978	SUCCESSFUL ENTRIES

Figure A2 (Continued). Example Output of Error Listing and Error Codes for WIM Program.

EALS PER VEHICLE

VEH TYPE	NON-COAL	COAL	ALL
4	.52088	.00000	.52088
5	.38486	.00000	.38486
6	.61542	8.22377	.88211
7	3.76975	7.26934	3.78083
8	.99553	.00000	.99553
9	.85748	11.08379	1.67364
10	1.45612	13.32233	6.56578
11	2.82693	.00000	2.82693
12	6.97262	.00000	6.97262
13	6.91883	.00000	6.91883
14	.85704	12.36966	1.94545

Figure A3. Example of UNITEAL Output Data

```
UNITEAL PROGRAM ERROR OUTPUT

    FUNCTIONAL CLASS=  2     YEAR= 1993

72102003793 61512190000060540009   99999  711219246246  0  0194 44  0  0 2384800
    NVT= 4      TW=  71.1      UW=  66.0     EXCESSIVE GROSS WT  ERROR NO.    1
72102003793 61515190000041570009   99999  883265309309  0  0210 46  0  0 2566810
    NVT= 4      TW=  88.3      UW=  66.0     EXCESSIVE GROSS WT  ERROR NO.    2
72102003793 616 9333000100500009   11200 184017430230235435416‍2 42212 41 4972801
    NVT=10      TW= 184.0      UW= 166.0     EXCESSIVE GROSS WT  ERROR NO.    3
72102558793 6 215334000999000009   99999 172613823521833429513‍6 47330 47 6429301
    NVT=10      TW= 172.6      UW= 166.0     EXCESSIVE GROSS WT  ERROR NO.    4


    4     EXCESSIVE GROSS WEIGHT(S)
    0     NEGLIGIBLE GROSS WEIGHT(S)
    0     EXCESSIVE WHEELBASE(S)
    0     NEGLIGIBLE WHEELBASE(S)
    0     VEHICLE TYPE "921"

 11702    SUCCESSFUL ENTRIES
```

Figure A3 (Continued). Example Output of Error Listing and Error Codes for UNITEAL Program.

94NWNC	6	3	0	0	0	0	0	0			6
94NWNC	6	4	123	104	19	0	0	265			6
94NWNC	6	5	1293	1293	0	0	0	2586			6
94NWNC	6	6	341	0	341	0	0	1023			6
94NWNC	6	7	55	0	0	53	2	222			6
94NWNC	6	8	711	1176	296	0	0	2479			6
94NWNC	6	9	967	245	1779	23	0	4835			6
94NWNC	6	10	39	11	34	39	0	235			6
94NWNC	6	11	21	78	3	0	0	105			6
94NWNC	6	12	4	12	4	0	0	24			6
94NWNC	6	13	0	0	0	0	0	0			6
94NWANC	6		3554	2919	2476	115	2	11774			6
94NWC	6	3	0	0	0	0	0	0			6
94NWC	6	4	0	0	0	0	0	0			6
94NWC	6	5	0	0	0	0	0	0			6
94NWC	6	6	0	0	0	0	0	0			6
94NWC	6	7	0	0	0	0	0	0			6
94NWC	6	8	0	0	0	0	0	0			6
94NWC	6	9	38	6	73	0	0	190			6
94NWC	6	10	26	2	25	26	0	156			6
94NWC	6	11	0	0	0	0	0	0			6
94NWC	6	12	0	0	0	0	0	0			6
94NWC	6	13	0	0	0	0	0	0			6
94NWAC	6		64	8	98	26	0	346			6
94WNC	6	3 1	0	0	0	0	0	0	0	0	6
94WNC	6	3 1	0	0	0	0	0	0	0	0	6
94WNC	6	3 2	0	0	0	0	0	0	0	0	6
94WNC	6	3 2	0	0	0	0	0	0	0	0	6
94WNC	6	3 3	0	0	0	0	0	0	0	0	6
94WNC	6	3 3	0	0	0	0	0	0	0	0	6
94WNC	6	3 4	0	0	0	0	0	0	0	0	6
94WNC	6	3 4	0	0	0	0	0	0	0	0	6
94WNC	6	3 5	0	0	0	0	0	0	0	0	6
94WNC	6	3 5	0	0	0	0	0	0	0	0	6
94WRC	6	3 6	0	0	0	0	0	0	0	0	6
94WNC	6	3 6	0	0	0	0	0	0	0	0	6
94WNC	6	4 1	0	0	0	3	21	64	22	4	6
94WNC	6	4 1	4	1	2	2	0	0	0	0	6
94WNC	6	4 2	0	4	9	32	34	19	5	1	6
94WNC	6	4 2	0	0	0	0	0	0	0	0	6
94WNC	6	4 3	0	0	3	8	2	2	3	1	6
94WNC	6	4 3	0	0	0	0	0	0	0	0	6
94WNC	6	4 4	0	0	0	0	0	0	0	0	6
94WNC	6	4 4	0	0	0	0	0	0	0	0	6
94WNC	6	4 5	0	0	0	0	0	0	0	0	6
94WNC	6	4 5	0	0	0	0	0	0	0	0	6
94WNC	6	4 6	0	5	43	124	47	29	12	4	6
94WNC	6	4 6	1	0	0	0	0	0	0	0	6
94WNC	6	5 1	0	0	0	285	758	183	53	9	6
94WNC	6	5 1	4	0	0	1	0	0	0	0	6
94WNC	6	5 2	0	305	555	169	83	80	47	39	6
94WNC	6	5 2	12	3	0	0	0	0	0	0	6
94WNC	6	5 3	0	0	0	0	0	0	0	0	6
94WNC	6	5 3	0	0	0	0	0	0	0	0	6
94WNC	6	5 4	0	0	0	0	0	0	0	0	6
94WNC	6	5 4	0	0	0	0	0	0	0	0	6
94WNC	6	5 5	0	0	0	0	0	0	0	0	6
94WNC	6	5 5	0	0	0	0	0	0	0	0	6
94WNC	6	5 6	0	326	1577	399	102	80	47	40	6
94WNC	6	5 6	12	3	0	0	0	0	0	0	6

Figure A4. Example Output from LOADOMTR Program.

94WNC	6	6	1	0	0	0	2	19	106	105	42	6
94WNC	6	6	1	33	9	3	10	8	4	0	0	6
94WNC	6	6	2	0	0	0	0	0	0	0	0	6
94WNC	6	6	2	0	0	0	0	0	0	0	0	6
94WNC	6	6	3	0	1	149	73	35	21	35	24	6
94WNC	6	6	3	3	0	0	0	0	0	0	0	6
94WNC	6	6	4	0	0	0	0	0	0	0	0	6
94WNC	6	6	4	0	0	0	0	0	0	0	0	6
94WNC	6	6	5	0	0	0	0	0	0	0	0	6
94WNC	6	6	5	0	0	0	0	0	0	0	0	6
94WNC	6	6	6	1	35	279	344	134	82	77	50	6
94WNC	6	6	6	16	5	0	0	0	0	0	0	6
94WNC	6	7	1	0	0	0	0	2	11	4	4	6
94WNC	6	7	1	11	4	8	6	5	0	0	0	6
94WNC	6	7	2	0	0	0	0	0	0	0	0	6
94WNC	6	7	2	0	0	0	0	0	0	0	0	6
94WNC	6	7	3	0	0	0	0	0	0	0	0	6
94WNC	6	7	3	0	0	0	0	0	0	0	0	6
94WNC	6	7	4	0	0	0	0	0	4	49	0	6
94WNC	6	7	4	0	0	0	0	0	0	0	0	6
94WNC	6	7	5	0	0	0	0	1	1	0	0	6
94WNC	6	7	5	0	0	0	0	0	0	0	0	6
94WNC	6	7	6	0	2	26	31	16	27	32	47	6
94WNC	6	7	6	30	11	0	0	0	0	0	0	6
94WNC	6	8	1	0	0	2	286	286	97	24	7	6
94WNC	6	8	1	5	1	1	1	1	0	0	0	6
94WNC	6	8	2	0	579	376	101	40	50	23	4	6
94WNC	6	8	2	2	1	0	0	0	0	0	0	6
94WNC	6	8	3	38	186	56	14	0	1	1	0	6
94WNC	6	8	3	0	0	0	0	0	0	0	0	6
94WNC	6	8	4	0	0	0	0	0	0	0	0	6
94WNC	6	8	4	0	0	0	0	0	0	0	0	6
94WNC	6	8	5	0	0	0	0	0	0	0	0	6
94WNC	6	8	5	0	0	0	0	0	0	0	0	6
94WNC	6	8	6	100	944	1045	239	59	58	26	5	6
94WNC	6	8	6	2	1	0	0	0	0	0	0	6
94WNC	6	9	1	0	0	0	6	22	394	421	101	6
94WNC	6	9	1	22	1	0	0	0	0	0	0	6
94WNC	6	9	2	0	7	73	28	10	55	53	15	6
94WNC	6	9	2	3	1	0	0	0	0	0	0	6
94WNC	6	9	3	0	79	555	301	160	284	301	69	6
94WNC	6	9	3	26	4	0	0	0	0	0	0	6
94WNC	6	9	4	0	19	3	0	0	0	1	0	6
94WNC	6	9	4	0	0	0	0	0	0	0	0	6
94WNC	6	9	5	0	0	0	0	0	0	0	0	6
94WNC	6	9	5	0	0	0	0	0	0	0	0	6
94WNC	6	9	6	5	247	1237	1359	451	624	655	189	6
94WNC	6	9	6	57	10	1	0	0	0	0	0	6
94WNC	6	10	1	0	0	0	0	0	14	21	4	6
94WNC	6	10	1	0	0	0	0	0	0	0	0	6
94WNC	6	10	2	0	0	2	0	1	2	5	1	6
94WNC	6	10	2	0	0	0	0	0	0	0	0	6
94WNC	6	10	3	0	0	4	5	1	12	10	1	6
94WNC	6	10	3	1	0	0	0	0	0	0	0	6
94WNC	6	10	4	0	1	9	4	4	8	8	3	6
94WNC	6	10	4	1	1	0	0	0	0	0	0	6
94WNC	6	10	5	0	0	0	0	0	0	0	0	6
94WNC	6	10	5	0	0	0	0	0	0	0	0	6
94WNC	6	10	6	1	10	31	58	18	42	44	19	6
94WNC	6	10	6	8	4	0	0	0	0	0	0	6

Figure A4 (Continued) Example Output from LOADOMTR Program.

94WNC	6	11	1	0	0	0	0	0	11	8	1	6
94WNC	6	11	1	1	0	0	0	0	0	0	0	6
94WNC	6	11	2	0	0	8	7	4	23	26	7	6
94WNC	6	11	2	2	1	0	0	0	0	0	0	6
94WNC	6	11	3	0	0	1	0	1	1	0	0	6
94WNC	6	11	3	0	0	0	0	0	0	0	0	6
94WNC	6	11	4	0	0	0	0	0	0	0	0	6
94WNC	6	11	4	0	0	0	0	0	0	0	0	6
94WNC	6	11	5	0	0	0	0	0	0	0	0	6
94WNC	6	11	5	0	0	0	0	0	0	0	0	6
94WNC	6	11	6	0	0	10	25	8	26	26	7	6
94WNC	6	11	6	2	1	0	0	0	0	0	0	6
94WNC	6	12	1	0	0	0	0	0	3	1	0	6
94WNC	6	12	1	0	0	0	0	0	0	0	0	6
94WNC	6	12	2	0	0	0	0	1	4	5	1	6
94WNC	6	12	2	1	0	0	0	0	0	0	0	6
94WNC	6	12	3	0	0	0	1	0	0	3	0	6
94WNC	6	12	3	0	0	0	0	0	0	0	0	6
94WNC	6	12	4	0	0	0	0	0	0	0	0	6
94WNC	6	12	4	0	0	0	0	0	0	0	0	6
94WNC	6	12	5	0	0	0	0	0	0	0	0	6
94WNC	6	12	5	0	0	0	0	0	0	0	0	6
94WNC	6	12	6	0	0	0	4	3	4	9	3	6
94WNC	6	12	6	1	0	0	0	0	0	0	0	6
94WNC	6	13	1	0	0	0	0	0	0	0	0	6
94WNC	6	13	1	0	0	0	0	0	0	0	0	6
94WNC	6	13	2	0	0	0	0	0	0	0	0	6
94WNC	6	13	2	0	0	0	0	0	0	0	0	6
94WNC	6	13	3	0	0	0	0	0	0	0	0	6
94WNC	6	13	3	0	0	0	0	0	0	0	0	6
94WNC	6	13	4	0	0	0	0	0	0	0	0	6
94WNC	6	13	4	0	0	0	0	0	0	0	0	6
94WNC	6	13	5	0	0	0	0	0	0	0	0	6
94WNC	6	13	5	0	0	0	0	0	0	0	0	6
94WNC	6	13	6	0	0	0	0	0	0	0	0	6
94WNC	6	13	6	0	0	0	0	0	0	0	0	6
94WANC	6		1	0	0	2	582	1108	883	659	172	6
94WANC	6		1	80	16	14	20	14	4	0	0	6
94WANC	6		2	0	895	1023	337	173	233	164	68	6
94WANC	6		2	20	6	0	0	0	0	0	0	6
94WANC	6		3	38	266	768	402	199	321	353	95	6
94WANC	6		3	30	4	0	0	0	0	0	0	6
94WANC	6		4	0	20	12	4	4	12	58	3	6
94WANC	6		4	1	1	0	0	0	0	0	0	6
94WANC	6		5	0	0	0	0	1	1	0	0	6
94WANC	6		5	0	0	0	0	0	0	0	0	6
94WANC	6		6	107	1569	4248	2583	838	972	928	364	6
94WANC	6		6	129	35	1	0	0	0	0	0	6
94WC	6	3	1	0	0	0	0	0	0	0	0	6
94WC	6	3	1	0	0	0	0	0	0	0	0	6
94WC	6	3	2	0	0	0	0	0	0	0	0	6
94WC	6	3	2	0	0	0	0	0	0	0	0	6
94WC	6	3	3	0	0	0	0	0	0	0	0	6
94WC	6	3	3	0	0	0	0	0	0	0	0	6
94WC	6	3	4	0	0	0	0	0	0	0	0	6
94WC	6	3	4	0	0	0	0	0	0	0	0	6
94WC	6	3	5	0	0	0	0	0	0	0	0	6
94WC	6	3	5	0	0	0	0	0	0	0	0	6
94WC	6	3	6	0	0	0	0	0	0	0	0	6
94WC	6	3	6	0	0	0	0	0	0	0	0	6

Figure A4 (Continued) Example Output from LOADOMTR Program.

94WC	6	4	1	0	0	0	0	0	0	0	0	6
94WC	6	4	1	0	0	0	0	0	0	0	0	6
94WC	6	4	2	0	0	0	0	0	0	0	0	6
94WC	6	4	2	0	0	0	0	0	0	0	0	6
94WC	6	4	3	0	0	0	0	0	0	0	0	6
94WC	6	4	3	0	0	0	0	0	0	0	0	6
94WC	6	4	4	0	0	0	0	0	0	0	0	6
94WC	6	4	4	0	0	0	0	0	0	0	0	6
94WC	6	4	5	0	0	0	0	0	0	0	0	6
94WC	6	4	5	0	0	0	0	0	0	0	0	6
94WC	6	4	6	0	0	0	0	0	0	0	0	6
94WC	6	4	6	0	0	0	0	0	0	0	0	6
94WC	6	5	1	0	0	0	0	0	0	0	0	6
94WC	6	5	1	0	0	0	0	0	0	0	0	6
94WC	6	5	2	0	0	0	0	0	0	0	0	6
94WC	6	5	2	0	0	0	0	0	0	0	0	6
94WC	6	5	3	0	0	0	0	0	0	0	0	6
94WC	6	5	3	0	0	0	0	0	0	0	0	6
94WC	6	5	4	0	0	0	0	0	0	0	0	6
94WC	6	5	4	0	0	0	0	0	0	0	0	6
94WC	6	5	5	0	0	0	0	0	0	0	0	6
94WC	6	5	5	0	0	0	0	0	0	0	0	6
94WC	6	5	6	0	0	0	0	0	0	0	0	6
94WC	6	5	6	0	0	0	0	0	0	0	0	6
94WC	6	6	1	0	0	0	0	0	0	0	0	6
94WC	6	6	1	0	0	0	0	0	0	0	0	6
94WC	6	6	2	0	0	0	0	0	0	0	0	6
94WC	6	6	2	0	0	0	0	0	0	0	0	6
94WC	6	6	3	0	0	0	0	0	0	0	0	6
94WC	6	6	3	0	0	0	0	0	0	0	0	6
94WC	6	6	4	0	0	0	0	0	0	0	0	6
94WC	6	6	4	0	0	0	0	0	0	0	0	6
94WC	6	6	5	0	0	0	0	0	0	0	0	6
94WC	6	6	5	0	0	0	0	0	0	0	0	6
94WC	6	6	6	0	0	0	0	0	0	0	0	6
94WC	6	6	6	0	0	0	0	0	0	0	0	6
94WC	6	7	1	0	0	0	0	0	0	0	0	6
94WC	6	7	1	0	0	0	0	0	0	0	0	6
94WC	6	7	2	0	0	0	0	0	0	0	0	6
94WC	6	7	2	0	0	0	0	0	0	0	0	6
94WC	6	7	3	0	0	0	0	0	0	0	0	6
94WC	6	7	3	0	0	0	0	0	0	0	0	6
94WC	6	7	4	0	0	0	0	0	0	0	0	6
94WC	6	7	4	0	0	0	0	0	0	0	0	6
94WC	6	7	5	0	0	0	0	0	0	0	0	6
94WC	6	7	5	0	0	0	0	0	0	0	0	6
94WC	6	7	6	0	0	0	0	0	0	0	0	6
94WC	6	7	6	0	0	0	0	0	0	0	0	6
94WC	6	8	1	0	0	0	0	0	0	0	0	6
94WC	6	8	1	0	0	0	0	0	0	0	0	6
94WC	6	8	2	0	0	0	0	0	0	0	0	6
94WC	6	8	2	0	0	0	0	0	0	0	0	6
94WC	6	8	3	0	0	0	0	0	0	0	0	6
94WC	6	8	3	0	0	0	0	0	0	0	0	6
94WC	6	8	4	0	0	0	0	0	0	0	0	6
94WC	6	8	4	0	0	0	0	0	0	0	0	6
94WC	6	8	5	0	0	0	0	0	0	0	0	6
94WC	6	8	5	0	0	0	0	0	0	0	0	6
94WC	6	8	6	0	0	0	0	0	0	0	0	6
94WC	6	8	6	0	0	0	0	0	0	0	0	6

Figure A4 (Continued) Example Output from LOADOMTR Program.

94UC	6	9	1	0	0	0	0	0	8	24	4	6
94UC	6	9	1	2	0	0	0	0	0	0	0	6
94UC	6	9	2	0	0	0	0	0	1	1	2	6
94UC	6	9	2	1	0	1	0	0	0	0	0	6
94UC	6	9	3	0	0	0	0	0	0	9	34	6
94UC	6	9	3	20	8	2	0	0	0	0	0	6
94UC	6	9	4	0	0	0	0	0	0	0	0	6
94UC	6	9	4	0	0	0	0	0	0	0	0	6
94UC	6	9	5	0	0	0	0	0	0	0	0	6
94UC	6	9	5	0	0	0	0	0	0	0	0	6
94UC	6	9	6	0	0	0	30	7	7	30	58	6
94UC	6	9	6	35	10	12	1	0	0	0	0	6
94UC	6	10	1	0	0	0	0	0	2	12	10	6
94UC	6	10	1	2	0	0	0	0	0	0	0	6
94UC	6	10	2	0	0	0	0	0	0	1	0	6
94UC	6	10	2	1	0	0	0	0	0	0	0	6
94UC	6	10	3	0	0	0	0	0	0	11	7	6
94UC	6	10	3	6	1	0	0	0	0	0	0	6
94UC	6	10	4	0	0	0	0	0	0	7	9	6
94UC	6	10	4	8	2	0	0	0	0	0	0	6
94UC	6	10	5	0	0	0	0	0	0	0	0	6
94UC	6	10	5	0	0	0	0	0	0	0	0	6
94UC	6	10	6	0	0	0	13	14	9	48	26	6
94UC	6	10	6	24	14	7	1	0	0	0	0	6
94UC	6	11	1	0	0	0	0	0	0	0	0	6
94UC	6	11	1	0	0	0	0	0	0	0	0	6
94UC	6	11	2	0	0	0	0	0	0	0	0	6
94UC	6	11	2	0	0	0	0	0	0	0	0	6
94UC	6	11	3	0	0	0	0	0	0	0	0	6
94UC	6	11	3	0	0	0	0	0	0	0	0	6
94UC	6	11	4	0	0	0	0	0	0	0	0	6
94UC	6	11	4	0	0	0	0	0	0	0	0	6
94UC	6	11	5	0	0	0	0	0	0	0	0	6
94UC	6	11	5	0	0	0	0	0	0	0	0	6
94UC	6	11	6	0	0	0	0	0	0	0	0	6
94UC	6	11	6	0	0	0	0	0	0	0	0	6
94UC	6	12	1	0	0	0	0	0	0	0	0	6
94UC	6	12	1	0	0	0	0	0	0	0	0	6
94UC	6	12	2	0	0	0	0	0	0	0	0	6
94UC	6	12	2	0	0	0	0	0	0	0	0	6
94UC	6	12	3	0	0	0	0	0	0	0	0	6
94UC	6	12	3	0	0	0	0	0	0	0	0	6
94UC	6	12	4	0	0	0	0	0	0	0	0	6
94UC	6	12	4	0	0	0	0	0	0	0	0	6
94UC	6	12	5	0	0	0	0	0	0	0	0	6
94UC	6	12	5	0	0	0	0	0	0	0	0	6
94UC	6	12	6	0	0	0	0	0	0	0	0	6
94UC	6	12	6	0	0	0	0	0	0	0	0	6
94UC	6	13	1	0	0	0	0	0	0	0	0	6
94UC	6	13	1	0	0	0	0	0	0	0	0	6
94UC	6	13	2	0	0	0	0	0	0	0	0	6
94UC	6	13	2	0	0	0	0	0	0	0	0	6
94UC	6	13	3	0	0	0	0	0	0	0	0	6
94UC	6	13	3	0	0	0	0	0	0	0	0	6
94UC	6	13	4	0	0	0	0	0	0	0	0	6
94UC	6	13	4	0	0	0	0	0	0	0	0	6
94UC	6	13	5	0	0	0	0	0	0	0	0	6
94UC	6	13	5	0	0	0	0	0	0	0	0	6
94UC	6	13	6	0	0	0	0	0	0	0	0	6
94UC	6	13	6	0	0	0	0	0	0	0	0	6

Figure A4 (Continued) Example Output from LOADOMTR Program.

94WAC	6	1	0	0	0	0	0	10	36	14		6	
94WAC	6	1	4	0	0	0	0	0	0	0		6	
94WAC	6	2	0	0	0	0	0	1	2	2		6	
94WAC	6	2	2	0	1	0	0	0	0	0		6	
94WAC	6	3	0	0	0	0	0	0	20	41		6	
94WAC	6	3	26	9	2	0	0	0	0	0		6	
94WAC	6	4	0	0	0	0	0	0	7	9		6	
94WAC	6	4	8	2	0	0	0	0	0	0		6	
94WAC	6	5	0	0	0	0	0	0	0	0		6	
94WAC	6	5	0	0	0	0	0	0	0	0		6	
94WAC	6	6	0	0	0	43	21	16	78	84		6	
94WAC	6	6	59	24	19	2	0	0	0	0		6	
94C	6		0	0	0	0	0	0	0	0	38	66	0
94C	6		0	0	6								

Figure A4 (Continued) Example Output from LOADOMTR Program.

LOADOMTR Output

NWNC and NWC Records

NWNC = Number of axles weighed for non-coal-hauling vehicles classified by vehicle Type and Axle Type
NWC = Number of axles weighed for coal-hauling vehicles classified by vehicle Type and Axle Type

Columns	Description
1-2	Year
3-7	Variable Name (NWNC, NWC)
8-9	Functional Classification
10-12	Blank
13-14	Vehicle Type (3-13)
15-20	Number of Type 1 Axles
21-26	Number of Type 2 Axles
27-32	Number of Type 3 Axles
33-38	Number of Type 4 Axles
39-44	Number of Type 5 Axles
45-50	Number of Type 6 Axles

Note: Format of LOADOMTR Output Data for NWNC and NWC Records Shown in Figure A4.

LOADOMTR OUTPUT

NWANC and NWAC Records

NWANC = Number of axles weighed for non-coal-hauling vehicles of Types 3-13 classified by Axle Type

NWAC = Number of axles weighed for coal-hauling vehicles of Types 3-13 classified by Axle Type

Columns	Description
1-2	Year
3-7	Variable Name (NWANC, NWAC)
8-9	Functional Classification
10-14	Blank
15-20	Number of Type 1 Axles - Without Regard to Vehicle Type
21-26	Number of Type 2 Axles - Without Regard to Vehicle Type
27-32	Number of Type 3 Axles - Without Regard to Vehicle Type
33-38	Number of Type 4 Axles - Without Regard to Vehicle Type
39-44	Number of Type 5 Axles - Without Regard to Vehicle Type
45-50	Number of Type 6 Axles - Without Regard to Vehicle Type

Note: Format of LOADOMTR Output Data for NWANC and NWAC Records shown in Figure A4.

LOADOMTR Output

NWNC and NWC Records

NWNC = Number of axles weighed for non-coal-hauling vehicles classified by vehicle Type and Axle Type
NWC = Number of axles weighed for coal-hauling vehicles classified by vehicle Type and Axle Type

Columns	Description
1-2	Year
3-7	Variable Name (NWNC, NWC)
8-9	Functional Classification
10-12	Blank
13-14	Vehicle Type (3-13)
15-20	Number of Type 1 Axles
21-26	Number of Type 2 Axles
27-32	Number of Type 3 Axles
33-38	Number of Type 4 Axles
39-44	Number of Type 5 Axles
45-50	Number of Type 6 Axles

Note: Format of LOADOMTR Output Data for NWNC and NWC Records shown in Figure A4.

LOADOMTR Output

WNC and WC Records

WNC = Number of axles weighed for non-coal-hauling vehicles classified by vehicle type, axle type, and load interval.
WC = Number of axles weighed for coal-hauling vehicles classified by vehicle type, axle type, and load interval.

FIRST RECORD.

Columns	Description
1-2	Year
3-7	Variable Name (WNC, WC)
8-9	Functional Classification
10	Blank
11-12	Vehicle Type
13-14	Axle Type
15-20	Number of Axles in Load Category 1
21-26	Number of Axles in Load Category 2
27-32	Number of Axles in Load Category 3
33-38	Number of Axles in Load Category 4
39-44	Number of Axles in Load Category 5
45-50	Number of Axles in Load Category 6
51-56	Number of Axles in Load Category 7
57-62	Number of Axles in Load Category 8

Note: Format of LOADOMTR Output Data for WNC and WC Records (Load Categories 1-8) shown in Figure A4.

LOADOMTR Output

WNC and WC Records

WNC = Number of axles weighed for non-coal-hauling vehicles classified by vehicle type, axle type, and load interval.
WC = Number of axles weighed for coal-hauling vehicles classified by vehicle type, axle type, and load interval.

SECOND RECORD.

Columns	Description
1-2	Year
3-7	Variable Name (WNC, WC)
8-9	Functional Classification
10	Blank
11-12	Vehicle Type
13-14	Axle Type
15-20	Number of Axles in Load Category 9
21-26	Number of Axles in Load Category 10
27-32	Number of Axles in Load Category 11
33-38	Number of Axles in Load Category 12
39-44	Number of Axles in Load Category 13
45-50	Number of Axles in Load Category 14
51-56	Number of Axles in Load Category 15
57-62	Number of Axles in Load Category 16

Note: Format of LOADOMTR Output Data for NWNC and NWC Records (Load Categories 9-16) shown in Figure A4.

LOADOMTR Output

WANC and WAC Records

WANC = Number of axles weighed for non-coal-hauling vehicles of Type 3-13 classified by axle type, and load interval.
WAC = Number of axles weighed for coal-hauling vehicles of Type 3-13 classified by axle type, and load interval.

FIRST RECORD.

Columns	Description
1-2	Year
3-7	Variable Name (WANC, WAC)
8-9	Functional Classification
10-12	Blank
13-14	Axle Type
15-20	Number of Axles in Load Category 1 without regard to vehicle type
21-26	Number of Axles in Load Category 2 without regard to vehicle type
27-32	Number of Axles in Load Category 3 without regard to vehicle type
33-38	Number of Axles in Load Category 4 without regard to vehicle type
39-44	Number of Axles in Load Category 5 without regard to vehicle type
45-50	Number of Axles in Load Category 6 without regard to vehicle type
51-56	Number of Axles in Load Category 7 without regard to vehicle type
57-62	Number of Axles in Load Category 8 without regard to vehicle type

Note: Format of LOADOMTR Output Data for WANC and WAC Records (Load Categories 1-8) shown in Figure A4.

LOADOMTR Output

WANC and WAC Records

WANC = Number of axles weighed for non-coal-hauling vehicles of Type 3-13 classified by axle type, and load interval.
WAC = Number of axles weighed for coal-hauling vehicles of Type 3-13 classified by axle type, and load interval.

SECOND RECORD.

Columns	Description
1-2	Year
3-7	Variable Name (WANC, WAC)
8-9	Functional Classification
10-12	Blank
13-14	Axle Type
15-20	Number of Axles in Load Category 9 without regard to vehicle type
21-26	Number of Axles in Load Category 10 without regard to vehicle type
27-32	Number of Axles in Load Category 11 without regard to vehicle type
33-38	Number of Axles in Load Category 12 without regard to vehicle type
39-44	Number of Axles in Load Category 13 without regard to vehicle type
45-50	Number of Axles in Load Category 14 without regard to vehicle type
51-56	Number of Axles in Load Category 15 without regard to vehicle type
57-62	Number of Axles in Load Category 16 without regard to vehicle type

Note: Format of LOADOMTR Output Data for WANC and WAC Records (Load Categories 9-16) shown in Figure A4.

LOADOMTR Output

C Records

C = Number of coal-hauling vehicles classified by vehicle type

FIRST RECORD.

Columns	Description
1-2	Year
3-7	Variable Name (C)
8-9	Functional Classification
10-14	Blank
15-20	Number of Type 1 Coal-Haul Vehicles
21-26	Number of Type 2 Coal-Haul Vehicles
27-32	Number of Type 3 Coal-Haul Vehicles
33-38	Number of Type 4 Coal-Haul Vehicles
39-44	Number of Type 5 Coal-Haul Vehicles
45-50	Number of Type 6 Coal-Haul Vehicles
51-56	Number of Type 7 Coal-Haul Vehicles
57-62	Number of Type 8 Coal-Haul Vehicles
63-68	Number of Type 9 Coal-Haul Vehicles
69-74	Number of Type 10 Coal-Haul Vehicles
75-80	Number of Type 11 Coal-Haul Vehicles

SECOND RECORD.

Columns	Description
1-2	Year
3-7	Variable Name (C)
8-9	Functional Classification
10-14	Blank
15-20	Number of Type 12 Coal-Haul Vehicles
21-26	Number of Type 13 Coal-Haul Vehicles

Note: Format of LOADOMTR Output Data for C Records shown in Figure A4.

```
1A46194 51006    229  162           4  1       4                  2 1
1A46594 51006    103   83           6  2    1  5                  2 1
1A46194 51007    123  101           6  2    2  5                  2 2
1A46594 51007  2 128   90          13  1       9                  2 2
1A46194 51008    131  108           7  6    4  5                  2 3
1A46594 51008    102  114          12  2    3 15                  2 3
1A46194 51009    140  102           9  5    1  6                  2 4
1A46594 51009  3 131  121           9  4      14                  2 4
1A46194 51010  1 144  111           8  4       9                  2 5
1A46594 51010    170  126           8  6    3 17                  2 5
1A46194 51011  2 157  128           8  7 1  5  7  1     2         2 6
1A46594 51011  4 234  177           8  8    3 18                  2 6
1A46194 51012  4 137  131           5  7    5  7                  2 7
1A46594 51012  4 199  137          11 10      19                  2 7
1A46194 51013    144  120           6  6       8                  2 8
1A46594 51013    162  125           8  5    2 15                  2 8
1A46194 51114    146   98           9  3    1  6                  2 9
1A46594 51114  1 200  118           6  7      12                  2 9
1A46194 51115  2 163   96          11  4       7                  210
1A46594 51115    322  145          10 10      10                  210
1A46194 51116  3 166  105           5  2    3  6                  211
1A46594 51116  4 375  190           9  8    3  6                  211
1A46194 51117    126   99           4  3       8                  212
1A46594 51117  2 238  139           8  6      11                  212
1A46194 51118    117   82           5  1    1  6                  213
1A46594 51118    221  144           6  4      12                  213
1A46194 51119    101   78           6          7                  214
1A46594 51119    191  132           6  3    1  7                  214
1A46194 51120     89   67           4  1       6                  215
1A46594 51120  1 162   96           4          5                  215
1A46194 51121     81   66           1          4                  216
1A46594 51121    133   93           2          5                  216
1A46194IN COLUMBIA, JUST NORTH OF TUTT ST.                        198
1A46594IN COLUMBIA, JUST NORTH OF TUTT ST.                        198
1A46194 KY  55   8 2 306 62000 11200932    10300 R                199
1A46594 KY  55   8 2 306 62000 11200932    10300 R                199
1P34394 72814     51   42      1    6  5 3     2     1            3 1
1P34794 72814  1  58   36      1    6  1    1  2                  3 1
1P34394 72815     82   42           4    2  2  3                  3 2
1P34794 72815     79   59           6  4 1  1  1                  3 2
1P34394 72816     56   41           4  1 1                        3 3
1P34794 72816     88   58           2  2    1  3                  3 3
1P34394 72817     57   42           5                             3 4
1P34794 72817  1  73   43              3    1                     3 4
1P34394 72818  1  64   35           2          3                  3 5
1P34794 72818     49   24           1       1  1                  3 5
1P34394 72819  1  46   31                                         3 6
1P34794 72819     52   35           2          2                  3 6
1P34394 72820     28   21           2                             3 7
1P34794 72820     36   17           1                             3 7
1P34394 72821     31   12           1  1       2                  3 8
1P34794 72821  1  31    9           2                             3 8
1P34394 72906     80   49           3  1    1  1                  3 9
1P34794 72906     32   27           2          3                  3 9
1P34394 72907     36   18           5  3 2     7                  310
1P34794 72907     46   32           1       4                     310
1P34394 72908     47   36           8  1    1  3                  311
1P34794 72908     35   29           5  5 2  3  2                  311
1P34394 72909     37   25          11  3 1  2  2                  312
```

Figure A5. Example Input Data for CLASSUM

Vehicle Classification Records - Data (Classum Input)

Columns	Description
1-3	County Number
4-6	Station Identification Number
7	Direction of Travel (1=N, 2=NE, 3=E, 4=SE, 5=S, 6=SW, 7=W, 8=NW)
8-9	Year of Data
10-11	Month of Data
12-13	Day of Month
14-15	Hour of Day
16-18	Type 1 Vehicles - Motorcycles
19-24	Type 2 Vehicles - Automobiles
25-29	Type 3 Vehicles - Pickups
30-33	Type 4 Vehciles - Buses (commercial)
34-36	Type 5 Vehicles - Buses (school & other)
37-41	Type 6 Vehicles - 2-axle, single unit trucks
42-44	Type 7 Vehicles - 3-axle, single unit trucks
45-47	Type 8 Vehicles - 4 or more axle, single unit trucks
48-51	Type 9 Vehicles - 4 or less axle, single trailer trucks
52-55	Type 10 Vehicles - 5-axle, single trailer trucks
56-58	Type 11 Vehicles - 6 or more axle, single trailer trucks
59-62	Type 12 Vehicles - 5 or less axle, multi-trailer trucks
63-65	Type 13 Vehicles - 6-axle, multi-trailer trucks
66-68	Type 14 Vehicles - 7 or more axle, multi-trailer trucks
69-72	Type 15 Vehicles - Coal Trucks

Note: Format of Input Data for CLASSUM as shown in Figure A5.

Vehicle Classification Records - Header Card (98) (Classum Input)

Columns	Description
1-3	County Number (1-120)
4-6	Station Identification Number
7	Direction of Travel (1=N, 2=NE, 3=E, 4=SE, 5=S, 6=SW, 7=W, 8=NW)
8-9	Year of Data
10-76	Location Description
78-79	Card Serial Number (99)

Vehicle Classification Records - Header Card (99) (Classum Input)

Columns	Description
1-3	County Number (1-120)
4-6	Station Identification Number
7	Direction of Travel (1=N, 2=NE, 3=E, 4=SE, 5=S, 6=SW, 7=W, 8=NW)
8-9	Year of Data
10-12	Route Type (US, KY, etc.)
13-16	Route Number
17	Route Suffix
18-19	District Number
20-21	Federal Aid System
22-23	State System
24-25	Functional Classification
26-31	Highway Weight Limit
32-37	AADT
38-39	Year of AADT
40	Season of Data
50-55	Milepoint
78-79	Card Serial Number (98)

Note: Format of Header Cards for CLASSUM Input as shown in Figure A5.

```
1CO  1STAA46RTE  KY  55 MP 10300YR94AADT 11200FED. AID2FUNC 6                 1 A46  6 1
2 1 099  42  6450 4346   0  276 164   1  35  394   1   0   2   0   0 -11715   1 A46  6 2
2 4 099  40  5797 4025   0  245 143   1  43  366   1   0   3   0   0 -10666   1 A46  6 3
2 7 099  46  5229 3861   0  231 156   1  39  377   1   0   3   0   0  -9949   1 A46  6 4
210 099  38  5478 3842   0  242 167   1  34  407   1   0   2   0   0 -10216   1 A46  6 5
3 0 099  42  5739 4019   0  249 158   1  38  386   1   0   3   0   0 -10637   1 A46  6 6
1CO  1STAP34RTE  KY  80 MP 20058YR94AADT  3110FED. AID2FUNC 7                 1 P34  7 1
2 1 099   2  2158 1226   8  128  32  10  30   64   0   1   0   0   0  -3664   1 P34  7 2
2 4 099   6  2025 1242   4  134  42  13  40   73   0   2   0   0   0  -3585   1 P34  7 3
2 7 099   7  1827 1191   2  126  46  16  36   75   0   1   0   0   0  -3332   1 P34  7 4
210 099   5  1842 1128   3  142  44  15  36  100   0   2   0   0   0  -3321   1 P34  7 5
3 0 099   6  1963 1197   5  133  42  14  36   79   0   2   0   0   0  -3476   1 P34  7 6
1CO  1STA010RTE  KY  80 MP 13500YR94AADT  4730FED. AID2FUNC 6                 1 010  6 1
2 1 099   7  2840 1887   0  124  62   9   5  152   0   0   4   0   0  -5094   1 010  6 2
2 4 099   7  2552 1748   0  110  54   9   7  141   0   0   4   0   0  -4635   1 010  6 3
2 7 099   8  2302 1676   0  104  59  11   6  146   0   0   4   0   0  -4320   1 010  6 4
210 099   6  2412 1668   0  109  63  10   5  157   0   0   4   0   0  -4438   1 010  6 5
3 0 099   7  2527 1745   0  112  60  10   6  150   0   0   4   0   0  -4622   1 010  6 6
1CO  2STAA07RTE  KY  98 MP   300YR94AADT  8360FED. AID4FUNC 7                 2 A07  7 1
2 1 099  13  5056 2882  18  144  27   3  42   54   0   0   0   0   0  -8242   2 A07  7 2
2 4 099  17  4604 3034  31  220   8   6  93   56   0   0   0   0   0  -8074   2 A07  7 3
2 7 099  24  4223 2418   0   39  62   0   9   56   0   0   0   0   0  -6834   2 A07  7 4
210 099  17  4305 2593  11  131  34   3  41   68   0   0   0   0   0  -7209   2 A07  7 5
3 0 099  18  4547 2732  15  134  33   4  47   59   0   0   0   0   0  -7590   2 A07  7 6
1CO  2STAA73RTE  US  31EMP  8100YR94AADT  4513FED. AID2FUNC 6                 2 A73  6 1
2 1 099   3  5045  975 229  144  36   3  74  495  15   2   0   0   0  -7025   2 A73  6 2
2 4 099  10  4735  988 127  150  46   4  96  561  14   3   0   0   0  -6739   2 A73  6 3
2 7 099  12  4272  948  71  142  51   5  88  579  15   3   0   0   0   6186   2 A73  6 4
210 099   9  4307  897 107  159  48   4  86  761  18   4   0   0   0  -6405   2 A73  6 5
3 0 099   9  4590  952 134  149  46   4  86  599  16   3   0   0   0  -6589   2 A73  6 6
1CO  3STA046RTE  US 127BMP  6099YR94AADT 10300FED. AID2FUNC 2                 3 046  2 1
2 1 099  27  7597 4810  37  399  83  34  61  582  12   3   0   0   0 -13649   3 046  2 2
2 4 099  27  6827 4455  31  353  72  32  75  541  11   2   0   0   0 -12430   3 046  2 3
2 7 099  81  6432 4674  10  393 117  51  72  681  12   3   0   0   0 -12531   3 046  2 4
210 099  26  6702 4468  20  327  95  36  52  495  11   3   0   0   0 -12239   3 046  2 5
3 0 099  41  6890 4602  25  368  92  39  65  575  12   3   0   0   0 -12713   3 046  2 6
1CO  5STAA60RTE  US  68 MP 12600YR94AADT  8800FED. AID2FUNC14                 5 A60 14 1
2 1 099  10  7060 3482   5  189  24   3 115   48   0   0   0   0   0 -10940   5 A60 14 2
2 4 099  27  6626 3527   2  198  32   4 150   55   0   0   0   0   0 -10624   5 A60 14 3
2 7 099  30  5978 3383   1  187  35   4 137   57   0   0   0   0   0  -9816   5 A60 14 4
210 099  24  6028 3204   2  210  33   4 135   75   0   0   0   0   0  -9718   5 A60 14 5
3 0 099  23  6424 3399   3  196  31   4 135   59   0   0   0   0   0 -10275   5 A60 14 6
1CO  5STAB04RTE  US  68 MP 12699YR94AADT  9410FED. AID3FUNC16                 5 B04 16 1
2 1 099   9  7681 3802  42  213  47   2   0   16   0   0   0   0   0 -11816   5 B04 16 2
2 4 099   9  8530 4537  59  277   4   1   2   18   0   0   0   0   0 -13442   5 B04 16 3
2 7 099  26  4970 2629   4  112 124   4   0   16   0   0   0   0   0  -7888   5 B04 16 4
210 099  14  6537 3410  25  200  62   3   0   21   0   0   0   0   0 -10276   5 B04 16 5
3 0 099  15  6930 3595  33  201  60   3   1   18   0   0   0   0   0 -10856   5 B04 16 6
1CO  5STAB09RTE  US  31VMP  1500YR94AADT 12800FED. AID2FUNC14                 5 B09 14 1
2 1 099  12  4249 1638   4   59  39   0  10    6   0   0   0   0   0  -6020   5 B09 14 2
2 4 099  18  3640 1656   8   67  41   0  21   11   0   0   0   0   0  -5465   5 B09 14 3
2 7 099  18  3765 1447   0   41  44   0   4    0   0   0   0   0   0  -5321   5 B09 14 4
210 099  15  3618 1475   2   56  45   0  10    6   0   0   0   0   0  -5232   5 B09 14 5
3 0 099  16  3818 1555   4   56  43   0  12    6   0   0   0   0   0  -5510   5 B09 14 6
1CO  5STAB33RTE  US  31EMP 13199YR94AADT 16400FED. AID2FUNC14                 5 B33 14 1
2 1 099  10  8956 3654  95  314 203   0   0  304   5   0   1   0   0 -13546   5 B33 14 2
2 4 099   6  8608 3613  47  417 274   0   0  416   0   0   0   0   0 -13384   5 B33 14 3
2 7 099  43  7056 3312  41  155 128   0   1  186  10   0   2   0   0 -10938   5 B33 14 4
210 099  19  7625 3292  49  293 221   0   0  354   6   0   1   0   0 -11866   5 B33 14 5
```

Figure A6. Example Output of Seasonal and Annual Average Daily Volume for Each Vehicle Type

CLASSUM Output - A (ref. Figure A6.)

Location Description Header Record.

Columns	Description
1	Code Number (1)
2-3	"CO"
4-6	County
7-9	"STA"
10-12	Station Number
13-15	"RTE"
16-23	Route
25-26	"MP"
27-32	Milepoint
33-34	"YR"
35-36	Year of Count
37-40	"AADT"
41-46	AADT
47-54	"FED. AID"
55	Federal Aid Category
56-59	"FUNC"
60-61	Functional Classification
77-79	County Number
81-83	Station Identification Number
85-86	Functional Classification
88	Record Number for Station

Note: Format of CLASSUM Output Data Location Description Header Record as shown in Figure A6.

CLASSUM Output - A (ref. Figure A6.)

Seasonal and Annual Average Volumes for Each Location
Four Records with Seasonal Volumes and One Record with Annual Average Volumes for Each Location

1	Code Number (2,3)
2-3	Month of Data
4-5	Date of Month
6-7	Time of Day
8-11	Number of Type 1 Vehicles
12-17	Number of Type 2 Vehicles
18-22	Number of Type 3 Vehicles
23-26	Number of Type 4 Vehicles
27-31	Number of Type 5 Vehicles
32-35	Number of Type 6 Vehicles
36-39	Number of Type 7 Vehicles
40-43	Number of Type 8 Vehicles
44-48	Number of Type 9 Vehicles
49-52	Number of Type 10 Vehicles
53-56	Number of Type 11 Vehicles
57-60	Number of Type 12 Vehicles
61-64	Number of Type 13 Vehicles
65-68	Number of Coal Trucks
69-75	Total Vehicles
77-79	County Number
81-83	Station Identification Number
86-86	Functional Classification
88	Record Number for Station

Note: Format of CLASSUM Output of Seasonal and Annual Average Volume as shown in Figure A6.

```
                STATION DESCRIPTION LISTING
CO  1STAA46 94  KY  55  IN COLUMBIA, JUST NORTH OF TUTT ST.
CO  1STAP34 94  KY  80  2.0 MILES WEST OF THE ADAIR-RUSSELL COUNTY LINE
CO  1STA010 94  KY  80  EAST OF COLUMBIA, AT THE RUSSELL CREEK BRIDGE
CO  2STAA07 94  KY  98  MAIN ST. IN SCOTTSVILLE BETWEEN 9TH ST. & THOMPKINSVILLE RD.(KY 98
CO  2STAA73 94  US  31E IN SCOTTSVILLE, 0.3 MILES NORTH OF KY 100
CO  3STA046 94  US 127B LAWRENCEBURG BYPASS, 0.5 MILES SOUTH OF KY 151
CO  5STAA60 94  US  68  MAIN ST. IN GLASGOW JUST WEST OF NORTH BROADWAY
CO  5STAB04 94  US  68  NORTH BROADWAY IN GLASGOW JUST EAST OF MAIN ST.
CO  5STAB09 94  US  31V GREEN ST.(1-WAY)IN GLASGOW JUST SOUTH OF WEST MAIN ST.(US 68)
CO  5STAB33 94  US  31E GLASGOW BYPASS JUST SOUTH OF CLEVLAND AVE.(KY 1297)
CO  5STAB42 94  US  31E SCOTTSVILLE RD. IN GLASGOW JUST NORTH OF OLD SCOTTSVILLE RD.
CO  6STAA15 94  US  60  MAIN ST. IN OWINGSVILLE JUST EAST OF BATH AVE.
CO  6STA275 94  US  60  JUST EAST OF VANCE ROAD
CO  6STA520 94   I  64  BETWEEN THE BATH-MONTGOMERY CO. LINE AND KY 36
CO  6STA521 94  US  60  0.5 MILES EAST OF STEPSTONE ROAD
CO  6STA760 94  KY  11  2 MILES NORTH OF KY 36 AT SHARPSBURG
CO  7STAB65 94  KY2079  19TH ST. IN MIDDLESBORO JUST WEST OF NUTWOOD RD.
CO  7STA520 94  KY  74  JUST EAST OF THE KENTUCKY-TENNESSEE STATE LINE
CO  7STA761 94  US  25E JUST SOUTH OF KY 190, SOUTH OF PINEVILLE
CO  8STAK04 94  KY 236  IN FLORENCE, BETWEEN TOWER DR. AND DONALDSON RD.
CO  8STAK41 94  KY  18  IN FLORENCE, BETWEEN GIRARD ST. AND PRICE PIKE
CO  8STAK94 94  KY  18  IN FLORENCE, JUST WEST OF BOONE AIRE PIKE
CO  8STAR07 94  US  25  IN WALTON, 0.3 MILES NORTH OF KY 14
CO  8STA010 94   I  75  IN FLORENCE BETWEEN KY 18 AND KY 236
CO  8STA270 94  KY 338  AT RICHWOOD, BETWEEN I-75 AND US 25
CO  9STAP26 94  US  68  1.6 MILES EAST OF US 460 EAST IN PARIS
CO 10STAC47 94  US  60  JUST EAST OF KY 180, WEST OF ASHLAND
CO 10STAP42 94  US  23  0.1 MILES NORTH OF THE BOYD-LAWRENCE COUNTY LINE
CO 10STA015 94  US  23  JUST SOUTH OF KY 3, SOUTH OF I-64
CO 11STAA08 94  KY  34  LEBANON RD. IN DANVILLE BETWEEN WALNUT ST. AND GUISENBERRY ST.
CO 11STAB12 94  US 127  4TH ST. IN DANVILLE BETWEEN GRANT ST. AND GREEN ST.
CO 11STAB36 94  KY  34  LEBANON RD. IN DANVILLE JUST WEST OF US 127 BYPASS
CO 11STA521 94  US  68  JUST EAST OF THE BOYLE-MARION COUNTY LINE
CO 11STA750 94  US  68  0.7 MILES WEST OF US 150 AT PERRYVILLE
CO 11STA752 94  US  68  0.4 MILES EAST OF US 150, NORTHEAST OF PERRYVILLE
CO 12STAA07 94  KY  10  MIAMI ST. IN BROOKSVILLE JUST WEST OF LINCOLN ST.
CO 12STA019 94  KY   8  0.3 MILES WEST OF WRANGLING RUN RD.EAST
CO 12STA802 94  KY 546  1 MILE WEST OF KY 1159
CO 14STAE05 94  KY  79  FIRST AVE. IN IRVINGTON JUST NORTH OF THE L&N RAILROAD CROSSING
CO 14STA807 94  KY 259  JUST NORTH OF KY 2779(NEW BETHEL CHURCH RD.)
CO 14STA810 94  US  60  0.7 MILES EAST OF KY 144 AT CLOVERPORT
CO 15STA529 94  KY  61  JUST NORTH OF THE BULLITT-NELSON COUNTY LINE
CO 15STA752 94   I  65  BETWEEN KY 44 AT SHEPEARDSVILLE AND KY 1526 AT BROOKS
CO 16STAA40 94  US 231  IN MORGANTOWN, 0.6 MILES NORTH OF THE GREEN RIVER PARKWAY
CO 16STAP37 94  US 231  4.6 MILES NORTH OF KY 403 NORTH, IN MORGANTOWN
CO 19STAA30 94  US  27  MONMOUTH ST. IN NEWPORT BETWEEN 19TH ST. AND 18TH ST.
CO 19STAE24 94  N00027  BRIGHTON ST. IN NEWPORT BETWEEN 12TH ST. AND HORNTON ST.
CO 19STAE29 94  US  27  YORK ST.(1-WAY)IN NEWPORT BETWEEN 10TH ST. AND 11TH ST.
CO 19STAE58 94  US  27  MONMOUTH ST.(1-WAY)IN NEWPORT JUST NORTH OF 11TH ST.
CO 19STAP96 94   I 471  BETWEEN I-275 AND US 27
CO 19STAS02 94  US  27  IN ALEXANDERIA. 0.1 MILE NORTH OF POPULAR RIDGE RD.
CO 19STA301 94  KY 546  JUST EAST OF KY 735 AT FLAGG SPRING
CO 19STA752 94  KY 546  AA HWY., 1.2 MILES WEST OF US 27, JUST WEST OF MURNAN RD.
CO 19STA806 94   I 471  AT THE KENTUCKY-OHIO STATE LINE
CO 19STA812 94   I 471F IN HIGHLAND HEIGHTS BETWEEN US 27 AND I-275
CO 20STA278 94  KY  20  0.5 MILES EAST OF KY 1377 AT MILBURN
CO 20STA773 94  KY 123  JUST NORTH OF KY 1741
CO 21STAA10 94  US  42  HIGHLAND AVE. IN CARROLLTON JUST WEST OF 2ND ST.
```

Figure A7. Example Output of Report Headings for Volumes by Vehicle Type.

		MOTOR CYCLES	PASNGR CARS	OTHER 2 AXLE 4 TIRE VEHCLS	BUSES	SINGLE UNIT 2AXLE 6 TIRES	SINGLE UNIT 3 AXLE	SINGLE UNIT 4 OR MORE AXLE	TRACTOR TRUCK SINGLE TRAILER 4 OR LESS AXLE	TRACTOR TRUCK SINGLE TRAILER 5 AXLE	TRACTOR TRUCK SINGLE TRAILER 6 OR MORE AXLE	TRACTOR TRUCK MULTI-TRAILER 5 OR LESS AXLE	TRACTOR TRUCK MULTI-TRAILER 6 AXLE	TRACTOR TRUCK MULTI-TRAILER 7 OR MORE AXLE	COAL TRUCKS	TOTAL	# OF HOURS OF DATA PER SEASON
COUNTY 1	WINTER	42.	6451.	4346.	0.	277.	164.	1.	35.	394.	1.	0.	3.	0.	0.	-11716.	0
STATION A46																	
ROUTE KY 55	SPRING	41.	5797.	4026.	0.	245.	143.	1.	44.	366.	1.	0.	3.	0.	0.	-10667.	16
MILE PT. 10.300																	
FED AID 2 FUNC 6	SUMMER	47.	5230.	3862.	0.	231.	157.	1.	40.	378.	1.	0.	3.	0.	0.	-9950.	0
DIRS COUNTED 1																	
AADT 11200	FALL	38.	5479.	3843.	0.	243.	167.	1.	34.	407.	1.	0.	3.	0.	0.	-10217.	0
% TRUCKS 7.9																	
% TRK W/C .0	ANNUAL AVERAGE	42.	5739.	4019.	0.	249.	158.	1.	38.	386.	1.	0.	3.	0.	0.	-10637.	
COUNTY 1	WINTER	2.	2158.	1226.	9.	129.	33.	11.	31.	65.	0.	1.	0.	0.	0.	-3665.	0
STATION P34																	
ROUTE KY 80	SPRING	7.	2026.	1242.	5.	134.	42.	13.	40.	74.	0.	2.	0.	0.	0.	-3586.	0
MILE PT. 20.058																	
FED AID 2 FUNC 7	SUMMER	8.	1827.	1192.	2.	127.	47.	16.	37.	76.	0.	2.	0.	0.	0.	-3333.	16
DIRS COUNTED 1																	
AADT 3110	FALL	6.	1843.	1128.	4.	142.	44.	16.	36.	100.	0.	2.	0.	0.	0.	-3322.	0
% TRUCKS 8.9																	
% TRK W/C .0	ANNUAL AVERAGE	6.	1963.	1197.	5.	133.	42.	14.	36.	79.	0.	2.	0.	0.	0.	-3476.	
COUNTY 1	WINTER	7.	2841.	1887.	0.	125.	62.	10.	6.	153.	0.	0.	4.	0.	0.	-5095.	0
STATION 010																	
ROUTE KY 80	SPRING	7.	2553.	1748.	0.	110.	54.	9.	7.	142.	0.	0.	4.	0.	0.	-4635.	16
MILE PT. 13.500																	
FED AID 2 FUNC 6	SUMMER	8.	2303.	1677.	0.	104.	60.	11.	7.	146.	0.	0.	5.	0.	0.	-4320.	0
DIRS COUNTED 1																	
AADT 4730	FALL	7.	2412.	1669.	0.	109.	64.	11.	6.	158.	0.	0.	4.	0.	0.	-4439.	0
% TRUCKS 7.4																	
% TRK W/C .0	ANNUAL AVERAGE	7.	2527.	1745.	0.	112.	60.	10.	6.	150.	0.	0.	4.	0.	0.	-4622.	

1 DAILY VOLUMES BY VEHICLE TYPE FOR 1994

Figure A8. Example Output of Daily Volumes by Vehicle Type

```
                 ERROR LISTING FOR CLASSIFICATION ESTIMATION
  5 B09 7 :(  12800)  US  31V AT MILEPOINT    1.500 AADT EXCEEDS LIMITS
  8 K41 7 :(  17100)  KY  18  AT MILEPOINT   16.100 AADT EXCEEDS LIMITS
 11 B36 7 :(   4440)  KY  34  AT MILEPOINT   10.700 AADT EXCEEDS LIMITS
 12 802 7 :(   1690)  KY 546  AT MILEPOINT    8.600 AADT EXCEEDS LIMITS
 48 778 7 :(   5150)  US 119  AT MILEPOINT   13.800 AADT EXCEEDS LIMITS
 56 781 7 :(   2480)  KY  61  AT MILEPOINT    8.000 AADT EXCEEDS LIMITS
 61 001 7 :(    550)  KY 718  AT MILEPOINT    9.100 AADT EXCEEDS LIMITS
 62 250 7 :(   3770)  US  31E AT MILEPOINT   11.510 AADT EXCEEDS LIMITS
 64 293 8 :(   3960)  US  23  AT MILEPOINT   14.700 TRUCKS OVER 50% OF VHCLS
 81 C13 7 :(   5060)  US  68  AT MILEPOINT   11.800 AADT EXCEEDS LIMITS
104 753 7 :(   2100)  KY  80  AT MILEPOINT     .100 AADT EXCEEDS LIMITS
120 P53 7 :(   6350)  KY9002  AT MILEPOINT   69.700 AADT EXCEEDS LIMITS
                   0 PIECES OF DATA WITH UNUSABLE HOUR  NUMBERS
                   2 PIECES OF DATA WITH UNUSABLE MONTH NUMBERS
```

EDIT CHECKS.

1. The county code is not within the range 001 to 120.
2. The station number is blank.
3. The federal-aid code is not within the range 1 to 4 or equal to 8.
4. The AADT recorded on the classification file differs from the projected AADT by more than double or less than half.
5. The percent of the volume that is trucks exceeds 50.
6. The coal-truck volume exceeds the truck volume.

Data records are rejected if the hour is not in the range 00 to 24.
Data records are rejected is the month is not in the range 01 to 12.

Figure A9. Example Output of Error Listing for CLASSUM Program.

```
1CO  1STAA46RTE  KY  55 MP 10300YR94AADT 11200FED. AID2FUNC 6                  1 A46  6 1
3 0 099  42  5739 4019   0  249 158   1  38  386   1   0   3   0   0 -10637   1 A46  6 6
1CO  1STAP34RTE  KY  80 MP 20058YR94AADT  3110FED. AID2FUNC 7                  1 P34  7 1
3 0 099   6  1963 1197   5  133  42  14  36   79   0   2   0   0   0  -3476   1 P34  7 6
1CO  1STA010RTE  KY  80 MP 13500YR94AADT  4730FED. AID2FUNC 6                  1 010  6 1
3 0 099   7  2527 1745   0  112  60  10   6  150   0   0   4   0   0  -4622   1 010  6 6
1CO  2STAA07RTE  KY  98 MP   300YR94AADT  8360FED. AID4FUNC 7                  2 A07  7 1
3 0 099  18  4547 2732  15  134  33   4  47   59   0   0   0   0   0  -7590   2 A07  7 6
1CO  2STAA73RTE  US  31EMP  8100YR94AADT  4513FED. AID2FUNC 6                  2 A73  6 1
3 0 099   9  4590  952 134  149  46   4  86  599  16   3   0   0   0  -6589   2 A73  6 6
1CO  3STA046RTE  US 127BMP  6099YR94AADT 10300FED. AID2FUNC 2                  3 046  2 1
3 0 099  41  6890 4602  25  368  92  39  65  575  12   3   0   0   0 -12713   3 046  2 6
1CO  5STAA60RTE  US  68 MP 12600YR94AADT  8800FED. AID2FUNC14                  5 A60 14 1
3 0 099  23  6424 3399   3  196  31   4 135   59   0   0   0   0   0 -10275   5 A60 14 6
1CO  5STAB04RTE  US  68 MP 12699YR94AADT  9410FED. AID3FUNC16                  5 B04 16 1
3 0 099  15  6930 3595  33  201  60   3   1   18   0   0   0   0   0 -10856   5 B04 16 6
1CO  5STAB09RTE  US  31VMP  1500YR94AADT 12800FED. AID2FUNC14                  5 B09 14 1
3 0 099  16  3818 1555   4   56  43   0  12    6   0   0   0   0   0  -5510   5 B09 14 6
1CO  5STAB33RTE  US  31EMP 13199YR94AADT 16400FED. AID2FUNC14                  5 B33 14 1
3 0 099  20  8062 3468  58  295 207   0   1  315   6   0   1   0   0 -12434   5 B33 14 6
1CO  5STAB42RTE  US  31EMP 10500YR94AADT 10100FED. AID2FUNC16                  5 B42 16 1
3 0 099  28  7853 1829  38  262  62   4 147  418  10   3   0   0   0 -10657   5 B42 16 6
1CO  6STAA15RTE  US  60 MP  6900YR94AADT  4570FED. AID4FUNC 7                  6 A15  7 1
3 0 099  11  3964 1039  94   45  28   1   2   10   1   0   0   0   0  -5195   6 A15  7 6
1CO  6STA275RTE  US  60 MP 12699YR94AADT  2830FED. AID4FUNC 7                  6 275  7 1
3 0 099   2  2447  559  42   47  20   2  40   10   2   0   0   1   0  -3172   6 275  7 6
1CO  6STA520RTE   I  64 MP118199YR94AADT 11100FED. AID1FUNC 1                  6 520  1 1
3 0 099  19  7566 2111  58  255  42  37 409  821  63  42   7  71   0 -11501   6 520  1 6
1CO  6STA521RTE  US  60 MP  5599YR94AADT  1070FED. AID4FUNC 7                  6 521  7 1
3 0 099   3   920  337   8   20   2   0   6    7   1   0   0   0   0  -1303   6 521  7 6
1CO  6STA760RTE  KY  11 MP  8000YR94AADT  1743FED. AID4FUNC 7                  6 760  7 1
3 0 099   2  1214  939   0  159  26   8  14   31   7   0   0   0   9  -2421   6 760  7 6
1CO  7STAB65RTE  KY2079 MP  2900YR94AADT  6500FED. AID3FUNC16                  7 B65 16 1
3 0 099   0  4683 2656  19  231  58   0   6  259   8   0   0   2 155  -7920   7 B65 16 6
1CO  7STA520RTE  KY  74 MP   100YR94AADT   650FED. AID4FUNC 7                  7 520  7 1
3 0 099   0   444  323   3   25 158   0   0  294   0   0   0   0 408  -1248   7 520  7 6
1CO  7STA761RTE  US  25EMP 11899YR94AADT 14700FED. AID2FUNC 2                  7 761  2 1
3 0 099   8 13165 5616 234  723 257  19  58  929   8 112   2   0 289 -21131   7 761  2 6
1CO  8STAK04RTE  KY 236 MP  1399YR94AADT 13300FED. AID3FUNC16                  8 K04 16 1
3 0 099  29  9533 1241   3   15 120  12  30   89   3   0   0   0   0 -11073   8 K04 16 6
1CO  8STAK41RTE  KY  18 MP 16100YR94AADT 17100FED. AID3FUNC16                  8 K41 16 1
3 0 099   4  6832  563  37   68   6   0  19    6   0   0   0   0   0  -7535   8 K41 16 6
1CO  8STAK94RTE  KY  18 MP 12000YR94AADT 25700FED. AID3FUNC16                  8 K94 16 1
3 0 099  28 12934 2018  40  226 229  42  61   62  19   4   0  18  31 -15680   8 K94 16 6
1CO  8STAR07RTE  US  25 MP   899YR94AADT  6640FED. AID3FUNC16                  8 R07 16 1
3 0 099  23  5501 1479  44  333 126  34  42   63   8   0   0   0   0  -7652   8 R07 16 6
1CO  8STA010RTE   I  75 MP182600YR94AADT117500FED. AID1FUNC11                  8 010 11 1
3 0 099  73 6877430468 166 3327 937 154 68614962 137 787 135   8  11-120615   8 010 11 6
1CO  8STA270RTE  KY 338 MP   100YR94AADT  8500FED. AID4FUNC 7                  8 270  7 1
3 0 099   2  4348 2573   1  378 113   8  86 3343  19  13   2   0   0 -10887   8 270  7 6
1CO  9STAP26RTE  US  68 MP  4183YR94AADT  7080FED. AID2FUNC 2                  9 P26  2 1
3 0 099  11  4678 2939   5  302  13   2 130  260  16   0   5   0   6  -8361   9 P26  2 6
1CO 10STAC47RTE  US  60 MP  4199YR94AADT 19300FED. AID2FUNC14                 10 C47 14 1
3 0 099  45 17666 3528  55  513 143   9 230  192  30   6   0   0   0 -22416  10 C47 14 6
1CO 10STAP42RTE  US  23 MP   100YR94AADT  9130FED. AID2FUNC 2                 10 P42  2 1
3 0 099   3  3291 2566   8  311  96  26 124 14802039   4   0   02582  -9948  10 P42  2 6
1CO 10STA015RTE  US  23 MP 10399YR94AADT 15200FED. AID2FUNC 2                 10 015  2 1
3 0 099  39  7062 5547  27  621 159  60 101 1111 686   0   0   0 653 -15413  10 015  2 6
1CO 11STAA08RTE  KY  34 MP  1299YR94AADT  5690FED. AID3FUNC16                 11 A08 16 1
```

Figure A10. Example Output of Annual Average Daily Volume for Each Vehicle Type.

```
1CO  3STA046RTE  US 127BMP  6099YR94AADT 10300FED. AID2FUNC 2                      3 046  2 1
3 0 099  41  6890 4602  25  368  92  39  65  575  12   3   0   0   0 -12713   3 046  2 6
1CO  7STA761RTE  US  25EMP 11899YR94AADT 14700FED. AID2FUNC 2                      7 761  2 1
3 0 099   8 13165 5616 234  723 257  19  58  929   8 112   2   0 289 -21131   7 761  2 6
1CO  9STAP26RTE  US  68 MP  4183YR94AADT  7080FED. AID2FUNC 2                      9 P26  2 1
3 0 099  11  4678 2939   5  302  13   2 130  260  16   0   5   0   6  -8361   9 P26  2 6
1CO 10STAP42RTE  US  23 MP   100YR94AADT  9130FED. AID2FUNC 2                     10 P42  2 1
3 0 099   3  3291 2566   8  311  96  26 124 14802039   4   0  02582  -9948  10 P42  2 6
1CO 10STA015RTE  US  23 MP 10399YR94AADT 15200FED. AID2FUNC 2                     10 015  2 1
3 0 099  39  7062 5547  27  621 159  60 101 1111 686   0   0   0 653 -15413  10 015  2 6
1CO 12STA802RTE  KY 546 MP  8600YR94AADT  1690FED. AID2FUNC 2                     12 802  2 1
3 0 099   2  2175 1360   3  194  34   3  81  528  13   2   1   0   0  -4396  12 802  2 6
1CO 14STA810RTE  US  60 MP  1799YR94AADT  2214FED. AID2FUNC 2                     14 810  2 1
3 0 099   1  1273  405   6   71  28   1  13  202   1   0   0   0   0  -2001  14 810  2 6
1CO 19STA301RTE  KY 546 MP 16100YR94AADT  4400FED. AID2FUNC 2                     19 301  2 1
3 0 099   0  2908 1263  19  228   6  41  46  624   0   4   0   0   0  -5139  19 301  2 6
1CO 19STA752RTE  KY 546 MP  3900YR94AADT 14500FED. AID2FUNC 2                     19 752  2 1
3 0 099   0  9533 4698   9  847 359 255  19  962  23   0   4   0   2 -16710  19 752  2 6
1CO 23STAA51RTE  US 127 MP 13500YR94AADT  4680FED. AID2FUNC 2                     23 A51  2 1
3 0 099  14  3576 1004  67  163  33   1  73   92   0   2   0   0   0  -5026  23 A51  2 6
1CO 26STA308RTE  KY9006 MP 35900YR94AADT  4140FED. AID2FUNC 2                     26 308  2 1
3 0 099   0  2033 1563   5  299 187   0   0  429 265   0   0   0 368  -4781  26 308  2 6
1CO 35STA782RTE  US  68 MP   500YR94AADT  2350FED. AID2FUNC 2                     35 782  2 1
3 0 099   2  1869  432  13  105   8   0 187   19   0   4   0   0   0  -2638  35 782  2 6
1CO 37STA565RTE  US 127 MP  3000YR94AADT 14600FED. AID2FUNC 2                     37 565  2 1
3 0 099  66 11872 6060  24  392  80  36  33  253  14   0   0   0   0 -18831  37 565  2 6
1CO 40STA516RTE  US  27 MP   100YR94AADT  5610FED. AID2FUNC 2                     40 516  2 1
3 0 099   2  5544 1160  27  107  25   0  74   59   2   2   0   0   0  -7003  40 516  2 6
1CO 40STA527RTE  US  27 MP  2099YR94AADT  7820FED. AID2FUNC 2                     40 527  2 1
3 0 099   3  7986 1802  38  159  19   3 115   25   1   1   0   0   0 -10152  40 527  2 6
1CO 45STA752RTE  US  23 MP 19100YR94AADT  9170FED. AID2FUNC 2                     45 752  2 1
3 0 099  19  4242 2125  64  201  71   4   7  722  36  16   6   0 141  -7514  45 752  2 6
1CO 47STA569RTE  KY9001 MP119649YR94AADT  9080FED. AID2FUNC 2                     47 569  2 1
3 0 099  17  5197 1430  64  154  39   0 670 1015  18  18   5   0   0  -8625  47 569  2 6
1CO 48STA778RTE  US 119 MP 13800YR94AADT  5150FED. AID2FUNC 2                     48 778  2 1
3 0 099   0  8077 3840  43  421 272   3  19  239  12   0   0   0 127 -12925  48 778  2 6
1CO 57STA505RTE  US  27 MP   200YR94AADT 12500FED. AID2FUNC 2                     57 505  2 1
3 0 099  10  6154 1340  17  131  30   2 112   71   2   2   0   0   0  -7870  57 505  2 6
1CO 61STA795RTE  US  25EMP 20600YR94AADT 11400FED. AID2FUNC 2                     61 795  2 1
3 0 099   0  7599 3931  46  526 179   2   7  825   0  13   0   0  78 -13127  61 795  2 6
1CO 63STAA65RTE  KY  80 MP 10000YR94AADT 11200FED. AID2FUNC 2                     63 A65  2 1
3 0 099  10  5955 5075  82  470 163  43  82  778  31  25   0   5 165 -12719  63 A65  2 6
1CO 64STA293RTE  US  23 MP 14699YR94AADT  9400FED. AID2FUNC 2                     64 293  2 1
3 0 099   0  1915 1693   6  274 138  11   0 12492282   0   0  02737  -7568  64 293  2 6
1CO 66STA773RTE  KY9006 MP 51000YR94AADT  6170FED. AID2FUNC 2                     66 773  2 1
3 0 099   0  2757 1977   3  229 123   3  43  553 142   0   0   0 245  -5830  66 773  2 6
1CO 67STAC26RTE  KY  15 MP   500YR94AADT  9520FED. AID2FUNC 2                     67 C26  2 1
3 0 099  19  7509 5055 144  359 157   1   1  303  30   0   0   0 174 -13579  67 C26  2 6
1CO 68STAP52RTE  KY   9 MP 15600YR94AADT  3420FED. AID2FUNC 2                     68 P52  2 1
3 0 099   2  2118 1006  33  117  26   0 256   35   1   4   0   0   0  -3599  68 P52  2 6
1CO 74STA342RTE  US  27 MP  9100YR94AADT  9020FED. AID2FUNC 2                     74 342  2 1
3 0 099   0  7757 3764   0  158  91  35   0  113   0   0   0   0   0 -11918  74 342  2 6
1CO 77STA280RTE  KY 114 MP  1899YR94AADT  6660FED. AID2FUNC 2                     77 280  2 1
3 0 099   3  4046  940  44  145  22   8 121  133  98  16   0   0   0  -5576  77 280  2 6
1CO 79STA259RTE  US  68 MP 26399YR94AADT  3730FED. AID2FUNC 2                     79 259  2 1
3 0 099  20  1995  812  29  110  27   1 183   97   1   0   0   0   0  -3275  79 259  2 6
1CO 81STA517RTE  US  68 MP  4699YR94AADT  2650FED. AID2FUNC 2                     81 517  2 1
3 0 099  12  2073 1301  12  206  33   7  13  260   6   0   0   0   0  -3924  81 517  2 6
1CO 81STA782RTE  KY 546 MP  3599YR94AADT  6240FED. AID2FUNC 2                     81 782  2 1
```

Figure A11. Example Output of Volumes for Each Vehicle Type and Functional Class.

CLASSUM Output - A (ref. Figure A10. and A11.)

Location Description Header Record. (First Record)

Columns	Description
1	Code Number (1)
2-3	"CO"
4-6	County
7-9	"STA"
10-12	Station Number
13-15	"RTE"
16-23	Route
25-26	"MP"
27-32	Milepoint
33-34	"YR"
35-36	Year of Count
37-40	"AADT"
41-46	AADT
47-54	"FED. AID"
55	Federal Aid Category
56-59	"FUNC"
60-61	Functional Classification
77-79	County Number
81-83	Station Identification Number
85-86	Functional Classification
88	Record Number for Station

Note: Format of CLASSUM Output Data Location Description Header Record as shown in Figures A10 and A11.

CLASSUM Output - A (ref. Figure A10. and A11.)

Annual Average Volumes for Each Location (Second Record)

Columns	Description
1	Code Number (3)
2-3	Month of Data
4-5	Date of Month
6-7	Time of Day
8-11	Number of Type 1 Vehicles
12-17	Number of Type 2 Vehicles
18-22	Number of Type 3 Vehicles
23-26	Number of Type 4 Vehicles
27-31	Number of Type 5 Vehicles
32-35	Number of Type 6 Vehicles
36-39	Number of Type 7 Vehicles
40-43	Number of Type 8 Vehicles
44-48	Number of Type 9 Vehicles
49-52	Number of Type 10 Vehicles
53-56	Number of Type 11 Vehicles
57-60	Number of Type 12 Vehicles
61-64	Number of Type 13 Vehicles
65-68	Number of Coal Trucks
69-75	Total Vehicles
77-79	County Number
81-83	Station Identification Number
86-86	Functional Classification
88	Record Number for Station

Note: Format of CLASSUM Output of Annual Average Volumes for Each Location as shown in Figures A10 and A11.

EAL TRAFFIC PARAMETERS FOR INDIVIDUAL CLASSIFICATION STATIONS
1994
FUNCTIONAL CLASS 02 -- RURAL PRINCIPAL ARTERIAL

COU	STA	ROUTE	MILE POINT	AADT	TRUCK FRACT	FRACT OF TRK WITH COAL	AXLES/TRUCK NORMAL	AXLES/TRUCK HEAVY COAL	EAL'S/AXLE NORMAL	EAL'S/AXLE HEAVY COAL	2-DIRECTION EAL'S IN 1000'S 4-TIRE VEHICLES	NON-COAL TRUCKS	COAL TRUCKS	TOTAL
3	046	US 127B	6.1	10300	.093	.000	3.747	.000	.213	.000	17.	279.	0.	296.
7	761	US 25E	11.9	14700	.111	.123	3.394	4.525	.227	2.079	24.	402.	690.	1116.
9	P26	US 68	4.2	7080	.088	.008	3.463	5.600	.213	2.219	12.	166.	23.	201.
10	P42	US 23	.1	9130	.411	.632	4.517	5.551	.226	2.224	10.	515.	10681.	11206.
10	015	US 23	10.4	15200	.179	.236	3.992	5.551	.218	2.224	23.	663.	2902.	3589.
12	802	KY 546	8.6	1690	.195	.000	4.108	.000	.189	.000	2.	94.	0.	96.
14	810	US 60	1.8	2214	.161	.000	4.051	.000	.183	.000	3.	96.	0.	100.
19	301	KY 546	16.1	4400	.188	.000	4.116	.000	.213	.000	7.	264.	0.	271.
19	752	KY 546	3.9	14500	.148	.001	3.571	5.500	.273	2.219	23.	764.	9.	795.
23	A51	US 127	13.5	4680	.086	.000	3.032	.000	.214	.000	8.	95.	0.	103.
26	308	KY9006	35.9	4140	.248	.311	3.501	5.552	.190	2.224	6.	171.	1438.	1615.
35	782	US 68	.5	2350	.127	.000	3.103	.000	.256	.000	4.	87.	0.	91.
37	565	US 127	3.0	14600	.044	.000	3.230	.000	.230	.000	25.	175.	0.	201.
40	516	US 27	.1	5610	.042	.000	3.139	.000	.220	.000	10.	60.	0.	70.
40	527	US 27	2.1	7820	.036	.000	2.816	.000	.240	.000	14.	69.	0.	82.
45	752	US 23	19.1	9170	.150	.125	4.081	5.064	.198	2.193	14.	355.	697.	1066.
47	569	KY9001	119.6	9080	.230	.000	4.161	.000	.214	.000	13.	678.	0.	691.
48	778	US 119	13.8	5150	.078	.126	2.865	4.490	.197	2.116	9.	72.	177.	258.
57	505	US 27	.2	12500	.047	.000	3.194	.000	.227	.000	22.	154.	0.	176.
61	795	US 25E	20.6	11400	.122	.049	3.655	4.559	.186	2.118	18.	327.	240.	585.
63	A65	KY 80	10.0	11200	.132	.098	3.637	4.845	.223	2.150	18.	394.	551.	963.
64	293	US 23	14.7	9400	.523	.691	4.721	5.552	.230	2.224	8.	601.	15324.	15934.
66	773	KY9006	51.0	6170	.188	.224	3.829	5.541	.186	2.225	9.	234.	1165.	1408.
67	C26	KY 15	.5	9520	.073	.175	2.915	4.672	.194	2.123	16.	119.	442.	577.
68	P52	KY 9	15.6	3420	.131	.000	3.169	.000	.252	.000	5.	130.	0.	136.
74	342	US 27	9.1	9020	.033	.000	3.260	.000	.265	.000	16.	95.	0.	111.
77	280	KY 114	1.9	6660	.105	.000	3.832	.000	.243	.000	11.	238.	0.	249.
79	259	US 68	26.4	3730	.137	.000	3.369	.000	.228	.000	6.	143.	0.	149.
81	517	US 68	4.7	2650	.137	.000	3.630	.000	.194	.000	4.	93.	0.	98.
81	782	KY 546	3.6	6240	.144	.000	3.745	.000	.196	.000	10.	242.	0.	252.
90	065	KY9002	32.5	5330	.241	.000	4.152	.000	.231	.000	7.	450.	0.	457.
91	784	US 68	6.0	3010	.102	.000	3.949	.000	.201	.000	5.	89.	0.	93.
94	A16	US 127	16.0	7350	.031	.000	2.980	.000	.235	.000	13.	59.	0.	72.
98	006	US 119	23.0	4270	.092	.000	3.591	.000	.259	.000	7.	133.	0.	140.
98	014	US 119	17.6	5140	.153	.464	2.587	4.191	.213	2.157	8.	85.	1208.	1301.

Figure A12. Example Output of Individual Classification Stations for Functional Class 2

Figure A13. Example Output of Average Values for Functional Class 2

SUMMARY OF AVERAGE VALUES FOR
FUNCTIONAL CLASS 02 -- RURAL PRINCIPAL ARTERIAL

YEAR	3 YR AVG	94	93	92	91	90	89	88	87	86	85
NUMBER OF WEIGH STA.		6	7	5							
UNCLASSIFIED ROADS (ALL AVC LOCATIONS AND MANUAL LOCATIONS WITH LESS THAN 3% OF TRUCKS CLASSIFIED AS HEAVY/COAL)											
NO OF CLASSIFICATION STA.	86	30	20	36	40	23	14	8	13	15	29
AADT	7091	7498	7415	6572	9163	6967	6594	5755	5030	5252	5816
PERCENT TRUCKS	11.910	11.995	11.295	12.180	11.033	11.288	12.915	15.604	11.214	8.849	11.579
AXLES PER TRUCK	3.610	3.555	3.653	3.632	3.589	3.685	3.738	3.852	3.608	3.253	3.492
EAL'S PER TRUCK AXLE	.227	.221	.207	.242	.274	.258	.163	.159	.170	.180	.237
CLASSIFIED ROADS (MANUAL LOCATION WITH 3% OR MORE OF TRUCKS CLASSIFIED AS HEAVY/COAL)											
NO OF CLASSIFICATION STA.	71	15	20	36	19	19	8	26	20	16	31
AADT	8075	8070	8476	7853	8681	8069	6951	8267	6655	9031	8299
PERCENT TRUCKS	16.399	18.415	15.379	16.126	15.235	15.645	11.578	14.548	16.794	16.983	16.490
PERCENT OF TRUCKS CLASSIFIED AS HEAVY/COAL	34.045	25.645	39.201	34.680	27.637	23.646	22.180	25.971	29.679	26.327	34.222
AXLES PER TRUCK NORMAL	3.292	3.563	3.129	3.269	3.403	3.577	3.170	3.679	3.551	3.648	3.464
AXLES PER TRUCK HEAVY/COAL	4.907	5.037	4.800	4.912	4.853	4.787	4.486	4.429	4.497	4.497	4.161
EAL'S PER TRUCK AXLE NORMAL	.242	.232	.213	.263	.258	.308	.163	.186	.169	.174	.243
EAL'S PER TRUCK AXLE HEAVY/COAL	2.122	2.168	2.158	2.083	2.251	2.246	3.718	4.731	4.431	4.469	4.823

Figure A14. Example Output of Average Values (Smoothed) for Functional Class 2

FUNCTIONAL CLASS 02 -- RURAL PRINCIPAL ARTERIAL
AVERAGE VALUES (SMOOTHED)

YEAR	ANNUAL CHANGE (%)	94	93	92	91	90	89	88	87	86	85
NO. OF WEIGH STA.		6	7								
UNCLASSIFIED ROADS (ALL AVC LOCATIONS AND MANUAL LOCATIONS WITH LESS THAN 3% OF TRUCKS CLASSIFIED AS HEAVY/COAL)											
NO. OF CLASSIFICATION STA.		30	20	36	40	23	14	8	13	15	29
AADT	3.602	7892	7607	7323	7039	6754	6470	6186	5902	5617	5333
PERCENT TRUCKS	.236	11.943	11.915	11.887	11.859	11.830	11.802	11.774	11.746	11.718	11.690
AXLES PER TRUCK	.276	3.655	3.645	3.635	3.624	3.614	3.604	3.594	3.584	3.574	3.564
EAL'S PER TRUCK AXLE	2.280	.235	.230	.224	.219	.214	.208	.203	.198	.192	.187
CLASSIFIED ROADS (MANUAL LOCATION WITH 3% OR MORE OF TRUCKS CLASSIFIED AS HEAVY/COAL)											
NO. OF CLASSIFICATION STA.		15	20	36	19	19	8	26	20	16	31
AADT	.359	8158	8129	8099	8070	8041	8012	7982	7953	7924	7894
PERCENT TRUCKS	.828	16.276	16.141	16.007	15.872	15.737	15.603	15.468	15.333	15.198	15.064
PERCENT OF TRUCKS CLASSIFIED AS HEAVY/COAL	1.376	30.728	30.305	29.882	29.459	29.036	28.613	28.191	27.768	27.345	26.922
AXLES PER TRUCK NORMAL	? -.796 ?	3.325	3.352	3.378	3.405	3.431	3.458	3.484	3.511	3.537	3.564
AXLES PER TRUCK HEAVY/COAL	1.629	5.014	4.932	4.851	4.769	4.687	4.606	4.524	4.442	4.361	4.279
EAL'S PER TRUCK AXLE NORMAL	2.436	.248	.242	.236	.230	.224	.218	.212	.206	.200	.194
EAL'S PER TRUCK AXLE HEAVY/COAL	?-21.470 ?	1.680	2.041	2.402	2.762	3.123	3.484	3.844	4.205	4.566	4.927

APPENDIX B

EXAMPLE OUTPUT OF DATA FROM ESAL PROCESSING
BY AGGREGATE CLASS

EAL TRAFFIC PARAMETERS FOR INDIVIDUAL CLASSIFICATION STATIONS
1994
AGGREGATE CLASS II -- RURAL PRINCIPAL ARTERIAL/
RURAL MINOR ARTERIAL

COU	STA	FC	ROUTE	MILE POINT	AADT	TRUCK FRACT	FRACT OF TRK WITH COAL	AXLES/TRUCK NORMAL	AXLES/TRUCK HEAVY COAL	EAL'S/AXLE NORMAL	EAL'S/AXLE HEAVY COAL	2-DIRECTION EAL'S IN 1000'S 4-TIRE VEHICLES	NON-COAL TRUCKS	COAL TRUCKS	TOTAL
1	010	6	KY 80	13.5	4730	.074	.000	3.625	.000	.219	.000	8.	102.	0.	110.
1	A46	6	KY 55	10.3	11200	.079	.000	3.666	.000	.187	.000	19.	220.	0.	239.
2	A73	6	US 31	8.1	4513	.157	.000	4.004	.000	.188	.000	7.	196.	0.	203.
3	046	2	US 127	6.1	10300	.093	.000	3.747	.000	.207	.000	17.	271.	0.	288.
7	761	2	US 25	11.9	14700	.111	.123	3.396	4.488	.221	2.013	24.	392.	663.	1079.
9	P26	2	US 68	4.2	7080	.088	.008	3.463	5.600	.203	2.195	12.	158.	22.	192.
10	015	2	US 23	10.4	15200	.179	.236	3.987	5.559	.213	2.201	23.	648.	2876.	3546.
10	P42	2	US 23	.1	9130	.411	.632	4.503	5.557	.221	2.201	10.	502.	10582.	11094.
12	802	2	KY 546	8.6	1690	.195	.000	4.108	.000	.184	.000	2.	91.	0.	93.
14	810	2	US 60	1.8	2214	.161	.000	4.050	.000	.179	.000	3.	94.	0.	98.
19	301	2	KY 546	16.1	4400	.188	.000	4.116	.000	.207	.000	7.	257.	0.	264.
19	752	2	KY 546	3.9	14500	.148	.001	3.572	5.500	.265	2.192	23.	741.	9.	773.
23	A51	2	US 127	13.5	4680	.086	.000	3.027	.000	.203	.000	8.	90.	0.	98.
26	308	2	KY9006	35.9	4140	.248	.311	3.497	5.558	.186	2.201	6.	168.	1424.	1598.
27	039	6	US 127	11.1	1390	.102	.000	4.028	.000	.172	.000	2.	36.	0.	38.
28	A06	6	US 60	10.4	12100	.039	.000	3.132	.000	.197	.000	21.	106.	0.	127.
29	008	6	KY 90	13.0	3100	.083	.000	3.432	.000	.249	.000	5.	81.	0.	86.
29	257	6	KY 61	.1	1440	.068	.000	3.239	.000	.205	.000	2.	24.	0.	26.
29	767	6	KY 90	4.3	2190	.070	.000	3.593	.000	.189	.000	4.	38.	0.	41.
29	A01	6	KY 61	14.8	4820	.035	.000	3.335	.000	.180	.000	8.	37.	0.	45.
32	P41	6	KY 7	11.4	2390	.053	.000	3.404	.000	.230	.000	4.	36.	0.	40.
35	782	2	US 68	.5	2350	.127	.000	3.104	.000	.231	.000	4.	79.	0.	82.
37	565	2	US 127	3.0	14600	.044	.000	3.230	.000	.222	.000	25.	169.	0.	195.
39	250	6	US 127	2.6	2930	.073	.000	2.921	.000	.228	.000	5.	52.	0.	57.
40	516	2	US 27	.1	5610	.042	.000	3.137	.000	.207	.000	10.	56.	0.	66.
40	527	2	US 27	2.1	7820	.036	.000	2.815	.000	.222	.000	14.	63.	0.	77.
43	002	6	KY 259	21.0	1450	.039	.000	3.253	.000	.201	.000	3.	14.	0.	16.
44	041	6	KY 61	18.0	2950	.095	.000	3.288	.000	.225	.000	5.	76.	0.	81.
45	752	2	US 23	19.1	9170	.150	.125	4.079	5.064	.195	2.162	14.	349.	687.	1050.
47	569	2	KY9001	119.6	9080	.230	.000	4.162	.000	.202	.000	13.	641.	0.	654.
48	778	2	US 119	13.8	5150	.078	.126	2.864	4.490	.192	2.084	9.	70.	174.	253.
49	258	6	US 62	8.7	4970	.074	.000	2.701	.000	.194	.000	8.	70.	0.	79.
53	314	6	US 51	5.3	2090	.112	.000	4.216	.000	.179	.000	3.	65.	0.	68.
53	751	6	US 51	8.0	2800	.124	.000	4.406	.000	.180	.000	4.	101.	0.	105.
55	308	6	US 421	4.5	2690	.145	.135	3.130	4.417	.324	2.082	4.	126.	178.	308.

Figure B1. Example Output of Aggregate Class II for Individual Classification Stations

EAL TRAFFIC PARAMETERS FOR INDIVIDUAL CLASSIFICATION STATIONS
1994
AGGREGATE CLASS II -- RURAL PRINCIPAL ARTERIAL/
RURAL MINOR ARTERIAL

COU	STA	FC	ROUTE	MILE POINT	AADT	TRUCK FRACT	FRACT OF TRK WITH COAL	AXLES/TRUCK NORMAL	AXLES/TRUCK HEAVY COAL	EAL'S/AXLE NORMAL	EAL'S/AXLE HEAVY COAL	2-DIRECTION EAL'S IN 1000'S 4-TIRE VEHICLES	NON-COAL TRUCKS	COAL TRUCKS	TOTAL
57	505	2	US 27	.2	12500	.047	.000	3.194	.000	.211	.000	22.	144.	0.	165.
61	795	2	US 25	20.6	11400	.122	.049	3.658	4.485	.182	2.070	18.	321.	230.	570.
62	250	6	US 31	11.5	3770	.021	.000	2.636	.000	.179	.000	7.	14.	0.	21.
63	A65	2	KY 80	10.0	11200	.132	.098	3.636	4.845	.217	2.119	18.	383.	543.	944.
64	293	2	US 23	14.7	9400	.523	.691	4.700	5.558	.228	2.201	8.	594.	15181.	15783.
65	A28	6	KY 11	3.3	5670	.054	.003	3.298	6.000	.246	2.206	10.	90.	5.	105.
66	501	6	US 421	10.0	2370	.149	.212	3.260	4.387	.187	2.127	4.	62.	255.	321.
66	759	6	US 421	15.8	3014	.086	.148	2.644	4.158	.193	1.999	5.	41.	115.	162.
66	767	6	US 421	17.7	3970	.114	.227	3.109	4.320	.183	2.031	6.	72.	330.	408.
66	773	2	KY9006	51.0	6170	.188	.224	3.833	5.529	.182	2.198	9.	229.	1149.	1386.
66	A15	6	US 421	21.6	5990	.079	.073	2.871	4.206	.198	1.999	10.	91.	104.	205.
67	C26	2	KY 15	.5	9520	.073	.175	2.909	4.672	.190	2.092	16.	116.	435.	568.
68	P52	2	KY 9	15.6	3420	.131	.000	3.169	.000	.228	.000	5.	118.	0.	124.
70	512	6	US 60	.1	7710	.045	.000	2.976	.000	.232	.000	12.	87.	0.	99.
74	005	6	US 27	14.6	5920	.095	.000	3.634	.000	.201	.000	10.	150.	0.	160.
74	342	2	US 27	9.1	9020	.033	.000	3.261	.000	.258	.000	16.	92.	0.	108.
76	507	6	US 421	12.2	4730	.033	.056	2.779	5.556	.342	2.194	8.	51.	40.	99.
77	280	2	KY 114	1.9	6660	.105	.000	3.828	.000	.234	.000	11.	229.	0.	240.
78	565	6	US 68	.1	3450	.099	.000	3.464	.000	.228	.000	6.	99.	0.	104.
78	786	6	KY 55	2.7	5950	.077	.000	3.562	.000	.216	.000	10.	128.	0.	138.
79	259	2	US 68	26.4	3730	.137	.000	3.369	.000	.211	.000	6.	132.	0.	138.
79	A24	6	US 641	7.9	5400	.029	.000	3.189	.000	.199	.000	10.	36.	0.	46.
79	P39	6	US 641	18.2	5440	.059	.000	3.272	.000	.233	.000	9.	89.	0.	99.
81	517	2	US 68	4.7	2650	.137	.000	3.629	.000	.189	.000	4.	91.	0.	95.
81	782	2	KY 546	3.6	6240	.144	.000	3.745	.000	.189	.000	10.	233.	0.	242.
82	A23	6	KY 79	9.6	2400	.123	.000	3.577	.000	.207	.000	4.	80.	0.	84.
83	252	6	US 460	14.0	1900	.093	.010	2.267	5.500	.279	2.192	3.	40.	9.	52.
83	P29	6	US 460	5.0	3010	.085	.048	2.641	4.917	.292	2.109	5.	69.	45.	119.
87	251	6	US 460	17.5	5510	.032	.000	2.952	.000	.215	.000	10.	41.	0.	51.
87	750	6	US 460	7.4	5600	.075	.000	3.135	.000	.246	.000	9.	119.	0.	128.
88	527	6	KY 203	.1	780	.066	.000	3.538	.000	.291	.000	1.	20.	0.	21.
88	A10	6	US 460	8.1	6000	.039	.000	3.045	.000	.223	.000	11.	58.	0.	68.
88	A47	6	US 460	15.4	6070	.067	.000	3.250	.000	.232	.000	10.	112.	0.	123.
90	065	2	KY9002	32.5	5330	.241	.000	4.152	.000	.221	.000	7.	430.	0.	437.
90	281	6	US 150	3.2	6220	.112	.000	3.469	.000	.196	.000	10.	172.	0.	182.

Figure B1. (Continued). Example Output of Aggregate Class II for Individual Classification Stations

EAL TRAFFIC PARAMETERS FOR INDIVIDUAL CLASSIFICATION STATIONS
1994
AGGREGATE CLASS II -- RURAL PRINCIPAL ARTERIAL/
RURAL MINOR ARTERIAL

COU	STA	FC	ROUTE	MILE POINT	AADT	TRUCK FRACT	FRACT OF TRK WITH COAL	AXLES/TRUCK NORMAL	AXLES/TRUCK HEAVY COAL	EAL'S/AXLE NORMAL	EAL'S/AXLE HEAVY COAL	2-DIRECTION EAL'S IN 1000'S 4-TIRE VEHICLES	NON-COAL TRUCKS	COAL TRUCKS	TOTAL
90	290	6	US 31	11.3	6750	.049	.000	2.695	.000	.230	.000	12.	75.	0.	86.
91	784	2	US 68	6.0	3010	.102	.000	3.946	.000	.196	.000	5.	86.	0.	91.
94	792	6	US 127	18.4	3300	.058	.000	3.120	.000	.248	.000	6.	54.	0.	60.
94	A16	2	US 127	16.0	7350	.031	.000	2.975	.000	.225	.000	13.	57.	0.	69.
96	P27	6	US 27	6.0	3810	.137	.031	3.127	4.688	.204	2.063	6.	118.	56.	180.
98	006	2	US 119	23.0	4270	.092	.000	3.588	.000	.253	.000	7.	130.	0.	137.
98	014	2	US 119	17.6	5140	.153	.464	2.584	4.191	.210	2.135	8.	84.	1196.	1287.
99	268	2	KY9000	35.9	6820	.159	.237	3.668	5.558	.255	2.201	10.	283.	1152.	1446.
100	P32	6	US 27	5.7	5810	.121	.000	3.412	.000	.236	.000	9.	207.	0.	216.
101	001	2	US 62	9.8	1470	.071	.000	2.146	.000	.191	.000	2.	15.	0.	18.
102	003	6	US 25	20.6	3170	.041	.000	2.783	.000	.191	.000	6.	25.	0.	31.
104	C38	2	US 127	14.9	8680	.058	.000	3.418	.000	.180	.000	15.	113.	0.	128.
104	P33	6	US 127	6.4	2390	.085	.000	3.276	.000	.212	.000	4.	52.	0.	56.
107	003	6	US 31	13.0	4820	.099	.000	3.082	.000	.231	.000	8.	124.	0.	132.
107	256	6	US 31	.9	6450	.163	.001	2.853	5.500	.200	2.192	10.	219.	9.	237.
109	501	6	US 68	.1	4820	.084	.000	2.960	.000	.265	.000	8.	117.	0.	125.
112	A21	6	US 421	6.4	1530	.087	.000	3.043	.000	.203	.000	3.	30.	0.	33.
114	506	2	US 68	5.7	6980	.089	.000	3.639	.000	.202	.000	12.	167.	0.	178.
114	575	2	US 68	7.2	10500	.192	.000	3.398	.000	.200	.000	15.	499.	0.	515.
117	330	2	KY9004	59.5	6160	.289	.013	4.515	5.583	.219	2.195	8.	636.	107.	752.
118	256	6	US 25	7.8	5210	.055	.320	2.445	2.935	.223	1.768	9.	39.	174.	223.
119	029	2	KY9000	55.8	2700	.143	.238	3.514	5.219	.323	2.134	4.	122.	374.	500.
119	P06	2	KY 15	11.7	1220	.091	.119	2.570	4.692	.371	2.039	2.	34.	45.	82.
120	023	2	US 60	11.9	36300	.091	.018	3.893	5.552	.210	2.200	60.	969.	259.	1288.
120	P53	2	KY9002	69.7	6350	.169	.017	4.228	5.611	.207	2.196	10.	337.	81.	427.

Figure B1. (Continued). Example Output of Aggregate Class II for Individual Classification Stations

Figure B2. Example Output of Average Values for Aggregate Class II

SUMMARY OF AVERAGE VALUES FOR
AGGREGATE CLASS II -- RURAL PRINCIPAL ARTERIAL/
RURAL MINOR ARTERIAL

YEAR	3 YR AVG	94	93	92
NUMBER OF WEIGH STA.		8	12	5
UNCLASSIFIED ROADS (ALL AVC LOCATIONS AND MANUAL LOCATIONS WITH LESS THAN 3% OF TRUCKS CLASSIFIED AS HEAVY/COAL)				
NO OF CLASSIFICATION STA.		71	61	90
AADT	5672	5730	5566	5697
PERCENT TRUCKS	9.700	9.507	9.479	10.002
AXLES PER TRUCK	3.422	3.399	3.426	3.436
EAL'S PER TRUCK AXLE	.223	.214	.205	.243
CLASSIFIED ROADS (MANUAL LOCATION WITH 3% OR MORE OF TRUCKS CLASSIFIED AS HEAVY/COAL)				
NO OF CLASSIFICATION STA.		24	33	50
AADT	7069	6493	7533	7040
PERCENT TRUCKS	14.865	15.188	14.255	15.112
PERCENT OF TRUCKS CLASSIFIED AS HEAVY/COAL	32.530	21.233	38.951	33.714
AXLES PER TRUCK NORMAL	3.210	3.308	3.104	3.233
AXLES PER TRUCK HEAVY/COAL	4.820	4.794	4.821	4.831
EAL'S PER TRUCK AXLE NORMAL	.242	.230	.223	.260
EAL'S PER TRUCK AXLE HEAVY/COAL	2.077	2.101	2.138	2.026

AGGREGATE CLASS II -- RURAL PRINCIPAL ARTERIAL/
RURAL MINOR ARTERIAL
AVERAGE VALUES (SMOOTHED)

YEAR	ANNUAL CHANGE (%)	94	93	92
NO. OF WEIGH STA.				
UNCLASSIFIED ROADS (ALL AVC LOCATIONS AND MANUAL LOCATIONS WITH LESS THAN 3% OF TRUCKS CLASSIFIED AS HEAVY/COAL)				
NO. OF CLASSIFICATION STA.		71	61	90
AADT	.284	5681	5664	5648
PERCENT TRUCKS	? -2.629 ?	9.415	9.663	9.910
AXLES PER TRUCK	? -.544 ?	3.402	3.420	3.439
EAL'S PER TRUCK AXLE	? -7.033 ?	.206	.221	.235
CLASSIFIED ROADS (MANUAL LOCATION WITH 3% OR MORE OF TRUCKS CLASSIFIED AS HEAVY/COAL)				
NO. OF CLASSIFICATION STA.		24	33	50
AADT	? -4.048 ?	6749	7022	7295
PERCENT TRUCKS	.255	14.890	14.852	14.814
PERCENT OF TRUCKS CLASSIFIED AS HEAVY/COAL	?-24.903 ?	25.059	31.299	37.540
AXLES PER TRUCK NORMAL	1.153	3.252	3.215	3.178
AXLES PER TRUCK HEAVY/COAL	? -.386 ?	4.797	4.815	4.834
EAL'S PER TRUCK AXLE NORMAL	? -6.737 ?	.223	.238	.253
EAL'S PER TRUCK AXLE HEAVY/COAL	1.764	2.126	2.088	2.051

Figure B3. Example Output of Average Values (Smoothed) for Aggregate Class II

Figure 11. Flowchart of Procedure for Annual ESAL Processing by Aggregate Class

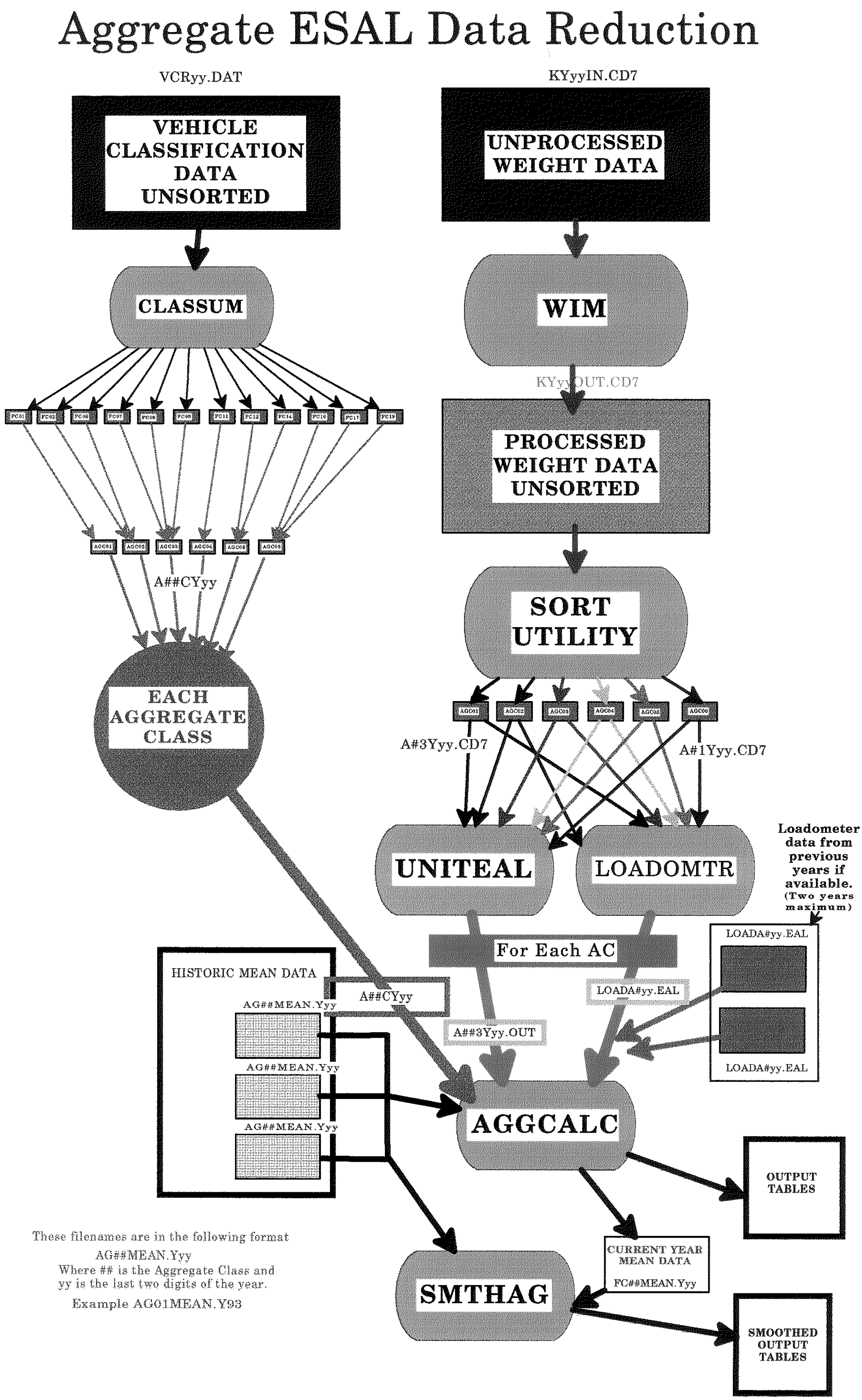


Figure 10. Flowchart of Procedure for Annual ESAL Processing by Functional Class