Appendix B

Data Organization

This report is based on the data that have been generated from the heavy-duty on-road diesel emissions program since its focus shifted to fine PM in 1998. This data exists, in raw and processed forms, as several gigabytes on the project's principal data reduction computer located in building T-2 at the NIEHS "Burden's Creek" facility (commonly referred to as "Jenkins Road" by project personnel). The data are also routinely backed up onto Compact Disc Rewritable (CD-RW) media which are used to mirror portions of the data on other computers, as needed. No attempt has been made to encrypt or otherwise protect the dataset from unauthorized access. Portions of this data have been shared with a number of other researchers, some of which have referenced it in their publications.

B.1 Data File Organization

Table B-1 is a listing of the C:\Diesel directory of the data reduction computer. All data accompanying this report are copied from this directory tree. The bulk of the data are organized by truck, from the pickup truck through the current 'KW2' configuration (see Table B-2). The other directories contain background information for the development of the on-road test facility and, more

Table B-1. Contents of C:\Diesel directory

DRAW	<DIR>	Drawings of facility components and subsystems
FACILITY	<DIR>	All other files related to the facility
PICKUP	<DIR>	Data from prototype facility (pickup truck)
FORD_9	<DIR>	Data from JCC Ford CL-9000 tractor
FRGHTLNR	<DIR>	Data from JCC Freightliner tractor
KW1	<DIR>	Data from Kenworth with "as-received" engine
CENTURY1	<DIR>	Data from UC-Davis Freightliner Century tractor
KW2	<DIR>	Data from Kenworth with rebuilt engine
PART	<DIR>	PM developmental data
700_ANAL	WK1	Fuel analysis for sample collected July of 2000
ALIGN10	WK4	Time-alignment template for 10-channel 1 Hz CEM data
ALIGN8	WK4	Time-alignment template for 8-channel 1 Hz CEM data
ALIGN8A	WK4	Time-alignment template for 8-channel 10 Hz CEM data
ALIGN9	WK4	Time-alignment template for 9-channel 1 Hz CEM data
DRI_Y1	WK4	Time-alignment template for DRI tunnel data
VEL_Y1	WK4	Time-alignment template for 7-channel 1 Hz CEM data
MATRICES	WK4	Template file for generating test matrix sheets

Table B-2. Vehicles Tested During On-Road Diesel Emissions Program

#	ID	Class	Year	Make/Model	Miles	Engine	Rating	History
0	Pickup	2b	1993	Ford F-250	<10,000	Navistar 7.3l	185 hp	New
1	Ford_9	8b	1989	Ford CL-9000	105,000	Cummins NTC-315	315 hp	Short Trips
2	Frghtlnr	8b	1990	Freightliner Conventional	550,000	Caterpillar 3176	325 hp	Unknown
3	KW1	8b	1990	Kenworth T800	>900,000	Detroit Diesel Series 60	425 hp	Long Haul
4	Century1	8b	1994	Freightliner Century	~300,000	Detroit Diesel Series 60	500 hp	Long Haul
5	KW2	8b	1990	Kenworth T800	>900,000	Detroit Diesel Series 60	425 hp	Recent Rebuild

recently, its PM measurement capabilities. The C:\Diesel directory also contains a few template and summary files that are not specific to a specific truck.

Table B-3 shows one of the six truck directories: KW1. Any files that relate to this truck/engine configuration, but not to a specific test series, belong in this directory. Files from specific test series are stored in the subdirectories labeled by load and grade condition. Each of these test-series directories nominally represents a half-day's or full-day's testing, all conducted along the same section of road at the same load condition. Each directory contains all raw and processed data for that test series.

Table B-4 is an example data directory. In order to keep things organized, there is an established naming scheme for all files. Sometimes, the scheme is dictated or influenced by the software that creates the file; on rare occasions (i.e., when the software has an inflexible naming scheme that is inconsistent with ours), a file will be renamed during data processing to make it clearer what test it represents. The files in Table B-4 are listed chronologically. Raw data files are typically identified by a date, a sequence number, and a file type. For example, files named by the scheme DDDD-##.WK4 are calibration records, where DDDD is the test date and ## is the sequence number. The first file of a test day is typically a calibration record; there will always be at least two of these (a calibration error check and a system bias check) before any CEM data are collected.

Table B-3. Contents of C:\Diesel\KW1 directory

SHKDOWN	<DIR>	Shakedown exercise raw data files (seldom processed)
CD	<DIR>	Coastdown files
MIT	<DIR>	Collaborative study with MIT/Aerodyne TILDAS system
FULL_0	<DIR>	Fully-loaded zero-grade data from March 1999
HALF_0	<DIR>	Half-loaded zero-grade data from March 1999
EMPTY_0	<DIR>	Empty-trailer zero-grade data from March 1999
SEQUENCE	<DIR>	Dynamometer simulation sequence data
TUNNEL	<DIR>	DRI tunnel study data
FULL_3&6	<DIR>	Fully-loaded 3% and 6% grade data
HALF_3&6	<DIR>	Half-loaded 3% and 6% grade data
MT_3&6	<DIR>	Empty-trailer 3% and 6% grade data
FILTERS	<DIR>	Data from collection of filters for PM lab analysis
FULL_00	<DIR>	Fully-loaded zero-grade data from October 1999
HALF_00	<DIR>	Half-loaded zero-grade data from October 1999
EMPTY_00	<DIR>	Empty-trailer zero-grade data from October 1999
DIOXIN	<DIR>	Data from collection of dioxin samples w/ APTB
UNLINKED	<DIR>	Portable versions of selected reduced data files
BACKUP	<DIR>	Archival versions of selected updated files

Table B-4. Example Data Directory

0315-0.WK4	03150008	03150005.PRN
0315-1.WK4	0315-16.MEC	03150006.PRN
0315-2.WK4	03150009	03150008.PRN
0315-3.WK4	0315-17.MEC	03150009.PRN
03150001	03150010	03150010.PRN
0315-8.WVU	03150011	0315-CS.WK4
03150002	R&P0315b.prn	R&P0315a.xls
0315-10.WVU	0315-19.MEC	R&P0315b.xls
0315-11.UDS	11m0315.dat	R&P0315c.xls
03150003	0315-4.WK4	R&P0315d.xls
R&P0315a.prn	Box0315.dat	11m0315.txt
03150005	R&P0315c.prn	Box0315.txt
0315-13.WVU	R&P0315d.prn	11m0315.xls
03150006	03150001.PRN	
0315-14.UDS	03150002.PRN	
0315-15.UDS	03150003.PRN	

Other files are identified as follows:

DDDD####	Binary data file generated by computer monitoring truck's on-board data stream.
DDDD####.prn	On-board data stream file converted to ASCII.
DDDD-##.wvu	DAS file representing a run of the WVU 5-peak test sequence.
DDDD-##.uds	DAS file representing a run of the Urban Dynamometer Driving Schedule for Heavy Duty Vehicles ["schedule d" - tabulated in 40 CFR Part 86, Appendix i(d)].
DDDD-##.mec	DAS file representing a run of the Modified Energy Conservation/Federal Test Procedure (MEC/FTP) cycle.
DDDD-##.vel	[no examples in Table 3] DAS file representing constant velocity data during parametric testing. May also include other types of data collected at 1-second intervals during parametric testing.
DDDD-##.cen	[no examples in Table 3] DAS file representing data from UC-Davis Freightliner Century truck. This data receives a special filetype because the available data channels are different than what is typically available from the fully-integrated test vehicles.
DDDD-##.rtp	[no examples in Table 3] DAS file representing non-parametric data collected in the research triangle area.
DDDD-##.fil	[no examples in Table 3] DAS file representing on-road testing where filter samples are collected for the fine PM lab (there are additional channels that monitor the filter collection).
DDDD-##.dio	[no examples in Table 3] DAS file representing on-road testing where dioxin samples are collected in cooperation with APTB (additional channels for monitoring media and meter temps).
DDDD-##.dri	[no examples in Table 3] DAS file representing on-road testing in cooperation with Desert Research Institute (first attempts to collect Fine PM data on-road).
R&PDDDDx.prn	ASCII data file generated by computer monitoring Tapered Element Oscillating Microbalance (TEOM, manufactured by Rupprecht &

	Patashnich -- R&P). These files use a sequence letter (shown here as "x"), when needed, instead of a number.
SssDDDDx.dat	ASCII data file generated by computer operating an Electrical Low Pressure Impactor (ELPI). The "SSs" sequence (two or three characters long) identifies the sampling location (CAB - Truck cab, BOX - rail-mounted instrument enclosure, 2m - plume sampling 2 meters behind stack, 11m - plume sampling 11 meters behind stack, etc.). Also uses a sequence letter.
SssDDDDx.txt	Reprocessed ELPI data.
$^{R\&P}/_{SSs}$DDDDx.xls	TEOM and ELPI files converted to spreadsheets for easy incorporation into data reduction spreadsheets.
DDDD-cs#.wk4	Calibration summary file - links to calibration records to calculate slope/intercept parameters for the CEM instruments.
TLGgg.$^{wk4}/_{123}/_{xls}$	Processed data files for parametric tests. These are multilayered spreadsheets that bring together an entire test series (usually consisting of several raw data files, calibration records, and weather data) T is a numerical representation of the truck (chronologically, starting with Truck 1=Ford_9, up to Truck 5=KW2). L is the load (F=full, H=half, E=empty trailer). Ggg is the grade condition (3&6=3% and 6% grades, 0=zero grade, 00 and 000 are repeats of the zero grade condition).
TL-Iii#.$^{wk4}/_{xls}$	Processed data files for special purpose and sequence tests. For dynamometer sequence tests, "seq" goes into the "Iii" identifier.

B.2 Processed Data Files

Figure B-1 shows how the raw data is incorporated into the data reduction spreadsheets. Obviously, the number of incorporated files varies from one test series to the next (dashed borders and connecting lines indicate files that may not exist). For example, the calibration summary requires a minimum of three calibration record files for input, but may use any number, depending on how many times the instruments were re-calibrated prior to the test series. It is important to note that the data reduction spreadsheet only uses one calibration summary; so, if any instruments require re-calibration in the middle of a test series, both a new calibration summary and a new data reduction spreadsheet must be created for the subsequent data. The gray filled boxes in the Figure B-1 flow chart show files that are not specific to the particular test series. The ELPI setup files are specific to the instrument that collected the data, where the Coast Down data are specific to the truck-trailer configuration that is being tested (for more recent configurations, coast-down data is extraneous because of the facility's ability to measure power directly). The climate data is specific to the test date and time, but is rarely incorporated as a real time data stream; it usually consists of a single average compiled from a few hourly weather observations during the testing.

The spreadsheets are equipped with macros that update the file links, import the raw data, perform time-alignment of CEM data, and calculate time-series and summary data. Appendix A contains a brief discussion of time alignment; the facility manual details the calculation procedures and formulae. The actual number of spreadsheet layers varies: the minimal three-layer version has a "Raw Data" layer, a "Calculated" layer, and a "Summary" layer. The Century1 data include a "DDEC" layer for the on-board data stream (which, for those tests, provided some of the input channels for the calculated time-series data. Spreadsheets from more recent testing include a "Fine PM" layer which incorporates some of the ELPI and TEOM data. If any of the data are summarized in graphical form, these will appear in a "Graphs" layer.

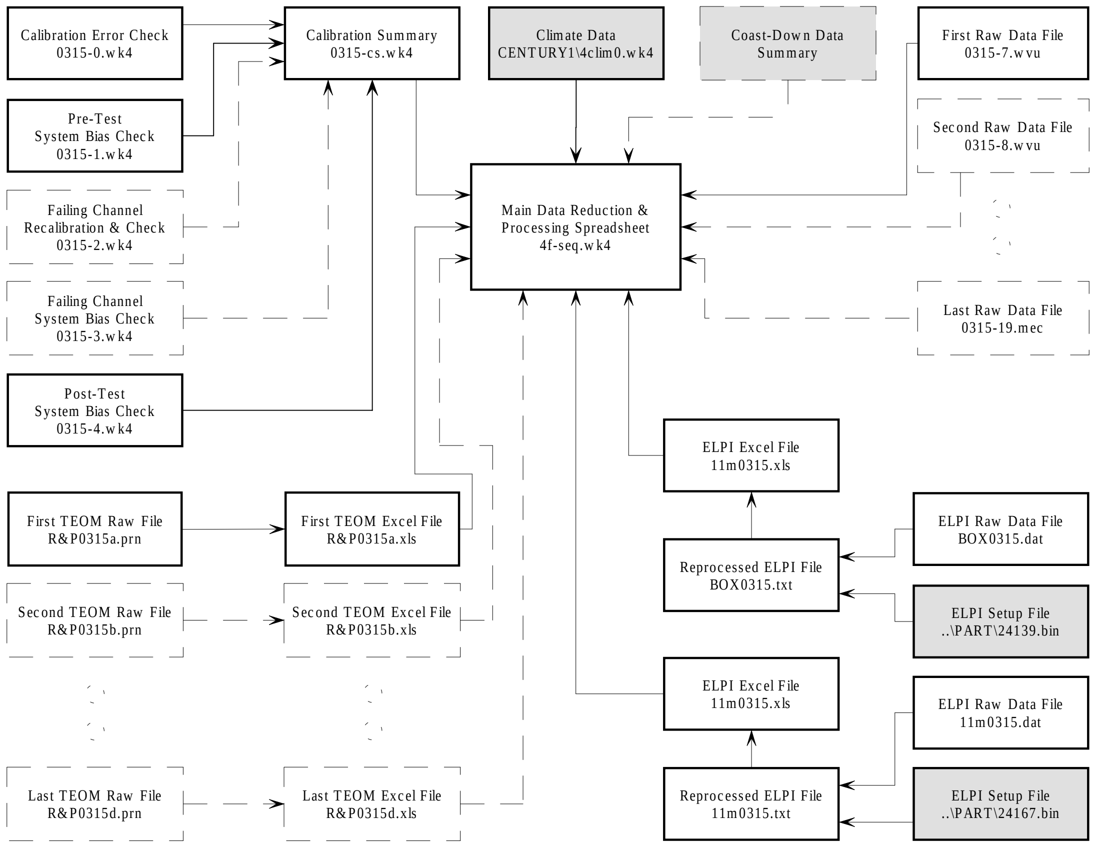

Figure B-1. Data File Dependency.

Figure B-2 is a somewhat dated representation of how the data flows within the main spreadsheet (i.e., it covers only gaseous pollutants). At the most macroscopic level, the spreadsheet's data flows from back to front. With the exception of a few measurements that require no further calculations (e.g., speed, rpm, and temperatures), all of the "Raw Data" layer values feed into formulas in the "Calculated" layer. The "Summary" layer calculates interval averages from all of the other layers. Additional data sources (e.g., onboard data stream, ELPI, TEOM) are added in layers behind the "Raw Data" layer.

Because the "Calculated" layer contains several formulas that are intended to propagate down through thousands of records, the spreadsheet employs a rather simplistic parsing technique to conserve disk storage and continuous memory usage. In short all of the formulas that calculate second-by-second data only exist in the top row of that table. The remaining rows store the data as values; this convention also avoids length recalculations when the time-series data are unchanged.

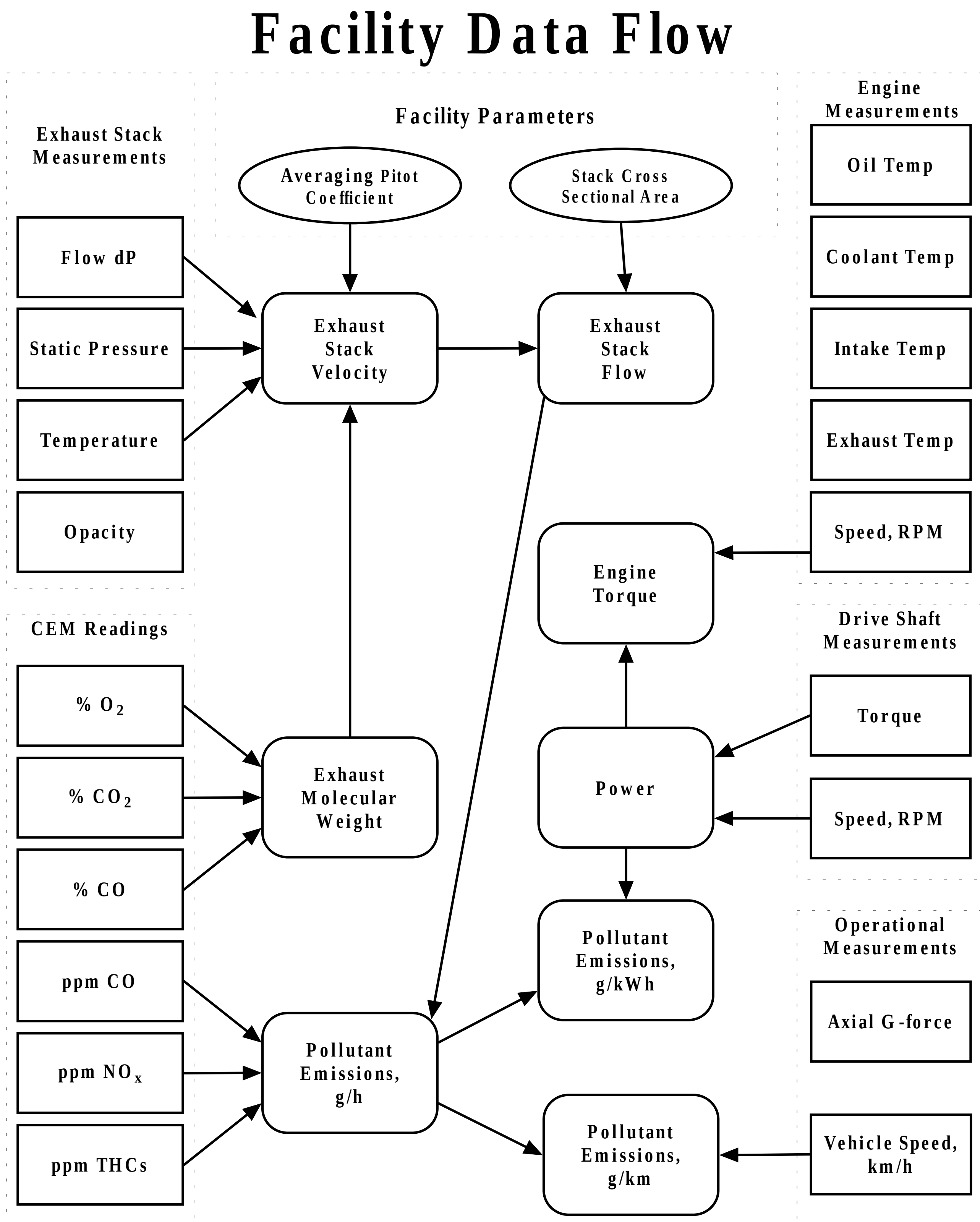

Figure B-2. Data Flow Schematic for Gaseous Pollutants.

When an all-inclusive recalculation is required, the user must run a macro that copies the formula down through the data, then immediately converts the formulas to values.

The "Summary" layer calculates interval averages from the real-time data, and presents them in a table that includes header information to describe the test series. Originally designed for parametric test data, the formulae in the table use the times entered to the far right in the table to define interval bounds and calculates average and total values, as appropriate. In spreadsheets where there are no specific intervals of interest (e.g., shakedown & route data) the table contains one row which calculates values for the entire test series.

The "Fine PM" layer is currently designed to incorporate ELPI and TEOM measurements into the main spreadsheet. At present, there are no macros to automate the incorporation process, and the process is not detailed in the facility manual or in a figure comparable to Figure B-2. The time alignment process uses the same "rolling regression" technique discussed in Appendix A, with variations in PM measurements matched to variations in CO. For this layer, the PM data are represented as mass concentrations ($\mu g/m^3$), which the TEOM measures directly and the ELPI estimates by converting the particle counts to unit-density-spherical (u.d.s.) mass values for each measurement bin.

The processing and interpretation of the PM data is continuously evolving. Figure B-3 shows how all of the pieces are expected to fit together. Essentially, because all of the PM analyzers receive a dilute sample, calculating emissions requires knowledge of the dilution ratios. These are measured using more sensitive versions of the same analyzers that measure exhaust concentrations. Dilution ratio is calculated using the following formula:

$$D.\ R. = \frac{(Exhaust\ -\ Background)}{(Dilute\ -\ Background)} \tag{B-1}$$

where the background concentration represents either ambient air or the diluent gas, depending on where the dilute sample comes from. It is often assumed that these background concentrations do not vary greatly, and a single value is used for all of the D.R. calculations (i.e., the plume NO_X measurements), where the more rigorous technique is to measure the background continuously with a separate analyzer channel (i.e., the dilution system CO_2 measurements). Once the D.R. is known, it

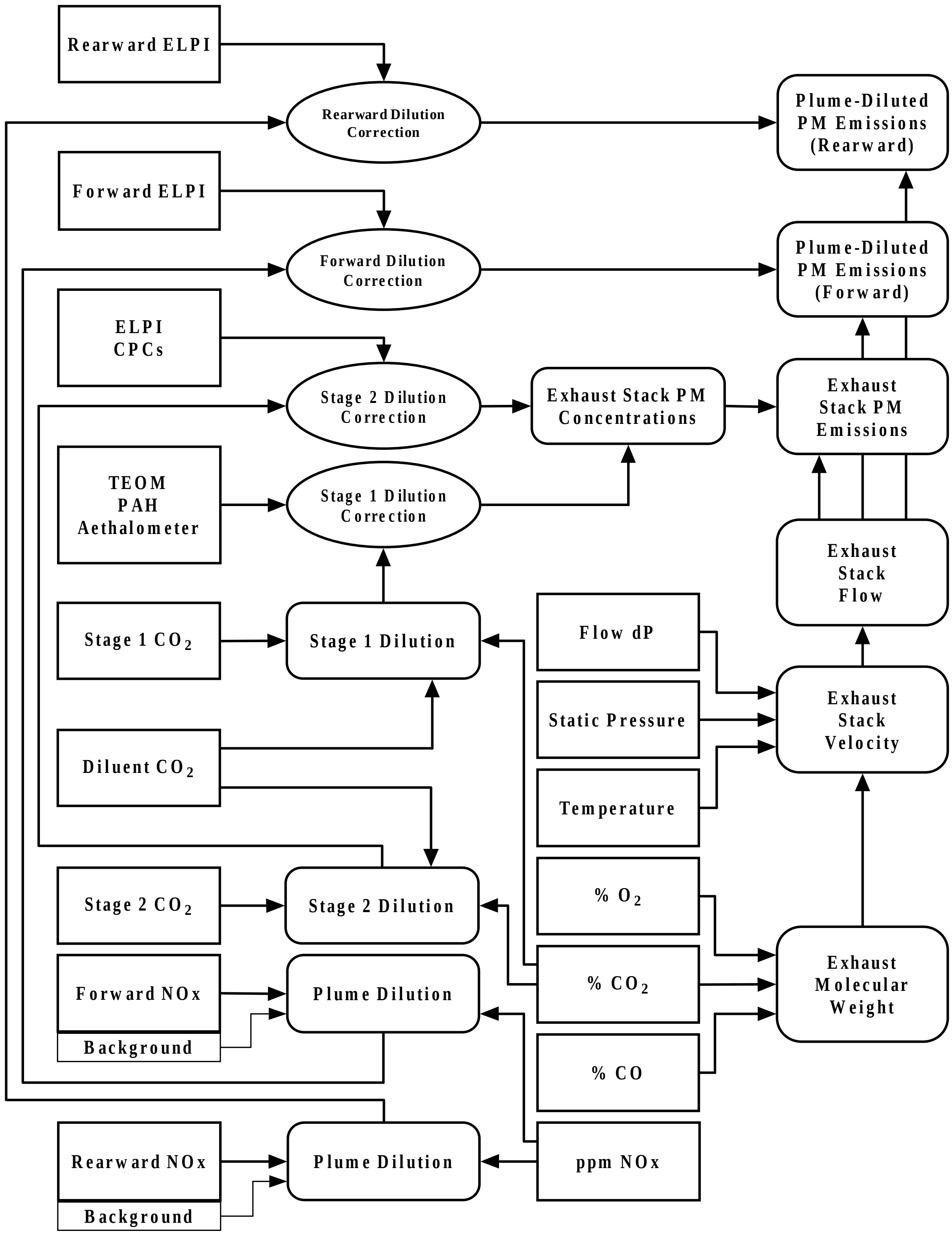

Figure B-3. Fine PM Data Calculations.

can simply be multiplied by the measured PM concentrations to get "as corrected" values which would be compatible with the exhaust flow measurements.

B.3 Types of Tests and Data

In general, different test series prove valuable for different types of comparisons. The parametric tests help identify general emissions trends under steady-state condition; these are also the tests that show the best data repeatability. The only transient tests that are done in a repetitious/parametric fashion are the level-grade accelerations and the dynamometer sequence tests. The data from these tests is less repeatable, but provide some insight nonetheless. For obvious reasons, the parametric test runs are bracketed by transients in the data files, and these transients are essential to time-aligning the data and identifying the parametric test intervals in the data.

Early in the project, some more realistic "route" tests were performed locally (i.e., with local grade variation contributing to data variability). The routes consisted of a "delivery" route which went through downtown Raleigh, an "urban interstate" route which traversed the entire Triangle area along I-40, and a "terminal entry/exit" segment that connected our staging area to the highway (it was assumed that the distance and traffic situation between Jenkins Road and I-40 is comparable to a commercial truck terminal; this assumption proved convenient for sequencing the tests in a realistic manner). The route tests were performed in triplicate for each load with the first two test trucks (Ford_9 and Frghtlnr). However, these tests proved very time consuming, and there was no straightforward way to interpret the data (too many input variable varying independently of one another). The only local tests that are now performed are shakedown exercises and sample collections (e.g., dioxin samples and filters for the fine PM lab). These tests are still valuable where "reality" is the primary consideration.

The original goal of the heavy-duty on-road emissions program was to compare emissions to operating parameters in a way that could lead to a modal emissions model. Parameters of interest were primarily those affecting power demand: load, grade, speed, and acceleration. The modal model goal is also applicable to fine PM measurements, but the parameter list may need to be expanded because of the atmospheric transformations that affect how PM emissions relate to PM inventories and exposures.

Shortly after the project began experimenting with fine PM analyzers connected to dilution systems, studies began surfacing to suggest that the parameters of the dilution system (e.g., the dilution ratios and residence times) were affecting the PM measurements. Then, with the commencement of in-plume sampling, the on-road program introduced yet another set of variables (e.g., truck airspeed, distance between stack and sampling probe). From the perspective of parametric testing, the only experimental parameter that has been added is the sampling location.

B.4 Currently Available Data

Table B-5 summarizes the data that were collected and processed for the Kenworth tractor before its engine overhaul (KW1 test series). The spreadsheets are listed in chronological order. Many of them have been converted from Lotus 1-2-3 to Microsoft EXCEL for subsequent data processing; in the table, an "X" indicates that the spreadsheet exists in the indicated filetype. In the data channel columns, an "X" indicates that the data was collected and verified, a blank means that the data was not collected or was invalidated. For PM data, there is also a "D" tag which indicates data for which valid dilution data were not available.

As shown here, the earliest tests for KW1 involved some preliminary plume dilution characterization, where the first on-road PM data were collected during the DRI tunnel study. Where that study used a single ELPI to characterize the truck's emissions, subsequent tests (the duplicate level grade tests-the "00" series), used more than one ELPI to compare results at various sampling locations.

Table B-6 shows the tests that were done in cooperation with UC-Davis during their "$SiNO_X$" catalyst demonstration project. This abbreviated series of tests was conducted on a Freightliner "Century" series truck with a 2000-spec engine. The TEOM was first introduced during these tests. The CPCs and the Magee Aethalometer were also deployed for the first time during this study (the resulting data have not been fully processed or interpreted, hence the gray area). All of these instruments, as well as the PAH analyzer and an ELPI, were fed sample from the two-stage dilution system which was developed for KW1 testing. The plume sampling equipment was operated during a few of the tests, but these activities were limited because they were peripheral to UC-Davis' goals.

Table B-5. Pre-Rebuild Kenworth Data

Spreadsheet	Files			CEMs			Dilution				ELPIs				
C:\DIESEL\KW1\..	WK4	123	XLS	CO	NOx	THC	2 meter	6 meter	8 meter	11 meter	Cab/Box	2 meter	6 meter	8 meter	11 meter
..\EMPTY_0\3E0-SA	X			X	X	X									
..\EMPTY_0\3E0-GA	X			X	X	X									
..\EMPTY_0\3E0-V	X			X	X	X									
..\HALF_0\3H0-SA	X			[1]	X	[1]									
..\HALF_0\3H0-GA	X			[1]	[1]	[1]									
..\HALF_0\3H0-V	X			X	X	X				X					
..\FULL_0\3F0-V	X			X	X	[1]				X					
..\FULL_0\3F0-SA	X			X	X	[1]				X					
..\FULL_0\3F0-GA	X			X	X	[1]				X					
..\SEQUENCE\3F-SEQ		X	X	X	X	X				X					
..\TUNNEL\3DRI1-1	X		X	[2]	[2]	[3]									
..\TUNNEL\3DRI1-2	X		X	[2]	[2]	[3]									
..\TUNNEL\3DRI2-1	X		X	[2]	[2]	[3]				X					
..\TUNNEL\3DRI2-2	X		X	X	X	[3]				X					
..\TUNNEL\3DRI2-3	X		X	X	X	[3]				X					
..\TUNNEL\3DRI2-4	X		X	X	X	[3]				X					
..\FULL_3&6\3F3&6		X	X	X	X	X	X			X	X				
..\HALF_3&6\3H3&6		X	X	X	X	X	X			X	X				
..\MT_3&6\3E3&6		X	X	X	X	X	X			X	X				
..\FULL_00\3F00A		X	X	X	X	X	X			X					
..\FULL_00\3F00C		X	X	X	X	X	X			X	X	X			X
..\FULL_00\3F00V	X		X	X	X	X	X			X	X	X			X
..\HALF_00\3H00A		X	X	X	X	X	[1]			X					
..\HALF_00\3H00C		X	X	X	X	X	[1]			X	X	[2]			X
..\HALF_00\3H00V	X		X	X	X	X	[1]			X	X	[2]			X
..\EMPTY_00\3E00A		X	X	X	X	[1]	X			X					
..\EMPTY_00\3E00C		X	X	X	X	[1]	X			X	X	X			X
..\EMPTY_00\3E00V	X		X	X	X	[1]	X			X	X	X			X
..\FILTERS\3FIL1		X	X	X	X	X									
..\FILTERS\3FIL2		X	X	X	[1]	[1]									
..\FILTERS\3FIL3		X	X	X	[1]	[1]					X				
..\FILTERS\3FIL4		X	X	X	X	[1]	X				X				
..\FILTERS\3FIL5		X	X	X	X	[1]	X				[2]				
..\FILTERS\3FIL6		X	X	X	X	X					[2]				
..\FILTERS\3FIL7		X	X	X	X	[1]									
..\FILTERS\3FIL8		X	X	X	X	[1]	X								
..\FILTERS\3FIL9		X	X	X	X	[1]	X								
..\FILTERS\3FIL10		X	X	X	X	[1]	X			X					
..\DIOXIN\DIOXIN1\3DIOX1		X	X	X	X	[1]	X			[1]	X	X			[2]
..\DIOXIN\DIOXIN2\3DIOX2		X	X	X	X	X	X			X	X	X			X
..\DIOXIN\DIOXIN3\3DIOX3		X	X	X	X	[1]	X			X	[2]	X			X
..\DIOXIN\DIOXIN4\3DIOX4		X	X	X	X	[1]				X					

[1] Data Validation Error [2] Matching Flow or Dilution Data Not Available [3] Other Error

Table B-6. Century Data Summary

Spreadsheet	Files			CEMs			Dilution				ELPIs					Other			
C:\DIESEL\CENTURY1\..	WK4	123	XLS	CO	NOx	THC	2 meter	6 meter	8 meter	11 meter	Cab/Box	2 meter	6 meter	8 meter	11 meter	TEOM	CPCs	PAH	Magee
..\GRADES\4H-RTP0		X		X	X	[1]					X								
..\FULL\4F0		X	X	X	X	X					X					X			
..\HALF\4H0-1		X	X	X	X	X					X					X			
..\HALF\4H0-2		X	X	X	X	X				X	X					[2]			
..\HALF\4H0-3		X	X	X	X	X				X	X					X			
..\HALF\4XIDLE		X		X	X	[1]													
..\HALF\4H0-4		X	X	X	X	X					X					X			
..\GRADES\4H-RTP1		X	X	X	X	X					X					X			
..\GRADES\4H-RTP2		X	X	X	X	X				X	[2]				X	X			
..\SEQUENCE\4F-SEQ		X	X	X	X	X					[2]				[2]	[2]			

[1] Data Validation Error

[2] Matching Flow or Dilution Data Not Available

The post-rebuild Kenworth data (KW2 test series) are summarized in Table B-7. These tests included the full complement of cab-mounted analyzers, as well as on-road plume sampling. Unfortunately, due to an alteration of the truck exhaust stack, there is some doubt as to whether these most recent tests are comparable to the earlier tests. It does appear that the plume sample is more dilute than the 2 meter and 11 meter samples that have been collected before, making the data substantially less useful (among the recommendations that will be made in this report is repeating some of these tests). The use of the "8 meter" location reflects the project’s goal of quantifying the plume dilution schedule at multiple points along the length of the trailer. Assuming that comparable data can be collected at each of the four available sampling locations, these data should lead to the development of a representative curve for truck plume dilution.

Table B-7. Post-Rebuild Kenworth Data

Spreadsheet	Files			CEMs			Dilution				ELPIs					Other			
C:\DIESEL\KW2\..	WK4	123	XLS	CO	NOx	THC	2 meter	6 meter	8 meter	11 meter	Cab/Box	2 meter	6 meter	8 meter	11 meter	TEOM	CPCs	PAH	Magee
..\XCOUNTRY\5E-XC1		X	X	X	[1]	[1]					[2]		[2]						
..\XCOUNTRY\5E-XC2		X	X	[2]	[2]	[1]	X	X				X	X						
..\XCOUNTRY\5E-XC3		X	X	[2]	[2]	[2]	X	X				X	X						
..\DIOXIN\REGFUEL\5DIOX1		X	X	X	X	[1]													
..\DIOXIN\REGFUEL\5DIOX2		X	X	X	[1]	[1]													
..\DIOXIN\REGFUEL\5DIOX3A		X	X	X	[1]	[1]													
..\DIOXIN\REGFUEL\5DIOX3B		X	X	X	X	[1]													
..\DIOXIN\REGFUEL\5DIOX4A		X	X	X	X	[1]													
..\DIOXIN\REGFUEL\5DIOX4B		X	X	X	X	[1]													
..\DIOXIN\REGFUEL\5DIOX5A		X	X	X	X	[1]													
..\DIOXIN\REGFUEL\5DIOX5B		X	X	X	X	[1]													
..\DIOXIN\REGFUEL\5DIOX6		X	X	X	X	[1]													
..\DIOXIN\REGFUEL\5DIOX7		X	X	X	X	[1]													
..\DIOXIN\REGFUEL\5DIOX8		X	X	X	X	[1]													
..\DIOXIN\LOWSFUEL\5DIOX9A		X	X	X	X	[1]													
..\DIOXIN\LOWSFUEL\5DIOX9B		X	X	X	X	[1]													
..\DIOXIN\LOWSFUEL\5DIOX10A		X	X	X	X	[1]													
..\DIOXIN\LOWSFUEL\5DIOX10B		X	X	X	X	[1]													
..\DIOXIN\LOWSFUEL\5DIOX11A		X	X	X	X	[1]													
..\DIOXIN\LOWSFUEL\5DIOX11B		X	X	X	X	[1]													
..\PLUME\5PLUME1		X	X	X	X	[1]	X			[1]		X			[2]				
..\PLUME\5PLUME2A		X	X	X	X	[1]	X			[1]									
..\PLUME\5PLUME2B		X	X	X	X	[1]	X			[1]									
..\FULL_3&6\5F3&6A		X	X	X	X	[1]	X				[2]	X				[2]			
..\FULL_3&6\5F3&6B		X	X	X	X	X	X				[2]	X				[2]			
..\HALF_3&6\5H3&6A		X	X	X	X	X	X				X	X				X			
..\HALF_3&6\5H3&6B		X	X	X	X	X	X				X	X				X			
..\MT_3&6\5E3&6		X	X	X	X	X	X				X	X				[2]			
..\FULL_0\5F0C		X	X	X	X	X	[3]		[3]		[2]	[2]		[2]		[2]			
..\FULL_0\5F0V		X	X	X	X	X	X		[3]		X	X		[2]		X			
..\HALF_0\5H0C		X	X	X	X	[1]	[3]		[3]		X	[2]		[2]		X			
..\HALF_0\5H0V		X	X	X	X	[1]	X		[3]		X	[3]		[3]		X			
..\MT_0\5E0C		X	X	X	X	X	[3]		[3]		X	X		[2]		X			
..\MT_0\5E0V		X	X	X	X	X	X		[3]		X	X		[2]		X			
..\SEQUENCE\5F-SEQ		X	X	X	[1]	[1]	[3]		[3]		[2]	[2]		[2]		[2]			
..\SEQUENCE\5F-SEQ2		X	X	X	X	X	[3]		[1]		[2]	[2]		[2]		[2]			
..\PLUMECPC\5F-CPC1		X		X	X	[1]	[3]		[3]			[2]		[2]					
..\PLUMECPC\5F-CPC2		X		X	X	[1]	X		[3]			X		[2]					

[1] Data Validation Error [2] Matching Flow or Dilution Data Not Available [3] Other Error