

APPENDIX A

Method to Calculate and Allocate Airport Ground Support Equipment

Houston/Galveston Attainment Demonstration and
Post-1999 Rate-of-Progress SIP

December 2000

Method to Calculate and Allocate Airport Ground Support Equipment in the Houston/Galveston Ozone Nonattainment Region

The Air Transit Association (ATA) of America conducted a survey of ground support equipment at three major airports in the Houston/Galveston ozone nonattainment area. Since not all carriers are members of the ATA, the equipment totals were upscaled by 25%. These equipment populations were then modeled by the ATA using the NONROAD model.

Since the ATA only reported oxides of nitrogen (NO_x) emission levels for all three airports which had commercial aircraft activity in Houston/Galveston region, TNRCC staff conducted another round of NONROAD modeling to estimate carbon monoxide and volatile organic compounds. After calculating the tons of emissions for all pollutants, and using source category codes specific to ground support equipment, these numbers were scaled to the ATA's NO_x emission estimate.

Finally, the emissions were required to be geographically allocated to the three airports (Houston Intercontinental, William P. Hobby, and Ellington Field). Using 1992 data for flight operations (landings and take-offs), emissions were ascribed to the individual airports.

MEMORANDUM

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To: Scott F. Belcher, Esq.

From: Ev Ashworth and Dan Godden

Date: May 25, 2000

Re: Revised ATA GSE Emission Estimate – Houston/Galveston Nonattainment Area

This memorandum provides the nitrogen oxide (NO_x) emission inventory for Ground Service Equipment (GSE) operations at the three major airports located within the Houston/Galveston nonattainment area:

- Ellington Field (EFD)
- William P. Hobby Airport (HOU)
- Houston Intercontinental Airport (IAH)

This memorandum follows the format of our earlier correspondence to you regarding the Dallas/Fort Worth Nonattainment Area (see ALG memo dated March 13, 2000). Based on the emission inventory approach summarized below, our NO_x emissions are estimated as follows:

GSE Data Set	Number of Units		Estimated NO _x Emissions (TPD)	
	1996	2007	1996	2007
ATA Member Survey Only (Assumes 80% of Pop.)	1,506	2,523	3.06	4.52
Estimated Total Population	1,883	3,154	3.83	5.65

Based on the data posed by the Texas Natural Resources Conservation Commission (TNRCC), 100% electrification of GSE operating at all the commercial airports is expected to reduce NO_x emissions by 8.26 tpd in 2007. Thus, the ATA NO_x emission estimate is approximately 32% lower than that assumed by TNRCC in its ozone modeling analysis (5.65 tpd versus 8.26 tpd).

We understand from prior discussions with TNRCC that a similar approach was used to generate the Houston GSE data as was used to generate the Dallas/Fort Worth GSE estimates. ALG has not reviewed these inventory data in detail with TNRCC, nor have we requested or obtained any supporting data from

TNRCC. If the TRNCC used a similar approach to develop GSE emissions estimates, this would mean that TNRCC relied in part on the EPA Nonroad Engine and Vehicle Emissions Study (NEVES). As explained in our March 13 memo, NEVES is flawed as it includes terminal tractors operating at ports and freight yards in the airport GSE population estimates. Additionally, as explained in our March 13, 2000 memo, the reported activity levels are higher than the NONROAD model assumptions (upon which NEVES was based), and fuel distribution reported by ATA participants provides significantly more gasoline use than estimated by the NONROAD model. Further comparisons between the ATA and TNRCC data may be made once we better understand the basis for the TNRCC estimate.

Summary of the Revised ATA GSE Emissions Inventory

ATA has worked with its members to gather the following GSE data from the three airports in Houston/Galveston area:

- Population by category of GSE used in 1996
- Fuel type for each GSE
- Horsepower for each GSE
- Model year for each GSE
- Activity for each GSE
- Estimated annual growth for all operations through 2007

We obtained data from all ATA member carriers with the exception of Trans World Airlines. Consistent with the ATA emissions inventory for the Dallas/Fort Worth area, data gaps were treated as follows:

Population: Where 1996 population data were not provided, carriers used current populations, which, as operations have increased over the past 4 years, are conservative.

Fuel type: Where fuel type data were not provided, we adjusted these missing data to be consistent with the ratio of gasoline:diesel:CNG that was determined by GSE category in the ATA Southern California GSE inventory (i.e., approximately 30% diesel). The default ratios in the NONROAD model were not used because they reflect a higher percentage of diesel engines than does the recent ATA member data.

Horsepower, Activity, Model Year: Where these data were not provided, we applied the average values by GSE category as determined in the ATA Southern California GSE inventory. The Southern California GSE inventory was exhaustive, and provides the most accurate usage data available. In any event, relying on the NONROAD default assumptions for these inputs will result in lower overall emissions.

Growth: ALG applied a growth factor of 4.8 percent per year, which is the default annual growth factor applied in the EPA NONROAD Model for total GSE for the period of 1996 to 2007. Over the 11 year period (1996-2007), this translates to 67.5% more GSE by 2007. This value is higher than assumed for the Dallas/Fort Worth area.

The data recently provided by ATA members are provided in the attached spreadsheets (with the exception of growth estimates, which is confidential business information). To generate emissions estimates, ALG used the EPA NONROAD predictive model, and substituted the average ATA values for population distributed by horsepower and fuel type, activity by fuel type, and growth. The EPA NONROAD Model

emission factors and average load by fuel type were then applied to these ATA data to generate total NOx emissions. The EPA NONROAD model was used, as it is the only model available to estimate emissions in 2007 based on current engine control requirements that apply to operations in Texas.

Based on these data, we provide the following summaries:

Summary of GSE owned by ATA members by Airport - 1996

Houston Intercontinental:	1,225 Units (81% of total)
Ellington Field:	27 Units (2% of total)
Hobby	254 Units(17% of total)

Summary of ATA Emissions Data

Year	Number of GSE	NO_x Emissions (Tons/Day)	Average NO_x Emissions per GSE (Pounds/Year)
1996	1,506	3.06	1,483
2007	2,523	4.52	1,308

The 2007 emissions were generated by adjusting the default NONROAD model growth indicators for GSE to be consistent with the expected 4.8%/year default growth rate.

The ATA population data for the three airports indicate that there are approximately 1,506 motorized GSE at these airports in 1996, not including TWA, non-ATA carriers, the airport operations, and fixed base operators. We estimate that inclusion of the operations not represented by the survey could increase the GSE total by as much as 25%. This 25% value is based on a comparison between ATA member operations and all GSE operations at Los Angeles International Airport in 1995, and was also applied to the Dallas/Fort Worth ATA emissions estimates. The projected total 2007 populations and emissions, scaled from the refined NONROAD results, are summarized below.

ATA GSE NOx Emission Estimates
for Three Major Airports in the Houston/Galveston Area

Year	Number of GSE	NO_x Emissions (Tons/Day)
1996	1,945	3.83
2007	3,154	5.65