CONTENTS OF GROWTH FACTOR README FILE

1. **What's the purpose of this readme?**
2. **What files are discussed?**
3. **How are these files used to project future-year air toxics emissions?**
4. **What variables are in these files?**
5. **Where did the information in the files come from?**

1. WHAT'S THE PURPOSE OF THIS README?

This README file describes the growth factor ancillary files that EPA is providing with its toxics emissions processing program, EMS-HAP (Version 2.0) and discusses how we developed them. EMS-HAP version 2.0 is an emissions model that prepares emission inventory data for subsequent air quality modeling using either the ASPEN or ISCST3 model. It can also project an inventory to a future year. EMS-HAP version 2.0 is available at http://www.epa.gov/scram001/tt22.htm#aspen

2. WHAT FILES ARE DISCUSSED?

The files supplied with EMS-HAP that contain the growth factors or are used in assigning growth factors are:

Filename	Description
gfwAKHIegas__bymact96_YY	Supplies growth factors by National/State and/or county and by MACT code for growing a base year inventory of 1996 to a projection year of YY (where YY is 99, 02,03,04,05,06,07 and 20). MACT code definitions may be found in the MACT_gen.txt ancillary file which has also been posted on this site.
gfwAKHI_bysic96_YY	Supplies growth factors by National/State and/or county and by SIC code or "pseudo" SIC code for growing a base year inventory of 1996 to a projection year of YY (where YY is 99, 02, 03, 04, 05, 06, 07 and 20). A "pseudo" SIC code represents a code that a user may define in order to assign a growth factor to a source in the non-point source inventory that is not based on a 2-digit industrial classification code. For example, we have defined a pseudo code called "POPN" which uses population-based growth factors (from the EGAS model) .

area_sic_110501.txt	links non-point source categories (by category name) to SIC or pseudo-SIC (e.g., POPN) so that the gfegas_bysic96_YY can be used to assign growth factors to non-point source categories that were not able to be assigned based on their MACT or SIC. For example, we assign the non-point source category called "consumer products usage" to the POPN pseudo SIC. This file also describes all of the pseudo-SIC codes present in the **gfwAKHI_bysic96_YY** files.

We have also provided an excel spreadsheet called **MACT_growth.xls** which provides the basis of the growth factors by MACT category. This file is not used by EMS-HAP, but it was used in the construction of the **gfwAKHIegas__bymact96_YY** files as a means to link the SCC-based EGAS growth factors to MACT categories. Because EGAS does not cover Alaska and Hawaii (AK/HI), the spreadsheet also contains which SIC to use from the Bureau of Economics (BEA) growth factor information to use for each MACT category. The primary methodology used was to find the most appropriate match between MACT category and SCC and to use SCC-based growth factors from EGAS4.0 (or for AK/HI, the most appropriate SIC-based BEA growth factors to use) This spreadsheet shows the SCC (or SIC for AK/HI) we used in EGAS and the basis EGAS used for growth factors. In some cases, the growth factors were replaced by information provided by the project lead for that MACT category, this is also denoted in the **MACT_growth.xls** spreadsheet.

The text file called **pseudoSICAKHI.txt** documents which BEA SIC-based growth factor we used for the pseudo SIC growth factors for Alaska and Hawaii. The rest of the U.S. used EGAS-based factors for the pseudo SIC codes which are described in the EMS-HAP ancillary file called **area_sic_110501.txt** (see above table).

3. HOW ARE THESE FILES USED TO PROJECT FUTURE-YEAR AIR TOXICS EMISSIONS?

These files are used to apply growth factors to 1996 emissions when running EMS-HAP to project emissions for a future year. In projecting future year emissions, the user can also project emissions due to reductions. See the README_reduce file regarding the national-level MACT-based emission reduction data provided with EMS-HAP.

These files are designed specifically for an inventory base-year of 1996. They contain growth factors by MACT category, State and/or county. Whether or not a growth factor is provided at the county level depends on the specific MACT category (some categories contain a single growth factor to apply across the nation) and/or the specific State (some States do not have different growth factors for all counties in the State). We recently appended growth factors for Alaska and Hawaii that we obtained from the Bureau of Economic Analysis (which last posted projected activity data in 1995) data since EGAS4.0 does not cover these areas. Note that we have not yet tested the projection software on a domain that includes Alaska and Hawaii.

The approach EMS-HAP uses to assign and apply this information to the inventory to project future-year emissions is presented in Chapter 6 in the EMS-HAP version 2.0 user's guide which can be downloaded from http://www.epa.gov/scram001/tt22.htm#aspen.

Here is a sample calculation: for a site (point source inventory) in Lee county, Florida, growth of methanol emissions from 1996 to 2007:

MACTcode=0714 (Printing and Publishing)
FIPS=12071 (Lee county, Florida)
GF from gfegas_bymact96_07.txt = 1.2796 (based on FIPS=12000, which is a State-level growth factor because there is no county level data for Florida in the gfegas_bymact96_07.txt file)

Site_ID =12071-16088
Methanol emissions for 1996 are: 57.8 tons
Grown methanol emissions for 2007 are calculated as follows:

Grown emissions = base emissions * GF
Grown emissions = 57.8 *1.2796 = 73.96

4. WHAT VARIABLES ARE IN THESE FILES?

The following table lists the information in the **gfwAKHIegas__bymact96_YY** file

Description/Name of Variable	Location in text file
State (2-digit FIPs State code)	columns 1-2
County (3-digit FIPS county code)	columns 4 to 6
MACT code	columns 8-14
Growth Factor (number with 4 places after the decimal)	columns 16-24

The following table lists the information in the **gfwAKHI_bysic96_YY** file

Description/Name of Variable	Location in text file
State (2-digit FIPs State code)	columns 1-2
County (3-digit FIPS county code)	columns 4 to 6
SIC or pseudo SIC code	columns 8-11
Growth Factor (number with 4 places after the decimal)	columns 13-21

The following table lists the information in the **area_sic_110501.txt** file

Description/Name of Variable	Location in text file
Source Category Name (from inventory)	columns 1-90
SIC or pseudo SIC that should be assigned for the purpose of applying an SIC or pseudo-SIC based growth factor	columns 91 to 94
either description of SIC or basis of decision and link to EGAS SCC-based growth factor data for pseudo SIC	columns 95-519

The information in the **MACT_growth.xls** spreadsheet is described by the row-headings.

5. WHERE DID THE INFORMATION IN THE FILES COME FROM?

gfwAKHIegas__bymact96_YY:

The MACT codes in the **gfwAKHIegas__bymact96_YY** files came from values assigned to the 1996 National Toxics Inventory during its development. Some of the MACT codes are in flux and will be changing to provide more specific information e.g., new codes have been developed to distinguish combustion versus non-combustion pulp and paper emission sources (1626-2 and 1626-1). Where data were not available to distinguish the sources with regards to the more specific codes, the broader code (e.g., 1626 for pulp and paper) was still used.

The growth factors in the **gfwAKHIegas__bymact96_YY** files are primarily from EGAS4.0, the Economic Growth and Analysis System. EGAS is an EPA economic and activity forecast model that provides credible growth factors for developing projected emission inventories using the following socioeconomic and energy consumption information:

- constant dollar output/value added estimates by Bureau of Labor Statistics (BLS) sector
- physical output (e.g., tons of basic oxygen furnace steel produced) estimates by BLS sector
- estimates of energy consumption by fuel type for the comercial, industrial, and electric utility fuel combusion sectors
- population
- vehicle miles traveled
- personal consumption expenditures for gasoline and oil

A User's Guide and a reference manual for EGAS 4.0 is available at http://www.epa.gov/ttn/chief/emch/projection/egas40/index.html

Much of the approach and underlying data involve incorporation of updated (1999) Regional Economic Models, Inc. (REMI). REMI models are developed using BLS data. EGAS also uses EIA energy consumption forecasts from "Annual Energy Outlook 1999." For some sectors, EGAS uses regression analyses relating REMI output data with production or other data that is speicfically related to source caetgory emissions activity. For this regression, EGAS utilizes historical constant dollar output data obtained from REMI's economic and demographic forecasting and simulation 14-Sector (EDFS-14) Single Region U.S. Model, which contains national output data for 1969-1996 for the same BLS sectors as its regional models, and national emissions activity data for 1970 to 1992.

EGAS provides growth factors at the county level for some areas of the country, and State and National levels for others. We ran this model for all regions of the country and for all years (1996 through 2020) using the "BLS" (Bureau of Labor Statistics) option and SCC option and used the various ".scc" EGAS output files for the various regions of the country. We then assigned the SCC-based factors from these files to the MACT codes using category definitions and also exploring the growth basis for the SCC and determining whether it would apply to the MACT category.

There are two situations where the underlying data are not from EGAS4.0:
1) We replaced some of the SCC-based factors from EGAS4.0 with information gathered by MACT category project leads.
2) Because EGAS does not cover Alaska or Hawaii, information from the Bureau of Economic Analysis (SIC - based activity) was used.

The mactgrowth.xls file shows how the MACT assignments were developed from the EGAS 4.0 (or BEA data in the case of Alaska and Hawaii) output data or MACT project leads.

gfwAKHI_bysic96_YY:

With the exception of the pseudo-SICs and Alaska and Hawaii growth factors, the growth factors in the **gfwAKHI_bysic96_YY** files came from the EGAS 4.0 model, run with the SIC option. The data for the pseduo SICs (e.g., "POPN") were created from using the various ".scc" files output from EGAS (again using the BLS option), for the lower 48 States and from the BEA for Alaska and Hawaii. We created pseudo SICs that reflect a particular (or a group of related) source category would grow. We assigned the SCC-based factors (SIC-based for Alaska and Hawaii, since BEA only produces SIC based factors) from these files to the pseudo SIC based on the source category we intended to use the pseudo-SIC for. We explored the source category definitions, codes that were assigned to the source category in the NTI and also exploring the growth basis for the SCC and determining whether it would apply to the that particular source category.

The **area_sic_110501.txt** ancillary file contains information on the basis of linking each non-point source category to a pseudo SCC and the particular SCC and EGAS output file that contains the growth factor data for that SCC. The **pseudoSICAKHI.txt** file (not used by EMS-HAP) documents which BEA SIC-based growth factor we used for the pseudo SIC growth factor for Alaska and Hawaii.

area_sic_110501.txt:

The **area_sic_110501.txt** ancillary file contains information on the basis of linking each non-point source category to a pseudo SCC and the particular SCC and EGAS output file that contains the growth factor data for that SCC. We used judgement with respect to deciding whether a source category should be linked to a 2-digit SIC or a growth factor based on an SCC (from the EGAS .scc files) or some combination of growth factors (e.g., if fuel type was not known for a combustion category, we add up the various fuel types). In the some cases, we received advice from the project lead for a category that is associated with a MACT standard. The **area_sic_110501.txt** file contains comments that discuss such recommendations, where provided.