

AERMOD Helper Files for All POINT sources

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1 Introduction

The SMOKE4AERMOD postprocessing scripts (<https://github.com/CEMPD/SMOKE/tree/master/scripts/aermod>) create “helper” files for point sources that allow the AERMOD modeler¹ to create AERMOD inputs for each source within each facility based on a unit emissions rate (1000 g/s or for fugitives 1000 g/s divided by the area of the source). For a further description of point sources, see <https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei>.

Helper file types are listed below. Any 1 facility will be present in multiple file types except that a facility would not necessarily be in both the Temporal Profiles (4) and have an Hourly (5) file if, for example, the facility has no sources with hourly emissions. Facilities for which we do not have hourly temporalization will not have an Hourly file.

Helper File Types

1. Locations by facility/src_id
2. Source Parameters – Point parameters by facility /src_id
3. Source Parameters – Area (or fugitive) parameters by facility / src_id
4. Temporal Profiles² – temporal scalars and qflag by facility /src_id. The qflag (flag that tells what type of variation, e.g., hour-of-day (HROFDAY); MONTH; month, hour-of-day and weekday_Saturday-Sunday; month, hour-of-day and day-of-week MHRDOW7, etc.)
5. Hourly unit emissions¹ by facility and src_id (1 file **per facility**, 1 factor per hour, this file will only have facilities that are in the ptegu sector)
6. Emissions by facility/ src_id
7. Crosswalk: facility /src_id to facility-id/unit-id/process-id/releasepoint-id

¹ James Thurman, Thurman.james@epa.gov, is the AERMOD modeler for the 2014 National Air Toxics Assessment

² Just the scalars – no 1000 g/s or area division

The point source data category of the National Emissions Inventory is exported from the Emission Inventory System into the Flat File 2010 (FF10) format, referred to as 'SMOKEFF' or 'FF10', that is compatible with SMOKE (see <https://www.cmascenter.org/smoke/documentation/4.0/html/ch08s02s08.html>). For the SMOKE processing for CMAQ used in EPA's most recent emissions platforms such as the 2014v7.1 platform (see <https://www.epa.gov/air-emissions-modeling/emissions-modeling-platforms>) the SMOKEFF is initially broken out initially into ptegu, ptnonipm and pt_oilgas sectors. For the SMOKE processing for AERMOD, the ptnonipm sector has airports removed and is combined with pt_oilgas. Although defined differently from the SMOKE processing for CMAQ, we still use the name 'ptnonipm' for this sector in the [SMOKE4AERMOD readme](#) and this document; we also refer to these sources as nonegu. The ptegu is run through SMOKE4AERMOD separately from ptnonipm due to the hourly temporalization for ptegu and the application of month, week and diurnal temporal profiles for ptnonipm. Airports use different source characterization so their helper files are constructed separately from non-airport sources (covered in Section 3).

The source (**src_id**), which identifies the source for input into AERMOD is defined as each unique combination of temporal profile assignments and release point parameters (release point type, release parameters and geographic coordinates) associated with emissions of a HAP or diesel PM within a specific facility. Note that for facilities with a ptegu component, the process/release point combinations at a facility with the same hourly profile and release parameters are treated as a single source.

The following SMOKEFF fields when combined (and after missing parameters are gap-filled) must be unique WITHIN a facility to create a src_id:

1. Temporal profile assignments (diurnal, month, day of week) or hourly
2. ERPTYPE
3. STKHGT
4. STKDIAM
5. STKTEMP
6. STKFLOW
7. STKVEL
8. LONGITUDE
9. LATITUDE
10. FUG_HEIGHT
11. FUG_WIDTH_YDIM (renamed to FUG_WIDTH_XDIM)
12. FUG_LENGTH_XDIM (renamed to FUG_LENGTH_YDIM)
13. FUG_ANGLE

Src_ids within a facility for non-airport sources are numbered SN001 through SN# for ptnonipm sector sources and SE001 to SE# for pteegu sources, where # is the number of unique combinations of temporal/release parameters within the facility. We pad zeroes in the numbering scheme such that there is always 3 digits after the "SN" or "SE". For airport sources the source id begins with AP and are padded with just one zero since there would never be more than 99 runways at an airport (AP01 to AP99).

2 No Airports Point (ptegu and ptnonipm, pt_oilgas)

Table 1 Fields for Point Location Helper File

Filename: point_combined_location.csv	
Format: one row per facility_id/src_id	
Notes: This file contains all point sources that have selected HAPs in the SMOKEFF other than airports, sources without geographic coordinates and Federal Waters sources. Ptegu and Ptnonipm sectors are run separately through different SMOKE4AERMOD scripts and are then merged into a single file with the format listed below. Sources within the continental US (CONUS) and outside (e.g. AK/HI/PR/VI) are combined (they must be run separately) which is why “combined” is in the filename.	
Field Name	Description
state	2-digit state FIPS. Use 88 for tribe
facility_id	EIS facility id (SMOKEFF)
facility_name	Facility name from the SMOKEFF, put in double quotes
src_id	Unique source within facility based on temporal and release location/parameters
grid_x	Lambert x coordinate
grid_y	Lambert y coordinate
Longitude	From SMOKEFF
Latitude	From SMOKEFF
UTM_X	UTM_X and UTM_Y and UTM_ZONE are the UTM coordinates for the release point with respect to the utm zone of the facility (all release points for the same facility are in the same UTM zone). The UTM zone for a facility is set based on the location of the first release point processed for that facility. If a facility is in both ptegu and ptnonipm, the zone determined from the ptegu inventory is used for the entire facility. All UTM coordinates computed for all sources within the facility (i.e., point, line, AREAPOLY) are referenced to that one zone. For fugitives, these coordinates represent the most western endpoint of the fugitive (In Figure 1, it is the location of the pin).
UTM_Y	
UTM_ZONE	
COL	Grid cell the facility falls into (col, row) based on the geographic coordinates of the release points and the particular grid. If a facility spans two grid cells, then the facility will be assigned to a single grid cell –it would use the ptegu grid cell if the facility is in both ptegu and ptnonipm. For CONUS facilities, this is used to determine the appropriate gridded met file to use. For nonCONUS facilities, these fields are not used. Leading zeroes for col/row are not provided in this file.
ROW	
Suggested Quality Assurance (QA) Checks:	
<div>1. Each unique facility (across the combined sectors) must have the same COL, ROW for all sources at the facility and the same UTM Zone for all sources at the facility. Develop a list of facility, sector, UTM zone, col row.</div> <div>2. The facility/src_id must be unique, based on the all temporal and release/location parameters for that facility.</div> <div>3. Every facility_id/src_id in this file should be in either the point_srcparam.csv or the point_fug_srcparam.csv file.</div> <div>4. Every facility_id/src_id in this file should be in either the point_temporal.csv or one of the facility-specific temporal files.</div> <div>5. Determine UTM coordinates (x,y and zone) based on the lat/lon of each src_id and compare to the UTM in this helper file.</div>	

Table 2 Fields for Point Source Parameter Helper File for non-fugitive point sources

Filename: point_combined_point_srcparam.csv	
Format: one row per facility_id/src_id	
Notes: As with the locations file, ptnonipm and ptegu sectors are run separately and are merged into a single file. This file should have facility_id/src_id records for which the emission release point type is NOT fugitive. (i.e., in the FF10 file, ERPTYPE is not "1"). Sources within the continental US (CONUS) and outside (e.g. AK/HI/PR/VI) are run separately and then combined -which is why "combined" is in the filename.	
Field Name	Description
facility_id	EIS facility id (SMOKEFF)
facility_name	facility name from the SMOKEFF, put in double quotes
src_id	
aermod_src_type	If ERPTYPE=2 (vertical): POINT If ERPTYPE=3 (horizontal) or 4 (goose neck), or 6 (downward facing vent): POINTHOR If ERPTYPE=5 (vertical with rain cap): POINTCAP
height	Stack height in meters, $\text{Height (meters)} = 0.3048 * \text{STKHGT}$ →where STKHGT is the value (in feet) of the stack height in the SMOKEFF
temp	Temperature in Kelvin, $\text{Temp (Kelvin)} = (\text{STKTEMP} 459.67) \times 5/9$ →where STKTEMP is the value (in F) of the stack temperature in the SMOKEFF
velocity	Velocity in m/s, $\text{Velocity (m/s)} = 0.3048 * \text{STKVEL}$ If velocity is not available (and release point type =2) then compute velocity from STKFLOW (ft ³ /s) as: $\text{Velocity (m/s)} = 4 * \text{STKFLOW} * (0.3048) / (\text{Pi} * \text{Diameter}^2)$ → where STKVEL is the value (in ft/s) of the stack velocity in the SMOKEFF, and → where STKFLOW is the value (in ft ³ /s) of the stack flowrate in the SMOKEFF
diameter	Diameter in meters, $\text{Diameter (m)} = 0.3048 * \text{STKDIAM}$ →where STKDIAM is the value (in feet) of the stack diameter in the SMOKEFF
Suggested Quality Assurance (QA) Checks:	
<ol style="list-style-type: none"> 1. Every facility_id/src_id combination in this file should also be in the point_location file 2. Calculate metric stack parameters from inventory and compare to helper parameters. 3. Check that point parameters file does not contain source type AREA 	

Table 3 Fields for Point Source Parameter Helper File for Fugitive point sources

Filename: point_combined_fug_srcparam.csv	
Format: one row per facility_id/src_id	
Notes: As with the locations file, ptnonipm and ptegu sectors are run separately and are merged into a single file. This file should only have facility_id/src_id records for which the emission release point type is fugitive (ERPTYPE = "1"). Sources within the continental US (CONUS) and outside (e.g. AK/HI/PR/VI) are run separately and then combined -which is why "combined" is in the filename.	
Field Name	Description
facility_id	EIS facility id (SMOKEFF)
facility_name	Facility name from the SMOKEFF, put in double quotes
src_id	
aermod_src_type	Value is: AREA

rel_ht (m)	<p>This is the release height in meters. Convert FF10 fugitive height field from feet to meters $FUG_HEIGHT (ft) * 0.3048$ → where FUG_HEIGHT is the value (in ft) of the fugitive height in the SMOKEFF</p>
x_length (m)	<p>This is the length of side of the AREA source in the X-direction (east-west) in meters, measured from the most western corner of the source (indicated by the latitude/longitude or UTM in Table 1), if the angle were 0 degrees. See Figure 1. Convert FF10 field from feet to meters $FUG_WIDTH_XDIM (Ft) * (0.3048)$ (EAST/WEST) → where FUG_WIDTH_XDIM is the value (in ft) of the fugitive width in the SMOKEFF</p>
y_length (m)	<p>This is the length of side of the AREA source in the Y-direction (north-south) in meters, measured from the most western corner of the source (indicated by the latitude/longitude or UTM in Table 1), if the angle were 0 degrees. See Figure 1. Convert FF10 field from feet to meters $FUG_LENGTH_YDIM (Ft) * (0.3048)$ (North/South) → where FUG_LENGTH_YDIM is the value (in ft) of the fugitive length in the SMOKEFF</p>
angle	<p>FUG_ANGLE (The orientation angle for the area in degrees from North, measured positive in the clockwise direction.) → where FUG_ANGLE is the value (in degrees) of the fugitive angle in the SMOKEFF</p>
szinit (m)	<p>This is the initial vertical dispersion. If the FUG_HEIGHT is > 10 m, $szinit = FUG_HEIGHT * (0.3048) / 4.3$ Otherwise $szinit = 0$ → where FUG_HEIGHT is the value (in ft) of the fugitive height in the SMOKEFF</p>
<p>Suggested QA Checks:</p> <ol style="list-style-type: none"> 1. Every facility_id/src_id combination in this file should also be in the point locations file 2. Calculate metric fugitive parameters from inventory and compare to helper parameters. 3. Check that fugitive parameters file only contains source type AREA 	

Figure 1 Representation of a fugitive source described in Table 2, with fugitive parameters, x_length and y_length (pin represents geographic coordinates specified in Table 1)

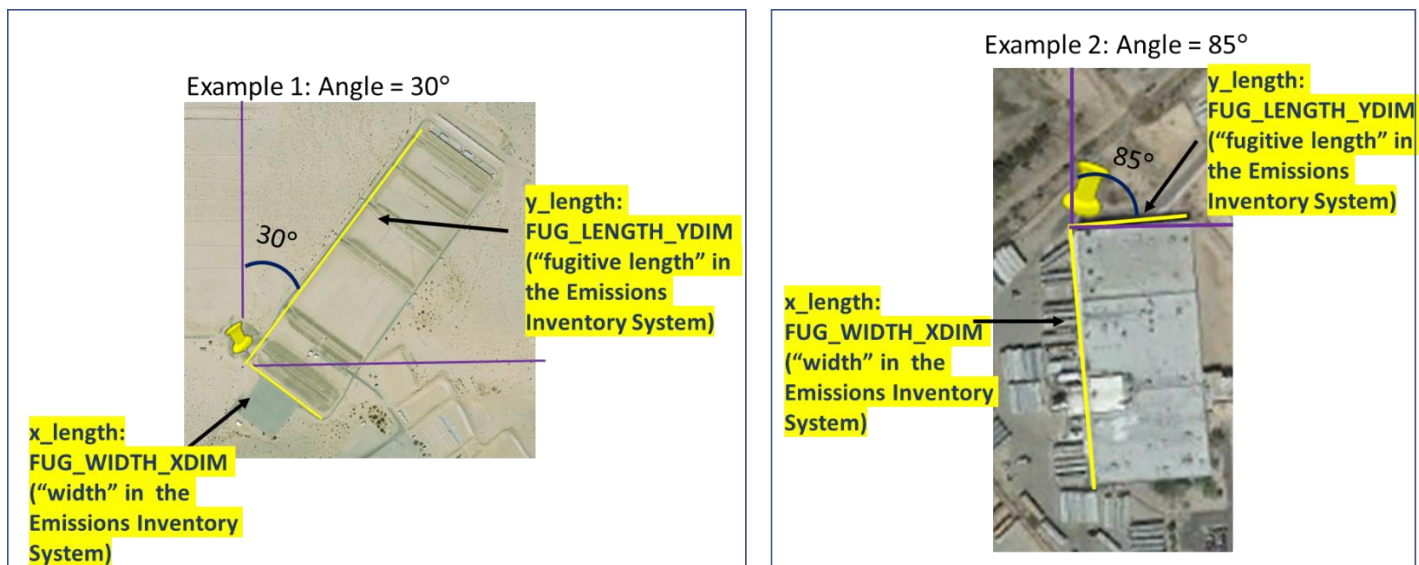


Table 4 Fields for Point Temporal (non-hourly) Helper File

Filename: point_combined_temporal.csv Format: one row per facility_id/src_id Notes: This file is for facility_id/src_id combinations in ptnonipm only; CONUS and nonCONUS are run separately and the 2 separate files are combined into a single file.	
Field Name	Description
facility_id	EIS facility id (SMOKEFF)
facility_name	Facility name from the SMOKEFF, put in double quotes
src_id	
qflag	Depends on temporal variability. Could be MONTH, MHRDOW, HROFDAY, MHRDOW7
Scalar1,..., Scalar N	<p>These provide the temporal scalars from which hourly emissions can be computed. The value and number of scalars depends on the qflag.</p> <p>For qflag=MONTH, N=12. The scalars equal the monthly temporal profile factors (after normalization) in the PTPRO SMOKE temporal profile file. Scalar1=January, Scalar2=February, Scalar3=March...Scalar12=December</p> <p>For qflag = HROFDAY, N=24. the 24 scalars equal the 24 hourly temporal profile factors (after normalization) in the PTPRO SMOKE temporal profile file. Scalar 1 = 12am to 1am, Scalar 2= 1am to 2 am,...Scalar 24=11 pm – 12 am</p> <p>For qflag=MHRDOW, N=864 (24 hours*3day types * 12 months) The SMOKE helper file scalars represent the hourly emissions fraction for representative month/day/hour combinations for which all weekdays are of equal weighting but Saturdays and Sundays may be different. They are computed from the SMOKE year-to-month temporal weighting factors, month-to-week temporal weighting factors and day-to-hour temporal weighting factors based on the following equation:</p> $Scalar_{mdh} = \frac{Monthfac_{month}}{\sum_{i=1}^{12} Scalar_{month} \times \#days_in_month_{month}} \times dayfac_{daytype} \times diurnal_{hourofday} \times 7$ <p>Where mdh is a value between 1 and 864 and is based on the following order: Hours 1-24 for January Weekday, hours 1-24 for February Weekday ...hours 1-24 for December Weekday, ...hours 1-24 January Saturday... hours 1-24 December Saturday, hours 1-24 January Sunday...hours 1-24 December Sunday. Therefore, the first scalar, Scalar₁, is the first hour of any weekday (Mon,Tues,Wed,Thurs or Fri) in January and Scalar₈₆₄ is the 24th hour for a Sunday in December. And where:</p> <ul style="list-style-type: none"> • <i>Monthfac_{month}</i> is the year-to-month temporal weighting factor for the specific <i>month</i> • <i>dayfac_{daytype}</i> is the month-to-week temporal weighting factor for the Weekday, Saturday or Sunday. Thus, every day between Monday and Friday has the same "Weekday" factor • <i>diurnal_{hourofday}</i> is the day to hour temporal weighting factor for the specific hour of day (1 is 12am to 1am, 2 is 1am to 2am... 24 is 11pm to 12am) <p>For qflag=MHRDOW7, N=2016 (24 hours*7 day types * 12 months) The SMOKE helper file scalars represent the hourly emissions fraction for representative month/day/hour combinations for which each day of the week could have a different weighting. They are computed from the SMOKE year-to-month temporal weighting factors, month-to-week temporal weighting factors and day-to-hour temporal weighting factors based on the following equation:</p>

	$Scalar_{mdh} = \frac{Monthfac_{month}}{\sum_{i=1}^{12} Scalar_{month} \times \#days_in_month_{month}} \times dayfac_{daytype} \times diurnal_{hourofday} \times 7$ <p>Where mdh is a value between 1 and 2016 and is based on the following representative month/day/hour combinations in the following order: Hours 1-24 for January Monday, hours 1-24 for February Monday...hours 1-24 for December Monday, hours 1-24 January Tuesday,...hours 1-24 December Tuesday, hours 1-24 January Saturday,...hours 1-24 December Saturday, hours 1-24 January Sunday...hours 1-24 December Sunday. Therefore, the first scalar, $Scalar_1$, is the first hour of any Monday in January, $Scalar_{25}$ is the first hour of any Monday in February, and $Scalar_{2016}$ is the 24th hour for a Sunday in December.</p> <p>And where:</p> <ul style="list-style-type: none"> • $Monthfac_{month}$ is the year-to-month temporal weighting factor for the specific <i>month</i> (e.g., Jan, Feb, etc.) • $dayfac_{daytype}$ is the month-to-week temporal weighting factor for the specific <i>day of the week</i> (e.g., Mon, Tues, Wed, Thurs, Fri) • $diurnal_{hourofday}$ is the day to hour temporal weighting factor for the specific hour of day (1 is 12am to 1am, 2 is 1am to 2am... 24 is 11pm to 12am)
<p>Suggested QA Checks:</p> <ol style="list-style-type: none"> 1. Every facility_id/src_id combination in this file should also be in the point_locations file 2. There should be no facility_id/src_id combinations that are in the hourly temporal csv file. 3. qflag = For HROFDAY and MONTH; sum of scalars=1 4. qflag = MHRDOW7, sum of scalars * 8760/2016 should not be more than 0.5% greater or less than 1 5. qflag= MHRDOW,(5*sum of weekday scalars + Saturday scalars + Sunday scalars)*8760/2016 should not be more than 0.5% greater or less than 1 	

Table 5 Fields for Point EGU HOURLY Temporal Helper Files

<p>Filename: Facilityid_2digitstateFIPS_hourly.csv, where Facilityid is the Facility_ID (EIS facility id) and the 2digitstateFIPS is the FIPS code of the state. For tribal facilities, "88" is used in place of the 2-digit state FIPS.</p> <p>Format: one row per facility_id/src_id and hour of the year</p> <p>Notes: There is one file per facility resulting from 2 separate runs (CONUS and nonCONUS). These files are for facility_id/src_id combinations in the ptegu sector only. The scalars should be provided in local time and that every month, day and hour needs to be contained in this file even if there are no emissions for that month, day, hour.</p>	
Field Name	Description
facility_id	EIS facility id (SMOKEFF)
src_id	
year	YYYY (this will be 2014 for the 2014 NATA)
month	MM
day	DD
hour	HH
factor	Hourly fraction computed by SMOKE based on CEMS data or average CEMS data
Temperature (K)	
Velocity (m/s)	
<p>Suggested QA Checks:</p> <ol style="list-style-type: none"> 1. Every facility_id/src_id combination in this file should also be in the point_locations file 2. There should be no facility_id/src_id combinations that are in the point_temporal csv file in this file. 3. Scalars should sum to 1 4. Check that every hour should be filled in, even if the scalar is 0 5. Spot check to make sure that LOCAL time is used (not GMT) 	

3 Airports Point Sources – Runway

Airports will have 2 sets of helper files- one for runway airports and one for nonrunway airports.

Airports are facilities extracted from the FF10 based on the FAC_SOURCE_TYPE field. FAC_SOURCE_TYPE =100 means it is an airport. Airports will be further divided into 2 groups: airports with runways and airports without runways. An airport cannot be in both groups.

For the runways: In addition to the FF10, which gives us the information to use for the temporal profile and the NEI facility name, we will use an ancillary runway file with the following parameters that will help with the LOCATION file.

This ancillary runway file contains only runway airports and is called:

Final_2014_Runway_Source_Airports_Endpoints_4.csv

- LOCType (not used)
- Siteno (not used)
- Airport name (not used)
- Width
- EIS Facility ID
- Start_x (this is an endpoint longitude)
- Start_y (this is an endpoint latitude)
- End_x (this is an endpoint longitude)
- End_y (this is an endpoint latitude)

The runway length should be computed based on the endpoints in the ancillary runway file

The runway area should be computed from the runway length and a width that is provided in the ancillary runway file

3.1 Airport Runways Location

Table 6 Fields for AIRPORT RUNWAY Location Helper File

Filename: airport_combined_line_locations.csv	
Format: one record per facility_id/src_id (i.e., one record per runway at a facility)	
Notes: CONUS and nonCONUS are run separately and afterwards the location files are combined together.	
Field Name	Description
state	2-digit state FIPS. Use 88 for tribe
facility_id	EIS facility id (SMOKEFF)
facility_name	Facility name from the SMOKEFF, put in double quotes
src_id	Id for each runway (AP01, AP02, etc.). The maximum number of runways is 8, so there could be an AP08 for src_id.
xs1	Utm x of endpoint 1 -- assume it is at the center of runway with regards to runway width
ys1	Utm y of endpoint 1
xs2	Utm x of endpoint 2
ys2	Utm y of endpoint 2
utm_zone	Based on the longitude of the facility in the FF10 inventory
col	Grid cell the facility falls into (col, row). The grid cell for a facility is assigned based on the location of the release point with the highest total emissions. The FF10 release point is used. Leading zeroes for col/row are not provided in this file.
row	
Suggested QA Checks:	
1. Ensure this file has all facility ids that are in the ancillary runway file	

2. Calculate the UTM X and UTM Y for both the start and end points of the runway using the single calculated UTM zone. Compare to UTM locations and helper file.

3.2 Airport runways parameter file

Table 7 Fields for Airport Runway Source Parameter Helper File

Filename: airport_combined_line_params.csv	
Format: one row per facility_id/src_id	
Notes: CONUS and nonCONUS are run separately and afterwards the runway source parameter files are combined together. This file should have facility_ids that are in ancillary runway file. Each src_id represents a runway at an airport.	
Field Name	Description
facility_id	Get from ancillary runway file
facility_name	Get from matching to FF10
src_id	Determine based on number of runways (AP01, AP02, etc.). The maximum number of runways is 8 so there could be up an AP08 for src_id.
src_type	LINE
runway area	Computed based on using endpoints and width in the ancillary file
frac	number of runways (they are equally divided) If there are two runways, fac value = 0.5. This value is for splitting emissions not for AERMOD
relhgt	Release height in meters: value is always 3
width	Width, in meters. Read value from ancillary file and is either 50 or 25
szinit	Initial vertical dispersion, in meters: value is always 3
Suggested QA Checks:	
1. Ensure this file has all facility_ids and src_ids that are in the airport runway locations file.	

3.3 Temporal profile

Table 8 Fields for Airport Runway Source Temporal Helper File

Filename: airport_combined_line_temporal.csv	
Format: One row per airport and src_id. Each src_id is a runway.	
Notes: CONUS and nonCONUS are run separately and afterwards the runway temporal files are combined together. We will have just one temporal profile per runway.	
Field Name	Description
facility_id	
facility_name	Facility name from the SMOKEFF, put in double quotes
src_id	
qflag	For airports it will be MHRDOW7
Scalar1 ... Scalar 2016	Hourly emissions for representative hours of the year. See Table 4 (MHRDOW7) for value of scalar
Suggested QA Checks:	
1. Ensure this file has all facility_ids and src_ids that are in the airport runway locations file.	

4 Airport Point Sources --- No Runways

Airports with no runways will have a different format that will be very similar to the non-airport point sources with airport with runway. Aggregate sources by facility ID (=EISID). There will only be one temporal profile per Srcid and just one Srcid per airport.

4.1 Locations file – Non-runway airports only

Table 9 Fields for AIRPORT NON-RUNWAY Location Helper File

Filename: airport_combined_nonrunway_locations.csv	
Format: one record per facility	
Notes: CONUS and nonCONUS are run separately and afterwards the location files are combined together.	
Field Name	Description
state	2-digit state FIPS. Use 88 for tribe
facility_id	EIS facility id (SMOKEFF)
facility_name	Facility name from the SMOKEFF, put in double quotes
src_id	AP01
grid_x	Lambert x coordinate
grid_y	Lambert y coordinate
Longitude	From FF10
Latitude	From FF10
utm_x	utm_x and utm_y and utm_zone are the UTM coordinates for the release point with respect to the utm zone of the facility (all release points for the same facility are the same and therefore in the same UTM zone). For the UTM zone, use the longitude of release point from the SMOKE FF10 and calculate the zone from a standard formula: $zone = \text{floor}(((lon+180)/6)+1)$
utm_y	
utm_zone	
col	grid cell the facility falls into (col, row) based on the geographic coordinates of the release points.
row	
For nonCONUS facilities the grid cell is not used by AERMOD.	
Suggested QA Checks:	
1. Ensure this file has all facility ids that have fac_source_type =100 but are not in the runway ancillary file	
2. Check that each release point has the same lat lon within each nonrunway facility.	

4.2 Area Parameters file – Non-runway airports only

Table 10 Fields for AIRPORT NON-RUNWAY Source Parameter Helper File

Filename: airport_combined_nonrunway_params.data	
Format: one record per facility	
Notes: CONUS and nonCONUS are run separately and afterwards the source parameter files are combined together.	
Field Name	Description
facility_id	EIS facility id (SMOKEFF)
facility_name	Facility name from the SMOKEFF, put in double quotes
src_id	AP01
Release height (m)	Release height in meters: value is always 3
lengthx	Length of side of AREA source in X-direction in meters: value is always 10
lengthy	Length of side of AREA source in Y-direction in meters: value is always 10
angle	0
Szinit (m)	Initial vertical dispersion, in meters: value is always 3
Suggested QA Checks:	
1. Ensure this file has all facility and src_ids that are in Airport_nonrunway_locations.csv.	

4.3 Temporal Profile– Non-runway airports only

Table 11 Fields for AIRPORT NON-RUNWAY Temporal Helper File

Filename: airport_combined_nonrunway_temporal.csv	
Format: one record per facility	
Notes: CONUS and nonCONUS are run separately and afterwards the temporal files are combined together.	
Field Name	Description
facility_id	EIS facility id (SMOKEFF)
facility_name	
src_id	
qflag	For airports it will be MHRDOW7
Scalar1	
...	
...	
...	
Scalar N	N is the number of scalars and because we have a different day profile for every day of the week, the number of scalars is $24*7*12=2016$
Suggested QA Checks:	
Ensure this file has all facility and src_ids that are in airport_combined_nonrunway_locations.csv.	

5 Emissions crosswalk file (for Point and Airports)

Table 12 Fields for POINT (NOT AIRPORTS) EMISSIONS Helper File

Filename: point_combined_srcid_emis.csv	
Format: one row per facility_id/src_id/pollutant	
Notes: Point contains both egus and nonegus, conus and nonConus except for airports. Airport file contains only airports. The pollutant is based on the SMOKE pollutant and the SMOKE name is used. That means individual pollutants in the SMOKEFF10 are aggregated (e.g., glycol ethers are grouped into a single SMOKE pollutant). Sources within the continental US (CONUS) and outside (e.g. AK/HI/PR/VI) are run separately and then combined -which is why “combined” is in the filename.	
Field Name	Description
state	2-digit state FIPS. Use 88 for tribe
facility_id	
facility_name	Facility name from the SMOKEFF, put in double quotes
fac_source_type	Code indicating facility type (from SMOKEFF) Note that the fac_source_type for rail yards is 151
src_id	
pollutant name	Use SMOKE name from the INVTABLE
Emissions (tons)	Emissions from the src_id multiplied by the INVTABLE factor that is specific to the SMOKE pollutant
Suggested QA Checks:	
<ol style="list-style-type: none"> 1. Every facility_id/src_id combination in this file should also be in the point_locations file 2. INVTABLE factor should be equal to the Metal/CN speciation factor from the NATA_Pollutants_listv17.xlsx 3. Sum emissions by facility and compare with FF10 summation? 4. Make sure this file has all pollutants from the INVTABLE with KEEP=Y. 5. Select only inventory sources that contain NATA HAPs using inventory table. Apply inventory table factors to emissions. 	

Table 13 Fields for AIRPORT (both runway and non-runway) EMISSIONS Helper Files

Filename: airport_combined_srcid_emis.csv Format: one row per facility/pollutant Sources within the continental US (CONUS) and outside (e.g. AK/HI/PR/VI) are run separately and then combined - which is why “combined” is in the filename.	
Field Name	Description
state	2-digit state FIPS. Use 88 for tribe
facility_id	
facility_name	Facility name from the SMOKEFF, put in double quotes
fac_source_type	Code indicating facility type (from SMOKEFF) should always be 100 for all records in this file
pollutant name	Use SMOKE name from the INVTABLE
Emissions (tons)	Emissions by airport from the FF10. For metals only -- multiply emissions from (2275050011=General Aviation /Piston; 2275060011=Air Taxi /Piston) by 0.5 Note that the Cntlmat program in SMOKE can apply SCC and pollutant-sepecific factors to the emissions. See source matching hierarchy built in Cntlmat program. https://www.cmascenter.org/smoke/documentation/4.5/html/ch06s02.html#sect_programs_cntlmat_source_match
Suggested QA Checks: 1. Every airport (fac_source_type =100) should be in this file.	

6 FF10 to facility/process/releasepoint crosswalk file

This was needed by James Thurman provided elevations by the SrcID to EC/R but they don't have the same Srcid numbering system so needed to map the SrcIDs to the FF10 records to apply the elevation data.

Table 14 Fields for source id to FF10 CROSSWALK Helper Files

Filename: point_combined_srcid_xwalk.csv and airport_combined_srcid_xwalk.csv Format: one row per facility_id/unit id/process id/ release point id Notes: This file could be used to determine which process/release points at a facility have the highest risks. There may be multiple files for point (nonegu), airport (nonrunway), airport (runway) or all will be put into the same file.	
state	2-digit state FIPS. Use 88 for tribe
facility_id	EIS facility id (SMOKEFF)
facility_name	Facility name from the SMOKEFF, put in double quotes
unit_id	EIS unit id (SMOKEFF)
process_id	EIS process id (SMOKEFF)
rel_point_id	EIS release point id (SMOKEFF)
src_id	
Suggested QA Checks: 1. Every facility_id/src_id combination in this file should also be in the point_locations file 2. Every facility / process/release point combination in the inventory with non zero NATA HAPs except for state="DM" should be included in this xwalk.	

7 Overall QA Summaries

Several QA reports are produced and incorporated into a QA workbook. The QA scripts use the environment variables from the EMF/SMOKE run scripts so they can be dropped in to the processing stream to give greater automation to the QA. They have a few other helpful pieces in them as well such as the facility in a single cell check and some lat/lon->UTM checks.

1. **Facility_counts** shows the number of facilities and sources in each helper file plus the inventory. There is also a cross-check that makes sure that exactly the same facilities and sources are in every helper file, but that only shows the sources that aren't in everything (so nothing to show).

Facility and source counts in FF10 – inventory versus Helper files. Check that all sources in each file is in each of the other helper files.

sector	locations		fugitive parameters		point parameters		total parameters		temporal		emissions xwalk		FF10 inventory
	facilities	sources	facilities	sources	facilities	sources	facilities	sources	facilities	sources	facilities	sources	facilities
nonegu	41102	136510	23057	40424	27098	96086	41102	136510	41102	136510	41102	136510	41102
egu	1672	6194	90	134	1618	6060	1672	6194	1672	6194	1672	6194	1672

Counts of facilities and AERMOD sources in AERMOD helper files
Inventory value includes only CONUS facilities with NATA HAPs values > 0
The sum of fugitive and point facilities may be more than the total because facilities may contain both fugitive and point sources.
Facilities and sources area cross-checked between helper files to verify that all sources in each file is in each of the other helper file. The result is a missing source list, which is empty.

2. **Nonegu_emis** shows a sum of all NATA HAPs emissions comparison between the two FF10 inventories used as inputs to the point AERMOD sector (ptnonipm). The inventory values are taken directly from the FF10 down to the process_id, cross-referenced to the AERMOD source using the crosswalk helper file, and then aggregated to the AERMOD source. The inventory sources include all sources within the CONUS domain that contain the NATA HAPs specified as “keep” in the inventory table.

The inventory source values are then outer joined with the emissions helper file. The outer join is important because it allows us to catch if there are sources in the inventory not in the helper file and vice-versa. If everything is correct then every source will be matched and the %diff will be 0%.

3. **Egu_emis** shows the EGU emissions similar to the nonegu emissions.

4. **Nonegu temporal** shows the calculated check values (sum) for each nonegu source with qflag type. The sum column values are calculated based on the qflag type where HROFDAY and MONTH are sum of the scalars, MHRDOW7 is the sum * (8760/2016), and MHRDOW is (5*sum of weekday + Saturday + Sunday) * (8760/2016). The out of range column is “Y” if the sum column does not equal 1 or is not within 0.5% of 1 depending on the qflag per the design document.

5. **EGU Temporal** shows the sum and count of the hourly EGU scalars by AERMOD source. The bad sum and bad count columns are “Y” if the sum and count fields are not exactly 1 or 8760, respectively.