Golder Associates Inc.

6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500
Telephone (352) 336-5600
Fax (352) 336-6603

September 17, 2007

Project No. 0738-7652

Air Permitting – South
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Attn: Ms. Debbie Nelson, Meteorologist

RE: AIR MODELING PROTOCOL FOR ASSESSING POLLUTANT AND AIR QUALITY RELATED VALUE IMPACTS FOR THE ADDITION OF UNIT 3 AT FPL'S WEST COUNTY ENERGY CENTER

On behalf of Florida Power & Light Company (FPL), Golder Associates Inc. (Golder) is providing this air modeling protocol to the Florida Department of Environmental Protection (FDEP) to present proposed near-field and Prevention of Significant Deterioration (PSD) Class I modeling methodologies to be used for the proposed addition of Unit 3 at the West County Energy Center (WCEC). The protocol presents the most current, accepted air modeling techniques and methodologies for predicting both near-field and far-field pollutant concentrations, based on recommendations consistent with FDEP and U.S. Environmental Protection Agency (EPA) requirements, as well as those of the Federal Land Managers (FLMs) for affected PSD Class I areas.

The key features of the air modeling analyses are included in the following sections.

PROJECT DESCRIPTION

Project Emissions

The proposed Project involves the addition of an additional 3-on-1 combined-cycle unit with a total net generating capacity of 1,250 megawatts to FPL's existing WCEC site in central Palm Beach County. The combustion turbine (CT) and heat recovery steam generator (HRSG) train for WCEC Unit 3 will use the same equipment design as WCEC Units 1 and 2. The primary fuel will be natural gas, with ultra-low sulfur distillate fuel oil (0.0015 percent sulfur) for use as the backup fuel for up to 500 hours per year per CT. Duct firing with natural gas up to 260 million British thermal units per hour (MMBtu/hr) (lower heating value) in each HRSG for an equivalent of 2,880 hours per year is also proposed. The proposed Project will result in emissions increases above the EPA significant emission rates (SER) for the following pollutants, thereby requiring PSD review for each pollutant:

- Sulfur dioxide (SO_2) – 193 tons per year (TPY);
- Nitrogen oxides (NO_x) – 332 TPY;
- Total particulate matter (PM) – 225 TPY;
- PM with aerodynamic diameters less than or equal to 10 microns (PM_{10}) – 130 TPY;
- Carbon monoxide (CO) – 413 TPY;
- Sulfuric acid mist (SAM) – 32.6 TPY; and
- Volatile organic compounds (VOC) – 66 TPY.

The maximum short-term emissions in pounds per hour (lb/hr) for different emission units of the Project are presented below:

Emission Unit	SO_2	PM_{10}	NO_x	CO	H_2SO_4
CT/HRSG (oil)	2.8	37.0	57.9	37.2	0.9
(gas)	12.0	4.8	15.7	27.2	1.9
Cooling Tower	–	1.17	–	–	–
Emergency Generator	0.03	0.6	61.7	2.3	–
Heater	0.05	0.02	0.95	0.8	–

Note: CT/HRSG emission rates are per CT/HRSG unit. A total of three units are planned.

Project Location

The existing WCEC site is mostly rural and flat and is located approximately 107 kilometers (km) north of the PSD Class I area of the Everglades National Park (NP). Because the second nearest PSD Class I area, the Chassahowitzka National Wilderness Area (NWA), is located 306 km from the site, the PSD Class I analysis will address impacts only at the Everglades NP. The locations of the nearest PSD Class I areas and Project site are shown in Figure 1.

The approximate location for this site is 562.2 km East and 2953.0 km North in the Universal Transverse Mercator (UTM) coordinate system in North American Datum (NAD) 27.

Palm Beach County is classified as an attainment area (includes unclassifiable) for all applicable pollutants: SO_2, nitrogen dioxide (NO_2), CO, PM_{10}, and ozone. Palm Beach County and surrounding counties are designated as PSD Class II areas for SO_2, PM, and NO_2. Palm Beach County is also designated a maintenance area for ozone.

Building Downwash Considerations

The proposed HRSG stacks will be approximately 140 feet tall and will be evaluated for determining compliance with Good Engineering Practice (GEP) regulations and the potential influence of nearby buildings and structures that could cause building downwash. For each stack that is below the GEP height, direction-specific building heights and maximum projected widths will be determined using the Building Profile Input Program (BPIP, Version 04274), which incorporates the Plume Rise Model Enhancement (PRIME) downwash algorithm developed by the Electric Power Research Institute (EPRI). The direction-specific building information output by BPIP will be input to the air dispersion model for processing.

DISPERSION MODELING – NEAR-FIELD ANALYSIS

A source impact analysis is required by FDEP Rule 62-212.400(5) Florida Administrative Code (F.A.C.). The near-field air modeling analysis will be performed using the American Meteorological Society (AMS)/EPA Regulatory Model (AERMOD, Version 07026) to predict concentrations in the vicinity of the proposed Project site location. The near-field analysis is based on predicting impacts within 50 km of the Project. The EPA regulatory default options will be used to predict all maximum impacts. These options include:

- Final plume rise at all receptor locations
- Stack-tip downwash
- Buoyancy-induced dispersion
- Default wind speed profile coefficients
- Default vertical potential temperature gradients
- Calm wind processing

Meteorological Data

The meteorological data to be used for the near-field analysis will consist of a 5-year hourly record from Palm Beach International Airport (PBI) and coincident upper air sounding data collected at Florida International University in Miami for years 2001 to 2005. The PBI meteorological data was processed with the AERMOD meteorological pre-processor program AERMET (Version 06341). The PBI meteorological data set has been used for the PSD application for the WCEC Units 1 and 2. The appropriateness of using the PBI weather data for the WCEC site with AERMOD will be confirmed with the FDEP prior to performing the modeling.

Receptors

Receptors will be placed along the WCEC site's restricted property boundary (i.e., fenceline) and beyond the fenceline according to the following receptor spacing.

- Along the property boundary or fenceline – 50 meters (m);
- Beyond the fenceline to 2 km – 100 m;
- From 2 km to 5 km – 250 m;
- From 5 km to 7 km – 500 m; and
- From 7 km to 10 km – 1,000 m.

All maximum predicted concentrations will be obtained from a receptor grid comprising 50-m resolution on the fence line and 100-m resolution or less beyond the fence line. AERMOD's terrain preprocessing program, AERMAP, Version 06341, will be used to process the receptor grid data in all near-field areas, using 7.5-minute U. S. Geological Survey (USGS) Digital Elevation Model (DEM) files.

Additional receptors will be modeled (i.e., extend the receptor grid beyond 10 km) if the maximum Project impacts on a pollutant-specific basis are not predicted to be less than the significant impact levels within 10 km of the site.

Significant Impact Analysis

A significant impact analysis will be performed for the proposed Project's emissions only. The Project's impacts will be evaluated for a range of CT operating loads and ambient temperatures. The operating load and ambient temperature that produces the highest air impacts will be determined. If the highest predicted impact for a particular pollutant exceeds a significant impact level, a more detailed modeling analysis (i.e., cumulative source modeling) will be performed for that pollutant. The critical load and temperature will then be used in the detailed analysis with other background facilities.

AAQS and PSD Class II Impact Analysis

Pollutant-specific analyses will be performed if the Project's impacts are predicted to be greater than the significant impact levels to demonstrate compliance with Florida Ambient Air Quality Standards (AAQS) and with PSD Class II Increments. The AAQS analysis will include the Project along with background facility emission data and a non-modeled background concentration for comparison to the AAQS. In the PSD Class II increment analysis, PSD increment consuming and expanding sources will be modeled for comparison to the allowable PSD Class II increments.

AAQS and PSD Class II Emission Inventories

If a detailed impact assessment is required for one or more pollutants for the near-field modeling analysis, background AAQS and PSD increment-affecting sources for those pollutants will be requested from FDEP. In addition, emissions and stack parameters for facilities will be developed from information contained in previous air modeling reports or from other data sources (e.g.,

Title V Permit Applications). The baseline emissions for the purpose of determining PSD increment consumption will be determined pursuant to the definition of "baseline concentration" in FDEP Rule 62-210.200(37) F.A.C.

To reduce the number of background sources evaluated, the "Screening Threshold" method developed by the North Carolina Department of Natural Resources and Community Development will be used. Based on this technique, facilities whose annual emissions (i.e., tons per year) are less than the threshold quantity, Q, are eliminated from the modeling analysis. Q is equal to $20 \times (D-SIA)$, where D is the distance in km from the facility to the Project site and SIA is the distance of the Project's pollutant-specific significant impact area (SIA). The facilities that are not eliminated in the screening analysis will be included in the AAQS and PSD Class II analyses.

Non-Modeled Background Concentrations

Total air quality impacts for comparison to AAQS will be based on the maximum impacts predicted from the modeled sources added to non-modeled background concentrations. The non-modeled background concentrations account for impacts from sources not explicitly modeled, and are generally estimated from ambient monitoring data representative of the Project site. Monitoring data near the Project site will be reviewed over the last several years and the highest measured concentration will be selected to represent background concentrations.

DISPERSION MODELING – FAR-FIELD ANALYSIS

The Everglades NP PSD Class I Area is located about 102 km south of the WCEC site. The analysis required by FDEP Rule 62-212.400(9) will be conducted.

The California Puff air modeling system (CALPUFF, Version 5.8 – i.e., the latest EPA-approved version) will be used on this Project to predict maximum air quality pollutant and Air Quality Related Value (AQRV) impacts on the Everglades NP. The CALPUFF model is a non-steady state Lagrangian puff long-range transport model that includes algorithms for chemical transformations (important for visibility controlling pollutants), and wet/dry deposition. Recent technical enhancements, including changes to the over-water boundary layer formulation and coastal effects modules (sponsored by the Minerals Management Service), are included in this version. The CALPUFF model will be used in a manner that is consistent with methodologies recommended in the following documents and as discussed in recent telephone conversations with the National Park Service (NPS):

- FLMs' AQRV Workgroup (FLAG) guidance document, finalized in December 2000 and referred to as the FLAG Phase I Report, and
- Interagency Workgroup on Air Quality Models (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long-Range Transport Impacts (EPA, 1998), referred to as the IWAQM Phase 2 report.

Parameter settings to be used in the CALPUFF modeling will be based on the latest regulatory guidance. Where the modeling guidance recommends regulatory model defaults, those defaults will be used. For ozone background concentrations, observed hourly ozone data for 2001 through 2003 from CASTNET and AIRS stations will be used. These data are available from the TRC website. A fixed monthly ammonia background concentration of 0.5 parts per billion (ppb) will be used. Parameters will be set to generate an hourly relative humidity file and calculate wet and dry fluxes and concentrations.

A sample CALPUFF control file has been included in Appendix A that provides the parameter settings proposed for use for this Project.

Project Emissions and PM Speciation

The CALPUFF model will include the proposed Project's emission, stack, and operating data based on the operating condition that has the highest emissions. Using the latest regulatory guidance, PM emissions for the proposed Project will include six particle size categories. The PM emissions will then be speciated into filterable and condensable species using the POSTUTIL utility program. Note that emissions for condensable inorganic PM are input directly to CALPUFF as sulfate (SO_4).

The effect that each species has on visibility impairment is related to a parameter called the extinction coefficient. The higher the extinction coefficient, the greater is that species' effect on visibility. Filterable PM is speciated into coarse (PMC), fine (PMF), and elemental carbon (EC). The default extinction coefficients for these species are 0.6, 1.0, and 10.0, respectively. PMC is PM with aerodynamic diameters greater than 2.5 microns. Both EC and PMF have aerodynamic diameters equal to or less than 2.5 microns. Condensable PM is composed of sulfate (SO_4) and secondary organic aerosols (SOA). The extinction coefficients for these species are 3 × f(RH) and 4 × f(RH), respectively, where f(RH) is the relative humidity factor.

PM speciation (PM_{10} versus $PM_{2.5}$) will be developed based on the best available vendor information for the proposed Project's emission sources.

A sample POSTUTIL control file for predicting visibility impairment is included in Appendix B.

Building Downwash Considerations

Building data will be included in the modeling using the same building dimensions developed for AERMOD.

Meteorological and Geophysical Data

The air modeling analyses will be conducted using the latest meteorological and geophysical databases that have been developed for use with the most recent versions of CALPUFF. These datasets were developed using CALMET Version 5.8 and were provided by the FDEP. The Florida domain has 4-km spacing and covers the period from 2001 to 2003.

Receptors

The NPS has developed 901 receptors to represent the boundary and internal areas for the Everglades NP. A figure showing the receptor locations at Everglades NP is presented in Figure 2. The minimum distance from the WCEC site to the Everglades NP is approximately 107 km.

Significant Impact Analysis

The CALPUFF model will be used to perform a PSD Class I significant impact analysis at the Everglades NP. The maximum predicted SO_2, NO_2, and PM_{10} concentrations due to the proposed Project will be compared to EPA's proposed PSD Class I significant impact levels. If the Project's impacts exceed the proposed EPA PSD Class I significant impact levels, then a more detailed PSD Class I increment analysis will be performed on a pollutant-specific basis.

The proposed PSD Class I significant impact levels are:

- SO_2: 3-hour – 1.0 micrograms per cubic meter ($\mu g/m^3$); 24-hour – 0.2 $\mu g/m^3$; and annual average – 0.1 $\mu g/m^3$
- NO_2: annual average – 0.1 $\mu g/m^3$
- PM_{10}: 24-hour – 0.3 $\mu g/m^3$; and annual average – 0.2 $\mu g/m^3$

PSD Class I Emission Inventories

If a detailed PSD Class I impact assessment is required for one or more pollutants, PSD-increment affecting sources will be modeled for comparison to the allowable PSD Class I increments. The baseline emissions for the purpose of determining PSD Increment consumption will be determined pursuant to the definition of "baseline concentration" in FDEP Rule 62-210.200(37) F.A.C. An inventory of background PSD Class I increment-affecting sources will be developed with the assistance and concurrence of the FDEP.

Visibility Impact

Based on the FLAG document, current regional haze guidelines characterize a change in visibility by the change in the light-extinction coefficient (b_{ext}). The b_{ext} is the attenuation of light per unit distance due to scattering and absorption by gases and particles in the atmosphere. A change in the extinction coefficient produces a perceived visual change. An index that simply quantifies the percent change in visibility due to the operation of a source is calculated as:

$$\Delta\% = (b_{exts} / b_{extb}) \times 100$$

where: b_{exts} is the extinction coefficient calculated for the source, and

b_{extb} is the background extinction coefficient.

The purpose of the visibility analysis is to calculate the extinction at each receptor for each day (24-hour period) of the year due to the proposed Project emissions. The criteria to determine if the Project's impacts are potentially significant are based on a change in extinction of 5 percent or greater for any day of the year.

The CALPUFF postprocessor model CALPOST will be used to calculate the combined visibility effects from the different pollutants that are emitted from the proposed Project. Based on communications with the NPS, daily background extinction coefficients are to be calculated on an hour-by-hour basis using hourly relative humidity data from CALMET and hygroscopic and non-hygroscopic extinction components specified in the FLAG document (Visibility Method 2). For the Everglades NP, the hygroscopic and non-hygroscopic components are 0.9 and 8.5 inverse megameter (Mm^{-1}) respectively. CALPOST then calculates the percent extinction change for each day of the year. A Rayleigh scattering term of 11.3 Mm^{-1} will be used for the analysis. This value is from Table A of the document entitled, *Revised IMPROVE Algorithm for Estimating Light Extinction from Particle Speciation Data* (IMPROVE, 2005). The revised relative humidity scattering enhancement factor [f(RH)] growth curve published by EPA in 2003 will be used in the analysis.

A sample CALPOST control file for visibility impairment using Method 2 is included in Appendix C.

Additional Visibility Assessments

In order to provide additional useful information for this analysis, Golder will determine the weather conditions for all days for which the visibility impairment is predicted to exceed 5 percent using Visibility Method 2. This analysis will review those days and identify hours with potential

meteorological conditions, such as rain and fog, that lead to existing reduced visibility conditions. These conditions often produce unrealistic impacts for a source when the visibility is already reduced due to natural causes.

Golder will also perform the visibility impairment analysis using Visibility Method 6 which applies monthly average relative humidity factors based on values from Table A-3 of *Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule* (EPA, September 2003). This approach is currently recommended for sources that are affected by the Best Available Retrofit Technology (BART) regulations and uses the predicted 98th percentile concentration to compare to visibility criteria. This comparison will provide an additional assessment of potential visibility impairment for the Project based on the evolving approach in assessing regional haze impacts at PSD Class I areas.

Sulfur and Nitrogen Deposition

As part of the AQRV analyses, total sulfur (S) and nitrogen (N) deposition rates will be predicted for the proposed Project at the Everglades NP. The deposition analysis criterion is based on the annual averaging period. The total deposition is estimated in kilograms per hectare per year (kg/ha/yr) of nitrogen or sulfur. The CALPUFF model is used to predict wet and dry deposition fluxes of various oxides of these elements.

For N deposition, the species include:

- Particulate ammonium nitrate (species NO_3), wet and dry deposition;
- Nitric acid (species HNO_3), wet and dry deposition;
- NO_x dry deposition; and
- Ammonium sulfate (species SO_4), wet and dry deposition.

For S deposition, the species include:

- SO_2, wet and dry deposition; and
- SO_4, wet and dry deposition.

The CALPUFF model produces results in units of micrograms per square meter per second ($\mu g/m^2/s$). The modeled deposition rates will be converted to N or S deposition in kg/ha/yr by using a multiplier equal to the ratio of the molecular weights of the substances (IWAQM Phase II report Section 3.3).

Deposition analysis thresholds (DAT) for total N and S deposition of 0.01 kg/ha/yr were provided by the U.S. Fish and Wildlife Service (January 2002). A DAT is the additional amount of N or S deposition within a Class I area, below which estimated impacts from a proposed new or modified source are considered insignificant. The maximum N and S depositions predicted for the proposed Project will be compared to these DAT or significant impact levels.

The wet and dry sulfate and nitrate fluxes will be converted into total N and S fluxes using the POSTUTIL utility program.

A sample control input file for N deposition is included in Appendix D.

ADDITIONAL IMPACT ANALYSES

The additional impact analyses required pursuant to FDEP Rule 62-212.400(8) will be conducted, including an analysis of the impacts of emissions from the Project on soils, vegetation, and visibility. To address such impacts, soil and vegetation types in the vicinity of the plant and in the area will be identified. A literature review will be conducted to identify the most recent data concerning threshold effect levels for the soil and vegetation types in those areas.

The analysis of impacts due to associated growth in the area must also be addressed. Growth effects will be addressed quantitatively and qualitatively, including impacts due to associated growth.

AMBIENT MONITORING ANALYSIS

The analysis required by FDEP Rule 62-212.400(6) will be conducted. The Project's maximum pollutant impacts will also be compared to *de minimis* air monitoring concentration to address preconstruction ambient air monitoring requirements under the PSD regulations. Should the Project's maximum pollutant impacts exceed a *de minimis* monitoring concentration, the applicant will meet the requirements using representative ambient air monitoring data.

We look forward to receiving your comments on this protocol and working with the FDEP on this important Project. If there are any questions, please contact Steve Marks or Ken Kosky at (352) 336-5600. Thank you.

Sincerely,

GOLDER ASSOCIATES INC.

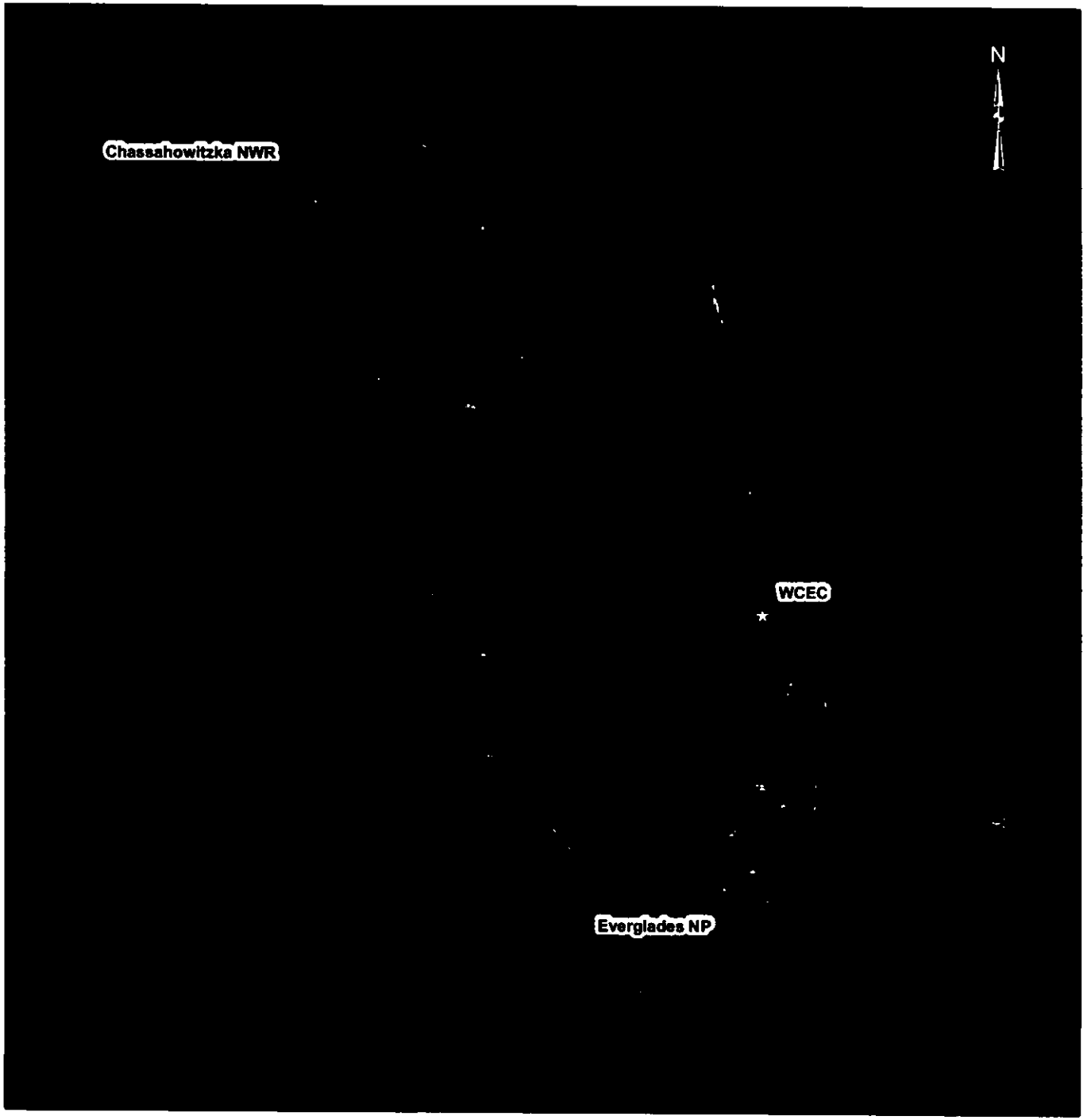
Steven R. Marks, C.C.M.
Associate

Kennard F. Kosky, P.E.
Principal

SRM/tz

Enclosures

Y:\Projects\2007\07387652 FPL WCEC Unit #3\Reports\Modeling Protocol\WestCounty3 air protocol 090707.doc



LEGEND

- ☆ WCEC
- National Parks and Wildlife Refuges

REFERENCE

1. WCEC Golder Associates Inc. 2. Aerial Photography - Aerials Express 1/15/2006 via ESRI ArcGIS Online Imagery 3. National Parks ESRI Data and Maps Media Kit
Projection Transverse Mercator Datum NAD 83 Coordinate System UTM Zone 17

50 0 50 Kilometers

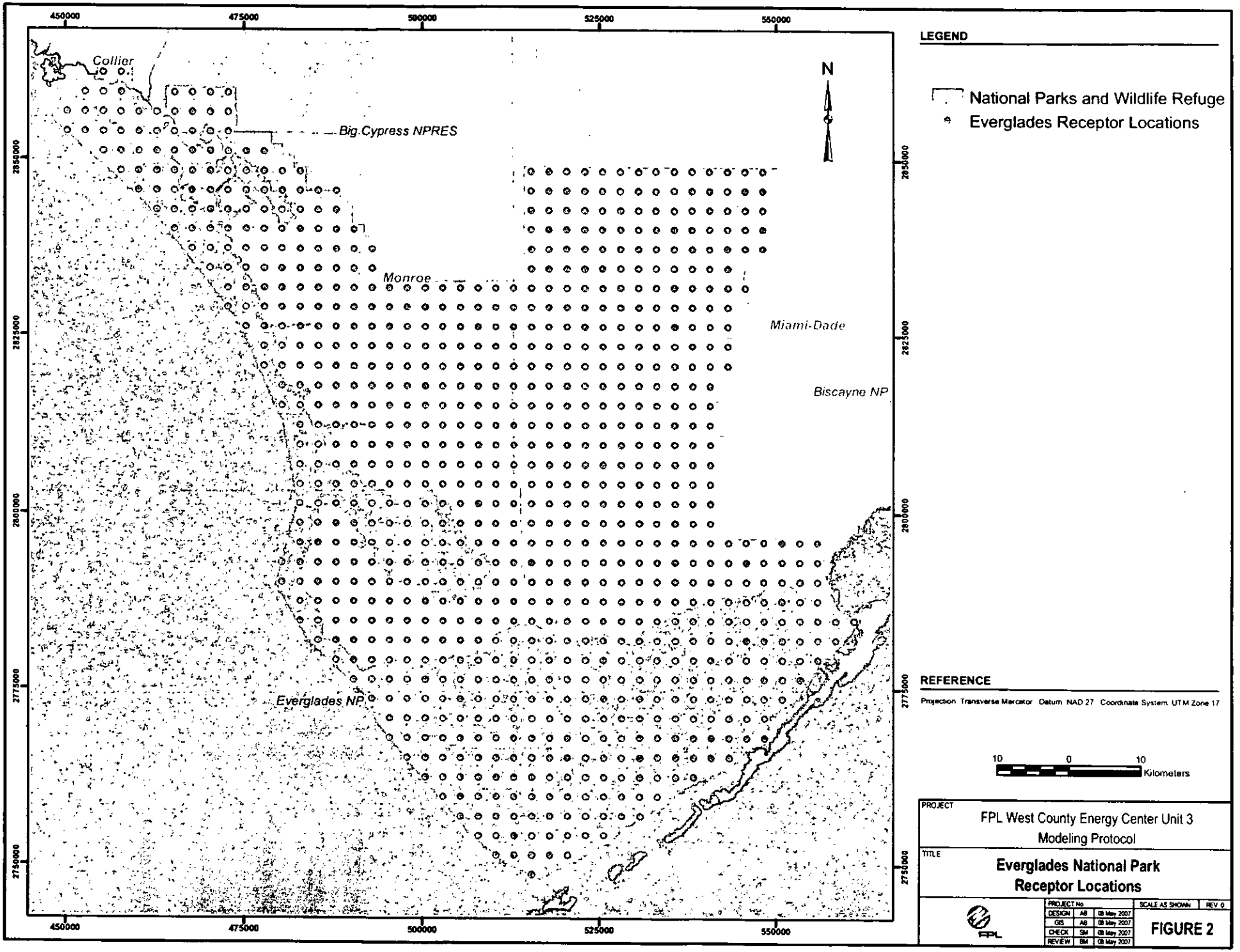
PROJECT
WEST COUNTY ENERGY CENTER UNIT 3
MODELING PROTOCOL

TITLE
AREA MAP

Golder Associates
Gainesville, Florida

PROJECT No. 073-88586-0203			SCALE AS SHOWN	REV. 0
DESIGN	SM	08/23/2007		
GIS	RL	08/23/2007		
CHECK	SM	08/23/2007		
REVIEW	SM	08/23/2007		

FIGURE 1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475000
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2850000
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Collier
Big Cypress NPRES
Monroe
Miami-Dade
Biscayne NP
Everglades NP
N
LEGEND
National Parks and Wildlife Refuge
Everglades Receptor Locations
REFERENCE
Projection Transverse Mercator Datum NAD 27 Coordinate System UTM Zone 17
10 0 10
Kilometers
PROJECT
FPL West County Energy Center Unit 3
Modeling Protocol
TITLE
Everglades National Park
Receptor Locations
PROJECT No.
SCALE AS SHOWN
REV. 0
DESIGN AB 08 May 2007
GIS AB 08 May 2007
CHECK SM 08 May 2007
REVIEW BM 08 May 2007
FPL
FIGURE 2

APPENDIX A

SAMPLE CALPUFF MODEL CONTROL FILE FOR VISIBILITY IMPACTS

```
FPL WCEC UNIT3 - 1250 MW 'G' CLASS - CALPUFF V 5.8              8/22/07
CT/HRSG AND COOLING TOWER
4-km FLORIDA DOMAIN, 2002, VISIB IMPACTS AT EVERGLADES NP
---------------- Run title (3 lines) ------------------------------------------

                    CALPUFF MODEL CONTROL FILE
                    --------------------------

--------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names

--------------
Default Name  Type           File Name
------------  ----           ---------
CALMET.DAT    input    * METDAT =             *
    or
ISCMET.DAT    input    * ISCDAT =             *
    or
PLMMET.DAT    input    * PLMDAT =             *
    or
PROFILE.DAT   input    * PRFDAT =             *
SURFACE.DAT   input    * SFCDAT =             *
RESTARTB.DAT  input    * RSTARTB=             *
--------------------------------------------------------------------------------
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CONC.DAT      output   ! CONDAT = EXAMPLE.CON !
DFLX.DAT      output   ! DFDAT  = EXAMPLE.DRY !
WFLX.DAT      output   ! WFDAT  = EXAMPLE.WET !

VISB.DAT      output   ! VISDAT = VISB.DAT    !
RESTARTE.DAT  output   * RSTARTE=             *
--------------------------------------------------------------------------------
Emission Files
--------------
PTEMARB.DAT   input    * PTDAT  =             *
VOLEMARB.DAT  input    * VOLDAT =             *
BAEMARB.DAT   input    * ARDAT  =             *
LNEMARB.DAT   input    * LNDAT  =             *
--------------------------------------------------------------------------------
Other Files
-----------
OZONE.DAT     input    ! OZDAT  =C:\BARTHRO3\OZONE.DAT !
VD.DAT        input    * VDDAT  =             *
CHEM.DAT      input    * CHEMDAT=             *
H2O2.DAT      input    * H2O2DAT=             *
HILL.DAT      input    * HILDAT=              *
HILLRCT.DAT   input    * RCTDAT=              *
COASTLN.DAT   input    * CSTDAT=              *
FLUXBDY.DAT   input    * BDYDAT=              *
BCON.DAT      input    * BCNDAT=              *
DEBUG.DAT     output   * DEBUG =              *
MASSFLX.DAT   output   * FLXDAT=              *
MASSBAL.DAT   output   * BALDAT=              *
FOG.DAT       output   * FOGDAT=              *
--------------------------------------------------------------------------------
All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case      ! LCFILES = T !
         F = UPPER CASE
NOTE: (1) file/path names can be up to 70 characters in length


Provision for multiple input files
----------------------------------

     Number of CALMET.DAT files for run (NMETDAT)
                                  Default: 1       ! NMETDAT =   36  !

     Number of PTEMARB.DAT files for run (NPTDAT)
                                  Default: 0       ! NPTDAT =  0  !

     Number of BAEMARB.DAT files for run (NARDAT)
                                  Default: 0       ! NARDAT =  0  !
```

```
     Number of VOLEMARB.DAT files for run (NVOLDAT)
                                    Default: 0       ! NVOLDAT =  0  !

!END!

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Subgroup (0a)
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  The following CALMET.DAT filenames are processed in sequence if NMETDAT>1

Default Name  Type          File Name
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CALMET.DAT    input    ! METDAT =C:\EPACALMET2002\EPAMET2002-DOM2-11A.DAT ! !END!
CALMET.DAT    input    ! METDAT =C:\EPACALMET2002\EPAMET2002-DOM2-11B.DAT ! !END!
CALMET.DAT    input    ! METDAT =C:\EPACALMET2002\EPAMET2002-DOM2-11C.DAT ! !END!
CALMET.DAT    input    ! METDAT =C:\EPACALMET2002\EPAMET2002-DOM2-12A.DAT ! !END!
CALMET.DAT    input    ! METDAT =C:\EPACALMET2002\EPAMET2002-DOM2-12B.DAT ! !END!
CALMET.DAT    input    ! METDAT =C:\EPACALMET2002\EPAMET2002-DOM2-12C.DAT ! !END!
------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

    Option to run all periods found
    in the met. file      (METRUN)   Default: 0       ! METRUN =   0  !

        METRUN = 0 - Run period explicitly defined below
        METRUN = 1 - Run all periods in met. file

     Starting date:   Year (IBYR) -- No default       ! IBYR =  2002 !
     (used only if   Month (IBMO) -- No default       ! IBMO =  1   !
      METRUN = 0)      Day (IBDY) -- No default       ! IBDY =  1   !
                      Hour (IBHR) -- No default       ! IBHR =  1   !

     Note: IBHR is the time at the END of the first hour of the simulation
           (IBHR=1, the first hour of a day, runs from 00:00 to 01:00)

     Base time zone        (XBTZ) -- No default       ! XBTZ = 5.0  !
     The zone is the number of hours that must be
     ADDED to the time to obtain UTC (or GMT)
     Examples: PST = 8., MST = 7.
               CST = 6., EST = 5.

     Length of run (hours) (IRLG) -- No default       ! IRLG = 8760 !
```

```
      Number of chemical species (NSPEC)
                                    Default: 5       ! NSPEC = 12   !

      Number of chemical species
      to be emitted  (NSE)          Default: 3       ! NSE = 10    !

      Flag to stop run after
      SETUP phase (ITEST)           Default: 2       ! ITEST =  2   !
      (Used to allow checking
      of the model inputs, files, etc.)
            ITEST = 1 - STOPS program after SETUP phase
            ITEST = 2 - Continues with execution of program
                        after SETUP

      Restart Configuration:

         Control flag (MRESTART)    Default: 0       ! MRESTART =  0   !

            0 = Do not read or write a restart file
            1 = Read a restart file at the beginning of
                the run
            2 = Write a restart file during run
            3 = Read a restart file at beginning of run
                and write a restart file during run

         Number of periods in Restart
         output cycle (NRESPD)      Default: 0       ! NRESPD =  0   !

            0 = File written only at last period
           >0 = File updated every NRESPD periods

      Meteorological Data Format (METFM)
                                    Default: 1       ! METFM =  1   !

            METFM = 1 - CALMET binary file (CALMET.MET)
            METFM = 2 - ISC ASCII file (ISCMET.MET)
            METFM = 3 - AUSPLUME ASCII file (PLMMET.MET)
            METFM = 4 - CTDM plus tower file (PROFILE.DAT) and
                        surface parameters file (SURFACE.DAT)
            METFM = 5 - AERMET tower file (PROFILE.DAT) and
                        surface parameters file (SURFACE.DAT)

      Meteorological Profile Data Format (MPRFFM)
             (used only for METFM = 1, 2, 3)
                                    Default: 1       ! MPRFFM =  1   !

            MPRFFM = 1 - CTDM plus tower file (PROFILE.DAT)
            MPRFFM = 2 - AERMET tower file (PROFILE.DAT)

      PG sigma-y is adjusted by the factor (AVET/PGTIME)**0.2
      Averaging Time (minutes) (AVET)
                                    Default: 60.0    ! AVET = 60.  !
      PG Averaging Time (minutes) (PGTIME)
                                    Default: 60.0    ! PGTIME = 60.  !

!END!

------------------------------------------------------------------------------

INPUT GROUP: 2 -- Technical options
---------------


      Vertical distribution used in the
      near field (MGAUSS)                Default: 1     ! MGAUSS =  1   !
         0 = uniform
         1 = Gaussian

      Terrain adjustment method
      (MCTADJ)                           Default: 3     ! MCTADJ =  3   !
         0 = no adjustment
         1 = ISC-type of terrain adjustment
```

```
   2 = simple, CALPUFF-type of terrain
       adjustment
   3 = partial plume path adjustment

Subgrid-scale complex terrain
flag (MCTSG)                          Default: 0      ! MCTSG =  0   !
   0 = not modeled
   1 = modeled

Near-field puffs modeled as
elongated slugs? (MSLUG)              Default: 0      ! MSLUG =  0   !
   0 = no
   1 = yes (slug model used)

Transitional plume rise modeled ?
(MTRANS)                              Default: 1      ! MTRANS =  1   !
   0 = no  (i.e., final rise only)
   1 = yes (i.e., transitional rise computed)

Stack tip downwash? (MTIP)            Default: 1      ! MTIP =  1   !
   0 = no  (i.e., no stack tip downwash)
   1 = yes (i.e., use stack tip downwash)

Method used to simulate building
downwash? (MBDW)                      Default: 1      ! MBDW =   1   !
   1 = ISC method
   2 = PRIME method

Vertical wind shear modeled above
stack top? (MSHEAR)                   Default: 0      ! MSHEAR =  0   !
   0 = no  (i.e., vertical wind shear not modeled)
   1 = yes (i.e., vertical wind shear modeled)

Puff splitting allowed? (MSPLIT)      Default: 0      ! MSPLIT =  0   !
   0 = no (i.e., puffs not split)
   1 = yes (i.e., puffs are split)

Chemical mechanism flag (MCHEM)       Default: 1      ! MCHEM =  1   !
   0 = chemical transformation not
       modeled
   1 = transformation rates computed
       internally (MESOPUFF II scheme)
   2 = user-specified transformation
       rates used
   3 = transformation rates computed
       internally (RIVAD/ARM3 scheme)
   4 = secondary organic aerosol formation
       computed (MESOPUFF II scheme for OH)

Aqueous phase transformation flag (MAQCHEM)
(Used only if MCHEM = 1, or 3)        Default: 0      ! MAQCHEM =  0   !
   0 = aqueous phase transformation
       not modeled
   1 = transformation rates adjusted
       for aqueous phase reactions

Wet removal modeled ? (MWET)          Default: 1      ! MWET =  1   !
   0 = no
   1 = yes

Dry deposition modeled ? (MDRY)       Default: 1      ! MDRY =  1   !
   0 = no
   1 = yes
   (dry deposition method specified
    for each species in Input Group 3)


Gravitational settling (plume tilt)
modeled ? (MTILT)                     Default: 0      ! MTILT =  0   !
   0 = no
   1 = yes
   (puff center falls at the gravitational
    settling velocity for 1 particle species)

Restrictions:
```

```
    - MDRY   = 1
    - NSPEC = 1   (must be particle species as well)
    - sg     = 0  GEOMETRIC STANDARD DEVIATION in Group 8 is
                  set to zero for a single particle diameter

Method used to compute dispersion
coefficients (MDISP)                    Default: 3     ! MDISP =  3   !

   1 = dispersion coefficients computed from measured values
       of turbulence, sigma v, sigma w
   2 = dispersion coefficients from internally calculated
       sigma v, sigma w using micrometeorological variables
       (u*, w*, L, etc.)
   3 = PG dispersion coefficients for RURAL areas (computed using
       the ISCST multi-segment approximation) and MP coefficients in
       urban areas
   4 = same as 3 except PG coefficients computed using
       the MESOPUFF II eqns.
   5 = CTDM sigmas used for stable and neutral conditions.
       For unstable conditions, sigmas are computed as in
       MDISP = 3, described above.  MDISP = 5 assumes that
       measured values are read

Sigma-v/sigma-theta, sigma-w measurements used? (MTURBVW)
(Used only if MDISP = 1 or 5)           Default: 3     ! MTURBVW =  3   !
   1 = use sigma-v or sigma-theta measurements
       from PROFILE.DAT to compute sigma-y
       (valid for METFM = 1, 2, 3, 4, 5)
   2 = use sigma-w measurements
       from PROFILE.DAT to compute sigma-z
       (valid for METFM = 1, 2, 3, 4, 5)
   3 = use both sigma-(v/theta) and sigma-w
       from PROFILE.DAT to compute sigma-y and sigma-z
       (valid for METFM = 1, 2, 3, 4, 5)
   4 = use sigma-theta measurements
       from PLMMET.DAT to compute sigma-y
       (valid only if METFM = 3)

Back-up method used to compute dispersion
when measured turbulence data are
missing (MDISP2)                        Default: 3     ! MDISP2 =  3   !
(used only if MDISP = 1 or 5)
   2 = dispersion coefficients from internally calculated
       sigma v, sigma w using micrometeorological variables
       (u*, w*, L, etc.)
   3 = PG dispersion coefficients for RURAL areas (computed using
       the ISCST multi-segment approximation) and MP coefficients in
       urban areas
   4 = same as 3 except PG coefficients computed using
       the MESOPUFF II eqns.

[DIAGNOSTIC FEATURE]
Method used for Lagrangian timescale for Sigma-y
(used only if MDISP=1,2 or MDISP2=1,2)
(MTAULY)                                Default: 0     ! MTAULY =  0   !
   0 = Draxler default 617.284 (s)
   1 = Computed as Lag. Length / (.75 q) -- after SCIPUFF
  10 < Direct user input (s)              -- e.g., 306.9


[DIAGNOSTIC FEATURE]
Method used for Advective-Decay timescale for Turbulence
(used only if MDISP=2 or MDISP2=2)
(MTAUADV)                               Default: 0     ! MTAUADV =  0   !
   0 = No turbulence advection
   1 = Computed (OPTION NOT IMPLEMENTED)
  10 < Direct user input (s)    -- e.g., 300


Method used to compute turbulence sigma-v &
sigma-w using micrometeorological variables
(Used only if MDISP = 2 or MDISP2 = 2)
(MCTURB)                                Default: 1     ! MCTURB =  1   !
   1 = Standard CALPUFF subroutines
   2 = AERMOD subroutines
```

```
PG sigma-y,z adj. for roughness?      Default: 0     ! MROUGH =  0  !
(MROUGH)
   0 = no
   1 = yes

Partial plume penetration of          Default: 1     ! MPARTL =  1  !
elevated inversion?
(MPARTL)
   0 = no
   1 = yes

Strength of temperature inversion     Default: 0     ! MTINV =  0  !
provided in PROFILE.DAT extended records?
(MTINV)
   0 = no (computed from measured/default gradients)
   1 = yes

PDF used for dispersion under convective conditions?
                                      Default: 0     ! MPDF =  0  !
(MPDF)
   0 = no
   1 = yes

Sub-Grid TIBL module used for shore line?
                                      Default: 0     ! MSGTIBL = 0  !
(MSGTIBL)
   0 = no
   1 = yes

Boundary conditions (concentration) modeled?
                                      Default: 0     ! MBCON = 0  !
(MBCON)
   0 = no
   1 = yes, using formatted BCON.DAT file
   2 = yes, using unformatted CONC.DAT file

Note:  MBCON > 0 requires that the last species modeled
       be 'BCON'.  Mass is placed in species BCON when
       generating boundary condition puffs so that clean
       air entering the modeling domain can be simulated
       in the same way as polluted air.  Specify zero
       emission of species BCON for all regular sources.

Individual source contributions saved?
                                      Default: 0     ! MSOURCE = 0  !
(MSOURCE)
   0 = no
   1 = yes


Analyses of fogging and icing impacts due to emissions from
arrays of mechanically-forced cooling towers can be performed
using CALPUFF in conjunction with a cooling tower emissions
processor (CTEMISS) and its associated postprocessors.  Hourly
emissions of water vapor and temperature from each cooling tower
cell are computed for the current cell configuration and ambient
conditions by CTEMISS. CALPUFF models the dispersion of these
emissions and provides cloud information in a specialized format
for further analysis. Output to FOG.DAT is provided in either
'plume mode' or 'receptor mode' format.

Configure for FOG Model output?
                                      Default: 0     ! MFOG =  0   !
(MFOG)
   0 = no
   1 = yes  - report results in PLUME Mode format
   2 = yes  - report results in RECEPTOR Mode format


Test options specified to see if
they conform to regulatory
values? (MREG)                        Default: 1     ! MREG =  1   !

   0 = NO checks are made
```

```
        1 = Technical options must conform to USEPA
            Long Range Transport (LRT) guidance
                        METFM    1 or 2
                        AVET     60. (min)
                        PGTIME   60. (min)
                        MGAUSS   1
                        MCTADJ   3
                        MTRANS   1
                        MTIP     1
                        MCHEM    1 or 3 (if modeling SOx, NOx)
                        MWET     1
                        MDRY     1
                        MDISP    2 or 3
                        MPDF     0 if MDISP=3
                                 1 if MDISP=2
                        MROUGH   0
                        MPARTL   1
                        SYTDEP   550. (m)
                        MHFTSZ   0
                        SVMIN    0.5 (m/s)

!END!

-------------------------------------------------------------------------------

INPUT GROUP: 3a, 3b -- Species list
-------------------

------------
Subgroup (3a)
------------

  The following species are modeled:

! CSPEC =          SO2 !          !END!
! CSPEC =          SO4 !          !END!
! CSPEC =          NOX !          !END!
! CSPEC =         HNO3 !          !END!
! CSPEC =          NO3 !          !END!
! CSPEC =       PM0063 !          !END!
! CSPEC =       PM0100 !          !END!
! CSPEC =       PM0125 !          !END!
! CSPEC =       PM0250 !          !END!
! CSPEC =       PM0600 !          !END!
! CSPEC =       PM1000 !          !END!
! CSPEC =           CO !          !END!

                                                    Dry                 OUTPUT GROUP
    SPECIES          MODELED          EMITTED     DEPOSITED               NUMBER
     NAME        (0=NO, 1=YES)    (0=NO, 1=YES)  (0=NO,                (0=NONE,
   (Limit: 12                                     1=COMPUTED-GAS        1=1st CGRUP,
    Characters                                    2=COMPUTED-PARTICLE   2=2nd CGRUP,
    in length)                                    3=USER-SPECIFIED)     3= etc.)

!          SO2  =         1,              1,          1,                 0   !
!          SO4  =         1,              1,          2,                 0   !
!          NOX  =         1,              1,          1,                 0   !
!         HNO3  =         1,              0,          1,                 0   !
!          NO3  =         1,              0,          2,                 0   !
!       PM0063  =         1,              1,          2,                 1   !
!       PM0100  =         1,              1,          2,                 1   !
!       PM0125  =         1,              1,          2,                 1   !
!       PM0250  =         1,              1,          2,                 1   !
!       PM0600  =         1,              1,          2,                 1   !
!       PM1000  =         1,              1,          2,                 1   !
!           CO  =         1,              1,          0,                 0   !

!END!

-------------
Subgroup (3b)
-------------
  The following names are used for Species-Groups in which results
```

```
  for certain species are combined (added) prior to output.  The
  CGRUP name will be used as the species name in output files.
  Use this feature to model specific particle-size distributions
  by treating each size-range as a separate species.
  Order must be consistent with 3(a) above.


INPUT GROUP: 4 -- Map Projection and Grid control parameters
--------------

     Projection for all (X,Y):
     -------------------------

     Map projection
     (PMAP)                    Default: UTM     ! PMAP = LCC  !

         UTM :  Universal Transverse Mercator
         TTM :  Tangential Transverse Mercator
         LCC :  Lambert Conformal Conic
          PS :  Polar Stereographic
          EM :  Equatorial Mercator
        LAZA :  Lambert Azimuthal Equal Area

     False Easting and Northing (km) at the projection origin
     (Used only if PMAP= TTM, LCC, or LAZA)
     (FEAST)                   Default=0.0      ! FEAST  = 0.000  !
     (FNORTH)                  Default=0.0      ! FNORTH = 0.000  !

     UTM zone (1 to 60)
     (Used only if PMAP=UTM)
     (IUTMZN)                  No Default       ! IUTMZN =  0 !

     Hemisphere for UTM projection?
     (Used only if PMAP=UTM)
     (UTMHEM)                  Default: N       ! UTMHEM = N  !
         N   :  Northern hemisphere projection
         S   :  Southern hemisphere projection

     Latitude and Longitude (decimal degrees) of projection origin
     (Used only if PMAP= TTM, LCC, PS, EM, or LAZA)
     (RLAT0)                   No Default       ! RLAT0 =  40N !
     (RLON0)                   No Default       ! RLON0 =  97W !

         TTM :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         LCC :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         PS  :  RLON0 identifies central (grid N/S) meridian of projection
                RLAT0 selected for convenience
         EM  :  RLON0 identifies central meridian of projection
                RLAT0 is REPLACED by 0.0N (Equator)
         LAZA:  RLON0 identifies longitude of tangent-point of mapping plane
                RLAT0 identifies latitude of tangent-point of mapping plane

     Matching parallel(s) of latitude (decimal degrees) for projection
     (Used only if PMAP= LCC or PS)
     (XLAT1)                   No Default       ! XLAT1 = 33N  !
     (XLAT2)                   No Default       ! XLAT2 = 45N  !

         LCC :  Projection cone slices through Earth's surface at XLAT1 and XLAT2
         PS  :  Projection plane slices through Earth at XLAT1
                (XLAT2 is not used)

     ----------
     Note:  Latitudes and longitudes should be positive, and include a
            letter N,S,E, or W indicating north or south latitude, and
            east or west longitude.  For example,
            35.9  N Latitude  =  35.9N
            118.7 E Longitude = 118.7E


     Datum-region
     ------------

     The Datum-Region for the coordinates is identified by a character
```

string. Many mapping products currently available use the model of the Earth known as the World Geodetic System 1984 (WGS-84). Other local models may be in use, and their selection in CALMET will make its output consistent with local mapping products. The list of Datum-Regions with official transformation parameters is provided by the National Imagery and Mapping Agency (NIMA).

NIMA Datum - Regions(Examples)

WGS-84	WGS-84 Reference Ellipsoid and Geoid, Global coverage (WGS84)
NAS-C	NORTH AMERICAN 1927 Clarke 1866 Spheroid, MEAN FOR CONUS (NAD27)
NAR-C	NORTH AMERICAN 1983 GRS 80 Spheroid, MEAN FOR CONUS (NAD83)
NWS-84	NWS 6370KM Radius, Sphere
ESR-S	ESRI REFERENCE 6371KM Radius, Sphere

Datum-region for output coordinates
(DATUM) Default: WGS-84 ! DATUM = NWS-84 !

METEOROLOGICAL Grid:

Rectangular grid defined for projection PMAP,
with X the Easting and Y the Northing coordinate

No. X grid cells (NX) No default ! NX = 263 !
No. Y grid cells (NY) No default ! NY = 206 !
No. vertical layers (NZ) No default ! NZ = 10 !

Grid spacing (DGRIDKM) No default ! DGRIDKM = 4. !
Units: km

Cell face heights
(ZFACE(nz+1)) No defaults
Units: m

* ZFACE = .0, 20.0, 40.0, 80.0, 160.0, 300.0, 600.0, 1000.0, 1500.0, 2200.0, 3000.0 *
! ZFACE = 0.,20.,40.,80.,160.,320.,640.,1200.,2000.,3000.,4000. !

Reference Coordinates
of SOUTHWEST corner of
grid cell(1, 1):

X coordinate (XORIGKM) No default ! XORIGKM = 721.995 !
Y coordinate (YORIGKM) No default ! YORIGKM = -1598.000 !
Units: km

COMPUTATIONAL Grid:

The computational grid is identical to or a subset of the MET. grid. The lower left (LL) corner of the computational grid is at grid point (IBCOMP, JBCOMP) of the MET. grid. The upper right (UR) corner of the computational grid is at grid point (IECOMP, JECOMP) of the MET. grid. The grid spacing of the computational grid is the same as the MET. grid.

X index of LL corner (IBCOMP) No default ! IBCOMP = 1 !
(1 <= IBCOMP <= NX)

Y index of LL corner (JBCOMP) No default ! JBCOMP = 1 !
(1 <= JBCOMP <= NY)

X index of UR corner (IECOMP) No default ! IECOMP = 263 !
(1 <= IECOMP <= NX)

Y index of UR corner (JECOMP) No default ! JECOMP = 206 !
(1 <= JECOMP <= NY)

SAMPLING Grid (GRIDDED RECEPTORS):

The lower left (LL) corner of the sampling grid is at grid point (IBSAMP, JBSAMP) of the MET. grid. The upper right (UR) corner of the sampling grid is at grid point (IESAMP, JESAMP) of the MET. grid.

```
      The sampling grid must be identical to or a subset of the computational
      grid.  It may be a nested grid inside the computational grid.
      The grid spacing of the sampling grid is DGRIDKM/MESHDN.

         Logical flag indicating if gridded
         receptors are used (LSAMP)          Default: T      ! LSAMP = F !
         (T=yes, F=no)

         X index of LL corner (IBSAMP)       No default      ! IBSAMP =  1   !
          (IBCOMP <= IBSAMP <= IECOMP)

         Y index of LL corner (JBSAMP)       No default      ! JBSAMP =  1   !
          (JBCOMP <= JBSAMP <= JECOMP)


         X index of UR corner (IESAMP)       No default      ! IESAMP =  263 !
          (IBCOMP <= IESAMP <= IECOMP)

         Y index of UR corner (JESAMP)       No default      ! JESAMP =  206  !
          (JBCOMP <= JESAMP <= JECOMP)


        Nesting factor of the sampling
         grid (MESHDN)                       Default: 1      ! MESHDN =  1   !
         (MESHDN is an integer >= 1)

!END!

-------------------------------------------------------------------------------


INPUT GROUP: 5 -- Output Options
--------------

     FILE                          DEFAULT VALUE              VALUE THIS RUN
     ----                          -------------              --------------

   Concentrations (ICON)                 1                    !  ICON =  1    !
   Dry Fluxes (IDRY)                     1                    !  IDRY =  1    !
   Wet Fluxes (IWET)                     1                    !  IWET =  1    !
   2D Temperature (IT2D)                 0                    !  IT2D =  0    !
   2D Density (IRHO)                     0                    !  IRHO =  0    !
   Relative Humidity (IVIS)              1                    !  IVIS =  1    !
    (relative humidity file is
     required for visibility
     analysis)
   Use data compression option in output file?
   (LCOMPRS)                          Default: T          ! LCOMPRS = T !

   *
    0 = Do not create file, 1 = create file


    QA PLOT FILE OUTPUT OPTION:

       Create a standard series of output files (e.g.
       locations of sources, receptors, grids ...)
       suitable for plotting?
       (IQAPLOT)                      Default: 1          !  IQAPLOT =  1    !
         0 = no
         1 = yes

    DIAGNOSTIC MASS FLUX OUTPUT OPTIONS:

       Mass flux across specified boundaries
       for selected species reported?
       (IMFLX)                        Default: 0          ! IMFLX =  0  !
         0 = no
         1 = yes (FLUXBDY.DAT and MASSFLX.DAT filenames
                  are specified in Input Group 0)

       Mass balance for each species
       reported?
       (IMBAL)                        Default: 0          ! IMBAL =  0  !
```

```
        0 = no
        1 = yes (MASSBAL.DAT filename is
             specified in Input Group 0)


    LINE PRINTER OUTPUT OPTIONS:

       Print concentrations (ICPRT)     Default: 0         ! ICPRT =  0   !
       Print dry fluxes (IDPRT)         Default: 0         ! IDPRT =  0   !
       Print wet fluxes (IWPRT)         Default: 0         ! IWPRT =  0   !
       (0 = Do not print, 1 = Print)

       Concentration print interval
       (ICFRQ) in timesteps             Default: 1         ! ICFRQ =  24  !
       Dry flux print interval
       (IDFRQ) in timesteps             Default: 1         ! IDFRQ =  1   !
       Wet flux print interval
       (IWFRQ) in timesteps             Default: 1         ! IWFRQ =  1   !

       Units for Line Printer Output
       (IPRTU)                          Default: 1         ! IPRTU =  3   !
                      for               for
                 Concentration     Deposition
           1 =       g/m**3          g/m**2/s
           2 =      mg/m**3         mg/m**2/s
           3 =      ug/m**3         ug/m**2/s
           4 =      ng/m**3         ng/m**2/s
           5 =     Odour Units

       Messages tracking progress of run
       written to the screen ?
       (IMESG)                          Default: 2         ! IMESG =  2   !
         0 = no
         1 = yes (advection step, puff ID)
         2 = yes (YYYYJJJHH, # old puffs, # emitted puffs)


    SPECIES (or GROUP for combined species) LIST FOR OUTPUT OPTIONS

                  ---- CONCENTRATIONS ----   ------ DRY FLUXES ------   ------ WET FLUXES ------   -- MASS
FLUX --
   SPECIES
   /GROUP         PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON DISK?   SAVED ON
DISK?
   -------        ------------------------   ------------------------   ------------------------   -----------
----
!          SO2 =      0,           1,           0,           1,           0,           1,           0   !
!          SO4 =      0,           1,           0,           1,           0,           1,           0   !
!          NOX =      0,           1,           0,           1,           0,           1,           0   !
!         HNO3 =      0,           1,           0,           1,           0,           1,           0   !
!          NO3 =      0,           1,           0,           1,           0,           1,           0   !
!         PM10 =      0,           1,           0,           1,           0,           1,           0   !
!           CO =      0,           1,           0,           1,           0,           1,           0   !

    OPTIONS FOR PRINTING "DEBUG" QUANTITIES (much output)

      Logical for debug output
      (LDEBUG)                                Default: F     ! LDEBUG = F !

      First puff to track
      (IPFDEB)                                Default: 1     ! IPFDEB =  1  !

      Number of puffs to track
      (NPFDEB)                                Default: 1     ! NPFDEB =  1  !

      Met. period to start output
      (NN1)                                   Default: 1     ! NN1 =  1   !

      Met. period to end output
      (NN2)                                   Default: 10    ! NN2 =  10  !

!END!
```

```
INPUT GROUP: 6a, 6b, & 6c -- Subgrid scale complex terrain inputs
-------------------------

---------------
Subgroup (6a)
---------------
       Number of terrain features (NHILL)        Default: 0      ! NHILL =  0   !

       Number of special complex terrain
       receptors  (NCTREC)                       Default: 0      ! NCTREC =  0   !

       Terrain and CTSG Receptor data for
       CTSG hills input in CTDM format ?
       (MHILL)                                   No Default      ! MHILL =  2   !
       1 = Hill and Receptor data created
           by CTDM processors & read from
           HILL.DAT and HILLRCT.DAT files
       2 = Hill data created by OPTHILL &
           input below in Subgroup (6b);
           Receptor data in Subgroup (6c)

       Factor to convert horizontal dimensions   Default: 1.0    ! XHILL2M = 1. !
       to meters (MHILL=1)

       Factor to convert vertical dimensions     Default: 1.0    ! ZHILL2M = 1. !
       to meters (MHILL=1)

       X-origin of CTDM system relative to       No Default      ! XCTDMKM = 0.0E00 !
       CALPUFF coordinate system, in Kilometers  (MHILL=1)

       Y-origin of CTDM system relative to       No Default      ! YCTDMKM = 0.0E00 !
       CALPUFF coordinate system, in Kilometers  (MHILL=1)

! END !

---------------
Subgroup (6b)
---------------

                      1 **
     HILL information

HILL            XC         YC        THETAH   ZGRID   RELIEF     EXPO 1     EXPO 2     SCALE 1     SCALE 2     AMAX1
AMAX2
 NO.           (km)       (km)       (deg.)    (m)       (m)        (m)        (m)         (m)         (m)        (m)
(m)
----           ----       ----       ------   -----   ------     ------     ------     -------     -------     -----
-----

---------------
Subgroup (6c)
---------------

    COMPLEX TERRAIN RECEPTOR INFORMATION

                     XRCT         YRCT         ZRCT          XHH
                     (km)         (km)          (m)
                    ------       -----        ------         ----


-------------------
1
     Description of Complex Terrain Variables:
          XC, YC   = Coordinates of center of hill
          THETAH   = Orientation of major axis of hill (clockwise from
                     North)
          ZGRID    = Height of the  0  of the grid above mean sea
                     level
          RELIEF   = Height of the crest of the hill above the grid elevation
          EXPO 1   = Hill-shape exponent for the major axis
          EXPO 2   = Hill-shape exponent for the major axis
          SCALE 1  = Horizontal length scale along the major axis
```

```
          SCALE 2 = Horizontal length scale along the minor axis
          AMAX    = Maximum allowed axis length for the major axis
          BMAX    = Maximum allowed axis length for the major axis

          XRCT, YRCT = Coordinates of the complex terrain receptors
          ZRCT    = Height of the ground (MSL) at the complex terrain
                    Receptor
          XHH     = Hill number associated with each complex terrain receptor
                    (NOTE: MUST BE ENTERED AS A REAL NUMBER)

   **
     NOTE: DATA for each hill and CTSG receptor are treated as a separate
           input subgroup and therefore must end with an input group terminator.

-------------------------------------------------------------------------------


INPUT GROUP: 7 -- Chemical parameters for dry deposition of gases
--------------

      SPECIES      DIFFUSIVITY      ALPHA STAR      REACTIVITY    MESOPHYLL RESISTANCE     HENRY'S LAW
COEFFICIENT
       NAME         (cm**2/s)                                          (s/cm)               (dimensionless)
       -------      -----------      ----------      ----------    --------------------     -------------------
----

!          SO2 =      0.1509,          1000,             8,               0,                  0.04 !
!          NOX =      0.1656,             1,             8,               5,                   3.5 !
!         HNO3 =      0.1628,             1,            18,               0,           0.00000008 !

!END!


-------------------------------------------------------------------------------


INPUT GROUP: 8 -- Size parameters for dry deposition of particles
--------------

     For SINGLE SPECIES, the mean and standard deviation are used to
     compute a deposition velocity for NINT (see group 9) size-ranges,
     and these are then averaged to obtain a mean deposition velocity.

     For GROUPED SPECIES, the size distribution should be explicitly
     specified (by the 'species' in the group), and the standard deviation
     for each should be entered as 0.  The model will then use the
     deposition velocity for the stated mean diameter.

      SPECIES       GEOMETRIC MASS MEAN        GEOMETRIC STANDARD
       NAME              DIAMETER                  DEVIATION
                         (microns)                 (microns)
       -------       --------------------       ------------------
!          SO4 =          0.48,                      2.    !
!          NO3 =          0.48,                      2.    !
!       PM0063 =          0.63,                      0.    !
!       PM0100 =          1.00,                      0.    !
!       PM0125 =          1.25,                      0.    !
!       PM0250 =          2.50,                      0.    !
!       PM0600 =          6.00,                      0.    !
!       PM1000 =         10.00,                      0.    !

!END!


-------------------------------------------------------------------------------


INPUT GROUP: 9 -- Miscellaneous dry deposition parameters
--------------

     Reference cuticle resistance (s/cm)
     (RCUTR)                          Default: 30     !  RCUTR = 30.0 !
     Reference ground resistance  (s/cm)
     (RGR)                            Default: 10     !    RGR = 10.0 !
     Reference pollutant reactivity
```

```
      (REACTR)                          Default: 8      ! REACTR = 8.0 !

      Number of particle-size intervals used to
      evaluate effective particle deposition velocity
      (NINT)                            Default: 9      !   NINT =  9  !

      Vegetation state in unirrigated areas
      (IVEG)                            Default: 1      !   IVEG =  1  !
         IVEG=1 for active and unstressed vegetation
         IVEG=2 for active and stressed vegetation
         IVEG=3 for inactive vegetation

!END!

----------------------------------------------------------------------------


INPUT GROUP: 10 -- Wet Deposition Parameters
---------------


                      Scavenging Coefficient -- Units: (sec)**(-1)

       Pollutant      Liquid Precip.       Frozen Precip.
       ---------      --------------       --------------
!          SO2 =         3.0E-05,             0.0E00 !
!          SO4 =         1.0E-04,            3.0E-05 !
!         HNO3 =         6.0E-05,             0.0E00 !
!          NO3 =         1.0E-04,            3.0E-05 !
!       PM0063 =         1.0E-04,            3.0E-05 !
!       PM0100 =         1.0E-04,            3.0E-05 !
!       PM0125 =         1.0E-04,            3.0E-05 !
!       PM0250 =         1.0E-04,            3.0E-05 !
!       PM0600 =         1.0E-04,            3.0E-05 !
!       PM1000 =         1.0E-04,            3.0E-05 !

!END!

----------------------------------------------------------------------------


INPUT GROUP: 11 -- Chemistry Parameters
---------------

     Ozone data input option (MOZ)     Default: 1            ! MOZ =  1   !
     (Used only if MCHEM = 1, 3, or 4)
        0 = use a monthly background ozone value
        1 = read hourly ozone concentrations from
            the OZONE.DAT data file

     Monthly ozone concentrations
     (Used only if MCHEM = 1, 3, or 4 and
      MOZ = 0 or MOZ = 1 and all hourly O3 data missing)
     (BCKO3) in ppb                    Default: 12*80.
     !  BCKO3 = 12*50. !

     Monthly ammonia concentrations
     (Used only if MCHEM = 1, or 3)
     (BCKNH3) in ppb                   Default: 12*10.
     !  BCKNH3 = 12*0.5 !

     Nighttime SO2 loss rate (RNITE1)
     in percent/hour                   Default: 0.2          ! RNITE1 = .2 !

     Nighttime NOx loss rate (RNITE2)
     in percent/hour                   Default: 2.0          ! RNITE2 = 2.0 !

     Nighttime HNO3 formation rate (RNITE3)
     in percent/hour                   Default: 2.0          ! RNITE3 = 2.0 !

     H2O2 data input option (MH2O2)    Default: 1            ! MH2O2 =  1   !
     (Used only if MAQCHEM = 1)
        0 = use a monthly background H2O2 value
```

```
        1 = read hourly H2O2 concentrations from
            the H2O2.DAT data file

      Monthly H2O2 concentrations
      (Used only if MQACHEM = 1 and
       MH2O2 = 0 or MH2O2 = 1 and all hourly H2O2 data missing)
      (BCKH2O2) in ppb                    Default: 12*1.
      !  BCKH2O2 = 12*1 !


 --- Data for SECONDARY ORGANIC AEROSOL (SOA) Option
      (used only if MCHEM = 4)

      The SOA module uses monthly values of:
           Fine particulate concentration in ug/m^3 (BCKPMF)
           Organic fraction of fine particulate     (OFRAC)
           VOC / NOX ratio (after reaction)         (VCNX)
      to characterize the air mass when computing
      the formation of SOA from VOC emissions.
      Typical values for several distinct air mass types are:

         Month    1    2    3    4    5    6    7    8    9   10   11   12
                 Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

      Clean Continental
         BCKPMF   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.
         OFRAC  .15  .15  .20  .20  .20  .20  .20  .20  .20  .20  .20  .15
         VCNX    50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.

      Clean Marine (surface)
         BCKPMF  .5   .5   .5   .5   .5   .5   .5   .5   .5   .5   .5   .5
         OFRAC  .25  .25  .30  .30  .30  .30  .30  .30  .30  .30  .30  .25
         VCNX    50.  50.  50.  50.  50.. 50.  50.  50.  50.  50.  50.  50.

      Urban - low biogenic (controls present)
         BCKPMF  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.
         OFRAC  .20  .20  .25  .25  .25  .25  .25  .25  .20  .20  .20  .20
         VCNX     4.   4.   4.   4.   4.   4.   4.   4.   4.   4.   4.   4.

      Urban - high biogenic (controls present)
         BCKPMF  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.
         OFRAC  .25  .25  .30  .30  .30  .55  .55  .55  .35  .35  .35  .25
         VCNX    15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.

      Regional Plume
         BCKPMF  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.
         OFRAC  .20  .20  .25  .35  .25  .40  .40  .40  .30  .30  .30  .20
         VCNX    15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.

      Urban - no controls present
         BCKPMF 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100.
         OFRAC  .30  .30  .35  .35  .35  .55  .55  .55  .35  .35  .35  .30
         VCNX     2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.

      Default: Clean Continental
      !  BCKPMF = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00 !
      !  OFRAC  = 0.15, 0.15, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.15 !
      !  VCNX   = 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00 !


 !END!


 ------------------------------------------------------------------------------


 INPUT GROUP: 12 -- Misc. Dispersion and Computational Parameters
 ----------------

      Horizontal size of puff (m) beyond which
      time-dependent dispersion equations (Heffter)
      are used to determine sigma-y and
      sigma-z (SYTDEP)                          Default: 550.    ! SYTDEP = 5.5E02 !

      Switch for using Heffter equation for sigma z
```

```
as above (0 = Not use Heffter; 1 = use Heffter
(MHFTSZ)                                  Default: 0      ! MHFTSZ =  0   !

Stability class used to determine plume
growth rates for puffs above the boundary
layer (JSUP)                              Default: 5      ! JSUP =  5   !

Vertical dispersion constant for stable
conditions (k1 in Eqn. 2.7-3)  (CONK1)    Default: 0.01   ! CONK1 = .01 !

Vertical dispersion constant for neutral/
unstable conditions (k2 in Eqn. 2.7-4)
(CONK2)                                   Default: 0.1    ! CONK2 = .1 !

Factor for determining Transition-point from
Schulman-Scire to Huber-Snyder Building Downwash
scheme (SS used for Hs < Hb + TBD * HL)
(TBD)                                     Default: 0.5    ! TBD = .5 !
   TBD < 0   ==> always use Huber-Snyder
   TBD = 1.5 ==> always use Schulman-Scire
   TBD = 0.5 ==> ISC Transition-point

Range of land use categories for which
urban dispersion is assumed
(IURB1, IURB2)                            Default: 10     ! IURB1 =  10  !
                                                  19      ! IURB2 =  19  !

Site characterization parameters for single-point Met data files ---------
(needed for METFM = 2,3,4,5)

   Land use category for modeling domain
   (ILANDUIN)                             Default: 20     ! ILANDUIN =  20  !

   Roughness length (m) for modeling domain
   (Z0IN)                                 Default: 0.25   ! Z0IN = .25 !

   Leaf area index for modeling domain
   (XLAIIN)                               Default: 3.0    ! XLAIIN = 3.0 !

   Elevation above sea level (m)
   (ELEVIN)                               Default: 0.0    ! ELEVIN = .0 !

   Latitude (degrees) for met location
   (XLATIN)                               Default: -999.  ! XLATIN = -999.0 !

   Longitude (degrees) for met location
   (XLONIN)                               Default: -999.  ! XLONIN = -999.0 !

Specialized information for interpreting single-point Met data files -----

   Anemometer height (m) (Used only if METFM = 2,3)
   (ANEMHT)                               Default: 10.    ! ANEMHT = 10.0 !

   Form of lateral turbulance data in PROFILE.DAT file
   (Used only if METFM = 4,5 or MTURBVW = 1 or 3)
   (ISIGMAV)                              Default: 1      ! ISIGMAV =  1  !
       0 = read sigma-theta
       1 = read sigma-v

   Choice of mixing heights (Used only if METFM = 4)
   (IMIXCTDM)                             Default: 0      ! IMIXCTDM =  0  !
       0 = read PREDICTED mixing heights
       1 = read OBSERVED mixing heights

Maximum length of a slug (met. grid units)
(XMXLEN)                                  Default: 1.0    ! XMXLEN = 1.0 !

Maximum travel distance of a puff/slug (in
grid units) during one sampling step
(XSAMLEN)                                 Default: 1.0    ! XSAMLEN = 1.0 !

Maximum Number of slugs/puffs release from
one source during one time step
(MXNEW)                                   Default: 99     ! MXNEW =  99   !
```

```
Maximum Number of sampling steps for
one puff/slug during one time step
(MXSAM)                                   Default: 99      ! MXSAM =  99   !

Number of iterations used when computing
the transport wind for a sampling step
that includes gradual rise (for CALMET
and PROFILE winds)
(NCOUNT)                                  Default: 2       ! NCOUNT =  2   !

Minimum sigma y for a new puff/slug (m)
(SYMIN)                                   Default: 1.0     ! SYMIN = 1.0  !

Minimum sigma z for a new puff/slug (m)
(SZMIN)                                   Default: 1.0     ! SZMIN = 1.0  !

Default minimum turbulence velocities sigma-v and sigma-w
for each stability class over land and over water (m/s)
(SVMIN(12) and SWMIN(12))

                 ---------- LAND ----------        --------- WATER ----------
   Stab Class :  A    B    C    D    E    F         A    B    C    D    E    F
                 ---  ---  ---  ---  ---  ---       ---  ---  ---  ---  ---  ---
Default SVMIN : .50, .50, .50, .50, .50, .50,      .37, .37, .37, .37, .37, .37
Default SWMIN : .20, .12, .08, .06, .03, .016,     .20, .12, .08, .06, .03, .016

      ! SVMIN = 0.500, 0.500, 0.500, 0.500, 0.500, 0.500, 0.370, 0.370, 0.370, 0.370, 0.370, 0.370!
      ! SWMIN = 0.200, 0.120, 0.080, 0.060, 0.030, 0.016, 0.200, 0.120, 0.080, 0.060, 0.030, 0.016!

Divergence criterion for dw/dz across puff
used to initiate adjustment for horizontal
convergence (1/s)
Partial adjustment starts at CDIV(1), and
full adjustment is reached at CDIV(2)
(CDIV(2))                                 Default: 0.0,0.0  ! CDIV = .0, .0 !

Minimum wind speed (m/s) allowed for
non-calm conditions. Also used as minimum
speed returned when using power-law
extrapolation toward surface
(WSCALM)                                  Default: 0.5     ! WSCALM = .5 !

Maximum mixing height (m)
(XMAXZI)                                  Default: 3000.   ! XMAXZI = 3000.0 !

Minimum mixing height (m)
(XMINZI)                                  Default: 50.     ! XMINZI = 50.0 !

Default wind speed classes --
5 upper bounds (m/s) are entered;
the 6th class has no upper limit
(WSCAT(5))                        Default    :
                                  ISC RURAL  : 1.54, 3.09, 5.14, 8.23, 10.8 (10.8+)

                          Wind Speed Class :  1     2     3     4     5
                                              ---   ---   ---   ---   ---
                                    ! WSCAT = 1.54, 3.09, 5.14, 8.23, 10.80 !

Default wind speed profile power-law
exponents for stabilities 1-6
(PLX0(6))                         Default    : ISC RURAL values
                                  ISC RURAL  : .07, .07, .10, .15, .35, .55
                                  ISC URBAN  : .15, .15, .20, .25, .30, .30

                           Stability Class :  A     B     C     D     E     F
                                              ---   ---   ---   ---   ---   ---
                                     ! PLX0 = 0.07, 0.07, 0.10, 0.15, 0.35, 0.55 !

Default potential temperature gradient
for stable classes E, F (degK/m)
(PTG0(2))                         Default: 0.020, 0.035
                                     ! PTG0 = 0.020,   0.035 !

Default plume path coefficients for
each stability class (used when option
```

```
for partial plume height terrain adjustment
is selected -- MCTADJ=3)
(PPC(6))                    Stability Class :  A     B     C     D     E     F
                               Default  PPC : .50,  .50,  .50,  .50,  .35,  .35
                                             ---   ---   ---   ---   ---   ---
                                      !  PPC = 0.50, 0.50, 0.50, 0.50, 0.35, 0.35 !

Slug-to-puff transition criterion factor
equal to sigma-y/length of slug
(SL2PF)                                Default: 10.        ! SL2PF = 10.0 !

Puff-splitting control variables ------------------------

  VERTICAL SPLIT
  --------------

  Number of puffs that result every time a puff
  is split - nsplit=2 means that 1 puff splits
  into 2
  (NSPLIT)                             Default:   3        ! NSPLIT =  3  !

  Time(s) of a day when split puffs are eligible to
  be split once again; this is typically set once
  per day, around sunset before nocturnal shear develops.
  24 values: 0 is midnight (00:00) and 23 is 11 PM (23:00)
  0=do not re-split     1=eligible for re-split
  (IRESPLIT(24))                       Default:  Hour 17 = 1
  !  IRESPLIT = 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0 !

  Split is allowed only if last hour's mixing
  height (m) exceeds a minimum value
  (ZISPLIT)                            Default: 100.       ! ZISPLIT = 100.0 !

  Split is allowed only if ratio of last hour's
  mixing ht to the maximum mixing ht experienced
  by the puff is less than a maximum value (this
  postpones a split until a nocturnal layer develops)
  (ROLDMAX)                            Default: 0.25       ! ROLDMAX = 0.25 !


  HORIZONTAL SPLIT
  ----------------

  Number of puffs that result every time a puff
  is split - nsplith=5 means that 1 puff splits
  into 5
  (NSPLITH)                            Default:   5        ! NSPLITH =  5  !

  Minimum sigma-y (Grid Cells Units) of puff
  before it may be split
  (SYSPLITH)                           Default:  1.0       ! SYSPLITH = 1.0 !

  Minimum puff elongation rate (SYSPLITH/hr) due to
  wind shear, before it may be split
  (SHSPLITH)                           Default:  2.        ! SHSPLITH = 2.0 !

  Minimum concentration (g/m^3) of each
  species in puff before it may be split
  Enter array of NSPEC values; if a single value is
  entered, it will be used for ALL species
  (CNSPLITH)                           Default:  1.0E-07   ! CNSPLITH = 1.0E-07 !

Integration control variables ------------------------

  Fractional convergence criterion for numerical SLUG
  sampling integration
  (EPSSLUG)                            Default:   1.0e-04  ! EPSSLUG = 1.0E-04 !

  Fractional convergence criterion for numerical AREA
  source integration
  (EPSAREA)                            Default:   1.0e-06  ! EPSAREA = 1.0E-06 !

  Trajectory step-length (m) used for numerical rise
  integration
  (DSRISE)                             Default:   1.0      ! DSRISE = 1.0 !
```

```
        Boundary Condition (BC) Puff control variables -----------------------

        Minimum height (m) to which BC puffs are mixed as they are emitted
        (MBCON=2 ONLY).  Actual height is reset to the current mixing height
        at the release point if greater than this minimum.
        (HTMINBC)                          Default:   500.      ! HTMINBC = 500.0 !

        Search radius (km) about a receptor for sampling nearest BC puff.
        BC puffs are typically emitted with a spacing of one grid cell
        length, so the search radius should be greater than DGRIDKM.
        (RSAMPBC)                          Default:   10.       ! RSAMPBC = 10.0 !

        Near-Surface depletion adjustment to concentration profile used when
        sampling BC puffs?
        (MDEPBC)                           Default:   1         ! MDEPBC =  1  !
           0 = Concentration is NOT adjusted for depletion
           1 = Adjust Concentration for depletion

!END!

-------------------------------------------------------------------------------


INPUT GROUPS: 13a, 13b, 13c, 13d -- Point source parameters
---------------------------------

---------------
Subgroup (13a)
---------------

     Number of point sources with
     parameters provided below       (NPT1)  No default  !  NPT1 =  1 !

     Units used for point source
     emissions below                 (IPTU)  Default: 1  !  IPTU =   3  !
           1 =        g/s
           2 =       kg/hr
           3 =       lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (13d)         (NSPT1) Default: 0  !  NSPT1 = 0  !

     Number of point sources with
     variable emission parameters
     provided in external file       (NPT2)  No default  !  NPT2 =  0  !

     (If NPT2 > 0, these point
     source emissions are read from
     the file: PTEMARB.DAT)

!END!

---------------
Subgroup (13b)
---------------
                                    a
          POINT SOURCE: CONSTANT DATA
          ---------------------------                                    b          c
  Source       X          Y        Stack     Base      Stack     Exit  Exit     Bldg.  Emission
   No.     Coordinate Coordinate Height Elevation Diameter  Vel.  Temp.   Dwash   Rates
             (km)       (km)       (m)       (m)       (m)   (m/s) (deg. K)
  ------   ---------- ---------- ------  ------    -------- ----- -------- ----- --------
**********   EMISSION RATES ARE IN LB/HR    ************************

 1   ! SRCNAM = WCEC3!
```

```
 1  ! X = 1669.925, -1327.892, 45.4, 6.1, 6.7, 18.0, 358, 1.0, 12.0, 1.9, 57.9, 0.0, 0.0, 1.5, 4.7, 0.0, 2.8,
11.6, 14.7, 37.2 !
 !END!
```

---

a
Data for each source are treated as a separate input subgroup
and therefore must end with an input group terminator.

SRCNAM is a 12-character name for a source
(No default)
X is an array holding the source data listed by the column headings
(No default)
SIGYZI is an array holding the initial sigma-y and sigma-z (m)
(Default: 0.,0.)
FMFAC is a vertical momentum flux factor (0. or 1.0) used to represent
the effect of rain-caps or other physical configurations that
reduce momentum rise associated with the actual exit velocity.
(Default: 1.0 -- full momentum used)
ZPLTFM is the platform height (m) for sources influenced by an isolated
structure that has a significant open area between the surface
and the bulk of the structure, such as an offshore oil platform.
The Base Elevation is

b
0. = No building downwash modeled, 1. = downwash modeled
1. = Downwash modeled for buildings resting on the surface
2. = Downwash modeled for buildings raised above the surface (ZPLTFM > 0.)
NOTE: must be entered as a REAL number (i.e., with decimal point)

c
An emission rate must be entered for every pollutant modeled.
Enter emission rate of zero for secondary pollutants that are
modeled, but not emitted. Units are specified by IPTU
(e.g. 1 for g/s).

Subgroup (13c)

```
 1  ! SRCNAM = WCEC3 !
       1  !  HEIGHT =       !

       1  !  WIDTH =        !

       1  !  LENGTH =       !

       1  !  XBADJ =        !

       1  !  YBADJ =        !

!END!
```

BUILDING DIMENSION DATA FOR SOURCES SUBJECT TO DOWNWASH

Source No. — Effective building height, width, length and X/Y offset (in meters) every 10 degrees. LENGTH, XBADJ, and YBADJ are only needed for MBDW=2 (PRIME downwash option) [a]

Subgroup (13c)

---

a
Building height, width, length, and X/Y offset from the source are treated
as a separate input subgroup for each source and therefore must end with
an input group terminator. The X/Y offset is the position, relative to the
stack, of the center of the upwind face of the projected building, with the
x-axis pointing along the flow direction.

Subgroup (13d)

POINT SOURCE: VARIABLE EMISSIONS DATA[a]

Use this subgroup to describe temporal variations in the emission rates given in 13b. Factors entered multiply the rates in 13b. Skip sources here that have constant emissions. For more elaborate variation in source parameters, use PTEMARB.DAT and NPT2 > 0.

IVARY determines the type of variation, and is source-specific:
(IVARY) Default: 0

- 0 = Constant
- 1 = Diurnal cycle (24 scaling factors: hours 1-24)
- 2 = Monthly cycle (12 scaling factors: months 1-12)
- 3 = Hour & Season (4 groups of 24 hourly scaling factors, where first group is DEC-JAN-FEB)
- 4 = Speed & Stab. (6 groups of 6 scaling factors, where first group is Stability Class A, and the speed classes have upper bounds (m/s) defined in Group 12
- 5 = Temperature (12 scaling factors, where temperature classes have upper bounds (C) of: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 50+)

---

[a] Data for each species are treated as a separate input subgroup and therefore must end with an input group terminator.

INPUT GROUPS: 14a, 14b, 14c, 14d -- Area source parameters

Subgroup (14a)

Number of polygon area sources with parameters specified below (NAR1) No default ! NAR1 = 0 !

Units used for area source emissions below (IARU) Default: 1 ! IARU = 1 !

- 1 = g/m**2/s
- 2 = kg/m**2/hr
- 3 = lb/m**2/hr
- 4 = tons/m**2/yr
- 5 = Odour Unit * m/s (vol. flux/m**2 of odour compound)
- 6 = Odour Unit * m/min
- 7 = metric tons/m**2/yr

Number of source-species combinations with variable emissions scaling factors provided below in (14d) (NSAR1) Default: 0 ! NSAR1 = 0 !

Number of buoyant polygon area sources with variable location and emission parameters (NAR2) No default ! NAR2 = 0 !
(If NAR2 > 0, ALL parameter data for these sources are read from the file: BAEMARB.DAT)

!END!

Subgroup (14b)

AREA SOURCE: CONSTANT DATA[a]

Source No.	Effect. Height (m)	Base Elevation (m)	Initial Sigma z (m)	Emission Rates [b]

---

[a] Data for each source are treated as a separate input subgroup and therefore must end with an input group terminator.

[b] An emission rate must be entered for every pollutant modeled. Enter emission rate of zero for secondary pollutants that are modeled, but not emitted. Units are specified by IARU (e.g. 1 for g/m**2/s).

Subgroup (14c)

COORDINATES (UTM-km) FOR EACH VERTEX(4) OF EACH POLYGON

Source No.	Ordered list of X followed by list of Y, grouped by source [a]

---

[a] Data for each source are treated as a separate input subgroup and therefore must end with an input group terminator.

Subgroup (14d)

AREA SOURCE: VARIABLE EMISSIONS DATA [a]

Use this subgroup to describe temporal variations in the emission rates given in 14b. Factors entered multiply the rates in 14b. Skip sources here that have constant emissions. For more elaborate variation in source parameters, use BAEMARB.DAT and NAR2 > 0.

IVARY determines the type of variation, and is source-specific:

(IVARY) Default: 0

0 =	Constant	
1 =	Diurnal cycle	(24 scaling factors: hours 1-24)
2 =	Monthly cycle	(12 scaling factors: months 1-12)
3 =	Hour & Season	(4 groups of 24 hourly scaling factors, where first group is DEC-JAN-FEB)
4 =	Speed & Stab.	(6 groups of 6 scaling factors, where first group is Stability Class A, and the speed classes have upper bounds (m/s) defined in Group 12
5 =	Temperature	(12 scaling factors, where temperature classes have upper bounds (C) of: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 50+)

---

[a] Data for each species are treated as a separate input subgroup and therefore must end with an input group terminator.

INPUT GROUPS: 15a, 15b, 15c -- Line source parameters

Subgroup (15a)

Number of buoyant line sources
with variable location and emission
parameters (NLN2) — No default ! NLN2 = 0 !

(If NLN2 > 0, ALL parameter data for
these sources are read from the file: LNEMARB.DAT)

Number of buoyant line sources (NLINES) — No default ! NLINES = 0 !

Units used for line source
emissions below (ILNU) — Default: 1 ! ILNU = 1 !

1 = g/s
2 = kg/hr
3 = lb/hr
4 = tons/yr
5 = Odour Unit * m**3/s (vol. flux of odour compound)
6 = Odour Unit * m**3/min
7 = metric tons/yr

Number of source-species
combinations with variable
emissions scaling factors
provided below in (15c) (NSLN1) Default: 0 ! NSLN1 = 0 !

Maximum number of segments used to model
each line (MXNSEG) — Default: 7 ! MXNSEG = 7 !

The following variables are required only if NLINES > 0. They are
used in the buoyant line source plume rise calculations.

Number of distances at which transitional rise is computed	Default: 6 ! NLRISE = 6 !	
Average building length (XL)	No default (in meters)	! XL = .0 !
Average building height (HBL)	No default (in meters)	! HBL = .0 !
Average building width (WBL)	No default (in meters)	! WBL = .0 !
Average line source width (WML)	No default (in meters)	! WML = .0 !
Average separation between buildings (DXL)	No default (in meters)	! DXL = .0 !
Average buoyancy parameter (FPRIMEL)	No default (in m**4/s**3)	! FPRIMEL = .0 !

!END!

Subgroup (15b)

BUOYANT LINE SOURCE: CONSTANT DATA

Source No.	Beg. X Coordinate (km)	Beg. Y Coordinate (km)	End. X Coordinate (km)	End. Y Coordinate (km)	Release Height (m)	Base Elevation (m)	Emission Rates[a]

---

[a] Data for each source are treated as a separate input subgroup and therefore must end with an input group terminator.

b
An emission rate must be entered for every pollutant modeled. Enter emission rate of zero for secondary pollutants that are modeled, but not emitted. Units are specified by ILNTU (e.g. 1 for g/s).

Subgroup (15c)

BUOYANT LINE SOURCE: VARIABLE EMISSIONS DATA [a]

Use this subgroup to describe temporal variations in the emission rates given in 15b. Factors entered multiply the rates in 15b. Skip sources here that have constant emissions.

IVARY determines the type of variation, and is source-specific:
(IVARY) Default: 0

0 =	Constant	
1 =	Diurnal cycle	(24 scaling factors: hours 1-24)
2 =	Monthly cycle	(12 scaling factors: months 1-12)
3 =	Hour & Season	(4 groups of 24 hourly scaling factors, where first group is DEC-JAN-FEB)
4 =	Speed & Stab.	(6 groups of 6 scaling factors, where first group is Stability Class A, and the speed classes have upper bounds (m/s) defined in Group 12
5 =	Temperature	(12 scaling factors, where temperature classes have upper bounds (C) of: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 50+)

---

a
Data for each species are treated as a separate input subgroup and therefore must end with an input group terminator.

INPUT GROUPS: 16a, 16b, 16c -- Volume source parameters

Subgroup (16a)

Number of volume sources with parameters provided in 16b,c (NVL1) No default ! NVL1 = 0 !

Units used for volume source emissions below in 16b (IVLU) Default: 1 ! IVLU = 1 !

1 =	g/s
2 =	kg/hr
3 =	lb/hr
4 =	tons/yr
5 =	Odour Unit * m**3/s (vol. flux of odour compound)
6 =	Odour Unit * m**3/min
7 =	metric tons/yr

Number of source-species combinations with variable emissions scaling factors provided below in (16c) (NSVL1) Default: 0 ! NSVL1 = 0 !

Number of volume sources with variable location and emission parameters (NVL2) No default ! NVL2 = 0 !

(If NVL2 > 0, ALL parameter data for

these sources are read from the VOLEMARB.DAT file(s))

!END!

Subgroup (16b)

VOLUME SOURCE: CONSTANT DATA [a]

X UTM Coordinate (km)	Y UTM Coordinate (km)	Effect. Height (m)	Base Elevation (m)	Initial Sigma y (m)	Initial Sigma z (m)	Emission Rates [b]

---

[a] Data for each source are treated as a separate input subgroup and therefore must end with an input group terminator.

[b] An emission rate must be entered for every pollutant modeled. Enter emission rate of zero for secondary pollutants that are modeled, but not emitted. Units are specified by IVLU (e.g. 1 for g/s).

Subgroup (16c)

VOLUME SOURCE: VARIABLE EMISSIONS DATA [a]

Use this subgroup to describe temporal variations in the emission rates given in 16b. Factors entered multiply the rates in 16b. Skip sources here that have constant emissions. For more elaborate variation in source parameters, use VOLEMARB.DAT and NVL2 > 0.

IVARY determines the type of variation, and is source-specific:
(IVARY) Default: 0

- 0 = Constant
- 1 = Diurnal cycle (24 scaling factors: hours 1-24)
- 2 = Monthly cycle (12 scaling factors: months 1-12)
- 3 = Hour & Season (4 groups of 24 hourly scaling factors, where first group is DEC-JAN-FEB)
- 4 = Speed & Stab. (6 groups of 6 scaling factors, where first group is Stability Class A, and the speed classes have upper bounds (m/s) defined in Group 12
- 5 = Temperature (12 scaling factors, where temperature classes have upper bounds (C) of: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 50+)

---

[a] Data for each species are treated as a separate input subgroup and therefore must end with an input group terminator.

INPUT GROUPS: 17a & 17b -- Non-gridded (discrete) receptor information

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Subgroup (17a)

Number of non-gridded receptors (NREC) No default ! NREC = 281 !

!END!

Subgroup (17b)

NON-GRIDDED (DISCRETE) RECEPTOR DATA [a]

Receptor No.	X Coordinate (km)	Y Coordinate (km)	Ground Elevation (m)	Height Above Ground (m) [b]	
RECEPTORS OBTAINED FROM THE NPS/FWS EXTRACTION PROGRAM					
ALL RECEPTORS ARE LCC (KM)					
901 EVERGLADES NP RECEPTORS					
RECEPTORS OBTAINED FROM THE NPS/FWS EXTRACTION PROGRAM					
ALL RECEPTORS ARE LCC (KM)					
1 ! X =	1660.127,	-1542.381,	0,	0.000!	!END!
2 ! X =	1654.541,	-1540.491,	0,	0.000!	!END!
3 ! X =	1657.082,	-1540.035,	0,	0.000!	!END!
4 ! X =	1659.624,	-1539.579,	0,	0.000!	!END!
5 ! X =	1662.165,	-1539.122,	0,	0.000!	!END!
6 ! X =	1664.706,	-1538.665,	0,	0.000!	!END!
7 ! X =	1651.498,	-1538.144,	0,	0.000!	!END!
8 ! X =	1654.039,	-1537.689,	0,	0.000!	!END!
9 ! X =	1656.580,	-1537.234,	0,	0.000!	!END!
10 ! X =	1659.121,	-1536.778,	0,	0.000!	!END!
11 ! X =	1661.661,	-1536.321,	0,	0.000!	!END!
12 ! X =	1664.201,	-1535.864,	0,	0.000!	!END!
13 ! X =	1666.742,	-1535.406,	0,	0.000!	!END!
14 ! X =	1669.282,	-1534.947,	0,	0.000!	!END!
15 ! X =	1648.457,	-1535.797,	0,	0.000!	!END!
16 ! X =	1650.998,	-1535.343,	0,	0.000!	!END!
17 ! X =	1653.538,	-1534.888,	0,	0.000!	!END!
18 ! X =	1656.078,	-1534.433,	0,	0.000!	!END!
19 ! X =	1658.617,	-1533.977,	0,	0.000!	!END!
20 ! X =	1661.157,	-1533.520,	0,	0.000!	!END!
21 ! X =	1663.697,	-1533.063,	0,	0.000!	!END!
22 ! X =	1666.236,	-1532.605,	0,	0.000!	!END!
23 ! X =	1668.775,	-1532.146,	0,	0.000!	!END!
24 ! X =	1671.315,	-1531.687,	0,	0.000!	!END!
25 ! X =	1673.854,	-1531.227,	0,	0.000!	!END!
26 ! X =	1645.418,	-1533.449,	0,	0.000!	!END!
27 ! X =	1647.957,	-1532.996,	0,	0.000!	!END!
28 ! X =	1650.497,	-1532.542,	0,	0.000!	!END!
29 ! X =	1653.036,	-1532.087,	0,	0.000!	!END!
30 ! X =	1655.575,	-1531.632,	0,	0.000!	!END!
31 ! X =	1658.114,	-1531.177,	0,	0.000!	!END!
32 ! X =	1660.653,	-1530.720,	0,	0.000!	!END!
33 ! X =	1663.192,	-1530.263,	0,	0.000!	!END!
34 ! X =	1665.731,	-1529.805,	0,	0.000!	!END!
35 ! X =	1668.269,	-1529.346,	0,	0.000!	!END!
36 ! X =	1670.808,	-1528.887,	0,	0.000!	!END!
37 ! X =	1673.346,	-1528.427,	0,	0.000!	!END!
38 ! X =	1675.884,	-1527.966,	0,	0.000!	!END!
39 ! X =	1642.380,	-1531.100,	0,	0.000!	!END!
40 ! X =	1644.918,	-1530.648,	0,	0.000!	!END!
41 ! X =	1647.457,	-1530.195,	0,	0.000!	!END!
42 ! X =	1649.996,	-1529.741,	0,	0.000!	!END!
43 ! X =	1652.534,	-1529.287,	0,	0.000!	!END!
44 ! X =	1655.073,	-1528.832,	0,	0.000!	!END!
45 ! X =	1657.611,	-1528.376,	0,	0.000!	!END!
46 ! X =	1660.149,	-1527.920,	0,	0.000!	!END!
47 ! X =	1662.687,	-1527.463,	0,	0.000!	!END!
48 ! X =	1665.225,	-1527.005,	0,	0.000!	!END!
49 ! X =	1667.763,	-1526.547,	0,	0.000!	!END!
50 ! X =	1670.301,	-1526.088,	0,	0.000!	!END!
51 ! X =	1672.838,	-1525.628,	0,	0.000!	!END!
52 ! X =	1675.376,	-1525.167,	0,	0.000!	!END!
53 ! X =	1677.913,	-1524.706,	0,	0.000!	!END!
54 ! X =	1680.450,	-1524.244,	0,	0.000!	!END!
55 ! X =	1639.343,	-1528.750,	0,	0.000!	!END!

```
  56 ! X =    1641.881,  -1528.299,        0,       0.000!   !END!
  57 ! X =    1644.419,  -1527.847,        0,       0.000!   !END!
  58 ! X =    1646.957,  -1527.394,        0,       0.000!   !END!
  59 ! X =    1649.495,  -1526.941,        0,       0.000!   !END!
  60 ! X =    1652.033,  -1526.487,        0,       0.000!   !END!
  61 ! X =    1654.571,  -1526.032,        0,       0.000!   !END!
  62 ! X =    1657.108,  -1525.576,        0,       0.000!   !END!
  63 ! X =    1659.645,  -1525.120,        0,       0.000!   !END!
  64 ! X =    1662.183,  -1524.663,        0,       0.000!   !END!
  65 ! X =    1664.720,  -1524.206,        0,       0.000!   !END!
  66 ! X =    1667.257,  -1523.747,        0,       0.000!   !END!
  67 ! X =    1669.794,  -1523.288,        0,       0.000!   !END!
  68 ! X =    1672.331,  -1522.829,        0,       0.000!   !END!
  69 ! X =    1674.867,  -1522.368,        0,       0.000!   !END!
  70 ! X =    1677.404,  -1521.907,        0,       0.000!   !END!
  71 ! X =    1679.940,  -1521.445,        0,       0.000!   !END!
  72 ! X =    1682.476,  -1520.983,        0,       0.000!   !END!
  73 ! X =    1685.012,  -1520.520,        0,       0.000!   !END!
  74 ! X =    1636.308,  -1526.400,        0,       0.000!   !END!
  75 ! X =    1638.845,  -1525.950,        0,       0.000!   !END!
  76 ! X =    1641.383,  -1525.498,        0,       0.000!   !END!
  77 ! X =    1643.920,  -1525.046,        0,       0.000!   !END!
  78 ! X =    1646.457,  -1524.594,        0,       0.000!   !END!
  79 ! X =    1648.995,  -1524.141,        0,       0.000!   !END!
  80 ! X =    1651.531,  -1523.687,        0,       0.000!   !END!
  81 ! X =    1654.068,  -1523.232,        0,       0.000!   !END!
  82 ! X =    1656.605,  -1522.777,        0,       0.000!   !END!
  83 ! X =    1659.142,  -1522.320,        0,       0.000!   !END!
  84 ! X =    1661.678,  -1521.864,        0,       0.000!   !END!
  85 ! X =    1664.215,  -1521.406,        0,       0.000!   !END!
  86 ! X =    1666.751,  -1520.948,        0,       0.000!   !END!
  87 ! X =    1669.287,  -1520.489,        0,       0.000!   !END!
  88 ! X =    1671.823,  -1520.030,        0,       0.000!   !END!
  89 ! X =    1674.359,  -1519.569,        0,       0.000!   !END!
  90 ! X =    1676.895,  -1519.108,        0,       0.000!   !END!
  91 ! X =    1679.430,  -1518.647,        0,       0.000!   !END!
  92 ! X =    1681.966,  -1518.184,        0,       0.000!   !END!
  93 ! X =    1684.501,  -1517.721,        0,       0.000!   !END!
  94 ! X =    1687.036,  -1517.258,        0,       0.000!   !END!
  95 ! X =    1689.571,  -1516.793,        0,       0.000!   !END!
  96 ! X =    1635.811,  -1523.599,        0,       0.000!   !END!
  97 ! X =    1638.348,  -1523.149,        0,       0.000!   !END!
  98 ! X =    1640.884,  -1522.698,        0,       0.000!   !END!
  99 ! X =    1643.421,  -1522.246,        0,       0.000!   !END!
 100 ! X =    1645.958,  -1521.794,        0,       0.000!   !END!
 101 ! X =    1648.494,  -1521.341,        0,       0.000!   !END!
 102 ! X =    1651.030,  -1520.887,        0,       0.000!   !END!
 103 ! X =    1653.566,  -1520.432,        0,       0.000!   !END!
 104 ! X =    1656.102,  -1519.977,        0,       0.000!   !END!
 105 ! X =    1658.638,  -1519.521,        0,       0.000!   !END!
 106 ! X =    1661.174,  -1519.065,        0,       0.000!   !END!
 107 ! X =    1663.709,  -1518.607,        0,       0.000!   !END!
 108 ! X =    1666.245,  -1518.149,        0,       0.000!   !END!
 109 ! X =    1668.780,  -1517.690,        0,       0.000!   !END!
 110 ! X =    1671.315,  -1517.231,        0,       0.000!   !END!
 111 ! X =    1673.850,  -1516.771,        0,       0.000!   !END!
 112 ! X =    1676.385,  -1516.310,        0,       0.000!   !END!
 113 ! X =    1678.920,  -1515.849,        0,       0.000!   !END!
 114 ! X =    1681.455,  -1515.386,        0,       0.000!   !END!
 115 ! X =    1683.990,  -1514.923,        0,       0.000!   !END!
 116 ! X =    1686.524,  -1514.460,        0,       0.000!   !END!
 117 ! X =    1689.058,  -1513.995,        0,       0.000!   !END!
 118 ! X =    1632.778,  -1521.249,        0,       0.000!   !END!
 119 ! X =    1635.314,  -1520.799,        0,       0.000!   !END!
 120 ! X =    1637.850,  -1520.349,        0,       0.000!   !END!
 121 ! X =    1640.386,  -1519.898,        0,       0.000!   !END!
 122 ! X =    1642.922,  -1519.446,        0,       0.000!   !END!
 123 ! X =    1645.458,  -1518.994,        0,       0.000!   !END!
 124 ! X =    1647.993,  -1518.541,        0,       0.000!   !END!
 125 ! X =    1650.529,  -1518.087,        0,       0.000!   !END!
 126 ! X =    1653.064,  -1517.633,        0,       0.000!   !END!
 127 ! X =    1655.599,  -1517.178,        0,       0.000!   !END!
 128 ! X =    1658.134,  -1516.722,        0,       0.000!   !END!
 129 ! X =    1660.669,  -1516.266,        0,       0.000!   !END!
 130 ! X =    1663.204,  -1515.808,        0,       0.000!   !END!
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131 ! X =    1665.739,  -1515.351,        0,       0.000!   !END!
132 ! X =    1668.273,  -1514.892,        0,       0.000!   !END!
133 ! X =    1670.808,  -1514.433,        0,       0.000!   !END!
134 ! X =    1673.342,  -1513.973,        0,       0.000!   !END!
135 ! X =    1675.876,  -1513.512,        0,       0.000!   !END!
136 ! X =    1678.410,  -1513.051,        0,       0.000!   !END!
137 ! X =    1680.944,  -1512.589,        0,       0.000!   !END!
138 ! X =    1683.478,  -1512.126,        0,       0.000!   !END!
139 ! X =    1686.012,  -1511.662,        0,       0.000!   !END!
140 ! X =    1688.545,  -1511.198,        0,       0.000!   !END!
141 ! X =    1691.079,  -1510.733,        1,       0.000!   !END!
142 ! X =    1629.747,  -1518.897,        0,       0.000!   !END!
143 ! X =    1632.282,  -1518.449,        0,       0.000!   !END!
144 ! X =    1634.817,  -1517.999,        0,       0.000!   !END!
145 ! X =    1637.353,  -1517.549,        0,       0.000!   !END!
146 ! X =    1639.888,  -1517.098,        0,       0.000!   !END!
147 ! X =    1642.423,  -1516.647,        0,       0.000!   !END!
148 ! X =    1644.958,  -1516.195,        0,       0.000!   !END!
149 ! X =    1647.493,  -1515.742,        0,       0.000!   !END!
150 ! X =    1650.027,  -1515.288,        0,       0.000!   !END!
151 ! X =    1652.562,  -1514.834,        0,       0.000!   !END!
152 ! X =    1655.096,  -1514.379,        0,       0.000!   !END!
153 ! X =    1657.631,  -1513.923,        0,       0.000!   !END!
154 ! X =    1660.165,  -1513.467,        0,       0.000!   !END!
155 ! X =    1662.699,  -1513.010,        0,       0.000!   !END!
156 ! X =    1665.233,  -1512.552,        0,       0.000!   !END!
157 ! X =    1667.767,  -1512.094,        0,       0.000!   !END!
158 ! X =    1670.300,  -1511.635,        0,       0.000!   !END!
159 ! X =    1672.834,  -1511.175,        1,       0.000!   !END!
160 ! X =    1675.367,  -1510.714,        1,       0.000!   !END!
161 ! X =    1677.901,  -1510.253,        0,       0.000!   !END!
162 ! X =    1680.434,  -1509.791,        0,       0.000!   !END!
163 ! X =    1682.967,  -1509.328,        0,       0.000!   !END!
164 ! X =    1685.500,  -1508.865,        0,       0.000!   !END!
165 ! X =    1688.033,  -1508.401,        0,       0.000!   !END!
166 ! X =    1690.565,  -1507.936,        0,       0.000!   !END!
167 ! X =    1693.098,  -1507.471,        0,       0.000!   !END!
168 ! X =    1626.717,  -1516.545,        0,       0.000!   !END!
169 ! X =    1629.251,  -1516.097,        0,       0.000!   !END!
170 ! X =    1631.786,  -1515.649,        1,       0.000!   !END!
171 ! X =    1634.321,  -1515.200,        0,       0.000!   !END!
172 ! X =    1636.855,  -1514.750,        0,       0.000!   !END!
173 ! X =    1639.390,  -1514.299,        1,       0.000!   !END!
174 ! X =    1641.924,  -1513.848,        0,       0.000!   !END!
175 ! X =    1644.458,  -1513.396,        0,       0.000!   !END!
176 ! X =    1646.992,  -1512.943,        0,       0.000!   !END!
177 ! X =    1649.526,  -1512.489,        0,       0.000!   !END!
178 ! X =    1652.060,  -1512.035,        0,       0.000!   !END!
179 ! X =    1654.594,  -1511.580,        0,       0.000!   !END!
180 ! X =    1657.127,  -1511.125,        0,       0.000!   !END!
181 ! X =    1659.661,  -1510.669,        0,       0.000!   !END!
182 ! X =    1662.194,  -1510.212,        0,       0.000!   !END!
183 ! X =    1664.727,  -1509.754,        0,       0.000!   !END!
184 ! X =    1667.260,  -1509.296,        0,       0.000!   !END!
185 ! X =    1669.793,  -1508.837,        0,       0.000!   !END!
186 ! X =    1672.326,  -1508.377,        0,       0.000!   !END!
187 ! X =    1674.858,  -1507.917,        0,       0.000!   !END!
188 ! X =    1677.391,  -1507.456,        0,       0.000!   !END!
189 ! X =    1679.923,  -1506.994,        0,       0.000!   !END!
190 ! X =    1682.456,  -1506.531,        0,       0.000!   !END!
191 ! X =    1684.988,  -1506.068,        0,       0.000!   !END!
192 ! X =    1687.520,  -1505.604,        0,       0.000!   !END!
193 ! X =    1690.052,  -1505.140,        0,       0.000!   !END!
194 ! X =    1692.584,  -1504.674,        0,       0.000!   !END!
195 ! X =    1695.115,  -1504.208,        0,       0.000!   !END!
196 ! X =    1623.688,  -1514.192,        0,       0.000!   !END!
197 ! X =    1626.222,  -1513.745,        0,       0.000!   !END!
198 ! X =    1628.756,  -1513.298,        1,       0.000!   !END!
199 ! X =    1631.290,  -1512.849,        1,       0.000!   !END!
200 ! X =    1633.824,  -1512.400,        1,       0.000!   !END!
201 ! X =    1636.358,  -1511.950,        1,       0.000!   !END!
202 ! X =    1638.892,  -1511.500,        1,       0.000!   !END!
203 ! X =    1641.425,  -1511.049,        1,       0.000!   !END!
204 ! X =    1643.959,  -1510.597,        1,       0.000!   !END!
205 ! X =    1646.492,  -1510.144,        1,       0.000!   !END!
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206 ! X =    1649.025,   -1509.691,        0,       0.000!   !END!
207 ! X =    1651.558,   -1509.237,        0,       0.000!   !END!
208 ! X =    1654.091,   -1508.782,        0,       0.000!   !END!
209 ! X =    1656.624,   -1508.327,        0,       0.000!   !END!
210 ! X =    1659.156,   -1507.871,        1,       0.000!   !END!
211 ! X =    1661.689,   -1507.414,        1,       0.000!   !END!
212 ! X =    1664.221,   -1506.956,        1,       0.000!   !END!
213 ! X =    1666.754,   -1506.498,        0,       0.000!   !END!
214 ! X =    1669.286,   -1506.039,        0,       0.000!   !END!
215 ! X =    1671.818,   -1505.580,        0,       0.000!   !END!
216 ! X =    1674.350,   -1505.120,        0,       0.000!   !END!
217 ! X =    1676.881,   -1504.659,        0,       0.000!   !END!
218 ! X =    1679.413,   -1504.197,        0,       0.000!   !END!
219 ! X =    1681.944,   -1503.735,        0,       0.000!   !END!
220 ! X =    1684.476,   -1503.272,        0,       0.000!   !END!
221 ! X =    1687.007,   -1502.808,        0,       0.000!   !END!
222 ! X =    1689.538,   -1502.343,        0,       0.000!   !END!
223 ! X =    1692.069,   -1501.878,        0,       0.000!   !END!
224 ! X =    1694.600,   -1501.412,        1,       0.000!   !END!
225 ! X =    1697.131,   -1500.946,        0,       0.000!   !END!
226 ! X =    1620.661,   -1511.839,        0,       0.000!   !END!
227 ! X =    1623.195,   -1511.393,        0,       0.000!   !END!
228 ! X =    1625.728,   -1510.946,        0,       0.000!   !END!
229 ! X =    1628.261,   -1510.498,        1,       0.000!   !END!
230 ! X =    1630.795,   -1510.050,        1,       0.000!   !END!
231 ! X =    1633.328,   -1509.601,        1,       0.000!   !END!
232 ! X =    1635.861,   -1509.151,        1,       0.000!   !END!
233 ! X =    1638.394,   -1508.701,        1,       0.000!   !END!
234 ! X =    1640.926,   -1508.250,        1,       0.000!   !END!
235 ! X =    1643.459,   -1507.798,        1,       0.000!   !END!
236 ! X =    1645.992,   -1507.346,        1,       0.000!   !END!
237 ! X =    1648.524,   -1506.892,        1,       0.000!   !END!
238 ! X =    1651.056,   -1506.439,        1,       0.000!   !END!
239 ! X =    1653.588,   -1505.984,        1,       0.000!   !END!
240 ! X =    1656.120,   -1505.529,        1,       0.000!   !END!
241 ! X =    1658.652,   -1505.073,        0,       0.000!   !END!
242 ! X =    1661.184,   -1504.616,        1,       0.000!   !END!
243 ! X =    1663.716,   -1504.159,        1,       0.000!   !END!
244 ! X =    1666.247,   -1503.701,        1,       0.000!   !END!
245 ! X =    1668.778,   -1503.242,        1,       0.000!   !END!
246 ! X =    1671.310,   -1502.783,        1,       0.000!   !END!
247 ! X =    1673.841,   -1502.323,        0,       0.000!   !END!
248 ! X =    1676.372,   -1501.862,        0,       0.000!   !END!
249 ! X =    1678.903,   -1501.400,        0,       0.000!   !END!
250 ! X =    1681.433,   -1500.938,        0,       0.000!   !END!
251 ! X =    1683.964,   -1500.475,        0,       0.000!   !END!
252 ! X =    1686.494,   -1500.012,        0,       0.000!   !END!
253 ! X =    1689.025,   -1499.547,        0,       0.000!   !END!
254 ! X =    1691.555,   -1499.082,        0,       0.000!   !END!
255 ! X =    1694.085,   -1498.617,        1,       0.000!   !END!
256 ! X =    1696.615,   -1498.150,        0,       0.000!   !END!
257 ! X =    1699.145,   -1497.683,        0,       0.000!   !END!
258 ! X =    1620.168,   -1509.039,        0,       0.000!   !END!
259 ! X =    1622.701,   -1508.593,        1,       0.000!   !END!
260 ! X =    1625.234,   -1508.147,        1,       0.000!   !END!
261 ! X =    1627.766,   -1507.699,        1,       0.000!   !END!
262 ! X =    1630.299,   -1507.251,        1,       0.000!   !END!
263 ! X =    1632.831,   -1506.802,        1,       0.000!   !END!
264 ! X =    1635.364,   -1506.353,        1,       0.000!   !END!
265 ! X =    1637.896,   -1505.902,        1,       0.000!   !END!
266 ! X =    1640.428,   -1505.451,        1,       0.000!   !END!
267 ! X =    1642.959,   -1505.000,        1,       0.000!   !END!
268 ! X =    1645.491,   -1504.547,        1,       0.000!   !END!
269 ! X =    1648.023,   -1504.094,        1,       0.000!   !END!
270 ! X =    1650.554,   -1503.641,        1,       0.000!   !END!
271 ! X =    1653.086,   -1503.186,        1,       0.000!   !END!
272 ! X =    1655.617,   -1502.731,        1,       0.000!   !END!
273 ! X =    1658.148,   -1502.275,        1,       0.000!   !END!
274 ! X =    1660.679,   -1501.819,        1,       0.000!   !END!
275 ! X =    1663.210,   -1501.362,        1,       0.000!   !END!
276 ! X =    1665.741,   -1500.904,        1,       0.000!   !END!
277 ! X =    1668.271,   -1500.445,        1,       0.000!   !END!
278 ! X =    1670.802,   -1499.986,        1,       0.000!   !END!
279 ! X =    1673.332,   -1499.526,        1,       0.000!   !END!
280 ! X =    1675.862,   -1499.065,        1,       0.000!   !END!
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281 ! X =    1678.392,   -1498.604,        1,        0.000!   !END!
282 ! X =    1680.922,   -1498.142,        0,        0.000!   !END!
283 ! X =    1683.452,   -1497.679,        0,        0.000!   !END!
284 ! X =    1685.982,   -1497.216,        0,        0.000!   !END!
285 ! X =    1688.511,   -1496.751,        1,        0.000!   !END!
286 ! X =    1691.041,   -1496.287,        0,        0.000!   !END!
287 ! X =    1693.570,   -1495.821,        0,        0.000!   !END!
288 ! X =    1617.144,   -1506.685,        0,        0.000!   !END!
289 ! X =    1619.676,   -1506.240,        0,        0.000!   !END!
290 ! X =    1622.208,   -1505.794,        1,        0.000!   !END!
291 ! X =    1624.740,   -1505.347,        1,        0.000!   !END!
292 ! X =    1627.272,   -1504.900,        1,        0.000!   !END!
293 ! X =    1629.803,   -1504.452,        1,        0.000!   !END!
294 ! X =    1632.335,   -1504.003,        1,        0.000!   !END!
295 ! X =    1634.866,   -1503.554,        1,        0.000!   !END!
296 ! X =    1637.398,   -1503.104,        1,        0.000!   !END!
297 ! X =    1639.929,   -1502.653,        1,        0.000!   !END!
298 ! X =    1642.460,   -1502.202,        0,        0.000!   !END!
299 ! X =    1644.991,   -1501.750,        0,        0.000!   !END!
300 ! X =    1647.522,   -1501.297,        1,        0.000!   !END!
301 ! X =    1650.052,   -1500.843,        1,        0.000!   !END!
302 ! X =    1652.583,   -1500.389,        1,        0.000!   !END!
303 ! X =    1655.113,   -1499.934,        1,        0.000!   !END!
304 ! X =    1657.644,   -1499.478,        1,        0.000!   !END!
305 ! X =    1660.174,   -1499.022,        1,        0.000!   !END!
306 ! X =    1662.704,   -1498.565,        1,        0.000!   !END!
307 ! X =    1665.234,   -1498.107,        1,        0.000!   !END!
308 ! X =    1667.764,   -1497.649,        1,        0.000!   !END!
309 ! X =    1670.294,   -1497.189,        1,        0.000!   !END!
310 ! X =    1672.823,   -1496.730,        1,        0.000!   !END!
311 ! X =    1675.353,   -1496.269,        1,        0.000!   !END!
312 ! X =    1677.882,   -1495.808,        1,        0.000!   !END!
313 ! X =    1680.411,   -1495.346,        0,        0.000!   !END!
314 ! X =    1682.940,   -1494.883,        0,        0.000!   !END!
315 ! X =    1685.469,   -1494.420,        1,        0.000!   !END!
316 ! X =    1687.998,   -1493.956,        1,        0.000!   !END!
317 ! X =    1690.527,   -1493.491,        0,        0.000!   !END!
318 ! X =    1693.055,   -1493.026,        0,        0.000!   !END!
319 ! X =    1616.652,   -1503.886,        0,        0.000!   !END!
320 ! X =    1619.183,   -1503.441,        0,        0.000!   !END!
321 ! X =    1621.715,   -1502.995,        1,        0.000!   !END!
322 ! X =    1624.246,   -1502.549,        1,        0.000!   !END!
323 ! X =    1626.777,   -1502.102,        1,        0.000!   !END!
324 ! X =    1629.308,   -1501.654,        1,        0.000!   !END!
325 ! X =    1631.838,   -1501.205,        0,        0.000!   !END!
326 ! X =    1634.369,   -1500.756,        1,        0.000!   !END!
327 ! X =    1636.900,   -1500.306,        1,        0.000!   !END!
328 ! X =    1639.430,   -1499.855,        0,        0.000!   !END!
329 ! X =    1641.960,   -1499.404,        0,        0.000!   !END!
330 ! X =    1644.491,   -1498.952,        0,        0.000!   !END!
331 ! X =    1647.021,   -1498.499,        1,        0.000!   !END!
332 ! X =    1649.551,   -1498.046,        1,        0.000!   !END!
333 ! X =    1652.080,   -1497.592,        1,        0.000!   !END!
334 ! X =    1654.610,   -1497.137,        1,        0.000!   !END!
335 ! X =    1657.140,   -1496.681,        1,        0.000!   !END!
336 ! X =    1659.669,   -1496.225,        1,        0.000!   !END!
337 ! X =    1662.199,   -1495.768,        1,        0.000!   !END!
338 ! X =    1664.728,   -1495.310,        1,        0.000!   !END!
339 ! X =    1667.257,   -1494.852,        1,        0.000!   !END!
340 ! X =    1669.786,   -1494.393,        1,        0.000!   !END!
341 ! X =    1672.315,   -1493.933,        1,        0.000!   !END!
342 ! X =    1674.843,   -1493.473,        1,        0.000!   !END!
343 ! X =    1677.372,   -1493.012,        1,        0.000!   !END!
344 ! X =    1679.900,   -1492.550,        1,        0.000!   !END!
345 ! X =    1682.428,   -1492.088,        1,        0.000!   !END!
346 ! X =    1684.957,   -1491.624,        1,        0.000!   !END!
347 ! X =    1687.485,   -1491.161,        1,        0.000!   !END!
348 ! X =    1690.013,   -1490.696,        1,        0.000!   !END!
349 ! X =    1692.540,   -1490.231,        1,        0.000!   !END!
350 ! X =    1618.691,   -1500.642,        0,        0.000!   !END!
351 ! X =    1621.221,   -1500.197,        1,        0.000!   !END!
352 ! X =    1623.752,   -1499.750,        1,        0.000!   !END!
353 ! X =    1626.282,   -1499.303,        1,        0.000!   !END!
354 ! X =    1628.812,   -1498.856,        1,        0.000!   !END!
355 ! X =    1631.342,   -1498.407,        0,        0.000!   !END!
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356 ! X =    1633.872,  -1497.958,        0,       0.000!   !END!
357 ! X =    1636.402,  -1497.508,        1,       0.000!   !END!
358 ! X =    1638.932,  -1497.058,        1,       0.000!   !END!
359 ! X =    1641.461,  -1496.606,        0,       0.000!   !END!
360 ! X =    1643.990,  -1496.155,        1,       0.000!   !END!
361 ! X =    1646.520,  -1495.702,        1,       0.000!   !END!
362 ! X =    1649.049,  -1495.249,        1,       0.000!   !END!
363 ! X =    1651.578,  -1494.795,        1,       0.000!   !END!
364 ! X =    1654.107,  -1494.340,        1,       0.000!   !END!
365 ! X =    1656.636,  -1493.885,        1,       0.000!   !END!
366 ! X =    1659.164,  -1493.428,        1,       0.000!   !END!
367 ! X =    1661.693,  -1492.972,        1,       0.000!   !END!
368 ! X =    1664.221,  -1492.514,        1,       0.000!   !END!
369 ! X =    1666.750,  -1492.056,        1,       0.000!   !END!
370 ! X =    1669.278,  -1491.597,        1,       0.000!   !END!
371 ! X =    1671.806,  -1491.138,        1,       0.000!   !END!
372 ! X =    1674.334,  -1490.677,        1,       0.000!   !END!
373 ! X =    1676.862,  -1490.216,        1,       0.000!   !END!
374 ! X =    1679.389,  -1489.755,        1,       0.000!   !END!
375 ! X =    1681.917,  -1489.292,        1,       0.000!   !END!
376 ! X =    1684.444,  -1488.829,        1,       0.000!   !END!
377 ! X =    1686.971,  -1488.366,        1,       0.000!   !END!
378 ! X =    1689.499,  -1487.901,        1,       0.000!   !END!
379 ! X =    1692.026,  -1487.436,        1,       0.000!   !END!
380 ! X =    1618.198,  -1497.844,        0,       0.000!   !END!
381 ! X =    1620.728,  -1497.398,        1,       0.000!   !END!
382 ! X =    1623.258,  -1496.952,        1,       0.000!   !END!
383 ! X =    1625.787,  -1496.505,        1,       0.000!   !END!
384 ! X =    1628.317,  -1496.058,        1,       0.000!   !END!
385 ! X =    1630.846,  -1495.609,        1,       0.000!   !END!
386 ! X =    1633.375,  -1495.160,        0,       0.000!   !END!
387 ! X =    1635.904,  -1494.711,        0,       0.000!   !END!
388 ! X =    1638.433,  -1494.260,        0,       0.000!   !END!
389 ! X =    1640.962,  -1493.809,        1,       0.000!   !END!
390 ! X =    1643.490,  -1493.357,        1,       0.000!   !END!
391 ! X =    1646.019,  -1492.905,        1,       0.000!   !END!
392 ! X =    1648.547,  -1492.452,        1,       0.000!   !END!
393 ! X =    1651.076,  -1491.998,        1,       0.000!   !END!
394 ! X =    1653.604,  -1491.543,        1,       0.000!   !END!
395 ! X =    1656.132,  -1491.088,        1,       0.000!   !END!
396 ! X =    1658.660,  -1490.632,        1,       0.000!   !END!
397 ! X =    1661.187,  -1490.176,        1,       0.000!   !END!
398 ! X =    1663.715,  -1489.718,        1,       0.000!   !END!
399 ! X =    1666.243,  -1489.260,        1,       0.000!   !END!
400 ! X =    1668.770,  -1488.801,        1,       0.000!   !END!
401 ! X =    1671.297,  -1488.342,        1,       0.000!   !END!
402 ! X =    1673.824,  -1487.882,        1,       0.000!   !END!
403 ! X =    1676.351,  -1487.421,        1,       0.000!   !END!
404 ! X =    1617.706,  -1495.046,        0,       0.000!   !END!
405 ! X =    1620.235,  -1494.600,        1,       0.000!   !END!
406 ! X =    1622.764,  -1494.154,        1,       0.000!   !END!
407 ! X =    1625.293,  -1493.707,        1,       0.000!   !END!
408 ! X =    1627.821,  -1493.260,        0,       0.000!   !END!
409 ! X =    1630.350,  -1492.812,        1,       0.000!   !END!
410 ! X =    1632.878,  -1492.363,        0,       0.000!   !END!
411 ! X =    1635.406,  -1491.913,        1,       0.000!   !END!
412 ! X =    1637.934,  -1491.463,        1,       0.000!   !END!
413 ! X =    1640.462,  -1491.012,        1,       0.000!   !END!
414 ! X =    1642.990,  -1490.561,        1,       0.000!   !END!
415 ! X =    1645.518,  -1490.108,        1,       0.000!   !END!
416 ! X =    1648.046,  -1489.655,        1,       0.000!   !END!
417 ! X =    1650.573,  -1489.202,        1,       0.000!   !END!
418 ! X =    1653.101,  -1488.747,        1,       0.000!   !END!
419 ! X =    1655.628,  -1488.292,        1,       0.000!   !END!
420 ! X =    1658.155,  -1487.836,        1,       0.000!   !END!
421 ! X =    1660.682,  -1487.380,        1,       0.000!   !END!
422 ! X =    1663.209,  -1486.922,        1,       0.000!   !END!
423 ! X =    1665.736,  -1486.465,        1,       0.000!   !END!
424 ! X =    1668.262,  -1486.006,        1,       0.000!   !END!
425 ! X =    1670.789,  -1485.547,        1,       0.000!   !END!
426 ! X =    1673.315,  -1485.087,        1,       0.000!   !END!
427 ! X =    1675.841,  -1484.626,        1,       0.000!   !END!
428 ! X =    1617.214,  -1492.248,        0,       0.000!   !END!
429 ! X =    1619.742,  -1491.803,        0,       0.000!   !END!
430 ! X =    1622.270,  -1491.357,        0,       0.000!   !END!
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431 ! X =    1624.798,   -1490.910,        1,        0.000!   !END!
432 ! X =    1627.326,   -1490.463,        1,        0.000!   !END!
433 ! X =    1629.853,   -1490.015,        1,        0.000!   !END!
434 ! X =    1632.381,   -1489.566,        1,        0.000!   !END!
435 ! X =    1634.909,   -1489.116,        1,        0.000!   !END!
436 ! X =    1637.436,   -1488.666,        1,        0.000!   !END!
437 ! X =    1639.963,   -1488.216,        1,        0.000!   !END!
438 ! X =    1642.490,   -1487.764,        1,        0.000!   !END!
439 ! X =    1645.017,   -1487.312,        1,        0.000!   !END!
440 ! X =    1647.544,   -1486.859,        1,        0.000!   !END!
441 ! X =    1650.071,   -1486.405,        1,        0.000!   !END!
442 ! X =    1652.597,   -1485.951,        1,        0.000!   !END!
443 ! X =    1655.124,   -1485.496,        1,        0.000!   !END!
444 ! X =    1657.650,   -1485.040,        1,        0.000!   !END!
445 ! X =    1660.177,   -1484.584,        1,        0.000!   !END!
446 ! X =    1662.703,   -1484.127,        1,        0.000!   !END!
447 ! X =    1665.229,   -1483.669,        1,        0.000!   !END!
448 ! X =    1667.755,   -1483.211,        1,        0.000!   !END!
449 ! X =    1670.280,   -1482.752,        1,        0.000!   !END!
450 ! X =    1672.806,   -1482.292,        1,        0.000!   !END!
451 ! X =    1675.331,   -1481.831,        1,        0.000!   !END!
452 ! X =    1616.721,   -1489.450,        0,        0.000!   !END!
453 ! X =    1619.249,   -1489.005,        0,        0.000!   !END!
454 ! X =    1621.776,   -1488.559,        0,        0.000!   !END!
455 ! X =    1624.303,   -1488.113,        1,        0.000!   !END!
456 ! X =    1626.830,   -1487.666,        1,        0.000!   !END!
457 ! X =    1629.357,   -1487.218,        1,        0.000!   !END!
458 ! X =    1631.884,   -1486.769,        1,        0.000!   !END!
459 ! X =    1634.411,   -1486.320,        1,        0.000!   !END!
460 ! X =    1636.937,   -1485.870,        1,        0.000!   !END!
461 ! X =    1639.464,   -1485.419,        1,        0.000!   !END!
462 ! X =    1641.990,   -1484.968,        1,        0.000!   !END!
463 ! X =    1644.516,   -1484.516,        1,        0.000!   !END!
464 ! X =    1647.043,   -1484.063,        1,        0.000!   !END!
465 ! X =    1649.569,   -1483.610,        1,        0.000!   !END!
466 ! X =    1652.094,   -1483.155,        1,        0.000!   !END!
467 ! X =    1654.620,   -1482.701,        1,        0.000!   !END!
468 ! X =    1657.146,   -1482.245,        1,        0.000!   !END!
469 ! X =    1659.671,   -1481.789,        1,        0.000!   !END!
470 ! X =    1662.197,   -1481.332,        1,        0.000!   !END!
471 ! X =    1664.722,   -1480.874,        1,        0.000!   !END!
472 ! X =    1667.247,   -1480.416,        1,        0.000!   !END!
473 ! X =    1669.772,   -1479.957,        1,        0.000!   !END!
474 ! X =    1672.297,   -1479.497,        1,        0.000!   !END!
475 ! X =    1674.821,   -1479.037,        1,        0.000!   !END!
476 ! X =    1616.229,   -1486.653,        0,        0.000!   !END!
477 ! X =    1618.756,   -1486.208,        0,        0.000!   !END!
478 ! X =    1621.282,   -1485.762,        1,        0.000!   !END!
479 ! X =    1623.809,   -1485.316,        1,        0.000!   !END!
480 ! X =    1626.335,   -1484.869,        1,        0.000!   !END!
481 ! X =    1628.861,   -1484.421,        1,        0.000!   !END!
482 ! X =    1631.387,   -1483.973,        1,        0.000!   !END!
483 ! X =    1633.913,   -1483.523,        1,        0.000!   !END!
484 ! X =    1636.439,   -1483.074,        1,        0.000!   !END!
485 ! X =    1638.965,   -1482.623,        1,        0.000!   !END!
486 ! X =    1641.490,   -1482.172,        1,        0.000!   !END!
487 ! X =    1644.016,   -1481.720,        1,        0.000!   !END!
488 ! X =    1646.541,   -1481.267,        1,        0.000!   !END!
489 ! X =    1649.066,   -1480.814,        1,        0.000!   !END!
490 ! X =    1651.591,   -1480.360,        1,        0.000!   !END!
491 ! X =    1654.116,   -1479.905,        1,        0.000!   !END!
492 ! X =    1656.641,   -1479.450,        1,        0.000!   !END!
493 ! X =    1659.166,   -1478.994,        1,        0.000!   !END!
494 ! X =    1661.690,   -1478.537,        1,        0.000!   !END!
495 ! X =    1664.215,   -1478.080,        1,        0.000!   !END!
496 ! X =    1666.739,   -1477.621,        1,        0.000!   !END!
497 ! X =    1669.263,   -1477.162,        1,        0.000!   !END!
498 ! X =    1671.787,   -1476.703,        1,        0.000!   !END!
499 ! X =    1674.311,   -1476.243,        1,        0.000!   !END!
500 ! X =    1615.737,   -1483.856,        0,        0.000!   !END!
501 ! X =    1618.263,   -1483.411,        1,        0.000!   !END!
502 ! X =    1620.789,   -1482.965,        1,        0.000!   !END!
503 ! X =    1623.314,   -1482.519,        1,        0.000!   !END!
504 ! X =    1625.840,   -1482.072,        1,        0.000!   !END!
505 ! X =    1628.365,   -1481.625,        1,        0.000!   !END!
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506 ! X =    1630.890,   -1481.176,        1,        0.000!   !END!
507 ! X =    1633.416,   -1480.727,        1,        0.000!   !END!
508 ! X =    1635.941,   -1480.278,        1,        0.000!   !END!
509 ! X =    1638.466,   -1479.827,        1,        0.000!   !END!
510 ! X =    1640.990,   -1479.376,        1,        0.000!   !END!
511 ! X =    1643.515,   -1478.924,        1,        0.000!   !END!
512 ! X =    1646.040,   -1478.472,        1,        0.000!   !END!
513 ! X =    1648.564,   -1478.019,        1,        0.000!   !END!
514 ! X =    1651.088,   -1477.565,        1,        0.000!   !END!
515 ! X =    1653.613,   -1477.110,        1,        0.000!   !END!
516 ! X =    1656.137,   -1476.655,        1,        0.000!   !END!
517 ! X =    1658.661,   -1476.199,        1,        0.000!   !END!
518 ! X =    1661.184,   -1475.742,        1,        0.000!   !END!
519 ! X =    1663.708,   -1475.285,        1,        0.000!   !END!
520 ! X =    1666.232,   -1474.827,        1,        0.000!   !END!
521 ! X =    1668.755,   -1474.368,        1,        0.000!   !END!
522 ! X =    1671.278,   -1473.909,        1,        0.000!   !END!
523 ! X =    1673.802,   -1473.449,        1,        0.000!   !END!
524 ! X =    1612.719,   -1481.503,        0,        0.000!   !END!
525 ! X =    1615.245,   -1481.059,        0,        0.000!   !END!
526 ! X =    1617.770,   -1480.614,        1,        0.000!   !END!
527 ! X =    1620.295,   -1480.169,        1,        0.000!   !END!
528 ! X =    1622.820,   -1479.723,        1,        0.000!   !END!
529 ! X =    1625.345,   -1479.276,        1,        0.000!   !END!
530 ! X =    1627.869,   -1478.828,        1,        0.000!   !END!
531 ! X =    1630.394,   -1478.380,        1,        0.000!   !END!
532 ! X =    1632.918,   -1477.931,        1,        0.000!   !END!
533 ! X =    1635.442,   -1477.482,        1,        0.000!   !END!
534 ! X =    1637.967,   -1477.032,        1,        0.000!   !END!
535 ! X =    1640.491,   -1476.581,        1,        0.000!   !END!
536 ! X =    1643.015,   -1476.129,        1,        0.000!   !END!
537 ! X =    1645.538,   -1475.677,        1,        0.000!   !END!
538 ! X =    1648.062,   -1475.224,        1,        0.000!   !END!
539 ! X =    1650.586,   -1474.770,        1,        0.000!   !END!
540 ! X =    1653.109,   -1474.315,        1,        0.000!   !END!
541 ! X =    1655.632,   -1473.860,        1,        0.000!   !END!
542 ! X =    1658.155,   -1473.405,        1,        0.000!   !END!
543 ! X =    1660.678,   -1472.948,        1,        0.000!   !END!
544 ! X =    1663.201,   -1472.491,        1,        0.000!   !END!
545 ! X =    1665.724,   -1472.033,        1,        0.000!   !END!
546 ! X =    1668.247,   -1471.574,        1,        0.000!   !END!
547 ! X =    1670.769,   -1471.115,        1,        0.000!   !END!
548 ! X =    1673.292,   -1470.655,        1,        0.000!   !END!
549 ! X =    1612.228,   -1478.706,        0,        0.000!   !END!
550 ! X =    1614.753,   -1478.262,        1,        0.000!   !END!
551 ! X =    1617.277,   -1477.818,        1,        0.000!   !END!
552 ! X =    1619.801,   -1477.372,        1,        0.000!   !END!
553 ! X =    1622.325,   -1476.927,        1,        0.000!   !END!
554 ! X =    1624.849,   -1476.480,        1,        0.000!   !END!
555 ! X =    1627.373,   -1476.033,        1,        0.000!   !END!
556 ! X =    1629.897,   -1475.585,        1,        0.000!   !END!
557 ! X =    1632.421,   -1475.136,        1,        0.000!   !END!
558 ! X =    1634.944,   -1474.686,        1,        0.000!   !END!
559 ! X =    1637.468,   -1474.236,        1,        0.000!   !END!
560 ! X =    1639.991,   -1473.785,        1,        0.000!   !END!
561 ! X =    1642.514,   -1473.334,        1,        0.000!   !END!
562 ! X =    1645.037,   -1472.882,        1,        0.000!   !END!
563 ! X =    1647.560,   -1472.429,        1,        0.000!   !END!
564 ! X =    1650.083,   -1471.975,        1,        0.000!   !END!
565 ! X =    1652.605,   -1471.521,        1,        0.000!   !END!
566 ! X =    1655.128,   -1471.066,        1,        0.000!   !END!
567 ! X =    1657.650,   -1470.610,        1,        0.000!   !END!
568 ! X =    1660.172,   -1470.154,        1,        0.000!   !END!
569 ! X =    1662.695,   -1469.697,        1,        0.000!   !END!
570 ! X =    1665.217,   -1469.239,        1,        0.000!   !END!
571 ! X =    1667.739,   -1468.781,        1,        0.000!   !END!
572 ! X =    1670.260,   -1468.322,        1,        0.000!   !END!
573 ! X =    1672.782,   -1467.862,        1,        0.000!   !END!
574 ! X =    1609.213,   -1476.353,        0,        0.000!   !END!
575 ! X =    1611.737,   -1475.910,        1,        0.000!   !END!
576 ! X =    1614.261,   -1475.466,        1,        0.000!   !END!
577 ! X =    1616.784,   -1475.022,        1,        0.000!   !END!
578 ! X =    1619.308,   -1474.576,        1,        0.000!   !END!
579 ! X =    1621.831,   -1474.131,        1,        0.000!   !END!
580 ! X =    1624.354,   -1473.684,        1,        0.000!   !END!
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581 ! X =    1626.877,   -1473.237,        1,        0.000!   !END!
582 ! X =    1629.400,   -1472.789,        1,        0.000!   !END!
583 ! X =    1631.923,   -1472.340,        1,        0.000!   !END!
584 ! X =    1634.446,   -1471.891,        1,        0.000!   !END!
585 ! X =    1636.969,   -1471.441,        1,        0.000!   !END!
586 ! X =    1639.491,   -1470.991,        1,        0.000!   !END!
587 ! X =    1642.013,   -1470.539,        1,        0.000!   !END!
588 ! X =    1644.536,   -1470.087,        1,        0.000!   !END!
589 ! X =    1647.058,   -1469.634,        1,        0.000!   !END!
590 ! X =    1649.580,   -1469.181,        1,        0.000!   !END!
591 ! X =    1652.102,   -1468.727,        1,        0.000!   !END!
592 ! X =    1654.623,   -1468.272,        1,        0.000!   !END!
593 ! X =    1657.145,   -1467.816,        1,        0.000!   !END!
594 ! X =    1659.667,   -1467.360,        1,        0.000!   !END!
595 ! X =    1662.188,   -1466.903,        1,        0.000!   !END!
596 ! X =    1664.709,   -1466.446,        1,        0.000!   !END!
597 ! X =    1667.230,   -1465.987,        1,        0.000!   !END!
598 ! X =    1669.751,   -1465.528,        1,        0.000!   !END!
599 ! X =    1672.272,   -1465.069,        1,        0.000!   !END!
600 ! X =    1674.793,   -1464.608,        1,        0.000!   !END!
601 ! X =    1608.723,   -1473.557,        0,        0.000!   !END!
602 ! X =    1611.246,   -1473.114,        1,        0.000!   !END!
603 ! X =    1613.769,   -1472.670,        1,        0.000!   !END!
604 ! X =    1616.291,   -1472.226,        1,        0.000!   !END!
605 ! X =    1618.814,   -1471.781,        1,        0.000!   !END!
606 ! X =    1621.337,   -1471.335,        1,        0.000!   !END!
607 ! X =    1623.859,   -1470.889,        1,        0.000!   !END!
608 ! X =    1626.382,   -1470.442,        1,        0.000!   !END!
609 ! X =    1628.904,   -1469.994,        1,        0.000!   !END!
610 ! X =    1631.426,   -1469.545,        1,        0.000!   !END!
611 ! X =    1633.948,   -1469.096,        1,        0.000!   !END!
612 ! X =    1636.470,   -1468.646,        1,        0.000!   !END!
613 ! X =    1638.991,   -1468.196,        1,        0.000!   !END!
614 ! X =    1641.513,   -1467.745,        1,        0.000!   !END!
615 ! X =    1644.034,   -1467.293,        1,        0.000!   !END!
616 ! X =    1646.556,   -1466.840,        1,        0.000!   !END!
617 ! X =    1649.077,   -1466.387,        1,        0.000!   !END!
618 ! X =    1651.598,   -1465.933,        1,        0.000!   !END!
619 ! X =    1654.119,   -1465.478,        1,        0.000!   !END!
620 ! X =    1656.640,   -1465.023,        1,        0.000!   !END!
621 ! X =    1659.161,   -1464.567,        1,        0.000!   !END!
622 ! X =    1661.681,   -1464.110,        1,        0.000!   !END!
623 ! X =    1664.202,   -1463.652,        1,        0.000!   !END!
624 ! X =    1666.722,   -1463.194,        1,        0.000!   !END!
625 ! X =    1669.242,   -1462.735,        1,        0.000!   !END!
626 ! X =    1671.763,   -1462.276,        1,        0.000!   !END!
627 ! X =    1674.282,   -1461.816,        1,        0.000!   !END!
628 ! X =    1605.710,   -1471.203,        0,        0.000!   !END!
629 ! X =    1608.232,   -1470.761,        0,        0.000!   !END!
630 ! X =    1610.754,   -1470.318,        0,        0.000!   !END!
631 ! X =    1613.277,   -1469.874,        1,        0.000!   !END!
632 ! X =    1615.799,   -1469.430,        1,        0.000!   !END!
633 ! X =    1618.321,   -1468.985,        1,        0.000!   !END!
634 ! X =    1620.842,   -1468.540,        1,        0.000!   !END!
635 ! X =    1623.364,   -1468.093,        0,        0.000!   !END!
636 ! X =    1625.886,   -1467.647,        1,        0.000!   !END!
637 ! X =    1628.407,   -1467.199,        1,        0.000!   !END!
638 ! X =    1630.928,   -1466.751,        1,        0.000!   !END!
639 ! X =    1633.450,   -1466.302,        1,        0.000!   !END!
640 ! X =    1635.971,   -1465.852,        1,        0.000!   !END!
641 ! X =    1638.492,   -1465.402,        1,        0.000!   !END!
642 ! X =    1641.013,   -1464.950,        1,        0.000!   !END!
643 ! X =    1643.533,   -1464.499,        1,        0.000!   !END!
644 ! X =    1646.054,   -1464.046,        1,        0.000!   !END!
645 ! X =    1648.574,   -1463.593,        1,        0.000!   !END!
646 ! X =    1651.095,   -1463.139,        1,        0.000!   !END!
647 ! X =    1653.615,   -1462.685,        1,        0.000!   !END!
648 ! X =    1656.135,   -1462.229,        1,        0.000!   !END!
649 ! X =    1658.655,   -1461.773,        1,        0.000!   !END!
650 ! X =    1661.175,   -1461.317,        1,        0.000!   !END!
651 ! X =    1663.695,   -1460.859,        1,        0.000!   !END!
652 ! X =    1666.214,   -1460.401,        1,        0.000!   !END!
653 ! X =    1668.734,   -1459.943,        1,        0.000!   !END!
654 ! X =    1671.253,   -1459.483,        1,        0.000!   !END!
655 ! X =    1673.772,   -1459.023,        1,        0.000!   !END!
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656 ! X =    1602.698,  -1468.848,     0,     0.000!   !END!
657 ! X =    1605.220,  -1468.407,     0,     0.000!   !END!
658 ! X =    1607.742,  -1467.965,     1,     0.000!   !END!
659 ! X =    1610.263,  -1467.522,     1,     0.000!   !END!
660 ! X =    1612.785,  -1467.079,     1,     0.000!   !END!
661 ! X =    1615.306,  -1466.635,     1,     0.000!   !END!
662 ! X =    1617.827,  -1466.190,     0,     0.000!   !END!
663 ! X =    1620.348,  -1465.745,     1,     0.000!   !END!
664 ! X =    1622.869,  -1465.299,     1,     0.000!   !END!
665 ! X =    1625.390,  -1464.852,     1,     0.000!   !END!
666 ! X =    1627.911,  -1464.404,     1,     0.000!   !END!
667 ! X =    1630.431,  -1463.956,     1,     0.000!   !END!
668 ! X =    1632.952,  -1463.507,     1,     0.000!   !END!
669 ! X =    1635.472,  -1463.058,     1,     0.000!   !END!
670 ! X =    1637.992,  -1462.607,     1,     0.000!   !END!
671 ! X =    1640.512,  -1462.156,     1,     0.000!   !END!
672 ! X =    1643.032,  -1461.705,     1,     0.000!   !END!
673 ! X =    1645.552,  -1461.252,     1,     0.000!   !END!
674 ! X =    1648.072,  -1460.799,     1,     0.000!   !END!
675 ! X =    1650.591,  -1460.346,     1,     0.000!   !END!
676 ! X =    1653.111,  -1459.891,     1,     0.000!   !END!
677 ! X =    1655.630,  -1459.436,     1,     0.000!   !END!
678 ! X =    1658.149,  -1458.980,     1,     0.000!   !END!
679 ! X =    1660.668,  -1458.524,     1,     0.000!   !END!
680 ! X =    1663.187,  -1458.067,     1,     0.000!   !END!
681 ! X =    1665.706,  -1457.609,     1,     0.000!   !END!
682 ! X =    1668.225,  -1457.150,     1,     0.000!   !END!
683 ! X =    1670.743,  -1456.691,     1,     0.000!   !END!
684 ! X =    1673.262,  -1456.231,     0,     0.000!   !END!
685 ! X =    1602.209,  -1466.052,     0,     0.000!   !END!
686 ! X =    1604.731,  -1465.611,     1,     0.000!   !END!
687 ! X =    1607.251,  -1465.169,     1,     0.000!   !END!
688 ! X =    1609.772,  -1464.727,     1,     0.000!   !END!
689 ! X =    1612.293,  -1464.284,     1,     0.000!   !END!
690 ! X =    1614.813,  -1463.840,     1,     0.000!   !END!
691 ! X =    1617.334,  -1463.395,     1,     0.000!   !END!
692 ! X =    1619.854,  -1462.950,     1,     0.000!   !END!
693 ! X =    1622.374,  -1462.504,     1,     0.000!   !END!
694 ! X =    1624.894,  -1462.057,     1,     0.000!   !END!
695 ! X =    1627.414,  -1461.610,     1,     0.000!   !END!
696 ! X =    1629.934,  -1461.162,     1,     0.000!   !END!
697 ! X =    1632.454,  -1460.713,     1,     0.000!   !END!
698 ! X =    1634.973,  -1460.264,     1,     0.000!   !END!
699 ! X =    1637.493,  -1459.814,     1,     0.000!   !END!
700 ! X =    1640.012,  -1459.363,     1,     0.000!   !END!
701 ! X =    1642.531,  -1458.911,     1,     0.000!   !END!
702 ! X =    1645.050,  -1458.459,     1,     0.000!   !END!
703 ! X =    1647.569,  -1458.006,     1,     0.000!   !END!
704 ! X =    1650.088,  -1457.553,     1,     0.000!   !END!
705 ! X =    1652.607,  -1457.098,     1,     0.000!   !END!
706 ! X =    1655.125,  -1456.643,     1,     0.000!   !END!
707 ! X =    1657.644,  -1456.188,     1,     0.000!   !END!
708 ! X =    1660.162,  -1455.731,     1,     0.000!   !END!
709 ! X =    1662.680,  -1455.274,     1,     0.000!   !END!
710 ! X =    1665.198,  -1454.816,     1,     0.000!   !END!
711 ! X =    1667.716,  -1454.358,     1,     0.000!   !END!
712 ! X =    1670.234,  -1453.899,     1,     0.000!   !END!
713 ! X =    1672.751,  -1453.439,     1,     0.000!   !END!
714 ! X =    1675.269,  -1452.979,     0,     0.000!   !END!
715 ! X =    1599.200,  -1463.697,     0,     0.000!   !END!
716 ! X =    1601.721,  -1463.257,     0,     0.000!   !END!
717 ! X =    1604.241,  -1462.816,     1,     0.000!   !END!
718 ! X =    1606.761,  -1462.374,     1,     0.000!   !END!
719 ! X =    1609.281,  -1461.932,     1,     0.000!   !END!
720 ! X =    1611.801,  -1461.489,     1,     0.000!   !END!
721 ! X =    1614.321,  -1461.045,     1,     0.000!   !END!
722 ! X =    1616.840,  -1460.601,     1,     0.000!   !END!
723 ! X =    1619.360,  -1460.155,     1,     0.000!   !END!
724 ! X =    1621.879,  -1459.710,     1,     0.000!   !END!
725 ! X =    1644.548,  -1455.666,     1,     0.000!   !END!
726 ! X =    1647.066,  -1455.213,     1,     0.000!   !END!
727 ! X =    1649.585,  -1454.760,     1,     0.000!   !END!
728 ! X =    1652.102,  -1454.306,     1,     0.000!   !END!
729 ! X =    1654.620,  -1453.851,     1,     0.000!   !END!
730 ! X =    1657.138,  -1453.395,     1,     0.000!   !END!
```

```
731 ! X =    1659.655,   -1452.939,        1,        0.000!   !END!
732 ! X =    1662.173,   -1452.482,        1,        0.000!   !END!
733 ! X =    1664.690,   -1452.024,        1,        0.000!   !END!
734 ! X =    1667.207,   -1451.566,        1,        0.000!   !END!
735 ! X =    1669.724,   -1451.107,        1,        0.000!   !END!
736 ! X =    1672.241,   -1450.647,        1,        0.000!   !END!
737 ! X =    1596.193,   -1461.341,        0,        0.000!   !END!
738 ! X =    1598.712,   -1460.902,        0,        0.000!   !END!
739 ! X =    1601.232,   -1460.462,        1,        0.000!   !END!
740 ! X =    1603.752,   -1460.021,        1,        0.000!   !END!
741 ! X =    1606.271,   -1459.579,        1,        0.000!   !END!
742 ! X =    1608.790,   -1459.137,        1,        0.000!   !END!
743 ! X =    1611.309,   -1458.694,        1,        0.000!   !END!
744 ! X =    1613.828,   -1458.250,        1,        0.000!   !END!
745 ! X =    1616.347,   -1457.806,        1,        0.000!   !END!
746 ! X =    1618.866,   -1457.361,        1,        0.000!   !END!
747 ! X =    1621.384,   -1456.915,        1,        0.000!   !END!
748 ! X =    1644.047,   -1452.873,        1,        0.000!   !END!
749 ! X =    1646.564,   -1452.420,        1,        0.000!   !END!
750 ! X =    1649.081,   -1451.967,        1,        0.000!   !END!
751 ! X =    1651.598,   -1451.513,        1,        0.000!   !END!
752 ! X =    1654.115,   -1451.058,        1,        0.000!   !END!
753 ! X =    1656.632,   -1450.603,        1,        0.000!   !END!
754 ! X =    1659.149,   -1450.147,        1,        0.000!   !END!
755 ! X =    1661.666,   -1449.690,        1,        0.000!   !END!
756 ! X =    1664.182,   -1449.233,        1,        0.000!   !END!
757 ! X =    1666.699,   -1448.775,        1,        0.000!   !END!
758 ! X =    1669.215,   -1448.316,        1,        0.000!   !END!
759 ! X =    1671.731,   -1447.856,        1,        0.000!   !END!
760 ! X =    1674.247,   -1447.396,        1,        0.000!   !END!
761 ! X =    1676.763,   -1446.935,        1,        0.000!   !END!
762 ! X =    1593.187,   -1458.985,        0,        0.000!   !END!
763 ! X =    1595.706,   -1458.546,        0,        0.000!   !END!
764 ! X =    1598.225,   -1458.107,        0,        0.000!   !END!
765 ! X =    1600.743,   -1457.667,        1,        0.000!   !END!
766 ! X =    1603.262,   -1457.226,        1,        0.000!   !END!
767 ! X =    1605.781,   -1456.785,        1,        0.000!   !END!
768 ! X =    1608.299,   -1456.342,        1,        0.000!   !END!
769 ! X =    1610.818,   -1455.900,        1,        0.000!   !END!
770 ! X =    1613.336,   -1455.456,        1,        0.000!   !END!
771 ! X =    1615.854,   -1455.012,        1,        0.000!   !END!
772 ! X =    1618.372,   -1454.567,        1,        0.000!   !END!
773 ! X =    1643.545,   -1450.080,        1,        0.000!   !END!
774 ! X =    1646.061,   -1449.628,        1,        0.000!   !END!
775 ! X =    1648.578,   -1449.175,        1,        0.000!   !END!
776 ! X =    1651.094,   -1448.721,        1,        0.000!   !END!
777 ! X =    1653.611,   -1448.266,        1,        0.000!   !END!
778 ! X =    1656.127,   -1447.811,        1,        0.000!   !END!
779 ! X =    1658.643,   -1447.355,        1,        0.000!   !END!
780 ! X =    1661.159,   -1446.898,        1,        0.000!   !END!
781 ! X =    1663.674,   -1446.441,        1,        0.000!   !END!
782 ! X =    1666.190,   -1445.983,        1,        0.000!   !END!
783 ! X =    1668.705,   -1445.524,        1,        0.000!   !END!
784 ! X =    1671.221,   -1445.065,        1,        0.000!   !END!
785 ! X =    1673.736,   -1444.605,        1,        0.000!   !END!
786 ! X =    1676.251,   -1444.144,        1,        0.000!   !END!
787 ! X =    1590.182,   -1456.627,        0,        0.000!   !END!
788 ! X =    1592.700,   -1456.190,        0,        0.000!   !END!
789 ! X =    1595.219,   -1455.751,        0,        0.000!   !END!
790 ! X =    1597.737,   -1455.312,        1,        0.000!   !END!
791 ! X =    1600.255,   -1454.872,        1,        0.000!   !END!
792 ! X =    1602.773,   -1454.431,        1,        0.000!   !END!
793 ! X =    1605.291,   -1453.990,        1,        0.000!   !END!
794 ! X =    1607.808,   -1453.548,        1,        0.000!   !END!
795 ! X =    1610.326,   -1453.106,        1,        0.000!   !END!
796 ! X =    1612.843,   -1452.662,        1,        0.000!   !END!
797 ! X =    1615.361,   -1452.218,        1,        0.000!   !END!
798 ! X =    1643.043,   -1447.288,        1,        0.000!   !END!
799 ! X =    1645.559,   -1446.836,        1,        0.000!   !END!
800 ! X =    1648.075,   -1446.383,        1,        0.000!   !END!
801 ! X =    1650.590,   -1445.929,        1,        0.000!   !END!
802 ! X =    1653.106,   -1445.475,        1,        0.000!   !END!
803 ! X =    1655.621,   -1445.019,        1,        0.000!   !END!
804 ! X =    1658.136,   -1444.564,        1,        0.000!   !END!
805 ! X =    1660.652,   -1444.107,        1,        0.000!   !END!
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806 ! X =    1663.167,  -1443.650,    1,    0.000!   !END!
807 ! X =    1665.681,  -1443.192,    1,    0.000!   !END!
808 ! X =    1668.196,  -1442.733,    1,    0.000!   !END!
809 ! X =    1670.711,  -1442.274,    1,    0.000!   !END!
810 ! X =    1673.225,  -1441.814,    1,    0.000!   !END!
811 ! X =    1675.740,  -1441.354,    0,    0.000!   !END!
812 ! X =    1587.179,  -1454.269,    0,    0.000!   !END!
813 ! X =    1589.696,  -1453.832,    1,    0.000!   !END!
814 ! X =    1592.214,  -1453.395,    1,    0.000!   !END!
815 ! X =    1594.732,  -1452.956,    1,    0.000!   !END!
816 ! X =    1597.249,  -1452.517,    1,    0.000!   !END!
817 ! X =    1599.766,  -1452.078,    1,    0.000!   !END!
818 ! X =    1602.283,  -1451.637,    1,    0.000!   !END!
819 ! X =    1604.800,  -1451.196,    1,    0.000!   !END!
820 ! X =    1607.317,  -1450.754,    1,    0.000!   !END!
821 ! X =    1609.834,  -1450.312,    1,    0.000!   !END!
822 ! X =    1612.351,  -1449.868,    1,    0.000!   !END!
823 ! X =    1614.867,  -1449.425,    1,    0.000!   !END!
824 ! X =    1642.542,  -1444.496,    1,    0.000!   !END!
825 ! X =    1645.057,  -1444.044,    1,    0.000!   !END!
826 ! X =    1647.572,  -1443.591,    1,    0.000!   !END!
827 ! X =    1650.086,  -1443.137,    1,    0.000!   !END!
828 ! X =    1652.601,  -1442.683,    1,    0.000!   !END!
829 ! X =    1655.116,  -1442.228,    1,    0.000!   !END!
830 ! X =    1657.630,  -1441.772,    1,    0.000!   !END!
831 ! X =    1660.145,  -1441.316,    1,    0.000!   !END!
832 ! X =    1662.659,  -1440.859,    1,    0.000!   !END!
833 ! X =    1665.173,  -1440.401,    1,    0.000!   !END!
834 ! X =    1667.687,  -1439.943,    1,    0.000!   !END!
835 ! X =    1670.201,  -1439.484,    1,    0.000!   !END!
836 ! X =    1672.714,  -1439.024,    1,    0.000!   !END!
837 ! X =    1675.228,  -1438.563,    0,    0.000!   !END!
838 ! X =    1584.177,  -1451.911,    0,    0.000!   !END!
839 ! X =    1586.694,  -1451.475,    0,    0.000!   !END!
840 ! X =    1589.211,  -1451.038,    0,    0.000!   !END!
841 ! X =    1591.728,  -1450.600,    1,    0.000!   !END!
842 ! X =    1594.245,  -1450.162,    1,    0.000!   !END!
843 ! X =    1596.761,  -1449.723,    1,    0.000!   !END!
844 ! X =    1599.278,  -1449.283,    1,    0.000!   !END!
845 ! X =    1601.794,  -1448.843,    1,    0.000!   !END!
846 ! X =    1604.310,  -1448.402,    1,    0.000!   !END!
847 ! X =    1606.827,  -1447.960,    1,    0.000!   !END!
848 ! X =    1609.343,  -1447.518,    1,    0.000!   !END!
849 ! X =    1642.040,  -1441.704,    1,    0.000!   !END!
850 ! X =    1644.554,  -1441.252,    1,    0.000!   !END!
851 ! X =    1647.069,  -1440.799,    1,    0.000!   !END!
852 ! X =    1649.583,  -1440.346,    1,    0.000!   !END!
853 ! X =    1652.097,  -1439.892,    1,    0.000!   !END!
854 ! X =    1654.610,  -1439.437,    1,    0.000!   !END!
855 ! X =    1657.124,  -1438.981,    1,    0.000!   !END!
856 ! X =    1659.638,  -1438.525,    1,    0.000!   !END!
857 ! X =    1662.151,  -1438.068,    1,    0.000!   !END!
858 ! X =    1664.664,  -1437.611,    1,    0.000!   !END!
859 ! X =    1667.178,  -1437.152,    1,    0.000!   !END!
860 ! X =    1669.691,  -1436.693,    1,    0.000!   !END!
861 ! X =    1672.204,  -1436.234,    1,    0.000!   !END!
862 ! X =    1674.716,  -1435.773,    0,    0.000!   !END!
863 ! X =    1581.176,  -1449.551,    0,    0.000!   !END!
864 ! X =    1583.693,  -1449.116,    0,    0.000!   !END!
865 ! X =    1586.209,  -1448.680,    0,    0.000!   !END!
866 ! X =    1588.726,  -1448.243,    1,    0.000!   !END!
867 ! X =    1591.242,  -1447.806,    1,    0.000!   !END!
868 ! X =    1593.758,  -1447.368,    1,    0.000!   !END!
869 ! X =    1596.274,  -1446.929,    1,    0.000!   !END!
870 ! X =    1598.789,  -1446.490,    1,    0.000!   !END!
871 ! X =    1601.305,  -1446.049,    1,    0.000!   !END!
872 ! X =    1603.820,  -1445.609,    0,    0.000!   !END!
873 ! X =    1575.662,  -1447.625,    0,    0.000!   !END!
874 ! X =    1578.178,  -1447.191,    0,    0.000!   !END!
875 ! X =    1580.693,  -1446.757,    0,    0.000!   !END!
876 ! X =    1583.209,  -1446.322,    1,    0.000!   !END!
877 ! X =    1585.725,  -1445.886,    0,    0.000!   !END!
878 ! X =    1588.240,  -1445.449,    0,    0.000!   !END!
879 ! X =    1590.756,  -1445.012,    1,    0.000!   !END!
880 ! X =    1593.271,  -1444.574,
```

```
881 ! X =    1595.786,   -1444.135,        1,        0.000!    !END!
882 ! X =    1598.301,   -1443.696,        1,        0.000!    !END!
883 ! X =    1575.180,   -1444.831,        0,        0.000!    !END!
884 ! X =    1577.695,   -1444.397,        0,        0.000!    !END!
885 ! X =    1580.210,   -1443.963,        0,        0.000!    !END!
886 ! X =    1582.725,   -1443.527,        1,        0.000!    !END!
887 ! X =    1585.240,   -1443.092,        1,        0.000!    !END!
888 ! X =    1587.755,   -1442.655,        0,        0.000!    !END!
889 ! X =    1590.270,   -1442.218,        1,        0.000!    !END!
890 ! X =    1592.784,   -1441.780,        1,        0.000!    !END!
891 ! X =    1595.298,   -1441.342,        1,        0.000!    !END!
892 ! X =    1597.813,   -1440.903,        1,        0.000!    !END!
893 ! X =    1577.213,   -1441.603,        1,        0.000!    !END!
894 ! X =    1579.728,   -1441.169,        1,        0.000!    !END!
895 ! X =    1582.242,   -1440.734,        1,        0.000!    !END!
896 ! X =    1589.784,   -1439.425,        1,        0.000!    !END!
897 ! X =    1592.297,   -1438.987,        1,        0.000!    !END!
898 ! X =    1594.811,   -1438.549,        1,        0.000!    !END!
899 ! X =    1597.324,   -1438.110,        1,        0.000!    !END!
900 ! X =    1579.245,   -1438.375,        1,        0.000!    !END!
901 ! X =    1581.758,   -1437.940,
```

a
Data for each receptor are treated as a separate input subgroup and therefore must end with an input group terminator.

b
Receptor height above ground is optional. If no value is entered, the receptor is placed on the ground.

APPENDIX B

SAMPLE POSTUTIL MODEL CONTROL FILE FOR VISIBILITY IMPACTS

```
FPL WCEC UNIT 3 - POSTUTIL VISIBILITY IMPACTS       8/22/07
EVERGLADES NP CLASS I RECEPTORS
4-km FL DOMAIN, 2002

---------------- Run title (3 lines) ------------------------------------------

                  POSTUTIL MODEL CONTROL FILE
                  ---------------------------

-------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names
--------------

-------------
Subgroup (0a)
-------------

Output Files
------------

 File            Default File Name
 ----            -----------------
 List File       POSTUTIL.LST        ! UTLLST =EXAMPLE.LST   !
 Data File       MODEL.DAT           ! UTLDAT =EXAMPLE.CON   !


Input Files
-----------

 A time-varying file of "background" concentrations can be included
 when the ammonia-limiting method (ALM) for setting the HNO3/NO3
 concentration partition is accomplished in 1 step.  This option
 is selected by setting MNITRATE=3 in Input Group 1.
 Species required in the "background" concentration file are:
 SO4, NO3, HNO3 and TNH3 (total NH3).

 File            Default File Name
 ----            -----------------
 BCKG File       BCKGALM.DAT         * BCKGALM =BCKGALM.DAT     *


 A number of CALPUFF data files may be processed in this application.
 The files may represent individual CALPUFF simulations that were made
 for a specific set of species and/or sources.  Specify the total number
 of CALPUFF runs you wish to combine, and provide the filename for each
 in subgroup 0b.

     Number of CALPUFF data files (NFILES)
                                   Default: 1       ! NFILES  = 1   !


 Meteorological data files are needed for the HNO3/NO3 partition option.
 Three types of meteorological data files can be used:
       METFM= 0 - CALMET.DAT
       METFM= 1 - 1-D file with RH, Temp and Rhoair timeseries
       METFM= 2 - 2-D files with either Rh, Temp or Rhoair in each
                  (3 2_D files are needed)
      The default is to use CALMET.DAT files.

                                   Default: 0       ! METFM   = 0   !


 Multiple meteorological data files may be used in sequence to span the
 processing period.  Specify the number of time-period files (NMET) that
 you need to use, and provide a filename for each in subgroup 0b.
 - NMET is 0 if no meteorological files are provided
 - NMET is 1 if METFM=1 (multiple file feature is not available)
 - NMET is 1 or more if METFM=0 or 2 (multiple CALMET files or 2DMET files)

     Number of meteorological data file time-periods (NMET)
                                   Default: 0       ! NMET    = 0   !
```

```
 All filenames will be converted to lower case if LCFILES = T
 Otherwise, if LCFILES = F, filenames will be converted to UPPER CASE

     Convert filenames to lower case?  Default: T      ! LCFILES = T !
         T = lower case
         F = UPPER CASE

!END!

----------------------------------------------------------------
 NOTE: file/path names can be up to 70 characters in length
----------------------------------------------------------------

-------------
Subgroup (0b)
-------------

NMET CALMET Data Files (METFM=0):

Input File      Default File Name
----------      -----------------
   1            MET.DAT             * UTLMET =CALMET.DAT   * *END*


NMET 1-D Data Files (METFM=1):

Input File      Default File Name
----------      -----------------
   1            MET_1D.DAT          * MET1D    = MET_1D.DAT * *END*


NMET 2-D Data Files of Each Type (METFM=2):

Input File      Default File Name
----------      -----------------
   1            RHUMD.DAT           * M2DRHU   = RELHUM.DAT * *END*
   1            TEMP.DAT            * M2DTMP   = TEMP.DAT   * *END*
   1            RHOAIR.DAT          * M2DRHO   = RHOAIR.DAT * *END*


NFILES CALPUFF Data Files:

Input File      Default File Name
----------      -----------------
   1            CALPUFF.DAT         ! MODDAT =..\PFIC19BV.CON  ! !END!


-------------
Note:  provide NMET lines of the form    * UTLMET = name * *END*

                                    or   * MET1D  = name * *END*

                                    or   * M2DRHU = name * *END*
                                (and)    * M2DTMP = name * *END*
                                (and)    * M2DRHO = name * *END*

       and NFILES lines of the form      * MODDAT = name * *END*

       where the * should be replaced with an exclamation point,
       the special delimiter character.


------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

     Starting date:     Year  (ISYR) --    No default    ! ISYR  =  2002 !
                        Month (ISMO) --    No default    ! ISMO  = 1    !
                        Day   (ISDY) --    No default    ! ISDY  = 1    !
                        Hour  (ISHR) --    No default    ! ISHR  = 1    !

     Number of periods to process
                               (NPER) -- No default    ! NPER  = 8760 !
```

```
    Number of species to process from CALPUFF runs
                          (NSPECINP) -- No default    ! NSPECINP = 6 !

    Number of species to write to output file
                          (NSPECOUT) -- No default    ! NSPECOUT = 9 !

    Number of species to compute from those modeled
    (must be no greater than NSPECOUT)
                          (NSPECCMP) -- No default    ! NSPECCMP = 4 !
```

When multiple files are used, a species name may appear in more than one file. Data for this species will be summed (appropriate if the CALPUFF runs use different source groups). If this summing is not appropriate, remove duplicate species from the file(s).

```
    Stop run if duplicate species names
    are found? (MDUPLCT)              Default: 0        ! MDUPLCT  =  0  !
       0 = no  (i.e., duplicate species are summed)
       1 = yes (i.e., run is halted)
```

Data for each species in a CALPUFF data file may also be scaled as they are read. This can be done to alter the emission rate of all sources that were modeled in a particular CALPUFF application. The scaling factor for each species is entered in Subgroup (2d), for each file for which scaling is requested.

```
    Number of CALPUFF data files that will be scaled
    (must be no greater than NFILES)
    (NSCALED)                         Default: 0        ! NSCALED = 1 !
```

Ammonia-Limiting Method Option to recompute the HNO3/NO3 concentration partition prior to performing other actions is controlled by MNITRATE. This option will NOT alter any deposition fluxes contained in the CALPUFF file(s). Three partition selections are provided. The first two are typically used in sequence (POSTUTIL is run more than once). The first selection (MNITRATE=1) computes the partition for the TOTAL (all sources) concentration fields (SO4, NO3, HNO3; NH3), and the second (MNITRATE=2) uses this partition (from the previous application of POSTUTIL) to compute the partition for individual source groups. The third selection (MNITRATE=3) can be used instead in a single POSTUTIL application if a file of background concentrations is provided (BCKGALM in Input Group 0).

```
Required information for MNITRATE=1 includes:
         species NO3, HNO3, and SO4
         NH3 concentration(s)
         met. data file for RH and T

Required information for MNITRATE=2 includes:
         species NO3 and HNO3 for a source group
         species NO3ALL and HNO3ALL for all source groups, properly
         partitioned

Required information for MNITRATE=3 includes:
         species NO3, HNO3, and SO4 for a source group
         species NO3, HNO3, SO4 and TNH3 from the background BCKGALM file
         If TNH3 is not in the background BCKGALM file, monthly TNH3
         concentrations are used (BCKTNH3)

    Recompute the HNO3/NO3 partition for concentrations?
    (MNITRATE)                        Default: 0        ! MNITRATE  =  0  !
       0 = no
       1 = yes, for all sources combined
       2 = yes, for a source group
       3 = yes, ALM application in one step
```

SOURCE OF AMMONIA:

Ammonia may be available as a modeled species in the CALPUFF files, and it may or may not be appropriate to use it for repartitioning NO3/HNO3 (in option MNITRATE=1 or MNITRATE=3). Its use is controlled by NH3TYP. When NH3 is listed as a processed species in Subgroup (2a), as one of the NSPECINP ASPECI entries, and the right option is chosen for NH3TYP,

the NH3 modeled values from the CALPUFF concentration files will be used
in the chemical equilibrium calculation.

NH3TYP also controls when monthly background ammonia values are used. Both gaseous (NH3) and total (TNH3) ammonia can be provided monthly as BCKNH3/BCKTNH3.

What is the input source of Ammonia?
(NH3TYP) No Default ! NH3TYP = 3 !

0 = No background will be used.
ONLY NH3 from the concentration files listed in Subgroup (2a) as a processed species will be used.
(Cannot be used with MNITRATE=3)

1 = NH3 Monthly averaged background (BCKNH3) listed below will be added to NH3 from concentration files listed in Subgroup (2a)

2 = NH3 from background concentration file BCKGALM will be added to NH3 from concentration files listed in Subgroup (2a)
(ONLY possible for MNITRATE=3)

3 = NH3 Monthly averaged background (BCKNH3) listed below will be used alone.

4 = NH3 from background concentration file BCKGALM will be used alone
(ONLY possible for MNITRATE=3)

NH3TYP	NH3 CONC	NH3 FROM BCKNH3	NH3 FROM BCKGALM
0	X	0	0
1	X	X	0
2	X	0	X
3	0	X	0
4	0	0	X

Default monthly (12 values) background ammonia concentration (ppb) used for HNO3/NO3 partition:

Gaseous NH3 (BCKNH3) Default: -999
! BCKNH3 = 12*0.5 !

Total TNH3 (BCKTNH3) Default: -999
* BCKTNH3 = 1., 1., 1., 1.1, 1.4, 1.3, 1.3, 1.2, 4*1. *

If a single value is entered, this is used for all 12 months.
Month 1 is JANUARY, Month 12 is DECEMBER.

!END!

INPUT GROUP: 2 -- Species Processing Information

Subgroup (2a)

The following NSPECINP species will be processed:

! ASPECI = SO2 ! !END!
! ASPECI = SO4 ! !END!
! ASPECI = NOX ! !END!
! ASPECI = HNO3 ! !END!
! ASPECI = NO3 ! !END!
! ASPECI = PM10 ! !END!

```
-------------
Subgroup (2b)
-------------

  The following NSPECOUT species will be written:

! ASPECO =          SO2 !          !END!
! ASPECO =          SO4 !          !END!
! ASPECO =          NOX !          !END!
! ASPECO =         HNO3 !          !END!
! ASPECO =          NO3 !          !END!
! ASPECO =          SOA !          !END!
! ASPECO =           EC !          !END!
! ASPECO =         SOIL !          !END!
! ASPECO =          PMC !          !END!

-------------
Subgroup (2c)
-------------

  The following NSPECCMP species will be computed by scaling and summing
  one or more of the processed input species.  Identify the name(s) of
  the computed species and provide the scaling factors for each of the
  NSPECINP input species (NSPECCMP groups of NSPECINP+1 lines each):

NOTE: SO4 IS INPUT TO CALPUFF EXPLICITLY

! CSPECCMP =      SOA !
!      SO2  =      0.0 !
!      SO4  =      0.0 !
!      NOX  =      0.0 !
!     HNO3  =      0.0 !
!      NO3  =      0.0 !
!     PM10  =      0.006 !
!END!

! CSPECCMP =       EC !
!      SO2  =      0.0 !
!      SO4  =      0.0 !
!      NOX  =      0.0 !
!     HNO3  =      0.0 !
!      NO3  =      0.0 !
!     PM10  =    0.074 !
!END!

! CSPECCMP =     SOIL !
!      SO2  =      0.0 !
!      SO4  =      0.0 !
!      NOX  =      0.0 !
!     HNO3  =      0.0 !
!      NO3  =      0.0 !
!     PM10  =    0.921 !
!END!

! CSPECCMP =      PMC !
!      SO2  =      0.0 !
!      SO4  =      0.0 !
!      NOX  =      0.0 !
!     HNO3  =      0.0 !
!      NO3  =      0.0 !
!     PM10  =    0.000 !
!END!

-------------
Subgroup (2d)
-------------

  Each species in NSCALED CALPUFF data files may be scaled before being
  processed (e.g., to change the emission rate for all sources modeled
  in the run that produced a data file).  For each file, identify the
  file name and then provide the name(s) of the scaled species and the
  corresponding scaling factors (A,B where x' = Ax+B).
```

```
                A(Default=1.0)       B(Default=0.0)
                --------------       --------------

! MODDAT =..\PFIC19BV.CON  !
!       SO2 =     0.860,                0.0    !
!       SO4 =     0.860,                0.0    !
!       NOX =     0.860,                0.0    !
!      HNO3 =     0.860,                0.0    !
!       NO3 =     0.860,                0.0    !
!      PM10 =     0.860,                0.0    !
!END!
```

APPENDIX C

SAMPLE CALPOST MODEL CONTROL FILE FOR VISIBILITY

```
FPL WCEC UNIT 3 PROJECT - CALPOST FOR VISIBLITY            EPA  8/22/07
METHOD 2, EVERGLADES NP
4-km FL DOMAIN, 2002, ENP RECEPTORS
---------------- Run title (3 lines) ------------------------------------------

                    CALPOST MODEL CONTROL FILE
                    --------------------------

------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names
--------------

Input Files
-----------

File                        Default File Name
----                        -----------------
Conc/Dep Flux File          MODEL.DAT           ! MODDAT =..\EXAMPLE.CON  !
Relative Humidity File      VISB.DAT            ! VISDAT =..\..\VISB.DAT  !
Background Data File        BACK.DAT            *BACKDAT =   *
Transmissometer or          VSRN.DAT            *VSRDAT =    *
Nephelometer Data File       or
DATSAV Weather Data File     or
Prognostic Weather  File

Output Files
------------

File                        Default File Name
----                        -----------------
List File                   CALPOST.LST         ! PSTLST =EXAMPLEVIS.LST  !

Pathname for Timeseries Files    (blank)        * TSPATH =    *
(activate with exclamation points only if
providing NON-BLANK character string)

Pathname for Plot Files    (blank)              * PLPATH =    *
(activate with exclamation points only if
 providing NON-BLANK character string)

User Character String (U) to augment default filenames
(activate with exclamation points only if
 providing NON-BLANK character string)

Timeseries            TSERIES_ASPEC_ttHR_CONC_TSUNAM.DAT
Peak Value            PEAKVAL_ASPEC_ttHR_CONC_TSUNAM.DAT

                                                * TSUNAM =    *

Top Nth Rank Plot     RANK(ALL)_ASPEC_ttHR_CONC_TUNAM.DAT
                 or   RANK(ii)_ASPEC_ttHR_CONC_TUNAM.GRD

                                                * TUNAM =    *

Exceedance Plot        EXCEED_ASPEC_ttHR_CONC_XUNAM.DAT
                   or  EXCEED_ASPEC_ttHR_CONC_XUNAM.GRD

                                                * XUNAM =    *

Echo Plot
(Specific Days)
           yyyy_Mmm_Ddd_hh00(UTCszzzz)_L00_ASPEC_ttHR_CONC.DAT
     or    yyyy_Mmm_Ddd_hh00(UTCszzzz)_L00_ASPEC_ttHR_CONC.GRD


Visibility Plot       DAILY_VISIB_VUNAM.DAT    ! VUNAM =VTEST    !
(Daily Peak Summary)



Auxiliary Output Files
----------------------

File                        Default File Name
```

```
----                          -----------------
Visibility Change             DELVIS.DAT          ! DVISDAT = deciview.dat  !

------------------------------------------------------------------------------
All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case                ! LCFILES = T !
         F = UPPER CASE
NOTE: (1) file/path names can be up to 132 characters in length
NOTE: (2) Filenames for ALL PLOT and TIMESERIES FILES are constructed
          using a template that includes a pathname, user-supplied
          character(s), and context-specific strings, where
             ASPEC = Species Name
              CONC = CONC Or WFLX Or DFLX Or TFLX
                tt = Averaging Period (e.g. 03)
                ii = Rank (e.g. 02)
                hh = Hour(ending) in LST
             szzzz = LST time zone shift (EST is -0500)
              yyyy = Year(LST)
                mm = Month(LST)
                dd = day of month (LST)
          are determined internally based on selections made below.
          If a path or user-supplied character(s) are supplied, each
          must contain at least 1 non-blank character.

!END!
------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

     Option to run all periods found
     in the met. file(s)  (METRUN)        Default: 0   ! METRUN =   0  !

         METRUN = 0 - Run period explicitly defined below
         METRUN = 1 - Run all periods in CALPUFF data file(s)

     Starting date:    Year  (ISYR) --    No default   ! ISYR  =  2002   !
     (used only if     Month (ISMO) --    No default   ! ISMO  =  1    !
      METRUN = 0)      Day   (ISDY) --    No default   ! ISDY  =  1    !
                       Hour  (ISHR) --    No default   ! ISHR  =  1    !

     Number of hours to process (NHRS) -- No default   ! NHRS  =  8760  !

     Process every hour of data?(NREP) -- Default: 1   ! NREP  =  1  !
      (1 = every hour processed,
       2 = every 2nd hour processed,
       5 = every 5th hour processed, etc.)

Species & Concentration/Deposition Information
----------------------------------------------

      Species to process (ASPEC)       -- No default   ! ASPEC = VISIB !
      (ASPEC = VISIB for visibility processing)

      Layer/deposition code (ILAYER)   -- Default: 1   ! ILAYER = 1 !
        '1'  for CALPUFF concentrations,
        '-1' for dry deposition fluxes,
        '-2' for wet deposition fluxes,
        '-3' for wet+dry deposition fluxes.

      Scaling factors of the form:     -- Defaults:    ! A =  0.0    !
            X(new) = X(old) * A + B          A = 0.0   ! B =  0.0    !
        (NOT applied if A = B = 0.0)         B = 0.0

      Add Hourly Background Concentrations/Fluxes?
                               (LBACK)  -- Default: F   ! LBACK =  F !

Source information
------------------

  Option to process source contributions:
         0 =  Process only total reported contributions
         1 =  Sum all individual source contributions and process
```

```
        2 =  Run in TRACEBACK mode to identify source
             contributions at a SINGLE receptor
                          (MSOURCE) -- Default: 0    ! MSOURCE =  0  !

Receptor information
--------------------

  Gridded receptors processed?     (LG) -- Default: F    ! LG  = F  !
  Discrete receptors processed? '  (LD) -- Default: F    ! LD  = T  !
  CTSG Complex terrain receptors processed?
                                  (LCT) -- Default: F    ! LCT = F  !

--Report results by DISCRETE receptor RING?
  (only used when LD = T)      (LDRING) -- Default: F    ! LDRING = F  !

--Select range of DISCRETE receptors (only used when LD = T):

  Select ALL DISCRETE receptors by setting NDRECP flag to -1;
                               OR
  Select SPECIFIC DISCRETE receptors by entering a flag (0,1) for each
     0 = discrete receptor not processed
     1 = discrete receptor processed
  using repeated value notation to select blocks of receptors:
     23*1, 15*0, 12*1
  Flag for all receptors after the last one assigned is set to 0
  (NDRECP) -- Default: -1

  ! NDRECP = -1 !


--Select range of GRIDDED receptors (only used when LG = T):

       X index of LL corner (IBGRID) -- Default: -1      ! IBGRID = -1  !
           (-1 OR 1 <= IBGRID <= NX)

       Y index of LL corner (JBGRID) -- Default: -1      ! JBGRID = -1  !
           (-1 OR 1 <= JBGRID <= NY)

       X index of UR corner (IEGRID) -- Default: -1      ! IEGRID = -1  !
           (-1 OR 1 <= IEGRID <= NX)

       Y index of UR corner (JEGRID) -- Default: -1      ! JEGRID = -1  !
           (-1 OR 1 <= JEGRID <= NY)

  Note: Entire grid is processed if IBGRID=JBGRID=IEGRID=JEGRID=-1


--Specific gridded receptors can also be excluded from CALPOST
  processing by filling a processing grid array with 0s and 1s.  If the
  processing flag for receptor index (i,j) is 1 (ON), that receptor
  will be processed if it lies within the range delineated by IBGRID,
  JBGRID,IEGRID,JEGRID and if LG=T. If it is 0 (OFF), it will not be
  processed in the run.  By default, all array values are set to 1 (ON).

  Number of gridded receptor rows provided in Subgroup (1a) to
  identify specific gridded receptors to process
                          (NGONOFF) -- Default: 0       ! NGONOFF =  0  !

!END!


--------------
Subgroup (1a) -- Specific gridded receptors included/excluded
--------------

    Specific gridded receptors are excluded from CALPOST processing
    by filling a processing grid array with 0s and 1s.  A total of
    NGONOFF lines are read here.  Each line corresponds to one 'row'
    in the sampling grid, starting with the NORTHERNMOST row that
    contains receptors that you wish to exclude, and finishing with
    row 1 to the SOUTH (no intervening rows may be skipped).  Within
    a row, each receptor position is assigned either a 0 or 1,
    starting with the westernmost receptor.
       0 = gridded receptor not processed
       1 = gridded receptor processed
```

```
    Repeated value notation may be used to select blocks of receptors:
       23*1, 15*0, 12*1

    Because all values are initially set to 1, any receptors north of
    the first row entered, or east of the last value provided in a row,
    remain ON.

    (NGXRECP) -- Default: 1


------------------------------------------------------------------------------

INPUT GROUP: 2 -- Visibility Parameters (ASPEC = VISIB)
--------------

    Identify the Base Time Zone for the CALPUFF simulation
                          (BTZONE) -- No default    ! BTZONE =  5.!

    Particle growth curve f(RH) for hygroscopic species
                           (MFRH) -- Default: 2    ! MFRH   =  2  !

         1 =  IWAQM (1998) f(RH) curve (originally used with MVISBK=1)
         2 =  FLAG (2000) f(RH) tabulation
         3 =  EPA (2003) f(RH) tabulation

    Maximum relative humidity (%) used in particle growth curve
                           (RHMAX) -- Default: 98    ! RHMAX  = 95.0 !

    Modeled species to be included in computing the light extinction
     Include SULFATE?           (LVSO4) -- Default: T    ! LVSO4  = T  !
     Include NITRATE?           (LVNO3) -- Default: T    ! LVNO3  = T  !
     Include ORGANIC CARBON?    (LVOC)  -- Default: T    ! LVOC   = T  !
     Include COARSE PARTICLES? (LVPMC) -- Default: T    ! LVPMC  = T  !
     Include FINE PARTICLES?    (LVPMF) -- Default: T    ! LVPMF  = T  !
     Include ELEMENTAL CARBON? (LVEC)  -- Default: T    ! LVEC   = T  !

    And, when ranking for TOP-N, TOP-50, and Exceedance tables,
     Include BACKGROUND?        (LVBK)  -- Default: T    ! LVBK   = F  !

    Species name used for particulates in MODEL.DAT file
                  COARSE     (SPECPMC) -- Default: PMC ! SPECPMC = PMC !
                  FINE       (SPECPMF) -- Default: PMF ! SPECPMF = SOIL !

Extinction Efficiency (1/Mm per ug/m**3)
----------------------------------------
    MODELED particulate species:
              PM  COARSE       (EEPMC) -- Default: 0.6 ! EEPMC  = 0.6 !
              PM  FINE         (EEPMF) -- Default: 1.0 ! EEPMF  = 1.0 !
    BACKGROUND particulate species:
              PM  COARSE     (EEPMCBK) -- Default: 0.6 ! EEPMCBK = 0.6 !
    Other species:
             AMMONIUM SULFATE (EESO4) -- Default: 3.0 ! EESO4  = 3.0 !
             AMMONIUM NITRATE (EENO3) -- Default: 3.0 ! EENO3  = 3.0 !
             ORGANIC CARBON   (EEOC)  -- Default: 4.0 ! EEOC   = 4.0 !
             SOIL             (EESOIL)-- Default: 1.0 ! EESOIL = 1.0 !
             ELEMENTAL CARBON (EEEC)  -- Default: 10. ! EEEC   = 10.0 !

Background Extinction Computation
---------------------------------

    Method used for the 24h-average of percent change of light extinction:
    Hourly ratio of source light extinction / background light extinction
    is averaged?                (LAVER) -- Default: F    ! LAVER = F  !


    Method used for background light extinction
                           (MVISBK) -- Default: 2    ! MVISBK =  2  !

         1 =  Supply single light extinction and hygroscopic fraction
              - Hourly F(RH) adjustment applied to hygroscopic background
                and modeled sulfate and nitrate
         2 =  Compute extinction from speciated PM measurements (A)
              - Hourly F(RH) adjustment applied to observed and modeled sulfate
                and nitrate
```

```
        - F(RH) factor is capped at F(RHMAX)
    3 = Compute extinction from speciated PM measurements (B)
        - Hourly F(RH) adjustment applied to observed and modeled sulfate
          and nitrate
        - Receptor-hour excluded if RH>RHMAX
        - Receptor-day excluded if fewer than 6 valid receptor-hours
    4 = Read hourly transmissometer background extinction measurements
        - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
        - Hour excluded if measurement invalid (missing, interference,
          or large RH)
        - Receptor-hour excluded if RH>RHMAX
        - Receptor-day excluded if fewer than 6 valid receptor-hours
    5 = Read hourly nephelometer background extinction measurements
        - Rayleigh extinction value (BEXTRAY) added to measurement
        - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
        - Hour excluded if measurement invalid (missing, interference,
          or large RH)
        - Receptor-hour excluded if RH>RHMAX
        - Receptor-day excluded if fewer than 6 valid receptor-hours
    6 = Compute extinction from speciated PM measurements
        - FLAG monthly RH adjustment factor applied to observed and
          modeled sulfate and nitrate
    7 = Use observed weather or prognostic weather information for
        background extinction during weather events; otherwise, use Method 2
        - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
        - F(RH) factor is capped at F(RHMAX)
        - During observed weather events, compute Bext from visual range
          if using an observed weather data file, or
        - During prognostic weather events, use Bext from the prognostic
          weather file
        - Use Method 2 for hours without a weather event

Additional inputs used for MVISBK = 1:
---------------------------------------
 Background light extinction (1/Mm)
                        (BEXTBK) -- No default    ! BEXTBK = 0.0 !
 Percentage of particles affected by relative humidity
                        (RHFRAC) -- No default    ! RHFRAC = 0.0 !

Additional inputs used for MVISBK = 6:
---------------------------------------
 Extinction coefficients for hygroscopic species (modeled and
 background) are computed using a monthly RH adjustment factor
 in place of an hourly RH factor (VISB.DAT file is NOT needed).
 Enter the 12 monthly factors here (RHFAC).  Month 1 is January.

 (RHFAC)  -- No default      ! RHFAC = 0.0, 0.0, 0.0, 0.0,
                                       0.0, 0.0, 0.0, 0.0,
                                       0.0, 0.0, 0.0, 0.0 !

USED MVISBK = 6, DAILY EXTINCTIONS CALCULATED FROM MONTHLY F(RH) FROM TABLE A-2
IN "GUIDANCE FOR ESTIMATING NATURAL VISIBLITY CONDITIONS UNDER THE REGIONAL
HAZE RULE (EPA, 2003)".

Additional inputs used for MVISBK = 7:
---------------------------------------
 The weather data file (DATSAV abbreviated space-delimited) that
 is identified as VSRN.DAT may contain data for more than one
 station.  Identify the stations that are needed in the order in
 which they will be used to obtain valid weather and visual range.
 The first station that contains valid data for an hour will be
 used.  Enter up to MXWSTA (set in PARAMS file) integer station IDs
 of up to 6 digits each as variable IDWSTA, and enter the corresponding
 time zone for each, as variable TZONE (= UTC-LST).

 A prognostic weather data file with Bext for weather events may be used
 in place of the observed weather file.  Identify this as the VSRN.DAT
 file and use a station ID of IDWSTA = 999999, and TZONE = 0.

 NOTE:  TZONE identifies the time zone used in the dataset.  The
        DATSAV abbreviated space-delimited data usually are prepared
        with UTC time rather than local time, so TZONE is typically
        set to zero.

 (IDWSTA)    -- No default
```

```
     ! IDWSTA = 690230 ,80020 ,80140 !
      (TZONE)     -- No default
     ! TZONE  = 0.0 ,0.0 ,0.0 !

     Additional inputs used for MVISBK = 2,3,6,7:
     --------------------------------------------
      Background extinction coefficients are computed from monthly
      CONCENTRATIONS of ammonium sulfate (BKSO4), ammonium nitrate (BKNO3),
      coarse particulates (BKPMC), organic carbon (BKOC), soil (BKSOIL), and
      elemental carbon (BKEC).  Month 1 is January.
      (ug/m**3)

EXTINCTIONS FOR THE ENP ARE PROVIDED IN THE FLAG DOCUMENT (12/00)
NON-HYGROSCOPIC - 8.5
HYGROSCOPIC -  0.9/3 = 0.3
USED MVISBK = 6, DAILY EXTINCTIONS CALCULATED FROM MONTHLY RH FACTORS PROVIDED

      (BKSO4)   -- No default      ! BKSO4 = 0.3, 0.3, 0.3, 0.3,
                                             0.3, 0.3, 0.3, 0.3,
                                             0.3, 0.3, 0.3, 0.3 !
      (BKNO3)   -- No default      ! BKNO3 = 0.0, 0.0, 0.0, 0.0,
                                             0.0, 0.0, 0.0, 0.0,
                                             0.0, 0.0, 0.0, 0.0 !
      (BKPMC)   -- No default      ! BKPMC = 0.0, 0.0, 0.0, 0.0,
                                             0.0, 0.0, 0.0, 0.0,
                                             0.0, 0.0, 0.0, 0.0 !
      (BKOC)    -- No default      ! BKOC  = 0.0, 0.0, 0.0, 0.0,
                                             0.0, 0.0, 0.0, 0.0,
                                             0.0, 0.0, 0.0, 0.0 !
      (BKSOIL)  -- No default      ! BKSOIL= 8.5, 8.5, 8.5, 8.5,
                                             8.5, 8.5, 8.5, 8.5,
                                             8.5, 8.5, 8.5, 8.5 !
      (BKEC)    -- No default      ! BKEC  = 0.0, 0.0, 0.0, 0.0,
                                             0.0, 0.0, 0.0, 0.0,
                                             0.0, 0.0, 0.0, 0.0 !

     Additional inputs used for MVISBK = 2,3,5,6,7:
     ----------------------------------------------
      Extinction due to Rayleigh scattering is added (1/Mm)
                               (BEXTRAY) -- Default: 10.0 ! BEXTRAY = 10.0 !

RAYLEIGH SCATTERING TAKEN FROM TABLE A2 OF THE "REVISED IMPROVE ALGORITHM FOR ESTIMATING
LIGHT EXTINCTION FROM PARTICLE SPECIATION DATA".

!END!
-------------------------------------------------------------------------------

INPUT GROUP: 3 -- Output options
--------------

Documentation
-------------

     Documentation records contained in the header of the
     CALPUFF output file may be written to the list file.
     Print documentation image?
                               (LDOC) -- Default: F    !  LDOC =  F   !

Output Units
------------
     Units for All Output       (IPRTU) -- Default: 1    ! IPRTU =  1    !
                     for             for
                Concentration    Deposition
        1 =         g/m**3         g/m**2/s
        2 =        mg/m**3        mg/m**2/s
        3 =        ug/m**3        ug/m**2/s
        4 =        ng/m**3        ng/m**2/s
        5 =       Odour Units

     Visibility: extinction expressed in 1/Mega-meters (IPRTU is ignored)


Averaging time(s) reported
--------------------------
```

```
    1-hr averages            (L1HR) -- Default: T   !   L1HR = F   !

    3-hr averages            (L3HR) -- Default: T   !   L3HR = F   !

    24-hr averages          (L24HR) -- Default: T   !  L24HR = T   !

    Run-length averages     (LRUNL) -- Default: T   !  LRUNL = F   !

    User-specified averaging time in hours - results for
    an averaging time of NAVG hours are reported for
    NAVG greater than 0:
                            (NAVG) -- Default: 0   !   NAVG =  0   !
```

Types of tabulations reported

1) Visibility: daily visibility tabulations are always reported for the selected receptors when ASPEC = VISIB. In addition, any of the other tabulations listed below may be chosen to characterize the light extinction coefficients. [List file or Plot/Analysis File]

2) Top 50 table for each averaging time selected [List file only]

```
                           (LT50) -- Default: T   !   LT50 = T   !
```

3) Top 'N' table for each averaging time selected [List file or Plot file]

```
                          (LTOPN) -- Default: F   !  LTOPN = F   !
```

   -- Number of 'Top-N' values at each receptor selected (NTOP must be <= 4)

```
                           (NTOP) -- Default: 4   ! NTOP =  2   !
```

   -- Specific ranks of 'Top-N' values reported (NTOP values must be entered)

```
                  (ITOP(4) array) -- Default:     ! ITOP =  1,2  !
                                     1,2,3,4
```

4) Threshold exceedance counts for each receptor and each averaging time selected [List file or Plot file]

```
                         (LEXCD) -- Default: F   !  LEXCD = F   !
```

   -- Identify the threshold for each averaging time by assigning a non-negative value (output units).

```
                                  -- Default: -1.0
   Threshold for  1-hr averages    (THRESH1) !  THRESH1 = -1.0  !
   Threshold for  3-hr averages    (THRESH3) !  THRESH3 = -1.0  !
   Threshold for 24-hr averages   (THRESH24) ! THRESH24 = -1.0  !
   Threshold for NAVG-hr averages (THRESHN) !  THRESHN = -1.0  !
```

   -- Counts for the shortest averaging period selected can be tallied daily, and receptors that experience more than NCOUNT counts over any NDAY period will be reported. This type of exceedance violation output is triggered only if NDAY > 0.

```
   Accumulation period(Days)
                          (NDAY) -- Default: 0   !    NDAY =  0   !
   Number of exceedances allowed
                        (NCOUNT) -- Default: 1   !  NCOUNT =  1   !
```

5) Selected day table(s)

   Echo Option -- Many records are written each averaging period selected and output is grouped by day [List file or Plot file]

```
                    (LECHO) -- Default: F   !  LECHO = F  !

      Timeseries Option -- Averages at all selected receptors for
      each selected averaging period are written to timeseries files.
      Each file contains one averaging period, and all receptors are
      written to a single record each averaging time.
      [TSERIES_ASPEC_ttHR_CONC_TSUNAM.DAT files]
                    (LTIME) -- Default: F   !  LTIME = F  !

      Peak Value Option -- Averages at all selected receptors for
      each selected averaging period are screened and the peak value
      each period is written to timeseries files.
      Each file contains one averaging period.
      [PEAKVAL_ASPEC_ttHR_CONC_TSUNAM.DAT files]
                    (LPEAK) -- Default: F   !  LPEAK = F  !

        -- Days selected for output
                (IECHO(366)) -- Default: 366*0
           ! IECHO  = 366*0  !
           (366 values must be entered)

Plot output options
-------------------

     Plot files can be created for the Top-N, Exceedance, and Echo
     tables selected above.  Two formats for these files are available,
     DATA and GRID.  In the DATA format, results at all receptors are
     listed along with the receptor location [x,y,val1,val2,...].
     In the GRID format, results at only gridded receptors are written,
     using a compact representation.  The gridded values are written in
     rows (x varies), starting with the most southern row of the grid.
     The GRID format is given the .GRD extension, and includes headers
     compatible with the SURFER(R) plotting software.

     A plotting and analysis file can also be created for the daily
     peak visibility summary output, in DATA format only.

     Generate Plot file output in addition to writing tables
     to List file?
                          (LPLT) -- Default: F   ! LPLT  = F !

     Use GRID format rather than DATA format,
     when available?
                          (LGRD) -- Default: F   ! LGRD  = F !


Auxiliary Output Files (for subsequent analyses)
------------------------------------------------

      Visibility

      A separate output file may be requested that contains the change
      in visibility at each selected receptor when ASPEC = VISIB.  This
      file can be processed to construct visibility measures that are
      not available in CALPOST.

      Output file with the visibility change at each receptor?
                          (MDVIS) -- Default: 0   ! MDVIS  = 0 !

           0 =  Do Not create file
           1 =  Create file of DAILY (24 hour) Delta-Deciview
           2 =  Create file of DAILY (24 hour) Extinction Change (%)
           3 =  Create file of HOURLY Delta-Deciview
           4 =  Create file of HOURLY Extinction Change (%)


Additional Debug Output
-----------------------

   Output selected information to List file
    for debugging?
                          (LDEBUG) -- Default: F  ! LDEBUG  = F !

   Output hourly extinction information to REPORT.HRV?
```

(Visibility Method 7)

(LVEXTHR) -- Default: F ! LVEXTHR = F !

!END!

APPENDIX D

SAMPLE CALPOST MODEL CONTROL FILE FOR NITROGEN DEPOSITION

```
FPL WCEC UNIT 3 PROJECT - CALPOST N DEPOSITION IMPACTS   EPA   8/22/07
EVERGLADES NP
4-km FL DOMAIN, 2002, ENP RECEPTORS
---------------- Run title (3 lines) ------------------------------------------

                    CALPOST MODEL CONTROL FILE
                    --------------------------

------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names
--------------

Input Files
-----------

File                        Default File Name
----                        -----------------
Conc/Dep Flux File          MODEL.DAT           ! MODDAT =..\EXAMPLE.DEP   !
Relative Humidity File      VISB.DAT            * VISDAT =   *
Background Data File        BACK.DAT            *BACKDAT =   *
Transmissometer or          VSRN.DAT            *VSRDAT =    *
Nephelometer Data File       or
DATSAV Weather Data File     or
Prognostic Weather  File

Output Files
------------

File                        Default File Name
----                        -----------------
List File                   CALPOST.LST         ! PSTLST =EXAMPLENDEP.LST  !

Pathname for Timeseries Files    (blank)        * TSPATH =    *
(activate with exclamation points only if
providing NON-BLANK character string)

Pathname for Plot Files    (blank)              * PLPATH =    *
(activate with exclamation points only if
 providing NON-BLANK character string)

User Character String (U) to augment default filenames
(activate with exclamation points only if
 providing NON-BLANK character string)

Timeseries           TSERIES_ASPEC_ttHR_CONC_TSUNAM.DAT
Peak Value           PEAKVAL_ASPEC_ttHR_CONC_TSUNAM.DAT

                                             * TSUNAM =    *

Top Nth Rank Plot    RANK(ALL)_ASPEC_ttHR_CONC_TUNAM.DAT
                or   RANK(ii)_ASPEC_ttHR_CONC_TUNAM.GRD

                                             * TUNAM =     *

Exceedance Plot       EXCEED_ASPEC_ttHR_CONC_XUNAM.DAT
                  or  EXCEED_ASPEC_ttHR_CONC_XUNAM.GRD
```

```
                                                * XUNAM =    *

Echo Plot
(Specific Days)
           yyyy_Mmm_Ddd_hh00(UTCszzzz)_L00_ASPEC_ttHR_CONC.DAT
     or    yyyy_Mmm_Ddd_hh00(UTCszzzz)_L00_ASPEC_ttHR_CONC.GRD


Visibility Plot      DAILY_VISIB_VUNAM.DAT    ! VUNAM =VTEST    !
(Daily Peak Summary)



Auxiliary Output Files
----------------------

File                        Default File Name
----                        -----------------
Visibility Change           DELVIS.DAT           * DVISDAT = deciview.dat  *


------------------------------------------------------------------------------
All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case               ! LCFILES = T !
         F = UPPER CASE
NOTE: (1) file/path names can be up to 132 characters in length
NOTE: (2) Filenames for ALL PLOT and TIMESERIES FILES are constructed
          using a template that includes a pathname, user-supplied
          character(s), and context-specific strings, where
             ASPEC = Species Name
              CONC = CONC Or WFLX Or DFLX Or TFLX
                tt = Averaging Period (e.g. 03)
                ii = Rank (e.g. 02)
                hh = Hour(ending) in LST
             szzzz = LST time zone shift (EST is -0500)
              yyyy = Year(LST)
                mm = Month(LST)
                dd = day of month (LST)
          are determined internally based on selections made below.
          If a path or user-supplied character(s) are supplied, each
          must contain at least 1 non-blank character.

!END!
------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
-----------------

     Option to run all periods found
     in the met. file(s)  (METRUN)        Default: 0    ! METRUN =    0   !

         METRUN = 0 - Run period explicitly defined below
         METRUN = 1 - Run all periods in CALPUFF data file(s)

     Starting date:    Year  (ISYR) --    No default    ! ISYR  =  2002    !
```

```
      (used only if      Month (ISMO) --     No default    ! ISMO  =  1    !
       METRUN = 0)       Day   (ISDY) --     No default    ! ISDY  =  1    !
                         Hour  (ISHR) --     No default    ! ISHR  =  1    !

      Number of hours to process (NHRS) -- No default    ! NHRS  =  8760   !

      Process every hour of data?(NREP) -- Default: 1    ! NREP  =  1   !
       (1 = every hour processed,
        2 = every 2nd hour processed,
        5 = every 5th hour processed, etc.)

Species & Concentration/Deposition Information
----------------------------------------------

      Species to process (ASPEC)        -- No default    ! ASPEC = N !
      (ASPEC = VISIB for visibility processing)

      Layer/deposition code (ILAYER)    -- Default: 1    ! ILAYER = -3 !
        '1'  for CALPUFF concentrations,
        '-1' for dry deposition fluxes,
        '-2' for wet deposition fluxes,
        '-3' for wet+dry deposition fluxes.

      Scaling factors of the form:      -- Defaults:     ! A =  0.0     !
            X(new) = X(old) * A + B          A = 0.0     ! B =  0.0     !
        (NOT applied if A = B = 0.0)         B = 0.0

      Add Hourly Background Concentrations/Fluxes?
                               (LBACK)  -- Default: F    ! LBACK =  F !

Source information
------------------

  Option to process source contributions:
         0 =  Process only total reported contributions
         1 =  Sum all individual source contributions and process
         2 =  Run in TRACEBACK mode to identify source
              contributions at a SINGLE receptor
                             (MSOURCE) -- Default: 0    ! MSOURCE =  0  !

Receptor information
--------------------

  Gridded receptors processed?     (LG) -- Default: F    ! LG  = F  !
  Discrete receptors processed?    (LD) -- Default: F    ! LD  = T  !
  CTSG Complex terrain receptors processed?
                                  (LCT) -- Default: F    ! LCT = F  !

--Report results by DISCRETE receptor RING?
  (only used when LD = T)      (LDRING) -- Default: F    ! LDRING = F  !

--Select range of DISCRETE receptors (only used when LD = T):

  Select ALL DISCRETE receptors by setting NDRECP flag to -1;
                                OR
  Select SPECIFIC DISCRETE receptors by entering a flag (0,1) for each
     0 = discrete receptor not processed
```

```
      1 = discrete receptor processed
   using repeated value notation to select blocks of receptors:
      23*1, 15*0, 12*1
   Flag for all receptors after the last one assigned is set to 0
   (NDRECP) -- Default: -1

   ! NDRECP = -1 !


--Select range of GRIDDED receptors (only used when LG = T):

         X index of LL corner (IBGRID) -- Default: -1      ! IBGRID = -1  !
             (-1 OR 1 <= IBGRID <= NX)

         Y index of LL corner (JBGRID) -- Default: -1      ! JBGRID = -1  !
             (-1 OR 1 <= JBGRID <= NY)

         X index of UR corner (IEGRID) -- Default: -1      ! IEGRID = -1  !
             (-1 OR 1 <= IEGRID <= NX)

         Y index of UR corner (JEGRID) -- Default: -1      ! JEGRID = -1  !
             (-1 OR 1 <= JEGRID <= NY)

   Note: Entire grid is processed if IBGRID=JBGRID=IEGRID=JEGRID=-1


--Specific gridded receptors can also be excluded from CALPOST
   processing by filling a processing grid array with 0s and 1s.  If the
   processing flag for receptor index (i,j) is 1 (ON), that receptor
   will be processed if it lies within the range delineated by IBGRID,
   JBGRID,IEGRID,JEGRID and if LG=T. If it is 0 (OFF), it will not be
   processed in the run.  By default, all array values are set to 1 (ON).

   Number of gridded receptor rows provided in Subgroup (1a) to
   identify specific gridded receptors to process
                             (NGONOFF) -- Default: 0       ! NGONOFF =  0  !

!END!


--------------
Subgroup (1a) -- Specific gridded receptors included/excluded
--------------

    Specific gridded receptors are excluded from CALPOST processing
    by filling a processing grid array with 0s and 1s.  A total of
    NGONOFF lines are read here.  Each line corresponds to one 'row'
    in the sampling grid, starting with the NORTHERNMOST row that
    contains receptors that you wish to exclude, and finishing with
    row 1 to the SOUTH (no intervening rows may be skipped).  Within
    a row, each receptor position is assigned either a 0 or 1,
    starting with the westernmost receptor.
       0 = gridded receptor not processed
       1 = gridded receptor processed

    Repeated value notation may be used to select blocks of receptors:
       23*1, 15*0, 12*1
```

```
    Because all values are initially set to 1, any receptors north of
    the first row entered, or east of the last value provided in a row,
    remain ON.

    (NGXRECP) -- Default: 1

------------------------------------------------------------------------------

INPUT GROUP: 2 -- Visibility Parameters (ASPEC = VISIB)
--------------

    Identify the Base Time Zone for the CALPUFF simulation
                            (BTZONE) -- No default   ! BTZONE =  5.!

    Particle growth curve f(RH) for hygroscopic species
                              (MFRH) -- Default: 2   ! MFRH   =  2  !

        1 =  IWAQM (1998) f(RH) curve (originally used with MVISBK=1)
        2 =  FLAG (2000) f(RH) tabulation
        3 =  EPA (2003) f(RH) tabulation

    Maximum relative humidity (%) used in particle growth curve
                             (RHMAX) -- Default: 98   ! RHMAX  = 95.0 !

    Modeled species to be included in computing the light extinction
     Include SULFATE?          (LVSO4) -- Default: T   ! LVSO4  = T  !
     Include NITRATE?          (LVNO3) -- Default: T   ! LVNO3  = T  !
     Include ORGANIC CARBON?   (LVOC)  -- Default: T   ! LVOC   = T  !
     Include COARSE PARTICLES? (LVPMC) -- Default: T   ! LVPMC  = T  !
     Include FINE PARTICLES?   (LVPMF) -- Default: T   ! LVPMF  = T  !
     Include ELEMENTAL CARBON? (LVEC)  -- Default: T   ! LVEC   = T  !

    And, when ranking for TOP-N, TOP-50, and Exceedance tables,
     Include BACKGROUND?       (LVBK)  -- Default: T   ! LVBK   = F  !

    Species name used for particulates in MODEL.DAT file
                  COARSE    (SPECPMC) -- Default: PMC ! SPECPMC = PMC !
                  FINE      (SPECPMF) -- Default: PMF ! SPECPMF = SOIL !

Extinction Efficiency (1/Mm per ug/m**3)
----------------------------------------
    MODELED particulate species:
              PM  COARSE      (EEPMC) -- Default: 0.6 ! EEPMC  = 0.6 !
              PM  FINE        (EEPMF) -- Default: 1.0 ! EEPMF  = 1.0 !
    BACKGROUND particulate species:
              PM  COARSE    (EEPMCBK) -- Default: 0.6 ! EEPMCBK = 0.6 !
    Other species:
             AMMONIUM SULFATE (EESO4) -- Default: 3.0 ! EESO4  = 3.0 !
             AMMONIUM NITRATE (EENO3) -- Default: 3.0 ! EENO3  = 3.0 !
             ORGANIC CARBON   (EEOC)  -- Default: 4.0 ! EEOC   = 4.0 !
             SOIL             (EESOIL)-- Default: 1.0 ! EESOIL = 1.0 !
             ELEMENTAL CARBON (EEEC)  -- Default: 10. ! EEEC   = 10.0 !

Background Extinction Computation
---------------------------------
```

```
Method used for the 24h-average of percent change of light extinction:
Hourly ratio of source light extinction / background light extinction
is averaged?                (LAVER) -- Default: F    ! LAVER = F   !


Method used for background light extinction
                            (MVISBK) -- Default: 2    ! MVISBK =  2  !

     1 =  Supply single light extinction and hygroscopic fraction
          - Hourly F(RH) adjustment applied to hygroscopic background
            and modeled sulfate and nitrate
     2 =  Compute extinction from speciated PM measurements (A)
          - Hourly F(RH) adjustment applied to observed and modeled sulfate
            and nitrate
          - F(RH) factor is capped at F(RHMAX)
     3 =  Compute extinction from speciated PM measurements (B)
          - Hourly F(RH) adjustment applied to observed and modeled sulfate
            and nitrate
          - Receptor-hour excluded if RH>RHMAX
          - Receptor-day excluded if fewer than 6 valid receptor-hours
     4 =  Read hourly transmissometer background extinction measurements
          - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
          - Hour excluded if measurement invalid (missing, interference,
            or large RH)
          - Receptor-hour excluded if RH>RHMAX
          - Receptor-day excluded if fewer than 6 valid receptor-hours
     5 =  Read hourly nephelometer background extinction measurements
          - Rayleigh extinction value (BEXTRAY) added to measurement
          - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
          - Hour excluded if measurement invalid (missing, interference,
            or large RH)
          - Receptor-hour excluded if RH>RHMAX
          - Receptor-day excluded if fewer than 6 valid receptor-hours
     6 =  Compute extinction from speciated PM measurements
          - FLAG monthly RH adjustment factor applied to observed and
            modeled sulfate and nitrate
     7 =  Use observed weather or prognostic weather information for
          background extinction during weather events; otherwise, use Method
2

          - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
          - F(RH) factor is capped at F(RHMAX)
          - During observed weather events, compute Bext from visual range
            if using an observed weather data file, or
          - During prognostic weather events, use Bext from the prognostic
            weather file
          - Use Method 2 for hours without a weather event

Additional inputs used for MVISBK = 1:
---------------------------------------
 Background light extinction (1/Mm)
                            (BEXTBK) -- No default    ! BEXTBK = 0.0 !
 Percentage of particles affected by relative humidity
                            (RHFRAC) -- No default    ! RHFRAC = 0.0 !

Additional inputs used for MVISBK = 6:
---------------------------------------
```

```
      Extinction coefficients for hygroscopic species (modeled and
      background) are computed using a monthly RH adjustment factor
      in place of an hourly RH factor (VISB.DAT file is NOT needed).
      Enter the 12 monthly factors here (RHFAC).  Month 1 is January.

      (RHFAC)   -- No default      ! RHFAC = 0.0, 0.0, 0.0, 0.0,
                                             0.0, 0.0, 0.0, 0.0,
                                             0.0, 0.0, 0.0, 0.0 !

USED MVISBK = 6, DAILY EXTINCTIONS CALCULATED FROM MONTHLY F(RH) FROM TABLE A-2
IN "GUIDANCE FOR ESTIMATING NATURAL VISIBLITY CONDITIONS UNDER THE REGIONAL
HAZE RULE (EPA, 2003)".

    Additional inputs used for MVISBK = 7:
    --------------------------------------
      The weather data file (DATSAV abbreviated space-delimited) that
      is identified as VSRN.DAT may contain data for more than one
      station.  Identify the stations that are needed in the order in
      which they will be used to obtain valid weather and visual range.
      The first station that contains valid data for an hour will be
      used.  Enter up to MXWSTA (set in PARAMS file) integer station IDs
      of up to 6 digits each as variable IDWSTA, and enter the corresponding
      time zone for each, as variable TZONE (= UTC-LST).

      A prognostic weather data file with Bext for weather events may be used
      in place of the observed weather file.  Identify this as the VSRN.DAT
      file and use a station ID of IDWSTA = 999999, and TZONE = 0.

      NOTE:  TZONE identifies the time zone used in the dataset.  The
             DATSAV abbreviated space-delimited data usually are prepared
             with UTC time rather than local time, so TZONE is typically
             set to zero.

      (IDWSTA)    -- No default
    ! IDWSTA = 690230 ,80020 ,80140 !
      (TZONE)     -- No default
    ! TZONE  = 0.0 ,0.0 ,0.0 !

    Additional inputs used for MVISBK = 2,3,6,7:
    --------------------------------------------
      Background extinction coefficients are computed from monthly
      CONCENTRATIONS of ammonium sulfate (BKSO4), ammonium nitrate (BKNO3),
      coarse particulates (BKPMC), organic carbon (BKOC), soil (BKSOIL), and
      elemental carbon (BKEC).  Month 1 is January.
      (ug/m**3)

EXTINCTIONS FOR THE ENP ARE PROVIDED IN THE FLAG DOCUMENT (12/00)
NON-HYGROSCOPIC - 8.5
HYGROSCOPIC -  0.9/3 = 0.3
USED MVISBK = 6, DAILY EXTINCTIONS CALCULATED FROM MONTHLY RH FACTORS PROVIDED

      (BKSO4)   -- No default      ! BKSO4 = 0.3, 0.3, 0.3, 0.3,
                                             0.3, 0.3, 0.3, 0.3,
                                             0.3, 0.3, 0.3, 0.3 !
      (BKNO3)   -- No default      ! BKNO3 = 0.0, 0.0, 0.0, 0.0,
                                             0.0, 0.0, 0.0, 0.0,
```

```
                                          0.0, 0.0, 0.0, 0.0 !
    (BKPMC)   -- No default     ! BKPMC = 0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0 !
    (BKOC)    -- No default     ! BKOC  = 0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0 !
    (BKSOIL)  -- No default     ! BKSOIL= 8.5, 8.5, 8.5, 8.5,
                                          8.5, 8.5, 8.5, 8.5,
                                          8.5, 8.5, 8.5, 8.5 !
    (BKEC)    -- No default     ! BKEC  = 0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0 !

  Additional inputs used for MVISBK = 2,3,5,6,7:
  ----------------------------------------------
   Extinction due to Rayleigh scattering is added (1/Mm)
                          (BEXTRAY) -- Default: 10.0 ! BEXTRAY = 10.0 !

RAYLEIGH SCATTERING TAKEN FROM TABLE A2 OF THE "REVISED IMPROVE ALGORITHM FOR
ESTIMATING
LIGHT EXTINCTION FROM PARTICLE SPECIATION DATA".

!END!
--------------------------------------------------------------------------------

INPUT GROUP: 3 -- Output options
--------------

Documentation
-------------

    Documentation records contained in the header of the
    CALPUFF output file may be written to the list file.
    Print documentation image?
                               (LDOC) -- Default: F   !  LDOC =  F  !

Output Units
------------
    Units for All Output       (IPRTU) -- Default: 1   ! IPRTU =  1   !
                    for             for
                Concentration    Deposition
       1 =          g/m**3         g/m**2/s
       2 =         mg/m**3        mg/m**2/s
       3 =         ug/m**3        ug/m**2/s
       4 =         ng/m**3        ng/m**2/s
       5 =       Odour Units

   Visibility: extinction expressed in 1/Mega-meters (IPRTU is ignored)


Averaging time(s) reported
--------------------------

    1-hr averages           (L1HR) -- Default: T   !   L1HR = F  !

    3-hr averages           (L3HR) -- Default: T   !   L3HR = F  !
```

```
    24-hr averages          (L24HR) -- Default: T   !  L24HR = F  !

    Run-length averages     (LRUNL) -- Default: T   !  LRUNL = T  !

    User-specified averaging time in hours - results for
    an averaging time of NAVG hours are reported for
    NAVG greater than 0:
                            (NAVG) -- Default: 0   !   NAVG =  0  !
```

Types of tabulations reported
---

1) Visibility: daily visibility tabulations are always reported for the selected receptors when ASPEC = VISIB. In addition, any of the other tabulations listed below may be chosen to characterize the light extinction coefficients.
   [List file or Plot/Analysis File]

2) Top 50 table for each averaging time selected
   [List file only]
   (LT50) -- Default: T ! LT50 = F !

3) Top 'N' table for each averaging time selected
   [List file or Plot file]
   (LTOPN) -- Default: F ! LTOPN = T !

   -- Number of 'Top-N' values at each receptor selected (NTOP must be <= 4)
   (NTOP) -- Default: 4 ! NTOP = 1 !

   -- Specific ranks of 'Top-N' values reported (NTOP values must be entered)
   (ITOP(4) array) -- Default: 1,2,3,4 ! ITOP = 1 !

4) Threshold exceedance counts for each receptor and each averaging time selected
   [List file or Plot file]
   (LEXCD) -- Default: F ! LEXCD = F !

   -- Identify the threshold for each averaging time by assigning a non-negative value (output units).

   -- Default: -1.0

```
   Threshold for  1-hr averages   (THRESH1) !  THRESH1 = -1.0  !
   Threshold for  3-hr averages   (THRESH3) !  THRESH3 = -1.0  !
   Threshold for 24-hr averages  (THRESH24) ! THRESH24 = -1.0  !
   Threshold for NAVG-hr averages (THRESHN) !  THRESHN = -1.0  !
```

   -- Counts for the shortest averaging period selected can be tallied daily, and receptors that experience more than NCOUNT

```
      counts over any NDAY period will be reported.  This type of
      exceedance violation output is triggered only if NDAY > 0.

      Accumulation period(Days)
                        (NDAY) -- Default: 0    !     NDAY =   0   !
      Number of exceedances allowed
                      (NCOUNT) -- Default: 1    !   NCOUNT =   1   !


   5) Selected day table(s)

      Echo Option -- Many records are written each averaging period
      selected and output is grouped by day
      [List file or Plot file]
                           (LECHO) -- Default: F    !   LECHO = F   !

      Timeseries Option -- Averages at all selected receptors for
      each selected averaging period are written to timeseries files.
      Each file contains one averaging period, and all receptors are
      written to a single record each averaging time.
      [TSERIES_ASPEC_ttHR_CONC_TSUNAM.DAT files]
                           (LTIME) -- Default: F    !   LTIME = F   !

      Peak Value Option -- Averages at all selected receptors for
      each selected averaging period are screened and the peak value
      each period is written to timeseries files.
      Each file contains one averaging period.
      [PEAKVAL_ASPEC_ttHR_CONC_TSUNAM.DAT files]
                           (LPEAK) -- Default: F    !   LPEAK = F   !

        -- Days selected for output
                      (IECHO(366)) -- Default: 366*0
         ! IECHO  = 366*0  !
         (366 values must be entered)

Plot output options
-------------------

      Plot files can be created for the Top-N, Exceedance, and Echo
      tables selected above.  Two formats for these files are available,
      DATA and GRID.  In the DATA format, results at all receptors are
      listed along with the receptor location [x,y,val1,val2,...].
      In the GRID format, results at only gridded receptors are written,
      using a compact representation.  The gridded values are written in
      rows (x varies), starting with the most southern row of the grid.
      The GRID format is given the .GRD extension, and includes headers
      compatible with the SURFER(R) plotting software.

      A plotting and analysis file can also be created for the daily
      peak visibility summary output, in DATA format only.

      Generate Plot file output in addition to writing tables
      to List file?
                                  (LPLT) -- Default: F    ! LPLT  = F !

      Use GRID format rather than DATA format,
      when available?
```

```
                                (LGRD) -- Default: F   ! LGRD  = F !

Auxiliary Output Files (for subsequent analyses)
------------------------------------------------

      Visibility

      A separate output file may be requested that contains the change
      in visibility at each selected receptor when ASPEC = VISIB.  This
      file can be processed to construct visibility measures that are
      not available in CALPOST.

      Output file with the visibility change at each receptor?
                              (MDVIS) -- Default: 0   ! MDVIS  = 0 !

           0 =  Do Not create file
           1 =  Create file of DAILY (24 hour) Delta-Deciview
           2 =  Create file of DAILY (24 hour) Extinction Change (%)
           3 =  Create file of HOURLY Delta-Deciview
           4 =  Create file of HOURLY Extinction Change (%)


Additional Debug Output
-----------------------

   Output selected information to List file
    for debugging?
                             (LDEBUG) -- Default: F  ! LDEBUG  = F !

   Output hourly extinction information to REPORT.HRV?
    (Visibility Method 7)
                            (LVEXTHR) -- Default: F  ! LVEXTHR = F !

!END!
```