RMT®
Integrated Environmental Solutions

805 Las Cimas Parkway, Suite 300
Austin, TX 78746-6179
Telephone: 512-327-9840
Fax: 512-327-6163

April 24, 2007

Mr. Daniel Jamieson
Permit Engineer, Air Permits Division
Texas Commission on Environmental Quality
Building C, Mail Code 162
12100 Park 35 Circle
Austin, Texas 78753

AIR PERMITS DIVISION
APR 24 2007
RECEIVED

Subject: BART Exemption Demonstration
Sid Richardson Carbon, Ltd.
Big Spring Plant
Big Spring, Howard County
TCEQ Account: HT-0027-B
RN100226026
CN600131171

Dear Dan:

On behalf of Sid Richardson Carbon, Ltd. (Sid Richardson), RMT, Inc. (RMT) submits this Best Available Retrofit Technology (BART) Exemption Demonstration per 30 Texas Administrative Code §116.1510(b) for their carbon black manufacturing plant located in Big Spring, Howard County. An air dispersion modeling analysis conducted using a model and modeling guidelines approved by the executive director is attached. The results of this analysis demonstrate that the BART-eligible sources at this plant do not contribute to visibility impairment at any Class I area.

A summary of the maximum predicted changes in visibility at each applicable Class I area as predicted by the CALPUFF modeling analysis is provided in the table included as Attachment 1. The maximum predicted change in visibility was 0.409 deciviews at the Big Bend National Park for the 2002 modeling year. This is less than the 0.5 deciviews exemption value of §116.1510(b). Therefore, this facility is not subject to the BART Analysis and BART Control Implementation requirements of §116.1520 and §116.1530, respectively.

The modeling analysis follows the modeling protocol submitted on February 23, 2007, as revised to include a Federal Land Manager (FLM) comment received in your letter dated March 21, 2007 (identified as topic "6"). Specifically, guidance contained in Section F (page 11) and Appendix B (Input Group 11) in the TCEQ's *Best Available Retrofit Technology (BART) Modeling Protocol to Determine Sources Subject to BART in the State of Texas, January 2007* guidance document requires the use of a temporally and spatially invariant background ozone concentration (of 40 ppb) in the CALPUFF modeling analysis. The FLM prefers the use of hourly ozone background concentrations. Therefore, the CALPUFF modeling analysis was conducted using hourly ozone background concentrations provided by the TCEQ (in three ozone.dat files) in your March 21, 2007 email communication.

The modeling stack parameters are summarized on the tables included as Attachments 2 and 3. The modeled emissions are summarized on the tables included as Attachments 4 and 5. These emissions correspond to the maximum 24-hour average emissions between 2002 and 2005 as determined from actual production data and emission factors developed from stack test. An incinerator (EPN: 13A) build in 1996 (outside the BART applicability window) acts as a control device for thirteen carbon black reactors. Only Unit 3 reactors were built between 1962 and 1977. Following guidance received from Mr. Michael Wilhoit of the TCEQ, only the fraction of incinerator emissions originating from Unit 3 reactors was modeled. Additionally, SO_2 emitted from the incinerator was also modeled even though Unit 3 reactors emit sulfur in reduced form (H_2S or other reduced sulfur compounds).

A description of the electronic input and output files that are contained in the attached DVD media is included as Attachment 6. A copy of the February 23, 2007 BART Modeling Protocol is included as Attachment 7. A copy of the TCEQ letter listing comments to the proposed modeling protocol from the TCEQ Air Dispersion Modeling Team, FLMs, and United States Environmental Protection Agency (USEPA) is included as Attachment 8. A description of the modifications made to the original CALPUFF model code by Bowman Environmental, Inc. is included as Attachment 9.

Thank you for the modeling guidance you have provided for this project. If you have any questions, please call me at (512) 329-3161 or Mr. Long Nguyen of Sid Richardson at (817) 390-8604.

Sincerely,

RMT, Inc.

David L. Castro
Air Quality Specialist

Attachments

cc: Mr. Long B. Nguyen, Sid Richardson Carbon Ltd.
Mr. Riaz Bismilla, Sid Richardson Carbon Ltd.
Mr. Erik Snyder, EPA Region 6
Ms. Judith Logan, U.S. Forest Service
Mr. Michael George, National Park Service
Mr. Tim Allen, U.S. Fish and Wildlife Service
Mr. Larry Moon, RMT
Central Files

PROFESSIONAL ENGINEER CERTIFICATION

I, Larry A. Moon, a registered professional engineer in the State of Texas, Registration No. 69515, certify that this Best Available Retrofit Technology Exemption Modeling Demonstration for the Sid Richardson Carbon, Ltd. Big Spring Plant was prepared by me or by others under my direct supervision.

04-24-07

STATE OF TEXAS
LARRY A. MOON
69515
LICENSED
PROFESSIONAL ENGINEER

Larry A. Moon

ATTACHMENT 1
CALPUFF VISIBILITY MODELING RESULTS [1]
NOX, SOX AND PM10 [2]
MAXIMUM 24-HOUR EMISSIONS, 2002 - 2005
BIG SPRING - HT0027B
SID RICHARDSON CARBON LTD.

Class I Area [3]		Distance (km)	Direction	Postutil Output					
				Largest Daily Visibility Change (dv)			# Days with dv > 0.5		
				2001	2002	2003	2001	2002	2003
Big Bend	BIBE	334	Southwest	0.306	0.409	0.188			
Caney Creek	CACR	714	East-Northeast	0.117	0.093	0.106			
Carlsbad Caverns	GUMO	281	West	0.231	0.305	0.237			
Guadalupe Mountains	GUMO	317	West	0.216	0.259	0.352			
Hercules-Glade	HEGL	915	Northeast	0.061	0.100	0.114			
Mingo	MING	1148	Northeast	0.058	0.095	0.071			
Salt Creek	SACR	314	Northwest	0.357	0.295	0.228			
Upper Buffalo	UPBU	833	Northeast	0.095	0.116	0.093			
White Mountain	WHIT	421	West-Northwest	0.153	0.241	0.141			
Wichita Mountains	WIMO	365	Northeast	0.302	0.297	0.307			
MAXIMUM FOR YEAR				0.357	0.409	0.352			
MAXIMUM ANY YEAR				0.409					

[1] Using EPA2004 versions of CALPUFF, POSTUTIL AND CALPOST per TCEQ January 2007 BACT modeling protocol document.
[2] PM10 conservatively modeled as PM2.5 per TCEQ January 2007 BACT modeling protocol document.
[3] December 6, 2006 list of TCEQ-required Class I areas.

ATTACHMENT 2
PHYSICAL STACK PARAMETERS
SID RICHARDSON CARBON, LTD
BIG SPRING, TEXAS

EPN	FIN	Description	Location (m) NAD27 UTM		Elevation	Height	Diameter	Velocity	Temperature
			Easting	Northing	(ft)	(ft)	(ft)	(ft/s)	(F)
12A	DRY1006	U3 dryer stack	273,170.9	3,573,772.9	2,505.3	198	4.33	95.0	550
13A	PR1007	Incinerator	273,184.0	3,573,826.2	2505.3	166	13	30.3	578
SF-3	PR1007	U3 SBF vent	273,188.1	3,573,784.9	2505.3	50	1.25	84	160
DF-1	DRY1006	U1 DEBF South/North Vents	273,185.0	3,573,729.2	2503.5	135	2.5	86.6	400

ATTACHMENT 3
MODELED STACK PARAMETERS
SID RICHARDSON CARBON, LTD
BIG SPRING, TEXAS

Modeling Identifier	Location (km) WGS-G LCC		Zone	Height	Elevation	Diameter	Velocity	Temperature	Initial Sigma (m)		Vertical Momentum Flux Factor
	Easting	Northing		(m)	(m)	(m)	(m/sec)	(K)	Horizontal	Vertical	
12A	-414.7525	-845.4819	14	60.35	763.6	1.320	28.96	560.9	0	0	1.0
13A	-414.7525	-845.4819	14	50.60	763.6	3.962	9.24	576.5	0	0	1.0
SF3	-414.7525	-845.4819	14	15.24	763.6	0.381	25.60	344.3	0	0	1.0
DF1	-414.7551	-845.5822	14	41.15	763.1	0.762	26.40	477.6	0	0	1.0

ATTACHMENT 4
ACTUAL EMISSIONS (MAXIMUM 24-HOUR EMISSIONS, 2002 - 2005)
SID RICHARDSON CARBON, LTD
BIG SPRING, TEXAS

Modeling Identifier	SO2 (lb/hr)	NOX (lb/hr)	PM10 (lb/hr)
12A	241.0	15.89	8.879
13A	439.2	42.02	2.4738
SF3			0.5942
DF1			0.1565

ATTACHMENT 5
MODELED ACTUAL EMISSIONS - SCREENING ANALYSIS
SID RICHARDSON CARBON, LTD
BIG SPRING, TEXAS

Modeling Identifier	SO2 (g/sec)	SO4 (g/sec)	NOX (g/sec)	HNO3 (g/sec)	NO3 (g/sec)	PM10 (g/sec)	PM25 (g/sec)
12A	30.36	0	2.002	0	0	0	1.119
13A	55.34	0	5.295	0	0	0	0.3117
SF3	0	0	0	0	0	0	0.07487
DF1	0	0	0	0	0	0	0.01972

ATTACHMENT 6
INPUT / OUTPUT FILE STRUCTURE
BIG SPRING - HT0027B
SID RICHARDSON CARBON LTD.

Folder	Folder	Folder	Folder	Folder	Files
BigSpring	Ozone	---	---	---	ozone_2001.dat - TCEQ data ozone_2002.dat - TCEQ data ozone_2003.dat - TCEQ data
	CalMet	BART	2001	---	calpuff.inp - calpuff input calpuff.lst - calpuff output conc.dat - calpuff output dflx.dat - calpuff output visb.ZIP - calpuff output postutil.inp - postutil input postutil.lst - postutil output postutilconcout.dat - postutil output
				BigBend	calpost.inp - calpost input calpost.lst - calpost output
				Caney	calpost.inp - calpost input calpost.lst - calpost output
				Carlsbad	calpost.inp - calpost input calpost.lst - calpost output
				Guadalupe	calpost.inp - calpost input calpost.lst - calpost output
				HerculesGlade	calpost.inp - calpost input calpost.lst - calpost output
				Mingo	calpost.inp - calpost input calpost.lst - calpost output
				SaltCreek	calpost.inp - calpost input calpost.lst - calpost output
				Upper Buffalo	calpost.inp - calpost input calpost.lst - calpost output
				WhiteMtn	calpost.inp - calpost input calpost.lst - calpost output
				Wichita	calpost.inp - calpost input calpost.lst - calpost output

ATTACHMENT 6
INPUT / OUTPUT FILE STRUCTURE
BIG SPRING - HT0027B
SID RICHARDSON CARBON LTD.

Folder	Folder	Folder	Folder	Folder	Files
BigSpring	CalMet	BART	2002	---	calpuff.inp - calpuff input calpuff.lst - calpuff output conc.dat - calpuff output dflx.dat - calpuff output visb.ZIP - calpuff output postutil.inp - postutil input postutil.lst - postutil output postutilconcout.dat - postutil output
				BigBend	calpost.inp - calpost input calpost.lst - calpost output
				Caney	calpost.inp - calpost input calpost.lst - calpost output
				Carlsbad	calpost.inp - calpost input calpost.lst - calpost output
				Guadalupe	calpost.inp - calpost input calpost.lst - calpost output
				HerculesGlade	calpost.inp - calpost input calpost.lst - calpost output
				Mingo	calpost.inp - calpost input calpost.lst - calpost output
				SaltCreek	calpost.inp - calpost input calpost.lst - calpost output
				Upper Buffalo	calpost.inp - calpost input calpost.lst - calpost output
				WhiteMtn	calpost.inp - calpost input calpost.lst - calpost output
				Wichita	calpost.inp - calpost input calpost.lst - calpost output

ATTACHMENT 6
INPUT / OUTPUT FILE STRUCTURE
BIG SPRING - HT0027B

SID RICHARDSON CARBON LTD.

Folder	Folder	Folder	Folder	Folder	Files
BigSpring	CalMet	BART	2003	---	calpuff.inp - calpuff input calpuff.lst - calpuff output conc.dat - calpuff output dflx.dat - calpuff output visb.ZIP - calpuff output postutil.inp - postutil input postutil.lst - postutil output postutilconcout.dat - postutil output
				BigBend	calpost.inp - calpost input calpost.lst - calpost output
				Caney	calpost.inp - calpost input calpost.lst - calpost output
				Carlsbad	calpost.inp - calpost input calpost.lst - calpost output
				Guadalupe	calpost.inp - calpost input calpost.lst - calpost output
				HerculesGlade	calpost.inp - calpost input calpost.lst - calpost output
				Mingo	calpost.inp - calpost input calpost.lst - calpost output
				SaltCreek	calpost.inp - calpost input calpost.lst - calpost output
				Upper Buffalo	calpost.inp - calpost input calpost.lst - calpost output
				WhiteMtn	calpost.inp - calpost input calpost.lst - calpost output
				Wichita	calpost.inp - calpost input calpost.lst - calpost output

ATTACHMENT 7

MODELING PROTOCOL

RMT®
Integrated Environmental Solutions

805 Las Cimas Parkway, Suite 300
Austin, TX 78746-6179
Telephone: 512-327-9840
Fax: 512-327-6163

February 23, 2007

Mr. Daniel Jamieson
Permit Engineer, Air Permits Division
Texas Commission on Environmental Quality
Building C, Mail Code 162
12100 Park 35 Circle
Austin, Texas 78753

Subject: BART Modeling Protocol
Sid Richardson Carbon Ltd.
Big Spring Plant
Account No. HT-0027-B

Dear Dan:

On behalf of Sid Richardson Carbon Ltd. (Sid Richardson); RMT, Inc. (RMT) submits this Best Available Retrofit Technology (BART) modeling protocol for their carbon black manufacturing plant located in Big Spring, Howard County.

RMT proposes to closely follow the guidance contained in the Texas Commission on Environmental Quality (TCEQ) *Best Available Retrofit Technology (BART) Modeling Protocol to Determine Sources Subject to BART in the State of Texas, January 2007* document along with your clarifications. Since this guidance will be rigidly followed, the TCEQ's suggested protocol will not be reprinted here. However, here is a list of several key modeling topics.

1. The CALPUFF modeling components versions listed in Table 2 will be utilized. These correspond to the current regulatory version of the model.

2. RMT obtained a copy of the 2001 – 2003 CENRAP-developed CALMET datasets from Ms. Lee Warden of the Oklahoma Department of Environmental Quality for use in this CALPUFF screening level modeling. These screening datasets were compiled with the "no-obs" option (surface and upper air observational data was not utilized). Therefore, the maximum visibility impact will be reported in this screening analysis instead of the 98th percentile value.

3. The maximum 24-hour actual emissions that occurred between 2002 to 2005 will be modeled.

4. Per your instruction, emissions of volatile organic compounds (VOCs) will not be included in the CALPUFF modeling.

5. Sid Richardson does not posses detailed speciation of particulate matter emissions. Therefore, the guidance included in Section E will be followed and particulate matter with diameters less

RECEIVED
FEB 23 2007
AIR PERMITS DIVISION

than 10 micrometers (inhalable coarse particulate or PM_{10}) will be conservatively modeled as particulate matter with diameters less than 2.5 micrometers (fine particulate or $PM_{2.5}$).

6. Tables summarizing the proposed CALPUFF, POSTUTIL and CALPOST control file inputs are attached for your review and comments.

7. The Class I Areas listed in Table A-4 of *ADDENDUM I BART Exemption Screening Analysis, Draft December 6, 2006* will be modeled. The receptors developed by the National Park Service (NPS) for CALPUFF modeling at these Class I Areas will be utilized. These Class I Areas are summarized on page 5 of the attached CALPUFF Control File Inputs summary table.

8. The TCEQ's CALPUFF control file inputs of Appendix B includes a "base time zone" value equal to "6". However, the CENRAP-provided meteorological datasets were compiled with a time zone of "0" corresponding to Central Standard Time. Therefore CALPUFF variable XBTZ will be set equal to "0".

9. Tables summarizing the source parameters and emission rates that will be modeled are attached for your review and comments.

We appreciate your expeditious review of this protocol. Please call me at (512) 329-3161 if you have any questions regarding the proposed modeling analysis.

Sincerely,

RMT, Inc.

David L. Castro
Air Quality Specialist

Attachments

cc: Mr. Long Nguyen, Sid Richardson Carbon Ltd.
Mr. Riaz Bismilla, Sid Richardson Carbon Ltd.
Mr. Larry Moon, RMT
Central Files

MODELED STACK PARAMETERS
SID RICHARDSON CARBON, LTD
BIG SPRING, TEXAS

Modeling Identifier	Location (km) NAD27 UTM		Zone	Height	Elevation	Diameter	Velocity	Temperature	Initial Sigma (m)		Vertical Momentum Flux Factor
	Easting	Northing		(m)	(m)	(m)	(m/sec)	(K)	Horizontal	Vertical	
12A	273.1709	3573.7729	14	60.35	763.6	1.320	28.96	560.9	0	0	1.0
13A	273.1840	3573.8262	14	50.60	763.6	3.962	9.24	576.5	0	0	1.0
SF3	273.1881	3573.7849	14	15.24	763.6	0.381	25.60	344.3	0	0	1.0
DF1	273.1850	3573.7292	14	41.15	763.1	0.762	26.40	477.6	0	0	1.0

MODELED ACTUAL EMISSIONS - SCREENING
SID RICHARDSON CARBON, LTD
BIG SPRING, TEXAS

Modeling Identifier	SO2 (g/sec)	SO4 (g/sec)	NOX (g/sec)	HNO3 (g/sec)	NO3 (g/sec)	PM10 (g/sec)	PM25 (g/sec)
12A	30.36	0	2.002	0	0	0	1.119
13A	13.83	0	1.324	0	0	0	0.07792
SF3	0	0	0	0	0	0	0.07487
DF1	0	0	0	0	0	0	0.01972

ACTUAL EMISSIONS (MAXIMUM 24-HOUR EMISSIONS, 2002 - 2005)
SID RICHARDSON CARBON, LTD
BIG SPRING, TEXAS

Modeling Identifier	SO2		NOX		PM10	
	(TPY)	(lb/hr)	(TPY)	(lb/hr)	(TPY)	(lb/hr)
12A		241.0		15.89		8.879
13A		109.8		10.51		0.6184
SF3						0.5942
DF1						0.1565

CALPUFF Control File Inputs

INPUT GROUP 1: General Run Control Parameters					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
METRUN	Model all periods in met file?	0	0	0	No (all periods are identified)
IBYR	Starting year	--	2002	2002	Plus 2001 and 2003
IBMO	Starting month	--	1	1	
IBDY	Starting day	--	1	1	
IBHR	Starting hour	--	1	1	
XBTZ	Base time zone	--	6	0	CENRAP met dataset central time zone =0
IRLG	Length of run (hours)	--	8760	8760	2001 & 2002 = 8760 hrs, 2003 = 8748 hrs (8747 dc?)
NSPEC	Total number of MESOPUFF II chemical species modeled	5	7	7	
NSE	Number of species emitted	3	4	3	NOX, SO2 and PM25 only
METFM	Meteorological data format	1	1	1	CALMET unformatted file
AVET	Averaging time (minutes)	60	60	60	
PGTIME	Averaging time for PG - sigma v (minutes)	60	60	60	
INPUT GROUP 2: Technical Options					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
MGAUSS	Vertical distribution used in near field	1	1	1	Gaussian
MCTADJ	Terrain adjustment method	3	3	3	
MCTSG	Sub-grid scale complex terrain module flag	0	0	0	CTSG not modeled
MSLUG	Near-field puffs modeled as elongated slugs?	0	0	0	No
MTRANS	Transitional plume rise modeled?	1	1	1	Yes
MTIP	Stack tip downwash modeled?	1	1	1	Yes
MBDW	Method used to simulate building downwash?		1	1	ISC method
MSHEAR	Vertical wind shear above stack top modeled in plume rise?	0	0	0	No
MSPLIT	Puff splitting allowed?	0	0	0	No
MCHEM	Chemical mechanism flag	1	1	1	Transformation rates computed internally (MESOPUFF II scheme)
MAQCHEM	Aqueous phase transformation flag	0	0	0	Not modeled
MWET	Wet removal modeled?	1	1	1	Yes
MDRY	Dry deposition modeled?	1	1	1	Yes
MDISP	Method used to compute dispersion coefficients	3	3	3	PG dispersion coefficients in rural & MP coefficients in urban areas
MTURBVW	Sigma-v / sigma-theta, sigma-w measurements used?	3	3	3	Use both sigma-(v/theta) and sigma-w from PROFILE.DAT (note: not provided)
MDISP2	Backup mehtod used to compute dispersion when measured turbulance data are missing	3	3	3	PG dispersion coefficients in rural & MP coefficients in urban areas
MROUGH	PG sigma-y, sigma-z adjusted for roughness?	0	0	0	No
MPARTL	Partial plume penetration of elevated inversion?	1	1	1	Yes
MTINV	Strength of temperature inversion?	0	0	0	No
MPDF	PDF used for dispersion under convective conditions?	0	0	0	No
MSGTIBL	Sub-grid TIBL module used for shoreline?	0	0	0	No
MBCON	Boundary conditions (concentration) modeled?	0	0	0	No
MFOG	Configure for FOG model output?	0	0	0	No
MREG	TEST options specified to see if they conform to regulatory values?	1	1	1	Yes
INPUT GROUP 3: Species List					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
CSPEC	Chemical species modeled?	--	SO2 SO4 NOX HNO3 NO3 PM10 PM25	SO2 SO4 NOX HNO3 NO3 PM10 PM25	Modeled: All listed Emitted: SO2, NOX, PM10, PM25 Dry deposited: SO2, SO4, NOX, HNO3, NO3, PM10, PM25
INPUT GROUP 4: Map Projection and Grid Control Parameters					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
PMAP	Map projection		LCC	LCC	Lambert conformal conic
FEAST	False easting		0	0	
FNORT	False northing		0	0	
RLATO	Latitude		40N	40N	
RLONG	Longitude		97W	97W	
XLAT1	Matching parallel(s) of latitude for projection		33N	33N	

CALPUFF Control File Inputs

Variable	Description	Default	TCEQ	RMT	Comments
XLAT2	Matching parallel(s) of latitude for projection		45N	45N	
DATUM	Daum region for the coordinates		WGS-G	WGS-G	WGS-84 GRS 80 speroid, global coverage (WGS84)
NX	No. X grid cells in meteorological grid		306	306	
NY	No. Y grid cells in meteorological grid		246	246	
NZ	No. vertical layers in meteorological grid		10	10	
DGRIDKM	Grid spacing (km)		6	6	
ZFACE	Cell face heights in meteorological grid (m)	--	0, 20, 40, 80, 160, 320, 640, 1200, 2000, 3000, 4000	0, 20, 40, 80, 160, 320, 640, 1200, 2000, 3000, 4000	
XORIGKM	Reference coordinates of SW corner of grid cell (1,1) (km)	--	-1008	-1008	
YORIGKM	Reference coordinates of SW corner of grid cell (1,1) (km)	--	-1620	-1620	
IBCOMP	X index of lower left corner of computational grid	--	1	1	
JBCOMP	Y index of lower left corner of computational grid	--	1	1	
IECOMP	X index of upper right corner of computational grid	--	306	306	
JECOMP	Y index of upper rightcorner of computational grid	--	246	246	
LSAMP	Sampling grid used?	1	0	0	No, receptors only in Class I areas assessed
IBSAMP	X index of lower left corner of sampling grid	--	--	--	
JBSAMP	Y index of lower left corner of sampling grid	--	--	--	
IESAMP	X index of upper right corner of sampling grid	--	--	--	
JESAMP	Y index of upper rightcorner of sampling grid	--	--	--	
MESHDN		1	1	1	
INPUT GROUP 5: Output Options					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
SPECIES	Species (or group) list for output option				Concentrations saved for SO2, SO4, NOX, HNO3, NO3, PM10, PM25
INPUT GROUP 6: Subgrid Scal Complex Terrain (CTSG) Inputs					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
NHILL	Number of terrain features	0	0	0	
NCTREC	Number of special compex terrain receptors	0	0	0	
MHILL	Terrain and CTSG receptor data for CTSG hills input in CTDM format?	--	2	2	Hill data created by OPHILL & input data below in subgroup 6b; receptor data in subgroup 6c; (Note: no data provided)
XHILL2M	Factor to convert horizontal dimensions to meters	1	1	1	
ZHILL2M	Factor to convert vertical dimensions to meters	1	1	1	
XCTDMKM	X-origin of CTDM system relative to CALPUFF coordinate system (km)	--	0	0	
YCTDMKM	Y-origin of CTDM system relative to CALPUFF coordinate system (km)	--	0	0	
INPUT GROUP 7: Chemical Parameters for Dry Deposition of Gases					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
SPECIES			-->	-->	SO2; NOX; HNO3
DIFFUSVTY	Diffusivity		-->	-->	0.1509; 0.1656; 0.1628
ALPHA STR	Alpha Star		-->	-->	1000; 1; 1
REACTVTY	Reactivity		-->	-->	8; 8; 18
MESO RES	Mesophyll resistance		-->	-->	0; 5; 0
HENRYS C	Henry's law coefficient		-->	-->	0.04; 3.5; 8.0E-8
INPUT GROUP 8: Size Parameters for Dry Deposition of Particles					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
SPECIES			-->	-->	SO4; NO3; PM10; PM25
GEO.MASS.MEAN DIA.	Geometric mass mean diameter (µm)		-->	-->	0.48; 0.48; 0.48; 0.48
GEO.STAND.DEV.	Geometric standard deviation (µm)		-->	-->	2; 2; 2; 2
INPUT GROUP 9: Miscellaneous Dry Deposition Parameters					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
RCUTR	Reference cuticle resistance (s/cm)	30	30	30	
RGR	Reference ground resistance (s/cm)	10	10	10	
REACTR	Reference pollutant reactivity	8	8	8	

CALPUFF Control File Inputs

Variable	Description	Default	TCEQ	RMT	Comments
NINT	Number of particle-sized intervals to evaluate effective particle deposition velocity	9	9	9	
IVEG	Vegetation state in unirrigated areas	1	1	1	Active and unstressed
INPUT GROUP 10: Wet Deposition Parameters					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
POLL			-->	-->	TCEQ: SO2; SO4; NOX; HNO3; NO3 RMT: SO2; SO4; NOX; HNO3; NO3; PM10; PM25
LIQ PRECIP	Scavenging coefficient for liquid precipitation (s^{-1})		-->	-->	TCEQ: 3E-5; 1E-4; 0; 6E-5; 1E-4 RMT: 3E-5; 1E-4; 0; 6E-5; 1E-4; 1E-4; 0
FRZ PRECIP	Scavenging coefficient for frozen precipitation (s^{-1})		-->	-->	TCEQ: 0; 3E-5; 0; 0; 3E-5 RMT: 0; 3E-5; 0; 0; 3E-5; 3E-5; 0
INPUT GROUP 11: Chemistry Parameters					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
MOZ	Ozone data input option	1	0	0	
BCKO3	Background ozone concentrations (ppm)	80	40	40	
BCKNH3	Background ammonia concentrations (ppm)	10	3	3	
RNITE1	Nitetime SO2 loss rate (%/hr)	0.2	0.2	0.2	
RNITE2	Nitetime NOX loss rate (%/hr)	2	2	2	
RNITE3	Nitetime HNO3 formation rate (%/hr)	2	2	2	
MH2O2	H2O2 data input option	1	1	1	
BCKH2O2	Background monthly H2O2 concentrations	1	--	--	Not used; MQACHEM=0
BCKPMF	Fine particulate concentration for SOA option	1	--	--	Not used; MCHEM=1
OFRAC	Organic fraction of fine particulate for SOA option	0.2	--	--	Not used; MCHEM=1
VCNX	VOC/NOX ratio for SOA option	50	--	--	Not used; MCHEM=1
INPUT GROUP 12: Miscellaneous Dispersion and Computational Parameters					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
SYTDEP	Hoizontal size of puff (m) beyound which the time-dependent dispersion equations of Heffter (1965) are used	550	550	550	
MHFTSZ	Switch for using Heffter equation for sigma-z	0	0	0	Do not use Heffter formulas for sigma-z
JSUP	Stability class used to determine plume growth rates for puffs above boundary layer	5	5	5	
CONK1	Vertical dispersion constant for stable conditions	0.01	0.01	0.01	
CONK2	Vertical dispersion constant for neutral/unstable conditions	0.1	0.1	0.1	
TBD	Factor determining transition-point from Schulman-Scire to Huber-Snyder building downwash scheme	0.5	0.5	0.5	No building downwash used
IURB1	Lower range of land use categories for which urban dispersion is assumed	10	10	10	
IURB2	Upper range of land use categories for which urban dispersion is assumed	19	19	19	
ILANDUIN	Land use category for modeling domain	20	--	--	METFM=1, not used
ZOIN	Roughness length (m) for modeling domain	-0.25	--	--	METFM=1, not used
XLAIIN	Leaf area index for modeling domain	3	--	--	METFM=1, not used
ELEVIN	Elevation above sea level	0	--	--	METFM=1, not used
XLATIN	Latitude (degrees) for met location	-999	--	--	METFM=1, not used
XLONIN	Longitude (degrees) for met location	-999	--	--	METFM=1, not used
ANEMHT	Anemometer height (m)	10	--	--	METFM=1, not used
ISIGMAV	Form of lateral turbulance data in PROFILE.DAT	1	1	1	Read sigma-v
IMIXCTDM	Choice of mixing heights	0	--	--	METFM=1, not used
XMXLEN	Maximum length of emitted slug in meteorological grid units	1	1	1	
XSAMLEN	Maximum travel distance of a puff/slug in meteorological grid units during one sampling step	1	1	1	
MXNEW	Maximum number of puffs/slugs released from one source during one time step	99	99	99	
MXSAM	Maximum number of sampling steps for one puff/slug during one time step	99	99	99	
NCOUNT	Number of iterations used when computing the transport wind for a sampling step that includes gradual rise	2	2	2	
SYMIN	Minimum sigma-y (m) for a new puff/slug	1	1	1	

CALPUFF Control File Inputs

Variable	Description	Default	TCEQ	RMT	Comments
SZMIN	Minimum sigma-z (m) for a new puff/slug	1	1	1	
SVMIN	Default minimum turbulence velocities sigma-v (m/sec) for each stability class	-->	-->	-->	A B C D E F .5 .5 .5 .5 .5 .5
SWMIN	Default minimum turbulence velocities sigma-w (m/sec) for each stability class	-->	-->	-->	A B C D E F .2 .12 .08 .06 .03 .016
CDIV	Divergence criterion for dw/dz (1/sec) across puff used to initiate adjustment ofr horizontal convergence	0.01	0, 0	0, 0	
WSALM	Minimum wind speed allowed for non-calm conditions. Used a minimum speed returned when using power-law extrapolation towards surface	0.5	0.5	0.5	
XMAXZI	Maximum mixing height (m)	3000	4000	4000	Top interface in CALMET simulation
XMINZI	Minimum mixing height (m)	50	20	20	
WSCAT	Default wind speed classes	-->	-->	-->	1 2 3 4 5 1.54 3.09 5.14 8.23 10.80
PLXO	Default wind speed profile power-law exponents for stabilities 1 - 6	-->	-->	-->	A B C D E F .07 .07 .10 .15 .35 .55
PTGO	Default potential temperature gradient for stable classes E, F (degK/m)	-->	-->	-->	0.020, 0.035
PPC	Default plume path coeffients for each stability class (when MCTADJ=3)	-->	-->	-->	A B C D E F .5 .5 .5 .5 .35 .35
SL2PF	Slug-to-puff transitions criterion factor equal to sigma-y/length of slug	10	10	10	
NSPLIT	Number of puffs that result every time a puff is split	3	3	3	
IRESPLIT	Time of day when split puffs are eligible to be split once again; this is typically set once per day, around sunset before nocturnal shear develops	--	-->	-->	Hour 18 = 1
ZISPLIT	Split is allowed only if last hour's mixing height (m) exceeds a minimum value	100	100	100	
ROLDMAX	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 minimum value	0.25	0.25	0.25	
NSPLITH	Number of puffs that result every time a puff is split	5	5	5	
SYSPLITH	Minimum sigma-y of puff before it may be split	1	1	1	
SHSPLITH	Minimum puff elongation rate due to wind shear, before it may be split	2	2	2	
CNSPLITH	Minimum concentration of each species in puff before it may be split	1E-07	1E-07	1E-07	
EPSSLUG	Fractional convergence criterion for numerical SLUG sampling integration	1E-04	1E-04	1E-04	
EPSAREA	Fractional convergence criterion for numerical AREA source integration	1E-06	1E-06	1E-06	
DSRISE	Trajectory step-length (m) used for numerical rise integration	1	1	1	
HTMINBC	Minimum height (m) to which BC puffs are mixed as they are emitted. Actual height is reset to the current mixing height at the release point if greater than this minimum		500	500	
RSAMPBC	Search radius (in BC segment lengths) about a receptor for samplinig nearest BC puff. BC puffs are emitted with a spacing of one segment length, so the search radius should be greater than 1.		10	10	
MDEPBC	Near-surface depletion adjustment to concentration profile used when sampling BC puffs?		1	1	Adjust concentration for depletion
INPUT GROUP 13: Point Source Parameters					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
NPT1	Number of point sources with constant stack parameters or variable emission rate scale factors	--	--	4	Constant stack parameters
IPTU	Units used for point source emissions	1	1	1	g/sec
NSPT1	Number of source-species combinations with variable emissions scaling factors	0	0	0	

CALPUFF Control File Inputs

Variable	Description	Default	TCEQ	RMT	Comments
NPT2	Number of point sources with variable emission parameters provided in external file	--	0	0	
SIGYZI	Initial sigma-y and sigma-z (m)	0, 0	--	0, 0	
FMFAC	Vertical momentum flux factor	1	--	1	Full momentum, no rain cap
INPUT GROUP 14: Area Source Parameters - Not Used **INPUT GROUP 15: Line Source Parameters - Not Used** **INPUT GROUP 16: Volume Source Parameters - Not Used** **INPUT GROUP 17: Non-gridded (Descrete) Receptor Information**					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
NREC	Number of non-gridded receptors	--	0 - 3996	1526	Derived from NPS Class I area database.
				480	BIBE - Big Bend (TX)
				80	CACR - Caney Creek (AR)
				256	GUMO - Carlsbad Caverns (NM)
				127	GUMO - Guadalupe Mountains (TX)
				80	HEGL - Hercules Glades (MO)
				47	MING - Mingo (MO)
				55	SACR - Salt Creek (NM)
				72	UPBU - Upper Buffalo (AR)
				270	WHIT - White Mountain (NM)
				59	WIMO - Wichita Mountains (OK)

POSTUTIL Control File Inputs

INPUT GROUP 1: General Run Control Parameters					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
ISYR	Starting Year	--	2002	2002	2001 and 2003 also modeled
ISMO	Starting Month	--	1	1	
IDY	Starting Day	--	1	1	
ISHR	Starting Hour	--	1	1	
NPER	Number of periods to process	--	8760	8760	2001 & 2002 = 8760 hrs, 2003 = 8748 hrs (8747 dc?)
NSPECINP	Number of species to process from CALPUFF run	--	7	7	
NSPECOUT	Number of species to write to output file	--	7	7	
NSPECCMP	Number of species to compute from those modeled	--	0	0	
MDUPLCT	Stop run if duplicate species names found?	--	0	0	
NSCALED	Number of CALPUFF data files that will be scaled	--	0	0	
MNITRATE	Re-compute HNO3/NO3 partition for concentrations?	--	1	1	Yes, for all sources combined
BCKNH3	Default ammonia concentrations used for HNO3/NO3 partition	10	3	3	12*3
INPUT GROUP 2: Species Processing Information					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
ASPECI	NSPECINP species will be processed	--	-->	-->	SO2, SO4, NOX, HNO3, NO3, PM10, PM25
ASPECO	NSPECOUT species will be written	--	-->	-->	SO2, SO4, NOX, HNO3, NO3, PM10, PM25
CSPECCMP	Nitrogen species to be computed by scaling and summing one or more of the processed input species using the scaling factors for each of the NSPECINP input species	--	--	--	Not used
CSPECCMP	Sulfur species to be computed by scaling and summing one or more of the processed input species using the scaling factors for each of the NSPECINP input species	--	--	--	Not used
MODDAT	Each species in NSCALED CALPUFF data files may be scaled before processing (e.g. to change the emission rate for all sources modeled in the run that produced a data file). For each scaled species the scaling factors are A and B where x' = Ax + B	--	--	--	Not used

CALPOST Control File Inputs

INPUT GROUP 1: General Run Control Parameters					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
METRUN	Option to run all periods found in met files	--	0	0	Run period explicity defined
ISYR	Starting Year	--	2002	2002	2001 and 2003 also modeled
ISMO	Starting Month	--	1	1	
IDY	Starting Day	--	1	1	
ISHR	Starting Hour	--	1	1	
NHRS	Number of periods to process	--	8760	8760	2001 & 2002 = 8760 hrs, 2003 = 8748 hrs (8747 dc?)
NREP	Process every hour of data?	1	1	1	Every hour processed
ASPEC	Species to process	--	VISIB	VISIB	Visiblility processed
ILAYER	Layer/deposition code	1	1	1	CALPUFF concentrations
A, B	Scaling factors X(new) = X(old)*A + B	0, 0	0, 0	0, 0	
LBACK	Add hourly background concentrations/fluxes?	0	0	0	
MSOURCE	Option to process source contributions		0	0	
LG	Gridded receptors processed?	0	0	0	
LD	Descrete receptors processed?	0	1	1	Receptors located only in Class I areas assessed
LCT	CTSG complex terrain receptors processed?	0	0	0	
LDRING	Report results by DISCRETE receptor RING?	0	0	0	
NDRECP	Flag for all receptors after the last one is assigned is set to "0"	-1	-1	-->	All modeled receptors are manually set to 1 or 0
IBGRID	Range of grided receptors	-1	-1	-1	(When LG=1), Entire grid processed if = -1
JBGRID	Range of grided receptors	-1	-1	-1	(When LG=1), Entire grid processed if = -1
IEGRID	Range of grided receptors	-1	-1	-1	(When LG=1), Entire grid processed if = -1
JEGRID	Range of grided receptors	-1	-1	-1	(When LG=1), Entire grid processed if = -1
NGONOFF	Number of gridded receptor rows provided to identify specific gridded receptors to process	0	0	0	
BTZONE	Base time zone for the CALPUFF simulation		6	6	
MFRH	Particle growth curve f(RH) for hygroscopic species		2	2	FLAG (2000) f(RH) tabulation. Not used
INPUT GROUP 2: Species Processing Information					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
RHMAX	Maximum relative humidity (%) used in particle growth curve	98	--	--	Not Used
LVSO4	Modeled species to be included in computing light extinction	1	1	1	
LVNO3	Modeled species to be included in computing light extinction	1	1	1	
LVOC	Modeled species to be included in computing light extinction	1	0	0	
LVPMC	Modeled species to be included in computing light extinction	1	1	1	
LVPMF	Modeled species to be included in computing light extinction	1	1	1	
LVEC	Modeled species to be included in computing light extinction	1	0	0	
LVBK	Include BACKGROUND when ranking for TOP-N, TOP-50 and exceedence tables?	1	1	1	
SPECPMC	Species name for particulate in MODEL.DAT file	PMC	PM10	PM10	
SPECPMF	Species name for particulate in MODEL.DAT file	PMF	PM25	PM25	
EEPMC	Extinction efficiency for coarse particulates	0.6	0.6	0.6	
EEPMF	Extinction efficiency for fine particulates	1	1	1	
EEPMCBK	Extinction efficiency for coarse particulate background	0.6	0.6	0.6	
EESO4	Extinction efficiency for ammonium sulfate	3	3	3	
EENO3	Extinction efficiency for ammonium nitrate	3	3	3	
EEOC	Extinction efficiency for organic carbon	4	4	4	
EESOIL	Extinction efficiency for soil	1	1	1	
EEEC	Extinction efficiency for elemental carbon	10	10	10	
LAVER	Background extinction computation		0	0	

CALPOST Control File Inputs

Variable	Description	Default	TCEQ	RMT	Comments
MVISBK	Method used for background light extinction	2	6	6	Compute extinction from speciated PM measurements, FLAG RH adjustment factor applied to observed and modeled sulfate and nitrate
RHFAC	Extinction coefficients for hygroscopic species (modeled and background) Monthly RH adjustment factors.	12*value	-->	-->	From Table 4 in TCEQ protocol document
BKSO4	Monthly conc to compute background extinction coefficients	-->	-->	-->	From Table 5 in TCEQ protocol document
BKNO3	Monthly conc to compute background extinction coefficients	-->	-->	-->	From Table 5 in TCEQ protocol document
BKPMC	Monthly conc to compute background extinction coefficients	-->	-->	-->	From Table 5 in TCEQ protocol document
BKOC	Monthly conc to compute background extinction coefficients	-->	-->	-->	From Table 5 in TCEQ protocol document
BKSOIL	Monthly conc to compute background extinction coefficients	-->	-->	-->	From Table 5 in TCEQ protocol document
BKEC	Monthly conc to compute background extinction coefficients	-->	-->	-->	From Table 5 in TCEQ protocol document
BEXTRAY	Extinction due to Rayleigh scattering (1/Mm)	10	10	10	
INPUT GROUP 3: Output Options					
Variable	**Description**	**Default**	**TCEQ**	**RMT**	**Comments**
IPRTU	Units for all output	1	3	3	micrograms/cubic meter
L1HR	Report 1 hr averaging time	1	0	0	
L3HR	Report 3 hr averaging time	1	0	0	
L24HR	Report 24 hr averaging time	1	1	1	
LRUNL	Report run-length (annual) averaging time	1	0	0	
LTOP50	Visivility: Top 50 table for each averaging period selected	1	0	0	
LTOPN	Visivility: Top "N" table for each averaging period selected	0	0	0	
NTOP	Number of "Top-N" values at each receptors selected (NTOP must be <= 4)	4	4	4	Variable not applicable if NTOPN = 0
ITOP	Ranks of "Top-N" values at each receptor	1,2,3,4	0	0	
MDVIS	Output file with visibility change at each receptor?		0	0	Create file of DAILY (24-hour) delta-deciview. Grid model run.

ATTACHMENT 8

TCEQ/EPA/FLM COMMENTS TO MODELING PROTOCOL

March 21, 2007

Mr. David Castro
RMT, Inc.
805 Las Cimas Parkway, Suite 300
Austin, Texas 78746-6179

Re: BART Modeling Protocol for Sid Richardson Carbon, Ltd.

Dear Mr. Castro:

Your modeling protocol document dated February 23, 2007 has been reviewed by the Texas Commission on Environmental Quality (TCEQ), Air Dispersion Modeling Team. This protocol describes a proposed methodology for a screening CALPUFF BART exemption modeling analysis for the Sid Richardson Carbon, Ltd. facility located in Big Spring, Texas. My comments with respect to the submitted modeling protocol document are given below:

Project Identification Information.

Account Number: HT-0027-B
Regulated Entity Number: RN100226026
Customer Reference Number: CN600131171
Nearest City, County: Big Spring, Howard County

Modeling Protocol Document: Submitted by RMT, Inc., February 23, 2007.

List of modeling topics

2. If the CALPUFF model code was re-complied to use the CENRAP CALMET dataset, please be sure to include the modified parameter files and a description of the re-compilation process followed.

3. When documenting the emission rates used in the BART modeling exercise, be sure to explain what the maximum 24-hour actual emissions are based on (e.g., CEM data, permit limits, etc.).

6. The Federal Land Managers (FLMs) and Environmental Protection Agency (EPA) noted their preference for the use of an ozone.dat file. When an ozone.dat file is used, the fixed value (40 ppb in this case) is only used when all data are missing. The TCEQ has created three ozone.dat files (2001, 2002, and 2003) that may be used in the modeling exercise. These files have been included in a zip file as an attachment to the email that contained these comments.

9. The location of the stacks listed in the table of modeled stack parameters are listed with UTM coordinates. Be sure to convert these locations to a lambert conformal conic coordinate system that is consistent with the CENRAP CALMET dataset.

Please include the modeling input and output files in electronic format. In order to expedite the modeling review, it is preferred that the modeling report be submitted in electronic format as well.

Re: BART Modeling Protocol for Sid Richardson Carbon, Ltd.

Please provide a table listing all the electronic file names and a description of the electronic files.

Your modeling protocol document is a representation of the methodology that you are proposing for the air dispersion modeling analysis for this project. Any changes or additions to this modeling analysis methodology should be clearly addressed either by a revision to the modeling protocol or in the modeling analysis report.

If you have any questions please call me at (512) 239-4342 or write to the Texas Commission on Environmental Quality, Air Permits Division, MC-163, P.O. Box 13087, Austin, Texas 78711-3087.

Sincerely,

Dan Jamieson
Air Permits Division
Texas Commission on Environmental Quality

ATTACHMENT 9

DESCRIPTION OF MODIFICATIONS TO MODEL

From: "Tom Bowman" <tbowman@beeline-software.com>
To: "'David Castro'" <David.Castro@rmtinc.com>
Date: 04/23/2007 9:13 AM
Subject: RE: CALPUFF analysis - TCEQ request for information

David,

I have sent you my batch files that show the compiler options and the modified params files. No changes were made to any of the TRC code other than those made to the params files. As I stated before, I used the same compiler and compiler options as TRC. Here is the version of the compiler I used:
Lahey/Fujitsu Fortran 95 Compiler Release 7.10.02 S/N: 002720681377654

Here is the version that TRC used:
Lahey/Fujitsu Fortran 95 Express Release 7.10.02 S/N: 003050432726350

I used TRC's batch files with their compiler options and the same version of the Lahey compiler.

These is no further info. I double-click on the batch file and it executes the compiler and it produces the exe that I sent to you.

Please forward this email to Mr. Daniel Jamieson. If he has any questions, he can contact me.

Thanks,
Tom

J. Thomas Bowman, Ph.D., P.E.
BEE-Line Software
www.beeline-software.com <http://www.beeline-software.com/>
(828) 628-0636 General
(828) 628-0635 Direct
(828) 894-6373 Fax

```
c-----------------------------------------------------------------------
c --- PARAMETER statements                                        CALPUFF
c-----------------------------------------------------------------------
c --- Specify model version
      character*12 mver, mlevel, mmodel
      parameter(mver='5.711a',mlevel='040716')
      parameter(mmodel='CALPUFF')
c
c --- Specify parameters
      parameter(mxpuff=100000)
      parameter(mxspec=20)
c      parameter(mxnx=265,mxny=265,mxnz=12)                    jtb 10/3/2006
      parameter(mxnx=388,mxny=265,mxnz=16)
      parameter(mxnxg=265,mxnyg=265,mxrec=10000)
      parameter(mxrfog=40)
      parameter(mxss=350,mxus=99,mxps=700)
      parameter(mxpt1=200,mxpt2=200,mxarea=200,mxvert=5)
      parameter(mxlines=24,mxlngrp=1,mxvol=200)
      parameter(mxrise=50)
      parameter(mxpdep=9,mxint=9)
      parameter(mxoz=725,mxaq=1)
      parameter(mxhill=20,mxtpts=25,mxrect=1000,mxcntr=21)
      parameter(mxprfz=50)
      parameter(mxent=10,mxntr=50,mxnw=5000)
      parameter(mxvalz=10)
      parameter(mxcoast=10,mxptcst=5000)
      parameter(mxbndry=10,mxptbdy=5000)   ! keep mxbndry LE 20
c      parameter(mxmetdat=48, mxemdat=12)                   jtb 07/11/2006
      parameter(mxmetdat=366, mxemdat=12)
      parameter(mxmetsav=2)
      parameter(mxsg=30)
      parameter(io3=3,io4=4,io5=1,io6=2,io7=7,io8=8,io9=9)
      parameter(io10=10,io11=11,io12=12,io15=15,io19=19)
      parameter(io20=20,io22=22,io23=23,io24=24)
      parameter(io25=25,io28=28,io29=29,io30=30,io31=31,io32=32)
      parameter(io35=35,io36=36,io37=37)
      parameter(iomesg=0)
      parameter(iox=99)
      parameter(iopt2=100)
      parameter(ioar2=iopt2+mxemdat)
      parameter(iovol=ioar2+mxemdat)
c
c
c --- Compute derived parameters
      parameter(mxbc=2*mxnx+2*mxny)
      parameter(mxnzp1=mxnz+1)
      parameter(mxvertp1=mxvert+1)
      parameter(mxnxy=mxnx*mxny)
      parameter(mxnxyg=mxnxg*mxnyg)
      parameter(mxgsp=mxnxg*mxnyg*mxspec)
      parameter(mxrsp=mxrec*mxspec)
      parameter(mxcsp=mxrect*mxspec)
      parameter(mx2=2*mxspec,mx5=5*mxspec,mx7=7*mxspec)
      parameter(mxp2=2+mxspec,mxp3=3+mxspec)
      parameter(mxp4=4+mxspec,mxp6=6+mxspec)
      parameter(mxp7=7+mxspec,mxp8=8+mxspec,mxp14=mxspec+14)
      parameter(mxpuf6=6*mxpuff)
      parameter(mxlev=mxprfz)
      parameter(mxprfp1=mxprfz+1)
      parameter(mxentp1=mxent+1)
      parameter(mxgrup=mxspec)
      parameter(mxq12=mxspec*(mxpt1+mxarea)*2)
      parameter(mxspar=mxspec*mxarea,mxspln=mxspec*mxlines)
      parameter(mxsppt1=mxspec*mxpt1,mxspvl=mxspec*mxvol)
      parameter(mxspbc=mxspec*mxbc)
c
c --- Specify parameters for sizing GUI:
      parameter(mxavar=1)
      parameter(mxlvar=1)
      parameter(mxpvar=1)
      parameter(mxvvar=1)
c
c --- GENERAL PARAMETER definitions:
c        MXPUFF - Maximum number of active puffs allowed on the
c                 computational grid at one time
c        MXSLUG - Maximum number of active slugs allowed on the
c                 computational grid at one time (can be set to
c                 one if the slug option is not used)
c        MXSPEC - Maximum number of chemical species.  N.B.: Changes
c                 to MXSPEC may also require code changes to BLOCK DATA
c                 and READCF.
c        MXGRUP - Maximum number of Species-Groups.  Results for grouped
c                 species are added together and reported using the
c                 name of the group, rather than the name of one of the
```

```
c                 species in the group. (MXGRUP = MXSPEC since specie
c                 names are used as group names whenever group names are
c                 not provided)
c          MXNX - Maximum number of METEOROLOGICAL grid cells in
c                 the X direction
c          MXNY - Maximum number of METEOROLOGICAL grid cells in
c                 the Y direction
c          MXNZ - Maximum number of vertical layers in
c                 the METEOROLOGICAL grid
c         MXNXG - Maximum number of SAMPLING grid cells in
c                 the X direction
c         MXNYG - Maximum number of SAMPLING grid cells in
c                 the Y direction
c         MXREC - Maximum number of non-gridded receptors
c        MXRFOG - Maximum number of distances used when MFOG=1
c                 NOTE:  There are NPT1+NPT2 receptor 'trails', with
c                        MXRFOG receptors on each, so
c                        MXREC >= (NPT1+NPT2)*MXRFOG
c          MXSS - Maximum number of surface meteorological stations
c                 in the CALMET data
c          MXUS - Maximum number of upper air stations in the CALMET
c                 data
c          MXPS - Maximum number of precipitation stations in the
c                 CALMET data
c          MXBC - Maximum number of sources used to represent boundary
c                 conditions (inlux of background mass); source
c                 segments span the computational domain perimeter
c         MXPT1 - Maximum number of point sources with constant
c                 emission parameters
c         MXPT2 - Maximum number of point sources with time-varying
c                 emission parameters
c        MXAREA - Maximum number of polygon area sources with constant
c                 emission parameters (i.e., non-gridded area sources)
c        MXVERT - Maximum number of vertices in polygon area source
c        MXLINES- Maximum number of line sources
c        MXLNGRP- Maximum number of groups of line sources
c         MXVOL - Maximum number of volume sources
c        MXRISE - Maximum number of points in computed plume rise
c                 tabulation for buoyant area and line sources
c        MXPDEP - Maximum number of particle species dry deposited
c         MXINT - Maximum number of particle size intervals used
c                 in defining mass-weighted deposition velocities
c          MXOZ - Maximum number of ozone data stations (for use in the
c                 chemistry module)
c          MXAQ - Maximum number of Air Quality data stations (e.g.
c                 H2O2 data stations for aqueous chemistry module)
c        MXHILL - Maximum number of subgrid-scale (CTSG) terrain
c                 features
c        MXTPTS - Maximum number of points used to obtain flow
c                 factors along the trajectory of a puff over the hill
c        MXRECT - Maximum number of complex terrain (CTSG) receptors
c        MXCNTR - Maximum number of hill height contours (CTDM ellipses)
c        MXPRFZ - Maximum number of vertical levels of met. data in
c                 CTDM PROFILE file
c         MXLEV - Maximum number of vertical levels of met. data
c                 allowed in the CTSG module (set to MXPRFZ in the
c                 current implementation of CALPUFF)
c         MXENT - Maximum number of perturbed entrainment coefficients
c                 entered
c         MXNTR - Maximum number of downwind distances for which
c                 numerical plume rise will be reported
c          MXNW - Maximum number of downwind distances for numerical
c                 plume rise integration (should be set equal to
c                 SLAST/DS)
c        MXVALZ - Maximum number of heights above ground at which valley
c                 widths are found for each grid cell
c       MXCOAST - Maximum number of coasts provided in COASTLN.DAT file
c       MXPTCST - Maximum number of points used to store all coastlines
c       MXBNDRY - Maximum number of boundaries provided in FLUXBDY.DAT
c       MXPTBDY - Maximum number of points used to store all boundaries
c      MXMETDAT - Maximum number of CALMET.DAT files used in run
c       MXEMDAT - Maximum number of variable emissions files (each type)
c      MXMETSAV - Maximum number of met periods for which source tables
c                 (e.g. numerical rise) are saved
c         MXQ12 - Maximum number of groups of 12 emission rate scaling
c                 factors.  Factors come in groups of 12,24,36, or 96.
c                 These are specified for source-species combinations,
c                 but not all combinations will be filled.  Default
c                 value of MXQ12 assumes that no more than 24 factors
c                 are provided for each source-species combination for
c                 point and area sources.
c
c --- CONTROL FILE READER definitions:
c          MXSG - Maximum number of input groups in control file
```

```
c
c --- FORTRAN I/O unit numbers:
c           IO3 - Restart file (RESTARTB.DAT)   - input  - unformatted
c           IO4 - Restart file (RESTARTE.DAT)   - output - unformatted
c           IO5 - Control file (CALPUFF.INP)    - input  - formatted
c           IO6 - List file (CALPUFF.LST)       - output - formatted
c
c           IO7 - Meteorological data file      - input  - unformatted
c                 (CALMET.DAT)
c
c           IO8 - Concentration output file     - output - unformatted
c                 (CONC.DAT)
c           IO9 - Dry flux output file          - output - unformatted
c                 (DFLX.DAT)
c          IO10 - Wet flux output file          - output - unformatted
c                 (WFLX.DAT)
c          IO11 - Visibility output file        - output - unformatted
c                 (VISB.DAT)
c          IO12 - Fog plume data output file    - output - unformatted
c                 (FOG.DAT)
c          IO15 - Boundary Condition file       - input  - unformatted
c                 (BCON.DAT)
c          IO19 - Buoyant line sources file     - input  - free format
c                 (LNEMARB.DAT) with arbitrarily
c                 varying location & emissions
c          IO20 - User-specified deposition     - input  - formatted
c                 velocities (VD.DAT)
c          IO22 - Hourly ozone monitoring data  - input  - formatted
c                 (OZONE.DAT)
c          IO23 - Hourly H2O2 monitoring data   - input  - formatted
c                 (H2O2.DAT)
c          IO24 - User-specified chemical       - input  - formatted
c                 transformation rates
c                 (CHEM.DAT)
c          IO25 - User-specified coast line(s)  - input  - free format
c                 for sub-grid TIBL module
c                 (COASTLN.DAT)
c          IO28 - CTSG hill specifications from - input  - formatted
c                 CTDM terrain processor
c                 (HILL.DAT)
c          IO29 - CTSG receptor specifications  - input  - formatted
c                 from CTDM receptor generator
c                 (RECS.DAT)
c          IO30 - Tracking puff/slug data       - output - formatted
c                 (DEBUG.DAT)
c          IO31 - CTDM "tower" data             - input  - formatted
c                 (PROFILE.DAT)
c          IO32 - CTDM surface layer parameters - input  - formatted
c                 (SURFACE.DAT)
c          IO35 - User-specified boundary lines(s)- input- free format
c                 for mass flux calculations
c                 (FLUXBDY.DAT)
c          IO36 - Mass flux data                - output - formatted
c                 (MASSFLX.DAT)
c          IO37 - Mass balance data             - output - formatted
c                 (MASSBAL.DAT)
c         IOPT2 - 1st Pt. source emissions file - input  - unformatted
c                 (PTEMARB.DAT) with arbitrarily          or free fmt
c                 varying point source emissions
c         IOAR2 - 1st Buoyant area sources file - input  - free format
c                 (BAEMARB.DAT) with arbitrarily
c                 varying location & emissions
c         IOVOL - 1st Volume source file        - input  - unformatted
c                 (VOLEMARB.DAT) with arbitrarily          of free fmt
c                 varying location & emissions
c        IOMESG - Fortran unit number for screen- output - formatted
c                 output (NOTE: This unit is
c                 NOT opened -- it must be a
c                 preconnected unit to the screen
c                 -- Screen output can be suppressed
c                 by the input "IMESG" in the
c                 control file)
c           IOX - Fortran unit number for      - scratch - formatted
c                 temporary file of "doc" records
c                 written to header of output files
c
c
c --- GUI memory control parameters:  variable emissions scaling factors
c     for areas, lines, points, and volumes require much memory in GUI.
c     To reduce GUI memory requirement, set one or more of the
c     following parameters to ZERO when such scaling is not required.
c     These parameters have no effect on CALPUFF, but are read by the
c     GUI at execution time.
c
```

```
c        MXAVAR - Using scaled area sources?   (1:yes, 0:no)
c        MXLVAR - Using scaled line sources?   (1:yes, 0:no)
c        MXPVAR - Using scaled point sources?  (1:yes, 0:no)
c        MXVVAR - Using scaled volume sources? (1:yes, 0:no)
c
c
c ------------------------------------------------------------
```

```
c-----------------------------------------------------------------------
c  PARAMETERS -- Array dimensions and I/O units                POSTUTIL
c-----------------------------------------------------------------------
c --- Specify model version
      character*12 mver, mlevel
      parameter(mver='1.3',mlevel='030402')
c --- Specify application size
      PARAMETER(mxtpd=24)
      PARAMETER(mxssg=10)
c      PARAMETER(mxgx=210)
c      PARAMETER(mxgy=210)
      PARAMETER(mxgx=388)
      PARAMETER(mxgy=265)
      PARAMETER(mxgrec=mxgx*mxgy)
      PARAMETER(mxnx=mxgx,mxny=mxgy,mxnxy=mxgrec)
      PARAMETER(mxdrec=10000)
      PARAMETER(mxctrec=1000)
c      PARAMETER(mxnz=12,mxspec=20)  jtb 07/11/2006
      PARAMETER(mxnz=16,mxspec=20)
c --- Only 1 level of output is expected from CALPUFF application
c --- PARAMETER(mxsplv=mxnz*mxspec)
      PARAMETER(mxsplv=mxspec)
      PARAMETER(mxnzp1=mxnz+1)
c      PARAMETER(mxss=250,mxus=99,mxps=300,mxprfz=50)  jtb 07/11/2006
      PARAMETER(mxss=350,mxus=99,mxps=700,mxprfz=50)
      PARAMETER(mxfile=366)
c      PARAMETER(mxfile=10)                              jtb 07/11/2006
      PARAMETER(icols=25)
      PARAMETER(in1=10,in2=5,in3=9,in4=4)
      PARAMETER(io7=in4)
      PARAMETER(io1=7,io2=8,io6=6)
      PARAMETER(iox=99)
      parameter(mxsg=3)

c-----------------------------------------------------------------------
c     DEFINITIONS       [i]=integer     [r]=real        [a]=array
c-----------------------------------------------------------------------
c mxtpd          maximum number of time periods (CALPUFF files)      [i]
c                (NOT ACTIVE)
c mxssg          maximum number of source-species groups             [i]
c                in CALPUFF output files
c                (NOT ACTIVE)
c mxgx           maximum number gridded receptors along "x"          [i]
c mxgy           maximum number gridded receptors along "y"          [i]
c mxgrec         product mxgx*mxgy                                   [i]
c mxnx           maximum number of met grid cells along "x"          [i]
c mxny           maximum number of met grid cells along "y"          [i]
c mxnxy          product mxnx*mxny                                   [i]
c mxdrec         maximum number of discrete receptors                [i]
c mxctrec        maximum number of complex terrain (CTSG) receptors  [i]
c mxnz           maximum number of levels                            [i]
c mxnzp1         maximum number of levels + 1                        [i]
c mxspec         maximum number of species                           [i]
c mxsplv         max number of chemical species * max number levels  [i]
c mxss           maximum number of surface met stations              [i]
c mxus           maximum number of upper air met stations            [i]
c mxps           maximum number of precipitation stations            [i]
c mxprfz         maximum number of levels in vertical profile        [i]
c mxfile         max number of CALPUFF data files processed          [i]
c icols          number of columns in gridded integer output         [i]
c in1            unit number for input data file (CALPUFF.DAT)       [i]
c                - this is for the first file in the list, the
c                - subsequent files are incremented from in1
c                - MAKE CERTAIN NO OTHER UNIT #s EXCEED in1
c in2            unit number for control file input (POSTUTIL.INP)   [i]
c in3            unit number for input file of RH data (CALPUFF.VIS) [i]
c in4 (io7)      unit number for complete met. input file (MET.DAT)  [i]
c io1            unit number for output list file (POSTUTIL.LST)     [i]
c io2            unit number for output data file (MODEL.DAT)        [i]
c io6            unit number for screen output (error messages)      [i]
c iox            unit number for control file images (scratch)       [i]
c-----------------------------------------------------------------------
c
c --- CONTROL FILE READER definitions:
c          MXSG - Maximum number of input groups in control file
```

```
c-----------------------------------------------------------------------
c  PARAMETERS -- Array dimensions and I/O units                  CALPOST
c-----------------------------------------------------------------------
c       Modified by J. Thomas Bowman BEE-Line Software 2/8/2007
c --- Specify model version
      character*12 mver, mlevel
      parameter(mver='5.51',mlevel='030709')
c --- Specify application size
c      PARAMETER(mxgx=265)                                    jtb 2/8/07
c      PARAMETER(mxgy=265)                                    jtb 2/8/07
      PARAMETER(mxgx=388)
      PARAMETER(mxgy=265)
      PARAMETER(mxgrec=mxgx*mxgy)
      PARAMETER(mxdrec=10000, mxring=40)
      PARAMETER(mxctrec=1000)
      PARAMETER(mxtser=30)
      PARAMETER(mxnz=1,mxspec=20)
      PARAMETER(mxsplv=mxnz*mxspec)
      PARAMETER(mxss=350)
      PARAMETER(mxwsta=30)
      PARAMETER(mxday=366)
c ---       PARAMETER(mxday=400)
      PARAMETER(mxwin=10)
      PARAMETER(mxrnk=10,mxtop=4)              !Keep mxtop=4
      PARAMETER(icols=25)
      PARAMETER(in1=4,in2=5,in3=9,in4=18,in5=19)
      PARAMETER(io1=8,io6=6)
      PARAMETER(iot1=21,iot3=22,iot24=23,iotn=24)
      PARAMETER(mapu=11)
      PARAMETER(iox1=12,iox2=13,iox3=14,iox4=15)
      PARAMETER(iowx1=31,iowx2=32,iohrv=33)
      parameter(mxsg=4)
c-----------------------------------------------------------------------
c     DEFINITIONS       [i]=integer     [r]=real        [a]=array
c-----------------------------------------------------------------------
c mxgx            maximum number gridded receptors along "x"          [i]
c mxgy            maximum number gridded receptors along "y"          [i]
c mxgrec          product mxgx*mxgy                                   [i]
c mxdrec          maximum number of discrete receptors                [i]
c mxring          maximum number of discrete receptor "rings"         [i]
c mxctrec         maximum number of complex terrain (CTSG) receptors  [i]
c mxtser          maximum number of receptors in timeseries output    [i]
c mxnz            maximum number of levels                            [i]
c mxspec          maximum number of species                           [i]
c mxsplv          max number of chemical species * max number levels  [i]
c mxss            max number of surface stations in CALMET/CALPUFF    [i]
c mxwsta          max number of weather stations in VSRN.DAT (DATSAV3)[i]
c mxday           max number of days in run for violation option      [i]
c mxwin           max number of days in window (for violation search) [i]
c mxrnk           max rank of top-ranked concentrations               [i]
c mxtop           max number of top-ranked concentrations             [i]
c icols           number of columns in gridded integer output         [i]
c in1             unit number for "concentration" input file          [i]
c in2             unit number for control file input                  [i]
c in3             unit number for input file of RH data               [i]
c in4             unit number for input file of background data       [i]
c in5             unit number for input file of visual range data     [i]
c io1             unit number for output list file                    [i]
c io6             unit number for standard output (error messages)    [i]
c iot1            unit number for timeseries file (1hr avg)           [i]
c iot3            unit number for timeseries file (3hr avg)           [i]
c iot24           unit number for timeseries file (24hr avg)          [i]
c iotn            unit number for timeseries file (Nhr avg)           [i]
c mapu            unit number for current plot-file                   [i]
c iox1            unit number for scratch file (extinction summary)   [i]
c iox2            unit number for scratch file (deciview summary)     [i]
c iox3            unit number for scratch file (run length extinction)[i]
c iox4            unit number for scratch file (run length deciview)  [i]
c iowx1           unit number for scratch file (weather data image 1) [i]
c                 (saved as DEBUG.WX1 when LDEBUG=T)
c iowx2           unit number for scratch file (weather data image 2) [i]
c                 (saved as DEBUG.WX2 when LDEBUG=T)
c iohrv           unit number for hourly visibility calculation       [i]
c                 details (saved as DEBUG.HRV when LDEBUG=T)
c-----------------------------------------------------------------------
c
c --- CONTROL FILE READER definitions:
c          MXSG - Maximum number of input groups in control file
```