Appendix 9.8

BART Exemption modeling –

- Monarch Cement
- Kansas City BPU – Quindaro
- Kansas City BPU – Nearman
- Westar Energy – Hutchinson
- Westar Energy – Lawrence

day	2001 WM	2002 WM	2003 WM
1	0	0	0.004
2	0.015	0	0
3	0.043	0.005	0.007
4	0.012	0	0.01
5	0.001	0	0
6	0.03	0	0
7	0	0	0.012
8	0.002	0.013	0.007
9	0	0.027	0.012
10	0	0.03	0
11	0.005	0.006	0.003
12	0.005	0	0.003
13	0.001	0.001	0.038
14	0.006	0	0.002
15	0.005	0	0.015
16	0.146	0.001	0
17	0.007	0.027	0.004
18	0	0	0
19	0	0	0.019
20	0	0	0.027
21	0	0.002	0.087
22	0	0	0.058
23	0	0	0.01
24	0.001	0	0.003
25	0.008	0.002	0
26	0.002	0.003	0
27	0.01	0	0.001
28	0.037	0.014	0.001
29	0.002	0.004	0
30	0	0	0.002
31	0	0	0.012
32	0	0	0.035
33	0	0	0
34	0.008	0.001	0.002
35	0	0.014	0
36	0.003	0.002	0
37	0.043	0	0.007
38	0	0.001	0
39	0	0	0.002
40	0	0	0
41	0.002	0	0
42	0	0.004	0
43	0	0.032	0
44	0	0.012	0
45	0.001	0	0.004
46	0	0	0
47	0	0.001	0
48	0.006	0.001	0
49	0.01	0	0
50	0	0.001	0.028
51	0.046	0.003	0.003
52	0.039	0.001	0
53	0	0.001	0
54	0	0	0.003

day	2001 WM	2002 WM	2003 WM
55	0.001	0	0
56	0	0	0.047
57	0	0	0.081
58	0.03	0.002	0.108
59	0	0	0.097
60	0.01	0	0.013
61	0.001	0	0.033
62	0	0	0
63	0	0.002	0.001
64	0	0	0
65	0	0	0
66	0.026	0	0.001
67	0.049	0	0.005
68	0.002	0	0.039
69	0	0	0.025
70	0	0.001	0
71	0.001	0	0
72	0	0	0.003
73	0	0.001	0.01
74	0	0	0
75	0	0.013	0
76	0.004	0	0
77	0	0	0.001
78	0	0.02	0.003
79	0	0	0
80	0	0	0
81	0	0.001	0.004
82	0.001	0	0.011
83	0.008	0.004	0
84	0.093	0	0
85	0.007	0	0.001
86	0	0	0
87	0	0	0
88	0	0.007	0
89	0.007	0.003	0
90	0	0.014	0.008
91	0	0	0
92	0	0.001	0
93	0.004	0.008	0
94	0	0.004	0.002
95	0	0	0.017
96	0	0	0
97	0.001	0	0
98	0	0	0
99	0	0.003	0
100	0	0	0
101	0	0	0
102	0	0	0
103	0	0.002	0
104	0	0.001	0
105	0	0	0
106	0.01	0	0
107	0	0	0
108	0	0	0.002

day	2001 WM	2002 WM	2003 WM
109	0	0	0
110	0	0	0
111	0	0	0
112	0.001	0	0
113	0	0	0
114	0	0.019	0.01
115	0.02	0.01	0
116	0.003	0	0
117	0.005	0.006	0
118	0	0.001	0.011
119	0	0.001	0
120	0	0.006	0.001
121	0	0.024	0.004
122	0	0.005	0.012
123	0	0.011	0.002
124	0	0	0.001
125	0.005	0	0
126	0.001	0	0.131
127	0.006	0	0.001
128	0.022	0	0.001
129	0	0.004	0.019
130	0	0.001	0.002
131	0.001	0	0
132	0	0	0
133	0	0	0
134	0	0	0
135	0	0	0
136	0	0	0.011
137	0	0.005	0
138	0	0.007	0
139	0.005	0	0
140	0.002	0	0.011
141	0	0	0.034
142	0.003	0	0
143	0.004	0	0
144	0	0.001	0
145	0	0	0.016
146	0	0	0
147	0	0	0
148	0	0	0.002
149	0	0	0.012
150	0	0	0.004
151	0	0	0.006
152	0	0	0
153	0	0	0
154	0	0	0
155	0	0	0
156	0	0	0
157	0	0.001	0
158	0	0.001	0
159	0.001	0	0
160	0.002	0	0
161	0	0	0
162	0	0	0

day	2001 WM	2002 WM	2003 WM
163	0	0	0
164	0	0	0
165	0	0.009	0
166	0	0	0.01
167	0	0	0
168	0	0	0
169	0	0	0.002
170	0	0	0.002
171	0	0	0
172	0	0	0
173	0	0	0
174	0	0	0
175	0	0	0
176	0	0	0
177	0	0	0.001
178	0	0	0.009
179	0.002	0	0
180	0	0	0
181	0	0	0
182	0	0	0.001
183	0	0	0.002
184	0.003	0	0
185	0.002	0	0
186	0.004	0	0
187	0	0	0
188	0	0	0
189	0	0.001	0
190	0.002	0.001	0
191	0	0.001	0.169
192	0	0.115	0
193	0.002	0	0.005
194	0	0	0.01
195	0	0.002	0.003
196	0	0	0
197	0.001	0	0
198	0.002	0	0.011
199	0.001	0	0.002
200	0	0	0.019
201	0	0.001	0.002
202	0	0.003	0.001
203	0	0.002	0.003
204	0	0	0.003
205	0	0.001	0
206	0	0	0
207	0	0	0
208	0	0	0.003
209	0	0	0.004
210	0.003	0	0.071
211	0	0	0.001
212	0	0	0
213	0	0	0.002
214	0	0	0.001
215	0	0	0
216	0	0	0.003

day	2001 WM	2002 WM	2003 WM
217	0	0	0.162
218	0	0	0.002
219	0	0	0.001
220	0	0	0
221	0.002	0	0
222	0.002	0	0
223	0.01	0	0.001
224	0.013	0	0
225	0.006	0	0
226	0	0	0
227	0	0	0.001
228	0	0	0.002
229	0	0	0.001
230	0	0	0.001
231	0.03	0	0
232	0.002	0	0.001
233	0	0	0.002
234	0	0.001	0
235	0.002	0.002	0.302
236	0	0	0.062
237	0.001	0	0
238	0	0	0.002
239	0	0	0
240	0	0	0.001
241	0	0	0.001
242	0	0	0
243	0	0	0.002
244	0	0	0
245	0	0.001	0
246	0	0	0.007
247	0	0	0.05
248	0	0	0.001
249	0	0	0
250	0.001	0	0
251	0	0	0
252	0	0	0
253	0	0	0
254	0	0.001	0.001
255	0	0.01	0
256	0	0	0
257	0	0	0
258	0	0	0.01
259	0	0	0
260	0	0	0
261	0	0	0
262	0	0	0
263	0	0.001	0.005
264	0	0	0
265	0	0.008	0.046
266	0	0.003	0.002
267	0	0	0
268	0.03	0	0.012
269	0	0	0.006
270	0	0	0

day	2001 WM	2002 WM	2003 WM
271	0	0	0
272	0	0.002	0.001
273	0	0	0.001
274	0.001	0	0.024
275	0.001	0	0.003
276	0	0	0.001
277	0	0	0.002
278	0	0	0.011
279	0	0	0.002
280	0	0.014	0
281	0	0	0
282	0	0	0.004
283	0.011	0	0
284	0	0	0
285	0	0.01	0
286	0	0.013	0
287	0	0.003	0
288	0	0.001	0
289	0	0.001	0.002
290	0	0	0
291	0	0	0.014
292	0	0.007	0.095
293	0	0.025	0.004
294	0	0.002	0.025
295	0	0	0
296	0.008	0.007	0.002
297	0.002	0	0.002
298	0	0	0.009
299	0	0.019	0.005
300	0.016	0.002	0.004
301	0	0.01	0.005
302	0	0	0
303	0	0	0.004
304	0	0.011	0
305	0.003	0.171	0.073
306	0	0.026	0
307	0	0	0
308	0	0	0
309	0	0.008	0.02
310	0	0.001	0
311	0	0.002	0.041
312	0	0	0.001
313	0	0.001	0
314	0.042	0	0
315	0	0	0.005
316	0	0.002	0.003
317	0	0.046	0.013
318	0	0	0
319	0	0	0.009
320	0	0	0
321	0	0.013	0
322	0	0.002	0.001
323	0	0.002	0
324	0.003	0	0

day	2001 WM	2002 WM	2003 WM
325	0	0	0.003
326	0	0	0
327	0.005	0	0
328	0	0.006	0.002
329	0	0	0
330	0.006	0	0.004
331	0	0.005	0
332	0	0.022	0
333	0	0.015	0.004
334	0.006	0	0
335	0.001	0	0.056
336	0.002	0.003	0
337	0	0.01	0
338	0	0.029	0
339	0.001	0	0
340	0.003	0.008	0
341	0.018	0.011	0
342	0	0.098	0.004
343	0.006	0.004	0.004
344	0	0.003	0
345	0	0	0.001
346	0	0	0
347	0	0	0.046
348	0.002	0.029	0
349	0	0.014	0.001
350	0	0.008	0
351	0.001	0.011	0
352	0.004	0	0
353	0.003	0	0
354	0.012	0.001	0
355	0	0.001	0
356	0.001	0	0
357	0	0.009	0
358	0	0	0
359	0	0	0
360	0.01	0.001	0
361	0	0.001	0.001
362	0.003	0.076	0
363	0	0	0.001
364	0	0.003	0
365			

	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)		
Rank	**2001**	**2002**	**2003**
Peak 24-hour Average	0.146	0.171	0.302
2	0.093	0.115	0.169
3	0.049	0.098	0.162
4	0.046	0.076	0.131
5	0.043	0.046	0.108
6	0.043	0.032	0.097
7	0.042	0.03	0.095
8	0.039	0.029	0.087
9	0.037	0.029	0.081
10	0.03	0.027	0.073
11	0.03	0.027	0.071
12	0.03	0.026	0.062
13	0.03	0.025	0.058
14	0.026	0.024	0.056
15	0.022	0.022	0.05
16	0.02	0.02	0.047
17	0.018	0.019	0.046
18	0.016	0.019	0.046
19	0.015	0.015	0.041
20	0.013	0.014	0.039
21	0.012	0.014	0.038
22	0.012	0.014	0.035
23	0.011	0.014	0.034
24	0.01	0.014	0.033
25	0.01	0.013	0.028
26	0.01	0.013	0.027
27	0.01	0.013	0.025
28	0.01	0.013	0.025
29	0.01	0.012	0.024
30	0.008	0.011	0.02
31	0.008	0.011	0.019
32	0.008	0.011	0.019
33	0.008	0.011	0.019
34	0.007	0.01	0.017
35	0.007	0.01	0.016
36	0.007	0.01	0.015
37	0.006	0.01	0.014
38	0.006	0.01	0.013
39	0.006	0.009	0.013
40	0.006	0.009	0.012
41	0.006	0.008	0.012
42	0.006	0.008	0.012
43	0.006	0.008	0.012
44	0.005	0.008	0.012
45	0.005	0.008	0.012
46	0.005	0.007	0.011
47	0.005	0.007	0.011
48	0.005	0.007	0.011
49	0.005	0.007	0.011
50	0.005	0.006	0.011
51	0.004	0.006	0.011
52	0.004	0.006	0.01
53	0.004	0.006	0.01
54	0.004	0.005	0.01
55	0.004	0.005	0.01
56	0.003	0.005	0.01
57	0.003	0.005	0.01
58	0.003	0.004	0.01
59	0.003	0.004	0.009
60	0.003	0.004	0.009
61	0.003	0.004	0.009
62	0.003	0.004	0.008
63	0.003	0.004	0.007
64	0.003	0.003	0.007
65	0.003	0.003	0.007

Grey Cells Have Visibilty Impacts > 0.5 Δ Deciviews

	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)		
Rank	**2001**	**2002**	**2003**
66	0.002	0.003	0.007
67	0.002	0.003	0.006
68	0.002	0.003	0.006
69	0.002	0.003	0.005
70	0.002	0.003	0.005
71	0.002	0.003	0.005
72	0.002	0.003	0.005
73	0.002	0.003	0.005
74	0.002	0.002	0.005
75	0.002	0.002	0.004
76	0.002	0.002	0.004
77	0.002	0.002	0.004
78	0.002	0.002	0.004
79	0.002	0.002	0.004
80	0.002	0.002	0.004
81	0.002	0.002	0.004
82	0.002	0.002	0.004
83	0.002	0.002	0.004
84	0.002	0.002	0.004
85	0.001	0.002	0.004
86	0.001	0.002	0.004
87	0.001	0.002	0.004
88	0.001	0.002	0.004
89	0.001	0.002	0.004
90	0.001	0.001	0.003
91	0.001	0.001	0.003
92	0.001	0.001	0.003
93	0.001	0.001	0.003
94	0.001	0.001	0.003
95	0.001	0.001	0.003
96	0.001	0.001	0.003
97	0.001	0.001	0.003
98	0.001	0.001	0.003
99	0.001	0.001	0.003
100	0.001	0.001	0.003
101	0.001	0.001	0.003
102	0.001	0.001	0.003
103	0.001	0.001	0.003
104	0.001	0.001	0.003
105	0.001	0.001	0.002
106	0.001	0.001	0.002
107	0.001	0.001	0.002
108	0	0.001	0.002
109	0	0.001	0.002
110	0	0.001	0.002
111	0	0.001	0.002
112	0	0.001	0.002
113	0	0.001	0.002
114	0	0.001	0.002
115	0	0.001	0.002
116	0	0.001	0.002
117	0	0.001	0.002
118	0	0.001	0.002
119	0	0.001	0.002
120	0	0.001	0.002
121	0	0.001	0.002
122	0	0.001	0.002
123	0	0.001	0.002
124	0	0.001	0.002
125	0	0.001	0.002
126	0	0.001	0.002
127	0	0	0.002
128	0	0	0.002
129	0	0	0.002
130	0	0	0.002

Grey Cells Have Visibilty Impacts > 0.5 Δ Deciviews

	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)		
Rank	**2001**	**2002**	**2003**
131	0	0	0.002
132	0	0	0.001
133	0	0	0.001
134	0	0	0.001
135	0	0	0.001
136	0	0	0.001
137	0	0	0.001
138	0	0	0.001
139	0	0	0.001
140	0	0	0.001
141	0	0	0.001
142	0	0	0.001
143	0	0	0.001
144	0	0	0.001
145	0	0	0.001
146	0	0	0.001
147	0	0	0.001
148	0	0	0.001
149	0	0	0.001
150	0	0	0.001
151	0	0	0.001
152	0	0	0.001
153	0	0	0.001
154	0	0	0.001
155	0	0	0.001
156	0	0	0.001
157	0	0	0.001
158	0	0	0.001
159	0	0	0.001
160	0	0	0.001
161	0	0	0.001
162	0	0	0.001
163	0	0	0.001
164	0	0	0.001
165	0	0	0.001
166	0	0	0
167	0	0	0
168	0	0	0
169	0	0	0
170	0	0	0
171	0	0	0
172	0	0	0
173	0	0	0
174	0	0	0
175	0	0	0
176	0	0	0
177	0	0	0
178	0	0	0
179	0	0	0
180	0	0	0
181	0	0	0
182	0	0	0
183	0	0	0
184	0	0	0
185	0	0	0
186	0	0	0
187	0	0	0
188	0	0	0
189	0	0	0
190	0	0	0
191	0	0	0
192	0	0	0
193	0	0	0
194	0	0	0
195	0	0	0

Grey Cells Have Visibilty Impacts > 0.5 Δ Deciviews

	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)		
Rank	**2001**	**2002**	**2003**
196	0	0	0
197	0	0	0
198	0	0	0
199	0	0	0
200	0	0	0
201	0	0	0
202	0	0	0
203	0	0	0
204	0	0	0
205	0	0	0
206	0	0	0
207	0	0	0
208	0	0	0
209	0	0	0
210	0	0	0
211	0	0	0
212	0	0	0
213	0	0	0
214	0	0	0
215	0	0	0
216	0	0	0
217	0	0	0
218	0	0	0
219	0	0	0
220	0	0	0
221	0	0	0
222	0	0	0
223	0	0	0
224	0	0	0
225	0	0	0
226	0	0	0
227	0	0	0
228	0	0	0
229	0	0	0
230	0	0	0
231	0	0	0
232	0	0	0
233	0	0	0
234	0	0	0
235	0	0	0
236	0	0	0
237	0	0	0
238	0	0	0
239	0	0	0
240	0	0	0
241	0	0	0
242	0	0	0
243	0	0	0
244	0	0	0
245	0	0	0
246	0	0	0
247	0	0	0
248	0	0	0
249	0	0	0
250	0	0	0
251	0	0	0
252	0	0	0
253	0	0	0
254	0	0	0
255	0	0	0
256	0	0	0
257	0	0	0
258	0	0	0
259	0	0	0
260	0	0	0

Grey Cells Have Visibilty Impacts > 0.5 Δ Deciviews

	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)		
Rank	**2001**	**2002**	**2003**
261	0	0	0
262	0	0	0
263	0	0	0
264	0	0	0
265	0	0	0
266	0	0	0
267	0	0	0
268	0	0	0
269	0	0	0
270	0	0	0
271	0	0	0
272	0	0	0
273	0	0	0
274	0	0	0
275	0	0	0
276	0	0	0
277	0	0	0
278	0	0	0
279	0	0	0
280	0	0	0
281	0	0	0
282	0	0	0
283	0	0	0
284	0	0	0
285	0	0	0
286	0	0	0
287	0	0	0
288	0	0	0
289	0	0	0
290	0	0	0
291	0	0	0
292	0	0	0
293	0	0	0
294	0	0	0
295	0	0	0
296	0	0	0
297	0	0	0
298	0	0	0
299	0	0	0
300	0	0	0
301	0	0	0
302	0	0	0
303	0	0	0
304	0	0	0
305	0	0	0
306	0	0	0
307	0	0	0
308	0	0	0
309	0	0	0
310	0	0	0
311	0	0	0
312	0	0	0
313	0	0	0
314	0	0	0
315	0	0	0
316	0	0	0
317	0	0	0
318	0	0	0
319	0	0	0
320	0	0	0
321	0	0	0
322	0	0	0
323	0	0	0
324	0	0	0
325	0	0	0

Grey Cells Have Visibilty Impacts > 0.5 Δ Deciviews

	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)		
Rank	**2001**	**2002**	**2003**
326	0	0	0
327	0	0	0
328	0	0	0
329	0	0	0
330	0	0	0
331	0	0	0
332	0	0	0
333	0	0	0
334	0	0	0
335	0	0	0
336	0	0	0
337	0	0	0
338	0	0	0
339	0	0	0
340	0	0	0
341	0	0	0
342	0	0	0
343	0	0	0
344	0	0	0
345	0	0	0
346	0	0	0
347	0	0	0
348	0	0	0
349	0	0	0
350	0	0	0
351	0	0	0
352	0	0	0
353	0	0	0
354	0	0	0
355	0	0	0
356	0	0	0
357	0	0	0
358	0	0	0
359	0	0	0
360	0	0	0
361	0	0	0
362	0	0	0
363	0	0	0
364	0	0	0

Grey Cells Have Visibilty Impacts > 0.5 Δ Deciviews

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
Peak 24-hour Average	0.302
2	0.171
3	0.169
4	0.162
5	0.146
6	0.131
7	0.115
8	0.108
9	0.098
10	0.097
11	0.095
12	0.093
13	0.087
14	0.081
15	0.076
16	0.073
17	0.071
18	0.062
19	0.058
20	0.056
21	0.05
22	0.049
23	0.047
24	0.046
25	0.046
26	0.046
27	0.046
28	0.043
29	0.043
30	0.042
31	0.041
32	0.039
33	0.039
34	0.038
35	0.037
36	0.035
37	0.034
38	0.033
39	0.032
40	0.03
41	0.03
42	0.03
43	0.03
44	0.03
45	0.029
46	0.029
47	0.028
48	0.027
49	0.027
50	0.027
51	0.026
52	0.026
53	0.025

Grey Cells Have Visibilty Impacts > 0.5 Δ Deciviews

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
54	0.025
55	0.025
56	0.024
57	0.024
58	0.022
59	0.022
60	0.02
61	0.02
62	0.02
63	0.019
64	0.019
65	0.019
66	0.019
67	0.019
68	0.018
69	0.017
70	0.016
71	0.016
72	0.015
73	0.015
74	0.015
75	0.014
76	0.014
77	0.014
78	0.014
79	0.014
80	0.014
81	0.013
82	0.013
83	0.013
84	0.013
85	0.013
86	0.013
87	0.013
88	0.012
89	0.012
90	0.012
91	0.012
92	0.012
93	0.012
94	0.012
95	0.012
96	0.012
97	0.011
98	0.011
99	0.011
100	0.011
101	0.011
102	0.011
103	0.011
104	0.011
105	0.011
106	0.011

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
107	0.011
108	0.01
109	0.01
110	0.01
111	0.01
112	0.01
113	0.01
114	0.01
115	0.01
116	0.01
117	0.01
118	0.01
119	0.01
120	0.01
121	0.01
122	0.01
123	0.01
124	0.01
125	0.01
126	0.009
127	0.009
128	0.009
129	0.009
130	0.009
131	0.008
132	0.008
133	0.008
134	0.008
135	0.008
136	0.008
137	0.008
138	0.008
139	0.008
140	0.008
141	0.007
142	0.007
143	0.007
144	0.007
145	0.007
146	0.007
147	0.007
148	0.007
149	0.007
150	0.007
151	0.007
152	0.006
153	0.006
154	0.006
155	0.006
156	0.006
157	0.006
158	0.006
159	0.006

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
160	0.006
161	0.006
162	0.006
163	0.006
164	0.006
165	0.005
166	0.005
167	0.005
168	0.005
169	0.005
170	0.005
171	0.005
172	0.005
173	0.005
174	0.005
175	0.005
176	0.005
177	0.005
178	0.005
179	0.005
180	0.005
181	0.005
182	0.004
183	0.004
184	0.004
185	0.004
186	0.004
187	0.004
188	0.004
189	0.004
190	0.004
191	0.004
192	0.004
193	0.004
194	0.004
195	0.004
196	0.004
197	0.004
198	0.004
199	0.004
200	0.004
201	0.004
202	0.004
203	0.004
204	0.004
205	0.004
206	0.004
207	0.004
208	0.003
209	0.003
210	0.003
211	0.003
212	0.003

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
213	0.003
214	0.003
215	0.003
216	0.003
217	0.003
218	0.003
219	0.003
220	0.003
221	0.003
222	0.003
223	0.003
224	0.003
225	0.003
226	0.003
227	0.003
228	0.003
229	0.003
230	0.003
231	0.003
232	0.003
233	0.003
234	0.003
235	0.003
236	0.003
237	0.003
238	0.003
239	0.003
240	0.003
241	0.003
242	0.003
243	0.002
244	0.002
245	0.002
246	0.002
247	0.002
248	0.002
249	0.002
250	0.002
251	0.002
252	0.002
253	0.002
254	0.002
255	0.002
256	0.002
257	0.002
258	0.002
259	0.002
260	0.002
261	0.002
262	0.002
263	0.002
264	0.002
265	0.002

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
266	0.002
267	0.002
268	0.002
269	0.002
270	0.002
271	0.002
272	0.002
273	0.002
274	0.002
275	0.002
276	0.002
277	0.002
278	0.002
279	0.002
280	0.002
281	0.002
282	0.002
283	0.002
284	0.002
285	0.002
286	0.002
287	0.002
288	0.002
289	0.002
290	0.002
291	0.002
292	0.002
293	0.002
294	0.002
295	0.002
296	0.002
297	0.002
298	0.002
299	0.002
300	0.002
301	0.002
302	0.002
303	0.002
304	0.002
305	0.001
306	0.001
307	0.001
308	0.001
309	0.001
310	0.001
311	0.001
312	0.001
313	0.001
314	0.001
315	0.001
316	0.001
317	0.001
318	0.001

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
319	0.001
320	0.001
321	0.001
322	0.001
323	0.001
324	0.001
325	0.001
326	0.001
327	0.001
328	0.001
329	0.001
330	0.001
331	0.001
332	0.001
333	0.001
334	0.001
335	0.001
336	0.001
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338	0.001
339	0.001
340	0.001
341	0.001
342	0.001
343	0.001
344	0.001
345	0.001
346	0.001
347	0.001
348	0.001
349	0.001
350	0.001
351	0.001
352	0.001
353	0.001
354	0.001
355	0.001
356	0.001
357	0.001
358	0.001
359	0.001
360	0.001
361	0.001
362	0.001
363	0.001
364	0.001
365	0.001
366	0.001
367	0.001
368	0.001
369	0.001
370	0.001
371	0.001

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
372	0.001
373	0.001
374	0.001
375	0.001
376	0.001
377	0.001
378	0.001
379	0.001
380	0.001
381	0.001
382	0.001
383	0.001
384	0.001
385	0.001
386	0.001
387	0.001
388	0.001
389	0.001
390	0.001
391	0.001
392	0.001
393	0.001
394	0.001
395	0.001
396	0.001
397	0.001
398	0.001
399	0
400	0
401	0
402	0
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406	0
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408	0
409	0
410	0
411	0
412	0
413	0
414	0
415	0
416	0
417	0
418	0
419	0
420	0
421	0
422	0
423	0
424	0

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
425	0
426	0
427	0
428	0
429	0
430	0
431	0
432	0
433	0
434	0
435	0
436	0
437	0
438	0
439	0
440	0
441	0
442	0
443	0
444	0
445	0
446	0
447	0
448	0
449	0
450	0
451	0
452	0
453	0
454	0
455	0
456	0
457	0
458	0
459	0
460	0
461	0
462	0
463	0
464	0
465	0
466	0
467	0
468	0
469	0
470	0
471	0
472	0
473	0
474	0
475	0
476	0
477	0

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
478	0
479	0
480	0
481	0
482	0
483	0
484	0
485	0
486	0
487	0
488	0
489	0
490	0
491	0
492	0
493	0
494	0
495	0
496	0
497	0
498	0
499	0
500	0
501	0
502	0
503	0
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530	0

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
531	0
532	0
533	0
534	0
535	0
536	0
537	0
538	0
539	0
540	0
541	0
542	0
543	0
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578	0
579	0
580	0
581	0
582	0
583	0

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
584	0
585	0
586	0
587	0
588	0
589	0
590	0
591	0
592	0
593	0
594	0
595	0
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628	0
629	0
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631	0
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634	0
635	0
636	0

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
637	0
638	0
639	0
640	0
641	0
642	0
643	0
644	0
645	0
646	0
647	0
648	0
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680	0
681	0
682	0
683	0
684	0
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689	0

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
690	0
691	0
692	0
693	0
694	0
695	0
696	0
697	0
698	0
699	0
700	0
701	0
702	0
703	0
704	0
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734	0
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Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
743	0
744	0
745	0
746	0
747	0
748	0
749	0
750	0
751	0
752	0
753	0
754	0
755	0
756	0
757	0
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781	0
782	0
783	0
784	0
785	0
786	0
787	0
788	0
789	0
790	0
791	0
792	0
793	0
794	0
795	0

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
796	0
797	0
798	0
799	0
800	0
801	0
802	0
803	0
804	0
805	0
806	0
807	0
808	0
809	0
810	0
811	0
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828	0
829	0
830	0
831	0
832	0
833	0
834	0
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836	0
837	0
838	0
839	0
840	0
841	0
842	0
843	0
844	0
845	0
846	0
847	0
848	0

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
849	0
850	0
851	0
852	0
853	0
854	0
855	0
856	0
857	0
858	0
859	0
860	0
861	0
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863	0
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870	0
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873	0
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888	0
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890	0
891	0
892	0
893	0
894	0
895	0
896	0
897	0
898	0
899	0
900	0
901	0

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
902	0
903	0
904	0
905	0
906	0
907	0
908	0
909	0
910	0
911	0
912	0
913	0
914	0
915	0
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917	0
918	0
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947	0
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949	0
950	0
951	0
952	0
953	0
954	0

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
955	0
956	0
957	0
958	0
959	0
960	0
961	0
962	0
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999	0
1000	0
1001	0
1002	0
1003	0
1004	0
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1006	0
1007	0

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
1008	0
1009	0
1010	0
1011	0
1012	0
1013	0
1014	0
1015	0
1016	0
1017	0
1018	0
1019	0
1020	0
1021	0
1022	0
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1024	0
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1031	0
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1033	0
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1038	0
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1044	0
1045	0
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1048	0
1049	0
1050	0
1051	0
1052	0
1053	0
1054	0
1055	0
1056	0
1057	0
1058	0
1059	0
1060	0

Rank	Wichita Mountains Modeled Daily Visibility Impact (Δ Deciviews)
1061	0
1062	0
1063	0
1064	0
1065	0
1066	0
1067	0
1068	0
1069	0
1070	0
1071	0
1072	0
1073	0
1074	0
1075	0
1076	0
1077	0
1078	0
1079	0
1080	0
1081	0
1082	0
1083	0
1084	0
1085	0
1086	0
1087	0
1088	0
1089	0
1090	0
1091	0
1092	0

BART Modeling Report

Kansas City Board of Public Utilities

Nearman and Quindaro Facilities

Prepared by:
Black & Veatch

September 2006

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1.0 Introduction

1.1 Objectives

Under regional haze regulations, the Environmental Protection Agency (EPA) has issued final guidelines dated July 6, 2005 for Best Available Retrofit Technology (BART) determinations (70 FR 39104-39172). Sources are BART-eligible if they meet three criteria including potential emissions of at least 250 tons per year of a visibility-impairing pollutant, were put in place between August 7, 1962 and August 7, 1977, and fall within one of the 26 listed source categories in the guidance. A BART engineering evaluation using five statutory factors --1) existing controls; 2) cost; 3) energy and non-air environmental impacts; 4) remaining useful life of the source; 5) degree of visibility improvement expected from the application of controls --is required for any BART-eligible source that can be reasonably expected to cause or contribute to impairment of visibility in any of the 156 federal parks and wilderness (Class I) areas protected under the regional haze rule. Air quality modeling is an important tool available to the States to determine whether a source can be reasonably expected to contribute to visibility impairment in a Class I area.

According to 40 CFR Part 51 Appendix Y, States have the option to "*use dispersion modeling to determine that an individual source cannot reasonably be anticipated to cause or contribute to visibility impairment in a Class I area and thus is not subject to BART*." Kansas Department of Health and Environment (KDHE) has chosen to exercise the "individual source attribution approach" option. In that approach, a BART-eligible source that is responsible for a 1.0 deciview (dv) change or more is considered to "cause" visibility impairment. A BART-eligible source that is responsible for a 0.5 dv change or more is considered to "contribute" to visibility impairment in a Class I area. Any BART eligible source determined to cause or contribute to visibility impairment in any Class I area is subject to BART and must undergo a BART determination analysis.

The air dispersion modeling analyses presented in this report were conducted in accordance with the KDHE *Best Available Retrofit Technology (BART) Modeling Protocol to Determine Sources Subject to BART in the State of Kansas* dated March 30, 2006 and the *CENRAP BART Modeling Guidelines* dated December 15, 2005, and the modeling methodology proposed in the BART Modeling Protocol, submitted to KDHE September 1, 2006.

1.2 Source Impact Evaluation and Criteria

Modeling is performed on a "BART-eligible" source to determine if the source is "subject-to-BART". For sources that are determined to be subject to BART, a second application of modeling is performed to quantify the visibility benefits from the BART control options. In all cases, the CALPUFF modeling system was used with three years (2001-2003) of meteorological data as recommended by the BART Modeling Protocol.

As stated in the BART Modeling Protocol, emissions of NO_x, SO_2, and particulate matter up to 10 μm in size (PM_{10}) emissions were included in the refined BART exemption modeling. The model calculated the number of days that all BART-eligible sources at a single facility contribute to a delta-deciview (Δ dv) greater than or equal to 0.5 dv (contribution threshold) for each year. If the daily 98th percentile (22nd highest value for all years combined) is greater than this contribution threshold,

then the sources are considered “subject-to-BART” and must proceed with the BART determination analysis.

2.0 Source Description

The Nearman facility is located in Kansas City, Kansas within Wyandotte County. It has one unit that is BART eligible, Unit 1, which began commercial operation in 1981 and is rated at 235 MW. This unit is a wall-fired, dry bottom pulverized coal unit equipped with an Electrostatic Precipitator (ESP) for particulate control.

The Quindaro facility is located in Kansas City, Kansas within Wyandotte County. It has two units that are BART eligible, Units 1 and 2. Unit 1 is rated at 73 MW with commercial operation beginning in 1966. This unit is a cyclone furnace crushed coal unit equipped with an Electrostatic Precipitator (ESP) for particulate control. Unit 2 is rated at 135 MW with commercial operation beginning in 1971. This unit is a wall-fired, dry bottom pulverized coal unit equipped with an Electrostatic Precipitator (ESP) for particulate control.

The stack parameters used by KDHE for each unit in the initial modeling were used for the refined analyses described herein.

2.1 Location of Sources vs. Relevant Class I Areas

There are no Mandatory Federal Class I areas located in the state of Kansas. The closest Class I areas to potential Kansas BART sources are the Wichita Mountains in Oklahoma and Hercules-Glades Wilderness Area in Missouri. KDHE performed initial screening modeling for the BPU sources for nine Class I areas located throughout the Central Regional Air Planning (CENRAP) Association area. The results of this modeling are shown in Table 2-1 and indicate that refined exemption modeling must be undertaken for the BPU facilities. Based on correspondence with KDHE staff, it was agreed to model a subset of these areas for the refined exemption modeling. As such, and in order to keep the size of the refined modeling domain manageable, visibility impacts in five of the nine Class I areas was determined. The Class I areas include the Hercules-Glades, Mingo, Upper Buffalo, Caney Creek, and Wichita Mountains Wilderness Areas. Figure 2-1 provides the locations of these Class I areas with respect to the BPU facilities.

These five were chosen because they each had more than ten days above the 0.5 Δdv threshold over the 3-year modeling period of 2001-2003 as shown in Table 2-1 (Note: the Mingo and Wichita Mountain Wilderness Areas did not have more than ten days above the threshold for the Quindaro sources; however, they were included since they had more than ten days above the threshold for the Nearman source). The remaining four Class I areas each had significantly less than ten exceedance days above the threshold, with the greatest number of days above the threshold being only three and in some cases zero.

Furthermore, it is reasonably assumed that if results at these Class I areas, with their higher number of days above the threshold, demonstrate the facilities are not subject to BART, the Class I areas in Colorado and South Dakota would also demonstrate compliance. Given those areas' large distance from the facilities (greater than 600 km) and the fact they are in the opposite direction of the general west-to-east wind flow throughout the Midwest, this assumption is reasonable. This approach is meant to be consistent with the previously referenced July 6, 2005 Federal Register notice which dictates that "a

Table 2-1
KDHE Initial CALPUFF Modeling Results
(Number of Days Above 0.5 Deciview Contribution Threshold) [a]

Source	Class I Area [b]								
	Badlands	**Caney Creek**[b]	Great Sand Dunes	**Hercules Glades**[b]	**Mingo**[b]	Rocky Mountain	**Upper Buffalo**[b]	**Wichita Mountain**[b]	Wind Cave
BPU – Nearman	3	23	3	30	16	1	21	15	2
BPU – Quindaro	0	13	1	18	6	1	13	9	0

[a] Out of a modeled three year period.
[b] Those Class I areas in bold were evaluated further for both facilities in the refined BART exemption modeling.

Figure 2-1
BPU Facilities with respect to the Class I areas

common sense approach should be taken, particularly where an analysis may add a significant resource burden."

2.2 Unit Specific Source Data

Table 2-2 provides the stack parameters and Table 2-3 provides emissions data that were used in the modeling.

2.2.1 SO_2 and NO_x Emissions

As requested by KDHE, the SO_2 and NO_x emissions included in the analyses were the maximum 24-hour actual emission rate of normal operations (excluding periods of startup, shutdown, and malfunction) from the highest emitting day of the period 2002-2004. As such, Black & Veatch determined these emissions from CEMS data provided by BPU for each unit for that period. The maximum 24-hour actual emissions of NO_x and SO_2 did not occur during a period of startup, shutdown, or malfunction and were thus used in the modeling analysis.

2.2.2 PM_{10} Emissions

The PM_{10} emissions were speciated into appropriate filterable and condensable particulate matter categories: elemental carbon (soot), "soil" (fine PM <= 2.5 μm diameter), coarse particulate matter (2.5-10 μm diameter), inorganics, and organics for modeling purposes. The aforementioned speciated categories are illustrated in Figure 2-2. The appropriate source-specific particulate matter speciation spreadsheets provided by the National Park Service (NPS) and available on their web site (http://www2.nature.nps.gov/air/Permits/ect/index.cfm) were used to calculate the PM_{10} speciation emissions. For Nearman Unit 1 and Quindaro Unit 2, the NPS spreadsheet that represents a dry bottom PC boiler controlled by an ESP was used. For Quindaro Unit 1, the NPS spreadsheet that represents a cyclone furnace controlled by an ESP was used. The PM_{10} emissions and speciation methodology used for the BART modeling is described below. The NPS spreadsheets used are provided in Appendix E.

- Filterable PM_{10} emissions in tons per year were obtained from the 2002, 2003, and 2004 Kansas Annual Emission Inventory (AEI) forms for each source as reported to KDHE. Total heat input per year, per unit was obtained from CEMS data. Together, these two pieces of information (total annual filterable PM_{10} emissions and total annual heat input on a per unit, per year basis) were used to derive emission factors for PM_{10} in lb/mmBtu. These emission factors were then applied back to the hourly heat input values obtained from the CEMS data to derive hourly filterable PM_{10} emissions. Then, just as with NO_x and SO_2, the maximum 24-hour emission rate over the three year period for each unit was selected and used in the NPS speciation spreadsheets.

- Filterable PM_{10} emissions derived above were subdivided by size category using the appropriate NPS speciation spreadsheets. This is illustrated in Figure 2-2 as Elemental Carbon (EC) 0-0.625 μm diameter, Fine PM <= 2.5 μm diameter, and Course PM 2.5-10 μm diameter.

- Condensable PM_{10} was subdivided into inorganic and organic compounds using the NPS speciation spreadsheets. The inorganic portion is by default assumed to be H_2SO_4 and was modeled as SO_4. The organic portion was modeled as secondary organic aerosols (SOA).

Table 2-2 CALPUFF Modeling Parameters							
Unit	Stack Location[a]		Stack Height[b] (m)	Base Elevation[b] (m)	Stack Diameter[b] (m)	Stack Exit Velocity[b] (m/s)	Stack Exit Temperature[b] (K)
	LCC East (km)	LCC North (km)					
Nearman	-13.381	266.079	121.92	227.10	7.10	13.41	424.80
Quindaro 1	-7.846	265.177	106.68	225.64	4.05	25.30	436.48
Quindaro 2	-7.846	265.177	106.68	225.64	3.78	11.89	436.71

[a] Stack Coordinates in Lambert format included in the CALPUFF modeling.
[b] Stack parameters from KDHE modeling files.

Table 2-3 CALPUFF Modeling Emissions								
Unit	NO_x Emissions (g/s)	SO_2 Emissions (g/s)	PM_{10} Emissions (g/s)	Primary Particle Speciation*				
				EC (g/s)	Fine PM (g/s)	Course PM (g/s)	H_2SO_4 (g/s)	SOA (g/s))
Nearman	486.26	542.99	2.44	0.04	1.02	1.39	0.78	0.20
Quindaro 1	134.20	112.48	0.11	0.002	0.06	0.05	1.68	0.42
Quindaro 2	56.35	196.18	0.91	0.01	0.38	0.51	0.34	0.09

* Primary particulate speciated into the following categories using the NPS Speciation Spreadsheet: Elemental Carbon (EC), Fine PM, Course PM, Condensable Inorganic PM (SO_4), and Condensable Organic PM (SOA).

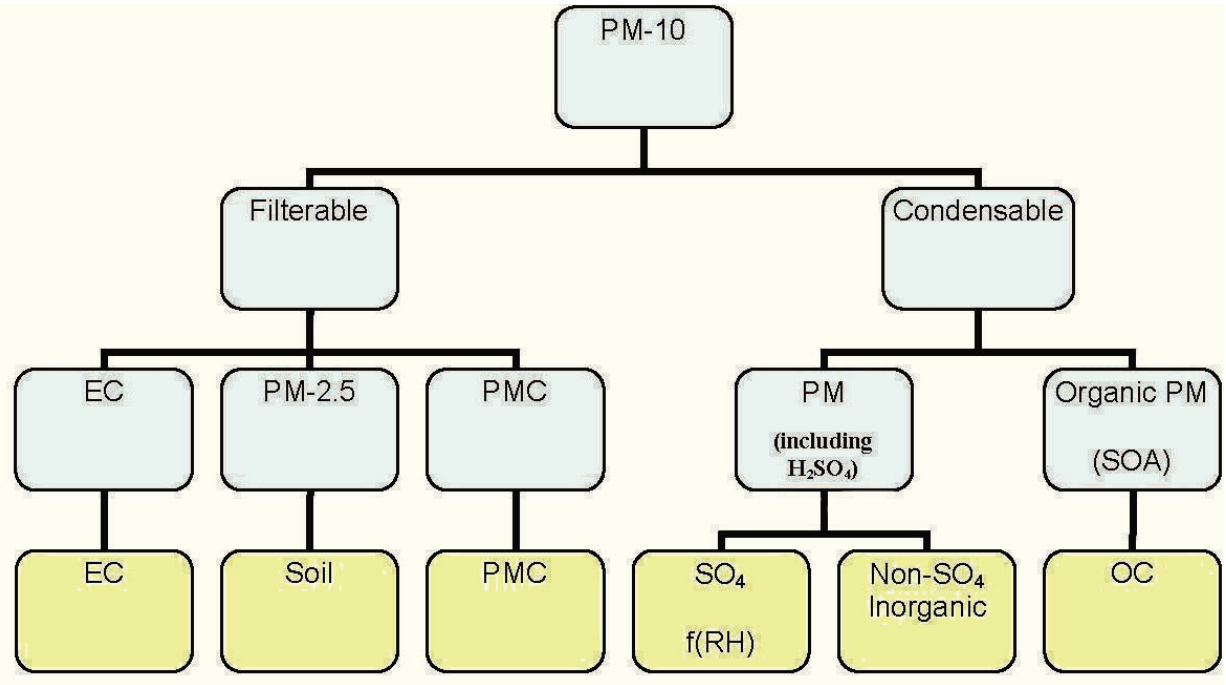


Figure 2-2
Speciation of PM_{10} Emissions

- All particulate modeling was performed using 1 gram per second nominal emission rates in CALPUFF for the specific size ranges presented in the NPS speciation spreadsheets (i.e., $PM_{8.0}$, $PM_{4.25}$, $PM_{1.88}$, $PM_{1.25}$, $PM_{0.813}$, and $PM_{0.625}$). These modeled species were grouped in POSTUTIL as to represent the appropriate visibility pollutants (e.g., $PM_{course} = PM_{8.0} + PM_{4.25}$ and $PM_{fine} = PM_{1.88} + PM_{1.25} + PM_{0.813} + PM_{0.625}$) and were scaled with the emission rates derived from the NPS spreadsheets. EC and SOA was derived from the $PM_{1.88}$ species and scaled with the emission rates derived from the NPS spreadsheets.

2.3 Model Versions

The versions of the CALPUFF modeling system programs that were used for the modeling are listed in Table 2-4. Due to known bugs in the regulatory version of CALPUFF, it was proposed that the latest Version 6 CALPUFF modeling system available for download on the SRC website (www.scr.com) be used for these modeling analyses. Another reason for the use of Version 6 of the CALPUFF modeling system over the regulatory version is that it contains the appropriate sized array for the number of z data levels used in this analysis (i.e., the regulatory version is limited to 32 z levels and does not allow the 34 z levels found in the MM5 data to be processed in CALMET).

It should be noted, however, and KDHE was aware of the issue, that the MM5 data files obtained from CENRAP via KDHE have an erroneous header line of "3D.DAT". This header line is an indicator to the CALMET program that the MM5 data is in 3D format and is to be read in as such. Conversations with Dennis McNally of Alpine Geophysics, the creator of the MM5 data for CENRAP, revealed that the data is standard MM5 data and not 3D data as the header line indicates. Since the data is not 3D data (and CALMET attempted to read the data as such because of the header line), the CALMET program crashed. Black & Veatch developed a work-around, by commenting out the portion of the CALMET Fortran code that attempted to read the data as 3D data, thereby forcing CALMET to read the MM5 data in standard format. With this change, CALMET executed on the CENRAP MM5 data to completion. The updated code and program executable were shared with KDHE in an email to Andy Hawkins on August 24, 2006 and will be included in the CD/DVD in Appendix H (forthcoming). The CALMET code change is included in Appendix G.

2.4 Modeling Domain

The modeling domain was sufficiently large to include the BPU BART-eligible sources, as well as the receptors at the relevant Class I areas with at least 50-km buffer in each direction. The map projection was the Lambert Conformal Conic (LCC) and the coordinate system was North America Datum 1927 (NAD 27). The modeling domain is shown in Figure 2-3. A grid resolution of 4-km was used in the refined modeling.

The origin coordinates of the domain is Latitude 36.758 N, Longitude 94.557 W and was assigned as the 0, 0 reference point of the domain. The southwest corner of the modeling domain is latitude 33.755 N, Longitude 99.339 W, which translates to -443.23 km (X) and -322.16 (Y) in LCC coordinates. The domain measured 892 km in the east-west (X) direction by 752 km in the north-south (Y) direction. At a refined grid spacing of 4-km, the number of X grid cells was 223 and the number of the Y grid cells was 188.

Table 2-4 Model Versions				
Program	KDHE Suggested		BPU Analyses	
	Version	Level	Version	Level
SMERGE			5.56	050324
PMERGE			5.31	030528
TERREL	3.311	030709	3.681	060202
CTGCOMP	2.42	030709	2.22	030528
CTGPROG	2.42	030709	2.66	060202
MAKEGEO	2.22	030709	2.26	041230
CALMET	5.53a	040716	6.211	060414
CALPUFF	5.753	051130	6.112	060412
POSTUTIL	1.4	040818	1.52	060412
CALPOST	5.6392	051130	6.131	060410
CALSUM			1.33	051122

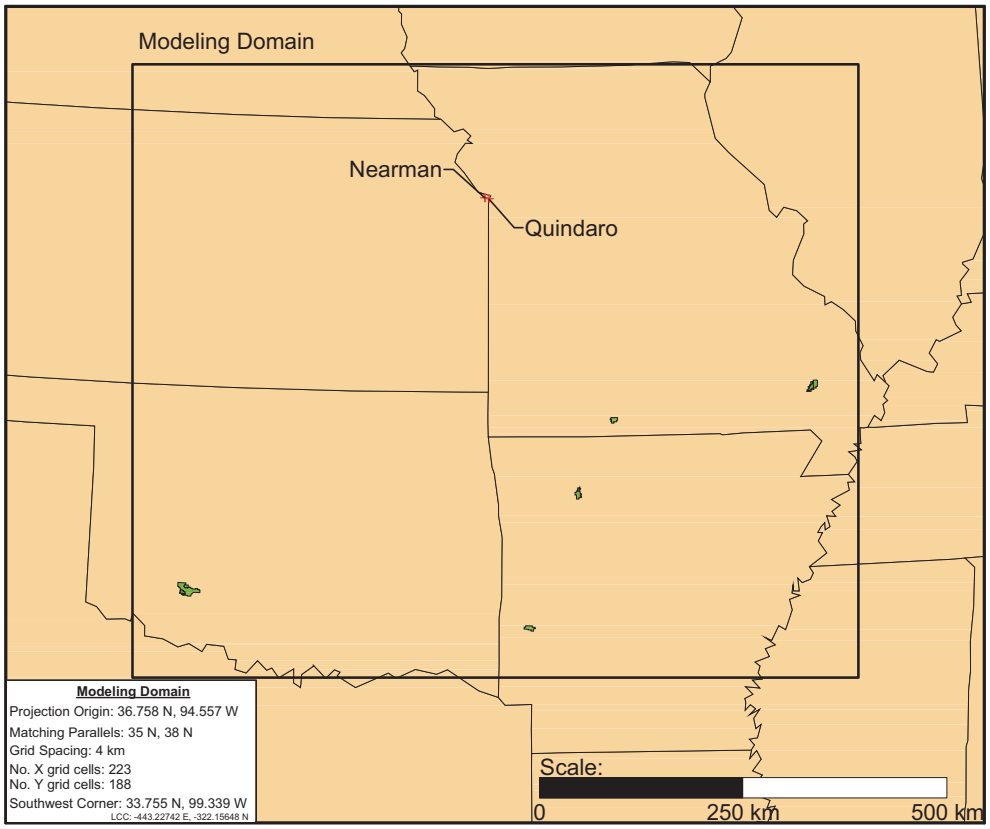


Figure 2-3
Class I Modeling Domain

3.0 Geophysical and Meteorological Data

CENRAP contracted Alpine Geophysics to produce CALPUFF-ready, CALMET meteorological data files for use in the initial screening analysis. The development of the initial CALMET meteorological fields from mesoscale meteorological-generation 5 (MM5) data were conducted in No-Observations ("No-Obs") mode. The MM5 data already reflect assimilation of observational data and are likely to adequately characterize regional wind patterns that are consistent with the 6-km grid scale. Blending of MM5 data with local observations (which are mainly at the surface) could lead to wind structures that may not be realistic under some conditions and may result in poorer characterization of the regional winds. Thus, the effort required to prepare observational data sets for CALMET for the large initial domain involved considerable effort that may not have provided corresponding improvement of the wind field.

Grid resolution better than 6-km is needed for a finer-grid CALPUFF assessment of visibility impacts in most cases. For the finer resolution modeling presented in this report, available surface and precipitation observations were used in addition to MM5 prognostic meteorological model outputs to produce refined CALMET meteorological data files at a 4-km resolution.

3.1 Mesoscale Model Data

Pennsylvania State University in conjunction with the National Center for Atmospheric Research (NCAR) Assessment Laboratory have developed mesoscale meteorological data sets of prognostic wind fields, or "guess" fields, for the United States. The hourly meteorological variables used to create these data sets (wind, temperature, dew point depression, and geopotential height for eight standard levels and up to 15 significant levels) are extensive and are used to initialize the modeling domain with meteorological data. The following MM5 data provided by KDHE were used:

- 2001 MM5 data set at 12 km resolution developed for EPA by Alpine Geophysics (McNally and Tesche, 2002; McNally 2003);
- 2002 MM5 data set at 36 km resolution developed for CENRAP by Iowa DNR (Johnson, 2003a,b),
- 2003 MM5 data set at 36 km resolution developed for the Midwest RPO (Baker, 2005; Baker et al., 2004; Kembell-Cook et al., 2005)

The MM5 data sets, used to simulate atmospheric variables within the modeling domain in CALMET, although advanced, lack the fine detail of specific temporal and spatial meteorological variables and geophysical data. These variables were processed into the appropriate format and introduced into the CALMET model through the utilization of additional data files obtained from numerous sources. These ancillary data files are described in more detail in the following sections.

3.2 Surface Data Station and Processing

The surface station data for the CALPUFF analysis consisted of data from 37 National Weather Service (NWS) stations or Federal Aviation Administration (FAA) Flight Service stations within the CALMET domain. Figure 3-1 provides an illustration of the location of the surface stations used. A listing of the surface stations is provided in Appendix A (Table A-2). The surface station parameters include wind speed, wind direction, cloud ceiling height, opaque cloud cover, dry bulb temperature, relative humidity, station pressure, and a precipitation code that is based on current weather conditions. The data was processed with the CALMET preprocessor utility program, SMERGE, to create one surface file for each year modeled.

3.3 Precipitation Data Stations and Processing

Precipitation data was processed from a network of hourly precipitation data files collected from 197 primary and secondary NWS precipitation recording stations within the CALMET domain. Figure 3-2 provides an illustration of the location of the precipitation stations used. A listing of the precipitation stations is provided in Appendix A (Table A-3). The data was processed with the CALMET preprocessor utility programs PXTRACT and PMERGE to create one precipitation file for each year modeled.

3.4 Geophysical Data Processing (Terrain and Land Use)

Terrain elevations for each grid cell of the modeling domain were obtained from 1-degree digital elevation model (DEM) files available from the United States Geological Survey (USGS). Figure 3-3 depicts the terrain elevations in the domain and Table A-4 in Appendix A lists the DEM files used. The DEM data were extracted for the modeling domain grid using the CALMET preprocessor program TERREL.

Land use data, based on annual averaged values, was also obtained from the USGS. Figure 3-4 shows the land use of the domain and Table A-5 in Appendix A lists the land use files used. Land use values for the domain grid were extracted with the preprocessor programs CTGCOMP and CTGPROC. Other parameters processed for the modeling domain include surface roughness, surface albedo, Bowen ratio, soil heat flux, and leaf index field. Once preprocessed, all of the land use parameters were combined with the terrain information in a processor called MAKEGEO. This processor produced one GEO.DAT file for input to CALMET.

3.5 CALMET Variables

The selection of the specific variables used in CALMET is provided in Appendix A.

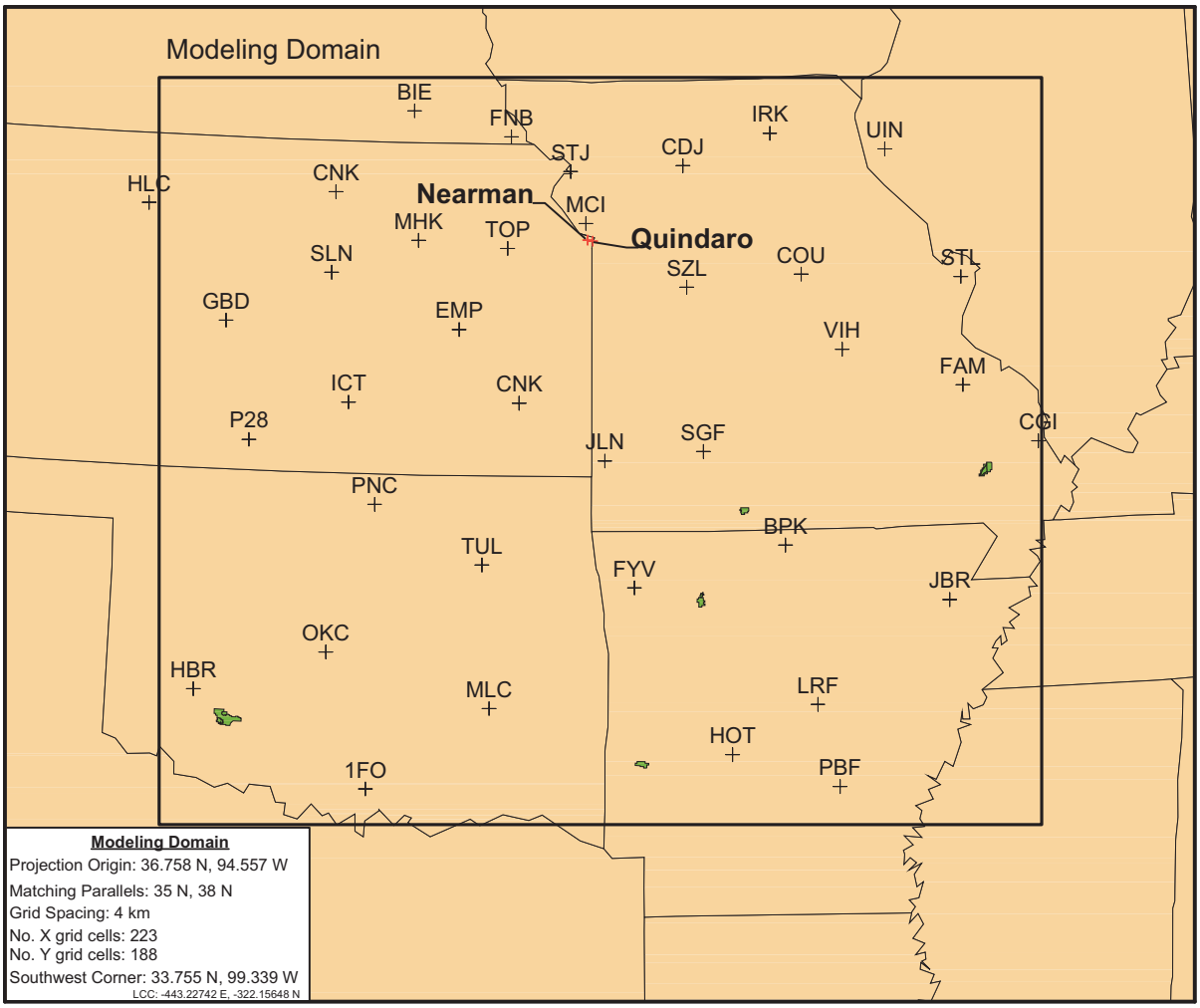


Figure 3-1
Surface Stations

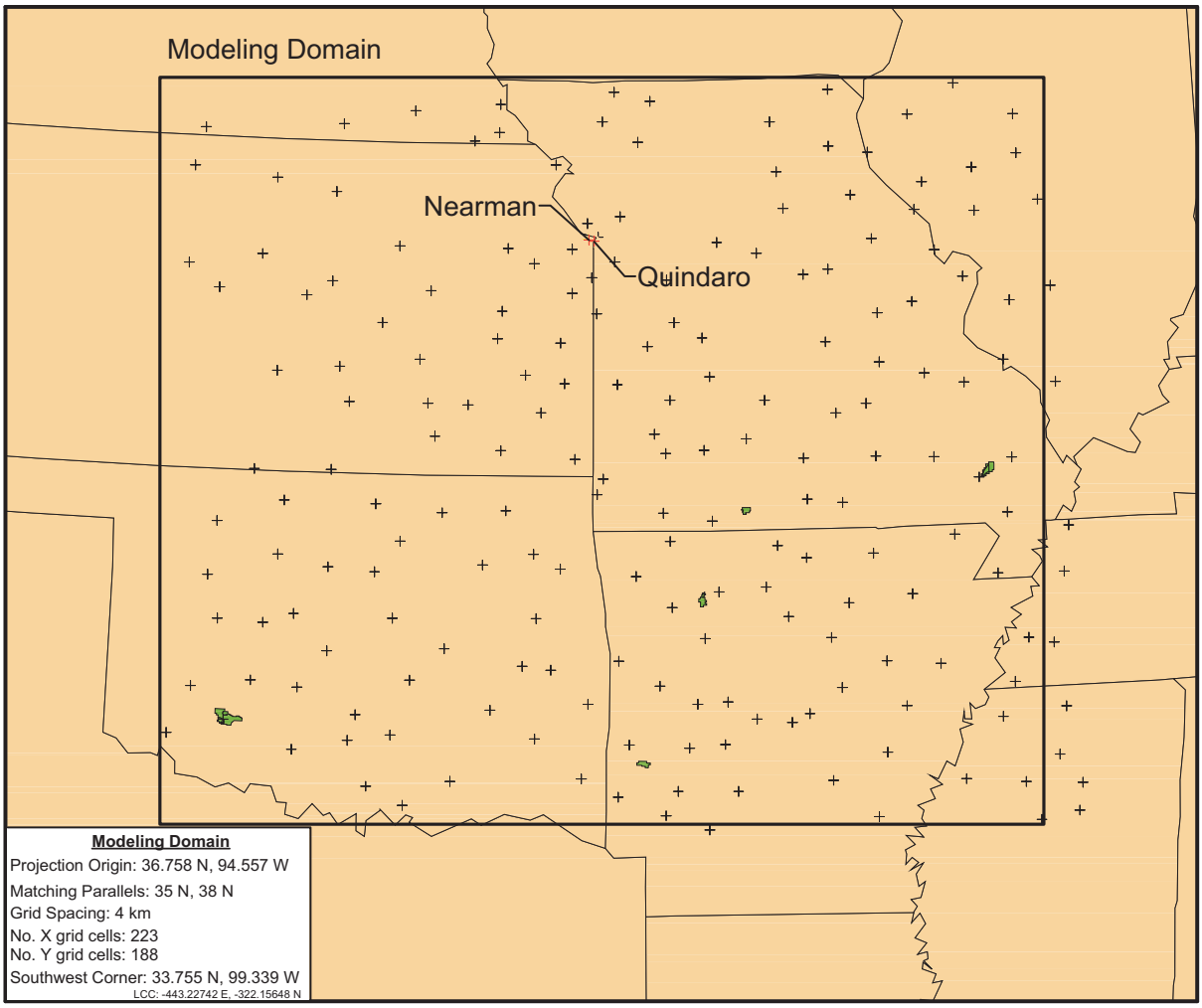


Figure 3-2
Precipitation Stations

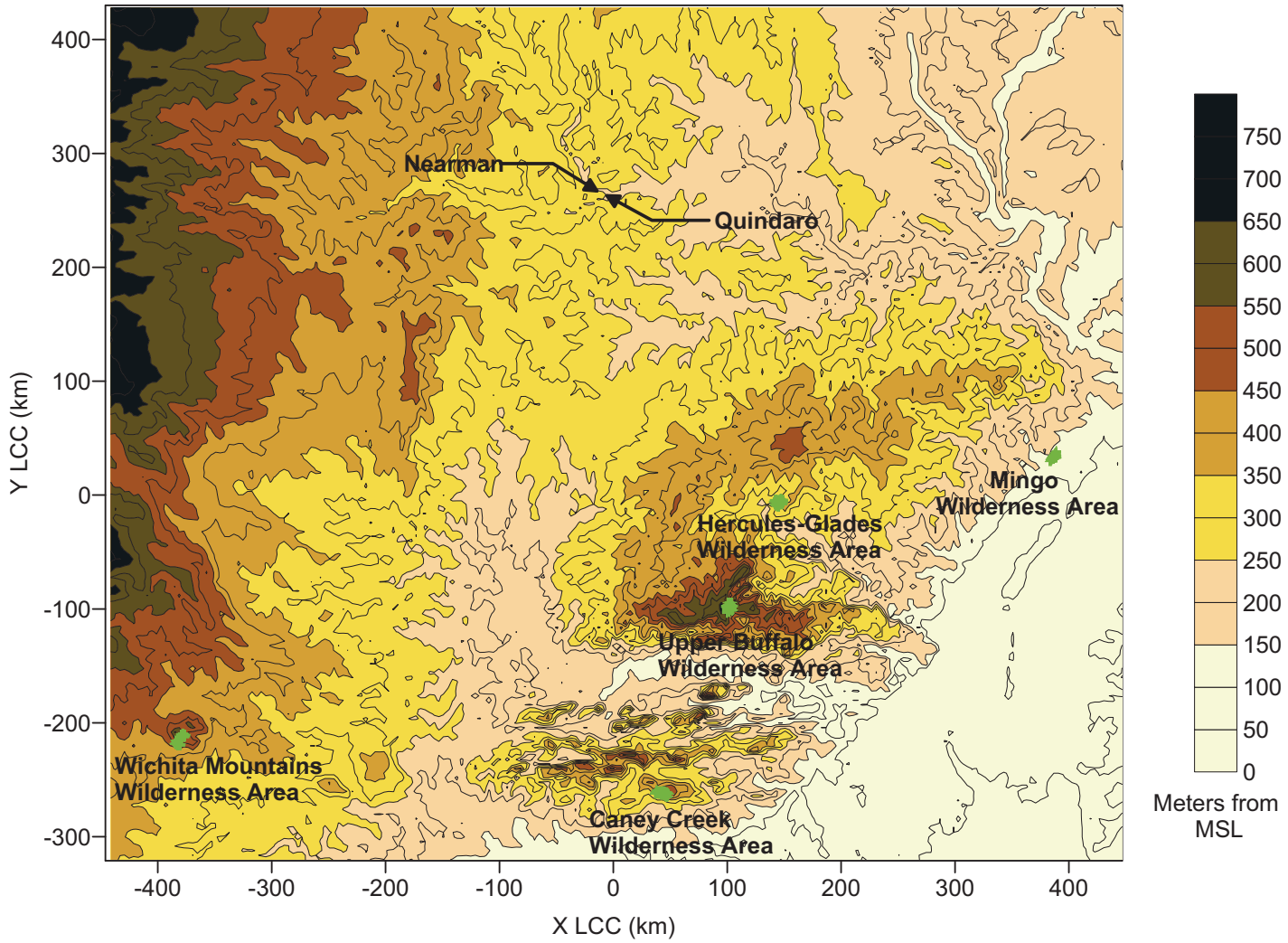


Figure 3-3
Terrain Elevation Plot

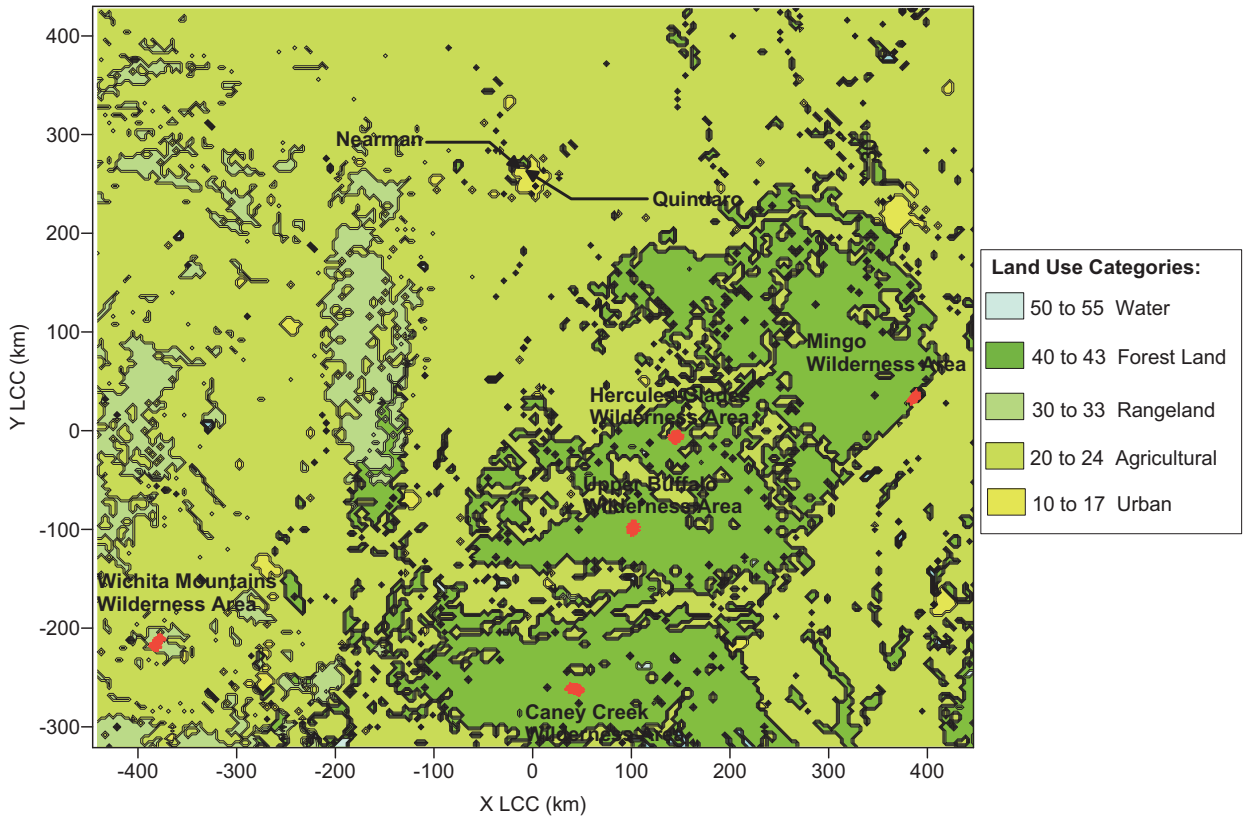


Figure 3-4
Land Use Plot

4.0 Air Quality Modeling Methodology

The CALPUFF modeling system (Scire et al., 2000a, b) is recommended as the preferred modeling approach for use in BART analyses. CALPUFF and its meteorological model, CALMET, are designed to handle the complexities posed by complex terrain, large source-receptor distances, chemical transformation and deposition, and other issues related to Class I visibility impacts. The CALPUFF modeling system has been adopted by the EPA as a Guideline Model for source-receptor distances greater than 50 km, and for use on a case-by-case basis in complex flow situations for shorter distances (68 FR 18440-18482). CALPUFF is recommended for Class I impact assessments by the Federal Land Managers Workgroup (FLAG 2000) and the Interagency Workgroup on Air Quality Modeling (IWAQM) (EPA 1998). The final BART guidance recommends CALPUFF as "the best modeling application available for predicting a singe source's contribution to visibility impairment" (70 FR 39122).

CALPUFF is a non-steady-state, Lagrangian, puff transport and dispersion model that advects Gaussian puffs of multiple pollutants from modeled sources. CALPUFF's algorithms have been designed to be applicable on spatial scales from a few tens of meters to hundreds of kilometers from a source. It includes algorithms for near-field effects such as building downwash, stack tip downwash and transitional plume rise as well as processes important in the far-field such as chemical transformation, wet deposition, and dry deposition. CALPUFF contains an option to allow puff splitting in the horizontal and vertical directions, which extends the distance range of the model. The primary outputs from CALPUFF are hourly concentrations and hourly deposition fluxes evaluated at user-specified receptor locations.

A set of postprocessing programs associated with CALPUFF computes visibility effects and allows cumulative source impacts to be assessed, including potential non-linear effects of ammonia limitation on nitrate formation. The CALPOST postprocessor contains several options for computing change in extinction and deciviews for visibility assessments. The POSTUTIL postprocessor includes options for summing contributions of individual sources or groups of sources to assess cumulative impacts. POSTUTIL also contains CALPUFF's nitric acid-nitrate chemical equilibrium module, which allows the cumulative effects of ammonia consumption by background sources to be assessed in the postprocessor. In addition, the combination of CALPUFF and POSTUTIL allows the effects of source emissions of ammonia to be incrementally added to background ammonia levels when determining nitrate formation.

4.1 CALPUFF Domain and Variables

The CALPUFF computational domain was the same as that used in CALMET. The selection of the specific variables used in CALPUFF is provided in Appendix B.

4.2 Receptors

The CALPUFF analyses used an array of discrete receptors with receptor elevations for the Class I areas, which were created and distributed by the NPS. Specifically, the array consists of receptors spaced to cover the extent of the Class I areas. Receptor elevations are included in the same NPS-provided receptor files. Appendix F provides illustrations of the receptors to be used in the modeling analysis for each Class I area.

4.3 Downwash

Because the modeling conducted for BART is concerned with long-range transport, not localized impacts, data about building heights and widths that are used to calculate building downwash was not included in the modeling analyses. Stack tip downwash is a phenomenon different from building induced downwash and is additionally a regulatory default option (i.e., in order to turn stack tip downwash off, the user must also change the variable to skip regulatory checks of the model). As such, stack tip downwash was used for this analysis.

This same methodology (no building induced downwash, but perform stack tip downwash) was used by CENRAP and documented the CENRAP modeling guidelines. Additionally, the CALPUFF modeling files provided by KDHE utilized the stack tip downwash option.

4.4 Ozone Concentrations

Background ozone concentrations are important for the photochemical conversion of SO_2 and NO_x to sulfates (SO_4) and nitrates (NO_3), respectively. CALPUFF allows the use of a single background ozone value, monthly background ozone values, or spatial, hourly ozone data from one or more ozone monitoring stations (the preferred method) to represent the background ozone concentrations within the domain.

The hourly ozone concentrations files that were used by KDHE in the initial screening analysis were used for the refined BART evaluation. These hourly ozone data files were obtained directly from KDHE. In addition to the hourly ozone data, the same monthly average background ozone value of 40 ppb as used by KDHE in the initial modeling was used in this refined modeling for times when hourly ozone data are not available.

4.5 CALPOST and POSTUTIL

The two main postprocessors of interest for BART applications are the CALPOST and POSTUTIL programs. CALPOST is used to process the CALPUFF outputs by producing tabulations summarizing the results of the simulations, identifying, for example, the highest and second-highest hourly-average concentrations at each receptor. When performing visibility-related modeling, CALPOST uses concentrations from CALPUFF to compute light extinction and related measures of visibility (haze index in deciviews), reporting these for a 24-hour averaging time.

The POSTUTIL processor is a program that has several functions, including creating cumulative impacts of multiple sources from different simulations via summation, computing the difference between two sets of predicted impacts (useful for evaluating the benefits of BART controls), and

evaluating the equilibrium relationship between nitric acid and nitrate aerosols via a chemistry module. The later function allows the potential non-linear effects of ammonia scavenging by sulfate and nitrate sources to be evaluated in the formation of nitrate from an individual source.

In its simplest form, CALPUFF makes the full ambient ammonia concentration available to each puff without regard for any scavenging by other puffs. POSTUTIL corrects for such scavenging when the puffs generated by the CALPUFF model overlap, as could be the case for a single source when the wind speed is low, or when nitrate formation is to be attributed to each of several sources that are in a cluster and whose plumes overlap. The selections of the specific variables used in POSTUTIL and CALPOST are provided in Appendices C and D, respectively.

4.5.1 Light Extinction

Light extinction must be computed in order to calculate visibility. CALPOST has seven methods for computing light extinction. This BART refined analysis used Method 6, which computes extinction from speciated particulate matter with monthly Class I area-specific relative humidity adjustment factors. Relative humidity is an important factor in determining light extinction (and therefore visibility) because sulfate and nitrate aerosols, which absorb moisture from the air, have greater extinction efficiencies with greater relative humidity. This BART analysis applied relative humidity correction factors [f(RH)s], obtained from the *Guidance for Estimating Natural Visibility Conditions under the Regional Haze Rule* (EPA, 2003), to sulfate and nitrate concentrations outputs from CALPUFF. The f(RH) values for the Class I areas that were assessed are provided in Table 4-1. The default Rayleigh scatter value (b_{ray}) of 10 Mm^{-1} was also used. The light extinction equation is provided below.

$$b_{ext} = 3 * f(RH) * [(NH_4)_2SO_4] + 3* f(RH) * [NH_4NO_3] + 4*[OC] + 1* [PM_f] + 0.6*[PM_c] + 10* [EC] + b_{ray}$$

4.5.2 Natural Background

The EPA's default average annual aerosol concentrations for the eastern and western halves of the U.S., included in Table 2-1 of EPA's *Guidance for Estimating Natural Visibility Conditions Under Regional Haze Program,* was used to determine the natural background at each of the Class I areas. The location of the Class I area determined which average annual aerosol concentration was used. The values are provide in Table 4-2

4.5.3 Ammonia Concentrations

Ambient concentrations of nitrate (NO_3) are limited by the availability of ammonia, which is preferentially scavenged by sulfates (SO_4). Due to this preferential reaction between ammonia and sulfates, a lower ammonia concentration would tend to decrease particle nitrate concentrations prior to affecting particle sulfate concentrations.

In CALPUFF, a continuous emissions plume is represented by a series of puffs. The model allows the full amount of the background ammonia concentrations to be available to each emissions puff to

form nitrate, which tends to overestimate nitrate formation. To compensate, the POSTUTIL utility program can be used to repartition HNO_3 and NO_3. However, the refined modeling was performed using the same fixed background ammonia level of 3 ppb that was used for the initial screening analysis performed by KDHE.

Table 4-1
Monthly Relative Humidity Factors

Class I Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mingo	3.3	3.0	2.8	2.6	3.0	3.2	3.3	3.5	3.5	3.1	3.1	3.3
Hercules-Glades	3.2	2.9	2.7	2.7	3.3	3.3	3.3	3.3	3.4	3.1	3.1	3.3
Upper Buffalo	3.3	3.0	2.7	2.8	3.4	3.4	3.4	3.4	3.6	3.3	3.2	3.3
Caney Creek	3.4	3.1	2.9	3.0	3.6	3.6	3.4	3.4	3.6	3.5	3.4	3.5
Wichita Mountain	2.7	2.6	2.4	2.4	3.0	2.7	2.3	2.5	2.9	2.6	2.7	2.8

Table 4-2
Average Annual Natural Background Levels

Component	Average Annual Natural Background ($\mu g/m^3$)	
	East[a]	West[b]
Ammonium Sulfate	0.23	0.12
Ammonium Nitrate	0.10	0.10
Organic Carbon Mass	1.40	0.47
Elemental Carbon	0.02	0.02
Soil	0.50	0.50
Coarse Mass	3.0	3.0

[a] Includes Caney Creek, Hercules-Glades, Mingo, and Upper Buffalo Class I areas.

[b] Includes Wichita Mountains Class I area.

5.0 CALPUFF, CALPOST and POSTUTIL Results

Based on the air dispersion modeling methodology outlined in the previous sections, the refined CALPUFF modeling was performed for the BART eligible units on a facility basis and the modeled 22nd highest 24-hour impact in a 3 year period was compared to the recommended 0.5 deciview (dv) value. A CD/DVD of all input (other than MM5 data) and output files and data in electronic format for the CALMET, CALPUFF, CALPOST and POSTUTIL runs will be provided in Appendix H under separate submittal to be forthcoming.

Tables 5-1 through 5-20 present the 98th percentile results of the BART modeling for both the Nearman and Quindaro facilities for each Class I area evaluated. Each of the following pages in the remainder of this section (one page for each facility and Class I area combination) presents a series of two tables. The first table presents the top 22 model-predicted impacts over the entire three-year period modeled. The second table, provided at the request of KDHE, presents the top 8 model-predicted impacts for each individual year modeled.

As indicated in the following tables, the Quindaro facility is below 0.5 dv at all Class I areas evaluated. The Nearman facility is below 0.5 dv at three of the five Class I areas evaluated and is only slightly above this value at the two closest areas: Hercules-Glades and Upper Buffalo. Of the 1,093 days (i.e., 24-hour averaging periods) modeled, only 7 days total, beyond the 22nd highest impacts at each Class I area, are slightly above 0.5 dv. Given the magnitude of these results, BPU requests that both the Nearman and Quindaro facilities be found not subject to the BART provisions of the Regional Haze Rule.

Table 5-1 Nearman Modeling Results on Caney Creek Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
1.004
0.851
0.822
0.801
0.735
0.732
0.579
0.575
0.534
0.511
0.503
0.472
0.438
0.414
0.407
0.406
0.398
0.388
0.386
0.379
0.373
0.344

Table 5-2 Nearman Modeling Results on Caney Creek Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
0.851	1.004	0.579
0.822	0.801	0.511
0.735	0.534	0.407
0.732	0.472	0.388
0.575	0.438	0.373
0.503	0.414	0.314
0.406	0.379	0.232
0.398	0.344	0.222

Table 5-3 Nearman Modeling Results on Hercules-Glades Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
1.951
1.455
0.978
0.886
0.791
0.779
0.764
0.763
0.758
0.745
0.741
0.737
0.644
0.641
0.625
0.610
0.586
0.584
0.581
0.575
0.572
0.572

Table 5-4 Nearman Modeling Results on Hercules-Glades Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
1.951	0.978	0.764
1.455	0.886	0.763
0.791	0.758	0.641
0.779	0.745	0.581
0.741	0.625	0.572
0.737	0.610	0.568
0.644	0.575	0.501
0.586	0.572	0.469

Table 5-5 Nearman Modeling Results on Mingo Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
1.439
1.209
0.652
0.563
0.541
0.520
0.510
0.501
0.489
0.456
0.375
0.366
0.353
0.346
0.346
0.345
0.334
0.310
0.290
0.289
0.289
0.288

Table 5-6 Nearman Modeling Results on Mingo Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
0.563	1.439	1.209
0.520	0.652	0.501
0.510	0.541	0.456
0.366	0.489	0.375
0.353	0.346	0.345
0.346	0.334	0.289
0.310	0.290	0.288
0.289	0.280	0.243

Table 5-7 Nearman Modeling Results on Upper Buffalo Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
1.863
1.438
1.201
1.047
0.940
0.881
0.826
0.711
0.685
0.635
0.630
0.617
0.615
0.585
0.581
0.576
0.571
0.570
0.551
0.547
0.525
0.504

Table 5-8 Nearman Modeling Results on Upper Buffalo Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
1.863	1.047	0.940
1.438	0.881	0.711
1.201	0.826	0.525
0.685	0.635	0.499
0.630	0.615	0.484
0.617	0.585	0.471
0.581	0.551	0.444
0.576	0.504	0.384

Table 5-9 Nearman Modeling Results on Wichita Mountains Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
1.699
0.968
0.836
0.728
0.564
0.558
0.544
0.478
0.429
0.417
0.386
0.361
0.337
0.336
0.326
0.324
0.319
0.299
0.259
0.258
0.242
0.221

Table 5-10 Nearman Modeling Results on Wichita Mountains Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
0.968	0.564	1.699
0.728	0.429	0.836
0.544	0.386	0.558
0.319	0.361	0.478
0.299	0.336	0.417
0.258	0.209	0.337
0.220	0.198	0.326
0.218	0.196	0.324

Table 5-11 Quindaro Modeling Results on Caney Creek Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
0.456
0.441
0.438
0.369
0.342
0.327
0.308
0.286
0.270
0.262
0.234
0.232
0.222
0.215
0.207
0.201
0.189
0.186
0.178
0.178
0.175
0.171

Table 5-12 Quindaro Modeling Results on Caney Creek Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
0.441	0.456	0.327
0.438	0.369	0.232
0.342	0.308	0.207
0.270	0.286	0.189
0.222	0.262	0.168
0.215	0.234	0.140
0.201	0.186	0.125
0.175	0.178	0.123

Table 5-13 Quindaro Modeling Results on Hercules-Glades Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
0.951
0.673
0.512
0.461
0.445
0.430
0.423
0.389
0.388
0.363
0.355
0.350
0.346
0.338
0.336
0.324
0.318
0.317
0.295
0.292
0.283
0.282

Table 5-14 Quindaro Modeling Results on Hercules-Glades Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
0.951	0.512	0.423
0.673	0.445	0.346
0.461	0.430	0.318
0.389	0.363	0.292
0.388	0.355	0.262
0.350	0.338	0.250
0.336	0.317	0.242
0.324	0.295	0.227

Table 5-15 Quindaro Modeling Results on Mingo Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
0.853
0.573
0.391
0.364
0.321
0.263
0.252
0.245
0.231
0.230
0.216
0.214
0.210
0.208
0.191
0.155
0.149
0.145
0.143
0.140
0.140
0.134

Table 5-16 Quindaro Modeling Results on Mingo Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
0.245	0.853	0.573
0.230	0.391	0.364
0.210	0.321	0.252
0.208	0.263	0.231
0.155	0.214	0.216
0.145	0.191	0.149
0.140	0.143	0.118
0.119	0.140	0.103

Table 5-17 Quindaro Modeling Results on Upper Buffalo Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
0.811
0.776
0.547
0.540
0.447
0.428
0.426
0.368
0.366
0.352
0.292
0.289
0.287
0.282
0.278
0.269
0.266
0.265
0.260
0.254
0.252
0.252

Table 5-18 Quindaro Modeling Results on Upper Buffalo Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
0.811	0.426	0.776
0.547	0.368	0.428
0.540	0.366	0.252
0.447	0.352	0.252
0.287	0.292	0.209
0.282	0.289	0.198
0.278	0.269	0.164
0.266	0.265	0.156

Table 5-19 Quindaro Modeling Results on Wichita Mountains Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
0.910
0.526
0.429
0.373
0.280
0.264
0.261
0.241
0.194
0.191
0.186
0.185
0.171
0.169
0.164
0.149
0.146
0.135
0.121
0.121
0.117
0.113

Table 5-20 Quindaro Modeling Results on Wichita Mountains Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
0.526	0.261	0.910
0.373	0.191	0.429
0.264	0.185	0.280
0.186	0.169	0.241
0.171	0.164	0.194
0.121	0.110	0.149
0.113	0.104	0.146
0.110	0.095	0.135

Appendix A-CALMET Control File Inputs & Meteorological data

Variable	Description	BPU Value	Agreement with Default	Comments
INPUT GROUP 0: Input and Output				
NUSTA	Number of Upper air stations	0	n/a	Not using Upper air station observations
NOWSTA	Number of over water met stations	0	n/a	Not using over water met stations
INPUT GROUP 1: General Run Control Parameters				
IBYR	Starting year of the CALPUFF run	2001	n/a	2002 and 2003 are the other years modeled
IBMO	Starting month	1	n/a	
IBDY	Starting day	1	n/a	
IBHR	Starting hour	1	n/a	
IEYR	Ending year	2001		
IEMO	Ending month	2	n/a	CALMET run in monthly increments
IEDY	Ending day	1	n/a	
IEHR	Ending hour	1	n/a	
ABTZ	Base time zone	6.0	n/a	Central Standard Time
IRTYPE	Run Length	1	Y	Must be 1 to run CALPUFF
LCALGRD	Compute variables used by both CALGRID and CALPUFF	T	Y	Compute all fields required by CALPUFF
ITEST	Stop run after SETUP to do input QA	2	Y	
INPUT GROUP 2: Map Projection and Grid Control Parameters				
PMAP	Map Projection	LCC	UTM	
FEAST	False Easting at the projection origin	0.00	Y	
FNORTH	False Northing at the projection origin	0.00	Y	
IUTMZN	UTM zone	n/a	n/a	
UTMHEM	Hemisphere for UTM projection	n/a	n/a	
RLATO	Latitude (dec. degrees) of projection origin	36.758 N	n/a	
RLONO	Longitude (dec. degrees) of projection origin	94.557 W	n/a	
XLAT1	Matching parallel(s) of latitude projection	35 N	n/a	
XLAT2	Matching parallel(s) of latitude projection	38 N	n/a	
DATUM	Datum region for output coordinates	NAS-C	n/a	
NX	Number of X grid cells in meteorological grid	223	n/a	
NY	Number of Y grid cells in meteorological grid	188	n/a	
DGRIDKM	Grid spacing, km	4	n/a	Refined grid spacing
XORIGKM	Ref. Coordinate of SW corner of grid cell (1,1)	-443.227	n/a	

Variable	Description	BPU Value	Agreement with Default	Comments
YORIGKM	Ref. Coordinate of SW corner of grid cell (1,1)	-322.156	n/a	
NZ	No. of vertical layers	10	n/a	
ZFACE	Cell face heights in arbitrary vertical grid, m	0,20,40, 80,160,320, 640,1200,2000, 3000,4000	n/a	
INPUT GROUP 3: Output Options				
LSAVE	Disk output option	T	Y	
IFORMO	Type of unformatted output type	1	Y	
LPRINT	Print met fields	F	Y	
IPRINF	Print intervals	1	Y	
IUVOUT(NZ)	Specify layers of u,v wind components to print	NZ*0	Y	
IWOUT(NZ)	Specify layers of w wind components to print	NZ*0	Y	
ITOUT(NZ)	Specify layers of 3-D temperature field to print	NZ*0	Y	
LDB	Print input met data and variables	F	Y	
NN1	First time step for debug data to be printed	1	Y	
NN2	Last time step for debug data to be printed	1	Y	
IOUTD	Control 1variable for writing test/debug wind fields	0	Y	
NZPRN2	Number of levels starting at surface to print	1	Y	
IPR0	Print interpolated wind components	0	Y	
IPR1	Print terrain adjusted surface wind components	0	Y	
IPR2	Print initial divergence fields	0	Y	
IPR3	Print final wind speed and direction	0	Y	
IPR4	Print final divergence fields	0	Y	
IPR5	Print winds after kinematic effects	0	Y	
IPR6	Print winds after Froude number adjustment	0	Y	
IPR7	Print winds after slope flows are added	0	Y	
IPR8	Print final field components	0	Y	
INPUT GROUP 4: Meteorological Data Options				
NOOBS	1= Use of surface and precipitation (no upper air observations); use MM5 for	1	N	1= Use of surface and precipitation (no upper air observations); use MM5 for upper air data

Variable	Description	BPU Value	Agreement with Default	Comments
	upper air data			
NSSTA	Number of meteorological surface stations	37	n/a	
NPSTA	Number of precipitation stations	197	n/a	
ICLOUD	Gridded cloud fields	0	N	
IFORMS	Formatted surface meteorological data file	2	Y	
IFORMP	Formatted surface precipitation data file	2	Y	
IFORMC	Formatted cloud data file	2	Y	No additional cloud data used in the model.
INPUT GROUP 5: Windfield Options and Parameters				
IWFCOD	Model selection variable	1	Y	
IFRADJ	Compute Froude number adjustment factor	1	Y	
IKINE	Compute kinematic effects	1	N	Modeling did compute kinematic effects
IOBR	Use O'Brien (1970) vertical velocity adjustment	0	Y	
ISLOPE	Compute slope flow effects	1	Y	
IEXTRP	Extrapolate surface wind obs to upper level	-4	Y	
ICALM	Extrapolate surface winds if calm	0	Y	
BIAS	Layer dependent biases weighting aloft measurements	NZ*0	Y	
RMIN2	Minimum vertical extrapolation distance	4	Y	
IPROG	Use gridded prognostic wind field model output fields as input to the diagnostic wind field model	14	N	Use winds from MM5.DAT file as initial guess field
ISTEPPG	MM5 output timestep	1	Y	
LVARY	Use varying radius of influence	F	Y	
RMAX1	Maximum radius of influence over land in sfc layer	100	n/a	These values are typical of the Midwest where terrain influences/changes are not expected to be significant.
RMAX2	Maximum radius of influence over land aloft	300	n/a	
RMAX3	Maximum radius of influence over water	500	n/a	
RMIN	Minimum radius of influence used anywhere	0.1	Y	
TERRAD	Terrain feature radius of influence	10	n/a	
R1	Weighting of first guess surface field	40	n/a	
R2	Weighting of first guess aloft field	100	n/a	
RPROG	MM4 windfield weighting parameter	0	n/a	Not used since IPROG is not equal to 1.

Variable	Description	BPU Value	Agreement with Default	Comments
DIVLIM	Minimum divergence criterion	5.E-6	Y	
NITER	Number of divergences minimization iterations	50	Y	
NSMMTH	Number of passes through smoothing filter in each layer of CALMET	2,4,4,4,4, 4,4,4,4,4	Y	
NINTR2	Maximum number of stations use din each layer for the interpretation of data to a grid point	99	Y	
CRITFN	Critical Froude number	1.0	Y	
ALPHA	Kinematic effects parameter	0.1	Y	
FEXTR2	Scaling factor for extrapolating sfc winds aloft	NZ*0	Y	
NBAR	Number of terrain barriers	0	Y	
IDIOTP1	Surface temperature computation switch	0	Y	
ISURFT	Number of sfc met station to use for temp calcs	22	n/a	Set to the KCI surface station number. (724460)
IDIOPT2	Domain average lapse rate switch	0	Y	
IUPT	Upper air station to use for lapse rate calculation	0	n/a	Not used since no upper air stations used in the modeling.
ZUPT	Depth through wish lapse rate is calculated	200	Y	
IDIOPT3	Domain averaged wind components	0	Y	
IUPWIND	Number of aloft stations to use for wind calc	-1	Y	
ZUPWIND	Bottom and top of layer through which the domain scale winds are computed	1, 1000	Y	
IDIOPT4	Observed surface wind component switch	0	Y	
IDIOPT5	Observed aloft wind component switch	0	Y	
LLBREZE	Use lake breeze model	F	Y	
NBOX	Number of lake breeze regions	n/a	n/a	
NLB	Number of stations in the region	n/a	n/a	
METBXID (NLB)	Stations ID's in the region	n/a	n/a	
Input Group 6				
CONSTB	Neutral stability mixing height coefficient	1.41	Y	
CONSTE	Convective stability mixing height coefficient	0.15	Y	
CONSTN	Stable stability maxing height coefficient	2400	Y	

Variable	Description	BPU Value	Agreement with Default	Comments
CONSTW	Overwater mixing height coefficient	0.16	Y	
FCORIOL	Absolute vale of Coriolis parameter	1 E-4	Y	
IAVEZI	Conduct spatial averaging	1	Y	
MNMDAV	Maximum search radius in averaging process	1	Y	
HAFANG	Half angle of upwind looking cone for averaging	30	Y	
ILEVZI	Layers of wind use in upwind averaging	1	Y	
DPTMIN	Minimum potential temperature lapse rate in the stable layer above the current convective mixing height	0.001	Y	
DZZI	Depth of layer above current convective mixing height through which lapse rate is computed	200	Y	
ZIMIN	Minimum overland mixing height	50	Y	
ZIMAX	Maximum overland mixing height	3000	Y	
ZIMINW	Minimum overwater mixing height	50	Y	
ZIMAXW	Maximum overwater mixing height	3000	Y	
ITPROG	3D temperature from observations or from MM5	1	N	Use Surface stations (no upper air observations). Use MM5 for upper air data.
IRAD	Type of interpolation	1	Y	
TRADKM	Temperature interpolation radius of influence	36	N	Use KDHE/CENRAP value.
NUMTS	Maximum number of station for temperature interpolation	5	Y	
IAVET	Spatially average temperatures	1	Y	
TGDEFB	Temperature gradient below mixing height over water	-0.0098	Y	
TGDEFA	Temperature gradient above mixing height over water	-0.0045	Y	
JWAT1	Beginning land use categories over water	999	n/a	Disabled
JWAT2	Ending land use categories for water	999	n/a	Disabled
NFLAGP	Precipitation interpolation flag	2	Y	
SIGMAP	Radius of influence for precipitation interpolation	100	Y	

Variable	Description	BPU Value	Agreement with Default	Comments
CUTP	Minimum precipitation rate cutoff (mm/hr)	0.01	Y	

Table A-2 Surface Stations[a]						
Station Name	State	Station Symbol	WMO Station Number	Lambert Coordinates[b]		Anemometer Height (m)
				X (km)	Y (km)	
Surface Stations						
Little Rock	AR	LRF	723405	219.93455	-201.13628	10.06
Jonesboro	AR	JBR	723407	352.83938	-95.78153	10.06
Hot Springs	AR	HOT	723415	133.87753	-251.68949	7.92
Pine Bluff	AR	PBF	723417	242.30134	-283.79712	7.92
Baxter	AR	BPK	723439	187.21509	-41.01201	10.06 [c]
Fayetteville	AR	FYV	723445	34.88345	-84.01216	10.06
Quincy	IL	UIN	724396	287.33008	357.2104	10.06
Kansas City	KS	MCI	724460	-14.07279	282.18782	10.00
Wichita	KS	ICT	724500	-253.47016	102.74862	10.06
Chanute	KS	CNK	724507	-81.4212	101.57744	10.06
Great Bend	KS	GBD	724517	-376.96508	185.10608	10.67
Medicine Lodge	KS	P28	724520	-353.93499	65.24987	10.00
Manhattan	KS	MHK	724555	-182.82723	265.29369	10.06
Emporia	KS	EMP	724556	-141.93171	175.6397	10.06
Topeka	KS	TOP	724560	-92.92109	257.14018	10.00
Concordia	KS	CNK	724580	-266.0986	314.23136	10.00
Salina	KS	SLN	724586	-270.43964	233.22453	10.06
Hill City	KS	HLC	724655	-454.53465	303.51113	10.06
Cape Girardeau	MO	CGI	723489	442.25809	63.81684	10.06 [c]
Joplin	MO	JLN	723495	5.06233	43.49001	10.06
St. Louis	MO	STL	724340	364.02908	228.99337	10.00
Springfield	MO	SGF	724400	104.42294	53.00248	10.00
Columbia	MO	COU	724450	203.04051	231.31708	10.00
Farmington	MO	FAM	724454	366.11669	120.18716	10.06 [c]
Kirksville	MO	IRK	724455	171.4102	372.89348	10.06
Vichy/Rolla	MO	VIH	724456	244.34347	155.7771	10.06
Chillicothe	MO	CDJ	724464	83.76224	340.39673	10.06 [c]
Whiteman	MO	SZL	724467	87.61207	218.2058	6.40
St. Joseph	MO	STJ	724490	-29.42714	334.46549	10.06
Beatrice	NE	BIE	725515	-186.78676	395.48065	9.14
Falls City	NE	FNB	725533	-89.10754	369.36562	10.06
Hobart	OK	HBR	723525	-410.01857	-185.44413	10.06
Ardmore	OK	1FO	723529	-236.45891	-286.1749	7.01
Oklahoma City	OK	OKC	723530	-276.41855	-148.48818	7.92
Ponca City	OK	PNC	723546	-227.05795	-0.10833	10.06
Tulsa	OK	TUL	723560	-118.94489	-61.08069	10.00
McAlester	OK	MLC	723566	-111.78596	-205.39372	10.06

[a] All Stations used in 2001, 2002, and 2003 in the analysis.
[b] All coordinates are in Lambert (km) based on the Lat/Lon origin of 36.758°, -94.557° and the parallels 35°N and 38°N.
[c] Anemometer height not given and assumed a height of 10.06 m.

Table A-3
Hourly Precipitation Stations [a]

Station ID	State	Station Number	Lambert Coordinates[b]	
			X (km)	Y (km)
030064	Arkansas	30064	313.541	-90.135
030130	Arkansas	30130	156.988	-216.231
030220	Arkansas	30220	138.236	-288.986
030326	Arkansas	30326	287.687	-157.620
030458	Arkansas	30458	249.518	-99.299
030530	Arkansas	30530	242.685	-184.508
030764	Arkansas	30764	125.034	-241.863
030832	Arkansas	30832	59.088	-183.193
030842	Arkansas	30842	188.702	-113.097
030900	Arkansas	30900	97.227	-201.375
030936	Arkansas	30936	307.970	-202.658
031020	Arkansas	31020	177.535	-41.802
031457	Arkansas	31457	104.583	-135.282
031632	Arkansas	31632	355.935	-30.186
031952	Arkansas	31952	17.034	-294.823
032148	Arkansas	32148	280.025	-314.365
032356	Arkansas	32356	69.365	-37.585
032444	Arkansas	32444	35.139	-72.919
032489	Arkansas	32489	192.434	-219.597
032574	Arkansas	32574	17.681	-158.045
032794	Arkansas	32794	166.068	-83.449
032978	Arkansas	32978	231.894	-134.185
033132	Arkansas	33132	274.041	-49.268
034756	Arkansas	34756	28.228	-242.332
034988	Arkansas	34988	88.992	-245.504
035110	Arkansas	35110	77.536	-288.983
035112	Arkansas	35112	65.284	-313.468
035200	Arkansas	35200	127.651	-199.045
035228	Arkansas	35228	206.718	-53.944
035320	Arkansas	35320	210.135	-210.778
035602	Arkansas	35602	118.603	-88.387
035754	Arkansas	35754	233.942	-277.854
035908	Arkansas	35908	109.308	-327.744
036393	Arkansas	36393	71.406	-104.125
036920	Arkansas	36920	288.560	-249.477
038052	Arkansas	38052	342.096	-160.196
110330	Illinois	110330	307.815	392.204
110510	Illinois	110510	410.743	205.585
111290	Illinois	111290	451.971	220.029
113666	Illinois	113666	375.320	295.378

Table A-3
Hourly Precipitation Stations [a]

Station ID	State	Station Number	Lambert Coordinates[b]	
			X (km)	Y (km)
114442	Illinois	114442	372.539	338.951
114629	Illinois	114629	404.657	145.736
115334	Illinois	115334	353.939	423.482
115413	Illinois	115413	414.111	392.674
115841	Illinois	115841	439.121	306.637
115983	Illinois	115983	457.208	123.408
116837	Illinois	116837	322.384	324.265
117077	Illinois	117077	267.905	353.867
118179	Illinois	118179	417.482	353.284
140326	Kansas	140326	-326.196	134.600
140637	Kansas	140637	-174.534	101.377
140957	Kansas	140957	-29.345	256.119
141233	Kansas	141233	-272.007	34.895
141351	Kansas	141351	-182.576	145.611
141404	Kansas	141404	-40.966	161.900
141612	Kansas	141612	-67.353	241.713
141740	Kansas	141740	-26.512	44.886
141767	Kansas	141767	-266.165	314.388
141867	Kansas	141867	-171.387	214.533
142582	Kansas	142582	-60.662	91.725
142686	Kansas	142686	-134.117	99.687
142938	Kansas	142938	-384.281	218.535
143248	Kansas	143248	-167.464	68.216
143366	Kansas	143366	-263.292	138.579
143527	Kansas	143527	-414.776	243.402
143686	Kansas	143686	-29.211	211.876
143954	Kansas	143954	-101.250	53.704
143984	Kansas	143984	-76.316	129.615
143997	Kansas	143997	-325.664	328.719
144104	Kansas	144104	-104.440	166.209
144178	Kansas	144178	-296.383	210.521
144341	Kansas	144341	-349.343	35.820
145039	Kansas	145039	-220.194	182.567
145210	Kansas	145210	-99.734	193.910
145306	Kansas	145306	-202.705	259.611
146374	Kansas	146374	-408.516	341.117
147551	Kansas	147551	-270.382	224.549
147756	Kansas	147756	-9.651	227.563
148167	Kansas	148167	-93.692	257.025
148250	Kansas	148250	-45.525	340.993
148293	Kansas	148293	-37.008	120.998

Table A-3
Hourly Precipitation Stations [a]

Station ID	State	Station Number	Lambert Coordinates[b]	
			X (km)	Y (km)
148830	Kansas	148830	-253.728	103.157
148946	Kansas	148946	-340.904	252.104
220237	Mississippi	220237	404.945	-213.475
221314	Mississippi	221314	481.912	-307.737
221707	Mississippi	221707	367.851	-276.151
222773	Mississippi	222773	427.996	-279.009
223650	Mississippi	223650	443.751	-317.129
224173	Mississippi	224173	468.602	-202.881
227820	Mississippi	227820	485.022	-279.780
229079	Mississippi	229079	461.971	-251.377
230022	Missouri	230022	413.221	47.397
230088	Missouri	230088	276.430	48.265
230204	Missouri	230204	46.493	158.321
231283	Missouri	231283	335.215	255.919
231383	Missouri	231383	62.484	-9.227
231600	Missouri	231600	250.615	310.999
231640	Missouri	231640	314.790	296.384
231674	Missouri	231674	334.988	47.706
231711	Missouri	231711	73.277	182.442
231791	Missouri	231791	203.194	230.981
232302	Missouri	232302	207.395	4.912
232331	Missouri	232331	-4.626	191.253
232809	Missouri	232809	365.245	122.803
233079	Missouri	233079	228.115	236.191
233219	Missouri	233219	-3.214	268.412
233369	Missouri	233369	12.844	414.102
233999	Missouri	233999	399.464	-69.150
234358	Missouri	234358	-13.881	282.095
234387	Missouri	234387	18.959	288.957
234544	Missouri	234544	169.346	384.377
234825	Missouri	234825	164.336	104.442
234919	Missouri	234919	236.207	91.643
235027	Missouri	235027	53.447	70.223
235050	Missouri	235050	176.009	334.126
235130	Missouri	235130	227.740	416.952
235207	Missouri	235207	408.949	-7.815
235298	Missouri	235298	116.161	263.017
235307	Missouri	235307	145.937	65.602
235562	Missouri	235562	271.927	267.108
235594	Missouri	235594	64.884	50.792
235671	Missouri	235671	182.853	297.308

Table A-3
Hourly Precipitation Stations [a]

Station ID	State	Station Number	Lambert Coordinates[b]	
			X (km)	Y (km)
235834	Missouri	235834	203.658	46.222
235987	Missouri	235987	16.166	120.007
236012	Missouri	236012	156.083	252.250
236563	Missouri	236563	36.717	363.806
236777	Missouri	236777	109.053	127.970
236826	Missouri	236826	325.110	131.936
237130	Missouri	237130	48.915	405.027
237300	Missouri	237300	277.738	192.416
237455	Missouri	237455	363.703	229.257
237506	Missouri	237506	266.595	101.331
237656	Missouri	237656	-4.107	9.406
237967	Missouri	237967	1.909	25.060
237976	Missouri	237976	103.547	54.071
238003	Missouri	238003	1.047	384.393
238043	Missouri	238043	279.810	143.027
238051	Missouri	238051	228.399	359.971
238082	Missouri	238082	69.155	104.428
238252	Missouri	238252	111.765	-17.110
238466	Missouri	238466	101.375	167.066
238524	Missouri	238524	13.473	243.489
238620	Missouri	238620	225.627	163.214
238700	Missouri	238700	380.504	27.308
238712	Missouri	238712	65.709	225.132
238746	Missouri	238746	312.578	203.855
238880	Missouri	238880	243.022	1.715
250435	Nebraska	250435	-101.237	401.891
250622	Nebraska	250622	-186.739	395.480
252225	Nebraska	252225	-102.394	373.568
252433	Nebraska	252433	-127.126	365.045
253595	Nebraska	253595	-397.612	379.516
253737	Nebraska	253737	-258.708	382.626
340179	Oklahoma	340179	-438.209	-229.596
340215	Oklahoma	340215	-325.751	-50.218
340292	Oklahoma	340292	-237.267	-283.779
341437	Oklahoma	341437	-152.487	-278.949
341544	Oklahoma	341544	-20.111	-276.413
341684	Oklahoma	341684	-210.451	-114.848
341750	Oklahoma	341750	-306.449	-184.117
342334	Oklahoma	342334	-386.595	-114.640
342654	Oklahoma	342654	-312.180	-246.609
343281	Oklahoma	343281	-353.404	-176.771

Table A-3
Hourly Precipitation Stations [a]

Station ID	State	Station Number	Lambert Coordinates[b]	
			X (km)	Y (km)
343497	Oklahoma	343497	-340.924	-118.829
343740	Oklahoma	343740	-319.185	4.176
344052	Oklahoma	344052	-255.949	-237.592
344202	Oklahoma	344202	-413.685	-182.434
344865	Oklahoma	344865	-200.535	-302.939
344975	Oklahoma	344975	-79.714	-163.216
345589	Oklahoma	345589	-275.219	-63.072
345664	Oklahoma	345664	-112.090	-207.362
346130	Oklahoma	346130	-65.707	-115.263
346485	Oklahoma	346485	-96.160	-6.821
346620	Oklahoma	346620	-309.897	-109.997
346638	Oklahoma	346638	-158.240	-145.507
346661	Oklahoma	346661	-276.414	-147.533
346859	Oklahoma	346859	-247.906	-211.861
346935	Oklahoma	346935	-160.233	-8.640
346944	Oklahoma	346944	-202.624	-37.336
347196	Oklahoma	347196	-227.048	0.261
347309	Oklahoma	347309	-68.212	-50.536
347705	Oklahoma	347705	-212.857	-232.353
347739	Oklahoma	347739	-41.345	-65.496
348497	Oklahoma	348497	-50.931	-167.128
348501	Oklahoma	348501	-228.403	-68.070
348708	Oklahoma	348708	-396.435	-70.492
348992	Oklahoma	348992	-119.647	-61.256
349023	Oklahoma	349023	-67.257	-236.296
349404	Oklahoma	349404	-386.895	-16.485
349629	Oklahoma	349629	-380.897	-216.368
349724	Oklahoma	349724	-13.419	-201.471
349748	Oklahoma	349748	-193.067	-177.139
402680	Tennessee	402680	466.119	-67.302
405720	Tennessee	405720	456.091	-138.739
405954	Tennessee	405954	416.901	-178.333
406358	Tennessee	406358	430.564	-133.864
408065	Tennessee	408065	470.634	-21.018

[a] All Stations used in 2001, 2002, and 2003.
[b] All coordinates are in Lambert Coordinates (km) Using Lat/Lon Origin of 36.758°, -94.557° with parallels 35°N and 38°N.

Table A-4: USGS Terrain Data Used in Analysis

Ardmore-E
Ardmore-W
Belleville-W
Beloit-E
Beloit-W
Blytheville-W
Burlington-E
Burlington-W
Centerville-E
Centerville-W
Clinton-E
Clinton-W
Decatur-W
Dyersburg-W
El Dorado-E
El Dorado-W
Enid-E
Enid-W
Fort Smith-E
Fort Smith-W
Grand Island-E
Grand Island-W
Great Bend-E
Great Bend-W
Greenwood-E
Greenwood-W
Harrison-E
Harrison-W
Helena-E
Helena-W
Hutchinson-E
Hutchinson-W
Jefferson City-E
Jefferson City-W
Joplin-E
Joplin-W
Kansas City-E
Kansas City-W
Lawrence-E
Lawrence-W
Lawton-E
Lawton-W
Lincoln-E
Lincoln-W
Little Rock-E
Little Rock-W
Manhattan-E
Manhattan-W
McAlester-E
McAlester-W
Memphis-E
Memphis-W
Moberly-E
Moberly-W
Nebraska City-E
Nebraska City-W
Oklahoma City-E
Oklahoma City-W
Paducah-W
Peoria-W
Poplar Buff-E
Poplar Buff-W
Pratt-E
Pratt-W
Quincy-E
Quincy-W
Rolla-E
Rolla-W
Russellville-E
Russellville-W
Saint Louis-E
Saint Louis-W
Sherman-E
Sherman-W
Springfield-E
Springfield-W
Texarkana-E
Texarkana-W
Tulsa-E
Tulsa-W
Tupelo-W
Wichita-E
Wichita-W
Wichita Falls-E
Wichita Falls-W
West Point-W
Woodward-E
Woodward-W

Table A-5: USGS Land Use Data Used in Analysis

1:250,000 scale data	1:100,000 scale data
Ardmore	Antlers
Belleville	Conway
Beloit	Dequeen
Blytheville	Fly Gap Mountain
Burlington	McAlester
Centerville	Mena
Clinton	Mountain View
Decatur	Russellville
Dyersburg	
El Dorado	
Enid	
Fort Smith	
Grand Island	
Great Bend	
Greenwood	
Harrison	
Helena	
Hutchinson	
Jefferson City	
Joplin	
Kansas City	
Lawrence	
Lawton	
Lincoln	
Little Rock	
Manhattan	
Memphis	
Moberly	
Nebraska City	
Oklahoma City	
Paducah	
Peoria	
Poplar Buff	
Pratt	
Quincy	
Rolla	
Saint Louis	
Sherman	
Springfield	
Texarkana	
Tulsa	
Tupelo	
Wichita	
Wichita Falls	
West Point	
Woodward	

Appendix B-CALPUFF Control File Inputs

Variable	Description	Value	Default	Comments
INPUT GROUP 1: General run control parameters				
METRUN	Control parameter for running all periods in met. File (0=no; 1=yes)	0	Y	
IBYR	Starting year of the CALPUFF run	2001	n/a	2002 and 2003 are the other years modeled
IBMO	Starting month	1	n/a	
IBDY	Starting day	1	n/a	
IBHR	Starting hour	1	n/a	
IEYR	Ending year	2002	n/a	
IEMO	Ending month	1	n/a	
IEDY	Ending day	1	n/a	
IEHR	Ending hour	1	n/a	
XBTZ	Base time zone	6.0	n/a	Central Standard Time
IRLG	Length of the run (hours)	8736	n/a	2001 couldn't use 2002s MM5 data files because of the different resolution 36 km vs. 12 km), therefore the CALMET run stopped 6 hours short of a full year. Since visibility is a 24-hour concern, the CALPUFF was stopped one full day short of a year. 2002=8760hrs. 2003=8736hrs because the MM5 data had only 12 hrs on 12/31. Since visibility is a 24-hour concern, the CALPUFF was stopped one full day short of a year.
NSPEC	Total number of species modeled	11	5	
NSE	Number of species emitted	9	3	
METFM	Meteorological data format	1	Y	CALMET unformatted file
AVET	Averaging time (minutes)	60.0	Y	
PGTIME	Averaging time (minutes) for PG - σ_y	60.0	Y	
INPUT GROUP 2: Technical options				
MGAUSS	Control variable determining the vertical distribution used in the near field	1	Y	Gaussian
MCTADJ	Terrain adjustment method	3	Y	Partial plume path adjustment
MCTSG	CALPUFF sub-grid scale complex terrain module (CTSG) flag	0	Y	CTSG not modeled
MSLUG	Near-field puffs are modeled as elongated "slugs"?	0	Y	No
MTRANS	Transitional plume rise modeled?	1	Y	Transitional plume rise computed
MTIP	Stack tip downwash modeled?	1	Y	Yes

Variable	Description	Value	Default	Comments
MBDW	Method used to simulate building downwash?	1	Y	ISC. However, building downwash not used.
MSHEAR	Vertical wind shear above stack top modeled in plume rise?	0	Y	No
MSPLIT	Puff splitting allowed?	1	N	KDHE has indicated the allowance of puff splitting.
MCHEM	Chemical mechanism flag	1	Y	Transformation rates computed internally (MESOPUFF II scheme)
MAQCHEM	Aqueous phase transformation flag	0	Y	Aqueous phase not modeled
MWET	Wet removal modeled?	1	Y	Yes
MDRY	Dry deposition modeled?	1	Y	Yes
MDISP	Method used to compute dispersion coefficients	3	Y	PG dispersion coefficients in RURAL & MP coefficients in urban areas
MTURBVW	Sigma-v/sigma-theta, sigma-w measurements used?	-	-	Not used since MDISP = 3.
MDISP2	Backup method used to compute dispersion when measured turbulence data are missing	-	-	Not used since MDISP = 3.
MROUGH	PG sigma-y,z adj. for roughness?	0	Y	No
MPARTL	Partial plume penetration of elevated inversion?	1	Y	Yes
MTINV	Strength of temperature inversion	0	Y	No
MPDF	PDF used for dispersion under convective conditions?	0	Y	No
MSGTIBL	Sub-Grid TIBL module used for shoreline?	0	Y	No
MBCON	Boundary conditions (concentration) modeled?	0	Y	No
MFOG	Configure for FOG model output	0	Y	No
MREG	TEST options specified to see if they conform to regulatory values?	1	Y	Checks made
INPUT GROUP 3: Species list				
CSPEC	Species modeled	SO2 SO4 NOX HNO3 NO3 PM8.00 PM4.25 PM1.88 PM1.25 PM0.813 PM0.625	n/a	**Modeled**: All **Emitted**: SO2, NOx, SO4, PM8P00, PM4P25, PM1P88, PM1P25, PM0P813, PM0P625 **Dry deposited**: SO2(gas), SO4(particle), NOx(gas), HNO3(gas), NO3(particle), PM8P00(particle), PM4P25(particle), PM1P88(particle), PM1P25(particle), PM0P813(particle), PM0P625 (particle) (all but NOx are wet deposited also) These particulate sizes are based on the NPS spreadsheet speciations.

Variable	Description	Value	Default	Comments
INPUT GROUP 4: Map projection and grid control parameters				
PMAP	Map projection	LCC	N	Lambert conformal conic
FEAST	False Easting	0.0	Y	
FNORT	False Northing	0.0	Y	
RLATO	Latitude	36.758N	n/a	
RLONG	Longitude	94.557W	n/a	
XLAT1 XLAT2	Matching parallel(s) of latitude for projection	35N 38N	n/a n/a	
DATUM	Datum region for the coordinates	NAS-C	N	
NX NY NZ	Meteorological grid: No. X grid cells in meteorological grid No. Y grid cells in meteorological grid No. vertical layers in meteorological grid	223 188 10	n/a	
DGRIDKM	Grid spacing (km)	4	n/a	
ZFACE	Cell face heights (m)	0, 20, 40,80, 160, 320, 640,1200, 2000, 3000, 4000	n/a	
XORIGKM YORIGKM	Reference coordinates of SW corner of grid cell (1,1) (km)	-443.2274 -322.1564	n/a	
IBCOMP JBCOMP IECOMP JECOMP	Computational grid: X index of LL corner Y index of LL corner X index of UR corner Y index of UR corner	1 1 223 188	n/a	
LSAMP IBSAMP JBSAMP IESAMP JESAMP MESHDN	Logical flag indicating if gridded receptors are used X index of LL corner Y index of LL corner X index of UR corner Y index of UR corner Nesting factor of the sampling grid	F 1	- Y	Receptors are only in the Class I areas assessed
INPUT GROUP 5: Output options				
SPECIES	Species (or group) list for output options	1	n/a	Concentrations saved for SO2, SO4, NOx, HNO3, NO3, PM8.00 PM4.25, PM1.88, PM1.25, PM0.813, PM0.625
INPUT GROUP 6: Subgrid scale complex terrain (CTSG) inputs				
NHILL	Number of terrain features	0	Y	
NCTREC	Number of special complex terrain receptors	0	Y	
MHILL	Terrain and CTSG receptor data for CTSG hills input in CTDM format?	0	n/a	None input.

Variable	Description	Value	Default	Comments
XHILL2M	Factor to convert horizontal dimensions to meters	1	Y	
ZHILL2M	Factor to convert vertical dimensions to meters	1	Y	
XCTDMKM	X-origin of CTDM system relative to CALPUFF coordinate system, in Km	0	n/a	
YCTDMKM	Y-origin of CTDM system relative to CALPUFF coordinate system, in Km	0	n/a	
INPUT GROUP 7: Chemical parameters for dry deposition of gases				
SPECIES DIFFUSVTY ALPHA STR REACTVTY MESO RES HENRYS C	Chemical parameters for dry deposition of gases	-	Y Y Y Y Y Y	SO2; NOx; HNO3 0.1509 0.1656 0.1628 1000 1 1 8 8 18 0 5 0 0.04 3.5 8.0*E-8
INPUT GROUP 8: Size parameters for dry deposition of particles				
SPECIES GEO. MASS MEAN DIA. GEO.STAND DEV.	Single species: mean and standard deviation used to compute deposition velocity for NINT size-ranges; averaged to obtain mean deposition velocity. Grouped species: size distribution specified, standard deviation as "0". Model uses deposition velocity for stated mean diameter.	-	n/a	Species Diameter Std Dev. SO4 0.48 2 NO3 0.48 2 PM8.00 8.00 0 PM4.25 4.25 0 PM1.88 1.88 0 PM1.25 1.25 0 PM0.813 0.813 0 PM0.625 0.625 0 When modeling known diameters, use a standard deviation of zero.
INPUT GROUP 9: Miscellaneous dry deposition parameters				
RCUTR	Reference cuticle resistance	30	Y	
RGR	Reference ground resistance	10	Y	
REACTR	Reference pollutant reactivity	8	Y	
NINT	Number of particle-size intervals to evaluate effective particle deposition velocity	9	Y	
IVEG	Vegetation state in unirrigated areas	1	Y	
INPUT GROUP 10: Wet deposition parameters				
POLL LIQ PRECIP FRZ PRECIP	Scavenging coefficients	-	Y Y Y	Poll Liq Frz SO2 3E-5 0 SO4 1E-4 3E-5 NOx 0 0 HNO3 6E-5 0 NO3 1E-4 3E-5 PM8.00 1E-4 3E-5 PM4.25 1E-4 3E-5 PM1.88 1E-4 3E-5 PM1.25 1E-4 3E-5 PM0.813 1E-4 3E-5 PM0.625 1E-4 3E-5

Variable	Description	Value	Default	Comments
INPUT GROUP 11: Chemistry parameters				
MOZ	Ozone data input option	1	N	Read hourly ozone conc. From the OZONE.DAT data file
BCKO3	Monthly ozone concentrations	12*40	N	
BCKNH3	Monthly ammonia concentrations	12*3	N	
RNITE1	Nighttime SO2 loss rate	0.2	Y	
RNITE2	Nighttime NOx loss rate	2.0	Y	
RNITE3	Nighttime HNO3 formation rate	2.0	Y	
MH2O2	H2O2 data input option	-	-	MQACHEM = 0; not used
BCKH2O2	Monthly H2O2 concentrations	-	-	MQACHEM = 0; not used
BCKPMF OFRAC VCNX	Secondary Organic Aerosol options	-	-	MCHEM = 1; thus, not used
INPUT GROUP 12: Misc. Dispersion and computational parameters				
SYTDEP	Horizontal size of puff beyond which time-dependent dispersion equations (Heffter) are used.	550	Y	
MHFTSZ	Switch for using Heffter equation for sigma z as above	0	Y	
JSUP	Stability class used to determine plume growth rates for puffs above boundary layer	5	Y	
CONK1	Vertical dispersion constant for stable conditions	0.01	Y	
CONK2	Vertical dispersion constant for neutral/unstable conditions	0.1	Y	
TBD	Factor determining transition-point from Schulman-Scire to Huber-Snyder building downwash scheme	0.5	Y	No building downwash used
IURB1 IURB2	Range of land use categories for which urban dispersion is assumed	10 19	Y Y	METFM=1; not used
ILANDUIN	Land use category for modeling domain	-	-	METFM=1; not used
ZOIN	Roughness length (m) for modeling domain	-	-	METFM=1; not used
XLAIIN	Leaf area index for modeling domain	-	-	METFM=1; not used
ELEVIN	Elevation above sea level	-	-	METFM=1; not used
XLATIN	Latitude (degrees) for met location	-	-	METFM=1; not used
XLONIN	Longitude (degrees) for met location	-	-	METFM=1; not used
ANEMHT	Anemometer height (m)	-	-	METFM=1; not used
ISIGMAV	Form of lateral turbulence data in PROFILE.DAT	1	Y	Read sigma-v
IMIXCTDM	Choice of mixing heights	-	-	METFM=1; not used
XMXLEN	Maximum length of a slug	1	Y	
XSAMLEN	Maximum travel distance of a puff/slug during one sampling step	1	Y	

Variable	Description	Value	Default	Comments
MXNEW	Maximum number of slugs/puffs released from one source during one time step	99	Y	
MXSAM	Maximum number of sampling steps for one puff/slug during one time step	99	Y	
NCOUNT	Number of iterations used when computing the transport wind for a sampling step that includes gradual rise	2	Y	
SYMIN	Minimum sigma y for a new puff/slug	1	Y	
SZMIN	Minimum sigma z for a new puff/slug	1	Y	
SVMIN SWMIN	Default minimum turbulence velocities sigma-v and sigma-w for each stability class	-	Y	A B C D E F .5 .5 .5 .5 .5 .5 .2 .12 .08 .06 .03 .016
CDIV	Divergence criterion for dw/dz across puff used to initiate adjustment for horizontal convergence	0, 0	Y	
WSCALM	Minimum wind speed allowed for non-calm conditions. Used as minimum speed returned when using power-law extrapolation toward surface	0.5	Y	
XMAXZI	Maximum mixing height (m)	4000	N	Top interface in CALMET simulation
XMINZI	Minimum mixing height (m)	20	N	
WSCAT	Default wind speed classes	-	Y	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	-	Y ISC RURAL	A B C D E F .07 .07 .10 .15 .35 .55
PTGO	Default potential temperature gradient for stable classes E, F (deg K/m)	-	Y	0.020; 0.035
PPC	Default plume path coefficients for each stability class	-	Y	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	Y	
NSPLIT	Number of puffs that result every time a puff is split	3	Y	
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	-	N	Hour 18 = 1 This value was used in the KDHE initial modeling.
ZISPLIT	Split is allowed only if last hour's mixing height (m) exceeds a minimum value	100	Y	
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	0.25	Y	

Variable	Description	Value	Default	Comments
	maximum value			
NSPLITH	Number of puffs that result every time a puff is split	5	Y	
SYSPLITH	Minimum sigma-y of puff before it may be split	1	Y	
SHSPLITH	Minimum puff elongation rate due to wind shear, before it may be split	2	Y	
CNSPLITH	Minimum concentration of each species in puff before it may be split	1E-7	Y	
EPSSLUG	Fractional convergence criterion for numerical SLUG sampling integration	1E-4	Y	
EPSAREA	Fractional convergence criterion for numerical AREA source integration	1E-6	Y	
DSRISE	Trajectory step-length (m) used for numerical rise integration	1	Y	
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	Y	
RSAMPBC	Search radius (in BC segment lengths) about a receptor for sampling nearest BC puff. BC puffs are emitted with a spacing of one segment length, so the search radius should be greater than 1	10	Y	
MDEPBC	Near-surface depletion adjustment to concentration profile used when sampling BC puffs?	1	Y	Adjust concentration for depletion
INPUT GROUP 13: Point source parameters				
NPT1	Number of point sources with parameters	-	n/a	See Appendix B
IPTU	Units used for point source emissions	1	Y	
NSPT1	Number of source-species combinations with variable emissions scaling factors	0	Y	
NPT2	Number of point sources with variable emission parameters provided in external file	0	n/a	
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 (discrete) receptor information				

Variable	Description	Value	Default	Comments
NREC	Number of non-gridded receptors	338	n/a	80 Caney Creek 80 Hercules-Glades 47 Mingo 72 Upper Buffalo 59 Wichita Mountains

Appendix C – POSTUTIL Control File Inputs

Variable	Description	Value	Default	Comments
INPUT GROUP 1: General run control parameters				
ISYR	Starting Year	2001	n/a	2002 and 2003 also modeled
ISMO	Starting month	1	n/a	
IDY	Starting day	1	n/a	
ISHR	Starting hour	1	n/a	
NPER	Number of periods to process	8736	n/a	2002=8760 hrs, 2003=8736hrs only 12 hrs on 12/31
NSPECINP	Number of species to process from CALPUFF runs	11	n/a	See list below
NSPECOUT	Number of species to write to output file	9	n/a	See list below
NSPECCMP	Number of species to compute from those modeled	4	n/a	
MDUPLCT	Stop run if duplicate species names found?	0	Y	
NSCALED	Number of CALPUFF data files that will be scaled	0	Y	
MNITRATE	Re-compute the HNO3/NO3 partition for concentrations?	0	N	Not used.
BCKNH3	Default ammonia concentrations used for HNO3/NO3 partition	-	N	12*3
INPUT GROUP 2: Species processing information				
ASPECI	NSPECINP species will be processed	-	n/a	SO2 SO4 NOX HNO3 NO3 PM8.00 PM4.25 PM1.88 PM1.25 PM0.813 PM0.625
ASPECO	NSPECOUT species will be written	-	n/a	SO2 SO4 NOX HNO3 NO3 PMC PMF (or SOIL) EC SOA

Appendix D – CALPOST Control File Inputs

Variable	Description	Value	Default	Comments
INPUT GROUP 1: General run control parameters				
METRUN	Option to run all periods found in met files	0	Y	Run period explicitly defined
ISYR	Starting Year	2001	n/a	2002 and 2003 also modeled
ISMO	Starting month	1	n/a	
IDY	Starting day	1	n/a	
ISHR	Starting hour	1	n/a	
NHRS	Number of hours to process	8736	n/a	2002=8760hrs, 2003=8736hrs only 12 hrs on 12/31
NREP	Process every hour of data?	1	Y	Every hour processed
ASPEC	Species to process	VISIB	n/a	Visibility processing
ILAYER	Layer/deposition code	1	Y	CALPUFF concentrations
A, B	Scaling factors X(new) = X(old) *A + B	0, 0	Y	
LBACK	Add hourly background concentrations/fluxes?	F	Y	
MSOURCE	Option to process source contributions	0	Y	
LG LD	Gridded receptors processed? Discrete receptors processed?	F T	Y N	Discrete receptors located only in the Class I areas assessed and are from NPS.
LCT	CTSG Complex terrain receptors processed?	F	Y	
LDRING	Report results by DISCRETE receptor RING?	F	Y	
NDRECP	Flag for all receptors after the last one assigned is set to "0"	-1	Y	As appropriate for Class I area being analyzed
IBGRID JBGRID IEGRID JEGRID	Range of gridded receptors	-1 -1 -1 -1	Y	When LG = T Entire grid processed if all =-1
NGONOFF	Number of gridded receptor rows provided to identify specific gridded receptors to process	0	Y	
BTZONE	Base time zone for the CALPUFF simulation	6	n/a	
MFRH	Particle growth curve f(RH) for hygroscopic species	2	Y	FLAG (2000) f(RH) tabulation. Note: not used for Method 6.
RHMAX	Maximum relative humidity (%) used in particle growth curve	-	N	Not used for Method 6.
LVSO4 LVNO3 LVOC LVPMC LVPMF LVEC	Modeled species to be included in computing light extinction	T T T T T T	Y Y Y Y Y Y	
LVBK	Include BACKGROUND when ranking for TOP-N, TOP-50, and exceedence tables?	T	Y	
SPECPMC SPECPMF	Species name used for particulates in MODEL.DAT file	PMC SOIL	Y Y	PMF = SOIL
EEPMC EEPMF	Modeled particulate species	0.6 1.0	Y Y	

Variable	Description	Value	Default	Comments
EEPMCBK	Background particulate species	0.6	Y	
EESO4 EENO3 EEOC EESOIL EEEC	Other species	3.0 3.0 4.0 1.0 10	Y Y Y Y Y	
LAVER	Background extinction computation	F	Y	
MVISBK	Method used for background light extinction	6	N	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	-	n/a	See Table 4-1 in this document
BKSO4 BKNO3 BKPMC BKOC BKSOIL BKEC	Monthly concentrations of ammonium sulfate, ammonium nitrate, coarse particulates, organic carbon, soil and elemental carbon to compute background extinction coefficients	-	n/a	See Table 4-2 in this document
BEXTRAY	Extinction due to Rayleigh scattering (1/Mm)	10	Y	
IPRTU	Units for all output	1	Y	grams/cubic meter
L24HR	Averaging time reported	T	n/a	
LTOPN	Visibility: Top "N" table for each averaging time selected.	F	Y	
NTOP	Number of 'Top-N' values at each receptor selected (NTOP must be <=4)	4	Y	
MDVIS	Output file with visibility change at each receptor?	0	Y	Create file of DAILY (24 hour) delta-deciview. Grid model run.

Appendix E - National Park Service Particle Speciation Spreadsheets

Nearman
Controlled PM10 Speciation from AP-42 Tables 1.1-5 & 1.1-6
Dry Bottom Boiler burning Pulverized Coal using only ESP for Emissions control

assumes heating value of **8027.38** Btu/lb and a sulfur content of **0.37** % and an ash content of **5.17** % and f(RH) = **1**

	Controlled PM10 Emissions (**Bold** values from Table 1.1-5.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/ton)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
PC-DB	0.0244	0.0174	0.0097	0.6	0.0077	0.0074	1	0.00029	10	**0.007**	**0.006**	SO4	3*f(RH)	**0.001**	SOA	4

	Controlled PM10 Emissions (**Bold** Values from Table 1.1-6.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/ton)	(lb/ton)	(lb/ton)	Coef.	(lb/ton)	(lb/ton)	Coef.	(lb/ton)	Coef.	(lb/ton)	(lb/ton)	Type	Ext.Coef.	(lb/ton)	Type	Ext.Coef.
PC-DB	0.392	**0.279**	0.155	0.6	**0.124**	0.119	1	0.0046	10	0.112	0.090	SO4	3*f(RH)	0.022	SOA	4

	Controlled PM10 Emissions															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(% of Total)	(% of Total)	(% of Total)	Coef.	(% of Total)	(% of Total)	Coef.	(% of Total)	Coef.	(% of Total)	(% of Total)	Type	Ext.Coef.	(% of Total)	Type	Ext.Coef.
PC-DB	100%	71.3%	39.6%	0.6	31.7%	30.5%	1	1.2%	10	28.7%	23.0%	SO4	3*f(RH)	5.7%	SOA	4

If you are given Total PM10 emissions in lb/hr:

	Controlled PM10 Emissions (**Bold** Value is **Input** by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/hr)	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Type	Ext.Coef.	(lb/hr)	Type	Ext.Coef.
PC-DB	**27.2**	19.4	10.8	0.6	8.6	8.3	1	0.3	10	7.8	6.2	SO4	3	1.6	SOA	4
		Weighted Extinction		6.5			8.3		3.2				18.7			6.2

If you are given Total PM10 emissions in lb/mmBtu:

	Controlled PM10 Emissions (**Bold** Value is **Input** by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
PC-DB	**0.10**	0.07	0.04	0.6	0.03	0.03	1	0.0012	10	0.03	0.02	SO4	3	0.01	SOA	4

If you are given Filterable PM10 emissions:

	Controlled PM10 Emissions (**Bold** values from Table 1.1-5 and from Table 6 of EPA's January 2002 DRAFT "Catalog of Global Emissions Inventories and Emission Inventory Tools for Black Carbon.")															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(% of Total)	(% of Total)	(% of Filterable)	Coef.	(% of Filterable)	(% of Filterable)	1	(% of Filterable)	Coef.	(% of Total)	(% of Condensible)	Type	Ext.Coef.	(% of Condensible)	Type	Ext.Coef.
PC-DB	100%	71.3%	55.6%	0.6	44.4%	42.8%	1	1.6%	10	28.7%	**80.0%**	SO4	3	**20.0%**	SOA	4
						(% of Fine)	Coef.	(% of Fine)	Coef.							
						96.3%	1	**3.7%**	10							

If you are given Filterable PM10 emissions in lb/hr:

	Controlled PM10 Emissions (**Bold** Value is **Input** by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/hr)	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Type	Ext.Coef.	(lb/hr)	Type	Ext.Coef.
PC-DB	27.2	**19.39**	10.8	0.6	8.6	8.3	1	0.3	10	7.8	6.2	SO4	3	1.6	SOA	4

If you are given Filterable PM10 emissions in lb/mmBtu:

	Controlled PM10 Emissions (**Bold** Value is **Input** by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
PC-DB	0.10	**0.07**	0.04	0.6	0.03	0.03	1	0.0012	10	0.03	0.02	SO4	3	0.01	SOA	4

Coarse	39.6%	Coarse	10.8
Fine Soil	30.5%	Fine Soil	8.3
Fine EC	1.2%	Fine EC	0.3
CPM IOR	23.0%	CPM IOR	6.2
CPM OR	5.7%	CPM OR	1.6
	100.0%		27.2

Nearman
PC with ESP
from AP-42 Table 1.1-6
(User inputs **filterable** emission rate in lb/hr)

Particle Size (um)	Cumulative Mass < Stated Size **ESP**	Fraction of PM10 < Stated Size (%)	Particle Size Range (um)	Emissions in Size Range (lb/hr)
10	67%	100%	10-6	4.9
6	50%	75%	6-2.5	6.1
2.5	29%	43%	2.5-1.25	3.5
1.25	17%	25%	1.25-1.0	0.9
1	14%	21%	1.0-625	0.6
0.625	12%	18%	0.625-0	3.5

CALPUFF

Particle Size (um)	Particle Size Range (um)	Fraction of PM10 (%)	Emissions in Size Range (lb/hr)	Extinction Coef.	Emissions in Size Range (g/sec)	
8	10-6	25%	4.9	0.6	0.62	
4.25	6-2.5	31%	6.1	0.6	0.77	57% Coarse >/= 2.5 micron
1.88	2.5-1.25	18%	3.5	1	0.44	43% Fine Soil </= 2.5 micron
1.25	1.25-1	4%	0.9	1	0.11	
0.813	1.6-25	3%	0.6	1	0.07	
0.625	0.625-0	18%	3.5	1	0.40	
		100%	19.4	10	0.04	3.7% of Fine Soil
					2.45	

Quindaro Stack 1
Controlled PM10 Speciation from AP-42 Tables 1.1-5 & 1.1-8
Cyclone Furnace ESP for Emissions control

assumes heating value of **8748.69** Btu/lb and a sulfur content of **0.38** % and an ash content of **5.47** % and f(RH) = **1**

	Controlled PM10 Emissions (**Bold** values from Table 1.1-5.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/ton)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
Cyclone	0.0714	0.0034	0.0016	0.6	0.0019	0.0018	1	0.00007	10	**0.068**	**0.054**	SO4	3*f(RH)	**0.014**	SOA	4

	Controlled PM10 Emissions (**Bold** Values from Table 1.1-8.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/ton)	(lb/ton)	(lb/ton)	Coef.	(lb/ton)	(lb/ton)	Coef.	(lb/ton)	Coef.	(lb/ton)	(lb/ton)	Type	Ext.Coef.	(lb/ton)	Type	Ext.Coef.
Cyclone	1.250	**0.060**	0.027	0.6	**0.033**	0.032	1	0.0012	10	1.190	0.952	SO4	3*f(RH)	0.238	SOA	4

	Controlled PM10 Emissions															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(% of Total)	(% of Total)	(% of Total)	Coef.	(% of Total)	(% of Total)	Coef.	(% of Total)	Coef.	(% of Total)	(% of Total)	Type	Ext.Coef.	(% of Total)	Type	Ext.Coef.
Cyclone	100%	4.8%	2.2%	0.6	2.6%	2.5%	1	0.1%	10	95.2%	76.1%	SO4	3*f(RH)	19.0%	SOA	4

If you are given Total PM10 emissions in lb/hr:

	Controlled PM10 Emissions (**Bold** Value is **Input** by user.)															
Boiler	Total PM10	Filterable	Coarse	####	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/hr)	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Type	Ext.Coef.	(lb/hr)	Type	Ext.Coef.
Cyclone	**17.5**	0.8	0.4	0.6	0.5	0.4	1	0.02	10	16.6	13.3	SO4	3	3.3	SOA	4
		Weighted Extinction		0.2			0.4		0.2				39.9			13.3

If you are given Total PM10 emissions in lb/mmBtu:

	Controlled PM10 Emissions (**Bold** Value is **Input** by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
Cyclone	**0.10**	0.00	0.00	0.6	0.00	0.00	1	0.0001	10	0.10	0.08	SO4	3	0.02	SOA	4

Filterable PM10 emissions:

	Controlled PM10 Emissions (**Bold** values from Table 1.1-5 and from Table 6 of EPA's January 2002 DRAFT "Catalog of Global Emissions Inventories and Emission Inventory Tools for Black Carbon.")															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(% of Total)	(% of Total)	(% of Filterable)	Coef.	(% of Filterable)	(% of Filterable)	1	(% of Filterable)	Coef.	(% of Total)	(% of Condensible)	Type	Ext.Coef.	(% of Condensible)	Type	Ext.Coef.
Cyclone	100%	4.8%	45.5%	0.6	54.5%	52.5%	1	2.0%	10	95.2%	**80.0%**	SO4	3	**20.0%**	SOA	4
						(% of Fine)	Coef.	(% of Fine)	Coef.							
						96.3%	1	**3.7%**	10							

If you are given Filterable PM10 emissions in lb/hr:

	Controlled PM10 Emissions (**Bold** Value is **Input** by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/hr)	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Type	Ext.Coef.	(lb/hr)	Type	Ext.Coef.
Cyclone	17.5	**0.84**	0.4	0.6	0.5	0.4	1	0.0	10	16.6	13.3	SO4	3	3.3	SOA	4

If you are given Filterable PM10 emissions in lb/mmBtu:

	Controlled PM10 Emissions (**Bold** Value is **Input** by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
Cyclone	0.10	**0.00**	0.00	0.6	0.00	0.00	1	0.0001	10	0.10	0.08	SO4	3	0.02	SOA	4

Coarse	2.2%	Coarse	0.4
Fine Soil	2.5%	Fine Soil	0.4
Fine EC	0.1%	Fine EC	0.0
CPM IOR	76.1%	CPM IOR	13.3
CPM OR	19.0%	CPM OR	3.3
	100.0%		17.5

Quindaro Stack 1
Cyclone Furnace with ESP
from AP-42 Table 1.1-8
(User inputs **filterable** emission rate in lb/hr)

Particle Size (um)	Cumulative Mass < Stated Size **ESP**	Fraction of PM10 < Stated Size (%)	Particle Size Range (um)	Emissions in Size Range (lb/hr)
10	68%	100%	10-6	0.1
6	56%	82%	6-2.5	0.2
2.5	36%	53%	2.5-1.25	0.2
1.25	22%	32%	1.25-1.0	0.1
1	17%	25%	1.0-625	0.2
0.625		0%	0.625-0	0.0

CALPUFF

Particle Size (um)	Particle Size Range (um)	Fraction of PM10 (%)	Emissions in Size Range (lb/hr)	Extinction Coef.	Emissions in Size Range (g/sec)	
8	10-6	18%	0.1	0.6	0.02	
4.25	6-2.5	29%	0.2	0.6	0.03	47% Coarse >/= 2.5 micron
1.88	2.5-1.25	21%	0.2	1	0.02	53% Fine Soil </= 2.5 micron
1.25	1.25-1	7%	0.1	1	0.01	
0.813	1.6-25	25%	0.2	1	0.03	
0.625	0.625-0	0.0%	0.000	1	-0.002	
		100%	0.8	10	0.002	3.7% of Fine Soil
					0.11	

Quindaro Stack 2
Controlled PM10 Speciation from AP-42 Tables 1.1-5 & 1.1-6
Dry Bottom Boiler burning Pulverized Coal using only ESP for Emissions control

assumes heating value of **8748.69** Btu/lb and a sulfur content of **0.38** % and an ash content of **5.47** % and f(RH) = **1**

	Controlled PM10 Emissions (**Bold** values from Table 1.1-5.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/ton)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
PC-DB	0.0249	0.0169	0.0094	0.6	0.0075	0.0072	1	0.00028	10	**0.008**	**0.006**	SO4	3*f(RH)	**0.002**	SOA	4

	Controlled PM10 Emissions (**Bold** Values from Table 1.1-6.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/ton)	(lb/ton)	(lb/ton)	Coef.	(lb/ton)	(lb/ton)	Coef.	(lb/ton)	Coef.	(lb/ton)	(lb/ton)	Type	Ext.Coef.	(lb/ton)	Type	Ext.Coef.
PC-DB	0.435	**0.295**	0.164	0.6	**0.131**	0.126	1	0.0049	10	0.140	0.112	SO4	3*f(RH)	0.028	SOA	4

	Controlled PM10 Emissions															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(% of Total)	(% of Total)	(% of Total)	Coef.	(% of Total)	(% of Total)	Coef.	(% of Total)	Coef.	(% of Total)	(% of Total)	Type	Ext.Coef.	(% of Total)	Type	Ext.Coef.
PC-DB	100%	67.8%	37.7%	0.6	30.2%	29.0%	1	1.1%	10	32.2%	25.7%	SO4	3*f(RH)	6.4%	SOA	4

If you are given Total PM10 emissions in lb/hr:

	Controlled PM10 Emissions (**Bold** Value is **Input** by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/hr)	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Type	Ext.Coef.	(lb/hr)	Type	Ext.Coef.
PC-DB	**10.6**	7.2	4.0	0.6	3.2	3.1	1	0.1	10	3.4	2.7	SO4	3	0.7	SOA	4
		Weighted Extinction		2.4			3.1		1.2				8.2			2.7

If you are given Total PM10 emissions in lb/mmBtu:

	Controlled PM10 Emissions (**Bold** Value is **Input** by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
PC-DB	**0.10**	0.07	0.04	0.6	0.03	0.03	1	0.0011	10	0.03	0.03	SO4	3	0.01	SOA	4

If you are given Filterable PM10 emissions:

	Controlled PM10 Emissions (**Bold** values from Table 1.1-5 and from Table 6 of EPA's January 2002 DRAFT "Catalog of Global Emissions Inventories and Emission Inventory Tools for Black Carbon.")															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(% of Total)	(% of Total)	(% of Filterable)	Coef.	(% of Filterable)	(% of Filterable)	1	(% of Filterable)	Coef.	(% of Total)	(% of Condensible)	Type	Ext.Coef.	(% of Condensible)	Type	Ext.Coef.
PC-DB	100%	67.8%	55.6%	0.6	44.4%	42.8%	1	1.6%	10	32.2%	**80.0%**	SO4	3	**20.0%**	SOA	4
						(% of Fine)	Coef.	(% of Fine)	Coef.							
						96.3%	1	**3.7%**	10							

If you are given Filterable PM10 emissions in lb/hr:

	Controlled PM10 Emissions (**Bold** Value is **Input** by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/hr)	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Type	Ext.Coef.	(lb/hr)	Type	Ext.Coef.
PC-DB	10.6	**7.19**	4.0	0.6	3.2	3.1	1	0.1	10	3.4	2.7	SO4	3	0.7	SOA	4

If you are given Filterable PM10 emissions in lb/mmBtu:

	Controlled PM10 Emissions (**Bold** Value is **Input** by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
PC-DB	0.10	**0.07**	0.04	0.6	0.03	0.03	1	0.0011	10	0.03	0.03	SO4	3	0.01	SOA	4

Coarse	37.7%	Coarse	4.0
Fine Soil	29.0%	Fine Soil	3.1
Fine EC	1.1%	Fine EC	0.1
CPM IOR	25.7%	CPM IOR	2.7
CPM OR	6.4%	CPM OR	0.7
	100.0%		10.6

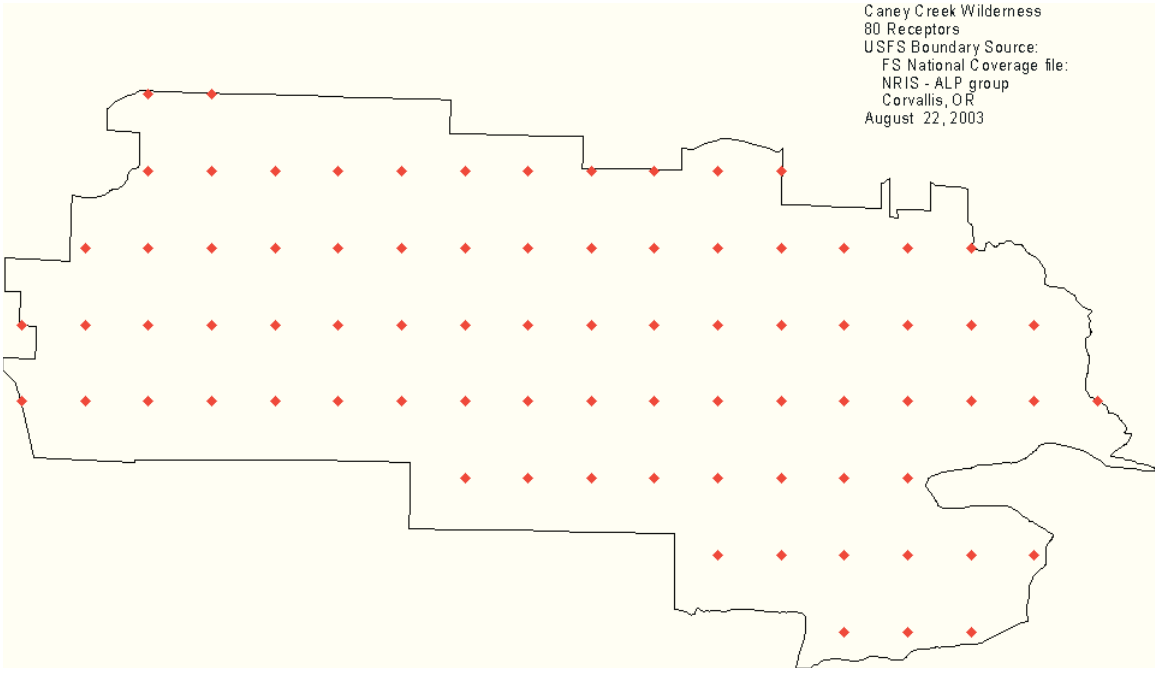
Quindaro Stack 2
PC with ESP
from AP-42 Table 1.1-6
(User inputs **filterable** emission rate in lb/hr)

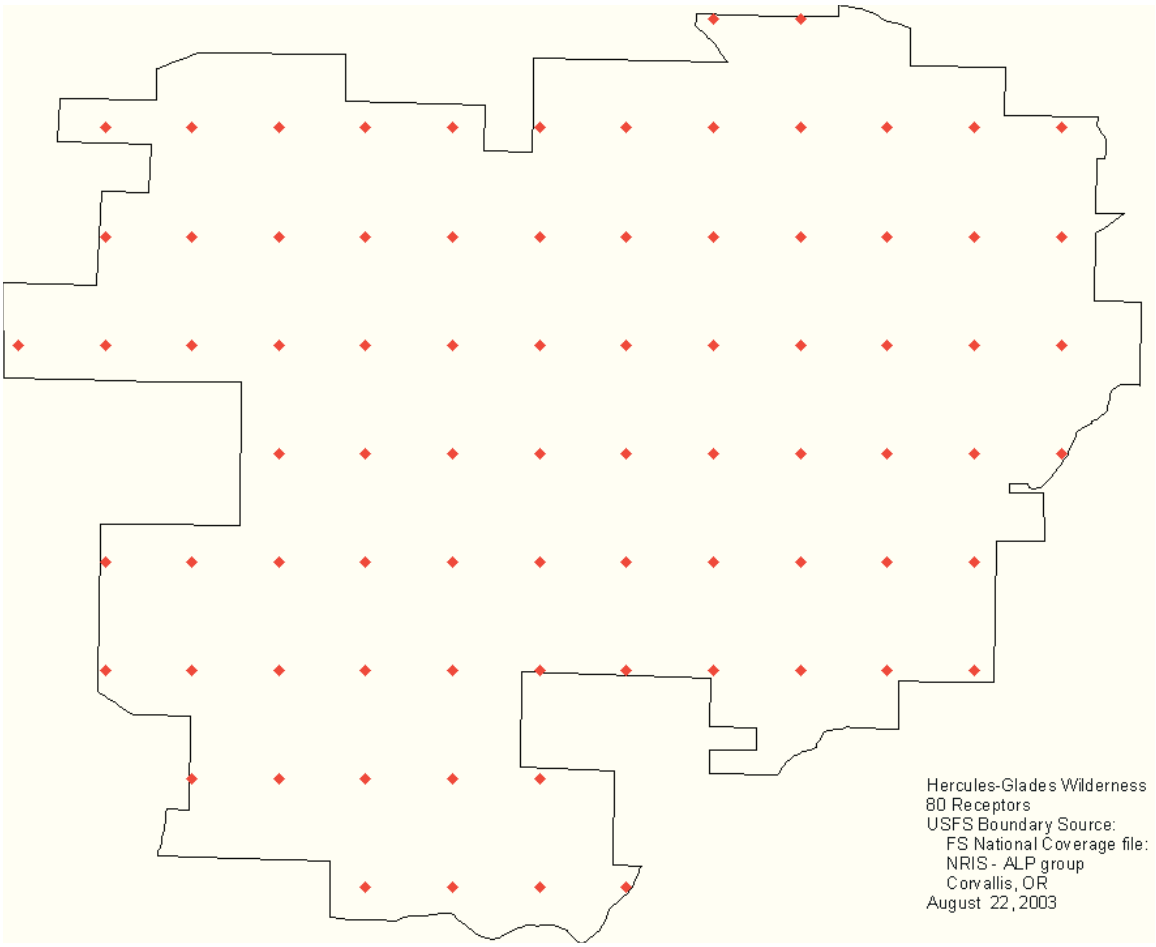
Particle Size (um)	Cumulative Mass < Stated Size **ESP**	Fraction of PM10 < Stated Size (%)	Particle Size Range (um)	Emissions in Size Range (lb/hr)
10	67%	100%	10-6	1.8
6	50%	75%	6-2.5	2.3
2.5	29%	43%	2.5-1.25	1.3
1.25	17%	25%	1.25-1.0	0.3
1	14%	21%	1.0-625	0.2
0.625	12%	18%	0.625-0	1.3

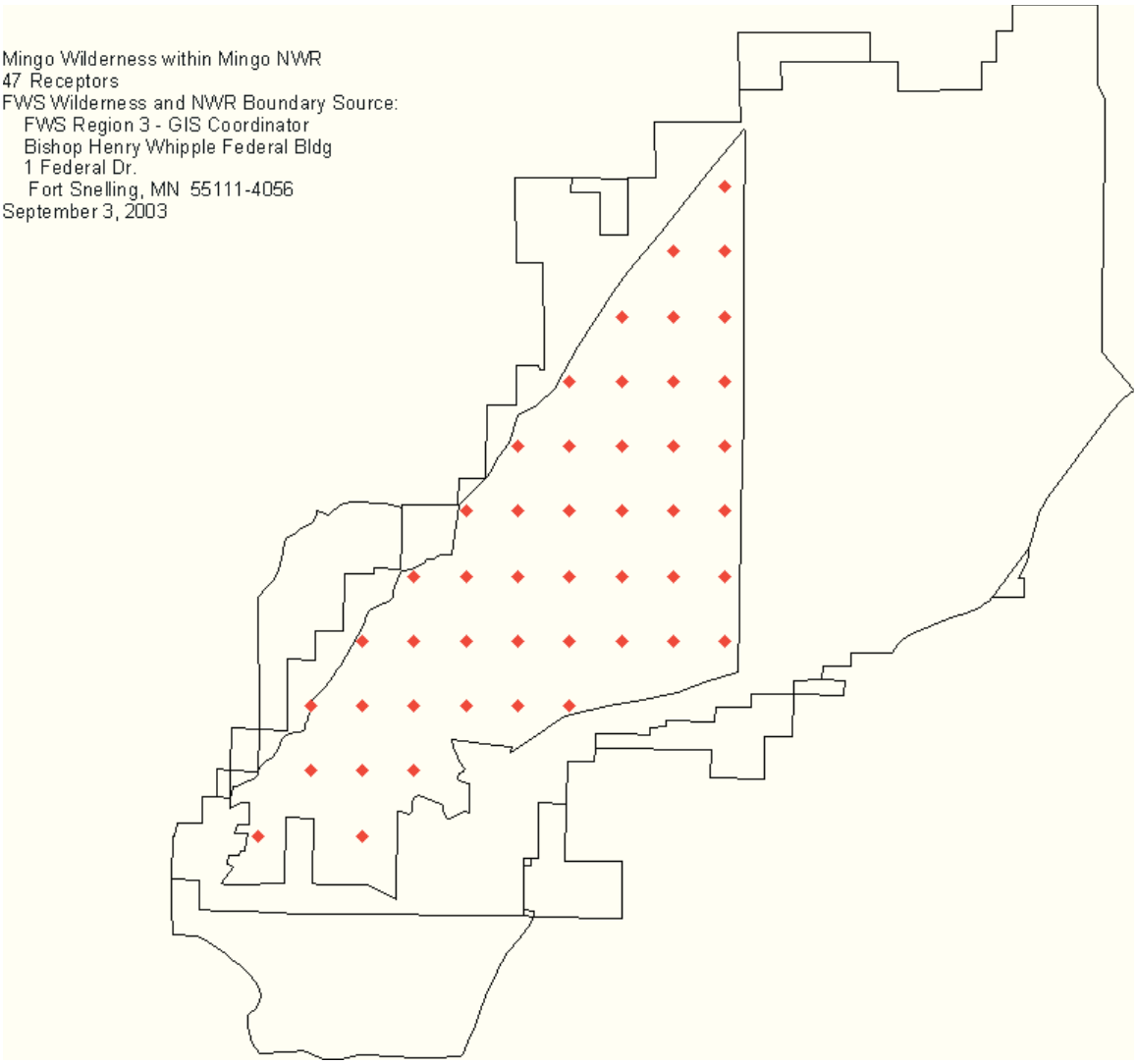
CALPUFF

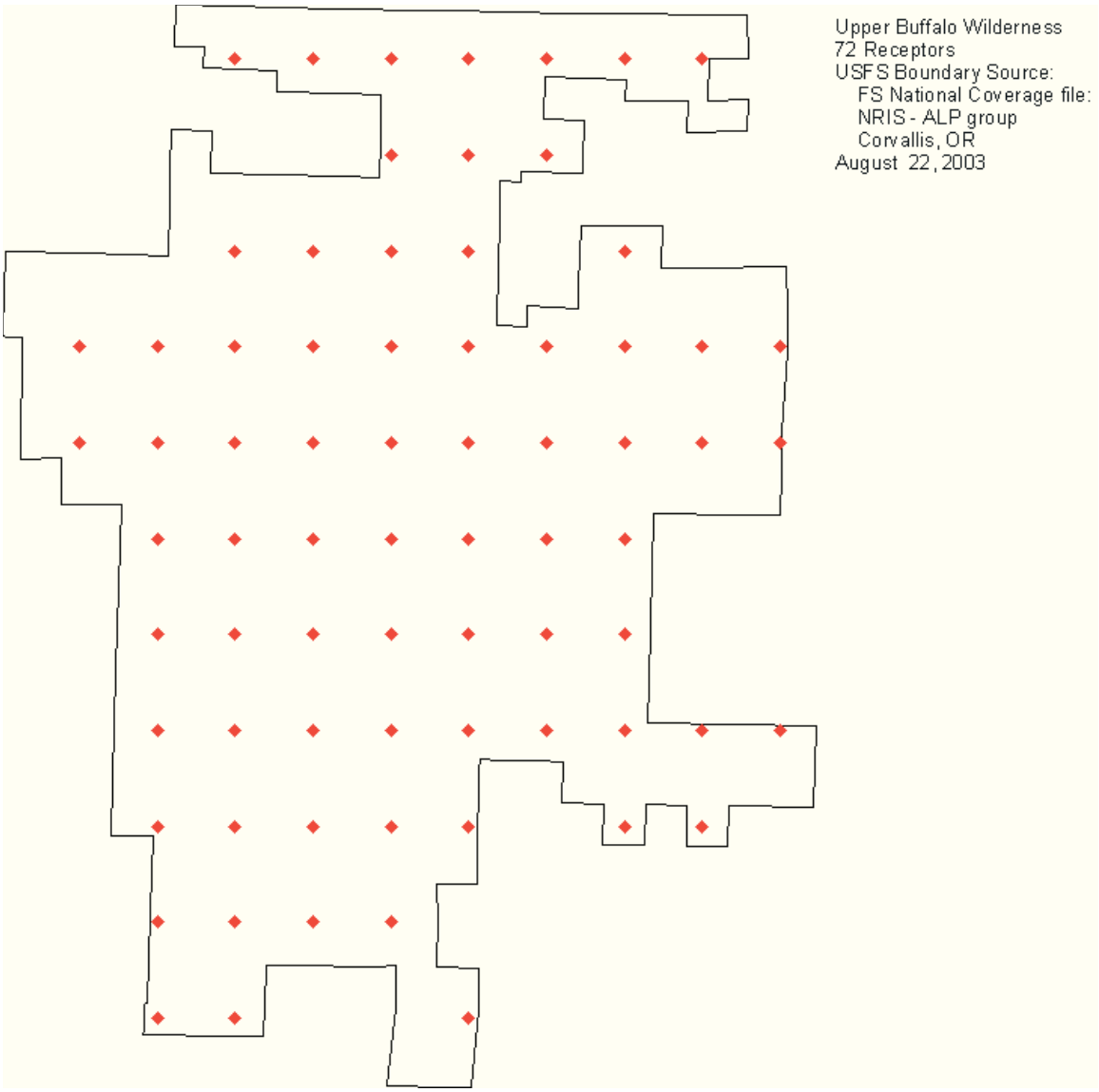
Particle Size (um)	Particle Size Range (um)	Fraction of PM10 (%)	Emissions in Size Range (lb/hr)	Extinction Coef.	Emissions in Size Range (g/sec)	
8	10-6	25%	1.8	0.6	0.23	
4.25	6-2.5	31%	2.3	0.6	0.28	57% Coarse >/= 2.5 micron
1.88	2.5-1.25	18%	1.3	1	0.16	43% Fine Soil </= 2.5 micron
1.25	1.25-1	4%	0.3	1	0.04	
0.813	1.6-25	3%	0.2	1	0.03	
0.625	0.625-0	18%	1.3	1	0.15	
		100%	7.2	10	0.01	3.7% of Fine Soil
					0.91	

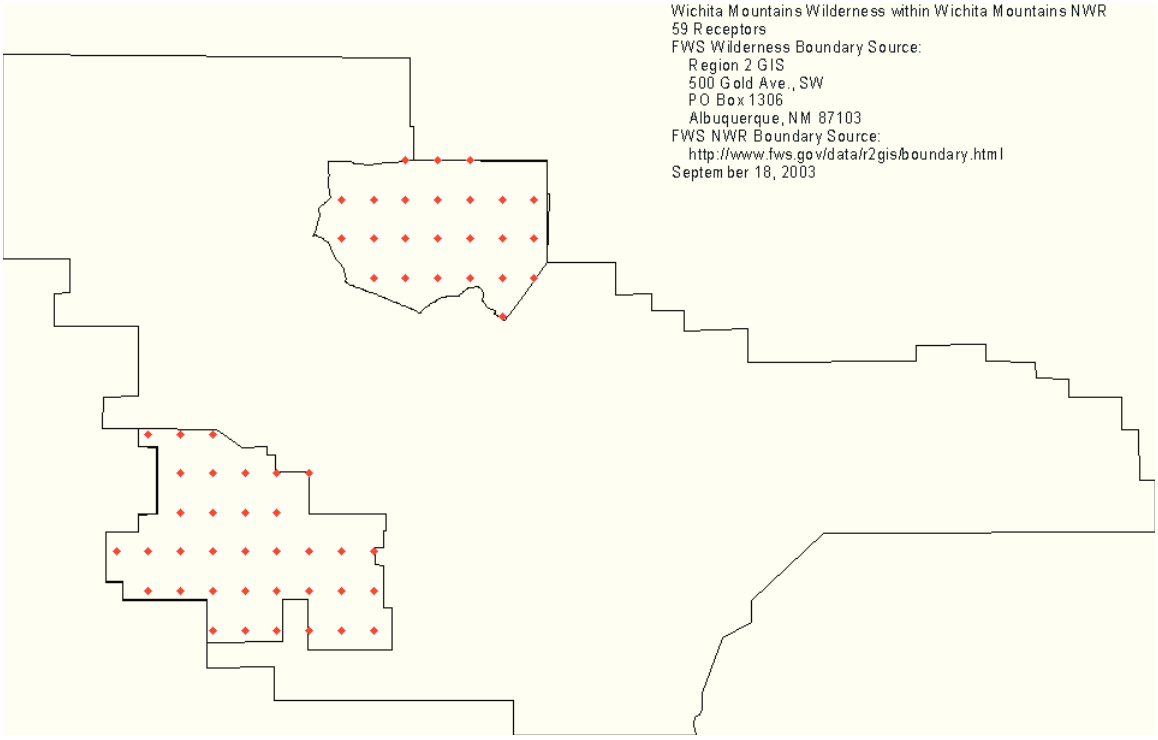
Appendix F - National Park Service Receptors




Hercules-Glades Wilderness
80 Receptors
USFS Boundary Source:
FS National Coverage file:
NRIS - ALP group
Corvallis, OR
August 22, 2003


Mingo Wilderness within Mingo NWR
47 Receptors
FWS Wilderness and NWR Boundary Source:
FWS Region 3 - GIS Coordinator
Bishop Henry Whipple Federal Bldg
1 Federal Dr.
Fort Snelling, MN 55111-4056
September 3, 2003


Upper Buffalo Wilderness
72 Receptors
USFS Boundary Source:
FS National Coverage file:
NRIS - ALP group
Corvallis, OR
August 22, 2003


Wichita Mountains Wilderness within Wichita Mountains NWR
59 Receptors
FWS Wilderness Boundary Source:
Region 2 GIS
500 Gold Ave., SW
PO Box 1306
Albuquerque, NM 87103
FWS NWR Boundary Source:
http://www.fws.gov/data/r2gis/boundary.html
September 18, 2003

Appendix G - CALMET Code Changes

```
c --- MM5.DAT file number
      nfm3d=1

c --- Read first two records to determine  file format
c ---   iMM53d = 0 for MM5.DAT file structure
c ---   iMM53d = 1 for 3D.DAT file structure prior to Version 2.0
c ---   iMM53d = 2 for 3D.DAT file structure, Version 2.0 or later
      read(io20,'(a)')buff1
      read(io20,'(a)')buff2

cc --- Step (1): Check for "3D.DAT" or "MM53D.DAT" on second c --- record of
file (indication of old 3D.DAT file structure c --- prior to Version 2.0)
      read(buff2,'(a12)')cset3d

C      if(cset3d.eq.'3D.DAT'.or.cset3d.eq.'MM53D.DAT')then
C         imm53d=1
C      else
c
c ---    Step (2) check for new standard 3D.DAT file structure
c ---    with dataset name, version and comments on first record
C         if(buff1(1:6).eq.'3D.DAT')then
C
C            imm53d=2
C         else
c
c ---       Structure does not fit 3D.DAT conventions -- assume
c ---       file is in MM5.DAT format
            imm53d=0
C         endif
C      endif
```

KDHE is aware of the issue that the MM5 data files obtained from CENRAP via KDHE have an erroneous header line of "3D.DAT". This header line is an indicator to the CALMET program that the MM5 data is in 3D format and is to be read in as such. Conversations with Dennis McNally of Alpine Geophysics, the creator of the MM5 data for CENRAP, revealed that the data is standard MM5 data and not 3D data as the header line indicates. Since the data is not 3D data (and CALMET attempted to read the data as such because of the header line), the CALMET program crashed. Black & Veatch developed a work-around, by commenting out the portion of the CALMET Fortran code that attempted to read the data as 3D data, thereby forcing CALMET to read the MM5 data in standard format. With this change, CALMET executed on the CENRAP MM5 data to completion. The updated code (provided above as highlighted text) and program executable were shared with KDHE in an email to Andy Hawkins on August 24, 2006 and is included in the CD/DVD as part of the final report.

Appendix H – Modeling Files

December 19, 2007

Andy Hawkins
Kansas Department of Health and Environment
Bureau of Air and Radiation
1000 SW Jackson Street
Topeka, Kansas 66612-1366

RE: Revised BART Exemption Modeling Results for Nearman Due to CEMs Malfunction Reporting

Dear Andy:

Based on conversations with Tom Gross on December 4 and 13, 2007, it is our understanding that CEMs malfunction events are included in the realm of emissions that may be excluded (namely emissions associated with startup, shutdown, and malfunction) from the 24-hour emission rates used in the subject-to-BART visibility impact modeling. To that end, we have re-evaluated our highest daily emissions of NO_x and SO_2 for the BART time period of 2001 through 2003, excluding periods of CEMs malfunction, and have determined that the Nearman subject-to-BART modeling was based on unrepresentative CEMs malfunction substitute emissions data that over estimated the modeled visibility impairment results.

As the following analysis demonstrates, the Nearman facility is below 0.5 dv at all Class I areas evaluated and is, therefore, not subject to the BART provisions of the Regional Haze Rule.

Determination of Emissions

Using the reporting capabilities in Nearman's CEM DAHS, an "Analyzer Downtime" report was created, showing the times and dates of CEM malfunctions during the first quarter of 2002 (see Attachment 1). If a day experienced a CEMs malfunction, it was removed from the analysis and the next highest day was evaluated until no such malfunction occurred as to warrant that day's removal from the analysis. This procedure is illustrated in the following two tables. The bolded days in each table are those first days where no malfunction occurred and as such their emissions were used in the modeling.

Highest Daily NO_x Emissions for 2001 through 2003					
Year	Month	Day	Ranked NO_x Emissions (tons)	CEMs Malfunction?	Reason for the Malfunction
2002	1	8	46.31	Y	Bad Photomultiplier Tube
2002	2	22	44.37	Y	Wet Instrument Air
2002	2	21	41.50	Y	Wet Instrument Air
2002	1	7	36.69	Y	Bad Photomultiplier Tube
2002	2	23	34.57	Y	**NA**
2002	**3**	**7**	**30.77**	**N**	NA
2002	1	4	28.63	Y	NA
2002	3	12	27.78	N	NA
2002	1	9	24.18	N	NA
2002	1	5	20.19	Y	NA
2002	2	28	18.88	N	NA
2002	1	3	18.01	N	NA
2004	3	17	17.95	Y	NA

Highest Daily SO_2 Emissions for 2001 through 2003					
Year	Month	Day	Ranked SO_2 Emissions (tons)	CEMs Malfunction?	Reason for the Malfunction
2002	2	21	51.71	Y	Wet Instrument Air
2002	2	22	48.72	Y	Wet Instrument Air
2002	2	23	47.23	Y	Wet Instrument Air
2002	**3**	**7**	**41.07**	**N**	**NA**
2003	4	28	35.56	N	NA
2004	3	17	34.23	N	NA
2004	2	23	34.18	N	NA
2004	3	13	34.14	Y	NA
2003	5	19	34.01	N	NA
2004	3	15	33.99	N	NA
2003	5	21	33.87	N	NA
2004	3	14	33.81	N	NA

After further investigation of the malfunctions, BPU discovered that the NO_x analyzer malfunctions on January 7 and 8, 2002 were a result of the analyzer's photomultiplier tube malfunctioning. This was reported in BPU's quarterly Emissions Summary Report to KDHE dated April 25, 2002 (see Attachment 2). This was not a spare parts item that BPU had readily available, and as a result, the part took a couple of days to order and replace. The malfunctions on the remaining dates (February 21, 22, and 23, 2002) were due to wet instrument air entering the CEM system. This was also reported in BPU's

quarterly Emissions Summary Report dated April 25, 2002 (Attachment 2). According to supplemental information provided in the report, the tubing took several days to dry out and be fixed, and as a result, the NO_x and SO_2 analyzers were both unable to capture accurate and representative data during those days.

Modeling

Using the approved air dispersion modeling methodology outlined in the September 2006 *BART Modeling Report, Kansas City Board of Public Utilities, Nearman and Quindaro Facilities*, revised emissions rates for NO_x and SO_2, as discussed above, were input to the model to determine the applicability of the BART program to the Nearman facility. The following tables from that report show the revised input values and the resulting model output for Nearman.

As indicated in the following results tables, the Nearman facility is below 0.5 dv at all Class I areas evaluated. As such, BPU requests that the Nearman facility be found not subject to the BART provisions of the Regional Haze Rule. Finally, submitted with this analysis, is a CD-ROM containing the appropriate modeling input and output files for your records.

If you have any questions, please call me at (913) 573-9728. KCBPU appreciates your assistance in this matter and looks forward to your approval of this revised analysis.

Sincerely,

Leah Bennett
Senior Environmental Scientist
BPU Air Quality Program

cc: Darrell Dorsey, John Fuentez

Table 2-3
CALPUFF Modeling Emissions

Unit	NO_x Emissions (g/s)	SO_2 Emissions (g/s)	PM_{10} Emissions (g/s)	Primary Particle Speciation*				
				EC (g/s)	Fine PM (g/s)	Course PM (g/s)	H_2SO_4 (g/s)	SOA (g/s))
Nearman	323.13	431.22	2.44	0.04	1.02	1.39	0.78	0.20
Quindaro 1	134.20	112.48	0.11	0.002	0.06	0.05	1.68	0.42
Quindaro 2	56.35	196.18	0.91	0.01	0.38	0.51	0.34	0.09

* Primary particulate speciated into the following categories using the NPS Speciation Spreadsheet: Elemental Carbon (EC), Fine PM, Course PM, Condensable Inorganic PM (SO_4), and Condensable Organic PM (SOA).

Table 5-1 Nearman Modeling Results on Caney Creek Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
0.711
0.617
0.601
0.567
0.522
0.521
0.430
0.410
0.400
0.375
0.369
0.350
0.315
0.309
0.296
0.288
0.284
0.280
0.273
0.271
0.262
0.242

Table 5-2 Nearman Modeling Results on Caney Creek Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
0.617	0.711	0.430
0.601	0.567	0.375
0.522	0.410	0.284
0.521	0.369	0.273
0.400	0.315	0.271
0.350	0.296	0.242
0.309	0.280	0.174
0.288	0.262	0.166

Table 5-3 Nearman Modeling Results on Hercules-Glades Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
1.468
1.037
0.715
0.635
0.570
0.563
0.562
0.558
0.546
0.530
0.520
0.510
0.496
0.473
0.454
0.450
0.432
0.430
0.417
0.411
0.406
0.401

Table 5-4 Nearman Modeling Results on Hercules-Glades Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
1.468	0.715	0.563
1.037	0.635	0.530
0.570	0.558	0.473
0.562	0.546	0.417
0.520	0.454	0.406
0.510	0.432	0.401
0.496	0.430	0.373
0.450	0.411	0.335

Table 5-5 Nearman Modeling Results on Mingo Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
1.059
0.906
0.462
0.401
0.393
0.370
0.364
0.361
0.340
0.321
0.288
0.266
0.258
0.256
0.252
0.245
0.243
0.218
0.217
0.215
0.214
0.209

Table 5-6 Nearman Modeling Results on Mingo Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
0.401	1.059	0.906
0.370	0.462	0.364
0.361	0.393	0.321
0.288	0.340	0.266
0.252	0.258	0.256
0.243	0.245	0.217
0.218	0.209	0.215
0.214	0.200	0.172

Table 5-7 Nearman Modeling Results on Upper Buffalo Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
1.431
1.042
0.907
0.765
0.665
0.640
0.611
0.525
0.480
0.476
0.456
0.448
0.445
0.435
0.412
0.408
0.387
0.385
0.373
0.355
0.354
0.326

Table 5-8 Nearman Modeling Results on Upper Buffalo Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
1.431	0.765	0.665
1.042	0.640	0.525
0.907	0.611	0.385
0.480	0.448	0.373
0.476	0.445	0.354
0.456	0.412	0.326
0.435	0.387	0.325
0.408	0.355	0.281

Table 5-9 Nearman Modeling Results on Wichita Mountains Wilderness Area 2001-2003 (22nd High)
Delta Deciview Ranks 1-22
1.292
0.715
0.634
0.527
0.411
0.404
0.402
0.362
0.326
0.313
0.281
0.263
0.249
0.245
0.242
0.234
0.231
0.228
0.184
0.170
0.162
0.156

Table 5-10 Nearman Modeling Results on Wichita Mountains Wilderness Area by Year (8th High)		
2001	2002	2003
Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8	Delta Deciview Ranks 1-8
0.715	0.411	1.292
0.527	0.313	0.634
0.402	0.281	0.404
0.249	0.263	0.362
0.234	0.245	0.326
0.184	0.156	0.242
0.170	0.151	0.231
0.162	0.143	0.228

Attachment 1

Analyzer Downtime Report

First Quarter of 2002

GE Energy NetDAHS©
Episode List Report
Version 57.0
NEARMAN POWER STATION
KANSAS CITY BPU
KANSAS CITY, KS
from 1/1/2002 00:00 to 3/31/2002 23:59
Generated: 12/10/2007 10:08
Types: ALL

Pollutant: NOX_INP Episode: NOx Analyzer Downtime

Incident Start	Incident End	Type Value / Limit (%Dev)	Reason	Action
01/04/02 07:00	01/04/02 14:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
01/05/02 07:00	01/05/02 08:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
01/05/02 09:00	01/05/02 09:59	6: Invalid - In Cal	In calibration	No Action Taken
01/06/02 07:00	01/06/02 08:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
01/07/02 07:00	01/09/02 09:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
01/09/02 10:00	01/09/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
01/16/02 10:00	01/16/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
02/20/02 16:00	02/20/02 17:59	6: Invalid - In Cal	In calibration	No Action Taken
02/21/02 07:00	02/21/02 08:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/21/02 09:00	02/21/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
02/21/02 11:00	02/21/02 15:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/21/02 16:00	02/21/02 16:59	6: Invalid - In Cal	In calibration	No Action Taken
02/21/02 17:00	02/22/02 06:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/22/02 07:00	02/22/02 07:59	6: Invalid - In Cal	In calibration	No Action Taken
02/22/02 08:00	02/22/02 09:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/22/02 10:00	02/22/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
02/23/02 07:00	02/24/02 06:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/24/02 07:00	02/24/02 08:59	6: Invalid - In Cal	In calibration	No Action Taken
02/27/02 07:00	02/27/02 08:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/27/02 09:00	02/27/02 09:59	6: Invalid - In Cal	In calibration	No Action Taken
03/07/02 08:00	03/07/02 11:59	6: Invalid - In Cal	In calibration	No Action Taken
03/07/02 13:00	03/07/02 14:59	6: Invalid - In Cal	In calibration	No Action Taken
03/11/02 10:00	03/11/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
03/12/02 11:00	03/12/02 11:59	6: Invalid - In Cal	In calibration	No Action Taken
03/12/02 14:00	03/12/02 14:59	6: Invalid - In Cal	In calibration	No Action Taken
03/15/02 14:00	03/15/02 15:59	6: Invalid - In Cal	In calibration	No Action Taken

Total Reported Time: 2160.0 Hours

TOTAL DURATION 136.00 Hours

6: Invalid - In Cal = 24.00 Hours
252: In calibration = 24.00 Hours
8: Invalid - DataErr/HWFail = 112.00 Hours
16: Pri. Analyzer Malfunction = 112.00 Hours

Pollutant: SO2_INP Episode: SO2 Analyzer Downtime

Incident Start	Incident End	Type Value / Limit (%Dev)	Reason	Action
01/04/02 10:00	01/04/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
01/16/02 10:00	01/16/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
02/20/02 16:00	02/20/02 17:59	6: Invalid - In Cal	In calibration	No Action Taken
02/21/02 07:00	02/21/02 08:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/21/02 09:00	02/21/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
02/21/02 11:00	02/21/02 15:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/21/02 16:00	02/21/02 16:59	6: Invalid - In Cal	In calibration	No Action Taken
02/21/02 17:00	02/22/02 06:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/22/02 07:00	02/22/02 07:59	6: Invalid - In Cal	In calibration	No Action Taken
02/22/02 08:00	02/22/02 09:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/22/02 10:00	02/22/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
02/23/02 07:00	02/24/02 06:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/24/02 07:00	02/24/02 08:59	6: Invalid - In Cal	In calibration	No Action Taken
03/07/02 08:00	03/07/02 11:59	6: Invalid - In Cal	In calibration	No Action Taken
03/07/02 13:00	03/07/02 14:59	6: Invalid - In Cal	In calibration	No Action Taken
03/11/02 10:00	03/11/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
03/12/02 11:00	03/12/02 11:59	6: Invalid - In Cal	In calibration	No Action Taken
03/12/02 14:00	03/12/02 14:59	6: Invalid - In Cal	In calibration	No Action Taken
03/15/02 14:00	03/15/02 15:59	6: Invalid - In Cal	In calibration	No Action Taken

Total Reported Time: 2160.0 Hours

TOTAL DURATION 69.00 Hours

6: Invalid - In Cal = 22.00 Hours
252: In calibration = 22.00 Hours
8: Invalid - DataErr/HWFail = 47.00 Hours
16: Pri. Analyzer Malfunction = 47.00 Hours

Attachment 2

Emissions Summary Report for Nearman Creek Power Station

First Quarter of 2002

FILE COPY

Board of Public Utilities 700 MINNESOTA AVENUE • KANSAS CITY, KANSAS 66101 • (913) 573-9000

April 25, 2002

Mr. Vick Cooper, Director
Air Operating Permit and Compliance
Bureau of Air Quality & Radiation Control
Kansas Department of Health & Environment
1000 SW Jackson
Topeka, Kansas 66612

Mr. Bruce Andersen
Acting Director, Air Pollution Control
KC/WC Department of Health
619 Ann Avenue
Kansas City, Kansas 66101

SUBJECT: Emissions Summary Report for Nearman Creek Power Station
FIRST QUARTER OF 2002
January 1, 2002 through March 31, 2002

Gentlemen:

Enclosed is the subject quarterly Emissions Summary Report per 40 CFR 60.7. All reported periods of excess emissions are based on data read and integrated by computer. Of course, the raw data is available for review at your request.

If you have any comments or questions, please call Curt Deitz at (913) 573-9891.

Sincerely,

Patrick J. Cassidy, Director
Environmental Services

PJC/tlw

Enclosures

c: B. Peterson, EPA w/enclosure
B. Cevera w/enclosure
D. Dorsey w/enclosure

D:\WORD\letters & memos\Part 60\PART60N 0302.doc
Environmental/General Air/2002 CEM Part 60

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
Bureau of Air and Radiation
Air and Asbestos Compliance Section

Summary Report
Gaseous and Opacity Excess Emission and Monitoring System Performance

Reporting dates 01/01/2002 through 03/31/2002
Generated: 04/16/2002

Pollutant: OPACITY
Emission Limit: 20%

Company Name: Kansas City BPU
Address: 1211 N. 8th Street, Kansas City, KS 66101-2192
Model: United Sciences 500C
Date of Latest CEMS
Certification Audit: (PST) Successful, 06/13/95

Unit Description: Nearman-1 Steam Generator for Electric Power

Total source operating time in reporting period: **129,600 minutes (note 1)**

Emission data summary (note 1)		CEMS Downtime summary (note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	3804	a. Monitoring Equipment Malfunction.....	1020
b. Control Equipment Failure.....	36	b. Non-Monitoring Equipment Malfunction...	0
c. Process Problems.....	0	c. Quality Assurance.....	60
d. Other Known Excess Emissions Cause.....	0	d. Other Known Monitor Downtime Cause.....	0
e. UnKnown Excess Emissions Cause.....	0	e. UnKnown Monitor Downtime Cause.....	0
f. Cleaning/Soot Blowing.....	0		
2. Total duration of excess emission.....	3840	2. Total duration of CEMS downtime.....	1080
3. Excess emission duration (%).....	3.0%	3. CEMS downtime (%).....	0.8%

[1] For opacity, record all times in minutes. For gases, record all times in hours.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Patrick J. Cassidy
Signature: Cassidy, for
Title: Director, Environmental Services
Date: 04/23/02

Nearman Creek Opacity Exceedence Explanation:

During the 1st Quarter 2002, Nearman Creek Power Station went through periods of shut down and start up. Configuration of the plant electrostatic precipitator is for it to be off during these times for safety reasons.

Curt Deitz
Senior Environmental Scientist
Kansas City, Kansas Board of Public Utilities
(913) 573-9891

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
Bureau of Air and Radiation
Air and Asbestos Compliance Section

Summary Report
Gaseous and Opacity Excess Emission and Monitoring System Performance

Reporting dates 01/01/2002 through 03/31/2002
Generated: 04/16/2002

Pollutant: SO2
Emission Limit: 1.2 lb/mmBTU

Company Name: Kansas City BPU
Address: 1211 N. 8th Street, Kansas City, KS 66101-2192
Model: TECO 43B
Date of Latest CEMS
Certification Audit: 12/94

Unit Description: Nearman-1 Steam Generator for Electric Power

Total source operating time in reporting period: **2160.0 hours (note 1)**

Emission data summary (note 1)		CEMS Downtime summary (note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	48.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	21.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
f. Cleaning/Soot Blowing.....	0.0		
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	69.0
3. Excess emission duration (%).....	0.0%	3. CEMS downtime (%).....	3.2%

[1] For opacity, record all times in minutes. For gases, record all times in hours.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Patrick J. Cassidy
Signature: Cassidy, for
Title: Director, Environmental Services
Date: 04/23/02

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
Bureau of Air and Radiation
Air and Asbestos Compliance Section

Summary Report
Gaseous and Opacity Excess Emission and Monitoring System Performance

Reporting dates 01/01/2002 through 03/31/2002
Generated: 04/16/2002

Pollutant: NOx
Emission Limit: 0.7 lb/mmBTU

Company Name: Kansas City BPU
Address: 1211 N. 8th Street, Kansas City, KS 66101-2192
Model: TECO 42D
Date of Latest CEMS Certification Audit: 12/94

Unit Description: Nearman-1 Steam Generator for Electric Power

Total source operating time in reporting period: **2160.0 hours (note 1)**

Emission data summary (note 1)		CEMS Downtime summary (note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	112.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	24.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
f. Cleaning/Soot Blowing.....	0.0		
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	136.0
3. Excess emission duration (%).....	0.0%	3. CEMS downtime (%).....	6.3%

[1] For opacity, record all times in minutes. For gases, record all times in hours.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Patrick J. Cassidy
Signature: Cantleit, for
Title: Director, Environmental Services
Date: 04/23/02

NOX Monitor Downtime Exceedence Explanation:

During the 1st Quarter 2002, Nearman Creek Power Station's plant wide instrument air system had a malfunction. Unfortunately, this caused wet air to enter the CEM system. It took several days to repair the problem and to dry out. The system is now repaired.

The NOX monitor also had a photomultiplier tube go out this quarter (January 4-9). This is the first photomultiplier tube to go out in six years. This item, due to its infrequent failure rate and very high cost, was not on our spare parts list. This item had to be overnight shipped from the factory in Pennsylvania. Unfortunately there was a weekend involved which caused some further delay. It is now repaired.

Curt Deitz
Senior Environmental Scientist
Kansas City, Kansas Board of Public Utilities
(913) 573-9891

Enertec NTDahs®
Episode List Report
NEARMAN POWER STATION
KANSAS CITY BPU
KANSAS CITY, KS
from 01/01/02 00:00 to 03/31/02 23:59
Generated: 04/16/2002
Types: ALL

POLLUTANT: NOX_INP EPISODE: NOx Analyzer Downtime

Incident Start	Incident End	Type Value / Limit (%dev)	Reason	Action
01/04/02 07:00	01/04/02 14:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	Repaired Analyzer
01/05/02 07:00	01/05/02 08:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
01/05/02 09:00	01/05/02 09:59	6: Invalid - In Cal	In calibration	No Action Taken
01/06/02 07:00	01/06/02 08:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
01/07/02 07:00	01/09/02 09:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
01/09/02 10:00	01/09/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
01/16/02 10:00	01/16/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
02/20/02 16:00	02/20/02 17:59	6: Invalid - In Cal	In calibration	No Action Taken
02/21/02 07:00	02/21/02 08:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/21/02 09:00	02/21/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
02/21/02 11:00	02/21/02 15:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/21/02 16:00	02/21/02 16:59	6: Invalid - In Cal	In calibration	No Action Taken
02/21/02 17:00	02/22/02 06:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/22/02 07:00	02/22/02 07:59	6: Invalid - In Cal	In calibration	No Action Taken
02/22/02 08:00	02/22/02 09:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/22/02 10:00	02/22/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
02/23/02 07:00	02/24/02 06:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/24/02 07:00	02/24/02 08:59	6: Invalid - In Cal	In calibration	No Action Taken
02/27/02 07:00	02/27/02 08:59	8: Invalid - DataErr/HWFail	Pri. Analyzer Malfunctio	No Action Taken
02/27/02 09:00	02/27/02 09:59	6: Invalid - In Cal	In calibration	No Action Taken
03/07/02 08:00	03/07/02 11:59	6: Invalid - In Cal	In calibration	No Action Taken
03/07/02 13:00	03/07/02 14:59	6: Invalid - In Cal	In calibration	No Action Taken
03/11/02 10:00	03/11/02 10:59	6: Invalid - In Cal	In calibration	No Action Taken
03/12/02 11:00	03/12/02 11:59	6: Invalid - In Cal	In calibration	No Action Taken
03/12/02 14:00	03/12/02 14:59	6: Invalid - In Cal	In calibration	No Action Taken
03/15/02 14:00	03/15/02 15:59	6: Invalid - In Cal	In calibration	No Action Taken

Total Reported Time: 2160.0 hours

TOTAL DURATION = 136.00 hours

6: Invalid - In Cal = 24.00 hours
252: In calibration = 24.00 hours
8: Invalid - DataErr/HWFail = 112.00 hours
16: Pri. Analyzer Malfunction = 112.00 hours

Enertec NTDahs®
Episode List Report
NEARMAN POWER STATION
KANSAS CITY BPU
KANSAS CITY, KS
from 01/01/02 00:00 to 03/31/02 23:59
Generated: 04/16/2002
Types: ALL

POLLUTANT: OPAC_INP EPISODE: Opacity Six_minute Check

Incident Start	Incident End	Type	Value	/ Limit	(%dev)	Reason	Action
01/04/02 10:18	01/04/02 10:23	1: OV	31.100	20.000	(55.50%)	Startup	No Action Taken
01/14/02 11:12	01/14/02 11:17	1: OV	35.200	20.000	(76.00%)	Startup	No Action Taken
01/14/02 13:36	01/14/02 13:41	1: OV	38.700	20.000	(93.50%)	Startup	No Action Taken
01/14/02 13:42	01/14/02 13:47	1: OV	89.200	20.000	(346.00%)	Startup	No Action Taken
01/14/02 13:48	01/14/02 13:53	1: OV	87.900	20.000	(339.50%)	Startup	No Action Taken
01/14/02 13:54	01/14/02 13:59	1: OV	81.100	20.000	(305.50%)	Startup	No Action Taken
01/14/02 14:00	01/14/02 14:05	1: OV	75.000	20.000	(275.00%)	Startup	No Action Taken
01/14/02 14:06	01/14/02 14:11	1: OV	67.900	20.000	(239.50%)	Startup	No Action Taken
01/14/02 14:12	01/14/02 14:17	1: OV	70.300	20.000	(251.50%)	Startup	No Action Taken
01/14/02 14:18	01/14/02 14:23	1: OV	23.200	20.000	(16.00%)	Startup	No Action Taken
01/14/02 15:30	01/14/02 15:35	1: OV	41.100	20.000	(105.50%)	Startup	No Action Taken
01/14/02 15:36	01/14/02 15:41	1: OV	37.800	20.000	(89.00%)	Startup	No Action Taken
01/14/02 15:42	01/14/02 15:47	1: OV	38.200	20.000	(91.00%)	Startup	No Action Taken
01/14/02 15:48	01/14/02 15:53	1: OV	36.800	20.000	(84.00%)	Startup	No Action Taken
01/14/02 15:54	01/14/02 15:59	1: OV	38.800	20.000	(94.00%)	Startup	No Action Taken
01/14/02 16:00	01/14/02 16:05	1: OV	39.400	20.000	(97.00%)	Startup	No Action Taken
01/14/02 16:06	01/14/02 16:11	1: OV	39.400	20.000	(97.00%)	Startup	No Action Taken
01/14/02 16:12	01/14/02 16:17	1: OV	45.700	20.000	(128.50%)	Startup	No Action Taken
01/14/02 16:18	01/14/02 16:23	1: OV	50.400	20.000	(152.00%)	Startup	No Action Taken
01/14/02 16:24	01/14/02 16:29	1: OV	48.500	20.000	(142.50%)	Startup	No Action Taken
01/14/02 16:30	01/14/02 16:35	1: OV	46.700	20.000	(133.50%)	Startup	No Action Taken
01/14/02 16:36	01/14/02 16:41	1: OV	47.000	20.000	(135.00%)	Startup	No Action Taken
01/14/02 16:42	01/14/02 16:47	1: OV	46.500	20.000	(132.50%)	Startup	No Action Taken
01/14/02 16:48	01/14/02 16:53	1: OV	43.600	20.000	(118.00%)	Startup	No Action Taken
01/14/02 16:54	01/14/02 16:59	1: OV	43.600	20.000	(118.00%)	Startup	No Action Taken
01/14/02 17:00	01/14/02 17:05	1: OV	42.400	20.000	(112.00%)	Startup	No Action Taken
01/14/02 17:06	01/14/02 17:11	1: OV	42.900	20.000	(114.50%)	Startup	No Action Taken
01/14/02 17:12	01/14/02 17:17	1: OV	44.100	20.000	(120.50%)	Startup	No Action Taken
01/14/02 17:18	01/14/02 17:23	1: OV	44.400	20.000	(122.00%)	Startup	No Action Taken
01/14/02 17:24	01/14/02 17:29	1: OV	43.100	20.000	(115.50%)	Startup	No Action Taken
01/14/02 17:30	01/14/02 17:35	1: OV	41.900	20.000	(109.50%)	Startup	No Action Taken
01/14/02 17:36	01/14/02 17:41	1: OV	39.900	20.000	(99.50%)	Startup	No Action Taken
01/14/02 17:42	01/14/02 17:47	1: OV	41.100	20.000	(105.50%)	Startup	No Action Taken
01/14/02 17:48	01/14/02 17:53	1: OV	40.600	20.000	(103.00%)	Startup	No Action Taken
01/14/02 17:54	01/14/02 17:59	1: OV	38.900	20.000	(94.50%)	Startup	No Action Taken
01/14/02 18:00	01/14/02 18:05	1: OV	37.300	20.000	(86.50%)	Startup	No Action Taken
01/14/02 18:06	01/14/02 18:11	1: OV	36.200	20.000	(81.00%)	Startup	No Action Taken
01/14/02 18:12	01/14/02 18:17	1: OV	34.700	20.000	(73.50%)	Startup	No Action Taken
01/14/02 18:18	01/14/02 18:23	1: OV	34.100	20.000	(70.50%)	Startup	No Action Taken
01/14/02 18:24	01/14/02 18:29	1: OV	30.600	20.000	(53.00%)	Startup	No Action Taken
01/14/02 18:30	01/14/02 18:35	1: OV	28.100	20.000	(40.50%)	Startup	No Action Taken
01/14/02 18:36	01/14/02 18:41	1: OV	27.400	20.000	(37.00%)	Startup	No Action Taken
01/14/02 18:42	01/14/02 18:47	1: OV	29.100	20.000	(45.50%)	Startup	No Action Taken
01/14/02 18:48	01/14/02 18:53	1: OV	25.800	20.000	(29.00%)	Startup	No Action Taken
01/15/02 09:42	01/15/02 09:47	1: OV	45.200	20.000	(126.00%)	Startup	No Action Taken
01/15/02 09:48	01/15/02 09:53	1: OV	34.000	20.000	(70.00%)	Startup	No Action Taken
01/15/02 09:54	01/15/02 09:59	1: OV	30.000	20.000	(50.00%)	Startup	No Action Taken
01/15/02 10:00	01/15/02 10:05	1: OV	28.000	20.000	(40.00%)	Startup	No Action Taken
01/15/02 10:06	01/15/02 10:11	1: OV	24.300	20.000	(21.50%)	Startup	No Action Taken
01/15/02 10:12	01/15/02 10:17	1: OV	21.500	20.000	(7.50%)	Startup	No Action Taken
01/15/02 10:18	01/15/02 10:23	1: OV	20.500	20.000	(2.50%)	Startup	No Action Taken
01/15/02 11:00	01/15/02 11:05	1: OV	26.200	20.000	(31.00%)	Startup	No Action Taken
01/15/02 17:48	01/15/02 17:53	1: OV	21.600	20.000	(8.00%)	Startup	No Action Taken
01/15/02 17:54	01/15/02 17:59	1: OV	57.100	20.000	(185.50%)	Startup	No Action Taken
01/15/02 18:00	01/15/02 18:05	1: OV	80.700	20.000	(303.50%)	Startup	No Action Taken
01/15/02 18:06	01/15/02 18:11	1: OV	38.700	20.000	(93.50%)	Startup	No Action Taken
01/15/02 18:12	01/15/02 18:17	1: OV	27.900	20.000	(39.50%)	Startup	No Action Taken
01/15/02 22:18	01/15/02 22:23	1: OV	25.500	20.000	(27.50%)	Startup	No Action Taken
01/15/02 22:42	01/15/02 22:47	1: OV	20.500	20.000	(2.50%)	Startup	No Action Taken
01/16/02 02:42	01/16/02 02:47	1: OV	28.900	20.000	(44.50%)	Startup	No Action Taken
01/16/02 02:48	01/16/02 02:53	1: OV	25.700	20.000	(28.50%)	Startup	No Action Taken
01/16/02 03:30	01/16/02 03:35	1: OV	20.900	20.000	(4.50%)	Startup	No Action Taken
01/16/02 03:54	01/16/02 03:59	1: OV	20.900	20.000	(4.50%)	Startup	No Action Taken
01/16/02 06:06	01/16/02 06:11	1: OV	21.700	20.000	(8.50%)	Startup	No Action Taken
01/16/02 06:12	01/16/02 06:17	1: OV	21.100	20.000	(5.50%)	Startup	No Action Taken
01/16/02 06:18	01/16/02 06:23	1: OV	24.300	20.000	(21.50%)	Startup	No Action Taken

01/16/02 06:24	01/16/02 06:29	1: OV	23.400	20.000	(17.00%)	Startup	No Action Taken
01/16/02 06:30	01/16/02 06:35	1: OV	24.300	20.000	(21.50%)	Startup	No Action Taken
01/16/02 06:36	01/16/02 06:41	1: OV	23.500	20.000	(17.50%)	Startup	No Action Taken
01/16/02 07:06	01/16/02 07:11	1: OV	36.800	20.000	(84.00%)	Startup	No Action Taken
01/16/02 07:12	01/16/02 07:17	1: OV	35.300	20.000	(76.50%)	Startup	No Action Taken
01/16/02 07:18	01/16/02 07:23	1: OV	26.300	20.000	(31.50%)	Startup	No Action Taken
01/16/02 07:24	01/16/02 07:29	1: OV	29.200	20.000	(46.00%)	Startup	No Action Taken
01/16/02 07:30	01/16/02 07:35	1: OV	25.100	20.000	(25.50%)	Startup	No Action Taken
01/16/02 07:36	01/16/02 07:41	1: OV	23.600	20.000	(18.00%)	Startup	No Action Taken
01/16/02 07:42	01/16/02 07:47	1: OV	21.400	20.000	(7.00%)	Startup	No Action Taken
01/16/02 07:48	01/16/02 07:53	1: OV	25.500	20.000	(27.50%)	Startup	No Action Taken
01/16/02 07:54	01/16/02 07:59	1: OV	30.800	20.000	(54.00%)	Startup	No Action Taken
01/16/02 08:00	01/16/02 08:05	1: OV	31.200	20.000	(56.00%)	Startup	No Action Taken
01/16/02 08:06	01/16/02 08:11	1: OV	34.900	20.000	(74.50%)	Startup	No Action Taken
01/16/02 08:12	01/16/02 08:17	1: OV	23.900	20.000	(19.50%)	Startup	No Action Taken
01/16/02 08:18	01/16/02 08:23	1: OV	21.300	20.000	(6.50%)	Startup	No Action Taken
01/16/02 08:30	01/16/02 08:35	1: OV	21.400	20.000	(7.00%)	Startup	No Action Taken
01/16/02 08:36	01/16/02 08:41	1: OV	22.300	20.000	(11.50%)	Startup	No Action Taken
01/16/02 08:42	01/16/02 08:47	1: OV	21.600	20.000	(8.00%)	Startup	No Action Taken
01/16/02 09:06	01/16/02 09:11	1: OV	20.500	20.000	(2.50%)	Startup	No Action Taken
01/16/02 09:12	01/16/02 09:17	1: OV	21.500	20.000	(7.50%)	Startup	No Action Taken
01/16/02 09:18	01/16/02 09:23	1: OV	24.300	20.000	(21.50%)	Startup	No Action Taken
01/16/02 09:24	01/16/02 09:29	1: OV	25.900	20.000	(29.50%)	Startup	No Action Taken
01/16/02 09:30	01/16/02 09:35	1: OV	25.600	20.000	(28.00%)	Startup	No Action Taken
01/16/02 09:36	01/16/02 09:41	1: OV	23.600	20.000	(18.00%)	Startup	No Action Taken
01/16/02 09:42	01/16/02 09:47	1: OV	23.800	20.000	(19.00%)	Startup	No Action Taken
01/16/02 09:48	01/16/02 09:53	1: OV	21.600	20.000	(8.00%)	Startup	No Action Taken
01/16/02 09:54	01/16/02 09:59	1: OV	22.300	20.000	(11.50%)	Startup	No Action Taken
01/16/02 10:00	01/16/02 10:05	1: OV	25.100	20.000	(25.50%)	Startup	No Action Taken
01/16/02 10:06	01/16/02 10:11	1: OV	21.800	20.000	(9.00%)	Startup	No Action Taken
01/16/02 10:12	01/16/02 10:17	1: OV	22.500	20.000	(12.50%)	Startup	No Action Taken
01/16/02 10:18	01/16/02 10:23	1: OV	22.400	20.000	(12.00%)	Startup	No Action Taken
01/16/02 10:24	01/16/02 10:29	1: OV	23.600	20.000	(18.00%)	Startup	No Action Taken
01/16/02 10:30	01/16/02 10:35	1: OV	21.400	20.000	(7.00%)	Startup	No Action Taken
01/16/02 10:36	01/16/02 10:41	1: OV	21.600	20.000	(8.00%)	Startup	No Action Taken
01/16/02 10:42	01/16/02 10:47	1: OV	22.000	20.000	(10.00%)	Startup	No Action Taken
01/16/02 10:54	01/16/02 10:59	1: OV	20.200	20.000	(1.00%)	Startup	No Action Taken
01/16/02 11:00	01/16/02 11:05	1: OV	20.600	20.000	(3.00%)	Startup	No Action Taken
01/16/02 11:24	01/16/02 11:29	1: OV	20.400	20.000	(2.00%)	Startup	No Action Taken
01/16/02 11:36	01/16/02 11:41	1: OV	20.600	20.000	(3.00%)	Startup	No Action Taken
02/04/02 08:42	02/04/02 08:47	1: OV	24.600	20.000	(23.00%)	Startup	No Action Taken
02/04/02 08:48	02/04/02 08:53	1: OV	89.300	20.000	(346.50%)	Startup	No Action Taken
02/04/02 08:54	02/04/02 08:59	1: OV	84.100	20.000	(320.50%)	Startup	No Action Taken
02/04/02 09:00	02/04/02 09:05	1: OV	73.100	20.000	(265.50%)	Startup	No Action Taken
02/04/02 09:06	02/04/02 09:11	1: OV	61.300	20.000	(206.50%)	Startup	No Action Taken
02/04/02 09:12	02/04/02 09:17	1: OV	49.400	20.000	(147.00%)	Startup	No Action Taken
02/04/02 09:18	02/04/02 09:23	1: OV	31.300	20.000	(56.50%)	Startup	No Action Taken
02/04/02 09:24	02/04/02 09:29	1: OV	28.900	20.000	(44.50%)	Startup	No Action Taken
02/04/02 09:30	02/04/02 09:35	1: OV	32.300	20.000	(61.50%)	Startup	No Action Taken
02/04/02 09:36	02/04/02 09:41	1: OV	34.500	20.000	(72.50%)	Startup	No Action Taken
02/04/02 09:42	02/04/02 09:47	1: OV	33.000	20.000	(65.00%)	Startup	No Action Taken
02/04/02 09:48	02/04/02 09:53	1: OV	34.500	20.000	(72.50%)	Startup	No Action Taken
02/04/02 09:54	02/04/02 09:59	1: OV	31.300	20.000	(56.50%)	Startup	No Action Taken
02/04/02 10:00	02/04/02 10:05	1: OV	33.800	20.000	(69.00%)	Startup	No Action Taken
02/04/02 10:06	02/04/02 10:11	1: OV	30.200	20.000	(51.00%)	Startup	No Action Taken
02/04/02 10:12	02/04/02 10:17	1: OV	26.400	20.000	(32.00%)	Startup	No Action Taken
02/04/02 10:18	02/04/02 10:23	1: OV	26.400	20.000	(32.00%)	Startup	No Action Taken
02/04/02 10:24	02/04/02 10:29	1: OV	24.500	20.000	(22.50%)	Startup	No Action Taken
02/04/02 10:30	02/04/02 10:35	1: OV	22.700	20.000	(13.50%)	Startup	No Action Taken
02/04/02 10:48	02/04/02 10:53	1: OV	21.600	20.000	(8.00%)	Startup	No Action Taken
02/04/02 10:54	02/04/02 10:59	1: OV	25.400	20.000	(27.00%)	Startup	No Action Taken
02/04/02 11:00	02/04/02 11:05	1: OV	31.400	20.000	(57.00%)	Startup	No Action Taken
02/04/02 11:06	02/04/02 11:11	1: OV	34.600	20.000	(73.00%)	Startup	No Action Taken
02/04/02 11:12	02/04/02 11:17	1: OV	33.700	20.000	(68.50%)	Startup	No Action Taken
02/04/02 11:18	02/04/02 11:23	1: OV	41.200	20.000	(106.00%)	Startup	No Action Taken
02/04/02 11:24	02/04/02 11:29	1: OV	49.100	20.000	(145.50%)	Startup	No Action Taken
02/04/02 11:30	02/04/02 11:35	1: OV	61.400	20.000	(207.00%)	Startup	No Action Taken
02/04/02 11:36	02/04/02 11:41	1: OV	64.600	20.000	(223.00%)	Startup	No Action Taken
02/04/02 11:42	02/04/02 11:47	1: OV	64.000	20.000	(220.00%)	Startup	No Action Taken
02/04/02 11:48	02/04/02 11:53	1: OV	64.000	20.000	(220.00%)	Startup	No Action Taken
02/04/02 11:54	02/04/02 11:59	1: OV	61.100	20.000	(205.50%)	Startup	No Action Taken
02/04/02 12:00	02/04/02 12:05	1: OV	59.900	20.000	(199.50%)	Startup	No Action Taken
02/04/02 12:06	02/04/02 12:11	1: OV	59.300	20.000	(196.50%)	Startup	No Action Taken
02/04/02 12:12	02/04/02 12:17	1: OV	58.200	20.000	(191.00%)	Startup	No Action Taken
02/04/02 12:18	02/04/02 12:23	1: OV	57.100	20.000	(185.50%)	Startup	No Action Taken
02/04/02 12:24	02/04/02 12:29	1: OV	56.900	20.000	(184.50%)	Startup	No Action Taken
02/04/02 12:30	02/04/02 12:35	1: OV	55.200	20.000	(176.00%)	Startup	No Action Taken
02/04/02 12:36	02/04/02 12:41	1: OV	54.500	20.000	(172.50%)	Startup	No Action Taken
02/04/02 12:42	02/04/02 12:47	1: OV	52.900	20.000	(164.50%)	Startup	No Action Taken

02/04/02	12:48	02/04/02	12:53	1: OV	52.800 /	20.000	(164.00%)	Startup	No Action Taken
02/04/02	12:54	02/04/02	12:59	1: OV	53.200 /	20.000	(166.00%)	Startup	No Action Taken
02/04/02	13:00	02/04/02	13:05	1: OV	83.300 /	20.000	(316.50%)	Startup	No Action Taken
02/04/02	13:06	02/04/02	13:11	1: OV	79.100 /	20.000	(295.50%)	Startup	No Action Taken
02/04/02	13:12	02/04/02	13:17	1: OV	68.800 /	20.000	(244.00%)	Startup	No Action Taken
02/04/02	13:18	02/04/02	13:23	1: OV	61.900 /	20.000	(209.50%)	Startup	No Action Taken
02/04/02	13:24	02/04/02	13:29	1: OV	53.500 /	20.000	(167.50%)	Startup	No Action Taken
02/04/02	13:30	02/04/02	13:35	1: OV	35.900 /	20.000	(79.50%)	Startup	No Action Taken
02/04/02	13:36	02/04/02	13:41	1: OV	29.100 /	20.000	(45.50%)	Startup	No Action Taken
02/04/02	13:42	02/04/02	13:47	1: OV	28.400 /	20.000	(42.00%)	Startup	No Action Taken
02/04/02	13:48	02/04/02	13:53	1: OV	25.800 /	20.000	(29.00%)	Startup	No Action Taken
02/04/02	13:54	02/04/02	13:59	1: OV	24.400 /	20.000	(22.00%)	Startup	No Action Taken
02/04/02	14:00	02/04/02	14:05	1: OV	23.800 /	20.000	(19.00%)	Startup	No Action Taken
02/04/02	14:06	02/04/02	14:11	1: OV	25.500 /	20.000	(27.50%)	Startup	No Action Taken
02/04/02	14:12	02/04/02	14:17	1: OV	26.500 /	20.000	(32.50%)	Startup	No Action Taken
02/04/02	14:18	02/04/02	14:23	1: OV	24.700 /	20.000	(23.50%)	Startup	No Action Taken
02/04/02	14:24	02/04/02	14:29	1: OV	24.500 /	20.000	(22.50%)	Startup	No Action Taken
02/04/02	14:30	02/04/02	14:35	1: OV	24.900 /	20.000	(24.50%)	Startup	No Action Taken
02/04/02	14:36	02/04/02	14:41	1: OV	24.200 /	20.000	(21.00%)	Startup	No Action Taken
02/04/02	14:42	02/04/02	14:47	1: OV	23.700 /	20.000	(18.50%)	Startup	No Action Taken
02/04/02	14:48	02/04/02	14:53	1: OV	22.600 /	20.000	(13.00%)	Startup	No Action Taken
02/04/02	14:54	02/04/02	14:59	1: OV	21.400 /	20.000	(7.00%)	Startup	No Action Taken
02/04/02	19:18	02/04/02	19:23	1: OV	24.900 /	20.000	(24.50%)	Startup	No Action Taken
02/04/02	19:24	02/04/02	19:29	1: OV	25.600 /	20.000	(28.00%)	Startup	No Action Taken
02/05/02	18:54	02/05/02	18:59	1: OV	58.700 /	20.000	(193.50%)	Startup	No Action Taken
02/05/02	19:00	02/05/02	19:05	1: OV	58.700 /	20.000	(193.50%)	Startup	No Action Taken
02/05/02	19:06	02/05/02	19:11	1: OV	31.100 /	20.000	(55.50%)	Startup	No Action Taken
02/05/02	19:12	02/05/02	19:17	1: OV	23.700 /	20.000	(18.50%)	Startup	No Action Taken
02/05/02	22:12	02/05/02	22:17	1: OV	22.500 /	20.000	(12.50%)	Startup	No Action Taken
02/05/02	22:54	02/05/02	22:59	1: OV	20.700 /	20.000	(3.50%)	Startup	No Action Taken
02/05/02	23:00	02/05/02	23:05	1: OV	20.700 /	20.000	(3.50%)	Startup	No Action Taken
02/06/02	00:36	02/06/02	00:41	1: OV	22.000 /	20.000	(10.00%)	Startup	No Action Taken
02/06/02	02:12	02/06/02	02:17	1: OV	26.600 /	20.000	(33.00%)	Startup	No Action Taken
02/06/02	02:18	02/06/02	02:23	1: OV	21.100 /	20.000	(5.50%)	Startup	No Action Taken
02/06/02	02:24	02/06/02	02:29	1: OV	23.400 /	20.000	(17.00%)	Startup	No Action Taken
02/06/02	02:30	02/06/02	02:35	1: OV	20.700 /	20.000	(3.50%)	Startup	No Action Taken
02/06/02	02:48	02/06/02	02:53	1: OV	38.500 /	20.000	(92.50%)	Startup	No Action Taken
02/06/02	02:54	02/06/02	02:59	1: OV	33.400 /	20.000	(67.00%)	Startup	No Action Taken
02/06/02	03:00	02/06/02	03:05	1: OV	26.000 /	20.000	(30.00%)	Startup	No Action Taken
02/06/02	03:06	02/06/02	03:11	1: OV	20.300 /	20.000	(1.50%)	Startup	No Action Taken
02/06/02	03:18	02/06/02	03:23	1: OV	28.000 /	20.000	(40.00%)	Startup	No Action Taken
02/06/02	03:24	02/06/02	03:29	1: OV	33.800 /	20.000	(69.00%)	Startup	No Action Taken
02/06/02	03:30	02/06/02	03:35	1: OV	29.300 /	20.000	(46.50%)	Startup	No Action Taken
02/06/02	03:36	02/06/02	03:41	1: OV	32.300 /	20.000	(61.50%)	Startup	No Action Taken
02/06/02	03:42	02/06/02	03:47	1: OV	25.900 /	20.000	(29.50%)	Startup	No Action Taken
02/06/02	03:48	02/06/02	03:53	1: OV	25.100 /	20.000	(25.50%)	Startup	No Action Taken
02/06/02	05:48	02/06/02	05:53	1: OV	21.000 /	20.000	(5.00%)	Startup	No Action Taken
02/06/02	05:54	02/06/02	05:59	1: OV	21.300 /	20.000	(6.50%)	Startup	No Action Taken
02/06/02	06:00	02/06/02	06:05	1: OV	21.300 /	20.000	(6.50%)	Startup	No Action Taken
02/06/02	06:06	02/06/02	06:11	1: OV	21.800 /	20.000	(9.00%)	Startup	No Action Taken
02/06/02	06:12	02/06/02	06:17	1: OV	21.800 /	20.000	(9.00%)	Startup	No Action Taken
02/06/02	06:18	02/06/02	06:23	1: OV	22.400 /	20.000	(12.00%)	Startup	No Action Taken
02/06/02	06:24	02/06/02	06:29	1: OV	26.600 /	20.000	(33.00%)	Startup	No Action Taken
02/06/02	06:30	02/06/02	06:35	1: OV	20.600 /	20.000	(3.00%)	Startup	No Action Taken
02/06/02	06:36	02/06/02	06:41	1: OV	22.400 /	20.000	(12.00%)	Startup	No Action Taken
02/06/02	06:42	02/06/02	06:47	1: OV	26.400 /	20.000	(32.00%)	Startup	No Action Taken
02/06/02	06:48	02/06/02	06:53	1: OV	20.700 /	20.000	(3.50%)	Startup	No Action Taken
02/06/02	06:54	02/06/02	06:59	1: OV	21.400 /	20.000	(7.00%)	Startup	No Action Taken
02/06/02	07:06	02/06/02	07:11	1: OV	20.600 /	20.000	(3.00%)	Startup	No Action Taken
02/06/02	07:12	02/06/02	07:17	1: OV	23.800 /	20.000	(19.00%)	Startup	No Action Taken
02/06/02	07:18	02/06/02	07:23	1: OV	22.200 /	20.000	(11.00%)	Startup	No Action Taken
02/06/02	07:24	02/06/02	07:29	1: OV	21.300 /	20.000	(6.50%)	Startup	No Action Taken
02/06/02	07:42	02/06/02	07:47	1: OV	24.100 /	20.000	(20.50%)	Startup	No Action Taken
02/06/02	07:48	02/06/02	07:53	1: OV	27.700 /	20.000	(38.50%)	Startup	No Action Taken
02/06/02	07:54	02/06/02	07:59	1: OV	21.300 /	20.000	(6.50%)	Startup	No Action Taken
02/06/02	08:06	02/06/02	08:11	1: OV	22.000 /	20.000	(10.00%)	Startup	No Action Taken
02/06/02	08:12	02/06/02	08:17	1: OV	21.100 /	20.000	(5.50%)	Startup	No Action Taken
02/06/02	08:18	02/06/02	08:23	1: OV	20.400 /	20.000	(2.00%)	Startup	No Action Taken
02/06/02	08:24	02/06/02	08:29	1: OV	20.500 /	20.000	(2.50%)	Startup	No Action Taken
02/06/02	08:30	02/06/02	08:35	1: OV	20.900 /	20.000	(4.50%)	Startup	No Action Taken
02/06/02	08:36	02/06/02	08:41	1: OV	22.300 /	20.000	(11.50%)	Startup	No Action Taken
02/06/02	08:42	02/06/02	08:47	1: OV	28.100 /	20.000	(40.50%)	Startup	No Action Taken
02/06/02	08:48	02/06/02	08:53	1: OV	25.600 /	20.000	(28.00%)	Startup	No Action Taken
02/06/02	08:54	02/06/02	08:59	1: OV	24.300 /	20.000	(21.50%)	Startup	No Action Taken
02/06/02	09:00	02/06/02	09:05	1: OV	25.400 /	20.000	(27.00%)	Startup	No Action Taken
02/06/02	09:06	02/06/02	09:11	1: OV	25.500 /	20.000	(27.50%)	Startup	No Action Taken
02/06/02	09:12	02/06/02	09:17	1: OV	26.500 /	20.000	(32.50%)	Startup	No Action Taken
02/06/02	09:18	02/06/02	09:23	1: OV	25.700 /	20.000	(28.50%)	Startup	No Action Taken
02/06/02	09:24	02/06/02	09:29	1: OV	24.900 /	20.000	(24.50%)	Startup	No Action Taken

02/06/02	09:30 - 02/06/02	09:35	1: OV	23.700 /	20.000	(18.50%)	Startup	No Action Taken
02/06/02	09:36 - 02/06/02	09:41	1: OV	23.300 /	20.000	(16.50%)	Startup	No Action Taken
02/06/02	09:42 - 02/06/02	09:47	1: OV	24.400 /	20.000	(22.00%)	Startup	No Action Taken
02/06/02	09:48 - 02/06/02	09:53	1: OV	24.600 /	20.000	(23.00%)	Startup	No Action Taken
02/06/02	09:54 - 02/06/02	09:59	1: OV	23.200 /	20.000	(16.00%)	Startup	No Action Taken
02/06/02	10:00 - 02/06/02	10:05	1: OV	23.400 /	20.000	(17.00%)	Startup	No Action Taken
02/06/02	10:06 - 02/06/02	10:11	1: OV	22.700 /	20.000	(13.50%)	Startup	No Action Taken
02/06/02	10:12 - 02/06/02	10:17	1: OV	22.000 /	20.000	(10.00%)	Startup	No Action Taken
02/06/02	10:18 - 02/06/02	10:23	1: OV	23.000 /	20.000	(15.00%)	Startup	No Action Taken
02/06/02	10:24 - 02/06/02	10:29	1: OV	21.600 /	20.000	(8.00%)	Startup	No Action Taken
02/06/02	10:30 - 02/06/02	10:35	1: OV	21.300 /	20.000	(6.50%)	Startup	No Action Taken
02/06/02	10:36 - 02/06/02	10:41	1: OV	22.500 /	20.000	(12.50%)	Startup	No Action Taken
02/06/02	10:42 - 02/06/02	10:47	1: OV	22.200 /	20.000	(11.00%)	Startup	No Action Taken
02/06/02	10:48 - 02/06/02	10:53	1: OV	22.500 /	20.000	(12.50%)	Startup	No Action Taken
02/06/02	10:54 - 02/06/02	10:59	1: OV	21.800 /	20.000	(9.00%)	Startup	No Action Taken
02/06/02	11:00 - 02/06/02	11:05	1: OV	22.700 /	20.000	(13.50%)	Startup	No Action Taken
02/06/02	11:06 - 02/06/02	11:11	1: OV	22.600 /	20.000	(13.00%)	Startup	No Action Taken
02/06/02	11:12 - 02/06/02	11:17	1: OV	23.800 /	20.000	(19.00%)	Startup	No Action Taken
02/06/02	11:18 - 02/06/02	11:23	1: OV	22.400 /	20.000	(12.00%)	Startup	No Action Taken
02/06/02	11:24 - 02/06/02	11:29	1: OV	24.500 /	20.000	(22.50%)	Startup	No Action Taken
02/06/02	11:30 - 02/06/02	11:35	1: OV	24.100 /	20.000	(20.50%)	Startup	No Action Taken
02/06/02	11:36 - 02/06/02	11:41	1: OV	23.800 /	20.000	(19.00%)	Startup	No Action Taken
02/06/02	11:42 - 02/06/02	11:47	1: OV	24.600 /	20.000	(23.00%)	Startup	No Action Taken
02/06/02	11:48 - 02/06/02	11:53	1: OV	24.200 /	20.000	(21.00%)	Startup	No Action Taken
02/06/02	11:54 - 02/06/02	11:59	1: OV	25.400 /	20.000	(27.00%)	Startup	No Action Taken
02/06/02	12:00 - 02/06/02	12:05	1: OV	25.900 /	20.000	(29.50%)	Startup	No Action Taken
02/06/02	12:06 - 02/06/02	12:11	1: OV	26.200 /	20.000	(31.00%)	Startup	No Action Taken
02/06/02	12:12 - 02/06/02	12:17	1: OV	26.000 /	20.000	(30.00%)	Startup	No Action Taken
02/06/02	12:18 - 02/06/02	12:23	1: OV	25.500 /	20.000	(27.50%)	Startup	No Action Taken
02/06/02	12:24 - 02/06/02	12:29	1: OV	26.600 /	20.000	(33.00%)	Startup	No Action Taken
02/06/02	12:30 - 02/06/02	12:35	1: OV	26.200 /	20.000	(31.00%)	Startup	No Action Taken
02/06/02	12:36 - 02/06/02	12:41	1: OV	24.700 /	20.000	(23.50%)	Startup	No Action Taken
02/06/02	12:42 - 02/06/02	12:47	1: OV	22.900 /	20.000	(14.50%)	Startup	No Action Taken
02/06/02	12:48 - 02/06/02	12:53	1: OV	24.400 /	20.000	(22.00%)	Startup	No Action Taken
02/06/02	12:54 - 02/06/02	12:59	1: OV	24.400 /	20.000	(22.00%)	Startup	No Action Taken
02/06/02	13:00 - 02/06/02	13:05	1: OV	23.700 /	20.000	(18.50%)	Startup	No Action Taken
02/06/02	13:06 - 02/06/02	13:11	1: OV	23.900 /	20.000	(19.50%)	Startup	No Action Taken
02/06/02	13:12 - 02/06/02	13:17	1: OV	23.400 /	20.000	(17.00%)	Startup	No Action Taken
02/06/02	13:18 - 02/06/02	13:23	1: OV	22.900 /	20.000	(14.50%)	Startup	No Action Taken
02/06/02	13:24 - 02/06/02	13:29	1: OV	22.100 /	20.000	(10.50%)	Startup	No Action Taken
02/06/02	13:30 - 02/06/02	13:35	1: OV	22.100 /	20.000	(10.50%)	Startup	No Action Taken
02/06/02	13:36 - 02/06/02	13:41	1: OV	22.100 /	20.000	(10.50%)	Startup	No Action Taken
02/06/02	13:42 - 02/06/02	13:47	1: OV	20.800 /	20.000	(4.00%)	Startup	No Action Taken
02/06/02	14:48 - 02/06/02	14:53	1: OV	40.400 /	20.000	(102.00%)	Startup	No Action Taken
02/07/02	08:30 - 02/07/02	08:35	1: OV	32.500 /	20.000	(62.50%)	Startup	No Action Taken
02/07/02	13:42 - 02/07/02	13:47	1: OV	49.300 /	20.000	(146.50%)	Startup	No Action Taken
02/07/02	13:48 - 02/07/02	13:53	1: OV	88.400 /	20.000	(342.00%)	Startup	No Action Taken
02/07/02	13:54 - 02/07/02	13:59	1: OV	76.400 /	20.000	(282.00%)	Startup	No Action Taken
02/07/02	14:00 - 02/07/02	14:05	1: OV	61.400 /	20.000	(207.00%)	Startup	No Action Taken
02/07/02	14:06 - 02/07/02	14:11	1: OV	57.400 /	20.000	(187.00%)	Startup	No Action Taken
02/07/02	14:12 - 02/07/02	14:17	1: OV	34.200 /	20.000	(71.00%)	Startup	No Action Taken
02/07/02	16:24 - 02/07/02	16:29	1: OV	51.200 /	20.000	(156.00%)	Startup	No Action Taken
02/07/02	16:30 - 02/07/02	16:35	1: OV	40.500 /	20.000	(102.50%)	Startup	No Action Taken
02/07/02	16:36 - 02/07/02	16:41	1: OV	32.100 /	20.000	(60.50%)	Startup	No Action Taken
02/07/02	16:42 - 02/07/02	16:47	1: OV	28.300 /	20.000	(41.50%)	Startup	No Action Taken
02/07/02	16:48 - 02/07/02	16:53	1: OV	27.500 /	20.000	(37.50%)	Startup	No Action Taken
02/07/02	16:54 - 02/07/02	16:59	1: OV	26.500 /	20.000	(32.50%)	Startup	No Action Taken
02/07/02	17:00 - 02/07/02	17:05	1: OV	25.600 /	20.000	(28.00%)	Startup	No Action Taken
02/07/02	17:06 - 02/07/02	17:11	1: OV	25.000 /	20.000	(25.00%)	Startup	No Action Taken
02/07/02	17:12 - 02/07/02	17:17	1: OV	24.300 /	20.000	(21.50%)	Startup	No Action Taken
02/07/02	17:18 - 02/07/02	17:23	1: OV	26.100 /	20.000	(30.50%)	Startup	No Action Taken
02/07/02	17:24 - 02/07/02	17:29	1: OV	27.500 /	20.000	(37.50%)	Startup	No Action Taken
02/07/02	17:30 - 02/07/02	17:35	1: OV	24.900 /	20.000	(24.50%)	Startup	No Action Taken
02/07/02	17:36 - 02/07/02	17:41	1: OV	24.600 /	20.000	(23.00%)	Startup	No Action Taken
02/07/02	17:42 - 02/07/02	17:47	1: OV	23.800 /	20.000	(19.00%)	Startup	No Action Taken
02/07/02	17:48 - 02/07/02	17:53	1: OV	22.900 /	20.000	(14.50%)	Startup	No Action Taken
02/07/02	17:54 - 02/07/02	17:59	1: OV	22.500 /	20.000	(12.50%)	Startup	No Action Taken
02/07/02	18:00 - 02/07/02	18:05	1: OV	22.000 /	20.000	(10.00%)	Startup	No Action Taken
02/07/02	18:06 - 02/07/02	18:11	1: OV	20.600 /	20.000	(3.00%)	Startup	No Action Taken
02/07/02	18:18 - 02/07/02	18:23	1: OV	39.300 /	20.000	(96.50%)	Startup	No Action Taken
02/07/02	18:24 - 02/07/02	18:29	1: OV	28.900 /	20.000	(44.50%)	Startup	No Action Taken
02/07/02	18:30 - 02/07/02	18:35	1: OV	28.500 /	20.000	(42.50%)	Startup	No Action Taken
02/07/02	18:36 - 02/07/02	18:41	1: OV	31.400 /	20.000	(57.00%)	Startup	No Action Taken
02/07/02	18:42 - 02/07/02	18:47	1: OV	34.600 /	20.000	(73.00%)	Startup	No Action Taken
02/07/02	18:48 - 02/07/02	18:53	1: OV	39.000 /	20.000	(95.00%)	Startup	No Action Taken
02/07/02	18:54 - 02/07/02	18:59	1: OV	42.500 /	20.000	(112.50%)	Startup	No Action Taken
02/07/02	19:00 - 02/07/02	19:05	1: OV	44.000 /	20.000	(120.00%)	Startup	No Action Taken
02/07/02	19:06 - 02/07/02	19:11	1: OV	46.200 /	20.000	(131.00%)	Startup	No Action Taken
02/07/02	19:12 - 02/07/02	19:17	1: OV	45.300 /	20.000	(126.50%)	Startup	No Action Taken

02/07/02 19:18	02/07/02 19:23	1: OV	29.500	20.000	(47.50%)	Startup		No Action Taken
02/07/02 19:24	02/07/02 19:29	1: OV	23.300	20.000	(16.50%)	Startup		No Action Taken
02/07/02 19:30	02/07/02 19:35	1: OV	22.500	20.000	(12.50%)	Startup		No Action Taken
02/07/02 19:36	02/07/02 19:41	1: OV	23.400	20.000	(17.00%)	Startup		No Action Taken
02/08/02 06:24	02/08/02 06:29	1: OV	32.300	20.000	(61.50%)	Startup		No Action Taken
02/08/02 06:30	02/08/02 06:35	1: OV	27.400	20.000	(37.00%)	Startup		No Action Taken
02/08/02 06:36	02/08/02 06:41	1: OV	22.000	20.000	(10.00%)	Startup		No Action Taken
02/08/02 07:06	02/08/02 07:11	1: OV	20.800	20.000	(4.00%)	Startup		No Action Taken
02/08/02 08:48	02/08/02 08:53	1: OV	20.300	20.000	(1.50%)	Startup		No Action Taken
02/08/02 09:42	02/08/02 09:47	1: OV	21.500	20.000	(7.50%)	Startup		No Action Taken
02/08/02 09:48	02/08/02 09:53	1: OV	20.700	20.000	(3.50%)	Startup		No Action Taken
02/08/02 09:54	02/08/02 09:59	1: OV	20.800	20.000	(4.00%)	Startup		No Action Taken
02/08/02 10:00	02/08/02 10:05	1: OV	22.500	20.000	(12.50%)	Startup		No Action Taken
02/08/02 10:06	02/08/02 10:11	1: OV	25.300	20.000	(26.50%)	Startup		No Action Taken
02/08/02 10:12	02/08/02 10:17	1: OV	29.800	20.000	(49.00%)	Startup		No Action Taken
02/08/02 10:18	02/08/02 10:23	1: OV	24.600	20.000	(23.00%)	Startup		No Action Taken
02/08/02 10:24	02/08/02 10:29	1: OV	23.900	20.000	(19.50%)	Startup		No Action Taken
02/08/02 10:30	02/08/02 10:35	1: OV	27.700	20.000	(38.50%)	Startup		No Action Taken
02/08/02 10:36	02/08/02 10:41	1: OV	22.800	20.000	(14.00%)	Startup		No Action Taken
02/08/02 10:42	02/08/02 10:47	1: OV	22.800	20.000	(14.00%)	Startup		No Action Taken
02/08/02 10:48	02/08/02 10:53	1: OV	22.500	20.000	(12.50%)	Startup		No Action Taken
02/08/02 10:54	02/08/02 10:59	1: OV	23.000	20.000	(15.00%)	Startup		No Action Taken
02/08/02 11:00	02/08/02 11:05	1: OV	26.800	20.000	(34.00%)	Startup		No Action Taken
02/08/02 11:06	02/08/02 11:11	1: OV	26.900	20.000	(34.50%)	Startup		No Action Taken
02/08/02 11:12	02/08/02 11:17	1: OV	24.900	20.000	(24.50%)	Startup		No Action Taken
02/08/02 11:18	02/08/02 11:23	1: OV	22.800	20.000	(14.00%)	Startup		No Action Taken
02/08/02 11:24	02/08/02 11:29	1: OV	22.000	20.000	(10.00%)	Startup		No Action Taken
02/08/02 11:30	02/08/02 11:35	1: OV	21.700	20.000	(8.50%)	Startup		No Action Taken
02/08/02 11:36	02/08/02 11:41	1: OV	21.700	20.000	(8.50%)	Startup		No Action Taken
02/08/02 11:42	02/08/02 11:47	1: OV	22.400	20.000	(12.00%)	Startup		No Action Taken
02/08/02 11:48	02/08/02 11:53	1: OV	20.900	20.000	(4.50%)	Startup		No Action Taken
02/08/02 11:54	02/08/02 11:59	1: OV	20.600	20.000	(3.00%)	Startup		No Action Taken
02/08/02 12:00	02/08/02 12:05	1: OV	20.700	20.000	(3.50%)	Startup		No Action Taken
02/08/02 12:06	02/08/02 12:11	1: OV	21.900	20.000	(9.50%)	Startup		No Action Taken
02/08/02 12:12	02/08/02 12:17	1: OV	22.500	20.000	(12.50%)	Startup		No Action Taken
02/08/02 12:18	02/08/02 12:23	1: OV	22.000	20.000	(10.00%)	Startup		No Action Taken
02/08/02 12:24	02/08/02 12:29	1: OV	22.400	20.000	(12.00%)	Startup		No Action Taken
02/08/02 12:30	02/08/02 12:35	1: OV	22.000	20.000	(10.00%)	Startup		No Action Taken
02/08/02 12:36	02/08/02 12:41	1: OV	22.500	20.000	(12.50%)	Startup		No Action Taken
02/08/02 12:42	02/08/02 12:47	1: OV	23.000	20.000	(15.00%)	Startup		No Action Taken
02/08/02 12:48	02/08/02 12:53	1: OV	23.000	20.000	(15.00%)	Startup		No Action Taken
02/08/02 12:54	02/08/02 12:59	1: OV	21.800	20.000	(9.00%)	Startup		No Action Taken
02/08/02 13:00	02/08/02 13:05	1: OV	22.700	20.000	(13.50%)	Startup		No Action Taken
02/08/02 13:06	02/08/02 13:11	1: OV	21.500	20.000	(7.50%)	Startup		No Action Taken
02/08/02 13:12	02/08/02 13:17	1: OV	23.200	20.000	(16.00%)	Startup		No Action Taken
02/08/02 13:18	02/08/02 13:23	1: OV	22.600	20.000	(13.00%)	Startup		No Action Taken
02/08/02 13:24	02/08/02 13:29	1: OV	21.500	20.000	(7.50%)	Startup		No Action Taken
02/08/02 13:30	02/08/02 13:35	1: OV	21.300	20.000	(6.50%)	Startup		No Action Taken
02/08/02 13:36	02/08/02 13:41	1: OV	25.000	20.000	(25.00%)	Startup		No Action Taken
02/08/02 13:42	02/08/02 13:47	1: OV	22.600	20.000	(13.00%)	Startup		No Action Taken
02/08/02 13:48	02/08/02 13:53	1: OV	22.500	20.000	(12.50%)	Startup		No Action Taken
02/08/02 13:54	02/08/02 13:59	1: OV	22.600	20.000	(13.00%)	Startup		No Action Taken
02/08/02 14:00	02/08/02 14:05	1: OV	22.300	20.000	(11.50%)	Startup		No Action Taken
02/08/02 14:06	02/08/02 14:11	1: OV	22.300	20.000	(11.50%)	Startup		No Action Taken
02/08/02 14:12	02/08/02 14:17	1: OV	22.100	20.000	(10.50%)	Startup		No Action Taken
02/08/02 14:18	02/08/02 14:23	1: OV	21.000	20.000	(5.00%)	Startup		No Action Taken
02/08/02 14:24	02/08/02 14:29	1: OV	21.300	20.000	(6.50%)	Startup		No Action Taken
02/08/02 14:30	02/08/02 14:35	1: OV	21.900	20.000	(9.50%)	Startup		No Action Taken
02/08/02 14:36	02/08/02 14:41	1: OV	22.200	20.000	(11.00%)	Startup		No Action Taken
02/08/02 14:42	02/08/02 14:47	1: OV	21.600	20.000	(8.00%)	Startup		No Action Taken
02/08/02 14:48	02/08/02 14:53	1: OV	21.800	20.000	(9.00%)	Startup		No Action Taken
02/08/02 14:54	02/08/02 14:59	1: OV	21.700	20.000	(8.50%)	Startup		No Action Taken
02/08/02 15:00	02/08/02 15:05	1: OV	21.200	20.000	(6.00%)	Startup		No Action Taken
02/08/02 15:06	02/08/02 15:11	1: OV	21.500	20.000	(7.50%)	Startup		No Action Taken
02/08/02 15:12	02/08/02 15:17	1: OV	22.400	20.000	(12.00%)	Startup		No Action Taken
02/08/02 15:18	02/08/02 15:23	1: OV	23.400	20.000	(17.00%)	Startup		No Action Taken
02/08/02 15:24	02/08/02 15:29	1: OV	23.500	20.000	(17.50%)	Startup		No Action Taken
02/08/02 15:30	02/08/02 15:35	1: OV	23.900	20.000	(19.50%)	Startup		No Action Taken
02/08/02 15:36	02/08/02 15:41	1: OV	22.200	20.000	(11.00%)	Startup		No Action Taken
02/08/02 15:42	02/08/02 15:47	1: OV	21.800	20.000	(9.00%)	Startup		No Action Taken
02/08/02 15:48	02/08/02 15:53	1: OV	21.600	20.000	(8.00%)	Startup		No Action Taken
02/08/02 15:54	02/08/02 15:59	1: OV	21.800	20.000	(9.00%)	Startup		No Action Taken
02/08/02 16:00	02/08/02 16:05	1: OV	21.700	20.000	(8.50%)	Startup		No Action Taken
02/08/02 16:06	02/08/02 16:11	1: OV	22.300	20.000	(11.50%)	Startup		No Action Taken
02/08/02 16:12	02/08/02 16:17	1: OV	22.800	20.000	(14.00%)	Startup		No Action Taken
02/08/02 16:18	02/08/02 16:23	1: OV	22.000	20.000	(10.00%)	Startup		No Action Taken
02/08/02 16:24	02/08/02 16:29	1: OV	22.800	20.000	(14.00%)	Startup		No Action Taken
02/08/02 16:30	02/08/02 16:35	1: OV	23.100	20.000	(15.50%)	Startup		No Action Taken
02/08/02 16:36	02/08/02 16:41	1: OV	22.300	20.000	(11.50%)	Startup		No Action Taken

02/08/02 16:42	02/08/02 16:47	1: OV	22.100	20.000	(10.50%)	Startup	No Action Taken
02/08/02 16:48	02/08/02 16:53	1: OV	22.500	20.000	(12.50%)	Startup	No Action Taken
02/08/02 16:54	02/08/02 16:59	1: OV	22.400	20.000	(12.00%)	Startup	No Action Taken
02/08/02 17:00	02/08/02 17:05	1: OV	22.200	20.000	(11.00%)	Startup	No Action Taken
02/08/02 17:06	02/08/02 17:11	1: OV	22.700	20.000	(13.50%)	Startup	No Action Taken
02/08/02 17:12	02/08/02 17:17	1: OV	22.900	20.000	(14.50%)	Startup	No Action Taken
02/08/02 17:18	02/08/02 17:23	1: OV	22.300	20.000	(11.50%)	Startup	No Action Taken
02/08/02 17:24	02/08/02 17:29	1: OV	21.600	20.000	(8.00%)	Startup	No Action Taken
02/08/02 17:30	02/08/02 17:35	1: OV	22.300	20.000	(11.50%)	Startup	No Action Taken
02/08/02 17:36	02/08/02 17:41	1: OV	21.600	20.000	(8.00%)	Startup	No Action Taken
02/08/02 17:42	02/08/02 17:47	1: OV	21.900	20.000	(9.50%)	Startup	No Action Taken
02/08/02 17:48	02/08/02 17:53	1: OV	22.800	20.000	(14.00%)	Startup	No Action Taken
02/08/02 17:54	02/08/02 17:59	1: OV	22.200	20.000	(11.00%)	Startup	No Action Taken
02/08/02 18:00	02/08/02 18:05	1: OV	22.100	20.000	(10.50%)	Startup	No Action Taken
02/08/02 18:06	02/08/02 18:11	1: OV	21.700	20.000	(8.50%)	Startup	No Action Taken
02/08/02 18:12	02/08/02 18:17	1: OV	21.500	20.000	(7.50%)	Startup	No Action Taken
02/08/02 18:18	02/08/02 18:23	1: OV	21.600	20.000	(8.00%)	Startup	No Action Taken
02/08/02 18:24	02/08/02 18:29	1: OV	22.200	20.000	(11.00%)	Startup	No Action Taken
02/08/02 18:30	02/08/02 18:35	1: OV	22.600	20.000	(13.00%)	Startup	No Action Taken
02/08/02 18:36	02/08/02 18:41	1: OV	20.900	20.000	(4.50%)	Startup	No Action Taken
02/08/02 18:42	02/08/02 18:47	1: OV	21.000	20.000	(5.00%)	Startup	No Action Taken
02/08/02 18:48	02/08/02 18:53	1: OV	20.400	20.000	(2.00%)	Startup	No Action Taken
02/08/02 19:00	02/08/02 19:05	1: OV	20.300	20.000	(1.50%)	Startup	No Action Taken
02/08/02 19:06	02/08/02 19:11	1: OV	21.900	20.000	(9.50%)	Startup	No Action Taken
02/08/02 19:12	02/08/02 19:17	1: OV	22.300	20.000	(11.50%)	Startup	No Action Taken
02/08/02 19:18	02/08/02 19:23	1: OV	20.700	20.000	(3.50%)	Startup	No Action Taken
02/08/02 19:24	02/08/02 19:29	1: OV	21.600	20.000	(8.00%)	Startup	No Action Taken
02/08/02 19:30	02/08/02 19:35	1: OV	20.700	20.000	(3.50%)	Startup	No Action Taken
02/08/02 19:36	02/08/02 19:41	1: OV	21.100	20.000	(5.50%)	Startup	No Action Taken
02/08/02 19:42	02/08/02 19:47	1: OV	21.100	20.000	(5.50%)	Startup	No Action Taken
02/08/02 19:48	02/08/02 19:53	1: OV	21.300	20.000	(6.50%)	Startup	No Action Taken
02/08/02 19:54	02/08/02 19:59	1: OV	20.600	20.000	(3.00%)	Startup	No Action Taken
02/08/02 20:06	02/08/02 20:11	1: OV	20.100	20.000	(0.50%)	Startup	No Action Taken
02/08/02 20:12	02/08/02 20:17	1: OV	20.200	20.000	(1.00%)	Startup	No Action Taken
02/08/02 20:18	02/08/02 20:23	1: OV	20.400	20.000	(2.00%)	Startup	No Action Taken
02/08/02 20:24	02/08/02 20:29	1: OV	20.100	20.000	(0.50%)	Startup	No Action Taken
02/08/02 20:30	02/08/02 20:35	1: OV	20.500	20.000	(2.50%)	Startup	No Action Taken
02/08/02 20:36	02/08/02 20:41	1: OV	20.600	20.000	(3.00%)	Startup	No Action Taken
02/08/02 20:42	02/08/02 20:47	1: OV	22.000	20.000	(10.00%)	Startup	No Action Taken
02/08/02 20:48	02/08/02 20:53	1: OV	22.000	20.000	(10.00%)	Startup	No Action Taken
02/08/02 20:54	02/08/02 20:59	1: OV	20.400	20.000	(2.00%)	Startup	No Action Taken
02/08/02 21:00	02/08/02 21:05	1: OV	20.200	20.000	(1.00%)	Startup	No Action Taken
02/08/02 21:06	02/08/02 21:11	1: OV	20.200	20.000	(1.00%)	Startup	No Action Taken
02/08/02 21:12	02/08/02 21:17	1: OV	20.700	20.000	(3.50%)	Startup	No Action Taken
02/08/02 21:18	02/08/02 21:23	1: OV	20.500	20.000	(2.50%)	Startup	No Action Taken
02/08/02 21:36	02/08/02 21:41	1: OV	20.400	20.000	(2.00%)	Startup	No Action Taken
02/08/02 21:54	02/08/02 21:59	1: OV	20.300	20.000	(1.50%)	Startup	No Action Taken
02/22/02 14:12	02/22/02 14:17	1: OV	21.200	20.000	(6.00%)	Startup	No Action Taken
02/23/02 22:00	02/23/02 22:05	1: OV	62.000	20.000	(210.00%)	Startup	No Action Taken
02/23/02 22:06	02/23/02 22:11	1: OV	63.300	20.000	(216.50%)	Startup	No Action Taken
02/23/02 22:12	02/23/02 22:17	1: OV	59.800	20.000	(199.00%)	Startup	No Action Taken
02/23/02 22:18	02/23/02 22:23	1: OV	57.000	20.000	(185.00%)	Startup	No Action Taken
02/23/02 22:24	02/23/02 22:29	1: OV	52.300	20.000	(161.50%)	Startup	No Action Taken
02/23/02 22:30	02/23/02 22:35	1: OV	53.200	20.000	(166.00%)	Startup	No Action Taken
02/23/02 22:36	02/23/02 22:41	1: OV	50.500	20.000	(152.50%)	Startup	No Action Taken
02/23/02 22:42	02/23/02 22:47	1: OV	20.300	20.000	(1.50%)	Startup	No Action Taken
02/23/02 23:36	02/23/02 23:41	1: OV	25.000	20.000	(25.00%)	Startup	No Action Taken
02/23/02 23:42	02/23/02 23:47	1: OV	25.200	20.000	(26.00%)	Startup	No Action Taken
02/23/02 23:48	02/23/02 23:53	1: OV	22.900	20.000	(14.50%)	Startup	No Action Taken
02/23/02 23:54	02/23/02 23:59	1: OV	22.600	20.000	(13.00%)	Startup	No Action Taken
02/24/02 00:00	02/24/02 00:05	1: OV	22.000	20.000	(10.00%)	Startup	No Action Taken
02/24/02 00:06	02/24/02 00:11	1: OV	21.800	20.000	(9.00%)	Startup	No Action Taken
02/24/02 00:12	02/24/02 00:17	1: OV	21.400	20.000	(7.00%)	Startup	No Action Taken
02/24/02 00:18	02/24/02 00:23	1: OV	21.800	20.000	(9.00%)	Startup	No Action Taken
02/24/02 00:24	02/24/02 00:29	1: OV	26.400	20.000	(32.00%)	Startup	No Action Taken
02/24/02 00:30	02/24/02 00:35	1: OV	26.300	20.000	(31.50%)	Startup	No Action Taken
02/24/02 00:36	02/24/02 00:41	1: OV	24.200	20.000	(21.00%)	Startup	No Action Taken
02/24/02 00:42	02/24/02 00:47	1: OV	24.400	20.000	(22.00%)	Startup	No Action Taken
02/24/02 00:48	02/24/02 00:53	1: OV	25.400	20.000	(27.00%)	Startup	No Action Taken
02/24/02 00:54	02/24/02 00:59	1: OV	24.200	20.000	(21.00%)	Startup	No Action Taken
02/24/02 01:00	02/24/02 01:05	1: OV	24.500	20.000	(22.50%)	Startup	No Action Taken
02/24/02 01:06	02/24/02 01:11	1: OV	23.400	20.000	(17.00%)	Startup	No Action Taken
02/24/02 01:12	02/24/02 01:17	1: OV	24.100	20.000	(20.50%)	Startup	No Action Taken
02/24/02 01:18	02/24/02 01:23	1: OV	22.700	20.000	(13.50%)	Startup	No Action Taken
02/24/02 01:24	02/24/02 01:29	1: OV	23.200	20.000	(16.00%)	Startup	No Action Taken
02/24/02 01:30	02/24/02 01:35	1: OV	21.300	20.000	(6.50%)	Startup	No Action Taken
02/24/02 01:36	02/24/02 01:41	1: OV	20.900	20.000	(4.50%)	Startup	No Action Taken
02/24/02 01:42	02/24/02 01:47	1: OV	21.000	20.000	(5.00%)	Startup	No Action Taken
02/24/02 01:48	02/24/02 01:53	1: OV	20.400	20.000	(2.00%)	Startup	No Action Taken

02/24/02 01:54	02/24/02 01:59	1: OV	20.100 /	20.000	(0.50%)	Startup	No Action Taken
02/24/02 02:48	02/24/02 02:53	1: OV	24.500 /	20.000	(22.50%)	Startup	No Action Taken
02/24/02 02:54	02/24/02 02:59	1: OV	23.300 /	20.000	(16.50%)	Startup	No Action Taken
02/24/02 03:00	02/24/02 03:05	1: OV	20.600 /	20.000	(3.00%)	Startup	No Action Taken
02/24/02 03:06	02/24/02 03:11	1: OV	21.300 /	20.000	(6.50%)	Startup	No Action Taken
02/24/02 03:30	02/24/02 03:35	1: OV	21.400 /	20.000	(7.00%)	Startup	No Action Taken
02/24/02 05:30	02/24/02 05:35	1: OV	20.900 /	20.000	(4.50%)	Startup	No Action Taken
02/24/02 05:36	02/24/02 05:41	1: OV	21.700 /	20.000	(8.50%)	Startup	No Action Taken
02/24/02 05:42	02/24/02 05:47	1: OV	22.100 /	20.000	(10.50%)	Startup	No Action Taken
02/24/02 05:48	02/24/02 05:53	1: OV	22.000 /	20.000	(10.00%)	Startup	No Action Taken
02/24/02 05:54	02/24/02 05:59	1: OV	22.100 /	20.000	(10.50%)	Startup	No Action Taken
02/24/02 06:00	02/24/02 06:05	1: OV	21.900 /	20.000	(9.50%)	Startup	No Action Taken
02/24/02 06:06	02/24/02 06:11	1: OV	21.400 /	20.000	(7.00%)	Startup	No Action Taken
02/24/02 06:12	02/24/02 06:17	1: OV	21.900 /	20.000	(9.50%)	Startup	No Action Taken
02/24/02 06:18	02/24/02 06:23	1: OV	21.600 /	20.000	(8.00%)	Startup	No Action Taken
02/24/02 07:30	02/24/02 07:35	1: OV	21.200 /	20.000	(6.00%)	Startup	No Action Taken
02/25/02 07:18	02/25/02 07:23	1: OV	28.900 /	20.000	(44.50%)	Startup	No Action Taken
02/25/02 07:24	02/25/02 07:29	1: OV	29.400 /	20.000	(47.00%)	Startup	No Action Taken
02/25/02 07:30	02/25/02 07:35	1: OV	26.800 /	20.000	(34.00%)	Startup	No Action Taken
02/25/02 07:36	02/25/02 07:41	1: OV	24.200 /	20.000	(21.00%)	Startup	No Action Taken
02/25/02 07:42	02/25/02 07:47	1: OV	22.900 /	20.000	(14.50%)	Startup	No Action Taken
02/25/02 07:48	02/25/02 07:53	1: OV	21.200 /	20.000	(6.00%)	Startup	No Action Taken
02/25/02 07:54	02/25/02 07:59	1: OV	20.800 /	20.000	(4.00%)	Startup	No Action Taken
02/25/02 08:00	02/25/02 08:05	1: OV	20.800 /	20.000	(4.00%)	Startup	No Action Taken
02/25/02 08:54	02/25/02 08:59	1: OV	25.000 /	20.000	(25.00%)	Startup	No Action Taken
02/25/02 09:00	02/25/02 09:05	1: OV	21.200 /	20.000	(6.00%)	Startup	No Action Taken
02/25/02 09:24	02/25/02 09:29	1: OV	27.500 /	20.000	(37.50%)	Startup	No Action Taken
02/25/02 09:30	02/25/02 09:35	1: OV	22.900 /	20.000	(14.50%)	Startup	No Action Taken
02/25/02 10:06	02/25/02 10:11	1: OV	25.000 /	20.000	(25.00%)	Startup	No Action Taken
02/25/02 10:12	02/25/02 10:17	1: OV	53.300 /	20.000	(166.50%)	Startup	No Action Taken
02/25/02 10:18	02/25/02 10:23	1: OV	46.800 /	20.000	(134.00%)	Startup	No Action Taken
02/25/02 10:24	02/25/02 10:29	1: OV	32.700 /	20.000	(63.50%)	Startup	No Action Taken
02/25/02 10:30	02/25/02 10:35	1: OV	61.100 /	20.000	(205.50%)	Startup	No Action Taken
02/25/02 10:36	02/25/02 10:41	1: OV	91.700 /	20.000	(358.50%)	Startup	No Action Taken
02/25/02 10:48	02/25/02 10:53	1: OV	32.500 /	20.000	(62.50%)	Startup	No Action Taken
02/25/02 10:54	02/25/02 10:59	1: OV	24.600 /	20.000	(23.00%)	Startup	No Action Taken
02/25/02 11:18	02/25/02 11:23	1: OV	37.500 /	20.000	(87.50%)	Startup	No Action Taken
02/25/02 11:24	02/25/02 11:29	1: OV	38.100 /	20.000	(90.50%)	Startup	No Action Taken
02/25/02 11:30	02/25/02 11:35	1: OV	30.300 /	20.000	(51.50%)	Startup	No Action Taken
02/25/02 16:42	02/25/02 16:47	1: OV	25.100 /	20.000	(25.50%)	Startup	No Action Taken
02/25/02 16:48	02/25/02 16:53	1: OV	25.800 /	20.000	(29.00%)	Startup	No Action Taken
02/25/02 16:54	02/25/02 16:59	1: OV	22.000 /	20.000	(10.00%)	Startup	No Action Taken
02/25/02 17:24	02/25/02 17:29	1: OV	31.900 /	20.000	(59.50%)	Startup	No Action Taken
02/25/02 17:30	02/25/02 17:35	1: OV	31.600 /	20.000	(58.00%)	Startup	No Action Taken
02/25/02 17:36	02/25/02 17:41	1: OV	33.100 /	20.000	(65.50%)	Startup	No Action Taken
02/25/02 17:42	02/25/02 17:47	1: OV	24.300 /	20.000	(21.50%)	Startup	No Action Taken
02/25/02 17:48	02/25/02 17:53	1: OV	32.100 /	20.000	(60.50%)	Startup	No Action Taken
02/25/02 17:54	02/25/02 17:59	1: OV	31.100 /	20.000	(55.50%)	Startup	No Action Taken
02/25/02 18:00	02/25/02 18:05	1: OV	39.200 /	20.000	(96.00%)	Startup	No Action Taken
02/25/02 18:06	02/25/02 18:11	1: OV	36.500 /	20.000	(82.50%)	Startup	No Action Taken
02/25/02 18:12	02/25/02 18:17	1: OV	33.600 /	20.000	(68.00%)	Startup	No Action Taken
02/25/02 18:18	02/25/02 18:23	1: OV	24.900 /	20.000	(24.50%)	Startup	No Action Taken
02/25/02 18:24	02/25/02 18:29	1: OV	24.200 /	20.000	(21.00%)	Startup	No Action Taken
02/25/02 18:30	02/25/02 18:35	1: OV	20.300 /	20.000	(1.50%)	Startup	No Action Taken
02/25/02 18:36	02/25/02 18:41	1: OV	20.200 /	20.000	(1.00%)	Startup	No Action Taken
02/25/02 18:54	02/25/02 18:59	1: OV	25.400 /	20.000	(27.00%)	Startup	No Action Taken
02/25/02 19:00	02/25/02 19:05	1: OV	26.500 /	20.000	(32.50%)	Startup	No Action Taken
02/25/02 19:06	02/25/02 19:11	1: OV	26.300 /	20.000	(31.50%)	Startup	No Action Taken
02/25/02 19:18	02/25/02 19:23	1: OV	31.800 /	20.000	(59.00%)	Startup	No Action Taken
02/25/02 19:24	02/25/02 19:29	1: OV	25.300 /	20.000	(26.50%)	Startup	No Action Taken
02/25/02 19:36	02/25/02 19:41	1: OV	28.100 /	20.000	(40.50%)	Startup	No Action Taken
02/25/02 19:42	02/25/02 19:47	1: OV	22.400 /	20.000	(12.00%)	Startup	No Action Taken
02/25/02 19:48	02/25/02 19:53	1: OV	22.800 /	20.000	(14.00%)	Startup	No Action Taken
02/25/02 19:54	02/25/02 19:59	1: OV	20.900 /	20.000	(4.50%)	Startup	No Action Taken
02/25/02 20:00	02/25/02 20:05	1: OV	22.100 /	20.000	(10.50%)	Startup	No Action Taken
02/25/02 20:06	02/25/02 20:11	1: OV	20.100 /	20.000	(0.50%)	Startup	No Action Taken
02/25/02 20:12	02/25/02 20:17	1: OV	22.900 /	20.000	(14.50%)	Startup	No Action Taken
02/25/02 20:18	02/25/02 20:23	1: OV	27.800 /	20.000	(39.00%)	Startup	No Action Taken
02/25/02 20:24	02/25/02 20:29	1: OV	23.600 /	20.000	(18.00%)	Startup	No Action Taken
02/25/02 20:30	02/25/02 20:35	1: OV	21.200 /	20.000	(6.00%)	Startup	No Action Taken
02/25/02 20:36	02/25/02 20:41	1: OV	21.100 /	20.000	(5.50%)	Startup	No Action Taken
03/05/02 09:42	03/05/02 09:47	1: OV	21.000 /	20.000	(5.00%)	Control Equip. Malfuncti	No Action Taken
03/14/02 14:06	03/14/02 14:11	1: OV	25.200 /	20.000	(26.00%)	Control Equip. Malfuncti	No Action Taken
03/20/02 14:18	03/20/02 14:23	1: OV	48.800 /	20.000	(144.00%)	Control Equip. Malfuncti	No Action Taken
03/20/02 14:24	03/20/02 14:29	1: OV	35.300 /	20.000	(76.50%)	Control Equip. Malfuncti	No Action Taken
03/20/02 14:30	03/20/02 14:35	1: OV	21.200 /	20.000	(6.00%)	Control Equip. Malfuncti	No Action Taken
03/28/02 09:00	03/28/02 09:05	1: OV	21.400 /	20.000	(7.00%)	Control Equip. Malfuncti	No Action Taken
03/29/02 20:06	03/29/02 20:11	1: OV	23.900 /	20.000	(19.50%)	Shutdown	No Action Taken
03/29/02 20:12	03/29/02 20:17	1: OV	31.200 /	20.000	(56.00%)	Shutdown	No Action Taken

03/29/02 20:18 - 03/29/02 20:23	1: OV	32.700 /	20.000	(63.50%)	Shutdown	No Action Taken
03/29/02 20:24 - 03/29/02 20:29	1: OV	28.100 /	20.000	(40.50%)	Shutdown	No Action Taken
03/29/02 20:30 - 03/29/02 20:35	1: OV	27.700 /	20.000	(38.50%)	Shutdown	No Action Taken
03/29/02 20:36 - 03/29/02 20:41	1: OV	24.300 /	20.000	(21.50%)	Shutdown	No Action Taken
03/29/02 20:42 - 03/29/02 20:47	1: OV	27.200 /	20.000	(36.00%)	Shutdown	No Action Taken
03/29/02 20:54 - 03/29/02 20:59	1: OV	21.500 /	20.000	(7.50%)	Shutdown	No Action Taken
03/29/02 21:00 - 03/29/02 21:05	1: OV	21.400 /	20.000	(7.00%)	Shutdown	No Action Taken
03/29/02 21:06 - 03/29/02 21:11	1: OV	52.800 /	20.000	(164.00%)	Shutdown	No Action Taken
03/29/02 21:12 - 03/29/02 21:17	1: OV	93.600 /	20.000	(368.00%)	Shutdown	No Action Taken
03/29/02 21:18 - 03/29/02 21:23	1: OV	91.000 /	20.000	(355.00%)	Shutdown	No Action Taken
03/29/02 21:24 - 03/29/02 21:29	1: OV	89.600 /	20.000	(348.00%)	Shutdown	No Action Taken
03/29/02 21:30 - 03/29/02 21:35	1: OV	89.200 /	20.000	(346.00%)	Shutdown	No Action Taken
03/29/02 21:36 - 03/29/02 21:41	1: OV	85.700 /	20.000	(328.50%)	Shutdown	No Action Taken
03/29/02 21:42 - 03/29/02 21:47	1: OV	87.000 /	20.000	(335.00%)	Shutdown	No Action Taken
03/29/02 21:48 - 03/29/02 21:53	1: OV	85.300 /	20.000	(326.50%)	Shutdown	No Action Taken
03/29/02 21:54 - 03/29/02 21:59	1: OV	84.500 /	20.000	(322.50%)	Shutdown	No Action Taken
03/29/02 22:00 - 03/29/02 22:05	1: OV	76.500 /	20.000	(282.50%)	Shutdown	No Action Taken
03/29/02 22:06 - 03/29/02 22:11	1: OV	64.700 /	20.000	(223.50%)	Shutdown	No Action Taken
03/29/02 22:12 - 03/29/02 22:17	1: OV	56.800 /	20.000	(184.00%)	Shutdown	No Action Taken
03/29/02 22:18 - 03/29/02 22:23	1: OV	54.500 /	20.000	(172.50%)	Shutdown	No Action Taken
03/29/02 22:24 - 03/29/02 22:29	1: OV	49.600 /	20.000	(148.00%)	Shutdown	No Action Taken
03/29/02 22:30 - 03/29/02 22:35	1: OV	47.700 /	20.000	(138.50%)	Shutdown	No Action Taken
03/29/02 22:36 - 03/29/02 22:41	1: OV	45.600 /	20.000	(128.00%)	Shutdown	No Action Taken
03/29/02 22:42 - 03/29/02 22:47	1: OV	45.200 /	20.000	(126.00%)	Shutdown	No Action Taken
03/29/02 22:48 - 03/29/02 22:53	1: OV	44.000 /	20.000	(120.00%)	Shutdown	No Action Taken
03/29/02 22:54 - 03/29/02 22:59	1: OV	43.500 /	20.000	(117.50%)	Shutdown	No Action Taken
03/29/02 23:00 - 03/29/02 23:05	1: OV	40.600 /	20.000	(103.00%)	Shutdown	No Action Taken
03/29/02 23:06 - 03/29/02 23:11	1: OV	40.800 /	20.000	(104.00%)	Shutdown	No Action Taken
03/29/02 23:12 - 03/29/02 23:17	1: OV	39.700 /	20.000	(98.50%)	Shutdown	No Action Taken
03/29/02 23:18 - 03/29/02 23:23	1: OV	38.200 /	20.000	(91.00%)	Shutdown	No Action Taken
03/29/02 23:24 - 03/29/02 23:29	1: OV	37.700 /	20.000	(88.50%)	Shutdown	No Action Taken
03/29/02 23:30 - 03/29/02 23:35	1: OV	36.300 /	20.000	(81.50%)	Shutdown	No Action Taken
03/29/02 23:36 - 03/29/02 23:41	1: OV	36.100 /	20.000	(80.50%)	Shutdown	No Action Taken
03/29/02 23:42 - 03/29/02 23:47	1: OV	34.000 /	20.000	(70.00%)	Shutdown	No Action Taken
03/29/02 23:48 - 03/29/02 23:53	1: OV	32.800 /	20.000	(64.00%)	Shutdown	No Action Taken
03/29/02 23:54 - 03/29/02 23:59	1: OV	32.200 /	20.000	(61.00%)	Shutdown	No Action Taken
03/30/02 00:00 - 03/30/02 00:05	1: OV	33.800 /	20.000	(69.00%)	Shutdown	No Action Taken
03/30/02 00:06 - 03/30/02 00:11	1: OV	31.800 /	20.000	(59.00%)	Shutdown	No Action Taken
03/30/02 00:12 - 03/30/02 00:17	1: OV	32.300 /	20.000	(61.50%)	Shutdown	No Action Taken
03/30/02 00:18 - 03/30/02 00:23	1: OV	31.500 /	20.000	(57.50%)	Shutdown	No Action Taken
03/30/02 00:24 - 03/30/02 00:29	1: OV	30.800 /	20.000	(54.00%)	Shutdown	No Action Taken
03/30/02 00:30 - 03/30/02 00:35	1: OV	29.100 /	20.000	(45.50%)	Shutdown	No Action Taken
03/30/02 00:36 - 03/30/02 00:41	1: OV	29.300 /	20.000	(46.50%)	Shutdown	No Action Taken
03/30/02 00:42 - 03/30/02 00:47	1: OV	28.200 /	20.000	(41.00%)	Shutdown	No Action Taken
03/30/02 00:48 - 03/30/02 00:53	1: OV	27.600 /	20.000	(38.00%)	Shutdown	No Action Taken
03/30/02 00:54 - 03/30/02 00:59	1: OV	26.500 /	20.000	(32.50%)	Shutdown	No Action Taken
03/30/02 01:00 - 03/30/02 01:05	1: OV	25.800 /	20.000	(29.00%)	Shutdown	No Action Taken
03/30/02 01:06 - 03/30/02 01:11	1: OV	25.800 /	20.000	(29.00%)	Shutdown	No Action Taken
03/30/02 01:12 - 03/30/02 01:17	1: OV	26.100 /	20.000	(30.50%)	Shutdown	No Action Taken
03/30/02 01:18 - 03/30/02 01:23	1: OV	26.400 /	20.000	(32.00%)	Shutdown	No Action Taken
03/30/02 01:24 - 03/30/02 01:29	1: OV	25.800 /	20.000	(29.00%)	Shutdown	No Action Taken
03/30/02 01:30 - 03/30/02 01:35	1: OV	32.400 /	20.000	(62.00%)	Shutdown	No Action Taken
03/30/02 01:36 - 03/30/02 01:41	1: OV	31.100 /	20.000	(55.50%)	Shutdown	No Action Taken
03/30/02 01:42 - 03/30/02 01:47	1: OV	39.500 /	20.000	(97.50%)	Shutdown	No Action Taken
03/30/02 01:48 - 03/30/02 01:53	1: OV	39.900 /	20.000	(99.50%)	Shutdown	No Action Taken
03/30/02 01:54 - 03/30/02 01:59	1: OV	30.700 /	20.000	(53.50%)	Shutdown	No Action Taken
03/30/02 02:00 - 03/30/02 02:05	1: OV	31.500 /	20.000	(57.50%)	Shutdown	No Action Taken
03/30/02 02:06 - 03/30/02 02:11	1: OV	30.000 /	20.000	(50.00%)	Shutdown	No Action Taken
03/30/02 02:12 - 03/30/02 02:17	1: OV	27.400 /	20.000	(37.00%)	Shutdown	No Action Taken
03/30/02 02:18 - 03/30/02 02:23	1: OV	27.600 /	20.000	(38.00%)	Shutdown	No Action Taken
03/30/02 02:24 - 03/30/02 02:29	1: OV	26.400 /	20.000	(32.00%)	Shutdown	No Action Taken
03/30/02 02:30 - 03/30/02 02:35	1: OV	25.000 /	20.000	(25.00%)	Shutdown	No Action Taken
03/30/02 02:36 - 03/30/02 02:41	1: OV	26.900 /	20.000	(34.50%)	Shutdown	No Action Taken
03/30/02 02:42 - 03/30/02 02:47	1: OV	28.800 /	20.000	(44.00%)	Shutdown	No Action Taken
03/30/02 02:48 - 03/30/02 02:53	1: OV	27.200 /	20.000	(36.00%)	Shutdown	No Action Taken
03/30/02 02:54 - 03/30/02 02:59	1: OV	26.700 /	20.000	(33.50%)	Shutdown	No Action Taken
03/30/02 03:00 - 03/30/02 03:05	1: OV	27.200 /	20.000	(36.00%)	Shutdown	No Action Taken
03/30/02 03:06 - 03/30/02 03:11	1: OV	28.300 /	20.000	(41.50%)	Shutdown	No Action Taken
03/30/02 03:12 - 03/30/02 03:17	1: OV	33.700 /	20.000	(68.50%)	Shutdown	No Action Taken
03/30/02 03:18 - 03/30/02 03:23	1: OV	35.800 /	20.000	(79.00%)	Shutdown	No Action Taken
03/30/02 03:24 - 03/30/02 03:29	1: OV	38.800 /	20.000	(94.00%)	Shutdown	No Action Taken
03/30/02 03:30 - 03/30/02 03:35	1: OV	30.800 /	20.000	(54.00%)	Shutdown	No Action Taken
03/30/02 03:36 - 03/30/02 03:41	1: OV	28.500 /	20.000	(42.50%)	Shutdown	No Action Taken
03/30/02 03:42 - 03/30/02 03:47	1: OV	27.900 /	20.000	(39.50%)	Shutdown	No Action Taken
03/30/02 03:48 - 03/30/02 03:53	1: OV	30.100 /	20.000	(50.50%)	Shutdown	No Action Taken
03/30/02 03:54 - 03/30/02 03:59	1: OV	30.000 /	20.000	(50.00%)	Shutdown	No Action Taken
03/30/02 04:00 - 03/30/02 04:05	1: OV	30.200 /	20.000	(51.00%)	Shutdown	No Action Taken
03/30/02 04:06 - 03/30/02 04:11	1: OV	29.700 /	20.000	(48.50%)	Shutdown	No Action Taken
03/30/02 04:12 - 03/30/02 04:17	1: OV	29.200 /	20.000	(46.00%)	Shutdown	No Action Taken

03/30/02 04:18 - 03/30/02 04:23	1: OV	29.600 /	20.000	(48.00%)	Shutdown	No Action Taken
03/30/02 04:24 - 03/30/02 04:29	1: OV	29.300 /	20.000	(46.50%)	Shutdown	No Action Taken
03/30/02 04:30 - 03/30/02 04:35	1: OV	30.000 /	20.000	(50.00%)	Shutdown	No Action Taken
03/30/02 04:36 - 03/30/02 04:41	1: OV	30.500 /	20.000	(52.50%)	Shutdown	No Action Taken
03/30/02 04:42 - 03/30/02 04:47	1: OV	29.600 /	20.000	(48.00%)	Shutdown	No Action Taken
03/30/02 04:48 - 03/30/02 04:53	1: OV	27.600 /	20.000	(38.00%)	Shutdown	No Action Taken
03/30/02 04:54 - 03/30/02 04:59	1: OV	27.800 /	20.000	(39.00%)	Shutdown	No Action Taken
03/30/02 05:00 - 03/30/02 05:05	1: OV	27.800 /	20.000	(39.00%)	Shutdown	No Action Taken
03/30/02 05:06 - 03/30/02 05:11	1: OV	29.300 /	20.000	(46.50%)	Shutdown	No Action Taken
03/30/02 05:12 - 03/30/02 05:17	1: OV	28.900 /	20.000	(44.50%)	Shutdown	No Action Taken
03/30/02 05:18 - 03/30/02 05:23	1: OV	80.900 /	20.000	(304.50%)	Shutdown	No Action Taken
03/30/02 05:24 - 03/30/02 05:29	1: OV	27.600 /	20.000	(38.00%)	Shutdown	No Action Taken
03/30/02 13:54 - 03/30/02 13:59	1: OV	36.600 /	20.000	(83.00%)	Shutdown	No Action Taken
03/30/02 14:00 - 03/30/02 14:05	1: OV	35.100 /	20.000	(75.50%)	Shutdown	No Action Taken
03/30/02 14:06 - 03/30/02 14:11	1: OV	58.200 /	20.000	(191.00%)	Shutdown	No Action Taken
03/30/02 14:12 - 03/30/02 14:17	1: OV	55.600 /	20.000	(178.00%)	Shutdown	No Action Taken
03/30/02 14:18 - 03/30/02 14:23	1: OV	45.800 /	20.000	(129.00%)	Shutdown	No Action Taken
03/30/02 14:24 - 03/30/02 14:29	1: OV	39.800 /	20.000	(99.00%)	Shutdown	No Action Taken
03/30/02 14:30 - 03/30/02 14:35	1: OV	37.100 /	20.000	(85.50%)	Shutdown	No Action Taken
03/30/02 14:36 - 03/30/02 14:41	1: OV	35.100 /	20.000	(75.50%)	Shutdown	No Action Taken
03/30/02 14:42 - 03/30/02 14:47	1: OV	29.900 /	20.000	(49.50%)	Shutdown	No Action Taken

Total Reported Time: 2160.0 hours

TOTAL DURATION = 64.00 hours

1: Over limit = 64.00 hours
2: Control Equip. Malfunction = 0.60 hours
3: Startup = 53.20 hours
4: Shutdown = 10.20 hours

Westar Energy

November 21, 2006

Mr. Andy Hawkins
Kansas Department of Health and Environment
Bureau of Air and Radiation
1000 SW Jackson, Suite 400
Topeka, Kansas 66612-1367

Dear Mr. Hawkins:

Westar Energy, Inc. (Westar) is submitting the results of the Best Available Retrofit Technology (BART) exemption modeling analysis performed to determine whether or not any of Westar's BART-eligible sources are exempt from BART. BART-eligible sources are exempt from BART if the 98th percentile of the visibility impacts predicted by the modeling is below EPA's recommended visibility contribution threshold of 0.5 Δdv for the three-year modeling period (2001-2003).

The BART-eligible sources that were modeled include:

- Hutchinson Energy Center (HEC) - Boiler Unit 4
- Gordon Evans Energy Center (GEEC) - Boiler Unit 2
- Jeffrey Energy Center (JEC) - Boiler Units 1 and 2
- Lawrence Energy Center (LEC) - Boiler Unit 5

The nearby Class I areas included in the analysis were:

- Wichita Mountains
- Hercules Glades
- Upper Buffalo
- Caney Creek
- Mingo Wildlife Refuge

An initial modeling protocol (Version 0) detailing the methods and model input parameters was submitted to the Kansas Department of Health and Environment (KDHE) in May of 2006. In September of 2006, Westar resubmitted a revised protocol (Version 1) to address KDHE's comments on the initial protocol. The revised protocol was approved by KDHE in an email dated September 25, 2006. Additional model input parameters that were not addressed in the modeling protocols include the maximum actual 24-hour emission rates of NO_X, SO_2, and PM_{10} that occurred between 2002 and 2004 and the good engineering practice (GEP) stack height for stacks where the actual stack height is above the GEP stack height. These parameters are included in Attachment 1. It should also be noted that there is one correction to the stack diameter of LEC Boiler Unit 5, which was reported as 18.5 feet (ft) in the modeling protocol; the correct diameter is 18.0 ft.

Westar completed the BART exemption modeling analysis based on the approved modeling protocol referenced above. We have determined that HEC Boiler Unit 4 and LEC Boiler Unit 5 are exempt from the BART rule, since the 98th percentile of the 2001-2003 visibility impacts are below 0.5 Δdv. We have also determined that GEEC Boiler Unit 2 and JEC Boiler Units 1 and 2 will require further analysis to determine BART, since the 98th percentile of the 2001-2003 visibility impacts are above 0.5 Δdv. The modeled 98th percentile of the 2001-2003 visibility impacts and the number of days from 2001-2003 with a visibility impact greater than 0.5 Δdv are summarized in Table 1 for each source and each Class I area.

TABLE 1. SUMMARY OF 98TH PERCENTILE VISIBILITY IMPACTS AND NUMBER OF DAYS WITH VISIBILITY IMPACT GREATER THAN 0.5 ΔDV

	Wichita Mountains		Hercules Glades		Caney Creek		Mingo Wildlife		Upper Buffalo		Exempt from BART?
	98th % DV	Days > 0.5 DV	98th % DV	Days > 0.5 DV	98th % DV	Days > 0.5 DV	98th % DV	Days > 0.5 DV	98th % DV	Days > 0.5 DV	
HEC	0.369	10	0.119	1	0.100	1	0.047	0	0.107	3	Yes
JEC	0.990	59	0.904	63	0.730	37	0.493	21	0.846	53	No
LEC	0.173	4	0.286	2	0.156	3	0.141	0	0.242	3	Yes
GEEC	1.081	85	0.395	16	0.381	14	0.172	4	0.415	16	No

In addition to looking at the overall 98th percentile impacts for the three-year period from 2001-2003, Westar also evaluated the 98th percentile results for each individual year, as requested by you in an email dated September 25, 2006. Specifically, you requested that Westar include information about any one year with a 98th percentile result greater than 0.5 Δdv (i.e., any one year with greater than 7 days of a visibility impact greater than 0.5 Δdv). Westar has determined that for the two sources that are exempt (HEC Boiler Unit 4 and LEC Boiler Unit 5), the 98th percentile visibility impacts for each individual year, in addition to the 98th percentile visibility impacts for the three-year period, were less than 0.5 Δdv. For the two sources that are not exempt from BART (GEEC Boiler Unit 2 and JEC Boiler Units 1 and 2), there are one-year 98th percentile visibility impacts, in addition to the 98th percentile visibility impacts for the three-year period, which exceed 0.5 Δdv. The number of days in each year with a visibility impact greater than 0.5 Δdv are detailed in Table 2.

TABLE 2. NUMBER OF DAYS IN EACH YEAR WITH VISIBILITY IMPACT GREATER THAN 0.5 ΔDV

	Wichita Mountains			Hercules Glades			Caney Creek			Mingo Wildlife			Upper Buffalo		
	2001	2002	2003	2001	2002	2003	2001	2002	2003	2001	2002	2003	2001	2002	2003
HEC	6	3	1	0	0	1	0	1	0	0	0	0	1	1	1
JEC	14	24	21	15	24	24	13	11	13	10	7	4	18	17	18
LEC	3	1	0	2	0	0	1	0	2	0	0	0	2	0	1
GEEC	27	29	29	7	4	5	5	4	5	2	0	2	8	4	4

Copies of the meteorological, land use, and DEM data, as well as all input and output files, are provided on an external hard drive as Attachment 2. If there are any questions regarding the contents of this letter, please feel free to contact me at (785) 575- 8447.

Sincerely,

WESTAR ENERGY, INC.

Stephanie Hirner

Stephanie Hirner
Environmental Engineer, Air Programs

Attachments

cc: Mr. Dan Wilkus, Westar
Ms. Stephanie Hirner, Westar
Ms. Kasi Dubbs, Trinity

ATTACHMENT 1. EMISSION CALCULATIONS AND MODEL INPUT PARAMETERS

Table A-1. Model Inputs Summary

Source Name	Latitude NAD83 dec deg	Longitude NAD83 dec deg	UTM X NAD83 Zone 14	UTM Y NAD83 Zone 14	LCC East	LCC North	Base Elevation	GEP Stack Height	Actual Stack Height	Modeled Stack Height	Stack Diameter	Exit Velocity	Gas Temperature
	dec. deg.	dec. deg.	km	km	km	km	ft	ft	ft	ft	ft	ft/sec	°F
Westar Energy - Lawrence Unit 5	39.007	95.275	822.578	4323.95	351.450	572.184	845	525	355	355	18.0	80.0	166
Westar Energy - Jeffrey Unit 1	39.287	96.116	748.746	4352.838	277.868	600.518	1300	574	600	574	26.0	91.3	300
Westar Energy - Jeffrey Unit 2	39.287	96.116	748.746	4352.838	277.868	600.518	1300	574	600	574	26.0	91.3	300
Westar Energy - Hutchinson Unit 4S	38.092	38.092	598.828	4216.416	128.865	464.133	1595	213	149	149	8.0	56.0	313
Westar Energy - Hutchinson Unit 4N	38.092	38.092	598.828	4216.416	128.865	464.133	1595	213	149	149	8.0	56.0	313
Westar Energy - Gordon Evans Unit 2A	37.793	97.518	630.457	4183.633	160.479	431.425	1383	381	197	197	13.0	69.0	290
Westar Energy - Gordon Evans Unit 2B	37.793	97.518	630.457	4183.633	160.479	431.425	1383	381	197	197	13.0	69.0	290

BART-Eligible Source Name	Highest 24 hr Actual Mass Emission Rate 2002-2004* ton/24 hr								Input to CALPUFF Hourly Equivalent of Highest 24 hr Mass Emission Rate lb/hr							
	SO_2	NO_X	PM_{10}	SO_4	PM_C	PM_f	SOA	EC	SO_2	NO_X	PM_{10} Total	SO_4	PM_C	PM_f	SOA	EC
Westar Energy - Lawrence Unit 5	28.0	18.4	3.23	1.529	0.732	0.564	0.382	0.022	2334.7	1536.7	269.1	127.4	61.0	47.0	31.9	1.8
Westar Energy - Jeffrey Unit 1	83.3	47.7	3.93	2.182	0.667	0.514	0.546	0.020	6938.9	3972.3	327.4	181.9	55.6	42.8	45.5	1.6
Westar Energy - Jeffrey Unit 2	85.5	47.1	3.65	2.025	0.619	0.477	0.506	0.018	7128.2	3924.0	303.9	168.8	51.6	39.8	42.2	1.5
Westar Energy - Hutchinson Unit 4N	21.4	3.83	1.24	0.103	0.305	0.758	0.018	0.061	1782.8	319.2	103.7	8.6	25.4	63.2	1.5	5.0
Westar Energy - Hutchinson Unit 4S	21.4	3.83	1.24	0.103	0.305	0.758	0.018	0.061	1782.8	319.2	103.7	8.6	25.4	63.2	1.5	5.0
Westar Energy - Gordon Evans Unit 2A	34.6	28.9	2.59	0.232	0.628	1.563	0.041	0.125	2883.3	2409.2	215.8	19.4	52.3	130.2	3.4	10.4
Westar Energy - Gordon Evans Unit 2B	34.6	28.9	2.59	0.232	0.628	1.563	0.041	0.125	2883.3	2409.2	215.8	19.4	52.3	130.2	3.4	10.4

*The Highest 24 hr Actual Mass Emission Rates of SO_2 and NO_X are determined from actual monitored data. The Highest 24 hr Actual Mass Emission Rate of PM_{10} is calculated based on the actual fuel usage data, AP-42 emission factors (see Table A-2), and a scaling factor to convert the average actual rate to the maximum rate per the methods described in the modeling protocol.

Table A-2. Annual Total PM10 Emission Rates

Annual Fuel Usage

	HEC Unit 4		GEEC Unit 2		JEC Unit 1		JEC Unit 2		LEC Unit 5	
	Fuel Oil #6 (Mgal)	Natural Gas (MMscf)	Fuel Oil #6 (Mgal)	Natural Gas (MMscf)	Coal (tons)	Fuel Oil #2 (Mgal)	Coal (tons)	Fuel Oil #2 (Mgal)	Coal (tons)	Natural Gas (MMscf)
2002	4,195	1,240	20,400	3,435	3,338,415	362	3,298,179	255	1,630,890	16
2003	12,308	370	28,343	612	3,147,353	0.23	3,426,758	0	1,565,365	17
2004	9,118	336	27,500	951	3,017,880	0.46	3,143,630	0	1,509,160	26

Constant PM10 Filterable and Condensable Emission Factors

	PM10 Filterable Emission Factor*	Emission Factor Units	Emission Factor Source	PM10 Condensable Emission Factor**	Units	Emission Factor Source
Natural Gas	1.9	lb/MMscf	AP-42 Table 1.4-2	5.7	lb/MMscf	AP-42 Table 1.4-2
Fuel Oil No. 2	1	lb/Mgal	FIRE	1.3	lb/Mgal	AP-42 Table 1.3-2

*The AP-42 natural gas filterable emission factor is for PM. Assume all PM is PM10
**AP-42 condensible emission factors are for PM. Assume all PM is PM10

PM10 Filterable and Condensable Emission Factors By Year & Facility

	HEC Unit 4	GEEC Unit 2	JEC Unit 1	JEC Unit 2	LEC Unit 5		
	PM10 Filterable Emission Factor*	PM10 Filterable Emission Factor*	PM10 Filterable Emission Factor*	PM10 Filterable Emission Factor*	PM10 Filterable Emission Factor*	Emission Factor Units	Emission Factor Source
Fuel Oil No. 6, 2002	15.20	13.55	N/A	N/A	N/A	lb/Mgal	AP-42 Table 1.3-4 PM_{10} = 5.9(1.125+0.37)
Fuel Oil No. 6, 2003	13.81	12.18	N/A	N/A	N/A	lb/Mgal	AP-42 Table 1.3-4 PM_{10} = 5.9(1.125+0.37)
Fuel Oil No. 6, 2004	12.59	12.43	N/A	N/A	N/A	lb/Mgal	AP-42 Table 1.3-4 PM_{10} = 5.9(1.125+0.37)
Coal, 2002	N/A	N/A	11.16	11.16	12.72	lb/ton	AP-42 Table 1.1-4 PM_{10} = 2.3A
Coal, 2003	N/A	N/A	11.18	11.18	12.67	lb/ton	AP-42 Table 1.1-4 PM_{10} = 2.3A
Coal, 2004	N/A	N/A	10.95	10.95	14.90	lb/ton	AP-42 Table 1.1-4 PM_{10} = 2.3A

	HEC Unit 4	GEEC Unit 2	JEC Unit 1	JEC Unit 2	LEC Unit 5		
	PM10 Condensible Emission Factor**	PM10 Condensible Emission Factor**	PM10 Condensible Emission Factor**	PM10 Condensible Emission Factor**	PM10 Condensible Emission Factor**	Units	Emission Factor Source
Fuel Oil No. 6, 2002	1.50	1.50	N/A	N/A	N/A	lb/Mgal	AP-42 Table 1.3-2
Fuel Oil No. 6, 2003	1.50	1.50	N/A	N/A	N/A	lb/Mgal	AP-42 Table 1.3-2
Fuel Oil No. 6, 2004	1.50	1.50	N/A	N/A	N/A	lb/Mgal	AP-42 Table 1.3-2
Coal, 2002	N/A	N/A	0.59	0.59	0.46	lb/ton	AP-42 Table 1.1-5 PM_{10} = (0.15-0.03)*Heating Value
Coal, 2003	N/A	N/A	0.53	0.53	0.46	lb/ton	AP-42 Table 1.1-5 PM_{10} = (0.15-0.03)*Heating Value
Coal, 2004	N/A	N/A	0.55	0.55	0.46	lb/ton	AP-42 Table 1.1-5 PM_{10} = (0.15-0.03)*Heating Value

	HEC Unit 4		GEEC Unit 2		JEC Unit 1			JEC Unit 2			LEC Unit 5		
	Sulfur Content (%)	Ash Content (%)	Sulfur Content (%)	Ash Content (%)	Sulfur Content (%)	Heating Value (BtuMBtu/ton)	Ash Content (%)	Sulfur Content (%)	Heating Value (BtuMBtu/ton)	Ash Content (%)	Sulfur Content (%)	Heating Value (BtuMBtu/ton)	Ash Content (%)
Fuel Oil No. 6, 2002	1.97	N/A	1.72	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fuel Oil No. 6, 2003	1.78	N/A	1.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fuel Oil No. 6, 2004	1.59	N/A	1.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Coal, 2002	N/A	N/A	N/A	N/A	0.55	24.1	4.85	0.55	24.1	4.85	0.49	24.1	5.53
Coal, 2003	N/A	N/A	N/A	N/A	0.52	24.1	4.86	0.52	24.1	4.86	0.49	24.2	5.51
Coal, 2004	N/A	N/A	N/A	N/A	0.57	24.2	4.76	0.57	24.2	4.76	0.49	24.0	5.48

PM10 Control Efficiency

	HEC Unit 4		GEEC Unit 2		JEC Unit 1		JEC Unit 2		LEC Unit 5	
	Filterable	Condensable	Filterable	Condensable	Filterable	Condensable	Filterable	Condensable	Filterable	Condensable
2002	NA	NA	NA	NA	95.7%	95.7%	95.7%	95.7%	95.7%	95.7%
2003	NA	NA	NA	NA	97.7%	97.7%	97.7%	97.7%	98.6%	98.6%
2004	NA	NA	NA	NA	97.7%	97.7%	97.7%	97.7%	98.6%	98.6%

PM10 Emissions

	HEC Unit 4		GEEC Unit 2		JEC Unit 1		JEC Unit 2		LEC Unit 5	
	Filterable	Condensable	Filterable	Condensable	Filterable	Condensable	Filterable	Condensable	Filterable	Condensable
2002	33.1	6.7	141.5	23.1	606.4	43.0	795.8	42.3	450.9	16.3
2003	85.4	10.3	172.8	23.0	404.6	19.2	440.5	20.9	341.8	12.4
2004	58.2	7.8	171.8	23.3	380.0	22.6	395.8	23.6	382.4	11.8

Total Annual Actual PM10 Emissions Per Unit

	HEC Unit 4 (tpy)	GEEC Unit 2 (tpy)	JEC Unit 1 (tpy)	JEC Unit 2 (tpy)	LEC Unit 5 (tpy)
2002	39.7	158.5	649.4	837.9	467.1
2003	95.8	195.9	423.8	461.4	354.0
2004	65.9	195.1	402.6	419.4	394.2

Average Actual 24-Hour PM10 Emissions Per Unit

	HEC Unit 4 (tons/24-Hour)	GEEC Unit 2 (tons/24-Hour)	JEC Unit 1 (tons/24-Hour)	JEC Unit 2 (tons/24-Hour)	LEC Unit 5 (tons/24-Hour)
2002	0.11	0.48	2.33	2.30	1.28
2003	0.26	0.54	1.16	1.26	0.97
2004	0.18	0.53	1.10	1.15	1.08
2002-2004 High	0.26	0.54	2.33	2.30	1.28

Scaling Factor* to Convert Average Actual 24-Hour PM10 Emissions Per Unit to Maximum Actual 24-Hour PM10 Emissions Per Unit

	HEC Unit 4	GEEC Unit 2	JEC Unit 1	JEC Unit 2	LEC Unit 5
SO2	9.92	7.29	1.47	1.46	3.03
NOx	9.08	12.00	1.91	1.77	2.02
Average	9.50	9.65	1.69	1.59	2.52

*The Scaling Factor is calculated by dividing the maximum 24 hr SO2 and NOx emission rates, as monitored by the CEMS, by the average 24 hr SO2 and NOx emission rates.
A sample calculation is shown below for the HEC Unit 4 scaling factor.

Maximum Daily SO2 (ton/day)	42.6	This value is the highest 24-hr SO2 emission rate from the 2002-2004 CEMS data.
2002-2004 Total SO2 (tons)	4,721.1	This value is the sum of the 24-hr SO2 emission rates from the 2002-2004 CEMS data.
Average Daily SO2 (ton/day)	4.3	This value is the sum of the 24-hr SO2 emission rates from the 2002-2004 CEMS data divided by 1,095 days (365 days*3 years).

$$\text{Scaling Factor} = \frac{\text{Maximum Daily SO2}}{\text{Average Daily SO2}}$$

$$\text{Scaling Factor} = \frac{42.6\ \text{ton/day}}{4.3\ \text{ton/day}} = 9.92$$

Maximum Daily NOx (ton/day)	7.7	This value is the highest 24-hr NOx emission rate from the 2002-2004 CEMS data.
2002-2004 Total NOx (tons)	924.2	This value is the sum of the 24-hr NOx emission rates from the 2002-2004 CEMS data.
Average Daily NOx (ton/day)	0.8	This value is the sum of the 24-hr NOx emission rates from the 2002-2004 CEMS data divided by 1,095 days (365 days*3 years).

$$\text{Scaling Factor} = \frac{\text{Maximum Daily NOx}}{\text{Average Daily NOx}}$$

$$\text{Scaling Factor} = \frac{7.7\ \text{ton/day}}{0.8\ \text{ton/day}} = 9.08$$

$$\text{Average Scaling Factor} = \frac{(9.92 + 9.08)}{2} = 9.50$$

Maximum Actual 24-Hour PM10 Emissions Per Unit

	HEC Unit 4 (tons/24-Hour)	GEEC Unit 2 (tons/24-Hour)	JEC Unit 1 (tons/24-Hour)	JEC Unit 2 (tons/24-Hour)	LEC Unit 5 (tons/24-Hour)
PM10	2.49	5.18	3.93	3.65	3.23

Table A-3. LEC Unit 5 PM Speciation

Controlled PM10 Speciation from AP-42 Tables 1.1-5 & 1.1-6
Dry Bottom Boiler burning Pulverized Coal using only ESP for Emissions control

assumes heating value of 12040 Btu/lb and a sulfur content of 0.49 % and an ash content of 5.84 % and f(RH) = 1

	Controlled PM10 Emissions (Bold values from Table 1.1-5.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/ton)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
PC-DB	0.0321	0.0131	0.0073	0.6	0.0058	0.0056	1	0.00022	10	**0.019**	**0.015**	SO4	3*f(RH)	**0.004**	SOA	4

	Controlled PM10 Emissions (Bold Values from Table 1.1-6.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/ton)	(lb/ton)	(lb/ton)	Coef.	(lb/ton)	(lb/ton)	Coef.	(lb/ton)	Coef.	(lb/ton)	(lb/ton)	Type	Ext.Coef.	(lb/ton)	Type	Ext.Coef.
PC-DB	0.773	**0.315**	0.175	0.6	**0.140**	0.135	1	0.0052	10	0.458	0.366	SO4	3*f(RH)	0.092	SOA	4

	Controlled PM10 Emissions															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(% of Total)	(% of Total)	(% of Total)	Coef.	(% of Total)	(% of Total)	Coef.	(% of Total)	Coef.	(% of Total)	(% of Total)	Type	Ext.Coef.	(% of Total)	Type	Ext.Coef.
PC-DB	100%	40.8%	22.7%	0.6	18.1%	17.5%	1	0.7%	10	59.2%	47.4%	SO4	3*f(RH)	11.8%	SOA	4

If you are given Total PM10 emissions in lb/hr:

	Controlled PM10 Emissions (Bold Value is Input by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/hr)	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Type	Ext.Coef.	(lb/hr)	Type	Ext.Coef.
PC-DB	269.1	109.8	61.0	0.6	48.8	47.0	1	1.8	10	159.3	127.4	SO4	3	31.9	SOA	4
		Weighted Extinction		36.6			47.0		18.1				382.3			127.4 2.3

Coarse	22.7%
Fine Soil	17.5%
Fine EC	0.7%
CPM IOR	47.4%
CPM OR	11.8%
	100.0%

Coarse	61.0
Fine Soil	47.0
Fine EC	1.8
CPM IOR	127.4
CPM OR	31.9
	269.1

Table A-4. JEC Unit 1 PM Speciation

Controlled PM10 Speciation from AP-42 Tables 1.1-5 & 1.1-6
Dry Bottom Boiler burning Pulverized Coal using only ESP for Emissions control

assumes heating value of 12071.5 Btu/lb and a sulfur content of 0.55 % and an ash content of 4.82 % and f(RH) = 1

Controlled PM10 Emissions (Bold values from Table 1.1-5.)

Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/ton)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
PC-DB	0.0353	0.0108	0.0060	0.6	0.0048	0.0046	1	0.00018	10	**0.025**	**0.020**	SO4	3*f(RH)	**0.005**	SOA	4

Controlled PM10 Emissions (Bold Values from Table 1.1-6.)

Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/ton)	(lb/ton)	(lb/ton)	Coef.	(lb/ton)	(lb/ton)	Coef.	(lb/ton)	Coef.	(lb/ton)	(lb/ton)	Type	Ext.Coef.	(lb/ton)	Type	Ext.Coef.
PC-DB	0.852	**0.260**	0.145	0.6	**0.116**	0.111	1	0.0043	10	0.592	0.473	SO4	3*f(RH)	0.118	SOA	4

Controlled PM10 Emissions

Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(% of Total)	(% of Total)	(% of Total)	Coef.	(% of Total)	(% of Total)	Coef.	(% of Total)	Coef.	(% of Total)	(% of Total)	Type	Ext.Coef.	(% of Total)	Type	Ext.Coef.
PC-DB	100%	30.6%	17.0%	0.6	13.6%	13.1%	1	0.5%	10	69.4%	55.5%	SO4	3*f(RH)	13.9%	SOA	4

If you are given Total PM10 emissions in lb/hr:

Controlled PM10 Emissions (Bold Value is Input by user.)

Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/hr)	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Type	Ext.Coef.	(lb/hr)	Type	Ext.Coef.
PC-DB	327.4	100.1	55.6	0.6	44.5	42.8	1	1.6	10	227.3	181.9	SO4	3	45.5	SOA	4
		Weighted Extinction		33.4			42.8		16.5				545.6			181.9 2.5

Coarse	17.0%
Fine Soil	13.1%
Fine EC	0.5%
CPM IOR	55.5%
CPM OR	13.9%
	100.0%

Coarse	55.6
Fine Soil	42.8
Fine EC	1.6
CPM IOR	181.9
CPM OR	45.5
	327.4

Table A-5. JEC Unit 2 PM Speciation

Controlled PM10 Speciation from AP-42 Tables 1.1-5 & 1.1-6
Dry Bottom Boiler burning Pulverized Coal using only ESP for Emissions control

assumes heating value of 12071.5 Btu/lb and a sulfur content of 0.55 % and an ash content of 4.82 % and f(RH) = 1

	Controlled PM10 Emissions (Bold values from Table 1.1-5.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/ton)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
PC-DB	0.0353	0.0108	0.0060	0.6	0.0048	0.0046	1	0.00018	10	**0.025**	**0.020**	SO4	3*f(RH)	**0.005**	SOA	4

	Controlled PM10 Emissions (Bold Values from Table 1.1-6.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/ton)	(lb/ton)	(lb/ton)	Coef.	(lb/ton)	(lb/ton)	Coef.	(lb/ton)	Coef.	(lb/ton)	(lb/ton)	Type	Ext.Coef.	(lb/ton)	Type	Ext.Coef.
PC-DB	0.852	**0.260**	0.145	0.6	**0.116**	0.111	1	0.0043	10	0.592	0.473	SO4	3*f(RH)	0.118	SOA	4

	Controlled PM10 Emissions															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(% of Total)	(% of Total)	(% of Total)	Coef.	(% of Total)	(% of Total)	Coef.	(% of Total)	Coef.	(% of Total)	(% of Total)	Type	Ext.Coef.	(% of Total)	Type	Ext.Coef.
PC-DB	100%	30.6%	17.0%	0.6	13.6%	13.1%	1	0.5%	10	69.4%	55.5%	SO4	3*f(RH)	13.9%	SOA	4

If you are given Total PM10 emissions in lb/hr:

	Controlled PM10 Emissions (Bold Value is Input by user.)															
Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/hr)	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Type	Ext.Coef.	(lb/hr)	Type	Ext.Coef.
PC-DB	303.9	92.9	51.6	0.6	41.3	39.8	1	1.5	10	211.0	168.8	SO4	3	42.2	SOA	4
		Weighted Extinction		31.0			39.8		15.3				506.3			168.8 2.5

Coarse	17.0%
Fine Soil	13.1%
Fine EC	0.5%
CPM IOR	55.5%
CPM OR	13.9%
	100.0%

Coarse	51.6
Fine Soil	39.8
Fine EC	1.5
CPM IOR	168.8
CPM OR	42.2
	303.9

Table A-6. GEEC Unit 2 PM Speciation

Controlled PM10 Speciation from AP-42 Tables 1.3-2 & 1.3-4
Uncontrolled Utility Residual Oil Boiler

assumes firing of # 6 oil with a sulfur content of 1.59 %S; therefore, A = 2.154533333 Assume heating value of 156,052 Btu/Gal f(RH) = 1

Uncontrolled PM10 Emissions (Bold Values from Tables 1.3-2 and 1.3-4.)

Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mGal)	(lb/mGal)	(lb/mGal)	Coef.	(lb/mGal)	(lb/mGal)	Coef.	(lb/mGal)	Coef.	(lb/mGal)	(lb/mGal)	Type	Ext.Coef.	(lb/mGal)	Type	Ext.Coef.
Utility	14.21	**12.71**	3.45	0.6	**9.26**	8.58	1	0.69	10	**1.5**	1.28	SO4	3*f(RH)	0.23	SOA	4

Uncontrolled PM10 Emissions

Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(% of Total)	(% of Total)	(% of Total)	Coef.	(% of Total)	(% of Total)	Coef.	(% of Total)	Coef.	(% of Total)	(% of Total)	Type	Ext.Coef.	(% of Total)	Type	Ext.Coef.
Utility	100%	89.4%	24.3%	0.6	65.2%	60.4%	1	4.8%	10	10.6%	9.0%	SO4	3*f(RH)	1.6%	SOA	4

Uncontrolled PM10 Emissions

Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/ton)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
Utility	0.09	0.08	0.02	0.6	0.06	0.05	1	0.004	10	0.01	0.01	SO4	3*f(RH)	0.001	SOA	4

If you are given Total PM10 emissions in lb/hr:

Uncontrolled PM10 Emissions (Bold Value is Input by user.)

Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/hr)	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Type	Ext.Coef.	(lb/hr)	Type	Ext.Coef.
Utility	215.8	193.0	52.3	0.6	140.7	130.2	1	10.4	10	22.8	19.4	SO4	3	3.4	SOA	4
		Weighted Extinction		31.4			130.2		104.1				58.1			13.7

1.6

Coarse	24.3%
Fine Soil	60.4%
Fine EC	4.8%
CPM IOR	9.0%
CPM OR	1.6%
	100.0%

Coarse	52.3
Fine Soil	130.2
Fine EC	10.4
CPM IOR	19.4
CPM OR	3.4
	215.8

Table A-7. HEC Unit 4 PM Speciation

Controlled PM10 Speciation from AP-42 Tables 1.3-2 & 1.3-4
Uncontrolled Utility Residual Oil Boiler

assumes firing of # 6 oil with a sulfur content of 1.77 %S; therefore, A = 2.356133333 Assume heating value of 156,270 Btu/Gal f(RH) = 1

Uncontrolled PM10 Emissions (Bold Values from Tables 1.3-2 and 1.3-4.)

Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mGal)	(lb/mGal)	(lb/mGal)	Coef.	(lb/mGal)	(lb/mGal)	Coef.	(lb/mGal)	Coef.	(lb/mGal)	(lb/mGal)	Type	Ext.Coef.	(lb/mGal)	Type	Ext.Coef.
Utility	15.40	**13.90**	3.77	0.6	**10.13**	9.38	1	0.75	10	1.5	1.28	SO4	3*f(RH)	0.23	SOA	4

Uncontrolled PM10 Emissions

Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(% of Total)	(% of Total)	(% of Total)	Coef.	(% of Total)	(% of Total)	Coef.	(% of Total)	Coef.	(% of Total)	(% of Total)	Type	Ext.Coef.	(% of Total)	Type	Ext.Coef.
Utility	100%	90.3%	24.5%	0.6	65.8%	60.9%	1	4.9%	10	9.7%	8.3%	SO4	3*f(RH)	1.5%	SOA	4

Uncontrolled PM10 Emissions

Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/mmBtu)	(lb/mmBtu)	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/ton)	Coef.	(lb/mmBtu)	Coef.	(lb/mmBtu)	(lb/mmBtu)	Type	Ext.Coef.	(lb/mmBtu)	Type	Ext.Coef.
Utility	0.10	0.09	0.02	0.6	0.06	0.06	1	0.005	10	0.01	0.01	SO4	3*f(RH)	0.001	SOA	4

If you are given Total PM10 emissions in lb/hr:

Uncontrolled PM10 Emissions (Bold Value is Input by user.)

Boiler	Total PM10	Filterable	Coarse	Ext.	Fine	Fine Soil	Ext.	Fine EC	Ext.	Condensible	CPM IOR	Particle		CPM OR	Particle	
Type	(lb/hr)	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Coef.	(lb/hr)	Coef.	(lb/hr)	(lb/hr)	Type	Ext.Coef.	(lb/hr)	Type	Ext.Coef.
Utility	103.7	93.6	25.4	0.6	68.2	63.2	1	5.0	10	10.1	8.6	SO4	3	1.5	SOA	4
		Weighted Extinction		15.2			63.2		50.5				25.8			6.1	1.5

Coarse	24.5%
Fine Soil	60.9%
Fine EC	4.9%
CPM IOR	8.3%
CPM OR	1.5%
	100.0%

Coarse	25.4
Fine Soil	63.2
Fine EC	5.0
CPM IOR	8.6
CPM OR	1.5
	103.7

ATTACHMENT 2. MODELING FILES

- DEM Files (*.dem)
- Land Use Files (*.ctg)
- CTGPROC Input and Output Files
- TERREL Input and Output Files
- MAKEGEO Input and Output Files
- 2001-2003 Surface Meteorological Data Files
- 2001-2003 Precipitation Data Files
- 2001-2003 CALMET Input and Output Files
- 2001-2003 CALPUFF Input and Output Files
- 2001-2003 CALPOST Input and Output Files
- 2001-2003 Ozone Data Files