APPENDIX A

Design Value Determinations

APPENDIX A: DESIGN VALUE DETERMINATIONS

Design values are used to determine the level of control needed to demonstrate attainment of PM_{10} National Ambient Air Quality Standards (NAAQS). Conceptually, this involves determining the PM_{10} design concentration for a particular site or receptor that must be reduced to the level of the NAAQS. The U.S. EPA revised its NAAQS for particulate matter on July 1, 1987.[1] The PM_{10} (health based) standards are set at 150 micrograms per cubic meter ($\mu g/m^3$) for a 24-hour average and 50 $\mu g/m^3$ for the annual average.

U.S. EPA guideline documents were followed in the selection of design values in the attainment demonstration for both the 24-hour and annual average PM_{10} NAAQS.[2] Air quality monitoring data for calendar years 1997 through 1999 were evaluated in the determination of design values. This time frame was chosen to ensure that ambient air data reflected improved enforcement of air pollution control regulations implemented in 1995 and 1996.

Annual Average Design Value

The annual design concentration is the expected annual arithmetic mean determined by the approach discussed in Appendix K of Part 50. Under 40 Code of Federal Regulations 50.6(b), the annual standard is attained when the expected annual arithmetic mean PM_{10} concentration is less than or equal to the level of the standard. The expected annual arithmetic mean is determined by averaging the annual arithmetic mean PM_{10} concentrations for three calendar years. Given the potential for incomplete data and seasonal variations in PM_{10} concentrations, the annual mean is calculated by averaging the four quarterly means of PM_{10} concentrations within the calendar year.

The three calendar years evaluated in the determination of the annual average design value for this PM_{10} SIP Revision were 1997, 1998, and 1999. J.D. Smith was the only PM_{10} air quality monitoring station located within the Las Vegas Valley Nonattainment Area that exceeded the annual average NAAQS for PM_{10} during this period. Table A-1 illustrates quarterly arithmetic averages, annual arithmetic means, and the three-year arithmetic average for calendar years 1997
through 1999. The three-year arithmetic average of 53 micrograms per cubic meter ($\mu g/m^3$) is presented in the last column in bold print.

In accordance with Appendix K of Part 50 (Code of Federal Regulations), the quarterly mean, expressed in $\mu g/m^3$, must be rounded to the nearest tenth (fractional values of 0.05 should be rounded up). Similarly, the average of quarterly means for an annual average of a calendar year must be rounded up to the nearest tenth (fractional values of 0.05 should be rounded up). The multi-year estimate (calendar years 1997 through

[1] Federal Register, "Revisions to the National Ambient Air Quality Standards for Particulate Matter: 40 CFR Parts 51 and 52," 52 FR 24663, July 1, 1987.
[2] *PM_{10} SIP Guideline*, U.S. EPA, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 277711; EPA-450-2-86-001, June 1987.

1999) is the arithmetic average of the three annual means. This multi-year estimate, expressed in $\mu g/m^3$, is rounded to the nearest integer for comparison with the annual standard (fractional values of 0.5 are rounded up).

Table A-1

PM_{10} Air Quality Monitoring Data for the J.D. Smith Site (1997 – 1999)

Calendar Year	Quarter	Quarterly Arithmetic Average	Annual Arithmetic Aveage	Design Value 3-Year Average
1997	Q1	57.7 $\mu g/m^3$	65.0 $\mu g/m^3$	**53 $\mu g/m^3$**
	Q2	83.2 $\mu g/m^3$		
	Q3	63.6 $\mu g/m^3$		
	Q4	55.6 $\mu g/m^3$		
1998	Q1	35.5 $\mu g/m^3$	42.3 $\mu g/m^3$	
	Q2	36.6 $\mu g/m^3$		
	Q3	45.8 $\mu g/m^3$		
	Q4	51.4 $\mu g/m^3$		
1999	Q1	56.4 $\mu g/m^3$	52.3 $\mu g/m^3$	
	Q2	40.2 $\mu g/m^3$		
	Q3	45.1 $\mu g/m^3$		
	Q4	67.6 $\mu g/m^3$		

Source: Clark County Health District, August 2000.

24-Hour Design Values

Five air quality monitoring stations experienced violations of the 24-hour PM_{10} NAAQS during calendar years 1997 through 1999. These stations are Craig Road, J.D. Smith, E. Flamingo, Green Valley, and Pittman. Clark County utilized the Table Look-Up Method in the determination of appropriate 24-hour design concentrations for the five problem sites.[3] Table A-2 presents 24-hour PM_{10} concentrations for days when at least one of the five sites violated the 24-hour PM_{10} NAAQS during calendar years 1997 through 1999.

[3] Ibid.

Table A-2

Violations of the 24-Hour PM_{10} National Ambient Air Quality Standard (1997 – 1999)

Date	Craig Road	Pittman	J.D.Smith	East Flamingo	Green Valley
0/110/97	49	61	60	**155**	*N/A
01/20/97	50	37	55	**160**	29
02/18/97	43	46	**241**	28	42
03/24/97	**165**	80	64	85	90
04/23/97	**174**	**258**	**397**	88	*N/A
04/24/97	54	62	**165**	*N/A	63
05/24/97	36	44	53	108	**248**
06/06/97	52	56	**158**	61	115
06/30/97	118	90	*N/A	**157**	78
07/11/97	55	60	111	42	**153**
07/17/97	80	*N/A	**153**	66	*N/A
08/09/97	108	148	138	115	**339**
10/11/97	85	77	**167**	29	*N/A
10/24/97	79	71	**181**	43	75
11/26/97	**198**	**186**	110	*N/A	**230**
06/16/98	**170**	135	**169**	72	82
11/17/98	**164**	91	79	80	62
12/19/98	**208**	92	91	149	*N/A
12/21/98	*N/A	14	27	**281**	15
12/28/98	71	64	43	**188**	47
01/20/99	**254**	138	79	**163**	*N/A
01/21/99	118	**196**	115	105	81
02/25/99	**202**	**260**	78	*N/A	**281**
03/09/99	137	**183**	74	*N/A	*N/A
03/30/99	**261**	**239**	123	**189**	**358**
03/31/99	**442**	**217**	**218**	150	**200**
05/13/99	*N/A	88	24	**192**	128
12/01/99	**182**	116	133	62	65
12/07/99	**195**	135	**170**	83	53

*N/A means no data available or equipment service/malfunction.
Source: Clark County Health District, Air Quality Division (August 2000)

The 24-hour PM_{10} design value at a site is affected by the highest sampled concentrations. In the tabular approach for the determination of a 24-hour design value at a site, where the number of measured 24-hour concentrations over a three year period range between 696 and 1042, the design value is the third highest concentration measured. The number of observations from each of the five sites is presented in Table A-3.

Table A-3

Number of Observations at Each of the Five Monitoring Sites

Monitoring Station	Number of Observations 1997-1999
Craig Road	1,004
East Flamingo	892
Green Valley	983
J. D. Smith	992
Pittman	1,009

Table A-4 illustrates the three highest 24-hour concentrations measured at each of the five sites during calendar years 1997 through 1999. The third highest concentration measured at each site, which is in bold print, is the 24-hour design value utilized in the attainment demonstration.

Table A-4

24-Hour Design Values (1997 through 1999)*

High Conentrations	Craig Road	Pittman	J.D. Smith	East Flamingo	Green Valley
Highest	442 $\mu g/m^3$	260 $\mu g/m^3$	397 $\mu g/m^3$	281 $\mu g/m^3$	442 $\mu g/m^3$
2nd Highest	261 $\mu g/m^3$	258 $\mu g/m^3$	241 $\mu g/m^3$	192 $\mu g/m^3$	261 $\mu g/m^3$
3rd Highest	**254 $\mu g/m^3$**	**239 $\mu g/m^3$**	**218 $\mu g/m^3$**	**189 $\mu g/m^3$**	**281 $\mu g/m^3$**

*24-hour Design Values are the 3rd Highest Measured Concentration.

In addition to the design values presented in Table A-4 for the five monitoring sites, a valley-wide 24-hour design value was also developed for the attainment demonstration and the development of a mobile source emissions budget for transportation conformity determinations. Consistent with U.S. EPA policy, the 24-hour valley-wide design value was chosen on the basis that it was the third highest of each of the highest 24-hour concentrations in a calendar year, as shown in Table A-5. Additionally, it was the sixth highest value overall for all monitors for the entire monitoring network. U. S. EPA recommends the use of the sixth highest value when using the entire monitoring network in their 1987 guidance.[4] It was the highest concentration measured in 1998 (281 $\mu g/m^3$) on December 21, 1998.

[4] Op cit.

Table A-5

Highest Concentration ($\mu g/m^3$) Each Calendar Year

Year	Highest Concentration	Date
1997	442	March 31, 1997
1998	281	December 21, 1998
1999	397	April 23, 1999