APPENDIX C

AIR QUALITY IMPACT ASSESSMENT

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IMPACT ASSESSMENT METHODOLOGY

As described in Chapter 3, without refined atmospheric dispersion modeling, it is difficult to assess off-site pollutant impacts that may result from ground-disturbing activities. However, a rough estimate of pollutant emissions (in tons per year) will be developed using generic emission factors for criteria such as the number of vehicle miles traveled, holes drilled, area cleared, etc. These emission factors can be used and the specific parameters for each location can be used to roughly assess pollutant impacts associated with the ground-disturbing activities.

The U.S. Environmental Protection Agency (EPA) published *Compilation of Air Pollutant Emission Factors, Volume 1, Fifth Edition, AP-42* in October 1997 that presents estimates of pollutant emissions based on the type of activity being conducted. Sections of this compilation address fugitive dust emissions from paved and unpaved roads, emissions from western surface coal mining, and heavy construction operations. The section on western surface coal mining describes emission estimates from road grading, blasting, and removal of topsoil. The information presented in these sections of AP-42 was used to estimate the offsite pollutant emissions in this report, and is included in this appendix.

AP-42 Section 13.2.3, Miscellaneous Sources, Heavy Construction Operations, provides information on emission factors to assess particulate emissions from construction. Construction emissions include demolition and debris removal (bulldozing, truck loading and unloading of debris, truck travel), site preparation (bulldozing, scrapers, truck loading and unloading), and general construction (vehicular traffic). A conservative emission factor for construction activity operations is 1.2 tons of total suspended particulates (TSP) per acre per month. This emission factor is not directly applicable for particulate matter of 10 microns or less in size (PM_{10}) emissions; therefore, PM_{10} emission estimates, which are assumed to equal TSP emissions, will be conservatively high. This emission factor was derived using soils with moderate silt contents, a medium activity level, and a semi-arid climate, and is acceptable for use in the study area. This conservative emission factor covers all activities, grading, truck loading, bulldozing, road travel, etc. that occur on a construction site. This value likely will give higher emission estimates than individual activity estimates.

AP-42 Section 13.2.2, Miscellaneous Sources, Unpaved Roads, provides an equation to assess particulate emissions from vehicle travel on unpaved roads similar to those likely to be present in the study area. The following equation is used to estimate emissions per vehicle mile traveled:

$E = k(5.9)\ (s/12)\ (S/30)\ (W/3)^{0.7}\ (w/4)^{0.5}\ (365\text{-}p/365)$

E = emission factor in pounds (lb) per vehicle miles traveled (VMT)

k = particle size multiplier (dimensionless) - 0.36 for PM_{10}

s = silt content of road surface material (%) – 12% mean silt content for dirt rural roads

S = mean vehicle speed (miles per hour [mph]) – mean speed assumed to be 25 mph

W = mean vehicle weight (ton) – mean weight assumed to be 2 tons (small) and 20 tons (big)

w = mean number of wheels – assumed to be 4

p = number of days with at least 0.01 inches of precipitation per year – average of 37 days per year (*1998 Local Climatological Data Annual Summary with Comparative Data Phoenix, Arizona National Climatic Data Center [NCDC]*)

$E = (0.36)(5.9)(12/12)(25/30)[(2/3)^{0.7}][(4/4)^{0.5}](365\text{-}37/365)$

E = 1.2 lb/VMT for small vehicles

$E = (0.36)(5.9)(12/12)(25/30)[(20/3)^{0.7}][(4/4)^{0.5}](365\text{-}37/365)$

E = 6.0 lb/VMT for large vehicles

The emission factor for PM_{10} from unpaved roads from small vehicles (e.g., pickup trucks) is 1.2 lb/VMT. For significantly larger trucks, the emission factor is 6.0 lb/VMT. The emission factor for large vehicles assumes a vehicle weight of 20 tons, vehicle speed of 25 mph, and 4 wheels. These emission factors will be used for vehicle travel over unpaved roads for all activities in the study area.

Table 11.9-2 in Section 11.9 of AP-42, Western Surface Coal Mining, presents a PM_{10} emission factor for bulldozing of overburden of 0.75 lb/ton moved. The truck loading and unloading emission factor comes from Section 13.2.4, Aggregate Handling and Storage Piles. The equation for material handling is as follows:

$E = k(0.0032)\ (U/5)^{1.3}/(M/2)^{1.4}$

k = 0.35 for PM_{10}

U = mean wind speed (6.2 mph for 1997 PHX National Weather Service [NWS])

M = moisture content (7.4 for sand)

E = 6.8E-4 pounds of PM_{10} emitted for each ton of material moved.

IMPACT ASSESSMENT

No Action

For the purposes of this analysis, two operating scenarios are presented. Option 1 assumes that no more than 30 percent of the 499 acres would be cleared at any one time. This would result in a maximum of 150 acres being worked per year. Option 2 assumes that no more than 10 percent of the total acreage would be developed per year, resulting in a maximum of 50 acres. It is assumed that each piece of heavy equipment would travel 4 miles per hour and operate for two months each on demolition and debris removal, and site preparation, for a total of 720 hours of operation per year (40 hours per week for 18 weeks). It is assumed that six pieces of heavy equipment (two trucks, two bulldozers, two graders or loaders) would be operating at once. Therefore, it is assumed heavy vehicles would travel a total of 17,280 miles per year (1,440 VMT per heavy vehicle per area). There is no heavy vehicle traffic assumed on site during general construction activities. Light vehicles are assumed to travel 2 miles per hour and operate for two months each on demolition and debris removal, site preparation, and general construction for 1,080 hours of operation per year (40 hours per week multiplied by 27 weeks). There are assumed to be three light vehicles operating at once. Light vehicles are assumed to travel 6 miles per hour and operate for two months on general construction activities. Light vehicles are assumed to travel 10,800 miles per year (2,160 VMT for demolition and debris removal and site preparation and 6,480 VMT for general construction).

It is assumed that all 255 acres would have the top 6 inches of soil removed. Therefore, each acre would have 21,780 cubic feet of soil moved. Assuming that 1 cubic foot of soil (sand) weighs approximately 62 pounds, there would be approximately 675 tons of soil moved per acre.

Table C-1 presents the total assumed controlled PM_{10} emissions per year for each area in the no action under Option 1, while Table C-2 presents the same information for Option 2.

TABLE C-1
TOTAL ASSUMED CONTROLLED PM_{10} EMISSIONS PER YEAR – NO ACTION ALTERNATIVE, OPTION 1

Activity	Emission Factor	Units	Amount Traveled or Moved	Control Efficiency	Total Emissions (lb/yr)
Demolition and Debris Removal – Bulldozing	0.75	lb/ton	101,250 tons	50%	37,969
Demolition and Debris Removal – Truck Loading	6.8E-04	lb/ton	101,250 tons	50%	34.4
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,160 VMT	50%	1,296
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	8,640 VMT	50%	25,920
Site Preparation – Bulldozing	0.75	lb/ton	101,250 tons	50%	37,969
Site Preparation – Scrapers Unloading Topsoil	0.04	lb/ton	101,250 tons	50%	2,025
Site Preparation – Scrapers Removing Topsoil	20.2	lb/VMT	1,440 VMT	75%*	7,272
Site Preparation – Scrapers in Travel	0.6	lb/VMT	1,440 VMT	50%	432
Site Preparation – Grading	0.6	lb/VMT	2,880 VMT	50%	864
Site Preparation – Truck Unloading	6.8E-04	lb/ton	101,250 tons	50%	34.4
Site Preparation – Compacting	0.75	lb/ton	101,250 tons	50%	37,969

TABLE C-1 TOTAL ASSUMED CONTROLLED PM_{10} EMISSIONS PER YEAR – NO ACTION ALTERNATIVE, OPTION 1					
Activity	**Emission Factor**	**Units**	**Amount Traveled or Moved**	**Control Efficiency**	**Total Emissions (lb/yr)**
Site Preparation – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,160 VMT	50%	1,296
Site Preparation – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	8,160 VMT	50%	24,480
General Construction – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	6,480 VMT	50%	3,888
General Construction – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	0 VMT	50%	0
Wind Erosion on Exposed Surfaces	0.38	ton/acre/ yr	150 acres	50%	57,000
TOTAL EMISSIONS					119.2 tons per year
Note: * - this emission factor is for TSP, 50 percent reduction for watering and additional 50 percent reduction converting from TSP to PM_{10}					

Using the 1.2 tons per acre per month TSP emission factor, recommended by the EPA if measured concentrations are unknown, the total emissions would be as follows:

1.2 tons/acre/month x 150 acres x 12 months/yr = 2,160 tons of TSP emission per year without controlling PM_{10}.

TABLE C-2 TOTAL ASSUMED CONTROLLED PM_{10} EMISSIONS PER YEAR – NO ACTION ALTERNATIVE, OPTION 2					
Activity	**Emission Factor**	**Units**	**Amount Traveled or Moved**	**Control Efficiency**	**Total Emissions (lb/yr)**
Demolition and Debris Removal – Bulldozing	0.75	lb/ton	33,750 tons	50%	12,656
Demolition and Debris Removal – Truck Loading	6.8E-04	lb/ton	33,750 tons	50%	11.5
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,160 VMT	50%	1,296
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	8,640 VMT	50%	25,920
Site Preparation – Bulldozing	0.75	lb/ton	33,750 tons	50%	12,656
Site Preparation – Scrapers Unloading Topsoil	0.04	lb/ton	33,750 tons	50%	675
Site Preparation – Scrapers Removing Topsoil	20.2	lb/VMT	1,440 VMT	75%*	7,272
Site Preparation – Scrapers in Travel	0.6	lb/VMT	1,440 VMT	50%	432
Site Preparation – Grading	0.6	lb/VMT	2,880 VMT	50%	864
Site Preparation – Truck Unloading	6.8E-04	lb/ton	33,750 tons	50%	11.5
Site Preparation – Compacting	0.75	lb/ton	33,750 tons	50%	12,656
Site Preparation – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,160 VMT	50%	1,296
Site Preparation – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	8,160 VMT	50%	24,480

TABLE C-2
TOTAL ASSUMED CONTROLLED PM_{10} EMISSIONS PER YEAR – NO ACTION ALTERNATIVE, OPTION 2

Activity	Emission Factor	Units	Amount Traveled or Moved	Control Efficiency	Total Emissions (lb/yr)
General Construction – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	6,480 VMT	50%	3,888
General Construction – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	0 VMT	50%	0
Wind Erosion on Exposed Surfaces	0.38	ton/acre/ yr	50 acres	50%	19,000
TOTAL EMISSIONS					61.6 tons per year

Note:
* - this emission factor is for TSP, 50 percent reduction for watering and additional 50 percent reduction converting from TSP to PM_{10}

Using the 1.2 tons per acre per month TSP emission factor, recommended by the EPA if measured concentrations are unknown, the total emissions would be as follows:

> 1.2 tons/acre/month x 50 acres x 12 months/yr = 720 tons of TSP emission per year without controlling PM_{10}.

Proposed Action

For the purposes of this analysis, two operating scenarios are presented. Option 1 assumes that no more than 30 percent of the 300 acres would be cleared at any one time. This would result in a maximum of 90 acres being worked per year. Option 2 assumes that no more than 10 percent of the total acreage would be developed per year, resulting in a maximum of 30 acres. It is assumed that each piece of heavy equipment would travel 4 miles per hour and operate for two months each on demolition and debris removal, and site preparation, for a total of 720 hours of operation per year (40 hours per week for 18 weeks). It is assumed that six pieces of heavy equipment (two trucks, two bulldozers, two graders or loaders) would be operating at once. Therefore, it is assumed heavy vehicles would travel a total of 20,330 miles per year (1,694 VMT per heavy vehicle per area). There is no heavy vehicle traffic assumed on site during general construction activities. Light vehicles are assumed to travel 2 miles per hour and operate for two months each on demolition and debris removal, site preparation, and general construction for 1,080 hours of operation per year (40 hours per week multiplied by 27 weeks). There are assumed to be three light vehicles operating at once. Light vehicles are assumed to travel 6 miles per hour and operate for two months on general construction activities. Light vehicles are assumed to travel 12,706 miles per year (2,451 VMT for demolition and debris removal and site preparation and 7,264 VMT for general construction).

It is assumed that all 300 acres would have the top 6 inches of soil removed. Therefore, each acre would have 21,780 cubic feet of soil moved. Assuming that 1 cubic foot of soil (sand) weighs approximately 62 pounds, there would be approximately 675 tons of soil moved per acre.

Table C-3 presents the total assumed controlled PM_{10} emissions per year for each area in the proposed action under Option 1, while Table C-4 presents the same information for Option 2.

TABLE C-3
TOTAL ASSUMED CONTROLLED PM_{10} EMISSIONS PER YEAR – PROPOSED ACTION, OPTION 1

Activity	Emission Factor	Units	Amount Traveled or Moved	Control Efficiency	Total Emissions (lb/yr)
Demolition and Debris Removal – Bulldozing	0.75	lb/ton	61,149 tons	50%	22,931
Demolition and Debris Removal – Truck Loading	6.8E-04	lb/ton	61,149 tons	50%	20.8
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,541 VMT	50%	1,525
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	8,640 VMT	50%	30,495
Site Preparation – Bulldozing	0.75	lb/ton	61,149 tons	50%	22,931
Site Preparation – Scrapers Unloading Topsoil	0.04	lb/ton	61,149 tons	50%	1,223
Site Preparation – Scrapers Removing Topsoil	20.2	lb/VMT	1,694 VMT	75%*	8,555
Site Preparation – Scrapers in Travel	0.6	lb/VMT	1,694 VMT	50%	508
Site Preparation – Grading	0.6	lb/VMT	3,388 VMT	50%	1,016
Site Preparation – Truck Unloading	6.8E-04	lb/ton	61,149 tons	50%	20.8
Site Preparation – Compacting	0.75	lb/ton	61,149 tons	50%	22,931
Site Preparation – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,541 VMT	50%	1,525
Site Preparation – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	9,600 VMT	50%	28,801
General Construction – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	7,624 VMT	50%	4,574
General Construction – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	0 VMT	50%	0
Wind Erosion on Exposed Surfaces	0.38	ton/acre/yr	90 acres	50%	34,200
TOTAL EMISSIONS					90.6 tons per year

Note:
* - this emission factor is for TSP, 50 percent reduction for watering and additional 50 percent reduction converting from TSP to PM_{10}

Using the 1.2 tons per acre per month TSP emission factor, recommended by the EPA if measured concentrations are unknown, the total emissions would be as follows:

> 1.2 tons/acre/month x 90 acres x 12 months/yr = 1,296 tons of TSP emission per year without controlling PM_{10}.

TABLE C-4
TOTAL ASSUMED CONTROLLED PM_{10} EMISSIONS PER YEAR – PROPOSED ACTION, OPTION 2

Activity	Emission Factor	Units	Amount Traveled or Moved	Control Efficiency	Total Emissions (lb/yr)
Demolition and Debris Removal – Bulldozing	0.75	lb/ton	19,853 tons	50%	7,445
Demolition and Debris Removal – Truck Loading	6.8E-04	lb/ton	19,853 tons	50%	6.8
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,541 VMT	50%	1,525
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	10,165 VMT	50%	30,495
Site Preparation – Bulldozing	0.75	lb/ton	19,853 tons	50%	7,445
Site Preparation – Scrapers Unloading Topsoil	0.04	lb/ton	19,853 tons	50%	397.1
Site Preparation – Scrapers Removing Topsoil	20.2	lb/VMT	1,694 VMT	75%*	8,555
Site Preparation – Scrapers in Travel	0.6	lb/VMT	1,694 VMT	50%	508.2
Site Preparation – Grading	0.6	lb/VMT	3,388 VMT	50%	1,016
Site Preparation – Truck Unloading	6.8E-04	lb/ton	19,853 tons	50%	6.8
Site Preparation – Compacting	0.75	lb/ton	19,853 tons	50%	7,445
Site Preparation – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,541 VMT	50%	1,525
Site Preparation – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	9,600 VMT	50%	22,920
General Construction – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	7,624 VMT	50%	5,032
General Construction – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	0 VMT	50%	0
Wind Erosion on Exposed Surfaces	0.38	ton/acre/yr	30 acres	50%	11,400
TOTAL EMISSIONS					54.4 tons per year

Note:
* - this emission factor is for TSP, 50 percent reduction for watering and additional 50 percent reduction converting from TSP to PM_{10}

Using the 1.2 tons per acre per month TSP emission factor, recommended by the EPA if measured concentrations are unknown, the total emissions would be as follows:

> 1.2 tons/acre/month x 30 acres x 12 months/yr = 432 tons of TSP emission per year without controlling PM_{10}.

Alternative 1

For the purposes of this analysis, two operating scenarios are presented. Option 1 assumes no more than 30 percent of the 182 acres would be cleared at any one time, resulting in a maximum of 55 acres being worked per year. Option 2 assumes no more than 10 percent of the total acreage would be cleared, resulting in a maximum of 18 acres per year. It is assumed that each piece of heavy equipment would travel 4 miles per hour and operate for two months each on demolition and debris removal, and site preparation, for each of the 700 hours of operation per

year (40 hours per week for 17.5 weeks). It is assumed that six pieces of heavy equipment (two trucks, two bulldozers, two graders or loaders) would be operating at once. Therefore, it is assumed heavy vehicles would travel a total of 21,840 miles per year (3,388 VMT per heavy vehicle). There is no heavy vehicle traffic assumed on site during general construction activities. Light vehicles are assumed to travel 2 miles per hour and operate for two months each on demolition and debris removal, site preparation, and general construction for 1,000 hours of operation per year (40 hours per week multiplied by 25 weeks). There are assumed to be three light vehicles operating at once. Light vehicles are assumed to travel 7,800 miles per year (VMT).

It is assumed that all 182 acres would have the top 6 inches of soil removed. Therefore, each acre would have 21,780 cubic feet of soil moved. Assuming that 1 cubic foot of soil (sand) weighs approximately 62 pounds, there would be approximately 675 tons of soil moved per acre.

Table C-5 presents the total assumed controlled PM_{10} emissions per year for each area in the Alternative 1 plan under Option 1, while Table C-6 presents the same information for Option 2.

TABLE C-5
TOTAL ASSUMED CONTROLLED PM_{10} EMISSIONS PER YEAR – ALTERNATIVE 1, OPTION 1

Activity	Emission Factor	Units	Amount Traveled or Moved	Control Efficiency	Total Emissions (lb/yr)
Demolition and Debris Removal – Bulldozing	0.75	lb/ton	36,855 tons	50%	13,821
Demolition and Debris Removal – Truck Loading	6.8E-04	lb/ton	36,855 tons	50%	12.5
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,808 VMT	50%	1,685
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	11,232 VMT	50%	33,696
Site Preparation – Bulldozing	0.75	lb/ton	36,855 tons	50%	13,821
Site Preparation – Scrapers Unloading Topsoil	0.04	lb/ton	36,855 tons	50%	737
Site Preparation – Scrapers Removing Topsoil	20.2	lb/VMT	1,872 VMT	75%*	9,454
Site Preparation – Scrapers in Travel	0.6	lb/VMT	1,872 VMT	50%	562
Site Preparation – Grading	0.6	lb/VMT	3,744 VMT	50%	1,123
Site Preparation – Truck Unloading	6.8E-04	lb/ton	36,855 tons	50%	12.5
Site Preparation – Compacting	0.75	lb/ton	36,855 tons	50%	13,821
Site Preparation – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,808 VMT	50%	1,685
Site Preparation – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	10,608 VMT	50%	31,824
General Construction – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	8,424 VMT	50%	5,054

TABLE C-5 TOTAL ASSUMED CONTROLLED PM_{10} EMISSIONS PER YEAR – ALTERNATIVE 1, OPTION 1					
Activity	**Emission Factor**	**Units**	**Amount Traveled or Moved**	**Control Efficiency**	**Total Emissions (lb/yr)**
General Construction – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	0 VMT	50%	0
Wind Erosion on Exposed Surfaces	0.38	ton/acre/ yr	55 acres	50%	20,748
TOTAL EMISSIONS					74 tons per year
Note: * - this emission factor is for TSP, 50 percent reduction for watering and additional 50 percent reduction converting from TSP to PM_{10}					

Using the 1.2 tons per acre per month TSP emission factor, recommended by the EPA if measured concentrations are unknown, the total emissions would be as follows:

1.2 tons/acre/month x 55 acres x 12 months/yr = 792 tons of TSP emission per year without controlling PM_{10}.

TABLE C-6 TOTAL ASSUMED CONTROLLED PM_{10} EMISSIONS PER YEAR – ALTERNATIVE 1, OPTION 2					
Activity	**Emission Factor**	**Units**	**Amount Traveled or Moved**	**Control Efficiency**	**Total Emissions (lb/yr)**
Demolition and Debris Removal – Bulldozing	0.75	lb/ton	12,285 tons	50%	4,607
Demolition and Debris Removal – Truck Loading	6.8E-04	lb/ton	12,285 tons	50%	4.2
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,808 VMT	50%	1,685
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	11,232 VMT	50%	33,696
Site Preparation – Bulldozing	0.75	lb/ton	12,285 tons	50%	4,607
Site Preparation – Scrapers Unloading Topsoil	0.04	lb/ton	12,285 tons	50%	246
Site Preparation – Scrapers Removing Topsoil	20.2	lb/VMT	1,872 VMT	75%*	9,454
Site Preparation – Scrapers in Travel	0.6	lb/VMT	1,872 VMT	50%	562
Site Preparation – Grading	0.6	lb/VMT	3,744 VMT	50%	1,123
Site Preparation – Truck Unloading	6.8E-04	lb/ton	12,285 tons	50%	4.2
Site Preparation – Compacting	0.75	lb/ton	12,285 tons	50%	4,607
Site Preparation – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,808 VMT	50%	1,685
Site Preparation – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	10,608 VMT	50%	31,824
General Construction – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	8,424 VMT	50%	5,054

TABLE C-6 TOTAL ASSUMED CONTROLLED PM_{10} EMISSIONS PER YEAR – ALTERNATIVE 1, OPTION 2					
Activity	**Emission Factor**	**Units**	**Amount Traveled or Moved**	**Control Efficiency**	**Total Emissions (lb/yr)**
General Construction – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	0 VMT	50%	0
Wind Erosion on Exposed Surfaces	0.38	ton/acre/ yr	18 acres	50%	6,916
TOTAL EMISSIONS					53 tons per year
Note: * - this emission factor is for TSP, 50 percent reduction for watering and additional 50 percent reduction converting from TSP to PM_{10}					

Using the 1.2 tons per acre per month TSP emission factor, recommended by the EPA if measured concentrations are unknown, the total emissions would be as follows:

> 1.2 tons/acre/month x 18 acres x 12 months/yr = 259 tons of TSP emission per year without controlling PM_{10}.

Alternative 2

For the purposes of this analysis, two operating scenarios are presented. Option 1 assumes no more than 30 percent of the 476 acres would be cleared at any one time. This would result in a maximum of 143 acres being worked per year. Option 2 assumes no more than 10 percent of the total acreage would be cleared, resulting in a maximum of 48 acres per year. It is assumed that each piece of heavy equipment would travel 4 miles per hour for each of the 700 hours of operation per year (40 hours per week multiplied by 17.5 weeks). There are assumed to be six pieces of heavy equipment (two trucks, two bulldozers, two graders or loaders) operating at once. Therefore, it is assumed heavy vehicles would travel a total of 20,246 miles per year (3,471 VMT per heavy vehicle). There is no heavy vehicle traffic assumed on site during general construction activities. Light vehicles are assumed to travel 2 miles an hour and operate for two months each on demolition and debris removal, site preparation, and general construction for 1,000 hours of operation per year (40 hours per week multiplied by 25 weeks). There are assumed to be three light vehicles operating at once. Light vehicles are assumed to travel 7,230 miles per year (VMT).

It is assumed that all 476 acres would have the top 6 inches of soil removed. Therefore, each acre would have 21,780 cubic feet of soil moved. Assuming that 1 cubic foot of soil (sand) weighs approximately 62 pounds, there would be approximately 675 tons of soil moved per acre.

Table C-7 presents the total assumed controlled PM_{10} emissions per year for each area in the Alternative 2 under Option 1, while Table C-8 presents the same information for Option 2.

TABLE C-7
TOTAL ASSUMED CONTROLLED PM_{10} EMISSIONS PER YEAR – ALTERNATIVE 2, OPTION 1

Activity	Emission Factor	Units	Amount Traveled or Moved	Control Efficiency	Total Emissions (lb/yr)
Demolition and Debris Removal – Bulldozing	0.75	lb/ton	97,613 tons	50%	36,605
Demolition and Debris Removal – Truck Loading	6.8E-04	lb/ton	97,613 tons	50%	33.2
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,603 VMT	50%	1,562
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	10,412 VMT	50%	31,236
Site Preparation – Bulldozing	0.75	lb/ton	97,613 tons	50%	36,605
Site Preparation – Scrapers Unloading Topsoil	0.04	lb/ton	97,613 tons	50%	1,952
Site Preparation – Scrapers Removing Topsoil	20.2	lb/VMT	1,735 VMT	75%*	8,763
Site Preparation – Scrapers in Travel	0.6	lb/VMT	1,735 VMT	50%	521
Site Preparation – Grading	0.6	lb/VMT	3,471 VMT	50%	1,041
Site Preparation – Truck Unloading	6.8E-04	lb/ton	97,613 tons	50%	33.2
Site Preparation – Compacting	0.75	lb/ton	97,613 tons	50%	36,605
Site Preparation – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,603 VMT	50%	1,562
Site Preparation – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	9,834 VMT	50%	29,501
General Construction – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	7,809 VMT	50%	4,685
General Construction – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	0 VMT	50%	0
Wind Erosion on Exposed Surfaces	0.38	ton/acre/ yr	143 acres	50%	54,264
TOTAL EMISSIONS					122.5 tons per year

Note:
* - this emission factor is for TSP, 50 percent reduction for watering and additional 50 percent reduction converting from TSP to PM_{10}

Using the 1.2 tons per acre per month TSP emission factor, recommended by the EPA if measured concentrations are unknown, the total emissions would be as follows:

1.2 tons/acre/month x 143 acres x 12 months/yr = 2,059 tons of TSP emission per year without controlling PM_{10}.

TABLE C-8
TOTAL ASSUMED CONTROLLED PM_{10} EMISSIONS
PER YEAR – ALTERNATIVE 2, OPTION 2

Activity	Emission Factor	Units	Amount Traveled or Moved	Control Efficiency	Total Emissions (lb/yr)
Demolition and Debris Removal – Bulldozing	0.75	lb/ton	32,538 tons	50%	12,202
Demolition and Debris Removal – Truck Loading	6.8E-04	lb/ton	32,538 tons	50%	11.1
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,603 VMT	50%	1,562
Demolition and Debris Removal – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	10,412 VMT	50%	31,236
Site Preparation – Bulldozing	0.75	lb/ton	32,538 tons	50%	12,202
Site Preparation – Scrapers Unloading Topsoil	0.04	lb/ton	32,538 tons	50%	651
Site Preparation – Scrapers Removing Topsoil	20.2	lb/VMT	1,735 VMT	75%*	8,763
Site Preparation – Scrapers in Travel	0.6	lb/VMT	1,735 VMT	50%	521
Site Preparation – Grading	0.6	lb/VMT	3,471 VMT	50%	1,041
Site Preparation – Truck Unloading	6.8E-04	lb/ton	32,538 tons	50%	11.1
Site Preparation – Compacting	0.75	lb/ton	32,538 tons	50%	12,202
Site Preparation – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	2,603 VMT	50%	1,562
Site Preparation – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	9,834 VMT	50%	29,501
General Construction – Vehicle Travel on Unpaved Roads, Light Vehicles	1.2	lb/VMT	7,8009 VMT	50%	4,685
General Construction – Vehicle Travel on Unpaved Roads, Heavy Vehicles	6.0	lb/VMT	0 VMT	50%	0
Wind Erosion on Exposed Surfaces	0.38	ton/acre/ yr	48 acres	50%	18,808
TOTAL EMISSIONS					67.1 tons per year

Note:
* - this emission factor is for TSP, 50 percent reduction for watering and additional 50 percent reduction converting from TSP to PM_{10}

Using the 1.2 tons per acre per month TSP emission factor, recommended by the EPA if measured concentrations are unknown, the total emissions would be as follows:

> 1.2 tons/acre/month x 48 acres x 12 months/yr = 691 tons of TSP emission per year without controlling PM_{10}.

A secondary emission source associated with the proposed action is potential long-term increase in vehicle traffic due to increase in recreational traffic in the area. State and local transportation plans have estimated the total change in traffic across the CAP canal as 142,000 vehicles per day in 2005 up to 254,000 vehicles per day in 2015. It is reasonable to conservatively assume that 2% of this traffic rate would directly utilize the Reach 11 recreational facilities, and at most would travel 5 miles per trip in the area. On this basis, accepted USEPA emission estimation methods result in an insignificant predicted increase in air pollutant emissions, as shown in Table C-9.

TABLE C-9 CHANGE IN VEHICLE EMISSIONS PER YEAR FOR LONG-TERM INCREASE IN RECREATIONAL TRAFFIC				
	Vehicle miles/year	**CO**	**NOx**	**VOC**
Emission Factor[1] (g/vehicle mile)		**0.7144**	**10.355**	**0.9308**
2005 Ton per year vehicle emissions [2]	**14,200**	**0.014**	**0.208**	**0.019**
2015 Ton per year vehicle emissions [3]	**25,400**	**0.026**	**0.372**	**0.033**
Emission rate change (ton per year)– 10 years		**0.012**	**0.164**	**0.014**

1 – U.S. EPA Document AP-42, Vol. II, Appendix H, Table H-5 (1995). Average factor for 1990 to present model, light-duty gasoline powered vehicles.
2 – 2% of total 142,000 vehicle trips in area, at 5 miles per trip
3 – 2% of total 254,000 vehicle trips in area, at 5 miles per trip