



# Memorandum

To: Joel Hamby, City of Imperial                      From: Valorie Thompson  
Aten Road and Dogwood Road  
Re: Signalization Project                              Date: April 3, 2012  
Estimated Emission Reductions

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Urgent       For Review       Please Comment       Please Reply       Please Recycle

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At the request of the City of Imperial, SRA has conducted air emission calculations to assess the potential for emission reductions from the signalization of the intersection of Aten Road and Dogwood Road. The intersection is a four-way stop, and currently experiences delays due to the need for all vehicles to stop. The City is proposing to install an actuated signal, which would allow free-flow traffic on Aten Road.

To calculate the emissions reductions, SRA obtained vehicle speeds predicted by Darnell and Associates<sup>1</sup> for each segment approaching the intersection. Emission factors were obtained from the EMFAC2011 model for travel speeds at 10 mph, 15 mph, and 20 mph, as well as 25 mph and 55 mph. Emission factors for all pollutants were then obtained at the speeds cited in the Darnell and Associates' memorandum for the intersection segments by interpolating between vehicle speeds. Finally, to obtain a composite emission factor for each speed, the emission factor for each category of vehicle was multiplied by the percentage of vehicle miles traveled for each vehicle category. Composite emission factors are presented in Table 1.

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<sup>1</sup> Darnell and Associates. 2012. *Aten Road at Dogwood Road Travel Speeds*. April 2.

**Table 1. Composite Emission Factors, Imperial County, Calculated Based on Vehicle Speeds**

Speed, mph	ROG	TOG	CO	NOx	PM10	PM2.5
12.8	1.75E+00	1.97E+00	2.24E+01	2.81E+00	8.57E-02	7.82E-02
13.3	1.61E+00	1.82E+00	2.07E+01	2.66E+00	7.91E-02	7.23E-02
14.1	1.42E+00	1.61E+00	1.86E+01	2.46E+00	7.05E-02	6.44E-02
14.75	1.29E+00	1.46E+00	1.72E+01	2.32E+00	6.46E-02	5.90E-02
15.9	1.03E+00	1.17E+00	1.40E+01	1.97E+00	5.03E-02	4.59E-02
25	3.19E-01	3.87E-01	5.92E+00	1.03E+00	1.61E-02	1.48E-02
55	1.70E-01	2.05E-01	3.82E+00	1.20E+00	2.81E-02	2.59E-02

Based on these emission factors, emissions were calculated with and without the attenuated signal at the intersection of Aten Road and Dogwood Road. Emissions estimates are provided in Table 2.

**Table 2. Emission Estimates, With and Without Actuated Signal**

Without Signal			Emissions, lbs/day				
Direction	ADT	VMT	ROG	CO	NOx	PM10	PM2.5
Aten EB	9080	908	2.579	34.392	4.652	0.129	0.118
Aten WB	8641	864.1	1.953	26.717	3.752	0.096	0.087
Dogwood NB	6832	683.2	2.420	31.227	4.007	0.119	0.109
Dogwood SB	5985	598.5	2.306	29.528	3.712	0.113	0.103
<b>Totals, lbs/day</b>			<b>9.259</b>	<b>12.864</b>	<b>16.123</b>	<b>0.457</b>	<b>0.418</b>
<b>Totals, ton/year</b>			<b>1.690</b>	<b>22.240</b>	<b>2.943</b>	<b>0.083</b>	<b>0.076</b>
With Signal			Emissions, lbs/day				
Direction	ADT	VMT	ROG	CO	NOx	PM10	PM2.5
Aten EB	9080	908	0.341	7.639	2.396	0.056	0.052
Aten WB	8641	864.1	0.324	7.270	2.280	0.054	0.049
Dogwood NB	6832	683.2	0.481	8.911	1.553	0.024	0.022
Dogwood SB	5985	598.5	0.421	7.806	1.360	0.021	0.020
<b>Totals, lbs/day</b>			<b>1.567</b>	<b>31.626</b>	<b>7.589</b>	<b>0.156</b>	<b>0.143</b>
<b>Totals, ton/year</b>			<b>0.286</b>	<b>5.772</b>	<b>1.385</b>	<b>0.028</b>	<b>0.026</b>
<b>Emission Reduction, tons/year</b>			<b>1.404</b>	<b>16.468</b>	<b>1.558</b>	<b>0.055</b>	<b>0.050</b>

Based on the emission calculations, it is estimated that the signalization of Aten Road and Dogwood Road with an actuated signal would reduce emissions of ozone precursors NOx and VOCs by 1.5581 tons/year and 1.404 tons/year, respectively.

Accordingly, the project would result in a net air quality benefit due to the reduction in idling time and the elimination of the four-way stop at the intersection.