

# Breathe Better (B<sup>2</sup>) Annual Report - 2011-2012

## Data Methodology

The following example illustrates the methodology used for the Breathe Better project outcomes, using data and results from the **38** actively participating schools in 2011-2012. Schools submitted data on the occurrence of idling on their campuses, as follows:

- Schools recorded the number of school buses serving their afternoon routes and ensured that all were participating. Among the participating schools that provided usable data pertaining to buses, the total was **22**.
- For the **2011-2012** school year, 50 schools were identified as participants in the Breathe Better program. However only **38** schools submitted usable data about cars and of those only 22 submitted usable data about buses. “Usable data” is defined as one baseline data set before starting Breathe Better and at least one additional data set before June 2012. **Only schools that submit at least two data sets are included in the calculations.**

The data is summarized below:

	Car Data - Baseline			Car Data – Final 2011		
	<i>Total # cars</i>	<i># Idling</i>	<i>% Idling</i>	<i>Total # cars</i>	<i># Idling</i>	<i>% Idling</i>
<b>TOTAL (n=38)</b>	<b>4,228</b>	<b>1043</b>	<b>24.7</b>	<b>2,585</b>	<b>409</b>	<b>15.8</b>

	Bus Data - Baseline			Bus Data – Final 2011		
	<i>Total # buses</i>	<i># Idling</i>	<i>% Idling</i>	<i>Total # buses</i>	<i># Idling</i>	<i>% Idling</i>
<b>TOTAL (n=30)</b>	<b>272</b>	<b>60</b>	<b>22.1</b>	<b>213</b>	<b>36</b>	<b>16.9</b>

## **Outcome #1: Audience Reached:**

The Breathe Better program reached approximately **38,479** individuals (students, parents, and bus drivers) and more than **50** schools were involved in the anti-idling campaign. The numbers of students identified below are based on S.C. Department of Education first 45-days report.

Schools	School District	Students Enrolled
Millbrook Elementary	Aiken	633
Wren Elementary	Anderson 1	567
Hunt Meadows Elementary	Anderson 1	426
Nevitt Forest Community School	Anderson 5	405
Hanahan Middle School	Berkeley	1,034
Daniel Island Academy (Private)	Charleston	280
Ruby Elementary	Chesterfield	268

Williams Middle School	Florence 1	641
A.J. Whittenburg Elementary School of Engineering	Greenville	390
Christ Church Episcopal School	Greenville	960
Fountain Inn Elementary	Greenville	791
Oakview Elementary School	Greenville	1,241
Sterling School	Greenville	746
Taylor Elementary	Greenville	739
Ocean Bay Middle School	Horry	1,066
Doby's Mill Elementary	Kershaw	560
Jackson School	Kershaw	485
Indian Land Elementary School	Lancaster	1,312
Indian Land Middle	Lancaster	571
Batesburg-Leesville Elem	Lexington 3	464
Springdale Elementary	Lexington 2	572
Nursery Road Elementary	Lexington 5	542
Gilbert High School	Lexington	941
White Knoll High School	Lexington	1,905
Pleasant Hill Elementary	Lexington	334
Prosperity-Rikard Elementary	Newberry	332
Newberry Elementary School	Newberry	412
Newberry High School	Newberry	752
Newberry Middle School	Newberry	690
Mid-Carolina High	Newberry	721
Mid-Carolina Middle	Newberry	589
Dover Elementary	Orangeburg	299
Pickens Middle School	Pickens	834
Bridgecreek Elementary	Richland 2	591
A.C. Moore Elementary	Richland 2	423
Columbia Jewish Day School (Private)	Richland (Private)	48
Pine Street Elementary	Spartanburg	679
Roebuck Elementary Schools	Spartanburg	720
Spartanburg Charter School (Public Charter)	Spartanburg	313
Wellsford Academy of Science & Tech	Spartanburg 5	397
Clover High School	York	1,901
India Hook Elementary	York	564
Ebinport Elementary School	York	538
Finley Road Elementary	York	435
Gold Hill Elementary	York	821
Gold Hill Middle	York	783
Springfield Elementary School	York	563
Springfield Middle School	York	720
<b>TOTAL</b>		<b>33,979</b>

### **Outcome #2: Behavior Change Observed:**

Although, more than **50** entities (schools, school districts and counties) were exposed to information about the Breathe Better program only **38** schools were considered active and reported usable data. All of these schools reported (at least anecdotally) a decrease in idling over time. The average baseline (Fall 2011) for schools prior to Breathe Better was about **25%** of all cars idling. As of 2012, the schools that reported car data were averaging about **16%** of all cars idling. Although this data is self-reported and contains some inconsistencies, some of which are related to the warm weather during the fall and spring data collections, despite this factor, the overall trend has been towards positive behavioral change.

### **Outcome #3: Emissions Reductions Estimated:**

Emissions reductions are estimated for the following pollutants: carbon dioxide (CO<sub>2</sub>), volatile organic compounds (VOCs), carbon monoxide (CO), oxides of nitrogen (NO<sub>x</sub>) and particulate matter (PM). Proportionate quantities of priority and toxic chemicals are also reduced.

Due to the varying circumstances at these schools and several confounding factors (ex. effect of weather on drivers' behavior), the following assumptions are necessary to estimate quantitative emissions reductions:

- All participating drivers avoided idling on all 180 days of the 2010-2011 school year (participation started at different times of the year and may have varied at times)
- Each driver reduced daily idling time by 15 minutes on average (based on anecdotal observations from participating schools)
- Both schools buses and personal vehicles consume fuel at 0.5 gallons/hour (g/hr) while idling, based on these sources:
  - EPA idling reduction calculator <http://www.epa.gov/cleanschoolbus/antiidling.htm>
  - Natural Resource Canada, Office of Energy Efficiency converted to English units is about 0.5 gallon/hour. Estimates on the fuel consumption of personal vehicles while idling are inconsistent, varying by vehicle size and from one source to another, ranging from 0.1 gallon/hour to 1.0 gallon/hour. No U.S. federal agency has an estimate online; estimates on state agency websites vary greatly and lack citations or calculation methods. The Natural Resources Canada, [Office of Energy Efficiency](#) cites how their figure was calculated and is therefore the best compromise.

Assuming that all **4500** vehicles (personal vehicles and school buses) reduced their daily idling time by 15 minutes/day for all 180 days of the 2011-2012 school year, each vehicle:

- avoided 45 hours of idling; and therefore
- saved 22.5 gallons of fuel.

Therefore, the school buses collectively **saved 6120 gallons of diesel**, and the personal vehicles collectively saved **95,193 gallons of gasoline**.

- 2,000 pounds = **1 ton**
- **Diesel fuel emits 22.2 lbs CO<sub>2</sub>/gallon** consumed, and gasoline emits **19.4 lbs CO<sub>2</sub>/gallon** consumed (<http://www.epa.gov/OMS/climate/420f05001.htm>).
  - **School buses: 68 tons CO<sub>2</sub> reduced**
  - **Personal vehicles: 923 tons CO<sub>2</sub> reduced**

The school buses collectively reduced idling time by **12,240 hours**, and the personal vehicles collectively reduced idling time by **190,260 hours**.

- **453.6 grams = 1 pound**
- Under “summer conditions” (i.e. 75°F), idling school buses (heavy-duty diesel vehicles) emit: **12.5 g/hr VOCs, 55 g/hr NO<sub>x</sub>, 94 g/hr CO, and 2.52 g/hr PM**  
(<http://www.epa.gov/OMS/consumer/f98014.pdf>)
  - **337** pounds VOCs reduced
  - **1484** pounds NO<sub>x</sub> reduced
  - **2537** pounds CO reduced
  - **68** pounds PM reduced
- Under “summer conditions” (i.e. 75°F), idling personal vehicles\* (cars and light trucks) emit: **20.1 g/hr VOCs, 5.2 g/hr NO<sub>x</sub>, and 284 g/hr CO**  
(<http://www.epa.gov/OMS/consumer/f98014.pdf>)

\*NOTE: since most schools did not count cars and light trucks separately, these values are the AVERAGE emissions of the two vehicle classes.

- **8431** pounds VOCs reduced
- **2181** pounds NO<sub>x</sub> reduced
- **119,122** pounds CO reduced

Collectively, all vehicles that actively participated in Breathe Better by reducing idling time during the 2011-2012 school year achieved the following estimated emissions reductions:

- **991** tons CO<sub>2</sub>
- **8768** pounds VOCs\*\*
- **3665** pounds NO<sub>x</sub>\*\*
- **121659** pounds CO
- **68** pounds PM\*\*\*
- proportionate quantities of priority and toxic chemicals (not calculated to date)

\*\*Ground-level ozone precursors    \*\*\*Bus emissions only

