



**Maricopa County**  
Air Quality Department

**SUBJECT:** Voluntary Vehicle Repair & Retrofit Program  
Fiscal Year 2009 Annual Report – Revised November 15, 2009

**DATES:** July 1, 2008 – June 30, 2009

**ADEQ Contract EV06-0008 - Amendment 3, 4**

**Executive Summary**

The FY2009 Annual (July 2008 - June 2009) Report for the Maricopa County Voluntary Vehicle Repair and Retrofit (VVR&R) Program will summarize the current and historical success of the program. The VVR&R program has continued to achieve its goal of reducing vehicle emissions in a cost-effective manner. The program offered the citizens of Maricopa County the opportunity to voluntarily repair and, when possible, retrofit their high-emitting older vehicles with newer technology.

	<b>FY2009 1st Qtr</b>	<b>FY2009 2nd Qtr</b>	<b>FY2009 3rd Qtr</b>	<b>FY2009 4th Qtr</b>	<b>FY2009 Total</b>	<b>FY2008 Total</b>
<b>Average Spent by Customers &amp; Maricopa County / Vehicle Repaired</b>	\$727	\$740	\$729	\$710	\$726	\$757
<b>Average Spent by Maricopa County / Vehicle Repaired</b>	\$492	\$514	\$491	\$487	\$495	\$504
<b>Number of LD/ID Vehicles Repaired</b>	14	12	8	16	50	65
<b>Number of IM147 Vehicles Repaired</b>	312	186	244	228	970	971
<b>Number of OBD-II Vehicles Repaired</b>	23	10	41	41	124	46
<b>Number of Diesel Vehicles Repaired (8,500+ lbs.)</b>	0	0	0	0	0	1
<b>Number of Vehicles Repaired – All Test Types</b>	349	208	302	285	1,144	1,083
<b>Number of Retrofit Kits Installed</b>	0	3	1	2	6	8
<b>Amount Spent by Customers &amp; Maricopa County for All Vehicles Repaired</b>	\$253,644	\$153,882	\$220,190	\$202,266	\$829,981	\$820,052
<b>Amount Spent by Maricopa County for All Vehicles Repaired</b>	\$171,682	\$106,914	\$148,392	\$138,823	\$565,812	\$545,754
<b>Administrative Costs</b>	\$29,339	\$30,820	\$30,028	\$29,684	\$119,871	\$126,426

### Emissions Reductions - Basic Idle & Loaded Testing

Emissions reduction calculations vary depending on the type of test used. Older vehicles (1967 – 1981) and some newer trucks use the Basic Idle and Loaded methods for emissions testing. Because of how the hydrocarbons and carbon monoxide are measured, there is no formula available to determine cost effectiveness with these vehicles. The following grid will illustrate the average percent reduction for each pollutant:

	Idle Test		Loaded Test	
	HC	CO	HC	CO
<b>1st Qtr FY09</b>	66%	82%	57%	54%
<b>2nd Qtr FY09</b>	75%	92%	73%	88%
<b>3rd Qtr FY09</b>	57%	82%	73%	69%
<b>4th Qtr FY09</b>	67%	68%	57%	67%
<b>FY2009 Total</b>	67%	82%	64%	72%
<b>FY2008 Total</b>	63%	64%	63%	95%

The following table shows the average and total amounts spent by 1) Customers and Maricopa County and 2) Maricopa County on LD/ID tested vehicles:

	Average Spent by Customers & Maricopa County per Vehicle Repaired	Average Spent by Maricopa County per Vehicle Repaired	Total Spent by Customers & Maricopa County per Vehicle Repaired	Total Spent by Maricopa County per Vehicle Repaired
<b>1st Qtr FY09</b>	\$665	\$459	\$9,303	\$6,426
<b>2nd Qtr FY09</b>	\$739	\$490	\$8,871	\$5,881
<b>3rd Qtr FY09</b>	\$571	\$398	\$4,570	\$3,187
<b>4th Qtr FY09</b>	\$664	\$492	\$10,629	\$7,877
<b>FY2009 Total</b>	\$667	\$467	\$33,373	\$23,370
<b>FY2008 Total</b>	\$468	\$468	\$46,712	\$30,436

### Emissions Reductions - Inspection and Maintenance (IM147) Testing

More modern vehicles (1981-1995) calculate emissions using the Inspection and Maintenance testing method. Because Inspection and Maintenance Testing measures each pollutant in grams per mile, a cost effectiveness formula can be applied, accounting for tons reduced and the average miles driven:

	HC	CO	NOx
<b>1st Qtr FY09</b>	71%	80%	57%
<b>2nd Qtr FY09</b>	72%	81%	55%
<b>3rd Qtr FY09</b>	73%	80%	61%
<b>4th Qtr FY09</b>	68%	80%	61%
<b>FY2009 Total</b>	71%	80%	59%
<b>FY2008 Total</b>	74%	82%	53%

Costs in the grid below, are annualized over two years and assume that the Voluntary Vehicle Repair and Retrofit Program’s emission savings benefits will be realized over at least that length of time. By comparison, emission reduction efforts of similar pollutants at stationary sources within Maricopa County can cost far more. Using current cost effectiveness values for Reasonably Available Control

Technology (RACT), emission reduction costs range from \$5,000 to \$8,000 per ton for like-type pollutants. This demonstrates that the VVR&R Program is an especially cost effective way of reducing emissions from the largest source of emissions in Maricopa County.

	FY2009 1 <sup>st</sup> Qtr	FY2009 2 <sup>nd</sup> Qtr	FY2009 3 <sup>rd</sup> Qtr	FY2009 4 <sup>th</sup> Qtr	FY2009 Total	FY2008 Total
<b>Metric Tons Reduced</b>	48.45	27.74	35.32	35.25	146.77	179.84
<b>Standard Tons Reduced</b>	53.41	30.58	38.93	38.86	161.78	198.24
<b>Maricopa County Cost per Metric Ton</b>	\$1,591.82	\$1,732.24	\$1,709.74	\$1,607.80	\$1,650.58	\$1,369.73
<b>Maricopa County Cost per Standard Ton</b>	\$1,444.20	\$1,571.57	\$1,551.35	\$1,458.40	\$1,497.44	\$1,242.59
<b>Customer &amp; Maricopa County Cost per Metric Ton</b>	\$2,332.17	\$2,476.59	\$2,473.75	\$2,350.14	\$2,397.86	\$1,863.86
<b>Customer &amp; Maricopa County Cost per Standard Ton</b>	\$2,115.74	\$2,246.87	\$2,244.58	\$2,131.76	\$2,175.38	\$1,863.86

The following table shows the cost effectiveness of repairs made to IM147 tested vehicles:

	FY2009 1 <sup>st</sup> Qtr	FY2009 2 <sup>nd</sup> Qtr	FY2009 3 <sup>rd</sup> Qtr	FY2009 4 <sup>th</sup> Qtr	FY2009 Total	FY2008 Total
<b>Average Spent by Customers &amp; Maricopa County per Vehicle Repaired</b>	\$724	\$739	\$716	\$727	\$726	\$761
<b>Average Amount Spent by Maricopa County Per Vehicle Repaired</b>	\$494	\$517	\$495	\$497	\$500	\$507
<b>Total Spent by Customers &amp; Maricopa County for Vehicles Repaired</b>	\$226,004	\$137,419	\$174,763	\$165,680	\$703,865	\$738,983
<b>Total Spent by Maricopa County for Vehicles Repaired</b>	\$154,259	\$96,117	\$120,788	\$113,347	\$484,510	\$492,663

### **Emissions Reductions - On-Board Diagnostic, Generation II (OBD-II) Testing**

All newer vehicles (1996 and later models) receive Inspection and Maintenance testing using an On-Board Diagnostic, Generation II method. This method along with traditional tailpipe testing offer different approaches in identifying vehicles in need of emission related repairs. On-Board Diagnostic, Generation II (OBD-II) testing does not measure pollutants such as hydrocarbons, carbon monoxide and oxides of nitrogen. Instead, a failing emissions test will be comprised of varying Diagnostic Trouble Codes. With OBD-II testing, data is efficiently collected by connecting a generic scan tool to a Data Link Connector located under the instrument panel.

OBD-II systems use an Engine Control Module to continuously monitor the emissions control system in addition to other major engine components for proper operation. This technology makes it possible to diagnose failing or malfunctioning emission control devices for repair or replacement before high emissions occur. Effectively, an Inspection and Maintenance testing station is programmed into each OBD-II vehicle. All related OBD-II technology standards including the data, the scan tool, the diagnostic test modes and the Diagnostic Trouble Codes are established by the Society of Automobile Engineers.

The following table shows the cost effectiveness of repairs made to OBD-II tested vehicles:

	FY2009 1 <sup>st</sup> Qtr	FY2009 2 <sup>nd</sup> Qtr	FY2009 3 <sup>rd</sup> Qtr	FY2009 4 <sup>th</sup> Qtr	FY2009 Total	FY2008 Total
Average Spent by Customers & Maricopa County Per Vehicle Repaired	\$797	\$759	\$817	\$633	\$748	\$749
Average Spent by Maricopa County Per Vehicle Repaired	\$478	\$492	\$488	\$429	\$467	\$496
Total Spent by Customers & Maricopa County for Vehicles Repaired	\$18,337	\$7,592	\$40,857	\$25,957	\$92,743	\$34,357
Total Spent by Maricopa County for Vehicles Repaired	\$10,998	\$4,917	\$24,417	\$17,600	\$57,931	\$26,656

### Emissions Reductions - Diesel Program

In 2001, Maricopa County established a diesel repair program as mandated ARS §49-474.03. Qualifying diesel powered motor vehicles registered in Area A or B with a gross vehicle weight of more than 8,500 pounds that fail any random roadside vehicle test conducted by the state or that fail a required emissions test are eligible for up to \$1,000 in repair or retrofit costs from the program. Qualified vehicle owners will be responsible for one-half of the costs of the qualified repair and the other half of the costs may be funded by the program up to \$1,000.

The following table shows the cost effectiveness of repairs made to Diesel vehicles:

	FY2009 1 <sup>st</sup> Qtr	FY2009 2 <sup>nd</sup> Qtr	FY2009 3 <sup>rd</sup> Qtr	FY2009 4 <sup>th</sup> Qtr	FY2009 Total	FY2008 Total
Average Spent by Customers & Maricopa County per Vehicle Repaired	\$0	\$0	\$0	\$0	\$0	\$458
Average Spent by Maricopa County per Vehicle Repaired	\$0	\$0	\$0	\$0	\$0	\$229
Total Spent by Customers & Maricopa County for Vehicles Repaired	\$0	\$0	\$0	\$0	\$0	\$229
Total Spent by Maricopa County per Vehicle Repaired	\$0	\$0	\$0	\$0	\$0	\$229

### Customer Satisfaction

Customers are provided a self-addressed stamped survey postcard after their vehicle is repaired. Using the following scale, customers are asked to rank how well the program requirements were explained to them, as well as, to rank their satisfaction with the repair process and the service received by their participating garage.

1. Extremely Disagree
2. Disagree
3. No Opinion/Okay
4. Agree
5. Extremely Agree

Of the 1,144 vehicles repaired during FY2009, 401 customers returned their surveys resulting in a 35% response rate. The following chart reflects the collective, average response rates from all surveys received during this period:

Question on Comment Card	FY2009 Average Scores
When I called, the program was thoroughly explained.	4.73
My experience with the repair facility was satisfactory.	4.80
I am satisfied with the repairs made to my vehicle.	4.78

### Repeat Customers

In 2004, the Voluntary Vehicle Repair and Retrofit Program Advisory Committee determined that since the intent of the program is to reduce tailpipe emissions on as many vehicles as possible, eligibility was extended to include the same owner, entering the same vehicle, through the program more than once. Below, the number of Repeat Customers is broken down by quarter for FY2009.

	FY2009 1 <sup>st</sup> Qtr	FY2009 2 <sup>nd</sup> Qtr	FY2009 3 <sup>rd</sup> Qtr	FY2009 4 <sup>th</sup> Qtr	FY2009 Total
Number of Repeat Customers	28	18	29	24	99

### Vehicle Repair Summary

The number of vehicles repaired, the number of retrofit kits installed and the number of diesel vehicles repaired are detailed in the grid below for FY2009 (July 1, 2008 – June 30, 2009) and for the current, cumulative VVR&R Program (July 2000 – June 2009).

Model Year	Number of Vehicles Repaired		Number of Retrofit Kits Installed		Number of Diesel Vehicles Repaired (gvw 8,500+ lbs)	
	FY2009	Cumulative Program	FY2009	Cumulative Program	FY2009	Cumulative Program
1967	1	28	0	0	0	0
1968	3	28	0	0	0	0
1969	1	35	0	0	0	0
1970	2	22	0	0	0	0
1971	1	28	0	0	0	0
1972	4	51	0	0	0	0
1973	2	41	0	0	0	0
1974	1	35	0	0	0	0
1975	1	33	0	18	0	0
1976	7	63	2	25	0	0
1977	2	60	0	28	0	0
1978	1	86	1	50	0	1
1979	6	105	1	68	0	0
1980	5	73	2	41	0	0
1981	2	153	0	2	0	0
1982	8	179	0	0	0	0
1983	8	256	0	1	0	0
1984	20	367	0	2	0	0
1985	34	558	0	0	0	0
1986	37	805	0	0	0	1
1987	50	832	0	1	0	0
1988	54	784	0	1	0	0
1989	48	763	0	2	0	0
1990	85	764	0	0	0	1
1991	92	625	0	0	0	0
1992	88	536	0	0	0	0
1993	122	547	0	0	0	0
1994	142	471	0	0	0	0
1995	192	373	0	0	0	0
1996	83	129	0	0	0	0
1997	42	42	0	0	0	0
<b>Total</b>	<b>1,144</b>	<b>8,872</b>	<b>6</b>	<b>239</b>	<b>0</b>	<b>3</b>

### Program Summary

	<b>Pilot Program</b>	<b>Current Program</b>
<b>Dates of Service</b>	1/1999 – 6/2000	7/2000 – 6/2009
<b>Number of Vehicles Repaired</b>	1,662	8,872
<b>Number of Retrofit Kits Installed</b>	37	239
<b>Total Percent Reduction in HC – Idle</b>	78% (1/99 – 10/00)	73%
<b>Total Percent Reduction in HC – Loaded</b>	65% (1/99 – 10/00)	66%
<b>Total Percent Reduction in CO – Idle</b>	77% (1/99 – 10/00)	72%
<b>Total Percent Reduction in CO – Loaded</b>	77% (1/99 – 10/00)	82%
<b>Total Percent Reduction in HC – IM147</b>	83% (1/99 – 10/00)	73%
<b>Total Percent Reduction in CO – IM147</b>	87% (1/99 – 10/00)	82%
<b>Total Percent Reduction in NOx – IM147</b>	76% (1/99 – 10/00)	53%
<b>Metric Tons Reduced – IM147</b>	425	1,403
<b>Standard Tons Reduced – IM147</b>	469	1,546
<b>Average Amount Spent by Maricopa County per Vehicle Repaired</b>	\$383	\$502
<b>Total Amount Spent by Maricopa County for All Vehicles Repaired</b>	\$636,743.37	\$4,449,283.47

### Funding History

<b>Year</b>	<b>Amount</b>	<b>Source</b>
<b>Pilot</b>	\$640,000	SB1427
<b>FY01</b>	\$1,920,000	SB1504
<b>FY01</b>	\$92,800	ADEQ's Catalytic Converter Replacement Program
<b>FY02</b>	\$320,000	HB2538
<b>FY03</b>	-0-	HB2538 Allocation removed during Special Legislative Session
<b>FY04</b>	\$399,534	ADEQ Contract 99-0089, Amendment No. 7
<b>FY05</b>	\$725,000	ADEQ Contract EV05-0013
<b>FY06</b>	\$725,000	ADEQ Contract EV06-0008
<b>FY07</b>	\$725,000	ADEQ Contract EV06-0008, Amendment No. 1
<b>FY08</b>	\$725,000	ADEQ Contract EV06-0008, Amendment No. 2
<b>FY09</b>	\$725,000	ADEQ Contract EV06-0008, Amendment No. 3
<b>FY09</b>	\$688,700	ADEQ Contract EV06-0008, Amendment No. 4 (Funding reduced by \$36,300)

### **Program Parameters**

In order to qualify for the Voluntary Vehicle Repair and Retrofit Program, vehicles must meet the following criteria established by ARS §49-474.03 and the VVR&R Program's Advisory Committee:

- ⇒ The owner must be willing to participate and the vehicle must be functionally operational
- ⇒ The vehicle must be titled in Arizona
- ⇒ The vehicle must have been registered during the immediately preceding 12 months. It cannot have been unregistered for more than 60 days
- ⇒ The vehicle must have failed a required emissions test in the "Emissions Inspection Results" within the past 60 days; failures in the "Equipment" or "Pressure & Purge Inspection Results" are not eligible
- ⇒ The emissions control system has not been tampered with, removed, or disabled
- ⇒ Work must be done at a participating garage
- ⇒ One vehicle per owner
- ⇒ Motor homes, motorcycles, salvage/restored vehicles and fleet vehicles are not eligible
- ⇒ If the vehicle is eligible for a retrofit kit (most 1975-1981 vehicles and some newer model year trucks), one must be installed
- ⇒ There are no reimbursements available for work already done
- ⇒ Some vehicles may not be eligible for assistance if they are in extremely poor condition

### **Process**

The primary method of communication regarding this program is located on various pamphlets people receive as they proceed through the registration and emissions testing process. Information on the program is included on the pamphlet entitled "Important Emissions Testing Information" which is sent to all owners due to re-register their vehicles.

If they fail the emissions test, customers receive a pamphlet from the emissions station entitled "Car Care – Failed Vehicle Information." In addition, banners have been installed at each of Maricopa County's fifteen testing stations. Customers may call the Voluntary Vehicle Repair and Retrofit Program Helpline or go directly to the Maricopa County Air Quality Department website to locate an authorized repair facility.

When customers take their vehicle to the repair facility, they bring their title, current proof of registration, and the emissions failure notice. Customers sign an agreement sheet and a vehicle diagnostic is performed. The customers are informed about necessary repairs and associated costs. If customers continue in the program, they pay the first \$150 to the repair facility. The Maricopa County Air Quality Department pays, up to, an additional \$550 for repairs to address the specific emission failure or, up to, an additional \$650 for repair and retrofit kit installation. If the cost to bring the vehicle to emission standards exceeds these amounts, owners may opt to pay the additional expense or withdraw their vehicle from the program. If they choose to withdraw from the program, they are charged a \$50 diagnostic fee.

Repairs generally take a day, after which the mechanic takes the vehicle to an emission station to obtain a pass notice. The facility forwards all paperwork (customer agreement, invoices with balances noted, and copies of title, registration, failure and pass notices) to Kachina Automotive. Kachina Automotive then submits copies of this information, along with a final invoice, to Maricopa



County. Maricopa County pays Kachina Automotive who then distributes payment to each repair facility.

### **Checks & Balances**

A system of checks and balances has been established, with the help of the State of Arizona Waiver Facilities, to ensure repairs are properly completed as indicated on the invoices and money is spent appropriately. Each customer is given a self-addressed stamped postcard with survey questions on the process and the service. This allows the program to gather immediate feedback. If customers call with complaints, they may be referred to a waiver station. There, technicians compare the invoiced repairs with what was actually done to the vehicles and test the vehicles to be sure they are passing the emissions test. Most vehicles receive positive reports from the waiver stations, but those that do not are referred back to the garages for further evaluation and repair. From the program inception to date, all vehicles have been repaired to everyone's satisfaction.

### **Retrofit Kits**

The retrofit kits utilized in this program are supplied by Neutronics Enterprises, Inc. The kit converts vehicles originally built with open loop carburetor or fuel injection systems and oxidation catalysts into closed-loop (feedback) systems with three-way catalysts. The exclusive Neutronics representative in Maricopa County is Kachina Automotive Equipment, Inc. Kachina, as an authorized vendor for Maricopa County and is responsible for maintaining an inventory of the retrofit kits. In addition, Maricopa County subcontracts with Kachina to oversee all aspects of selecting and training of the repair facilities.

The VVR&R Program currently has seven authorized repair facilities in the Valley. Currently, facilities are located in Avondale, Mesa, Higley, Tempe, North Phoenix, North-East Phoenix, and Central-West Phoenix.

### **Advisory Committee**

The Advisory Committee, established under ARS §49-588.34, meets as needed to advise and make recommendations on the development and implementation of the Voluntary Vehicle Repair and Retrofit Program. Members include representatives from the Arizona Department of Transportation, the Arizona Department of Environmental Quality, automobile hobbyists, and the automotive aftermarket products industry.

### **Program Status and Recommendations**

The FY2009 VVR&R Program experienced greater customer demand for emissions repair assistance than funding would allow. Due to prevailing economic conditions, grant funding from the Arizona Department of Environmental Quality was reduced in FY2009 from previous fiscal years. As a result, it was necessary for the program to suspend repair services in June 2009. A Wait List option for qualifying customer vehicles was implemented and is being maintained. FY2010 funding for the program has yet to be secured. Maricopa County has included a request for VVR&R Program funding in its American Recovery and Reinvestment Act (ARRA) stimulus application to the Department of Energy for Energy Efficiency and Conservation Block Grant (EECBG) funding.

The number of retrofit kits installed by the program has been on the decline, year after year. It is expected that this trend would continue as the regional vehicle fleet becomes newer and the number of vehicles that can accept a retrofit kit diminishes.

In addition to the reduced demand for the retrofit kit technology, the program learned that effective January 1, 2009 the Neutronics Retrofit Kit used by the program would no longer be certified by the California Air Resource Board (CARB). The CARB has not accredited any other retrofit kit.

In conjunction with the CARB decertification of the Neutronics Retrofit Kit, California has changed its requirements for aftermarket catalytic converters used on pre-OBD-II vehicles. The new design requirements will result in good emission reduction benefits (see CARB report, air quality benefits from this link: <http://www.arb.ca.gov/msprog/aftermktcat/aftermktcat.htm>) with efficiencies comparable to OBD-II compatible converters and performance much closer to the original equipment (OE) converter functionality levels. Because pre-OBD-II converters do not have to be designed to be compatible with OBD-II catalyst monitors, the pre-OBD-II aftermarket converters will offer greater vehicle model coverage. Under these new design standards, warranty requirements for new aftermarket converters will be 5 years/50,000 miles and cover the cost of parts and labor if a replacement is needed.

As a result of these developments and as a way to advance the VVR&R Program, the Advisory Committee has expressed interest in exploring the new rules adopted by California to determine if they can recommend program and statute revisions that would phase-out the use of the retrofit kit and implement the new higher standard pre-OBD-II catalytic converters now being manufactured for the California aftermarket.