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Contract #06221 Task 9
Final Report

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South Coast Air Quality Management District

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The Foundation of California Community Colleges for providing access to registrations and Smog Check test results.

I. Summary

The South Coast Air Quality Management District (SCAQMD) contracted Environmental Systems Products (ESP) to conduct a Remote Sensing program to identify high emitting light- and medium-duty vehicles operating within and throughout the four counties of the SCAQMD. High emitters were recruited into the AQMD HEROS (High Emitter Repair or Scrap) program. The on-road vehicle emissions measurement phase was conducted from February 2007 through April 2008. During this period ESP successfully measured and recorded three million sets of vehicle emissions, including speed and acceleration data as vehicles passed remote sensing units. Of these, 1.75 million measurements were from vehicles with California license plates and operating within acceptable program parameters to effectively measure and record vehicle exhaust emissions.

ESP used three remote sensing vans equipped with RSD4500 systems to measure emissions of vehicles operating in Los Angeles, Orange, Riverside and San Bernardino Counties. Vans were deployed with both single and dual RSD4500 systems. In the dual configuration, both RSD4500 systems typically recorded a measurement on the same vehicle. More than 949,000 unique vehicles were successfully measured with California plates, close to the program goal of one million valid unique California vehicles. Vehicles matched to California registrations totaled 754,000, and vehicles determined as registered within the jurisdictional boundaries of the SCAQMD totaled 682,830. From the vehicles registered within the SCAQMD, 25,218 were selected as high emitters potentially eligible for recruitment into the associated HEROS voluntary repair and retirement program. Recruiting, verification testing, repairs, and retirement operations were performed by the Foundation for California Community Colleges (FCCC).

This report describes the on-road operations, the identification of on-road high emitters and characterizes on-road fleet emissions in the District. A companion report calculates emissions reduction benefits of recruited vehicles and projects RSD program benefits.

Section II of the report describes on-road operations. After a slow start due to site permitting difficulties and delays, ESP was able to conduct the on-road measurement activity with far greater cost-effectiveness than was projected by ERG in the 2005 ERG/ARB/BAR study[i]. In the earlier study, the CalTrans permits obtained only allowed site operations during the off-peak traffic hours of 9:00 am to 3:00 pm. Since the set-up, vehicle measurement activity and end of day pack-up of the equipment all had to occur within these hours, the productive measurement time was severely limited. In this SCAQMD program, SCAQMD and ESP were able to obtain CalTrans permits to operate during both peak and off-peak hours. In addition, ESP operated vans using a single person, as is the norm, instead of two persons used by the contractor in the earlier study. Finally, whereas the earlier study speculated that metered on-ramps would be unsuitable monitoring sites, ESP determined that in practice they performed well. Thus ESP was able to measure vehicles and identify high emitters for a lower cost than projected by ERG. The RSD cost to measure unique California vehicles was $1.33 each. The RSD cost to identify high emitters was under $50 per high emitter. This compares favorably to

the California Smog Check program where six vehicles are typically inspected for $50 each to find one high emitter.

Section III of the report describes high emitter identification and the results of follow-up testing. Close to 700 of the 25,000 high emitting vehicles identified on-road were recruited as volunteers for follow-up inspection at FCCC operated Smog Check Referee stations. Eighty percent (80%) of these high emitters failed the first Smog Check inspection conducted at the Referee stations. Thirty-five percent (35%) exceeded the Smog Check program gross emitter limits, 37% failed tailpipe or OBD inspection and 8% were tampered vehicles.

A sample of 278 vehicles was inspected using both the acceleration simulation mode (ASM) procedure and the two-speed idle (TSI) inspection procedure. Of these, 92% failed one or both of the two inspections. Forty-seven percent (47%) exceeded the Smog Check program gross emitter limits, 35% failed tailpipe or OBD inspection and 9% were tampered (see Table III-6 First Test Results at Referee Stations). Vehicles inspected using only the ASM procedure failed at a 72% rate. Vehicles inspected using only the TSI procedure failed at an 80% rate.

A number of vehicles identified as on-road high emitters that did not respond to HEROS program recruitment efforts subsequently obtained a test at a licensed Smog Check station. As much as 43% of these vehicles identified as a high emitter by ESP underwent Change of Ownership tests. The large percentage of identified high emitting vehicles changing owners indicates some owners, which presumably received the recruitment letter, elected to trade-in their vehicle rather than participate in the program. As a result any incremental emission reduction benefit resulting from testing and repair or scrapping was not attributed to the program. In addition, a number of vehicles may have been scrapped or sold out of the State following receipt of the recruitment letter. Again the extent to which the program contributed to such emission reductions was not determined or credited. A follow-up search of active registrations would be useful in determining the percentage of the identified high emitters that ceased operating in the AQMD. ESP did not have access to registration information to perform this analysis.

Section IV of the report characterizes the emissions of the light- and medium-duty vehicle on-road fleet. Older vehicles have emissions that are many times those of new models. Vehicle models 1995 and older accounted for 18% of the vehicles measured on-road but 69%, 64%, 56% and 51% of HC, CO, NO and particulate emissions respectively. These results do not include heavy-duty vehicles with high stack exhausts.

The South Coast AQMD on-road measurements were compared to the results of 2007 RSD studies in other areas. The AQMD fleet was found to be older than fleets in Michigan and Virginia. As a consequence there were a greater percentage of on-road high emitters in the AQMD.

Average NOx and PM emissions of modern light- and medium-duty diesel trucks as new as 2006 models were many times those of gasoline vehicles.

Recommendations

To assess overall program benefits, a follow-up analysis should be performed in 2009 to determine the extent to which high emitting vehicles, whose owners were contacted, have ceased operating in the district.

A mandatory high emitter program, in addition to Smog Check, could cost effectively identify the small percentage of dirty vehicles that are big contributors to emissions and encourage owners to obtain repairs or scrap the vehicle. The presence of on-road monitors may also encourage vehicle owners of OBD-II equipped vehicles to respond promptly to Malfunction Indicator Lights (MIL). To reduce the cost to recipients of a high-emitter notice, to improve public acceptance, and to facilitate data collection, high emitter notices could include a coupon for a free follow-up inspection. Licensed inspection stations would redeem coupons by filing inspection and diagnosis reports with the managing agency.

Vehicles responding to high emitter notices should be inspected thoroughly using OBD, if applicable, ASM and the two-speed idle procedures. In addition, these vehicles should be carefully checked for evidence of evaporative emissions using visual inspection, the tank pressure test and a hand-held HC detector.

Under the 2008 Carl Moyer Guidelines, to be eligible for high emitting vehicle repair (VRV) or retirement (VAVR) projects, a vehicle's Smog Check test must exceed the pass/fail emission standard for the vehicle's model year and class. Vehicles with emissions below the pass/fail standards may still be retired through other conventional retirement projects. Vehicles over a certain age have such high emissions on average that their accelerated retirement is cost effective whether or not they fail the Smog Check test on a specific date. To ease high emitter program administration, it is recommended that all old model vehicles be eligible for accelerated retirement Carl Moyer funding when such action is projected to meet the Carl Moyer cost-effectiveness criteria, independent of Smog Check test results.

II. On-road Operations

A. On-road collection operations

1. Summary of on-road collection operations

The on-road vehicle emissions measurement phase was conducted from February 2007 through April 2008. ESP used three remote sensing vans equipped with RSD4500 systems to measure emissions of vehicles operating in Los Angeles, Orange, Riverside and San Bernardino Counties. As indicated in Table II-1, ESP successfully measured the emissions, speed and acceleration of three million vehicle passing remote sensing units. In 10% of cases the RSD system was not considered fully ready, e.g. it might not have completed calibration, 20% of vehicles were not in the desired operating mode (VSP) and about 10% of plates were not able to be read. A net 1.75 million vehicles emissions were measured within the desired operating mode and California license plates were recorded.

More than one measurement was obtained on many vehicles. The number of unique California plates measured was 949,532. Of these, 754,000 were matched to registrations of which 682,000 were registered in the AQMD. From February through November 2007, 95% of plates presented to DMV were matched to registrations. From December 2007 through April 2008, the percentage of matched vehicles was sharply lower. A 95% match rate is fairly typical for remote sensing programs. The 5% unmatched include errors in decoding hard-to-read plates and, possibly, expired or fraudulent plates. Except for the problem that developed in the matching process, described later in section II.B.3, another estimated 150,000 vehicles or more could have been matched.

Table II-1 On-road Activity and Measurements

Collection Sessions		1,007	
Collection hours		8,521	
Total Emissions Records		4,486,396	
	Invalid gas	1,244,599	
	Invalid speed/accel	260,510	
Total Gas & S/A Valid Records		2,981,287	66%
	Emissions out of range	4,894	
	RSD not ready	309,856	
	Outside VSP range	614,848	
	Unread plates(M/C, trailer, HD, not visible, temporary)	281,275	
	Out-of-state	18,468	
Valid CA Records		1,751,946	39%

Table II-2 Unique Vehicle Summary

Unique Valid with CA Plates	949,532	
Unique CA with DMV Match	754,149	79%
Unique CA DMV Matched within SCAQMD ZIP	682,830	72%
Unique HEI	25,218	3.7%

Non-Repeat Valid Readings

When vans were equipped with two sets of RSD equipment, they typically acquired two measurements for a single vehicle passing the units. In order to count unique vehicle observations the concept of a Non-Repeat Valid Reading (NRVR) was used.

A repeat valid reading is when two or more valid readings are recorded for a specific vehicle at a specific location and within 30-seconds of one another. Therefore, a NRVR was defined as a single Valid Reading of a specific vehicle at a specific location in a 30-second period and all other readings of the vehicle in the 30-second period are considered repeat readings.

In total the project recorded 2,038,060 NRVRs.

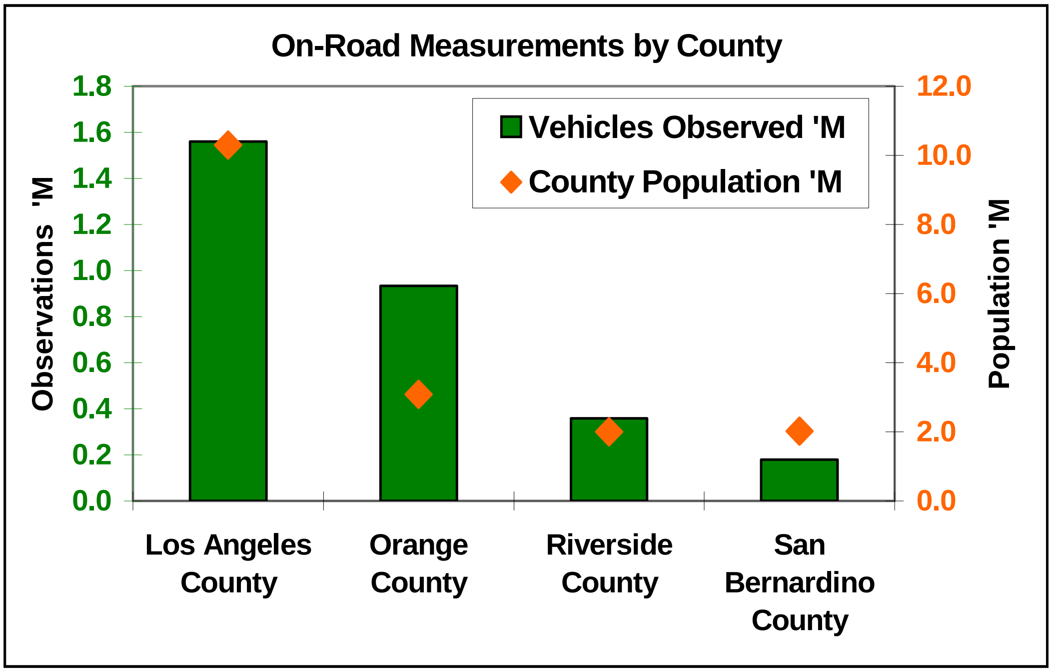
2. AQMD Coverage

Table II-3 lists the number of on-road sessions, approximate active observation hours, vehicles observed passing the RSD units and the four AQMD county populations. Figure II-1 On-Road Observations by County graphically compares the observations and county populations. Compared to population, there was a greater level of vehicles observed in Orange County and fewer in San Bernardino County.

Table II-3 On-road Measurements by County

County	RSD Van Sessions	Active Observation Hours	Vehicles Observed	2006 County Population
Los Angeles County	590	4,894	1,560,195	10,292,723
Orange County	285	2,211	933,453	3,083,894
Riverside County	78	800	358,572	2,004,608
San Bernardino County	54	460	179,399	2,016,277
Total	1,007	8,365	3,031,619	17,397,502

Figure II-1 On-Road Observations by County



Hourly Measurements

Figures II-2 to II-5 shows the measurements per hour in each of the counties. Measurement rates were generally in the same range. Each hour indicated on the x-axis runs from the start of the hour through the end of the hour using the 24-hour clock. For example, hour 18 includes measurements made between 6:00pm and 7:00pm. Hourly traffic patterns vary with only Orange County sites exhibiting pronounced morning and afternoon peaks.

Figure II-2 Los Angeles County Hourly Measurement Rate

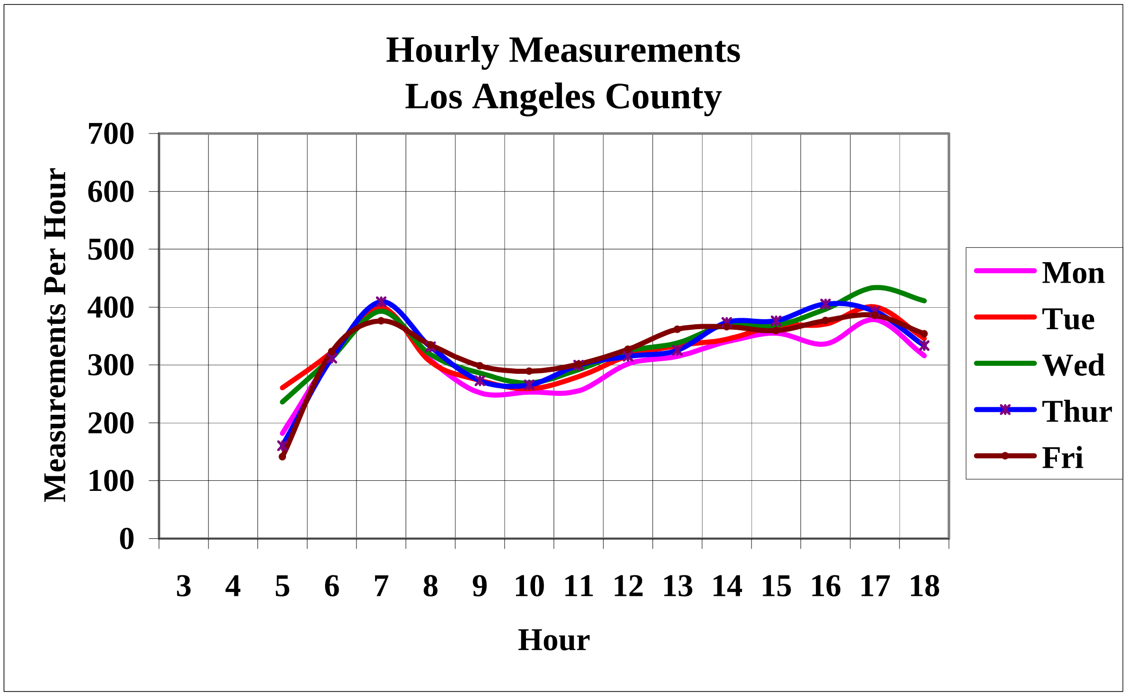


Figure II-3 Orange County Hourly Measurement Rate

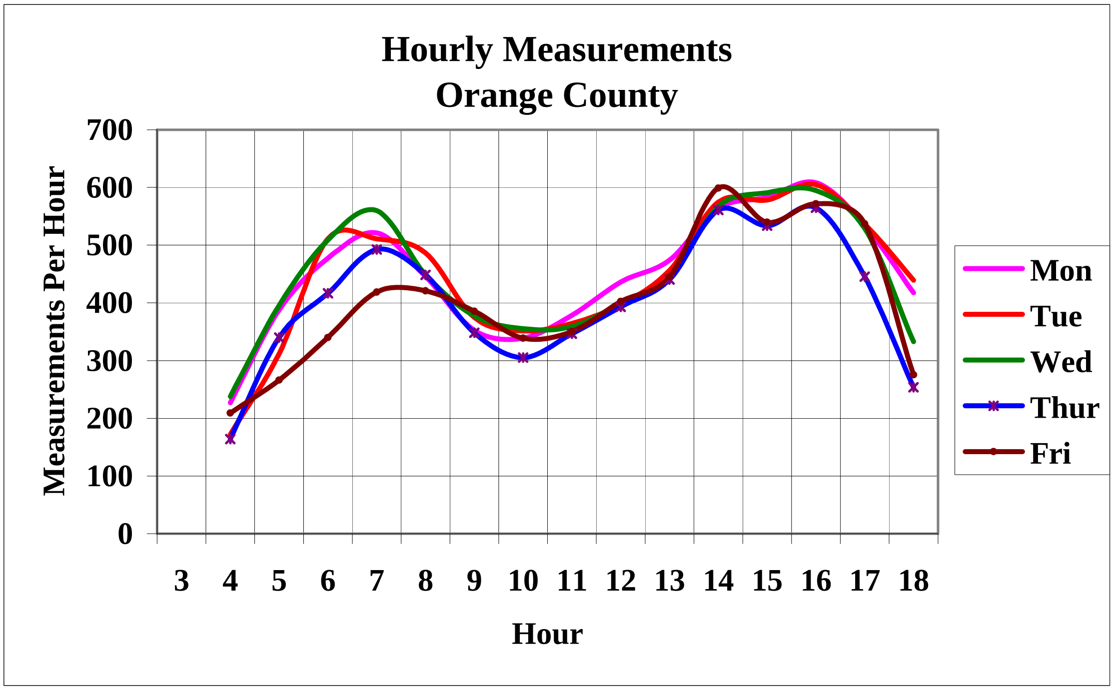


Figure II-4 Riverside County Hourly Measurement Rate

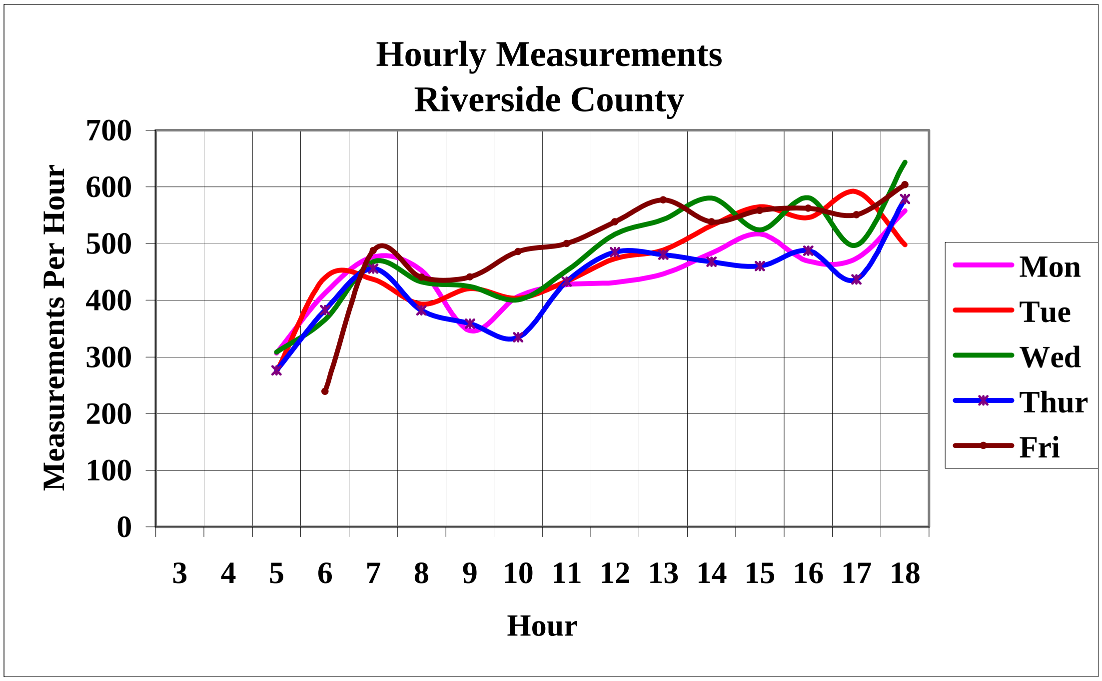
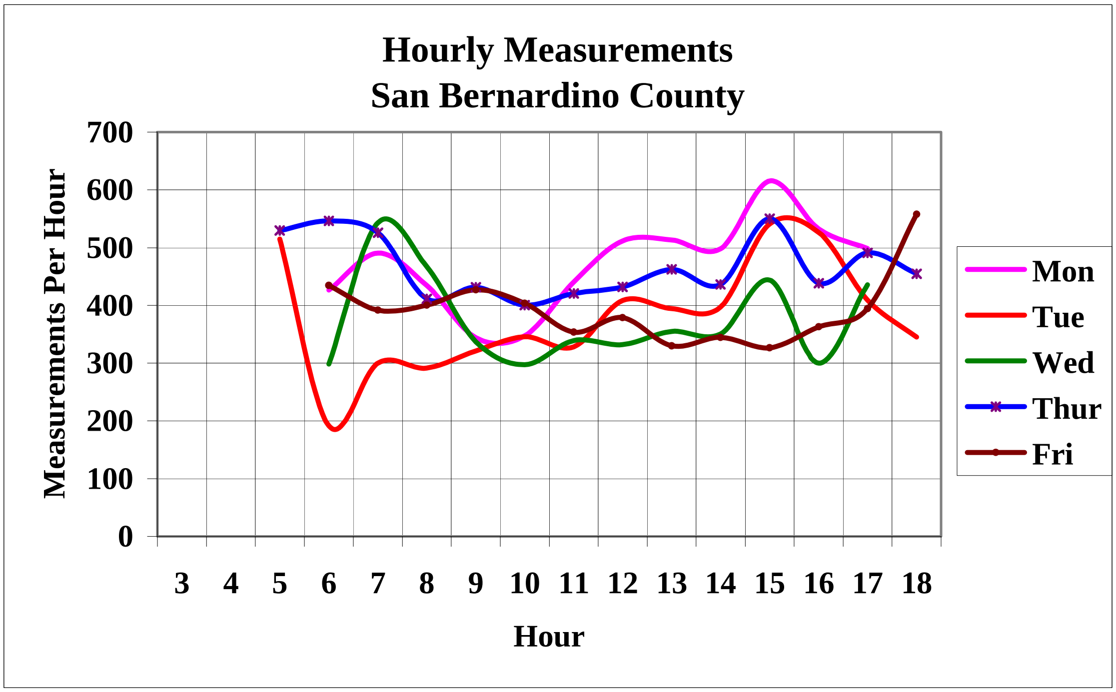


Figure II-5 San Bernardino County Hourly Measurement Rate



Monthly Progress

ESP provided reports tracking the monthly progress of data collection. Figure II-6 shows the progress in collecting NRVRs. Progress was initially slower than planned due to equipment and permitting delays. The number of vans was increased from two to three during the project. The collection phase was extended by two months to accomplish the NRVR goal, which was actually exceeded at the end of the first extension month.

Figure II-7 shows the monthly progress in unique California plates and South Coast registered vehicles. While the total unique California plated vehicles measured came close to meeting the goal of one million, the number of South Coast registered vehicles progressed at a notably lower rate from December 2007 through April 2008. This was in large part due to an unexplained decline in the rate at which plates were matched to DMV registrations. This is reported further in a subsequent section.

Table II-4 is a copy of the final monthly report for the on-road activity.

Figure II-6 Monthly Progress: NRVR Measurements

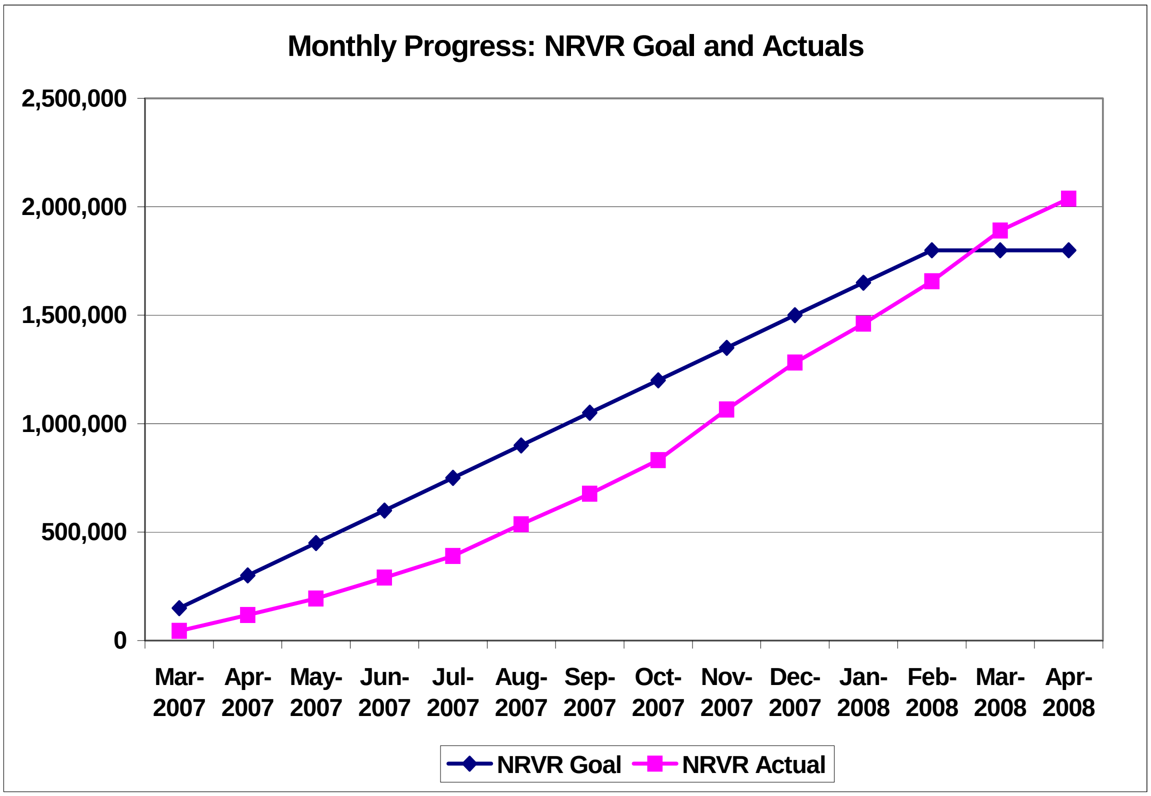


Figure II-7 Monthly Progress: Unique Vehicles Measured

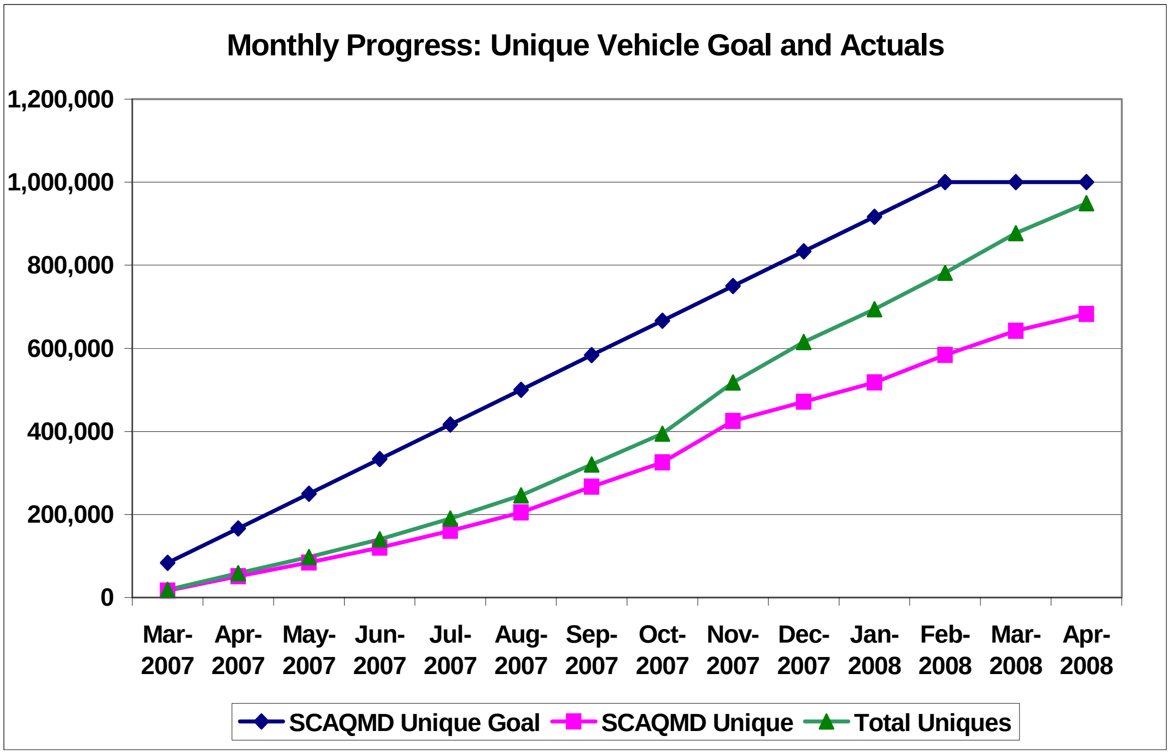


Table II-4 Final Monthly Report

RSD Summary Report - SCAQMD

For period 04/01/2008 to 04/30/2008

The World Leader in Vehicle Testing

Utilization	
# Vans Utilized	3
# Sites Utilized	22
# RSD SDMs Utilized	5
Collection Van Days	48
Days Down - Wthr/Equip	0/2
Days Down - Misc	5
Operational Hours:Mins	491:15

Out of State Summary	
NV	156
OR	46
CO	36
AZ	118
WA	48
Other States	678
Out of State Total	1,082

Emissions Record Summary	
Total Emission Records	334,037
Valid - CA Records	104,559
Valid - Out of State	1,082
Valid - Unreadable	20,069
Total Valid Readings	125,728
Unique CA Records	91,326

Unread Plate Summary	
Motorcycles	46
Trailers	199
Plate Not Visible	13,460
Heavy Goods Vehicle	2,793
Temporary Plates	3,571
Unread Total	20,069

Unique Summary		
Category	Period	ToDate
CA	91,326	949,532
CA/DMV	54,009	754,149
CA/DMV/SCAQMD	47,895	682,830
HEI	1,679	25,218
NRVR	147,241	2,038,060

Valid Record Types		
Total Records	334,037	%
VALID-CA	104,559	31.3%
VALID-NV	156	0.0%
VALID-OR	46	0.0%
VALID-CO	36	0.0%
VALID-AZ	118	0.0%
VALID-WA	48	0.0%
VALID-OOS	678	0.2%
VALID-NOTAGEDIT	18	0.0%
VALID-UNREADABLE	20,069	6.0%
Total Valid	125,728	37.6%

Unique VALID CA Records	91,326	27.3%

Note: This value is derived from total uniques to date and can not be calculated from data on this sheet.

Invalid (In order of reject criteria.)		
Total Records	334,037	%
INVALID-GAS	53,690	16.1%
INVALID-SPEED/ACCEL	32,589	9.8%
INVALID-CVA	78,866	23.6%
INVALID-VSP	50,105	15.0%
INVALID-NO	0	0.0%
INVALID-RH	0	0.0%
INVALID-TEMP	0	0.0%
INVALID-MaxCO2	195	0.1%
INVALID-IRSMOKE	8	0.0%
INVALID-UVSMOKE	31	0.0%
INVALID-MISC	62	0.0%
Total Invalid	215,546	64.5%

3. Permitting, site maps & locations

ESP designed and established an initial network of on-road sites in the four SCAQMD counties that would yield the desired numbers and a representative cross-section of the population. ESP performed initial site selection from 9/8/06 through 9/20/06. Each candidate site was visited and inspected to determine if it would meet the necessary criteria to ensure it will be a safe and productive testing location. During the initial survey of sites, ESP drove over 2,100 miles and identified 437 potential sites within the 4 counties of L.A., Orange, San Bernardino and Riverside. Of these, 120 sites were identified as potentially good candidates. A majority of the sites were onramps to the freeways. Some surface street sites were also identified.

Permits for sites on California state highways were purchased from Cal-Trans. For each site, ESP administrative staff issued a check and a completed a permit application. The documentation was sent to the ESP field contact who delivered these to Cal-Trans offices and scheduled a site inspection with a Cal-Trans Site Inspector.

Following a satisfactory site inspection ESP reported to the Cal-Trans office to pick up the approved site permit. ESP then scheduled RSD emissions testing dates with the Cal-Trans Site Inspector and upon completion of roadside emissions testing, ESP completed and filed a Cal-Trans Completion of Work form.

Each city has a Traffic Engineering Department that deals with surface street site permits and requires individuals to adhere to the Work Area Traffic Control Handbook, (WATCH). This handbook is the guide to controlling traffic on surface streets. As a note, surface street sites require additional safety devices including illuminated signage and additional traffic cones.

There were several criteria used to determine suitability of a site:

- Safety – There must be enough room to safely park the RSD van and for the operator to move freely around the equipment during the day.
- All local and federal DOT municipalities' rules and regulations must be learned and adhered to, including the WATCH Manual and the MUTCD guidelines.
- Vehicle speed between 25-45 mph. The equipment can test at higher speeds but the amount of invalid records will increase
- Road Slope - A positive road slope ensures the vehicle engine is in a loaded mode providing a valid VSP
- Valid Traffic Volume – There must be enough vehicles at each site to ensure the ESP meets the goals of the contract.

a) Vehicle Specific Power (VSP)

Vehicle Specific Power (VSP)[ii] is the vehicle engine power per unit mass required to overcome gravitational force, inertia, aerodynamic drag and rolling resistance. Expressed in kilowatts per ton, for light vehicles it is approximately the sum of[iii]:

- Gravitational force: 4.39 x sin(Road grade degrees/57.3) x Speed mph
- Inertial force: 0.22 x Speed mph x Acceleration mph/s
- Aerodynamic drag: 0.0000272 x (Speed mph)^^{3}
- Rolling resistance: 0.0954 x Speed mph

Vehicle Specific Power (VSP) is used to determine whether a vehicle was operating within a representative power range when it was measured by RSD. For light vehicles, VSP can be estimated from external observation of vehicle speed, vehicle acceleration and the road grade. A 5% grade, which is not that unusual for a freeway ramp, is equivalent to a horizontal acceleration of 1.9 mph/s. To put this in perspective, the Federal Test Procedure (FTP) and IM240 test contain accelerations and decelerations that are in the range of -3.5 to +3.5 mph/s. Thus, the slope of the site can make a considerable contribution to specific power. Wind and variations in air density with temperature also have a small impact on the drag component of specific power.

The rate of fuel consumption is approximately proportional to VSP. At negative values of VSP, the inertia of the vehicle is greater than the opposing forces and power is either dissipated through the vehicle driving the engine or through braking and very little fuel is being used. This situation typically occurs on downhill grades or during deceleration. When a vehicle engine transitions from producing power to absorbing power, the tailpipe emissions to CO_2 ratios can vary widely.

Under moderate to heavy load conditions, vehicle engines may enter enrichment modes that can increase emissions many times. This was an issue with 1980's and earlier models that were often designed to control emissions up to the maximum VSP found in the FTP driving cycle of 22 kW/t. At higher VSP levels these vehicles used fuel enrichment to boost power. If remote sensing measurements are to be used to identify excess emissions, it is desirable to screen out measurements of vehicles legitimately operating in enrichment mode. Therefore, it is useful to use VSP as a performance measure for determining whether a vehicle was operating within an acceptable power range when it was measured by remote sensing. To avoid using measurements that were not representative of vehicle emissions performance, measurements made below a vehicle specific power (VSP) of 3 kW/t were not used. The upper end of the valid VSP range for high emitter selection was a maximum of 30 kW/t for 1990 and newer models. The ASM 2525 and ASM 5015 tests have VSP in the range of 5 to 8 kW/t.

b) Site Characteristics

An ideal site is a one-lane on-ramp to a highway. Ideally there is at least a 10-foot wide shoulder on the right hand side to accommodate the RSD work van. This space allows the operator enough freedom to safely enter and exit the van with ease during equipment set up. It also provides a small buffer between the vehicle traffic and the parked work van.

Testing equipment is set up in order to determine the speed and acceleration of the vehicle, capture an image of the vehicle license plate, and record an exhaust plume measurement. Optimal data is obtained on sites with moderate road slopes where vehicles are accelerating and traveling at speeds between 25-45 miles per hour.

c) Typical Southern California Site Description

After initially visiting over 400 potential sites in the greater Los Angeles area, 120 initial sites were identified in the first round of site selection. One hundred and twenty sites is a typical number of sites used in other ESP programs like Missouri with 100 sites, Colorado with 130 and Virginia with 105.

Site selection was an ongoing process. Unproductive sites were deleted from the initial list and new sites were added during the project.

The overwhelming majority of southern California on-ramps consisted of two lanes. The right lane is generally for single occupant vehicle traffic and frequently the left lane is reserved for multiple occupant vehicle traffic (diamond car pool). The diamond car pool lane traffic does not have to stop at the red meter prior to merging with highway traffic. The single occupant traffic must stop at the red meter. Typically both lanes of traffic are forced to merge into a single lane after the meter as they approach the highway. It is at this point on the on-ramp, once the vehicle traffic is funneled into a single lane by narrowing fog lines, where vehicle emissions measurement must occur. Here vehicles are traveling at near optimal conditions as they accelerate onto the highway.

4. Permit Application Process

After establishing a network of sites, written authorization or a permit must be obtained from the oversight agency responsible for the traffic control of the locations. Depending on which state, county or city, each jurisdiction will require certain documentation. This documentation includes,

- A Traffic Control Plan
- Letter of Introduction describing the project, duration, hours of operation, etc.
- Insurance Forms
- Reassurance that the MUTCD or WATCH guidelines are followed
- Permit Fees

In some cases, it was helpful to provide a link to the website when explaining to the Traffic Engineer how the equipment is positioned along the side of the road (behind the fog line) and how it operates.

To obtain the most productivity out of any site, testing hours must be permitted during peak traffic volume periods before 9 AM and after 3 PM. Limiting testing hours to the 6-

hour period from 9 AM to 3 PM, as was done during the 2005 study, eliminates higher volumes of commuter vehicles from being measured.

After meetings over many weeks, ESP and AQMD were able to obtain CalTrans permits to operate all day. The improved data collection efficiencies over earlier California studies helped the program come close to the goal of testing 1 million unique vehicles. Obtaining a permit for each site required a considerable amount of time and paperwork and a permit fee.

Appendix C contains a list of active sites. Figures II-8 to II-12 show satellite views of typical site locations. The first four sites are examples of on-ramps and the last is an example of a surface street.

Figure II-8 Site CALAF070

Figure II-9 Site CALAF078

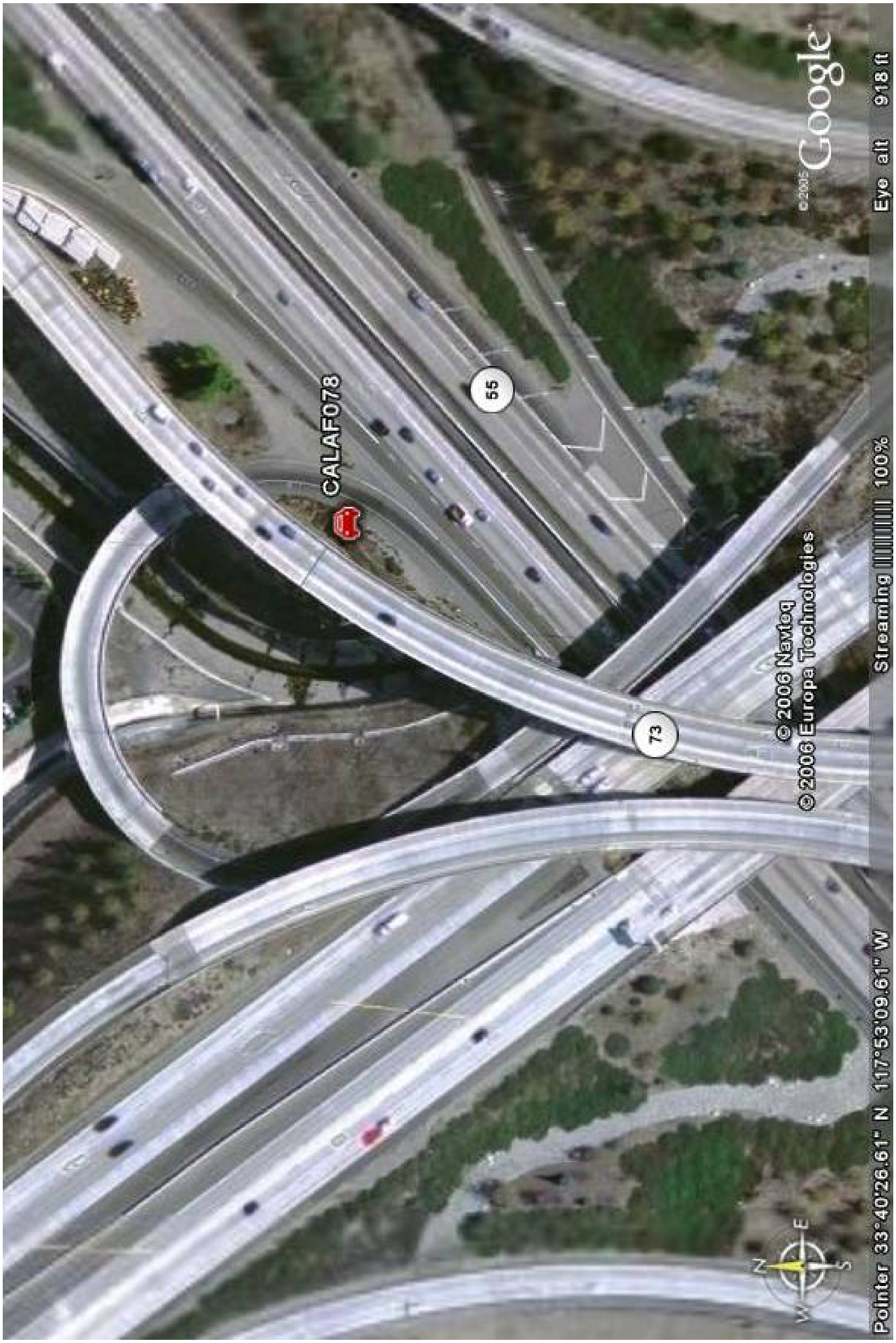


Figure II-10 Site CASBF027

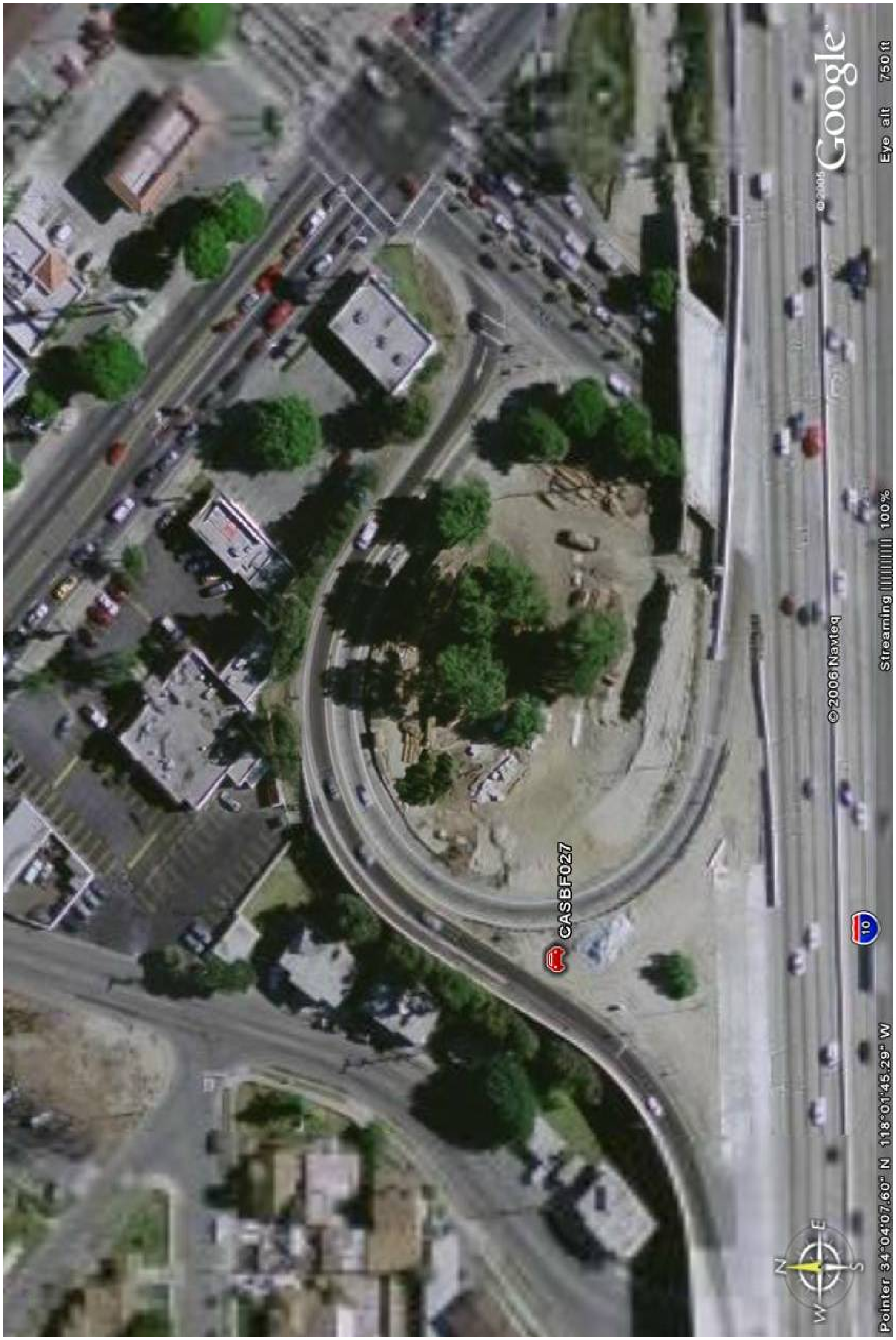


Figure II-11 Site CARCF028

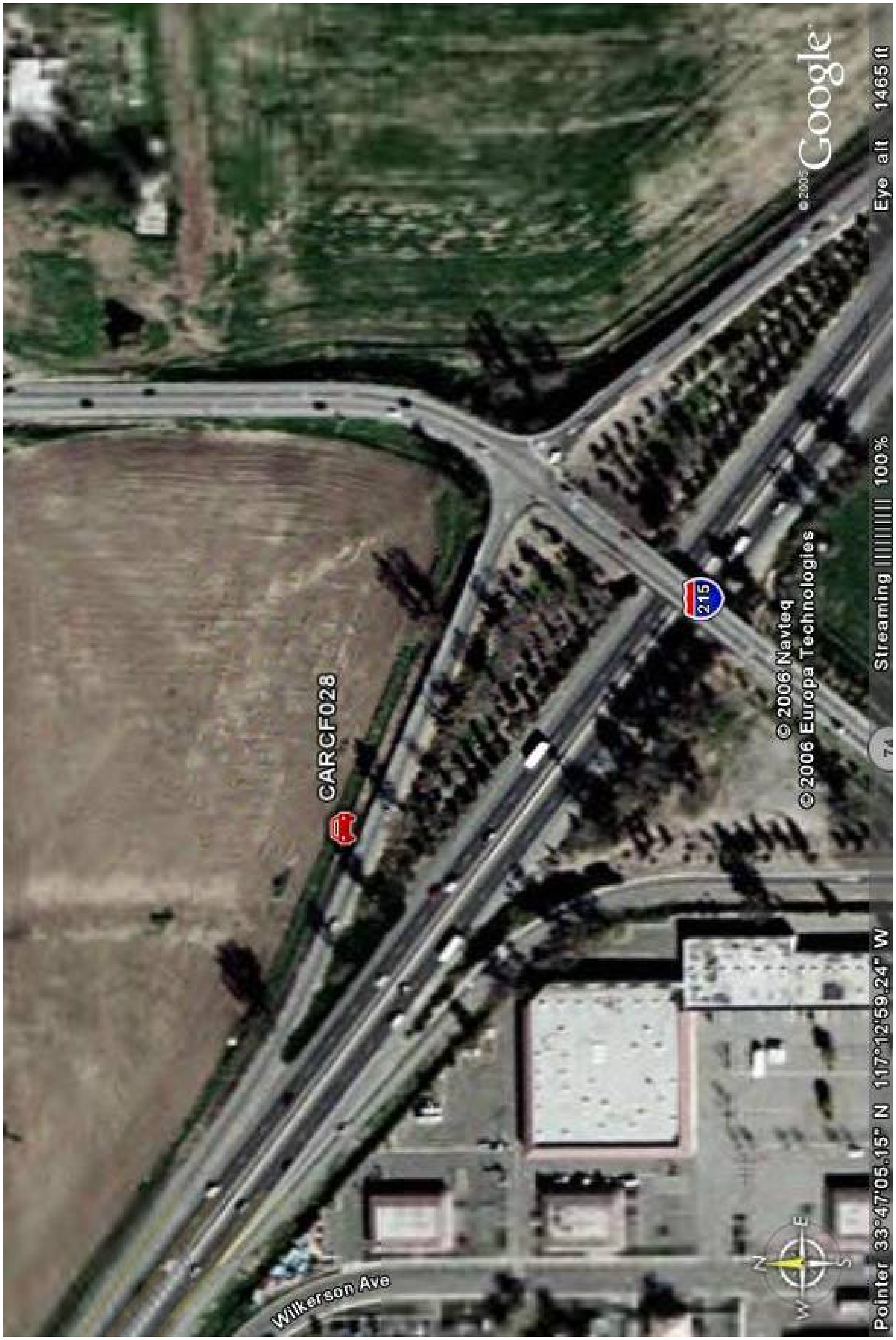
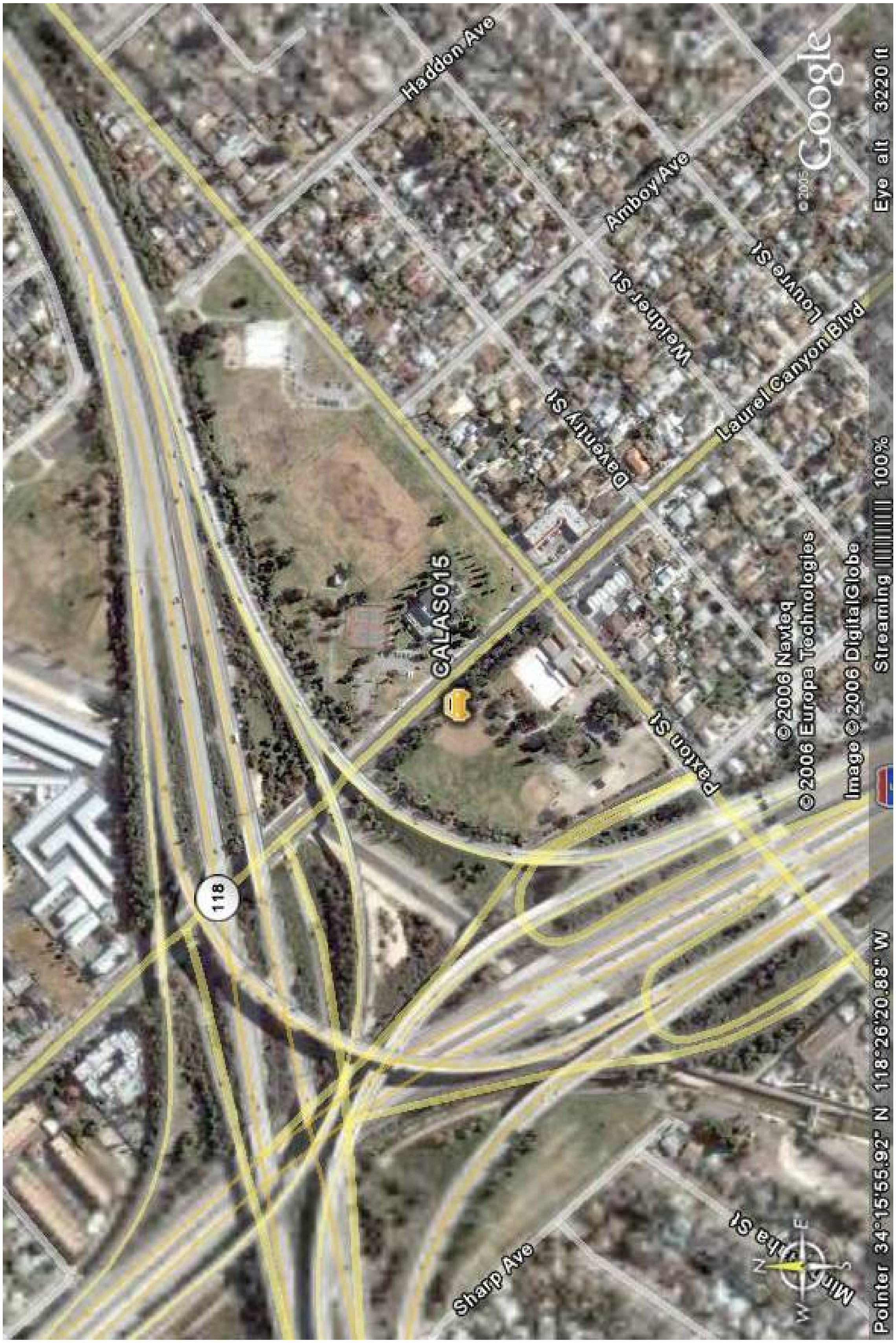


Figure II-12 Site CALAS015



5. *Method of On-Road Operation*

Vans typically arrived on site and started testing between 4:00 AM and 6:00 AM. Depending upon the site productivity, the vans might remain on site until 7:00 PM. When feasible, some vans changed sites after the morning rush hour and deployed their equipment at a more productive site for the remainder of the testing day.

Upon arriving at the testing site, each operator parked the van on the shoulder of the on-ramp at the optimal testing location. He/she turned on the vehicle hazard flasher lights and engaged the parking brake for additional stability. The site shoulders consisted of highway level pavement, elevated asphalt atop a small rounded curb, or dirt with/without ground cover or any combination of the three. Wearing a reflective yellow safety vest and protective eyewear, the operator erected several different pieces of testing and safety equipment. This equipment included: twenty 36" tall orange rubber safety cones with dual bands of reflective tape, a 4'x 4' diamond warning sign, a source detector module (SDM) w/ stand, a corner cube mirror (CCM) w/stand, two 30" long speed & acceleration bars, two cameras w/ tripod and associated power and communication cables.

One of the two cameras provided a color image of the vehicle plate that was used for manual tag editing. The second camera, also referred to as an Automated License Plate Reader (ALPR) camera, provided a black and white image.

As one can see from Figure II-14, most of the testing equipment was placed on or behind the fog lines of the on-ramp. In this way no piece of equipment impeded vehicle travel and its presence encouraged motorists to center their vehicles in the driving lane. As necessary, safety cones or small equipment were allowed to encroach into the driving lane as much as 18" from each side of the lane.

The diamond warning sign was displayed well ahead of the testing location and equipment to warn the motorist of the testing equipment they would encounter as they drove towards the highway.

Except for a very few scenarios, the van was parked on the right hand shoulder anywhere from 50-150 feet after the meter line. The SDM was set up in front of the van. The CCM was set up directly across from the SDM on the other side of the traffic lane. Depending upon the placement of the SDM, this allowed the CCM to be placed either in the gore between the right hand highway lane/right hand highway shoulder and the on-ramp lane or simply behind the fog line of the on-ramp. The small speed & acceleration bars were placed approximately 6 feet prior to the SDM/CCM location. The tripod and camera were placed to the rear of the van.

Initially when dual RSD systems were deployed, they were separated by 30ft and straddled the van with the first SDM 6ft behind the van and the second 4ft in front of the van. Beginning in April 2007, because of low valid gas readings on the first SDM at the back of the van, ESP moved both of the SDMs to the front of the van. In this configuration the SDMs were also 30ft apart with the furthest being 34ft in front (downstream) of the van.

Figure II-13: Typical RSD Equipment Setup

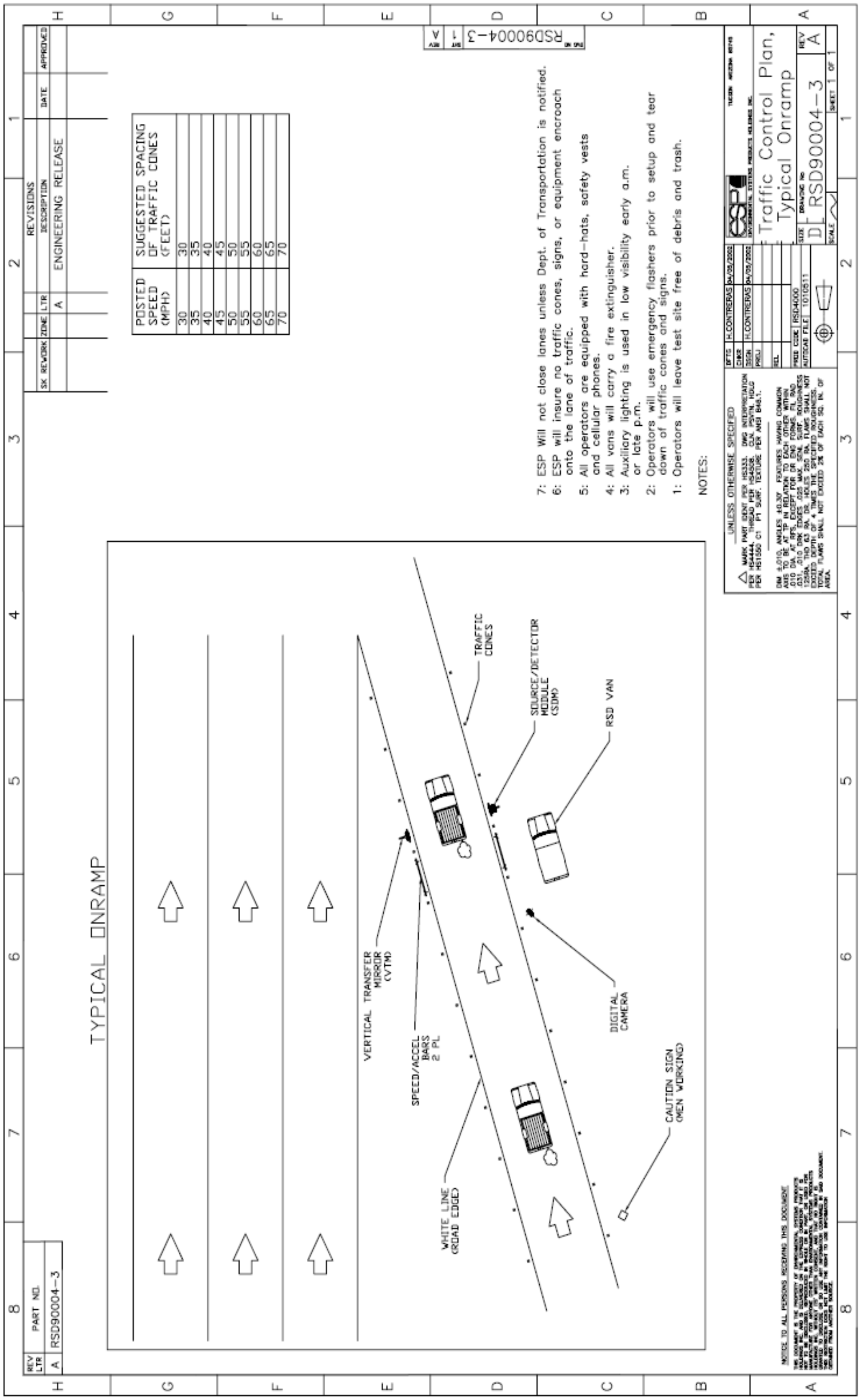


Figure II-14 RSD Equipment Deployed

6. *Continuous Network Improvement*

During the project, ESP reviewed existing site performance and selected new sites to maintain, expand and improve the overall site network.

From Session Summary reports, the Operations Supervisor reviewed the results and assessed a number of factors beginning with whether to utilize the site again or to replace it with another site in the near vicinity. Table II-5 shows an example of the Session Summary report. Factors below were used to evaluate each site after data was collected.

Equipment Performance

- Valid capture rate which includes the following,
  - % of valid gas capture
  - % of valid speed and acceleration capture
  - # of vehicles tested meeting the VSP criteria
  - % of readable plates

Site Performance

- Was the operator set up at the assigned site or did he/she move due to low volume or site issues?
- Was the site productive all day or only during the AM or PM rush hours?
- Number of vehicles observed more than once
- High number of heavy duty vehicles
- Was it difficult to calibrate during the day?

Operator Performance

- Was the Operator set up and operating at the designated time set by the Supervisor, usually 6 am? Time may vary depending on the site. Were there circumstances causing the operator to setup after the agreed upon start time?
- Was the analyzer calibrated and audited as prescribed by the operating procedures?
- Was the camera aligned and optimized to minimize the number of unreadable plates? This also applies during low light conditions.

ESP began data collection in Los Angeles, where permit applications were submitted first. The operations supervisor's responsibilities included coordinating with FCCC to balance data collection across sites in order to achieve an appropriate flow of high candidates to each participating Referee Station.

Sites that were no longer providing high volumes of the desired mix of remote sensing data were rescheduled or retired. The following factors were considered when rescheduling sites:

- Unique capture rate over consecutive days (number of consecutive visits);
- The flow of vehicles at each FCCC Facility
- Diurnal record distributions (a.m. or p.m. site);
- Emissions distribution (high emitter, fleet characterization, or control site).

Table II-5 Session Summary Report

RSD Monthly Report - SCAQMD - For period of 2/1/2007 to 2/28/2007

Utilization	
# Sites Utilized	
# Vans Utilized	
# RSD SDMs Utilized	
Collection Unit Days	
Days Down (Weather/Equipment)	
Operational Hours/Mins	81:46

Emissions Record Summary	
Total Emissions Records	26570
Valid - CA Records	8833
Valid - Out of State	55
Valid - Unreadable	1105
Total Valid Readings	10000

Out of State Summary	
NV	10
CO	10
OR	10
AZ	4
Other States	21
Out of State Total	55

Unread Plate Summary	
Motorcycles	0
Trailers	4
Plate Not Visible	873
Heavy Good Vehicle	228
Temporary Plates	0
Unread Total	1105

Uni
CA
HEI

Session Summary - Part 1

Date	Session ID	Site	Site Slope	Van	Operator	SDM	#Cals	#Audits	Avg Temp	Avg Humidity	Avg Baro	Total Records	Valid - Records		Valid CA Records		Valid OOS Records	
1-Feb-07	23	CAOCS003	0.8	CA01	TIM	4503	5	27	16.44	51.57	29.60	1375	500	36.4%	465	33.8%	2	0.1%
1-Feb-07	24	CAOCS003	0.8	CA01	TYLER	4504	6	46	16.25	53.41	29.59	1270	404	31.8%	378	29.8%	4	0.3%
2-Feb-07	11	CAOCS003	0.8	CA01	TIM	4504	2	21	18.73	43.39	29.72	1428	493	34.5%	450	31.5%	2	0.1%
2-Feb-07	14	CAOCS003	0.8	CA01	TIM	4503	2	5	15.08	56.50	29.75	48	6	12.5%	0	0.0%	0	0.0%
2-Feb-07	15	CAOCS003	0.8	CA01	TIM	4503	3	22	19.03	40.82	29.73	1323	434	32.8%	402	30.4%	3	0.2%
5-Feb-07	28	CALAS027	0.1	CA01	TYLER	4503	3	15	26.16	25.56	30.08	855	428	50.1%	351	41.1%	1	0.1%
5-Feb-07	34	CALAS027	0.1	CA01	TYLER	4504	2	13	26.50	25.29	30.07	1121	453	40.4%	301	26.9%	2	0.2%
6-Feb-07	30	CALAS027	0.1	CA01	TIM	4503	2	21	21.66	51.56	30.09	1436	657	45.8%	595	41.4%	1	0.1%
6-Feb-07	31	CALAS027	0.1	CA01	TYLER	4504	2	18	21.46	52.96	30.07	1400	187	13.4%	171	12.2%	1	0.1%
7-Feb-07	32	CALAS027	0.1	CA01	TIM	4503	3	20	18.55	58.63	30.07	1236	640	51.8%	569	46.0%	6	0.5%
7-Feb-07	33	CALAS027	0.1	CA01	TYLER	4504	2	17	18.39	59.99	30.06	1208	489	40.5%	428	35.4%	6	0.5%
8-Feb-07	35	CAOCS003	0.8	CA01	TIM	4503	2	18	20.65	29.76	29.69	1073	498	46.4%	437	40.7%	4	0.4%
8-Feb-07	36	CAOCS003	0.8	CA01	TYLER	4504	2	5	17.94	49.00	29.70	41	0	0.0%	0	0.0%	0	0.0%
8-Feb-07	37	CAOCS003	0.8	CA01	TYLER	4504	2	16	20.80	30.00	29.68	1015	332	32.7%	282	27.8%	5	0.5%
9-Feb-07	38	CAOCS003	0.8	CA01	TYLER	4503	3	19	21.49	37.48	29.73	1377	568	41.2%	524	38.1%	2	0.1%
9-Feb-07	39	CAOCS003	0.8	CA01	TYLER	4504	2	23	21.41	39.33	29.71	1400	449	32.1%	399	28.5%	6	0.4%
12-Feb-07	40	CAOCS003	0.8	CA01	TYLER	4503	4	19	18.41	51.20	29.69	1729	736	42.6%	643	37.2%	5	0.3%
12-Feb-07	41	CAOCS003	0.8	CA01	TYLER	4504	3	20	18.31	52.74	29.68	1683	597	35.5%	539	32.0%	11	0.7%
13-Feb-07	42	CAOCS003	0.8	CA01	TYLER	4503	6	27	18.79	42.34	29.63	1180	508	43.1%	443	37.5%	9	0.8%
13-Feb-07	43	CAOCS003	0.8	CA01	TYLER	4504	7	29	18.47	44.96	29.62	832	305	36.7%	248	29.8%	6	0.7%
14-Feb-07	44	CAOCS003	0.8	CA01	TYLER	4503	2	3	24.69	30.50	29.77	13	0	0.0%	0	0.0%	0	0.0%
14-Feb-07	45	CAOCS003	0.8	CA01	TYLER	4504	3	18	18.88	48.65	29.80	1509	372	24.7%	330	21.9%	5	0.3%
15-Feb-07	46	CAOCS004	1	CA01	TYLER	4503	8	32	20.94	31.84	30.14	324	212	65.4%	196	60.5%	4	1.2%
15-Feb-07	47	CAOCS004	1.4	CA01	TIM	4504	3	21	21.40	29.38	30.15	452	245	54.2%	227	50.2%	4	0.9%
21-Feb-07	48	CAOCS003	0.8	CA01	TIM	4503	6	19	21.14	44.26	29.70	1242	487	39.2%	417	33.6%	4	0.3%
Totals	***Averages***		***0.7***				***3.4***	***19.8***	***20.1***	***43.2***	***29.8***	**26570**	**10000**	**37.6%**	**8795**	**33.1%**	**93**	**0.4%**

Session Summary - Part 2

Date	Session ID	Site	Slope	Van	Operator	SDM	Avg Traffic/ Hour	Total Records	Valid Gas		Valid Speed Accel		Valid CVA		Valid VSP (3 to 22 kW/T)		Valid All	
1-Feb-07	23	CAOCS003	0.8	CA01	TIM	4503	326	1375	886	64.4%	1347	98.0%	1297	94.3%	830	60.4%	500	36.4%
1-Feb-07	24	CAOCS003	0.8	CA01	TYLER	4504	281	1270	708	55.7%	1242	97.8%	1182	93.1%	767	60.4%	404	31.8%
2-Feb-07	11	CAOCS003	0.8	CA01	TIM	4504	365	1428	821	57.5%	1396	97.8%	1401	98.1%	822	57.6%	493	34.5%
2-Feb-07	14	CAOCS003	0.8	CA01	TIM	4503	411	48	35	72.9%	48	100.0%	17	35.4%	29	60.4%	6	12.5%
2-Feb-07	15	CAOCS003	0.8	CA01	TIM	4503	359	1323	790	59.7%	1290	97.5%	1290	97.5%	774	58.5%	434	32.8%
5-Feb-07	28	CALAS027	0.1	CA01	TYLER	4503	351	855	529	61.9%	839	98.1%	814	95.2%	637	74.5%	428	50.1%
5-Feb-07	34	CALAS027	0.1	CA01	TYLER	4504	448	1121	604	53.9%	1095	97.7%	1106	98.7%	638	56.9%	453	40.4%
6-Feb-07	30	CALAS027	0.1	CA01	TIM	4503	414	1436	825	57.5%	1394	97.1%	1414	98.5%	959	66.8%	657	45.8%
6-Feb-07	31	CALAS027	0.1	CA01	TYLER	4504	410	1400	663	47.4%	668	47.7%	1364	97.4%	313	22.4%	187	13.4%
7-Feb-07	32	CALAS027	0.1	CA01	TIM	4503	362	1236	789	63.8%	1212	98.1%	1206	97.6%	866	70.1%	640	51.8%
7-Feb-07	33	CALAS027	0.1	CA01	TYLER	4504	361	1208	655	54.2%	1176	97.4%	1205	99.8%	728	60.3%	489	40.5%
8-Feb-07	35	CAOCS003	0.8	CA01	TIM	4503	368	1073	710	66.2%	1049	97.8%	1063	99.1%	723	67.4%	498	46.4%
8-Feb-07	36	CAOCS003	0.8	CA01	TYLER	4504	273	41	28	68.3%	39	95.1%	0	0.0%	25	61.0%	0	0.0%
8-Feb-07	37	CAOCS003	0.8	CA01	TYLER	4504	371	1015	565	55.7%	990	97.5%	1012	99.7%	602	59.3%	332	32.7%
9-Feb-07	38	CAOCS003	0.8	CA01	TYLER	4503	384	1377	882	64.1%	1350	98.0%	1358	98.6%	877	63.7%	568	41.2%
9-Feb-07	39	CAOCS003	0.8	CA01	TYLER	4504	389	1400	772	55.1%	1371	97.9%	1340	95.7%	824	58.9%	449	32.1%
12-Feb-07	40	CAOCS003	0.8	CA01	TYLER	4503	387	1729	1173	67.8%	1696	98.1%	1698	98.2%	1096	63.4%	736	42.6%
12-Feb-07	41	CAOCS003	0.8	CA01	TYLER	4504	384	1683	983	58.4%	1635	97.1%	1668	99.1%	1000	59.4%	597	35.5%
13-Feb-07	42	CAOCS003	0.8	CA01	TYLER	4503	303	1180	783	66.4%	1142	96.8%	1146	97.1%	762	64.6%	508	43.1%
13-Feb-07	43	CAOCS003	0.8	CA01	TYLER	4504	207	832	509	61.2%	817	98.2%	784	94.2%	504	60.6%	305	36.7%
14-Feb-07	44	CAOCS003	0.8	CA01	TYLER	4503	780	13	11	84.6%	12	92.3%	0	0.0%	9	69.2%	0	0.0%
14-Feb-07	45	CAOCS003	0.8	CA01	TYLER	4504	361	1509	932	61.8%	1033	68.5%	1483	98.3%	584	38.7%	372	24.7%
15-Feb-07	46	CAOCS004	1	CA01	TYLER	4503	80	324	268	82.7%	316	97.5%	309	95.4%	260	80.2%	212	65.4%
15-Feb-07	47	CAOCS004	1.4	CA01	TIM	4504	104	452	337	74.6%	441	97.6%	428	94.7%	336	74.3%	245	54.2%
21-Feb-07	48	CAOCS003	0.8	CA01	TIM	4503	284	1242	879	70.8%	1213	97.7%	1197	96.4%	720	58.0%	487	39.2%
Totals	***Averages***		***0.7***				***350.5***	**26570**	**16137**	**60.7%**	**24811**	**93.4%**	**25782**	**97.0%**	**15685**	**59.0%**	**10000**	**37.6%**

B. Vehicle Registration Matching

1. Data Collection and Tag Editing

At the end of each day, the data from each van was copied to a DVD. Every other day, the archived data was collected by the Operations Supervisor and mailed to ESP Tucson to be tag edited. The Tag Editing (TE) Supervisor loaded the data from the DVD onto the Tag Editing Server and assigned data sets to each Tag Editor. As each day's data was tag edited and checked by the TE Supervisor for quality assurance, the TE Supervisor generated a Weekly Summary Report that summarized the data collection efforts by each van and posted those results on the ESP website.

2. Automated Plate Reading

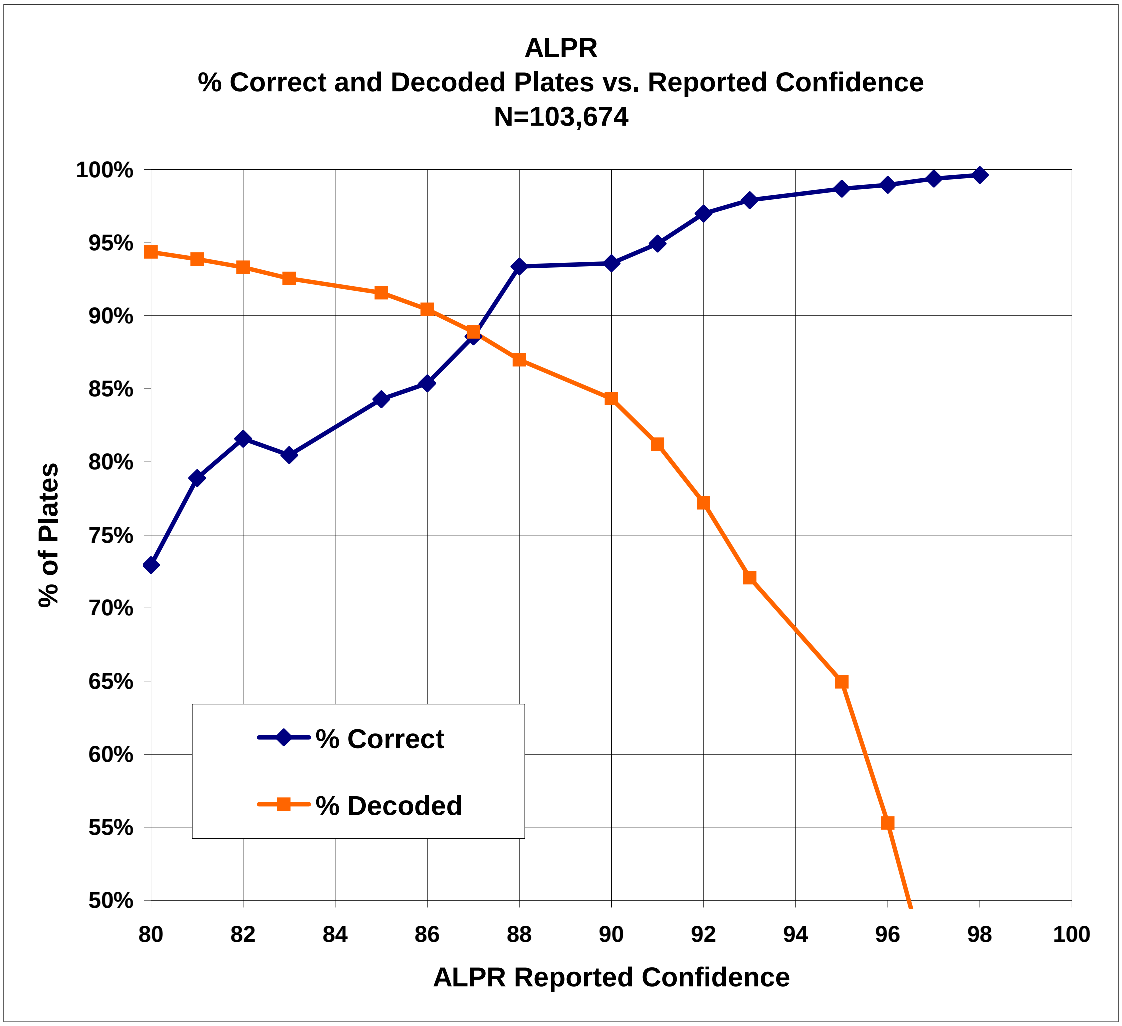
The RSD units were equipped with ALPR that used optical recognition to decode plates. Early in the data collection phase, trials were run to assess the degree of confidence reported by the ALPR vs. the percentage of correctly decoded plates. Figure 2-15 plots the % of plates decoded for the reported ALPR confidence in the decryption and the % of plates that were determined to be correct when compared to manual tag editing.

ESP used several ALPR confidence levels between 90 & 100% to get a good trade-off between accuracy of plate decodes and productivity.

3. High Emitter Quality Assurance

ESP staff reviewed the data for each individual high emitter candidate for Quality Assurance. The QA check verified accurate ALPR decoding or initial tag editing of the license plate and consistency of the vehicle images with the DMV vehicle information.

Figure II-15: ALPR Performance



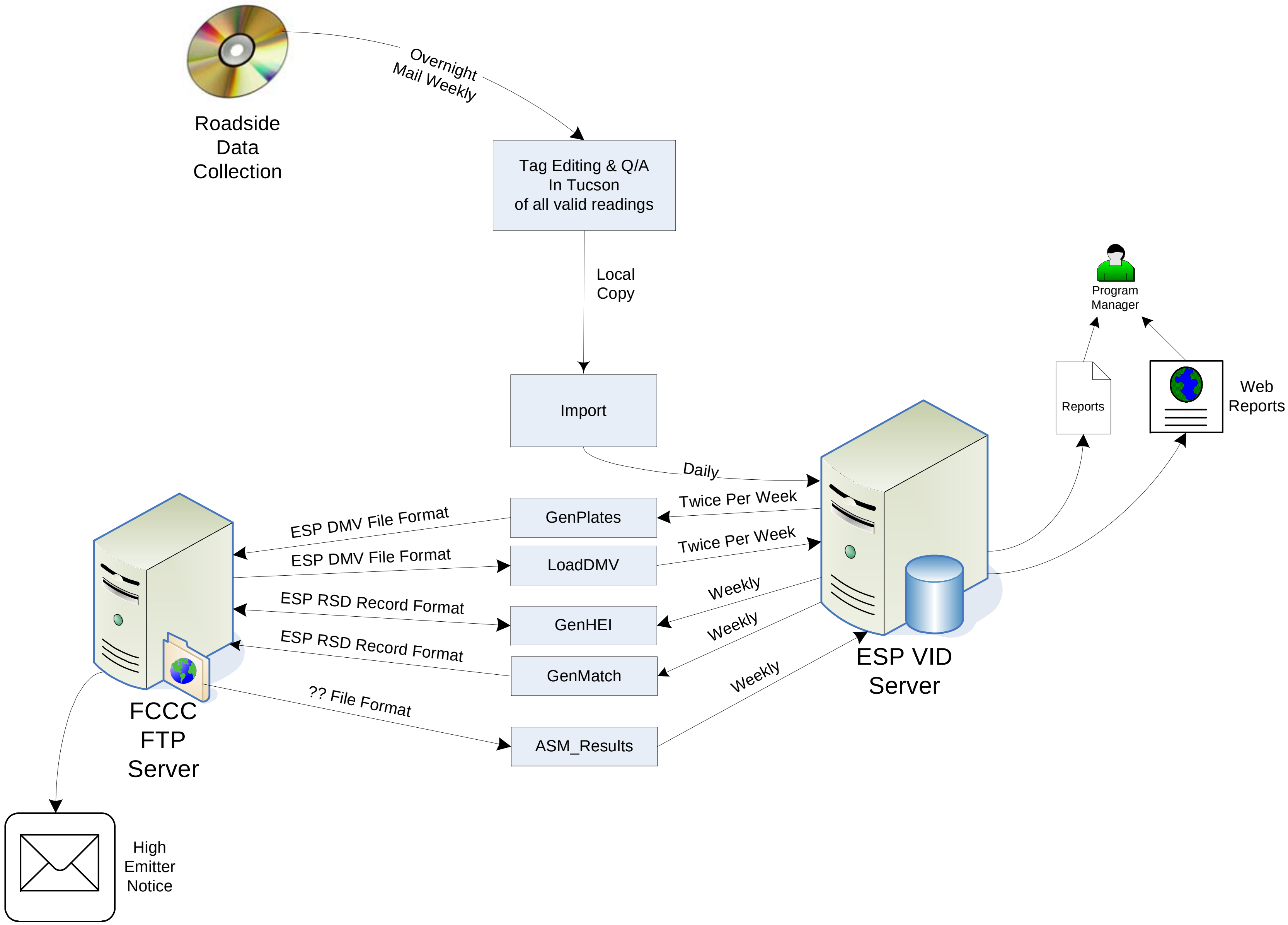
4. ESP/FCCC Plate Tag Edit and Registration Matching Procedure

Tag edited plates were sent via ftp to FCCC for matching against DMV registrations. The vehicle VIN, year, make, model and other information were then returned to ESP. The vehicle information is used as part of the high emitter determination process.

Figure II-16 on the next page summarizes the data flow between ESP and FCCC. File formats are in Appendix D.

The last box on the data flow chart shows feedback of ASM results from FCCC to ESP. However, FCCC was not able to obtain ASM results from the VID on a frequent basis and results were only available infrequently and with a one to two month delay. Consequently, the automated flow of ASM results was not implemented and the file format is not defined. Automated feedback of results would be desirable in a future program.

Figure II-16 ESP and FCCC Data Flow



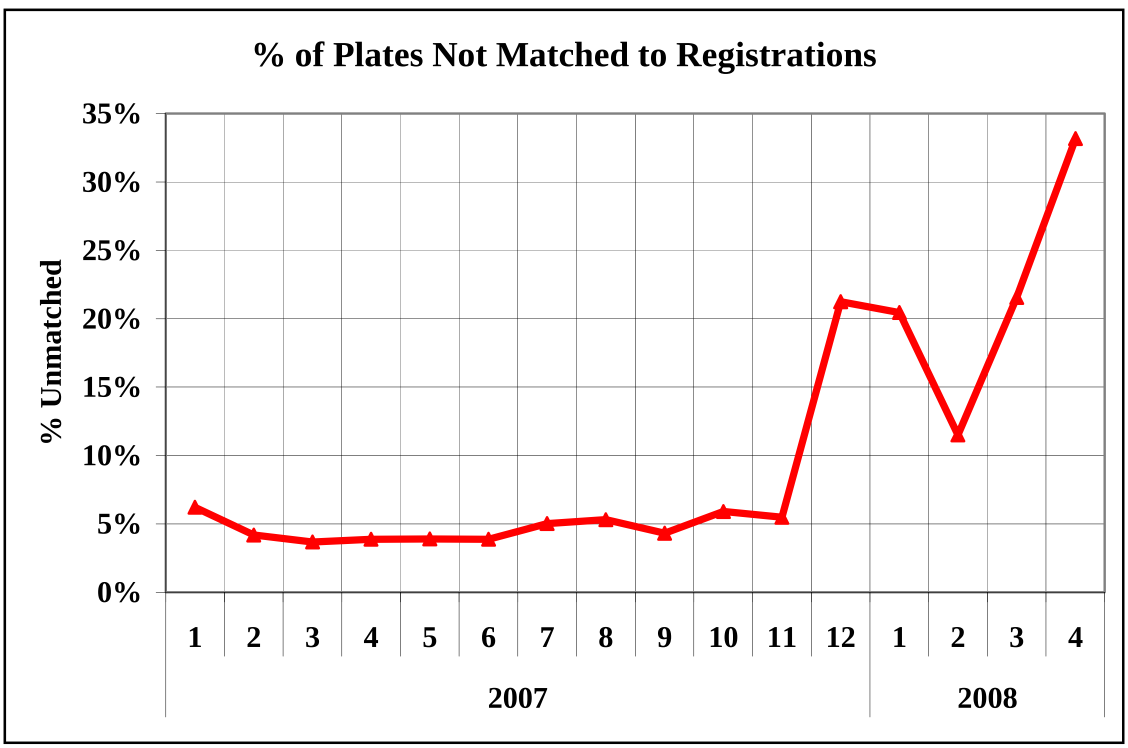
Throughout most of 2007, the percentage of plates that were not matched to DMV registrations was fairly constant at an average of 4.8%. Starting with December data, the unmatched rate suddenly increased dramatically and remained high (Figure II-17). This was despite re-submission of plates that were initially unmatched.

Components of the 4.8% include:

- Tag edit transcription errors,
- Incorrect ALPR decodes, and
- Vehicles driving with unregistered plates.

Something clearly went astray in the matching process in December 2007. If the 4.8% rate had been sustained, it is projected that another 150,000 (20%) of unique California vehicles, and 135,000 unique South Coast vehicles, would have been identified. ESP is attempting to obtain matching registration information for these vehicles through alternative sources.

Figure II-17: % Of Monthly Plates Not Matched to Registrations



III. High Emitter Identification

A total of 25,218 high emitters of HC or NO were identified, which were 3.7% of the 682,830 South Coast registered vehicles measured on-road. These are shown by Cutpoint version and pollutant in Table III-1. Some vehicles failed for more than one pollutant.

During the collection period, no equipment was available to perform follow-up testing for smoke/PM. Therefore, smoking vehicles were not flagged for recruitment. In a subsequent off-line exercise, 1,974 vehicles were identified in the RSD database with high smoke (Table III-2) using the RSD UV Smoke channel. These represented 0.3% of measured California vehicles. This selection was not restricted to South Coast vehicles and did not consider Smog Check dates. Details of these were separately submitted to South Coast AQMD. Out of the 1,974 identified smokers, 947 of these had previously been identified as South Coast registered high emitters of HC or NO and 1,027 were additional vehicles. Therefore, a net total 26,245 unique high emitting vehicles were identified.

Table III-1 HC and NO High Emitters Identified

Cutpoints	Net Vehicles	High HC	High NO	Total Exceedances
1	138	68	74	142
2	11,259	3,588	8,075	11,663
3	13,821	4,607	9,998	14,605
Total	25,218	8,263	18,147	26,410

Table III-2 Smoke Emitters Identified

Cutpoints	1 Hit Smoke	2 Hit Smoke	Total
1	n/a	n/a	n/a
2	259	130	389
3	922	663	1,585
Total	1,181	793	1,974

A. Screening and Selection criteria

This section describes the criteria used in selecting vehicles as high emitters using RSD.

A key measure of the success of the program was the ability to reduce harmful, qualifying emissions within the Carl Moyer[iv] cost effectiveness limit, currently $14,300 per ton, that is required to qualify for Carl Moyer funding.

Given the goals of maximizing the air quality benefits and of meeting the Carl Moyer cost effectiveness threshold, the approach adopted was to select candidate vehicles whose repair or retirement was expected to yield the greatest air quality benefit. The primary method for selecting candidates was, therefore, based on the estimated benefits resulting

from their repair or retirement according to the ARB Carl Moyer guidelines. The details of these calculations were contained in the Task 3 High Emitting Vehicle Identification Plan[v], which established an initial set of High Emitter cutpoints. Values were based initially on the on-road emissions distributions in the 2005 California study.

The plan objective was to provide 400-600 unique, high-emitting vehicles to FCCC each week, which corresponded to approximately 3% of the vehicles observed on-road. However, the exclusion of vehicles within 90 days of their previous or next Smog Check eliminated 25% of potential candidates. Thus the 3% rate was reduced to a potential 2.2% and the actual rate of candidate high emitters was closer to 2%.

Revisions to cutpoints and selection criteria were made based on progress in measuring on-road vehicles, registration matching and other parameters including the lower than expected voluntary vehicle owner participation rate.

The first set of cutpoints was based primarily on having single measurements. When vehicles had multiple measurements, the initial selection algorithm required a certain % to exceed the 'high emitter' cutpoint, e.g. 65%. However, because of the use of dual RSD systems on single van, many vehicles had exactly two measurements. Almost half of these vehicles with emissions exceeding the cutpoint on one measurement had emissions just below the cutpoint on the second measurement. Although it was highly likely these vehicles were high emitters, they did not meet the selection criteria.

A modified SCAQMD high emitter algorithm was developed to select more of these vehicles with two measurements as high emitters. Two levels of RSD cutpoints were established: 1) very high, 2) high. The 'very high' cutpoints acted like the original cutpoints. The 'high' cutpoints were set at about 50% of the 'very high' cutpoint, e.g., if the 'very high' HC cutpoint was 500 ppm then the 'high' cutpoint would be 250 ppm. A similar approach was used for NOx and smoke.

With two cutpoints, 'very high' and 'high', an additional criterion was added; the % of measurements that have to exceed the 'high' standard. For example, if the criteria for the % of measurements required to pass the very high and high cutpoints were set to 30% and 70% respectively, then the following was required to qualify as a high emitter:

1 measurement: 1/1 very high, 1/1 high
2 measurements: 1/2 very high, 2/2 high
3 measurements: 1/3 very high, 3/3 high
4 measurements: 2/4 very high, 3/4 high
5 measurements: 2/5 very high, 4/5 high
Etc

Other screening criteria included:

- Vehicle registered Zip Code in South Coast AQMD
- Model Year: 1960 to 2008
- VSP Range: typically 3 to 30 kW/t
- Vehicle Type, and
- Fuel Type – Gasoline

- At least 90 days remaining before next Smog Check is due, and
- At least 90 days following the last Smog Check.
-

Details of the algorithm and screening criteria are provided in Appendix E.

B. High Emitter Cutpoints

Three sets of emissions cutpoints were used. Figures III-1 to 3 graphically compare the three sets of cutpoints to median, 95th percentile and 98th percentile on-road emissions.

The first and second sets of cutpoints were similar except that older model HC and NO cutpoints were tightened in the second set of cutpoints. Also, as described above, with the first set of cutpoints only very high cutpoints were used. With the second set of cutpoints the concept of very high and high cutpoints was introduced.

Early in 2008 the cutpoints were tightened to the third set of values shown in Table III-4 to increase the pool of candidates. This was in response to FCCC reporting a low rate of recruitment of voluntary high emitter vehicles. The 2007 database was also mined for additional candidates that failed the tighter cutpoints. The third set of cutpoints was designed to identify up to 5% of on-road vehicles.

Figure III-1 HC High Emitter Cutpoints

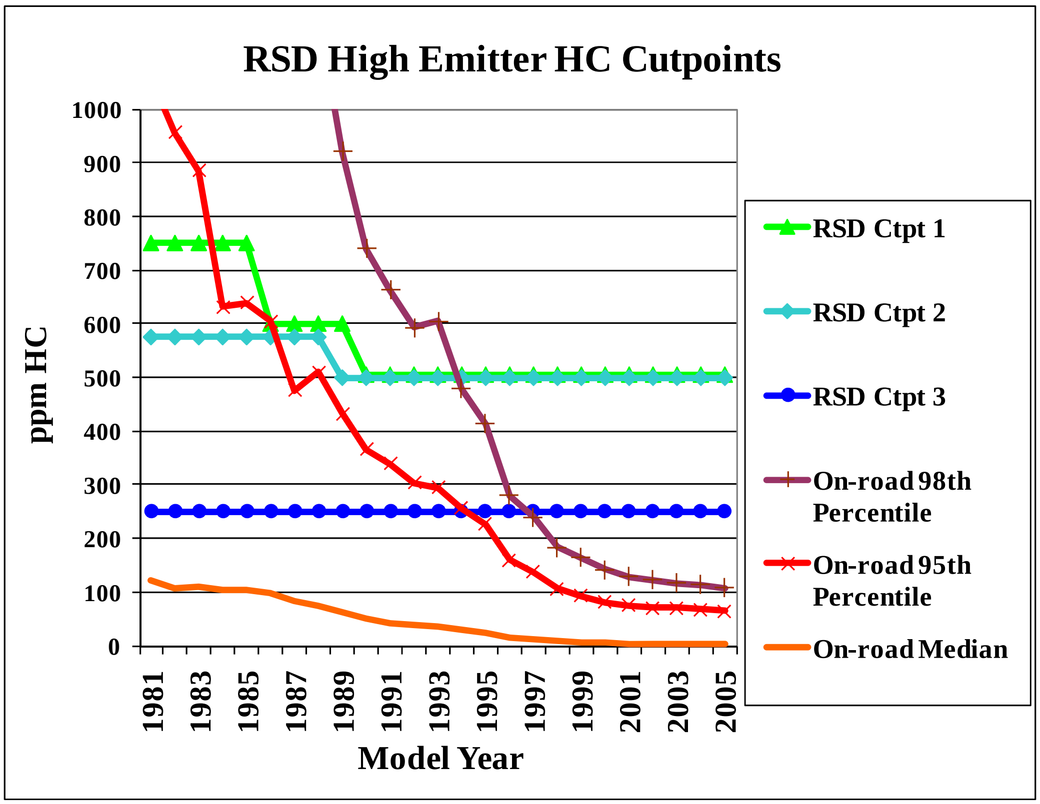


Figure III-2 NO High Emitter Cutpoints

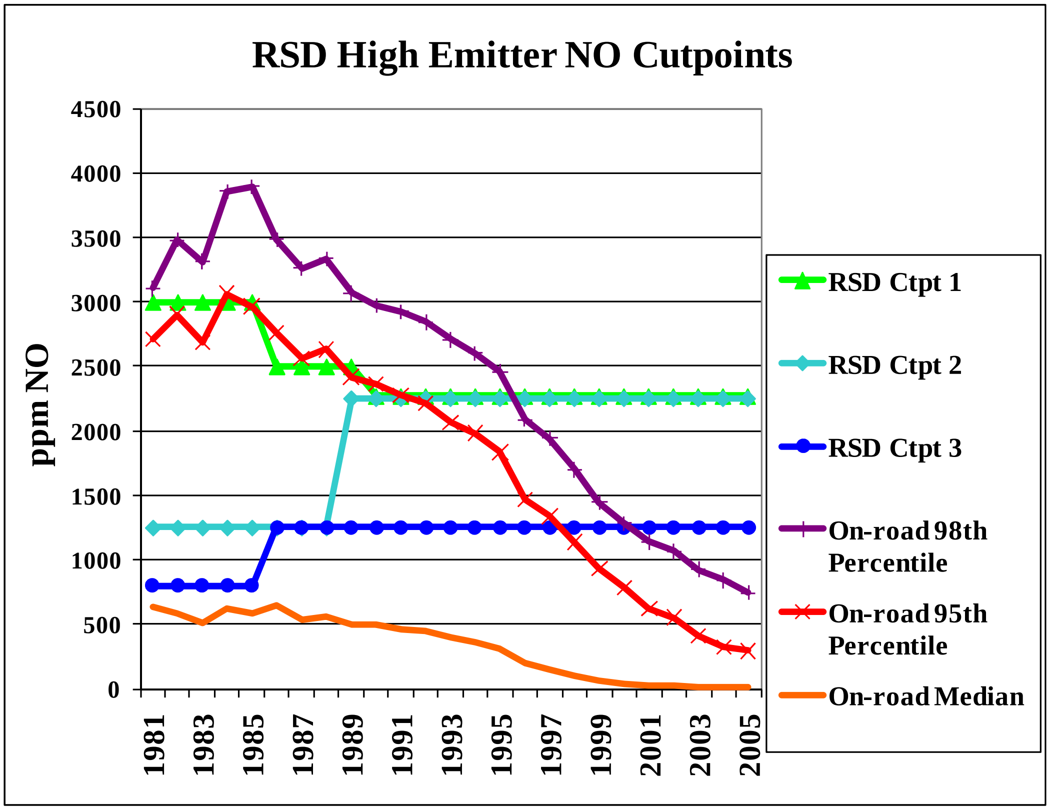


Figure III-3 UV Smoke (PM) High Emitter Cutpoints

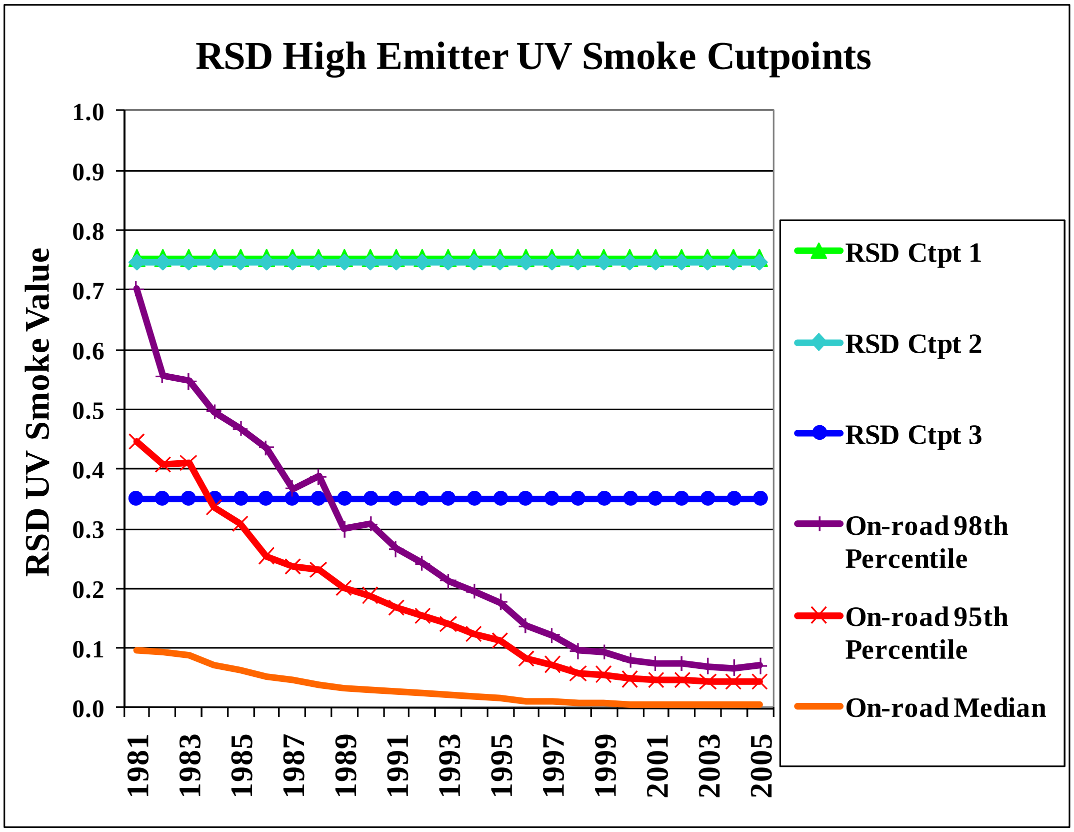


Table III-3 Version 2 Cutpoints

Version 2 of RSD SCAQMD Cutpoints for Gasoline Vehicles						
	Very High Cutpoints			High Cutpoints		
Model Year	HC ppm	NO ppm	PM RSD Smoke	HC ppm	NO ppm	PM RSD Smoke
1975 & older	575	1250	0.75	300	800	0.40
1976	575	1250	0.75	300	800	0.40
1977	575	1250	0.75	300	800	0.40
1978	575	1250	0.75	300	800	0.40
1979	575	1250	0.75	300	800	0.40
1980	575	1250	0.75	300	800	0.40
1981	575	1250	0.75	300	800	0.40
1982	575	1250	0.75	300	800	0.40
1983	575	1250	0.75	300	800	0.40
1984	575	1250	0.75	300	800	0.40
1985	575	1250	0.75	300	800	0.40
1986	575	1250	0.75	300	800	0.40
1987	575	1250	0.75	300	800	0.40
1988	575	1250	0.75	300	800	0.40
1989	500	2250	0.75	250	1000	0.40
1990	500	2250	0.75	250	1000	0.40
1991	500	2250	0.75	250	1000	0.40
1992	500	2250	0.75	250	1000	0.40
1993	500	2250	0.75	250	1000	0.40
1994	500	2250	0.75	250	1000	0.40
1995	500	2250	0.75	250	1000	0.40
1996	500	2250	0.75	250	1000	0.40
1997	500	2250	0.75	250	1000	0.40
1998	500	2250	0.75	250	1000	0.40
1999	500	2250	0.75	250	1000	0.40
2000	500	2250	0.75	250	1000	0.40
2001	500	2250	0.75	250	1000	0.40
2002	500	2250	0.75	250	1000	0.40
2003 & Newer	500	2250	0.75	250	1000	0.40

Table III-4 Version 3 Cutpoints

Version 3 of RSD SCAQMD Cutpoints for Gasoline Vehicles						
	Very High Cutpoints			High Cutpoints		
Model Year	HC ppm	NO ppm	PM RSD Smoke	HC ppm	NO ppm	PM RSD Smoke
1975 & older	300	800	0.35	150	600	0.15
1976	300	800	0.35	150	600	0.15
1977	300	800	0.35	150	600	0.15
1978	300	800	0.35	150	600	0.15
1979	300	800	0.35	150	600	0.15
1980	300	800	0.35	150	600	0.15
1981	250	800	0.35	125	600	0.15
1982	250	800	0.35	125	600	0.15
1983	250	800	0.35	125	600	0.15
1984	250	800	0.35	125	600	0.15
1985	250	800	0.35	125	600	0.15
1986	250	1250	0.35	125	600	0.15
1987	250	1250	0.35	125	600	0.15
1988	250	1250	0.35	125	600	0.15
1989	250	1250	0.35	125	600	0.15
1990	250	1250	0.35	125	600	0.15
1991	250	1250	0.35	125	600	0.15
1992	250	1250	0.35	125	600	0.15
1993	250	1250	0.35	125	600	0.15
1994	250	1250	0.35	125	600	0.15
1995	250	1250	0.35	125	600	0.15
1996	250	1250	0.35	125	600	0.15
1997	250	1250	0.35	125	600	0.15
1998	250	1250	0.35	125	600	0.15
1999	250	1250	0.35	125	600	0.15
2000	250	1250	0.35	125	600	0.15
2001	250	1250	0.35	125	600	0.15
2002	250	1250	0.35	125	600	0.15
2003 & Newer	250	1250	0.35	125	600	0.15

C. Frequency of High Emitters and Average Emissions

Figure III-4 shows the number of South Coast vehicles measured by model year and the portion that were identified as high emitters. The newest model vehicles were very clean and as few as 1 in 2000 were identified as high emitters. For 1980 and older models, approximately 50% were high emitters.

Figure III-5 illustrates the large difference in average emissions between normal vehicles (those not identified as high emitters) and the high emitters selected using the three sets of cutpoints. Few high emitters were selected prior to the implementation of the second set of cutpoints. For simplicity, the results for the first two sets of cutpoints have been combined.

Vehicles failing the first two sets of cutpoints had average emissions 50, 14 and 87 times higher than normal vehicles for HC, NO and Smoke respectively.

Vehicles failing the third set of cutpoints, but not failing the second set of cutpoints, had emissions that were 12, 9 and 33 times higher than normal vehicles for HC, NO and Smoke respectively.

Figure III-4 South Coast Vehicles Measured

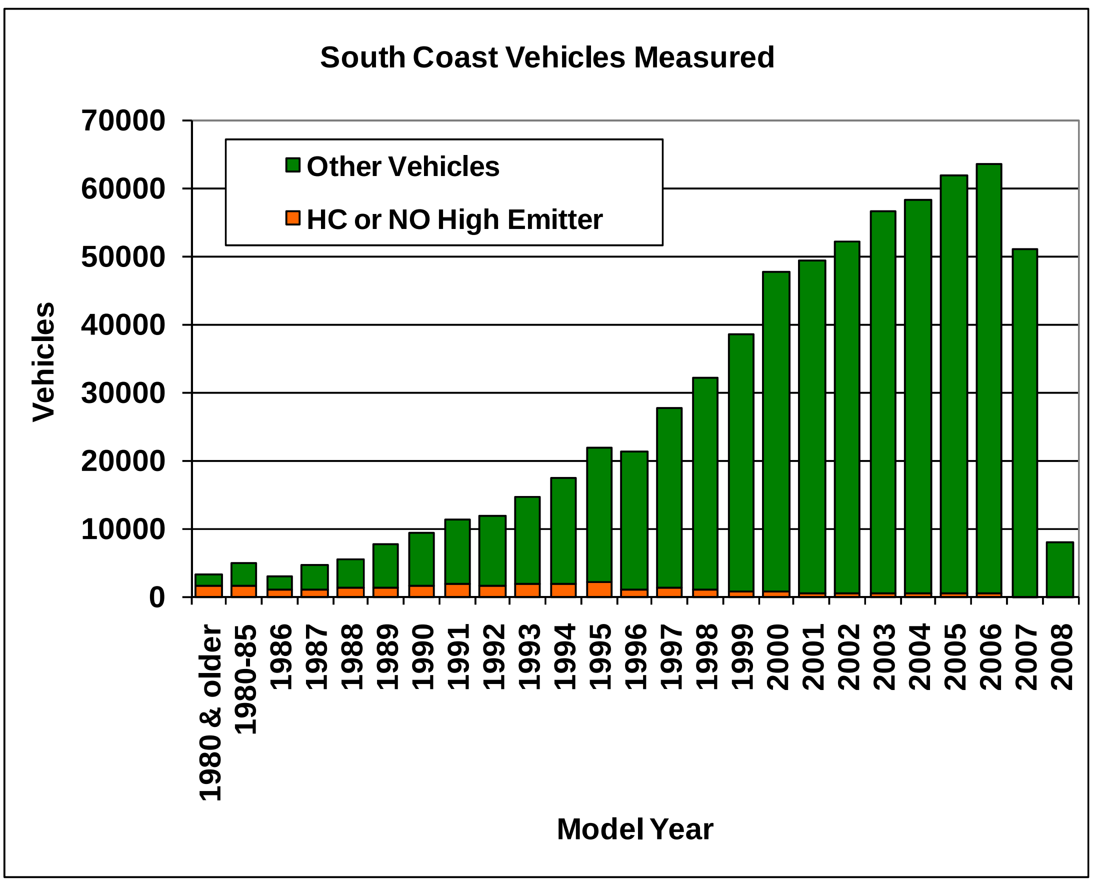
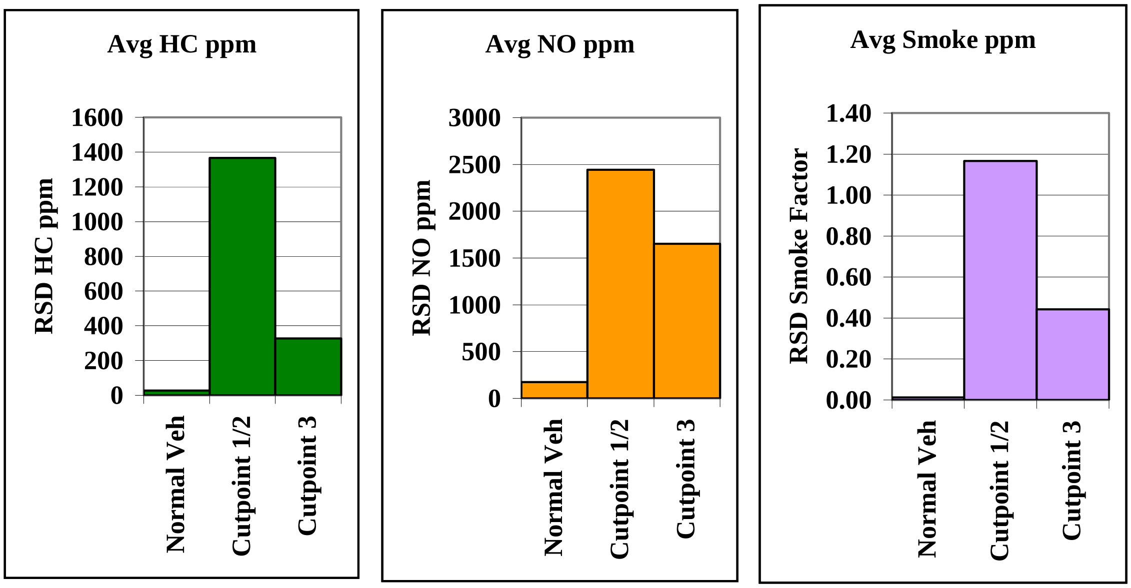


Figure III-5 Average Emissions: Normal & High Emitters



Figures III-6, 8, 10 and 12 show the numbers of high emitters identified by model year for specific pollutants. Figures III-7, 9, 11 and 13 show the percentage of on-road vehicles that were found to be high emitters. Less than 1% of five to six year-old models were high emitters.

South Coast vehicles model year 1995 & older models accounted for 18% of the South Coast vehicles measurements, for over 80% of the Cutpoint 1 or 2 high emitters, and for over 60% of the Cutpoint 3 high emitters.

The lower rate of high emitters among OBD-II equipped vehicles is evident for all pollutants, HC, NO and Smoke.

Figure III-6 HC & NO High Emitters Reported

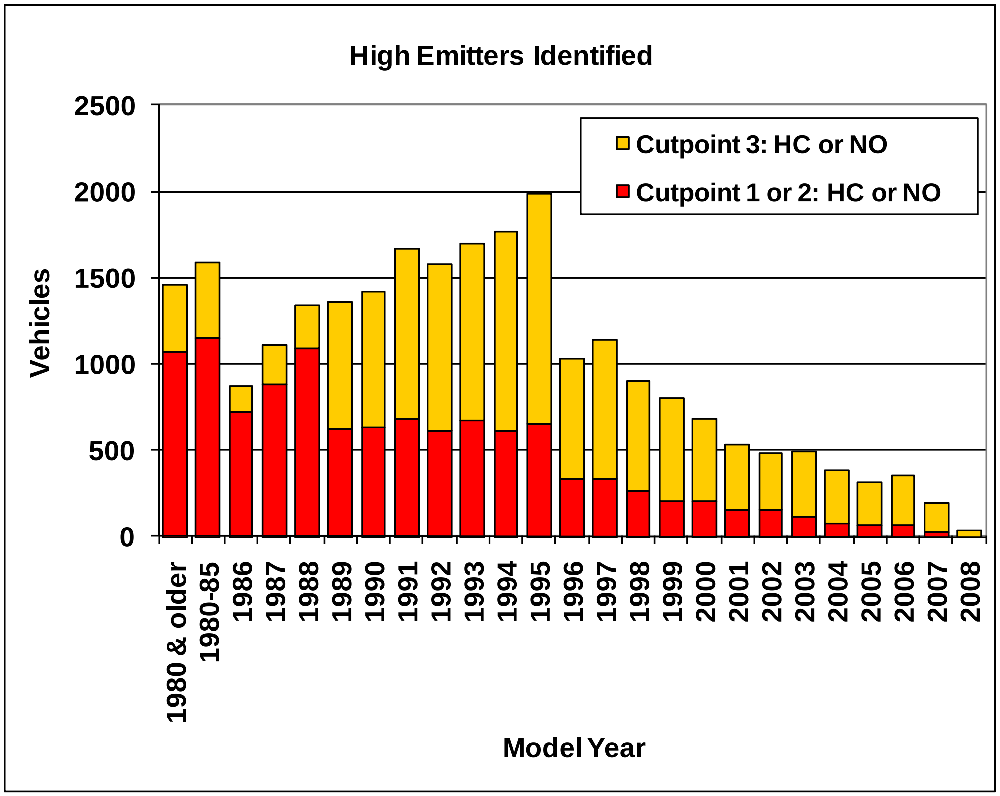


Figure III-7 Rate of HC & NO High Emitters by Model Year

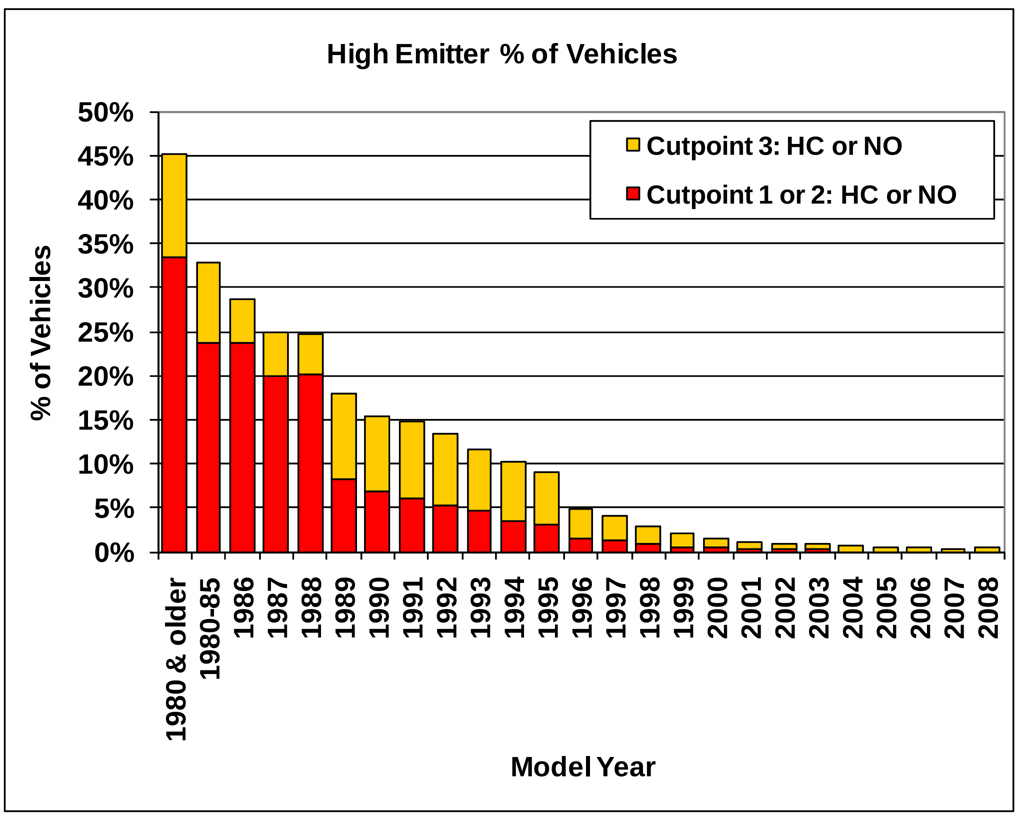


Figure III-8 HC High Emitters Reported

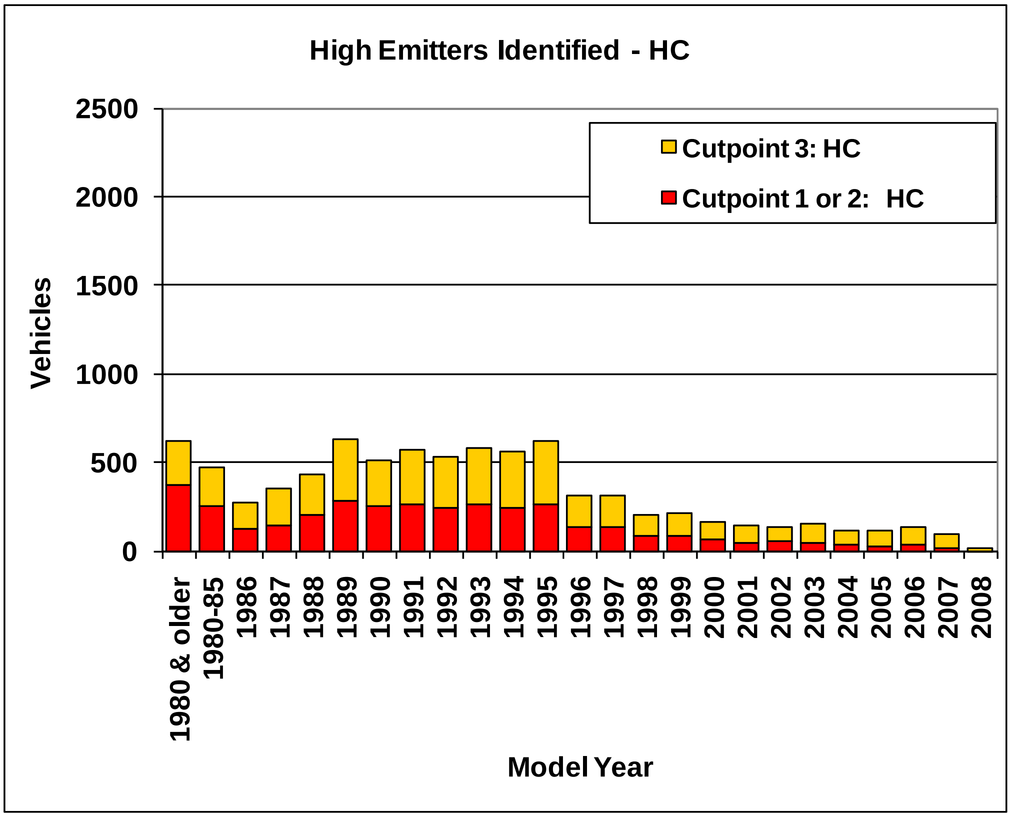


Figure III-9 Rate of HC High Emitters by Model Year

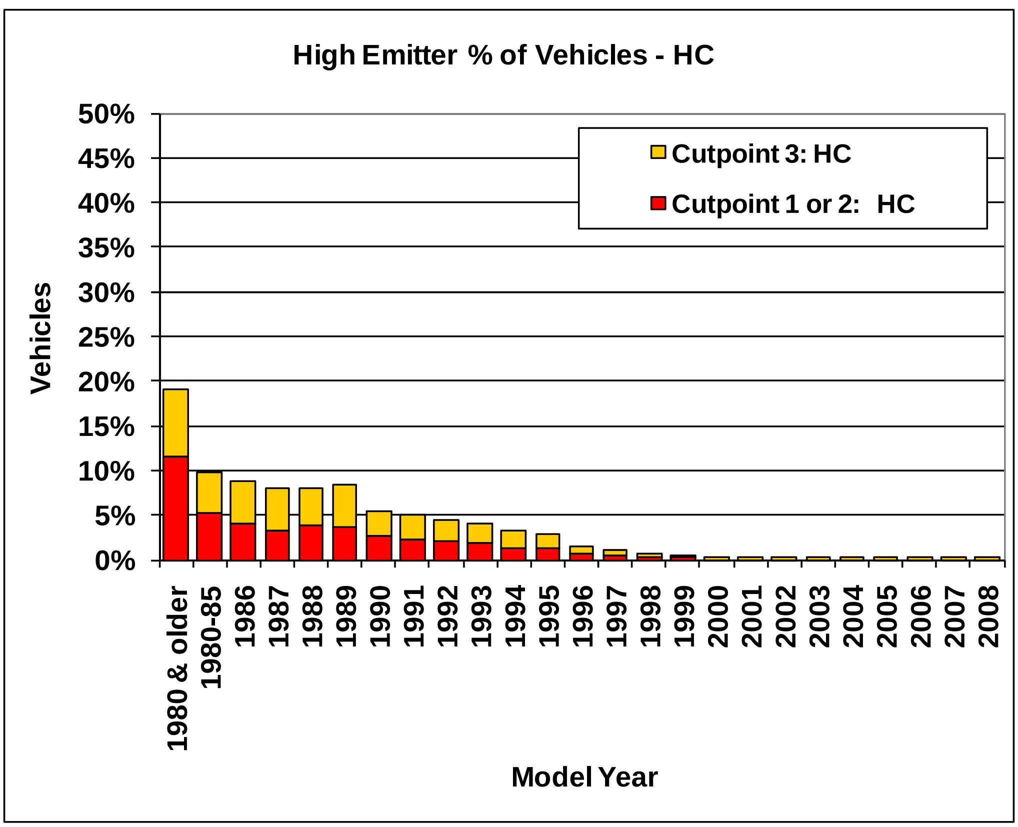


Figure III-10 NO High Emitters Reported

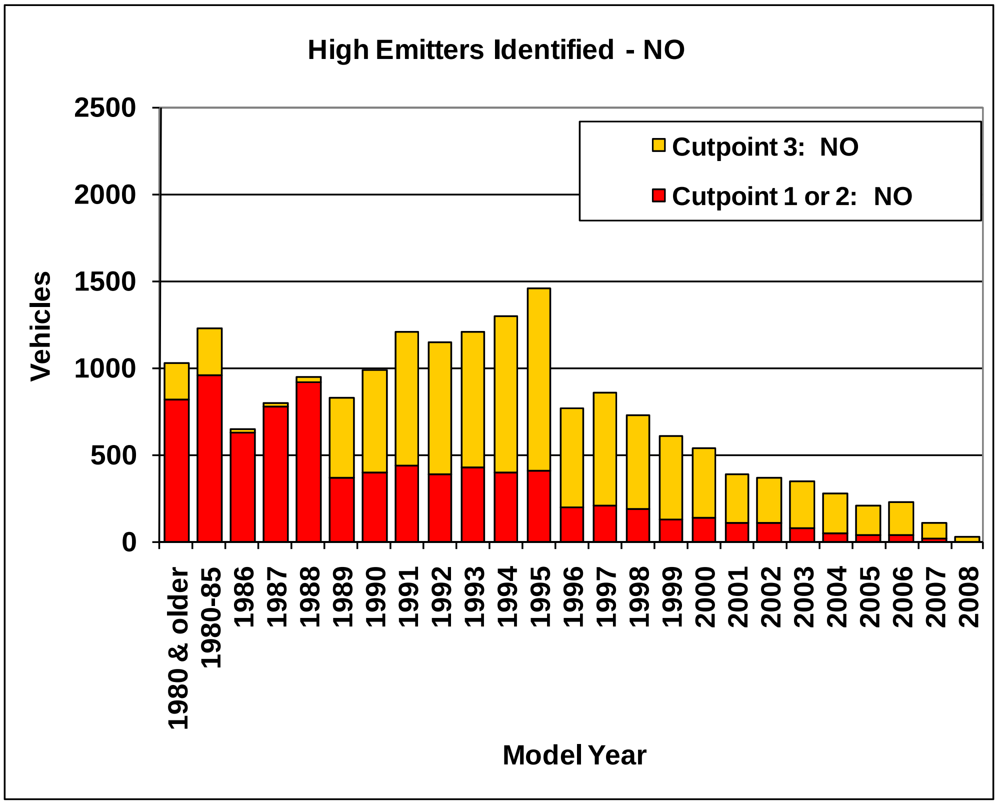


Figure III-11 Rate of NO High Emitters by Model Year

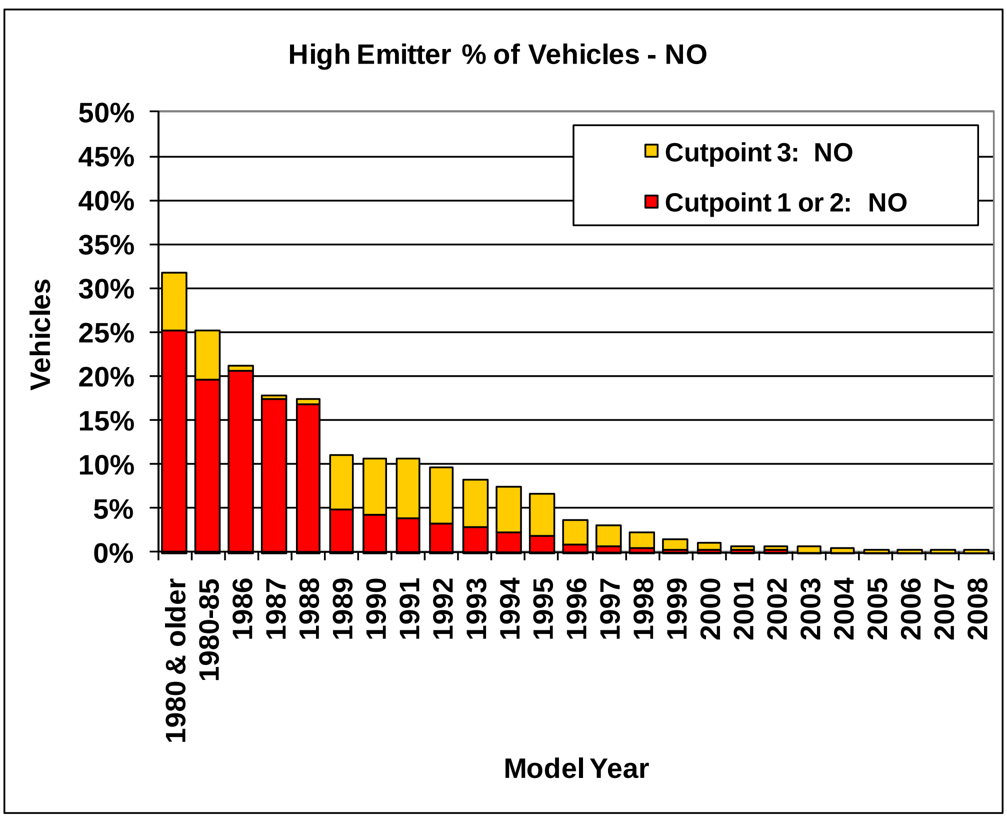


Figure III-12 UV Smoke (PM) High Emitter Reported

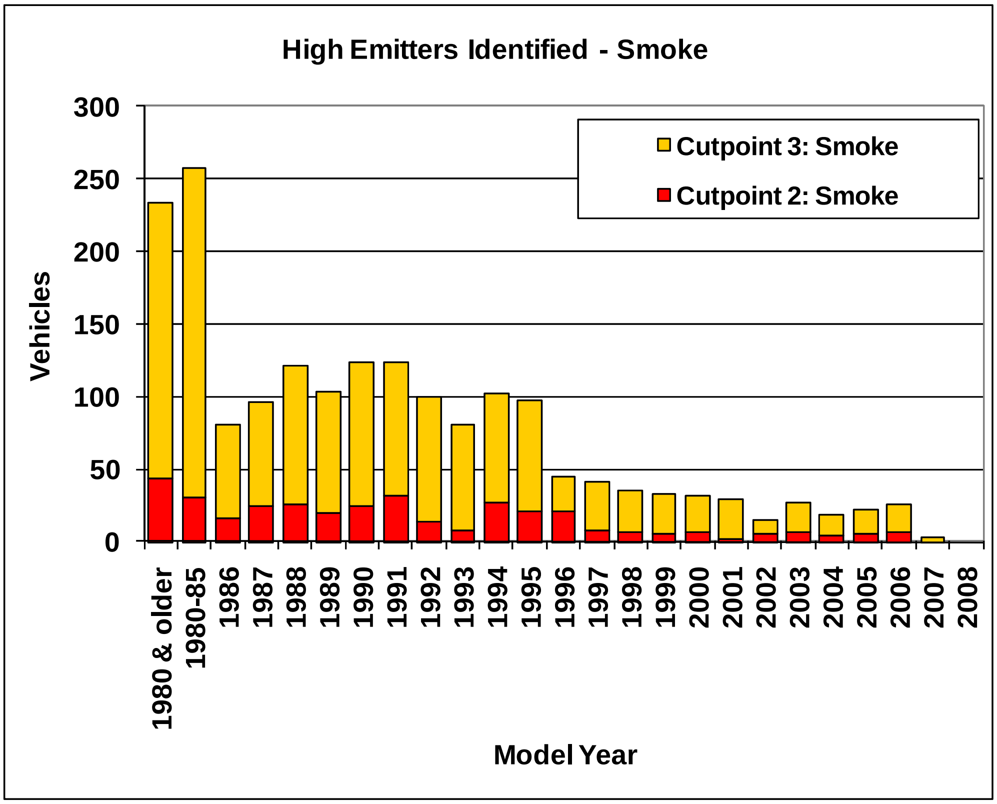
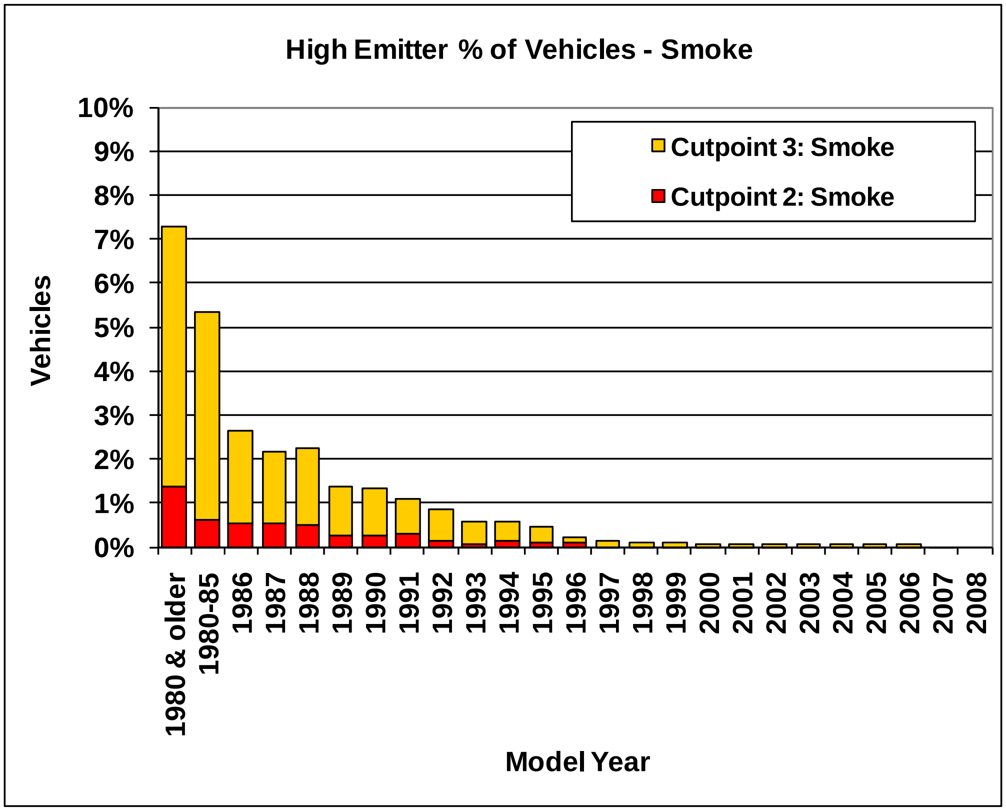


Figure III-13 Rate of UV Smoke (PM) High Emitters



D. Recruited High Emitters and Confirmation Test Results

Contacting, testing and recruitment of high emitters were managed by the Foundation for California Community Colleges (FCCC). FCCC is also the Smog Check program referee contractor.

Identified high emitters of HC or NO were contacted by FCCC and invited to visit a Referee station for confirmatory vehicle inspection and recruitment into the HEROS program. The HEROS program provides monetary incentives for voluntary repair of vehicles (VRV) or for voluntary accelerated vehicle retirement (VAVR). To improve convenience for vehicle owners, some Gold Shield Smog Check stations were invited to participate during the course of the program.

Through July 31, 2008, approximately 10% of the identified high emitters of HC or NO had obtained follow-up inspections.

To review confirmatory test results, ESP selected the most recent identification of each high emitter and the first Smog Check test performed after the date the vehicle was observed by RSD. In a few cases, earlier tests at a participating station were included on the assumption that these vehicles had also been reported earlier as high emitters.

Table III-5 shows the number of vehicles and their initial test results. Within the Smog Check program, vehicles with high exhaust emissions are categorized as High emitters or Gross emitters. Gross emitters are vehicles that failed the Smog Check exhaust emissions test by a wide margin. Vehicles identified as Tampered have passed the exhaust emissions test but have missing emissions control equipment or the equipment has been interfered with. The majority of the tests were not performed at a Referee facility or participating Gold Shield station, i.e. they were conducted outside the control of the pilot program.

Table III-5 First Test Results after High Emitter Identification (excluding aborts)

Station Type	Vehicles	%	Gross Emitter	High Emitter or Failed OBD	Tampered Only	Gross, High or Tampered
Referee	687	27%	35%	37%	8%	80%
Participating Gold Shield	8	0%	13%	25%	0%	38%
Other Stations	1843	73%	11%	19%	2%	33%
Total	2538					

Table III-6 provides a more detailed breakdown of tests and results for vehicles first visiting Referee stations. It shows the tailpipe tests used and the reason for the inspection. Vehicles received either an ASM test, a TSI test or both tests. For the vehicles given both ASM and TSI tests, the “worst” result from the two tests was used in order of, 1) gross emitter (G), 2) failed tailpipe or OBD (F), and 3) tampered (T). For

example if the ASM result was "F" and the TSI result was "G", the reported result is "G". This logic is the similar to that used to record the overall result in individual Smog Check tests.

For vehicles given both ASM and TSI tests, the reason for inspection was normally recorded as a training mode test. For vehicles given a single test the reason for inspection was normally recorded as a pre-test. A number of the TSI only tests were applied to heavier vehicles.

The overall failure rate of vehicles tested at referee stations was 80%. When vehicles were given both the ASM and TSI tests the failure rate increased to 92%. This is much higher than the failure rates of vehicles at Participating Gold Shield stations (38%) and other stations (33%).

Table III-6 First Test Results at Referee Stations

				Referee Inspection(s) Result			
Inspection(s)	Reason for Inspection		Vehicles	Gross Emitter	High Emitter or Failed OBD	Tampered	Gross, High or Tampered
ASM & TSI	**E**	**Training Mode Test**	**271**	**47%**	**35%**	**9%**	**92%**
ASM & TSI	Q	Pre-test	3	33%	33%	33%	100%
ASM & TSI	C	Change of Ownership	4	50%	25%	0%	75%
Subtotal			278	47%	35%	9%	92%
ASM Only	E	Training Mode Test	14	64%	21%	0%	86%
ASM Only	**Q**	**Pre-test**	**356**	**24%**	**40%**	**7%**	**71%**
ASM Only	C	Change of Ownership	6	33%	33%	0%	67%
Subtotal			376	26%	40%	6%	72%
TSI Only	**E**	**Training Mode Test**	**21**	**48%**	**29%**	**10%**	**86%**
TSI Only	**Q**	**Pre-test**	**11**	**9%**	**27%**	**9%**	**45%**
TSI Only	C	Change of Ownership	1	0%	0%	0%	0%
Subtotal			33	33%	27%	9%	70%
Total Vehicles			687	35%	37%	8%	80%

Table III-7 provides a more detailed breakdown of tests and results for vehicles first visiting regular Smog Check stations not directly participating in the pilot. Points of note include:

- Overall fail rates were far lower than at the Referee stations;
- Biennial test vehicles had the lowest fail rates, followed by change of owner and vehicles identified by the California high emitter profile;
- There was a high percentage (43%) of change of owner tests.

The results suggest that one response of owners of high emitters is to trade the vehicle.

The lower failure rate at non-participating stations is important to note. The result is consistent with results reported by Eastern Research Group (ERG)[i]. In a comparison of roadside ASM and referee I/M Station ASM results (ERG table 9.5), 85% of vehicles failing roadside ASM subsequently failed at the Referee station. This is roughly the same failure rate as found in the high emitters selected by remote sensing and tested at Referee stations.

In a comparison of roadside ASM and regular I/M Station ASM results (ERG Table 9-6) out of 92 vehicles failing roadside ASM only 39 (42%) failed their subsequent Smog Check test. This is roughly consistent with the 33% failure rate found in the high emitters selected by remote sensing and subsequently tested at Smog Check stations.

The differences in subsequent failure rates at Referee stations vs. Smog Check stations is believed to result from repairs being performed in advance of the subsequent inspection, from high emitter vehicle variability or from a lack of rigor in the Smog Check station inspection.

ARB evaluations of Smog Check using random roadside ASM tests also found that to be true. For vehicles failing and subsequently passing a Smog Check test, which we refer to as 'fail-pass' vehicles, 40% failed ASM roadside tests within a year[vi]. In this case the high failure rate of 'fail-pass' vehicles on random roadside ASM tests suggests either high emitter vehicle variability, lack of rigor in the Smog Check station inspection or short-lived repairs.

Whatever the causes of the low failure rate of high emitters at Smog Check stations and high fail rate of 'fail-pass' vehicles at random roadside ASM tests, it is clear the accuracy and the benefits of remote sensing high emitter selection should not be judged by looking solely at subsequent Smog Check station results. Results from voluntary Referee Station tests and from immediate pullover studies are the most reliable indicators of the effectiveness of remote sensing high emitter selection. Since the failure rates in mandatory follow-up Smog Check tests were about half of the failure rates found in Referee or pullover studies, if Smog Check station results were used to estimate repair benefits of a remote sensing high emitter program, those repair benefits would need to be approximately doubled.

It is also important to know how many of the vehicles contacted remain actively registered. If vehicles were traded and resold outside California, there would be no follow-up test. In this case the high emitter is eliminated without payment of any incentive. The true benefit of the HEROS pilot is therefore the combination of:

- Retired (VAVR) vehicles;
- Repaired (VRV) vehicles, including those repaired before obtaining the follow-up Smog Check test;
- Incremental vehicles traded-in, repaired and retested (the change of owner vehicles);
- Incremental vehicles taken out of operation: a) traded-in and sold out-of-state, or b) scrapped outside of the pilot.

It is likely that the incremental change of owner and unreported trade or scrap benefits were greater than the calculated VAVR and VRV benefits.

Table III-7 First Test Results at Non-Participating Stations

				Non-Program Inspection(s) Result			
Inspection(s)	Reason for Inspection		Vehicles	Gross Emitter	High Emitter or Failed OBD	Tampered	Gross, High or Tampered
ASM & TSI	C	Change of Ownership	1	0%	0%	0%	0%
Subtotal			1	0%	0%	0%	0%
ASM Only	B	Biennial	102	4%	13%	1%	18%
ASM Only	C	Change of Ownership	743	9%	20%	2%	31%
ASM Only	D	0.1% Random Sample	6	33%	33%	33%	100%
ASM Only	E	Training Mode Test	1	100%	0%	0%	100%
ASM Only	I	Initial Registration	2	0%	0%	0%	0%
ASM Only	P	High Emitter Profile(HEP)	800	14%	19%	2%	35%
ASM Only	Q	Pre-test	52	29%	46%	4%	79%
ASM Only	S	1.9% Random Sample	36	19%	28%	0%	47%
Subtotal			1742	12%	20%	2%	34%
TSI Only	B	Biennial	24	0%	4%	0%	4%
TSI Only	C	Change of Ownership	51	4%	10%	0%	14%
TSI Only	D	0.1% Random Sample	1	0%	0%	0%	0%
TSI Only	P	High Emitter Profile(HEP)	22	0%	0%	0%	0%
TSI Only	Q	Pre-test	1	100%	0%	0%	100%
TSI Only	S	1.9% Random Sample	1	0%	0%	0%	0%
Subtotal			100	3%	6%	0%	9%
Total Vehicles			1843	11%	19%	2%	33%

RSD emissions of vehicles subsequently first tested at Referee stations or other Smog Check stations were similar. HC emissions of vehicles going to Referee stations were 12% higher for cutpoint series 1 & 2 and 2% higher for cutpoint series 3. NO emissions of vehicles going to Referee stations were 9% lower for cutpoint series 1 & 2 and 4% lower for cutpoint series 3.

Table III-8 shows the failure rates by type of Smog Check test performed, the cutpoint series and the type of facility attended. The highest failure rate of 92% occurred at referee facilities using both the ASM and TSI tests. For vehicles tested at Referee facilities using only the ASM test, failure rates were 77% for cutpoint series 1 & 2 and 67% for cutpoint series 3. At Smog Check stations not participating directly in the program, the equivalent failure rates were 36% and 31%.

Table III-8 First Test Results by Type of Station and Cutpoint Series

Station Type	Test	Cutpoints	Vehicles	Gross %	Fail %	Tamper %	All
Referee	ASM & TSI	1 or 2	278	47%	35%	9%	92%
	ASM Only	1 or 2	173	32%	38%	8%	77%
	ASM Only	3	203	21%	41%	5%	67%
	TSI Only	1 or 2	25	44%	28%	8%	80%
	TSI Only	3	8	0%	25%	13%	38%
Subtotal			687	35%	37%	8%	80%
Participating Gold Shield	ASM Only	1 or 2	6	17%	17%	0%	33%
	ASM Only	3	2	0%	50%	0%	50%
Subtotal			8	13%	25%	0%	38%
Other Stations Not in Pilot	ASM & TSI	1 or 2	1	0%	0%	0%	0%
	ASM Only	1 or 2	1018	15%	19%	3%	36%
	ASM Only	3	724	7%	22%	2%	31%
	TSI Only	1 or 2	67	3%	9%	0%	12%
	TSI Only	3	33	3%	0%	0%	3%
Subtotal			1843	11%	19%	2%	33%
Total			2538	18%	24%	4%	45%

Tables III-9 and III-10 show failure rates for RSD HC high emitters and RSD NO high emitters.

Table III-9 First Test Results by Type of Station and Cutpoint Series for RSD HC High Emitters

Station Type	Test	Cutpoints	Vehicles	Gross %	Fail %	Tamper %	All
Referee	ASM & TSI	1 or 2	72	39%	43%	10%	92%
	ASM Only	1 or 2	56	38%	39%	11%	88%
	ASM Only	3	67	37%	31%	1%	70%
	TSI Only	1 or 2	6	67%	17%	0%	83%
Subtotal			201	39%	37%	7%	83%
Participating Gold Shield	ASM Only	1 or 2	2	0%	0%	0%	0%
	ASM Only	3	1	0%	100%	0%	100%
Subtotal			3	0%	33%	0%	33%
Other Stations Not in Pilot	ASM & TSI	1 or 2	1	0%	0%	0%	0%
	ASM Only	1 or 2	291	14%	19%	4%	37%
	ASM Only	3	284	9%	23%	2%	33%
	TSI Only	1 or 2	20	10%	0%	0%	10%
	TSI Only	3	9	0%	0%	0%	0%
Subtotal			605	11%	20%	3%	34%
Total			809	18%	24%	4%	46%

Table III-10 First Test Results by Type of Station and Cutpoint Series for RSD NO High Emitters

Station Type	Test	Cutpoints	Vehicles	Gross %	Fail %	Tamper %	All
Referee	ASM & TSI	1 or 2	213	51%	32%	9%	92%
	ASM Only	1 or 2	122	30%	36%	7%	73%
	ASM Only	3	143	14%	45%	6%	65%
	TSI Only	1 or 2	19	37%	32%	11%	79%
	TSI Only	3	8	0%	25%	13%	38%
Subtotal			505	34%	36%	8%	78%
Participating Gold Shield	ASM Only	1 or 2	4	25%	25%	0%	50%
	ASM Only	3	1	0%	0%	0%	0%
Subtotal			5	20%	20%	0%	40%
Other Stations Not in Pilot	ASM Only	1 or 2	754	16%	19%	2%	36%
	ASM Only	3	479	6%	22%	2%	30%
	TSI Only	1 or 2	49	0%	12%	0%	12%
	TSI Only	3	27	4%	0%	0%	4%
Subtotal			1309	11%	19%	2%	32%
Total			1819	18%	24%	4%	45%

Figure III-14 to 17 compare average RSD emissions to ASM emissions at Referee stations. On-road RSD HC emissions are higher than ASM emission – even for vehicles failing the ASM test as Smog Check gross emitters. On-road NO emissions are similar to the ASM NOx emissions of vehicles failing ASM as Smog Check gross emitters.

In the case of vehicles failing the RSD HC high emitter cutpoint series 1 & 2, the average on-road emissions varied significantly with the ASM test result, or vice-versa. Some relationship was also observed for vehicles failing the RSD NO high emitter series 1 & 2. For vehicles failing cutpoint series 3, there was little difference in the average on-road RSD emissions vs. the ASM test result.

Figure III-14 RSD and ASM HC – Cutpoint series 1 & 2

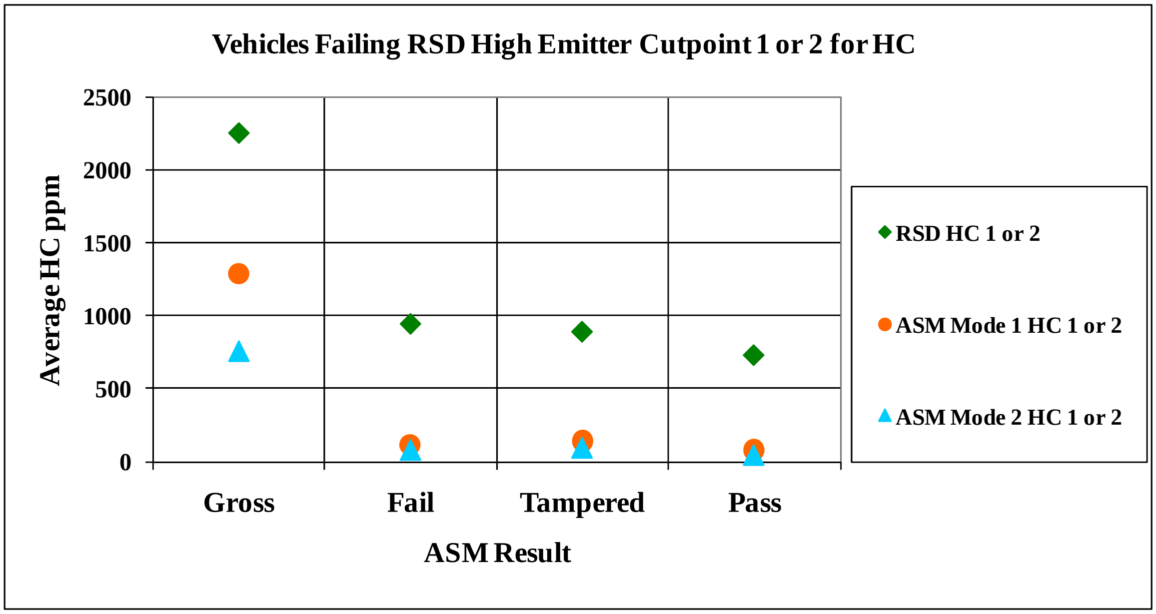


Figure III-15 RSD and ASM HC – Cutpoint series 3

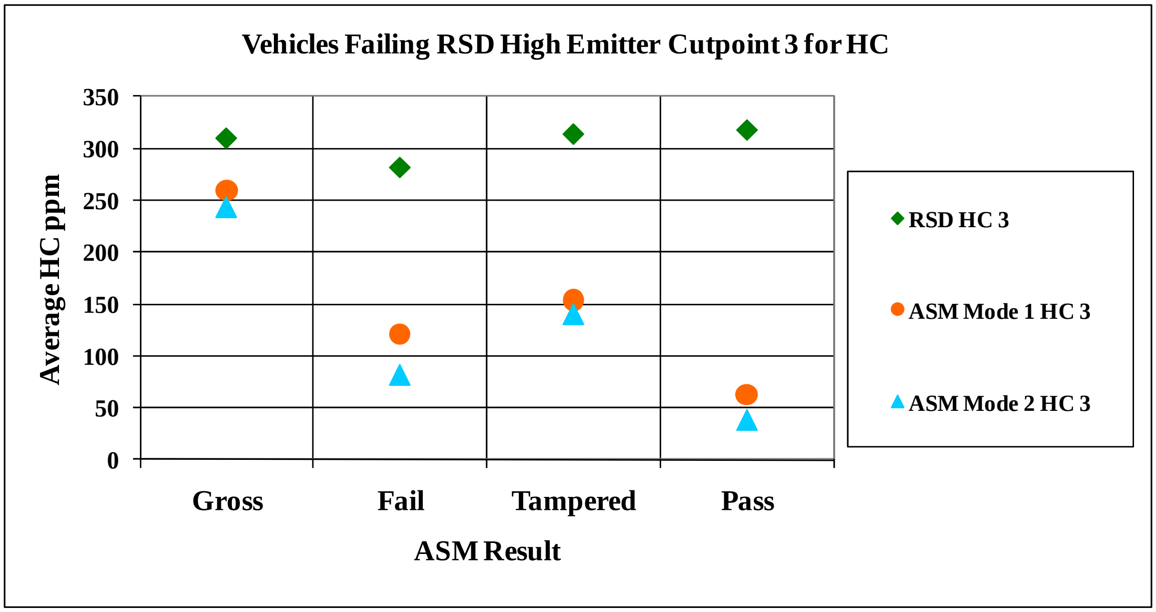


Figure III-16 RSD and ASM NOx – Cutpoint series 1 & 2

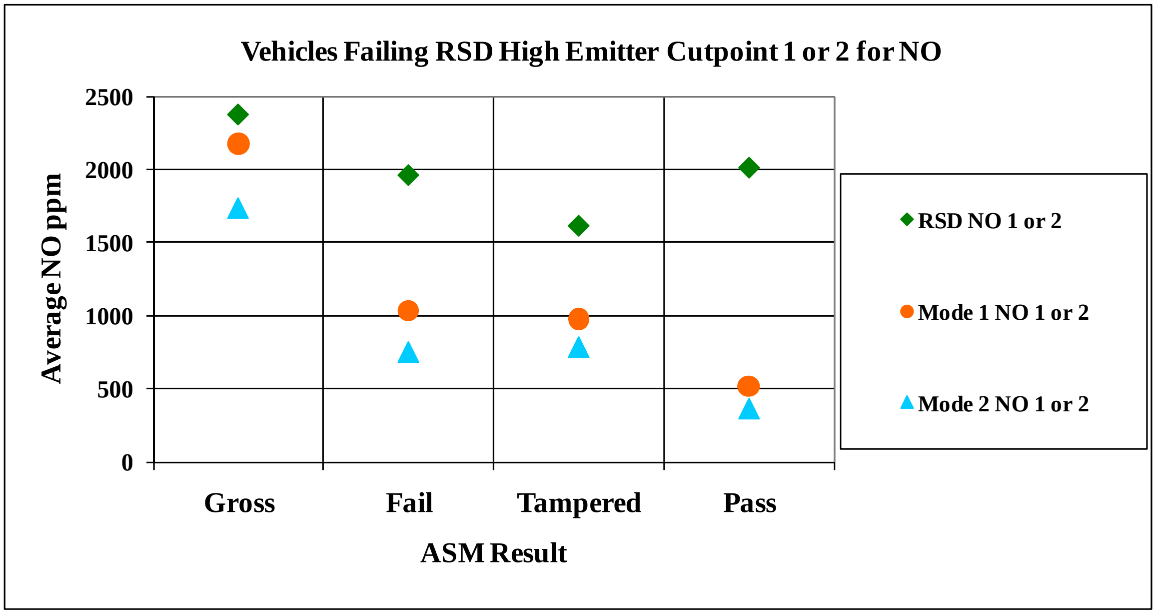
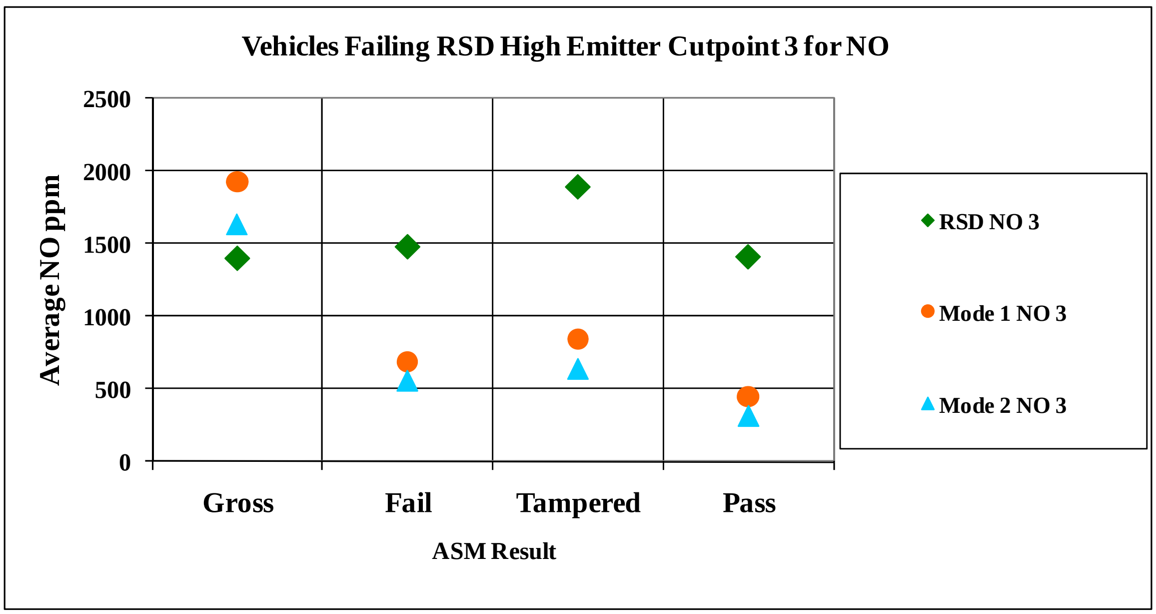


Figure III-17 RSD and ASM NOx – Cutpoint series 3



E. High PM Emitters

As noted earlier, ESP identified 1,974 high emitters of particulate matter (PM). Although light- and medium-duty diesel vehicles are a small fraction (~1.4%) of the on-road fleet measurements, they were 27% of the high PM vehicles. Figure III-18 shows the numbers of high PM vehicles by model year and Figure III-19 shows the percentage of vehicles in

each model year that emitted high PM. More than one quarter of 1990 and older model diesels emitted high levels of particulates.

Figures III-20 and 21 illustrate the tailpipe emissions from high PM emitters.

Air Resources Board and AQMD are currently assessing particulate emissions from gasoline vehicles and researching economic methods of testing for high particulate emissions.

Figure III-18 High PM Vehicles by Model Year

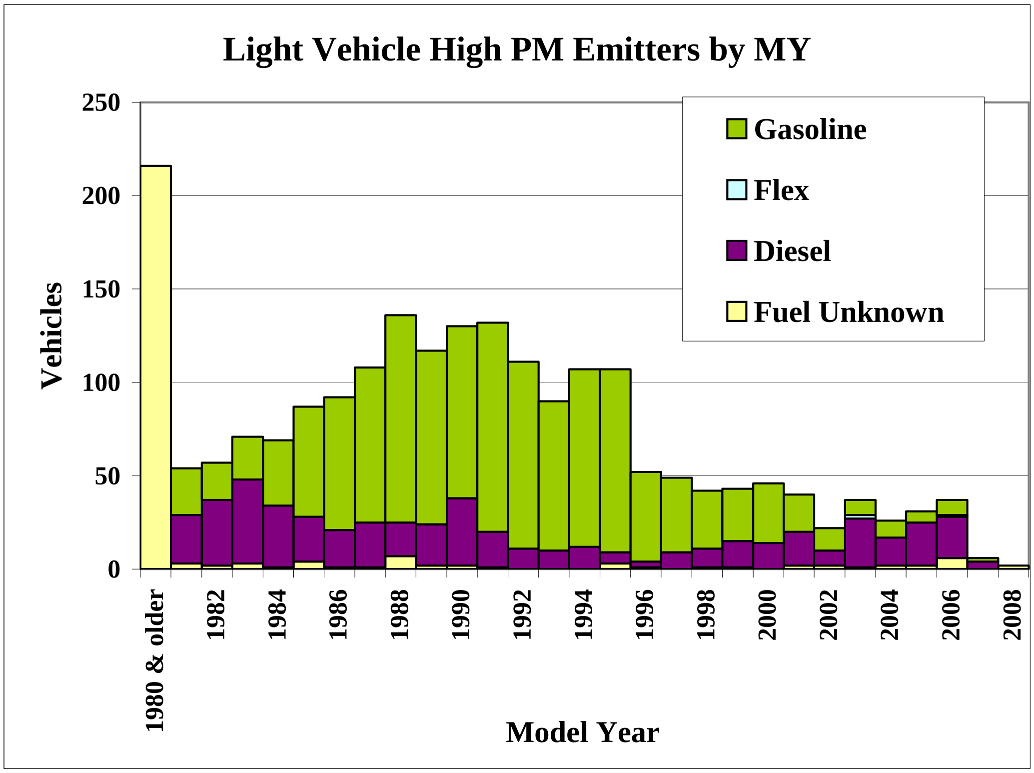


Figure III-19 Frequency of High PM Vehicles by Model Year

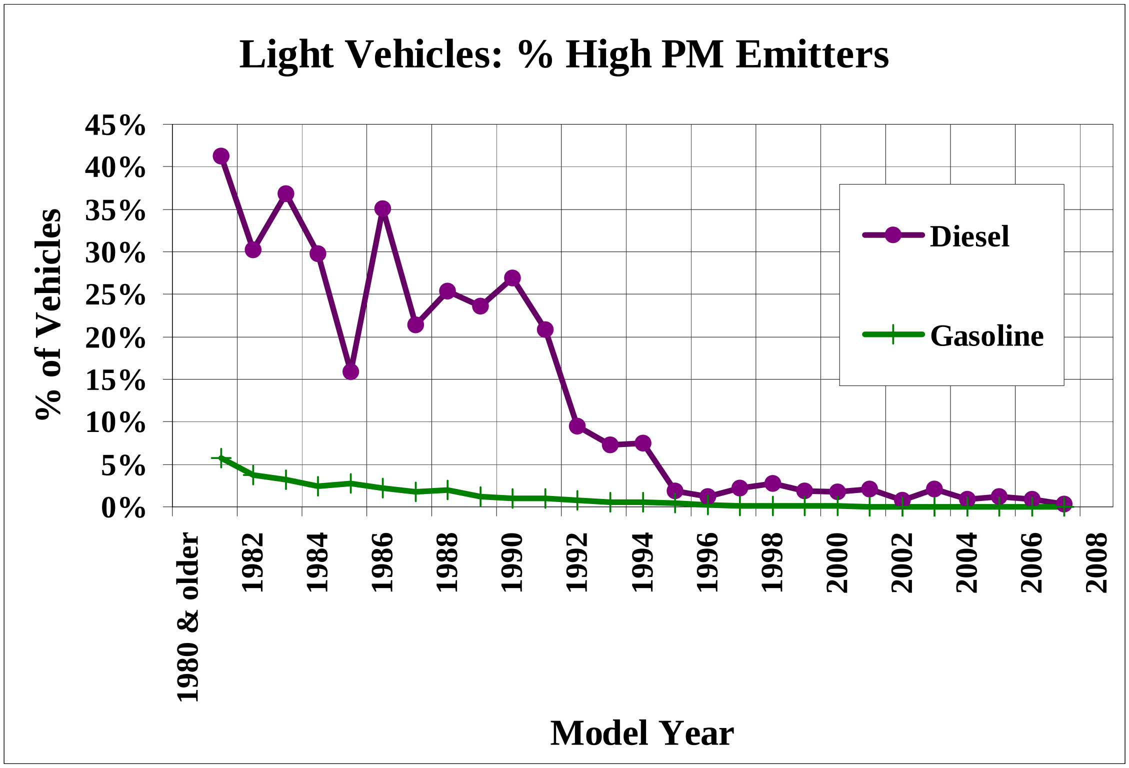


Figure III-20 Examples of High PM Gasoline Vehicles

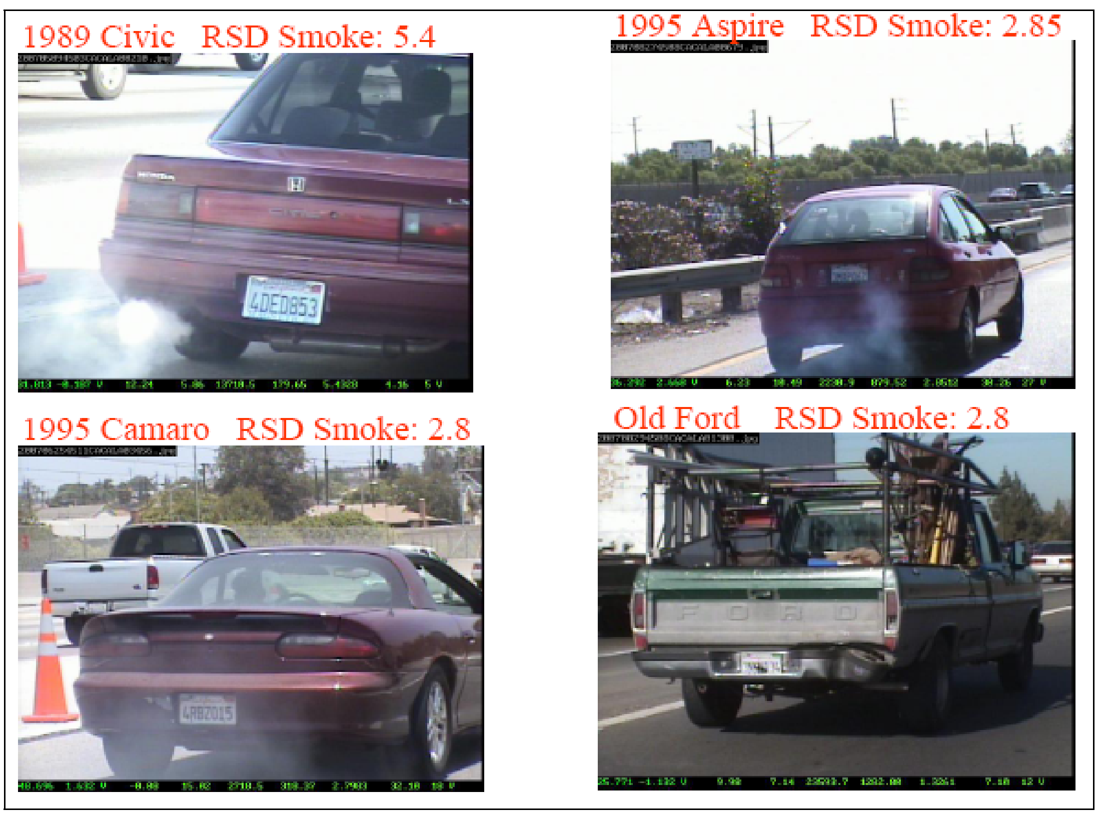


Figure III-21 Examples of High PM Diesel Vehicles

IV. AQMD On-Road Fleet Characterization

A. Average Emissions and Approximate Contributions

Figures IV-1 to IV-8 show average emissions and approximate contributions to emissions by vehicle type and model year for the major vehicle types.

The data covered light and medium-duty vehicles with low exhausts. Heavy vehicles with high stack exhausts were not measured in the program and are not included in the results.

Data Screening

Data were screened for hours of data collection when more than 5% of 2003 and newer model vehicles recorded HC emissions greater than 250 ppm HC. Because typically very few of these newer model vehicles actually have high HC emissions on tests, they can be used as a quality control mechanism to detect and screen out periods that may have excessive cold start emissions, condensing exhaust or spray from tires. This screened out 0.8% of hours.

During equipment set-up and calibration, varying background emissions of HC and CO can result in small biases in HC and CO measurements. Median HC and CO running emissions of new model vehicles are typically zero or very close to zero. Data for each session were adjusted to match this condition. This resulted in a net decrease of 7 ppm HC and 0.01% CO. Results for NO and Smoke were not adjusted because to do so would have resulted in negative average emissions for the newest one or two models. This implies that median emissions of NO and smoke for 2003 to 2008 models are non-zero. While the adjustments applied of 7 ppm HC and 0.01% CO are tiny compared to emissions from high emitters, they are significant compared to average emissions of new model vehicles.

Projection of Emissions Contributions

For a particular model year, the number of RSD measurements is proportional to the vehicle miles traveled. To estimate approximate contributions, fuel economies were assumed and the contribution for a vehicle group was calculated as:

Proportionate contribution = Measurements x average emissions / fuel economy

Assumed fuel economies were:

Vehicle Type	Assumed Fuel Economy mpg
Gasoline Passenger	22
Gasoline Truck 1	20
Gasoline Truck 2	17
Gasoline Truck 3	12
Diesel Passenger	26
Diesel Truck 2	20
Diesel Truck 3	17

Diesel Truck 4	15
All 1980 & Older	18

The RSD smoke channel is calibrated such that a value of 1 corresponds approximately (depending on an average size distribution and assuming black smoke) to a diesel particle mass of 1% of fuel by weight. A vehicle with a reading of 1 is a “Black Smoker”. The conversion for gasoline smoke is more approximate. There are several different types of gasoline smoke including black smoke (carbon), blue smoke (oil) and white smoke (coolant). Since the mass of particulate matter will vary dependent on the type of smoke, a crude assumption is used that gasoline vehicle PM mass is 50% of black smoke. To calculate proportionate contributions of PM for gasoline vehicles, the reported RSD value was multiplied by 50%.

Results

Older vehicles have emissions that are many times those of new models. 1995 and older models were projected to account for 18% of vehicle miles traveled and 69%, 64%, 56% and 51% of HC, CO, NO and particulates respectively.

The 1990 to 1995 models emitted the greater mass of HC, CO and NO emissions compared to other years. Many of these 12 to17 year-old vehicles remained in operation and they had considerably higher average emissions than newer models.

Diesel vehicles had much higher NO and Smoke emissions – even for new models (Figure IV-7). The diesel vehicles were 1.4% of vehicles and contributed 20% of PM (Figure IV-8).

Figure IV-1 Average HC ppm by Vehicle Type

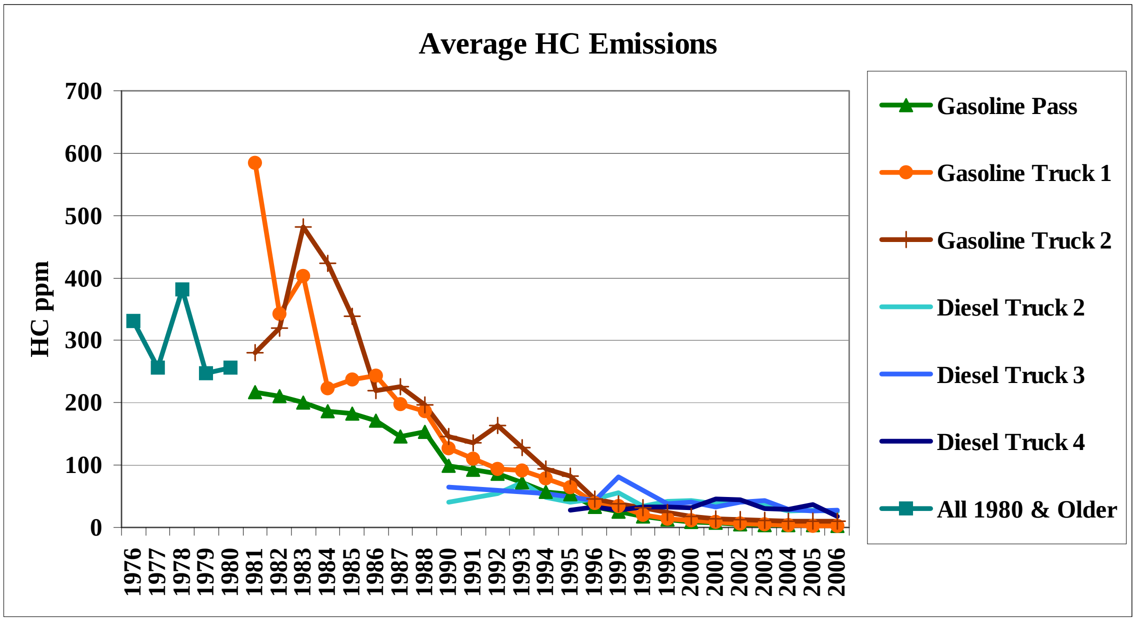


Figure IV-2 Approximate HC Contribution by Vehicle Type

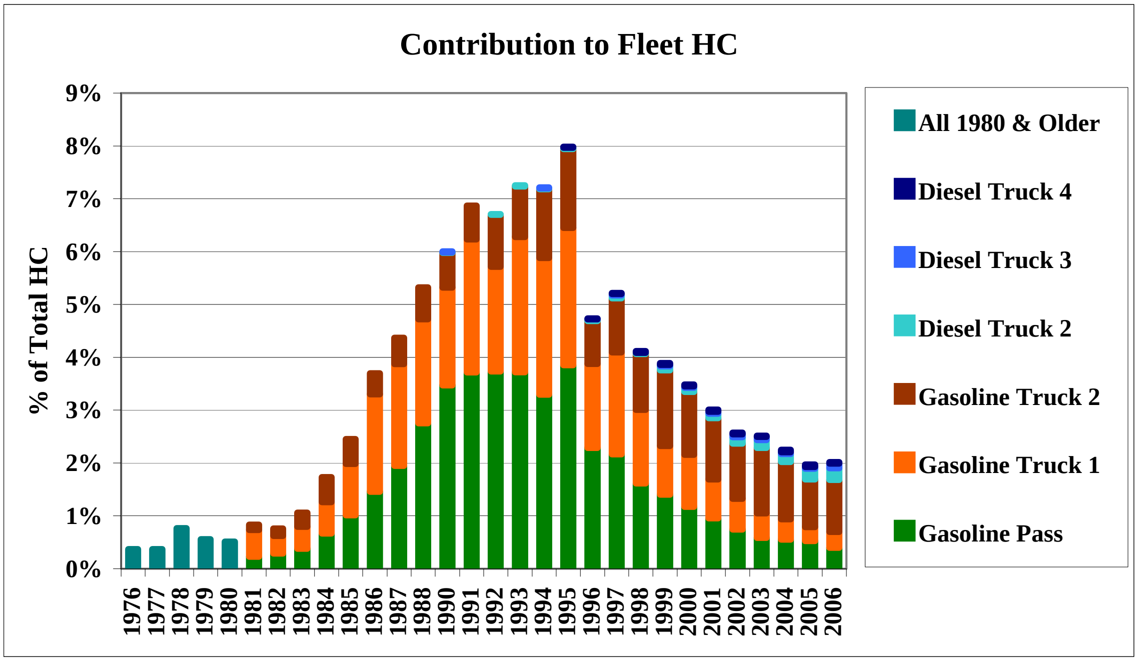


Figure IV-3 Average CO % by Vehicle Type

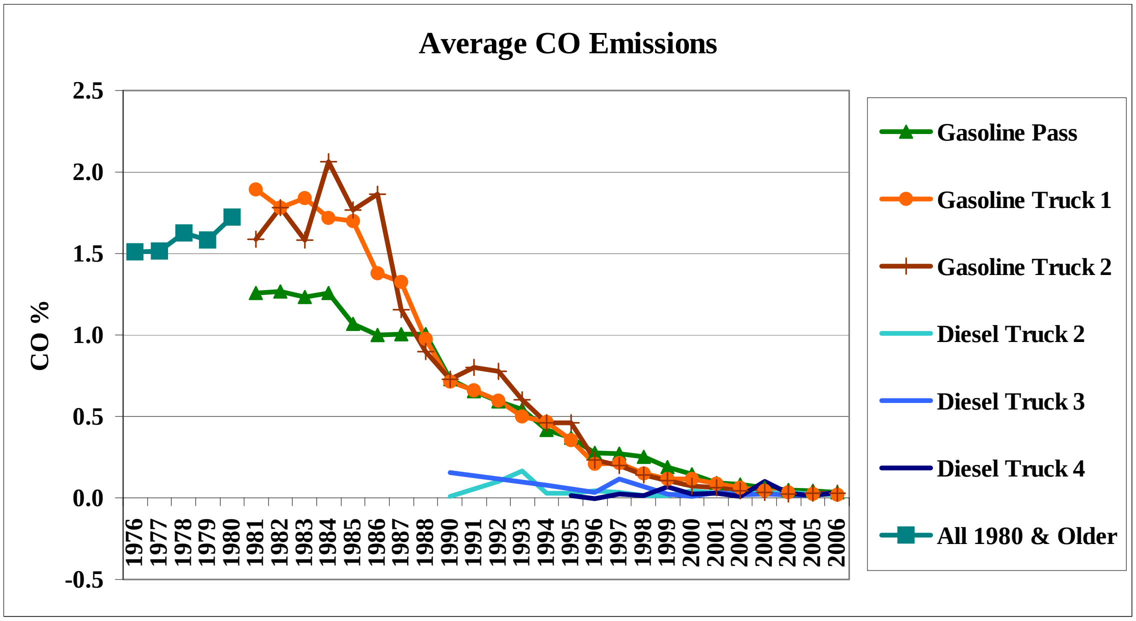


Figure IV-4 Approximate CO Contribution by Vehicle Type

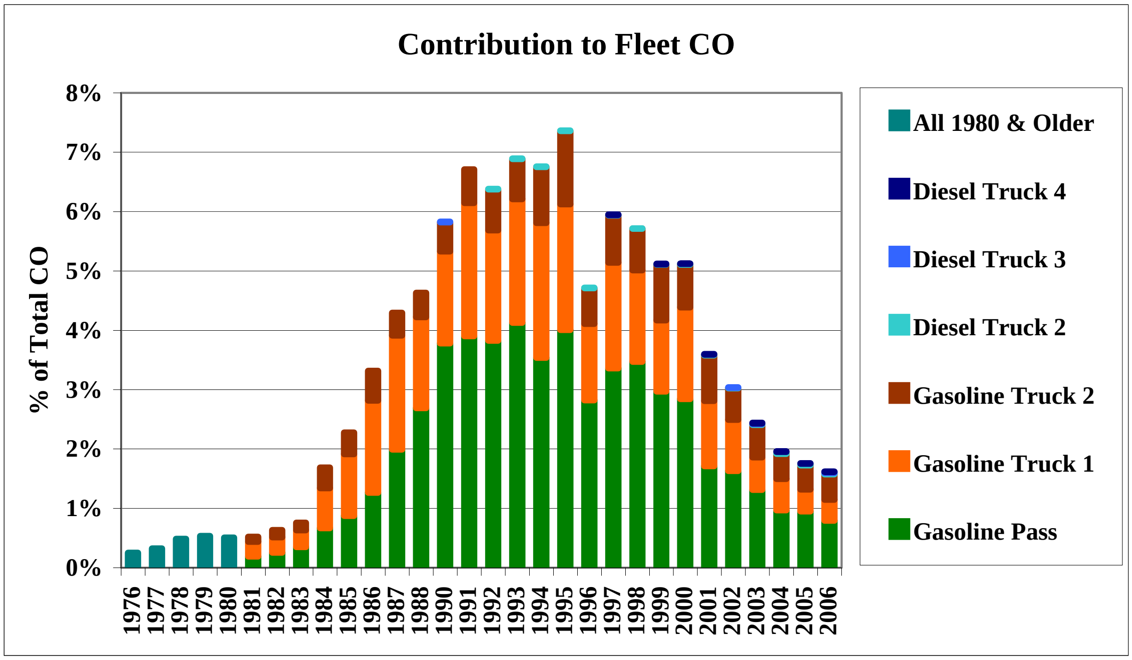


Figure IV-5 Average NO ppm by Vehicle Type

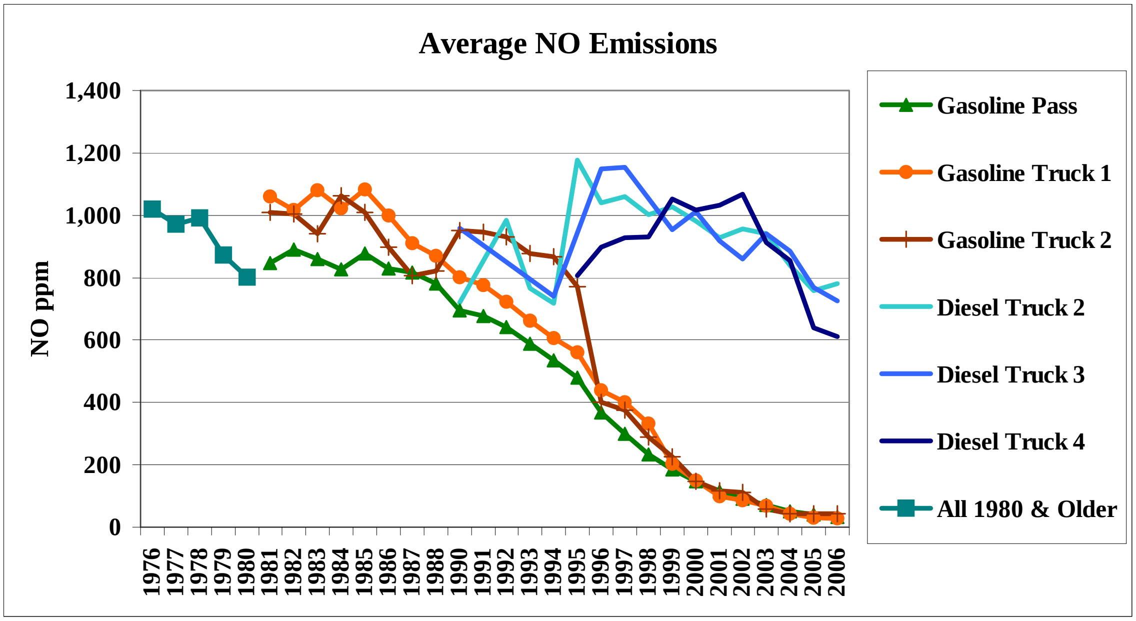


Figure IV-6 Approximate NO Contribution by Vehicle Type

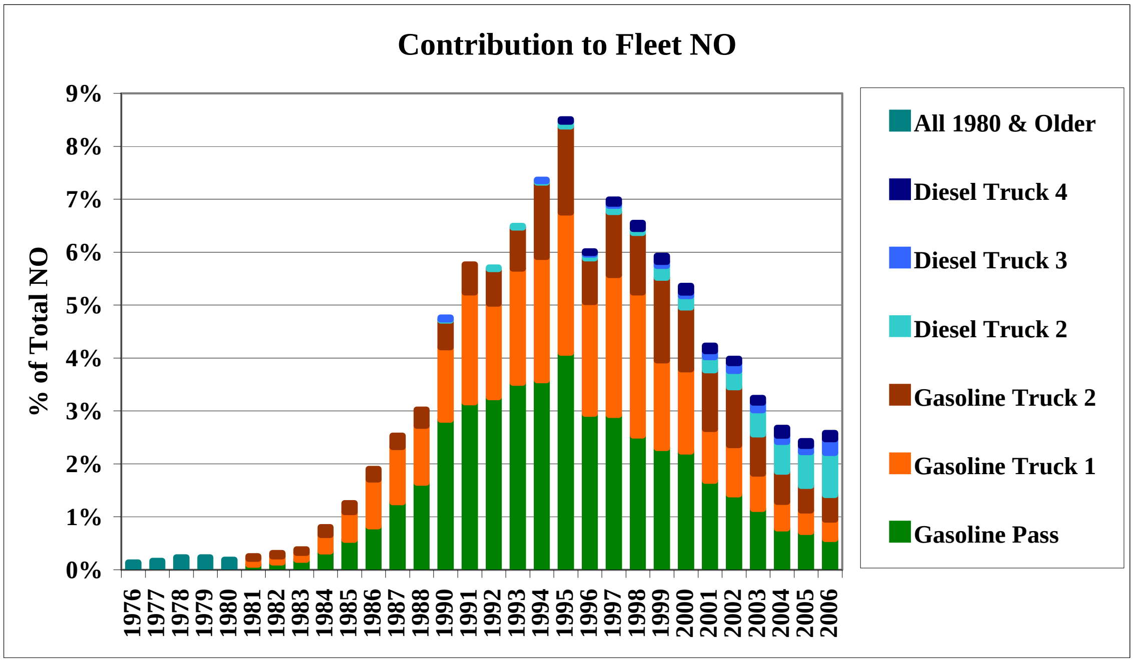


Figure IV-7 Average RSD Smoke Factor by Vehicle Type

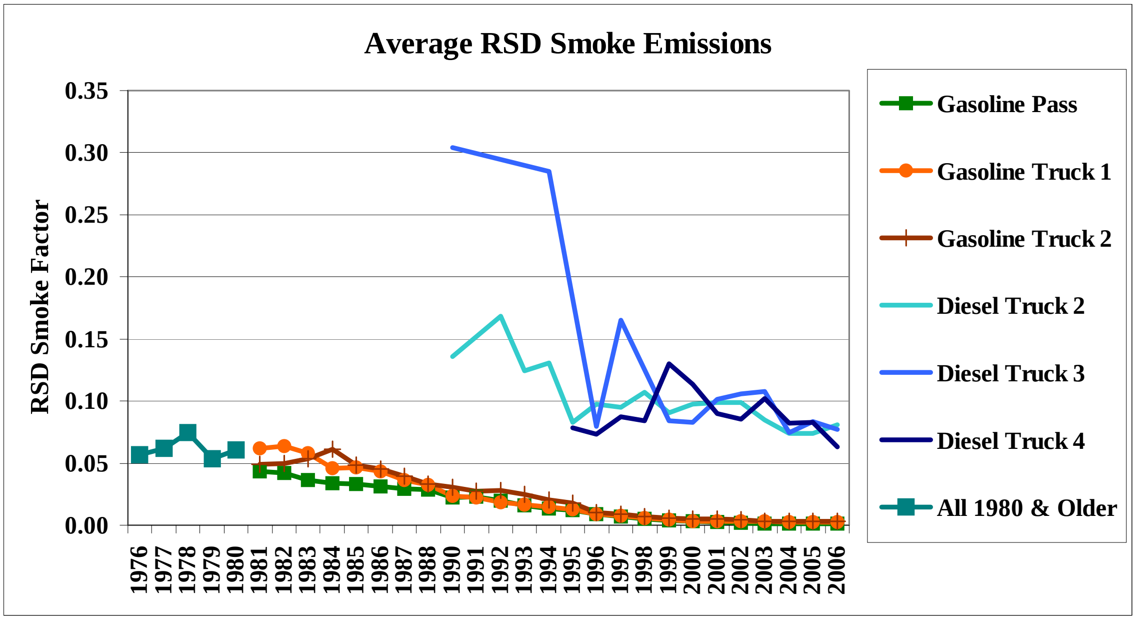
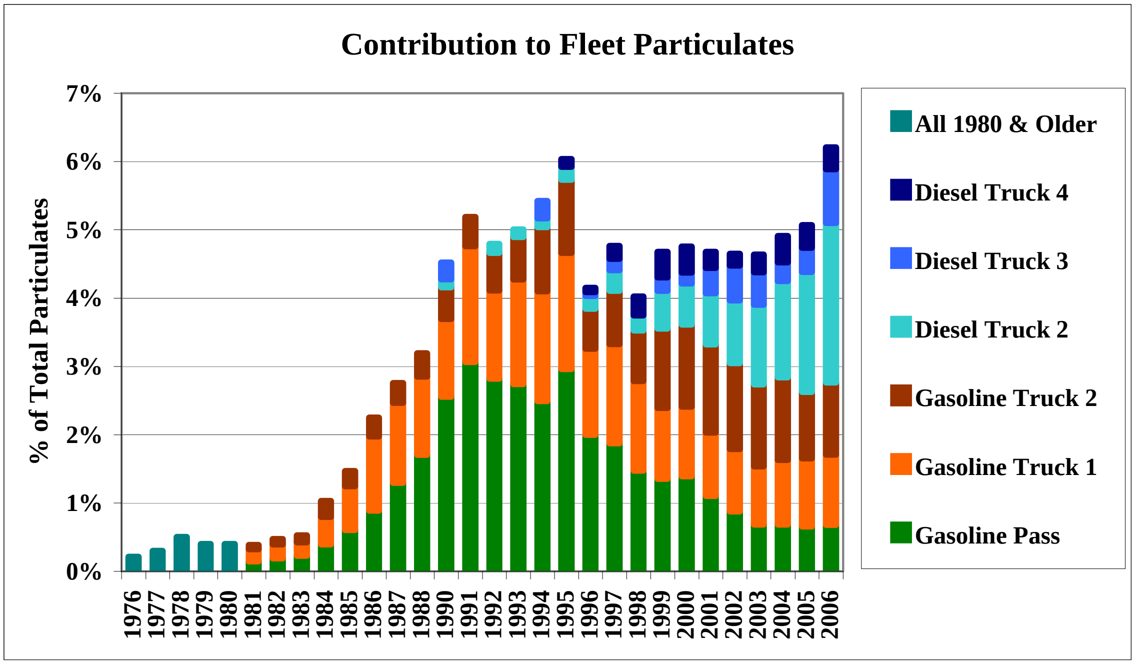


Figure IV-8 Approximate Particulates Contribution by Vehicle Type



B. Distribution of Vehicles by Emission Level

ESP created decile plots for each pollutant by model year (Figures IV-9 to IV-12). Measurements within each model year were sorted from cleanest to dirtiest and divided into ten groups with an equal number of results. Average emissions were then calculated for each of the ten groups.

Most of the vehicles within each model year are relatively clean. Within each model year, the emissions are skewed with the dirtiest 10% of vehicles contributing much of the emissions for the model year.

Newer model year vehicles generally have lower emissions than the older model year vehicles and progressively greater fractions of newer models are clean. A majority of newer model vehicles have virtually zero hot running emissions.

Figure IV-9 Model Year Emissions Deciles - HC

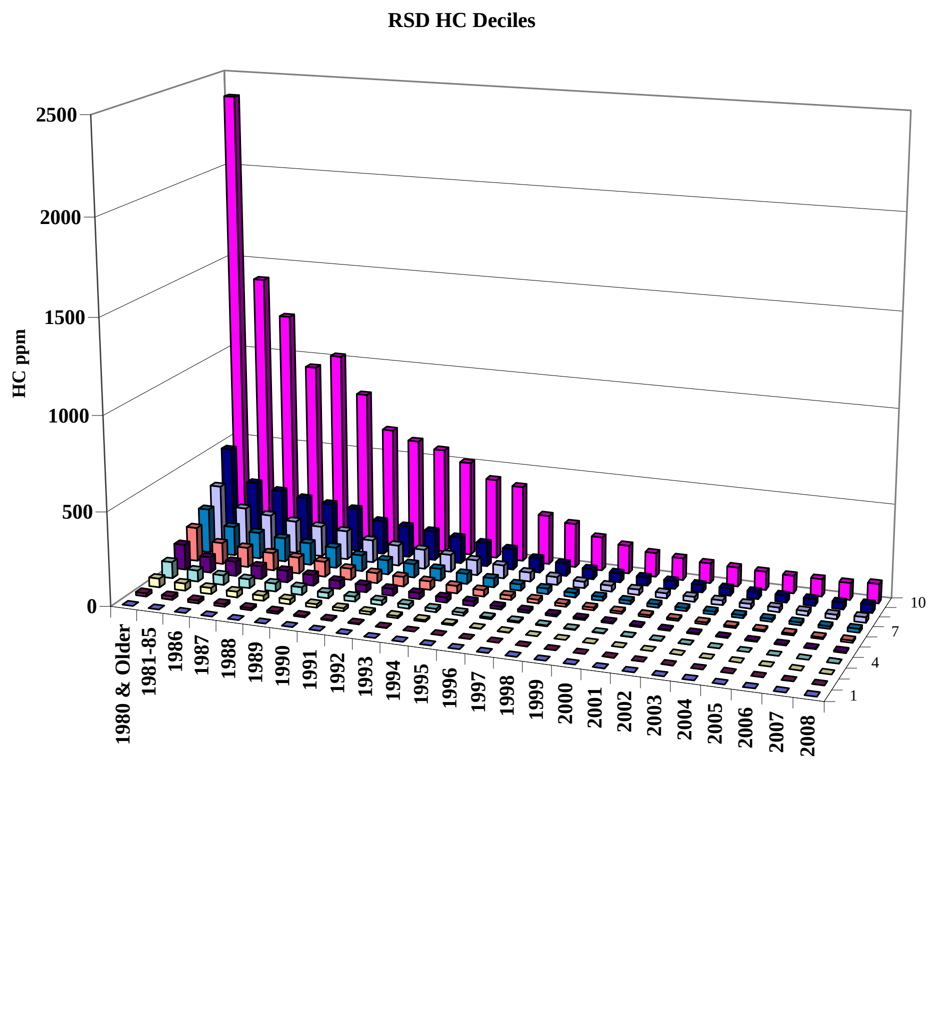


Figure IV-10 Model Year Emissions Deciles -CO

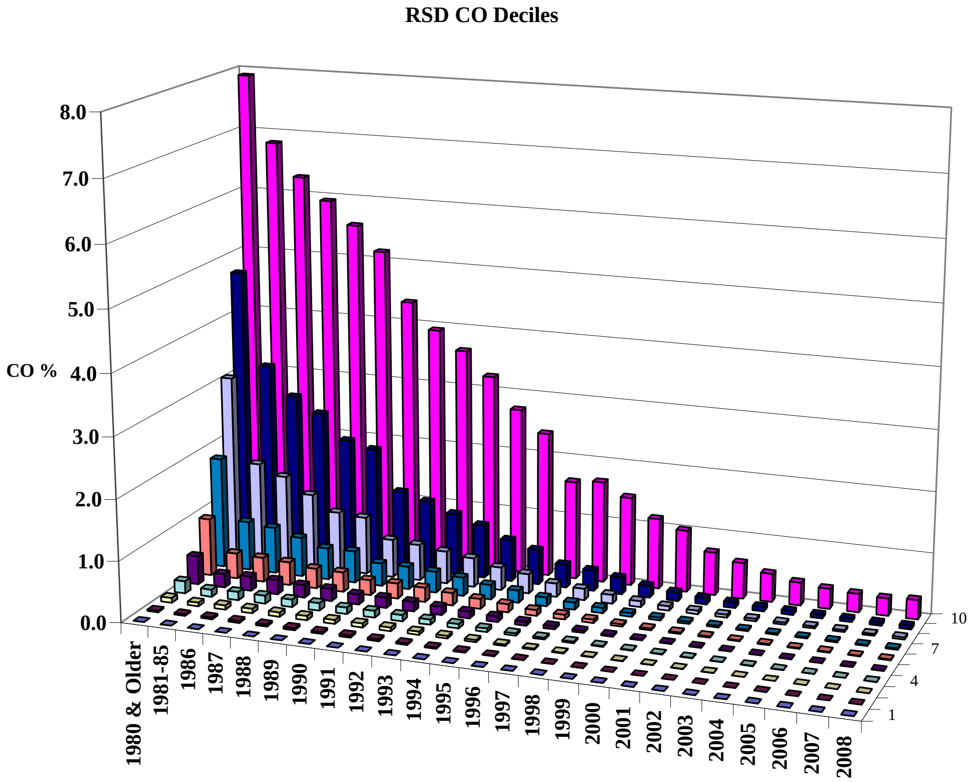


Figure IV-11 Model Year Emissions Deciles - NO

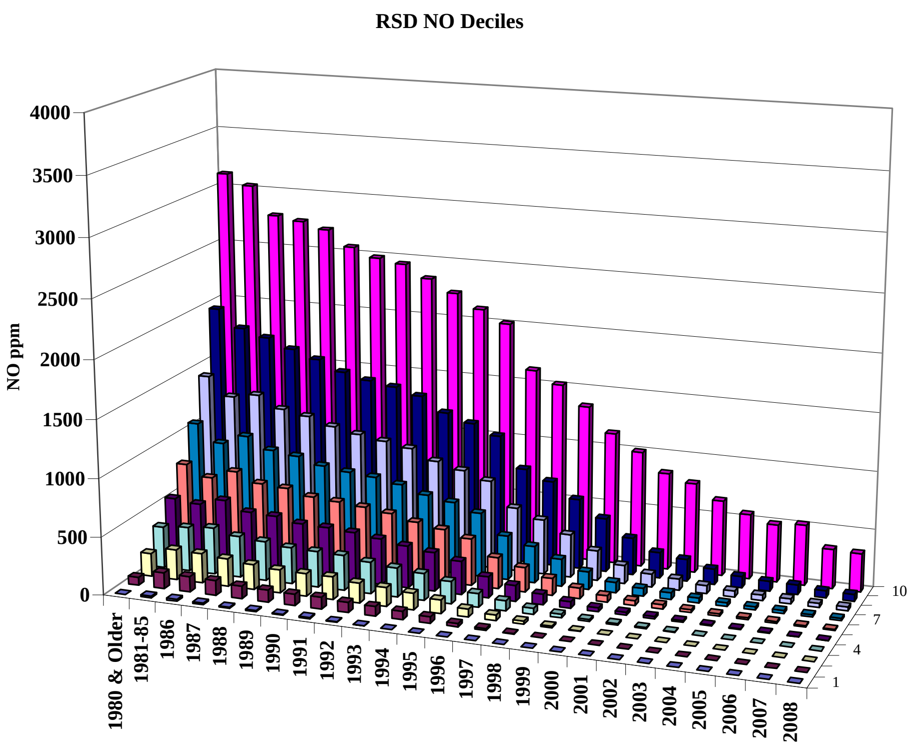
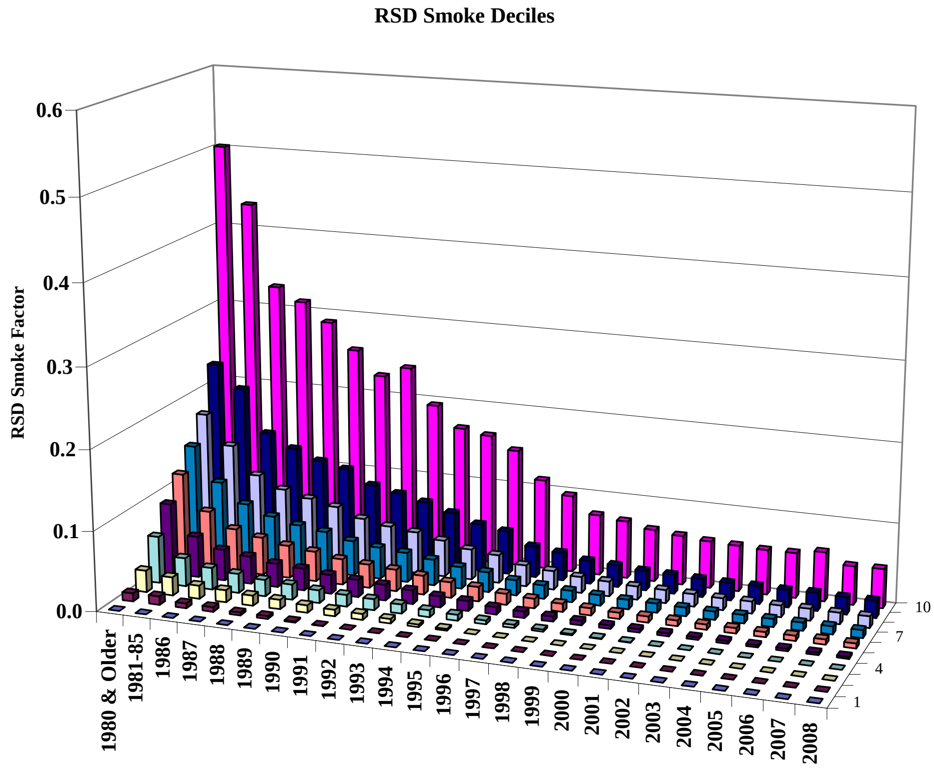


Figure IV-12 Model Year Emissions Deciles - Smoke/PM



C. Registrations Matched vs. Unmatched

Average emissions of vehicles with plates matched to registrations were compared to those for which plate matching registration information was never found. Data from the start of the program through the end of November 2007[1] were used in this comparison. Figure IV-13 shows that on-road operating conditions were similar for both sets of vehicles. Unmatched vehicles had emissions that were 18%, 15%, 7% and 7% higher for HC, CO, NO and RSD smoke respectively (Figure IV-14). The age distribution of the unmatched vehicles is unknown.

[1] As described in Section II, some problems occurred with the registration matching process after November 2007.

Figure IV-13: Matched and Unmatched Average Speed, Acceleration and VSP

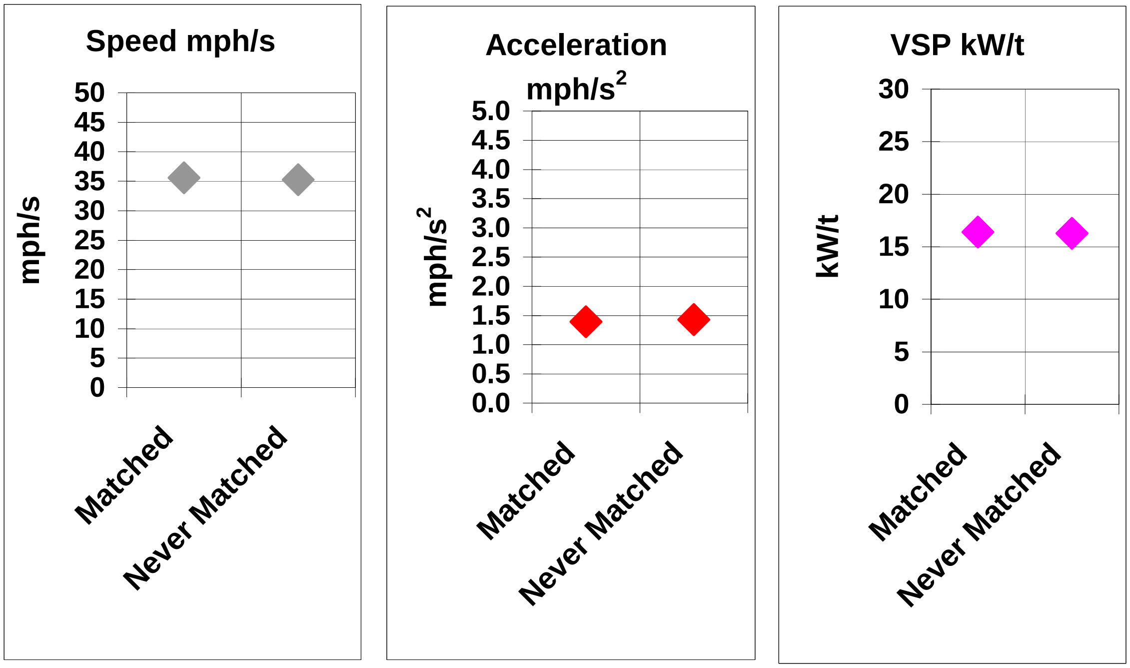
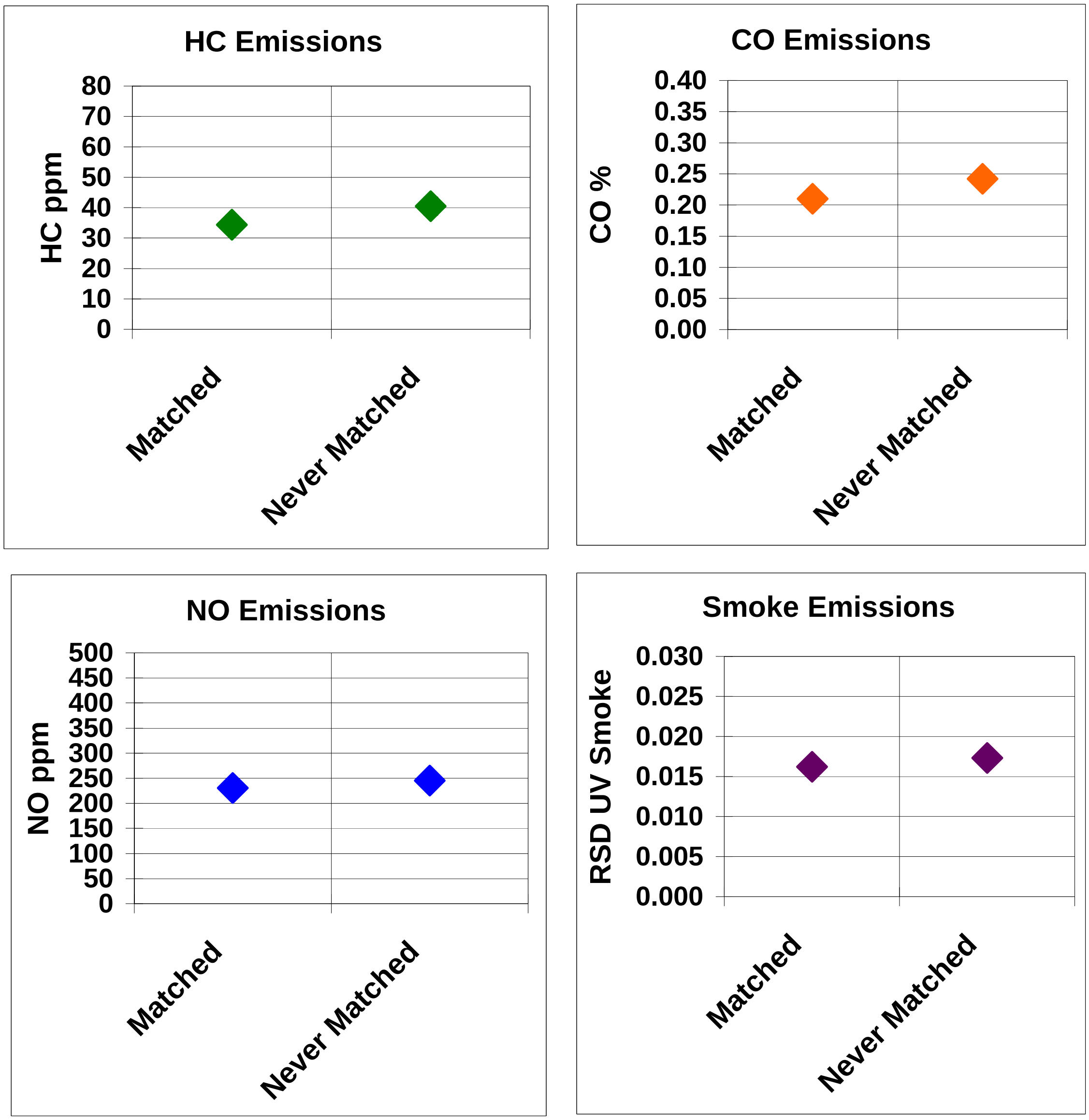


Figure IV-14: Matched and Unmatched Registration Plate Emissions



D. Emissions by County

Figures IV-16 through IV-18 show the average age of measured vehicles and average emissions by County. The four counties of the AQMD are show on the left of the charts. Values for vehicles registered in neighboring San Diego and Ventura counties are shown on the right together with the averages for vehicles registered in all other counties. Operating conditions were similar for vehicles measured from all counties.

San Diego, Ventura and other county vehicles were measured within the South Coast AQMD counties and may not be entirely representative of their home county on-road fleets.

Among South Coast AQMD counties, Los Angeles county vehicles were oldest on average. Los Angeles county vehicles also had the highest average emissions. San Bernardino county vehicles had higher HC emissions than might be expected based on their average age.

Figure IV-16 Average Vehicle Age and VSP by County

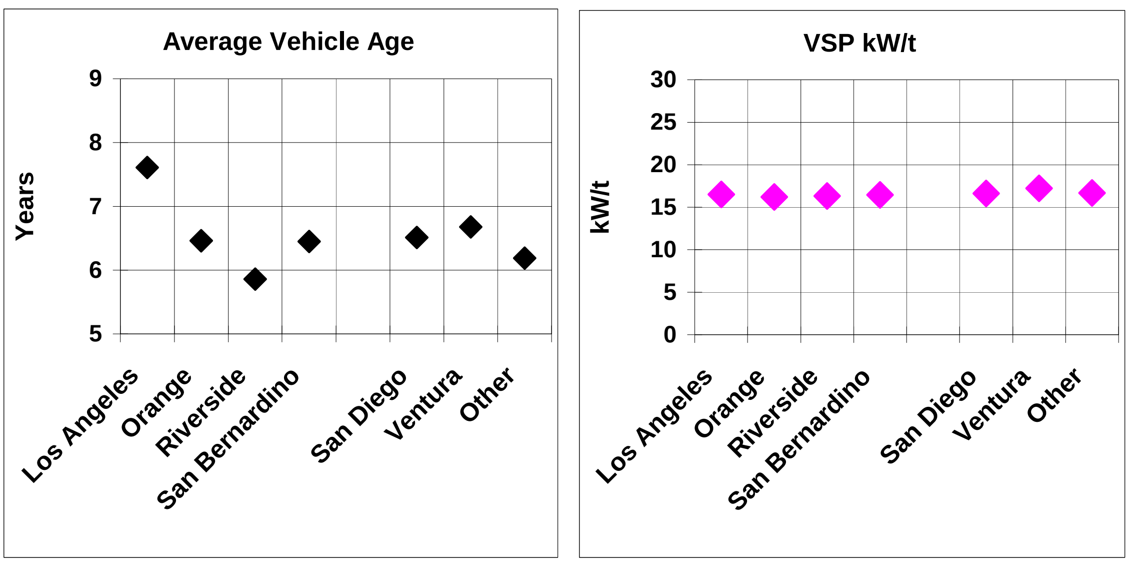


Figure IV-17 Average HC and CO Emissions by County

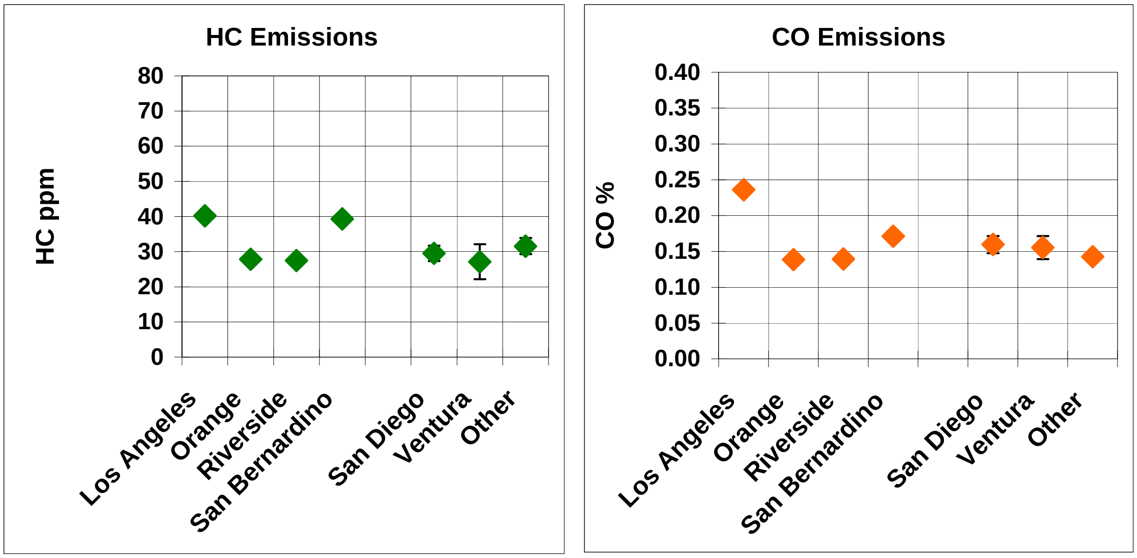
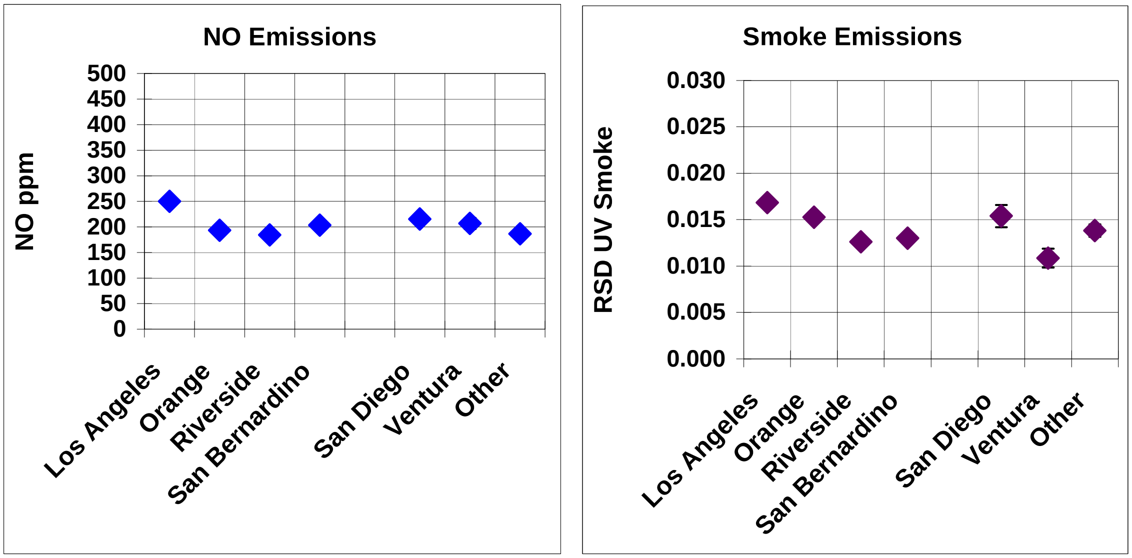


Figure IV-18 Average NO and Smoke/PM Emissions by County



E. Fraction of High Emitters in South Coast vs. Other Regions

Ideally several conditions should be met in order to compare the emissions of vehicles measured in one region with those in another:

- Measurements should be contemporary;
- Made with the same type of equipment
- Under similar operating conditions
- Using similar screening techniques.

ESP performed an RSD survey for the Clean Air Strategic Alliance of Alberta (CASA) in 2006[vii]. In 2007, ESP performed an RSD study in southeastern Michigan for the Southeast Michigan Council of Governments (SEMCOG)[viii]. Both studies used RSD 4000 series systems.

ESP operates an ongoing remote sensing program using RSD4000 units in Virginia. Virginia is unique in that remote sensing data was collected in areas subject to an inspection and maintenance program and in areas not subject to the I/M program. The I/M area is in northern Virginia, south of Washington DC. The Virginia non-I/M area results included measurements from Fredericksburg, Richmond and Tidewater. Virginia, therefore, provided two points of comparison and the Virginia 2006 remote sensing data had been processed to prepare a 2006 report using similar screening techniques[ix].

Therefore, ESP has been able to compare the South Coast AQMD results to those from Alberta, Michigan and Virginia.

Table IV-1 shows average on-road emissions in these areas. South Coast had higher average HC and CO emissions than Michigan and Virginia. South Coast had lower NO emissions than the non-I/M region of Virginia. NO emissions are sensitive to the vehicle operating conditions at the site.

Table IV-2 compares the number of high emitters where high emitters are defined as HC greater than 500 ppm hexane, CO greater than 3%, NO greater than 2000 ppm or RSD smoke factor greater than 0.75. The fraction of high emitters in South Coast fell between the Virginia I/M area and the Virginia non-I/M area.

Table IV-3 shows the estimated fraction of total on-road emissions contributed by high emitters. In the South Coast these percentages were 20% of HC, 40% of CO and 18% of NO.

The higher average emissions and percentage of high emitters observed in South Coast vs. the Virginia I/M area is consistent with an older fleet. Figure IV-19 shows the comparative average age of vehicles in each region. South Coast has the oldest fleet. RSD measured South Coast vehicles averaged seven years old compared to Michigan

vehicles, which averaged 4.7 years old and Northern Virginia vehicles that averaged 5.7 years old[2].

Table IV-1 Average Emissions

	Alberta VSP 5-20	Michigan	Virginia Non-I/M	Virginia I/M	SC AQMD
Average HC ppm	48	16	27	20	28
Average CO %	0.18	0.11	0.15	0.12	0.18
Average NO ppm	250	158	262	208	220
UV Smoke RSD	0.027	0.015	0.015	0.010	0.015

Table IV-2 Percentage of Vehicles Observed as High Emitters

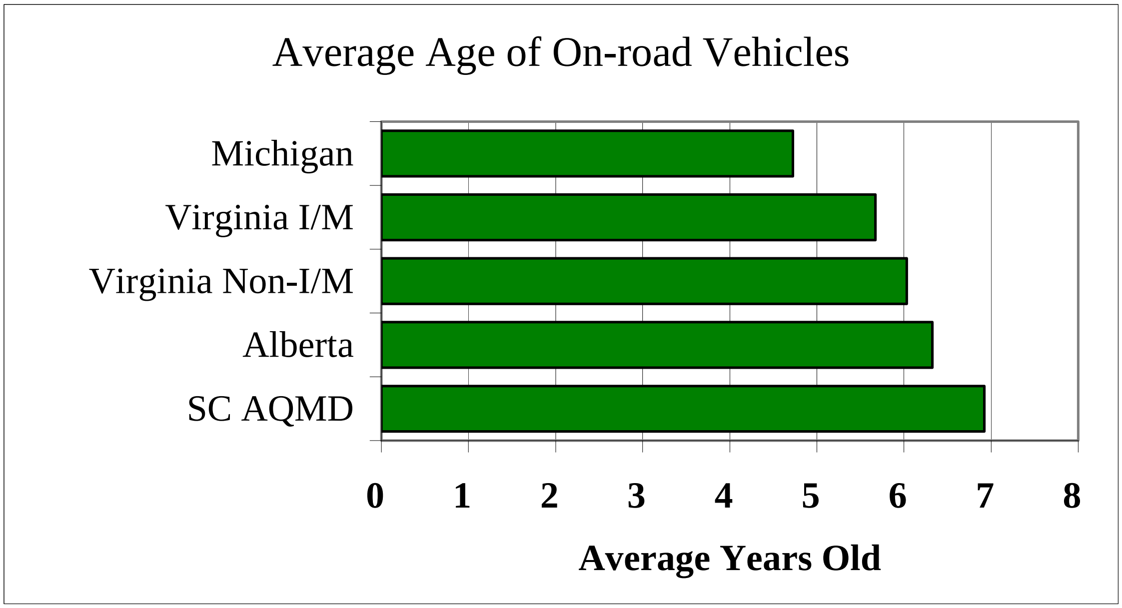
	Alberta	Michigan	Virginia Non-I/M	Virginia I/M	SC AQMD
HC > 500ppm	1.3%	0.4%	0.7%	0.4%	0.6%
CO > 3%	1.2%	0.5%	0.9%	0.6%	1.4%
NO > 2000ppm	2.5%	1.4%	2.6%	1.6%	1.5%
Smoke > 0.75 RSD	0.1%	0.1%	0.1%	0.1%	0.05%
Combined	4.6%	2.0%	3.9%	2.5%	3.3%

Table IV-3 High Emitter Contributions to Total On-road Emissions

	Alberta	Michigan	Virginia Non-I/M	Virginia I/M	Calif
High Emitter % of total HC	31%	27%	30%	20%	30%
High Emitter % of total CO	60%	42%	51%	44%	40%
High Emitter % of total NO	26%	21%	25%	19%	18%
High Emitter % of total Smoke	7%	3%	7%	4%	4%

[2] Assumes the mid-point of model year sales is one-quarter into the model year.

Figure IV-19 Comparative Age of Fleets in Different Regions



As subsequent charts illustrate, the frequency of South Coast high emitters by model year was comparable to non-I/M areas. The lower overall frequency of high emitters in Michigan was due to a younger fleet.

Figures IV-21 – IV-23 illustrate the high emitter frequency by model year. South Coast has higher rates of HC and CO high emitters than the Virginia I/M area but lower rates of NO high emitters. Many factors can influence emissions levels, including I/M standards, fuel and climatic conditions

Figure IV-20 Comparative High Emitter Rates in Different Regions

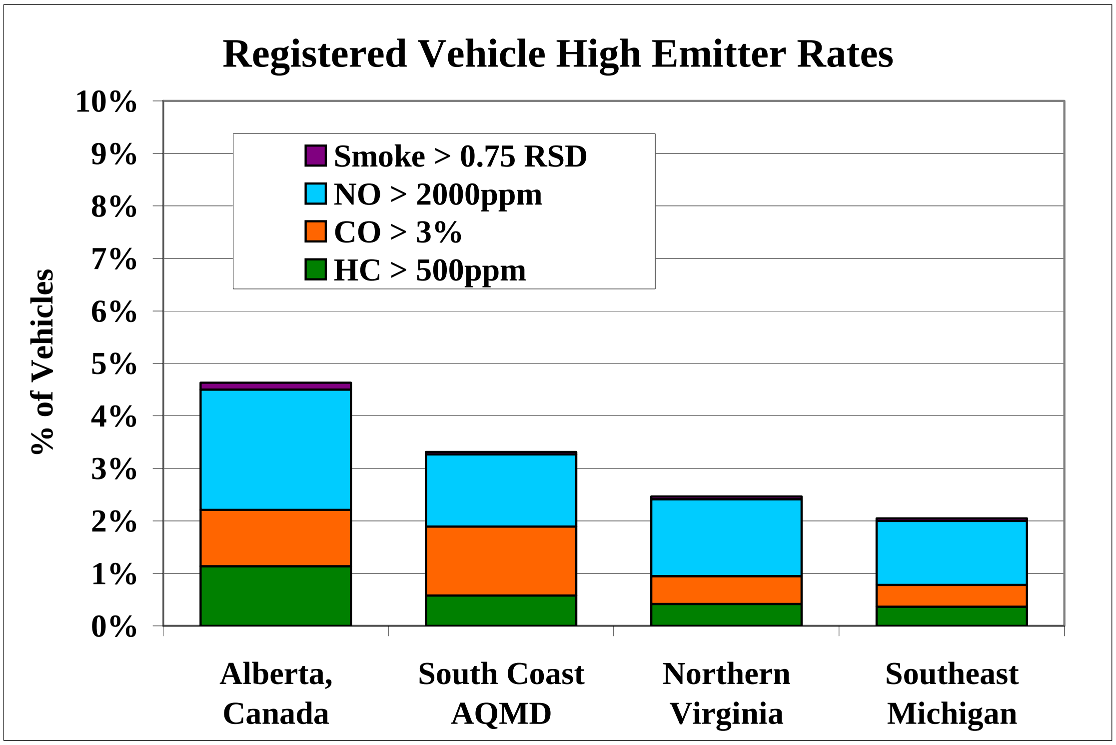


Figure IV-21 Comparative High Emitter Rates in Different Regions - HC

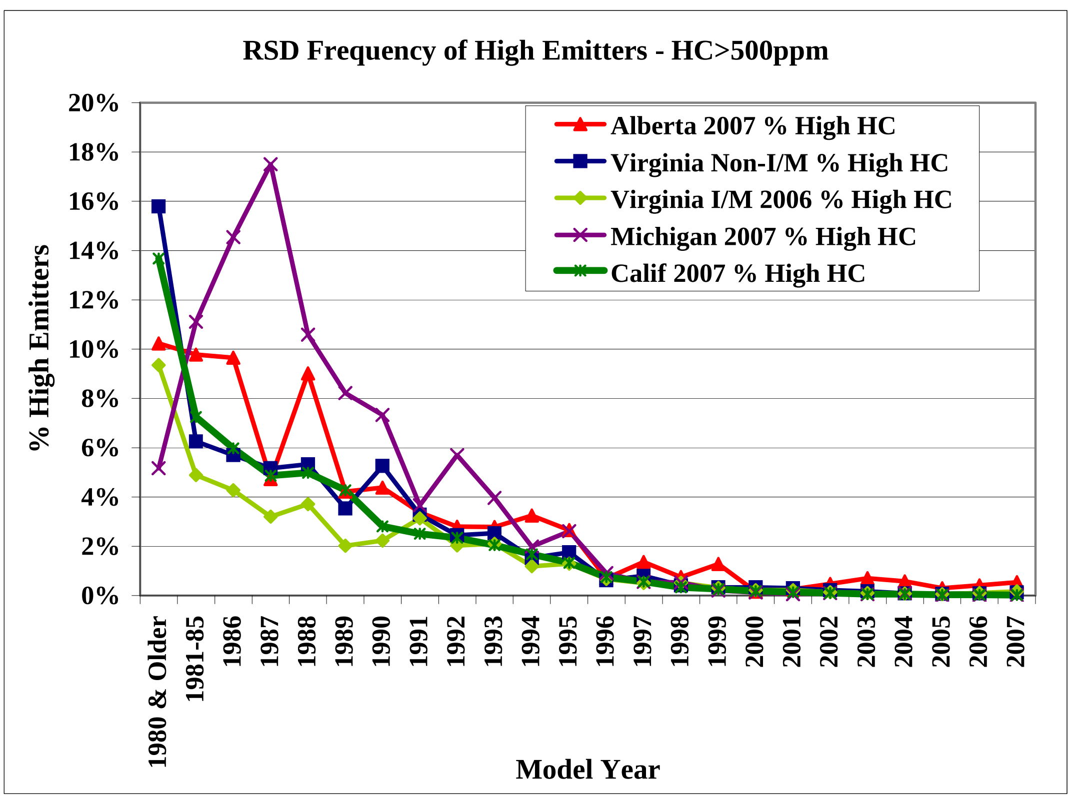


Figure IV-22 Comparative High Emitter Rates in Different Regions - CO

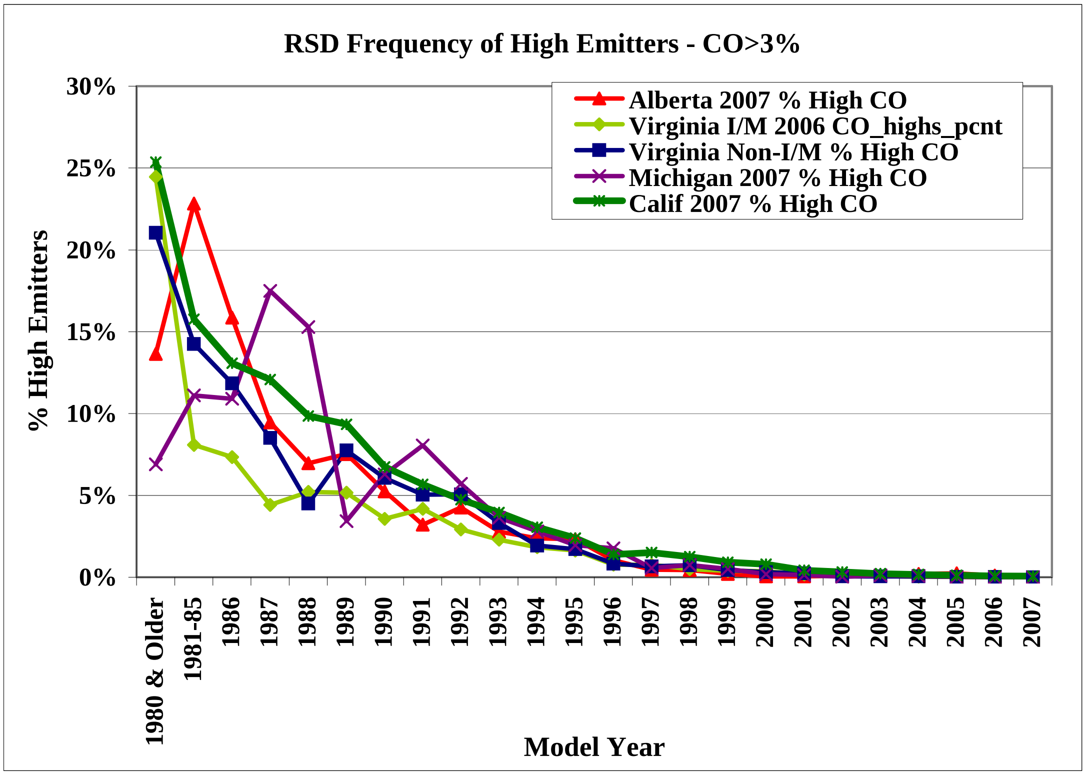
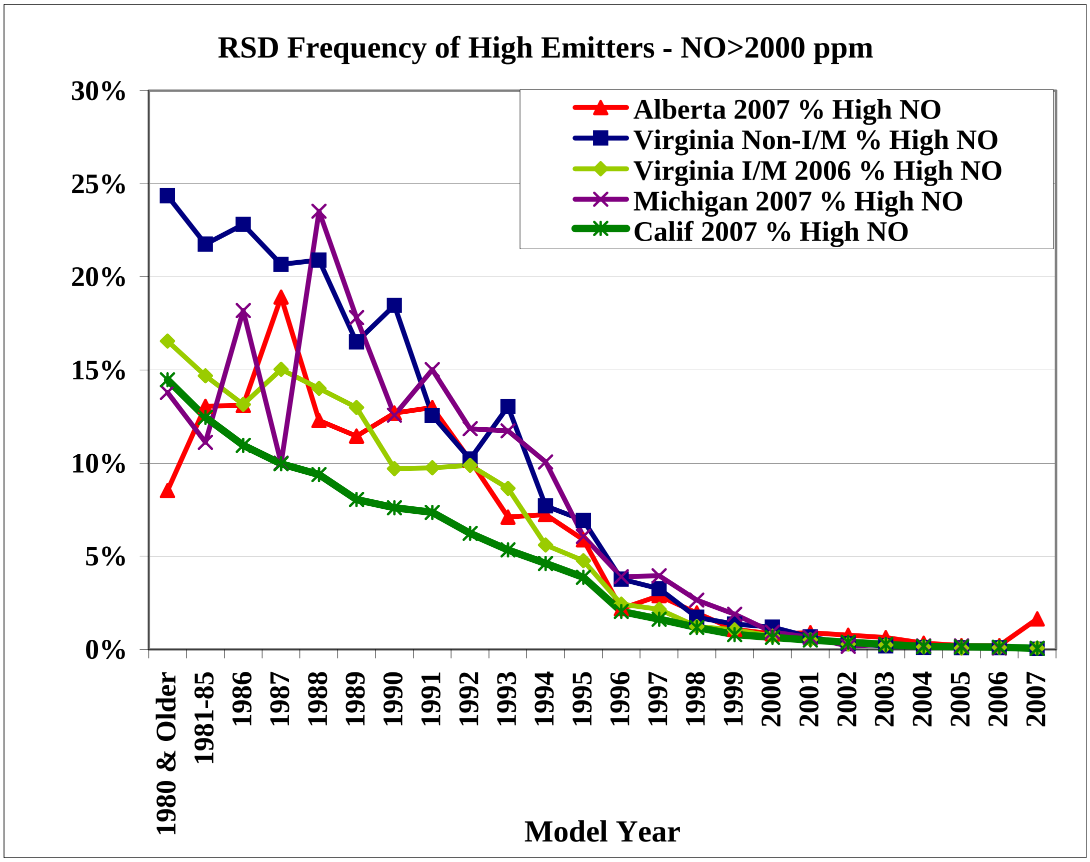


Figure IV-23 Comparative High Emitter Rates in Different Regions - NO



V. Conclusions and Recommendations

Findings:

Following are the key findings of the remote sensing program:

- *The program broadly met its data collection goal*s.

  Just over 949 thousand unique vehicles were successfully measured with California plates, which came close to the goal of 1 million valid unique California vehicles. 754,000 vehicles were matched to registrations and 682,000 were registered in the South Coast Air Quality Management District. An estimated 150,000 more California vehicles would have been matched if access to a full set of registration data had been available.

- *There are numerous, suitable RSD sites available in the South Coast AQMD.*

  Over 120 suitable sites were identified. Additional sites could be found if needed. Permits were obtained from CalTrans for full-day operation.

- *There are many on-road, high emitters operating in the South Coast AQMD.*

  2 to 5% of vehicles operating on-road were characterized as high emitters with emissions tens or hundreds of time higher than normal emitters.

- *RSD successfully identified high emitters.*

  26,245 unique high emitting vehicles were reported as high emitters for recruitment into the associated HEROS voluntary repair and retirement program or for PM testing.

  80% of vehicles that voluntarily went to Referee stations for follow-up testing failed the Smog Check test. 92% of vehicles inspected using ASM and TSI procedures failed one or the other or both.

- *High Emitters contribute a disproportionate fraction of total emissions.*

  The dirtiest 3.3% of vehicles contributed 30%, 40% and 18%of HC, CO and NO respectively.

- *California has an older fleet than other areas.*

  RSD measured South Coast vehicles averaged seven years old compared to Michigan vehicles, which averaged 4.7 years old and Northern Virginia vehicles that averaged 5.7 years old.

- *1995 & Older Models contributed the majority of total emissions.*

  1995 and older models were projected to account for 18% of vehicle miles traveled but 69%, 64%, 56% and 51% of HC, CO, NO and particulate emissions respectively.

- *Diesel Vehicles*

  Diesel vehicles had much higher rates of smokers and high NO emitters than gasoline vehicles. 25% of 1990 and older diesel models had high smoke emissions.

Conclusions and Recommendations:

- *A mandatory high emitter program using RSD technology could assist in reducing light duty vehicle emissions.*

  A mandatory high emitter program, in addition to Smog Check, could identify the small percentage of the worst high emitting vehicles that contribute a disproportionate amount of in-use emissions and encourage owners to obtain repairs or scrap the vehicle.

  We also speculate the presence of on-road monitors would encourage vehicle owners of OBD-II equipped vehicles to respond promptly to malfunction indicator lights.

- *A mandatory RSD program would be a cost effective addition to Smog Check.*

  The RSD cost to measure unique California vehicles was $1.33 each. The RSD cost to identify high emitters was under $50 per high emitter. This compares favorably to the Smog Check program where six vehicles are typically inspected for $50 each to find one high emitter.

- *The inspection of vehicles identified as on-road high emitters should be thorough.*

  Vehicles identified as on-road high emitters should be tested using the ASM and the two-speed idle procedures. In addition, vehicles should be carefully checked for evidence of evaporative emissions using visual inspection, the tank pressure test and a hand-held HC detector.

- *The inspection of vehicles identified as on-road high emitters should be free to the motorist.*

  To reduce the burden on the recipient of a high-emitter notice, the notice could include a coupon for the follow-up inspection. The licensed inspector could redeem the coupon by filing an inspection and diagnosis report with the managing agency. This will improve acceptance of the high emitter program and ensure adequate information is collected.

Appendix A - State Of California Smog Check Referee Stations

Bar Address	Bar City	Bar Zip	ESP Name
400 WEST WASHINGTON BLVD	LOS ANGELES	90015	LA TRADE TECH COLLEGE
16007 CRENSHAW BLVD	TORRANCE	90506	EL CAMINO COLLEGE
3600 WORKMAN WILL RD	WHITTIER	90601	RIO HONDO COLLEGE
6201 WINNETKA	WOODLAND HILLS	91371	L.A. PIERCE COLLEGE FOUNDATION
5885 HAVEN AVE	RANCHO CUCAMONGA	91737	CHAFFEY COLLEGE
1303 CESAR CHAVEZ AVE	MONTEREY PARK	91754	EAST LOS ANGELES COLLEGE
900 OTAY LAKE RD	CHULA VISTA	91910	SOUTHWESTERN COLLEGE
1440 BLACK MOUNTAIN ROAD	SAN DIEGO	92126	MIRAMAR COLLEGE
43-500 MONTEREY AVENUE	PALM DESERT	92260	COLLEGE OF THE DESERT
18422 BEAR VALLEY RD	VICTORVILLE	92392	FOUNDATION FOR CALIFORNIA COMM COLLEGE
701 S MOUNT VERNON AVENUE	SAN BERNARDINO	92410	SAN BERNARDINO VALLEY COLLEGE
1499 NORTH STATE STREET	SAN JACINTO	92583	MT SAN JACINTO COMMUNITY
15744 GOLDEN WEST ST	HUNTINGTON BEACH	92618	GOLDENWEST COLLEGE
321 E CHAPMAN AVENUE	FULLERTON	92832	FULLERTON COLLEGE
4000 S ROSE AVE	OXNARD	93033	OXNARD COLLEGE
721 CLIFF DRIVE	SANTA BARBARA	93103	SANTA BARBARA COLLEGE
915 S MOONEY BLVD	VISALIA	93277	COLLEGE OF THE SEQUOIAS
1801 PANORAMA DRIVE	BAKERSFIELD	93305	BAKERSFIELD COLLEGE
HWY 1 EDUCATION DRIVE	SAN LUIS OBISPO	93401	CUESTA COLLEGE - Foundation for Comm. Col
3041 WEST AVE K	LANCASTER	93536	ANTELOPE VALLEY COLLEGE
2930 E ANNADALE AVE	FRESNO	93725	FRESNO CTC
1752 EAST ALISAL STREET	SALINAS	93905	HARTNELL COLLEGE
3300 COLLEGE DRIVE	SAN BRUNO	94066	SKYLINE COLLEGE
555 ATLANTIC AVENUE	ALAMEDA	94501	COLLEGE OF ALAMEDA-BOX 28
4000 SUISUN VALLEY ROAD	FAIRFIELD	94535	SOLANO COMMUNITY COLLEGE
200 WHITNEY PLACE	FREMONT	94539	FREMONT-WYO-TECH
3033 COLLIER CANYON ROAD	LIVERMORE	94550	LAS POSITAS COLLEGE
2600 MISSION BELL ROAD	SAN PABLO	94806	CONTRA COSTA COLLEGE
3095 YERBA BUENA ROAD	SAN JOSE	95135	EVERGREEN COLLEGE
435 COLLEGE AVENUE	MODESTO	95350	MODESTO JUNIOR COLLEGE
1501 MENDOCINO AVENUE	SANTA ROSA	95401	SANTA ROSA JR COLLEGE
2401 FLORIN ROAD	SACRAMENTO	95822	FLORIN TECH CENTER
1045 NATIONAL DR #3	SACRAMENTO	95834	NATOMAS
2088 N BEALE ROAD	MARYSVILLE	95901	YUBA CITY COLLEGE
3536 BUTTE CAMPUS DRIVE	OROVILLE	95965	BUTTE COLLEGE
11555 OLD OREGON TRAIL	REDDING	96049	SHASTA COLLEGE

On the following page is a directory of zip codes for California. The zip codes relevant to the South Coast Program will be used in determining the level of coverage obtained from each test site. Zip Codes that are highlighted zip codes are shared with a neighboring district and the % of the zip code contained in the district is shown.

Appendix B - California Zip Code Directory

ZIP	PO_NAME	COUNTY	Shared Zip Code	ZIP	PO_NAME	COUNTY	Shared Zip Code
90001	Los Angeles	Los Angeles		90048	Los Angeles	Los Angeles	
90002	Los Angeles	Los Angeles		90049	Los Angeles	Los Angeles	
90003	Los Angeles	Los Angeles		90056	Los Angeles	Los Angeles	
90004	Los Angeles	Los Angeles		90057	Los Angeles	Los Angeles	
90005	Los Angeles	Los Angeles		90049	Los Angeles	Los Angeles	
90006	Los Angeles	Los Angeles		90056	Los Angeles	Los Angeles	
90007	Los Angeles	Los Angeles		90057	Los Angeles	Los Angeles	
90008	Los Angeles	Los Angeles		90058	Los Angeles	Los Angeles	
90010	Los Angeles	Los Angeles		90059	Los Angeles	Los Angeles	
90011	Los Angeles	Los Angeles		90061	Los Angeles	Los Angeles	
90012	Los Angeles	Los Angeles		90062	Los Angeles	Los Angeles	
90013	Los Angeles	Los Angeles		90063	Los Angeles	Los Angeles	
90014	Los Angeles	Los Angeles		90064	Los Angeles	Los Angeles	
90015	Los Angeles	Los Angeles		90065	Los Angeles	Los Angeles	
90016	Los Angeles	Los Angeles		90066	Los Angeles	Los Angeles	
90017	Los Angeles	Los Angeles		90067	Los Angeles	Los Angeles	
90018	Los Angeles	Los Angeles		90068	Los Angeles	Los Angeles	
90019	Los Angeles	Los Angeles		90069	West Hollywood	Los Angeles	
90020	Los Angeles	Los Angeles		90071	Los Angeles	Los Angeles	
90021	Los Angeles	Los Angeles		90073	Los Angeles	Los Angeles	
90022	Los Angeles	Los Angeles		90077	Los Angeles	Los Angeles	
90023	Los Angeles	Los Angeles		90089	Los Angeles	Los Angeles	
90024	Los Angeles	Los Angeles		90095	Los Angeles	Los Angeles	
90025	Los Angeles	Los Angeles		90201	Bell	Los Angeles	
90026	Los Angeles	Los Angeles		90210	Beverly Hills	Los Angeles	
90027	Los Angeles	Los Angeles		90211	Beverly Hills	Los Angeles	
90028	Los Angeles	Los Angeles		90212	Beverly Hills	Los Angeles	
90029	Los Angeles	Los Angeles		90220	Compton	Los Angeles	
90031	Los Angeles	Los Angeles		90221	Compton	Los Angeles	
90032	Los Angeles	Los Angeles		90222	Compton	Los Angeles	
90033	Los Angeles	Los Angeles		90230	Culver City	Los Angeles	
90034	Los Angeles	Los Angeles		90232	Culver City	Los Angeles	
90035	Los Angeles	Los Angeles		90240	Downey	Los Angeles	
90036	Los Angeles	Los Angeles		90241	Downey	Los Angeles	
90037	Los Angeles	Los Angeles		90242	Downey	Los Angeles	
90038	Los Angeles	Los Angeles		90245	El Segundo	Los Angeles	
90039	Los Angeles	Los Angeles		90247	Gardena	Los Angeles	
90040	Los Angeles	Los Angeles		90248	Gardena	Los Angeles	
90041	Los Angeles	Los Angeles		90249	Gardena	Los Angeles	
90042	Los Angeles	Los Angeles		90250	Hawthorne	Los Angeles	
90043	Los Angeles	Los Angeles		90254	Hermosa Beach	Los Angeles	
90044	Los Angeles	Los Angeles		90255	Huntington Park	Los Angeles	
90045	Los Angeles	Los Angeles		90260	Lawndale	Los Angeles	
90046	Los Angeles	Los Angeles		90262	Lynwood	Los Angeles	
90047	Los Angeles	Los Angeles		90263	Malibu	Los Angeles	

ZIP	PO_NAME	COUNTY	Shared Zip Code	ZIP	PO_NAME	COUNTY	Shared Zip Code
90265	Malibu	Los Angeles		90623	La Palma	Orange	
90266	Manhattan Beach	Los Angeles		90623	La Palma	Los Angeles	
90270	Maywood	Los Angeles		90630	Cypress	Orange	
90272	Pacific Palisades	Los Angeles		90630	Cypress	Los Angeles	
90274	Palos Verdes Peninsula	Los Angeles		90631	La Habra	Los Angeles	
90275	Rancho Palos Verdes	Los Angeles		90631	La Habra	Orange	
90277	Redondo Beach	Los Angeles		90638	La Mirada	Los Angeles	
90278	Redondo Beach	Los Angeles		90638	La Mirada	Orange	
90280	South Gate	Los Angeles		90639	La Mirada	Los Angeles	
90290	Topanga	Los Angeles		90640	Montebello	Los Angeles	
90291	Venice	Los Angeles		90650	Norwalk	Los Angeles	
90292	Marina del Rey	Los Angeles		90660	Pico Rivera	Los Angeles	
90293	Playa del Rey	Los Angeles		90670	Santa Fe Springs	Los Angeles	
90301	Inglewood	Los Angeles		90680	Stanton	Orange	
90302	Inglewood	Los Angeles		90701	Artesia	Los Angeles	
90303	Inglewood	Los Angeles		90703	Cerritos	Los Angeles	
90304	Inglewood	Los Angeles		90704	Avalon	Los Angeles	
90305	Inglewood	Los Angeles		90706	Bellflower	Los Angeles	
90401	Santa Monica	Los Angeles		90710	Harbor City	Los Angeles	
90402	Santa Monica	Los Angeles		90712	Lakewood	Los Angeles	
90403	Santa Monica	Los Angeles		90713	Lakewood	Los Angeles	
90404	Santa Monica	Los Angeles		90715	Lakewood	Los Angeles	
90405	Santa Monica	Los Angeles		90716	Hawaiian Gardens	Los Angeles	
90501	Torrance	Los Angeles		90717	Lomita	Los Angeles	
90502	Torrance	Los Angeles		90720	Los Alamitos	Orange	
90503	Torrance	Los Angeles		90723	Paramount	Los Angeles	
90504	Torrance	Los Angeles		90731	San Pedro	Los Angeles	
90505	Torrance	Los Angeles		90732	San Pedro	Los Angeles	
90506	Torrance	Los Angeles		90740	Seal Beach	Orange	
90601	Whittier	Los Angeles		90742	Sunset Beach	Orange	
90602	Whittier	Los Angeles		90743	Surfside	Orange	
90603	Whittier	Los Angeles		90744	Wilmington	Los Angeles	
90604	Whittier	Los Angeles		90745	Carson	Los Angeles	
90605	Whittier	Los Angeles		90746	Carson	Los Angeles	
90606	Whittier	Los Angeles		90747	Carson	Los Angeles	
90620	Buena Park	Orange		90755	Signal Hill	Los Angeles	
90621	Buena Park	Orange		90802	Long Beach	Los Angeles	

ZIP	PO_NAME	COUNTY	Shared Zip Code	ZIP	PO_NAME	COUNTY	Shared Zip Code
90804	Long Beach	Los Angeles		91303	Canoga Park	Los Angeles	
90805	Long Beach	Los Angeles		91304	Canoga Park	Los Angeles	
90806	Long Beach	Los Angeles		91306	Winnetka	Los Angeles	
90807	Long Beach	Los Angeles		91307	West Hills	Los Angeles	
90808	Long Beach	Los Angeles		91311	Chatsworth	Los Angeles	
90810	Long Beach	Los Angeles		91316	Encino	Los Angeles	
90813	Long Beach	Los Angeles		91321	Newhall	Los Angeles	
90814	Long Beach	Los Angeles		91324	Northridge	Los Angeles	
90815	Long Beach	Los Angeles		91325	Northridge	Los Angeles	
90822	Long Beach	Los Angeles		91326	Northridge	Los Angeles	
90840	Long Beach	Los Angeles		91330	Northridge	Los Angeles	
91001	Altadena	Los Angeles		91331	Pacoima	Los Angeles	
91006	Arcadia	Los Angeles		91335	Reseda	Los Angeles	
91007	Arcadia	Los Angeles		91340	San Fernando	Los Angeles	
91010	Duarte	Los Angeles		91342	Sylmar	Los Angeles	
91011	La Canada Flintridge	Los Angeles		91343	North Hills	Los Angeles	
91016	Monrovia	Los Angeles		91344	Granada Hills	Los Angeles	
91020	Montrose	Los Angeles		91345	Mission Hills	Los Angeles	
91024	Sierra Madre	Los Angeles		91350	Santa Clarita	Los Angeles	
91030	South Pasadena	Los Angeles		91351	Canyon Country	Los Angeles	
91040	Sunland	Los Angeles		91352	Sun Valley	Los Angeles	
91042	Tujunga	Los Angeles		91354	Valencia	Los Angeles	
91101	Pasadena	Los Angeles		91355	Valencia	Los Angeles	
91103	Pasadena	Los Angeles		91356	Tarzana	Los Angeles	
91104	Pasadena	Los Angeles		91361	Westlake Village	Los Angeles	
91105	Pasadena	Los Angeles		91362	Thousand Oaks	Los Angeles	
91107	Pasadena	Los Angeles		91364	Woodland Hills	Los Angeles	
91108	San Marino	Los Angeles		91367	Woodland Hills	Los Angeles	
91123	Pasadena	Los Angeles		91371	Woodland Hills	Los Angeles	
91201	Glendale	Los Angeles		91381	Stevenson Ranch	Los Angeles	
91202	Glendale	Los Angeles		91384	Castaic	Los Angeles	
91203	Glendale	Los Angeles		91387	Canyon Country	Los Angeles	
91204	Glendale	Los Angeles		91390	Santa Clarita	Los Angeles	Partial 98%
91205	Glendale	Los Angeles		91401	Van Nuys	Los Angeles	
91206	Glendale	Los Angeles		91402	Panorama City	Los Angeles	
91207	Glendale	Los Angeles		91403	Sherman Oaks	Los Angeles	
91208	Glendale	Los Angeles		91405	Van Nuys	Los Angeles	
91214	La Crescenta	Los Angeles		91406	Van Nuys	Los Angeles	
91301	Agoura Hills	Los Angeles		91411	Van Nuys	Los Angeles	

ZIP	PO_NAME	COUNTY	Shared Zip Code	ZIP	PO_NAME	COUNTY	Shared Zip Code
91423	Sherman Oaks	Los Angeles		91752	Mira Loma	Riverside	
91436	Encino	Los Angeles		91754	Monterey Park	Los Angeles	
91501	Burbank	Los Angeles		91755	Monterey Park	Los Angeles	
91502	Burbank	Los Angeles		91759	Mt Baldy	San Bernardino	Partial 90%
91504	Burbank	Los Angeles		91761	Ontario	San Bernardino	
91505	Burbank	Los Angeles		91762	Ontario	San Bernardino	
91506	Burbank	Los Angeles		91763	Montclair	San Bernardino	
91521	Burbank	Los Angeles		91764	Ontario	San Bernardino	
91522	Burbank	Los Angeles		91765	Diamond Bar	Los Angeles	
91523	Burbank	Los Angeles		91766	Pomona	Los Angeles	
91601	North Hollywood	Los Angeles		91766	Pomona	San Bernardino	
91602	North Hollywood	Los Angeles		91767	Pomona	Los Angeles	
91604	Studio City	Los Angeles		91768	Pomona	Los Angeles	
91605	North Hollywood	Los Angeles		91770	Rosemead	Los Angeles	
91606	North Hollywood	Los Angeles		91773	San Dimas	Los Angeles	
91607	Valley Village	Los Angeles		91775	San Gabriel	Los Angeles	
91608	Universal City	Los Angeles		91776	San Gabriel	Los Angeles	
91701	Rancho Cucamonga	San Bernardino		91780	Temple City	Los Angeles	
91702	Azusa	Los Angeles		91784	Upland	San Bernardino	
91706	Baldwin Park	Los Angeles		91786	Upland	San Bernardino	
91709	Chino Hills	San Bernardino		91786	Upland	Los Angeles	
91710	Chino	San Bernardino		91789	Walnut	Los Angeles	
91710	Chino	Los Angeles		91790	West Covina	Los Angeles	
91711	Claremont	Los Angeles		91791	West Covina	Los Angeles	
91722	Covina	Los Angeles		91801	Alhambra	Los Angeles	
91723	Covina	Los Angeles		91803	Alhambra	Los Angeles	
91724	Covina	Los Angeles		92203	Indio	Riverside	
91730	Rancho Cucamonga	San Bernardino		92210	Indian Wells	Riverside	
91731	El Monte	Los Angeles		92211	Palm Desert	Riverside	
91732	El Monte	Los Angeles		92220	Banning	Riverside	
91733	South El Monte	Los Angeles		92223	Beaumont	Riverside	
91737	Rancho Cucamonga	San Bernardino		92230	Cabazon	Riverside	
91739	Rancho Cucamonga	San Bernardino		92234	Cathedral City	Riverside	
91740	Glendora	Los Angeles		92236	Coachella	Riverside	
91741	Glendora	Los Angeles		92239	Desert Center	Riverside	
91744	La Puente	Los Angeles		92240	Desert Hot Springs	Riverside	
91745	Hacienda Heights	Los Angeles		92241	Desert Hot Springs	Riverside	
91746	La Puente	Los Angeles		92252	Joshua Tree	San Bernardino	
91748	Rowland Heights	Los Angeles		92253	La Quinta	Riverside	
91750	La Verne	Los Angeles		92254	Mecca	Riverside	

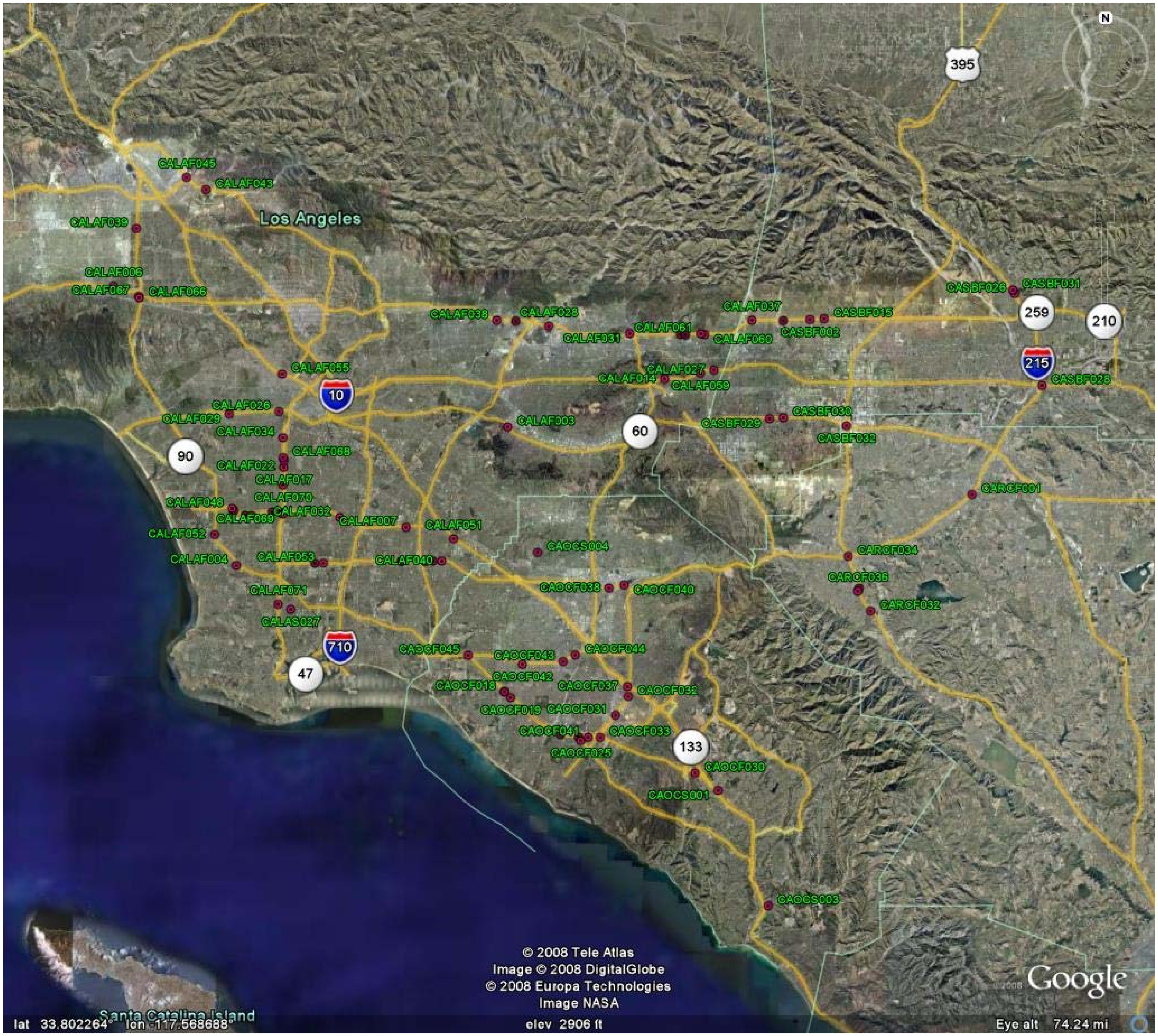
ZIP	PO_NAME	COUNTY	Shared Zip Code
92260	Palm Desert	Riverside	
92262	Palm Springs	Riverside	
92264	Palm Springs	Riverside	
92270	Rancho Mirage	Riverside	
92274	Thermal	Riverside	
92276	Thousand Palms	Riverside	
92277	Twentynine Palms	San Bernardino	
92282	White Water	Riverside	
92284	Yucca Valley	San Bernardino	
92305	Angelus Oaks	San Bernardino	Partial 98%
92313	Grand Terrace	San Bernardino	
92314	Big Bear City	San Bernardino	Partial 75%
92315	Big Bear Lake	San Bernardino	
92316	Bloomington	San Bernardino	
92317	Blue Jay	San Bernardino	
92320	Calimesa	Riverside	
92321	Cedar Glen	San Bernardino	
92322	Cedarpines Park	San Bernardino	
92324	Colton	San Bernardino	
92324	Colton	Riverside	
92325	Crestline	San Bernardino	
92332	Essex	San Bernardino	
92335	Fontana	San Bernardino	
92336	Fontana	San Bernardino	
92337	Fontana	San Bernardino	
92339	Forest Falls	San Bernardino	
92346	Highland	San Bernardino	
92350	Loma Linda	San Bernardino	
92352	Lake Arrowhead	San Bernardino	

ZIP	PO_NAME	COUNTY	Shared Zip Code
92354	Loma Linda	San Bernardino	
92358	Lytle Creek	San Bernardino	Partial 95%
92359	Mentone	San Bernardino	
92373	Redlands	San Bernardino	
92373	Redlands	Riverside	
92374	Redlands	San Bernardino	
92376	Rialto	San Bernardino	
92377	Rialto	San Bernardino	
92382	Running Springs	San Bernardino	
92385	Skyforest	San Bernardino	
92397	Wrightwood	San Bernardino	Partial 1%
92399	Yucaipa	San Bernardino	
92399	Yucaipa	Riverside	
92401	San Bernardino	San Bernardino	
92404	San Bernardino	San Bernardino	
92405	San Bernardino	San Bernardino	
92407	San Bernardino	San Bernardino	Partial 85%
92408	San Bernardino	San Bernardino	
92410	San Bernardino	San Bernardino	
92411	San Bernardino	San Bernardino	
92501	Riverside	Riverside	
92503	Riverside	Riverside	
92504	Riverside	Riverside	
92505	Riverside	Riverside	
92506	Riverside	Riverside	
92507	Riverside	Riverside	
92508	Riverside	Riverside	
92509	Riverside	Riverside	
92509	Riverside	San Bernardino	

ZIP	PO_NAME	COUNTY	Shared Zip Code
92518	March Air Reserve Base	Riverside	
92521	Riverside	Riverside	
92530	Lake Elsinore	Riverside	
92530	Lake Elsinore	Orange	
92532	Lake Elsinore	Riverside	
92536	Aguanga	Riverside	
92539	Anza	Riverside	
92543	Hemet	Riverside	
92544	Hemet	Riverside	
92545	Hemet	Riverside	
92548	Homeland	Riverside	
92549	Idyllwild	Riverside	
92551	Moreno Valley	Riverside	
92553	Moreno Valley	Riverside	
92555	Moreno Valley	Riverside	
92557	Moreno Valley	Riverside	
92561	Mountain Center	Riverside	
92562	Murrieta	Riverside	
92563	Murrieta	Riverside	
92567	Nuevo	Riverside	
92570	Perris	Riverside	
92571	Perris	Riverside	
92582	San Jacinto	Riverside	
92583	San Jacinto	Riverside	
92584	Menifee	Riverside	
92585	Sun City	Riverside	
92586	Sun City	Riverside	
92587	Sun City	Riverside	
92590	Temecula	Riverside	
92591	Temecula	Riverside	
92592	Temecula	Riverside	
92595	Wildmar	Riverside	
92596	Winchester	Riverside	
92602	Irvine	Orange	
92603	Irvine	Orange	
92604	Irvine	Orange	
92610	Foothill Ranch	Orange	
92612	Irvine	Orange	
92614	Irvine	Orange	
92617	Irvine	Orange	
92618	Irvine	Orange	
92620	Irvine	Orange	
92624	Capistrano Beach	Orange	
92625	Corona del Mar	Orange	
92626	Costa Mesa	Orange	
92627	Costa Mesa	Orange	
92629	Dana Point	Orange	
92630	Lake Forest	Orange	
92637	Laguna Woods	Orange	
92646	Huntington Beach	Orange	
92647	Huntington Beach	Orange	
92648	Huntington Beach	Orange	
92649	Huntington Beach	Orange	
92651	Laguna Beach	Orange	
92653	Laguna Hills	Orange	
92655	Midway City	Orange	
92656	Aliso Viejo	Orange	
92657	Newport Coast	Orange	
92660	Newport Beach	Orange	
92661	Newport Beach	Orange	
92662	Newport Beach	Orange	
92663	Newport Beach	Orange	
92672	San Clemente	Orange	
92673	San Clemente	Orange	
92675	San Juan Capistrano	Orange	
92675	San Juan Capistrano	Riverside	
92676	Silverado	Orange	
92677	Laguna Niguel	Orange	
92679	Trabuco Canyon	Orange	
92683	Westminster	Orange	
92688	Rancho Santa Margarita	Orange	
92691	Mission Viejo	Orange	
92692	Mission Viejo	Orange	
92694	Ladera Ranch	Orange	
92697	Irvine	Orange	
92701	Santa Ana	Orange	
92703	Santa Ana	Orange	
92704	Santa Ana	Orange	
92705	Santa Ana	Orange	
92706	Santa Ana	Orange	
92707	Santa Ana	Orange	
92708	Fountain Valley	Orange	
92780	Tustin	Orange	
92782	Tustin	Orange	
92801	Anaheim	Orange	
92802	Anaheim	Orange	
92804	Anaheim	Orange	
92805	Anaheim	Orange	
92806	Anaheim	Orange	
92807	Anaheim	Orange	
92808	Anaheim	Orange	
92821	Brea	Orange	

ZIP	PO_NAME	COUNTY	Shared Zip Code	ZIP	PO_NAME	COUNTY	Shared Zip Code
92823	Brea	Orange					
92931	Fullerton	Orange					
92832	Fullerton	Orange					
92833	Fullerton	Orange					
92835	Fullerton	Orange					
92840	Garden Grove	Orange					
92841	Garden Grove	Orange					
92843	Garden Grove	Orange					
92844	Garden Grove	Orange					
92845	Garden Grove	Orange					
92860	Norco	Riverside					
92861	Villa Park	Orange					
92862	Orange	Orange					
92865	Orange	Orange					
92866	Orange	Orange					
92867	Orange	Orange					
92868	Orange	Orange					
92869	Orange	Orange					
92870	Placentia	Orange					
92879	Corona	Riverside					
92880	Corona	Riverside					
92881	Corona	Riverside					
92882	Corona	Riverside					
92883	Corona	Riverside					
92886	Yorba Linda	Orange					
92887	Yorba Linda	Orange					
93063	Simi Valley	Los Angeles					
93243	Lebec	Los Angeles					
93510	Acton	Los Angeles	Partial 75%				
93532	Lake Hughes	Los Angeles	Partial 70%				
93536	Lancaster	Los Angeles	Partial 1%				
93550	Palmdale	Los Angeles	Partial 5%				
93551	Palmdale	Los Angeles	Partial 5%				
93563	Valyermo	Los Angeles	Partial 80%				

Appendix C – List of Active Sites


395
CALAF045
CALAF043
Los Angeles
CALAF039
CALAF006
CALAF067
CALAF066
CALAF038
CALAF028
CALAF031
CALAF061
CALAF060
CALAF037
CASBF015
CASBF002
CASBF026
CASBF031
259
210
215
CASBF028
CALAF055
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CALAF027
CALAF014
CALAF059
CALAF026
CALAF029
CALAF034
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CALAF003
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CASBF030
CASBF032
CALAF068
CALAF022
CALAF017
CALAF070
CALAF048
CALAF069
CALAF032
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CARCF001
CAOCS004
CALAF004
CALAF053
CALAF040
CARCF034
CARCF036
CAOCF038
CAOCF040
CALAF071
CARCF032
CALAS027
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47
CAOCF045
CAOCF043
CAOCF044
CAOCF042
CAOCF018
CAOCF037
CAOCF032
CAOCF019
CAOCF031
CAOCF041
CAOCF033
CAOCF025
133
CAOCF030
CAOCS001
CAOCS003
© 2008 Tele Atlas
Image © 2008 DigitalGlobe
© 2008 Europa Technologies
Image NASA
Google
Santa Catalina Island
lat 33.802264° lon -117.568688°
elev 2906 ft
Eye alt 74.24 mi

Site	Description	Location	County
CALAF002	4th St onto I-5 N	Where I-5 meets I-10; Boyle Heights	Los Angeles
CALAF003	7th Ave onto Hwy 60 W	About 2.5 miles east of I-605; La Puente	Los Angeles
CALAF004	Artesia (Hwy 91) onto I-405 S	Just west of I-110	Los Angeles
CALAF005	Asuza (Hwy 39) onto I-210 W	Covina	Los Angeles
CALAF006	Balboa onto Hwy 101 N	Just west of I-405; Encino	Los Angeles
CALAF007	Bellflower Blvd onto I-105 E	One mile west of I-605	Los Angeles
CALAF008	Bellflower Blvd onto Hwy 91 W	One mile west of I-605	Los Angeles
CALAF009	Crenshaw Ave onto I-105 E	Just west of I-110, Hawthorne/Inglewood/Gardena	Los Angeles
CALAF010	Crenshaw Blvd onto I-105 W	Just west of I-110, Hawthorne/Inglewood/Gardena	Los Angeles
CALAF012	El Segundo onto I-405 S	Just south of I-105; El Segundo	Los Angeles
CALAF013	Etiwanda EB onto I-10 E	Just west of I-15 Ontario/Rancho Cucamonga	Los Angeles
CALAF014	Fairplex Dr. onto I-10 EB	Pomona	Los Angeles
CALAF015	Fairfax Ave. onto I-10 W	About 3.5 miles east of I-405; Culver City	Los Angeles
CALAF016	Figueroa/Exposition Blvd onto I-110 S	About 1.5 miles south of I-10	Los Angeles
CALAF017	Florence onto I-110 N	Just north of Hwy 42; Florence/Inglewood	Los Angeles
CALAF018	Pioneer Blvd S onto Artesia Fwy Hwy91 W	Artesia	Los Angeles
CALAF020	Fruit Street onto I-210 E	Claremont/Pomona	Los Angeles
CALAF021	Fruit Street onto I-210 W	Claremont/Pomona	Los Angeles
CALAF022	Gage Ave onto I-110 N	North of I-105; Florence/Inglewood	Los Angeles
CALAF025	Holt Ave onto I-10 E	Covina	Los Angeles
CALAF026	Hoover onto I-10 W	Just west of I-110 intersection	Los Angeles
CALAF027	Indian Hill Blvd. onto I-10 WB	Pomona/Claremont	Los Angeles
CALAF028	Irwindale onto I-210 W	About 1 mile east of I-605; Irwindale	Los Angeles
CALAF029	La Brea onto I-10 W	About 4 miles of I-110	Los Angeles
CALAF031	Lonehill onto I-210 W	Glendora/Covina	Los Angeles
CALAF032	Long Beach onto I-105 E	About 2 miles west of I-710	Los Angeles
CALAF034	Martin Luther King onto I-110 S	South of I-10, south of Exposition Park	Los Angeles
CALAF036	Mountain Ave onto I-210 E	Just west of I-605; Monrovia/Duarte	Los Angeles
CALAF037	Mountain Ave onto I-210 W	Upland/Claremont	Los Angeles
CALAF038	Myrtle Ave onto I-210 W	About 2.5 miles west of I-605	Los Angeles
CALAF039	Nordhoff onto I-405 S	Two miles south of Hwy 118; North Hills	Los Angeles
CALAF040	Norwalk Blvd onto Hwy 91 W	Two miles east of I-605; Norwalk	Los Angeles
CALAF043	Osborne onto I-210 W	About 1.5 miles east of Hwy 118	Los Angeles
CALAF044	Bellflower Blvd WB onto hwy 91 WB		Los Angeles
CALAF045	Paxton onto I-210 W	Where Hwy 118 meets I-210	Los Angeles
CALAF046	Pioneer Blvd onto Hwy 91 W	One mile east of I-605	Los Angeles
CALAF047	Prairie Ave onto I-105 E	About 1.5 miles east of I-405; Inglewood/Hawthorne	Los Angeles
CALAF048	Prairie Ave onto I-105 W	About 1.5 miles east of I-405; Inglewood/Hawthorne	Los Angeles
CALAF051	Rosecrans onto I-5 S	About 3.5 miles south of I-605; Norwalk	Los Angeles
CALAF052	Rosecrans WB onto I-405 N	Two miles south of I-105; Hawthorne	Los Angeles
CALAF053	Acacia WB onto Hwy 91 W	About 1 mile west of I-710	Los Angeles

Site	Description	Location	County
CALAF055	Silverlake Blvd onto Hwy 101 N	2 miles NW of Chinatown	Los Angeles
CALAF057	Studebaker NB onto Hwy 91 EB		Los Angeles
CALAF058	Sunflower onto I-210 W	Glendora	Los Angeles
CALAF059	Towne Ave onto I-10 E	Pomona	Los Angeles
CALAF060	Towne Ave onto I-210 E	Claremont	Los Angeles
CALAF061	Towne Ave onto I-210 W	Claremont	Los Angeles
CALAF062	Vermont Ave onto I-105 E	Just west of I-110; Westmont	Los Angeles
CALAF063	Vermont onto I-105 W	Just west of I-110; Westmont	Los Angeles
CALAF065	Wilmington onto Hwy 91 W	About 2.5 miles west of I-710; Compton	Los Angeles
CALAF066	101 SB to 405 NB		Los Angeles
CALAF067	101 NB to 405 SB		Los Angeles
CALAF068	Slauson Ave. onto 110 SB		Los Angeles
CALAF069	Imperial Hwy onto 110 SB		Los Angeles
CALAF070	Manchester Blvd. onto 110 SB		Los Angeles
CALAF071	Figueroa/220th Str. onto 110 NB		Los Angeles
CAOCF018.	NB Beach Blvd onto NB 405	Westminister	Orange
CAOCF019.	EB Edinger Ave onto SB 405	Westminister	Orange
CAOCF025.	SB Bear st (I73) onto SB 405 connector	North of Baker St and west of the 405	Orange
CAOCF030.	Fortune/Enterprise Drive onto NB I-405	Irvine	Orange
CAOCF031.	Dyer Rd onto NB I-55	Santa Ana	Orange
CAOCF032.	Sycamore Ave./Newport Ave. onto NB I-55	Tustin	Orange
CAOCF033.	EB 55 onto SB 405	Irvine	Orange
CAOCF034.	Fairview onto SB 405	Costa Mesa	Orange
CAOCF035.	South Coast Drive onto NB 405	Santa Ana	Orange
CAOCF037.	NB I-5 onto SB I-55	Tustin/Santa Ana	Orange
CAOCF038	SB Kraemer Blvd. onto WB Hwy 91	One Mile East of Hwy 57	Orange
CAOCF039	NB Hwy 57 onto WB Hwy 91	Anaheim	Orange
CAOCF040	S. Tustin to 91 EB	Anaheim	Orange
CAOCF041	Bristol St. to 405 SB	Costa Mesa	Orange
CAOCF042	NB Magnolia St. to 22 EB	Garden Grove	Orange
CAOCF043	Trask Ave. to 22 EB	Garden Grove	Orange
CAOCF044	NB Fairview to 22 EB	Garden Grove	Orange
CAOCF045	Valley View to 405 NB	Garden Grove	Orange
CARCF001	Arlington/Riverside Ave onto Hwy 91 EB	About 3.5 miles from Hwy 60/ I-215 intersection	Riverside
CARCF018	NWB Hwy 79 onto NB 15	Temecula	Riverside
CARCF032.	El Cajalco RD onto NB I-15	Corona	Riverside
CARCF033.	Ontario Ave. onto NB I-15	Corona	Riverside
CARCF034.	SB I-15 onto EB I-91	Corona	Riverside
CARCF035.	Columbia Ave onto SB I-215	Riverside	Riverside
CARCF036.	Ontario Ave. onto SB I-15	Corona	Riverside
CASBF002	Archibald Ave. onto Hwy 210 W	Rancho Cucamonga	San Bernardino
CASBF005	Campus Ave onto I-210 E	Eight miles west of I-15, Cross Roads mall; Upland	San Bernardino

Site	Description	Location	County
CASBF015	Haven Ave onto I-210 W	Just west of I-15; Rancho Cucamonga	San Bernardino
CASBF026	University Parkway onto I-215 S	About 2 miles north of I-210; San Bernardino	San Bernardino
CASBF028	NB I-215 onto WB I-10		San Bernardino
CASBF029	Euclid onto EB Hwy 60		San Bernardino
CASBF030	Grove Avenue onto WB Hwy 60		San Bernardino
CASBF031	University Parkway onto NB I-215		San Bernardino
CASBF032	NB I-15 onto WB Hwy 60		San Bernardino
CALAS001	NB Studebaker Rd. North of Westminister	LA - Long Beach	Los Angeles County
CALAS002	NB Montebello Blvd between Jefferson and Liberty	LA - Montebello	Los Angeles County
CALAS003	WB Woodman Avenue between Roscoe and Branford	LA - Van Nuys	Los Angeles County
CALAS004	NB Vineland Road north of Sherman Way	LA - Burbank	Los Angeles County
CALAS005	SB Asuza between Merced and Francisquito	LA - West Covina	Los Angeles County
CALAS006	NB Figueroa St, Between Sycamore Pk Dr and Echo St	Los Angeles	Los Angeles County
CALAS007	EB VALLEY BLVD, Between Block Pl and Marianna	Los Angeles	Los Angeles County
CALAS008	WB PASADENA AVE., Between Arroyo Rd & Sycamore Ave	South Pasadena	Los Angeles County
CALAS009	NB Osborne St, Between Dronfield Ave and Foothill Blvd	Pacoima	Los Angeles County
CALAS010	WB Glenoaks Blvd, Between Montague St and Osborne St	Pacoima	Los Angeles County
CALAS011	WB FOOTHILL BLVD, Between Lowell Ave and Tujunga Canyon	Tujunga	Los Angeles County
CALAS012	EB DEVONSHIRE, Between Desoto and Mason	Chatsworth	Los Angeles County
CALAS013	EB DEVONSHIRE, Between Vanalden Ave and Wilbur Ave	Northridge	Los Angeles County
CALAS014	WB Chatsworth St, Between Crebs Ave and Wilbur Ave	Porter Ranch	Los Angeles County
CALAS015	EB Laurel Canyon Blvd, Between 118 FWY overpass and Paxton St	Pacoima	Los Angeles County
CALAS016	SB Paxton St, Between Bradley Ave and San Fernando Rd	Pacoima	Los Angeles County
CALAS017	SB Osborne St, Between Norris Ave and Ralston Ave	Pacoima	Los Angeles County
CALAS018	EB Glenoaks Blvd, Between Paxton St and Filmore St	Pacoima	Los Angeles County
CALAS019	NB Laurel Canyon Blvd, Between Tonopah St and Branford St	Arleta	Los Angeles County
CALAS020	WB Foothills Blvd, Between Terra Bella and Pierce St	Lake View Terrace	Los Angeles County
CALAS021	EB Ranaldi St, Between Haskell Ave and Woodley Ave.	Granada Hills	Los Angeles County
CALAS022	WB BURBANK @ Los Angeles Valley College	Van Nuys	Los Angeles County
CALAS023	SB Lakewood Blvd between Donovan St and Imperial Hwy	Downey	Los Angeles County
CALAS031	NB Prairie Ave, Between Redondo Beach Blvd and Mahattan Beach Blvd @ Alondra Park	Lawndale	Los Angeles County
CALAS025	NB Garfield Ave, Between Glady St and Karmont Ave	South Gate	Los Angeles County
CALAS026	NB WOODRUFF AVE, Between of Del Amo Blvd and Hardwick St	Lakewood	Los Angeles County
CALAS027	EB 223 Rd St, Between Catskill and Grace Ave	Carson	Los Angeles County
CALAS028	NB Main St, Between Lifford St and Victoria St	Carson	Los Angeles County
CALAS029	NB LOS COYOTES DIAG, Between Keynote St and Walkerton St	Long Beach	Los Angeles County
CAOCS001	NB Rockfield north of Lake Forest Drive	Orange County - Lake Forest	Orange County
CAOCS002	EB Chapman Avenue east of Crawford Canyon	Orange County - Orange	Orange County
CAOCS003	Ortega Hwy/SR 74 east of Rancho Viejo Rd	Orange County - San Juan Capistrano	Orange County
CAOCS004	North Parks Rd @ Catlin St	Fullerton	Orange County
CARCS001	NB Van Buren Blvd between Central and Jurupa Avenue	Riverside	Riverside County

Appendix D – ESP / FCCC Data Exchange

1. Overview

This document describes the file formats for various data files that are exchanged between ESP, FCCC and CA-DMV

All **Files** are comprised of a variable number of **Records** unless stated otherwise in Comment
Each **Record** is comprised of fixed number of **Fields**, separated by commas and terminated with <cr><lf>
Each **Field** if comprised of a variable number (0 – MaxLength) of ascii characters

2. ESP DMV Vehicle Format

Field	Fieldname	Format	Max Length	Note	Source Card, Field	Comment
1	RSD Emissions ID	NNNNNNN	7			RSD Emissions ID
2	RSD Plate	AAAAAAAA	7		Card1, 1	Registration Plate right padded with spaces to 7 characters
3	DMV Date Queried	YYYYMMDD	8		Card1, 4	Date of DMV data Queried
4	DMV VIN	AAA-AAA	30		Card1, 7	Vehicle Identification Number right padded with spaces to30 characters
5	DMV Date Registered	YYYYMMDD	8		Card3, 31	Date Registered at DMV
6	DMV Registration Expiration	YYYYMMDD	8		Card2, 14	
7	DMV Emissions Status	AAAA	4	3		Result of current emissions test
8	DMV Emissions Prev Date	YYYYMMDD	8	3		Date of current emissions test
9	DMV Emissions Prev Result	AAAA	4	3		Result of previous emissions test
10	DMV Emissions Next Date	YYYYMMDD	8		Card5, 7	Date of next due emissions test
11	DMV Vehicle Type	AAAA	4	3		Vehicle Type Code *(See Table A)*
12	DMV Vehicle Make	AAA-AAA	20		Card2, 18	
13	DMV Vehicle Model Year	YY	2		Card2, 16	Model Year
14	DMV Vehicle Empty Weight	NNNNNN	6	3		Empty Weight (lbs)
15	DMV GVWR	NNNNNN	6	3		Rated GVWR (lbs)
16	DMV Fuel Type	AA	2	3		Fuel Type Code *(See Table B)*
17	DMV Jurisdiction	AA	2		Card2, 26	County of Registration *(See Table C)*
18	DMV ZIP	NNNNNNNNN	9		Card2, 24	ZIP 5 or 5+4 without hyphen
19	DMV IM Code	AAA-AAA	10	3		IM Record Status
20	DMV Record Status	NN	2		Card6, 14	Code/Status of DMV Record *(See Table D)*

Notes:

1. Files send from ESP to FCCC/DMV will contain only the first 2 fields
2. Files from DMV to ESP will have all available fields populated
3. Not Populated at this time from the DMV Card Image format, for future use

3. ESP RSD Record Format

Field	Fieldname	Format	Max Length	Comment
1	RSD HEI_ID	NNNNNN	6	VID HEI Key, 0 = Not HEI Vehicle
2	RSD Emissions_ID	NNNNNNNN	8	VID Emissions Key
3	RSD Plate	AAAAAAAA	8	Registration Plate
4	RSD State	AA	2	State Abbreviation Or UK for unknown
5	RSD PictureName	AAAA—AAA	12	Picture Filename
6	RSD Serial Number	NNNN	4	RSD SDM Serial Number
7	RSD CO	sNN.NN	6	% CO Measured
8	RSD CO2	sNN.NN	6	% CO2 Measured
9	RSD HC	sNNNNN	6	ppm HC Measured
10	RSD NO	sNNNNN	6	ppm NO Measured
11	RSD PM	sN.NN	5	UV Smoke Factor Measured
12	RSD HEI CO Failed	Y or N	1	Y if HC above Cutpoint
13	RSD HEI NO Failed	Y or N	1	Y if NO above Cutpoint
14	RSD HEI PM Failed	Y or N	1	Y if PM above Cutpoint
15	RSD Speed	NN.N	4	Vehicle Speed (mph)
16	RSD Accel	sNN.N	5	Vehicle Acceleration (mph/sec)
17	RSD VSP	NN.NN	4	Vehicle Specific Power (kw/ton)
18	RSD Site	AAAAAA	6	Observation Site ID
19	RSD Temp	sNNN.N	6	Ambient Temperature (deg F)
20	RSD Humidity	NN.N	4	Ambient Relative Humidity (percent)
21	RSD Pressure	NN.NN	5	Ambient Barometric Pressure (in Hg)
22	RSD HCF	N.NNN	5	NO Humidity Correction Factor
23	RSD Date	YYYYMMDD	8	Date of Observation
24	RSD Time	HH:MM:SS	8	Time of Observation (local time)
25	DMV Date Queried	YYYYMMDD	8	Date of DMV was Queried
26	DMV VIN	AAA-AAA	22	Vehicle Identification Number
27	DMV Date Registered	YYYYMMDD	8	Date Registered at DMV
28	DMV Registration Expiration	YYYYMMDD	8	
29	DMV Emissions Status	AAAA	4	Result of current emissions test
30	DMV Emissions Prev Date	YYYYMMDD	8	Date of current emissions test
31	DMV Emissions Prev Result	AAAA	4	Result of previous emissions test
32	DMV Emissions Next Date	YYYYMMDD	8	Date of next due emissions test
34	DMV Vehicle Type	AAAA	4	Vehicle Type Code *(See Table A)*
35	DMV Vehicle Make	AAA-AAA	20	
36	DMV Vehicle Model Year	YYYY	4	Model Year
37	DMV Vehicle Empty Weight	NNNNNN	6	Empty Weight (lbs)
38	DMV GVWR	NNNNNN	6	Rated GVWR (lbs)
39	DMV Fuel Type	AA	2	Fuel Type Code *(See Table B)*
40	DMV Jurisdiction	AAAA	4	County of Registration *(See Table C)*
41	DMV ZIP	NNNNNNNNN	9	ZIP 5 or 5+4 without hyphen
42	DMV IM Code	AAA-AAA	10	IM Region Code
43	DMV Record Status	AAA-AAA	10	Status code of this DMV Record *(See Table D)*
44	RSD HEI ConfigID	NNNNNN	6	HE Configuration ID

4. Naming conventions for data transfer files

a. Plate Request files to DMV

ESP2DMV_yymmdd_nnn.csv
yymmdd = year,month,day dataset generated
nnn = Number or records in dataset (use as many digits as required)
example: ESP2DMV_070419_23138.csv

Plate Request Files are transmitted twice per week.

b. Vehicle Data Files from DMV (Returned Plate Request files)

DMV2ESP_yymmdd_nnn.csv
yymmdd_nnn same as corresponding ESP2DMV file above
example: DMV2ESP _070419_23138.csv

Vehicle Data Files are transmitted twice per week.

c. HEI Candidate Files to FCCC

ESP2FCCC_HEI_yymmdd_nnn.csv
yymmdd = year,month,day dataset generated
nnn = Number or records in dataset (use as many digits as required)
example: ESP2FCCC_HEI_070419_183.csv

HEI Candidate Files are transmitted once per week.

d. RSD DMV Matched Emissions Files to FCCC (same file format as HEI Candidate files)

ESP2FCCC_MATCH_yymmdd_nnn.csv
yymmdd = year,month,day dataset generated
nnn = Number or records in dataset (use as many digits as required)
example: ESP2FCCC_MATCH_070419_48156.csv

DMV Matched Emissions Files are transmitted once per week.

TABLE A: Vehicle Type Codes

LDV	Light-Duty Vehicles (Passenger Cars)
LDT1	Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3750 lbs. LVW)
LDT2	Light Duty Trucks 2 (0-6,001 lbs. GVWR, 3751-5750 lbs. LVW)
LDT3	Light Duty Trucks 3 (6,001-8500 lbs. GVWR, 0-3750 lbs. LVW)
LDT4	Light Duty Trucks 4 (6,001-8500 lbs. GVWR, 3751-5750 lbs. LVW)
HD2B	Class 2b Heavy Duty Vehicles (8501-10,000 lbs. GVWR)
HD3	Class 3 Heavy Duty Vehicles (10,001-14,000 lbs. GVWR)
HD4	Class 4 Heavy Duty Vehicles (14,001-16,000 lbs. GVWR)
HD5	Class 5 Heavy Duty Vehicles (16,001-19,500 lbs. GVWR)
HD6	Class 6 Heavy Duty Vehicles (19,501-26,000 lbs. GVWR)
HD7	Class 7 Heavy Duty Vehicles (26,001-33,000 lbs. GVWR)
HD8A	Class 8a Heavy Duty Vehicles (33,001-60,000 lbs. GVWR)
HD8B	Class 8b Heavy Duty Vehicles (>60,000 lbs. GVWR)
HDBS	School Busses
HDBT	Transit and Urban Busses
MC	Motorcycles (All)

TABLE B: Fuel Type Breakdown

D	Diesel
E1	Ethanol (greater than 20%)
E2	Ethanol (greater than 20%)
G	Gasoline
HD	Hybrid – Diesel/Electric
HG	Hybrid – Gas/Electric
M	Methanol (greater than 20%)
N	Liquid/Compressed Natural Gas (LNG/CNG)
NG	LNG/CNG dual-fuel engine, operating on gasoline
NN	LNG/CNG dual-fuel engine, operating on LNG/CNG
P	Liquid Propane Gas (LPG),
PG	LPG dual-fuel engine, operating on gasoline
PP	LPG dual-fuel engine, operating on propane

Appendix E – High Emitter Selection Algorithm

SCAQMD Programmable High Emitter Algorithm

Last Updated Apr 27, 2007

The original set of cutpoints was based primarily on having single measurements. Now we have two measurements on many vehicles and quite a few vehicles exceed the cutpoint on one measurement but are just under on the second. Although it is highly likely these vehicles are high emitters, they are not selected by the original algorithm.

Version 2 of the SCAQMD high emitter algorithm will select more of these vehicles as high emitters is to establish two levels of RSD cutpoints: 1) very high, 2) high. The 'very high' cutpoints would act like the current cutpoints. The 'high' cutpoints would be set at about 50% of the 'very high' cutpoint, e,g, if the 'very high' HC cutpoint is 500 ppm then the 'high' cutpoint would be 250 ppm. A similar approach would be applied to NOx and smoke.

Vehicles with more than two measurements

When vehicles have multiple measurements, the original algorithm requires a certain % to exceed the 'very high' cutpoint, e.g. 65%.

With two cutpoints, 'very high' and 'high', an additional criterion would be added; the % of measurements that have to exceed the 'high' standard. For example, if the criteria for the % of measurements required to pass the very high and high cutpoints are set to 30% and 70% respectively, then the following would be required to qualify as a high emitter:

1 measurement: 1/1 very high, 1/1 high

2 measurements: 1/2 very high, 2/2 high

3 measurements: 1/3 very high, 3/3 high

4 measurements: 2/4 very high, 3/4 high

5 measurements: 2/5 very high, 4/5 high

etc

Programmable High Emitter Algorithm Details

If the Vehicle's Registration ZIP code is >= 70% within the SCAQMD area then
If the Vehicle's Year is between MIN_YEAR and MAX_YEAR then
If the Vehicle's Year >= 1976 then check for

If the (Vehicle's Next Smog Check Required Date – Current Date) > NEXT_SMOG_DAYS then
If the (Current Date - Vehicle's Previous Smog Check Required Date) > PREV_SMOG_DAYS then

Lookup RSD High Emitter Cut-points based on Year, Vehicle Type, and Fuel Type

Using the RSD_QUAL_LEVEL, Only use Valid RSD Readings with appropriate flags and with the same license plate and VIN

Then If the NUM_RSD_READINGS are greater than the cut-points, optional on the same gas by the RSD_SAME_GAS flag:

- With the max time between any two RSD readings =< MAX_RSD_TIME

- With the min time between any two RSD readings >= MIN_RSD_TIME

If the vehicle was previously flagged as a high emitter, and there are new RSD readings over the cut-points and if the (date of the new RSD readings – date of the previous last observation as high emitter) >RSD_REFLAG and RSD_REFLAG! = 0, then re-flag as high emitter

If PM_FAILURE = 'Y' and if the vehicle fails on PM only , then Vehicle's Registration ZIP code must within must be in PM ZIP code areas to enable testing at the two FCCC PM referee stations with ETaPS then

Then Flag the Vehicle as a high emitter candidate to FCCC.
All the new emissions records of the high emitter candidates will be sent to the FCCC weekly in the ESP RSD Record format with the RSD HEI_ID > 0.

Programmable Parameters

Variables	Description	Units	Default Value
HEI_VERSION	Version of the HEI Algorithm		2
CP_VERSION	Version of the Cut-Points Table		1
NEXT_SMOG_DAYS	Days before the next Smog Check is required	Days	90
PREV_SMOG_DAYS	Days since the previous Smog Check is performed	Days	0
MIN_YEAR	Min Vehicle Year to use in the algorithm	Year	1960
MAX_YEAR	Max Vehicle Year to use in the algorithm	Year	2008
MIN_VSP	Min Vehicle Specific Power required	kW/T	3
MAX_VSP	Max Vehicle Specific Power required	kW/T	30
RSD_QUAL_LEVEL	Binary Bits to select different RSD quality checks of the data being processed		7
RSD_SAME_GAS	Flag for does the RSD reading have to be over for the same gas?	Y or N	Y
RSD_REFLAG	Re-flag a previous high emitter as a new high emitter 0 = Disabled (Don't send a second notice)	Days	0
NUM_RSD_READINGS	Number of RSD reading(s) over the RSD cut-points required to flag a vehicle as a high emitter		1
MAX_RSD_TIME	The max time between any two RSD readings	Days	180
MIN_RSD_TIME	The min time between any two RSD readings	Hours	0.00
PREC_FAIL_RATE_GROSS	Percentage of readings during the last MAX_RSD_TIME days that failed Very High_Cutpoints	Percent	30
PREC_FAIL_RATE_HIGH	Percentage of readings during the last MAX_RSD_TIME days that failed High_Cutpoints	Percent	70
NO_READINGS	H-Humidity corrected and N-Normal		H
DMV_MATCH	Flag for do we have the DMV data or not?	Y or N	N
PM_FAILURE	Flag for do we test for PM only failure	Y or N	N
HEIS_GVWR	Vehicle types by the GVWR	Lbs	8500
HEIS_FuelType	Different fuel types to be tested are separated by commas		G

Note - 1: The PM_FAILURE Flag to "Y" will be only set when the two FCCC referee stations have the ETaPS sensor in place have.

Version 2 of RSD SCAQMD Cutpoints for Gasoline Vehicles						
	Very High Cutpoints			High Cutpoints		
Model Year	HC ppm	NO ppm	PM RSD Smoke	HC ppm	NO ppm	PM RSD Smoke
1975 & older	575	1250	0.75	300	800	0.40
1976	575	1250	0.75	300	800	0.40
1977	575	1250	0.75	300	800	0.40
1978	575	1250	0.75	300	800	0.40
1979	575	1250	0.75	300	800	0.40
1980	575	1250	0.75	300	800	0.40
1981	575	1250	0.75	300	800	0.40
1982	575	1250	0.75	300	800	0.40
1983	575	1250	0.75	300	800	0.40
1984	575	1250	0.75	300	800	0.40
1985	575	1250	0.75	300	800	0.40
1986	575	1250	0.75	300	800	0.40
1987	575	1250	0.75	300	800	0.40
1988	575	1250	0.75	300	800	0.40
1989	500	2250	0.75	250	1000	0.40
1990	500	2250	0.75	250	1000	0.40
1991	500	2250	0.75	250	1000	0.40
1992	500	2250	0.75	250	1000	0.40
1993	500	2250	0.75	250	1000	0.40
1994	500	2250	0.75	250	1000	0.40
1995	500	2250	0.75	250	1000	0.40
1996	500	2250	0.75	250	1000	0.40
1997	500	2250	0.75	250	1000	0.40
1998	500	2250	0.75	250	1000	0.40
1999	500	2250	0.75	250	1000	0.40
2000	500	2250	0.75	250	1000	0.40
2001	500	2250	0.75	250	1000	0.40
2002	500	2250	0.75	250	1000	0.40
2003 & Newer	500	2250	0.75	250	1000	0.40

References

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[v] "Task 3 High Emitting Vehicle Identification Plan", ESP report prepared for South Coast Air Quality Management District, November 2006

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