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2017 Annual Report

Massachusetts Vehicle Check Inspection and Maintenance Program

April 29, 2019

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2017 Annual Report Massachusetts Enhanced Inspection and Maintenance Program

1 EXECUTIVE SUMMARY

This Annual Report is required by the U.S. Environmental Protection Agency (EPA) under 40 CFR 51.366. This regulation requires that annual reports cover four categories of information:¹

- Station and inspector oversight,
- Quality control,
- Compliance and enforcement, and
- Emissions test data.

2017 was the ninth full year of operation of Massachusetts Vehicle Check, the Commonwealth's enhanced Inspection and Maintenance (I&M) Program.

The Massachusetts Department of Environmental Protection (MassDEP) and the Massachusetts Department of Transportation's Registry of Motor Vehicles Division (RMV) jointly administer the Massachusetts Vehicle Check Program. The contract with Parsons Environmental & Infrastructure Group Inc. to manage and implement the Vehicle Check Program that began in 2008 ended on September 30, 2017. In November 2016, the Commonwealth contracted with Applus Technologies to manage and implement the program starting on October 1, 2017. This contract continues the same program design established October 1, 2008 and adds new features to assist with program oversight that are described in the 2016 – 2017 biennial report procedures section. The Massachusetts Vehicle Check is a comprehensive vehicle emissions and safety testing program including:

- Inspections provided by a decentralized network of inspection stations;
- Stations and inspectors licensed by the Commonwealth;

¹ See "Attachment A: Index of Report Pages Relevant to EPA Regulation Sections" for details about where specific required items appear in this report.

- Annual safety tests;
- Commercial vehicle safety inspections that meet U.S. Department of Transportation requirements, so these vehicles only need one comprehensive check;
- An annual On-Board Diagnostic (OBD) emissions test for vehicles that are equipped with OBD systems (vehicles 15 or more years old are exempt);
- An annual opacity test for emissions for diesel vehicles model year 1984 and newer greater than 10,000 lbs. gross vehicle weight rating (GVWR) that are not equipped with OBD;
- A safety test and any applicable emissions test upon transfer of ownership;
- A requirement that vehicles that fail their initial emissions test be repaired and pass a re-test within 60 days;
- Waiver eligibility, for a one-year waiver of the emissions standards, for certain vehicles that fail their emissions test after being repaired by a state-registered repairer;
- An “economic hardship” extension for vehicles that failed their emissions test and require replacement of a major (and expensive) component to pass, giving the vehicle owner one year to finance repairs or replace the vehicle;
- Ten Motorist Assistance Centers (MACs) located across the state to provide information to motorists, technical assistance to repair technicians, help with getting vehicles “ready” for testing after emissions repairs, vehicle evaluations for repair waivers and economic hardship extensions, and vehicle testing quality assurance;
- Market-based fees for commercial vehicle inspections; and
- An inspection fee of \$35 for non-commercial vehicles. The fee was increased from \$29 to \$35 on July 1, 2014, the first increase since 1999.

The Agencies amended the program’s implementing regulations (MassDEP at 310 CMR 60.02, and RMV at 540 CMR 4.00-4.09) to incorporate these changes in September 2008, and the enhanced program started operation on October 1, 2008. A revision to the Massachusetts State Implementation Plan (SIP), reflecting the changes to MassDEP and RMV regulations, was submitted to EPA in June 2009, with a minor revision in November, 2009. The regulatory changes received EPA approval effective March 26, 2013.

This report covers the period between January 1, 2017 and December 31, 2017.

1.1 Major Findings

Emissions Tests Conducted

In 2017, an annual emissions test was required for the majority of the fleet. The following non-diesel² vehicles required an OBD test:

² A diesel vehicle is defined as a vehicle powered by an engine using a compression ignition thermodynamic cycle. Non-diesel vehicles are typically fueled with gasoline, including hybrids, but may also be powered by alternative fuels such as natural gas.

- Vehicles in model years 2003-2007 weighing 8,500 lbs. GVWR or less,
- Model year 2008 and newer vehicles weighing 14,000 lbs. GVWR or less.

The following diesel vehicles required an OBD test:

- Vehicles in model years 2003-2006 weighing 8,500 lbs. GVWR or less,
- Model year 2007 and newer vehicles weighing 14,000 lbs. GVWR or less.

Heavy duty diesel vehicles (weighing over 10,000 lbs. GVWR) with model year 1984 or newer that were not subject to the OBD test required an opacity test.

An emissions test was also required when a vehicle meeting any of the above requirements changed ownership or had its registration transferred to Massachusetts from another state.

In 2017, there were approximately 5.03 million vehicles registered in Massachusetts. From January 1, 2017 through December 31, 2017, the I&M Program conducted 3,877,643³ emissions tests, including initial tests and retests. 3,723,384 unique vehicles (74% of the Massachusetts fleet) received an initial emissions test in 2017. Of these vehicles, 3,596,760 were non-diesel fueled (e.g., gasoline, natural gas, etc.) and 126,624 were diesel fueled.

Motorist Compliance and Enforcement

Of the 3,597,990 non-diesel vehicles complying with program's testing requirements and receiving an initial OBD test in 2017, 181,322 (5.0%) failed their initial test. Of the 32,822 diesel vehicles receiving an initial OBD test, 4,028 (12.3%) failed their initial test. Of the 93,771 diesel vehicles receiving an initial opacity test, 1,151 (1.2%) failed their initial test.

Of all non-diesel vehicles tested, 21,565 (0.6%) did not comply with program requirements and pass a subsequent retest, or receive a waiver or hardship extension by March 31, 2018. Two waivers from the requirement that failing vehicles pass an emissions re-test were granted in 2017 (less than 0.01% of vehicles failing initial emissions tests), along with 14 economic hardship extensions. Of all diesel vehicles receiving an OBD test, 660 (2.0%) did not pass a subsequent retest by March 31, 2018.

Vehicles failing to receive safety inspections or emissions tests when required are subject to enforcement by RMV as well as state and local law enforcement agencies.

Station and Inspector Oversight

In 2017, RMV performed 8,220 site audits to determine if program inspectors were correctly performing all safety and emissions tests and if the station's physical conditions continued to meet program requirements. All stations operating throughout the year

³ The 3,877,643 emissions tests reflects one initial test for the year for each vehicle, even though some vehicles go through the emissions test cycle more than once because of off-cycle tests at change of ownership.

received at least one visit. Based on the results of the site audits and other data, RMV held 175 hearings for stations and issued 225 adverse actions against stations (e.g., warning letters, license revocations or license suspensions).

In 2017, 6,790 licensed inspectors performed at least one test. Based on the results of the site audits and other data, RMV held 147 hearings for inspectors, and issued 177 adverse actions against inspectors (e.g., warnings, license revocations or license suspensions).

MassDEP and the Attorney General's Office complement RMV enforcement actions where there is substantial or repeat noncompliance by a station or inspector. In 2017 MassDEP and the Attorney General's Office continued to work on three on-going cases where stations and inspectors used improper inspection procedures.

2017 Program Changes

Beginning on October 1, 2017, several new measures were implemented to aid with program oversight. A digital image of the inspector is now automatically captured when the inspector logs into the workstation to perform an inspection. This helps verify the identity of the inspector. Also, the inspector is now required to take the following 4 images of the vehicle being inspected using a hand held digital camera: 1) front of the vehicle, 2) rear of the vehicle, 3) vehicle identification number (VIN) tag, and 4) odometer reading. These images help verify the identity of the vehicle being inspected and its mileage. These images all become part of the inspection record.

1.2 Contents of This Report

Section 2 of this report describes the Massachusetts I&M Program and provides information on the number of vehicles covered, inspection stations and inspectors, and types of emissions tests administered. The remaining sections of the report describe specific aspects of the program:

- Motorist Compliance with Testing Requirements (Section 3)
- Performance of Emissions Test Equipment (Section 4)
- Station and Inspector Oversight (Section 5)

The attachments to this report contain detailed data on vehicles tested, results of emissions tests, and audit results:

- Attachment A: Index of Report Pages Relevant to EPA Regulation Sections
- Attachment B: 2017 Detailed Emissions Test Data
- Attachment C: 2017 Test Data by Station
- Attachment D: 2017 Quality Control Report

2 THE MASSACHUSETTS I&M PROGRAM

2.1 Why Does Massachusetts Have an I&M Program?

The Clean Air Act requires I&M programs in areas in the U.S. most impacted by ozone and carbon monoxide pollution, as well as in states that are part of the Ozone Transport Region (OTR.) As a result of having areas designated nonattainment for the 1997 8-hour ozone NAAQS and by virtue of its inclusion in the OTR, Massachusetts has implemented a statewide enhanced I&M program. Massachusetts has since attained the 1997 ozone NAAQS (and was designated as unclassifiable/attainment for the current 2015 ozone NAAQS.) To maintain the air quality improvements that have been made, Massachusetts must continue to implement a variety of federally mandated programs⁴, including the I&M program. EPA sets minimum standards for I&M programs⁵.

The Massachusetts I&M Program (currently known as “Massachusetts Vehicle Check”) was authorized by the Legislature by Chapter 210 of the Acts of 1997, and is jointly administered by MassDEP and RMV. The program’s goals are to implement a comprehensive test that provides the emission reductions needed for the Massachusetts SIP, provide convenience to motorists, ensure vehicle safety, and work well in local inspection shops. To maximize customer convenience, the legislation combines emissions and safety testing, and requires that the combined test be delivered in local inspection stations, convenient to where people live and work.

In January 2008, the Commonwealth contracted with Parsons Commercial Technology Group, Inc. (now Parsons Environmental & Infrastructure Group Inc.) (Contractor), to supply inspection equipment and operate the Massachusetts I&M Program through September 30, 2017. In November 2016, the Commonwealth contracted with Applus Technologies to supply inspection equipment and operate the Massachusetts I&M Program starting October 1, 2017. This report describes the program in 2017.

2.2 Vehicles Subject to Inspection

40 CFR 51.366 (d) (1) (i): An estimate of the number of vehicles subject to the inspection program, including the results of an analysis of the registration data base;

In 2017, there were approximately 5.03 million vehicles with active registrations in the Massachusetts fleet. Each vehicle registered in Massachusetts must be inspected annually. All vehicles must receive a safety inspection every year, and the vast majority must also receive an emissions test every year. In addition, vehicles are required to receive a safety and an emissions inspection within seven days of transfer of ownership,

⁴ These programs are established in legally binding and federally enforceable “State Implementation Plans” or “SIPs.”

⁵ 40 CFR Part 51, Subpart S (§51.350 et seq.)

or within seven days of their initial Massachusetts registration when transferring registration from another state.

In 2017, non-diesel⁶ vehicles were exempted from the emissions inspection if they were:

- Light duty vehicles older than model year 2003,
- Medium duty vehicles older than model year 2008, or
- Heavy duty vehicles

Diesel vehicles were exempted from the emissions inspection in 2017 if they were:

- Light duty vehicles older than model year 2003,
- Medium duty vehicles with a gross vehicle weight rating (GVWR) of 10,000 lbs. or less and older than model year 2007, or
- Heavy duty vehicles with a GVWR of more than 10,000 lbs. and older than model year 1984.

Also exempted were vehicles of any type that were less than one year old and still registered to the original owner.

2.3 Inspection Stations

40 CFR 51.366 (b) ⁷ (1): The number of inspection stations and lanes: (i) Operating throughout the year; and (ii) Operating for only part of the year;

Most Massachusetts vehicles receive their inspections at local public stations. The program also allows owners of vehicle fleets to purchase their own testing equipment so they can test their own vehicles. The number of public and fleet stations fluctuates slightly from month to month, as businesses join or leave the program.

In 2017, 1,587 stations conducted emissions tests (OBD and/or diesel opacity) throughout the year, and another 206 conducted tests during part of the year. There were 1,699 “workstations” or sets of inspection equipment used for testing emissions throughout 2017, and 117 workstations used for testing emissions during part of the year. A small number of inspection stations have more than one workstation. In Massachusetts, the number of workstations is equivalent to the number of lanes in a centralized testing program. Table 1 shows the numbers of workstations and stations testing emissions throughout the year and for part of the year. As part of the new program contract, all stations were required to retire their existing workstations and begin using new workstations starting October 1, 2017.

⁶Non-diesel vehicles are typically fueled with gasoline, including hybrids, but may also be powered by alternative fuels such as natural gas.

⁷For all references to 40 CFR 51.366: 57 FR 52987, Nov. 5, 1992, as amended at 61 FR 40945, Aug. 6, 1996; 65 FR 45534, July 24, 2000; 66 FR 18178, Apr. 5, 2001.

At any given time, some of the workstations and stations are not operating, due to factors such as station renovation, or change of ownership or location. Table 1 also shows that the number of workstations and stations testing in any given month is fewer than the total number of workstations and stations, as seen by the number of stations and workstations testing in December.

Table 1: Number of Stations and Workstations Testing Emissions in 2017

	Workstations	Stations
Testing All Year	1,699	1,587
Testing for Part of Year	117	206
Total During Year	1,816	1,793
Testing in December	1,731	1,685

Table 2 shows the breakdown of fleet and public stations.

Table 2: Public and Fleet Stations in 2017

	Public	Fleet	Total Stations
Testing All Year	1,499	88	1,587
Testing for Part of Year	149	57	206
Total During Year	1,648	145	1,793
Testing in December	1,566	119	1,685

In Tables 1 and 2, a station or workstation must have conducted emissions inspections in each month in 2017 to be counted as “testing all year.” Stations or workstations that were licensed for the entire year, but did not test in one or more months are considered “testing for part of the year,” as are stations that entered or left the program during the year.

2.4 Inspectors

40 CFR 51.366 (b) (5): The number of inspectors licensed or certified to conduct testing;

At the close of calendar year 2017 there were 7,612 trained and licensed inspectors certified to conduct emission tests (see Table 3). However, in 2017 only 6,704 inspectors conducted emissions tests and 6,790 inspectors tested at least one vehicle for safety or safety plus emissions.

**Table 3: Number of Inspectors
January 1, 2017 through December 31, 2017**

	#Inspectors
Inspectors Trained And Licensed on December 31, 2017	7,612
Inspectors Who Inspected at Least One Vehicle in 2017	6,790
Inspectors Who Tested Emissions in 2017	6,704

2.5 Emissions Tests Administered

The Massachusetts I&M Program uses the vehicle’s OBD system for emissions testing of most vehicles. These systems include computers and sensors that assess the condition of the vehicle’s emissions control systems. The emissions test accesses the OBD system in these vehicles to find out whether the emission control system is working properly. The Massachusetts I&M Program started testing all non-diesel vehicles equipped with modern OBD systems (i.e., OBD II) based on the data in those systems on June 14, 2004. The program that started on October 1, 2008 continued using OBD tests for non-diesel vehicles, and added OBD testing for diesel vehicles that are equipped with these systems.

Massachusetts has used a snap acceleration opacity test for heavy duty diesel vehicles since 2001 (except between August 2008 and October 2009, when the new program contractor was preparing, testing, and installing new diesel testing equipment and related software).

3 MOTORIST COMPLIANCE WITH TESTING REQUIREMENTS

3.1 Overall Motorist Compliance with Testing Requirements

40 CFR 51.366 (d) (1) (ii): The percentage of motorist compliance based upon a comparison of the number of valid final tests with the number of subject vehicles;

Table 4 summarizes the overall compliance rate for 2017, which compares the total number of unique vehicles receiving an I&M test (including safety-only tests) to the number of unique registered vehicles that were estimated to be due for an inspection during this period.

Table 4: 2017 Overall Testing Compliance Rates

	Vehicle Count	Compliance %
Average Number of Vehicles Registered in MA in 2017	5,031,688	
Unique Vehicles Tested in 2017 (Safety Only or Safety and Emissions Tests)	4,786,557	95.1%

Please note that Table 4 may overstate compliance with testing requirements: the *average number of vehicles registered in the Commonwealth* can fluctuate from month to month, as vehicles are removed from the fleet and possibly replaced with new or out of state vehicles. By contrast, the *unique vehicles tested in 2017* counts all Massachusetts-registered vehicles that were tested during the year, even though they may only have been part of the fleet for a portion of the year. A compliance rate specifically for emissions tests in this period is not available, since the program does not track the number of registered vehicles that are exempt from the emissions testing requirement (e.g., those that are less than one year old, or are non-diesel and are older than model year 2003).

Of the 181,322 non-diesel vehicles that failed their initial OBD test, 21,565 (11.9% of the failing vehicles, and 0.6% of all non-diesel vehicles tested) did not pass a subsequent retest, or receive a waiver or economic hardship extension by March 31, 2018. (The retest would be considered a “final test” as per EPA’s requirement noted above). Of the 32,822 diesel vehicles receiving an OBD test, 660 (2.0% of all diesels OBD tested) did not pass a subsequent retest by March 31, 2018. Two waivers from the requirement that failing vehicles pass an emissions re-test were granted in 2017 along with 14 economic hardship extensions (less than 0.1% of vehicles failing initial emissions tests).

The 22,225 vehicles (non-diesel and diesel) with no known outcome do not include vehicles that have expired or cancelled registrations. If those vehicles are included, the total number of vehicles with no known outcome increases to 38,339 (1.0% of vehicles tested). Vehicles failing to receive safety inspections or emissions tests when required are subject to enforcement by RMV as well as state and local law enforcement agencies.

3.2 Registration File Audits and Compliance with Deadlines

40 CFR 51.366 (d) (2) (ii): [Registration denial based enforcement programs shall provide. . .] The number of registration file audits, number of registrations reviewed, and compliance rates found in such audits. . . .

40 CFR 51.366 (d) (3): Computer-matching based enforcement programs shall provide the following additional information:

(i) The number and percentage of subject vehicles that were tested by the initial deadline, and by other milestones in the cycle;

In 2017, RMV completed a scan of the vehicle registration database each month. These registration reviews examine the testing status of each registered vehicle to determine compliance with testing requirements. The results of these reviews are summarized in Table 5, below.

These registration reviews are snapshots in time, and therefore tend to understate compliance. Registration reviews determine whether the most recent inspection for each vehicle was performed within the last 12 months and was a “pass.” The I&M regulations allow up to 60 days for emissions repairs and re-testing. The registration reviews count vehicles that failed their emissions test as “out of compliance” if they did not complete repairs and pass a re-inspection by the time of the registration review, even though the vehicle may still be within its 60-day period. Also, registration reviews only capture compliance status at a particular moment in time. A vehicle that was tested seven weeks late in 2017 would ultimately have been in compliance but would have been counted as out-of-compliance on two registration reviews.

Table 5: 2017 RMV Registration Reviews

Date	Active Registrations	Number Non Compliant	Percent In Compliance
1/16/2017	4,994,699	513,927	89.70%
2/15/2017	4,984,896	541,096	89.10%
3/15/2017	4,989,205	528,929	89.40%
4/15/2017	5,002,683	522,824	89.50%
5/15/2017	5,017,095	521,894	89.60%
6/15/2017	5,037,423	521,624	89.60%
7/15/2017	5,047,641	531,843	89.50%
8/15/2017	5,058,896	526,950	89.60%
9/15/2017	5,069,625	531,190	89.50%
10/16/2017	5,071,447	543,145	89.30%
11/15/2017	5,050,203	535,303	89.40%
12/15/2017	5,056,443	532,262	89.50%
Average	5,031,688	529,249	89.50%

3.3 Parking Lot Audits

40 CFR 51.366 (d) (4) (iii): [Sticker-based enforcement systems shall provide . . .] The number of parking lot sticker audits conducted, the number of vehicles surveyed in each, and the noncompliance rate found during those audits.

In 2017, RMV conducted audits of vehicle stickers at 119 Massachusetts parking lots. Table 6 summarizes the results of these audits.

Table 6: 2017 Parking Lot Audits

Parking lot audits conducted	119
Vehicles surveyed	2,975
Vehicles with valid inspection stickers	2,801
Compliance rate	94.1%

3.4 Other Compliance Surveys

40 CFR 51.366 (d) (1) (vi): The number of compliance surveys conducted, number of vehicles surveyed in each, and the compliance rates found;

RMV conducted registration file audits and vehicle sticker audits at Massachusetts parking lots, as described in Sections 3.2 and 3.3 respectively. No other compliance surveys were conducted in 2017.

RMV recognizes the need to have a registration enforcement program to enhance its efforts to ensure that motorists comply with the requirements of the Massachusetts I&M Program. However, RMV's aging information technology infrastructure cannot support a registration enforcement program while also meeting the data requirements of the other federal programs that RMV works under (which are increasing at unparalleled levels). RMV is continually exploring more cost-effective ways to get this job done in a proficient manner, and is scheduled to replace its primary registration, license, and title database (Automated License and Registration System (ALARS)) beginning in March of 2018 and concluding in November 2019. The replacement is expected to provide significantly more efficient data processing, which would allow RMV to move forward with the development and implementation of a successful registration enforcement program.

As part of the RMV's modernization efforts in 2017, RMV staff continued to define the business rules that should be included in a modernized database, including the business rules for implementing registration enforcement.

3.5 Motorist Time Extensions

40 CFR 51.366 (d) (1) (v): The number of time extensions and other exemptions granted to motorists;

Massachusetts offers an economic hardship repair extension for non-commercial vehicles that do not pass their initial emissions test and a re-test. Motorists are eligible for this extension if they meet all of the following criteria:

- the cost of repairing or replacing a single component to correct a diagnostic trouble code (DTC) for the component is more than 1.5 times the repair expenditure limit applicable for the model year of the vehicle:
 - \$1,320 for vehicles five model years old or newer;
 - \$1,170 for vehicles over five but not exceeding 10 model years old; and
 - \$1,020 for vehicles over 10 model years old.
- the vehicle does not qualify for a waiver;
- the economic hardship repair extension is not for an emissions inspection or re-inspection associated with initial registration or transfer of ownership;
- MassDEP or its designee agrees with the findings of the registered repair technician regarding the cause of the failure, and the appropriateness and reasonableness of the repair estimate;
- the motorist has used all relevant warranty coverage including recalls to repair the vehicle;
- all safety inspection requirements are met;

- the vehicle is registered with RMV as a private passenger motor vehicle or auto home; and
- the emission control system is present and there is no evidence of tampering.

An economic hardship repair extension is valid until the vehicle's next emissions inspection. This extension cannot be renewed or extended: at the end of the extension period, the vehicle must pass its emissions test.

In 2017, 14 economic hardship extensions were issued.

3.6 Waivers of Emission Standards

A non-commercial vehicle that does not pass a re-test is eligible for a waiver of the emissions standards if the following criteria are satisfied:

- At least the following amount has been spent for a Registered Emissions Repair Technician to repair the vehicle's emissions system (including labor and materials)⁸:
 - \$880 for a vehicle five model years old or newer
 - \$780 for a vehicle more than five but less than ten model years old
 - \$680 for a vehicle more than ten model years old
- The vehicle's emissions-control system must be intact with no evidence of tampering;
- The vehicle must have passed its safety inspection within the previous 60 days; and
- The vehicle's OBD system must connect successfully with the inspection station's computer, must be "ready" for its re-test, and cannot be showing DTCs for engine misfire, catalytic converter efficiency failure, or energy storage for a hybrid vehicle.

To obtain a waiver, the motorist must bring the vehicle to a Motorist Assistance Center (MAC) for an evaluation of eligibility. If the MAC determines that the vehicle meets all the requirements for a waiver, the MAC provides a waiver authorization, which the motorist must bring to an inspection station to obtain a valid sticker.

A waiver is valid until the vehicle's next emissions inspection.

In 2017, two waivers were issued.

3.7 Preventing False Registration by Motorists

⁸ Only the cost of repairs performed by a Registered Emissions Repair Technician qualifies for a waiver. Expenditures for repairs made by non-registered technicians are not eligible.

40 CFR 51.366 (d) (2) (i): [Registration denial based enforcement programs shall provide . . .] A report of the program's efforts and actions to prevent motorists from falsely registering vehicles out of the program area or falsely changing fuel type or weight class on the vehicle registration, and the results of special studies to investigate the frequency of such activity; and

40 CFR 51.366 (d) (3) (ii): [Computer-matching based enforcement programs shall provide . . .] A report on the program's efforts to detect and enforce against motorists falsely changing vehicle classifications to circumvent program requirements, and the frequency of this type of activity;

40 CFR 51.366 (d) (4) (ii): [Sticker-based enforcement systems shall provide . . .] A report on the program's efforts to detect and enforce against motorists falsely changing vehicle classifications to circumvent program requirements, and the frequency of this type of activity;

The reporting requirements for efforts to prevent false registration are not relevant to Massachusetts because:

- All of Massachusetts is covered by the program;
- All vehicles are required to be inspected annually for either safety or safety and emissions;
- If a motorist falsely reports fuel type or weight in order to avoid an emissions inspection, the inspector enters corrected data based on his or her examination of the fuel cap and the vehicle information appearing on the vehicle's door label. In addition, the workstation uses a separate VIN decoder to pre-populate critical fields (model year, fuel type, and GVWR) that determine whether a vehicle receives an emissions test. Changes to these fields by inspectors are flagged by the software for investigation by RMV.

3.8 Additional Sticker-Related Activities

40 CFR 51.366 (d) (4): Sticker-based enforcement systems shall provide the following additional information:

(i) A report on the program's efforts to prevent, detect, and enforce against sticker theft and counterfeiting, and the frequency of this type of activity;

In 2017, state and local police issued 46,037 inspection sticker motor-vehicle violations. Most of these violations were for expired stickers, but some violations lead to the discovery of sticker theft and counterfeiting. Sticker tracking efforts to detect theft and counterfeiting are discussed in section 5.1 and 5.4.3 of this report. Digital audits also detect theft and counterfeiting, and are discussed in section 5.2.

4 PERFORMANCE OF EMISSIONS TEST EQUIPMENT

The Massachusetts Vehicle Check program uses two methods to ensure that the emissions test equipment is operating properly:

1. The workstations have been designed to run daily “self checks” and self checks after vehicles fail to communicate so that equipment with significant issues is identified (and repaired) as quickly as possible,
2. RMV field investigators audit equipment performance in the field.

4.1 OBD Test Equipment Self Checks

Workstations have been designed to run several daily “self-checks” to ensure that they are operating properly. Every 24 hours, the workstation is programmed to require the inspector to perform equipment checks that ensure the functionality of the OBD scan tool, printer, barcode scanner, and, if equipped, diesel opacity meter. The self-checks include:

- A daily “loopback” check that tests the continuity of the OBD scan tool cable and pins in the Diagnostic Link Connector (DLC). If a loopback test fails, the workstation is locked out from performing OBD tests until a loopback check can be passed. Inspectors are also required to perform a loopback check prior to a vehicle failing its emissions test for failure to communicate with the workstation. This is to verify that the emissions test failure is not due to an equipment-related problem.
- A daily printer/barcode scanner check that tests print quality and the proper function of the barcode scanner. The workstation prints sample 1D and 2D barcodes and sample Vehicle Inspection Report (VIR) text. The inspector examines the quality of the printed sample and records a failure if the text is not legible. If the print quality is good, the inspector is then prompted to scan the 1D and 2D barcodes. If the workstation cannot read the barcodes, the workstation records a failure. Failure to read the barcodes can be caused by a faulty barcode scanner or poor print quality. If the printer/barcode scanner check fails, the workstation is locked out from performing all inspections until it can pass the check.
- For workstations equipped with diesel opacity meters, the three daily self-checks are electronic zero and span; accuracy at 37.5% opacity by extinguishing three of eight light pulses; and current draw of the sample fan. All three checks have tolerances which must be met to pass. If any of the three checks fails, the workstation is locked out from performing diesel opacity tests until all three checks pass.

All inspection stations were required to purchase new workstation equipment provided by Applus Technologies for program tests beginning on October 1, 2017. The new equipment includes a California Bureau of Automotive Repair (BAR) certified Data Acquisition Device (DAD) for performing OBD scans. This new scan tool includes a

more comprehensive daily self-check than the previous scan tool. For this reason, the Commonwealth has discontinued performing separate OBD test equipment audits beginning October 1, 2017.

4.2 OBD Test Equipment Audits

40 CFR 51.366 (c) Quality control report. ...Basic statistics on the quality control program for January through December of the previous year, including:

- (1) The number of emission testing sites and lanes in use in the program;
- (2) The number of equipment audits by station and lane;
- (3) The number and percentage of stations that have failed equipment audits; and
- (4) Number and percentage of stations and lanes shut down as a result of equipment audits.

In Massachusetts' decentralized program, the number of workstations is equivalent to the number of lanes in a centralized testing program. Most Massachusetts stations have only one workstation.

In 2017, twenty-four RMV field investigators conducted 3,818 audits of the OBD emissions test equipment used to conduct vehicle inspections in the Commonwealth. This covered 1,653 different workstations (lanes) and 1,601 different inspection stations, with 1,463 workstations being audited more than once.

In 2017, 1,587 stations and 1,699 workstations (lanes) conducted emissions inspections throughout the period.⁹ A total of 1,793 stations and 1,816 workstations conducted at least one emissions test at some time during the year.

The results of the audits are described in detail in Attachment D, and are summarized here.¹⁰

4.3 Audit Results for OBD Test Equipment

To pass an overall audit, the workstation cannot fail any of the audit's individual parts.

Table 7 describes the results of the workstation OBD test equipment audits conducted in 2017. It summarizes the workstation audit results for each individual OBD audit part and the overall workstation audit results.

⁹ A station or workstation must have conducted at least one emissions inspection in each month in 2017 to be counted as "testing throughout the period."

¹⁰ The OBD test equipment audits focus on workstation performance. In this report, the data for 40 CFR 51.366(c)(3) is provided for workstations, rather than for stations. A summary of failures for stations can be found in Attachment D, 2017 Quality Control Report.

Table 7: 2017 OBD Test Equipment Audit Results

2017 Audit Results – 3,818 Audits completed					
<u>Communications Check</u>	<u>Accuracy Check (including RPM)</u>	<u>Visual Check</u>	<u>Failing Totals</u>	<u>Combination Subtotals</u>	<u>Percentage Failure rate of Audits</u>
Failing Functional Checks					
<u>Fail</u>	<u>NA</u>	<u>Fail</u>	<u>0</u>	<u>0</u>	<u>0.0%</u>
<u>Fail</u>	<u>NA</u>	<u>Pass</u>	<u>0</u>		
Failing Visual Cable and Connector Checks					
<u>Pass</u>	<u>NA</u>	<u>Fail</u>	<u>0</u>	<u>15</u>	<u>0.39%</u>
<u>Pass</u>	<u>Pass</u>	<u>Fail</u>	<u>15</u>		
Overall number of Audit Failures					
			<u>Total Fails</u>	<u>15</u>	<u>0.39%</u>

Zero workstations failed a functional check out of 3,818 audits.

Workstations failed the visual cable and connector check on fifteen audits. One of these failing cable and connector audits was conducted when the workstation was automatically locked out from performing OBD inspections due to no prior OBD calibration within 24 hours.

Inspection stations are required to open service request tickets for all audit failures. Field investigators continue to monitor the cable and connector conditions for all stations and issue station violations if the stations are unresponsive to repair requirements.

No workstations were manually shut down as a result of the equipment audit failures. One workstation was automatically locked out from performing inspections by the workstation software prior to the audits, preventing inspections from occurring with defective equipment.

5 STATION AND INSPECTOR OVERSIGHT

The Massachusetts I&M Program uses overt, digital and covert audits to assess station and inspector performance. The results of each type of audit conducted in 2017 are described in this section.

5.1 Overt Performance Audits

40 CFR 51.366 (b) (2): The number of inspection stations and lanes operating throughout the year:

- (i) Receiving overt performance audits in the year;
- (ii) Not receiving overt performance audits in the year;

RMV conducts regular site visits/performance audits to determine if the inspectors are correctly performing all tests and if the station's physical conditions continue to meet program requirements. RMV typically visits inspection stations at least three times during the year, and performs additional visits to follow up on past problems or to investigate stations or inspectors based on consumer complaints or data analysis.

The Contractor maintains records of all inspections in a database to which MassDEP and RMV have access. RMV conducts monthly "digital audits" before visiting stations, to identify stations that may need investigation. A "digital audit" is a query of the database for information that may indicate issues warranting attention during the site visit. Digital audit items include the station's emissions testing and inspection failure rates and vehicle characteristics recorded during the inspection that do not match the vehicle information in the registration database.

RMV site visits cover a wide range of items including:

- Observing inspectors performing an inspection;
- Examining station and inspector licenses;
- Collecting voided inspection stickers and checking to see that stickers are stored in a secure location;
- Examining the inspection equipment and bay;
- Supplementing the inspector's training; and
- Investigating consumer complaints and/or anomalous digital audit findings.

RMV staff prepares a written report summarizing the results of each inspection. Violations of policies or regulations identified at site visits are forwarded to RMV headquarters for possible enforcement action.

In 2017, RMV conducted 8,220 overt station visits/audits. All 1,793 stations and 1,816 workstations that conducted emissions inspections during this period received at least one audit.

5.2 Digital Audits

In addition to RMV's overt station visits/audits, in 2017 MassDEP continued an initiative that started in late 2008 to use digital audits of the inspection database to identify suspected improper emissions inspections, and in many cases, to determine that an improper inspection occurred. When the data indicated that an improper inspection most likely occurred, MassDEP staff visited the station to confirm the accuracy of digital audit findings and to gather more information about the unusual situations that had been identified. RMV staff participated in many of these station visits.

During 2017, the program continued to focus on data mining to identify fraudulent inspection practices. On a monthly basis, MassDEP reviews all potential violations for the entire network during the previous month.

These digital audits were an effective tool for identifying improper inspections, particularly cases in which stations were "clean scanning" by conducting OBD tests on different vehicles than the ones brought in for inspection, and using the results from the fraudulent tests to issue stickers. In 2017, 1,477 suspect tests were identified through data mining of 4,786,557 inspections and flagged for evaluation. Of these, a total of 327 were potential violations referred to RMV staff. There were 200 inspector errors, 81 fraudulent tests, and 46 instances of the inspector and/or station inspecting outside their license class.

In addition to digital audits to identify fraudulent inspections, MassDEP increased the data mining for vehicles that appeared to be tampered based on their OBD results. These vehicles are flagged so that they automatically fail their next regular inspection and receive a referral to a MAC for further investigation. If the MAC determines the vehicle has been tampered, the motorist is required to return the vehicle to stock condition before it is allowed to be re-inspected. In May 2016, the inspection software was updated to eliminate the need for manual data mining for tampered vehicles and allow the MAC referral to occur in real time, not waiting until the next inspection. It also freed up time for staff to focus on other enforcement efforts. The real-time MAC referrals ended with the end of the program contract on September 30, 2017. The new workstation software implemented October 1, 2017 did not yet have this feature programmed into it for the remainder of 2017.

5.3 Covert Audits

Covert audits, or "covert performance audits," are under-cover inspections done with vehicles set to fail one or more parts of the emissions test. This section summarizes covert audits performed by the Contractor. While RMV staff also conducts covert audits as part of their enforcement activities, the results of their covert audits are not included in the following tables. In 2017, covert audits ended September 30th with the end of the Parsons contract. Due to the level of effort involved with implementing a new covert vehicle audit program with a new contractor, covert audits were scheduled to resume in mid-2018.

In 2017 the Contractor performed 940 covert vehicle audits. Of these, none were scheduled in response to Agency requests and all 940 audits were selected randomly or targeted based on data analysis. Some stations received more than one covert audit, as summarized in Table 8.

Table 8: 2017 Covert Audits per Station

Number of Audits Per Station	Count of Stations
1	762
2	83
3	4
Total Number of Stations Audited	849
Total Number of 2017 Audits	940

5.3.1 Covert Auditors and Covert Vehicles

40 CFR 51.366 (b) (8): The total number of covert vehicles available for undercover audits over the year;
 (b) (9): The number of covert auditors available for undercover audits.

Covert audit vehicles are selected to represent the range of OBD communication protocols. Four vehicles were used for covert audits in 2017, representing three communication protocols:

- KWP (ISO 14230-4),
- VPW, and
- PWM.

One of the four vehicles was set up as a communication failure, so there was no protocol represented.

In 2017, four covert auditors conducted covert vehicle audits.

5.3.2 Number of Covert Audits Conducted in 2017

40 CFR 51.366 (b) (2): The number of inspection stations and lanes operating throughout the year: . . .
 (iii) Receiving covert performance audits in the year;
 (iv) Not receiving covert performance audits in the year;

Table 9 summarizes the number of covert audits conducted during 2017 for each type of inspection station. Only public stations can receive covert vehicle audits because fleet stations only test vehicles that are part of the company’s fleet, making it impossible for the Contractor to present a covert (or “undercover”) vehicle for testing. Also, covert vehicle audits are not conducted at stations that inspect only heavy duty vehicles.

Table 9: Number of Inspection Stations and Covert Audits in 2017

	2017 Covert Audits			Stations NOT Receiving Covert Audits
	2017 # of Stations	Audited Stations	# Of Audits	
Fleet stations	88	0	0	88
Public stations	1,499	849	940	650
All stations	1,587	849	940	738

Table 10 shows the total number of workstations in the inspection network and the number of workstations that received covert audits. A workstation is counted as “operating throughout the year” if it conducted at least one emissions inspection each month of the year.

Since the inspector is required to drive the vehicle into the inspection bay during a covert audit, the covert auditor has no control over which workstation is used at stations with multiple workstations.

Table 10: Number of Workstations and Covert Audits in 2017

# of Workstations	Audited Workstations	# of Audits	Workstations Not Audited
1,699	850	940	849

5.3.3 Covert Audit Overview

A “false pass” on a covert audit is an inspection that passes a vehicle that was set to fail its OBD test.

Covert vehicles are set to fail the OBD test in a variety of ways including:

- Malfunction Indicator Lamp (MIL) commanded on and DTCs being set,
- failing to communicate, and
- failing because the readiness monitors are not set.

In addition to these three types of OBD failures, the MIL bulb on the dashboard was made inoperable for some of the vehicles that were set to fail with DTCs set.

For most covert audits, the vehicles were also set to fail the safety test.

5.3.4 Covert Audit Results by Type of OBD Failure

- 40 CFR 51.366 (b) (3): The number of covert audits:
- (i) Conducted with the vehicle set to fail per test type;
 - (ii) Conducted with the vehicle set to fail any combination of two or more test types
 - (iii) Resulting in a false pass per test type;
 - (iv) Resulting in a false pass for any combination of two or more test types;

Since OBD tests are the only type of emissions test covered by the covert audit program, there were no audits set to fail two or more test types. For the 940 covert audits with OBD set to fail, there were zero false passes. Without consulting the auditor, one station repaired the covert vehicle set to fail communications so that it could communicate successfully and pass the OBD test. That repair was not considered a false pass.

5.4 Station and Inspector Enforcement

- 40 CFR 51.366 (b) (6): The number of hearings:
- (i) Held to consider adverse actions against inspectors and stations; and
 - (ii) Resulting in adverse actions against inspectors and stations;

- 40 CFR 51.366 (b) (4): The number of inspectors and stations:
- (i) That were suspended, fired, or otherwise prohibited from testing as a result of covert audits;
 - (ii) That were suspended, fired, or otherwise prohibited from testing for other causes; and

- 40 CFR 51.366 (b) (2): The number of inspection stations and lanes operating throughout the year: . . .
- (v) That have been shut down as a result of overt performance audits;

Based on the results of the site audits, covert audits, and other data, RMV held 175 hearings for stations and issued 225 adverse actions against stations (e.g., warning letters, license revocations, or license suspensions). The written violations in 2017 resulted in 77 station license suspensions or revocations.

Based on the results of the site audits, covert audits and other data, RMV held 147 hearings for inspectors, and issued 177 adverse actions against inspectors (e.g., warnings, license revocations, or license suspensions). The written violations in 2017 resulted in 55 inspector license suspensions or revocations.

5.4.2 Fines Collected

- 40 CFR 51.366 (b) (4): The number of inspectors and stations: . . . (iii) That received fines;
- 40 CFR 51.366 (b) (7): The total amount collected in fines from inspectors and stations by type of violation;

In 2017, there were no enforcement cases where fines were assessed. MassDEP and the Attorney General’s Office continued to work on three on-going cases where stations and inspectors used improper inspection procedures that may result in fines in the future.

5.4.3 Station Compliance Documents - Issued and Missing Documents

40 CFR 51.366 (d) (1) (iii): The total number of compliance documents issued to inspection stations;
(iv) The number of missing compliance documents;

Inspection stations are responsible for the compliance documents (stickers) shipped to them. Failure to properly account for unused stickers may subject a station or inspector to enforcement action. The sticker accounting system is designed to track all stickers from the time they are delivered to the inspection stations to when they are placed on vehicles or are voided and collected by RMV Field Investigators.

In 2017, 5,991,100 stickers were issued to inspection stations 5,260,561 stickers were placed on vehicles, and 3,114 stickers were reported as stolen. Due to the transition of program contracts in 2017, the number of stickers collected and destroyed by RMV and the number of “unaccounted for” stickers were not able to be determined.

The new workstation equipment deployed on October 1, 2017 uses a different sticker printing method and sticker stock from the previous program. For the contract that ended on September 30, 2017, data regarding stickers voided and picked up by RMV between January 1 and September 30 were not migrated to the new database. Also, all of the end of year overstock from the previous program was picked up after the contract was over, and the software normally used to track those was no longer functional.

For the new program beginning on October 1, 2017, software to track stickers picked up and destroyed by RMV had not been developed in time to account for the unused 2017 stickers.

The following table summarizes the sticker accounting for 2017 stickers based on the data available.

Table 11: 2017 Inspection Stickers

	Number of Stickers	
Total Number Printed	7,200,000	
Assigned to Station	5,991,100	
Total used (on vehicles)	-5,260,561	
Collected and destroyed by RMV (as recorded by software)	not available	
Missing compliance documents	not available	
Reported stolen	3,114	
Remaining "unaccounted for"		not available

6 EMISSIONS TEST RESULTS

6.1 Emissions Tests and the Massachusetts Fleet

The Massachusetts I&M Program administered OBD and opacity emissions tests during all of 2017.

In 2017, 181,322 (5.0%) of the 3,596,760 unique non-diesel (gasoline, natural gas, etc.) vehicles receiving initial OBD tests failed their initial tests. Of the 32,822 diesel vehicles receiving an initial OBD test, 4,028 (12.3%) failed their initial tests. Of 93,771 diesel vehicles receiving an initial opacity test, 1,151 (1.2%) failed their initial opacity tests. The Massachusetts Program requires that failing vehicles be repaired and re-tested within 60 days of failing their initial emissions test.

Table 16 summarizes the failure rates for initial OBD tests in Massachusetts in 2017:

Table 12: 2017 Failure Rate for Initial Emissions Tests by Test Type and Fuel

Test Type	Fuel	Failure Rate
Opacity	Diesel	1.2%
OBD	Non-Diesel	5.0%
OBD	Diesel	12.3%
All Initial OBD Tests		5.1%
All Initial Emissions Tests		5.0%

Of the initial emissions test failures, please note:

- Approximately 97.1% of retested vehicles passed the retest.
- 22,225 (12.0%) of the vehicles that failed an initial OBD test and were still registered in Massachusetts had not passed a retest, obtained a waiver, or been granted a hardship extension by March 31, 2018.¹¹
- Two waivers and 14 hardship extensions were granted (less than 0.1% of the vehicles that failed their initial emissions test).

Details of all emissions test results from are included in Attachment B.

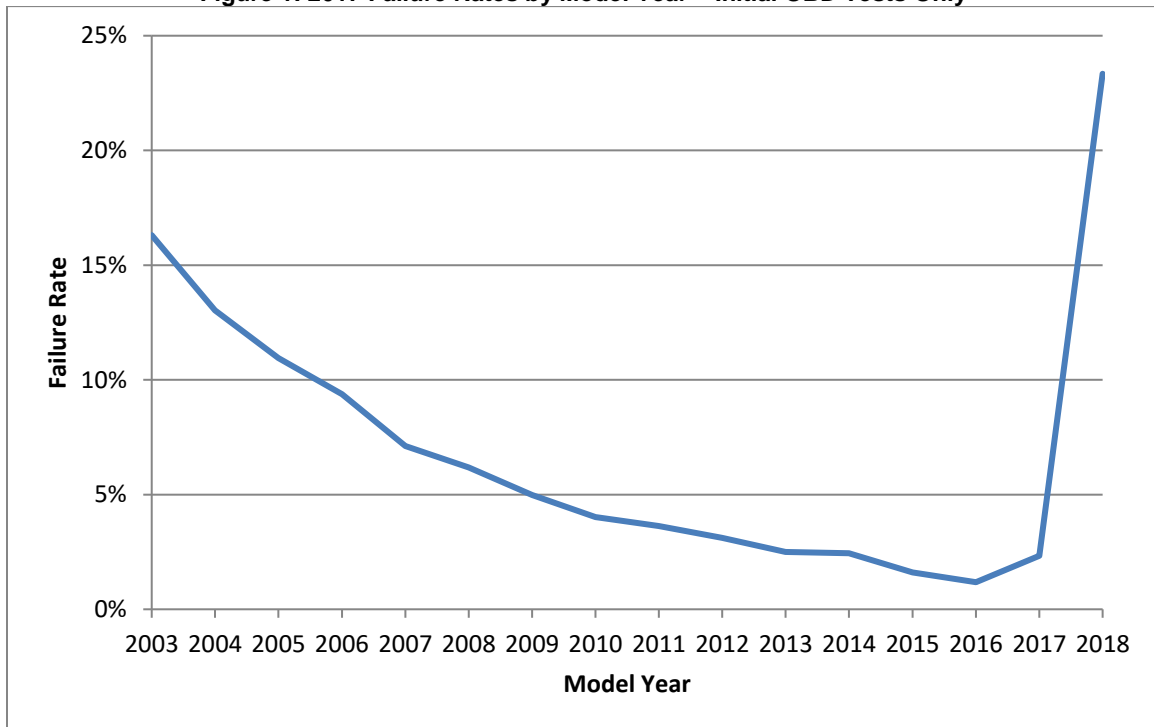
¹¹ 38,339 vehicles failed an initial OBD test and had not passed a retest by March 31, 2018 and did not have an expired or cancelled registration by June 5, 2018.

A limited number of vehicles failed their initial inspections because their OBD computer could not communicate with the OBD scan tool and workstation equipment. In these cases, the workstation allows an alternative test to be performed, which consists of performing a Key-On Engine-Off (KOEO) bulb check to see whether the MIL bulb is functioning and a Key-On Engine-Running (KOER) to see if the MIL is commanded on. Failing either check will result in an OBD test failure.

In 2017, 1,062 of the 3,784,710 total OBD tests (initial and retest) were alternative tests that consisted of MIL bulb checks instead of an electronic scan of the OBD system. Attachment B describes the particular years, makes, models, and counts of vehicles receiving these tests. The new workstation equipment stations began using October 1, 2017 utilizes a California Bureau of Automotive Repair (BAR) certified Data Acquisition Device (DAD) that does not have any known problems communicating with vehicles. For this reason, no alternative tests have been performed since October 1, 2017. Attachment B also describes diesel fueled vehicles that receive an OBD readiness exemption due to monitors that are difficult to set.

Figure 1 shows the initial OBD failure rates by model year. As can be seen, the age of the vehicle has a significant impact on failure rate. Please note that the spike in the failure rate in for model year 2018 is based on a very small sample size (784). While this includes some new vehicles that have changed ownership within the first year, most of these failures were for readiness for new vehicles that inadvertently received an emissions test due to inspector error. The Massachusetts I&M Program is not designed to achieve a specific overall failure rate or a specific failure rate for any particular test or type of vehicle.

Figure 1: 2017 Failure Rates by Model Year – Initial OBD Tests Only



6.2 Overall Conclusions about Program Operation During 2017

2017 was the ninth full year of operation for the enhanced Massachusetts I&M Program and included a transition from one program contract to another. The program is meeting its goals of a comprehensive test that maintains the emission reductions needed for the Massachusetts SIP, is convenient to motorists, ensures vehicle safety, and works well in local inspection shops.

Most vehicles that failed their initial emissions test were repaired successfully and passed their re-test. The program continues to issue a very small number of waivers, far below the commitment in the Massachusetts SIP to limit waivers to no more than 1% of vehicles that fail an initial emissions test.

Attachment A: Index of Report Pages Relevant to EPA Regulation Sections

**Massachusetts Enhanced Emissions and Safety Test
Inspection and Maintenance Program**

Attachment A: Index of Report Pages Relevant to EPA Regulation Sections

Rules

40 CFR 51.366 (a) (1), (2) & (5) Attachment B
40 CFR 51.366 (a) (3) &(4) Attachment C
40 CFR 51.366 (b) (1) (i) & (ii) 6
40 CFR 51.366 (b) (2) (i) & (ii) 18
40 CFR 51.366 (b) (2) (iii) & (iv) 20
40 CFR 51.366 (b) (2) (v) 22
40 CFR 51.366 (b) (3) (i), (ii), (iii) & (iv) 22
40 CFR 51.366 (b) (4) (i) & (ii) 22
40 CFR 51.366 (b) (4) (iii) 22
40 CFR 51.366 (b) (5) 7
40 CFR 51.366 (b) (6) (i) & (ii) 22
40 CFR 51.366 (b) (7) 22
40 CFR 51.366 (b) (8) 20
40 CFR 51.366 (b) (9) 20
40 CFR 51.366 (c) Attachment D
40 CFR 51.366 (c) (1), (2), (3), (4) 16
40 CFR 51.366 (d) (1) (i) 5
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40 CFR 51.366 (d) (1) (iii) & (iv) 23
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40 CFR 51.366 (d) (2) (i) 13
40 CFR 51.366 (d) (2) (ii) 10
40 CFR 51.366 (d) (3) (i) 10
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Attachment B: Detailed 2017 Emissions Test Data

**Massachusetts Enhanced Emissions and Safety Test
Inspection and Maintenance Program**

Attachment C: 2017 Test Data by Station

**Massachusetts Enhanced Emissions and Safety Test
Inspection and Maintenance Program**
