APPENDIX D

Data Record Reporting Procedures for Over-the-Air Reprogrammed Vehicles and Engines
California Air Resources Board
August 16, 2018

Background
Pursuant to California’s On-Board Diagnostic (OBD) requirements for light- and medium-duty vehicles (title 13, California Code of Regulations (CCR) section 1968.2(g)(8)) and heavy-duty engines (title 13, CCR section 1971.1(h)(6)), manufacturers are required to compile and submit in-use tracking data records for test groups and engine families that are Over-the-Air (OTA) reprogrammed if any of the specified tracking data would be cleared as a result of the reprogramming event. The procedures below describe how the data records are to be constructed, formatted, and submitted to CARB.

Data Fields and Format
The required data fields are presented in the table below. The first six fields describe the data record. The remaining fields are comprised of aggregated data parameters that OBD equipped vehicles and engines are required to make available. As indicated in the table, some of the data fields are computed from single data parameters read from reprogrammed vehicles. Others are the ratio of typically two data parameters. In these cases, the parameters are to be divided on an individual vehicle basis before the average and standard deviation are calculated. All averages and standard deviations shall be unweighted. All parameters shall be scaled as specified in the relevant industry standard (i.e., SAE J1979 or SAE J1939).

The header for the CSV file must exactly match the template below under “Example Record”. No data field names may be omitted even if the vehicle does not support certain parameters. The data record shall include only a comma for unsupported fields as shown in the example records. The first 10 emission increasing auxiliary emission control device (EI-AECD) activation parameters and the first 10 greenhouse gas (GHG) Active Technology parameters shall be reported. Any additional EI-AECD or GHG Active Technology parameters shall be omitted from the file. Each data record shall be submitted in a separate CSV file.

Submission Information and Deadlines
Manufacturers are required to collect and submit the data within 60 days of the release of the software update over the air. The data should not be aggregated until after 45 days from the release of the software. Vehicles or engines that are not successfully reflashed within this timeframe may be left out of the aggregated data record. Records should be posted to the manufacturers’ space on CARB’s DMS system using a filename based on the certification engine family/test group name and the date of the OTA release, as follows: family_OTA_mmddyyyy.csv.
### Record Identification Fields

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
<th>Vehicle/Engine Parameters</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAMILY</td>
<td>Test Group, Engine Family Name, or Vehicle Family Name</td>
<td>Certification Identifier for Family or Test Group</td>
<td>Text</td>
</tr>
<tr>
<td>CALID</td>
<td>Calibration Identification Number</td>
<td>Certification Identification Number</td>
<td>Text</td>
</tr>
<tr>
<td>CVN</td>
<td>Calibration Verification Number</td>
<td>Calibration Verification Number</td>
<td>Text</td>
</tr>
<tr>
<td>CALDATE</td>
<td>Date the calibration was released over the air</td>
<td>none - entered separately</td>
<td>Date DD/MM/YYYY</td>
</tr>
<tr>
<td>VEHCOUNT</td>
<td>Number of vehicle records included in the aggregate record</td>
<td>none - entered separately</td>
<td>Integer</td>
</tr>
<tr>
<td>CORRUPTCOUNT</td>
<td>Number of vehicle records rejected based on detected data errors</td>
<td>none - entered separately</td>
<td>Integer</td>
</tr>
<tr>
<td>ODOMETER-AVE</td>
<td>Vehicle odometer reading (average)</td>
<td></td>
<td>Integer</td>
</tr>
<tr>
<td>ODOMETER-SD</td>
<td>Vehicle odometer reading (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
</tbody>
</table>

### In-Use Monitoring Performance Ratio (IUMPR) Fields

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
<th>Vehicle/Engine Parameters</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENDEN-AVE</td>
<td>IUMPR General Denominator (average)</td>
<td>General Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td>GENDEN-SD</td>
<td>IUMPR General Denominator (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>IGNCOUNT-AVE</td>
<td>IUMPR Ignition Counter (average)</td>
<td>Ignition Counter</td>
<td>Floating Point</td>
</tr>
<tr>
<td>IGNCOUNT-SD</td>
<td>IUMPR Ignition Counter (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
</tbody>
</table>

### Gasoline Vehicle/Engine Ratios

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
<th>Vehicle/Engine Parameters</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-CATRATB1-AVE</td>
<td>Catalyst IUMPR Ratio Bank 1 (average)</td>
<td>Catalyst Bank 1 Numerator / Catalyst Bank 1 Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td>G-CATRATB1-SD</td>
<td>Catalyst IUMPR Ratio Bank 1 (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>G-CATRATB2-AVE</td>
<td>Catalyst IUMPR Ratio Bank 2 (average)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-CATRATB2-SD</strong></td>
<td>Catalyst IUMPR Ratio Bank 2 (standard deviation)</td>
<td>Catalyst Bank 2 Numerator / Catalyst Bank 2 Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td>-------------------</td>
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</tr>
<tr>
<td><strong>G-O2SRATB1-AVE</strong></td>
<td>Oxygen Sensor Ratio Bank 1 (average)</td>
<td>Oxygen Sensor Bank 1 Numerator / Oxygen Sensor Bank 1 Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-O2SRATB1-SD</strong></td>
<td>Oxygen Sensor Ratio Bank 1 (standard deviation)</td>
<td>Floating Point</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-O2SRATB2-SD</strong></td>
<td>Oxygen Sensor Ratio Bank 2 (average)</td>
<td>Oxygen Sensor Bank 2 Numerator / Oxygen Sensor Bank 2 Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-O2SRATB2-SD</strong></td>
<td>Oxygen Sensor Ratio Bank 2 (standard deviation)</td>
<td>Floating Point</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-G-EROVTAT-AVE</strong></td>
<td>EGR / VVT Ratio (average)</td>
<td>EGR-VVT Numerator / EGR-VVT Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-G-EROVTAT-SD</strong></td>
<td>EGR / VVT Ratio (standard deviation)</td>
<td>Floating Point</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-SAIRRAT-AVE</strong></td>
<td>Secondary Air Ratio (average)</td>
<td>Secondary Air Numerator / Secondary Air Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-SAIRRAT-SD</strong></td>
<td>Secondary Air Ratio (standard deviation)</td>
<td>Floating Point</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-EVAPRAT-AVE</strong></td>
<td>Evaporative System Ratio (average)</td>
<td>Evaporative System Numerator / Evaporative System Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-EVAPRAT-SD</strong></td>
<td>Evaporative System Ratio (standard deviation)</td>
<td>Floating Point</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-S02RATB1-AVE</strong></td>
<td>Secondary Oxygen Sensor Ratio Bank 1 (average)</td>
<td>Secondary Oxygen Sensor 1 Numerator / Secondary Oxygen Sensor 1 Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-S02RATB1-SD</strong></td>
<td>Secondary Oxygen Sensor Ratio Bank 1 (standard deviation)</td>
<td>Floating Point</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-S02RATB2-AVE</strong></td>
<td>Secondary Oxygen Sensor Ratio Bank 2 (average)</td>
<td>Secondary Oxygen Sensor 2 Numerator / Secondary Oxygen Sensor 2 Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-S02RATB2-SD</strong></td>
<td>Secondary Oxygen Sensor Ratio Bank 2 (standard deviation)</td>
<td>Floating Point</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-AFRATB1-AVE</strong></td>
<td>Air/Fuel Ratio Bank 1 (average)</td>
<td>AF Ratio Imbalance 1 Numerator / AF Ratio Imbalance 1 Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-AFRATB1-SD</strong></td>
<td>Air/Fuel Ratio Bank 1 (standard deviation)</td>
<td>Floating Point</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-AFRATB2-AVE</strong></td>
<td>Air/Fuel Ratio Bank 2 (average)</td>
<td>AF Ratio Imbalance 2 Numerator / AF Ratio Imbalance 2 Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td><strong>G-AFRATB2-SD</strong></td>
<td>Air/Fuel Ratio Bank 2 (standard deviation)</td>
<td>Floating Point</td>
<td>Floating Point</td>
</tr>
</tbody>
</table>

**Diesel Vehicle/Engine Ratios**

<table>
<thead>
<tr>
<th><strong>D-NMHCRAAT-AVE</strong></th>
<th>NMHC Catalyst Ratio (average)</th>
<th>NMHC Catalyst Numerator/NMHC Catalyst Denominator</th>
<th>Floating Point</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D-NMHCRAAT-SD</strong></td>
<td>NMHC Catalyst Ratio (standard deviation)</td>
<td>Floating Point</td>
<td>Floating Point</td>
</tr>
<tr>
<td>Field Name</td>
<td>Description</td>
<td>Vehicle/Engine Parameters</td>
<td>Format</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>D-NOXSCRRAT-AVE</td>
<td>NOx SCR Catalyst Ratio (average)</td>
<td>NOx SCR Catalyst Numerator/NOx SCR Catalyst Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td>D-NOXSCRRAT-SD</td>
<td>NOx SCR Catalyst Ratio (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>D-NOXADSRAT-AVE</td>
<td>NOx Adsorber Ratio (average)</td>
<td>NOx Adsorber Numerator/NOx Adsorber Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td>D-NOXADSRAT-SD</td>
<td>NOx Adsorber Ratio (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>D-PMFRAT-AVE</td>
<td>PM Filter Ratio (average)</td>
<td>PM Filter Numerator/PM Filter Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td>D-PMFRAT-SD</td>
<td>PM Filter Ratio (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>D-EGSRAT-AVE</td>
<td>Exhaust Gas Sensor Ratio (average)</td>
<td>Diesel Exhaust Gas Sensor Numerator/Diesel Exhaust Gas Sensor Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td>D-EGSRAT-SD</td>
<td>Exhaust Gas Sensor Ratio (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>D-EGRVVRTRAT-AVE</td>
<td>EGR/VVT Ratio (average)</td>
<td>Diesel EGR-VVT Numerator / Diesel EGR-VVT Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td>D-EGRVVRTRAT-SD</td>
<td>EGR/VVT Ratio (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>D-BOOSTRAT-AVE</td>
<td>Boost Ratio (average)</td>
<td>Boost Numerator/Boost Denominator</td>
<td>Floating Point</td>
</tr>
<tr>
<td>D-BOOSTRAT-SD</td>
<td>Boost Ratio (standard deviation)</td>
<td></td>
<td>Floating Point</td>
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</table>

### Vehicle/Engine Run Time and Emissions Performance Fields

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
<th>Vehicle/Engine Parameters</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>TERT-AVE</td>
<td>Total Engine Run Time (average)</td>
<td>Total Engine Run Time</td>
<td>Floating Point</td>
</tr>
<tr>
<td>TERT-SD</td>
<td>Total Engine Run Time (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>TEIT-AVE</td>
<td>Total Engine Idle Time (average)</td>
<td>Total Engine Idle Time</td>
<td>Floating Point</td>
</tr>
<tr>
<td>TEIT-SD</td>
<td>Total Engine Idle Time (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>TRTPTOAPERT-AVE</td>
<td>Total Run Time with PTO Active as a ratio of Total Engine Run Time (average) (HD OBD only)</td>
<td>Total Run Time wPTO Active / Total Engine Run Time</td>
<td>Floating Point</td>
</tr>
<tr>
<td>TRTPTOAPERT-SD</td>
<td>Total Run Time with PTO Active as a ratio of Total Engine Run Time (standard deviation) (HD OBD Only)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>TRTAECDDn1APERT-AVE</td>
<td>Total Run Time for Timer 1 Activity for AECD(n) as a ratio of total engine run time (average)</td>
<td>Total Run Time wAECDn Active Timer 1/Total Engine Run Time</td>
<td>Floating Point</td>
</tr>
<tr>
<td>TRTAECDDn1APERT-SD</td>
<td>Total Run Time for Timer 1 Activity for AECD(n) as a ratio of total engine run time (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>TRTAECDDn2APERT-AVE</td>
<td>Total Run Time for Timer 2 Activity for AECD(n) as a ratio of total engine run time (average)</td>
<td>Total Run Time wAECDn Active Timer 2/Total Engine Run Time</td>
<td>Floating Point</td>
</tr>
<tr>
<td>TRTAECDDn2APERT-SD</td>
<td>Total Run Time for Timer 2 Activity for AECD(n) as a ratio of total engine run time (standard deviation)</td>
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<td>Floating Point</td>
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### NOx Tracking Fields

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
<th>Vehicle/Engine Parameters</th>
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<tbody>
<tr>
<td>NOXEOEBn-L-AVE</td>
<td>Engine out NOx - lifetime for bin n (average)</td>
<td>Lifetime Engine Out NOx Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXEOEBn-L-SD</td>
<td>Engine out NOx - lifetime for bin n(standard deviation)</td>
<td>Lifetime Engine Out NOx Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXDTBn-L-AVE</td>
<td>Distance traveled for NOx bin n (average)</td>
<td>Lifetime Distance Traveled Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXDTBn-L-SD</td>
<td>Distance traveled for NOx bin n (standard deviation)</td>
<td>Lifetime Distance Traveled Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXRTBn-L-AVE</td>
<td>Engine run time for NOx bin n (average)</td>
<td>Lifetime Engine Run Time Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXRTBn-L-SD</td>
<td>Engine run time for NOx bin n (standard deviation)</td>
<td>Lifetime Engine Run Time Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXVFCBn-L-AVE</td>
<td>Vehicle fuel consumption for NOx bin n (average)</td>
<td>Lifetime Vehicle Fuel Consumption Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXVFCBn-L-SD</td>
<td>Vehicle fuel consumption for NOx bin n (standard deviation)</td>
<td>Lifetime Vehicle Fuel Consumption Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXEOMPEOEBn-L-AVE</td>
<td>Engine out NOx as a ratio to engine out energy for bin n (average).</td>
<td>Lifetime Engine Out NOx Bin n/Lifetime Engine Out Energy Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXEOMPEOEBn-L-SD</td>
<td>Engine out NOx as a ratio to engine out energy for bin n (standard deviation)</td>
<td>Lifetime Engine Out NOx Bin n/Lifetime Engine Out Energy Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Formula</td>
<td>Data Type</td>
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<tr>
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</tr>
<tr>
<td>NOXEOMPDTBn-L-AVE</td>
<td>Engine out NOx as a ratio to distance traveled for bin n (average)</td>
<td>Lifetime Engine Out NOx Bin n/Lifetime Distance Traveled Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXEOMPDTBn-L-SD</td>
<td>Engine out NOx as a ratio to distance traveled for bin n (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXEOMPERTBn-L-AVE</td>
<td>Engine out NOx as a ratio to engine run time for bin n (average)</td>
<td>Lifetime Engine Out NOx Bin n/Lifetime Engine Run Time Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXEOMPERTBn-L-SD</td>
<td>Engine out NOx as a ratio to engine run time for bin n (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXEMPVFCBn-L-AVE</td>
<td>Engine out NOx as a ratio to vehicle fuel consumption for bin n (average)</td>
<td>Lifetime Engine Out NOx Bin n/Lifetime Vehicle Fuel Consumption Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXEMPVFCBn-L-SD</td>
<td>Engine out NOx as a ratio to vehicle fuel consumption for bin n (standard deviation)</td>
<td>Lifetime Engine Out NOx Bin n/Lifetime Vehicle Fuel Consumption Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXTPMPEOEObn-L-AVE</td>
<td>Tailpipe NOx as a ratio to engine out energy for bin n (average)</td>
<td>Lifetime Tailpipe NOx Bin n/Lifetime Engine Out Energy Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXTPMPEOEObn-L-SD</td>
<td>Tailpipe NOx as a ratio to engine out energy for bin n (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXTPMPDTBn-L-AVE</td>
<td>Tailpipe NOx as a ratio to distance traveled for bin n (average)</td>
<td>Lifetime Tailpipe NOx Bin n/Lifetime Distance Traveled Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXTPMPDTBn-L-SD</td>
<td>Tailpipe NOx as a ratio to distance traveled for bin n (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXTPMPERTBn-L-AVE</td>
<td>Tailpipe NOx as a ratio to engine run time for bin n (average)</td>
<td>Lifetime Tailpipe NOx Bin n/Lifetime Engine Run Time Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXTPMPERTBn-L-SD</td>
<td>Tailpipe NOx as a ratio to engine run time for bin n (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXTPMPVFCBn-L-AVE</td>
<td>Tailpipe NOx as a ratio to vehicle fuel consumption for bin n (average)</td>
<td>Lifetime Tailpipe NOx Bin n/Lifetime Vehicle Fuel Consumption Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXTPMPVFCBn-L-SD</td>
<td>Tailpipe NOx as a ratio to vehicle fuel consumption for bin n (standard deviation)</td>
<td>Lifetime Tailpipe NOx Bin n/Lifetime Vehicle Fuel Consumption Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXEOEb-LEA-AVE</td>
<td>Engine out NOx - lifetime for bin n (average)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXEOEBn-LEA-SD</td>
<td>Engine out NOx - lifetime for bin n (standard deviation)</td>
<td>Lifetime Engine Active Engine Out NOx Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------</td>
<td>-----------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>NOXDTBn-LEA-AVE</td>
<td>Distance traveled for NOx bin n (average)</td>
<td>Lifetime Engine Active Distance Traveled Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXDTBn-LEA-SD</td>
<td>Distance traveled for NOx bin n (standard deviation)</td>
<td>Lifetime Engine Active Engine Out NOx Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXRTBn-LEA-AVE</td>
<td>Engine run time for NOx bin n (standard deviation)</td>
<td>Lifetime Engine Active Engine Run Time Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXRTBn-LEA-SD</td>
<td>Engine run time for NOx bin n (average)</td>
<td>Lifetime Engine Active Engine Run Time Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXVFCBn-LEA-AVE</td>
<td>Vehicle fuel consumption for NOx bin n (average)</td>
<td>Lifetime Engine Active Vehicle Fuel Consumption Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXVFCBn-LEA-SD</td>
<td>Vehicle fuel consumption for NOx bin n (standard deviation)</td>
<td>Lifetime Engine Active Vehicle Fuel Consumption Bin n</td>
<td>Floating Point</td>
</tr>
<tr>
<td>NOXEOMPEOEBn-LEA-AVE</td>
<td>Engine out NOx as a ratio to engine out energy for bin n (average)</td>
<td>Lifetime Engine Active Engine Out NOx Bin n/Lifetime Engine Active Engine Out Energy Bin n</td>
<td>Floating Point</td>
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<tr>
<td>NOXEOMPEOEBn-LEA-SD</td>
<td>Engine out NOx as a ratio to engine out energy for bin n (standard deviation)</td>
<td>Lifetime Engine Active Engine Out NOx Bin n/Lifetime Engine Active Engine Out Energy Bin n</td>
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<td>Engine out NOx as a ratio to distance traveled for bin n (average)</td>
<td>Lifetime Engine Active Engine Out NOx Bin n/Lifetime Engine Active Engine Out Distance Traveled Bin n</td>
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<td>Engine out NOx as a ratio to engine run time for bin n (average)</td>
<td>Lifetime Engine Active Tailpipe NOx Bin n/Lifetime Engine Active Engine Run Time Bin n</td>
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<td>Lifetime Engine Active Tailpipe NOx Bin n/Lifetime Engine Active Engine Run Time Bin n</td>
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<td>NOXEOMPVFCBn-LEA-AVE</td>
<td>Engine out NOx as a ratio to vehicle fuel consumption for bin n (average)</td>
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<td>Tailpipe NOx as a ratio to engine out energy for bin n (average)</td>
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<td>Tailpipe NOx as a ratio to vehicle fuel consumption for bin n (standard deviation)</td>
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**Greenhouse Gas Performance Fields**

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<th>Description</th>
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<tr>
<td>GHGVFC-AVE</td>
<td>Vehicle fuel consumption (average)</td>
<td>Lifetime Vehicle Fuel Consumption</td>
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<td>Vehicle fuel consumption (standard deviation)</td>
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<tr>
<td>GHGEFC-AVE</td>
<td>Engine fuel consumption (average) (HD OBD only)</td>
<td>Lifetime Engine Fuel Consumption</td>
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<td>GHGEFC-SD</td>
<td>Engine fuel consumption (standard deviation) (HD OBD only)</td>
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<td>GHGEIFC-AVE</td>
<td>Engine fuel consumption at idle (average) (HD OBD only)</td>
<td>Lifetime Engine Idle Fuel Consumption</td>
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<td>GHGPTOFC-AVE</td>
<td>Fuel consumed by engine for PTO activation (average) (HD OBD only)</td>
<td>Lifetime PTO Fuel Consumption</td>
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<td>Fuel consumed by engine for PTO activation (standard deviation) (HD OBD only)</td>
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<td>GHGDT-AVE</td>
<td>Distance Traveled (average)</td>
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<td>Distance Traveled (lifetime)</td>
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<td>Output Energy from the Engine (average)</td>
<td>Lifetime Engine Output Energy</td>
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<tr>
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<td>Output Energy from the Engine (standard deviation)</td>
<td>Floating Point</td>
<td></td>
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<td>GHGEOEPDT-AVE</td>
<td>Engine Output Energy as a ratio to distance traveled (average)</td>
<td>Lifetime Engine Output Energy/Lifetime Distance Traveled</td>
<td>Floating Point</td>
</tr>
<tr>
<td>GHGEOEPDT-SD</td>
<td>Engine Output Energy as a ratio to distance traveled (standard deviation)</td>
<td>Floating Point</td>
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<tr>
<td>GHGPKEPDT-AVE</td>
<td>Positive Kinetic Energy of vehicle as a ratio to distance traveled (average)</td>
<td>Lifetime Positive Kinetic Energy/Lifetime Distance Traveled</td>
<td>Floating Point</td>
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<tr>
<td>GHGPKEPDT-SD</td>
<td>Positive Kinetic Energy of vehicle as a ratio to distance traveled (standard deviation)</td>
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<td>GHGEIFCPIRT-AVE</td>
<td>Engine idle fuel consumption as a function of engine idle run time (average) (HD OBD Only)</td>
<td>Lifetime Engine Idle Fuel Consumption/Lifetime Idle Run Time</td>
<td>Floating Point</td>
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<td>GHGEIFCPIRT-SD</td>
<td>Engine idle fuel consumption as a function of engine idle run time (standard deviation) (HD OBD Only)</td>
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<td>PTO fuel consumption as a ratio to PTO activation run time (average) (HD OBD only)</td>
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<td>Engine idle run time as a ratio to engine run time (average)</td>
<td>Lifetime Idle Run Time/Lifetime Engine Run Time</td>
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<td>GHGIRTPERT-SD</td>
<td>Engine idle run time as a ratio to engine run time (standard deviation)</td>
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<tr>
<td>GHGUSRTPERT-AVE</td>
<td>Engine run time at urban speeds as a ratio to total engine run time (average) (HD OBD only)</td>
<td>Lifetime Urban Speed Run Time/Lifetime Engine Run Time</td>
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<td>GHGUSRTPERT-SD</td>
<td>Engine run time at urban speeds as a ratio to total engine run time (standard deviation) (HD OBD only)</td>
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<td>GHGPTORTPERT-AVE</td>
<td>Engine run time with PTO active as a ratio to total engine run time (average) (HD OBD only)</td>
<td>Lifetime PTO Run Time/Lifetime Engine Run Time</td>
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<td>Engine run time with PTO active as a ratio to total engine run time (standard deviation) (HD OBD only)</td>
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<td>GHGSSTRTPIRTPSSTRT-AVE</td>
<td>Engine run time with start-stop technology active as a ratio to the sum of engine idle run time and engine run time with start-stop technology active (average) (HD OBD only)</td>
<td>Lifetime Start-Stop Technology Run Time/(Lifetime Engine Idle Run Time + Lifetime Start-Stop Technology Run Time)</td>
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<td>GHGSSTRTPIRTPSSTRT-SD</td>
<td>Engine run time with start-stop technology active as a ratio to the sum of engine idle run time and engine run time with start-stop technology active (standard deviation) (HD OBD only)</td>
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<tr>
<td>GHGAESTACPIRT-AVE</td>
<td>Auto Engine Shutdown Technology Activation Counts as a ratio of engine idle run time (average) (HD OBD only)</td>
<td>Lifetime Auto Engine Shutdown Technology Activation Counts/Lifetime Engine Idle Run Time</td>
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<td>GHGAESTACPIRT-SD</td>
<td>Auto Engine Shutdown Technology Activation Counts as a ratio of engine idle run time (standard deviation) (HD OBD only)</td>
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<td>GHGATRTrnPERT-AVE</td>
<td>Engine run time while Active Technology n is active as a ratio to total engine run time (average) (HD OBD only)</td>
<td>Lifetime Active Technology n Run Time/Lifetime Engine Run Time</td>
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<td>GHGATDTnPDT-AVE</td>
<td>Distance traveled while Active Technology n is active as a ratio to total distance (average) (HD OBD only)</td>
<td>Lifetime Active Technology n Distance Traveled/Lifetime Engine Run Time</td>
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<td>Distance traveled while Active Technology n is active as a ratio to total distance (standard deviation) (HD OBD only)</td>
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<td>GHGAOCTnC1RTPERT-AVE</td>
<td>Counter 1 runtime for active off-cycle technology n as a ratio to engine run time (average) (OBD II only)</td>
<td>Lifetime Active Off-Cycle Technology Counter 1 Run Time/Lifetime Engine Run Time</td>
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<td>Counter 1 runtime for active off-cycle technology n as a ratio to engine run time (standard deviation) (OBD II only)</td>
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<td>Counter 1 runtime for active off-cycle technology n as a ratio to distance traveled (average) (OBD II only)</td>
<td>Lifetime Active Off-Cycle Technology Counter 1 Run Time/Lifetime Distance Traveled</td>
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<td>GHGAOCTnC2RTPERT-AVE</td>
<td>Counter 2 runtime for active off-cycle technology n as a ratio to engine run time (average) (OBD II only)</td>
<td>Lifetime Active Off-Cycle Technology Counter 2 Run Time/Lifetime Engine Run Time</td>
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<td>Lifetime Active Off-Cycle Technology Counter 2 Run Time/Lifetime Distance Traveled</td>
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<td>GHGAOCTnC2RTPDT-SD</td>
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<td>GHGEFCPEOE-AVE</td>
<td>Engine fuel consumption as a ratio to engine output energy (average) (HD OBD only)</td>
<td>Lifetime Engine Fuel Consumption/Lifetime Engine Output Energy</td>
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<td>Vehicle fuel consumption as a ratio to engine output energy (average)</td>
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<td>Lifetime Vehicle Fuel Consumption/Lifetime Engine Output Energy</td>
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<td>Vehicle fuel consumption as a ratio to engine run time (average)</td>
<td>Lifetime Vehicle Fuel Consumption/Lifetime Engine Run Time</td>
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<td>Lifetime Engine Fuel Consumption/Lifetime Distance Traveled</td>
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<td>Lifetime Engine Fuel Consumption/Lifetime Engine Run Time</td>
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<tr>
<td>GHGWHROEPDTWHR-AVE</td>
<td>Waste heat recovery energy as a ratio to distance traveled while waste heat recovery technology is active (average) (HD OBD only)</td>
<td>Lifetime WHR Output Energy/Lifetime Distance Traveled While WHR Active</td>
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<td>GHGWHROEPDTWHR-SD</td>
<td>Waste heat recovery energy as a ratio to distance traveled while waste heat recovery technology is active (standard deviation) (HD OBD only)</td>
<td>Lifetime WHR Output Energy/Lifetime Distance Traveled While WHR Active</td>
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</table>

**Additional GHG Performance Parameters for Hybrid Vehicles**

<table>
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<tr>
<td>HPSART-AVE</td>
<td>Propulsion system active run time (average)</td>
<td>Lifetime PSA Run Time</td>
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<td>HPSART-SD</td>
<td>Propulsion system active run time (standard deviation)</td>
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<tr>
<td>HIPSART-AVE</td>
<td>Propulsion system active run time while vehicle is at idle (average)</td>
<td>Lifetime Idle PSA Run Time</td>
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<tr>
<td>HIPSART-SD</td>
<td>Propulsion system active run time while vehicle is at idle (standard deviation)</td>
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<tr>
<td>HUPSART-AVE</td>
<td>Propulsion system active run time while vehicle is operating at urban speeds (average)</td>
<td>Lifetime Urban PSA Run Time</td>
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<td>HUPSART-SD</td>
<td>Propulsion system active run time while vehicle is operating at urban speeds (standard deviation)</td>
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<td>HIRTPIPSART-AVE</td>
<td>Engine Idle Run Time as a ratio to PSA active run time while vehicle is at idle (average)</td>
<td>Lifetime Idle Run Time/Lifetime Idle PSA Run Time</td>
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<td>Engine Idle Run Time as a ratio to PSA active run time while vehicle is at idle (standard deviation)</td>
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<td>HUSRTPUPSART-AVE</td>
<td>Engine run time while at urban speeds as a ratio to PSA active run time while at urban speeds (average) (HD OBD only)</td>
<td>Lifetime Urban Speed Run Time/Lifetime Urban PSA Run Time</td>
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<td>HUSRTPUPSART-SD</td>
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<tr>
<td>HPERTPPSART-AVE</td>
<td>Engine run time as a ratio to PSA run time (average)</td>
<td>Lifetime Engine Run Time/Lifetime PSA Run Time</td>
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<td>Engine run time as a ratio to PSA run time (standard deviation)</td>
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**Additional GHG Performance Fields for Plug-In Hybrid Vehicles**

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<td>PHDTCDEOPDT-AVE</td>
<td>Distance traveled in charge depleting mode with the engine off as a ratio to total distance traveled (average)</td>
<td>Lifetime Distance Traveled Charge Depleting Engine Off/Lifetime Distance Traveled</td>
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<td>Distance traveled in charge depleting mode with the engine off as a ratio to total distance traveled (standard deviation)</td>
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<td>PHDTCDERPDT-AVE</td>
<td>Distance traveled in charge depleting mode with the engine running as a ratio to total distance traveled (average)</td>
<td>Lifetime Distance Traveled Charge Depleting Engine Running/Lifetime Distance Traveled</td>
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<tr>
<td>PHDTCDERPDT-SD</td>
<td>Distance traveled in charge depleting mode with the engine running as a ratio to total distance traveled (standard deviation)</td>
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<td>PHDTDSCIMPDT-AVE</td>
<td>Distance traveled in driver selected charge increasing mode as a ratio to total distance traveled (average)</td>
<td>Lifetime Distance Traveled in Driver Selected Charge Increasing Mode/Lifetime Distance Traveled</td>
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<td>PHDTDSCIMPDT-SD</td>
<td>Distance traveled in driver selected charge increasing mode as a ratio to total distance traveled (standard deviation)</td>
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<td>PHFCCDPDTCDER-AVE</td>
<td>Fuel consumed in charge depleting mode as a ratio to distance traveled in charge depleting mode with the engine running (average)</td>
<td>Lifetime Fuel Consumed Charge Depleting/Lifetime Distance Traveled Charge Depleting Engine Running</td>
<td>Floating Point</td>
</tr>
<tr>
<td>PHFCCDPDTCDER-SD</td>
<td>Fuel consumed in charge depleting mode as a ratio to distance traveled in charge depleting mode with the engine running (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>PHFCDSCIMPDTDSCIM-AVE</td>
<td>Fuel consumed in driver selected charge increasing mode as a ratio to distance traveled in driver selected charge increasing mode (average)</td>
<td>Lifetime Fuel consumed in Driver Selected Charge Increasing Mode/Lifetime Distance Traveled in Driver Selected Charge Increasing Mode</td>
<td>Floating Point</td>
</tr>
<tr>
<td>PHFCDSCIMPDTDSCIM-SD</td>
<td>Fuel consumed in driver selected charge increasing mode as a ratio to distance traveled in driver selected charge increasing mode (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>PHGECCDEOPDTCDEO-AVE</td>
<td>Grid energy consumed in charge depleting engine off mode as a ratio to distance traveled in charge depleting engine off mode (average)</td>
<td>Lifetime Grid Energy Consumed Charge Depleting Engine Off / Lifetime Distance Traveled Charge Depleting Engine Off</td>
<td>Floating Point</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>PHGECCDEOPDTCDEO-SD</td>
<td>Grid energy consumed in charge depleting engine off mode as a ratio to distance traveled in charge depleting engine off mode (standard deviation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHGECCDERPDTCDER-AVE</td>
<td>Grid energy consumed in charge depleting mode with engine running as a ratio to distance traveled in charge depleting engine running mode (average)</td>
<td>Lifetime Grid Energy Consumed Charge Depleting Engine Running/Lifetime Distance Traveled Charge Depleting Engine Running</td>
<td>Floating Point</td>
</tr>
<tr>
<td>PHGECCDERPDTCDER-SD</td>
<td>Grid energy consumed in charge depleting mode with engine running as a ratio to distance traveled in charge depleting engine running mode (standard deviation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHGETB-AVE</td>
<td>Total grid energy sent into battery (average)</td>
<td>Lifetime Total Grid Energy Sent Into Battery</td>
<td>Floating Point</td>
</tr>
<tr>
<td>PHGETB-SD</td>
<td>Total grid energy sent into battery (standard deviation)</td>
<td></td>
<td>Floating Point</td>
</tr>
<tr>
<td>PHGETBPDTPD-AVE</td>
<td>Total grid energy sent into battery as a ratio of total distance traveled (average)</td>
<td>Lifetime Total Grid Energy Sent Into Battery/Lifetime Distance Traveled</td>
<td>Floating Point</td>
</tr>
<tr>
<td>PHGETBPDT-SD</td>
<td>Total grid energy sent into battery as a ratio of total distance traveled (standard deviation)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Example Records:

The first row of the data record shall include the field names exactly as shown below. The second row shall contain the corresponding data values. Following the field names are two rows of data. The first is for a gasoline powered light-duty plug-in hybrid vehicle with a single cylinder bank, no secondary air, and four active GHG technologies. The second row is for a non-hybrid heavy-duty diesel engine with no NOx adsorber, four EI-AECDs, 4 active GHG technologies, and no start/stop technology. The column names are not repeated for the second example.

FAMILY, CALID, CVN, CALDATE, VEHCOUNT, CORRUPTCOUNT, ODOMETER-AVE, ODOMETER-SD, GENDEN-AVE, GENDEN-SD, IGNCOUNT-AVE, IGNCOUNT-SD, G-CATRATB1-AVE, G-CATRATB1-SD, G-CATRATB2-AVE, G-CATRATB2-SD, G-O2SRATB1-AVE, G-O2SRATB1-SD, G-O2SRATB2-AVE, G-O2SRATB2-SD, G-EGRVVRAT-AVE, G-EGRVVRAT-SD, G-SAIRRAT-AVE, G-SAIRRAT-SD, G-EVAPRAT-AVE, G-EVAPRAT-SD, G-SO2RATB1-AVE, G-SO2RATB1-SD, G-SO2RATB2-AVE, G-SO2RATB2-SD, G-AFRATB1-AVE, G-AFRATB1-SD, G-AFRATB2-AVE, G-AFRATB2-SD, D-NMHCRAVET-AVE, D-NMHCRAVET-SD, D-NOXSCRRAT-AVE, D-NOXSCRRAT-SD, D-NOXADSRAVET-AVE, D-NOXADSRAVET-SD, D-PMFRAT-AVE, D-PMFRAT-SD, D-EGSRAT-AVE, D-EGSRAT-SD, D-EGRVVRAT-AVE, D-EGRVVRAT-SD, D-BOOSTRAT-AVE, D-BOOSTRAT-SD, TERT-AVE, TERT-SD, TEIT-AVE, TEIT-SD, TRTPTOAPTERT-AVE, TRTPTOAPTERT-SD, TRTAECD11APTERT-AVE, TRTAECD11APTERT-SD, TRTAECD12APTERT-AVE, TRTAECD12APTERT-SD, TRTAECD21APTERT-AVE, TRTAECD21APTERT-SD, TRTAECD22APTERT-AVE, TRTAECD22APTERT-SD, TRTAECD31APTERT-AVE, TRTAECD31APTERT-SD, TRTAECD32APTERT-AVE, TRTAECD32APTERT-SD, TRTAECD41APTERT-AVE, TRTAECD41APTERT-SD, TRTAECD42APTERT-AVE, TRTAECD42APTERT-SD, TRTAECD51APTERT-AVE, TRTAECD51APTERT-SD, TRTAECD52APTERT-AVE, TRTAECD52APTERT-SD, TRTAECD61APTERT-AVE, TRTAECD61APTERT-SD, TRTAECD62APTERT-AVE, TRTAECD62APTERT-SD, TRTAECD71APTERT-AVE, TRTAECD71APTERT-SD, TRTAECD72APTERT-AVE, TRTAECD72APTERT-SD, TRTAECD81APTERT-AVE, TRTAECD81APTERT-SD, TRTAECD82APTERT-AVE, TRTAECD82APTERT-SD, TRTAECD91APTERT-AVE, TRTAECD91APTERT-SD, TRTAECD92APTERT-AVE, TRTAECD92APTERT-SD, TRTAECD101APTERT-AVE, TRTAECD101APTERT-SD, TRTAECD102APTERT-AVE, TRTAECD102APTERT-SD, TRTNRDAPTERT-AVE, TRTNRDAPTERT-SD, TRTEL7200PTERT-AVE, TRTEL7200PTERT-SD, NOXEOEB1L-AVE, NOXEOEB1L-SD, NOXDTB1L-AVE, NOXDTB1L-SD, NOXRTB1L-AVE, NOXRTB1L-SD, NOXVFCB1L-AVE, NOXVFCB1L-SD, NOXEMOPPEOE1L-AVE, NOXEMOPPEOE1L-SD, NOXEMOPPTHB1L-AVE, NOXEMOPPDB1L-SD, NOXEMOPVFCB1L-AVE, NOXEMOPVFCB1L-SD, NOXTPMPEOE1L-AVE, NOXTPMPEOE1L-SD, NOXTPMPDB1L-AVE, NOXTPMPDB1L-SD,
NOXTPMPERTB1-L-AVE, NOXTPMPERTB1-L-SD, NOXTPMPVFCB1-L-AVE, 
NOXTPMPVFCB1-L-SD, NOXEOEB2-L-AVE, NOXEOEB2-L-SD, NOXDTB2-L-AVE, 
NOXDTB2-L-SD, NOXRTB2-L-AVE, NOXRTB2-L-SD, NOXVFCB2-L-AVE, NOXVFCB2- 
L-SD, NOXEPOMPEOB2-L-AVE, NOXEPOMPEOB2-L-SD, NOXEPOMPDTB2-L-AVE, 
NOXEPOMPDTB2-L-SD, NOXEPOMPERTB2-L-AVE, NOXEPOMPERTB2-L-SD, 
NOXEPOMPVFCB2-L-AVE, NOXEPOMPVFCB2-L-SD, NOXTPMPPEOB2-L-AVE, 
NOXTPMPPEOB2-L-SD, NOXTPMPDTB2-L-AVE, NOXTPMPDTB2-L-SD, 
NOXTPMPERTB2-L-AVE, NOXTPMPERTB2-L-SD, NOXTPMPVFCB2-L-AVE, 
NOXTPMPVFCB2-L-SD, NOXEOEB3-L-AVE, NOXEOEB3-L-SD, NOXDTB3-L-AVE, 
NOXDTB3-L-SD, NOXRTB3-L-AVE, NOXRTB3-L-SD, NOXVFCB3-L-AVE, NOXVFCB3- 
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NOXTPMPPEOB3-L-SD, NOXTPMPDTB3-L-AVE, NOXTPMPDTB3-L-SD, 
NOXTPMPERTB3-L-AVE, NOXTPMPERTB3-L-SD, NOXTPMPVFCB3-L-AVE, 
NOXTPMPVFCB3-L-SD, NOXEOEB4-L-AVE, NOXEOEB4-L-SD, NOXDTB4-L-AVE, 
NOXDTB4-L-SD, NOXRTB4-L-AVE, NOXRTB4-L-SD, NOXVFCB4-L-AVE, NOXVFCB4- 
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NOXTPMPPEOB4-L-SD, NOXTPMPDTB4-L-AVE, NOXTPMPDTB4-L-SD, 
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GHGAOCT3C1RTPERT-AVE, GHGAOCT3C1RTPERT-SD, GHGAOCT3C1RTPD-AVE, GHGAOCT3C1RTPD-SD, GHGAOCT3C2RTPERT-AVE, GHGAOCT3C2RTPERT-SD, GHGAOCT3C2RTPD-AVE, GHGAOCT3C2RTPD-SD, GHGATRT4PERT-AVE, GHGATRT4PERT-SD, GHGATDT4PDT-AVE, GHGATDT4PDT-SD, GHGAOCT4C1RTPERT-AVE, GHGAOCT4C1RTPERT-SD, GHGAOCT4C1RTPD-AVE, GHGAOCT4C1RTPD-SD, GHGAOCT4C2RTPERT-AVE, GHGAOCT4C2RTPERT-SD, GHGAOCT4C2RTPD-AVE, GHGAOCT4C2RTPD-SD, GHGATRT5PERT-AVE, GHGATRT5PERT-SD, GHGATDT5PDT-AVE, GHGATDT5PDT-SD, GHGAOCT5C1RTPERT-AVE, GHGAOCT5C1RTPERT-SD, GHGAOCT5C1RTPD-AVE, GHGAOCT5C1RTPD-SD, GHGAOCT5C2RTPERT-AVE, GHGAOCT5C2RTPERT-SD, GHGAOCT5C2RTPD-AVE, GHGAOCT5C2RTPD-SD, GHGATRT6PERT-AVE, GHGATRT6PERT-SD, GHGATDT6PDT-AVE, GHGATDT6PDT-SD, GHGAOCT6C1RTPERT-AVE, GHGAOCT6C1RTPERT-SD, GHGAOCT6C1RTPD-AVE, GHGAOCT6C1RTPD-SD, GHGAOCT6C2RTPERT-AVE, GHGAOCT6C2RTPERT-SD, GHGAOCT6C2RTPD-AVE, GHGAOCT6C2RTPD-SD, GHGATRT7PERT-AVE, GHGATRT7PERT-SD, GHGATDT7PDT-AVE, GHGATDT7PDT-SD, GHGAOCT7C1RTPERT-AVE, GHGAOCT7C1RTPERT-SD, GHGAOCT7C1RTPD-AVE, GHGAOCT7C1RTPD-SD, GHGAOCT7C2RTPERT-AVE, GHGAOCT7C2RTPERT-SD, GHGAOCT7C2RTPD-AVE, GHGAOCT7C2RTPD-SD, GHGATRT8PERT-AVE, GHGATRT8PERT-SD, GHGATDT8PDT-AVE, GHGATDT8PDT-SD, GHGAOCT8C1RTPERT-AVE, GHGAOCT8C1RTPERT-SD, GHGAOCT8C1RTPD-AVE, GHGAOCT8C1RTPD-SD, GHGAOCT8C2RTPERT-AVE, GHGAOCT8C2RTPERT-SD, GHGAOCT8C2RTPD-AVE, GHGAOCT8C2RTPD-SD, GHGATRT9PERT-AVE, GHGATRT9PERT-SD, GHGATDT9PDT-AVE, GHGATDT9PDT-SD, GHGAOCT9C1RTPERT-AVE, GHGAOCT9C1RTPERT-SD, GHGAOCT9C1RTPD-AVE, GHGAOCT9C1RTPD-SD, GHGAOCT9C2RTPERT-AVE, GHGAOCT9C2RTPERT-SD, GHGAOCT9C2RTPD-AVE, GHGAOCT9C2RTPD-SD, GHGATRT10PERT-AVE, GHGATRT10PERT-SD, GHGATDT10PDT-AVE, GHGATDT10PDT-SD, GHGAOCT10C1RTPERT-AVE, GHGAOCT10C1RTPERT-SD, GHGAOCT10C1RTPD-AVE, GHGAOCT10C1RTPD-SD, GHGAOCT10C2RTPERT-AVE, GHGAOCT10C2RTPERT-SD, GHGAOCT10C2RTPD-AVE, GHGAOCT10C2RTPD-SD, GHGEFCPEOE-AVE, GHGEFCPEOE-SD, GHGVFCPEOE-AVE, GHGVFCPEOE-SD, GHGVFCPERT-AVE, GHGVFCPERT-SD, GHGVFCPDT-AVE, GHGVFCPDT-SD, GHGEFCPDT-AVE, GHGEFCPDT-SD, GHGEFCPERT-AVE, GHGEFCPERT-SD, GHGWHROEPDTWWHRA-AVE, GHGWHROEPDTWWHRA-SD, HPSART-AVE, HPSART-SD, HIPSART-AVE, HIPSART-SD, HUPSART-AVE, HUPSART-SD, HIRTPIPSART-AVE, HIRTPIPSART-SD, HUSRTPUPSART-AVE, HUSRTPUPSART-SD, HPERTPPSART-AVE, HPERTPPSART-SD, PHDTCDEOPDT-AVE, PHDTCDEOPDT-SD, PHDTCDERPDT-AVE, PHDTCDERPDT-SD, PHDTDSCIMPDT-AVE, PHDTDSCIMPDT-SD, PHFCCDPDTCDER-AVE, PHFCCDPDTCDER-SD, PHFCDSCIMPDTSCIM-AVE, PHFCDSCIMPDTSCIM-SD, PHGECCDEOPDTCDEO-AVE, PHGECCDEOPDTCDEO-SD, PHGECCDERPDTCDER-AVE, PHGECCDERPDTCDER-SD, PHGETB-AVE, PHGETB-SD, PHGETBPDT-AVE, PHGETBPDT-SD