



TEXAS SOUTHERN UNIVERSITY



Quantification of the Impact of Roadway Conditions on Emissions

Technical Report 0-6808-1
Cooperative Research Program

CENTER FOR TRANSPORTATION INFRASTRUCTURE SYSTEMS
THE UNIVERSITY OF TEXAS AT EL PASO
EL PASO, TX 79968
[HTTP://CTIS.UTEP.EDU](http://ctis.utep.edu)

in cooperation with the
Federal Highway Administration and the
Texas Department of Transportation

1. Report No. TX 0-6808-R1		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle QUANTIFICATION OF THE IMPACT OF ROADWAY CONDITIONS ON EMISSIONS				5. Report Date August 2016; Published November 2017	
				6. Performing Organization Code	
7. Author(s) Carlos M. Chang, Fengxiang Qiao, Imad N. Abdallah, Mehdi Azimi, Oscar D. Gonzalez, Mahreen Nabi, Mahbuba Khan, Qing Li, Shahrouz J. Ghadimi, Nahim Buhaya, Soheil Nazarian, Lei Yu.				8. Performing Organization Report No. TX 0-6808-R1	
9. Performing Organization Name and Address Center for Transportation Infrastructure Systems The University of Texas at El Paso, El Paso, TX 79968-0516 Innovative Transportation Research Institute Texas Southern University, Houston, TX 77004				10. Work Unit No.	
				11. Contract or Grant No. 0-6808	
12. Sponsoring Agency Name and Address Texas Department of Transportation Research and Technology Implementation Office P.O. Box 5080 Austin, Texas 78763-5080				13. Type of Report and Period Covered Technical Report July 29, 2014 – Aug. 31, 2016	
				14. Sponsoring Agency Code	
15. Supplementary Notes Project performed in cooperation with the Texas Department of Transportation Project title: Quantification of the Impact of Road Conditions on Emissions					
16. Abstract <p>The scope of this project involved developing a methodology to quantify the impact of road's condition on emissions and providing guidance to assist TxDOT in improving maintenance strategies to reduce gas emissions. The research quantified vehicle gas emissions for Carbon Dioxide (CO₂), Carbon Monoxide (CO), Hydrocarbons (HC), and Nitrogen (NO_x) based on pavement condition. On the same pavement sections, the International Roughness Index (IRI) and gas emissions were measured with the Portable Emission Measurement System (PEMS). Statistical analysis was performed to investigate the relationship between pavement roughness and gas emissions. As a result of this study, it was found that the better the pavement condition the lower the vehicle gas emissions. Equations to estimate vehicle gas emissions from pavement condition are presented in this report. Potential gas emission savings due to the implementation of effective maintenance and rehabilitation practices are also quantified.</p>					
17. Key Words: Vehicle gas emission, roughness, IRI, Ride Score, Portable Emission Measurement System, pavement maintenance strategies.			18. Distribution Statement No restrictions. This document is available to the public through the National Technical Information service, 5285 Port Royal Road, Springfield, Virginia 22161, www.ntis.gov		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 306	22. Price

QUANTIFICATION OF THE IMPACT OF ROADWAY CONDITIONS ON EMISSIONS

by

Carlos M. Chang¹, Fengxiang Qiao², Imad N. Abdallah¹, Mehdi Azimi², Oscar D. Gonzalez¹,
Mahreen Nabi², Mahbuba Khan², Qing Li², Shahrouz J. Ghadimi¹, Nahim Buhaya¹,
Soheil Nazarian¹, Lei Yu²

¹The University of Texas at El Paso
²Texas Southern University

Report TX 0-6808-R1
Project TX 0-6808

Project Title: *S wcpwkkc vkp"qhl'j g"ko rcev'qhc'Tqcf)u'Eqpf kkp'u'qp'Go kuikppu'*

Conducted for
Texas Department of Transportation

Report date: August 2016

Center for Transportation Infrastructure Systems
The University of Texas at El Paso
El Paso, TX 79968-0516
<http://ctis.utep.edu>

Innovative Transportation Research Institute
Texas Southern University
3100 Cleburne Street
Houston, TX 77004
(713) 313-1915
<http://coset.tsu.edu/itri/>

DISCLAIMERS

The contents of this report reflect the view of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Texas Department of Transportation. Texas Southern University (TSU) collected the gas emissions data used by the University of Texas at El Paso (UTEP) to develop the equations presented in this report. This report does not constitute a standard, a specification or a regulation.

The material contained in this report is experimental in nature and is published for informational purposes only. Any discrepancies with official views or policies of the Texas Department of Transportation should be discussed with the appropriate Austin Division prior to implementation of the procedures or results.

NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES

Carlos M. Chang¹, Fengxiang Qiao², Imad N. Abdallah¹, Mehdi Azimi², Oscar D. Gonzalez¹,
Mahreen Nabi², Mahbuba Khan², Qing Li², Shahrouz J. Ghadimi¹, Nahim Buhaya¹, Soheil
Nazarian¹, Lei Yu²

¹The University of Texas at El Paso

²Texas Southern University

ACKNOWLEDGMENTS

The authors would like to express their sincere appreciation to TxDOT for providing funding to conduct research project 0-6808 “Quantification of the Impact of Roadway Conditions on Emissions”, and collecting roughness data. The research team wants to acknowledge the Project Manager Wade Odell and the Project Management Committee (PMC) members for their advice and support during the development of this study.

The research team also appreciate Pengfei Liu and Ying Wu from TSU for their support in the field gas emission data collection; and Oscar Ortega, Edgar Rodriguez, Luiz Valdez, and Erick Muñoz from UTEP for their assistance in preparing the Final Report.

TABLE OF CONTENTS

	Page
List of Figures	xi
List of Tables	xiii
Chapter 1. Introduction	1
Problem Statement.....	1
Research Objectives	1
Research Tasks	2
Organization of the Report	2
Chapter 2. State-of-the-Practice to Quantify Gas Emissions Based on Pavement Condition	5
Background on Vehicle Gas Emissions, Transportation, and Roads	5
Methods to Quantify Gas Emissions	6
Efforts to Establish a Relationship Between Pavement Condition and Gas Emissions	9
Pavement Maintenance and Rehabilitation Strategies and Gas Emissions	11
TxDOT Maintenance and Rehabilitation Treatments	14
Chapter 3. Field Tests to Quantify the Effects of Pavement Condition on Emissions	19
Process to Select the Pavement Sites.....	19
PEMS Gas Emissions Data Collection Method	25
Processing PEMS Raw Data	31
Pavement Roughness Data Collection Method	32
Chapter 4. Impact of Pavement Conditions on Gas Emissions	33
Statistical Analysis	33
Impact of Pavement Condition on Vehicle Gas Emissions.....	39
Hypothesis Tests to Investigate the Influence of Pavement Condition and Speed on Gas Emissions	44
Chapter 5. Effectiveness of Maintenance Strategies in Reducing Gas Emissions	47
Relationship between IRI and Ride Score.....	47
Ride Score Increase After Treatment	48
Impact of Maintenance and Rehabilitation Treatments on Gas Emissions.....	48
Potential Gas Emission Savings Due to Maintenance and Rehabilitation Strategies.....	55
Chapter 6. Guidelines to Improve Pavement Maintenance Strategies to Reduce Vehicle Gas Emissions	59
Environmental Policies and Guidelines.....	59

TxDOT Environmental Management Efforts.....	60
Pavement Maintenance Strategies to Reduce Gas Emissions	62
Recommendations to Implement the Guidelines.....	64
Chapter 7. Summary, Conclusions, and Recommendations	65
Impact of Pavement Condition on Vehicle Gas Emissions.....	65
Maintenance Strategies to Reduce Vehicle Gas Emissions.....	67
Recommendations	69
References.....	71
Appendix A. Questionnaire: Impact of Roadway Conditions on Gas Emissions.....	A-1
Appendix B. Project Sites Descriptions.....	B-1
Appendix C. PEMS and Roughness Data.....	C-1
Appendix D. PEMS-IRI Data Analysis	D-1
Appendix E. Hypothesis Test Reports.....	E-1

LIST OF FIGURES

	Page
Figure 1. Global Road Transport GHG Emissions (ASTAE 2010).....	5
Figure 2. PEMS Systematic Flow Diagram – PEMS (Tu 2011).....	8
Figure 3. Relationship between IRI, Road Condition, and Vehicle Speeds. (Oregon State University 2014).....	10
Figure 4. Pavement Maintenance and Greenhouse Gas Emissions. (ASTAE 2010).....	12
Figure 5. Total CO ₂ Emissions for Different Pavement Types over 40 Years (ASTAE 2010).....	13
Figure 6. Pavements in Austin.....	20
Figure 7. Pavement in Bryan-College Station.....	20
Figure 8. Pavements in El Paso.....	20
Figure 9. Pavements in Houston.....	20
Figure 10. Pavement in San Antonio.....	21
Figure 11. Selected Light Duty Vehicle for the Research Project.....	25
Figure 12. Power Cable Connection in PEMS Installation.....	26
Figure 13. RPM Connection with the Black Wire of Test Vehicles Engine.....	27
Figure 14. Connection of the RPM Cable with Sensor Connector Box (Black Wire).....	27
Figure 15. Connection of Temperature Sensor Cable with the Air Tube of the Test Vehicle.....	27
Figure 16. Connection of Temperature Sensor Cable with Sensor Connector Box (White Wire).....	27
Figure 17. Unscrewing the Pressure Port of Test Vehicle Engine.....	27
Figure 18. Installation of Two Heads of the Pressure Cable.....	28
Figure 19. Connection of Pressure Cable with PEMS Computer.....	28
Figure 20. The Exhaust Cable.....	28
Figure 21. Installation with the Tailpipe of the Test Vehicle Other Connections.....	28
Figure 22. Other End of the Exhaust Cable is Connected to the H ₂ O Condensation Bowl.....	29
Figure 23. Test Vehicle with PEMS Equipment.....	30
Figure 24. Axion Labview Software Recording Data in PEMS Computer.....	30
Figure 25. Example of PEMS Data Exported to Excel from a Field txt File.....	31
Figure 26. High Speed Inertial Profiler.....	32
Figure 27. Histogram of CO ₂	34
Figure 28. Histogram of CO.....	34
Figure 29. Histogram of HC.....	34
Figure 30. Histogram of NO _x	34
Figure 31. Histogram of IRI.....	34

Figure 32. Summary of Descriptive Statistics for IRI, Gas Emissions, and Speed.....	35
Figure 33. IRI versus CO ₂	36
Figure 34. IRI versus CO	36
Figure 35. IRI versus HC	36
Figure 36. IRI versus NO _x	36
Figure 37 Regression Analysis for IRI and CO ₂	41
Figure 38 Regression Analysis for IRI and CO	41
Figure 39 Regression Analysis for IRI and HC	41
Figure 40 Regression Analysis for IRI and NO _x	41
Figure 41. Regression Analysis for Speed and CO ₂	43
Figure 42. Regression Analysis for Speed and CO	43
Figure 43. Regression Analysis for Speed and HC	43
Figure 44. Regression Analysis for Speed and NO _x	43
Figure 45. IRI vs Ride Score Analysis.....	47
Figure 46. Ride Score and IRI vs CO ₂	49
Figure 47. Ride Score and IRI vs CO.....	49
Figure 48. Ride Score and IRI vs HC.....	50
Figure 49. Ride Score and IRI vs NO _x	50
Figure 50. CO ₂ Savings by Treatment Type	55
Figure 51. CO Savings by Treatment Type.....	56
Figure 52. HC Savings by Treatment Type.....	56
Figure 53. NO _x Savings by Treatment Type	57

LIST OF TABLES

	Page
Table 1. Tons of CO ₂ Equivalents for Various Road Categories. (ASTAE 2010).....	6
Table 2. Effect of Roughness (IRI) on Fuel Consumption. (Chatti and Zaabar, 2010)	10
Table 3. GHG Emissions by Work Items for Various Road Categories. (ASTAE 2010)	11
Table 4. GHG Emissions by Generator and Road Categories. (ASTAE 2010).....	11
Table 5. Pavement Condition Assessment Based on PMIS Scores. (TxDOT-h 2014).....	15
Table 6. Asphalt Pavement Treatments. (Chang et al., 2014).....	15
Table 7. Jointed Concrete Pavement Treatments. (Chang et al., 2014)	16
Table 8. Continuously Reinforced Pavement Treatments. (Chang et al., 2014).....	16
Table 9. PMIS Scores After Treatment. (Chang et al., 2014).....	17
Table 10. Summary of Number of Sections by Pavement Condition Category (IRI).....	19
Table 11. Austin District Projects.	21
Table 12. Bryan-College Station District Project.....	21
Table 13. El Paso District Projects.....	22
Table 14. Houston District Projects.	23
Table 15. San Antonio District Projects.....	25
Table 16. Pavement Condition Categories Based on IRI (inch/mile).	37
Table 17. Descriptive Statistics of Gas Emissions Clustered by Pavement Condition	37
Table 18. Speed Categories (mile/hour).....	38
Table 19. Number of Data Records by Speed Category (mph).....	38
Table 20. Descriptive Statistics of Gas Emissions Clustered by Speed.	38
Table 21. IRI and Gas Emissions Dataset.....	40
Table 22. Summary of Regression Analysis Results for IRI-Gas Emissions.....	41
Table 23. Speed and Gas Emissions Dataset.....	42
Table 24. Summary of Regression Analysis Results for Speed-Gas Emissions.	43
Table 25. ANOVA Test Results for Pavement Condition Categories.	44
Table 26. ANOVA Test Results for Speed Categories.	44
Table 27. Summary of Statistics for the Ride Score Increase After Treatment (Chang et al., 2014).	48
Table 28. Summary of Regression Analysis Results for Ride Score and Vehicle Gas Emissions	51
Table 29. Gas Emissions Savings for Asphalt Treatments	51
Table 30. Gas Emissions Savings for JCP Concrete Treatments	53
Table 31. Gas Emissions Savings for CRCP Concrete Treatments.	54
Table 32. Summary of the Parameters for IRI-Gas Emission Equations.....	65

Table 33. Summary of Parameters for Speed-Gas Emission Equations.	66
Table 34. Summary of the Parameters for the Ride Score-Gas Emission Equations.	67
Table 35. Summary of Vehicle Gas Emission Savings for Preventive Maintenance.	68
Table 36. Summary of Vehicle Gas Emission Savings for Light Rehabilitation.	68
Table 37. Summary of Vehicle Gas Emission Savings for Medium Rehabilitation.	68
Table 38. Summary of Vehicle Gas Emission Savings for Heavy Rehabilitation.	69

CHAPTER 1

INTRODUCTION

This research project involved quantifying the impact of road's condition on vehicle gas emissions and developing guidance to assist the Texas Department of Transportation (TxDOT) in improving maintenance strategies to reduce the emissions. Vehicle gas emissions, including Carbon Dioxide (CO₂), Carbon Monoxide (CO), Hydrocarbons (HC), and Nitrogen Oxide (NO_x) at different pavement conditions were collected using a Portable Emission Measurement System (PEMS). Pavement condition data were also collected on Asphalt Concrete Pavements (ACP), Jointed Concrete Pavements (JCP), and Continuously Reinforced Concrete Pavements (CRCP). Statistical analyses were performed to study the relationship between pavement roughness, in terms of the International Roughness Index (IRI), and vehicle gas emissions. An evaluation of the effectiveness of maintenance and rehabilitation strategies in reducing gas emissions was also performed, and guidelines to reduce these emissions are included in this Final Report.

PROBLEM STATEMENT

Roads in poor condition not only decreases driver's comfort but also affects traveling speed and result on increased user costs especially in fuel consumption, vehicle damage, and travel time. Due to limited funds, maintenance and rehabilitation programs are often deferred for short-term cost reduction, although in the long-term this approach has negative effects on agency and user costs. Reducing road maintenance for short-term cost reduction may also have long-term negative effects on air-quality due to deferred maintenance. There are some research projects conducted for Carbon Dioxide (CO₂), Carbon Monoxide (CO), Hydrocarbons (HC), and Nitrogen Oxide (NO_x) to investigate the influence of speed and traffic condition, but the effects of pavement condition and maintenance treatments have not been studied in detail.

It is assumed that pavements in good condition generate lower gas emissions than pavements in poor condition, but there has not been a systematic method to quantify the impact of road condition on vehicle gas emissions. Besides, vehicle gas emission savings due to the implementation of best maintenance and rehabilitation practices are needed to demonstrate the benefits of these strategies. Knowing the impact of a road's condition on gas emissions should result in better informed decisions at TxDOT.

RESEARCH OBJECTIVES

The main objectives of this research project are:

- a. Quantify vehicle gas emissions associated with different pavement conditions.
- b. Provide a direct comparison of the effectiveness of different maintenance and rehabilitation strategies in reducing vehicle gas emissions.

- c Make specific recommendations to implement maintenance and rehabilitation strategies with guidelines to reduce vehicle gas emissions.

RESEARCH TASKS

To accomplish the research objectives, the study was divided into three tasks:

Task 1: Information Review and Survey

An information review was conducted to document the relevant challenges, methods, and tools for quantifying the impact of road's condition on vehicle gas emissions. This information review was complemented with a survey on-line to expand the findings and summarize current practices at the Departments of Transportation (DOT's) to address the impact of a road's condition on emissions. Three sub-tasks were developed in this task:

- Subtask 1.1: Collect documents relevant to the project through an extensive information review.
- Subtask 1.2: Prepare a questionnaire for an on-line survey based on the information review.
- Subtask 1.3: Prepare an on-line survey to assess the current state-of-knowledge at the DOTs.

Task 2: Effect of Pavement Condition on Vehicle Gas Emissions

Field tests to measure vehicle gas emissions and roughness were conducted in Austin, Bryan-College Station, El Paso, Houston, and San Antonio. A comprehensive statistical analysis was performed to study the relationship between pavement condition and gas emissions. The statistical analysis includes the development of stratified data charts by road's condition, regression analysis, and hypothesis tests to investigate the influence of pavement condition, in terms of IRI, and speed on vehicle gas emissions. Additional analysis was performed to determine the effectiveness of different maintenance and rehabilitation pavement strategies to reduce vehicle gas emissions. Three sub-tasks were performed in this task:

- Subtask 2.1: Field tests to quantify the effect of pavement condition on vehicle gas emissions.
- Subtask 2.2: Relationship between pavement condition and vehicle gas emissions.
- Subtask 2.3: Effectiveness of different maintenance and rehabilitation pavement strategies in reducing vehicle gas emissions.

Task 3: Guidelines for Improved Maintenance Strategies to Reduce Vehicle Gas Emissions

TxDOT existing environmental policies and maintenance strategies were reviewed to recommend the best practices on how to reduce vehicle gas emissions.

ORGANIZATION OF THE REPORT

This report documents the activities carried out during the research project, and summarizes the findings and recommendations. The report is composed of seven chapters. This chapter provides an

introduction to the research project, describes the problem, objectives, research tasks, and organization of the report.

Chapter 2 contains a summary of documents related to gas emissions and roads, including methods and tools to quantify gas emissions, previous efforts to establish a relationship with the pavement condition, and maintenance and rehabilitation strategies to reduce vehicle gas emissions.

Chapter 3 describes field data collection surveys conducted to measure vehicle gas emissions using a portable emission measurement system (PEMS), and pavement roughness. Pavement sections located in Austin, Bryan-College Station, El Paso, Houston, and San Antonio were selected. Field tests were performed on asphalt and concrete pavements at different roughness conditions.

Chapter 4 includes the statistical analysis to study the relationship between pavement condition and vehicle gas emissions. The analysis involved the development of stratified datasets based on roughness and speed with descriptive statistics, regression analysis, and hypothesis tests. The step-by-step process to develop the equations to quantify the impact of pavement condition on gas emissions is also described in this Chapter.

Chapter 5 explains the process to determine the effectiveness of maintenance and rehabilitation strategies on vehicle gas emissions. Potential gas emissions savings for TxDOT treatment categories including Preventive Maintenance (PM), Light Rehabilitation (LRhb), Medium Rehabilitation (MRhb), and Heavy Rehabilitation (HRhb) are estimated based on the ride score increase due to the treatment.

Chapter 6 recommends best practices for maintenance and rehabilitation pavement strategies to reduce vehicle emissions.

Chapter 7 contains a summary, conclusions, and recommendations to implement the findings of this study. The Chapter includes the final equations to quantify vehicle gas emissions from IRI or Ride Score, and potential gas emission savings due to maintenance and rehabilitation pavement treatments.

CHAPTER 2

STATE-OF-THE-PRACTICE TO QUANTIFY GAS EMISSIONS BASED ON PAVEMENT CONDITION

A comprehensive information review and surveys were conducted to assess the state-of-the-practice in studying the relationship between pavement condition and vehicle gas emissions. Emphasis was placed in finding methods, tools to quantify gas emissions, and maintenance strategies to reduce these emissions. Results of the survey were useful to complement the information review and are included in Appendix A. Findings from the information review are organized in this Chapter as follows:

- Background on vehicle gas emissions, transportation, and roads
- Methods to quantify gas emissions
- Efforts to establish a relationship between pavement condition and vehicle gas emissions
- Pavement maintenance and rehabilitation strategies to reduce gas emissions

BACKGROUND ON VEHICLE GAS EMISSIONS, TRANSPORTATION, AND ROADS

Transportation-related emissions are the dominant source of air pollution, and the second largest source of carbon dioxide (CO₂) emissions in the United States, which accounts for approximately 14% of the international greenhouse gas (GHG) emissions as shown in Figure 1. Road transportation is about 72% of the transport sector's contribution to GHG emissions. (ASTAE 2010)

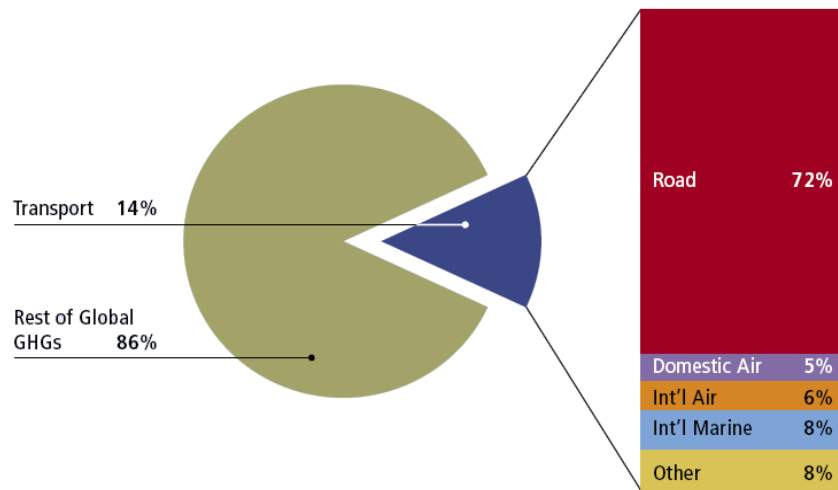


Figure 1. Global Road Transport GHG Emissions. (ASTAE 2010)

Transportation has also been the fastest-growing source of U.S. GHG emissions. The major source of CO, NO₂, and SO₂ emissions in transportation comes from fuel combustion. Ozone is not directly emitted, but it is formed when oxides of nitrogen (NO_x) and volatile organic compounds (VOC's) react in the presence of sunlight. Particulate Matter (PM) can be directly emitted, or it can be formed when

emissions of NO_x, sulfur oxides (SO_x), ammonia, organic compounds, and other gases react in the atmosphere (EPA 2011).

On-road mobile source emissions are typically estimated from vehicle miles travelled (VMT), that are obtained from local travel demand models (TDMs) for various roadway segments (links) or from Highway Performance Monitoring System (HPMS). The HPMS is a national level highway information system that includes data on the extent, condition, performance, usage, and operating characteristics of the nation’s highways. Hourly VMT estimates for each link are multiplied by emission rates calculated from emissions data. On-road fuel combustion produces approximately 23% of the GHG emissions in the US; although the overall GHG emissions contribution of the transportation sector is significantly larger as there are GHG emissions generated by extracting and refining of fuels, vehicle manufacture, and roads construction and maintenance. Therefore, only 70% of a vehicle’s total GHG emissions are directly proportional to the distance driven and therefore reflected in this estimate (SHRP 2 2013).

An assessment of GHG emissions of road construction was performed on a study made by the Asia Sustainable and Alternative Energy Program on “typical” road sections of various types or categories. The calculations were made on simplified assumptions, and were performed with the “Changer” tool that was developed by the International Road Federation (IRF). The global GHG emissions for the construction of 1km section of each type of road are shown in Table 1. (ASTAE 2010)

Table 1. Tons of CO₂ Equivalents for Various Road Categories. (ASTAE 2010)

Parameter	Expressway	National Road	Provincial Road	Rural Road Gravel	Rural Road DBST
Emissions (t CO ₂ eq. /km)	3234	794	207	90	103
Factor equivalent to	100	24.5	6.4	2.8	3.2

It is observed that the construction of 1 Km of an expressway emits as many tons of CO₂ as 4 Km of national roads, 15 Km of provincial roads, and about 33 Km of rural roads.

METHODS TO QUANTIFY GAS EMISSIONS

There are a number of methods to quantify gas emissions including CO₂, NO_x, Carbon Monoxide (CO), and hydrocarbons (HC). The most popular macroscopic level of emission estimate methods has been MOBILE (EPA 2003), EMFAC (Niemeier et al., 2004), COPERT (EEA 2007), and IVE (Davis, et al., 2005), which are widely used to assess numerous air quality planning functions, but request only average speed to simulate traffic conditions. MOVES2014 integrates both macroscopic and microscopic level concepts, using a newly adopted parameter called vehicle specific power (VSP) and its distribution models (EPA 2014). At present, the most common gas emission methods are: MOVES (EPA 2014), IVE, and the Portable Emissions Measurement System (PEMS).

Motor Vehicle Emission Simulator (MOVES)

This new emission simulator system estimates emissions for mobile sources covering a broad range of pollutants and allows multiple scale analysis. MOVES currently estimate emissions from cars, trucks, and motorcycles. EPA released MOVES2014 to allow MOVES users to easily account for emissions under new car and light truck energy and greenhouse gas standards, providing the capability to incorporate non-highway mobile sources by incorporating EPA's NONROAD2008, and to benefit from several improvements to MOVES general performance.

International Vehicle Emissions (IVE)

IVE is specifically designed to have the flexibility to address mobile source air emissions. IVE functions as a tool to help cities and regions develop emissions estimates to:

- Focus control strategies and transportation planning on those that are most effective
- Predict how the strategies affect local emissions
- Measure progress in reducing emissions over time

There are three critical components necessary to develop accurate mobile source emissions inventories: 1) vehicle emission rates; 2) vehicle activity; and 3) vehicle fleet distribution. IVE is designed to use appropriate existing information and easily collectable local data to quantify these three essential inputs. Once this information is collected, appropriate mobile source inventories are developed (IVE 2014).

Portable Emission Measurement System (PEMS)

This system is used to collect vehicle gas emissions and engine data as the vehicle is driven under real-world conditions. The device can be installed in a light duty vehicle to conduct a real-world monitoring of on-board emissions, and measure second-by-second fuel consumption and emissions of carbon dioxide (CO₂), carbon monoxide (CO), hydrocarbon (HC), and nitrogen oxide (NO_x) for gasoline-powered vehicles.

PEMS is designed to measure mass vehicle exhaust emissions under actual on-road driving conditions using vehicle and engine operating data and concentrations of pollutants in exhaust gas sampled from the tailpipe. The system is comprised of a dual gas analyzer, an engine diagnostic scanner, and an onboard computer. The dual gas analyzer measures the volume percentage of CO₂, CO, HC, NO_x, and O₂ in the vehicle exhaust. The engine scanner downloads second-by-second engine and vehicle data from the On-Board Diagnostics (OBD) link of the vehicle. PEMS has three connections with the vehicle: a power cable typically connected to the cigarette lighter or power port, an engine data link connected to the OBD link, and an emissions sampling probe inserted into the tailpipe.

The concentrations of CO₂, CO, HC, NO_x, and O₂ in the exhaust gas are determined by a functional equivalent of a repair-grade dual gas analyzer subsystem. The second-by-second exhaust mass flow is calculated based on the intake air mass flow, known composition of intake air, measured composition of exhaust, and user-supplied composition of fuel. Multiplying the exhaust mass flow by the concentrations of different pollutants yields grams-per-second emission data. PEMS has two basic

ways of obtaining engine data for the flow calculation. The first method is by obtaining the data from the vehicle engine computer and directly sensing the data. When testing vehicles with an engine control unit (ECU) through an available diagnostic port, the system can be equipped with an ECU scanner that will communicate with the ECU and obtain any needed engine parameters. The second method by which PEMS obtains engine data is by directly sensing the engine parameters. This method, termed a sensor array installation, involves attaching several analog sensors to the engine. (Yu and Qiao, 2004)

PEMS allows: a) to evaluate performance of after-treatment devices on off-road/on-road equipment, b) to compare on/off road measurement with engine dynamometer measurements, c) to evaluate different techniques of real time particulate measurements, and d) to establish a standard test cycle in order to evaluate the performance of retrofit device. Figure 2 shows the systematic flow diagram of how the Portable Emission Measurement System (PEMS) work.

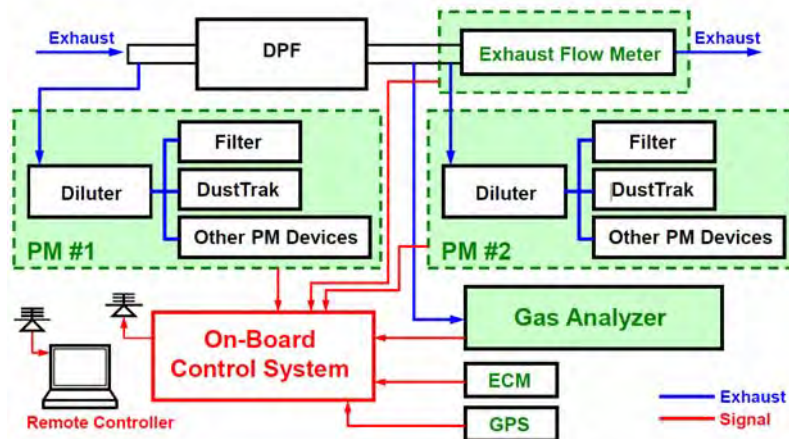


Figure 2. PEMS Systematic Flow Diagram – PEMS. (Tu 2011)

Gas emissions based on Vehicle Travel Information

There are a number of tools including MOBILE (EPA), EMFAC (Caltrans), and COPERT (EEA 2014) to estimate gas emissions from vehicle travel information. Fuel combustion is typically related to gas emissions in these tools; but pavement condition is not a data input.

MOBILE (on-road vehicles, previously used by EPA): MOBILE is based on EPA for estimating pollution from highway vehicles. MOBILE calculates emissions of carbon monoxide (CO), hydrocarbons (HC), and oxides of nitrogen (NO_x) from passenger cars, motorcycles, light-duty and heavy-duty trucks. MOBILE is based on emissions tests of thousands of vehicles. MOBILE accounts for the emission impacts of factors such as changes in vehicle emission standards, changes in vehicle populations and activity, and variation in local conditions such as temperature, humidity, and fuel quality (EPA 2013).

Emission Factors (EMFAC): EMFAC was developed by the California Air Resources Board and it has been used to calculate CO₂ emission rates for on-road motor vehicles, from light-duty passenger vehicles to heavy-duty trucks that operate on highways, freeways, and local roads in California. EMFAC uses the same diesel truck and bus vehicle populations, miles traveled and other emissions-related factors developed for the Truck and Bus Rule approved by the Air Resources Board in 2010. In order to incorporate the new detailed data and methods to estimate emissions from diesel trucks and buses, a modular emissions approach was implemented for EMFAC2011. The first module, named EMFAC-LDV, estimates passenger vehicles emissions. A second module, called EMFAC-HD, estimates emission from diesel trucks and buses. A third module, called EMFAC-SG, integrates the output of EMFAC-LDV and EMFAC-HD and provides users with the ability to conduct scenario assessments for air quality and transportation planning. (EMFAC 2011)

Computer Program to Calculate Emissions from Road Transport (COPERT): COPERT calculates vehicle gas emissions based on user-provided activity data from vehicles of specific categories, making use of vehicle-specific emission factors programmed for each vehicle type. The program accounts for four gas emission sources: 1) hot emissions, 2) cold-start emissions, 3) fuel evaporation emissions, and 4) non-exhaust PM emissions. COPERT utilizes speed-dependent emission factor formula developed empirically from multiple real-world tests on urban drives. These drive cycles are not constant-speed but involve stop-go city traffic and suburban driving cycles, and the speed-dependent emission factor curves are derived from the mean results of each distinct cycle. The total emissions are calculated as a product of activity data provided by the user and the speed-dependent emissions factors calculated by the software.

EFFORTS TO ESTABLISH A RELATIONSHIP BETWEEN PAVEMENT CONDITION AND GAS EMISSIONS

There are some studies that have investigated the relationship between pavement condition and gas emissions. In 2011, Morgan State University studied the relationship between pavement roughness and fuel consumption for Baltimore County. A two-step approach was applied in this study: data collection followed by statistical analysis. Data collection involved obtaining IRI information for state roads in Baltimore County and collecting average speeds on selected road segments. Data analysis included determining the significance of the relationship between the average vehicle speeds based on IRI categories, estimating emissions, and defining the correlation, if any, and the significance between IRI and gas emissions. The results show that fuel consumption varies over a range of approximately 11% from the smoothest to the roughest road tested when texture wavelengths are in the range of 0.6 to 3.5 m. (Kalembo 2011).

IRI can also be correlated with fuel consumption levels. For example, a HDM-4 calibration study for the Highway Development and Maintenance Management System in the U.S. conducted in 2010 included fuel vehicle consumption levels at different speeds that are adjusted by IRI (Chatti and Zaabar, 2010), as Table 2 shows.

Table 2. Effect of Roughness (IRI) on Fuel Consumption. (Chatti and Zaabar, 2010)

Speed	Vehicle Class	Calibrated HDM 4 Equations					
		Base (mL/km)	Adjustment factors from the base value				
			IRI (m/km)				
		1	2	3	4	5	6
56 km/h (35 mph)	Medium Car	70.14	1.03	1.05	1.08	1.1	1.13
	Van	76.99	1.01	1.02	1.03	1.04	1.05
	SUV	78.69	1.02	1.05	1.07	1.09	1.12
	Light Truck	124.21	1.01	1.02	1.04	1.05	1.06
	Articulated Truck	273.41	1.02	1.04	1.07	1.09	1.11
88 km/h (55 mph)	Medium Car	83.38	1.03	1.05	1.08	1.1	1.13
	Van	96.98	1.01	1.02	1.03	1.04	1.05
	SUV	101.29	1.02	1.04	1.07	1.09	1.11
	Light Truck	180.18	1.01	1.02	1.03	1.04	1.05
	Articulated Truck	447.31	1.02	1.03	1.05	1.06	1.08
112 km/h (70 mph)	Medium Car	107.85	1.02	1.05	1.07	1.09	1.12
	Van	128.96	1.01	1.02	1.03	1.03	1.04
	SUV	140.49	1.02	1.04	1.06	1.08	1.1
	Light Truck	251.41	1.01	1.02	1.02	1.03	1.04
	Articulated Truck	656.11	1.01	1.02	1.04	1.05	1.06

In 2014, Oregon Department of Transportation published the report “Rough Roads Ahead: The Cost of Poor Highway Conditions to Oregon’s Economy” showing that fuel consumption for typical highway speeds can rise up to 5% on a rough road compared to a normal quality road. The International Roughness Index (IRI) is a roughness index obtained from measuring longitudinal road profiles. Figure 3 illustrates the relationship between IRI, road condition, and vehicle speeds (Oregon State University 2014).

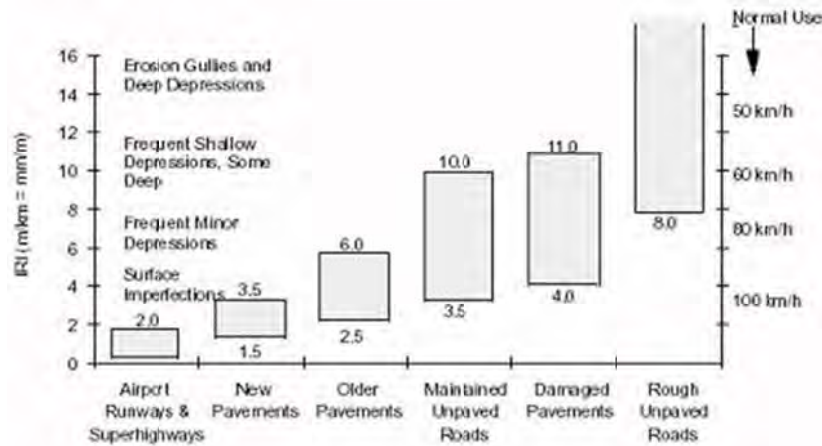


Figure 3. Relationship between IRI, Road Condition, and Vehicle Speeds. (Oregon State University 2014)

PAVEMENT MAINTENANCE AND REHABILITATION STRATEGIES AND GAS EMISSIONS

Maintenance and rehabilitation treatments can make pavements smoother and consequently decreasing fuel consumption and gas emissions. However, a life cycle cost perspective should also consider the material production process, equipment operation costs, and environmental impacts (Wang 2014). The choice of materials and techniques for road construction and maintenance has a wide variety of impacts ranging from local pollution and environmental degradation to the contribution to greenhouse gases and climate change; manufacturers and engineering companies have conducted studies on the GHG contribution of their material and alternate construction techniques.

According to a study conducted by ASTAE in 2010, GHG emissions from the fabrication/extraction of construction materials represent about 90% of the global emissions for expressway and national roads; and about 80% for provincial and rural roads. Table 3 shows the gas emissions produced by a) the extraction/production of construction materials, b) their transport, and c) the consumption of engines used for laying the materials. Table 4 shows that material transport is also a significant GHG producer, with around 25% for expressway and national roads and up to 20% for provincial and rural roads. These two elements are critical to reduce GHG impact of a construction project.

Table 3. GHG Emissions by Work Items for Various Road Categories. (ASTAE 2010)

Emissions (t CO₂ eq. / km)	Expressway	National Road	Provincial Road	Rural Road Gravel	Rural Road DBST
Earthworks	161.40	15.89	12.00	2.74	2.68
Pavement	1333.86	424.66	157.30	72.20	85.53
Culverts	238.48	51.45	16.69	11.85	11.57
Structures	1067.99	119.39	20.57	3.03	2.95
Road Furniture	432.40	182.42	0.00	0.00	0.00
Total	3234.12	793.81	206.56	89.82	102.74

Table 4. GHG Emissions by Generator and Road Categories. (ASTAE 2010)

Emissions (t CO₂ eq.)	Transport emissions	Material emissions	Machines emissions	Total
Expressway	1003.71	2121.83	108.58	3234.12
National Road	235.00	522.62	36.19	793.81
Provincial Road	66.08	111.52	28.96	206.56
Rural Road – Gravel	19.83	55.51	14.48	89.82
Rural Road - DBST	25.91	62.35	14.48	102.74

Miller and Bahia investigated the energy, gas emissions, and environmental impact of asphalt pavement treatments. It was found that preventive maintenance treatments are the least energy intensive. Cold process patching and surface treatments are recommended as the most energy efficient pavement preservation treatments (Miller and Bahia, 2009).

Recycling at the end of the life cycle may also provide substantial benefits in terms of reducing GHG emissions as shown in Figure 4. The two basic approaches of asphalt recycling are: a) inclusion of RAP (reclaimed asphalt pavement) which has previously been refined from the existing road, and using it as an aggregate and binder replacement in HMA (hot mix asphalt), and b) surface recycling, both at ambient or cold in-place recycling (CIR) or hot in-place recycling (HIR). Terrel and Hicks (2008) analyzed the energy use for hot in-place recycling (HIR) and found that this process utilizes less energy than hot mix asphalt (HMA) new paving. They showed that recent technologies as the HIR system has the most potentiality to reduce total emissions (Terrel and Hicks, 2008). Chappat and Bilal conducted a comprehensive analysis on energy consumption and GHG emissions comparing 20 different paving products used in the most common maintenance and rehabilitation treatments. The analysis considered the entire production process from the extraction of raw materials to the end of pavement's service life. It was found that the least energy demanding process is cold in-place recycling (CIR) (Chappat and Bilal, 2003).

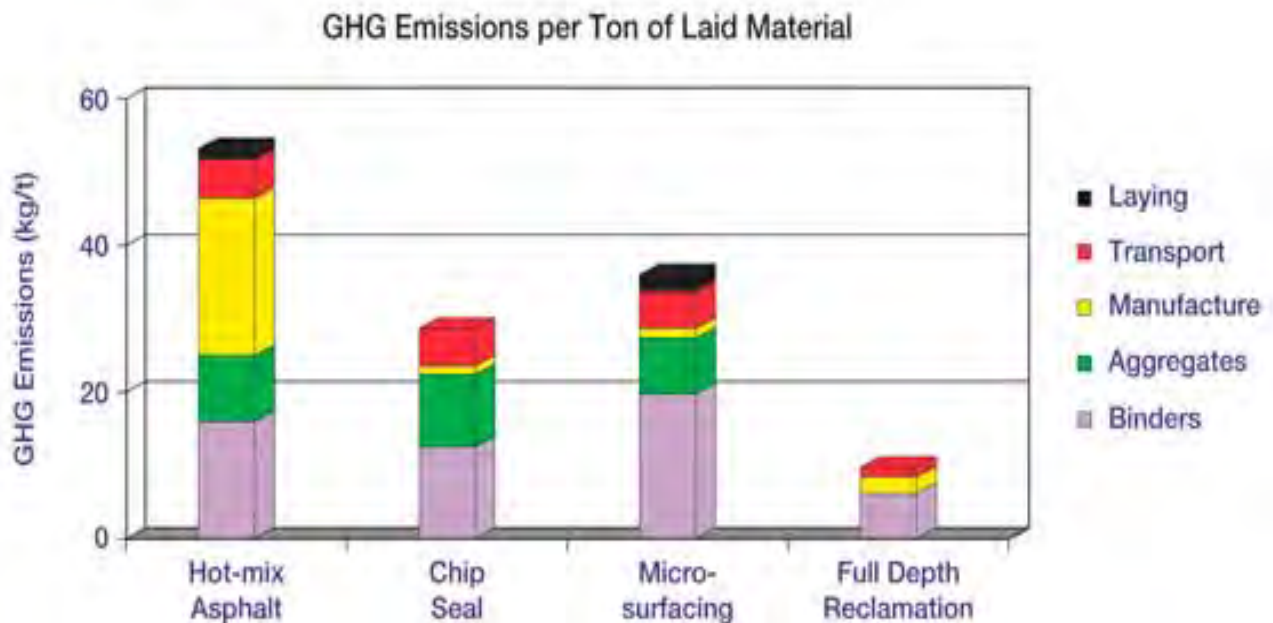


Figure 4. Pavement Maintenance and Greenhouse Gas Emissions. (ASTAE 2010)

In Figure 5, total CO₂ emissions are shown for different pavement types over a period of 40 years for a 1 km long and 13 m wide road section. Differences are observed among the pavement types in the total CO₂ emissions generated during construction, maintenance, and operation.

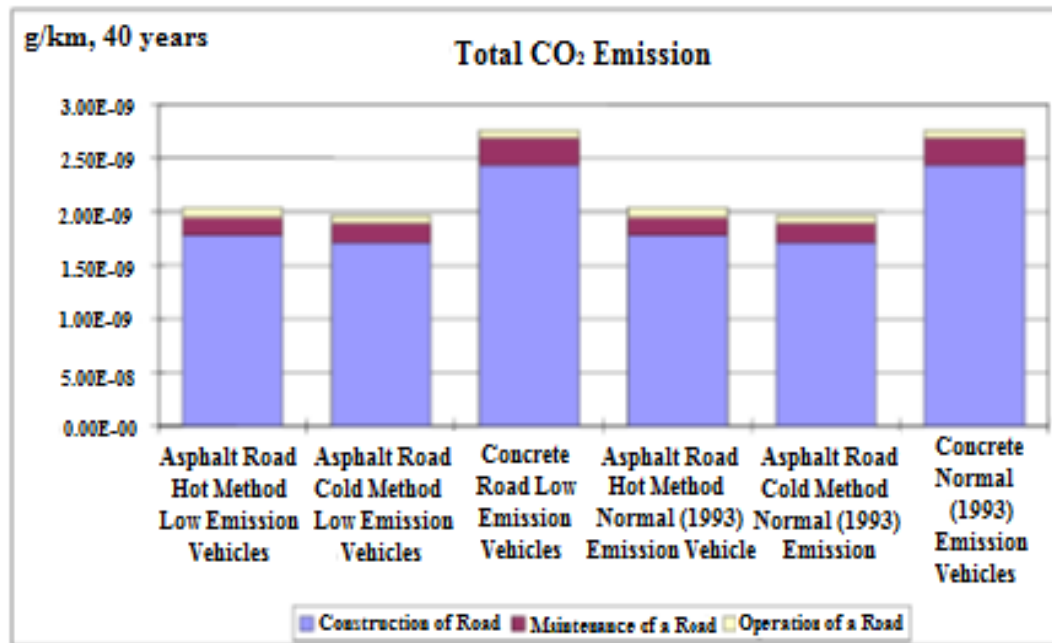


Figure 5. Total CO₂ Emissions for Different Pavement Types over 40 Years. (ASTAE 2010)

Bureau of Transport and Communications Economics in Australia conducted a study to evaluate the effects of reducing the roughness of the National Highway System and the Pacific Highway on greenhouse gas emissions, and vehicle operating costs over 1996-2015. During their analysis, they took into consideration GHG emissions from the production of materials. GHG emissions in transport and application of road rehabilitation materials were also considered into the analysis. Total gas emission from fuel consumption of vehicles, production, transport, and application of the materials were calculated. The results showed that there was a reduction in CO₂ equivalent emissions. The results were based on a comparison between a National Association of Australian State Road Authorities (NAASRA) value of 110 (266 in/mi) and IRIs from different pavement rehabilitation treatments. Using MDSHA rating system, the comparison was between pavements in fair condition (99 in/mi) and pavements in poor condition (266 in/mi). In this rating system, an IRI less than 70 in/mi is considered as very good, 70 in/mi to 110 in/mi as good, 110 in/mi to 150 in/mi as fair, and greater than 150 in/mi as poor.

There has been some research conducted in Texas about maintenance and gas emissions. A study by University of Texas at Arlington stated that concrete pavements have lower CO₂ emission than asphalt pavements at 30 mph. Although the data were very limited in the study to make general conclusions (Ardekani and Sumitsawan, 2010).

TxDOT MAINTENANCE AND REHABILITATION TREATMENTS

TxDOT defines three pavement types: Asphalt Concrete Pavements (ACP), Jointed Concrete Pavements (JCP), and Continuously Reinforced Concrete Pavements (CRCP). Guidelines to assign treatment levels for asphalt and concrete pavements were developed in TxDOT research project 0-6673 “Improvement in Pavement Ride, Distress and Condition Based on Different Pavement Types” (Chang et al., 2014). Four treatment categories are defined in these guidelines: Preventive Maintenance (PM), Light Rehabilitation (LRhb), Medium Rehabilitation (MRhb), and Heavy Rehabilitation (HRhb).

- Preventive Maintenance is used to reduce the rate of deterioration and retard failures of pavements still in good condition. The functional life of the pavement is extended by protecting the pavement structure from water infiltration and repairing any minor surface distresses at an early stage of development. While minor surface defects are temporarily corrected, combining the treatment with activities such as patching may result in a short term ride improvement. Structural capacity is not increased and low severity non-load related distresses are corrected. Maintenance treatments are performed in pre-scheduled time intervals, or in response to the development of a deficiency that affects pavement performance, but no significant increase in structural capacity is expected.
- Light Rehabilitation is mainly composed of non-structural improvements to address surface distresses mainly related to aging and environmental effects. In addition, it restores functional characteristics and protects structural integrity. Structural capacity will not significantly improve but ride quality improvement is expected.
- Medium Rehabilitation is a structural improvement that extends the service life of an existing pavement and increase its load-carrying capacity. This is usually accomplished by increasing the pavement thickness to carry increased vehicle loading or volume. Treatments under this category also restore functional characteristics improving the ride quality considerably.
- Heavy Rehabilitation is the partial or complete removal and replacement of the existing pavement structure to restore functional and structural conditions to at least the original conditions. Good ride quality is restored and all distresses are removed. Treatments under this category are performed on pavement sections with extensive structural distresses.

Treatment selection for individual sections depends on the pavement condition, traffic volume, and environmental factors. TxDOT conducts field surveys to evaluate the pavement functional and structural integrity using the following scores:

- Distress score: Visible surface pavement deterioration
- Ride score: Pavement roughness
- Condition score: Overall pavement condition
- SSI score: Structural strength index
- Skid score: Skid resistance

Pavement scores are stored in the Pavement Management Information System (PMIS). PMIS is used by TxDOT for “storing, retrieving, analyzing, and reporting information to help with pavement-related

decision-making processes”. Location, pavement type and characteristics, pavement distress surveys, climatic data, and traffic data among other data are available in this database. Current criteria to classify a pavement based on PMIS scores are shown in Table 5.

Table 5. Pavement Condition Assessment Based on PMIS Scores. (TxDOT-h 2014)

Classification	Distress Score	Ride Score	Condition Score	SSI Score	Skid Score
Very Good	90-100	4.0-4.9	90-100	90-100	100
Good	80-89	3.0-3.9	70-89	80-89	N/A
Fair	70-79	2.0-2.9	50-69	70-79	
Poor	60-69	1.0-1.9	35-49	60-69	
Very Poor	1-59	0.1-0.9	1-34	1-59	0

Tables 6, 7, and 8 show the list of work treatments for asphalt, jointed concrete, and continuously reinforce concrete pavements respectively.

Table 6. Asphalt Pavement Treatments. (Chang et al., 2014)

Treatment Level	TxDOT’s Description	Frequency of Use by TxDOT		
		Frequent	Rare	Expanding
Preventive Maintenance	Cape Seal		X	
	Fog Seal	X		
	Microsurfacing		X	
	Seal Coat	X		
	Thin Overlay (2 in. thick or less)	X		
	Ultra-Thin Friction Course	X		
Light Rehabilitation	Base Repair and Seal	X		
	Cold In-Place Recycling		X	
	Hot In-Place Recycling		X	
	Mill and Inlay; or Mill, Seal and Thin Overlay	X		
	Overlay Greater than 2" Thick but Less than 3"		X	
Medium Rehabilitation	Base Repair, Spot Seal, Edge Repair and Overlay	X		
	Level Up and Overlay	X		
	Mill and Overlay	X		
	Mill, Stabilize Base, and Seal		X	
	Overlay Between 3" and 5"		X	
Heavy Rehabilitation	Full Depth Reclamation (Pulverization and Resurfacing)	X		
	Mill, Cement Stabilize Base, and Overlay	X		
	Reconstruction	X		
	Thick Overlay Greater than 5"		X	

Table 7. Jointed Concrete Pavement Treatments. (Chang et al., 2014)

Treatment Level	TxDOT's Description	Frequency of Use		
		Frequent	Rare	Expanding
Preventive Maintenance	Joint and Crack Sealing	X		
	Diamond Grinding and/or Grooving			X
	Partial Depth Patch			X
	Ultra-Thin Friction Course		X	
Light Rehabilitation	Thin Asphalt Overlay	X		
	Dowel Bar Retrofit and Diamond Grinding		X	
	Full Depth Repair of Concrete	X		
Medium Rehabilitation	Full Depth Repair and Structural Asphalt Overlay and/or Slab Stabilization	X		
	Slab Replacement	-	-	-
Heavy Rehabilitation	Rubblizing and Asphalt Overlay			X
	Unbonded Concrete Overlay			X
	Reconstruction	X		

Table 8. Continuously Reinforced Pavement Treatments. (Chang et al., 2014)

Treatment Level	TxDOT's Description	Frequency of Use		
		Frequent	Rare	Expanding
Preventive Maintenance	Diamond Grinding and/or Grooving			X
	Partial Depth Patch	X		
	Ultra-Thin Friction Course		X	
Light Rehabilitation	Thin Asphalt Overlay	X		
	Full Depth Repair of Concrete	X		
Medium Rehabilitation	Full Depth Repair and Structural Asphalt Overlay and/or Slab Stabilization	X		
	Bonded Concrete Overlay			X
Heavy Rehabilitation	Reconstruction	X		
	Unbonded Concrete Overlay			X

After maintenance or rehabilitation is applied to a pavement, the PMIS scores are increased or reset to 100. Table 9 shows the Ride Score, Distress Score, and Condition Score increase for each treatment and pavement type.

Table 9. PMIS Scores After Treatment. (Chang et al., 2014)

Pavement Type	Treatment Level	Ride Score	Distress Score	Condition Score
Flexible	PM	Increase by 0.5	Reset to 100	Reset to 100
	LRhb	Increase by 1.2	Reset to 100	Reset to 100
	MRhb	Reset to 4.5	Reset to 100	Reset to 100
	HRhb	Reset to 4.5	Reset to 100	Reset to 100
Rigid (CRCP ¹)	PM	Increase by 0.8	Reset to 100	Reset to 100
	LRhb	Increase by 1.9	Reset to 100	Reset to 100
	MRhb	Reset to 4.2	Reset to 100	Reset to 100
	HRhb	Reset to 4.2	Reset to 100	Reset to 100
Rigid (JCP ²)	PM	Increase by 0.7	Reset to 100	Reset to 95
	LRhb	Increase by 1.6	Reset to 100	Reset to 100
	MRhb	Reset to 4.5	Reset to 100	Reset to 100
	HRhb	Reset to 4.5	Reset to 100	Reset to 100

¹ Continuously-Reinforced Concrete Pavement, ² Jointed Concrete Pavement

CHAPTER 3

FIELD TESTS TO QUANTIFY THE EFFECTS OF PAVEMENT CONDITION ON EMISSIONS

Field tests were conducted in Austin, Bryan-College Station, El Paso, Houston, and San Antonio to collect gas emissions and roughness data on pavements at different conditions. The research activities conducted in this study included:

- a. Identify TxDOT projects with pavement sections at different conditions based on roughness.
- b. Collect roughness data to obtain the International Roughness Index (IRI) in the selected pavement sections.
- c. Use a portable emission measurement system (PEMS) to collect vehicle emissions and engine data as the vehicle is driven under real-world conditions.
- d. Consolidate IRI and PEMS data for statistical analysis.

This Chapter describes the process to select the pavement sites, and data collection methods for vehicle gas emissions and roughness. Appendix B includes a description of each project site; and the PEMS and roughness data are in Appendix C.

PROCESS TO SELECT THE PAVEMENT SITES

The first step was to review the 4-year pavement management plans and pavement condition information from the Pavement Management Information System (PMIS) to select preliminary pavement sites for field data collection. The pavement site selection was based on: the pavement type, section location, pavement condition, traffic levels, climatic zones, and treatment category. Meetings were conducted with TxDOT districts to decide the final list of sections for data collection. Pavement sections were selected in Austin, Bryan-College Station, El Paso, Houston, and San Antonio. Table 10 shows a summary of the number of tenth of mile pavement sections classified by pavement condition category in terms of IRI.

Table 10. Summary of Number of Sections by Pavement Condition Category (IRI).

Pavement Condition Category	IRI (inch/mile)	Austin Number of Sections	Bryan Station Number of Sections	El Paso Number of Sections	Houston Number of Sections	San Antonio Number of Sections	Total
Very Good	1 – 59	6	0	1	173	0	180
Good	60 – 95	133	1	25	401	6	566
Fair	96 – 130	70	2	38	215	19	344
Poor	131 -169	43	0	15	175	51	284
Very Poor	170 – 950	5	0	24	107	60	196
Total		257	3	103	1071	136	1540

Note: Sections are 0.1 mile of length, 1121 flexible pavement sections, and 419 concrete pavement sections.

Figures 6 to 10 show the geographic location for the selected sites in Austin, Bryan-College Station, El Paso, Houston, and San Antonio respectively.

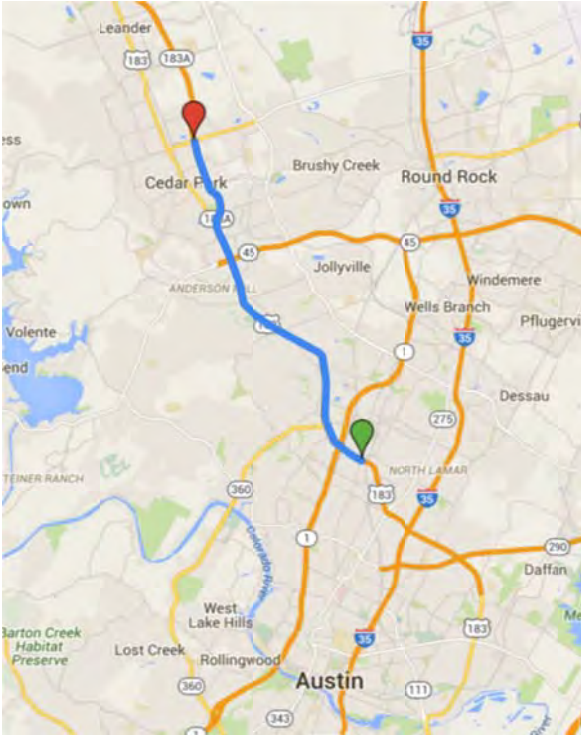


Figure 6. Pavements in Austin.



Figure 7. Pavement in Bryan-College Station.



Figure 8. Pavements in El Paso.

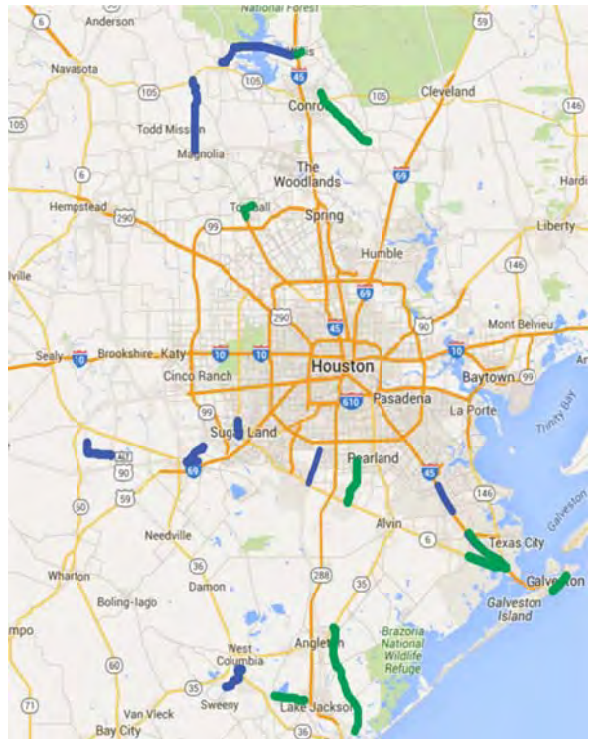


Figure 9. Pavements in Houston.

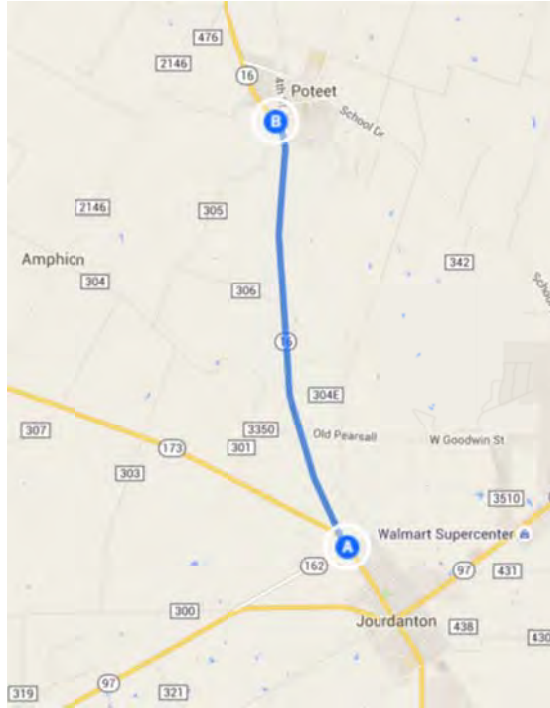


Figure 10. Pavement in San Antonio.

Tables 11 to 15 show the specific location for each project, including TxDOT identification, roadway name, type of pavement, latitude and longitude, length of the project, and number of tenth of a mile sections.

Table 11. Austin District Projects.

ID #	TxDOT ID (CSJ)	Roadway Name	Pavement Type	From	To	Length	Number of 0.1 Mile Sections
AUS	N/A	US 183	Concrete	Brunet	FM 1431	12.80	128
				TRM: N/A	TRM: N/A		
				Latitude: 30.3731369	Latitude:30.53135408		
				Longitude: -97.72612884	Longitude: -97.81633847		
AUS	N/A	US 183	Concrete	FM 1431	Brunet	12.80	128
				TRM: N/A	TRM: N/A		
				Latitude:30.53135408	Latitude: 30.3731369		
				Longitude: -97.81633847	Longitude: -97.72612884		

Table 12. Bryan-College Station District Project.

ID #	TxDOT ID (CSJ)	Roadway Name	Pavement Type	From	To	Length	Number of 0.1 Mile Sections
BCS	N/A	N/A	Asphalt	Air Strip	Air Strip	0.30	3
				TRM: N/A	TRM: N/A		
				Latitude: 30.628593	Latitude: 30.624471		
				Longitude: -96.48162	Longitude: -96.48163		

Table 13. El Paso District Projects.

ID #	TxDOT ID (CSJ)	Roadway Name	Highway	Pavement Type	From	To	Length	Number of 0.1 Mile Sections
ELP-01	0608-01-001	Spur 16	SP16	Asphalt	Doniphan Dr.	375	1.18	12
					TRM: 316 + 1.180	TRM: 316 + 0.00		
					Latitude: 31.89267855	Latitude: 31.90752063		
					Longitude: -106.597403	Longitude: -106.5871697		
ELP-02	0608-01-001	Spur 16	SP16	Asphalt	375	Doniphan Dr.	1.22	13
					TRM: 316 + 0.00	TRM: 316 + 1.220		
					Latitude: 31.90759424	Latitude: 31.89275318		
					Longitude: -106.5872322	Longitude: -106.5974924		
ELP-03	0924-06-343	Paseo del Norte	CS	Asphalt	Northern Pass Dr.	Desert Blvd.	1.49	15
					TRM: - + -	TRM: - + -		
					Latitude: 31.88523869	Latitude: 31.88327118		
					Longitude: -106.5565557	Longitude: -106.5811932		
ELP-04	0001-04-091	W. Paisano	US85	Asphalt	S. Kansas St.	W. San Antonio Ave.	0.71	8
					TRM: 329 + 1.20	TRM: 326 + 0.188		
					Latitude: 31.756091	Latitude: 31.75608062		
					Longitude: -106.484186	Longitude: -106.4944809		
ELP-05	0001-04-091	E. Paisano	US85	Asphalt	W. San Antonio Ave.	S. Kansas St.	0.72	8
					TRM: 326 + 0.188	TRM: 329 + 1.20		
					Latitude: 31.75599531	Latitude: 31.7560422		
					Longitude: -106.4946026	Longitude: -106.4840517		
ELP-06	2121-02-129	I-10 E. Frontage	IH10	Asphalt	N. Eucalyptus St.	U-Turn	0.56	6
					TRM: 20 + 0.013	TRM: 24 + 0.627		
					Latitude: 31.77335895	Latitude: 31.77768477		
					Longitude: -106.4702813	Longitude: -106.4619739		
ELP-07	2121-02-129	I-10 E. Frontage	IH10	Asphalt	Raynolds St.	Romary Rd.	0.54	6
					TRM: 23 + 0.170	TRM: 23 + 0.710		
					Latitude: 31.77697665	Latitude: 31.7769581		
					Longitude: -106.4327599	Longitude: -106.4236253		
ELP-08	0167-02-049	Dyer St.(US 478)	US478	Asphalt	Tompkins Rd.	Hayes Ave.	0.96	10
					TRM: 22 + 0.825	TRM: 22 + 1.8		
					Latitude: 31.80761884	Latitude: 31.82154642		
					Longitude: -106.4447499	Longitude: -106.444678		
ELP-09	2326-01-023	Mc Combs St. (FM 2529)	FM2529	Asphalt	US 54	Dyer St. (Bus 54)	2.49	25
					TRM: 314 + 1.348	TRM: 316 + 1.855		
					Latitude: 31.938911	Latitude: 31.90237123		
					Longitude: -106.407814	Longitude: -106.4069079		
ELP-10	0002-02-053	Alameda Ave.	SH20	Asphalt	1110 (Clint)	3rd St. (Fabens)	6.14	62
					TRM: 350 + 0.00	TRM: 356 + 0.164		
					Latitude: 31.58545661	Latitude: 31.50291947		
					Longitude: -106.2312945	Longitude: -106.1588183		
ELP-11		I-10	IH10	Asphalt	Acala Rd. (68)	Knox Ave. (72)	4.16	42
					TRM: 68 + 0.340	TRM: 72 + 0.255		
					Latitude: 31.34011767	Latitude: 31.30613392		
					Longitude: -105.8889463	Longitude: -105.8433571		

Table 14. Houston District Projects.

ID	TxDOT CSJ	Roadway Name	Pavement Type	From	To	Length	Number of 0.1 Mile Sections
HOU-01	6272-84-001	SH6	Asphalt	500' S OF VOSS RD	0.56 MI N OF US 90A	1.477	15
				IRI TRM: 0680 +01.0	IRI TRM: 0684 +00.6		
				Plan TRM: 682+1032	Plan TRM: 684+0.551		
				Latitude: 29.644368	Latitude: 29.622381		
				Longitude: -95.651516	Longitude: -95.650072		
HOU-02	6274-32-001	FM1952	Asphalt	AUSTIN C/L	FM 1489	5.596	56
				IRI TRM: 0638 +00.0	IRI TRM: 0642 +01.5		
				Plan TRM: 638+0.000	Plan TRM: 642+1.494		
				Latitude: 29.600573	Latitude: 29.571799		
				Longitude: -96.054448	Longitude: -95.990234		
HOU-03	6279-23-001	FM522	Asphalt	SH 36	FM 1459	4.8	48
				IRI TRM: 0514 -00.1	IRI TRM: 0518 +00.9		
				Plan TRM: 514-0.100	Plan TRM: 518+0.900		
				Latitude: 29.113536	Latitude: 29.078538		
				Longitude: -95.640447	Longitude: -95.689102		
HOU-04	6277-73-001	FM1486	Asphalt	SH 105	FM 1774	10.59	106
				IRI TRM: 0432 +01.5	IRI TRM: 0444 +00.6		
				Plan TRM: 432+1.865	Plan TRM: 444+0.554		
				Latitude: 30.365435	Latitude: 30.216778		
				Longitude: -95.776613	Longitude: -95.770866		
HOU-05	1259-01-039	FM1097	Asphalt	FM 149	IH 45	13.6	136
				IRI TRM: 0660 +00.0	IRI TRM: 0674 +00.5		
				Plan TRM: 660+0.655	Plan TRM: 674+0.435		
				Latitude: 30.404118	Latitude: 30.421026		
				Longitude: -95.698067	Longitude: -95.491961		
HOU-06	0027-07-041	US90A	Asphalt	MILLIE ST	BRAZOS RIVER	2.652	27
				IRI TRM: 0666 +00.0	IRI TRM: 0668 +00.8		
				Plan TRM: 666+0.012	Plan TRM: 668+0.810		
				Latitude: 29.558894	Latitude: 29.582658		
				Longitude: -95.791715	Longitude: -95.758038		
HOU-07	0027-08-170	US90A	Asphalt	0.5 MI EAST OF FM 359	BRAZOS RIVER	0.608	6
				IRI TRM: 0668 +00.8	IRI TRM: 0668 +01.8		
				Plan TRM: 668+1.520	Plan TRM: 668+0.912		
				Latitude: 29.589411	Latitude: 29.584530		
				Longitude: -95.748217	Longitude: -95.756668		
HOU-08	1683-01-038	FM1640	Asphalt	MILLIE ST	FM 2218	1.735	18
				IRI TRM: 0654 +01.5	IRI TRM: 0656 +01.5		
				Plan TRM: 654+1.601	Plan TRM: 656+1.386		
				Latitude: 29.557456	Latitude: 29.558272		
				Longitude: -95.793372	Longitude: -95.764815		
HOU-09	0111-03-058	FM521	Asphalt	HARRIS COUNTY LINE	SH 6	5.528	54
				IRI TRM: 0718 +00.5	IRI TRM: 0726 +00.0		
				Plan TRM: 726+0.000	Plan TRM: 718+0.891		
				Latitude: 29.581556	Latitude: 29.508092		
				Longitude: -95.431645	Longitude: -95.461003		
HOU-10	0500-04-126	IH45	Asphalt	FM 517	FM 518	3.7	30
				IRI TRM: 0019 +00.0	IRI TRM: 0023 +00.9		
				Plan TRM: 023+0.550	Plan TRM: 019+0.206		
				Latitude: 29.452979	Latitude: 29.499156		
				Longitude: -95.079951	Longitude: -95.111533		
HOU-10	0500-04-126	IH45	Asphalt	FM 518	FM 517	3	76
				IRI TRM: 0023 +00.9	IRI TRM: 0019 +00.0		
				Plan TRM: 019+0.206	Plan TRM: 023+0.550		
				Latitude: 29.499259	Latitude: 29.461515		
				Longitude: -95.111987	Longitude: -95.087261		
HOU-11	0500-04-129	IH45	Asphalt	FM 1764	TEXAS CITY W/YE (SB ML OF	7.6	57
				IRI TRM: 0006 +00.5	IRI TRM: 0015 +00.0		
				Plan TRM: 015+0.145	Plan TRM: 006+0.830		
				Latitude: 29.399237	Latitude: 29.330639		
				Longitude: -95.029692	Longitude: -94.934299		
HOU-12	1003-01-091	FM523	Asphalt	SH 35	FM 2004	5.7	57
				IRI TRM: 0510 +00.0	IRI TRM: 0516 +00.4		
				Plan TRM: 510+0.000	Plan TRM: 516+0.378		
				Latitude: 29.202637	Latitude: 29.126323		
				Longitude: -95.394676	Longitude: -95.385188		

Table 14. Houston District Projects (Continued)

HOU-13	1003-01-092	FM523	Asphalt	FM 2004	SH 332	10.6	106
				IRI TRM: 0516 +00.4	IRI TRM: 0516 +01.4		
				Plan TRM: 516+0.378	Plan TRM: 526+1.412		
				Latitude: 29.118564	Latitude: 28.982179		
				Longitude: -95.380105	Longitude: -95.33736		
HOU-14	1524-01-078	SH332	Asphalt	FM 521	FM 2004	4.4	45
				IRI TRM: 0672 +01.0	IRI TRM: 0678 +01.0		
				Plan TRM: 672+1.195	Plan TRM: 678+0.931		
				Latitude: 29.057513	Latitude: 29.047706		
				Longitude: -95.54266	Longitude: -95.471333		
HOU-15	1684-01-021	FM1128	Asphalt	FM 518	SH 6	6.13	61
				IRI TRM: 0484 +00.0	IRI TRM: 0488 +02.0		
				Plan TRM: 490-0.970	Plan TRM: 484+0.016		
				Latitude: 29.559186	Latitude: 29.478324		
				Longitude: -95.331136	Longitude: -95.352715		
HOU-16	0500-04-127	IH45	Asphalt	TEXAS CITY WYE	FM 1764 (NB ML ONLY)	6.6	66
				IRI TRM: 0007 +00.2	IRI TRM: 0015 +00.0		
				Plan TRM: 014+0.607	Plan TRM: 007+0.245		
				Latitude: 29.341096	Latitude: 29.399797		
				Longitude: -94.946431	Longitude: -95.02988		
HOU-17	3158-01-037	FM3083	Asphalt	LP 336 NORTH	0.280 MI N OF FM 1485	10.519	106
				IRI TRM: 0668 +01.0	IRI TRM: 0680 +00.5		
				Plan TRM: 668+1.480	Plan TRM: 680+0.066		
				Latitude: 30.340411	Latitude: 30.238492		
				Longitude: -95.427709	Longitude: -95.300692		
HOU-18	1259-01-036	FM1097	Asphalt	IH 45	SH 75	0.698	7
				IRI TRM: 0674 +00.5	IRI TRM: 0674 +01.2		
				Plan TRM: 674+0.542	Plan TRM: 674+1.240		
				Latitude: 30.421064	Latitude: 30.424014		
				Longitude: -95.491821	Longitude: -95.479780		
HOU-19	0192-04-104	SH6	Asphalt	FM 2004	IH 45	5.82	59
				IRI TRM: 0730 +00.5	IRI TRM: 0736 +01.1		
				Plan TRM: 736+0.905	Plan TRM: 730+0.730		
				Latitude: 29.330755	Latitude: 29.352696		
				Longitude: -94.938908	Longitude: -95.030534		
HOU-20	0912-73-182	CS	Asphalt	SEA/WALL BLVD; 39TH ST	FERRY RD	3.31	34
				IRI TRM:	IRI TRM:		
				Plan TRM:	Plan TRM:		
				Latitude:	Latitude:		
				Longitude:	Longitude:		
HOU-21	2941-02-050	FM2920	Asphalt	BUS 249	HOWARD ST	1.662	17
				IRI TRM: 0664 +00.0	IRI TRM: 0664 +01.2		
				Plan TRM: 664+0.025	Plan TRM: 664+1.687		
				Latitude: 30.089335	Latitude: 30.100533		
				Longitude: -95.635973	Longitude: -95.607750		
HOU-22	2941-01-023	FM2920	Asphalt	SH 249 NB FRONTAGE RD	BUS 249	0.14	2
				IRI TRM: 0662 +01.7	IRI TRM: 0664 +00.0		
				Plan TRM: 662+1.852	Plan TRM: 664+0.006		
				Latitude: 30.089329	Latitude: 30.089367		
				Longitude: -95.635750	Longitude: -95.632540		
HOU-23	0720-03-129	BS249B	Asphalt	0.28 MI N OF FM 2920	1.1 MI S OF FM 2920	1.386	14
				IRI TRM: 0452 -00.4	IRI TRM: 0452 +01.2		
				Plan TRM: 452-0.258	Plan TRM: 452+1.128		
				Latitude: 30.093822	Latitude: 30.074306		
				Longitude: -95.633738	Longitude: -95.627107		
HOU-24	N/A	US59/69	Concrete	Almeda Rd.	S Rice Ave.	5.6	56
				TRM: 0512+01.0 (and 0095+28	TRM: 0516+02.6 (and 0095+28		
				Latitude: 29.733104	Latitude: 29.726252		
				Longitude: -95.374986	Longitude: -95.468306		
HOU-25	N/A	US59/69	Asphalt	Rice Ave.	Bissonnet St.	5.9	59
				TRM: 0095+28.1	TRM: 0095+22.2		
				Latitude: 29.726215	Latitude: 29.675866		
				Longitude: -95.468280	Longitude: -95.541971		

Table 15. San Antonio District Projects

ID #	TxDOT ID (CSJ)	Roadway Name	Pavement Type	From	To	Length	Number of 0.1 Mile Sections
SA	N/A	TX 16	Concrete	County Line Rd	4th St.	6.7	67
				TRM: N/A	TRM: N/A		
				Latitude: 28.935031	Latitude: 29.029168		
				Longitude: -98.558944	Longitude: -98.575768		
SA	N/A	TX 16	Concrete	Old Jordanton Rd	TX 162	6.7	67
				TRM: N/A	TRM: N/A		
				Latitude: 29.031757	Latitude: 28.935300		
				Longitude: -98.576873	Longitude: -98.559184		

PEMS GAS EMISSIONS DATA COLLECTION METHOD

Portable Emissions Measurement System (PEMS) is a portable and mobile unit of system that calculates gas emission of a combustion engine. It measures second-by-second gas emissions such as Carbon Dioxide (CO₂), Carbon monoxide (CO), Nitrogen Oxides (NO_x), Hydrocarbons (HC) as well as Fuel Consumptions (FC) while the vehicle operates, which allows real-world in-use testing. It can also measure other On-Board Diagnostics (OBD) data like Intake Air temperature (IAT), engine speed (RPM) and Manifold Absolute Pressure (MAP). It also gives the vehicle location every second using a GPS device.

The PEMS is composed of five components: dual gas analyzers, a PM measurement system, an engine sensor array, a global position system (GPS), and an on-board computer. The two parallel gas analyzers simultaneously measure the volume percentage of CO₂, CO, HC, NO_x in the vehicle exhaust. For this project, a light duty gasoline vehicle Subaru Forester, Model 2004 shown in Figure 11, was selected for testing.



Figure 11. Selected Light Duty Vehicle for the Research Project.

PEMS can be connected to vehicles in two different ways: a) On-board diagnostics (OBD) II and b) Sensors. In our project, PEMS was connected by three different sensors: a) Engine speed sensor, b) IAT sensor, and c) MAP sensor. PEMS is designed to measure emissions during the actual use of the internal-combustion engine of a vehicle. The whole installation process includes several steps.

Step 1: Power Chord Installation

The connection between the Power Chord and the battery of test car powers up the whole equipment. This connection required a cable which is connected to the battery of the test car in the proper way. In Figure 12, the red cable of the power chord is attached with the positive red jumper clamp and the black cable of the power chord is connected with the negative black jumper clamp.



Figure 12. Power Cable Connection in PEMS Installation.

Step 2: Sensor Installation

This installation process includes three different sensors:

1. RPM Sensor
2. Temperature Sensor, and
3. Air Pressure Sensor.

Figure 13 shows the major connection between RPM sensor and the black tube of the vehicle's engine. The other part of the chord is connected to the sensor connector box (Figure 14). Then a cable will connect the sensor connector box with the PEMS computer to get the RPM readings of the vehicle for each second while driving. Figures 15 and 16 show the connection of the temperature sensor cable (white cable) to the air tube on one end, and to the sensor connector box at the other end.



Figure 13. RPM Connection with the Black Wire of Test Vehicles Engine



Figure 14. Connection of RPM Cable with Sensor Connector Box (Black Wire)



Figure 15. Connection of Temperature Sensor Cable with the Air Tube of the Test Vehicle



Figure 16. Connection of Temperature Sensor Cable with Sensor Connector Box (White Wire)

This connection requires more time than other two connections. The cable with two heads is connected to the pressure port of the engine of the test vehicle. The other end of the pressure cable is directly connected to the PEMS computer. (Figures 17 to 19)



Figure 17. Unscrewing the Pressure Port of Test Vehicle Engine.



Figure 18. Installation of Two Heads of the Pressure Cable.



Figure 19. Connection of Pressure Cable with PEMS Computer.

Step 3: Exhaust Cable Installation

The exhaust cable is connected to the tailpipe in one end and with the H₂O condensation bowl at the other end, which is connected to the PEMS computer (Figures 20 and 21).



Figure 20. The Exhaust Cable.



Figure 21. Installation with the Tailpipe of the Test Vehicle Other Connections.

A GPS is connected directly to the PEMS computer to record the location of the vehicle, latitude and longitude, second by second. Four more clear tubes are attached to the PEMS computer to clear the gas analyzer as shown in Figure 22.



Figure 22. Other End of the Exhaust Cable is Connected to the H₂O Condensation Bowl.

Data Collection

After installing the equipment, the driver starts the vehicle. The computer was started to run the Axion Lab view Software, and all the additional buttons for data recording were powered on. Figure 23 shows the complete setup of all the PEMS instruments. Figure 24 shows the software and data recording through the PEMS software.

Field gas data were collected in regular driving situation (free-flow conditions), with open windows, different acceleration and speed. The tests were conducted in sunny days and one single vehicle with one designated driver was used for the test. The data collection involved fueling, and continuously recording exhaust gas concentration, engine data, and GPS data on a second-by-second basis. The actual fuel use was also recorded. During testing, periodic checks of the system status were made. The PEMS computer recorded second by second data of fuel consumption (FC) and emission of hydrocarbon (HC), carbon monoxide (CO), carbon dioxide (CO₂), nitrogen oxide (NO_x), speed, etc. Through the software the data was recorded in txt format. After finishing the test, the raw files were copied from the PEMS computer and extracted the data into the Microsoft Excel files. Figure 25 shows a raw data in Microsoft Excel file format.



Figure 23. Test Vehicle with PEMS Equipment.



Figure 24. Axion Labview Software Recording Data in PEMS Computer.

Figure 25. Example of PEMS Data Exported to Excel from a Field txt File.

It is important to emphasize that there are several factors that influence gas emission measurements including vehicle type, vehicle dynamics, ambient temperature, vehicle age, fuel type, vehicle speed and acceleration (deceleration). Some of these factors were controlled in the field surveys, as the type of vehicle, route, driver, and scheduling of data collection activities. Other factors, such as traffic and environmental conditions are more difficult to control. PEMS gas emission measures are subjected to these factors, and the range is very broad since the results depend of the entire data collection process.

PROCESSING PEMS RAW DATA

The PEMS provides gas emission rates in a time dependent manner (g/s, mg/s). To later compare with the IRI, PEMS raw data were transformed into a space-dependent (m/km) format following these steps:

Step 1: Checking that PEMS data match with the road segment of the project.

Step 2: Calculating the distance (m) traveled per second.

Step 3: Converting the gas emission rates per second collected in the field for CO₂ (g/s), and CO (mg/s), HC (mg/s), NO_x (mg/s) into gas emission rates per distance (g/m).

Step 4: Interpolating each type of gas emission rates per distance (g/m) and corresponding speed (kph) for each unit distance (m) to distribute the data into the space domain.

Step 5: Taking the average of all gas emission factors (g/m) and speed (kph) for every 0.1 mile (rounded about 161 meters).

Step 6: Converting PEMS data from System International (SI) units into English units.

PAVEMENT ROUGHNESS DATA COLLECTION METHOD

The Federal Highway Administration (FHWA) requests State Departments of Transportation (DOT's) to report the International Roughness Index (IRI) in the Highway Performance Monitoring System Data collection since 1990. IRI is a profile-based statistic index that was initially established in a study conducted by the World Bank, and it is used to evaluate pavement smoothness. IRI was developed mathematically to represent the reaction of a single tire on a vehicle suspension (quarter-car) to roughness in the pavement surface, traveling at 50 mph. The algorithm of the quarter-car simulation is described in ASTM E-1364.

Equipment for Measuring Ride Quality

The inertial profiler is a device that uses laser sensors to measure ride quality based on the pavement profile. There are generally three types of inertial profilers:

- One that can travel at highway speeds or a high speed profiler
- A light weight profiler that can travel at a minimum speed of 12 mph
- A portable profiler

Figure 26 shows a high speed profiler used in this research project to collect pavement profile data.



Figure 26. High Speed Inertial Profiler.

Processing Ride Data

The ride data of the pavement profile is processed by TxDOT using the Ride Quality computer program. The output report includes a description of the project: District, county, highway, beginning and end reference markers, lane designation, and IRI values every 0.1 mile.

CHAPTER 4

IMPACT OF PAVEMENT CONDITION ON GAS EMISSIONS

Statistical analysis was performed to study the relationship between pavement condition and vehicle gas emissions. The analysis involved the generation of stratified datasets to compare descriptive statistics, regression analysis, and hypothesis tests. The results of the statistical analysis are gas emission equations based on IRI.

The research activities described in this Chapter include the following:

- a. Statistical analyses using IRI and PEMS data to identify relevant factors that influence the relationship between pavement condition and gas emissions. Stratified datasets were prepared to compare descriptive statistics for gas emissions and IRI, and regression analysis was performed to investigate the relationship between IRI and CO₂, CO, HC, and NO_x.
- b. Development of gas emission equations based on IRI to quantify the impact of pavement condition on gas emissions.

A summary of descriptive statistics and scatter plots of IRI versus gas emissions are included in Appendix D. Hypothesis test reports to evaluate the statistical significance of gas emission measurements between speed and pavement condition categories are located in Appendix E.

STATISTICAL ANALYSIS

PEMS and roughness data (IRI) were collected in the same road pavement sections. Several rounds of PEMS data were recorded at different speeds to study the influence of pavement condition on gas emissions. The step by step process to study the relationship between IRI and vehicle gas emissions is described as follows:

Step 1: Characterize gas emissions and IRI data by plotting histograms and calculating descriptive statistics (mean, variance, standard deviation, median, minimum, maximum, and quartiles). Figures 27 to 30 show the histograms for Carbon Dioxide (CO₂), Carbon monoxide (CO), Nitrogen Oxides (NO_x), and Hydrocarbons (HC).

It is observed that gas emission histograms are not symmetric and skewed to the left with a heavy tail. Figure 31 shows the histogram for the IRI as the average of the left and right wheel path measurements. Although, the IRI histogram is not symmetric; it does not show a heavy tail to the left.

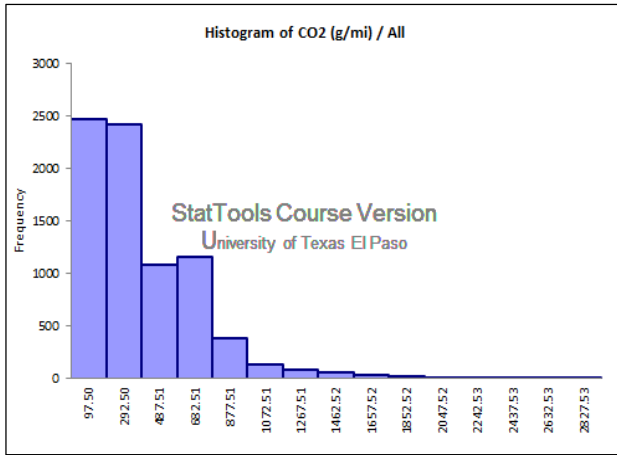


Figure 27. Histogram of CO₂.

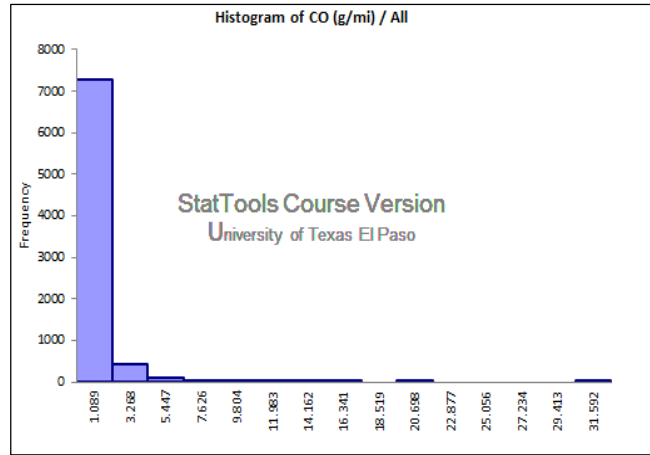


Figure 28. Histogram of CO.

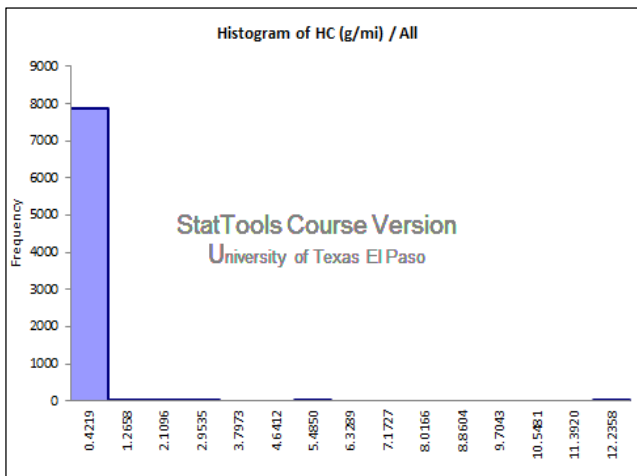


Figure 29. Histogram of HC.

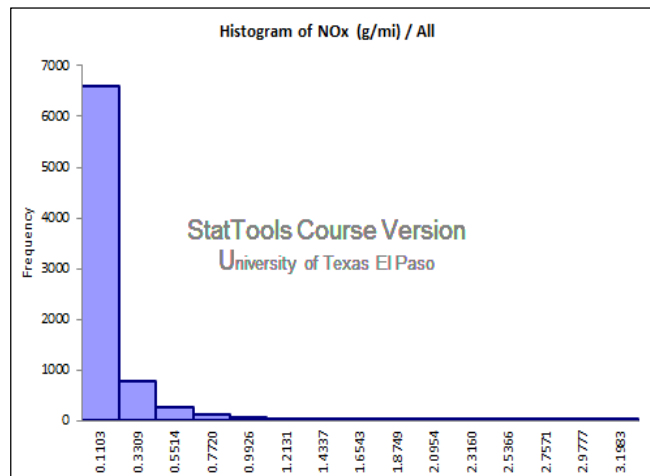


Figure 30. Histogram of NO_x.

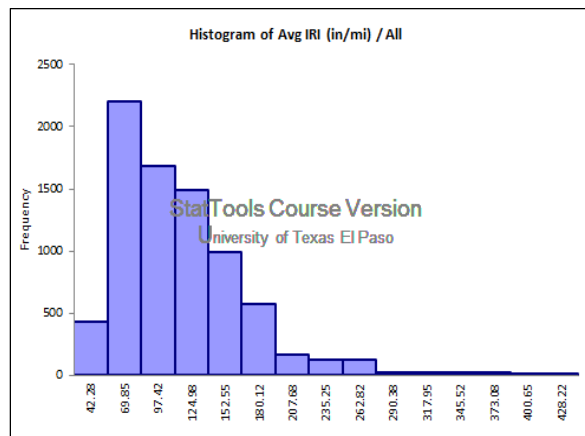


Figure 31. Histogram of IRI.

A summary of descriptive statistics for the entire data set is shown in Figure 32. Data observations from the histograms are confirmed by the statistical parameters. The skewness is higher for CO and HC, 6.9556 g/mile and 32.6546 g/mile respectively, and also show higher kurtosis that confirms the heavy tail. CO₂ has the highest interquartile range when compared to the other gases reflecting a broader range of values in the dataset. The IRI shows similar statistical parameters for the left and right wheel paths with 75% of the IRI average values below 136 in/mile.

StatTools Report								
Analysis: One Variable Summary								
Performed By: Ortega, Oscar I								
Date: Monday, January 02, 2017								
Updating: Live								
	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	CO ₂ (g/mi)	CO (g/mi)	HC (g/mi)	NO _x (g/mi)	Speed (mph)
<i>One Variable Summary</i>	All	All	All	All	All	All	All	All
Mean	110.43	120.28	115.35	392.97	0.789	0.1011	0.1343	58.00
Variance	2777.18	3508.45	2868.91	102046.99	1.950	0.0422	0.0607	242.48
Std. Dev.	52.70	59.23	53.56	319.45	1.397	0.2054	0.2464	15.57
Skewness	1.7943	1.7673	1.6607	1.9803	6.9556	32.6546	5.2165	0.1097
Kurtosis	8.4703	7.9066	7.6658	9.9558	95.9637	1852.8938	43.8733	4.5260
Median	98.66	110.94	105.50	291.49	0.386	0.0441	0.0538	61.18
Mean Abs. Dev.	39.18	43.27	40.08	242.29	0.738	0.0965	0.1369	12.47
Mode	59.00	64.00	58.50	77.08	0.000	0.0000	0.0000	46.23
Minimum	25.00	31.00	28.50	0.00	0.000	0.0000	0.0000	6.83
Maximum	450.76	494.00	442.00	2925.03	32.681	12.6577	3.3086	130.22
Range	425.76	463.00	413.50	2925.03	32.681	12.6577	3.3086	123.39
Count	7893	7893	7893	7893	7893	7893	7893	7893
Sum	871603.35	949337.08	910463.58	3101732.07	6226.033	798.0745	1059.9471	457755.60
1st Quartile	72.07	77.00	75.47	167.59	0.137	0.0193	0.0151	47.28
3rd Quartile	136.00	145.46	141.76	573.59	0.881	0.1313	0.1491	68.95
Interquartile Range	63.93	68.46	66.29	406.00	0.744	0.1121	0.1340	21.67
1.00%	43.00	44.00	44.50	12.36	0.000	0.0000	0.0000	22.00
2.50%	48.00	49.00	50.50	32.49	0.000	0.0000	0.0006	26.42
5.00%	52.79	55.00	55.50	63.97	0.007	0.0000	0.0017	31.24
10.00%	59.00	61.00	61.50	99.41	0.028	0.0046	0.0039	37.11
20.00%	68.00	72.00	70.50	148.57	0.098	0.0154	0.0104	44.42
80.00%	146.92	155.38	154.00	636.09	1.060	0.1690	0.1844	70.29
90.00%	173.94	185.81	178.00	766.78	1.841	0.2777	0.3342	73.38
95.00%	203.00	231.37	207.06	945.43	2.802	0.3594	0.5397	76.86
97.50%	249.00	274.56	256.89	1196.46	4.225	0.4424	0.7862	79.66
99.00%	304.59	342.94	316.51	1544.55	6.604	0.6175	1.1845	107.90

Figure 32. Summary of Descriptive Statistics for IRI, Gas Emissions, and Speed.

There were few data records in which one of the gases with a value of 0 g/mile while the other three gases registered significant values. The percentage of these records was very low (0% for CO₂, 2.99% for CO, 6.18% for HC, and 0.8% for NO_x). Results of a comprehensive descriptive statistics analysis of gas emissions datasets clustered by speed categories, and pavement condition are included in Appendix D.

Step 2: Plots of IRI versus Carbon Dioxide (CO₂), Carbon monoxide (CO), Hydrocarbons (HC), and Nitrogen Oxides (NO_x), are shown in Figures 33 to 36 respectively. Data points belong to gas emission measurements from every speed round in all the sections. Due to the skewness of the gas emissions data, a logarithmic scale for the Y axis was preferred for these plots. All these data points are scattered, and there are no clear patterns between IRI and PEMS gas emissions directly observed from these plots. Although, the dataset analysis indicates that about 86% of CO₂ measurements are between 100 and 1000 g/mile; 79% of CO measurements are between 0.1 and 10 g/mile; 93% of HC measurements are between 0.001 and 1 g/mile; and 95% of NO_x measurements are between 0.001 and 1 g/mile. Details of the statistical analysis are found in Appendix D.

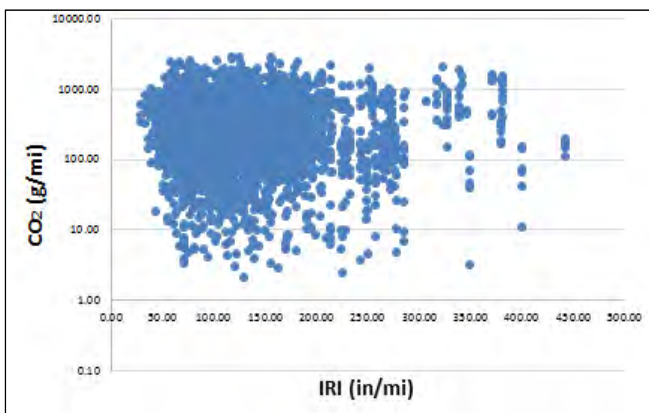


Figure 33. IRI versus CO₂.

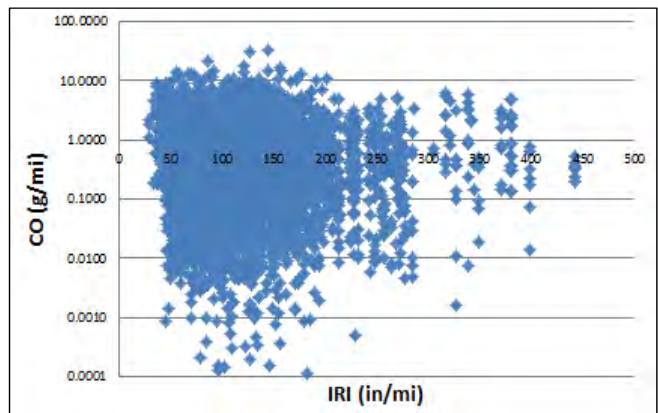


Figure 34. IRI versus CO.

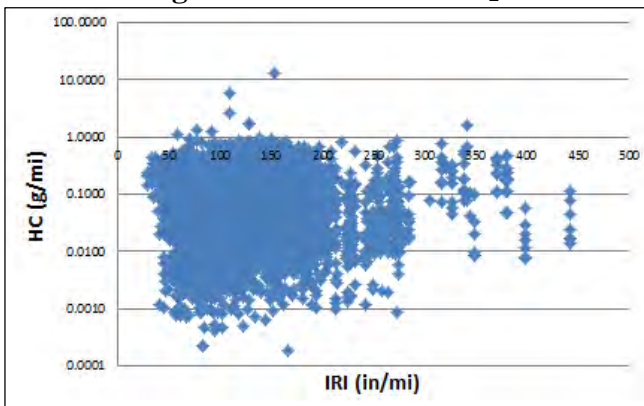


Figure 35. IRI versus HC.

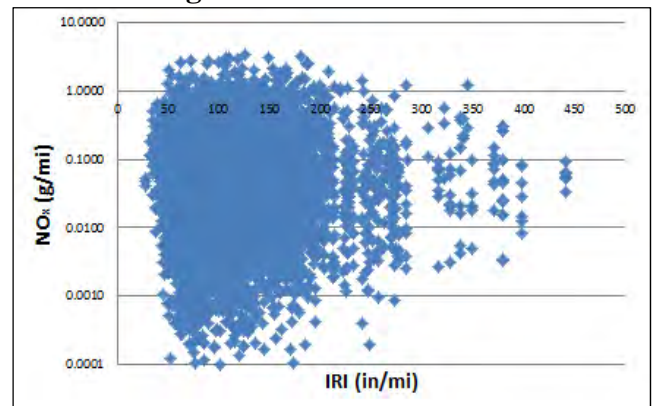


Figure 36. IRI versus NO_x.

Step 3: Prepare stratified data sets of gas emissions clustered by pavement condition category as defined by Texas Department of Transportation in terms of IRI as described in Table 16.

Table 16. Pavement Condition Categories Based on IRI (inch/mile).

IRI Score	Description
1-59	Very Good
60-95	Good
96-130	Fair
131-169	Poor
170-950	Very Poor

(TxDOT-h 2005)

Table 17 shows descriptive statistics for the gas emissions data stratified by pavement condition. No clear pattern is observed between pavement condition and gas emissions from this general analysis. Standard deviations are large when compared to the mean values and reflects the variability of gas measurements within each condition category.

Table 17. Descriptive Statistics of Gas Emissions Clustered by Pavement Condition.

PEMS Gas	Condition Category	Descriptive Statistics		
		Frequency	Mean	Standard Dev.
CO ₂ (g/mi)	Very Good	665	470.38	272.98
	Good	2707	378.54	286.15
	Fair	2091	401.77	326.93
	Poor	1434	380.78	350.82
	Very Poor	996	402.89	386.52
	All records	7893	395.25	317.85
CO (g/mi)	Very Good	665	0.78	1.43
	Good	2707	0.73	1.19
	Fair	2091	0.79	1.49
	Poor	1434	0.88	1.73
	Very Poor	996	0.84	1.35
	All records	7893	0.78	1.41
HC (g/mi)	Very Good	665	0.13	0.12
	Good	2707	0.08	0.11
	Fair	2091	0.13	0.20
	Poor	1434	0.11	0.40
	Very Poor	996	0.10	0.15
	All records	7893	0.10	0.21
NO _x (g/mi)	Very Good	665	0.12	0.19
	Good	2707	0.13	0.22
	Fair	2091	0.13	0.27
	Poor	1434	0.15	0.25
	Very Poor	996	0.16	0.36
	All records	7893	0.13	0.25

Step 4: Prepare stratified data sets of PEMS gas emissions measurements clustered by speed categories as defined in Table 18.

Table 18. Speed Categories (mile/hour).

Speed Category	Speed (mile/hour)
Low	< 45
Medium	≥ 45 – < 60
High	≥ 60 – < 99

Table 19 shows a summary of the number of records for pavement sections located in Austin, Bryan-College Station, El Paso, Houston, and San Antonio classified by speed category. Several rounds of gas emissions data were collected in the field at different speeds for the same pavement section.

Table 19. Number of Data Records by Speed Category (mph).

Speed Category	Austin Number of Records	Bryan Number of Records	El Paso Number of Records	Houston Number of Records	San Antonio Number of Records	Total
Low	9	5	595	880	61	1828
Medium	272	0	339	1175	198	2167
High	1921	0	236	1002	716	3983
Total	2202	0	1170	3057	975	7978

Table 20 shows descriptive statistics for the vehicle gas emissions data stratified by speed categories. It is observed from a comparison of CO₂, CO, HC, and NO_x mean values that as the speed increases the gas emissions decreases.

Table 20. Descriptive Statistics of Gas Emissions Clustered by Speed.

PEMS Gas	Speed Category	Descriptive Statistics		
		Frequency	Mean	Standard Dev.
CO ₂ (g/mi)	Low	1701	548.19	440.67
	Medium	2111	400.48	288.95
	High	4166	324.54	241.41
CO (g/mi)	Low	1701	0.89	1.82
	Mid	2111	0.56	1.08
	High	4166	0.85	1.31
HC (g/mi)	Low	1701	0.15	0.38
	Medium	2111	0.11	0.12
	High	4166	0.08	0.11

Table 20. Descriptive Statistics of Gas Emissions Clustered by Speed. (Continued)

PEMS Gas	Speed Category	Descriptive Statistics		
		Frequency	Mean	Standard Dev.
NO _x (g/mi)	Low	1701	0.15	0.35
	Medium	2111	0.11	0.23
	High	4166	0.14	0.19

Step 5: Conduct regression analyses to determine if there was a relationship between pavement condition and gas emissions. Datasets were prepared to develop equations for vehicle gas emissions based on pavement condition. The process to develop the gas emission equations based on IRI is explained in the next section.

Step 6: Conduct hypothesis tests to investigate if there is a significant difference of gas emission measurements among pavement condition categories, and speed categories. Hypothesis test reports are included in Appendix E.

IMPACT OF PAVEMENT CONDITION ON VEHICLE GAS EMISSIONS

A comprehensive model to quantify vehicle gas emissions should consider a number of factors including vehicle type, vehicle dynamics, ambient temperature, vehicle age, fuel type, vehicle speed, and acceleration (deceleration), in addition to pavement condition. Some of these factors were controlled in the field surveys (e.g. type and age of vehicle, route, drive), but other factors, such as traffic and environmental conditions, are more difficult to control.

The scope of this research was to study the relationship, if any, between gas emissions and pavement condition. From the general statistics analysis, it was concluded that individual PEMS measurements did not follow a pattern when compared to IRI. PEMS gas emission measures are very broad as a result of the factors affecting the field data collection process. Therefore, clustered-bin analysis was used to analyze the datasets. CO₂, CO, HC, and NO_x, gas emissions were clustered in IRI bins of 5 in/mile for further analysis. The mean values of the gas emissions were calculated as representative points for each IRI bin. More details of the statistical analyses are described in Appendix D.

Table 21 shows a selected dataset from the clustered bins analysis representing 90 percent of the field data was finally used to develop the equations for gas emissions based on IRI. Figures 37 to 40 show the plots of IRI versus gas emissions with the results of the regression analysis for CO₂, CO, HC, and NO_x respectively.

Table 21. IRI and Gas Emissions Dataset.

IRI (in/mi)	CO₂ (g/mi)	CO (g/mi)	HC (g/mi)	NO_x (g/mi)
47.5	454.22	1.17	0.16	0.11
52.5	467.73	0.76	0.15	0.13
57.5	477.33	0.67	0.12	0.11
62.5	430.38	0.66	0.10	0.13
67.5	407.76	0.66	0.09	0.12
72.5	364.51	0.62	0.08	0.12
77.5	375.39	0.78	0.07	0.13
82.5	342.17	0.80	0.05	0.14
87.5	316.34	0.80	0.06	0.12
92.5	422.43	0.85	0.10	0.17
95.5	304.59	0.60	0.10	0.07
98.0	334.71	0.56	0.08	0.10
102.5	416.11	0.69	0.13	0.10
107.5	459.93	0.79	0.15	0.16
112.5	351.48	0.81	0.10	0.14
117.5	397.96	0.74	0.13	0.16
122.5	376.14	0.93	0.12	0.14
127.5	427.33	0.94	0.13	0.12
130.5	436.34	0.86	0.15	0.09
133.0	351.29	0.78	0.08	0.19
137.5	344.03	0.87	0.09	0.12
142.5	419.43	1.15	0.10	0.16
147.5	317.20	0.74	0.10	0.14
152.5	366.35	0.72	0.16	0.12
157.5	461.54	0.92	0.09	0.16
180.0	340.05	0.75	0.08	0.16
260.0	422.64	0.79	0.10	-
320.0	807.62	1.54	0.25	-
340.0	574.25	1.40	0.24	0.19
370.0	889.66	1.49	0.23	-

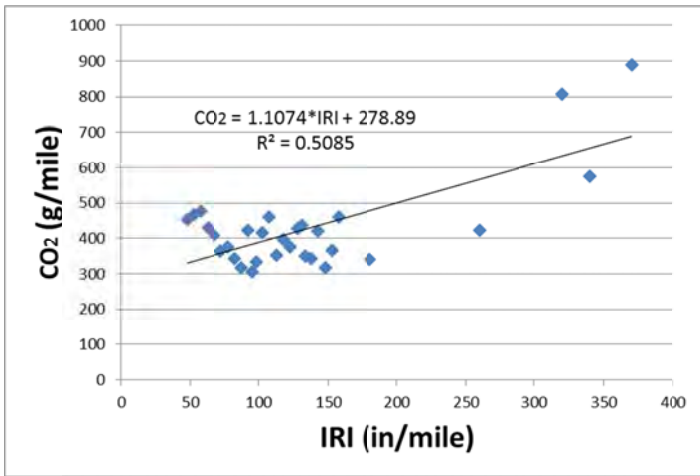


Figure 37. Regression Analysis for IRI and CO₂

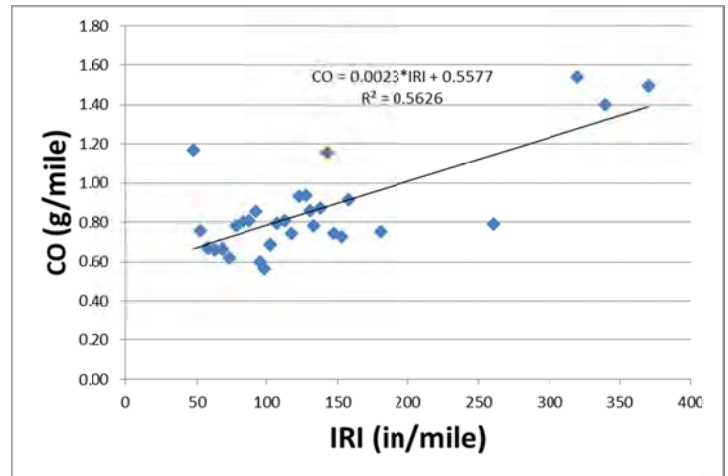


Figure 38. Regression Analysis for IRI and CO.

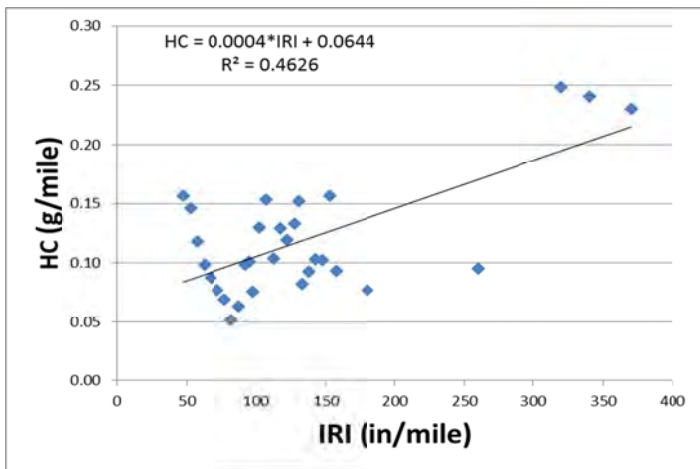


Figure 39. Regression Analysis for IRI and HC.

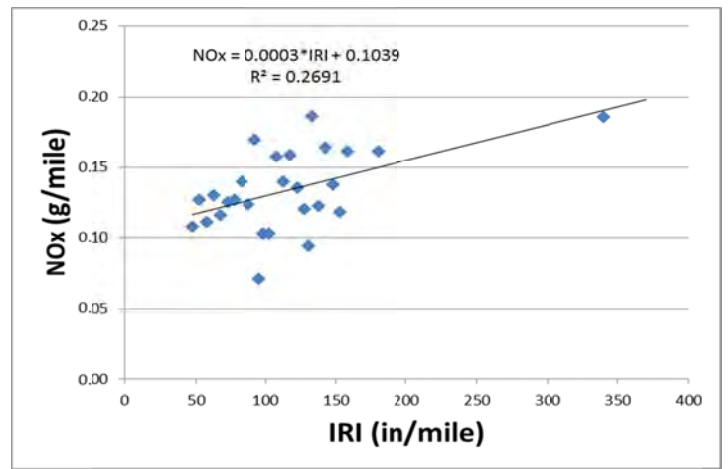


Figure 40. Regression Analysis for IRI and NO_x.

The general equation for gas emissions based on IRI is given by:

$$\text{Vehicle Gas Emissions (g/mile)} = m \cdot \text{IRI (in/mile)} + b$$

The results of linear regression analysis for IRI versus vehicle gas emissions are summarized in Table 22.

Table 22. Summary of Regression Analysis Results for IRI-Gas Emissions.

PEMS – Gas Y (g/mile)	m	b	R ²
CO ₂	1.1074	278.89	0.5085
CO	0.0023	0.5577	0.5626
HC	0.0004	0.0644	0.4626
NO _x	0.0003	0.1039	0.2691

Note: Y (Gas g/mile) = m IRI (in/mile) + b

R²s results vary between 0.2691 and 0.5626 which are considered acceptable for this type of analysis. However, it should be recognized that the IRI is not the only factor affecting PEMS gas emission measurements, there are other factors that influence gas emissions including vehicle type, vehicle dynamics, ambient temperature, vehicle age, fuel type, vehicle speed and acceleration (deceleration). Therefore, additional analysis was conducted to study the influence of speed on gas emissions.

Influence of Speed in the Gas Emissions

Gas emissions data for CO₂, CO, HC, and NO_x were clustered by speed bins of 5 mph and the mean values were calculated as representative points. Table 23 shows the selected dataset of points from the clustered bins analysis that was used for the regression analysis. Details of the statistical analyses are described in Appendix D.

Table 23. Speed and Gas Emissions Dataset.

Speed (mph)	CO₂ (g/mi)	CO (g/mi)	HC (g/mi)	NO_x (g/mi)
12.5	758.73	3.61	0.24	0.40
22.5	916.02	1.76	0.32	0.30
27.5	706.06	0.90	0.16	0.18
32.5	519.24	1.04	0.14	0.10
37.5	489.51	0.71	0.11	0.14
42.5	479.83	0.67	0.13	0.13
47.5	466.37	0.50	0.13	0.10
52.5	403.63	0.59	0.12	0.12
57.5	302.81	0.60	0.08	0.11
62.5	284.06	0.57	0.06	0.10
67.5	312.98	0.66	0.08	0.14
72.5	378.15	1.12	0.10	0.18
77.5	371.09	1.50	0.08	0.18

Figures 41 to 44 show data plots with the results of the speed regression analysis for CO₂, CO, HC, and NO_x respectively. The plots show that the gas emissions decrease as the speed increases up to certain speed, and then the gas emissions begin to increase again.

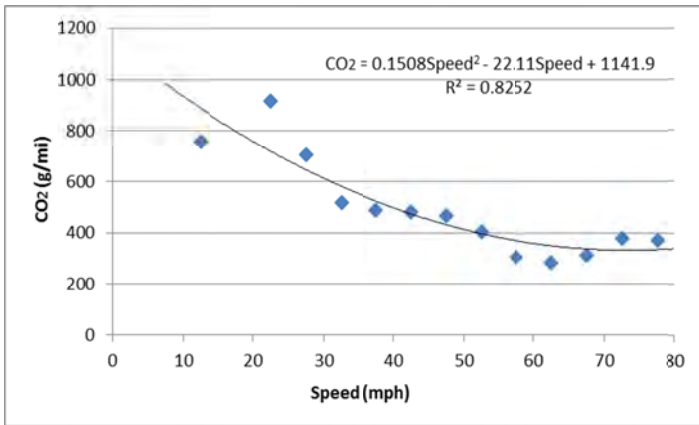


Figure 41. Regression Analysis for Speed and CO₂.

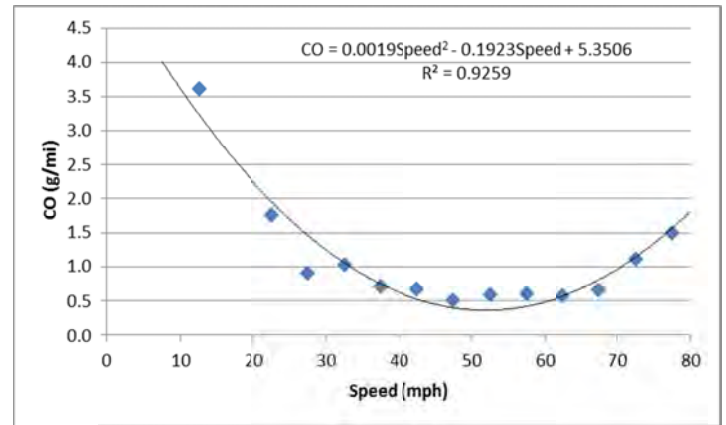


Figure 42. Regression Analysis for Speed and CO.

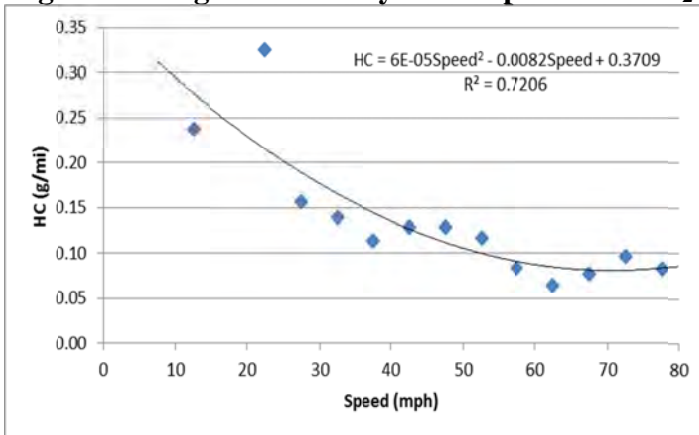


Figure 43. Regression Analysis for Speed and HC.

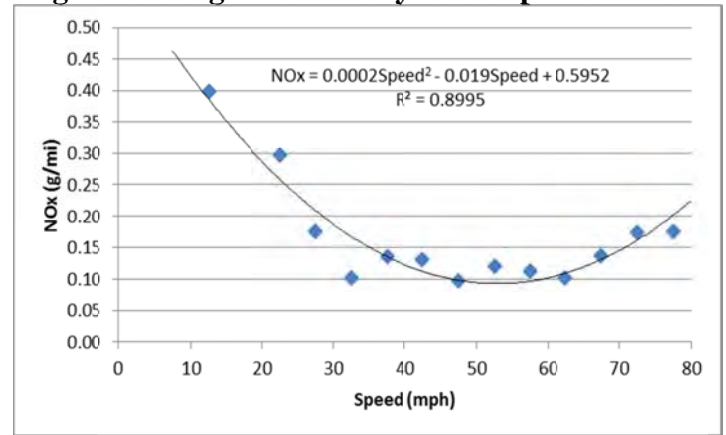


Figure 44. Regression Analysis for Speed and NO_x.

The general equation for gas emissions based on speed is given by:

$$Y (\text{Gas g/mile}) = a * \text{Speed}^2 (\text{mph}) + b * \text{Speed} (\text{mph}) + c$$

The results of linear regression analyses for speed versus vehicle gas emissions are summarized in Table 24.

Table 24. Summary of Regression Analysis Results for Speed-Gas Emissions.

PEMS – Gas Y (g/mile)	a	b	c	R ²
CO ₂	0.1508	-22.11	1141.9	0.8252
CO	0.0019	-0.1923	5.3506	0.9259
HC	6E-05	-0.0082	0.3709	0.7206
NO _x	0.0002	-0.019	0.5952	0.8995

Note: $Y (\text{Gas g/mile}) = a * \text{Speed}^2 (\text{mph}) + b * \text{Speed} (\text{mph}) + c$

R²s results vary between 0.7206 and 0.9259 which are considered acceptable for this type of analysis. This analysis also showed that there is a speed range (55 -70 mph) where the vehicle gas emissions are the lowest. After this range, gas emissions increase again as the speed increases.

HYPOTHESIS TESTS TO INVESTIGATE THE INFLUENCE OF PAVEMENT CONDITION AND SPEED ON GAS EMISSIONS

Hypothesis tests were conducted to investigate any significant differences of gas emission measurements at different pavement condition and speed categories. One-way analysis of variance (ANOVA) tests were performed for this analysis. ANOVA test compares if the means from three or more groups are all equal. The null hypothesis is that the means are equal and no significant differences are observed among the groups. The alternative hypothesis is that at least one of the means is different from at least one of the other groups. Small p-values indicate that the means are not all equal, and larger F-ratios indicate a more convincing evidence of unequal means.

A summary of the hypothesis test results for CO₂, CO, HC, and NO_x for pavement condition and speed categories is provided in Tables 25 and 26 respectively. Appendix E includes all the hypothesis test reports.

Table 25. ANOVA Test Results for Pavement Condition Categories.

Gas Emissions	F -Ratio	p- Value	Comment
CO ₂	15.86	< 0.0001	Evidence of unequal means of CO ₂ for different pavement condition categories
CO	4.448	< 0.0014	Evidence of unequal means of CO for different pavement condition categories.
HC	25.238	< 0.0001	Evidence of unequal means of HC for different pavement condition categories.
NO _x	2.4424	< 0.0446	Evidence of unequal means of NO _x for different pavement condition categories.

Table 26. ANOVA Test Results for Speed Categories.

Gas Emissions	F -Ratio	p- Value	Comment
CO ₂	338.54	< 0.0001	Evidence of unequal means of CO ₂ for different speed categories.
CO	39.043	< 0.0001	Evidence of unequal means of CO for different speed categories.
HC	67.1759	< 0.0001	Evidence of unequal means of HC for different speed categories.
NO _x	14.8475	< 0.0001	Evidence of unequal means of NO _x for different speed categories.

From the results of the ANOVA tests, it is confirmed that there is significant evidence of unequal means of gas emissions among pavement categories and also speed categories. From the statistical test reports is observed that:

- a. ANOVA results for CO₂ indicate that the differences of gas emission measurements are significant at 95% confidence level for pavements in very good condition when compared to pavements in good, fair, and very poor condition. CO₂ emissions show also significant differences among speed categories.
- b. ANOVA results for CO indicate that the differences of gas emission measurements are significant at 95% confidence level for pavements in very good condition when compared to pavements in good, fair, poor, and very poor condition. These differences are also significant between pavements in good condition and pavements in fair condition. CO emissions show significant differences between high and medium speed; and medium and low speed categories.
- c. ANOVA results for HC indicate that the differences of gas emission measurements are significant at 95% confidence level for pavements in very good condition when they are compared to pavements in good, fair, poor, and very poor condition. These differences are also significant between pavements in good condition and pavements in fair, and very poor condition. HC emissions show also significant differences among speed categories.
- d. ANOVA results for NO_x indicate that the differences of gas emission measurements are significant at 95% confidence level for pavements in very good condition and pavements in poor condition. These differences are also significant between pavements in good condition and pavements in poor condition. NO_x emissions show significant differences between high and medium speed; and medium and low speed categories.

CHAPTER 5

EFFECTIVENESS OF MAINTENANCE STRATEGIES IN REDUCING GAS EMISSIONS

This Chapter describes the methodology to determine the effectiveness of maintenance and rehabilitation strategies on reducing vehicle gas emissions. Different TxDOT treatment categories and gas emissions savings were studied including: Preventive Maintenance (PM), Light Rehabilitation (LRhb), Medium Rehabilitation (MRhb), and Heavy Rehabilitation (HRhb).

RELATIONSHIP BETWEEN IRI AND RIDE SCORE

Research project TxDOT-0-6673 “Improvements in Pavement Ride, Distress, and Condition based on Different Treatment Types” was conducted by University of Texas at El Paso (UTEP) and the Texas Transportation Institute (TTI) from September 1, 2011 –August 31, 2013 (Chang et al., 2014). The scope of this project involved preparing a set of guidelines to assist TxDOT districts in identifying the appropriate PMIS treatment levels to develop pavement management plans, and also to predict the improvement of pavement ride, distress, and condition due to assigned treatments.

A comprehensive statistical investigation from historical pavement performance and construction data was performed for thirteen Districts: Amarillo, Atlanta, Austin, Brownwood, Bryan, Childress, Dallas, El Paso, Houston, Laredo, Lufkin, Pharr, and San Antonio. Using data from this project, a correlation between IRI and Ride Score is shown in Figure 45. The correlation between IRI and Ride Score is very good with an R^2 as high as 0.98.

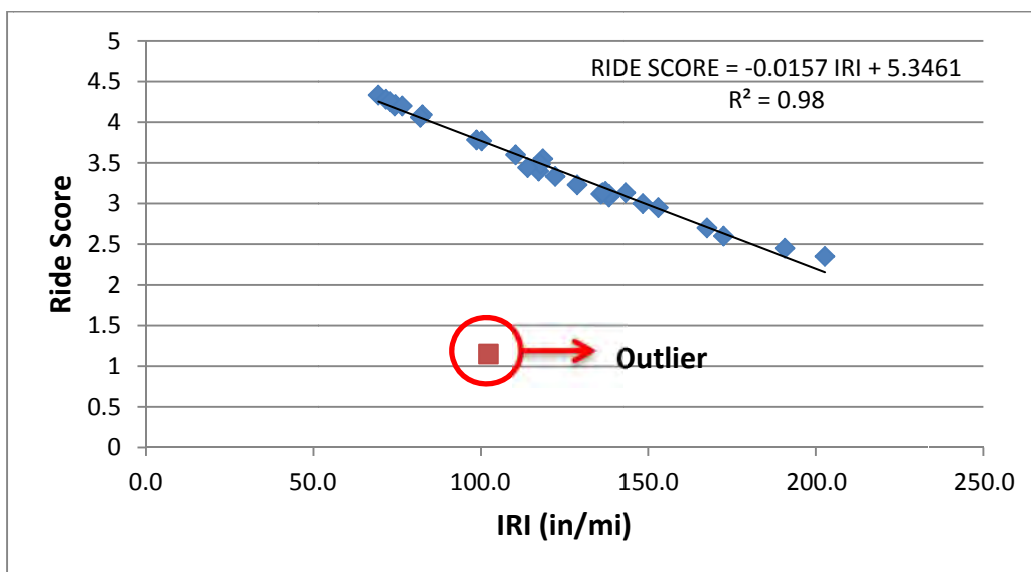


Figure 45. IRI vs Ride Score Analysis.

RIDE SCORE INCREASE AFTER TREATMENT

The statistical analysis in research project TxDOT-0-6673 resulted in finding the increase of PMIS scores due to Preventive Maintenance (PM), Light Rehabilitation (LRhb), Medium rehabilitation (MRhb), and Heavy Rehabilitation (HRhb). Table 27 shows a summary of the statistical analysis performed in research project TxDOT 0-6673 for the ride score increase after treatment.

Table 27. Summary of Statistics for the Ride Score Increase After Treatment (Chang et al., 2014).

Asphalt Pavements	Ride Score Increase		
	Minimum	Median	Maximum
Preventive maintenance	0.1	0.4	3.6
Light rehabilitation	0.1	0.8	4.4
Medium rehabilitation	0.1	0.9	3.4
Heavy rehabilitation	0.1	1.3	3.7
Concrete JCP Pavements	Ride Score Increase		
	Minimum	Median	Maximum
Preventive maintenance	0.1	0.3	0.7
Light rehabilitation	0.1	0.3	1.8
Medium rehabilitation	0.1	0.3	2.2
Heavy rehabilitation	-	-	-
Concrete CRCP Pavement	Ride Score Increase		
	Minimum	Median	Maximum
Preventive maintenance	0.1	0.3	0.8
Light rehabilitation	0.1	0.4	1.9
Medium rehabilitation	0.1	0.5	2.2
Heavy rehabilitation	0.1	0.9	2.4

IMPACT OF MAINTENANCE AND REHABILITATION TREATMENTS ON GAS EMISSIONS

The impact of maintenance and rehabilitation treatments on vehicle gas emissions are quantified using the ride score increase after treatment. For this purpose, the first step was to obtain the ride scores from the IRI data using the equation shown in Figure 45:

$$\text{Ride Score} = -0.0157 \text{ IRI (in/mile)} + 5.3461$$

The second step was to conduct regression analysis to determine the relationship between ride score and vehicle gas emissions. Figures 46 to 49 show the results of the analysis for IRI and Ride Score versus gas emissions. The highest relationship between gas emissions and roughness or ride score was for CO with an R² of 0.5626 as shown in Figure 47.

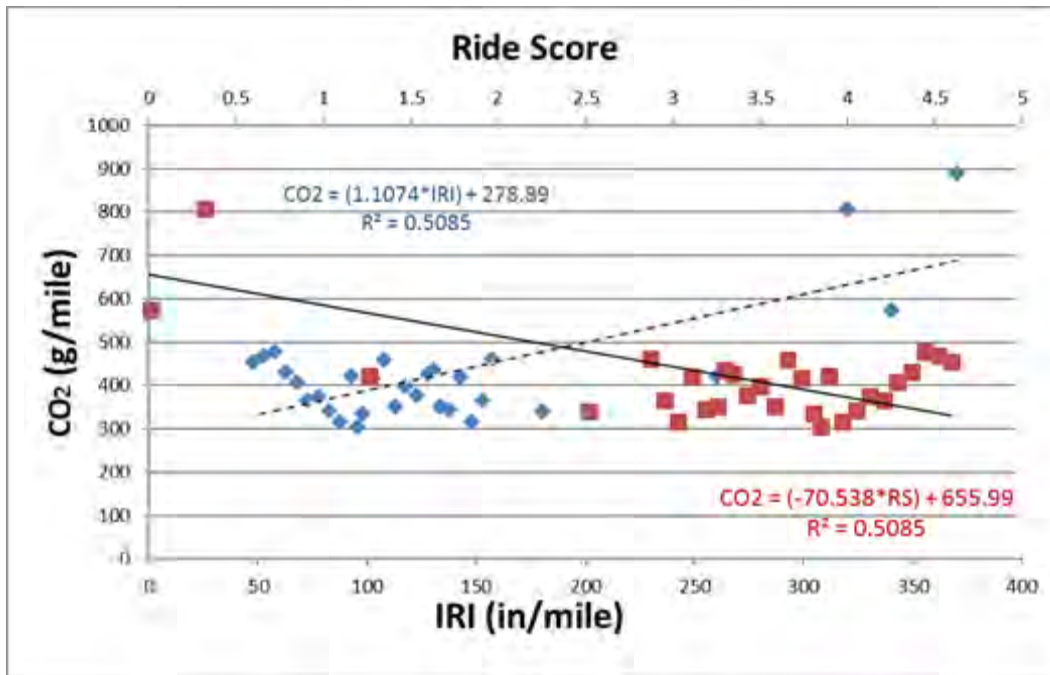


Figure 46. Ride Score and IRI vs CO₂.

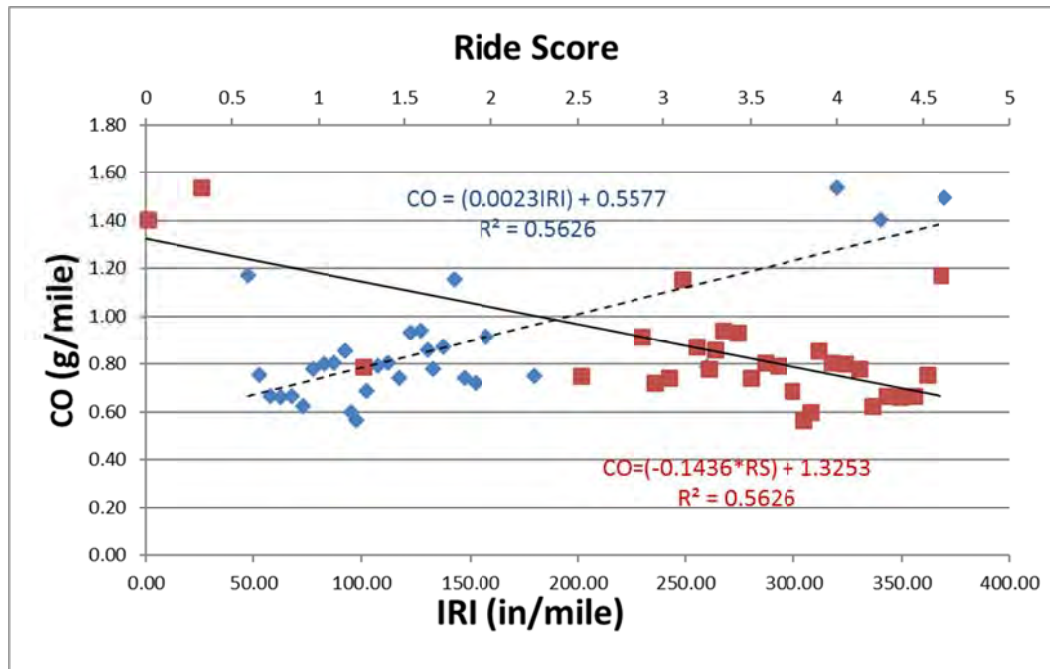


Figure 47. Ride Score and IRI vs CO.

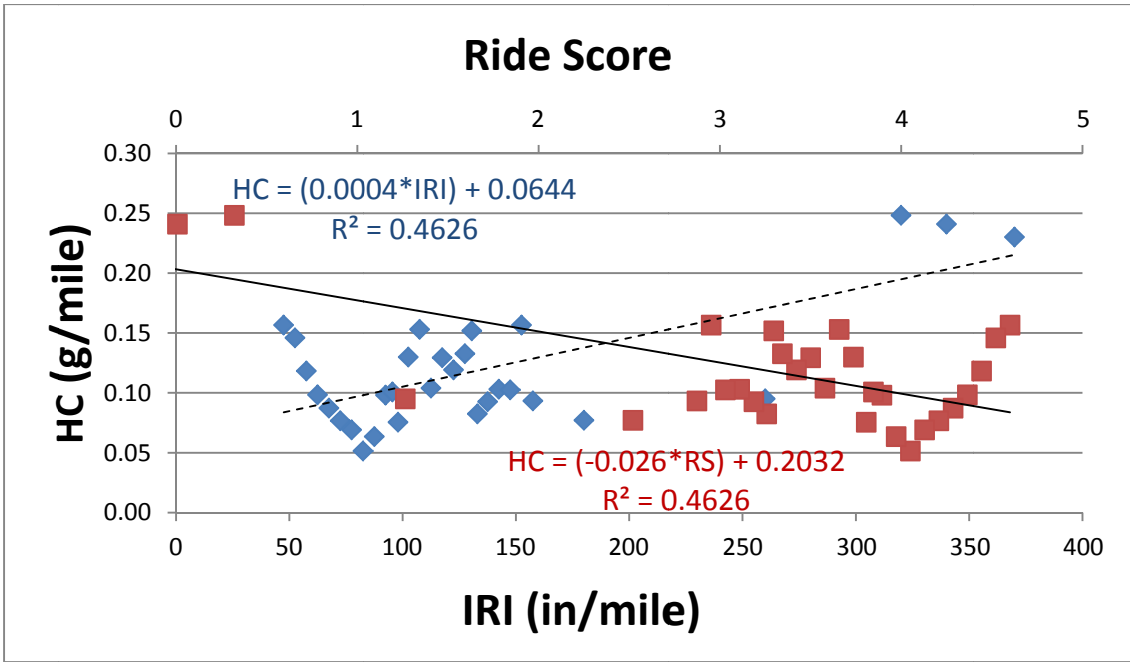


Figure 48. Ride Score and IRI vs HC.

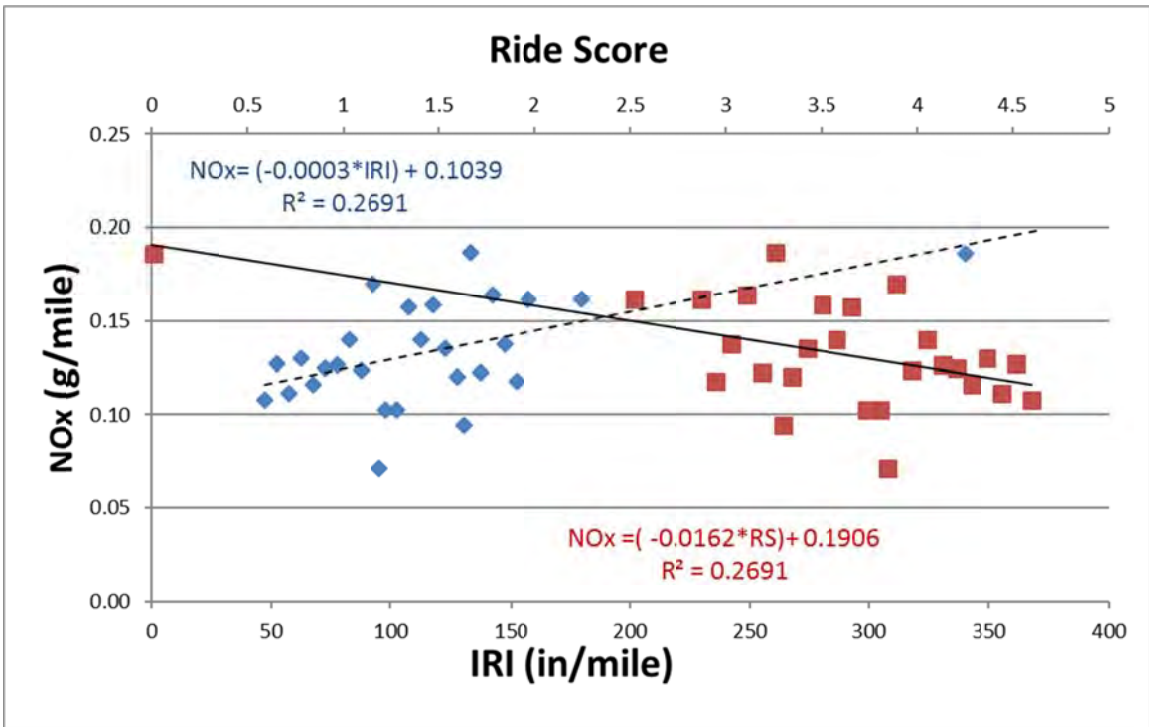


Figure 49. Ride Score and IRI vs NO_x.

Therefore, the general equation to quantify gas emissions from Ride Score is given by:

$$\text{Vehicle Gas Emissions (g/mile)} = m \cdot \text{Ride Score (in/mile)} + b$$

A summary of the results of the regression analysis for the Ride Score and gas emissions is shown in Table 28.

Table 28. Summary of Regression Analysis Results for Ride Score and Vehicle Gas Emissions.

PEMS – Gas Y (g/mile)	Slope (m)	Intercept (b)	R²
CO ₂	-70.538	655.99	0.5085
CO	-0.1436	1.3253	0.5626
HC	-0.026	0.2032	0.4626
NO _x	-0.0162	0.1906	0.2691

$$Y(\text{g/mile}) = m * \text{Ride Score} + b$$

Impact of Maintenance and Rehabilitation Treatments on Vehicle Gas Emissions

Vehicle gas emissions savings are quantified for PM, LRhb, MRhb, and HRhb with the Ride Score-Gas emission equations using the ride score increase. Minimum, median, and maximum potential gas emission savings for CO₂, CO, HC, and NO_x are shown in Tables 29, 30, and 31 for asphalt, JCP, and CRCP pavements respectively

Table 29. Gas Emissions Savings for Asphalt Treatments.

Treatment Categories and Gas Emissions		Minimum	Median	Maximum
Preventive Maintenance	Ride Score Increase	0.1	0.4	3.6
	CO ₂ (g/mi)	7.05	28.22	253.94
	CO (mg/mi)	14.36	57.44	516.96
	HC (mg/mi)	2.60	10.40	93.60
	NO _x (mg/mi)	1.62	6.48	58.32

Table 29. Gas Emissions Savings for Asphalt Treatments. (Continue)

Treatment Categories and Gas Emissions		Minimum	Median	Maximum
Light Rehabilitation	Ride Score Increase	0.1	0.8	4.4
	CO ₂ (g/mi)	7.05	56.43	310.37
	CO (mg/mi)	14.36	114.88	631.84
	HC (mg/mi)	2.60	20.80	114.40
	NO _x (mg/mi)	1.62	12.96	71.28
Medium Rehabilitation	Ride Score Increase	0.1	0.9	3.4
	CO ₂ (g/mi)	7.05	63.48	239.83
	CO (mg/mi)	14.36	129.24	488.24
	HC (mg/mi)	2.60	23.40	88.40
	NO _x (mg/mi)	1.62	14.58	55.08
Heavy Rehabilitation	Ride Score Increase	0.1	1.3	3.7
	CO ₂ (g/mi)	7.05	91.70	260.99
	CO (mg/mi)	14.36	186.68	531.32
	HC (mg/mi)	2.60	33.80	96.20
	NO _x (mg/mi)	1.62	21.06	59.94

Note: Vehicle gas savings are reported for CO₂ in g/mi; CO, HC, and NO_x in mg/mi (1000 mg/mi = 1 g/mi)

Table 30. Gas Emissions Savings for JCP Concrete Treatments.

Pavement Treatment Categories and Gas Emissions		Minimum	Median	Maximum
Preventive Maintenance	Ride Score Increase	0.1	0.3	0.7
	CO ₂ (g/mi)	7.05	21.16	49.38
	CO (mg/mi)	14.36	43.08	100.52
	HC (mg/mi)	2.60	7.80	18.20
	NO _x (mg/mi)	1.62	4.86	11.34
Light Rehabilitation	Ride Score Increase	0.1	0.3	1.8
	CO ₂ (g/mi)	7.05	21.16	126.97
	CO (mg/mi)	14.36	43.08	258.48
	HC (mg/mi)	2.60	7.80	46.80
	NO _x (mg/mi)	1.62	4.86	29.16
Medium Rehabilitation	Ride Score Increase	0.1	0.3	2.2
	CO ₂ (g/mi)	7.05	21.16	155.18
	CO (mg/mi)	14.36	43.08	315.92
	HC (mg/mi)	2.60	7.80	57.20
	NO _x (mg/mi)	1.62	4.86	35.64

Note: Vehicle gas savings are reported for CO₂ in g/mi; CO, HC, and NO_x in mg/mi (1000 mg/mi = 1 g/mi)

Table 31. Gas Emissions Savings for CRCP Concrete Treatments.

Pavement Treatment Categories and Gas Emissions		Minimum	Median	Maximum
Preventive Maintenance	Ride Score Increase	0.1	0.3	0.8
	CO ₂ (g/mi)	7.05	21.16	56.43
	CO (mg/mi)	14.36	43.08	114.80
	HC (mg/mi)	2.60	7.80	20.80
	NO _x (mg/mi)	1.62	4.86	12.96
Light Rehabilitation	Ride Score Increase	0.1	0.4	1.9
	CO ₂ (g/mi)	7.05	28.22	134.02
	CO (mg/mi)	14.36	57.44	272.84
	HC (mg/mi)	2.60	10.40	49.40
	NO _x (mg/mi)	1.62	6.48	30.78
Medium Rehabilitation	Ride Score Increase	0.1	0.5	2.2
	CO ₂ (g/mi)	7.05	35.27	155.18
	CO (mg/mi)	14.36	71.80	315.9
	HC (mg/mi)	2.60	13.00	57.20
	NO _x (mg/mi)	1.62	8.10	35.64
Heavy Rehabilitation	Ride Score Increase	0.1	0.9	2.4
	CO ₂ (g/mi)	7.05	63.48	169.29
	CO (mg/mi)	14.36	129.24	344.64
	HC (mg/mi)	2.60	23.40	62.40
	NO _x (mg/mi)	1.62	14.58	38.88

Note: Vehicle gas savings are reported for CO₂ in g/mi; CO, HC, and NO_x in mg/mi (1000 mg/mi = 1 g/mi)

POTENTIAL GAS EMISSION SAVINGS DUE TO MAINTENANCE AND REHABILITATION STRATEGIES

A summary of the potential savings on CO₂, CO, HC, and NO_x for asphalt maintenance and rehabilitation treatments are shown in Figures 50 through 53. Light rehabilitation treatments have the major effect for asphalt pavements in terms of reducing gas emission when compared to other treatment categories, medium rehabilitation for JCP, and high rehabilitation for CRCP. It is also observed that CO₂ shows the highest potential of savings.

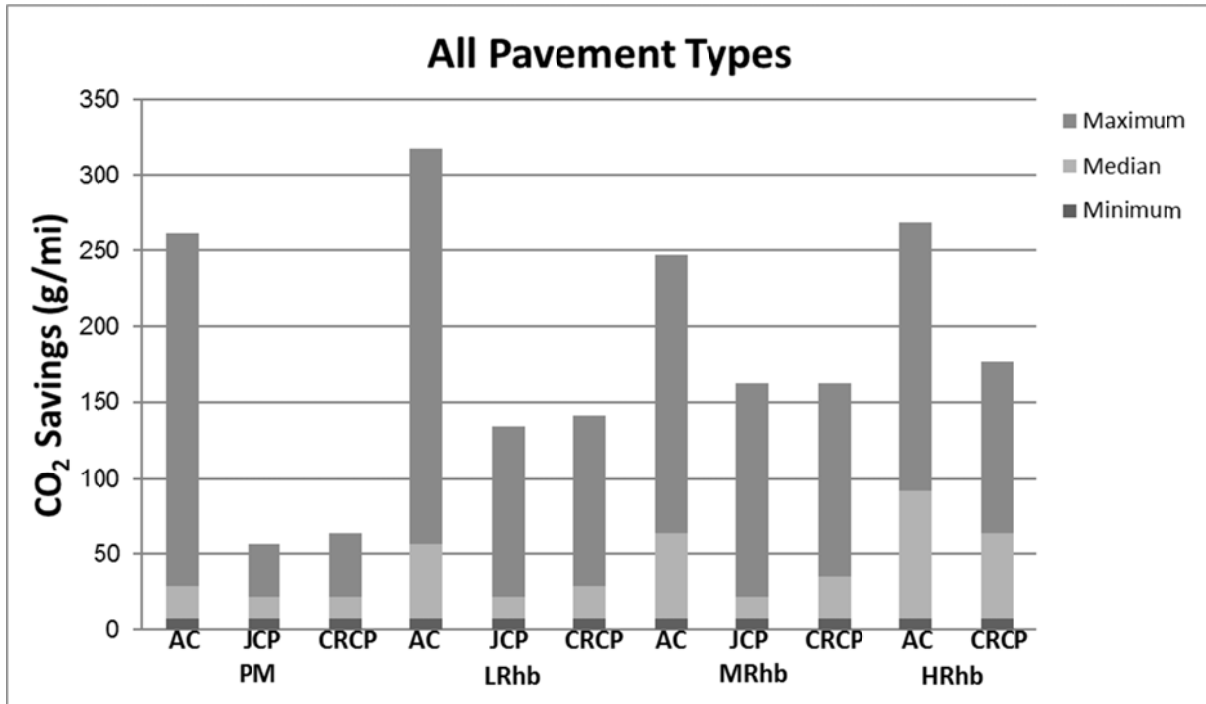


Figure 50. CO₂ Savings by Treatment Type.

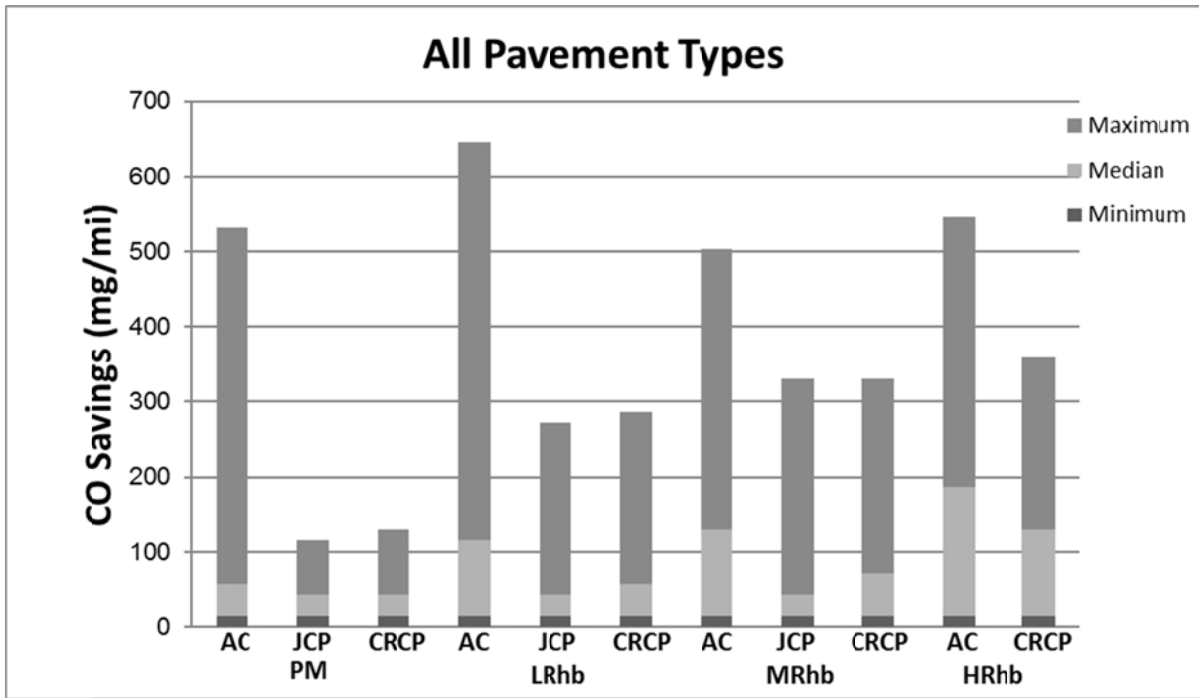


Figure 51. CO Savings by Treatment Type.

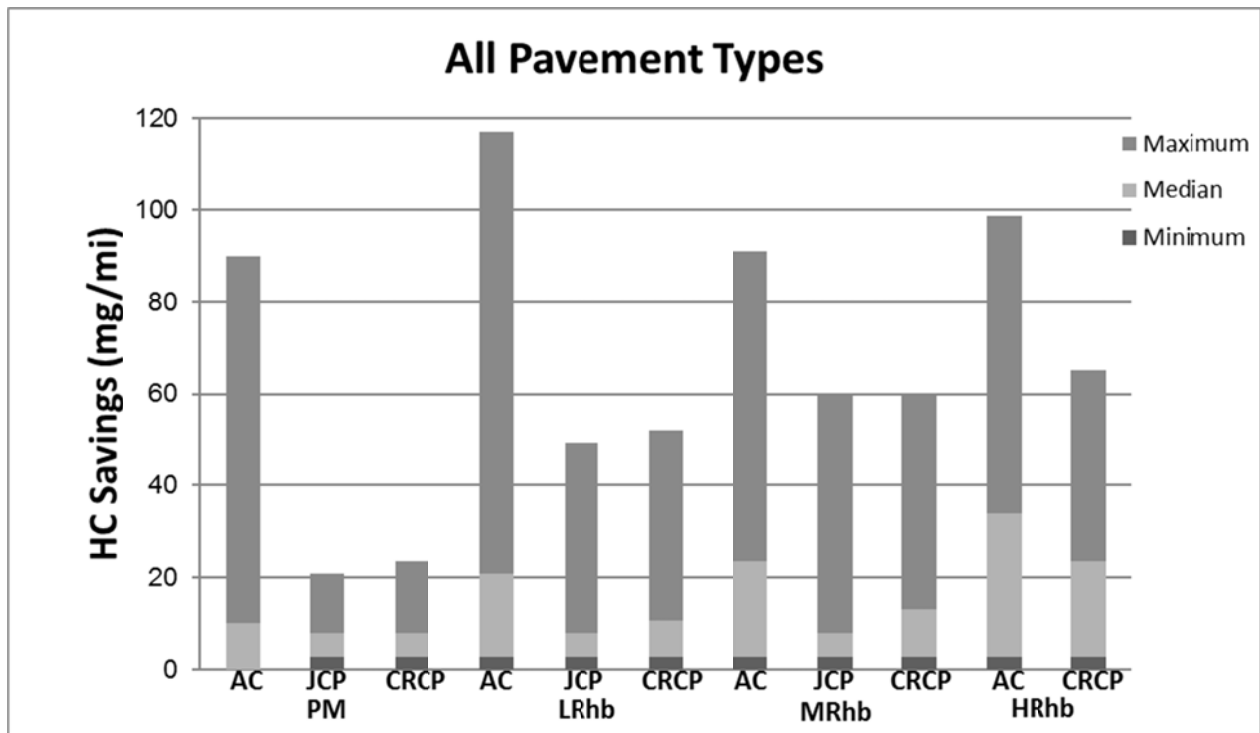


Figure 52. HC Savings by Treatment Type.

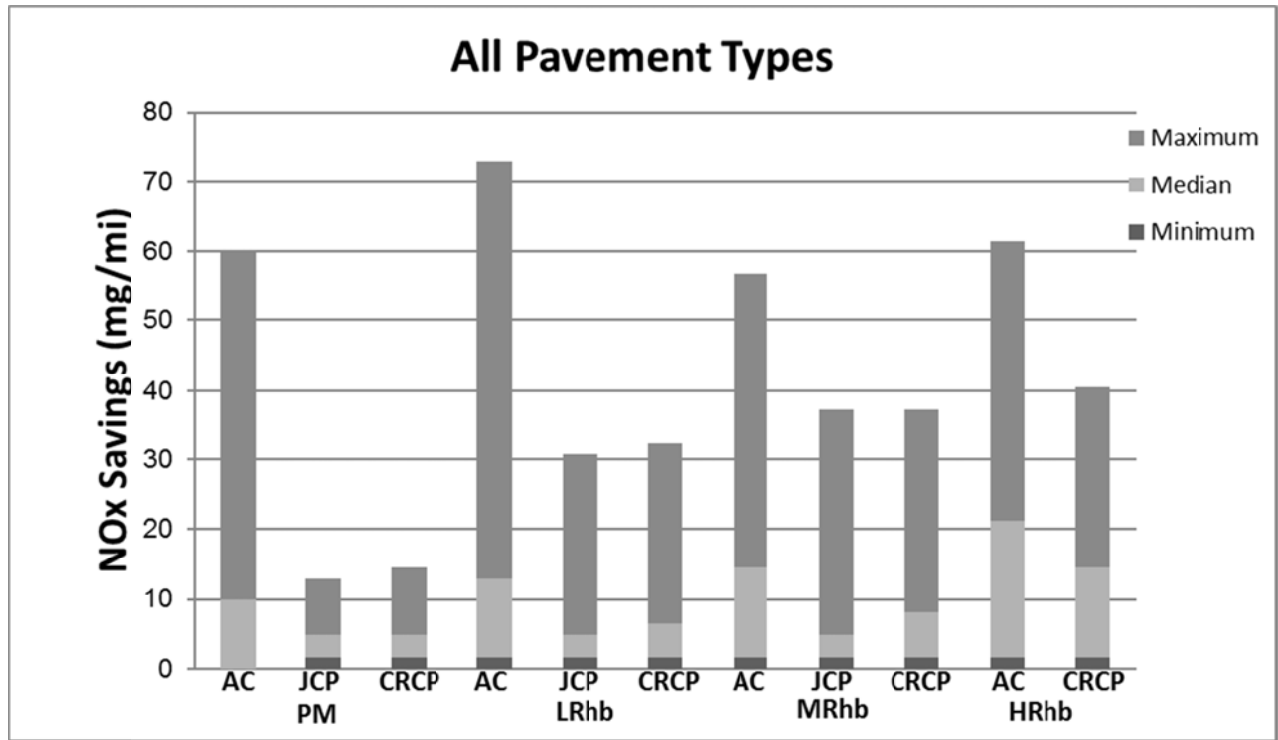


Figure 53. NO_x Savings by Treatment Type.

CHAPTER 6

GUIDELINES TO IMPROVE PAVEMENT MAINTENANCE STRATEGIES TO REDUCE VEHICLE GAS EMISSIONS

This Chapter describes best practices for pavement maintenance and rehabilitation strategies in order to reduce gas emissions. Current policies and guidelines of the Federal Highway Administration (FHWA) and TxDOT management efforts to comply with environmental regulations are summarized in the next sections. The review of existing policies and current efforts is the foundation to provide guidelines to foster the practice of environmental-friendly pavement preservation strategies.

ENVIRONMENTAL POLICIES AND GUIDELINES

Federal Highway Administration (FHWA) provides funding for highways through different budget programs like the Surface Transportation Program-Metropolitan Mobility (STP-MM) for urban areas with a population larger than 200,000, Transit Funding (e.g. FTA Section 5307 Urbanized Area Formula Program) that provides transferred funds to other federal aided projects, and the Congestion Mitigation and Air Quality Improvement Program (CMAQ) passed by Congress through the Clean Air Act Amendments (TxDOT-g 2016).

CMAQ is authorized by Federal-aid Highway Program under Moving Ahead for Progress in the 21st Century (MAP-21) (FHWA-a 2016). CMAQ program allocates DOTs funding to invest on projects that maintain or improve national ambient air quality standards (NAAQS) for ozone, carbon monoxide (CO), and particulate matter (PM). These funds can be spent on new start up transportation services as long as air quality benefits are demonstrated. Projects funded by CMAQ should reduce CO, ozone, precursor (NO_x and VOCs), PM, or PM precursor (e.g. NO_x) emissions from transportation sources (FHWA-c, 2008). Only projects that are included in the Metropolitan Planning Organizations (MPO's) current plan and Transportation Improvement Program (TIP) can use CMAQ funds. Funding CMAQ projects not only enables local governments to improve air quality, but also decreases congestion that costs \$200 billion per year to the U.S. economy. States have the option to transfer a defined fraction of their CMAQ appointment to the projects in other programs like the Surface Transportation Program (STP) or National Highway System (NHS). Annual reporting of CMAQ project obligations by DOTs, enables FHWA to have an active database of CMAQ investments, work progress of the projects and their performance to support DOTs and MPOs planning process (FHWA-b 2016).

FHWA also recommends strategies to reduce greenhouse gas emissions from transportation sources by focusing on vehicle travel, fuel economy, carbon content, and fuels (Grant et al., 1998). All these strategies are aimed to provide practical ways to mitigate the impact of vehicle gas emissions. Regarding the carbon content, the use of Alternative Fuel Vehicle (AFV) is considered as an effective approach by adopting differential taxes for the different types of fuels. This approach is based on moving from current traditional fuels to those with lower life-cycle carbon content. It is possible to use more effective fuels to decrease gas emissions, although regulations to better managed the travel demand are also highly beneficial. As an instance, using battery electric vehicles, hybrid and fuel cell vehicles help GHG reduction. Hereby, regulations, incentives for manufacturers, and economic

policies can be implemented by federal, state, and local authorities to have short and long term effects on reducing GHG emissions. (Grant et al, 1998).

TxDOT ENVIRONMENTAL MANAGEMENT EFFORTS

TxDOT uses different resources to collect funds for transportation projects including fuel taxes, vehicle registration fees, federal reimbursements, local matching funds, and other state and local funds (TxDOT-g 2016). Federal funded projects are proposed by the Metropolitan Planning Organizations (MPO) based on their policy boards. As an example for the CMAQ program, MPO decides which projects are located in non-attainment areas for air quality (TxDOT-g 2016). These are areas that do not contribute to ambient air quality in a nearby area, the National Ambient Air Quality Standards (NAAQS) criteria to identify a no-attainment area is based on the severity of the pollution in that area.

TxDOT benefits from the Environmental Management System (EMS) during all phases of the project from design to construction. The EMS is based on a continuous improvement approach that consist of Plan, Do, Check, and Act. The EMS includes initiatives to ensure environmental compliance of the legal environmental requirements such as air quality improvement. These initiatives encourage higher usage of public transportation, alternative fuels, increasing the number of High Occupancy Vehicle (HOV) lanes, and expand highway capacity. TxDOT also benefits from programs implemented to decrease CO₂ emissions from cars like the Smoking Vehicle Program, Smog City, and Drive Clean Across Texas (TxDOT-f 2016). As an instance, the Drive Clean Across Texas encourages the public to help reduce air pollution by driving less, maintaining their vehicles in good condition, avoiding unnecessary idling, buying more energy-efficient vehicles, and driving at the speed limit.

TxDOT maintenance programs are conceived to address efficiency in the traffic flow, to improve safety, to preserve the aesthetic appeal of transportation infrastructure, and to protect environmental resources. TxDOT provides an environmental assessment for pavement maintenance programs that includes preserving shoulders to insure uninterrupted and safe traffic through a fully functional pavement network. To insure safe roadway and maintain satisfactory riding roadway conditions, a preventive maintenance program is the best strategy. AASHTO states that “preventive maintenance is a program strategy intended to arrest light deterioration, retard progressive failures, and reduce the need for corrective maintenance and service activities... [Preventative maintenance] treatments reduce the amount of water that may infiltrate the pavement, slow the rate of deterioration, or correct surface roughness. Timely application of maintenance treatments can maintain or extend a pavements service life five to ten years or longer before significant maintenance effort is required.” TxDOT has implemented good practices to preserve the subgrade, base, flexible and rigid pavement surfaces. In order to maintain base and sub-grade of travel lanes and shoulders, activities like removal and replacement, in place repair, installing and/or maintaining underdrains are conducted by TxDOT. As an example, existing materials are reused for in-place repair instead of discarding them, stabilization of base or subgrade materials is also a common practice by adding lime, cement, asphalt or fly ash. In-place repair can be done by a reclaimer machine that pulverizes the existing pavement surface to return this material as the recycled road bed, or blending it with cement and soil to have a homogenous material.

As TxDOT manual mentions, “Maintaining flexible surfaces of the roadway consists of leveling or overlaying with a laydown machine, maintainer, dragbox, or by hand; sealing cracks; applying a seal coat; strip or spot seal coat; fog seal; microsurfacing; repairing potholes; milling or planning; spot milling; and treat bleeding pavement.” There are also recommendations to use more friendly materials and maintenance techniques in flexible pavements. For example, it is encouraged to use Warm mix asphalt (WMA) instead of Hot Mix Asphalt (HMA) when possible. HMA is produced at 160 °C reducing the asphalt viscosity and moisture levels while WMA adds asphalt emulsions, waxes, or zeolites to the mixture to decrease this temperature. The use of WMA results of less fossil fuel consumption, thereby reducing the emissions of fumes. There are also cold asphalt mixes, in which the asphalt is emulsified before mixing with the aggregate, that results in a lower temperature usage. Cold asphalt mixes are mainly used in low traffic areas.

To prepare surfaces for pavement construction, cutback asphalt has been traditionally used. Although, the use of cutbacks is limited by TxDOT for certain time and locations, such as ozone nonattainment areas or completely banned for non-attainment areas, from April 15 to September 15 (TxDOT-b 2015). Recommendations to use emulsions are presented in the document Uses of Asphalt Emulsion (TxDOT-a 2006) with the purpose of lowering the temperature of asphalt applications to a range of 45°C to 70°C instead of the 150°C to 190°C range for hot asphalt mixes. For a number of pavement surface courses, in addition to the materials mentioned before, other recycled materials like tire rubber, crushed slag, cellulose or mineral fiber, manufactured sand among others are also recommended for asphalt pavements.

For concrete pavements, treatments such as slab stabilization/jacking; cleaning and sealing joints and cracks; blowouts and stress relief; repair spalling; and full depth removal and replacement are recommended. There are also environmental friendly alternatives for sub-base and base course treatments including recycled materials such as crushed concrete, recycled asphalt pavement (RAP), glass cullet, and fly ash.

At present, there are no Occupational Safety and Health Administration (OSHA) air quality standards for asphalt fumes, and it is not required to perform air sampling during asphalt paving but an improvement in those regulations should be considered (TxDOT-d 2011). It is also mentioned in these standards that TxDOT’s Current Action complies with all the regulatory requirements related to Air Quality. Impacts of maintenance program activities should include dust and exhaust from vehicles and equipment when performing maintenance activities to make sure that no measurable pollutant affects Texas air quality. For this purpose, regulations to limit the fine particulate matters in winter time, reduce emissions from TxDOT ferries, and VOC emissions from cutback asphalts ensure cleaner air. Moreover, technologically advanced equipment should be used for sweeping the lead in order to reduce the amount of particulate matters in the air.

The Clean Air Act (CAA), the National Environmental Policy Act (NEPA) and the Federal-Aid Highways Code provides environmental regulations for TxDOT to control air quality pollutions from transportation sources. TxDOT provides environmental compliance toolkits to environmental practitioners that receive guidance and technical advice to comply with these environmental regulations. One of these toolkits is the Air Quality Toolkit that includes tables for a number of pollutants based on case studies conducted in Texas to analyze the level of carbon dioxide emissions in

a project (TxDOT-e 2016). TxDOT districts involved in the studies were: Austin, Corpus Christi, Dallas-Fort Worth Metropolitan Area, El Paso, Houston Galveston Bay Metropolitan Area, San Antonio, and Waco. Emission Rate Lookup Tables (ERLT) are used to estimate GHG emissions. GHG emissions at different vehicle speeds can be estimated using the Environmental Protection Agency (EPA) MOVES2014. This tool calculates free flow emission rates reported in the ERLT in grams per mile. Knowing the gas emissions rates per day and the Vehicle Miles of Travel (VMT), total gas emissions produced by vehicles in a road sector are calculated. The latest version of the Vehicle Emission Simulator MOVES2014 (Version October 2014) includes a new ERLT for Austin district. These data are used to set the limits for pollutants including Ozone (O₃), Carbon Monoxide (CO), Particulate Matter (PM), Nitrogen Dioxide (NO₂), Sulfur Dioxide (SO₂), Lead (PB), and Mobile Source Air Toxics (MSAT) that cause cancer. These data have been developed for summer and winter seasons.

There are other initiatives to regulate maintenance and rehabilitation pavement practices including: Environmental Assessment that combines the results of individual maintenance program reviews to identify best management practices to reduce environmental impacts (TxDOT-d 2011). The Best Management Practice (BMP) program by TxDOT Maintenance Division (MNT) to study the environmental impacts of nine maintenance programs including bridge, customer service, debris and spills, drainage, ferries, enhancement; pavement; roadside appurtenances, and traffic. This program assists TxDOT to preserve the transportation infrastructure safely, functional, clean, and with longer service life (TxDOT-c 2011).

In summary, current TxDOT environmental documents mainly focus on controlling dust and noise pollutions, but there are not gas emissions estimates due to maintenance and rehabilitation treatments for the entire life-cycle of a pavement.

PAVEMENT MAINTENANCE STRATEGIES TO REDUCE GAS EMISSIONS

It is possible to reduce gas emissions by implementing environmental friendly pavement maintenance strategies. For example, environmental friendly materials used in pavement preservation treatments lead to reduce emissions (e.g. fly ash and tire rubber). Improvements on highway design are also recommended for this purpose. An example is the guidelines developed by the California Department of Transportation (Caltrans) Complete Streets Implementation Action Plan 2, which spurred a series of comprehensive edits to its Highway Design Manual with a Complete Streets Implementation Action Plan (CSIAP). Caltrans follows the “Complete Streets” approach to foster alternative modes of transportation as a mean for economic revitalization by improving the return on transportation infrastructure investments. All the initiatives implemented through “Complete Streets” has led to improve the air quality while encouraging livable communities by enhancing safety and providing walking and bicycling facilities.

TxDOT treatment categories are: Preventive Maintenance (PM), Light Rehabilitation (LRhb), Medium Rehabilitation (MRhb), and Heavy Rehabilitation (HRhb). The effectiveness of these maintenance activities is closely tied to the timing of maintenance. The timing of maintenance has a significant influence on the treatment effectiveness in terms of extending the remaining life of the pavement. The risk of failure and rehabilitation costs increases as the pavement ages without maintenance.

Maintenance treatments applied at an early stage of the pavement's life, at pre-scheduled intervals while the pavement is in good condition and structurally sound, can extend its service life. If the pavement is not maintained effectively, it will eventually deteriorate to a point where the only choice is reconstruction, or other extensive repair, which is the more expensive option and with the greatest negative impact to the environment. Preventive maintenance and light rehabilitation treatments have the highest potential to contribute for gas emissions savings.

Quantifying Gas Emissions in Life Cycle Cost Analysis

The methodology to determine the effectiveness of maintenance and rehabilitation strategies should include quantifying the gas emissions due to the treatments. Results from these research should be used in Life-Cycle Cost Analysis. LCCA is an economic assessment that considers all significant costs of ownership over the economic life. The purpose of LCCA is to identify the best alternative to provide the desired level of service to meet users' requirements of serviceability and safety at the minimum cost. The factors that influence the results of the LCCA are:

- Length of the analysis period
- Costs included in the analysis
- Salvage value
- Discount and inflation rates
- Performance models

Therefore, the use of decision making tools to assist in the analysis of maintenance and rehabilitation strategies is recommended. Agency costs and user's costs are typically included in LCCA tools but very few consider environmental costs. One of these tools is the Pavement Life-cycle Assessment Tool for Environmental and Economic Effects (PaLATE) that was developed by Dr. Horvath, UC-Berkeley. PaLATE is an Excel-based tool for Life-Cycle Cost Analysis (LCCA) that considers initial construction and maintenance activities (Horvath 2016). The tool takes the user through a series of data input worksheets to gather information about the roadway design, construction materials, maintenance materials, materials transportation distances and modes, and on-site construction and off-site equipment. The costs include materials, equipment, and labor. To analyze the life-cycle costs over the service life, the costs of alternative construction and maintenance scenarios are converted to Net Present Value (NPV) (Horvath 2016). The results are reported in two sections: environmental and economic. NPV is presented in bar graphs by phase (Initial construction and Maintenance) and include materials, labor, and equipment costs. The environmental results in terms of gas emissions are shown for initial construction and maintenance for materials production, transportation, an equipment. Energy consumption, water usage, hazardous waste, and global warming potential in terms of CO₂, NO_x, PM₁₀, SO₂ and CO emissions are considered in the analysis (Horvath 2016).

To analyze the environmental effects of a project throughout its service life, a Life Cycle Assessment (LCA) should be conducted when comparing maintenance and rehabilitation strategies. This LCA process includes: life-cycle inventory, impact analysis to assess effects of the project on human health and the environment, and improvement analysis to investigate the consequences of energy reduction through the whole lifecycle process.

RECOMMENDATIONS TO IMPLEMENT THE GUIDELINES

At present, TxDOT projects comply with current regulations for air quality, but are mainly focused on dust and exhaust from vehicles and equipment. It would be beneficial for TxDOT to include the findings about gas emissions from this research project and implement them in the future construction and maintenance programs like the Best Maintenance Practice.

Savings for gas emissions due to maintenance and rehabilitation strategies can be quantified in the Life-Cycle Cost Analysis (LCCA) using the results shown in Chapter 5. A proactive approach with emphasis on preventive maintenance results in the least energy consumption, therefore it saves more money by performing maintenance activities at the right time while increasing the air quality. Pavement materials that use less energy (e.g. warm mixes, cold asphalt mixes, emulsions) and recycled materials also help to reduce gas emissions. It is also recommended, if it is feasible, to accelerate the project delivery process to reduce congestion and vehicle gas emissions from construction and maintenance activities.

It is important to combine a set of actions to control the level of emissions in the infrastructure transportation system. For example, California State includes practices to improve pavement surface smoothness, rigidity, and durability. To reduce emissions, it is also possible to implement laws to regulate the use of existing vehicles and encourage more efficient fuel consumption engines. Low friction motor oils, fuel-efficient tires, and adjusting the tire's pressure can help to reduce vehicle gas emissions. In addition, new emerging apps can foster the interaction of smart phones and vehicles to provide drivers with real-time information for eco-driving and eco-routing.

Although it is mandatory to build and maintain transportation infrastructure facilities in a sustainable way, money can be saved through smart design and construction choices. Therefore, it is recommended to use an improved Rating System to measure and manage sustainability on transportation projects. By using a rating system, it is possible to keep records of energy and carbon footprints, Life Cycle Cost Analysis (LCCA), and provide feedback for improving pollution prevention programs.

The Pavement Management Information System (PMIS) enables TxDOT to store pavement condition data and analyze the impact of maintenance and rehabilitation treatments on pavement performance. It is recommended to also collect and store gas emission measurements before and after treatment to enhance the models presented in this study.

It is also beneficial to maintain fluent communication among the districts responsible for maintenance programs and TxDOT's environmental office to incorporate new environmental friendly strategies into regular best pavement preservation practices.

CHAPTER 7

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The main purpose of this research study was to quantify the impact of road's condition on vehicle gas emissions, and to provide guidance to the Texas Department of Transportation (TxDOT) to implement maintenance and rehabilitation strategies to reduce those emissions. This Chapter presents a summary of the conclusions with the equations to estimate vehicle gas emissions (CO₂, CO, HC, and NO_x) based on pavement condition (IRI), and gas emission potential savings due to maintenance and rehabilitation pavement treatments.

IMPACT OF PAVEMENT CONDITION ON VEHICLE GAS EMISSIONS

Vehicle gas emissions, CO₂, CO, HC, and NO_x, were collected with PEMS at different pavement conditions and speeds. IRI data were also collected in the same sections to study the relationship of pavement condition and gas emissions. The major focus of this research was to establish the relationship between pavement condition, in terms of IRI, and vehicle gas emissions. A summary of the findings from this analysis follows.

- a. There is a relationship between the pavement condition, in terms of IRI, and vehicle gas emissions. Linear regression analysis for IRI versus vehicle gas emissions resulted in R²s that vary between 0.2691 and 0.5626 which are considered acceptable for this type of analysis.
- b. The general equation for gas emissions based on IRI is given by:

$$\text{Vehicle Gas Emissions (g/mile)} = m \text{ IRI (in/mile)} + b$$

The parameters for the CO₂, CO, HC, and NO_x gas emission equations are summarized in Table 32.

Table 32. Summary of the Parameters for IRI-Gas Emissions Equations.

PEMS – Gas Y (g/mile)	m	b
CO ₂	1.1074	278.89
CO	0.0023	0.5577
HC	0.0004	0.0644
NO _x	0.0003	0.1039

Note: $Y \text{ (Gas g/mile)} = m \text{ IRI (in/mile)} + b$

It is observed from the statistical analysis that pavements with lower IRIs, better pavement condition, have lower gas emissions.

- c. The influence of speed on vehicle gas emissions was also analyzed independently from the other parameters. Results from the regression statistical analysis show R^2 s that vary between 0.7206 and 0.9259 which are considered acceptable for this type of analysis. The general equation for gas emissions based on speed is given by:

$$Y (\text{Gas g/mile}) = a * \text{Speed}^2 (\text{mph}) + b * \text{Speed} (\text{mph}) + c$$

The parameters for CO₂, CO, HC, and NO_x gas emission equations based on speed are summarized in Table 33.

Table 33. Summary of Parameters for Speed-Gas Emission Equations.

PEMS – Gas Y (g/mile)	a	b	c
CO ₂	0.1508	-22.11	1141.9
CO	0.0019	-0.1923	5.3506
HC	6E-05	-0.0082	0.3709
NO _x	0.0002	-0.019	0.5952

Note: $Y (\text{Gas g/mile}) = a * \text{Speed}^2 (\text{mph}) + b * \text{Speed} (\text{mph}) + c$

The results of the statistical analysis show that gas emissions decrease as the speed increases up to a certain speed and then begin to increase again. The speed range, where the vehicle gas emissions are the lowest, is 55-70 mph depending on the type of gas.

- d. One-way analysis of variance (ANOVA) hypothesis tests confirmed that there is significant evidence of unequal means of gas emissions among pavement and speed categories. At the 95% confidence level, the differences of gas emission measurements (CO₂, CO, HC, NO_x) are significant for pavements at different condition categories. Gas emissions also show significant differences for different speed categories.
- e. The IRI-Gas Emission equations can be used to quantify the CO₂, CO, HC, and NO_x for a given pavement condition. However, there are several factors that influence gas emission measurements including vehicle type, vehicle dynamics, ambient temperature, vehicle age, fuel type, vehicle speed and acceleration (deceleration). Some of these factors were controlled in the field surveys as the type of vehicle, route, driver, and scheduling of data collection activities. Other factors, such as traffic and environmental conditions are more difficult to control. PEMS gas emission measures were subjected to these factors, and the range of measurements was very broad since the results depend in the entire data collection process.

MAINTENANCE STRATEGIES TO REDUCE VEHICLE GAS EMISSIONS

- a. The effectiveness of TxDOT treatments and potential gas emission savings were studied for Preventive Maintenance (PM), Light Rehabilitation (LRhb), Medium Rehabilitation (MRhb), and Heavy Rehabilitation (HRhb). The impact of maintenance and rehabilitation treatments on vehicle gas emissions were quantified using the ride score increase due to treatment.
- b. Data from Research project TxDOT-0-6673 “Improvements in Pavement Ride, Distress, and Condition based on Different Treatment Types” (Chang et al., 2014) were used to establish a relationship between IRI and Ride Score with the following equation:

$$\text{Ride Score} = -0.0157 \text{ IRI (in/mile)} + 5.3461$$

- c. Regression analysis was conducted to determine the relationship between the ride score and vehicle gas emissions. The general equation to quantify gas emissions from Ride Score is given by:

$$\text{Vehicle Gas Emissions (g/mile)} = m \cdot \text{Ride Score (in/mile)} + b$$

The parameters for CO₂, CO, HC, and NO_x gas emission equations based on ride score are summarized in Table 34.

Table 34. Summary of the Parameters for the Ride Score-Gas Emission Equations.

PEMS – Gas Y (g/mile)	m	b
CO ₂	-70.538	655.99
CO	-0.1436	1.3253
HC	-0.026	0.2032
NO _x	-0.0162	0.1906

Note: Y (Gas g/mile) = m * Ride Score + b

It is observed from the statistical analysis that pavements with higher Ride Scores, better pavement condition, have lower gas emissions.

- d. The IRI or Ride Score before and after treatment can be used to evaluate the improvement in pavement condition and corresponding gas emission savings. Gas emissions savings are calculated with the Ride Score–Gas Emission equations using the ride score increase due to treatment. Summaries of the potential savings on gas emissions for asphalt and concrete pavement treatment categories are shown in Tables 35 through 38.

Light rehabilitation treatments have the major effect for asphalt pavements in terms of reducing gas emission when compared to other treatment categories, medium rehabilitation for JCP, and high rehabilitation for CRCP. It is also observed that CO₂ shows the highest potential of savings.

Table 35. Summary of Vehicle Gas Emission Savings for Preventive Maintenance.

Pavement Type	Vehicle Gas Emission	CO₂ (g/mile)	CO (mg/mile)	HC (mg/mile)	NO_x (mg/mile)
Asphalt	Minimum	7.05	14.36	2.60	1.62
	Medium	28.22	57.44	10.40	6.48
	Maximum	253.94	516.96	93.60	58.32
JCP	Minimum	7.05	14.36	2.60	1.62
	Medium	21.16	43.08	7.80	4.86
	Maximum	49.38	100.52	18.20	11.34
CRCP	Minimum	7.05	14.36	2.60	1.62
	Medium	21.16	43.08	7.80	4.86
	Maximum	56.43	114.88	20.80	12.96

Table 36. Summary of Vehicle Gas Emission Savings for Light Rehabilitation.

Pavement Type	Vehicle Gas Emission	CO₂ (g/mile)	CO (mg/mile)	HC (mg/mile)	NO_x (mg/mile)
Asphalt	Minimum	7.05	14.36	2.60	1.62
	Medium	56.43	114.88	20.80	12.96
	Maximum	310.37	631.84	114.40	71.28
JCP	Minimum	7.05	14.36	2.60	1.62
	Medium	21.16	43.08	7.80	4.86
	Maximum	126.97	258.48	46.80	29.16
CRCP	Minimum	7.05	14.36	2.60	1.62
	Medium	28.22	57.44	10.40	6.48
	Maximum	134.02	272.84	49.40	30.78

Table 37. Summary of Vehicle Gas Emission Savings for Medium Rehabilitation.

Pavement Type	Vehicle Gas Emission	CO₂ (g/mile)	CO (mg/mile)	HC (mg/mile)	NO_x (mg/mile)
Asphalt	Minimum	7.05	14.36	2.60	1.62
	Medium	63.48	129.24	23.40	14.58
	Maximum	239.83	488.24	88.40	55.08
JCP	Minimum	7.05	14.36	2.60	1.62
	Medium	21.16	43.08	7.80	4.86
	Maximum	155.18	315.92	57.20	35.64
CRCP	Minimum	7.05	14.36	2.60	1.62
	Medium	35.27	71.80	13.00	8.10
	Maximum	155.18	315.92	57.20	35.64

Table 38. Summary of Vehicle Gas Emission Savings for Heavy Rehabilitation.

Pavement Type	Vehicle Gas Emission	CO₂ (g/mile)	CO (mg/mile)	HC (mg/mile)	NO_x (mg/mile)
Asphalt	Minimum	7.05	14.36	2.60	1.62
	Medium	91.70	186.88	33.80	21.06
	Maximum	260.99	531.32	96.20	59.94
CRCP	Minimum	7.05	14.36	2.60	1.62
	Medium	63.48	129.24	23.40	14.58
	Maximum	169.29	344.64	62.40	38.88

RECOMMENDATIONS

- a. At present, TxDOT projects comply with current regulations for air quality, but are mainly focused on dust and exhaust from vehicles and equipment. It would be beneficial to include the findings about gas emissions from this research and implement them in maintenance programs (e.g. the Best Maintenance Practice). Therefore, an implementation project is recommended to integrate the results of this research into regular TxDOT preservation best practices.
- b. The methodology to determine the effectiveness of maintenance and rehabilitation strategies should include quantifying gas emissions. Savings for gas emissions can be quantified using the equations developed in this study in Life-Cycle Cost Analysis (LCCA) to compare maintenance and rehabilitation strategies.
- c. It is possible to reduce gas emissions by implementing environmental friendly pavement maintenance strategies. Environmental friendly materials used in pavement preservation treatments leads to reduce emissions, however, the effectiveness of these treatments is also closely tied to the timing of the interventions. The timing of maintenance has a significant influence on the treatment effectiveness.
- d. The Pavement Management Information System (PMIS) enables TxDOT to store pavement condition data and analyze the impact of maintenance and rehabilitation treatments on pavement performance. It is recommended to collect gas emission measurements before and after treatment for future validation of the equations presented in this report.
- e. The amount and type of gas emissions generated by vehicles not only depends on pavement condition but also on a number of other factors including vehicle type, vehicle dynamics, ambient temperature, vehicle age, fuel type, vehicle speed and acceleration (deceleration). The scope of the study was to establish the relationship between pavement roughness and vehicle gas emissions, further research is recommended to study the interaction of all the other factors that affect gas emissions.

REFERENCES

- Air Resources Board. (2011). “EMFAC 2011: Overview”. California Environmental Protection Agency.
- Ardekani, S. A., and Palinee S. (2010). *Effect of Pavement Type on Fuel Consumption and Emissions in City Driving*. University of Texas at Arlington. Department of Civil Engineering, Arlington, TX.
- Asia Sustainable and Alternative Energy Program (ASTAE). (2010). Introduction to Greenhouse Gas Emissions in Road Construction and Rehabilitation.
- California Department of Transportation (Caltrans). (2014). Complete Streets Implementation Action Plan 2.0: Meeting the Safety and Mobility Needs of All Users for All Modes.
- Chang, C. M., S. Nazarian, I. Abdallah, D. Saenz, A. Wimsatt, T. Freeman, and E. Fernando. (2014). *Improvement in Pavement Ride, Distress, and Condition Based on Different Pavement Types*. University of Texas at El Paso. Center for Transportation Infrastructure Systems, El Paso, TX.
- Chappat, M. & Bilal, J. (2003). “The Environmental Road of the Future: Life Cycle Analysis, Energy Consumption and Greenhouse Gas Emissions”. Colas Group.
http://www.colas.com/sites/default/files/publications/route-future-english_1.pdf (08/2016).
- Chatti, K. and I. Zaabar. (2010). Estimating the Effects of Pavement Condition on Vehicle Operating Costs. NCHRP Report 720. National Cooperative Highway Research Program (NCHRP), Transportation Research Board, Washington, D.C.
- Davis, N., J. Lents., M. Osses, N. Nikkila, and M.J. Barth. (2005). “Development and Application of an International Vehicle Emissions Model”. *CD-ROM Transportation Research Board (TRB)*.
- Environmental Protection Agency (EPA). (2003). *User’s Guide to MOBILE6.1 and MOBILE6.2*. EPA-420-R-03-010. Washington, D.C.
- Environmental Protection Agency (EPA). (2011). *Inventory of U.S. Greenhouse Gas Emissions and Sinks*.
- Environmental Protection Agency (EPA). (2013). *MOBILE Model (On-Road Vehicles)*.
- Environmental Protection Agency (EPA). (2014). *MOVES (Motor Vehicle Emission Simulator)*.
- European Environment Agency (EEA). (2007). *Environmental Statement*.
- European Environment Agency (EEA). (2014). *Do lower speed limits on motorways reduce fuel consumption and pollutant emissions*.
- Federal Highway Administration (FHWA)-a. “Congestion Mitigation and Air Quality Improvement (CMAQ)”. http://www.fhwa.dot.gov/environment/air_quality/cmaq/ (08/2016).

Federal Highway Administration (FHWA)-b. “Office of Planning, Environment, & Realty (HEP)”. <http://www.fhwa.dot.gov/hep/> (08/2016).

Federal Highway Administration (FHWA)-c. (2008). “The Congestion Mitigation and Air Quality (CMAQ) Improvement Program under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users FINAL PROGRAM GUIDANCE”.

Grant, M., K. See, and D. Downing. (1998). “Transportation and Global Climate Change: A Review and Analysis of the Literature”. US Department of Transportation, Washington, D.C.

Horvath, A. (2007). “PaLATE, Pavement Life-cycle Assessment Tool for Environmental and Economic Effects”. Consortium on Green Design and Manufacturing. University of California at Berkeley. <http://www.ce.berkeley.edu/~horvath/palate.html> (08/2016).

IVE Model. (2008). *IVE Model User’s Manual Version 2.0*.

Kalembo, C., Jeihani, M., and Saka, A. (2011). *Evaluation of the Impact of Pavement Roughness on Vehicle Gas Emissions in Baltimore County*. Morgan State University. Department of Transportation and Urban Infrastructures Studies, Baltimore, MD.

Miller, T. and Bahia, H. (2009). *Sustainable Asphalt Pavements Technologies, Knowledge Gaps and Opportunities. Modified Asphalt Research Center*. University of Wisconsin Madison. Department of Civil and Environmental Engineering, Madison, WI.

Niemeier, D. A., Y. Zheng, and T. Kear. (2004). “UCDrive: A New Gridded Mobile Source Emission Inventory Model”. *Atmospheric Environment*..38 (2004), 305-319.

Oregon State University. (2014). Pavement Evaluation (Module 09).

The Second Strategic Highway Research Program (SHRP 2). (2013). “Incorporating Greenhouse Gas Emissions into Transportation Planning and Decision Making”. Report Number: S2-C09-RR-1. National Academy of Sciences. Washington D.C.

Terrel, R. L. and Hicks, R. G. (2008). *Viability of Hot In-Place Recycling as a Pavement Preservation Strategy*. Report Number: CP2C-2008-106. 2008. California State University. California Pavement Preservation Center, Chico, CA.

Tu, J. (2011). “Portable Emission Measurement System (PEMS)”. California Environmental Protection Agency.

Texas Department of Transportation (TxDOT)-a. (2006). *Asphalt Emulsion, Construction Division, 2006*.

Texas Department of Transportation (TxDOT)-b. (2015). *Asphalt Material and Uses, Construction Material and Pavement Section*.

Texas Department of Transportation (TxDOT)-c. (2011). *Best Management Practice Summary Report, Maintenance Program*.

Texas Department of Transportation (TxDOT)-d. (2011). *Environmental Assessment, Maintenance Program*.

Texas Department of Transportation (TxDOT)-e. (2016). *Environmental Compliance Toolkits*. <http://www.txdot.gov/inside-txdot/division/environmental/compliance-toolkits.html> (08/2016).

Texas Department of Transportation (TxDOT)-f, (2016). *Environmental Management System*. <http://www.txdot.gov/inside-txdot/division/environmental/ems-courses.html> (08/2016).

Texas Department of Transportation (TxDOT)-g. (2016). *Statewide Transportation Improvement Program (STIP)*. <http://www.txdot.gov/inside-txdot/division/transportation-planning/stips/info.html> (08/2016).

Texas Department of Transportation (TxDOT)-h, (2014). *Condition of Texas Pavements: PMIS Annual Report FY 2011–2014*.

Wang T., Harvey J., and Kendall A. (2014). *Reducing Greenhouse Gas Emissions Through Strategic Management of Highway Pavement Roughness*. University of California Davis. University of California Pavement Research Center, Davis, CA.

Yu, L., and F. Qiao. (2004). *Collection and Evaluation of On-Road Vehicle Emission and Activity Data*. Texas Southern University. Houston Advanced Research Center, Houston, TX. 53-55.

APPENDIX A
QUESTIONNAIRE
IMPACT OF ROADWAY CONDITIONS ON GAS EMISSIONS

Questionnaire
Quantification of the Impact of Roadway Conditions on Emissions

The purpose of this research project involves quantifying the impact of a road's condition on emissions and developing detailed guidance to assist TxDOT in improving the maintenance strategies to reduce emissions. The research will quantify the vehicular emissions associated with different pavement conditions of flexible pavement, continuously reinforced concrete pavement (CRCP), and jointed concrete pavement (JCP). An evaluation of effectiveness of different maintenance strategies in reducing emissions from roadways will be also performed.

Information

Name: _____

E-Mail: _____

Phone: _____

Title: _____

DOT/District: _____

Please help us gather information for this TxDOT research project 0-6808 "Quantification of the Impact of Roadway Conditions on Emissions" by answering the five questions below. The short survey takes less than 15 minutes to complete.

Q1. Is this a topic of interest to you?

YES: _____

NO: _____

Q2.a Have you done any studies on this subject?

YES: _____

NO: _____

Q2.b If “YES”, please provide information.

Q3. What is your opinion on the method used to measure the impact of roadway conditions on emissions?

Q4.a Are you aware of any research report or paper about the impact of a road’s condition on emissions?

YES: _____

NO: _____

Q4.b If “YES”, please provide references.

Q5. Please provide any additional comments you have regarding to the methods used in the quantification of the impact of roadway condition on emissions.

SUMMARY OF RESPONSES

Summary of Survey Responses

Responses were obtained from the following state departments of transportation: North Dakota, Tennessee, Colorado, Utah, New Hampshire, and Florida. Figures A-1 to A-8 summarizes the questionnaire's responses to questions 1 to 5.

Name:	E-Mail	Phone	Title:	DOT/District:
Brad Darr	bdarr@nd.gov	701-328-4443	State Maintenance Engineer	NDDOT
Greg Duncan	Greg.Duncan@tn.gov	6157412342	Assistant Chief Engineer of Operations	Tennessee DOT
David C. Wieder	david.wieder@state.co.us	(303) 512-5502	Manager - Staff Maintenance	Colorado DOT HQ
Lloyd Neeley	lneeley@utah.gov	801-965-4789	Engineer for Maintenance	Utah DOT
Caleb Dobbins	cdobbins@dot.state.nh.us	603-271-2693	State Maintenance Engineer	NHDOT
Tim Lattner	tim.lattner@dot.state.fl.us	850-410-5656	Director, Office of Maintenance	Florida DOT

Figure A.1. Survey Information Response.

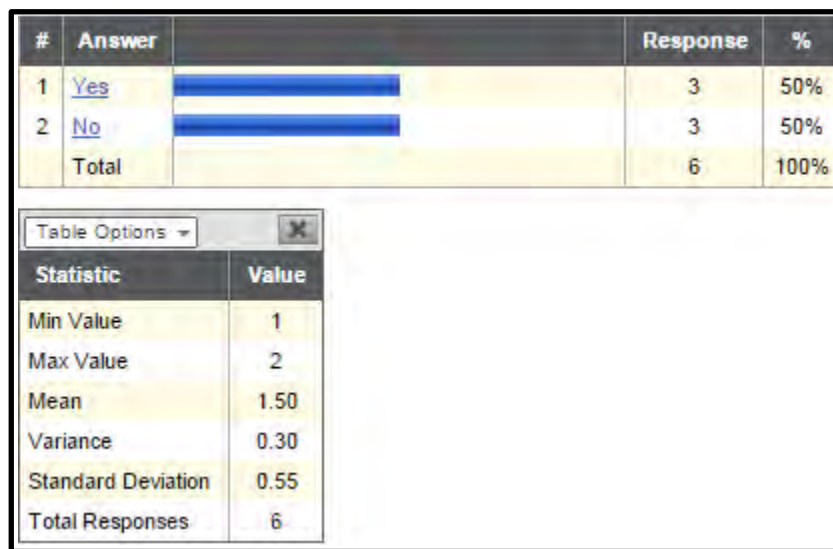


Figure A.2. Answers to Q1. Is this a topic of interest to you?

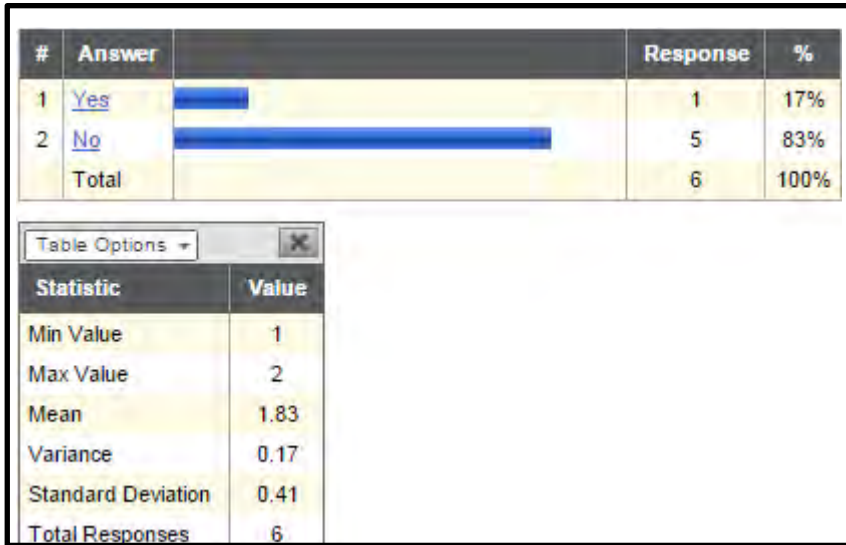


Figure A.3. Answers to Q2.a Have you done any studies on the subject?

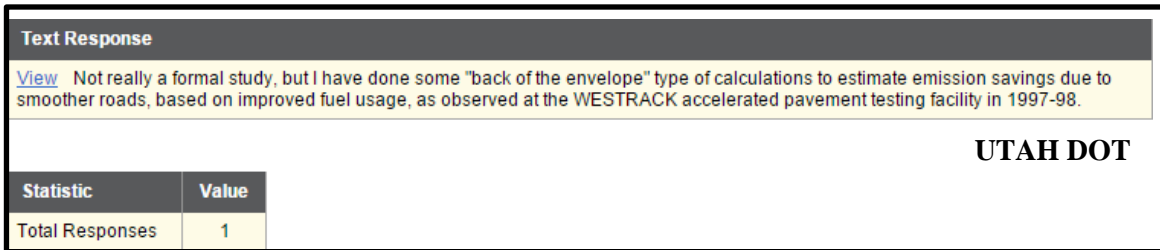


Figure A.4. Q2.b Please provide information.

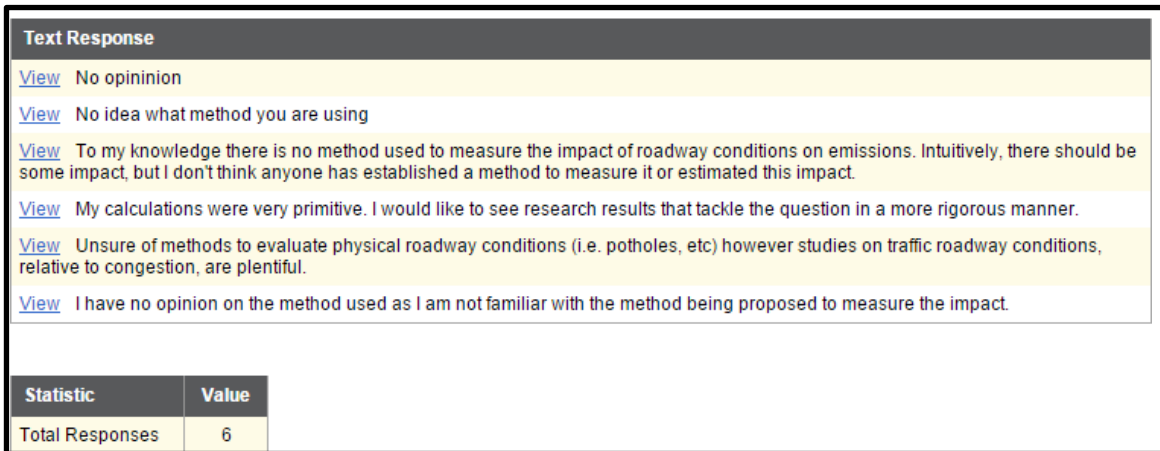


Figure A.5. Answers to Q3. What is your opinion on the method used to measure the impact of roadway conditions on emissions?

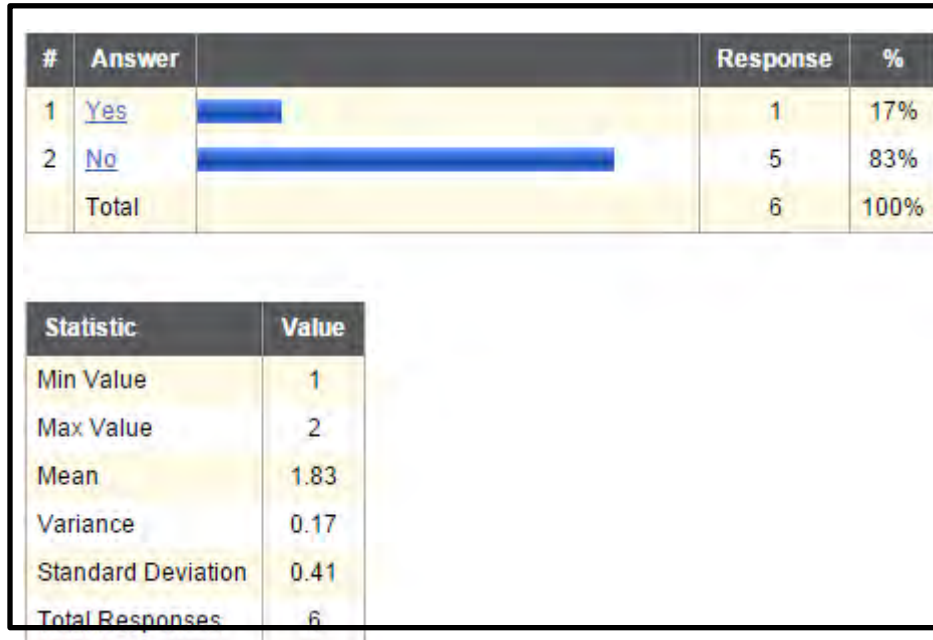


Figure A.6. Answers to Q4.a Are you aware of any research report or paper about the impact of a road's condition on emissions?

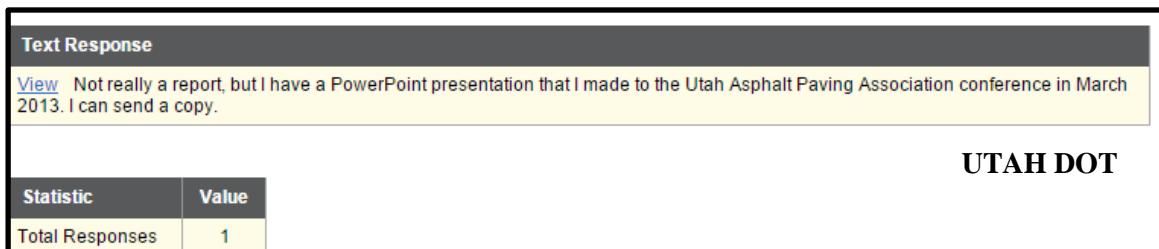


Figure A.7. Q4.b Please provide references.

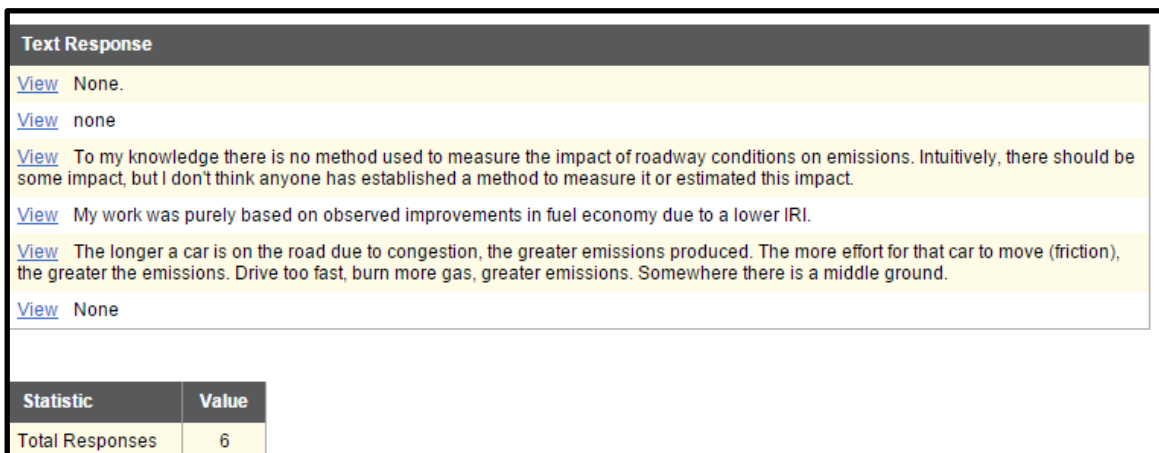


Figure A.8. Q5. Please provide any additional comment you have regarding to the methods used in the quantification of the impact of roadway conditions on emissions.

APPENDIX B
PROJECT SITES DESCRIPTIONS

AUSTIN

Project ID: AUS
Test Section: U.S. 183 (From Brunet to FM 1431)
Pavement Type: Concrete

Figure AUS-1 shows the location of the section AUSTIN, giving the benchmarks of the starting point (Latitude: 30.3731369, Longitude: -97.72612884) and ending point (Latitude: 30.53135408, Longitude: -97.81633847). This section has a length of 12.80 miles, which is located on U.S. 183A Toll Road. Existing section is continuously reinforced concrete pavement having different condition scores, distress scores, ride scores, and IRI.

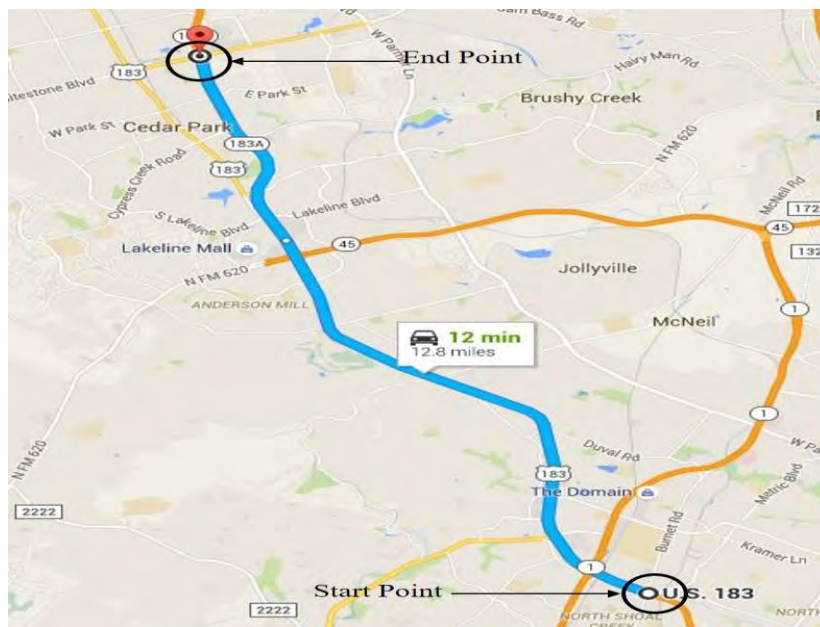


Figure B.1. AUS-1 – Location.



Figure B.2. AUS-2 - Continuously reinforced concrete pavement.

BRAYAN/ COLLEGE STATION

Project ID: Brayan/ College station
Test Section: Air strip
Pavement Type:

Figure CS-1 shows the location of the only section in College Station giving as benchmarks the starting point (Latitude: 30.628593 Longitude: -96.48162) and ending point (Latitude: 30.624471 Longitude: -96.48163). This section has a length of 0.3 miles in an air strip.

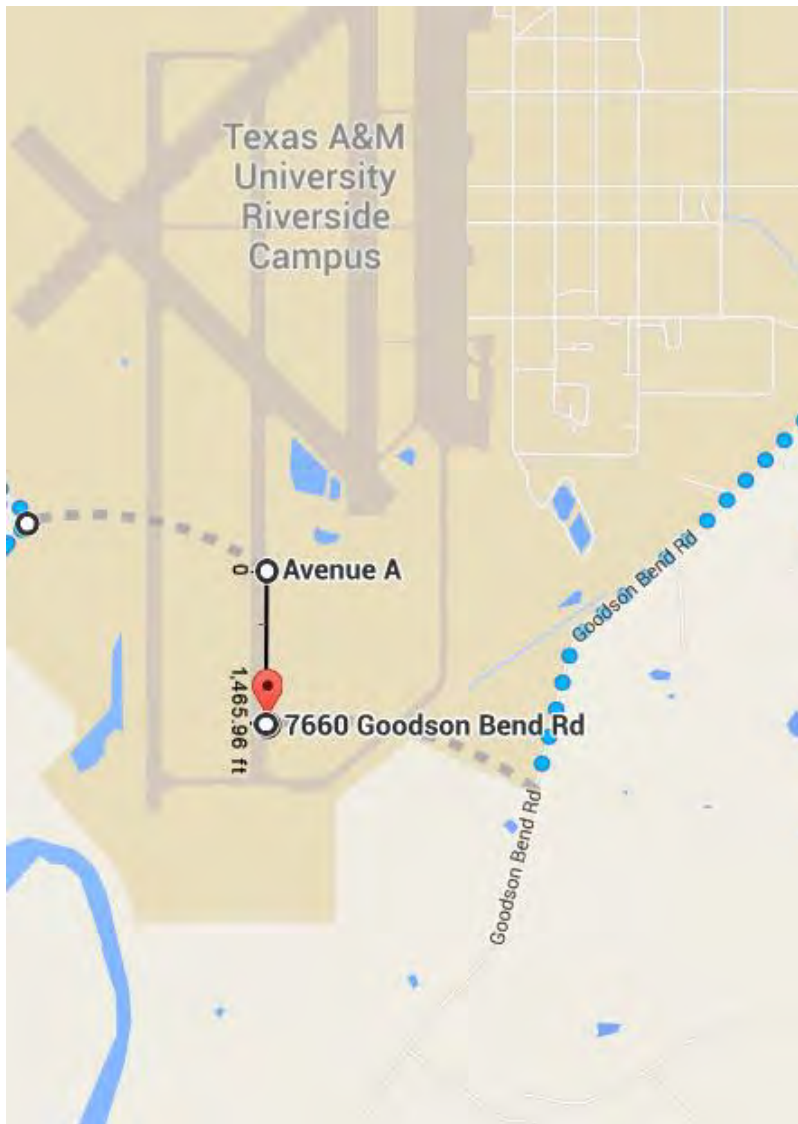


Figure B.3. BCS-1: Bryan/ College Station Location.

EL PASO

Project ID: ELP-01
Test Section: Spur 16 (From Doniphan Dr. to Loop 375)
Pavement Type: Asphalt

Figure ELP-01-1 shows the location of the section ELP-01, giving as benchmarks the starting point (TRM 316+1.180, green) and ending point (TRM 316+000, red). This section has a length of 1.18 miles.

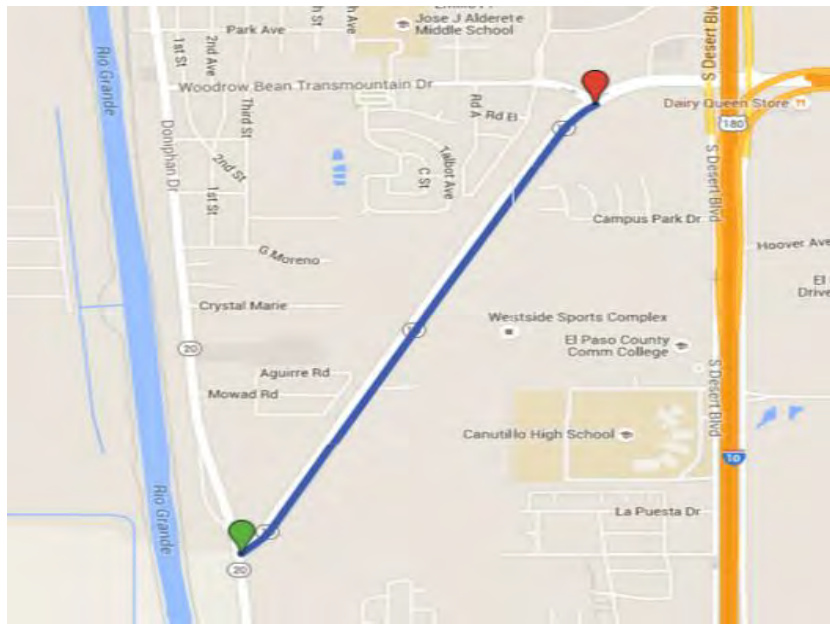


Figure B.4. ELP-01-1 – Map of ELP-09 Location.



Figure B.5. ELP-01-2 – TxDOT Roughness Data Collection.

Project ID: ELP-02
Test Section: Spur 16 (From Loop 375 to Doniphan Dr.)
Pavement Type: Asphalt

Figure ELP-02-1 shows the location of the section ELP-02, giving as benchmarks the starting point (TRM 316+000, green) and ending point (TRM 316+1.122, red). This section has a length of 1.22 miles.

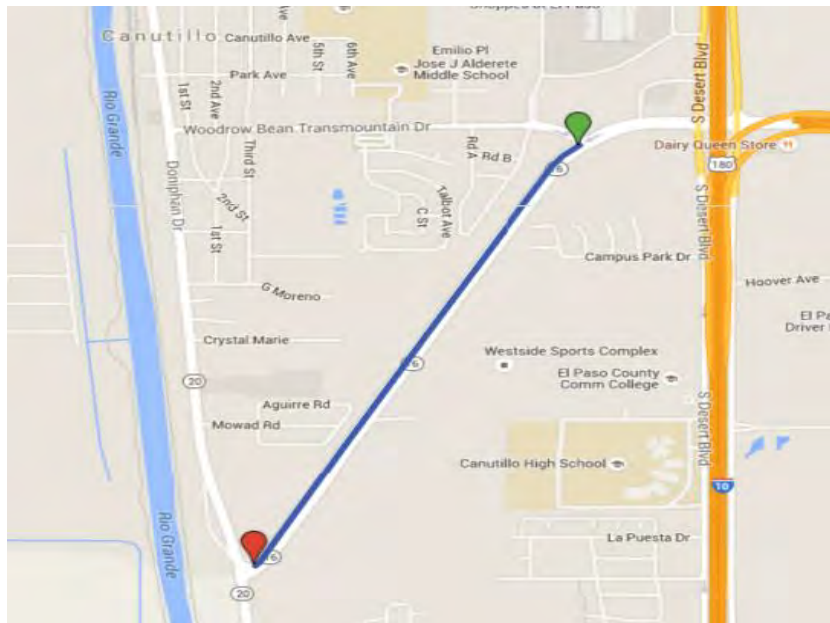


Figure B.6. ELP-02-1 – Map of ELP-02 Location.

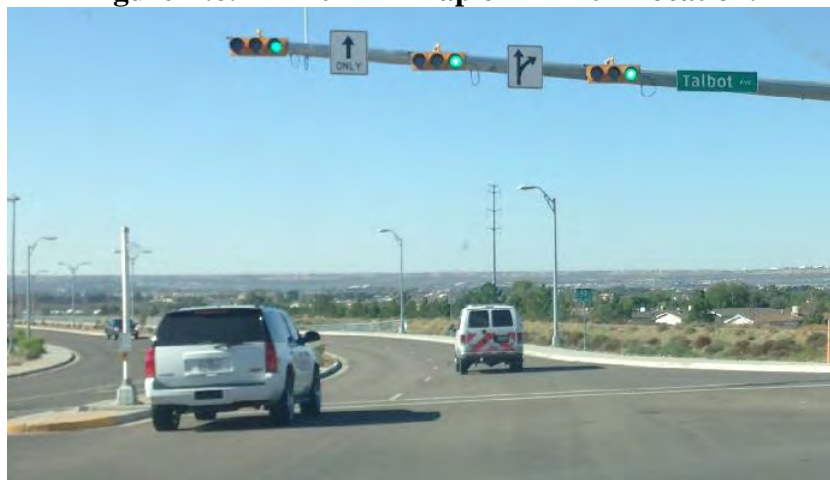


Figure B.7. ELP-02-2 – TxDOT Roughness Data Collection.

Project ID: ELP-03

Test Section: Paseo del Norte (Northern Pass Dr. to Dessert Blvd.)

Pavement Type: Asphalt

Figure ELP-03-1 shows the location of the section ELP-03, giving as benchmarks the starting point (Northern Pass Dr, green) and ending point (Dessert Blvd, red). This section has a length of 1.49 miles in which there are two traffic lights.

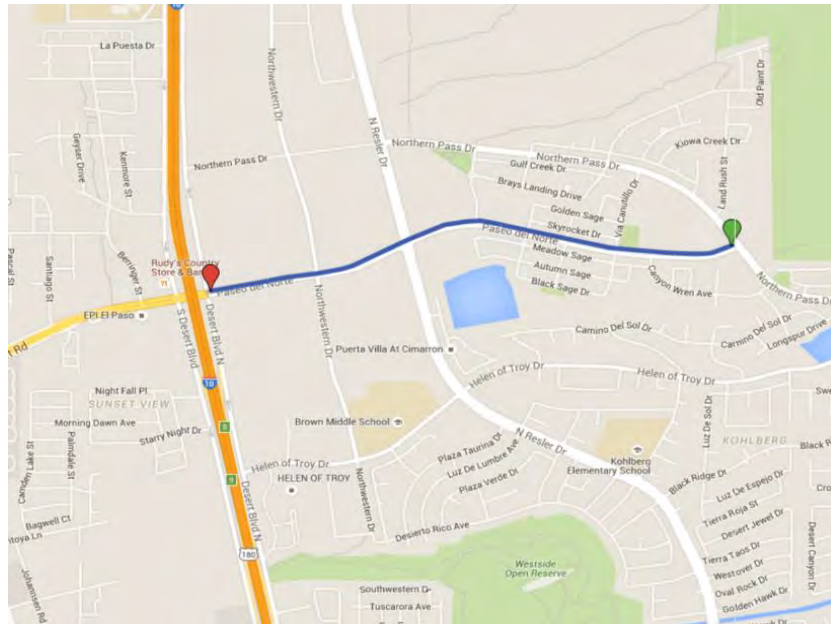


Figure B.8. ELP-03-1 – Map of ELP-09 Location.



Figure B.9. ELP-03-2 – TxDOT Roughness Data Collection.

Project ID: ELP-04

Test Section: W. Paisano (S. Kansas St. to W. San Antonio Ave.)

Pavement Type: Asphalt

Figure ELP-04-1 shows the location of the section ELP-04, giving as benchmarks the starting point (TRM: 326 + 0.188, green) and ending point (TRM: 329 + 1.20, red). This section has a length of 0.71 miles in which there are five traffic lights.

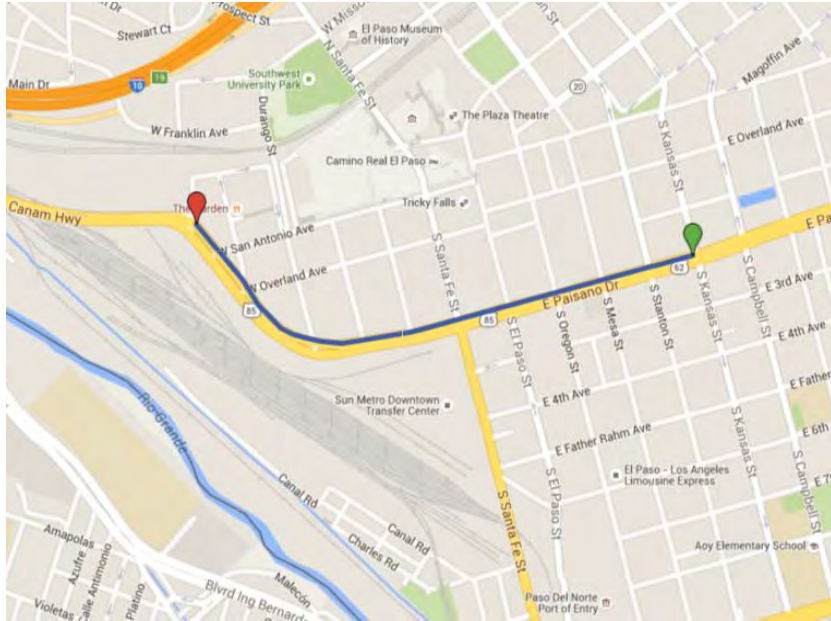


Figure B.10. ELP-04-1 – Map of ELP-09 Location.

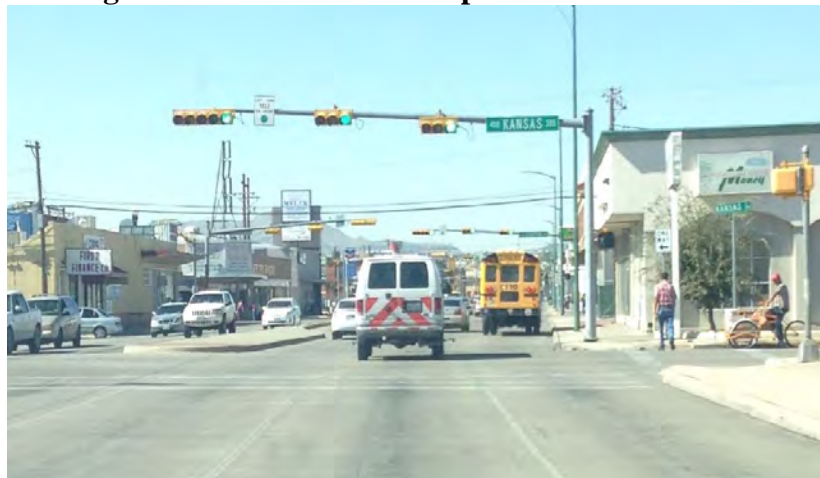


Figure B.11. ELP-04-2 – TxDOT Roughness Data Collection.

Project ID: ELP-05

Test Section: E. Paisano (W. San Antonio Ave. to S. Kansas St.)

Pavement Type: Asphalt

Figure ELP-05-1 shows the location of the section ELP-05, giving as benchmarks the starting point (TRM 329+1.20, green) and ending point (TRM 326+0.188, red). This section has a length of 0.72 miles in which there are five traffic lights.

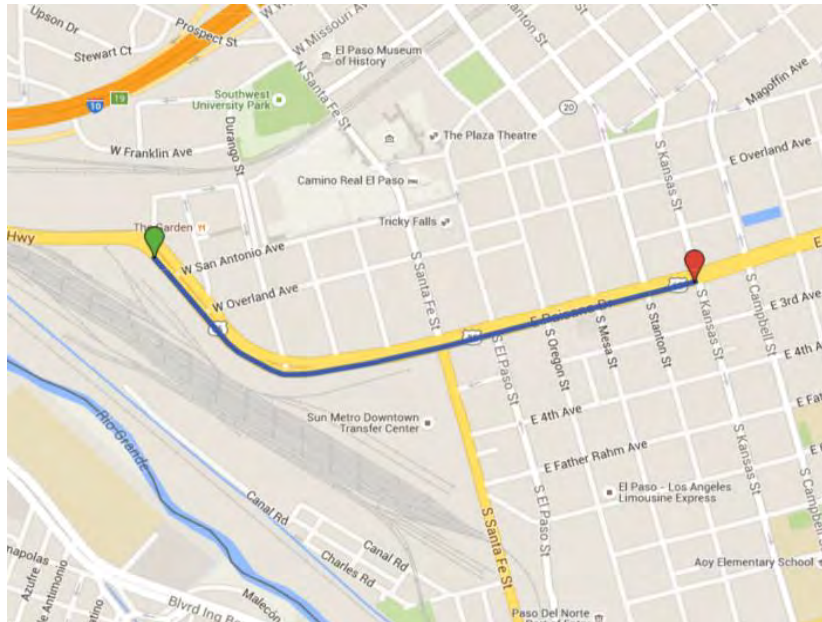


Figure B.12. ELP-05-1 – Map of ELP-09 Location.

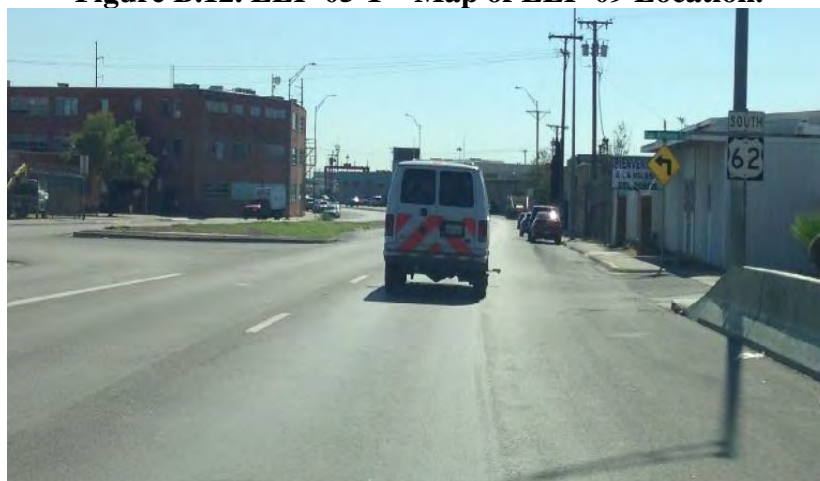


Figure B.13. ELP-05-2 – TxDOT Roughness Data Collection.

Project ID: ELP-06

Test Section: I-10 E. Frontage (N. Eucalyptus St. to U-Turn)

Pavement Type: Asphalt

Figure ELP-06-1 shows the location of the section ELP-06, giving as benchmarks the starting point (TRM 20+0.013, green) and ending point (TRM 24+0.627, red). This section has a length of 0.56 miles.

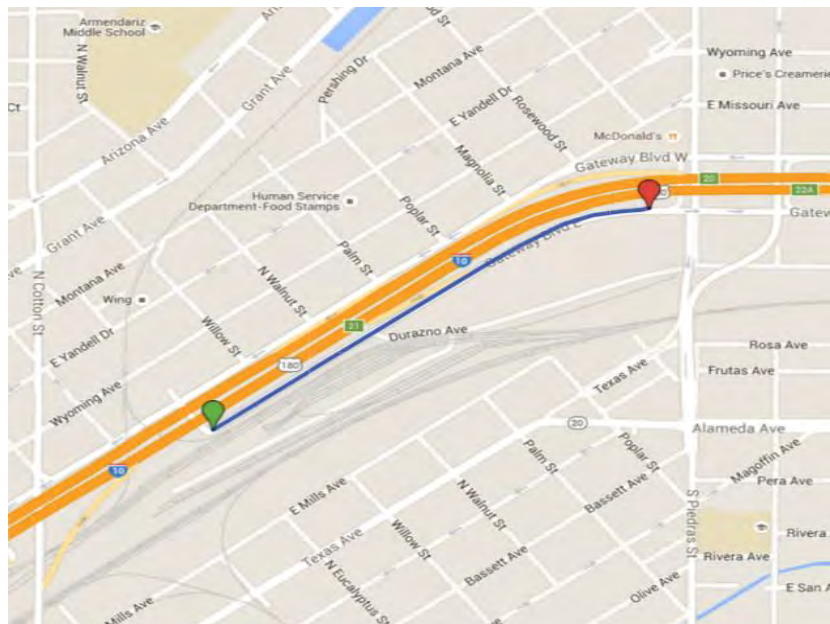


Figure B.14. ELP-06-1 – Map of ELP-09 Location.



Figure B.15. ELP-06-2 – TxDOT Roughness Data Collection.

Project ID: ELP-07

Test Section: i-10 E. Frontage (Raynolds St. to Romany Rd.)

Pavement Type: Asphalt

Figure ELP-07-1 shows the location of the section ELP-07, giving as benchmarks the starting point (TRM 23+0.170, green) and ending point (TRM 23+0.710, red). This section has a length of 0.54 miles.

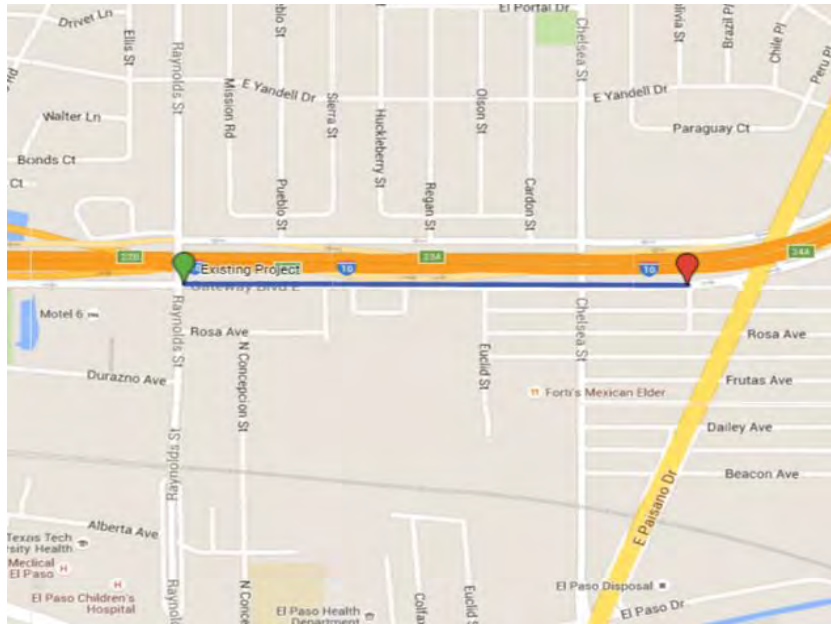


Figure B.16. ELP-07-1 – Map of ELP-09 Location.



Figure B.17. ELP-07-2 – TxDOT Roughness Data Collection.

Project ID: ELP-08
Test Section: Dyer St. (Tompkins Rd. to Hayes Ave.)
Pavement Type: Asphalt

Figure ELP-08-1 shows the location of the section ELP-08, giving as benchmarks the starting point (TRM 22+0.825, green) and ending point (TRM 22+1.8, red). This section has a length of 0.96 miles in which there are four traffic lights.

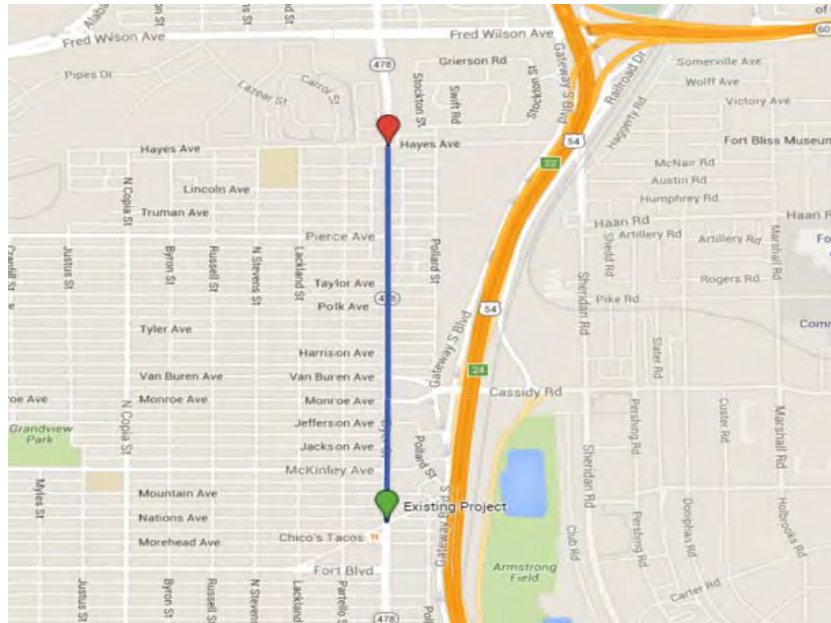


Figure B.18. ELP-08-1 – Map of ELP-09 Location.



Figure B.19. ELP-08-2 – TxDOT Roughness Data Collection.

Project ID: ELP-09
Test Section: McCombs St. (From US 54 to Dyer St.)
Pavement Type: Asphalt

Figure ELP-09-1 shows the location of the section ELP-09, giving as benchmarks the starting point (TRM 314+1.348, green) and ending point (TRM 316+1.855, red). This section has a length of 2.49 miles in which there are three traffic lights. This control section job was let in 2014 as a Thin Surface Mixture Overlay.

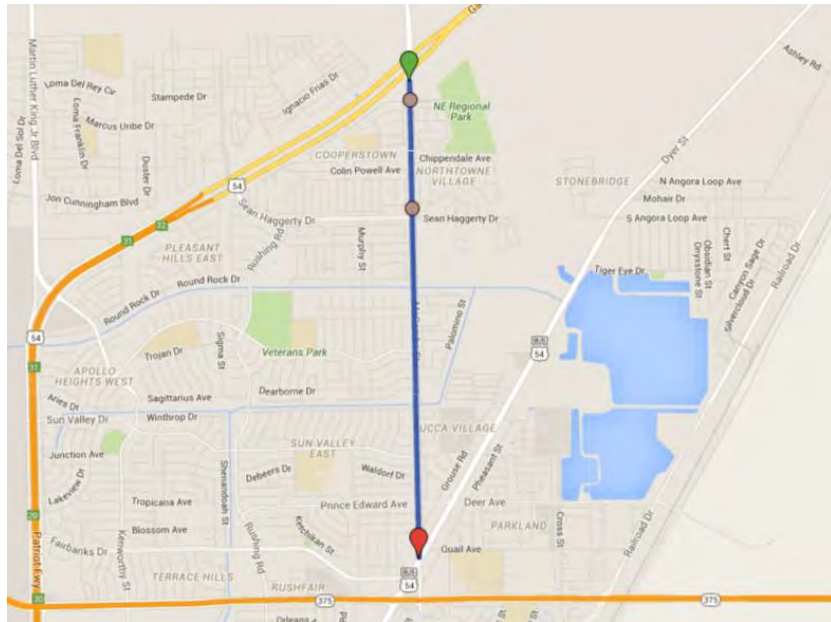


Figure B.20. ELP-09-1 – Map of ELP-09 Location.



Figure B.21. ELP-09-2 – Thin Surface Mixture Overlay.

Project ID: ELP-10
Test Section: Alameda Ave. (Clint to Fabens)
Pavement Type: Asphalt

Figure ELP-10-1 shows the location of the section ELP-10, giving as benchmarks the starting point (TRM 350+0.00, green) and ending point (TRM 356+0.164, red). This section has a length of 6.14 miles and no traffic lights.

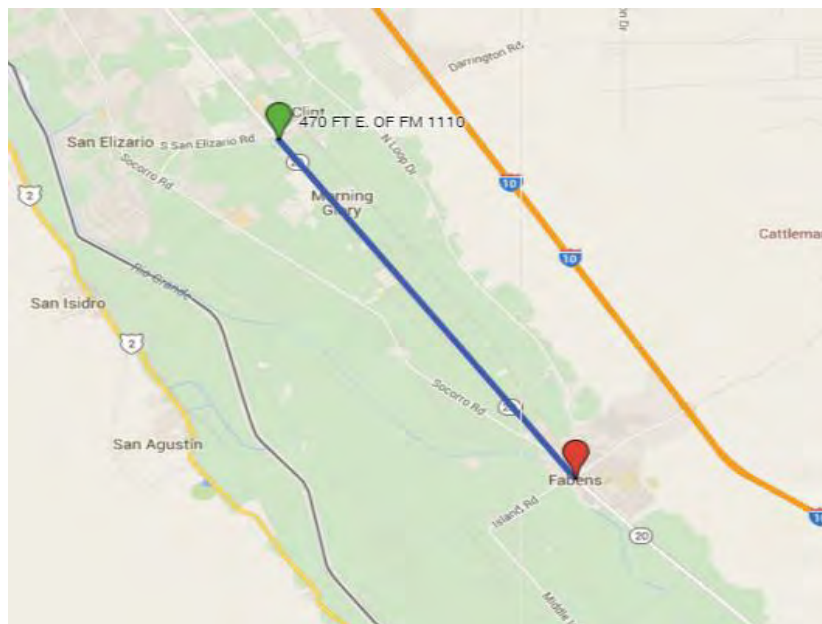


Figure B.22. ELP-10-1 – Map of ELP-09 Location.



Figure B.23. ELP-10-2 – TxDOT Roughness Data Collection.

HOUSTON

Project ID: HOU-1

Test Section: Texas State Highway 6 (From Voss Rd. to Hwy 90 Alt)

Pavement Type: Asphalt

Figure HOU-01-1 shows the location of the section HOU-1, giving the benchmarks of the starting point (Latitude: 29.644368, Longitude: -95.651516) and ending point (Latitude: 29.622381, Longitude: -95.650072). This section has a length of 1.477 miles, which is located on Texas State Highway 6. Existing section had asphalt pavement during the time of emission testing.

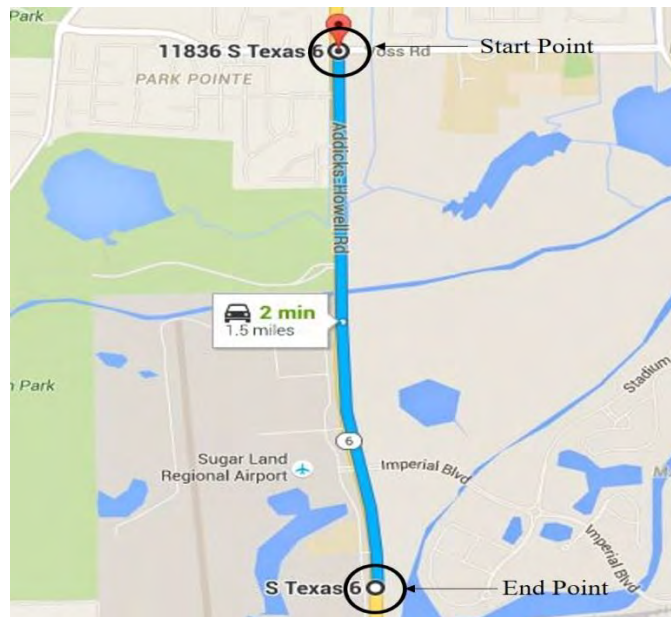


Figure B.24. HOU-01-1 – Location.



Figure B.25. HOU-01-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-2
Test Section: FM 1952 (From County Line Rd. to FM 1489)
Pavement Type: Asphalt

Figure HOU-2-1 shows the location of the section HOU-2, giving the benchmarks of the starting point (Latitude: 29.600573, Longitude: -96.054448) and ending point (Latitude: 29.571799, Longitude: -95.990234). This section has a length of 5.596 miles, which is located on FM 1952. Existing section had asphalt pavement during the time of emission testing.

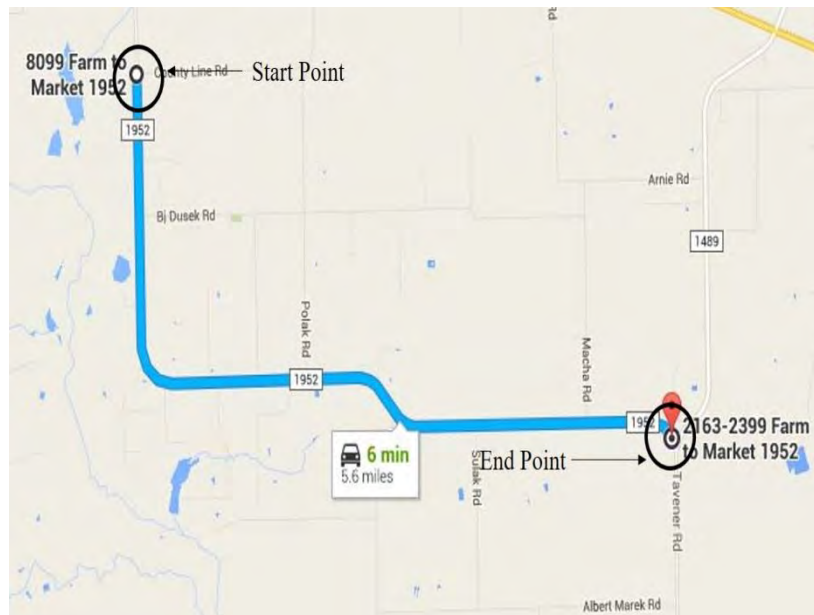


Figure B.26. HOU-02-1 – Location.



Figure B.27. HOU-02-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-3
Test Section: FM 522 (From SH 36 to FM 1459)
Pavement Type: Asphalt

Figure HOU-3-1 shows the location of the section HOU-3, giving the benchmarks of the starting point (Latitude: 29.113536, Longitude: -95.640447) and ending point (Latitude: 29.078538, Longitude: -95.689102). This section has a length of 4.80 miles, which is located on FM 522. Existing section had asphalt pavement during the time of emission testing.

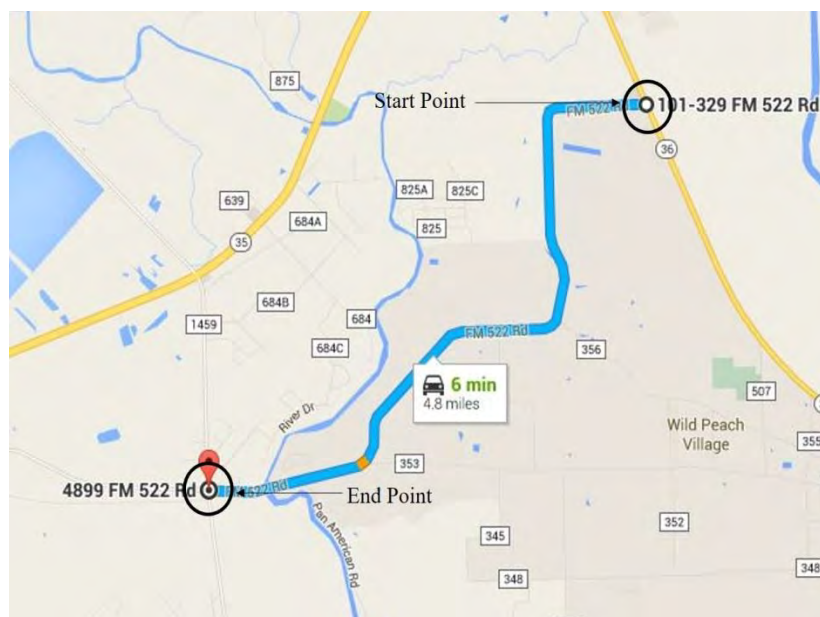


Figure B.28. HOU-03-1 – Location.



Figure B.29. HOU-03-2 - Asphalt pavement with ACP Overlay. (Source: Google)

Project ID: HOU-4
Test Section: FM 1486 (From SH 105 to FM 1774)
Pavement Type: Asphalt

Figure HOU-4-1 shows the location of the section HOU-4, giving the benchmarks of the starting point (Latitude: 30.365435, Longitude: -95.776613) and ending point (Latitude: 30.216778, Longitude: -95.770866). This section has a length of 10.59 miles, which is located on FM 1486. Existing section had asphalt pavement during the time of emission testing.

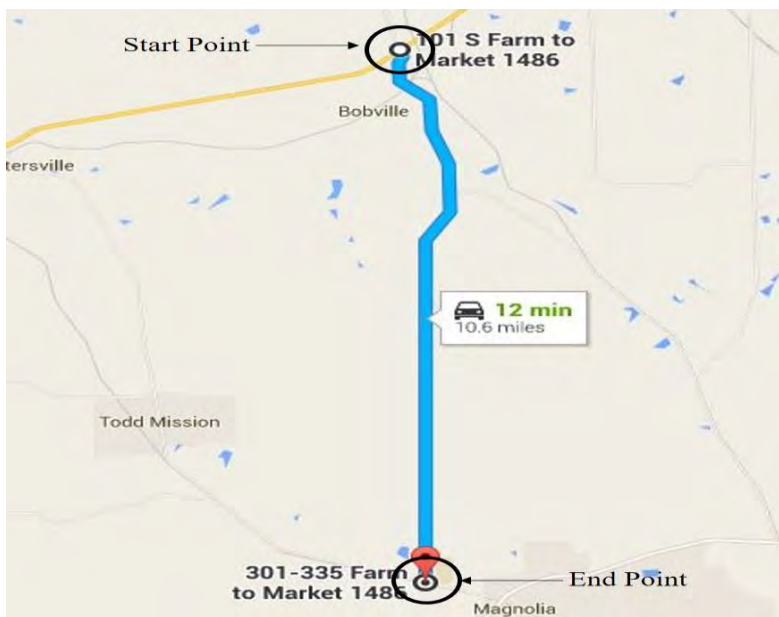


Figure B.30. HOU-04-1 – Location.



Figure B.31. HOU-04-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-5
Test Section: FM 1097 (From FM 149 to IH 45)
Pavement Type: Asphalt

Figure HOU-5-1 shows the location of the section HOU-5, giving the benchmarks of the starting point (Latitude: 30.404118, Longitude: -95.698067) and ending point (Latitude: 30.421026, Longitude: -95.491961). This section has a length of 13.60 miles, which is located on FM 1097. Existing section had asphalt pavement during the time of emission testing.

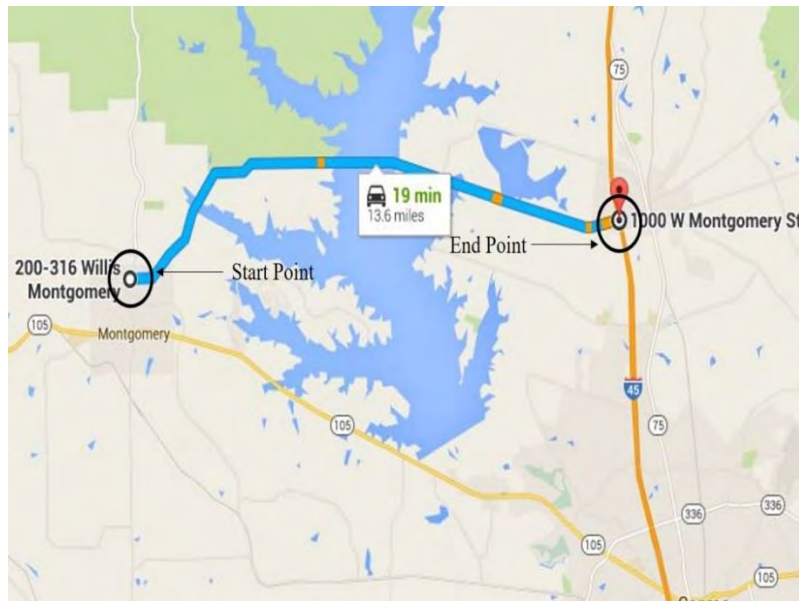


Figure B.32. HOU-05-1 – Location.



Figure B.33. HOU-05-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-6
Test Section: US 90 Alt (From Millie St. to Brazos River)
Pavement Type: Asphalt

Figure HOU-6-1 shows the location of the section HOU-6, giving the benchmarks of the starting point (Latitude: 29.558894, Longitude: -95.791715) and ending point (Latitude: 29.582658, Longitude: -95.758038). This section has a length of 2.652 miles, which is located on US 90 Alt. Existing section had asphalt pavement during the time of emission testing.

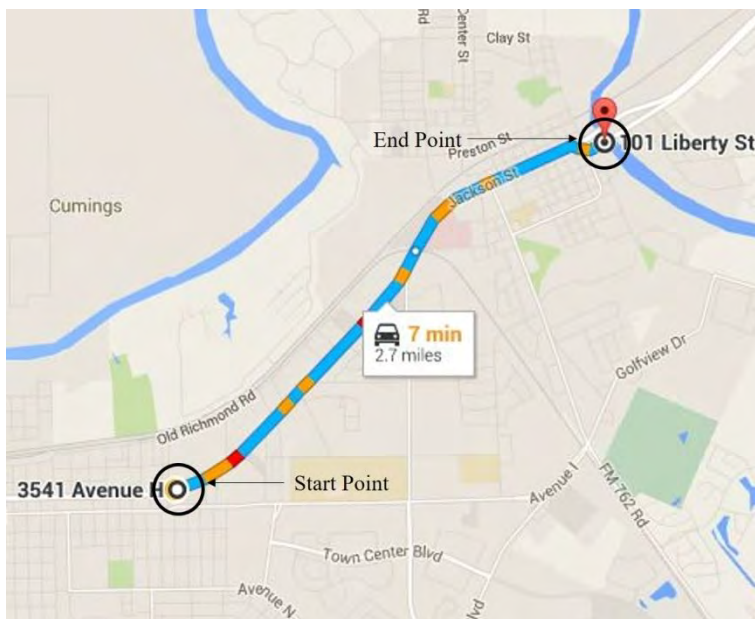


Figure B.34. HOU-06-1 – Location.



Figure B.35. HOU-06-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-7

Test Section: US 90 Alt (From 0.5 Mi East of FM 359 to Brazos River)

Pavement Type: Asphalt

Figure HOU-7-1 shows the location of the section HOU-7, giving the benchmarks of the starting point (Latitude: 29.589411, Longitude: -95.748217) and ending point (Latitude: 29.584530, Longitude: -95.756668). This section has a length of 0.608 mile, which is located on US 90 Alt. Existing section had asphalt pavement during the time of emission testing.

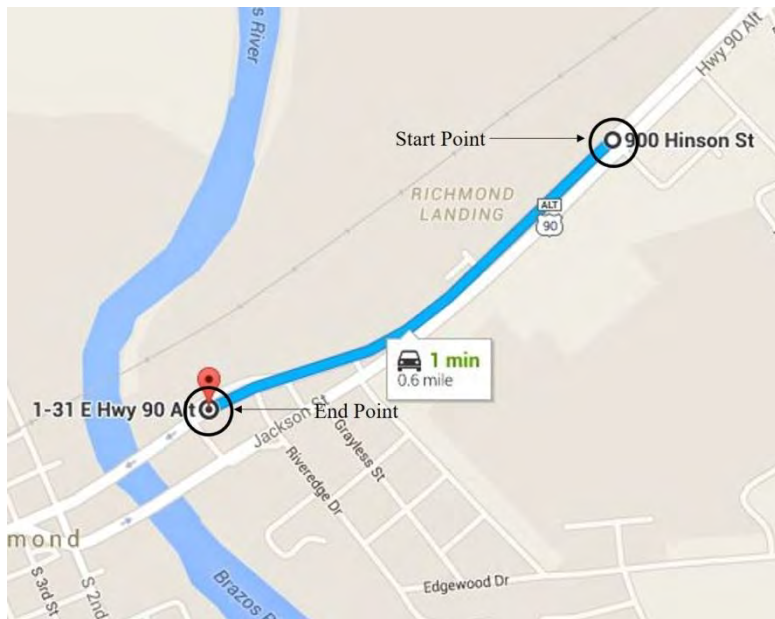


Figure B.36. HOU-07-1 – Location.



Figure B.37. HOU-07-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-8
Test Section: FM 1640 (From Millie St. to FM 2218)
Pavement Type: Asphalt

Figure HOU-8-1 shows the location of the section HOU-8, giving the benchmarks of the starting point (Latitude: 29.557456, Longitude: -95.793372) and ending point (Latitude: 29.558272, Longitude: -95.764815). This section has a length of 1.735 miles, which is located on FM 1640. Existing section had asphalt pavement during the time of emission testing.

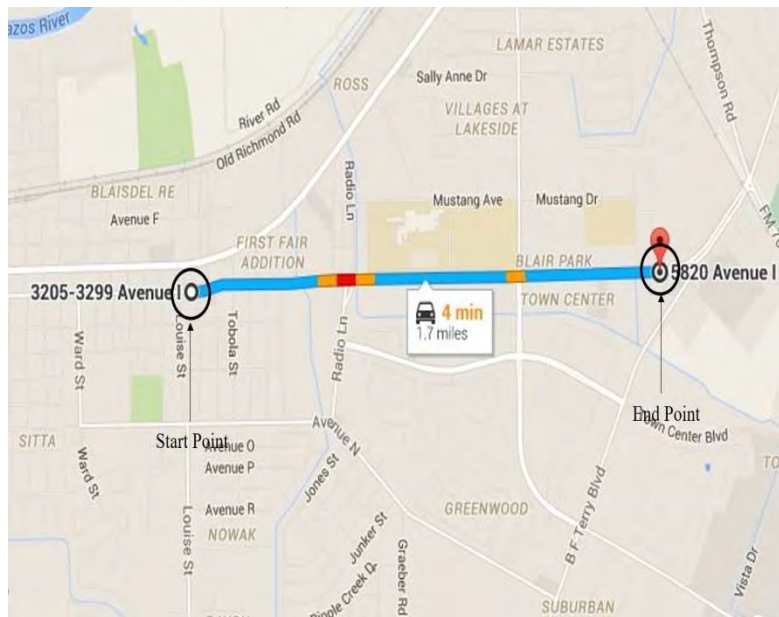


Figure B.38. HOU-08-1- Location.



Figure B.39. HOU-08-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-9
Test Section: FM 521 (From FM 2234 to SH 6)
Pavement Type: Asphalt

Figure HOU-9-1 shows the location of the section HOU-9, giving the benchmarks of the starting point (Latitude: 29.581556, Longitude: -95.431645) and ending point (Latitude: 29.508092, Longitude: -95.461003). This section has a length of 5.528 miles, which is located on FM 521. Existing section had asphalt pavement during the time of emission testing.

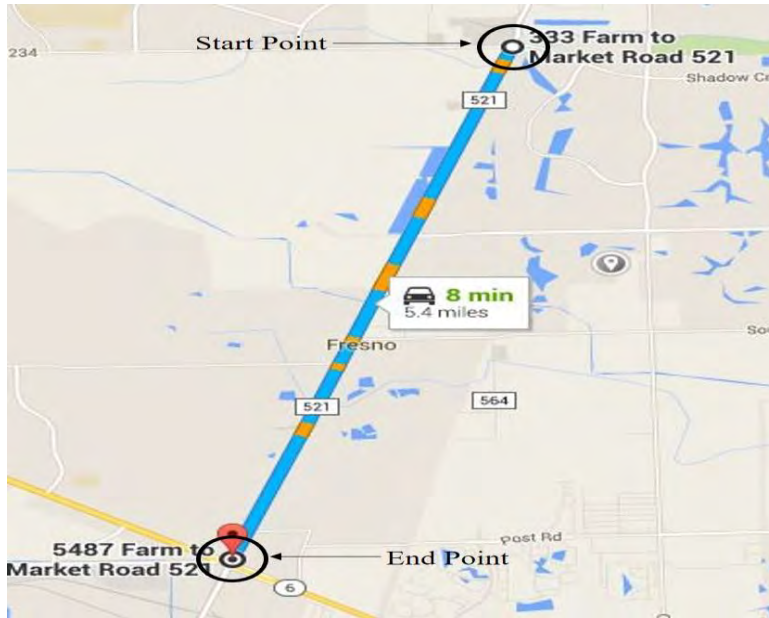


Figure B.40. HOU-09-1- Location.



Figure B.41. HOU-09-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-10
Test Section: IH 45 (From FM 517 to FM 518)
Pavement Type: Asphalt

Figure HOU-10-1 shows the location of the section HOU-10, giving the benchmarks of the starting point (Latitude: 29.452979, Longitude: -95.079951) and ending point (Latitude: 29.499156, Longitude: -95.111533). This section has a length of 3.70 miles, which is located on IH 45. Existing section had asphalt pavement during the time of emission testing.

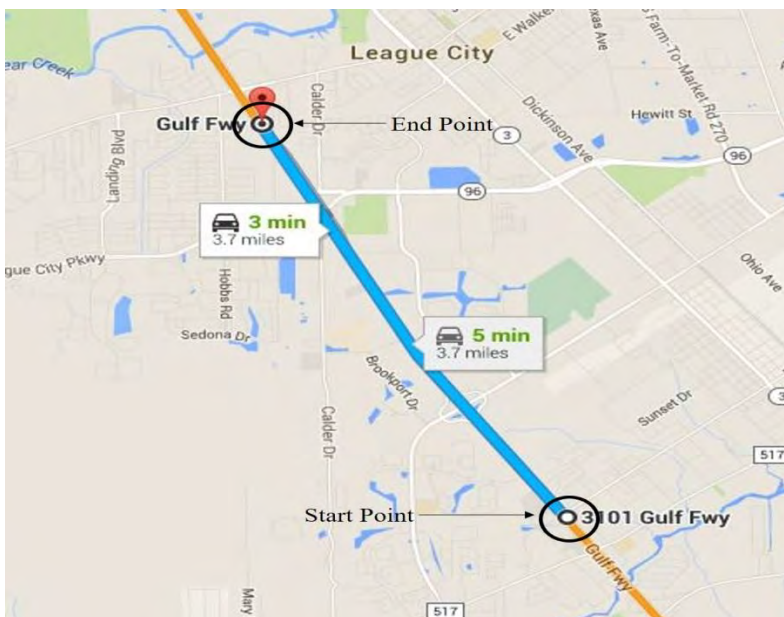


Figure B.42. HOU-10-1- Location.



Figure B.43. HOU-10-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-11
Test Section: IH 45 (From FM 1746 to Texas City 197)
Pavement Type: Asphalt

Figure HOU-11-1 shows the location of the section HOU-11, giving the benchmarks of the starting point (Latitude: 29.399237, Longitude: -95.029692) and ending point (Latitude: 29.330639, Longitude: -94.934299). This section has a length of 7.60 miles, which is located on IH 45. Existing section had asphalt pavement during the time of emission testing.

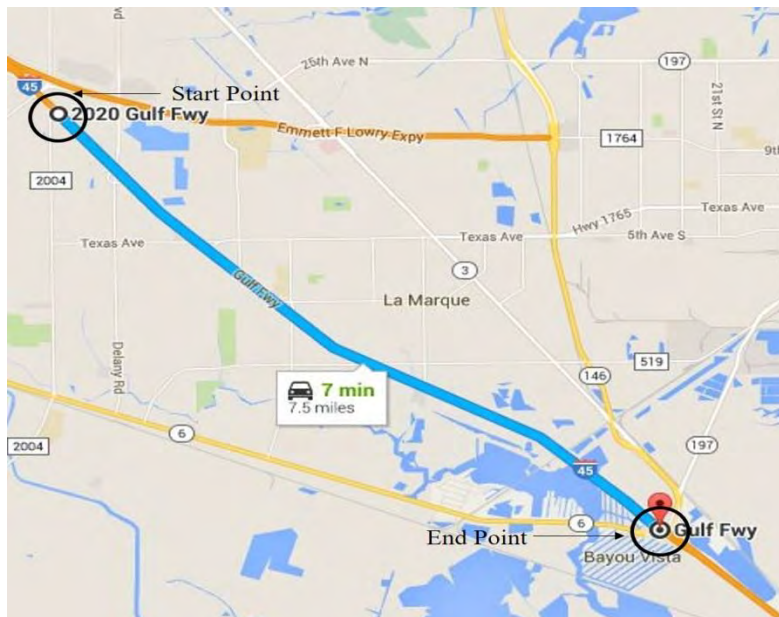


Figure B.44. HOU-11-1- Location.



Figure B.45. HOU-11-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-12
Test Section: FM 523 (From SH 35 to FM 2004)
Pavement Type: Asphalt

Figure HOU-12-1 shows the location of the section HOU-12, giving the benchmarks of the starting point (Latitude: 29.202637, Longitude: -95.394676) and ending point (Latitude: 29.126323, Longitude: -95.385188). This section has a length of 5.70 miles, which is located on FM 523. Existing section had asphalt pavement during the time of emission testing.

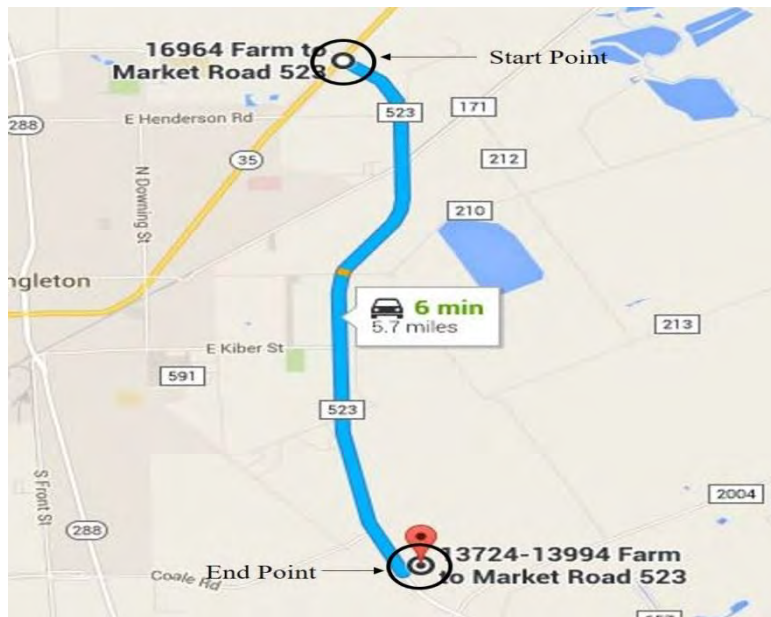


Figure B.46. HOU-12-1- Location.



Figure B.47. HOU-12-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-13

Test Section: FM523 (from FM 2004 to SH 332)

Pavement Type: Asphalt

Figure HOU-13-1 shows the location of the section HOU-13, giving as benchmarks the starting point (Latitude: 29.118564, Longitude: -95.380105) and ending point (Latitude: 28.982179, Longitude: -95.33736). This section has asphalt pavement with a length of 10.6 miles in Farm to Market road 523 in Brazoria county.

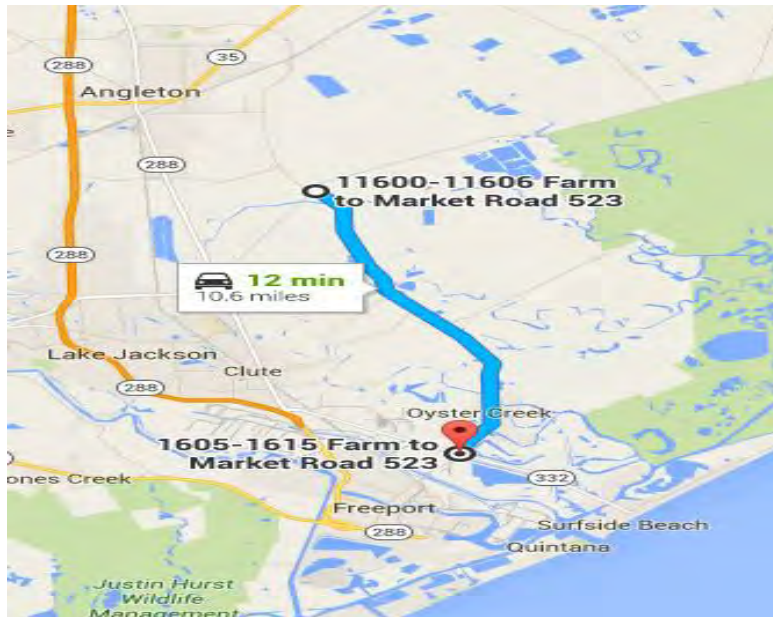


Figure B.48. HOU-12-1- Location.



Figure B.49. HOU-13-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-14
Test Section: SH332 (from FM 521 to FM 2004)
Pavement Type: Asphalt

Figure HOU-14-1 shows the location of the section HOU-14, giving as benchmarks the starting point (Latitude: 29.057513, Longitude: -95.54266) and ending point (Latitude:29.047706, Longitude: -95.471333). This section has asphalt pavement with a length of 4.4 miles in Brazoria road in Brazoria county.

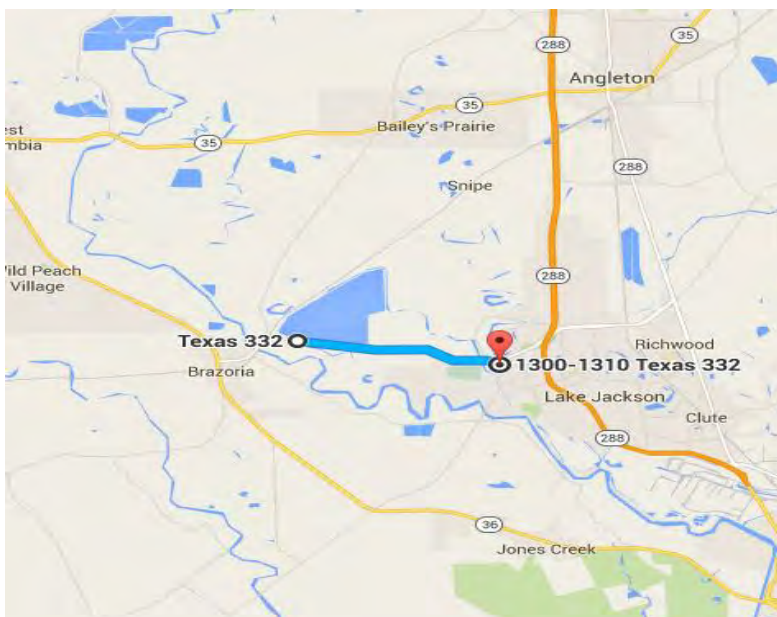


Figure B.50. HOU-14-1- Location.



Figure B.51. HOU-14-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-15

Test Section: FM1128 (from FM 518 to SH 6)

Pavement Type: Asphalt

Figure HOU-15-1 shows the location of the section HOU-15, giving as benchmarks the starting point (Latitude: 29.559186, Longitude: -95.331136) and ending point (Latitude: 29.478324, Longitude: -95.352715). This section has asphalt pavement with a length of 6.13 miles in farm to Market road in Brazoria county.

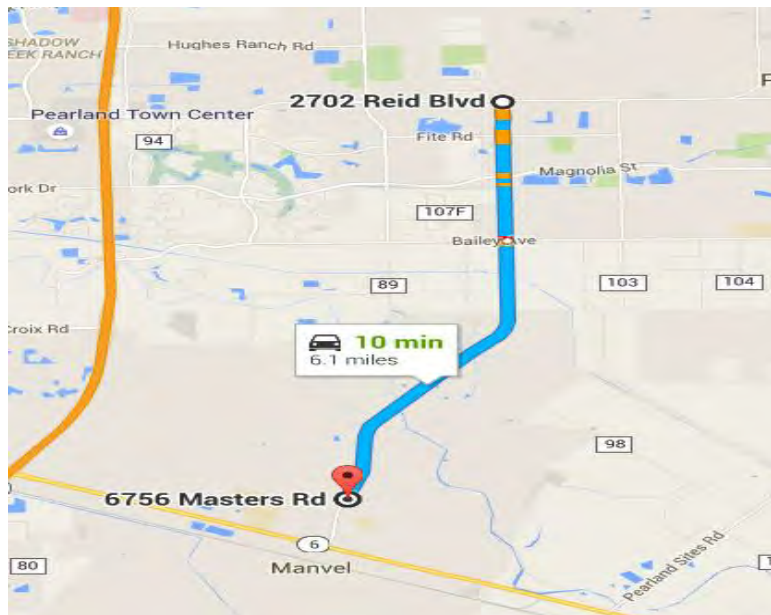


Figure B.52. HOU-15-1- Location.



Figure B.53. HOU-15-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-16

Test Section: IH45 (from TEXAS CITY WYE to FM 1764 (NB ML ONLY))

Pavement Type: Asphalt

Figure HOU-16-1 shows the location of the section HOU-16, giving as benchmarks the starting point (Latitude: 29.341096, Longitude: -94.946431) and ending point (Latitude: 29.399797, Longitude: -95.02988). This section has asphalt pavement with a length of 6.6 miles in IH45 in Galveston county.

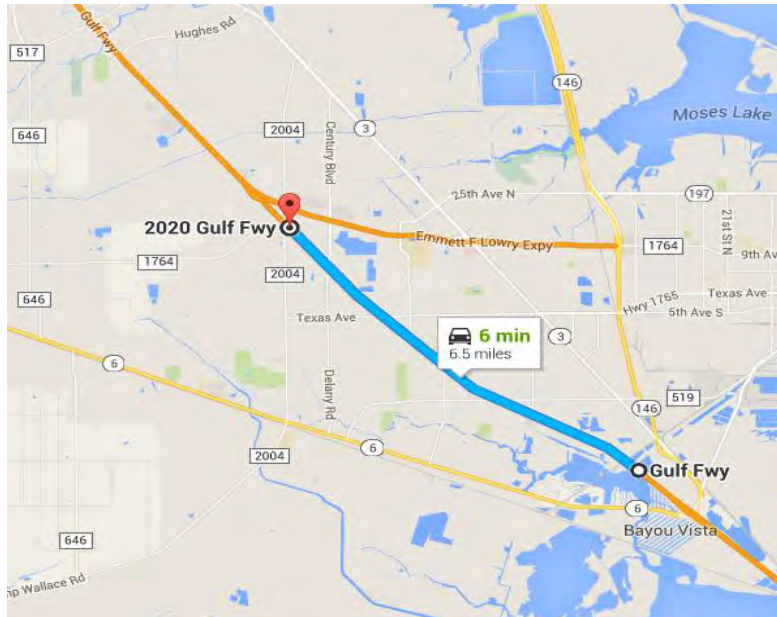


Figure B.54. HOU-16-1- Location.



Figure B.55. HOU-16-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-17

Test Section: FM3083 (from LP 336 NORTH to 0.280 MI N OF FM 1485)

Pavement Type: Asphalt

Figure HOU-17-1 shows the location of the section HOU-17, giving as benchmarks the starting point (Latitude: 30.340411, Longitude: -95.427709) and ending point (Latitude:30.238492, Longitude: -95.300692). This section has asphalt pavement with a length of 10.52 miles in Farm to Market Road 3083.

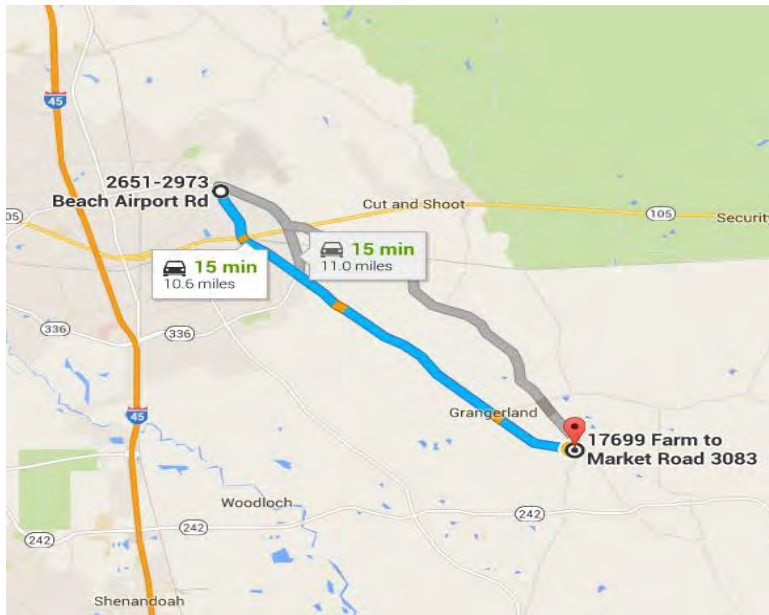


Figure B.56. HOU-17-1- Location.



Figure B.57. HOU-17-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-18
Test Section: FM1097 (from IH 45 to SH 75)
Pavement Type: Asphalt

Figure HOU-18-1 shows the location of the section HOU-18, giving as benchmarks the starting point (Latitude: 30.421064, Longitude: -95.491821) and ending point (Latitude:30.424014, Longitude: -95.479780). This section has asphalt pavement with a length of 0.668 miles in W Montgomery Street.

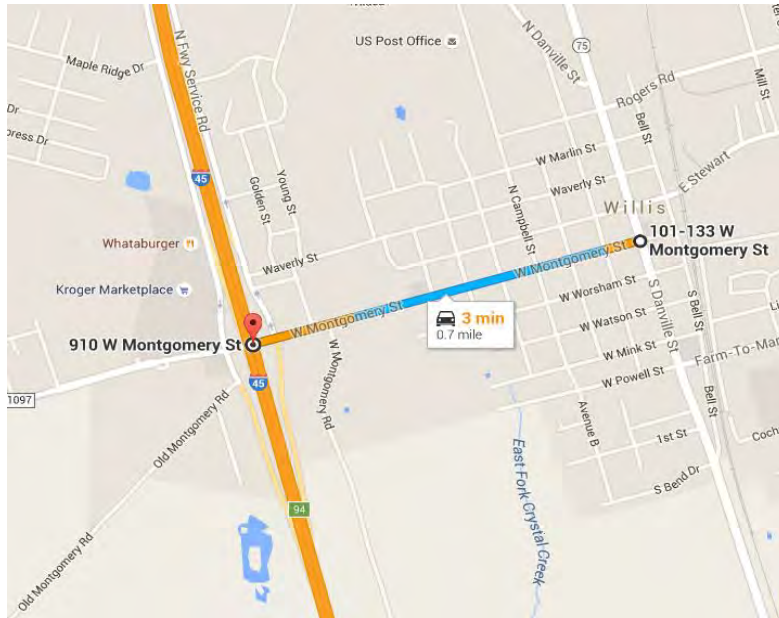


Figure B.58. HOU-18-1- Location.



Figure B.59. HOU-18-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-19
Test Section: SH6 (from FM 2004 to IH 45)
Pavement Type: Asphalt

Figure HOU-19-1 shows the location of the section HOU-19, giving as benchmarks the starting point (Latitude: 29.330755, Longitude: -94.938908) and ending point (Latitude:29.352696, Longitude: -95.030534). This section has asphalt pavement with a length of 5.82 miles in Texas State Highway 6.

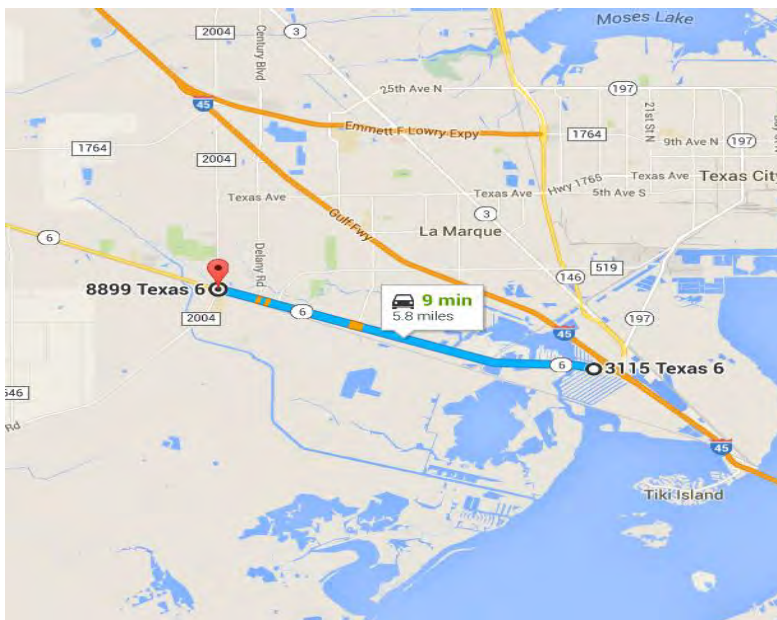


Figure B.60. HOU-19-1- Location.



Figure B.61. HOU-19-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-21
Test Section: FM2920 (from BUS 249 to HOWARD ST)
Pavement Type: Asphalt

Figure HOU-21-1 shows the location of the section HOU-21, giving as benchmarks the starting point (Latitude: 30.089335, Longitude: -95.635973) and ending point (Latitude:30.100533, Longitude: -95.607750). This section has asphalt pavement with a length of 1.66 miles in W Main Street.

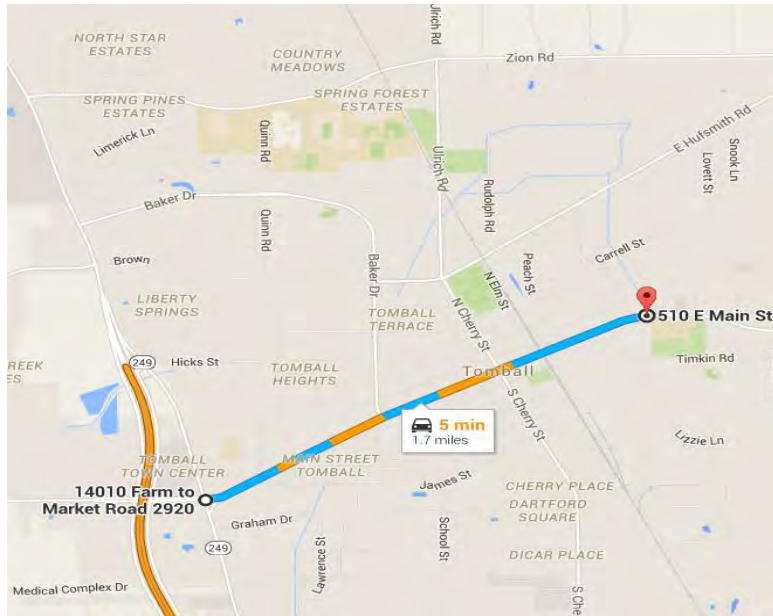


Figure B.62. HOU-21-1- Location.



Figure B.63. HOU-21-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-22

Test Section: FM2920 (from SH 249 NB FRONTAGE ROAD to BUS 249)

Pavement Type: Asphalt

Figure HOU-22-1 shows the location of the section HOU-22, giving as benchmarks the starting point (Latitude: 30.089329, Longitude: -95.635750) and ending point (Latitude:30.089367, Longitude: -95.632540). This section has asphalt pavement with a length of 0.14 miles in waller-Tomball road.

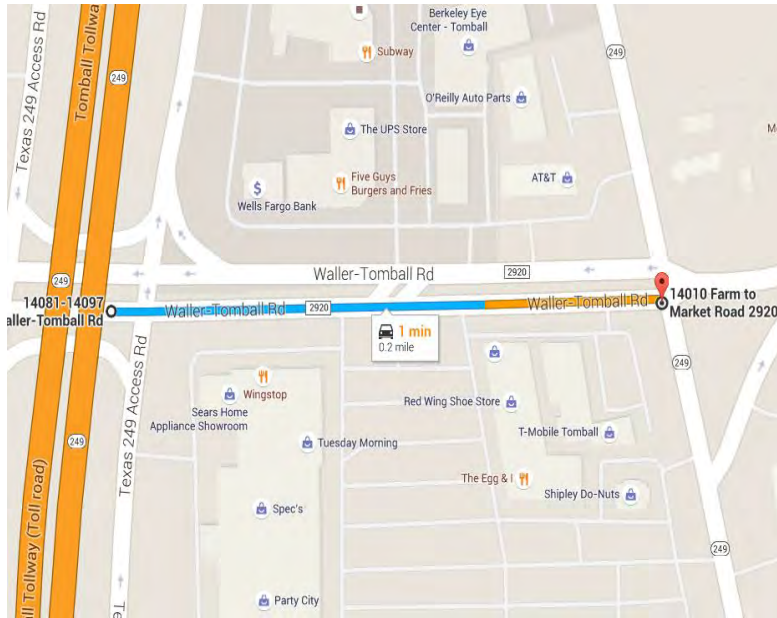


Figure B.64. HOU-22-1- Location.



Figure B.65. HOU-22-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-23

Test Section: BS249B (From 0.28 MI N OF FM 2920 to 1.1 MI S OF FM 2920)

Pavement Type: Asphalt

Figure HOU-23-1 shows the location of the section HOU-23, giving as benchmarks the starting point (Latitude: 30.093822, Longitude: -95.633738) and ending point (Latitude:30.074306, Longitude: -95.627107). This section has asphalt pavement with a length of 1.39 miles in Tomball Parkway.

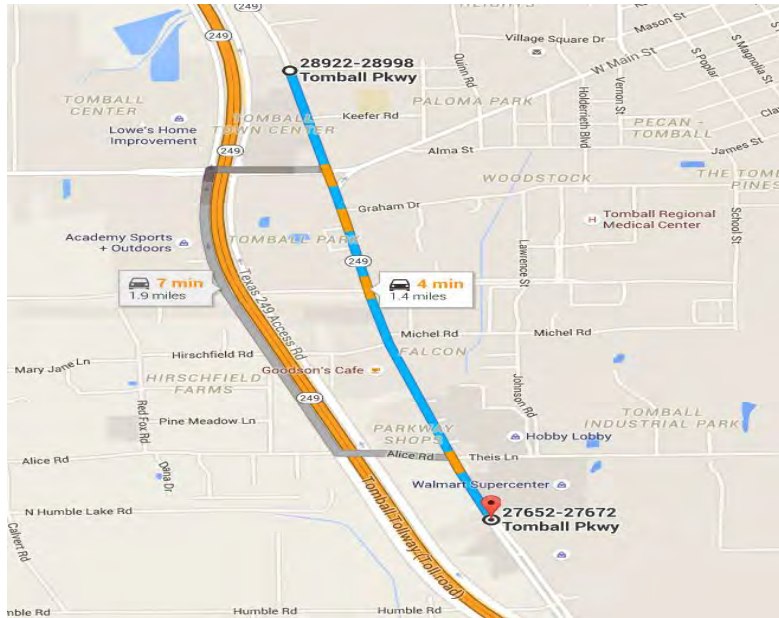


Figure B.66. HOU-23-1- Location.



Figure B.67. HOU-23-2 - Asphalt pavement. (Source: Google)

Project ID: HOU-24
Test Section: US59/69 (between Almeda and S Rice Ave.)
Pavement Type: Concrete

Figure HOU-24-1 shows the location of the section HOU-24, giving as benchmarks the starting point (Latitude: 29.733104 Longitude: -95.374986) and ending point (Latitude: 29.726252 Longitude: -95.468306). This section has concrete pavement with a length of 5.6 miles in freeway.

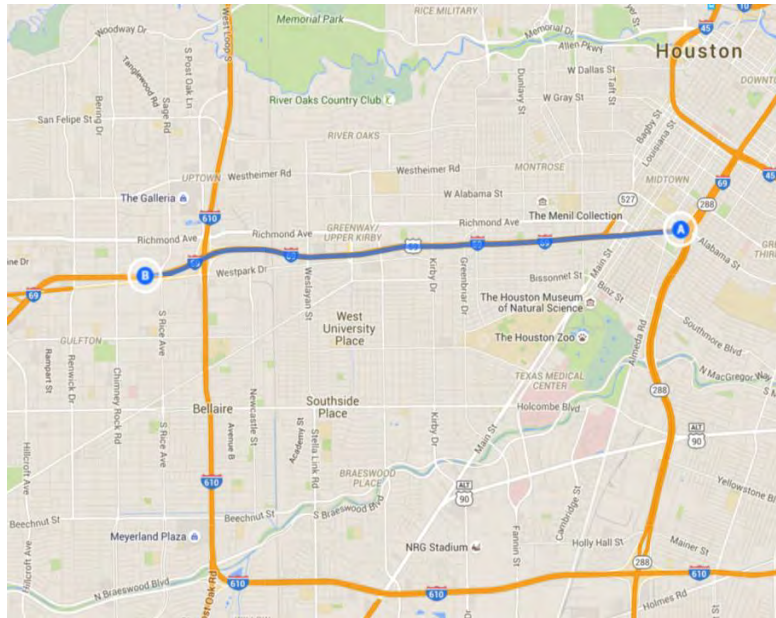


Figure B.68. HOU-24-1- Location.

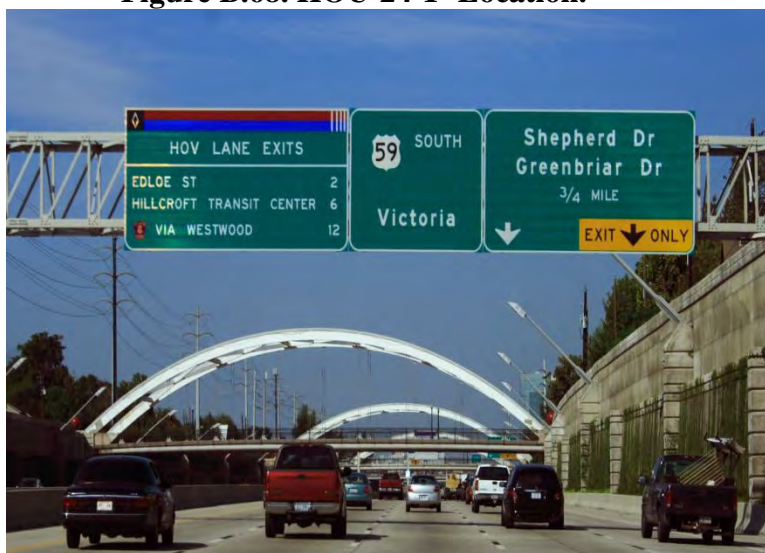


Figure B.69. HOU-24-2 - Concrete pavement. (Source: Google)

Project ID: HOU-25

Test Section: US59/69 (between Rice Ave. and Bissonnet St.)

Pavement Type: Asphalt

Figure HOU-25-1 shows the location of the section HOU-25, giving as benchmarks the starting point (TRM: 0095+28.1, green) and ending point (TRM: 0095+22.2, red). This section has asphalt pavement with a length of 5.9 miles in freeway.

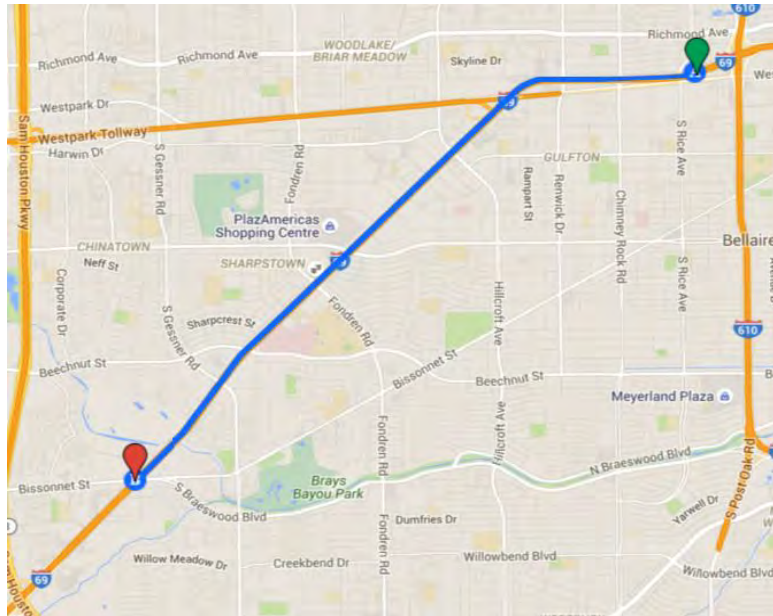


Figure B.70. HOU-25-1- Location.

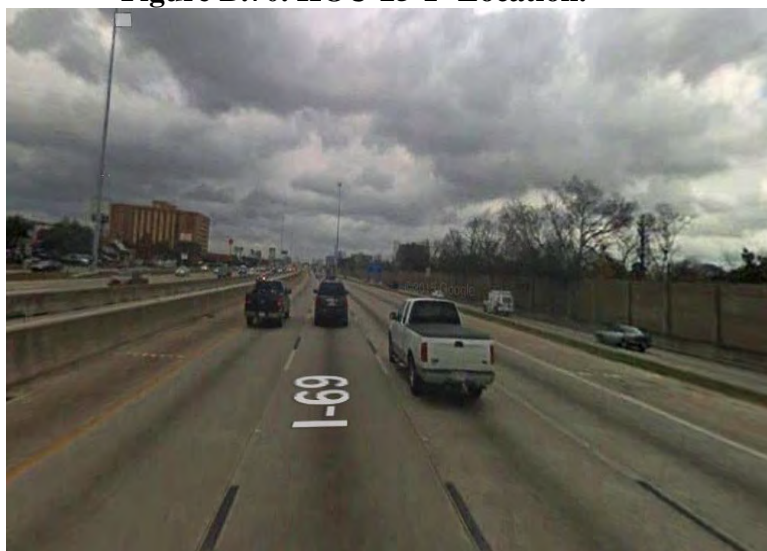


Figure B.71. HOU-25-2: Asphalt pavement. (source: Google earth)

SAN ANTONIO

Project ID: SA
Test Section: TX 16 (From County Line Road to Old Jourdanton Road)
Pavement Type: Concrete

Figure SA-01-1 shows the location of the section SA, giving the benchmarks of the starting point (Latitude: 28.934444, Longitude: -98.558545) and ending point (Latitude: 29.031706, Longitude: -98.576785). This section has a length of 6.90 miles, which is located on TX 16 state highway. Existing section has concrete pavement with different condition scores, distress scores, ride scores, IRI.

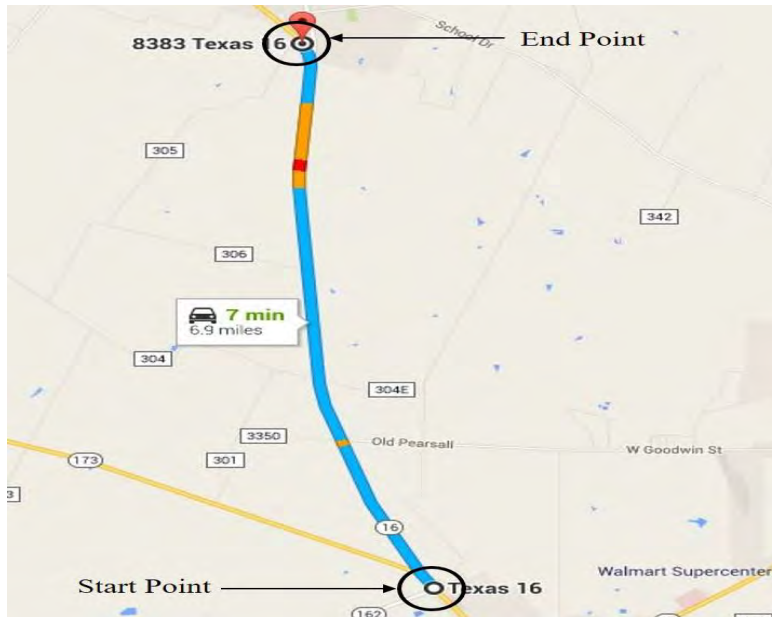


Figure B.72. SA-01-1- Location.



Figure B.73. SA-01-2: Concrete pavement. (source: Google earth)

APPENDIX C
PEMS AND ROUGHNESS DATA

AUSTIN

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R1	Austin	0.10	157.87	143.64	150.76	Poor	196.30	0.07	0.02	0.04	61.97	98.91	61.46	High
AUS-Brunet	R1	Austin	0.20	110.14	115.04	112.59	Fair	225.23	0.05	0.02	0.05	71.08	102.53	63.71	High
AUS-Brunet	R1	Austin	0.30	117.80	120.46	119.13	Fair	245.96	0.08	0.02	0.05	77.73	108.84	67.63	High
AUS-Brunet	R1	Austin	0.40	142.24	138.18	140.21	Poor	202.18	0.13	0.02	0.05	63.96	109.13	67.81	High
AUS-Brunet	R1	Austin	0.50	123.38	145.46	134.42	Poor	197.44	0.14	0.02	0.05	62.50	107.85	67.02	High
AUS-Brunet	R1	Austin	0.60	140.45	170.34	155.40	Poor	230.50	0.13	0.02	0.10	73.05	102.82	63.89	High
AUS-Brunet	R1	Austin	0.70	184.93	184.60	184.76	Very Poor	265.97	0.16	0.02	0.06	84.13	98.43	61.16	High
AUS-Brunet	R1	Austin	0.80	142.41	133.62	138.01	Poor	315.50	0.29	0.02	0.08	99.83	99.18	61.63	High
AUS-Brunet	R1	Austin	0.90	168.59	176.29	172.44	Very Poor	307.88	0.33	0.02	0.17	97.44	101.74	63.22	High
AUS-Brunet	R1	Austin	1.00	145.09	148.46	146.78	Poor	277.23	0.35	0.02	0.15	87.76	103.84	64.52	High
AUS-Brunet	R1	Austin	1.10	120.48	94.27	107.37	Fair	309.13	0.34	0.03	0.12	97.93	105.20	65.37	High
AUS-Brunet	R1	Austin	1.20	99.68	85.35	92.51	Good	296.44	0.24	0.03	0.12	93.74	107.65	66.89	High
AUS-Brunet	R1	Austin	1.30	185.64	122.76	154.20	Poor	265.82	0.12	0.02	0.11	83.88	106.36	66.09	High
AUS-Brunet	R1	Austin	1.40	154.71	168.28	161.49	Poor	376.86	0.18	0.03	0.12	119.03	104.18	64.73	High
AUS-Brunet	R1	Austin	1.50	149.50	185.81	167.66	Poor	394.92	0.32	0.03	0.20	124.89	104.76	65.10	High
AUS-Brunet	R1	Austin	1.60	162.22	169.17	165.69	Poor	335.86	0.29	0.02	0.18	106.25	107.48	66.79	High
AUS-Brunet	R1	Austin	1.70	115.19	119.73	117.46	Fair	307.28	0.19	0.02	0.08	97.20	106.75	66.33	High
AUS-Brunet	R1	Austin	1.80	111.77	112.98	112.37	Fair	341.22	0.15	0.02	0.06	107.83	104.76	65.09	High
AUS-Brunet	R1	Austin	1.90	82.92	72.37	77.64	Good	381.79	0.23	0.02	0.10	120.78	103.13	64.08	High
AUS-Brunet	R1	Austin	2.00	111.58	114.48	113.03	Fair	365.05	0.38	0.02	0.17	115.50	105.68	65.67	High
AUS-Brunet	R1	Austin	2.10	107.13	99.39	103.26	Fair	223.91	0.19	0.02	0.14	70.69	109.28	67.90	High
AUS-Brunet	R1	Austin	2.20	88.42	102.99	95.71	Good	169.47	0.10	0.01	0.02	53.52	111.35	69.19	High
AUS-Brunet	R1	Austin	2.30	84.91	90.49	87.70	Good	296.78	0.19	0.02	0.06	93.85	112.66	70.01	High
AUS-Brunet	R1	Austin	2.40	130.42	121.11	125.77	Fair	255.43	0.27	0.01	0.05	80.83	112.90	70.15	High
AUS-Brunet	R1	Austin	2.50	123.03	146.61	134.82	Poor	224.51	0.31	0.01	0.07	71.16	113.43	70.48	High
AUS-Brunet	R1	Austin	2.60	88.69	120.76	104.72	Fair	55.99	0.10	0.00	0.01	17.68	114.62	71.22	High
AUS-Brunet	R1	Austin	2.70	77.19	71.44	74.31	Good	144.43	0.24	0.01	0.03	45.57	109.71	68.17	High
AUS-Brunet	R1	Austin	2.80	89.33	85.71	87.52	Good	267.71	0.34	0.01	0.17	84.73	105.39	65.49	High
AUS-Brunet	R1	Austin	2.90	98.79	93.75	96.27	Fair	322.91	0.32	0.02	0.20	101.94	102.61	63.76	High
AUS-Brunet	R1	Austin	3.00	159.93	167.34	163.64	Poor	309.77	0.26	0.02	0.15	98.03	106.19	65.99	High
AUS-Brunet	R1	Austin	3.10	101.97	91.82	96.90	Fair	196.61	0.17	0.01	0.07	62.09	109.32	67.93	High
AUS-Brunet	R1	Austin	3.20	83.35	88.70	86.03	Good	192.21	0.17	0.01	0.06	60.67	111.29	69.15	High
AUS-Brunet	R1	Austin	3.30	72.87	68.56	70.71	Good	276.95	0.28	0.03	0.14	87.74	110.48	68.65	High
AUS-Brunet	R1	Austin	3.40	71.81	63.65	67.73	Good	160.20	0.16	0.02	0.12	50.70	111.30	69.16	High
AUS-Brunet	R1	Austin	3.50	104.74	105.52	105.13	Fair	209.49	0.35	0.03	0.16	66.29	109.13	67.81	High
AUS-Brunet	R1	Austin	3.60	85.49	94.13	89.81	Good	224.45	0.37	0.03	0.48	71.10	108.25	67.26	High
AUS-Brunet	R1	Austin	3.70	116.48	122.56	119.52	Fair	129.47	0.24	0.02	0.20	41.05	105.82	65.75	High
AUS-Brunet	R1	Austin	3.80	136.01	129.05	132.53	Poor	129.40	0.29	0.02	0.11	40.95	103.44	64.28	High
AUS-Brunet	R1	Austin	3.90	85.12	86.58	85.85	Good	176.82	0.62	0.02	0.26	55.99	103.49	64.30	High
AUS-Brunet	R1	Austin	4.00	83.95	83.91	83.93	Good	241.25	0.84	0.03	0.31	76.66	104.95	65.21	High
AUS-Brunet	R1	Austin	4.10	80.65	85.17	82.91	Good	235.08	0.65	0.03	0.35	74.53	104.69	65.05	High
AUS-Brunet	R1	Austin	4.20	64.03	66.55	65.29	Good	308.63	0.78	0.04	0.48	97.88	106.01	65.87	High
AUS-Brunet	R1	Austin	4.30	84.82	87.59	86.21	Good	314.94	0.54	0.03	0.39	99.84	109.14	67.82	High
AUS-Brunet	R1	Austin	4.40	85.98	92.57	89.27	Good	281.97	0.40	0.03	0.16	89.35	110.90	68.91	High
AUS-Brunet	R1	Austin	4.50	78.43	87.35	82.89	Good	294.27	0.34	0.04	0.14	93.02	110.03	68.37	High
AUS-Brunet	R1	Austin	4.60	77.59	94.38	85.99	Good	333.64	0.26	0.05	0.14	105.53	108.13	67.19	High
AUS-Brunet	R1	Austin	4.70	82.66	88.42	85.54	Good	370.11	0.28	0.05	0.19	117.09	107.00	66.49	High
AUS-Brunet	R1	Austin	4.80	106.82	120.64	113.73	Fair	375.52	0.46	0.05	0.23	118.92	107.27	66.66	High
AUS-Brunet	R1	Austin	4.90	135.13	127.19	131.16	Poor	347.01	0.41	0.05	0.23	109.91	110.49	68.66	High
AUS-Brunet	R1	Austin	5.00	73.99	89.72	81.86	Good	249.67	0.28	0.04	0.10	79.00	113.69	70.65	High
AUS-Brunet	R1	Austin	5.10	98.02	95.38	96.70	Fair	225.50	0.30	0.04	0.07	71.36	113.68	70.64	High
AUS-Brunet	R1	Austin	5.20	120.22	126.59	123.40	Fair	244.78	0.22	0.04	0.07	77.46	112.27	69.76	High
AUS-Brunet	R1	Austin	5.30	137.04	132.79	134.91	Poor	315.55	0.19	0.05	0.08	99.82	112.19	69.71	High
AUS-Brunet	R1	Austin	5.40	99.43	99.50	99.47	Fair	316.59	0.23	0.05	0.07	100.13	113.00	70.21	High
AUS-Brunet	R1	Austin	5.50	111.27	116.97	114.12	Fair	317.51	0.30	0.05	0.09	100.44	113.05	70.25	High
AUS-Brunet	R1	Austin	5.60	171.97	172.55	172.26	Very Poor	177.15	0.30	0.03	0.05	56.21	114.53	71.16	High
AUS-Brunet	R1	Austin	5.70	130.38	158.44	144.41	Poor	216.93	0.30	0.03	0.07	68.60	113.36	70.44	High
AUS-Brunet	R1	Austin	5.80	98.03	115.62	106.83	Fair	214.22	0.39	0.03	0.11	67.86	116.82	72.59	High
AUS-Brunet	R1	Austin	5.90	112.52	109.51	111.01	Fair	220.68	0.55	0.03	0.07	69.97	117.34	72.91	High
AUS-Brunet	R1	Austin	6.00	79.75	68.09	73.92	Good	229.61	0.52	0.03	0.07	72.78	115.23	71.60	High
AUS-Brunet	R1	Austin	6.10	91.67	75.42	83.54	Good	247.19	0.49	0.04	0.15	78.35	113.33	70.42	High
AUS-Brunet	R1	Austin	6.20	92.64	70.40	81.52	Good	247.43	0.43	0.04	0.17	78.38	111.99	69.59	High
AUS-Brunet	R1	Austin	6.30	80.78	66.19	73.48	Good	263.60	0.43	0.04	0.15	83.65	113.68	70.64	High
AUS-Brunet	R1	Austin	6.40	83.21	65.34	74.28	Good	202.88	0.29	0.03	0.05	64.25	116.74	72.54	High
AUS-Brunet	R1	Austin	6.50	72.93	70.28	71.61	Good	107.36	0.23	0.02	0.03	34.04	112.69	70.02	High
AUS-Brunet	R1	Austin	6.60	71.39	80.76	76.07	Good	280.84	0.45	0.04	0.05	89.02	108.79	67.60	High
AUS-Brunet	R1	Austin	6.70	84.37	84.90	84.64	Good	232.58	0.18	0.03	0.05	73.63	107.58	66.84	High
AUS-Brunet	R1	Austin	6.80	65.23	63.99	64.61	Good	241.03	0.15	0.03	0.04	76.32	106.00	65.87	High
AUS-Brunet	R1	Austin	6.90	72.07	68.50	70.29	Good	312.03	0.15	0.04	0.08	98.73	106.46	66.15	High
AUS-Brunet	R1	Austin	7.00	92.01	93.99	93.00	Good	371.09	0.17	0.05	0.13	117.25	108.26	67.27	High
AUS-Brunet	R1	Austin	7.10	93.00	94.81	93.91	Good	351.97	0.12	0.05	0.16	111.23	111.14	69.06	High
AUS-Brunet	R1	Austin	7.20	136.62	129.26	132.94	Poor	275.42	0.13	0.04	0.07	87.05	114.26	71.00	High
AUS-Brunet	R1	Austin	7.30	71.13	77.48	74.30	Good	81.52	0.44	0.01	0.01	25.91	115.69	71.89	High
AUS-Brunet	R1	Austin	7.40	56.98	74.31	65.65	Good	148.79	0.09	0.02	0.02	47.09	112.87	70.14	High
AUS-Brunet	R1	Austin	7.50	64.92	88.07	76.50	Good	175.01	0.17	0.02	0.02	55.33	114.00	70.84	High
AUS-Brunet	R1	Austin	7.60	67.30	83.80	75.55	Good	103.44	0.22	0.01	0.02	32.83	112.85	70.12	High
AUS-Brunet	R1	Austin	7.70	81.01	74.63	77.82	Good	274.63	0.55	0.03	0.05	86.94	107.98	67.09	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R1	Austin	7.80	72.58	68.63	70.61	Good	335.44	0.45	0.04	0.08	106.31	110.81	68.85	High
AUS-Brunet	R1	Austin	7.90	72.25	76.41	74.33	Good	302.93	0.42	0.04	0.08	95.94	113.60	70.59	High
AUS-Brunet	R1	Austin	8.00	73.22	66.40	69.81	Good	201.37	0.39	0.03	0.06	63.86	113.50	70.52	High
AUS-Brunet	R1	Austin	8.10	162.55	173.90	168.22	Poor	67.70	0.15	0.01	0.02	21.45	109.27	67.89	High
AUS-Brunet	R1	Austin	8.20	67.95	74.87	71.41	Good	206.61	0.40	0.03	0.11	65.54	104.71	65.06	High
AUS-Brunet	R1	Austin	8.30	88.30	90.63	89.47	Good	208.59	0.29	0.03	0.05	65.97	105.00	65.24	High
AUS-Brunet	R1	Austin	8.40	149.97	160.06	155.01	Poor	295.92	0.32	0.04	0.09	93.61	106.40	66.12	High
AUS-Brunet	R1	Austin	8.50	78.57	73.12	75.84	Good	257.62	0.24	0.03	0.10	81.53	110.35	68.57	High
AUS-Brunet	R1	Austin	8.60	152.66	154.44	153.55	Poor	216.35	0.25	0.03	0.06	68.49	109.72	68.18	High
AUS-Brunet	R1	Austin	8.70	115.42	155.14	135.28	Poor	218.54	0.25	0.03	0.08	69.12	109.75	68.19	High
AUS-Brunet	R1	Austin	8.80	102.37	131.72	117.05	Fair	294.04	0.26	0.04	0.21	93.02	108.98	67.72	High
AUS-Brunet	R1	Austin	8.90	109.94	130.27	120.11	Fair	299.25	0.25	0.04	0.09	94.52	108.85	67.64	High
AUS-Brunet	R1	Austin	9.00	100.97	96.75	98.86	Fair	272.26	0.15	0.04	0.05	86.15	108.07	67.15	High
AUS-Brunet	R1	Austin	9.10	87.11	81.25	84.18	Good	313.81	0.05	0.04	0.00	99.29	108.48	67.41	High
AUS-Brunet	R1	Austin	9.20	94.27	89.68	91.98	Good	346.59	0.02	0.05	0.01	109.51	109.99	68.35	High
AUS-Brunet	R1	Austin	9.30	79.92	92.17	86.04	Good	325.62	0.03	0.05	0.00	102.85	110.35	68.57	High
AUS-Brunet	R1	Austin	9.40	96.60	105.61	101.11	Fair	277.56	0.12	0.04	0.00	87.83	112.52	69.92	High
AUS-Brunet	R1	Austin	9.50	87.43	91.55	89.49	Good	83.74	0.09	0.01	0.00	26.40	112.96	70.19	High
AUS-Brunet	R1	Austin	9.60	60.74	63.57	62.15	Good	75.33	0.14	0.01	0.00	23.92	109.82	68.24	High
AUS-Brunet	R1	Austin	9.70	64.12	73.15	68.63	Good	193.85	0.29	0.03	0.00	61.36	110.00	68.35	High
AUS-Brunet	R1	Austin	9.80	57.10	86.71	71.90	Good	359.98	0.41	0.05	0.00	114.02	112.55	69.93	High
AUS-Brunet	R1	Austin	9.90	106.95	109.91	108.43	Fair	341.87	0.45	0.05	0.00	108.38	116.74	72.54	High
AUS-Brunet	R1	Austin	10.00	156.45	152.36	154.41	Poor	284.17	0.60	0.04	0.00	90.03	122.42	76.07	High
AUS-Brunet	R1	Austin	10.10	92.73	92.21	92.47	Good	149.93	0.45	0.02	0.00	47.62	125.75	78.14	High
AUS-Brunet	R1	Austin	10.20	54.43	50.46	52.44	Very Good	237.98	0.91	0.03	0.19	75.67	123.22	76.56	High
AUS-Brunet	R1	Austin	10.30	62.19	58.73	60.46	Good	300.64	1.34	0.04	0.15	95.73	123.40	76.68	High
AUS-Brunet	R1	Austin	10.40	54.39	63.03	58.71	Very Good	298.73	1.48	0.05	0.18	95.08	127.64	79.31	High
AUS-Brunet	R1	Austin	10.50	56.50	69.78	63.14	Good	300.61	1.66	0.05	0.19	95.82	130.39	81.02	High
AUS-Brunet	R1	Austin	10.60	82.86	93.69	88.27	Good	213.46	1.36	0.04	0.09	68.09	132.85	82.55	High
AUS-Brunet	R1	Austin	10.70	144.71	150.07	147.39	Poor	78.74	0.45	0.02	0.04	25.14	131.22	81.54	High
AUS-Brunet	R1	Austin	10.80	69.81	64.52	67.16	Good	166.78	0.38	0.03	0.03	52.96	126.43	78.56	High
AUS-Brunet	R1	Austin	10.90	76.34	75.05	75.69	Good	339.65	1.76	0.06	0.07	108.23	124.79	77.54	High
AUS-Brunet	R1	Austin	11.00	56.08	56.45	56.26	Very Good	317.22	1.87	0.06	0.16	101.17	124.33	77.25	High
AUS-Brunet	R1	Austin	11.10	146.11	147.68	146.90	Poor	306.06	1.58	0.05	0.19	97.54	122.44	76.08	High
AUS-Brunet	R1	Austin	11.20	134.45	140.79	137.62	Poor	313.58	1.22	0.05	0.19	99.59	119.50	74.25	High
AUS-Brunet	R1	Austin	11.30	127.53	127.64	127.58	Fair	288.58	1.30	0.05	0.23	91.80	119.93	74.52	High
AUS-Brunet	R1	Austin	11.40	92.25	97.43	94.84	Good	295.47	1.24	0.05	0.15	93.98	120.00	74.56	High
AUS-Brunet	R1	Austin	11.50	66.52	86.55	76.54	Good	279.74	1.12	0.05	0.15	88.98	119.95	74.54	High
AUS-Brunet	R1	Austin	11.60	55.83	84.35	70.09	Good	307.58	1.15	0.06	0.18	97.79	119.01	73.95	High
AUS-Brunet	R1	Austin	11.70	60.08	74.21	67.15	Good	296.00	1.01	0.06	0.16	94.03	119.80	74.44	High
AUS-Brunet	R1	Austin	11.80	60.51	74.91	67.71	Good	299.66	0.86	0.06	0.22	95.12	120.00	74.56	High
AUS-Brunet	R1	Austin	11.90	72.21	100.24	86.23	Good	247.57	0.62	0.05	0.12	78.55	120.63	74.95	High
AUS-Brunet	R1	Austin	12.00	70.82	75.58	73.20	Good	321.62	0.77	0.06	0.18	102.02	121.24	75.33	High
AUS-Brunet	R1	Austin	12.10	81.86	96.80	89.33	Good	169.29	0.64	0.04	0.06	53.81	122.08	75.86	High
AUS-Brunet	R1	Austin	12.20	61.95	88.99	75.47	Good	300.13	0.77	0.06	0.10	95.26	118.04	73.35	High
AUS-Brunet	R1	Austin	12.30	115.51	117.33	116.42	Fair	303.50	0.92	0.06	0.06	96.36	118.18	73.43	High
AUS-Brunet	R1	Austin	12.40	87.77	78.68	83.22	Good	234.20	0.86	0.05	0.08	74.46	118.85	73.85	High
AUS-Brunet	R1	Austin	12.50	64.67	65.09	64.88	Good	316.25	1.09	0.06	0.32	100.46	118.13	73.40	High
AUS-Brunet	R1	Austin	12.60	63.22	61.74	62.48	Good	344.72	1.17	0.06	0.29	109.56	119.41	74.20	High
AUS-Brunet	R1	Austin	12.70	113.83	114.94	114.39	Fair	141.19	0.81	0.03	0.11	45.09	117.94	73.29	High
AUS-Brunet	R1	Austin	12.80	109.42	111.88	110.65	Fair	9.80	0.24	0.01	0.01	3.24	109.69	68.16	High
AUS-Brunet	R2	Austin	0.10	157.87	143.64	150.76	Poor	202.90	0.21	0.03	0.00	64.20	105.30	65.43	High
AUS-Brunet	R2	Austin	0.20	110.14	115.04	112.59	Fair	134.27	0.09	0.02	0.00	42.53	107.24	66.64	High
AUS-Brunet	R2	Austin	0.30	117.80	120.46	119.13	Fair	310.86	0.25	0.05	0.00	98.29	110.54	68.69	High
AUS-Brunet	R2	Austin	0.40	142.24	138.18	140.21	Poor	319.86	0.37	0.05	0.00	101.05	114.94	71.42	High
AUS-Brunet	R2	Austin	0.50	123.38	145.46	134.42	Poor	306.28	0.53	0.05	0.00	97.01	117.73	73.15	High
AUS-Brunet	R2	Austin	0.60	140.45	170.34	155.40	Poor	268.09	0.80	0.05	0.00	85.10	115.94	72.04	High
AUS-Brunet	R2	Austin	0.70	184.93	184.60	184.76	Very Poor	264.75	0.88	0.05	0.00	84.11	112.06	69.63	High
AUS-Brunet	R2	Austin	0.80	142.41	133.62	138.01	Poor	346.69	1.00	0.06	0.00	110.06	111.74	69.43	High
AUS-Brunet	R2	Austin	0.90	168.59	176.29	172.44	Very Poor	185.21	1.83	0.03	0.00	59.35	112.50	69.91	High
AUS-Brunet	R2	Austin	1.00	145.09	148.46	146.78	Poor	269.68	0.54	0.04	0.04	85.45	110.01	68.36	High
AUS-Brunet	R2	Austin	1.10	120.48	94.27	107.37	Fair	283.29	0.16	0.04	0.04	89.55	110.00	68.35	High
AUS-Brunet	R2	Austin	1.20	99.68	85.35	92.51	Good	291.50	0.02	0.05	0.08	92.05	110.36	68.58	High
AUS-Brunet	R2	Austin	1.30	185.64	122.76	154.20	Poor	314.05	0.00	0.05	0.07	99.19	109.78	68.21	High
AUS-Brunet	R2	Austin	1.40	154.71	168.28	161.49	Poor	362.54	0.12	0.06	0.15	114.64	108.71	67.55	High
AUS-Brunet	R2	Austin	1.50	149.50	185.81	167.66	Poor	337.78	0.25	0.06	0.16	106.93	106.18	65.98	High
AUS-Brunet	R2	Austin	1.60	162.22	169.17	165.69	Poor	366.38	0.35	0.07	0.22	116.05	105.11	65.31	High
AUS-Brunet	R2	Austin	1.70	115.19	119.73	117.46	Fair	326.19	0.36	0.06	0.18	103.30	106.74	66.33	High
AUS-Brunet	R2	Austin	1.80	111.77	112.98	112.37	Fair	341.41	0.42	0.07	0.17	108.09	105.56	65.59	High
AUS-Brunet	R2	Austin	1.90	82.92	72.37	77.64	Good	393.46	0.55	0.08	0.25	124.56	104.12	64.70	High
AUS-Brunet	R2	Austin	2.00	111.58	114.48	113.03	Fair	348.69	0.60	0.07	0.22	110.54	106.33	66.07	High
AUS-Brunet	R2	Austin	2.10	107.13	99.39	103.26	Fair	284.14	0.41	0.06	0.18	90.00	109.70	68.16	High
AUS-Brunet	R2	Austin	2.20	88.42	102.99	95.71	Good	179.15	0.24	0.04	0.03	56.71	113.27	70.38	High
AUS-Brunet	R2	Austin	2.30	84.91	90.49	87.70	Good	169.91	0.44	0.03	0.03	54.04	112.87	70.14	High
AUS-Brunet	R2	Austin	2.40	130.42	121.11	125.77	Fair	244.96	0.47	0.05	0.05	77.62	109.80	68.23	High
AUS-Brunet	R2	Austin	2.50	123.03	146.61	134.82	Poor	211.22	0.53	0.04	0.10	66.95	110.43	68.62	High
AUS-Brunet	R2	Austin	2.60	88.69	120.76	104.72	Fair	67.66	0.22	0.01	0.01	21.46	111.29	69.15	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R2	Austin	2.70	77.19	71.44	74.31	Good	250.58	0.73	0.05	0.09	79.54	111.91	69.54	High
AUS-Brunet	R2	Austin	2.80	89.33	85.71	87.52	Good	294.38	0.68	0.06	0.07	93.51	111.22	69.11	High
AUS-Brunet	R2	Austin	2.90	98.79	93.75	96.27	Fair	298.16	0.50	0.06	0.14	94.35	109.55	68.07	High
AUS-Brunet	R2	Austin	3.00	159.93	167.34	163.64	Poor	200.22	0.29	0.04	0.16	63.40	111.08	69.02	High
AUS-Brunet	R2	Austin	3.10	101.97	91.82	96.90	Fair	117.16	0.27	0.02	0.02	37.09	109.84	68.25	High
AUS-Brunet	R2	Austin	3.20	83.35	88.70	86.03	Good	264.13	0.63	0.05	0.12	83.73	109.65	68.13	High
AUS-Brunet	R2	Austin	3.30	72.87	68.56	70.71	Good	324.56	0.81	0.06	0.18	103.03	114.17	70.94	High
AUS-Brunet	R2	Austin	3.40	71.81	63.65	67.73	Good	144.03	0.44	0.03	0.05	45.68	115.70	71.89	High
AUS-Brunet	R2	Austin	3.50	104.74	105.52	105.13	Fair	207.97	0.71	0.04	0.09	66.15	112.50	69.90	High
AUS-Brunet	R2	Austin	3.60	85.49	94.13	89.81	Good	302.71	0.91	0.06	0.18	96.16	112.88	70.14	High
AUS-Brunet	R2	Austin	3.70	116.48	122.56	119.52	Fair	274.13	0.75	0.05	0.21	86.93	113.52	70.54	High
AUS-Brunet	R2	Austin	3.80	136.01	129.05	132.53	Poor	137.17	0.38	0.03	0.05	43.45	114.00	70.83	High
AUS-Brunet	R2	Austin	3.90	85.12	86.58	85.85	Good	146.50	0.38	0.03	0.02	46.38	111.77	69.45	High
AUS-Brunet	R2	Austin	4.00	83.95	83.91	83.93	Good	168.14	0.40	0.03	0.02	53.32	110.16	68.45	High
AUS-Brunet	R2	Austin	4.10	80.65	85.17	82.91	Good	244.68	0.51	0.05	0.06	77.58	107.12	66.56	High
AUS-Brunet	R2	Austin	4.20	64.03	66.55	65.29	Good	352.53	0.76	0.07	0.18	111.83	109.78	68.22	High
AUS-Brunet	R2	Austin	4.30	84.82	87.59	86.21	Good	322.63	0.72	0.06	0.29	102.21	115.27	71.63	High
AUS-Brunet	R2	Austin	4.40	85.98	92.57	89.27	Good	290.78	0.66	0.06	0.14	92.29	116.77	72.56	High
AUS-Brunet	R2	Austin	4.50	78.43	87.35	82.89	Good	291.81	0.73	0.05	0.15	92.50	117.00	72.70	High
AUS-Brunet	R2	Austin	4.60	77.59	94.38	85.99	Good	310.13	0.76	0.06	0.21	98.37	115.86	71.99	High
AUS-Brunet	R2	Austin	4.70	82.66	88.42	85.54	Good	325.94	0.66	0.06	0.26	103.40	112.89	70.14	High
AUS-Brunet	R2	Austin	4.80	106.82	120.64	113.73	Fair	351.31	0.58	0.07	0.25	111.45	111.45	69.25	High
AUS-Brunet	R2	Austin	4.90	135.13	127.19	131.16	Poor	342.15	0.50	0.06	0.18	108.32	113.15	70.31	High
AUS-Brunet	R2	Austin	5.00	73.99	89.72	81.86	Good	279.10	0.50	0.05	0.10	88.44	116.35	72.30	High
AUS-Brunet	R2	Austin	5.10	98.02	95.38	96.70	Fair	197.91	0.48	0.04	0.05	62.79	117.03	72.72	High
AUS-Brunet	R2	Austin	5.20	120.22	126.59	123.40	Fair	265.85	0.70	0.05	0.11	84.40	115.85	71.98	High
AUS-Brunet	R2	Austin	5.30	137.04	132.79	134.91	Poor	280.87	0.68	0.05	0.12	89.19	116.00	72.08	High
AUS-Brunet	R2	Austin	5.40	99.43	99.50	99.47	Fair	298.18	0.64	0.06	0.15	94.62	115.36	71.68	High
AUS-Brunet	R2	Austin	5.50	111.27	116.97	114.12	Fair	268.69	0.51	0.05	0.15	85.21	114.15	70.93	High
AUS-Brunet	R2	Austin	5.60	171.97	172.55	172.26	Very Poor	160.79	0.28	0.03	0.08	50.88	113.92	70.79	High
AUS-Brunet	R2	Austin	5.70	130.38	158.44	144.41	Poor	165.57	0.23	0.03	0.09	52.55	111.74	69.43	High
AUS-Brunet	R2	Austin	5.80	98.03	115.62	106.83	Fair	252.28	0.21	0.05	0.07	79.96	114.12	70.91	High
AUS-Brunet	R2	Austin	5.90	112.52	109.51	111.01	Fair	281.09	0.13	0.05	0.06	88.90	116.73	72.53	High
AUS-Brunet	R2	Austin	6.00	79.75	68.09	73.92	Good	296.48	0.10	0.06	0.10	93.73	117.31	72.90	High
AUS-Brunet	R2	Austin	6.10	91.67	75.42	83.54	Good	229.71	0.16	0.04	0.17	72.71	116.79	72.57	High
AUS-Brunet	R2	Austin	6.20	92.64	70.40	81.52	Good	210.74	0.19	0.04	0.22	66.71	114.79	71.33	High
AUS-Brunet	R2	Austin	6.30	80.78	66.19	73.48	Good	208.59	0.22	0.04	0.30	66.11	114.54	71.17	High
AUS-Brunet	R2	Austin	6.40	83.21	65.34	74.28	Good	304.40	0.45	0.05	0.46	96.38	116.69	72.51	High
AUS-Brunet	R2	Austin	6.50	72.93	70.28	71.61	Good	234.85	0.50	0.03	0.26	74.51	119.62	74.33	High
AUS-Brunet	R2	Austin	6.60	71.39	80.76	76.07	Good	96.63	0.26	0.02	0.10	30.71	115.45	71.74	High
AUS-Brunet	R2	Austin	6.70	84.37	84.90	84.64	Good	344.06	0.82	0.06	0.60	109.13	109.86	68.27	High
AUS-Brunet	R2	Austin	6.80	65.23	63.99	64.61	Good	248.87	0.58	0.04	0.20	78.93	111.95	69.56	High
AUS-Brunet	R2	Austin	6.90	72.07	68.50	70.29	Good	288.79	0.58	0.05	0.29	91.53	112.00	69.59	High
AUS-Brunet	R2	Austin	7.00	92.01	93.99	93.00	Good	307.22	0.49	0.06	0.21	97.29	111.75	69.44	High
AUS-Brunet	R2	Austin	7.10	93.00	94.81	93.91	Good	326.21	0.51	0.06	0.25	103.32	110.55	68.69	High
AUS-Brunet	R2	Austin	7.20	136.62	129.26	132.94	Poor	297.48	0.45	0.06	0.12	94.09	112.86	70.13	High
AUS-Brunet	R2	Austin	7.30	71.13	77.48	74.30	Good	85.28	0.18	0.02	0.03	26.98	115.24	71.61	High
AUS-Brunet	R2	Austin	7.40	56.98	74.31	65.65	Good	90.46	0.25	0.02	0.02	28.70	109.98	68.34	High
AUS-Brunet	R2	Austin	7.50	64.92	88.07	76.50	Good	266.57	0.44	0.04	0.04	84.43	110.37	68.58	High
AUS-Brunet	R2	Austin	7.60	67.30	83.80	75.55	Good	296.33	0.32	0.05	0.06	93.74	112.99	70.21	High
AUS-Brunet	R2	Austin	7.70	81.01	74.63	77.82	Good	265.38	0.21	0.05	0.08	83.86	112.91	70.16	High
AUS-Brunet	R2	Austin	7.80	72.58	68.63	70.61	Good	361.60	0.30	0.06	0.14	114.45	113.52	70.54	High
AUS-Brunet	R2	Austin	7.90	72.25	76.41	74.33	Good	345.15	0.55	0.06	0.25	109.28	115.38	71.69	High
AUS-Brunet	R2	Austin	8.00	73.22	66.40	69.81	Good	332.60	0.68	0.06	0.19	105.50	115.32	71.66	High
AUS-Brunet	R2	Austin	8.10	162.55	173.90	168.22	Poor	200.66	0.45	0.04	0.10	63.63	115.86	71.99	High
AUS-Brunet	R2	Austin	8.20	67.95	74.87	71.41	Good	241.61	0.58	0.04	0.08	76.63	112.95	70.18	High
AUS-Brunet	R2	Austin	8.30	88.30	90.63	89.47	Good	257.30	0.57	0.04	0.15	81.55	113.00	70.21	High
AUS-Brunet	R2	Austin	8.40	149.97	160.06	155.01	Poor	297.31	0.59	0.05	0.19	94.30	114.19	70.96	High
AUS-Brunet	R2	Austin	8.50	78.57	73.12	75.84	Good	311.32	0.58	0.06	0.10	98.64	115.98	72.07	High
AUS-Brunet	R2	Austin	8.60	152.66	154.44	153.55	Poor	279.98	0.42	0.05	0.12	88.69	115.83	71.97	High
AUS-Brunet	R2	Austin	8.70	115.42	155.14	135.28	Poor	222.72	0.36	0.04	0.10	70.65	117.22	72.84	High
AUS-Brunet	R2	Austin	8.80	102.37	131.72	117.05	Fair	288.76	0.40	0.05	0.15	91.40	114.99	71.45	High
AUS-Brunet	R2	Austin	8.90	109.94	130.27	120.11	Fair	298.01	0.31	0.05	0.16	94.40	113.76	70.69	High
AUS-Brunet	R2	Austin	9.00	100.97	96.75	98.86	Fair	254.19	0.21	0.05	0.19	80.52	112.33	69.80	High
AUS-Brunet	R2	Austin	9.10	87.11	81.25	84.18	Good	313.10	0.20	0.05	0.19	99.07	111.09	69.03	High
AUS-Brunet	R2	Austin	9.20	94.27	89.68	91.98	Good	363.23	0.28	0.06	0.20	114.86	112.52	69.92	High
AUS-Brunet	R2	Austin	9.30	79.92	92.17	86.04	Good	342.62	0.48	0.05	0.21	108.53	113.55	70.56	High
AUS-Brunet	R2	Austin	9.40	96.60	105.61	101.11	Fair	208.28	0.44	0.03	0.08	66.03	113.45	70.50	High
AUS-Brunet	R2	Austin	9.50	87.43	91.55	89.49	Good	263.29	0.58	0.04	0.15	83.48	114.18	70.95	High
AUS-Brunet	R2	Austin	9.60	60.74	63.57	62.15	Good	223.02	0.53	0.03	0.07	70.63	118.12	73.40	High
AUS-Brunet	R2	Austin	9.70	64.12	73.15	68.63	Good	326.06	0.79	0.04	0.15	103.41	121.14	75.27	High
AUS-Brunet	R2	Austin	9.80	57.10	86.71	71.90	Good	247.39	0.71	0.03	0.12	78.44	122.24	75.96	High
AUS-Brunet	R2	Austin	9.90	106.95	109.91	108.43	Fair	267.41	0.77	0.04	0.15	84.78	120.15	74.66	High
AUS-Brunet	R2	Austin	10.00	156.45	152.36	154.41	Poor	248.59	0.66	0.03	0.12	78.81	120.63	74.95	High
AUS-Brunet	R2	Austin	10.10	92.73	92.21	92.47	Good	126.50	0.34	0.02	0.07	40.17	119.65	74.35	High
AUS-Brunet	R2	Austin	10.20	54.43	50.46	52.44	Very Good	215.07	0.53	0.03	0.17	68.31	114.98	71.44	High
AUS-Brunet	R2	Austin	10.30	62.19	58.73	60.46	Good	293.81	0.64	0.04	0.19	93.16	116.50	72.39	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R2	Austin	10.40	54.39	63.03	58.71	Very Good	202.02	0.42	0.03	0.10	64.06	118.00	73.32	High
AUS-Brunet	R2	Austin	10.50	56.50	69.78	63.14	Good	201.22	0.40	0.02	0.09	63.71	117.86	73.23	High
AUS-Brunet	R2	Austin	10.60	82.86	93.69	88.27	Good	234.30	0.49	0.03	0.15	74.15	117.54	73.03	High
AUS-Brunet	R2	Austin	10.70	144.71	150.07	147.39	Poor	297.90	0.67	0.04	0.20	94.50	119.34	74.15	High
AUS-Brunet	R2	Austin	10.80	69.81	64.52	67.16	Good	247.62	0.54	0.03	0.13	78.49	121.63	75.58	High
AUS-Brunet	R2	Austin	10.90	76.34	75.05	75.69	Good	306.84	0.73	0.04	0.18	97.27	119.49	74.25	High
AUS-Brunet	R2	Austin	11.00	56.08	56.45	56.26	Very Good	304.09	0.79	0.04	0.23	96.54	115.58	71.82	High
AUS-Brunet	R2	Austin	11.10	146.11	147.68	146.90	Poor	313.89	0.92	0.03	0.21	99.53	113.56	70.56	High
AUS-Brunet	R2	Austin	11.20	134.45	140.79	137.62	Poor	308.19	0.83	0.03	0.15	97.79	113.27	70.38	High
AUS-Brunet	R2	Austin	11.30	127.53	127.64	127.58	Fair	319.61	0.80	0.04	0.14	101.47	114.09	70.89	High
AUS-Brunet	R2	Austin	11.40	92.25	97.43	94.84	Good	349.70	0.86	0.04	0.14	110.92	116.22	72.22	High
AUS-Brunet	R2	Austin	11.50	66.52	86.55	76.54	Good	254.52	0.97	0.03	0.12	80.86	118.60	73.69	High
AUS-Brunet	R2	Austin	11.60	55.83	84.35	70.09	Good	298.74	1.72	0.04	0.04	95.34	116.38	72.32	High
AUS-Brunet	R2	Austin	11.70	60.08	74.21	67.15	Good	207.76	0.62	0.03	0.00	66.00	116.59	72.45	High
AUS-Brunet	R2	Austin	11.80	60.51	74.91	67.71	Good	139.19	0.25	0.02	0.00	43.97	113.13	70.30	High
AUS-Brunet	R2	Austin	11.90	72.21	100.24	86.23	Good	231.08	0.43	0.04	0.00	73.17	111.43	69.24	High
AUS-Brunet	R2	Austin	12.00	70.82	75.58	73.20	Good	198.27	1.10	0.03	0.00	63.17	114.10	70.90	High
AUS-Brunet	R2	Austin	12.10	81.86	96.80	89.33	Good	250.51	0.89	0.04	0.01	79.63	111.41	69.23	High
AUS-Brunet	R2	Austin	12.20	61.95	88.99	75.47	Good	158.69	0.39	0.03	0.00	50.42	110.30	68.54	High
AUS-Brunet	R2	Austin	12.30	115.51	117.33	116.42	Fair	205.31	0.43	0.04	0.01	65.20	106.74	66.33	High
AUS-Brunet	R2	Austin	12.40	87.77	78.68	83.22	Good	129.84	0.56	0.03	0.00	41.24	105.06	65.28	High
AUS-Brunet	R2	Austin	12.50	64.67	65.09	64.88	Good	368.55	1.36	0.07	0.01	117.23	104.32	64.82	High
AUS-Brunet	R2	Austin	12.60	63.22	61.74	62.48	Good	337.27	0.53	0.06	0.01	106.87	107.13	66.57	High
AUS-Brunet	R2	Austin	12.70	113.83	114.94	114.39	Fair	95.85	0.17	0.02	0.02	30.29	106.28	66.04	High
AUS-Brunet	R2	Austin	12.80	109.42	111.88	110.65	Fair	6.53	0.06	0.00	0.00	1.94	98.71	61.34	High
AUS-Brunet	R3	Austin	0.10	157.87	143.64	150.76	Poor	129.60	0.13	0.02	0.02	40.97	110.76	68.82	High
AUS-Brunet	R3	Austin	0.20	110.14	115.04	112.59	Fair	196.41	0.36	0.03	0.03	62.13	111.00	68.97	High
AUS-Brunet	R3	Austin	0.30	117.80	120.46	119.13	Fair	232.49	0.40	0.04	0.06	73.65	113.45	70.49	High
AUS-Brunet	R3	Austin	0.40	142.24	138.18	140.21	Poor	285.86	0.48	0.04	0.09	90.62	115.52	71.78	High
AUS-Brunet	R3	Austin	0.50	123.38	145.46	134.42	Poor	254.75	0.45	0.04	0.11	80.78	116.70	72.52	High
AUS-Brunet	R3	Austin	0.60	140.45	170.34	155.40	Poor	159.30	0.28	0.03	0.08	50.46	111.33	69.18	High
AUS-Brunet	R3	Austin	0.70	184.93	184.60	184.76	Very Poor	364.21	0.62	0.06	0.30	115.44	107.17	66.59	High
AUS-Brunet	R3	Austin	0.80	142.41	133.62	138.01	Poor	350.09	0.46	0.06	0.21	110.91	110.32	68.55	High
AUS-Brunet	R3	Austin	0.90	168.59	176.29	172.44	Very Poor	190.95	0.28	0.03	0.11	60.55	113.75	70.68	High
AUS-Brunet	R3	Austin	1.00	145.09	148.46	146.78	Poor	252.50	0.61	0.04	0.14	80.04	109.09	67.78	High
AUS-Brunet	R3	Austin	1.10	120.48	94.27	107.37	Fair	249.47	0.67	0.04	0.15	79.17	110.69	68.78	High
AUS-Brunet	R3	Austin	1.20	99.68	85.35	92.51	Good	229.12	0.60	0.03	0.13	72.65	109.86	68.26	High
AUS-Brunet	R3	Austin	1.30	185.64	122.76	154.20	Poor	313.81	0.78	0.05	0.18	99.58	108.03	67.13	High
AUS-Brunet	R3	Austin	1.40	154.71	168.28	161.49	Poor	375.31	0.92	0.06	0.30	119.11	108.00	67.11	High
AUS-Brunet	R3	Austin	1.50	149.50	185.81	167.66	Poor	329.58	0.88	0.05	0.32	104.53	108.18	67.22	High
AUS-Brunet	R3	Austin	1.60	162.22	169.17	165.69	Poor	320.76	0.75	0.05	0.29	101.73	109.63	68.12	High
AUS-Brunet	R3	Austin	1.70	115.19	119.73	117.46	Fair	306.09	0.64	0.05	0.28	97.07	110.29	68.53	High
AUS-Brunet	R3	Austin	1.80	111.77	112.98	112.37	Fair	298.14	1.46	0.05	0.09	94.93	107.03	66.51	High
AUS-Brunet	R3	Austin	1.90	82.92	72.37	77.64	Good	371.95	0.88	0.06	0.14	117.92	105.10	65.31	High
AUS-Brunet	R3	Austin	2.00	111.58	114.48	113.03	Fair	349.51	0.59	0.05	0.31	110.64	107.27	66.66	High
AUS-Brunet	R3	Austin	2.10	107.13	99.39	103.26	Fair	265.66	0.29	0.04	0.09	83.96	110.85	68.88	High
AUS-Brunet	R3	Austin	2.20	88.42	102.99	95.71	Good	195.60	0.15	0.03	0.03	61.89	113.73	70.67	High
AUS-Brunet	R3	Austin	2.30	84.91	90.49	87.70	Good	305.08	0.32	0.04	0.06	96.57	116.85	72.61	High
AUS-Brunet	R3	Austin	2.40	130.42	121.11	125.77	Fair	294.83	0.47	0.04	0.10	93.25	118.00	73.32	High
AUS-Brunet	R3	Austin	2.50	123.03	146.61	134.82	Poor	114.65	0.22	0.02	0.03	36.30	117.34	72.91	High
AUS-Brunet	R3	Austin	2.60	88.69	120.76	104.72	Fair	166.75	0.32	0.03	0.06	52.92	115.44	71.73	High
AUS-Brunet	R3	Austin	2.70	77.19	71.44	74.31	Good	248.12	0.43	0.04	0.12	78.67	116.21	72.21	High
AUS-Brunet	R3	Austin	2.80	89.33	85.71	87.52	Good	237.12	0.39	0.04	0.14	75.12	113.96	70.81	High
AUS-Brunet	R3	Austin	2.90	98.79	93.75	96.27	Fair	339.37	0.51	0.05	0.22	107.44	111.32	69.17	High
AUS-Brunet	R3	Austin	3.00	159.93	167.34	163.64	Poor	136.37	0.84	0.03	0.00	43.53	110.76	68.82	High
AUS-Brunet	R3	Austin	3.10	101.97	91.82	96.90	Fair	309.50	0.41	0.05	0.00	97.97	111.08	69.02	High
AUS-Brunet	R3	Austin	3.20	83.35	88.70	86.03	Good	253.06	0.42	0.04	0.00	80.25	118.28	73.50	High
AUS-Brunet	R3	Austin	3.30	72.87	68.56	70.71	Good	247.34	0.94	0.04	0.00	78.74	120.00	74.56	High
AUS-Brunet	R3	Austin	3.40	71.81	63.65	67.73	Good	125.66	0.62	0.02	0.00	40.03	118.93	73.90	High
AUS-Brunet	R3	Austin	3.50	104.74	105.52	105.13	Fair	209.94	1.07	0.03	0.00	66.84	115.06	71.49	High
AUS-Brunet	R3	Austin	3.60	85.49	94.13	89.81	Good	310.94	1.41	0.05	0.00	98.94	115.69	71.89	High
AUS-Brunet	R3	Austin	3.70	116.48	122.56	119.52	Fair	235.72	0.98	0.04	0.00	75.06	116.86	72.62	High
AUS-Brunet	R3	Austin	3.80	136.01	129.05	132.53	Poor	148.82	1.09	0.03	0.01	47.59	115.44	71.73	High
AUS-Brunet	R3	Austin	3.90	85.12	86.58	85.85	Good	103.17	0.15	0.02	0.00	32.68	112.53	69.92	High
AUS-Brunet	R3	Austin	4.00	83.95	83.91	83.93	Good	261.51	0.30	0.04	0.01	82.69	111.46	69.26	High
AUS-Brunet	R3	Austin	4.10	80.65	85.17	82.91	Good	301.88	0.36	0.04	0.10	95.47	112.57	69.95	High
AUS-Brunet	R3	Austin	4.20	64.03	66.55	65.29	Good	298.76	0.47	0.05	0.06	94.53	114.40	71.08	High
AUS-Brunet	R3	Austin	4.30	84.82	87.59	86.21	Good	306.91	0.56	0.05	0.24	97.30	116.01	72.08	High
AUS-Brunet	R3	Austin	4.40	85.98	92.57	89.27	Good	219.70	0.49	0.04	0.08	69.62	116.17	72.19	High
AUS-Brunet	R3	Austin	4.50	78.43	87.35	82.89	Good	246.23	0.51	0.05	0.18	78.07	112.81	70.10	High
AUS-Brunet	R3	Austin	4.60	77.59	94.38	85.99	Good	323.91	0.56	0.06	0.21	102.62	110.90	68.91	High
AUS-Brunet	R3	Austin	4.70	82.66	88.42	85.54	Good	363.24	0.48	0.07	0.19	114.89	109.12	67.81	High
AUS-Brunet	R3	Austin	4.80	106.82	120.64	113.73	Fair	384.86	0.58	0.07	0.21	121.99	109.55	68.07	High
AUS-Brunet	R3	Austin	4.90	135.13	127.19	131.16	Poor	345.70	0.56	0.06	0.25	109.46	113.08	70.26	High
AUS-Brunet	R3	Austin	5.00	73.99	89.72	81.86	Good	191.11	0.30	0.03	0.10	60.59	116.73	72.53	High
AUS-Brunet	R3	Austin	5.10	98.02	95.38	96.70	Fair	236.80	0.42	0.04	0.07	74.99	115.22	71.59	High
AUS-Brunet	R3	Austin	5.20	120.22	126.59	123.40	Fair	263.57	0.56	0.04	0.10	83.59	115.00	71.46	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R3	Austin	5.30	137.04	132.79	134.91	Poor	304.46	0.64	0.05	0.16	96.47	114.68	71.26	High
AUS-Brunet	R3	Austin	5.40	99.43	99.50	99.47	Fair	360.96	0.87	0.05	0.18	114.41	116.85	72.61	High
AUS-Brunet	R3	Austin	5.50	111.27	116.97	114.12	Fair	248.30	0.74	0.03	0.15	78.80	118.80	73.82	High
AUS-Brunet	R3	Austin	5.60	171.97	172.55	172.26	Very Poor	85.83	0.27	0.01	0.05	27.28	116.81	72.58	High
AUS-Brunet	R3	Austin	5.70	130.38	158.44	144.41	Poor	163.79	0.49	0.03	0.02	52.03	111.69	69.40	High
AUS-Brunet	R3	Austin	5.80	98.03	115.62	106.83	Fair	305.56	0.74	0.05	0.05	96.94	115.44	71.73	High
AUS-Brunet	R3	Austin	5.90	112.52	109.51	111.01	Fair	334.73	0.88	0.05	0.11	106.22	120.46	74.85	High
AUS-Brunet	R3	Austin	6.00	79.75	68.09	73.92	Good	332.08	1.56	0.05	0.18	105.63	124.02	77.06	High
AUS-Brunet	R3	Austin	6.10	91.67	75.42	83.54	Good	182.83	0.81	0.03	0.15	58.10	124.45	77.33	High
AUS-Brunet	R3	Austin	6.20	92.64	70.40	81.52	Good	223.48	1.06	0.03	0.10	71.23	121.81	75.69	High
AUS-Brunet	R3	Austin	6.30	80.78	66.19	73.48	Good	92.18	0.53	0.01	0.02	29.42	119.03	73.96	High
AUS-Brunet	R3	Austin	6.40	83.21	65.34	74.28	Good	294.27	1.60	0.04	0.18	93.83	116.04	72.11	High
AUS-Brunet	R3	Austin	6.50	72.93	70.28	71.61	Good	349.12	1.62	0.05	0.29	111.09	119.69	74.37	High
AUS-Brunet	R3	Austin	6.60	71.39	80.76	76.07	Good	233.81	0.99	0.04	0.13	74.34	121.81	75.69	High
AUS-Brunet	R3	Austin	6.70	84.37	84.90	84.64	Good	218.46	0.85	0.03	0.11	69.50	118.15	73.42	High
AUS-Brunet	R3	Austin	6.80	65.23	63.99	64.61	Good	295.22	0.91	0.05	0.18	93.70	116.29	72.26	High
AUS-Brunet	R3	Austin	6.90	72.07	68.50	70.29	Good	272.86	0.69	0.04	0.23	86.51	116.72	72.53	High
AUS-Brunet	R3	Austin	7.00	92.01	93.99	93.00	Good	330.12	0.67	0.04	0.16	104.64	116.08	72.13	High
AUS-Brunet	R3	Austin	7.10	93.00	94.81	93.91	Good	234.01	0.40	0.03	0.11	74.11	116.64	72.48	High
AUS-Brunet	R3	Austin	7.20	136.62	129.26	132.94	Poor	310.65	0.46	0.03	0.13	98.41	115.56	71.81	High
AUS-Brunet	R3	Austin	7.30	71.13	77.48	74.30	Good	190.91	0.27	0.02	0.06	60.48	118.98	73.93	High
AUS-Brunet	R3	Austin	7.40	56.98	74.31	65.65	Good	159.78	0.25	0.02	0.08	50.69	118.57	73.68	High
AUS-Brunet	R3	Austin	7.50	64.92	88.07	76.50	Good	263.96	0.48	0.03	0.09	83.65	120.23	74.71	High
AUS-Brunet	R3	Austin	7.60	67.30	83.80	75.55	Good	341.91	0.73	0.03	0.18	108.34	122.53	76.13	High
AUS-Brunet	R3	Austin	7.70	81.01	74.63	77.82	Good	314.07	0.75	0.03	0.17	99.55	123.80	76.92	High
AUS-Brunet	R3	Austin	7.80	72.58	68.63	70.61	Good	321.77	0.75	0.03	0.17	102.08	125.42	77.93	High
AUS-Brunet	R3	Austin	7.90	72.25	76.41	74.33	Good	327.92	0.75	0.03	0.18	103.87	124.66	77.46	High
AUS-Brunet	R3	Austin	8.00	73.22	66.40	69.81	Good	336.37	0.69	0.03	0.18	106.60	123.37	76.66	High
AUS-Brunet	R3	Austin	8.10	162.55	173.90	168.22	Poor	278.75	0.56	0.03	0.09	88.37	124.43	77.31	High
AUS-Brunet	R3	Austin	8.20	67.95	74.87	71.41	Good	297.09	0.61	0.03	0.09	94.23	125.78	78.15	High
AUS-Brunet	R3	Austin	8.30	88.30	90.63	89.47	Good	272.08	0.54	0.03	0.09	86.25	126.00	78.29	High
AUS-Brunet	R3	Austin	8.40	149.97	160.06	155.01	Poor	296.34	0.60	0.03	0.18	93.98	125.80	78.17	High
AUS-Brunet	R3	Austin	8.50	78.57	73.12	75.84	Good	305.70	0.70	0.03	0.15	96.89	127.43	79.18	High
AUS-Brunet	R3	Austin	8.60	152.66	154.44	153.55	Poor	248.44	0.62	0.02	0.09	78.78	125.11	77.74	High
AUS-Brunet	R3	Austin	8.70	115.42	155.14	135.28	Poor	254.34	0.67	0.02	0.24	80.59	126.22	78.43	High
AUS-Brunet	R3	Austin	8.80	102.37	131.72	117.05	Fair	322.47	0.83	0.03	0.34	102.44	125.82	78.18	High
AUS-Brunet	R3	Austin	8.90	109.94	130.27	120.11	Fair	318.73	0.64	0.03	0.18	100.94	124.78	77.53	High
AUS-Brunet	R3	Austin	9.00	100.97	96.75	98.86	Fair	319.80	0.35	0.03	0.14	101.19	124.01	77.06	High
AUS-Brunet	R3	Austin	9.10	87.11	81.25	84.18	Good	327.01	0.14	0.02	0.24	103.22	124.88	77.60	High
AUS-Brunet	R3	Austin	9.20	94.27	89.68	91.98	Good	344.42	0.07	0.02	0.30	108.88	125.79	78.16	High
AUS-Brunet	R3	Austin	9.30	79.92	92.17	86.04	Good	317.96	0.05	0.02	0.26	100.41	124.56	77.40	High
AUS-Brunet	R3	Austin	9.40	96.60	105.61	101.11	Fair	266.34	0.03	0.01	0.15	84.19	124.00	77.05	High
AUS-Brunet	R3	Austin	9.50	87.43	91.55	89.49	Good	251.19	0.09	0.01	0.28	79.44	124.17	77.16	High
AUS-Brunet	R3	Austin	9.60	60.74	63.57	62.15	Good	165.04	0.07	0.00	0.14	52.04	127.15	79.01	High
AUS-Brunet	R3	Austin	9.70	64.12	73.15	68.63	Good	162.52	0.19	0.00	0.11	51.42	128.36	79.76	High
AUS-Brunet	R3	Austin	9.80	57.10	86.71	71.90	Good	268.15	1.36	0.00	0.32	85.33	126.83	78.81	High
AUS-Brunet	R3	Austin	9.90	106.95	109.91	108.43	Fair	281.31	1.04	0.00	0.20	89.34	125.35	77.89	High
AUS-Brunet	R3	Austin	10.00	156.45	152.36	154.41	Poor	284.09	0.90	0.00	0.25	90.17	125.57	78.02	High
AUS-Brunet	R3	Austin	10.10	92.73	92.21	92.47	Good	180.55	0.50	0.00	0.19	57.21	125.67	78.09	High
AUS-Brunet	R3	Austin	10.20	54.43	50.46	52.44	Very Good	233.62	0.44	0.01	0.13	74.01	123.99	77.04	High
AUS-Brunet	R3	Austin	10.30	62.19	58.73	60.46	Good	274.32	0.39	0.02	0.11	86.88	123.71	76.87	High
AUS-Brunet	R3	Austin	10.40	54.39	63.03	58.71	Very Good	214.35	0.31	0.02	0.13	67.87	125.41	77.93	High
AUS-Brunet	R3	Austin	10.50	56.50	69.78	63.14	Good	231.79	0.33	0.02	0.07	73.36	124.38	77.28	High
AUS-Brunet	R3	Austin	10.60	82.86	93.69	88.27	Good	176.25	0.34	0.02	0.09	55.82	125.32	77.87	High
AUS-Brunet	R3	Austin	10.70	144.71	150.07	147.39	Poor	229.39	1.08	0.02	0.04	72.97	123.18	76.54	High
AUS-Brunet	R3	Austin	10.80	69.81	64.52	67.16	Good	267.23	1.47	0.03	0.07	85.17	124.83	77.57	High
AUS-Brunet	R3	Austin	10.90	76.34	75.05	75.69	Good	315.48	1.70	0.03	0.16	100.59	125.84	78.20	High
AUS-Brunet	R3	Austin	11.00	56.08	56.45	56.26	Very Good	278.46	1.55	0.03	0.18	88.78	123.61	76.81	High
AUS-Brunet	R3	Austin	11.10	146.11	147.68	146.90	Poor	291.02	1.52	0.03	0.24	92.69	119.55	74.28	High
AUS-Brunet	R3	Austin	11.20	134.45	140.79	137.62	Poor	276.35	1.12	0.02	0.34	87.91	116.83	72.60	High
AUS-Brunet	R3	Austin	11.30	127.53	127.64	127.58	Fair	270.50	0.78	0.02	0.15	85.89	115.20	71.58	High
AUS-Brunet	R3	Austin	11.40	92.25	97.43	94.84	Good	332.15	0.71	0.03	0.13	105.22	115.44	71.73	High
AUS-Brunet	R3	Austin	11.50	66.52	86.55	76.54	Good	310.87	0.64	0.03	0.14	98.64	117.77	73.18	High
AUS-Brunet	R3	Austin	11.60	55.83	84.35	70.09	Good	157.05	0.40	0.01	0.06	49.88	118.00	73.32	High
AUS-Brunet	R3	Austin	11.70	60.08	74.21	67.15	Good	165.96	0.79	0.02	0.10	52.83	111.19	69.09	High
AUS-Brunet	R3	Austin	11.80	60.51	74.91	67.71	Good	309.83	0.84	0.03	0.15	98.22	109.63	68.12	High
AUS-Brunet	R3	Austin	11.90	72.21	100.24	86.23	Good	324.73	0.79	0.03	0.17	102.89	113.95	70.80	High
AUS-Brunet	R3	Austin	12.00	70.82	75.58	73.20	Good	330.19	0.90	0.03	0.13	104.86	119.56	74.29	High
AUS-Brunet	R3	Austin	12.10	81.86	96.80	89.33	Good	205.68	0.84	0.02	0.08	65.40	120.60	74.94	High
AUS-Brunet	R3	Austin	12.20	61.95	88.99	75.47	Good	263.36	1.39	0.02	0.20	83.86	119.22	74.08	High
AUS-Brunet	R3	Austin	12.30	115.51	117.33	116.42	Fair	211.28	0.93	0.02	0.12	67.25	117.66	73.11	High
AUS-Brunet	R3	Austin	12.40	87.77	78.68	83.22	Good	209.83	0.71	0.02	0.07	66.79	116.22	72.22	High
AUS-Brunet	R3	Austin	12.50	64.67	65.09	64.88	Good	229.26	0.54	0.02	0.17	72.75	115.98	72.06	High
AUS-Brunet	R3	Austin	12.60	63.22	61.74	62.48	Good	239.30	0.46	0.02	0.25	75.91	114.23	70.98	High
AUS-Brunet	R3	Austin	12.70	113.83	114.94	114.39	Fair	17.05	0.08	0.00	0.01	5.50	106.89	66.42	High
AUS-Brunet	R3	Austin	12.80	109.42	111.88	110.65	Fair	129.50	0.38	0.02	0.05	41.21	95.19	59.15	Medium
AUS-Brunet	R4	Austin	0.10	157.87	143.64	150.76	Poor	63.39	0.11	0.01	0.04	20.03	103.25	64.16	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Codition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R4	Austin	0.20	110.14	115.04	112.59	Fair	120.33	0.20	0.01	0.02	38.12	101.86	63.29	High
AUS-Brunet	R4	Austin	0.30	117.80	120.46	119.13	Fair	282.06	0.32	0.03	0.08	89.32	105.68	65.67	High
AUS-Brunet	R4	Austin	0.40	142.24	138.18	140.21	Poor	190.48	0.13	0.02	0.03	60.17	109.87	68.27	High
AUS-Brunet	R4	Austin	0.50	123.38	145.46	134.42	Poor	200.16	0.11	0.02	0.14	63.28	109.79	68.22	High
AUS-Brunet	R4	Austin	0.60	140.45	170.34	155.40	Poor	232.54	0.27	0.02	0.18	73.48	105.54	65.58	High
AUS-Brunet	R4	Austin	0.70	184.93	184.60	184.76	Very Poor	293.04	0.48	0.03	0.24	92.72	103.28	64.17	High
AUS-Brunet	R4	Austin	0.80	142.41	133.62	138.01	Poor	310.71	0.50	0.03	0.28	98.45	104.60	65.00	High
AUS-Brunet	R4	Austin	0.90	168.59	176.29	172.44	Very Poor	268.06	0.33	0.03	0.17	84.92	106.77	66.34	High
AUS-Brunet	R4	Austin	1.00	145.09	148.46	146.78	Poor	267.43	0.19	0.03	0.12	84.64	107.11	66.56	High
AUS-Brunet	R4	Austin	1.10	120.48	94.27	107.37	Fair	242.53	0.12	0.03	0.07	76.62	108.00	67.11	High
AUS-Brunet	R4	Austin	1.20	99.68	85.35	92.51	Good	168.57	0.22	0.02	0.07	53.24	105.97	65.85	High
AUS-Brunet	R4	Austin	1.30	185.64	122.76	154.20	Poor	284.77	0.31	0.04	0.04	90.17	104.00	64.62	High
AUS-Brunet	R4	Austin	1.40	154.71	168.28	161.49	Poor	326.92	0.25	0.05	0.06	103.47	102.94	63.96	High
AUS-Brunet	R4	Austin	1.50	149.50	185.81	167.66	Poor	305.29	0.19	0.04	0.07	96.50	101.74	63.22	High
AUS-Brunet	R4	Austin	1.60	162.22	169.17	165.69	Poor	324.58	0.15	0.04	0.08	102.65	101.07	62.80	High
AUS-Brunet	R4	Austin	1.70	115.19	119.73	117.46	Fair	286.17	0.07	0.04	0.05	90.42	103.17	64.11	High
AUS-Brunet	R4	Austin	1.80	111.77	112.98	112.37	Fair	254.01	0.03	0.04	0.06	80.31	101.33	62.96	High
AUS-Brunet	R4	Austin	1.90	82.92	72.37	77.64	Good	362.15	0.16	0.05	0.08	114.53	99.05	61.55	High
AUS-Brunet	R4	Austin	2.00	111.58	114.48	113.03	Fair	347.92	0.44	0.05	0.20	110.15	102.48	63.68	High
AUS-Brunet	R4	Austin	2.10	107.13	99.39	103.26	Fair	73.25	0.26	0.01	0.07	23.41	105.24	65.39	High
AUS-Brunet	R4	Austin	2.20	88.42	102.99	95.71	Good	120.36	0.15	0.02	0.02	38.13	103.18	64.12	High
AUS-Brunet	R4	Austin	2.30	84.91	90.49	87.70	Good	188.34	0.05	0.03	0.01	59.45	106.30	66.05	High
AUS-Brunet	R4	Austin	2.40	130.42	121.11	125.77	Fair	209.25	0.01	0.03	0.04	66.11	104.11	64.69	High
AUS-Brunet	R4	Austin	2.50	123.03	146.61	134.82	Poor	173.14	0.01	0.03	0.03	54.76	104.24	64.77	High
AUS-Brunet	R4	Austin	2.60	88.69	120.76	104.72	Fair	82.01	0.07	0.01	0.02	25.93	106.07	65.91	High
AUS-Brunet	R4	Austin	2.70	77.19	71.44	74.31	Good	155.37	0.69	0.02	0.04	49.52	104.95	65.21	High
AUS-Brunet	R4	Austin	2.80	89.33	85.71	87.52	Good	259.89	0.15	0.04	0.03	82.19	103.22	64.14	High
AUS-Brunet	R4	Austin	2.90	98.79	93.75	96.27	Fair	248.25	0.05	0.04	0.02	78.59	101.00	62.76	High
AUS-Brunet	R4	Austin	3.00	159.93	167.34	163.64	Poor	147.60	0.05	0.02	0.04	46.70	100.37	62.37	High
AUS-Brunet	R4	Austin	3.10	101.97	91.82	96.90	Fair	174.08	0.30	0.03	0.02	55.18	98.01	60.90	High
AUS-Brunet	R4	Austin	3.20	83.35	88.70	86.03	Good	222.54	0.38	0.03	0.03	70.45	102.84	63.90	High
AUS-Brunet	R4	Austin	3.30	72.87	68.56	70.71	Good	235.85	0.47	0.03	0.01	74.73	105.01	65.25	High
AUS-Brunet	R4	Austin	3.40	71.81	63.65	67.73	Good	138.78	0.33	0.02	0.01	44.00	105.72	65.69	High
AUS-Brunet	R4	Austin	3.50	104.74	105.52	105.13	Fair	78.01	0.24	0.01	0.01	24.68	102.67	63.79	High
AUS-Brunet	R4	Austin	3.60	85.49	94.13	89.81	Good	272.23	0.70	0.04	0.07	86.47	100.33	62.34	High
AUS-Brunet	R4	Austin	3.70	116.48	122.56	119.52	Fair	206.84	0.40	0.03	0.11	65.54	102.31	63.57	High
AUS-Brunet	R4	Austin	3.80	136.01	129.05	132.53	Poor	130.92	0.18	0.02	0.06	41.42	101.65	63.16	High
AUS-Brunet	R4	Austin	3.90	85.12	86.58	85.85	Good	142.98	0.16	0.02	0.06	45.23	102.50	63.69	High
AUS-Brunet	R4	Austin	4.00	83.95	83.91	83.93	Good	239.66	0.22	0.04	0.14	75.85	103.15	64.10	High
AUS-Brunet	R4	Austin	4.10	80.65	85.17	82.91	Good	244.59	0.16	0.04	0.07	77.51	104.68	65.04	High
AUS-Brunet	R4	Austin	4.20	64.03	66.55	65.29	Good	154.04	0.07	0.03	0.04	48.80	104.53	64.95	High
AUS-Brunet	R4	Austin	4.30	84.82	87.59	86.21	Good	248.10	0.07	0.04	0.13	78.47	103.03	64.02	High
AUS-Brunet	R4	Austin	4.40	85.98	92.57	89.27	Good	153.86	0.17	0.03	0.05	48.77	103.94	64.59	High
AUS-Brunet	R4	Austin	4.50	78.43	87.35	82.89	Good	207.76	0.67	0.04	0.08	65.96	99.89	62.07	High
AUS-Brunet	R4	Austin	4.60	77.59	94.38	85.99	Good	331.79	0.53	0.06	0.14	105.17	98.01	60.90	High
AUS-Brunet	R4	Austin	4.70	82.66	88.42	85.54	Good	336.51	0.55	0.06	0.25	106.60	97.47	60.56	High
AUS-Brunet	R4	Austin	4.80	106.82	120.64	113.73	Fair	375.41	0.55	0.06	0.36	118.86	98.78	61.38	High
AUS-Brunet	R4	Austin	4.90	135.13	127.19	131.16	Poor	328.57	0.47	0.05	0.37	104.05	103.54	64.34	High
AUS-Brunet	R4	Austin	5.00	73.99	89.72	81.86	Good	164.00	0.23	0.02	0.09	52.12	106.90	66.42	High
AUS-Brunet	R4	Austin	5.10	98.02	95.38	96.70	Fair	100.08	0.19	0.02	0.02	31.74	103.97	64.60	High
AUS-Brunet	R4	Austin	5.20	120.22	126.59	123.40	Fair	219.19	0.39	0.04	0.19	69.45	101.07	62.80	High
AUS-Brunet	R4	Austin	5.30	137.04	132.79	134.91	Poor	227.68	0.31	0.04	0.16	72.07	101.37	62.99	High
AUS-Brunet	R4	Austin	5.40	99.43	99.50	99.47	Fair	308.16	0.42	0.05	0.03	97.58	102.32	63.58	High
AUS-Brunet	R4	Austin	5.50	111.27	116.97	114.12	Fair	275.80	0.31	0.04	0.00	87.31	104.42	64.88	High
AUS-Brunet	R4	Austin	5.60	171.97	172.55	172.26	Very Poor	157.36	0.14	0.03	0.00	49.82	106.83	66.38	High
AUS-Brunet	R4	Austin	5.70	130.38	158.44	144.41	Poor	182.93	0.33	0.03	0.00	57.94	105.97	65.85	High
AUS-Brunet	R4	Austin	5.80	98.03	115.62	106.83	Fair	61.39	0.10	0.01	0.00	19.44	108.44	67.38	High
AUS-Brunet	R4	Austin	5.90	112.52	109.51	111.01	Fair	223.85	0.24	0.03	0.01	70.91	106.28	66.04	High
AUS-Brunet	R4	Austin	6.00	79.75	68.09	73.92	Good	168.26	0.12	0.02	0.00	53.27	106.66	66.28	High
AUS-Brunet	R4	Austin	6.10	91.67	75.42	83.54	Good	224.94	0.08	0.03	0.00	71.17	105.00	65.24	High
AUS-Brunet	R4	Austin	6.20	92.64	70.40	81.52	Good	213.23	0.07	0.03	0.00	67.43	104.28	64.80	High
AUS-Brunet	R4	Austin	6.30	80.78	66.19	73.48	Good	123.95	0.05	0.02	0.00	39.19	105.52	65.56	High
AUS-Brunet	R4	Austin	6.40	83.21	65.34	74.28	Good	181.30	0.11	0.03	0.01	57.38	104.77	65.10	High
AUS-Brunet	R4	Austin	6.50	72.93	70.28	71.61	Good	248.63	0.15	0.03	0.06	78.56	106.73	66.32	High
AUS-Brunet	R4	Austin	6.60	71.39	80.76	76.07	Good	155.97	0.12	0.02	0.04	49.42	107.21	66.62	High
AUS-Brunet	R4	Austin	6.70	84.37	84.90	84.64	Good	225.43	0.26	0.04	0.13	71.49	104.10	64.69	High
AUS-Brunet	R4	Austin	6.80	65.23	63.99	64.61	Good	203.39	0.21	0.03	0.21	64.40	103.48	64.30	High
AUS-Brunet	R4	Austin	6.90	72.07	68.50	70.29	Good	252.93	0.24	0.05	0.09	80.00	103.30	64.19	High
AUS-Brunet	R4	Austin	7.00	92.01	93.99	93.00	Good	229.17	0.19	0.04	0.15	72.48	102.88	63.93	High
AUS-Brunet	R4	Austin	7.10	93.00	94.81	93.91	Good	267.34	0.12	0.05	0.14	84.53	101.36	62.98	High
AUS-Brunet	R4	Austin	7.20	136.62	129.26	132.94	Poor	88.99	0.05	0.02	0.02	28.12	102.58	63.74	High
AUS-Brunet	R4	Austin	7.30	71.13	77.48	74.30	Good	231.85	0.19	0.04	0.15	73.24	102.51	63.70	High
AUS-Brunet	R4	Austin	7.40	56.98	74.31	65.65	Good	48.53	0.05	0.01	0.02	15.37	107.27	66.65	High
AUS-Brunet	R4	Austin	7.50	64.92	88.07	76.50	Good	32.67	0.03	0.01	0.01	10.25	104.07	64.67	High
AUS-Brunet	R4	Austin	7.60	67.30	83.80	75.55	Good	161.56	0.01	0.03	0.01	51.00	100.11	62.21	High
AUS-Brunet	R4	Austin	7.70	81.01	74.63	77.82	Good	181.18	0.00	0.03	0.01	57.23	97.67	60.69	High
AUS-Brunet	R4	Austin	7.80	72.58	68.63	70.61	Good	325.95	0.00	0.06	0.04	103.03	100.78	62.62	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R4	Austin	7.90	72.25	76.41	74.33	Good	286.97	0.00	0.05	0.08	90.76	102.82	63.89	High
AUS-Brunet	R4	Austin	8.00	73.22	66.40	69.81	Good	308.85	0.00	0.05	0.10	97.58	103.72	64.45	High
AUS-Brunet	R4	Austin	8.10	162.55	173.90	168.22	Poor	178.98	0.04	0.03	0.05	56.56	105.36	65.46	High
AUS-Brunet	R4	Austin	8.20	67.95	74.87	71.41	Good	169.72	0.05	0.03	0.04	53.59	104.18	64.73	High
AUS-Brunet	R4	Austin	8.30	88.30	90.63	89.47	Good	201.21	0.02	0.03	0.04	63.66	103.09	64.06	High
AUS-Brunet	R4	Austin	8.40	149.97	160.06	155.01	Poor	230.49	0.09	0.04	0.17	72.86	103.67	64.42	High
AUS-Brunet	R4	Austin	8.50	78.57	73.12	75.84	Good	184.03	0.14	0.03	0.09	58.24	104.51	64.94	High
AUS-Brunet	R4	Austin	8.60	152.66	154.44	153.55	Poor	215.82	0.19	0.04	0.13	68.30	96.17	59.76	Medium
AUS-Brunet	R4	Austin	8.70	115.42	155.14	135.28	Poor	228.62	0.17	0.04	0.20	72.37	102.47	63.67	High
AUS-Brunet	R4	Austin	8.80	102.37	131.72	117.05	Fair	266.39	0.14	0.05	0.08	84.28	103.16	64.10	High
AUS-Brunet	R4	Austin	8.90	109.94	130.27	120.11	Fair	258.62	0.11	0.05	0.08	81.79	103.00	64.00	High
AUS-Brunet	R4	Austin	9.00	100.97	96.75	98.86	Fair	247.35	0.08	0.05	0.05	78.10	102.47	63.67	High
AUS-Brunet	R4	Austin	9.10	87.11	81.25	84.18	Good	251.08	0.09	0.04	0.07	79.47	103.00	64.00	High
AUS-Brunet	R4	Austin	9.20	94.27	89.68	91.98	Good	323.31	0.20	0.06	0.18	102.32	102.49	63.68	High
AUS-Brunet	R4	Austin	9.30	79.92	92.17	86.04	Good	395.84	1.24	0.07	0.35	125.80	104.79	65.11	High
AUS-Brunet	R4	Austin	9.40	96.60	105.61	101.11	Fair	348.81	1.44	0.06	0.44	110.92	110.43	68.62	High
AUS-Brunet	R4	Austin	9.50	87.43	91.55	89.49	Good	206.17	0.61	0.04	0.16	65.37	114.16	70.94	High
AUS-Brunet	R4	Austin	9.60	60.74	63.57	62.15	Good	60.05	0.18	0.01	0.02	19.11	115.36	71.68	High
AUS-Brunet	R4	Austin	9.70	64.12	73.15	68.63	Good	127.61	0.38	0.02	0.06	40.46	112.18	69.71	High
AUS-Brunet	R4	Austin	9.80	57.10	86.71	71.90	Good	323.72	0.79	0.05	0.25	102.65	111.74	69.43	High
AUS-Brunet	R4	Austin	9.90	106.95	109.91	108.43	Fair	274.40	0.66	0.05	0.13	87.08	114.55	71.18	High
AUS-Brunet	R4	Austin	10.00	156.45	152.36	154.41	Poor	226.21	0.59	0.04	0.11	71.74	115.00	71.46	High
AUS-Brunet	R4	Austin	10.10	92.73	92.21	92.47	Good	229.05	0.55	0.04	0.12	72.66	115.70	71.89	High
AUS-Brunet	R4	Austin	10.20	54.43	50.46	52.44	Very Good	148.75	0.32	0.03	0.07	47.11	115.60	71.83	High
AUS-Brunet	R4	Austin	10.30	62.19	58.73	60.46	Good	231.73	0.37	0.04	0.17	73.40	113.64	70.61	High
AUS-Brunet	R4	Austin	10.40	54.39	63.03	58.71	Very Good	257.57	0.36	0.05	0.14	81.45	115.77	71.93	High
AUS-Brunet	R4	Austin	10.50	56.50	69.78	63.14	Good	177.99	0.30	0.04	0.09	56.31	116.89	72.63	High
AUS-Brunet	R4	Austin	10.60	82.86	93.69	88.27	Good	162.07	0.61	0.03	0.09	51.50	116.90	72.64	High
AUS-Brunet	R4	Austin	10.70	144.71	150.07	147.39	Poor	219.72	0.65	0.05	0.05	69.69	115.83	71.98	High
AUS-Brunet	R4	Austin	10.80	69.81	64.52	67.16	Good	280.84	0.21	0.07	0.03	88.89	117.79	73.19	High
AUS-Brunet	R4	Austin	10.90	76.34	75.05	75.69	Good	295.07	0.56	0.08	0.07	93.63	118.64	73.72	High
AUS-Brunet	R4	Austin	11.00	56.08	56.45	56.26	Very Good	310.26	0.59	0.09	0.22	98.40	116.48	72.38	High
AUS-Brunet	R4	Austin	11.10	146.11	147.68	146.90	Poor	307.94	0.40	0.09	0.35	97.45	114.27	71.00	High
AUS-Brunet	R4	Austin	11.20	134.45	140.79	137.62	Poor	315.57	0.28	0.08	0.23	99.91	113.00	70.21	High
AUS-Brunet	R4	Austin	11.30	127.53	127.64	127.58	Fair	287.59	0.06	0.07	0.24	90.89	113.52	70.54	High
AUS-Brunet	R4	Austin	11.40	92.25	97.43	94.84	Good	323.61	0.00	0.08	0.13	102.26	114.15	70.93	High
AUS-Brunet	R4	Austin	11.50	66.52	86.55	76.54	Good	264.44	1.00	0.07	0.13	84.05	115.99	72.07	High
AUS-Brunet	R4	Austin	11.60	55.83	84.35	70.09	Good	241.34	2.71	0.06	0.18	77.71	114.66	71.24	High
AUS-Brunet	R4	Austin	11.70	60.08	74.21	67.15	Good	223.16	0.96	0.05	0.14	70.97	113.64	70.61	High
AUS-Brunet	R4	Austin	11.80	60.51	74.91	67.71	Good	217.70	0.34	0.05	0.38	68.96	112.80	70.09	High
AUS-Brunet	R4	Austin	11.90	72.21	100.24	86.23	Good	259.80	0.93	0.06	0.28	82.52	112.81	70.10	High
AUS-Brunet	R4	Austin	12.00	70.82	75.58	73.20	Good	246.94	0.75	0.04	0.10	78.51	113.77	70.69	High
AUS-Brunet	R4	Austin	12.10	81.86	96.80	89.33	Good	213.21	0.66	0.04	0.12	67.71	114.02	70.85	High
AUS-Brunet	R4	Austin	12.20	61.95	88.99	75.47	Good	267.51	0.81	0.06	0.38	85.06	111.95	69.56	High
AUS-Brunet	R4	Austin	12.30	115.51	117.33	116.42	Fair	304.76	0.82	0.06	0.15	96.76	112.84	70.12	High
AUS-Brunet	R4	Austin	12.40	87.77	78.68	83.22	Good	263.27	0.56	0.05	0.07	83.54	115.46	71.74	High
AUS-Brunet	R4	Austin	12.50	64.67	65.09	64.88	Good	230.40	0.41	0.05	0.10	73.09	115.67	71.88	High
AUS-Brunet	R4	Austin	12.60	63.22	61.74	62.48	Good	317.56	0.48	0.06	0.20	100.57	114.27	71.00	High
AUS-Brunet	R4	Austin	12.70	113.83	114.94	114.39	Fair	160.36	0.24	0.03	0.06	50.75	113.24	70.36	High
AUS-Brunet	R4	Austin	12.80	109.42	111.88	110.65	Fair	265.02	0.38	0.05	0.09	83.90	107.47	66.78	High
AUS-Brunet	R5	Austin	0.10	157.87	143.64	150.76	Poor	83.46	0.06	0.01	0.06	26.42	100.14	62.22	High
AUS-Brunet	R5	Austin	0.20	110.14	115.04	112.59	Fair	136.58	0.13	0.01	0.05	43.27	100.38	62.37	High
AUS-Brunet	R5	Austin	0.30	117.80	120.46	119.13	Fair	208.75	0.24	0.02	0.05	66.02	103.75	64.47	High
AUS-Brunet	R5	Austin	0.40	142.24	138.18	140.21	Poor	150.98	0.61	0.01	0.17	47.99	104.13	64.70	High
AUS-Brunet	R5	Austin	0.50	123.38	145.46	134.42	Poor	289.86	0.66	0.02	0.11	91.80	104.96	65.22	High
AUS-Brunet	R5	Austin	0.60	140.45	170.34	155.40	Poor	250.29	0.24	0.02	0.08	79.14	104.75	65.09	High
AUS-Brunet	R5	Austin	0.70	184.93	184.60	184.76	Very Poor	187.34	0.26	0.01	0.11	59.31	102.82	63.89	High
AUS-Brunet	R5	Austin	0.80	142.41	133.62	138.01	Poor	311.56	0.60	0.03	0.20	98.79	100.39	62.38	High
AUS-Brunet	R5	Austin	0.90	168.59	176.29	172.44	Very Poor	198.53	0.43	0.02	0.06	62.89	103.12	64.08	High
AUS-Brunet	R5	Austin	1.00	145.09	148.46	146.78	Poor	173.35	0.41	0.02	0.12	54.97	100.06	62.17	High
AUS-Brunet	R5	Austin	1.10	120.48	94.27	107.37	Fair	275.36	0.59	0.03	0.14	87.18	100.60	62.51	High
AUS-Brunet	R5	Austin	1.20	99.68	85.35	92.51	Good	286.75	0.51	0.03	0.13	90.90	102.02	63.39	High
AUS-Brunet	R5	Austin	1.30	185.64	122.76	154.20	Poor	314.87	0.49	0.03	0.14	99.81	103.54	64.33	High
AUS-Brunet	R5	Austin	1.40	154.71	168.28	161.49	Poor	214.48	0.44	0.02	0.11	68.01	101.13	62.84	High
AUS-Brunet	R5	Austin	1.50	149.50	185.81	167.66	Poor	353.10	0.69	0.04	0.19	111.87	97.02	60.29	High
AUS-Brunet	R5	Austin	1.60	162.22	169.17	165.69	Poor	385.34	0.71	0.04	0.39	122.08	98.35	61.11	High
AUS-Brunet	R5	Austin	1.70	115.19	119.73	117.46	Fair	381.29	0.80	0.04	0.33	120.89	101.87	63.30	High
AUS-Brunet	R5	Austin	1.80	111.77	112.98	112.37	Fair	276.26	0.69	0.03	0.36	87.54	105.82	65.75	High
AUS-Brunet	R5	Austin	1.90	82.92	72.37	77.64	Good	207.00	1.20	0.02	0.12	65.97	99.56	61.86	High
AUS-Brunet	R5	Austin	2.00	111.58	114.48	113.03	Fair	362.98	1.43	0.04	0.34	115.30	96.73	60.11	High
AUS-Brunet	R5	Austin	2.10	107.13	99.39	103.26	Fair	253.44	1.01	0.03	0.21	80.51	103.76	64.47	High
AUS-Brunet	R5	Austin	2.20	88.42	102.99	95.71	Good	126.98	0.51	0.01	0.03	40.35	107.78	66.97	High
AUS-Brunet	R5	Austin	2.30	84.91	90.49	87.70	Good	117.13	0.52	0.01	0.03	37.33	105.38	65.48	High
AUS-Brunet	R5	Austin	2.40	130.42	121.11	125.77	Fair	176.45	0.19	0.02	0.02	55.99	101.53	63.09	High
AUS-Brunet	R5	Austin	2.50	123.03	146.61	134.82	Poor	190.10	0.60	0.02	0.03	60.38	99.99	62.13	High
AUS-Brunet	R5	Austin	2.60	88.69	120.76	104.72	Fair	163.06	0.34	0.02	0.06	51.67	105.08	65.30	High
AUS-Brunet	R5	Austin	2.70	77.19	71.44	74.31	Good	279.64	0.55	0.03	0.10	88.63	108.14	67.20	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R5	Austin	2.80	89.33	85.71	87.52	Good	88.87	0.63	0.01	0.02	28.33	107.64	66.89	High
AUS-Brunet	R5	Austin	2.90	98.79	93.75	96.27	Fair	242.76	0.66	0.03	0.03	77.05	100.84	62.66	High
AUS-Brunet	R5	Austin	3.00	159.93	167.34	163.64	Poor	230.71	0.32	0.02	0.03	73.14	99.95	62.11	High
AUS-Brunet	R5	Austin	3.10	101.97	91.82	96.90	Fair	163.79	0.42	0.01	0.03	52.05	101.09	62.82	High
AUS-Brunet	R5	Austin	3.20	83.35	88.70	86.03	Good	107.15	0.26	0.01	0.01	33.89	102.85	63.91	High
AUS-Brunet	R5	Austin	3.30	72.87	68.56	70.71	Good	241.33	0.50	0.02	0.18	76.62	101.50	63.07	High
AUS-Brunet	R5	Austin	3.40	71.81	63.65	67.73	Good	185.21	0.34	0.02	0.12	58.69	102.09	63.44	High
AUS-Brunet	R5	Austin	3.50	104.74	105.52	105.13	Fair	107.44	0.17	0.01	0.04	34.00	103.49	64.31	High
AUS-Brunet	R5	Austin	3.60	85.49	94.13	89.81	Good	242.44	0.46	0.02	0.12	76.78	100.52	62.46	High
AUS-Brunet	R5	Austin	3.70	116.48	122.56	119.52	Fair	199.85	0.41	0.02	0.19	63.37	100.33	62.34	High
AUS-Brunet	R5	Austin	3.80	136.01	129.05	132.53	Poor	141.36	0.27	0.01	0.04	44.83	98.38	61.13	High
AUS-Brunet	R5	Austin	3.90	85.12	86.58	85.85	Good	127.60	0.30	0.01	0.02	40.41	98.60	61.27	High
AUS-Brunet	R5	Austin	4.00	83.95	83.91	83.93	Good	238.76	0.63	0.03	0.13	75.82	99.45	61.79	High
AUS-Brunet	R5	Austin	4.10	80.65	85.17	82.91	Good	217.83	0.62	0.03	0.07	69.07	99.14	61.60	High
AUS-Brunet	R5	Austin	4.20	64.03	66.55	65.29	Good	275.36	0.84	0.03	0.23	87.45	100.20	62.26	High
AUS-Brunet	R5	Austin	4.30	84.82	87.59	86.21	Good	253.35	0.74	0.03	0.20	80.44	103.36	64.22	High
AUS-Brunet	R5	Austin	4.40	85.98	92.57	89.27	Good	136.46	0.37	0.02	0.06	43.33	101.35	62.97	High
AUS-Brunet	R5	Austin	4.50	78.43	87.35	82.89	Good	264.93	0.61	0.03	0.04	83.95	97.72	60.72	High
AUS-Brunet	R5	Austin	4.60	77.59	94.38	85.99	Good	347.02	0.56	0.04	0.04	109.97	98.00	60.89	High
AUS-Brunet	R5	Austin	4.70	82.66	88.42	85.54	Good	365.44	0.43	0.04	0.12	115.61	98.00	60.89	High
AUS-Brunet	R5	Austin	4.80	106.82	120.64	113.73	Fair	232.95	0.97	0.02	0.10	74.03	95.35	59.25	Medium
AUS-Brunet	R5	Austin	4.90	135.13	127.19	131.16	Poor	369.63	1.52	0.03	0.12	117.58	95.03	59.05	Medium
AUS-Brunet	R5	Austin	5.00	73.99	89.72	81.86	Good	266.82	1.01	0.02	0.17	84.86	102.17	63.49	High
AUS-Brunet	R5	Austin	5.10	98.02	95.38	96.70	Fair	257.90	1.17	0.03	0.12	82.02	104.25	64.77	High
AUS-Brunet	R5	Austin	5.20	120.22	126.59	123.40	Fair	146.91	0.74	0.02	0.00	46.88	104.65	65.03	High
AUS-Brunet	R5	Austin	5.30	137.04	132.79	134.91	Poor	281.27	1.39	0.04	0.00	89.50	102.25	63.54	High
AUS-Brunet	R5	Austin	5.40	99.43	99.50	99.47	Fair	331.25	1.44	0.05	0.00	105.43	105.12	65.32	High
AUS-Brunet	R5	Austin	5.50	111.27	116.97	114.12	Fair	293.59	1.26	0.05	0.01	93.41	107.29	66.66	High
AUS-Brunet	R5	Austin	5.60	171.97	172.55	172.26	Very Poor	99.08	0.38	0.02	0.00	31.47	107.47	66.78	High
AUS-Brunet	R5	Austin	5.70	130.38	158.44	144.41	Poor	24.88	0.17	0.01	0.00	8.08	102.48	63.68	High
AUS-Brunet	R5	Austin	5.80	98.03	115.62	106.83	Fair	167.28	0.57	0.03	0.00	53.16	100.87	62.68	High
AUS-Brunet	R5	Austin	5.90	112.52	109.51	111.01	Fair	209.20	0.49	0.03	0.00	66.39	103.85	64.53	High
AUS-Brunet	R5	Austin	6.00	79.75	68.09	73.92	Good	183.21	0.35	0.03	0.00	57.95	103.47	64.30	High
AUS-Brunet	R5	Austin	6.10	91.67	75.42	83.54	Good	235.22	0.44	0.03	0.01	74.44	102.00	63.38	High
AUS-Brunet	R5	Austin	6.20	92.64	70.40	81.52	Good	241.11	0.34	0.03	0.04	76.41	102.00	63.38	High
AUS-Brunet	R5	Austin	6.30	80.78	66.19	73.48	Good	179.80	0.30	0.02	0.05	56.93	102.62	63.76	High
AUS-Brunet	R5	Austin	6.40	83.21	65.34	74.28	Good	193.47	0.44	0.02	0.06	61.30	103.05	64.03	High
AUS-Brunet	R5	Austin	6.50	72.93	70.28	71.61	Good	242.18	0.67	0.03	0.07	76.90	105.09	65.30	High
AUS-Brunet	R5	Austin	6.60	71.39	80.76	76.07	Good	109.62	0.59	0.02	0.03	34.76	102.66	63.79	High
AUS-Brunet	R5	Austin	6.70	84.37	84.90	84.64	Good	332.44	0.35	0.04	0.04	105.25	99.14	61.60	High
AUS-Brunet	R5	Austin	6.80	65.23	63.99	64.61	Good	186.49	0.15	0.03	0.02	58.92	101.82	63.27	High
AUS-Brunet	R5	Austin	6.90	72.07	68.50	70.29	Good	201.85	0.15	0.03	0.03	63.91	100.59	62.50	High
AUS-Brunet	R5	Austin	7.00	92.01	93.99	93.00	Good	326.46	0.28	0.04	0.05	103.24	100.76	62.61	High
AUS-Brunet	R5	Austin	7.10	93.00	94.81	93.91	Good	284.81	0.24	0.04	0.08	90.09	101.52	63.08	High
AUS-Brunet	R5	Austin	7.20	136.62	129.26	132.94	Poor	226.75	0.23	0.03	0.09	71.76	103.51	64.32	High
AUS-Brunet	R5	Austin	7.30	71.13	77.48	74.30	Good	95.10	0.13	0.01	0.02	30.18	106.35	66.08	High
AUS-Brunet	R5	Austin	7.40	56.98	74.31	65.65	Good	71.74	0.13	0.01	0.00	22.76	103.73	64.46	High
AUS-Brunet	R5	Austin	7.50	64.92	88.07	76.50	Good	92.40	0.17	0.01	0.01	29.29	102.99	64.00	High
AUS-Brunet	R5	Austin	7.60	67.30	83.80	75.55	Good	153.11	0.22	0.02	0.10	48.55	101.07	62.80	High
AUS-Brunet	R5	Austin	7.70	81.01	74.63	77.82	Good	239.23	0.34	0.04	0.15	75.71	99.99	62.13	High
AUS-Brunet	R5	Austin	7.80	72.58	68.63	70.61	Good	266.66	0.35	0.04	0.31	84.31	100.76	62.61	High
AUS-Brunet	R5	Austin	7.90	72.25	76.41	74.33	Good	227.93	0.37	0.04	0.17	72.15	101.36	62.98	High
AUS-Brunet	R5	Austin	8.00	73.22	66.40	69.81	Good	270.37	0.50	0.04	0.08	85.68	98.38	61.13	High
AUS-Brunet	R5	Austin	8.10	162.55	173.90	168.22	Poor	249.42	0.43	0.04	0.11	78.93	101.50	63.07	High
AUS-Brunet	R5	Austin	8.20	67.95	74.87	71.41	Good	153.46	0.24	0.03	0.05	48.44	102.24	63.53	High
AUS-Brunet	R5	Austin	8.30	88.30	90.63	89.47	Good	191.28	0.25	0.03	0.10	60.49	99.59	61.88	High
AUS-Brunet	R5	Austin	8.40	149.97	160.06	155.01	Poor	234.27	0.29	0.04	0.07	74.16	101.78	63.24	High
AUS-Brunet	R5	Austin	8.50	78.57	73.12	75.84	Good	177.47	0.19	0.03	0.05	56.11	103.55	64.34	High
AUS-Brunet	R5	Austin	8.60	152.66	154.44	153.55	Poor	85.86	0.13	0.01	0.02	27.25	100.18	62.25	High
AUS-Brunet	R5	Austin	8.70	115.42	155.14	135.28	Poor	286.48	0.46	0.05	0.25	90.84	96.93	60.23	High
AUS-Brunet	R5	Austin	8.80	102.37	131.72	117.05	Fair	365.82	0.54	0.06	0.20	115.86	100.74	62.59	High
AUS-Brunet	R5	Austin	8.90	109.94	130.27	120.11	Fair	355.47	0.82	0.06	0.22	112.76	106.30	66.05	High
AUS-Brunet	R5	Austin	9.00	100.97	96.75	98.86	Fair	380.40	0.93	0.06	0.69	120.69	111.20	69.09	High
AUS-Brunet	R5	Austin	9.10	87.11	81.25	84.18	Good	303.42	0.83	0.05	0.28	96.32	115.28	71.63	High
AUS-Brunet	R5	Austin	9.20	94.27	89.68	91.98	Good	253.08	0.83	0.04	0.12	80.36	115.23	71.60	High
AUS-Brunet	R5	Austin	9.30	79.92	92.17	86.04	Good	310.72	0.94	0.05	0.21	98.68	111.89	69.53	High
AUS-Brunet	R5	Austin	9.40	96.60	105.61	101.11	Fair	304.57	0.88	0.05	0.18	96.63	112.88	70.14	High
AUS-Brunet	R5	Austin	9.50	87.43	91.55	89.49	Good	171.15	0.95	0.03	0.08	54.52	115.46	71.74	High
AUS-Brunet	R5	Austin	9.60	60.74	63.57	62.15	Good	110.30	0.56	0.02	0.03	35.13	114.61	71.22	High
AUS-Brunet	R5	Austin	9.70	64.12	73.15	68.63	Good	211.40	0.50	0.03	0.02	67.06	116.94	72.66	High
AUS-Brunet	R5	Austin	9.80	57.10	86.71	71.90	Good	242.80	0.57	0.03	0.05	77.04	117.13	72.78	High
AUS-Brunet	R5	Austin	9.90	106.95	109.91	108.43	Fair	287.43	0.71	0.04	0.18	91.23	116.84	72.60	High
AUS-Brunet	R5	Austin	10.00	156.45	152.36	154.41	Poor	124.88	0.40	0.02	0.07	39.73	116.74	72.54	High
AUS-Brunet	R5	Austin	10.10	92.73	92.21	92.47	Good	274.11	0.90	0.03	0.14	87.03	116.31	72.27	High
AUS-Brunet	R5	Austin	10.20	54.43	50.46	52.44	Very Good	188.51	0.62	0.03	0.14	59.86	118.41	73.58	High
AUS-Brunet	R5	Austin	10.30	62.19	58.73	60.46	Good	224.34	0.81	0.04	0.24	71.36	118.39	73.57	High
AUS-Brunet	R5	Austin	10.40	54.39	63.03	58.71	Very Good	148.32	0.64	0.03	0.12	47.27	120.10	74.63	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R5	Austin	10.50	56.50	69.78	63.14	Good	187.56	0.84	0.03	0.16	59.69	118.27	73.49	High
AUS-Brunet	R5	Austin	10.60	82.86	93.69	88.27	Good	190.63	0.85	0.04	0.12	60.66	118.59	73.69	High
AUS-Brunet	R5	Austin	10.70	144.71	150.07	147.39	Poor	121.03	0.52	0.03	0.06	38.48	118.24	73.47	High
AUS-Brunet	R5	Austin	10.80	69.81	64.52	67.16	Good	278.49	1.20	0.06	0.86	88.60	117.74	73.16	High
AUS-Brunet	R5	Austin	10.90	76.34	75.05	75.69	Good	288.80	1.29	0.07	0.48	91.96	118.45	73.60	High
AUS-Brunet	R5	Austin	11.00	56.08	56.45	56.26	Very Good	332.35	1.53	0.08	0.69	105.74	114.48	71.13	High
AUS-Brunet	R5	Austin	11.10	146.11	147.68	146.90	Poor	314.11	1.30	0.07	0.57	99.93	111.29	69.15	High
AUS-Brunet	R5	Austin	11.20	134.45	140.79	137.62	Poor	382.54	1.63	0.07	0.62	121.71	110.02	68.36	High
AUS-Brunet	R5	Austin	11.30	127.53	127.64	127.58	Fair	300.78	1.37	0.06	0.62	95.77	114.47	71.13	High
AUS-Brunet	R5	Austin	11.40	92.25	97.43	94.84	Good	335.04	1.46	0.06	0.49	106.62	118.41	73.58	High
AUS-Brunet	R5	Austin	11.50	66.52	86.55	76.54	Good	317.92	6.53	0.05	0.50	103.67	123.81	76.93	High
AUS-Brunet	R5	Austin	11.60	55.83	84.35	70.09	Good	222.87	13.34	0.03	0.21	77.06	127.44	79.19	High
AUS-Brunet	R5	Austin	11.70	60.08	74.21	67.15	Good	134.13	1.45	0.02	0.09	43.18	125.40	77.92	High
AUS-Brunet	R5	Austin	11.80	60.51	74.91	67.71	Good	47.26	0.47	0.01	0.02	15.13	119.15	74.04	High
AUS-Brunet	R5	Austin	11.90	72.21	100.24	86.23	Good	293.16	1.10	0.06	0.07	93.16	114.52	71.16	High
AUS-Brunet	R5	Austin	12.00	70.82	75.58	73.20	Good	214.45	0.97	0.04	0.10	68.20	116.61	72.46	High
AUS-Brunet	R5	Austin	12.10	81.86	96.80	89.33	Good	224.53	0.97	0.04	0.09	71.36	114.67	71.25	High
AUS-Brunet	R5	Austin	12.20	61.95	88.99	75.47	Good	210.53	0.85	0.04	0.13	66.84	113.06	70.25	High
AUS-Brunet	R5	Austin	12.30	115.51	117.33	116.42	Fair	267.94	0.98	0.05	0.14	85.23	112.56	69.94	High
AUS-Brunet	R5	Austin	12.40	87.77	78.68	83.22	Good	268.79	0.89	0.05	0.15	85.33	113.96	70.81	High
AUS-Brunet	R5	Austin	12.50	64.67	65.09	64.88	Good	343.99	1.14	0.06	0.19	109.10	116.30	72.27	High
AUS-Brunet	R5	Austin	12.60	63.22	61.74	62.48	Good	214.06	0.84	0.04	0.15	68.01	116.21	72.21	High
AUS-Brunet	R5	Austin	12.70	113.83	114.94	114.39	Fair	18.66	0.20	0.01	0.01	6.06	109.22	67.86	High
AUS-Brunet	R6	Austin	0.10	157.87	143.64	150.76	Poor	71.17	0.15	0.01	0.03	22.55	102.26	63.54	High
AUS-Brunet	R6	Austin	0.20	110.14	115.04	112.59	Fair	141.42	0.21	0.03	0.05	44.73	100.03	62.16	High
AUS-Brunet	R6	Austin	0.30	117.80	120.46	119.13	Fair	98.01	0.09	0.02	0.02	30.99	102.84	63.90	High
AUS-Brunet	R6	Austin	0.40	142.24	138.18	140.21	Poor	225.97	0.09	0.03	0.02	71.52	101.42	63.02	High
AUS-Brunet	R6	Austin	0.50	123.38	145.46	134.42	Poor	160.26	0.05	0.02	0.01	50.62	102.29	63.56	High
AUS-Brunet	R6	Austin	0.60	140.45	170.34	155.40	Poor	195.02	1.20	0.03	0.10	62.30	94.59	58.78	Medium
AUS-Brunet	R6	Austin	0.70	184.93	184.60	184.76	Very Poor	263.03	3.11	0.04	0.13	84.77	93.39	58.03	Medium
AUS-Brunet	R6	Austin	0.80	142.41	133.62	138.01	Poor	317.00	1.75	0.05	0.07	100.99	96.45	59.93	Medium
AUS-Brunet	R6	Austin	0.90	168.59	176.29	172.44	Very Poor	227.80	0.72	0.03	0.05	72.22	100.09	62.19	High
AUS-Brunet	R6	Austin	1.00	145.09	148.46	146.78	Poor	287.46	0.70	0.04	0.07	91.12	100.95	62.73	High
AUS-Brunet	R6	Austin	1.10	120.48	94.27	107.37	Fair	281.96	0.72	0.04	0.12	89.46	104.39	64.87	High
AUS-Brunet	R6	Austin	1.20	99.68	85.35	92.51	Good	272.39	0.65	0.04	0.15	86.48	106.00	65.86	High
AUS-Brunet	R6	Austin	1.30	185.64	122.76	154.20	Poor	272.07	0.50	0.04	0.13	86.11	105.24	65.39	High
AUS-Brunet	R6	Austin	1.40	154.71	168.28	161.49	Poor	250.37	0.35	0.04	0.14	79.19	102.91	63.95	High
AUS-Brunet	R6	Austin	1.50	149.50	185.81	167.66	Poor	275.92	0.43	0.04	0.10	87.45	98.43	61.16	High
AUS-Brunet	R6	Austin	1.60	162.22	169.17	165.69	Poor	266.37	0.39	0.04	0.14	84.44	96.15	59.74	Medium
AUS-Brunet	R6	Austin	1.70	115.19	119.73	117.46	Fair	251.24	0.50	0.04	0.11	79.59	96.61	60.03	High
AUS-Brunet	R6	Austin	1.80	111.77	112.98	112.37	Fair	259.25	0.73	0.04	0.12	82.26	93.28	57.96	Medium
AUS-Brunet	R6	Austin	1.90	82.92	72.37	77.64	Good	323.81	1.14	0.04	0.19	102.84	90.10	55.99	Medium
AUS-Brunet	R6	Austin	2.00	111.58	114.48	113.03	Fair	281.30	1.10	0.04	0.15	89.33	91.22	56.68	Medium
AUS-Brunet	R6	Austin	2.10	107.13	99.39	103.26	Fair	194.68	0.85	0.03	0.11	61.99	95.71	59.47	Medium
AUS-Brunet	R6	Austin	2.20	88.42	102.99	95.71	Good	180.33	0.99	0.02	0.13	57.47	99.08	61.56	High
AUS-Brunet	R6	Austin	2.30	84.91	90.49	87.70	Good	247.11	1.40	0.03	0.21	78.74	102.48	63.68	High
AUS-Brunet	R6	Austin	2.40	130.42	121.11	125.77	Fair	126.13	0.68	0.02	0.09	40.08	101.05	62.79	High
AUS-Brunet	R6	Austin	2.50	123.03	146.61	134.82	Poor	130.19	0.67	0.02	0.11	41.42	96.52	59.98	Medium
AUS-Brunet	R6	Austin	2.60	88.69	120.76	104.72	Fair	150.22	0.72	0.02	0.05	47.83	96.35	59.87	Medium
AUS-Brunet	R6	Austin	2.70	77.19	71.44	74.31	Good	238.55	1.00	0.04	0.13	75.79	100.21	62.27	High
AUS-Brunet	R6	Austin	2.80	89.33	85.71	87.52	Good	300.12	0.87	0.05	0.22	95.29	99.07	61.56	High
AUS-Brunet	R6	Austin	2.90	98.79	93.75	96.27	Fair	308.37	0.80	0.05	0.25	97.91	97.87	60.81	High
AUS-Brunet	R6	Austin	3.00	159.93	167.34	163.64	Poor	219.07	0.53	0.03	0.21	69.43	100.13	62.22	High
AUS-Brunet	R6	Austin	3.10	101.97	91.82	96.90	Fair	180.07	0.29	0.03	0.26	57.10	101.38	63.00	High
AUS-Brunet	R6	Austin	3.20	83.35	88.70	86.03	Good	205.54	0.19	0.03	0.20	65.10	105.01	65.25	High
AUS-Brunet	R6	Austin	3.30	72.87	68.56	70.71	Good	56.57	0.04	0.01	0.02	17.83	102.88	63.93	High
AUS-Brunet	R6	Austin	3.40	71.81	63.65	67.73	Good	263.86	0.21	0.05	0.27	83.59	99.65	61.92	High
AUS-Brunet	R6	Austin	3.50	104.74	105.52	105.13	Fair	215.46	0.12	0.04	0.25	68.11	104.34	64.84	High
AUS-Brunet	R6	Austin	3.60	85.49	94.13	89.81	Good	264.03	0.11	0.05	0.32	83.40	103.53	64.33	High
AUS-Brunet	R6	Austin	3.70	116.48	122.56	119.52	Fair	218.90	0.08	0.03	0.08	69.17	104.16	64.72	High
AUS-Brunet	R6	Austin	3.80	136.01	129.05	132.53	Poor	66.02	0.04	0.01	0.01	20.82	103.67	64.42	High
AUS-Brunet	R6	Austin	3.90	85.12	86.58	85.85	Good	126.76	0.07	0.02	0.03	40.17	100.13	62.22	High
AUS-Brunet	R6	Austin	4.00	83.95	83.91	83.93	Good	142.70	0.11	0.03	0.06	44.96	98.63	61.29	High
AUS-Brunet	R6	Austin	4.10	80.65	85.17	82.91	Good	297.60	0.27	0.05	0.05	94.22	97.28	60.45	High
AUS-Brunet	R6	Austin	4.20	64.03	66.55	65.29	Good	288.11	0.21	0.06	0.05	91.18	100.25	62.29	High
AUS-Brunet	R6	Austin	4.30	84.82	87.59	86.21	Good	253.83	0.22	0.05	0.05	80.30	101.98	63.37	High
AUS-Brunet	R6	Austin	4.40	85.98	92.57	89.27	Good	208.57	0.19	0.04	0.05	65.99	100.63	62.53	High
AUS-Brunet	R6	Austin	4.50	78.43	87.35	82.89	Good	300.54	0.26	0.05	0.10	95.22	100.45	62.42	High
AUS-Brunet	R6	Austin	4.60	77.59	94.38	85.99	Good	355.13	0.32	0.07	0.15	112.30	99.27	61.68	High
AUS-Brunet	R6	Austin	4.70	82.66	88.42	85.54	Good	360.29	0.30	0.06	0.19	114.04	99.00	61.52	High
AUS-Brunet	R6	Austin	4.80	106.82	120.64	113.73	Fair	346.14	0.27	0.06	0.15	109.52	99.85	62.05	High
AUS-Brunet	R6	Austin	4.90	135.13	127.19	131.16	Poor	300.18	0.22	0.05	0.12	94.96	101.77	63.24	High
AUS-Brunet	R6	Austin	5.00	73.99	89.72	81.86	Good	243.08	0.14	0.04	0.07	76.92	104.89	65.17	High
AUS-Brunet	R6	Austin	5.10	98.02	95.38	96.70	Fair	227.80	0.09	0.04	0.05	72.05	106.66	66.28	High
AUS-Brunet	R6	Austin	5.20	120.22	126.59	123.40	Fair	120.03	0.18	0.02	0.03	38.04	105.96	65.84	High
AUS-Brunet	R6	Austin	5.30	137.04	132.79	134.91	Poor	250.62	0.26	0.04	0.05	79.39	99.86	62.05	High
AUS-Brunet	R6	Austin	5.40	99.43	99.50	99.47	Fair	311.56	0.15	0.05	0.03	98.35	101.26	62.92	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R6	Austin	5.50	111.27	116.97	114.12	Fair	290.66	0.08	0.05	0.04	91.99	103.03	64.02	High
AUS-Brunet	R6	Austin	5.60	171.97	172.55	172.26	Very Poor	234.63	0.03	0.04	0.05	74.32	105.91	65.81	High
AUS-Brunet	R6	Austin	5.70	130.38	158.44	144.41	Poor	56.10	0.03	0.01	0.01	17.79	107.39	66.73	High
AUS-Brunet	R6	Austin	5.80	98.03	115.62	106.83	Fair	37.35	0.02	0.01	0.00	11.79	105.15	65.34	High
AUS-Brunet	R6	Austin	5.90	112.52	109.51	111.01	Fair	199.04	0.04	0.03	0.02	63.03	100.82	62.65	High
AUS-Brunet	R6	Austin	6.00	79.75	68.09	73.92	Good	279.40	0.03	0.04	0.01	88.30	101.36	62.98	High
AUS-Brunet	R6	Austin	6.10	91.67	75.42	83.54	Good	246.90	0.04	0.03	0.02	78.02	102.13	63.46	High
AUS-Brunet	R6	Austin	6.20	92.64	70.40	81.52	Good	230.11	0.04	0.03	0.02	72.88	103.24	64.15	High
AUS-Brunet	R6	Austin	6.30	80.78	66.19	73.48	Good	194.45	0.05	0.03	0.02	61.56	104.51	64.94	High
AUS-Brunet	R6	Austin	6.40	83.21	65.34	74.28	Good	153.36	0.13	0.02	0.02	48.52	105.38	65.48	High
AUS-Brunet	R6	Austin	6.50	72.93	70.28	71.61	Good	155.08	0.16	0.02	0.06	49.03	103.71	64.44	High
AUS-Brunet	R6	Austin	6.60	71.39	80.76	76.07	Good	251.08	0.24	0.04	0.11	79.48	101.67	63.17	High
AUS-Brunet	R6	Austin	6.70	84.37	84.90	84.64	Good	199.93	0.14	0.03	0.18	63.18	100.37	62.37	High
AUS-Brunet	R6	Austin	6.80	65.23	63.99	64.61	Good	81.46	0.08	0.01	0.02	25.73	97.02	60.28	High
AUS-Brunet	R6	Austin	6.90	72.07	68.50	70.29	Good	203.70	0.21	0.03	0.06	64.37	92.90	57.73	Medium
AUS-Brunet	R6	Austin	7.00	92.01	93.99	93.00	Good	394.61	0.55	0.05	0.23	125.02	93.15	57.88	Medium
AUS-Brunet	R6	Austin	7.10	93.00	94.81	93.91	Good	333.68	0.74	0.05	0.36	105.81	98.41	61.15	High
AUS-Brunet	R6	Austin	7.20	136.62	129.26	132.94	Poor	195.21	0.45	0.03	0.18	61.95	103.17	64.11	High
AUS-Brunet	R6	Austin	7.30	71.13	77.48	74.30	Good	58.44	0.14	0.01	0.02	18.51	103.28	64.17	High
AUS-Brunet	R6	Austin	7.40	56.98	74.31	65.65	Good	111.84	0.31	0.02	0.04	35.40	101.85	63.28	High
AUS-Brunet	R6	Austin	7.50	64.92	88.07	76.50	Good	123.47	0.40	0.02	0.10	39.32	103.34	64.21	High
AUS-Brunet	R6	Austin	7.60	67.30	83.80	75.55	Good	227.26	0.66	0.04	0.17	72.12	103.31	64.19	High
AUS-Brunet	R6	Austin	7.70	81.01	74.63	77.82	Good	153.51	0.34	0.03	0.10	48.70	101.62	63.14	High
AUS-Brunet	R6	Austin	7.80	72.58	68.63	70.61	Good	230.13	0.52	0.04	0.19	73.03	100.69	62.57	High
AUS-Brunet	R6	Austin	7.90	72.25	76.41	74.33	Good	211.39	0.46	0.03	0.14	67.03	98.65	61.30	High
AUS-Brunet	R6	Austin	8.00	73.22	66.40	69.81	Good	199.87	0.44	0.03	0.01	63.34	94.54	58.75	Medium
AUS-Brunet	R6	Austin	8.10	162.55	173.90	168.22	Poor	295.03	0.74	0.05	0.00	93.53	96.95	60.24	High
AUS-Brunet	R6	Austin	8.20	67.95	74.87	71.41	Good	252.96	0.71	0.04	0.00	80.24	101.47	63.05	High
AUS-Brunet	R6	Austin	8.30	88.30	90.63	89.47	Good	201.34	0.61	0.03	0.00	64.00	103.84	64.52	High
AUS-Brunet	R6	Austin	8.40	149.97	160.06	155.01	Poor	210.85	1.49	0.03	0.00	67.37	104.01	64.63	High
AUS-Brunet	R6	Austin	8.50	78.57	73.12	75.84	Good	197.65	0.91	0.03	0.00	62.87	104.61	65.00	High
AUS-Brunet	R6	Austin	8.60	152.66	154.44	153.55	Poor	113.82	0.66	0.02	0.00	36.23	101.67	63.17	High
AUS-Brunet	R6	Austin	8.70	115.42	155.14	135.28	Poor	229.41	1.33	0.04	0.00	73.10	101.08	62.81	High
AUS-Brunet	R6	Austin	8.80	102.37	131.72	117.05	Fair	359.31	1.87	0.06	0.00	114.46	104.54	64.96	High
AUS-Brunet	R6	Austin	8.90	109.94	130.27	120.11	Fair	311.68	1.69	0.05	0.00	99.29	108.95	67.70	High
AUS-Brunet	R6	Austin	9.00	100.97	96.75	98.86	Fair	292.48	1.57	0.04	0.09	93.21	110.61	68.73	High
AUS-Brunet	R6	Austin	9.10	87.11	81.25	84.18	Good	323.39	1.84	0.04	0.45	103.10	112.53	69.92	High
AUS-Brunet	R6	Austin	9.20	94.27	89.68	91.98	Good	348.16	2.06	0.05	0.35	110.99	113.70	70.65	High
AUS-Brunet	R6	Austin	9.30	79.92	92.17	86.04	Good	242.71	1.55	0.04	0.28	77.46	113.98	70.83	High
AUS-Brunet	R6	Austin	9.40	96.60	105.61	101.11	Fair	224.27	1.41	0.04	0.15	71.60	113.43	70.48	High
AUS-Brunet	R6	Austin	9.50	87.43	91.55	89.49	Good	139.36	0.78	0.03	0.07	44.47	112.91	70.16	High
AUS-Brunet	R6	Austin	9.60	60.74	63.57	62.15	Good	102.73	0.57	0.02	0.03	32.82	114.08	70.88	High
AUS-Brunet	R6	Austin	9.70	64.12	73.15	68.63	Good	211.21	1.04	0.03	0.11	67.22	114.29	71.01	High
AUS-Brunet	R6	Austin	9.80	57.10	86.71	71.90	Good	291.77	1.37	0.04	0.26	92.83	116.56	72.43	High
AUS-Brunet	R6	Austin	9.90	106.95	109.91	108.43	Fair	124.31	0.69	0.02	0.12	39.72	115.69	71.89	High
AUS-Brunet	R6	Austin	10.00	156.45	152.36	154.41	Poor	291.41	0.97	0.04	0.08	92.42	112.39	69.84	High
AUS-Brunet	R6	Austin	10.10	92.73	92.21	92.47	Good	248.93	0.89	0.04	0.06	79.03	115.67	71.87	High
AUS-Brunet	R6	Austin	10.20	54.43	50.46	52.44	Very Good	143.26	0.61	0.02	0.03	45.57	117.28	72.87	High
AUS-Brunet	R6	Austin	10.30	62.19	58.73	60.46	Good	238.18	1.32	0.04	0.06	75.88	114.66	71.25	High
AUS-Brunet	R6	Austin	10.40	54.39	63.03	58.71	Very Good	254.36	1.26	0.04	0.04	80.96	115.30	71.64	High
AUS-Brunet	R6	Austin	10.50	56.50	69.78	63.14	Good	201.28	0.94	0.04	0.08	64.06	117.99	73.31	High
AUS-Brunet	R6	Austin	10.60	82.86	93.69	88.27	Good	107.70	0.46	0.02	0.06	34.29	115.97	72.06	High
AUS-Brunet	R6	Austin	10.70	144.71	150.07	147.39	Poor	265.65	1.01	0.05	0.14	84.55	115.10	71.52	High
AUS-Brunet	R6	Austin	10.80	69.81	64.52	67.16	Good	259.38	0.87	0.06	0.18	82.52	118.41	73.58	High
AUS-Brunet	R6	Austin	10.90	76.34	75.05	75.69	Good	278.43	0.95	0.06	0.28	88.40	118.43	73.59	High
AUS-Brunet	R6	Austin	11.00	56.08	56.45	56.26	Very Good	258.68	0.90	0.06	0.47	82.20	115.85	71.99	High
AUS-Brunet	R6	Austin	11.10	146.11	147.68	146.90	Poor	190.96	0.63	0.04	0.28	60.70	111.03	68.99	High
AUS-Brunet	R6	Austin	11.20	134.45	140.79	137.62	Poor	313.95	0.89	0.06	0.32	99.63	105.49	65.55	High
AUS-Brunet	R6	Austin	11.30	127.53	127.64	127.58	Fair	365.57	1.00	0.07	0.29	115.99	109.76	68.20	High
AUS-Brunet	R6	Austin	11.40	92.25	97.43	94.84	Good	350.29	0.97	0.06	0.31	111.08	113.99	70.83	High
AUS-Brunet	R6	Austin	11.50	66.52	86.55	76.54	Good	320.65	1.03	0.06	0.36	101.72	116.60	72.45	High
AUS-Brunet	R6	Austin	11.60	55.83	84.35	70.09	Good	247.97	1.03	0.04	0.21	78.84	117.37	72.93	High
AUS-Brunet	R6	Austin	11.70	60.08	74.21	67.15	Good	301.88	1.33	0.06	0.23	95.96	116.85	72.61	High
AUS-Brunet	R6	Austin	11.80	60.51	74.91	67.71	Good	265.71	1.22	0.05	0.14	84.63	118.35	73.54	High
AUS-Brunet	R6	Austin	11.90	72.21	100.24	86.23	Good	312.91	1.51	0.06	0.28	99.56	118.88	73.87	High
AUS-Brunet	R6	Austin	12.00	70.82	75.58	73.20	Good	184.50	1.15	0.04	0.17	58.99	120.41	74.82	High
AUS-Brunet	R6	Austin	12.10	81.86	96.80	89.33	Good	247.70	5.43	0.05	0.17	81.07	120.32	74.76	High
AUS-Brunet	R6	Austin	12.20	61.95	88.99	75.47	Good	242.49	2.07	0.05	0.18	77.58	119.00	73.94	High
AUS-Brunet	R6	Austin	12.30	115.51	117.33	116.42	Fair	164.70	0.94	0.03	0.08	52.51	117.30	72.89	High
AUS-Brunet	R6	Austin	12.40	87.77	78.68	83.22	Good	175.61	0.74	0.04	0.09	55.88	112.74	70.05	High
AUS-Brunet	R6	Austin	12.50	64.67	65.09	64.88	Good	168.52	0.57	0.04	0.04	53.57	110.77	68.83	High
AUS-Brunet	R6	Austin	12.60	63.22	61.74	62.48	Good	260.30	1.13	0.06	0.11	82.85	107.58	66.85	High
AUS-Brunet	R6	Austin	12.70	113.83	114.94	114.39	Fair	201.92	0.96	0.04	0.13	64.35	105.48	65.54	High
AUS-Brunet	R7	Austin	0.10	157.87	143.64	150.76	Poor	142.38	0.34	0.03	0.07	45.22	88.60	55.06	Medium
AUS-Brunet	R7	Austin	0.20	110.14	115.04	112.59	Fair	170.46	0.41	0.03	0.05	54.08	91.48	56.84	Medium
AUS-Brunet	R7	Austin	0.30	117.80	120.46	119.13	Fair	103.65	0.23	0.02	0.03	32.87	97.07	60.32	High
AUS-Brunet	R7	Austin	0.40	142.24	138.18	140.21	Poor	161.68	0.34	0.03	0.03	51.24	93.29	57.97	Medium

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R7	Austin	0.50	123.38	145.46	134.42	Poor	153.85	0.25	0.03	0.01	48.70	92.38	57.40	Medium
AUS-Brunet	R7	Austin	0.60	140.45	170.34	155.40	Poor	291.94	0.24	0.05	0.02	92.30	87.70	54.50	Medium
AUS-Brunet	R7	Austin	0.70	184.93	184.60	184.76	Very Poor	307.19	0.86	0.05	0.06	97.57	89.34	55.51	Medium
AUS-Brunet	R7	Austin	0.80	142.41	133.62	138.01	Poor	341.23	1.39	0.06	0.09	108.51	92.03	57.18	Medium
AUS-Brunet	R7	Austin	0.90	168.59	176.29	172.44	Very Poor	188.93	0.66	0.03	0.08	60.14	95.19	59.15	Medium
AUS-Brunet	R7	Austin	1.00	145.09	148.46	146.78	Poor	211.52	0.46	0.03	0.12	67.12	96.08	59.70	Medium
AUS-Brunet	R7	Austin	1.10	120.48	94.27	107.37	Fair	180.52	0.29	0.03	0.04	57.31	95.89	59.58	Medium
AUS-Brunet	R7	Austin	1.20	99.68	85.35	92.51	Good	118.92	0.23	0.02	0.08	37.85	92.73	57.62	Medium
AUS-Brunet	R7	Austin	1.30	185.64	122.76	154.20	Poor	357.65	0.62	0.05	0.37	113.29	90.74	56.39	Medium
AUS-Brunet	R7	Austin	1.40	154.71	168.28	161.49	Poor	339.23	0.50	0.05	0.21	107.44	92.00	57.17	Medium
AUS-Brunet	R7	Austin	1.50	149.50	185.81	167.66	Poor	285.66	0.36	0.04	0.12	90.37	91.39	56.79	Medium
AUS-Brunet	R7	Austin	1.60	162.22	169.17	165.69	Poor	238.50	0.25	0.03	0.16	75.52	90.25	56.08	Medium
AUS-Brunet	R7	Austin	1.70	115.19	119.73	117.46	Fair	285.88	0.39	0.04	0.09	90.44	89.02	55.31	Medium
AUS-Brunet	R7	Austin	1.80	111.77	112.98	112.37	Fair	305.89	0.63	0.04	0.06	96.93	88.75	55.15	Medium
AUS-Brunet	R7	Austin	1.90	82.92	72.37	77.64	Good	322.51	0.75	0.04	0.06	102.29	87.59	54.43	Medium
AUS-Brunet	R7	Austin	2.00	111.58	114.48	113.03	Fair	176.05	0.50	0.02	0.07	55.91	86.72	53.89	Medium
AUS-Brunet	R7	Austin	2.10	107.13	99.39	103.26	Fair	129.18	0.27	0.02	0.01	40.91	86.82	53.95	Medium
AUS-Brunet	R7	Austin	2.20	88.42	102.99	95.71	Good	220.89	0.32	0.03	0.05	70.02	91.45	56.82	Medium
AUS-Brunet	R7	Austin	2.30	84.91	90.49	87.70	Good	236.26	0.33	0.03	0.04	74.84	97.84	60.79	High
AUS-Brunet	R7	Austin	2.40	130.42	121.11	125.77	Fair	71.22	0.19	0.01	0.02	22.66	93.82	58.30	Medium
AUS-Brunet	R7	Austin	2.50	123.03	146.61	134.82	Poor	181.32	0.32	0.03	0.02	57.41	90.23	56.07	Medium
AUS-Brunet	R7	Austin	2.60	88.69	120.76	104.72	Fair	137.35	0.17	0.03	0.04	43.53	92.33	57.37	Medium
AUS-Brunet	R7	Austin	2.70	77.19	71.44	74.31	Good	104.75	0.07	0.02	0.01	33.12	94.09	58.47	Medium
AUS-Brunet	R7	Austin	2.80	89.33	85.71	87.52	Good	255.76	0.05	0.05	0.05	80.95	90.92	56.49	Medium
AUS-Brunet	R7	Austin	2.90	98.79	93.75	96.27	Fair	272.37	0.28	0.05	0.05	86.26	87.00	54.06	Medium
AUS-Brunet	R7	Austin	3.00	159.93	167.34	163.64	Poor	294.81	0.46	0.05	0.13	93.42	90.41	56.18	Medium
AUS-Brunet	R7	Austin	3.10	101.97	91.82	96.90	Fair	147.67	0.35	0.02	0.09	46.86	96.65	60.06	High
AUS-Brunet	R7	Austin	3.20	83.35	88.70	86.03	Good	164.84	0.75	0.02	0.06	52.37	96.53	59.98	Medium
AUS-Brunet	R7	Austin	3.30	72.87	68.56	70.71	Good	265.44	1.15	0.04	0.16	84.53	98.52	61.22	High
AUS-Brunet	R7	Austin	3.40	71.81	63.65	67.73	Good	225.74	0.99	0.03	0.26	71.93	100.31	62.33	High
AUS-Brunet	R7	Austin	3.50	104.74	105.52	105.13	Fair	233.09	0.89	0.03	0.25	74.06	103.70	64.44	High
AUS-Brunet	R7	Austin	3.60	85.49	94.13	89.81	Good	136.75	0.61	0.02	0.11	43.54	101.84	63.28	High
AUS-Brunet	R7	Austin	3.70	116.48	122.56	119.52	Fair	224.76	0.79	0.03	0.03	71.39	97.86	60.81	High
AUS-Brunet	R7	Austin	3.80	136.01	129.05	132.53	Poor	82.02	0.25	0.01	0.01	26.09	98.08	60.94	High
AUS-Brunet	R7	Austin	3.90	85.12	86.58	85.85	Good	204.49	0.41	0.03	0.03	64.81	96.64	60.05	High
AUS-Brunet	R7	Austin	4.00	83.95	83.91	83.93	Good	183.32	0.29	0.03	0.01	58.06	98.71	61.33	High
AUS-Brunet	R7	Austin	4.10	80.65	85.17	82.91	Good	118.37	0.18	0.02	0.01	37.52	95.07	59.08	Medium
AUS-Brunet	R7	Austin	4.20	64.03	66.55	65.29	Good	241.93	0.35	0.03	0.02	76.59	93.17	57.89	Medium
AUS-Brunet	R7	Austin	4.30	84.82	87.59	86.21	Good	230.28	0.32	0.03	0.05	72.83	95.00	59.03	Medium
AUS-Brunet	R7	Austin	4.40	85.98	92.57	89.27	Good	165.83	0.22	0.02	0.05	52.48	94.88	58.96	Medium
AUS-Brunet	R7	Austin	4.50	78.43	87.35	82.89	Good	125.39	0.14	0.02	0.01	39.80	88.84	55.20	Medium
AUS-Brunet	R7	Austin	4.60	77.59	94.38	85.99	Good	280.63	0.84	0.04	0.10	89.00	83.96	52.17	Medium
AUS-Brunet	R7	Austin	4.70	82.66	88.42	85.54	Good	370.82	1.16	0.05	0.18	117.69	84.02	52.21	Medium
AUS-Brunet	R7	Austin	4.80	106.82	120.64	113.73	Fair	359.59	0.83	0.05	0.24	114.00	85.53	53.14	Medium
AUS-Brunet	R7	Austin	4.90	135.13	127.19	131.16	Poor	243.07	1.04	0.03	0.20	77.32	88.64	55.08	Medium
AUS-Brunet	R7	Austin	5.00	73.99	89.72	81.86	Good	259.37	0.90	0.03	0.28	82.39	92.40	57.41	Medium
AUS-Brunet	R7	Austin	5.10	98.02	95.38	96.70	Fair	235.46	0.74	0.03	0.15	74.69	96.85	60.18	High
AUS-Brunet	R7	Austin	5.20	120.22	126.59	123.40	Fair	265.13	0.79	0.03	0.30	84.24	97.78	60.76	High
AUS-Brunet	R7	Austin	5.30	137.04	132.79	134.91	Poor	101.15	0.28	0.01	0.03	32.12	97.71	60.72	High
AUS-Brunet	R7	Austin	5.40	99.43	99.50	99.47	Fair	248.46	0.56	0.02	0.17	78.75	94.02	58.42	Medium
AUS-Brunet	R7	Austin	5.50	111.27	116.97	114.12	Fair	229.33	0.50	0.02	0.11	72.73	93.11	57.86	Medium
AUS-Brunet	R7	Austin	5.60	171.97	172.55	172.26	Very Poor	96.83	0.18	0.01	0.08	30.68	95.04	59.06	Medium
AUS-Brunet	R7	Austin	5.70	130.38	158.44	144.41	Poor	172.60	0.21	0.02	0.04	54.57	92.59	57.53	Medium
AUS-Brunet	R7	Austin	5.80	98.03	115.62	106.83	Fair	256.90	0.54	0.03	0.04	81.46	99.17	61.62	High
AUS-Brunet	R7	Austin	5.90	112.52	109.51	111.01	Fair	144.54	0.98	0.02	0.04	46.22	103.23	64.14	High
AUS-Brunet	R7	Austin	6.00	79.75	68.09	73.92	Good	266.81	1.49	0.03	0.07	85.20	100.21	62.27	High
AUS-Brunet	R7	Austin	6.10	91.67	75.42	83.54	Good	275.13	1.48	0.03	0.08	87.67	102.38	63.62	High
AUS-Brunet	R7	Austin	6.20	92.64	70.40	81.52	Good	133.40	0.61	0.01	0.10	42.44	103.34	64.21	High
AUS-Brunet	R7	Austin	6.30	80.78	66.19	73.48	Good	73.27	0.25	0.01	0.01	23.32	100.79	62.63	High
AUS-Brunet	R7	Austin	6.40	83.21	65.34	74.28	Good	111.75	0.28	0.01	0.04	35.49	98.97	61.50	High
AUS-Brunet	R7	Austin	6.50	72.93	70.28	71.61	Good	217.14	0.51	0.03	0.04	68.96	97.41	60.53	High
AUS-Brunet	R7	Austin	6.60	71.39	80.76	76.07	Good	252.57	0.41	0.03	0.03	80.07	98.95	61.48	High
AUS-Brunet	R7	Austin	6.70	84.37	84.90	84.64	Good	199.31	0.20	0.02	0.02	63.21	98.29	61.08	High
AUS-Brunet	R7	Austin	6.80	65.23	63.99	64.61	Good	173.56	0.19	0.02	0.01	54.96	97.00	60.27	High
AUS-Brunet	R7	Austin	6.90	72.07	68.50	70.29	Good	283.23	0.32	0.03	0.08	89.67	97.43	60.54	High
AUS-Brunet	R7	Austin	7.00	92.01	93.99	93.00	Good	283.37	0.29	0.03	0.14	89.73	97.92	60.85	High
AUS-Brunet	R7	Austin	7.10	93.00	94.81	93.91	Good	259.55	0.25	0.03	0.10	82.10	97.98	60.88	High
AUS-Brunet	R7	Austin	7.20	136.62	129.26	132.94	Poor	235.06	0.22	0.02	0.17	74.48	100.51	62.45	High
AUS-Brunet	R7	Austin	7.30	71.13	77.48	74.30	Good	114.68	0.15	0.01	0.03	36.28	103.33	64.21	High
AUS-Brunet	R7	Austin	7.40	56.98	74.31	65.65	Good	99.23	0.15	0.01	0.01	31.53	103.82	64.51	High
AUS-Brunet	R7	Austin	7.50	64.92	88.07	76.50	Good	165.48	0.16	0.02	0.02	52.27	105.99	65.86	High
AUS-Brunet	R7	Austin	7.60	67.30	83.80	75.55	Good	123.02	0.49	0.02	0.00	39.10	104.89	65.17	High
AUS-Brunet	R7	Austin	7.70	81.01	74.63	77.82	Good	269.74	0.29	0.03	0.00	85.36	101.06	62.80	High
AUS-Brunet	R7	Austin	7.80	72.58	68.63	70.61	Good	202.49	0.08	0.02	0.00	63.97	104.53	64.95	High
AUS-Brunet	R7	Austin	7.90	72.25	76.41	74.33	Good	153.40	0.17	0.02	0.00	48.55	101.60	63.13	High
AUS-Brunet	R7	Austin	8.00	73.22	66.40	69.81	Good	168.83	0.26	0.02	0.00	53.37	95.96	59.63	Medium
AUS-Brunet	R7	Austin	8.10	162.55	173.90	168.22	Poor	259.84	0.49	0.03	0.00	82.37	96.19	59.77	Medium

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R7	Austin	8.20	67.95	74.87	71.41	Good	233.57	0.47	0.03	0.00	73.98	101.01	62.76	High
AUS-Brunet	R7	Austin	8.30	88.30	90.63	89.47	Good	202.28	0.42	0.03	0.00	64.11	103.81	64.50	High
AUS-Brunet	R7	Austin	8.40	149.97	160.06	155.01	Poor	187.24	0.39	0.02	0.00	59.43	103.50	64.31	High
AUS-Brunet	R7	Austin	8.50	78.57	73.12	75.84	Good	203.42	0.47	0.03	0.00	64.50	105.04	65.27	High
AUS-Brunet	R7	Austin	8.60	152.66	154.44	153.55	Poor	288.30	0.67	0.04	0.33	91.36	106.00	65.87	High
AUS-Brunet	R7	Austin	8.70	115.42	155.14	135.28	Poor	206.06	0.50	0.03	0.20	65.35	108.99	67.72	High
AUS-Brunet	R7	Austin	8.80	102.37	131.72	117.05	Fair	279.92	0.57	0.04	0.16	88.70	108.47	67.40	High
AUS-Brunet	R7	Austin	8.90	109.94	130.27	120.11	Fair	234.46	0.48	0.03	0.29	74.37	107.96	67.08	High
AUS-Brunet	R7	Austin	9.00	100.97	96.75	98.86	Fair	292.41	0.61	0.04	0.32	92.71	107.84	67.01	High
AUS-Brunet	R7	Austin	9.10	87.11	81.25	84.18	Good	243.88	0.69	0.03	0.31	77.36	108.64	67.51	High
AUS-Brunet	R7	Austin	9.20	94.27	89.68	91.98	Good	264.86	0.94	0.04	0.27	84.18	108.11	67.18	High
AUS-Brunet	R7	Austin	9.30	79.92	92.17	86.04	Good	291.99	1.05	0.04	0.25	92.75	105.96	65.84	High
AUS-Brunet	R7	Austin	9.40	96.60	105.61	101.11	Fair	251.64	0.85	0.04	0.19	79.88	106.78	66.35	High
AUS-Brunet	R7	Austin	9.50	87.43	91.55	89.49	Good	97.65	0.33	0.02	0.06	30.99	107.00	66.49	High
AUS-Brunet	R7	Austin	9.60	60.74	63.57	62.15	Good	34.28	0.14	0.01	0.01	10.99	106.40	66.11	High
AUS-Brunet	R7	Austin	9.70	64.12	73.15	68.63	Good	205.86	0.45	0.03	0.04	65.37	105.15	65.34	High
AUS-Brunet	R7	Austin	9.80	57.10	86.71	71.90	Good	289.42	0.45	0.04	0.04	91.73	108.03	67.12	High
AUS-Brunet	R7	Austin	9.90	106.95	109.91	108.43	Fair	123.73	0.19	0.02	0.01	39.25	107.46	66.77	High
AUS-Brunet	R7	Austin	10.00	156.45	152.36	154.41	Poor	128.63	0.22	0.02	0.01	40.75	105.30	65.43	High
AUS-Brunet	R7	Austin	10.10	92.73	92.21	92.47	Good	102.36	0.19	0.02	0.02	32.48	100.84	62.66	High
AUS-Brunet	R7	Austin	10.20	54.43	50.46	52.44	Very Good	143.29	0.23	0.02	0.05	45.50	99.08	61.57	High
AUS-Brunet	R7	Austin	10.30	62.19	58.73	60.46	Good	166.85	0.37	0.03	0.05	52.91	99.59	61.88	High
AUS-Brunet	R7	Austin	10.40	54.39	63.03	58.71	Very Good	223.66	0.61	0.04	0.04	70.92	100.16	62.24	High
AUS-Brunet	R7	Austin	10.50	56.50	69.78	63.14	Good	266.74	0.94	0.04	0.04	84.62	102.27	63.54	High
AUS-Brunet	R7	Austin	10.60	82.86	93.69	88.27	Good	97.75	0.13	0.02	0.01	30.97	106.22	66.00	High
AUS-Brunet	R7	Austin	10.70	144.71	150.07	147.39	Poor	128.35	0.20	0.02	0.01	40.66	103.32	64.20	High
AUS-Brunet	R7	Austin	10.80	69.81	64.52	67.16	Good	236.10	0.39	0.04	0.08	74.86	103.31	64.19	High
AUS-Brunet	R7	Austin	10.90	76.34	75.05	75.69	Good	252.62	0.46	0.05	0.05	80.12	104.64	65.02	High
AUS-Brunet	R7	Austin	11.00	56.08	56.45	56.26	Very Good	241.96	0.43	0.05	0.07	76.67	102.08	63.43	High
AUS-Brunet	R7	Austin	11.10	146.11	147.68	146.90	Poor	238.50	0.29	0.05	0.03	75.43	97.73	60.72	High
AUS-Brunet	R7	Austin	11.20	134.45	140.79	137.62	Poor	177.35	0.18	0.03	0.05	56.23	94.01	58.41	Medium
AUS-Brunet	R7	Austin	11.30	127.53	127.64	127.58	Fair	235.09	0.39	0.04	0.15	74.36	92.32	57.36	Medium
AUS-Brunet	R7	Austin	11.40	92.25	97.43	94.84	Good	300.24	0.64	0.05	0.13	95.16	92.15	57.26	Medium
AUS-Brunet	R7	Austin	11.50	66.52	86.55	76.54	Good	357.33	0.90	0.06	0.24	113.27	96.96	60.25	High
AUS-Brunet	R7	Austin	11.60	55.83	84.35	70.09	Good	298.84	0.69	0.05	0.18	94.82	102.49	63.68	High
AUS-Brunet	R7	Austin	11.70	60.08	74.21	67.15	Good	237.83	0.53	0.04	0.19	75.31	104.00	64.62	High
AUS-Brunet	R7	Austin	11.80	60.51	74.91	67.71	Good	135.54	0.34	0.02	0.05	42.96	103.38	64.24	High
AUS-Brunet	R7	Austin	11.90	72.21	100.24	86.23	Good	191.47	0.47	0.03	0.04	60.79	102.00	63.38	High
AUS-Brunet	R7	Austin	12.00	70.82	75.58	73.20	Good	344.11	0.76	0.05	0.16	109.01	103.14	64.09	High
AUS-Brunet	R7	Austin	12.10	81.86	96.80	89.33	Good	312.73	0.90	0.05	0.24	99.29	108.29	67.29	High
AUS-Brunet	R7	Austin	12.20	61.95	88.99	75.47	Good	265.60	0.86	0.04	0.18	84.26	110.73	68.80	High
AUS-Brunet	R7	Austin	12.30	115.51	117.33	116.42	Fair	251.26	0.85	0.04	0.15	79.77	110.79	68.84	High
AUS-Brunet	R7	Austin	12.40	87.77	78.68	83.22	Good	241.65	0.74	0.04	0.13	76.72	110.80	68.85	High
AUS-Brunet	R7	Austin	12.50	64.67	65.09	64.88	Good	202.65	0.60	0.04	0.11	64.41	109.68	68.15	High
AUS-Brunet	R7	Austin	12.60	63.22	61.74	62.48	Good	280.98	0.83	0.05	0.19	89.30	109.12	67.80	High
AUS-Brunet	R7	Austin	12.70	113.83	114.94	114.39	Fair	169.01	0.48	0.03	0.13	53.60	106.52	66.19	High
AUS-Brunet	R8	Austin	0.10	157.87	143.64	150.76	Poor	28.17	0.10	0.01	0.00	9.03	84.29	52.37	Medium
AUS-Brunet	R8	Austin	0.20	110.14	115.04	112.59	Fair	151.43	0.29	0.04	0.03	48.11	81.66	50.74	Medium
AUS-Brunet	R8	Austin	0.30	117.80	120.46	119.13	Fair	292.05	0.28	0.06	0.04	92.35	91.26	56.70	Medium
AUS-Brunet	R8	Austin	0.40	142.24	138.18	140.21	Poor	265.73	0.19	0.05	0.04	83.98	98.52	61.22	High
AUS-Brunet	R8	Austin	0.50	123.38	145.46	134.42	Poor	283.02	1.32	0.05	0.07	90.04	100.65	62.54	High
AUS-Brunet	R8	Austin	0.60	140.45	170.34	155.40	Poor	217.24	0.48	0.04	0.03	68.85	100.03	62.16	High
AUS-Brunet	R8	Austin	0.70	184.93	184.60	184.76	Very Poor	270.68	0.39	0.06	0.08	85.73	96.51	59.97	Medium
AUS-Brunet	R8	Austin	0.80	142.41	133.62	138.01	Poor	256.34	0.43	0.05	0.08	81.25	97.03	60.29	High
AUS-Brunet	R8	Austin	0.90	168.59	176.29	172.44	Very Poor	220.32	0.34	0.04	0.05	69.77	98.94	61.48	High
AUS-Brunet	R8	Austin	1.00	145.09	148.46	146.78	Poor	248.16	0.42	0.05	0.24	78.70	99.32	61.72	High
AUS-Brunet	R8	Austin	1.10	120.48	94.27	107.37	Fair	208.61	0.30	0.04	0.09	66.01	100.69	62.56	High
AUS-Brunet	R8	Austin	1.20	99.68	85.35	92.51	Good	162.36	0.20	0.03	0.12	51.49	99.86	62.05	High
AUS-Brunet	R8	Austin	1.30	185.64	122.76	154.20	Poor	247.70	0.32	0.04	0.07	78.52	96.54	59.99	Medium
AUS-Brunet	R8	Austin	1.40	154.71	168.28	161.49	Poor	286.17	0.59	0.05	0.09	90.69	94.69	58.84	Medium
AUS-Brunet	R8	Austin	1.50	149.50	185.81	167.66	Poor	288.16	0.77	0.06	0.24	91.43	92.99	57.78	Medium
AUS-Brunet	R8	Austin	1.60	162.22	169.17	165.69	Poor	324.17	0.86	0.07	0.35	103.05	92.46	57.45	Medium
AUS-Brunet	R8	Austin	1.70	115.19	119.73	117.46	Fair	302.56	0.64	0.06	0.34	96.00	94.41	58.66	Medium
AUS-Brunet	R8	Austin	1.80	111.77	112.98	112.37	Fair	228.95	0.44	0.05	0.31	72.56	94.17	58.52	Medium
AUS-Brunet	R8	Austin	1.90	82.92	72.37	77.64	Good	315.72	0.58	0.05	0.20	99.93	89.62	55.69	Medium
AUS-Brunet	R8	Austin	2.00	111.58	114.48	113.03	Fair	326.44	0.55	0.05	0.16	103.36	91.89	57.10	Medium
AUS-Brunet	R8	Austin	2.10	107.13	99.39	103.26	Fair	230.09	0.33	0.04	0.10	72.77	97.95	60.86	High
AUS-Brunet	R8	Austin	2.20	88.42	102.99	95.71	Good	83.73	0.14	0.02	0.01	26.58	101.82	63.27	High
AUS-Brunet	R8	Austin	2.30	84.91	90.49	87.70	Good	279.67	0.47	0.05	0.21	88.65	102.48	63.68	High
AUS-Brunet	R8	Austin	2.40	130.42	121.11	125.77	Fair	78.87	0.86	0.02	0.03	25.30	101.50	63.07	High
AUS-Brunet	R8	Austin	2.50	123.03	146.61	134.82	Poor	218.66	1.12	0.04	0.05	69.59	96.65	60.05	High
AUS-Brunet	R8	Austin	2.60	88.69	120.76	104.72	Fair	102.63	0.33	0.02	0.01	32.66	101.49	63.06	High
AUS-Brunet	R8	Austin	2.70	77.19	71.44	74.31	Good	184.53	0.40	0.03	0.03	58.57	102.00	63.38	High
AUS-Brunet	R8	Austin	2.80	89.33	85.71	87.52	Good	232.25	0.46	0.04	0.03	73.72	101.07	62.80	High
AUS-Brunet	R8	Austin	2.90	98.79	93.75	96.27	Fair	238.70	1.05	0.04	0.03	75.97	96.15	59.74	Medium
AUS-Brunet	R8	Austin	3.00	159.93	167.34	163.64	Poor	116.85	0.50	0.02	0.01	37.17	95.63	59.42	Medium
AUS-Brunet	R8	Austin	3.10	101.97	91.82	96.90	Fair	156.77	0.44	0.03	0.02	49.86	94.55	58.75	Medium

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R8	Austin	3.20	83.35	88.70	86.03	Good	253.11	0.52	0.05	0.02	80.30	99.66	61.92	High
AUS-Brunet	R8	Austin	3.30	72.87	68.56	70.71	Good	80.08	0.56	0.02	0.01	25.76	100.49	62.44	High
AUS-Brunet	R8	Austin	3.40	71.81	63.65	67.73	Good	242.52	0.35	0.04	0.06	76.86	98.75	61.36	High
AUS-Brunet	R8	Austin	3.50	104.74	105.52	105.13	Fair	174.86	0.14	0.03	0.02	55.41	100.52	62.46	High
AUS-Brunet	R8	Austin	3.60	85.49	94.13	89.81	Good	225.86	0.25	0.04	0.01	71.48	102.41	63.64	High
AUS-Brunet	R8	Austin	3.70	116.48	122.56	119.52	Fair	95.70	0.25	0.02	0.01	30.46	100.23	62.28	High
AUS-Brunet	R8	Austin	3.80	136.01	129.05	132.53	Poor	131.16	0.55	0.02	0.06	41.58	98.43	61.16	High
AUS-Brunet	R8	Austin	3.90	85.12	86.58	85.85	Good	168.43	0.69	0.04	0.06	53.53	95.23	59.17	Medium
AUS-Brunet	R8	Austin	4.00	83.95	83.91	83.93	Good	302.96	0.59	0.06	0.05	96.01	100.49	62.44	High
AUS-Brunet	R8	Austin	4.10	80.65	85.17	82.91	Good	282.53	0.36	0.06	0.06	89.55	105.01	65.25	High
AUS-Brunet	R8	Austin	4.20	64.03	66.55	65.29	Good	118.97	0.49	0.03	0.03	37.77	104.98	65.23	High
AUS-Brunet	R8	Austin	4.30	84.82	87.59	86.21	Good	58.31	0.17	0.01	0.01	18.56	100.36	62.36	High
AUS-Brunet	R8	Austin	4.40	85.98	92.57	89.27	Good	186.71	0.12	0.04	0.03	59.02	90.73	56.38	Medium
AUS-Brunet	R8	Austin	4.50	78.43	87.35	82.89	Good	343.68	0.20	0.06	0.04	108.74	91.62	56.93	Medium
AUS-Brunet	R8	Austin	4.60	77.59	94.38	85.99	Good	219.96	2.21	0.04	0.12	70.64	94.83	58.93	Medium
AUS-Brunet	R8	Austin	4.70	82.66	88.42	85.54	Good	272.86	0.63	0.05	0.06	86.50	89.27	55.47	Medium
AUS-Brunet	R8	Austin	4.80	106.82	120.64	113.73	Fair	193.43	0.43	0.04	0.04	61.43	85.61	53.20	Medium
AUS-Brunet	R8	Austin	4.90	135.13	127.19	131.16	Poor	300.23	1.30	0.06	0.15	95.52	85.05	52.85	Medium
AUS-Brunet	R8	Austin	5.00	73.99	89.72	81.86	Good	295.59	1.15	0.06	0.21	93.95	92.98	57.78	Medium
AUS-Brunet	R8	Austin	5.10	98.02	95.38	96.70	Fair	104.46	0.38	0.02	0.05	33.31	97.24	60.42	High
AUS-Brunet	R8	Austin	5.20	120.22	126.59	123.40	Fair	266.57	0.84	0.06	0.16	84.71	95.17	59.14	Medium
AUS-Brunet	R8	Austin	5.30	137.04	132.79	134.91	Poor	252.36	0.73	0.05	0.18	79.99	98.32	61.10	High
AUS-Brunet	R8	Austin	5.40	99.43	99.50	99.47	Fair	299.72	0.88	0.07	0.14	95.10	99.52	61.84	High
AUS-Brunet	R8	Austin	5.50	111.27	116.97	114.12	Fair	161.20	0.45	0.04	0.11	51.25	100.29	62.32	High
AUS-Brunet	R8	Austin	5.60	171.97	172.55	172.26	Very Poor	130.25	0.36	0.03	0.05	41.34	98.68	61.32	High
AUS-Brunet	R8	Austin	5.70	130.38	158.44	144.41	Poor	197.96	0.42	0.04	0.04	62.66	98.86	61.43	High
AUS-Brunet	R8	Austin	5.80	98.03	115.62	106.83	Fair	236.46	0.45	0.04	0.04	75.05	105.78	65.73	High
AUS-Brunet	R8	Austin	5.90	112.52	109.51	111.01	Fair	254.52	0.43	0.05	0.12	80.56	108.95	67.70	High
AUS-Brunet	R8	Austin	6.00	79.75	68.09	73.92	Good	207.63	0.38	0.04	0.06	65.87	110.42	68.61	High
AUS-Brunet	R8	Austin	6.10	91.67	75.42	83.54	Good	134.66	0.44	0.02	0.00	42.89	107.99	67.10	High
AUS-Brunet	R8	Austin	6.20	92.64	70.40	81.52	Good	10.80	0.51	0.01	0.00	3.59	99.81	62.02	High
AUS-Brunet	R8	Austin	6.30	80.78	66.19	73.48	Good	50.82	0.23	0.03	0.00	16.07	89.50	55.61	Medium
AUS-Brunet	R8	Austin	6.40	83.21	65.34	74.28	Good	162.39	0.05	0.03	0.00	51.43	91.29	56.72	Medium
AUS-Brunet	R8	Austin	6.50	72.93	70.28	71.61	Good	208.86	0.15	0.03	0.00	66.02	93.52	58.11	Medium
AUS-Brunet	R8	Austin	6.60	71.39	80.76	76.07	Good	183.50	0.12	0.03	0.00	58.12	93.82	58.30	Medium
AUS-Brunet	R8	Austin	6.70	84.37	84.90	84.64	Good	171.76	0.18	0.03	0.00	54.35	91.67	56.96	Medium
AUS-Brunet	R8	Austin	6.80	65.23	63.99	64.61	Good	154.15	0.21	0.02	0.00	48.87	90.16	56.02	Medium
AUS-Brunet	R8	Austin	6.90	72.07	68.50	70.29	Good	286.94	0.50	0.04	0.00	90.86	92.67	57.58	Medium
AUS-Brunet	R8	Austin	7.00	92.01	93.99	93.00	Good	201.05	0.39	0.02	0.03	63.63	94.12	58.48	Medium
AUS-Brunet	R8	Austin	7.10	93.00	94.81	93.91	Good	151.84	0.33	0.02	0.12	48.17	90.64	56.32	Medium
AUS-Brunet	R8	Austin	7.20	136.62	129.26	132.94	Poor	168.26	0.36	0.02	0.06	53.30	89.68	55.73	Medium
AUS-Brunet	R8	Austin	7.30	71.13	77.48	74.30	Good	113.86	0.24	0.01	0.07	36.07	93.49	58.09	Medium
AUS-Brunet	R8	Austin	7.40	56.98	74.31	65.65	Good	5.97	0.08	0.01	0.01	1.95	91.44	56.82	Medium
AUS-Brunet	R8	Austin	7.50	64.92	88.07	76.50	Good	63.89	0.21	0.02	0.01	20.44	87.33	54.26	Medium
AUS-Brunet	R8	Austin	7.60	67.30	83.80	75.55	Good	87.62	0.12	0.02	0.01	27.65	83.61	51.95	Medium
AUS-Brunet	R8	Austin	7.70	81.01	74.63	77.82	Good	331.55	0.28	0.05	0.03	104.90	83.81	52.08	Medium
AUS-Brunet	R8	Austin	7.80	72.58	68.63	70.61	Good	280.31	0.18	0.04	0.03	88.56	92.51	57.48	Medium
AUS-Brunet	R8	Austin	7.90	72.25	76.41	74.33	Good	36.40	0.19	0.01	0.01	11.59	91.15	56.64	Medium
AUS-Brunet	R8	Austin	8.00	73.22	66.40	69.81	Good	279.27	1.24	0.04	0.10	88.80	85.63	53.21	Medium
AUS-Brunet	R8	Austin	8.10	162.55	173.90	168.22	Poor	165.69	0.98	0.03	0.02	52.90	88.16	54.78	Medium
AUS-Brunet	R8	Austin	8.20	67.95	74.87	71.41	Good	182.88	0.12	0.03	0.02	57.83	89.47	55.59	Medium
AUS-Brunet	R8	Austin	8.30	88.30	90.63	89.47	Good	326.47	0.45	0.05	0.09	103.25	93.33	57.99	Medium
AUS-Brunet	R8	Austin	8.40	149.97	160.06	155.01	Poor	354.06	0.71	0.06	0.29	112.22	102.74	63.84	High
AUS-Brunet	R8	Austin	8.50	78.57	73.12	75.84	Good	310.35	0.76	0.05	0.36	98.45	110.72	68.80	High
AUS-Brunet	R8	Austin	8.60	152.66	154.44	153.55	Poor	95.38	0.33	0.02	0.07	30.36	115.85	71.98	High
AUS-Brunet	R8	Austin	8.70	115.42	155.14	135.28	Poor	224.60	0.77	0.04	0.16	71.45	108.58	67.47	High
AUS-Brunet	R8	Austin	8.80	102.37	131.72	117.05	Fair	179.55	0.56	0.03	0.09	57.00	109.67	68.15	High
AUS-Brunet	R8	Austin	8.90	109.94	130.27	120.11	Fair	162.33	0.56	0.03	0.07	51.57	104.92	65.19	High
AUS-Brunet	R8	Austin	9.00	100.97	96.75	98.86	Fair	288.67	0.76	0.05	0.08	91.62	103.14	64.09	High
AUS-Brunet	R8	Austin	9.10	87.11	81.25	84.18	Good	270.31	0.76	0.04	0.09	85.78	107.13	66.57	High
AUS-Brunet	R8	Austin	9.20	94.27	89.68	91.98	Good	183.70	0.61	0.03	0.05	58.42	107.67	66.91	High
AUS-Brunet	R8	Austin	9.30	79.92	92.17	86.04	Good	225.19	1.01	0.04	0.10	71.66	104.60	65.00	High
AUS-Brunet	R8	Austin	9.40	96.60	105.61	101.11	Fair	253.26	1.59	0.04	0.22	80.70	104.98	65.23	High
AUS-Brunet	R8	Austin	9.50	87.43	91.55	89.49	Good	95.93	0.52	0.02	0.05	30.72	108.43	67.38	High
AUS-Brunet	R8	Austin	9.60	60.74	63.57	62.15	Good	49.30	0.20	0.01	0.01	15.66	109.00	67.73	High
AUS-Brunet	R8	Austin	9.70	64.12	73.15	68.63	Good	171.54	0.50	0.03	0.02	54.48	109.78	68.21	High
AUS-Brunet	R8	Austin	9.80	57.10	86.71	71.90	Good	194.67	0.49	0.03	0.09	61.75	111.42	69.23	High
AUS-Brunet	R8	Austin	9.90	106.95	109.91	108.43	Fair	133.94	0.36	0.02	0.08	42.65	109.06	67.77	High
AUS-Brunet	R8	Austin	10.00	156.45	152.36	154.41	Poor	194.35	0.48	0.03	0.13	61.58	109.15	67.82	High
AUS-Brunet	R8	Austin	10.10	92.73	92.21	92.47	Good	128.55	0.27	0.02	0.03	40.67	108.83	67.62	High
AUS-Brunet	R8	Austin	10.20	54.43	50.46	52.44	Very Good	213.12	0.41	0.03	0.16	67.54	109.24	67.88	High
AUS-Brunet	R8	Austin	10.30	62.19	58.73	60.46	Good	192.60	0.32	0.03	0.13	60.92	111.63	69.36	High
AUS-Brunet	R8	Austin	10.40	54.39	63.03	58.71	Very Good	87.44	0.14	0.01	0.03	27.70	110.93	68.93	High
AUS-Brunet	R8	Austin	10.50	56.50	69.78	63.14	Good	149.67	0.22	0.02	0.13	47.35	110.26	68.51	High
AUS-Brunet	R8	Austin	10.60	82.86	93.69	88.27	Good	59.26	0.09	0.01	0.02	18.79	110.33	68.56	High
AUS-Brunet	R8	Austin	10.70	144.71	150.07	147.39	Poor	74.70	0.16	0.02	0.03	23.76	103.55	64.34	High
AUS-Brunet	R8	Austin	10.80	69.81	64.52	67.16	Good	204.09	0.24	0.03	0.03	64.55	102.19	63.49	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R8	Austin	10.90	76.34	75.05	75.69	Good	254.36	0.24	0.03	0.03	80.53	104.70	65.05	High
AUS-Brunet	R8	Austin	11.00	56.08	56.45	56.26	Very Good	257.85	0.24	0.04	0.07	81.51	103.29	64.18	High
AUS-Brunet	R8	Austin	11.10	146.11	147.68	146.90	Poor	279.32	0.23	0.04	0.04	88.36	101.08	62.81	High
AUS-Brunet	R8	Austin	11.20	134.45	140.79	137.62	Poor	241.54	0.13	0.05	0.10	76.39	100.58	62.50	High
AUS-Brunet	R8	Austin	11.30	127.53	127.64	127.58	Fair	203.39	0.09	0.04	0.17	64.25	99.91	62.08	High
AUS-Brunet	R8	Austin	11.40	92.25	97.43	94.84	Good	197.99	0.11	0.04	0.04	62.67	98.65	61.30	High
AUS-Brunet	R8	Austin	11.50	66.52	86.55	76.54	Good	234.11	0.13	0.05	0.06	73.99	98.54	61.23	High
AUS-Brunet	R8	Austin	11.60	55.83	84.35	70.09	Good	313.80	0.23	0.06	0.16	99.24	101.22	62.89	High
AUS-Brunet	R8	Austin	11.70	60.08	74.21	67.15	Good	364.81	0.49	0.06	0.26	115.68	105.97	65.84	High
AUS-Brunet	R8	Austin	11.80	60.51	74.91	67.71	Good	354.25	0.72	0.06	0.52	112.32	112.67	70.01	High
AUS-Brunet	R8	Austin	11.90	72.21	100.24	86.23	Good	300.15	0.78	0.05	0.47	95.18	118.65	73.73	High
AUS-Brunet	R8	Austin	12.00	70.82	75.58	73.20	Good	247.84	1.80	0.04	0.37	79.26	119.59	74.31	High
AUS-Brunet	R8	Austin	12.10	81.86	96.80	89.33	Good	171.04	1.07	0.03	0.26	54.69	119.94	74.53	High
AUS-Brunet	R8	Austin	12.20	61.95	88.99	75.47	Good	126.60	0.99	0.03	0.05	40.47	113.93	70.79	High
AUS-Brunet	R8	Austin	12.30	115.51	117.33	116.42	Fair	262.08	0.79	0.04	0.07	83.15	111.54	69.31	High
AUS-Brunet	R8	Austin	12.40	87.77	78.68	83.22	Good	210.37	0.89	0.04	0.07	66.94	109.98	68.34	High
AUS-Brunet	R8	Austin	12.50	64.67	65.09	64.88	Good	239.11	0.23	0.04	0.04	75.73	110.87	68.89	High
AUS-Brunet	R8	Austin	12.60	63.22	61.74	62.48	Good	315.45	0.36	0.06	0.11	99.86	111.73	69.43	High
AUS-Brunet	R8	Austin	12.70	113.83	114.94	114.39	Fair	173.78	2.64	0.03	0.09	56.30	111.35	69.19	High
AUS-Brunet	R9	Austin	0.10	157.87	143.64	150.76	Poor	93.71	0.16	0.02	0.05	29.70	94.59	58.78	Medium
AUS-Brunet	R9	Austin	0.20	110.14	115.04	112.59	Fair	79.44	0.10	0.01	0.01	25.09	95.53	59.36	Medium
AUS-Brunet	R9	Austin	0.30	117.80	120.46	119.13	Fair	63.79	0.06	0.01	0.01	20.12	95.58	59.39	Medium
AUS-Brunet	R9	Austin	0.40	142.24	138.18	140.21	Poor	205.22	0.12	0.03	0.30	64.95	93.66	58.19	Medium
AUS-Brunet	R9	Austin	0.50	123.38	145.46	134.42	Poor	183.80	0.05	0.03	0.08	58.10	95.67	59.45	Medium
AUS-Brunet	R9	Austin	0.60	140.45	170.34	155.40	Poor	110.80	0.04	0.02	0.01	34.97	90.40	56.17	Medium
AUS-Brunet	R9	Austin	0.70	184.93	184.60	184.76	Very Poor	354.66	0.28	0.05	0.21	112.26	83.19	51.69	Medium
AUS-Brunet	R9	Austin	0.80	142.41	133.62	138.01	Poor	315.01	0.42	0.05	0.09	99.83	90.92	56.49	Medium
AUS-Brunet	R9	Austin	0.90	168.59	176.29	172.44	Very Poor	123.87	0.91	0.02	0.04	39.58	93.48	58.09	Medium
AUS-Brunet	R9	Austin	1.00	145.09	148.46	146.78	Poor	112.08	0.07	0.02	0.05	35.55	85.73	53.27	Medium
AUS-Brunet	R9	Austin	1.10	120.48	94.27	107.37	Fair	373.54	0.20	0.05	0.11	118.16	87.27	54.23	Medium
AUS-Brunet	R9	Austin	1.20	99.68	85.35	92.51	Good	305.58	0.29	0.04	0.22	96.69	96.03	59.67	Medium
AUS-Brunet	R9	Austin	1.30	185.64	122.76	154.20	Poor	250.34	0.27	0.04	0.11	79.13	98.39	61.14	High
AUS-Brunet	R9	Austin	1.40	154.71	168.28	161.49	Poor	151.22	0.20	0.02	0.05	47.81	94.05	58.44	Medium
AUS-Brunet	R9	Austin	1.50	149.50	185.81	167.66	Poor	271.75	0.68	0.04	0.09	86.18	86.66	53.85	Medium
AUS-Brunet	R9	Austin	1.60	162.22	169.17	165.69	Poor	228.26	2.79	0.03	0.08	73.47	84.39	52.44	Medium
AUS-Brunet	R9	Austin	1.70	115.19	119.73	117.46	Fair	241.69	2.22	0.03	0.17	77.49	84.56	52.54	Medium
AUS-Brunet	R9	Austin	1.80	111.77	112.98	112.37	Fair	280.67	0.57	0.04	0.05	88.96	82.22	51.09	Medium
AUS-Brunet	R9	Austin	1.90	82.92	72.37	77.64	Good	381.25	1.07	0.05	0.17	121.06	83.02	51.59	Medium
AUS-Brunet	R9	Austin	2.00	111.58	114.48	113.03	Fair	336.14	1.08	0.04	0.28	106.75	89.39	55.55	Medium
AUS-Brunet	R9	Austin	2.10	107.13	99.39	103.26	Fair	143.61	1.60	0.02	0.08	46.16	95.27	59.20	Medium
AUS-Brunet	R9	Austin	2.20	88.42	102.99	95.71	Good	154.49	0.53	0.02	0.12	48.97	98.06	60.93	High
AUS-Brunet	R9	Austin	2.30	84.91	90.49	87.70	Good	180.34	0.58	0.02	0.05	57.31	100.12	62.21	High
AUS-Brunet	R9	Austin	2.40	130.42	121.11	125.77	Fair	94.07	0.32	0.01	0.02	29.82	96.45	59.93	Medium
AUS-Brunet	R9	Austin	2.50	123.03	146.61	134.82	Poor	55.43	0.16	0.01	0.01	17.51	90.32	56.12	Medium
AUS-Brunet	R9	Austin	2.60	88.69	120.76	104.72	Fair	29.38	0.09	0.01	0.01	9.34	87.92	54.63	Medium
AUS-Brunet	R9	Austin	2.70	77.19	71.44	74.31	Good	138.27	0.17	0.02	0.04	43.80	84.45	52.48	Medium
AUS-Brunet	R9	Austin	2.80	89.33	85.71	87.52	Good	325.28	0.26	0.04	0.04	102.76	83.40	51.82	Medium
AUS-Brunet	R9	Austin	2.90	98.79	93.75	96.27	Fair	285.51	0.19	0.04	0.07	90.40	85.54	53.15	Medium
AUS-Brunet	R9	Austin	3.00	159.93	167.34	163.64	Poor	136.89	0.27	0.02	0.02	43.32	88.91	55.25	Medium
AUS-Brunet	R9	Austin	3.10	101.97	91.82	96.90	Fair	33.86	0.18	0.01	0.01	10.82	83.41	51.83	Medium
AUS-Brunet	R9	Austin	3.20	83.35	88.70	86.03	Good	196.12	0.59	0.03	0.02	62.16	83.04	51.60	Medium
AUS-Brunet	R9	Austin	3.30	72.87	68.56	70.71	Good	201.86	0.65	0.03	0.02	64.16	86.85	53.97	Medium
AUS-Brunet	R9	Austin	3.40	71.81	63.65	67.73	Good	145.81	0.55	0.02	0.01	46.28	86.75	53.90	Medium
AUS-Brunet	R9	Austin	3.50	104.74	105.52	105.13	Fair	96.01	0.46	0.01	0.00	30.63	87.16	54.16	Medium
AUS-Brunet	R9	Austin	3.60	85.49	94.13	89.81	Good	272.02	0.53	0.03	0.13	86.24	85.55	53.16	Medium
AUS-Brunet	R9	Austin	3.70	116.48	122.56	119.52	Fair	165.18	0.46	0.02	0.10	52.37	87.84	54.58	Medium
AUS-Brunet	R9	Austin	3.80	136.01	129.05	132.53	Poor	100.89	0.30	0.01	0.04	32.03	89.22	55.44	Medium
AUS-Brunet	R9	Austin	3.90	85.12	86.58	85.85	Good	119.75	0.36	0.01	0.04	38.00	87.75	54.53	Medium
AUS-Brunet	R9	Austin	4.00	83.95	83.91	83.93	Good	149.37	0.30	0.02	0.01	47.34	88.49	54.99	Medium
AUS-Brunet	R9	Austin	4.10	80.65	85.17	82.91	Good	270.27	0.62	0.03	0.02	85.78	88.18	54.79	Medium
AUS-Brunet	R9	Austin	4.20	64.03	66.55	65.29	Good	96.91	0.31	0.01	0.01	30.79	87.52	54.38	Medium
AUS-Brunet	R9	Austin	4.30	84.82	87.59	86.21	Good	274.35	0.49	0.05	0.00	86.92	85.65	53.22	Medium
AUS-Brunet	R9	Austin	4.40	85.98	92.57	89.27	Good	234.43	0.29	0.04	0.00	74.19	89.53	55.63	Medium
AUS-Brunet	R9	Austin	4.50	78.43	87.35	82.89	Good	214.92	0.24	0.04	0.00	67.91	89.10	55.36	Medium
AUS-Brunet	R9	Austin	4.60	77.59	94.38	85.99	Good	374.72	0.93	0.06	0.00	118.87	90.83	56.44	Medium
AUS-Brunet	R9	Austin	4.70	82.66	88.42	85.54	Good	374.76	1.64	0.06	0.00	119.19	94.01	58.41	Medium
AUS-Brunet	R9	Austin	4.80	106.82	120.64	113.73	Fair	357.67	1.66	0.06	0.00	113.89	97.89	60.82	High
AUS-Brunet	R9	Austin	4.90	135.13	127.19	131.16	Poor	331.54	1.45	0.06	0.00	105.42	103.13	64.08	High
AUS-Brunet	R9	Austin	5.00	73.99	89.72	81.86	Good	317.97	1.27	0.06	0.00	101.08	108.80	67.60	High
AUS-Brunet	R9	Austin	5.10	98.02	95.38	96.70	Fair	314.45	1.11	0.05	0.06	99.94	114.83	71.35	High
AUS-Brunet	R9	Austin	5.20	120.22	126.59	123.40	Fair	270.27	0.97	0.06	0.19	85.86	117.78	73.19	High
AUS-Brunet	R9	Austin	5.30	137.04	132.79	134.91	Poor	325.49	1.43	0.08	0.53	103.48	118.69	73.75	High
AUS-Brunet	R9	Austin	5.40	99.43	99.50	99.47	Fair	324.62	1.54	0.08	0.32	103.32	120.32	74.76	High
AUS-Brunet	R9	Austin	5.50	111.27	116.97	114.12	Fair	268.37	1.38	0.06	0.22	85.57	121.08	75.24	High
AUS-Brunet	R9	Austin	5.60	171.97	172.55	172.26	Very Poor	157.44	1.85	0.04	0.07	50.67	121.92	75.76	High
AUS-Brunet	R9	Austin	5.70	130.38	158.44	144.41	Poor	198.54	0.17	0.05	0.05	62.73	121.48	75.48	High
AUS-Brunet	R9	Austin	5.80	98.03	115.62	106.83	Fair	191.38	1.43	0.04	0.03	61.20	122.41	76.06	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-Brunet	R9	Austin	5.90	112.52	109.51	111.01	Fair	324.37	1.79	0.07	0.07	103.39	124.58	77.41	High
AUS-Brunet	R9	Austin	6.00	79.75	68.09	73.92	Good	277.61	1.82	0.06	0.26	88.72	126.80	78.79	High
AUS-Brunet	R9	Austin	6.10	91.67	75.42	83.54	Good	250.39	1.75	0.05	0.14	79.98	125.47	77.96	High
AUS-Brunet	R9	Austin	6.20	92.64	70.40	81.52	Good	245.25	1.72	0.05	0.17	78.38	123.93	77.00	High
AUS-Brunet	R9	Austin	6.30	80.78	66.19	73.48	Good	152.07	1.08	0.03	0.11	48.55	123.84	76.95	High
AUS-Brunet	R9	Austin	6.40	83.21	65.34	74.28	Good	136.91	2.92	0.03	0.10	44.75	122.67	76.22	High
AUS-Brunet	R9	Austin	6.50	72.93	70.28	71.61	Good	261.64	1.18	0.05	0.11	83.18	119.21	74.08	High
AUS-Brunet	R9	Austin	6.60	71.39	80.76	76.07	Good	202.12	1.13	0.04	0.03	64.43	119.08	73.99	High
AUS-Brunet	R9	Austin	6.70	84.37	84.90	84.64	Good	196.93	1.05	0.04	0.09	62.80	116.44	72.35	High
AUS-Brunet	R9	Austin	6.80	65.23	63.99	64.61	Good	256.21	1.25	0.05	0.19	81.57	113.61	70.60	High
AUS-Brunet	R9	Austin	6.90	72.07	68.50	70.29	Good	331.78	1.53	0.06	0.23	105.65	115.12	71.53	High
AUS-Brunet	R9	Austin	7.00	92.01	93.99	93.00	Good	301.62	1.29	0.06	0.23	95.98	115.99	72.07	High
AUS-Brunet	R9	Austin	7.10	93.00	94.81	93.91	Good	152.07	1.42	0.03	0.12	48.79	114.69	71.26	High
AUS-Brunet	R9	Austin	7.20	136.62	129.26	132.94	Poor	264.90	0.91	0.05	0.07	84.12	110.43	68.62	High
AUS-Brunet	R9	Austin	7.30	71.13	77.48	74.30	Good	166.92	0.69	0.03	0.02	52.98	113.73	70.67	High
AUS-Brunet	R9	Austin	7.40	56.98	74.31	65.65	Good	140.29	0.55	0.03	0.01	44.53	115.14	71.54	High
AUS-Brunet	R9	Austin	7.50	64.92	88.07	76.50	Good	144.86	0.46	0.03	0.03	45.95	115.61	71.84	High
AUS-Brunet	R9	Austin	7.60	67.30	83.80	75.55	Good	145.14	0.41	0.03	0.05	46.09	112.32	69.80	High
AUS-Brunet	R9	Austin	7.70	81.01	74.63	77.82	Good	213.07	0.57	0.04	0.13	67.61	108.24	67.26	High
AUS-Brunet	R9	Austin	7.80	72.58	68.63	70.61	Good	57.32	1.74	0.01	0.02	19.10	106.61	66.25	High
AUS-Brunet	R9	Austin	7.90	72.25	76.41	74.33	Good	131.26	0.13	0.02	0.03	41.64	94.93	58.98	Medium
AUS-Brunet	R9	Austin	8.00	73.22	66.40	69.81	Good	311.52	0.22	0.06	0.07	98.61	92.00	57.17	Medium
AUS-Brunet	R9	Austin	8.10	162.55	173.90	168.22	Poor	194.41	0.37	0.04	0.03	61.62	95.55	59.37	Medium
AUS-Brunet	R9	Austin	8.20	67.95	74.87	71.41	Good	247.86	0.49	0.05	0.02	78.47	98.51	61.21	High
AUS-Brunet	R9	Austin	8.30	88.30	90.63	89.47	Good	167.67	0.34	0.03	0.01	53.20	99.12	61.59	High
AUS-Brunet	R9	Austin	8.40	149.97	160.06	155.01	Poor	193.10	0.39	0.04	0.08	61.32	99.29	61.70	High
AUS-Brunet	R9	Austin	8.50	78.57	73.12	75.84	Good	194.25	0.36	0.04	0.06	61.53	98.99	61.51	High
AUS-Brunet	R9	Austin	8.60	152.66	154.44	153.55	Poor	204.57	0.46	0.04	0.08	64.77	96.81	60.15	High
AUS-Brunet	R9	Austin	8.70	115.42	155.14	135.28	Poor	155.40	0.66	0.03	0.04	49.41	100.02	62.15	High
AUS-Brunet	R9	Austin	8.80	102.37	131.72	117.05	Fair	199.40	1.03	0.04	0.06	63.52	97.60	60.65	High
AUS-Brunet	R9	Austin	8.90	109.94	130.27	120.11	Fair	259.36	1.69	0.05	0.05	82.83	95.02	59.04	Medium
AUS-Brunet	R9	Austin	9.00	100.97	96.75	98.86	Fair	369.87	0.54	0.08	0.07	117.15	98.23	61.04	High
AUS-Brunet	R9	Austin	9.10	87.11	81.25	84.18	Good	321.83	0.76	0.07	0.14	102.15	103.47	64.30	High
AUS-Brunet	R9	Austin	9.20	94.27	89.68	91.98	Good	316.97	0.88	0.07	0.23	100.58	105.79	65.73	High
AUS-Brunet	R9	Austin	9.30	79.92	92.17	86.04	Good	345.28	1.07	0.08	0.25	109.61	106.43	66.13	High
AUS-Brunet	R9	Austin	9.40	96.60	105.61	101.11	Fair	271.26	0.87	0.06	0.17	86.15	109.93	68.31	High
AUS-Brunet	R9	Austin	9.50	87.43	91.55	89.49	Good	169.32	0.80	0.04	0.08	53.98	111.56	69.32	High
AUS-Brunet	R9	Austin	9.60	60.74	63.57	62.15	Good	87.64	0.04	0.02	0.01	27.76	114.56	71.19	High
AUS-Brunet	R9	Austin	9.70	64.12	73.15	68.63	Good	149.41	0.10	0.03	0.03	47.12	115.39	71.70	High
AUS-Brunet	R9	Austin	9.80	57.10	86.71	71.90	Good	227.51	0.37	0.05	0.09	72.11	114.39	71.08	High
AUS-Brunet	R9	Austin	9.90	106.95	109.91	108.43	Fair	216.92	0.56	0.05	0.23	68.81	113.00	70.22	High
AUS-Brunet	R9	Austin	10.00	156.45	152.36	154.41	Poor	157.13	0.43	0.03	0.10	49.94	113.00	70.21	High
AUS-Brunet	R9	Austin	10.10	92.73	92.21	92.47	Good	132.04	0.32	0.03	0.10	41.90	111.95	69.56	High
AUS-Brunet	R9	Austin	10.20	54.43	50.46	52.44	Very Good	196.08	0.59	0.05	0.10	62.21	109.33	67.93	High
AUS-Brunet	R9	Austin	10.30	62.19	58.73	60.46	Good	187.27	0.49	0.05	0.04	59.43	110.51	68.67	High
AUS-Brunet	R9	Austin	10.40	54.39	63.03	58.71	Very Good	174.00	0.44	0.04	0.03	55.27	112.39	69.84	High
AUS-Brunet	R9	Austin	10.50	56.50	69.78	63.14	Good	156.38	0.39	0.04	0.01	49.64	111.91	69.54	High
AUS-Brunet	R9	Austin	10.60	82.86	93.69	88.27	Good	116.48	0.26	0.03	0.02	36.92	111.16	69.07	High
AUS-Brunet	R9	Austin	10.70	144.71	150.07	147.39	Poor	160.28	0.35	0.05	0.06	50.73	109.92	68.30	High
AUS-Brunet	R9	Austin	10.80	69.81	64.52	67.16	Good	187.78	0.45	0.06	0.21	59.58	110.88	68.90	High
AUS-Brunet	R9	Austin	10.90	76.34	75.05	75.69	Good	203.10	0.33	0.04	0.18	64.32	109.69	68.16	High
AUS-Brunet	R9	Austin	11.00	56.08	56.45	56.26	Very Good	294.76	0.43	0.06	0.25	93.38	106.58	66.23	High
AUS-Brunet	R9	Austin	11.10	146.11	147.68	146.90	Poor	278.45	0.43	0.06	0.19	88.24	105.88	65.79	High
AUS-Brunet	R9	Austin	11.20	134.45	140.79	137.62	Poor	268.44	0.41	0.06	0.15	85.12	104.43	64.89	High
AUS-Brunet	R9	Austin	11.30	127.53	127.64	127.58	Fair	37.64	0.38	0.01	0.02	12.13	102.16	63.48	High
AUS-Brunet	R9	Austin	11.40	92.25	97.43	94.84	Good	247.88	0.36	0.06	0.05	78.57	96.54	59.98	Medium
AUS-Brunet	R9	Austin	11.50	66.52	86.55	76.54	Good	271.15	0.11	0.06	0.02	85.71	98.19	61.01	High
AUS-Brunet	R9	Austin	11.60	55.83	84.35	70.09	Good	305.03	0.08	0.07	0.05	96.50	100.74	62.60	High
AUS-Brunet	R9	Austin	11.70	60.08	74.21	67.15	Good	249.12	0.05	0.06	0.03	78.68	104.77	65.10	High
AUS-Brunet	R9	Austin	11.80	60.51	74.91	67.71	Good	208.64	0.17	0.05	0.06	66.02	104.48	64.92	High
AUS-Brunet	R9	Austin	11.90	72.21	100.24	86.23	Good	168.88	0.23	0.04	0.07	53.46	104.87	65.16	High
AUS-Brunet	R9	Austin	12.00	70.82	75.58	73.20	Good	190.71	0.39	0.05	0.12	60.58	104.42	64.88	High
AUS-Brunet	R9	Austin	12.10	81.86	96.80	89.33	Good	264.40	0.65	0.07	0.13	84.00	105.36	65.47	High
AUS-Brunet	R9	Austin	12.20	61.95	88.99	75.47	Good	242.64	0.52	0.06	0.07	76.89	106.15	65.96	High
AUS-Brunet	R9	Austin	12.30	115.51	117.33	116.42	Fair	201.78	0.38	0.05	0.06	64.08	107.22	66.63	High
AUS-Brunet	R9	Austin	12.40	87.77	78.68	83.22	Good	198.00	0.56	0.05	0.05	62.77	106.62	66.25	High
AUS-Brunet	R9	Austin	12.50	64.67	65.09	64.88	Good	131.41	0.38	0.04	0.02	41.62	104.13	64.70	High
AUS-Brunet	R9	Austin	12.60	63.22	61.74	62.48	Good	317.74	0.55	0.08	0.04	100.71	102.21	63.51	High
AUS-Brunet	R9	Austin	12.70	113.83	114.94	114.39	Fair	246.85	0.28	0.07	0.02	78.24	103.79	64.49	High
AUS-FM1431	R1	Austin	0.10	114.93	115.03	114.98	Fair	275.27	0.75	0.06	0.20	87.35	124.35	77.27	High
AUS-FM1431	R1	Austin	0.20	123.73	134.84	129.28	Fair	228.41	0.90	0.05	0.13	72.64	128.17	79.64	High
AUS-FM1431	R1	Austin	0.30	52.79	73.41	63.10	Good	240.62	1.89	0.05	0.22	76.94	129.00	80.16	High
AUS-FM1431	R1	Austin	0.40	71.84	86.73	79.29	Good	216.74	1.89	0.05	0.13	69.40	128.48	79.83	High
AUS-FM1431	R1	Austin	0.50	72.73	90.48	81.61	Good	253.20	2.14	0.06	0.20	81.00	126.78	78.78	High
AUS-FM1431	R1	Austin	0.60	116.88	114.38	115.63	Fair	243.36	2.09	0.06	0.23	77.93	125.95	78.26	High
AUS-FM1431	R1	Austin	0.70	87.14	86.48	86.81	Good	330.05	2.84	0.08	0.29	105.73	127.68	79.34	High
AUS-FM1431	R1	Austin	0.80	59.83	76.58	68.20	Good	288.03	2.49	0.07	0.35	92.35	129.12	80.23	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R1	Austin	0.90	71.83	91.46	81.64	Good	269.61	2.31	0.07	0.28	86.32	130.00	80.78	High
AUS-FM1431	R1	Austin	1.00	60.22	75.25	67.74	Good	230.90	1.88	0.06	0.21	73.91	129.43	80.43	High
AUS-FM1431	R1	Austin	1.10	79.79	81.10	80.45	Good	296.40	2.18	0.07	0.28	94.77	128.30	79.72	High
AUS-FM1431	R1	Austin	1.20	80.11	79.55	79.83	Good	256.16	1.57	0.05	0.14	81.83	129.00	80.16	High
AUS-FM1431	R1	Austin	1.30	65.44	66.95	66.19	Good	215.27	1.16	0.04	0.10	68.73	129.00	80.16	High
AUS-FM1431	R1	Austin	1.40	68.54	76.34	72.44	Good	170.16	0.70	0.04	0.11	54.20	127.14	79.00	High
AUS-FM1431	R1	Austin	1.50	66.02	60.86	63.44	Good	183.07	0.55	0.04	0.09	58.09	124.22	77.18	High
AUS-FM1431	R1	Austin	1.60	145.56	162.10	153.83	Poor	323.99	0.78	0.07	0.19	102.80	123.52	76.75	High
AUS-FM1431	R1	Austin	1.70	134.74	142.17	138.46	Poor	120.05	0.31	0.03	0.04	38.10	125.81	78.17	High
AUS-FM1431	R1	Austin	1.80	132.54	131.62	132.08	Poor	124.56	0.37	0.03	0.06	39.60	124.46	77.34	High
AUS-FM1431	R1	Austin	1.90	78.32	71.24	74.78	Good	268.80	0.79	0.06	0.10	85.37	125.90	78.23	High
AUS-FM1431	R1	Austin	2.00	82.22	80.43	81.33	Good	191.00	1.20	0.04	0.07	61.07	127.90	79.48	High
AUS-FM1431	R1	Austin	2.10	75.28	87.55	81.42	Good	294.79	2.38	0.07	0.14	94.38	125.23	77.81	High
AUS-FM1431	R1	Austin	2.20	118.86	103.47	111.17	Fair	289.92	2.24	0.07	0.17	92.75	123.56	76.78	High
AUS-FM1431	R1	Austin	2.30	124.80	132.05	128.43	Fair	356.96	2.20	0.08	0.25	114.04	122.61	76.18	High
AUS-FM1431	R1	Austin	2.40	77.62	75.70	76.66	Good	361.43	1.72	0.08	0.20	115.02	124.44	77.32	High
AUS-FM1431	R1	Austin	2.50	73.50	81.71	77.61	Good	324.78	1.19	0.07	0.20	103.29	126.29	78.47	High
AUS-FM1431	R1	Austin	2.60	68.28	75.55	71.92	Good	306.88	0.95	0.07	0.12	97.46	126.45	78.57	High
AUS-FM1431	R1	Austin	2.70	56.55	59.46	58.01	Very Good	293.21	0.80	0.06	0.13	93.05	125.05	77.71	High
AUS-FM1431	R1	Austin	2.80	110.72	133.13	121.92	Fair	330.36	0.79	0.07	0.19	104.77	124.02	77.07	High
AUS-FM1431	R1	Austin	2.90	148.20	159.15	153.68	Poor	208.75	0.48	0.05	0.06	66.14	123.99	77.04	High
AUS-FM1431	R1	Austin	3.00	120.53	132.13	126.33	Fair	300.08	0.69	0.07	0.16	95.15	123.89	76.98	High
AUS-FM1431	R1	Austin	3.10	62.76	75.98	69.37	Good	325.94	0.71	0.07	0.16	103.31	125.99	78.29	High
AUS-FM1431	R1	Austin	3.20	66.31	70.92	68.61	Good	329.56	0.64	0.07	0.24	104.45	125.17	77.78	High
AUS-FM1431	R1	Austin	3.30	73.97	78.75	76.36	Good	333.86	0.49	0.08	0.19	105.73	123.12	76.50	High
AUS-FM1431	R1	Austin	3.40	92.02	88.39	90.20	Good	336.49	0.59	0.07	0.13	106.60	123.39	76.67	High
AUS-FM1431	R1	Austin	3.50	87.69	93.16	90.42	Good	210.59	0.82	0.05	0.05	67.02	125.81	78.17	High
AUS-FM1431	R1	Austin	3.60	70.77	68.37	69.57	Good	169.41	0.49	0.04	0.04	53.73	126.12	78.37	High
AUS-FM1431	R1	Austin	3.70	96.45	69.69	83.07	Good	241.33	0.75	0.05	0.06	76.66	126.92	78.86	High
AUS-FM1431	R1	Austin	3.80	97.59	92.59	95.09	Good	286.64	1.25	0.06	0.12	91.28	128.50	79.85	High
AUS-FM1431	R1	Austin	3.90	79.39	89.39	84.39	Good	193.21	0.97	0.04	0.06	61.52	129.86	80.69	High
AUS-FM1431	R1	Austin	4.00	120.47	136.40	128.43	Fair	105.86	0.50	0.02	0.04	33.79	127.58	79.27	High
AUS-FM1431	R1	Austin	4.10	60.87	62.24	61.55	Good	276.92	1.12	0.06	0.24	88.11	125.02	77.68	High
AUS-FM1431	R1	Austin	4.20	98.59	140.84	119.71	Fair	293.04	1.07	0.07	0.17	93.18	125.31	77.86	High
AUS-FM1431	R1	Austin	4.30	113.42	125.15	119.28	Fair	298.71	1.00	0.07	0.16	94.95	126.66	78.70	High
AUS-FM1431	R1	Austin	4.40	97.29	128.27	112.78	Fair	301.40	0.95	0.06	0.22	95.75	128.29	79.72	High
AUS-FM1431	R1	Austin	4.50	112.44	139.09	125.76	Fair	226.43	0.70	0.05	0.12	71.94	128.13	79.61	High
AUS-FM1431	R1	Austin	4.60	91.26	127.00	109.13	Fair	213.77	0.68	0.05	0.08	67.82	126.86	78.82	High
AUS-FM1431	R1	Austin	4.70	59.54	65.13	62.34	Good	70.93	0.22	0.02	0.06	22.46	123.27	76.59	High
AUS-FM1431	R1	Austin	4.80	119.14	130.22	124.68	Fair	147.09	0.37	0.03	0.05	46.66	116.57	72.44	High
AUS-FM1431	R1	Austin	4.90	126.24	95.62	110.93	Fair	227.92	0.61	0.05	0.14	72.36	116.89	72.63	High
AUS-FM1431	R1	Austin	5.00	83.41	62.64	73.02	Good	68.00	0.44	0.02	0.02	21.67	115.75	71.92	High
AUS-FM1431	R1	Austin	5.10	96.48	79.25	87.86	Good	239.43	0.98	0.05	0.10	76.28	111.35	69.19	High
AUS-FM1431	R1	Austin	5.20	73.51	66.64	70.08	Good	287.78	1.13	0.06	0.08	91.54	113.63	70.61	High
AUS-FM1431	R1	Austin	5.30	90.39	89.40	89.90	Good	228.26	1.89	0.05	0.04	73.08	117.19	72.82	High
AUS-FM1431	R1	Austin	5.40	69.04	67.97	68.50	Good	258.14	0.66	0.06	0.06	81.92	112.98	70.20	High
AUS-FM1431	R1	Austin	5.50	84.58	56.92	70.75	Good	223.02	0.71	0.05	0.03	70.82	108.04	67.13	High
AUS-FM1431	R1	Austin	5.60	58.48	59.87	59.17	Very Good	337.05	0.82	0.07	0.16	106.87	106.03	65.89	High
AUS-FM1431	R1	Austin	5.70	107.00	108.78	107.89	Fair	124.45	0.68	0.03	0.07	39.59	108.03	67.13	High
AUS-FM1431	R1	Austin	5.80	116.80	122.88	119.84	Fair	203.93	0.60	0.05	0.07	64.86	105.45	65.52	High
AUS-FM1431	R1	Austin	5.90	96.50	77.77	87.13	Good	200.41	0.19	0.04	0.04	63.42	110.41	68.60	High
AUS-FM1431	R1	Austin	6.00	89.22	74.62	81.92	Good	92.43	0.12	0.02	0.01	29.27	109.67	68.15	High
AUS-FM1431	R1	Austin	6.10	75.68	65.40	70.54	Good	238.88	0.42	0.05	0.07	75.75	108.87	67.65	High
AUS-FM1431	R1	Austin	6.20	68.27	60.09	64.18	Good	129.55	1.34	0.03	0.07	41.55	109.87	68.27	High
AUS-FM1431	R1	Austin	6.30	67.93	60.31	64.12	Good	183.72	0.43	0.04	0.01	58.14	111.00	68.97	High
AUS-FM1431	R1	Austin	6.40	75.78	61.68	68.73	Good	169.76	0.51	0.03	0.00	53.84	109.44	68.00	High
AUS-FM1431	R1	Austin	6.50	71.10	70.06	70.58	Good	118.97	0.51	0.02	0.00	37.81	104.13	64.70	High
AUS-FM1431	R1	Austin	6.60	61.76	59.94	60.85	Good	265.77	0.86	0.05	0.00	84.46	99.65	61.92	High
AUS-FM1431	R1	Austin	6.70	75.13	68.98	72.06	Good	189.91	0.49	0.03	0.00	60.27	102.55	63.72	High
AUS-FM1431	R1	Austin	6.80	59.67	52.36	56.01	Very Good	207.85	0.42	0.04	0.01	65.97	102.60	63.75	High
AUS-FM1431	R1	Austin	6.90	61.53	57.62	59.57	Very Good	246.40	0.25	0.05	0.00	78.12	104.69	65.05	High
AUS-FM1431	R1	Austin	7.00	79.65	76.23	77.94	Good	250.42	0.19	0.05	0.01	79.31	105.82	65.75	High
AUS-FM1431	R1	Austin	7.10	138.37	122.74	130.55	Fair	318.13	0.21	0.06	0.00	100.70	104.65	65.02	High
AUS-FM1431	R1	Austin	7.20	104.00	99.92	101.96	Fair	251.71	0.39	0.04	0.00	79.92	102.76	63.85	High
AUS-FM1431	R1	Austin	7.30	187.67	184.30	185.98	Very Poor	370.52	0.82	0.06	0.10	117.47	105.46	65.53	High
AUS-FM1431	R1	Austin	7.40	133.72	147.93	140.82	Poor	298.95	0.71	0.04	0.20	94.92	112.86	70.13	High
AUS-FM1431	R1	Austin	7.50	96.27	90.27	93.27	Good	158.28	0.40	0.03	0.07	50.23	116.10	72.14	High
AUS-FM1431	R1	Austin	7.60	93.97	119.88	106.93	Fair	197.68	0.48	0.03	0.10	62.58	113.79	70.71	High
AUS-FM1431	R1	Austin	7.70	121.25	154.90	138.07	Poor	117.71	0.28	0.02	0.05	37.29	112.91	70.16	High
AUS-FM1431	R1	Austin	7.80	79.03	86.80	82.91	Good	241.77	0.55	0.04	0.24	76.62	110.03	68.37	High
AUS-FM1431	R1	Austin	7.90	81.06	72.43	76.75	Good	305.02	0.54	0.05	0.21	96.65	109.52	68.05	High
AUS-FM1431	R1	Austin	8.00	110.39	106.54	108.47	Fair	260.55	0.40	0.05	0.20	82.51	113.95	70.80	High
AUS-FM1431	R1	Austin	8.10	132.25	127.92	130.09	Fair	110.54	0.21	0.02	0.03	35.09	117.34	72.91	High
AUS-FM1431	R1	Austin	8.20	63.06	75.74	69.40	Good	30.18	0.08	0.01	0.00	9.59	116.63	72.47	High
AUS-FM1431	R1	Austin	8.30	64.71	75.01	69.86	Good	81.23	0.26	0.02	0.02	25.72	112.74	70.06	High
AUS-FM1431	R1	Austin	8.40	81.33	95.90	88.62	Good	208.30	0.30	0.04	0.03	66.00	112.01	69.60	High
AUS-FM1431	R1	Austin	8.50	82.37	93.03	87.70	Good	36.42	0.06	0.01	0.00	11.53	111.82	69.48	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R1	Austin	8.60	91.95	97.55	94.75	Good	124.75	0.17	0.03	0.03	39.58	105.29	65.43	High
AUS-FM1431	R1	Austin	8.70	84.79	107.62	96.21	Fair	336.93	0.26	0.06	0.06	106.63	107.07	66.53	High
AUS-FM1431	R1	Austin	8.80	88.82	99.00	93.91	Good	339.89	0.16	0.06	0.08	107.52	113.53	70.55	High
AUS-FM1431	R1	Austin	8.90	79.09	79.66	79.37	Good	318.66	0.26	0.06	0.10	100.84	117.85	73.23	High
AUS-FM1431	R1	Austin	9.00	73.31	85.24	79.28	Good	199.58	0.33	0.03	0.08	63.26	117.06	72.74	High
AUS-FM1431	R1	Austin	9.10	106.67	127.69	117.18	Fair	259.02	0.57	0.04	0.11	82.10	114.75	71.30	High
AUS-FM1431	R1	Austin	9.20	94.94	106.70	100.82	Fair	125.05	0.27	0.02	0.04	39.75	114.71	71.28	High
AUS-FM1431	R1	Austin	9.30	71.06	87.12	79.09	Good	181.47	0.33	0.03	0.10	57.47	112.87	70.13	High
AUS-FM1431	R1	Austin	9.40	113.89	116.64	115.27	Fair	313.56	0.47	0.06	0.17	99.27	111.46	69.26	High
AUS-FM1431	R1	Austin	9.50	67.94	66.27	67.11	Good	205.12	0.34	0.04	0.07	65.01	113.81	70.72	High
AUS-FM1431	R1	Austin	9.60	78.41	81.18	79.79	Good	217.34	0.44	0.04	0.08	68.93	114.00	70.84	High
AUS-FM1431	R1	Austin	9.70	85.36	77.88	81.62	Good	276.20	0.66	0.05	0.15	87.55	111.70	69.41	High
AUS-FM1431	R1	Austin	9.80	75.02	68.45	71.74	Good	280.87	0.59	0.05	0.26	88.99	112.00	69.60	High
AUS-FM1431	R1	Austin	9.90	143.01	147.30	145.15	Poor	204.65	0.42	0.04	0.13	64.96	113.82	70.72	High
AUS-FM1431	R1	Austin	10.00	106.98	95.56	101.27	Fair	90.98	0.19	0.02	0.02	28.93	115.20	71.58	High
AUS-FM1431	R1	Austin	10.10	93.21	68.94	81.07	Good	161.76	0.34	0.03	0.09	51.27	115.39	71.70	High
AUS-FM1431	R1	Austin	10.20	82.47	81.20	81.84	Good	247.55	0.69	0.04	0.12	78.64	112.69	70.02	High
AUS-FM1431	R1	Austin	10.30	104.68	96.36	100.52	Fair	247.89	0.62	0.04	0.14	78.66	109.06	67.76	High
AUS-FM1431	R1	Austin	10.40	153.64	130.77	142.20	Poor	150.00	0.34	0.03	0.08	47.60	109.56	68.08	High
AUS-FM1431	R1	Austin	10.50	139.22	115.45	127.34	Fair	282.12	0.52	0.05	0.20	89.55	110.46	68.64	High
AUS-FM1431	R1	Austin	10.60	66.30	64.89	65.59	Good	248.28	0.41	0.05	0.10	78.47	112.75	70.06	High
AUS-FM1431	R1	Austin	10.70	100.25	93.24	96.75	Fair	293.30	0.51	0.05	0.35	92.91	109.25	67.88	High
AUS-FM1431	R1	Austin	10.80	120.67	108.07	114.37	Fair	302.44	0.47	0.05	0.19	95.78	111.38	69.21	High
AUS-FM1431	R1	Austin	10.90	123.28	113.67	118.47	Fair	94.69	0.19	0.02	0.04	30.14	114.70	71.27	High
AUS-FM1431	R1	Austin	11.00	112.71	93.86	103.28	Fair	97.74	0.21	0.02	0.02	30.98	114.41	71.09	High
AUS-FM1431	R1	Austin	11.10	104.96	102.30	103.63	Fair	225.19	0.47	0.04	0.08	71.40	116.41	72.34	High
AUS-FM1431	R1	Austin	11.20	117.12	115.31	116.22	Fair	246.58	0.60	0.04	0.18	78.24	119.68	74.37	High
AUS-FM1431	R1	Austin	11.30	103.22	124.10	113.66	Fair	128.03	0.68	0.02	0.09	40.77	122.49	76.11	High
AUS-FM1431	R1	Austin	11.40	114.42	121.99	118.20	Fair	141.04	0.43	0.02	0.04	44.71	122.79	76.30	High
AUS-FM1431	R1	Austin	11.50	127.73	120.40	124.06	Fair	112.83	0.16	0.02	0.03	35.70	124.45	77.33	High
AUS-FM1431	R1	Austin	11.60	147.92	122.25	135.08	Poor	83.09	0.67	0.02	0.01	26.58	121.32	75.38	High
AUS-FM1431	R1	Austin	11.70	167.27	161.15	164.21	Poor	223.32	0.84	0.04	0.03	71.07	117.65	73.11	High
AUS-FM1431	R1	Austin	11.80	155.68	139.57	147.62	Poor	208.96	0.44	0.04	0.02	66.36	116.74	72.54	High
AUS-FM1431	R1	Austin	11.90	181.18	142.38	161.78	Poor	325.86	0.70	0.06	0.11	103.24	117.32	72.90	High
AUS-FM1431	R1	Austin	12.00	161.17	148.55	154.86	Poor	257.42	1.10	0.04	0.08	81.90	120.58	74.93	High
AUS-FM1431	R1	Austin	12.10	162.37	169.90	166.13	Poor	176.10	0.74	0.03	0.23	55.98	121.19	75.31	High
AUS-FM1431	R1	Austin	12.20	181.33	178.97	180.15	Very Poor	81.84	0.75	0.02	0.04	26.26	118.14	73.41	High
AUS-FM1431	R1	Austin	12.30	141.77	139.02	140.40	Poor	196.51	0.47	0.04	0.06	62.21	116.30	72.26	High
AUS-FM1431	R1	Austin	12.40	163.18	155.40	159.29	Poor	240.82	0.45	0.04	0.05	76.39	116.89	72.63	High
AUS-FM1431	R1	Austin	12.50	176.72	148.86	162.79	Poor	258.67	0.58	0.04	0.20	82.06	116.00	72.08	High
AUS-FM1431	R1	Austin	12.60	123.93	124.68	124.31	Fair	243.50	0.57	0.04	0.19	77.20	113.27	70.39	High
AUS-FM1431	R1	Austin	12.70	72.83	101.71	87.27	Good	298.50	0.66	0.05	0.50	94.70	108.49	67.42	High
AUS-FM1431	R1	Austin	12.80	111.27	113.90	112.59	Fair	276.74	0.45	0.05	0.55	87.66	108.00	67.11	High
AUS-FM1431	R2	Austin	0.10	114.93	115.03	114.98	Fair	295.58	1.60	0.05	0.16	94.19	120.61	74.95	High
AUS-FM1431	R2	Austin	0.20	123.73	134.84	129.28	Fair	319.42	1.84	0.05	0.21	101.83	125.26	77.83	High
AUS-FM1431	R2	Austin	0.30	52.79	73.41	63.10	Good	204.14	1.42	0.03	0.10	65.18	129.60	80.53	High
AUS-FM1431	R2	Austin	0.40	71.84	86.73	79.29	Good	314.01	2.20	0.05	0.15	100.28	129.22	80.29	High
AUS-FM1431	R2	Austin	0.50	72.73	90.48	81.61	Good	305.69	2.27	0.05	0.15	97.83	130.10	80.84	High
AUS-FM1431	R2	Austin	0.60	116.88	114.38	115.63	Fair	269.88	2.20	0.04	0.15	86.40	131.41	81.65	High
AUS-FM1431	R2	Austin	0.70	87.14	86.48	86.81	Good	252.04	2.19	0.04	0.13	80.74	131.77	81.88	High
AUS-FM1431	R2	Austin	0.80	59.83	76.58	68.20	Good	274.03	2.39	0.05	0.21	87.84	131.99	82.01	High
AUS-FM1431	R2	Austin	0.90	71.83	91.46	81.64	Good	253.08	2.15	0.04	0.18	81.05	131.81	81.90	High
AUS-FM1431	R2	Austin	1.00	60.22	75.25	67.74	Good	215.00	1.76	0.04	0.09	68.83	130.57	81.13	High
AUS-FM1431	R2	Austin	1.10	79.79	81.10	80.45	Good	236.43	1.73	0.04	0.14	75.64	128.34	79.75	High
AUS-FM1431	R2	Austin	1.20	80.11	79.55	79.83	Good	314.57	1.96	0.05	0.22	100.35	128.68	79.96	High
AUS-FM1431	R2	Austin	1.30	65.44	66.95	66.19	Good	296.10	1.87	0.04	0.39	94.46	133.03	82.66	High
AUS-FM1431	R2	Austin	1.40	68.54	76.34	72.44	Good	186.15	1.28	0.03	0.23	59.53	134.93	83.84	High
AUS-FM1431	R2	Austin	1.50	66.02	60.86	63.44	Good	292.03	2.47	0.04	0.09	93.44	133.34	82.85	High
AUS-FM1431	R2	Austin	1.60	145.56	162.10	153.83	Poor	150.76	1.93	0.02	0.03	48.66	133.38	82.88	High
AUS-FM1431	R2	Austin	1.70	134.74	142.17	138.46	Poor	127.59	1.10	0.02	0.05	40.90	129.31	80.35	High
AUS-FM1431	R2	Austin	1.80	132.54	131.62	132.08	Poor	203.96	1.35	0.03	0.07	65.20	128.21	79.66	High
AUS-FM1431	R2	Austin	1.90	78.32	71.24	74.78	Good	139.43	0.98	0.02	0.06	44.63	130.64	81.18	High
AUS-FM1431	R2	Austin	2.00	82.22	80.43	81.33	Good	146.95	0.87	0.02	0.19	46.84	128.16	79.64	High
AUS-FM1431	R2	Austin	2.10	75.28	87.55	81.42	Good	364.82	2.03	0.05	0.27	116.25	126.52	78.62	High
AUS-FM1431	R2	Austin	2.20	118.86	103.47	111.17	Fair	360.14	2.11	0.04	0.33	114.95	127.18	79.02	High
AUS-FM1431	R2	Austin	2.30	124.80	132.05	128.43	Fair	348.80	2.06	0.04	0.27	111.19	127.04	78.94	High
AUS-FM1431	R2	Austin	2.40	77.62	75.70	76.66	Good	358.75	2.26	0.04	0.23	114.51	127.23	79.06	High
AUS-FM1431	R2	Austin	2.50	73.50	81.71	77.61	Good	364.72	2.52	0.04	0.36	116.56	129.13	80.24	High
AUS-FM1431	R2	Austin	2.60	68.28	75.55	71.92	Good	321.69	2.07	0.03	0.29	102.74	129.78	80.64	High
AUS-FM1431	R2	Austin	2.70	56.55	59.46	58.01	Very Good	286.95	1.77	0.03	0.08	91.54	128.11	79.60	High
AUS-FM1431	R2	Austin	2.80	110.72	133.13	121.92	Fair	330.43	2.22	0.03	0.21	105.51	127.00	78.91	High
AUS-FM1431	R2	Austin	2.90	148.20	159.15	153.68	Poor	336.13	2.37	0.02	0.37	107.39	127.14	79.00	High
AUS-FM1431	R2	Austin	3.00	120.53	132.13	126.33	Fair	284.70	1.99	0.01	0.34	91.02	128.96	80.13	High
AUS-FM1431	R2	Austin	3.10	62.76	75.98	69.37	Good	314.20	2.14	0.01	0.39	100.31	130.00	80.78	High
AUS-FM1431	R2	Austin	3.20	66.31	70.92	68.61	Good	348.93	2.17	0.01	0.38	111.32	129.51	80.47	High
AUS-FM1431	R2	Austin	3.30	73.97	78.75	76.36	Good	358.80	1.99	0.01	0.56	114.26	126.88	78.84	High
AUS-FM1431	R2	Austin	3.40	92.02	88.39	90.20	Good	286.93	1.31	0.01	0.35	91.28	126.34	78.50	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R2	Austin	3.50	87.69	93.16	90.42	Good	295.22	1.24	0.00	0.22	93.86	128.39	79.78	High
AUS-FM1431	R2	Austin	3.60	70.77	68.37	69.57	Good	209.71	0.98	0.00	0.10	66.64	129.93	80.73	High
AUS-FM1431	R2	Austin	3.70	96.45	69.69	83.07	Good	269.78	1.69	0.00	0.11	85.94	130.74	81.24	High
AUS-FM1431	R2	Austin	3.80	97.59	92.59	95.09	Good	173.86	1.57	0.00	0.09	55.74	130.80	81.28	High
AUS-FM1431	R2	Austin	3.90	79.39	89.39	84.39	Good	104.81	0.79	0.00	0.06	33.57	127.14	79.00	High
AUS-FM1431	R2	Austin	4.00	120.47	136.40	128.43	Fair	253.30	1.99	0.01	0.09	80.88	122.81	76.31	High
AUS-FM1431	R2	Austin	4.10	60.87	62.24	61.55	Good	293.92	2.17	0.02	0.05	94.01	125.08	77.72	High
AUS-FM1431	R2	Austin	4.20	98.59	140.84	119.71	Fair	298.90	2.30	0.02	0.08	95.62	126.22	78.43	High
AUS-FM1431	R2	Austin	4.30	113.42	125.15	119.28	Fair	244.53	1.90	0.02	0.10	78.09	126.61	78.67	High
AUS-FM1431	R2	Austin	4.40	97.29	128.27	112.78	Fair	260.20	1.86	0.02	0.13	83.11	125.20	77.80	High
AUS-FM1431	R2	Austin	4.50	112.44	139.09	125.76	Fair	286.24	1.84	0.03	0.14	91.32	125.00	77.67	High
AUS-FM1431	R2	Austin	4.60	91.26	127.00	109.13	Fair	297.19	1.62	0.03	0.16	94.56	125.00	77.67	High
AUS-FM1431	R2	Austin	4.70	59.54	65.13	62.34	Good	302.49	1.27	0.03	0.14	96.11	125.01	77.68	High
AUS-FM1431	R2	Austin	4.80	119.14	130.22	124.68	Fair	276.41	0.88	0.03	0.15	87.81	126.42	78.55	High
AUS-FM1431	R2	Austin	4.90	126.24	95.62	110.93	Fair	153.11	0.39	0.02	0.05	48.50	126.14	78.38	High
AUS-FM1431	R2	Austin	5.00	83.41	62.64	73.02	Good	175.55	0.35	0.02	0.08	55.64	124.29	77.23	High
AUS-FM1431	R2	Austin	5.10	96.48	79.25	87.86	Good	313.47	0.51	0.03	0.08	99.24	124.27	77.22	High
AUS-FM1431	R2	Austin	5.20	73.51	66.64	70.08	Good	289.22	0.48	0.03	0.11	91.43	126.83	78.81	High
AUS-FM1431	R2	Austin	5.30	90.39	89.40	89.90	Good	310.26	0.55	0.03	0.11	98.30	128.00	79.54	High
AUS-FM1431	R2	Austin	5.40	69.04	67.97	68.50	Good	335.43	0.63	0.04	0.17	106.21	127.57	79.27	High
AUS-FM1431	R2	Austin	5.50	84.58	56.92	70.75	Good	347.57	0.60	0.04	0.19	110.07	125.52	78.00	High
AUS-FM1431	R2	Austin	5.60	58.48	59.87	59.17	Very Good	353.90	0.46	0.04	0.16	112.00	125.00	77.67	High
AUS-FM1431	R2	Austin	5.70	107.00	108.78	107.89	Fair	250.41	0.28	0.03	0.08	79.21	125.00	77.67	High
AUS-FM1431	R2	Austin	5.80	116.80	122.88	119.84	Fair	122.04	0.17	0.01	0.02	38.64	122.64	76.21	High
AUS-FM1431	R2	Austin	5.90	96.50	77.77	87.13	Good	228.14	0.39	0.02	0.02	72.24	122.30	75.99	High
AUS-FM1431	R2	Austin	6.00	89.22	74.62	81.92	Good	76.55	0.46	0.01	0.01	24.56	121.26	75.35	High
AUS-FM1431	R2	Austin	6.10	75.68	65.40	70.54	Good	113.48	0.03	0.01	0.01	35.82	116.02	72.09	High
AUS-FM1431	R2	Austin	6.20	68.27	60.09	64.18	Good	277.52	0.02	0.03	0.03	87.62	115.24	71.61	High
AUS-FM1431	R2	Austin	6.30	67.93	60.31	64.12	Good	225.60	0.02	0.02	0.01	71.36	117.81	73.20	High
AUS-FM1431	R2	Austin	6.40	75.78	61.68	68.73	Good	240.45	0.11	0.02	0.02	75.98	118.00	73.32	High
AUS-FM1431	R2	Austin	6.50	71.10	70.06	70.58	Good	238.82	0.24	0.02	0.04	75.46	117.45	72.98	High
AUS-FM1431	R2	Austin	6.60	61.76	59.94	60.85	Good	307.88	0.42	0.03	0.14	97.54	114.52	71.16	High
AUS-FM1431	R2	Austin	6.70	75.13	68.98	72.06	Good	214.38	0.33	0.02	0.09	67.86	116.34	72.29	High
AUS-FM1431	R2	Austin	6.80	59.67	52.36	56.01	Very Good	265.75	0.63	0.02	0.08	84.25	116.56	72.43	High
AUS-FM1431	R2	Austin	6.90	61.53	57.62	59.57	Very Good	209.60	0.58	0.02	0.05	66.53	116.69	72.51	High
AUS-FM1431	R2	Austin	7.00	79.65	76.23	77.94	Good	200.25	0.56	0.02	0.09	63.62	117.17	72.80	High
AUS-FM1431	R2	Austin	7.10	138.37	122.74	130.55	Fair	232.92	0.72	0.02	0.12	74.05	113.22	70.35	High
AUS-FM1431	R2	Austin	7.20	104.00	99.92	101.96	Fair	362.45	1.00	0.03	0.30	115.08	109.89	68.28	High
AUS-FM1431	R2	Austin	7.30	187.67	184.30	185.98	Very Poor	332.69	0.82	0.03	0.35	105.49	112.60	69.97	High
AUS-FM1431	R2	Austin	7.40	133.72	147.93	140.82	Poor	187.88	0.46	0.02	0.11	59.63	115.58	71.82	High
AUS-FM1431	R2	Austin	7.50	96.27	90.27	93.27	Good	78.86	0.23	0.01	0.01	24.99	114.59	71.20	High
AUS-FM1431	R2	Austin	7.60	93.97	119.88	106.93	Fair	290.97	1.00	0.03	0.09	92.47	111.85	69.50	High
AUS-FM1431	R2	Austin	7.70	121.25	154.90	138.07	Poor	302.41	1.00	0.03	0.13	96.08	115.13	71.54	High
AUS-FM1431	R2	Austin	7.80	79.03	86.80	82.91	Good	235.49	0.73	0.02	0.14	74.86	116.89	72.63	High
AUS-FM1431	R2	Austin	7.90	81.06	72.43	76.75	Good	281.24	0.79	0.03	0.18	89.20	115.30	71.64	High
AUS-FM1431	R2	Austin	8.00	110.39	106.54	108.47	Fair	254.54	0.70	0.02	0.22	80.81	117.44	72.97	High
AUS-FM1431	R2	Austin	8.10	132.25	127.92	130.09	Fair	66.41	0.21	0.01	0.02	21.16	118.30	73.51	High
AUS-FM1431	R2	Austin	8.20	63.06	75.74	69.40	Good	73.92	0.18	0.01	0.02	23.38	117.06	72.74	High
AUS-FM1431	R2	Austin	8.30	64.71	75.01	69.86	Good	157.22	0.36	0.01	0.05	49.97	117.94	73.28	High
AUS-FM1431	R2	Austin	8.40	81.33	95.90	88.62	Good	174.08	0.46	0.01	0.03	55.18	118.44	73.59	High
AUS-FM1431	R2	Austin	8.50	82.37	93.03	87.70	Good	54.50	0.14	0.00	0.01	17.26	116.47	72.37	High
AUS-FM1431	R2	Austin	8.60	91.95	97.55	94.75	Good	48.69	0.10	0.00	0.00	15.32	111.58	69.33	High
AUS-FM1431	R2	Austin	8.70	84.79	107.62	96.21	Fair	125.00	0.14	0.01	0.01	39.48	106.60	66.24	High
AUS-FM1431	R2	Austin	8.80	88.82	99.00	93.91	Good	238.04	0.15	0.02	0.02	75.32	107.97	67.09	High
AUS-FM1431	R2	Austin	8.90	79.09	79.66	79.37	Good	147.67	0.04	0.01	0.01	46.67	107.95	67.08	High
AUS-FM1431	R2	Austin	9.00	73.31	85.24	79.28	Good	261.08	0.08	0.03	0.03	82.60	106.20	65.99	High
AUS-FM1431	R2	Austin	9.10	106.67	127.69	117.18	Fair	148.57	0.10	0.03	0.00	47.05	105.26	65.41	High
AUS-FM1431	R2	Austin	9.20	94.94	106.70	100.82	Fair	131.23	0.17	0.02	0.00	41.59	102.97	63.98	High
AUS-FM1431	R2	Austin	9.30	71.06	87.12	79.09	Good	255.21	0.57	0.04	0.00	81.02	103.88	64.55	High
AUS-FM1431	R2	Austin	9.40	113.89	116.64	115.27	Fair	359.56	0.90	0.06	0.00	114.02	109.81	68.23	High
AUS-FM1431	R2	Austin	9.50	67.94	66.27	67.11	Good	252.96	0.57	0.04	0.00	80.18	114.76	71.31	High
AUS-FM1431	R2	Austin	9.60	78.41	81.18	79.79	Good	232.74	0.64	0.04	0.00	73.84	116.03	72.10	High
AUS-FM1431	R2	Austin	9.70	85.36	77.88	81.62	Good	233.98	0.69	0.04	0.00	74.23	115.95	72.05	High
AUS-FM1431	R2	Austin	9.80	75.02	68.45	71.74	Good	285.71	0.82	0.04	0.00	90.69	114.48	71.14	High
AUS-FM1431	R2	Austin	9.90	143.01	147.30	145.15	Poor	229.17	0.64	0.04	0.00	72.74	117.00	72.70	High
AUS-FM1431	R2	Austin	10.00	106.98	95.56	101.27	Fair	53.31	0.18	0.01	0.00	16.93	117.38	72.94	High
AUS-FM1431	R2	Austin	10.10	93.21	68.94	81.07	Good	42.05	0.16	0.01	0.00	13.34	113.76	70.69	High
AUS-FM1431	R2	Austin	10.20	82.47	81.20	81.84	Good	99.54	0.22	0.02	0.01	31.60	107.24	66.64	High
AUS-FM1431	R2	Austin	10.30	104.68	96.36	100.52	Fair	134.14	0.28	0.02	0.01	42.48	98.26	61.06	High
AUS-FM1431	R2	Austin	10.40	153.64	130.77	142.20	Poor	370.20	0.85	0.05	0.08	117.43	97.76	60.74	High
AUS-FM1431	R2	Austin	10.50	139.22	115.45	127.34	Fair	239.49	0.58	0.04	0.10	75.85	106.61	66.25	High
AUS-FM1431	R2	Austin	10.60	66.30	64.89	65.59	Good	114.37	0.30	0.02	0.03	36.29	107.49	66.79	High
AUS-FM1431	R2	Austin	10.70	100.25	93.24	96.75	Fair	161.98	0.54	0.02	0.07	51.50	100.36	62.36	High
AUS-FM1431	R2	Austin	10.80	120.67	108.07	114.37	Fair	215.89	0.81	0.03	0.13	68.48	97.52	60.59	High
AUS-FM1431	R2	Austin	10.90	123.28	113.67	118.47	Fair	85.08	0.29	0.01	0.04	27.21	99.10	61.58	High
AUS-FM1431	R2	Austin	11.00	112.71	93.86	103.28	Fair	237.69	0.52	0.03	0.04	75.39	101.77	63.24	High
AUS-FM1431	R2	Austin	11.10	104.96	102.30	103.63	Fair	143.86	0.20	0.02	0.01	45.52	109.41	67.99	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R2	Austin	11.20	117.12	115.31	116.22	Fair	155.87	0.15	0.02	0.01	49.31	112.10	69.65	High
AUS-FM1431	R2	Austin	11.30	103.22	124.10	113.66	Fair	120.26	0.13	0.02	0.01	37.89	111.47	69.27	High
AUS-FM1431	R2	Austin	11.40	114.42	121.99	118.20	Fair	155.36	0.27	0.02	0.02	49.21	112.50	69.90	High
AUS-FM1431	R2	Austin	11.50	127.73	120.40	124.06	Fair	118.85	0.28	0.02	0.02	37.73	116.31	72.27	High
AUS-FM1431	R2	Austin	11.60	147.92	122.25	135.08	Poor	78.23	0.21	0.01	0.01	24.78	115.49	71.76	High
AUS-FM1431	R2	Austin	11.70	167.27	161.15	164.21	Poor	198.05	0.51	0.02	0.13	62.89	112.12	69.67	High
AUS-FM1431	R2	Austin	11.80	155.68	139.57	147.62	Poor	162.93	0.46	0.02	0.10	51.66	112.88	70.14	High
AUS-FM1431	R2	Austin	11.90	181.18	142.38	161.78	Poor	293.96	0.95	0.04	0.05	93.33	111.99	69.59	High
AUS-FM1431	R2	Austin	12.00	161.17	148.55	154.86	Poor	297.71	0.85	0.04	0.03	94.49	116.29	72.26	High
AUS-FM1431	R2	Austin	12.10	162.37	169.90	166.13	Poor	223.49	0.69	0.03	0.03	70.92	118.58	73.68	High
AUS-FM1431	R2	Austin	12.20	181.33	178.97	180.15	Very Poor	114.77	0.39	0.01	0.03	36.43	118.44	73.60	High
AUS-FM1431	R2	Austin	12.30	141.77	139.02	140.40	Poor	95.08	0.28	0.01	0.05	30.11	116.25	72.24	High
AUS-FM1431	R2	Austin	12.40	163.18	155.40	159.29	Poor	239.90	0.52	0.03	0.21	76.09	114.64	71.23	High
AUS-FM1431	R2	Austin	12.50	176.72	148.86	162.79	Poor	229.90	0.46	0.02	0.18	72.90	114.92	71.41	High
AUS-FM1431	R2	Austin	12.60	123.93	124.68	124.31	Fair	240.85	0.42	0.03	0.23	76.20	113.01	70.22	High
AUS-FM1431	R2	Austin	12.70	72.83	101.71	87.27	Good	313.49	0.53	0.03	0.36	99.25	110.08	68.40	High
AUS-FM1431	R2	Austin	12.80	111.27	113.90	112.59	Fair	339.70	0.65	0.04	0.39	107.73	110.03	68.37	High
AUS-FM1431	R3	Austin	0.10	114.93	115.03	114.98	Fair	177.91	4.54	0.03	0.01	58.44	117.84	73.22	High
AUS-FM1431	R3	Austin	0.20	123.73	134.84	129.28	Fair	226.91	3.97	0.04	0.00	73.64	119.54	74.28	High
AUS-FM1431	R3	Austin	0.30	52.79	73.41	63.10	Good	199.46	1.58	0.04	0.00	63.90	121.18	75.30	High
AUS-FM1431	R3	Austin	0.40	71.84	86.73	79.29	Good	241.57	1.90	0.04	0.01	77.32	123.22	76.57	High
AUS-FM1431	R3	Austin	0.50	72.73	90.48	81.61	Good	277.42	2.37	0.05	0.00	88.88	123.12	76.50	High
AUS-FM1431	R3	Austin	0.60	116.88	114.38	115.63	Fair	196.71	1.76	0.03	0.00	62.97	124.00	77.05	High
AUS-FM1431	R3	Austin	0.70	87.14	86.48	86.81	Good	245.58	2.10	0.04	0.00	78.63	123.58	76.79	High
AUS-FM1431	R3	Austin	0.80	59.83	76.58	68.20	Good	302.56	2.45	0.05	0.01	96.75	124.67	77.47	High
AUS-FM1431	R3	Austin	0.90	71.83	91.46	81.64	Good	245.22	1.91	0.04	0.01	78.45	127.39	79.16	High
AUS-FM1431	R3	Austin	1.00	60.22	75.25	67.74	Good	207.49	1.53	0.03	0.00	66.44	125.23	77.81	High
AUS-FM1431	R3	Austin	1.10	79.79	81.10	80.45	Good	234.32	1.44	0.04	0.00	74.80	122.34	76.02	High
AUS-FM1431	R3	Austin	1.20	80.11	79.55	79.83	Good	286.86	1.19	0.04	0.17	91.32	122.06	75.85	High
AUS-FM1431	R3	Austin	1.30	65.44	66.95	66.19	Good	330.52	0.99	0.04	0.31	104.90	125.03	77.69	High
AUS-FM1431	R3	Austin	1.40	68.54	76.34	72.44	Good	178.60	0.57	0.02	0.15	56.81	127.12	78.99	High
AUS-FM1431	R3	Austin	1.50	66.02	60.86	63.44	Good	241.37	0.81	0.04	0.10	76.77	125.14	77.76	High
AUS-FM1431	R3	Austin	1.60	145.56	162.10	153.83	Poor	139.71	0.47	0.02	0.05	44.42	124.25	77.21	High
AUS-FM1431	R3	Austin	1.70	134.74	142.17	138.46	Poor	127.48	0.38	0.02	0.09	40.49	120.51	74.88	High
AUS-FM1431	R3	Austin	1.80	132.54	131.62	132.08	Poor	121.87	0.33	0.02	0.17	38.78	120.59	74.93	High
AUS-FM1431	R3	Austin	1.90	78.32	71.24	74.78	Good	118.21	0.29	0.02	0.08	37.56	120.40	74.81	High
AUS-FM1431	R3	Austin	2.00	82.22	80.43	81.33	Good	76.88	1.01	0.02	0.05	24.76	118.67	73.74	High
AUS-FM1431	R3	Austin	2.10	75.28	87.55	81.42	Good	274.41	0.46	0.04	0.06	87.03	115.42	71.72	High
AUS-FM1431	R3	Austin	2.20	118.86	103.47	111.17	Fair	235.38	2.05	0.04	0.04	75.32	113.92	70.79	High
AUS-FM1431	R3	Austin	2.30	124.80	132.05	128.43	Fair	324.40	1.56	0.05	0.12	103.19	112.27	69.76	High
AUS-FM1431	R3	Austin	2.40	77.62	75.70	76.66	Good	349.05	1.45	0.06	0.13	110.98	114.90	71.40	High
AUS-FM1431	R3	Austin	2.50	73.50	81.71	77.61	Good	348.82	1.69	0.06	0.24	111.12	118.46	73.61	High
AUS-FM1431	R3	Austin	2.60	68.28	75.55	71.92	Good	338.53	1.63	0.06	0.25	107.77	121.63	75.58	High
AUS-FM1431	R3	Austin	2.70	56.55	59.46	58.01	Very Good	320.72	1.48	0.05	0.18	102.05	123.79	76.92	High
AUS-FM1431	R3	Austin	2.80	110.72	133.13	121.92	Fair	199.05	0.90	0.04	0.08	63.28	123.61	76.81	High
AUS-FM1431	R3	Austin	2.90	148.20	159.15	153.68	Poor	230.79	1.26	0.04	0.08	73.49	120.27	74.73	High
AUS-FM1431	R3	Austin	3.00	120.53	132.13	126.33	Fair	179.81	2.35	0.04	0.08	58.04	119.79	74.44	High
AUS-FM1431	R3	Austin	3.10	62.76	75.98	69.37	Good	190.67	0.79	0.03	0.04	60.69	119.21	74.08	High
AUS-FM1431	R3	Austin	3.20	66.31	70.92	68.61	Good	258.23	1.88	0.05	0.11	82.63	117.60	73.07	High
AUS-FM1431	R3	Austin	3.30	73.97	78.75	76.36	Good	299.25	2.25	0.05	0.15	95.69	113.15	70.31	High
AUS-FM1431	R3	Austin	3.40	92.02	88.39	90.20	Good	330.28	0.74	0.06	0.18	104.71	113.08	70.26	High
AUS-FM1431	R3	Austin	3.50	87.69	93.16	90.42	Good	309.58	0.91	0.05	0.15	98.25	117.06	72.74	High
AUS-FM1431	R3	Austin	3.60	70.77	68.37	69.57	Good	170.53	1.14	0.03	0.06	54.46	120.38	74.80	High
AUS-FM1431	R3	Austin	3.70	96.45	69.69	83.07	Good	280.09	1.30	0.05	0.06	89.23	121.72	75.63	High
AUS-FM1431	R3	Austin	3.80	97.59	92.59	95.09	Good	278.93	1.84	0.05	0.05	89.01	124.86	77.58	High
AUS-FM1431	R3	Austin	3.90	79.39	89.39	84.39	Good	171.95	1.30	0.03	0.08	55.00	125.98	78.28	High
AUS-FM1431	R3	Austin	4.00	120.47	136.40	128.43	Fair	249.12	1.49	0.04	0.19	79.43	124.42	77.31	High
AUS-FM1431	R3	Austin	4.10	60.87	62.24	61.55	Good	290.65	1.71	0.05	0.11	92.64	126.77	78.77	High
AUS-FM1431	R3	Austin	4.20	98.59	140.84	119.71	Fair	302.23	1.87	0.05	0.25	96.41	128.13	79.62	High
AUS-FM1431	R3	Austin	4.30	113.42	125.15	119.28	Fair	235.90	1.45	0.04	0.17	75.31	129.26	80.32	High
AUS-FM1431	R3	Austin	4.40	97.29	128.27	112.78	Fair	145.02	0.82	0.02	0.10	46.29	128.38	79.77	High
AUS-FM1431	R3	Austin	4.50	112.44	139.09	125.76	Fair	91.03	0.45	0.01	0.06	28.98	123.93	77.01	High
AUS-FM1431	R3	Austin	4.60	91.26	127.00	109.13	Fair	139.14	0.57	0.02	0.14	44.19	118.42	73.58	High
AUS-FM1431	R3	Austin	4.70	59.54	65.13	62.34	Good	268.41	0.72	0.04	0.39	85.13	116.89	72.63	High
AUS-FM1431	R3	Austin	4.80	119.14	130.22	124.68	Fair	192.95	0.33	0.03	0.06	61.17	117.78	73.19	High
AUS-FM1431	R3	Austin	4.90	126.24	95.62	110.93	Fair	251.08	0.32	0.04	0.15	79.53	118.25	73.48	High
AUS-FM1431	R3	Austin	5.00	83.41	62.64	73.02	Good	188.93	0.23	0.03	0.06	59.77	121.54	75.52	High
AUS-FM1431	R3	Austin	5.10	96.48	79.25	87.86	Good	276.89	0.51	0.04	0.07	87.87	123.24	76.58	High
AUS-FM1431	R3	Austin	5.20	73.51	66.64	70.08	Good	197.02	0.42	0.03	0.10	62.47	123.08	76.48	High
AUS-FM1431	R3	Austin	5.30	90.39	89.40	89.90	Good	240.97	0.48	0.03	0.07	76.48	122.02	75.82	High
AUS-FM1431	R3	Austin	5.40	69.04	67.97	68.50	Good	289.55	0.47	0.04	0.15	91.75	120.55	74.90	High
AUS-FM1431	R3	Austin	5.50	84.58	56.92	70.75	Good	330.81	0.37	0.05	0.26	104.78	119.00	73.94	High
AUS-FM1431	R3	Austin	5.60	58.48	59.87	59.17	Very Good	331.61	0.26	0.05	0.12	104.87	119.31	74.13	High
AUS-FM1431	R3	Austin	5.70	107.00	108.78	107.89	Fair	239.63	0.25	0.03	0.07	75.83	120.88	75.11	High
AUS-FM1431	R3	Austin	5.80	116.80	122.88	119.84	Fair	66.70	0.09	0.01	0.02	21.11	120.32	74.76	High
AUS-FM1431	R3	Austin	5.90	96.50	77.77	87.13	Good	93.51	0.11	0.01	0.01	29.50	115.58	71.82	High
AUS-FM1431	R3	Austin	6.00	89.22	74.62	81.92	Good	294.96	0.37	0.04	0.17	93.39	115.26	71.62	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R3	Austin	6.10	75.68	65.40	70.54	Good	219.64	0.26	0.03	0.10	69.52	118.43	73.59	High
AUS-FM1431	R3	Austin	6.20	68.27	60.09	64.18	Good	218.36	0.23	0.03	0.11	69.09	119.97	74.54	High
AUS-FM1431	R3	Austin	6.30	67.93	60.31	64.12	Good	126.23	0.23	0.02	0.09	40.01	119.98	74.55	High
AUS-FM1431	R3	Austin	6.40	75.78	61.68	68.73	Good	218.81	0.40	0.03	0.09	69.34	118.00	73.32	High
AUS-FM1431	R3	Austin	6.50	71.10	70.06	70.58	Good	282.81	0.41	0.04	0.22	89.64	117.29	72.88	High
AUS-FM1431	R3	Austin	6.60	61.76	59.94	60.85	Good	256.71	0.29	0.03	0.17	81.25	117.00	72.70	High
AUS-FM1431	R3	Austin	6.70	75.13	68.98	72.06	Good	237.48	0.24	0.03	0.22	75.17	117.49	73.00	High
AUS-FM1431	R3	Austin	6.80	59.67	52.36	56.01	Very Good	239.57	0.25	0.03	0.22	75.73	119.14	74.03	High
AUS-FM1431	R3	Austin	6.90	61.53	57.62	59.57	Very Good	228.58	0.29	0.03	0.10	72.36	120.22	74.70	High
AUS-FM1431	R3	Austin	7.00	79.65	76.23	77.94	Good	217.94	0.32	0.03	0.12	69.02	120.61	74.94	High
AUS-FM1431	R3	Austin	7.10	138.37	122.74	130.55	Fair	233.60	0.38	0.03	0.31	74.09	117.35	72.92	High
AUS-FM1431	R3	Austin	7.20	104.00	99.92	101.96	Fair	318.35	0.49	0.04	0.29	100.83	114.41	71.09	High
AUS-FM1431	R3	Austin	7.30	187.67	184.30	185.98	Very Poor	301.70	0.49	0.03	0.19	95.59	116.54	72.42	High
AUS-FM1431	R3	Austin	7.40	133.72	147.93	140.82	Poor	144.02	0.17	0.01	0.07	45.62	118.69	73.75	High
AUS-FM1431	R3	Austin	7.50	96.27	90.27	93.27	Good	84.21	0.17	0.01	0.02	26.66	113.27	70.38	High
AUS-FM1431	R3	Austin	7.60	93.97	119.88	106.93	Fair	255.33	0.38	0.03	0.04	80.90	112.04	69.62	High
AUS-FM1431	R3	Austin	7.70	121.25	154.90	138.07	Poor	231.65	0.36	0.03	0.03	73.38	114.79	71.33	High
AUS-FM1431	R3	Austin	7.80	79.03	86.80	82.91	Good	177.52	0.30	0.02	0.04	56.13	115.77	71.94	High
AUS-FM1431	R3	Austin	7.90	81.06	72.43	76.75	Good	94.04	0.16	0.01	0.01	29.67	112.19	69.71	High
AUS-FM1431	R3	Austin	8.00	110.39	106.54	108.47	Fair	201.75	0.34	0.03	0.04	63.84	111.34	69.18	High
AUS-FM1431	R3	Austin	8.10	132.25	127.92	130.09	Fair	46.08	0.07	0.01	0.01	14.58	114.48	71.13	High
AUS-FM1431	R3	Austin	8.20	63.06	75.74	69.40	Good	121.58	0.21	0.02	0.01	38.46	113.45	70.49	High
AUS-FM1431	R3	Austin	8.30	64.71	75.01	69.86	Good	48.61	0.08	0.01	0.00	15.44	114.91	71.40	High
AUS-FM1431	R3	Austin	8.40	81.33	95.90	88.62	Good	62.85	0.11	0.01	0.01	19.90	109.37	67.96	High
AUS-FM1431	R3	Austin	8.50	82.37	93.03	87.70	Good	116.43	0.17	0.01	0.01	36.78	108.18	67.22	High
AUS-FM1431	R3	Austin	8.60	91.95	97.55	94.75	Good	177.03	0.31	0.02	0.01	56.09	106.97	66.47	High
AUS-FM1431	R3	Austin	8.70	84.79	107.62	96.21	Fair	219.63	0.41	0.03	0.03	69.61	110.66	68.76	High
AUS-FM1431	R3	Austin	8.80	88.82	99.00	93.91	Good	166.48	0.73	0.03	0.03	52.94	111.34	69.18	High
AUS-FM1431	R3	Austin	8.90	79.09	79.66	79.37	Good	304.41	0.63	0.04	0.03	96.48	110.67	68.77	High
AUS-FM1431	R3	Austin	9.00	73.31	85.24	79.28	Good	192.66	0.40	0.03	0.03	61.09	111.40	69.22	High
AUS-FM1431	R3	Austin	9.10	106.67	127.69	117.18	Fair	35.59	0.13	0.01	0.01	11.41	96.46	59.94	Medium
AUS-FM1431	R3	Austin	9.20	94.94	106.70	100.82	Fair	244.65	0.40	0.03	0.05	77.61	72.73	45.19	Medium
AUS-FM1431	R3	Austin	9.30	71.06	87.12	79.09	Good	353.01	0.32	0.04	0.03	111.58	80.05	49.74	Medium
AUS-FM1431	R3	Austin	9.40	113.89	116.64	115.27	Fair	356.18	0.34	0.05	0.10	112.79	91.71	56.99	Medium
AUS-FM1431	R3	Austin	9.50	67.94	66.27	67.11	Good	357.17	0.38	0.04	0.14	112.97	98.50	61.21	High
AUS-FM1431	R3	Austin	9.60	78.41	81.18	79.79	Good	271.88	0.26	0.03	0.13	86.03	102.94	63.96	High
AUS-FM1431	R3	Austin	9.70	85.36	77.88	81.62	Good	284.15	0.26	0.03	0.10	89.91	108.17	67.21	High
AUS-FM1431	R3	Austin	9.80	75.02	68.45	71.74	Good	162.34	0.22	0.02	0.05	51.35	113.96	70.81	High
AUS-FM1431	R3	Austin	9.90	143.01	147.30	145.15	Poor	255.90	0.52	0.03	0.09	81.17	117.03	72.72	High
AUS-FM1431	R3	Austin	10.00	106.98	95.56	101.27	Fair	191.10	1.46	0.02	0.09	61.12	118.21	73.45	High
AUS-FM1431	R3	Austin	10.10	93.21	68.94	81.07	Good	178.80	0.84	0.02	0.05	57.08	112.59	69.96	High
AUS-FM1431	R3	Austin	10.20	82.47	81.20	81.84	Good	228.51	0.86	0.03	0.04	72.60	111.28	69.15	High
AUS-FM1431	R3	Austin	10.30	104.68	96.36	100.52	Fair	135.38	0.55	0.02	0.05	42.96	114.09	70.89	High
AUS-FM1431	R3	Austin	10.40	153.64	130.77	142.20	Poor	245.87	0.95	0.03	0.20	78.11	110.89	68.90	High
AUS-FM1431	R3	Austin	10.50	139.22	115.45	127.34	Fair	277.89	0.91	0.03	0.24	88.28	109.22	67.87	High
AUS-FM1431	R3	Austin	10.60	66.30	64.89	65.59	Good	190.07	0.53	0.02	0.14	60.38	110.58	68.71	High
AUS-FM1431	R3	Austin	10.70	100.25	93.24	96.75	Fair	99.35	0.29	0.01	0.05	31.58	112.51	69.91	High
AUS-FM1431	R3	Austin	10.80	120.67	108.07	114.37	Fair	112.14	0.36	0.01	0.03	35.56	114.66	71.25	High
AUS-FM1431	R3	Austin	10.90	123.28	113.67	118.47	Fair	20.33	0.08	0.00	0.01	6.49	112.89	70.15	High
AUS-FM1431	R3	Austin	11.00	112.71	93.86	103.28	Fair	74.88	0.38	0.01	0.02	23.97	109.23	67.87	High
AUS-FM1431	R3	Austin	11.10	104.96	102.30	103.63	Fair	184.00	0.71	0.02	0.02	58.46	112.40	69.84	High
AUS-FM1431	R3	Austin	11.20	117.12	115.31	116.22	Fair	57.94	0.60	0.01	0.01	18.64	115.92	72.03	High
AUS-FM1431	R3	Austin	11.30	103.22	124.10	113.66	Fair	111.22	0.38	0.02	0.03	35.37	113.28	70.39	High
AUS-FM1431	R3	Austin	11.40	114.42	121.99	118.20	Fair	162.97	0.62	0.02	0.02	51.76	114.24	70.98	High
AUS-FM1431	R3	Austin	11.50	127.73	120.40	124.06	Fair	107.37	0.50	0.01	0.01	34.26	113.58	70.57	High
AUS-FM1431	R3	Austin	11.60	147.92	122.25	135.08	Poor	190.83	0.85	0.02	0.04	60.71	112.36	69.82	High
AUS-FM1431	R3	Austin	11.70	167.27	161.15	164.21	Poor	217.70	1.02	0.03	0.02	69.30	112.90	70.15	High
AUS-FM1431	R3	Austin	11.80	155.68	139.57	147.62	Poor	185.04	0.91	0.03	0.00	58.86	115.36	71.68	High
AUS-FM1431	R3	Austin	11.90	181.18	142.38	161.78	Poor	209.96	0.93	0.04	0.00	66.81	114.82	71.34	High
AUS-FM1431	R3	Austin	12.00	161.17	148.55	154.86	Poor	189.34	0.81	0.03	0.00	60.19	118.21	73.45	High
AUS-FM1431	R3	Austin	12.10	162.37	169.90	166.13	Poor	30.70	0.14	0.01	0.00	9.81	120.27	74.73	High
AUS-FM1431	R3	Austin	12.20	181.33	178.97	180.15	Very Poor	120.09	0.75	0.02	0.00	38.21	116.03	72.10	High
AUS-FM1431	R3	Austin	12.30	141.77	139.02	140.40	Poor	152.24	0.90	0.02	0.00	48.60	113.56	70.56	High
AUS-FM1431	R3	Austin	12.40	163.18	155.40	159.29	Poor	276.60	2.47	0.04	0.00	88.63	109.67	68.14	High
AUS-FM1431	R3	Austin	12.50	176.72	148.86	162.79	Poor	337.77	0.08	0.05	0.01	106.73	109.51	68.04	High
AUS-FM1431	R3	Austin	12.60	123.93	124.68	124.31	Fair	181.95	0.32	0.03	0.00	57.63	111.64	69.37	High
AUS-FM1431	R4	Austin	0.10	114.93	115.03	114.98	Fair	221.52	0.68	0.03	0.13	70.39	114.89	71.39	High
AUS-FM1431	R4	Austin	0.20	123.73	134.84	129.28	Fair	91.06	0.64	0.02	0.02	29.03	115.21	71.59	High
AUS-FM1431	R4	Austin	0.30	52.79	73.41	63.10	Good	235.16	0.93	0.04	0.04	74.80	114.49	71.14	High
AUS-FM1431	R4	Austin	0.40	71.84	86.73	79.29	Good	295.78	1.02	0.05	0.10	93.97	115.94	72.04	High
AUS-FM1431	R4	Austin	0.50	72.73	90.48	81.61	Good	261.35	0.95	0.04	0.25	83.05	117.13	72.78	High
AUS-FM1431	R4	Austin	0.60	116.88	114.38	115.63	Fair	194.88	0.72	0.03	0.10	61.89	116.52	72.40	High
AUS-FM1431	R4	Austin	0.70	87.14	86.48	86.81	Good	294.91	1.02	0.05	0.16	93.68	117.44	72.97	High
AUS-FM1431	R4	Austin	0.80	59.83	76.58	68.20	Good	319.52	1.02	0.06	0.35	101.40	120.20	74.69	High
AUS-FM1431	R4	Austin	0.90	71.83	91.46	81.64	Good	275.52	0.89	0.05	0.27	87.51	123.07	76.47	High
AUS-FM1431	R4	Austin	1.00	60.22	75.25	67.74	Good	89.48	0.62	0.02	0.04	28.64	121.73	75.64	High
AUS-FM1431	R4	Austin	1.10	79.79	81.10	80.45	Good	233.17	0.40	0.04	0.00	73.84	115.74	71.92	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R4	Austin	1.20	80.11	79.55	79.83	Good	241.80	0.31	0.04	0.00	76.52	116.54	72.41	High
AUS-FM1431	R4	Austin	1.30	65.44	66.95	66.19	Good	202.72	0.19	0.03	0.00	64.23	117.38	72.94	High
AUS-FM1431	R4	Austin	1.40	68.54	76.34	72.44	Good	134.04	0.06	0.02	0.00	42.44	116.01	72.08	High
AUS-FM1431	R4	Austin	1.50	66.02	60.86	63.44	Good	99.56	0.10	0.02	0.00	31.40	111.44	69.24	High
AUS-FM1431	R4	Austin	1.60	145.56	162.10	153.83	Poor	174.02	0.26	0.03	0.00	55.04	107.48	66.78	High
AUS-FM1431	R4	Austin	1.70	134.74	142.17	138.46	Poor	308.89	0.53	0.05	0.00	97.85	110.42	68.61	High
AUS-FM1431	R4	Austin	1.80	132.54	131.62	132.08	Poor	56.10	0.19	0.01	0.00	17.81	114.41	71.09	High
AUS-FM1431	R4	Austin	1.90	78.32	71.24	74.78	Good	149.17	0.28	0.02	0.00	47.41	112.97	70.20	High
AUS-FM1431	R4	Austin	2.00	82.22	80.43	81.33	Good	275.75	0.70	0.04	0.00	87.61	114.98	71.44	High
AUS-FM1431	R4	Austin	2.10	75.28	87.55	81.42	Good	271.88	0.89	0.04	0.04	86.33	115.56	71.81	High
AUS-FM1431	R4	Austin	2.20	118.86	103.47	111.17	Fair	308.18	0.91	0.03	0.27	97.85	113.23	70.36	High
AUS-FM1431	R4	Austin	2.30	124.80	132.05	128.43	Fair	333.49	0.82	0.04	0.31	105.81	113.25	70.37	High
AUS-FM1431	R4	Austin	2.40	77.62	75.70	76.66	Good	344.26	0.83	0.04	0.31	109.13	115.33	71.66	High
AUS-FM1431	R4	Austin	2.50	73.50	81.71	77.61	Good	299.85	1.10	0.04	0.31	95.24	117.37	72.93	High
AUS-FM1431	R4	Austin	2.60	68.28	75.55	71.92	Good	313.34	0.93	0.04	0.31	99.36	116.77	72.55	High
AUS-FM1431	R4	Austin	2.70	56.55	59.46	58.01	Very Good	274.56	0.72	0.03	0.26	87.18	115.97	72.06	High
AUS-FM1431	R4	Austin	2.80	110.72	133.13	121.92	Fair	197.40	0.47	0.03	0.21	62.67	113.66	70.63	High
AUS-FM1431	R4	Austin	2.90	148.20	159.15	153.68	Poor	257.11	0.54	0.04	0.08	81.42	110.43	68.62	High
AUS-FM1431	R4	Austin	3.00	120.53	132.13	126.33	Fair	190.17	0.33	0.03	0.02	60.28	109.77	68.21	High
AUS-FM1431	R4	Austin	3.10	62.76	75.98	69.37	Good	287.13	0.43	0.04	0.06	90.91	110.34	68.56	High
AUS-FM1431	R4	Austin	3.20	66.31	70.92	68.61	Good	318.16	0.62	0.05	0.26	100.72	109.12	67.80	High
AUS-FM1431	R4	Austin	3.30	73.97	78.75	76.36	Good	366.16	0.88	0.05	0.18	116.09	108.16	67.21	High
AUS-FM1431	R4	Austin	3.40	92.02	88.39	90.20	Good	383.86	0.89	0.06	0.28	121.69	111.07	69.01	High
AUS-FM1431	R4	Austin	3.50	87.69	93.16	90.42	Good	305.52	0.72	0.05	0.20	96.92	115.75	71.93	High
AUS-FM1431	R4	Austin	3.60	70.77	68.37	69.57	Good	173.97	0.53	0.03	0.04	55.12	118.53	73.65	High
AUS-FM1431	R4	Austin	3.70	96.45	69.69	83.07	Good	157.68	0.53	0.02	0.02	50.07	118.24	73.47	High
AUS-FM1431	R4	Austin	3.80	97.59	92.59	95.09	Good	164.81	0.53	0.02	0.03	52.38	116.00	72.08	High
AUS-FM1431	R4	Austin	3.90	79.39	89.39	84.39	Good	240.63	0.65	0.03	0.15	76.25	114.80	71.33	High
AUS-FM1431	R4	Austin	4.00	120.47	136.40	128.43	Fair	237.72	0.53	0.04	0.12	75.30	115.94	72.04	High
AUS-FM1431	R4	Austin	4.10	60.87	62.24	61.55	Good	231.74	0.45	0.03	0.13	73.53	117.93	73.28	High
AUS-FM1431	R4	Austin	4.20	98.59	140.84	119.71	Fair	221.21	0.45	0.03	0.12	70.18	117.29	72.88	High
AUS-FM1431	R4	Austin	4.30	113.42	125.15	119.28	Fair	236.93	0.51	0.03	0.15	75.15	115.60	71.83	High
AUS-FM1431	R4	Austin	4.40	97.29	128.27	112.78	Fair	185.34	0.36	0.02	0.09	58.63	115.62	71.84	High
AUS-FM1431	R4	Austin	4.50	112.44	139.09	125.76	Fair	227.67	0.42	0.03	0.15	72.27	114.51	71.15	High
AUS-FM1431	R4	Austin	4.60	91.26	127.00	109.13	Fair	276.25	0.69	0.04	0.06	87.60	113.88	70.76	High
AUS-FM1431	R4	Austin	4.70	59.54	65.13	62.34	Good	287.62	0.93	0.04	0.06	91.32	115.93	72.04	High
AUS-FM1431	R4	Austin	4.80	119.14	130.22	124.68	Fair	125.45	0.56	0.02	0.02	39.97	115.92	72.03	High
AUS-FM1431	R4	Austin	4.90	126.24	95.62	110.93	Fair	181.70	0.94	0.03	0.11	57.91	115.71	71.90	High
AUS-FM1431	R4	Austin	5.00	83.41	62.64	73.02	Good	90.40	0.47	0.01	0.01	28.80	116.98	72.69	High
AUS-FM1431	R4	Austin	5.10	96.48	79.25	87.86	Good	161.83	0.49	0.02	0.09	51.38	114.39	71.08	High
AUS-FM1431	R4	Austin	5.20	73.51	66.64	70.08	Good	199.76	0.63	0.03	0.11	63.41	113.62	70.60	High
AUS-FM1431	R4	Austin	5.30	90.39	89.40	89.90	Good	37.37	0.34	0.01	0.02	12.00	111.24	69.12	High
AUS-FM1431	R4	Austin	5.40	69.04	67.97	68.50	Good	203.13	0.14	0.03	0.05	64.20	100.64	62.54	High
AUS-FM1431	R4	Austin	5.50	84.58	56.92	70.75	Good	375.40	0.00	0.06	0.08	118.48	99.01	61.52	High
AUS-FM1431	R4	Austin	5.60	58.48	59.87	59.17	Very Good	297.13	0.03	0.04	0.09	93.91	102.20	63.50	High
AUS-FM1431	R4	Austin	5.70	107.00	108.78	107.89	Fair	148.33	0.06	0.02	0.03	46.77	101.37	62.99	High
AUS-FM1431	R4	Austin	5.80	116.80	122.88	119.84	Fair	188.34	0.08	0.03	0.06	59.57	101.71	63.20	High
AUS-FM1431	R4	Austin	5.90	96.50	77.77	87.13	Good	157.80	0.10	0.02	0.05	49.90	104.05	64.65	High
AUS-FM1431	R4	Austin	6.00	89.22	74.62	81.92	Good	147.10	0.19	0.02	0.08	46.61	104.86	65.16	High
AUS-FM1431	R4	Austin	6.10	75.68	65.40	70.54	Good	114.38	0.17	0.02	0.03	36.16	103.95	64.59	High
AUS-FM1431	R4	Austin	6.20	68.27	60.09	64.18	Good	102.07	0.15	0.02	0.01	32.24	103.03	64.02	High
AUS-FM1431	R4	Austin	6.30	67.93	60.31	64.12	Good	62.04	0.09	0.01	0.01	19.61	100.77	62.62	High
AUS-FM1431	R4	Austin	6.40	75.78	61.68	68.73	Good	255.77	0.26	0.04	0.22	80.94	98.70	61.33	High
AUS-FM1431	R4	Austin	6.50	71.10	70.06	70.58	Good	311.15	0.35	0.04	0.17	98.56	101.77	63.23	High
AUS-FM1431	R4	Austin	6.60	61.76	59.94	60.85	Good	247.77	0.72	0.04	0.09	78.60	103.30	64.19	High
AUS-FM1431	R4	Austin	6.70	75.13	68.98	72.06	Good	152.68	0.42	0.02	0.08	48.40	103.21	64.13	High
AUS-FM1431	R4	Austin	6.80	59.67	52.36	56.01	Very Good	143.94	0.49	0.02	0.10	45.72	103.46	64.29	High
AUS-FM1431	R4	Austin	6.90	61.53	57.62	59.57	Very Good	145.80	0.39	0.02	0.08	46.33	100.59	62.50	High
AUS-FM1431	R4	Austin	7.00	79.65	76.23	77.94	Good	143.53	0.27	0.02	0.03	45.43	99.65	61.92	High
AUS-FM1431	R4	Austin	7.10	138.37	122.74	130.55	Fair	284.36	0.36	0.04	0.05	89.87	96.50	59.96	Medium
AUS-FM1431	R4	Austin	7.20	104.00	99.92	101.96	Fair	336.28	0.36	0.05	0.06	106.55	97.50	60.59	High
AUS-FM1431	R4	Austin	7.30	187.67	184.30	185.98	Very Poor	272.41	0.26	0.04	0.12	86.12	101.89	63.31	High
AUS-FM1431	R4	Austin	7.40	133.72	147.93	140.82	Poor	136.49	0.11	0.02	0.13	43.16	103.53	64.33	High
AUS-FM1431	R4	Austin	7.50	96.27	90.27	93.27	Good	208.11	0.22	0.03	0.10	66.01	104.84	65.15	High
AUS-FM1431	R4	Austin	7.60	93.97	119.88	106.93	Fair	130.83	0.17	0.02	0.10	41.38	105.40	65.49	High
AUS-FM1431	R4	Austin	7.70	121.25	154.90	138.07	Poor	172.85	0.23	0.03	0.10	54.82	104.34	64.83	High
AUS-FM1431	R4	Austin	7.80	79.03	86.80	82.91	Good	221.22	0.32	0.03	0.12	70.07	104.19	64.74	High
AUS-FM1431	R4	Austin	7.90	81.06	72.43	76.75	Good	203.74	0.34	0.03	0.16	64.51	104.01	64.63	High
AUS-FM1431	R4	Austin	8.00	110.39	106.54	108.47	Fair	98.91	0.19	0.02	0.03	31.30	103.10	64.06	High
AUS-FM1431	R4	Austin	8.10	132.25	127.92	130.09	Fair	76.68	0.16	0.01	0.02	24.34	102.06	63.42	High
AUS-FM1431	R4	Austin	8.20	63.06	75.74	69.40	Good	150.84	0.27	0.03	0.09	47.89	104.91	65.19	High
AUS-FM1431	R4	Austin	8.30	64.71	75.01	69.86	Good	144.49	0.26	0.03	0.06	45.83	108.05	67.14	High
AUS-FM1431	R4	Austin	8.40	81.33	95.90	88.62	Good	77.60	0.13	0.02	0.06	24.58	108.93	67.68	High
AUS-FM1431	R4	Austin	8.50	82.37	93.03	87.70	Good	36.30	0.05	0.01	0.01	11.41	102.64	63.78	High
AUS-FM1431	R4	Austin	8.60	91.95	97.55	94.75	Good	92.41	0.05	0.02	0.01	29.29	98.82	61.40	High
AUS-FM1431	R4	Austin	8.70	84.79	107.62	96.21	Fair	195.70	0.02	0.04	0.02	61.80	97.98	60.88	High
AUS-FM1431	R4	Austin	8.80	88.82	99.00	93.91	Good	183.01	0.00	0.03	0.01	57.82	100.87	62.68	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R4	Austin	8.90	79.09	79.66	79.37	Good	233.80	0.00	0.04	0.02	73.86	101.24	62.91	High
AUS-FM1431	R4	Austin	9.00	73.31	85.24	79.28	Good	314.67	0.02	0.05	0.02	99.43	101.89	63.31	High
AUS-FM1431	R4	Austin	9.10	106.67	127.69	117.18	Fair	252.47	0.06	0.04	0.05	79.78	104.57	64.98	High
AUS-FM1431	R4	Austin	9.20	94.94	106.70	100.82	Fair	129.52	0.09	0.02	0.01	40.94	105.45	65.52	High
AUS-FM1431	R4	Austin	9.30	71.06	87.12	79.09	Good	240.38	0.24	0.04	0.07	75.97	106.54	66.20	High
AUS-FM1431	R4	Austin	9.40	113.89	116.64	115.27	Fair	233.61	0.29	0.04	0.09	73.88	108.35	67.32	High
AUS-FM1431	R4	Austin	9.50	67.94	66.27	67.11	Good	172.73	0.21	0.03	0.13	54.56	107.65	66.89	High
AUS-FM1431	R4	Austin	9.60	78.41	81.18	79.79	Good	47.77	0.08	0.01	0.01	15.17	105.83	65.76	High
AUS-FM1431	R4	Austin	9.70	85.36	77.88	81.62	Good	274.64	0.42	0.04	0.03	86.89	99.64	61.91	High
AUS-FM1431	R4	Austin	9.80	75.02	68.45	71.74	Good	299.98	0.34	0.04	0.03	94.97	101.95	63.35	High
AUS-FM1431	R4	Austin	9.90	143.01	147.30	145.15	Poor	135.08	0.16	0.02	0.02	42.94	105.51	65.56	High
AUS-FM1431	R4	Austin	10.00	106.98	95.56	101.27	Fair	40.24	0.05	0.01	0.00	12.73	104.57	64.97	High
AUS-FM1431	R4	Austin	10.10	93.21	68.94	81.07	Good	150.19	0.10	0.03	0.02	47.57	102.17	63.48	High
AUS-FM1431	R4	Austin	10.20	82.47	81.20	81.84	Good	256.13	0.09	0.04	0.02	81.01	103.30	64.19	High
AUS-FM1431	R4	Austin	10.30	104.68	96.36	100.52	Fair	215.35	0.17	0.03	0.03	68.20	99.88	62.06	High
AUS-FM1431	R4	Austin	10.40	153.64	130.77	142.20	Poor	234.21	0.26	0.04	0.13	74.26	99.64	61.91	High
AUS-FM1431	R4	Austin	10.50	139.22	115.45	127.34	Fair	172.06	0.20	0.03	0.04	54.52	103.50	64.31	High
AUS-FM1431	R4	Austin	10.60	66.30	64.89	65.59	Good	289.34	0.31	0.05	0.11	91.60	103.76	64.47	High
AUS-FM1431	R4	Austin	10.70	100.25	93.24	96.75	Fair	282.84	0.24	0.05	0.11	89.51	102.11	63.45	High
AUS-FM1431	R4	Austin	10.80	120.67	108.07	114.37	Fair	222.25	0.20	0.04	0.10	70.46	101.14	62.84	High
AUS-FM1431	R4	Austin	10.90	123.28	113.67	118.47	Fair	83.27	0.08	0.02	0.03	26.43	101.21	62.89	High
AUS-FM1431	R4	Austin	11.00	112.71	93.86	103.28	Fair	129.58	0.39	0.03	0.03	41.12	99.17	61.62	High
AUS-FM1431	R4	Austin	11.10	104.96	102.30	103.63	Fair	162.76	0.22	0.03	0.02	51.47	104.96	65.22	High
AUS-FM1431	R4	Austin	11.20	117.12	115.31	116.22	Fair	74.93	0.11	0.01	0.00	23.67	105.16	65.34	High
AUS-FM1431	R4	Austin	11.30	103.22	124.10	113.66	Fair	89.41	0.19	0.01	0.01	28.34	102.68	63.80	High
AUS-FM1431	R4	Austin	11.40	114.42	121.99	118.20	Fair	106.05	0.28	0.02	0.01	33.53	105.08	65.29	High
AUS-FM1431	R4	Austin	11.50	127.73	120.40	124.06	Fair	93.50	0.29	0.02	0.04	29.75	107.98	67.09	High
AUS-FM1431	R4	Austin	11.60	147.92	122.25	135.08	Poor	57.27	0.17	0.01	0.01	18.30	105.93	65.82	High
AUS-FM1431	R4	Austin	11.70	167.27	161.15	164.21	Poor	118.16	0.21	0.02	0.04	37.46	101.56	63.10	High
AUS-FM1431	R4	Austin	11.80	155.68	139.57	147.62	Poor	159.96	0.24	0.03	0.08	50.61	101.50	63.07	High
AUS-FM1431	R4	Austin	11.90	181.18	142.38	161.78	Poor	269.54	0.38	0.05	0.09	85.33	102.40	63.63	High
AUS-FM1431	R4	Austin	12.00	161.17	148.55	154.86	Poor	170.94	0.36	0.03	0.08	54.16	103.56	64.35	High
AUS-FM1431	R4	Austin	12.10	162.37	169.90	166.13	Poor	138.94	0.36	0.02	0.09	44.12	104.87	65.16	High
AUS-FM1431	R4	Austin	12.20	181.33	178.97	180.15	Very Poor	64.30	0.20	0.01	0.00	20.54	102.66	63.79	High
AUS-FM1431	R4	Austin	12.30	141.77	139.02	140.40	Poor	115.32	0.25	0.02	0.00	36.54	100.14	62.22	High
AUS-FM1431	R4	Austin	12.40	163.18	155.40	159.29	Poor	129.86	0.21	0.02	0.00	41.14	99.49	61.82	High
AUS-FM1431	R4	Austin	12.50	176.72	148.86	162.79	Poor	220.65	0.29	0.03	0.01	69.78	97.24	60.42	High
AUS-FM1431	R4	Austin	12.60	123.93	124.68	124.31	Fair	273.91	0.31	0.04	0.00	86.64	96.87	60.19	High
AUS-FM1431	R4	Austin	12.70	72.83	101.71	87.27	Good	357.45	0.43	0.05	0.00	113.13	96.02	59.67	Medium
AUS-FM1431	R4	Austin	12.80	111.27	113.90	112.59	Fair	315.11	0.40	0.04	0.01	99.74	98.41	61.15	High
AUS-FM1431	R5	Austin	0.10	114.93	115.03	114.98	Fair	194.18	1.47	0.03	0.05	62.13	115.10	71.52	High
AUS-FM1431	R5	Austin	0.20	123.73	134.84	129.28	Fair	99.45	0.88	0.02	0.03	31.90	115.89	72.01	High
AUS-FM1431	R5	Austin	0.30	52.79	73.41	63.10	Good	193.49	1.28	0.03	0.03	61.87	113.63	70.61	High
AUS-FM1431	R5	Austin	0.40	71.84	86.73	79.29	Good	244.59	1.38	0.04	0.04	78.01	114.58	71.19	High
AUS-FM1431	R5	Austin	0.50	72.73	90.48	81.61	Good	251.40	1.36	0.05	0.10	80.02	115.38	71.70	High
AUS-FM1431	R5	Austin	0.60	116.88	114.38	115.63	Fair	206.37	1.18	0.04	0.11	65.79	114.65	71.24	High
AUS-FM1431	R5	Austin	0.70	87.14	86.48	86.81	Good	205.89	1.09	0.04	0.12	65.56	115.92	72.03	High
AUS-FM1431	R5	Austin	0.80	59.83	76.58	68.20	Good	276.11	1.46	0.05	0.21	87.94	116.34	72.29	High
AUS-FM1431	R5	Austin	0.90	71.83	91.46	81.64	Good	166.17	1.06	0.03	0.14	52.94	118.27	73.49	High
AUS-FM1431	R5	Austin	1.00	60.22	75.25	67.74	Good	229.15	1.04	0.05	0.14	72.89	116.49	72.38	High
AUS-FM1431	R5	Austin	1.10	79.79	81.10	80.45	Good	272.68	0.87	0.05	0.12	86.60	116.19	72.20	High
AUS-FM1431	R5	Austin	1.20	80.11	79.55	79.83	Good	255.23	0.66	0.04	0.00	80.92	119.73	74.40	High
AUS-FM1431	R5	Austin	1.30	65.44	66.95	66.19	Good	156.97	0.69	0.03	0.00	49.94	121.29	75.37	High
AUS-FM1431	R5	Austin	1.40	68.54	76.34	72.44	Good	83.79	0.89	0.02	0.00	26.98	118.63	73.71	High
AUS-FM1431	R5	Austin	1.50	66.02	60.86	63.44	Good	210.75	0.97	0.04	0.00	67.13	115.42	71.72	High
AUS-FM1431	R5	Austin	1.60	145.56	162.10	153.83	Poor	180.00	0.65	0.03	0.00	57.14	115.92	72.03	High
AUS-FM1431	R5	Austin	1.70	134.74	142.17	138.46	Poor	65.32	0.39	0.01	0.00	20.83	114.16	70.93	High
AUS-FM1431	R5	Austin	1.80	132.54	131.62	132.08	Poor	92.14	0.69	0.02	0.00	29.37	110.79	68.84	High
AUS-FM1431	R5	Austin	1.90	78.32	71.24	74.78	Good	223.53	1.27	0.04	0.00	71.25	111.17	69.07	High
AUS-FM1431	R5	Austin	2.00	82.22	80.43	81.33	Good	118.22	0.95	0.03	0.00	69.49	114.93	71.41	High
AUS-FM1431	R5	Austin	2.10	75.28	87.55	81.42	Good	214.26	0.87	0.03	0.00	68.18	115.34	71.67	High
AUS-FM1431	R5	Austin	2.20	118.86	103.47	111.17	Fair	240.85	0.86	0.04	0.00	76.56	110.44	68.62	High
AUS-FM1431	R5	Austin	2.30	124.80	132.05	128.43	Fair	349.35	0.94	0.03	0.31	110.95	109.40	67.98	High
AUS-FM1431	R5	Austin	2.40	77.62	75.70	76.66	Good	343.19	1.00	0.03	0.24	108.86	112.56	69.94	High
AUS-FM1431	R5	Austin	2.50	73.50	81.71	77.61	Good	333.07	1.13	0.03	0.29	105.86	115.07	71.50	High
AUS-FM1431	R5	Austin	2.60	68.28	75.55	71.92	Good	295.00	1.16	0.02	0.24	93.75	116.79	72.57	High
AUS-FM1431	R5	Austin	2.70	56.55	59.46	58.01	Very Good	213.15	0.98	0.02	0.22	67.80	114.40	71.08	High
AUS-FM1431	R5	Austin	2.80	110.72	133.13	121.92	Fair	315.26	1.41	0.03	0.39	100.44	113.17	70.32	High
AUS-FM1431	R5	Austin	2.90	148.20	159.15	153.68	Poor	315.96	1.32	0.03	0.31	100.58	115.17	71.57	High
AUS-FM1431	R5	Austin	3.00	120.53	132.13	126.33	Fair	217.88	1.00	0.02	0.14	69.30	116.40	72.33	High
AUS-FM1431	R5	Austin	3.10	62.76	75.98	69.37	Good	207.51	0.93	0.02	0.12	66.01	116.03	72.10	High
AUS-FM1431	R5	Austin	3.20	66.31	70.92	68.61	Good	330.58	1.29	0.04	0.24	105.06	115.00	71.46	High
AUS-FM1431	R5	Austin	3.30	73.97	78.75	76.36	Good	356.65	1.09	0.04	0.24	113.26	114.62	71.22	High
AUS-FM1431	R5	Austin	3.40	92.02	88.39	90.20	Good	336.27	0.82	0.04	0.20	106.68	114.83	71.35	High
AUS-FM1431	R5	Austin	3.50	87.69	93.16	90.42	Good	183.21	0.97	0.02	0.07	58.45	116.17	72.18	High
AUS-FM1431	R5	Austin	3.60	70.77	68.37	69.57	Good	201.82	0.93	0.02	0.03	64.25	115.60	71.83	High
AUS-FM1431	R5	Austin	3.70	96.45	69.69	83.07	Good	219.24	0.48	0.02	0.02	69.52	118.18	73.43	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R5	Austin	3.80	97.59	92.59	95.09	Good	225.88	0.49	0.02	0.07	71.67	119.34	74.15	High
AUS-FM1431	R5	Austin	3.90	79.39	89.39	84.39	Good	88.51	0.24	0.01	0.02	28.17	117.74	73.16	High
AUS-FM1431	R5	Austin	4.00	120.47	136.40	128.43	Fair	132.65	0.34	0.01	0.02	42.01	113.15	70.31	High
AUS-FM1431	R5	Austin	4.10	60.87	62.24	61.55	Good	134.59	0.24	0.01	0.01	42.67	112.43	69.86	High
AUS-FM1431	R5	Austin	4.20	98.59	140.84	119.71	Fair	227.74	0.30	0.02	0.02	72.02	111.16	69.07	High
AUS-FM1431	R5	Austin	4.30	113.42	125.15	119.28	Fair	219.70	0.20	0.02	0.03	69.47	112.01	69.60	High
AUS-FM1431	R5	Austin	4.40	97.29	128.27	112.78	Fair	79.04	0.17	0.01	0.01	25.10	110.64	68.75	High
AUS-FM1431	R5	Austin	4.50	112.44	139.09	125.76	Fair	107.12	0.28	0.01	0.01	33.90	105.14	65.33	High
AUS-FM1431	R5	Austin	4.60	91.26	127.00	109.13	Fair	213.45	0.26	0.02	0.10	67.53	102.70	63.81	High
AUS-FM1431	R5	Austin	4.70	59.54	65.13	62.34	Good	141.21	0.18	0.02	0.02	44.66	102.31	63.57	High
AUS-FM1431	R5	Austin	4.80	119.14	130.22	124.68	Fair	229.26	0.41	0.03	0.06	72.67	101.61	63.14	High
AUS-FM1431	R5	Austin	4.90	126.24	95.62	110.93	Fair	106.20	0.16	0.01	0.04	33.64	103.16	64.10	High
AUS-FM1431	R5	Austin	5.00	83.41	62.64	73.02	Good	135.86	0.20	0.02	0.04	42.97	102.32	63.58	High
AUS-FM1431	R5	Austin	5.10	96.48	79.25	87.86	Good	183.33	0.24	0.02	0.10	58.15	103.72	64.45	High
AUS-FM1431	R5	Austin	5.20	73.51	66.64	70.08	Good	52.40	0.06	0.01	0.01	16.60	100.91	62.71	High
AUS-FM1431	R5	Austin	5.30	90.39	89.40	89.90	Good	287.41	0.34	0.03	0.16	90.93	97.64	60.67	High
AUS-FM1431	R5	Austin	5.40	69.04	67.97	68.50	Good	332.93	0.44	0.04	0.15	105.24	99.27	61.68	High
AUS-FM1431	R5	Austin	5.50	84.58	56.92	70.75	Good	334.38	0.32	0.04	0.20	105.83	100.24	62.28	High
AUS-FM1431	R5	Austin	5.60	58.48	59.87	59.17	Very Good	330.01	0.24	0.04	0.19	104.40	101.72	63.21	High
AUS-FM1431	R5	Austin	5.70	107.00	108.78	107.89	Fair	292.15	0.15	0.04	0.12	92.40	103.43	64.27	High
AUS-FM1431	R5	Austin	5.80	116.80	122.88	119.84	Fair	95.40	0.06	0.01	0.02	30.19	105.71	65.69	High
AUS-FM1431	R5	Austin	5.90	96.50	77.77	87.13	Good	16.98	0.03	0.00	0.01	5.41	102.40	63.63	High
AUS-FM1431	R5	Austin	6.00	89.22	74.62	81.92	Good	252.84	0.24	0.03	0.04	80.12	98.03	60.91	High
AUS-FM1431	R5	Austin	6.10	75.68	65.40	70.54	Good	268.01	0.18	0.03	0.03	84.79	102.07	63.43	High
AUS-FM1431	R5	Austin	6.20	68.27	60.09	64.18	Good	145.41	0.05	0.02	0.01	45.97	105.38	65.48	High
AUS-FM1431	R5	Austin	6.30	67.93	60.31	64.12	Good	158.08	0.02	0.02	0.03	49.86	106.11	65.93	High
AUS-FM1431	R5	Austin	6.40	75.78	61.68	68.73	Good	150.67	0.17	0.02	0.03	47.76	102.73	63.83	High
AUS-FM1431	R5	Austin	6.50	71.10	70.06	70.58	Good	295.68	0.32	0.03	0.03	93.58	103.43	64.27	High
AUS-FM1431	R5	Austin	6.60	61.76	59.94	60.85	Good	187.03	0.18	0.02	0.02	59.20	103.79	64.49	High
AUS-FM1431	R5	Austin	6.70	75.13	68.98	72.06	Good	133.44	0.09	0.02	0.02	42.24	101.82	63.27	High
AUS-FM1431	R5	Austin	6.80	59.67	52.36	56.01	Very Good	226.12	0.15	0.03	0.04	71.53	100.50	62.45	High
AUS-FM1431	R5	Austin	6.90	61.53	57.62	59.57	Very Good	202.30	0.13	0.02	0.05	64.00	103.09	64.06	High
AUS-FM1431	R5	Austin	7.00	79.65	76.23	77.94	Good	194.59	0.11	0.02	0.05	61.43	103.67	64.42	High
AUS-FM1431	R5	Austin	7.10	138.37	122.74	130.55	Fair	281.28	0.14	0.03	0.16	89.02	102.11	63.45	High
AUS-FM1431	R5	Austin	7.20	104.00	99.92	101.96	Fair	248.15	0.21	0.03	0.12	78.51	100.45	62.41	High
AUS-FM1431	R5	Austin	7.30	187.67	184.30	185.98	Very Poor	285.66	0.36	0.04	0.32	90.50	101.96	63.35	High
AUS-FM1431	R5	Austin	7.40	133.72	147.93	140.82	Poor	126.12	0.20	0.01	0.19	40.05	105.42	65.50	High
AUS-FM1431	R5	Austin	7.50	96.27	90.27	93.27	Good	72.62	0.16	0.01	0.02	23.07	103.41	64.26	High
AUS-FM1431	R5	Austin	7.60	93.97	119.88	106.93	Fair	89.58	0.15	0.01	0.05	28.39	100.87	62.68	High
AUS-FM1431	R5	Austin	7.70	121.25	154.90	138.07	Poor	173.13	0.17	0.02	0.15	54.78	99.22	61.65	High
AUS-FM1431	R5	Austin	7.80	79.03	86.80	82.91	Good	278.26	0.21	0.03	0.16	87.88	101.21	62.89	High
AUS-FM1431	R5	Austin	7.90	81.06	72.43	76.75	Good	232.70	0.22	0.03	0.14	73.61	103.00	64.00	High
AUS-FM1431	R5	Austin	8.00	110.39	106.54	108.47	Fair	199.62	0.20	0.03	0.06	63.23	104.59	64.99	High
AUS-FM1431	R5	Austin	8.10	132.25	127.92	130.09	Fair	58.21	0.11	0.01	0.03	18.46	105.62	65.63	High
AUS-FM1431	R5	Austin	8.20	63.06	75.74	69.40	Good	84.68	0.12	0.01	0.01	26.86	105.73	65.70	High
AUS-FM1431	R5	Austin	8.30	64.71	75.01	69.86	Good	46.17	0.05	0.01	0.00	14.56	106.95	66.45	High
AUS-FM1431	R5	Austin	8.40	81.33	95.90	88.62	Good	44.29	0.03	0.01	0.01	14.15	102.55	63.72	High
AUS-FM1431	R5	Austin	8.50	82.37	93.03	87.70	Good	88.89	0.00	0.01	0.00	28.07	99.82	62.03	High
AUS-FM1431	R5	Austin	8.60	91.95	97.55	94.75	Good	76.14	0.00	0.01	0.00	23.98	98.60	61.27	High
AUS-FM1431	R5	Austin	8.70	84.79	107.62	96.21	Fair	167.76	0.00	0.02	0.01	52.98	97.21	60.41	High
AUS-FM1431	R5	Austin	8.80	88.82	99.00	93.91	Good	77.47	0.00	0.01	0.00	24.48	98.03	60.91	High
AUS-FM1431	R5	Austin	8.90	79.09	79.66	79.37	Good	276.03	0.01	0.03	0.01	87.22	96.11	59.72	Medium
AUS-FM1431	R5	Austin	9.00	73.31	85.24	79.28	Good	332.12	0.05	0.03	0.04	104.98	98.56	61.24	High
AUS-FM1431	R5	Austin	9.10	106.67	127.69	117.18	Fair	231.53	0.06	0.02	0.05	73.06	100.64	62.54	High
AUS-FM1431	R5	Austin	9.20	94.94	106.70	100.82	Fair	141.25	0.04	0.01	0.01	44.70	100.89	62.69	High
AUS-FM1431	R5	Austin	9.30	71.06	87.12	79.09	Good	143.40	0.07	0.02	0.01	45.45	99.24	61.67	High
AUS-FM1431	R5	Austin	9.40	113.89	116.64	115.27	Fair	183.34	0.11	0.02	0.03	57.97	98.43	61.16	High
AUS-FM1431	R5	Austin	9.50	67.94	66.27	67.11	Good	266.16	0.16	0.03	0.07	84.21	98.81	61.40	High
AUS-FM1431	R5	Austin	9.60	78.41	81.18	79.79	Good	238.11	0.23	0.03	0.04	75.37	102.49	63.69	High
AUS-FM1431	R5	Austin	9.70	85.36	77.88	81.62	Good	232.40	0.22	0.03	0.10	73.51	103.39	64.24	High
AUS-FM1431	R5	Austin	9.80	75.02	68.45	71.74	Good	273.62	0.27	0.03	0.07	86.50	103.37	64.23	High
AUS-FM1431	R5	Austin	9.90	143.01	147.30	145.15	Poor	209.99	0.23	0.02	0.08	66.46	105.56	65.59	High
AUS-FM1431	R5	Austin	10.00	106.98	95.56	101.27	Fair	22.91	0.11	0.00	0.01	7.22	104.07	64.66	High
AUS-FM1431	R5	Austin	10.10	93.21	68.94	81.07	Good	95.59	0.15	0.01	0.01	30.29	102.00	63.38	High
AUS-FM1431	R5	Austin	10.20	82.47	81.20	81.84	Good	241.80	0.17	0.03	0.09	76.47	101.91	63.32	High
AUS-FM1431	R5	Austin	10.30	104.68	96.36	100.52	Fair	203.66	0.09	0.02	0.02	64.43	100.14	62.23	High
AUS-FM1431	R5	Austin	10.40	153.64	130.77	142.20	Poor	185.56	0.15	0.02	0.02	58.71	96.86	60.19	High
AUS-FM1431	R5	Austin	10.50	139.22	115.45	127.34	Fair	170.80	0.14	0.02	0.03	54.13	97.96	60.87	High
AUS-FM1431	R5	Austin	10.60	66.30	64.89	65.59	Good	129.03	0.08	0.02	0.02	40.88	96.49	59.95	Medium
AUS-FM1431	R5	Austin	10.70	100.25	93.24	96.75	Fair	273.76	0.13	0.03	0.04	86.59	92.59	57.53	Medium
AUS-FM1431	R5	Austin	10.80	120.67	108.07	114.37	Fair	293.75	0.24	0.03	0.03	92.94	92.26	57.33	Medium
AUS-FM1431	R5	Austin	10.90	123.28	113.67	118.47	Fair	139.14	1.54	0.02	0.03	44.64	96.82	60.16	High
AUS-FM1431	R5	Austin	11.00	112.71	93.86	103.28	Fair	118.15	0.21	0.01	0.01	37.45	99.08	61.57	High
AUS-FM1431	R5	Austin	11.10	104.96	102.30	103.63	Fair	183.36	0.34	0.02	0.04	58.18	105.05	65.28	High
AUS-FM1431	R5	Austin	11.20	117.12	115.31	116.22	Fair	51.80	0.14	0.01	0.00	16.41	108.20	67.23	High
AUS-FM1431	R5	Austin	11.30	103.22	124.10	113.66	Fair	111.47	0.23	0.02	0.02	35.30	103.90	64.56	High
AUS-FM1431	R5	Austin	11.40	114.42	121.99	118.20	Fair	101.29	0.24	0.02	0.09	32.18	105.86	65.78	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R5	Austin	11.50	127.73	120.40	124.06	Fair	33.55	0.10	0.01	0.01	10.66	105.39	65.48	High
AUS-FM1431	R5	Austin	11.60	147.92	122.25	135.08	Poor	103.98	0.17	0.02	0.01	33.00	103.54	64.34	High
AUS-FM1431	R5	Austin	11.70	167.27	161.15	164.21	Poor	138.34	0.12	0.02	0.01	43.64	101.66	63.17	High
AUS-FM1431	R5	Austin	11.80	155.68	139.57	147.62	Poor	178.10	0.08	0.03	0.00	56.37	99.83	62.03	High
AUS-FM1431	R5	Austin	11.90	181.18	142.38	161.78	Poor	149.99	0.12	0.02	0.01	47.50	101.14	62.84	High
AUS-FM1431	R5	Austin	12.00	161.17	148.55	154.86	Poor	279.21	0.80	0.04	0.02	88.56	100.28	62.31	High
AUS-FM1431	R5	Austin	12.10	162.37	169.90	166.13	Poor	121.25	0.18	0.02	0.00	38.41	103.43	64.27	High
AUS-FM1431	R5	Austin	12.20	181.33	178.97	180.15	Very Poor	96.21	0.14	0.01	0.00	30.58	101.63	63.15	High
AUS-FM1431	R5	Austin	12.30	141.77	139.02	140.40	Poor	153.21	0.12	0.02	0.00	48.43	101.32	62.96	High
AUS-FM1431	R5	Austin	12.40	163.18	155.40	159.29	Poor	138.18	0.04	0.02	0.00	43.65	103.39	64.25	High
AUS-FM1431	R5	Austin	12.50	176.72	148.86	162.79	Poor	184.23	0.00	0.03	0.00	58.21	101.11	62.83	High
AUS-FM1431	R5	Austin	12.60	123.93	124.68	124.31	Fair	221.53	0.01	0.03	0.00	70.04	98.06	60.93	High
AUS-FM1431	R5	Austin	12.70	72.83	101.71	87.27	Good	312.97	0.19	0.05	0.00	99.09	96.85	60.18	High
AUS-FM1431	R5	Austin	12.80	111.27	113.90	112.59	Fair	312.16	1.22	0.04	0.01	99.26	97.06	60.31	High
AUS-FM1431	R6	Austin	0.10	114.93	115.03	114.98	Fair	200.51	0.83	0.03	0.13	63.75	115.56	71.81	High
AUS-FM1431	R6	Austin	0.20	123.73	134.84	129.28	Fair	165.71	0.96	0.03	0.06	52.94	117.18	72.81	High
AUS-FM1431	R6	Austin	0.30	52.79	73.41	63.10	Good	286.80	1.59	0.05	0.07	91.44	116.86	72.62	High
AUS-FM1431	R6	Austin	0.40	71.84	86.73	79.29	Good	298.21	1.37	0.05	0.14	94.89	118.05	73.35	High
AUS-FM1431	R6	Austin	0.50	72.73	90.48	81.61	Good	331.00	1.62	0.05	0.27	105.28	119.89	74.50	High
AUS-FM1431	R6	Austin	0.60	116.88	114.38	115.63	Fair	303.78	2.34	0.05	0.36	97.17	123.10	76.49	High
AUS-FM1431	R6	Austin	0.70	87.14	86.48	86.81	Good	152.77	1.52	0.03	0.13	49.10	124.47	77.34	High
AUS-FM1431	R6	Austin	0.80	59.83	76.58	68.20	Good	226.76	0.83	0.04	0.11	72.12	120.70	75.00	High
AUS-FM1431	R6	Austin	0.90	71.83	91.46	81.64	Good	264.04	1.58	0.05	0.17	84.22	120.41	74.82	High
AUS-FM1431	R6	Austin	1.00	60.22	75.25	67.74	Good	161.26	1.28	0.03	0.05	51.54	118.48	73.62	High
AUS-FM1431	R6	Austin	1.10	79.79	81.10	80.45	Good	291.38	1.52	0.05	0.05	92.85	116.51	72.40	High
AUS-FM1431	R6	Austin	1.20	80.11	79.55	79.83	Good	237.57	2.32	0.04	0.06	76.17	117.36	72.92	High
AUS-FM1431	R6	Austin	1.30	65.44	66.95	66.19	Good	250.49	0.75	0.05	0.03	79.53	118.46	73.61	High
AUS-FM1431	R6	Austin	1.40	68.54	76.34	72.44	Good	224.28	0.82	0.04	0.04	71.20	119.21	74.07	High
AUS-FM1431	R6	Austin	1.50	66.02	60.86	63.44	Good	206.41	2.71	0.04	0.10	66.50	119.62	74.33	High
AUS-FM1431	R6	Austin	1.60	145.56	162.10	153.83	Poor	187.01	0.43	0.04	0.04	59.40	118.24	73.47	High
AUS-FM1431	R6	Austin	1.70	134.74	142.17	138.46	Poor	146.99	0.94	0.03	0.06	46.93	117.37	72.93	High
AUS-FM1431	R6	Austin	1.80	132.54	131.62	132.08	Poor	48.21	0.37	0.01	0.01	15.45	117.03	72.72	High
AUS-FM1431	R6	Austin	1.90	78.32	71.24	74.78	Good	198.78	0.54	0.04	0.03	63.04	114.51	71.15	High
AUS-FM1431	R6	Austin	2.00	82.22	80.43	81.33	Good	301.42	0.78	0.05	0.05	95.73	118.01	73.33	High
AUS-FM1431	R6	Austin	2.10	75.28	87.55	81.42	Good	237.63	1.21	0.04	0.11	75.73	120.47	74.86	High
AUS-FM1431	R6	Austin	2.20	118.86	103.47	111.17	Fair	293.65	1.35	0.05	0.18	93.44	117.20	72.82	High
AUS-FM1431	R6	Austin	2.30	124.80	132.05	128.43	Fair	321.42	1.44	0.06	0.29	102.24	116.01	72.09	High
AUS-FM1431	R6	Austin	2.40	77.62	75.70	76.66	Good	233.68	0.99	0.04	0.18	74.44	114.33	71.04	High
AUS-FM1431	R6	Austin	2.50	73.50	81.71	77.61	Good	342.63	1.46	0.06	0.30	108.97	113.91	70.78	High
AUS-FM1431	R6	Austin	2.60	68.28	75.55	71.92	Good	266.97	1.12	0.04	0.24	84.91	114.08	70.89	High
AUS-FM1431	R6	Austin	2.70	56.55	59.46	58.01	Very Good	310.24	1.19	0.05	0.31	98.64	112.37	69.82	High
AUS-FM1431	R6	Austin	2.80	110.72	133.13	121.92	Fair	285.51	1.10	0.05	0.25	90.85	112.00	69.59	High
AUS-FM1431	R6	Austin	2.90	148.20	159.15	153.68	Poor	262.27	1.20	0.05	0.18	83.56	111.24	69.12	High
AUS-FM1431	R6	Austin	3.00	120.53	132.13	126.33	Fair	347.29	1.74	0.07	0.40	110.65	114.00	70.84	High
AUS-FM1431	R6	Austin	3.10	62.76	75.98	69.37	Good	284.94	1.63	0.05	0.36	90.79	117.81	73.20	High
AUS-FM1431	R6	Austin	3.20	66.31	70.92	68.61	Good	239.58	1.62	0.05	0.11	76.47	114.23	70.98	High
AUS-FM1431	R6	Austin	3.30	73.97	78.75	76.36	Good	360.79	1.43	0.07	0.18	114.70	111.51	69.29	High
AUS-FM1431	R6	Austin	3.40	92.02	88.39	90.20	Good	356.01	1.25	0.07	0.35	113.27	113.71	70.65	High
AUS-FM1431	R6	Austin	3.50	87.69	93.16	90.42	Good	217.59	0.89	0.04	0.16	69.18	117.02	72.71	High
AUS-FM1431	R6	Austin	3.60	70.77	68.37	69.57	Good	260.71	1.25	0.05	0.07	82.98	118.34	73.53	High
AUS-FM1431	R6	Austin	3.70	96.45	69.69	83.07	Good	208.20	2.25	0.04	0.03	66.91	120.11	74.63	High
AUS-FM1431	R6	Austin	3.80	97.59	92.59	95.09	Good	262.88	1.56	0.05	0.06	83.90	120.64	74.96	High
AUS-FM1431	R6	Austin	3.90	79.39	89.39	84.39	Good	240.76	1.52	0.05	0.09	76.84	121.00	75.19	High
AUS-FM1431	R6	Austin	4.00	120.47	136.40	128.43	Fair	221.84	1.31	0.04	0.17	70.73	121.12	75.26	High
AUS-FM1431	R6	Austin	4.10	60.87	62.24	61.55	Good	280.51	1.66	0.05	0.28	89.57	122.23	75.95	High
AUS-FM1431	R6	Austin	4.20	98.59	140.84	119.71	Fair	159.67	0.99	0.03	0.13	51.05	120.64	74.96	High
AUS-FM1431	R6	Austin	4.30	113.42	125.15	119.28	Fair	166.47	1.10	0.03	0.05	53.15	116.80	72.57	High
AUS-FM1431	R6	Austin	4.40	97.29	128.27	112.78	Fair	286.28	1.54	0.05	0.11	91.18	116.28	72.25	High
AUS-FM1431	R6	Austin	4.50	112.44	139.09	125.76	Fair	283.46	1.37	0.05	0.23	90.19	118.36	73.55	High
AUS-FM1431	R6	Austin	4.60	91.26	127.00	109.13	Fair	99.41	0.72	0.02	0.09	31.79	118.07	73.36	High
AUS-FM1431	R6	Austin	4.70	59.54	65.13	62.34	Good	165.95	0.44	0.03	0.01	52.58	112.48	69.89	High
AUS-FM1431	R6	Austin	4.80	119.14	130.22	124.68	Fair	200.44	0.20	0.03	0.00	63.55	111.04	69.00	High
AUS-FM1431	R6	Austin	4.90	126.24	95.62	110.93	Fair	119.25	0.17	0.02	0.00	37.79	110.90	68.91	High
AUS-FM1431	R6	Austin	5.00	83.41	62.64	73.02	Good	166.15	0.35	0.03	0.00	52.78	110.70	68.79	High
AUS-FM1431	R6	Austin	5.10	96.48	79.25	87.86	Good	232.40	0.39	0.04	0.00	73.68	111.55	69.31	High
AUS-FM1431	R6	Austin	5.20	73.51	66.64	70.08	Good	257.94	0.43	0.04	0.00	81.72	113.01	70.22	High
AUS-FM1431	R6	Austin	5.30	90.39	89.40	89.90	Good	276.36	0.52	0.04	0.00	87.63	114.77	71.32	High
AUS-FM1431	R6	Austin	5.40	69.04	67.97	68.50	Good	142.05	0.57	0.02	0.00	45.24	112.11	69.66	High
AUS-FM1431	R6	Austin	5.50	84.58	56.92	70.75	Good	233.14	1.67	0.04	0.01	74.42	102.42	63.64	High
AUS-FM1431	R6	Austin	5.60	58.48	59.87	59.17	Very Good	299.83	0.32	0.04	0.01	94.93	103.23	64.15	High
AUS-FM1431	R6	Austin	5.70	107.00	108.78	107.89	Fair	184.00	0.25	0.02	0.00	58.27	104.29	64.80	High
AUS-FM1431	R6	Austin	5.80	116.80	122.88	119.84	Fair	131.46	0.43	0.02	0.03	41.81	100.86	62.67	High
AUS-FM1431	R6	Austin	5.90	96.50	77.77	87.13	Good	200.85	0.17	0.03	0.02	63.63	103.11	64.07	High
AUS-FM1431	R6	Austin	6.00	89.22	74.62	81.92	Good	240.14	0.12	0.03	0.02	75.88	106.24	66.01	High
AUS-FM1431	R6	Austin	6.10	75.68	65.40	70.54	Good	126.00	0.14	0.02	0.02	39.87	105.05	65.28	High
AUS-FM1431	R6	Austin	6.20	68.27	60.09	64.18	Good	156.42	0.17	0.02	0.01	49.59	103.61	64.38	High
AUS-FM1431	R6	Austin	6.30	67.93	60.31	64.12	Good	225.81	0.17	0.03	0.01	71.42	104.78	65.11	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R6	Austin	6.40	75.78	61.68	68.73	Good	131.20	0.09	0.02	0.01	41.44	104.50	64.93	High
AUS-FM1431	R6	Austin	6.50	71.10	70.06	70.58	Good	247.18	0.35	0.04	0.02	78.29	98.89	61.45	High
AUS-FM1431	R6	Austin	6.60	61.76	59.94	60.85	Good	277.86	0.29	0.04	0.03	88.04	99.96	62.11	High
AUS-FM1431	R6	Austin	6.70	75.13	68.98	72.06	Good	219.54	0.16	0.04	0.03	69.56	101.70	63.19	High
AUS-FM1431	R6	Austin	6.80	59.67	52.36	56.01	Very Good	126.63	0.17	0.03	0.02	68.67	102.30	63.57	High
AUS-FM1431	R6	Austin	6.90	61.53	57.62	59.57	Very Good	215.82	0.17	0.03	0.04	68.27	103.52	64.33	High
AUS-FM1431	R6	Austin	7.00	79.65	76.23	77.94	Good	274.30	0.24	0.05	0.10	86.81	104.87	65.16	High
AUS-FM1431	R6	Austin	7.10	138.37	122.74	130.55	Fair	284.85	0.35	0.05	0.16	90.24	102.99	63.99	High
AUS-FM1431	R6	Austin	7.20	104.00	99.92	101.96	Fair	313.24	0.48	0.05	0.19	99.19	102.66	63.79	High
AUS-FM1431	R6	Austin	7.30	187.67	184.30	185.98	Very Poor	277.69	0.53	0.05	0.16	87.99	104.89	65.17	High
AUS-FM1431	R6	Austin	7.40	133.72	147.93	140.82	Poor	265.07	0.57	0.05	0.14	84.13	107.99	67.10	High
AUS-FM1431	R6	Austin	7.50	96.27	90.27	93.27	Good	209.99	0.51	0.04	0.18	66.67	111.89	69.52	High
AUS-FM1431	R6	Austin	7.60	93.97	119.88	106.93	Fair	36.65	0.46	0.01	0.02	11.89	109.57	68.08	High
AUS-FM1431	R6	Austin	7.70	121.25	154.90	138.07	Poor	227.43	0.46	0.04	0.03	72.17	103.89	64.55	High
AUS-FM1431	R6	Austin	7.80	79.03	86.80	82.91	Good	246.72	0.22	0.05	0.03	77.99	105.27	65.41	High
AUS-FM1431	R6	Austin	7.90	81.06	72.43	76.75	Good	310.27	0.25	0.06	0.07	98.18	106.65	66.27	High
AUS-FM1431	R6	Austin	8.00	110.39	106.54	108.47	Fair	135.86	0.19	0.03	0.04	43.00	110.08	68.40	High
AUS-FM1431	R6	Austin	8.10	132.25	127.92	130.09	Fair	46.57	0.21	0.01	0.02	14.81	106.39	66.11	High
AUS-FM1431	R6	Austin	8.20	63.06	75.74	69.40	Good	34.92	0.02	0.01	0.00	10.98	105.98	65.85	High
AUS-FM1431	R6	Austin	8.30	64.71	75.01	69.86	Good	114.25	0.01	0.03	0.03	36.06	104.57	64.97	High
AUS-FM1431	R6	Austin	8.40	81.33	95.90	88.62	Good	112.40	0.01	0.02	0.01	35.46	105.47	65.54	High
AUS-FM1431	R6	Austin	8.50	82.37	93.03	87.70	Good	25.40	0.01	0.01	0.00	8.09	100.11	62.20	High
AUS-FM1431	R6	Austin	8.60	91.95	97.55	94.75	Good	30.84	0.01	0.01	0.01	9.71	94.27	58.58	Medium
AUS-FM1431	R6	Austin	8.70	84.79	107.62	96.21	Fair	68.77	0.02	0.02	0.02	21.76	87.63	54.45	Medium
AUS-FM1431	R6	Austin	8.80	88.82	99.00	93.91	Good	160.55	0.07	0.03	0.02	50.93	86.80	53.94	Medium
AUS-FM1431	R6	Austin	8.90	79.09	79.66	79.37	Good	208.85	0.30	0.03	0.02	66.24	87.75	54.53	Medium
AUS-FM1431	R6	Austin	9.00	73.31	85.24	79.28	Good	216.99	1.04	0.04	0.03	69.02	84.94	52.78	Medium
AUS-FM1431	R6	Austin	9.10	106.67	127.69	117.18	Fair	286.75	1.12	0.05	0.05	91.10	85.54	53.15	Medium
AUS-FM1431	R6	Austin	9.20	94.94	106.70	100.82	Fair	141.25	0.61	0.02	0.02	44.83	91.12	56.62	Medium
AUS-FM1431	R6	Austin	9.30	71.06	87.12	79.09	Good	268.79	1.18	0.05	0.04	85.42	93.75	58.25	Medium
AUS-FM1431	R6	Austin	9.40	113.89	116.64	115.27	Fair	116.81	0.90	0.02	0.04	37.35	94.01	58.42	Medium
AUS-FM1431	R6	Austin	9.50	67.94	66.27	67.11	Good	197.97	0.48	0.03	0.03	62.83	91.42	56.81	Medium
AUS-FM1431	R6	Austin	9.60	78.41	81.18	79.79	Good	224.71	0.51	0.04	0.03	71.31	94.55	58.75	Medium
AUS-FM1431	R6	Austin	9.70	85.36	77.88	81.62	Good	120.27	0.40	0.02	0.02	38.31	92.37	57.39	Medium
AUS-FM1431	R6	Austin	9.80	75.02	68.45	71.74	Good	247.76	0.90	0.04	0.08	78.84	89.06	55.34	Medium
AUS-FM1431	R6	Austin	9.90	143.01	147.30	145.15	Poor	230.98	0.88	0.04	0.09	73.40	93.35	58.01	Medium
AUS-FM1431	R6	Austin	10.00	106.98	95.56	101.27	Fair	132.73	1.06	0.02	0.08	42.52	95.81	59.53	Medium
AUS-FM1431	R6	Austin	10.10	93.21	68.94	81.07	Good	263.76	0.56	0.05	0.09	83.63	100.74	62.60	High
AUS-FM1431	R6	Austin	10.20	82.47	81.20	81.84	Good	295.57	0.12	0.06	0.11	93.50	104.49	64.93	High
AUS-FM1431	R6	Austin	10.30	104.68	96.36	100.52	Fair	295.45	0.13	0.07	0.15	93.36	104.00	64.62	High
AUS-FM1431	R6	Austin	10.40	153.64	130.77	142.20	Poor	195.54	0.24	0.04	0.18	61.85	104.96	65.22	High
AUS-FM1431	R6	Austin	10.50	139.22	115.45	127.34	Fair	214.80	2.38	0.05	0.12	69.02	105.35	65.46	High
AUS-FM1431	R6	Austin	10.60	66.30	64.89	65.59	Good	309.75	1.21	0.08	0.27	98.52	107.72	66.93	High
AUS-FM1431	R6	Austin	10.70	100.25	93.24	96.75	Fair	185.70	0.58	0.04	0.21	58.80	105.27	65.41	High
AUS-FM1431	R6	Austin	10.80	120.67	108.07	114.37	Fair	238.99	0.67	0.05	0.52	75.86	102.37	63.61	High
AUS-FM1431	R6	Austin	10.90	123.28	113.67	118.47	Fair	81.52	0.24	0.01	0.06	25.94	103.51	64.32	High
AUS-FM1431	R6	Austin	11.00	112.71	93.86	103.28	Fair	106.17	0.27	0.02	0.02	33.81	103.56	64.35	High
AUS-FM1431	R6	Austin	11.10	104.96	102.30	103.63	Fair	220.28	1.01	0.04	0.04	70.20	108.25	67.26	High
AUS-FM1431	R6	Austin	11.20	117.12	115.31	116.22	Fair	135.38	1.03	0.03	0.06	43.32	107.19	66.60	High
AUS-FM1431	R6	Austin	11.30	103.22	124.10	113.66	Fair	145.96	0.41	0.03	0.04	46.31	111.33	69.18	High
AUS-FM1431	R6	Austin	11.40	114.42	121.99	118.20	Fair	70.05	0.26	0.02	0.02	22.33	111.27	69.14	High
AUS-FM1431	R6	Austin	11.50	127.73	120.40	124.06	Fair	101.40	0.24	0.02	0.02	32.19	111.62	69.36	High
AUS-FM1431	R6	Austin	11.60	147.92	122.25	135.08	Poor	51.67	0.08	0.01	0.00	16.28	109.91	68.29	High
AUS-FM1431	R6	Austin	11.70	167.27	161.15	164.21	Poor	109.36	0.10	0.03	0.03	34.61	101.92	63.33	High
AUS-FM1431	R6	Austin	11.80	155.68	139.57	147.62	Poor	143.95	0.09	0.03	0.02	45.52	99.11	61.58	High
AUS-FM1431	R6	Austin	11.90	181.18	142.38	161.78	Poor	218.46	0.06	0.05	0.03	68.99	98.85	61.43	High
AUS-FM1431	R6	Austin	12.00	161.17	148.55	154.86	Poor	177.82	0.21	0.04	0.02	56.36	101.90	63.32	High
AUS-FM1431	R6	Austin	12.10	162.37	169.90	166.13	Poor	94.60	0.16	0.02	0.01	29.96	98.16	60.99	High
AUS-FM1431	R6	Austin	12.20	181.33	178.97	180.15	Very Poor	147.01	0.23	0.03	0.01	46.62	97.56	60.62	High
AUS-FM1431	R6	Austin	12.30	141.77	139.02	140.40	Poor	80.11	0.14	0.02	0.01	25.38	97.74	60.73	High
AUS-FM1431	R6	Austin	12.40	163.18	155.40	159.29	Poor	276.90	0.45	0.06	0.04	87.74	97.36	60.49	High
AUS-FM1431	R6	Austin	12.50	176.72	148.86	162.79	Poor	204.81	0.33	0.04	0.02	64.88	99.28	61.69	High
AUS-FM1431	R6	Austin	12.60	123.93	124.68	124.31	Fair	337.85	0.54	0.07	0.04	107.08	99.57	61.87	High
AUS-FM1431	R6	Austin	12.70	72.83	101.71	87.27	Good	242.99	0.47	0.05	0.07	77.10	98.27	61.06	High
AUS-FM1431	R6	Austin	12.80	111.27	113.90	112.59	Fair	218.02	1.25	0.05	0.06	69.51	96.05	59.68	Medium
AUS-FM1431	R7	Austin	0.10	114.93	115.03	114.98	Fair	207.73	2.68	0.03	0.15	67.07	109.56	68.07	High
AUS-FM1431	R7	Austin	0.20	123.73	134.84	129.28	Fair	220.72	1.24	0.04	0.05	70.32	111.65	69.38	High
AUS-FM1431	R7	Austin	0.30	52.79	73.41	63.10	Good	308.50	1.44	0.05	0.13	98.27	114.36	71.06	High
AUS-FM1431	R7	Austin	0.40	71.84	86.73	79.29	Good	199.84	1.25	0.04	0.09	63.79	114.58	71.20	High
AUS-FM1431	R7	Austin	0.50	72.73	90.48	81.61	Good	248.31	1.38	0.05	0.15	79.18	112.41	69.85	High
AUS-FM1431	R7	Austin	0.60	116.88	114.38	115.63	Fair	236.88	1.02	0.05	0.20	75.29	112.44	69.86	High
AUS-FM1431	R7	Austin	0.70	87.14	86.48	86.81	Good	173.58	0.67	0.04	0.07	55.22	111.32	69.17	High
AUS-FM1431	R7	Austin	0.80	59.83	76.58	68.20	Good	182.59	0.61	0.04	0.11	57.86	108.68	67.53	High
AUS-FM1431	R7	Austin	0.90	71.83	91.46	81.64	Good	318.43	0.92	0.06	0.21	100.93	108.03	67.12	High
AUS-FM1431	R7	Austin	1.00	60.22	75.25	67.74	Good	320.78	0.78	0.06	0.16	101.79	111.29	69.16	High
AUS-FM1431	R7	Austin	1.10	79.79	81.10	80.45	Good	272.79	0.59	0.05	0.13	86.56	113.51	70.53	High
AUS-FM1431	R7	Austin	1.20	80.11	79.55	79.83	Good	278.97	0.58	0.06	0.12	88.53	114.24	70.99	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R7	Austin	1.30	65.44	66.95	66.19	Good	130.84	0.87	0.03	0.05	41.77	115.17	71.56	High
AUS-FM1431	R7	Austin	1.40	68.54	76.34	72.44	Good	209.65	0.82	0.04	0.16	66.68	112.77	70.07	High
AUS-FM1431	R7	Austin	1.50	66.02	60.86	63.44	Good	215.86	0.59	0.04	0.14	68.44	110.96	68.95	High
AUS-FM1431	R7	Austin	1.60	145.56	162.10	153.83	Poor	167.92	0.55	0.03	0.05	53.32	110.48	68.65	High
AUS-FM1431	R7	Austin	1.70	134.74	142.17	138.46	Poor	121.24	0.43	0.02	0.03	38.45	108.55	67.45	High
AUS-FM1431	R7	Austin	1.80	132.54	131.62	132.08	Poor	155.14	0.46	0.03	0.05	49.13	106.93	66.44	High
AUS-FM1431	R7	Austin	1.90	78.32	71.24	74.78	Good	127.81	0.27	0.02	0.02	40.61	109.01	67.73	High
AUS-FM1431	R7	Austin	2.00	82.22	80.43	81.33	Good	250.60	0.37	0.05	0.01	79.32	110.95	68.94	High
AUS-FM1431	R7	Austin	2.10	75.28	87.55	81.42	Good	174.99	0.22	0.03	0.01	55.38	110.67	68.77	High
AUS-FM1431	R7	Austin	2.20	118.86	103.47	111.17	Fair	225.50	0.95	0.04	0.03	71.69	104.88	65.17	High
AUS-FM1431	R7	Austin	2.30	124.80	132.05	128.43	Fair	343.43	1.18	0.06	0.11	109.04	103.17	64.11	High
AUS-FM1431	R7	Austin	2.40	77.62	75.70	76.66	Good	291.49	0.53	0.05	0.13	92.35	105.84	65.76	High
AUS-FM1431	R7	Austin	2.50	73.50	81.71	77.61	Good	324.70	0.49	0.05	0.18	102.83	105.69	65.67	High
AUS-FM1431	R7	Austin	2.60	68.28	75.55	71.92	Good	277.99	0.45	0.05	0.27	88.02	106.70	66.30	High
AUS-FM1431	R7	Austin	2.70	56.55	59.46	58.01	Very Good	327.67	0.49	0.06	0.23	103.77	106.81	66.37	High
AUS-FM1431	R7	Austin	2.80	110.72	133.13	121.92	Fair	300.85	0.60	0.06	0.24	95.38	108.47	67.40	High
AUS-FM1431	R7	Austin	2.90	148.20	159.15	153.68	Poor	245.94	0.57	0.05	0.09	77.99	109.00	67.73	High
AUS-FM1431	R7	Austin	3.00	120.53	132.13	126.33	Fair	220.20	0.43	0.04	0.08	69.69	110.18	68.46	High
AUS-FM1431	R7	Austin	3.10	62.76	75.98	69.37	Good	252.68	0.42	0.05	0.19	80.08	110.92	68.93	High
AUS-FM1431	R7	Austin	3.20	66.31	70.92	68.61	Good	290.42	0.51	0.06	0.25	92.02	108.51	67.42	High
AUS-FM1431	R7	Austin	3.30	73.97	78.75	76.36	Good	341.20	0.44	0.06	0.21	108.06	106.08	65.92	High
AUS-FM1431	R7	Austin	3.40	92.02	88.39	90.20	Good	359.78	0.40	0.06	0.19	113.72	107.39	66.73	High
AUS-FM1431	R7	Austin	3.50	87.69	93.16	90.42	Good	284.21	0.36	0.05	0.10	90.07	110.56	68.70	High
AUS-FM1431	R7	Austin	3.60	70.77	68.37	69.57	Good	154.41	0.26	0.03	0.02	48.93	113.10	70.27	High
AUS-FM1431	R7	Austin	3.70	96.45	69.69	83.07	Good	113.54	0.16	0.02	0.00	36.00	113.28	70.39	High
AUS-FM1431	R7	Austin	3.80	97.59	92.59	95.09	Good	108.83	0.28	0.02	0.00	34.45	107.22	66.62	High
AUS-FM1431	R7	Austin	3.90	79.39	89.39	84.39	Good	150.52	0.22	0.02	0.00	47.76	105.04	65.27	High
AUS-FM1431	R7	Austin	4.00	120.47	136.40	128.43	Fair	183.81	0.24	0.03	0.00	58.18	104.90	65.18	High
AUS-FM1431	R7	Austin	4.10	60.87	62.24	61.55	Good	171.72	0.17	0.03	0.00	54.40	106.32	66.06	High
AUS-FM1431	R7	Austin	4.20	98.59	140.84	119.71	Fair	81.60	0.67	0.02	0.00	26.16	100.83	62.65	High
AUS-FM1431	R7	Austin	4.30	113.42	125.15	119.28	Fair	220.62	0.83	0.04	0.00	70.09	99.58	61.87	High
AUS-FM1431	R7	Austin	4.40	97.29	128.27	112.78	Fair	192.68	0.88	0.03	0.00	61.36	98.97	61.50	High
AUS-FM1431	R7	Austin	4.50	112.44	139.09	125.76	Fair	242.55	0.24	0.03	0.00	76.78	99.72	61.96	High
AUS-FM1431	R7	Austin	4.60	91.26	127.00	109.13	Fair	181.76	0.05	0.02	0.00	57.51	100.97	62.74	High
AUS-FM1431	R7	Austin	4.70	59.54	65.13	62.34	Good	246.33	0.10	0.03	0.03	77.86	100.99	62.75	High
AUS-FM1431	R7	Austin	4.80	119.14	130.22	124.68	Fair	143.84	0.10	0.02	0.02	45.59	101.39	63.00	High
AUS-FM1431	R7	Austin	4.90	126.24	95.62	110.93	Fair	16.81	0.06	0.01	0.00	5.36	96.71	60.09	High
AUS-FM1431	R7	Austin	5.00	83.41	62.64	73.02	Good	121.27	0.12	0.02	0.01	38.39	94.18	58.52	Medium
AUS-FM1431	R7	Austin	5.10	96.48	79.25	87.86	Good	111.94	0.04	0.02	0.01	35.44	92.79	57.66	Medium
AUS-FM1431	R7	Austin	5.20	73.51	66.64	70.08	Good	259.89	0.04	0.04	0.01	82.04	91.90	57.10	Medium
AUS-FM1431	R7	Austin	5.30	90.39	89.40	89.90	Good	259.04	0.02	0.04	0.01	82.00	96.30	59.84	Medium
AUS-FM1431	R7	Austin	5.40	69.04	67.97	68.50	Good	265.65	0.04	0.04	0.01	84.05	94.91	58.97	Medium
AUS-FM1431	R7	Austin	5.50	84.58	56.92	70.75	Good	288.75	0.08	0.05	0.03	91.36	93.02	57.80	Medium
AUS-FM1431	R7	Austin	5.60	58.48	59.87	59.17	Very Good	270.78	0.17	0.05	0.05	85.62	93.76	58.26	Medium
AUS-FM1431	R7	Austin	5.70	107.00	108.78	107.89	Fair	169.91	0.28	0.03	0.05	53.93	94.54	58.74	Medium
AUS-FM1431	R7	Austin	5.80	116.80	122.88	119.84	Fair	83.18	0.17	0.02	0.01	26.35	91.86	57.08	Medium
AUS-FM1431	R7	Austin	5.90	96.50	77.77	87.13	Good	212.38	0.25	0.04	0.01	67.09	94.35	58.63	Medium
AUS-FM1431	R7	Austin	6.00	89.22	74.62	81.92	Good	177.07	0.14	0.03	0.01	56.00	97.00	60.27	High
AUS-FM1431	R7	Austin	6.10	75.68	65.40	70.54	Good	75.08	0.05	0.01	0.00	23.68	96.60	60.02	High
AUS-FM1431	R7	Austin	6.20	68.27	60.09	64.18	Good	145.60	0.16	0.03	0.02	46.01	93.21	57.92	Medium
AUS-FM1431	R7	Austin	6.30	67.93	60.31	64.12	Good	76.83	0.11	0.02	0.01	24.25	93.38	58.02	Medium
AUS-FM1431	R7	Austin	6.40	75.78	61.68	68.73	Good	199.79	0.22	0.03	0.05	63.28	91.51	56.86	Medium
AUS-FM1431	R7	Austin	6.50	71.10	70.06	70.58	Good	249.59	0.25	0.04	0.02	79.15	92.10	57.23	Medium
AUS-FM1431	R7	Austin	6.60	61.76	59.94	60.85	Good	265.92	0.20	0.05	0.03	84.16	90.58	56.28	Medium
AUS-FM1431	R7	Austin	6.70	75.13	68.98	72.06	Good	210.78	0.23	0.04	0.02	66.78	93.36	58.01	Medium
AUS-FM1431	R7	Austin	6.80	59.67	52.36	56.01	Very Good	180.81	0.21	0.03	0.02	57.20	97.18	60.38	High
AUS-FM1431	R7	Austin	6.90	61.53	57.62	59.57	Very Good	164.05	0.17	0.03	0.02	51.89	96.10	59.72	Medium
AUS-FM1431	R7	Austin	7.00	79.65	76.23	77.94	Good	67.81	0.07	0.02	0.00	21.55	95.00	59.03	Medium
AUS-FM1431	R7	Austin	7.10	138.37	122.74	130.55	Fair	204.10	0.13	0.04	0.00	64.63	88.78	55.16	Medium
AUS-FM1431	R7	Austin	7.20	104.00	99.92	101.96	Fair	231.07	0.12	0.04	0.02	73.00	87.24	54.21	Medium
AUS-FM1431	R7	Austin	7.30	187.67	184.30	185.98	Very Poor	263.83	0.20	0.05	0.06	83.54	84.27	52.36	Medium
AUS-FM1431	R7	Austin	7.40	133.72	147.93	140.82	Poor	208.27	2.25	0.04	0.02	66.88	90.36	56.14	Medium
AUS-FM1431	R7	Austin	7.50	96.27	90.27	93.27	Good	177.13	0.26	0.03	0.02	56.15	94.06	58.45	Medium
AUS-FM1431	R7	Austin	7.60	93.97	119.88	106.93	Fair	219.62	0.25	0.04	0.04	69.59	97.16	60.37	High
AUS-FM1431	R7	Austin	7.70	121.25	154.90	138.07	Poor	90.55	0.10	0.02	0.02	28.66	97.49	60.58	High
AUS-FM1431	R7	Austin	7.80	79.03	86.80	82.91	Good	242.28	0.21	0.05	0.13	76.67	94.65	58.81	Medium
AUS-FM1431	R7	Austin	7.90	81.06	72.43	76.75	Good	291.52	0.27	0.06	0.08	92.29	97.91	60.84	High
AUS-FM1431	R7	Austin	8.00	110.39	106.54	108.47	Fair	93.22	0.15	0.02	0.04	29.54	100.29	62.32	High
AUS-FM1431	R7	Austin	8.10	132.25	127.92	130.09	Fair	14.48	0.08	0.01	0.01	4.71	96.28	59.82	Medium
AUS-FM1431	R7	Austin	8.20	63.06	75.74	69.40	Good	59.34	0.09	0.02	0.01	18.88	95.23	59.17	Medium
AUS-FM1431	R7	Austin	8.30	64.71	75.01	69.86	Good	68.10	0.05	0.01	0.01	21.56	97.95	60.87	High
AUS-FM1431	R7	Austin	8.40	81.33	95.90	88.62	Good	127.16	0.03	0.03	0.02	40.25	96.68	60.08	High
AUS-FM1431	R7	Austin	8.50	82.37	93.03	87.70	Good	164.21	0.03	0.03	0.01	51.78	98.55	61.23	High
AUS-FM1431	R7	Austin	8.60	91.95	97.55	94.75	Good	78.04	0.01	0.02	0.00	24.69	99.05	61.55	High
AUS-FM1431	R7	Austin	8.70	84.79	107.62	96.21	Fair	135.71	0.04	0.04	0.04	42.97	95.22	59.17	Medium
AUS-FM1431	R7	Austin	8.80	88.82	99.00	93.91	Good	24.94	0.25	0.01	0.02	8.00	83.57	51.93	Medium
AUS-FM1431	R7	Austin	8.90	79.09	79.66	79.37	Good	27.35	0.19	0.02	0.04	8.74	61.08	37.95	Low

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R7	Austin	9.00	73.31	85.24	79.28	Good	248.62	0.17	0.07	0.49	78.82	48.31	30.02	Low
AUS-FM1431	R7	Austin	9.10	106.67	127.69	117.18	Fair	406.43	0.53	0.10	0.10	128.72	57.44	35.69	Low
AUS-FM1431	R7	Austin	9.20	94.94	106.70	100.82	Fair	198.99	0.27	0.05	0.03	63.02	69.74	43.33	Low
AUS-FM1431	R7	Austin	9.30	71.06	87.12	79.09	Good	287.39	0.26	0.05	0.04	91.04	77.95	48.44	Medium
AUS-FM1431	R7	Austin	9.40	113.89	116.64	115.27	Fair	173.06	0.29	0.04	0.04	54.75	78.76	48.94	Medium
AUS-FM1431	R7	Austin	9.50	67.94	66.27	67.11	Good	256.24	0.28	0.05	0.02	81.13	82.22	51.09	Medium
AUS-FM1431	R7	Austin	9.60	78.41	81.18	79.79	Good	274.33	0.22	0.06	0.03	86.75	88.83	55.20	Medium
AUS-FM1431	R7	Austin	9.70	85.36	77.88	81.62	Good	223.99	0.11	0.05	0.03	70.85	91.41	56.80	Medium
AUS-FM1431	R7	Austin	9.80	75.02	68.45	71.74	Good	242.91	0.16	0.05	0.01	76.80	90.00	55.92	Medium
AUS-FM1431	R7	Austin	9.90	143.01	147.30	145.15	Poor	249.94	0.15	0.05	0.01	79.08	94.04	58.43	Medium
AUS-FM1431	R7	Austin	10.00	106.98	95.56	101.27	Fair	66.07	0.04	0.01	0.00	20.87	97.00	60.27	High
AUS-FM1431	R7	Austin	10.10	93.21	68.94	81.07	Good	216.46	0.11	0.05	0.02	68.50	98.26	61.06	High
AUS-FM1431	R7	Austin	10.20	82.47	81.20	81.84	Good	236.78	0.12	0.05	0.05	74.87	99.32	61.72	High
AUS-FM1431	R7	Austin	10.30	104.68	96.36	100.52	Fair	254.65	0.26	0.06	0.11	80.68	95.29	59.21	Medium
AUS-FM1431	R7	Austin	10.40	153.64	130.77	142.20	Poor	194.33	0.31	0.04	0.06	61.59	96.51	59.97	Medium
AUS-FM1431	R7	Austin	10.50	139.22	115.45	127.34	Fair	200.47	0.35	0.05	0.09	63.63	97.79	60.77	High
AUS-FM1431	R7	Austin	10.60	66.30	64.89	65.59	Good	280.07	0.47	0.06	0.17	88.86	99.94	62.10	High
AUS-FM1431	R7	Austin	10.70	100.25	93.24	96.75	Fair	281.07	0.44	0.06	0.13	89.02	97.68	60.70	High
AUS-FM1431	R7	Austin	10.80	120.67	108.07	114.37	Fair	148.03	0.26	0.03	0.06	46.91	96.87	60.19	High
AUS-FM1431	R7	Austin	10.90	123.28	113.67	118.47	Fair	43.37	0.09	0.01	0.02	13.76	95.10	59.09	Medium
AUS-FM1431	R7	Austin	11.00	112.71	93.86	103.28	Fair	34.44	0.14	0.02	0.02	11.05	85.63	53.21	Medium
AUS-FM1431	R7	Austin	11.10	104.96	102.30	103.63	Fair	222.22	0.21	0.05	0.07	70.26	82.94	51.53	Medium
AUS-FM1431	R7	Austin	11.20	117.12	115.31	116.22	Fair	281.27	0.20	0.06	0.03	89.00	90.83	56.44	Medium
AUS-FM1431	R7	Austin	11.30	103.22	124.10	113.66	Fair	117.27	0.10	0.03	0.01	37.12	97.97	60.87	High
AUS-FM1431	R7	Austin	11.40	114.42	121.99	118.20	Fair	39.61	0.06	0.01	0.01	12.49	97.95	60.86	High
AUS-FM1431	R7	Austin	11.50	127.73	120.40	124.06	Fair	137.68	0.12	0.03	0.02	43.50	97.89	60.83	High
AUS-FM1431	R7	Austin	11.60	147.92	122.25	135.08	Poor	140.55	0.11	0.03	0.01	44.44	100.80	62.64	High
AUS-FM1431	R7	Austin	11.70	167.27	161.15	164.21	Poor	196.06	0.13	0.04	0.03	62.00	101.25	62.92	High
AUS-FM1431	R7	Austin	11.80	155.68	139.57	147.62	Poor	213.53	0.15	0.05	0.04	67.55	101.49	63.06	High
AUS-FM1431	R7	Austin	11.90	181.18	142.38	161.78	Poor	122.02	0.08	0.03	0.02	38.63	101.39	63.00	High
AUS-FM1431	R7	Austin	12.00	161.17	148.55	154.86	Poor	224.44	0.11	0.05	0.05	70.91	101.15	62.85	High
AUS-FM1431	R7	Austin	12.10	162.37	169.90	166.13	Poor	96.40	0.08	0.02	0.01	30.57	101.06	62.80	High
AUS-FM1431	R7	Austin	12.20	181.33	178.97	180.15	Very Poor	37.33	0.03	0.01	0.00	11.92	99.33	61.72	High
AUS-FM1431	R7	Austin	12.30	141.77	139.02	140.40	Poor	63.12	0.02	0.02	0.01	20.00	94.28	58.58	Medium
AUS-FM1431	R7	Austin	12.40	163.18	155.40	159.29	Poor	273.58	0.04	0.07	0.03	86.60	94.50	58.72	Medium
AUS-FM1431	R7	Austin	12.50	176.72	148.86	162.79	Poor	202.50	0.03	0.05	0.01	64.09	96.91	60.22	High
AUS-FM1431	R7	Austin	12.60	123.93	124.68	124.31	Fair	259.97	0.45	0.06	0.04	82.35	97.31	60.47	High
AUS-FM1431	R7	Austin	12.70	72.83	101.71	87.27	Good	188.40	1.07	0.04	0.04	60.12	92.74	57.63	Medium
AUS-FM1431	R7	Austin	12.80	111.27	113.90	112.59	Fair	192.20	1.10	0.04	0.02	61.21	89.23	55.44	Medium
AUS-FM1431	R8	Austin	0.10	114.93	115.03	114.98	Fair	167.24	2.89	0.03	0.08	54.42	116.53	72.41	High
AUS-FM1431	R8	Austin	0.20	123.73	134.84	129.28	Fair	130.71	0.64	0.02	0.04	41.58	115.51	71.77	High
AUS-FM1431	R8	Austin	0.30	52.79	73.41	63.10	Good	77.39	0.21	0.01	0.01	24.70	113.30	70.40	High
AUS-FM1431	R8	Austin	0.40	71.84	86.73	79.29	Good	225.83	0.54	0.04	0.06	71.66	111.00	68.97	High
AUS-FM1431	R8	Austin	0.50	72.73	90.48	81.61	Good	160.19	0.43	0.02	0.08	50.70	111.67	69.39	High
AUS-FM1431	R8	Austin	0.60	116.88	114.38	115.63	Fair	203.77	0.78	0.03	0.06	64.74	107.61	66.87	High
AUS-FM1431	R8	Austin	0.70	87.14	86.48	86.81	Good	310.02	0.39	0.05	0.06	98.23	109.95	68.32	High
AUS-FM1431	R8	Austin	0.80	59.83	76.58	68.20	Good	289.03	0.39	0.04	0.05	91.57	115.29	71.64	High
AUS-FM1431	R8	Austin	0.90	71.83	91.46	81.64	Good	241.56	0.48	0.04	0.08	76.71	119.02	73.96	High
AUS-FM1431	R8	Austin	1.00	60.22	75.25	67.74	Good	205.70	0.56	0.03	0.08	65.31	116.07	72.12	High
AUS-FM1431	R8	Austin	1.10	79.79	81.10	80.45	Good	204.15	0.50	0.03	0.12	64.78	113.67	70.63	High
AUS-FM1431	R8	Austin	1.20	80.11	79.55	79.83	Good	148.10	0.36	0.02	0.08	46.97	112.40	69.84	High
AUS-FM1431	R8	Austin	1.30	65.44	66.95	66.19	Good	245.69	0.44	0.04	0.06	77.84	108.25	67.26	High
AUS-FM1431	R8	Austin	1.40	68.54	76.34	72.44	Good	226.43	0.24	0.04	0.01	71.75	108.93	67.68	High
AUS-FM1431	R8	Austin	1.50	66.02	60.86	63.44	Good	203.29	0.28	0.03	0.01	64.43	109.94	68.31	High
AUS-FM1431	R8	Austin	1.60	145.56	162.10	153.83	Poor	187.40	0.99	0.03	0.03	59.81	109.16	67.83	High
AUS-FM1431	R8	Austin	1.70	134.74	142.17	138.46	Poor	83.78	0.04	0.01	0.01	26.48	107.41	66.74	High
AUS-FM1431	R8	Austin	1.80	132.54	131.62	132.08	Poor	73.51	0.00	0.01	0.00	23.32	107.06	66.52	High
AUS-FM1431	R8	Austin	1.90	78.32	71.24	74.78	Good	143.40	0.00	0.02	0.02	45.34	107.39	66.73	High
AUS-FM1431	R8	Austin	2.00	82.22	80.43	81.33	Good	233.31	0.00	0.03	0.00	73.68	110.27	68.52	High
AUS-FM1431	R8	Austin	2.10	75.28	87.55	81.42	Good	265.16	0.00	0.04	0.00	83.76	111.98	69.58	High
AUS-FM1431	R8	Austin	2.20	118.86	103.47	111.17	Fair	206.28	0.00	0.03	0.00	65.26	111.03	68.99	High
AUS-FM1431	R8	Austin	2.30	124.80	132.05	128.43	Fair	243.87	0.15	0.04	0.00	77.13	108.05	67.14	High
AUS-FM1431	R8	Austin	2.40	77.62	75.70	76.66	Good	311.96	0.38	0.04	0.00	98.76	106.69	66.29	High
AUS-FM1431	R8	Austin	2.50	73.50	81.71	77.61	Good	313.38	0.44	0.04	0.00	99.08	109.70	68.16	High
AUS-FM1431	R8	Austin	2.60	68.28	75.55	71.92	Good	252.10	0.36	0.03	0.00	79.89	110.88	68.90	High
AUS-FM1431	R8	Austin	2.70	56.55	59.46	58.01	Very Good	294.34	0.37	0.04	0.00	93.16	109.30	67.92	High
AUS-FM1431	R8	Austin	2.80	110.72	133.13	121.92	Fair	253.07	0.28	0.04	0.00	80.01	109.94	68.31	High
AUS-FM1431	R8	Austin	2.90	148.20	159.15	153.68	Poor	194.19	0.14	0.03	0.01	61.39	109.15	67.82	High
AUS-FM1431	R8	Austin	3.00	120.53	132.13	126.33	Fair	184.85	0.17	0.04	0.07	58.50	107.02	66.50	High
AUS-FM1431	R8	Austin	3.10	62.76	75.98	69.37	Good	272.31	0.28	0.05	0.05	86.21	108.03	67.13	High
AUS-FM1431	R8	Austin	3.20	66.31	70.92	68.61	Good	301.39	0.41	0.06	0.21	95.51	108.02	67.12	High
AUS-FM1431	R8	Austin	3.30	73.97	78.75	76.36	Good	341.21	0.51	0.06	0.14	108.10	106.25	66.02	High
AUS-FM1431	R8	Austin	3.40	92.02	88.39	90.20	Good	319.43	0.41	0.06	0.12	101.13	106.75	66.33	High
AUS-FM1431	R8	Austin	3.50	87.69	93.16	90.42	Good	227.70	0.53	0.05	0.08	72.26	109.04	67.75	High
AUS-FM1431	R8	Austin	3.60	70.77	68.37	69.57	Good	171.87	1.30	0.04	0.04	54.98	110.82	68.86	High
AUS-FM1431	R8	Austin	3.70	96.45	69.69	83.07	Good	41.38	0.03	0.01	0.00	13.12	110.37	68.58	High
AUS-FM1431	R8	Austin	3.80	97.59	92.59	95.09	Good	161.81	0.11	0.03	0.03	51.14	104.62	65.01	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R8	Austin	3.90	79.39	89.39	84.39	Good	256.57	0.21	0.05	0.03	81.11	106.25	66.02	High
AUS-FM1431	R8	Austin	4.00	120.47	136.40	128.43	Fair	171.93	0.18	0.03	0.03	54.44	108.85	67.64	High
AUS-FM1431	R8	Austin	4.10	60.87	62.24	61.55	Good	139.42	0.22	0.03	0.03	44.04	106.05	65.90	High
AUS-FM1431	R8	Austin	4.20	98.59	140.84	119.71	Fair	221.65	0.22	0.05	0.03	70.14	105.84	65.76	High
AUS-FM1431	R8	Austin	4.30	113.42	125.15	119.28	Fair	225.73	0.11	0.05	0.01	71.33	106.25	66.02	High
AUS-FM1431	R8	Austin	4.40	97.29	128.27	112.78	Fair	226.14	0.11	0.05	0.04	71.42	106.98	66.47	High
AUS-FM1431	R8	Austin	4.50	112.44	139.09	125.76	Fair	280.03	0.21	0.06	0.07	88.70	108.78	67.59	High
AUS-FM1431	R8	Austin	4.60	91.26	127.00	109.13	Fair	263.89	0.29	0.06	0.05	83.49	112.07	69.64	High
AUS-FM1431	R8	Austin	4.70	59.54	65.13	62.34	Good	201.63	0.30	0.04	0.08	63.89	112.95	70.18	High
AUS-FM1431	R8	Austin	4.80	119.14	130.22	124.68	Fair	82.11	0.15	0.02	0.04	26.04	109.43	68.00	High
AUS-FM1431	R8	Austin	4.90	126.24	95.62	110.93	Fair	32.92	0.08	0.01	0.01	10.31	104.90	65.18	High
AUS-FM1431	R8	Austin	5.00	83.41	62.64	73.02	Good	246.05	0.28	0.05	0.05	77.85	102.66	63.79	High
AUS-FM1431	R8	Austin	5.10	96.48	79.25	87.86	Good	279.40	0.16	0.06	0.06	88.29	108.18	67.22	High
AUS-FM1431	R8	Austin	5.20	73.51	66.64	70.08	Good	285.60	0.10	0.06	0.03	90.30	110.88	68.90	High
AUS-FM1431	R8	Austin	5.30	90.39	89.40	89.90	Good	245.08	0.15	0.05	0.05	77.54	113.90	70.78	High
AUS-FM1431	R8	Austin	5.40	69.04	67.97	68.50	Good	257.13	0.27	0.05	0.08	81.44	112.01	69.60	High
AUS-FM1431	R8	Austin	5.50	84.58	56.92	70.75	Good	299.23	0.35	0.07	0.19	94.59	108.43	67.38	High
AUS-FM1431	R8	Austin	5.60	58.48	59.87	59.17	Very Good	295.91	0.30	0.06	0.15	93.61	107.23	66.63	High
AUS-FM1431	R8	Austin	5.70	107.00	108.78	107.89	Fair	145.33	0.14	0.03	0.09	45.91	106.76	66.34	High
AUS-FM1431	R8	Austin	5.80	116.80	122.88	119.84	Fair	48.86	0.09	0.01	0.01	15.54	101.87	63.30	High
AUS-FM1431	R8	Austin	5.90	96.50	77.77	87.13	Good	202.86	0.26	0.05	0.03	64.24	100.04	62.16	High
AUS-FM1431	R8	Austin	6.00	89.22	74.62	81.92	Good	306.39	0.26	0.07	0.03	96.95	104.39	64.87	High
AUS-FM1431	R8	Austin	6.10	75.68	65.40	70.54	Good	192.19	0.48	0.04	0.04	61.11	108.98	67.72	High
AUS-FM1431	R8	Austin	6.20	68.27	60.09	64.18	Good	178.11	0.69	0.04	0.03	56.68	109.32	67.93	High
AUS-FM1431	R8	Austin	6.30	67.93	60.31	64.12	Good	245.13	0.26	0.06	0.02	77.68	111.12	69.05	High
AUS-FM1431	R8	Austin	6.40	75.78	61.68	68.73	Good	221.40	0.30	0.05	0.03	70.12	111.97	69.57	High
AUS-FM1431	R8	Austin	6.50	71.10	70.06	70.58	Good	248.89	0.27	0.06	0.16	78.88	111.09	69.03	High
AUS-FM1431	R8	Austin	6.60	61.76	59.94	60.85	Good	78.56	0.15	0.02	0.04	24.96	106.86	66.40	High
AUS-FM1431	R8	Austin	6.70	75.13	68.98	72.06	Good	272.42	0.55	0.06	0.06	86.42	101.78	63.24	High
AUS-FM1431	R8	Austin	6.80	59.67	52.36	56.01	Very Good	117.05	1.06	0.03	0.02	37.50	103.62	64.39	High
AUS-FM1431	R8	Austin	6.90	61.53	57.62	59.57	Very Good	249.35	0.57	0.06	0.03	79.24	101.61	63.14	High
AUS-FM1431	R8	Austin	7.00	79.65	76.23	77.94	Good	271.24	0.20	0.06	0.04	85.85	106.35	66.09	High
AUS-FM1431	R8	Austin	7.10	138.37	122.74	130.55	Fair	256.71	0.18	0.06	0.04	81.26	105.83	65.76	High
AUS-FM1431	R8	Austin	7.20	104.00	99.92	101.96	Fair	224.95	0.21	0.06	0.16	71.18	104.48	64.92	High
AUS-FM1431	R8	Austin	7.30	187.67	184.30	185.98	Very Poor	266.03	0.26	0.07	0.13	84.27	104.10	64.68	High
AUS-FM1431	R8	Austin	7.40	133.72	147.93	140.82	Poor	201.02	0.18	0.05	0.11	63.66	105.93	65.82	High
AUS-FM1431	R8	Austin	7.50	96.27	90.27	93.27	Good	135.50	0.13	0.04	0.09	42.81	108.39	67.35	High
AUS-FM1431	R8	Austin	7.60	93.97	119.88	106.93	Fair	192.71	0.26	0.07	0.23	61.05	107.39	66.73	High
AUS-FM1431	R8	Austin	7.70	121.25	154.90	138.07	Poor	189.44	0.22	0.07	0.31	60.06	107.86	67.02	High
AUS-FM1431	R8	Austin	7.80	79.03	86.80	82.91	Good	193.05	0.23	0.07	0.15	61.04	106.07	65.91	High
AUS-FM1431	R8	Austin	7.90	81.06	72.43	76.75	Good	152.44	1.44	0.06	0.18	48.93	104.90	65.18	High
AUS-FM1431	R8	Austin	8.00	110.39	106.54	108.47	Fair	69.63	0.69	0.03	0.05	22.24	100.24	62.29	High
AUS-FM1431	R8	Austin	8.10	132.25	127.92	130.09	Fair	58.78	0.21	0.02	0.02	18.61	98.98	61.50	High
AUS-FM1431	R8	Austin	8.20	63.06	75.74	69.40	Good	4.14	0.02	0.01	0.01	1.29	96.55	59.99	Medium
AUS-FM1431	R8	Austin	8.30	64.71	75.01	69.86	Good	24.47	0.01	0.04	0.02	7.60	93.19	57.90	Medium
AUS-FM1431	R8	Austin	8.40	81.33	95.90	88.62	Good	291.84	0.00	0.10	0.12	92.28	94.34	58.62	Medium
AUS-FM1431	R8	Austin	8.50	82.37	93.03	87.70	Good	187.27	0.00	0.04	0.01	59.16	101.18	62.87	High
AUS-FM1431	R8	Austin	8.60	91.95	97.55	94.75	Good	105.88	0.01	0.02	0.01	33.41	100.91	62.70	High
AUS-FM1431	R8	Austin	8.70	84.79	107.62	96.21	Fair	138.98	0.00	0.03	0.01	43.95	100.34	62.35	High
AUS-FM1431	R8	Austin	8.80	88.82	99.00	93.91	Good	168.78	0.01	0.04	0.01	53.32	99.66	61.93	High
AUS-FM1431	R8	Austin	8.90	79.09	79.66	79.37	Good	242.50	0.11	0.05	0.03	76.65	100.49	62.44	High
AUS-FM1431	R8	Austin	9.00	73.31	85.24	79.28	Good	164.15	0.87	0.04	0.01	52.30	98.65	61.30	High
AUS-FM1431	R8	Austin	9.10	106.67	127.69	117.18	Fair	72.89	0.38	0.03	0.02	23.20	89.72	55.75	Medium
AUS-FM1431	R8	Austin	9.20	94.94	106.70	100.82	Fair	133.56	0.35	0.03	0.02	42.38	87.76	54.53	Medium
AUS-FM1431	R8	Austin	9.30	71.06	87.12	79.09	Good	228.53	0.49	0.06	0.04	72.48	87.52	54.38	Medium
AUS-FM1431	R8	Austin	9.40	113.89	116.64	115.27	Fair	226.22	0.35	0.06	0.03	71.68	90.97	56.52	Medium
AUS-FM1431	R8	Austin	9.50	67.94	66.27	67.11	Good	247.16	0.36	0.06	0.03	78.34	92.77	57.64	Medium
AUS-FM1431	R8	Austin	9.60	78.41	81.18	79.79	Good	251.24	0.38	0.06	0.03	79.57	94.92	58.98	Medium
AUS-FM1431	R8	Austin	9.70	85.36	77.88	81.62	Good	220.77	0.29	0.05	0.03	70.02	99.27	61.68	High
AUS-FM1431	R8	Austin	9.80	75.02	68.45	71.74	Good	223.47	0.28	0.05	0.05	70.70	97.34	60.49	High
AUS-FM1431	R8	Austin	9.90	143.01	147.30	145.15	Poor	141.41	0.44	0.03	0.07	44.94	96.85	60.18	High
AUS-FM1431	R8	Austin	10.00	106.98	95.56	101.27	Fair	176.00	0.55	0.04	0.03	55.80	98.70	61.33	High
AUS-FM1431	R8	Austin	10.10	93.21	68.94	81.07	Good	99.63	0.07	0.02	0.01	31.61	101.92	63.33	High
AUS-FM1431	R8	Austin	10.20	82.47	81.20	81.84	Good	257.33	0.16	0.06	0.05	81.40	101.01	62.76	High
AUS-FM1431	R8	Austin	10.30	104.68	96.36	100.52	Fair	121.53	0.68	0.03	0.06	38.77	96.89	60.21	High
AUS-FM1431	R8	Austin	10.40	153.64	130.77	142.20	Poor	179.99	0.26	0.04	0.14	57.08	94.01	58.41	Medium
AUS-FM1431	R8	Austin	10.50	139.22	115.45	127.34	Fair	176.42	0.08	0.04	0.04	55.86	95.68	59.46	Medium
AUS-FM1431	R8	Austin	10.60	66.30	64.89	65.59	Good	177.81	0.07	0.04	0.03	56.15	95.96	59.63	Medium
AUS-FM1431	R8	Austin	10.70	100.25	93.24	96.75	Fair	232.14	0.05	0.05	0.03	73.22	91.96	57.14	Medium
AUS-FM1431	R8	Austin	10.80	120.67	108.07	114.37	Fair	312.96	0.03	0.07	0.10	98.91	91.05	56.58	Medium
AUS-FM1431	R8	Austin	10.90	123.28	113.67	118.47	Fair	92.09	1.02	0.02	0.03	29.61	96.64	60.05	High
AUS-FM1431	R8	Austin	11.00	112.71	93.86	103.28	Fair	12.79	0.17	0.01	0.01	4.15	86.46	53.72	Medium
AUS-FM1431	R8	Austin	11.10	104.96	102.30	103.63	Fair	137.25	0.01	0.04	0.17	43.27	54.53	33.89	Low
AUS-FM1431	R8	Austin	11.20	117.12	115.31	116.22	Fair	305.39	0.22	0.08	0.07	96.71	66.51	41.33	Low
AUS-FM1431	R8	Austin	11.30	103.22	124.10	113.66	Fair	381.35	0.47	0.10	0.08	120.70	80.58	50.07	Medium
AUS-FM1431	R8	Austin	11.40	114.42	121.99	118.20	Fair	113.06	0.13	0.03	0.02	35.85	94.33	58.62	Medium
AUS-FM1431	R8	Austin	11.50	127.73	120.40	124.06	Fair	171.77	0.16	0.05	0.09	54.36	96.05	59.68	Medium

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R8	Austin	11.60	147.92	122.25	135.08	Poor	118.43	0.05	0.03	0.02	37.37	99.96	62.11	High
AUS-FM1431	R8	Austin	11.70	167.27	161.15	164.21	Poor	181.46	0.17	0.05	0.02	57.46	99.08	61.57	High
AUS-FM1431	R8	Austin	11.80	155.68	139.57	147.62	Poor	156.00	0.29	0.04	0.03	49.48	99.95	62.10	High
AUS-FM1431	R8	Austin	11.90	181.18	142.38	161.78	Poor	210.27	0.38	0.06	0.11	66.60	99.02	61.53	High
AUS-FM1431	R8	Austin	12.00	161.17	148.55	154.86	Poor	270.20	0.43	0.07	0.09	85.66	100.11	62.21	High
AUS-FM1431	R8	Austin	12.10	162.37	169.90	166.13	Poor	197.63	0.35	0.06	0.08	62.62	106.07	65.91	High
AUS-FM1431	R8	Austin	12.20	181.33	178.97	180.15	Very Poor	139.81	0.23	0.04	0.06	44.40	107.46	66.78	High
AUS-FM1431	R8	Austin	12.30	141.77	139.02	140.40	Poor	23.36	0.08	0.01	0.01	7.39	105.52	65.57	High
AUS-FM1431	R8	Austin	12.40	163.18	155.40	159.29	Poor	68.56	0.14	0.01	0.00	21.71	101.76	63.23	High
AUS-FM1431	R8	Austin	12.50	176.72	148.86	162.79	Poor	157.32	0.18	0.03	0.00	49.90	96.78	60.13	High
AUS-FM1431	R8	Austin	12.60	123.93	124.68	124.31	Fair	89.98	0.12	0.02	0.00	28.49	92.38	57.40	Medium
AUS-FM1431	R8	Austin	12.70	72.83	101.71	87.27	Good	121.75	0.13	0.02	0.00	38.48	84.59	52.56	Medium
AUS-FM1431	R8	Austin	12.80	111.27	113.90	112.59	Fair	306.71	0.35	0.04	0.00	97.05	79.82	49.60	Medium
AUS-FM1431	R9	Austin	0.10	114.93	115.03	114.98	Fair	184.04	2.15	0.04	0.07	59.25	110.75	68.81	High
AUS-FM1431	R9	Austin	0.20	123.73	134.84	129.28	Fair	167.07	1.23	0.04	0.07	53.46	112.44	69.86	High
AUS-FM1431	R9	Austin	0.30	52.79	73.41	63.10	Good	135.33	0.19	0.03	0.01	42.96	111.85	69.50	High
AUS-FM1431	R9	Austin	0.40	71.84	86.73	79.29	Good	241.94	1.02	0.06	0.03	77.05	110.57	68.71	High
AUS-FM1431	R9	Austin	0.50	72.73	90.48	81.61	Good	325.82	0.74	0.07	0.12	103.32	111.83	69.49	High
AUS-FM1431	R9	Austin	0.60	116.88	114.38	115.63	Fair	305.14	0.62	0.06	0.00	96.76	116.43	72.35	High
AUS-FM1431	R9	Austin	0.70	87.14	86.48	86.81	Good	241.48	1.14	0.04	0.00	76.90	118.92	73.89	High
AUS-FM1431	R9	Austin	0.80	59.83	76.58	68.20	Good	256.12	1.61	0.05	0.00	81.80	120.19	74.68	High
AUS-FM1431	R9	Austin	0.90	71.83	91.46	81.64	Good	293.94	2.06	0.05	0.00	93.94	121.11	75.26	High
AUS-FM1431	R9	Austin	1.00	60.22	75.25	67.74	Good	221.97	1.26	0.04	0.00	70.78	123.17	76.54	High
AUS-FM1431	R9	Austin	1.10	79.79	81.10	80.45	Good	42.47	1.68	0.02	0.00	14.23	118.59	73.69	High
AUS-FM1431	R9	Austin	1.20	80.11	79.55	79.83	Good	271.22	2.28	0.06	0.00	86.96	115.15	71.55	High
AUS-FM1431	R9	Austin	1.30	65.44	66.95	66.19	Good	195.33	1.29	0.04	0.00	62.39	119.08	73.99	High
AUS-FM1431	R9	Austin	1.40	68.54	76.34	72.44	Good	155.14	1.22	0.03	0.00	49.60	117.88	73.25	High
AUS-FM1431	R9	Austin	1.50	66.02	60.86	63.44	Good	189.78	0.74	0.03	0.00	60.32	115.89	72.01	High
AUS-FM1431	R9	Austin	1.60	145.56	162.10	153.83	Poor	118.46	0.65	0.02	0.00	37.88	114.12	70.91	High
AUS-FM1431	R9	Austin	1.70	134.74	142.17	138.46	Poor	66.52	0.28	0.01	0.01	21.17	111.30	69.16	High
AUS-FM1431	R9	Austin	1.80	132.54	131.62	132.08	Poor	93.58	0.21	0.02	0.01	29.72	109.32	67.93	High
AUS-FM1431	R9	Austin	1.90	78.32	71.24	74.78	Good	207.05	0.37	0.04	0.02	65.53	110.42	68.61	High
AUS-FM1431	R9	Austin	2.00	82.22	80.43	81.33	Good	236.58	0.45	0.05	0.02	74.99	114.39	71.08	High
AUS-FM1431	R9	Austin	2.10	75.28	87.55	81.42	Good	236.98	0.50	0.05	0.12	75.24	114.26	71.00	High
AUS-FM1431	R9	Austin	2.20	118.86	103.47	111.17	Fair	168.44	0.45	0.03	0.15	53.44	110.74	68.81	High
AUS-FM1431	R9	Austin	2.30	124.80	132.05	128.43	Fair	269.89	0.77	0.05	0.22	85.65	107.46	66.77	High
AUS-FM1431	R9	Austin	2.40	77.62	75.70	76.66	Good	300.74	0.75	0.06	0.14	95.48	107.98	67.10	High
AUS-FM1431	R9	Austin	2.50	73.50	81.71	77.61	Good	307.40	0.63	0.06	0.13	97.39	108.00	67.11	High
AUS-FM1431	R9	Austin	2.60	68.28	75.55	71.92	Good	199.20	0.33	0.04	0.13	63.19	107.45	66.77	High
AUS-FM1431	R9	Austin	2.70	56.55	59.46	58.01	Very Good	282.22	0.46	0.06	0.15	89.35	105.12	65.32	High
AUS-FM1431	R9	Austin	2.80	110.72	133.13	121.92	Fair	273.51	0.49	0.05	0.12	86.66	104.37	64.85	High
AUS-FM1431	R9	Austin	2.90	148.20	159.15	153.68	Poor	158.78	0.31	0.03	0.09	50.47	103.35	64.22	High
AUS-FM1431	R9	Austin	3.00	120.53	132.13	126.33	Fair	242.07	0.52	0.05	0.05	76.76	101.87	63.30	High
AUS-FM1431	R9	Austin	3.10	62.76	75.98	69.37	Good	289.81	0.43	0.06	0.03	91.88	105.54	65.58	High
AUS-FM1431	R9	Austin	3.20	66.31	70.92	68.61	Good	317.74	0.34	0.07	0.06	100.55	105.31	65.44	High
AUS-FM1431	R9	Austin	3.30	73.97	78.75	76.36	Good	344.56	0.36	0.08	0.12	109.19	105.08	65.29	High
AUS-FM1431	R9	Austin	3.40	92.02	88.39	90.20	Good	301.18	0.30	0.07	0.13	95.21	107.38	66.72	High
AUS-FM1431	R9	Austin	3.50	87.69	93.16	90.42	Good	195.42	0.22	0.05	0.05	61.76	109.26	67.89	High
AUS-FM1431	R9	Austin	3.60	70.77	68.37	69.57	Good	69.42	0.11	0.02	0.01	21.98	108.16	67.21	High
AUS-FM1431	R9	Austin	3.70	96.45	69.69	83.07	Good	143.59	0.31	0.03	0.07	45.47	106.67	66.28	High
AUS-FM1431	R9	Austin	3.80	97.59	92.59	95.09	Good	218.94	0.48	0.05	0.15	69.48	106.78	66.35	High
AUS-FM1431	R9	Austin	3.90	79.39	89.39	84.39	Good	152.55	0.31	0.04	0.06	48.37	106.98	66.47	High
AUS-FM1431	R9	Austin	4.00	120.47	136.40	128.43	Fair	110.72	0.22	0.03	0.04	35.15	104.24	64.77	High
AUS-FM1431	R9	Austin	4.10	60.87	62.24	61.55	Good	249.65	0.35	0.06	0.04	79.02	105.14	65.33	High
AUS-FM1431	R9	Austin	4.20	98.59	140.84	119.71	Fair	238.84	0.22	0.05	0.02	75.57	106.57	66.22	High
AUS-FM1431	R9	Austin	4.30	113.42	125.15	119.28	Fair	174.52	0.13	0.04	0.01	55.22	108.62	67.50	High
AUS-FM1431	R9	Austin	4.40	97.29	128.27	112.78	Fair	218.76	0.16	0.05	0.04	69.20	108.00	67.11	High
AUS-FM1431	R9	Austin	4.50	112.44	139.09	125.76	Fair	242.99	0.21	0.05	0.03	76.85	108.42	67.37	High
AUS-FM1431	R9	Austin	4.60	91.26	127.00	109.13	Fair	187.32	0.16	0.04	0.03	59.24	108.89	67.66	High
AUS-FM1431	R9	Austin	4.70	59.54	65.13	62.34	Good	190.76	0.15	0.04	0.02	60.30	107.83	67.01	High
AUS-FM1431	R9	Austin	4.80	119.14	130.22	124.68	Fair	137.38	0.15	0.03	0.03	43.40	105.69	65.67	High
AUS-FM1431	R9	Austin	4.90	126.24	95.62	110.93	Fair	91.60	0.13	0.02	0.04	29.03	104.65	65.03	High
AUS-FM1431	R9	Austin	5.00	83.41	62.64	73.02	Good	167.11	0.24	0.04	0.03	52.93	103.65	64.41	High
AUS-FM1431	R9	Austin	5.10	96.48	79.25	87.86	Good	238.12	0.27	0.05	0.02	75.40	106.45	66.14	High
AUS-FM1431	R9	Austin	5.20	73.51	66.64	70.08	Good	160.95	0.15	0.03	0.01	50.92	106.82	66.37	High
AUS-FM1431	R9	Austin	5.30	90.39	89.40	89.90	Good	161.63	0.13	0.04	0.01	51.15	106.51	66.18	High
AUS-FM1431	R9	Austin	5.40	69.04	67.97	68.50	Good	236.58	0.18	0.05	0.03	74.87	102.10	63.44	High
AUS-FM1431	R9	Austin	5.50	84.58	56.92	70.75	Good	267.62	0.21	0.06	0.03	84.73	98.84	61.41	High
AUS-FM1431	R9	Austin	5.60	58.48	59.87	59.17	Very Good	196.05	0.20	0.04	0.06	62.00	95.89	59.58	Medium
AUS-FM1431	R9	Austin	5.70	107.00	108.78	107.89	Fair	166.63	0.19	0.04	0.05	52.88	95.30	59.22	Medium
AUS-FM1431	R9	Austin	5.80	116.80	122.88	119.84	Fair	184.22	0.19	0.04	0.12	58.36	94.17	58.51	Medium
AUS-FM1431	R9	Austin	5.90	96.50	77.77	87.13	Good	276.47	0.24	0.06	0.13	87.44	100.18	62.25	High
AUS-FM1431	R9	Austin	6.00	89.22	74.62	81.92	Good	176.57	0.39	0.04	0.04	56.07	105.18	65.36	High
AUS-FM1431	R9	Austin	6.10	75.68	65.40	70.54	Good	253.99	0.64	0.06	0.11	80.69	105.99	65.86	High
AUS-FM1431	R9	Austin	6.20	68.27	60.09	64.18	Good	94.93	0.26	0.03	0.15	30.17	109.07	67.77	High
AUS-FM1431	R9	Austin	6.30	67.93	60.31	64.12	Good	161.14	1.60	0.08	0.11	51.67	105.67	65.66	High
AUS-FM1431	R9	Austin	6.40	75.78	61.68	68.73	Good	236.44	0.56	0.08	0.06	75.03	108.21	67.24	High

Table C.1. PEMS and Roughness Data, AUSTIN.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Codition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
AUS-FM1431	R9	Austin	6.50	71.10	70.06	70.58	Good	233.84	0.39	0.08	0.07	74.15	107.64	66.88	High
AUS-FM1431	R9	Austin	6.60	61.76	59.94	60.85	Good	120.04	0.25	0.04	0.04	38.04	105.39	65.48	High
AUS-FM1431	R9	Austin	6.70	75.13	68.98	72.06	Good	89.32	0.25	0.03	0.02	28.38	102.35	63.60	High
AUS-FM1431	R9	Austin	6.80	59.67	52.36	56.01	Very Good	157.67	0.48	0.05	0.08	50.17	97.87	60.81	High
AUS-FM1431	R9	Austin	6.90	61.53	57.62	59.57	Very Good	153.32	0.35	0.04	0.06	48.69	99.95	62.10	High
AUS-FM1431	R9	Austin	7.00	79.65	76.23	77.94	Good	204.46	0.62	0.06	0.05	64.91	99.41	61.77	High
AUS-FM1431	R9	Austin	7.10	138.37	122.74	130.55	Fair	301.19	1.06	0.07	0.08	95.62	98.21	61.03	High
AUS-FM1431	R9	Austin	7.20	104.00	99.92	101.96	Fair	178.78	0.77	0.04	0.04	56.92	98.31	61.09	High
AUS-FM1431	R9	Austin	7.30	187.67	184.30	185.98	Very Poor	42.54	0.34	0.01	0.01	13.61	92.63	57.56	Medium
AUS-FM1431	R9	Austin	7.40	133.72	147.93	140.82	Poor	162.68	0.28	0.05	0.03	51.61	85.17	52.92	Medium
AUS-FM1431	R9	Austin	7.50	96.27	90.27	93.27	Good	115.14	0.07	0.03	0.01	36.52	89.88	55.85	Medium
AUS-FM1431	R9	Austin	7.60	93.97	119.88	106.93	Fair	124.24	0.11	0.03	0.01	39.44	90.23	56.07	Medium
AUS-FM1431	R9	Austin	7.70	121.25	154.90	138.07	Poor	131.24	0.13	0.03	0.02	41.57	89.02	55.32	Medium
AUS-FM1431	R9	Austin	7.80	79.03	86.80	82.91	Good	257.54	0.45	0.06	0.06	81.62	91.24	56.70	Medium
AUS-FM1431	R9	Austin	7.90	81.06	72.43	76.75	Good	274.04	0.89	0.06	0.06	87.00	94.25	58.57	Medium
AUS-FM1431	R9	Austin	8.00	110.39	106.54	108.47	Fair	180.34	0.72	0.04	0.07	57.38	98.14	60.98	High
AUS-FM1431	R9	Austin	8.10	132.25	127.92	130.09	Fair	33.38	0.14	0.01	0.00	10.71	99.94	62.10	High
AUS-FM1431	R9	Austin	8.20	63.06	75.74	69.40	Good	6.63	0.14	0.01	0.00	2.25	92.01	57.17	Medium
AUS-FM1431	R9	Austin	8.30	64.71	75.01	69.86	Good	3.46	0.11	0.02	0.01	1.24	76.40	47.47	Medium
AUS-FM1431	R9	Austin	8.40	81.33	95.90	88.62	Good	70.92	0.06	0.03	0.09	22.44	40.91	25.42	Low
AUS-FM1431	R9	Austin	8.50	82.37	93.03	87.70	Good	295.43	0.48	0.07	0.38	93.54	30.80	19.14	Low
AUS-FM1431	R9	Austin	8.60	91.95	97.55	94.75	Good	345.64	0.66	0.08	0.05	109.59	24.30	15.10	Low
AUS-FM1431	R9	Austin	8.70	84.79	107.62	96.21	Fair	186.74	0.24	0.05	0.04	59.31	44.50	27.65	Low
AUS-FM1431	R9	Austin	8.80	88.82	99.00	93.91	Good	85.35	0.22	0.02	0.02	27.06	39.74	24.70	Low
AUS-FM1431	R9	Austin	8.90	79.09	79.66	79.37	Good	277.89	4.96	0.08	0.10	90.42	35.16	21.85	Low
AUS-FM1431	R9	Austin	9.00	73.31	85.24	79.28	Good	261.72	4.25	0.08	0.06	85.01	35.74	22.21	Low
AUS-FM1431	R9	Austin	9.10	106.67	127.69	117.18	Fair	225.17	2.29	0.07	0.02	72.29	32.87	20.43	Low
AUS-FM1431	R9	Austin	9.20	94.94	106.70	100.82	Fair	211.17	2.15	0.05	0.02	67.78	30.90	19.20	Low
AUS-FM1431	R9	Austin	9.30	71.06	87.12	79.09	Good	168.60	2.52	0.04	0.02	54.61	33.12	20.58	Low
AUS-FM1431	R9	Austin	9.40	113.89	116.64	115.27	Fair	429.42	0.92	0.08	0.01	136.02	37.59	23.36	Low
AUS-FM1431	R9	Austin	9.50	67.94	66.27	67.11	Good	398.59	0.64	0.07	0.00	126.22	56.80	35.30	Low
AUS-FM1431	R9	Austin	9.60	78.41	81.18	79.79	Good	435.23	0.58	0.07	0.00	137.89	74.54	46.32	Medium
AUS-FM1431	R9	Austin	9.70	85.36	77.88	81.62	Good	421.26	0.36	0.07	0.01	133.15	85.25	52.97	Medium
AUS-FM1431	R9	Austin	9.80	75.02	68.45	71.74	Good	353.93	0.13	0.06	0.13	111.92	92.08	57.22	Medium
AUS-FM1431	R9	Austin	9.90	143.01	147.30	145.15	Poor	284.88	0.12	0.05	0.10	90.15	99.04	61.54	High
AUS-FM1431	R9	Austin	10.00	106.98	95.56	101.27	Fair	125.34	0.17	0.02	0.04	39.71	104.75	65.09	High
AUS-FM1431	R9	Austin	10.10	93.21	68.94	81.07	Good	89.53	0.32	0.03	0.03	28.46	102.27	63.55	High
AUS-FM1431	R9	Austin	10.20	82.47	81.20	81.84	Good	74.21	1.09	0.01	0.01	24.01	99.05	61.55	High
AUS-FM1431	R9	Austin	10.30	104.68	96.36	100.52	Fair	177.81	1.49	0.04	0.04	56.99	88.32	54.88	Medium
AUS-FM1431	R9	Austin	10.40	153.64	130.77	142.20	Poor	317.86	1.04	0.06	0.12	101.06	89.52	55.63	Medium
AUS-FM1431	R9	Austin	10.50	139.22	115.45	127.34	Fair	93.49	0.36	0.02	0.03	29.68	94.96	59.01	Medium
AUS-FM1431	R9	Austin	10.60	66.30	64.89	65.59	Good	137.59	0.47	0.03	0.03	43.61	91.87	57.08	Medium
AUS-FM1431	R9	Austin	10.70	100.25	93.24	96.75	Fair	238.83	0.65	0.05	0.06	75.76	83.27	51.74	Medium
AUS-FM1431	R9	Austin	10.80	120.67	108.07	114.37	Fair	364.68	0.86	0.07	0.08	115.73	86.53	53.77	Medium
AUS-FM1431	R9	Austin	10.90	123.28	113.67	118.47	Fair	204.62	1.20	0.04	0.06	65.23	95.65	59.43	Medium
AUS-FM1431	R9	Austin	11.00	112.71	93.86	103.28	Fair	154.42	0.14	0.03	0.03	48.86	103.03	64.02	High
AUS-FM1431	R9	Austin	11.10	104.96	102.30	103.63	Fair	40.65	0.01	0.01	0.00	12.95	107.06	66.52	High
AUS-FM1431	R9	Austin	11.20	117.12	115.31	116.22	Fair	29.38	0.01	0.01	0.00	9.30	103.94	64.59	High
AUS-FM1431	R9	Austin	11.30	103.22	124.10	113.66	Fair	166.27	0.02	0.04	0.02	52.52	102.58	63.74	High
AUS-FM1431	R9	Austin	11.40	114.42	121.99	118.20	Fair	33.51	0.08	0.02	0.01	10.53	103.92	64.57	High
AUS-FM1431	R9	Austin	11.50	127.73	120.40	124.06	Fair	99.84	0.10	0.02	0.01	31.58	103.58	64.36	High
AUS-FM1431	R9	Austin	11.60	147.92	122.25	135.08	Poor	38.76	0.05	0.01	0.00	12.27	103.43	64.27	High
AUS-FM1431	R9	Austin	11.70	167.27	161.15	164.21	Poor	203.91	0.20	0.04	0.02	64.50	99.59	61.88	High
AUS-FM1431	R9	Austin	11.80	155.68	139.57	147.62	Poor	269.32	0.56	0.06	0.03	85.32	103.40	64.25	High
AUS-FM1431	R9	Austin	11.90	181.18	142.38	161.78	Poor	62.12	0.18	0.01	0.00	19.74	104.60	65.00	High
AUS-FM1431	R9	Austin	12.00	161.17	148.55	154.86	Poor	109.08	0.25	0.02	0.01	34.67	101.10	62.82	High
AUS-FM1431	R9	Austin	12.10	162.37	169.90	166.13	Poor	211.75	0.42	0.04	0.09	67.11	99.70	61.95	High
AUS-FM1431	R9	Austin	12.20	181.33	178.97	180.15	Very Poor	41.00	0.08	0.01	0.00	13.01	101.74	63.22	High
AUS-FM1431	R9	Austin	12.30	141.77	139.02	140.40	Poor	107.39	0.21	0.03	0.03	34.00	97.90	60.83	High
AUS-FM1431	R9	Austin	12.40	163.18	155.40	159.29	Poor	244.17	0.22	0.05	0.04	77.29	100.59	62.50	High
AUS-FM1431	R9	Austin	12.50	176.72	148.86	162.79	Poor	332.21	0.40	0.07	0.03	105.23	103.45	64.28	High
AUS-FM1431	R9	Austin	12.60	123.93	124.68	124.31	Fair	306.29	0.64	0.07	0.21	97.16	108.50	67.42	High
AUS-FM1431	R9	Austin	12.70	72.83	101.71	87.27	Good	268.48	0.71	0.06	0.19	85.22	106.41	66.12	High
AUS-FM1431	R9	Austin	12.80	111.27	113.90	112.59	Fair	287.08	0.83	0.07	0.23	91.06	104.85	65.15	High

BRYAN COLLEGE STATION

Table C.2. PEMS and Roughness Data, BRYAN COLLEGE STATION.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO ₂ (g/mi)	CO (g/mi)	HC (g/mi)	NO _x (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
BCS	R4	College Station	0.10	121.85	110.94	116.39	Fair	1639.49	6.68	0.34	0.16	480.68	66.30	41.20	Low
BCS	R6	College Station	0.10	121.85	110.94	116.39	Fair	2785.80	2.57	0.66	0.77	824.52	66.94	41.59	Low
BCS	R7	College Station	0.10	121.85	110.94	116.39	Fair	2887.79	1.90	0.74	0.09	853.40	53.85	33.46	Low
BCS	R8	College Station	0.10	121.85	110.94	116.39	Fair	2902.84	8.76	0.72	0.18	869.19	56.07	34.84	Low
BCS	R9	College Station	0.10	121.85	110.94	116.39	Fair	1917.26	2.59	0.48	0.17	547.64	53.63	33.33	Low

EL PASO

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Codition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-01	R1	El Paso	0.10	134.11	125.27	129.69	Fair	1606.65	0.62	0.43	0.10	508.11	40.40	25.10	Low
EP-01	R1	El Paso	0.20	60.86	95.20	78.03	Good	1097.55	0.30	0.29	0.10	347.27	60.82	37.79	Low
EP-01	R1	El Paso	0.30	56.10	76.65	66.38	Good	809.43	0.30	0.21	0.06	255.98	73.38	45.60	Medium
EP-01	R1	El Paso	0.40	62.72	83.58	73.15	Good	375.24	0.13	0.10	0.00	118.66	76.35	47.44	Medium
EP-01	R1	El Paso	0.50	101.99	119.55	110.77	Fair	526.14	1.13	0.14	0.02	166.80	77.63	48.23	Medium
EP-01	R1	El Paso	0.60	52.92	79.34	66.13	Good	612.23	2.31	0.16	0.15	194.55	77.84	48.37	Medium
EP-01	R1	El Paso	0.70	97.19	136.78	116.99	Fair	628.07	2.07	0.17	0.18	199.61	79.27	49.26	Medium
EP-01	R1	El Paso	0.80	61.87	87.23	74.55	Good	210.48	0.94	0.06	0.03	67.00	77.63	48.24	Medium
EP-01	R1	El Paso	0.90	58.89	85.52	72.21	Good	672.67	2.22	0.19	0.08	213.80	69.87	43.41	Low
EP-01	R1	El Paso	1.00	60.31	79.93	70.12	Good	566.04	1.61	0.15	0.15	179.72	77.52	48.17	Medium
EP-01	R1	El Paso	1.10	72.88	85.01	78.95	Good	316.94	0.66	0.08	0.02	100.36	76.35	47.44	Medium
EP-01	R1	El Paso	1.18	81.02	87.00	84.01	Good	25.12	0.04	0.02	0.01	7.90	58.74	36.50	Low
EP-01	R2	El Paso	0.10	134.11	125.27	129.69	Fair	1781.12	0.09	0.49	0.16	563.14	43.55	27.06	Low
EP-01	R2	El Paso	0.20	60.86	95.20	78.03	Good	1252.99	0.25	0.35	0.27	396.31	68.22	42.39	Low
EP-01	R2	El Paso	0.30	56.10	76.65	66.38	Good	902.56	0.40	0.26	0.34	285.55	81.60	50.70	Medium
EP-01	R2	El Paso	0.40	62.72	83.58	73.15	Good	541.85	0.38	0.15	0.11	171.33	88.18	54.79	Medium
EP-01	R2	El Paso	0.50	101.99	119.55	110.77	Fair	594.80	0.55	0.17	0.09	188.21	88.44	54.96	Medium
EP-01	R2	El Paso	0.60	52.92	79.34	66.13	Good	752.77	0.76	0.21	0.17	238.46	90.31	56.11	Medium
EP-01	R2	El Paso	0.70	97.19	136.78	116.99	Fair	540.17	2.18	0.15	0.09	171.81	92.78	57.65	Medium
EP-01	R2	El Paso	0.80	61.87	87.23	74.55	Good	696.41	2.87	0.19	0.23	221.45	90.43	56.19	Medium
EP-01	R2	El Paso	0.90	58.89	85.52	72.21	Good	527.91	0.43	0.14	0.30	167.20	90.56	56.27	Medium
EP-01	R2	El Paso	1.00	60.31	79.93	70.12	Good	503.41	0.15	0.14	0.08	159.20	90.00	55.92	Medium
EP-01	R2	El Paso	1.10	72.88	85.01	78.95	Good	76.46	0.09	0.02	0.01	24.25	87.00	54.06	Medium
EP-01	R2	El Paso	1.18	81.02	87.00	84.01	Good	15.55	0.13	0.02	0.01	5.06	68.05	42.28	Low
EP-01	R3	El Paso	0.10	134.11	125.27	129.69	Fair	1796.30	0.09	0.45	0.09	567.99	42.39	26.34	Low
EP-01	R3	El Paso	0.20	60.86	95.20	78.03	Good	1175.96	0.33	0.29	0.07	371.98	66.94	41.60	Low
EP-01	R3	El Paso	0.30	56.10	76.65	66.38	Good	769.58	0.32	0.14	0.06	243.50	78.10	48.53	Medium
EP-01	R3	El Paso	0.40	62.72	83.58	73.15	Good	537.83	0.11	0.10	0.04	169.92	83.50	51.88	Medium
EP-01	R3	El Paso	0.50	101.99	119.55	110.77	Fair	594.20	0.00	0.11	0.03	187.70	85.78	53.30	Medium
EP-01	R3	El Paso	0.60	52.92	79.34	66.13	Good	608.62	0.06	0.11	0.02	192.37	86.18	53.55	Medium
EP-01	R3	El Paso	0.70	97.19	136.78	116.99	Fair	740.00	0.13	0.14	0.03	233.93	87.64	54.46	Medium
EP-01	R3	El Paso	0.80	61.87	87.23	74.55	Good	544.08	0.04	0.11	0.07	171.92	89.44	55.58	Medium
EP-01	R3	El Paso	0.90	58.89	85.52	72.21	Good	540.70	0.15	0.11	0.07	170.95	86.07	53.48	Medium
EP-01	R3	El Paso	1.00	60.31	79.93	70.12	Good	646.27	0.42	0.13	0.04	204.51	86.88	53.99	Medium
EP-01	R3	El Paso	1.10	72.88	85.01	78.95	Good	34.33	0.09	0.02	0.00	10.80	83.43	51.84	Medium
EP-01	R3	El Paso	1.18	81.02	87.00	84.01	Good	20.85	0.09	0.02	0.01	6.68	59.64	37.06	Low
EP-01	R4	El Paso	0.10	134.11	125.27	129.69	Fair	1552.05	0.85	0.34	0.08	490.78	38.63	24.00	Low
EP-01	R4	El Paso	0.20	60.86	95.20	78.03	Good	1045.79	0.28	0.24	0.05	330.66	61.27	38.07	Low
EP-01	R4	El Paso	0.30	56.10	76.65	66.38	Good	89.23	0.02	0.03	0.02	28.05	64.83	40.28	Low
EP-01	R4	El Paso	0.40	62.72	83.58	73.15	Good	416.53	0.01	0.10	0.03	131.66	62.35	38.74	Low
EP-01	R4	El Paso	0.50	101.99	119.55	110.77	Fair	94.53	0.01	0.03	0.07	29.86	59.13	36.74	Low
EP-01	R4	El Paso	0.60	52.92	79.34	66.13	Good	849.62	0.09	0.19	0.10	268.65	58.06	36.08	Low
EP-01	R4	El Paso	0.70	97.19	136.78	116.99	Fair	651.96	0.07	0.14	0.01	206.02	65.29	40.57	Low
EP-01	R4	El Paso	0.80	61.87	87.23	74.55	Good	530.41	0.09	0.11	0.01	167.54	65.08	40.44	Low
EP-01	R4	El Paso	0.90	58.89	85.52	72.21	Good	374.93	0.11	0.10	0.00	118.42	65.16	40.49	Low
EP-01	R4	El Paso	1.00	60.31	79.93	70.12	Good	584.20	0.24	0.15	0.01	184.81	64.23	39.91	Low
EP-01	R4	El Paso	1.10	72.88	85.01	78.95	Good	505.09	0.03	0.14	0.01	159.48	66.98	41.62	Low
EP-01	R5	El Paso	0.10	134.11	125.27	129.69	Fair	1583.42	1.11	0.36	0.12	500.79	39.35	24.45	Low
EP-01	R5	El Paso	0.20	60.86	95.20	78.03	Good	963.32	0.27	0.23	0.08	304.52	62.23	38.67	Low
EP-01	R5	El Paso	0.30	56.10	76.65	66.38	Good	117.58	0.02	0.04	0.06	37.21	64.53	40.10	Low
EP-01	R5	El Paso	0.40	62.72	83.58	73.15	Good	400.97	0.03	0.10	0.02	126.69	62.29	38.70	Low
EP-01	R5	El Paso	0.50	101.99	119.55	110.77	Fair	398.14	0.07	0.09	0.01	125.91	63.94	39.73	Low
EP-01	R5	El Paso	0.60	52.92	79.34	66.13	Good	512.26	0.10	0.12	0.00	161.94	64.63	40.16	Low
EP-01	R5	El Paso	0.70	97.19	136.78	116.99	Fair	508.10	0.09	0.12	0.00	160.65	65.00	40.39	Low
EP-01	R5	El Paso	0.80	61.87	87.23	74.55	Good	519.63	0.01	0.12	0.00	164.20	63.55	39.49	Low
EP-01	R5	El Paso	0.90	58.89	85.52	72.21	Good	550.22	0.00	0.12	0.00	173.92	62.25	38.68	Low
EP-01	R5	El Paso	1.00	60.31	79.93	70.12	Good	546.26	0.00	0.12	0.00	172.57	64.55	40.11	Low
EP-01	R5	El Paso	1.18	81.02	87.00	84.01	Good	87.51	0.00	0.03	0.02	28.00	41.89	26.03	Low
EP-01	R6	El Paso	0.10	134.11	125.27	129.69	Fair	1447.26	2.39	0.34	0.06	458.49	37.12	23.07	Low
EP-01	R6	El Paso	0.20	60.86	95.20	78.03	Good	800.43	0.18	0.19	0.03	252.87	56.94	35.38	Low
EP-01	R6	El Paso	0.30	56.10	76.65	66.38	Good	396.85	0.08	0.09	0.00	125.42	59.59	37.03	Low
EP-01	R6	El Paso	0.40	62.72	83.58	73.15	Good	366.05	0.05	0.09	0.01	115.82	62.81	39.03	Low
EP-01	R6	El Paso	0.50	101.99	119.55	110.77	Fair	415.99	0.08	0.09	0.01	131.52	63.00	39.15	Low
EP-01	R6	El Paso	0.60	52.92	79.34	66.13	Good	465.43	0.08	0.09	0.01	147.14	64.58	40.13	Low
EP-01	R6	El Paso	0.70	97.19	136.78	116.99	Fair	452.72	0.11	0.09	0.01	143.10	64.42	40.03	Low
EP-01	R6	El Paso	0.80	61.87	87.23	74.55	Good	398.45	0.12	0.09	0.06	125.96	58.34	36.25	Low
EP-01	R6	El Paso	0.90	58.89	85.52	72.21	Good	714.77	0.23	0.16	0.04	225.99	60.70	37.72	Low
EP-01	R6	El Paso	1.00	60.31	79.93	70.12	Good	489.49	0.12	0.11	0.00	154.75	63.63	39.54	Low
EP-01	R6	El Paso	1.10	72.88	85.01	78.95	Good	268.59	0.04	0.06	0.00	84.90	63.28	39.32	Low
EP-01	R6	El Paso	1.18	81.02	87.00	84.01	Good	46.48	0.01	0.02	0.01	14.79	51.03	31.71	Low
EP-01	R7	El Paso	0.10	134.11	125.27	129.69	Fair	825.51	2.01	0.22	0.01	262.02	29.12	18.10	Low
EP-01	R7	El Paso	0.20	60.86	95.20	78.03	Good	478.13	0.68	0.12	0.01	151.56	35.14	21.83	Low
EP-01	R7	El Paso	0.30	56.10	76.65	66.38	Good	833.09	0.76	0.20	0.01	263.64	42.65	26.50	Low
EP-01	R7	El Paso	0.40	62.72	83.58	73.15	Good	501.64	1.02	0.12	0.01	158.97	51.99	32.31	Low
EP-01	R7	El Paso	0.50	101.99	119.55	110.77	Fair	426.42	0.68	0.11	0.01	135.13	54.83	34.07	Low
EP-01	R7	El Paso	0.60	52.92	79.34	66.13	Good	399.68	0.23	0.10	0.00	126.36	53.56	33.28	Low
EP-01	R7	El Paso	0.70	97.19	136.78	116.99	Fair	396.94	0.19	0.10	0.00	125.48	50.16	31.17	Low

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Codition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-01	R7	El Paso	0.80	61.87	87.23	74.55	Good	441.11	0.07	0.10	0.00	139.43	45.08	28.01	Low
EP-01	R7	El Paso	1.00	60.31	79.93	70.12	Good	499.87	0.00	0.09	0.00	157.79	50.71	31.51	Low
EP-01	R7	El Paso	1.18	81.02	87.00	84.01	Good	264.02	0.00	0.04	0.00	83.53	49.00	30.44	Low
EP-01	R8	El Paso	0.10	134.11	125.27	129.69	Fair	924.90	0.54	0.22	0.03	292.62	26.83	16.67	Low
EP-01	R8	El Paso	0.20	60.86	95.20	78.03	Good	426.42	0.06	0.10	0.02	134.76	36.63	22.76	Low
EP-01	R8	El Paso	0.30	56.10	76.65	66.38	Good	790.45	0.25	0.22	0.02	249.86	44.14	27.43	Low
EP-01	R8	El Paso	0.40	62.72	83.58	73.15	Good	421.00	0.11	0.12	0.00	132.95	51.54	32.03	Low
EP-01	R8	El Paso	0.50	101.99	119.55	110.77	Fair	166.42	0.03	0.05	0.00	52.69	48.62	30.21	Low
EP-01	R8	El Paso	0.60	52.92	79.34	66.13	Good	406.99	0.16	0.11	0.01	128.61	40.20	24.98	Low
EP-01	R8	El Paso	0.70	97.19	136.78	116.99	Fair	938.69	0.38	0.24	0.01	296.86	44.59	27.71	Low
EP-01	R8	El Paso	0.80	61.87	87.23	74.55	Good	659.76	0.26	0.16	0.01	208.75	49.92	31.02	Low
EP-01	R8	El Paso	0.90	58.89	85.52	72.21	Good	463.33	0.12	0.11	0.01	146.45	51.51	32.01	Low
EP-01	R8	El Paso	1.00	60.31	79.93	70.12	Good	466.10	0.05	0.11	0.00	147.39	49.26	30.61	Low
EP-01	R8	El Paso	1.10	72.88	85.01	78.95	Good	339.95	0.01	0.08	0.00	107.39	50.85	31.60	Low
EP-01	R8	El Paso	1.18	81.02	87.00	84.01	Good	219.15	0.02	0.05	0.01	69.06	40.31	25.05	Low
EP-01	R9	El Paso	0.10	134.11	125.27	129.69	Fair	1352.59	0.93	0.33	0.09	427.90	37.13	23.07	Low
EP-01	R9	El Paso	0.20	60.86	95.20	78.03	Good	347.37	0.50	0.07	0.01	110.05	52.06	32.35	Low
EP-01	R9	El Paso	0.30	56.10	76.65	66.38	Good	222.73	0.32	0.04	0.00	70.35	47.14	29.29	Low
EP-01	R9	El Paso	0.40	62.72	83.58	73.15	Good	410.60	0.15	0.07	0.01	129.75	43.69	27.15	Low
EP-01	R9	El Paso	0.50	101.99	119.55	110.77	Fair	326.20	0.03	0.05	0.00	102.95	44.61	27.72	Low
EP-01	R9	El Paso	0.60	52.92	79.34	66.13	Good	567.10	0.15	0.12	0.01	179.41	41.51	25.79	Low
EP-01	R9	El Paso	0.70	97.19	136.78	116.99	Fair	732.39	0.22	0.16	0.01	231.57	44.82	27.85	Low
EP-01	R9	El Paso	0.80	61.87	87.23	74.55	Good	595.68	0.17	0.13	0.00	188.26	45.83	28.48	Low
EP-01	R9	El Paso	0.90	58.89	85.52	72.21	Good	657.59	0.27	0.14	0.02	207.86	47.45	29.49	Low
EP-01	R9	El Paso	1.00	60.31	79.93	70.12	Good	555.15	0.09	0.13	0.01	175.56	50.34	31.28	Low
EP-01	R9	El Paso	1.10	72.88	85.01	78.95	Good	435.21	0.02	0.10	0.00	137.66	53.50	33.24	Low
EP-01	R9	El Paso	1.18	81.02	87.00	84.01	Good	523.92	0.85	0.12	0.07	166.08	44.06	27.38	Low
EP-02	R1	El Paso	0.10	134.61	181.17	157.89	Poor	1165.51	1.87	0.29	0.17	369.21	47.79	29.70	Low
EP-02	R1	El Paso	0.20	69.51	82.48	76.00	Good	815.64	1.75	0.21	0.23	258.67	66.10	41.07	Low
EP-02	R1	El Paso	0.30	72.21	76.84	74.53	Good	704.00	1.10	0.18	0.21	223.07	80.17	49.81	Medium
EP-02	R1	El Paso	0.40	75.01	78.87	76.94	Good	466.68	0.98	0.13	0.04	148.23	85.33	53.02	Medium
EP-02	R1	El Paso	0.50	69.86	84.62	77.24	Good	431.98	1.11	0.12	0.03	136.97	89.24	55.45	Medium
EP-02	R1	El Paso	0.60	72.33	81.54	76.94	Good	184.28	0.50	0.05	0.06	58.40	93.57	58.14	Medium
EP-02	R1	El Paso	0.70	78.35	89.52	83.94	Good	194.40	0.53	0.05	0.02	61.72	90.80	56.42	Medium
EP-02	R1	El Paso	0.80	84.93	118.48	101.71	Fair	286.30	0.54	0.07	0.02	90.79	91.36	56.77	Medium
EP-02	R1	El Paso	0.90	65.29	91.47	78.38	Good	227.03	0.29	0.06	0.08	71.83	88.82	55.19	Medium
EP-02	R1	El Paso	1.00	67.27	103.10	85.19	Good	89.66	0.13	0.03	0.01	28.43	86.34	53.65	Medium
EP-02	R1	El Paso	1.10	63.33	77.81	70.57	Good	5.81	0.05	0.02	0.00	1.72	76.26	47.39	Medium
EP-02	R1	El Paso	1.20	98.76	92.77	95.77	Good	13.93	0.01	0.02	0.01	4.34	58.35	36.26	Low
EP-02	R1	El Paso	1.22	134.50	120.56	127.53	Fair	204.67	0.01	0.06	0.09	64.27	25.37	15.77	Low
EP-02	R2	El Paso	0.10	134.61	181.17	157.89	Poor	1632.48	0.90	0.40	0.18	516.50	43.27	26.89	Low
EP-02	R2	El Paso	0.20	69.51	82.48	76.00	Good	1123.80	0.11	0.37	0.29	355.37	69.32	43.07	Low
EP-02	R2	El Paso	0.30	72.21	76.84	74.53	Good	784.47	0.02	0.26	0.13	248.01	83.47	51.87	Medium
EP-02	R2	El Paso	0.40	75.01	78.87	76.94	Good	263.75	0.03	0.08	0.09	83.41	89.61	55.68	Medium
EP-02	R2	El Paso	0.70	78.35	89.52	83.94	Good	145.11	0.00	0.05	0.01	45.68	87.61	54.44	Medium
EP-02	R2	El Paso	0.80	84.93	118.48	101.71	Fair	192.17	0.00	0.06	0.00	60.86	86.02	53.45	Medium
EP-02	R2	El Paso	0.90	65.29	91.47	78.38	Good	516.13	0.01	0.18	0.06	163.25	86.37	53.67	Medium
EP-02	R2	El Paso	1.00	67.27	103.10	85.19	Good	138.79	0.11	0.04	0.02	43.92	86.66	53.85	Medium
EP-02	R2	El Paso	1.10	63.33	77.81	70.57	Good	8.05	0.12	0.02	0.00	2.60	78.11	48.53	Medium
EP-02	R2	El Paso	1.20	98.76	92.77	95.77	Good	20.55	0.01	0.03	0.01	6.61	56.08	34.85	Low
EP-02	R3	El Paso	0.10	134.61	181.17	157.89	Poor	1621.02	1.03	0.42	0.36	513.12	42.31	26.29	Low
EP-02	R3	El Paso	0.20	69.51	82.48	76.00	Good	1231.06	2.27	0.33	0.40	390.35	70.07	43.54	Low
EP-02	R3	El Paso	0.30	72.21	76.84	74.53	Good	562.21	0.79	0.16	0.19	178.19	85.03	52.84	Medium
EP-02	R3	El Paso	0.40	75.01	78.87	76.94	Good	323.95	0.12	0.09	0.06	102.49	89.66	55.71	Medium
EP-02	R3	El Paso	0.50	69.86	84.62	77.24	Good	359.14	0.29	0.10	0.10	113.61	91.76	57.02	Medium
EP-02	R3	El Paso	0.60	72.33	81.54	76.94	Good	329.78	0.69	0.09	0.08	104.59	94.14	58.49	Medium
EP-02	R3	El Paso	0.70	78.35	89.52	83.94	Good	122.45	0.30	0.03	0.01	38.92	95.58	59.39	Medium
EP-02	R3	El Paso	0.80	84.93	118.48	101.71	Fair	381.63	0.70	0.10	0.10	121.15	93.54	58.13	Medium
EP-02	R3	El Paso	0.90	65.29	91.47	78.38	Good	239.93	0.50	0.06	0.04	76.13	93.72	58.24	Medium
EP-02	R3	El Paso	1.00	67.27	103.10	85.19	Good	342.41	0.76	0.09	0.18	108.72	92.13	57.25	Medium
EP-02	R3	El Paso	1.10	63.33	77.81	70.57	Good	11.47	0.08	0.01	0.00	3.74	88.17	54.79	Medium
EP-02	R3	El Paso	1.20	98.76	92.77	95.77	Good	16.51	0.02	0.02	0.01	5.27	67.08	41.68	Low
EP-02	R4	El Paso	0.10	134.61	181.17	157.89	Poor	1134.73	1.89	0.25	0.03	359.48	38.90	24.17	Low
EP-02	R4	El Paso	0.20	69.51	82.48	76.00	Good	569.24	0.38	0.13	0.03	180.12	58.58	36.40	Low
EP-02	R4	El Paso	0.30	72.21	76.84	74.53	Good	211.92	0.10	0.06	0.09	66.95	60.99	37.90	Low
EP-02	R4	El Paso	0.40	75.01	78.87	76.94	Good	426.04	0.10	0.10	0.01	134.66	65.85	40.92	Low
EP-02	R4	El Paso	0.50	69.86	84.62	77.24	Good	76.08	0.03	0.03	0.00	23.91	70.42	43.76	Low
EP-02	R4	El Paso	0.60	72.33	81.54	76.94	Good	130.10	0.02	0.04	0.02	41.19	67.84	42.16	Low
EP-02	R4	El Paso	0.70	78.35	89.52	83.94	Good	151.20	0.01	0.03	0.00	47.87	69.75	43.34	Low
EP-02	R4	El Paso	0.80	84.93	118.48	101.71	Fair	79.85	0.00	0.02	0.00	25.35	68.33	42.46	Low
EP-02	R4	El Paso	1.10	63.33	77.81	70.57	Good	83.82	0.01	0.03	0.06	26.57	58.57	36.39	Low
EP-02	R4	El Paso	1.20	98.76	92.77	95.77	Good	104.35	0.04	0.02	0.02	33.16	50.62	31.46	Low
EP-02	R4	El Paso	1.22	134.50	120.56	127.53	Fair	155.64	0.15	0.03	0.01	49.21	37.00	22.99	Low
EP-02	R5	El Paso	0.10	134.61	181.17	157.89	Poor	1193.62	0.14	0.30	0.03	377.51	39.39	24.48	Low
EP-02	R5	El Paso	0.20	69.51	82.48	76.00	Good	600.71	0.08	0.13	0.01	189.91	59.18	36.77	Low
EP-02	R5	El Paso	0.30	72.21	76.84	74.53	Good	27.53	0.01	0.02	0.00	8.83	63.77	39.63	Low
EP-02	R5	El Paso	0.40	75.01	78.87	76.94	Good	155.03	0.02	0.05	0.02	48.99	57.26	35.58	Low

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-02	R5	El Paso	0.50	69.86	84.62	77.24	Good	261.51	0.03	0.06	0.01	82.70	62.44	38.80	Low
EP-02	R5	El Paso	0.60	72.33	81.54	76.94	Good	153.33	0.03	0.03	0.00	48.47	67.00	41.63	Low
EP-02	R5	El Paso	0.70	78.35	89.52	83.94	Good	95.61	0.02	0.03	0.01	30.15	65.96	40.99	Low
EP-02	R5	El Paso	0.80	84.93	118.48	101.71	Fair	121.40	0.01	0.03	0.01	38.35	64.51	40.09	Low
EP-02	R5	El Paso	0.90	65.29	91.47	78.38	Good	371.46	0.00	0.09	0.01	117.35	63.02	39.16	Low
EP-02	R5	El Paso	1.00	67.27	103.10	85.19	Good	158.81	0.14	0.04	0.00	50.12	63.87	39.69	Low
EP-02	R5	El Paso	1.10	63.33	77.81	70.57	Good	153.68	0.11	0.04	0.00	48.65	60.56	37.63	Low
EP-02	R5	El Paso	1.20	98.76	92.77	95.77	Good	118.51	0.03	0.03	0.00	37.38	53.08	32.98	Low
EP-02	R5	El Paso	1.22	134.50	120.56	127.53	Fair	1875.92	0.03	0.43	0.00	589.22	21.35	13.27	Low
EP-02	R6	El Paso	0.10	134.61	181.17	157.89	Poor	1217.48	1.24	0.18	0.04	385.07	38.09	23.67	Low
EP-02	R6	El Paso	0.20	69.51	82.48	76.00	Good	609.07	0.12	0.09	0.01	192.68	58.59	36.41	Low
EP-02	R6	El Paso	0.30	72.21	76.84	74.53	Good	184.90	0.00	0.04	0.00	58.39	65.90	40.95	Low
EP-02	R6	El Paso	0.40	75.01	78.87	76.94	Good	164.89	0.02	0.04	0.02	52.18	64.82	40.28	Low
EP-02	R6	El Paso	0.50	69.86	84.62	77.24	Good	170.91	0.04	0.03	0.01	53.90	65.84	40.91	Low
EP-02	R6	El Paso	0.60	72.33	81.54	76.94	Good	28.21	0.03	0.02	0.00	9.14	65.78	40.87	Low
EP-02	R6	El Paso	0.70	78.35	89.52	83.94	Good	219.60	0.04	0.04	0.02	69.41	63.96	39.74	Low
EP-02	R6	El Paso	0.80	84.93	118.48	101.71	Fair	236.20	0.15	0.04	0.00	74.64	66.12	41.09	Low
EP-02	R6	El Paso	0.90	65.29	91.47	78.38	Good	135.25	0.10	0.03	0.00	42.74	65.18	40.50	Low
EP-02	R6	El Paso	1.00	67.27	103.10	85.19	Good	186.96	0.08	0.04	0.00	59.26	60.80	37.78	Low
EP-02	R6	El Paso	1.10	63.33	77.81	70.57	Good	416.96	0.08	0.09	0.00	131.81	61.32	38.10	Low
EP-02	R6	El Paso	1.20	98.76	92.77	95.77	Good	42.84	0.03	0.02	0.01	13.62	56.40	35.05	Low
EP-02	R6	El Paso	1.22	134.50	120.56	127.53	Fair	834.37	2.37	0.18	0.10	264.68	17.33	10.77	Low
EP-02	R7	El Paso	0.10	134.61	181.17	157.89	Poor	878.85	0.59	0.22	0.02	278.14	35.16	21.85	Low
EP-02	R7	El Paso	0.20	69.51	82.48	76.00	Good	129.26	0.21	0.04	0.00	40.95	45.87	28.50	Low
EP-02	R7	El Paso	0.30	72.21	76.84	74.53	Good	129.96	0.22	0.04	0.00	41.15	44.33	27.54	Low
EP-02	R7	El Paso	0.40	75.01	78.87	76.94	Good	133.79	0.13	0.04	0.00	42.13	42.51	26.42	Low
EP-02	R7	El Paso	0.50	69.86	84.62	77.24	Good	328.43	0.15	0.09	0.11	103.98	45.18	28.07	Low
EP-02	R7	El Paso	0.60	72.33	81.54	76.94	Good	135.60	0.03	0.03	0.00	42.75	50.82	31.58	Low
EP-02	R7	El Paso	0.70	78.35	89.52	83.94	Good	136.00	0.01	0.03	0.00	42.99	51.75	32.15	Low
EP-02	R7	El Paso	0.80	84.93	118.48	101.71	Fair	150.95	0.02	0.04	0.00	47.81	50.14	31.16	Low
EP-02	R7	El Paso	0.90	65.29	91.47	78.38	Good	140.00	0.02	0.03	0.02	44.20	46.80	29.08	Low
EP-02	R7	El Paso	1.00	67.27	103.10	85.19	Good	126.36	0.03	0.03	0.01	39.95	41.33	25.68	Low
EP-02	R7	El Paso	1.10	63.33	77.81	70.57	Good	266.43	0.03	0.08	0.18	84.18	35.47	22.04	Low
EP-02	R7	El Paso	1.20	98.76	92.77	95.77	Good	535.19	0.08	0.15	0.06	169.35	43.36	26.94	Low
EP-02	R7	El Paso	1.22	134.50	120.56	127.53	Fair	180.18	0.09	0.05	0.00	56.82	33.74	20.97	Low
EP-02	R8	El Paso	0.10	134.61	181.17	157.89	Poor	1056.97	0.91	0.23	0.01	334.43	35.20	21.87	Low
EP-02	R8	El Paso	0.20	69.51	82.48	76.00	Good	297.45	0.19	0.07	0.02	94.08	52.49	32.61	Low
EP-02	R8	El Paso	0.30	72.21	76.84	74.53	Good	141.62	0.04	0.03	0.01	44.80	52.58	32.67	Low
EP-02	R8	El Paso	0.40	75.01	78.87	76.94	Good	144.45	0.06	0.03	0.00	45.74	51.07	31.74	Low
EP-02	R8	El Paso	0.50	69.86	84.62	77.24	Good	229.51	0.29	0.05	0.01	72.77	52.24	32.46	Low
EP-02	R8	El Paso	0.60	72.33	81.54	76.94	Good	108.72	0.11	0.03	0.02	34.34	55.00	34.18	Low
EP-02	R8	El Paso	0.70	78.35	89.52	83.94	Good	119.67	0.03	0.03	0.00	37.90	54.54	33.89	Low
EP-02	R8	El Paso	0.80	84.93	118.48	101.71	Fair	127.14	0.04	0.03	0.00	40.17	53.00	32.93	Low
EP-02	R8	El Paso	0.90	65.29	91.47	78.38	Good	148.70	0.04	0.03	0.01	47.00	48.46	30.11	Low
EP-02	R8	El Paso	1.00	67.27	103.10	85.19	Good	344.99	0.08	0.08	0.08	108.99	44.26	27.50	Low
EP-02	R8	El Paso	1.10	63.33	77.81	70.57	Good	343.76	0.11	0.08	0.02	108.72	47.93	29.78	Low
EP-02	R8	El Paso	1.20	98.76	92.77	95.77	Good	153.28	0.04	0.04	0.00	48.42	45.01	27.97	Low
EP-02	R8	El Paso	1.22	134.50	120.56	127.53	Fair	413.91	0.07	0.09	0.00	131.81	20.78	12.91	Low
EP-02	R9	El Paso	0.10	134.61	181.17	157.89	Poor	741.46	0.29	0.18	0.01	234.39	30.51	18.96	Low
EP-02	R9	El Paso	0.20	69.51	82.48	76.00	Good	417.97	0.22	0.10	0.00	132.18	44.04	27.36	Low
EP-02	R9	El Paso	0.30	72.21	76.84	74.53	Good	162.74	0.13	0.04	0.00	51.58	47.30	29.39	Low
EP-02	R9	El Paso	0.40	75.01	78.87	76.94	Good	149.03	0.07	0.04	0.00	47.16	46.27	28.75	Low
EP-02	R9	El Paso	0.50	69.86	84.62	77.24	Good	125.57	0.03	0.03	0.00	39.67	46.50	28.90	Low
EP-02	R9	El Paso	0.60	72.33	81.54	76.94	Good	118.13	0.02	0.03	0.01	37.42	48.55	30.17	Low
EP-02	R9	El Paso	0.70	78.35	89.52	83.94	Good	123.67	0.01	0.03	0.02	39.11	48.46	30.11	Low
EP-02	R9	El Paso	0.80	84.93	118.48	101.71	Fair	128.06	0.02	0.03	0.04	40.46	46.98	29.19	Low
EP-02	R9	El Paso	0.90	65.29	91.47	78.38	Good	170.60	0.03	0.04	0.02	54.11	43.04	26.75	Low
EP-02	R9	El Paso	1.00	67.27	103.10	85.19	Good	658.35	0.21	0.16	0.16	208.34	46.28	28.76	Low
EP-02	R9	El Paso	1.10	63.33	77.81	70.57	Good	455.19	0.12	0.11	0.01	144.03	54.37	33.78	Low
EP-02	R9	El Paso	1.20	98.76	92.77	95.77	Good	134.95	0.04	0.03	0.01	42.57	52.22	32.45	Low
EP-02	R9	El Paso	1.22	134.50	120.56	127.53	Fair	232.98	0.05	0.06	0.00	73.72	28.08	17.45	Low
EP-03	R1	El Paso	0.10	150.81	229.35	190.08	Very Poor	1021.59	1.37	0.15	0.42	323.66	106.69	66.29	High
EP-03	R1	El Paso	0.20	120.84	251.41	186.13	Very Poor	232.28	0.17	0.04	0.02	73.60	152.40	94.70	High
EP-03	R1	El Paso	0.30	228.97	312.32	270.65	Very Poor	156.32	2.45	0.04	0.05	50.75	160.61	99.80	High
EP-03	R1	El Paso	0.40	188.34	265.27	226.81	Very Poor	173.80	1.54	0.03	0.03	55.83	181.35	112.69	High
EP-03	R1	El Paso	0.50	202.18	311.59	256.89	Very Poor	57.14	0.08	0.01	0.03	18.13	177.85	110.51	High
EP-03	R1	El Paso	0.60	211.95	342.94	277.45	Very Poor	100.41	0.11	0.02	0.07	31.88	173.02	107.51	High
EP-03	R1	El Paso	0.70	197.32	297.98	247.65	Very Poor	75.03	1.43	0.02	0.04	24.44	174.53	108.45	High
EP-03	R1	El Paso	0.80	249.41	319.49	284.45	Very Poor	141.60	0.20	0.03	0.16	44.84	175.07	108.78	High
EP-03	R1	El Paso	0.90	141.52	160.77	151.15	Poor	83.14	0.18	0.02	0.07	26.29	162.97	101.26	High
EP-03	R1	El Paso	1.00	372.63	369.38	371.01	Very Poor	1339.36	0.70	0.24	0.14	423.48	94.43	58.68	Medium
EP-03	R1	El Paso	1.10	116.25	167.27	141.76	Poor	159.53	0.24	0.03	0.01	50.59	159.53	99.13	High
EP-03	R1	El Paso	1.20	171.52	235.97	203.75	Very Poor	34.65	0.13	0.02	0.01	11.02	131.10	81.46	High
EP-03	R1	El Paso	1.30	156.73	183.37	170.05	Very Poor	819.03	0.22	0.16	0.17	259.09	123.69	76.86	High
EP-03	R1	El Paso	1.40	136.13	140.73	138.43	Poor	389.68	0.09	0.08	0.02	123.20	171.51	106.57	High
EP-03	R1	El Paso	1.49	145.90	132.69	139.30	Poor	613.21	0.77	0.13	0.10	193.91	103.55	64.34	High
EP-03	R2	El Paso	0.10	150.81	229.35	190.08	Very Poor	1356.89	0.14	0.28	0.06	428.77	114.52	71.16	High

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-03	R2	El Paso	0.20	120.84	251.41	186.13	Very Poor	202.66	0.04	0.05	0.04	64.05	170.06	105.67	High
EP-03	R2	El Paso	0.30	228.97	312.32	270.65	Very Poor	505.91	0.38	0.11	0.14	160.00	186.84	116.10	High
EP-03	R2	El Paso	0.40	188.34	265.27	226.81	Very Poor	120.24	0.11	0.03	0.01	38.21	205.84	127.90	High
EP-03	R2	El Paso	0.50	202.18	311.59	256.89	Very Poor	8.50	0.04	0.02	0.01	2.76	193.30	120.11	High
EP-03	R2	El Paso	0.60	211.95	342.94	277.45	Very Poor	116.40	0.03	0.04	0.08	36.70	178.84	111.13	High
EP-03	R2	El Paso	0.70	197.32	297.98	247.65	Very Poor	39.19	0.11	0.02	0.01	12.47	181.14	112.55	High
EP-03	R2	El Paso	0.80	249.41	319.49	284.45	Very Poor	109.16	0.55	0.02	0.03	34.89	179.96	111.82	High
EP-03	R2	El Paso	0.90	141.52	160.77	151.15	Poor	16.65	0.10	0.02	0.01	5.32	165.23	102.67	High
EP-03	R2	El Paso	1.00	372.63	369.38	371.01	Very Poor	1356.08	2.24	0.32	0.05	429.69	94.18	58.52	Medium
EP-03	R2	El Paso	1.10	116.25	167.27	141.76	Poor	291.69	2.23	0.07	0.15	93.34	160.39	99.66	High
EP-03	R2	El Paso	1.20	171.52	235.97	203.75	Very Poor	149.99	0.29	0.06	0.07	47.50	170.95	106.22	High
EP-03	R2	El Paso	1.30	156.73	183.37	170.05	Very Poor	383.53	3.03	0.09	0.07	122.86	181.57	112.82	High
EP-03	R2	El Paso	1.40	136.13	140.73	138.43	Poor	208.99	1.56	0.05	0.02	66.96	192.33	119.51	High
EP-03	R2	El Paso	1.49	145.90	132.69	139.30	Poor	29.79	0.28	0.03	0.00	9.47	164.74	102.37	High
EP-03	R3	El Paso	0.10	150.81	229.35	190.08	Very Poor	1112.10	0.67	0.25	0.12	351.63	105.34	65.45	High
EP-03	R3	El Paso	0.20	120.84	251.41	186.13	Very Poor	552.30	0.72	0.13	0.09	174.87	168.60	104.76	High
EP-03	R3	El Paso	0.30	228.97	312.32	270.65	Very Poor	371.55	0.56	0.09	0.03	117.83	195.73	121.62	High
EP-03	R3	El Paso	0.40	188.34	265.27	226.81	Very Poor	229.90	1.84	0.06	0.08	73.48	207.93	129.20	High
EP-03	R3	El Paso	0.50	202.18	311.59	256.89	Very Poor	85.87	0.53	0.03	0.04	27.45	208.75	129.71	High
EP-03	R3	El Paso	0.60	211.95	342.94	277.45	Very Poor	27.66	0.02	0.01	0.01	8.64	203.81	126.64	High
EP-03	R3	El Paso	0.70	197.32	297.98	247.65	Very Poor	64.05	0.01	0.03	0.01	20.25	190.53	118.39	High
EP-03	R3	El Paso	0.80	249.41	319.49	284.45	Very Poor	162.48	0.20	0.05	0.01	51.48	197.88	122.96	High
EP-03	R3	El Paso	0.90	141.52	160.77	151.15	Poor	24.51	0.05	0.02	0.01	7.78	160.33	99.63	High
EP-03	R3	El Paso	1.00	372.63	369.38	371.01	Very Poor	1600.16	0.82	0.22	0.09	506.18	90.03	55.94	Medium
EP-03	R3	El Paso	1.10	116.25	167.27	141.76	Poor	632.32	0.39	0.08	0.03	200.03	179.15	111.32	High
EP-03	R3	El Paso	1.20	171.52	235.97	203.75	Very Poor	73.62	0.18	0.01	0.01	23.39	197.25	122.56	High
EP-03	R3	El Paso	1.30	156.73	183.37	170.05	Very Poor	7.85	0.16	0.01	0.01	2.45	174.49	108.42	High
EP-03	R3	El Paso	1.40	136.13	140.73	138.43	Poor	27.10	0.06	0.01	0.01	8.66	137.33	85.33	High
EP-03	R3	El Paso	1.49	145.90	132.69	139.30	Poor	626.84	1.87	0.13	0.03	199.32	74.54	46.31	Medium
EP-03	R4	El Paso	0.10	150.81	229.35	190.08	Very Poor	1149.62	0.09	0.31	0.04	363.31	109.42	67.99	High
EP-03	R4	El Paso	0.20	120.84	251.41	186.13	Very Poor	476.71	0.25	0.13	0.01	150.95	169.57	105.37	High
EP-03	R4	El Paso	0.30	228.97	312.32	270.65	Very Poor	353.68	2.33	0.10	0.01	112.84	196.18	121.90	High
EP-03	R4	El Paso	0.40	188.34	265.27	226.81	Very Poor	93.94	0.17	0.03	0.01	29.85	205.37	127.61	High
EP-03	R4	El Paso	0.50	202.18	311.59	256.89	Very Poor	101.62	0.00	0.03	0.03	32.24	201.91	125.46	High
EP-03	R4	El Paso	0.80	249.41	319.49	284.45	Very Poor	346.74	0.04	0.09	0.04	109.67	196.92	122.36	High
EP-03	R4	El Paso	0.90	141.52	160.77	151.15	Poor	48.15	0.02	0.02	0.00	15.26	185.32	115.16	High
EP-03	R4	El Paso	1.00	372.63	369.38	371.01	Very Poor	1577.97	2.73	0.40	0.08	500.37	99.41	61.77	High
EP-03	R4	El Paso	1.10	116.25	167.27	141.76	Poor	152.67	0.46	0.05	0.07	48.47	166.73	103.60	High
EP-03	R4	El Paso	1.20	171.52	235.97	203.75	Very Poor	516.12	1.77	0.10	0.04	164.12	161.73	100.50	High
EP-03	R4	El Paso	1.30	156.73	183.37	170.05	Very Poor	244.04	0.40	0.05	0.04	77.27	178.57	110.96	High
EP-03	R4	El Paso	1.40	136.13	140.73	138.43	Poor	35.00	0.05	0.02	0.02	11.18	173.65	107.90	High
EP-03	R4	El Paso	1.49	145.90	132.69	139.30	Poor	84.12	0.03	0.03	0.04	26.68	117.28	72.88	High
EP-03	R5	El Paso	0.20	120.84	251.41	186.13	Very Poor	512.80	0.01	0.17	0.02	162.20	189.53	117.77	High
EP-03	R5	El Paso	0.30	228.97	312.32	270.65	Very Poor	47.40	0.14	0.04	0.01	14.96	197.12	122.49	High
EP-03	R5	El Paso	0.40	188.34	265.27	226.81	Very Poor	200.63	0.06	0.07	0.02	63.32	196.03	121.81	High
EP-03	R5	El Paso	0.50	202.18	311.59	256.89	Very Poor	182.20	0.06	0.06	0.00	57.67	203.15	126.23	High
EP-03	R5	El Paso	0.60	211.95	342.94	277.45	Very Poor	60.27	0.08	0.02	0.01	19.08	203.44	126.41	High
EP-03	R5	El Paso	0.70	197.32	297.98	247.65	Very Poor	14.74	0.01	0.02	0.00	4.63	191.55	119.02	High
EP-03	R5	El Paso	0.80	249.41	319.49	284.45	Very Poor	97.50	0.01	0.04	0.02	30.72	188.36	117.04	High
EP-03	R5	El Paso	0.90	141.52	160.77	151.15	Poor	181.37	1.72	0.06	0.08	58.33	172.80	107.37	High
EP-03	R5	El Paso	1.00	372.63	369.38	371.01	Very Poor	1527.83	3.07	0.45	0.11	484.20	99.68	61.94	High
EP-03	R5	El Paso	1.10	116.25	167.27	141.76	Poor	239.92	0.15	0.08	0.03	75.95	174.89	108.67	High
EP-03	R5	El Paso	1.20	171.52	235.97	203.75	Very Poor	319.22	0.07	0.10	0.01	100.82	184.46	114.62	High
EP-03	R5	El Paso	1.30	156.73	183.37	170.05	Very Poor	99.56	0.00	0.03	0.00	31.57	192.44	119.58	High
EP-03	R5	El Paso	1.40	136.13	140.73	138.43	Poor	13.87	0.01	0.02	0.00	4.37	174.13	108.20	High
EP-03	R5	El Paso	1.49	145.90	132.69	139.30	Poor	444.06	0.71	0.12	0.04	140.74	88.92	55.25	Medium
EP-03	R6	El Paso	0.10	150.81	229.35	190.08	Very Poor	1196.04	1.37	0.32	0.19	378.71	103.63	64.39	High
EP-03	R6	El Paso	0.20	120.84	251.41	186.13	Very Poor	316.42	0.39	0.09	0.03	100.21	170.32	105.83	High
EP-03	R6	El Paso	0.30	228.97	312.32	270.65	Very Poor	123.51	0.22	0.05	0.01	39.20	182.16	113.19	High
EP-03	R6	El Paso	0.40	188.34	265.27	226.81	Very Poor	109.79	0.10	0.03	0.01	34.74	188.43	117.08	High
EP-03	R6	El Paso	0.50	202.18	311.59	256.89	Very Poor	107.19	0.07	0.03	0.00	34.02	186.87	116.11	High
EP-03	R6	El Paso	0.60	211.95	342.94	277.45	Very Poor	207.18	0.06	0.05	0.00	65.46	192.89	119.85	High
EP-03	R6	El Paso	0.70	197.32	297.98	247.65	Very Poor	53.25	0.01	0.02	0.00	16.77	194.67	120.97	High
EP-03	R6	El Paso	0.80	249.41	319.49	284.45	Very Poor	7.14	0.00	0.02	0.00	2.31	184.31	114.53	High
EP-03	R6	El Paso	0.90	141.52	160.77	151.15	Poor	165.84	0.02	0.06	0.02	52.40	168.32	104.59	High
EP-03	R6	El Paso	1.00	372.63	369.38	371.01	Very Poor	424.39	0.17	0.10	0.02	134.28	181.70	112.90	High
EP-03	R6	El Paso	1.10	116.25	167.27	141.76	Poor	24.72	0.10	0.01	0.00	7.90	199.91	124.22	High
EP-03	R6	El Paso	1.20	171.52	235.97	203.75	Very Poor	42.22	0.10	0.02	0.01	13.37	194.02	120.56	High
EP-03	R6	El Paso	1.30	156.73	183.37	170.05	Very Poor	38.83	0.06	0.02	0.01	12.36	179.60	111.60	High
EP-03	R6	El Paso	1.40	136.13	140.73	138.43	Poor	334.83	0.14	0.08	0.04	105.87	182.83	113.61	High
EP-03	R6	El Paso	1.49	145.90	132.69	139.30	Poor	42.24	0.23	0.02	0.01	13.31	151.91	94.39	High
EP-03	R7	El Paso	0.10	150.81	229.35	190.08	Very Poor	1382.66	0.86	0.29	0.09	437.34	104.25	64.78	High
EP-03	R7	El Paso	0.20	120.84	251.41	186.13	Very Poor	369.65	0.19	0.08	0.03	116.96	175.36	108.96	High
EP-03	R7	El Paso	0.30	228.97	312.32	270.65	Very Poor	377.43	0.21	0.09	0.02	119.46	194.68	120.97	High
EP-03	R7	El Paso	0.40	188.34	265.27	226.81	Very Poor	232.85	0.09	0.05	0.00	73.66	209.56	130.22	High
EP-03	R7	El Paso	0.50	202.18	311.59	256.89	Very Poor	23.61	0.03	0.01	0.00	7.40	209.01	129.87	High
EP-03	R7	El Paso	0.60	211.95	342.94	277.45	Very Poor	148.42	0.03	0.04	0.01	46.91	201.44	125.17	High

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-03	R7	El Paso	0.70	197.32	297.98	247.65	Very Poor	26.43	0.00	0.01	0.00	8.28	202.64	125.91	High
EP-03	R7	El Paso	0.80	249.41	319.49	284.45	Very Poor	9.54	0.00	0.02	0.00	3.03	182.36	113.31	High
EP-03	R7	El Paso	1.00	372.63	369.38	371.01	Very Poor	454.27	0.15	0.12	0.04	143.68	179.17	111.33	High
EP-03	R7	El Paso	1.10	116.25	167.27	141.76	Poor	72.20	0.32	0.04	0.01	23.09	196.63	122.18	High
EP-03	R7	El Paso	1.20	171.52	235.97	203.75	Very Poor	101.33	0.36	0.03	0.01	32.20	201.82	125.41	High
EP-03	R7	El Paso	1.30	156.73	183.37	170.05	Very Poor	36.06	0.04	0.02	0.00	11.33	195.87	121.71	High
EP-03	R7	El Paso	1.40	136.13	140.73	138.43	Poor	464.26	0.16	0.15	0.02	146.89	196.21	121.92	High
EP-03	R7	El Paso	1.49	145.90	132.69	139.30	Poor	223.23	1.10	0.07	0.01	71.05	197.06	122.45	High
EP-03	R8	El Paso	0.10	150.81	229.35	190.08	Very Poor	1487.98	1.23	0.33	0.15	470.87	110.09	68.40	High
EP-03	R8	El Paso	0.20	120.84	251.41	186.13	Very Poor	483.24	0.85	0.11	0.05	153.07	181.57	112.82	High
EP-03	R8	El Paso	0.30	228.97	312.32	270.65	Very Poor	113.46	0.28	0.03	0.01	35.99	199.08	123.70	High
EP-03	R8	El Paso	0.40	188.34	265.27	226.81	Very Poor	278.23	0.22	0.06	0.02	88.14	206.98	128.61	High
EP-03	R8	El Paso	0.50	202.18	311.59	256.89	Very Poor	31.41	0.02	0.01	0.00	10.00	207.32	128.82	High
EP-03	R8	El Paso	0.60	211.95	342.94	277.45	Very Poor	10.63	0.03	0.01	0.00	3.37	193.54	120.26	High
EP-03	R8	El Paso	0.70	197.32	297.98	247.65	Very Poor	18.68	0.02	0.01	0.00	5.94	183.41	113.97	High
EP-03	R8	El Paso	0.80	249.41	319.49	284.45	Very Poor	89.34	0.03	0.03	0.02	28.26	176.52	109.69	High
EP-03	R8	El Paso	0.90	141.52	160.77	151.15	Poor	33.09	0.07	0.02	0.01	10.38	143.32	89.06	High
EP-03	R8	El Paso	1.00	372.63	369.38	371.01	Very Poor	1393.89	1.60	0.41	0.07	441.27	87.56	54.41	Medium
EP-03	R8	El Paso	1.10	116.25	167.27	141.76	Poor	417.50	0.47	0.13	0.02	132.23	171.56	106.60	High
EP-03	R8	El Paso	1.20	171.52	235.97	203.75	Very Poor	258.51	0.43	0.08	0.03	81.90	194.36	120.77	High
EP-03	R8	El Paso	1.30	156.73	183.37	170.05	Very Poor	8.89	0.19	0.02	0.00	3.06	185.14	115.04	High
EP-03	R8	El Paso	1.40	136.13	140.73	138.43	Poor	4.16	0.06	0.02	0.00	1.39	164.32	102.10	High
EP-03	R8	El Paso	1.49	145.90	132.69	139.30	Poor	718.07	0.31	0.20	0.39	227.24	148.12	92.04	High
EP-03	R9	El Paso	0.10	150.81	229.35	190.08	Very Poor	1335.02	1.02	0.36	0.28	422.52	113.10	70.28	High
EP-03	R9	El Paso	0.20	120.84	251.41	186.13	Very Poor	319.65	0.00	0.09	0.06	101.07	177.65	110.38	High
EP-03	R9	El Paso	0.30	228.97	312.32	270.65	Very Poor	112.35	0.32	0.04	0.01	35.78	180.22	111.98	High
EP-03	R9	El Paso	0.40	188.34	265.27	226.81	Very Poor	133.49	0.14	0.04	0.02	42.24	182.97	113.69	High
EP-03	R9	El Paso	0.50	202.18	311.59	256.89	Very Poor	47.23	0.01	0.02	0.00	14.92	185.54	115.29	High
EP-03	R9	El Paso	0.60	211.95	342.94	277.45	Very Poor	5.07	0.00	0.02	0.00	1.57	174.75	108.59	High
EP-03	R9	El Paso	0.70	197.32	297.98	247.65	Very Poor	98.66	0.01	0.04	0.08	31.27	161.08	100.09	High
EP-03	R9	El Paso	0.80	249.41	319.49	284.45	Very Poor	26.18	0.01	0.02	0.01	8.28	167.19	103.89	High
EP-03	R9	El Paso	0.90	141.52	160.77	151.15	Poor	32.07	0.01	0.02	0.02	10.19	129.16	80.26	High
EP-03	R9	El Paso	1.10	116.25	167.27	141.76	Poor	179.12	0.00	0.05	0.01	56.64	164.58	102.27	High
EP-03	R9	El Paso	1.20	171.52	235.97	203.75	Very Poor	248.72	0.32	0.07	0.05	78.81	162.04	100.69	High
EP-03	R9	El Paso	1.30	156.73	183.37	170.05	Very Poor	492.41	0.77	0.12	0.02	156.06	182.31	113.28	High
EP-03	R9	El Paso	1.40	136.13	140.73	138.43	Poor	72.31	0.06	0.02	0.00	22.92	193.20	120.05	High
EP-03	R9	El Paso	1.49	145.90	132.69	139.30	Poor	19.98	0.05	0.02	0.01	6.33	143.80	89.36	High
EP-04	R1	El Paso	0.10	312.72	320.29	316.51	Very Poor	1369.46	0.47	0.44	0.08	433.25	64.62	40.15	Low
EP-04	R1	El Paso	0.20	254.92	251.67	253.30	Very Poor	535.63	0.14	0.18	0.05	169.33	113.50	70.52	High
EP-04	R1	El Paso	0.30	352.01	406.63	379.32	Very Poor	513.30	0.14	0.17	0.05	166.75	113.63	70.61	High
EP-04	R1	El Paso	0.40	365.45	395.18	380.32	Very Poor	804.12	0.14	0.17	0.05	164.14	113.77	70.69	High
EP-04	R1	El Paso	0.50	98.66	87.63	93.15	Good	488.68	0.13	0.17	0.05	161.51	113.89	70.77	High
EP-04	R1	El Paso	0.60	121.28	109.32	115.30	Fair	347.78	0.13	0.17	0.05	158.86	114.01	70.85	High
EP-04	R1	El Paso	0.70	98.88	95.62	97.25	Fair	644.52	0.13	0.16	0.05	156.18	114.13	70.92	High
EP-04	R2	El Paso	0.10	312.72	320.29	316.51	Very Poor	626.38	0.28	0.15	0.05	197.57	59.68	37.08	Low
EP-04	R2	El Paso	0.20	254.92	251.67	253.30	Very Poor	1080.24	4.79	0.28	0.25	343.68	103.51	64.32	High
EP-04	R2	El Paso	0.30	352.01	406.63	379.32	Very Poor	315.02	4.80	0.28	0.25	344.68	103.95	64.59	High
EP-04	R2	El Paso	0.40	365.45	395.18	380.32	Very Poor	688.08	4.80	0.28	0.25	345.62	104.39	64.87	High
EP-04	R2	El Paso	0.50	98.66	87.63	93.15	Good	404.60	4.81	0.28	0.25	346.50	104.84	65.15	High
EP-04	R2	El Paso	0.60	121.28	109.32	115.30	Fair	315.45	4.81	0.28	0.25	347.31	105.29	65.43	High
EP-04	R2	El Paso	0.70	98.88	95.62	97.25	Fair	168.83	4.83	0.28	0.25	348.02	105.75	65.71	High
EP-04	R3	El Paso	0.10	312.72	320.29	316.51	Very Poor	843.98	2.67	0.37	0.07	268.41	79.15	49.18	Medium
EP-04	R3	El Paso	0.20	254.92	251.67	253.30	Very Poor	1177.11	2.39	0.48	0.30	373.42	127.65	79.32	High
EP-04	R3	El Paso	0.30	352.01	406.63	379.32	Very Poor	258.95	2.36	0.47	0.30	370.20	128.12	79.61	High
EP-04	R3	El Paso	0.40	365.45	395.18	380.32	Very Poor	413.42	2.34	0.46	0.29	367.03	128.59	79.90	High
EP-04	R3	El Paso	0.50	98.66	87.63	93.15	Good	404.46	2.31	0.46	0.29	363.90	129.04	80.18	High
EP-04	R3	El Paso	0.60	121.28	109.32	115.30	Fair	383.84	2.29	0.45	0.29	360.79	129.49	80.46	High
EP-04	R3	El Paso	0.70	98.88	95.62	97.25	Fair	589.90	2.27	0.45	0.29	357.71	129.93	80.73	High
EP-04	R4	El Paso	0.10	312.72	320.29	316.51	Very Poor	1382.82	6.01	0.78	0.09	440.59	86.59	53.80	Medium
EP-04	R4	El Paso	0.20	254.92	251.67	253.30	Very Poor	425.48	0.37	0.24	0.02	134.92	118.79	73.81	High
EP-04	R4	El Paso	0.30	352.01	406.63	379.32	Very Poor	179.70	0.37	0.24	0.02	134.95	118.86	73.86	High
EP-04	R4	El Paso	0.40	365.45	395.18	380.32	Very Poor	1386.85	0.37	0.24	0.02	134.98	118.93	73.90	High
EP-04	R4	El Paso	0.50	98.66	87.63	93.15	Good	484.87	0.37	0.24	0.02	135.00	118.99	73.94	High
EP-04	R4	El Paso	0.60	121.28	109.32	115.30	Fair	363.99	0.37	0.24	0.02	135.02	119.06	73.98	High
EP-04	R4	El Paso	0.70	98.88	95.62	97.25	Fair	309.68	0.36	0.24	0.02	135.03	119.12	74.02	High
EP-04	R5	El Paso	0.20	254.92	251.67	253.30	Very Poor	785.56	1.80	0.19	0.03	249.02	103.57	64.35	High
EP-04	R5	El Paso	0.30	352.01	406.63	379.32	Very Poor	193.03	1.75	0.18	0.03	246.77	103.90	64.56	High
EP-04	R5	El Paso	0.40	365.45	395.18	380.32	Very Poor	1458.88	1.71	0.18	0.02	244.64	104.23	64.77	High
EP-04	R5	El Paso	0.50	98.66	87.63	93.15	Good	601.78	1.67	0.18	0.02	242.57	104.55	64.97	High
EP-04	R5	El Paso	0.60	121.28	109.32	115.30	Fair	831.14	1.63	0.18	0.02	240.51	104.87	65.16	High
EP-04	R5	El Paso	0.70	98.88	95.62	97.25	Fair	229.84	1.59	0.18	0.02	238.44	105.18	65.36	High
EP-04	R6	El Paso	0.10	312.72	320.29	316.51	Very Poor	664.49	2.63	0.16	0.03	211.19	115.99	72.08	High
EP-04	R6	El Paso	0.20	254.92	251.67	253.30	Very Poor	229.99	0.56	0.05	0.00	72.97	119.29	74.13	High
EP-04	R6	El Paso	0.30	352.01	406.63	379.32	Very Poor	1434.19	0.55	0.05	0.00	72.14	118.90	73.88	High
EP-04	R6	El Paso	0.40	365.45	395.18	380.32	Very Poor	1527.20	0.53	0.05	0.00	71.34	118.49	73.63	High
EP-04	R6	El Paso	0.50	98.66	87.63	93.15	Good	638.75	0.52	0.05	0.00	70.57	118.06	73.36	High
EP-04	R6	El Paso	0.60	121.28	109.32	115.30	Fair	511.84	0.50	0.05	0.00	69.84	117.61	73.08	High

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Codition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-04	R6	El Paso	0.70	98.88	95.62	97.25	Fair	280.70	0.49	0.05	0.00	69.13	117.15	72.79	High
EP-04	R7	El Paso	0.10	312.72	320.29	316.51	Very Poor	1433.08	5.34	0.26	0.07	455.02	76.40	47.47	Medium
EP-04	R7	El Paso	0.20	254.92	251.67	253.30	Very Poor	908.73	0.88	0.19	0.10	287.51	91.92	57.12	Medium
EP-04	R7	El Paso	0.30	352.01	406.63	379.32	Very Poor	171.25	0.88	0.19	0.10	287.49	92.12	57.24	Medium
EP-04	R7	El Paso	0.40	365.45	395.18	380.32	Very Poor	1196.46	0.88	0.19	0.10	287.47	92.33	57.37	Medium
EP-04	R7	El Paso	0.50	98.66	87.63	93.15	Good	529.13	0.88	0.19	0.10	287.45	92.54	57.50	Medium
EP-04	R7	El Paso	0.60	121.28	109.32	115.30	Fair	156.74	0.88	0.19	0.10	287.42	92.75	57.63	Medium
EP-04	R7	El Paso	0.70	98.88	95.62	97.25	Fair	232.09	0.88	0.19	0.10	287.39	92.96	57.76	Medium
EP-04	R8	El Paso	0.10	312.72	320.29	316.51	Very Poor	368.83	0.39	0.07	0.00	116.53	84.02	52.21	Medium
EP-04	R8	El Paso	0.20	254.92	251.67	253.30	Very Poor	920.75	2.55	0.18	0.02	292.39	75.84	47.13	Medium
EP-04	R8	El Paso	0.30	352.01	406.63	379.32	Very Poor	344.06	2.57	0.18	0.02	294.28	75.81	47.11	Medium
EP-04	R8	El Paso	0.40	365.45	395.18	380.32	Very Poor	970.30	2.60	0.18	0.02	296.12	75.78	47.09	Medium
EP-04	R8	El Paso	0.50	98.66	87.63	93.15	Good	960.56	2.63	0.18	0.02	297.90	75.75	47.07	Medium
EP-04	R8	El Paso	0.60	121.28	109.32	115.30	Fair	551.14	2.66	0.18	0.02	299.61	75.72	47.05	Medium
EP-04	R8	El Paso	0.70	98.88	95.62	97.25	Fair	233.98	2.68	0.18	0.03	301.22	75.70	47.04	Medium
EP-04	R9	El Paso	0.10	312.72	320.29	316.51	Very Poor	845.11	1.43	0.16	0.03	267.84	67.06	41.67	Low
EP-04	R9	El Paso	0.20	254.92	251.67	253.30	Very Poor	634.14	0.31	0.11	0.05	200.72	82.72	51.40	Medium
EP-04	R9	El Paso	0.30	352.01	406.63	379.32	Very Poor	321.17	0.31	0.11	0.05	199.62	82.93	51.53	Medium
EP-04	R9	El Paso	0.40	365.45	395.18	380.32	Very Poor	1281.10	0.30	0.11	0.05	198.32	83.13	51.66	Medium
EP-04	R9	El Paso	0.50	98.66	87.63	93.15	Good	662.41	0.30	0.11	0.05	196.86	83.33	51.78	Medium
EP-04	R9	El Paso	0.60	121.28	109.32	115.30	Fair	433.36	0.30	0.11	0.04	195.32	83.52	51.90	Medium
EP-04	R9	El Paso	0.70	98.88	95.62	97.25	Fair	370.62	0.29	0.11	0.04	193.74	83.72	52.02	Medium
EP-05	R1	El Paso	0.10	158.73	125.38	142.06	Poor	1183.26	1.64	0.18	0.09	357.58	105.93	65.82	High
EP-05	R1	El Paso	0.20	149.96	111.07	130.52	Fair	222.25	0.29	0.04	0.09	70.38	125.70	78.10	High
EP-05	R1	El Paso	0.30	159.34	145.10	152.22	Poor	243.58	0.14	0.04	0.01	77.10	121.65	75.59	High
EP-05	R1	El Paso	0.40	309.64	344.63	327.14	Very Poor	696.43	0.46	0.25	0.02	220.15	81.47	50.62	Medium
EP-05	R1	El Paso	0.50	322.53	353.77	338.15	Very Poor	482.51	0.88	0.19	0.15	153.04	88.37	54.91	Medium
EP-05	R1	El Paso	0.60	264.96	274.56	269.76	Very Poor	535.76	1.84	0.21	0.06	170.27	100.59	62.50	High
EP-05	R1	El Paso	0.70	273.64	272.82	273.23	Very Poor	497.26	0.28	0.16	0.01	157.25	119.11	74.01	High
EP-05	R2	El Paso	0.10	158.73	125.38	142.06	Poor	1982.46	1.09	0.58	0.18	614.91	97.75	60.74	High
EP-05	R2	El Paso	0.20	149.96	111.07	130.52	Fair	787.43	0.28	0.22	0.07	249.28	160.16	99.52	High
EP-05	R2	El Paso	0.30	159.34	145.10	152.22	Poor	369.29	0.18	0.06	0.03	116.75	168.92	104.96	High
EP-05	R2	El Paso	0.40	309.64	344.63	327.14	Very Poor	158.18	0.00	0.05	0.06	49.96	128.52	79.86	High
EP-05	R2	El Paso	0.50	322.53	353.77	338.15	Very Poor	1910.81	5.72	0.49	0.42	607.51	64.10	39.83	Low
EP-05	R2	El Paso	0.60	264.96	274.56	269.76	Very Poor	938.56	1.73	0.23	0.12	297.62	81.94	50.91	Medium
EP-05	R2	El Paso	0.70	273.64	272.82	273.23	Very Poor	280.51	0.90	0.07	0.16	88.97	118.98	73.93	High
EP-05	R3	El Paso	0.20	149.96	111.07	130.52	Fair	984.55	0.56	0.56	0.10	311.77	163.22	101.42	High
EP-05	R3	El Paso	0.30	159.34	145.10	152.22	Poor	126.93	0.46	0.07	0.00	40.36	171.83	106.77	High
EP-05	R3	El Paso	0.40	309.64	344.63	327.14	Very Poor	541.00	0.37	0.31	0.07	171.63	96.46	59.94	Medium
EP-05	R3	El Paso	0.50	322.53	353.77	338.15	Very Poor	1010.06	3.24	0.55	0.37	321.32	66.92	41.58	Low
EP-05	R3	El Paso	0.60	264.96	274.56	269.76	Very Poor	813.11	1.38	0.67	0.17	258.16	81.39	50.57	Medium
EP-05	R3	El Paso	0.70	273.64	272.82	273.23	Very Poor	509.76	1.78	0.36	0.02	162.27	100.01	62.15	High
EP-05	R4	El Paso	0.10	158.73	125.38	142.06	Poor	1324.64	1.94	0.70	0.18	420.11	95.88	59.58	Medium
EP-05	R4	El Paso	0.20	149.96	111.07	130.52	Fair	335.16	0.36	0.18	0.01	106.17	124.13	77.13	High
EP-05	R4	El Paso	0.30	159.34	145.10	152.22	Poor	259.05	0.27	0.14	0.00	82.08	127.02	78.92	High
EP-05	R4	El Paso	0.40	309.64	344.63	327.14	Very Poor	609.01	0.10	0.33	0.02	192.82	81.61	50.71	Medium
EP-05	R4	El Paso	0.50	322.53	353.77	338.15	Very Poor	816.73	3.40	0.34	0.07	259.83	97.88	60.82	High
EP-05	R4	El Paso	0.60	264.96	274.56	269.76	Very Poor	1027.89	4.89	0.25	0.19	327.32	67.89	42.19	Low
EP-05	R4	El Paso	0.70	273.64	272.82	273.23	Very Poor	445.07	1.79	0.11	0.01	141.46	88.54	55.02	Medium
EP-05	R5	El Paso	0.10	158.73	125.38	142.06	Poor	1337.46	0.20	0.29	0.15	402.88	112.14	69.68	High
EP-05	R5	El Paso	0.20	149.96	111.07	130.52	Fair	127.19	0.06	0.03	0.05	40.17	136.45	84.79	High
EP-05	R5	El Paso	0.30	159.34	145.10	152.22	Poor	193.50	0.07	0.04	0.01	61.23	121.82	75.70	High
EP-05	R5	El Paso	0.40	309.64	344.63	327.14	Very Poor	956.07	3.21	0.19	0.12	303.75	62.89	39.08	Low
EP-05	R5	El Paso	0.50	322.53	353.77	338.15	Very Poor	549.30	4.29	0.12	0.02	175.82	103.98	64.61	High
EP-05	R5	El Paso	0.60	264.96	274.56	269.76	Very Poor	828.43	5.03	0.18	0.14	264.43	110.30	68.54	High
EP-05	R5	El Paso	0.70	273.64	272.82	273.23	Very Poor	149.81	1.49	0.04	0.06	48.17	118.17	73.43	High
EP-05	R6	El Paso	0.10	158.73	125.38	142.06	Poor	1344.14	2.89	0.25	0.10	410.05	101.69	63.18	High
EP-05	R6	El Paso	0.20	149.96	111.07	130.52	Fair	325.33	0.22	0.06	0.01	102.84	132.53	82.35	High
EP-05	R6	El Paso	0.30	159.34	145.10	152.22	Poor	188.23	0.31	0.04	0.00	59.60	129.62	80.54	High
EP-05	R6	El Paso	0.40	309.64	344.63	327.14	Very Poor	804.78	0.37	0.15	0.02	254.33	80.26	49.87	Medium
EP-05	R6	El Paso	0.50	322.53	353.77	338.15	Very Poor	572.60	0.23	0.11	0.02	181.10	95.89	59.58	Medium
EP-05	R6	El Paso	0.60	264.96	274.56	269.76	Very Poor	265.20	0.22	0.05	0.01	83.85	114.74	71.30	High
EP-05	R6	El Paso	0.70	273.64	272.82	273.23	Very Poor	687.47	2.05	0.14	0.03	218.37	117.13	72.78	High
EP-05	R7	El Paso	0.10	158.73	125.38	142.06	Poor	615.48	0.59	0.11	0.07	188.73	87.59	54.43	Medium
EP-05	R7	El Paso	0.20	149.96	111.07	130.52	Fair	247.04	0.00	0.05	0.01	78.00	85.81	53.32	Medium
EP-05	R7	El Paso	0.30	159.34	145.10	152.22	Poor	629.16	0.00	0.11	0.02	198.95	90.65	56.33	Medium
EP-05	R7	El Paso	0.40	309.64	344.63	327.14	Very Poor	320.85	0.01	0.06	0.00	101.40	112.62	69.98	High
EP-05	R7	El Paso	0.50	322.53	353.77	338.15	Very Poor	595.47	0.01	0.11	0.00	188.26	69.15	42.97	Low
EP-05	R7	El Paso	0.60	264.96	274.56	269.76	Very Poor	509.59	0.10	0.09	0.05	161.10	99.24	61.66	High
EP-05	R7	El Paso	0.70	273.64	272.82	273.23	Very Poor	404.95	0.81	0.08	0.03	128.43	106.85	66.40	High
EP-05	R8	El Paso	0.10	158.73	125.38	142.06	Poor	919.50	0.18	0.17	0.02	278.13	99.47	61.81	High
EP-05	R8	El Paso	0.20	149.96	111.07	130.52	Fair	179.34	0.18	0.03	0.00	56.77	111.50	69.28	High
EP-05	R8	El Paso	0.30	159.34	145.10	152.22	Poor	191.81	0.07	0.03	0.00	60.56	101.48	63.06	High
EP-05	R8	El Paso	0.40	309.64	344.63	327.14	Very Poor	386.56	0.13	0.07	0.03	122.27	77.41	48.10	Medium
EP-05	R8	El Paso	0.50	322.53	353.77	338.15	Very Poor	418.67	0.97	0.08	0.01	132.78	77.97	48.45	Medium
EP-05	R8	El Paso	0.60	264.96	274.56	269.76	Very Poor	581.16	0.56	0.11	0.01	183.91	91.84	57.07	Medium
EP-05	R8	El Paso	0.70	273.64	272.82	273.23	Very Poor	239.37	0.13	0.04	0.00	75.71	105.97	65.85	High

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Codition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-05	R9	El Paso	0.10	158.73	125.38	142.06	Poor	1183.26	1.64	0.18	0.09	357.58	105.93	65.82	High
EP-05	R9	El Paso	0.20	149.96	111.07	130.52	Fair	222.25	0.29	0.04	0.09	70.38	125.70	78.10	High
EP-05	R9	El Paso	0.30	159.34	145.10	152.22	Poor	243.58	0.14	0.04	0.01	77.10	121.65	75.59	High
EP-05	R9	El Paso	0.40	309.64	344.63	327.14	Very Poor	696.43	0.46	0.25	0.02	220.15	81.47	50.62	Medium
EP-05	R9	El Paso	0.50	322.53	353.77	338.15	Very Poor	482.51	0.88	0.19	0.15	153.04	88.37	54.91	Medium
EP-05	R9	El Paso	0.60	264.96	274.56	269.76	Very Poor	535.76	1.84	0.21	0.06	170.27	100.59	62.50	High
EP-05	R9	El Paso	0.70	273.64	272.82	273.23	Very Poor	497.26	0.28	0.16	0.01	157.25	119.11	74.01	High
EP-06	R1	El Paso	0.10	91.95	125.60	108.78	Fair	1233.75	1.11	0.35	0.10	390.71	42.47	26.39	Low
EP-06	R1	El Paso	0.20	56.77	59.80	58.29	Very Good	870.82	0.42	0.26	0.11	275.61	63.40	39.39	Low
EP-06	R1	El Paso	0.30	146.73	166.89	156.81	Poor	576.84	0.09	0.17	0.02	182.38	73.35	45.58	Medium
EP-06	R1	El Paso	0.40	172.03	184.32	178.18	Very Poor	363.11	0.15	0.11	0.00	114.82	75.30	46.79	Medium
EP-06	R1	El Paso	0.50	170.41	182.94	176.68	Very Poor	159.80	0.11	0.05	0.00	50.48	72.57	45.09	Medium
EP-06	R1	El Paso	0.56	123.89	126.12	125.01	Fair	27.36	0.12	0.03	0.01	8.84	63.67	39.56	Low
EP-06	R2	El Paso	0.10	91.95	125.60	108.78	Fair	1379.90	1.03	0.27	0.16	436.53	49.43	30.72	Low
EP-06	R2	El Paso	0.20	56.77	59.80	58.29	Very Good	1101.84	0.69	0.22	0.12	348.56	71.70	44.55	Low
EP-06	R2	El Paso	0.30	146.73	166.89	156.81	Poor	890.06	0.64	0.18	0.19	281.59	82.58	51.31	Medium
EP-06	R2	El Paso	0.40	172.03	184.32	178.18	Very Poor	93.60	0.11	0.03	0.04	29.68	84.09	52.25	Medium
EP-06	R2	El Paso	0.50	170.41	182.94	176.68	Very Poor	99.59	0.05	0.04	0.06	31.59	73.74	45.82	Medium
EP-06	R2	El Paso	0.56	123.89	126.12	125.01	Fair	43.42	0.02	0.03	0.02	13.76	64.12	39.84	Low
EP-06	R3	El Paso	0.10	91.95	125.60	108.78	Fair	1349.34	1.87	0.38	0.46	427.55	50.24	31.22	Low
EP-06	R3	El Paso	0.20	56.77	59.80	58.29	Very Good	1159.83	1.25	0.34	0.49	367.19	72.87	45.28	Medium
EP-06	R3	El Paso	0.30	146.73	166.89	156.81	Poor	728.61	1.41	0.21	0.61	231.10	84.24	52.35	Medium
EP-06	R3	El Paso	0.40	172.03	184.32	178.18	Very Poor	174.58	0.31	0.06	0.05	55.28	84.90	52.76	Medium
EP-06	R3	El Paso	0.50	170.41	182.94	176.68	Very Poor	285.34	0.44	0.08	0.02	90.42	81.18	50.44	Medium
EP-06	R3	El Paso	0.56	123.89	126.12	125.01	Fair	19.06	0.18	0.03	0.01	6.04	73.47	45.65	Medium
EP-06	R4	El Paso	0.10	91.95	125.60	108.78	Fair	1199.59	0.66	0.33	0.22	379.44	45.11	28.03	Low
EP-06	R4	El Paso	0.20	56.77	59.80	58.29	Very Good	352.52	0.21	0.09	0.01	111.46	62.85	39.05	Low
EP-06	R4	El Paso	0.30	146.73	166.89	156.81	Poor	172.65	0.09	0.05	0.04	54.61	61.11	37.97	Low
EP-06	R4	El Paso	0.40	172.03	184.32	178.18	Very Poor	376.77	0.04	0.13	0.11	119.26	57.96	36.02	Low
EP-06	R4	El Paso	0.50	170.41	182.94	176.68	Very Poor	259.75	0.00	0.11	0.23	82.18	55.93	34.75	Low
EP-06	R4	El Paso	0.56	123.89	126.12	125.01	Fair	199.97	0.00	0.07	0.01	63.02	55.38	34.41	Low
EP-06	R5	El Paso	0.10	91.95	125.60	108.78	Fair	992.12	2.22	0.28	0.13	314.67	43.78	27.20	Low
EP-06	R5	El Paso	0.20	56.77	59.80	58.29	Very Good	686.42	0.40	0.20	0.07	217.17	57.24	35.57	Low
EP-06	R5	El Paso	0.30	146.73	166.89	156.81	Poor	181.96	0.09	0.07	0.02	57.55	60.94	37.87	Low
EP-06	R5	El Paso	0.40	172.03	184.32	178.18	Very Poor	304.44	0.02	0.09	0.07	96.33	59.27	36.83	Low
EP-06	R5	El Paso	0.50	170.41	182.94	176.68	Very Poor	222.57	0.00	0.06	0.11	70.32	56.09	34.85	Low
EP-06	R5	El Paso	0.56	123.89	126.12	125.01	Fair	144.71	0.01	0.04	0.00	45.87	52.65	32.71	Low
EP-06	R6	El Paso	0.10	91.95	125.60	108.78	Fair	1215.20	1.29	0.36	0.09	384.91	44.10	27.40	Low
EP-06	R6	El Paso	0.20	56.77	59.80	58.29	Very Good	268.34	0.47	0.08	0.04	85.10	60.01	37.29	Low
EP-06	R6	El Paso	0.30	146.73	166.89	156.81	Poor	392.18	0.52	0.11	0.05	124.36	56.35	35.01	Low
EP-06	R6	El Paso	0.40	172.03	184.32	178.18	Very Poor	293.24	0.10	0.06	0.00	92.74	58.93	36.62	Low
EP-06	R6	El Paso	0.50	170.41	182.94	176.68	Very Poor	241.42	0.02	0.04	0.00	76.28	55.91	34.74	Low
EP-06	R6	El Paso	0.56	123.89	126.12	125.01	Fair	157.47	0.01	0.03	0.00	49.86	52.05	32.34	Low
EP-06	R7	El Paso	0.10	91.95	125.60	108.78	Fair	1014.41	2.58	0.27	0.11	322.04	42.18	26.21	Low
EP-06	R7	El Paso	0.20	56.77	59.80	58.29	Very Good	260.55	2.13	0.07	0.03	83.47	53.71	33.38	Low
EP-06	R7	El Paso	0.30	146.73	166.89	156.81	Poor	171.52	0.41	0.05	0.00	54.54	50.21	31.20	Low
EP-06	R7	El Paso	0.40	172.03	184.32	178.18	Very Poor	302.14	0.07	0.08	0.01	95.56	47.68	29.63	Low
EP-06	R7	El Paso	0.50	170.41	182.94	176.68	Very Poor	488.45	0.06	0.13	0.02	154.51	48.51	30.14	Low
EP-06	R7	El Paso	0.56	123.89	126.12	125.01	Fair	239.09	0.09	0.06	0.06	75.52	50.18	31.18	Low
EP-06	R8	El Paso	0.10	91.95	125.60	108.78	Fair	844.95	1.17	0.22	0.08	267.66	99.65	61.92	High
EP-06	R8	El Paso	0.20	56.77	59.80	58.29	Very Good	336.58	0.56	0.08	0.03	106.51	126.91	78.86	High
EP-06	R8	El Paso	0.30	146.73	166.89	156.81	Poor	225.71	0.34	0.06	0.02	71.47	120.03	74.58	High
EP-06	R8	El Paso	0.40	172.03	184.32	178.18	Very Poor	171.57	0.14	0.05	0.00	54.34	113.85	70.74	High
EP-06	R8	El Paso	0.50	170.41	182.94	176.68	Very Poor	661.44	0.73	0.23	0.07	209.32	114.74	71.30	High
EP-06	R8	El Paso	0.56	123.89	126.12	125.01	Fair	224.15	0.54	0.08	0.00	71.05	125.72	78.12	High
EP-06	R9	El Paso	0.10	91.95	125.60	108.78	Fair	707.39	1.15	0.19	0.24	224.27	39.86	24.77	Low
EP-06	R9	El Paso	0.20	56.77	59.80	58.29	Very Good	218.39	0.17	0.06	0.01	69.12	43.14	26.80	Low
EP-06	R9	El Paso	0.30	146.73	166.89	156.81	Poor	258.20	0.15	0.07	0.00	81.56	39.38	24.47	Low
EP-06	R9	El Paso	0.40	172.03	184.32	178.18	Very Poor	563.32	0.08	0.15	0.00	178.14	41.94	26.06	Low
EP-06	R9	El Paso	0.50	170.41	182.94	176.68	Very Poor	212.89	0.02	0.06	0.00	67.35	43.05	26.75	Low
EP-06	R9	El Paso	0.56	123.89	126.12	125.01	Fair	913.59	0.48	0.24	0.03	289.08	41.34	25.69	Low
EP-07	R1	El Paso	0.10	115.30	137.00	126.15	Fair	1292.80	2.18	0.39	0.60	438.32	51.38	31.93	Low
EP-07	R1	El Paso	0.20	98.32	119.65	108.99	Fair	246.39	1.01	0.08	0.08	75.93	63.64	39.55	Low
EP-07	R1	El Paso	0.30	129.42	143.40	136.41	Poor	80.77	0.10	0.03	0.02	29.06	62.18	38.64	Low
EP-07	R1	El Paso	0.40	116.28	112.70	114.49	Fair	240.51	0.09	0.03	0.02	28.61	62.15	38.62	Low
EP-07	R1	El Paso	0.50	142.63	166.84	154.74	Poor	1295.14	0.09	0.03	0.02	28.19	62.12	38.60	Low
EP-07	R1	El Paso	0.54	106.66	112.52	109.59	Fair	186.45	0.09	0.03	0.02	27.80	62.09	38.58	Low
EP-07	R2	El Paso	0.20	98.32	119.65	108.99	Fair	956.16	4.05	0.29	0.49	317.01	70.78	43.98	Low
EP-07	R2	El Paso	0.30	129.42	143.40	136.41	Poor	544.39	1.90	0.16	0.23	185.38	79.79	49.58	Medium
EP-07	R2	El Paso	0.40	116.28	112.70	114.49	Fair	211.52	1.88	0.16	0.23	184.20	79.84	49.61	Medium
EP-07	R2	El Paso	0.50	142.63	166.84	154.74	Poor	152.44	1.85	0.16	0.23	183.02	79.88	49.64	Medium
EP-07	R2	El Paso	0.54	106.66	112.52	109.59	Fair	78.25	1.83	0.16	0.23	181.86	79.93	49.67	Medium
EP-07	R3	El Paso	0.10	115.30	137.00	126.15	Fair	1672.23	3.05	0.37	0.29	540.09	48.20	29.95	Low
EP-07	R3	El Paso	0.20	98.32	119.65	108.99	Fair	1029.86	1.58	0.23	0.55	344.64	71.28	44.29	Low
EP-07	R3	El Paso	0.30	129.42	143.40	136.41	Poor	509.99	0.80	0.11	0.13	166.00	79.71	49.53	Medium
EP-07	R3	El Paso	0.40	116.28	112.70	114.49	Fair	256.22	0.80	0.11	0.13	165.47	79.75	49.56	Medium
EP-07	R3	El Paso	0.50	142.63	166.84	154.74	Poor	477.05	0.79	0.11	0.13	164.97	79.80	49.58	Medium

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-07	R3	El Paso	0.54	106.66	112.52	109.59	Fair	153.73	0.79	0.11	0.13	164.50	79.84	49.61	Medium
EP-07	R4	El Paso	0.10	115.30	137.00	126.15	Fair	1183.22	0.50	0.44	0.03	390.68	40.52	25.18	Low
EP-07	R4	El Paso	0.20	98.32	119.65	108.99	Fair	563.03	0.02	0.20	0.00	179.91	52.97	32.91	Low
EP-07	R4	El Paso	0.30	129.42	143.40	136.41	Poor	190.73	0.00	0.09	0.01	69.41	58.73	36.50	Low
EP-07	R4	El Paso	0.40	116.28	112.70	114.49	Fair	123.73	0.00	0.09	0.01	68.57	58.74	36.50	Low
EP-07	R4	El Paso	0.50	142.63	166.84	154.74	Poor	758.54	0.00	0.09	0.01	67.73	58.75	36.50	Low
EP-07	R4	El Paso	0.54	106.66	112.52	109.59	Fair	216.55	0.00	0.09	0.01	66.90	58.75	36.51	Low
EP-07	R5	El Paso	0.10	115.30	137.00	126.15	Fair	0.00	0.00	0.00	0.00	0.00	43.31	26.91	Low
EP-07	R5	El Paso	0.20	98.32	119.65	108.99	Fair	0.00	0.00	0.00	0.00	0.00	57.81	35.92	Low
EP-07	R5	El Paso	0.30	129.42	143.40	136.41	Poor	0.00	0.00	0.00	0.00	0.00	59.72	37.11	Low
EP-07	R5	El Paso	0.50	142.63	166.84	154.74	Poor	328.04	0.00	0.00	0.00	0.00	59.72	37.11	Low
EP-07	R5	El Paso	0.54	106.66	112.52	109.59	Fair	173.53	0.00	0.00	0.00	0.00	59.72	37.11	Low
EP-07	R6	El Paso	0.10	115.30	137.00	126.15	Fair	1111.41	5.25	0.34	0.04	361.71	40.26	25.01	Low
EP-07	R6	El Paso	0.20	98.32	119.65	108.99	Fair	504.58	0.79	0.15	0.01	167.31	52.29	32.49	Low
EP-07	R6	El Paso	0.30	129.42	143.40	136.41	Poor	260.95	0.39	0.07	0.00	89.68	56.64	35.19	Low
EP-07	R6	El Paso	0.40	116.28	112.70	114.49	Fair	171.65	0.39	0.07	0.00	89.12	56.65	35.20	Low
EP-07	R6	El Paso	0.50	142.63	166.84	154.74	Poor	1483.56	0.39	0.07	0.00	88.54	56.65	35.20	Low
EP-07	R6	El Paso	0.54	106.66	112.52	109.59	Fair	366.25	0.38	0.07	0.00	87.95	56.65	35.20	Low
EP-07	R7	El Paso	0.10	115.30	137.00	126.15	Fair	658.41	1.07	0.28	0.49	209.16	36.36	22.59	Low
EP-07	R7	El Paso	0.20	98.32	119.65	108.99	Fair	418.22	0.14	0.16	0.01	139.87	44.06	27.38	Low
EP-07	R7	El Paso	0.30	129.42	143.40	136.41	Poor	144.52	0.04	0.06	0.00	48.26	45.64	28.36	Low
EP-07	R7	El Paso	0.40	116.28	112.70	114.49	Fair	217.68	0.04	0.06	0.00	47.93	45.64	28.36	Low
EP-07	R7	El Paso	0.50	142.63	166.84	154.74	Poor	1380.32	0.04	0.06	0.00	47.61	45.65	28.37	Low
EP-07	R7	El Paso	0.54	106.66	112.52	109.59	Fair	313.42	0.04	0.06	0.00	47.31	45.65	28.37	Low
EP-07	R8	El Paso	0.10	115.30	137.00	126.15	Fair	616.04	2.08	0.26	0.30	204.50	40.04	24.88	Low
EP-07	R8	El Paso	0.20	98.32	119.65	108.99	Fair	296.28	0.19	0.11	0.01	94.65	44.00	27.34	Low
EP-07	R8	El Paso	0.30	129.42	143.40	136.41	Poor	244.57	0.06	0.09	0.02	72.61	44.33	27.55	Low
EP-07	R8	El Paso	0.40	116.28	112.70	114.49	Fair	349.10	0.06	0.09	0.02	73.04	44.34	27.55	Low
EP-07	R8	El Paso	0.50	142.63	166.84	154.74	Poor	869.20	0.06	0.09	0.02	73.47	44.35	27.56	Low
EP-07	R8	El Paso	0.54	106.66	112.52	109.59	Fair	215.45	0.06	0.09	0.02	73.91	44.36	27.57	Low
EP-07	R9	El Paso	0.10	115.30	137.00	126.15	Fair	528.74	0.17	0.15	0.00	166.72	35.41	22.00	Low
EP-07	R9	El Paso	0.20	98.32	119.65	108.99	Fair	437.89	0.03	0.12	0.00	143.05	39.80	24.73	Low
EP-07	R9	El Paso	0.30	129.42	143.40	136.41	Poor	273.45	0.02	0.07	0.00	88.50	43.89	27.27	Low
EP-07	R9	El Paso	0.40	116.28	112.70	114.49	Fair	305.32	0.02	0.07	0.00	88.30	43.91	27.29	Low
EP-07	R9	El Paso	0.50	142.63	166.84	154.74	Poor	1535.96	0.02	0.07	0.00	88.10	43.93	27.30	Low
EP-07	R9	El Paso	0.54	106.66	112.52	109.59	Fair	170.45	0.02	0.07	0.00	87.90	43.96	27.31	Low
EP-08	R1	El Paso	0.10	121.05	139.11	130.08	Fair	1289.57	0.63	0.59	0.11	408.21	52.00	32.31	Low
EP-08	R1	El Paso	0.20	97.38	110.51	103.95	Fair	335.24	1.02	0.16	0.17	106.61	60.19	37.40	Low
EP-08	R1	El Paso	0.30	120.21	202.26	161.24	Poor	530.81	2.51	0.23	0.17	169.23	57.95	36.01	Low
EP-08	R1	El Paso	0.40	194.21	141.90	168.06	Poor	680.11	2.39	0.26	0.27	216.13	57.06	35.46	Low
EP-08	R1	El Paso	0.50	94.70	80.36	87.53	Good	854.02	2.27	0.35	0.31	271.13	60.91	37.85	Low
EP-08	R1	El Paso	0.60	101.87	106.90	104.39	Fair	483.68	1.19	0.20	0.04	153.54	66.25	41.17	Low
EP-08	R1	El Paso	0.70	105.16	111.69	108.43	Fair	393.52	1.00	0.17	0.01	125.04	65.65	40.79	Low
EP-08	R1	El Paso	0.80	109.06	97.07	103.07	Fair	185.07	0.40	0.09	0.01	58.70	62.07	38.57	Low
EP-08	R1	El Paso	0.90	114.09	89.35	101.72	Fair	177.57	0.07	0.07	0.04	56.26	52.70	32.75	Low
EP-08	R1	El Paso	0.96	211.97	242.90	227.44	Very Poor	370.06	0.01	0.14	0.00	117.07	24.50	15.23	Low
EP-08	R2	El Paso	0.10	121.05	139.11	130.08	Fair	1127.91	8.05	0.33	0.43	360.49	42.39	26.34	Low
EP-08	R2	El Paso	0.20	97.38	110.51	103.95	Fair	1084.00	1.66	0.30	0.51	343.46	56.90	35.36	Low
EP-08	R2	El Paso	0.30	120.21	202.26	161.24	Poor	349.35	0.27	0.10	0.02	110.62	62.78	39.01	Low
EP-08	R2	El Paso	0.40	194.21	141.90	168.06	Poor	1200.46	2.30	0.38	0.14	380.60	34.74	21.59	Low
EP-08	R2	El Paso	0.50	94.70	80.36	87.53	Good	952.36	3.59	0.30	0.18	303.11	41.87	26.02	Low
EP-08	R2	El Paso	0.60	101.87	106.90	104.39	Fair	701.65	1.40	0.27	0.06	222.50	51.29	31.87	Low
EP-08	R2	El Paso	0.70	105.16	111.69	108.43	Fair	854.57	3.32	0.35	0.07	271.90	59.35	36.88	Low
EP-08	R2	El Paso	0.80	109.06	97.07	103.07	Fair	97.57	0.22	0.05	0.02	30.90	62.55	38.87	Low
EP-08	R2	El Paso	0.90	114.09	89.35	101.72	Fair	202.61	0.05	0.08	0.03	63.99	44.48	27.64	Low
EP-08	R3	El Paso	0.10	121.05	139.11	130.08	Fair	861.91	2.34	0.30	0.05	273.54	30.11	18.71	Low
EP-08	R3	El Paso	0.20	97.38	110.51	103.95	Fair	1605.26	0.34	0.54	0.09	507.63	33.86	21.04	Low
EP-08	R3	El Paso	0.30	120.21	202.26	161.24	Poor	829.57	1.22	0.29	0.08	262.89	34.63	21.52	Low
EP-08	R3	El Paso	0.40	194.21	141.90	168.06	Poor	1544.27	1.07	0.56	0.18	489.00	47.48	29.50	Low
EP-08	R3	El Paso	0.50	94.70	80.36	87.53	Good	779.09	1.88	0.34	0.21	247.41	63.61	39.53	Low
EP-08	R3	El Paso	0.60	101.87	106.90	104.39	Fair	617.56	1.54	0.27	0.18	196.00	66.64	41.41	Low
EP-08	R3	El Paso	0.70	105.16	111.69	108.43	Fair	832.66	2.47	0.35	0.38	264.56	69.08	42.92	Low
EP-08	R3	El Paso	0.80	109.06	97.07	103.07	Fair	108.83	0.43	0.06	0.04	34.61	70.60	43.87	Low
EP-08	R3	El Paso	0.90	114.09	89.35	101.72	Fair	180.65	0.44	0.08	0.02	57.22	40.08	24.91	Low
EP-08	R4	El Paso	0.10	121.05	139.11	130.08	Fair	1638.93	0.67	0.53	0.10	518.63	34.54	21.46	Low
EP-08	R4	El Paso	0.20	97.38	110.51	103.95	Fair	520.39	0.15	0.17	0.02	164.57	49.65	30.85	Low
EP-08	R4	El Paso	0.30	120.21	202.26	161.24	Poor	722.33	0.08	0.23	0.01	228.26	38.47	23.90	Low
EP-08	R4	El Paso	0.40	194.21	141.90	168.06	Poor	973.71	0.36	0.32	0.02	307.95	48.50	30.13	Low
EP-08	R4	El Paso	0.50	94.70	80.36	87.53	Good	491.94	0.95	0.16	0.01	155.82	54.54	33.89	Low
EP-08	R4	El Paso	0.60	101.87	106.90	104.39	Fair	668.59	2.35	0.21	0.07	212.55	52.97	32.91	Low
EP-08	R4	El Paso	0.70	105.16	111.69	108.43	Fair	353.12	1.00	0.11	0.00	112.28	53.96	33.53	Low
EP-08	R4	El Paso	0.80	109.06	97.07	103.07	Fair	222.22	0.34	0.07	0.00	70.36	52.21	32.44	Low
EP-08	R4	El Paso	0.90	114.09	89.35	101.72	Fair	212.03	0.09	0.06	0.08	67.17	40.17	24.96	Low
EP-08	R5	El Paso	0.10	121.05	139.11	130.08	Fair	810.31	1.82	0.27	0.04	256.89	27.92	17.35	Low
EP-08	R5	El Paso	0.20	97.38	110.51	103.95	Fair	1505.87	1.03	0.50	0.12	476.75	34.87	21.67	Low
EP-08	R5	El Paso	0.30	120.21	202.26	161.24	Poor	503.36	0.32	0.17	0.01	159.34	45.86	28.49	Low
EP-08	R5	El Paso	0.40	194.21	141.90	168.06	Poor	882.31	1.84	0.29	0.03	279.88	45.08	28.01	Low

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Codition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-08	R5	El Paso	0.50	94.70	80.36	87.53	Good	505.79	0.95	0.17	0.02	160.24	51.61	32.07	Low
EP-08	R5	El Paso	0.60	101.87	106.90	104.39	Fair	628.54	2.99	0.21	0.00	200.19	53.20	33.06	Low
EP-08	R5	El Paso	0.70	105.16	111.69	108.43	Fair	261.87	0.88	0.09	0.00	83.21	53.09	32.99	Low
EP-08	R5	El Paso	0.80	109.06	97.07	103.07	Fair	407.86	0.34	0.13	0.03	129.09	49.69	30.88	Low
EP-08	R5	El Paso	0.90	114.09	89.35	101.72	Fair	234.34	0.26	0.07	0.00	74.09	44.67	27.76	Low
EP-08	R6	El Paso	0.10	121.05	139.11	130.08	Fair	648.11	0.48	0.24	0.12	205.25	34.67	21.54	Low
EP-08	R6	El Paso	0.20	97.38	110.51	103.95	Fair	1477.98	0.08	0.48	0.11	467.19	32.55	20.22	Low
EP-08	R6	El Paso	0.30	120.21	202.26	161.24	Poor	675.32	0.18	0.22	0.06	213.40	44.69	27.77	Low
EP-08	R6	El Paso	0.40	194.21	141.90	168.06	Poor	730.43	0.92	0.23	0.04	231.41	49.69	30.88	Low
EP-08	R6	El Paso	0.50	94.70	80.36	87.53	Good	524.92	1.48	0.16	0.11	166.80	51.64	32.09	Low
EP-08	R6	El Paso	0.60	101.87	106.90	104.39	Fair	562.86	0.63	0.18	0.17	178.47	52.82	32.82	Low
EP-08	R6	El Paso	0.70	105.16	111.69	108.43	Fair	518.06	0.54	0.17	0.05	164.03	55.31	34.37	Low
EP-08	R6	El Paso	0.80	109.06	97.07	103.07	Fair	347.68	0.19	0.11	0.01	110.08	56.15	34.89	Low
EP-08	R6	El Paso	0.90	114.09	89.35	101.72	Fair	188.66	0.05	0.06	0.02	59.62	46.75	29.05	Low
EP-08	R7	El Paso	0.10	121.05	139.11	130.08	Fair	421.39	0.41	0.11	0.20	133.44	22.19	13.79	Low
EP-08	R7	El Paso	0.30	120.21	202.26	161.24	Poor	666.30	0.00	0.16	0.02	210.42	43.70	27.15	Low
EP-08	R7	El Paso	0.40	194.21	141.90	168.06	Poor	612.75	0.13	0.15	0.02	193.65	45.18	28.07	Low
EP-08	R7	El Paso	0.50	94.70	80.36	87.53	Good	348.41	0.18	0.11	0.01	110.17	41.90	26.03	Low
EP-08	R7	El Paso	0.60	101.87	106.90	104.39	Fair	749.40	0.45	0.23	0.02	237.35	41.04	25.50	Low
EP-08	R7	El Paso	0.70	105.16	111.69	108.43	Fair	442.92	0.13	0.14	0.01	140.20	44.00	27.34	Low
EP-08	R7	El Paso	0.80	109.06	97.07	103.07	Fair	323.99	0.07	0.10	0.03	102.42	44.16	27.44	Low
EP-08	R7	El Paso	0.90	114.09	89.35	101.72	Fair	384.46	0.20	0.12	0.04	121.73	38.69	24.04	Low
EP-08	R8	El Paso	0.10	121.05	139.11	130.08	Fair	755.13	2.65	0.25	0.22	240.01	25.56	15.88	Low
EP-08	R8	El Paso	0.20	97.38	110.51	103.95	Fair	792.48	0.53	0.25	0.08	250.68	33.21	20.64	Low
EP-08	R8	El Paso	0.30	120.21	202.26	161.24	Poor	568.76	0.57	0.17	0.01	180.29	28.21	17.53	Low
EP-08	R8	El Paso	0.40	194.21	141.90	168.06	Poor	1008.87	1.33	0.33	0.02	319.72	38.47	23.90	Low
EP-08	R8	El Paso	0.50	94.70	80.36	87.53	Good	333.10	0.39	0.13	0.00	105.56	43.33	26.92	Low
EP-08	R8	El Paso	0.60	101.87	106.90	104.39	Fair	531.43	0.24	0.21	0.02	168.26	38.47	23.90	Low
EP-08	R8	El Paso	0.70	105.16	111.69	108.43	Fair	808.89	0.31	0.31	0.03	255.88	45.26	28.12	Low
EP-08	R8	El Paso	0.80	109.06	97.07	103.07	Fair	368.37	0.21	0.14	0.01	116.70	50.97	31.67	Low
EP-08	R8	El Paso	0.90	114.09	89.35	101.72	Fair	174.06	0.20	0.05	0.01	55.15	44.19	27.46	Low
EP-08	R9	El Paso	0.10	121.05	139.11	130.08	Fair	1023.37	0.58	0.32	0.03	323.79	35.69	22.18	Low
EP-08	R9	El Paso	0.20	97.38	110.51	103.95	Fair	642.52	0.23	0.21	0.00	203.26	43.82	27.23	Low
EP-08	R9	El Paso	0.30	120.21	202.26	161.24	Poor	698.37	0.17	0.22	0.02	220.93	34.30	21.31	Low
EP-08	R9	El Paso	0.40	194.21	141.90	168.06	Poor	949.04	0.16	0.31	0.08	300.26	41.88	26.03	Low
EP-08	R9	El Paso	0.50	94.70	80.36	87.53	Good	469.92	0.99	0.15	0.01	148.86	45.01	27.97	Low
EP-08	R9	El Paso	0.60	101.87	106.90	104.39	Fair	668.12	0.32	0.22	0.05	211.45	46.56	28.93	Low
EP-08	R9	El Paso	0.70	105.16	111.69	108.43	Fair	247.45	0.33	0.08	0.00	78.43	46.89	29.13	Low
EP-08	R9	El Paso	0.80	109.06	97.07	103.07	Fair	352.22	0.64	0.11	0.00	111.58	42.72	26.54	Low
EP-08	R9	El Paso	0.90	114.09	89.35	101.72	Fair	400.45	0.04	0.10	0.01	126.70	39.39	24.47	Low
EP-09	R1	El Paso	0.10	106.54	136.09	121.32	Fair	1280.19	3.87	0.34	0.03	406.61	20.07	12.47	Low
EP-09	R1	El Paso	0.20	58.90	89.16	74.03	Good	1178.35	0.63	0.33	0.06	372.86	47.20	29.33	Low
EP-09	R1	El Paso	0.30	91.04	163.13	127.09	Fair	668.48	0.73	0.18	0.25	211.70	61.88	38.45	Low
EP-09	R1	El Paso	0.40	91.42	108.85	100.14	Fair	537.13	0.84	0.14	0.02	170.24	69.83	43.39	Low
EP-09	R1	El Paso	0.50	97.39	132.71	115.05	Fair	444.37	0.59	0.11	0.01	140.73	73.52	45.68	Medium
EP-09	R1	El Paso	0.60	73.97	102.54	88.26	Good	346.87	0.34	0.08	0.01	109.96	75.89	47.16	Medium
EP-09	R1	El Paso	0.70	83.86	80.38	82.12	Good	21.86	0.03	0.02	0.00	6.83	67.86	42.16	Low
EP-09	R1	El Paso	0.80	114.25	160.01	137.13	Poor	884.11	2.64	0.22	0.12	280.86	44.43	27.61	Low
EP-09	R1	El Paso	0.90	80.66	127.22	103.94	Fair	899.07	1.67	0.22	0.19	285.06	65.13	40.47	Low
EP-09	R1	El Paso	1.00	78.49	114.76	96.63	Fair	534.34	1.49	0.13	0.01	169.83	73.68	45.78	Medium
EP-09	R1	El Paso	1.10	91.27	153.57	122.42	Fair	246.13	0.22	0.06	0.01	77.85	73.76	45.83	Medium
EP-09	R1	El Paso	1.20	75.61	125.73	100.67	Fair	327.58	0.20	0.08	0.02	103.58	72.90	45.30	Medium
EP-09	R1	El Paso	1.30	69.69	123.54	96.62	Fair	579.40	0.44	0.14	0.01	183.29	77.23	47.99	Medium
EP-09	R1	El Paso	1.40	76.84	107.00	91.92	Good	467.62	0.61	0.07	0.00	147.98	79.66	49.50	Medium
EP-09	R1	El Paso	1.49	87.30	121.60	104.45	Fair	528.30	0.67	0.07	0.01	167.31	83.65	51.98	Medium
EP-09	R1	El Paso	1.60	80.85	126.01	103.43	Fair	632.15	0.77	0.09	0.02	200.05	87.54	54.39	Medium
EP-09	R1	El Paso	1.70	80.83	120.47	100.65	Fair	125.99	0.18	0.02	0.00	39.79	89.49	55.61	Medium
EP-09	R1	El Paso	1.80	137.07	220.48	178.78	Very Poor	130.87	0.17	0.02	0.00	41.38	85.61	53.20	Medium
EP-09	R1	El Paso	1.90	94.58	176.18	135.38	Poor	151.17	0.15	0.02	0.00	47.92	79.34	49.30	Medium
EP-09	R1	El Paso	2.00	80.45	136.85	108.65	Fair	451.10	1.43	0.07	0.12	143.13	69.58	43.23	Low
EP-09	R1	El Paso	2.10	79.92	129.30	104.61	Fair	745.59	4.50	0.11	0.05	237.87	76.95	47.82	Medium
EP-09	R1	El Paso	2.20	73.98	131.95	102.97	Fair	86.23	0.30	0.03	0.02	27.42	78.90	49.03	Medium
EP-09	R1	El Paso	2.30	75.52	181.63	128.58	Fair	591.67	0.89	0.14	0.09	187.41	77.21	47.97	Medium
EP-09	R1	El Paso	2.40	70.25	126.80	98.53	Fair	99.42	0.29	0.03	0.00	31.63	80.00	49.71	Medium
EP-09	R1	El Paso	2.49	89.94	139.35	114.65	Fair	7.02	0.11	0.02	0.00	2.35	69.42	43.14	Low
EP-09	R2	El Paso	0.20	58.90	89.16	74.03	Good	1608.35	0.01	0.49	0.34	508.43	45.48	28.26	Low
EP-09	R2	El Paso	0.30	91.04	163.13	127.09	Fair	1002.77	0.07	0.31	0.31	317.03	70.25	43.65	Low
EP-09	R2	El Paso	0.40	91.42	108.85	100.14	Fair	531.47	0.24	0.17	0.08	168.13	82.27	51.12	Medium
EP-09	R2	El Paso	0.50	97.39	132.71	115.05	Fair	117.64	0.12	0.04	0.00	37.21	82.25	51.11	Medium
EP-09	R2	El Paso	0.60	73.97	102.54	88.26	Good	242.70	0.23	0.10	0.05	76.82	76.08	47.28	Medium
EP-09	R2	El Paso	0.70	83.86	80.38	82.12	Good	273.85	0.13	0.09	0.01	86.59	79.94	49.67	Medium
EP-09	R2	El Paso	0.80	114.25	160.01	137.13	Poor	457.92	0.22	0.13	0.37	144.90	77.30	48.03	Medium
EP-09	R2	El Paso	0.90	80.66	127.22	103.94	Fair	454.25	0.72	0.11	0.05	143.91	85.53	53.14	Medium
EP-09	R2	El Paso	1.00	78.49	114.76	96.63	Fair	436.31	1.16	0.11	0.02	138.56	87.28	54.24	Medium
EP-09	R2	El Paso	1.10	91.27	153.57	122.42	Fair	74.35	0.19	0.02	0.00	23.61	85.90	53.37	Medium
EP-09	R2	El Paso	1.20	75.61	125.73	100.67	Fair	245.80	0.23	0.07	0.02	77.82	79.34	49.30	Medium
EP-09	R2	El Paso	1.30	69.69	123.54	96.62	Fair	733.49	1.18	0.18	0.07	232.34	82.65	51.35	Medium

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-09	R2	El Paso	1.40	76.84	107.00	91.92	Good	594.79	1.56	0.15	0.04	188.74	91.35	56.76	Medium
EP-09	R2	El Paso	1.49	87.30	121.60	104.45	Fair	203.01	0.45	0.06	0.01	64.37	93.19	57.90	Medium
EP-09	R2	El Paso	1.60	80.85	126.01	103.43	Fair	381.86	0.82	0.10	0.02	121.17	90.11	55.99	Medium
EP-09	R2	El Paso	1.70	80.83	120.47	100.65	Fair	169.40	0.28	0.04	0.00	53.58	89.34	55.51	Medium
EP-09	R2	El Paso	1.80	137.07	220.48	178.78	Very Poor	368.07	0.46	0.09	0.01	116.58	86.75	53.91	Medium
EP-09	R2	El Paso	1.90	94.58	176.18	135.38	Poor	244.57	0.28	0.06	0.01	77.43	86.67	53.85	Medium
EP-09	R2	El Paso	2.00	80.45	136.85	108.65	Fair	109.29	0.19	0.04	0.01	34.68	80.02	49.72	Medium
EP-09	R2	El Paso	2.10	79.92	129.30	104.61	Fair	330.77	0.23	0.09	0.03	104.74	78.38	48.70	Medium
EP-09	R2	El Paso	2.20	73.98	131.95	102.97	Fair	115.91	0.64	0.04	0.01	37.03	71.47	44.41	Low
EP-09	R2	El Paso	2.30	75.52	181.63	128.58	Fair	1786.21	2.94	0.44	0.14	566.23	38.46	23.90	Low
EP-09	R2	El Paso	2.40	70.25	126.80	98.53	Fair	886.16	0.92	0.22	0.12	280.61	67.00	41.63	Low
EP-09	R2	El Paso	2.49	89.94	139.35	114.65	Fair	45.94	0.07	0.02	0.01	14.64	59.80	37.16	Low
EP-09	R3	El Paso	0.20	58.90	89.16	74.03	Good	1703.41	3.10	0.40	0.28	539.97	47.94	29.79	Low
EP-09	R3	El Paso	0.30	91.04	163.13	127.09	Fair	1153.57	3.02	0.28	0.59	366.24	72.89	45.29	Medium
EP-09	R3	El Paso	0.40	91.42	108.85	100.14	Fair	716.37	1.93	0.18	0.37	227.41	84.75	52.66	Medium
EP-09	R3	El Paso	0.50	97.39	132.71	115.05	Fair	312.71	0.72	0.08	0.02	99.22	88.40	54.93	Medium
EP-09	R3	El Paso	0.60	73.97	102.54	88.26	Good	10.70	0.23	0.02	0.00	3.49	78.31	48.66	Medium
EP-09	R3	El Paso	0.70	83.86	80.38	82.12	Good	43.18	0.17	0.03	0.02	13.78	51.01	31.70	Low
EP-09	R3	El Paso	0.80	114.25	160.01	137.13	Poor	1657.36	0.70	0.39	0.18	524.36	38.97	24.21	Low
EP-09	R3	El Paso	0.90	80.66	127.22	103.94	Fair	1277.31	1.62	0.30	0.22	404.53	70.37	43.72	Low
EP-09	R3	El Paso	1.00	78.49	114.76	96.63	Fair	439.05	0.86	0.11	0.09	139.10	82.90	51.51	Medium
EP-09	R3	El Paso	1.10	91.27	153.57	122.42	Fair	360.33	0.79	0.09	0.02	114.32	84.19	52.31	Medium
EP-09	R3	El Paso	1.20	75.61	125.73	100.67	Fair	287.54	0.56	0.07	0.04	91.17	85.03	52.84	Medium
EP-09	R3	El Paso	1.30	69.69	123.54	96.62	Fair	157.15	0.25	0.04	0.00	49.69	83.10	51.64	Medium
EP-09	R3	El Paso	1.40	76.84	107.00	91.92	Good	297.53	0.27	0.07	0.03	94.25	77.70	48.28	Medium
EP-09	R3	El Paso	1.49	87.30	121.60	104.45	Fair	484.13	0.31	0.11	0.02	153.22	81.32	50.53	Medium
EP-09	R3	El Paso	1.60	80.85	126.01	103.43	Fair	261.47	0.07	0.07	0.01	82.77	83.67	51.99	Medium
EP-09	R3	El Paso	1.70	80.83	120.47	100.65	Fair	314.96	0.00	0.10	0.01	99.45	81.44	50.61	Medium
EP-09	R3	El Paso	1.80	137.07	220.48	178.78	Very Poor	780.63	0.01	0.25	0.13	246.79	84.62	52.58	Medium
EP-09	R3	El Paso	1.90	94.58	176.18	135.38	Poor	83.51	0.01	0.04	0.01	26.46	82.54	51.29	Medium
EP-09	R3	El Paso	2.00	80.45	136.85	108.65	Fair	992.04	0.48	0.33	0.33	313.81	39.75	24.70	Low
EP-09	R3	El Paso	2.10	79.92	129.30	104.61	Fair	1500.68	1.61	0.43	0.18	475.08	59.39	36.90	Low
EP-09	R3	El Paso	2.20	73.98	131.95	102.97	Fair	630.75	0.96	0.17	0.24	199.85	78.45	48.75	Medium
EP-09	R3	El Paso	2.30	75.52	181.63	128.58	Fair	647.56	1.83	0.18	0.37	205.70	83.32	51.77	Medium
EP-09	R3	El Paso	2.40	70.25	126.80	98.53	Fair	122.75	0.22	0.04	0.01	38.94	84.54	52.53	Medium
EP-09	R3	El Paso	2.49	89.94	139.35	114.65	Fair	22.84	0.08	0.03	0.01	7.24	61.67	38.32	Low
EP-09	R4	El Paso	0.30	91.04	163.13	127.09	Fair	148.19	0.00	0.04	0.02	47.01	67.73	42.09	Low
EP-09	R4	El Paso	0.40	91.42	108.85	100.14	Fair	299.78	0.00	0.06	0.03	94.70	68.86	42.79	Low
EP-09	R4	El Paso	0.60	73.97	102.54	88.26	Good	340.82	0.00	0.07	0.00	107.85	70.08	43.55	Low
EP-09	R4	El Paso	0.80	114.25	160.01	137.13	Poor	1485.00	0.34	0.39	0.07	469.62	35.40	22.00	Low
EP-09	R4	El Paso	0.90	80.66	127.22	103.94	Fair	844.40	0.20	0.23	0.04	266.87	63.65	39.55	Low
EP-09	R4	El Paso	1.00	78.49	114.76	96.63	Fair	331.77	0.21	0.09	0.01	104.88	68.93	42.83	Low
EP-09	R4	El Paso	1.10	91.27	153.57	122.42	Fair	213.74	0.32	0.05	0.01	67.67	68.82	42.77	Low
EP-09	R4	El Paso	1.20	75.61	125.73	100.67	Fair	425.29	0.16	0.11	0.01	134.61	68.44	42.52	Low
EP-09	R4	El Paso	1.30	69.69	123.54	96.62	Fair	245.95	0.03	0.06	0.00	77.64	70.37	43.73	Low
EP-09	R4	El Paso	1.40	76.84	107.00	91.92	Good	256.24	0.01	0.07	0.00	81.12	68.13	42.33	Low
EP-09	R4	El Paso	1.49	87.30	121.60	104.45	Fair	384.21	0.03	0.10	0.00	121.40	67.24	41.78	Low
EP-09	R4	El Paso	1.60	80.85	126.01	103.43	Fair	380.60	0.03	0.10	0.00	120.39	69.70	43.31	Low
EP-09	R4	El Paso	1.70	80.83	120.47	100.65	Fair	298.80	0.03	0.08	0.00	94.37	70.41	43.75	Low
EP-09	R4	El Paso	1.80	137.07	220.48	178.78	Very Poor	414.36	0.04	0.11	0.02	131.09	70.13	43.58	Low
EP-09	R4	El Paso	1.90	94.58	176.18	135.38	Poor	224.24	0.68	0.06	0.09	71.22	67.77	42.11	Low
EP-09	R4	El Paso	2.00	80.45	136.85	108.65	Fair	416.58	0.21	0.12	0.04	131.96	54.21	33.69	Low
EP-09	R4	El Paso	2.10	79.92	129.30	104.61	Fair	881.65	0.22	0.24	0.07	278.77	63.48	39.45	Low
EP-09	R4	El Paso	2.20	73.98	131.95	102.97	Fair	365.03	0.02	0.10	0.02	115.31	71.17	44.22	Low
EP-09	R4	El Paso	2.30	75.52	181.63	128.58	Fair	257.07	0.01	0.07	0.02	81.43	70.19	43.62	Low
EP-09	R4	El Paso	2.40	70.25	126.80	98.53	Fair	71.03	0.05	0.03	0.01	22.42	61.89	38.45	Low
EP-09	R5	El Paso	0.20	58.90	89.16	74.03	Good	1419.95	0.31	0.40	0.08	466.61	40.94	25.44	Low
EP-09	R5	El Paso	0.30	91.04	163.13	127.09	Fair	683.56	0.20	0.23	0.02	269.75	61.92	38.47	Low
EP-09	R5	El Paso	0.40	91.42	108.85	100.14	Fair	219.60	0.04	0.05	0.03	53.89	66.83	41.52	Low
EP-09	R5	El Paso	0.50	97.39	132.71	115.05	Fair	320.81	0.04	0.10	0.01	119.02	66.48	41.31	Low
EP-09	R5	El Paso	0.60	73.97	102.54	88.26	Good	78.32	0.03	0.03	0.01	28.17	65.31	40.58	Low
EP-09	R5	El Paso	0.70	83.86	80.38	82.12	Good	52.07	0.02	0.03	0.01	12.98	56.24	34.94	Low
EP-09	R5	El Paso	0.80	114.25	160.01	137.13	Poor	1734.31	0.07	0.40	0.08	484.46	37.56	23.34	Low
EP-09	R5	El Paso	0.90	80.66	127.22	103.94	Fair	437.81	0.05	0.15	0.17	173.79	62.13	38.60	Low
EP-09	R5	El Paso	1.00	78.49	114.76	96.63	Fair	273.90	0.01	0.11	0.04	119.90	66.89	41.56	Low
EP-09	R5	El Paso	1.10	91.27	153.57	122.42	Fair	402.04	0.00	0.09	0.02	98.92	65.04	40.41	Low
EP-09	R5	El Paso	1.20	75.61	125.73	100.67	Fair	267.54	0.00	0.09	0.00	109.55	69.29	43.06	Low
EP-09	R5	El Paso	1.30	69.69	123.54	96.62	Fair	153.65	0.00	0.04	0.02	30.84	66.28	41.18	Low
EP-09	R5	El Paso	1.40	76.84	107.00	91.92	Good	216.25	0.00	0.07	0.01	79.89	64.64	40.16	Low
EP-09	R5	El Paso	1.49	87.30	121.60	104.45	Fair	511.72	0.03	0.11	0.01	131.07	64.54	40.10	Low
EP-09	R5	El Paso	1.60	80.85	126.01	103.43	Fair	450.00	0.03	0.14	0.00	168.92	70.74	43.96	Low
EP-09	R5	El Paso	1.70	80.83	120.47	100.65	Fair	179.93	0.02	0.05	0.00	57.15	71.64	44.51	Low
EP-09	R5	El Paso	1.80	137.07	220.48	178.78	Very Poor	260.39	0.00	0.06	0.03	89.80	68.72	42.70	Low
EP-09	R5	El Paso	1.90	94.58	176.18	135.38	Poor	54.49	0.03	0.02	0.00	23.91	65.14	40.48	Low
EP-09	R5	El Paso	2.00	80.45	136.85	108.65	Fair	868.77	0.02	0.11	0.04	152.66	42.51	26.41	Low
EP-09	R5	El Paso	2.10	79.92	129.30	104.61	Fair	1310.37	0.23	0.37	0.11	480.11	46.79	29.08	Low
EP-09	R5	El Paso	2.20	73.98	131.95	102.97	Fair	279.01	0.07	0.11	0.01	129.92	65.90	40.95	Low

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-09	R5	El Paso	2.30	75.52	181.63	128.58	Fair	45.75	0.04	0.06	0.00	75.57	65.28	40.56	Low
EP-09	R5	El Paso	2.40	70.25	126.80	98.53	Fair	45.57	0.00	0.03	0.01	17.05	55.45	34.45	Low
EP-09	R6	El Paso	0.30	91.04	163.13	127.09	Fair	551.77	0.00	0.17	0.01	170.84	53.52	33.26	Low
EP-09	R6	El Paso	0.40	91.42	108.85	100.14	Fair	492.12	0.01	0.18	0.02	178.13	62.88	39.07	Low
EP-09	R6	El Paso	0.50	97.39	132.71	115.05	Fair	198.47	0.01	0.07	0.02	66.89	66.63	41.40	Low
EP-09	R6	El Paso	0.60	73.97	102.54	88.26	Good	109.61	0.02	0.05	0.01	44.12	64.52	40.09	Low
EP-09	R6	El Paso	0.70	83.86	80.38	82.12	Good	65.58	0.00	0.03	0.01	21.09	57.28	35.59	Low
EP-09	R6	El Paso	0.80	114.25	160.01	137.13	Poor	1628.35	0.37	0.37	0.04	455.84	35.28	21.92	Low
EP-09	R6	El Paso	0.90	80.66	127.22	103.94	Fair	589.16	0.37	0.19	0.01	238.87	61.28	38.07	Low
EP-09	R6	El Paso	1.00	78.49	114.76	96.63	Fair	254.04	0.03	0.06	0.01	78.50	65.55	40.73	Low
EP-09	R6	El Paso	1.10	91.27	153.57	122.42	Fair	371.52	0.09	0.10	0.01	120.73	66.55	41.35	Low
EP-09	R6	El Paso	1.20	75.61	125.73	100.67	Fair	311.08	0.09	0.06	0.00	78.18	67.45	41.91	Low
EP-09	R6	El Paso	1.30	69.69	123.54	96.62	Fair	350.72	0.08	0.09	0.00	103.21	69.21	43.00	Low
EP-09	R6	El Paso	1.40	76.84	107.00	91.92	Good	171.16	0.11	0.07	0.01	84.47	70.19	43.62	Low
EP-09	R6	El Paso	1.49	87.30	121.60	104.45	Fair	221.01	0.07	0.05	0.00	57.59	67.60	42.00	Low
EP-09	R6	El Paso	1.60	80.85	126.01	103.43	Fair	324.86	0.11	0.09	0.00	103.23	66.75	41.48	Low
EP-09	R6	El Paso	1.70	80.83	120.47	100.65	Fair	327.03	0.06	0.08	0.00	103.22	67.36	41.86	Low
EP-09	R6	El Paso	1.90	94.58	176.18	135.38	Poor	152.62	0.00	0.05	0.00	55.33	65.62	40.78	Low
EP-09	R6	El Paso	2.00	80.45	136.85	108.65	Fair	887.70	0.07	0.10	0.01	111.95	40.48	25.15	Low
EP-09	R6	El Paso	2.10	79.92	129.30	104.61	Fair	1105.02	0.63	0.42	0.06	497.46	46.17	28.69	Low
EP-09	R6	El Paso	2.20	73.98	131.95	102.97	Fair	389.17	0.25	0.12	0.05	128.91	60.91	37.85	Low
EP-09	R6	El Paso	2.30	75.52	181.63	128.58	Fair	44.30	0.06	0.05	0.00	51.92	64.71	40.21	Low
EP-09	R6	El Paso	2.40	70.25	126.80	98.53	Fair	44.29	0.02	0.03	0.01	14.26	54.13	33.64	Low
EP-09	R7	El Paso	0.20	58.90	89.16	74.03	Good	1131.42	0.00	0.31	0.02	406.59	34.98	21.74	Low
EP-09	R7	El Paso	0.30	91.04	163.13	127.09	Fair	389.26	0.01	0.09	0.03	122.36	50.02	31.08	Low
EP-09	R7	El Paso	0.40	91.42	108.85	100.14	Fair	250.46	0.10	0.06	0.01	84.60	52.91	32.88	Low
EP-09	R7	El Paso	0.50	97.39	132.71	115.05	Fair	420.00	0.18	0.11	0.01	144.02	55.19	34.29	Low
EP-09	R7	El Paso	0.60	73.97	102.54	88.26	Good	144.47	0.04	0.03	0.00	38.84	57.37	35.65	Low
EP-09	R7	El Paso	0.70	83.86	80.38	82.12	Good	488.10	0.21	0.10	0.01	125.80	56.39	35.04	Low
EP-09	R7	El Paso	0.80	114.25	160.01	137.13	Poor	243.56	0.23	0.09	0.03	100.26	61.37	38.13	Low
EP-09	R7	El Paso	0.90	80.66	127.22	103.94	Fair	231.40	0.18	0.07	0.02	90.07	64.24	39.92	Low
EP-09	R7	El Paso	1.00	78.49	114.76	96.63	Fair	78.49	0.08	0.03	0.02	25.02	60.88	37.83	Low
EP-09	R7	El Paso	1.10	91.27	153.57	122.42	Fair	184.84	0.09	0.05	0.17	49.11	54.27	33.72	Low
EP-09	R7	El Paso	1.20	75.61	125.73	100.67	Fair	235.83	0.05	0.05	0.01	67.20	54.35	33.77	Low
EP-09	R7	El Paso	1.30	69.69	123.54	96.62	Fair	260.49	0.06	0.06	0.00	77.82	54.27	33.72	Low
EP-09	R7	El Paso	1.40	76.84	107.00	91.92	Good	357.40	0.14	0.08	0.00	109.58	54.47	33.84	Low
EP-09	R7	El Paso	1.49	87.30	121.60	104.45	Fair	361.25	0.10	0.09	0.01	125.18	57.74	35.88	Low
EP-09	R7	El Paso	1.60	80.85	126.01	103.43	Fair	250.45	0.07	0.08	0.00	79.40	58.80	36.54	Low
EP-09	R7	El Paso	1.70	80.83	120.47	100.65	Fair	250.92	0.08	0.08	0.00	79.43	58.70	36.47	Low
EP-09	R7	El Paso	1.80	137.07	220.48	178.78	Very Poor	258.07	0.09	0.08	0.04	78.73	58.35	36.26	Low
EP-09	R7	El Paso	1.90	94.58	176.18	135.38	Poor	137.91	0.09	0.05	0.01	54.35	56.88	35.34	Low
EP-09	R7	El Paso	2.00	80.45	136.85	108.65	Fair	829.74	0.23	0.17	0.01	204.55	36.40	22.62	Low
EP-09	R7	El Paso	2.10	79.92	129.30	104.61	Fair	608.21	0.15	0.20	0.01	249.80	51.19	31.81	Low
EP-09	R7	El Paso	2.20	73.98	131.95	102.97	Fair	191.50	0.38	0.05	0.00	62.09	56.72	35.24	Low
EP-09	R7	El Paso	2.30	75.52	181.63	128.58	Fair	169.66	0.22	0.05	0.00	63.92	52.65	32.71	Low
EP-09	R7	El Paso	2.40	70.25	126.80	98.53	Fair	167.94	0.61	0.05	0.00	65.60	49.57	30.80	Low
EP-09	R8	El Paso	0.20	58.90	89.16	74.03	Good	1423.07	0.33	0.35	0.08	486.34	37.63	23.38	Low
EP-09	R8	El Paso	0.30	91.04	163.13	127.09	Fair	580.13	0.42	0.12	0.01	186.77	55.84	34.70	Low
EP-09	R8	El Paso	0.40	91.42	108.85	100.14	Fair	571.70	0.48	0.12	0.02	194.07	64.44	40.04	Low
EP-09	R8	El Paso	0.50	97.39	132.71	115.05	Fair	362.29	0.21	0.08	0.02	125.78	70.61	43.87	Low
EP-09	R8	El Paso	0.60	73.97	102.54	88.26	Good	161.58	0.16	0.04	0.02	63.20	70.98	44.11	Low
EP-09	R8	El Paso	0.70	83.86	80.38	82.12	Good	141.21	0.08	0.02	0.01	27.72	61.65	38.30	Low
EP-09	R8	El Paso	0.80	114.25	160.01	137.13	Poor	510.12	0.29	0.11	0.02	140.23	51.80	32.19	Low
EP-09	R8	El Paso	0.90	80.66	127.22	103.94	Fair	521.63	0.54	0.13	0.01	169.27	60.97	37.88	Low
EP-09	R8	El Paso	1.00	78.49	114.76	96.63	Fair	131.58	0.13	0.07	0.01	78.52	65.69	40.82	Low
EP-09	R8	El Paso	1.10	91.27	153.57	122.42	Fair	190.68	0.10	0.05	0.01	60.64	61.49	38.21	Low
EP-09	R8	El Paso	1.20	75.61	125.73	100.67	Fair	115.67	0.01	0.04	0.09	21.98	57.80	35.92	Low
EP-09	R8	El Paso	1.30	69.69	123.54	96.62	Fair	278.24	0.00	0.08	0.08	90.86	57.11	35.49	Low
EP-09	R8	El Paso	1.40	76.84	107.00	91.92	Good	224.76	0.02	0.06	0.01	75.01	58.08	36.09	Low
EP-09	R8	El Paso	1.49	87.30	121.60	104.45	Fair	445.25	0.12	0.11	0.00	141.56	59.74	37.12	Low
EP-09	R8	El Paso	1.60	80.85	126.01	103.43	Fair	254.02	0.14	0.07	0.00	82.63	63.21	39.28	Low
EP-09	R8	El Paso	1.70	80.83	120.47	100.65	Fair	234.69	0.16	0.05	0.02	54.04	60.44	37.56	Low
EP-09	R8	El Paso	1.80	137.07	220.48	178.78	Very Poor	398.92	0.34	0.12	0.01	149.13	62.71	38.96	Low
EP-09	R8	El Paso	1.90	94.58	176.18	135.38	Poor	89.45	0.05	0.03	0.00	32.97	62.64	38.92	Low
EP-09	R8	El Paso	2.00	80.45	136.85	108.65	Fair	601.56	0.01	0.03	0.01	15.10	46.76	29.05	Low
EP-09	R8	El Paso	2.10	79.92	129.30	104.61	Fair	1029.58	0.28	0.40	0.08	474.09	40.07	24.90	Low
EP-09	R8	El Paso	2.20	73.98	131.95	102.97	Fair	423.61	0.51	0.13	0.01	156.22	56.49	35.10	Low
EP-09	R8	El Paso	2.30	75.52	181.63	128.58	Fair	423.00	0.11	0.03	0.00	38.13	56.28	34.97	Low
EP-09	R8	El Paso	2.40	70.25	126.80	98.53	Fair	476.24	0.06	0.03	0.00	41.50	45.79	28.45	Low
EP-09	R8	El Paso	2.49	89.94	139.35	114.65	Fair	817.07	0.61	0.22	0.12	258.72	39.86	24.77	Low
EP-10	R1	El Paso	0.30	142.21	166.44	154.33	Poor	926.37	0.33	0.75	0.15	293.34	79.60	49.46	Medium
EP-10	R1	El Paso	0.40	166.71	131.37	149.04	Poor	829.80	0.41	0.66	0.12	262.82	87.89	54.61	Medium
EP-10	R1	El Paso	0.50	162.14	122.79	142.47	Poor	101.98	4.11	0.15	0.01	34.49	89.58	55.66	Medium
EP-10	R1	El Paso	0.60	142.69	129.04	135.87	Poor	68.06	0.82	0.13	0.00	22.20	75.69	47.03	Medium
EP-10	R1	El Paso	0.70	118.76	129.11	123.94	Fair	844.96	0.82	0.62	0.14	267.86	75.31	46.80	Medium
EP-10	R1	El Paso	0.80	120.56	119.82	120.19	Fair	371.54	1.92	0.32	0.10	118.58	84.96	52.79	Medium
EP-10	R1	El Paso	0.90	112.30	139.63	125.97	Fair	617.89	0.98	0.51	0.24	196.16	82.66	51.37	Medium

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-10	R1	El Paso	1.00	120.03	139.88	129.96	Fair	715.33	0.86	0.56	0.10	226.81	90.58	56.29	Medium
EP-10	R1	El Paso	1.10	113.20	118.33	115.77	Fair	469.81	2.73	0.38	0.07	150.15	95.37	59.26	Medium
EP-10	R1	El Paso	1.20	106.31	117.68	112.00	Fair	611.91	0.66	0.47	0.05	193.99	95.53	59.36	Medium
EP-10	R1	El Paso	1.30	103.30	93.15	98.23	Fair	634.05	0.40	0.48	0.02	200.91	98.47	61.19	High
EP-10	R1	El Paso	1.40	102.45	119.32	110.89	Fair	756.56	0.62	0.57	0.04	239.85	102.67	63.80	High
EP-10	R1	El Paso	1.50	98.35	107.27	102.81	Fair	475.01	0.98	0.36	0.03	150.91	107.20	66.61	High
EP-10	R1	El Paso	1.60	93.33	110.95	102.14	Fair	300.41	0.48	0.22	0.01	95.40	103.36	64.22	High
EP-10	R1	El Paso	1.90	120.00	133.19	126.60	Fair	509.58	2.36	0.39	0.00	162.52	106.37	66.09	High
EP-10	R1	El Paso	2.00	107.26	134.53	120.90	Fair	261.12	0.14	0.20	0.01	82.63	104.69	65.05	High
EP-10	R1	El Paso	2.10	107.64	129.89	118.77	Fair	492.03	0.19	0.37	0.03	155.85	100.52	62.46	High
EP-10	R1	El Paso	2.20	101.82	93.21	97.52	Fair	455.57	0.98	0.34	0.00	144.66	100.72	62.58	High
EP-10	R1	El Paso	2.30	112.72	113.46	113.09	Fair	566.49	1.26	0.42	0.11	179.96	100.48	62.44	High
EP-10	R1	El Paso	2.40	109.32	121.98	115.65	Fair	347.60	0.01	0.26	0.05	109.95	100.89	62.69	High
EP-10	R1	El Paso	2.50	115.12	126.18	120.65	Fair	330.73	0.28	0.25	0.01	104.86	97.86	60.81	High
EP-10	R1	El Paso	2.60	122.69	113.05	117.87	Fair	523.50	0.32	0.39	0.00	165.85	94.93	58.99	Medium
EP-10	R1	El Paso	2.70	103.55	133.17	118.36	Fair	509.72	0.21	0.37	0.01	161.52	95.73	59.48	Medium
EP-10	R1	El Paso	2.80	114.85	140.50	127.68	Fair	733.97	0.23	0.53	0.00	232.40	97.93	60.85	High
EP-10	R1	El Paso	3.10	149.29	127.15	138.22	Poor	618.50	0.09	0.45	0.02	195.86	98.66	61.30	High
EP-10	R1	El Paso	3.20	107.23	132.65	119.94	Fair	558.26	0.12	0.37	0.04	176.74	99.83	62.03	High
EP-10	R1	El Paso	3.30	118.44	140.87	129.66	Fair	696.22	0.20	0.46	0.01	220.53	102.41	63.64	High
EP-10	R1	El Paso	3.40	90.23	113.62	101.93	Fair	702.57	0.17	0.46	0.04	222.38	106.11	65.93	High
EP-10	R1	El Paso	3.50	100.00	113.84	106.92	Fair	587.34	0.23	0.38	0.02	186.00	109.37	67.96	High
EP-10	R1	El Paso	3.60	106.64	93.81	100.23	Fair	532.76	0.26	0.35	0.05	168.87	109.92	68.30	High
EP-10	R1	El Paso	3.70	125.48	90.91	108.20	Fair	454.22	0.26	0.29	0.01	143.86	108.47	67.40	High
EP-10	R1	El Paso	3.80	111.00	89.02	100.01	Fair	453.66	0.15	0.29	0.00	143.67	107.01	66.49	High
EP-10	R1	El Paso	3.90	110.49	105.00	107.75	Fair	458.47	0.15	0.29	0.00	145.18	106.01	65.87	High
EP-10	R1	El Paso	4.00	95.53	91.23	93.38	Good	481.35	0.17	0.31	0.00	152.39	105.80	65.74	High
EP-10	R1	El Paso	4.10	93.86	79.11	86.49	Good	376.53	1.72	0.24	0.01	119.96	103.80	64.50	High
EP-10	R1	El Paso	4.20	99.29	119.66	109.48	Fair	443.88	0.62	0.21	0.01	140.61	102.31	63.58	High
EP-10	R1	El Paso	4.30	102.12	99.17	100.65	Fair	657.84	0.51	0.31	0.03	208.37	101.36	62.98	High
EP-10	R1	El Paso	4.40	103.38	120.48	111.93	Fair	600.29	0.24	0.29	0.02	189.95	105.96	65.84	High
EP-10	R1	El Paso	4.50	113.43	116.56	115.00	Fair	583.70	0.11	0.29	0.01	184.71	107.55	66.83	High
EP-10	R1	El Paso	4.60	111.23	133.48	122.36	Fair	576.13	0.06	0.29	0.00	182.20	107.75	66.96	High
EP-10	R1	El Paso	4.70	93.77	98.14	95.96	Good	474.80	0.06	0.24	0.01	150.20	107.00	66.49	High
EP-10	R1	El Paso	4.80	104.41	138.14	121.28	Fair	552.04	0.17	0.28	0.05	174.75	106.28	66.04	High
EP-10	R1	El Paso	4.90	104.26	102.68	103.47	Fair	631.21	0.18	0.32	0.04	199.77	107.74	66.95	High
EP-10	R1	El Paso	5.00	124.38	128.44	126.41	Fair	616.16	0.13	0.32	0.09	195.04	109.74	68.19	High
EP-10	R1	El Paso	5.10	181.95	165.72	173.84	Very Poor	700.21	0.22	0.37	0.13	221.63	110.80	68.85	High
EP-10	R1	El Paso	5.20	112.92	130.51	121.72	Fair	481.95	2.13	0.25	0.08	153.48	111.57	69.33	High
EP-10	R1	El Paso	5.30	132.18	120.02	126.10	Fair	299.64	1.00	0.15	0.01	95.27	110.61	68.73	High
EP-10	R1	El Paso	5.40	150.33	135.55	142.94	Poor	179.57	1.58	0.09	0.01	57.67	105.18	65.36	High
EP-10	R1	El Paso	5.50	163.96	136.53	150.25	Poor	510.85	0.79	0.26	0.17	162.06	101.67	63.17	High
EP-10	R1	El Paso	5.60	138.24	156.27	147.26	Poor	497.98	0.35	0.25	0.01	157.78	100.87	62.68	High
EP-10	R1	El Paso	5.70	137.18	153.35	145.27	Poor	608.93	0.91	0.28	0.02	193.07	101.96	63.35	High
EP-10	R1	El Paso	5.80	134.55	127.19	130.87	Fair	383.60	6.70	0.22	0.04	124.62	104.79	65.11	High
EP-10	R1	El Paso	5.90	137.33	144.39	140.86	Poor	441.53	1.83	0.23	0.04	140.62	100.38	62.38	High
EP-10	R1	El Paso	6.00	117.16	97.23	107.20	Fair	675.12	1.27	0.34	0.04	214.17	104.92	65.19	High
EP-10	R1	El Paso	6.10	115.53	135.22	125.38	Fair	398.10	0.78	0.20	0.01	126.24	106.47	66.16	High
EP-10	R1	El Paso	6.14	120.82	115.69	118.26	Fair	347.02	0.74	0.18	0.01	110.23	104.97	65.23	High
EP-10	R2	El Paso	0.10	148.64	161.97	155.31	Poor	1495.04	0.36	0.08	0.20	472.33	48.59	30.19	Low
EP-10	R2	El Paso	0.20	194.64	159.28	176.96	Very Poor	1309.50	5.59	0.07	0.31	416.30	72.59	45.10	Medium
EP-10	R2	El Paso	0.40	166.71	131.37	149.04	Poor	590.72	1.40	0.03	0.16	187.35	95.15	59.12	Medium
EP-10	R2	El Paso	0.50	162.14	122.79	142.47	Poor	673.06	1.48	0.04	0.17	213.36	98.24	61.04	High
EP-10	R2	El Paso	0.60	142.69	129.04	135.87	Poor	653.45	0.89	0.04	0.07	206.85	102.82	63.89	High
EP-10	R2	El Paso	0.70	118.76	129.11	123.94	Fair	641.43	0.54	0.04	0.06	202.96	106.84	66.39	High
EP-10	R2	El Paso	0.80	120.56	119.82	120.19	Fair	400.62	0.32	0.02	0.05	126.68	109.56	68.08	High
EP-10	R2	El Paso	0.90	112.30	139.63	125.97	Fair	156.70	0.14	0.01	0.01	49.67	106.26	66.03	High
EP-10	R2	El Paso	1.00	120.03	139.88	129.96	Fair	221.39	0.23	0.01	0.00	70.01	100.94	62.72	High
EP-10	R2	El Paso	1.10	113.20	118.33	115.77	Fair	337.78	0.37	0.02	0.08	106.97	96.45	59.93	Medium
EP-10	R2	El Paso	1.20	106.31	117.68	112.00	Fair	657.81	0.63	0.03	0.07	208.09	97.40	60.52	High
EP-10	R2	El Paso	1.30	103.30	93.15	98.23	Fair	636.05	0.73	0.03	0.09	201.41	101.23	62.90	High
EP-10	R2	El Paso	1.40	102.45	119.32	110.89	Fair	493.71	2.21	0.02	0.17	157.11	104.61	65.00	High
EP-10	R2	El Paso	1.50	98.35	107.27	102.81	Fair	599.12	1.90	0.03	0.10	190.18	104.57	64.98	High
EP-10	R2	El Paso	1.60	93.33	110.95	102.14	Fair	649.66	1.08	0.03	0.16	205.72	107.27	66.65	High
EP-10	R2	El Paso	1.70	94.27	118.45	106.36	Fair	552.72	0.72	0.03	0.07	174.97	110.18	68.46	High
EP-10	R2	El Paso	1.80	111.03	108.63	109.83	Fair	261.46	0.45	0.01	0.02	82.86	109.84	68.25	High
EP-10	R2	El Paso	1.90	120.00	133.19	126.60	Fair	399.13	0.63	0.02	0.10	126.37	105.86	65.78	High
EP-10	R2	El Paso	2.00	107.26	134.53	120.90	Fair	449.72	0.58	0.02	0.02	142.39	103.97	64.60	High
EP-10	R2	El Paso	2.10	107.64	129.89	118.77	Fair	442.42	0.52	0.02	0.02	140.08	102.99	64.00	High
EP-10	R2	El Paso	2.20	101.82	93.21	97.52	Fair	501.94	0.61	0.02	0.03	158.82	103.01	64.01	High
EP-10	R2	El Paso	2.30	112.72	113.46	113.09	Fair	595.28	0.78	0.03	0.04	188.37	104.78	65.11	High
EP-10	R2	El Paso	2.40	109.32	121.98	115.65	Fair	567.66	0.74	0.03	0.06	179.77	107.35	66.70	High
EP-10	R2	El Paso	2.50	115.12	126.18	120.65	Fair	482.75	0.68	0.03	0.10	152.79	107.25	66.64	High
EP-10	R2	El Paso	2.60	122.69	113.05	117.87	Fair	558.62	0.67	0.03	0.05	176.77	107.46	66.77	High
EP-10	R2	El Paso	2.70	103.55	133.17	118.36	Fair	213.30	1.33	0.01	0.02	68.02	107.54	66.82	High
EP-10	R2	El Paso	2.80	114.85	140.50	127.68	Fair	291.24	0.52	0.02	0.01	92.19	101.36	62.98	High
EP-10	R2	El Paso	2.90	119.33	135.94	127.64	Fair	563.30	0.37	0.04	0.09	178.13	100.99	62.75	High

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-10	R2	El Paso	3.00	99.81	119.35	109.58	Fair	575.09	0.01	0.05	0.01	181.77	102.03	63.40	High
EP-10	R2	El Paso	3.10	149.29	127.15	138.22	Poor	555.25	0.03	0.04	0.01	175.45	103.27	64.17	High
EP-10	R2	El Paso	3.20	107.23	132.65	119.94	Fair	557.77	0.22	0.04	0.01	176.37	104.04	64.65	High
EP-10	R2	El Paso	3.30	118.44	140.87	129.66	Fair	592.73	0.25	0.05	0.01	187.34	105.60	65.62	High
EP-10	R2	El Paso	3.40	90.23	113.62	101.93	Fair	699.93	0.39	0.05	0.02	221.28	108.17	67.22	High
EP-10	R2	El Paso	3.50	100.00	113.84	106.92	Fair	700.89	0.46	0.05	0.07	221.60	110.82	68.86	High
EP-10	R2	El Paso	3.60	106.64	93.81	100.23	Fair	603.28	0.50	0.05	0.03	190.81	113.32	70.41	High
EP-10	R2	El Paso	3.70	125.48	90.91	108.20	Fair	514.24	0.52	0.04	0.03	162.70	114.00	70.84	High
EP-10	R2	El Paso	3.80	111.00	89.02	100.01	Fair	464.24	0.48	0.04	0.03	146.87	113.21	70.34	High
EP-10	R2	El Paso	3.90	110.49	105.00	107.75	Fair	528.63	0.37	0.03	0.04	167.29	111.99	69.59	High
EP-10	R2	El Paso	4.00	95.53	91.23	93.38	Good	537.50	0.30	0.03	0.03	169.94	112.00	69.59	High
EP-10	R2	El Paso	4.10	93.86	79.11	86.49	Good	531.70	0.40	0.03	0.03	168.19	112.00	69.59	High
EP-10	R2	El Paso	4.20	99.29	119.66	109.48	Fair	532.02	0.42	0.03	0.05	168.27	112.06	69.63	High
EP-10	R2	El Paso	4.30	102.12	99.17	100.65	Fair	540.51	0.37	0.04	0.04	170.94	112.99	70.21	High
EP-10	R2	El Paso	4.40	103.38	120.48	111.93	Fair	558.77	0.46	0.04	0.04	176.78	113.68	70.64	High
EP-10	R2	El Paso	4.50	113.43	116.56	115.00	Fair	574.15	0.57	0.05	0.06	181.61	114.00	70.84	High
EP-10	R2	El Paso	4.60	111.23	133.48	122.36	Fair	586.98	0.54	0.05	0.05	185.70	114.00	70.84	High
EP-10	R2	El Paso	4.70	93.77	98.14	95.96	Good	372.02	0.32	0.04	0.03	117.71	114.59	71.20	High
EP-10	R2	El Paso	4.80	104.41	138.14	121.28	Fair	161.15	0.16	0.01	0.01	51.07	110.63	68.74	High
EP-10	R2	El Paso	4.90	104.26	102.68	103.47	Fair	514.48	0.54	0.05	0.23	162.87	107.02	66.50	High
EP-10	R2	El Paso	5.00	124.38	128.44	126.41	Fair	605.25	0.53	0.06	0.06	191.43	107.14	66.58	High
EP-10	R2	El Paso	5.10	181.95	165.72	173.84	Very Poor	419.71	0.39	0.04	0.04	132.83	108.57	67.46	High
EP-10	R2	El Paso	5.20	112.92	130.51	121.72	Fair	340.75	0.27	0.03	0.02	107.72	106.68	66.29	High
EP-10	R2	El Paso	5.30	132.18	120.02	126.10	Fair	403.98	0.21	0.04	0.05	127.70	104.52	64.94	High
EP-10	R2	El Paso	5.40	150.33	135.55	142.94	Poor	542.68	0.21	0.06	0.03	171.64	104.01	64.63	High
EP-10	R2	El Paso	5.50	163.96	136.53	150.25	Poor	557.49	0.17	0.06	0.02	176.23	105.34	65.46	High
EP-10	R2	El Paso	5.60	138.24	156.27	147.26	Poor	424.28	2.56	0.05	0.03	135.30	105.77	65.72	High
EP-10	R2	El Paso	5.70	137.18	153.35	145.27	Poor	540.75	1.08	0.06	0.19	171.39	104.79	65.11	High
EP-10	R2	El Paso	5.80	134.55	127.19	130.87	Fair	550.38	0.24	0.07	0.05	173.96	106.68	66.29	High
EP-10	R2	El Paso	5.90	137.33	144.39	140.86	Poor	556.05	0.03	0.07	0.10	175.73	108.11	67.18	High
EP-10	R2	El Paso	6.00	117.16	97.23	107.20	Fair	566.97	0.05	0.07	0.04	179.14	109.25	67.88	High
EP-10	R2	El Paso	6.10	115.53	135.22	125.38	Fair	559.44	0.15	0.07	0.06	176.80	110.30	68.54	High
EP-10	R2	El Paso	6.14	120.82	115.69	118.26	Fair	450.16	0.16	0.06	0.03	142.36	111.00	68.97	High
EP-10	R3	El Paso	0.10	148.64	161.97	155.31	Poor	1292.81	0.08	0.54	0.05	408.79	47.24	29.35	Low
EP-10	R3	El Paso	0.20	194.64	159.28	176.96	Very Poor	758.97	0.00	0.32	0.04	240.01	65.08	40.44	Low
EP-10	R3	El Paso	0.40	166.71	131.37	149.04	Poor	405.51	0.00	0.17	0.03	128.31	67.76	42.10	Low
EP-10	R3	El Paso	0.50	162.14	122.79	142.47	Poor	467.49	0.00	0.19	0.01	147.96	73.28	45.53	Medium
EP-10	R3	El Paso	1.00	120.03	139.88	129.96	Fair	505.63	0.00	0.21	0.00	159.88	67.43	41.90	Low
EP-10	R3	El Paso	1.10	113.20	118.33	115.77	Fair	209.41	0.07	0.09	0.00	66.12	70.58	43.86	Low
EP-10	R3	El Paso	1.20	106.31	117.68	112.00	Fair	313.88	0.10	0.14	0.01	99.30	66.96	41.61	Low
EP-10	R3	El Paso	1.30	103.30	93.15	98.23	Fair	523.32	0.06	0.23	0.00	165.50	69.64	43.28	Low
EP-10	R3	El Paso	1.40	102.45	119.32	110.89	Fair	552.20	0.02	0.24	0.01	174.63	75.45	46.88	Medium
EP-10	R3	El Paso	1.50	98.35	107.27	102.81	Fair	397.96	0.00	0.17	0.01	125.95	78.00	48.47	Medium
EP-10	R3	El Paso	1.70	94.27	118.45	106.36	Fair	298.01	0.00	0.13	0.00	94.34	75.49	46.91	Medium
EP-10	R3	El Paso	1.80	111.03	108.63	109.83	Fair	417.19	0.00	0.19	0.00	131.86	74.39	46.22	Medium
EP-10	R3	El Paso	1.90	120.00	133.19	126.60	Fair	601.77	0.00	0.27	0.00	190.45	76.12	47.30	Medium
EP-10	R3	El Paso	2.10	107.64	129.89	118.77	Fair	437.97	0.00	0.19	0.01	138.49	85.18	52.93	Medium
EP-10	R3	El Paso	2.30	112.72	113.46	113.09	Fair	190.56	0.00	0.08	0.00	60.34	79.71	49.53	Medium
EP-10	R3	El Paso	2.40	109.32	121.98	115.65	Fair	202.81	0.00	0.09	0.00	64.07	76.39	47.47	Medium
EP-10	R3	El Paso	2.50	115.12	126.18	120.65	Fair	271.73	0.01	0.13	0.00	86.05	73.49	45.66	Medium
EP-10	R3	El Paso	2.60	122.69	113.05	117.87	Fair	637.46	0.00	0.39	0.00	201.68	73.98	45.97	Medium
EP-10	R3	El Paso	2.70	103.55	133.17	118.36	Fair	365.32	0.04	0.23	0.00	115.48	79.51	49.41	Medium
EP-10	R3	El Paso	2.80	114.85	140.50	127.68	Fair	255.82	0.03	0.16	0.01	81.07	78.65	48.87	Medium
EP-10	R3	El Paso	3.10	149.29	127.15	138.22	Poor	458.17	0.08	0.28	0.02	144.98	76.59	47.59	Medium
EP-10	R3	El Paso	3.20	107.23	132.65	119.94	Fair	403.71	0.15	0.25	0.83	127.95	77.99	48.46	Medium
EP-10	R3	El Paso	3.30	118.44	140.87	129.66	Fair	442.98	0.02	0.23	0.05	140.23	78.00	48.47	Medium
EP-10	R3	El Paso	3.60	106.64	93.81	100.23	Fair	477.45	0.00	0.26	0.01	151.18	76.14	47.31	Medium
EP-10	R3	El Paso	3.70	125.48	90.91	108.20	Fair	400.91	0.00	0.22	0.02	126.72	77.71	48.28	Medium
EP-10	R3	El Paso	4.20	99.29	119.66	109.48	Fair	208.61	0.00	0.12	0.00	66.07	74.12	46.06	Medium
EP-10	R3	El Paso	4.30	102.12	99.17	100.65	Fair	351.00	0.00	0.20	0.02	111.16	71.00	44.12	Low
EP-10	R3	El Paso	4.40	103.38	120.48	111.93	Fair	516.46	0.00	0.29	0.01	163.40	72.28	44.91	Low
EP-10	R3	El Paso	4.50	113.43	116.56	115.00	Fair	561.16	0.00	0.31	0.02	177.58	77.23	47.99	Medium
EP-10	R3	El Paso	4.70	93.77	98.14	95.96	Good	337.04	0.00	0.19	0.00	106.71	78.89	49.02	Medium
EP-10	R3	El Paso	4.80	104.41	138.14	121.28	Fair	358.02	0.00	0.20	0.00	113.41	76.43	47.49	Medium
EP-10	R3	El Paso	4.90	104.26	102.68	103.47	Fair	549.24	0.00	0.31	0.01	173.76	79.27	49.25	Medium
EP-10	R3	El Paso	5.10	181.95	165.72	173.84	Very Poor	193.22	0.00	0.11	0.00	61.07	76.15	47.32	Medium
EP-10	R3	El Paso	5.20	112.92	130.51	121.72	Fair	196.22	0.00	0.11	0.00	61.97	72.64	45.14	Medium
EP-10	R3	El Paso	5.30	132.18	120.02	126.10	Fair	599.93	0.00	0.32	0.01	189.91	71.87	44.66	Low
EP-10	R3	El Paso	5.40	150.33	135.55	142.94	Poor	593.20	0.00	0.32	0.02	187.59	78.06	48.51	Medium
EP-10	R3	El Paso	5.60	138.24	156.27	147.26	Poor	370.03	0.00	0.20	0.00	117.03	76.57	47.58	Medium
EP-10	R3	El Paso	5.70	137.18	153.35	145.27	Poor	520.83	0.00	0.29	0.01	164.55	77.89	48.40	Medium
EP-10	R3	El Paso	6.00	117.16	97.23	107.20	Fair	368.10	0.00	0.20	0.01	116.44	78.45	48.74	Medium
EP-10	R4	El Paso	0.10	148.64	161.97	155.31	Poor	1283.34	0.28	0.65	0.06	405.96	45.41	28.22	Low
EP-10	R4	El Paso	0.20	194.64	159.28	176.96	Very Poor	973.57	0.14	0.49	0.03	308.02	65.53	40.72	Low
EP-10	R4	El Paso	0.30	142.21	166.44	154.33	Poor	565.49	0.06	0.29	0.01	178.86	76.14	47.31	Medium
EP-10	R4	El Paso	0.40	166.71	131.37	149.04	Poor	510.10	0.19	0.26	0.01	161.46	80.19	49.83	Medium
EP-10	R4	El Paso	0.50	162.14	122.79	142.47	Poor	68.35	0.03	0.04	0.00	21.56	79.18	49.20	Medium

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-10	R4	El Paso	0.60	142.69	129.04	135.87	Poor	88.00	0.02	0.05	0.00	27.88	71.61	44.50	Low
EP-10	R4	El Paso	0.70	118.76	129.11	123.94	Fair	561.40	0.02	0.29	0.10	177.56	69.58	43.24	Low
EP-10	R4	El Paso	0.80	120.56	119.82	120.19	Fair	632.68	0.00	0.33	0.01	200.14	77.30	48.03	Medium
EP-10	R4	El Paso	1.00	120.03	139.88	129.96	Fair	464.79	0.01	0.23	0.01	147.26	77.52	48.17	Medium
EP-10	R4	El Paso	1.10	113.20	118.33	115.77	Fair	489.78	0.05	0.24	0.00	154.97	80.74	50.17	Medium
EP-10	R4	El Paso	1.20	106.31	117.68	112.00	Fair	426.59	0.05	0.21	0.00	135.03	83.18	51.68	Medium
EP-10	R4	El Paso	1.30	103.30	93.15	98.23	Fair	154.58	0.02	0.08	0.00	48.86	81.63	50.72	Medium
EP-10	R4	El Paso	1.40	102.45	119.32	110.89	Fair	295.17	0.05	0.14	0.00	93.41	78.24	48.61	Medium
EP-10	R4	El Paso	1.50	98.35	107.27	102.81	Fair	464.95	0.10	0.21	0.00	147.19	78.14	48.55	Medium
EP-10	R4	El Paso	1.60	93.33	110.95	102.14	Fair	609.78	0.08	0.25	0.01	192.81	80.98	50.32	Medium
EP-10	R4	El Paso	1.70	94.27	118.45	106.36	Fair	573.18	0.13	0.23	0.03	181.36	85.89	53.37	Medium
EP-10	R4	El Paso	1.80	111.03	108.63	109.83	Fair	416.14	0.05	0.17	0.01	131.61	88.97	55.29	Medium
EP-10	R4	El Paso	1.90	120.00	133.19	126.60	Fair	386.16	0.01	0.16	0.00	122.12	89.00	55.30	Medium
EP-10	R4	El Paso	2.00	107.26	134.53	120.90	Fair	122.93	0.05	0.05	0.01	38.78	85.60	53.19	Medium
EP-10	R4	El Paso	2.10	107.64	129.89	118.77	Fair	356.65	0.13	0.14	0.01	112.86	81.34	50.54	Medium
EP-10	R4	El Paso	2.20	101.82	93.21	97.52	Fair	529.29	0.14	0.20	0.01	167.40	83.47	51.87	Medium
EP-10	R4	El Paso	2.30	112.72	113.46	113.09	Fair	155.09	0.02	0.07	0.00	49.05	83.34	51.78	Medium
EP-10	R4	El Paso	2.50	115.12	126.18	120.65	Fair	507.90	0.00	0.25	0.00	160.69	80.03	49.73	Medium
EP-10	R4	El Paso	2.60	122.69	113.05	117.87	Fair	522.79	0.00	0.26	0.00	165.46	84.35	52.41	Medium
EP-10	R4	El Paso	2.70	103.55	133.17	118.36	Fair	516.51	0.00	0.26	0.00	163.30	86.72	53.88	Medium
EP-10	R4	El Paso	2.80	114.85	140.50	127.68	Fair	73.81	0.00	0.04	0.00	23.31	85.94	53.40	Medium
EP-10	R4	El Paso	2.90	119.33	135.94	127.64	Fair	61.09	0.00	0.03	0.00	19.44	77.47	48.14	Medium
EP-10	R4	El Paso	3.00	99.81	119.35	109.58	Fair	426.94	0.00	0.22	0.01	135.16	72.60	45.11	Medium
EP-10	R4	El Paso	3.10	149.29	127.15	138.22	Poor	472.44	0.01	0.24	0.02	149.44	74.06	46.02	Medium
EP-10	R4	El Paso	3.20	107.23	132.65	119.94	Fair	581.83	0.03	0.30	0.12	184.04	77.89	48.40	Medium
EP-10	R4	El Paso	3.40	90.23	113.62	101.93	Fair	447.56	0.00	0.23	0.00	141.66	84.63	52.59	Medium
EP-10	R4	El Paso	3.50	100.00	113.84	106.92	Fair	92.15	0.01	0.05	0.00	29.09	81.85	50.86	Medium
EP-10	R4	El Paso	3.60	106.64	93.81	100.23	Fair	227.49	0.03	0.12	0.00	72.01	76.79	47.72	Medium
EP-10	R4	El Paso	3.70	125.48	90.91	108.20	Fair	399.45	0.06	0.20	0.00	126.51	74.41	46.24	Medium
EP-10	R4	El Paso	3.80	111.00	89.02	100.01	Fair	648.47	0.05	0.33	0.01	205.15	76.80	47.72	Medium
EP-10	R4	El Paso	4.00	95.53	91.23	93.38	Good	203.85	0.00	0.11	0.00	64.40	81.50	50.64	Medium
EP-10	R4	El Paso	4.10	93.86	79.11	86.49	Good	394.56	0.00	0.20	0.00	124.79	77.41	48.10	Medium
EP-10	R4	El Paso	4.30	102.12	99.17	100.65	Fair	506.47	0.00	0.26	0.00	160.14	81.33	50.54	Medium
EP-10	R4	El Paso	4.50	113.43	116.56	115.00	Fair	248.09	0.00	0.13	0.00	78.41	85.39	53.06	Medium
EP-10	R4	El Paso	4.70	93.77	98.14	95.96	Good	324.47	0.00	0.16	0.00	102.60	79.64	49.49	Medium
EP-10	R4	El Paso	4.80	104.41	138.14	121.28	Fair	579.89	0.01	0.30	0.00	183.32	80.97	50.31	Medium
EP-10	R4	El Paso	4.90	104.26	102.68	103.47	Fair	465.13	0.05	0.24	0.00	147.16	83.84	52.09	Medium
EP-10	R4	El Paso	5.00	124.38	128.44	126.41	Fair	277.68	0.02	0.15	0.00	87.82	85.55	53.16	Medium
EP-10	R4	El Paso	5.10	181.95	165.72	173.84	Very Poor	101.28	0.00	0.06	0.00	31.89	80.60	50.08	Medium
EP-10	R4	El Paso	5.20	112.92	130.51	121.72	Fair	311.81	0.00	0.17	0.01	98.61	74.56	46.33	Medium
EP-10	R4	El Paso	5.40	150.33	135.55	142.94	Poor	559.23	0.00	0.29	0.01	176.91	80.90	50.27	Medium
EP-10	R4	El Paso	5.50	163.96	136.53	150.25	Poor	175.04	0.01	0.09	0.00	55.26	81.46	50.62	Medium
EP-10	R4	El Paso	5.60	138.24	156.27	147.26	Poor	210.35	0.01	0.11	0.00	66.54	76.59	47.59	Medium
EP-10	R4	El Paso	5.70	137.18	153.35	145.27	Poor	377.99	0.01	0.22	0.01	119.54	75.46	46.89	Medium
EP-10	R4	El Paso	5.80	134.55	127.19	130.87	Fair	428.05	0.00	0.26	0.00	135.50	76.41	47.48	Medium
EP-10	R4	El Paso	5.90	137.33	144.39	140.86	Poor	420.68	0.03	0.25	0.01	133.08	77.22	47.98	Medium
EP-10	R4	El Paso	6.00	117.16	97.23	107.20	Fair	346.23	0.00	0.21	0.01	109.58	78.00	48.47	Medium
EP-10	R5	El Paso	0.10	148.64	161.97	155.31	Poor	860.55	0.00	0.42	0.01	272.20	38.42	23.87	Low
EP-10	R5	El Paso	0.20	194.64	159.28	176.96	Very Poor	633.30	0.07	0.31	0.01	200.41	52.35	32.53	Low
EP-10	R5	El Paso	0.30	142.21	166.44	154.33	Poor	280.22	0.11	0.14	0.00	88.63	56.43	35.06	Low
EP-10	R5	El Paso	0.40	166.71	131.37	149.04	Poor	410.93	0.08	0.21	0.01	130.05	55.83	34.69	Low
EP-10	R5	El Paso	0.50	162.14	122.79	142.47	Poor	245.52	0.07	0.15	0.01	77.63	59.73	37.11	Low
EP-10	R5	El Paso	0.60	142.69	129.04	135.87	Poor	342.69	0.05	0.20	0.00	108.51	58.60	36.41	Low
EP-10	R5	El Paso	0.70	118.76	129.11	123.94	Fair	242.14	0.02	0.14	0.00	76.57	59.00	36.66	Low
EP-10	R5	El Paso	0.80	120.56	119.82	120.19	Fair	252.60	0.00	0.15	0.00	79.84	58.99	36.66	Low
EP-10	R5	El Paso	0.90	112.30	139.63	125.97	Fair	602.24	0.00	0.35	0.01	190.42	60.98	37.89	Low
EP-10	R5	El Paso	1.10	113.20	118.33	115.77	Fair	208.69	0.00	0.10	0.01	65.93	68.16	42.35	Low
EP-10	R5	El Paso	1.20	106.31	117.68	112.00	Fair	217.79	0.02	0.11	0.00	68.96	66.04	41.03	Low
EP-10	R5	El Paso	1.30	103.30	93.15	98.23	Fair	205.18	0.06	0.10	0.00	64.92	63.56	39.49	Low
EP-10	R5	El Paso	1.40	102.45	119.32	110.89	Fair	226.24	0.03	0.11	0.00	71.50	62.10	38.59	Low
EP-10	R5	El Paso	1.50	98.35	107.27	102.81	Fair	357.22	0.06	0.18	0.00	112.98	62.19	38.64	Low
EP-10	R5	El Paso	1.60	93.33	110.95	102.14	Fair	255.27	0.03	0.13	0.00	80.71	63.00	39.15	Low
EP-10	R5	El Paso	1.70	94.27	118.45	106.36	Fair	273.69	0.01	0.14	0.01	86.60	63.00	39.15	Low
EP-10	R5	El Paso	1.80	111.03	108.63	109.83	Fair	343.44	0.00	0.18	0.00	108.62	63.79	39.63	Low
EP-10	R5	El Paso	2.00	107.26	134.53	120.90	Fair	261.95	0.00	0.14	0.00	82.88	63.63	39.54	Low
EP-10	R5	El Paso	2.40	109.32	121.98	115.65	Fair	359.17	0.00	0.18	0.01	113.68	64.53	40.10	Low
EP-10	R5	El Paso	2.80	114.85	140.50	127.68	Fair	267.57	0.00	0.13	0.01	84.51	60.00	37.28	Low
EP-10	R5	El Paso	2.90	119.33	135.94	127.64	Fair	332.28	0.00	0.17	0.00	105.14	60.00	37.28	Low
EP-10	R5	El Paso	3.00	99.81	119.35	109.58	Fair	321.73	0.00	0.16	0.00	101.82	60.41	37.54	Low
EP-10	R5	El Paso	3.30	118.44	140.87	129.66	Fair	290.58	0.01	0.14	0.00	91.97	59.95	37.25	Low
EP-10	R5	El Paso	3.40	90.23	113.62	101.93	Fair	271.96	0.00	0.14	0.00	85.81	60.00	37.28	Low
EP-10	R5	El Paso	3.50	100.00	113.84	106.92	Fair	413.71	0.00	0.21	0.01	130.93	60.93	37.86	Low
EP-10	R5	El Paso	3.80	111.00	89.02	100.01	Fair	384.06	0.00	0.15	0.00	121.33	64.31	39.96	Low
EP-10	R5	El Paso	4.00	95.53	91.23	93.38	Good	307.56	0.00	0.12	0.01	97.18	65.00	40.39	Low
EP-10	R5	El Paso	4.10	93.86	79.11	86.49	Good	389.42	0.00	0.15	0.00	123.23	65.00	40.39	Low
EP-10	R5	El Paso	4.30	102.12	99.17	100.65	Fair	148.63	0.00	0.08	0.00	47.06	62.77	39.00	Low
EP-10	R5	El Paso	4.40	103.38	120.48	111.93	Fair	430.38	0.00	0.21	0.05	136.31	59.43	36.93	Low

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-10	R5	El Paso	4.50	113.43	116.56	115.00	Fair	514.66	0.00	0.26	0.00	162.81	66.83	41.53	Low
EP-10	R5	El Paso	4.70	93.77	98.14	95.96	Good	147.56	0.00	0.07	0.00	46.67	65.50	40.70	Low
EP-10	R5	El Paso	4.80	104.41	138.14	121.28	Fair	500.00	0.01	0.25	0.01	158.18	62.57	38.88	Low
EP-10	R5	El Paso	4.90	104.26	102.68	103.47	Fair	616.99	0.03	0.31	0.01	195.14	70.74	43.96	Low
EP-10	R5	El Paso	5.00	124.38	128.44	126.41	Fair	211.71	0.01	0.11	0.00	66.96	74.29	46.16	Medium
EP-10	R5	El Paso	5.10	181.95	165.72	173.84	Very Poor	131.85	0.01	0.07	0.00	41.67	68.68	42.67	Low
EP-10	R5	El Paso	5.30	132.18	120.02	126.10	Fair	442.12	0.00	0.23	0.01	139.90	67.02	41.65	Low
EP-10	R5	El Paso	5.40	150.33	135.55	142.94	Poor	322.00	0.00	0.16	0.01	101.81	68.81	42.76	Low
EP-10	R5	El Paso	5.60	138.24	156.27	147.26	Poor	384.65	0.00	0.20	0.02	121.71	62.34	38.74	Low
EP-10	R5	El Paso	6.00	117.16	97.23	107.20	Fair	192.59	0.00	0.09	0.00	61.07	67.18	41.74	Low
EP-10	R5	El Paso	6.10	115.53	135.22	125.38	Fair	239.84	0.06	0.12	0.00	75.77	64.72	40.22	Low
EP-10	R5	El Paso	6.14	120.82	115.69	118.26	Fair	315.20	0.08	0.15	0.01	99.67	64.23	39.91	Low
EP-10	R6	El Paso	0.10	148.64	161.97	155.31	Poor	798.26	1.12	0.41	0.01	253.12	35.07	21.79	Low
EP-10	R6	El Paso	0.20	194.64	159.28	176.96	Very Poor	814.93	0.28	0.42	0.01	257.82	49.63	30.84	Low
EP-10	R6	El Paso	0.30	142.21	166.44	154.33	Poor	482.44	0.04	0.25	0.02	152.50	61.54	38.24	Low
EP-10	R6	El Paso	0.40	166.71	131.37	149.04	Poor	297.81	0.02	0.16	0.00	94.16	63.81	39.65	Low
EP-10	R6	El Paso	0.60	142.69	129.04	135.87	Poor	385.86	0.00	0.19	0.00	122.03	66.60	41.38	Low
EP-10	R6	El Paso	0.70	118.76	129.11	123.94	Fair	286.83	0.00	0.14	0.00	90.72	67.68	42.05	Low
EP-10	R6	El Paso	0.90	112.30	139.63	125.97	Fair	603.13	0.02	0.31	0.00	190.61	71.23	44.26	Low
EP-10	R6	El Paso	1.00	120.03	139.88	129.96	Fair	259.19	0.00	0.14	0.01	82.06	75.66	47.01	Medium
EP-10	R6	El Paso	1.10	113.20	118.33	115.77	Fair	120.89	0.00	0.07	0.00	38.18	72.35	44.96	Low
EP-10	R6	El Paso	1.20	106.31	117.68	112.00	Fair	375.44	0.00	0.24	0.09	118.77	67.41	41.88	Low
EP-10	R6	El Paso	1.50	98.35	107.27	102.81	Fair	466.17	0.00	0.29	0.00	147.53	74.84	46.50	Medium
EP-10	R6	El Paso	1.80	111.03	108.63	109.83	Fair	226.74	0.00	0.13	0.02	71.76	67.69	42.06	Low
EP-10	R6	El Paso	1.90	120.00	133.19	126.60	Fair	257.12	0.00	0.13	0.00	81.47	67.37	41.86	Low
EP-10	R6	El Paso	2.20	101.82	93.21	97.52	Fair	559.65	0.02	0.28	0.00	177.05	74.39	46.22	Medium
EP-10	R6	El Paso	2.60	122.69	113.05	117.87	Fair	175.43	0.00	0.09	0.00	55.51	59.42	36.92	Low
EP-10	R6	El Paso	2.70	103.55	133.17	118.36	Fair	482.51	0.00	0.25	0.00	152.75	60.03	37.30	Low
EP-10	R6	El Paso	3.00	99.81	119.35	109.58	Fair	197.09	0.00	0.10	0.00	62.35	62.86	39.06	Low
EP-10	R6	El Paso	3.30	118.44	140.87	129.66	Fair	520.14	0.00	0.27	0.00	164.45	61.82	38.41	Low
EP-10	R6	El Paso	3.60	106.64	93.81	100.23	Fair	142.27	0.00	0.07	0.00	45.05	67.01	41.64	Low
EP-10	R6	El Paso	3.90	110.49	105.00	107.75	Fair	194.35	0.00	0.11	0.04	61.48	58.39	36.28	Low
EP-10	R6	El Paso	4.10	93.86	79.11	86.49	Good	488.81	0.00	0.25	0.00	154.51	65.14	40.47	Low
EP-10	R6	El Paso	4.20	99.29	119.66	109.48	Fair	281.85	0.00	0.14	0.01	89.16	66.92	41.59	Low
EP-10	R6	El Paso	4.30	102.12	99.17	100.65	Fair	384.32	0.01	0.19	0.02	121.70	64.56	40.12	Low
EP-10	R6	El Paso	4.50	113.43	116.56	115.00	Fair	220.55	0.00	0.11	0.01	69.63	63.15	39.24	Low
EP-10	R6	El Paso	4.70	93.77	98.14	95.96	Good	165.54	0.00	0.07	0.01	52.17	59.30	36.85	Low
EP-10	R6	El Paso	4.80	104.41	138.14	121.28	Fair	539.39	0.00	0.21	0.02	170.48	58.16	36.14	Low
EP-10	R6	El Paso	5.10	181.95	165.72	173.84	Very Poor	188.15	0.75	0.08	0.01	59.94	60.94	37.87	Low
EP-10	R6	El Paso	5.20	112.92	130.51	121.72	Fair	179.81	0.11	0.09	0.00	57.00	55.39	34.42	Low
EP-10	R6	El Paso	5.30	132.18	120.02	126.10	Fair	505.66	0.12	0.26	0.01	159.97	56.37	35.03	Low
EP-10	R6	El Paso	5.40	150.33	135.55	142.94	Poor	192.76	0.02	0.10	0.00	61.06	57.97	36.02	Low
EP-10	R6	El Paso	5.50	163.96	136.53	150.25	Poor	478.48	0.02	0.24	0.01	151.40	58.16	36.14	Low
EP-10	R6	El Paso	5.60	138.24	156.27	147.26	Poor	275.07	0.01	0.14	0.00	86.83	62.49	38.83	Low
EP-10	R6	El Paso	5.90	137.33	144.39	140.86	Poor	298.44	0.00	0.15	0.01	94.44	48.60	30.20	Low
EP-10	R6	El Paso	6.00	117.16	97.23	107.20	Fair	372.43	0.00	0.19	0.00	117.75	52.99	32.93	Low
EP-10	R6	El Paso	6.10	115.53	135.22	125.38	Fair	149.97	0.03	0.07	0.00	47.32	50.16	31.17	Low
EP-10	R6	El Paso	6.14	120.82	115.69	118.26	Fair	604.12	0.49	0.31	0.01	191.27	49.97	31.05	Low
EP-10	R7	El Paso	0.10	148.64	161.97	155.31	Poor	1258.82	0.57	0.65	0.09	398.37	45.40	28.21	Low
EP-10	R7	El Paso	0.20	194.64	159.28	176.96	Very Poor	828.97	0.02	0.43	0.01	262.27	61.94	38.49	Low
EP-10	R7	El Paso	0.30	142.21	166.44	154.33	Poor	395.55	0.00	0.21	0.01	125.17	70.52	43.82	Low
EP-10	R7	El Paso	0.40	166.71	131.37	149.04	Poor	60.36	0.01	0.04	0.00	19.06	66.97	41.61	Low
EP-10	R7	El Paso	0.50	162.14	122.79	142.47	Poor	386.74	0.00	0.20	0.00	122.20	63.16	39.24	Low
EP-10	R7	El Paso	0.80	120.56	119.82	120.19	Fair	250.21	0.00	0.13	0.02	79.21	64.03	39.79	Low
EP-10	R7	El Paso	0.90	112.30	139.63	125.97	Fair	113.49	0.00	0.06	0.00	35.89	62.02	38.54	Low
EP-10	R7	El Paso	1.00	120.03	139.88	129.96	Fair	208.49	0.01	0.10	0.00	66.05	58.28	36.21	Low
EP-10	R7	El Paso	1.10	113.20	118.33	115.77	Fair	326.27	0.01	0.16	0.01	103.14	58.32	36.24	Low
EP-10	R7	El Paso	1.70	94.27	118.45	106.36	Fair	402.38	0.00	0.20	0.00	127.19	61.74	38.36	Low
EP-10	R7	El Paso	1.90	120.00	133.19	126.60	Fair	225.86	0.00	0.11	0.00	71.37	65.27	40.56	Low
EP-10	R7	El Paso	2.00	107.26	134.53	120.90	Fair	256.20	0.00	0.13	0.00	81.12	63.46	39.43	Low
EP-10	R7	El Paso	2.10	107.64	129.89	118.77	Fair	390.80	0.00	0.26	0.00	123.74	63.00	39.15	Low
EP-10	R7	El Paso	2.30	112.72	113.46	113.09	Fair	203.25	0.00	0.13	0.00	64.43	64.85	40.29	Low
EP-10	R7	El Paso	2.50	115.12	126.18	120.65	Fair	361.53	0.00	0.24	0.03	114.48	55.75	34.64	Low
EP-10	R7	El Paso	2.80	114.85	140.50	127.68	Fair	149.87	0.00	0.07	0.00	47.38	63.03	39.16	Low
EP-10	R7	El Paso	2.90	119.33	135.94	127.64	Fair	214.63	0.00	0.11	0.00	67.82	60.18	37.39	Low
EP-10	R7	El Paso	3.00	99.81	119.35	109.58	Fair	184.25	0.00	0.09	0.00	58.22	57.27	35.58	Low
EP-10	R7	El Paso	3.10	149.29	127.15	138.22	Poor	259.81	0.01	0.13	0.00	82.18	54.80	34.05	Low
EP-10	R7	El Paso	3.20	107.23	132.65	119.94	Fair	597.43	0.02	0.30	0.01	189.00	56.26	34.96	Low
EP-10	R7	El Paso	3.30	118.44	140.87	129.66	Fair	387.00	0.01	0.19	0.00	122.41	63.54	39.48	Low
EP-10	R7	El Paso	3.50	100.00	113.84	106.92	Fair	283.65	0.03	0.14	0.00	89.72	64.37	40.00	Low
EP-10	R7	El Paso	3.60	106.64	93.81	100.23	Fair	275.93	0.01	0.14	0.00	87.25	65.00	40.39	Low
EP-10	R7	El Paso	3.70	125.48	90.91	108.20	Fair	372.81	0.00	0.18	0.00	117.84	65.34	40.60	Low
EP-10	R7	El Paso	3.90	110.49	105.00	107.75	Fair	212.14	0.00	0.13	0.04	67.19	59.43	36.93	Low
EP-10	R7	El Paso	4.10	93.86	79.11	86.49	Good	153.03	0.00	0.08	0.00	48.48	59.50	36.97	Low
EP-10	R7	El Paso	4.20	99.29	119.66	109.48	Fair	474.85	0.03	0.23	0.01	150.06	57.14	35.50	Low
EP-10	R7	El Paso	4.30	102.12	99.17	100.65	Fair	320.80	0.07	0.16	0.00	101.42	61.29	38.08	Low
EP-10	R7	El Paso	4.40	103.38	120.48	111.93	Fair	284.45	0.10	0.14	0.00	90.04	60.86	37.82	Low

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-10	R7	El Paso	4.50	113.43	116.56	115.00	Fair	309.01	0.23	0.15	0.01	97.93	62.10	38.59	Low
EP-10	R7	El Paso	4.60	111.23	133.48	122.36	Fair	226.93	0.15	0.11	0.00	71.85	61.19	38.02	Low
EP-10	R7	El Paso	4.70	93.77	98.14	95.96	Good	370.71	0.14	0.19	0.00	117.40	59.89	37.22	Low
EP-10	R7	El Paso	4.80	104.41	138.14	121.28	Fair	349.47	0.04	0.18	0.02	110.58	59.73	37.11	Low
EP-10	R7	El Paso	4.90	104.26	102.68	103.47	Fair	531.20	0.37	0.27	0.03	168.16	65.33	40.59	Low
EP-10	R7	El Paso	5.00	124.38	128.44	126.41	Fair	336.27	0.36	0.17	0.00	106.61	69.58	43.23	Low
EP-10	R7	El Paso	5.10	181.95	165.72	173.84	Very Poor	164.89	0.09	0.08	0.02	52.08	67.24	41.78	Low
EP-10	R7	El Paso	5.20	112.92	130.51	121.72	Fair	149.91	0.03	0.07	0.00	47.36	62.97	39.13	Low
EP-10	R7	El Paso	5.60	138.24	156.27	147.26	Poor	332.71	0.00	0.10	0.00	105.12	60.74	37.74	Low
EP-10	R7	El Paso	5.70	137.18	153.35	145.27	Poor	310.27	0.00	0.10	0.00	98.02	61.47	38.20	Low
EP-10	R7	El Paso	5.80	134.55	127.19	130.87	Fair	390.61	0.02	0.16	0.01	123.50	63.12	39.22	Low
EP-10	R7	El Paso	6.00	117.16	97.23	107.20	Fair	328.20	0.00	0.16	0.00	103.80	64.00	39.77	Low
EP-10	R7	El Paso	6.14	120.82	115.69	118.26	Fair	314.88	0.00	0.15	0.00	99.45	66.00	41.01	Low
EP-10	R8	El Paso	0.10	148.64	161.97	155.31	Poor	1215.55	0.67	0.62	0.03	384.90	40.85	25.39	Low
EP-10	R8	El Paso	0.20	194.64	159.28	176.96	Very Poor	1200.35	0.32	0.62	0.08	379.86	61.12	37.98	Low
EP-10	R8	El Paso	0.30	142.21	166.44	154.33	Poor	639.74	1.64	0.33	0.01	203.00	78.00	48.46	Medium
EP-10	R8	El Paso	0.40	166.71	131.37	149.04	Poor	593.73	1.76	0.31	0.00	188.70	80.70	50.14	Medium
EP-10	R8	El Paso	0.50	162.14	122.79	142.47	Poor	604.01	2.89	0.31	0.01	192.43	84.36	52.42	Medium
EP-10	R8	El Paso	0.60	142.69	129.04	135.87	Poor	454.96	3.74	0.24	0.02	145.86	86.50	53.75	Medium
EP-10	R8	El Paso	0.70	118.76	129.11	123.94	Fair	212.26	0.93	0.11	0.01	67.66	84.43	52.46	Medium
EP-10	R8	El Paso	0.80	120.56	119.82	120.19	Fair	574.67	0.36	0.29	0.00	182.07	82.79	51.44	Medium
EP-10	R8	El Paso	0.90	112.30	139.63	125.97	Fair	476.67	2.93	0.24	0.01	152.12	84.88	52.74	Medium
EP-10	R8	El Paso	1.00	120.03	139.88	129.96	Fair	223.89	0.28	0.12	0.01	70.89	82.15	51.05	Medium
EP-10	R8	El Paso	1.10	113.20	118.33	115.77	Fair	560.88	0.23	0.28	0.00	177.38	80.63	50.10	Medium
EP-10	R8	El Paso	1.20	106.31	117.68	112.00	Fair	223.76	0.75	0.12	0.00	71.14	81.05	50.36	Medium
EP-10	R8	El Paso	1.30	103.30	93.15	98.23	Fair	295.45	0.15	0.15	0.01	93.44	74.20	46.11	Medium
EP-10	R8	El Paso	1.40	102.45	119.32	110.89	Fair	810.50	0.17	0.40	0.00	256.49	76.53	47.56	Medium
EP-10	R8	El Paso	1.50	98.35	107.27	102.81	Fair	416.73	0.65	0.21	0.00	131.97	81.78	50.82	Medium
EP-10	R8	El Paso	1.60	93.33	110.95	102.14	Fair	460.08	0.45	0.23	0.00	145.84	79.63	49.48	Medium
EP-10	R8	El Paso	1.80	111.03	108.63	109.83	Fair	340.75	0.43	0.17	0.02	107.98	79.88	49.63	Medium
EP-10	R8	El Paso	1.90	120.00	133.19	126.60	Fair	541.03	0.59	0.28	0.01	171.62	78.89	49.02	Medium
EP-10	R8	El Paso	2.00	107.26	134.53	120.90	Fair	654.31	0.71	0.33	0.00	207.29	81.67	50.75	Medium
EP-10	R8	El Paso	2.10	107.64	129.89	118.77	Fair	524.58	2.38	0.27	0.02	166.96	85.29	52.99	Medium
EP-10	R8	El Paso	2.20	101.82	93.21	97.52	Fair	220.26	0.47	0.11	0.06	69.84	82.69	51.38	Medium
EP-10	R8	El Paso	2.30	112.72	113.46	113.09	Fair	604.15	0.10	0.32	0.05	191.28	79.61	49.47	Medium
EP-10	R8	El Paso	2.40	109.32	121.98	115.65	Fair	369.36	0.05	0.19	0.11	116.93	81.70	50.77	Medium
EP-10	R8	El Paso	2.50	115.12	126.18	120.65	Fair	387.97	0.09	0.23	0.06	122.79	80.32	49.91	Medium
EP-10	R8	El Paso	2.60	122.69	113.05	117.87	Fair	360.46	0.21	0.24	0.01	114.20	79.09	49.15	Medium
EP-10	R8	El Paso	2.70	103.55	133.17	118.36	Fair	375.93	0.15	0.24	0.03	118.94	76.84	47.75	Medium
EP-10	R8	El Paso	2.80	114.85	140.50	127.68	Fair	634.10	0.27	0.41	0.03	200.87	77.85	48.37	Medium
EP-10	R8	El Paso	2.90	119.33	135.94	127.64	Fair	556.14	1.18	0.36	0.04	176.68	81.76	50.80	Medium
EP-10	R8	El Paso	3.00	99.81	119.35	109.58	Fair	524.92	0.44	0.34	0.04	166.23	82.96	51.55	Medium
EP-10	R8	El Paso	3.10	149.29	127.15	138.22	Poor	444.27	0.74	0.29	0.01	141.05	84.76	52.67	Medium
EP-10	R8	El Paso	3.20	107.23	132.65	119.94	Fair	431.12	0.41	0.28	0.01	136.61	81.89	50.88	Medium
EP-10	R8	El Paso	3.30	118.44	140.87	129.66	Fair	472.30	0.46	0.24	0.00	149.67	82.46	51.24	Medium
EP-10	R8	El Paso	3.40	90.23	113.62	101.93	Fair	422.99	0.58	0.21	0.00	134.07	82.01	50.96	Medium
EP-10	R8	El Paso	3.50	100.00	113.84	106.92	Fair	639.45	2.37	0.33	0.03	203.43	83.69	52.00	Medium
EP-10	R8	El Paso	3.60	106.64	93.81	100.23	Fair	596.36	3.93	0.32	0.05	190.65	87.42	54.32	Medium
EP-10	R8	El Paso	3.70	125.48	90.91	108.20	Fair	392.03	4.52	0.21	0.03	126.22	89.39	55.54	Medium
EP-10	R8	El Paso	3.80	111.00	89.02	100.01	Fair	241.21	0.09	0.13	0.01	76.37	84.97	52.80	Medium
EP-10	R8	El Paso	3.90	110.49	105.00	107.75	Fair	246.37	0.00	0.13	0.00	77.95	82.14	51.04	Medium
EP-10	R8	El Paso	4.00	95.53	91.23	93.38	Good	469.19	0.24	0.25	0.02	148.49	78.29	48.65	Medium
EP-10	R8	El Paso	4.10	93.86	79.11	86.49	Good	566.88	2.20	0.30	0.00	180.31	80.36	49.93	Medium
EP-10	R8	El Paso	4.20	99.29	119.66	109.48	Fair	545.97	4.23	0.29	0.02	174.67	83.92	52.15	Medium
EP-10	R8	El Paso	4.30	102.12	99.17	100.65	Fair	496.43	6.19	0.27	0.15	160.18	84.66	52.61	Medium
EP-10	R8	El Paso	4.40	103.38	120.48	111.93	Fair	414.66	0.44	0.22	0.06	131.47	84.00	52.20	Medium
EP-10	R8	El Paso	4.50	113.43	116.56	115.00	Fair	100.03	0.34	0.07	0.00	31.95	80.42	49.97	Medium
EP-10	R8	El Paso	4.60	111.23	133.48	122.36	Fair	644.41	1.06	0.34	0.01	204.38	76.84	47.75	Medium
EP-10	R8	El Paso	4.70	93.77	98.14	95.96	Good	639.94	1.43	0.33	0.01	203.14	80.35	49.93	Medium
EP-10	R8	El Paso	4.80	104.41	138.14	121.28	Fair	517.04	1.42	0.27	0.01	164.26	82.00	50.95	Medium
EP-10	R8	El Paso	4.90	104.26	102.68	103.47	Fair	293.08	0.62	0.15	0.18	92.84	80.85	50.24	Medium
EP-10	R8	El Paso	5.00	124.38	128.44	126.41	Fair	413.07	0.02	0.22	0.07	130.79	77.72	48.29	Medium
EP-10	R8	El Paso	5.10	181.95	165.72	173.84	Very Poor	355.25	0.10	0.18	0.03	112.33	76.36	47.45	Medium
EP-10	R8	El Paso	5.20	112.92	130.51	121.72	Fair	617.22	0.36	0.32	0.04	195.34	78.07	48.51	Medium
EP-10	R8	El Paso	5.30	132.18	120.02	126.10	Fair	568.47	0.38	0.30	0.03	180.01	80.76	50.18	Medium
EP-10	R8	El Paso	5.40	150.33	135.55	142.94	Poor	412.68	0.41	0.22	0.11	130.69	80.35	49.93	Medium
EP-10	R8	El Paso	5.50	163.96	136.53	150.25	Poor	294.15	0.12	0.15	0.08	93.09	78.51	48.78	Medium
EP-10	R8	El Paso	5.60	138.24	156.27	147.26	Poor	476.91	0.12	0.24	0.14	150.84	76.25	47.38	Medium
EP-10	R8	El Paso	5.70	137.18	153.35	145.27	Poor	561.83	0.14	0.29	0.04	177.68	76.98	47.84	Medium
EP-10	R8	El Paso	5.80	134.55	127.19	130.87	Fair	534.80	0.43	0.28	0.03	169.36	80.33	49.91	Medium
EP-10	R8	El Paso	5.90	137.33	144.39	140.86	Poor	334.44	0.21	0.18	0.32	105.84	80.01	49.72	Medium
EP-10	R8	El Paso	6.00	117.16	97.23	107.20	Fair	465.04	0.62	0.25	0.12	147.38	77.08	47.90	Medium
EP-10	R8	El Paso	6.10	115.53	135.22	125.38	Fair	431.23	3.09	0.23	0.09	137.96	79.87	49.63	Medium
EP-10	R8	El Paso	6.14	120.82	115.69	118.26	Fair	263.47	0.22	0.14	0.08	83.34	78.55	48.81	Medium
EP-10	R9	El Paso	0.10	148.64	161.97	155.31	Poor	1544.55	0.90	0.78	0.23	489.25	48.46	30.11	Low
EP-10	R9	El Paso	0.20	194.64	159.28	176.96	Very Poor	1186.97	3.16	0.60	0.16	377.00	71.19	44.23	Low
EP-10	R9	El Paso	0.30	142.21	166.44	154.33	Poor	552.50	5.48	0.29	0.01	177.47	82.62	51.34	Medium

Table C.3. PEMS and Roughness Data, EL PASO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Codition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
EP-10	R9	El Paso	0.40	166.71	131.37	149.04	Poor	586.31	5.72	0.31	0.00	188.36	84.73	52.65	Medium
EP-10	R9	El Paso	0.70	118.76	129.11	123.94	Fair	213.42	0.94	0.11	0.11	67.94	100.19	62.25	High
EP-10	R9	El Paso	0.80	120.56	119.82	120.19	Fair	462.45	1.49	0.24	0.22	147.03	98.37	61.13	High
EP-10	R9	El Paso	0.90	112.30	139.63	125.97	Fair	481.30	1.09	0.25	0.30	152.90	99.68	61.94	High
EP-10	R9	El Paso	1.00	120.03	139.88	129.96	Fair	410.72	0.42	0.22	0.16	130.12	99.19	61.63	High
EP-10	R9	El Paso	1.10	113.20	118.33	115.77	Fair	332.95	1.35	0.18	0.05	105.95	96.02	59.66	Medium
EP-10	R9	El Paso	1.20	106.31	117.68	112.00	Fair	417.00	6.40	0.22	0.01	135.06	95.47	59.33	Medium
EP-10	R9	El Paso	1.30	103.30	93.15	98.23	Fair	426.57	4.50	0.23	0.01	137.22	94.15	58.50	Medium
EP-10	R9	El Paso	1.40	102.45	119.32	110.89	Fair	814.19	8.97	0.42	0.04	262.06	97.52	60.60	High
EP-10	R9	El Paso	1.50	98.35	107.27	102.81	Fair	595.83	3.96	0.31	0.10	190.43	104.86	65.16	High
EP-10	R9	El Paso	1.60	93.33	110.95	102.14	Fair	365.60	3.04	0.19	0.05	117.08	108.10	67.17	High
EP-10	R9	El Paso	1.70	94.27	118.45	106.36	Fair	298.88	0.57	0.17	0.02	94.76	104.03	64.64	High
EP-10	R9	El Paso	1.80	111.03	108.63	109.83	Fair	762.36	2.30	0.33	0.15	242.17	104.72	65.07	High
EP-10	R9	El Paso	2.20	101.82	93.21	97.52	Fair	157.82	0.05	0.06	0.01	49.96	104.19	64.74	High
EP-10	R9	El Paso	2.30	112.72	113.46	113.09	Fair	311.20	0.05	0.11	0.01	98.53	99.35	61.73	High
EP-10	R9	El Paso	2.40	109.32	121.98	115.65	Fair	654.97	0.55	0.22	0.05	207.44	99.22	61.65	High
EP-10	R9	El Paso	2.50	115.12	126.18	120.65	Fair	622.10	1.08	0.21	0.15	197.18	102.66	63.79	High
EP-10	R9	El Paso	2.60	122.69	113.05	117.87	Fair	576.19	1.22	0.21	0.25	182.76	105.58	65.61	High
EP-10	R9	El Paso	2.70	103.55	133.17	118.36	Fair	197.71	0.50	0.07	0.03	62.68	106.18	65.97	High
EP-10	R9	El Paso	2.80	114.85	140.50	127.68	Fair	346.40	0.66	0.14	0.10	109.96	100.91	62.70	High
EP-10	R9	El Paso	2.90	119.33	135.94	127.64	Fair	546.13	1.06	0.26	0.25	173.35	100.85	62.66	High
EP-10	R9	El Paso	3.00	99.81	119.35	109.58	Fair	292.91	0.89	0.14	0.03	93.15	99.89	62.07	High
EP-10	R9	El Paso	3.10	149.29	127.15	138.22	Poor	575.29	8.42	0.28	0.01	186.17	98.62	61.28	High
EP-10	R9	El Paso	3.20	107.23	132.65	119.94	Fair	423.66	3.91	0.21	0.01	135.97	97.94	60.86	High
EP-10	R9	El Paso	3.40	90.23	113.62	101.93	Fair	805.11	6.79	0.42	0.13	258.04	103.72	64.45	High
EP-10	R9	El Paso	3.50	100.00	113.84	106.92	Fair	295.47	2.30	0.15	0.09	94.54	108.67	67.52	High
EP-10	R9	El Paso	3.60	106.64	93.81	100.23	Fair	316.25	0.57	0.16	0.04	100.38	105.86	65.78	High
EP-10	R9	El Paso	3.70	125.48	90.91	108.20	Fair	379.46	4.21	0.20	0.06	122.11	103.73	64.46	High
EP-10	R9	El Paso	3.80	111.00	89.02	100.01	Fair	617.90	0.58	0.31	0.05	195.71	101.04	62.78	High
EP-10	R9	El Paso	3.90	110.49	105.00	107.75	Fair	400.82	3.14	0.20	0.10	128.30	103.68	64.43	High
EP-10	R9	El Paso	4.00	95.53	91.23	93.38	Good	521.86	0.32	0.27	0.09	165.25	102.30	63.57	High
EP-10	R9	El Paso	4.10	93.86	79.11	86.49	Good	642.44	1.90	0.33	0.09	204.17	105.18	65.35	High
EP-10	R9	El Paso	4.20	99.29	119.66	109.48	Fair	547.08	3.33	0.28	0.08	174.57	107.40	66.74	High
EP-10	R9	El Paso	4.30	102.12	99.17	100.65	Fair	395.56	1.49	0.20	0.04	125.94	106.70	66.30	High
EP-10	R9	El Paso	4.40	103.38	120.48	111.93	Fair	367.48	1.20	0.19	0.06	116.77	105.96	65.84	High
EP-10	R9	El Paso	4.50	113.43	116.56	115.00	Fair	365.47	0.91	0.19	0.21	116.04	102.79	63.87	High
EP-10	R9	El Paso	4.60	111.23	133.48	122.36	Fair	352.59	0.80	0.18	0.10	111.88	100.04	62.16	High
EP-10	R9	El Paso	4.70	93.77	98.14	95.96	Good	477.34	3.98	0.25	0.03	153.03	95.49	59.33	Medium
EP-10	R9	El Paso	4.80	104.41	138.14	121.28	Fair	368.53	3.63	0.19	0.01	118.39	96.40	59.90	Medium
EP-10	R9	El Paso	5.00	124.38	128.44	126.41	Fair	684.33	4.46	0.36	0.45	218.71	101.31	62.95	High
EP-10	R9	El Paso	5.10	181.95	165.72	173.84	Very Poor	400.12	1.56	0.21	0.15	127.25	104.57	64.98	High
EP-10	R9	El Paso	5.20	112.92	130.51	121.72	Fair	167.25	0.15	0.09	0.07	53.04	101.64	63.15	High
EP-10	R9	El Paso	5.30	132.18	120.02	126.10	Fair	472.59	6.49	0.25	0.10	152.72	95.68	59.45	Medium
EP-10	R9	El Paso	5.40	150.33	135.55	142.94	Poor	607.69	8.54	0.32	0.02	196.41	94.54	58.74	Medium
EP-10	R9	El Paso	5.50	163.96	136.53	150.25	Poor	635.29	7.36	0.34	0.13	204.64	98.18	61.01	High
EP-10	R9	El Paso	5.60	138.24	156.27	147.26	Poor	530.29	0.03	0.28	0.52	167.75	100.61	62.51	High
EP-10	R9	El Paso	5.70	137.18	153.35	145.27	Poor	565.45	0.37	0.29	0.44	179.07	101.21	62.89	High
EP-10	R9	El Paso	5.80	134.55	127.19	130.87	Fair	400.73	0.27	0.21	0.10	126.93	101.67	63.17	High
EP-10	R9	El Paso	5.90	137.33	144.39	140.86	Poor	472.10	0.18	0.24	0.06	149.50	101.00	62.76	High
EP-10	R9	El Paso	6.00	117.16	97.23	107.20	Fair	372.58	0.18	0.19	0.07	117.96	99.66	61.92	High
EP-10	R9	El Paso	6.10	115.53	135.22	125.38	Fair	360.84	1.18	0.19	0.02	114.66	96.08	59.70	Medium
EP-10	R9	El Paso	6.14	120.82	115.69	118.26	Fair	492.21	7.90	0.25	0.03	159.39	94.19	58.53	Medium

HOUSTON

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-01	R1	Houston	0.10	69.00	70.00	69.50	Good	418.33	0.06	0.26	0.01	132.28	71.25	44.53	Low
HOUSTON-01	R1	Houston	0.20	60.00	67.00	63.50	Good	639.63	0.06	0.39	0.02	202.36	71.89	44.93	Low
HOUSTON-01	R1	Houston	0.30	47.00	55.00	51.00	Very Good	720.22	0.00	0.44	0.04	228.26	73.06	45.66	Medium
HOUSTON-01	R1	Houston	0.40	52.00	64.00	58.00	Very Good	597.08	0.03	0.37	0.08	188.72	74.28	46.43	Medium
HOUSTON-01	R1	Houston	0.50	52.00	56.00	54.00	Very Good	266.79	0.04	0.17	0.01	84.53	74.67	46.67	Medium
HOUSTON-01	R1	Houston	0.60	61.00	59.00	60.00	Good	743.13	0.00	0.45	0.01	235.07	77.18	48.24	Medium
HOUSTON-01	R1	Houston	0.70	78.00	123.00	100.50	Fair	569.63	0.03	0.35	0.06	180.00	77.30	48.31	Medium
HOUSTON-01	R1	Houston	0.80	59.00	58.00	58.50	Very Good	699.10	0.03	0.43	0.05	221.31	77.83	48.64	Medium
HOUSTON-01	R1	Houston	0.90	71.00	64.00	67.50	Good	739.93	0.00	0.45	0.02	234.44	78.23	48.90	Medium
HOUSTON-01	R1	Houston	1.00	50.00	70.00	60.00	Good	734.04	0.00	0.45	0.03	231.94	70.17	43.86	Low
HOUSTON-01	R1	Houston	1.10	68.00	72.00	70.00	Good	621.55	0.00	0.38	0.01	196.36	78.51	49.07	Medium
HOUSTON-01	R1	Houston	1.20	59.00	56.00	57.50	Very Good	722.20	0.00	0.44	0.01	228.73	78.87	49.30	Medium
HOUSTON-01	R1	Houston	1.30	58.00	68.00	63.00	Good	730.67	0.07	0.45	0.06	231.16	79.38	49.61	Medium
HOUSTON-01	R1	Houston	1.40	58.00	71.00	64.50	Good	676.78	0.00	0.41	0.02	214.05	82.57	51.60	Medium
HOUSTON-01	R1	Houston	1.50	67.00	82.00	74.50	Good	668.05	0.03	0.41	0.05	211.65	84.60	52.88	Medium
HOUSTON-01	R2	Houston	0.10	52.00	56.00	54.00	Very Good	863.67	0.51	0.54	0.61	273.57	73.93	45.94	Medium
HOUSTON-01	R2	Houston	0.20	69.00	70.00	69.50	Good	730.02	0.36	0.46	0.33	230.92	79.21	49.22	Medium
HOUSTON-01	R2	Houston	0.30	60.00	67.00	63.50	Good	714.09	0.35	0.45	0.21	226.42	79.44	49.36	Medium
HOUSTON-01	R2	Houston	0.40	58.00	68.00	63.00	Good	449.60	0.22	0.28	0.08	142.10	79.93	49.66	Medium
HOUSTON-01	R2	Houston	0.50	52.00	64.00	58.00	Very Good	373.64	0.18	0.23	0.05	118.36	76.22	47.36	Medium
HOUSTON-01	R2	Houston	0.60	78.00	123.00	100.50	Fair	171.93	0.08	0.11	0.03	54.44	71.49	44.42	Low
HOUSTON-01	R2	Houston	0.70	67.00	82.00	74.50	Good	258.60	0.12	0.16	0.05	81.65	73.22	45.50	Medium
HOUSTON-01	R2	Houston	0.80	59.00	58.00	58.50	Very Good	491.18	0.20	0.31	0.09	155.81	69.35	43.09	Low
HOUSTON-01	R2	Houston	0.90	47.00	55.00	51.00	Very Good	687.39	0.28	0.43	0.12	217.60	74.91	46.54	Medium
HOUSTON-01	R2	Houston	1.00	50.00	70.00	60.00	Good	482.04	0.18	0.30	0.07	152.88	74.70	46.42	Medium
HOUSTON-01	R2	Houston	1.10	71.00	64.00	67.50	Good	386.94	0.12	0.24	0.08	122.80	67.22	41.77	Low
HOUSTON-01	R2	Houston	1.20	61.00	59.00	60.00	Good	600.72	0.16	0.37	0.30	189.89	68.75	42.72	Low
HOUSTON-01	R2	Houston	1.30	58.00	71.00	64.50	Good	691.67	0.16	0.43	0.38	218.79	70.31	43.69	Low
HOUSTON-01	R2	Houston	1.40	68.00	72.00	70.00	Good	1447.65	0.33	0.91	0.47	458.24	73.52	45.68	Medium
HOUSTON-01	R2	Houston	1.50	59.00	56.00	57.50	Very Good	1755.81	0.32	1.10	0.36	555.52	74.26	46.14	Medium
HOUSTON-01	R3	Houston	0.10	52.00	56.00	54.00	Very Good	310.91	0.39	0.12	0.05	98.51	91.47	57.17	Medium
HOUSTON-01	R3	Houston	0.20	69.00	70.00	69.50	Good	168.26	0.25	0.07	0.03	53.38	92.46	57.79	Medium
HOUSTON-01	R3	Houston	0.30	60.00	67.00	63.50	Good	206.47	0.34	0.08	0.02	65.71	92.00	57.50	Medium
HOUSTON-01	R3	Houston	0.40	58.00	68.00	63.00	Good	215.66	0.39	0.08	0.02	68.63	89.24	55.78	Medium
HOUSTON-01	R3	Houston	0.50	52.00	64.00	58.00	Very Good	215.48	0.40	0.08	0.01	68.05	90.19	56.37	Medium
HOUSTON-01	R3	Houston	0.60	78.00	123.00	100.50	Fair	212.74	0.39	0.08	0.01	67.30	90.48	56.55	Medium
HOUSTON-01	R3	Houston	0.70	67.00	82.00	74.50	Good	195.55	0.35	0.08	0.01	61.84	93.90	58.69	Medium
HOUSTON-01	R3	Houston	0.80	59.00	58.00	58.50	Very Good	192.06	0.34	0.07	0.01	60.63	94.98	59.36	Medium
HOUSTON-01	R3	Houston	0.90	47.00	55.00	51.00	Very Good	210.95	0.35	0.08	0.02	66.69	86.91	54.32	Medium
HOUSTON-01	R3	Houston	1.00	50.00	70.00	60.00	Good	230.11	0.36	0.09	0.03	72.76	88.27	55.17	Medium
HOUSTON-01	R3	Houston	1.10	71.00	64.00	67.50	Good	238.13	0.35	0.09	0.05	75.32	92.73	57.96	Medium
HOUSTON-01	R3	Houston	1.20	61.00	59.00	60.00	Good	241.18	0.33	0.09	0.07	76.22	87.65	54.78	Medium
HOUSTON-01	R3	Houston	1.30	58.00	71.00	64.50	Good	225.59	0.29	0.09	0.07	71.37	85.75	53.60	Medium
HOUSTON-01	R3	Houston	1.40	68.00	72.00	70.00	Good	231.73	0.28	0.09	0.05	73.44	87.46	54.66	Medium
HOUSTON-01	R3	Houston	1.50	59.00	56.00	57.50	Very Good	242.85	0.27	0.09	0.05	76.80	83.60	52.25	Medium
HOUSTON-01	R4	Houston	0.10	52.00	56.00	54.00	Very Good	379.31	0.92	0.09	0.05	120.37	92.61	57.54	Medium
HOUSTON-01	R4	Houston	0.20	69.00	70.00	69.50	Good	481.19	0.89	0.12	0.11	152.86	86.70	53.87	Medium
HOUSTON-01	R4	Houston	0.30	60.00	67.00	63.50	Good	564.57	0.85	0.14	0.30	178.71	88.51	55.00	Medium
HOUSTON-01	R4	Houston	0.40	58.00	68.00	63.00	Good	556.15	0.64	0.13	0.44	175.75	86.82	53.95	Medium
HOUSTON-01	R4	Houston	0.50	52.00	64.00	58.00	Very Good	545.60	0.47	0.13	0.32	172.51	80.01	49.71	Medium
HOUSTON-01	R4	Houston	0.60	78.00	123.00	100.50	Fair	352.98	0.20	0.08	0.17	111.55	81.13	50.41	Medium
HOUSTON-01	R4	Houston	0.70	67.00	82.00	74.50	Good	141.63	0.06	0.03	0.06	44.48	91.34	56.76	Medium
HOUSTON-01	R4	Houston	0.80	59.00	58.00	58.50	Very Good	173.14	0.07	0.05	0.07	54.51	88.42	54.94	Medium
HOUSTON-01	R4	Houston	0.90	47.00	55.00	51.00	Very Good	231.38	0.08	0.06	0.08	73.12	87.91	54.62	Medium
HOUSTON-01	R4	Houston	1.00	50.00	70.00	60.00	Good	412.18	0.12	0.10	0.11	130.02	92.61	57.54	Medium
HOUSTON-01	R4	Houston	1.10	71.00	64.00	67.50	Good	626.92	0.14	0.15	0.11	198.57	83.79	52.07	Medium
HOUSTON-01	R4	Houston	1.20	61.00	59.00	60.00	Good	573.01	0.10	0.14	0.07	181.50	77.45	48.13	Medium
HOUSTON-01	R4	Houston	1.30	58.00	71.00	64.50	Good	320.55	0.05	0.07	0.03	101.43	76.37	47.45	Medium
HOUSTON-01	R4	Houston	1.40	68.00	72.00	70.00	Good	181.02	0.02	0.04	0.01	57.02	84.31	52.39	Medium
HOUSTON-01	R4	Houston	1.50	59.00	56.00	57.50	Very Good	213.69	0.02	0.05	0.01	67.76	90.28	56.10	Medium
HOUSTON-01	R5	Houston	0.10	52.00	56.00	54.00	Very Good	207.30	0.20	0.06	0.01	65.49	83.52	51.90	Medium
HOUSTON-01	R5	Houston	0.20	69.00	70.00	69.50	Good	216.53	0.22	0.06	0.01	68.61	84.91	52.76	Medium
HOUSTON-01	R5	Houston	0.30	60.00	67.00	63.50	Good	226.45	0.23	0.07	0.02	72.00	83.30	51.76	Medium
HOUSTON-01	R5	Houston	0.40	58.00	68.00	63.00	Good	231.09	0.23	0.07	0.03	73.03	79.56	49.43	Medium
HOUSTON-01	R5	Houston	0.50	52.00	64.00	58.00	Very Good	308.43	0.29	0.09	0.05	97.92	75.67	47.02	Medium
HOUSTON-01	R5	Houston	0.60	78.00	123.00	100.50	Fair	681.88	0.64	0.20	0.19	215.58	79.22	49.22	Medium
HOUSTON-01	R5	Houston	0.70	67.00	82.00	74.50	Good	704.37	0.63	0.21	0.35	222.89	80.86	50.25	Medium
HOUSTON-01	R5	Houston	0.80	59.00	58.00	58.50	Very Good	700.54	0.62	0.21	0.31	221.98	83.20	51.70	Medium
HOUSTON-01	R5	Houston	0.90	47.00	55.00	51.00	Very Good	707.46	0.63	0.21	0.18	223.73	89.81	55.81	Medium
HOUSTON-01	R5	Houston	1.00	50.00	70.00	60.00	Good	709.27	0.63	0.21	0.09	224.62	93.73	58.24	Medium
HOUSTON-01	R5	Houston	1.10	71.00	64.00	67.50	Good	697.57	0.62	0.21	0.06	220.75	87.07	54.10	Medium
HOUSTON-01	R5	Houston	1.20	61.00	59.00	60.00	Good	672.08	0.60	0.20	0.06	213.07	64.67	40.18	Low
HOUSTON-01	R5	Houston	1.30	58.00	71.00	64.50	Good	634.63	0.57	0.19	0.06	200.98	80.82	50.22	Medium
HOUSTON-01	R5	Houston	1.40	68.00	72.00	70.00	Good	620.48	0.58	0.18	0.07	196.81	85.08	52.87	Medium
HOUSTON-01	R5	Houston	1.50	59.00	56.00	57.50	Very Good	405.80	0.38	0.12	0.07	128.25	86.20	53.56	Medium
HOUSTON-01	R6	Houston	0.10	52.00	56.00	54.00	Very Good	571.97	0.18	0.16	0.00	181.21	76.85	47.75	Medium
HOUSTON-01	R6	Houston	0.20	69.00	70.00	69.50	Good	460.13	0.15	0.13	0.00	145.20	81.54	50.67	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-01	R6	Houston	0.30	60.00	67.00	63.50	Good	440.12	0.14	0.12	0.00	139.25	77.33	48.05	Medium
HOUSTON-01	R6	Houston	0.40	58.00	68.00	63.00	Good	475.33	0.15	0.13	0.00	150.71	36.59	22.73	Low
HOUSTON-01	R6	Houston	0.50	52.00	64.00	58.00	Very Good	483.19	0.15	0.13	0.00	153.07	58.57	36.40	Low
HOUSTON-01	R6	Houston	0.60	78.00	123.00	100.50	Fair	513.59	0.14	0.14	0.00	162.54	62.06	38.56	Low
HOUSTON-01	R6	Houston	0.70	67.00	82.00	74.50	Good	484.44	0.11	0.13	0.00	152.98	35.28	21.92	Low
HOUSTON-01	R6	Houston	0.80	59.00	58.00	58.50	Very Good	454.84	0.10	0.13	0.00	144.00	62.94	39.11	Low
HOUSTON-01	R6	Houston	0.90	47.00	55.00	51.00	Very Good	537.47	0.10	0.15	0.00	169.69	79.27	49.26	Medium
HOUSTON-01	R6	Houston	1.00	50.00	70.00	60.00	Good	609.56	0.11	0.17	0.00	193.04	88.64	55.08	Medium
HOUSTON-01	R6	Houston	1.10	71.00	64.00	67.50	Good	580.34	0.08	0.16	0.00	183.70	88.15	54.77	Medium
HOUSTON-01	R6	Houston	1.20	61.00	59.00	60.00	Good	572.05	0.08	0.16	0.00	180.58	93.00	57.79	Medium
HOUSTON-01	R6	Houston	1.30	58.00	71.00	64.50	Good	619.93	0.08	0.17	0.00	196.15	98.83	61.41	High
HOUSTON-01	R6	Houston	1.40	68.00	72.00	70.00	Good	570.46	0.05	0.16	0.00	180.19	98.00	60.89	High
HOUSTON-01	R6	Houston	1.50	59.00	56.00	57.50	Very Good	480.15	0.04	0.13	0.00	152.06	99.05	61.55	High
HOUSTON-01	R7	Houston	0.10	52.00	56.00	54.00	Very Good	370.74	2.52	0.10	0.03	118.73	70.41	44.00	Low
HOUSTON-01	R7	Houston	0.20	69.00	70.00	69.50	Good	492.79	1.64	0.13	0.02	156.20	72.26	45.16	Medium
HOUSTON-01	R7	Houston	0.30	60.00	67.00	63.50	Good	753.83	1.29	0.20	0.04	239.19	76.43	47.77	Medium
HOUSTON-01	R7	Houston	0.40	58.00	68.00	63.00	Good	591.23	0.69	0.16	0.03	186.86	74.67	46.67	Medium
HOUSTON-01	R7	Houston	0.50	52.00	64.00	58.00	Very Good	461.54	0.50	0.12	0.01	146.57	73.27	45.79	Medium
HOUSTON-01	R7	Houston	0.60	78.00	123.00	100.50	Fair	454.27	0.39	0.12	0.01	144.00	77.07	48.17	Medium
HOUSTON-01	R7	Houston	0.70	67.00	82.00	74.50	Good	163.29	0.13	0.04	0.00	51.36	78.87	49.30	Medium
HOUSTON-01	R7	Houston	0.80	59.00	58.00	58.50	Very Good	219.00	0.18	0.06	0.01	69.45	73.06	45.66	Medium
HOUSTON-01	R7	Houston	0.90	47.00	55.00	51.00	Very Good	238.55	0.18	0.07	0.03	75.29	76.13	47.58	Medium
HOUSTON-01	R7	Houston	1.00	50.00	70.00	60.00	Good	293.01	0.20	0.08	0.05	92.81	74.48	46.55	Medium
HOUSTON-01	R7	Houston	1.10	71.00	64.00	67.50	Good	430.12	0.26	0.12	0.07	136.32	68.89	43.06	Low
HOUSTON-01	R7	Houston	1.20	61.00	59.00	60.00	Good	628.07	0.34	0.17	0.07	198.72	37.52	23.45	Low
HOUSTON-01	R7	Houston	1.30	58.00	71.00	64.50	Good	750.41	0.37	0.20	0.07	237.12	55.03	34.39	Low
HOUSTON-01	R7	Houston	1.40	68.00	72.00	70.00	Good	461.25	0.21	0.12	0.03	145.89	70.84	44.28	Low
HOUSTON-01	R7	Houston	1.50	59.00	56.00	57.50	Very Good	276.30	0.11	0.07	0.01	87.75	80.70	50.44	Medium
HOUSTON-01	R8	Houston	0.10	52.00	56.00	54.00	Very Good	504.42	0.36	0.13	0.03	159.30	70.68	44.18	Low
HOUSTON-01	R8	Houston	0.20	69.00	70.00	69.50	Good	511.96	0.27	0.14	0.02	161.95	78.31	48.95	Medium
HOUSTON-01	R8	Houston	0.30	60.00	67.00	63.50	Good	409.52	0.15	0.11	0.02	129.39	88.49	55.31	Medium
HOUSTON-01	R8	Houston	0.40	58.00	68.00	63.00	Good	211.31	0.07	0.06	0.00	66.75	91.93	57.46	Medium
HOUSTON-01	R8	Houston	0.50	52.00	64.00	58.00	Very Good	144.79	0.04	0.04	0.00	45.85	90.25	56.41	Medium
HOUSTON-01	R8	Houston	0.60	78.00	123.00	100.50	Fair	116.05	0.03	0.03	0.00	36.73	88.40	55.25	Medium
HOUSTON-01	R8	Houston	0.70	67.00	82.00	74.50	Good	117.38	0.03	0.03	0.01	37.22	87.65	54.78	Medium
HOUSTON-01	R8	Houston	0.80	59.00	58.00	58.50	Very Good	127.36	0.02	0.03	0.01	40.35	86.74	54.21	Medium
HOUSTON-01	R8	Houston	0.90	47.00	55.00	51.00	Very Good	118.49	0.02	0.03	0.02	37.47	81.84	51.15	Medium
HOUSTON-01	R8	Houston	1.00	50.00	70.00	60.00	Good	109.16	0.02	0.03	0.03	34.45	73.07	45.67	Medium
HOUSTON-01	R8	Houston	1.10	71.00	64.00	67.50	Good	104.79	0.01	0.03	0.04	33.25	72.74	45.46	Medium
HOUSTON-01	R8	Houston	1.20	61.00	59.00	60.00	Good	105.37	0.01	0.03	0.04	32.86	74.61	46.63	Medium
HOUSTON-01	R8	Houston	1.30	58.00	71.00	64.50	Good	108.56	0.01	0.03	0.05	34.32	35.87	22.42	Low
HOUSTON-01	R8	Houston	1.40	68.00	72.00	70.00	Good	101.16	0.01	0.03	0.05	31.59	52.96	33.10	Low
HOUSTON-01	R8	Houston	1.50	59.00	56.00	57.50	Very Good	119.34	0.01	0.03	0.05	37.71	65.85	41.16	Low
HOUSTON-01	R9	Houston	0.10	52.00	56.00	54.00	Very Good	543.50	0.60	0.14	0.02	172.08	70.04	43.52	Low
HOUSTON-01	R9	Houston	0.20	69.00	70.00	69.50	Good	508.13	0.52	0.13	0.02	160.46	65.17	40.49	Low
HOUSTON-01	R9	Houston	0.30	60.00	67.00	63.50	Good	506.40	0.47	0.13	0.03	160.46	62.53	38.85	Low
HOUSTON-01	R9	Houston	0.40	58.00	68.00	63.00	Good	503.62	0.45	0.13	0.06	158.93	50.85	31.60	Low
HOUSTON-01	R9	Houston	0.50	52.00	64.00	58.00	Very Good	502.07	0.40	0.13	0.08	158.65	52.77	32.79	Low
HOUSTON-01	R9	Houston	0.60	78.00	123.00	100.50	Fair	490.14	0.35	0.13	0.08	155.19	76.92	47.80	Medium
HOUSTON-01	R9	Houston	0.70	67.00	82.00	74.50	Good	499.42	0.33	0.13	0.09	157.90	76.78	47.71	Medium
HOUSTON-01	R9	Houston	0.80	59.00	58.00	58.50	Very Good	488.00	0.30	0.13	0.07	153.93	76.54	47.56	Medium
HOUSTON-01	R9	Houston	0.90	47.00	55.00	51.00	Very Good	493.11	0.26	0.13	0.04	155.76	77.88	48.39	Medium
HOUSTON-01	R9	Houston	1.00	50.00	70.00	60.00	Good	287.03	0.15	0.07	0.01	90.79	82.80	51.45	Medium
HOUSTON-01	R9	Houston	1.10	71.00	64.00	67.50	Good	323.11	0.17	0.08	0.01	102.51	89.61	55.68	Medium
HOUSTON-01	R9	Houston	1.20	61.00	59.00	60.00	Good	317.07	0.17	0.08	0.01	100.56	90.74	56.38	Medium
HOUSTON-01	R9	Houston	1.30	58.00	71.00	64.50	Good	341.84	0.18	0.09	0.00	108.37	85.90	53.37	Medium
HOUSTON-01	R9	Houston	1.40	68.00	72.00	70.00	Good	330.99	0.18	0.08	0.01	104.46	87.32	54.26	Medium
HOUSTON-01	R9	Houston	1.50	59.00	56.00	57.50	Very Good	490.77	0.26	0.12	0.02	155.65	88.86	54.68	Medium
HOUSTON-02	R1	Houston	0.10	56.00	77.00	66.50	Good	1124.85	0.05	0.50	0.32	355.63	83.66	52.29	Medium
HOUSTON-02	R1	Houston	0.20	65.00	73.00	69.00	Good	1031.99	0.09	0.46	0.15	326.28	85.44	53.40	Medium
HOUSTON-02	R1	Houston	0.30	62.00	62.00	62.00	Good	978.43	0.09	0.44	0.07	309.57	86.53	54.08	Medium
HOUSTON-02	R1	Houston	0.40	79.00	57.00	68.00	Good	960.99	0.13	0.43	0.05	303.98	88.42	55.26	Medium
HOUSTON-02	R1	Houston	0.50	88.00	61.00	74.50	Good	986.60	0.13	0.44	0.07	312.37	89.61	56.01	Medium
HOUSTON-02	R1	Houston	0.60	69.00	75.00	72.00	Good	1023.63	0.14	0.47	0.09	323.75	91.40	57.12	Medium
HOUSTON-02	R1	Houston	0.70	81.00	102.00	91.50	Good	1007.93	0.13	0.46	0.09	318.98	92.59	57.87	Medium
HOUSTON-02	R1	Houston	0.80	63.00	73.00	68.00	Good	1002.02	0.13	0.45	0.11	316.76	94.37	58.98	Medium
HOUSTON-02	R1	Houston	0.90	49.00	64.00	56.50	Very Good	1013.00	0.13	0.47	0.09	320.41	95.37	59.60	Medium
HOUSTON-02	R1	Houston	1.00	59.00	69.00	64.00	Good	1028.95	0.14	0.47	0.06	325.35	96.36	60.22	High
HOUSTON-02	R1	Houston	1.10	78.00	95.00	86.50	Good	1014.63	0.14	0.47	0.05	321.33	97.35	60.84	High
HOUSTON-02	R1	Houston	1.20	83.00	126.00	104.50	Fair	1000.25	0.18	0.46	0.04	316.77	98.54	61.59	High
HOUSTON-02	R1	Houston	1.30	79.00	162.00	120.50	Fair	959.95	0.17	0.44	0.04	303.37	100.33	62.71	High
HOUSTON-02	R1	Houston	1.40	78.00	109.00	93.50	Good	799.34	0.18	0.37	0.03	252.88	101.32	63.33	High
HOUSTON-02	R1	Houston	1.50	104.00	104.00	104.00	Fair	921.67	0.29	0.43	0.04	291.96	102.31	63.95	High
HOUSTON-02	R1	Houston	1.60	109.00	73.00	91.00	Good	968.05	0.34	0.45	0.06	306.42	103.31	64.57	High
HOUSTON-02	R1	Houston	1.70	79.00	72.00	75.50	Good	946.06	0.38	0.44	0.06	299.16	104.50	65.31	High
HOUSTON-02	R1	Houston	1.80	51.00	52.00	51.50	Very Good	906.59	0.40	0.42	0.07	287.06	106.18	66.36	High
HOUSTON-02	R1	Houston	1.90	69.00	48.00	58.50	Very Good	862.35	0.46	0.40	0.10	272.87	106.28	66.43	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-02	R1	Houston	2.00	60.00	52.00	56.00	Very Good	842.53	0.49	0.39	0.12	266.50	107.18	66.98	High
HOUSTON-02	R1	Houston	2.10	71.00	52.00	61.50	Good	810.94	0.47	0.38	0.16	256.53	107.27	67.05	High
HOUSTON-02	R1	Houston	2.20	109.00	102.00	105.50	Fair	852.72	0.49	0.39	0.23	269.91	108.17	67.61	High
HOUSTON-02	R1	Houston	2.30	107.00	146.00	126.50	Fair	848.22	0.45	0.39	0.28	268.33	108.27	67.67	High
HOUSTON-02	R1	Houston	2.40	63.00	61.00	62.00	Good	838.92	0.45	0.39	0.18	265.67	109.06	68.16	High
HOUSTON-02	R1	Houston	2.50	52.00	64.00	58.00	Very Good	832.05	0.44	0.39	0.10	263.22	108.27	67.67	High
HOUSTON-02	R1	Houston	2.60	46.00	56.00	51.00	Very Good	831.88	0.48	0.39	0.06	263.46	109.16	68.23	High
HOUSTON-02	R1	Houston	2.70	56.00	57.00	56.50	Very Good	832.07	0.56	0.39	0.05	263.70	109.16	68.23	High
HOUSTON-02	R1	Houston	2.80	51.00	53.00	52.00	Very Good	830.72	0.59	0.39	0.06	262.82	109.16	68.23	High
HOUSTON-02	R1	Houston	2.90	57.00	64.00	60.50	Good	781.96	0.66	0.37	0.06	247.79	109.16	68.23	High
HOUSTON-02	R1	Houston	3.00	84.00	86.00	85.00	Good	734.84	0.85	0.35	0.07	233.09	109.16	68.23	High
HOUSTON-02	R1	Houston	3.10	52.00	58.00	55.00	Very Good	740.48	0.89	0.35	0.08	234.49	109.16	68.23	High
HOUSTON-02	R1	Houston	3.20	50.00	53.00	51.50	Very Good	685.85	0.80	0.32	0.11	217.07	109.26	68.29	High
HOUSTON-02	R1	Houston	3.30	58.00	58.00	58.00	Very Good	618.85	0.72	0.29	0.13	196.09	110.15	68.85	High
HOUSTON-02	R1	Houston	3.40	72.00	75.00	73.50	Good	593.13	0.69	0.28	0.10	188.12	110.15	68.85	High
HOUSTON-02	R1	Houston	3.50	68.00	79.00	73.50	Good	317.89	0.37	0.15	0.05	100.84	110.25	68.91	High
HOUSTON-02	R1	Houston	3.60	59.00	48.00	53.50	Very Good	678.40	0.82	0.32	0.22	214.89	111.15	69.47	High
HOUSTON-02	R1	Houston	3.70	55.00	48.00	51.50	Very Good	772.98	1.00	0.36	0.39	244.97	111.24	69.53	High
HOUSTON-02	R1	Houston	3.80	55.00	49.00	52.00	Very Good	498.84	0.69	0.24	0.16	158.14	112.14	70.09	High
HOUSTON-02	R1	Houston	3.90	55.00	47.00	51.00	Very Good	443.23	0.63	0.21	0.07	140.33	112.24	70.15	High
HOUSTON-02	R1	Houston	4.00	90.00	117.00	103.50	Fair	449.94	0.64	0.21	0.05	142.43	113.13	70.71	High
HOUSTON-02	R1	Houston	4.10	53.00	40.00	46.50	Very Good	513.76	0.74	0.24	0.06	162.85	113.23	70.77	High
HOUSTON-02	R1	Houston	4.20	48.00	49.00	48.50	Very Good	702.56	0.98	0.33	0.11	222.55	114.12	71.33	High
HOUSTON-02	R1	Houston	4.30	49.00	44.00	46.50	Very Good	702.46	0.97	0.33	0.09	222.55	114.02	71.26	High
HOUSTON-02	R1	Houston	4.40	50.00	55.00	52.50	Very Good	708.14	0.95	0.33	0.07	224.44	112.83	70.52	High
HOUSTON-02	R1	Houston	4.50	63.00	69.00	66.00	Good	706.62	0.92	0.33	0.06	224.17	111.05	69.40	High
HOUSTON-02	R1	Houston	4.60	62.00	102.00	82.00	Good	713.15	0.93	0.33	0.06	226.25	110.05	68.78	High
HOUSTON-02	R1	Houston	4.70	59.00	88.00	73.50	Good	748.78	0.90	0.35	0.08	237.45	109.06	68.16	High
HOUSTON-02	R1	Houston	4.80	65.00	92.00	78.50	Good	774.50	0.90	0.36	0.12	245.31	108.07	67.54	High
HOUSTON-02	R1	Houston	4.90	60.00	62.00	61.00	Good	775.16	0.90	0.36	0.10	245.61	107.08	66.92	High
HOUSTON-02	R1	Houston	5.00	70.00	65.00	67.50	Good	643.49	0.75	0.30	0.06	203.89	106.18	66.36	High
HOUSTON-02	R1	Houston	5.10	63.00	72.00	67.50	Good	665.49	0.77	0.31	0.06	210.84	106.08	66.30	High
HOUSTON-02	R1	Houston	5.20	60.00	69.00	64.50	Good	729.44	0.85	0.34	0.06	230.91	105.29	65.81	High
HOUSTON-02	R1	Houston	5.30	59.00	51.00	55.00	Very Good	641.49	1.55	0.30	0.05	203.44	106.18	66.36	High
HOUSTON-02	R1	Houston	5.40	62.00	61.00	61.50	Good	256.94	1.02	0.12	0.02	81.64	106.28	66.43	High
HOUSTON-02	R1	Houston	5.50	126.00	122.00	124.00	Fair	100.73	0.21	0.05	0.01	32.08	107.18	66.98	High
HOUSTON-02	R2	Houston	0.10	56.00	77.00	66.50	Good	918.26	0.80	0.45	0.04	290.52	76.51	47.82	Medium
HOUSTON-02	R2	Houston	0.20	65.00	73.00	69.00	Good	991.22	0.87	0.49	0.05	313.92	77.70	48.56	Medium
HOUSTON-02	R2	Houston	0.30	62.00	62.00	62.00	Good	960.99	0.84	0.46	0.35	304.45	79.49	49.68	Medium
HOUSTON-02	R2	Houston	0.40	79.00	57.00	68.00	Good	606.75	0.53	0.29	0.24	192.00	80.48	50.30	Medium
HOUSTON-02	R2	Houston	0.50	88.00	61.00	74.50	Good	690.67	0.60	0.33	0.15	218.76	81.67	51.04	Medium
HOUSTON-02	R2	Houston	0.60	69.00	75.00	72.00	Good	838.85	0.70	0.40	0.08	265.90	83.66	52.29	Medium
HOUSTON-02	R2	Houston	0.70	81.00	102.00	91.50	Good	865.61	0.72	0.41	0.09	274.44	85.44	53.40	Medium
HOUSTON-02	R2	Houston	0.80	63.00	73.00	68.00	Good	872.37	0.72	0.41	0.15	276.20	86.63	54.15	Medium
HOUSTON-02	R2	Houston	0.90	49.00	64.00	56.50	Very Good	695.73	0.55	0.33	0.18	220.14	88.52	55.32	Medium
HOUSTON-02	R2	Houston	1.00	59.00	69.00	64.00	Good	613.96	0.51	0.28	0.14	194.47	89.61	56.01	Medium
HOUSTON-02	R2	Houston	1.10	78.00	95.00	86.50	Good	704.13	0.86	0.33	0.10	222.89	91.40	57.12	Medium
HOUSTON-02	R2	Houston	1.20	83.00	126.00	104.50	Fair	724.75	0.89	0.33	0.07	229.92	92.59	57.87	Medium
HOUSTON-02	R2	Houston	1.30	79.00	162.00	120.50	Fair	725.83	0.79	0.33	0.08	229.81	94.37	58.98	Medium
HOUSTON-02	R2	Houston	1.40	78.00	109.00	93.50	Good	726.63	0.73	0.34	0.11	230.16	95.47	59.67	Medium
HOUSTON-02	R2	Houston	1.50	104.00	104.00	104.00	Fair	729.34	0.66	0.34	0.17	230.75	96.26	60.16	High
HOUSTON-02	R2	Houston	1.60	109.00	73.00	91.00	Good	725.19	0.60	0.33	0.16	229.82	96.36	60.22	High
HOUSTON-02	R2	Houston	1.70	79.00	72.00	75.50	Good	727.88	0.57	0.33	0.10	230.75	97.35	60.84	High
HOUSTON-02	R2	Houston	1.80	51.00	52.00	51.50	Very Good	712.41	0.52	0.32	0.08	225.79	98.24	61.40	High
HOUSTON-02	R2	Houston	1.90	69.00	48.00	58.50	Very Good	707.93	0.46	0.32	0.09	224.42	98.34	61.46	High
HOUSTON-02	R2	Houston	2.00	60.00	52.00	56.00	Very Good	714.14	0.44	0.32	0.06	225.84	99.24	62.02	High
HOUSTON-02	R2	Houston	2.10	71.00	52.00	61.50	Good	718.01	0.40	0.33	0.04	227.32	99.34	62.08	High
HOUSTON-02	R2	Houston	2.20	109.00	102.00	105.50	Fair	715.05	0.37	0.32	0.03	226.45	100.23	62.64	High
HOUSTON-02	R2	Houston	2.30	107.00	146.00	126.50	Fair	715.69	0.34	0.32	0.03	226.79	100.33	62.71	High
HOUSTON-02	R2	Houston	2.40	63.00	61.00	62.00	Good	701.88	0.30	0.32	0.03	222.01	101.22	63.26	High
HOUSTON-02	R2	Houston	2.50	52.00	64.00	58.00	Very Good	714.23	0.28	0.33	0.02	226.27	101.32	63.33	High
HOUSTON-02	R2	Houston	2.60	46.00	56.00	51.00	Very Good	704.83	0.25	0.33	0.02	222.99	102.21	63.88	High
HOUSTON-02	R2	Houston	2.70	56.00	57.00	56.50	Very Good	704.45	0.25	0.32	0.03	222.72	102.31	63.95	High
HOUSTON-02	R2	Houston	2.80	51.00	53.00	52.00	Very Good	707.94	0.24	0.33	0.06	224.15	103.31	64.57	High
HOUSTON-02	R2	Houston	2.90	57.00	64.00	60.50	Good	700.95	0.21	0.32	0.06	221.71	104.20	65.12	High
HOUSTON-02	R2	Houston	3.00	84.00	86.00	85.00	Good	701.92	0.22	0.32	0.05	222.04	104.30	65.19	High
HOUSTON-02	R2	Houston	3.10	52.00	58.00	55.00	Very Good	705.51	0.25	0.33	0.03	223.40	105.19	65.74	High
HOUSTON-02	R2	Houston	3.20	50.00	53.00	51.50	Very Good	702.19	0.31	0.32	0.02	222.12	105.29	65.81	High
HOUSTON-02	R2	Houston	3.30	58.00	58.00	58.00	Very Good	664.48	0.32	0.25	0.02	210.13	106.18	66.36	High
HOUSTON-02	R2	Houston	3.40	72.00	75.00	73.50	Good	669.42	0.39	0.25	0.03	211.73	106.28	66.43	High
HOUSTON-02	R2	Houston	3.50	68.00	79.00	73.50	Good	673.05	0.45	0.25	0.02	213.14	107.18	66.98	High
HOUSTON-02	R2	Houston	3.60	59.00	48.00	53.50	Very Good	672.61	0.51	0.25	0.02	212.96	107.18	66.98	High
HOUSTON-02	R2	Houston	3.70	55.00	48.00	51.50	Very Good	676.59	0.54	0.25	0.03	214.02	107.27	67.05	High
HOUSTON-02	R2	Houston	3.80	55.00	49.00	52.00	Very Good	678.27	0.60	0.25	0.04	214.55	108.17	67.61	High
HOUSTON-02	R2	Houston	3.90	55.00	47.00	51.00	Very Good	680.89	0.64	0.26	0.04	215.60	108.17	67.61	High
HOUSTON-02	R2	Houston	4.00	90.00	117.00	103.50	Fair	683.47	0.64	0.26	0.05	216.46	108.17	67.61	High
HOUSTON-02	R2	Houston	4.10	53.00	40.00	46.50	Very Good	677.32	0.63	0.25	0.06	214.69	108.17	67.61	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-02	R2	Houston	4.20	48.00	49.00	48.50	Very Good	677.99	0.60	0.26	0.08	214.69	108.27	67.67	High
HOUSTON-02	R2	Houston	4.30	49.00	44.00	46.50	Very Good	677.61	0.60	0.26	0.08	214.50	109.16	68.23	High
HOUSTON-02	R2	Houston	4.40	50.00	55.00	52.50	Very Good	672.62	0.60	0.25	0.06	212.76	109.16	68.23	High
HOUSTON-02	R2	Houston	4.50	63.00	69.00	66.00	Good	674.68	0.60	0.26	0.04	213.60	109.26	68.29	High
HOUSTON-02	R2	Houston	4.60	62.00	102.00	82.00	Good	669.23	0.63	0.25	0.03	211.89	110.15	68.85	High
HOUSTON-02	R2	Houston	4.70	59.00	88.00	73.50	Good	670.04	0.66	0.25	0.03	212.21	110.25	68.91	High
HOUSTON-02	R2	Houston	4.80	65.00	92.00	78.50	Good	662.96	0.68	0.25	0.03	210.01	111.15	69.47	High
HOUSTON-02	R2	Houston	4.90	60.00	62.00	61.00	Good	663.62	0.68	0.25	0.04	210.01	111.24	69.53	High
HOUSTON-02	R2	Houston	5.00	70.00	65.00	67.50	Good	668.85	0.71	0.25	0.04	211.86	112.14	70.09	High
HOUSTON-02	R2	Houston	5.10	63.00	72.00	67.50	Good	663.72	0.71	0.25	0.04	210.19	112.14	70.09	High
HOUSTON-02	R2	Houston	5.20	60.00	69.00	64.50	Good	676.42	0.72	0.26	0.04	214.23	112.24	70.15	High
HOUSTON-02	R2	Houston	5.30	59.00	51.00	55.00	Very Good	678.86	0.76	0.26	0.04	215.24	113.13	70.71	High
HOUSTON-02	R2	Houston	5.40	62.00	61.00	61.50	Good	679.47	0.76	0.26	0.04	215.24	113.13	70.71	High
HOUSTON-02	R2	Houston	5.50	126.00	122.00	124.00	Fair	679.63	0.76	0.26	0.04	215.24	113.13	70.71	High
HOUSTON-02	R3	Houston	0.10	56.00	77.00	66.50	Good	974.95	0.35	0.34	0.06	308.75	61.03	38.14	Low
HOUSTON-02	R3	Houston	0.20	65.00	73.00	69.00	Good	1162.21	0.47	0.41	0.09	368.07	64.21	40.13	Low
HOUSTON-02	R3	Houston	0.30	62.00	62.00	62.00	Good	1119.23	0.55	0.39	0.10	354.28	67.98	42.49	Low
HOUSTON-02	R3	Houston	0.40	79.00	57.00	68.00	Good	1006.77	0.58	0.36	0.06	318.57	70.95	44.35	Low
HOUSTON-02	R3	Houston	0.50	88.00	61.00	74.50	Good	909.38	0.61	0.32	0.04	287.63	73.83	46.15	Medium
HOUSTON-02	R3	Houston	0.60	69.00	75.00	72.00	Good	849.19	0.64	0.30	0.06	268.94	75.82	47.39	Medium
HOUSTON-02	R3	Houston	0.70	81.00	102.00	91.50	Good	865.45	0.65	0.31	0.12	274.18	77.80	48.63	Medium
HOUSTON-02	R3	Houston	0.80	63.00	73.00	68.00	Good	787.32	0.63	0.28	0.16	249.53	79.39	49.62	Medium
HOUSTON-02	R3	Houston	0.90	49.00	64.00	56.50	Very Good	755.19	0.60	0.27	0.12	239.03	79.39	49.62	Medium
HOUSTON-02	R3	Houston	1.00	59.00	69.00	64.00	Good	747.78	0.57	0.27	0.06	236.62	79.79	49.87	Medium
HOUSTON-02	R3	Houston	1.10	78.00	95.00	86.50	Good	756.09	0.57	0.27	0.03	239.11	81.67	51.04	Medium
HOUSTON-02	R3	Houston	1.20	83.00	126.00	104.50	Fair	797.71	0.60	0.29	0.03	252.58	83.76	52.35	Medium
HOUSTON-02	R3	Houston	1.30	79.00	162.00	120.50	Fair	842.77	0.60	0.30	0.04	266.56	85.54	53.46	Medium
HOUSTON-02	R3	Houston	1.40	78.00	109.00	93.50	Good	848.48	0.60	0.31	0.06	268.28	86.63	54.15	Medium
HOUSTON-02	R3	Houston	1.50	104.00	104.00	104.00	Fair	853.34	0.57	0.31	0.08	270.42	88.42	55.26	Medium
HOUSTON-02	R3	Houston	1.60	109.00	73.00	91.00	Good	845.75	0.57	0.31	0.11	267.50	89.61	56.01	Medium
HOUSTON-02	R3	Houston	1.70	79.00	72.00	75.50	Good	829.81	4.40	0.30	0.09	264.80	91.50	57.19	Medium
HOUSTON-02	R3	Houston	1.80	51.00	52.00	51.50	Very Good	629.59	10.35	0.23	0.05	204.01	92.59	57.87	Medium
HOUSTON-02	R3	Houston	1.90	69.00	48.00	58.50	Very Good	550.32	12.31	0.21	0.03	180.00	94.47	59.05	Medium
HOUSTON-02	R3	Houston	2.00	60.00	52.00	56.00	Very Good	751.35	4.70	0.28	0.07	240.00	95.47	59.67	Medium
HOUSTON-02	R3	Houston	2.10	71.00	52.00	61.50	Good	787.80	1.23	0.29	0.20	249.94	96.66	60.41	High
HOUSTON-02	R3	Houston	2.20	109.00	102.00	105.50	Fair	792.97	0.78	0.30	0.41	251.00	98.44	61.53	High
HOUSTON-02	R3	Houston	2.30	107.00	146.00	126.50	Fair	784.12	0.42	0.29	0.36	248.19	99.44	62.15	High
HOUSTON-02	R3	Houston	2.40	63.00	61.00	62.00	Good	776.85	0.24	0.29	0.29	245.71	100.53	62.83	High
HOUSTON-02	R3	Houston	2.50	52.00	64.00	58.00	Very Good	765.91	0.14	0.29	0.29	242.14	102.41	64.01	High
HOUSTON-02	R3	Houston	2.60	46.00	56.00	51.00	Very Good	761.83	0.14	0.28	0.23	240.89	103.40	64.63	High
HOUSTON-02	R3	Houston	2.70	56.00	57.00	56.50	Very Good	761.21	0.10	0.28	0.14	240.79	104.40	65.25	High
HOUSTON-02	R3	Houston	2.80	51.00	53.00	52.00	Very Good	759.76	0.17	0.28	0.08	240.14	105.39	65.87	High
HOUSTON-02	R3	Houston	2.90	57.00	64.00	60.50	Good	754.00	0.27	0.28	0.06	238.40	106.38	66.49	High
HOUSTON-02	R3	Houston	3.00	84.00	86.00	85.00	Good	722.73	0.29	0.27	0.05	228.77	107.37	67.11	High
HOUSTON-02	R3	Houston	3.10	52.00	58.00	55.00	Very Good	711.61	0.32	0.27	0.05	225.30	108.37	67.73	High
HOUSTON-02	R3	Houston	3.20	50.00	53.00	51.50	Very Good	710.85	0.29	0.27	0.08	225.02	109.36	68.35	High
HOUSTON-02	R3	Houston	3.30	58.00	58.00	58.00	Very Good	800.32	0.29	0.30	0.15	253.31	110.35	68.97	High
HOUSTON-02	R3	Houston	3.40	72.00	75.00	73.50	Good	794.48	0.28	0.30	0.22	251.50	111.15	69.47	High
HOUSTON-02	R3	Houston	3.50	68.00	79.00	73.50	Good	787.03	0.28	0.29	0.16	248.97	111.34	69.59	High
HOUSTON-02	R3	Houston	3.60	59.00	48.00	53.50	Very Good	780.61	0.28	0.29	0.09	247.16	112.14	70.09	High
HOUSTON-02	R3	Houston	3.70	55.00	48.00	51.50	Very Good	775.33	0.28	0.30	0.07	245.14	112.24	70.15	High
HOUSTON-02	R3	Houston	3.80	55.00	49.00	52.00	Very Good	732.56	0.33	0.28	0.05	232.06	113.13	70.71	High
HOUSTON-02	R3	Houston	3.90	55.00	47.00	51.00	Very Good	682.37	0.37	0.26	0.06	216.00	113.33	70.83	High
HOUSTON-02	R3	Houston	4.00	90.00	117.00	103.50	Fair	684.14	0.40	0.26	0.07	216.51	114.12	71.33	High
HOUSTON-02	R3	Houston	4.10	53.00	40.00	46.50	Very Good	659.48	0.44	0.25	0.05	208.94	113.92	71.20	High
HOUSTON-02	R3	Houston	4.20	48.00	49.00	48.50	Very Good	591.76	0.54	0.22	0.03	187.58	113.13	70.71	High
HOUSTON-02	R3	Houston	4.30	49.00	44.00	46.50	Very Good	558.33	2.69	0.21	0.02	177.90	113.13	70.71	High
HOUSTON-02	R3	Houston	4.40	50.00	55.00	52.50	Very Good	150.09	2.72	0.06	0.01	48.93	112.93	70.58	High
HOUSTON-02	R3	Houston	4.50	63.00	69.00	66.00	Good	76.21	2.22	0.04	0.00	25.04	112.14	70.09	High
HOUSTON-02	R3	Houston	4.60	62.00	102.00	82.00	Good	52.74	0.92	0.03	0.00	17.17	112.14	70.09	High
HOUSTON-02	R3	Houston	4.70	59.00	88.00	73.50	Good	147.57	0.61	0.07	0.01	47.16	112.14	70.09	High
HOUSTON-02	R3	Houston	4.80	65.00	92.00	78.50	Good	367.09	0.53	0.14	0.02	116.49	112.34	70.21	High
HOUSTON-02	R3	Houston	4.90	60.00	62.00	61.00	Good	512.68	0.40	0.19	0.04	162.48	113.23	70.77	High
HOUSTON-02	R3	Houston	5.00	70.00	65.00	67.50	Good	628.24	0.34	0.24	0.08	198.88	114.12	71.33	High
HOUSTON-02	R3	Houston	5.10	63.00	72.00	67.50	Good	673.22	0.27	0.25	0.07	213.01	114.32	71.45	High
HOUSTON-02	R3	Houston	5.20	60.00	69.00	64.50	Good	693.56	0.22	0.26	0.04	219.66	115.31	72.07	High
HOUSTON-02	R3	Houston	5.30	59.00	51.00	55.00	Very Good	696.97	0.19	0.26	0.03	220.71	115.91	72.44	High
HOUSTON-02	R3	Houston	5.40	62.00	61.00	61.50	Good	701.09	0.19	0.26	0.02	221.79	115.11	71.95	High
HOUSTON-02	R3	Houston	5.50	126.00	122.00	124.00	Fair	705.36	0.19	0.26	0.01	223.19	115.11	71.95	High
HOUSTON-02	R4	Houston	0.10	56.00	77.00	66.50	Good	1430.32	0.57	0.58	0.26	452.92	72.44	45.28	Medium
HOUSTON-02	R4	Houston	0.20	65.00	73.00	69.00	Good	1458.76	0.58	0.59	0.44	461.36	72.24	45.15	Medium
HOUSTON-02	R4	Houston	0.30	62.00	62.00	62.00	Good	1341.29	0.54	0.55	0.31	424.52	71.45	44.66	Low
HOUSTON-02	R4	Houston	0.40	79.00	57.00	68.00	Good	1234.18	0.71	0.50	0.15	390.64	71.65	44.78	Low
HOUSTON-02	R4	Houston	0.50	88.00	61.00	74.50	Good	1082.24	0.87	0.43	0.08	342.78	72.64	45.40	Medium
HOUSTON-02	R4	Houston	0.60	69.00	75.00	72.00	Good	1026.12	2.06	0.41	0.05	325.21	73.53	45.96	Medium
HOUSTON-02	R4	Houston	0.70	81.00	102.00	91.50	Good	1002.73	1.74	0.40	0.04	317.88	74.63	46.64	Medium
HOUSTON-02	R4	Houston	0.80	63.00	73.00	68.00	Good	979.81	1.57	0.39	0.05	310.51	75.62	47.26	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-02	R4	Houston	0.90	49.00	64.00	56.50	Very Good	963.90	1.42	0.39	0.05	305.62	76.61	47.88	Medium
HOUSTON-02	R4	Houston	1.00	59.00	69.00	64.00	Good	946.97	1.22	0.38	0.06	299.70	77.60	48.50	Medium
HOUSTON-02	R4	Houston	1.10	78.00	95.00	86.50	Good	923.04	1.11	0.37	0.07	292.42	78.60	49.12	Medium
HOUSTON-02	R4	Houston	1.20	83.00	126.00	104.50	Fair	945.43	1.05	0.38	0.13	299.64	79.39	49.62	Medium
HOUSTON-02	R4	Houston	1.30	79.00	162.00	120.50	Fair	937.58	0.96	0.38	0.23	297.31	79.39	49.62	Medium
HOUSTON-02	R4	Houston	1.40	78.00	109.00	93.50	Good	450.11	0.42	0.18	0.17	142.78	79.39	49.62	Medium
HOUSTON-02	R4	Houston	1.50	104.00	104.00	104.00	Fair	701.82	0.66	0.29	0.16	222.33	79.39	49.62	Medium
HOUSTON-02	R4	Houston	1.60	109.00	73.00	91.00	Good	737.23	0.69	0.30	0.09	233.64	79.39	49.62	Medium
HOUSTON-02	R4	Houston	1.70	79.00	72.00	75.50	Good	893.76	0.88	0.36	0.07	283.05	79.39	49.62	Medium
HOUSTON-02	R4	Houston	1.80	51.00	52.00	51.50	Very Good	938.47	0.92	0.38	0.06	297.04	79.19	49.49	Medium
HOUSTON-02	R4	Houston	1.90	69.00	48.00	58.50	Very Good	941.18	0.97	0.38	0.08	297.89	78.40	49.00	Medium
HOUSTON-02	R4	Houston	2.00	60.00	52.00	56.00	Very Good	894.64	0.96	0.36	0.07	283.31	78.20	48.87	Medium
HOUSTON-02	R4	Houston	2.10	71.00	52.00	61.50	Good	844.81	0.98	0.34	0.06	267.65	77.21	48.25	Medium
HOUSTON-02	R4	Houston	2.20	109.00	102.00	105.50	Fair	828.25	1.00	0.34	0.08	262.59	76.41	47.76	Medium
HOUSTON-02	R4	Houston	2.30	107.00	146.00	126.50	Fair	828.11	1.03	0.34	0.10	262.25	76.41	47.76	Medium
HOUSTON-02	R4	Houston	2.40	63.00	61.00	62.00	Good	828.30	1.00	0.34	0.17	262.57	76.21	47.63	Medium
HOUSTON-02	R4	Houston	2.50	52.00	64.00	58.00	Very Good	823.69	0.96	0.34	0.25	260.71	75.42	47.14	Medium
HOUSTON-02	R4	Houston	2.60	46.00	56.00	51.00	Very Good	812.92	0.91	0.34	0.29	257.53	75.42	47.14	Medium
HOUSTON-02	R4	Houston	2.70	56.00	57.00	56.50	Very Good	752.86	0.81	0.31	0.20	238.48	75.42	47.14	Medium
HOUSTON-02	R4	Houston	2.80	51.00	53.00	52.00	Very Good	739.86	0.76	0.31	0.12	234.46	75.42	47.14	Medium
HOUSTON-02	R4	Houston	2.90	57.00	64.00	60.50	Good	705.52	0.69	0.29	0.08	223.26	75.62	47.26	Medium
HOUSTON-02	R4	Houston	3.00	84.00	86.00	85.00	Good	616.27	0.58	0.26	0.06	194.95	76.61	47.88	Medium
HOUSTON-02	R4	Houston	3.10	52.00	58.00	55.00	Very Good	645.03	0.61	0.27	0.06	204.37	77.60	48.50	Medium
HOUSTON-02	R4	Houston	3.20	50.00	53.00	51.50	Very Good	724.45	0.65	0.30	0.11	229.29	78.69	49.18	Medium
HOUSTON-02	R4	Houston	3.30	58.00	58.00	58.00	Very Good	674.01	0.60	0.28	0.14	213.37	80.58	50.36	Medium
HOUSTON-02	R4	Houston	3.40	72.00	75.00	73.50	Good	610.93	0.57	0.25	0.07	193.65	81.37	50.86	Medium
HOUSTON-02	R4	Houston	3.50	68.00	79.00	73.50	Good	388.50	1.56	0.16	0.02	123.74	81.57	50.98	Medium
HOUSTON-02	R4	Houston	3.60	59.00	48.00	53.50	Very Good	220.19	1.65	0.09	0.01	70.23	82.56	51.60	Medium
HOUSTON-02	R4	Houston	3.70	55.00	48.00	51.50	Very Good	327.64	0.78	0.14	0.02	103.88	83.36	52.10	Medium
HOUSTON-02	R4	Houston	3.80	55.00	49.00	52.00	Very Good	386.10	0.41	0.16	0.03	122.40	83.16	51.98	Medium
HOUSTON-02	R4	Houston	3.90	55.00	47.00	51.00	Very Good	514.93	0.32	0.21	0.06	163.14	81.97	51.23	Medium
HOUSTON-02	R4	Houston	4.00	90.00	117.00	103.50	Fair	578.74	0.28	0.24	0.09	183.43	80.18	50.11	Medium
HOUSTON-02	R4	Houston	4.10	53.00	40.00	46.50	Very Good	574.95	0.23	0.23	0.08	181.95	79.09	49.43	Medium
HOUSTON-02	R4	Houston	4.20	48.00	49.00	48.50	Very Good	589.30	0.24	0.24	0.09	186.65	77.21	48.25	Medium
HOUSTON-02	R4	Houston	4.30	49.00	44.00	46.50	Very Good	644.90	0.23	0.26	0.08	203.82	76.41	47.76	Medium
HOUSTON-02	R4	Houston	4.40	50.00	55.00	52.50	Very Good	759.96	0.48	0.31	0.06	240.37	76.61	47.88	Medium
HOUSTON-02	R4	Houston	4.50	63.00	69.00	66.00	Good	761.54	0.99	0.31	0.04	241.48	77.60	48.50	Medium
HOUSTON-02	R4	Houston	4.60	62.00	102.00	82.00	Good	765.94	1.20	0.31	0.05	242.67	78.20	48.87	Medium
HOUSTON-02	R4	Houston	4.70	59.00	88.00	73.50	Good	724.80	1.26	0.30	0.05	229.96	77.01	48.13	Medium
HOUSTON-02	R4	Houston	4.80	65.00	92.00	78.50	Good	671.47	1.26	0.27	0.05	213.01	75.02	46.89	Medium
HOUSTON-02	R4	Houston	4.90	60.00	62.00	61.00	Good	667.32	1.22	0.28	0.06	211.38	73.44	45.90	Medium
HOUSTON-02	R4	Houston	5.00	70.00	65.00	67.50	Good	668.17	1.05	0.28	0.06	211.92	73.63	46.02	Medium
HOUSTON-02	R4	Houston	5.10	63.00	72.00	67.50	Good	664.51	0.92	0.28	0.05	210.84	74.82	46.77	Medium
HOUSTON-02	R4	Houston	5.20	60.00	69.00	64.50	Good	658.47	0.85	0.27	0.04	208.81	76.61	47.88	Medium
HOUSTON-02	R4	Houston	5.30	59.00	51.00	55.00	Very Good	655.39	0.82	0.27	0.04	207.79	77.60	48.50	Medium
HOUSTON-02	R4	Houston	5.40	62.00	61.00	61.50	Good	626.90	1.07	0.26	0.04	198.81	78.40	49.00	Medium
HOUSTON-02	R4	Houston	5.50	126.00	122.00	124.00	Fair	385.24	2.12	0.16	0.07	122.67	78.20	48.87	Medium
HOUSTON-02	R5	Houston	0.10	56.00	77.00	66.50	Good	778.47	0.43	0.24	0.01	246.53	70.66	44.16	Low
HOUSTON-02	R5	Houston	0.20	65.00	73.00	69.00	Good	765.76	0.43	0.24	0.02	242.33	71.65	44.78	Low
HOUSTON-02	R5	Houston	0.30	62.00	62.00	62.00	Good	759.88	0.39	0.24	0.03	240.12	72.64	45.40	Medium
HOUSTON-02	R5	Houston	0.40	79.00	57.00	68.00	Good	736.97	0.35	0.23	0.04	232.96	73.63	46.02	Medium
HOUSTON-02	R5	Houston	0.50	88.00	61.00	74.50	Good	663.83	0.30	0.21	0.04	210.22	74.63	46.64	Medium
HOUSTON-02	R5	Houston	0.60	69.00	75.00	72.00	Good	651.20	0.28	0.21	0.02	206.31	75.82	47.39	Medium
HOUSTON-02	R5	Houston	0.70	81.00	102.00	91.50	Good	614.77	0.16	0.25	0.01	194.28	77.60	48.50	Medium
HOUSTON-02	R5	Houston	0.80	63.00	73.00	68.00	Good	607.90	0.16	0.25	0.02	192.00	78.79	49.25	Medium
HOUSTON-02	R5	Houston	0.90	49.00	64.00	56.50	Very Good	603.31	0.16	0.25	0.03	190.88	80.48	50.30	Medium
HOUSTON-02	R5	Houston	1.00	59.00	69.00	64.00	Good	605.37	0.13	0.25	0.07	191.78	81.57	50.98	Medium
HOUSTON-02	R5	Houston	1.10	78.00	95.00	86.50	Good	601.70	0.11	0.25	0.08	190.24	82.56	51.60	Medium
HOUSTON-02	R5	Houston	1.20	83.00	126.00	104.50	Fair	605.70	0.11	0.26	0.06	191.35	83.56	52.22	Medium
HOUSTON-02	R5	Houston	1.30	79.00	162.00	120.50	Fair	611.12	0.08	0.26	0.05	193.51	84.55	52.84	Medium
HOUSTON-02	R5	Houston	1.40	78.00	109.00	93.50	Good	607.85	0.08	0.25	0.05	192.43	85.34	53.34	Medium
HOUSTON-02	R5	Houston	1.50	104.00	104.00	104.00	Fair	594.74	0.08	0.25	0.04	188.16	85.54	53.46	Medium
HOUSTON-02	R5	Houston	1.60	109.00	73.00	91.00	Good	594.21	0.05	0.25	0.03	187.74	86.53	54.08	Medium
HOUSTON-02	R5	Houston	1.70	79.00	72.00	75.50	Good	589.77	0.05	0.25	0.02	186.73	87.53	54.70	Medium
HOUSTON-02	R5	Houston	1.80	51.00	52.00	51.50	Very Good	593.39	0.05	0.25	0.01	187.58	88.32	55.20	Medium
HOUSTON-02	R5	Houston	1.90	69.00	48.00	58.50	Very Good	590.41	0.05	0.25	0.01	186.57	88.52	55.32	Medium
HOUSTON-02	R5	Houston	2.00	60.00	52.00	56.00	Very Good	593.53	0.05	0.25	0.01	187.83	89.31	55.82	Medium
HOUSTON-02	R5	Houston	2.10	71.00	52.00	61.50	Good	586.33	0.03	0.25	0.00	185.54	89.51	55.94	Medium
HOUSTON-02	R5	Houston	2.20	109.00	102.00	105.50	Fair	581.35	0.03	0.25	0.01	183.95	90.31	56.44	Medium
HOUSTON-02	R5	Houston	2.30	107.00	146.00	126.50	Fair	582.25	0.03	0.25	0.01	184.17	90.50	56.56	Medium
HOUSTON-02	R5	Houston	2.40	63.00	61.00	62.00	Good	578.63	0.03	0.25	0.02	183.22	91.30	57.06	Medium
HOUSTON-02	R5	Houston	2.50	52.00	64.00	58.00	Very Good	579.85	0.03	0.25	0.01	183.44	91.30	57.06	Medium
HOUSTON-02	R5	Houston	2.60	46.00	56.00	51.00	Very Good	570.06	0.03	0.24	0.01	180.08	91.50	57.19	Medium
HOUSTON-02	R5	Houston	2.70	56.00	57.00	56.50	Very Good	564.98	0.03	0.24	0.01	178.49	92.29	57.68	Medium
HOUSTON-02	R5	Houston	2.80	51.00	53.00	52.00	Very Good	552.29	0.02	0.24	0.00	174.84	92.49	57.81	Medium
HOUSTON-02	R5	Houston	2.90	57.00	64.00	60.50	Good	456.09	0.02	0.20	0.00	144.30	93.28	58.30	Medium
HOUSTON-02	R5	Houston	3.00	84.00	86.00	85.00	Good	356.11	0.02	0.15	0.00	112.82	93.48	58.43	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-02	R5	Houston	3.10	52.00	58.00	55.00	Very Good	246.58	0.03	0.11	0.00	77.79	94.27	58.92	Medium
HOUSTON-02	R5	Houston	3.20	50.00	53.00	51.50	Very Good	106.43	0.02	0.05	0.01	33.92	94.47	59.05	Medium
HOUSTON-02	R5	Houston	3.30	58.00	58.00	58.00	Very Good	97.96	0.02	0.05	0.01	30.73	95.47	59.67	Medium
HOUSTON-02	R5	Houston	3.40	72.00	75.00	73.50	Good	104.66	0.02	0.05	0.01	33.16	96.26	60.16	High
HOUSTON-02	R5	Houston	3.50	68.00	79.00	73.50	Good	110.26	0.02	0.05	0.01	34.80	96.26	60.16	High
HOUSTON-02	R5	Houston	3.60	59.00	48.00	53.50	Very Good	125.97	0.02	0.06	0.01	39.96	96.26	60.16	High
HOUSTON-02	R5	Houston	3.70	55.00	48.00	51.50	Very Good	148.59	0.02	0.06	0.01	46.82	96.06	60.04	High
HOUSTON-02	R5	Houston	3.80	55.00	49.00	52.00	Very Good	161.97	0.02	0.07	0.01	51.24	94.87	59.29	Medium
HOUSTON-02	R5	Houston	3.90	55.00	47.00	51.00	Very Good	172.72	0.02	0.07	0.01	54.45	93.08	58.18	Medium
HOUSTON-02	R5	Houston	4.00	90.00	117.00	103.50	Fair	159.60	0.01	0.07	0.00	50.43	91.99	57.50	Medium
HOUSTON-02	R5	Houston	4.10	53.00	40.00	46.50	Very Good	158.49	0.01	0.07	0.00	50.35	90.11	56.32	Medium
HOUSTON-02	R5	Houston	4.20	48.00	49.00	48.50	Very Good	161.56	0.01	0.07	0.01	50.94	89.11	55.70	Medium
HOUSTON-02	R5	Houston	4.30	49.00	44.00	46.50	Very Good	165.21	0.01	0.07	0.01	52.24	88.12	55.08	Medium
HOUSTON-02	R5	Houston	4.40	50.00	55.00	52.50	Very Good	182.13	0.01	0.08	0.01	57.60	87.13	54.46	Medium
HOUSTON-02	R5	Houston	4.50	63.00	69.00	66.00	Good	227.10	0.01	0.10	0.00	71.65	86.14	53.84	Medium
HOUSTON-02	R5	Houston	4.60	62.00	102.00	82.00	Good	319.72	0.00	0.14	0.00	101.40	85.15	53.22	Medium
HOUSTON-02	R5	Houston	4.70	59.00	88.00	73.50	Good	489.37	0.00	0.21	0.00	155.02	84.15	52.60	Medium
HOUSTON-02	R5	Houston	4.80	65.00	92.00	78.50	Good	603.85	0.00	0.26	0.00	191.29	83.16	51.98	Medium
HOUSTON-02	R5	Houston	4.90	60.00	62.00	61.00	Good	650.06	0.00	0.28	0.00	205.71	82.37	51.48	Medium
HOUSTON-02	R5	Houston	5.00	70.00	65.00	67.50	Good	677.09	0.00	0.29	0.00	214.42	82.17	51.36	Medium
HOUSTON-02	R5	Houston	5.10	63.00	72.00	67.50	Good	709.76	0.00	0.30	0.00	224.31	81.18	50.73	Medium
HOUSTON-02	R5	Houston	5.20	60.00	69.00	64.50	Good	737.10	0.00	0.32	0.00	233.27	80.38	50.24	Medium
HOUSTON-02	R5	Houston	5.30	59.00	51.00	55.00	Very Good	674.66	0.00	0.29	0.01	213.63	80.38	50.24	Medium
HOUSTON-02	R5	Houston	5.40	62.00	61.00	61.50	Good	656.33	0.00	0.29	0.02	207.63	80.58	50.36	Medium
HOUSTON-02	R5	Houston	5.50	126.00	122.00	124.00	Fair	665.99	0.00	0.29	0.02	210.49	81.57	50.98	Medium
HOUSTON-02	R6	Houston	0.10	56.00	77.00	66.50	Good	270.84	0.09	0.12	0.02	85.53	65.50	40.94	Low
HOUSTON-02	R6	Houston	0.20	65.00	73.00	69.00	Good	539.70	0.17	0.23	0.15	171.05	65.50	40.94	Low
HOUSTON-02	R6	Houston	0.30	62.00	62.00	62.00	Good	592.74	0.19	0.26	0.30	187.94	65.69	41.06	Low
HOUSTON-02	R6	Houston	0.40	79.00	57.00	68.00	Good	602.28	0.16	0.26	0.20	190.57	66.59	41.62	Low
HOUSTON-02	R6	Houston	0.50	88.00	61.00	74.50	Good	604.34	0.11	0.26	0.10	190.87	67.68	42.30	Low
HOUSTON-02	R6	Houston	0.60	69.00	75.00	72.00	Good	641.99	0.11	0.28	0.06	203.10	68.67	42.92	Low
HOUSTON-02	R6	Houston	0.70	81.00	102.00	91.50	Good	450.00	0.08	0.19	0.02	141.95	69.66	43.54	Low
HOUSTON-02	R6	Houston	0.80	63.00	73.00	68.00	Good	357.74	0.08	0.15	0.01	113.58	70.46	44.04	Low
HOUSTON-02	R6	Houston	0.90	49.00	64.00	56.50	Very Good	651.14	0.18	0.28	0.02	206.06	70.46	44.04	Low
HOUSTON-02	R6	Houston	1.00	59.00	69.00	64.00	Good	636.09	0.20	0.27	0.02	201.44	70.66	44.16	Low
HOUSTON-02	R6	Houston	1.10	78.00	95.00	86.50	Good	581.96	0.21	0.25	0.02	184.29	71.65	44.78	Low
HOUSTON-02	R6	Houston	1.20	83.00	126.00	104.50	Fair	578.54	0.23	0.24	0.02	183.06	72.44	45.28	Medium
HOUSTON-02	R6	Houston	1.30	79.00	162.00	120.50	Fair	571.62	0.23	0.24	0.02	180.98	72.64	45.40	Medium
HOUSTON-02	R6	Houston	1.40	78.00	109.00	93.50	Good	542.16	0.22	0.23	0.01	171.24	73.44	45.90	Medium
HOUSTON-02	R6	Houston	1.50	104.00	104.00	104.00	Fair	512.00	0.21	0.22	0.01	162.24	73.63	46.02	Medium
HOUSTON-02	R6	Houston	1.60	109.00	73.00	91.00	Good	494.29	0.18	0.21	0.00	156.67	74.43	46.52	Medium
HOUSTON-02	R6	Houston	1.70	79.00	72.00	75.50	Good	488.23	0.17	0.21	0.00	154.37	74.43	46.52	Medium
HOUSTON-02	R6	Houston	1.80	51.00	52.00	51.50	Very Good	484.75	0.17	0.20	0.00	153.19	74.63	46.64	Medium
HOUSTON-02	R6	Houston	1.90	69.00	48.00	58.50	Very Good	473.05	0.17	0.20	0.00	149.31	75.42	47.14	Medium
HOUSTON-02	R6	Houston	2.00	60.00	52.00	56.00	Very Good	468.50	0.17	0.20	0.00	148.16	75.62	47.26	Medium
HOUSTON-02	R6	Houston	2.10	71.00	52.00	61.50	Good	460.80	0.14	0.19	0.00	145.87	76.41	47.76	Medium
HOUSTON-02	R6	Houston	2.20	109.00	102.00	105.50	Fair	461.11	0.12	0.19	0.01	145.87	76.41	47.76	Medium
HOUSTON-02	R6	Houston	2.30	107.00	146.00	126.50	Fair	459.34	0.10	0.19	0.01	145.12	76.41	47.76	Medium
HOUSTON-02	R6	Houston	2.40	63.00	61.00	62.00	Good	456.67	0.08	0.19	0.01	144.75	76.61	47.88	Medium
HOUSTON-02	R6	Houston	2.50	52.00	64.00	58.00	Very Good	452.80	0.06	0.19	0.02	143.26	77.40	48.38	Medium
HOUSTON-02	R6	Houston	2.60	46.00	56.00	51.00	Very Good	454.12	0.04	0.19	0.02	144.00	77.40	48.38	Medium
HOUSTON-02	R6	Houston	2.70	56.00	57.00	56.50	Very Good	466.16	0.02	0.20	0.02	147.69	77.40	48.38	Medium
HOUSTON-02	R6	Houston	2.80	51.00	53.00	52.00	Very Good	494.94	0.02	0.21	0.02	156.55	77.40	48.38	Medium
HOUSTON-02	R6	Houston	2.90	57.00	64.00	60.50	Good	348.20	0.02	0.15	0.02	110.49	77.60	48.50	Medium
HOUSTON-02	R6	Houston	3.00	84.00	86.00	85.00	Good	156.92	0.01	0.07	0.01	49.71	78.20	48.87	Medium
HOUSTON-02	R6	Houston	3.10	52.00	58.00	55.00	Very Good	163.21	0.01	0.07	0.00	51.69	77.40	48.38	Medium
HOUSTON-02	R6	Houston	3.20	50.00	53.00	51.50	Very Good	174.38	0.01	0.07	0.00	54.79	77.21	48.25	Medium
HOUSTON-02	R6	Houston	3.30	58.00	58.00	58.00	Very Good	187.15	0.01	0.08	0.00	59.25	76.21	47.63	Medium
HOUSTON-02	R6	Houston	3.40	72.00	75.00	73.50	Good	241.22	0.01	0.10	0.00	75.99	75.22	47.01	Medium
HOUSTON-02	R6	Houston	3.50	68.00	79.00	73.50	Good	297.58	0.01	0.13	0.00	94.46	74.43	46.52	Medium
HOUSTON-02	R6	Houston	3.60	59.00	48.00	53.50	Very Good	233.97	0.01	0.10	0.00	73.93	74.23	46.39	Medium
HOUSTON-02	R6	Houston	3.70	55.00	48.00	51.50	Very Good	217.62	0.01	0.09	0.00	68.50	73.44	45.90	Medium
HOUSTON-02	R6	Houston	3.80	55.00	49.00	52.00	Very Good	215.61	0.01	0.09	0.00	68.50	73.44	45.90	Medium
HOUSTON-02	R6	Houston	3.90	55.00	47.00	51.00	Very Good	227.46	0.01	0.10	0.00	71.80	73.24	45.77	Medium
HOUSTON-02	R6	Houston	4.00	90.00	117.00	103.50	Fair	300.32	0.00	0.13	0.01	94.68	72.44	45.28	Medium
HOUSTON-02	R6	Houston	4.10	53.00	40.00	46.50	Very Good	410.37	0.00	0.17	0.01	129.40	72.44	45.28	Medium
HOUSTON-02	R6	Houston	4.20	48.00	49.00	48.50	Very Good	535.81	0.00	0.23	0.02	169.64	72.44	45.28	Medium
HOUSTON-02	R6	Houston	4.30	49.00	44.00	46.50	Very Good	584.50	0.00	0.25	0.01	184.64	72.44	45.28	Medium
HOUSTON-02	R6	Houston	4.40	50.00	55.00	52.50	Very Good	566.53	0.00	0.24	0.01	179.41	72.64	45.40	Medium
HOUSTON-02	R6	Houston	4.50	63.00	69.00	66.00	Good	567.73	0.00	0.24	0.01	179.81	73.44	45.90	Medium
HOUSTON-02	R6	Houston	4.60	62.00	102.00	82.00	Good	602.50	0.00	0.25	0.01	190.19	73.63	46.02	Medium
HOUSTON-02	R6	Houston	4.70	59.00	88.00	73.50	Good	647.53	0.00	0.27	0.02	204.51	74.63	46.64	Medium
HOUSTON-02	R6	Houston	4.80	65.00	92.00	78.50	Good	666.04	0.00	0.28	0.02	210.69	75.42	47.14	Medium
HOUSTON-02	R6	Houston	4.90	60.00	62.00	61.00	Good	670.37	0.00	0.37	0.02	212.41	75.62	47.26	Medium
HOUSTON-02	R6	Houston	5.00	70.00	65.00	67.50	Good	669.11	0.00	0.37	0.01	211.70	76.41	47.76	Medium
HOUSTON-02	R6	Houston	5.10	63.00	72.00	67.50	Good	660.38	0.00	0.36	0.01	208.91	76.61	47.88	Medium
HOUSTON-02	R6	Houston	5.20	60.00	69.00	64.50	Good	658.22	0.00	0.36	0.00	208.45	77.60	48.50	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-02	R6	Houston	5.30	59.00	51.00	55.00	Very Good	657.19	0.00	0.36	0.00	207.80	78.40	49.00	Medium
HOUSTON-02	R6	Houston	5.40	62.00	61.00	61.50	Good	622.52	0.00	0.34	0.01	197.09	78.60	49.12	Medium
HOUSTON-02	R6	Houston	5.50	126.00	122.00	124.00	Fair	530.81	0.00	0.29	0.00	167.76	79.39	49.62	Medium
HOUSTON-03	R1	Houston	0.20	124.00	115.00	119.50	Fair	863.77	0.08	0.60	0.11	273.31	63.05	39.41	Low
HOUSTON-03	R1	Houston	0.30	127.00	141.00	134.00	Poor	1045.88	0.09	0.73	0.09	330.79	62.05	38.78	Low
HOUSTON-03	R1	Houston	0.40	145.00	177.00	161.00	Poor	1090.76	0.10	0.77	0.14	345.05	61.05	38.16	Low
HOUSTON-03	R1	Houston	0.50	116.00	123.00	119.50	Fair	1041.57	0.05	0.74	0.27	329.78	61.85	38.66	Low
HOUSTON-03	R1	Houston	0.60	100.00	126.00	113.00	Fair	930.48	0.04	0.66	0.35	294.56	62.85	39.28	Low
HOUSTON-03	R1	Houston	0.70	97.00	93.00	95.00	Good	821.55	0.04	0.59	0.37	260.35	64.75	40.47	Low
HOUSTON-03	R1	Houston	0.80	97.00	112.00	104.50	Fair	792.10	0.04	0.57	0.32	250.80	66.75	41.72	Low
HOUSTON-03	R1	Houston	0.90	110.00	113.00	111.50	Fair	720.12	0.03	0.52	0.20	228.26	68.75	42.97	Low
HOUSTON-03	R1	Houston	1.00	98.00	103.00	100.50	Fair	585.59	0.00	0.42	0.14	185.23	69.85	43.66	Low
HOUSTON-03	R1	Houston	1.10	104.00	106.00	105.00	Fair	558.23	0.00	0.41	0.09	176.86	70.85	44.28	Low
HOUSTON-03	R1	Houston	1.20	97.00	113.00	105.00	Fair	665.71	0.00	0.49	0.08	210.69	70.95	44.34	Low
HOUSTON-03	R1	Houston	1.30	101.00	110.00	105.50	Fair	874.81	0.00	0.64	0.08	276.80	70.95	44.34	Low
HOUSTON-03	R1	Houston	1.40	113.00	109.00	111.00	Fair	899.63	0.05	0.66	0.24	284.44	70.05	43.78	Low
HOUSTON-03	R1	Houston	1.50	120.00	102.00	111.00	Fair	1000.17	0.09	0.74	0.40	316.45	68.15	42.59	Low
HOUSTON-03	R1	Houston	1.60	93.00	95.00	94.00	Good	1072.71	0.14	0.80	0.87	339.67	67.05	41.91	Low
HOUSTON-03	R1	Houston	1.70	104.00	138.00	121.00	Fair	1077.88	0.19	0.81	1.28	341.00	66.05	41.28	Low
HOUSTON-03	R1	Houston	1.80	94.00	108.00	101.00	Fair	998.99	0.22	0.75	0.88	316.15	67.65	42.28	Low
HOUSTON-03	R1	Houston	1.90	116.00	121.00	118.50	Fair	994.59	0.22	0.75	0.83	314.76	68.85	43.03	Low
HOUSTON-03	R1	Houston	2.00	109.00	110.00	109.50	Fair	980.63	0.22	0.75	0.90	310.37	69.75	43.59	Low
HOUSTON-03	R1	Houston	2.10	124.00	115.00	119.50	Fair	974.46	0.22	0.75	0.91	308.69	69.95	43.72	Low
HOUSTON-03	R1	Houston	2.20	127.00	141.00	134.00	Poor	968.03	0.17	0.75	0.99	306.58	69.95	43.72	Low
HOUSTON-03	R1	Houston	2.30	145.00	177.00	161.00	Poor	954.12	0.17	0.74	1.32	302.27	70.75	44.22	Low
HOUSTON-03	R1	Houston	2.40	116.00	123.00	119.50	Fair	717.04	0.13	0.56	1.35	227.10	70.95	44.34	Low
HOUSTON-03	R1	Houston	2.50	100.00	126.00	113.00	Fair	693.06	0.25	0.54	1.07	219.37	70.95	44.34	Low
HOUSTON-03	R1	Houston	2.60	97.00	93.00	95.00	Good	665.07	2.33	0.52	0.62	211.62	71.85	44.90	Low
HOUSTON-03	R1	Houston	2.70	97.00	112.00	104.50	Fair	503.06	4.61	0.39	0.28	161.83	73.75	46.09	Medium
HOUSTON-03	R1	Houston	2.80	110.00	113.00	111.50	Fair	499.73	3.55	0.39	0.20	159.79	75.64	47.28	Medium
HOUSTON-03	R1	Houston	2.90	98.00	103.00	100.50	Fair	501.81	2.64	0.40	0.17	160.41	76.84	48.03	Medium
HOUSTON-03	R1	Houston	3.00	104.00	106.00	105.00	Fair	504.02	1.24	0.40	0.22	160.41	77.84	48.65	Medium
HOUSTON-03	R1	Houston	3.10	97.00	113.00	105.00	Fair	505.92	0.25	0.40	0.25	160.41	78.84	49.28	Medium
HOUSTON-03	R1	Houston	3.20	101.00	110.00	105.50	Fair	512.00	0.12	0.41	0.18	161.98	79.84	49.90	Medium
HOUSTON-03	R1	Houston	3.30	113.00	109.00	111.00	Fair	513.52	0.07	0.41	0.13	162.78	80.84	50.53	Medium
HOUSTON-03	R1	Houston	3.40	120.00	102.00	111.00	Fair	512.41	0.00	0.41	0.12	162.16	80.94	50.59	Medium
HOUSTON-03	R1	Houston	3.50	93.00	95.00	94.00	Good	512.18	0.00	0.41	0.13	162.16	82.74	51.71	Medium
HOUSTON-03	R1	Houston	3.60	104.00	138.00	121.00	Fair	510.23	0.00	0.41	0.15	161.23	82.04	51.27	Medium
HOUSTON-03	R1	Houston	3.70	94.00	108.00	101.00	Fair	493.76	0.00	0.40	0.11	156.34	83.74	52.34	Medium
HOUSTON-03	R1	Houston	3.80	116.00	121.00	118.50	Fair	493.07	0.00	0.40	0.11	156.34	83.94	52.46	Medium
HOUSTON-03	R1	Houston	3.90	85.00	104.00	94.50	Good	489.29	0.00	0.40	0.13	155.08	83.94	52.46	Medium
HOUSTON-03	R1	Houston	4.00	96.00	112.00	104.00	Fair	415.18	0.00	0.34	0.08	131.66	83.94	52.46	Medium
HOUSTON-03	R1	Houston	4.10	114.00	107.00	110.50	Fair	79.73	0.00	0.07	0.01	25.32	83.04	51.90	Medium
HOUSTON-03	R1	Houston	4.20	148.00	108.00	128.00	Fair	143.12	0.00	0.15	0.02	45.39	82.94	51.84	Medium
HOUSTON-03	R1	Houston	4.30	114.00	118.00	116.00	Fair	60.62	0.00	0.11	0.01	18.94	82.94	51.84	Medium
HOUSTON-03	R1	Houston	4.40	94.00	110.00	102.00	Fair	26.70	0.00	0.09	0.01	8.69	82.14	51.34	Medium
HOUSTON-03	R1	Houston	4.50	97.00	122.00	109.50	Fair	17.01	0.00	0.09	0.02	5.47	82.84	51.77	Medium
HOUSTON-03	R1	Houston	4.60	115.00	128.00	121.50	Fair	12.19	0.00	0.10	0.02	4.20	84.64	52.90	Medium
HOUSTON-03	R1	Houston	4.70	106.00	127.00	116.50	Fair	9.57	0.00	0.11	0.02	2.87	85.74	53.59	Medium
HOUSTON-03	R1	Houston	4.80	192.00	224.00	208.00	Very Poor	8.09	0.00	0.12	0.02	2.97	85.94	53.71	Medium
HOUSTON-03	R2	Houston	0.10	109.00	110.00	109.50	Fair	589.42	1.51	0.28	0.07	187.06	69.05	43.16	Low
HOUSTON-03	R2	Houston	0.20	124.00	115.00	119.50	Fair	714.45	0.58	0.34	0.38	226.29	67.15	41.97	Low
HOUSTON-03	R2	Houston	0.30	127.00	141.00	134.00	Poor	858.40	0.77	0.41	1.49	271.54	66.95	41.84	Low
HOUSTON-03	R2	Houston	0.40	145.00	177.00	161.00	Poor	754.28	1.22	0.36	1.80	238.85	68.75	42.97	Low
HOUSTON-03	R2	Houston	0.50	116.00	123.00	119.50	Fair	610.68	1.18	0.29	0.79	193.85	69.85	43.66	Low
HOUSTON-03	R2	Houston	0.60	100.00	126.00	113.00	Fair	585.70	1.00	0.28	0.38	185.50	71.75	44.84	Low
HOUSTON-03	R2	Houston	0.70	97.00	93.00	95.00	Good	577.25	0.80	0.27	0.24	182.92	73.75	46.09	Medium
HOUSTON-03	R2	Houston	0.80	97.00	112.00	104.50	Fair	500.50	0.58	0.24	0.14	158.42	74.84	46.78	Medium
HOUSTON-03	R2	Houston	0.90	110.00	113.00	111.50	Fair	488.73	0.50	0.24	0.11	155.14	76.74	47.96	Medium
HOUSTON-03	R2	Houston	1.00	98.00	103.00	100.50	Fair	706.89	0.70	0.34	0.29	224.26	77.84	48.65	Medium
HOUSTON-03	R2	Houston	1.10	104.00	106.00	105.00	Fair	538.99	0.70	0.26	0.37	170.50	79.74	49.84	Medium
HOUSTON-03	R2	Houston	1.20	97.00	113.00	105.00	Fair	529.55	0.86	0.25	0.26	167.72	80.84	50.53	Medium
HOUSTON-03	R2	Houston	1.30	101.00	110.00	105.50	Fair	712.62	0.99	0.34	0.40	225.85	82.74	51.71	Medium
HOUSTON-03	R2	Houston	1.40	113.00	109.00	111.00	Fair	761.47	1.02	0.36	0.90	241.19	83.84	52.40	Medium
HOUSTON-03	R2	Houston	1.50	120.00	102.00	111.00	Fair	669.26	0.96	0.32	0.76	212.21	85.74	53.59	Medium
HOUSTON-03	R2	Houston	1.60	93.00	95.00	94.00	Good	637.54	0.97	0.30	0.44	202.22	86.84	54.27	Medium
HOUSTON-03	R2	Houston	1.70	104.00	138.00	121.00	Fair	638.67	0.95	0.30	0.34	202.57	88.73	55.46	Medium
HOUSTON-03	R2	Houston	1.80	94.00	108.00	101.00	Fair	633.33	0.91	0.30	0.34	200.78	90.73	56.71	Medium
HOUSTON-03	R2	Houston	1.90	116.00	121.00	118.50	Fair	644.12	0.98	0.41	0.37	204.09	90.93	56.83	Medium
HOUSTON-03	R2	Houston	2.00	109.00	110.00	109.50	Fair	638.72	0.92	0.41	0.38	202.55	90.93	56.83	Medium
HOUSTON-03	R2	Houston	2.10	124.00	115.00	119.50	Fair	432.76	0.59	0.28	0.21	136.98	91.83	57.39	Medium
HOUSTON-03	R2	Houston	2.20	127.00	141.00	134.00	Poor	395.13	0.54	0.25	0.13	125.07	91.93	57.46	Medium
HOUSTON-03	R2	Houston	2.30	145.00	177.00	161.00	Poor	615.55	0.82	0.39	0.22	195.04	91.93	57.46	Medium
HOUSTON-03	R2	Houston	2.40	116.00	123.00	119.50	Fair	634.41	0.85	0.41	0.44	200.90	91.93	57.46	Medium
HOUSTON-03	R2	Houston	2.50	100.00	126.00	113.00	Fair	485.95	0.65	0.32	0.29	154.25	91.93	57.46	Medium
HOUSTON-03	R2	Houston	2.60	97.00	93.00	95.00	Good	226.08	0.31	0.15	0.07	71.48	91.93	57.46	Medium
HOUSTON-03	R2	Houston	2.70	97.00	112.00	104.50	Fair	146.73	0.21	0.10	0.03	46.50	92.83	58.02	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-03	R2	Houston	2.80	110.00	113.00	111.50	Fair	246.51	0.42	0.20	0.05	78.03	92.93	58.08	Medium
HOUSTON-03	R2	Houston	2.90	98.00	103.00	100.50	Fair	97.37	0.25	0.12	0.03	30.92	94.73	59.21	Medium
HOUSTON-03	R2	Houston	3.00	104.00	106.00	105.00	Fair	43.34	0.17	0.09	0.03	13.98	94.03	58.77	Medium
HOUSTON-03	R2	Houston	3.10	97.00	113.00	105.00	Fair	34.91	0.10	0.05	0.02	11.21	93.93	58.71	Medium
HOUSTON-03	R2	Houston	3.20	101.00	110.00	105.50	Fair	49.52	0.08	0.05	0.04	15.89	92.13	57.58	Medium
HOUSTON-03	R2	Houston	3.30	113.00	109.00	111.00	Fair	57.69	0.10	0.06	0.04	18.61	91.93	57.46	Medium
HOUSTON-03	R2	Houston	3.40	120.00	102.00	111.00	Fair	41.07	0.10	0.06	0.04	13.40	91.93	57.46	Medium
HOUSTON-03	R2	Houston	3.50	93.00	95.00	94.00	Good	26.66	0.10	0.06	0.04	8.18	91.03	56.90	Medium
HOUSTON-03	R2	Houston	3.60	104.00	138.00	121.00	Fair	43.85	0.11	0.08	0.05	14.17	91.83	57.39	Medium
HOUSTON-03	R2	Houston	3.70	94.00	108.00	101.00	Fair	286.35	0.36	0.27	0.29	90.86	91.93	57.46	Medium
HOUSTON-03	R2	Houston	3.80	116.00	121.00	118.50	Fair	472.13	0.38	0.32	0.65	149.59	91.03	56.90	Medium
HOUSTON-03	R2	Houston	3.90	85.00	104.00	94.50	Good	535.70	0.38	0.34	0.68	169.95	90.93	56.83	Medium
HOUSTON-03	R2	Houston	4.00	96.00	112.00	104.00	Fair	703.83	0.44	0.44	0.57	223.31	90.93	56.83	Medium
HOUSTON-03	R2	Houston	4.10	114.00	107.00	110.50	Fair	803.35	0.46	0.49	0.39	254.31	90.93	56.83	Medium
HOUSTON-03	R2	Houston	4.20	148.00	108.00	128.00	Fair	855.86	0.45	0.53	0.22	270.83	89.13	55.71	Medium
HOUSTON-03	R2	Houston	4.30	114.00	118.00	116.00	Fair	884.13	0.43	0.54	0.21	279.93	88.03	55.02	Medium
HOUSTON-03	R2	Houston	4.40	94.00	110.00	102.00	Fair	896.76	0.39	0.55	0.23	284.25	87.04	54.40	Medium
HOUSTON-03	R2	Houston	4.50	97.00	122.00	109.50	Fair	908.95	0.36	0.55	0.33	287.63	85.14	53.21	Medium
HOUSTON-03	R2	Houston	4.60	115.00	128.00	121.50	Fair	907.64	0.36	0.55	0.45	287.28	84.04	52.52	Medium
HOUSTON-03	R2	Houston	4.70	106.00	127.00	116.50	Fair	915.69	0.32	0.55	0.45	289.78	83.04	51.90	Medium
HOUSTON-03	R2	Houston	4.80	192.00	224.00	208.00	Very Poor	913.52	0.28	0.55	0.29	289.39	82.04	51.27	Medium
HOUSTON-03	R3	Houston	0.10	109.00	110.00	109.50	Fair	1228.44	0.33	0.54	0.46	388.25	71.75	44.84	Low
HOUSTON-03	R3	Houston	0.20	124.00	115.00	119.50	Fair	1188.37	0.27	0.52	0.69	375.85	72.85	45.53	Medium
HOUSTON-03	R3	Houston	0.30	127.00	141.00	134.00	Poor	960.45	0.17	0.42	0.47	304.06	73.85	46.15	Medium
HOUSTON-03	R3	Houston	0.40	145.00	177.00	161.00	Poor	801.37	0.14	0.35	0.20	253.94	74.84	46.78	Medium
HOUSTON-03	R3	Houston	0.50	116.00	123.00	119.50	Fair	770.73	0.14	0.34	0.09	243.77	75.84	47.40	Medium
HOUSTON-03	R3	Houston	0.60	100.00	126.00	113.00	Fair	672.47	0.15	0.29	0.07	212.26	75.94	47.46	Medium
HOUSTON-03	R3	Houston	0.70	97.00	93.00	95.00	Good	594.93	2.27	0.26	0.03	189.72	76.84	48.03	Medium
HOUSTON-03	R3	Houston	0.80	97.00	112.00	104.50	Fair	291.69	3.71	0.13	0.01	93.72	76.94	48.09	Medium
HOUSTON-03	R3	Houston	0.90	110.00	113.00	111.50	Fair	696.05	10.43	0.30	0.04	225.52	76.94	48.09	Medium
HOUSTON-03	R3	Houston	1.00	98.00	103.00	100.50	Fair	654.55	3.67	0.29	0.03	208.92	77.84	48.65	Medium
HOUSTON-03	R3	Houston	1.10	104.00	106.00	105.00	Fair	483.78	0.80	0.21	0.01	153.10	77.04	48.15	Medium
HOUSTON-03	R3	Houston	1.20	97.00	113.00	105.00	Fair	492.18	0.57	0.21	0.02	155.55	76.04	47.53	Medium
HOUSTON-03	R3	Houston	1.30	101.00	110.00	105.50	Fair	457.32	0.37	0.20	0.01	145.16	75.94	47.46	Medium
HOUSTON-03	R3	Houston	1.40	113.00	109.00	111.00	Fair	334.06	0.24	0.14	0.01	105.91	76.84	48.03	Medium
HOUSTON-03	R3	Houston	1.50	120.00	102.00	111.00	Fair	214.29	0.14	0.09	0.00	67.82	76.94	48.09	Medium
HOUSTON-03	R3	Houston	1.60	93.00	95.00	94.00	Good	190.97	0.14	0.08	0.00	60.39	77.84	48.65	Medium
HOUSTON-03	R3	Houston	1.70	104.00	138.00	121.00	Fair	190.47	0.14	0.08	0.01	60.39	77.14	48.21	Medium
HOUSTON-03	R3	Houston	1.80	94.00	108.00	101.00	Fair	190.40	0.12	0.08	0.02	60.33	77.84	48.65	Medium
HOUSTON-03	R3	Houston	1.90	116.00	121.00	118.50	Fair	189.85	0.10	0.08	0.01	60.43	77.04	48.15	Medium
HOUSTON-03	R3	Houston	2.00	109.00	110.00	109.50	Fair	192.17	0.09	0.08	0.01	61.24	76.94	48.09	Medium
HOUSTON-03	R3	Houston	2.10	124.00	115.00	119.50	Fair	280.25	0.09	0.12	0.03	88.32	76.04	47.53	Medium
HOUSTON-03	R3	Houston	2.20	127.00	141.00	134.00	Poor	348.92	0.11	0.15	0.10	110.40	77.74	48.59	Medium
HOUSTON-03	R3	Houston	2.30	145.00	177.00	161.00	Poor	636.03	0.23	0.27	0.33	201.60	77.04	48.15	Medium
HOUSTON-03	R3	Houston	2.40	116.00	123.00	119.50	Fair	638.38	0.23	0.27	0.38	201.60	76.94	48.09	Medium
HOUSTON-03	R3	Houston	2.50	100.00	126.00	113.00	Fair	629.91	0.23	0.27	0.27	199.57	76.94	48.09	Medium
HOUSTON-03	R3	Houston	2.60	97.00	93.00	95.00	Good	623.97	0.22	0.27	0.13	197.27	78.74	49.21	Medium
HOUSTON-03	R3	Houston	2.70	97.00	112.00	104.50	Fair	626.60	0.22	0.27	0.08	197.88	79.84	49.90	Medium
HOUSTON-03	R3	Houston	2.80	110.00	113.00	111.50	Fair	546.08	0.20	0.24	0.03	173.07	79.04	49.40	Medium
HOUSTON-03	R3	Houston	2.90	98.00	103.00	100.50	Fair	442.10	0.16	0.19	0.02	139.72	80.74	50.46	Medium
HOUSTON-03	R3	Houston	3.00	104.00	106.00	105.00	Fair	422.27	0.13	0.18	0.02	134.02	82.84	51.77	Medium
HOUSTON-03	R3	Houston	3.10	97.00	113.00	105.00	Fair	420.17	0.13	0.18	0.01	132.92	83.84	52.40	Medium
HOUSTON-03	R3	Houston	3.20	101.00	110.00	105.50	Fair	418.25	0.11	0.18	0.03	132.04	83.94	52.46	Medium
HOUSTON-03	R3	Houston	3.30	113.00	109.00	111.00	Fair	419.51	0.11	0.18	0.06	132.92	83.94	52.46	Medium
HOUSTON-03	R3	Houston	3.40	120.00	102.00	111.00	Fair	358.94	0.10	0.16	0.04	113.43	83.04	51.90	Medium
HOUSTON-03	R3	Houston	3.50	93.00	95.00	94.00	Good	209.87	0.06	0.09	0.02	66.46	81.14	50.71	Medium
HOUSTON-03	R3	Houston	3.60	104.00	138.00	121.00	Fair	231.99	0.06	0.10	0.03	73.55	80.04	50.03	Medium
HOUSTON-03	R3	Houston	3.70	94.00	108.00	101.00	Fair	642.73	0.17	0.28	0.20	202.93	79.04	49.40	Medium
HOUSTON-03	R3	Houston	3.80	116.00	121.00	118.50	Fair	653.67	0.18	0.28	0.61	206.68	76.24	47.65	Medium
HOUSTON-03	R3	Houston	3.90	85.00	104.00	94.50	Good	465.34	0.17	0.20	0.46	147.06	75.04	46.90	Medium
HOUSTON-03	R3	Houston	4.00	96.00	112.00	104.00	Fair	451.94	0.18	0.19	0.28	142.92	74.05	46.28	Medium
HOUSTON-03	R3	Houston	4.10	114.00	107.00	110.50	Fair	324.10	0.15	0.14	0.10	102.30	73.95	46.22	Medium
HOUSTON-03	R3	Houston	4.20	148.00	108.00	128.00	Fair	166.79	0.07	0.07	0.04	52.59	73.95	46.22	Medium
HOUSTON-03	R3	Houston	4.30	114.00	118.00	116.00	Fair	151.82	0.07	0.07	0.04	48.07	73.95	46.22	Medium
HOUSTON-03	R3	Houston	4.40	94.00	110.00	102.00	Fair	151.79	0.06	0.07	0.03	48.14	73.05	45.65	Medium
HOUSTON-03	R3	Houston	4.50	97.00	122.00	109.50	Fair	156.06	0.06	0.07	0.03	49.47	71.15	44.47	Low
HOUSTON-03	R3	Houston	4.60	115.00	128.00	121.50	Fair	327.49	0.12	0.14	0.11	103.34	70.05	43.78	Low
HOUSTON-03	R3	Houston	4.70	106.00	127.00	116.50	Fair	389.90	0.14	0.17	0.20	123.23	69.05	43.16	Low
HOUSTON-03	R3	Houston	4.80	192.00	224.00	208.00	Very Poor	169.70	0.06	0.07	0.08	53.94	67.25	42.03	Low
HOUSTON-03	R4	Houston	0.10	109.00	110.00	109.50	Fair	600.61	0.13	0.26	0.41	190.23	70.05	43.78	Low
HOUSTON-03	R4	Houston	0.20	124.00	115.00	119.50	Fair	368.86	0.08	0.16	0.14	116.52	68.95	43.09	Low
HOUSTON-03	R4	Houston	0.30	127.00	141.00	134.00	Poor	107.94	0.03	0.05	0.03	34.43	67.95	42.47	Low
HOUSTON-03	R4	Houston	0.40	145.00	177.00	161.00	Poor	67.88	0.04	0.05	0.02	21.19	66.95	41.84	Low
HOUSTON-03	R4	Houston	0.50	116.00	123.00	119.50	Fair	42.55	0.05	0.06	0.03	13.52	67.85	42.41	Low
HOUSTON-03	R4	Houston	0.60	100.00	126.00	113.00	Fair	24.92	0.05	0.04	0.02	7.62	67.95	42.47	Low
HOUSTON-03	R4	Houston	0.70	97.00	93.00	95.00	Good	20.88	0.03	0.02	0.02	6.39	66.15	41.34	Low
HOUSTON-03	R4	Houston	0.80	97.00	112.00	104.50	Fair	26.90	0.02	0.02	0.02	8.63	65.95	41.22	Low

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-03	R4	Houston	0.90	110.00	113.00	111.50	Fair	28.03	0.02	0.02	0.03	8.83	67.85	42.41	Low
HOUSTON-03	R4	Houston	1.00	98.00	103.00	100.50	Fair	24.36	0.03	0.03	0.03	7.56	68.85	43.03	Low
HOUSTON-03	R4	Houston	1.10	104.00	106.00	105.00	Fair	20.32	0.03	0.04	0.04	6.14	70.85	44.28	Low
HOUSTON-03	R4	Houston	1.20	97.00	113.00	105.00	Fair	15.28	0.03	0.04	0.04	4.79	71.85	44.90	Low
HOUSTON-03	R4	Houston	1.30	101.00	110.00	105.50	Fair	14.99	0.03	0.05	0.04	5.21	71.95	44.97	Low
HOUSTON-03	R4	Houston	1.40	113.00	109.00	111.00	Fair	26.86	0.03	0.06	0.04	8.22	71.05	44.40	Low
HOUSTON-03	R4	Houston	1.50	120.00	102.00	111.00	Fair	61.52	0.02	0.06	0.07	19.73	70.05	43.78	Low
HOUSTON-03	R4	Houston	1.60	93.00	95.00	94.00	Good	186.76	0.03	0.10	0.38	59.41	69.05	43.16	Low
HOUSTON-03	R4	Houston	1.70	104.00	138.00	121.00	Fair	420.49	0.06	0.19	1.17	132.76	69.85	43.66	Low
HOUSTON-03	R4	Houston	1.80	94.00	108.00	101.00	Fair	552.59	0.05	0.23	1.18	174.89	69.05	43.16	Low
HOUSTON-03	R4	Houston	1.90	116.00	121.00	118.50	Fair	834.25	0.08	0.35	1.68	263.79	67.05	41.91	Low
HOUSTON-03	R4	Houston	2.00	109.00	110.00	109.50	Fair	1068.63	0.10	0.43	2.88	337.83	66.05	41.28	Low
HOUSTON-03	R4	Houston	2.10	124.00	115.00	119.50	Fair	1150.56	0.10	0.47	2.87	363.79	64.15	40.10	Low
HOUSTON-03	R4	Houston	2.20	127.00	141.00	134.00	Poor	1176.60	0.11	0.48	2.05	371.79	59.26	37.04	Low
HOUSTON-03	R4	Houston	2.30	145.00	177.00	161.00	Poor	1190.90	0.11	0.49	1.61	376.41	52.36	32.73	Low
HOUSTON-03	R4	Houston	2.40	116.00	123.00	119.50	Fair	1205.15	0.05	0.49	1.19	380.89	47.26	29.54	Low
HOUSTON-03	R4	Houston	2.50	100.00	126.00	113.00	Fair	1185.48	0.11	0.49	0.85	375.05	46.97	29.35	Low
HOUSTON-03	R4	Houston	2.60	97.00	93.00	95.00	Good	1108.17	0.15	0.46	0.60	350.81	47.86	29.92	Low
HOUSTON-03	R4	Houston	2.70	97.00	112.00	104.50	Fair	967.40	0.65	0.40	0.41	306.24	49.86	31.16	Low
HOUSTON-03	R4	Houston	2.80	110.00	113.00	111.50	Fair	883.39	1.94	0.37	0.33	280.24	52.76	32.98	Low
HOUSTON-03	R4	Houston	2.90	98.00	103.00	100.50	Fair	948.34	1.28	0.40	1.20	300.39	54.86	34.29	Low
HOUSTON-03	R4	Houston	3.00	104.00	106.00	105.00	Fair	1001.61	1.30	0.43	2.42	317.20	57.86	36.16	Low
HOUSTON-03	R4	Houston	3.10	97.00	113.00	105.00	Fair	901.58	2.76	0.38	1.76	286.24	60.65	37.91	Low
HOUSTON-03	R4	Houston	3.20	101.00	110.00	105.50	Fair	775.09	6.13	0.33	0.85	247.84	62.75	39.22	Low
HOUSTON-03	R4	Houston	3.30	113.00	109.00	111.00	Fair	716.46	3.09	0.30	0.60	227.99	64.85	40.53	Low
HOUSTON-03	R4	Houston	3.40	120.00	102.00	111.00	Fair	702.22	1.67	0.30	0.85	223.12	66.85	41.78	Low
HOUSTON-03	R4	Houston	3.50	93.00	95.00	94.00	Good	668.39	3.22	0.28	1.22	212.97	68.85	43.03	Low
HOUSTON-03	R4	Houston	3.60	104.00	138.00	121.00	Fair	295.05	3.97	0.12	0.66	95.24	70.85	44.28	Low
HOUSTON-03	R4	Houston	3.70	94.00	108.00	101.00	Fair	722.80	7.59	0.31	1.31	232.10	71.85	44.90	Low
HOUSTON-03	R4	Houston	3.80	116.00	121.00	118.50	Fair	703.26	4.12	0.29	1.21	224.51	73.85	46.15	Medium
HOUSTON-03	R4	Houston	3.90	85.00	104.00	94.50	Good	575.82	2.73	0.24	0.95	183.36	75.84	47.40	Medium
HOUSTON-03	R4	Houston	4.00	96.00	112.00	104.00	Fair	551.63	1.72	0.23	0.98	175.39	77.84	48.65	Medium
HOUSTON-03	R4	Houston	4.10	114.00	107.00	110.50	Fair	564.35	0.87	0.24	1.30	178.62	78.84	49.28	Medium
HOUSTON-03	R4	Houston	4.20	148.00	108.00	128.00	Fair	534.19	0.79	0.22	0.98	169.56	79.84	49.90	Medium
HOUSTON-03	R4	Houston	4.30	114.00	118.00	116.00	Fair	595.80	0.83	0.25	0.76	188.98	79.94	49.96	Medium
HOUSTON-03	R4	Houston	4.40	94.00	110.00	102.00	Fair	477.01	0.79	0.20	0.63	151.21	80.84	50.53	Medium
HOUSTON-03	R4	Houston	4.50	97.00	122.00	109.50	Fair	375.15	0.76	0.16	0.53	119.04	81.84	51.15	Medium
HOUSTON-03	R4	Houston	4.60	115.00	128.00	121.50	Fair	556.32	1.63	0.23	1.36	176.64	82.84	51.77	Medium
HOUSTON-03	R4	Houston	4.70	106.00	127.00	116.50	Fair	466.12	3.44	0.20	1.89	149.12	83.84	52.40	Medium
HOUSTON-03	R4	Houston	4.80	192.00	224.00	208.00	Very Poor	663.93	4.75	0.28	1.97	212.28	83.94	52.46	Medium
HOUSTON-04	R1	Houston	0.10	130.00	164.00	147.00	Poor	842.81	0.34	0.25	0.05	266.49	68.26	42.66	Low
HOUSTON-04	R1	Houston	0.20	68.00	93.00	80.50	Good	812.48	0.36	0.24	0.04	256.83	69.26	43.29	Low
HOUSTON-04	R1	Houston	0.30	131.00	193.00	162.00	Poor	910.01	0.45	0.27	0.08	288.00	70.56	44.10	Low
HOUSTON-04	R1	Houston	0.40	184.00	240.00	212.00	Very Poor	834.46	0.48	0.25	0.15	263.70	72.26	45.16	Medium
HOUSTON-04	R1	Houston	0.50	156.00	170.00	163.00	Poor	457.36	0.33	0.13	0.11	144.98	73.46	45.91	Medium
HOUSTON-04	R1	Houston	0.60	88.00	136.00	112.00	Fair	350.82	0.34	0.10	0.06	110.92	75.26	47.04	Medium
HOUSTON-04	R1	Houston	0.70	58.00	106.00	82.00	Good	422.56	0.60	0.12	0.06	133.62	76.26	47.66	Medium
HOUSTON-04	R1	Houston	0.80	49.00	78.00	63.50	Good	393.61	1.67	0.12	0.07	125.18	77.26	48.29	Medium
HOUSTON-04	R1	Houston	0.90	51.00	91.00	71.00	Good	555.87	3.00	0.16	0.14	177.23	77.96	48.72	Medium
HOUSTON-04	R1	Houston	1.00	67.00	103.00	85.00	Good	646.45	1.90	0.19	0.20	205.29	77.59	48.23	Medium
HOUSTON-04	R1	Houston	1.10	85.00	113.00	99.00	Fair	644.38	0.95	0.19	0.23	203.82	77.95	48.13	Medium
HOUSTON-04	R1	Houston	1.20	238.00	286.00	262.00	Very Poor	634.96	0.34	0.19	0.17	200.83	78.26	48.91	Medium
HOUSTON-04	R1	Houston	1.30	109.00	100.00	104.50	Fair	641.75	0.14	0.19	0.10	202.73	78.66	49.16	Medium
HOUSTON-04	R1	Houston	1.40	51.00	68.00	59.50	Very Good	655.67	0.20	0.19	0.08	207.51	77.96	48.72	Medium
HOUSTON-04	R1	Houston	1.50	56.00	67.00	61.50	Good	657.36	0.26	0.19	0.07	208.25	77.06	48.50	Medium
HOUSTON-04	R1	Houston	1.60	82.00	96.00	89.00	Good	660.80	0.27	0.19	0.06	209.05	77.66	48.54	Medium
HOUSTON-04	R1	Houston	1.70	76.00	85.00	80.50	Good	697.71	0.25	0.21	0.07	220.68	76.96	48.10	Medium
HOUSTON-04	R1	Houston	1.80	61.00	57.00	59.00	Very Good	883.09	0.39	0.26	0.24	279.02	76.96	48.10	Medium
HOUSTON-04	R1	Houston	1.90	77.00	85.00	81.00	Good	702.50	0.41	0.21	0.39	222.17	76.96	48.10	Medium
HOUSTON-04	R1	Houston	2.00	53.00	81.00	67.00	Good	418.48	0.30	0.12	0.18	132.64	77.26	48.29	Medium
HOUSTON-04	R1	Houston	2.10	91.00	117.00	104.00	Fair	253.01	0.19	0.07	0.06	79.75	77.96	48.72	Medium
HOUSTON-04	R1	Houston	2.20	86.00	114.00	100.00	Fair	320.96	0.26	0.09	0.08	101.52	78.26	48.91	Medium
HOUSTON-04	R1	Houston	2.30	246.00	267.00	256.50	Very Poor	326.26	0.25	0.10	0.11	103.14	79.26	49.54	Medium
HOUSTON-04	R1	Houston	2.40	92.00	110.00	101.00	Fair	390.78	0.26	0.12	0.17	123.38	80.26	50.16	Medium
HOUSTON-04	R1	Houston	2.50	87.00	101.00	94.00	Good	345.90	0.22	0.10	0.15	109.11	81.26	50.79	Medium
HOUSTON-04	R1	Houston	2.60	62.00	69.00	65.50	Good	309.24	0.18	0.09	0.15	97.98	82.26	51.41	Medium
HOUSTON-04	R1	Houston	2.70	65.00	87.00	76.00	Good	306.20	0.16	0.09	0.17	97.15	83.56	52.22	Medium
HOUSTON-04	R1	Houston	2.80	69.00	92.00	80.50	Good	377.15	0.20	0.11	0.25	119.10	85.55	53.47	Medium
HOUSTON-04	R1	Houston	2.90	60.00	77.00	68.50	Good	476.78	0.23	0.14	0.31	150.58	87.55	54.72	Medium
HOUSTON-04	R1	Houston	3.00	86.00	90.00	88.00	Good	429.83	0.25	0.13	0.23	135.98	89.75	56.10	Medium
HOUSTON-04	R1	Houston	3.10	112.00	120.00	116.00	Fair	375.35	0.99	0.11	0.13	119.43	92.55	57.84	Medium
HOUSTON-04	R1	Houston	3.20	73.00	76.00	74.50	Good	488.96	2.79	0.15	0.10	155.87	94.55	59.09	Medium
HOUSTON-04	R1	Houston	3.30	51.00	60.00	55.50	Very Good	200.01	1.19	0.06	0.03	63.80	96.55	60.34	High
HOUSTON-04	R1	Houston	3.40	67.00	66.00	66.50	Good	445.35	1.71	0.13	0.11	141.65	97.95	61.22	High
HOUSTON-04	R1	Houston	3.50	106.00	126.00	116.00	Fair	703.31	1.63	0.21	0.30	223.35	97.95	61.22	High
HOUSTON-04	R1	Houston	3.60	43.00	58.00	50.50	Very Good	778.70	0.59	0.23	0.40	246.69	98.25	61.40	High
HOUSTON-04	R1	Houston	3.70	51.00	73.00	62.00	Good	851.03	0.38	0.25	0.37	269.38	98.95	61.84	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-04	R1	Houston	3.80	50.00	59.00	54.50	Very Good	888.68	2.30	0.26	0.31	281.91	99.25	62.03	High
HOUSTON-04	R1	Houston	3.90	43.00	71.00	57.00	Very Good	811.80	5.28	0.24	0.21	259.00	100.25	62.65	High
HOUSTON-04	R1	Houston	4.00	44.00	70.00	57.00	Very Good	710.45	5.76	0.21	0.15	227.55	100.95	63.09	High
HOUSTON-04	R1	Houston	4.10	43.00	52.00	47.50	Very Good	698.32	2.62	0.21	0.15	221.85	100.94	63.10	High
HOUSTON-04	R1	Houston	4.20	47.00	53.00	50.00	Very Good	690.04	0.46	0.20	0.19	218.42	100.95	63.09	High
HOUSTON-04	R1	Houston	4.30	61.00	80.00	70.50	Good	684.62	0.12	0.20	0.24	216.64	101.25	63.28	High
HOUSTON-04	R1	Houston	4.40	80.00	79.00	79.50	Good	681.18	0.30	0.20	0.24	215.72	101.95	63.72	High
HOUSTON-04	R1	Houston	4.50	55.00	82.00	68.50	Good	674.93	0.45	0.20	0.17	213.46	101.95	63.72	High
HOUSTON-04	R1	Houston	4.60	95.00	119.00	107.00	Fair	594.27	3.95	0.18	0.10	189.75	102.55	64.09	High
HOUSTON-04	R1	Houston	4.70	60.00	65.00	62.50	Good	76.10	1.56	0.02	0.01	25.00	103.64	64.78	High
HOUSTON-04	R1	Houston	4.80	49.00	57.00	53.00	Very Good	61.91	1.72	0.03	0.01	20.19	102.65	64.15	High
HOUSTON-04	R1	Houston	4.90	59.00	62.00	60.50	Good	38.24	0.96	0.02	0.01	12.53	101.05	63.15	High
HOUSTON-04	R1	Houston	5.00	48.00	75.00	61.50	Good	16.78	0.33	0.02	0.01	5.31	97.55	60.97	High
HOUSTON-04	R1	Houston	5.10	51.00	69.00	60.00	Good	12.60	0.15	0.02	0.01	4.35	92.55	57.84	Medium
HOUSTON-04	R1	Houston	5.20	61.00	48.00	54.50	Very Good	13.70	0.14	0.04	0.01	4.59	87.75	54.85	Medium
HOUSTON-04	R1	Houston	5.30	52.00	57.00	54.50	Very Good	15.10	0.10	0.04	0.01	4.92	81.96	51.22	Medium
HOUSTON-04	R1	Houston	5.40	50.00	60.00	55.00	Very Good	30.69	0.05	0.04	0.01	9.97	75.06	46.91	Medium
HOUSTON-04	R1	Houston	5.50	41.00	51.00	46.00	Very Good	84.81	0.03	0.05	0.02	26.75	68.86	43.04	Low
HOUSTON-04	R1	Houston	5.60	50.00	65.00	57.50	Very Good	272.38	0.01	0.10	0.08	86.31	65.37	40.85	Low
HOUSTON-04	R1	Houston	5.70	65.00	61.00	63.00	Good	436.20	0.02	0.14	0.12	138.09	63.37	39.60	Low
HOUSTON-04	R1	Houston	5.80	76.00	65.00	70.50	Good	289.51	0.26	0.09	0.06	91.97	61.97	38.73	Low
HOUSTON-04	R1	Houston	5.90	58.00	49.00	53.50	Very Good	567.68	1.01	0.17	0.13	180.18	61.67	38.54	Low
HOUSTON-04	R1	Houston	6.00	50.00	64.00	57.00	Very Good	732.76	1.05	0.22	0.24	232.29	60.97	38.10	Low
HOUSTON-04	R1	Houston	6.10	62.00	63.00	62.50	Good	728.57	0.81	0.22	0.25	231.15	61.27	38.29	Low
HOUSTON-04	R1	Houston	6.20	55.00	64.00	59.50	Very Good	1105.41	0.99	0.33	0.21	350.25	61.97	38.73	Low
HOUSTON-04	R1	Houston	6.30	35.00	40.00	37.50	Very Good	1024.65	0.82	0.30	0.13	324.52	62.27	38.92	Low
HOUSTON-04	R1	Houston	6.40	48.00	52.00	50.00	Very Good	782.48	0.59	0.23	0.09	247.77	62.97	39.35	Low
HOUSTON-04	R1	Houston	6.50	59.00	74.00	66.50	Good	649.84	0.49	0.19	0.08	205.97	63.17	39.48	Low
HOUSTON-04	R1	Houston	6.60	51.00	73.00	62.00	Good	668.69	0.47	0.20	0.08	211.41	64.27	40.17	Low
HOUSTON-04	R1	Houston	6.70	43.00	58.00	50.50	Very Good	457.46	0.32	0.13	0.06	144.66	65.27	40.79	Low
HOUSTON-04	R1	Houston	6.80	48.00	51.00	49.50	Very Good	405.47	0.27	0.12	0.07	128.00	66.56	41.60	Low
HOUSTON-04	R1	Houston	6.90	54.00	63.00	58.50	Very Good	278.71	0.26	0.08	0.05	88.55	68.26	42.66	Low
HOUSTON-04	R1	Houston	7.00	58.00	65.00	61.50	Good	258.10	5.64	0.08	0.05	84.78	69.26	43.29	Low
HOUSTON-04	R1	Houston	7.10	47.00	54.00	50.50	Very Good	86.10	5.87	0.03	0.01	30.32	70.26	43.91	Low
HOUSTON-04	R1	Houston	7.20	52.00	63.00	57.50	Very Good	117.97	12.68	0.05	0.02	43.49	70.16	43.85	Low
HOUSTON-04	R1	Houston	7.30	65.00	78.00	71.50	Good	100.97	5.81	0.05	0.02	34.70	66.36	41.48	Low
HOUSTON-04	R1	Houston	7.40	60.00	64.00	62.00	Good	101.64	2.12	0.04	0.03	32.83	61.37	38.35	Low
HOUSTON-04	R1	Houston	7.50	56.00	57.00	56.50	Very Good	112.83	1.09	0.04	0.06	36.24	58.77	36.73	Low
HOUSTON-04	R1	Houston	7.60	45.00	60.00	52.50	Very Good	278.40	1.38	0.09	0.23	88.46	55.97	34.98	Low
HOUSTON-04	R1	Houston	7.70	52.00	65.00	58.50	Very Good	639.20	2.12	0.19	0.56	202.63	55.97	34.98	Low
HOUSTON-04	R1	Houston	7.80	58.00	62.00	60.00	Good	882.35	1.86	0.26	0.60	280.33	56.27	35.17	Low
HOUSTON-04	R1	Houston	7.90	51.00	66.00	58.50	Very Good	645.31	0.49	0.19	0.29	203.94	57.87	36.17	Low
HOUSTON-04	R1	Houston	8.00	58.00	59.00	58.50	Very Good	603.63	0.30	0.18	0.19	191.37	60.77	37.98	Low
HOUSTON-04	R1	Houston	8.10	58.00	61.00	59.50	Very Good	359.83	0.14	0.11	0.08	114.11	63.57	39.73	Low
HOUSTON-04	R1	Houston	8.20	54.00	72.00	63.00	Good	355.99	0.24	0.11	0.06	112.92	65.77	41.10	Low
HOUSTON-04	R1	Houston	8.30	58.00	56.00	57.00	Very Good	437.83	0.45	0.13	0.06	138.34	68.66	42.91	Low
HOUSTON-04	R1	Houston	8.40	68.00	68.00	68.00	Good	623.28	0.75	0.18	0.07	197.09	71.56	44.73	Low
HOUSTON-04	R1	Houston	8.50	90.00	135.00	112.50	Fair	519.90	0.65	0.15	0.05	164.57	73.46	45.91	Medium
HOUSTON-04	R1	Houston	8.60	64.00	68.00	66.00	Good	465.20	0.58	0.13	0.04	147.46	74.96	46.85	Medium
HOUSTON-04	R1	Houston	8.70	54.00	63.00	58.50	Very Good	435.29	0.49	0.13	0.03	137.47	74.96	46.85	Medium
HOUSTON-04	R1	Houston	8.80	59.00	77.00	68.00	Good	586.57	0.58	0.17	0.04	185.86	74.96	46.85	Medium
HOUSTON-04	R1	Houston	8.90	55.00	61.00	58.00	Very Good	784.92	0.70	0.23	0.10	248.61	75.26	47.04	Medium
HOUSTON-04	R1	Houston	9.00	58.00	63.00	60.50	Good	857.72	0.73	0.25	0.17	271.33	75.96	47.47	Medium
HOUSTON-04	R1	Houston	9.10	61.00	56.00	58.50	Very Good	800.09	0.82	0.23	0.14	253.41	76.56	47.85	Medium
HOUSTON-04	R1	Houston	9.20	65.00	70.00	67.50	Good	467.33	0.61	0.13	0.05	147.86	78.26	48.91	Medium
HOUSTON-04	R1	Houston	9.30	62.00	77.00	69.50	Good	336.81	0.51	0.10	0.03	106.77	79.26	49.54	Medium
HOUSTON-04	R1	Houston	9.40	87.00	94.00	90.50	Good	450.32	0.77	0.13	0.05	142.74	80.26	50.16	Medium
HOUSTON-04	R1	Houston	9.50	109.00	117.00	113.00	Fair	623.98	1.09	0.18	0.20	197.89	81.46	50.91	Medium
HOUSTON-04	R1	Houston	9.60	151.00	167.00	159.00	Poor	667.85	1.05	0.19	0.36	211.73	82.66	51.66	Medium
HOUSTON-04	R1	Houston	9.70	88.00	89.00	88.50	Good	788.96	1.20	0.23	0.48	249.86	82.26	51.41	Medium
HOUSTON-04	R1	Houston	9.80	81.00	84.00	82.50	Good	883.31	1.50	0.26	0.47	280.05	83.26	52.03	Medium
HOUSTON-04	R1	Houston	9.90	69.00	92.00	80.50	Good	622.95	1.17	0.18	0.26	197.47	84.26	52.66	Medium
HOUSTON-04	R1	Houston	10.00	82.00	106.00	94.00	Good	622.71	1.25	0.18	0.16	197.20	84.95	53.10	Medium
HOUSTON-04	R1	Houston	10.10	94.00	105.00	99.50	Fair	649.74	1.37	0.19	0.12	205.96	85.25	53.28	Medium
HOUSTON-04	R1	Houston	10.20	68.00	88.00	78.00	Good	727.87	1.63	0.22	0.12	230.93	86.25	53.91	Medium
HOUSTON-04	R1	Houston	10.30	78.00	105.00	91.50	Good	779.57	1.78	0.23	0.26	247.61	86.95	54.35	Medium
HOUSTON-04	R1	Houston	10.40	69.00	78.00	73.50	Good	852.71	1.91	0.25	0.51	270.52	87.25	54.53	Medium
HOUSTON-04	R1	Houston	10.50	83.00	88.00	85.50	Good	868.48	1.90	0.26	0.41	275.31	88.45	55.28	Medium
HOUSTON-04	R1	Houston	10.60	78.00	102.00	90.00	Good	870.74	1.95	0.26	0.25	275.92	90.55	56.59	Medium
HOUSTON-04	R2	Houston	0.10	130.00	164.00	147.00	Poor	1032.33	0.09	0.27	0.12	326.05	47.47	29.67	Low
HOUSTON-04	R2	Houston	0.20	68.00	93.00	80.50	Good	722.73	0.02	0.22	0.05	228.54	49.57	30.98	Low
HOUSTON-04	R2	Houston	0.30	131.00	193.00	162.00	Poor	640.32	0.07	0.20	0.03	202.85	51.57	32.23	Low
HOUSTON-04	R2	Houston	0.40	184.00	240.00	212.00	Very Poor	624.66	0.09	0.19	0.02	197.84	53.87	33.67	Low
HOUSTON-04	R2	Houston	0.50	156.00	170.00	163.00	Poor	584.82	0.10	0.18	0.02	185.32	56.57	35.36	Low
HOUSTON-04	R2	Houston	0.60	88.00	136.00	112.00	Fair	486.54	0.09	0.15	0.01	153.77	58.57	36.61	Low
HOUSTON-04	R2	Houston	0.70	58.00	106.00	82.00	Good	153.56	0.04	0.05	0.00	48.55	60.27	37.67	Low
HOUSTON-04	R2	Houston	0.80	49.00	78.00	63.50	Good	148.36	0.04	0.05	0.00	46.90	61.57	38.48	Low

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-04	R2	Houston	0.90	51.00	91.00	71.00	Good	149.56	0.04	0.05	0.00	47.10	63.57	39.73	Low
HOUSTON-04	R2	Houston	1.00	67.00	103.00	85.00	Good	153.16	0.05	0.05	0.00	48.63	65.27	40.79	Low
HOUSTON-04	R2	Houston	1.10	85.00	113.00	99.00	Fair	136.97	0.04	0.04	0.00	43.39	66.56	41.60	Low
HOUSTON-04	R2	Houston	1.20	238.00	286.00	262.00	Very Poor	113.43	0.04	0.03	0.00	36.11	68.26	42.66	Low
HOUSTON-04	R2	Houston	1.30	109.00	100.00	104.50	Fair	108.13	0.04	0.03	0.00	34.54	68.96	43.10	Low
HOUSTON-04	R2	Houston	1.40	51.00	68.00	59.50	Very Good	109.86	0.04	0.03	0.00	34.91	68.50	43.23	Low
HOUSTON-04	R2	Houston	1.50	56.00	67.00	61.50	Good	115.96	0.04	0.03	0.00	36.82	68.96	43.10	Low
HOUSTON-04	R2	Houston	1.60	82.00	96.00	89.00	Good	115.48	0.04	0.03	0.00	36.33	69.26	43.29	Low
HOUSTON-04	R2	Houston	1.70	76.00	85.00	80.50	Good	104.90	0.03	0.03	0.00	32.94	69.96	43.73	Low
HOUSTON-04	R2	Houston	1.80	61.00	57.00	59.00	Very Good	122.65	0.03	0.04	0.00	38.70	69.96	43.73	Low
HOUSTON-04	R2	Houston	1.90	77.00	85.00	81.00	Good	165.37	0.04	0.05	0.00	52.20	69.66	43.54	Low
HOUSTON-04	R2	Houston	2.00	53.00	81.00	67.00	Good	172.24	0.04	0.05	0.00	54.90	68.66	42.91	Low
HOUSTON-04	R2	Houston	2.10	91.00	117.00	104.00	Fair	172.06	0.04	0.05	0.00	54.00	67.66	42.29	Low
HOUSTON-04	R2	Houston	2.20	86.00	114.00	100.00	Fair	172.20	0.03	0.05	0.00	54.17	66.96	41.85	Low
HOUSTON-04	R2	Houston	2.30	246.00	267.00	256.50	Very Poor	166.72	0.03	0.05	0.01	53.03	66.66	41.67	Low
HOUSTON-04	R2	Houston	2.40	92.00	110.00	101.00	Fair	307.01	0.05	0.09	0.04	97.38	65.96	41.23	Low
HOUSTON-04	R2	Houston	2.50	87.00	101.00	94.00	Good	630.63	0.08	0.18	0.10	199.74	65.67	41.04	Low
HOUSTON-04	R2	Houston	2.60	62.00	69.00	65.50	Good	828.54	0.11	0.24	0.13	261.99	64.97	40.60	Low
HOUSTON-04	R2	Houston	2.70	65.00	87.00	76.00	Good	806.32	0.09	0.23	0.11	255.18	64.67	40.42	Low
HOUSTON-04	R2	Houston	2.80	69.00	92.00	80.50	Good	571.83	0.05	0.17	0.05	181.08	63.97	39.98	Low
HOUSTON-04	R2	Houston	2.90	60.00	77.00	68.50	Good	459.66	0.03	0.13	0.03	145.12	63.97	39.98	Low
HOUSTON-04	R2	Houston	3.00	86.00	90.00	88.00	Good	415.53	0.02	0.12	0.01	131.43	63.97	39.98	Low
HOUSTON-04	R2	Houston	3.10	112.00	120.00	116.00	Fair	352.18	0.02	0.10	0.01	111.20	63.97	39.98	Low
HOUSTON-04	R2	Houston	3.20	73.00	76.00	74.50	Good	359.24	0.02	0.10	0.01	113.83	63.77	39.85	Low
HOUSTON-04	R2	Houston	3.30	51.00	60.00	55.50	Very Good	668.95	0.03	0.19	0.01	211.59	62.97	39.35	Low
HOUSTON-04	R2	Houston	3.40	67.00	66.00	66.50	Good	824.30	0.04	0.24	0.01	260.26	62.67	39.17	Low
HOUSTON-04	R2	Houston	3.50	106.00	126.00	116.00	Fair	839.42	0.04	0.24	0.00	265.29	61.97	38.73	Low
HOUSTON-04	R2	Houston	3.60	43.00	58.00	50.50	Very Good	774.28	0.05	0.22	0.00	244.96	61.97	38.73	Low
HOUSTON-04	R2	Houston	3.70	51.00	73.00	62.00	Good	692.32	0.11	0.20	0.00	218.77	62.27	38.92	Low
HOUSTON-04	R2	Houston	3.80	50.00	59.00	54.50	Very Good	691.84	0.21	0.20	0.01	218.93	63.27	39.54	Low
HOUSTON-04	R2	Houston	3.90	43.00	71.00	57.00	Very Good	699.63	0.21	0.20	0.02	221.31	64.27	40.17	Low
HOUSTON-04	R2	Houston	4.00	44.00	70.00	57.00	Very Good	697.75	0.21	0.20	0.03	220.69	65.27	40.79	Low
HOUSTON-04	R2	Houston	4.10	43.00	52.00	47.50	Very Good	697.99	0.21	0.20	0.02	220.92	66.26	41.42	Low
HOUSTON-04	R2	Houston	4.20	47.00	53.00	50.00	Very Good	698.54	0.21	0.20	0.02	220.81	67.26	42.04	Low
HOUSTON-04	R2	Houston	4.30	61.00	80.00	70.50	Good	693.01	0.21	0.20	0.01	219.50	68.56	42.85	Low
HOUSTON-04	R2	Houston	4.40	80.00	79.00	79.50	Good	704.91	0.20	0.20	0.02	223.29	70.56	44.10	Low
HOUSTON-04	R2	Houston	4.50	55.00	82.00	68.50	Good	664.63	0.16	0.19	0.03	210.42	72.26	45.16	Medium
HOUSTON-04	R2	Houston	4.60	95.00	119.00	107.00	Fair	421.19	0.10	0.12	0.02	132.98	73.56	45.98	Medium
HOUSTON-04	R2	Houston	4.70	60.00	65.00	62.50	Good	193.98	0.05	0.05	0.01	61.07	75.26	47.04	Medium
HOUSTON-04	R2	Houston	4.80	49.00	57.00	53.00	Very Good	197.08	0.06	0.06	0.00	61.99	76.26	47.66	Medium
HOUSTON-04	R2	Houston	4.90	59.00	62.00	60.50	Good	211.84	0.06	0.06	0.00	66.98	77.26	48.29	Medium
HOUSTON-04	R2	Houston	5.00	48.00	75.00	61.50	Good	202.56	0.05	0.06	0.00	64.00	78.26	48.91	Medium
HOUSTON-04	R2	Houston	5.10	51.00	69.00	60.00	Good	177.55	0.04	0.05	0.00	56.39	78.96	49.35	Medium
HOUSTON-04	R2	Houston	5.20	61.00	48.00	54.50	Very Good	181.29	0.04	0.05	0.00	57.09	79.26	49.54	Medium
HOUSTON-04	R2	Houston	5.30	52.00	57.00	54.50	Very Good	172.70	0.04	0.05	0.00	54.68	80.26	50.16	Medium
HOUSTON-04	R2	Houston	5.40	50.00	60.00	55.00	Very Good	165.51	0.03	0.05	0.00	52.50	80.96	50.60	Medium
HOUSTON-04	R2	Houston	5.50	41.00	51.00	46.00	Very Good	149.85	0.01	0.03	0.00	47.21	81.26	50.79	Medium
HOUSTON-04	R2	Houston	5.60	50.00	65.00	57.50	Very Good	166.95	0.02	0.04	0.00	52.76	82.26	51.41	Medium
HOUSTON-04	R2	Houston	5.70	65.00	61.00	63.00	Good	354.03	0.03	0.08	0.00	111.55	82.96	51.85	Medium
HOUSTON-04	R2	Houston	5.80	76.00	65.00	70.50	Good	600.95	0.05	0.14	0.00	190.30	82.66	51.66	Medium
HOUSTON-04	R2	Houston	5.90	58.00	49.00	53.50	Very Good	706.58	0.09	0.16	0.00	223.11	81.66	51.04	Medium
HOUSTON-04	R2	Houston	6.00	50.00	64.00	57.00	Very Good	649.59	0.12	0.15	0.00	205.56	80.96	50.60	Medium
HOUSTON-04	R2	Houston	6.10	62.00	63.00	62.50	Good	513.50	0.16	0.12	0.00	162.72	80.66	50.41	Medium
HOUSTON-04	R2	Houston	6.20	55.00	64.00	59.50	Very Good	522.84	0.19	0.12	0.00	165.60	79.66	49.79	Medium
HOUSTON-04	R2	Houston	6.30	35.00	40.00	37.50	Very Good	455.23	0.18	0.11	0.01	144.00	78.96	49.35	Medium
HOUSTON-04	R2	Houston	6.40	48.00	52.00	50.00	Very Good	318.33	0.13	0.08	0.01	100.46	78.96	49.35	Medium
HOUSTON-04	R2	Houston	6.50	59.00	74.00	66.50	Good	253.97	0.11	0.06	0.01	80.51	79.26	49.54	Medium
HOUSTON-04	R2	Houston	6.60	51.00	73.00	62.00	Good	253.88	0.10	0.06	0.01	80.06	79.66	49.79	Medium
HOUSTON-04	R2	Houston	6.70	43.00	58.00	50.50	Very Good	186.27	0.08	0.04	0.00	58.58	78.96	49.35	Medium
HOUSTON-04	R2	Houston	6.80	48.00	51.00	49.50	Very Good	159.94	0.08	0.04	0.00	50.42	78.96	49.35	Medium
HOUSTON-04	R2	Houston	6.90	54.00	63.00	58.50	Very Good	177.04	0.11	0.06	0.00	55.72	78.96	49.35	Medium
HOUSTON-04	R2	Houston	7.00	58.00	65.00	61.50	Good	296.07	0.17	0.09	0.01	93.99	79.26	49.54	Medium
HOUSTON-04	R2	Houston	7.10	47.00	54.00	50.50	Very Good	429.03	0.20	0.11	0.03	136.06	79.96	49.97	Medium
HOUSTON-04	R2	Houston	7.20	52.00	63.00	57.50	Very Good	518.46	0.23	0.13	0.03	163.87	79.96	49.97	Medium
HOUSTON-04	R2	Houston	7.30	65.00	78.00	71.50	Good	610.53	0.27	0.15	0.02	193.08	79.96	49.97	Medium
HOUSTON-04	R2	Houston	7.40	60.00	64.00	62.00	Good	673.39	0.27	0.16	0.01	212.71	79.66	49.79	Medium
HOUSTON-04	R2	Houston	7.50	56.00	57.00	56.50	Very Good	641.39	0.26	0.15	0.01	202.74	78.66	49.16	Medium
HOUSTON-04	R2	Houston	7.60	45.00	60.00	52.50	Very Good	374.28	0.15	0.09	0.00	118.61	77.66	48.54	Medium
HOUSTON-04	R2	Houston	7.70	52.00	65.00	58.50	Very Good	152.95	0.05	0.04	0.00	48.38	76.66	47.91	Medium
HOUSTON-04	R2	Houston	7.80	58.00	62.00	60.00	Good	270.99	0.10	0.06	0.00	85.59	75.36	47.10	Medium
HOUSTON-04	R2	Houston	7.90	51.00	66.00	58.50	Very Good	573.49	0.18	0.14	0.01	181.28	73.36	45.85	Medium
HOUSTON-04	R2	Houston	8.00	58.00	59.00	58.50	Very Good	753.83	0.23	0.18	0.03	238.40	71.66	44.79	Low
HOUSTON-04	R2	Houston	8.10	58.00	61.00	59.50	Very Good	728.13	0.23	0.17	0.06	230.24	70.66	44.16	Low
HOUSTON-04	R2	Houston	8.20	54.00	72.00	63.00	Good	810.40	0.25	0.19	0.05	256.17	70.26	43.91	Low
HOUSTON-04	R2	Houston	8.30	58.00	56.00	57.00	Very Good	862.91	0.27	0.21	0.05	273.21	71.26	44.54	Low
HOUSTON-04	R2	Houston	8.40	68.00	68.00	68.00	Good	880.53	0.31	0.21	0.05	278.68	72.26	45.16	Medium
HOUSTON-04	R2	Houston	8.50	90.00	135.00	112.50	Fair	787.42	0.32	0.19	0.03	248.83	73.26	45.79	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-04	R2	Houston	8.60	64.00	68.00	66.00	Good	582.60	0.29	0.14	0.01	184.32	74.26	46.41	Medium
HOUSTON-04	R2	Houston	8.70	54.00	63.00	58.50	Very Good	689.98	0.37	0.17	0.01	218.22	74.96	46.85	Medium
HOUSTON-04	R2	Houston	8.80	59.00	77.00	68.00	Good	729.22	0.39	0.18	0.02	230.40	74.66	46.66	Medium
HOUSTON-04	R2	Houston	8.90	55.00	61.00	58.00	Very Good	724.06	0.39	0.18	0.02	228.99	73.36	45.85	Medium
HOUSTON-04	R2	Houston	9.00	58.00	63.00	60.50	Good	725.66	0.39	0.18	0.01	229.61	71.96	44.98	Low
HOUSTON-04	R2	Houston	9.10	61.00	56.00	58.50	Very Good	622.81	0.31	0.15	0.01	197.26	72.26	45.16	Medium
HOUSTON-04	R2	Houston	9.20	65.00	70.00	67.50	Good	356.99	0.18	0.09	0.00	112.83	73.26	45.79	Medium
HOUSTON-04	R2	Houston	9.30	62.00	77.00	69.50	Good	254.22	0.14	0.06	0.00	80.81	73.96	46.23	Medium
HOUSTON-04	R2	Houston	9.40	87.00	94.00	90.50	Good	350.89	0.19	0.09	0.00	110.86	74.16	46.35	Medium
HOUSTON-04	R2	Houston	9.50	109.00	117.00	113.00	Fair	557.38	0.30	0.14	0.01	176.05	74.96	46.85	Medium
HOUSTON-04	R2	Houston	9.60	151.00	167.00	159.00	Poor	570.14	0.33	0.14	0.01	180.10	74.96	46.85	Medium
HOUSTON-04	R2	Houston	9.70	88.00	89.00	88.50	Good	459.79	0.29	0.11	0.01	145.41	74.66	46.66	Medium
HOUSTON-04	R2	Houston	9.80	81.00	84.00	82.50	Good	563.68	0.38	0.14	0.01	178.40	73.96	46.23	Medium
HOUSTON-04	R2	Houston	9.90	69.00	92.00	80.50	Good	710.27	0.51	0.17	0.01	224.80	73.66	46.04	Medium
HOUSTON-04	R2	Houston	10.00	82.00	106.00	94.00	Good	751.85	0.57	0.18	0.01	238.21	72.96	45.60	Medium
HOUSTON-04	R2	Houston	10.10	94.00	105.00	99.50	Fair	765.43	0.58	0.19	0.02	242.03	72.96	45.60	Medium
HOUSTON-04	R2	Houston	10.20	68.00	88.00	78.00	Good	759.61	0.54	0.19	0.03	240.32	72.96	45.60	Medium
HOUSTON-04	R2	Houston	10.30	78.00	105.00	91.50	Good	689.66	0.49	0.17	0.03	218.11	72.66	45.41	Medium
HOUSTON-04	R2	Houston	10.40	69.00	78.00	73.50	Good	606.04	0.43	0.15	0.02	192.00	71.66	44.79	Low
HOUSTON-04	R2	Houston	10.50	83.00	88.00	85.50	Good	614.63	0.44	0.16	0.02	194.30	70.96	44.35	Low
HOUSTON-04	R2	Houston	10.60	78.00	102.00	90.00	Good	615.07	0.41	0.15	0.02	194.31	70.96	44.35	Low
HOUSTON-05	R1	Houston	0.10	146.00	123.00	134.50	Poor	49.98	0.03	0.00	0.00	15.51	77.97	48.73	Medium
HOUSTON-05	R1	Houston	0.20	58.00	75.00	66.50	Good	61.69	0.04	0.00	0.00	19.20	77.69	48.59	Medium
HOUSTON-05	R1	Houston	0.30	50.00	71.00	60.50	Good	66.26	0.04	0.00	0.00	20.92	77.07	48.17	Medium
HOUSTON-05	R1	Houston	0.40	61.00	62.00	61.50	Good	80.35	0.04	0.00	0.00	25.43	76.97	48.11	Medium
HOUSTON-05	R1	Houston	0.50	52.00	61.00	56.50	Very Good	103.56	0.05	0.00	0.00	32.91	76.59	48.32	Medium
HOUSTON-05	R1	Houston	0.60	70.00	86.00	78.00	Good	175.48	0.07	0.00	0.01	55.33	75.97	47.48	Medium
HOUSTON-05	R1	Houston	0.70	54.00	53.00	53.50	Very Good	299.59	0.11	0.00	0.01	94.74	75.94	47.45	Medium
HOUSTON-05	R1	Houston	0.80	51.00	59.00	55.00	Very Good	326.95	0.11	0.00	0.01	103.07	75.19	47.30	Medium
HOUSTON-05	R1	Houston	0.90	102.00	99.00	100.50	Fair	118.84	0.04	0.00	0.00	37.40	76.97	48.11	Medium
HOUSTON-05	R1	Houston	1.00	62.00	83.00	72.50	Good	115.24	0.03	0.00	0.00	36.65	76.97	48.11	Medium
HOUSTON-05	R1	Houston	1.10	47.00	53.00	50.00	Very Good	500.35	0.14	0.01	0.01	158.00	75.07	46.92	Medium
HOUSTON-05	R1	Houston	1.20	68.00	137.00	102.50	Fair	577.06	0.14	0.01	0.01	182.02	74.97	46.86	Medium
HOUSTON-05	R1	Houston	1.30	57.00	79.00	68.00	Good	566.03	0.14	0.01	0.03	178.86	75.97	47.48	Medium
HOUSTON-05	R1	Houston	1.40	66.00	79.00	72.50	Good	474.30	0.09	0.01	0.04	149.80	76.87	48.04	Medium
HOUSTON-05	R1	Houston	1.50	56.00	80.00	68.00	Good	340.87	0.07	0.01	0.03	108.05	78.87	49.29	Medium
HOUSTON-05	R1	Houston	1.60	73.00	63.00	68.00	Good	346.02	0.07	0.01	0.02	109.44	79.97	49.98	Medium
HOUSTON-05	R1	Houston	1.70	56.00	88.00	72.00	Good	340.78	0.06	0.01	0.02	108.00	79.97	49.98	Medium
HOUSTON-05	R1	Houston	1.80	149.00	178.00	163.50	Poor	324.01	0.04	0.01	0.03	102.53	80.87	50.54	Medium
HOUSTON-05	R1	Houston	1.90	115.00	142.00	128.50	Fair	242.98	0.03	0.00	0.02	76.66	81.87	51.17	Medium
HOUSTON-05	R1	Houston	2.00	158.00	163.00	160.50	Poor	103.42	0.01	0.00	0.01	33.01	81.97	51.23	Medium
HOUSTON-05	R1	Houston	2.10	114.00	104.00	109.00	Fair	92.55	0.01	0.00	0.01	29.50	81.50	51.57	Medium
HOUSTON-05	R1	Houston	2.20	59.00	63.00	61.00	Good	210.19	0.03	0.00	0.01	66.76	81.07	50.67	Medium
HOUSTON-05	R1	Houston	2.30	61.00	58.00	59.50	Very Good	91.23	0.01	0.00	0.00	28.76	80.07	50.04	Medium
HOUSTON-05	R1	Houston	2.40	61.00	76.00	68.50	Good	103.34	0.01	0.00	0.00	32.77	79.07	49.42	Medium
HOUSTON-05	R1	Houston	2.50	138.00	172.00	155.00	Poor	127.22	0.01	0.00	0.01	39.83	78.07	48.79	Medium
HOUSTON-05	R1	Houston	2.60	69.00	104.00	86.50	Good	223.20	0.03	0.01	0.01	70.39	76.07	47.55	Medium
HOUSTON-05	R1	Houston	2.70	59.00	74.00	66.50	Good	279.81	0.03	0.01	0.01	88.67	75.97	47.48	Medium
HOUSTON-05	R1	Houston	2.80	58.00	74.00	66.00	Good	334.24	0.04	0.01	0.02	105.35	75.97	47.48	Medium
HOUSTON-05	R1	Houston	2.90	54.00	68.00	61.00	Good	209.94	0.01	0.01	0.02	66.66	76.87	48.04	Medium
HOUSTON-05	R1	Houston	3.00	80.00	110.00	95.00	Good	71.69	0.00	0.00	0.01	22.92	77.87	48.67	Medium
HOUSTON-05	R1	Houston	3.10	55.00	64.00	59.50	Very Good	76.84	0.00	0.00	0.01	24.37	77.97	48.73	Medium
HOUSTON-05	R1	Houston	3.20	120.00	114.00	117.00	Fair	92.92	0.00	0.00	0.01	29.54	77.97	48.73	Medium
HOUSTON-05	R1	Houston	3.30	125.00	141.00	133.00	Poor	110.06	0.01	0.00	0.01	34.41	76.97	48.11	Medium
HOUSTON-05	R1	Houston	3.40	66.00	67.00	66.50	Good	108.07	0.01	0.00	0.01	34.41	76.64	48.69	Medium
HOUSTON-05	R1	Houston	3.50	44.00	54.00	49.00	Very Good	107.06	0.00	0.00	0.01	33.66	76.35	48.45	Medium
HOUSTON-05	R1	Houston	3.60	64.00	68.00	66.00	Good	266.07	0.01	0.01	0.01	83.78	76.10	48.35	Medium
HOUSTON-05	R1	Houston	3.70	57.00	54.00	55.50	Very Good	464.88	0.02	0.01	0.02	146.62	76.33	48.34	Medium
HOUSTON-05	R1	Houston	3.80	61.00	63.00	62.00	Good	552.37	0.02	0.01	0.01	174.30	76.46	48.11	Medium
HOUSTON-05	R1	Houston	3.90	83.00	111.00	97.00	Fair	136.09	0.01	0.00	0.00	43.07	78.87	49.29	Medium
HOUSTON-05	R1	Houston	4.00	67.00	57.00	62.00	Good	149.31	0.00	0.00	0.00	46.86	79.87	49.92	Medium
HOUSTON-05	R1	Houston	4.10	79.00	77.00	78.00	Good	312.07	0.00	0.01	0.00	98.43	78.97	49.36	Medium
HOUSTON-05	R1	Houston	4.20	141.00	175.00	158.00	Poor	417.36	0.00	0.01	0.00	132.18	77.97	48.73	Medium
HOUSTON-05	R1	Houston	4.30	88.00	112.00	100.00	Fair	282.83	0.01	0.01	0.00	89.35	77.35	48.42	Medium
HOUSTON-05	R1	Houston	4.40	59.00	61.00	60.00	Good	172.25	0.01	0.00	0.00	54.65	77.97	48.73	Medium
HOUSTON-05	R1	Houston	4.50	69.00	65.00	67.00	Good	295.22	0.03	0.01	0.00	93.51	76.97	48.11	Medium
HOUSTON-05	R1	Houston	4.60	46.00	67.00	56.50	Very Good	415.30	0.04	0.01	0.00	131.12	75.97	47.48	Medium
HOUSTON-05	R1	Houston	4.70	47.00	65.00	56.00	Very Good	636.20	0.08	0.01	0.00	200.84	75.97	47.48	Medium
HOUSTON-05	R1	Houston	4.80	52.00	128.00	90.00	Good	745.04	0.10	0.02	0.00	235.71	75.97	47.48	Medium
HOUSTON-05	R1	Houston	4.90	57.00	105.00	81.00	Good	749.06	0.13	0.02	0.01	236.38	76.97	48.11	Medium
HOUSTON-05	R1	Houston	5.00	89.00	84.00	86.50	Good	744.35	0.13	0.02	0.02	234.89	76.97	48.11	Medium
HOUSTON-05	R1	Houston	5.10	97.00	124.00	110.50	Fair	662.94	0.15	0.01	0.02	209.72	77.97	48.73	Medium
HOUSTON-05	R1	Houston	5.20	100.00	153.00	126.50	Fair	645.37	0.14	0.01	0.01	204.15	78.97	49.36	Medium
HOUSTON-05	R1	Houston	5.30	97.00	118.00	107.50	Fair	329.53	0.09	0.01	0.01	104.40	79.97	49.98	Medium
HOUSTON-05	R1	Houston	5.40	60.00	60.00	60.00	Good	98.83	0.03	0.00	0.00	30.98	78.07	48.79	Medium
HOUSTON-05	R1	Houston	5.50	41.00	51.00	46.00	Very Good	111.37	0.04	0.00	0.01	35.57	76.07	47.55	Medium
HOUSTON-05	R1	Houston	5.60	40.00	51.00	45.50	Very Good	238.06	0.09	0.01	0.01	75.40	74.07	46.30	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-05	R1	Houston	5.70	58.00	63.00	60.50	Good	508.87	0.26	0.02	0.02	160.58	72.07	45.05	Medium
HOUSTON-05	R1	Houston	5.80	36.00	44.00	40.00	Very Good	617.17	0.39	0.02	0.03	195.24	71.07	44.42	Low
HOUSTON-05	R1	Houston	5.90	122.00	131.00	126.50	Fair	394.91	0.27	0.01	0.03	124.94	70.97	44.36	Low
HOUSTON-05	R1	Houston	6.00	128.00	111.00	119.50	Fair	390.60	0.30	0.01	0.04	123.26	72.87	45.55	Medium
HOUSTON-05	R1	Houston	6.10	129.00	106.00	117.50	Fair	338.38	0.26	0.01	0.04	107.31	72.97	45.61	Medium
HOUSTON-05	R1	Houston	6.20	84.00	90.00	87.00	Good	423.86	0.34	0.02	0.03	134.06	73.87	46.17	Medium
HOUSTON-05	R1	Houston	6.30	69.00	83.00	76.00	Good	511.88	0.40	0.02	0.04	162.26	74.87	46.80	Medium
HOUSTON-05	R1	Houston	6.40	133.00	150.00	141.50	Poor	577.49	0.47	0.02	0.05	182.78	74.97	46.86	Medium
HOUSTON-05	R1	Houston	6.50	150.00	156.00	153.00	Poor	592.65	0.48	0.02	0.05	187.20	75.97	47.48	Medium
HOUSTON-05	R1	Houston	6.60	153.00	169.00	161.00	Poor	663.56	0.57	0.02	0.05	209.94	75.97	47.48	Medium
HOUSTON-05	R1	Houston	6.70	167.00	168.00	167.50	Poor	711.42	0.61	0.03	0.04	224.78	77.87	48.67	Medium
HOUSTON-05	R1	Houston	6.80	151.00	157.00	154.00	Poor	663.66	0.57	0.02	0.03	210.25	78.87	49.29	Medium
HOUSTON-05	R1	Houston	6.90	165.00	161.00	163.00	Poor	646.04	0.55	0.02	0.02	204.02	79.87	49.92	Medium
HOUSTON-05	R1	Houston	7.00	149.00	158.00	153.50	Poor	705.99	0.60	0.02	0.02	223.56	80.87	50.54	Medium
HOUSTON-05	R1	Houston	7.10	146.00	181.00	163.50	Poor	804.81	0.65	0.03	0.02	254.58	80.97	50.61	Medium
HOUSTON-05	R1	Houston	7.20	193.00	204.00	198.50	Very Poor	770.61	0.62	0.03	0.03	244.04	81.87	51.17	Medium
HOUSTON-05	R1	Houston	7.30	174.00	194.00	184.00	Very Poor	665.39	0.51	0.02	0.03	210.53	82.87	51.79	Medium
HOUSTON-05	R1	Houston	7.40	184.00	184.00	184.00	Very Poor	485.02	0.37	0.02	0.03	153.10	83.87	52.42	Medium
HOUSTON-05	R1	Houston	7.50	224.00	241.00	232.50	Very Poor	191.92	0.15	0.01	0.01	60.99	84.97	53.11	Medium
HOUSTON-05	R1	Houston	7.60	223.00	205.00	214.00	Very Poor	69.43	0.05	0.00	0.00	21.68	84.97	53.11	Medium
HOUSTON-05	R1	Houston	7.70	111.00	102.00	106.50	Fair	65.33	0.05	0.00	0.00	20.33	84.97	53.11	Medium
HOUSTON-05	R1	Houston	7.80	61.00	83.00	72.00	Good	115.17	0.09	0.00	0.01	36.74	83.07	51.92	Medium
HOUSTON-05	R1	Houston	7.90	89.00	106.00	97.50	Fair	480.38	0.36	0.02	0.02	151.98	82.97	51.86	Medium
HOUSTON-05	R1	Houston	8.00	74.00	108.00	91.00	Good	776.52	0.59	0.03	0.03	245.93	80.07	50.04	Medium
HOUSTON-05	R1	Houston	8.10	81.00	146.00	113.50	Fair	755.67	0.57	0.03	0.02	239.08	83.57	52.23	Medium
HOUSTON-05	R1	Houston	8.20	60.00	77.00	68.50	Good	550.37	0.42	0.02	0.01	173.98	83.07	51.92	Medium
HOUSTON-05	R1	Houston	8.30	84.00	129.00	106.50	Fair	631.74	0.51	0.03	0.01	199.54	83.97	52.48	Medium
HOUSTON-05	R1	Houston	8.40	61.00	79.00	70.00	Good	716.19	0.61	0.03	0.01	226.29	83.97	52.48	Medium
HOUSTON-05	R1	Houston	8.50	68.00	96.00	82.00	Good	724.75	0.65	0.03	0.01	229.03	83.97	52.48	Medium
HOUSTON-05	R1	Houston	8.60	57.00	68.00	62.50	Good	478.28	0.45	0.02	0.00	151.54	83.97	52.48	Medium
HOUSTON-05	R1	Houston	8.70	64.00	75.00	69.50	Good	175.02	0.16	0.01	0.00	55.57	84.97	53.11	Medium
HOUSTON-05	R1	Houston	8.80	82.00	59.00	70.50	Good	276.71	0.27	0.01	0.00	87.77	83.97	52.48	Medium
HOUSTON-05	R1	Houston	8.90	102.00	77.00	89.50	Good	217.13	0.21	0.01	0.00	68.62	83.07	51.92	Medium
HOUSTON-05	R1	Houston	9.00	82.00	78.00	80.00	Good	96.45	0.10	0.00	0.00	30.17	82.07	51.29	Medium
HOUSTON-05	R1	Houston	9.10	88.00	113.00	100.50	Fair	75.58	0.08	0.00	0.00	23.88	81.97	51.23	Medium
HOUSTON-05	R1	Houston	9.20	79.00	93.00	86.00	Good	82.54	0.09	0.00	0.00	25.99	81.57	51.45	Medium
HOUSTON-05	R1	Houston	9.30	103.00	139.00	121.00	Fair	94.20	0.11	0.00	0.00	29.83	81.07	50.67	Medium
HOUSTON-05	R1	Houston	9.40	127.00	161.00	144.00	Poor	65.71	0.09	0.00	0.00	20.62	80.97	50.61	Medium
HOUSTON-05	R1	Houston	9.50	85.00	66.00	75.50	Good	56.24	0.09	0.00	0.00	17.98	80.07	50.04	Medium
HOUSTON-05	R1	Houston	9.60	90.00	89.00	89.50	Good	146.50	0.29	0.01	0.01	46.46	78.07	48.79	Medium
HOUSTON-05	R1	Houston	9.70	80.00	77.00	78.50	Good	211.70	0.46	0.02	0.02	67.24	77.07	48.17	Medium
HOUSTON-05	R1	Houston	9.80	72.00	70.00	71.00	Good	316.93	0.58	0.02	0.03	100.24	76.97	48.11	Medium
HOUSTON-05	R1	Houston	9.90	66.00	64.00	65.00	Good	279.97	0.41	0.02	0.03	88.73	77.87	48.67	Medium
HOUSTON-05	R1	Houston	10.00	79.00	73.00	76.00	Good	234.90	0.27	0.01	0.02	74.46	78.87	49.29	Medium
HOUSTON-05	R1	Houston	10.10	73.00	57.00	65.00	Good	307.47	0.29	0.02	0.02	96.97	78.97	49.36	Medium
HOUSTON-05	R1	Houston	10.20	103.00	79.00	91.00	Good	298.97	0.22	0.01	0.02	94.78	78.97	49.36	Medium
HOUSTON-05	R1	Houston	10.30	125.00	118.00	121.50	Fair	161.14	0.10	0.01	0.01	51.18	79.87	49.92	Medium
HOUSTON-05	R1	Houston	10.40	105.00	109.00	107.00	Fair	82.58	0.05	0.00	0.01	25.92	79.97	49.98	Medium
HOUSTON-05	R1	Houston	10.50	57.00	61.00	59.00	Very Good	129.63	0.07	0.01	0.01	40.78	79.07	49.42	Medium
HOUSTON-05	R1	Houston	10.60	90.00	86.00	88.00	Good	243.40	0.12	0.01	0.01	76.95	77.07	48.17	Medium
HOUSTON-05	R1	Houston	10.70	124.00	128.00	126.00	Fair	456.39	0.22	0.02	0.02	144.00	75.97	47.48	Medium
HOUSTON-05	R1	Houston	10.80	75.00	61.00	68.00	Good	364.59	0.15	0.01	0.02	115.20	75.97	47.48	Medium
HOUSTON-05	R1	Houston	10.90	67.00	58.00	62.50	Good	114.20	0.04	0.00	0.01	36.38	75.97	47.48	Medium
HOUSTON-05	R1	Houston	11.00	101.00	124.00	112.50	Fair	259.47	0.09	0.01	0.01	82.07	75.07	46.92	Medium
HOUSTON-05	R1	Houston	11.10	64.00	55.00	59.50	Very Good	429.26	0.15	0.02	0.01	135.44	73.97	46.23	Medium
HOUSTON-05	R1	Houston	11.20	65.00	44.00	54.50	Very Good	80.97	0.03	0.00	0.00	25.69	73.97	46.23	Medium
HOUSTON-05	R1	Houston	11.30	63.00	59.00	61.00	Good	89.81	0.04	0.00	0.00	28.02	73.97	46.23	Medium
HOUSTON-05	R1	Houston	11.40	49.00	50.00	49.50	Very Good	117.72	0.05	0.00	0.01	37.55	72.07	45.05	Medium
HOUSTON-05	R1	Houston	11.50	47.00	42.00	44.50	Very Good	97.59	0.05	0.00	0.01	31.20	71.97	44.98	Low
HOUSTON-05	R1	Houston	11.60	52.00	55.00	53.50	Very Good	67.37	0.03	0.00	0.00	21.60	71.97	44.98	Low
HOUSTON-05	R1	Houston	11.70	55.00	53.00	54.00	Very Good	72.51	0.04	0.00	0.00	22.72	70.97	44.36	Low
HOUSTON-05	R1	Houston	11.80	49.00	63.00	56.00	Very Good	80.13	0.05	0.00	0.01	25.23	66.18	41.36	Low
HOUSTON-05	R1	Houston	11.90	55.00	49.00	52.00	Very Good	81.15	0.06	0.00	0.01	25.93	62.18	38.86	Low
HOUSTON-05	R1	Houston	12.00	57.00	63.00	60.00	Good	78.21	0.05	0.00	0.01	24.92	60.08	37.55	Low
HOUSTON-05	R1	Houston	12.10	72.00	74.00	73.00	Good	74.76	0.05	0.00	0.01	24.00	59.98	37.49	Low
HOUSTON-05	R1	Houston	12.20	66.00	67.00	66.50	Good	85.17	0.05	0.00	0.01	26.88	59.98	37.49	Low
HOUSTON-05	R1	Houston	12.30	60.00	57.00	58.50	Very Good	123.90	0.07	0.01	0.03	38.71	60.98	38.11	Low
HOUSTON-05	R1	Houston	12.40	76.00	60.00	68.00	Good	218.76	0.12	0.01	0.06	68.93	60.47	38.56	Low
HOUSTON-05	R1	Houston	12.50	58.00	56.00	57.00	Very Good	397.47	0.19	0.02	0.12	125.62	61.88	38.67	Low
HOUSTON-05	R1	Houston	12.60	65.00	58.00	61.50	Good	347.75	0.15	0.01	0.10	109.97	63.88	39.92	Low
HOUSTON-05	R1	Houston	12.70	61.00	55.00	58.00	Very Good	398.89	0.15	0.01	0.10	125.70	66.88	41.80	Low
HOUSTON-05	R1	Houston	12.80	68.00	62.00	65.00	Good	494.82	0.19	0.02	0.12	156.33	68.87	43.05	Low
HOUSTON-05	R1	Houston	12.90	101.00	96.00	98.50	Fair	431.42	0.16	0.02	0.11	136.38	71.77	44.86	Low
HOUSTON-05	R1	Houston	13.00	88.00	94.00	91.00	Good	359.25	0.14	0.02	0.09	113.20	74.77	46.73	Medium
HOUSTON-05	R1	Houston	13.10	90.00	85.00	87.50	Good	216.45	0.11	0.01	0.05	68.16	76.87	48.04	Medium
HOUSTON-05	R1	Houston	13.20	82.00	99.00	90.50	Good	223.96	0.13	0.01	0.03	70.98	77.87	48.67	Medium
HOUSTON-05	R1	Houston	13.30	82.00	113.00	97.50	Fair	580.28	0.39	0.02	0.06	183.14	77.97	48.73	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-05	R1	Houston	13.40	89.00	98.00	93.50	Good	102.34	0.07	0.00	0.01	32.49	77.97	48.73	Medium
HOUSTON-05	R1	Houston	13.50	81.00	82.00	81.50	Good	190.82	0.50	0.01	0.01	60.52	78.97	49.36	Medium
HOUSTON-05	R1	Houston	13.60	218.00	328.00	273.00	Very Poor	646.09	2.98	0.03	0.04	205.45	77.07	48.17	Medium
HOUSTON-05	R2	Houston	0.10	146.00	123.00	134.50	Poor	728.58	0.85	0.01	0.01	230.40	56.98	35.61	Low
HOUSTON-05	R2	Houston	0.20	58.00	75.00	66.50	Good	1082.81	1.16	0.01	0.01	345.60	55.98	34.99	Low
HOUSTON-05	R2	Houston	0.30	50.00	71.00	60.50	Good	1512.74	1.62	0.01	0.02	477.26	54.98	34.36	Low
HOUSTON-05	R2	Houston	0.40	61.00	62.00	61.50	Good	1685.86	1.74	0.01	0.03	537.60	53.98	33.74	Low
HOUSTON-05	R2	Houston	0.50	52.00	61.00	56.50	Very Good	2415.60	2.38	0.01	0.04	763.20	52.08	32.55	Low
HOUSTON-05	R2	Houston	0.90	102.00	99.00	100.50	Fair	1647.72	3.75	0.01	0.01	524.96	45.98	28.74	Low
HOUSTON-05	R2	Houston	1.00	62.00	83.00	72.50	Good	2080.42	12.33	0.02	0.01	665.83	46.98	29.36	Low
HOUSTON-05	R2	Houston	1.20	68.00	137.00	102.50	Fair	2626.27	8.91	0.02	0.06	835.20	49.98	31.24	Low
HOUSTON-05	R2	Houston	1.30	57.00	79.00	68.00	Good	1197.53	2.73	0.01	0.04	379.71	50.98	31.86	Low
HOUSTON-05	R2	Houston	1.40	66.00	79.00	72.50	Good	786.40	1.48	0.01	0.02	248.92	52.88	33.05	Low
HOUSTON-05	R2	Houston	1.50	56.00	80.00	68.00	Good	813.81	1.27	0.00	0.01	257.28	53.98	33.74	Low
HOUSTON-05	R2	Houston	1.60	73.00	63.00	68.00	Good	886.23	1.23	0.00	0.02	280.86	55.78	34.86	Low
HOUSTON-05	R2	Houston	1.70	56.00	88.00	72.00	Good	1001.72	1.26	0.01	0.02	316.80	56.98	35.61	Low
HOUSTON-05	R2	Houston	1.80	149.00	178.00	163.50	Poor	1075.20	1.20	0.01	0.04	339.20	56.98	35.61	Low
HOUSTON-05	R2	Houston	1.90	115.00	142.00	128.50	Fair	958.98	0.90	0.01	0.07	305.28	55.98	34.99	Low
HOUSTON-05	R2	Houston	2.00	158.00	163.00	160.50	Poor	779.18	0.66	0.00	0.08	244.80	56.98	35.61	Low
HOUSTON-05	R2	Houston	2.10	114.00	104.00	109.00	Fair	698.50	0.53	0.00	0.08	220.80	56.98	35.61	Low
HOUSTON-05	R2	Houston	2.20	59.00	63.00	61.00	Good	695.41	0.47	0.00	0.09	221.54	56.98	35.61	Low
HOUSTON-05	R2	Houston	2.30	61.00	58.00	59.50	Very Good	956.89	0.56	0.01	0.10	303.71	56.98	35.61	Low
HOUSTON-05	R2	Houston	2.40	61.00	76.00	68.50	Good	1353.29	0.79	0.01	0.12	429.38	57.98	36.24	Low
HOUSTON-05	R2	Houston	2.50	138.00	172.00	155.00	Poor	2925.03	1.70	0.02	0.16	926.84	57.98	36.24	Low
HOUSTON-05	R2	Houston	2.80	58.00	74.00	66.00	Good	2465.09	1.43	0.02	0.15	780.18	58.98	36.86	Low
HOUSTON-05	R2	Houston	2.90	54.00	68.00	61.00	Good	2006.09	1.08	0.03	0.14	633.78	58.98	36.86	Low
HOUSTON-05	R2	Houston	3.00	80.00	110.00	95.00	Good	1787.64	0.96	0.03	0.15	565.36	56.98	35.61	Low
HOUSTON-05	R2	Houston	3.10	55.00	64.00	59.50	Very Good	1495.62	0.74	0.02	0.11	472.90	55.98	34.99	Low
HOUSTON-05	R2	Houston	3.20	120.00	114.00	117.00	Fair	1303.00	0.58	0.02	0.07	412.16	55.98	34.99	Low
HOUSTON-05	R2	Houston	3.30	125.00	141.00	133.00	Poor	1221.44	0.55	0.02	0.03	386.00	54.98	34.36	Low
HOUSTON-05	R2	Houston	3.40	66.00	67.00	66.50	Good	1188.76	0.48	0.02	0.03	375.70	53.98	33.74	Low
HOUSTON-05	R2	Houston	3.50	44.00	54.00	49.00	Very Good	441.97	0.16	0.01	0.01	139.73	52.98	33.11	Low
HOUSTON-05	R2	Houston	3.60	64.00	68.00	66.00	Good	283.44	0.10	0.00	0.01	89.94	52.98	33.11	Low
HOUSTON-05	R2	Houston	3.70	57.00	54.00	55.50	Very Good	328.82	0.12	0.01	0.01	104.08	53.98	33.74	Low
HOUSTON-05	R2	Houston	3.80	61.00	63.00	62.00	Good	471.75	0.15	0.00	0.01	148.97	54.98	34.36	Low
HOUSTON-05	R2	Houston	3.90	83.00	111.00	97.00	Fair	500.86	0.16	0.00	0.00	157.90	54.98	34.36	Low
HOUSTON-05	R2	Houston	4.00	67.00	57.00	62.00	Good	363.59	0.15	0.00	0.00	115.20	54.98	34.36	Low
HOUSTON-05	R2	Houston	4.10	79.00	77.00	78.00	Good	555.32	7.36	0.00	0.01	179.52	56.88	35.55	Low
HOUSTON-05	R2	Houston	4.20	141.00	175.00	158.00	Poor	229.49	5.39	0.00	0.00	75.54	57.98	36.24	Low
HOUSTON-05	R2	Houston	4.30	88.00	112.00	100.00	Fair	350.31	7.56	0.00	0.00	114.26	58.98	36.86	Low
HOUSTON-05	R2	Houston	4.40	59.00	61.00	60.00	Good	350.79	4.44	0.00	0.01	113.31	59.98	37.49	Low
HOUSTON-05	R2	Houston	4.50	69.00	65.00	67.00	Good	373.36	4.32	0.00	0.01	119.92	59.98	37.49	Low
HOUSTON-05	R2	Houston	4.60	46.00	67.00	56.50	Very Good	154.49	1.65	0.00	0.00	50.05	59.08	36.92	Low
HOUSTON-05	R2	Houston	4.70	47.00	65.00	56.00	Very Good	491.12	5.00	0.00	0.01	157.69	58.98	36.86	Low
HOUSTON-05	R2	Houston	4.80	52.00	128.00	90.00	Good	736.26	7.46	0.00	0.01	236.16	57.98	36.24	Low
HOUSTON-05	R2	Houston	4.90	57.00	105.00	81.00	Good	284.97	6.46	0.00	0.01	93.12	56.98	35.61	Low
HOUSTON-05	R2	Houston	5.00	89.00	84.00	86.50	Good	137.46	3.88	0.00	0.00	45.12	55.98	34.99	Low
HOUSTON-05	R2	Houston	5.10	97.00	124.00	110.50	Fair	164.04	3.97	0.00	0.00	53.69	55.98	34.99	Low
HOUSTON-05	R2	Houston	5.20	100.00	153.00	126.50	Fair	191.61	2.94	0.00	0.00	61.57	56.98	35.61	Low
HOUSTON-05	R2	Houston	5.30	97.00	118.00	107.50	Fair	359.06	5.06	0.00	0.00	116.21	56.98	35.61	Low
HOUSTON-05	R2	Houston	5.40	60.00	60.00	60.00	Good	192.08	2.83	0.00	0.00	61.71	55.98	34.99	Low
HOUSTON-05	R2	Houston	5.50	41.00	51.00	46.00	Very Good	164.79	2.45	0.00	0.00	53.41	55.98	34.99	Low
HOUSTON-05	R2	Houston	5.60	40.00	51.00	45.50	Very Good	169.12	2.42	0.00	0.00	54.40	55.98	34.99	Low
HOUSTON-05	R2	Houston	5.70	58.00	63.00	60.50	Good	174.99	2.33	0.00	0.00	56.38	56.98	35.61	Low
HOUSTON-05	R2	Houston	5.80	36.00	44.00	40.00	Very Good	174.83	1.97	0.00	0.00	56.34	57.98	36.24	Low
HOUSTON-05	R2	Houston	5.90	122.00	131.00	126.50	Fair	505.98	3.91	0.00	0.00	161.66	59.98	37.49	Low
HOUSTON-05	R2	Houston	6.00	128.00	111.00	119.50	Fair	824.66	5.75	0.01	0.02	263.49	61.98	38.74	Low
HOUSTON-05	R2	Houston	6.10	129.00	106.00	117.50	Fair	869.53	3.01	0.01	0.05	276.73	62.98	39.36	Low
HOUSTON-05	R2	Houston	6.20	84.00	90.00	87.00	Good	1358.55	2.69	0.02	0.16	430.16	64.98	40.61	Low
HOUSTON-05	R2	Houston	6.30	69.00	83.00	76.00	Good	1477.81	0.66	0.02	0.24	467.63	65.98	41.23	Low
HOUSTON-05	R2	Houston	6.40	133.00	150.00	141.50	Poor	1447.50	0.33	0.02	0.18	457.34	66.98	41.86	Low
HOUSTON-05	R2	Houston	6.50	150.00	156.00	153.00	Poor	1453.45	0.20	0.02	0.11	459.67	66.98	41.86	Low
HOUSTON-05	R2	Houston	6.60	153.00	169.00	161.00	Poor	1435.23	0.32	0.02	0.11	452.96	67.98	42.48	Low
HOUSTON-05	R2	Houston	6.70	167.00	168.00	167.50	Poor	1436.02	0.39	0.02	0.22	453.33	67.98	42.48	Low
HOUSTON-05	R2	Houston	6.80	151.00	157.00	154.00	Poor	727.07	0.39	0.01	0.17	230.19	67.98	42.48	Low
HOUSTON-05	R2	Houston	6.90	165.00	161.00	163.00	Poor	610.89	1.42	0.01	0.16	194.02	68.97	43.11	Low
HOUSTON-05	R2	Houston	7.00	149.00	158.00	153.50	Poor	851.03	3.01	0.01	0.15	269.81	70.97	44.36	Low
HOUSTON-05	R2	Houston	7.10	146.00	181.00	163.50	Poor	969.02	3.43	0.01	0.11	307.54	71.97	44.98	Low
HOUSTON-05	R2	Houston	7.20	193.00	204.00	198.50	Very Poor	675.63	3.15	0.01	0.06	215.24	71.97	44.98	Low
HOUSTON-05	R2	Houston	7.30	174.00	194.00	184.00	Very Poor	688.13	3.45	0.01	0.04	219.28	70.97	44.36	Low
HOUSTON-05	R2	Houston	7.40	184.00	184.00	184.00	Very Poor	774.90	3.47	0.01	0.03	246.57	70.97	44.36	Low
HOUSTON-05	R2	Houston	7.50	224.00	241.00	232.50	Very Poor	473.81	2.14	0.01	0.01	150.57	70.97	44.36	Low
HOUSTON-05	R2	Houston	7.60	223.00	205.00	214.00	Very Poor	248.57	1.62	0.00	0.00	79.45	71.97	44.98	Low
HOUSTON-05	R2	Houston	7.70	111.00	102.00	106.50	Fair	552.94	4.95	0.01	0.00	176.77	71.97	44.98	Low
HOUSTON-05	R2	Houston	7.80	61.00	83.00	72.00	Good	792.26	4.61	0.01	0.01	252.63	71.97	44.98	Low
HOUSTON-05	R2	Houston	7.90	89.00	106.00	97.50	Fair	329.22	1.89	0.00	0.01	105.27	70.97	44.36	Low
HOUSTON-05	R2	Houston	8.00	74.00	108.00	91.00	Good	129.82	0.93	0.00	0.00	41.00	69.97	43.73	Low

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-05	R2	Houston	8.10	81.00	146.00	113.50	Fair	109.62	1.22	0.00	0.00	35.15	66.98	41.86	Low
HOUSTON-05	R2	Houston	8.20	60.00	77.00	68.50	Good	95.32	1.27	0.00	0.01	30.32	65.98	41.23	Low
HOUSTON-05	R2	Houston	8.30	84.00	129.00	106.50	Fair	83.52	0.80	0.00	0.01	26.74	64.98	40.61	Low
HOUSTON-05	R2	Houston	8.40	61.00	79.00	70.00	Good	97.96	0.40	0.00	0.03	30.86	64.98	40.61	Low
HOUSTON-05	R2	Houston	8.50	68.00	96.00	82.00	Good	117.50	0.34	0.00	0.04	37.70	64.98	40.61	Low
HOUSTON-05	R2	Houston	8.60	57.00	68.00	62.50	Good	161.00	0.27	0.00	0.04	51.20	64.98	40.61	Low
HOUSTON-05	R2	Houston	8.70	64.00	75.00	69.50	Good	385.53	0.46	0.00	0.06	121.72	64.98	40.61	Low
HOUSTON-05	R2	Houston	8.80	82.00	59.00	70.50	Good	518.63	0.54	0.00	0.05	164.11	65.98	41.23	Low
HOUSTON-05	R2	Houston	8.90	102.00	77.00	89.50	Good	301.27	0.30	0.00	0.02	94.93	65.98	41.23	Low
HOUSTON-05	R2	Houston	9.00	82.00	78.00	80.00	Good	182.27	0.18	0.00	0.01	57.60	64.98	40.61	Low
HOUSTON-05	R2	Houston	9.10	88.00	113.00	100.50	Fair	329.77	0.45	0.00	0.01	104.73	64.98	40.61	Low
HOUSTON-05	R2	Houston	9.20	79.00	93.00	86.00	Good	559.81	1.36	0.00	0.01	176.99	64.98	40.61	Low
HOUSTON-05	R2	Houston	9.30	103.00	139.00	121.00	Fair	592.29	2.24	0.00	0.01	188.29	64.98	40.61	Low
HOUSTON-05	R2	Houston	9.40	127.00	161.00	144.00	Poor	490.05	1.97	0.00	0.01	155.92	64.98	40.61	Low
HOUSTON-05	R2	Houston	9.50	85.00	66.00	75.50	Good	342.86	1.19	0.00	0.00	109.34	64.98	40.61	Low
HOUSTON-05	R2	Houston	9.60	90.00	89.00	89.50	Good	134.94	0.40	0.00	0.00	43.20	65.98	41.23	Low
HOUSTON-05	R2	Houston	9.70	80.00	77.00	78.50	Good	221.30	0.60	0.00	0.01	70.08	65.98	41.23	Low
HOUSTON-05	R2	Houston	9.80	72.00	70.00	71.00	Good	200.42	0.49	0.00	0.02	63.35	66.98	41.86	Low
HOUSTON-05	R2	Houston	9.90	66.00	64.00	65.00	Good	158.53	0.31	0.00	0.02	49.79	67.98	42.48	Low
HOUSTON-05	R2	Houston	10.00	79.00	73.00	76.00	Good	266.44	0.46	0.00	0.02	84.41	67.98	42.48	Low
HOUSTON-05	R2	Houston	10.10	73.00	57.00	65.00	Good	724.04	1.12	0.01	0.04	229.39	67.98	42.48	Low
HOUSTON-05	R2	Houston	10.20	103.00	79.00	91.00	Good	579.05	0.78	0.00	0.02	183.09	67.98	42.48	Low
HOUSTON-05	R2	Houston	10.30	125.00	118.00	121.50	Fair	261.92	0.34	0.00	0.01	83.31	67.98	42.48	Low
HOUSTON-05	R2	Houston	10.40	105.00	109.00	107.00	Fair	387.17	0.50	0.00	0.01	122.27	66.98	41.86	Low
HOUSTON-05	R2	Houston	10.50	57.00	61.00	59.00	Very Good	630.32	0.79	0.00	0.01	199.07	66.98	41.86	Low
HOUSTON-05	R2	Houston	10.60	90.00	86.00	88.00	Good	805.46	1.01	0.01	0.01	255.09	66.98	41.86	Low
HOUSTON-05	R2	Houston	10.70	124.00	128.00	126.00	Fair	911.22	1.10	0.01	0.01	288.00	66.98	41.86	Low
HOUSTON-05	R2	Houston	10.80	75.00	61.00	68.00	Good	913.72	1.06	0.01	0.02	289.03	65.98	41.23	Low
HOUSTON-05	R2	Houston	10.90	67.00	58.00	62.50	Good	1066.35	1.19	0.01	0.06	337.52	65.98	41.23	Low
HOUSTON-05	R2	Houston	11.00	101.00	124.00	112.50	Fair	1183.34	1.27	0.01	0.13	374.40	66.98	41.86	Low
HOUSTON-05	R2	Houston	11.10	64.00	55.00	59.50	Very Good	1253.92	1.23	0.02	0.22	396.48	68.87	43.05	Low
HOUSTON-05	R2	Houston	11.20	65.00	44.00	54.50	Very Good	171.97	0.14	0.00	0.09	54.06	70.97	44.36	Low
HOUSTON-05	R2	Houston	11.30	63.00	59.00	61.00	Good	158.55	0.11	0.00	0.06	49.75	71.97	44.98	Low
HOUSTON-05	R2	Houston	11.40	49.00	50.00	49.50	Very Good	454.54	0.37	0.01	0.05	143.56	72.97	45.61	Medium
HOUSTON-05	R2	Houston	11.50	47.00	42.00	44.50	Very Good	453.23	0.32	0.01	0.02	143.13	72.97	45.61	Medium
HOUSTON-05	R2	Houston	11.60	52.00	55.00	53.50	Very Good	505.74	0.34	0.01	0.02	159.90	73.97	46.23	Medium
HOUSTON-05	R2	Houston	11.70	55.00	53.00	54.00	Very Good	366.95	0.23	0.01	0.03	116.06	75.97	47.48	Medium
HOUSTON-05	R2	Houston	11.80	49.00	63.00	56.00	Very Good	106.34	0.07	0.00	0.01	33.88	76.97	48.11	Medium
HOUSTON-05	R2	Houston	11.90	55.00	49.00	52.00	Very Good	177.94	0.16	0.00	0.02	55.91	78.97	49.36	Medium
HOUSTON-05	R2	Houston	12.00	57.00	63.00	60.00	Good	246.24	0.21	0.00	0.02	77.93	79.97	49.98	Medium
HOUSTON-05	R2	Houston	12.10	72.00	74.00	73.00	Good	279.84	0.21	0.00	0.03	88.49	80.97	50.61	Medium
HOUSTON-05	R2	Houston	12.20	66.00	67.00	66.50	Good	184.96	0.12	0.00	0.02	58.41	81.97	51.23	Medium
HOUSTON-05	R2	Houston	12.30	60.00	57.00	58.50	Very Good	129.98	0.08	0.00	0.01	40.80	81.97	51.23	Medium
HOUSTON-05	R2	Houston	12.40	76.00	60.00	68.00	Good	171.55	0.11	0.00	0.01	54.40	80.97	50.61	Medium
HOUSTON-05	R2	Houston	12.50	58.00	56.00	57.00	Very Good	294.28	0.18	0.00	0.01	93.30	79.97	49.98	Medium
HOUSTON-05	R2	Houston	12.60	65.00	58.00	61.50	Good	672.80	0.48	0.01	0.02	212.55	78.97	49.36	Medium
HOUSTON-05	R2	Houston	12.70	61.00	55.00	58.00	Very Good	714.53	0.54	0.01	0.02	226.34	77.97	48.73	Medium
HOUSTON-05	R2	Houston	12.80	68.00	62.00	65.00	Good	761.29	0.61	0.01	0.03	240.80	76.97	48.11	Medium
HOUSTON-05	R2	Houston	12.90	101.00	96.00	98.50	Fair	150.72	0.14	0.00	0.01	48.00	75.97	47.48	Medium
HOUSTON-05	R2	Houston	13.00	88.00	94.00	91.00	Good	130.22	0.65	0.00	0.00	41.60	74.97	46.86	Medium
HOUSTON-05	R2	Houston	13.10	90.00	85.00	87.50	Good	130.39	0.69	0.00	0.00	41.37	72.97	45.61	Medium
HOUSTON-05	R2	Houston	13.20	82.00	99.00	90.50	Good	131.84	0.44	0.00	0.00	41.97	71.97	44.98	Low
HOUSTON-05	R2	Houston	13.30	82.00	113.00	97.50	Fair	126.44	0.39	0.00	0.00	40.41	70.97	44.36	Low
HOUSTON-05	R2	Houston	13.40	89.00	98.00	93.50	Good	109.26	0.29	0.00	0.00	34.91	69.97	43.73	Low
HOUSTON-05	R2	Houston	13.50	81.00	82.00	81.50	Good	105.06	0.25	0.00	0.00	33.67	70.87	44.30	Low
HOUSTON-05	R2	Houston	13.60	218.00	328.00	273.00	Very Poor	101.05	0.21	0.00	0.00	31.90	71.97	44.98	Low
HOUSTON-05	R3	Houston	0.10	146.00	123.00	134.50	Poor	670.94	2.98	0.19	0.03	213.91	44.68	27.93	Low
HOUSTON-05	R3	Houston	0.20	58.00	75.00	66.50	Good	225.08	4.79	0.07	0.01	74.13	47.38	29.61	Low
HOUSTON-05	R3	Houston	0.30	50.00	71.00	60.50	Good	237.78	7.64	0.08	0.02	78.76	48.98	30.61	Low
HOUSTON-05	R3	Houston	0.40	61.00	62.00	61.50	Good	203.40	4.08	0.07	0.03	65.83	48.98	30.61	Low
HOUSTON-05	R3	Houston	0.50	52.00	61.00	56.50	Very Good	187.95	1.35	0.06	0.05	59.95	48.98	30.61	Low
HOUSTON-05	R3	Houston	0.60	70.00	86.00	78.00	Good	293.10	1.28	0.09	0.08	92.87	48.98	30.61	Low
HOUSTON-05	R3	Houston	0.70	54.00	53.00	53.50	Very Good	609.94	2.08	0.18	0.17	193.96	48.98	30.61	Low
HOUSTON-05	R3	Houston	0.80	51.00	59.00	55.00	Very Good	763.37	4.32	0.23	0.25	243.69	49.38	30.86	Low
HOUSTON-05	R3	Houston	0.90	102.00	99.00	100.50	Fair	537.22	6.34	0.16	0.14	173.25	51.18	31.99	Low
HOUSTON-05	R3	Houston	1.00	62.00	83.00	72.50	Good	306.15	4.42	0.09	0.05	99.31	52.18	32.61	Low
HOUSTON-05	R3	Houston	1.10	47.00	53.00	50.00	Very Good	197.14	1.63	0.06	0.02	63.03	52.98	33.11	Low
HOUSTON-05	R3	Houston	1.20	68.00	137.00	102.50	Fair	198.96	0.89	0.06	0.01	63.51	52.58	32.86	Low
HOUSTON-05	R3	Houston	1.30	57.00	79.00	68.00	Good	200.83	0.66	0.06	0.01	64.13	50.28	31.43	Low
HOUSTON-05	R3	Houston	1.40	66.00	79.00	72.50	Good	195.14	0.55	0.06	0.00	61.46	47.78	29.86	Low
HOUSTON-05	R3	Houston	1.50	56.00	80.00	68.00	Good	697.43	2.10	0.21	0.01	221.54	46.78	29.24	Low
HOUSTON-05	R3	Houston	1.60	73.00	63.00	68.00	Good	861.54	2.78	0.26	0.01	274.29	46.18	28.86	Low
HOUSTON-05	R3	Houston	1.70	56.00	88.00	72.00	Good	482.08	1.45	0.15	0.02	153.11	47.38	29.61	Low
HOUSTON-05	R3	Houston	1.80	149.00	178.00	163.50	Poor	334.27	0.85	0.10	0.02	106.11	49.38	30.86	Low
HOUSTON-05	R3	Houston	1.90	115.00	142.00	128.50	Fair	378.39	0.74	0.11	0.03	119.91	51.38	32.11	Low
HOUSTON-05	R3	Houston	2.00	158.00	163.00	160.50	Poor	226.07	0.48	0.07	0.02	71.73	52.98	33.11	Low
HOUSTON-05	R3	Houston	2.10	114.00	104.00	109.00	Fair	180.01	0.42	0.05	0.01	56.73	52.78	32.99	Low

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-05	R3	Houston	2.20	59.00	63.00	61.00	Good	390.43	1.02	0.12	0.02	123.43	51.78	32.36	Low
HOUSTON-05	R3	Houston	2.30	61.00	58.00	59.50	Very Good	809.78	2.45	0.24	0.04	257.51	50.98	31.86	Low
HOUSTON-05	R3	Houston	2.40	61.00	76.00	68.50	Good	981.64	3.36	0.30	0.05	311.63	51.18	31.99	Low
HOUSTON-05	R3	Houston	2.50	138.00	172.00	155.00	Poor	1017.57	2.58	0.31	0.07	323.31	52.18	32.61	Low
HOUSTON-05	R3	Houston	2.60	69.00	104.00	86.50	Good	963.51	1.59	0.29	0.06	305.32	53.18	33.24	Low
HOUSTON-05	R3	Houston	2.70	59.00	74.00	66.50	Good	789.31	1.83	0.24	0.05	250.80	54.18	33.86	Low
HOUSTON-05	R3	Houston	2.80	58.00	74.00	66.00	Good	890.91	5.49	0.26	0.05	284.86	54.98	34.36	Low
HOUSTON-05	R3	Houston	2.90	54.00	68.00	61.00	Good	756.84	8.12	0.22	0.03	242.97	54.98	34.36	Low
HOUSTON-05	R3	Houston	3.00	80.00	110.00	95.00	Good	535.25	5.86	0.16	0.02	171.75	54.98	34.36	Low
HOUSTON-05	R3	Houston	3.10	55.00	64.00	59.50	Very Good	664.08	5.44	0.20	0.03	212.60	54.98	34.36	Low
HOUSTON-05	R3	Houston	3.20	120.00	114.00	117.00	Fair	624.22	1.45	0.18	0.05	197.93	54.98	34.36	Low
HOUSTON-05	R3	Houston	3.30	125.00	141.00	133.00	Poor	583.79	0.37	0.17	0.05	184.99	54.78	34.24	Low
HOUSTON-05	R3	Houston	3.40	66.00	67.00	66.50	Good	667.49	0.24	0.20	0.04	211.48	54.18	33.86	Low
HOUSTON-05	R3	Houston	3.50	44.00	54.00	49.00	Very Good	489.36	0.11	0.15	0.03	154.43	55.18	34.49	Low
HOUSTON-05	R3	Houston	3.60	64.00	68.00	66.00	Good	430.44	0.08	0.12	0.03	136.31	56.18	35.11	Low
HOUSTON-05	R3	Houston	3.70	57.00	54.00	55.50	Very Good	356.99	0.05	0.10	0.03	113.18	56.98	35.61	Low
HOUSTON-05	R3	Houston	3.80	61.00	63.00	62.00	Good	453.80	0.02	0.13	0.05	142.99	57.18	35.74	Low
HOUSTON-05	R3	Houston	3.90	83.00	111.00	97.00	Fair	457.47	0.02	0.13	0.09	144.49	58.18	36.36	Low
HOUSTON-05	R3	Houston	4.00	67.00	57.00	62.00	Good	368.69	0.00	0.11	0.10	116.36	59.38	37.11	Low
HOUSTON-05	R3	Houston	4.10	79.00	77.00	78.00	Good	507.12	0.00	0.15	0.19	160.00	61.18	38.24	Low
HOUSTON-05	R3	Houston	4.20	141.00	175.00	158.00	Poor	965.91	0.00	0.28	0.46	305.54	62.38	38.99	Low
HOUSTON-05	R3	Houston	4.30	88.00	112.00	100.00	Fair	1100.03	0.00	0.32	0.57	347.76	64.08	40.05	Low
HOUSTON-05	R3	Houston	4.40	59.00	61.00	60.00	Good	1021.55	0.00	0.30	0.43	323.23	65.38	40.86	Low
HOUSTON-05	R3	Houston	4.50	69.00	65.00	67.00	Good	937.38	0.00	0.27	0.24	296.55	67.38	42.11	Low
HOUSTON-05	R3	Houston	4.60	46.00	67.00	56.50	Very Good	886.13	0.00	0.26	0.13	280.51	69.17	43.23	Low
HOUSTON-05	R3	Houston	4.70	47.00	65.00	56.00	Very Good	635.44	0.00	0.18	0.06	201.03	70.17	43.86	Low
HOUSTON-05	R3	Houston	4.80	52.00	128.00	90.00	Good	180.92	0.56	0.05	0.01	57.44	71.17	44.48	Low
HOUSTON-05	R3	Houston	4.90	57.00	105.00	81.00	Good	328.68	1.79	0.09	0.02	105.09	71.77	44.86	Low
HOUSTON-05	R3	Houston	5.00	89.00	84.00	86.50	Good	462.57	3.18	0.13	0.02	148.07	70.77	44.23	Low
HOUSTON-05	R3	Houston	5.10	97.00	124.00	110.50	Fair	556.34	2.26	0.16	0.02	176.91	69.97	43.73	Low
HOUSTON-05	R3	Houston	5.20	100.00	153.00	126.50	Fair	561.42	0.50	0.16	0.02	178.05	70.17	43.86	Low
HOUSTON-05	R3	Houston	5.30	97.00	118.00	107.50	Fair	562.39	0.28	0.16	0.02	177.98	71.17	44.48	Low
HOUSTON-05	R3	Houston	5.40	60.00	60.00	60.00	Good	569.46	0.28	0.16	0.02	180.00	71.97	44.98	Low
HOUSTON-05	R3	Houston	5.50	41.00	51.00	46.00	Very Good	581.49	0.26	0.16	0.03	184.29	72.17	45.11	Medium
HOUSTON-05	R3	Houston	5.60	40.00	51.00	45.50	Very Good	584.78	0.24	0.16	0.04	184.92	73.17	45.73	Medium
HOUSTON-05	R3	Houston	5.70	58.00	63.00	60.50	Good	591.93	0.32	0.17	0.05	187.61	74.27	46.42	Medium
HOUSTON-05	R3	Houston	5.80	36.00	44.00	40.00	Very Good	586.51	0.39	0.17	0.04	185.47	76.37	47.73	Medium
HOUSTON-05	R3	Houston	5.90	122.00	131.00	126.50	Fair	573.93	0.46	0.16	0.03	181.66	77.97	48.73	Medium
HOUSTON-05	R3	Houston	6.00	128.00	111.00	119.50	Fair	294.01	1.13	0.09	0.02	93.78	77.97	48.73	Medium
HOUSTON-05	R3	Houston	6.10	129.00	106.00	117.50	Fair	135.20	0.85	0.04	0.01	42.83	77.97	48.73	Medium
HOUSTON-05	R3	Houston	6.20	84.00	90.00	87.00	Good	180.89	1.19	0.06	0.01	57.90	77.57	48.48	Medium
HOUSTON-05	R3	Houston	6.30	69.00	83.00	76.00	Good	298.49	0.60	0.09	0.02	94.99	75.77	47.36	Medium
HOUSTON-05	R3	Houston	6.40	133.00	150.00	141.50	Poor	548.25	0.43	0.15	0.05	173.26	74.77	46.73	Medium
HOUSTON-05	R3	Houston	6.50	150.00	156.00	153.00	Poor	619.91	0.23	0.17	0.04	196.15	73.97	46.23	Medium
HOUSTON-05	R3	Houston	6.60	153.00	169.00	161.00	Poor	619.23	0.08	0.17	0.03	196.15	73.97	46.23	Medium
HOUSTON-05	R3	Houston	6.70	167.00	168.00	167.50	Poor	695.78	0.06	0.19	0.02	220.10	73.77	46.11	Medium
HOUSTON-05	R3	Houston	6.80	151.00	157.00	154.00	Poor	736.30	0.03	0.20	0.01	232.77	72.97	45.61	Medium
HOUSTON-05	R3	Houston	6.90	165.00	161.00	163.00	Poor	752.01	0.03	0.21	0.00	237.64	73.17	45.73	Medium
HOUSTON-05	R3	Houston	7.00	149.00	158.00	153.50	Poor	762.87	0.03	0.21	0.00	241.30	73.97	46.23	Medium
HOUSTON-05	R3	Houston	7.10	146.00	181.00	163.50	Poor	731.38	0.13	0.20	0.01	231.33	74.17	46.36	Medium
HOUSTON-05	R3	Houston	7.20	193.00	204.00	198.50	Very Poor	663.73	0.24	0.18	0.02	209.87	75.17	46.98	Medium
HOUSTON-05	R3	Houston	7.30	174.00	194.00	184.00	Very Poor	643.44	0.40	0.17	0.02	203.34	76.17	47.61	Medium
HOUSTON-05	R3	Houston	7.40	184.00	184.00	184.00	Very Poor	638.66	0.37	0.17	0.04	202.20	77.17	48.23	Medium
HOUSTON-05	R3	Houston	7.50	224.00	241.00	232.50	Very Poor	533.96	0.31	0.14	0.04	168.68	78.17	48.86	Medium
HOUSTON-05	R3	Houston	7.60	223.00	205.00	214.00	Very Poor	294.37	0.18	0.08	0.02	93.09	79.17	49.48	Medium
HOUSTON-05	R3	Houston	7.70	111.00	102.00	106.50	Fair	265.94	0.18	0.07	0.01	84.24	79.97	49.98	Medium
HOUSTON-05	R3	Houston	7.80	61.00	83.00	72.00	Good	296.70	0.21	0.08	0.01	93.60	79.97	49.98	Medium
HOUSTON-05	R3	Houston	7.90	89.00	106.00	97.50	Fair	243.53	0.18	0.07	0.01	76.85	80.17	50.11	Medium
HOUSTON-05	R3	Houston	8.00	74.00	108.00	91.00	Good	228.73	0.16	0.06	0.01	72.53	80.97	50.61	Medium
HOUSTON-05	R3	Houston	8.10	81.00	146.00	113.50	Fair	238.12	0.17	0.06	0.01	75.19	81.17	50.73	Medium
HOUSTON-05	R3	Houston	8.20	60.00	77.00	68.50	Good	487.06	0.33	0.13	0.02	153.83	81.97	51.23	Medium
HOUSTON-05	R3	Houston	8.30	84.00	129.00	106.50	Fair	697.92	0.47	0.19	0.06	220.73	82.17	51.36	Medium
HOUSTON-05	R3	Houston	8.40	61.00	79.00	70.00	Good	596.55	0.37	0.16	0.07	189.00	83.17	51.98	Medium
HOUSTON-05	R3	Houston	8.50	68.00	96.00	82.00	Good	186.73	0.12	0.05	0.02	58.97	83.97	52.48	Medium
HOUSTON-05	R3	Houston	8.60	57.00	68.00	62.50	Good	254.02	0.16	0.07	0.01	80.42	83.77	52.36	Medium
HOUSTON-05	R3	Houston	8.70	64.00	75.00	69.50	Good	542.80	0.36	0.14	0.02	171.83	82.77	51.73	Medium
HOUSTON-05	R3	Houston	8.80	82.00	59.00	70.50	Good	554.69	3.76	0.14	0.03	177.01	81.97	51.23	Medium
HOUSTON-05	R3	Houston	8.90	102.00	77.00	89.50	Good	176.58	3.47	0.05	0.01	57.60	81.97	51.23	Medium
HOUSTON-05	R3	Houston	9.00	82.00	78.00	80.00	Good	92.27	2.33	0.03	0.00	30.35	81.57	50.98	Medium
HOUSTON-05	R3	Houston	9.10	88.00	113.00	100.50	Fair	68.34	1.51	0.04	0.00	22.38	79.77	49.86	Medium
HOUSTON-05	R3	Houston	9.20	79.00	93.00	86.00	Good	42.02	0.76	0.04	0.00	13.94	78.47	49.04	Medium
HOUSTON-05	R3	Houston	9.30	103.00	139.00	121.00	Fair	22.86	0.36	0.03	0.01	7.50	76.77	47.98	Medium
HOUSTON-05	R3	Houston	9.40	127.00	161.00	144.00	Poor	20.17	0.37	0.04	0.01	6.84	75.77	47.36	Medium
HOUSTON-05	R3	Houston	9.50	85.00	66.00	75.50	Good	17.13	0.24	0.04	0.01	5.39	74.77	46.73	Medium
HOUSTON-05	R3	Houston	9.60	90.00	89.00	89.50	Good	43.04	0.05	0.03	0.01	14.01	73.97	46.23	Medium
HOUSTON-05	R3	Houston	9.70	80.00	77.00	78.50	Good	41.85	0.02	0.02	0.01	13.23	73.97	46.23	Medium
HOUSTON-05	R3	Houston	9.80	72.00	70.00	71.00	Good	41.41	0.02	0.02	0.01	13.23	73.97	46.23	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-05	R3	Houston	9.90	66.00	64.00	65.00	Good	46.72	0.02	0.03	0.01	14.79	73.97	46.23	Medium
HOUSTON-05	R3	Houston	10.00	79.00	73.00	76.00	Good	85.62	0.02	0.04	0.01	27.24	73.97	46.23	Medium
HOUSTON-05	R3	Houston	10.10	73.00	57.00	65.00	Good	75.78	0.01	0.02	0.01	24.13	73.97	46.23	Medium
HOUSTON-05	R3	Houston	10.20	103.00	79.00	91.00	Good	61.76	0.01	0.02	0.01	19.46	73.97	46.23	Medium
HOUSTON-05	R3	Houston	10.30	125.00	118.00	121.50	Fair	72.23	0.01	0.02	0.01	22.57	73.97	46.23	Medium
HOUSTON-05	R3	Houston	10.40	105.00	109.00	107.00	Fair	130.50	0.01	0.04	0.01	41.25	73.97	46.23	Medium
HOUSTON-05	R3	Houston	10.50	57.00	61.00	59.00	Very Good	233.13	0.01	0.07	0.03	73.95	73.97	46.23	Medium
HOUSTON-05	R3	Houston	10.60	90.00	86.00	88.00	Good	446.32	0.02	0.12	0.08	141.28	74.17	46.36	Medium
HOUSTON-05	R3	Houston	10.70	124.00	128.00	126.00	Fair	573.50	0.03	0.15	0.09	181.53	75.17	46.98	Medium
HOUSTON-05	R3	Houston	10.80	75.00	61.00	68.00	Good	376.99	0.02	0.09	0.04	119.12	76.37	47.73	Medium
HOUSTON-05	R3	Houston	10.90	67.00	58.00	62.50	Good	340.35	0.01	0.09	0.02	107.82	77.97	48.73	Medium
HOUSTON-05	R3	Houston	11.00	101.00	124.00	112.50	Fair	100.31	0.00	0.03	0.00	31.75	77.97	48.73	Medium
HOUSTON-05	R3	Houston	11.10	64.00	55.00	59.50	Very Good	98.81	0.01	0.03	0.00	31.10	77.77	48.61	Medium
HOUSTON-05	R3	Houston	11.20	65.00	44.00	54.50	Very Good	65.42	0.01	0.04	0.00	21.00	76.77	47.98	Medium
HOUSTON-05	R3	Houston	11.30	63.00	59.00	61.00	Good	40.75	0.01	0.04	0.01	12.92	75.77	47.36	Medium
HOUSTON-05	R3	Houston	11.40	49.00	50.00	49.50	Very Good	36.55	0.01	0.03	0.01	11.58	74.57	46.61	Medium
HOUSTON-05	R3	Houston	11.50	47.00	42.00	44.50	Very Good	164.20	0.00	0.07	0.03	52.22	72.77	45.48	Medium
HOUSTON-05	R3	Houston	11.60	52.00	55.00	53.50	Very Good	290.92	0.00	0.08	0.06	91.75	72.17	45.11	Medium
HOUSTON-05	R3	Houston	11.70	55.00	53.00	54.00	Very Good	227.53	0.00	0.06	0.04	71.61	73.17	45.73	Medium
HOUSTON-05	R3	Houston	11.80	49.00	63.00	56.00	Very Good	374.35	0.00	0.09	0.04	117.99	74.17	46.36	Medium
HOUSTON-05	R3	Houston	11.90	55.00	49.00	52.00	Very Good	456.48	0.00	0.11	0.03	144.00	75.17	46.98	Medium
HOUSTON-05	R3	Houston	12.00	57.00	63.00	60.00	Good	376.86	0.00	0.10	0.02	119.43	76.17	47.61	Medium
HOUSTON-05	R3	Houston	12.10	72.00	74.00	73.00	Good	147.02	0.00	0.04	0.01	46.38	76.97	48.11	Medium
HOUSTON-05	R3	Houston	12.20	66.00	67.00	66.50	Good	377.08	0.02	0.10	0.02	119.25	76.77	47.98	Medium
HOUSTON-05	R3	Houston	12.30	60.00	57.00	58.50	Very Good	594.02	0.03	0.16	0.07	187.46	76.17	47.61	Medium
HOUSTON-05	R3	Houston	12.40	76.00	60.00	68.00	Good	628.73	0.06	0.16	0.07	198.70	77.37	48.36	Medium
HOUSTON-05	R3	Houston	12.50	58.00	56.00	57.00	Very Good	566.40	0.08	0.15	0.04	178.91	79.17	49.48	Medium
HOUSTON-05	R3	Houston	12.60	65.00	58.00	61.50	Good	427.45	0.06	0.11	0.02	135.36	79.97	49.98	Medium
HOUSTON-05	R3	Houston	12.70	61.00	55.00	58.00	Very Good	179.94	0.02	0.05	0.01	56.88	79.97	49.98	Medium
HOUSTON-05	R3	Houston	12.80	68.00	62.00	65.00	Good	169.80	0.02	0.04	0.01	54.00	79.97	49.98	Medium
HOUSTON-05	R3	Houston	12.90	101.00	96.00	98.50	Fair	433.16	0.06	0.11	0.01	136.80	79.97	49.98	Medium
HOUSTON-05	R3	Houston	13.00	88.00	94.00	91.00	Good	645.34	0.09	0.17	0.01	203.76	79.97	49.98	Medium
HOUSTON-05	R3	Houston	13.10	90.00	85.00	87.50	Good	205.23	0.04	0.05	0.00	64.80	79.97	49.98	Medium
HOUSTON-05	R3	Houston	13.20	82.00	99.00	90.50	Good	291.33	0.08	0.08	0.00	91.93	80.17	50.11	Medium
HOUSTON-05	R3	Houston	13.30	82.00	113.00	97.50	Fair	609.80	0.20	0.16	0.03	193.19	80.77	50.48	Medium
HOUSTON-05	R3	Houston	13.40	89.00	98.00	93.50	Good	566.95	0.21	0.15	0.04	179.55	80.17	50.11	Medium
HOUSTON-05	R3	Houston	13.50	81.00	82.00	81.50	Good	416.39	0.17	0.11	0.03	131.94	81.17	50.73	Medium
HOUSTON-05	R3	Houston	13.60	218.00	328.00	273.00	Very Poor	281.24	0.13	0.07	0.01	88.99	82.17	51.36	Medium
HOUSTON-05	R4	Houston	0.10	146.00	123.00	134.50	Poor	876.97	0.86	0.13	0.01	277.97	64.18	40.11	Low
HOUSTON-05	R4	Houston	0.20	58.00	75.00	66.50	Good	876.61	1.03	0.13	0.02	277.73	64.98	40.61	Low
HOUSTON-05	R4	Houston	0.30	50.00	71.00	60.50	Good	712.89	0.91	0.11	0.02	225.35	64.78	40.49	Low
HOUSTON-05	R4	Houston	0.40	61.00	62.00	61.50	Good	633.46	0.84	0.10	0.01	200.27	63.78	39.86	Low
HOUSTON-05	R4	Houston	0.50	52.00	61.00	56.50	Very Good	722.13	0.97	0.11	0.01	228.71	63.18	39.49	Low
HOUSTON-05	R4	Houston	0.60	70.00	86.00	78.00	Good	889.36	1.20	0.13	0.02	281.24	64.48	40.30	Low
HOUSTON-05	R4	Houston	0.70	54.00	53.00	53.50	Very Good	570.24	0.78	0.09	0.01	180.62	66.18	41.36	Low
HOUSTON-05	R4	Houston	0.80	51.00	59.00	55.00	Very Good	447.10	0.65	0.07	0.00	141.34	67.28	42.05	Low
HOUSTON-05	R4	Houston	0.90	102.00	99.00	100.50	Fair	691.80	1.03	0.10	0.01	219.39	67.98	42.48	Low
HOUSTON-05	R4	Houston	1.00	62.00	83.00	72.50	Good	729.54	1.08	0.11	0.01	231.34	68.18	42.61	Low
HOUSTON-05	R4	Houston	1.10	47.00	53.00	50.00	Very Good	739.26	1.09	0.11	0.02	234.44	69.17	43.23	Low
HOUSTON-05	R4	Houston	1.20	68.00	137.00	102.50	Fair	629.35	0.91	0.09	0.03	199.65	70.47	44.05	Low
HOUSTON-05	R4	Houston	1.30	57.00	79.00	68.00	Good	635.10	0.91	0.10	0.03	200.84	72.17	45.11	Medium
HOUSTON-05	R4	Houston	1.40	66.00	79.00	72.50	Good	790.72	1.10	0.12	0.03	250.34	73.17	45.73	Medium
HOUSTON-05	R4	Houston	1.50	56.00	80.00	68.00	Good	785.81	1.10	0.12	0.04	248.83	74.17	46.36	Medium
HOUSTON-05	R4	Houston	1.60	73.00	63.00	68.00	Good	644.28	0.91	0.10	0.05	204.29	75.27	47.05	Medium
HOUSTON-05	R4	Houston	1.70	56.00	88.00	72.00	Good	821.21	1.19	0.13	0.04	260.35	75.97	47.48	Medium
HOUSTON-05	R4	Houston	1.80	149.00	178.00	163.50	Poor	830.18	1.23	0.13	0.06	262.66	75.67	47.30	Medium
HOUSTON-05	R4	Houston	1.90	115.00	142.00	128.50	Fair	754.56	1.13	0.12	0.05	238.85	74.97	46.86	Medium
HOUSTON-05	R4	Houston	2.00	158.00	163.00	160.50	Poor	708.29	1.08	0.11	0.03	224.26	74.97	46.86	Medium
HOUSTON-05	R4	Houston	2.10	114.00	104.00	109.00	Fair	770.37	1.18	0.12	0.02	244.11	74.97	46.86	Medium
HOUSTON-05	R4	Houston	2.20	59.00	63.00	61.00	Good	828.76	1.26	0.13	0.03	262.31	74.97	46.86	Medium
HOUSTON-05	R4	Houston	2.30	61.00	58.00	59.50	Very Good	837.39	1.24	0.13	0.04	265.49	74.97	46.86	Medium
HOUSTON-05	R4	Houston	2.40	61.00	76.00	68.50	Good	685.75	0.98	0.11	0.02	217.34	74.97	46.86	Medium
HOUSTON-05	R4	Houston	2.50	138.00	172.00	155.00	Poor	426.97	0.60	0.07	0.01	135.39	74.77	46.73	Medium
HOUSTON-05	R4	Houston	2.60	69.00	104.00	86.50	Good	218.83	0.31	0.03	0.00	69.15	73.97	46.23	Medium
HOUSTON-05	R4	Houston	2.70	59.00	74.00	66.50	Good	124.43	0.18	0.02	0.00	39.27	74.17	46.36	Medium
HOUSTON-05	R4	Houston	2.80	58.00	74.00	66.00	Good	102.96	0.19	0.02	0.00	32.91	74.97	46.86	Medium
HOUSTON-05	R4	Houston	2.90	54.00	68.00	61.00	Good	93.81	0.25	0.03	0.00	29.81	75.27	47.05	Medium
HOUSTON-05	R4	Houston	3.00	80.00	110.00	95.00	Good	36.81	0.15	0.02	0.00	11.55	75.77	47.36	Medium
HOUSTON-05	R4	Houston	3.10	55.00	64.00	59.50	Very Good	24.37	0.16	0.02	0.01	7.57	74.77	46.73	Medium
HOUSTON-05	R4	Houston	3.20	120.00	114.00	117.00	Fair	25.08	0.22	0.03	0.01	7.76	73.47	45.92	Medium
HOUSTON-05	R4	Houston	3.30	125.00	141.00	133.00	Poor	80.23	0.60	0.08	0.02	25.39	71.47	44.67	Low
HOUSTON-05	R4	Houston	3.40	66.00	67.00	66.50	Good	204.30	0.50	0.07	0.04	64.69	69.77	43.61	Low
HOUSTON-05	R4	Houston	3.50	44.00	54.00	49.00	Very Good	141.97	0.18	0.03	0.03	44.85	68.48	42.80	Low
HOUSTON-05	R4	Houston	3.60	64.00	68.00	66.00	Good	81.69	0.09	0.01	0.02	25.79	66.78	41.73	Low
HOUSTON-05	R4	Houston	3.70	57.00	54.00	55.50	Very Good	98.13	0.10	0.01	0.01	30.95	65.78	41.11	Low
HOUSTON-05	R4	Houston	3.80	61.00	63.00	62.00	Good	119.27	0.12	0.02	0.01	37.83	64.98	40.61	Low
HOUSTON-05	R4	Houston	3.90	83.00	111.00	97.00	Fair	365.40	0.35	0.05	0.01	115.72	65.48	40.92	Low

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-05	R4	Houston	4.00	67.00	57.00	62.00	Good	698.65	0.65	0.10	0.02	221.00	66.98	41.86	Low
HOUSTON-05	R4	Houston	4.10	79.00	77.00	78.00	Good	516.74	0.48	0.07	0.02	163.84	66.98	41.86	Low
HOUSTON-05	R4	Houston	4.20	141.00	175.00	158.00	Poor	392.42	0.35	0.05	0.01	124.32	66.98	41.86	Low
HOUSTON-05	R4	Houston	4.30	88.00	112.00	100.00	Fair	296.94	0.26	0.04	0.01	94.11	66.68	41.67	Low
HOUSTON-05	R4	Houston	4.40	59.00	61.00	60.00	Good	132.42	0.12	0.02	0.00	42.19	66.18	41.36	Low
HOUSTON-05	R4	Houston	4.50	69.00	65.00	67.00	Good	132.99	0.12	0.02	0.00	42.31	67.48	42.17	Low
HOUSTON-05	R4	Houston	4.60	46.00	67.00	56.50	Very Good	192.65	0.17	0.03	0.00	61.33	69.47	43.42	Low
HOUSTON-05	R4	Houston	4.70	47.00	65.00	56.00	Very Good	562.73	0.48	0.08	0.01	178.35	70.97	44.36	Low
HOUSTON-05	R4	Houston	4.80	52.00	128.00	90.00	Good	810.70	0.73	0.11	0.01	256.58	70.97	44.36	Low
HOUSTON-05	R4	Houston	4.90	57.00	105.00	81.00	Good	817.06	0.77	0.11	0.02	258.42	70.77	44.23	Low
HOUSTON-05	R4	Houston	5.00	89.00	84.00	86.50	Good	102.74	0.01	0.04	0.01	32.62	69.47	43.42	Low
HOUSTON-05	R4	Houston	5.10	97.00	124.00	110.50	Fair	79.57	0.01	0.03	0.01	25.53	67.48	42.17	Low
HOUSTON-05	R4	Houston	5.20	100.00	153.00	126.50	Fair	956.30	0.97	0.13	0.13	302.30	65.98	41.23	Low
HOUSTON-05	R4	Houston	5.30	97.00	118.00	107.50	Fair	956.10	0.97	0.13	0.13	302.36	66.18	41.36	Low
HOUSTON-05	R4	Houston	5.40	60.00	60.00	60.00	Good	945.57	0.96	0.14	0.12	299.36	67.18	41.98	Low
HOUSTON-05	R4	Houston	5.50	41.00	51.00	46.00	Very Good	911.27	0.92	0.13	0.07	288.38	68.48	42.80	Low
HOUSTON-05	R4	Houston	5.60	40.00	51.00	45.50	Very Good	920.93	0.92	0.14	0.05	291.79	70.47	44.05	Low
HOUSTON-05	R4	Houston	5.70	58.00	63.00	60.50	Good	969.57	0.93	0.15	0.07	307.20	72.17	45.11	Medium
HOUSTON-05	R4	Houston	5.80	36.00	44.00	40.00	Very Good	968.87	0.88	0.15	0.14	306.41	73.47	45.92	Medium
HOUSTON-05	R4	Houston	5.90	122.00	131.00	126.50	Fair	785.85	0.68	0.12	0.18	248.73	75.27	47.05	Medium
HOUSTON-05	R4	Houston	6.00	128.00	111.00	119.50	Fair	729.61	0.60	0.11	0.17	231.12	75.97	47.48	Medium
HOUSTON-05	R4	Houston	6.10	129.00	106.00	117.50	Fair	315.05	0.24	0.05	0.04	99.84	76.47	47.80	Medium
HOUSTON-05	R4	Houston	6.20	84.00	90.00	87.00	Good	283.70	0.21	0.04	0.03	89.83	78.17	48.86	Medium
HOUSTON-05	R4	Houston	6.30	69.00	83.00	76.00	Good	329.80	0.24	0.05	0.02	104.23	79.17	49.48	Medium
HOUSTON-05	R4	Houston	6.40	133.00	150.00	141.50	Poor	441.75	0.31	0.06	0.04	139.55	80.47	50.29	Medium
HOUSTON-05	R4	Houston	6.50	150.00	156.00	153.00	Poor	542.51	0.37	0.08	0.18	171.72	82.47	51.54	Medium
HOUSTON-05	R4	Houston	6.60	153.00	169.00	161.00	Poor	594.46	0.36	0.09	0.40	187.78	83.97	52.48	Medium
HOUSTON-05	R4	Houston	6.70	167.00	168.00	167.50	Poor	617.94	0.34	0.09	0.27	195.70	83.97	52.48	Medium
HOUSTON-05	R4	Houston	6.80	151.00	157.00	154.00	Poor	640.71	0.33	0.09	0.12	202.57	84.17	52.61	Medium
HOUSTON-05	R4	Houston	6.90	165.00	161.00	163.00	Poor	261.30	0.12	0.04	0.03	82.84	85.17	53.23	Medium
HOUSTON-05	R4	Houston	7.00	149.00	158.00	153.50	Poor	72.47	0.03	0.01	0.01	22.65	86.47	54.04	Medium
HOUSTON-05	R4	Houston	7.10	146.00	181.00	163.50	Poor	65.65	0.03	0.01	0.00	20.83	88.27	55.17	Medium
HOUSTON-05	R4	Houston	7.20	193.00	204.00	198.50	Very Poor	123.12	0.06	0.03	0.01	38.62	88.97	55.60	Medium
HOUSTON-05	R4	Houston	7.30	174.00	194.00	184.00	Very Poor	100.63	0.04	0.02	0.01	31.96	88.97	55.60	Medium
HOUSTON-05	R4	Houston	7.40	184.00	184.00	184.00	Very Poor	62.48	0.03	0.01	0.01	19.96	88.97	55.60	Medium
HOUSTON-05	R4	Houston	7.50	224.00	241.00	232.50	Very Poor	61.78	0.00	0.02	0.00	19.50	88.47	55.29	Medium
HOUSTON-05	R4	Houston	7.60	223.00	205.00	214.00	Very Poor	68.03	0.00	0.02	0.01	21.20	86.47	54.04	Medium
HOUSTON-05	R4	Houston	7.70	111.00	102.00	106.50	Fair	110.31	0.00	0.03	0.01	34.69	84.67	52.92	Medium
HOUSTON-05	R4	Houston	7.80	61.00	83.00	72.00	Good	78.32	0.00	0.02	0.01	24.70	83.67	52.29	Medium
HOUSTON-05	R4	Houston	7.90	89.00	106.00	97.50	Fair	60.85	0.00	0.01	0.00	19.44	82.67	51.67	Medium
HOUSTON-05	R4	Houston	8.00	74.00	108.00	91.00	Good	49.56	0.00	0.02	0.00	15.90	81.47	50.92	Medium
HOUSTON-05	R4	Houston	8.10	81.00	146.00	113.50	Fair	38.93	0.00	0.02	0.01	12.43	79.67	49.79	Medium
HOUSTON-05	R4	Houston	8.20	60.00	77.00	68.50	Good	27.66	0.00	0.02	0.01	8.92	79.27	49.54	Medium
HOUSTON-05	R4	Houston	8.30	84.00	129.00	106.50	Fair	22.10	0.00	0.02	0.01	6.86	79.97	49.98	Medium
HOUSTON-05	R4	Houston	8.40	61.00	79.00	70.00	Good	12.36	0.00	0.02	0.00	3.91	79.67	49.79	Medium
HOUSTON-05	R4	Houston	8.50	68.00	96.00	82.00	Good	9.21	0.00	0.02	0.00	3.16	78.77	49.23	Medium
HOUSTON-05	R4	Houston	8.60	57.00	68.00	62.50	Good	9.38	0.00	0.02	0.00	3.16	77.47	48.42	Medium
HOUSTON-05	R4	Houston	8.70	64.00	75.00	69.50	Good	7.81	0.00	0.02	0.00	2.40	75.57	47.23	Medium
HOUSTON-05	R4	Houston	8.80	82.00	59.00	70.50	Good	5.93	0.00	0.02	0.00	1.60	73.67	46.05	Medium
HOUSTON-05	R4	Houston	8.90	102.00	77.00	89.50	Good	5.40	0.01	0.02	0.00	1.63	72.97	45.61	Medium
HOUSTON-05	R4	Houston	9.00	82.00	78.00	80.00	Good	5.81	0.01	0.02	0.01	1.65	72.77	45.48	Medium
HOUSTON-05	R4	Houston	9.10	88.00	113.00	100.50	Fair	7.26	0.01	0.02	0.00	2.49	71.97	44.98	Low
HOUSTON-05	R4	Houston	9.20	79.00	93.00	86.00	Good	20.73	0.00	0.02	0.01	6.96	71.77	44.86	Low
HOUSTON-05	R4	Houston	9.30	103.00	139.00	121.00	Fair	47.47	0.00	0.02	0.01	15.42	70.77	44.23	Low
HOUSTON-05	R4	Houston	9.40	127.00	161.00	144.00	Poor	63.62	0.00	0.01	0.02	20.54	69.97	43.73	Low
HOUSTON-05	R4	Houston	9.50	85.00	66.00	75.50	Good	74.23	0.00	0.01	0.03	23.61	69.27	43.30	Low
HOUSTON-05	R4	Houston	9.60	90.00	89.00	89.50	Good	88.78	0.00	0.02	0.06	28.47	66.18	41.36	Low
HOUSTON-05	R4	Houston	9.70	80.00	77.00	78.50	Good	103.85	0.00	0.02	0.08	32.64	63.48	39.67	Low
HOUSTON-05	R4	Houston	9.80	72.00	70.00	71.00	Good	160.04	0.00	0.03	0.12	50.88	61.68	38.55	Low
HOUSTON-05	R4	Houston	9.90	66.00	64.00	65.00	Good	582.25	0.00	0.09	0.36	184.32	60.98	38.11	Low
HOUSTON-05	R4	Houston	10.00	79.00	73.00	76.00	Good	159.76	0.02	0.03	0.00	50.25	60.68	37.92	Low
HOUSTON-05	R4	Houston	10.10	73.00	57.00	65.00	Good	85.95	0.01	0.02	0.00	27.19	59.98	37.49	Low
HOUSTON-05	R4	Houston	10.20	103.00	79.00	91.00	Good	486.00	0.00	0.07	0.07	153.48	59.98	37.49	Low
HOUSTON-05	R4	Houston	10.30	125.00	118.00	121.50	Fair	400.52	0.00	0.06	0.03	126.16	59.98	37.49	Low
HOUSTON-05	R4	Houston	10.40	105.00	109.00	107.00	Fair	490.20	0.00	0.07	0.03	154.75	60.28	37.67	Low
HOUSTON-05	R4	Houston	10.50	57.00	61.00	59.00	Very Good	713.74	0.03	0.11	0.03	225.43	61.48	38.42	Low
HOUSTON-05	R4	Houston	10.60	90.00	86.00	88.00	Good	658.09	0.09	0.10	0.04	207.70	63.78	39.86	Low
HOUSTON-05	R4	Houston	10.70	124.00	128.00	126.00	Fair	701.64	0.16	0.11	0.04	221.60	66.18	41.36	Low
HOUSTON-05	R4	Houston	10.80	75.00	61.00	68.00	Good	806.14	0.25	0.13	0.02	254.69	66.98	41.86	Low
HOUSTON-05	R4	Houston	10.90	67.00	58.00	62.50	Good	759.45	0.31	0.12	0.01	240.32	67.18	41.98	Low
HOUSTON-05	R4	Houston	11.00	101.00	124.00	112.50	Fair	691.80	1.03	0.10	0.01	219.39	68.48	42.80	Low
HOUSTON-05	R4	Houston	11.10	64.00	55.00	59.50	Very Good	729.54	1.08	0.11	0.01	231.34	70.67	44.17	Low
HOUSTON-05	R4	Houston	11.20	65.00	44.00	54.50	Very Good	694.47	0.46	0.11	0.04	219.80	73.47	45.92	Medium
HOUSTON-05	R4	Houston	11.30	63.00	59.00	61.00	Good	547.72	0.40	0.09	0.04	173.08	75.47	47.17	Medium
HOUSTON-05	R4	Houston	11.40	49.00	50.00	49.50	Very Good	104.15	0.09	0.02	0.01	32.84	77.47	48.42	Medium
HOUSTON-05	R4	Houston	11.50	47.00	42.00	44.50	Very Good	170.86	0.19	0.04	0.01	54.40	79.47	49.67	Medium
HOUSTON-05	R4	Houston	11.60	52.00	55.00	53.50	Very Good	321.17	0.36	0.06	0.04	101.40	81.47	50.92	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-05	R4	Houston	11.70	55.00	53.00	54.00	Very Good	467.10	0.47	0.08	0.08	147.67	83.17	51.98	Medium
HOUSTON-05	R4	Houston	11.80	49.00	63.00	56.00	Very Good	573.21	0.58	0.10	0.07	181.17	84.17	52.61	Medium
HOUSTON-05	R4	Houston	11.90	55.00	49.00	52.00	Very Good	605.58	0.61	0.10	0.05	191.54	84.67	52.92	Medium
HOUSTON-05	R4	Houston	12.00	57.00	63.00	60.00	Good	353.76	0.35	0.06	0.03	111.96	83.47	52.17	Medium
HOUSTON-05	R4	Houston	12.10	72.00	74.00	73.00	Good	208.73	0.20	0.04	0.02	66.36	82.27	51.42	Medium
HOUSTON-05	R4	Houston	12.20	66.00	67.00	66.50	Good	430.77	0.39	0.07	0.03	136.63	83.27	52.04	Medium
HOUSTON-05	R4	Houston	12.30	60.00	57.00	58.50	Very Good	601.87	0.52	0.11	0.04	190.22	84.17	52.61	Medium
HOUSTON-05	R4	Houston	12.40	76.00	60.00	68.00	Good	680.09	0.53	0.12	0.03	215.09	85.37	53.36	Medium
HOUSTON-05	R4	Houston	12.50	58.00	56.00	57.00	Very Good	698.89	0.50	0.12	0.02	221.29	86.77	54.23	Medium
HOUSTON-05	R4	Houston	12.60	65.00	58.00	61.50	Good	555.07	0.37	0.10	0.02	175.66	85.97	53.73	Medium
HOUSTON-05	R4	Houston	12.70	61.00	55.00	58.00	Very Good	346.70	0.21	0.06	0.01	109.83	86.27	53.92	Medium
HOUSTON-05	R4	Houston	12.80	68.00	62.00	65.00	Good	140.06	0.07	0.02	0.00	44.45	87.27	54.54	Medium
HOUSTON-05	R4	Houston	12.90	101.00	96.00	98.50	Fair	103.37	0.03	0.02	0.00	32.48	88.47	55.29	Medium
HOUSTON-05	R4	Houston	13.00	88.00	94.00	91.00	Good	120.78	0.04	0.02	0.00	38.11	90.47	56.54	Medium
HOUSTON-05	R4	Houston	13.10	90.00	85.00	87.50	Good	112.82	0.03	0.02	0.00	35.92	92.27	57.67	Medium
HOUSTON-05	R4	Houston	13.20	82.00	99.00	90.50	Good	103.49	0.03	0.02	0.00	32.93	93.27	58.29	Medium
HOUSTON-05	R4	Houston	13.30	82.00	113.00	97.50	Fair	93.06	0.02	0.02	0.00	29.49	93.97	58.73	Medium
HOUSTON-05	R4	Houston	13.40	89.00	98.00	93.50	Good	92.43	0.02	0.02	0.00	29.12	93.67	58.54	Medium
HOUSTON-05	R4	Houston	13.50	81.00	82.00	81.50	Good	93.27	0.02	0.02	0.00	29.21	92.97	58.10	Medium
HOUSTON-05	R4	Houston	13.60	218.00	328.00	273.00	Very Poor	91.41	0.01	0.02	0.00	28.90	92.67	57.92	Medium
HOUSTON-06	R1	Houston	0.10	120.00	125.00	122.50	Fair	358.98	0.22	0.00	0.00	113.27	41.68	26.05	Low
HOUSTON-06	R1	Houston	0.20	156.00	271.00	213.50	Very Poor	605.29	0.46	0.00	0.00	191.06	40.98	25.61	Low
HOUSTON-06	R1	Houston	0.30	181.00	221.00	201.00	Very Poor	785.09	0.70	0.00	0.01	248.25	41.28	25.80	Low
HOUSTON-06	R1	Houston	0.40	78.00	78.00	78.00	Good	555.78	0.52	0.00	0.01	175.66	42.28	26.43	Low
HOUSTON-06	R1	Houston	0.50	87.00	129.00	108.00	Fair	343.23	0.34	0.00	0.00	109.08	43.28	27.05	Low
HOUSTON-06	R1	Houston	0.60	106.00	149.00	127.50	Fair	241.71	0.24	0.00	0.00	75.93	43.98	27.49	Low
HOUSTON-06	R1	Houston	0.70	108.00	111.00	109.50	Fair	367.04	0.36	0.00	0.00	116.51	43.98	27.49	Low
HOUSTON-06	R1	Houston	0.80	104.00	132.00	118.00	Fair	590.20	0.55	0.00	0.01	187.20	43.98	27.49	Low
HOUSTON-06	R1	Houston	0.90	103.00	116.00	109.50	Fair	794.50	0.71	0.00	0.01	250.94	44.28	27.68	Low
HOUSTON-06	R1	Houston	1.00	95.00	118.00	106.50	Fair	888.48	0.75	0.00	0.02	280.42	45.58	28.49	Low
HOUSTON-06	R1	Houston	1.10	106.00	114.00	110.00	Fair	867.03	0.69	0.00	0.02	274.00	47.28	29.55	Low
HOUSTON-06	R1	Houston	1.20	64.00	137.00	100.50	Fair	799.66	0.64	0.00	0.02	252.44	48.58	30.36	Low
HOUSTON-06	R1	Houston	1.30	135.00	186.00	160.50	Poor	547.47	0.41	0.00	0.01	172.91	50.28	31.42	Low
HOUSTON-06	R1	Houston	1.40	91.00	280.00	185.50	Very Poor	283.04	0.21	0.00	0.00	89.22	50.98	31.86	Low
HOUSTON-06	R1	Houston	1.50	119.00	135.00	127.00	Fair	253.63	0.19	0.00	0.00	80.66	50.68	31.67	Low
HOUSTON-06	R1	Houston	1.60	161.00	221.00	191.00	Very Poor	398.88	0.32	0.00	0.00	126.72	49.98	31.24	Low
HOUSTON-06	R1	Houston	1.70	120.00	191.00	155.50	Poor	670.41	0.62	0.00	0.00	211.97	49.98	31.24	Low
HOUSTON-06	R1	Houston	1.80	113.00	101.00	107.00	Fair	772.00	0.82	0.00	0.01	243.91	50.28	31.42	Low
HOUSTON-06	R1	Houston	1.90	95.00	125.00	110.00	Fair	611.87	0.70	0.00	0.01	193.13	50.98	31.86	Low
HOUSTON-06	R1	Houston	2.00	95.00	101.00	98.00	Fair	508.10	0.61	0.00	0.00	160.56	51.28	32.05	Low
HOUSTON-06	R1	Houston	2.10	167.00	194.00	180.50	Very Poor	510.68	0.63	0.00	0.00	161.72	51.98	32.49	Low
HOUSTON-06	R1	Houston	2.20	149.00	234.00	191.50	Very Poor	505.77	0.63	0.00	0.00	159.51	51.98	32.49	Low
HOUSTON-06	R1	Houston	2.30	111.00	133.00	122.00	Fair	370.28	0.46	0.00	0.00	116.74	52.28	32.67	Low
HOUSTON-06	R1	Houston	2.40	96.00	143.00	119.50	Fair	185.94	0.22	0.00	0.00	58.69	52.98	33.11	Low
HOUSTON-06	R1	Houston	2.50	127.00	191.00	159.00	Poor	159.31	0.19	0.00	0.00	49.99	52.98	33.11	Low
HOUSTON-06	R2	Houston	0.10	120.00	125.00	122.50	Fair	383.97	2.91	0.00	0.00	122.98	36.98	23.12	Low
HOUSTON-06	R2	Houston	0.20	156.00	271.00	213.50	Very Poor	892.71	4.72	0.01	0.00	284.89	36.98	23.12	Low
HOUSTON-06	R2	Houston	0.30	181.00	221.00	201.00	Very Poor	1516.38	11.07	0.01	0.05	485.05	37.98	23.74	Low
HOUSTON-06	R2	Houston	0.40	78.00	78.00	78.00	Good	1623.87	4.69	0.01	0.40	515.44	40.88	25.55	Low
HOUSTON-06	R2	Houston	0.50	87.00	129.00	108.00	Fair	1299.78	2.51	0.02	0.74	412.36	43.98	27.49	Low
HOUSTON-06	R2	Houston	0.60	106.00	149.00	127.50	Fair	578.77	1.18	0.01	0.35	183.60	47.98	29.99	Low
HOUSTON-06	R2	Houston	0.70	108.00	111.00	109.50	Fair	313.21	0.90	0.00	0.12	99.07	49.98	31.24	Low
HOUSTON-06	R2	Houston	0.80	104.00	132.00	118.00	Fair	270.60	1.21	0.00	0.06	86.40	49.98	31.24	Low
HOUSTON-06	R2	Houston	0.90	103.00	116.00	109.50	Fair	279.36	2.13	0.00	0.03	89.86	49.98	31.24	Low
HOUSTON-06	R2	Houston	1.00	95.00	118.00	106.50	Fair	602.59	10.28	0.01	0.04	195.13	48.98	30.61	Low
HOUSTON-06	R2	Houston	1.10	106.00	114.00	110.00	Fair	623.47	10.63	0.01	0.03	202.19	48.98	30.61	Low
HOUSTON-06	R2	Houston	1.20	64.00	137.00	100.50	Fair	467.88	4.46	0.01	0.02	150.06	49.88	31.17	Low
HOUSTON-06	R2	Houston	1.30	135.00	186.00	160.50	Poor	438.28	1.63	0.01	0.04	139.39	49.98	31.24	Low
HOUSTON-06	R2	Houston	1.40	91.00	280.00	185.50	Very Poor	549.86	1.69	0.01	0.06	173.95	49.98	31.24	Low
HOUSTON-06	R2	Houston	1.50	119.00	135.00	127.00	Fair	872.72	2.41	0.01	0.05	276.48	49.98	31.24	Low
HOUSTON-06	R2	Houston	1.60	161.00	221.00	191.00	Very Poor	759.62	1.95	0.01	0.08	240.56	50.98	31.86	Low
HOUSTON-06	R2	Houston	1.70	120.00	191.00	155.50	Poor	388.23	1.18	0.01	0.20	123.04	52.88	33.05	Low
HOUSTON-06	R2	Houston	1.80	113.00	101.00	107.00	Fair	189.10	0.82	0.00	0.11	59.73	53.98	33.74	Low
HOUSTON-06	R2	Houston	1.90	95.00	125.00	110.00	Fair	160.33	0.61	0.00	0.06	51.20	53.98	33.74	Low
HOUSTON-06	R2	Houston	2.00	95.00	101.00	98.00	Fair	158.16	0.46	0.00	0.03	49.99	52.98	33.11	Low
HOUSTON-06	R2	Houston	2.10	167.00	194.00	180.50	Very Poor	159.29	0.39	0.00	0.02	50.95	51.98	32.49	Low
HOUSTON-06	R2	Houston	2.20	149.00	234.00	191.50	Very Poor	159.92	0.34	0.00	0.02	50.69	49.98	31.24	Low
HOUSTON-06	R2	Houston	2.30	111.00	133.00	122.00	Fair	159.72	0.29	0.00	0.01	50.44	49.08	30.67	Low
HOUSTON-06	R2	Houston	2.40	96.00	143.00	119.50	Fair	167.49	0.25	0.00	0.01	52.70	46.98	29.36	Low
HOUSTON-06	R2	Houston	2.50	127.00	191.00	159.00	Poor	160.22	0.21	0.00	0.01	50.55	48.98	30.61	Low
HOUSTON-06	R3	Houston	0.10	120.00	125.00	122.50	Fair	120.60	0.84	0.00	0.05	38.40	55.98	34.99	Low
HOUSTON-06	R3	Houston	0.20	156.00	271.00	213.50	Very Poor	110.15	0.66	0.00	0.03	35.52	56.08	35.05	Low
HOUSTON-06	R3	Houston	0.30	181.00	221.00	201.00	Very Poor	114.36	0.57	0.00	0.03	36.74	57.98	36.24	Low
HOUSTON-06	R3	Houston	0.40	78.00	78.00	78.00	Good	138.37	0.54	0.00	0.05	43.70	58.98	36.86	Low
HOUSTON-06	R3	Houston	0.50	87.00	129.00	108.00	Fair	377.23	1.20	0.00	0.18	119.24	58.98	36.86	Low
HOUSTON-06	R3	Houston	0.60	106.00	149.00	127.50	Fair	709.10	2.57	0.00	0.30	225.35	57.98	36.24	Low
HOUSTON-06	R3	Houston	0.70	108.00	111.00	109.50	Fair	842.79	3.09	0.00	0.25	267.32	57.98	36.24	Low

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-06	R3	Houston	0.80	104.00	132.00	118.00	Fair	500.32	1.62	0.00	0.10	159.13	56.98	35.61	Low
HOUSTON-06	R3	Houston	0.90	103.00	116.00	109.50	Fair	128.17	0.38	0.00	0.02	40.32	55.98	34.99	Low
HOUSTON-06	R3	Houston	1.00	95.00	118.00	106.50	Fair	150.92	0.49	0.00	0.01	47.84	55.98	34.99	Low
HOUSTON-06	R3	Houston	1.10	106.00	114.00	110.00	Fair	161.77	0.76	0.00	0.02	51.64	54.98	34.36	Low
HOUSTON-06	R3	Houston	1.20	64.00	137.00	100.50	Fair	98.38	0.53	0.00	0.02	31.33	53.98	33.74	Low
HOUSTON-06	R3	Houston	1.30	135.00	186.00	160.50	Poor	94.63	0.39	0.00	0.04	29.88	53.98	33.74	Low
HOUSTON-06	R3	Houston	1.40	91.00	280.00	185.50	Very Poor	120.05	0.42	0.00	0.10	37.70	55.08	34.43	Low
HOUSTON-06	R3	Houston	1.50	119.00	135.00	127.00	Fair	154.20	0.48	0.00	0.19	49.07	56.98	35.61	Low
HOUSTON-06	R3	Houston	1.60	161.00	221.00	191.00	Very Poor	182.11	0.49	0.00	0.21	57.60	57.98	36.24	Low
HOUSTON-06	R3	Houston	1.70	120.00	191.00	155.50	Poor	197.21	0.45	0.00	0.15	63.03	52.88	33.05	Low
HOUSTON-06	R3	Houston	1.80	113.00	101.00	107.00	Fair	260.88	0.52	0.00	0.13	83.08	44.99	28.12	Low
HOUSTON-06	R3	Houston	1.90	95.00	125.00	110.00	Fair	739.58	1.16	0.00	0.24	233.79	41.99	26.24	Low
HOUSTON-06	R3	Houston	2.00	95.00	101.00	98.00	Fair	609.90	0.76	0.00	0.14	193.13	40.89	25.55	Low
HOUSTON-06	R3	Houston	2.10	167.00	194.00	180.50	Very Poor	270.70	0.30	0.00	0.04	85.29	38.99	24.37	Low
HOUSTON-06	R3	Houston	2.20	149.00	234.00	191.50	Very Poor	527.07	0.70	0.00	0.06	166.28	37.89	23.68	Low
HOUSTON-06	R3	Houston	2.30	111.00	133.00	122.00	Fair	710.52	10.15	0.00	0.06	229.31	35.99	22.49	Low
HOUSTON-06	R3	Houston	2.40	96.00	143.00	119.50	Fair	765.54	4.58	0.00	0.05	244.07	36.99	23.12	Low
HOUSTON-06	R3	Houston	2.50	127.00	191.00	159.00	Poor	769.08	3.90	0.00	0.04	244.62	37.99	23.74	Low
HOUSTON-06	R4	Houston	0.10	120.00	125.00	122.50	Fair	731.85	1.31	0.08	0.02	232.04	56.08	35.05	Low
HOUSTON-06	R4	Houston	0.20	156.00	271.00	213.50	Very Poor	733.61	0.79	0.08	0.02	232.01	57.08	35.67	Low
HOUSTON-06	R4	Houston	0.30	181.00	221.00	201.00	Very Poor	731.09	0.65	0.08	0.02	230.99	58.08	36.30	Low
HOUSTON-06	R4	Houston	0.40	78.00	78.00	78.00	Good	727.87	0.62	0.08	0.02	230.40	59.97	37.48	Low
HOUSTON-06	R4	Houston	0.50	87.00	129.00	108.00	Fair	750.06	1.49	0.09	0.05	237.56	61.07	38.17	Low
HOUSTON-06	R4	Houston	0.60	106.00	149.00	127.50	Fair	747.27	1.34	0.09	0.05	236.42	63.07	39.42	Low
HOUSTON-06	R4	Houston	0.70	108.00	111.00	109.50	Fair	689.12	0.28	0.08	0.03	217.99	64.97	40.61	Low
HOUSTON-06	R4	Houston	0.80	104.00	132.00	118.00	Fair	617.04	0.31	0.07	0.01	195.49	65.97	41.23	Low
HOUSTON-06	R4	Houston	0.90	103.00	116.00	109.50	Fair	523.91	0.50	0.06	0.01	165.92	66.97	41.86	Low
HOUSTON-06	R4	Houston	1.00	95.00	118.00	106.50	Fair	405.73	0.44	0.05	0.00	128.75	67.97	42.48	Low
HOUSTON-06	R4	Houston	1.10	106.00	114.00	110.00	Fair	389.64	0.40	0.05	0.00	123.67	67.87	42.36	Low
HOUSTON-06	R4	Houston	1.20	64.00	137.00	100.50	Fair	393.69	0.41	0.05	0.00	124.52	67.93	42.47	Low
HOUSTON-06	R4	Houston	1.30	135.00	186.00	160.50	Poor	391.54	0.37	0.05	0.01	123.67	67.83	42.41	Low
HOUSTON-06	R4	Houston	1.40	91.00	280.00	185.50	Very Poor	320.99	0.25	0.04	0.01	101.65	67.97	42.48	Low
HOUSTON-06	R4	Houston	1.50	119.00	135.00	127.00	Fair	110.09	0.08	0.01	0.00	34.73	67.97	42.48	Low
HOUSTON-06	R4	Houston	1.60	161.00	221.00	191.00	Very Poor	98.34	0.09	0.02	0.00	30.95	66.97	41.86	Low
HOUSTON-06	R4	Houston	1.70	120.00	191.00	155.50	Poor	62.08	0.10	0.02	0.00	20.10	65.87	41.17	Low
HOUSTON-06	R4	Houston	1.80	113.00	101.00	107.00	Fair	56.65	0.10	0.02	0.01	18.03	63.87	39.92	Low
HOUSTON-06	R4	Houston	1.90	95.00	125.00	110.00	Fair	82.87	0.08	0.01	0.01	26.51	62.97	39.36	Low
HOUSTON-06	R4	Houston	2.00	95.00	101.00	98.00	Fair	104.52	0.08	0.01	0.02	33.45	56.98	35.61	Low
HOUSTON-06	R4	Houston	2.10	167.00	194.00	180.50	Very Poor	120.84	0.08	0.02	0.02	38.09	56.08	35.05	Low
HOUSTON-06	R4	Houston	2.20	149.00	234.00	191.50	Very Poor	141.60	0.09	0.02	0.01	44.59	57.98	36.23	Low
HOUSTON-06	R4	Houston	2.30	111.00	133.00	122.00	Fair	159.14	0.09	0.02	0.01	50.17	56.88	35.55	Low
HOUSTON-06	R4	Houston	2.40	96.00	143.00	119.50	Fair	97.31	0.05	0.01	0.00	30.66	53.78	33.61	Low
HOUSTON-06	R4	Houston	2.50	127.00	191.00	159.00	Poor	93.02	0.05	0.01	0.00	29.87	61.67	38.55	Low
HOUSTON-06	R5	Houston	0.10	120.00	125.00	122.50	Fair	1129.76	9.13	0.00	1.25	361.79	35.28	22.05	Low
HOUSTON-06	R5	Houston	0.20	156.00	271.00	213.50	Very Poor	872.89	2.78	0.00	1.17	277.11	40.18	25.11	Low
HOUSTON-06	R5	Houston	0.30	181.00	221.00	201.00	Very Poor	894.88	2.17	0.00	0.78	284.17	43.28	27.05	Low
HOUSTON-06	R5	Houston	0.40	78.00	78.00	78.00	Good	963.56	2.04	0.00	0.34	305.16	47.18	29.49	Low
HOUSTON-06	R5	Houston	0.50	87.00	129.00	108.00	Fair	911.54	1.93	0.00	0.13	288.91	49.18	30.74	Low
HOUSTON-06	R5	Houston	0.60	106.00	149.00	127.50	Fair	898.90	2.10	0.00	0.05	285.35	51.08	31.92	Low
HOUSTON-06	R5	Houston	0.70	108.00	111.00	109.50	Fair	96.67	0.35	0.00	0.00	30.93	53.18	33.24	Low
HOUSTON-06	R5	Houston	0.80	104.00	132.00	118.00	Fair	100.91	0.33	0.00	0.02	32.33	56.08	35.05	Low
HOUSTON-06	R5	Houston	0.90	103.00	116.00	109.50	Fair	128.58	0.37	0.00	0.05	41.02	57.08	35.67	Low
HOUSTON-06	R5	Houston	1.00	95.00	118.00	106.50	Fair	168.03	0.42	0.00	0.08	53.05	58.08	36.30	Low
HOUSTON-06	R5	Houston	1.10	106.00	114.00	110.00	Fair	199.54	0.43	0.00	0.07	63.08	59.07	36.92	Low
HOUSTON-06	R5	Houston	1.20	64.00	137.00	100.50	Fair	195.94	0.38	0.00	0.03	62.18	60.07	37.55	Low
HOUSTON-06	R5	Houston	1.30	135.00	186.00	160.50	Poor	179.11	0.31	0.00	0.01	56.90	61.07	38.17	Low
HOUSTON-06	R5	Houston	1.40	91.00	280.00	185.50	Very Poor	176.91	0.29	0.00	0.00	55.70	61.97	38.73	Low
HOUSTON-06	R5	Houston	1.50	119.00	135.00	127.00	Fair	796.21	1.79	0.00	0.03	251.08	62.07	38.80	Low
HOUSTON-06	R5	Houston	1.60	161.00	221.00	191.00	Very Poor	1240.76	2.72	0.00	0.55	391.38	62.97	39.36	Low
HOUSTON-06	R5	Houston	1.70	120.00	191.00	155.50	Poor	1910.48	4.10	0.00	1.85	610.56	62.87	39.30	Low
HOUSTON-06	R5	Houston	1.80	113.00	101.00	107.00	Fair	1906.68	4.02	0.00	2.32	599.04	61.87	38.67	Low
HOUSTON-06	R5	Houston	1.90	95.00	125.00	110.00	Fair	2037.24	4.27	0.00	3.05	648.00	60.97	38.11	Low
HOUSTON-06	R5	Houston	2.10	167.00	194.00	180.50	Very Poor	2479.16	5.07	0.00	3.23	782.77	59.97	37.48	Low
HOUSTON-06	R5	Houston	2.30	111.00	133.00	122.00	Fair	501.33	1.33	0.00	0.21	158.62	58.77	36.73	Low
HOUSTON-06	R5	Houston	2.40	96.00	143.00	119.50	Fair	214.00	0.60	0.00	0.10	68.34	56.88	35.55	Low
HOUSTON-06	R5	Houston	2.50	127.00	191.00	159.00	Poor	193.87	0.56	0.00	0.04	61.71	55.98	34.99	Low
HOUSTON-06	R6	Houston	0.10	120.00	125.00	122.50	Fair	242.95	0.28	0.23	0.07	77.16	55.98	34.99	Low
HOUSTON-06	R6	Houston	0.20	156.00	271.00	213.50	Very Poor	411.09	0.15	0.20	0.55	130.17	56.08	35.05	Low
HOUSTON-06	R6	Houston	0.30	181.00	221.00	201.00	Very Poor	518.47	0.10	0.23	0.58	163.66	57.08	35.67	Low
HOUSTON-06	R6	Houston	0.40	78.00	78.00	78.00	Good	644.60	0.09	0.28	0.42	204.32	58.08	36.30	Low
HOUSTON-06	R6	Houston	0.50	87.00	129.00	108.00	Fair	741.82	0.07	0.32	0.19	234.63	58.97	36.86	Low
HOUSTON-06	R6	Houston	0.60	106.00	149.00	127.50	Fair	582.15	0.03	0.25	0.08	184.52	59.07	36.92	Low
HOUSTON-06	R6	Houston	0.70	108.00	111.00	109.50	Fair	387.64	0.02	0.16	0.03	122.39	60.17	37.61	Low
HOUSTON-06	R6	Houston	0.80	104.00	132.00	118.00	Fair	573.19	0.03	0.24	0.03	181.45	62.17	38.86	Low
HOUSTON-06	R6	Houston	0.90	103.00	116.00	109.50	Fair	777.17	0.04	0.33	0.03	246.05	64.07	40.05	Low
HOUSTON-06	R6	Houston	1.00	95.00	118.00	106.50	Fair	710.21	0.03	0.30	0.02	224.46	64.97	40.61	Low
HOUSTON-06	R6	Houston	1.10	106.00	114.00	110.00	Fair	1450.00	0.46	0.62	0.07	458.71	66.07	41.29	Low

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-06	R6	Houston	1.20	64.00	137.00	100.50	Fair	1472.13	0.47	0.62	0.02	465.28	67.17	41.98	Low
HOUSTON-06	R6	Houston	1.30	135.00	186.00	160.50	Poor	1426.49	0.52	0.60	0.00	450.99	68.97	43.11	Low
HOUSTON-06	R6	Houston	1.40	91.00	280.00	185.50	Very Poor	1305.58	0.35	0.50	0.02	412.69	68.87	43.04	Low
HOUSTON-06	R6	Houston	1.50	119.00	135.00	127.00	Fair	1225.39	0.33	0.47	0.03	387.90	67.87	42.42	Low
HOUSTON-06	R6	Houston	1.60	161.00	221.00	191.00	Very Poor	1071.56	0.33	0.41	0.02	339.25	66.87	41.79	Low
HOUSTON-06	R6	Houston	1.70	120.00	191.00	155.50	Poor	1073.75	0.33	0.41	0.03	340.05	65.97	41.23	Low
HOUSTON-06	R6	Houston	1.80	113.00	101.00	107.00	Fair	1186.82	0.32	0.46	0.10	375.57	65.67	41.05	Low
HOUSTON-06	R6	Houston	1.90	95.00	125.00	110.00	Fair	1207.62	0.27	0.47	0.09	382.12	62.97	39.36	Low
HOUSTON-06	R6	Houston	2.00	95.00	101.00	98.00	Fair	1112.69	0.25	0.44	0.04	351.80	62.67	39.17	Low
HOUSTON-06	R6	Houston	2.10	167.00	194.00	180.50	Very Poor	889.53	0.48	0.35	0.03	281.38	60.27	37.67	Low
HOUSTON-06	R6	Houston	2.20	149.00	234.00	191.50	Very Poor	428.45	2.45	0.17	0.01	137.02	63.17	39.48	Low
HOUSTON-06	R6	Houston	2.30	111.00	133.00	122.00	Fair	299.90	1.17	0.12	0.00	95.30	64.87	40.55	Low
HOUSTON-06	R6	Houston	2.40	96.00	143.00	119.50	Fair	494.34	1.39	0.20	0.11	156.71	63.97	39.98	Low
HOUSTON-06	R6	Houston	2.50	127.00	191.00	159.00	Poor	367.25	0.76	0.15	0.10	116.89	63.67	39.80	Low
HOUSTON-07	R1	Houston	0.10	82.00	83.00	82.50	Good	190.35	1.00	0.00	0.00	60.70	60.59	37.87	Low
HOUSTON-07	R1	Houston	0.20	74.00	79.00	76.50	Good	240.90	1.03	0.00	0.00	76.13	62.28	38.93	Low
HOUSTON-07	R1	Houston	0.30	72.00	94.00	83.00	Good	263.01	0.98	0.00	0.00	83.26	63.48	39.68	Low
HOUSTON-07	R1	Houston	0.40	84.00	81.00	82.50	Good	291.21	0.95	0.00	0.01	92.90	65.48	40.93	Low
HOUSTON-07	R1	Houston	0.50	87.00	86.00	86.50	Good	342.37	1.14	0.01	0.01	109.63	67.28	42.05	Low
HOUSTON-07	R2	Houston	0.10	82.00	83.00	82.50	Good	97.34	0.05	0.00	0.01	30.81	81.98	51.24	Medium
HOUSTON-07	R2	Houston	0.20	74.00	79.00	76.50	Good	140.95	0.09	0.00	0.01	44.87	82.56	51.86	Medium
HOUSTON-07	R2	Houston	0.30	72.00	94.00	83.00	Good	530.17	0.41	0.01	0.03	167.80	83.38	52.49	Medium
HOUSTON-07	R2	Houston	0.40	84.00	81.00	82.50	Good	561.88	0.41	0.01	0.03	177.50	84.25	53.11	Medium
HOUSTON-07	R2	Houston	0.50	87.00	86.00	86.50	Good	587.15	0.41	0.01	0.05	185.44	83.79	52.46	Medium
HOUSTON-07	R3	Houston	0.10	82.00	83.00	82.50	Good	592.13	1.82	0.00	0.33	187.99	80.98	50.61	Medium
HOUSTON-07	R3	Houston	0.20	74.00	79.00	76.50	Good	150.65	0.82	0.00	0.06	47.69	83.08	51.92	Medium
HOUSTON-07	R3	Houston	0.30	72.00	94.00	83.00	Good	69.43	1.97	0.00	0.02	22.92	85.78	53.61	Medium
HOUSTON-07	R3	Houston	0.40	84.00	81.00	82.50	Good	304.65	10.91	0.00	0.07	101.43	87.98	54.99	Medium
HOUSTON-07	R3	Houston	0.50	87.00	86.00	86.50	Good	458.98	12.33	0.00	0.09	151.04	89.25	56.24	Medium
HOUSTON-07	R4	Houston	0.10	82.00	83.00	82.50	Good	910.17	0.69	0.11	0.08	287.59	80.98	50.61	Medium
HOUSTON-07	R4	Houston	0.20	74.00	79.00	76.50	Good	823.98	0.59	0.10	0.03	260.80	82.08	51.30	Medium
HOUSTON-07	R4	Houston	0.30	72.00	94.00	83.00	Good	733.81	0.53	0.09	0.01	231.98	83.98	52.49	Medium
HOUSTON-07	R4	Houston	0.40	84.00	81.00	82.50	Good	695.12	0.50	0.08	0.01	219.50	84.98	53.11	Medium
HOUSTON-07	R4	Houston	0.50	87.00	86.00	86.50	Good	623.96	0.42	0.07	0.02	197.38	85.98	53.74	Medium
HOUSTON-07	R5	Houston	0.10	82.00	83.00	82.50	Good	147.29	0.34	0.00	0.04	46.60	79.25	49.93	Medium
HOUSTON-07	R5	Houston	0.20	74.00	79.00	76.50	Good	121.13	0.28	0.00	0.12	38.21	78.88	49.30	Medium
HOUSTON-07	R5	Houston	0.30	72.00	94.00	83.00	Good	464.60	1.38	0.00	0.49	147.47	77.78	48.61	Medium
HOUSTON-07	R5	Houston	0.40	84.00	81.00	82.50	Good	494.39	1.99	0.00	0.41	157.09	75.98	47.49	Medium
HOUSTON-07	R5	Houston	0.50	87.00	86.00	86.50	Good	81.09	0.26	0.00	0.03	25.49	75.18	46.99	Medium
HOUSTON-07	R6	Houston	0.10	82.00	83.00	82.50	Good	82.74	0.00	0.03	0.01	26.52	69.58	43.49	Low
HOUSTON-07	R6	Houston	0.20	74.00	79.00	76.50	Good	104.40	0.00	0.03	0.05	33.53	66.58	41.61	Low
HOUSTON-07	R6	Houston	0.30	72.00	94.00	83.00	Good	130.56	0.00	0.03	0.12	41.97	63.48	39.68	Low
HOUSTON-07	R6	Houston	0.40	84.00	81.00	82.50	Good	216.29	0.00	0.04	0.29	67.65	59.39	37.12	Low
HOUSTON-07	R6	Houston	0.50	87.00	86.00	86.50	Good	392.06	0.99	0.07	0.04	124.02	54.29	33.93	Low
HOUSTON-08	R1	Houston	0.10	158.00	154.00	156.00	Poor	459.65	1.02	0.00	0.00	145.15	50.64	31.65	Low
HOUSTON-08	R1	Houston	0.20	133.00	194.00	163.50	Poor	683.21	1.15	0.00	0.01	216.58	49.94	31.21	Low
HOUSTON-08	R1	Houston	0.30	159.00	196.00	177.50	Very Poor	1060.93	1.50	0.01	0.00	336.95	49.35	31.11	Low
HOUSTON-08	R1	Houston	0.40	265.00	238.00	251.50	Very Poor	1287.04	1.77	0.01	0.01	407.36	50.44	31.52	Low
HOUSTON-08	R1	Houston	0.50	167.00	240.00	203.50	Very Poor	901.11	1.20	0.01	0.00	285.93	52.43	32.77	Low
HOUSTON-08	R1	Houston	0.60	81.00	137.00	109.00	Fair	603.15	0.91	0.00	0.00	190.10	54.43	34.02	Low
HOUSTON-08	R1	Houston	0.70	124.00	209.00	166.50	Poor	685.61	3.75	0.01	0.00	219.25	56.43	35.27	Low
HOUSTON-08	R1	Houston	0.80	105.00	167.00	136.00	Poor	881.50	7.13	0.01	0.00	281.56	58.43	36.52	Low
HOUSTON-08	R1	Houston	0.90	69.00	110.00	89.50	Good	807.56	4.34	0.01	0.00	257.59	60.42	37.76	Low
HOUSTON-08	R1	Houston	1.00	63.00	89.00	76.00	Good	870.23	2.75	0.01	0.00	276.76	62.42	39.01	Low
HOUSTON-08	R1	Houston	1.10	62.00	71.00	66.50	Good	769.03	2.05	0.01	0.00	243.95	64.22	40.14	Low
HOUSTON-08	R1	Houston	1.20	72.00	90.00	81.00	Good	398.03	1.04	0.00	0.00	126.32	65.22	40.76	Low
HOUSTON-08	R1	Houston	1.30	70.00	96.00	83.00	Good	499.56	4.10	0.00	0.00	159.35	66.12	41.32	Low
HOUSTON-08	R1	Houston	1.40	72.00	108.00	90.00	Good	771.42	11.53	0.01	0.00	249.04	67.21	42.01	Low
HOUSTON-08	R1	Houston	1.50	62.00	120.00	91.00	Good	570.24	5.19	0.00	0.00	183.04	67.91	42.45	Low
HOUSTON-08	R1	Houston	1.60	70.00	97.00	83.50	Good	423.24	1.95	0.00	0.00	134.95	67.50	42.24	Low
HOUSTON-08	R1	Houston	1.70	81.00	128.00	104.50	Fair	478.90	1.62	0.00	0.00	151.41	68.21	42.63	Low
HOUSTON-08	R2	Houston	0.10	158.00	154.00	156.00	Poor	1898.48	1.47	0.01	0.68	600.11	58.92	36.83	Low
HOUSTON-08	R2	Houston	0.20	133.00	194.00	163.50	Poor	1611.02	1.01	0.01	0.64	509.63	59.92	37.45	Low
HOUSTON-08	R2	Houston	0.30	159.00	196.00	177.50	Very Poor	1457.68	0.54	0.01	0.42	460.80	61.92	38.70	Low
HOUSTON-08	R2	Houston	0.40	265.00	238.00	251.50	Very Poor	1378.24	0.28	0.02	0.22	435.05	62.92	39.32	Low
HOUSTON-08	R2	Houston	0.50	167.00	240.00	203.50	Very Poor	1243.03	0.14	0.02	0.13	392.73	61.93	38.60	Low
HOUSTON-08	R2	Houston	0.60	81.00	137.00	109.00	Fair	1261.52	0.06	0.02	0.10	398.15	62.25	39.50	Low
HOUSTON-08	R2	Houston	0.70	124.00	209.00	166.50	Poor	1211.63	0.05	0.01	0.07	382.70	62.35	39.14	Low
HOUSTON-08	R2	Houston	0.80	105.00	167.00	136.00	Poor	718.10	0.03	0.00	0.04	226.56	61.39	38.70	Low
HOUSTON-08	R2	Houston	0.90	69.00	110.00	89.50	Good	377.38	0.28	0.00	0.02	118.92	61.31	38.35	Low
HOUSTON-08	R2	Houston	1.00	63.00	89.00	76.00	Good	675.57	8.95	0.00	0.03	217.60	62.19	39.32	Low
HOUSTON-08	R2	Houston	1.10	62.00	71.00	66.50	Good	745.20	13.20	0.00	0.02	241.55	64.92	40.57	Low
HOUSTON-08	R2	Houston	1.20	72.00	90.00	81.00	Good	159.45	2.54	0.00	0.01	51.20	65.92	41.20	Low
HOUSTON-08	R2	Houston	1.30	70.00	96.00	83.00	Good	164.11	2.53	0.00	0.02	53.03	65.10	41.35	Low
HOUSTON-08	R2	Houston	1.40	72.00	108.00	90.00	Good	454.15	6.65	0.00	0.06	146.79	66.91	41.82	Low
HOUSTON-08	R2	Houston	1.50	62.00	120.00	91.00	Good	793.68	5.54	0.00	0.10	253.63	67.91	42.45	Low
HOUSTON-08	R2	Houston	1.60	70.00	97.00	83.50	Good	570.00	1.35	0.00	0.09	181.03	66.12	41.41	Low

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-08	R2	Houston	1.70	81.00	128.00	104.50	Fair	449.89	0.49	0.00	0.06	142.67	59.92	37.45	Low
HOUSTON-08	R3	Houston	0.10	158.00	154.00	156.00	Poor	1104.90	0.58	0.00	0.22	349.29	62.02	38.76	Low
HOUSTON-08	R3	Houston	0.20	133.00	194.00	163.50	Poor	984.80	3.36	0.00	0.45	312.66	63.92	39.95	Low
HOUSTON-08	R3	Houston	0.30	159.00	196.00	177.50	Very Poor	741.99	1.02	0.00	0.32	234.98	65.02	40.64	Low
HOUSTON-08	R3	Houston	0.40	265.00	238.00	251.50	Very Poor	682.26	1.21	0.00	0.73	216.06	66.91	41.82	Low
HOUSTON-08	R3	Houston	0.50	167.00	240.00	203.50	Very Poor	305.82	0.66	0.00	0.17	96.86	67.91	42.45	Low
HOUSTON-08	R3	Houston	0.60	81.00	137.00	109.00	Fair	438.18	3.22	0.00	0.12	140.04	69.91	43.69	Low
HOUSTON-08	R3	Houston	0.70	124.00	209.00	166.50	Poor	565.42	1.16	0.00	0.34	179.31	70.91	44.32	Low
HOUSTON-08	R3	Houston	0.80	105.00	167.00	136.00	Poor	488.78	0.80	0.00	0.35	154.81	71.91	44.94	Low
HOUSTON-08	R3	Houston	0.90	69.00	110.00	89.50	Good	267.89	0.41	0.00	0.17	84.85	72.91	45.57	Medium
HOUSTON-08	R3	Houston	1.00	63.00	89.00	76.00	Good	86.73	0.14	0.00	0.06	27.44	72.36	45.35	Medium
HOUSTON-08	R3	Houston	1.10	62.00	71.00	66.50	Good	198.36	0.14	0.00	0.05	62.54	73.91	46.19	Medium
HOUSTON-08	R3	Houston	1.20	72.00	90.00	81.00	Good	310.97	0.15	0.00	0.05	98.14	73.21	46.31	Medium
HOUSTON-08	R3	Houston	1.30	70.00	96.00	83.00	Good	559.34	1.49	0.00	0.16	177.33	75.00	46.88	Medium
HOUSTON-08	R3	Houston	1.40	72.00	108.00	90.00	Good	842.78	0.57	0.00	0.32	266.35	76.80	48.00	Medium
HOUSTON-08	R3	Houston	1.50	62.00	120.00	91.00	Good	383.30	0.16	0.00	0.06	121.10	77.90	48.69	Medium
HOUSTON-08	R3	Houston	1.60	70.00	97.00	83.50	Good	279.94	1.07	0.00	0.28	88.91	79.90	49.94	Medium
HOUSTON-08	R3	Houston	1.70	81.00	128.00	104.50	Fair	583.01	1.07	0.00	0.15	184.69	79.36	49.34	Medium
HOUSTON-08	R4	Houston	0.10	158.00	154.00	156.00	Poor	100.83	0.25	0.00	0.02	32.37	72.91	45.57	Medium
HOUSTON-08	R4	Houston	0.20	133.00	194.00	163.50	Poor	120.73	0.24	0.00	0.07	38.74	73.01	45.63	Medium
HOUSTON-08	R4	Houston	0.30	159.00	196.00	177.50	Very Poor	136.06	0.24	0.00	0.11	42.67	73.91	46.19	Medium
HOUSTON-08	R4	Houston	0.40	265.00	238.00	251.50	Very Poor	153.63	0.25	0.00	0.11	49.27	73.91	46.19	Medium
HOUSTON-08	R4	Houston	0.50	167.00	240.00	203.50	Very Poor	169.97	0.26	0.00	0.08	53.71	74.90	46.82	Medium
HOUSTON-08	R4	Houston	0.60	81.00	137.00	109.00	Fair	229.70	0.33	0.00	0.06	71.75	75.90	47.44	Medium
HOUSTON-08	R4	Houston	0.70	124.00	209.00	166.50	Poor	395.96	0.56	0.00	0.06	126.33	76.90	48.06	Medium
HOUSTON-08	R4	Houston	0.80	105.00	167.00	136.00	Poor	986.40	1.38	0.00	0.06	312.37	78.00	48.75	Medium
HOUSTON-08	R4	Houston	0.90	69.00	110.00	89.50	Good	1638.13	2.26	0.00	0.02	518.84	78.90	49.31	Medium
HOUSTON-08	R4	Houston	1.00	63.00	89.00	76.00	Good	2578.04	10.74	0.00	0.24	819.89	80.00	50.00	Medium
HOUSTON-08	R4	Houston	1.10	62.00	71.00	66.50	Good	2202.14	4.08	0.00	0.82	696.71	80.90	50.56	Medium
HOUSTON-08	R4	Houston	1.20	72.00	90.00	81.00	Good	2105.63	2.53	0.00	0.89	667.05	81.80	51.12	Medium
HOUSTON-08	R4	Houston	1.30	70.00	96.00	83.00	Good	2064.17	2.24	0.00	0.46	653.47	80.00	50.00	Medium
HOUSTON-08	R4	Houston	1.40	72.00	108.00	90.00	Good	2006.21	2.47	0.00	0.17	634.78	78.80	49.25	Medium
HOUSTON-08	R4	Houston	1.50	62.00	120.00	91.00	Good	1728.94	1.96	0.00	0.02	546.60	76.80	48.00	Medium
HOUSTON-08	R4	Houston	1.60	70.00	97.00	83.50	Good	1525.50	1.72	0.00	0.11	482.29	74.80	46.75	Medium
HOUSTON-08	R4	Houston	1.70	81.00	128.00	104.50	Fair	1433.06	1.67	0.00	0.14	454.00	72.81	45.50	Medium
HOUSTON-08	R5	Houston	0.10	158.00	154.00	156.00	Poor	2686.09	6.70	0.00	0.05	852.66	70.01	43.76	Low
HOUSTON-08	R5	Houston	0.20	133.00	194.00	163.50	Poor	2332.15	5.05	0.00	0.14	740.03	71.01	44.38	Low
HOUSTON-08	R5	Houston	0.30	159.00	196.00	177.50	Very Poor	2098.68	4.05	0.00	0.03	664.11	72.01	45.01	Medium
HOUSTON-08	R5	Houston	0.40	265.00	238.00	251.50	Very Poor	1974.99	3.35	0.00	0.02	626.02	73.01	45.63	Medium
HOUSTON-08	R5	Houston	0.50	167.00	240.00	203.50	Very Poor	1730.33	2.46	0.00	0.00	547.33	74.01	46.25	Medium
HOUSTON-08	R5	Houston	0.60	81.00	137.00	109.00	Fair	1386.70	1.85	0.00	0.15	439.32	75.00	46.88	Medium
HOUSTON-08	R5	Houston	0.70	124.00	209.00	166.50	Poor	1236.55	1.80	0.00	0.12	391.27	76.00	47.50	Medium
HOUSTON-08	R5	Houston	0.80	105.00	167.00	136.00	Poor	81.43	0.29	0.00	0.01	25.77	77.00	48.13	Medium
HOUSTON-08	R5	Houston	0.90	69.00	110.00	89.50	Good	94.30	0.25	0.00	0.04	29.19	78.00	48.75	Medium
HOUSTON-08	R5	Houston	1.00	63.00	89.00	76.00	Good	126.58	0.29	0.00	0.08	39.64	79.00	49.37	Medium
HOUSTON-08	R5	Houston	1.10	62.00	71.00	66.50	Good	179.06	0.37	0.00	0.10	55.84	79.80	49.87	Medium
HOUSTON-08	R5	Houston	1.20	72.00	90.00	81.00	Good	297.36	0.60	0.00	0.13	93.18	78.80	49.25	Medium
HOUSTON-08	R5	Houston	1.30	70.00	96.00	83.00	Good	521.51	1.02	0.00	0.20	165.52	77.80	48.63	Medium
HOUSTON-08	R5	Houston	1.40	72.00	108.00	90.00	Good	1150.87	2.14	0.00	0.33	363.13	75.90	47.44	Medium
HOUSTON-08	R5	Houston	1.50	62.00	120.00	91.00	Good	1067.23	1.94	0.00	0.24	337.87	75.36	47.45	Medium
HOUSTON-08	R5	Houston	1.60	70.00	97.00	83.50	Good	1025.40	1.82	0.00	0.32	324.72	75.36	47.41	Medium
HOUSTON-08	R5	Houston	1.70	81.00	128.00	104.50	Fair	940.33	1.63	0.00	0.10	297.87	76.00	47.50	Medium
HOUSTON-08	R6	Houston	0.10	158.00	154.00	156.00	Poor	504.15	3.46	0.15	0.22	161.21	50.24	31.40	Low
HOUSTON-08	R6	Houston	0.20	133.00	194.00	163.50	Poor	542.51	1.07	0.15	0.45	171.68	53.23	33.27	Low
HOUSTON-08	R6	Houston	0.30	159.00	196.00	177.50	Very Poor	596.93	1.24	0.17	0.32	189.46	56.13	35.08	Low
HOUSTON-08	R6	Houston	0.40	265.00	238.00	251.50	Very Poor	639.47	1.11	0.18	0.14	202.85	58.13	36.33	Low
HOUSTON-08	R6	Houston	0.50	167.00	240.00	203.50	Very Poor	742.20	1.15	0.20	0.04	235.07	60.12	37.58	Low
HOUSTON-08	R6	Houston	0.60	81.00	137.00	109.00	Fair	480.75	0.54	0.13	0.14	152.19	62.02	38.76	Low
HOUSTON-08	R6	Houston	0.70	124.00	209.00	166.50	Poor	344.95	0.38	0.09	0.08	109.44	63.02	39.39	Low
HOUSTON-08	R6	Houston	0.80	105.00	167.00	136.00	Poor	167.08	0.18	0.04	0.02	52.56	64.12	40.07	Low
HOUSTON-08	R6	Houston	0.90	69.00	110.00	89.50	Good	172.86	0.17	0.05	0.00	54.79	65.92	41.20	Low
HOUSTON-08	R6	Houston	1.00	63.00	89.00	76.00	Good	797.31	0.48	0.21	0.10	252.45	66.02	41.26	Low
HOUSTON-08	R6	Houston	1.10	62.00	71.00	66.50	Good	801.55	0.44	0.21	0.26	253.38	67.01	41.88	Low
HOUSTON-08	R6	Houston	1.20	72.00	90.00	81.00	Good	793.88	0.40	0.21	0.16	250.80	68.01	42.51	Low
HOUSTON-08	R6	Houston	1.30	70.00	96.00	83.00	Good	763.39	0.35	0.20	0.04	241.45	69.11	43.19	Low
HOUSTON-08	R6	Houston	1.40	72.00	108.00	90.00	Good	77.12	0.02	0.03	0.02	24.79	71.01	44.38	Low
HOUSTON-08	R6	Houston	1.50	62.00	120.00	91.00	Good	98.70	0.02	0.03	0.04	30.77	68.61	42.88	Low
HOUSTON-08	R6	Houston	1.60	70.00	97.00	83.50	Good	108.82	0.01	0.03	0.08	34.71	65.62	41.01	Low
HOUSTON-08	R6	Houston	1.70	81.00	128.00	104.50	Fair	136.05	0.00	0.04	0.16	42.92	62.52	39.08	Low
HOUSTON-09	R1	Houston	0.10	75.00	79.00	77.00	Good	1282.26	1.81	0.00	0.29	405.83	44.46	27.63	Low
HOUSTON-09	R1	Houston	0.20	88.00	75.00	81.50	Good	804.21	0.61	0.00	0.14	254.36	61.89	38.46	Low
HOUSTON-09	R1	Houston	0.30	61.00	72.00	66.50	Good	734.94	0.37	0.00	0.10	232.37	71.89	44.67	Low
HOUSTON-09	R1	Houston	0.40	97.00	99.00	98.00	Fair	722.99	0.18	0.00	0.15	228.34	79.00	49.09	Medium
HOUSTON-09	R1	Houston	0.50	273.00	243.00	258.00	Very Poor	696.48	0.08	0.00	0.15	220.01	84.28	52.37	Medium
HOUSTON-09	R1	Houston	0.60	163.00	153.00	158.00	Poor	341.82	0.06	0.00	0.11	107.92	87.30	54.25	Medium
HOUSTON-09	R1	Houston	0.70	136.00	93.00	114.50	Fair	564.69	0.16	0.00	0.15	178.47	84.60	52.57	Medium
HOUSTON-09	R1	Houston	0.80	100.00	110.00	105.00	Fair	742.26	0.12	0.00	0.23	234.49	87.83	54.57	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-09	R1	Houston	0.90	96.00	100.00	98.00	Fair	553.95	0.05	0.00	0.25	175.07	93.06	57.83	Medium
HOUSTON-09	R1	Houston	1.00	93.00	74.00	83.50	Good	84.35	0.02	0.00	0.03	26.62	90.17	56.03	Medium
HOUSTON-09	R1	Houston	1.10	76.00	78.00	77.00	Good	130.63	0.05	0.00	0.06	41.36	78.23	48.61	Medium
HOUSTON-09	R1	Houston	1.20	76.00	61.00	68.50	Good	503.44	0.06	0.00	0.11	159.02	77.18	47.96	Medium
HOUSTON-09	R1	Houston	1.30	71.00	62.00	66.50	Good	775.04	0.13	0.00	0.19	244.83	82.57	51.30	Medium
HOUSTON-09	R1	Houston	1.40	67.00	66.00	66.50	Good	339.87	2.43	0.00	0.15	108.70	88.51	55.00	Medium
HOUSTON-09	R1	Houston	1.50	60.00	65.00	62.50	Good	43.65	0.42	0.00	0.02	13.84	78.87	49.01	Medium
HOUSTON-09	R1	Houston	1.60	67.00	54.00	60.50	Good	251.45	0.06	0.00	0.51	79.54	66.35	41.23	Low
HOUSTON-09	R1	Houston	1.70	71.00	57.00	64.00	Good	637.86	0.17	0.00	0.55	201.69	70.01	43.50	Low
HOUSTON-09	R1	Houston	1.80	81.00	128.00	104.50	Fair	454.48	0.15	0.00	0.37	143.50	75.72	47.05	Medium
HOUSTON-09	R1	Houston	1.90	81.00	68.00	74.50	Good	96.24	0.03	0.00	0.13	30.37	59.54	37.00	Low
HOUSTON-09	R1	Houston	2.00	66.00	56.00	61.00	Good	1553.45	0.54	0.00	0.50	491.11	34.34	21.34	Low
HOUSTON-09	R1	Houston	2.10	70.00	67.00	68.50	Good	850.42	6.25	0.00	0.15	271.74	61.26	38.07	Low
HOUSTON-09	R1	Houston	2.20	91.00	93.00	92.00	Good	997.88	0.29	0.00	0.35	315.33	72.77	45.22	Medium
HOUSTON-09	R1	Houston	2.30	84.00	70.00	77.00	Good	326.97	0.14	0.00	0.11	103.30	82.36	51.18	Medium
HOUSTON-09	R1	Houston	2.40	77.00	112.00	94.50	Good	103.75	0.08	0.00	0.03	32.81	75.30	46.79	Medium
HOUSTON-09	R1	Houston	2.50	73.00	81.00	77.00	Good	234.44	0.06	0.00	0.21	74.22	55.55	34.52	Low
HOUSTON-09	R1	Houston	2.60	153.00	227.00	190.00	Very Poor	1526.78	0.51	0.01	0.96	482.50	47.22	29.34	Low
HOUSTON-09	R1	Houston	2.70	87.00	131.00	109.00	Fair	723.47	0.62	0.01	0.31	229.03	64.30	39.95	Low
HOUSTON-09	R1	Houston	2.80	90.00	126.00	108.00	Fair	562.03	0.48	0.01	0.48	177.75	71.75	44.58	Low
HOUSTON-09	R1	Houston	2.90	100.00	123.00	111.50	Fair	521.55	0.29	0.00	0.48	164.87	75.00	46.60	Medium
HOUSTON-09	R1	Houston	3.00	97.00	129.00	113.00	Fair	116.69	0.05	0.00	0.34	36.87	67.26	41.79	Low
HOUSTON-09	R1	Houston	3.10	113.00	132.00	122.50	Fair	1937.61	3.87	0.03	1.36	613.42	37.09	23.05	Low
HOUSTON-09	R1	Houston	3.20	106.00	82.00	94.00	Good	788.47	1.60	0.01	0.80	249.92	65.95	40.98	Low
HOUSTON-09	R1	Houston	3.30	112.00	69.00	90.50	Good	1661.90	3.73	0.00	2.76	526.51	42.48	26.39	Low
HOUSTON-09	R1	Houston	3.40	147.00	68.00	107.50	Fair	1862.97	4.79	0.02	3.01	590.73	50.32	31.27	Low
HOUSTON-09	R1	Houston	3.50	209.00	275.00	242.00	Very Poor	1191.70	2.78	0.02	1.43	377.77	76.40	47.47	Medium
HOUSTON-09	R1	Houston	3.60	89.00	228.00	158.50	Poor	1091.61	2.18	0.02	0.99	345.95	88.49	54.99	Medium
HOUSTON-09	R1	Houston	3.70	81.00	106.00	93.50	Good	913.29	1.72	0.02	0.88	289.29	98.92	61.46	High
HOUSTON-09	R1	Houston	3.80	58.00	148.00	103.00	Fair	309.85	0.52	0.01	0.26	98.10	101.67	63.18	High
HOUSTON-09	R1	Houston	3.90	94.00	193.00	143.50	Poor	478.46	0.55	0.01	0.12	151.44	98.07	60.94	High
HOUSTON-09	R1	Houston	4.00	77.00	126.00	101.50	Fair	64.17	0.08	0.00	0.03	20.45	93.29	57.96	Medium
HOUSTON-09	R1	Houston	4.10	84.00	153.00	118.50	Fair	38.69	0.04	0.00	0.07	12.29	72.14	44.82	Low
HOUSTON-09	R1	Houston	4.20	65.00	75.00	70.00	Good	284.92	0.10	0.00	0.54	90.19	61.06	37.94	Low
HOUSTON-09	R1	Houston	4.30	66.00	82.00	74.00	Good	588.21	2.80	0.00	0.13	187.16	60.35	37.50	Low
HOUSTON-09	R1	Houston	4.40	55.00	89.00	72.00	Good	771.16	0.93	0.01	0.11	244.07	69.90	43.43	Low
HOUSTON-09	R1	Houston	4.50	59.00	82.00	70.50	Good	219.84	0.24	0.00	0.07	69.51	74.72	46.43	Medium
HOUSTON-09	R1	Houston	4.60	61.00	117.00	89.00	Good	337.48	0.27	0.00	0.09	106.69	67.28	41.80	Low
HOUSTON-09	R1	Houston	4.70	81.00	106.00	93.50	Good	240.84	0.09	0.00	0.00	76.09	69.46	43.16	Low
HOUSTON-09	R1	Houston	4.80	139.00	148.00	143.50	Poor	197.12	0.11	0.00	0.00	62.36	64.48	40.07	Low
HOUSTON-09	R1	Houston	4.90	51.00	66.00	58.50	Very Good	687.19	0.36	0.00	0.39	217.32	56.98	35.41	Low
HOUSTON-09	R1	Houston	5.00	62.00	76.00	69.00	Good	328.62	0.19	0.00	0.12	103.82	64.41	40.02	Low
HOUSTON-09	R1	Houston	5.10	52.00	77.00	64.50	Good	1017.11	0.62	0.00	0.40	321.69	73.47	45.65	Medium
HOUSTON-09	R1	Houston	5.20	60.00	75.00	67.50	Good	464.70	1.74	0.00	0.35	147.60	80.68	50.13	Medium
HOUSTON-09	R1	Houston	5.30	63.00	84.00	73.50	Good	52.74	0.56	0.00	0.06	16.95	72.21	44.87	Low
HOUSTON-09	R1	Houston	5.40	59.00	90.00	74.50	Good	287.23	0.12	0.00	0.30	90.96	44.13	27.42	Low
HOUSTON-09	R2	Houston	0.10	75.00	79.00	77.00	Good	732.50	1.30	0.01	0.33	232.02	73.93	45.94	Medium
HOUSTON-09	R2	Houston	0.20	88.00	75.00	81.50	Good	496.92	1.27	0.00	0.18	157.53	79.21	49.22	Medium
HOUSTON-09	R2	Houston	0.30	61.00	72.00	66.50	Good	390.15	0.22	0.00	0.10	123.37	79.44	49.36	Medium
HOUSTON-09	R2	Houston	0.40	97.00	99.00	98.00	Fair	344.78	0.14	0.00	0.08	109.01	79.93	49.66	Medium
HOUSTON-09	R2	Houston	0.50	273.00	243.00	258.00	Very Poor	175.43	0.27	0.00	0.04	55.45	76.22	47.36	Medium
HOUSTON-09	R2	Houston	0.60	163.00	153.00	158.00	Poor	275.50	0.33	0.00	0.24	87.31	71.49	44.42	Low
HOUSTON-09	R2	Houston	0.70	136.00	93.00	114.50	Fair	276.39	0.66	0.00	0.11	87.60	73.22	45.50	Medium
HOUSTON-09	R2	Houston	0.80	100.00	110.00	105.00	Fair	392.88	1.57	0.00	0.22	124.97	69.35	43.09	Low
HOUSTON-09	R2	Houston	0.90	96.00	100.00	98.00	Fair	698.07	0.61	0.00	0.41	220.81	74.91	46.54	Medium
HOUSTON-09	R2	Houston	1.00	93.00	74.00	83.50	Good	101.70	0.10	0.00	0.04	32.14	74.70	46.42	Medium
HOUSTON-09	R2	Houston	1.10	76.00	78.00	77.00	Good	397.56	0.15	0.00	0.55	125.77	67.22	41.77	Low
HOUSTON-09	R2	Houston	1.20	76.00	61.00	68.50	Good	340.15	0.21	0.00	0.17	107.59	68.75	42.72	Low
HOUSTON-09	R2	Houston	1.30	71.00	62.00	66.50	Good	555.77	1.06	0.00	0.21	176.21	70.31	43.69	Low
HOUSTON-09	R2	Houston	1.40	67.00	66.00	66.50	Good	422.39	1.08	0.00	0.10	133.92	73.52	45.68	Medium
HOUSTON-09	R2	Houston	1.50	60.00	65.00	62.50	Good	324.67	0.61	0.00	0.07	102.89	74.26	46.14	Medium
HOUSTON-09	R2	Houston	1.60	67.00	54.00	60.50	Good	226.63	0.65	0.00	0.01	71.89	69.25	43.03	Low
HOUSTON-09	R2	Houston	1.70	71.00	57.00	64.00	Good	125.62	0.23	0.00	0.01	39.85	61.72	38.35	Low
HOUSTON-09	R2	Houston	1.80	81.00	128.00	104.50	Fair	1850.15	0.36	0.00	0.59	585.25	37.03	23.01	Low
HOUSTON-09	R2	Houston	1.90	81.00	68.00	74.50	Good	740.17	0.54	0.00	0.30	234.10	45.24	28.11	Low
HOUSTON-09	R2	Houston	2.00	66.00	56.00	61.00	Good	875.12	1.45	0.00	0.14	277.15	54.73	34.01	Low
HOUSTON-09	R2	Houston	2.10	70.00	67.00	68.50	Good	471.18	0.85	0.00	0.06	149.24	64.15	39.86	Low
HOUSTON-09	R2	Houston	2.20	91.00	93.00	92.00	Good	321.44	0.56	0.00	0.01	101.76	63.57	39.50	Low
HOUSTON-09	R2	Houston	2.30	84.00	70.00	77.00	Good	432.36	2.72	0.00	0.02	138.01	61.57	38.26	Low
HOUSTON-09	R2	Houston	2.40	77.00	112.00	94.50	Good	598.04	2.78	0.00	0.12	190.33	64.62	40.15	Low
HOUSTON-09	R2	Houston	2.50	73.00	81.00	77.00	Good	455.60	1.28	0.00	0.06	144.55	66.19	41.13	Low
HOUSTON-09	R2	Houston	2.60	153.00	227.00	190.00	Very Poor	646.83	1.48	0.00	0.16	205.14	69.72	43.32	Low
HOUSTON-09	R2	Houston	2.70	87.00	131.00	109.00	Fair	354.84	0.61	0.00	0.29	112.33	73.59	45.72	Medium
HOUSTON-09	R2	Houston	2.80	90.00	126.00	108.00	Fair	66.88	0.11	0.00	0.10	21.05	65.54	40.72	Low
HOUSTON-09	R2	Houston	2.90	100.00	123.00	111.50	Fair	541.30	0.14	0.00	0.53	171.15	62.78	39.01	Low
HOUSTON-09	R2	Houston	3.00	97.00	129.00	113.00	Fair	364.75	0.05	0.00	0.21	115.37	67.25	41.79	Low
HOUSTON-09	R2	Houston	3.10	113.00	132.00	122.50	Fair	398.87	0.30	0.00	0.06	125.99	65.39	40.63	Low

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-09	R2	Houston	3.20	106.00	82.00	94.00	Good	1730.63	1.59	0.00	0.57	547.25	37.89	23.54	Low
HOUSTON-09	R2	Houston	3.30	112.00	69.00	90.50	Good	1270.65	1.32	0.00	0.74	402.01	68.93	42.83	Low
HOUSTON-09	R2	Houston	3.40	147.00	68.00	107.50	Fair	836.12	1.19	0.00	1.06	264.76	83.30	51.76	Medium
HOUSTON-09	R2	Houston	3.50	209.00	275.00	242.00	Very Poor	255.92	0.85	0.00	0.53	81.13	86.34	53.65	Medium
HOUSTON-09	R2	Houston	3.60	89.00	228.00	158.50	Poor	204.35	0.09	0.00	0.09	64.54	82.34	51.16	Medium
HOUSTON-09	R2	Houston	3.70	81.00	106.00	93.50	Good	297.31	0.10	0.00	0.11	93.93	79.55	49.43	Medium
HOUSTON-09	R2	Houston	3.80	58.00	148.00	103.00	Fair	604.38	0.80	0.00	0.26	191.26	78.30	48.65	Medium
HOUSTON-09	R2	Houston	3.90	94.00	193.00	143.50	Poor	141.96	0.21	0.00	0.03	44.83	75.67	47.02	Medium
HOUSTON-09	R2	Houston	4.00	77.00	126.00	101.50	Fair	220.37	0.22	0.00	0.33	69.71	55.49	34.48	Low
HOUSTON-09	R2	Houston	4.10	84.00	153.00	118.50	Fair	1029.81	1.14	0.00	0.61	325.94	58.14	36.13	Low
HOUSTON-09	R2	Houston	4.20	65.00	75.00	70.00	Good	647.30	0.69	0.00	0.38	204.77	72.93	45.31	Medium
HOUSTON-09	R2	Houston	4.30	66.00	82.00	74.00	Good	582.91	0.75	0.00	0.55	184.46	75.58	46.96	Medium
HOUSTON-09	R2	Houston	4.40	55.00	89.00	72.00	Good	552.54	0.87	0.00	0.32	175.12	79.92	49.66	Medium
HOUSTON-09	R2	Houston	4.50	59.00	82.00	70.50	Good	666.21	1.33	0.00	0.55	211.04	84.72	52.64	Medium
HOUSTON-09	R2	Houston	4.60	61.00	117.00	89.00	Good	373.19	0.71	0.00	0.20	118.13	87.44	54.33	Medium
HOUSTON-09	R2	Houston	4.70	81.00	106.00	93.50	Good	264.74	0.29	0.00	0.02	83.67	84.11	52.26	Medium
HOUSTON-09	R2	Houston	4.80	139.00	148.00	143.50	Poor	226.15	0.21	0.00	0.32	71.53	80.18	49.82	Medium
HOUSTON-09	R2	Houston	4.90	51.00	66.00	58.50	Very Good	464.25	0.53	0.00	0.10	146.72	76.98	47.83	Medium
HOUSTON-09	R2	Houston	5.00	62.00	76.00	69.00	Good	518.68	0.62	0.00	0.15	164.17	79.33	49.30	Medium
HOUSTON-09	R2	Houston	5.10	52.00	77.00	64.50	Good	61.25	0.18	0.00	0.03	19.32	73.32	45.56	Medium
HOUSTON-09	R2	Houston	5.20	60.00	75.00	67.50	Good	137.95	0.09	0.00	0.05	43.59	59.13	36.74	Low
HOUSTON-09	R2	Houston	5.30	63.00	84.00	73.50	Good	354.14	0.15	0.00	0.14	112.38	34.45	21.41	Low
HOUSTON-09	R3	Houston	0.10	75.00	79.00	77.00	Good	1104.90	0.58	0.00	0.22	349.29	41.47	25.77	Low
HOUSTON-09	R3	Houston	0.20	88.00	75.00	81.50	Good	984.80	3.36	0.00	0.45	312.66	42.46	26.38	Low
HOUSTON-09	R3	Houston	0.30	61.00	72.00	66.50	Good	741.99	1.02	0.00	0.32	234.98	62.00	38.52	Low
HOUSTON-09	R3	Houston	0.40	97.00	99.00	98.00	Fair	682.26	1.21	0.00	0.73	216.06	69.24	43.03	Low
HOUSTON-09	R3	Houston	0.50	273.00	243.00	258.00	Very Poor	305.82	0.66	0.00	0.17	96.86	70.19	43.61	Low
HOUSTON-09	R3	Houston	0.60	163.00	153.00	158.00	Poor	438.18	3.22	0.00	0.12	140.04	70.48	43.79	Low
HOUSTON-09	R3	Houston	0.70	136.00	93.00	114.50	Fair	565.42	1.16	0.00	0.34	179.31	73.90	45.92	Medium
HOUSTON-09	R3	Houston	0.80	100.00	110.00	105.00	Fair	488.78	0.80	0.00	0.35	154.81	74.98	46.59	Medium
HOUSTON-09	R3	Houston	0.90	96.00	100.00	98.00	Fair	267.89	0.41	0.00	0.17	84.85	76.91	47.79	Medium
HOUSTON-09	R3	Houston	1.00	93.00	74.00	83.50	Good	86.73	0.14	0.00	0.06	27.44	68.27	42.42	Low
HOUSTON-09	R3	Houston	1.10	76.00	78.00	77.00	Good	198.36	0.14	0.00	0.05	62.54	62.73	38.98	Low
HOUSTON-09	R3	Houston	1.20	76.00	61.00	68.50	Good	310.97	0.15	0.00	0.05	98.14	57.65	35.82	Low
HOUSTON-09	R3	Houston	1.30	71.00	62.00	66.50	Good	559.34	1.49	0.00	0.16	177.33	55.75	34.64	Low
HOUSTON-09	R3	Houston	1.40	67.00	66.00	66.50	Good	842.78	0.57	0.00	0.32	266.35	67.46	41.92	Low
HOUSTON-09	R3	Houston	1.50	60.00	65.00	62.50	Good	383.30	0.16	0.00	0.06	121.10	73.60	45.73	Medium
HOUSTON-09	R3	Houston	1.60	67.00	54.00	60.50	Good	279.94	1.07	0.00	0.28	88.91	55.66	34.58	Low
HOUSTON-09	R3	Houston	1.70	71.00	57.00	64.00	Good	583.01	1.07	0.00	0.15	184.69	56.05	34.83	Low
HOUSTON-09	R3	Houston	1.80	81.00	128.00	104.50	Fair	439.35	1.25	0.00	0.13	139.36	55.09	34.23	Low
HOUSTON-09	R3	Houston	1.90	81.00	68.00	74.50	Good	265.60	0.09	0.00	0.53	84.00	51.76	32.16	Low
HOUSTON-09	R3	Houston	2.00	66.00	56.00	61.00	Good	2133.19	1.12	0.00	1.57	673.94	38.54	23.95	Low
HOUSTON-09	R3	Houston	2.10	70.00	67.00	68.50	Good	1056.96	0.27	0.00	1.04	333.95	68.94	42.84	Low
HOUSTON-09	R3	Houston	2.20	91.00	93.00	92.00	Good	731.73	0.73	0.00	0.92	231.56	79.31	49.28	Medium
HOUSTON-09	R3	Houston	2.30	84.00	70.00	77.00	Good	253.38	0.60	0.00	0.22	80.22	81.25	50.48	Medium
HOUSTON-09	R3	Houston	2.40	77.00	112.00	94.50	Good	226.35	0.20	0.00	0.12	71.55	79.77	49.57	Medium
HOUSTON-09	R3	Houston	2.50	73.00	81.00	77.00	Good	159.32	0.17	0.00	0.07	50.31	71.16	44.22	Low
HOUSTON-09	R3	Houston	2.60	153.00	227.00	190.00	Very Poor	574.44	0.10	0.06	0.26	181.66	62.96	39.12	Low
HOUSTON-09	R3	Houston	2.70	87.00	131.00	109.00	Fair	1029.01	0.51	0.07	1.05	325.36	73.75	45.83	Medium
HOUSTON-09	R3	Houston	2.80	90.00	126.00	108.00	Fair	846.11	1.36	0.01	1.10	268.00	84.75	52.66	Medium
HOUSTON-09	R3	Houston	2.90	100.00	123.00	111.50	Fair	336.69	4.70	0.00	0.56	108.60	91.37	56.78	Medium
HOUSTON-09	R3	Houston	3.00	97.00	129.00	113.00	Fair	33.87	0.54	0.00	0.05	10.88	77.04	47.87	Medium
HOUSTON-09	R3	Houston	3.10	113.00	132.00	122.50	Fair	1682.78	2.31	0.00	2.12	532.46	38.15	23.70	Low
HOUSTON-09	R3	Houston	3.20	106.00	82.00	94.00	Good	1000.13	1.83	0.00	1.08	316.79	65.34	40.60	Low
HOUSTON-09	R3	Houston	3.30	112.00	69.00	90.50	Good	376.20	1.43	0.00	0.36	119.47	70.61	43.88	Low
HOUSTON-09	R3	Houston	3.40	147.00	68.00	107.50	Fair	693.62	1.69	0.00	0.42	219.91	73.58	45.72	Medium
HOUSTON-09	R3	Houston	3.50	209.00	275.00	242.00	Very Poor	730.45	3.42	0.00	0.33	232.49	80.95	50.30	Medium
HOUSTON-09	R3	Houston	3.60	89.00	228.00	158.50	Poor	856.48	3.96	0.00	1.22	272.42	88.05	54.71	Medium
HOUSTON-09	R3	Houston	3.70	81.00	106.00	93.50	Good	880.49	3.69	0.01	1.37	280.04	97.31	60.47	High
HOUSTON-09	R3	Houston	3.80	58.00	148.00	103.00	Fair	122.85	1.53	0.00	0.17	39.43	100.95	62.72	High
HOUSTON-09	R3	Houston	3.90	94.00	193.00	143.50	Poor	6.14	0.18	0.00	0.03	2.02	88.57	55.04	Medium
HOUSTON-09	R3	Houston	4.00	77.00	126.00	101.50	Fair	8.27	0.14	0.00	0.02	2.66	74.46	46.27	Medium
HOUSTON-09	R3	Houston	4.10	84.00	153.00	118.50	Fair	251.12	0.28	0.00	0.26	79.47	51.71	32.13	Low
HOUSTON-09	R3	Houston	4.20	65.00	75.00	70.00	Good	1282.60	1.74	0.00	0.63	406.09	51.47	31.98	Low
HOUSTON-09	R3	Houston	4.30	66.00	82.00	74.00	Good	595.86	1.06	0.00	0.13	188.83	68.22	42.39	Low
HOUSTON-09	R3	Houston	4.40	55.00	89.00	72.00	Good	478.54	2.91	0.00	0.27	152.58	70.62	43.88	Low
HOUSTON-09	R3	Houston	4.50	59.00	82.00	70.50	Good	301.17	1.66	0.00	0.25	95.90	71.24	44.27	Low
HOUSTON-09	R3	Houston	4.60	61.00	117.00	89.00	Good	613.87	4.43	0.00	0.87	196.19	73.75	45.82	Medium
HOUSTON-09	R3	Houston	4.70	81.00	106.00	93.50	Good	453.67	1.22	0.00	0.32	143.93	74.15	46.08	Medium
HOUSTON-09	R3	Houston	4.80	139.00	148.00	143.50	Poor	648.79	2.08	0.00	0.16	205.95	79.89	49.64	Medium
HOUSTON-09	R3	Houston	4.90	51.00	66.00	58.50	Very Good	114.01	0.59	0.00	0.04	36.40	79.90	49.65	Medium
HOUSTON-09	R3	Houston	5.00	62.00	76.00	69.00	Good	521.57	1.27	0.00	0.13	165.37	74.42	46.24	Medium
HOUSTON-09	R3	Houston	5.10	52.00	77.00	64.50	Good	465.07	0.97	0.00	0.13	147.20	79.84	49.61	Medium
HOUSTON-09	R3	Houston	5.20	60.00	75.00	67.50	Good	49.58	0.21	0.00	0.07	15.82	73.74	45.82	Medium
HOUSTON-09	R3	Houston	5.30	63.00	84.00	73.50	Good	117.20	0.19	0.00	0.15	37.01	59.75	37.12	Low
HOUSTON-09	R3	Houston	5.40	59.00	90.00	74.50	Good	286.80	0.42	0.00	0.02	90.89	43.27	26.89	Low
HOUSTON-10	R1	Houston	0.10	84.00	87.00	85.50	Good	623.00	20.98	0.06	1.42	207.37	83.32	51.77	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-10	R1	Houston	0.20	104.00	96.00	100.00	Fair	857.11	0.35	0.06	2.58	270.87	86.95	54.03	Medium
HOUSTON-10	R1	Houston	0.30	149.00	138.00	143.50	Poor	884.62	0.21	0.03	1.05	279.54	94.06	58.44	Medium
HOUSTON-10	R1	Houston	0.40	113.00	100.00	106.50	Fair	832.18	0.34	0.02	0.78	262.94	101.09	62.81	High
HOUSTON-10	R1	Houston	0.50	72.00	85.00	78.50	Good	422.66	7.86	0.00	0.27	137.44	102.86	63.92	High
HOUSTON-10	R1	Houston	0.60	170.00	200.00	185.00	Very Poor	747.16	0.12	0.00	0.20	235.98	102.32	63.58	High
HOUSTON-10	R1	Houston	0.70	158.00	122.00	140.00	Poor	807.73	1.18	0.00	0.36	255.69	104.37	64.85	High
HOUSTON-10	R1	Houston	0.80	221.00	187.00	204.00	Very Poor	771.72	1.78	0.00	1.03	244.62	104.64	65.02	High
HOUSTON-10	R1	Houston	0.90	156.00	113.00	134.50	Poor	642.86	2.94	0.00	0.70	204.61	105.81	65.74	High
HOUSTON-10	R1	Houston	1.00	148.00	117.00	132.50	Poor	591.75	1.97	0.00	0.35	187.78	108.45	67.39	High
HOUSTON-10	R1	Houston	1.10	136.00	100.00	118.00	Fair	462.00	0.84	0.00	0.31	146.42	110.05	68.38	High
HOUSTON-10	R1	Houston	1.20	122.00	100.00	111.00	Fair	564.49	0.52	0.00	0.01	178.64	109.76	68.20	High
HOUSTON-10	R1	Houston	1.30	156.00	125.00	140.50	Poor	616.68	0.58	0.00	0.23	195.05	109.00	67.73	High
HOUSTON-10	R1	Houston	1.40	203.00	201.00	202.00	Very Poor	600.74	1.85	0.00	0.27	190.66	109.51	68.05	High
HOUSTON-10	R1	Houston	1.50	100.00	82.00	91.00	Good	617.80	0.92	0.00	0.28	195.58	108.65	67.51	High
HOUSTON-10	R1	Houston	1.60	122.00	109.00	115.50	Fair	633.59	0.44	0.00	0.23	200.34	108.00	67.11	High
HOUSTON-10	R1	Houston	1.70	121.00	123.00	122.00	Fair	634.93	0.59	0.00	0.10	200.80	108.00	67.11	High
HOUSTON-10	R1	Houston	1.80	170.00	182.00	176.00	Very Poor	779.67	0.78	0.00	0.68	246.74	108.25	67.26	High
HOUSTON-10	R1	Houston	1.90	154.00	158.00	156.00	Poor	768.21	0.92	0.00	0.71	243.01	110.36	68.58	High
HOUSTON-10	R1	Houston	2.00	176.00	198.00	187.00	Very Poor	673.50	1.30	0.00	0.35	213.30	112.23	69.74	High
HOUSTON-10	R1	Houston	2.20	180.00	164.00	172.00	Very Poor	441.39	1.08	0.00	0.11	139.88	106.91	66.43	High
HOUSTON-10	R1	Houston	2.30	167.00	152.00	159.50	Poor	519.77	1.26	0.00	0.17	164.76	105.46	65.53	High
HOUSTON-10	R1	Houston	2.40	145.00	131.00	138.00	Poor	649.20	3.94	0.00	0.39	206.95	105.00	65.24	High
HOUSTON-10	R1	Houston	2.50	119.00	114.00	116.50	Fair	586.05	1.11	0.00	0.41	185.62	105.00	65.24	High
HOUSTON-10	R1	Houston	2.60	141.00	114.00	127.50	Fair	338.48	0.57	0.00	0.13	107.14	104.19	64.74	High
HOUSTON-10	R1	Houston	2.70	159.00	138.00	148.50	Poor	349.25	0.20	0.00	0.08	110.40	97.43	60.54	High
HOUSTON-10	R1	Houston	2.80	168.00	138.00	153.00	Poor	620.93	0.22	0.00	0.14	196.20	97.15	60.37	High
HOUSTON-10	R1	Houston	2.90	155.00	128.00	141.50	Poor	640.17	0.15	0.00	0.00	202.28	98.95	61.48	High
HOUSTON-10	R1	Houston	3.00	126.00	105.00	115.50	Fair	574.59	0.17	0.00	0.02	181.61	99.10	61.58	High
HOUSTON-10	R2	Houston	0.10	84.00	87.00	85.50	Good	586.38	2.98	0.00	0.56	186.70	124.81	77.55	High
HOUSTON-10	R2	Houston	0.20	104.00	96.00	100.00	Fair	409.16	4.21	0.00	0.34	131.32	122.56	76.15	High
HOUSTON-10	R2	Houston	0.30	149.00	138.00	143.50	Poor	612.57	0.58	0.01	0.12	193.79	120.00	74.56	High
HOUSTON-10	R2	Houston	0.40	113.00	100.00	106.50	Fair	625.68	0.87	0.01	0.17	198.02	119.34	74.16	High
HOUSTON-10	R2	Houston	0.50	72.00	85.00	78.50	Good	695.59	0.99	0.01	0.32	220.08	119.00	73.94	High
HOUSTON-10	R2	Houston	0.60	170.00	200.00	185.00	Very Poor	705.77	0.90	0.01	0.25	223.32	119.00	73.94	High
HOUSTON-10	R2	Houston	0.70	158.00	122.00	140.00	Poor	676.32	0.87	0.01	0.59	214.10	119.00	73.94	High
HOUSTON-10	R2	Houston	0.80	221.00	187.00	204.00	Very Poor	648.30	0.85	0.01	0.32	205.26	119.00	73.94	High
HOUSTON-10	R2	Houston	0.90	156.00	113.00	134.50	Poor	550.77	0.83	0.01	0.17	174.34	117.95	73.29	High
HOUSTON-10	R2	Houston	1.00	148.00	117.00	132.50	Poor	314.54	0.56	0.00	0.12	99.60	114.94	71.42	High
HOUSTON-10	R2	Houston	1.10	136.00	100.00	118.00	Fair	545.58	0.86	0.00	1.04	172.75	110.21	68.48	High
HOUSTON-10	R2	Houston	1.20	122.00	100.00	111.00	Fair	440.43	3.22	0.00	0.26	140.68	109.99	68.34	High
HOUSTON-10	R2	Houston	1.30	156.00	125.00	140.50	Poor	264.95	0.46	0.00	0.08	83.92	104.87	65.16	High
HOUSTON-10	R2	Houston	1.40	203.00	201.00	202.00	Very Poor	635.51	1.07	0.00	0.27	201.27	101.43	63.02	High
HOUSTON-10	R2	Houston	1.50	100.00	82.00	91.00	Good	499.05	1.15	0.00	0.27	158.30	103.48	64.30	High
HOUSTON-10	R2	Houston	1.60	122.00	109.00	115.50	Fair	385.78	0.90	0.01	0.15	122.43	98.68	61.31	High
HOUSTON-10	R2	Houston	1.70	121.00	123.00	122.00	Fair	644.07	0.82	0.00	0.07	203.91	100.10	62.20	High
HOUSTON-10	R2	Houston	1.80	170.00	182.00	176.00	Very Poor	419.40	0.42	0.00	0.06	132.57	100.05	62.17	High
HOUSTON-10	R2	Houston	1.90	154.00	158.00	156.00	Poor	742.01	0.72	0.00	0.11	234.60	98.23	61.03	High
HOUSTON-11	R1	Houston	0.10	162.00	185.00	173.50	Very Poor	648.89	0.64	0.07	0.19	205.33	112.56	69.94	High
HOUSTON-11	R1	Houston	0.20	184.00	221.00	202.50	Very Poor	709.23	0.61	0.08	0.16	224.41	114.67	71.26	High
HOUSTON-11	R1	Houston	0.30	249.00	247.00	248.00	Very Poor	736.79	0.76	0.09	0.19	233.18	115.00	71.46	High
HOUSTON-11	R1	Houston	0.40	208.00	180.00	194.00	Very Poor	635.06	0.78	0.08	0.38	201.03	114.72	71.28	High
HOUSTON-11	R1	Houston	0.50	163.00	154.00	158.50	Poor	772.94	0.83	0.08	0.57	244.72	115.58	71.82	High
HOUSTON-11	R1	Houston	0.60	159.00	152.00	155.50	Poor	775.46	0.72	0.06	0.43	245.40	117.29	72.88	High
HOUSTON-11	R1	Houston	0.70	177.00	174.00	175.50	Very Poor	668.03	0.79	0.05	0.37	211.44	118.98	73.93	High
HOUSTON-11	R1	Houston	0.80	139.00	155.00	147.00	Poor	586.71	0.79	0.04	0.43	185.73	117.63	73.09	High
HOUSTON-11	R1	Houston	0.90	185.00	179.00	182.00	Very Poor	731.88	0.92	0.05	0.50	231.73	115.88	72.00	High
HOUSTON-11	R1	Houston	1.00	175.00	187.00	181.00	Very Poor	733.24	0.77	0.05	0.35	231.92	117.00	72.70	High
HOUSTON-11	R1	Houston	1.10	155.00	174.00	164.50	Poor	593.94	0.54	0.04	0.20	187.87	116.35	72.30	High
HOUSTON-11	R1	Houston	1.20	148.00	167.00	157.50	Poor	603.69	0.51	0.04	0.15	191.01	113.71	70.66	High
HOUSTON-11	R1	Houston	1.30	209.00	186.00	197.50	Very Poor	751.31	0.58	0.05	0.41	237.73	113.00	70.21	High
HOUSTON-11	R1	Houston	1.40	164.00	190.00	177.00	Very Poor	756.95	0.61	0.05	0.33	239.47	113.12	70.29	High
HOUSTON-11	R1	Houston	1.50	173.00	165.00	169.00	Poor	700.00	0.55	0.05	0.33	221.42	113.67	70.63	High
HOUSTON-11	R1	Houston	1.60	153.00	167.00	160.00	Poor	725.07	0.97	0.05	0.48	229.53	113.54	70.55	High
HOUSTON-11	R1	Houston	1.70	181.00	201.00	191.00	Very Poor	542.62	9.94	0.04	0.38	176.39	114.39	71.08	High
HOUSTON-11	R1	Houston	1.80	154.00	191.00	172.50	Very Poor	738.48	1.35	0.06	0.65	233.87	113.30	70.40	High
HOUSTON-11	R1	Houston	1.90	165.00	168.00	166.50	Poor	695.62	1.27	0.05	0.42	220.43	113.89	70.77	High
HOUSTON-11	R1	Houston	2.00	155.00	161.00	158.00	Poor	797.14	1.27	0.07	0.91	252.48	111.59	69.34	High
HOUSTON-11	R1	Houston	2.10	152.00	181.00	166.50	Poor	822.21	1.15	0.07	0.85	260.34	109.15	67.82	High
HOUSTON-11	R1	Houston	2.20	151.00	154.00	152.50	Poor	705.06	1.08	0.06	0.73	223.33	110.28	68.53	High
HOUSTON-11	R1	Houston	2.30	123.00	128.00	125.50	Fair	625.72	1.01	0.05	0.18	198.27	112.71	70.03	High
HOUSTON-11	R1	Houston	2.40	145.00	136.00	140.50	Poor	576.25	0.96	0.05	0.12	182.51	114.95	71.42	High
HOUSTON-11	R1	Houston	2.50	161.00	167.00	164.00	Poor	595.75	0.97	0.05	0.20	188.67	114.16	70.93	High
HOUSTON-11	R1	Houston	2.60	146.00	155.00	150.50	Poor	778.84	1.10	0.07	0.55	246.49	113.52	70.54	High
HOUSTON-11	R1	Houston	2.70	148.00	150.00	149.00	Poor	800.26	0.99	0.07	0.42	253.19	115.60	71.83	High
HOUSTON-11	R1	Houston	2.80	131.00	138.00	134.50	Poor	720.48	0.98	0.07	0.36	227.97	116.78	72.56	High
HOUSTON-11	R1	Houston	2.90	163.00	152.00	157.50	Poor	707.78	0.96	0.07	0.29	224.06	116.05	72.11	High
HOUSTON-11	R1	Houston	3.00	176.00	159.00	167.50	Poor	705.80	0.79	0.07	0.35	223.34	115.94	72.04	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-11	R1	Houston	3.10	167.00	146.00	156.50	Poor	613.96	0.69	0.06	0.24	194.25	115.04	71.48	High
HOUSTON-11	R1	Houston	3.20	136.00	138.00	137.00	Poor	667.37	0.78	0.06	0.23	211.21	114.19	70.95	High
HOUSTON-11	R1	Houston	3.30	130.00	150.00	140.00	Poor	586.26	0.64	0.05	0.58	185.54	112.51	69.91	High
HOUSTON-11	R1	Houston	3.40	142.00	169.00	155.50	Poor	813.70	0.89	0.07	0.36	257.51	111.74	69.43	High
HOUSTON-11	R1	Houston	3.50	140.00	147.00	143.50	Poor	770.73	1.04	0.07	0.56	244.06	113.81	70.72	High
HOUSTON-11	R1	Houston	3.60	146.00	156.00	151.00	Poor	670.03	1.07	0.07	0.48	212.11	114.84	71.36	High
HOUSTON-11	R1	Houston	3.70	133.00	137.00	135.00	Poor	506.45	1.13	0.05	0.32	160.71	113.80	70.71	High
HOUSTON-11	R1	Houston	3.80	142.00	145.00	143.50	Poor	739.05	1.53	0.08	1.37	234.32	110.98	68.96	High
HOUSTON-11	R1	Houston	3.90	136.00	132.00	134.00	Poor	677.33	1.00	0.07	0.85	214.45	113.34	70.42	High
HOUSTON-11	R1	Houston	4.00	145.00	140.00	142.50	Poor	695.06	1.11	0.07	0.45	220.18	113.20	70.34	High
HOUSTON-11	R1	Houston	4.10	121.00	103.00	112.00	Fair	782.69	1.36	0.08	1.09	247.92	111.67	69.39	High
HOUSTON-11	R1	Houston	4.20	114.00	117.00	115.50	Fair	858.74	1.46	0.09	0.72	272.10	111.34	69.18	High
HOUSTON-11	R1	Houston	4.30	82.00	78.00	80.00	Good	800.76	1.19	0.08	0.63	253.54	114.15	70.93	High
HOUSTON-11	R1	Houston	4.40	88.00	77.00	82.50	Good	820.01	1.32	0.08	0.42	259.74	118.99	73.94	High
HOUSTON-11	R1	Houston	4.50	66.00	63.00	64.50	Good	714.73	2.25	0.08	0.63	226.95	122.96	76.40	High
HOUSTON-11	R1	Houston	4.60	88.00	81.00	84.50	Good	685.36	3.49	0.07	0.74	218.24	123.18	76.54	High
HOUSTON-11	R1	Houston	4.70	96.00	92.00	94.00	Good	139.10	2.05	0.02	0.08	45.00	119.64	74.34	High
HOUSTON-11	R1	Houston	4.80	89.00	94.00	91.50	Good	603.83	0.29	0.06	0.28	190.89	112.95	70.19	High
HOUSTON-11	R1	Houston	4.90	71.00	76.00	73.50	Good	719.86	0.15	0.08	0.18	227.60	113.80	70.71	High
HOUSTON-11	R1	Houston	5.00	111.00	112.00	111.50	Fair	593.30	0.32	0.06	0.19	187.52	113.77	70.69	High
HOUSTON-11	R1	Houston	5.10	102.00	101.00	101.50	Fair	669.99	0.47	0.07	0.17	211.90	112.15	69.69	High
HOUSTON-11	R1	Houston	5.20	80.00	80.00	80.00	Good	691.04	0.57	0.08	0.34	218.59	111.13	69.05	High
HOUSTON-11	R1	Houston	5.30	108.00	133.00	120.50	Fair	653.78	0.78	0.02	0.39	206.83	111.91	69.54	High
HOUSTON-11	R1	Houston	5.40	139.00	142.00	140.50	Poor	747.18	1.12	0.00	0.42	236.49	112.00	69.59	High
HOUSTON-11	R1	Houston	5.50	130.00	134.00	132.00	Poor	786.87	1.13	0.00	0.62	249.17	112.79	70.09	High
HOUSTON-11	R1	Houston	5.60	131.00	134.00	132.50	Poor	766.78	1.05	0.00	0.39	242.75	113.82	70.72	High
HOUSTON-11	R1	Houston	5.70	164.00	164.00	164.00	Poor	758.88	1.03	0.00	0.33	240.15	114.83	71.35	High
HOUSTON-11	R1	Houston	5.80	122.00	122.00	122.00	Fair	756.20	0.95	0.00	0.35	239.34	115.00	71.46	High
HOUSTON-11	R1	Houston	5.90	173.00	198.00	185.50	Very Poor	751.79	0.83	0.00	0.22	237.98	115.00	71.46	High
HOUSTON-11	R1	Houston	6.00	107.00	119.00	113.00	Fair	728.43	0.67	0.01	0.19	230.34	115.46	71.74	High
HOUSTON-11	R1	Houston	6.10	114.00	116.00	115.00	Fair	745.90	0.73	0.01	0.19	236.00	115.74	71.92	High
HOUSTON-11	R1	Houston	6.20	140.00	129.00	134.50	Poor	781.06	0.59	0.01	0.27	246.99	113.19	70.33	High
HOUSTON-11	R1	Houston	6.30	120.00	117.00	118.50	Fair	677.12	0.47	0.01	0.16	214.05	112.00	69.59	High
HOUSTON-11	R1	Houston	6.40	95.00	210.00	152.50	Poor	592.15	0.48	0.00	0.26	187.22	112.35	69.81	High
HOUSTON-11	R1	Houston	6.50	95.00	116.00	105.50	Fair	676.05	0.71	0.00	0.19	213.82	114.49	71.14	High
HOUSTON-11	R1	Houston	6.60	85.00	82.00	83.50	Good	748.23	1.04	0.01	0.37	236.99	115.25	71.61	High
HOUSTON-11	R1	Houston	6.70	82.00	82.00	82.00	Good	586.04	0.92	0.01	0.21	185.65	114.82	71.34	High
HOUSTON-11	R1	Houston	6.80	77.00	72.00	74.50	Good	581.08	0.81	0.01	0.26	183.90	113.01	70.22	High
HOUSTON-11	R1	Houston	6.90	85.00	78.00	81.50	Good	593.08	0.67	0.01	0.14	187.73	111.57	69.33	High
HOUSTON-11	R1	Houston	7.00	90.00	111.00	100.50	Fair	524.48	2.09	0.01	0.27	166.67	109.84	68.25	High
HOUSTON-11	R1	Houston	7.10	92.00	100.00	96.00	Fair	663.65	0.40	0.00	0.33	209.80	107.36	66.71	High
HOUSTON-11	R1	Houston	7.20	90.00	84.00	87.00	Good	724.56	0.23	0.01	0.17	229.03	108.08	67.16	High
HOUSTON-11	R1	Houston	7.30	87.00	94.00	90.50	Good	662.21	0.48	0.01	0.15	209.43	108.30	67.29	High
HOUSTON-11	R1	Houston	7.40	89.00	99.00	94.00	Good	592.71	1.18	0.01	0.21	187.74	107.81	66.99	High
HOUSTON-11	R1	Houston	7.50	84.00	85.00	84.50	Good	494.33	0.74	0.01	0.26	156.50	104.98	65.23	High
HOUSTON-11	R1	Houston	7.60	104.00	117.00	110.50	Fair	213.18	0.90	0.00	0.09	67.64	101.23	62.90	High
HOUSTON-11	R2	Houston	0.10	162.00	185.00	173.50	Very Poor	781.21	0.82	0.00	1.12	247.15	100.95	62.73	High
HOUSTON-11	R2	Houston	0.20	184.00	221.00	202.50	Very Poor	793.86	1.56	0.00	0.91	251.56	107.14	66.58	High
HOUSTON-11	R2	Houston	0.30	249.00	247.00	248.00	Very Poor	804.09	1.84	0.00	0.52	254.95	111.72	69.42	High
HOUSTON-11	R2	Houston	0.40	208.00	180.00	194.00	Very Poor	715.49	1.84	0.00	0.36	226.84	114.69	71.27	High
HOUSTON-11	R2	Houston	0.50	163.00	154.00	158.50	Poor	702.96	1.91	0.00	0.24	222.99	116.71	72.52	High
HOUSTON-11	R2	Houston	0.60	159.00	152.00	155.50	Poor	602.08	5.68	0.00	0.35	192.95	118.18	73.43	High
HOUSTON-11	R2	Houston	0.70	177.00	174.00	175.50	Very Poor	721.32	2.02	0.00	0.91	228.86	117.62	73.08	High
HOUSTON-11	R2	Houston	0.80	139.00	155.00	147.00	Poor	589.23	1.66	0.00	0.15	186.92	118.20	73.45	High
HOUSTON-11	R2	Houston	0.90	185.00	179.00	182.00	Very Poor	483.71	1.59	0.00	0.10	153.51	117.50	73.01	High
HOUSTON-11	R2	Houston	1.00	175.00	187.00	181.00	Very Poor	587.77	1.55	0.00	0.35	186.50	115.40	71.71	High
HOUSTON-11	R2	Houston	1.10	155.00	174.00	164.50	Poor	638.05	1.16	0.00	0.57	202.08	115.00	71.46	High
HOUSTON-11	R2	Houston	1.20	148.00	167.00	157.50	Poor	420.52	1.35	0.00	0.23	133.62	113.33	70.42	High
HOUSTON-11	R2	Houston	1.30	209.00	186.00	197.50	Very Poor	750.89	0.95	0.00	0.69	237.64	111.15	69.07	High
HOUSTON-11	R2	Houston	1.40	164.00	190.00	177.00	Very Poor	745.73	1.19	0.00	0.37	236.13	114.55	71.18	High
HOUSTON-11	R2	Houston	1.50	173.00	165.00	169.00	Poor	701.63	1.42	0.00	0.47	222.21	116.69	72.51	High
HOUSTON-11	R2	Houston	1.60	153.00	167.00	160.00	Poor	671.27	1.42	0.00	0.35	212.74	116.49	72.38	High
HOUSTON-11	R2	Houston	1.70	181.00	201.00	191.00	Very Poor	668.58	1.31	0.00	0.29	211.89	116.69	72.51	High
HOUSTON-11	R2	Houston	1.80	154.00	191.00	172.50	Very Poor	772.49	1.37	0.00	0.76	244.64	116.40	72.33	High
HOUSTON-11	R2	Houston	1.90	165.00	168.00	166.50	Poor	753.30	1.20	0.00	0.31	238.57	115.02	71.47	High
HOUSTON-11	R2	Houston	2.00	155.00	161.00	158.00	Poor	701.52	1.17	0.00	0.21	222.22	115.63	71.85	High
HOUSTON-11	R2	Houston	2.10	152.00	181.00	166.50	Poor	727.33	1.36	0.00	0.44	230.37	119.06	73.98	High
HOUSTON-11	R2	Houston	2.20	151.00	154.00	152.50	Poor	785.47	1.83	0.00	0.66	249.08	125.02	77.68	High
HOUSTON-11	R2	Houston	2.30	123.00	128.00	125.50	Fair	582.71	6.60	0.00	0.57	187.31	127.76	79.39	High
HOUSTON-11	R2	Houston	2.40	145.00	136.00	140.50	Poor	376.27	2.56	0.00	0.19	120.17	124.39	77.29	High
HOUSTON-11	R2	Houston	2.50	161.00	167.00	164.00	Poor	379.54	4.71	0.00	0.06	122.27	121.93	75.76	High
HOUSTON-11	R2	Houston	2.60	146.00	155.00	150.50	Poor	95.77	1.22	0.00	0.05	30.77	115.51	71.78	High
HOUSTON-11	R2	Houston	2.70	148.00	150.00	149.00	Poor	701.64	2.49	0.00	0.36	222.91	111.81	69.48	High
HOUSTON-11	R2	Houston	2.80	131.00	138.00	134.50	Poor	814.01	3.17	0.00	0.62	258.70	117.20	72.82	High
HOUSTON-11	R2	Houston	2.90	163.00	152.00	157.50	Poor	786.48	14.78	0.00	0.77	255.72	121.65	75.59	High
HOUSTON-11	R2	Houston	3.00	176.00	159.00	167.50	Poor	863.12	4.84	0.00	1.81	275.03	124.73	77.50	High
HOUSTON-11	R2	Houston	3.10	167.00	146.00	156.50	Poor	807.46	4.82	0.00	1.42	257.49	128.12	79.61	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-11	R2	Houston	3.20	136.00	138.00	137.00	Poor	761.63	4.87	0.00	0.91	243.06	129.79	80.65	High
HOUSTON-11	R2	Houston	3.30	130.00	150.00	140.00	Poor	732.99	5.21	0.00	0.62	233.99	130.67	81.19	High
HOUSTON-11	R2	Houston	3.40	142.00	169.00	155.50	Poor	672.38	5.14	0.00	0.69	214.95	131.76	81.87	High
HOUSTON-11	R2	Houston	3.50	140.00	147.00	143.50	Poor	380.87	14.59	0.00	0.24	127.55	131.70	81.84	High
HOUSTON-11	R2	Houston	3.60	146.00	156.00	151.00	Poor	671.20	6.08	0.00	0.23	215.04	128.69	79.96	High
HOUSTON-11	R2	Houston	3.70	133.00	137.00	135.00	Poor	791.56	7.38	0.00	0.64	253.65	130.37	81.01	High
HOUSTON-11	R2	Houston	3.80	142.00	145.00	143.50	Poor	759.36	7.30	0.00	0.75	243.44	131.91	81.97	High
HOUSTON-11	R2	Houston	3.90	136.00	132.00	134.00	Poor	670.43	6.37	0.00	0.47	214.85	130.96	81.38	High
HOUSTON-11	R2	Houston	4.00	145.00	140.00	142.50	Poor	606.77	4.47	0.00	0.36	193.87	127.86	79.45	High
HOUSTON-11	R2	Houston	4.10	121.00	103.00	112.00	Fair	641.24	1.85	0.00	0.42	203.43	126.20	78.41	High
HOUSTON-11	R2	Houston	4.20	114.00	117.00	115.50	Fair	782.83	2.51	0.00	0.60	248.50	129.18	80.27	High
HOUSTON-11	R2	Houston	4.30	82.00	78.00	80.00	Good	482.32	2.29	0.00	0.34	153.58	132.62	82.41	High
HOUSTON-11	R2	Houston	4.40	88.00	77.00	82.50	Good	690.67	1.83	0.10	0.38	219.15	130.52	81.10	High
HOUSTON-11	R2	Houston	4.50	66.00	63.00	64.50	Good	734.47	2.21	0.11	0.44	233.21	130.94	81.36	High
HOUSTON-11	R2	Houston	4.60	88.00	81.00	84.50	Good	618.90	1.85	0.09	0.44	196.50	130.79	81.27	High
HOUSTON-11	R2	Houston	4.70	96.00	92.00	94.00	Good	487.10	0.99	0.08	0.64	154.40	127.43	79.18	High
HOUSTON-11	R2	Houston	4.80	89.00	94.00	91.50	Good	519.66	0.99	0.08	0.17	164.68	123.01	76.43	High
HOUSTON-11	R2	Houston	4.90	71.00	76.00	73.50	Good	614.93	1.03	0.10	0.38	194.87	120.23	74.71	High
HOUSTON-11	R2	Houston	5.00	111.00	112.00	111.50	Fair	667.48	1.05	0.11	0.30	211.48	119.84	74.46	High
HOUSTON-11	R2	Houston	5.10	102.00	101.00	101.50	Fair	775.51	1.14	0.13	0.63	245.69	119.55	74.28	High
HOUSTON-11	R2	Houston	5.20	80.00	80.00	80.00	Good	804.87	1.42	0.14	0.34	255.19	120.98	75.17	High
HOUSTON-11	R2	Houston	5.30	108.00	133.00	120.50	Fair	413.52	7.15	0.08	0.19	134.14	121.20	75.31	High
HOUSTON-11	R2	Houston	5.40	139.00	142.00	140.50	Poor	774.50	2.33	0.14	0.41	245.89	119.71	74.38	High
HOUSTON-11	R2	Houston	5.50	130.00	134.00	132.00	Poor	737.92	3.26	0.13	0.25	234.91	121.00	75.19	High
HOUSTON-11	R2	Houston	5.60	131.00	134.00	132.50	Poor	736.58	2.84	0.13	0.29	234.20	121.75	75.65	High
HOUSTON-11	R2	Houston	5.70	164.00	164.00	164.00	Poor	732.19	2.74	0.13	0.36	232.65	122.00	75.81	High
HOUSTON-11	R2	Houston	5.80	122.00	122.00	122.00	Fair	664.33	2.40	0.12	0.35	211.07	122.00	75.81	High
HOUSTON-11	R2	Houston	5.90	173.00	198.00	185.50	Very Poor	688.25	1.88	0.12	0.46	218.44	121.00	75.19	High
HOUSTON-11	R2	Houston	6.00	107.00	119.00	113.00	Fair	735.26	1.37	0.13	0.91	233.14	117.36	72.93	High
HOUSTON-11	R2	Houston	6.10	114.00	116.00	115.00	Fair	546.67	0.89	0.09	0.21	173.17	115.20	71.58	High
HOUSTON-11	R2	Houston	6.20	140.00	129.00	134.50	Poor	105.90	0.18	0.02	0.01	33.54	112.02	69.60	High
HOUSTON-11	R2	Houston	6.30	120.00	117.00	118.50	Fair	31.45	0.11	0.01	0.03	10.06	104.39	64.87	High
HOUSTON-11	R2	Houston	6.40	95.00	210.00	152.50	Poor	8.12	0.12	0.02	0.03	2.70	98.31	61.08	High
HOUSTON-11	R3	Houston	0.10	162.00	185.00	173.50	Very Poor	603.93	0.82	0.12	1.22	191.28	103.86	64.53	High
HOUSTON-11	R3	Houston	0.20	184.00	221.00	202.50	Very Poor	620.86	0.80	0.11	0.33	196.58	104.85	65.15	High
HOUSTON-11	R3	Houston	0.30	249.00	247.00	248.00	Very Poor	771.17	0.94	0.13	0.31	244.01	109.60	68.10	High
HOUSTON-11	R3	Houston	0.40	208.00	180.00	194.00	Very Poor	703.23	0.91	0.12	0.33	222.58	112.68	70.02	High
HOUSTON-11	R3	Houston	0.50	163.00	154.00	158.50	Poor	660.77	1.01	0.11	0.15	209.36	115.07	71.50	High
HOUSTON-11	R3	Houston	0.60	159.00	152.00	155.50	Poor	713.19	1.29	0.12	0.46	225.88	116.69	72.50	High
HOUSTON-11	R3	Houston	0.70	177.00	174.00	175.50	Very Poor	587.13	1.52	0.10	0.30	186.42	118.20	73.44	High
HOUSTON-11	R3	Houston	0.80	139.00	155.00	147.00	Poor	396.90	1.05	0.07	0.14	125.96	116.87	72.62	High
HOUSTON-11	R3	Houston	0.90	185.00	179.00	182.00	Very Poor	522.14	0.73	0.09	0.30	165.40	114.30	71.02	High
HOUSTON-11	R3	Houston	1.00	175.00	187.00	181.00	Very Poor	143.75	0.72	0.03	0.09	45.80	111.68	69.39	High
HOUSTON-11	R3	Houston	1.10	155.00	174.00	164.50	Poor	493.09	0.92	0.08	0.10	156.41	108.08	67.16	High
HOUSTON-11	R3	Houston	1.20	148.00	167.00	157.50	Poor	622.54	0.74	0.10	0.18	197.08	108.45	67.39	High
HOUSTON-11	R3	Houston	1.30	209.00	186.00	197.50	Very Poor	777.75	2.20	0.12	0.28	246.90	111.67	69.39	High
HOUSTON-11	R3	Houston	1.40	164.00	190.00	177.00	Very Poor	440.58	2.38	0.07	0.20	140.41	114.39	71.08	High
HOUSTON-11	R3	Houston	1.50	173.00	165.00	169.00	Poor	702.89	0.64	0.11	0.20	222.51	113.98	70.82	High
HOUSTON-11	R3	Houston	1.60	153.00	167.00	160.00	Poor	798.71	2.91	0.12	0.19	253.89	117.48	73.00	High
HOUSTON-11	R3	Houston	1.70	181.00	201.00	191.00	Very Poor	560.37	3.28	0.09	0.33	178.62	119.91	74.51	High
HOUSTON-11	R3	Houston	1.80	154.00	191.00	172.50	Very Poor	396.22	1.49	0.06	0.52	125.88	115.85	71.99	High
HOUSTON-11	R3	Houston	1.90	165.00	168.00	166.50	Poor	824.91	1.95	0.13	2.15	261.63	112.74	70.05	High
HOUSTON-11	R3	Houston	2.00	155.00	161.00	158.00	Poor	515.18	1.14	0.08	0.72	163.48	115.46	71.75	High
HOUSTON-11	R3	Houston	2.10	152.00	181.00	166.50	Poor	546.66	1.27	0.09	0.38	173.29	116.18	72.19	High
HOUSTON-11	R3	Houston	2.20	151.00	154.00	152.50	Poor	665.34	1.56	0.11	0.50	210.98	119.28	74.12	High
HOUSTON-11	R3	Houston	2.30	123.00	128.00	125.50	Fair	569.55	1.30	0.10	0.53	180.59	120.40	74.81	High
HOUSTON-11	R3	Houston	2.40	145.00	136.00	140.50	Poor	266.30	1.54	0.05	0.11	84.84	118.38	73.56	High
HOUSTON-11	R3	Houston	2.50	161.00	167.00	164.00	Poor	570.41	0.40	0.09	0.29	180.50	113.02	70.23	High
HOUSTON-11	R3	Houston	2.60	146.00	155.00	150.50	Poor	725.75	0.53	0.12	0.11	229.57	116.38	72.32	High
HOUSTON-11	R3	Houston	2.70	148.00	150.00	149.00	Poor	733.92	1.04	0.12	0.30	232.49	118.58	73.68	High
HOUSTON-11	R3	Houston	2.80	131.00	138.00	134.50	Poor	595.39	0.92	0.10	0.28	188.62	119.53	74.27	High
HOUSTON-11	R3	Houston	2.90	163.00	152.00	157.50	Poor	536.41	0.85	0.09	0.21	170.01	117.73	73.16	High
HOUSTON-11	R3	Houston	3.00	176.00	159.00	167.50	Poor	596.71	0.80	0.10	0.27	188.99	116.94	72.67	High
HOUSTON-11	R3	Houston	3.10	167.00	146.00	156.50	Poor	604.54	0.65	0.10	0.17	191.46	117.26	72.86	High
HOUSTON-11	R3	Houston	3.20	136.00	138.00	137.00	Poor	610.88	0.56	0.11	0.13	193.33	115.19	71.58	High
HOUSTON-11	R3	Houston	3.30	130.00	150.00	140.00	Poor	568.01	0.38	0.15	0.17	179.70	115.00	71.46	High
HOUSTON-11	R3	Houston	3.40	142.00	169.00	155.50	Poor	395.50	0.36	0.11	0.15	125.17	113.43	70.48	High
HOUSTON-11	R3	Houston	3.50	140.00	147.00	143.50	Poor	642.41	1.99	0.17	0.74	204.04	112.34	69.81	High
HOUSTON-11	R3	Houston	3.60	146.00	156.00	151.00	Poor	527.91	3.87	0.14	0.66	168.87	114.16	70.94	High
HOUSTON-11	R3	Houston	3.70	133.00	137.00	135.00	Poor	682.94	2.31	0.18	0.42	216.95	113.65	70.62	High
HOUSTON-11	R3	Houston	3.80	142.00	145.00	143.50	Poor	750.98	1.58	0.20	0.22	238.22	116.69	72.51	High
HOUSTON-11	R3	Houston	3.90	136.00	132.00	134.00	Poor	730.54	2.47	0.19	0.51	232.19	117.21	72.83	High
HOUSTON-11	R3	Houston	4.00	145.00	140.00	142.50	Poor	670.17	2.40	0.17	0.61	213.02	115.51	71.77	High
HOUSTON-11	R3	Houston	4.10	121.00	103.00	112.00	Fair	555.22	1.92	0.14	0.32	176.43	115.51	71.77	High
HOUSTON-11	R3	Houston	4.20	114.00	117.00	115.50	Fair	594.73	1.89	0.16	0.42	189.02	117.68	73.12	High
HOUSTON-11	R3	Houston	4.30	82.00	78.00	80.00	Good	473.44	1.29	0.15	0.25	150.25	117.96	73.30	High
HOUSTON-11	R3	Houston	4.40	88.00	77.00	82.50	Good	574.59	0.97	0.23	0.58	182.19	114.41	71.09	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-11	R3	Houston	4.50	66.00	63.00	64.50	Good	497.85	0.84	0.21	0.30	157.90	113.76	70.69	High
HOUSTON-11	R3	Houston	4.60	88.00	81.00	84.50	Good	437.06	1.15	0.19	0.40	138.70	111.63	69.36	High
HOUSTON-11	R3	Houston	4.70	96.00	92.00	94.00	Good	564.63	1.09	0.26	0.95	179.14	108.49	67.41	High
HOUSTON-11	R3	Houston	4.80	89.00	94.00	91.50	Good	781.35	1.30	0.37	0.84	247.70	108.10	67.17	High
HOUSTON-11	R3	Houston	4.90	71.00	76.00	73.50	Good	840.29	1.60	0.41	0.85	266.66	111.54	69.31	High
HOUSTON-11	R3	Houston	5.00	111.00	112.00	111.50	Fair	720.77	1.68	0.36	0.87	228.76	115.04	71.48	High
HOUSTON-11	R3	Houston	5.10	102.00	101.00	101.50	Fair	646.66	1.68	0.33	0.37	205.39	115.47	71.75	High
HOUSTON-11	R3	Houston	5.20	80.00	80.00	80.00	Good	592.01	2.07	0.30	0.89	188.33	115.52	71.78	High
HOUSTON-11	R3	Houston	5.30	108.00	133.00	120.50	Fair	518.42	1.39	0.27	0.43	164.73	113.26	70.38	High
HOUSTON-11	R3	Houston	5.40	139.00	142.00	140.50	Poor	680.19	1.07	0.36	0.83	215.77	112.57	69.95	High
HOUSTON-11	R3	Houston	5.50	130.00	134.00	132.00	Poor	751.24	1.07	0.39	0.84	238.08	113.80	70.72	High
HOUSTON-11	R3	Houston	5.60	131.00	134.00	132.50	Poor	627.76	1.27	0.33	0.36	199.20	115.00	71.46	High
HOUSTON-11	R3	Houston	5.70	164.00	164.00	164.00	Poor	517.69	1.32	0.28	0.55	164.27	113.95	70.81	High
HOUSTON-11	R3	Houston	5.80	122.00	122.00	122.00	Fair	444.37	0.99	0.23	0.54	141.15	112.21	69.72	High
HOUSTON-11	R3	Houston	5.90	173.00	198.00	185.50	Very Poor	682.32	1.31	0.36	1.50	216.63	109.13	67.81	High
HOUSTON-11	R3	Houston	6.00	107.00	119.00	113.00	Fair	656.45	1.25	0.35	0.85	208.31	107.08	66.53	High
HOUSTON-11	R3	Houston	6.10	114.00	116.00	115.00	Fair	658.70	2.28	0.35	0.43	209.44	105.98	65.85	High
HOUSTON-11	R3	Houston	6.20	140.00	129.00	134.50	Poor	517.44	1.29	0.28	0.55	164.33	108.45	67.39	High
HOUSTON-11	R3	Houston	6.30	120.00	117.00	118.50	Fair	273.62	0.99	0.16	0.41	87.08	109.63	68.12	High
HOUSTON-11	R3	Houston	6.40	95.00	210.00	152.50	Poor	29.25	0.21	0.06	0.05	9.37	106.30	66.05	High
HOUSTON-12	R1	Houston	0.10	189.00	151.00	170.00	Very Poor	1101.35	0.50	0.00	1.12	348.22	58.70	36.47	Low
HOUSTON-12	R1	Houston	0.20	194.00	183.00	188.50	Very Poor	449.45	0.72	0.00	0.13	142.41	76.74	47.69	Medium
HOUSTON-12	R1	Houston	0.30	270.00	299.00	284.50	Very Poor	563.32	0.66	0.00	0.18	178.17	75.53	46.93	Medium
HOUSTON-12	R1	Houston	0.40	200.00	169.00	184.50	Very Poor	758.15	0.72	0.00	0.12	239.71	82.26	51.11	Medium
HOUSTON-12	R1	Houston	0.50	160.00	154.00	157.00	Poor	748.60	0.62	0.00	0.45	236.67	90.06	55.96	Medium
HOUSTON-12	R1	Houston	0.60	220.00	197.00	208.50	Very Poor	704.99	0.62	0.00	0.20	222.96	95.40	59.28	Medium
HOUSTON-12	R1	Houston	0.70	203.00	206.00	204.50	Very Poor	731.28	0.70	0.00	0.17	231.15	99.06	61.56	High
HOUSTON-12	R1	Houston	0.80	322.00	289.00	305.50	Very Poor	702.68	0.73	0.00	0.11	222.29	103.03	64.02	High
HOUSTON-12	R1	Houston	0.90	192.00	225.00	208.50	Very Poor	629.99	0.89	0.00	0.24	199.46	104.99	65.24	High
HOUSTON-12	R1	Houston	1.00	169.00	149.00	159.00	Poor	635.95	1.03	0.00	0.01	201.37	103.44	64.28	High
HOUSTON-12	R1	Houston	1.10	145.00	141.00	143.00	Poor	715.18	1.22	0.00	0.19	226.42	98.75	61.36	High
HOUSTON-12	R1	Houston	1.20	129.00	155.00	142.00	Poor	824.62	1.35	0.00	0.50	261.07	97.51	60.59	High
HOUSTON-12	R1	Houston	1.30	158.00	166.00	162.00	Poor	797.63	3.36	0.00	0.51	253.63	102.59	63.74	High
HOUSTON-12	R1	Houston	1.40	153.00	171.00	162.00	Poor	506.85	1.68	0.00	0.60	160.87	107.27	66.65	High
HOUSTON-12	R1	Houston	1.50	155.00	163.00	159.00	Poor	248.80	0.92	0.00	0.12	79.00	106.98	66.48	High
HOUSTON-12	R1	Houston	1.60	168.00	197.00	182.50	Very Poor	504.99	0.71	0.00	0.16	159.83	108.45	67.39	High
HOUSTON-12	R1	Houston	1.70	174.00	174.00	174.00	Very Poor	685.73	1.31	0.00	0.58	217.19	108.65	67.51	High
HOUSTON-12	R1	Houston	1.80	188.00	179.00	183.50	Very Poor	622.19	1.43	0.00	0.47	197.25	110.24	68.50	High
HOUSTON-12	R1	Houston	1.90	194.00	191.00	192.50	Very Poor	670.52	1.34	0.00	0.42	212.48	110.75	68.82	High
HOUSTON-12	R1	Houston	2.00	232.00	254.00	243.00	Very Poor	670.32	1.12	0.00	0.40	212.29	111.00	68.97	High
HOUSTON-12	R1	Houston	2.10	227.00	227.00	227.00	Very Poor	610.27	0.94	0.00	0.51	193.26	111.64	69.37	High
HOUSTON-12	R1	Houston	2.20	144.00	206.00	175.00	Very Poor	640.17	1.20	0.00	0.54	202.73	111.33	69.18	High
HOUSTON-12	R1	Houston	2.30	221.00	224.00	222.50	Very Poor	691.48	1.27	0.00	0.39	218.96	111.69	69.40	High
HOUSTON-12	R1	Houston	2.40	194.00	196.00	195.00	Very Poor	659.79	1.14	0.00	0.25	208.93	112.00	69.59	High
HOUSTON-12	R1	Houston	2.50	248.00	204.00	226.00	Very Poor	657.79	0.97	0.00	0.19	208.34	112.78	70.08	High
HOUSTON-12	R1	Houston	2.60	160.00	194.00	177.00	Very Poor	675.86	0.87	0.00	0.17	213.97	113.00	70.21	High
HOUSTON-12	R1	Houston	2.70	175.00	210.00	192.50	Very Poor	676.87	0.83	0.00	0.13	214.20	113.00	70.21	High
HOUSTON-12	R1	Houston	2.80	174.00	178.00	176.00	Very Poor	694.12	0.82	0.00	0.21	219.67	113.00	70.21	High
HOUSTON-12	R1	Houston	2.90	184.00	182.00	183.00	Very Poor	771.24	0.93	0.00	0.40	244.17	113.96	70.81	High
HOUSTON-12	R1	Houston	3.00	201.00	207.00	204.00	Very Poor	765.36	1.15	0.00	0.37	242.31	116.87	72.62	High
HOUSTON-12	R1	Houston	3.10	254.00	279.00	266.50	Very Poor	746.06	1.22	0.00	0.54	236.26	118.47	73.62	High
HOUSTON-12	R1	Houston	3.20	277.00	243.00	260.00	Very Poor	728.83	1.16	0.00	0.55	230.71	119.86	74.47	High
HOUSTON-12	R1	Houston	3.30	150.00	163.00	156.50	Poor	662.54	1.00	0.00	0.32	209.73	120.20	74.69	High
HOUSTON-12	R1	Houston	3.40	194.00	202.00	198.00	Very Poor	669.03	0.87	0.00	0.23	211.82	121.00	75.18	High
HOUSTON-12	R1	Houston	3.50	153.00	178.00	165.50	Poor	634.62	0.73	0.00	0.33	200.81	120.88	75.11	High
HOUSTON-12	R1	Houston	3.60	151.00	140.00	145.50	Poor	356.70	1.70	0.00	0.14	113.61	117.53	73.03	High
HOUSTON-12	R1	Houston	3.70	116.00	114.00	115.00	Fair	723.78	0.27	0.00	1.12	228.75	112.25	69.75	High
HOUSTON-12	R1	Houston	3.80	141.00	134.00	137.50	Poor	624.14	0.37	0.00	0.19	197.33	112.84	70.11	High
HOUSTON-12	R1	Houston	3.90	166.00	196.00	181.00	Very Poor	553.44	0.39	0.00	0.10	175.01	111.97	69.58	High
HOUSTON-12	R1	Houston	4.00	152.00	117.00	134.50	Poor	650.26	0.59	0.00	0.43	205.62	110.48	68.65	High
HOUSTON-12	R1	Houston	4.10	148.00	141.00	144.50	Poor	745.69	0.94	0.00	0.48	235.90	111.24	69.12	High
HOUSTON-12	R1	Houston	4.20	153.00	162.00	157.50	Poor	747.73	1.70	0.00	0.60	236.97	114.19	70.95	High
HOUSTON-12	R1	Houston	4.30	136.00	146.00	141.00	Poor	676.73	2.13	0.00	0.74	214.77	117.38	72.94	High
HOUSTON-12	R1	Houston	4.40	131.00	141.00	136.00	Poor	705.67	2.24	0.00	0.69	223.87	119.15	74.03	High
HOUSTON-12	R1	Houston	4.50	128.00	128.00	128.00	Fair	718.42	2.26	0.00	0.64	227.96	120.44	74.84	High
HOUSTON-12	R1	Houston	4.60	206.00	193.00	199.50	Very Poor	723.22	2.07	0.00	0.50	229.48	121.19	75.30	High
HOUSTON-12	R1	Houston	4.70	141.00	116.00	128.50	Fair	546.46	2.98	0.00	0.31	174.01	121.99	75.80	High
HOUSTON-12	R1	Houston	4.80	158.00	125.00	141.50	Poor	42.41	1.55	0.00	0.02	14.19	117.28	72.87	High
HOUSTON-12	R1	Houston	4.90	131.00	132.00	131.50	Poor	51.39	0.12	0.00	0.05	16.35	105.99	65.86	High
HOUSTON-12	R1	Houston	5.00	128.00	137.00	132.50	Poor	5.19	0.07	0.00	0.02	1.58	88.79	55.17	Medium
HOUSTON-12	R1	Houston	5.10	134.00	132.00	133.00	Poor	10.39	0.04	0.00	0.02	3.08	68.39	42.49	Low
HOUSTON-12	R1	Houston	5.20	136.00	129.00	132.50	Poor	453.28	0.06	0.00	0.31	143.03	52.24	32.46	Low
HOUSTON-12	R1	Houston	5.30	132.00	130.00	131.00	Poor	743.61	2.07	0.00	0.08	235.80	63.25	39.30	Low
HOUSTON-12	R1	Houston	5.40	149.00	132.00	140.50	Poor	675.39	1.39	0.00	0.44	214.05	66.79	41.50	Low
HOUSTON-12	R1	Houston	5.50	142.00	152.00	147.00	Poor	295.50	1.75	0.00	0.07	94.15	73.76	45.83	Medium
HOUSTON-12	R1	Houston	5.60	133.00	121.00	127.00	Fair	138.70	0.25	0.00	0.00	44.01	67.98	42.24	Low
HOUSTON-12	R1	Houston	5.70	135.00	109.00	122.00	Fair	346.91	0.40	0.00	0.02	109.64	64.55	40.11	Low

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-12	R2	Houston	0.10	189.00	151.00	170.00	Very Poor	1261.78	2.35	0.31	0.87	400.03	58.71	36.48	Low
HOUSTON-12	R2	Houston	0.20	194.00	183.00	188.50	Very Poor	897.95	1.67	0.20	0.72	284.52	76.91	47.79	Medium
HOUSTON-12	R2	Houston	0.30	270.00	299.00	284.50	Very Poor	788.53	1.35	0.16	1.20	249.76	85.58	53.18	Medium
HOUSTON-12	R2	Houston	0.40	200.00	169.00	184.50	Very Poor	815.67	1.10	0.15	0.77	258.30	94.16	58.51	Medium
HOUSTON-12	R2	Houston	0.50	160.00	154.00	157.00	Poor	812.89	0.84	0.13	0.47	257.29	101.04	62.79	High
HOUSTON-12	R2	Houston	0.60	220.00	197.00	208.50	Very Poor	772.29	0.78	0.11	0.79	244.34	106.26	66.03	High
HOUSTON-12	R2	Houston	0.70	203.00	206.00	204.50	Very Poor	738.32	0.75	0.09	0.58	233.58	109.76	68.20	High
HOUSTON-12	R2	Houston	0.80	322.00	289.00	305.50	Very Poor	688.50	0.60	0.08	0.29	217.76	112.25	69.75	High
HOUSTON-12	R2	Houston	0.90	192.00	225.00	208.50	Very Poor	636.23	0.66	0.07	0.20	201.37	112.84	70.12	High
HOUSTON-12	R2	Houston	1.00	169.00	149.00	159.00	Poor	667.00	0.50	0.09	0.28	211.01	108.44	67.38	High
HOUSTON-12	R2	Houston	1.10	145.00	141.00	143.00	Poor	743.63	0.47	0.11	0.33	235.19	105.28	65.42	High
HOUSTON-12	R2	Houston	1.20	129.00	155.00	142.00	Poor	763.69	0.39	0.13	0.56	241.56	107.48	66.79	High
HOUSTON-12	R2	Houston	1.30	158.00	166.00	162.00	Poor	593.53	0.26	0.10	0.50	187.60	111.58	69.33	High
HOUSTON-12	R2	Houston	1.40	153.00	171.00	162.00	Poor	127.07	0.54	0.02	0.05	40.39	111.84	69.49	High
HOUSTON-12	R2	Houston	1.50	155.00	163.00	159.00	Poor	397.59	0.21	0.06	0.14	125.73	107.12	66.56	High
HOUSTON-12	R2	Houston	1.60	168.00	197.00	182.50	Very Poor	518.17	1.82	0.08	0.17	164.60	106.89	66.42	High
HOUSTON-12	R2	Houston	1.70	174.00	174.00	174.00	Very Poor	649.83	3.94	0.10	0.38	207.29	105.56	65.59	High
HOUSTON-12	R2	Houston	1.80	188.00	179.00	183.50	Very Poor	726.44	3.50	0.12	0.97	231.31	108.71	67.55	High
HOUSTON-12	R2	Houston	1.90	194.00	191.00	192.50	Very Poor	725.24	3.44	0.11	1.02	230.94	112.40	69.84	High
HOUSTON-12	R2	Houston	2.00	232.00	254.00	243.00	Very Poor	713.52	3.34	0.11	1.00	227.04	115.87	72.00	High
HOUSTON-12	R2	Houston	2.10	227.00	227.00	227.00	Very Poor	689.71	3.19	0.11	1.09	219.52	119.10	74.01	High
HOUSTON-12	R2	Houston	2.20	144.00	206.00	175.00	Very Poor	642.51	2.93	0.11	0.87	204.44	120.00	74.56	High
HOUSTON-12	R2	Houston	2.30	221.00	224.00	222.50	Very Poor	521.79	2.41	0.09	0.48	166.09	119.72	74.39	High
HOUSTON-12	R2	Houston	2.40	194.00	196.00	195.00	Very Poor	287.70	1.65	0.05	0.22	91.67	116.98	72.69	High
HOUSTON-12	R2	Houston	2.50	248.00	204.00	226.00	Very Poor	531.78	1.81	0.09	0.49	169.02	110.57	68.70	High
HOUSTON-12	R2	Houston	2.60	160.00	194.00	177.00	Very Poor	667.43	1.36	0.11	0.33	211.72	112.07	69.63	High
HOUSTON-12	R2	Houston	2.70	175.00	210.00	192.50	Very Poor	683.32	1.43	0.11	0.37	216.60	113.17	70.32	High
HOUSTON-12	R2	Houston	2.80	174.00	178.00	176.00	Very Poor	709.39	1.40	0.12	0.67	224.83	114.18	70.95	High
HOUSTON-12	R2	Houston	2.90	184.00	182.00	183.00	Very Poor	570.36	1.10	0.12	0.41	180.73	115.79	71.95	High
HOUSTON-12	R2	Houston	3.00	201.00	207.00	204.00	Very Poor	582.63	1.06	0.13	0.33	184.58	115.41	71.71	High
HOUSTON-12	R2	Houston	3.10	254.00	279.00	266.50	Very Poor	580.83	0.90	0.13	0.26	183.89	114.21	70.96	High
HOUSTON-12	R2	Houston	3.20	277.00	243.00	260.00	Very Poor	645.12	0.89	0.15	0.35	204.30	114.00	70.84	High
HOUSTON-12	R2	Houston	3.30	150.00	163.00	156.50	Poor	728.85	1.58	0.17	0.65	231.19	114.86	71.37	High
HOUSTON-12	R2	Houston	3.40	194.00	202.00	198.00	Very Poor	653.13	3.18	0.16	0.93	207.98	116.87	72.62	High
HOUSTON-12	R2	Houston	3.50	153.00	178.00	165.50	Poor	699.51	3.09	0.17	0.87	222.61	118.19	73.44	High
HOUSTON-12	R2	Houston	3.60	151.00	140.00	145.50	Poor	718.60	3.36	0.17	1.45	228.92	119.18	74.05	High
HOUSTON-12	R2	Houston	3.70	116.00	114.00	115.00	Fair	423.08	2.59	0.10	1.02	135.06	119.85	74.47	High
HOUSTON-12	R2	Houston	3.80	141.00	134.00	137.50	Poor	473.12	2.56	0.11	0.68	150.80	115.30	71.65	High
HOUSTON-12	R2	Houston	3.90	166.00	196.00	181.00	Very Poor	648.22	1.71	0.15	0.73	205.70	113.64	70.61	High
HOUSTON-12	R2	Houston	4.00	152.00	117.00	134.50	Poor	643.10	1.53	0.15	0.56	204.09	112.61	69.97	High
HOUSTON-12	R2	Houston	4.10	148.00	141.00	144.50	Poor	747.63	1.54	0.18	0.53	237.11	112.82	70.10	High
HOUSTON-12	R2	Houston	4.20	153.00	162.00	157.50	Poor	744.05	1.29	0.18	0.51	235.78	114.63	71.23	High
HOUSTON-12	R2	Houston	4.30	136.00	146.00	141.00	Poor	724.15	1.19	0.17	0.57	229.39	116.28	72.25	High
HOUSTON-12	R2	Houston	4.40	131.00	141.00	136.00	Poor	751.95	1.36	0.18	0.65	238.47	117.63	73.09	High
HOUSTON-12	R2	Houston	4.50	128.00	128.00	128.00	Fair	711.48	1.62	0.17	1.23	225.78	118.00	73.32	High
HOUSTON-12	R2	Houston	4.60	206.00	193.00	199.50	Very Poor	683.76	1.85	0.16	1.18	217.08	118.19	73.44	High
HOUSTON-12	R2	Houston	4.70	141.00	116.00	128.50	Fair	477.81	1.57	0.11	0.80	151.75	117.29	72.88	High
HOUSTON-12	R2	Houston	4.80	158.00	125.00	141.50	Poor	697.21	2.03	0.16	0.59	221.43	115.22	71.59	High
HOUSTON-12	R2	Houston	4.90	131.00	132.00	131.50	Poor	618.02	1.39	0.14	0.41	196.06	116.00	72.08	High
HOUSTON-12	R2	Houston	5.00	128.00	137.00	132.50	Poor	484.87	1.81	0.11	0.39	154.11	114.62	71.22	High
HOUSTON-12	R2	Houston	5.10	134.00	132.00	133.00	Poor	326.53	1.87	0.08	0.17	104.15	109.06	67.77	High
HOUSTON-12	R2	Houston	5.20	136.00	129.00	132.50	Poor	732.76	3.15	0.17	0.44	233.04	106.90	66.42	High
HOUSTON-12	R2	Houston	5.30	132.00	130.00	131.00	Poor	769.25	2.22	0.17	0.79	244.24	109.97	68.33	High
HOUSTON-15	R1	Houston	0.10	126.00	282.00	204.00	Very Poor	1291.63	0.24	0.00	0.09	408.11	43.82	27.23	Low
HOUSTON-15	R1	Houston	0.20	57.00	62.00	59.50	Very Good	921.53	0.15	0.00	0.00	291.28	61.97	38.51	Low
HOUSTON-15	R1	Houston	0.30	77.00	91.00	84.00	Good	730.28	0.25	0.00	0.00	230.86	71.94	44.70	Low
HOUSTON-15	R1	Houston	0.40	87.00	64.00	75.50	Good	490.88	0.24	0.00	0.00	155.16	76.24	47.37	Medium
HOUSTON-15	R1	Houston	0.50	104.00	272.00	188.00	Very Poor	565.74	0.25	0.00	0.01	178.90	77.36	48.07	Medium
HOUSTON-15	R1	Houston	0.60	83.00	290.00	186.50	Very Poor	624.86	0.33	0.00	0.00	197.49	80.67	50.13	Medium
HOUSTON-15	R1	Houston	0.70	82.00	64.00	73.00	Good	262.27	0.17	0.00	0.00	82.96	81.11	50.40	Medium
HOUSTON-15	R1	Houston	0.80	61.00	63.00	62.00	Good	426.55	0.40	0.00	0.00	135.00	77.18	47.96	Medium
HOUSTON-15	R1	Houston	0.90	67.00	56.00	61.50	Good	233.85	0.24	0.00	0.01	74.08	74.52	46.31	Medium
HOUSTON-15	R1	Houston	1.00	61.00	73.00	67.00	Good	481.96	0.36	0.00	0.39	152.36	74.67	46.40	Medium
HOUSTON-15	R1	Houston	1.10	77.00	82.00	79.50	Good	85.04	0.13	0.00	0.04	26.92	70.91	44.06	Low
HOUSTON-15	R1	Houston	1.20	68.00	97.00	82.50	Good	426.19	0.73	0.00	0.21	135.13	49.36	30.67	Low
HOUSTON-15	R1	Houston	1.30	113.00	119.00	116.00	Fair	527.58	2.00	0.00	0.00	167.52	49.66	30.85	Low
HOUSTON-15	R1	Houston	1.40	60.00	57.00	58.50	Very Good	451.07	0.88	0.00	0.00	143.06	54.34	33.76	Low
HOUSTON-15	R1	Houston	1.50	66.00	52.00	59.00	Very Good	522.25	0.93	0.00	0.00	165.60	58.73	36.50	Low
HOUSTON-15	R1	Houston	1.60	74.00	113.00	93.50	Good	309.95	0.49	0.00	0.01	98.12	58.80	36.53	Low
HOUSTON-15	R1	Houston	1.70	69.00	86.00	77.50	Good	365.70	0.68	0.00	0.00	115.85	58.78	36.52	Low
HOUSTON-15	R1	Houston	1.80	74.00	95.00	84.50	Good	368.92	0.66	0.00	0.00	116.79	52.59	32.68	Low
HOUSTON-15	R1	Houston	1.90	55.00	80.00	67.50	Good	634.10	1.88	0.01	0.00	201.13	56.70	35.23	Low
HOUSTON-15	R1	Houston	2.00	65.00	95.00	80.00	Good	1148.92	0.39	0.05	0.03	363.19	34.07	21.17	Low
HOUSTON-15	R1	Houston	2.10	74.00	70.00	72.00	Good	966.09	0.59	0.05	0.01	305.51	42.77	26.58	Low
HOUSTON-15	R1	Houston	2.20	69.00	53.00	61.00	Good	1241.85	0.95	0.07	0.37	392.92	63.12	39.22	Low
HOUSTON-15	R1	Houston	2.30	75.00	56.00	65.50	Good	1017.76	2.05	0.06	0.53	322.43	78.86	49.00	Medium
HOUSTON-15	R1	Houston	2.40	83.00	73.00	78.00	Good	930.27	1.67	0.05	0.88	294.62	88.04	54.71	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-15	R1	Houston	2.50	101.00	93.00	97.00	Fair	820.72	0.93	0.04	0.63	259.77	95.25	59.19	Medium
HOUSTON-15	R1	Houston	2.60	84.00	67.00	75.50	Good	647.39	0.68	0.03	0.20	204.83	100.16	62.23	High
HOUSTON-15	R1	Houston	2.70	79.00	53.00	66.00	Good	527.63	7.20	0.03	0.05	170.31	101.61	63.14	High
HOUSTON-15	R1	Houston	2.80	85.00	56.00	70.50	Good	281.68	1.19	0.01	0.27	89.55	97.87	60.81	High
HOUSTON-15	R1	Houston	2.90	73.00	53.00	63.00	Good	443.93	0.48	0.02	2.66	140.50	94.00	58.41	Medium
HOUSTON-15	R1	Houston	3.00	80.00	46.00	63.00	Good	273.69	0.42	0.01	0.51	86.77	91.98	57.15	Medium
HOUSTON-15	R1	Houston	3.10	72.00	49.00	60.50	Good	731.44	0.78	0.03	0.46	231.32	89.08	55.35	Medium
HOUSTON-15	R1	Houston	3.20	57.00	53.00	55.00	Very Good	815.10	0.66	0.04	0.02	257.77	95.44	59.30	Medium
HOUSTON-15	R1	Houston	3.30	76.00	66.00	71.00	Good	795.40	0.62	0.04	0.03	251.64	100.40	62.39	High
HOUSTON-15	R1	Houston	3.40	61.00	65.00	63.00	Good	655.88	0.54	0.03	0.04	207.40	103.59	64.37	High
HOUSTON-15	R1	Houston	3.50	78.00	75.00	76.50	Good	494.67	2.77	0.02	0.00	157.59	104.45	64.91	High
HOUSTON-15	R1	Houston	3.60	89.00	77.00	83.00	Good	718.17	1.24	0.02	0.08	227.38	104.05	64.66	High
HOUSTON-15	R1	Houston	3.70	77.00	59.00	68.00	Good	700.66	0.72	0.01	0.24	221.73	106.73	66.32	High
HOUSTON-15	R1	Houston	3.80	68.00	67.00	67.50	Good	584.69	0.85	0.01	0.16	185.11	107.95	67.08	High
HOUSTON-15	R1	Houston	3.90	56.00	56.00	56.00	Very Good	401.27	1.59	0.01	0.13	127.40	106.03	65.89	High
HOUSTON-15	R1	Houston	4.00	77.00	73.00	75.00	Good	598.32	1.03	0.01	0.10	189.50	103.68	64.43	High
HOUSTON-15	R1	Houston	4.10	60.00	56.00	58.00	Very Good	612.18	0.62	0.01	0.03	193.67	104.00	64.62	High
HOUSTON-15	R1	Houston	4.20	74.00	74.00	74.00	Good	393.17	0.49	0.01	0.11	124.53	103.01	64.00	High
HOUSTON-15	R1	Houston	4.30	76.00	62.00	69.00	Good	21.57	0.08	0.00	0.04	6.95	95.35	59.25	Medium
HOUSTON-15	R1	Houston	4.40	72.00	65.00	68.50	Good	59.63	0.16	0.00	0.02	18.78	79.59	49.46	Medium
HOUSTON-15	R1	Houston	4.50	70.00	61.00	65.50	Good	461.23	0.32	0.00	0.03	145.77	73.85	45.89	Medium
HOUSTON-15	R1	Houston	4.60	77.00	72.00	74.50	Good	749.39	0.64	0.00	0.03	237.04	79.41	49.34	Medium
HOUSTON-15	R1	Houston	4.70	80.00	84.00	82.00	Good	730.13	0.57	0.00	0.40	230.95	86.93	54.02	Medium
HOUSTON-15	R1	Houston	4.80	86.00	86.00	86.00	Good	545.61	0.40	0.01	0.12	172.72	91.57	56.90	Medium
HOUSTON-15	R1	Houston	4.90	74.00	53.00	63.50	Good	258.90	0.19	0.00	0.01	81.77	90.98	56.53	Medium
HOUSTON-15	R1	Houston	5.00	95.00	83.00	89.00	Good	684.13	0.83	0.00	0.05	216.51	89.51	55.62	Medium
HOUSTON-15	R1	Houston	5.10	82.00	60.00	71.00	Good	434.37	1.30	0.00	0.11	137.94	90.93	56.50	Medium
HOUSTON-15	R1	Houston	5.20	78.00	64.00	71.00	Good	338.40	0.40	0.00	0.04	107.08	86.02	53.45	Medium
HOUSTON-15	R1	Houston	5.30	94.00	75.00	84.50	Good	683.42	0.73	0.00	0.06	216.13	88.36	54.91	Medium
HOUSTON-15	R1	Houston	5.40	76.00	70.00	73.00	Good	319.99	0.56	0.00	0.06	101.43	88.23	54.82	Medium
HOUSTON-15	R1	Houston	5.50	64.00	78.00	71.00	Good	131.62	0.21	0.00	0.01	41.61	86.13	53.52	Medium
HOUSTON-15	R1	Houston	5.60	80.00	97.00	88.50	Good	180.51	0.20	0.00	0.21	57.22	70.86	44.03	Low
HOUSTON-15	R1	Houston	5.70	63.00	79.00	71.00	Good	580.76	0.32	0.00	0.23	183.71	67.14	41.72	Low
HOUSTON-15	R1	Houston	5.80	73.00	75.00	74.00	Good	395.94	0.24	0.00	0.12	125.06	72.17	44.84	Low
HOUSTON-15	R1	Houston	5.90	62.00	74.00	68.00	Good	712.81	0.68	0.00	0.06	225.52	71.45	44.40	Low
HOUSTON-15	R1	Houston	6.00	69.00	59.00	64.00	Good	785.31	1.22	0.00	0.16	248.70	80.46	50.00	Medium
HOUSTON-15	R2	Houston	0.10	126.00	282.00	204.00	Very Poor	1549.10	1.48	0.00	0.59	489.98	42.55	26.44	Low
HOUSTON-15	R2	Houston	0.20	57.00	62.00	59.50	Very Good	1052.93	0.07	0.00	0.73	332.59	68.87	42.79	Low
HOUSTON-15	R2	Houston	0.30	77.00	91.00	84.00	Good	578.71	0.66	0.00	0.73	183.12	79.42	49.35	Medium
HOUSTON-15	R2	Houston	0.40	87.00	64.00	75.50	Good	77.08	0.32	0.00	0.09	24.55	72.75	45.20	Medium
HOUSTON-15	R2	Houston	0.50	104.00	272.00	188.00	Very Poor	1061.76	0.03	0.00	2.45	335.34	40.02	24.87	Low
HOUSTON-15	R2	Houston	0.60	83.00	290.00	186.50	Very Poor	1107.43	6.52	0.00	2.48	353.02	63.93	39.72	Low
HOUSTON-15	R2	Houston	0.70	82.00	64.00	73.00	Good	708.88	0.51	0.00	2.75	224.11	75.30	46.79	Medium
HOUSTON-15	R2	Houston	0.80	61.00	63.00	62.00	Good	543.87	0.02	0.00	0.67	171.67	79.24	49.24	Medium
HOUSTON-15	R2	Houston	0.90	67.00	56.00	61.50	Good	538.81	0.10	0.00	0.51	170.26	83.15	51.67	Medium
HOUSTON-15	R2	Houston	1.00	61.00	73.00	67.00	Good	360.84	0.21	0.00	0.21	114.07	80.30	49.90	Medium
HOUSTON-15	R2	Houston	1.10	77.00	82.00	79.50	Good	556.86	0.45	0.00	0.42	176.11	80.79	50.20	Medium
HOUSTON-15	R2	Houston	1.20	68.00	97.00	82.50	Good	1001.83	0.00	0.00	1.14	316.36	41.56	25.82	Low
HOUSTON-15	R2	Houston	1.30	113.00	119.00	116.00	Fair	1137.17	0.00	0.01	0.62	359.25	58.61	36.42	Low
HOUSTON-15	R2	Houston	1.40	60.00	57.00	58.50	Very Good	527.06	0.25	0.00	0.14	166.63	69.70	43.31	Low
HOUSTON-15	R2	Houston	1.50	66.00	52.00	59.00	Very Good	557.35	0.35	0.00	0.34	176.28	73.06	45.40	Medium
HOUSTON-15	R2	Houston	1.60	74.00	113.00	93.50	Good	759.22	0.32	0.01	0.69	240.11	78.67	48.88	Medium
HOUSTON-15	R2	Houston	1.70	69.00	86.00	77.50	Good	747.71	0.25	0.02	0.80	236.37	86.04	53.46	Medium
HOUSTON-15	R2	Houston	1.80	74.00	95.00	84.50	Good	675.70	0.12	0.02	0.28	213.46	91.17	56.65	Medium
HOUSTON-15	R2	Houston	1.90	55.00	80.00	67.50	Good	364.73	0.08	0.01	0.10	115.29	93.79	58.28	Medium
HOUSTON-15	R2	Houston	2.00	65.00	95.00	80.00	Good	453.45	0.12	0.01	0.07	143.31	90.96	56.52	Medium
HOUSTON-15	R2	Houston	2.10	74.00	70.00	72.00	Good	353.36	0.13	0.01	0.07	111.62	88.22	54.82	Medium
HOUSTON-15	R2	Houston	2.20	69.00	53.00	61.00	Good	737.18	1.11	0.02	0.53	233.37	90.16	56.03	Medium
HOUSTON-15	R2	Houston	2.30	75.00	56.00	65.50	Good	621.12	0.99	0.02	0.68	196.65	95.43	59.30	Medium
HOUSTON-15	R2	Houston	2.40	83.00	73.00	78.00	Good	723.55	1.18	0.03	0.82	229.14	97.67	60.69	High
HOUSTON-15	R2	Houston	2.50	101.00	93.00	97.00	Fair	616.36	0.97	0.03	0.60	195.16	101.21	62.89	High
HOUSTON-15	R2	Houston	2.60	84.00	67.00	75.50	Good	612.62	0.94	0.03	0.43	193.98	103.21	64.13	High
HOUSTON-15	R2	Houston	2.70	79.00	53.00	66.00	Good	673.31	1.13	0.03	1.10	213.39	104.75	65.09	High
HOUSTON-15	R2	Houston	2.80	85.00	56.00	70.50	Good	664.81	1.19	0.03	0.83	210.53	107.55	66.83	High
HOUSTON-15	R2	Houston	2.90	73.00	53.00	63.00	Good	502.46	0.73	0.02	0.40	159.14	108.73	67.56	High
HOUSTON-15	R2	Houston	3.00	80.00	46.00	63.00	Good	568.15	2.05	0.02	0.46	180.53	107.29	66.67	High
HOUSTON-15	R2	Houston	3.10	72.00	49.00	60.50	Good	350.11	1.77	0.01	0.50	111.52	104.57	64.98	High
HOUSTON-15	R2	Houston	3.20	57.00	53.00	55.00	Very Good	598.88	0.87	0.02	0.73	189.62	102.52	63.70	High
HOUSTON-15	R2	Houston	3.30	76.00	66.00	71.00	Good	592.10	2.36	0.02	0.53	188.21	104.86	65.16	High
HOUSTON-15	R2	Houston	3.40	61.00	65.00	63.00	Good	571.58	1.30	0.02	0.18	181.17	103.43	64.27	High
HOUSTON-15	R2	Houston	3.50	78.00	75.00	76.50	Good	671.72	0.21	0.02	0.12	212.32	104.86	65.16	High
HOUSTON-15	R2	Houston	3.60	89.00	77.00	83.00	Good	430.06	0.46	0.02	0.12	135.98	106.65	66.27	High
HOUSTON-15	R2	Houston	3.70	77.00	59.00	68.00	Good	420.87	0.34	0.01	0.11	133.06	102.35	63.60	High
HOUSTON-15	R2	Houston	3.80	68.00	67.00	67.50	Good	650.14	0.13	0.02	0.12	205.40	101.90	63.32	High
HOUSTON-15	R2	Houston	3.90	56.00	56.00	56.00	Very Good	604.91	0.47	0.03	0.15	191.33	104.45	64.90	High
HOUSTON-15	R2	Houston	4.00	77.00	73.00	75.00	Good	640.77	0.81	0.03	0.40	202.83	105.30	65.43	High
HOUSTON-15	R2	Houston	4.10	60.00	56.00	58.00	Very Good	439.04	2.74	0.02	0.24	140.13	106.59	66.23	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-15	R2	Houston	4.20	74.00	74.00	74.00	Good	668.52	1.40	0.03	0.30	211.87	104.00	64.62	High
HOUSTON-15	R2	Houston	4.30	76.00	62.00	69.00	Good	576.09	2.60	0.03	0.32	183.24	107.63	66.88	High
HOUSTON-15	R2	Houston	4.40	72.00	65.00	68.50	Good	479.05	1.23	0.02	0.21	152.06	105.71	65.68	High
HOUSTON-15	R2	Houston	4.50	70.00	61.00	65.50	Good	410.72	0.55	0.02	0.13	129.91	104.31	64.81	High
HOUSTON-15	R2	Houston	4.60	77.00	72.00	74.50	Good	427.66	0.65	0.02	0.26	135.41	101.38	62.99	High
HOUSTON-15	R2	Houston	4.70	80.00	84.00	82.00	Good	549.92	0.81	0.02	0.30	174.11	100.07	62.18	High
HOUSTON-15	R2	Houston	4.80	86.00	86.00	86.00	Good	370.59	0.72	0.02	0.42	117.50	97.69	60.70	High
HOUSTON-15	R2	Houston	4.90	74.00	53.00	63.50	Good	601.61	1.01	0.03	0.41	190.48	96.09	59.71	Medium
HOUSTON-15	R2	Houston	5.00	95.00	83.00	89.00	Good	532.07	1.37	0.02	0.88	168.80	96.91	60.22	High
HOUSTON-15	R2	Houston	5.10	82.00	60.00	71.00	Good	555.36	1.25	0.02	0.75	176.11	96.50	59.96	Medium
HOUSTON-15	R2	Houston	5.20	78.00	64.00	71.00	Good	553.59	1.05	0.02	0.56	175.36	97.57	60.63	High
HOUSTON-15	R2	Houston	5.30	94.00	75.00	84.50	Good	517.51	0.58	0.02	0.39	163.94	98.95	61.49	High
HOUSTON-15	R3	Houston	0.10	126.00	282.00	204.00	Very Poor	1549.10	1.48	0.00	0.59	489.98	42.55	26.44	Low
HOUSTON-15	R3	Houston	0.20	57.00	62.00	59.50	Very Good	1052.93	0.07	0.00	0.73	332.59	68.87	42.79	Low
HOUSTON-15	R3	Houston	0.30	77.00	91.00	84.00	Good	578.71	0.66	0.00	0.73	183.12	79.42	49.35	Medium
HOUSTON-15	R3	Houston	0.40	87.00	64.00	75.50	Good	77.08	0.32	0.00	0.09	24.55	72.75	45.20	Medium
HOUSTON-15	R3	Houston	0.50	104.00	272.00	188.00	Very Poor	1061.76	0.03	0.00	2.45	335.34	40.02	24.87	Low
HOUSTON-15	R3	Houston	0.60	83.00	290.00	186.50	Very Poor	1107.43	6.52	0.00	2.48	353.02	63.93	39.72	Low
HOUSTON-15	R3	Houston	0.70	82.00	64.00	73.00	Good	708.88	0.51	0.00	2.75	224.11	75.30	46.79	Medium
HOUSTON-15	R3	Houston	0.80	61.00	63.00	62.00	Good	543.87	0.02	0.00	0.67	171.67	79.24	49.24	Medium
HOUSTON-15	R3	Houston	0.90	67.00	56.00	61.50	Good	538.81	0.10	0.00	0.51	170.26	83.15	51.67	Medium
HOUSTON-15	R3	Houston	1.00	61.00	73.00	67.00	Good	360.84	0.21	0.00	0.21	114.07	80.30	49.90	Medium
HOUSTON-15	R3	Houston	1.10	77.00	82.00	79.50	Good	556.86	0.45	0.00	0.42	176.11	80.79	50.20	Medium
HOUSTON-15	R3	Houston	1.20	68.00	97.00	82.50	Good	1001.83	0.00	0.00	1.14	316.36	41.56	25.82	Low
HOUSTON-15	R3	Houston	1.30	113.00	119.00	116.00	Fair	1137.17	0.00	0.01	0.62	359.25	58.61	36.42	Low
HOUSTON-15	R3	Houston	1.40	60.00	57.00	58.50	Very Good	527.06	0.25	0.00	0.14	166.63	69.70	43.31	Low
HOUSTON-15	R3	Houston	1.50	66.00	52.00	59.00	Very Good	557.35	0.35	0.00	0.34	176.28	73.06	45.40	Medium
HOUSTON-15	R3	Houston	1.60	74.00	113.00	93.50	Good	759.22	0.32	0.01	0.69	240.11	78.67	48.88	Medium
HOUSTON-15	R3	Houston	1.70	69.00	86.00	77.50	Good	747.71	0.25	0.02	0.80	236.37	86.04	53.46	Medium
HOUSTON-15	R3	Houston	1.80	74.00	95.00	84.50	Good	675.70	0.12	0.02	0.28	213.46	91.17	56.65	Medium
HOUSTON-15	R3	Houston	1.90	55.00	80.00	67.50	Good	364.73	0.08	0.01	0.10	115.29	93.79	58.28	Medium
HOUSTON-15	R3	Houston	2.00	65.00	95.00	80.00	Good	453.45	0.12	0.01	0.07	143.31	90.96	56.52	Medium
HOUSTON-15	R3	Houston	2.10	74.00	70.00	72.00	Good	353.36	0.13	0.01	0.07	111.62	88.22	54.82	Medium
HOUSTON-15	R3	Houston	2.20	69.00	53.00	61.00	Good	737.18	1.11	0.02	0.53	233.37	90.16	56.03	Medium
HOUSTON-15	R3	Houston	2.30	75.00	56.00	65.50	Good	621.12	0.99	0.02	0.68	196.65	95.43	59.30	Medium
HOUSTON-15	R3	Houston	2.40	83.00	73.00	78.00	Good	723.55	1.18	0.03	0.82	229.14	97.67	60.69	High
HOUSTON-15	R3	Houston	2.50	101.00	93.00	97.00	Fair	616.36	0.97	0.03	0.60	195.16	101.21	62.89	High
HOUSTON-15	R3	Houston	2.60	84.00	67.00	75.50	Good	612.62	0.94	0.03	0.43	193.98	103.21	64.13	High
HOUSTON-15	R3	Houston	2.70	79.00	53.00	66.00	Good	673.31	1.13	0.03	1.10	213.39	104.75	65.09	High
HOUSTON-15	R3	Houston	2.80	85.00	56.00	70.50	Good	664.81	1.19	0.03	0.83	210.53	107.55	66.83	High
HOUSTON-15	R3	Houston	2.90	73.00	53.00	63.00	Good	502.46	0.73	0.02	0.40	159.14	108.73	67.56	High
HOUSTON-15	R3	Houston	3.00	80.00	46.00	63.00	Good	568.15	2.05	0.02	0.46	180.53	107.29	66.67	High
HOUSTON-15	R3	Houston	3.10	72.00	49.00	60.50	Good	350.11	1.77	0.01	0.50	111.52	104.57	64.98	High
HOUSTON-15	R3	Houston	3.20	57.00	53.00	55.00	Very Good	598.88	0.87	0.02	0.73	189.62	102.52	63.70	High
HOUSTON-15	R3	Houston	3.30	76.00	66.00	71.00	Good	592.10	2.36	0.02	0.53	188.21	104.86	65.16	High
HOUSTON-15	R3	Houston	3.40	61.00	65.00	63.00	Good	571.58	1.30	0.02	0.18	181.17	103.43	64.27	High
HOUSTON-15	R3	Houston	3.50	78.00	75.00	76.50	Good	671.72	0.21	0.02	0.12	212.32	104.86	65.16	High
HOUSTON-15	R3	Houston	3.60	89.00	77.00	83.00	Good	430.06	0.46	0.02	0.12	135.98	106.65	66.27	High
HOUSTON-15	R3	Houston	3.70	77.00	59.00	68.00	Good	420.87	0.34	0.01	0.11	133.06	102.35	63.60	High
HOUSTON-15	R3	Houston	3.80	68.00	67.00	67.50	Good	650.14	0.13	0.02	0.12	205.40	101.90	63.32	High
HOUSTON-15	R3	Houston	3.90	56.00	56.00	56.00	Very Good	604.91	0.47	0.03	0.15	191.33	104.45	64.90	High
HOUSTON-15	R3	Houston	4.00	77.00	73.00	75.00	Good	640.77	0.81	0.03	0.40	202.83	105.30	65.43	High
HOUSTON-15	R3	Houston	4.10	60.00	56.00	58.00	Very Good	439.04	2.74	0.02	0.24	140.13	106.59	66.23	High
HOUSTON-15	R3	Houston	4.20	74.00	74.00	74.00	Good	668.52	1.40	0.03	0.30	211.87	104.00	64.62	High
HOUSTON-15	R3	Houston	4.30	76.00	62.00	69.00	Good	576.09	2.60	0.03	0.32	183.24	107.63	66.88	High
HOUSTON-15	R3	Houston	4.40	72.00	65.00	68.50	Good	479.05	1.23	0.02	0.21	152.06	105.71	65.68	High
HOUSTON-15	R3	Houston	4.50	70.00	61.00	65.50	Good	410.72	0.55	0.02	0.13	129.91	104.31	64.81	High
HOUSTON-15	R3	Houston	4.60	77.00	72.00	74.50	Good	427.66	0.65	0.02	0.26	135.41	101.38	62.99	High
HOUSTON-15	R3	Houston	4.70	80.00	84.00	82.00	Good	549.92	0.81	0.02	0.30	174.11	100.07	62.18	High
HOUSTON-15	R3	Houston	4.80	86.00	86.00	86.00	Good	370.59	0.72	0.02	0.42	117.50	97.69	60.70	High
HOUSTON-15	R3	Houston	4.90	74.00	53.00	63.50	Good	601.61	1.01	0.03	0.41	190.48	96.09	59.71	Medium
HOUSTON-15	R3	Houston	5.00	95.00	83.00	89.00	Good	532.07	1.37	0.02	0.88	168.80	96.91	60.22	High
HOUSTON-15	R3	Houston	5.10	82.00	60.00	71.00	Good	555.36	1.25	0.02	0.75	176.11	96.50	59.96	Medium
HOUSTON-15	R3	Houston	5.20	78.00	64.00	71.00	Good	553.59	1.05	0.02	0.56	175.36	97.57	60.63	High
HOUSTON-15	R3	Houston	5.30	94.00	75.00	84.50	Good	517.51	0.58	0.02	0.39	163.94	98.95	61.49	High
HOUSTON-16	R1	Houston	0.10	227.00	258.00	242.50	Very Poor	263.70	0.09	0.32	0.12	83.56	95.54	59.37	Medium
HOUSTON-16	R1	Houston	0.20	143.00	142.00	142.50	Poor	347.96	0.11	0.43	0.27	110.26	100.63	62.53	High
HOUSTON-16	R1	Houston	0.30	158.00	148.00	153.00	Poor	372.60	4.16	0.45	0.27	120.04	108.33	67.31	High
HOUSTON-16	R1	Houston	0.40	175.00	158.00	166.50	Poor	598.60	4.30	0.62	0.21	191.76	115.21	71.59	High
HOUSTON-16	R1	Houston	0.50	181.00	182.00	181.50	Very Poor	720.89	1.30	0.67	0.28	228.96	119.53	74.27	High
HOUSTON-16	R1	Houston	0.60	183.00	173.00	178.00	Very Poor	709.60	2.12	0.63	0.73	225.75	121.77	75.66	High
HOUSTON-16	R1	Houston	0.70	132.00	130.00	131.00	Poor	523.41	2.03	0.43	0.56	166.67	123.61	76.81	High
HOUSTON-16	R1	Houston	0.80	162.00	171.00	166.50	Poor	603.91	1.84	0.47	0.51	192.16	121.62	75.57	High
HOUSTON-16	R1	Houston	0.90	171.00	145.00	158.00	Poor	617.86	1.66	0.49	0.63	196.40	121.66	75.59	High
HOUSTON-16	R1	Houston	1.00	166.00	151.00	158.50	Poor	551.73	0.80	0.44	0.60	175.04	120.40	74.81	High
HOUSTON-16	R1	Houston	1.10	180.00	207.00	193.50	Very Poor	635.31	0.85	0.51	0.48	201.62	119.81	74.45	High
HOUSTON-16	R1	Houston	1.20	130.00	161.00	145.50	Poor	540.76	1.08	0.44	0.29	171.77	120.92	75.14	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-16	R1	Houston	1.30	150.00	161.00	155.50	Poor	473.91	1.94	0.40	0.18	151.03	118.60	73.69	High
HOUSTON-16	R1	Houston	1.40	188.00	204.00	196.00	Very Poor	494.84	0.95	0.44	0.10	157.17	116.30	72.27	High
HOUSTON-16	R1	Houston	1.50	157.00	153.00	155.00	Poor	520.54	0.49	0.44	0.69	165.01	114.22	70.97	High
HOUSTON-16	R1	Houston	1.60	148.00	138.00	143.00	Poor	486.43	3.51	0.40	0.20	155.86	112.96	70.19	High
HOUSTON-16	R1	Houston	1.70	150.00	154.00	152.00	Poor	797.51	0.60	0.67	0.34	252.85	113.05	70.25	High
HOUSTON-16	R1	Houston	1.80	211.00	184.00	197.50	Very Poor	741.88	6.82	0.68	0.55	238.31	116.83	72.59	High
HOUSTON-16	R1	Houston	1.90	164.00	169.00	166.50	Poor	679.51	9.63	0.62	0.90	220.03	118.60	73.69	High
HOUSTON-16	R1	Houston	2.00	198.00	220.00	209.00	Very Poor	502.98	1.98	0.42	0.33	160.08	119.61	74.32	High
HOUSTON-16	R1	Houston	2.10	193.00	180.00	186.50	Very Poor	688.34	2.22	0.53	0.42	219.09	119.00	73.94	High
HOUSTON-16	R1	Houston	2.20	148.00	125.00	136.50	Poor	491.94	1.12	0.36	0.92	156.38	116.83	72.59	High
HOUSTON-16	R1	Houston	2.30	199.00	191.00	195.00	Very Poor	647.45	0.41	0.48	0.93	205.16	111.86	69.51	High
HOUSTON-16	R1	Houston	2.40	176.00	144.00	160.00	Poor	669.05	0.67	0.54	0.82	212.27	111.51	69.29	High
HOUSTON-16	R1	Houston	2.50	188.00	170.00	179.00	Very Poor	397.24	4.01	0.35	0.21	127.90	114.89	71.39	High
HOUSTON-16	R1	Houston	2.60	221.00	183.00	202.00	Very Poor	332.77	0.15	0.28	0.07	105.41	112.87	70.14	High
HOUSTON-16	R1	Houston	2.70	171.00	175.00	173.00	Very Poor	209.83	0.15	0.22	0.05	66.70	107.34	66.70	High
HOUSTON-16	R1	Houston	2.80	168.00	165.00	166.50	Poor	672.55	0.30	0.74	0.19	213.23	104.59	64.99	High
HOUSTON-16	R1	Houston	2.90	155.00	146.00	150.50	Poor	863.84	0.32	0.91	0.41	273.91	109.00	67.73	High
HOUSTON-16	R1	Houston	3.00	124.00	128.00	126.00	Fair	799.98	0.72	0.82	0.43	253.80	114.13	70.92	High
HOUSTON-16	R1	Houston	3.10	146.00	150.00	148.00	Poor	698.56	0.69	0.71	0.24	221.74	117.35	72.92	High
HOUSTON-16	R1	Houston	3.20	146.00	133.00	139.50	Poor	375.91	3.36	0.39	0.45	120.72	118.09	73.38	High
HOUSTON-16	R1	Houston	3.30	123.00	118.00	120.50	Fair	639.61	1.99	0.65	1.69	203.67	114.48	71.14	High
HOUSTON-16	R1	Houston	3.40	153.00	175.00	164.00	Poor	794.92	2.07	0.81	1.02	252.93	116.31	72.27	High
HOUSTON-16	R1	Houston	3.50	111.00	129.00	120.00	Fair	639.15	1.85	0.65	0.56	203.45	118.96	73.92	High
HOUSTON-16	R1	Houston	3.60	137.00	132.00	134.50	Poor	652.99	1.93	0.67	0.50	207.83	120.16	74.67	High
HOUSTON-16	R1	Houston	3.70	145.00	165.00	155.00	Poor	591.96	1.59	0.64	0.40	188.40	120.45	74.84	High
HOUSTON-16	R1	Houston	3.80	201.00	237.00	219.00	Very Poor	701.40	1.56	0.80	0.99	222.97	119.21	74.07	High
HOUSTON-16	R1	Houston	3.90	119.00	139.00	129.00	Fair	690.68	1.28	0.80	0.39	219.61	120.93	75.14	High
HOUSTON-16	R1	Houston	4.00	117.00	120.00	118.50	Fair	699.73	1.06	0.88	1.03	222.35	122.84	76.33	High
HOUSTON-16	R1	Houston	4.10	68.00	71.00	69.50	Good	533.24	0.67	0.73	0.27	169.45	123.86	76.96	High
HOUSTON-16	R1	Houston	4.20	70.00	66.00	68.00	Good	434.33	0.43	0.65	0.20	138.11	120.89	75.12	High
HOUSTON-16	R1	Houston	4.30	72.00	66.00	69.00	Good	425.02	0.24	0.71	0.78	135.00	114.87	71.38	High
HOUSTON-16	R1	Houston	4.40	87.00	77.00	82.00	Good	471.05	0.13	0.82	0.55	149.61	110.05	68.38	High
HOUSTON-16	R1	Houston	4.50	79.00	76.00	77.50	Good	802.52	0.14	1.36	0.33	254.77	110.80	68.85	High
HOUSTON-16	R1	Houston	4.60	101.00	82.00	91.50	Good	760.50	0.39	1.22	0.36	241.54	118.51	73.64	High
HOUSTON-16	R1	Houston	4.70	66.00	75.00	70.50	Good	552.34	2.52	0.86	0.21	176.59	123.47	76.72	High
HOUSTON-16	R1	Houston	4.80	118.00	111.00	114.50	Fair	446.83	1.85	0.66	0.20	142.62	122.76	76.28	High
HOUSTON-16	R1	Houston	4.90	99.00	95.00	97.00	Fair	672.13	2.20	0.62	0.24	213.96	120.61	74.94	High
HOUSTON-16	R1	Houston	5.00	85.00	98.00	91.50	Good	683.28	3.32	0.00	0.16	217.46	121.00	75.19	High
HOUSTON-16	R1	Houston	5.10	89.00	107.00	98.00	Fair	692.61	3.41	0.00	0.24	220.49	122.12	75.88	High
HOUSTON-16	R1	Houston	5.20	78.00	92.00	85.00	Good	662.38	3.43	0.00	0.60	210.85	123.71	76.87	High
HOUSTON-16	R1	Houston	5.30	133.00	147.00	140.00	Poor	702.65	3.55	0.00	0.74	223.65	124.85	77.58	High
HOUSTON-16	R1	Houston	5.40	130.00	140.00	135.00	Poor	736.74	3.68	0.00	1.25	234.59	126.98	78.90	High
HOUSTON-16	R1	Houston	5.50	172.00	170.00	171.00	Very Poor	326.58	2.49	0.00	0.36	104.42	128.50	79.84	High
HOUSTON-16	R1	Houston	5.60	115.00	117.00	116.00	Fair	605.12	2.28	0.00	0.32	192.34	125.48	77.97	High
HOUSTON-16	R1	Houston	5.70	162.00	177.00	169.50	Poor	678.62	1.98	0.00	0.43	215.38	125.98	78.28	High
HOUSTON-16	R1	Houston	5.80	98.00	103.00	100.50	Fair	448.25	1.15	0.00	0.50	142.11	126.41	78.55	High
HOUSTON-16	R1	Houston	5.90	122.00	132.00	127.00	Fair	580.39	1.24	0.00	0.65	183.90	124.07	77.09	High
HOUSTON-16	R1	Houston	6.00	84.00	81.00	82.50	Good	666.41	1.19	0.00	0.37	211.19	124.47	77.34	High
HOUSTON-16	R1	Houston	6.10	85.00	83.00	84.00	Good	617.02	1.00	0.00	0.35	195.40	125.00	77.67	High
HOUSTON-16	R1	Houston	6.20	86.00	87.00	86.50	Good	421.47	2.17	0.00	0.24	134.22	124.58	77.41	High
HOUSTON-16	R1	Houston	6.30	86.00	90.00	88.00	Good	285.33	1.15	0.00	0.09	90.69	120.24	74.71	High
HOUSTON-16	R1	Houston	6.40	87.00	85.00	86.00	Good	137.70	2.83	0.00	0.03	45.01	115.50	71.77	High
HOUSTON-16	R1	Houston	6.50	81.00	79.00	80.00	Good	5.62	0.12	0.00	0.02	1.78	100.25	62.29	High
HOUSTON-16	R1	Houston	6.60	76.00	73.00	74.50	Good	4.96	0.09	0.00	0.02	1.33	87.49	54.37	Medium
HOUSTON-16	R2	Houston	0.10	227.00	258.00	242.50	Very Poor	573.59	0.57	0.01	0.33	181.52	89.91	55.87	Medium
HOUSTON-16	R2	Houston	0.20	143.00	142.00	142.50	Poor	827.93	1.29	0.02	1.16	262.10	90.67	56.34	Medium
HOUSTON-16	R2	Houston	0.30	158.00	148.00	153.00	Poor	749.80	1.41	0.02	1.05	237.52	97.86	60.81	High
HOUSTON-16	R2	Houston	0.40	175.00	158.00	166.50	Poor	499.83	2.13	0.01	1.56	158.97	102.73	63.83	High
HOUSTON-16	R2	Houston	0.50	181.00	182.00	181.50	Very Poor	792.35	3.29	0.02	1.60	251.91	110.14	68.44	High
HOUSTON-16	R2	Houston	0.60	183.00	173.00	178.00	Very Poor	669.02	3.02	0.02	1.37	212.79	115.45	71.74	High
HOUSTON-16	R2	Houston	0.70	132.00	130.00	131.00	Poor	593.45	2.78	0.09	0.66	188.83	117.75	73.17	High
HOUSTON-16	R2	Houston	0.80	162.00	171.00	166.50	Poor	538.73	2.55	0.12	0.47	171.57	117.45	72.98	High
HOUSTON-16	R2	Houston	0.90	171.00	145.00	158.00	Poor	540.98	2.33	0.13	0.53	172.11	115.76	71.93	High
HOUSTON-16	R2	Houston	1.00	166.00	151.00	158.50	Poor	511.01	1.81	0.13	0.41	162.51	114.98	71.45	High
HOUSTON-16	R2	Houston	1.10	180.00	207.00	193.50	Very Poor	547.98	1.39	0.14	1.16	173.91	113.34	70.42	High
HOUSTON-16	R2	Houston	1.20	130.00	161.00	145.50	Poor	657.21	0.92	0.17	0.87	208.27	113.03	70.24	High
HOUSTON-16	R2	Houston	1.30	150.00	161.00	155.50	Poor	649.04	0.66	0.16	0.18	205.55	114.40	71.08	High
HOUSTON-16	R2	Houston	1.40	188.00	204.00	196.00	Very Poor	650.34	0.69	0.17	0.19	205.87	116.36	72.30	High
HOUSTON-16	R2	Houston	1.50	157.00	153.00	155.00	Poor	653.39	0.71	0.17	0.23	206.84	117.00	72.70	High
HOUSTON-16	R2	Houston	1.60	148.00	138.00	143.00	Poor	573.89	0.54	0.15	0.27	181.71	116.42	72.34	High
HOUSTON-16	R2	Houston	1.70	150.00	154.00	152.00	Poor	663.34	0.62	0.18	0.25	210.01	115.41	71.71	High
HOUSTON-16	R2	Houston	1.80	211.00	184.00	197.50	Very Poor	604.68	0.59	0.17	0.22	191.45	116.78	72.57	High
HOUSTON-16	R2	Houston	1.90	164.00	169.00	166.50	Poor	469.44	0.48	0.12	0.19	148.54	115.81	71.96	High
HOUSTON-16	R2	Houston	2.00	198.00	220.00	209.00	Very Poor	607.50	0.69	0.16	0.48	192.40	113.51	70.53	High
HOUSTON-16	R2	Houston	2.10	193.00	180.00	186.50	Very Poor	572.66	0.76	0.16	0.27	181.43	113.96	70.81	High
HOUSTON-16	R2	Houston	2.20	148.00	125.00	136.50	Poor	634.05	1.11	0.18	0.66	200.95	112.62	69.98	High
HOUSTON-16	R2	Houston	2.30	199.00	191.00	195.00	Very Poor	764.22	1.60	0.22	0.60	242.39	109.17	67.84	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-16	R2	Houston	2.40	176.00	144.00	160.00	Poor	707.65	1.71	0.20	0.89	224.58	110.61	68.73	High
HOUSTON-16	R2	Houston	2.50	188.00	170.00	179.00	Very Poor	444.59	4.14	0.13	0.20	142.62	113.00	70.21	High
HOUSTON-16	R2	Houston	2.60	221.00	183.00	202.00	Very Poor	433.96	0.96	0.13	0.05	137.66	112.90	70.15	High
HOUSTON-16	R2	Houston	2.70	171.00	175.00	173.00	Very Poor	576.37	1.84	0.17	0.30	183.25	109.85	68.26	High
HOUSTON-16	R2	Houston	2.80	168.00	165.00	166.50	Poor	663.47	1.00	0.19	0.57	210.30	110.97	68.96	High
HOUSTON-16	R2	Houston	2.90	155.00	146.00	150.50	Poor	394.01	0.80	0.11	0.22	124.98	110.97	68.95	High
HOUSTON-16	R2	Houston	3.00	124.00	128.00	126.00	Fair	778.30	1.11	0.21	1.27	246.56	109.67	68.14	High
HOUSTON-16	R2	Houston	3.10	146.00	150.00	148.00	Poor	686.35	1.33	0.18	1.04	217.69	112.33	69.80	High
HOUSTON-16	R2	Houston	3.20	146.00	133.00	139.50	Poor	592.10	1.25	0.16	0.75	187.79	112.88	70.14	High
HOUSTON-16	R2	Houston	3.30	123.00	118.00	120.50	Fair	445.90	1.11	0.12	0.34	141.38	111.68	69.40	High
HOUSTON-16	R2	Houston	3.40	153.00	175.00	164.00	Poor	548.86	1.34	0.15	0.54	174.16	109.32	67.93	High
HOUSTON-16	R2	Houston	3.50	111.00	129.00	120.00	Fair	519.19	1.33	0.14	0.52	164.85	108.51	67.43	High
HOUSTON-16	R2	Houston	3.60	137.00	132.00	134.50	Poor	580.36	1.59	0.16	0.81	184.29	107.33	66.69	High
HOUSTON-16	R2	Houston	3.70	145.00	165.00	155.00	Poor	613.31	1.73	0.16	0.68	194.72	108.00	67.11	High
HOUSTON-16	R2	Houston	3.80	201.00	237.00	219.00	Very Poor	598.44	1.66	0.16	1.07	189.97	107.91	67.05	High
HOUSTON-16	R2	Houston	3.90	119.00	139.00	129.00	Fair	641.28	1.60	0.17	0.61	203.61	108.22	67.25	High
HOUSTON-16	R2	Houston	4.00	117.00	120.00	118.50	Fair	589.74	1.36	0.16	0.71	187.03	109.76	68.20	High
HOUSTON-16	R2	Houston	4.10	68.00	71.00	69.50	Good	680.49	1.57	0.19	1.36	215.86	110.24	68.50	High
HOUSTON-16	R2	Houston	4.20	70.00	66.00	68.00	Good	708.61	1.91	0.20	1.45	224.98	111.66	69.38	High
HOUSTON-16	R2	Houston	4.30	72.00	66.00	69.00	Good	722.72	2.74	0.19	0.73	229.82	111.69	69.40	High
HOUSTON-16	R2	Houston	4.40	87.00	77.00	82.00	Good	717.37	3.28	0.19	1.28	228.44	111.17	69.08	High
HOUSTON-16	R2	Houston	4.50	79.00	76.00	77.50	Good	621.04	2.46	0.17	0.73	197.54	113.19	70.34	High
HOUSTON-16	R2	Houston	4.60	101.00	82.00	91.50	Good	364.43	2.63	0.10	0.37	116.47	115.54	71.80	High
HOUSTON-16	R2	Houston	4.70	66.00	75.00	70.50	Good	135.26	0.77	0.04	0.12	43.06	113.75	70.68	High
HOUSTON-16	R2	Houston	4.80	118.00	111.00	114.50	Fair	317.87	0.47	0.09	0.20	100.62	106.71	66.31	High
HOUSTON-16	R2	Houston	4.90	99.00	95.00	97.00	Fair	596.89	1.53	0.16	0.18	189.45	104.80	65.12	High
HOUSTON-16	R2	Houston	5.00	85.00	98.00	91.50	Good	583.51	1.26	0.16	0.14	184.99	104.08	64.67	High
HOUSTON-16	R2	Houston	5.10	89.00	107.00	98.00	Fair	708.68	1.47	0.19	0.45	224.72	107.78	66.97	High
HOUSTON-16	R2	Houston	5.20	78.00	92.00	85.00	Good	360.49	1.49	0.09	0.17	114.67	108.06	67.15	High
HOUSTON-16	R2	Houston	5.30	133.00	147.00	140.00	Poor	603.94	3.06	0.15	0.61	192.33	105.98	65.85	High
HOUSTON-16	R2	Houston	5.40	130.00	140.00	135.00	Poor	399.39	2.15	0.10	0.73	127.35	106.69	66.29	High
HOUSTON-16	R2	Houston	5.50	172.00	170.00	171.00	Very Poor	518.09	2.52	0.13	0.94	165.00	104.15	64.72	High
HOUSTON-16	R2	Houston	5.60	115.00	117.00	116.00	Fair	454.14	2.82	0.11	0.59	144.95	102.76	63.85	High
HOUSTON-16	R2	Houston	5.70	162.00	177.00	169.50	Poor	635.55	2.86	0.16	0.38	202.38	100.46	62.42	High
HOUSTON-16	R2	Houston	5.80	98.00	103.00	100.50	Fair	763.15	3.00	0.19	0.92	242.67	103.07	64.04	High
HOUSTON-16	R2	Houston	5.90	122.00	132.00	127.00	Fair	502.86	5.47	0.12	0.25	161.62	105.41	65.50	High
HOUSTON-16	R2	Houston	6.00	84.00	81.00	82.50	Good	455.22	2.68	0.10	0.13	145.22	102.95	63.97	High
HOUSTON-16	R2	Houston	6.10	85.00	83.00	84.00	Good	762.13	2.82	0.15	0.87	242.29	102.74	63.84	High
HOUSTON-16	R2	Houston	6.20	86.00	87.00	86.50	Good	446.78	2.17	0.08	0.37	142.30	106.03	65.88	High
HOUSTON-16	R2	Houston	6.30	86.00	90.00	88.00	Good	889.88	2.50	0.15	1.23	282.47	106.42	66.13	High
HOUSTON-16	R2	Houston	6.40	87.00	85.00	86.00	Good	827.70	5.26	0.14	1.53	264.14	111.62	69.36	High
HOUSTON-16	R2	Houston	6.50	81.00	79.00	80.00	Good	439.73	5.72	0.08	0.81	141.81	116.02	72.09	High
HOUSTON-16	R2	Houston	6.60	76.00	73.00	74.50	Good	58.56	1.46	0.03	0.11	19.14	113.71	70.66	High
HOUSTON-17	R1	Houston	0.10	72.00	66.00	69.00	Good	806.53	3.01	0.00	0.40	256.28	65.28	40.80	Low
HOUSTON-17	R1	Houston	0.20	66.00	55.00	60.50	Good	715.73	1.53	0.00	0.16	226.75	70.68	44.18	Low
HOUSTON-17	R1	Houston	0.30	39.00	41.00	40.00	Very Good	841.25	2.45	0.00	0.66	266.92	78.31	48.95	Medium
HOUSTON-17	R1	Houston	0.40	82.00	75.00	78.50	Good	658.12	1.87	0.00	0.93	208.67	88.49	55.31	Medium
HOUSTON-17	R1	Houston	0.50	65.00	78.00	71.50	Good	369.59	0.97	0.00	0.21	117.19	91.93	57.46	Medium
HOUSTON-17	R1	Houston	0.60	74.00	69.00	71.50	Good	365.87	0.84	0.00	0.08	115.92	90.25	56.41	Medium
HOUSTON-17	R1	Houston	0.70	257.00	271.00	264.00	Very Poor	269.94	0.57	0.00	0.00	85.47	88.40	55.25	Medium
HOUSTON-17	R1	Houston	0.80	88.00	104.00	96.00	Fair	541.92	1.25	0.00	0.16	171.79	87.65	54.78	Medium
HOUSTON-17	R1	Houston	0.90	78.00	98.00	88.00	Good	304.98	0.71	0.00	0.04	96.62	86.74	54.21	Medium
HOUSTON-17	R1	Houston	1.00	73.00	93.00	83.00	Good	52.05	0.22	0.00	0.01	16.46	81.84	51.15	Medium
HOUSTON-17	R1	Houston	1.10	61.00	92.00	76.50	Good	248.63	0.63	0.00	0.07	78.80	73.07	45.67	Medium
HOUSTON-17	R1	Houston	1.20	48.00	76.00	62.00	Good	560.91	1.67	0.00	0.13	178.04	72.74	45.46	Medium
HOUSTON-17	R1	Houston	1.30	58.00	60.00	59.00	Very Good	124.70	0.57	0.00	0.04	39.59	74.61	46.63	Medium
HOUSTON-17	R1	Houston	1.40	66.00	59.00	62.50	Good	980.12	3.81	0.18	0.48	311.37	35.87	22.42	Low
HOUSTON-17	R1	Houston	1.50	54.00	54.00	54.00	Very Good	775.52	1.17	0.16	0.03	245.68	52.96	33.10	Low
HOUSTON-17	R1	Houston	1.60	78.00	51.00	64.50	Good	505.19	0.57	0.11	0.00	159.90	65.85	41.16	Low
HOUSTON-17	R1	Houston	1.70	106.00	64.00	85.00	Good	398.09	0.41	0.09	0.00	126.07	69.94	43.71	Low
HOUSTON-17	R1	Houston	1.80	90.00	68.00	79.00	Good	601.72	1.51	0.13	0.00	190.82	70.41	44.00	Low
HOUSTON-17	R1	Houston	1.90	87.00	85.00	86.00	Good	655.50	0.43	0.14	0.01	207.43	72.26	45.16	Medium
HOUSTON-17	R1	Houston	2.00	64.00	88.00	76.00	Good	542.22	0.26	0.11	0.10	171.52	76.43	47.77	Medium
HOUSTON-17	R1	Houston	2.10	68.00	102.00	85.00	Good	253.82	0.11	0.06	0.27	80.19	74.67	46.67	Medium
HOUSTON-17	R1	Houston	2.20	329.00	361.00	345.00	Very Poor	509.30	0.14	0.11	1.22	161.06	73.27	45.79	Medium
HOUSTON-17	R1	Houston	2.30	119.00	99.00	109.00	Fair	683.67	0.23	0.15	0.09	216.13	77.07	48.17	Medium
HOUSTON-17	R1	Houston	2.40	53.00	59.00	56.00	Very Good	178.28	0.05	0.03	0.01	56.32	78.87	49.30	Medium
HOUSTON-17	R1	Houston	2.50	69.00	63.00	66.00	Good	389.78	0.05	0.04	0.10	123.16	73.06	45.66	Medium
HOUSTON-17	R1	Houston	2.60	82.00	74.00	78.00	Good	419.54	0.04	0.05	0.02	132.62	76.13	47.58	Medium
HOUSTON-17	R1	Houston	2.70	85.00	106.00	95.50	Good	111.86	0.02	0.01	0.03	35.30	74.48	46.55	Medium
HOUSTON-17	R1	Houston	2.80	115.00	94.00	104.50	Fair	129.95	0.01	0.01	0.01	41.00	68.89	43.06	Low
HOUSTON-17	R1	Houston	2.90	69.00	60.00	64.50	Good	996.42	0.12	0.11	0.26	314.85	37.52	23.45	Low
HOUSTON-17	R1	Houston	3.00	77.00	74.00	75.50	Good	1271.04	0.43	0.15	0.56	401.78	55.03	34.39	Low
HOUSTON-17	R1	Houston	3.10	62.00	62.00	62.00	Good	927.46	0.26	0.11	0.59	293.13	70.84	44.28	Low
HOUSTON-17	R1	Houston	3.20	84.00	74.00	79.00	Good	449.66	3.00	0.05	0.27	143.57	80.70	50.44	Medium
HOUSTON-17	R1	Houston	3.30	71.00	66.00	68.50	Good	216.38	0.36	0.03	0.06	68.46	79.29	49.55	Medium
HOUSTON-17	R1	Houston	3.40	65.00	61.00	63.00	Good	314.62	0.19	0.04	0.16	99.49	74.87	46.79	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-17	R1	Houston	3.50	68.00	90.00	79.00	Good	434.18	0.16	0.05	0.20	137.22	74.30	46.44	Medium
HOUSTON-17	R1	Houston	3.60	109.00	119.00	114.00	Fair	293.51	0.05	0.04	0.13	92.75	75.22	47.01	Medium
HOUSTON-17	R1	Houston	3.70	182.00	155.00	168.50	Poor	712.47	0.07	0.09	0.11	225.12	75.41	47.13	Medium
HOUSTON-17	R1	Houston	3.80	108.00	111.00	109.50	Fair	632.13	0.03	0.08	0.05	199.76	81.34	50.84	Medium
HOUSTON-17	R1	Houston	3.90	77.00	85.00	81.00	Good	234.84	0.02	0.03	0.05	74.20	82.24	51.40	Medium
HOUSTON-17	R1	Houston	4.00	80.00	74.00	77.00	Good	139.04	0.01	0.02	0.10	43.95	71.45	44.65	Low
HOUSTON-17	R1	Houston	4.10	58.00	61.00	59.50	Very Good	88.23	0.01	0.02	0.06	27.93	63.70	39.81	Low
HOUSTON-17	R1	Houston	4.20	87.00	80.00	83.50	Good	1880.82	6.56	0.48	1.40	597.88	39.54	24.72	Low
HOUSTON-17	R1	Houston	4.30	93.00	67.00	80.00	Good	1142.91	0.86	0.29	1.08	361.72	74.37	46.48	Medium
HOUSTON-17	R1	Houston	4.40	86.00	70.00	78.00	Good	714.70	0.65	0.18	0.78	226.36	86.98	54.36	Medium
HOUSTON-17	R1	Houston	4.50	61.00	58.00	59.50	Very Good	453.77	0.89	0.11	0.20	143.85	91.03	56.89	Medium
HOUSTON-17	R1	Houston	4.60	77.00	79.00	78.00	Good	239.35	0.56	0.06	0.00	75.85	88.35	55.22	Medium
HOUSTON-17	R1	Houston	4.70	58.00	59.00	58.50	Very Good	481.69	0.91	0.11	0.20	152.64	86.15	53.84	Medium
HOUSTON-17	R1	Houston	4.80	80.00	72.00	76.00	Good	317.95	0.69	0.07	0.07	100.68	87.00	54.38	Medium
HOUSTON-17	R1	Houston	4.90	79.00	70.00	74.50	Good	258.65	0.54	0.06	0.09	82.04	86.53	54.08	Medium
HOUSTON-17	R1	Houston	5.00	75.00	65.00	70.00	Good	491.33	0.85	0.12	0.26	155.79	85.13	53.20	Medium
HOUSTON-17	R1	Houston	5.10	110.00	107.00	108.50	Fair	571.59	0.76	0.14	0.72	181.04	86.40	54.00	Medium
HOUSTON-17	R1	Houston	5.20	57.00	60.00	58.50	Very Good	449.08	0.36	0.11	0.23	142.14	87.06	54.41	Medium
HOUSTON-17	R1	Houston	5.30	60.00	64.00	62.00	Good	282.52	0.13	0.06	0.08	89.42	87.40	54.62	Medium
HOUSTON-17	R1	Houston	5.40	46.00	61.00	53.50	Very Good	495.95	0.12	0.11	0.36	156.88	84.17	52.60	Medium
HOUSTON-17	R1	Houston	5.50	79.00	60.00	69.50	Good	843.78	0.15	0.19	0.62	266.75	86.82	54.26	Medium
HOUSTON-17	R1	Houston	5.60	58.00	56.00	57.00	Very Good	412.47	0.17	0.10	0.14	130.36	95.52	59.70	Medium
HOUSTON-17	R1	Houston	5.70	54.00	60.00	57.00	Very Good	206.60	0.89	0.05	0.04	65.63	90.63	56.64	Medium
HOUSTON-17	R1	Houston	5.80	54.00	56.00	55.00	Very Good	503.36	0.33	0.12	0.07	159.24	86.92	54.33	Medium
HOUSTON-17	R1	Houston	5.90	46.00	48.00	47.00	Very Good	487.50	0.33	0.11	0.07	154.20	90.51	56.57	Medium
HOUSTON-17	R1	Houston	6.00	46.00	49.00	47.50	Very Good	98.20	0.23	0.04	0.01	31.23	90.70	56.69	Medium
HOUSTON-17	R1	Houston	6.10	67.00	51.00	59.00	Very Good	500.13	0.62	0.12	0.06	158.27	87.01	54.38	Medium
HOUSTON-17	R1	Houston	6.20	87.00	98.00	92.50	Good	417.73	0.51	0.10	0.01	132.46	88.94	55.59	Medium
HOUSTON-17	R1	Houston	6.30	58.00	80.00	69.00	Good	211.32	0.35	0.05	0.00	66.89	85.44	53.40	Medium
HOUSTON-17	R1	Houston	6.40	61.00	57.00	59.00	Very Good	644.98	0.96	0.15	0.45	204.28	84.12	52.57	Medium
HOUSTON-17	R1	Houston	6.50	62.00	67.00	64.50	Good	406.40	0.82	0.10	0.38	128.90	86.72	54.20	Medium
HOUSTON-17	R1	Houston	6.60	82.00	69.00	75.50	Good	688.46	1.19	0.16	0.80	218.18	85.71	53.57	Medium
HOUSTON-17	R1	Houston	6.70	61.00	66.00	63.50	Good	204.67	0.59	0.05	0.12	65.06	86.04	53.78	Medium
HOUSTON-17	R1	Houston	6.80	105.00	103.00	104.00	Fair	429.62	0.08	0.10	0.43	135.76	78.66	49.16	Medium
HOUSTON-17	R1	Houston	6.90	93.00	75.00	84.00	Good	756.01	0.27	0.18	0.44	239.14	81.00	50.63	Medium
HOUSTON-17	R1	Houston	7.00	115.00	110.00	112.50	Fair	820.83	0.62	0.19	1.15	259.78	89.62	56.01	Medium
HOUSTON-17	R1	Houston	7.10	78.00	58.00	68.00	Good	415.64	0.44	0.10	0.46	131.60	94.90	59.31	Medium
HOUSTON-17	R1	Houston	7.20	71.00	65.00	68.00	Good	295.28	0.40	0.07	0.73	93.46	92.70	57.94	Medium
HOUSTON-17	R1	Houston	7.30	102.00	115.00	108.50	Fair	422.65	0.50	0.10	1.69	133.89	89.98	56.24	Medium
HOUSTON-17	R1	Houston	7.40	85.00	114.00	99.50	Fair	91.61	0.13	0.04	0.11	29.04	83.42	52.14	Medium
HOUSTON-17	R1	Houston	7.50	67.00	72.00	69.50	Good	573.66	0.35	0.14	0.16	181.60	81.06	50.66	Medium
HOUSTON-17	R1	Houston	7.60	73.00	88.00	80.50	Good	565.23	0.38	0.13	0.15	178.98	86.17	53.85	Medium
HOUSTON-17	R1	Houston	7.70	53.00	111.00	82.00	Good	292.07	0.29	0.08	0.10	92.47	83.99	52.50	Medium
HOUSTON-17	R1	Houston	7.80	56.00	90.00	73.00	Good	471.13	0.72	0.11	0.08	149.15	86.57	54.11	Medium
HOUSTON-17	R1	Houston	7.90	72.00	77.00	74.50	Good	146.82	0.33	0.04	0.04	46.47	82.18	51.36	Medium
HOUSTON-17	R1	Houston	8.00	64.00	54.00	59.00	Very Good	411.04	0.05	0.09	0.05	129.97	74.92	46.83	Medium
HOUSTON-17	R1	Houston	8.10	52.00	54.00	53.00	Very Good	407.57	0.02	0.09	0.06	128.78	75.36	47.10	Medium
HOUSTON-17	R1	Houston	8.20	46.00	45.00	45.50	Very Good	272.91	0.00	0.07	0.09	86.31	70.30	43.94	Low
HOUSTON-17	R1	Houston	8.30	51.00	45.00	48.00	Very Good	337.68	0.00	0.08	0.01	106.82	75.11	46.94	Medium
HOUSTON-17	R1	Houston	8.40	58.00	60.00	59.00	Very Good	225.02	0.01	0.06	0.21	71.11	67.37	42.11	Low
HOUSTON-17	R1	Houston	8.50	59.00	59.00	59.00	Very Good	728.01	0.08	0.17	0.15	230.03	71.27	44.54	Low
HOUSTON-17	R1	Houston	8.60	70.00	67.00	68.50	Good	308.75	0.11	0.07	0.00	97.71	74.01	46.26	Medium
HOUSTON-17	R1	Houston	8.70	103.00	114.00	108.50	Fair	612.64	0.14	0.14	0.04	193.70	73.73	46.08	Medium
HOUSTON-17	R1	Houston	8.80	56.00	49.00	52.50	Very Good	571.61	0.06	0.13	0.00	180.75	78.51	49.07	Medium
HOUSTON-17	R1	Houston	8.90	50.00	67.00	58.50	Very Good	253.08	0.02	0.06	0.00	80.06	78.94	49.34	Medium
HOUSTON-17	R1	Houston	9.00	78.00	78.00	78.00	Good	247.91	0.00	0.06	0.00	78.27	74.37	46.48	Medium
HOUSTON-17	R1	Houston	9.10	63.00	54.00	58.50	Very Good	365.22	0.00	0.08	0.00	115.55	72.05	45.03	Medium
HOUSTON-17	R1	Houston	9.20	85.00	72.00	78.50	Good	597.44	0.00	0.13	0.06	188.84	71.86	44.91	Low
HOUSTON-17	R1	Houston	9.30	43.00	53.00	48.00	Very Good	426.39	0.05	0.10	0.23	134.88	73.79	46.12	Medium
HOUSTON-17	R1	Houston	9.40	57.00	51.00	54.00	Very Good	456.30	0.06	0.10	0.02	144.23	74.43	46.52	Medium
HOUSTON-17	R1	Houston	9.50	49.00	49.00	49.00	Very Good	557.77	0.03	0.12	0.00	176.15	76.83	48.02	Medium
HOUSTON-17	R1	Houston	9.60	48.00	47.00	47.50	Very Good	509.81	0.01	0.11	0.00	161.09	79.86	49.91	Medium
HOUSTON-17	R1	Houston	9.70	46.00	46.00	46.00	Very Good	576.18	0.12	0.13	0.01	182.09	80.35	50.22	Medium
HOUSTON-17	R1	Houston	9.80	46.00	43.00	44.50	Very Good	707.66	0.29	0.16	0.13	223.87	85.21	53.26	Medium
HOUSTON-17	R1	Houston	9.90	56.00	55.00	55.50	Very Good	784.97	0.22	0.18	0.46	248.15	90.79	56.74	Medium
HOUSTON-17	R1	Houston	10.00	59.00	63.00	61.00	Good	457.83	4.10	0.11	0.21	146.80	97.51	60.94	High
HOUSTON-17	R1	Houston	10.10	59.00	68.00	63.50	Good	19.00	1.44	0.03	0.02	6.87	89.85	56.16	Medium
HOUSTON-17	R1	Houston	10.20	46.00	62.00	54.00	Very Good	223.12	0.29	0.06	0.06	70.64	80.31	50.19	Medium
HOUSTON-17	R1	Houston	10.30	53.00	69.00	61.00	Good	518.76	1.12	0.12	0.13	164.55	79.32	49.57	Medium
HOUSTON-17	R1	Houston	10.40	58.00	67.00	62.50	Good	375.03	2.09	0.09	0.02	119.57	80.73	50.46	Medium
HOUSTON-17	R1	Houston	10.50	72.00	97.00	84.50	Good	90.49	0.45	0.03	0.17	28.99	66.73	41.71	Low
HOUSTON-17	R2	Houston	0.10	72.00	66.00	69.00	Good	863.76	0.96	0.11	0.71	273.38	70.57	44.11	Low
HOUSTON-17	R2	Houston	0.20	66.00	55.00	60.50	Good	971.04	0.88	0.12	0.87	307.34	81.94	51.21	Medium
HOUSTON-17	R2	Houston	0.30	39.00	41.00	40.00	Very Good	767.50	0.73	0.09	0.61	242.93	90.09	56.31	Medium
HOUSTON-17	R2	Houston	0.40	82.00	75.00	78.50	Good	529.94	1.26	0.06	0.22	168.03	95.91	59.94	Medium
HOUSTON-17	R2	Houston	0.50	65.00	78.00	71.50	Good	176.90	0.25	0.02	0.01	55.98	94.86	59.29	Medium
HOUSTON-17	R2	Houston	0.60	74.00	69.00	71.50	Good	208.48	0.11	0.02	0.21	65.83	89.86	56.16	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-17	R2	Houston	0.70	257.00	271.00	264.00	Very Poor	701.04	0.37	0.05	0.52	221.63	90.21	56.38	Medium
HOUSTON-17	R2	Houston	0.80	88.00	104.00	96.00	Fair	642.01	0.34	0.05	0.60	203.02	95.94	59.96	Medium
HOUSTON-17	R2	Houston	0.90	78.00	98.00	88.00	Good	288.76	0.87	0.03	0.20	91.62	97.68	61.05	High
HOUSTON-17	R2	Houston	1.00	73.00	93.00	83.00	Good	600.60	0.01	0.06	0.42	189.61	95.57	59.73	Medium
HOUSTON-17	R2	Houston	1.10	61.00	92.00	76.50	Good	569.62	0.00	0.06	0.06	179.83	98.96	61.85	High
HOUSTON-17	R2	Houston	1.20	48.00	76.00	62.00	Good	375.21	0.03	0.03	0.00	118.60	97.56	60.97	High
HOUSTON-17	R2	Houston	1.30	58.00	60.00	59.00	Very Good	45.39	0.02	0.01	0.01	14.32	88.17	55.11	Medium
HOUSTON-17	R2	Houston	1.40	66.00	59.00	62.50	Good	921.54	8.80	0.09	0.42	295.57	37.46	23.41	Low
HOUSTON-17	R2	Houston	1.50	54.00	54.00	54.00	Very Good	868.19	2.77	0.10	0.16	275.73	47.63	29.77	Low
HOUSTON-17	R2	Houston	1.60	78.00	51.00	64.50	Good	967.74	0.42	0.11	0.50	306.11	65.61	41.00	Low
HOUSTON-17	R2	Houston	1.70	106.00	64.00	85.00	Good	932.44	0.39	0.10	1.44	294.76	80.18	50.11	Medium
HOUSTON-17	R2	Houston	1.80	90.00	68.00	79.00	Good	799.81	0.41	0.08	0.61	252.94	89.62	56.01	Medium
HOUSTON-17	R2	Houston	1.90	87.00	85.00	86.00	Good	372.24	2.54	0.03	0.21	118.91	89.74	56.09	Medium
HOUSTON-17	R2	Houston	2.00	64.00	88.00	76.00	Good	622.21	1.78	0.05	0.54	197.42	87.61	54.75	Medium
HOUSTON-17	R2	Houston	2.10	68.00	102.00	85.00	Good	604.75	0.67	0.05	0.25	191.42	90.64	56.65	Medium
HOUSTON-17	R2	Houston	2.20	329.00	361.00	345.00	Very Poor	459.38	0.38	0.04	0.28	145.36	91.38	57.11	Medium
HOUSTON-17	R2	Houston	2.30	119.00	99.00	109.00	Fair	663.84	0.61	0.06	0.45	210.04	91.00	56.88	Medium
HOUSTON-17	R2	Houston	2.40	53.00	59.00	56.00	Very Good	724.42	2.24	0.07	0.46	229.90	96.54	60.34	High
HOUSTON-17	R2	Houston	2.50	69.00	63.00	66.00	Good	592.64	2.18	0.05	0.62	188.33	101.13	63.20	High
HOUSTON-17	R2	Houston	2.60	82.00	74.00	78.00	Good	154.93	0.95	0.01	0.06	49.25	99.02	61.89	High
HOUSTON-17	R2	Houston	2.70	85.00	106.00	95.50	Good	126.17	0.17	0.01	0.01	40.03	93.56	58.47	Medium
HOUSTON-17	R2	Houston	2.80	115.00	94.00	104.50	Fair	102.43	0.11	0.01	0.02	32.40	87.42	54.64	Medium
HOUSTON-17	R2	Houston	2.90	69.00	60.00	64.50	Good	456.36	0.25	0.04	0.17	144.36	49.01	30.63	Low
HOUSTON-17	R2	Houston	3.00	77.00	74.00	75.50	Good	879.90	0.24	0.07	0.02	278.00	47.70	29.81	Low
HOUSTON-17	R2	Houston	3.10	62.00	62.00	62.00	Good	1049.86	0.81	0.09	0.29	331.95	60.54	37.84	Low
HOUSTON-17	R2	Houston	3.20	84.00	74.00	79.00	Good	550.47	0.43	0.05	0.23	174.16	73.43	45.89	Medium
HOUSTON-17	R2	Houston	3.30	71.00	66.00	68.50	Good	489.56	0.34	0.04	0.19	154.81	76.69	47.93	Medium
HOUSTON-17	R2	Houston	3.40	65.00	61.00	63.00	Good	529.56	0.37	0.04	0.09	167.48	79.24	49.53	Medium
HOUSTON-17	R2	Houston	3.50	68.00	90.00	79.00	Good	397.68	0.19	0.03	0.00	125.82	80.65	50.41	Medium
HOUSTON-17	R2	Houston	3.60	109.00	119.00	114.00	Fair	639.67	0.19	0.05	0.06	202.09	84.99	53.12	Medium
HOUSTON-17	R2	Houston	3.70	182.00	155.00	168.50	Poor	509.04	0.12	0.04	0.03	160.79	87.95	54.97	Medium
HOUSTON-17	R2	Houston	3.80	108.00	111.00	109.50	Fair	361.96	0.23	0.03	0.01	114.48	86.47	54.04	Medium
HOUSTON-17	R2	Houston	3.90	77.00	85.00	81.00	Good	487.19	0.53	0.04	0.02	154.29	84.28	52.68	Medium
HOUSTON-17	R2	Houston	4.00	80.00	74.00	77.00	Good	381.24	0.55	0.03	0.01	120.81	84.96	53.10	Medium
HOUSTON-17	R2	Houston	4.10	58.00	61.00	59.50	Very Good	41.24	0.11	0.01	0.01	13.06	78.30	48.94	Medium
HOUSTON-17	R2	Houston	4.20	87.00	80.00	83.50	Good	266.76	0.21	0.02	0.02	84.55	70.55	44.09	Low
HOUSTON-17	R2	Houston	4.30	93.00	67.00	80.00	Good	706.58	1.34	0.06	0.05	223.93	76.22	47.64	Medium
HOUSTON-17	R2	Houston	4.40	86.00	70.00	78.00	Good	473.61	2.99	0.04	0.00	151.17	83.65	52.28	Medium
HOUSTON-17	R2	Houston	4.50	61.00	58.00	59.50	Very Good	352.27	0.31	0.03	0.03	111.55	84.76	52.97	Medium
HOUSTON-17	R2	Houston	4.60	77.00	79.00	78.00	Good	52.62	0.28	0.01	0.11	16.71	74.35	46.47	Medium
HOUSTON-17	R2	Houston	4.70	58.00	59.00	58.50	Very Good	283.71	0.47	0.02	0.59	89.93	69.51	43.44	Low
HOUSTON-17	R2	Houston	4.80	80.00	72.00	76.00	Good	361.74	0.41	0.03	0.01	114.47	68.05	42.53	Low
HOUSTON-17	R2	Houston	4.90	79.00	70.00	74.50	Good	694.15	0.65	0.06	0.01	219.64	75.16	46.97	Medium
HOUSTON-17	R2	Houston	5.00	75.00	65.00	70.00	Good	619.35	0.57	0.05	0.11	195.89	84.12	52.57	Medium
HOUSTON-17	R2	Houston	5.10	110.00	107.00	108.50	Fair	462.05	0.51	0.04	0.01	146.27	86.68	54.18	Medium
HOUSTON-17	R2	Houston	5.20	57.00	60.00	58.50	Very Good	131.05	0.12	0.01	0.00	41.59	84.04	52.53	Medium
HOUSTON-17	R2	Houston	5.30	60.00	64.00	62.00	Good	643.28	0.54	0.05	0.00	203.49	82.04	51.28	Medium
HOUSTON-17	R2	Houston	5.40	46.00	61.00	53.50	Very Good	494.20	0.70	0.04	0.12	156.44	87.64	54.77	Medium
HOUSTON-17	R2	Houston	5.50	79.00	60.00	69.50	Good	393.52	0.71	0.03	0.03	124.64	86.48	54.05	Medium
HOUSTON-17	R2	Houston	5.60	58.00	56.00	57.00	Very Good	196.83	0.44	0.02	0.02	62.41	83.59	52.24	Medium
HOUSTON-17	R2	Houston	5.70	54.00	60.00	57.00	Very Good	522.20	0.68	0.04	0.01	165.42	82.97	51.86	Medium
HOUSTON-17	R2	Houston	5.80	54.00	56.00	55.00	Very Good	267.97	0.24	0.02	0.00	84.85	83.31	52.07	Medium
HOUSTON-17	R2	Houston	5.90	46.00	48.00	47.00	Very Good	670.74	0.73	0.06	0.00	212.19	84.40	52.75	Medium
HOUSTON-17	R2	Houston	6.00	46.00	49.00	47.50	Very Good	590.32	0.66	0.05	0.01	186.79	93.20	58.25	Medium
HOUSTON-17	R2	Houston	6.10	67.00	51.00	59.00	Very Good	216.69	1.32	0.02	0.03	69.02	95.06	59.41	Medium
HOUSTON-17	R2	Houston	6.20	87.00	98.00	92.50	Good	193.96	0.14	0.02	0.01	61.45	88.30	55.19	Medium
HOUSTON-17	R2	Houston	6.30	58.00	80.00	69.00	Good	442.08	0.50	0.04	0.12	139.85	87.00	54.37	Medium
HOUSTON-17	R2	Houston	6.40	61.00	57.00	59.00	Very Good	667.84	1.05	0.06	0.04	211.45	88.20	55.13	Medium
HOUSTON-17	R2	Houston	6.50	62.00	67.00	64.50	Good	270.90	0.45	0.02	0.05	85.77	90.55	56.60	Medium
HOUSTON-17	R2	Houston	6.60	82.00	69.00	75.50	Good	160.19	0.13	0.02	0.02	50.64	82.55	51.60	Medium
HOUSTON-17	R2	Houston	6.70	61.00	66.00	63.50	Good	347.08	0.13	0.03	0.03	109.70	77.60	48.50	Medium
HOUSTON-17	R2	Houston	6.80	105.00	103.00	104.00	Fair	540.74	0.16	0.04	0.05	171.03	72.29	45.18	Medium
HOUSTON-17	R2	Houston	6.90	93.00	75.00	84.00	Good	715.48	0.20	0.05	0.18	226.16	78.70	49.19	Medium
HOUSTON-17	R2	Houston	7.00	115.00	110.00	112.50	Fair	544.42	0.37	0.04	0.21	172.19	85.02	53.14	Medium
HOUSTON-17	R2	Houston	7.10	78.00	58.00	68.00	Good	235.96	0.19	0.02	0.01	74.67	84.73	52.95	Medium
HOUSTON-17	R2	Houston	7.20	71.00	65.00	68.00	Good	516.79	0.26	0.04	0.02	163.48	82.11	51.32	Medium
HOUSTON-17	R2	Houston	7.30	102.00	115.00	108.50	Fair	536.98	0.39	0.04	0.07	169.81	85.61	53.50	Medium
HOUSTON-17	R2	Houston	7.40	85.00	114.00	99.50	Fair	337.52	0.33	0.03	0.12	106.57	83.20	52.00	Medium
HOUSTON-17	R2	Houston	7.50	67.00	72.00	69.50	Good	593.20	0.39	0.05	0.18	187.77	86.04	53.77	Medium
HOUSTON-17	R2	Houston	7.60	73.00	88.00	80.50	Good	202.50	0.09	0.02	0.06	64.18	86.09	53.81	Medium
HOUSTON-17	R2	Houston	7.70	53.00	111.00	82.00	Good	449.07	0.05	0.04	0.19	141.85	81.64	51.03	Medium
HOUSTON-17	R2	Houston	7.80	56.00	90.00	73.00	Good	158.00	0.01	0.01	0.04	49.98	81.48	50.93	Medium
HOUSTON-17	R2	Houston	7.90	72.00	77.00	74.50	Good	133.72	0.01	0.01	0.15	42.40	57.91	36.20	Low
HOUSTON-17	R2	Houston	8.00	64.00	54.00	59.00	Very Good	1045.30	0.10	0.07	0.17	330.19	53.98	33.74	Low
HOUSTON-17	R2	Houston	8.10	52.00	54.00	53.00	Very Good	605.95	0.11	0.05	0.23	191.55	67.74	42.34	Low
HOUSTON-17	R2	Houston	8.20	46.00	45.00	45.50	Very Good	236.95	0.10	0.02	0.00	74.83	70.67	44.17	Low
HOUSTON-17	R2	Houston	8.30	51.00	45.00	48.00	Very Good	542.67	0.35	0.05	0.11	171.66	69.28	43.30	Low

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-17	R2	Houston	8.40	58.00	60.00	59.00	Very Good	163.85	0.21	0.01	0.03	52.01	71.50	44.69	Low
HOUSTON-17	R2	Houston	8.50	59.00	59.00	59.00	Very Good	447.85	0.39	0.04	0.10	141.73	62.18	38.86	Low
HOUSTON-17	R2	Houston	8.60	70.00	67.00	68.50	Good	232.64	0.51	0.02	0.04	73.63	59.91	37.44	Low
HOUSTON-17	R2	Houston	8.70	103.00	114.00	108.50	Fair	919.49	2.17	0.07	0.56	291.53	62.80	39.25	Low
HOUSTON-17	R2	Houston	8.80	56.00	49.00	52.50	Very Good	806.24	0.51	0.06	0.08	254.97	74.35	46.47	Medium
HOUSTON-17	R2	Houston	8.90	50.00	67.00	58.50	Very Good	759.19	0.57	0.06	1.02	240.14	84.00	52.50	Medium
HOUSTON-17	R2	Houston	9.00	78.00	78.00	78.00	Good	805.66	0.56	0.07	1.42	254.79	91.79	57.37	Medium
HOUSTON-17	R2	Houston	9.10	63.00	54.00	58.50	Very Good	718.01	0.88	0.06	0.94	227.31	99.51	62.19	High
HOUSTON-17	R2	Houston	9.20	85.00	72.00	78.50	Good	438.79	2.03	0.04	0.55	139.72	102.96	64.35	High
HOUSTON-17	R2	Houston	9.30	43.00	53.00	48.00	Very Good	240.93	1.07	0.02	0.11	76.58	97.73	61.08	High
HOUSTON-17	R2	Houston	9.40	57.00	51.00	54.00	Very Good	642.06	0.91	0.05	0.90	203.39	95.54	59.71	Medium
HOUSTON-17	R2	Houston	9.50	49.00	49.00	49.00	Very Good	607.36	1.83	0.05	1.26	192.78	99.12	61.95	High
HOUSTON-17	R2	Houston	9.60	48.00	47.00	47.50	Very Good	461.48	1.69	0.04	0.42	146.62	101.61	63.51	High
HOUSTON-17	R2	Houston	9.70	46.00	46.00	46.00	Very Good	381.16	1.23	0.04	0.12	121.06	96.75	60.47	High
HOUSTON-17	R2	Houston	9.80	46.00	43.00	44.50	Very Good	688.89	0.75	0.06	0.34	218.03	99.44	62.15	High
HOUSTON-17	R2	Houston	9.90	56.00	55.00	55.50	Very Good	722.84	0.89	0.06	0.50	228.88	104.19	65.12	High
HOUSTON-17	R2	Houston	10.00	59.00	63.00	61.00	Good	500.04	0.76	0.04	0.30	158.31	107.89	67.43	High
HOUSTON-17	R2	Houston	10.10	59.00	68.00	63.50	Good	428.50	0.68	0.04	0.26	135.64	106.02	66.26	High
HOUSTON-17	R2	Houston	10.20	46.00	62.00	54.00	Very Good	420.07	0.64	0.04	0.17	133.16	104.99	65.62	High
HOUSTON-17	R2	Houston	10.30	53.00	69.00	61.00	Good	250.85	1.15	0.02	0.08	79.86	102.34	63.96	High
HOUSTON-17	R2	Houston	10.40	58.00	67.00	62.50	Good	75.33	0.12	0.01	0.01	23.76	93.48	58.42	Medium
HOUSTON-17	R2	Houston	10.50	72.00	97.00	84.50	Good	24.12	0.07	0.01	0.01	7.71	74.35	46.47	Medium
HOUSTON-18	R1	Houston	0.10	120.00	186.00	153.00	Poor	1049.78	0.12	12.66	0.02	343.54	40.07	24.90	Low
HOUSTON-18	R1	Houston	0.20	69.00	149.00	109.00	Fair	363.58	0.09	0.58	0.01	115.33	51.01	31.69	Low
HOUSTON-18	R1	Houston	0.30	51.00	139.00	95.00	Good	156.70	0.16	0.01	0.00	49.72	55.57	34.53	Low
HOUSTON-18	R1	Houston	0.40	72.00	174.00	123.00	Fair	872.30	0.67	0.07	0.27	275.81	52.90	32.87	Low
HOUSTON-18	R1	Houston	0.50	77.00	199.00	138.00	Poor	491.56	0.29	0.04	0.24	155.35	61.80	38.40	Low
HOUSTON-18	R1	Houston	0.60	67.00	151.00	109.00	Fair	422.40	0.24	0.04	0.23	133.60	40.51	25.17	Low
HOUSTON-18	R2	Houston	0.10	120.00	186.00	153.00	Poor	1080.30	0.86	0.08	0.30	341.81	42.54	26.43	Low
HOUSTON-18	R2	Houston	0.20	69.00	149.00	109.00	Fair	1229.15	0.26	0.10	0.60	388.62	51.48	31.99	Low
HOUSTON-18	R2	Houston	0.30	51.00	139.00	95.00	Good	611.63	0.21	0.05	0.10	193.39	72.90	45.30	Medium
HOUSTON-18	R2	Houston	0.40	72.00	174.00	123.00	Fair	399.82	0.19	0.03	0.52	126.45	72.52	45.06	Medium
HOUSTON-18	R2	Houston	0.50	77.00	199.00	138.00	Poor	150.79	0.02	0.01	0.01	47.58	56.44	35.07	Low
HOUSTON-18	R2	Houston	0.60	67.00	151.00	109.00	Fair	409.03	0.05	0.03	0.26	129.35	26.95	16.74	Low
HOUSTON-18	R3	Houston	0.20	69.00	149.00	109.00	Fair	1568.08	0.44	2.64	0.42	138.86	55.65	34.78	Low
HOUSTON-18	R3	Houston	0.50	77.00	199.00	138.00	Poor	587.34	0.16	0.67	0.10	51.91	63.94	39.96	Low
HOUSTON-18	R3	Houston	0.60	67.00	151.00	109.00	Fair	928.94	0.26	5.81	0.43	84.60	51.58	32.24	Low
HOUSTON-19	R1	Houston	0.10	52.00	53.00	52.50	Very Good	826.20	0.41	0.00	0.58	261.31	68.41	42.51	Low
HOUSTON-19	R1	Houston	0.20	47.00	60.00	53.50	Very Good	423.88	0.15	0.00	0.18	133.95	74.86	46.52	Medium
HOUSTON-19	R1	Houston	0.30	143.00	134.00	138.50	Poor	405.12	0.16	0.00	0.25	127.87	73.71	45.80	Medium
HOUSTON-19	R1	Houston	0.40	43.00	51.00	47.00	Very Good	136.30	0.08	0.00	0.27	43.16	63.88	39.69	Low
HOUSTON-19	R1	Houston	0.50	63.00	59.00	61.00	Good	1130.33	1.84	0.00	1.13	357.92	41.76	25.95	Low
HOUSTON-19	R1	Houston	0.60	68.00	80.00	74.00	Good	1189.03	0.27	0.00	0.94	375.67	64.95	40.36	Low
HOUSTON-19	R1	Houston	0.70	89.00	94.00	91.50	Good	592.36	1.87	0.00	0.69	188.17	77.68	48.27	Medium
HOUSTON-19	R1	Houston	0.80	53.00	48.00	50.50	Very Good	519.50	0.74	0.00	0.51	164.48	77.56	48.19	Medium
HOUSTON-19	R1	Houston	0.90	50.00	57.00	53.50	Very Good	496.67	0.79	0.00	0.51	157.34	79.94	49.67	Medium
HOUSTON-19	R1	Houston	1.00	56.00	55.00	55.50	Very Good	646.17	0.88	0.00	0.85	204.53	83.52	51.90	Medium
HOUSTON-19	R1	Houston	1.10	75.00	72.00	73.50	Good	444.36	0.46	0.00	0.25	140.56	84.91	52.76	Medium
HOUSTON-19	R1	Houston	1.20	64.00	66.00	65.00	Good	411.55	0.20	0.00	0.24	130.10	83.30	51.76	Medium
HOUSTON-19	R1	Houston	1.30	66.00	71.00	68.50	Good	159.74	0.08	0.00	0.05	50.57	79.56	49.43	Medium
HOUSTON-19	R1	Houston	1.40	74.00	82.00	78.00	Good	572.50	0.18	0.00	0.08	180.85	75.67	47.02	Medium
HOUSTON-19	R1	Houston	1.50	78.00	76.00	77.00	Good	487.46	0.09	0.00	0.05	154.01	79.22	49.22	Medium
HOUSTON-19	R1	Houston	1.60	76.00	82.00	79.00	Good	630.20	0.05	0.00	0.03	199.09	80.86	50.25	Medium
HOUSTON-19	R1	Houston	1.70	74.00	81.00	77.50	Good	654.02	0.25	0.00	0.11	206.66	83.20	51.70	Medium
HOUSTON-19	R1	Houston	1.80	60.00	68.00	64.00	Good	761.16	0.29	0.01	0.41	240.52	89.81	55.81	Medium
HOUSTON-19	R1	Houston	1.90	59.00	52.00	55.50	Very Good	521.29	0.36	0.03	0.10	164.98	93.73	58.24	Medium
HOUSTON-19	R1	Houston	2.00	78.00	86.00	82.00	Good	304.24	0.40	0.03	0.10	96.34	87.07	54.10	Medium
HOUSTON-19	R1	Houston	2.10	62.00	59.00	60.50	Good	695.16	0.44	0.03	1.65	219.87	64.67	40.18	Low
HOUSTON-19	R1	Houston	2.20	62.00	75.00	68.50	Good	605.17	0.34	0.00	0.39	191.34	80.82	50.22	Medium
HOUSTON-19	R1	Houston	2.30	85.00	76.00	80.50	Good	402.57	2.28	0.00	0.38	128.31	85.08	52.87	Medium
HOUSTON-19	R1	Houston	2.40	89.00	92.00	90.50	Good	658.40	2.47	0.00	0.97	209.16	86.20	53.56	Medium
HOUSTON-19	R1	Houston	2.50	108.00	131.00	119.50	Fair	795.26	1.65	0.00	0.67	251.98	90.46	56.21	Medium
HOUSTON-19	R1	Houston	2.60	90.00	107.00	98.50	Fair	754.30	0.94	0.00	0.53	238.76	96.76	60.13	High
HOUSTON-19	R1	Houston	2.70	87.00	98.00	92.50	Good	630.42	0.68	0.00	0.31	199.49	102.52	63.70	High
HOUSTON-19	R1	Houston	2.80	92.00	110.00	101.00	Fair	517.73	0.80	0.00	0.47	163.86	102.56	63.73	High
HOUSTON-19	R1	Houston	2.90	99.00	127.00	113.00	Fair	606.95	0.94	0.00	0.23	192.23	102.85	63.91	High
HOUSTON-19	R1	Houston	3.00	83.00	88.00	85.50	Good	487.84	2.81	0.02	0.23	155.39	104.51	64.94	High
HOUSTON-19	R1	Houston	3.10	71.00	74.00	72.50	Good	688.99	1.08	0.10	0.19	218.26	104.38	64.86	High
HOUSTON-19	R1	Houston	3.20	64.00	63.00	63.50	Good	701.70	0.75	0.12	0.37	222.14	106.88	66.41	High
HOUSTON-19	R1	Houston	3.30	54.00	48.00	51.00	Very Good	564.55	2.07	0.14	0.30	179.49	109.52	68.05	High
HOUSTON-19	R1	Houston	3.40	52.00	41.00	46.50	Very Good	731.30	0.94	0.20	0.60	231.63	109.98	68.34	High
HOUSTON-19	R1	Houston	3.50	49.00	46.00	47.50	Very Good	669.43	0.72	0.18	0.56	212.02	111.87	69.52	High
HOUSTON-19	R1	Houston	3.60	53.00	61.00	57.00	Very Good	416.99	0.87	0.08	0.27	132.24	111.80	69.47	High
HOUSTON-19	R1	Houston	3.70	46.00	48.00	47.00	Very Good	112.32	0.16	0.02	0.04	35.57	106.09	65.92	High
HOUSTON-19	R1	Houston	3.80	69.00	55.00	62.00	Good	242.73	0.21	0.06	0.10	76.87	97.91	60.84	High
HOUSTON-19	R1	Houston	3.90	53.00	49.00	51.00	Very Good	88.67	0.08	0.03	0.03	28.09	90.65	56.33	Medium
HOUSTON-19	R1	Houston	4.00	52.00	53.00	52.50	Very Good	258.19	0.12	0.08	0.04	81.86	84.51	52.51	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-19	R1	Houston	4.10	48.00	55.00	51.50	Very Good	210.95	0.06	0.07	0.19	66.59	74.16	46.08	Medium
HOUSTON-19	R1	Houston	4.20	57.00	60.00	58.50	Very Good	393.96	0.07	0.09	0.09	124.38	79.69	49.52	Medium
HOUSTON-19	R1	Houston	4.30	51.00	56.00	53.50	Very Good	577.49	1.82	0.13	0.14	183.38	88.03	54.70	Medium
HOUSTON-19	R1	Houston	4.40	96.00	73.00	84.50	Good	657.23	1.52	0.16	0.17	208.50	92.18	57.28	Medium
HOUSTON-19	R1	Houston	4.50	192.00	219.00	205.50	Very Poor	460.94	1.51	0.16	0.10	146.42	92.52	57.49	Medium
HOUSTON-19	R1	Houston	4.60	139.00	145.00	142.00	Poor	566.57	1.29	0.22	0.33	179.83	93.97	58.39	Medium
HOUSTON-19	R1	Houston	4.70	120.00	111.00	115.50	Fair	689.16	1.40	0.27	0.45	218.60	95.84	59.55	Medium
HOUSTON-19	R1	Houston	4.80	104.00	152.00	128.00	Fair	655.83	1.27	0.26	0.67	208.06	97.70	60.71	High
HOUSTON-19	R1	Houston	4.90	106.00	208.00	157.00	Poor	363.97	1.85	0.15	0.12	116.00	98.33	61.10	High
HOUSTON-19	R1	Houston	5.00	112.00	131.00	121.50	Fair	535.04	0.48	0.26	0.84	169.57	95.41	59.28	Medium
HOUSTON-19	R1	Houston	5.10	95.00	130.00	112.50	Fair	363.69	0.85	0.21	0.17	115.51	94.55	58.75	Medium
HOUSTON-19	R1	Houston	5.20	88.00	118.00	103.00	Fair	268.30	0.21	0.19	0.05	85.00	86.20	53.56	Medium
HOUSTON-19	R1	Houston	5.30	66.00	111.00	88.50	Good	544.40	0.19	0.41	0.08	172.42	83.66	51.99	Medium
HOUSTON-19	R1	Houston	5.40	71.00	102.00	86.50	Good	432.13	0.17	0.38	0.06	136.97	88.29	54.86	Medium
HOUSTON-19	R2	Houston	0.10	52.00	53.00	52.50	Very Good	734.51	3.21	0.12	0.20	233.70	66.88	41.56	Low
HOUSTON-19	R2	Houston	0.20	47.00	60.00	53.50	Very Good	664.75	1.65	0.11	0.36	210.88	76.85	47.75	Medium
HOUSTON-19	R2	Houston	0.30	143.00	134.00	138.50	Poor	561.31	1.68	0.09	0.27	178.33	81.54	50.67	Medium
HOUSTON-19	R2	Houston	0.40	43.00	51.00	47.00	Very Good	129.02	0.13	0.02	0.07	41.00	77.33	48.05	Medium
HOUSTON-19	R2	Houston	0.50	63.00	59.00	61.00	Good	1432.35	0.60	0.20	0.70	452.81	36.59	22.73	Low
HOUSTON-19	R2	Houston	0.60	68.00	80.00	74.00	Good	846.57	3.24	0.12	0.28	269.12	58.57	36.40	Low
HOUSTON-19	R2	Houston	0.70	89.00	94.00	91.50	Good	289.97	0.48	0.04	0.10	92.00	62.06	38.56	Low
HOUSTON-19	R2	Houston	0.80	53.00	48.00	50.50	Very Good	1510.69	1.76	0.17	2.06	478.38	35.28	21.92	Low
HOUSTON-19	R2	Houston	0.90	50.00	57.00	53.50	Very Good	1142.47	1.50	0.14	1.65	361.93	62.94	39.11	Low
HOUSTON-19	R2	Houston	1.00	56.00	55.00	55.50	Very Good	916.77	0.87	0.11	0.98	290.13	79.27	49.26	Medium
HOUSTON-19	R2	Houston	1.10	75.00	72.00	73.50	Good	519.03	0.45	0.06	0.85	164.15	88.64	55.08	Medium
HOUSTON-19	R2	Houston	1.20	64.00	66.00	65.00	Good	507.46	0.44	0.06	0.36	160.57	88.15	54.77	Medium
HOUSTON-19	R2	Houston	1.30	66.00	71.00	68.50	Good	732.37	0.36	0.08	0.32	231.55	93.00	57.79	Medium
HOUSTON-19	R2	Houston	1.40	74.00	82.00	78.00	Good	523.07	0.12	0.06	0.10	165.38	98.83	61.41	High
HOUSTON-19	R2	Houston	1.50	78.00	76.00	77.00	Good	454.48	0.18	0.05	0.10	143.60	98.00	60.89	High
HOUSTON-19	R2	Houston	1.60	76.00	82.00	79.00	Good	641.47	0.46	0.07	0.26	202.86	99.05	61.55	High
HOUSTON-19	R2	Houston	1.70	74.00	81.00	77.50	Good	609.26	0.49	0.06	0.51	192.75	102.67	63.79	High
HOUSTON-19	R2	Houston	1.80	60.00	68.00	64.00	Good	503.54	0.36	0.05	0.38	159.37	104.86	65.16	High
HOUSTON-19	R2	Houston	1.90	59.00	52.00	55.50	Very Good	345.59	0.57	0.03	0.08	109.44	103.79	64.49	High
HOUSTON-19	R2	Houston	2.00	78.00	86.00	82.00	Good	520.97	3.46	0.05	0.99	166.20	101.42	63.02	High
HOUSTON-19	R2	Houston	2.10	62.00	59.00	60.50	Good	610.53	1.40	0.06	0.40	193.59	105.56	65.59	High
HOUSTON-19	R2	Houston	2.20	62.00	75.00	68.50	Good	149.58	0.32	0.02	0.08	47.47	104.55	64.97	High
HOUSTON-19	R2	Houston	2.30	85.00	76.00	80.50	Good	362.85	0.75	0.03	0.38	115.08	97.49	60.58	High
HOUSTON-19	R2	Houston	2.40	89.00	92.00	90.50	Good	555.18	0.65	0.04	0.15	175.66	99.78	62.00	High
HOUSTON-19	R2	Houston	2.50	108.00	131.00	119.50	Fair	186.72	0.76	0.02	0.03	59.42	99.35	61.74	High
HOUSTON-19	R2	Houston	2.60	90.00	107.00	98.50	Fair	287.71	0.41	0.02	0.09	91.00	92.42	57.43	Medium
HOUSTON-19	R2	Houston	2.70	87.00	98.00	92.50	Good	600.60	0.12	0.04	0.08	189.88	92.57	57.52	Medium
HOUSTON-19	R2	Houston	2.80	92.00	110.00	101.00	Fair	422.62	0.05	0.03	0.03	133.58	95.73	59.49	Medium
HOUSTON-19	R2	Houston	2.90	99.00	127.00	113.00	Fair	355.03	0.12	0.03	0.02	112.27	92.77	57.65	Medium
HOUSTON-19	R2	Houston	3.00	83.00	88.00	85.50	Good	694.61	0.42	0.05	0.14	219.60	94.81	58.91	Medium
HOUSTON-19	R2	Houston	3.10	71.00	74.00	72.50	Good	671.83	0.61	0.05	0.39	212.44	99.88	62.06	High
HOUSTON-19	R2	Houston	3.20	64.00	63.00	63.50	Good	430.28	0.44	0.04	0.23	136.12	102.65	63.79	High
HOUSTON-19	R2	Houston	3.30	54.00	48.00	51.00	Very Good	371.74	0.47	0.03	0.29	117.60	99.89	62.07	High
HOUSTON-19	R2	Houston	3.40	52.00	41.00	46.50	Very Good	472.23	0.63	0.04	0.71	149.47	99.00	61.52	High
HOUSTON-19	R2	Houston	3.50	49.00	46.00	47.50	Very Good	376.39	0.46	0.03	0.20	119.19	98.66	61.31	High
HOUSTON-19	R2	Houston	3.60	53.00	61.00	57.00	Very Good	247.70	0.40	0.02	0.08	78.42	93.28	57.96	Medium
HOUSTON-19	R2	Houston	3.70	46.00	48.00	47.00	Very Good	317.55	0.29	0.02	0.13	100.50	90.38	56.16	Medium
HOUSTON-19	R2	Houston	3.80	69.00	55.00	62.00	Good	434.23	0.67	0.02	0.05	137.56	88.26	54.84	Medium
HOUSTON-19	R2	Houston	3.90	53.00	49.00	51.00	Very Good	129.56	0.45	0.02	0.18	41.18	81.77	50.81	Medium
HOUSTON-19	R2	Houston	4.00	52.00	53.00	52.50	Very Good	498.94	0.41	0.03	0.98	157.78	81.71	50.77	Medium
HOUSTON-19	R2	Houston	4.10	48.00	55.00	51.50	Very Good	357.03	0.20	0.02	0.10	112.76	80.07	49.75	Medium
HOUSTON-19	R2	Houston	4.20	57.00	60.00	58.50	Very Good	747.04	0.39	0.04	0.17	236.16	83.94	52.16	Medium
HOUSTON-19	R2	Houston	4.30	51.00	56.00	53.50	Very Good	773.69	0.38	0.04	0.40	244.68	91.21	56.68	Medium
HOUSTON-19	R2	Houston	4.40	96.00	73.00	84.50	Good	571.24	4.81	0.03	0.18	182.86	96.70	60.08	High
HOUSTON-19	R2	Houston	4.50	192.00	219.00	205.50	Very Poor	604.53	1.44	0.03	0.59	191.70	98.08	60.94	High
HOUSTON-19	R2	Houston	4.60	139.00	145.00	142.00	Poor	695.44	0.89	0.04	0.32	220.27	100.79	62.63	High
HOUSTON-19	R2	Houston	4.70	120.00	111.00	115.50	Fair	509.65	4.84	0.03	0.25	163.34	103.20	64.13	High
HOUSTON-19	R2	Houston	4.80	104.00	152.00	128.00	Fair	449.49	1.77	0.03	0.18	142.78	101.64	63.16	High
HOUSTON-19	R2	Houston	4.90	106.00	208.00	157.00	Poor	297.91	0.68	0.02	0.05	94.45	97.66	60.68	High
HOUSTON-19	R2	Houston	5.00	112.00	131.00	121.50	Fair	516.67	0.70	0.03	0.10	163.55	95.64	59.43	Medium
HOUSTON-19	R2	Houston	5.10	95.00	130.00	112.50	Fair	518.28	2.94	0.03	0.17	165.17	96.33	59.86	Medium
HOUSTON-19	R2	Houston	5.20	88.00	118.00	103.00	Fair	603.52	2.12	0.03	0.56	191.61	94.05	58.44	Medium
HOUSTON-19	R2	Houston	5.30	66.00	111.00	88.50	Good	418.58	1.47	0.02	0.34	132.90	95.80	59.53	Medium
HOUSTON-19	R2	Houston	5.40	71.00	102.00	86.50	Good	663.84	2.24	0.03	0.15	210.80	97.47	60.57	High
HOUSTON-19	R3	Houston	0.10	52.00	53.00	52.50	Very Good	108.98	0.04	0.04	0.04	34.48	84.16	52.30	Medium
HOUSTON-19	R3	Houston	0.20	47.00	60.00	53.50	Very Good	37.42	0.02	0.03	0.07	11.88	65.37	40.62	Low
HOUSTON-19	R3	Houston	0.30	143.00	134.00	138.50	Poor	919.73	0.57	0.37	0.93	291.00	44.36	27.57	Low
HOUSTON-19	R3	Houston	0.40	43.00	51.00	47.00	Very Good	406.41	0.34	0.17	0.25	128.75	69.62	43.26	Low
HOUSTON-19	R3	Houston	0.50	63.00	59.00	61.00	Good	202.48	0.84	0.08	0.07	64.34	58.70	36.47	Low
HOUSTON-19	R3	Houston	0.60	68.00	80.00	74.00	Good	908.90	1.72	0.35	1.70	288.14	48.14	29.91	Low
HOUSTON-19	R3	Houston	0.70	89.00	94.00	91.50	Good	414.72	0.58	0.16	0.51	131.44	71.71	44.56	Low
HOUSTON-19	R3	Houston	0.80	53.00	48.00	50.50	Very Good	388.98	0.50	0.14	0.24	123.14	81.58	50.69	Medium
HOUSTON-19	R3	Houston	0.90	50.00	57.00	53.50	Very Good	305.94	0.56	0.11	0.43	97.16	87.38	54.29	Medium

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-19	R3	Houston	1.00	56.00	55.00	55.50	Very Good	276.68	1.11	0.10	0.33	88.04	90.06	55.96	Medium
HOUSTON-19	R3	Houston	1.10	75.00	72.00	73.50	Good	301.54	0.08	0.11	0.44	95.25	91.42	56.81	Medium
HOUSTON-19	R3	Houston	1.20	64.00	66.00	65.00	Good	292.80	0.21	0.10	0.20	92.60	93.72	58.23	Medium
HOUSTON-19	R3	Houston	1.30	66.00	71.00	68.50	Good	266.48	0.20	0.09	0.18	84.40	94.68	58.83	Medium
HOUSTON-19	R3	Houston	1.40	74.00	82.00	78.00	Good	352.52	0.23	0.12	0.12	111.57	95.54	59.37	Medium
HOUSTON-19	R3	Houston	1.50	78.00	76.00	77.00	Good	212.10	0.21	0.07	0.11	67.24	98.60	61.27	High
HOUSTON-19	R3	Houston	1.60	76.00	82.00	79.00	Good	21.18	0.19	0.02	0.02	6.85	91.74	57.01	Medium
HOUSTON-19	R3	Houston	1.70	74.00	81.00	77.50	Good	11.88	0.01	0.03	0.04	3.77	74.05	46.01	Medium
HOUSTON-19	R3	Houston	1.80	60.00	68.00	64.00	Good	446.24	0.03	0.15	0.63	141.01	58.50	36.35	Low
HOUSTON-19	R3	Houston	1.90	59.00	52.00	55.50	Very Good	497.46	0.07	0.16	0.18	157.13	74.51	46.30	Medium
HOUSTON-19	R3	Houston	2.00	78.00	86.00	82.00	Good	362.26	0.04	0.11	0.15	114.47	83.97	52.17	Medium
HOUSTON-19	R3	Houston	2.10	62.00	59.00	60.50	Good	297.80	0.02	0.09	0.07	94.11	89.13	55.39	Medium
HOUSTON-19	R3	Houston	2.20	62.00	75.00	68.50	Good	373.09	0.03	0.11	0.09	118.11	91.39	56.79	Medium
HOUSTON-19	R3	Houston	2.30	85.00	76.00	80.50	Good	376.87	1.09	0.11	0.17	119.69	97.46	60.56	High
HOUSTON-19	R3	Houston	2.40	89.00	92.00	90.50	Good	356.14	0.76	0.11	0.30	113.05	102.69	63.81	High
HOUSTON-19	R3	Houston	2.50	108.00	131.00	119.50	Fair	112.54	2.52	0.04	0.16	36.77	102.75	63.85	High
HOUSTON-19	R3	Houston	2.60	90.00	107.00	98.50	Fair	109.06	0.15	0.04	0.07	34.72	95.66	59.44	Medium
HOUSTON-19	R3	Houston	2.70	87.00	98.00	92.50	Good	248.07	0.05	0.07	0.06	78.55	95.04	59.06	Medium
HOUSTON-19	R3	Houston	2.80	92.00	110.00	101.00	Fair	193.30	1.20	0.06	0.04	61.72	93.84	58.31	Medium
HOUSTON-19	R3	Houston	2.90	99.00	127.00	113.00	Fair	314.81	0.17	0.09	0.06	99.54	95.16	59.13	Medium
HOUSTON-19	R3	Houston	3.00	83.00	88.00	85.50	Good	318.15	0.15	0.09	0.09	100.78	97.65	60.68	High
HOUSTON-19	R3	Houston	3.10	71.00	74.00	72.50	Good	303.35	0.15	0.09	0.10	95.91	100.15	62.23	High
HOUSTON-19	R3	Houston	3.20	64.00	63.00	63.50	Good	298.44	0.17	0.08	0.09	94.53	100.17	62.25	High
HOUSTON-19	R3	Houston	3.30	54.00	48.00	51.00	Very Good	281.47	0.31	0.08	0.16	89.20	100.95	62.73	High
HOUSTON-19	R3	Houston	3.40	52.00	41.00	46.50	Very Good	231.58	1.22	0.06	0.17	73.70	100.39	62.38	High
HOUSTON-19	R3	Houston	3.50	49.00	46.00	47.50	Very Good	116.71	0.42	0.03	0.06	37.07	97.58	60.63	High
HOUSTON-19	R3	Houston	3.60	53.00	61.00	57.00	Very Good	173.89	0.44	0.05	0.02	55.06	92.19	57.28	Medium
HOUSTON-19	R3	Houston	3.70	46.00	48.00	47.00	Very Good	161.41	0.35	0.04	0.01	51.16	89.88	55.85	Medium
HOUSTON-19	R3	Houston	3.80	69.00	55.00	62.00	Good	97.47	0.30	0.03	0.06	30.90	82.94	51.54	Medium
HOUSTON-19	R3	Houston	3.90	53.00	49.00	51.00	Very Good	405.90	0.74	0.10	0.12	128.66	82.87	51.49	Medium
HOUSTON-19	R3	Houston	4.00	52.00	53.00	52.50	Very Good	442.14	0.52	0.11	0.20	140.05	92.17	57.27	Medium
HOUSTON-19	R3	Houston	4.10	48.00	55.00	51.50	Very Good	337.82	1.80	0.08	0.27	107.72	98.77	61.37	High
HOUSTON-19	R3	Houston	4.20	57.00	60.00	58.50	Very Good	316.23	0.38	0.08	0.21	100.26	101.15	62.85	High
HOUSTON-19	R3	Houston	4.30	51.00	56.00	53.50	Very Good	248.61	0.69	0.06	0.16	78.97	101.84	63.28	High
HOUSTON-19	R3	Houston	4.40	96.00	73.00	84.50	Good	319.75	0.47	0.08	0.29	101.27	101.99	63.37	High
HOUSTON-19	R3	Houston	4.50	192.00	219.00	205.50	Very Poor	346.76	0.33	0.09	0.11	109.76	102.72	63.82	High
HOUSTON-19	R3	Houston	4.60	139.00	145.00	142.00	Poor	307.67	0.34	0.08	0.22	97.35	104.56	64.97	High
HOUSTON-19	R3	Houston	4.70	120.00	111.00	115.50	Fair	350.29	0.51	0.09	0.19	110.92	105.74	65.70	High
HOUSTON-19	R3	Houston	4.80	104.00	152.00	128.00	Fair	183.25	0.36	0.04	0.23	58.00	105.33	65.45	High
HOUSTON-19	R3	Houston	4.90	106.00	208.00	157.00	Poor	161.37	0.38	0.04	0.15	51.11	100.59	62.50	High
HOUSTON-19	R3	Houston	5.00	112.00	131.00	121.50	Fair	251.65	0.63	0.06	0.42	79.82	94.86	58.94	Medium
HOUSTON-19	R3	Houston	5.10	95.00	130.00	112.50	Fair	296.92	0.69	0.07	0.54	94.21	96.59	60.02	High
HOUSTON-19	R3	Houston	5.20	88.00	118.00	103.00	Fair	154.09	1.02	0.04	0.16	49.31	96.79	60.14	High
HOUSTON-19	R3	Houston	5.30	66.00	111.00	88.50	Good	11.77	0.10	0.02	0.03	3.78	81.92	50.90	Medium
HOUSTON-19	R3	Houston	5.40	71.00	102.00	86.50	Good	972.06	3.23	0.22	0.44	308.82	37.83	23.51	Low
HOUSTON-21	R1	Houston	0.10	110.00	114.00	112.00	Fair	872.49	8.84	0.14	0.00	280.06	31.15	19.36	Low
HOUSTON-21	R1	Houston	0.20	252.00	319.00	285.50	Very Poor	933.08	3.34	0.17	0.10	296.48	46.38	28.82	Low
HOUSTON-21	R1	Houston	0.30	162.00	263.00	212.50	Very Poor	429.18	0.68	0.08	0.04	136.00	61.07	37.95	Low
HOUSTON-21	R1	Houston	0.40	122.00	185.00	153.50	Poor	2180.78	3.87	0.37	2.12	690.86	41.97	26.08	Low
HOUSTON-21	R1	Houston	0.50	129.00	215.00	172.00	Very Poor	420.71	0.88	0.07	0.27	133.36	61.54	38.24	Low
HOUSTON-21	R1	Houston	0.60	124.00	175.00	149.50	Poor	1466.95	3.41	0.24	3.12	465.42	37.89	23.54	Low
HOUSTON-21	R1	Houston	0.70	155.00	171.00	163.00	Poor	781.11	3.48	0.13	0.77	248.68	61.97	38.50	Low
HOUSTON-21	R1	Houston	0.80	151.00	180.00	165.50	Poor	161.94	0.32	0.03	0.07	51.13	60.80	37.78	Low
HOUSTON-21	R1	Houston	0.90	149.00	176.00	162.50	Poor	500.04	2.88	0.08	0.15	159.48	51.78	32.18	Low
HOUSTON-21	R1	Houston	1.00	89.00	116.00	102.50	Fair	858.14	0.51	0.14	0.42	271.72	42.79	26.59	Low
HOUSTON-21	R1	Houston	1.10	116.00	144.00	130.00	Fair	749.75	0.85	0.13	0.74	237.41	55.11	34.24	Low
HOUSTON-21	R1	Houston	1.20	107.00	121.00	114.00	Fair	398.05	1.53	0.07	0.20	126.49	62.78	39.01	Low
HOUSTON-22	R1	Houston	0.10	131.00	141.00	136.00	Poor	505.34	1.89	0.08	0.29	160.46	42.66	26.50	Low
HOUSTON-22	R1	Houston	0.20	110.00	142.00	126.00	Fair	2314.29	4.58	0.39	0.24	733.90	27.35	17.00	Low
HOUSTON-22	R2	Houston	0.10	131.00	141.00	136.00	Poor	1327.51	6.08	0.22	0.04	0.42	28.13	17.48	Low
HOUSTON-22	R2	Houston	0.20	110.00	142.00	126.00	Fair	1623.74	8.79	0.28	0.21	0.52	25.06	15.57	Low
HOUSTON-22	R3	Houston	0.10	131.00	141.00	136.00	Poor	1298.32	7.87	0.23	0.03	414.06	22.55	14.01	Low
HOUSTON-22	R3	Houston	0.20	110.00	142.00	126.00	Fair	1373.74	31.60	0.28	3.31	450.15	22.55	14.01	Low
HOUSTON-23	R1	Houston	0.10	129.00	127.00	128.00	Fair	1735.24	3.13	1.74	0.26	550.10	31.41	19.52	Low
HOUSTON-23	R1	Houston	0.20	185.00	361.00	273.00	Very Poor	869.30	0.72	0.87	0.14	275.10	58.48	36.34	Low
HOUSTON-23	R1	Houston	0.30	127.00	254.00	190.50	Very Poor	479.84	0.33	0.48	0.07	151.93	65.84	40.91	Low
HOUSTON-23	R1	Houston	0.40	217.00	315.00	266.00	Very Poor	653.89	1.07	0.65	0.10	207.19	70.47	43.79	Low
HOUSTON-23	R1	Houston	0.50	257.00	386.00	321.50	Very Poor	317.81	0.82	0.32	0.05	100.83	73.39	45.60	Medium
HOUSTON-23	R1	Houston	0.60	188.00	494.00	341.00	Very Poor	1568.37	2.23	1.57	0.20	496.43	35.35	21.96	Low
HOUSTON-23	R1	Houston	0.70	101.00	175.00	138.00	Poor	640.31	1.04	0.64	0.09	202.80	55.91	34.74	Low
HOUSTON-23	R1	Houston	0.80	97.00	112.00	104.50	Fair	718.37	0.48	0.72	0.10	227.34	34.39	21.37	Low
HOUSTON-23	R1	Houston	0.90	124.00	154.00	139.00	Poor	959.09	1.20	0.96	0.14	303.74	41.72	25.93	Low
HOUSTON-23	R1	Houston	1.00	89.00	89.00	89.00	Good	730.91	1.14	0.73	0.11	231.69	58.13	36.12	Low
HOUSTON-23	R1	Houston	1.10	76.00	79.00	77.50	Good	508.55	0.64	0.51	0.08	161.19	57.14	35.51	Low
HOUSTON-23	R1	Houston	1.20	105.00	236.00	170.50	Very Poor	365.99	0.62	0.37	0.06	115.82	51.32	31.89	Low
HOUSTON-23	R2	Houston	0.10	129.00	127.00	128.00	Fair	1378.64	1.34	1.70	0.44	21811.33	13.55	8.42	Low
HOUSTON-23	R2	Houston	0.20	185.00	361.00	273.00	Very Poor	926.49	0.76	0.45	0.29	30595.54	19.01	11.81	Low

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-23	R2	Houston	0.30	127.00	254.00	190.50	Very Poor	481.11	0.42	0.13	0.15	34303.01	21.31	13.24	Low
HOUSTON-23	R2	Houston	0.40	217.00	315.00	266.00	Very Poor	316.14	0.43	0.14	0.10	34226.72	21.27	13.22	Low
HOUSTON-23	R2	Houston	0.50	257.00	386.00	321.50	Very Poor	1064.07	1.19	0.29	0.34	22887.19	14.22	8.84	Low
HOUSTON-23	R2	Houston	0.60	188.00	494.00	341.00	Very Poor	1237.46	2.16	0.68	0.39	22638.02	14.07	8.74	Low
HOUSTON-23	R2	Houston	0.70	101.00	175.00	138.00	Poor	204.53	0.24	0.00	0.06	24243.29	15.06	9.36	Low
HOUSTON-23	R2	Houston	0.80	97.00	112.00	104.50	Fair	511.23	0.44	0.00	0.16	17685.31	10.99	6.83	Low
HOUSTON-23	R2	Houston	0.90	124.00	154.00	139.00	Poor	1075.57	2.57	0.07	0.34	19872.97	12.35	7.67	Low
HOUSTON-23	R2	Houston	1.00	89.00	89.00	89.00	Good	529.36	1.72	0.28	0.17	22731.89	14.12	8.78	Low
HOUSTON-23	R2	Houston	1.10	76.00	79.00	77.50	Good	805.28	2.29	0.88	0.26	26908.70	16.72	10.39	Low
HOUSTON-23	R2	Houston	1.20	105.00	236.00	170.50	Very Poor	185.98	0.92	0.26	0.06	24298.21	15.10	9.38	Low
HOUSTON-23	R3	Houston	0.10	129.00	127.00	128.00	Fair	1378.95	1.98	0.21	0.24	436.80	46.75	29.05	Low
HOUSTON-23	R3	Houston	0.20	185.00	361.00	273.00	Very Poor	664.57	0.85	0.10	0.86	210.43	61.07	37.95	Low
HOUSTON-23	R3	Houston	0.30	127.00	254.00	190.50	Very Poor	259.99	0.95	0.05	0.05	82.63	65.20	40.51	Low
HOUSTON-23	R3	Houston	0.40	217.00	315.00	266.00	Very Poor	236.86	0.39	0.03	0.09	75.02	65.55	40.73	Low
HOUSTON-23	R3	Houston	0.50	257.00	386.00	321.50	Very Poor	2067.07	4.41	0.30	0.56	656.81	38.68	24.03	Low
HOUSTON-23	R3	Houston	0.60	188.00	494.00	341.00	Very Poor	474.51	2.08	0.08	0.23	151.05	58.15	36.13	Low
HOUSTON-23	R3	Houston	0.70	101.00	175.00	138.00	Poor	1383.11	2.17	0.18	0.14	438.10	35.87	22.29	Low
HOUSTON-23	R3	Houston	0.80	97.00	112.00	104.50	Fair	1119.80	10.26	0.17	0.52	359.03	32.47	20.17	Low
HOUSTON-23	R3	Houston	0.90	124.00	154.00	139.00	Poor	821.49	4.99	0.13	0.17	261.99	41.56	25.82	Low
HOUSTON-23	R3	Houston	1.00	89.00	89.00	89.00	Good	1208.91	7.23	0.19	2.44	385.73	35.08	21.80	Low
HOUSTON-23	R3	Houston	1.10	76.00	79.00	77.50	Good	388.35	2.70	0.06	0.58	124.01	52.79	32.80	Low
HOUSTON-23	R3	Houston	1.20	105.00	236.00	170.50	Very Poor	540.46	2.03	0.08	0.38	171.51	21.15	13.14	Low
HOUSTON-24	R1	Houston	0.10	140.00	139.00	139.50	Poor	273.81	0.12	0.14	0.05	86.70	104.03	64.64	High
HOUSTON-24	R1	Houston	0.20	140.00	150.00	145.00	Poor	410.84	0.17	0.21	0.07	129.98	106.57	66.22	High
HOUSTON-24	R1	Houston	0.30	132.00	130.00	131.00	Poor	55.37	0.05	0.05	0.02	17.56	101.92	63.33	High
HOUSTON-24	R1	Houston	0.40	157.00	130.00	143.50	Poor	522.16	0.05	0.24	0.07	165.04	97.91	60.84	High
HOUSTON-24	R1	Houston	0.50	155.00	132.00	143.50	Poor	492.10	0.00	0.21	0.02	155.72	101.30	62.94	High
HOUSTON-24	R1	Houston	0.60	138.00	132.00	135.00	Poor	398.84	0.00	0.17	0.01	126.03	100.46	62.42	High
HOUSTON-24	R1	Houston	0.70	133.00	129.00	131.00	Poor	770.56	0.00	0.32	0.03	243.71	102.11	63.45	High
HOUSTON-24	R1	Houston	0.80	183.00	160.00	171.50	Very Poor	677.94	0.94	0.29	0.06	214.82	107.06	66.53	High
HOUSTON-24	R1	Houston	0.90	152.00	133.00	142.50	Poor	602.76	3.50	0.25	0.07	192.33	109.27	67.90	High
HOUSTON-24	R1	Houston	1.00	164.00	129.00	146.50	Poor	741.68	1.39	0.30	0.05	235.28	112.97	70.20	High
HOUSTON-24	R1	Houston	1.10	172.00	130.00	151.00	Poor	749.29	1.21	0.31	0.09	237.47	113.12	70.29	High
HOUSTON-24	R1	Houston	1.20	127.00	132.00	129.50	Fair	628.86	1.69	0.27	0.12	199.61	115.59	71.83	High
HOUSTON-24	R1	Houston	1.30	161.00	113.00	137.00	Poor	463.03	0.90	0.20	0.14	146.82	113.05	70.25	High
HOUSTON-24	R1	Houston	1.40	69.00	86.00	77.50	Good	667.32	2.90	0.34	0.30	212.56	114.02	70.85	High
HOUSTON-24	R1	Houston	1.50	71.00	85.00	78.00	Good	526.87	2.50	0.28	0.25	167.89	119.94	74.52	High
HOUSTON-24	R1	Houston	1.60	67.00	72.00	69.50	Good	296.69	1.32	0.15	0.10	94.44	119.60	74.31	High
HOUSTON-24	R1	Houston	1.70	73.00	89.00	81.00	Good	285.71	0.19	0.15	0.30	90.46	111.62	69.36	High
HOUSTON-24	R1	Houston	1.80	118.00	119.00	118.50	Fair	478.19	0.07	0.25	0.22	151.26	109.94	68.31	High
HOUSTON-24	R1	Houston	1.90	88.00	97.00	92.50	Good	698.67	0.36	0.37	0.25	221.14	114.29	71.02	High
HOUSTON-24	R1	Houston	2.00	148.00	177.00	162.50	Poor	554.50	1.68	0.29	0.25	176.31	115.79	71.95	High
HOUSTON-24	R1	Houston	2.10	150.00	152.00	151.00	Poor	242.88	3.74	0.14	0.06	78.71	114.86	71.37	High
HOUSTON-24	R1	Houston	2.20	83.00	128.00	105.50	Fair	653.67	0.10	0.35	0.06	206.75	112.95	70.19	High
HOUSTON-24	R1	Houston	2.30	82.00	112.00	97.00	Fair	519.49	0.22	0.27	0.03	164.38	114.00	70.84	High
HOUSTON-24	R1	Houston	2.40	151.00	157.00	154.00	Poor	573.17	0.47	0.30	0.03	181.48	114.95	71.43	High
HOUSTON-24	R1	Houston	2.50	135.00	151.00	143.00	Poor	644.50	0.74	0.34	0.21	204.23	112.46	69.88	High
HOUSTON-24	R1	Houston	2.60	89.00	130.00	109.50	Fair	666.03	0.87	0.35	0.18	211.07	114.61	71.21	High
HOUSTON-24	R1	Houston	2.70	87.00	99.00	93.00	Good	697.18	2.20	0.37	0.18	221.66	119.67	74.36	High
HOUSTON-24	R1	Houston	2.80	89.00	132.00	110.50	Fair	538.14	2.68	0.29	0.18	171.52	122.13	75.89	High
HOUSTON-24	R1	Houston	2.90	107.00	141.00	124.00	Fair	375.63	0.68	0.20	0.37	119.19	120.46	74.85	High
HOUSTON-24	R1	Houston	3.00	140.00	150.00	145.00	Poor	476.95	0.92	0.26	0.71	151.39	117.37	72.93	High
HOUSTON-24	R1	Houston	3.10	133.00	187.00	160.00	Poor	417.41	1.07	0.22	0.39	132.64	113.25	70.37	High
HOUSTON-24	R1	Houston	3.20	98.00	127.00	112.50	Fair	548.74	1.47	0.29	0.22	174.32	114.31	71.03	High
HOUSTON-24	R1	Houston	3.30	86.00	100.00	93.00	Good	712.46	3.20	0.38	0.16	227.05	117.34	72.91	High
HOUSTON-24	R1	Houston	3.40	134.00	148.00	141.00	Poor	271.67	2.28	0.15	0.09	87.03	115.31	71.65	High
HOUSTON-24	R1	Houston	3.50	76.00	154.00	115.00	Fair	417.22	0.82	0.23	0.06	132.46	108.58	67.47	High
HOUSTON-24	R1	Houston	3.60	122.00	218.00	170.00	Very Poor	34.49	0.22	0.04	0.01	11.05	101.76	63.23	High
HOUSTON-24	R1	Houston	3.70	111.00	162.00	136.50	Poor	7.54	0.04	0.06	0.01	2.42	65.30	40.57	Low
HOUSTON-24	R1	Houston	3.80	133.00	135.00	134.00	Poor	86.42	0.00	0.06	0.07	27.44	45.48	28.26	Low
HOUSTON-24	R1	Houston	3.90	150.00	153.00	151.50	Poor	505.72	2.10	0.27	0.09	161.07	39.10	24.29	Low
HOUSTON-24	R1	Houston	4.00	124.00	119.00	121.50	Fair	551.41	4.70	0.30	0.04	176.87	40.71	25.30	Low
HOUSTON-24	R1	Houston	4.10	135.00	161.00	148.00	Poor	635.52	5.99	0.35	0.07	203.92	39.20	24.36	Low
HOUSTON-24	R1	Houston	4.20	132.00	153.00	142.50	Poor	1439.63	0.60	0.79	0.57	455.67	57.84	35.94	Low
HOUSTON-24	R1	Houston	4.30	117.00	118.00	117.50	Fair	825.22	2.71	0.45	0.11	262.45	75.47	46.90	Medium
HOUSTON-24	R1	Houston	4.40	98.00	124.00	111.00	Fair	42.33	0.05	0.05	0.01	13.40	78.51	48.79	Medium
HOUSTON-24	R1	Houston	4.50	115.00	146.00	130.50	Fair	103.55	0.01	0.11	0.07	33.00	68.55	42.60	Low
HOUSTON-24	R1	Houston	4.60	103.00	130.00	116.50	Fair	257.98	0.04	0.15	0.10	81.63	68.01	42.26	Low
HOUSTON-24	R1	Houston	4.70	117.00	160.00	138.50	Poor	886.95	1.85	0.48	0.20	281.56	57.97	36.02	Low
HOUSTON-24	R1	Houston	4.80	100.00	116.00	108.00	Fair	189.77	8.59	0.12	0.04	64.17	64.13	39.85	Low
HOUSTON-24	R1	Houston	4.90	172.00	182.00	177.00	Very Poor	797.77	13.09	0.53	0.15	259.11	32.62	20.27	Low
HOUSTON-24	R1	Houston	5.00	125.00	132.00	128.50	Fair	1269.49	9.70	0.82	0.45	406.65	52.31	32.50	Low
HOUSTON-24	R1	Houston	5.10	148.00	163.00	155.50	Poor	822.03	16.13	0.54	0.24	268.22	71.61	44.50	Low
HOUSTON-24	R1	Houston	5.20	125.00	135.00	130.00	Fair	598.93	5.72	0.38	0.24	192.45	82.97	51.56	Medium
HOUSTON-24	R2	Houston	0.10	140.00	139.00	139.50	Poor	470.80	0.41	0.20	0.06	149.11	106.58	66.22	High
HOUSTON-24	R2	Houston	0.20	140.00	150.00	145.00	Poor	394.30	2.07	0.16	0.02	125.65	113.54	70.55	High
HOUSTON-24	R2	Houston	0.30	132.00	130.00	131.00	Poor	397.91	1.20	0.17	0.09	126.46	110.64	68.75	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-24	R2	Houston	0.40	157.00	130.00	143.50	Poor	653.48	2.80	0.27	0.26	208.05	112.44	69.86	High
HOUSTON-24	R2	Houston	0.50	155.00	132.00	143.50	Poor	276.55	1.31	0.11	0.08	88.19	113.60	70.59	High
HOUSTON-24	R2	Houston	0.60	138.00	132.00	135.00	Poor	373.14	1.02	0.15	0.20	118.57	108.17	67.21	High
HOUSTON-24	R2	Houston	0.70	133.00	129.00	131.00	Poor	697.66	1.39	0.29	0.50	221.30	106.68	66.29	High
HOUSTON-24	R2	Houston	0.80	183.00	160.00	171.50	Very Poor	800.92	0.95	0.34	0.45	253.82	109.59	68.10	High
HOUSTON-24	R2	Houston	0.90	152.00	133.00	142.50	Poor	584.22	0.79	0.25	0.17	185.13	112.93	70.17	High
HOUSTON-24	R2	Houston	1.00	164.00	129.00	146.50	Poor	646.30	0.79	0.27	0.22	204.75	112.78	70.08	High
HOUSTON-24	R2	Houston	1.10	172.00	130.00	151.00	Poor	690.59	0.79	0.29	0.19	218.77	111.51	69.29	High
HOUSTON-24	R2	Houston	1.20	127.00	132.00	129.50	Fair	699.72	0.76	0.29	0.16	221.65	113.10	70.28	High
HOUSTON-24	R2	Houston	1.30	161.00	113.00	137.00	Poor	721.31	0.91	0.30	0.14	228.56	110.97	68.95	High
HOUSTON-24	R2	Houston	1.40	69.00	86.00	77.50	Good	489.65	6.38	0.21	0.06	157.99	113.47	70.51	High
HOUSTON-24	R2	Houston	1.50	71.00	85.00	78.00	Good	492.16	2.04	0.21	0.06	156.80	117.05	72.73	High
HOUSTON-24	R2	Houston	1.60	67.00	72.00	69.50	Good	698.32	1.28	0.30	0.16	221.47	115.67	71.88	High
HOUSTON-24	R2	Houston	1.70	73.00	89.00	81.00	Good	450.00	2.86	0.19	0.14	143.74	112.65	70.00	High
HOUSTON-24	R2	Houston	1.80	118.00	119.00	118.50	Fair	657.61	0.19	0.28	0.08	208.16	112.29	69.77	High
HOUSTON-24	R2	Houston	1.90	88.00	97.00	92.50	Good	612.88	0.76	0.25	0.04	194.23	116.73	72.53	High
HOUSTON-24	R2	Houston	2.00	148.00	177.00	162.50	Poor	533.32	1.13	0.22	0.03	169.20	116.63	72.47	High
HOUSTON-24	R2	Houston	2.10	150.00	152.00	151.00	Poor	690.34	1.54	0.29	0.13	219.06	116.25	72.24	High
HOUSTON-24	R2	Houston	2.20	83.00	128.00	105.50	Fair	653.99	1.66	0.27	0.23	207.62	117.60	73.08	High
HOUSTON-24	R2	Houston	2.30	82.00	112.00	97.00	Fair	323.02	2.64	0.13	0.13	103.51	119.42	74.21	High
HOUSTON-24	R2	Houston	2.40	151.00	157.00	154.00	Poor	356.21	0.65	0.15	0.47	112.89	113.87	70.75	High
HOUSTON-24	R2	Houston	2.50	135.00	151.00	143.00	Poor	657.80	0.76	0.27	0.66	208.50	109.64	68.13	High
HOUSTON-24	R2	Houston	2.60	89.00	130.00	109.50	Fair	716.95	0.98	0.29	0.25	227.14	112.37	69.82	High
HOUSTON-24	R2	Houston	2.70	87.00	99.00	93.00	Good	814.18	1.29	0.33	0.24	258.05	118.10	73.38	High
HOUSTON-24	R2	Houston	2.80	89.00	132.00	110.50	Fair	500.46	2.38	0.21	0.20	159.46	121.01	75.19	High
HOUSTON-24	R2	Houston	2.90	107.00	141.00	124.00	Fair	543.10	1.40	0.22	0.22	172.41	118.69	73.75	High
HOUSTON-24	R2	Houston	3.00	140.00	150.00	145.00	Poor	559.75	7.56	0.23	0.35	180.85	117.73	73.15	High
HOUSTON-24	R2	Houston	3.10	133.00	187.00	160.00	Poor	646.36	1.81	0.27	0.20	205.24	116.40	72.33	High
HOUSTON-24	R2	Houston	3.20	98.00	127.00	112.50	Fair	419.11	1.34	0.17	0.11	133.21	119.11	74.01	High
HOUSTON-24	R2	Houston	3.30	86.00	100.00	93.00	Good	686.30	3.99	0.28	0.14	218.99	121.35	75.40	High
HOUSTON-24	R2	Houston	3.40	134.00	148.00	141.00	Poor	190.92	3.93	0.09	0.04	62.38	118.31	73.52	High
HOUSTON-24	R2	Houston	3.50	76.00	154.00	115.00	Fair	23.55	0.07	0.02	0.01	7.38	105.75	65.71	High
HOUSTON-24	R2	Houston	3.60	122.00	218.00	170.00	Very Poor	65.43	0.04	0.06	0.02	20.80	81.79	50.82	Medium
HOUSTON-24	R2	Houston	3.70	111.00	162.00	136.50	Poor	260.70	0.03	0.11	0.04	82.40	84.25	52.35	Medium
HOUSTON-24	R2	Houston	3.80	133.00	135.00	134.00	Poor	14.81	0.03	0.03	0.01	4.67	81.86	50.87	Medium
HOUSTON-24	R2	Houston	3.90	150.00	153.00	151.50	Poor	53.87	0.25	0.06	0.12	17.31	60.91	37.85	Low
HOUSTON-24	R2	Houston	4.00	124.00	119.00	121.50	Fair	616.62	3.26	0.27	0.15	196.83	54.23	33.70	Low
HOUSTON-24	R2	Houston	4.10	135.00	161.00	148.00	Poor	184.16	0.51	0.10	0.07	58.60	51.50	32.00	Low
HOUSTON-24	R2	Houston	4.20	132.00	153.00	142.50	Poor	453.78	0.12	0.22	0.10	143.58	42.09	26.15	Low
HOUSTON-24	R2	Houston	4.30	117.00	118.00	117.50	Fair	726.26	0.26	0.35	0.06	229.76	55.40	34.43	Low
HOUSTON-24	R2	Houston	4.40	98.00	124.00	111.00	Fair	164.34	0.13	0.09	0.06	52.11	58.30	36.23	Low
HOUSTON-24	R2	Houston	4.50	115.00	146.00	130.50	Fair	992.69	0.46	0.41	0.14	314.15	43.98	27.33	Low
HOUSTON-24	R2	Houston	4.60	103.00	130.00	116.50	Fair	602.39	0.33	0.25	0.19	190.58	63.54	39.48	Low
HOUSTON-24	R2	Houston	4.70	117.00	160.00	138.50	Poor	748.85	1.75	0.32	0.18	237.52	42.95	26.69	Low
HOUSTON-24	R2	Houston	4.80	100.00	116.00	108.00	Fair	1267.80	7.03	0.54	0.44	404.50	40.89	25.41	Low
HOUSTON-24	R2	Houston	4.90	172.00	182.00	177.00	Very Poor	1609.50	1.70	0.69	1.31	509.99	62.01	38.53	Low
HOUSTON-24	R2	Houston	5.00	125.00	132.00	128.50	Fair	982.63	1.45	0.42	0.24	311.28	80.08	49.76	Medium
HOUSTON-24	R2	Houston	5.10	148.00	163.00	155.50	Poor	196.86	0.58	0.09	0.03	62.55	83.10	51.64	Medium
HOUSTON-24	R2	Houston	5.20	125.00	135.00	130.00	Fair	584.68	0.43	0.25	0.08	185.12	84.04	52.22	Medium
HOUSTON-24	R3	Houston	0.10	140.00	139.00	139.50	Poor	591.48	5.45	0.25	0.40	189.65	114.02	70.85	High
HOUSTON-24	R3	Houston	0.20	140.00	150.00	145.00	Poor	781.30	5.40	0.33	0.12	249.75	115.92	72.03	High
HOUSTON-24	R3	Houston	0.30	132.00	130.00	131.00	Poor	1183.29	3.03	0.49	0.15	375.67	114.37	71.06	High
HOUSTON-24	R3	Houston	0.40	157.00	130.00	143.50	Poor	1503.88	4.11	0.61	0.18	477.48	118.06	73.36	High
HOUSTON-24	R3	Houston	0.50	155.00	132.00	143.50	Poor	1168.40	32.68	0.48	0.24	385.64	118.61	73.70	High
HOUSTON-24	R3	Houston	0.60	138.00	132.00	135.00	Poor	1102.06	10.71	0.46	0.63	353.87	116.93	72.66	High
HOUSTON-24	R3	Houston	0.70	133.00	129.00	131.00	Poor	1107.63	4.17	0.46	0.22	352.23	119.81	74.45	High
HOUSTON-24	R3	Houston	0.80	183.00	160.00	171.50	Very Poor	864.80	10.92	0.36	0.28	278.88	121.85	75.71	High
HOUSTON-24	R3	Houston	0.90	152.00	133.00	142.50	Poor	812.33	3.91	0.34	0.41	258.73	121.82	75.69	High
HOUSTON-24	R3	Houston	1.00	164.00	129.00	146.50	Poor	569.03	2.29	0.23	0.19	181.10	120.00	74.57	High
HOUSTON-24	R3	Houston	1.10	172.00	130.00	151.00	Poor	985.08	2.04	0.40	0.71	312.36	116.74	72.54	High
HOUSTON-24	R3	Houston	1.20	127.00	132.00	129.50	Fair	690.78	8.65	0.28	0.18	222.73	118.54	73.66	High
HOUSTON-24	R3	Houston	1.30	161.00	113.00	137.00	Poor	739.10	1.05	0.29	0.06	234.31	115.69	71.89	High
HOUSTON-24	R3	Houston	1.40	69.00	86.00	77.50	Good	657.97	1.39	0.19	0.15	208.67	118.52	73.64	High
HOUSTON-24	R3	Houston	1.50	71.00	85.00	78.00	Good	737.08	2.12	0.21	0.07	234.07	123.22	76.57	High
HOUSTON-24	R3	Houston	1.60	67.00	72.00	69.50	Good	1009.70	3.35	0.29	0.26	320.90	123.74	76.89	High
HOUSTON-24	R3	Houston	1.70	73.00	89.00	81.00	Good	540.79	5.71	0.16	0.25	173.90	122.38	76.05	High
HOUSTON-24	R3	Houston	1.80	118.00	119.00	118.50	Fair	372.37	2.60	0.11	0.19	119.06	121.60	75.56	High
HOUSTON-24	R3	Houston	1.90	88.00	97.00	92.50	Good	623.88	3.56	0.18	0.38	199.02	119.97	74.55	High
HOUSTON-24	R3	Houston	2.00	148.00	177.00	162.50	Poor	812.01	2.21	0.23	0.18	257.75	118.71	73.76	High
HOUSTON-24	R3	Houston	2.10	150.00	152.00	151.00	Poor	934.60	1.24	0.27	0.24	296.23	119.44	74.22	High
HOUSTON-24	R3	Houston	2.20	83.00	128.00	105.50	Fair	726.29	1.12	0.21	0.22	230.09	120.12	74.64	High
HOUSTON-24	R3	Houston	2.30	82.00	112.00	97.00	Fair	564.67	0.84	0.16	0.59	178.87	117.94	73.28	High
HOUSTON-24	R3	Houston	2.40	151.00	157.00	154.00	Poor	833.52	11.04	0.26	0.59	268.96	115.72	71.91	High
HOUSTON-24	R3	Houston	2.50	135.00	151.00	143.00	Poor	1283.27	5.10	0.50	0.53	408.37	115.05	71.49	High
HOUSTON-24	R3	Houston	2.60	89.00	130.00	109.50	Fair	920.77	4.18	0.36	0.41	293.32	122.66	76.22	High
HOUSTON-24	R3	Houston	2.70	87.00	99.00	93.00	Good	649.24	3.19	0.26	0.12	206.91	124.32	77.25	High
HOUSTON-24	R3	Houston	2.80	89.00	132.00	110.50	Fair	218.76	0.89	0.09	0.01	69.72	121.38	75.42	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-24	R3	Houston	2.90	107.00	141.00	124.00	Fair	427.58	1.86	0.17	0.11	136.15	116.85	72.61	High
HOUSTON-24	R3	Houston	3.00	140.00	150.00	145.00	Poor	672.02	1.19	0.27	0.24	213.05	112.11	69.66	High
HOUSTON-24	R3	Houston	3.10	133.00	187.00	160.00	Poor	311.69	0.43	0.12	0.13	98.75	109.88	68.27	High
HOUSTON-24	R3	Houston	3.20	98.00	127.00	112.50	Fair	33.06	0.07	0.02	0.01	10.50	106.95	66.46	High
HOUSTON-24	R3	Houston	3.30	86.00	100.00	93.00	Good	347.87	0.33	0.15	0.10	110.03	100.80	62.64	High
HOUSTON-24	R3	Houston	3.40	134.00	148.00	141.00	Poor	652.75	0.51	0.25	0.08	206.71	99.06	61.55	High
HOUSTON-24	R3	Houston	3.50	76.00	154.00	115.00	Fair	393.81	0.90	0.16	0.06	124.90	99.91	62.08	High
HOUSTON-24	R3	Houston	3.60	122.00	218.00	170.00	Very Poor	117.77	0.38	0.05	0.01	37.31	97.06	60.31	High
HOUSTON-24	R3	Houston	3.70	111.00	162.00	136.50	Poor	6.15	0.04	0.01	0.00	1.94	90.33	56.13	Medium
HOUSTON-24	R3	Houston	3.80	133.00	135.00	134.00	Poor	13.72	0.00	0.02	0.00	4.35	76.53	47.55	Medium
HOUSTON-24	R3	Houston	3.90	150.00	153.00	151.50	Poor	72.11	0.00	0.03	0.01	22.85	38.19	23.73	Low
HOUSTON-24	R3	Houston	4.00	124.00	119.00	121.50	Fair	445.40	1.52	0.17	0.23	141.63	41.31	25.67	Low
HOUSTON-24	R3	Houston	4.10	135.00	161.00	148.00	Poor	269.97	1.07	0.11	0.26	85.84	55.59	34.54	Low
HOUSTON-24	R3	Houston	4.20	132.00	153.00	142.50	Poor	220.20	0.86	0.09	0.02	70.06	58.81	36.54	Low
HOUSTON-24	R3	Houston	4.30	117.00	118.00	117.50	Fair	170.21	0.66	0.07	0.21	54.07	57.41	35.67	Low
HOUSTON-24	R3	Houston	4.40	98.00	124.00	111.00	Fair	156.43	0.48	0.07	0.23	49.70	58.97	36.64	Low
HOUSTON-24	R3	Houston	4.50	115.00	146.00	130.50	Fair	179.63	0.19	0.08	0.19	56.88	56.29	34.97	Low
HOUSTON-24	R3	Houston	4.60	103.00	130.00	116.50	Fair	80.01	0.07	0.04	0.04	25.34	55.12	34.25	Low
HOUSTON-24	R3	Houston	4.70	117.00	160.00	138.50	Poor	93.82	0.62	0.04	0.03	30.00	28.15	17.49	Low
HOUSTON-24	R3	Houston	4.80	100.00	116.00	108.00	Fair	481.15	2.09	0.20	0.22	153.18	27.70	17.21	Low
HOUSTON-24	R3	Houston	4.90	172.00	182.00	177.00	Very Poor	138.98	1.61	0.06	0.03	44.75	25.22	15.67	Low
HOUSTON-24	R3	Houston	5.00	125.00	132.00	128.50	Fair	113.77	0.33	0.06	0.06	36.13	20.37	12.66	Low
HOUSTON-24	R3	Houston	5.10	148.00	163.00	155.50	Poor	109.65	1.44	0.05	0.02	35.39	20.11	12.49	Low
HOUSTON-24	R3	Houston	5.20	125.00	135.00	130.00	Fair	567.72	2.02	0.24	0.08	180.53	36.76	22.84	Low
HOUSTON-25	R1	Houston	0.10	53.00	47.00	50.00	Very Good	616.11	0.35	0.31	0.08	195.00	115.13	71.54	High
HOUSTON-25	R1	Houston	0.20	42.00	43.00	42.50	Very Good	667.70	0.47	0.33	0.08	211.52	119.88	74.49	High
HOUSTON-25	R1	Houston	0.30	48.00	45.00	46.50	Very Good	665.36	0.78	0.33	0.13	210.94	122.04	75.83	High
HOUSTON-25	R1	Houston	0.40	115.00	109.00	112.00	Fair	633.77	0.83	0.37	0.16	201.01	123.15	76.52	High
HOUSTON-25	R1	Houston	0.50	113.00	114.00	113.50	Fair	333.91	0.51	0.20	0.12	105.90	121.97	75.79	High
HOUSTON-25	R1	Houston	0.60	42.00	45.00	43.50	Very Good	325.76	0.49	0.19	0.33	103.41	116.97	72.68	High
HOUSTON-25	R1	Houston	0.70	34.00	39.00	36.50	Very Good	507.72	0.55	0.29	0.30	160.91	113.25	70.37	High
HOUSTON-25	R1	Houston	0.80	38.00	40.00	39.00	Very Good	668.38	0.49	0.38	0.19	211.62	112.74	70.06	High
HOUSTON-25	R1	Houston	0.90	183.00	187.00	185.00	Very Poor	668.53	0.40	0.38	0.07	211.73	113.18	70.33	High
HOUSTON-25	R1	Houston	1.00	48.00	42.00	45.00	Very Good	672.52	0.37	0.38	0.10	212.93	112.80	70.09	High
HOUSTON-25	R1	Houston	1.10	55.00	51.00	53.00	Very Good	552.68	0.39	0.31	0.07	174.88	110.17	68.46	High
HOUSTON-25	R1	Houston	1.20	61.00	58.00	59.50	Very Good	600.26	1.84	0.34	0.05	190.83	109.37	67.96	High
HOUSTON-25	R1	Houston	1.30	140.00	145.00	142.50	Poor	747.61	1.11	0.43	0.09	237.01	114.28	71.01	High
HOUSTON-25	R1	Houston	1.40	182.00	161.00	171.50	Very Poor	751.39	1.17	0.42	0.16	238.25	115.12	71.53	High
HOUSTON-25	R1	Houston	1.50	128.00	113.00	120.50	Fair	562.24	1.49	0.30	0.17	178.61	114.36	71.06	High
HOUSTON-25	R1	Houston	1.60	47.00	50.00	48.50	Very Good	361.84	0.53	0.19	0.06	114.88	114.25	70.99	High
HOUSTON-25	R1	Houston	1.70	41.00	44.00	42.50	Very Good	668.28	0.16	0.35	0.03	211.47	115.55	71.80	High
HOUSTON-25	R1	Houston	1.80	46.00	47.00	46.50	Very Good	727.41	0.55	0.38	0.06	230.34	117.52	73.03	High
HOUSTON-25	R1	Houston	1.90	46.00	43.00	44.50	Very Good	730.66	0.78	0.39	0.12	231.49	119.29	74.13	High
HOUSTON-25	R1	Houston	2.00	93.00	89.00	91.00	Good	724.96	0.94	0.39	0.22	229.80	121.03	75.20	High
HOUSTON-25	R1	Houston	2.10	156.00	140.00	148.00	Poor	716.70	0.97	0.39	0.24	227.20	122.84	76.33	High
HOUSTON-25	R1	Houston	2.20	48.00	49.00	48.50	Very Good	689.74	1.18	0.37	0.26	218.82	121.01	75.19	High
HOUSTON-25	R1	Houston	2.30	44.00	42.00	43.00	Very Good	641.19	2.88	0.34	0.12	204.28	118.66	73.73	High
HOUSTON-25	R1	Houston	2.40	42.00	47.00	44.50	Very Good	799.67	3.42	0.42	0.09	254.74	123.08	76.48	High
HOUSTON-25	R1	Houston	2.50	32.00	39.00	35.50	Very Good	149.72	1.52	0.09	0.03	48.15	125.51	77.99	High
HOUSTON-25	R1	Houston	2.60	35.00	41.00	38.00	Very Good	502.09	3.63	0.27	0.06	160.59	119.39	74.19	High
HOUSTON-25	R1	Houston	2.70	47.00	52.00	49.50	Very Good	507.94	2.94	0.27	0.13	162.28	117.43	72.97	High
HOUSTON-25	R1	Houston	2.80	43.00	44.00	43.50	Very Good	191.51	3.11	0.11	0.07	62.24	119.41	74.20	High
HOUSTON-25	R1	Houston	2.90	43.00	47.00	45.00	Very Good	443.39	1.93	0.24	0.05	141.28	115.40	71.71	High
HOUSTON-25	R1	Houston	3.00	48.00	45.00	46.50	Very Good	609.01	2.80	0.32	0.04	194.05	115.00	71.46	High
HOUSTON-25	R1	Houston	3.10	41.00	43.00	42.00	Very Good	682.47	1.54	0.37	0.08	216.64	117.12	72.77	High
HOUSTON-25	R1	Houston	3.20	115.00	119.00	117.00	Fair	533.57	1.34	0.28	0.16	169.48	117.65	73.10	High
HOUSTON-25	R1	Houston	3.30	143.00	192.00	167.50	Poor	902.83	2.88	0.48	0.28	287.08	119.69	74.37	High
HOUSTON-25	R1	Houston	3.40	41.00	44.00	42.50	Very Good	635.89	2.59	0.34	0.27	202.42	123.61	76.81	High
HOUSTON-25	R1	Houston	3.50	50.00	45.00	47.50	Very Good	551.63	1.89	0.29	0.18	175.55	122.52	76.13	High
HOUSTON-25	R1	Houston	3.60	112.00	106.00	109.00	Fair	665.81	2.13	0.35	0.21	211.68	123.13	76.51	High
HOUSTON-25	R1	Houston	3.70	118.00	115.00	116.50	Fair	385.36	1.12	0.21	0.12	122.35	122.89	76.36	High
HOUSTON-25	R1	Houston	3.80	43.00	45.00	44.00	Very Good	387.28	0.83	0.21	0.10	123.07	116.44	72.35	High
HOUSTON-25	R1	Houston	3.90	40.00	43.00	41.50	Very Good	257.92	0.40	0.14	0.05	81.80	111.08	69.03	High
HOUSTON-25	R1	Houston	4.00	45.00	50.00	47.50	Very Good	334.74	0.26	0.18	0.05	105.96	110.19	68.47	High
HOUSTON-25	R1	Houston	4.10	50.00	59.00	54.50	Very Good	897.22	0.46	0.47	0.32	284.08	113.02	70.23	High
HOUSTON-25	R1	Houston	4.20	42.00	45.00	43.50	Very Good	788.17	0.59	0.42	0.13	249.63	118.97	73.92	High
HOUSTON-25	R1	Houston	4.30	38.00	31.00	34.50	Very Good	529.15	0.61	0.28	0.08	167.63	120.85	75.09	High
HOUSTON-25	R1	Houston	4.40	109.00	92.00	100.50	Fair	684.63	0.82	0.36	0.30	216.95	115.89	72.01	High
HOUSTON-25	R1	Houston	4.50	145.00	107.00	126.00	Fair	493.16	0.63	0.26	0.17	156.38	112.46	69.88	High
HOUSTON-25	R1	Houston	4.60	38.00	39.00	38.50	Very Good	177.96	1.30	0.11	0.06	56.93	111.95	69.56	High
HOUSTON-25	R1	Houston	4.70	25.00	32.00	28.50	Very Good	438.77	2.23	0.24	0.05	139.84	112.74	70.05	High
HOUSTON-25	R1	Houston	4.80	124.00	122.00	123.00	Fair	451.79	1.32	0.24	0.03	143.56	113.91	70.78	High
HOUSTON-25	R1	Houston	4.90	47.00	46.00	46.50	Very Good	527.47	3.70	0.28	0.11	168.66	112.75	70.06	High
HOUSTON-25	R1	Houston	5.00	43.00	42.00	42.50	Very Good	19.40	0.30	0.03	0.01	6.31	101.50	63.07	High
HOUSTON-25	R1	Houston	5.10	38.00	33.00	35.50	Very Good	488.49	0.18	0.27	0.06	154.57	94.20	58.54	Medium
HOUSTON-25	R1	Houston	5.20	31.00	34.00	32.50	Very Good	831.70	0.18	0.43	0.11	263.17	106.40	66.12	High
HOUSTON-25	R1	Houston	5.30	34.00	39.00	36.50	Very Good	840.17	0.23	0.44	0.08	265.90	112.84	70.12	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-25	R1	Houston	5.40	126.00	114.00	120.00	Fair	531.49	5.36	0.28	0.11	170.77	114.57	71.19	High
HOUSTON-25	R1	Houston	5.50	54.00	69.00	61.50	Good	100.49	1.27	0.08	0.03	32.35	107.39	66.73	High
HOUSTON-25	R1	Houston	5.60	47.00	57.00	52.00	Very Good	574.16	0.23	0.30	0.11	181.80	108.24	67.26	High
HOUSTON-25	R1	Houston	5.70	33.00	42.00	37.50	Very Good	439.28	0.20	0.23	0.02	139.11	112.62	69.98	High
HOUSTON-25	R1	Houston	5.80	59.00	53.00	56.00	Very Good	641.52	0.31	0.33	0.08	203.11	112.14	69.68	High
HOUSTON-25	R1	Houston	5.90	230.00	119.00	174.50	Very Poor	329.29	0.19	0.17	0.07	104.21	110.01	68.36	High
HOUSTON-25	R2	Houston	0.10	53.00	47.00	50.00	Very Good	218.01	0.83	0.11	0.05	94.56	114.86	67.95	High
HOUSTON-25	R2	Houston	0.20	42.00	43.00	42.50	Very Good	627.05	0.88	0.31	0.05	156.41	115.17	68.14	High
HOUSTON-25	R2	Houston	0.30	48.00	45.00	46.50	Very Good	729.61	1.00	0.34	0.04	245.88	120.48	71.28	High
HOUSTON-25	R2	Houston	0.40	115.00	109.00	112.00	Fair	172.26	0.50	0.09	0.01	88.94	120.32	71.18	High
HOUSTON-25	R2	Houston	0.50	113.00	114.00	113.50	Fair	256.33	0.36	0.13	0.02	50.05	111.11	65.73	High
HOUSTON-25	R2	Houston	0.60	42.00	45.00	43.50	Very Good	619.46	0.72	0.28	0.07	198.21	111.32	65.86	High
HOUSTON-25	R2	Houston	0.70	34.00	39.00	36.50	Very Good	613.12	0.98	0.27	0.14	194.88	112.83	66.75	High
HOUSTON-25	R2	Houston	0.80	38.00	40.00	39.00	Very Good	239.73	0.43	0.11	0.03	87.97	111.96	66.23	High
HOUSTON-25	R2	Houston	0.90	183.00	187.00	185.00	Very Poor	760.57	1.18	0.34	0.23	215.48	109.56	64.81	High
HOUSTON-25	R2	Houston	1.00	48.00	42.00	45.00	Very Good	380.73	0.89	0.17	0.11	161.92	110.48	65.36	High
HOUSTON-25	R2	Houston	1.10	55.00	51.00	53.00	Very Good	250.19	2.63	0.12	0.04	57.41	102.90	60.87	High
HOUSTON-25	R2	Houston	1.20	61.00	58.00	59.50	Very Good	722.98	2.39	0.32	0.09	222.64	103.41	61.18	High
HOUSTON-25	R2	Houston	1.30	140.00	145.00	142.50	Poor	747.84	2.19	0.33	0.07	220.24	110.37	65.29	High
HOUSTON-25	R2	Houston	1.40	182.00	161.00	171.50	Very Poor	858.59	4.11	0.38	0.21	271.09	113.13	66.93	High
HOUSTON-25	R2	Houston	1.50	128.00	113.00	120.50	Fair	664.81	17.24	0.31	0.14	222.02	116.14	68.71	High
HOUSTON-25	R2	Houston	1.60	47.00	50.00	48.50	Very Good	660.25	3.76	0.31	0.07	233.02	121.13	71.66	High
HOUSTON-25	R2	Houston	1.70	41.00	44.00	42.50	Very Good	520.35	2.97	0.25	0.19	154.14	123.28	72.93	High
HOUSTON-25	R2	Houston	1.80	46.00	47.00	46.50	Very Good	504.29	3.98	0.24	0.19	173.44	122.62	72.54	High
HOUSTON-25	R2	Houston	1.90	46.00	43.00	44.50	Very Good	392.86	3.46	0.19	0.21	128.70	121.19	71.70	High
HOUSTON-25	R2	Houston	2.00	93.00	89.00	91.00	Good	692.28	2.69	0.33	0.62	195.16	117.63	69.59	High
HOUSTON-25	R2	Houston	2.10	156.00	140.00	148.00	Poor	844.54	2.66	0.40	0.41	268.22	119.84	70.90	High
HOUSTON-25	R2	Houston	2.20	48.00	49.00	48.50	Very Good	684.29	3.87	0.32	0.45	236.65	120.06	71.03	High
HOUSTON-25	R2	Houston	2.30	44.00	42.00	43.00	Very Good	323.03	1.79	0.15	0.13	103.50	117.35	69.43	High
HOUSTON-25	R2	Houston	2.40	42.00	47.00	44.50	Very Good	771.22	1.59	0.36	0.48	223.95	118.33	70.00	High
HOUSTON-25	R2	Houston	2.50	32.00	39.00	35.50	Very Good	601.99	3.22	0.28	0.22	206.21	122.25	72.32	High
HOUSTON-25	R2	Houston	2.60	35.00	41.00	38.00	Very Good	704.80	5.37	0.33	0.23	233.73	120.20	71.11	High
HOUSTON-25	R2	Houston	2.70	47.00	52.00	49.50	Very Good	407.92	5.14	0.19	0.07	145.81	119.95	70.96	High
HOUSTON-25	R2	Houston	2.80	43.00	44.00	43.50	Very Good	373.60	0.48	0.17	0.03	99.98	119.59	70.75	High
HOUSTON-25	R2	Houston	2.90	43.00	47.00	45.00	Very Good	653.75	0.72	0.30	0.09	199.23	118.07	69.85	High
HOUSTON-25	R2	Houston	3.00	48.00	45.00	46.50	Very Good	531.58	1.25	0.24	0.09	185.38	118.93	70.36	High
HOUSTON-25	R2	Houston	3.10	41.00	43.00	42.00	Very Good	372.14	0.63	0.17	0.09	110.20	116.51	68.92	High
HOUSTON-25	R2	Houston	3.20	115.00	119.00	117.00	Fair	625.62	0.81	0.28	0.10	193.15	115.01	68.04	High
HOUSTON-25	R2	Houston	3.30	143.00	192.00	167.50	Poor	411.28	2.04	0.18	0.07	136.97	115.11	68.10	High
HOUSTON-25	R2	Houston	3.40	41.00	44.00	42.50	Very Good	744.27	1.32	0.32	0.06	226.12	114.09	67.49	High
HOUSTON-25	R2	Houston	3.50	50.00	45.00	47.50	Very Good	378.75	2.40	0.17	0.04	157.03	116.76	69.07	High
HOUSTON-25	R2	Houston	3.60	112.00	106.00	109.00	Fair	469.86	0.74	0.20	0.04	117.75	113.39	67.08	High
HOUSTON-25	R2	Houston	3.70	118.00	115.00	116.50	Fair	374.07	0.37	0.16	0.02	136.69	113.31	67.03	High
HOUSTON-25	R2	Houston	3.80	43.00	45.00	44.00	Very Good	480.58	1.11	0.21	0.07	148.62	107.93	63.85	High
HOUSTON-25	R2	Houston	3.90	40.00	43.00	41.50	Very Good	161.91	1.96	0.08	0.02	60.74	104.28	61.69	High
HOUSTON-25	R2	Houston	4.00	45.00	50.00	47.50	Very Good	651.85	0.03	0.28	0.06	174.73	106.65	63.09	High
HOUSTON-25	R2	Houston	4.10	50.00	59.00	54.50	Very Good	541.93	0.16	0.23	0.04	207.26	111.85	66.17	High
HOUSTON-25	R2	Houston	4.20	42.00	45.00	43.50	Very Good	517.27	0.88	0.22	0.07	133.38	110.67	65.47	High
HOUSTON-25	R2	Houston	4.30	38.00	31.00	34.50	Very Good	769.98	0.90	0.34	0.12	236.26	111.87	66.18	High
HOUSTON-25	R2	Houston	4.40	109.00	92.00	100.50	Fair	840.39	0.93	0.32	0.15	265.99	111.23	65.81	High
HOUSTON-25	R2	Houston	4.50	145.00	107.00	126.00	Fair	369.39	0.54	0.13	0.04	163.30	110.64	65.45	High
HOUSTON-25	R2	Houston	4.60	38.00	39.00	38.50	Very Good	90.97	0.27	0.05	0.02	16.38	106.76	63.16	High
HOUSTON-25	R2	Houston	4.70	25.00	32.00	28.50	Very Good	608.24	1.13	0.21	0.04	171.18	109.77	64.94	High
HOUSTON-25	R2	Houston	4.80	124.00	122.00	123.00	Fair	177.73	0.35	0.06	0.00	89.46	112.15	66.35	High
HOUSTON-25	R2	Houston	4.90	47.00	46.00	46.50	Very Good	490.09	2.60	0.17	0.14	117.58	104.39	61.76	High
HOUSTON-25	R2	Houston	5.00	43.00	42.00	42.50	Very Good	544.95	3.26	0.19	0.19	175.23	102.45	60.61	High
HOUSTON-25	R2	Houston	5.10	38.00	33.00	35.50	Very Good	607.12	3.55	0.21	0.51	194.23	107.41	63.54	High
HOUSTON-25	R2	Houston	5.20	31.00	34.00	32.50	Very Good	473.64	2.62	0.16	0.18	174.53	113.90	67.38	High
HOUSTON-25	R2	Houston	5.30	34.00	39.00	36.50	Very Good	643.72	3.35	0.22	0.17	176.33	114.20	67.56	High
HOUSTON-25	R2	Houston	5.40	126.00	114.00	120.00	Fair	464.48	2.21	0.17	0.21	165.13	112.41	66.50	High
HOUSTON-25	R2	Houston	5.50	54.00	69.00	61.50	Good	400.43	1.82	0.17	0.32	132.57	110.08	65.12	High
HOUSTON-25	R2	Houston	5.60	47.00	57.00	52.00	Very Good	736.61	3.70	0.31	0.42	209.02	116.01	68.63	High
HOUSTON-25	R2	Houston	5.70	33.00	42.00	37.50	Very Good	607.17	3.70	0.25	0.18	217.04	122.26	72.33	High
HOUSTON-25	R2	Houston	5.80	59.00	53.00	56.00	Very Good	260.57	2.41	0.11	0.15	93.54	122.14	72.26	High
HOUSTON-25	R2	Houston	5.90	230.00	119.00	174.50	Very Poor	88.90	0.29	0.04	0.09	43.81	114.60	67.80	High
HOUSTON-25	R3	Houston	0.10	53.00	47.00	50.00	Very Good	557.60	6.79	0.23	0.19	178.96	117.62	69.58	High
HOUSTON-25	R3	Houston	0.20	42.00	43.00	42.50	Very Good	725.03	3.10	0.30	0.21	237.44	121.46	71.85	High
HOUSTON-25	R3	Houston	0.30	48.00	45.00	46.50	Very Good	476.35	2.58	0.20	0.14	159.69	124.29	73.53	High
HOUSTON-25	R3	Houston	0.40	115.00	109.00	112.00	Fair	553.50	1.75	0.23	0.05	178.46	120.32	71.18	High
HOUSTON-25	R3	Houston	0.50	113.00	114.00	113.50	Fair	721.59	2.47	0.30	0.07	233.00	119.83	70.89	High
HOUSTON-25	R3	Houston	0.60	42.00	45.00	43.50	Very Good	800.85	2.93	0.33	0.21	261.59	121.17	71.69	High
HOUSTON-25	R3	Houston	0.70	34.00	39.00	36.50	Very Good	813.75	2.69	0.35	0.21	273.82	124.98	73.94	High
HOUSTON-25	R3	Houston	0.80	38.00	40.00	39.00	Very Good	789.31	2.53	0.35	0.29	271.39	127.73	75.56	High
HOUSTON-25	R3	Houston	0.90	183.00	187.00	185.00	Very Poor	683.24	4.95	0.30	0.21	239.52	129.53	76.63	High
HOUSTON-25	R3	Houston	1.00	48.00	42.00	45.00	Very Good	376.69	1.68	0.16	0.15	125.28	125.42	74.20	High
HOUSTON-25	R3	Houston	1.10	55.00	51.00	53.00	Very Good	739.87	1.73	0.35	0.47	239.94	120.58	71.34	High
HOUSTON-25	R3	Houston	1.20	61.00	58.00	59.50	Very Good	731.01	1.00	0.37	0.36	239.85	122.06	72.21	High

Table C.4. PEMS and Roughness Data, HOUSTON.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
HOUSTON-25	R3	Houston	1.30	140.00	145.00	142.50	Poor	811.63	1.13	0.43	0.20	275.42	126.34	74.74	High
HOUSTON-25	R3	Houston	1.40	182.00	161.00	171.50	Very Poor	565.90	9.86	0.30	0.14	198.15	127.28	75.30	High
HOUSTON-25	R3	Houston	1.50	128.00	113.00	120.50	Fair	424.29	13.73	0.23	0.11	146.27	123.05	72.79	High
HOUSTON-25	R3	Houston	1.60	47.00	50.00	48.50	Very Good	425.42	3.70	0.23	0.04	142.15	123.19	72.88	High
HOUSTON-25	R3	Houston	1.70	41.00	44.00	42.50	Very Good	433.84	7.37	0.23	0.05	146.91	123.34	72.97	High
HOUSTON-25	R3	Houston	1.80	46.00	47.00	46.50	Very Good	810.12	3.19	0.42	0.15	268.19	122.71	72.60	High
HOUSTON-25	R3	Houston	1.90	46.00	43.00	44.50	Very Good	746.16	5.37	0.39	0.26	255.00	126.40	74.78	High
HOUSTON-25	R3	Houston	2.00	93.00	89.00	91.00	Good	441.38	14.32	0.24	0.16	156.77	126.79	75.01	High
HOUSTON-25	R3	Houston	2.10	156.00	140.00	148.00	Poor	106.43	2.07	0.07	0.03	36.48	123.03	72.79	High
HOUSTON-25	R3	Houston	2.20	48.00	49.00	48.50	Very Good	305.97	0.22	0.15	0.06	92.09	113.01	66.85	High
HOUSTON-25	R3	Houston	2.30	44.00	42.00	43.00	Very Good	774.82	2.14	0.31	0.21	232.47	111.41	65.91	High
HOUSTON-25	R3	Houston	2.40	42.00	47.00	44.50	Very Good	574.05	9.16	0.23	0.12	184.58	117.13	69.30	High
HOUSTON-25	R3	Houston	2.50	32.00	39.00	35.50	Very Good	583.49	8.11	0.24	0.10	190.33	119.27	70.56	High
HOUSTON-25	R3	Houston	2.60	35.00	41.00	38.00	Very Good	724.86	6.11	0.29	0.17	232.36	118.14	69.89	High
HOUSTON-25	R3	Houston	2.70	47.00	52.00	49.50	Very Good	45.62	3.42	0.03	0.01	16.10	116.96	69.19	High
HOUSTON-25	R3	Houston	2.80	43.00	44.00	43.50	Very Good	453.56	0.65	0.19	0.06	139.02	113.62	67.22	High
HOUSTON-25	R3	Houston	2.90	43.00	47.00	45.00	Very Good	753.99	1.37	0.30	0.05	239.97	118.45	70.07	High
HOUSTON-25	R3	Houston	3.00	48.00	45.00	46.50	Very Good	271.03	5.30	0.12	0.03	89.96	119.92	70.94	High
HOUSTON-25	R3	Houston	3.10	41.00	43.00	42.00	Very Good	419.41	0.67	0.17	0.03	129.67	115.18	68.14	High
HOUSTON-25	R3	Houston	3.20	115.00	119.00	117.00	Fair	400.43	0.50	0.15	0.03	122.17	113.94	67.41	High
HOUSTON-25	R3	Houston	3.30	143.00	192.00	167.50	Poor	704.80	0.76	0.27	0.05	215.97	114.22	67.57	High
HOUSTON-25	R3	Houston	3.40	41.00	44.00	42.50	Very Good	816.11	1.26	0.33	0.26	257.94	117.61	69.58	High
HOUSTON-25	R3	Houston	3.50	50.00	45.00	47.50	Very Good	538.60	8.73	0.23	0.14	179.27	121.49	71.87	High
HOUSTON-25	R3	Houston	3.60	112.00	106.00	109.00	Fair	763.27	6.21	0.33	0.20	254.53	123.06	72.80	High
HOUSTON-25	R3	Houston	3.70	118.00	115.00	116.50	Fair	573.22	4.24	0.25	0.07	192.61	124.08	73.41	High
HOUSTON-25	R3	Houston	3.80	43.00	45.00	44.00	Very Good	745.27	5.31	0.31	0.25	244.08	120.92	71.53	High
HOUSTON-25	R3	Houston	3.90	40.00	43.00	41.50	Very Good	765.10	3.33	0.33	0.39	250.42	121.44	71.84	High
HOUSTON-25	R3	Houston	4.00	45.00	50.00	47.50	Very Good	625.79	5.96	0.28	0.25	215.11	126.54	74.86	High
HOUSTON-25	R3	Houston	4.10	50.00	59.00	54.50	Very Good	367.52	13.85	0.17	0.07	131.82	127.00	75.13	High
HOUSTON-25	R3	Houston	4.20	42.00	45.00	43.50	Very Good	237.13	4.92	0.12	0.05	81.85	124.03	73.38	High
HOUSTON-25	R3	Houston	4.30	38.00	31.00	34.50	Very Good	199.51	0.91	0.09	0.03	63.12	117.47	69.49	High
HOUSTON-25	R3	Houston	4.40	109.00	92.00	100.50	Fair	581.63	6.09	0.22	0.06	174.75	110.51	65.38	High
HOUSTON-25	R3	Houston	4.50	145.00	107.00	126.00	Fair	732.68	5.95	0.27	0.11	213.57	107.52	63.61	High
HOUSTON-25	R3	Houston	4.60	38.00	39.00	38.50	Very Good	421.07	8.09	0.16	0.17	129.63	111.93	66.22	High
HOUSTON-25	R3	Houston	4.70	25.00	32.00	28.50	Very Good	349.26	1.84	0.15	0.05	109.47	116.86	69.13	High
HOUSTON-25	R3	Houston	4.80	124.00	122.00	123.00	Fair	786.49	2.38	0.32	0.08	248.14	117.02	69.23	High
HOUSTON-25	R3	Houston	4.90	47.00	46.00	46.50	Very Good	866.12	4.81	0.37	0.29	283.05	120.89	71.52	High
HOUSTON-25	R3	Houston	5.00	43.00	42.00	42.50	Very Good	873.46	4.80	0.38	0.49	287.61	121.87	72.10	High
HOUSTON-25	R3	Houston	5.10	38.00	33.00	35.50	Very Good	702.90	9.23	0.32	0.36	244.84	128.06	75.76	High
HOUSTON-25	R3	Houston	5.20	31.00	34.00	32.50	Very Good	332.76	4.56	0.15	0.11	118.39	130.93	77.46	High
HOUSTON-25	R3	Houston	5.30	34.00	39.00	36.50	Very Good	589.98	5.84	0.27	0.09	204.64	127.65	75.52	High
HOUSTON-25	R3	Houston	5.40	126.00	114.00	120.00	Fair	352.07	5.18	0.15	0.05	119.70	123.37	72.99	High
HOUSTON-25	R3	Houston	5.50	54.00	69.00	61.50	Good	671.64	3.00	0.27	0.36	214.10	118.22	69.94	High
HOUSTON-25	R3	Houston	5.60	47.00	57.00	52.00	Very Good	536.10	3.32	0.23	0.07	178.13	122.86	72.69	High
HOUSTON-25	R3	Houston	5.70	33.00	42.00	37.50	Very Good	493.30	3.17	0.21	0.09	163.98	122.91	72.71	High
HOUSTON-25	R3	Houston	5.80	59.00	53.00	56.00	Very Good	556.01	3.41	0.23	0.17	181.48	120.67	71.39	High
HOUSTON-25	R3	Houston	5.90	230.00	119.00	174.50	Very Poor	628.18	2.93	0.26	0.33	198.30	116.89	69.15	High

SAN ANTONIO

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-North	R1	San Antonio	0.10	68.59	71.75	70.17	Good	84.54	0.29	0.20	0.03	26.95	77.15	47.94	Medium
SA-North	R1	San Antonio	0.20	61.71	69.60	65.66	Good	118.65	1.47	0.28	0.02	38.36	75.79	47.09	Medium
SA-North	R1	San Antonio	0.30	64.05	57.96	61.01	Good	189.43	2.25	0.44	0.06	61.33	83.66	51.98	Medium
SA-North	R1	San Antonio	0.40	98.02	87.58	92.80	Good	80.66	0.51	0.18	0.03	25.86	91.77	57.02	Medium
SA-North	R1	San Antonio	0.50	212.74	242.70	227.72	Very Poor	111.83	0.43	0.24	0.06	35.75	88.42	54.94	Medium
SA-North	R1	San Antonio	0.60	127.85	182.73	155.29	Poor	134.25	0.40	0.28	0.04	42.86	90.92	56.50	Medium
SA-North	R1	San Antonio	0.70	125.88	95.21	110.55	Fair	163.12	0.46	0.34	0.07	52.03	92.29	57.35	Medium
SA-North	R1	San Antonio	0.80	149.86	134.17	142.02	Poor	126.02	0.41	0.25	0.09	40.19	95.33	59.24	Medium
SA-North	R1	San Antonio	0.90	204.01	121.08	162.55	Poor	133.72	0.55	0.27	0.11	42.75	95.81	59.53	Medium
SA-North	R1	San Antonio	1.00	214.35	177.14	195.75	Very Poor	146.00	0.74	0.30	0.11	46.74	98.01	60.90	High
SA-North	R1	San Antonio	1.10	159.79	166.98	163.39	Poor	120.09	0.63	0.24	0.07	38.46	103.34	64.21	High
SA-North	R1	San Antonio	1.20	198.77	180.83	189.80	Very Poor	42.06	0.26	0.07	0.02	13.52	102.06	63.42	High
SA-North	R1	San Antonio	1.30	264.70	185.54	225.12	Very Poor	60.46	0.38	0.12	0.02	19.47	97.86	60.81	High
SA-North	R1	San Antonio	1.40	164.97	101.14	133.06	Poor	160.64	0.68	0.24	0.01	51.11	98.62	61.28	High
SA-North	R1	San Antonio	1.50	229.08	146.73	187.91	Very Poor	157.51	0.61	0.34	0.03	50.23	100.94	62.72	High
SA-North	R1	San Antonio	1.60	250.71	138.33	194.52	Very Poor	159.93	0.41	0.22	0.04	50.78	101.61	63.14	High
SA-North	R1	San Antonio	1.70	288.60	136.09	212.35	Very Poor	69.03	0.16	0.06	0.03	21.90	103.69	64.43	High
SA-North	R1	San Antonio	1.80	241.86	154.84	198.35	Very Poor	8.84	0.05	0.02	0.00	2.83	96.03	59.67	Medium
SA-North	R1	San Antonio	1.90	240.49	185.32	212.91	Very Poor	6.33	0.11	0.04	0.00	2.22	73.45	45.64	Medium
SA-North	R1	San Antonio	2.00	304.59	222.16	263.38	Very Poor	94.55	0.49	0.36	0.07	30.45	50.62	31.46	Low
SA-North	R1	San Antonio	2.10	257.62	207.21	232.42	Very Poor	250.10	0.61	0.55	0.16	79.84	68.60	42.63	Low
SA-North	R1	San Antonio	2.20	191.80	222.32	207.06	Very Poor	146.58	0.34	0.30	0.04	46.80	82.55	51.29	Medium
SA-North	R1	San Antonio	2.30	189.41	150.21	169.81	Poor	78.53	0.27	0.20	0.16	25.06	84.96	52.79	Medium
SA-North	R1	San Antonio	2.40	150.60	142.42	146.51	Poor	139.97	0.67	0.56	0.40	44.99	88.20	54.80	Medium
SA-North	R1	San Antonio	2.50	147.56	126.55	137.06	Poor	112.49	0.53	0.44	0.10	36.12	92.83	57.68	Medium
SA-North	R1	San Antonio	2.60	188.87	151.65	170.26	Very Poor	18.65	0.10	0.07	0.01	6.05	91.45	56.82	Medium
SA-North	R1	San Antonio	2.70	168.87	142.47	155.67	Poor	74.73	0.39	0.29	0.02	24.11	83.06	51.61	Medium
SA-North	R1	San Antonio	2.80	213.14	149.92	181.53	Very Poor	126.27	0.71	0.53	0.03	40.79	80.48	50.01	Medium
SA-North	R1	San Antonio	2.90	154.27	178.44	166.36	Poor	180.85	0.82	0.63	0.01	58.16	86.45	53.72	Medium
SA-North	R1	San Antonio	3.00	125.24	194.47	159.86	Poor	88.57	0.41	0.31	0.05	28.56	86.99	54.05	Medium
SA-North	R1	San Antonio	3.10	116.99	154.96	135.98	Poor	110.39	0.48	0.34	0.02	35.38	84.72	52.64	Medium
SA-North	R1	San Antonio	3.20	137.45	139.26	138.36	Poor	138.35	0.33	0.22	0.01	44.20	86.98	54.04	Medium
SA-North	R1	San Antonio	3.30	165.87	137.66	151.77	Poor	127.63	0.19	0.14	0.05	40.57	90.61	56.30	Medium
SA-North	R1	San Antonio	3.40	121.81	130.28	126.05	Fair	124.88	0.17	0.14	0.05	39.73	94.98	59.02	Medium
SA-North	R1	San Antonio	3.50	184.27	129.33	156.80	Poor	49.16	0.08	0.07	0.02	15.71	99.18	61.63	High
SA-North	R1	San Antonio	3.60	115.15	132.01	123.58	Fair	125.26	0.33	0.26	0.03	39.82	98.97	61.50	High
SA-North	R1	San Antonio	3.70	205.56	154.76	180.16	Very Poor	96.27	0.22	0.20	0.01	30.60	98.12	60.97	High
SA-North	R1	San Antonio	3.80	141.04	171.45	156.25	Poor	195.37	0.39	0.38	0.02	62.30	100.47	62.43	High
SA-North	R1	San Antonio	3.90	93.90	141.55	117.73	Fair	189.28	0.37	0.37	0.04	60.22	105.75	65.71	High
SA-North	R1	San Antonio	4.00	99.63	207.99	153.81	Poor	184.44	0.36	0.36	0.06	58.66	108.68	67.53	High
SA-North	R1	San Antonio	4.10	127.06	174.40	150.73	Poor	105.84	0.27	0.22	0.08	33.79	110.22	68.49	High
SA-North	R1	San Antonio	4.20	104.26	146.26	125.26	Fair	142.78	0.80	0.29	0.05	45.82	105.81	65.75	High
SA-North	R1	San Antonio	4.30	173.94	194.96	184.45	Very Poor	132.61	0.74	0.27	0.02	42.53	105.35	65.46	High
SA-North	R1	San Antonio	4.40	147.08	150.91	149.00	Poor	150.09	0.95	0.20	0.14	48.02	103.58	64.36	High
SA-North	R1	San Antonio	4.50	204.14	155.38	179.76	Very Poor	75.38	0.87	0.12	0.08	24.31	100.36	62.36	High
SA-North	R1	San Antonio	4.60	160.08	180.71	170.40	Very Poor	107.30	1.39	0.20	0.07	34.68	99.07	61.56	High
SA-North	R1	San Antonio	4.70	186.48	162.94	174.71	Very Poor	109.40	0.83	0.21	0.03	35.22	99.57	61.87	High
SA-North	R1	San Antonio	4.80	133.28	191.04	162.16	Poor	109.58	0.65	0.14	0.08	35.06	103.67	64.42	High
SA-North	R1	San Antonio	4.90	154.67	157.41	156.04	Poor	84.05	0.54	0.16	0.03	26.99	107.25	66.64	High
SA-North	R1	San Antonio	5.00	111.28	181.93	146.61	Poor	68.52	0.58	0.14	0.04	21.97	105.07	65.29	High
SA-North	R1	San Antonio	5.10	153.64	103.50	128.57	Fair	20.33	0.12	0.04	0.00	6.43	102.13	63.46	High
SA-North	R1	San Antonio	5.20	139.47	117.43	128.45	Fair	36.25	0.17	0.07	0.01	11.50	95.91	59.59	Medium
SA-North	R1	San Antonio	5.30	152.53	119.06	135.80	Poor	117.76	0.49	0.15	0.01	37.55	93.70	58.22	Medium
SA-North	R1	San Antonio	5.40	97.00	209.87	153.44	Poor	115.49	0.57	0.21	0.02	36.94	97.66	60.68	High
SA-North	R1	San Antonio	5.50	98.44	169.61	134.03	Poor	55.99	0.13	0.03	0.02	17.83	99.46	61.80	High
SA-North	R1	San Antonio	5.60	86.91	225.96	156.44	Poor	121.26	0.57	0.24	0.03	38.84	96.73	60.11	High
SA-North	R1	San Antonio	5.70	80.58	105.92	93.25	Good	160.34	0.74	0.33	0.10	51.23	100.56	62.48	High
SA-North	R1	San Antonio	5.80	154.11	189.90	172.01	Very Poor	178.86	0.70	0.24	0.10	57.14	105.20	65.37	High
SA-North	R1	San Antonio	5.90	126.35	262.43	194.39	Very Poor	137.80	0.74	0.25	0.10	43.99	107.00	66.49	High
SA-North	R1	San Antonio	6.00	105.04	266.88	185.96	Very Poor	88.28	0.45	0.08	0.07	28.28	106.73	66.32	High
SA-North	R1	San Antonio	6.10	95.56	284.61	190.09	Very Poor	17.21	0.11	0.03	0.01	5.58	101.58	63.12	High
SA-North	R1	San Antonio	6.20	87.67	209.74	148.71	Poor	19.46	0.33	0.11	0.01	6.38	90.30	56.11	Medium
SA-North	R1	San Antonio	6.30	87.99	137.16	112.58	Fair	137.99	0.84	0.39	0.07	44.20	89.46	55.59	Medium
SA-North	R1	San Antonio	6.40	110.80	128.82	119.81	Fair	128.07	0.45	0.26	0.06	40.86	97.19	60.39	High
SA-North	R1	San Antonio	6.50	180.50	211.02	195.76	Very Poor	55.39	0.23	0.11	0.02	17.84	97.78	60.75	High
SA-North	R1	San Antonio	6.60	121.92	119.40	120.66	Fair	4.63	0.15	0.00	0.00	1.43	86.14	53.52	Medium
SA-North	R1	San Antonio	6.69	95.14	98.24	96.69	Fair	9.25	0.14	0.02	0.01	2.91	53.21	33.06	Low
SA-North	R2	San Antonio	0.10	68.59	71.75	70.17	Good	230.13	0.00	0.11	0.51	72.70	43.92	27.29	Low
SA-North	R2	San Antonio	0.20	61.71	69.60	65.66	Good	236.01	0.09	0.05	0.12	74.54	72.01	44.74	Low
SA-North	R2	San Antonio	0.30	64.05	57.96	61.01	Good	214.22	0.24	0.01	0.11	67.77	84.07	52.24	Medium
SA-North	R2	San Antonio	0.40	98.02	87.58	92.80	Good	195.66	0.50	0.01	0.12	62.09	91.03	56.56	Medium
SA-North	R2	San Antonio	0.50	212.74	242.70	227.72	Very Poor	187.50	0.23	0.02	0.05	59.35	97.16	60.37	High
SA-North	R2	San Antonio	0.60	127.85	182.73	155.29	Poor	185.38	0.15	0.01	0.05	58.51	102.53	63.71	High
SA-North	R2	San Antonio	0.70	125.88	95.21	110.55	Fair	144.75	0.90	0.01	0.03	46.17	105.31	65.44	High
SA-North	R2	San Antonio	0.80	149.86	134.17	142.02	Poor	152.31	0.64	0.02	0.04	48.50	108.52	67.43	High
SA-North	R2	San Antonio	0.90	204.01	121.08	162.55	Poor	140.35	0.22	0.01	0.03	44.44	111.77	69.45	High
SA-North	R2	San Antonio	1.00	214.35	177.14	195.75	Very Poor	137.11	0.29	0.01	0.03	43.51	112.66	70.00	High

Table C.S. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-North	R2	San Antonio	1.10	159.79	166.98	163.39	Poor	157.91	0.40	0.02	0.03	50.03	113.78	70.70	High
SA-North	R2	San Antonio	1.20	198.77	180.83	189.80	Very Poor	179.46	0.42	0.02	0.06	56.82	116.37	72.31	High
SA-North	R2	San Antonio	1.30	264.70	185.54	225.12	Very Poor	187.75	0.45	0.02	0.13	59.58	117.10	72.76	High
SA-North	R2	San Antonio	1.40	164.97	101.14	133.06	Poor	193.43	0.51	0.02	0.13	61.41	119.36	74.17	High
SA-North	R2	San Antonio	1.50	229.08	146.73	187.91	Very Poor	110.71	0.60	0.02	0.11	35.27	120.79	75.06	High
SA-North	R2	San Antonio	1.60	250.71	138.33	194.52	Very Poor	66.66	0.37	0.01	0.04	21.31	120.07	74.61	High
SA-North	R2	San Antonio	1.70	288.60	136.09	212.35	Very Poor	8.01	0.31	0.00	0.00	2.70	92.78	57.65	Medium
SA-North	R2	San Antonio	1.80	241.86	154.84	198.35	Very Poor	310.02	0.52	0.06	0.17	98.17	43.03	26.74	Low
SA-North	R2	San Antonio	1.90	240.49	185.32	212.91	Very Poor	273.78	0.12	0.05	0.14	86.69	71.96	44.71	Low
SA-North	R2	San Antonio	2.00	304.59	222.16	263.38	Very Poor	205.80	0.29	0.02	0.05	65.01	86.21	53.57	Medium
SA-North	R2	San Antonio	2.10	257.62	207.21	232.42	Very Poor	153.58	1.43	0.02	0.05	49.22	94.97	59.01	Medium
SA-North	R2	San Antonio	2.20	191.80	222.32	207.06	Very Poor	128.93	0.55	0.02	0.07	41.07	101.48	63.05	High
SA-North	R2	San Antonio	2.30	189.41	150.21	169.81	Poor	123.31	0.08	0.02	0.05	38.96	103.20	64.12	High
SA-North	R2	San Antonio	2.40	150.60	142.42	146.51	Poor	131.02	0.13	0.01	0.03	41.51	104.90	65.18	High
SA-North	R2	San Antonio	2.50	147.56	126.55	137.06	Poor	99.14	0.15	0.01	0.03	31.37	102.65	63.79	High
SA-North	R2	San Antonio	2.60	188.87	151.65	170.26	Very Poor	166.32	0.33	0.02	0.07	52.72	103.26	64.16	High
SA-North	R2	San Antonio	2.70	168.87	142.47	155.67	Poor	149.20	0.35	0.02	0.08	47.37	104.80	65.12	High
SA-North	R2	San Antonio	2.80	213.14	149.92	181.53	Very Poor	113.88	0.79	0.01	0.10	36.37	100.95	62.72	High
SA-North	R2	San Antonio	2.90	154.27	178.44	166.36	Poor	225.15	0.52	0.02	0.16	71.48	104.69	65.05	High
SA-North	R2	San Antonio	3.00	125.24	194.47	159.86	Poor	216.85	0.44	0.02	0.08	68.87	112.54	69.93	High
SA-North	R2	San Antonio	3.10	116.99	154.96	135.98	Poor	158.98	0.32	0.02	0.05	50.45	117.70	73.13	High
SA-North	R2	San Antonio	3.20	137.45	139.26	138.36	Poor	99.10	2.43	0.01	0.07	32.47	118.40	73.57	High
SA-North	R2	San Antonio	3.30	165.87	137.66	151.77	Poor	154.00	3.21	0.01	0.04	50.17	119.82	74.45	High
SA-North	R2	San Antonio	3.40	121.81	130.28	126.05	Fair	176.67	1.86	0.01	0.09	56.75	121.68	75.61	High
SA-North	R2	San Antonio	3.50	184.27	129.33	156.80	Poor	170.33	1.41	0.01	0.10	54.51	122.00	75.81	High
SA-North	R2	San Antonio	3.60	115.15	132.01	123.58	Fair	188.25	1.30	0.02	0.10	60.12	122.00	75.81	High
SA-North	R2	San Antonio	3.70	205.56	154.76	180.16	Very Poor	196.57	1.25	0.02	0.14	62.69	123.05	76.46	High
SA-North	R2	San Antonio	3.80	141.04	171.45	156.25	Poor	193.79	1.09	0.02	0.14	61.76	124.07	77.09	High
SA-North	R2	San Antonio	3.90	93.90	141.55	117.73	Fair	198.65	0.99	0.02	0.26	63.21	124.96	77.65	High
SA-North	R2	San Antonio	4.00	99.63	207.99	153.81	Poor	207.25	1.04	0.02	0.20	65.98	125.30	77.86	High
SA-North	R2	San Antonio	4.10	127.06	174.40	150.73	Poor	216.95	1.04	0.03	0.16	68.95	126.00	78.29	High
SA-North	R2	San Antonio	4.20	104.26	146.26	125.26	Fair	177.93	0.79	0.02	0.16	56.64	125.85	78.20	High
SA-North	R2	San Antonio	4.30	173.94	194.96	184.45	Very Poor	125.98	0.54	0.01	0.07	40.07	122.83	76.32	High
SA-North	R2	San Antonio	4.40	147.08	150.91	149.00	Poor	67.45	0.27	0.01	0.04	21.40	120.49	74.87	High
SA-North	R2	San Antonio	4.50	204.14	155.38	179.76	Very Poor	47.46	0.26	0.01	0.01	15.17	115.24	71.61	High
SA-North	R2	San Antonio	4.60	160.08	180.71	170.40	Very Poor	90.17	0.28	0.01	0.01	28.72	111.93	69.55	High
SA-North	R2	San Antonio	4.70	186.48	162.94	174.71	Very Poor	149.50	0.29	0.02	0.04	47.26	114.04	70.86	High
SA-North	R2	San Antonio	4.80	133.28	191.04	162.16	Poor	135.20	0.20	0.01	0.06	42.88	116.27	72.25	High
SA-North	R2	San Antonio	4.90	154.67	157.41	156.04	Poor	91.42	0.32	0.02	0.00	29.08	114.96	71.44	High
SA-North	R2	San Antonio	5.00	111.28	181.93	146.61	Poor	137.90	0.37	0.03	0.00	43.70	112.84	70.12	High
SA-North	R2	San Antonio	5.10	153.64	103.50	128.57	Fair	134.68	0.04	0.02	0.00	42.54	113.99	70.83	High
SA-North	R2	San Antonio	5.20	139.47	117.43	128.45	Fair	141.47	0.13	0.02	0.00	44.68	114.55	71.18	High
SA-North	R2	San Antonio	5.30	152.53	119.06	135.80	Poor	101.30	0.09	0.02	0.00	32.10	114.05	70.87	High
SA-North	R2	San Antonio	5.40	97.00	209.87	153.44	Poor	146.96	0.10	0.02	0.01	46.51	112.06	69.63	High
SA-North	R2	San Antonio	5.50	98.44	169.61	134.03	Poor	177.84	0.08	0.03	0.00	56.19	112.81	70.10	High
SA-North	R2	San Antonio	5.60	86.91	225.96	156.44	Poor	200.89	0.10	0.03	0.00	63.51	113.84	70.73	High
SA-North	R2	San Antonio	5.70	80.58	105.92	93.25	Good	190.30	0.07	0.02	0.00	60.20	114.46	71.12	High
SA-North	R2	San Antonio	5.80	154.11	189.90	172.01	Very Poor	158.10	0.05	0.03	0.00	50.02	116.15	72.17	High
SA-North	R2	San Antonio	5.90	126.35	262.43	194.39	Very Poor	90.78	0.06	0.01	0.01	28.70	114.21	70.97	High
SA-North	R2	San Antonio	6.00	105.04	266.88	185.96	Very Poor	169.11	0.27	0.02	0.03	53.47	111.45	69.25	High
SA-North	R2	San Antonio	6.10	95.56	284.61	190.09	Very Poor	123.08	0.07	0.02	0.01	38.80	111.97	69.58	High
SA-North	R2	San Antonio	6.20	87.67	209.74	148.71	Poor	24.27	0.01	0.00	0.00	7.56	107.39	66.73	High
SA-North	R2	San Antonio	6.30	87.99	137.16	112.58	Fair	4.61	0.01	0.00	0.00	1.50	87.27	54.23	Medium
SA-North	R2	San Antonio	6.40	110.80	128.82	119.81	Fair	3.15	0.03	0.01	0.01	1.24	58.15	36.13	Low
SA-North	R3	San Antonio	0.10	68.59	71.75	70.17	Good	7.19	0.09	0.39	0.12	4200.57	48.05	29.85	Low
SA-North	R3	San Antonio	0.20	61.71	69.60	65.66	Good	246.73	0.04	0.08	0.08	2140.77	78.62	48.85	Medium
SA-North	R3	San Antonio	0.30	64.05	57.96	61.01	Good	1058.84	0.02	0.11	0.07	1879.93	89.30	55.49	Medium
SA-North	R3	San Antonio	0.40	98.02	87.58	92.80	Good	379.19	0.02	0.16	0.06	1712.41	97.97	60.88	High
SA-North	R3	San Antonio	0.50	212.74	242.70	227.72	Very Poor	136.26	0.03	0.17	0.07	1598.73	104.92	65.19	High
SA-North	R3	San Antonio	0.60	127.85	182.73	155.29	Poor	398.42	0.01	0.14	0.06	1519.00	110.41	68.61	High
SA-North	R3	San Antonio	0.70	125.88	95.21	110.55	Fair	1855.99	0.02	0.18	0.06	1493.86	112.27	69.76	High
SA-North	R3	San Antonio	0.80	149.86	134.17	142.02	Poor	917.70	0.02	0.15	0.05	1438.87	116.58	72.44	High
SA-North	R3	San Antonio	0.90	204.01	121.08	162.55	Poor	589.38	0.01	0.05	0.02	1425.60	117.67	73.12	High
SA-North	R3	San Antonio	1.00	214.35	177.14	195.75	Very Poor	709.77	0.03	0.06	0.06	1450.34	115.66	71.87	High
SA-North	R3	San Antonio	1.10	159.79	166.98	163.39	Poor	373.11	0.02	0.06	0.04	1397.45	120.04	74.59	High
SA-North	R3	San Antonio	1.20	198.77	180.83	189.80	Very Poor	1018.39	0.01	0.04	0.05	1403.81	119.50	74.25	High
SA-North	R3	San Antonio	1.30	264.70	185.54	225.12	Very Poor	1165.32	0.02	0.03	0.07	1404.78	119.42	74.20	High
SA-North	R3	San Antonio	1.40	164.97	101.14	133.06	Poor	1836.44	0.01	0.04	0.04	1390.82	120.63	74.95	High
SA-North	R3	San Antonio	1.60	250.71	138.33	194.52	Very Poor	730.95	0.01	0.03	0.03	1386.87	120.98	75.17	High
SA-North	R3	San Antonio	1.70	288.60	136.09	212.35	Very Poor	2238.48	0.01	0.02	0.03	1441.99	116.39	72.32	High
SA-North	R3	San Antonio	1.80	241.86	154.84	198.35	Very Poor	1179.97	0.02	0.05	0.05	1428.89	117.44	72.97	High
SA-North	R3	San Antonio	1.90	240.49	185.32	212.91	Very Poor	1394.98	0.02	0.05	0.05	1425.09	117.75	73.17	High
SA-North	R3	San Antonio	2.00	304.59	222.16	263.38	Very Poor	885.47	0.01	0.04	0.03	1416.48	118.48	73.62	High
SA-North	R3	San Antonio	2.10	257.62	207.21	232.42	Very Poor	1170.62	0.01	0.08	0.06	1414.07	118.71	73.76	High
SA-North	R3	San Antonio	2.20	191.80	222.32	207.06	Very Poor	461.39	0.03	0.05	0.04	1356.95	123.68	76.85	High
SA-North	R3	San Antonio	2.30	189.41	150.21	169.81	Poor	982.86	0.06	0.03	0.04	1376.27	121.95	75.78	High
SA-North	R3	San Antonio	2.40	150.60	142.42	146.51	Poor	835.66	0.01	0.06	0.05	1369.83	122.53	76.14	High

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-North	R3	San Antonio	2.50	147.56	126.55	137.06	Poor	970.91	0.01	0.05	0.05	1386.83	121.03	75.21	High
SA-North	R3	San Antonio	2.60	188.87	151.65	170.26	Very Poor	917.72	0.02	0.06	0.05	1382.57	121.41	75.44	High
SA-North	R3	San Antonio	2.70	168.87	142.47	155.67	Poor	1073.74	0.03	0.04	0.07	1395.90	120.26	74.73	High
SA-North	R3	San Antonio	2.80	213.14	149.92	181.53	Very Poor	824.09	0.03	0.00	0.07	1393.10	120.51	74.88	High
SA-North	R3	San Antonio	2.90	154.27	178.44	166.36	Poor	526.20	0.03	0.00	0.07	1392.25	120.59	74.93	High
SA-North	R3	San Antonio	3.00	125.24	194.47	159.86	Poor	471.46	0.03	0.00	0.07	1371.08	122.46	76.09	High
SA-North	R3	San Antonio	3.10	116.99	154.96	135.98	Poor	279.85	0.02	0.01	0.04	1355.63	123.85	76.96	High
SA-North	R3	San Antonio	3.20	137.45	139.26	138.36	Poor	243.37	0.02	0.00	0.04	1364.97	123.01	76.44	High
SA-North	R3	San Antonio	3.30	165.87	137.66	151.77	Poor	394.33	0.02	0.00	0.06	1341.93	125.14	77.76	High
SA-North	R3	San Antonio	3.40	121.81	130.28	126.05	Fair	434.05	0.02	0.01	0.05	1314.38	127.76	79.39	High
SA-North	R3	San Antonio	3.50	184.27	129.33	156.80	Poor	892.24	0.02	0.00	0.05	1332.96	125.99	78.29	High
SA-North	R3	San Antonio	3.60	115.15	132.01	123.58	Fair	2907.72	0.02	0.01	0.07	1337.23	125.59	78.04	High
SA-North	R3	San Antonio	3.70	205.56	154.76	180.16	Very Poor	1069.03	0.02	0.00	0.05	1343.81	124.98	77.66	High
SA-North	R3	San Antonio	3.80	141.04	171.45	156.25	Poor	286.95	0.03	0.00	0.07	1354.51	124.00	77.05	High
SA-North	R3	San Antonio	3.90	93.90	141.55	117.73	Fair	265.25	0.04	0.03	0.07	1348.29	124.58	77.41	High
SA-North	R3	San Antonio	4.00	99.63	207.99	153.81	Poor	297.18	0.07	0.13	0.07	1343.77	125.00	77.67	High
SA-North	R3	San Antonio	4.10	127.06	174.40	150.73	Poor	282.82	0.06	0.10	0.07	1339.28	125.43	77.94	High
SA-North	R3	San Antonio	4.20	104.26	146.26	125.26	Fair	266.97	0.04	0.11	0.06	1350.35	124.41	77.30	High
SA-North	R3	San Antonio	4.30	173.94	194.96	184.45	Very Poor	260.29	0.02	0.07	0.04	1374.95	122.19	75.92	High
SA-North	R3	San Antonio	4.40	147.08	150.91	149.00	Poor	709.24	0.03	0.05	0.04	1409.20	119.24	74.09	High
SA-North	R3	San Antonio	4.50	204.14	155.38	179.76	Very Poor	453.34	0.02	0.02	0.04	1402.38	119.81	74.45	High
SA-North	R3	San Antonio	4.60	160.08	180.71	170.40	Very Poor	510.89	0.02	0.02	0.04	1404.36	119.65	74.35	High
SA-North	R3	San Antonio	4.70	186.48	162.94	174.71	Very Poor	653.42	0.04	0.03	0.05	1390.33	120.87	75.10	High
SA-North	R3	San Antonio	4.80	133.28	191.04	162.16	Poor	897.22	0.08	0.05	0.06	1364.75	123.14	76.51	High
SA-North	R3	San Antonio	4.90	154.67	157.41	156.04	Poor	852.54	0.06	0.07	0.06	1335.43	125.84	78.19	High
SA-North	R3	San Antonio	5.00	111.28	181.93	146.61	Poor	643.53	0.05	0.12	0.04	1331.51	126.22	78.43	High
SA-North	R3	San Antonio	5.10	153.64	103.50	128.57	Fair	714.11	0.04	0.09	0.04	1346.49	124.82	77.56	High
SA-North	R3	San Antonio	5.20	139.47	117.43	128.45	Fair	901.36	0.07	0.06	0.05	1360.12	123.58	76.79	High
SA-North	R3	San Antonio	5.30	152.53	119.06	135.80	Poor	1054.20	0.07	0.16	0.06	1357.68	123.80	76.93	High
SA-North	R3	San Antonio	5.40	97.00	209.87	153.44	Poor	1037.79	0.08	0.10	0.06	1344.93	124.98	77.66	High
SA-North	R3	San Antonio	5.50	98.44	169.61	134.03	Poor	1026.01	0.09	0.13	0.06	1330.28	126.37	78.52	High
SA-North	R3	San Antonio	5.60	86.91	225.96	156.44	Poor	1083.26	0.11	0.15	0.07	1323.64	127.01	78.92	High
SA-North	R3	San Antonio	5.70	80.58	105.92	93.25	Good	934.63	0.10	0.15	0.06	1315.33	127.81	79.42	High
SA-North	R3	San Antonio	5.80	154.11	189.90	172.01	Very Poor	809.60	0.02	0.21	0.06	1314.10	127.94	79.50	High
SA-North	R3	San Antonio	5.90	126.35	262.43	194.39	Very Poor	331.96	0.01	0.07	0.02	1315.93	127.78	79.40	High
SA-North	R3	San Antonio	6.00	105.04	266.88	185.96	Very Poor	1027.64	0.01	0.04	0.02	1407.11	119.57	74.29	High
SA-North	R3	San Antonio	6.10	95.56	284.61	190.09	Very Poor	204.78	0.01	0.02	0.02	1472.51	114.21	70.97	High
SA-North	R3	San Antonio	6.20	87.67	209.74	148.71	Poor	26.46	0.00	0.00	0.00	1623.12	103.81	64.51	High
SA-North	R3	San Antonio	6.30	87.99	137.16	112.58	Fair	94.77	0.03	0.00	0.00	2148.72	80.33	49.92	Medium
SA-North	R3	San Antonio	6.40	110.80	128.82	119.81	Fair	71.18	0.03	0.01	0.01	6084.01	33.48	20.80	Low
SA-North	R4	San Antonio	0.10	68.59	71.75	70.17	Good	413.40	0.00	0.31	0.07	131.01	48.88	30.37	Low
SA-North	R4	San Antonio	0.20	61.71	69.60	65.66	Good	237.66	0.00	0.18	0.05	75.36	74.42	46.24	Medium
SA-North	R4	San Antonio	0.30	64.05	57.96	61.01	Good	201.10	0.01	0.15	0.05	63.71	85.88	53.36	Medium
SA-North	R4	San Antonio	0.40	98.02	87.58	92.80	Good	184.43	0.09	0.14	0.05	58.45	92.95	57.76	Medium
SA-North	R4	San Antonio	0.50	212.74	242.70	227.72	Very Poor	187.31	0.09	0.12	0.07	59.30	98.31	61.09	High
SA-North	R4	San Antonio	0.60	127.85	182.73	155.29	Poor	175.45	0.00	0.02	0.01	55.43	102.88	63.93	High
SA-North	R4	San Antonio	0.70	125.88	95.21	110.55	Fair	136.19	0.10	0.02	0.01	42.99	105.44	65.52	High
SA-North	R4	San Antonio	0.80	149.86	134.17	142.02	Poor	144.06	0.07	0.02	0.00	45.49	107.89	67.04	High
SA-North	R4	San Antonio	0.90	204.01	121.08	162.55	Poor	114.27	0.07	0.01	0.00	36.02	110.79	68.84	High
SA-North	R4	San Antonio	1.00	214.35	177.14	195.75	Very Poor	131.23	0.16	0.01	0.00	41.50	111.71	69.41	High
SA-North	R4	San Antonio	1.10	159.79	166.98	163.39	Poor	110.60	0.25	0.01	0.00	34.98	112.41	69.85	High
SA-North	R4	San Antonio	1.20	198.77	180.83	189.80	Very Poor	200.22	1.24	0.02	0.01	63.91	114.12	70.91	High
SA-North	R4	San Antonio	1.30	264.70	185.54	225.12	Very Poor	140.96	0.60	0.01	0.00	44.84	115.83	71.98	High
SA-North	R4	San Antonio	1.40	164.97	101.14	133.06	Poor	94.44	0.47	0.01	0.00	30.07	110.86	68.89	High
SA-North	R4	San Antonio	1.50	229.08	146.73	187.91	Very Poor	65.01	0.29	0.01	0.00	20.72	108.97	67.71	High
SA-North	R4	San Antonio	1.60	250.71	138.33	194.52	Very Poor	63.31	0.26	0.01	0.00	20.06	106.95	66.45	High
SA-North	R4	San Antonio	1.70	288.60	136.09	212.35	Very Poor	11.13	0.14	0.00	0.00	3.72	89.23	55.45	Medium
SA-North	R4	San Antonio	1.90	240.49	185.32	212.91	Very Poor	294.52	0.02	0.11	0.04	93.20	68.22	42.39	Low
SA-North	R4	San Antonio	2.00	304.59	222.16	263.38	Very Poor	215.05	0.01	0.05	0.06	68.02	83.47	51.87	Medium
SA-North	R4	San Antonio	2.10	257.62	207.21	232.42	Very Poor	200.04	0.01	0.06	0.07	63.23	94.27	58.58	Medium
SA-North	R4	San Antonio	2.20	191.80	222.32	207.06	Very Poor	169.12	0.00	0.05	0.06	53.51	103.72	64.45	High
SA-North	R4	San Antonio	2.30	189.41	150.21	169.81	Poor	161.97	0.03	0.03	0.05	51.16	108.35	67.32	High
SA-North	R4	San Antonio	2.40	150.60	142.42	146.51	Poor	65.58	0.17	0.01	0.01	20.81	109.66	68.14	High
SA-North	R4	San Antonio	2.50	147.56	126.55	137.06	Poor	164.57	1.40	0.02	0.02	52.64	103.52	64.32	High
SA-North	R4	San Antonio	2.60	188.87	151.65	170.26	Very Poor	154.95	0.46	0.02	0.02	49.15	105.89	65.80	High
SA-North	R4	San Antonio	2.70	168.87	142.47	155.67	Poor	168.65	0.35	0.02	0.03	53.46	106.71	66.30	High
SA-North	R4	San Antonio	2.80	213.14	149.92	181.53	Very Poor	163.69	0.38	0.02	0.04	51.86	106.00	65.87	High
SA-North	R4	San Antonio	2.90	154.27	178.44	166.36	Poor	195.02	0.30	0.02	0.05	61.83	107.81	66.99	High
SA-North	R4	San Antonio	3.00	125.24	194.47	159.86	Poor	118.97	0.20	0.01	0.05	37.71	111.34	69.19	High
SA-North	R4	San Antonio	3.10	116.99	154.96	135.98	Poor	114.65	0.42	0.01	0.03	36.35	109.87	68.27	High
SA-North	R4	San Antonio	3.20	137.45	139.26	138.36	Poor	108.72	0.44	0.02	0.05	34.63	109.57	68.08	High
SA-North	R4	San Antonio	3.30	165.87	137.66	151.77	Poor	96.02	0.44	0.01	0.04	30.54	112.80	70.09	High
SA-North	R4	San Antonio	3.40	121.81	130.28	126.05	Fair	124.82	0.50	0.01	0.02	39.71	111.28	69.15	High
SA-North	R4	San Antonio	3.50	184.27	129.33	156.80	Poor	150.13	0.46	0.01	0.05	47.61	111.00	68.97	High
SA-North	R4	San Antonio	3.60	115.15	132.01	123.58	Fair	188.58	0.41	0.03	0.06	59.75	112.01	69.60	High
SA-North	R4	San Antonio	3.70	205.56	154.76	180.16	Very Poor	168.37	0.29	0.03	0.06	53.34	113.73	70.67	High
SA-North	R4	San Antonio	3.80	141.04	171.45	156.25	Poor	187.29	0.30	0.04	0.08	59.41	114.16	70.93	High

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-North	R4	San Antonio	3.90	93.90	141.55	117.73	Fair	136.19	0.18	0.03	0.05	43.22	115.13	71.54	High
SA-North	R4	San Antonio	4.00	99.63	207.99	153.81	Poor	162.12	0.23	0.04	0.08	51.32	111.77	69.45	High
SA-North	R4	San Antonio	4.10	127.06	174.40	150.73	Poor	183.66	0.23	0.05	0.11	58.31	111.00	68.97	High
SA-North	R4	San Antonio	4.20	104.26	146.26	125.26	Fair	184.70	0.15	0.04	0.06	58.41	111.00	68.97	High
SA-North	R4	San Antonio	4.30	173.94	194.96	184.45	Very Poor	109.07	0.11	0.02	0.05	34.48	110.13	68.43	High
SA-North	R4	San Antonio	4.40	147.08	150.91	149.00	Poor	104.04	0.18	0.02	0.05	33.08	106.93	66.44	High
SA-North	R4	San Antonio	4.50	204.14	155.38	179.76	Very Poor	34.45	0.07	0.01	0.01	10.93	105.55	65.59	High
SA-North	R4	San Antonio	4.60	160.08	180.71	170.40	Very Poor	95.51	0.13	0.01	0.01	30.14	103.32	64.20	High
SA-North	R4	San Antonio	4.70	186.48	162.94	174.71	Very Poor	120.15	0.08	0.01	0.01	38.08	106.39	66.11	High
SA-North	R4	San Antonio	4.80	133.28	191.04	162.16	Poor	154.13	0.07	0.05	0.01	48.62	108.34	67.32	High
SA-North	R4	San Antonio	4.90	154.67	157.41	156.04	Poor	138.27	0.07	0.06	0.02	43.70	109.99	68.34	High
SA-North	R4	San Antonio	5.00	111.28	181.93	146.61	Poor	95.02	0.08	0.03	0.02	30.02	109.92	68.30	High
SA-North	R4	San Antonio	5.10	153.64	103.50	128.57	Fair	112.99	0.37	0.02	0.03	35.95	108.13	67.19	High
SA-North	R4	San Antonio	5.20	139.47	117.43	128.45	Fair	149.75	0.31	0.02	0.05	47.50	108.83	67.63	High
SA-North	R4	San Antonio	5.30	152.53	119.06	135.80	Poor	100.82	0.30	0.01	0.04	32.02	109.48	68.03	High
SA-North	R4	San Antonio	5.40	97.00	209.87	153.44	Poor	104.45	0.51	0.03	0.03	33.35	108.05	67.14	High
SA-North	R4	San Antonio	5.50	98.44	169.61	134.03	Poor	145.49	0.82	0.04	0.07	46.44	106.69	66.29	High
SA-North	R4	San Antonio	5.60	86.91	225.96	156.44	Poor	182.99	0.86	0.05	0.07	58.29	107.88	67.03	High
SA-North	R4	San Antonio	5.70	80.58	105.92	93.25	Good	141.54	0.35	0.02	0.05	44.91	108.76	67.58	High
SA-North	R4	San Antonio	5.80	154.11	189.90	172.01	Very Poor	83.17	0.26	0.00	0.05	26.45	105.88	65.79	High
SA-North	R4	San Antonio	5.90	126.35	262.43	194.39	Very Poor	118.35	0.62	0.00	0.03	37.56	98.10	60.96	High
SA-North	R4	San Antonio	6.00	105.04	266.88	185.96	Very Poor	65.41	0.59	0.04	0.03	21.02	98.34	61.10	High
SA-North	R4	San Antonio	6.10	95.56	284.61	190.09	Very Poor	15.71	0.07	0.07	0.01	5.04	71.02	44.13	Low
SA-North	R5	San Antonio	0.10	68.59	71.75	70.17	Good	427.17	0.00	0.33	0.16	135.28	48.91	30.39	Low
SA-North	R5	San Antonio	0.20	61.71	69.60	65.66	Good	299.25	0.19	0.07	0.06	94.79	80.22	49.85	Medium
SA-North	R5	San Antonio	0.30	64.05	57.96	61.01	Good	210.21	1.03	0.07	0.11	66.97	92.30	57.35	Medium
SA-North	R5	San Antonio	0.40	98.02	87.58	92.80	Good	192.01	0.82	0.07	0.24	61.03	99.40	61.77	High
SA-North	R5	San Antonio	0.50	212.74	242.70	227.72	Very Poor	185.14	0.86	0.04	0.19	59.02	103.16	64.10	High
SA-North	R5	San Antonio	0.60	127.85	182.73	155.29	Poor	138.59	0.49	0.03	0.13	44.09	105.89	65.80	High
SA-North	R5	San Antonio	0.70	125.88	95.21	110.55	Fair	187.65	0.61	0.03	0.15	59.68	107.25	66.64	High
SA-North	R5	San Antonio	0.80	149.86	134.17	142.02	Poor	152.40	0.90	0.03	0.08	48.66	111.29	69.15	High
SA-North	R5	San Antonio	0.90	204.01	121.08	162.55	Poor	93.09	0.49	0.01	0.03	29.74	113.27	70.38	High
SA-North	R5	San Antonio	1.00	214.35	177.14	195.75	Very Poor	139.07	0.80	0.01	0.04	44.21	112.12	69.67	High
SA-North	R5	San Antonio	1.10	159.79	166.98	163.39	Poor	103.81	0.24	0.02	0.01	32.94	112.22	69.73	High
SA-North	R5	San Antonio	1.20	198.77	180.83	189.80	Very Poor	180.23	0.42	0.07	0.02	57.21	112.62	69.98	High
SA-North	R5	San Antonio	1.30	264.70	185.54	225.12	Very Poor	191.44	0.32	0.07	0.03	60.71	113.25	70.37	High
SA-North	R5	San Antonio	1.40	164.97	101.14	133.06	Poor	111.82	0.73	0.01	0.05	35.74	114.39	71.08	High
SA-North	R5	San Antonio	1.50	229.08	146.73	187.91	Very Poor	70.57	0.25	0.01	0.02	22.39	113.02	70.22	High
SA-North	R5	San Antonio	1.60	250.71	138.33	194.52	Very Poor	61.42	0.06	0.01	0.01	19.36	111.10	69.04	High
SA-North	R5	San Antonio	1.70	288.60	136.09	212.35	Very Poor	10.19	0.08	0.01	0.00	3.27	87.81	54.56	Medium
SA-North	R5	San Antonio	1.80	241.86	154.84	198.35	Very Poor	368.82	0.10	0.31	0.07	116.84	40.90	25.42	Low
SA-North	R5	San Antonio	1.90	240.49	185.32	212.91	Very Poor	295.95	0.03	0.28	0.09	93.69	71.86	44.65	Low
SA-North	R5	San Antonio	2.00	304.59	222.16	263.38	Very Poor	182.30	1.84	0.12	0.04	58.55	85.86	53.35	Medium
SA-North	R5	San Antonio	2.10	257.62	207.21	232.42	Very Poor	176.71	1.25	0.16	0.13	56.72	94.99	59.02	Medium
SA-North	R5	San Antonio	2.20	191.80	222.32	207.06	Very Poor	164.27	0.68	0.14	0.12	52.53	102.26	63.54	High
SA-North	R5	San Antonio	2.30	189.41	150.21	169.81	Poor	179.93	0.72	0.09	0.14	57.33	108.26	67.27	High
SA-North	R5	San Antonio	2.40	150.60	142.42	146.51	Poor	100.87	0.23	0.01	0.08	31.99	111.48	69.27	High
SA-North	R5	San Antonio	2.50	147.56	126.55	137.06	Poor	159.71	0.38	0.04	0.15	50.62	108.44	67.38	High
SA-North	R5	San Antonio	2.60	188.87	151.65	170.26	Very Poor	168.35	0.32	0.05	0.03	53.49	111.18	69.09	High
SA-North	R5	San Antonio	2.70	168.87	142.47	155.67	Poor	175.54	0.16	0.10	0.02	55.62	111.15	69.07	High
SA-North	R5	San Antonio	2.80	213.14	149.92	181.53	Very Poor	193.15	0.18	0.15	0.06	61.24	111.44	69.25	High
SA-North	R5	San Antonio	2.90	154.27	178.44	166.36	Poor	121.69	0.06	0.09	0.07	38.52	115.41	71.71	High
SA-North	R5	San Antonio	3.00	125.24	194.47	159.86	Poor	79.16	0.27	0.02	0.02	25.29	114.78	71.32	High
SA-North	R5	San Antonio	3.10	116.99	154.96	135.98	Poor	110.44	0.33	0.10	0.02	35.12	113.40	70.47	High
SA-North	R5	San Antonio	3.20	137.45	139.26	138.36	Poor	162.70	0.27	0.11	0.11	51.68	112.92	70.17	High
SA-North	R5	San Antonio	3.30	165.87	137.66	151.77	Poor	137.94	0.17	0.08	0.12	43.85	112.33	69.80	High
SA-North	R5	San Antonio	3.40	121.81	130.28	126.05	Fair	167.62	0.10	0.06	0.11	53.03	110.04	68.37	High
SA-North	R5	San Antonio	3.50	184.27	129.33	156.80	Poor	174.39	0.05	0.01	0.10	55.15	109.31	67.92	High
SA-North	R5	San Antonio	3.60	115.15	132.01	123.58	Fair	173.93	0.03	0.02	0.04	55.09	108.62	67.50	High
SA-North	R5	San Antonio	3.70	205.56	154.76	180.16	Very Poor	147.75	0.00	0.03	0.05	46.73	107.56	66.83	High
SA-North	R5	San Antonio	3.80	141.04	171.45	156.25	Poor	116.80	0.02	0.02	0.03	36.92	105.77	65.72	High
SA-North	R5	San Antonio	3.90	93.90	141.55	117.73	Fair	110.67	0.07	0.02	0.03	35.13	105.17	65.35	High
SA-North	R5	San Antonio	4.00	99.63	207.99	153.81	Poor	110.37	0.05	0.02	0.02	35.05	106.77	66.34	High
SA-North	R5	San Antonio	4.10	127.06	174.40	150.73	Poor	106.76	0.03	0.01	0.01	33.83	108.96	67.71	High
SA-North	R5	San Antonio	4.20	104.26	146.26	125.26	Fair	102.70	0.03	0.02	0.01	32.39	110.49	68.66	High
SA-North	R5	San Antonio	4.30	173.94	194.96	184.45	Very Poor	108.75	0.00	0.05	0.01	34.37	109.73	68.18	High
SA-North	R5	San Antonio	4.40	147.08	150.91	149.00	Poor	63.21	0.01	0.04	0.01	19.91	108.09	67.16	High
SA-North	R5	San Antonio	4.50	204.14	155.38	179.76	Very Poor	142.08	0.16	0.04	0.02	45.02	105.61	65.63	High
SA-North	R5	San Antonio	4.60	160.08	180.71	170.40	Very Poor	96.80	0.12	0.03	0.02	30.69	106.77	66.34	High
SA-North	R5	San Antonio	4.70	186.48	162.94	174.71	Very Poor	126.80	0.20	0.01	0.08	40.16	106.23	66.01	High
SA-North	R5	San Antonio	4.80	133.28	191.04	162.16	Poor	171.49	0.17	0.06	0.10	54.37	107.74	66.95	High
SA-North	R5	San Antonio	4.90	154.67	157.41	156.04	Poor	123.23	0.14	0.03	0.04	39.13	109.57	68.08	High
SA-North	R5	San Antonio	5.00	111.28	181.93	146.61	Poor	179.24	0.19	0.03	0.05	56.74	109.72	68.18	High
SA-North	R5	San Antonio	5.10	153.64	103.50	128.57	Fair	160.64	0.16	0.02	0.05	50.90	110.86	68.88	High
SA-North	R5	San Antonio	5.20	139.47	117.43	128.45	Fair	142.90	0.11	0.02	0.07	45.24	109.28	67.90	High
SA-North	R5	San Antonio	5.30	152.53	119.06	135.80	Poor	120.18	0.15	0.02	0.07	38.13	109.26	67.89	High
SA-North	R5	San Antonio	5.40	97.00	209.87	153.44	Poor	107.18	0.18	0.01	0.05	33.86	107.98	67.09	High

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-North	R5	San Antonio	5.50	98.44	169.61	134.03	Poor	117.04	0.24	0.01	0.06	37.15	105.16	65.34	High
SA-North	R5	San Antonio	5.60	86.91	225.96	156.44	Poor	44.02	0.08	0.00	0.02	13.90	103.14	64.09	High
SA-North	R5	San Antonio	5.70	80.58	105.92	93.25	Good	4.31	0.06	0.00	0.00	1.30	91.05	56.57	Medium
SA-North	R5	San Antonio	5.80	154.11	189.90	172.01	Very Poor	8.60	2.09	0.02	0.01	3.72	56.56	35.14	Low
SA-North	R6	San Antonio	0.10	68.59	71.75	70.17	Good	366.94	0.07	0.26	0.36	116.15	46.96	29.18	Low
SA-North	R6	San Antonio	0.20	61.71	69.60	65.66	Good	270.93	0.13	0.22	0.17	85.85	75.18	46.71	Medium
SA-North	R6	San Antonio	0.30	64.05	57.96	61.01	Good	191.85	0.00	0.28	0.21	60.84	88.74	55.14	Medium
SA-North	R6	San Antonio	0.40	98.02	87.58	92.80	Good	151.61	0.98	0.15	0.42	48.58	97.97	60.88	High
SA-North	R6	San Antonio	0.50	212.74	242.70	227.72	Very Poor	87.05	0.58	0.02	0.13	27.81	105.21	65.37	High
SA-North	R6	San Antonio	0.60	127.85	182.73	155.29	Poor	142.68	1.04	0.09	0.15	45.72	105.71	65.69	High
SA-North	R6	San Antonio	0.70	125.88	95.21	110.55	Fair	120.29	0.66	0.10	0.07	38.46	108.37	67.34	High
SA-North	R6	San Antonio	0.80	149.86	134.17	142.02	Poor	126.29	0.33	0.06	0.02	40.14	110.83	68.87	High
SA-North	R6	San Antonio	0.90	204.01	121.08	162.55	Poor	127.81	0.33	0.01	0.02	40.44	110.60	68.73	High
SA-North	R6	San Antonio	1.00	214.35	177.14	195.75	Very Poor	140.83	0.73	0.01	0.05	44.91	107.48	66.79	High
SA-North	R6	San Antonio	1.10	159.79	166.98	163.39	Poor	26.26	0.02	0.00	0.00	8.31	105.50	65.55	High
SA-North	R6	San Antonio	1.20	198.77	180.83	189.80	Very Poor	10.57	0.02	0.00	0.00	3.27	99.33	61.72	High
SA-North	R6	San Antonio	1.30	264.70	185.54	225.12	Very Poor	2.63	0.02	0.00	0.00	0.85	82.70	51.39	Medium
SA-North	R6	San Antonio	1.40	164.97	101.14	133.06	Poor	124.50	0.01	0.02	0.07	39.37	34.56	21.47	Low
SA-North	R6	San Antonio	1.50	229.08	146.73	187.91	Very Poor	245.58	0.13	0.04	0.24	77.65	50.36	31.29	Low
SA-North	R6	San Antonio	1.60	250.71	138.33	194.52	Very Poor	193.39	0.18	0.03	0.04	61.30	68.37	42.48	Low
SA-North	R6	San Antonio	1.70	288.60	136.09	212.35	Very Poor	134.78	0.10	0.01	0.02	42.66	80.55	50.05	Medium
SA-North	R6	San Antonio	1.80	241.86	154.84	198.35	Very Poor	76.42	0.14	0.01	0.02	24.18	85.39	53.06	Medium
SA-North	R6	San Antonio	1.90	240.49	185.32	212.91	Very Poor	114.12	0.22	0.01	0.08	36.16	88.43	54.95	Medium
SA-North	R6	San Antonio	2.00	304.59	222.16	263.38	Very Poor	140.47	0.39	0.01	0.03	44.51	90.70	56.36	Medium
SA-North	R6	San Antonio	2.10	257.62	207.21	232.42	Very Poor	74.06	0.20	0.01	0.01	23.50	92.42	57.43	Medium
SA-North	R6	San Antonio	2.20	191.80	222.32	207.06	Very Poor	80.29	0.27	0.04	0.01	25.57	87.55	54.40	Medium
SA-North	R6	San Antonio	2.30	189.41	150.21	169.81	Poor	201.89	0.45	0.08	0.03	64.00	91.09	56.60	Medium
SA-North	R6	San Antonio	2.40	150.60	142.42	146.51	Poor	137.58	0.19	0.03	0.02	43.59	96.07	59.70	Medium
SA-North	R6	San Antonio	2.50	147.56	126.55	137.06	Poor	94.68	0.11	0.01	0.02	29.93	95.04	59.05	Medium
SA-North	R6	San Antonio	2.60	188.87	151.65	170.26	Very Poor	105.54	0.11	0.01	0.03	33.41	94.98	59.02	Medium
SA-North	R6	San Antonio	2.70	168.87	142.47	155.67	Poor	66.71	0.05	0.01	0.02	21.11	94.08	58.46	Medium
SA-North	R6	San Antonio	2.80	213.14	149.92	181.53	Very Poor	41.46	0.04	0.00	0.01	13.07	92.98	57.77	Medium
SA-North	R6	San Antonio	2.90	154.27	178.44	166.36	Poor	108.47	0.17	0.01	0.01	34.38	92.38	57.40	Medium
SA-North	R6	San Antonio	3.00	125.24	194.47	159.86	Poor	147.28	0.14	0.02	0.04	46.58	99.77	62.00	High
SA-North	R6	San Antonio	3.10	116.99	154.96	135.98	Poor	66.20	0.14	0.01	0.01	20.93	100.61	62.52	High
SA-North	R6	San Antonio	3.20	137.45	139.26	138.36	Poor	142.20	0.46	0.01	0.05	45.26	99.44	61.79	High
SA-North	R6	San Antonio	3.30	165.87	137.66	151.77	Poor	152.72	0.34	0.02	0.02	48.38	102.01	63.39	High
SA-North	R6	San Antonio	3.40	121.81	130.28	126.05	Fair	145.65	0.58	0.03	0.03	46.31	102.01	63.39	High
SA-North	R6	San Antonio	3.50	184.27	129.33	156.80	Poor	158.50	0.30	0.06	0.04	50.33	103.65	64.41	High
SA-North	R6	San Antonio	3.60	115.15	132.01	123.58	Fair	95.02	0.15	0.01	0.01	30.13	104.25	64.78	High
SA-North	R6	San Antonio	3.70	205.56	154.76	180.16	Very Poor	162.68	1.40	0.02	0.04	52.18	100.42	62.40	High
SA-North	R6	San Antonio	3.80	141.04	171.45	156.25	Poor	134.34	0.27	0.01	0.03	42.56	100.15	62.23	High
SA-North	R6	San Antonio	3.90	93.90	141.55	117.73	Fair	117.30	0.18	0.01	0.04	37.10	100.63	62.53	High
SA-North	R6	San Antonio	4.00	99.63	207.99	153.81	Poor	96.60	0.20	0.01	0.03	30.68	99.39	61.76	High
SA-North	R6	San Antonio	4.10	127.06	174.40	150.73	Poor	30.44	0.10	0.01	0.01	9.63	96.27	59.82	Medium
SA-North	R6	San Antonio	4.20	104.26	146.26	125.26	Fair	76.62	0.26	0.02	0.02	24.40	94.95	59.00	Medium
SA-North	R6	San Antonio	4.30	173.94	194.96	184.45	Very Poor	86.84	0.21	0.04	0.02	27.52	97.11	60.34	High
SA-North	R6	San Antonio	4.40	147.08	150.91	149.00	Poor	37.51	0.12	0.01	0.00	11.78	98.00	60.89	High
SA-North	R6	San Antonio	4.50	204.14	155.38	179.76	Very Poor	160.16	0.34	0.03	0.01	50.85	98.81	61.40	High
SA-North	R6	San Antonio	4.60	160.08	180.71	170.40	Very Poor	18.60	0.03	0.00	0.00	5.81	98.89	61.45	High
SA-North	R6	San Antonio	4.70	186.48	162.94	174.71	Very Poor	28.10	0.05	0.00	0.00	8.92	92.33	57.37	Medium
SA-North	R6	San Antonio	4.80	133.28	191.04	162.16	Poor	50.83	0.04	0.01	0.00	15.96	90.19	56.04	Medium
SA-North	R6	San Antonio	4.90	154.67	157.41	156.04	Poor	16.83	0.00	0.00	0.00	5.37	79.50	49.40	Medium
SA-North	R6	San Antonio	5.00	111.28	181.93	146.61	Poor	20.65	0.01	0.01	0.00	6.64	71.42	44.38	Low
SA-North	R6	San Antonio	5.10	153.64	103.50	128.57	Fair	24.56	0.00	0.00	0.00	7.80	48.22	29.96	Low
SA-North	R6	San Antonio	5.20	139.47	117.43	128.45	Fair	391.28	0.00	0.39	0.17	124.05	50.35	31.29	Low
SA-North	R6	San Antonio	5.30	152.53	119.06	135.80	Poor	327.92	0.03	0.16	0.09	103.75	78.62	48.85	Medium
SA-North	R6	San Antonio	5.40	97.00	209.87	153.44	Poor	227.70	0.38	0.08	0.16	72.19	91.88	57.09	Medium
SA-North	R6	San Antonio	5.50	98.44	169.61	134.03	Poor	197.97	1.81	0.12	0.33	63.60	98.90	61.45	High
SA-North	R6	San Antonio	5.60	86.91	225.96	156.44	Poor	159.88	0.67	0.12	0.21	50.93	104.20	64.74	High
SA-North	R6	San Antonio	5.70	80.58	105.92	93.25	Good	130.25	0.17	0.03	0.07	41.18	105.96	65.84	High
SA-North	R6	San Antonio	5.80	154.11	189.90	172.01	Very Poor	30.04	0.03	0.00	0.01	9.58	103.09	64.06	High
SA-North	R6	San Antonio	5.90	126.35	262.43	194.39	Very Poor	11.27	0.88	0.01	0.00	4.07	80.66	50.12	Medium
SA-North	R6	San Antonio	6.00	105.04	266.88	185.96	Very Poor	113.50	0.20	0.59	0.46	36.57	24.66	15.33	Low
SA-North	R7	San Antonio	0.10	68.59	71.75	70.17	Good	355.63	0.00	0.30	0.22	112.57	45.73	28.42	Low
SA-North	R7	San Antonio	0.20	61.71	69.60	65.66	Good	225.01	0.03	0.15	0.04	71.24	69.38	43.11	Low
SA-North	R7	San Antonio	0.30	64.05	57.96	61.01	Good	197.62	0.03	0.07	0.03	62.51	80.97	50.32	Medium
SA-North	R7	San Antonio	0.40	98.02	87.58	92.80	Good	131.52	0.01	0.04	0.02	41.66	86.56	53.79	Medium
SA-North	R7	San Antonio	0.50	212.74	242.70	227.72	Very Poor	119.44	0.06	0.02	0.03	37.75	88.25	54.84	Medium
SA-North	R7	San Antonio	0.60	127.85	182.73	155.29	Poor	112.88	0.01	0.01	0.01	35.72	89.44	55.57	Medium
SA-North	R7	San Antonio	0.70	125.88	95.21	110.55	Fair	90.39	0.01	0.01	0.01	28.60	90.00	55.92	Medium
SA-North	R7	San Antonio	0.80	149.86	134.17	142.02	Poor	117.85	0.07	0.01	0.01	37.33	92.18	57.28	Medium
SA-North	R7	San Antonio	0.90	204.01	121.08	162.55	Poor	79.70	0.08	0.02	0.00	25.36	94.14	58.50	Medium
SA-North	R7	San Antonio	1.00	214.35	177.14	195.75	Very Poor	63.97	0.02	0.02	0.00	20.38	93.81	58.29	Medium
SA-North	R7	San Antonio	1.10	159.79	166.98	163.39	Poor	126.74	0.03	0.05	0.01	40.03	93.84	58.31	Medium
SA-North	R7	San Antonio	1.20	198.77	180.83	189.80	Very Poor	170.17	0.09	0.14	0.02	53.96	97.59	60.64	High
SA-North	R7	San Antonio	1.30	264.70	185.54	225.12	Very Poor	154.63	0.02	0.05	0.01	48.86	99.12	61.59	High

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-North	R7	San Antonio	1.40	164.97	101.14	133.06	Poor	33.08	0.01	0.00	0.00	10.47	98.45	61.17	High
SA-North	R7	San Antonio	1.50	229.08	146.73	187.91	Very Poor	31.15	0.01	0.00	0.00	9.80	94.60	58.78	Medium
SA-North	R7	San Antonio	1.60	250.71	138.33	194.52	Very Poor	17.86	0.00	0.00	0.00	5.63	88.78	55.17	Medium
SA-North	R7	San Antonio	1.70	288.60	136.09	212.35	Very Poor	104.25	0.09	0.01	0.01	32.98	47.22	29.34	Low
SA-North	R7	San Antonio	1.80	241.86	154.84	198.35	Very Poor	323.75	0.45	0.03	0.02	102.56	48.63	30.22	Low
SA-North	R7	San Antonio	1.90	240.49	185.32	212.91	Very Poor	201.67	0.15	0.02	0.00	63.83	70.44	43.77	Low
SA-North	R7	San Antonio	2.00	304.59	222.16	263.38	Very Poor	74.14	0.04	0.01	0.01	23.39	76.05	47.26	Medium
SA-North	R7	San Antonio	2.10	257.62	207.21	232.42	Very Poor	138.42	0.03	0.02	0.01	43.73	82.28	51.12	Medium
SA-North	R7	San Antonio	2.20	191.80	222.32	207.06	Very Poor	137.44	0.00	0.02	0.01	43.40	87.80	54.56	Medium
SA-North	R7	San Antonio	2.30	189.41	150.21	169.81	Poor	167.57	0.00	0.02	0.01	52.98	93.23	57.93	Medium
SA-North	R7	San Antonio	2.40	150.60	142.42	146.51	Poor	142.88	0.03	0.02	0.01	45.19	96.65	60.06	High
SA-North	R7	San Antonio	2.50	147.56	126.55	137.06	Poor	147.67	0.00	0.01	0.02	46.57	97.45	60.55	High
SA-North	R7	San Antonio	2.60	188.87	151.65	170.26	Very Poor	180.39	0.00	0.02	0.03	57.06	99.67	61.93	High
SA-North	R7	San Antonio	2.70	168.87	142.47	155.67	Poor	188.12	0.00	0.02	0.03	59.44	101.34	62.97	High
SA-North	R7	San Antonio	2.80	213.14	149.92	181.53	Very Poor	173.01	0.00	0.02	0.05	54.67	103.07	64.05	High
SA-North	R7	San Antonio	2.90	154.27	178.44	166.36	Poor	149.18	0.00	0.01	0.04	47.12	105.38	65.48	High
SA-North	R7	San Antonio	3.00	125.24	194.47	159.86	Poor	78.95	0.02	0.01	0.02	24.94	105.85	65.77	High
SA-North	R7	San Antonio	3.10	116.99	154.96	135.98	Poor	98.02	0.77	0.01	0.03	31.46	102.36	63.60	High
SA-North	R7	San Antonio	3.20	137.45	139.26	138.36	Poor	86.62	0.33	0.01	0.04	27.43	104.47	64.92	High
SA-North	R7	San Antonio	3.30	165.87	137.66	151.77	Poor	73.25	0.19	0.01	0.01	23.16	103.82	64.51	High
SA-North	R7	San Antonio	3.40	121.81	130.28	126.05	Fair	146.65	0.26	0.01	0.01	46.50	102.62	63.76	High
SA-North	R7	San Antonio	3.50	184.27	129.33	156.80	Poor	161.49	0.17	0.02	0.01	51.18	103.95	64.59	High
SA-North	R7	San Antonio	3.60	115.15	132.01	123.58	Fair	148.81	0.10	0.02	0.01	47.00	105.00	65.24	High
SA-North	R7	San Antonio	3.70	205.56	154.76	180.16	Very Poor	195.22	0.24	0.02	0.04	61.80	104.40	64.87	High
SA-North	R7	San Antonio	3.80	141.04	171.45	156.25	Poor	150.94	0.23	0.02	0.03	47.83	106.70	66.30	High
SA-North	R7	San Antonio	3.90	93.90	141.55	117.73	Fair	38.83	0.06	0.00	0.01	12.23	102.20	63.50	High
SA-North	R7	San Antonio	4.00	99.63	207.99	153.81	Poor	162.77	0.23	0.01	0.02	51.51	94.96	59.00	Medium
SA-North	R7	San Antonio	4.10	127.06	174.40	150.73	Poor	181.70	0.18	0.01	0.07	57.51	95.50	59.34	Medium
SA-North	R7	San Antonio	4.20	104.26	146.26	125.26	Fair	175.62	0.10	0.01	0.05	55.55	96.36	59.87	Medium
SA-North	R7	San Antonio	4.30	173.94	194.96	184.45	Very Poor	93.04	0.04	0.01	0.03	29.41	98.08	60.95	High
SA-North	R7	San Antonio	4.40	147.08	150.91	149.00	Poor	99.53	0.09	0.01	0.02	31.52	95.75	59.50	Medium
SA-North	R7	San Antonio	4.50	204.14	155.38	179.76	Very Poor	90.88	0.05	0.01	0.02	28.67	97.00	60.27	High
SA-North	R7	San Antonio	4.60	160.08	180.71	170.40	Very Poor	85.84	0.02	0.01	0.01	27.07	98.52	61.22	High
SA-North	R7	San Antonio	4.70	186.48	162.94	174.71	Very Poor	132.25	0.01	0.01	0.02	41.79	100.19	62.25	High
SA-North	R7	San Antonio	4.80	133.28	191.04	162.16	Poor	146.00	0.02	0.01	0.04	46.17	102.99	64.00	High
SA-North	R7	San Antonio	4.90	154.67	157.41	156.04	Poor	70.37	0.00	0.01	0.01	22.11	102.44	63.65	High
SA-North	R7	San Antonio	5.00	111.28	181.93	146.61	Poor	106.86	0.00	0.01	0.02	33.73	100.53	62.47	High
SA-North	R7	San Antonio	5.10	153.64	103.50	128.57	Fair	145.86	0.00	0.01	0.01	46.04	100.87	62.68	High
SA-North	R7	San Antonio	5.20	139.47	117.43	128.45	Fair	56.45	0.00	0.01	0.01	17.88	100.96	62.74	High
SA-North	R7	San Antonio	5.30	152.53	119.06	135.80	Poor	110.71	0.00	0.01	0.00	35.00	98.13	60.98	High
SA-North	R7	San Antonio	5.40	97.00	209.87	153.44	Poor	113.18	0.03	0.01	0.01	35.77	97.72	60.72	High
SA-North	R7	San Antonio	5.50	98.44	169.61	134.03	Poor	108.99	0.05	0.01	0.02	34.59	97.96	60.87	High
SA-North	R7	San Antonio	5.60	86.91	225.96	156.44	Poor	71.86	0.13	0.01	0.01	22.75	92.29	57.34	Medium
SA-North	R7	San Antonio	5.70	80.58	105.92	93.25	Good	146.78	0.27	0.01	0.02	46.47	90.16	56.02	Medium
SA-North	R7	San Antonio	5.80	154.11	189.90	172.01	Very Poor	92.53	0.11	0.01	0.01	29.28	91.66	56.96	Medium
SA-North	R7	San Antonio	5.90	126.35	262.43	194.39	Very Poor	100.26	0.17	0.01	0.00	31.67	88.60	55.06	Medium
SA-North	R7	San Antonio	6.00	105.04	266.88	185.96	Very Poor	103.65	0.17	0.01	0.01	32.82	89.50	55.61	Medium
SA-North	R7	San Antonio	6.10	95.56	284.61	190.09	Very Poor	14.88	0.12	0.00	0.00	4.72	83.36	51.80	Medium
SA-North	R7	San Antonio	6.20	87.67	209.74	148.71	Poor	10.43	0.00	0.01	0.00	3.19	61.94	38.49	Low
SA-North	R8	San Antonio	0.10	68.59	71.75	70.17	Good	462.40	0.00	0.14	0.41	146.28	47.61	29.58	Low
SA-North	R8	San Antonio	0.20	61.71	69.60	65.66	Good	192.48	0.68	0.02	0.05	61.18	73.78	45.84	Medium
SA-North	R8	San Antonio	0.30	64.05	57.96	61.01	Good	191.43	0.14	0.02	0.05	60.57	81.26	50.49	Medium
SA-North	R8	San Antonio	0.40	98.02	87.58	92.80	Good	172.32	0.32	0.01	0.08	54.71	88.24	54.83	Medium
SA-North	R8	San Antonio	0.50	212.74	242.70	227.72	Very Poor	182.96	0.59	0.01	0.11	58.17	92.15	57.26	Medium
SA-North	R8	San Antonio	0.60	127.85	182.73	155.29	Poor	169.29	0.44	0.01	0.12	53.71	96.65	60.05	High
SA-North	R8	San Antonio	0.70	125.88	95.21	110.55	Fair	139.27	0.36	0.04	0.07	44.17	99.02	61.53	High
SA-North	R8	San Antonio	0.80	149.86	134.17	142.02	Poor	156.00	0.24	0.01	0.12	49.25	103.88	64.55	High
SA-North	R8	San Antonio	0.90	204.01	121.08	162.55	Poor	123.79	0.27	0.00	0.04	39.24	105.71	65.68	High
SA-North	R8	San Antonio	1.00	214.35	177.14	195.75	Very Poor	166.84	0.38	0.00	0.03	52.87	107.55	66.83	High
SA-North	R8	San Antonio	1.10	159.79	166.98	163.39	Poor	130.08	0.25	0.01	0.02	41.12	110.54	68.69	High
SA-North	R8	San Antonio	1.20	198.77	180.83	189.80	Very Poor	137.83	0.18	0.01	0.02	43.63	110.82	68.86	High
SA-North	R8	San Antonio	1.30	264.70	185.54	225.12	Very Poor	124.08	0.21	0.01	0.04	39.34	108.16	67.21	High
SA-North	R8	San Antonio	1.40	164.97	101.14	133.06	Poor	168.35	3.55	0.01	0.06	54.89	104.54	64.96	High
SA-North	R8	San Antonio	1.50	229.08	146.73	187.91	Very Poor	120.23	0.05	0.01	0.03	38.04	109.31	67.92	High
SA-North	R8	San Antonio	1.60	250.71	138.33	194.52	Very Poor	29.50	0.06	0.00	0.01	9.32	108.79	67.60	High
SA-North	R8	San Antonio	1.70	288.60	136.09	212.35	Very Poor	23.27	0.06	0.00	0.01	7.45	102.13	63.46	High
SA-North	R8	San Antonio	1.80	241.86	154.84	198.35	Very Poor	124.98	0.13	0.00	0.02	39.46	98.47	61.18	High
SA-North	R8	San Antonio	1.90	240.49	185.32	212.91	Very Poor	103.18	0.05	0.00	0.02	32.68	101.22	62.90	High
SA-North	R8	San Antonio	2.00	304.59	222.16	263.38	Very Poor	54.27	0.03	0.00	0.01	17.06	98.58	61.26	High
SA-North	R8	San Antonio	2.10	257.62	207.21	232.42	Very Poor	32.49	0.02	0.00	0.00	10.19	95.15	59.13	Medium
SA-North	R8	San Antonio	2.20	191.80	222.32	207.06	Very Poor	104.84	0.03	0.01	0.01	33.28	94.40	58.66	Medium
SA-North	R8	San Antonio	2.30	189.41	150.21	169.81	Poor	169.98	0.06	0.05	0.01	53.86	97.30	60.46	High
SA-North	R8	San Antonio	2.40	150.60	142.42	146.51	Poor	176.92	0.05	0.01	0.02	55.82	101.73	63.21	High
SA-North	R8	San Antonio	2.50	147.56	126.55	137.06	Poor	163.50	0.15	0.01	0.02	51.77	103.78	64.49	High
SA-North	R8	San Antonio	2.60	188.87	151.65	170.26	Very Poor	153.92	0.12	0.01	0.02	48.74	105.90	65.81	High
SA-North	R8	San Antonio	2.70	168.87	142.47	155.67	Poor	151.09	0.05	0.01	0.01	47.82	104.91	65.19	High
SA-North	R8	San Antonio	2.80	213.14	149.92	181.53	Very Poor	152.37	0.00	0.01	0.03	48.15	104.00	64.62	High

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-North	R8	San Antonio	2.90	154.27	178.44	166.36	Poor	151.29	0.00	0.01	0.02	47.87	104.50	64.93	High
SA-North	R8	San Antonio	3.00	125.24	194.47	159.86	Poor	59.64	0.01	0.00	0.01	18.89	104.68	65.05	High
SA-North	R8	San Antonio	3.10	116.99	154.96	135.98	Poor	147.61	0.20	0.01	0.01	46.82	101.70	63.19	High
SA-North	R8	San Antonio	3.20	137.45	139.26	138.36	Poor	128.54	0.18	0.01	0.05	40.70	106.85	66.39	High
SA-North	R8	San Antonio	3.30	165.87	137.66	151.77	Poor	103.49	0.15	0.01	0.03	32.71	109.85	68.26	High
SA-North	R8	San Antonio	3.40	121.81	130.28	126.05	Fair	145.41	0.10	0.02	0.05	45.88	107.27	66.66	High
SA-North	R8	San Antonio	3.50	184.27	129.33	156.80	Poor	98.60	0.03	0.01	0.03	31.03	108.95	67.70	High
SA-North	R8	San Antonio	3.60	115.15	132.01	123.58	Fair	114.05	0.04	0.01	0.02	35.95	109.30	67.92	High
SA-North	R8	San Antonio	3.70	205.56	154.76	180.16	Very Poor	123.63	0.04	0.01	0.06	38.98	111.12	69.05	High
SA-North	R8	San Antonio	3.80	141.04	171.45	156.25	Poor	39.60	0.01	0.00	0.01	12.54	110.70	68.79	High
SA-North	R8	San Antonio	3.90	93.90	141.55	117.73	Fair	14.56	0.13	0.00	0.01	4.69	100.43	62.41	High
SA-North	R8	San Antonio	4.00	99.63	207.99	153.81	Poor	84.93	0.14	0.01	0.02	26.89	96.38	59.89	Medium
SA-North	R8	San Antonio	4.10	127.06	174.40	150.73	Poor	33.85	0.04	0.00	0.01	10.81	95.25	59.19	Medium
SA-North	R8	San Antonio	4.20	104.26	146.26	125.26	Fair	91.15	0.22	0.00	0.02	28.88	89.32	55.50	Medium
SA-North	R8	San Antonio	4.30	173.94	194.96	184.45	Very Poor	137.05	0.17	0.00	0.02	43.44	93.00	57.79	Medium
SA-North	R8	San Antonio	4.40	147.08	150.91	149.00	Poor	97.97	0.07	0.00	0.01	30.98	93.40	58.04	Medium
SA-North	R8	San Antonio	4.50	204.14	155.38	179.76	Very Poor	135.89	0.06	0.01	0.01	42.89	95.99	59.65	Medium
SA-North	R8	San Antonio	4.60	160.08	180.71	170.40	Very Poor	87.36	0.02	0.01	0.01	27.58	94.50	58.72	Medium
SA-North	R8	San Antonio	4.70	186.48	162.94	174.71	Very Poor	158.75	0.02	0.02	0.01	50.27	91.49	56.85	Medium
SA-North	R8	San Antonio	4.80	133.28	191.04	162.16	Poor	87.44	0.01	0.01	0.01	27.51	95.94	59.62	Medium
SA-North	R8	San Antonio	4.90	154.67	157.41	156.04	Poor	66.44	0.16	0.01	0.01	21.04	89.90	55.86	Medium
SA-North	R8	San Antonio	5.00	111.28	181.93	146.61	Poor	64.39	0.16	0.01	0.01	20.41	90.35	56.14	Medium
SA-North	R8	San Antonio	5.10	153.64	103.50	128.57	Fair	41.78	0.21	0.00	0.01	13.32	83.29	51.76	Medium
SA-North	R8	San Antonio	5.20	139.47	117.43	128.45	Fair	18.62	0.00	0.00	0.00	5.76	75.43	46.87	Medium
SA-North	R8	San Antonio	5.30	152.53	119.06	135.80	Poor	26.90	0.00	0.00	0.02	8.53	45.09	28.02	Low
SA-North	R9	San Antonio	0.10	68.59	71.75	70.17	Good	208.93	0.01	0.03	0.03	65.99	67.23	41.78	Low
SA-North	R9	San Antonio	0.20	61.71	69.60	65.66	Good	196.19	0.01	0.02	0.02	62.14	76.36	47.45	Medium
SA-North	R9	San Antonio	0.30	64.05	57.96	61.01	Good	139.96	0.39	0.36	0.04	44.84	86.63	53.83	Medium
SA-North	R9	San Antonio	0.40	98.02	87.58	92.80	Good	198.87	0.07	0.08	0.02	62.81	99.59	61.88	High
SA-North	R9	San Antonio	0.50	212.74	242.70	227.72	Very Poor	184.31	0.05	0.01	0.03	58.34	103.61	64.38	High
SA-North	R9	San Antonio	0.60	127.85	182.73	155.29	Poor	110.45	0.15	0.01	0.03	34.96	105.98	65.85	High
SA-North	R9	San Antonio	0.70	125.88	95.21	110.55	Fair	73.04	0.12	0.01	0.02	22.97	106.53	66.19	High
SA-North	R9	San Antonio	0.80	149.86	134.17	142.02	Poor	10.34	0.17	0.02	0.01	3.51	92.52	57.49	Medium
SA-North	R9	San Antonio	0.90	204.01	121.08	162.55	Poor	292.99	0.06	0.04	0.08	92.29	39.24	24.38	Low
SA-North	R9	San Antonio	1.00	214.35	177.14	195.75	Very Poor	281.69	0.00	0.03	0.06	88.91	63.70	39.58	Low
SA-North	R9	San Antonio	1.10	159.79	166.98	163.39	Poor	163.90	0.25	0.02	0.02	52.03	76.85	47.76	Medium
SA-North	R9	San Antonio	1.20	198.77	180.83	189.80	Very Poor	170.36	0.67	0.02	0.04	54.08	84.83	52.71	Medium
SA-North	R9	San Antonio	1.30	264.70	185.54	225.12	Very Poor	163.90	0.16	0.02	0.05	51.92	94.36	58.63	Medium
SA-North	R9	San Antonio	1.40	164.97	101.14	133.06	Poor	118.72	0.26	0.01	0.02	37.52	96.70	60.09	High
SA-North	R9	San Antonio	1.50	229.08	146.73	187.91	Very Poor	161.87	0.29	0.02	0.03	51.30	100.01	62.14	High
SA-North	R9	San Antonio	1.60	250.71	138.33	194.52	Very Poor	138.13	0.15	0.01	0.01	43.62	99.24	61.67	High
SA-North	R9	San Antonio	1.70	288.60	136.09	212.35	Very Poor	209.54	0.17	0.02	0.01	66.29	101.57	63.11	High
SA-North	R9	San Antonio	1.80	241.86	154.84	198.35	Very Poor	208.05	0.26	0.02	0.06	65.92	106.78	66.35	High
SA-North	R9	San Antonio	1.90	240.49	185.32	212.91	Very Poor	192.64	0.29	0.02	0.11	60.96	108.59	67.47	High
SA-North	R9	San Antonio	2.00	304.59	222.16	263.38	Very Poor	190.08	0.29	0.02	0.17	60.28	110.61	68.73	High
SA-North	R9	San Antonio	2.10	257.62	207.21	232.42	Very Poor	163.67	0.36	0.02	0.09	51.92	112.71	70.04	High
SA-North	R9	San Antonio	2.20	191.80	222.32	207.06	Very Poor	100.89	0.29	0.01	0.06	31.98	113.63	70.60	High
SA-North	R9	San Antonio	2.30	189.41	150.21	169.81	Poor	111.32	0.47	0.01	0.04	35.39	112.41	69.85	High
SA-North	R9	San Antonio	2.40	150.60	142.42	146.51	Poor	72.87	0.19	0.01	0.01	23.15	112.57	69.95	High
SA-North	R9	San Antonio	2.50	147.56	126.55	137.06	Poor	178.33	0.32	0.02	0.08	56.47	111.89	69.53	High
SA-North	R9	San Antonio	2.60	188.87	151.65	170.26	Very Poor	156.92	0.26	0.02	0.07	49.72	113.20	70.34	High
SA-North	R9	San Antonio	2.70	168.87	142.47	155.67	Poor	193.77	0.36	0.03	0.13	61.39	113.94	70.80	High
SA-North	R9	San Antonio	2.80	213.14	149.92	181.53	Very Poor	186.75	0.44	0.03	0.12	59.13	115.00	71.46	High
SA-North	R9	San Antonio	2.90	154.27	178.44	166.36	Poor	174.78	0.54	0.02	0.15	55.36	115.00	71.45	High
SA-North	R9	San Antonio	3.00	125.24	194.47	159.86	Poor	217.30	2.38	0.03	0.19	69.85	114.91	71.40	High
SA-North	R9	San Antonio	3.10	116.99	154.96	135.98	Poor	156.08	0.84	0.02	0.14	49.75	116.28	72.26	High
SA-North	R9	San Antonio	3.20	137.45	139.26	138.36	Poor	141.38	2.27	0.02	0.05	45.83	112.73	70.05	High
SA-North	R9	San Antonio	3.30	165.87	137.66	151.77	Poor	176.20	0.11	0.03	0.03	55.67	109.98	68.34	High
SA-North	R9	San Antonio	3.40	121.81	130.28	126.05	Fair	189.42	0.26	0.03	0.09	60.00	108.74	67.57	High
SA-North	R9	San Antonio	3.50	184.27	129.33	156.80	Poor	169.39	0.32	0.03	0.12	53.69	109.90	68.29	High
SA-North	R9	San Antonio	3.60	115.15	132.01	123.58	Fair	121.41	0.27	0.02	0.05	38.58	111.78	69.46	High
SA-North	R9	San Antonio	3.70	205.56	154.76	180.16	Very Poor	63.55	0.16	0.01	0.01	20.17	111.36	69.19	High
SA-North	R9	San Antonio	3.80	141.04	171.45	156.25	Poor	153.66	0.61	0.02	0.02	48.81	109.78	68.21	High
SA-North	R9	San Antonio	3.90	93.90	141.55	117.73	Fair	161.74	0.48	0.06	0.01	51.36	114.07	70.88	High
SA-North	R9	San Antonio	4.00	99.63	207.99	153.81	Poor	132.56	0.41	0.07	0.01	42.06	115.78	71.95	High
SA-North	R9	San Antonio	4.10	127.06	174.40	150.73	Poor	150.75	0.71	0.10	0.01	48.04	114.25	70.99	High
SA-North	R9	San Antonio	4.20	104.26	146.26	125.26	Fair	109.86	0.39	0.01	0.01	34.80	113.68	70.63	High
SA-North	R9	San Antonio	4.30	173.94	194.96	184.45	Very Poor	137.10	0.34	0.02	0.01	43.57	113.42	70.48	High
SA-North	R9	San Antonio	4.40	147.08	150.91	149.00	Poor	101.10	0.26	0.01	0.01	32.11	113.60	70.59	High
SA-North	R9	San Antonio	4.50	204.14	155.38	179.76	Very Poor	168.70	0.73	0.02	0.00	53.62	111.08	69.02	High
SA-North	R9	San Antonio	4.60	160.08	180.71	170.40	Very Poor	132.34	0.38	0.01	0.00	41.87	111.22	69.11	High
SA-North	R9	San Antonio	4.70	186.48	162.94	174.71	Very Poor	132.10	0.28	0.02	0.00	41.89	110.59	68.72	High
SA-North	R9	San Antonio	4.80	133.28	191.04	162.16	Poor	198.27	1.61	0.03	0.01	63.39	107.85	67.01	High
SA-North	R9	San Antonio	4.90	154.67	157.41	156.04	Poor	173.53	0.10	0.02	0.01	54.89	109.95	68.32	High
SA-North	R9	San Antonio	5.00	111.28	181.93	146.61	Poor	91.06	0.11	0.01	0.00	28.78	109.11	67.80	High
SA-North	R9	San Antonio	5.10	153.64	103.50	128.57	Fair	144.07	0.52	0.01	0.00	45.71	106.31	66.06	High
SA-North	R9	San Antonio	5.20	139.47	117.43	128.45	Fair	59.13	0.10	0.01	0.00	18.70	104.59	64.99	High

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-North	R9	San Antonio	5.30	152.53	119.06	135.80	Poor	11.63	0.15	0.00	0.00	3.70	93.70	58.23	Medium
SA-North	R9	San Antonio	5.40	97.00	209.87	153.44	Poor	18.85	0.06	0.01	0.02	5.97	63.23	39.29	Low
SA-North	R9	San Antonio	5.50	98.44	169.61	134.03	Poor	590.26	0.30	0.10	1.03	187.42	18.57	11.54	Low
SA-South	R1	San Antonio	0.10	105.87	123.95	115.00	Fair	291.49	0.79	0.66	0.53	93.25	53.96	33.53	Low
SA-South	R1	San Antonio	0.20	178.63	164.26	171.00	Very Poor	156.03	0.46	0.42	0.05	49.84	74.75	46.45	Medium
SA-South	R1	San Antonio	0.30	102.14	103.52	103.00	Fair	139.61	0.42	0.36	0.03	44.62	85.62	53.20	Medium
SA-South	R1	San Antonio	0.40	110.47	117.52	114.00	Fair	135.44	0.66	0.15	0.04	43.27	91.71	56.99	Medium
SA-South	R1	San Antonio	0.50	181.30	198.14	190.00	Very Poor	123.23	0.00	0.02	0.01	38.93	95.70	59.46	Medium
SA-South	R1	San Antonio	0.60	187.67	196.25	192.00	Very Poor	141.75	0.00	0.02	0.01	44.88	97.74	60.73	High
SA-South	R1	San Antonio	0.70	220.55	267.55	244.00	Very Poor	99.56	0.00	0.02	0.00	31.50	99.59	61.88	High
SA-South	R1	San Antonio	0.80	135.47	107.16	121.00	Fair	115.03	0.00	0.02	0.00	36.40	98.84	61.42	High
SA-South	R1	San Antonio	0.90	157.40	187.30	172.00	Very Poor	151.17	0.11	0.02	0.01	47.76	101.98	63.37	High
SA-South	R1	San Antonio	1.00	133.53	117.09	125.00	Fair	134.22	0.18	0.02	0.01	42.42	107.04	66.51	High
SA-South	R1	San Antonio	1.10	122.78	118.63	121.00	Fair	141.56	0.13	0.02	0.00	44.85	107.51	66.80	High
SA-South	R1	San Antonio	1.20	119.59	148.90	134.00	Poor	168.22	0.11	0.02	0.01	53.14	108.34	67.32	High
SA-South	R1	San Antonio	1.30	104.95	182.62	144.00	Poor	123.77	0.15	0.02	0.01	39.15	108.35	67.32	High
SA-South	R1	San Antonio	1.40	144.29	180.98	163.00	Poor	132.25	0.19	0.02	0.04	41.96	107.80	66.99	High
SA-South	R1	San Antonio	1.50	135.35	137.35	136.00	Poor	180.56	0.33	0.04	0.06	57.18	106.99	66.48	High
SA-South	R1	San Antonio	1.60	202.53	168.84	186.00	Very Poor	141.33	0.32	0.04	0.12	44.72	110.51	68.67	High
SA-South	R1	San Antonio	1.70	136.25	190.77	164.00	Poor	125.80	0.26	0.03	0.11	39.88	110.45	68.63	High
SA-South	R1	San Antonio	1.80	150.56	195.96	173.00	Very Poor	162.24	0.22	0.04	0.07	51.38	108.43	67.37	High
SA-South	R1	San Antonio	1.90	150.92	170.82	161.00	Poor	179.27	0.17	0.04	0.12	56.65	108.23	67.25	High
SA-South	R1	San Antonio	2.00	217.41	175.76	197.00	Very Poor	191.89	0.15	0.04	0.07	60.64	108.39	67.35	High
SA-South	R1	San Antonio	2.10	191.10	148.51	170.00	Very Poor	209.82	0.14	0.04	0.14	66.44	111.16	69.07	High
SA-South	R1	San Antonio	2.20	170.61	175.17	173.00	Very Poor	183.60	0.22	0.03	0.16	58.14	115.78	71.94	High
SA-South	R1	San Antonio	2.30	142.04	190.56	166.00	Poor	163.88	0.33	0.02	0.14	51.97	119.98	74.55	High
SA-South	R1	San Antonio	2.40	160.11	194.69	177.00	Very Poor	86.63	0.36	0.01	0.05	27.59	122.06	75.84	High
SA-South	R1	San Antonio	2.50	130.85	185.22	158.00	Poor	128.27	0.77	0.02	0.08	40.91	121.70	75.62	High
SA-South	R1	San Antonio	2.60	152.68	218.01	185.00	Very Poor	157.78	0.93	0.02	0.09	50.26	123.08	76.48	High
SA-South	R1	San Antonio	2.70	127.05	164.36	146.00	Poor	170.82	0.94	0.02	0.09	54.35	125.30	77.86	High
SA-South	R1	San Antonio	2.80	183.92	197.68	191.00	Very Poor	164.72	0.81	0.02	0.09	52.34	127.95	79.51	High
SA-South	R1	San Antonio	2.90	107.35	150.66	129.00	Fair	102.41	0.58	0.01	0.08	32.72	128.45	79.81	High
SA-South	R1	San Antonio	3.00	144.43	311.51	228.00	Very Poor	165.66	1.00	0.01	0.13	52.94	126.81	78.80	High
SA-South	R1	San Antonio	3.10	126.39	332.03	229.00	Very Poor	190.56	1.13	0.01	0.10	60.80	127.43	79.18	High
SA-South	R1	San Antonio	3.20	176.68	231.37	204.00	Very Poor	195.11	1.02	0.01	0.17	62.10	128.92	80.11	High
SA-South	R1	San Antonio	3.30	243.47	269.16	256.00	Very Poor	195.90	0.87	0.01	0.14	62.26	127.75	79.38	High
SA-South	R1	San Antonio	3.40	169.53	171.60	171.00	Very Poor	193.65	0.67	0.01	0.14	61.51	127.11	78.98	High
SA-South	R1	San Antonio	3.50	116.02	165.60	141.00	Poor	180.37	0.44	0.01	0.11	57.25	128.67	79.95	High
SA-South	R1	San Antonio	3.60	161.33	171.63	166.00	Poor	155.58	0.29	0.01	0.06	49.32	129.18	80.27	High
SA-South	R1	San Antonio	3.70	133.68	145.66	140.00	Poor	142.74	0.23	0.01	0.03	45.17	129.20	80.28	High
SA-South	R1	San Antonio	3.80	137.49	132.20	135.00	Poor	87.81	0.14	0.01	0.02	27.82	129.25	80.31	High
SA-South	R1	San Antonio	3.90	121.27	140.56	131.00	Poor	130.15	0.36	0.01	0.06	41.18	128.15	79.63	High
SA-South	R1	San Antonio	4.00	146.92	142.92	145.00	Poor	60.10	0.20	0.00	0.02	19.09	126.14	78.38	High
SA-South	R1	San Antonio	4.10	174.48	149.56	162.00	Poor	113.51	0.38	0.01	0.02	36.13	121.55	75.53	High
SA-South	R1	San Antonio	4.20	125.48	129.71	128.00	Fair	158.37	0.43	0.01	0.08	50.25	121.75	75.65	High
SA-South	R1	San Antonio	4.30	158.49	161.27	160.00	Poor	194.34	0.45	0.02	0.09	61.66	121.79	75.68	High
SA-South	R1	San Antonio	4.40	163.73	173.56	169.00	Poor	149.32	0.23	0.01	0.06	47.27	123.48	76.73	High
SA-South	R1	San Antonio	4.50	198.61	255.87	227.00	Very Poor	26.27	0.18	0.00	0.01	8.50	117.77	73.18	High
SA-South	R1	San Antonio	4.60	284.41	258.04	271.00	Very Poor	39.24	1.46	0.01	0.02	13.08	103.45	64.28	High
SA-South	R1	San Antonio	4.70	298.55	254.23	276.00	Very Poor	168.84	0.61	0.01	0.04	53.53	102.63	63.77	High
SA-South	R1	San Antonio	4.80	150.80	212.95	182.00	Very Poor	208.55	0.33	0.02	0.08	66.00	105.24	65.39	High
SA-South	R1	San Antonio	4.90	410.13	473.27	442.00	Very Poor	199.00	0.33	0.01	0.05	63.04	110.08	68.40	High
SA-South	R1	San Antonio	5.00	193.32	162.83	178.00	Very Poor	164.10	0.17	0.01	0.15	51.97	110.92	68.92	High
SA-South	R1	San Antonio	5.10	212.57	326.30	269.00	Very Poor	179.26	0.61	0.01	0.10	56.99	113.58	70.57	High
SA-South	R1	San Antonio	5.20	170.30	380.39	275.00	Very Poor	108.97	1.46	0.01	0.04	35.19	114.67	71.25	High
SA-South	R1	San Antonio	5.30	211.92	272.79	242.00	Very Poor	160.76	1.44	0.01	0.05	51.53	116.65	72.48	High
SA-South	R1	San Antonio	5.40	184.91	313.92	249.00	Very Poor	164.23	0.87	0.01	0.05	52.29	118.41	73.58	High
SA-South	R1	San Antonio	5.50	194.74	164.32	180.00	Very Poor	138.70	0.67	0.01	0.13	44.12	117.26	72.86	High
SA-South	R1	San Antonio	5.60	413.48	384.75	399.00	Very Poor	146.54	0.74	0.01	0.08	46.69	116.27	72.25	High
SA-South	R1	San Antonio	5.70	187.24	196.80	192.00	Very Poor	162.55	0.73	0.01	0.12	51.71	115.47	71.75	High
SA-South	R1	San Antonio	5.80	194.73	212.14	203.00	Very Poor	180.49	0.79	0.01	0.20	57.39	116.38	72.32	High
SA-South	R1	San Antonio	5.90	208.32	238.46	223.00	Very Poor	144.72	0.70	0.01	0.10	46.05	117.81	73.21	High
SA-South	R1	San Antonio	6.00	450.76	246.39	349.00	Very Poor	112.56	0.51	0.01	0.10	35.74	119.20	74.07	High
SA-South	R1	San Antonio	6.10	200.21	248.45	224.00	Very Poor	21.63	0.34	0.00	0.01	6.95	115.32	71.66	High
SA-South	R1	San Antonio	6.20	142.48	168.29	155.00	Poor	16.72	0.33	0.00	0.01	5.38	107.87	67.03	High
SA-South	R1	San Antonio	6.30	150.69	186.48	169.00	Poor	6.48	0.02	0.05	0.00	2.06	84.02	52.21	Medium
SA-South	R2	San Antonio	0.10	105.87	123.95	115.00	Fair	361.50	0.07	0.16	0.37	114.42	48.76	30.30	Low
SA-South	R2	San Antonio	0.20	178.63	164.26	171.00	Very Poor	254.47	0.09	0.09	0.10	80.43	77.03	47.86	Medium
SA-South	R2	San Antonio	0.30	102.14	103.52	103.00	Fair	201.57	1.17	0.07	0.07	64.15	88.83	55.20	Medium
SA-South	R2	San Antonio	0.40	110.47	117.52	114.00	Fair	199.52	0.28	0.05	0.12	63.16	97.87	60.81	High
SA-South	R2	San Antonio	0.50	181.30	198.14	190.00	Very Poor	163.80	0.47	0.04	0.07	51.86	104.51	64.94	High
SA-South	R2	San Antonio	0.60	187.67	196.25	192.00	Very Poor	140.62	0.35	0.04	0.05	44.70	106.86	66.40	High
SA-South	R2	San Antonio	0.70	220.55	267.55	244.00	Very Poor	144.28	0.47	0.03	0.03	45.81	109.64	68.12	High
SA-South	R2	San Antonio	0.80	135.47	107.16	121.00	Fair	113.63	0.43	0.02	0.02	36.08	110.70	68.79	High
SA-South	R2	San Antonio	0.90	157.40	187.30	172.00	Very Poor	161.10	0.60	0.03	0.03	51.23	112.92	70.17	High
SA-South	R2	San Antonio	1.00	133.53	117.09	125.00	Fair	158.35	0.56	0.03	0.03	50.36	116.30	72.26	High
SA-South	R2	San Antonio	1.10	122.78	118.63	121.00	Fair	74.50	0.49	0.01	0.02	23.75	115.80	71.95	High

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-South	R2	San Antonio	1.20	119.59	148.90	134.00	Poor	142.13	0.61	0.02	0.04	45.13	113.37	70.45	High
SA-South	R2	San Antonio	1.30	104.95	182.62	144.00	Poor	128.05	0.48	0.02	0.05	40.70	112.47	69.88	High
SA-South	R2	San Antonio	1.40	144.29	180.98	163.00	Poor	105.70	0.36	0.01	0.06	33.46	110.87	68.89	High
SA-South	R2	San Antonio	1.50	135.35	137.35	136.00	Poor	103.35	0.37	0.01	0.04	32.92	108.42	67.37	High
SA-South	R2	San Antonio	1.60	202.53	168.84	186.00	Very Poor	153.20	0.39	0.02	0.03	48.68	106.88	66.41	High
SA-South	R2	San Antonio	1.70	136.25	190.77	164.00	Poor	190.12	0.42	0.02	0.08	60.18	109.30	67.91	High
SA-South	R2	San Antonio	1.80	150.56	195.96	173.00	Very Poor	192.51	0.34	0.02	0.11	61.06	112.37	69.82	High
SA-South	R2	San Antonio	1.90	150.92	170.82	161.00	Poor	197.47	0.38	0.03	0.13	62.68	113.30	70.40	High
SA-South	R2	San Antonio	2.00	217.41	175.76	197.00	Very Poor	155.28	0.33	0.02	0.08	49.18	114.40	71.08	High
SA-South	R2	San Antonio	2.10	191.10	148.51	170.00	Very Poor	138.82	0.35	0.01	0.06	43.91	113.46	70.50	High
SA-South	R2	San Antonio	2.20	170.61	175.17	173.00	Very Poor	149.69	0.38	0.01	0.04	47.59	114.30	71.02	High
SA-South	R2	San Antonio	2.30	142.04	190.56	166.00	Poor	161.72	0.38	0.01	0.06	51.19	117.31	72.89	High
SA-South	R2	San Antonio	2.40	160.11	194.69	177.00	Very Poor	66.85	0.19	0.01	0.01	21.24	120.73	75.02	High
SA-South	R2	San Antonio	2.50	130.85	185.22	158.00	Poor	164.81	0.71	0.01	0.03	52.43	118.93	73.90	High
SA-South	R2	San Antonio	2.60	152.68	218.01	185.00	Very Poor	176.02	0.60	0.01	0.09	55.94	124.09	77.10	High
SA-South	R2	San Antonio	2.70	127.05	164.36	146.00	Poor	154.26	2.23	0.01	0.07	49.80	125.37	77.90	High
SA-South	R2	San Antonio	2.80	183.92	197.68	191.00	Very Poor	115.16	0.72	0.01	0.06	36.81	127.62	79.30	High
SA-South	R2	San Antonio	2.90	107.35	150.66	129.00	Fair	68.50	0.47	0.01	0.02	21.89	125.31	77.87	High
SA-South	R2	San Antonio	3.00	144.43	311.51	228.00	Very Poor	89.53	2.19	0.01	0.02	29.25	119.34	74.15	High
SA-South	R2	San Antonio	3.10	126.39	332.03	229.00	Very Poor	155.18	1.83	0.01	0.05	49.85	117.48	73.00	High
SA-South	R2	San Antonio	3.20	176.68	231.37	204.00	Very Poor	115.44	0.80	0.01	0.02	36.88	117.48	73.00	High
SA-South	R2	San Antonio	3.30	243.47	269.16	256.00	Very Poor	177.54	1.00	0.01	0.09	56.65	112.76	70.07	High
SA-South	R2	San Antonio	3.40	169.53	171.60	171.00	Very Poor	176.32	0.82	0.02	0.14	56.12	114.04	70.86	High
SA-South	R2	San Antonio	3.50	116.02	165.60	141.00	Poor	189.54	1.76	0.02	0.07	60.73	116.37	72.31	High
SA-South	R2	San Antonio	3.60	161.33	171.63	166.00	Poor	74.60	0.51	0.01	0.04	23.80	118.61	73.70	High
SA-South	R2	San Antonio	3.70	133.68	145.66	140.00	Poor	111.54	0.82	0.01	0.04	35.65	115.36	71.68	High
SA-South	R2	San Antonio	3.80	137.49	132.20	135.00	Poor	130.87	1.09	0.01	0.08	41.87	116.23	72.22	High
SA-South	R2	San Antonio	3.90	121.27	140.56	131.00	Poor	65.00	0.43	0.00	0.03	20.77	118.10	73.39	High
SA-South	R2	San Antonio	4.00	146.92	142.92	145.00	Poor	72.31	0.67	0.00	0.06	23.09	115.09	71.52	High
SA-South	R2	San Antonio	4.10	174.48	149.56	162.00	Poor	65.56	0.60	0.00	0.07	21.03	107.80	66.98	High
SA-South	R2	San Antonio	4.20	125.48	129.71	128.00	Fair	12.55	0.51	0.00	0.02	4.25	60.66	37.69	Low
SA-South	R2	San Antonio	4.30	158.49	161.27	160.00	Poor	192.78	0.52	0.04	0.21	61.00	57.12	35.49	Low
SA-South	R2	San Antonio	4.40	163.73	173.56	169.00	Poor	252.11	0.16	0.05	0.04	79.71	75.42	46.87	Medium
SA-South	R2	San Antonio	4.50	198.61	255.87	227.00	Very Poor	241.69	0.06	0.03	0.06	76.32	85.06	52.85	Medium
SA-South	R2	San Antonio	4.60	284.41	258.04	271.00	Very Poor	226.91	0.06	0.03	0.05	71.71	92.11	57.23	Medium
SA-South	R2	San Antonio	4.70	298.55	254.23	276.00	Very Poor	147.03	0.07	0.01	0.04	46.53	99.58	61.87	High
SA-South	R2	San Antonio	4.80	150.80	212.95	182.00	Very Poor	142.96	0.22	0.01	0.04	45.19	104.33	64.83	High
SA-South	R2	San Antonio	4.90	410.13	473.27	442.00	Very Poor	169.60	0.24	0.02	0.03	53.69	108.13	67.19	High
SA-South	R2	San Antonio	5.00	193.32	162.83	178.00	Very Poor	138.56	0.26	0.01	0.01	43.89	109.13	67.81	High
SA-South	R2	San Antonio	5.10	212.57	326.30	269.00	Very Poor	136.69	0.31	0.01	0.07	43.29	108.26	67.27	High
SA-South	R2	San Antonio	5.20	170.30	380.39	275.00	Very Poor	148.51	0.37	0.01	0.05	47.13	108.43	67.37	High
SA-South	R2	San Antonio	5.30	211.92	272.79	242.00	Very Poor	162.87	0.50	0.02	0.03	51.66	108.01	67.12	High
SA-South	R2	San Antonio	5.40	184.91	313.92	249.00	Very Poor	142.94	0.96	0.01	0.08	45.59	109.80	68.22	High
SA-South	R2	San Antonio	5.50	194.74	164.32	180.00	Very Poor	149.75	0.46	0.02	0.10	47.57	111.71	69.41	High
SA-South	R2	San Antonio	5.60	413.48	384.75	399.00	Very Poor	68.13	0.64	0.01	0.05	21.81	112.54	69.93	High
SA-South	R2	San Antonio	5.70	187.24	196.80	192.00	Very Poor	110.49	0.79	0.01	0.04	35.23	110.63	68.74	High
SA-South	R2	San Antonio	5.80	194.73	212.14	203.00	Very Poor	41.33	0.05	0.00	0.01	13.12	108.89	67.66	High
SA-South	R2	San Antonio	5.90	208.32	238.46	223.00	Very Poor	10.01	0.93	0.01	0.00	3.65	99.08	61.57	High
SA-South	R2	San Antonio	6.00	450.76	246.39	349.00	Very Poor	3.37	0.07	0.10	0.01	1.29	63.81	39.65	Low
SA-South	R3	San Antonio	0.10	105.87	123.95	115.00	Fair	376.64	0.00	0.28	0.58	119.36	48.64	30.22	Low
SA-South	R3	San Antonio	0.20	178.63	164.26	171.00	Very Poor	330.16	0.03	0.20	0.09	104.49	79.02	49.10	Medium
SA-South	R3	San Antonio	0.30	102.14	103.52	103.00	Fair	250.69	0.30	0.15	0.14	79.53	94.90	58.97	Medium
SA-South	R3	San Antonio	0.40	110.47	117.52	114.00	Fair	227.81	0.29	0.14	0.11	72.25	104.46	64.91	High
SA-South	R3	San Antonio	0.50	181.30	198.14	190.00	Very Poor	208.24	0.27	0.02	0.09	65.97	111.89	69.52	High
SA-South	R3	San Antonio	0.60	187.67	196.25	192.00	Very Poor	161.11	0.62	0.03	0.06	51.13	116.90	72.64	High
SA-South	R3	San Antonio	0.70	220.55	267.55	244.00	Very Poor	164.45	2.44	0.04	0.05	53.23	117.18	72.81	High
SA-South	R3	San Antonio	0.80	135.47	107.16	121.00	Fair	170.75	1.08	0.07	0.05	54.49	120.12	74.64	High
SA-South	R3	San Antonio	0.90	157.40	187.30	172.00	Very Poor	194.28	0.95	0.08	0.06	61.94	124.31	77.24	High
SA-South	R3	San Antonio	1.00	133.53	117.09	125.00	Fair	164.30	0.77	0.07	0.09	52.29	125.64	78.07	High
SA-South	R3	San Antonio	1.10	122.78	118.63	121.00	Fair	165.60	0.78	0.08	0.07	52.82	125.40	77.92	High
SA-South	R3	San Antonio	1.20	119.59	148.90	134.00	Poor	153.07	0.75	0.07	0.12	48.89	125.60	78.05	High
SA-South	R3	San Antonio	1.30	104.95	182.62	144.00	Poor	73.20	0.35	0.01	0.06	23.24	122.32	76.00	High
SA-South	R3	San Antonio	1.40	144.29	180.98	163.00	Poor	132.74	0.67	0.01	0.05	42.22	115.81	71.96	High
SA-South	R3	San Antonio	1.50	135.35	137.35	136.00	Poor	195.31	0.89	0.06	0.07	62.32	117.25	72.85	High
SA-South	R3	San Antonio	1.60	202.53	168.84	186.00	Very Poor	206.13	0.69	0.04	0.07	65.47	121.02	75.20	High
SA-South	R3	San Antonio	1.70	136.25	190.77	164.00	Poor	192.02	0.78	0.09	0.08	61.16	122.41	76.06	High
SA-South	R3	San Antonio	1.80	150.56	195.96	173.00	Very Poor	196.58	0.91	0.08	0.09	62.54	122.00	75.81	High
SA-South	R3	San Antonio	1.90	150.92	170.82	161.00	Poor	160.99	1.86	0.08	0.09	51.90	120.66	74.97	High
SA-South	R3	San Antonio	2.00	217.41	175.76	197.00	Very Poor	172.78	1.54	0.08	0.19	55.33	120.11	74.63	High
SA-South	R3	San Antonio	2.10	191.10	148.51	170.00	Very Poor	80.54	0.83	0.02	0.04	25.85	120.05	74.60	High
SA-South	R3	San Antonio	2.20	170.61	175.17	173.00	Very Poor	48.10	0.80	0.03	0.03	15.68	115.29	71.64	High
SA-South	R3	San Antonio	2.30	142.04	190.56	166.00	Poor	162.57	2.26	0.19	0.11	52.68	115.19	71.58	High
SA-South	R3	San Antonio	2.40	160.11	194.69	177.00	Very Poor	217.41	1.15	0.22	0.15	69.56	123.27	76.60	High
SA-South	R3	San Antonio	2.50	130.85	185.22	158.00	Poor	152.91	1.03	0.04	0.11	48.80	131.28	81.57	High
SA-South	R3	San Antonio	2.60	152.68	218.01	185.00	Very Poor	131.49	1.09	0.06	0.19	42.06	129.00	80.16	High
SA-South	R3	San Antonio	2.70	127.05	164.36	146.00	Poor	201.86	1.81	0.11	0.11	64.72	129.72	80.61	High
SA-South	R3	San Antonio	2.80	183.92	197.68	191.00	Very Poor	200.35	1.98	0.12	0.14	64.40	131.94	81.99	High

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-South	R3	San Antonio	2.90	107.35	150.66	129.00	Fair	174.31	1.85	0.10	0.31	56.11	130.47	81.07	High
SA-South	R3	San Antonio	3.00	144.43	311.51	228.00	Very Poor	216.50	2.41	0.15	0.30	69.77	128.71	79.98	High
SA-South	R3	San Antonio	3.10	126.39	332.03	229.00	Very Poor	187.41	1.76	0.09	0.14	60.15	131.17	81.50	High
SA-South	R3	San Antonio	3.20	176.68	231.37	204.00	Very Poor	196.82	1.60	0.06	0.16	62.99	132.02	82.03	High
SA-South	R3	San Antonio	3.30	243.47	269.16	256.00	Very Poor	110.50	1.15	0.04	0.04	35.45	133.39	82.88	High
SA-South	R3	San Antonio	3.40	169.53	171.60	171.00	Very Poor	133.88	3.67	0.03	0.05	44.08	132.37	82.25	High
SA-South	R3	San Antonio	3.50	116.02	165.60	141.00	Poor	136.73	2.09	0.03	0.06	44.26	131.67	81.81	High
SA-South	R3	San Antonio	3.60	161.33	171.63	166.00	Poor	128.69	1.56	0.02	0.06	41.42	128.61	79.91	High
SA-South	R3	San Antonio	3.70	133.68	145.66	140.00	Poor	54.81	0.61	0.01	0.04	17.61	127.66	79.33	High
SA-South	R3	San Antonio	3.80	137.49	132.20	135.00	Poor	158.78	1.33	0.03	0.04	50.85	120.18	74.67	High
SA-South	R3	San Antonio	3.90	121.27	140.56	131.00	Poor	96.12	0.68	0.01	0.07	30.67	117.22	72.84	High
SA-South	R3	San Antonio	4.00	146.92	142.92	145.00	Poor	22.25	0.15	0.00	0.01	7.11	109.24	67.88	High
SA-South	R3	San Antonio	4.10	174.48	149.56	162.00	Poor	3.03	0.05	0.00	0.00	1.06	94.37	58.64	Medium
SA-South	R3	San Antonio	4.20	125.48	129.71	128.00	Fair	2.18	0.08	0.00	0.00	0.98	67.57	41.99	Low
SA-South	R3	San Antonio	4.30	158.49	161.27	160.00	Poor	399.93	1.41	0.24	0.18	127.35	40.75	25.32	Low
SA-South	R3	San Antonio	4.40	163.73	173.56	169.00	Poor	346.67	0.22	0.21	0.11	109.82	72.46	45.03	Medium
SA-South	R3	San Antonio	4.50	198.61	255.87	227.00	Very Poor	162.71	0.72	0.08	0.06	51.83	83.11	51.65	Medium
SA-South	R3	San Antonio	4.60	284.41	258.04	271.00	Very Poor	185.61	0.73	0.07	0.04	59.14	83.82	52.08	Medium
SA-South	R3	San Antonio	4.70	298.55	254.23	276.00	Very Poor	173.33	0.39	0.04	0.08	55.02	89.92	55.87	Medium
SA-South	R3	San Antonio	4.80	150.80	212.95	182.00	Very Poor	173.62	0.60	0.07	0.09	55.14	97.29	60.45	High
SA-South	R3	San Antonio	4.90	410.13	473.27	442.00	Very Poor	186.04	0.52	0.08	0.05	59.10	103.56	64.35	High
SA-South	R3	San Antonio	5.00	193.32	162.83	178.00	Very Poor	160.78	0.36	0.08	0.06	51.00	106.33	66.07	High
SA-South	R3	San Antonio	5.10	212.57	326.30	269.00	Very Poor	147.74	0.39	0.08	0.05	46.91	106.07	65.91	High
SA-South	R3	San Antonio	5.20	170.30	380.39	275.00	Very Poor	102.27	0.30	0.06	0.03	32.40	105.24	65.40	High
SA-South	R3	San Antonio	5.30	211.92	272.79	242.00	Very Poor	118.80	0.38	0.05	0.04	37.74	100.64	62.54	High
SA-South	R3	San Antonio	5.40	184.91	313.92	249.00	Very Poor	51.25	0.21	0.03	0.01	16.40	97.41	60.53	High
SA-South	R3	San Antonio	5.50	194.74	164.32	180.00	Very Poor	21.76	0.13	0.01	0.00	6.91	91.23	56.69	Medium
SA-South	R3	San Antonio	5.60	413.48	384.75	399.00	Very Poor	42.50	0.22	0.03	0.01	13.64	85.36	53.04	Medium
SA-South	R3	San Antonio	5.70	187.24	196.80	192.00	Very Poor	146.33	0.48	0.07	0.02	46.52	84.82	52.70	Medium
SA-South	R3	San Antonio	5.80	194.73	212.14	203.00	Very Poor	15.98	0.25	0.01	0.00	5.13	83.95	52.17	Medium
SA-South	R3	San Antonio	5.90	208.32	238.46	223.00	Very Poor	5.64	0.21	0.02	0.00	1.86	63.76	39.62	Low
SA-South	R3	San Antonio	6.00	450.76	246.39	349.00	Very Poor	41.41	0.02	0.03	0.03	13.59	42.12	26.17	Low
SA-South	R4	San Antonio	0.10	105.87	123.95	115.00	Fair	233.21	0.39	0.27	0.35	74.13	47.25	29.36	Low
SA-South	R4	San Antonio	0.20	178.63	164.26	171.00	Very Poor	284.39	0.66	0.10	0.18	90.36	72.37	44.97	Low
SA-South	R4	San Antonio	0.30	102.14	103.52	103.00	Fair	238.23	0.45	0.08	0.08	75.64	87.35	54.28	Medium
SA-South	R4	San Antonio	0.40	110.47	117.52	114.00	Fair	216.97	0.41	0.06	0.13	68.81	96.97	60.25	High
SA-South	R4	San Antonio	0.50	181.30	198.14	190.00	Very Poor	194.69	0.41	0.03	0.11	61.75	105.01	65.25	High
SA-South	R4	San Antonio	0.60	187.67	196.25	192.00	Very Poor	99.98	0.27	0.01	0.05	31.63	108.49	67.41	High
SA-South	R4	San Antonio	0.70	220.55	267.55	244.00	Very Poor	82.84	0.36	0.01	0.05	26.35	105.14	65.33	High
SA-South	R4	San Antonio	0.80	135.47	107.16	121.00	Fair	161.54	0.64	0.01	0.03	51.17	107.43	66.76	High
SA-South	R4	San Antonio	0.90	157.40	187.30	172.00	Very Poor	155.32	0.45	0.02	0.03	49.34	110.48	68.65	High
SA-South	R4	San Antonio	1.00	133.53	117.09	125.00	Fair	85.67	0.26	0.01	0.04	27.11	110.48	68.65	High
SA-South	R4	San Antonio	1.10	122.78	118.63	121.00	Fair	121.04	0.45	0.01	0.02	38.49	105.21	65.37	High
SA-South	R4	San Antonio	1.20	119.59	148.90	134.00	Poor	173.55	0.56	0.03	0.04	55.12	106.16	65.97	High
SA-South	R4	San Antonio	1.30	104.95	182.62	144.00	Poor	86.54	0.23	0.01	0.02	27.39	106.38	66.10	High
SA-South	R4	San Antonio	1.40	144.29	180.98	163.00	Poor	71.02	0.27	0.01	0.01	22.52	102.79	63.87	High
SA-South	R4	San Antonio	1.50	135.35	137.35	136.00	Poor	147.89	0.85	0.01	0.03	47.17	97.47	60.56	High
SA-South	R4	San Antonio	1.60	202.53	168.84	186.00	Very Poor	218.57	1.04	0.02	0.10	69.58	102.76	63.85	High
SA-South	R4	San Antonio	1.70	136.25	190.77	164.00	Poor	194.95	0.81	0.03	0.07	61.93	107.72	66.93	High
SA-South	R4	San Antonio	1.80	150.56	195.96	173.00	Very Poor	214.67	0.69	0.03	0.18	68.24	110.01	68.36	High
SA-South	R4	San Antonio	1.90	150.92	170.82	161.00	Poor	184.56	0.45	0.02	0.09	58.59	113.12	70.29	High
SA-South	R4	San Antonio	2.00	217.41	175.76	197.00	Very Poor	155.64	0.39	0.02	0.06	49.49	113.04	70.24	High
SA-South	R4	San Antonio	2.10	191.10	148.51	170.00	Very Poor	36.73	0.12	0.01	0.01	11.61	112.15	69.69	High
SA-South	R4	San Antonio	2.20	170.61	175.17	173.00	Very Poor	90.45	0.15	0.01	0.02	28.55	108.55	67.45	High
SA-South	R4	San Antonio	2.30	142.04	190.56	166.00	Poor	97.60	0.10	0.02	0.05	30.83	109.82	68.24	High
SA-South	R4	San Antonio	2.40	160.11	194.69	177.00	Very Poor	93.92	0.06	0.02	0.02	29.66	110.96	68.95	High
SA-South	R4	San Antonio	2.50	130.85	185.22	158.00	Poor	106.29	0.07	0.02	0.01	33.64	110.72	68.80	High
SA-South	R4	San Antonio	2.60	152.68	218.01	185.00	Very Poor	136.30	0.04	0.02	0.02	43.14	111.45	69.25	High
SA-South	R4	San Antonio	2.70	127.05	164.36	146.00	Poor	134.72	0.05	0.02	0.03	42.58	113.48	70.51	High
SA-South	R4	San Antonio	2.80	183.92	197.68	191.00	Very Poor	112.03	0.04	0.02	0.02	35.44	114.59	71.20	High
SA-South	R4	San Antonio	2.90	107.35	150.66	129.00	Fair	80.28	0.11	0.01	0.02	25.41	112.78	70.08	High
SA-South	R4	San Antonio	3.00	144.43	311.51	228.00	Very Poor	99.99	0.24	0.01	0.07	31.65	108.30	67.30	High
SA-South	R4	San Antonio	3.10	126.39	332.03	229.00	Very Poor	179.74	0.27	0.03	0.07	57.07	107.00	66.49	High
SA-South	R4	San Antonio	3.20	176.68	231.37	204.00	Very Poor	183.84	0.25	0.02	0.06	58.24	107.00	66.49	High
SA-South	R4	San Antonio	3.30	243.47	269.16	256.00	Very Poor	184.93	0.06	0.03	0.12	58.34	109.41	67.99	High
SA-South	R4	San Antonio	3.40	169.53	171.60	171.00	Very Poor	71.58	0.03	0.02	0.06	22.52	110.99	68.97	High
SA-South	R4	San Antonio	3.50	116.02	165.60	141.00	Poor	83.24	0.25	0.02	0.02	26.42	107.18	66.60	High
SA-South	R4	San Antonio	3.60	161.33	171.63	166.00	Poor	52.04	0.22	0.01	0.01	16.51	104.02	64.64	High
SA-South	R4	San Antonio	3.70	133.68	145.66	140.00	Poor	120.84	0.25	0.02	0.02	38.27	104.33	64.83	High
SA-South	R4	San Antonio	3.80	137.49	132.20	135.00	Poor	102.24	0.16	0.02	0.02	32.41	104.58	64.98	High
SA-South	R4	San Antonio	3.90	121.27	140.56	131.00	Poor	149.99	0.35	0.02	0.03	47.67	106.02	65.88	High
SA-South	R4	San Antonio	4.00	146.92	142.92	145.00	Poor	120.65	0.29	0.01	0.02	38.32	108.74	67.57	High
SA-South	R4	San Antonio	4.10	174.48	149.56	162.00	Poor	171.18	0.57	0.01	0.03	54.40	107.68	66.91	High
SA-South	R4	San Antonio	4.20	125.48	129.71	128.00	Fair	189.61	0.35	0.03	0.03	60.13	109.46	68.01	High
SA-South	R4	San Antonio	4.30	158.49	161.27	160.00	Poor	66.93	0.11	0.01	0.03	21.23	108.63	67.50	High
SA-South	R4	San Antonio	4.40	163.73	173.56	169.00	Poor	86.68	0.53	0.01	0.03	27.59	101.55	63.10	High
SA-South	R4	San Antonio	4.50	198.61	255.87	227.00	Very Poor	123.27	1.21	0.02	0.03	39.73	98.84	61.42	High

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-South	R4	San Antonio	4.60	284.41	258.04	271.00	Very Poor	129.53	0.22	0.02	0.01	41.04	98.39	61.14	High
SA-South	R4	San Antonio	4.70	298.55	254.23	276.00	Very Poor	129.32	0.07	0.03	0.00	40.99	97.69	60.70	High
SA-South	R4	San Antonio	4.80	150.80	212.95	182.00	Very Poor	186.45	0.27	0.03	0.00	59.00	96.88	60.20	High
SA-South	R4	San Antonio	4.90	410.13	473.27	442.00	Very Poor	151.08	0.40	0.02	0.00	47.92	98.04	60.92	High
SA-South	R4	San Antonio	5.00	193.32	162.83	178.00	Very Poor	143.38	0.34	0.02	0.00	45.41	100.11	62.21	High
SA-South	R4	San Antonio	5.10	212.57	326.30	269.00	Very Poor	72.11	0.15	0.01	0.00	22.84	102.20	63.51	High
SA-South	R4	San Antonio	5.20	170.30	380.39	275.00	Very Poor	128.90	0.26	0.01	0.00	40.85	100.98	62.75	High
SA-South	R4	San Antonio	5.30	211.92	272.79	242.00	Very Poor	83.62	0.21	0.01	0.00	26.48	99.92	62.09	High
SA-South	R4	San Antonio	5.40	184.91	313.92	249.00	Very Poor	93.39	0.30	0.01	0.00	29.57	93.08	57.84	Medium
SA-South	R4	San Antonio	5.50	194.74	164.32	180.00	Very Poor	162.34	0.33	0.04	0.02	51.41	94.74	58.87	Medium
SA-South	R4	San Antonio	5.60	413.48	384.75	399.00	Very Poor	74.31	0.17	0.02	0.01	23.65	93.72	58.24	Medium
SA-South	R4	San Antonio	5.70	187.24	196.80	192.00	Very Poor	94.18	0.26	0.02	0.05	29.94	90.41	56.18	Medium
SA-South	R4	San Antonio	5.80	194.73	212.14	203.00	Very Poor	174.86	0.47	0.09	0.07	55.58	91.19	56.66	Medium
SA-South	R4	San Antonio	5.90	208.32	238.46	223.00	Very Poor	162.64	0.41	0.03	0.03	51.51	99.07	61.56	High
SA-South	R4	San Antonio	6.00	450.76	246.39	349.00	Very Poor	47.26	0.33	0.01	0.02	15.09	100.43	62.40	High
SA-South	R4	San Antonio	6.10	200.21	248.45	224.00	Very Poor	8.45	0.02	0.00	0.00	2.78	93.62	58.17	Medium
SA-South	R4	San Antonio	6.20	142.48	168.29	155.00	Poor	3.52	0.01	0.00	0.00	1.23	81.56	50.68	Medium
SA-South	R4	San Antonio	6.30	150.69	186.48	169.00	Poor	6.76	0.01	0.01	0.00	2.33	51.41	31.94	Low
SA-South	R5	San Antonio	0.10	105.87	123.95	115.00	Fair	408.62	0.08	0.39	0.46	129.52	48.69	30.25	Low
SA-South	R5	San Antonio	0.20	178.63	164.26	171.00	Very Poor	299.95	0.00	0.08	0.07	94.84	78.99	49.08	Medium
SA-South	R5	San Antonio	0.30	102.14	103.52	103.00	Fair	191.41	0.33	0.02	0.13	60.54	90.64	56.32	Medium
SA-South	R5	San Antonio	0.40	110.47	117.52	114.00	Fair	114.52	0.68	0.02	0.05	36.48	94.63	58.80	Medium
SA-South	R5	San Antonio	0.50	181.30	198.14	190.00	Very Poor	123.12	0.49	0.01	0.02	39.16	97.12	60.35	High
SA-South	R5	San Antonio	0.60	187.67	196.25	192.00	Very Poor	144.11	0.31	0.01	0.02	45.61	98.33	61.10	High
SA-South	R5	San Antonio	0.70	220.55	267.55	244.00	Very Poor	138.69	0.18	0.01	0.01	44.00	99.62	61.90	High
SA-South	R5	San Antonio	0.80	135.47	107.16	121.00	Fair	169.01	0.17	0.01	0.02	53.56	104.26	64.78	High
SA-South	R5	San Antonio	0.90	157.40	187.30	172.00	Very Poor	152.12	0.11	0.02	0.02	48.09	107.91	67.05	High
SA-South	R5	San Antonio	1.00	133.53	117.09	125.00	Fair	134.90	0.14	0.02	0.05	42.72	107.31	66.68	High
SA-South	R5	San Antonio	1.10	122.78	118.63	121.00	Fair	151.98	0.20	0.03	0.04	48.03	106.88	66.41	High
SA-South	R5	San Antonio	1.20	119.59	148.90	134.00	Poor	177.28	0.22	0.04	0.05	56.10	107.41	66.74	High
SA-South	R5	San Antonio	1.30	104.95	182.62	144.00	Poor	160.10	0.24	0.02	0.03	50.68	108.00	67.11	High
SA-South	R5	San Antonio	1.40	144.29	180.98	163.00	Poor	175.91	0.19	0.04	0.06	55.75	108.40	67.36	High
SA-South	R5	San Antonio	1.50	135.35	137.35	136.00	Poor	167.41	0.12	0.04	0.04	53.02	110.36	68.58	High
SA-South	R5	San Antonio	1.60	202.53	168.84	186.00	Very Poor	130.25	0.03	0.04	0.06	41.22	110.48	68.65	High
SA-South	R5	San Antonio	1.70	136.25	190.77	164.00	Poor	181.85	0.09	0.05	0.05	57.57	108.98	67.72	High
SA-South	R5	San Antonio	1.80	150.56	195.96	173.00	Very Poor	177.78	0.23	0.03	0.04	56.22	107.68	66.91	High
SA-South	R5	San Antonio	1.90	150.92	170.82	161.00	Poor	171.98	0.25	0.03	0.00	54.40	107.84	67.01	High
SA-South	R5	San Antonio	2.00	217.41	175.76	197.00	Very Poor	183.37	0.26	0.03	0.01	58.00	108.69	67.54	High
SA-South	R5	San Antonio	2.10	191.10	148.51	170.00	Very Poor	176.84	0.26	0.02	0.00	56.01	111.79	69.46	High
SA-South	R5	San Antonio	2.20	170.61	175.17	173.00	Very Poor	51.66	0.08	0.01	0.00	16.30	113.88	70.76	High
SA-South	R5	San Antonio	2.30	142.04	190.56	166.00	Poor	121.46	0.16	0.01	0.01	38.47	111.30	69.16	High
SA-South	R5	San Antonio	2.40	160.11	194.69	177.00	Very Poor	157.41	0.26	0.01	0.00	49.91	113.41	70.47	High
SA-South	R5	San Antonio	2.50	130.85	185.22	158.00	Poor	137.06	0.26	0.01	0.00	43.38	115.26	71.62	High
SA-South	R5	San Antonio	2.60	152.68	218.01	185.00	Very Poor	57.33	0.12	0.00	0.00	18.20	114.31	71.03	High
SA-South	R5	San Antonio	2.70	127.05	164.36	146.00	Poor	136.60	0.31	0.01	0.00	43.39	110.66	68.76	High
SA-South	R5	San Antonio	2.80	183.92	197.68	191.00	Very Poor	146.63	0.32	0.02	0.00	46.58	111.04	69.00	High
SA-South	R5	San Antonio	2.90	107.35	150.66	129.00	Fair	152.06	0.24	0.02	0.06	48.13	111.57	69.32	High
SA-South	R5	San Antonio	3.00	144.43	311.51	228.00	Very Poor	157.03	0.19	0.02	0.03	49.80	112.00	69.59	High
SA-South	R5	San Antonio	3.10	126.39	332.03	229.00	Very Poor	174.08	0.15	0.04	0.03	55.14	111.39	69.21	High
SA-South	R5	San Antonio	3.20	176.68	231.37	204.00	Very Poor	190.59	0.12	0.05	0.07	60.28	109.11	67.80	High
SA-South	R5	San Antonio	3.30	243.47	269.16	256.00	Very Poor	182.26	0.07	0.07	0.11	57.62	109.47	68.02	High
SA-South	R5	San Antonio	3.40	169.53	171.60	171.00	Very Poor	167.04	0.03	0.04	0.11	52.83	111.61	69.35	High
SA-South	R5	San Antonio	3.50	116.02	165.60	141.00	Poor	157.07	0.05	0.02	0.05	49.66	112.87	70.13	High
SA-South	R5	San Antonio	3.60	161.33	171.63	166.00	Poor	64.04	0.03	0.01	0.02	20.20	112.41	69.85	High
SA-South	R5	San Antonio	3.70	133.68	145.66	140.00	Poor	107.57	0.12	0.02	0.02	34.06	109.83	68.25	High
SA-South	R5	San Antonio	3.80	137.49	132.20	135.00	Poor	134.73	0.12	0.02	0.01	42.67	109.79	68.22	High
SA-South	R5	San Antonio	3.90	121.27	140.56	131.00	Poor	128.40	0.16	0.01	0.02	40.71	108.35	67.33	High
SA-South	R5	San Antonio	4.00	146.92	142.92	145.00	Poor	139.69	0.22	0.01	0.01	44.20	109.28	67.90	High
SA-South	R5	San Antonio	4.10	174.48	149.56	162.00	Poor	134.43	0.13	0.02	0.02	42.48	107.80	66.99	High
SA-South	R5	San Antonio	4.20	125.48	129.71	128.00	Fair	39.33	0.02	0.00	0.00	12.43	103.75	64.47	High
SA-South	R5	San Antonio	4.30	158.49	161.27	160.00	Poor	81.90	0.09	0.01	0.00	25.88	94.30	58.60	Medium
SA-South	R5	San Antonio	4.40	163.73	173.56	169.00	Poor	15.94	0.02	0.00	0.00	5.03	85.28	52.99	Medium
SA-South	R5	San Antonio	4.50	198.61	255.87	227.00	Very Poor	10.44	0.02	0.00	0.00	3.34	67.92	42.21	Low
SA-South	R5	San Antonio	4.60	284.41	258.04	271.00	Very Poor	357.74	0.01	0.28	0.10	113.41	38.36	23.84	Low
SA-South	R5	San Antonio	4.70	298.55	254.23	276.00	Very Poor	306.31	0.00	0.13	0.07	96.89	67.64	42.03	Low
SA-South	R5	San Antonio	4.80	150.80	212.95	182.00	Very Poor	203.57	1.77	0.04	0.05	65.31	77.49	48.15	Medium
SA-South	R5	San Antonio	4.90	410.13	473.27	442.00	Very Poor	184.86	0.19	0.05	0.06	58.66	81.45	50.61	Medium
SA-South	R5	San Antonio	5.00	193.32	162.83	178.00	Very Poor	155.87	0.04	0.04	0.02	49.32	86.83	53.96	Medium
SA-South	R5	San Antonio	5.10	212.57	326.30	269.00	Very Poor	94.35	0.02	0.03	0.03	29.90	90.08	55.97	Medium
SA-South	R5	San Antonio	5.20	170.30	380.39	275.00	Very Poor	177.33	0.02	0.08	0.10	56.23	94.70	58.84	Medium
SA-South	R5	San Antonio	5.30	211.92	272.79	242.00	Very Poor	177.53	0.00	0.07	0.03	56.16	98.46	61.18	High
SA-South	R5	San Antonio	5.40	184.91	313.92	249.00	Very Poor	161.27	0.00	0.05	0.02	50.99	100.71	62.58	High
SA-South	R5	San Antonio	5.50	194.74	164.32	180.00	Very Poor	180.65	0.01	0.09	0.03	57.16	102.64	63.78	High
SA-South	R5	San Antonio	5.60	413.48	384.75	399.00	Very Poor	158.34	0.07	0.06	0.03	50.15	103.93	64.58	High
SA-South	R5	San Antonio	5.70	187.24	196.80	192.00	Very Poor	206.99	0.11	0.08	0.08	65.35	105.58	65.60	High
SA-South	R5	San Antonio	5.80	194.73	212.14	203.00	Very Poor	172.24	0.08	0.08	0.07	54.46	109.89	68.28	High
SA-South	R5	San Antonio	5.90	208.32	238.46	223.00	Very Poor	175.93	0.21	0.02	0.10	55.66	113.11	70.28	High

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-South	R5	San Antonio	6.00	450.76	246.39	349.00	Very Poor	72.13	0.10	0.01	0.02	22.92	114.13	70.92	High
SA-South	R5	San Antonio	6.10	200.21	248.45	224.00	Very Poor	63.96	0.17	0.01	0.02	20.34	107.90	67.04	High
SA-South	R5	San Antonio	6.20	142.48	168.29	155.00	Poor	13.25	0.03	0.00	0.00	4.19	101.81	63.26	High
SA-South	R5	San Antonio	6.30	150.69	186.48	169.00	Poor	5.52	0.04	0.01	0.01	1.76	69.97	43.48	Low
SA-South	R6	San Antonio	0.10	105.87	123.95	115.00	Fair	391.78	0.01	0.25	0.28	123.99	55.73	34.63	Low
SA-South	R6	San Antonio	0.20	178.63	164.26	171.00	Very Poor	235.52	1.52	0.10	0.16	75.12	78.60	48.84	Medium
SA-South	R6	San Antonio	0.30	102.14	103.52	103.00	Fair	167.59	0.16	0.03	0.09	53.05	88.41	54.93	Medium
SA-South	R6	San Antonio	0.40	110.47	117.52	114.00	Fair	148.16	0.48	0.06	0.05	47.14	93.23	57.93	Medium
SA-South	R6	San Antonio	0.50	181.30	198.14	190.00	Very Poor	166.90	0.15	0.05	0.05	52.90	97.24	60.42	High
SA-South	R6	San Antonio	0.60	187.67	196.25	192.00	Very Poor	171.92	0.33	0.02	0.05	54.52	102.22	63.52	High
SA-South	R6	San Antonio	0.70	220.55	267.55	244.00	Very Poor	160.55	0.36	0.02	0.06	50.92	107.34	66.70	High
SA-South	R6	San Antonio	0.80	135.47	107.16	121.00	Fair	119.76	0.37	0.08	0.05	38.06	110.93	68.93	High
SA-South	R6	San Antonio	0.90	157.40	187.30	172.00	Very Poor	104.51	0.19	0.05	0.07	33.09	109.79	68.22	High
SA-South	R6	San Antonio	1.00	133.53	117.09	125.00	Fair	127.87	0.18	0.04	0.03	40.36	106.55	66.21	High
SA-South	R6	San Antonio	1.10	122.78	118.63	121.00	Fair	157.55	0.19	0.07	0.03	49.89	106.00	65.87	High
SA-South	R6	San Antonio	1.20	119.59	148.90	134.00	Poor	102.61	0.13	0.06	0.02	32.55	105.67	65.66	High
SA-South	R6	San Antonio	1.30	104.95	182.62	144.00	Poor	167.92	0.34	0.11	0.04	53.26	102.86	63.91	High
SA-South	R6	San Antonio	1.40	144.29	180.98	163.00	Poor	196.92	0.36	0.02	0.07	62.46	106.42	66.13	High
SA-South	R6	San Antonio	1.50	135.35	137.35	136.00	Poor	115.74	0.20	0.02	0.05	36.77	109.12	67.80	High
SA-South	R6	San Antonio	1.60	202.53	168.84	186.00	Very Poor	130.20	0.28	0.05	0.07	41.25	106.16	65.97	High
SA-South	R6	San Antonio	1.70	136.25	190.77	164.00	Poor	124.61	0.41	0.10	0.08	39.52	102.45	63.66	High
SA-South	R6	San Antonio	1.80	150.56	195.96	173.00	Very Poor	180.75	0.37	0.10	0.07	57.36	99.83	62.03	High
SA-South	R6	San Antonio	1.90	150.92	170.82	161.00	Poor	202.40	0.34	0.07	0.07	64.18	101.47	63.05	High
SA-South	R6	San Antonio	2.00	217.41	175.76	197.00	Very Poor	137.26	0.40	0.11	0.05	43.74	103.00	64.00	High
SA-South	R6	San Antonio	2.10	191.10	148.51	170.00	Very Poor	122.02	0.33	0.01	0.06	38.68	106.47	66.16	High
SA-South	R6	San Antonio	2.20	170.61	175.17	173.00	Very Poor	66.93	0.29	0.02	0.02	21.34	107.12	66.56	High
SA-South	R6	San Antonio	2.30	142.04	190.56	166.00	Poor	122.39	0.39	0.03	0.02	38.83	105.55	65.58	High
SA-South	R6	San Antonio	2.40	160.11	194.69	177.00	Very Poor	134.33	0.24	0.02	0.01	42.57	109.42	67.99	High
SA-South	R6	San Antonio	2.50	130.85	185.22	158.00	Poor	74.51	0.20	0.01	0.02	23.62	110.15	68.45	High
SA-South	R6	San Antonio	2.60	152.68	218.01	185.00	Very Poor	81.27	0.52	0.01	0.01	25.93	107.35	66.71	High
SA-South	R6	San Antonio	2.70	127.05	164.36	146.00	Poor	113.81	0.70	0.03	0.02	36.31	105.24	65.40	High
SA-South	R6	San Antonio	2.80	183.92	197.68	191.00	Very Poor	156.35	0.63	0.02	0.05	49.85	106.15	65.96	High
SA-South	R6	San Antonio	2.90	107.35	150.66	129.00	Fair	148.98	0.58	0.08	0.04	47.50	107.00	66.49	High
SA-South	R6	San Antonio	3.00	144.43	311.51	228.00	Very Poor	169.74	0.46	0.08	0.05	53.95	107.81	66.99	High
SA-South	R6	San Antonio	3.10	126.39	332.03	229.00	Very Poor	176.53	0.22	0.02	0.08	55.87	107.17	66.59	High
SA-South	R6	San Antonio	3.20	176.68	231.37	204.00	Very Poor	137.93	0.10	0.01	0.04	43.70	105.68	65.67	High
SA-South	R6	San Antonio	3.30	243.47	269.16	256.00	Very Poor	161.60	0.39	0.09	0.09	51.35	104.54	64.96	High
SA-South	R6	San Antonio	3.40	169.53	171.60	171.00	Very Poor	177.55	0.72	0.23	0.21	56.71	106.63	66.26	High
SA-South	R6	San Antonio	3.50	116.02	165.60	141.00	Poor	127.31	0.60	0.15	0.09	40.66	109.76	68.20	High
SA-South	R6	San Antonio	3.60	161.33	171.63	166.00	Poor	108.90	0.61	0.04	0.05	34.69	108.95	67.70	High
SA-South	R6	San Antonio	3.70	133.68	145.66	140.00	Poor	152.75	0.53	0.08	0.03	48.57	98.40	61.14	High
SA-South	R6	San Antonio	3.80	137.49	132.20	135.00	Poor	105.83	0.04	0.01	0.02	33.31	95.97	59.63	Medium
SA-South	R6	San Antonio	3.90	121.27	140.56	131.00	Poor	124.61	0.26	0.02	0.01	39.51	91.49	56.85	Medium
SA-South	R6	San Antonio	4.00	146.92	142.92	145.00	Poor	199.12	0.70	0.12	0.04	63.29	93.73	58.24	Medium
SA-South	R6	San Antonio	4.10	174.48	149.56	162.00	Poor	197.39	0.33	0.02	0.06	62.48	97.68	60.69	High
SA-South	R6	San Antonio	4.20	125.48	129.71	128.00	Fair	200.02	0.21	0.01	0.11	63.28	100.44	62.41	High
SA-South	R6	San Antonio	4.30	158.49	161.27	160.00	Poor	205.57	0.21	0.01	0.10	65.01	102.29	63.56	High
SA-South	R6	San Antonio	4.40	163.73	173.56	169.00	Poor	151.73	0.21	0.02	0.06	48.02	105.88	65.79	High
SA-South	R6	San Antonio	4.50	198.61	255.87	227.00	Very Poor	123.80	0.42	0.04	0.06	39.36	107.44	66.76	High
SA-South	R6	San Antonio	4.60	284.41	258.04	271.00	Very Poor	166.72	0.59	0.07	0.07	52.90	108.64	67.51	High
SA-South	R6	San Antonio	4.70	298.55	254.23	276.00	Very Poor	152.71	0.50	0.10	0.06	48.48	109.38	67.96	High
SA-South	R6	San Antonio	4.80	150.80	212.95	182.00	Very Poor	151.43	0.40	0.08	0.09	47.99	107.48	66.79	High
SA-South	R6	San Antonio	4.90	410.13	473.27	442.00	Very Poor	158.82	0.35	0.11	0.09	50.48	107.74	66.95	High
SA-South	R6	San Antonio	5.00	193.32	162.83	178.00	Very Poor	172.85	0.36	0.12	0.18	54.95	107.27	66.66	High
SA-South	R6	San Antonio	5.10	212.57	326.30	269.00	Very Poor	115.76	0.28	0.07	0.14	36.89	107.26	66.65	High
SA-South	R6	San Antonio	5.20	170.30	380.39	275.00	Very Poor	71.35	0.28	0.04	0.02	22.70	103.67	64.42	High
SA-South	R6	San Antonio	5.30	211.92	272.79	242.00	Very Poor	52.15	0.21	0.01	0.01	16.62	100.95	62.73	High
SA-South	R6	San Antonio	5.40	184.91	313.92	249.00	Very Poor	20.18	0.16	0.00	0.01	6.46	94.65	58.81	Medium
SA-South	R6	San Antonio	5.50	194.74	164.32	180.00	Very Poor	5.17	0.01	0.00	0.00	1.50	82.37	51.18	Medium
SA-South	R6	San Antonio	5.60	413.48	384.75	399.00	Very Poor	11.22	0.01	0.01	0.01	3.52	69.66	43.28	Low
SA-South	R6	San Antonio	5.70	187.24	196.80	192.00	Very Poor	10.91	0.01	0.01	0.01	3.33	47.38	29.44	Low
SA-South	R7	San Antonio	0.10	105.87	123.95	115.00	Fair	383.66	0.00	0.03	0.14	121.20	50.28	31.24	Low
SA-South	R7	San Antonio	0.20	178.63	164.26	171.00	Very Poor	172.28	0.03	0.02	0.02	54.45	70.47	43.79	Low
SA-South	R7	San Antonio	0.30	102.14	103.52	103.00	Fair	152.75	0.09	0.01	0.01	48.43	77.46	48.13	Medium
SA-South	R7	San Antonio	0.40	110.47	117.52	114.00	Fair	148.75	0.21	0.01	0.03	47.10	83.03	51.60	Medium
SA-South	R7	San Antonio	0.50	181.30	198.14	190.00	Very Poor	98.76	0.12	0.01	0.02	31.31	85.94	53.40	Medium
SA-South	R7	San Antonio	0.60	187.67	196.25	192.00	Very Poor	140.11	0.04	0.02	0.03	44.35	87.03	54.08	Medium
SA-South	R7	San Antonio	0.70	220.55	267.55	244.00	Very Poor	145.09	0.01	0.02	0.01	45.90	90.39	56.17	Medium
SA-South	R7	San Antonio	0.80	135.47	107.16	121.00	Fair	159.50	0.00	0.02	0.01	50.44	96.90	60.21	High
SA-South	R7	San Antonio	0.90	157.40	187.30	172.00	Very Poor	89.72	1.02	0.01	0.01	28.78	99.15	61.61	High
SA-South	R7	San Antonio	1.00	133.53	117.09	125.00	Fair	84.63	0.58	0.01	0.01	27.03	96.67	60.07	High
SA-South	R7	San Antonio	1.10	122.78	118.63	121.00	Fair	138.25	0.05	0.01	0.02	43.77	93.62	58.17	Medium
SA-South	R7	San Antonio	1.20	119.59	148.90	134.00	Poor	175.76	0.02	0.02	0.02	55.47	95.02	59.04	Medium
SA-South	R7	San Antonio	1.30	104.95	182.62	144.00	Poor	153.12	0.00	0.01	0.01	48.44	96.52	59.97	Medium
SA-South	R7	San Antonio	1.40	144.29	180.98	163.00	Poor	182.66	0.10	0.02	0.03	57.82	98.49	61.20	High
SA-South	R7	San Antonio	1.50	135.35	137.35	136.00	Poor	192.81	0.28	0.02	0.05	60.92	102.58	63.74	High
SA-South	R7	San Antonio	1.60	202.53	168.84	186.00	Very Poor	122.27	0.29	0.02	0.11	38.80	105.13	65.32	High

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-South	R7	San Antonio	1.70	136.25	190.77	164.00	Poor	180.35	0.62	0.02	0.09	57.36	102.64	63.78	High
SA-South	R7	San Antonio	1.80	150.56	195.96	173.00	Very Poor	148.30	0.52	0.01	0.08	47.10	102.51	63.70	High
SA-South	R7	San Antonio	1.90	150.92	170.82	161.00	Poor	171.58	0.67	0.02	0.03	54.64	99.70	61.95	High
SA-South	R7	San Antonio	2.00	217.41	175.76	197.00	Very Poor	216.11	0.81	0.03	0.00	68.64	102.19	63.50	High
SA-South	R7	San Antonio	2.10	191.10	148.51	170.00	Very Poor	187.84	0.60	0.02	0.00	59.62	108.52	67.43	High
SA-South	R7	San Antonio	2.20	170.61	175.17	173.00	Very Poor	112.09	0.34	0.02	0.00	35.46	111.76	69.44	High
SA-South	R7	San Antonio	2.30	142.04	190.56	166.00	Poor	121.00	0.29	0.02	0.00	38.44	112.41	69.85	High
SA-South	R7	San Antonio	2.40	160.11	194.69	177.00	Very Poor	111.01	0.17	0.02	0.00	35.16	113.00	70.22	High
SA-South	R7	San Antonio	2.50	130.85	185.22	158.00	Poor	64.09	0.11	0.01	0.00	20.32	110.67	68.77	High
SA-South	R7	San Antonio	2.60	152.68	218.01	185.00	Very Poor	180.99	1.29	0.02	0.00	57.73	108.28	67.29	High
SA-South	R7	San Antonio	2.70	127.05	164.36	146.00	Poor	111.86	0.31	0.01	0.00	35.53	110.70	68.79	High
SA-South	R7	San Antonio	2.80	183.92	197.68	191.00	Very Poor	146.77	0.27	0.01	0.00	46.47	109.03	67.75	High
SA-South	R7	San Antonio	2.90	107.35	150.66	129.00	Fair	157.12	0.21	0.01	0.03	49.74	109.53	68.06	High
SA-South	R7	San Antonio	3.00	144.43	311.51	228.00	Very Poor	134.45	0.14	0.01	0.03	42.55	108.65	67.51	High
SA-South	R7	San Antonio	3.10	126.39	332.03	229.00	Very Poor	182.38	0.13	0.01	0.02	57.68	107.06	66.53	High
SA-South	R7	San Antonio	3.20	176.68	231.37	204.00	Very Poor	195.76	0.09	0.02	0.06	61.94	105.09	65.30	High
SA-South	R7	San Antonio	3.30	243.47	269.16	256.00	Very Poor	196.16	0.05	0.02	0.07	61.85	106.55	66.21	High
SA-South	R7	San Antonio	3.40	169.53	171.60	171.00	Very Poor	185.89	0.00	0.02	0.05	58.86	109.44	68.00	High
SA-South	R7	San Antonio	3.50	116.02	165.60	141.00	Poor	195.34	0.02	0.02	0.05	61.65	111.69	69.40	High
SA-South	R7	San Antonio	3.60	161.33	171.63	166.00	Poor	139.34	0.16	0.01	0.04	44.07	114.33	71.04	High
SA-South	R7	San Antonio	3.70	133.68	145.66	140.00	Poor	113.86	0.35	0.01	0.03	36.12	114.96	71.43	High
SA-South	R7	San Antonio	3.80	137.49	132.20	135.00	Poor	129.34	0.55	0.01	0.07	41.06	113.77	70.69	High
SA-South	R7	San Antonio	3.90	121.27	140.56	131.00	Poor	145.18	0.67	0.01	0.07	46.20	112.22	69.73	High
SA-South	R7	San Antonio	4.00	146.92	142.92	145.00	Poor	70.84	0.38	0.01	0.06	22.65	110.87	68.89	High
SA-South	R7	San Antonio	4.10	174.48	149.56	162.00	Poor	64.17	0.40	0.01	0.02	20.48	104.31	64.82	High
SA-South	R7	San Antonio	4.20	125.48	129.71	128.00	Fair	30.69	0.20	0.00	0.00	9.71	95.60	59.41	Medium
SA-South	R7	San Antonio	4.30	158.49	161.27	160.00	Poor	150.02	0.70	0.02	0.02	47.78	88.31	54.87	Medium
SA-South	R7	San Antonio	4.40	163.73	173.56	169.00	Poor	77.72	0.20	0.01	0.00	24.64	87.40	54.31	Medium
SA-South	R7	San Antonio	4.50	198.61	255.87	227.00	Very Poor	92.49	0.66	0.02	0.05	29.47	64.85	40.30	Low
SA-South	R7	San Antonio	4.60	284.41	258.04	271.00	Very Poor	219.72	0.74	0.03	0.03	69.73	65.40	40.64	Low
SA-South	R7	San Antonio	4.70	298.55	254.23	276.00	Very Poor	260.91	0.78	0.04	0.08	82.77	76.01	47.23	Medium
SA-South	R7	San Antonio	4.80	150.80	212.95	182.00	Very Poor	241.28	0.50	0.04	0.06	76.52	84.03	52.21	Medium
SA-South	R7	San Antonio	4.90	410.13	473.27	442.00	Very Poor	167.99	0.37	0.02	0.06	53.29	87.65	54.46	Medium
SA-South	R7	San Antonio	5.00	193.32	162.83	178.00	Very Poor	189.93	0.44	0.01	0.12	60.22	92.33	57.37	Medium
SA-South	R7	San Antonio	5.10	212.57	326.30	269.00	Very Poor	158.12	0.39	0.01	0.10	50.06	99.17	61.62	High
SA-South	R7	San Antonio	5.20	170.30	380.39	275.00	Very Poor	109.63	0.29	0.01	0.04	34.85	100.91	62.70	High
SA-South	R7	San Antonio	5.30	211.92	272.79	242.00	Very Poor	76.09	0.23	0.01	0.01	24.14	96.67	60.07	High
SA-South	R7	San Antonio	5.40	184.91	313.92	249.00	Very Poor	177.42	0.50	0.02	0.02	56.12	92.93	57.74	Medium
SA-South	R7	San Antonio	5.50	194.74	164.32	180.00	Very Poor	136.59	0.42	0.01	0.05	43.40	95.77	59.51	Medium
SA-South	R7	San Antonio	5.60	413.48	384.75	399.00	Very Poor	155.13	0.32	0.02	0.08	49.14	94.26	58.57	Medium
SA-South	R7	San Antonio	5.70	187.24	196.80	192.00	Very Poor	133.37	0.65	0.02	0.04	42.42	95.00	59.03	Medium
SA-South	R7	San Antonio	5.80	194.73	212.14	203.00	Very Poor	130.92	0.41	0.02	0.06	41.56	95.61	59.41	Medium
SA-South	R7	San Antonio	5.90	208.32	238.46	223.00	Very Poor	92.46	0.16	0.02	0.01	29.27	97.22	60.41	High
SA-South	R7	San Antonio	6.00	450.76	246.39	349.00	Very Poor	120.55	0.39	0.02	0.02	38.22	96.41	59.91	Medium
SA-South	R7	San Antonio	6.10	200.21	248.45	224.00	Very Poor	76.71	0.29	0.01	0.02	24.38	96.09	59.71	Medium
SA-South	R7	San Antonio	6.20	142.48	168.29	155.00	Poor	15.83	0.08	0.00	0.00	4.98	88.08	54.73	Medium
SA-South	R7	San Antonio	6.30	150.69	186.48	169.00	Poor	241.81	0.19	0.04	0.06	76.67	43.84	27.24	Low
SA-South	R7	San Antonio	6.40	149.13	168.11	159.00	Poor	393.97	0.06	0.05	0.07	124.44	49.69	30.88	Low
SA-South	R8	San Antonio	0.10	105.87	123.95	115.00	Fair	413.46	0.37	0.05	0.18	130.79	56.67	35.21	Low
SA-South	R8	San Antonio	0.20	178.63	164.26	171.00	Very Poor	211.31	2.00	0.03	0.17	67.78	79.24	49.23	Medium
SA-South	R8	San Antonio	0.30	102.14	103.52	103.00	Fair	215.10	0.08	0.04	0.13	67.91	89.25	55.45	Medium
SA-South	R8	San Antonio	0.40	110.47	117.52	114.00	Fair	147.92	3.94	0.03	0.06	48.71	95.62	59.41	Medium
SA-South	R8	San Antonio	0.50	181.30	198.14	190.00	Very Poor	177.69	0.97	0.03	0.04	56.65	99.64	61.91	High
SA-South	R8	San Antonio	0.60	187.67	196.25	192.00	Very Poor	164.46	0.07	0.03	0.02	51.96	103.86	64.54	High
SA-South	R8	San Antonio	0.70	220.55	267.55	244.00	Very Poor	142.52	0.05	0.02	0.02	45.11	106.98	66.47	High
SA-South	R8	San Antonio	0.80	135.47	107.16	121.00	Fair	101.81	0.04	0.02	0.02	32.24	108.50	67.42	High
SA-South	R8	San Antonio	0.90	157.40	187.30	172.00	Very Poor	107.36	0.04	0.02	0.00	33.97	106.39	66.11	High
SA-South	R8	San Antonio	1.00	133.53	117.09	125.00	Fair	107.93	0.04	0.04	0.01	34.20	103.73	64.46	High
SA-South	R8	San Antonio	1.10	122.78	118.63	121.00	Fair	114.97	0.02	0.01	0.01	36.45	101.63	63.15	High
SA-South	R8	San Antonio	1.20	119.59	148.90	134.00	Poor	116.70	0.01	0.01	0.01	36.92	98.91	61.46	High
SA-South	R8	San Antonio	1.30	104.95	182.62	144.00	Poor	122.12	0.03	0.01	0.01	38.57	96.51	59.97	Medium
SA-South	R8	San Antonio	1.40	144.29	180.98	163.00	Poor	168.45	0.03	0.02	0.02	53.05	95.93	59.61	Medium
SA-South	R8	San Antonio	1.50	135.35	137.35	136.00	Poor	190.74	0.00	0.03	0.05	60.28	99.71	61.95	High
SA-South	R8	San Antonio	1.60	202.53	168.84	186.00	Very Poor	151.12	0.00	0.02	0.03	47.78	102.51	63.70	High
SA-South	R8	San Antonio	1.70	136.25	190.77	164.00	Poor	150.64	0.00	0.02	0.02	47.52	100.41	62.39	High
SA-South	R8	San Antonio	1.80	150.56	195.96	173.00	Very Poor	152.39	0.00	0.02	0.02	48.23	98.63	61.28	High
SA-South	R8	San Antonio	1.90	150.92	170.82	161.00	Poor	169.78	0.00	0.02	0.02	53.70	97.35	60.49	High
SA-South	R8	San Antonio	2.00	217.41	175.76	197.00	Very Poor	216.47	0.04	0.02	0.05	68.48	99.96	62.11	High
SA-South	R8	San Antonio	2.10	191.10	148.51	170.00	Very Poor	156.06	0.04	0.02	0.05	49.35	105.55	65.58	High
SA-South	R8	San Antonio	2.20	170.61	175.17	173.00	Very Poor	82.67	0.04	0.01	0.02	26.19	108.06	67.15	High
SA-South	R8	San Antonio	2.30	142.04	190.56	166.00	Poor	54.31	0.06	0.02	0.00	17.16	106.21	65.99	High
SA-South	R8	San Antonio	2.40	160.11	194.69	177.00	Very Poor	59.68	0.08	0.01	0.00	18.85	103.61	64.38	High
SA-South	R8	San Antonio	2.50	130.85	185.22	158.00	Poor	58.17	0.06	0.00	0.00	18.43	100.41	62.39	High
SA-South	R8	San Antonio	2.60	152.68	218.01	185.00	Very Poor	147.82	0.11	0.01	0.08	46.80	99.06	61.55	High
SA-South	R8	San Antonio	2.70	127.05	164.36	146.00	Poor	164.56	0.07	0.02	0.04	52.08	102.92	63.95	High
SA-South	R8	San Antonio	2.80	183.92	197.68	191.00	Very Poor	163.19	0.05	0.02	0.03	51.63	106.34	66.07	High
SA-South	R8	San Antonio	2.90	107.35	150.66	129.00	Fair	126.09	0.03	0.01	0.04	39.90	106.95	66.46	High

Table C.5. PEMS and Roughness Data, SAN ANTONIO.

Section	Round	District	Distance (mi)	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	Condition Category	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	FC (g/mi)	Speed (kph)	Speed (mph)	Speed Category
SA-South	R8	San Antonio	3.00	144.43	311.51	228.00	Very Poor	183.42	0.02	0.02	0.10	57.89	106.95	66.46	High
SA-South	R8	San Antonio	3.10	126.39	332.03	229.00	Very Poor	109.50	0.00	0.01	0.03	34.55	107.08	66.54	High
SA-South	R8	San Antonio	3.20	176.68	231.37	204.00	Very Poor	160.46	0.12	0.02	0.03	50.78	98.23	61.04	High
SA-South	R8	San Antonio	3.30	243.47	269.16	256.00	Very Poor	213.69	0.11	0.03	0.04	67.53	101.20	62.88	High
SA-South	R8	San Antonio	3.40	169.53	171.60	171.00	Very Poor	191.56	0.06	0.03	0.04	60.70	106.35	66.08	High
SA-South	R8	San Antonio	3.50	116.02	165.60	141.00	Poor	185.95	0.06	0.02	0.08	58.85	109.65	68.13	High
SA-South	R8	San Antonio	3.60	161.33	171.63	166.00	Poor	141.98	0.11	0.02	0.03	44.84	111.93	69.55	High
SA-South	R8	San Antonio	3.70	133.68	145.66	140.00	Poor	126.59	0.11	0.02	0.02	40.05	113.69	70.64	High
SA-South	R8	San Antonio	3.80	137.49	132.20	135.00	Poor	148.76	0.15	0.02	0.05	46.97	113.86	70.75	High
SA-South	R8	San Antonio	3.90	121.27	140.56	131.00	Poor	145.88	0.25	0.02	0.07	46.26	112.59	69.96	High
SA-South	R8	San Antonio	4.00	146.92	142.92	145.00	Poor	115.83	0.23	0.01	0.03	36.73	112.49	69.90	High
SA-South	R8	San Antonio	4.10	174.48	149.56	162.00	Poor	109.22	0.27	0.01	0.06	34.65	108.74	67.57	High
SA-South	R8	San Antonio	4.20	125.48	129.71	128.00	Fair	152.28	0.40	0.01	0.05	48.31	103.26	64.16	High
SA-South	R8	San Antonio	4.30	158.49	161.27	160.00	Poor	151.69	0.42	0.01	0.04	48.20	104.91	65.19	High
SA-South	R8	San Antonio	4.40	163.73	173.56	169.00	Poor	125.11	0.37	0.01	0.03	39.72	102.70	63.82	High
SA-South	R8	San Antonio	4.50	198.61	255.87	227.00	Very Poor	176.52	0.53	0.02	0.09	55.93	102.12	63.46	High
SA-South	R8	San Antonio	4.60	284.41	258.04	271.00	Very Poor	158.64	0.36	0.01	0.16	50.35	103.95	64.59	High
SA-South	R8	San Antonio	4.70	298.55	254.23	276.00	Very Poor	161.32	0.30	0.01	0.07	51.19	103.31	64.19	High
SA-South	R8	San Antonio	4.80	150.80	212.95	182.00	Very Poor	98.83	0.23	0.01	0.06	31.32	102.36	63.60	High
SA-South	R8	San Antonio	4.90	410.13	473.27	442.00	Very Poor	114.40	0.32	0.02	0.05	36.24	102.06	63.42	High
SA-South	R8	San Antonio	5.00	193.32	162.83	178.00	Very Poor	87.98	0.22	0.01	0.06	27.75	100.35	62.36	High
SA-South	R8	San Antonio	5.10	212.57	326.30	269.00	Very Poor	115.47	0.27	0.01	0.02	36.61	99.04	61.54	High
SA-South	R8	San Antonio	5.20	170.30	380.39	275.00	Very Poor	43.07	0.08	0.00	0.00	13.69	97.60	60.64	High
SA-South	R8	San Antonio	5.30	211.92	272.79	242.00	Very Poor	3.89	0.02	0.00	0.00	1.24	86.66	53.85	Medium
SA-South	R8	San Antonio	5.40	184.91	313.92	249.00	Very Poor	4.78	0.02	0.00	0.00	1.55	72.13	44.82	Low

APPENDIX D
PEMS-IRI DATA ANALYSIS

SUMMARY OF DESCRIPTIVE STATISTICS

Table D.1.1. Summary of Descriptive Statistics for IRI by Condition Category.

	Avg IRI (in/mi) (Very Good)	Avg IRI (in/mi) (Good)	Avg IRI (in/mi) (Fair)	Avg IRI (in/mi) (Poor)	Avg IRI (in/mi) (Very Poor)
<i>One Variable Summary</i>	All	All	All	All	All
Mean	52.36	76.48	113.27	149.41	218.40
Variance	40.14	99.96	94.54	123.14	3005.82
Std. Dev.	6.34	10.00	9.72	11.10	54.83
Skewness	-1.0916	0.1803	0.0604	0.0488	1.7519
Kurtosis	3.8290	1.9253	1.8945	1.7430	5.9833
Median	54.00	75.84	113.00	150.25	195.00
Mean Abs. Dev.	5.07	8.56	8.31	9.80	41.86
Mode	58.50	68.00	100.50	134.00	171.00
Minimum	28.50	60.00	96.00	131.00	170.00
Maximum	59.57	95.96	130.87	169.81	442.00
Range	31.07	35.96	34.87	38.81	272.00
Count	665	2707	2091	1434	996
Sum	34817.17	207020.88	236846.19	214249.32	217530.02
1st Quartile	48.50	68.00	104.61	139.30	180.15
3rd Quartile	58.00	84.50	121.00	158.50	244.00
Interquartile Range	9.50	16.50	16.39	19.21	63.85
1.00%	34.50	60.00	96.27	131.00	170.00
2.50%	36.50	60.50	96.75	132.08	170.26
5.00%	39.00	61.50	98.00	133.00	171.00
10.00%	43.50	63.10	100.50	134.82	172.44
20.00%	46.50	67.00	103.43	137.62	178.00
80.00%	58.01	86.50	123.40	161.00	256.89
90.00%	59.00	91.00	127.34	164.00	277.45
95.00%	59.50	93.38	128.57	166.50	341.00
97.50%	59.50	94.75	129.96	168.22	379.32
99.00%	59.57	95.50	130.52	169.00	399.00

Table D.1.2. Summary of Descriptive Statistics for Gas Emissions, Pavements in Very Good Condition.

	CO ₂ (g/mi)	CO (g/mi)	HC (g/mi)	NO _x (g/mi)
<i>One Variable Summary</i>	Very Good IRI	Very Good IRI	Very Good IRI	Very Good IRI
Mean	480.02	0.965	0.1451	0.1191
Variance	72013.93	2.616	0.0156	0.0348
Std. Dev.	268.35	1.617	0.1248	0.1865
Skewness	0.9306	3.8187	1.2257	4.3809
Kurtosis	7.0898	22.1612	7.1222	32.6324
Median	488.00	0.432	0.1102	0.0605
Mean Abs. Dev.	218.03	0.961	0.1040	0.1113
Mode	439.04	0.000	0.0000	0.0000
Minimum	13.70	0.000	0.0000	0.0000
Maximum	2415.60	13.850	1.0982	2.0621
Range	2401.90	13.850	1.0982	2.0621
Count	665	665	665	665
Sum	319212.47	641.477	96.5124	79.2218
1st Quartile	246.58	0.154	0.0393	0.0181
3rd Quartile	678.40	0.923	0.2386	0.1432
Interquartile Range	431.83	0.770	0.1993	0.1252
1.00%	37.42	0.000	0.0000	0.0000
2.50%	80.97	0.001	0.0009	0.0001
5.00%	106.43	0.010	0.0040	0.0021
10.00%	148.75	0.028	0.0136	0.0050
20.00%	215.07	0.098	0.0321	0.0110
80.00%	705.51	1.224	0.2603	0.1776
90.00%	775.52	2.616	0.3251	0.2874
95.00%	863.67	3.702	0.3653	0.4558
97.50%	956.89	5.435	0.3911	0.6081
99.00%	1142.47	8.726	0.4364	0.9364

Table D.1.3. Summary of Descriptive Statistics for Gas Emissions, Pavements in Good Condition.

	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)
<i>One Variable Summary</i>	Good IRI	Good IRI	Good IRI	Good IRI
Mean	378.54	0.727	0.0782	0.1297
Variance	81883.85	1.413	0.0119	0.0478
Std. Dev.	286.15	1.189	0.1090	0.2186
Skewness	2.0096	6.3257	3.4089	5.1054
Kurtosis	10.0926	67.7232	22.5470	44.7299
Median	288.79	0.401	0.0398	0.0587
Mean Abs. Dev.	214.35	0.636	0.0711	0.1257
Mode	77.08	0.000	0.0000	0.0000
Minimum	3.46	0.000	0.0000	0.0000
Maximum	2578.04	20.982	1.3632	2.7553
Range	2574.58	20.982	1.3632	2.7553
Count	2707	2707	2707	2707
Sum	1024694.99	1968.957	211.5926	350.9933
1st Quartile	192.19	0.152	0.0202	0.0162
3rd Quartile	529.94	0.862	0.0809	0.1534
Interquartile Range	337.76	0.711	0.0606	0.1373
1.00%	16.98	0.000	0.0000	0.0000
2.50%	43.04	0.000	0.0000	0.0005
5.00%	77.08	0.011	0.0000	0.0014
10.00%	113.86	0.037	0.0034	0.0037
20.00%	167.11	0.117	0.0165	0.0108
80.00%	600.72	1.019	0.1115	0.1867
90.00%	736.26	1.642	0.2157	0.3166
95.00%	876.61	2.325	0.3025	0.4811
97.50%	1031.99	3.325	0.3808	0.7279
99.00%	1423.07	5.705	0.4614	0.9917

Table D.1.4. Summary of Descriptive Statistics for Gas Emissions, Pavements in Fair Condition.

	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)
<i>One Variable Summary</i>	Fair IRI	Fair IRI	Fair IRI	Fair IRI
Mean	401.77	0.788	0.1251	0.1316
Variance	106880.17	2.234	0.0403	0.0722
Std. Dev.	326.93	1.495	0.2008	0.2687
Skewness	2.3765	7.4435	12.8679	5.7304
Kurtosis	13.0658	107.6246	325.5060	49.2141
Median	309.85	0.365	0.0558	0.0453
Mean Abs. Dev.	235.05	0.768	0.1138	0.1406
Mode	222.25	0.000	0.0000	0.0000
Minimum	0.00	0.000	0.0000	0.0000
Maximum	2907.72	31.599	5.8104	3.3086
Range	2907.72	31.599	5.8104	3.3086
Count	2091	2091	2091	2091
Sum	840092.32	1647.998	261.5235	275.1863
1st Quartile	183.36	0.111	0.0252	0.0116
3rd Quartile	553.95	0.853	0.1843	0.1429
Interquartile Range	370.59	0.742	0.1590	0.1312
1.00%	16.81	0.000	0.0000	0.0002
2.50%	33.86	0.000	0.0000	0.0006
5.00%	66.07	0.000	0.0000	0.0016
10.00%	104.46	0.020	0.0077	0.0032
20.00%	158.37	0.079	0.0195	0.0078
80.00%	603.28	1.014	0.2235	0.1758
90.00%	761.47	1.855	0.3152	0.3149
95.00%	956.16	2.938	0.4019	0.5414
97.50%	1261.52	4.541	0.5066	0.8336
99.00%	1647.72	7.558	0.6614	1.2670

Table D.1.5. Summary of Descriptive Statistics for Gas Emissions, Pavements in Poor Condition.

<i>One Variable Summary</i>	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)
	Poor IRI	Poor IRI	Poor IRI	Poor IRI
Mean	382.77	0.838	0.1010	0.1493
Variance	119394.10	2.533	0.1285	0.0649
Std. Dev.	345.53	1.591	0.3585	0.2547
Skewness	1.9258	8.5856	30.1637	4.2514
Kurtosis	8.9664	132.6582	1055.0204	30.5332
Median	248.44	0.390	0.0372	0.0583
Mean Abs. Dev.	267.00	0.795	0.1057	0.1526
Mode	243.58	0.000	0.0000	0.0000
Minimum	0.00	0.000	0.0000	0.0000
Maximum	2925.03	32.681	12.6577	3.1174
Range	2925.03	32.681	12.6577	3.1174
Count	1434	1434	1434	1434
Sum	548889.45	1201.713	144.8246	214.0298
1st Quartile	141.38	0.147	0.0154	0.0183
3rd Quartile	593.20	0.922	0.1091	0.1679
Interquartile Range	451.82	0.774	0.0937	0.1496
1.00%	10.43	0.000	0.0000	0.0000
2.50%	24.88	0.000	0.0000	0.0008
5.00%	56.10	0.012	0.0000	0.0025
10.00%	83.78	0.035	0.0041	0.0049
20.00%	124.61	0.106	0.0121	0.0132
80.00%	653.48	1.117	0.1522	0.2027
90.00%	791.56	1.926	0.2672	0.4102
95.00%	1032.33	3.063	0.3862	0.6162
97.50%	1295.14	4.467	0.4893	0.8292
99.00%	1544.55	7.131	0.6729	1.2546

Table D.1.6. Summary of Descriptive Statistics for Gas Emissions, Pavements in Very Poor Condition.

<i>One Variable Summary</i>	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)
	Very Poor IRI	Very Poor IRI	Very Poor IRI	Very Poor IRI
Mean	370.32	0.769	0.0840	0.1411
Variance	135742.45	1.504	0.0179	0.0829
Std. Dev.	368.43	1.226	0.1338	0.2879
Skewness	1.7770	4.3466	3.5656	5.0050
Kurtosis	6.7744	31.0647	24.0403	37.2645
Median	190.56	0.357	0.0296	0.0480
Mean Abs. Dev.	287.87	0.728	0.0859	0.1548
Mode	305.82	0.000	0.0000	0.0000
Minimum	2.63	0.000	0.0000	0.0000
Maximum	2479.16	13.095	1.5684	3.2345
Range	2476.54	13.095	1.5684	3.2345
Count	996	996	996	996
Sum	368842.84	765.888	83.6214	140.5160
1st Quartile	128.93	0.115	0.0123	0.0154
3rd Quartile	587.13	0.873	0.0977	0.1266
Interquartile Range	458.20	0.757	0.0854	0.1113
1.00%	7.85	0.000	0.0000	0.0001
2.50%	11.13	0.000	0.0000	0.0009
5.00%	31.41	0.009	0.0000	0.0020
10.00%	66.93	0.024	0.0017	0.0041
20.00%	110.50	0.078	0.0098	0.0115
80.00%	664.57	1.105	0.1219	0.1664
90.00%	809.60	1.844	0.2379	0.3530
95.00%	1170.62	3.017	0.3574	0.5924
97.50%	1386.85	4.106	0.4798	0.9931
99.00%	1577.97	5.718	0.6539	1.3725

Table D.2.1. Summary of Descriptive Statistics for IRI, Gas Emissions, and Speed, All Data.

	Left IRI (in/mi)	Right IRI (in/mi)	Avg IRI (in/mi)	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)	Speed (mph)
<i>One Variable Summary</i>	All	All	All	All	All	All	All	All
Mean	110.43	120.28	115.35	392.97	0.789	0.1011	0.1343	58.00
Variance	2777.18	3508.45	2868.91	102046.99	1.950	0.0422	0.0607	242.48
Std. Dev.	52.70	59.23	53.56	319.45	1.397	0.2054	0.2464	15.57
Skewness	1.7943	1.7673	1.6607	1.9803	6.9556	32.6546	5.2165	0.1097
Kurtosis	8.4703	7.9066	7.6658	9.9558	95.9637	1852.8938	43.8733	4.5260
Median	98.66	110.94	105.50	291.49	0.386	0.0441	0.0538	61.18
Mean Abs. Dev.	39.18	43.27	40.08	242.29	0.738	0.0965	0.1369	12.47
Mode	59.00	64.00	58.50	77.08	0.000	0.0000	0.0000	46.23
Minimum	25.00	31.00	28.50	0.00	0.000	0.0000	0.0000	6.83
Maximum	450.76	494.00	442.00	2925.03	32.681	12.6577	3.3086	130.22
Range	425.76	463.00	413.50	2925.03	32.681	12.6577	3.3086	123.39
Count	7893	7893	7893	7893	7893	7893	7893	7893
Sum	871603.35	949337.08	910463.58	3101732.07	6226.033	798.0745	1059.9471	457755.60
1st Quartile	72.07	77.00	75.47	167.59	0.137	0.0193	0.0151	47.28
3rd Quartile	136.00	145.46	141.76	573.59	0.881	0.1313	0.1491	68.95
Interquartile Range	63.93	68.46	66.29	406.00	0.744	0.1121	0.1340	21.67
1.00%	43.00	44.00	44.50	12.36	0.000	0.0000	0.0000	22.00
2.50%	48.00	49.00	50.50	32.49	0.000	0.0000	0.0006	26.42
5.00%	52.79	55.00	55.50	63.97	0.007	0.0000	0.0017	31.24
10.00%	59.00	61.00	61.50	99.41	0.028	0.0046	0.0039	37.11
20.00%	68.00	72.00	70.50	148.57	0.098	0.0154	0.0104	44.42
80.00%	146.92	155.38	154.00	636.09	1.060	0.1690	0.1844	70.29
90.00%	173.94	185.81	178.00	766.78	1.841	0.2777	0.3342	73.38
95.00%	203.00	231.37	207.06	945.43	2.802	0.3594	0.5397	76.86
97.50%	249.00	274.56	256.89	1196.46	4.225	0.4424	0.7862	79.66
99.00%	304.59	342.94	316.51	1544.55	6.604	0.6175	1.1845	107.90

Table D.2.2. Summary of Descriptive Statistics for Gas Emissions, Low Speed Dataset.

	CO2 (g/mi)	CO (g/mi)	HC (g/mi)	NOx (g/mi)
<i>One Variable Summary</i>	Low Speed	Low Speed	Low Speed	Low Speed
Mean	548.19	0.885	0.1453	0.1459
Variance	194190.35	3.323	0.1427	0.1255
Std. Dev.	440.67	1.823	0.3778	0.3543
Skewness	1.5225	5.6799	23.7789	5.0599
Kurtosis	6.2677	62.4152	741.8881	34.0842
Median	426.19	0.237	0.0821	0.0258
Mean Abs. Dev.	337.56	1.019	0.1322	0.1801
Mode	0.00	0.000	0.0000	0.0000
Minimum	0.00	0.000	0.0000	0.0000
Maximum	2925.03	31.599	12.6577	3.3086
Range	2925.03	31.599	12.6577	3.3086
Count	1701	1701	1701	1701
Sum	932468.35	1505.702	247.2172	248.1475
1st Quartile	216.29	0.039	0.0168	0.0061
3rd Quartile	759.45	0.911	0.1887	0.1172
Interquartile Range	543.16	0.872	0.1719	0.1110
1.00%	10.43	0.000	0.0000	0.0000
2.50%	26.90	0.000	0.0000	0.0001
5.00%	76.08	0.000	0.0000	0.0007
10.00%	113.77	0.000	0.0000	0.0020
20.00%	177.57	0.026	0.0063	0.0045
80.00%	858.40	1.179	0.2235	0.1643
90.00%	1134.73	2.391	0.3342	0.3658
95.00%	1432.35	4.020	0.4734	0.6199
97.50%	1638.93	6.077	0.6176	1.1677
99.00%	1937.61	8.801	0.7480	2.0621

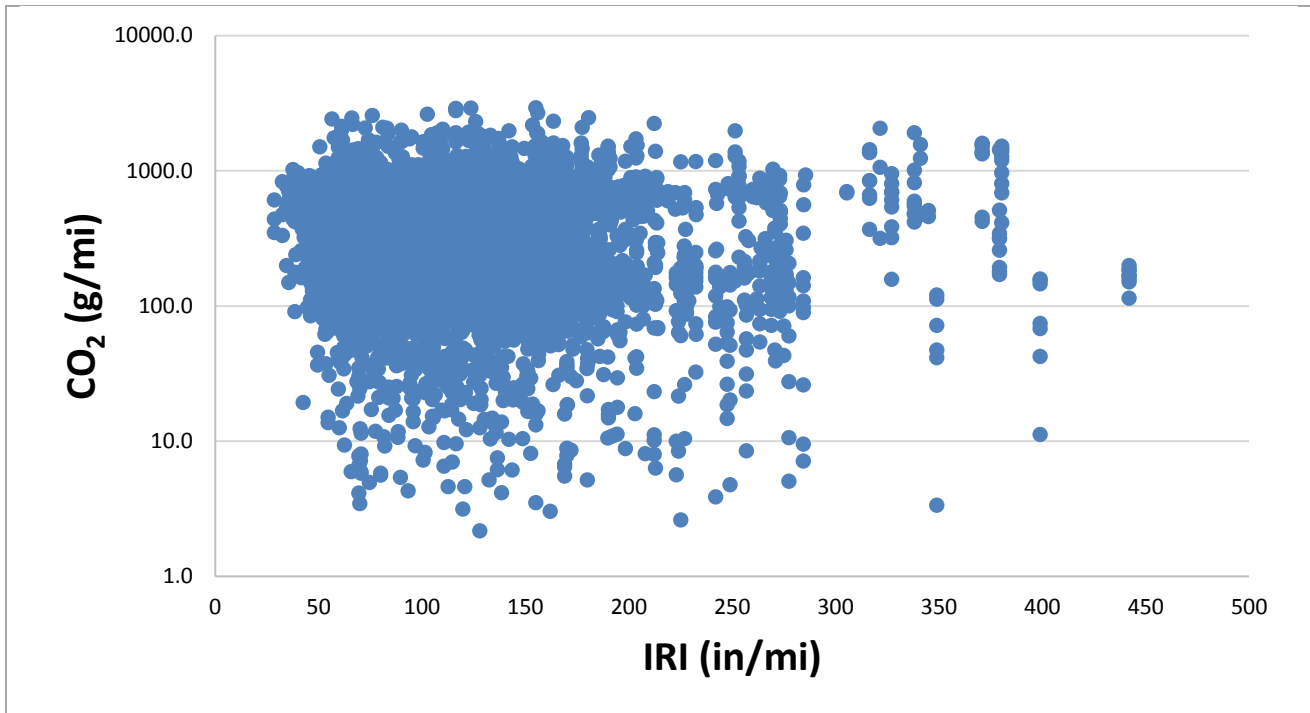
Table D.2.3. Summary of Descriptive Statistics for Gas Emissions, Medium Speed Dataset.

	CO ₂ (g/mi)	CO (g/mi)	HC (g/mi)	NO _x (g/mi)
<i>One Variable Summary</i>	Medium Speed	Medium Speed	Medium Speed	Medium Speed
Mean	400.48	0.556	0.1120	0.1090
Variance	83493.07	1.161	0.0156	0.0512
Std. Dev.	288.95	1.078	0.1248	0.2263
Skewness	1.4573	7.5309	1.7395	5.3477
Kurtosis	8.0575	96.3691	7.4713	45.0388
Median	350.89	0.255	0.0623	0.0336
Mean Abs. Dev.	228.32	0.537	0.0967	0.1212
Mode	77.08	0.000	0.0000	0.0000
Minimum	2.63	0.000	0.0000	0.0000
Maximum	2578.04	20.982	1.0982	2.7460
Range	2575.42	20.982	1.0982	2.7460
Count	2111	2111	2111	2111
Sum	845407.11	1173.244	236.4697	230.0618
1st Quartile	174.58	0.081	0.0185	0.0096
3rd Quartile	582.91	0.617	0.1760	0.1014
Interquartile Range	408.33	0.536	0.1576	0.0919
1.00%	6.63	0.000	0.0000	0.0000
2.50%	15.94	0.000	0.0000	0.0007
5.00%	41.85	0.000	0.0000	0.0015
10.00%	88.67	0.011	0.0022	0.0031
20.00%	146.73	0.050	0.0141	0.0073
80.00%	626.92	0.741	0.2057	0.1310
90.00%	743.13	1.246	0.2861	0.2807
95.00%	857.11	1.955	0.3635	0.4691
97.50%	986.60	2.982	0.4229	0.7513
99.00%	1356.08	4.606	0.5253	1.0640

Table D.2.4. Summary of Descriptive Statistics for Gas Emissions, High Speed Dataset.

	CO ₂ (g/mi)	CO (g/mi)	HC (g/mi)	NO _x (g/mi)
<i>One Variable Summary</i>	High Speed	High Speed	High Speed	High Speed
Mean	324.54	0.851	0.0786	0.1398
Variance	58281.07	1.728	0.0126	0.0378
Std. Dev.	241.41	1.315	0.1124	0.1945
Skewness	1.7570	7.3896	3.1251	3.3125
Kurtosis	9.4890	113.8832	17.7292	18.6349
Median	247.62	0.486	0.0372	0.0719
Mean Abs. Dev.	185.28	0.705	0.0740	0.1243
Mode	222.25	0.000	0.0000	0.0000
Minimum	4.16	0.000	0.0000	0.0000
Maximum	2907.72	32.681	1.3632	2.1535
Range	2903.56	32.681	1.3632	2.1535
Count	4167	4167	4167	4167
Sum	1352344.24	3547.088	327.6979	582.4857
1st Quartile	157.80	0.221	0.0202	0.0270
3rd Quartile	438.79	0.973	0.0674	0.1747
Interquartile Range	280.99	0.752	0.0471	0.1477
1.00%	24.27	0.000	0.0000	0.0003
2.50%	42.24	0.014	0.0000	0.0012
5.00%	68.13	0.033	0.0046	0.0028
10.00%	100.49	0.086	0.0100	0.0074
20.00%	142.68	0.175	0.0172	0.0198
80.00%	550.38	1.172	0.0976	0.2053
90.00%	690.04	1.862	0.2424	0.3377
95.00%	760.57	2.724	0.3250	0.5189
97.50%	824.62	3.943	0.3853	0.7078
99.00%	1027.64	6.076	0.4774	0.9712

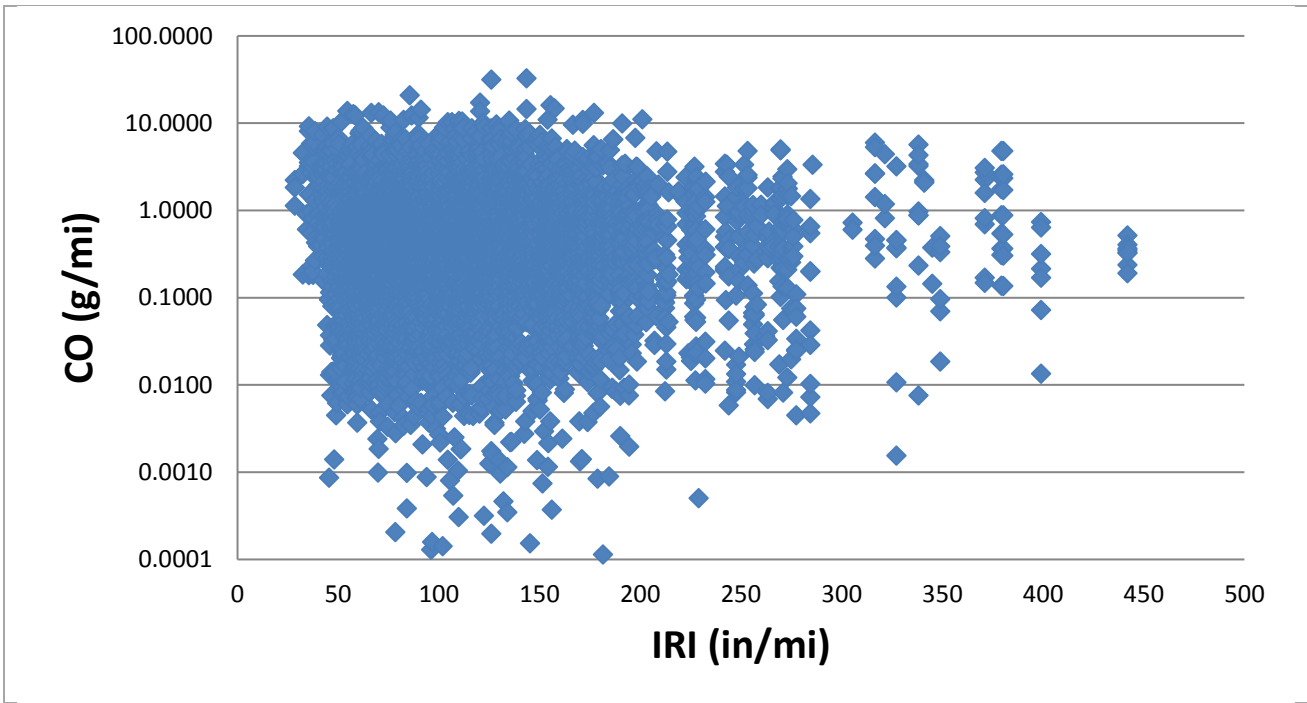
PEMS-IRI DATA PLOTS, ALL DATA



CO₂

Lower Limit (g/mi)	Upper Limit (g/mi)	Frequency	%
1E-24	1	3	0.04
1	10	56	0.71
10	100	743	9.41
100	1000	6758	85.62
1000	10000	333	4.22
	Total	7893	100

Figure D.1.1. IRI versus CO₂, All Data.



CO			
Lower Limit (g/mi)	Upper Limit (g/mi)	Frequency	%
1E-123	0.000001	254	3.22
0.000001	0.001	45	0.57
0.001	0.1	1294	16.39
0.1	1	4625	58.59
1	10	1645	20.84
10	100	30	0.38
	Total	7893	100.00

Figure D.1.2. IRI versus CO, All Data.

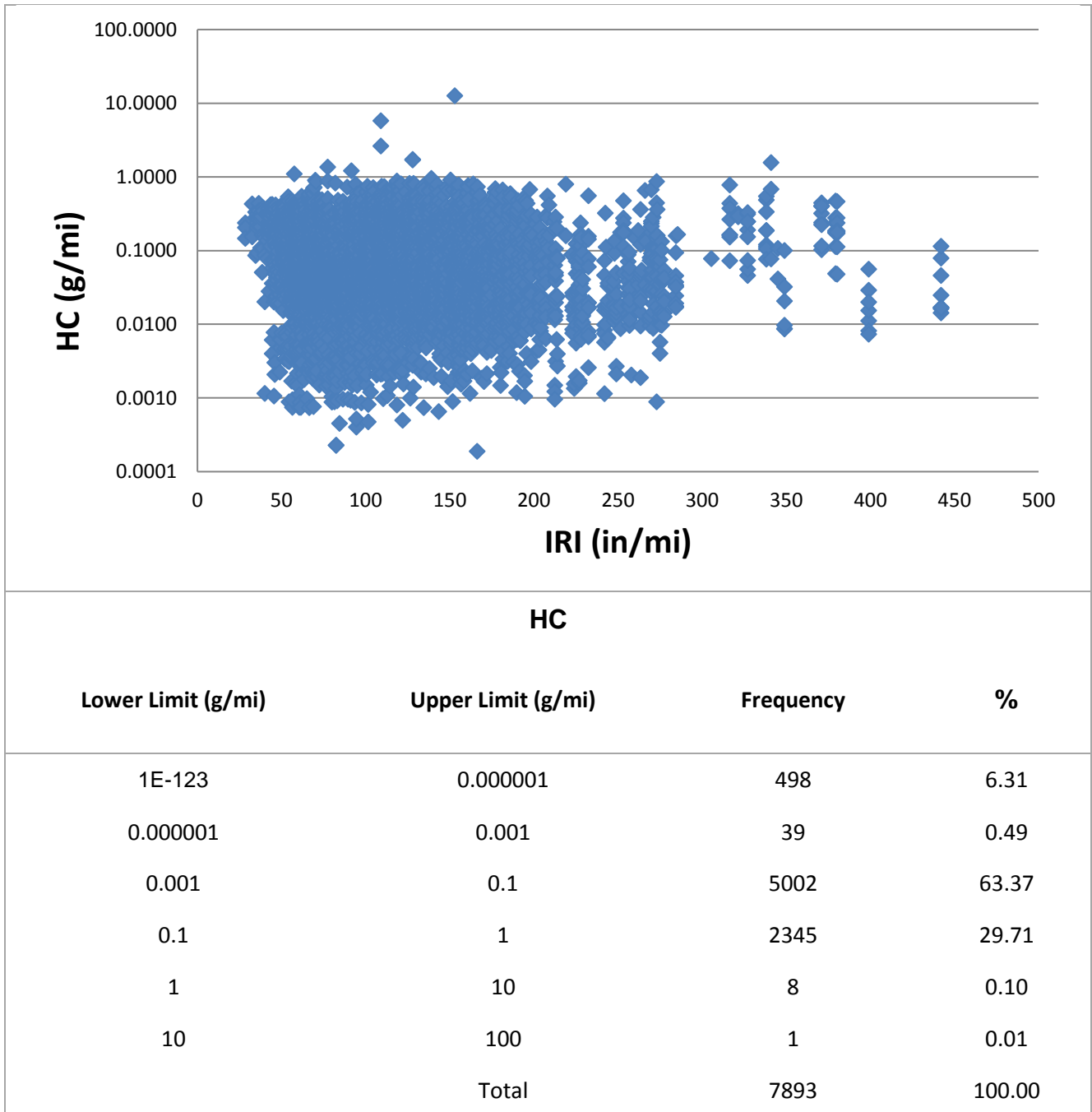
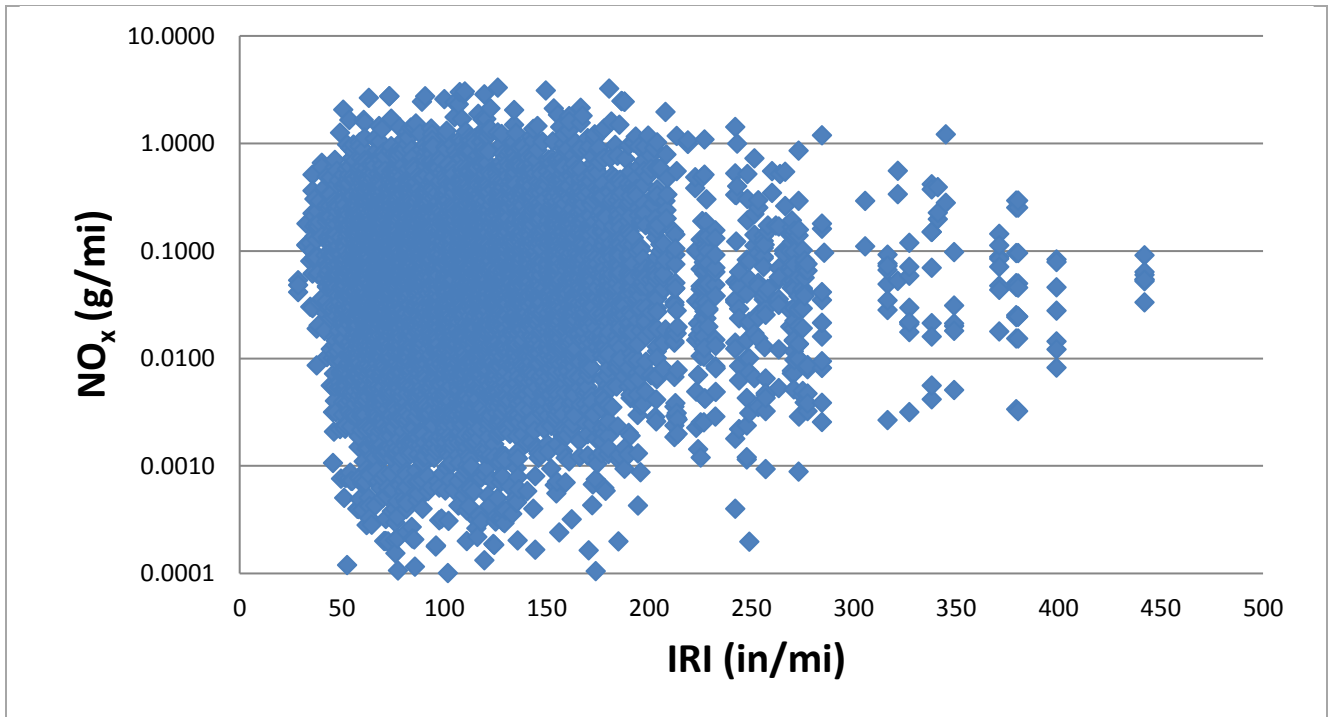


Figure D.1.3. IRI versus HC, All Data.



NO_x			
Lower Limit (g/mi)	Upper Limit (g/mi)	Frequency	%
1E-123	0.000001	77	0.98
0.000001	0.001	191	2.42
0.001	0.1	4908	62.18
0.1	1	2603	32.98
1	10	114	1.44
10	100	0	0
	Total	7893	100.00

Figure D.1.4. IRI versus NO_x, All Data.

PEMS-IRI DATA BY PAVEMENT CONDITION CATEGORY

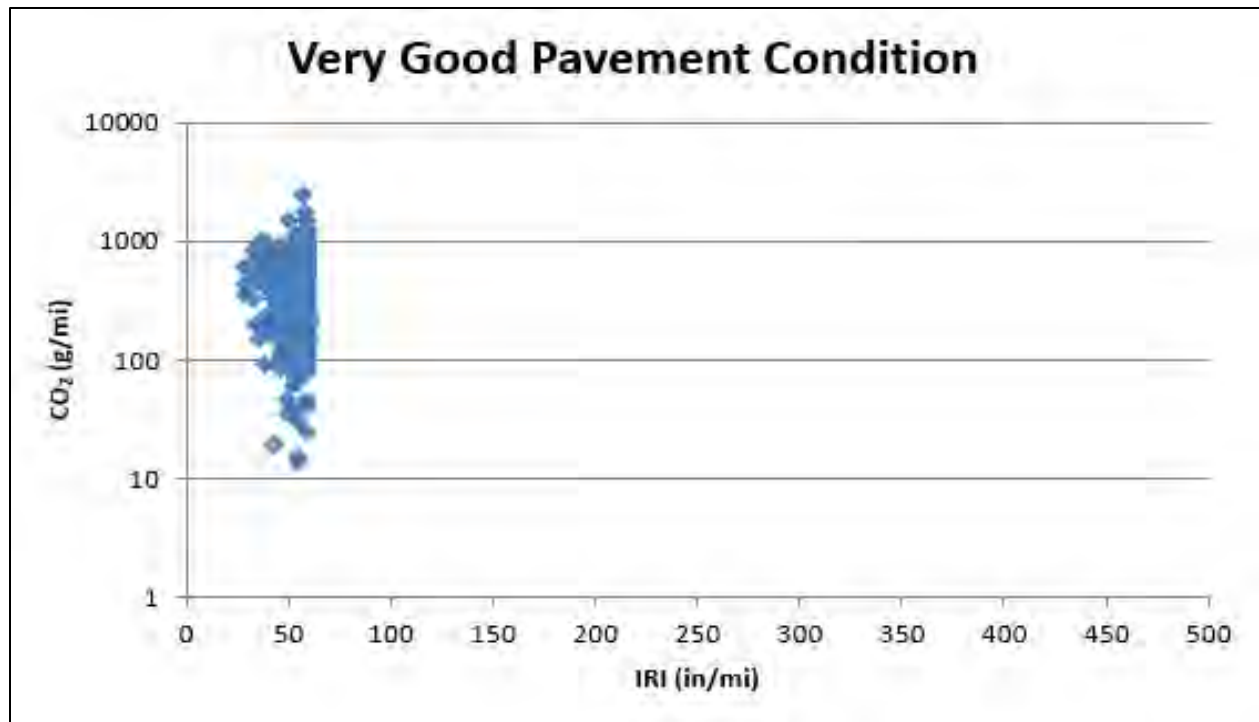


Figure D.2.1. IRI versus CO₂, Very Good Pavement Condition.

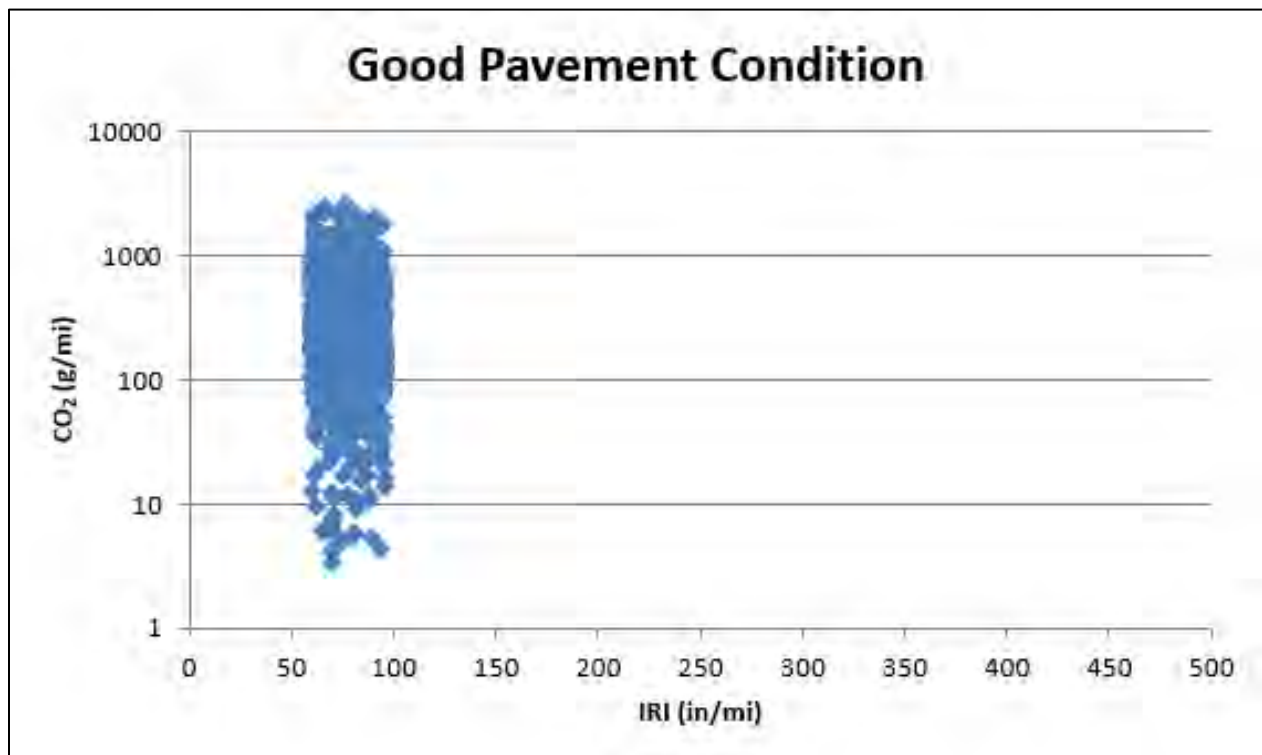


Figure D.2.2. IRI versus CO₂, Good Pavement Condition.

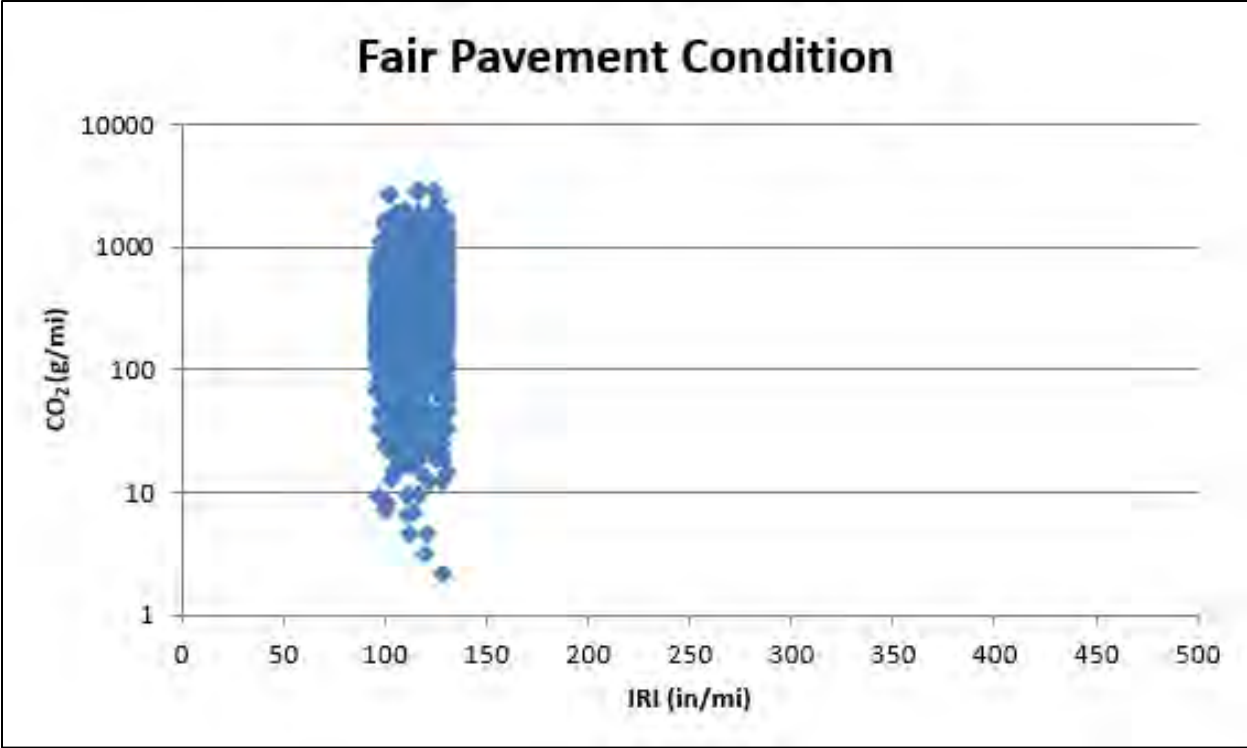


Figure D.2.3. IRI versus CO₂, Fair Pavement Condition.

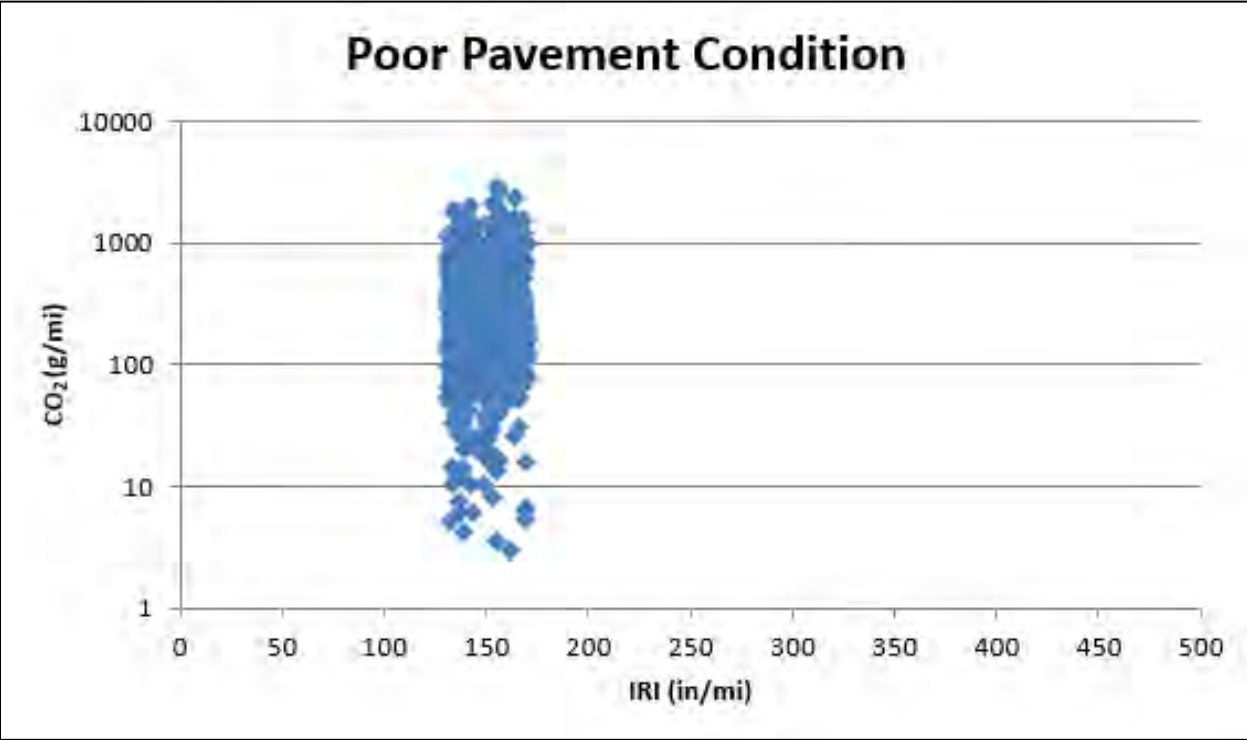


Figure D.2.4. IRI versus CO₂, Poor Pavement Condition.

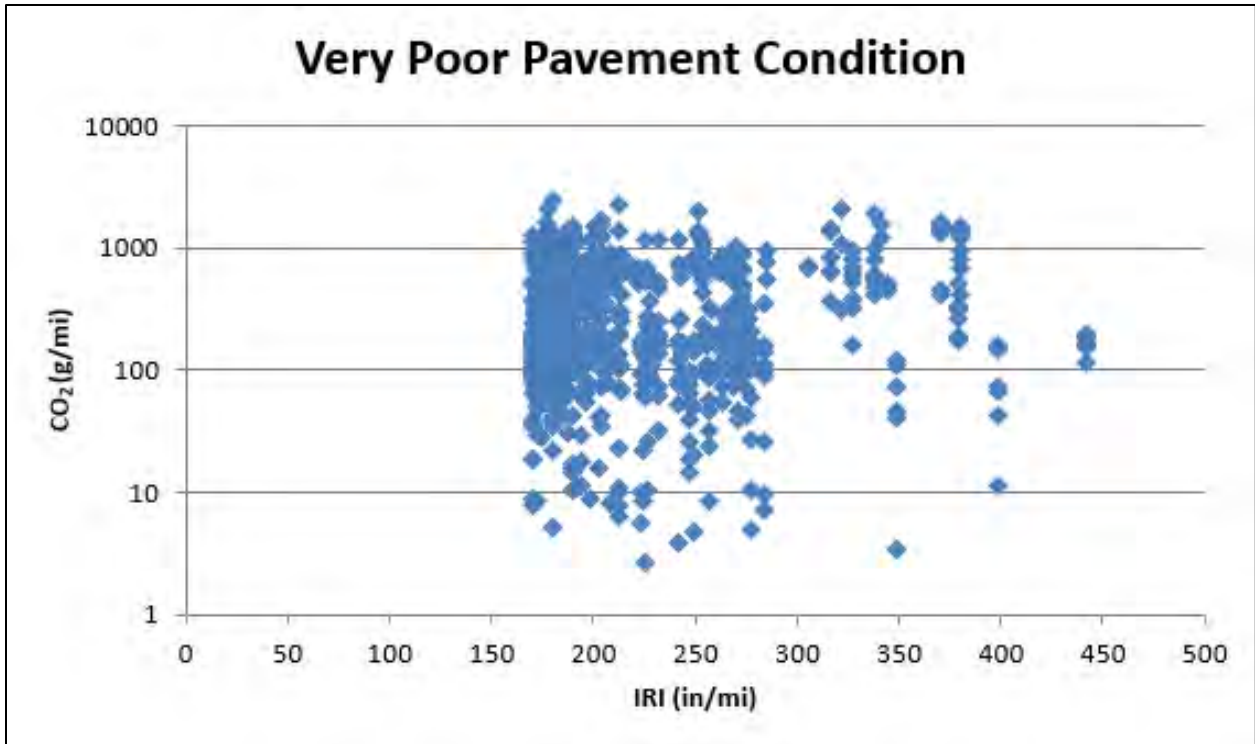


Figure D.2.5. IRI versus CO₂, Very Poor Pavement Condition.

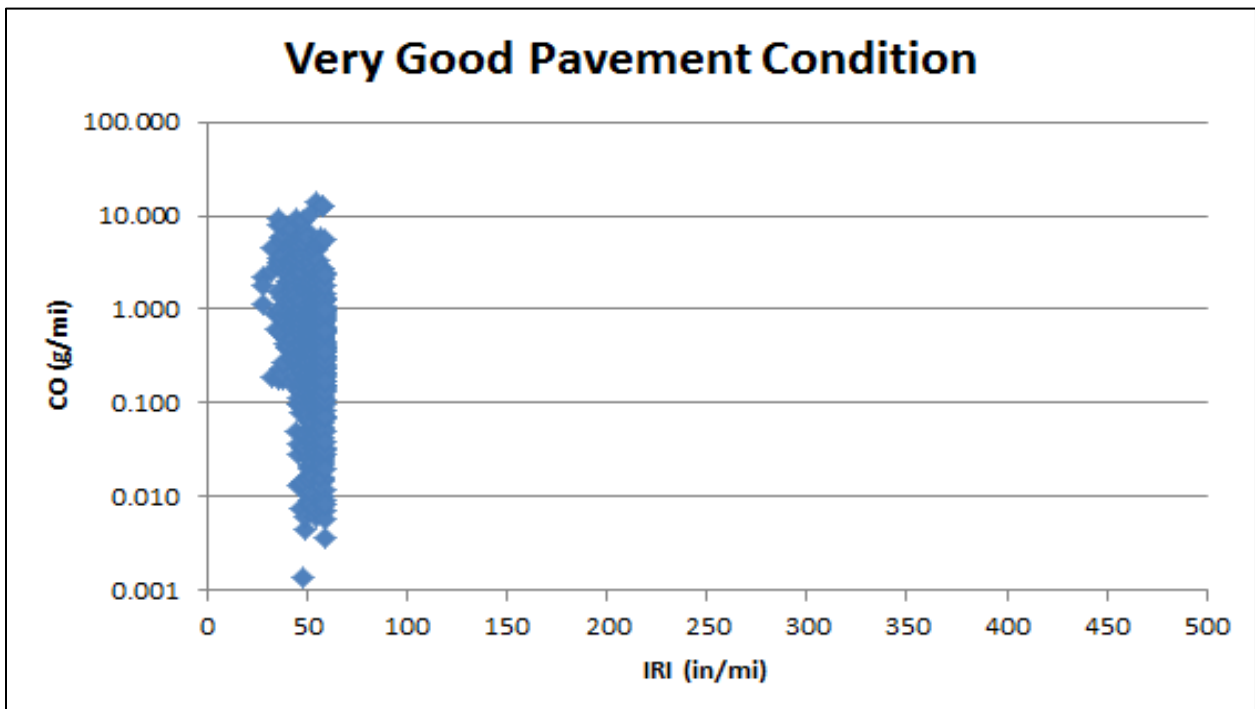


Figure D.2.6. IRI versus CO, Very Good Pavement Condition.



Figure D.2.7. IRI versus CO, Good Pavement Condition.

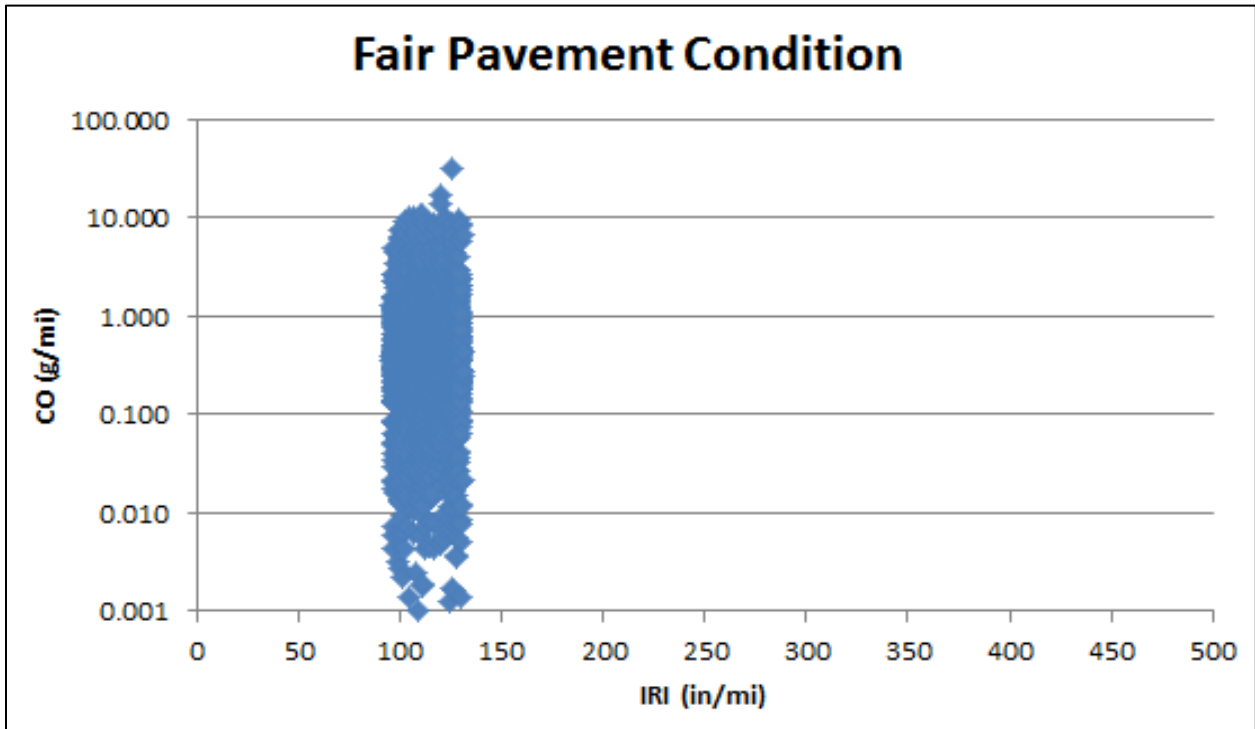


Figure D.2.8. IRI versus CO, Fair Pavement Condition.

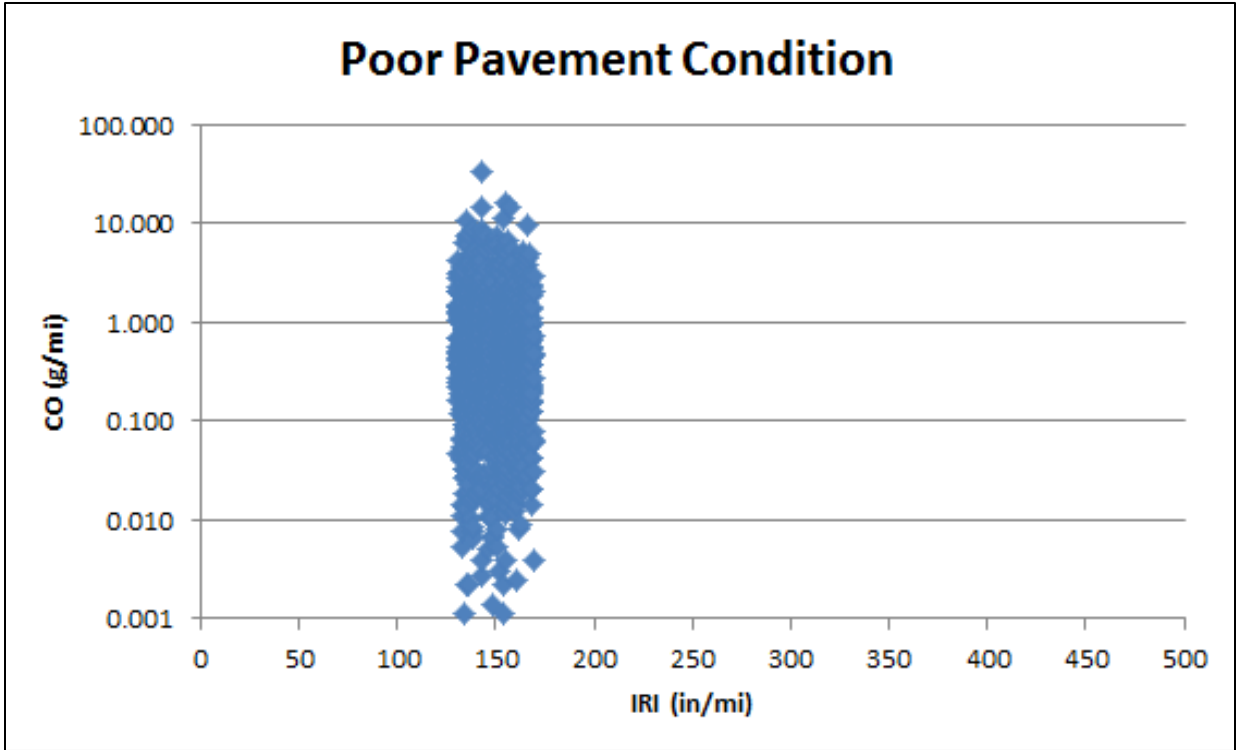


Figure D.2.9. IRI versus CO, Poor Pavement Condition.

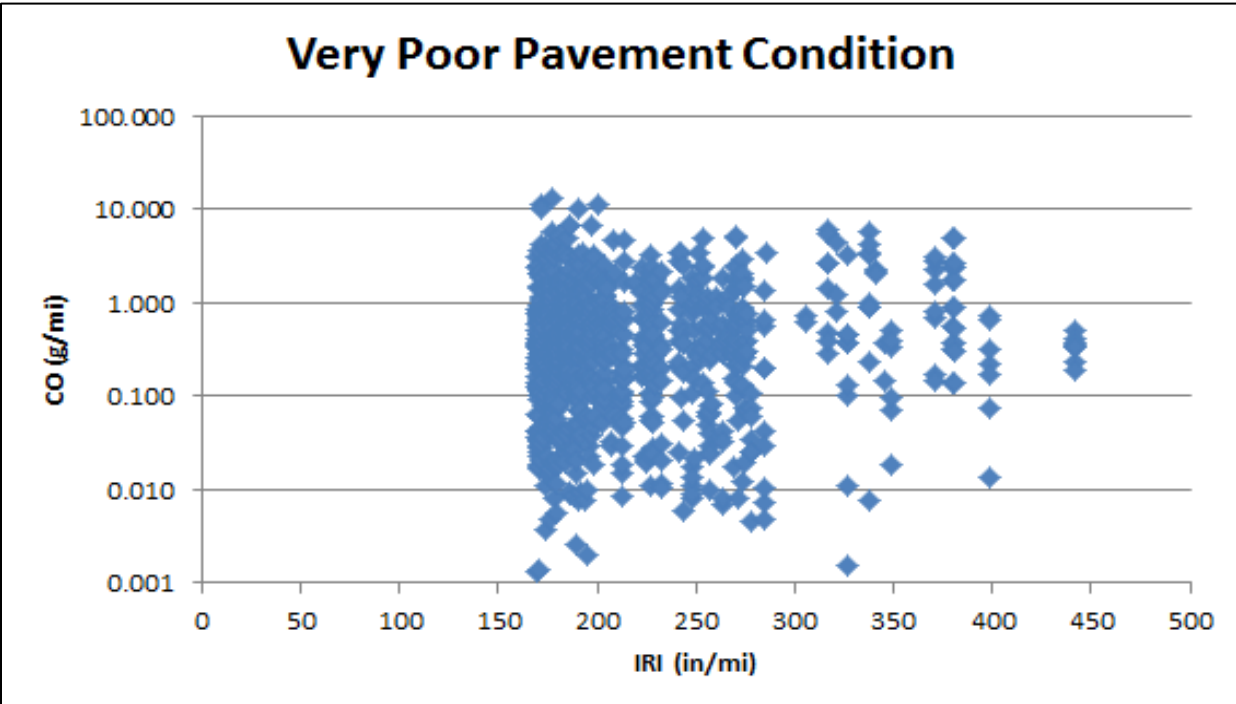


Figure D.2.10. IRI versus CO, Very Poor Pavement Condition.



Figure D.2.11. IRI versus HC, Very Good Pavement Condition.

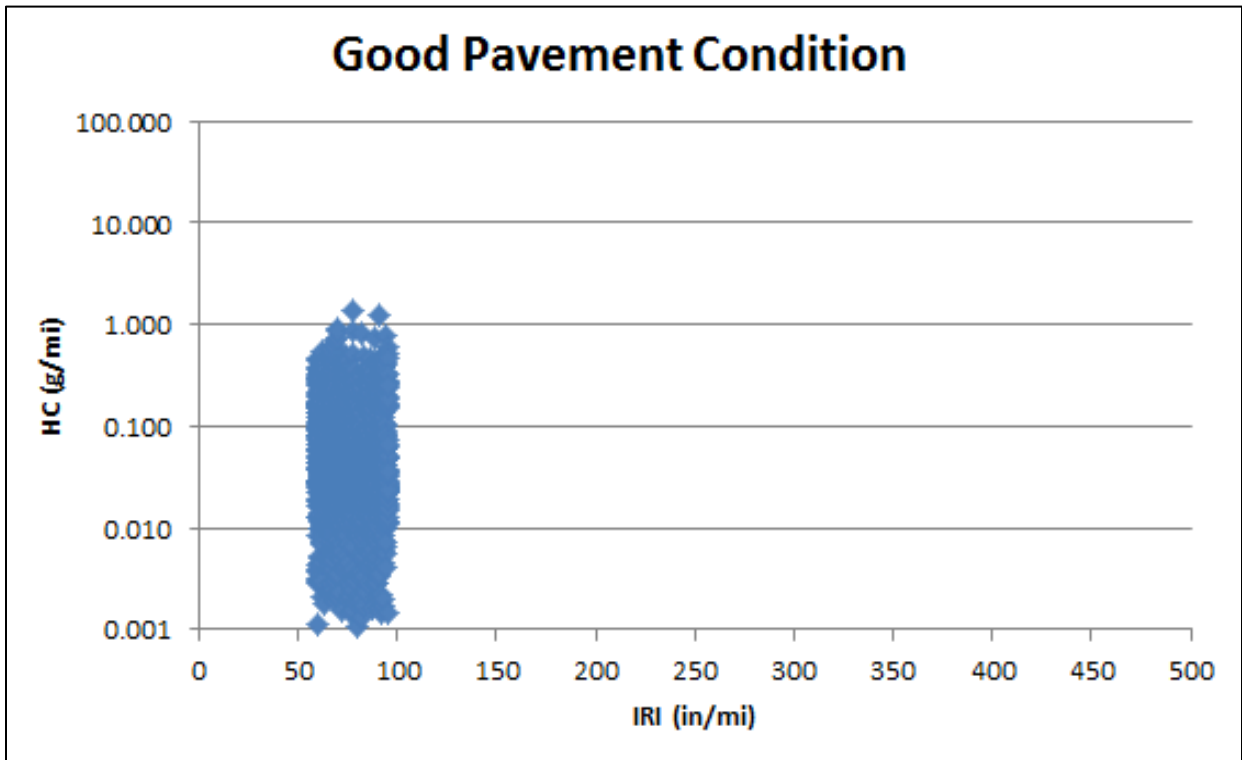


Figure D.2.12. IRI versus HC, Good Pavement Condition.

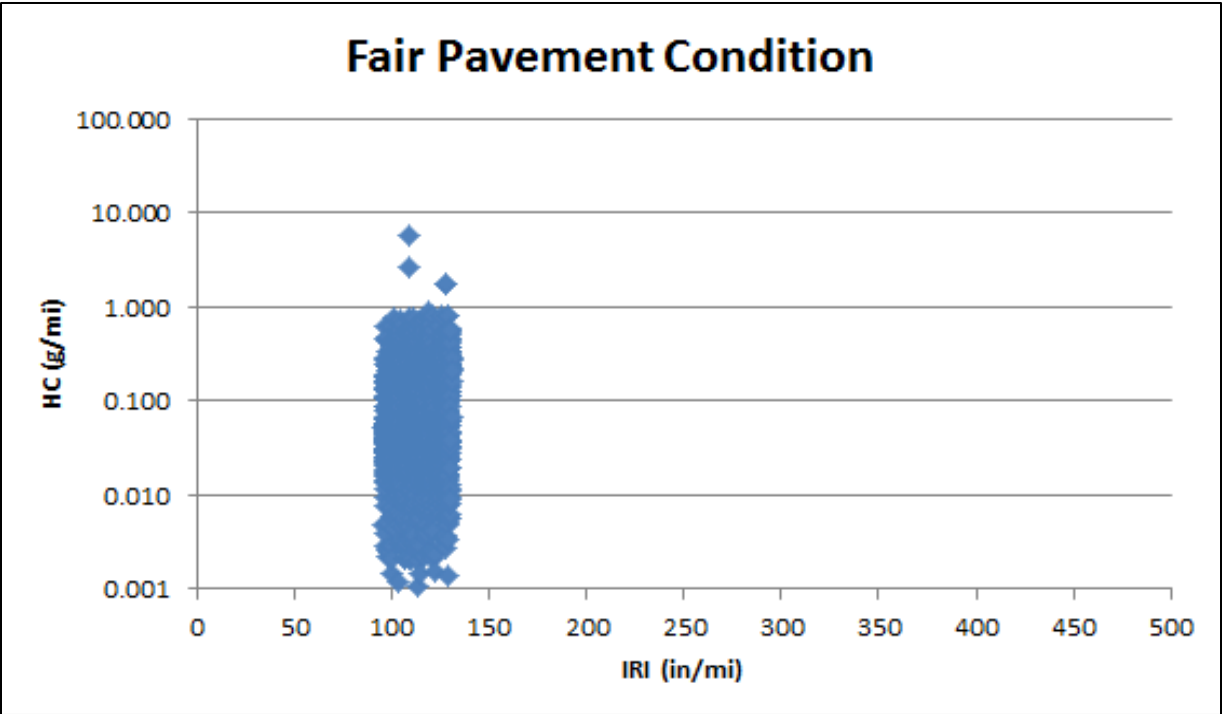


Figure D.2.13. IRI versus HC, Fair Pavement Condition.

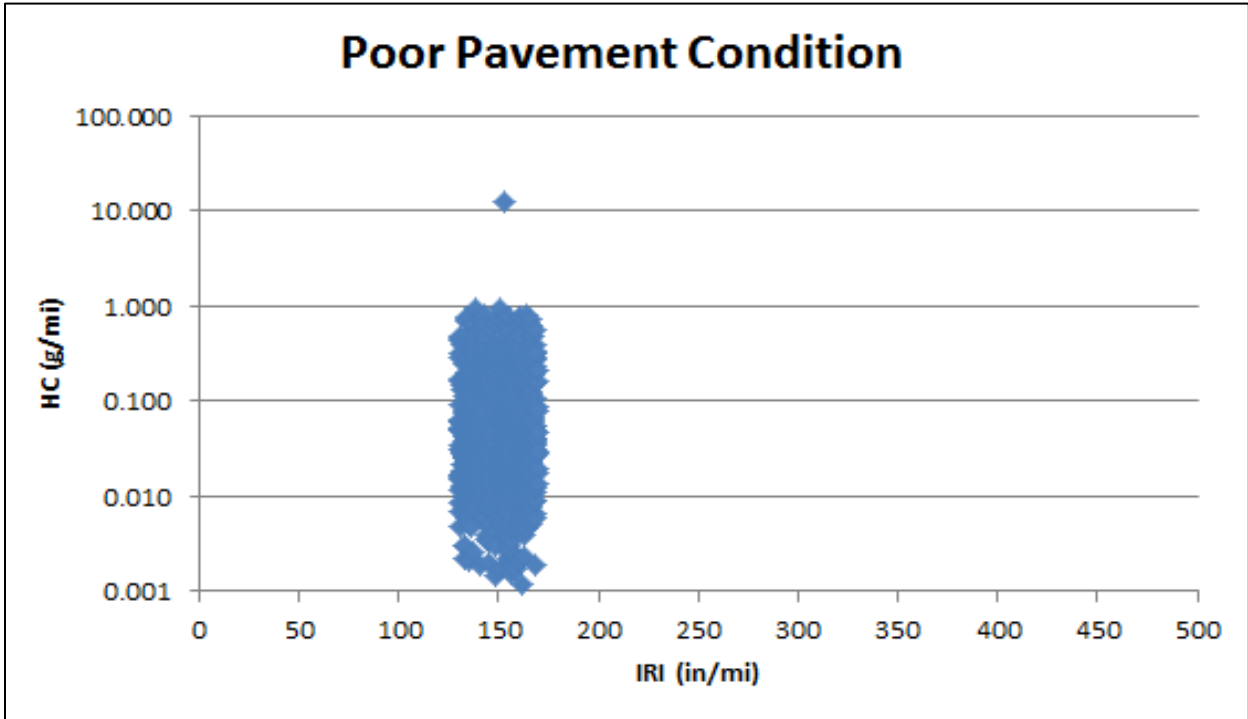


Figure D.2.14. IRI versus HC, Poor Pavement Condition.

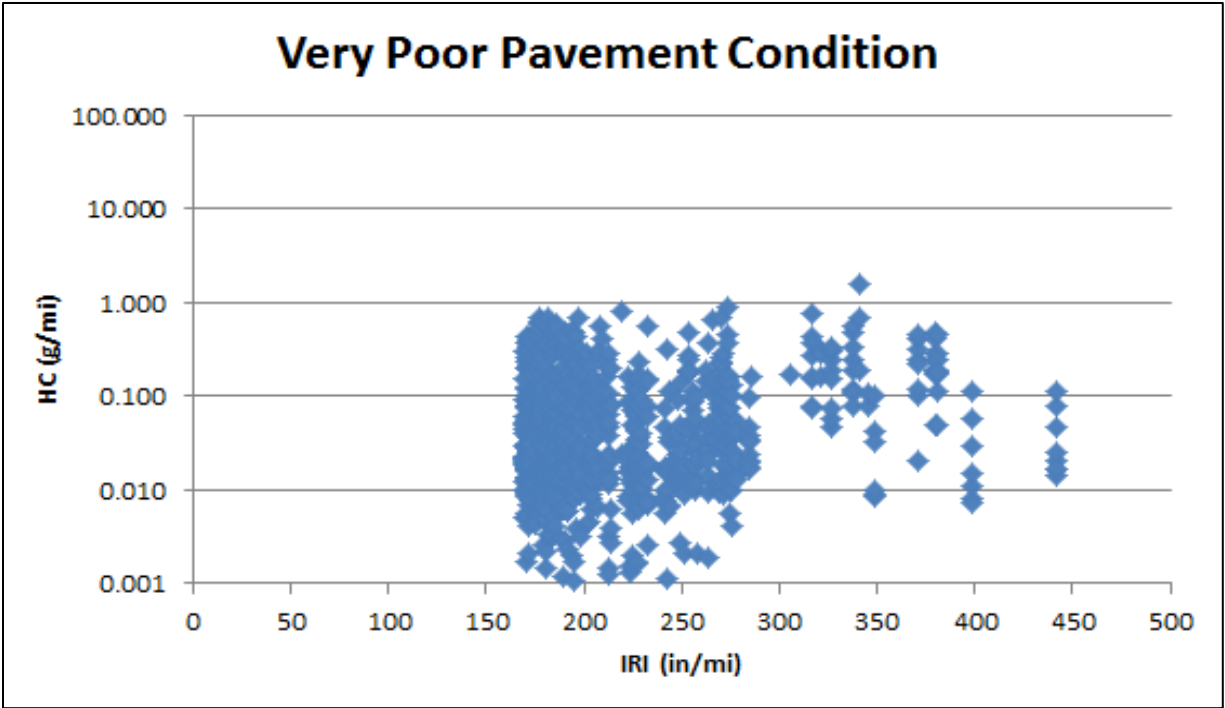


Figure D.2.15. IRI versus HC, Very Poor Pavement Condition.

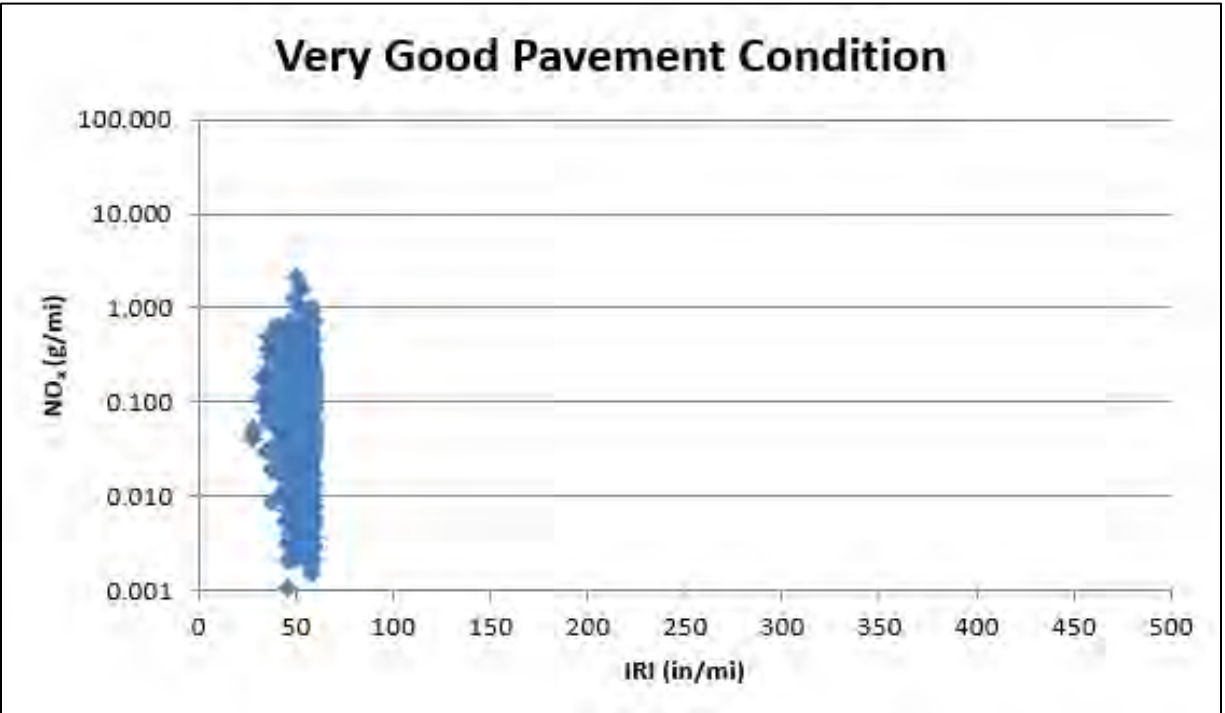


Figure D.2.16. IRI versus NO_x, Very Good Pavement Condition.

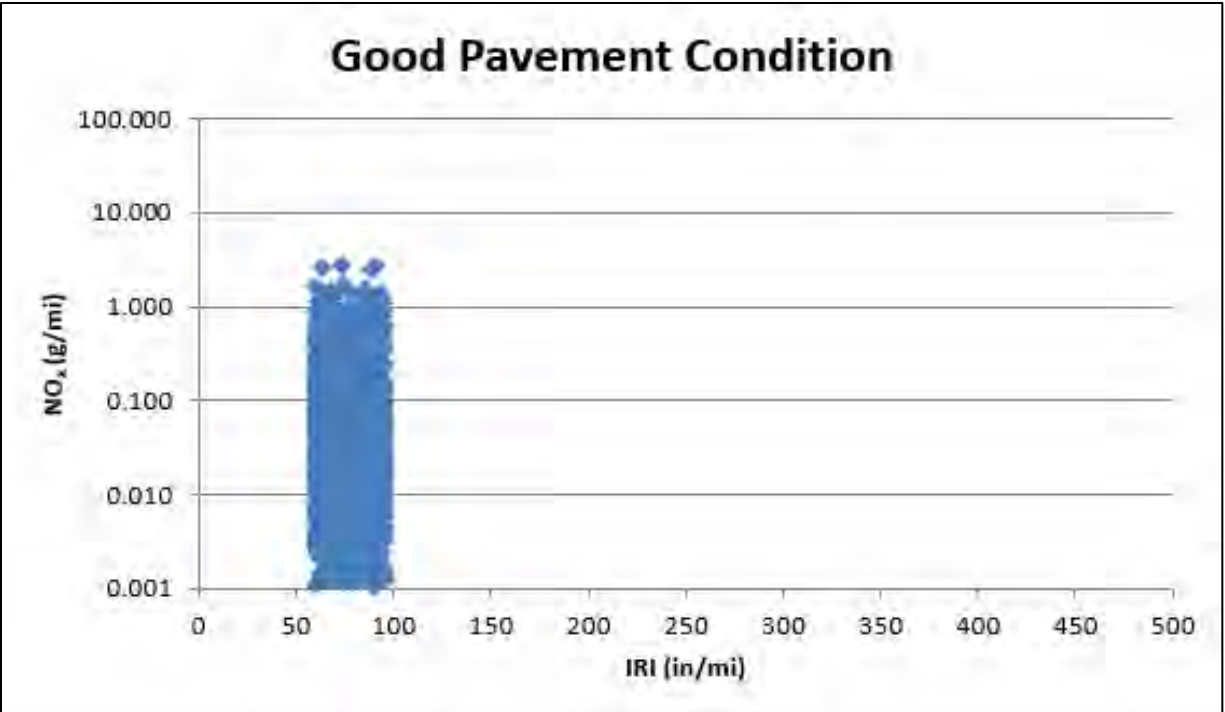


Figure D.2.17. IRI versus NO_x, Good Pavement Condition.

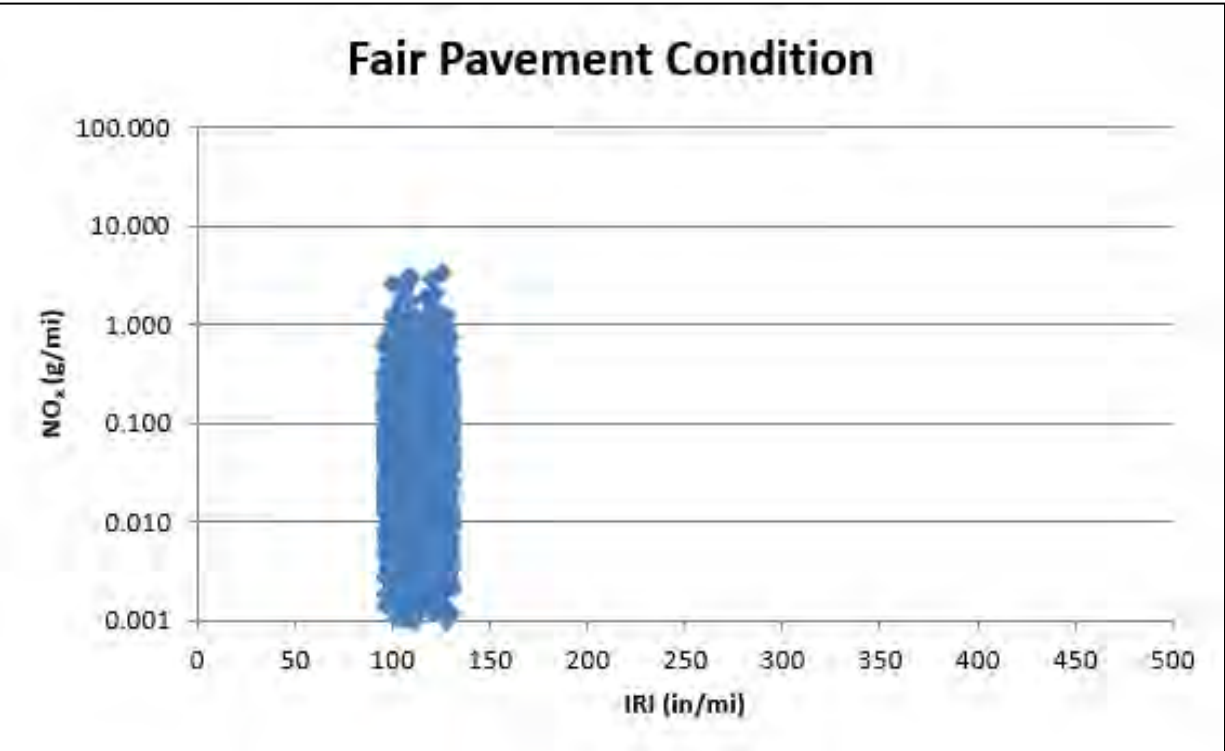


Figure D.2.18. IRI versus NO_x, Fair Pavement Condition.

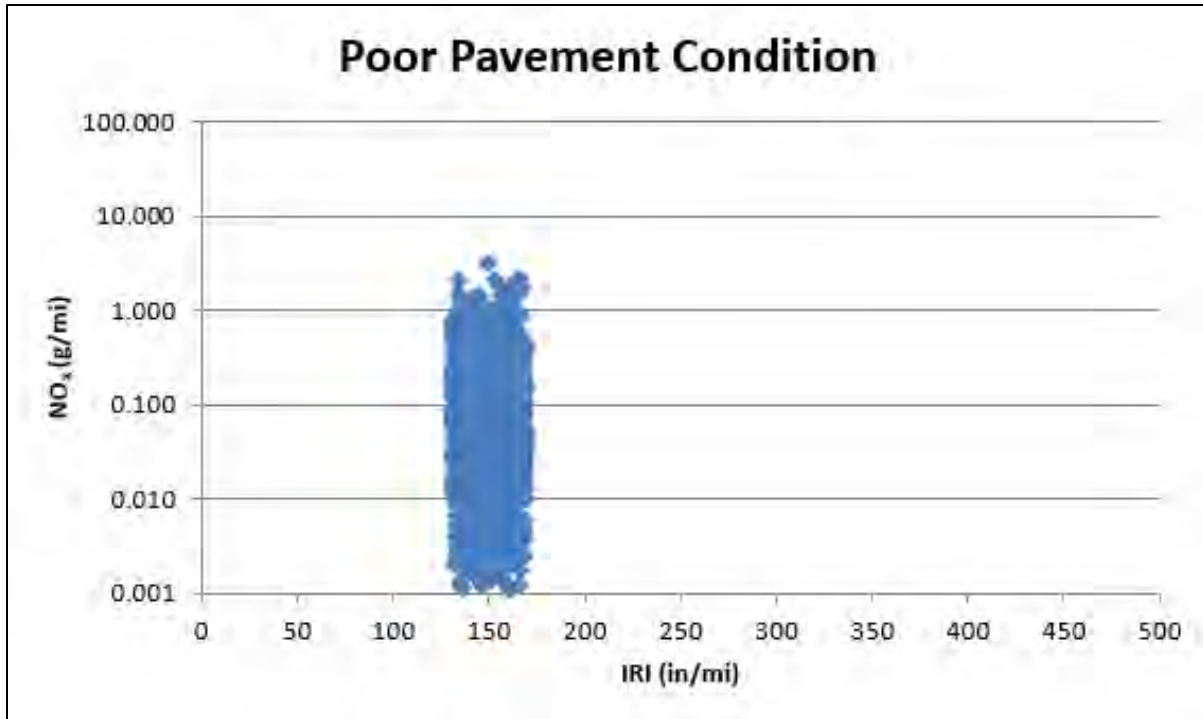


Figure D.2.19. IRI versus NO_x, Poor Pavement Condition.

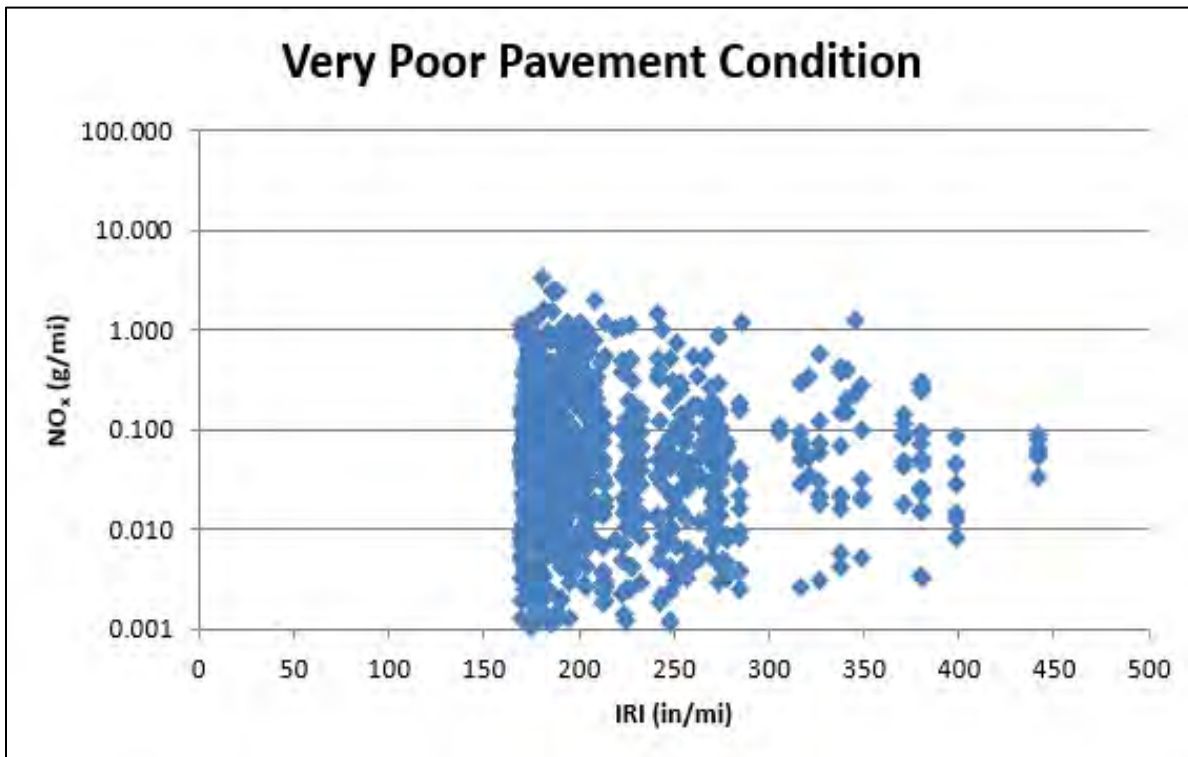


Figure D.2.20. IRI versus NO_x, Very Poor Pavement Condition.

PEMS-IRI DATA PLOTS BY SPEED CATEGORY

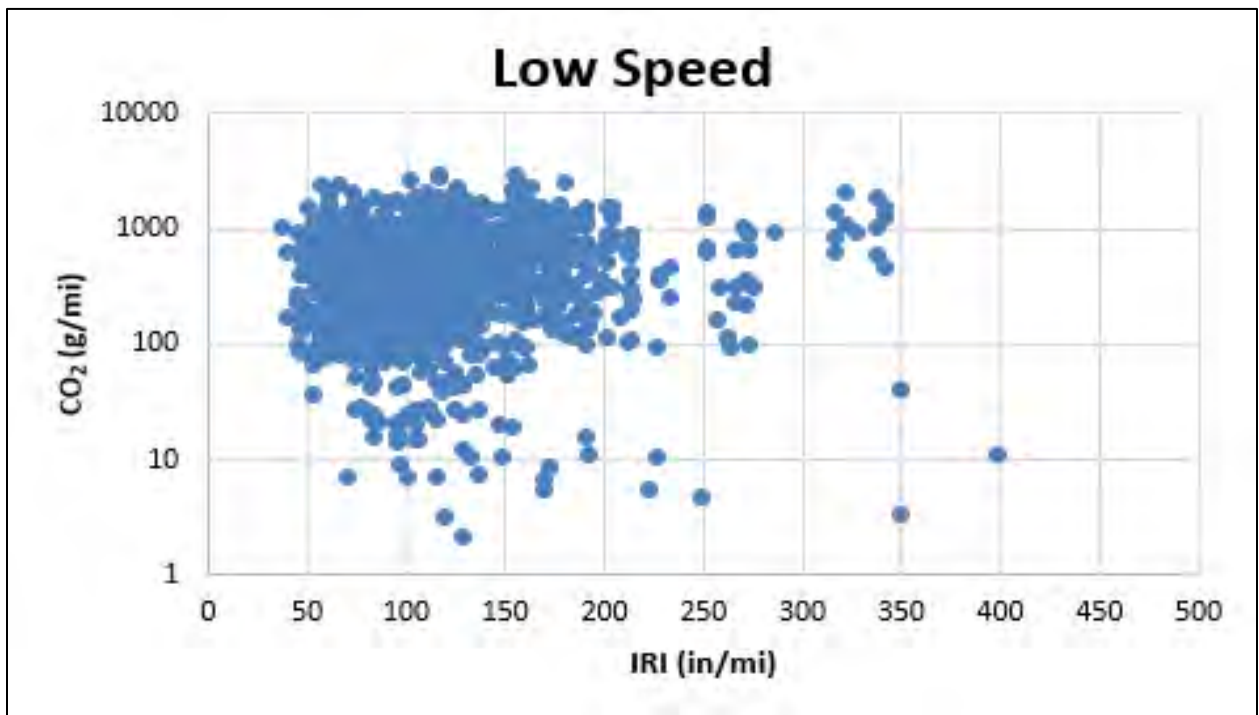


Figure D.3.1. IRI versus CO₂, Low Speed Category.

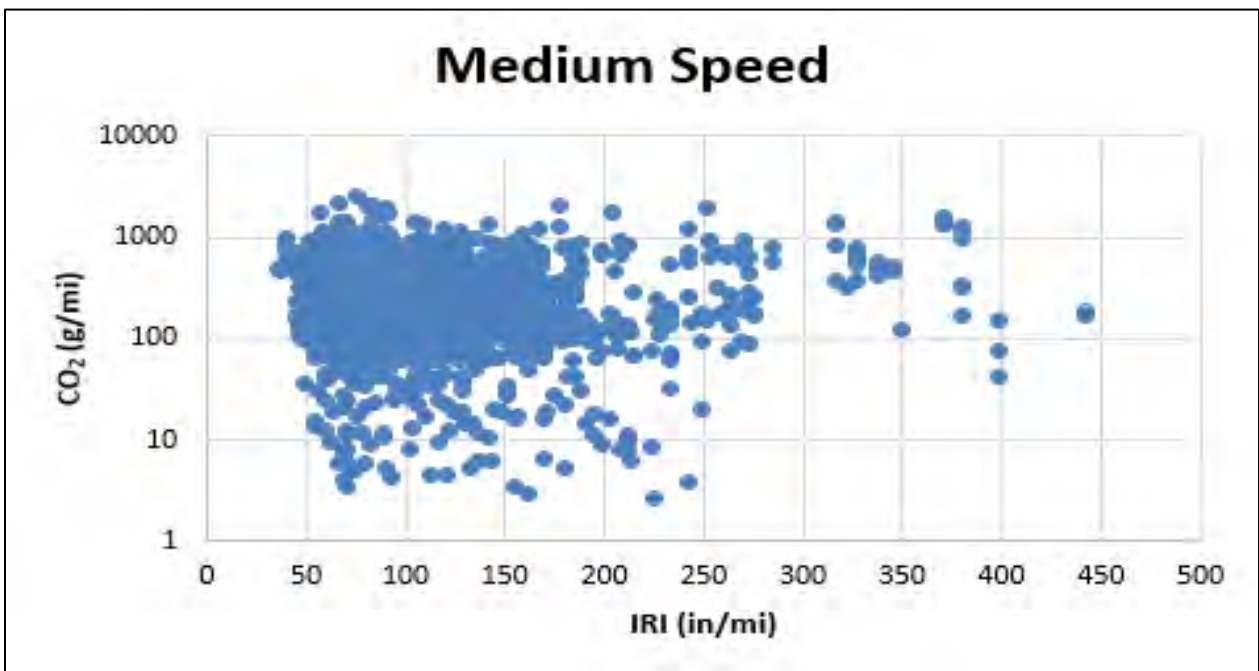


Figure D.3.2. IRI versus CO₂, Medium Speed Category.

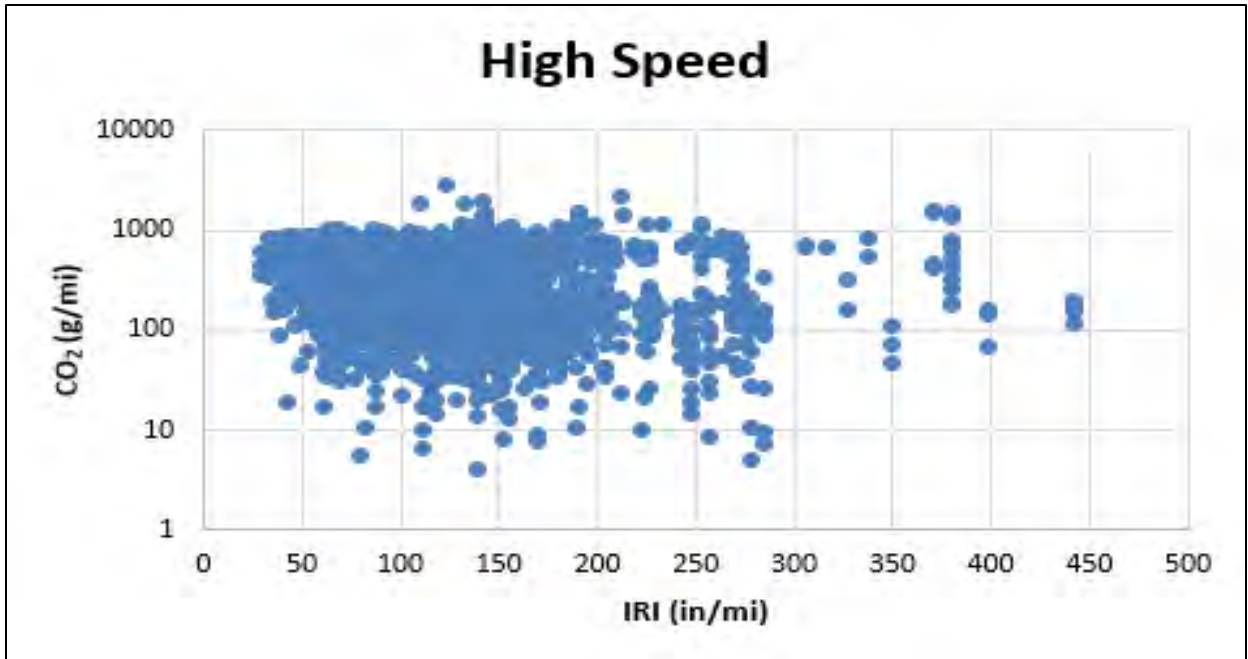


Figure D.3.3. IRI versus CO₂, High Speed Category.

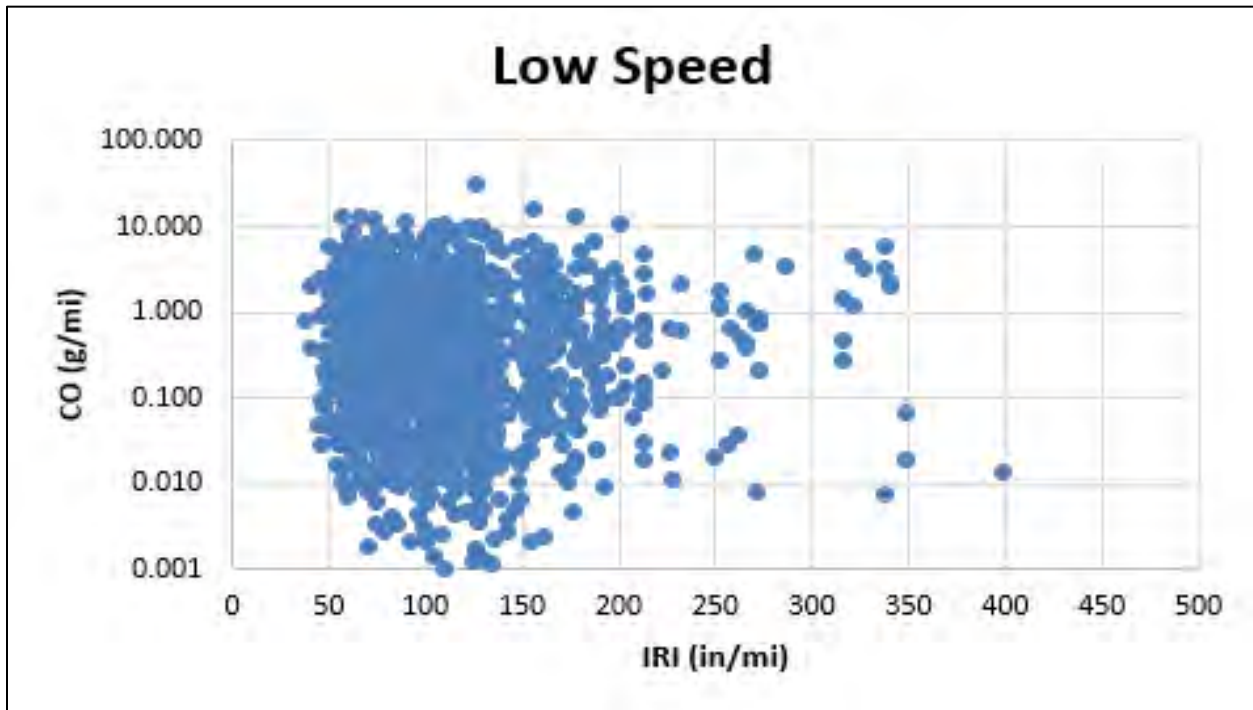


Figure D.3.4. IRI versus CO, Low Speed Category.

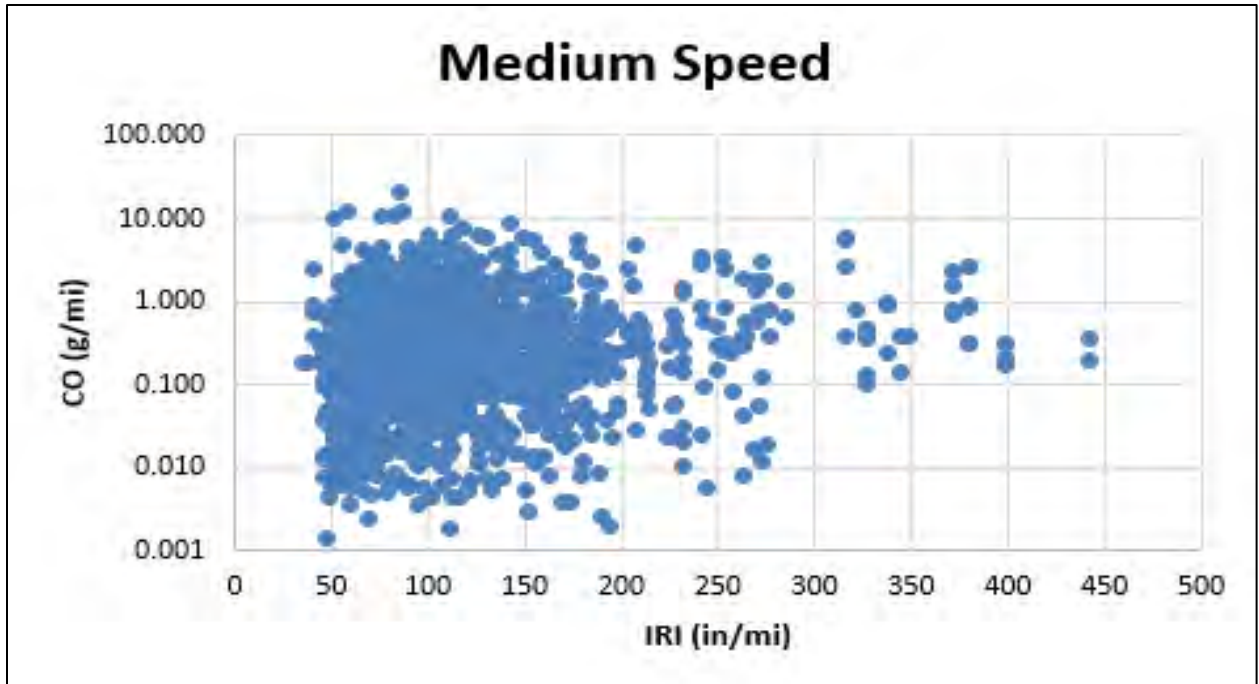


Figure D.3.5. IRI versus CO, Medium Speed Category.

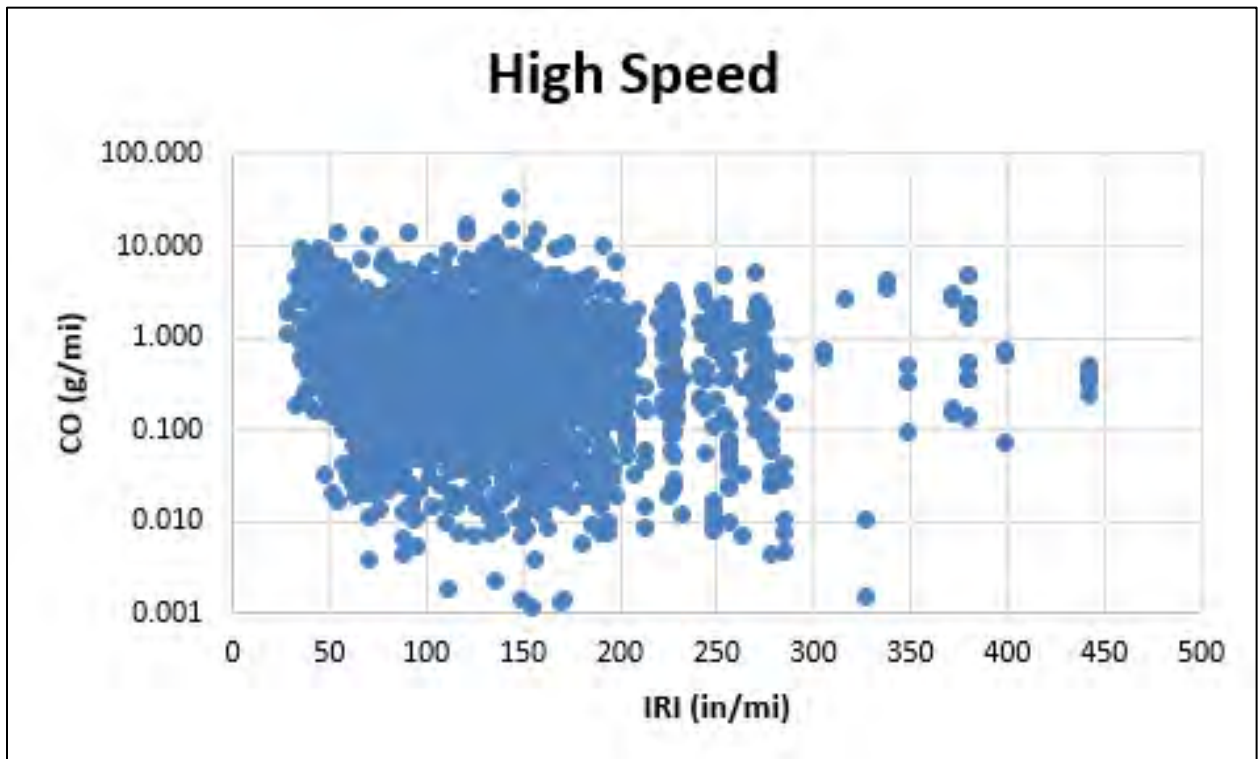


Figure D.3.6. IRI versus CO, High Speed Category.

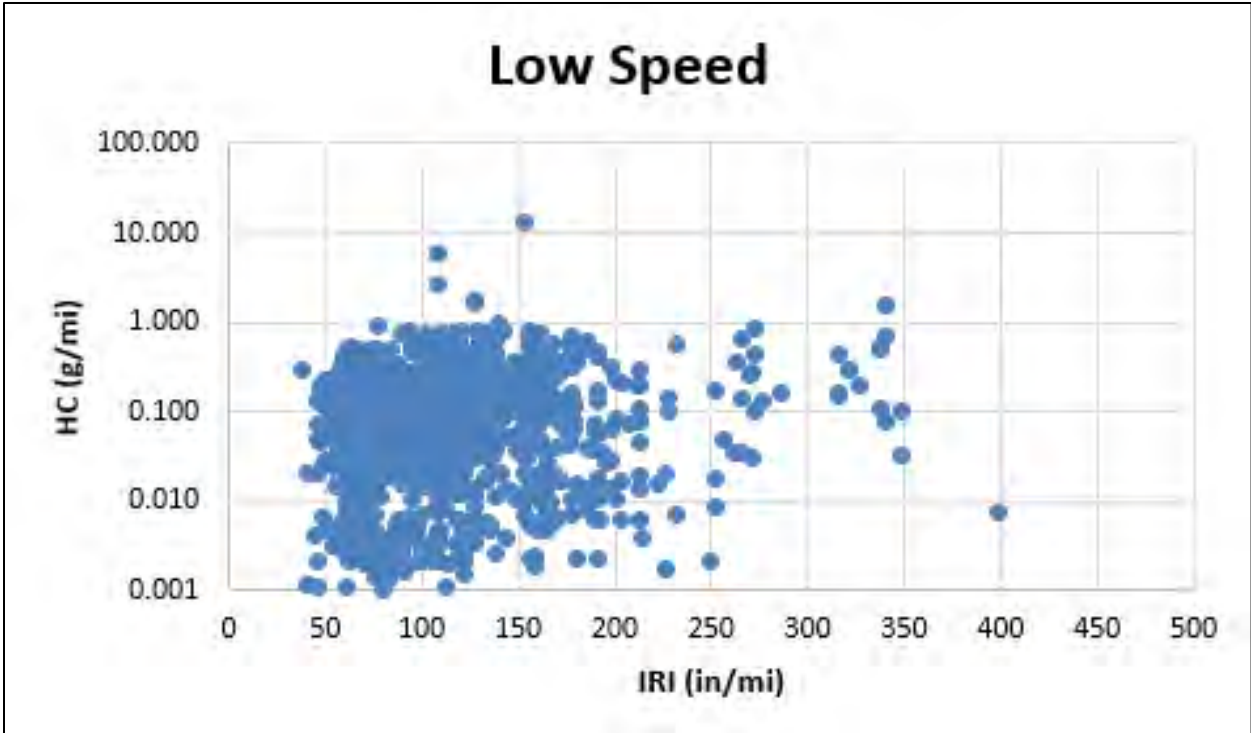


Figure D.3.7. IRI versus HC, Low Speed Category.

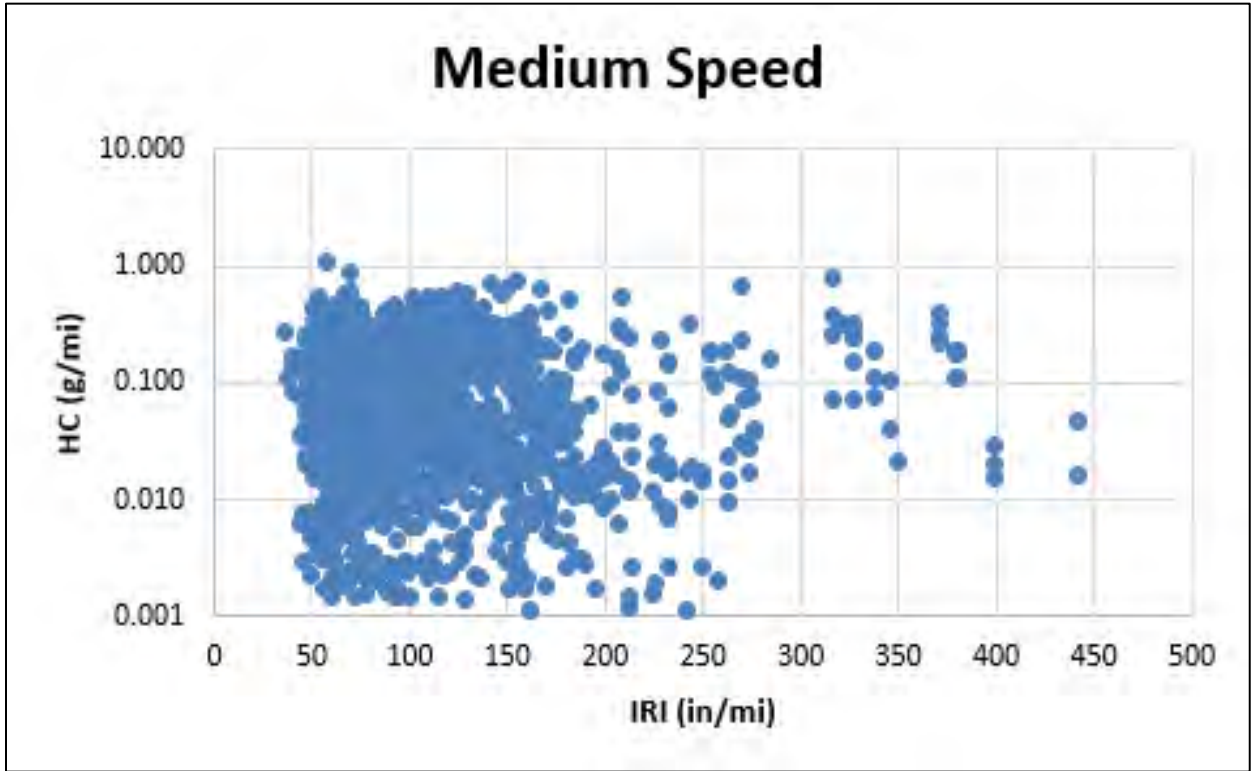


Figure D.3.8. IRI versus HC, Medium Speed Category.

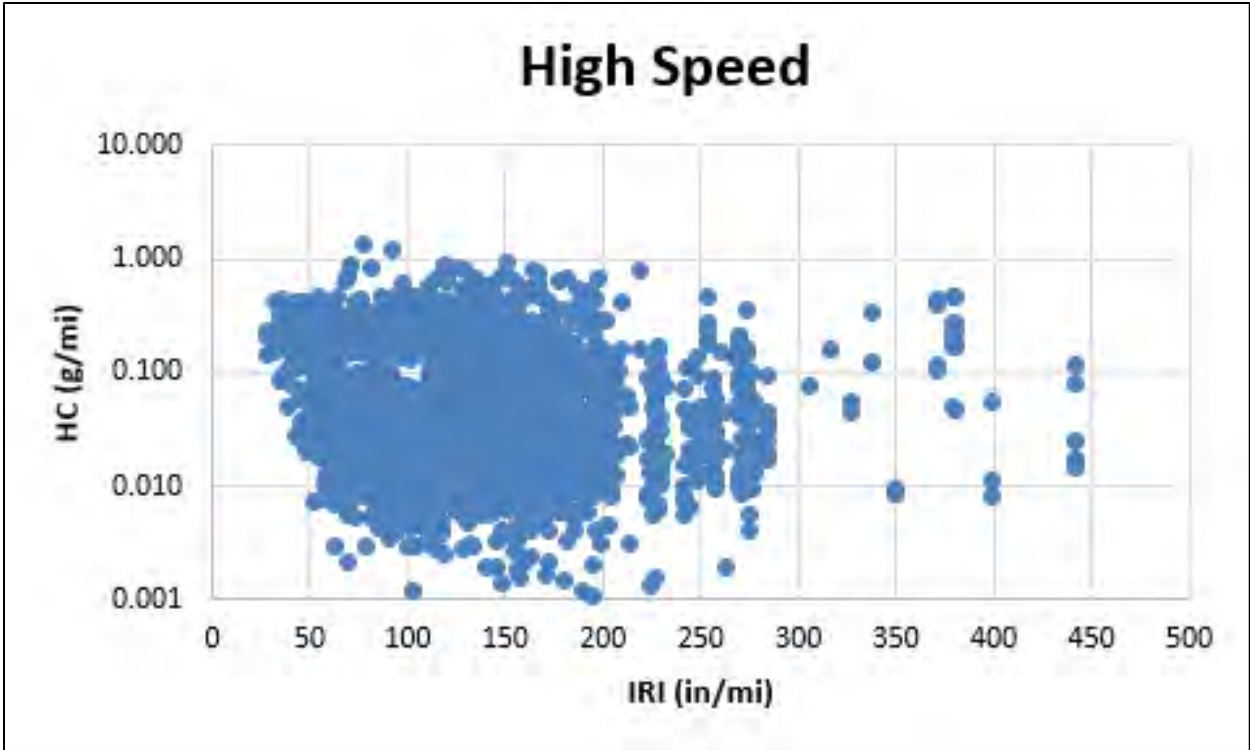


Figure D.3.9. IRI versus HC, High Speed Category.

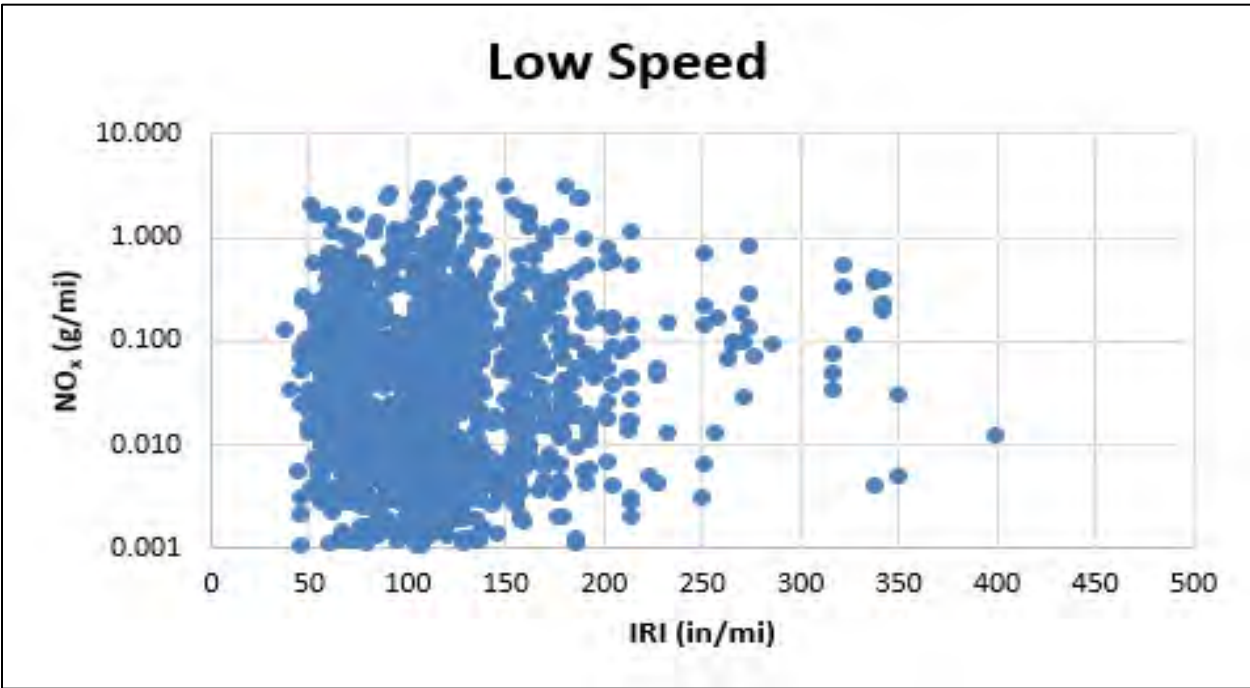


Figure D.3.10. IRI versus NO_x, Low Speed Category.

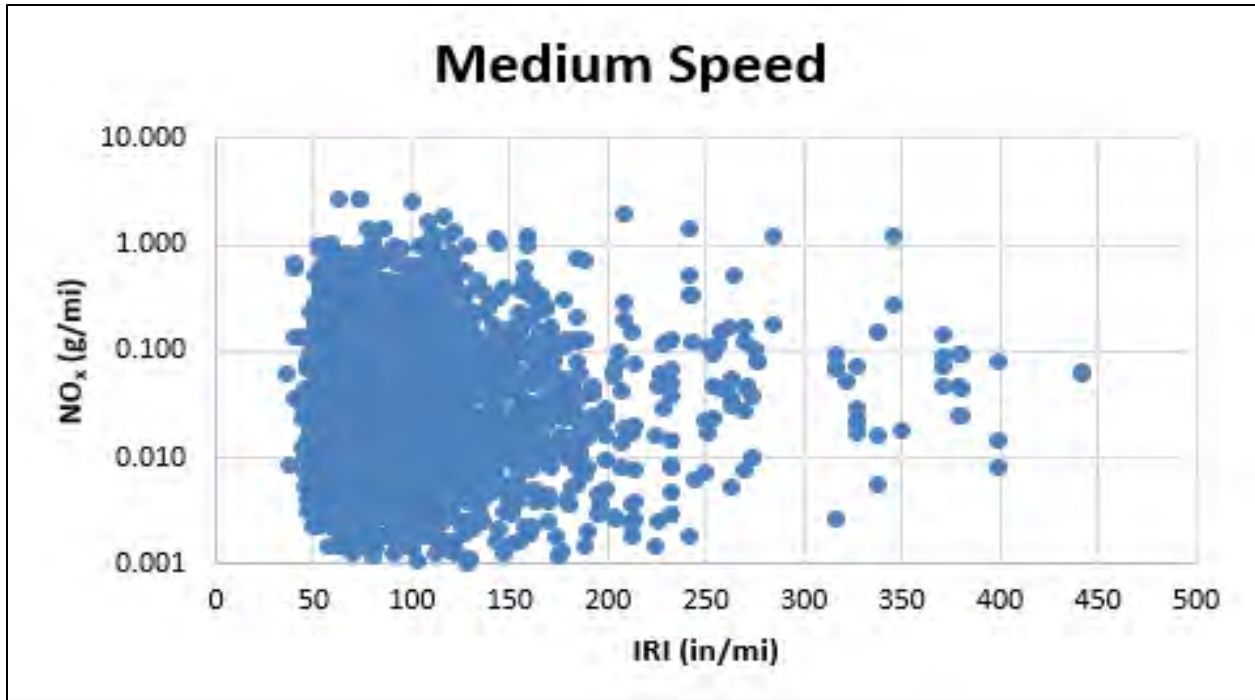


Figure D.3.11. IRI versus NO_x, Medium Speed Category.

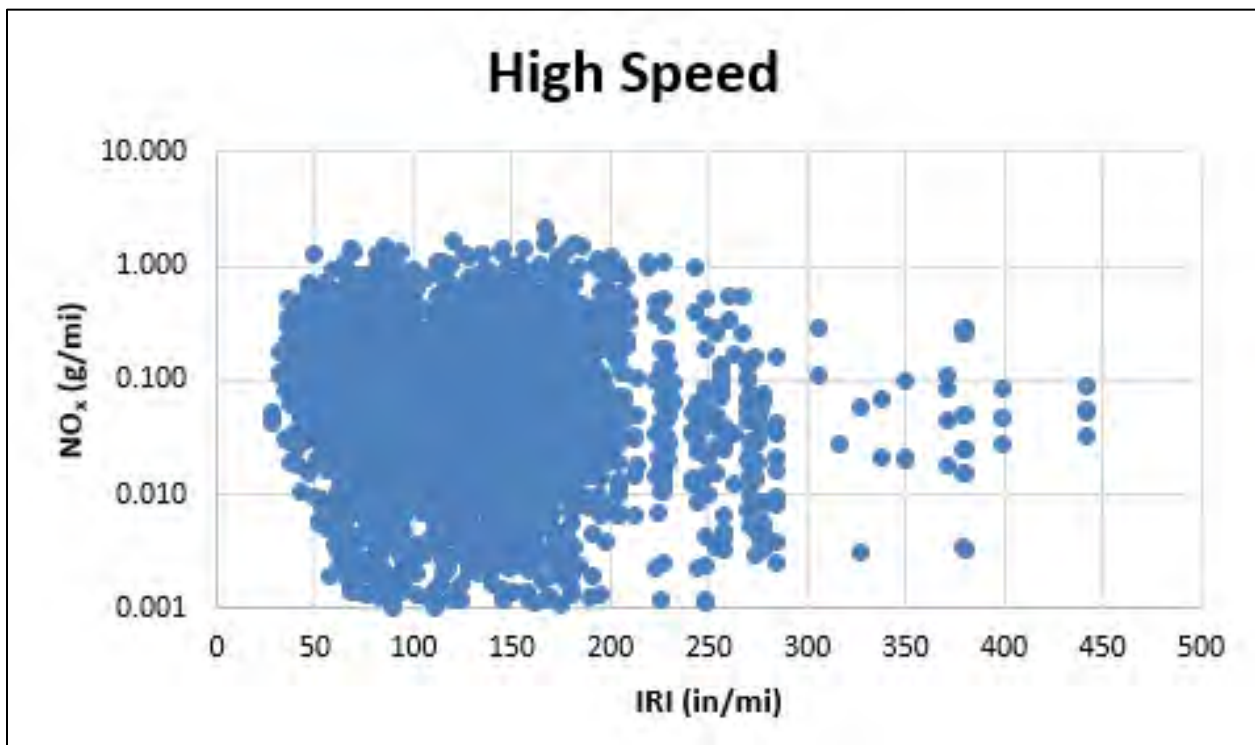


Figure D.3.12. IRI versus NO_x, High Speed Category.

SPEED-GASES DATA PLOTS BY SPEED CATEGORY, ALL DATA

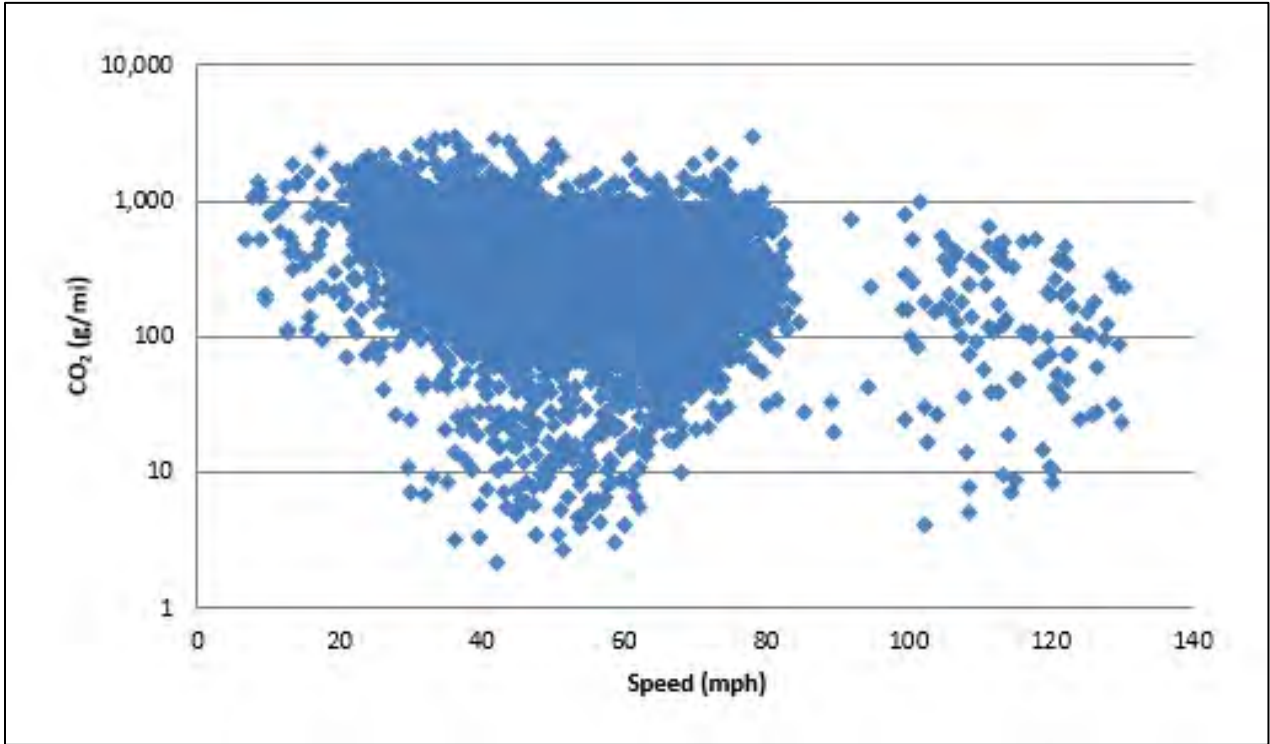


Figure D.4.1. Speed versus CO₂, All Speed Categories.

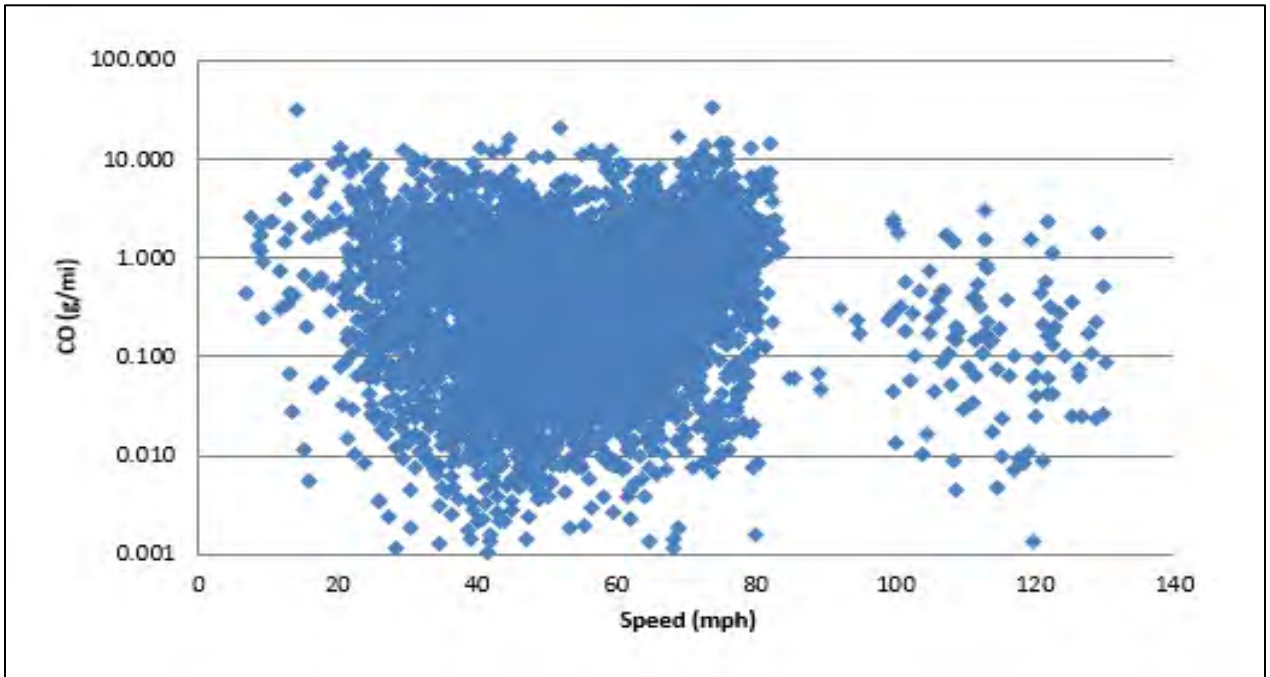


Figure D.4.2. Speed versus CO, All Speed Categories.

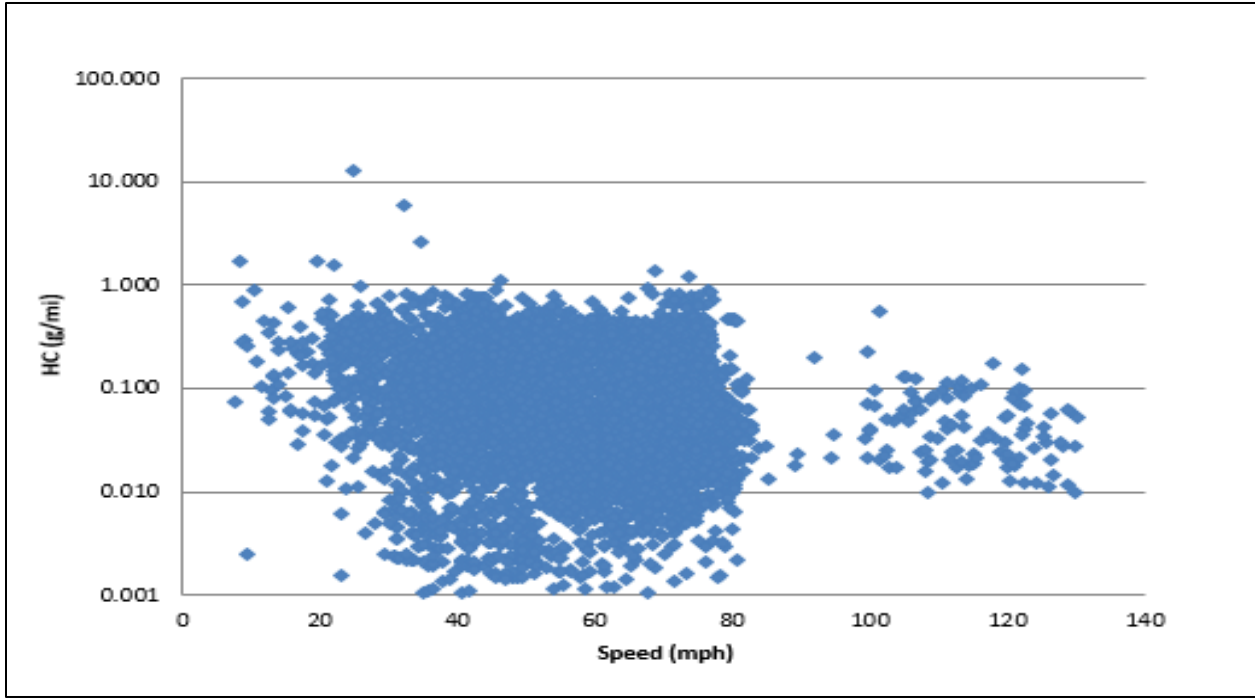


Figure D.4.3. Speed versus HC, All Speed Categories.

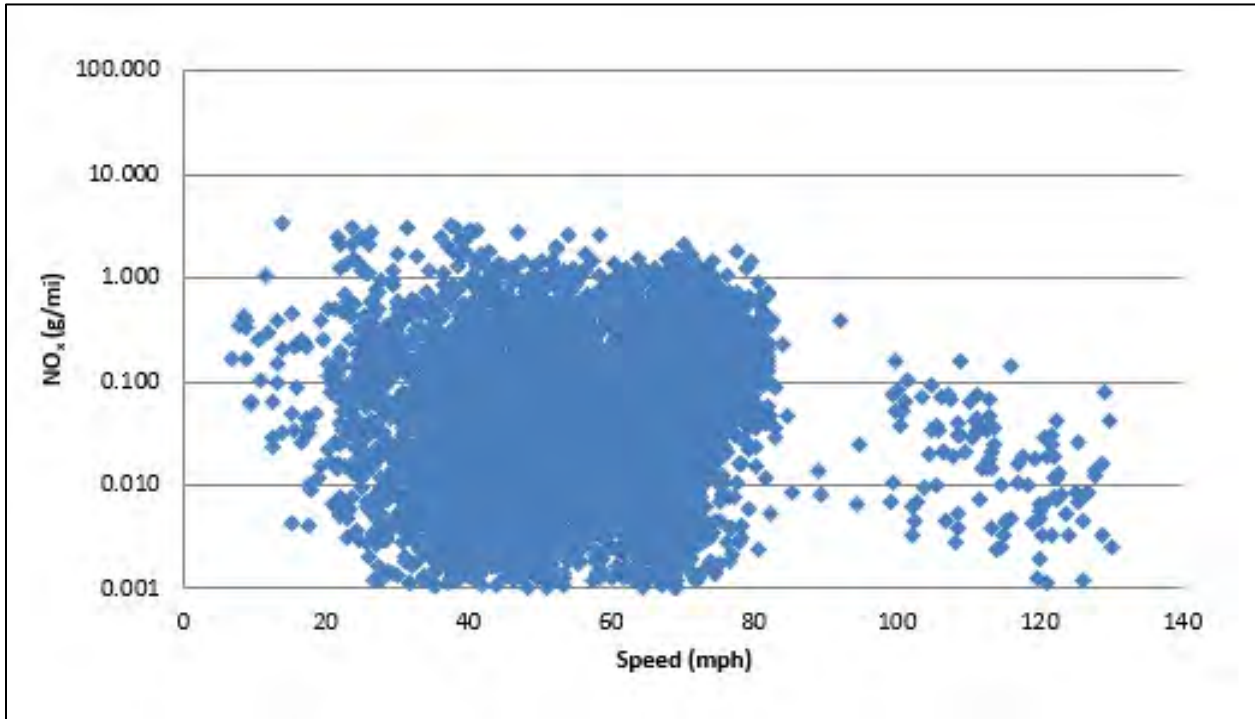


Figure D.4.4. Speed versus NO_x, All Speed Categories.

SPEED-GASES DATA PLOTS BY SPEED CATEGORY

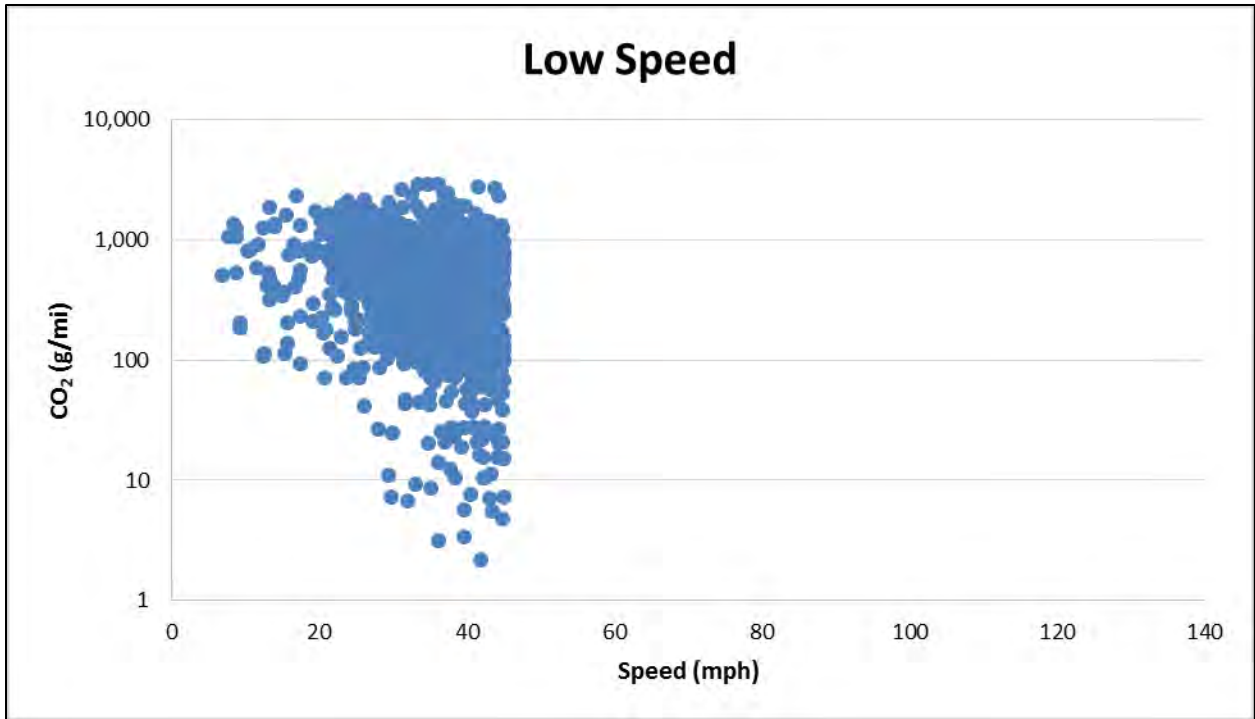


Figure D.5.1. Speed versus CO₂, Low Speed Category.

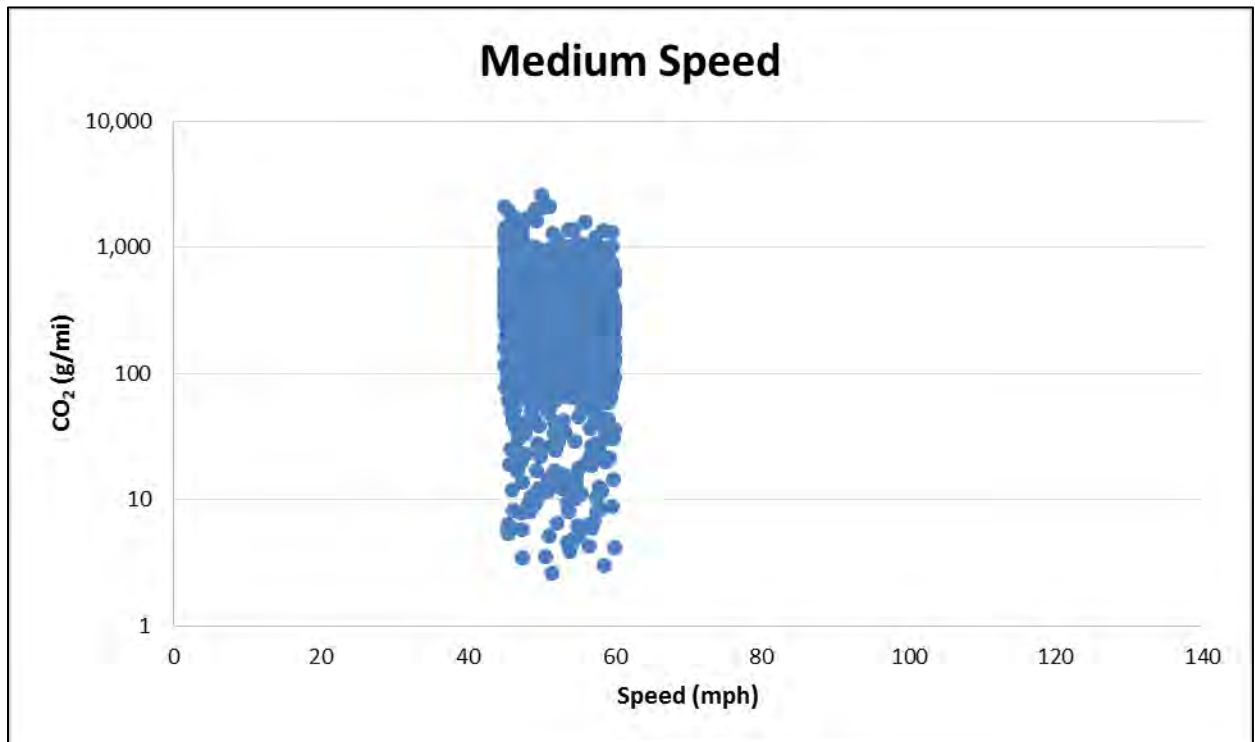


Figure D.5.2. Speed versus CO₂, Medium Speed Category.

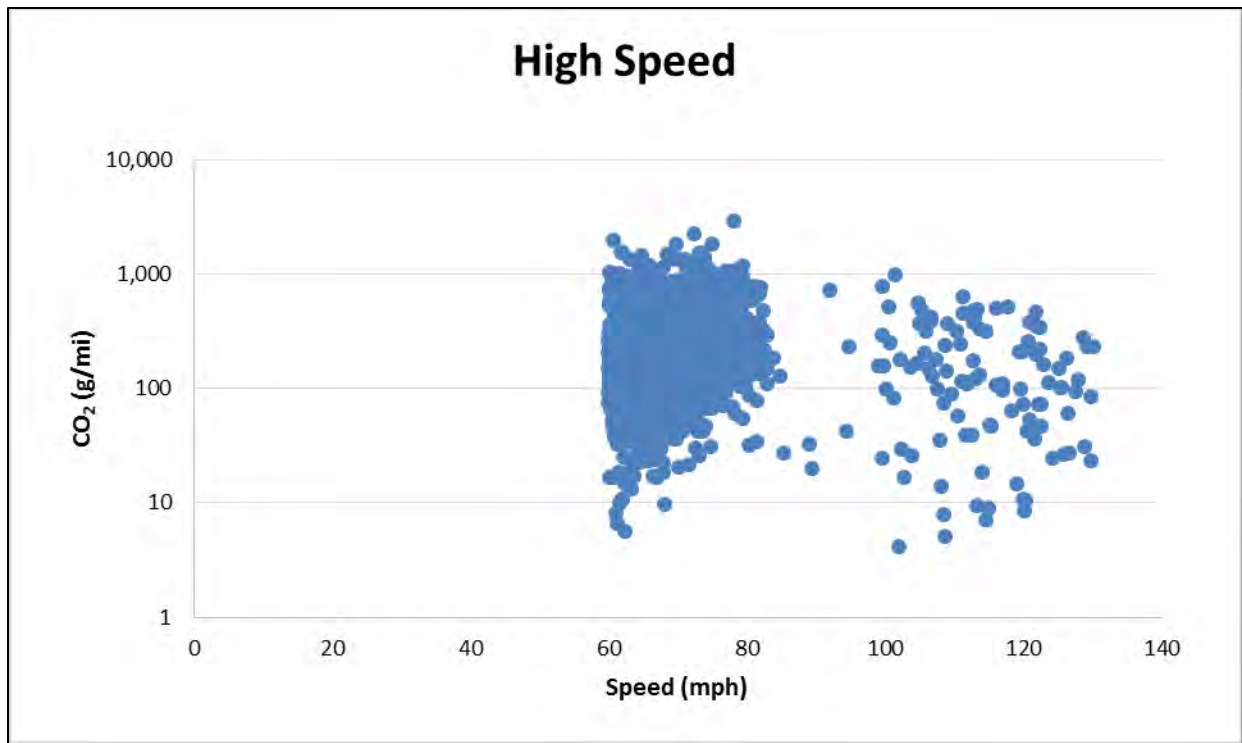


Figure D.5.3. Speed versus CO₂, High Speed Category.

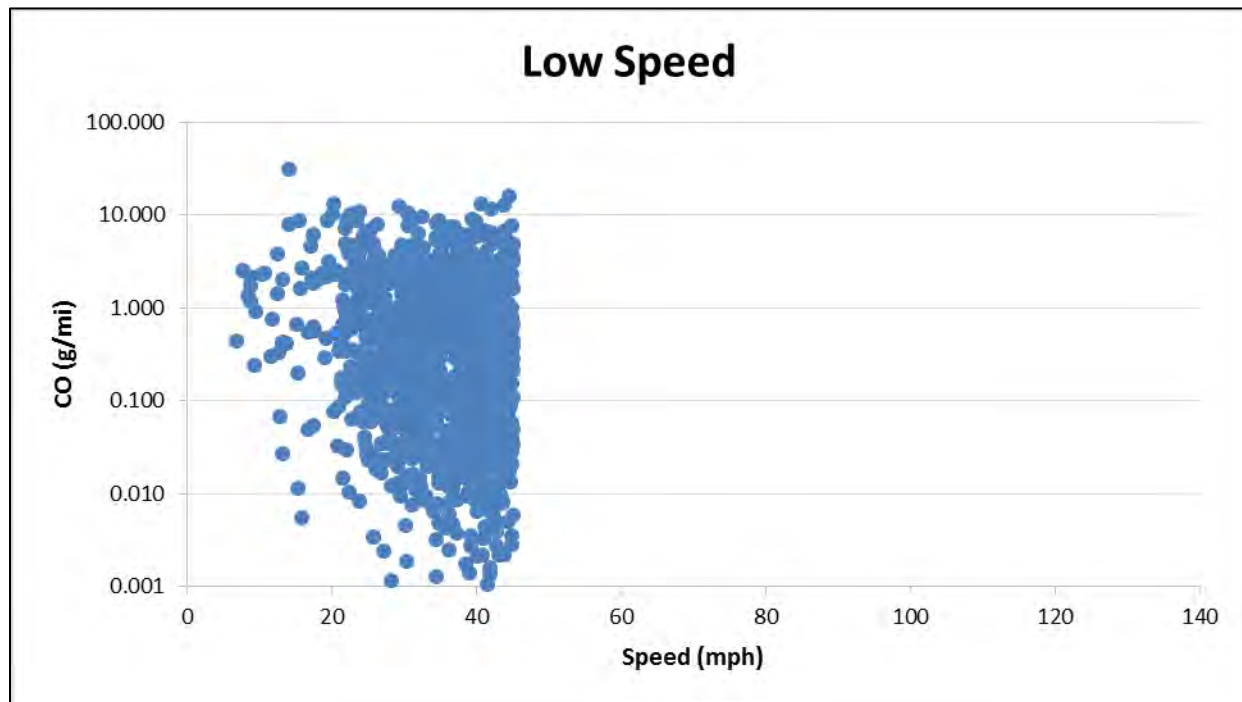


Figure D.5.4. Speed versus CO, Low Speed Category.

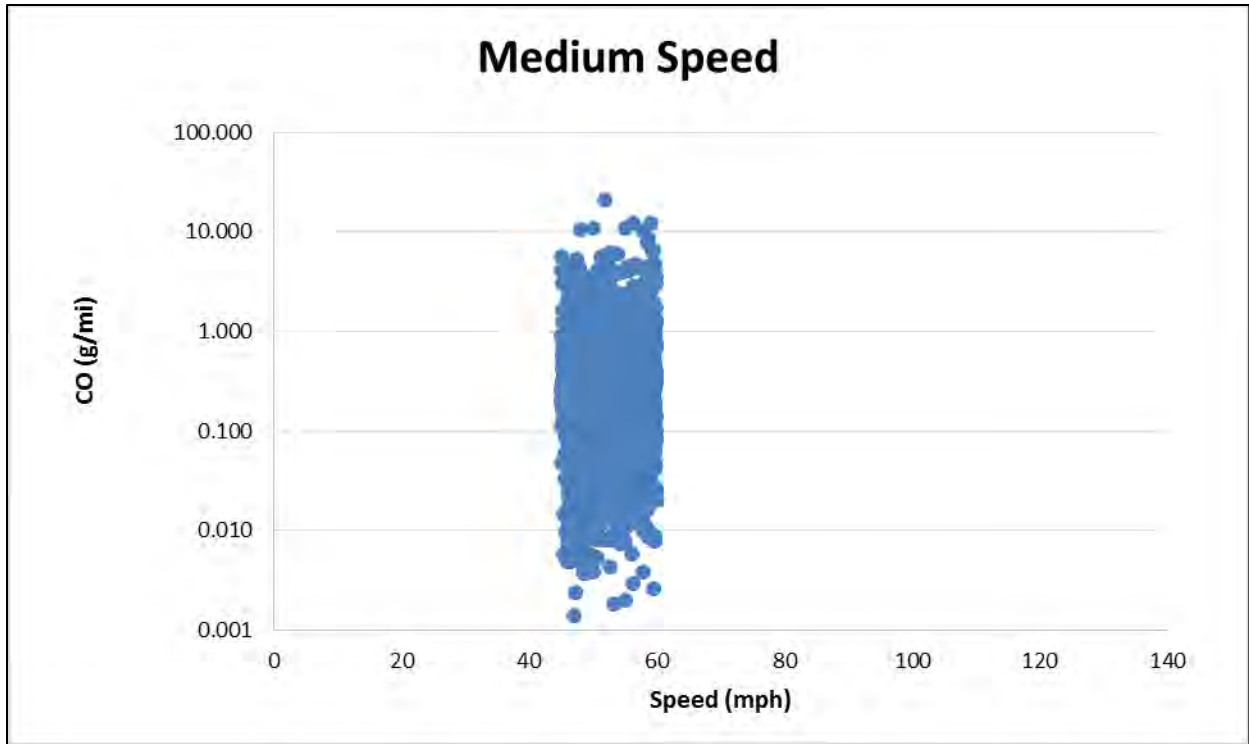


Figure D.5.5. Speed versus CO, Medium Speed Category.

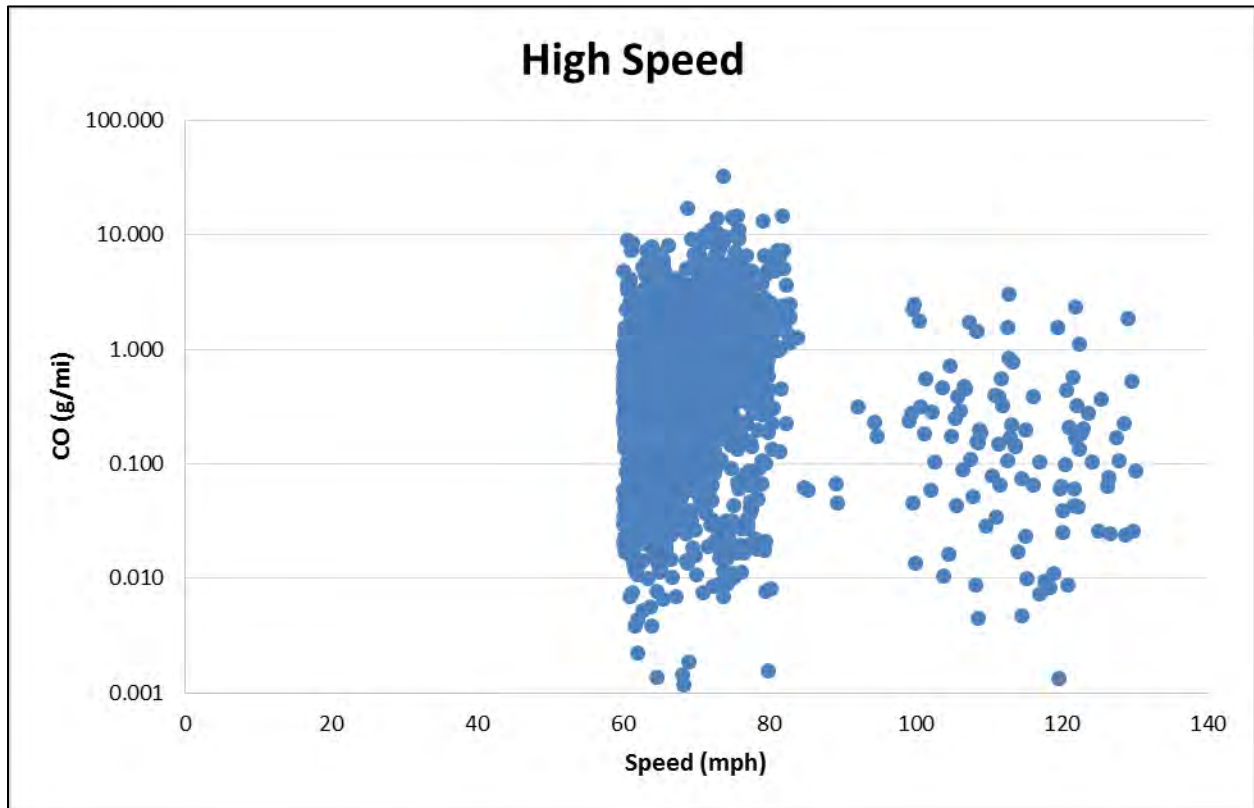


Figure D.5.6. Speed versus CO, High Speed Category.

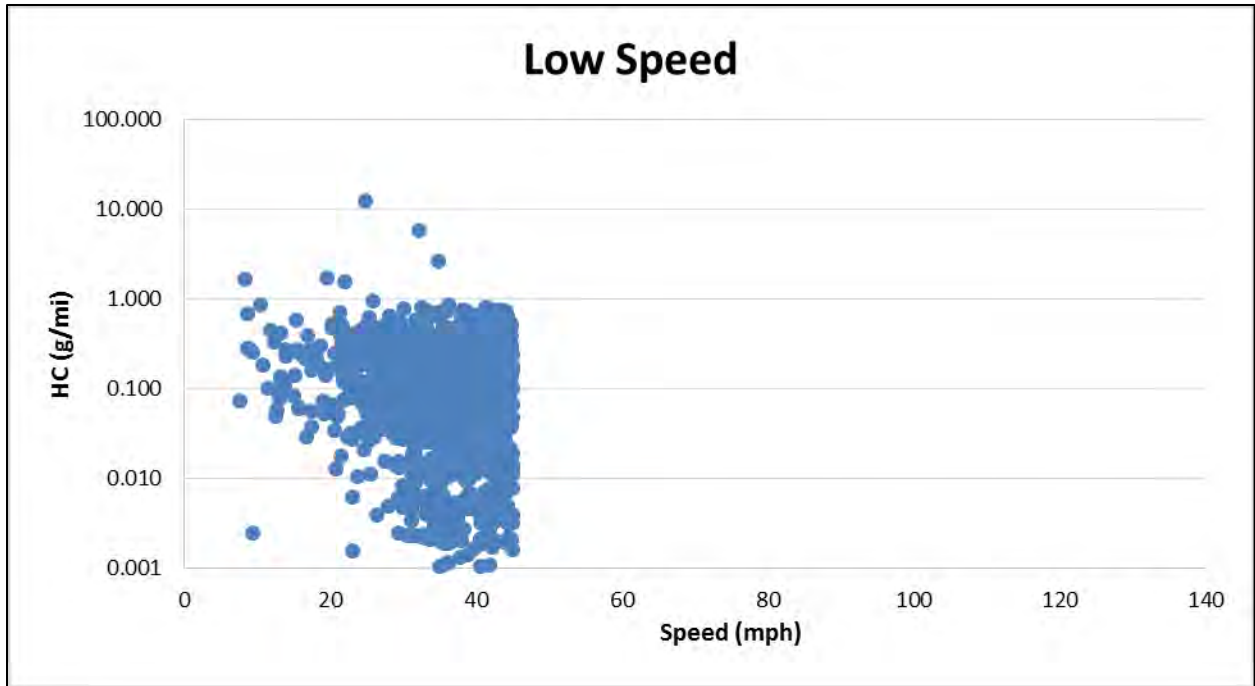


Figure D.5.7. Speed versus HC, Low Speed Category.

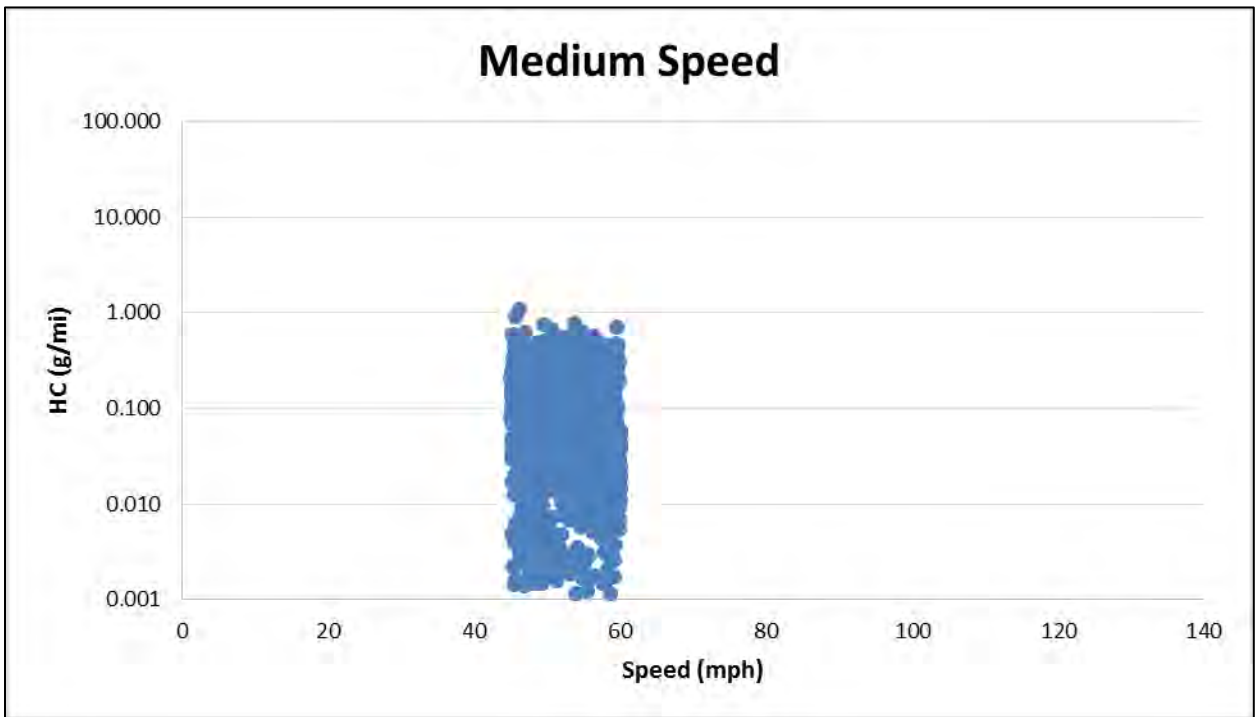


Figure D.5.8. Speed versus HC, Medium Speed Category.

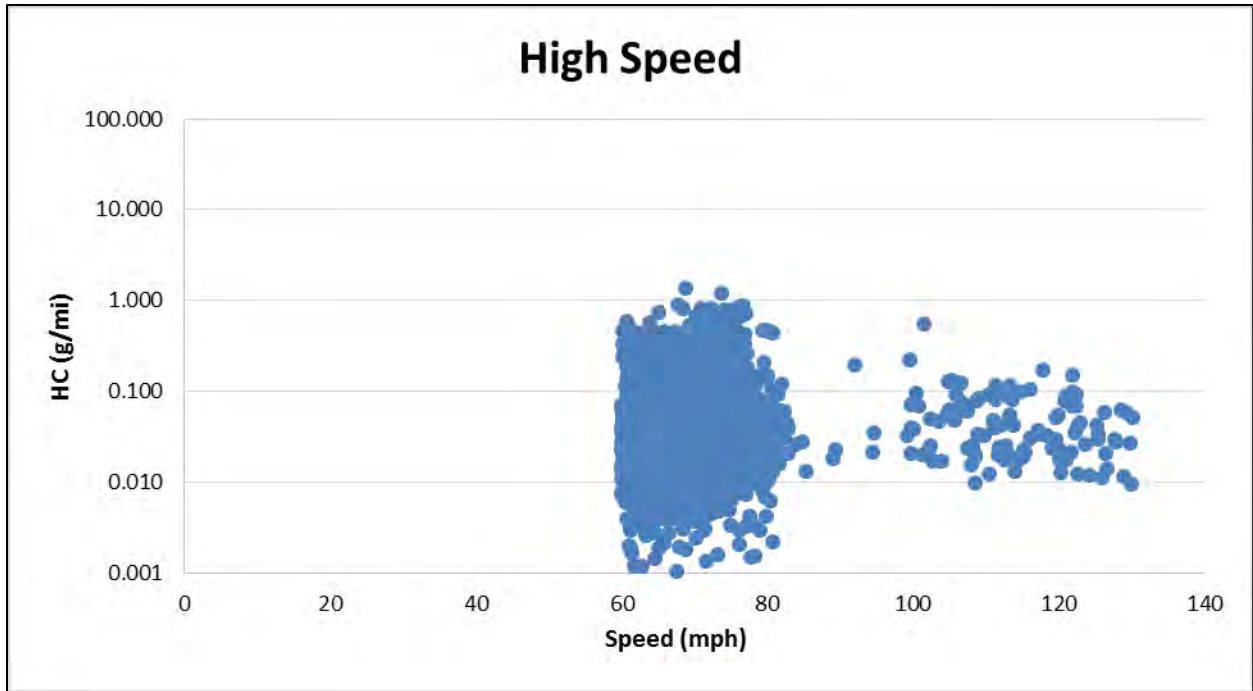


Figure D.5.9. Speed versus HC, High Speed Category.

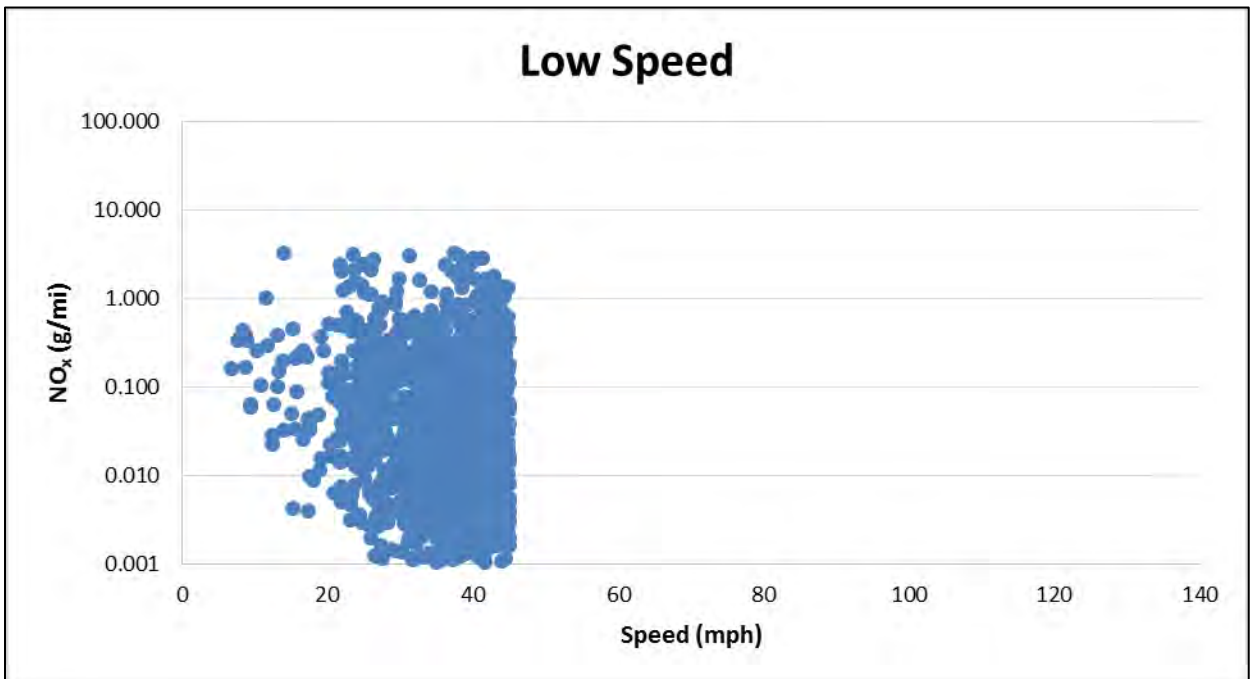


Figure D.5.10. Speed versus NO_x, Low Speed Category.

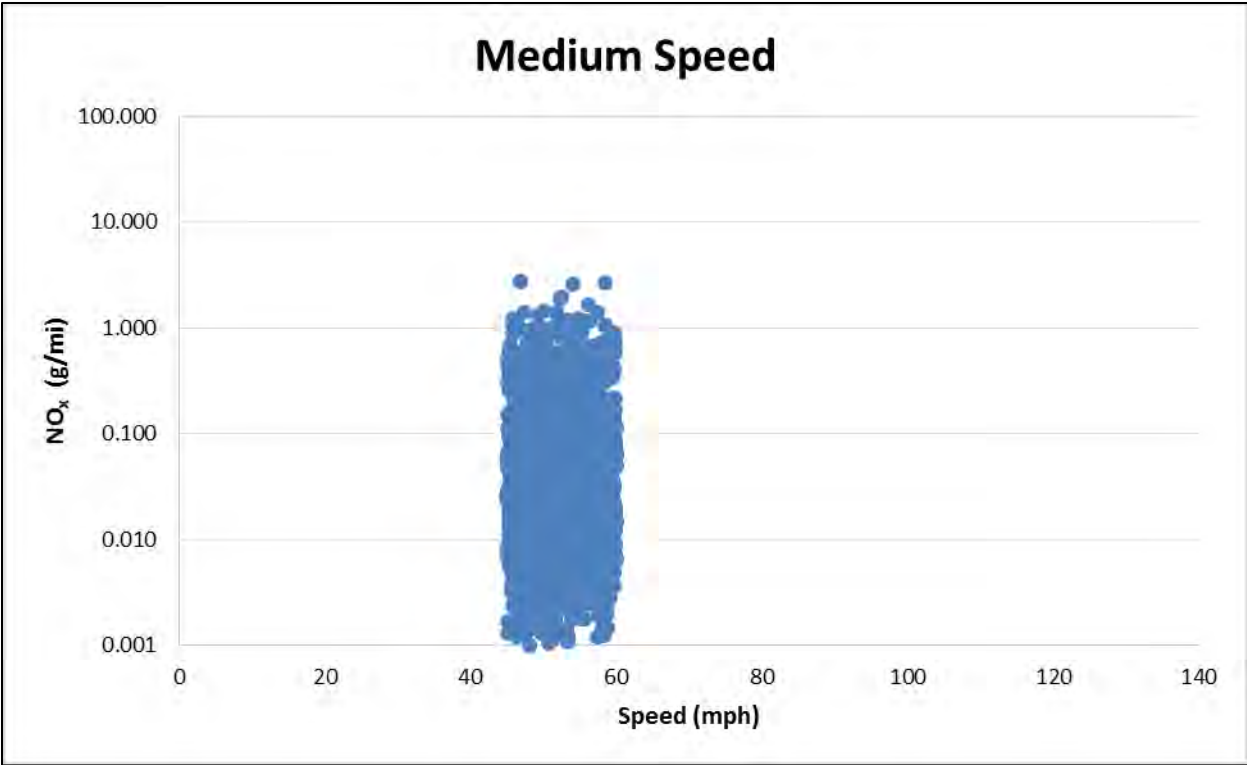


Figure D.5.11. Speed versus NO_x, Medium Speed Category.

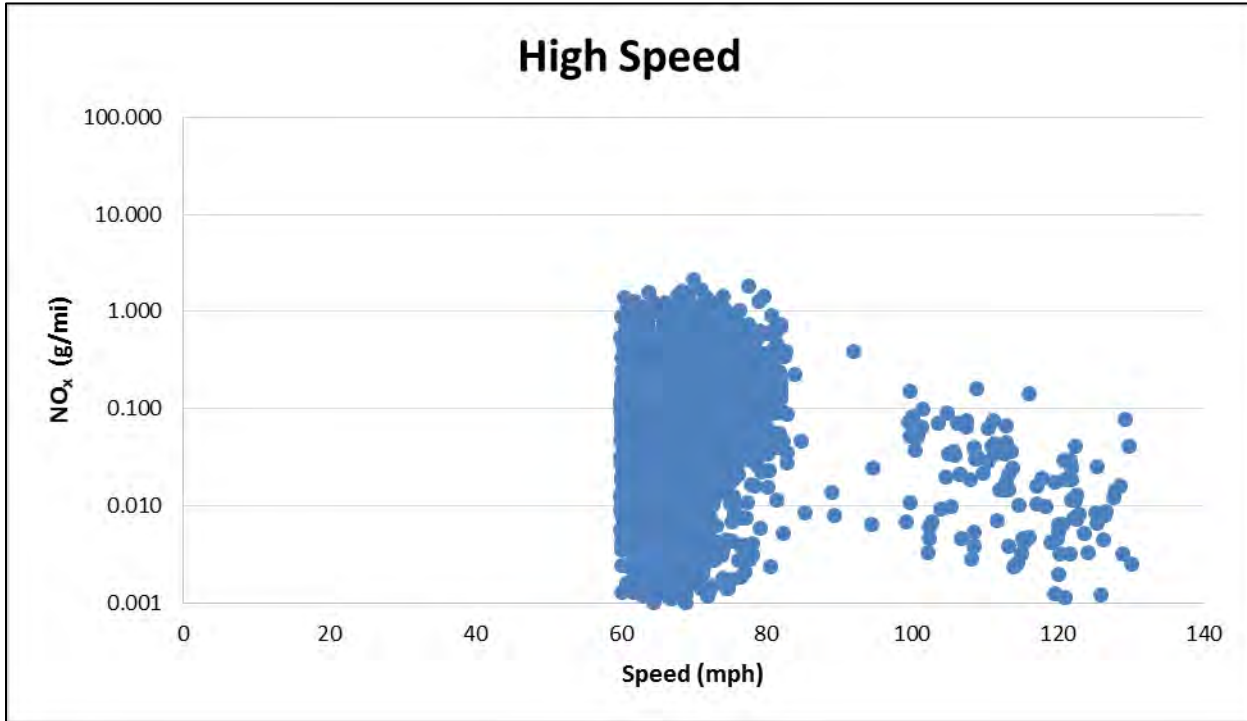


Figure D.5.12. Speed versus NO_x, High Speed Category.

IRI-PEMS BINS CLUSTERED ANALYSIS

RELATIONSHIP OF PAVEMENT CONDITION IRI AND GAS EMISSIONS

From the general descriptive statistics analysis, it was observed that individual PEMS measurements did not follow a clear pattern when compared to IRI. To study the relationship between pavement condition and CO₂, CO, HC, and NO_x dataset records were clustered by IRI bins of 5 inches/mile for further analysis. The mean gas emission values for each bin are shown in Table D.6.1.

Table D.6.1. Descriptive Statistics of Gas Emission Measurements Clustered by IRI Bins of 5 in/mile.

IRI Bins (in/mi)		Frequency	Mean CO ₂ (g/mi)	Mean CO (g/mi)	Mean HC (g/mi)	Mean NO _x (g/mi)	Avg. Speed (mph)
≥ 25	< 30	3	465.42	1.73	0.20	0.05	68.04
≥ 30	< 35	6	522.79	1.63	0.24	0.11	70.29
≥ 35	< 40	26	556.96	2.91	0.25	0.15	68.16
≥ 40	< 45	51	546.04	1.92	0.21	0.15	65.16
≥ 45	< 50	101	454.22	1.17	0.16	0.11	58.72
≥ 50	< 55	176	467.73	0.76	0.15	0.13	54.51
≥ 55	< 60	302	477.33	0.67	0.12	0.11	53.44
≥ 60	< 65	394	430.38	0.66	0.10	0.13	55.62
≥ 65	< 70	451	407.76	0.66	0.09	0.12	56.69
≥ 70	< 75	453	364.51	0.62	0.08	0.12	56.88
≥ 75	< 80	385	375.39	0.78	0.07	0.13	56.09
≥ 80	< 85	364	342.17	0.80	0.05	0.14	59.95
≥ 85	< 90	336	316.34	0.80	0.06	0.12	58.82
≥ 90	< 95	272	422.43	0.85	0.10	0.17	58.61
≥ 95	< 96	52	304.59	0.60	0.10	0.07	52.11
≥ 96	< 100	159	334.71	0.56	0.08	0.10	55.99
≥ 100	< 105	376	416.11	0.69	0.13	0.10	49.78
≥ 105	< 110	314	459.93	0.79	0.15	0.16	50.21
≥ 110	< 115	315	351.48	0.81	0.10	0.14	57.12
≥ 115	< 120	345	397.96	0.74	0.13	0.16	56.46
≥ 120	< 125	218	376.14	0.93	0.12	0.14	57.24
≥ 125	< 130	315	427.33	0.94	0.13	0.12	54.57
≥ 130	< 131	49	436.34	0.86	0.15	0.09	54.78
≥ 131	< 135	156	351.29	0.78	0.08	0.19	63.07
≥ 135	< 140	215	344.03	0.87	0.09	0.12	60.85
≥ 140	< 145	196	419.43	1.15	0.10	0.16	65.61
≥ 145	< 150	149	317.20	0.74	0.10	0.14	63.02

Table D.6.1. Descriptive Statistics of Gas Emissions Measurements Clustered by IRI Bins of 5 in/mile. (Continued)

IRI Bins (in/mi)		Frequency	Mean CO ₂ (g/mi)	Mean CO (g/mi)	Mean HC (g/mi)	Mean NO _x (g/mi)	Avg. Speed (mph)
≥ 150	< 155	183	366.35	0.72	0.16	0.12	64.42
≥ 155	< 160	211	461.54	0.92	0.09	0.16	58.02
≥ 160	< 165	193	384.28	0.64	0.08	0.14	58.16
≥ 165	< 170	131	397.40	0.81	0.09	0.18	60.84
≥ 170	< 190	408	340.05	0.75	0.08	0.16	62.72
≥ 190	< 210	206	423.59	0.81	0.08	0.17	61.89
≥ 210	< 230	101	264.26	0.57	0.05	0.11	64.66
≥ 230	< 250	55	244.57	0.61	0.04	0.12	68.62
≥ 250	< 270	74	422.64	0.79	0.10	0.11	65.55
≥ 270	< 290	69	250.40	0.56	0.08	0.07	79.20
≥ 290	< 310	2	695.59	0.67	0.04	0.20	66.88
≥ 310	< 330	20	807.62	1.54	0.25	0.09	48.54
≥ 330	< 350	20	574.25	1.40	0.24	0.19	48.53
≥ 350	< 390	26	889.66	1.49	0.23	0.09	67.01
≥ 390	< 410	7	93.74	0.31	0.02	0.04	59.98
≥ 430	< 450	8	166.47	0.34	0.04	0.05	62.04
Total		7893					

Figures D.6.1 to D.6.4 show the plots for the datasets from the bins analysis for CO₂, CO, HC, and NO_x respectively.

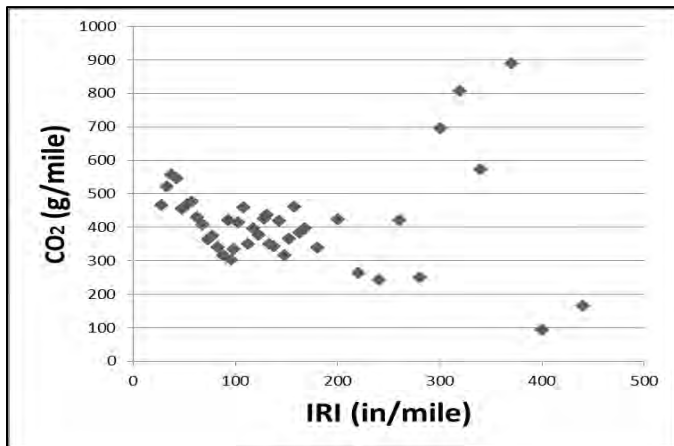


Figure D.6.1. IRI versus CO₂.

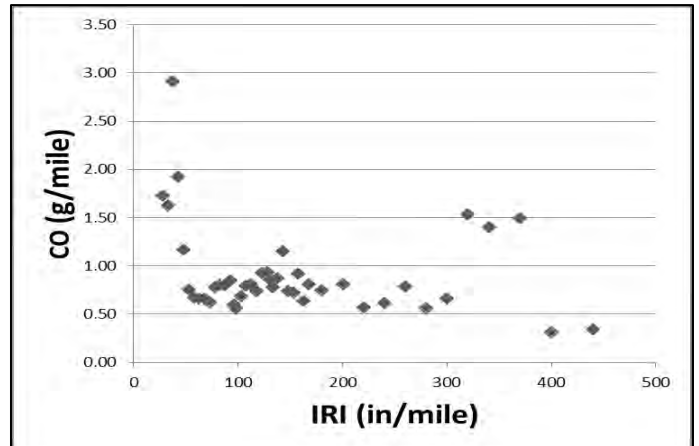


Figure D.6.2. IRI versus CO.

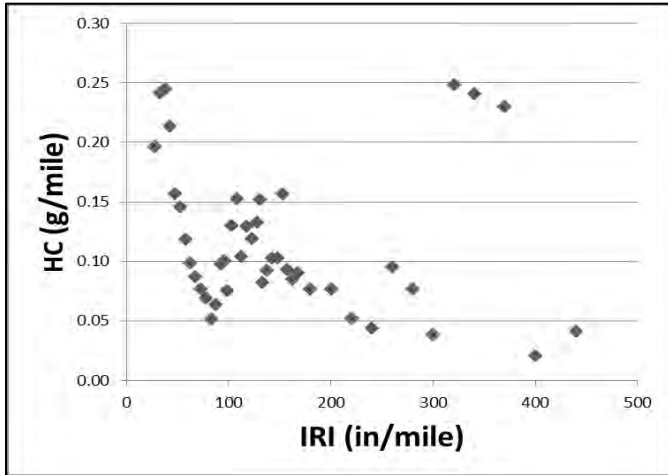


Figure D.6.3. IRI versus HC.

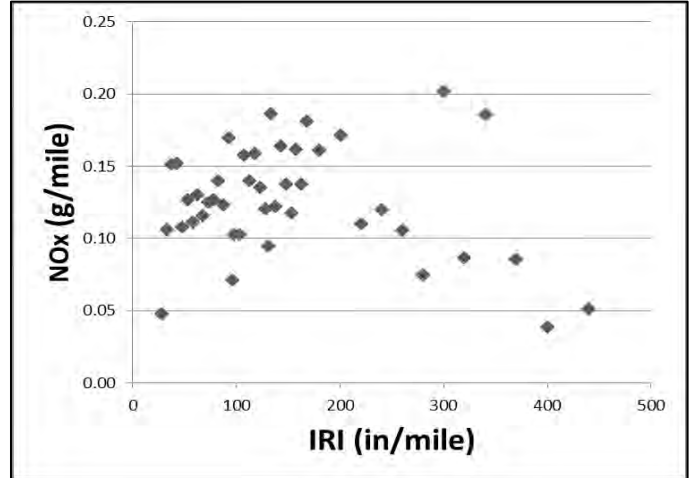


Figure D.6.4. IRI versus NO_x.

The datasets were analyzed to identify outliers, and a regression analysis was conducted with 90% of the dataset. The results of the analysis for each of the gases are shown in Figures D.6.5 to D.6.8.

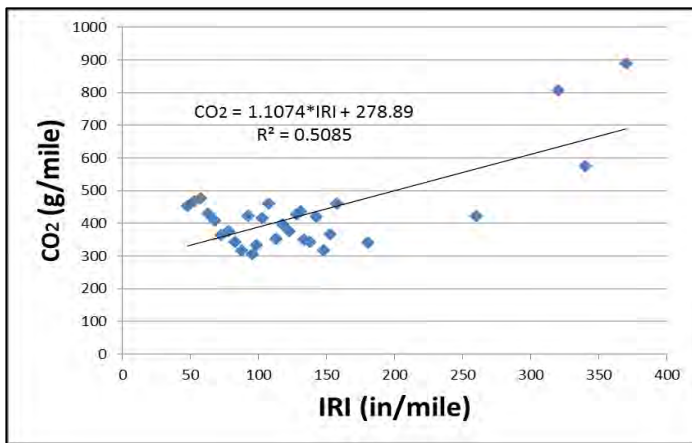


Figure D.6.5. IRI versus CO₂, 90% data.

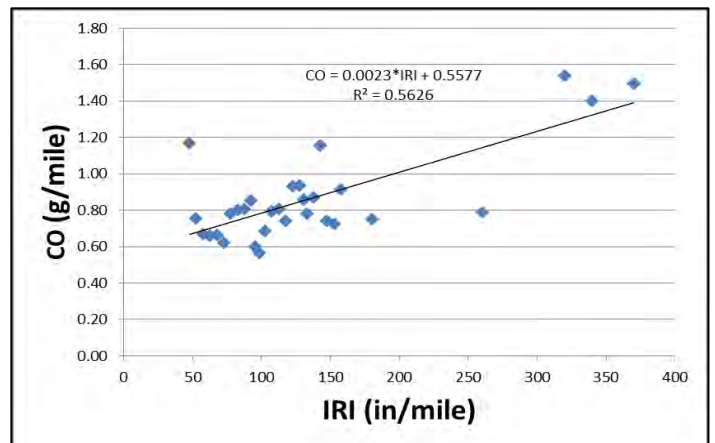


Figure D.6.6. IRI versus CO, 90% data.

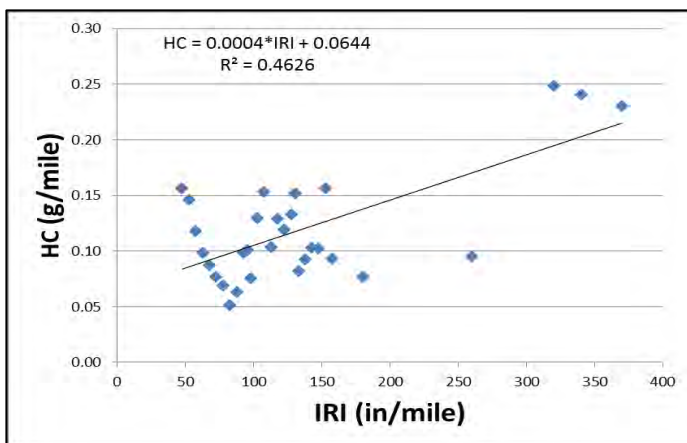


Figure D.6.7. IRI versus HC, 90% data.

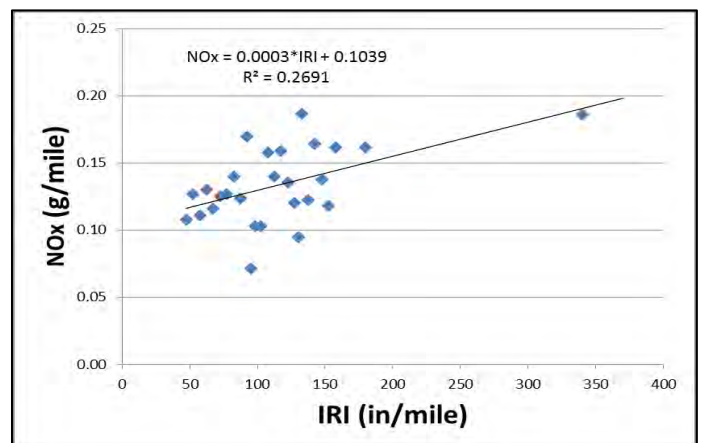


Figure D.6.8. IRI versus NO_x, 90% data

Influence of Speed in the Gas Emission

For additional analysis, gas emissions data for CO₂, CO, HC, and NO_x were clustered in speed bins of 5 mph and the mean values are shown in Table D.6.2.

Table D.6.2. Descriptive Statistics of Gas Emissions Clustered by Speed in Bins of 5 mph.

Speed Bins (mph)		Frequency	Mean Speed (mph)	Mean CO ₂ (g/mi)	Mean CO (g/mi)	Mean HC (g/mi)	Mean NO _x (g/mi)
5	10	8	8.50	773.35	1.32	0.41	0.25
10	15	15	12.65	758.73	3.61	0.24	0.40
15	20	23	17.24	706.85	2.16	0.25	0.12
20	25	105	22.96	916.02	1.76	0.32	0.30
25	30	190	27.55	706.06	0.90	0.16	0.18
30	35	284	32.71	519.24	1.04	0.14	0.10
35	40	470	37.70	489.51	0.71	0.11	0.14
40	45	606	42.51	479.83	0.67	0.13	0.13
45	50	871	47.71	466.37	0.50	0.13	0.10
50	55	632	52.42	403.63	0.59	0.12	0.12
55	60	608	57.62	302.81	0.60	0.08	0.11
60	65	1141	62.71	284.06	0.57	0.06	0.10
65	70	1333	67.47	312.98	0.66	0.08	0.14
70	75	1147	72.08	378.15	1.12	0.10	0.18
75	80	365	77.27	371.09	1.50	0.08	0.18
80	85	67	81.22	305.40	2.20	0.06	0.22
85	130	113	113.01	187.59	0.34	0.06	0.03
Total		7978					

Figures D.6.9 to D.6.12 show the plots for the datasets from the speed bins analysis for CO₂, CO, HC, and NO_x respectively.

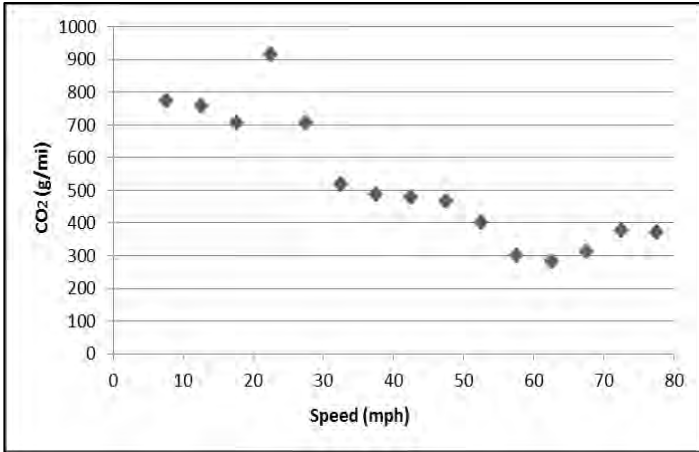


Figure D.6.9 Speed and CO₂.

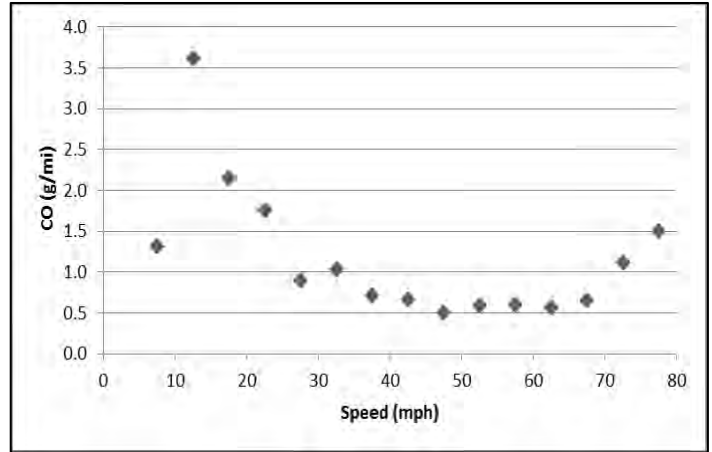


Figure D.6.10 Speed and CO.

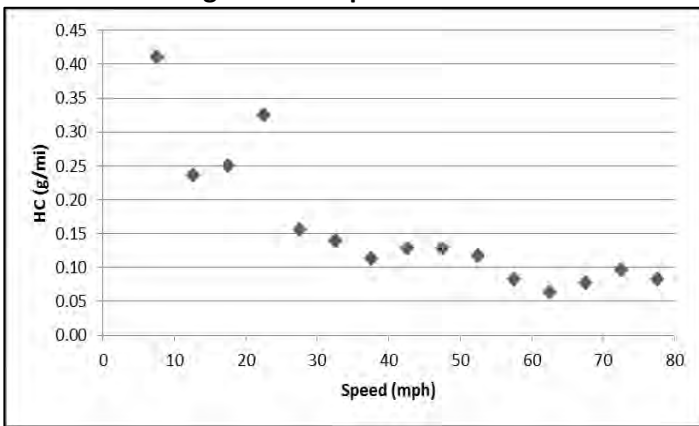


Figure D.6.11 Speed and HC.

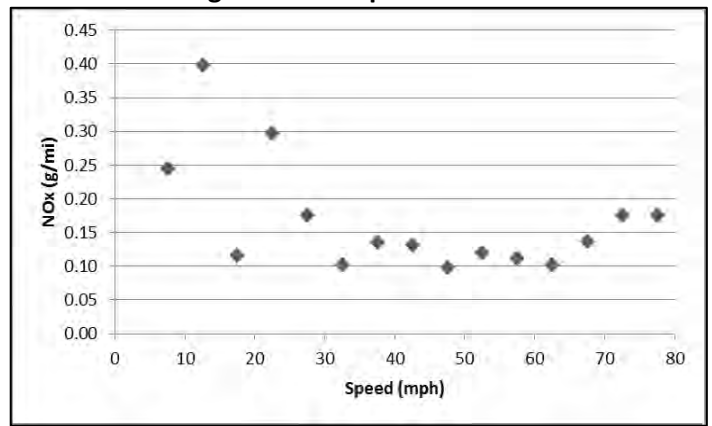


Figure D.6.12 Speed and NO_x.

The datasets were analyzed to identify outliers and a regression analysis with 90% of the dataset was conducted. Different trends for the Speed-Gas Emissions data were studied to finally select a polynomial equation. The results of the analysis for each of the gases are shown in Figures D.6.13 to D.6.16.

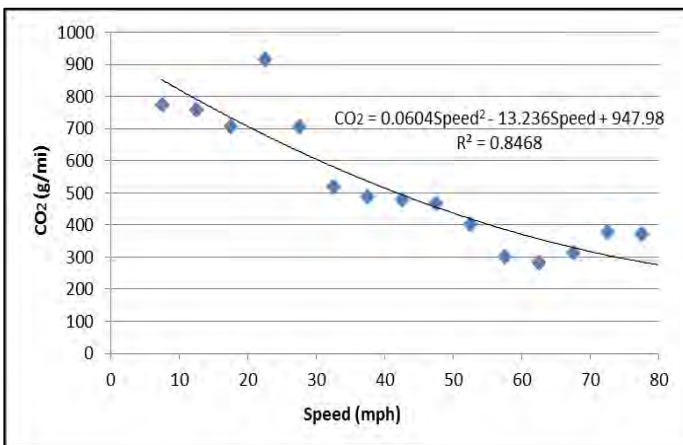


Figure D.6.13 Regression Analysis for Speed and CO₂.

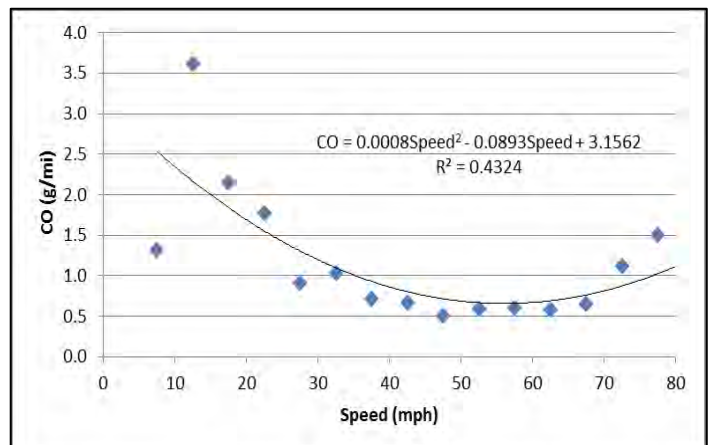


Figure D.6.14 Regression Analysis for Speed and CO.

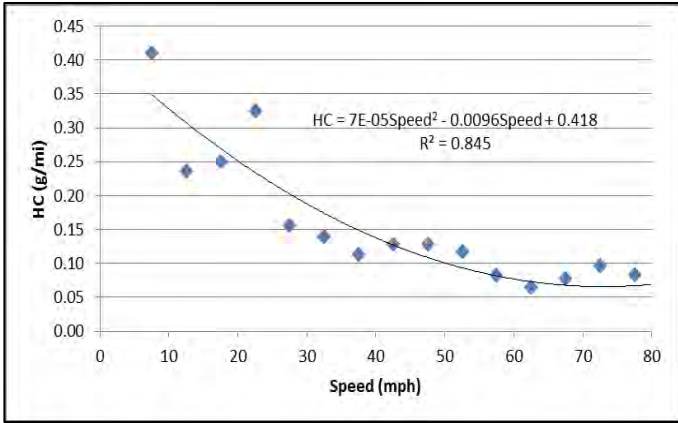


Figure D.6.15 Regression Analysis for Speed and HC.

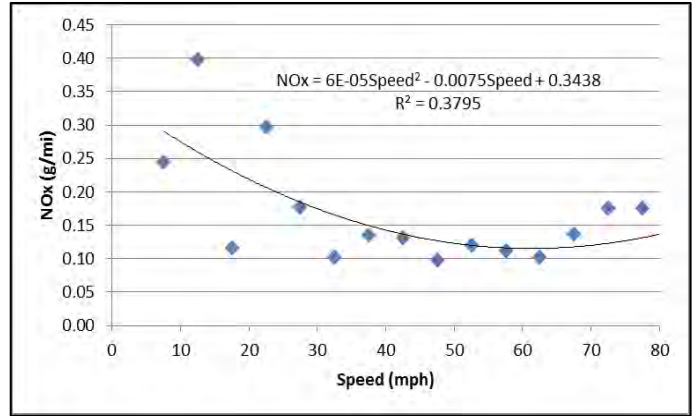


Figure D.6.16 Regression Analysis for Speed and NO_x.

APPENDIX E
HYPOTHESIS TEST REPORTS

Table E.1 ANOVA Gas Emission Hypothesis Test Results for different Pavement Conditions.

Gas Emissions	Pavement Condition	Very Good	Good	Fair	Poor	Very Poor	One Way ANOVA	
							F-Ratio	P-Value
CO ₂ (g/mi)	Frequency	665	2707	2091	1434	996	15.86	< 0.0001
	Mean	480.02	378.54	401.77	382.77	370.32		
	Std. Dev.	268.35	286.15	326.93	345.53	368.43		
CO (g/mi)	Frequency	665	2707	2091	1434	996	4.448	< 0.0014
	Mean	0.965	0.727	0.788	0.838	0.769		
	Std. Dev.	1.617	1.189	1.495	1.591	1.226		
HC (g/mi)	Frequency	665	2707	2091	1434	996	25.238	< 0.0001
	Mean	0.1451	0.0782	0.1251	0.1010	0.0840		
	Std. Dev.	0.1248	0.1090	0.2008	0.3585	0.1338		
NO _x (g/mi)	Frequency	665	2707	2091	1434	996	2.4424	< 0.0446
	Mean	0.1191	0.1297	0.1316	0.1493	0.1411		
	Std. Dev.	0.1865	0.2186	0.2687	0.2547	0.2879		

Table E.2. Comparison of CO₂ Emissions between Pavement Condition Categories.

CO ₂	Very Good	Good	Fair	Poor	Very Poor
Very Good		Significant	Significant	No Significant	Significant
Good	Significant		No Significant	No Significant	No Significant
Fair	Significant	No Significant		No Significant	No Significant
Poor	No Significant	Significant	No Significant		No Significant
Very Poor	Significant	No Significant	No Significant	No Significant	

Table E.3. Comparison of CO Emissions between Pavement Condition Categories.

CO	Very Good	Good	Fair	Poor	Very Poor
Very Good		Significant	Significant	Significant	Significant
Good	Significant		Significant	No Significant	No Significant
Fair	Significant	Significant		No Significant	Significant
Poor	Significant	No Significant	No Significant		No Significant
Very Poor	Significant	No Significant	Significant	No Significant	

Table E.4. Comparison of HC Emissions between Pavement Condition Categories.

HC	Very Good	Good	Fair	Poor	Very Poor
Very Good		Significant	Significant	Significant	Significant
Good	Significant		Significant	Significant	No Significant
Fair	Significant	Significant		Significant	Significant
Poor	Significant	Significant	Significant		Significant
Very Poor	Significant	No Significant	Significant	Significant	

Table E.5. Comparison of NO_x Emissions between Pavement Condition Categories.

NO _x	Very Good	Good	Fair	Poor	Very Poor
Very Good		No Significant	No Significant	Significant	No Significant
Good	No Significant		No Significant	Significant	No Significant
Fair	No Significant	No Significant		Significant	No Significant
Poor	Significant	Significant	Significant		No Significant
Very Poor	No Significant	No Significant	No Significant	No Significant	

StatTools Report
 Analysis: One-Way ANOVA
 Performed By: Chang, Abbas, Carlos M.
 Date: Monday, December 28, 2010
 Updating: Luz

One-Way ANOVA for CO₂ (g/mi) by Condition Category

ANOVA Summary

Total Sample Size	7893
Grand Mean	392.97
Pooled Std Dev	318.25
Pooled Variance	101284.23
Number of Samples	5
Confidence Level	95.00%

ANOVA Sample Stats

	CO ₂ (g/mi) (Very Good)	CO ₂ (g/mi) (Good)	CO ₂ (g/mi) (Fair)	CO ₂ (g/mi) (Poor)	CO ₂ (g/mi) (Very Poor)
Sample Size	665	2707	2091	1434	996
Sample Mean	480.02	378.54	401.77	382.77	370.32
Sample Std Dev	268.35	286.15	326.93	345.53	368.43
Sample Variance	72013.93	81883.85	106680.17	119394.10	135742.45
Pooling Weight	0.0842	0.3431	0.2650	0.1817	0.1261

One-Way ANOVA Table

	Sum of Squares	Degrees of Freedom	Mean Squares	F-Ratio	p-Value
Between Variation	6424867.93	4	1606216.98	15.86	< 0.0001
Within Variation	798929994.97	7888	101284.23		
Total Variation	805354862.89	7892			

Confidence Interval Tests

Difference of Means	No Correction		Bonferroni		Tukey		Scheffe		
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	
CO ₂ (g/mi) (Fair)-CO ₂ (g/mi) (Good)	23.23	5.067244585	41.39383366	-2.788014279	49.24709253	-2.045023	48.506101	-5.316699	51.777777
CO ₂ (g/mi) (Fair)-CO ₂ (g/mi) (Poor)	19.00	-2.392422804	40.38785617	-11.64087177	49.63630513	-10.76824	48.763671	-14.62115	52.616585
CO ₂ (g/mi) (Fair)-CO ₂ (g/mi) (Very Good)	-78.25	-106.0268773	-50.47900715	-118.0354862	-38.47039818	-116.902	-39.6035	-121.905	-34.6007
CO ₂ (g/mi) (Fair)-CO ₂ (g/mi) (Very Poor)	31.44	7.423099455	55.46025384	-2.961806423	65.84515972	-1.981943	64.865296	-6.308305	69.191658
CO ₂ (g/mi) (Good)-CO ₂ (g/mi) (Poor)	-4.23	-24.6088519	16.14320702	-33.41883037	24.95318549	-32.58757	24.121923	-36.25781	27.792169
CO ₂ (g/mi) (Good)-CO ₂ (g/mi) (Very Good)	-101.48	-128.4841476	-74.48281508	-140.1584185	-62.80854415	-139.057	-63.9101	-143.92	-59.0466
CO ₂ (g/mi) (Good)-CO ₂ (g/mi) (Very Poor)	8.21	-14.90890918	31.33118423	-24.90531766	41.32759271	-23.96211	40.384385	-28.12662	44.548899
CO ₂ (g/mi) (Poor)-CO ₂ (g/mi) (Very Good)	-97.25	-126.5195635	-67.98175429	-139.174552	-55.32676574	-137.98	-56.5208	-143.253	-51.2487
CO ₂ (g/mi) (Poor)-CO ₂ (g/mi) (Very Poor)	12.44	-13.28869163	38.17661156	-24.41471141	49.30263134	-23.36492	48.25284	-28.00003	52.887951
CO ₂ (g/mi) (Very Good)-CO ₂ (g/mi) (Very Poor)	109.69	78.45325589	140.9359818	64.94543604	154.4438017	66.21996	153.1693	60.59259	158.7966

Figure E.1. Hypothesis Test of CO₂ for Pavement Condition Categories.

StatTools Report	
Analysis:	One-Way ANOVA
Performed By:	Chang-Abbes, Carlos M
Date:	Wednesday, December 21, 2016
Updating:	Live

One-Way ANOVA for CO (g/mi) by Condition Category

ANOVA Summary	
Total Sample Size	7893
Grand Mean	0.789
Pooled Std Dev	1.395
Pooled Variance	1.947
Number of Samples	5
Confidence Level	95.00%

ANOVA Sample Stats	CO (g/mi) (Very Good)	CO (g/mi) (Good)	CO (g/mi) (Fair)	CO (g/mi) (Poor)	CO (g/mi) (Very Poor)
	All	All	All	All	All
Sample Size	665	2707	2091	1434	996
Sample Mean	0.965	0.727	0.788	0.838	0.769
Sample Std Dev	1.617	1.189	1.495	1.591	1.228
Sample Variance	2.616	1.413	2.234	2.533	1.504
Pooling Weight	0.0842	0.3431	0.2650	0.1817	0.1261

One-Way ANOVA Table	Sum of Squares	Degrees of Freedom	Mean Squares	F-Ratio	p-Value
Between Variation	34.644	4	8.661	4.448	0.0014
Within Variation	15357.634	7888	1.947		
Total Variation	15392.338	7892			

Confidence Interval Tests	Difference of Means	No Correction		Bonferroni		Tukey		Scheffe	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
CO (g/mi) (Fair)-CO (g/mi) (Good)	0.061	-0.018853408	0.140416327	-0.053285115	0.174848033	-0.050036	0.1715932	-0.064381	0.1859435
CO (g/mi) (Fair)-CO (g/mi) (Poor)	-0.050	-0.143658008	0.043907185	-0.184206765	0.084455941	-0.180381	0.08063	-0.197273	0.0975226
CO (g/mi) (Fair)-CO (g/mi) (Very Good)	-0.176	-0.298260486	-0.054717264	-0.350910846	-0.002066905	-0.34594	-0.00703	-0.367877	0.0148935
CO (g/mi) (Fair)-CO (g/mi) (Very Poor)	0.019	-0.086131804	0.124481552	-0.131663225	0.170012373	-0.127367	0.1657169	-0.146336	0.1846853
CO (g/mi) (Good)-CO (g/mi) (Poor)	-0.111	-0.19993219	-0.021320523	-0.238619552	0.01730581	-0.234975	0.0136612	-0.251067	0.029753
CO (g/mi) (Good)-CO (g/mi) (Very Good)	-0.237	-0.355651638	-0.118889031	-0.40683613	-0.067704538	-0.40201	-0.07253	-0.42333	-0.05121
CO (g/mi) (Good)-CO (g/mi) (Very Poor)	-0.042	-0.14297376	0.05976059	-0.186801859	0.103588688	-0.182666	0.0994533	-0.200925	0.1177121
CO (g/mi) (Poor)-CO (g/mi) (Very Good)	-0.127	-0.254939596	0.001712669	-0.310423932	0.057197005	-0.305189	0.0519618	-0.328304	0.0750766
CO (g/mi) (Poor)-CO (g/mi) (Very Poor)	0.069	-0.043771554	0.181872125	-0.092552303	0.230652874	-0.08795	0.2260502	-0.108272	0.2463723
CO (g/mi) (Very Good)-CO (g/mi) (Very Poor)	0.196	0.058689601	0.332637897	-0.000533875	0.391861374	0.005054	0.386273	-0.019618	0.4109459

Figure E.2. Hypothesis Test of CO for Pavement Condition Categories.

StatTools Report	
Analysis:	One-Way ANOVA
Performed By:	Chang-Abbes, Carlos M
Date:	Wednesday, December 21, 2016
Updating:	Live

One-Way ANOVA for HC (g/mi) by Condition Category

ANOVA Summary	
Total Sample Size	7893
Grand Mean	0.1011
Pooled Std Dev	0.2041
Pooled Variance	0.0417
Number of Samples	5
Confidence Level	95.00%

ANOVA Sample Stats	HC (g/mi) (Very Good)	HC (g/mi) (Good)	HC (g/mi) (Fair)	HC (g/mi) (Poor)	HC (g/mi) (Very Poor)
	All	All	All	All	All
Sample Size	665	2707	2091	1434	996
Sample Mean	0.1451	0.0782	0.1251	0.1010	0.0840
Sample Std Dev	0.1248	0.1090	0.2008	0.3585	0.1338
Sample Variance	0.0156	0.0119	0.0403	0.1285	0.0179
Pooling Weight	0.0842	0.3431	0.2650	0.1817	0.1261

One-Way ANOVA Table	Sum of Squares	Degrees of Freedom	Mean Squares	F-Ratio	p-Value
Between Variation	4.2074	4	1.0519	25.2398	< 0.0001
Within Variation	328.7283	7888	0.0417		
Total Variation	332.9358	7892			

Confidence Interval Tests	Difference of Means	No Correction		Bonferroni		Tukey		Scheffe	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
HC (g/mi) (Fair)-HC (g/mi) (Good)	0.0469	0.035255	0.058557	0.030218	0.0635944	0.030693	0.063119	0.028594	0.065218
HC (g/mi) (Fair)-HC (g/mi) (Poor)	0.0241	0.010357	0.037798	0.004424	0.0437307	0.004984	0.043171	0.002513	0.045642
HC (g/mi) (Fair)-HC (g/mi) (Very Good)	-0.0201	-0.03788	-0.00224	-0.045579	0.005458213	-0.044852	0.0047314	-0.048061	0.0079405
HC (g/mi) (Fair)-HC (g/mi) (Very Poor)	0.0411	0.025707	0.056521	0.019046	0.063182	0.019674	0.062553	0.016899	0.065329
HC (g/mi) (Good)-HC (g/mi) (Poor)	-0.0228	-0.0359	-0.00976	-0.04155	-0.004107	-0.04102	-0.00464	-0.04337	-0.00229
HC (g/mi) (Good)-HC (g/mi) (Very Good)	-0.0670	-0.08429	-0.04965	-0.09177	-0.042158	-0.09107	-0.04286	-0.09419	-0.03975
HC (g/mi) (Good)-HC (g/mi) (Very Poor)	-0.0058	-0.020623	0.0090382	-0.0270348	0.015450416	-0.02643	0.0148454	-0.029101	0.0175167
HC (g/mi) (Poor)-HC (g/mi) (Very Good)	-0.0441	-0.06291	-0.02536	-0.07103	-0.017246	-0.07026	-0.01801	-0.07365	-0.01463
HC (g/mi) (Poor)-HC (g/mi) (Very Poor)	0.0170	0.00053	0.033543	-0.0066068	0.040679347	-0.005933	0.040006	-0.008907	0.0429792
HC (g/mi) (Very Good)-HC (g/mi) (Very Poor)	0.0612	0.041134	0.081214	0.03247	0.0898787	0.033287	0.089061	0.029678	0.092671

Figure E.3. Hypothesis Test of HC for Pavement Condition Categories.

One-Way ANOVA for NO_x (g/mi) by Condition Category

ANOVA Summary	
Total Sample Size	7893
Grand Mean	0.1343
Pooled Std Dev	0.2464
Pooled Variance	0.0607
Number of Samples	5
Confidence Level	95.00%

ANOVA Sample Stats	NO _x (g/mi) (Very Good)	NO _x (g/mi) (Good)	NO _x (g/mi) (Fair)	NO _x (g/mi) (Poor)	NO _x (g/mi) (Very Poor)
	All	All	All	All	All
Sample Size	665	2707	2091	1434	996
Sample Mean	0.1191	0.1297	0.1316	0.1493	0.1411
Sample Std Dev	0.1865	0.2186	0.2687	0.2547	0.2879
Sample Variance	0.0348	0.0478	0.0722	0.0649	0.0829
Pooling Weight	0.0842	0.3431	0.2650	0.1817	0.1261

One-Way ANOVA Table	Sum of Squares	Degrees of Freedom	Mean Squares	F-Ratio	p-Value
Between Variation	0.5929	4	0.1482	2.4424	#N/A
Within Variation	478.7141	7888	0.0607		
Total Variation	479.3070	7892			

Confidence Interval Tests	Difference of Means	No Correction		Bonferroni		Tukey		Scheffe	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
NO _x (g/mi) (Fair)-NO _x (g/mi) (Good)	0.0019	-0.012115934	0.016003556	-0.018195015	0.022082577	-0.017621	0.021509	-0.020154	0.0240415
NO _x (g/mi) (Fair)-NO _x (g/mi) (Poor)	-0.0176	-0.034206141	-0.00109094	-0.041365145	0.006068061	-0.04069	0.0053926	-0.043672	0.008375
NO _x (g/mi) (Fair)-NO _x (g/mi) (Very Good)	0.0125	-0.009024468	0.033973818	-0.018320047	0.043269397	-0.017443	0.0423923	-0.021316	0.0462649
NO _x (g/mi) (Fair)-NO _x (g/mi) (Very Poor)	-0.0095	-0.02806737	0.00911705	-0.036106079	0.017155759	-0.035348	0.0163973	-0.038637	0.0197462
NO _x (g/mi) (Good)-NO _x (g/mi) (Poor)	-0.0196	-0.035364923	-0.00381972	-0.042184516	0.002399872	-0.041541	0.0023564	-0.044382	0.0051975
NO _x (g/mi) (Good)-NO _x (g/mi) (Very Good)	0.0105	-0.01036968	0.031431469	-0.019406456	0.040468244	-0.018554	0.0396156	-0.022319	0.0433803
NO _x (g/mi) (Good)-NO _x (g/mi) (Very Poor)	-0.0114	-0.029315619	0.006477738	-0.037053602	0.014215721	-0.036323	0.0134856	-0.039547	0.0167093
NO _x (g/mi) (Poor)-NO _x (g/mi) (Very Good)	0.0301	0.007466854	0.052779581	-0.002329072	0.062575507	-0.001405	0.0616512	-0.005486	0.0657322
NO _x (g/mi) (Poor)-NO _x (g/mi) (Very Poor)	0.0082	-0.011745852	0.028092417	-0.02035804	0.036704804	-0.019545	0.0358922	-0.023133	0.0394801
NO _x (g/mi) (Very Good)-NO _x (g/mi) (Very Poor)	-0.0219	-0.046133032	0.002233362	-0.056589114	0.012689444	-0.055603	0.0117029	-0.059959	0.0160589

Figure E.4. Hypothesis Test of NO_x for Pavement Condition Categories.

Table E.6. ANOVA Gas Emission Hypothesis Test Results for Different Speed Categories.

Gas Emissions	Speed	High	Medium	Low	One Way ANOVA	
					F-Ratio	P-Value
CO ₂ (g/mi)	Frequency	4165	2087	1641	338.54	< 0.0001
	Mean	324.32	401.15	556.82		
	Std. Dev.	240.69	290.19	444.92		
CO (g/mi)	Frequency	4165	2087	1641	39.043	< 0.0001
	Mean	0.852	0.562	0.918		
	Std. Dev.	1.315	1.082	1.848		
HC (g/mi)	Frequency	4165	2087	1641	67.1759	< 0.0001
	Mean	0.0786	0.1112	0.1456		
	Std. Dev.	0.1122	0.1250	0.3844		
NO _x (g/mi)	Frequency	4165	2087	1641	14.8475	< 0.0001
	Mean	0.1398	0.1102	0.1509		
	Std. Dev.	0.1945	0.2273	0.3597		

Table E.7. Comparison of CO₂ Emissions between Speed Categories.

CO ₂	High	Medium	Low
High		Significant	Significant
Medium	Significant		Significant
Low	Significant	Significant	

Table E.8. Comparison of CO Emissions between Speed Categories.

CO	High	Medium	Low
High		Significant	No Significant
Medium	Significant		Significant
Low	No Significant	Significant	

Table E.9. Comparison of HC Emissions between Speed Categories.

HC	High	Medium	Low
High		Significant	Significant
Medium	Significant		Significant
Low	Significant	Significant	

Table E.10. Comparison of NO_x Emissions between Speed Categories.

NO _x	High	Medium	Low
High		Significant	No Significant
Medium	Significant		Significant
Low	No Significant	Significant	

StatTools Report									
Analysis: One-Way ANOVA Performed By: Chang Albitras, Carlos M. Date: Wednesday, December 21, 2016 Updating: Live									
One-Way ANOVA for CO2 (g/mi) by Speed Category									
ANOVA Summary									
Total Sample Size	7893								
Grand Mean	392.97								
Pooled Std Dev	306.57								
Pooled Variance	93983.81								
Number of Samples	3								
Confidence Level	95.00%								
ANOVA Sample Stats									
	CO2 (g/mi) (High)	CO2 (g/mi) (Medium)	CO2 (g/mi) (Low)						
	All	All	All						
Sample Size	4165	2087	1641						
Sample Mean	324.32	401.15	556.82						
Sample Std Dev	240.69	290.19	444.92						
Sample Variance	57932.73	84207.79	197953.00						
Pooling Weight	0.5278	0.2644	0.2079						
OneWay ANOVA Table									
	Sum of Squares	Degrees of Freedom	Mean Squares	F-Ratio	p-Value				
Between Variation	63822611.73	2	31911305.86	339.54	< 0.0001				
Within Variation	741532251.16	7890	93983.81						
Total Variation	805354862.89	7892							
Confidence Interval Tests									
	Difference of Means	No Correction		Bonferroni		Tukey		Scheffe	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
CO2 (g/mi) {High}-CO2 (g/mi) {Low}	-232.50	-250.0125682	-214.9819375	-253.892453	-211.102052	-253.439053	-211.555453	-254.372461	-210.622045
CO2 (g/mi) {High}-CO2 (g/mi) {Medium}	-76.83	-92.94403033	-60.7101943	-96.514151	-57.1400736	-96.0969496	-57.557275	-96.9558355	-56.6983891
CO2 (g/mi) {Low}-CO2 (g/mi) {Medium}	155.67	135.842836	175.497445	131.4508133	179.8894677	131.9640616	179.3762195	130.9074456	180.4328355

Figure E.5. Hypothesis Test of CO₂ for Speed Categories.

StatTools Report

Analysis: One-Way ANOVA
 Performed By: Chang Albitres, Carlos M
 Date: Wednesday, December 21, 2016
 Updating: Live

One-Way ANOVA for CO (g/mi) by Speed Category

ANOVA Summary

Total Sample Size	7893
Grand Mean	0.789
Pooled Std Dev	1.390
Pooled Variance	1.932
Number of Samples	3
Confidence Level	95.00%

ANOVA Sample Stats	CO (g/mi) (High)	CO (g/mi) (Medium)	CO (g/mi) (Low)
	All	All	All
Sample Size	4165	2087	1641
Sample Mean	0.852	0.562	0.918
Sample Std Dev	1.315	1.082	1.848
Sample Variance	1.729	1.171	3.415
Pooling Weight	0.5278	0.2644	0.2079

OneWay ANOVA Table	Sum of Squares	Degrees of Freedom	Mean Squares	F-Ratio	p-Value
Between Variation	150.844	2	75.422	39.043	< 0.0001
Within Variation	15241.494	7890	1.932		
Total Variation	15392.338	7892			

Confidence Interval Tests	Difference of Means	No Correction		Bonferroni		Tukey		Scheffe	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
CO (g/mi) {High}-CO (g/mi) {Low}	-0.066	-0.145318111	0.013498786	-0.16290818	0.031088858	-0.16085262	0.029033296	-0.16508437	0.033265048
CO (g/mi) {High}-CO (g/mi) {Medium}	0.289	0.21640548	0.362542667	0.200219774	0.378728373	0.202111223	0.376836925	0.198217328	0.38073082
CO (g/mi) {Low}-CO (g/mi) {Medium}	0.355	0.26549352	0.445273953	0.245581591	0.465185881	0.247908483	0.46285899	0.243118148	0.467649325

Figure E.6. Hypothesis Test of CO for Speed Categories.

StatTools Report

Analysis: One-Way ANOVA
 Performed By: Chang Albitres, Carlos M
 Date: Wednesday, December 21, 2016
 Updating: Live

One-Way ANOVA for HC (g/mi) by Speed Category

ANOVA Summary

Total Sample Size	7893
Grand Mean	0.1011
Pooled Std Dev	0.2037
Pooled Variance	0.0415
Number of Samples	3
Confidence Level	95.00%

ANOVA Sample Stats	HC (g/mi) (High)	HC (g/mi) (Medium)	HC (g/mi) (Low)
	All	All	All
Sample Size	4165	2087	1641
Sample Mean	0.0786	0.1112	0.1456
Sample Std Dev	0.1122	0.1250	0.3844
Sample Variance	0.0126	0.0156	0.1478
Pooling Weight	0.5278	0.2644	0.2079

OneWay ANOVA Table	Sum of Squares	Degrees of Freedom	Mean Squares	F-Ratio	p-Value
Between Variation	5.5743	2	2.7872	67.1759	< 0.0001
Within Variation	327.3614	7890	0.0415		
Total Variation	332.9358	7892			

Confidence Interval Tests	Difference of Means	No Correction		Bonferroni		Tukey		Scheffe	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
HC (g/mi) {High}-HC (g/mi) {Low}	-0.0670	-0.078650264	-0.055374889	-0.08122817	-0.05279698	-0.08092692	-0.05309823	-0.0815471	-0.05247805
HC (g/mi) {High}-HC (g/mi) {Medium}	-0.0326	-0.043344594	-0.021927492	-0.04571669	-0.0195554	-0.04543949	-0.0198326	-0.04601015	-0.01926193
HC (g/mi) {Low}-HC (g/mi) {Medium}	0.0344	0.021202693	0.047550374	0.018284504	0.050468562	0.018625522	0.050127545	0.017923475	0.050829591

Figure E.7. Hypothesis Test of HC for Speed Categories.

StatTools Report

Analysis: One-Way ANOVA
 Performed By: Chang Albitras, Carlos M.
 Date: Wednesday, December 21, 2016
 Updating: Live

One-Way ANOVA for NO_x (g/mi) by Speed Category

ANOVA Summary

Total Sample Size	7893
Grand Mean	0.1343
Pooled Std Dev	0.2460
Pooled Variance	0.0605
Number of Samples	3
Confidence Level	95.00%

ANOVA Sample Stats	NO _x (g/mi) (High)	NO _x (g/mi) (Medium)	NO _x (g/mi) (Low)
	All	All	All
Sample Size	4165	2087	1641
Sample Mean	0.1398	0.1102	0.1509
Sample Std Dev	0.1945	0.2273	0.3597
Sample Variance	0.0378	0.0517	0.1294
Pooling Weight	0.5278	0.2644	0.2079

OneWay ANOVA Table	Sum of Squares	Degrees of Freedom	Mean Squares	F-Ratio	p-Value
Between Variation	1.7972	2	0.8986	14.8475	< 0.0001
Within Variation	477.5098	7890	0.0605		
Total Variation	479.3070	7892			

Confidence Interval Tests	Difference of Means	No Correction		Bonferroni		Tukey		Scheffe	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
NO _x (g/mi){High}-NO _x (g/mi){Low}	-0.0111	-0.025174691	0.002936166	-0.02828816	0.006049639	-0.02792433	0.005685801	-0.02867335	0.006434828
NO _x (g/mi){High}-NO _x (g/mi){Medium}	0.0297	0.016724177	0.042590704	0.01385928	0.045455601	0.014194069	0.045120812	0.013504843	0.045810038
NO _x (g/mi){Low}-NO _x (g/mi){Medium}	0.0408	0.024865984	0.056687422	0.021341539	0.060211867	0.021753403	0.059800003	0.020905505	0.0606479

Figure E.8. Hypothesis Test of NO_x for Speed Categories.