

# **Modeling Truck Idling Emissions in Central Texas**

## **2015 EPA Emissions Inventory Conference**

**Andrew Hoekzema, CAPCOG**

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# Presentation Overview

- Background
- Estimation of Extended Truck Idling in Central Texas
- Estimation of Short-Term Truck Idling in Central Texas
- Truck Idling Driver Survey
- Conclusion, Implications, and Recommendations

# Assumptions About Truck Idling in MOVES Model

## Extended Truck Idling

- Idling while combination long-haul driver is sleeping
- Duration: 1 hour or more
- Assumed duration: 8 hours
- Assumed to operate at high RPM with AC or heat
- Occurs off-network at truck stops, rest areas, parking lots, frontage roads

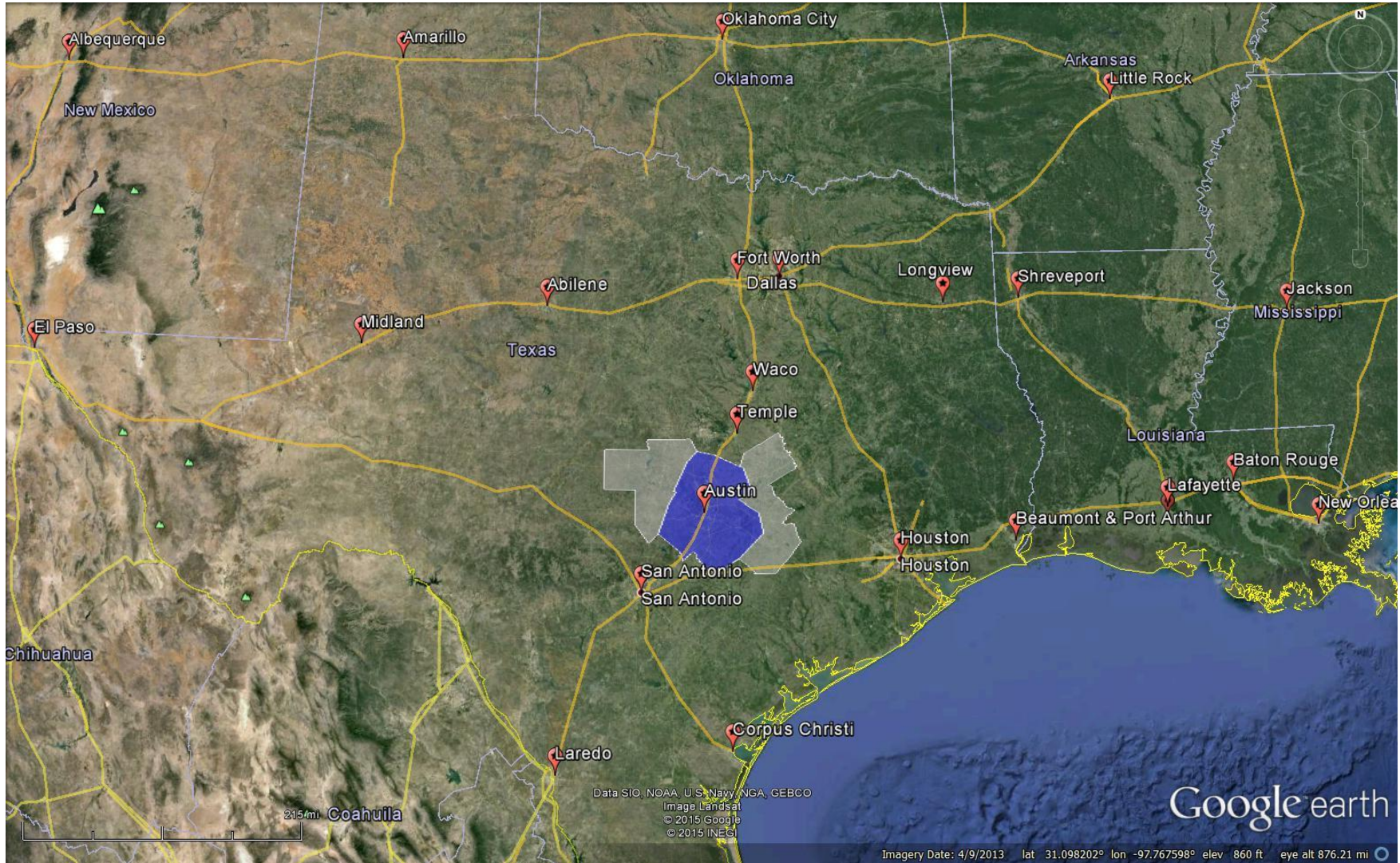
## Short-Term Truck Idling

- Idling while waiting to pick up or deliver goods
- Duration: less than 1 hour
- Any kind of truck
- Occurs off-network anywhere that trucks operate
- Unclear that it is fully accounted for in MOVES

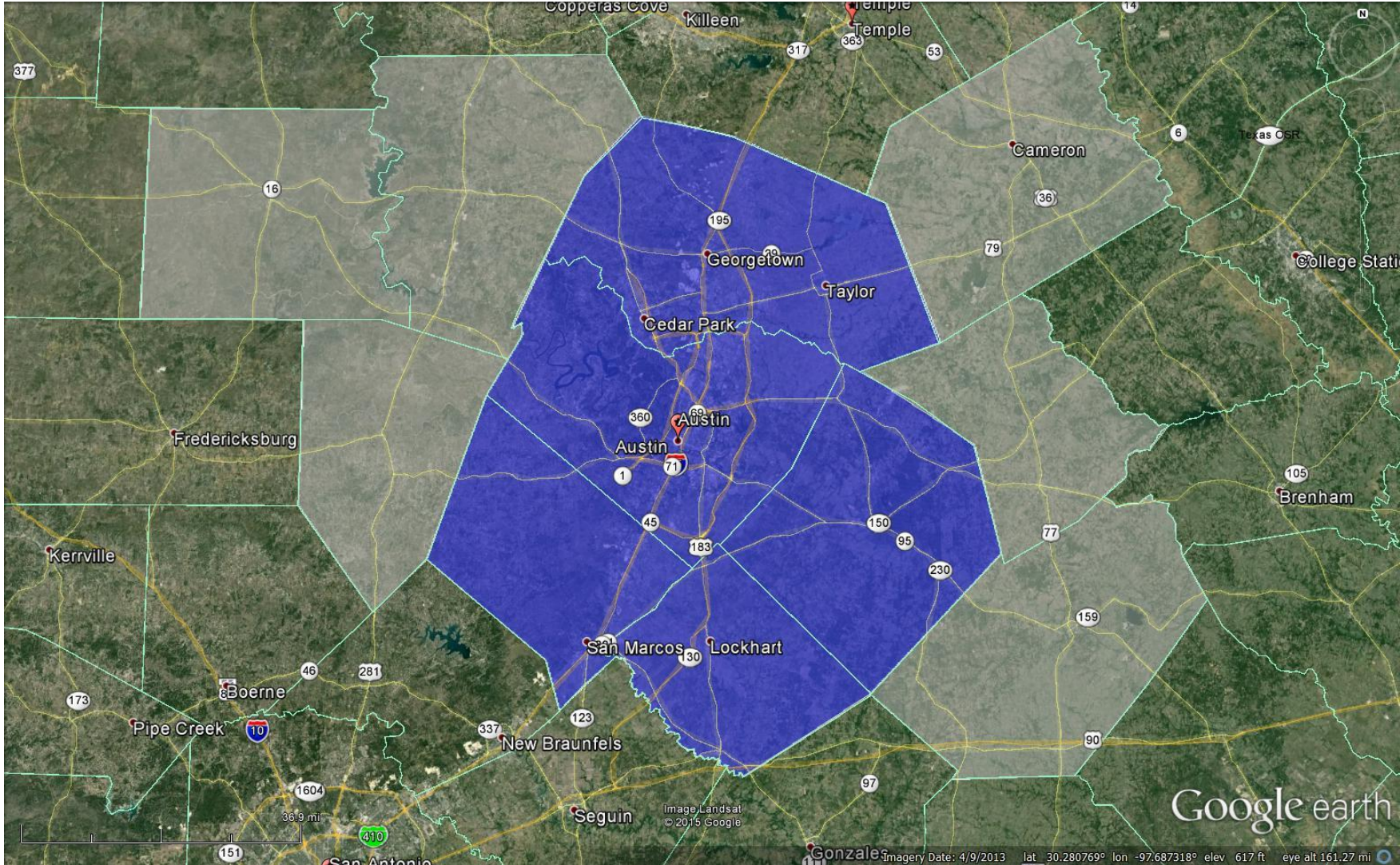
# Idling Restrictions in Central Texas

- Locally Enforced Idling Restrictions Since 2004
- Restricts Idling >5 minutes
- Applies to All Vehicles with GVWR > 14,000 lbs
- Enforceable Against Truck Drivers, Owners, and Property Owners
- Exemptions for Federally Mandated Rest Periods:
  - May 2006 – September 2009: Legislative Exemption
  - September 2009 – August 11, 2011: No Exemption
  - August 11, 2011 – Present: Administrative Exemption
  - Not exempt if within 2 miles of facility with idle reduction infrastructure
- Exemptions for PTO use, emergency vehicles, etc.

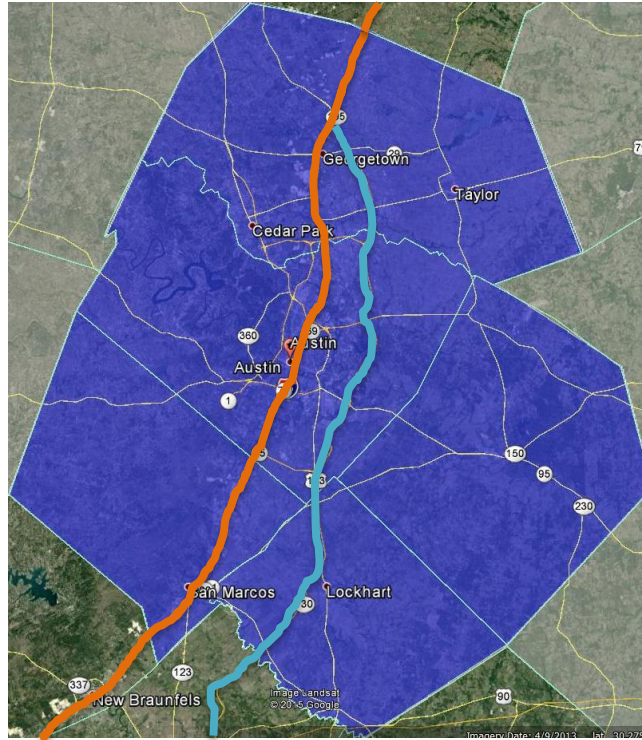
# Central Texas & Austin-Round Rock MSA



# Central Texas & Austin-Round Rock MSA



# Data Collection at Truck Stops



# Truck Stop Observations

- Data Collection Period: 7/13/2011 – 8/13/2011
- Summary Statistics:
  - 7 Truck Stops Observed in Austin-Round Rock MSA
  - 170 Hourly Observations
  - 6,632 Parking Space-Hours Observed
  - 3,837 Truck-Hours Observed (56% Occupancy Rate)
  - 2,102 trucks idling (55% idling rate)
  - Avg. Idling Rate = 0.32 trucks idling per parking space
- Statistical Analysis:
  - Significant Variation by Day Type and Time of Day
  - 1 Location Had Unique Profile

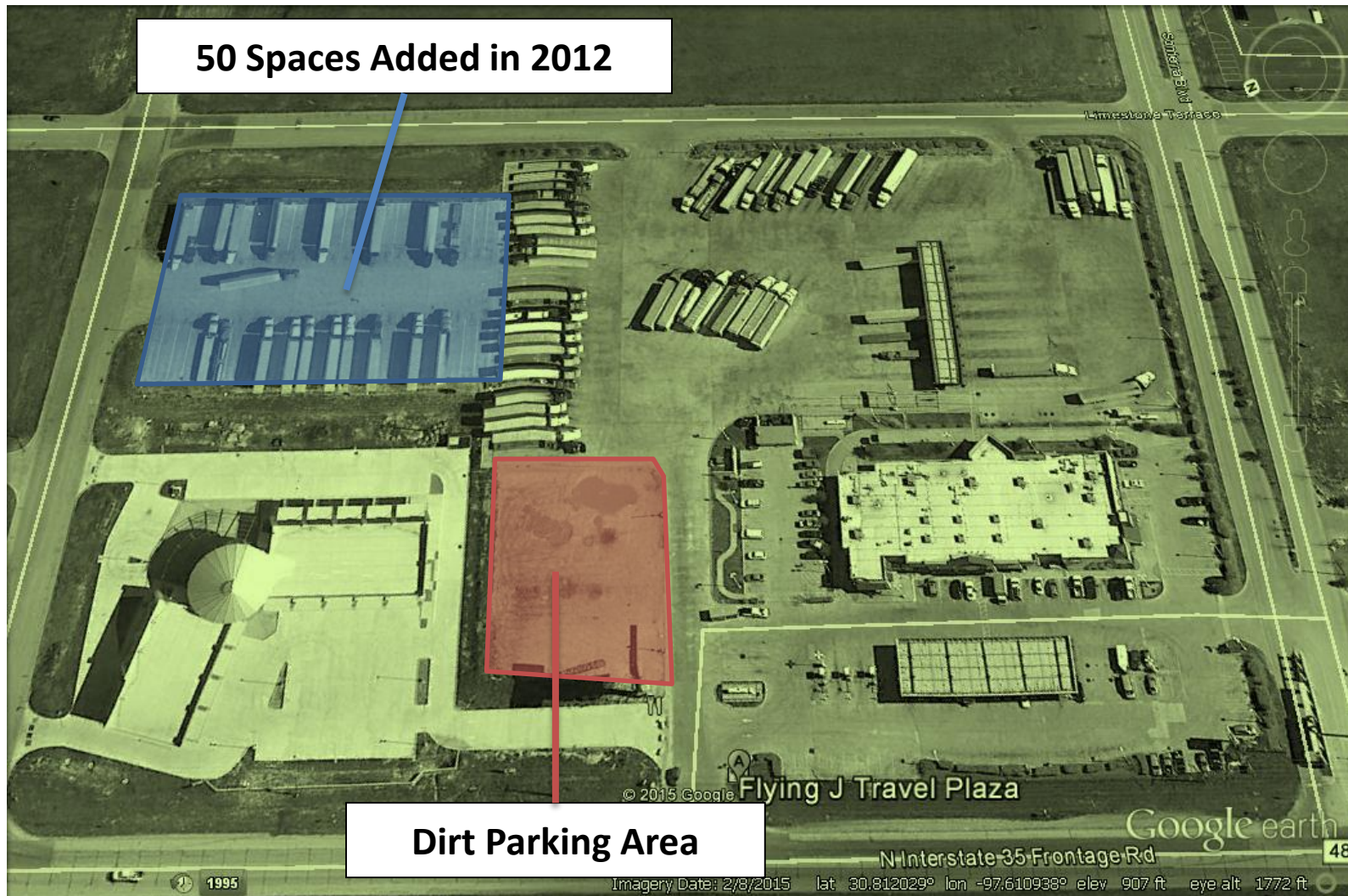


# Idling Rate Profiles

## Trucks Idling Per Parking Space Per Hour

Time Period	Facility Type	Mon.- Thu.	Fri.	Sat.	Sun.
12 am – 6 am	IH-35 Truck Stops	0.65	0.65	0.37	0.28
6 am – 8 am	IH-35 Truck Stops	0.39	0.39	0.31	0.23
8 am – 8 pm	IH-35 Truck Stops	0.26	0.12	0.19	0.15
8 pm – 12 pm	IH-35 Truck Stops	0.47	0.27	0.27	0.20
<b>24 Hours</b>	<b>IH-35 Truck Stops</b>	<b>0.40</b>	<b>0.30</b>	<b>0.26</b>	<b>0.20</b>
<b>24 Hours</b>	<b>Mustang Ridge</b>	<b>0.12</b>	<b>0.10</b>	<b>0.06</b>	<b>0.04</b>

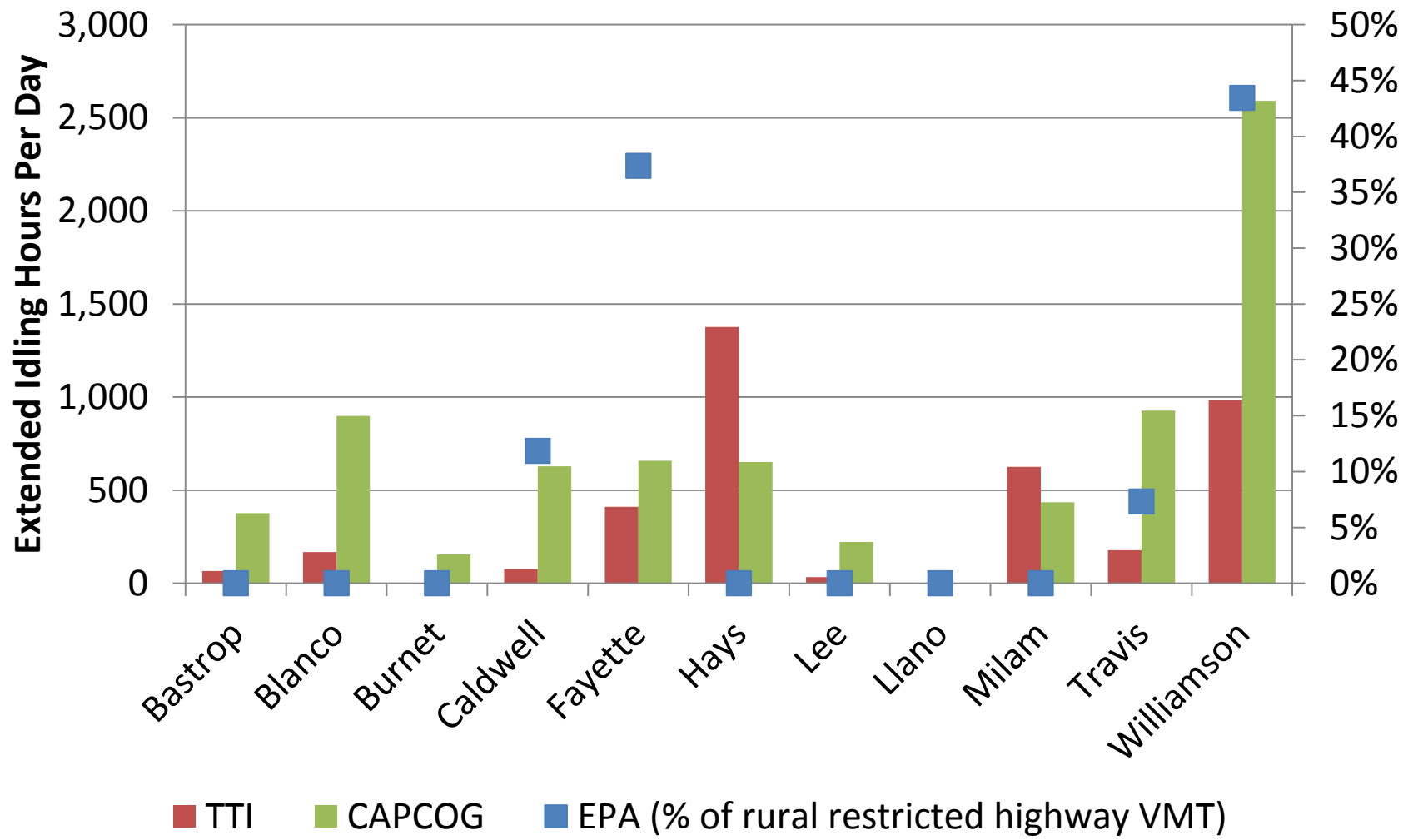
# Idling Location Inventories – Aerial Imagery



50 Spaces Added in 2012

Dirt Parking Area

# Extended Idling Activity Comparison

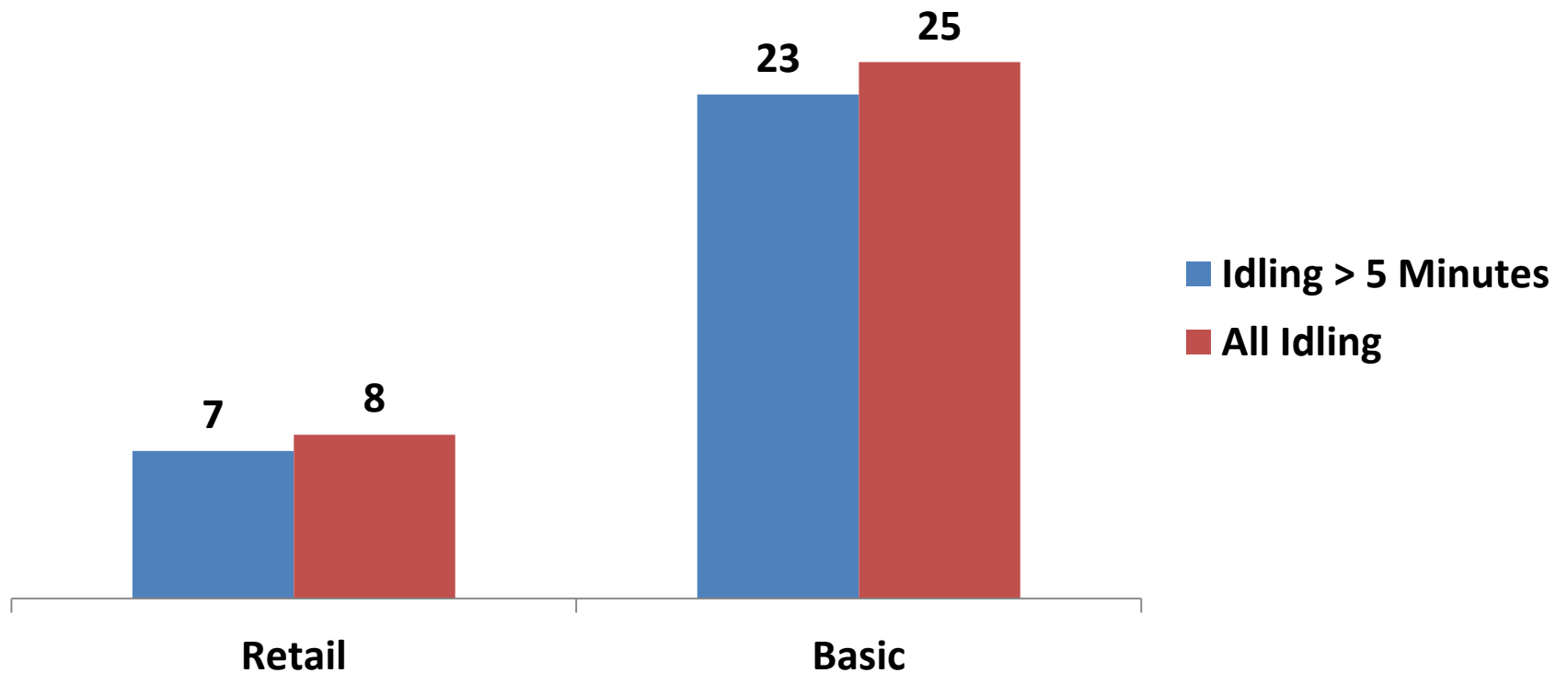


# Short-Term Idling – Truck Trips by NAICS Codes

NAICS Codes	Description	Employees	Daily Truck Trips
212	Mining & Quarrying	895	4,310
31-33	Manufacturing	37,419	3,080
42	Wholesale Trade	39,368	2,363
44-45	Retail Trade	90,874	15,449

# Short-Term Idling – Idling Duration

**Avg. Duration of Short-Term Idling by Establishment Type  
(minutes per truck trip)**



# Emissions Estimates for Austin-Round Rock MSA

## 2012 Summer Weekday Activity and Emissions (tpd)

Idling Type	Hours	CO	NO <sub>x</sub>	VOC	CO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
<b>Short-Term</b>	5,958	0.48	0.54	0.08	151.06	0.0259	0.0252
<b>Extended</b>	5,176	0.51	1.09	0.29	52.19	0.0265	0.0244
<b>Combined</b>	<b>11,134</b>	<b>0.99</b>	<b>1.63</b>	<b>0.37</b>	<b>203.24</b>	<b>0.0524</b>	<b>0.0496</b>

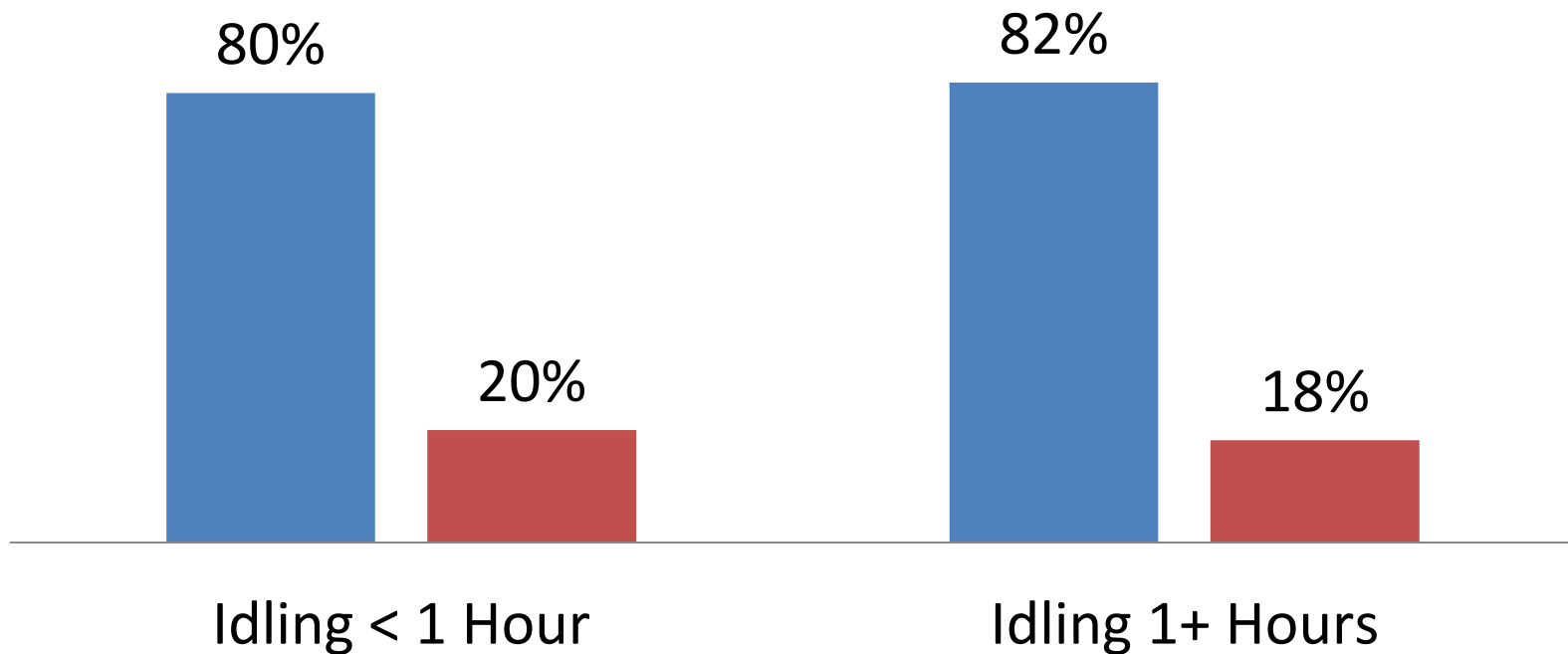
# Truck Idling Driver Survey

- Surveys conducted in July & August 2011
- Total responses: 118 drivers
  - Sleeper Cabs (Combination Long-Haul Trucks): 71
  - Day Cabs (Combination Short-Haul Trucks): 46
- Questions:
  - Truck & Engine Characteristics
  - Trip Characteristics
  - Idling Behavior
  - Idling Control Strategies

# Truck Driver Survey Results - Engine Idling Speed

## Engine Speed While Idling?

■ "Low" Speed (RPM <1000)     ■ "High" Speed (RPM >=1000)





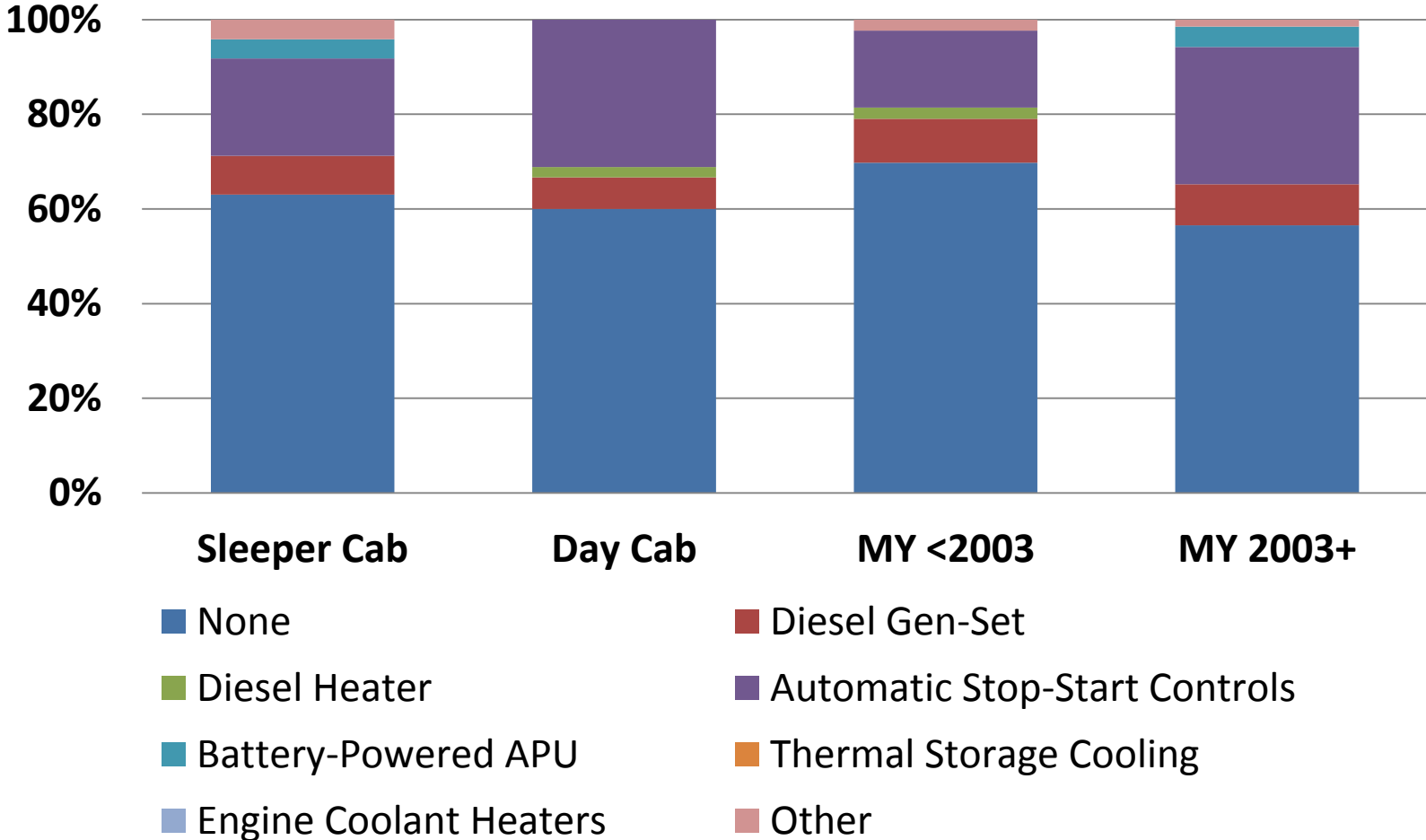
# Literature Review - Idling Engine Speed

Study	Sample Size	Average RPM
Brodrick (2001)	233	850
Irick (2002) – Drivers	100	965
Irick (2002) – Fleets	100	964
Lutsey (2003)	315	866
Texas Transportation Institute (2003)	16	838
<b>TOTAL</b>	<b>764</b>	<b>886</b>

- MOVES Assumes All Idling Occurs in “High” RPM Setting with A/C
- Avg. of 1991-2006 “High RPM/AC” Data = 1050 RPM
- Potential Implication: Idling Emission Rates May be Too High

# Truck Driver Survey Results – Control Strategies

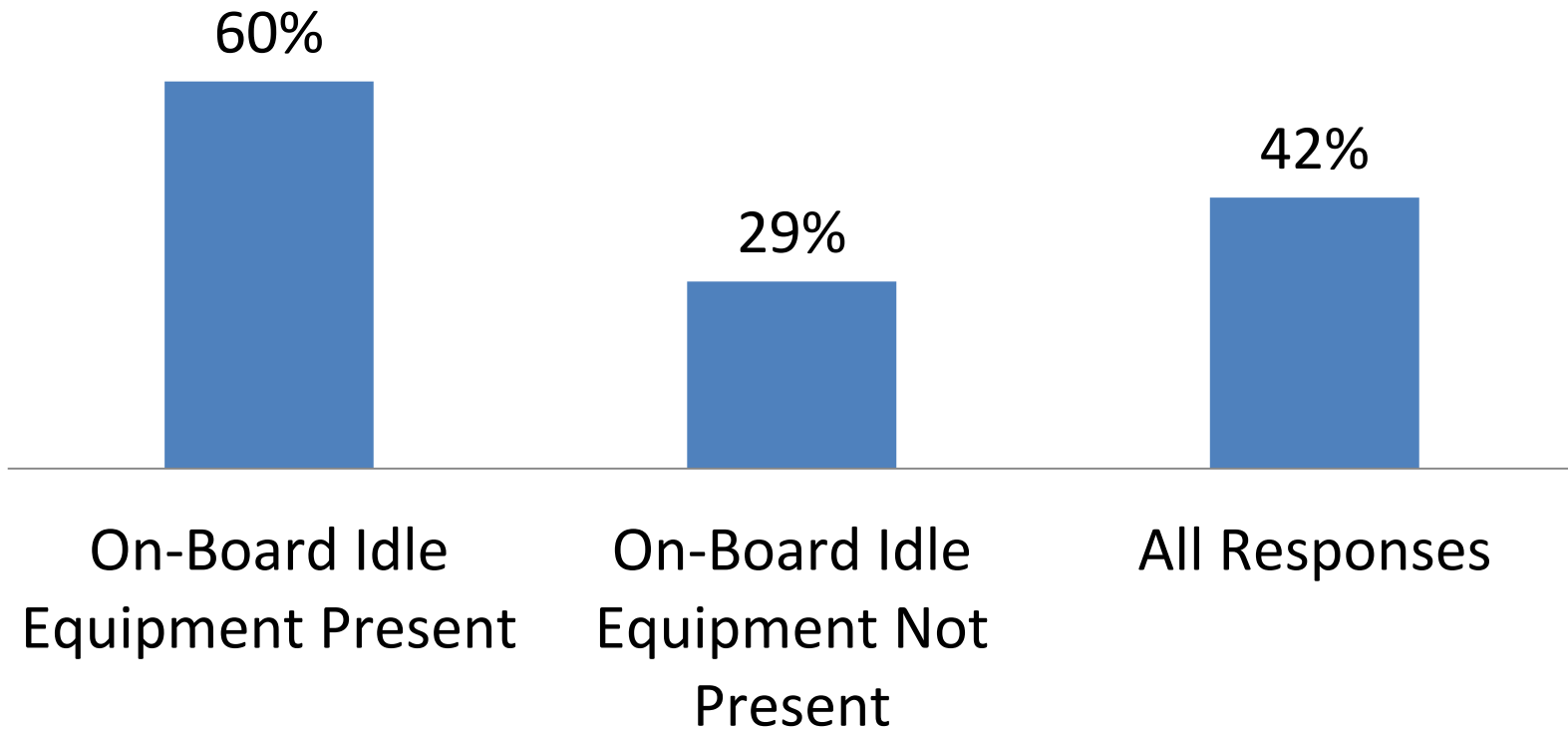
## Presence of On-Board Idle Reduction Technology



# Truck Driver Survey Results – Control Strategies

## Willing to Use Idle Reduction Infrastructure?

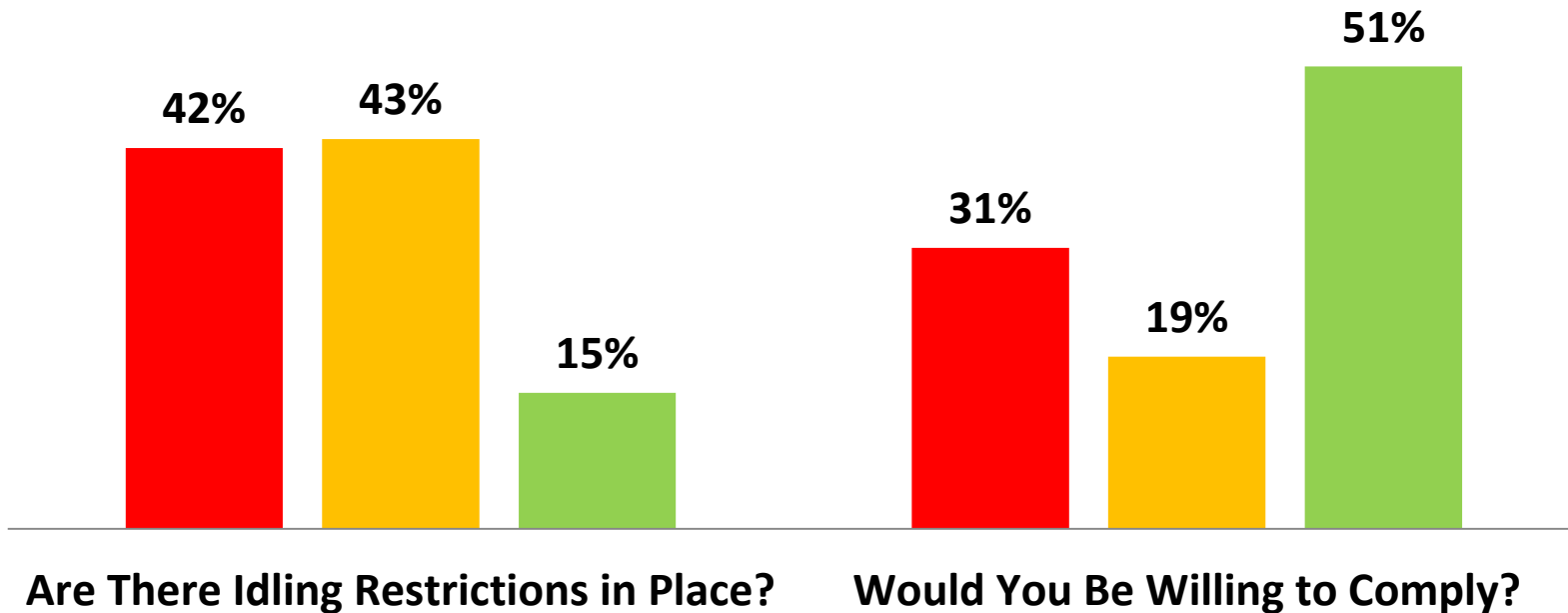
■ % "Yes"



# Truck Driver Survey Results – Control Strategies

## Awareness of Idling Restrictions and Compliance

■ No ■ Unsure ■ Yes



# Conclusions, Implications, and Recommendations

- Bottom-Up Data Collection Efforts
- Extended Idling v. Short-Term Idling
- Engine Speed Assumptions
- On-Board Idling Technology Assumptions
- Challenges for Control Strategies
  - Truck Stop Electrification
  - Idling Restrictions

# Questions?



**THANK YOU!**

**Capital Area Council of Governments**

**Air Quality Program**

<http://www.capcog.org/airquality>

**Andrew Hoekzema**

**Air Quality Program Manager**

[ahoekzema@capcog.org](mailto:ahoekzema@capcog.org)

**(512) 916-6043**