



# **Denver Metro/North Front Range Ozone Nonattainment Area SIP Planning Efforts (& the Role of Oil and Gas)**

**WRAP O&G Working Group  
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**MODERATE AREA  
STATE IMPLEMENTATION PLAN (SIP)  
FOR THE 2008 OZONE STANDARD (75 ppb)**

# 2008 8-Hour Ozone Standard

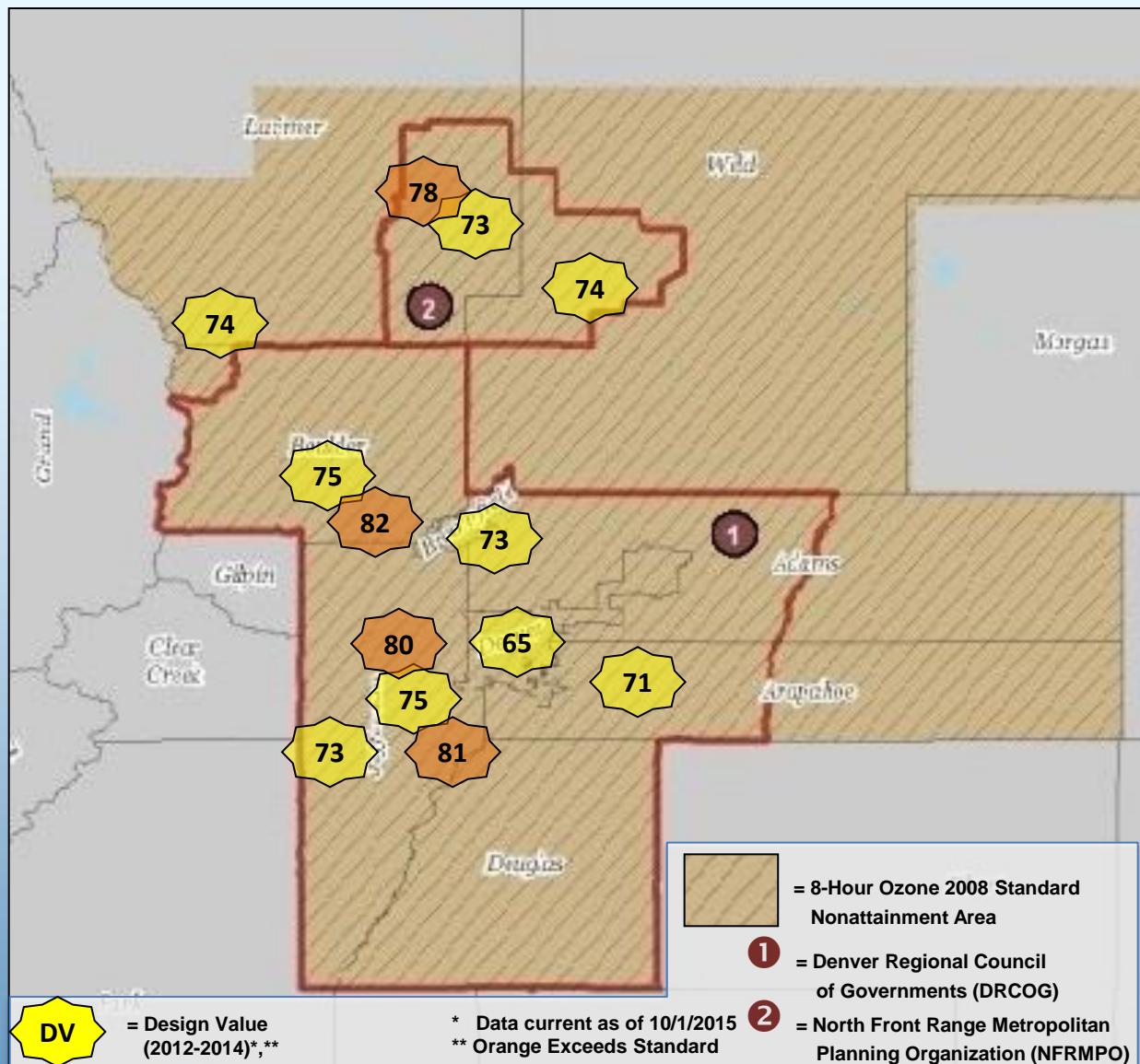
## Marginal Nonattainment Area

- Designation – July 2012
- Attainment deadline – July 2015
  - Based on 2012-2014 monitoring data → did not attain

## Moderate Nonattainment Area

- Bump-up to next highest classification – Published in FR May 2016
- Attainment deadline – July 2018
  - Based on 2015-2017 monitoring data
- Required SIP revision that meets Moderate area obligations per:
  - Clean Air Act – Sec. 182(b)
  - EPA's SIP Requirements Rule for the 2008 Ozone Standard (March 2015)

# 2012-2014 Design Values



Monitor	2012-2014 Design Value (ppb)*
Welby	73
Aurora East	71
South Boulder Creek	75
CAMP	65
La Casa^	--
Chatfield State Park	81
Welch	75
Rocky Flats	82
NREL	80
Aspen Park	73
Rocky Mtn. Nat'l Park	74
Fort Collins - West	78
Fort Collins - CSU	73
Greeley - Weld Tower	74

## Required SIP Elements

- **2011 Base Year & 2017 Future Year Emissions Inventories**
- **Reasonable Further Progress (RFP) Demonstration**
  - **15% reduction in VOC emissions by 2017**
- **Attainment Demonstration And Weight of Evidence Analysis**
- **Reasonably Available Control Measures (RACM) Analysis**
  - **Technologically and economically feasible measures**
- **Stationary Source Control Programs**
  - **Reasonably Available Control Technology (RACT) for existing sources**
  - **Nonattainment New Source Review (NSR) for new sources**
- **Motor Vehicle Inspection and Maintenance (IM) Program**
- **Contingency Measures Plan**
- **Motor Vehicle Emissions Budgets (MVEB)**

# Emission Inventory Categories

## ◆ Oil and gas sources

- Point sources
- Condensate tanks
- Area sources

## ◆ Point sources

- Includes power plants, combustion boilers, industrial processes

## ◆ Area sources

- Wide range of VOC source categories

## ◆ Non-road mobile sources

- Locomotives, aircraft, construction equipment, small engines

## ◆ On-road mobile sources

- Light-duty vehicles
- Heavy-duty vehicles

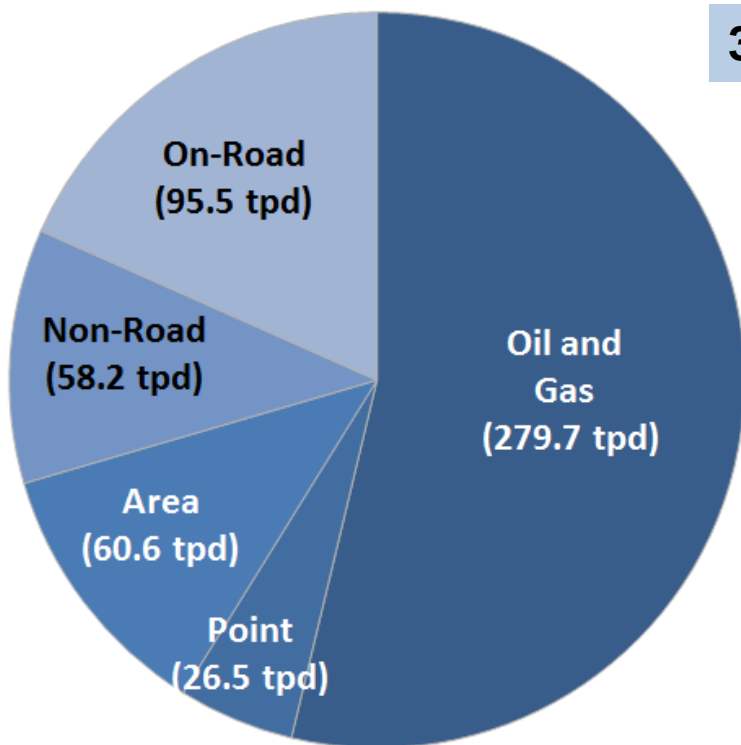
# 2011 and 2017 VOC Emissions Inventory

## All Anthropogenic Sources

VOC (tpd)		
2011	2017	$\Delta$
520.6	350.6	-170.0

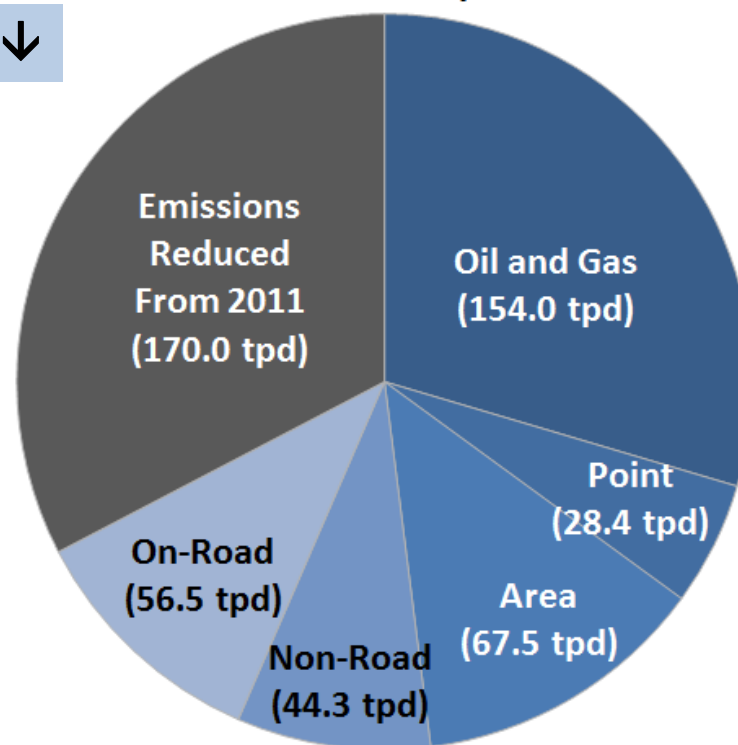
NO <sub>x</sub> (tpd)		
2011	2017	$\Delta$
325.8	236.0	-89.8

2011 VOC Sources



2017 VOC Sources Compared to 2011

33% ↓

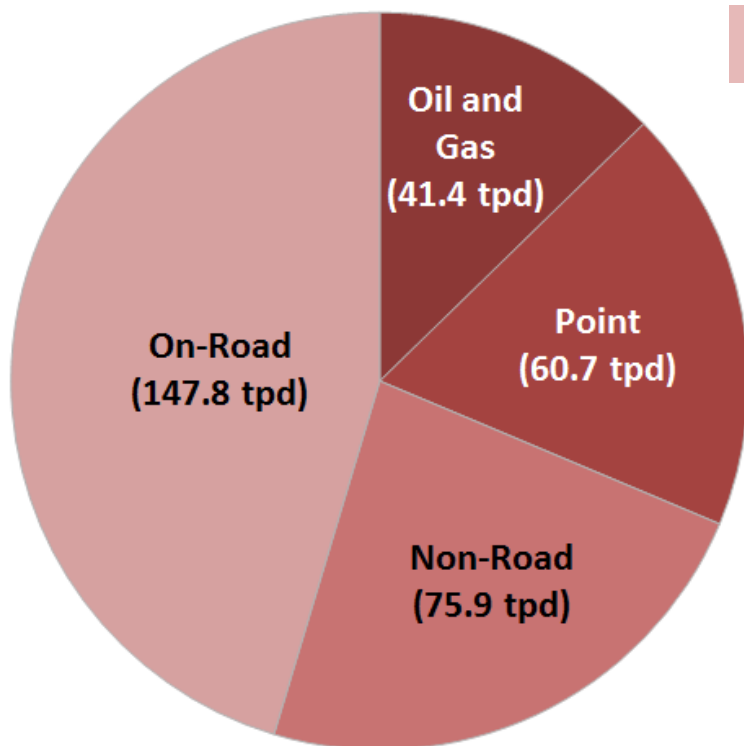


# 2011 and 2017 NO<sub>x</sub> Emissions Inventory

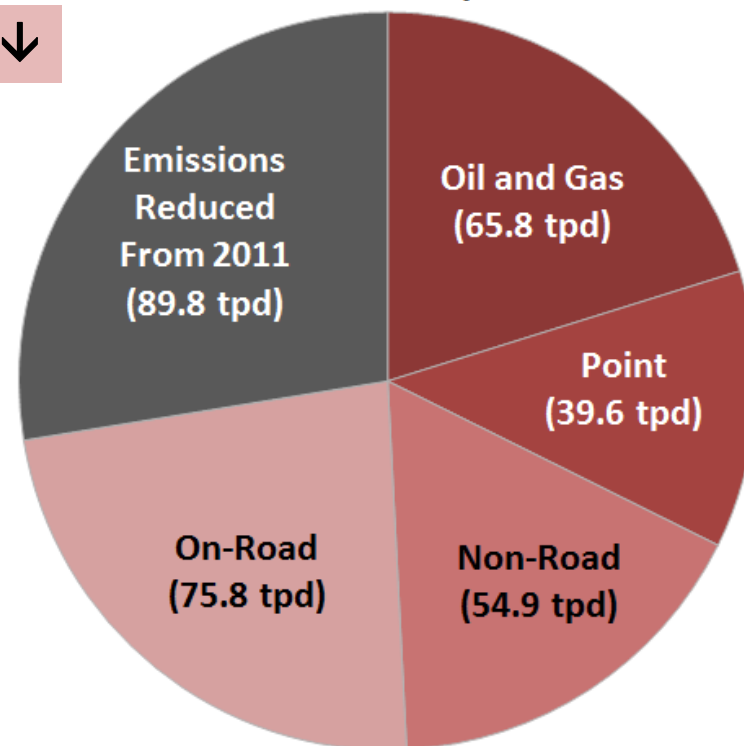
## All Anthropogenic Sources

VOC (tpd)		
2011	2017	Δ
520.6	350.6	-170.0

NO <sub>x</sub> (tpd)		
2011	2017	Δ
325.8	236.0	-89.8

2011 NO<sub>x</sub> Sources2017 NO<sub>x</sub> Sources Compared to 2011

28% ↓





# Control Measures in 2017 Inventory

- **Federal On-Road and Non-Road Mobile Source Standards/Regulations**
  - Light-duty vehicle and fuel standards
  - Heavy-duty vehicle and fuel standards
  - Non-road engine standards
- **Inspection and Maintenance Program**
  - AQCC Regulation No. 11 – Remove state-only requirement for Larimer and Weld counties
- **Oil and Gas Regulations**
  - AQCC Regulation No. 7 – existing and new revisions to Sec. XII
- **7.8 Reid Vapor Pressure (RVP) with 1 PSI Ethanol Waiver (8.8 RVP)**
- **Stage I Vapor Recovery at Gas Stations**
- **Power Plant Emissions Reductions – Clean Air Clean Jobs & Regional Haze**
  - AQCC Regulation No. 3
- **Other Stationary Source Regulations**
  - AQCC Regulation No. 3, No. 6, and No. 7

## Previously Adopted Regulation No. 7 Provisions

- Proper operation and maintenance of air pollution control equipment (XII.C.1.a.)
- Storage, processing, and handling operations shall minimize leakage of VOCs to the maximum extent practicable (XII.C.1.b.)
- Air pollution control equipment must meet a 95%+ control efficiency (XII.C.1.c.)
- Combustion devices must be enclosed with no visible emissions (XII.C.1.d.)
- 90% system-wide control for condensate tanks (> 2 tpy) (XII.D.2.a.(x))
- Leak detection and repair (LDAR) at Gas Processing Plants (XII.G.1.)
- 90% reduction of VOCs for flash separator/tank vents on glycol natural gas dehydrators (XII.H.1.)
- Monitoring, recordkeeping and reporting (XII.E., XII.F.)

# Newly Adopted Regulation No. 7 Provisions in SIP

- **Auto-Igniters (XII.C.1.e)**
  - Section XII.C.1.e is currently State-Only and requires that all combustion devices used to control emissions of VOCs from certain oil and gas facilities shall be equipped with and operate an auto-igniter
  - Propose to include in federally enforceable SIP
- **Audio, Visual, Olfactory (AVO) Inspections (XII. and XVII.C.1.d)**
  - Section XII requires visual inspection of condensate tanks and is part of the Ozone SIP
  - Section XVII.C.1.d requires broader AVO inspections of storage tanks (condensate, crude, produced water) and any associated equipment, but is a State-Only requirement
  - Propose to strengthen SIP control strategy by adding AVO requirement for condensate tanks in Section XII as an enforceable part of the SIP

## 2011 and 2017 Emissions Inventory

### Oil and Gas – Condensate Tanks

VOC (tpd)		
2011	2017	$\Delta$
216.0	78.7	-137.3

NO <sub>x</sub> (tpd)		
2011	2017	$\Delta$
1.1	0.6	-0.5

- ◆ **Data provided by top 6 producers (85% of industry production)**
  - Production in 2014 and projected 2017
  - Horizontal/vertical wells and stages of separation
  - Site-specific emission factors for each type of well and separation
  - Estimates for remainder of industry based on top producers
- ◆ **Emission estimates factor in:**
  - Advances in well design and technology
  - Federal regulations
  - AQCC Reg. No.7 (components of 2014 rule & 90% system-wide control)
  - Rule effectiveness (83% for Stage 1 separators, 86% for Stage 2-3)

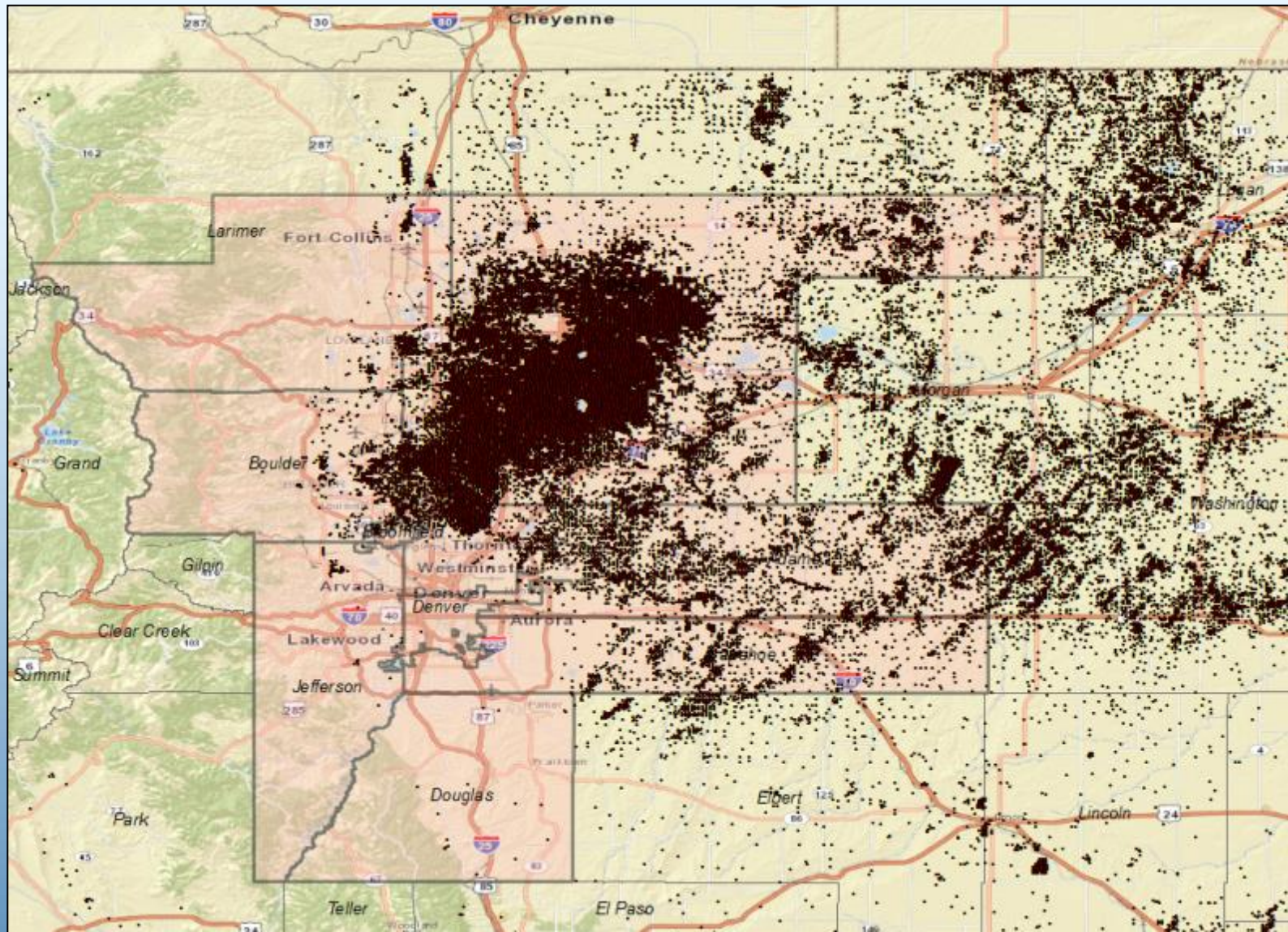
# 2011 and 2017 Emissions Inventory

## Condensate Tanks – VOC Emissions

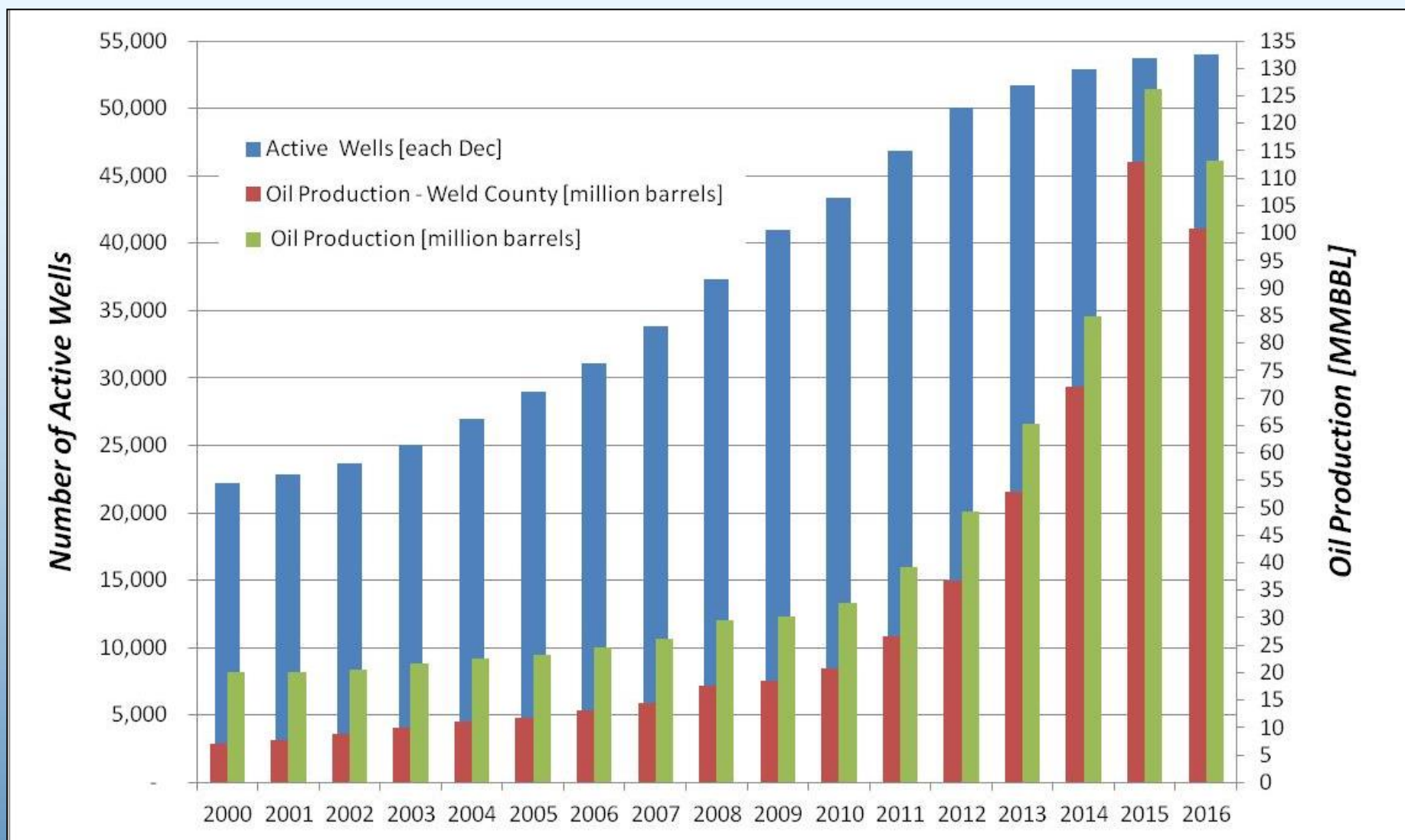
Well Type	Stages of Separation	2014 Oil Production (bbl)	2017 Oil Production (bbl)	Uncontrolled 2014 Emission Factors (lbs/bbl)	2017 Uncontrolled Emissions (tpd)	2017 Controlled Emissions* (tpd)
Horizontal	tankless	10,217,913	52,247,476	0.00	0.00	0.00
	1	13,431,681	9,853,200	7.27	98.15	24.83
	2	20,177,237	46,720,020	2.01	128.85	29.12
	3	26,382,023	26,689,883	0.96	35.22	7.96
	<b>Total</b>	<b>70,208,854</b>	<b>135,510,578</b>		<b>262.22</b>	<b>61.91</b>
Vertical	1	7,762,587	6,099,598	9.67	80.80	20.44
	2	3,006,421	2,045,998	7.71	21.60	4.88
	3	12,732	0	--	0.00	0.00
	<b>Total</b>	<b>10,781,740</b>	<b>8,145,596</b>		<b>102.40</b>	<b>25.32</b>
<b>TOTAL 9-COUNTY</b>		<b>80,990,594</b>	<b>143,656,174</b>		<b>364.63</b>	<b>87.24</b>
<b>TOTAL NONATTAINMENT AREA (90.2%)</b>		<b>73,049,467</b>	<b>129,570,686</b>		<b>328.88</b>	<b>78.68</b>
* Assumes 90% system-wide control; 83% Rule Effectiveness (RE) for 1 Stage; 86% RE for 2 and 3 Stage				<b>Reduction from 2011 (216 tpd VOC)</b>		<b>137.32</b>
						<b>64%</b>



## Significant Number of Wells in DM/NFR



# Colorado Annual Oil Production + Active Wells



Source: Air Pollution Control Division (APCD) July 2017

# 2011 and 2017 Emissions Inventory

## Oil and Gas – Point Sources

VOC (tpd)		
2011	2017	$\Delta$
14.8	16.3	1.5

NO <sub>x</sub> (tpd)		
2011	2017	$\Delta$
17.0	19.7	2.7

- ◆ **Sources**
  - External Combustion Boilers
  - Industrial Processes
  - Internal Combustion Sources
  - Petroleum and Solvent Evaporation
- ◆ Based on 2014 APEN emission inventory
- ◆ Emissions grown by increase in oil production 2014-2017
- ◆ IC Engines factor in federal/state controls



## 2011 and 2017 Emissions Inventory

### Oil and Gas – Area Sources

VOC (tpd)		
2011	2017	$\Delta$
48.9	59.0	10.0

NO <sub>x</sub> (tpd)		
2011	2017	$\Delta$
22.2	44.7	22.5

- ◆ **Includes a wide variety of sources:**
  - Engines, truck loading, pneumatic devices, fugitives, completions, blowdowns
- ◆ **Data provided by top 5 of 6 producers**
  - Estimates for remainder based on top producers and scaled up by either production or well count depending on source
  - Estimates based on current industry practice and requirements of state and federal rules
  - Assumed 60% reduction for fugitives (based on EPA RACT); applied to based on 2011 survey on fugitives estimates

# **REASONABLY AVAILABLE CONTROL TECHNOLOGY (RACT) ANALYSIS**

## 2017 RACT Analysis

- ◆ **For a Moderate Ozone Nonattainment Area**
  - Major Source Threshold = 100+ tons per year (tpy)
  - Reasonably Available Control Technology (RACT) Analyses must be conducted for all 'Major Sources' of NO<sub>x</sub> or VOC as part of SIP
- ◆ **46 Major Sources in Nonattainment Area**
  - Included oil and gas, breweries, boilers, engines, shale kilns, glass melters, etc.
- ◆ **RACT Analyses must be completed by December 2017**
  - Colorado has been meeting with major sources to provide guidance
- ◆ **Rulemaking to establish categorical RACT for major sources will occur 2018 – 2019**
  - To be based on data gather from RACT analysis process
- ◆ **NOTE:** If region is bumped-up to a Serious Nonattainment Area, major source threshold goes down to 50 tpy → 390 more sources to be considered 'major'; 95% will be oil and gas facilities

# **OIL AND GAS CONTROL TECHNIQUES GUIDELINES (CTG) RULEMAKING**

## Oil & Gas CTG Rulemaking

- ◆ EPA finalized a control techniques guidelines (CTG) for oil and natural gas VOC emissions late 2016
- ◆ EPA has provided states 2 years from final CTG to submit a RACT SIP for sources covered under the CTG
- ◆ The Colorado Air Pollution Control Division (APCD) has been collaborating with stakeholders to develop oil & gas RACT consistent with:
  - CTG
  - NSPS OOOOa
  - BLM venting and flaring rules
  - AQCC Reg. 7
- ◆ AQCC hearing scheduled for October 2017; legislative review in 2018

## Oil & Gas CTG Rulemaking

<u>Emission Sources</u>	<u>Reg. 7</u>	<u>CTG</u>
Storage vessels	Yes (XII, XVII)	Yes
Compressors	Yes (XVII)	Yes
Pneumatic controllers	Yes (XVIII)	Yes
Pneumatic pumps	No	Yes
Equipment leaks at natural gas plants	Yes (XII)	Yes
Fugitive emissions – well sites and compressor stations	Yes (XVII)	Yes
Liquids unloading	Yes (XVII)	No

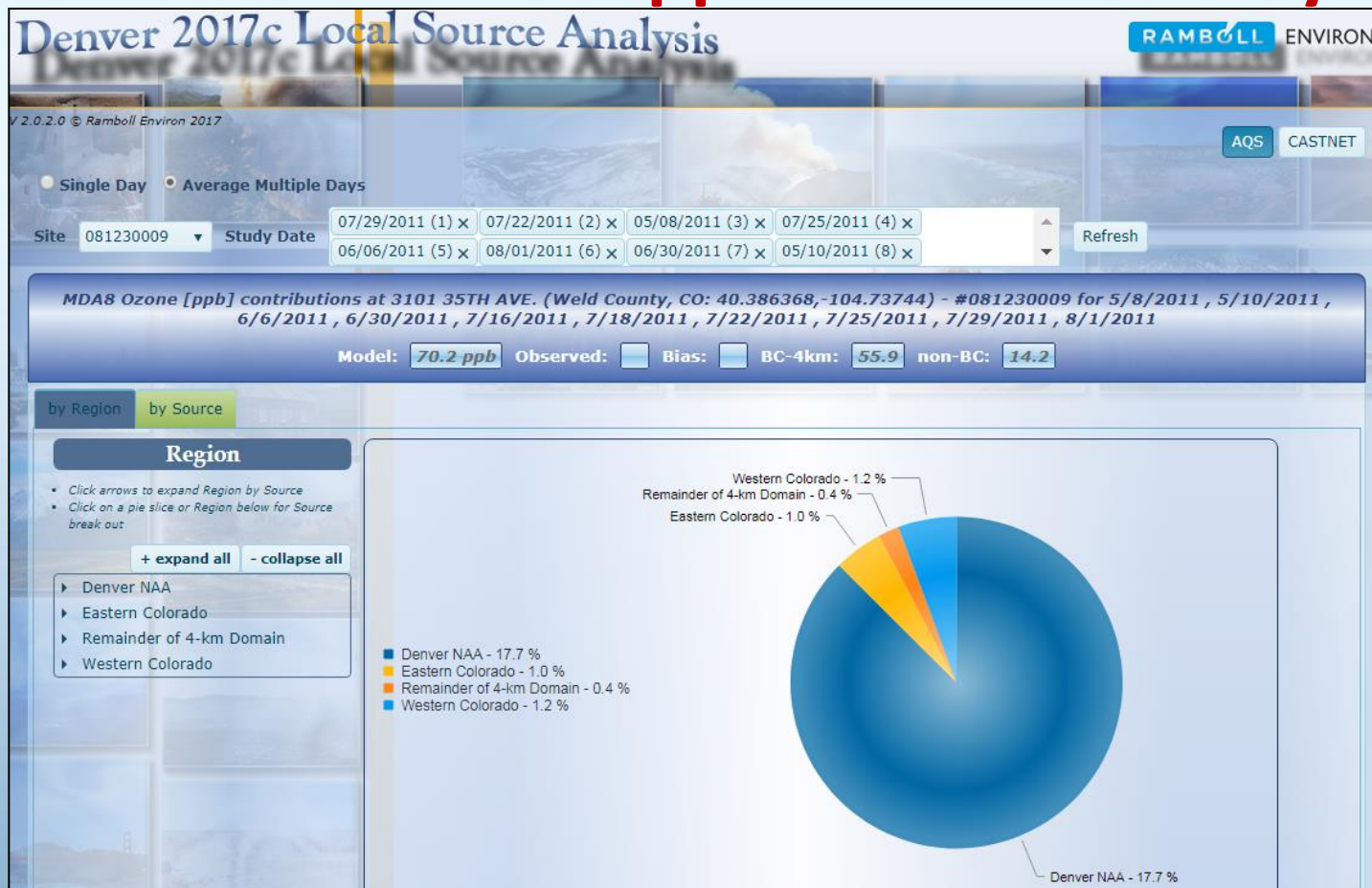
# Oil & Gas CTG Rulemaking

- ◆ **Leak detection and repair (LDAR) program inspections**
  - **Threshold for inspection of well production facilities**
  - **Inspection frequency**
  - **Comparability to CTG**
- ◆ **Alternative monitoring methods**
- ◆ **Pneumatic controller inspections**
  - **Program design**
  - **Task force**
  - **Reevaluation**
- ◆ **Requirements for no-bleed pneumatic controllers**
- ◆ **Requirements for repairing leaks**
- ◆ **Reporting and recordkeeping**
- ◆ **Compliance deadlines**
- ◆ **Cost estimates for some facilities**

# 2017 SOURCE APPORTIONMENT MODELING



# 2017 Local Source Apportionment Analyses

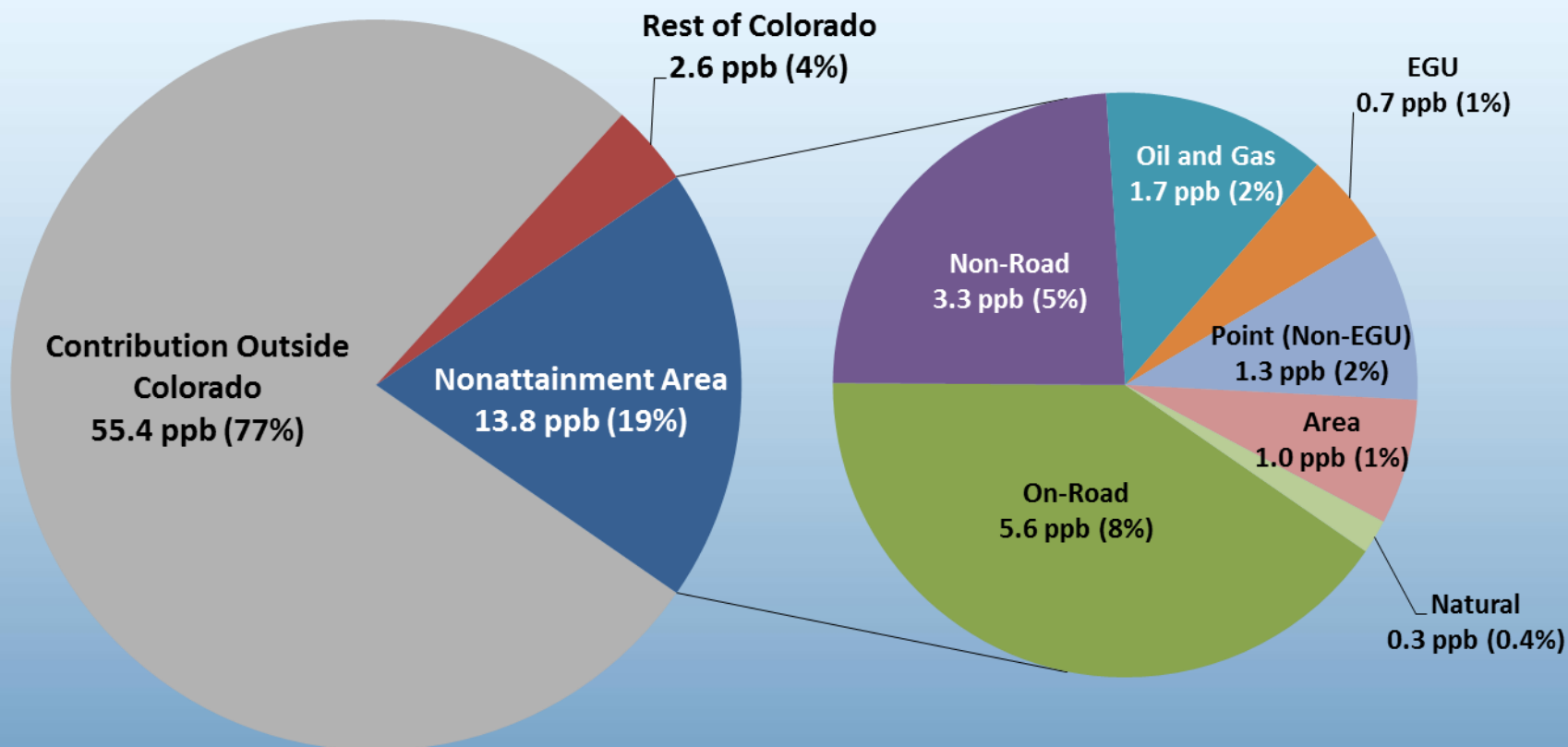


- ◆ Based on SIP Modeling platform
- ◆ Local source contribution available for every day at every monitor
- ◆ <https://ims.environcorp.com/DenverLSA/Results/PostAQS>

# 2017 Local Source Apportionment Analyses

## Chatfield

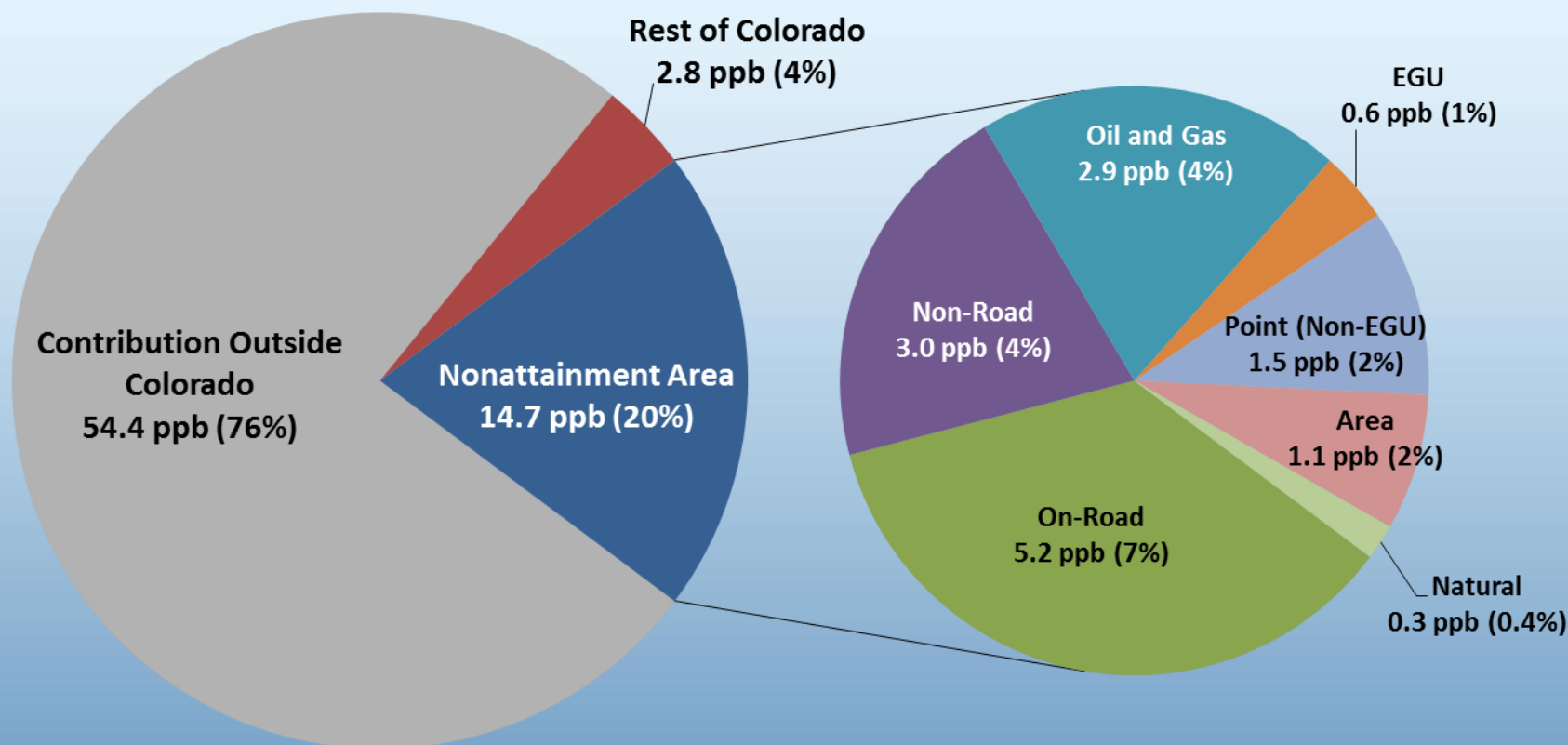
Total Modeled Ozone For Top 10 Days = 71.8 ppb



# 2017 Local Source Apportionment Analyses

NREL

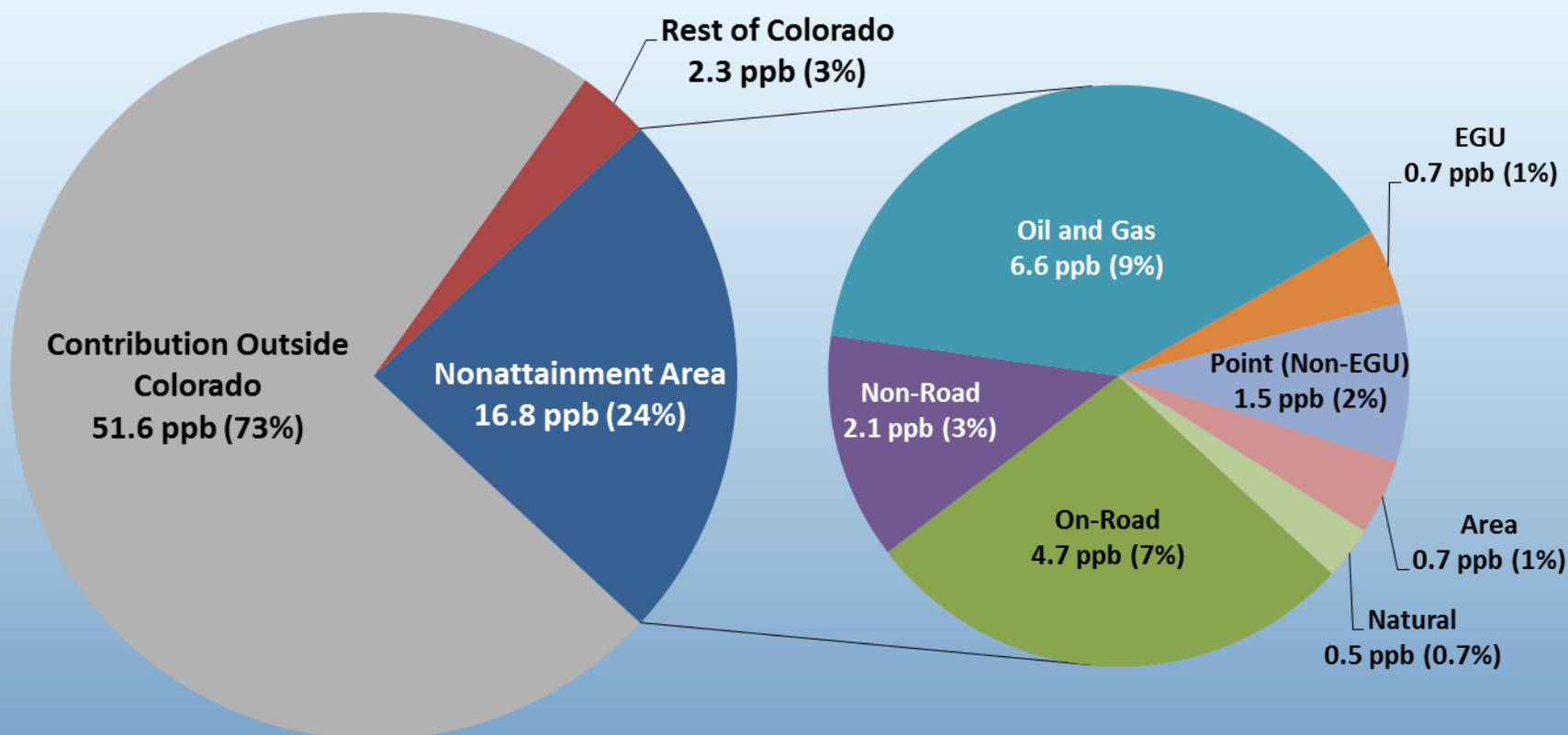
Total Modeled Ozone For Top 10 Days = 71.9 ppb



# 2017 Local Source Apportionment Analyses

## Fort Collins West

Total Modeled Ozone For Top 10 Days = 70.7 ppb



# Contact Information

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