

Stage II Vapor Recovery



Potential Ozone Reduction Strategy for Denver Metro Area-North Front Range

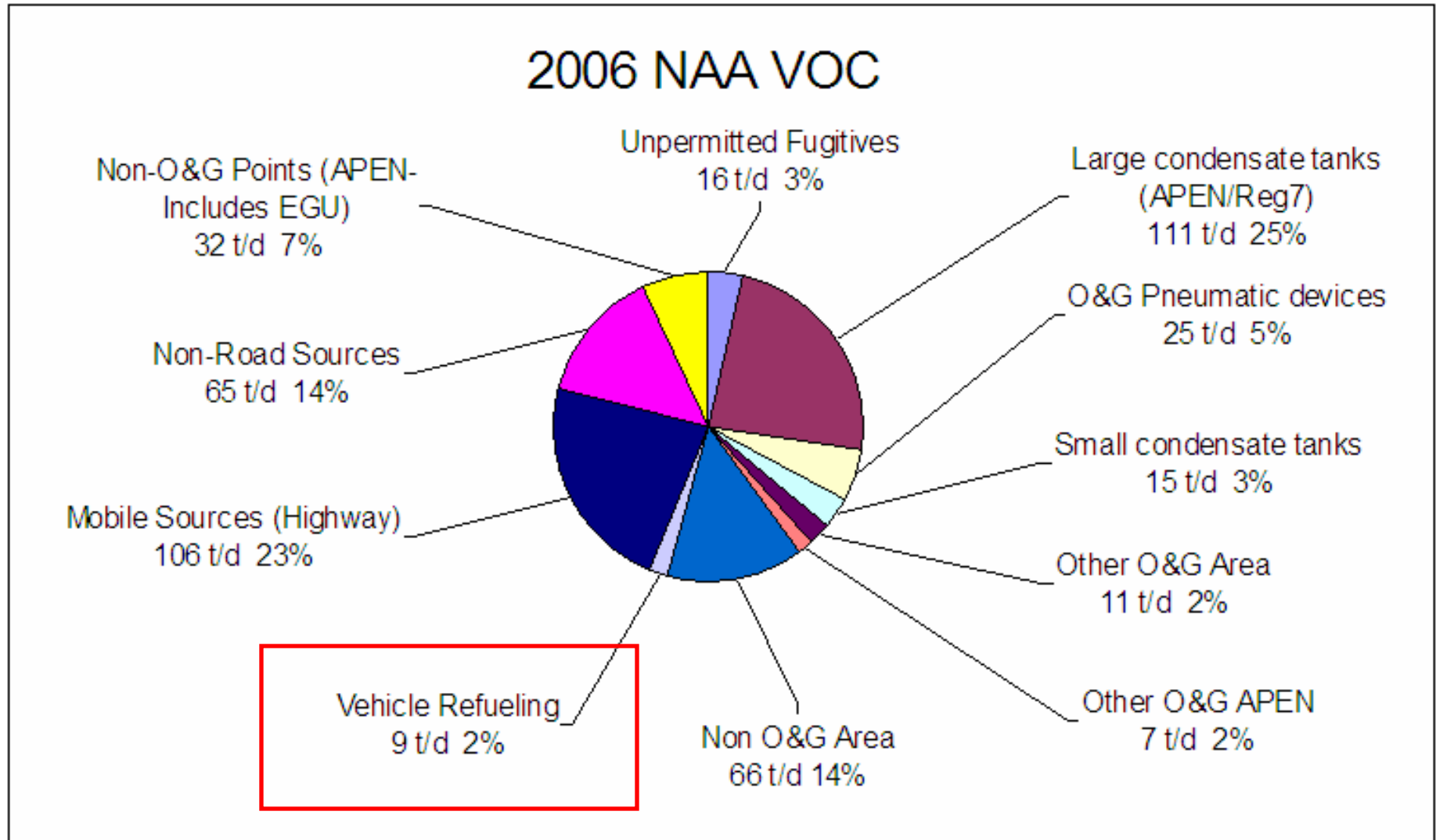
Technical Evaluation by Curt Taipale

June 18, 2008

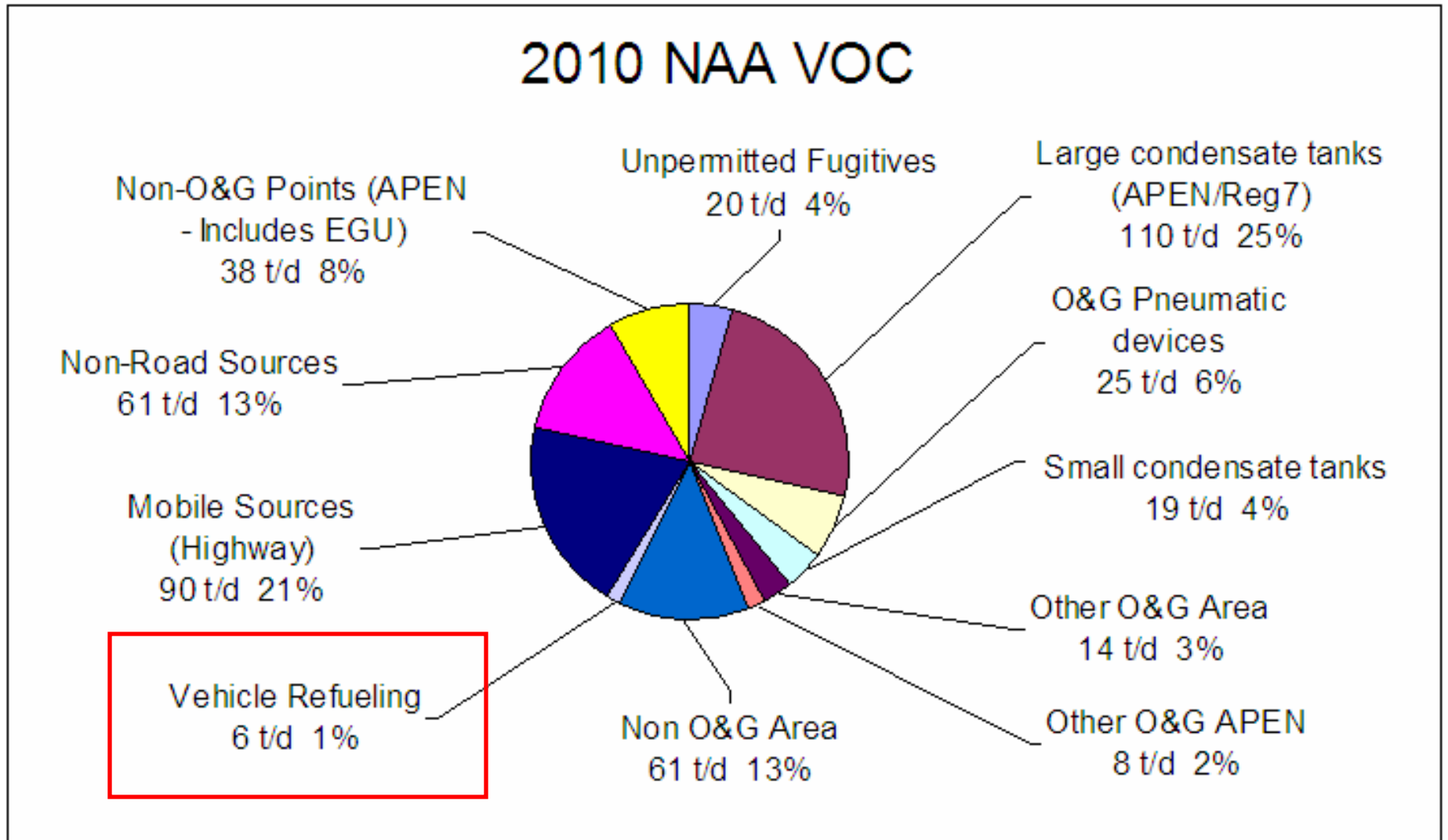
*Department of Public Health and Environment
Air Pollution Control Division*



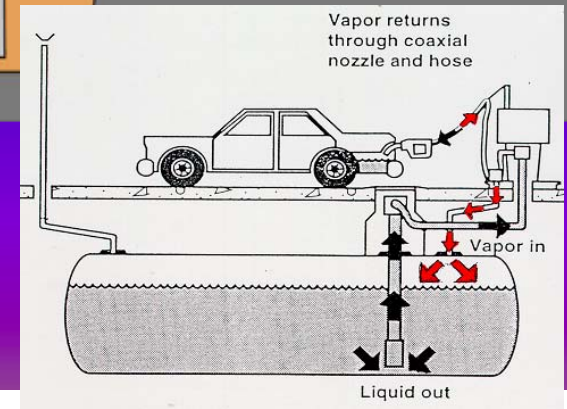
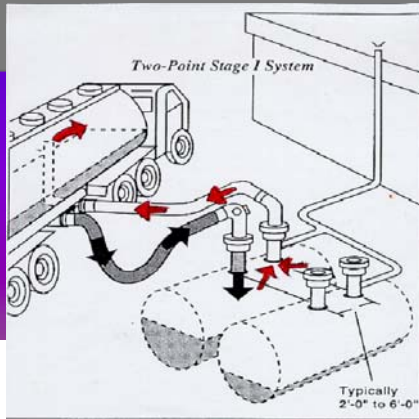
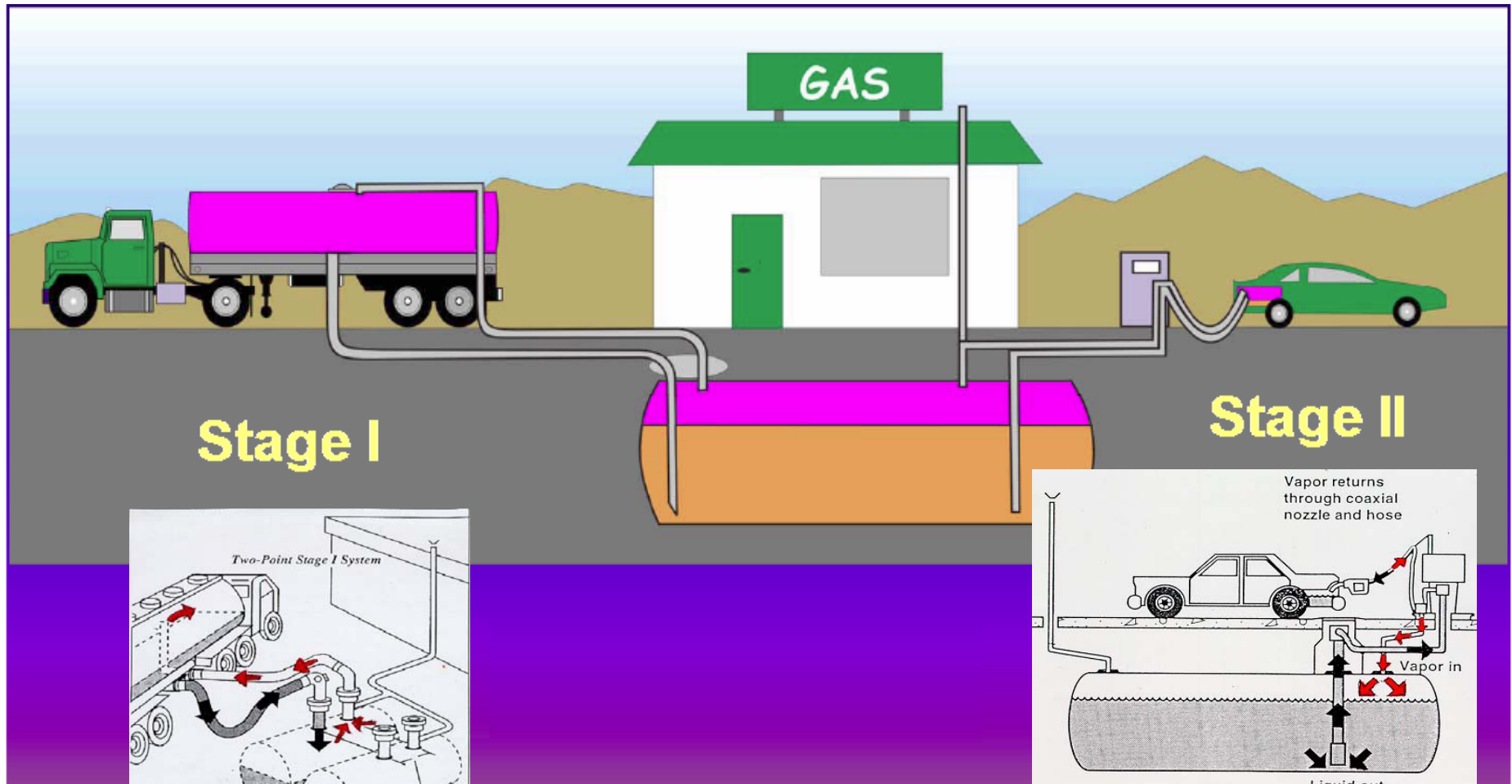
Non-Biogenic VOC Emissions



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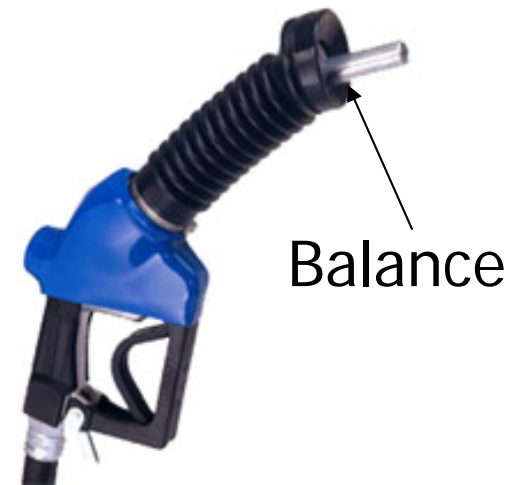


Gasoline Dispensing Facility (GDF) Vapor Recovery



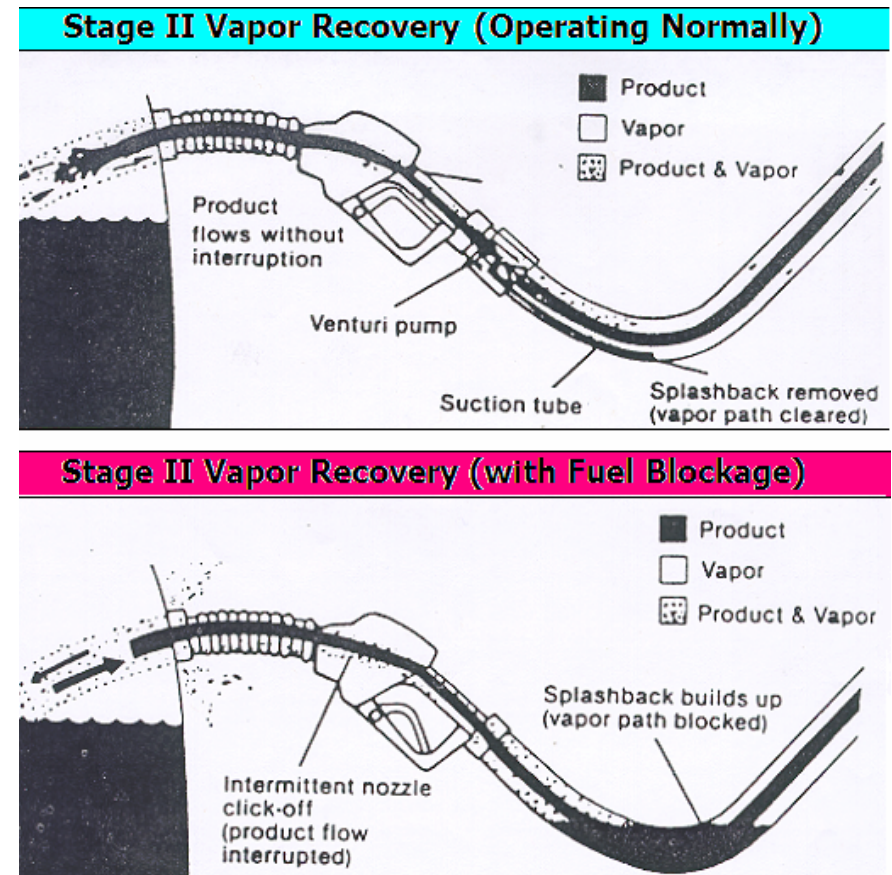
Stage II VR – How it works

- A properly maintained Stage II VR system recovers up to ~95% of refueling vapors (VOCs)
- Capture is achieved through two types of systems
 - Balance (uses a boot over the fill nozzle)
 - Vapor Assist (uses a slight vacuum to draw vapors)
- Captured vapors sent back to the underground storage tank
- Stage II requires special underground plumbing to accommodate the control system

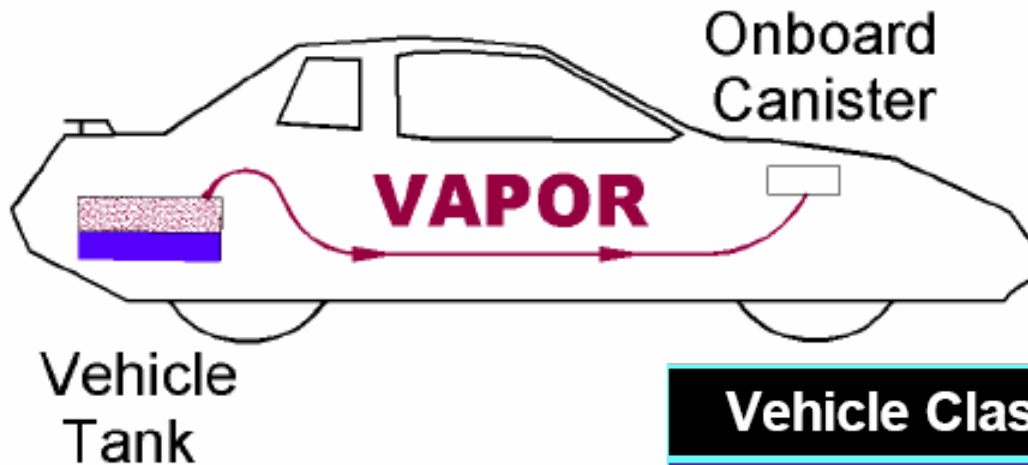


Stage II VR – Issues

- Stage II systems require routine maintenance and inspection to maintain integrity vapor control equipment
 - GDF operators responsible for day-to-day O&M
 - State inspectors responsible for ensuring each GDF meets regulatory requirements



Onboard Refueling Vapor Recovery or "ORVR"

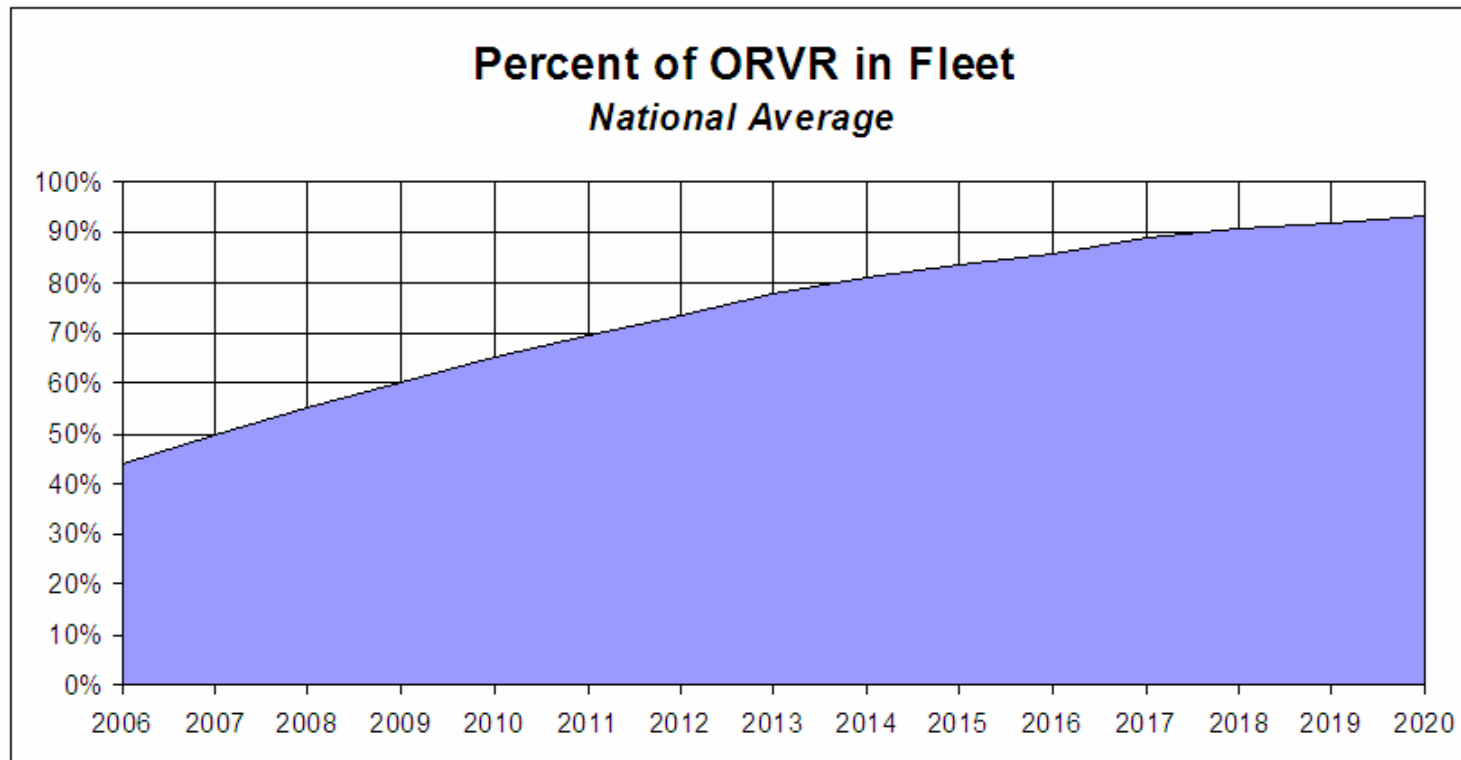


Vehicle Class	40%	80%	100%
Passenger	1998	1999	2000
LD Trucks & MDV (<6000 lbs)	2001	2002	2003
MD Vehicles (6001-8500 lbs)	2004	2005	2006



Stage II VR – Issues

- EPA assumes that Stage II VR of little benefit on newer cars & trucks which have on-board vapor controls called “Onboard Refueling Vapor Recovery” (ORVR)
 - Stage II VR benefit diminishes with fleet turnover as the number of ORVR vehicles increase



GDFs in DMA-NFR

- DMA-NFR has about 1,150 Gasoline Dispensing Facilities (GDFs)
 - Division has issued permits to about 895
- About 825 GDFs have gasoline throughputs over 10,000 gallons/month
- Eight metro-area Costco GDFs already have Stage II VR installed

Denver Metro Area - North Front Range (DMA-NFR) defined as the following 9 counties: Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, Larimer and Weld



Stage II VR Installation

- GDFs not pre-plumbed for Stage II VR will require excavation to install necessary underground plumbing
 - CWPMA surveyed members and other DMA-NFR GDFs to determine how many already had plumbing installed
 - 632 responses from 1,149 GDFs
 - 62 respondents (9.8%) have GDFs pre-plumbed for Stage II VR
 - Based on survey, Division estimates that about 80 GDFs may have Stage II VR plumbing
 - Remaining DMA-NFR GDFs (about 745) would need excavation



Stage II VR Implementation

- The potential conversion of about 825 GDFs necessitates a phased implementation
 - Limited number of contractors available to do the work and availability of control equipment
 - CWPMA estimates that about 180 GDFs could be converted each year with existing qualified contractors
 - Division expects that the conversion of all 825 GDFs could be done in about 3 years (~275 GDFs per year)
 - 2-year phase-in probably difficult w/o impacts to public
 - Because of the large number of GDFs (~745) requiring excavation
 - To optimize VOC reductions, the highest throughput GDFs and those with Stage II pre-plumbing could be addressed in the first year phase-in period
 - Phased implementation would create price competition issues among GDFs that undergo conversion in different years
- If a Stage II VR rule was adopted this year
 - Full phase-in would likely be around 2011 - 2012



Stage II GDF Costs

- Basic Stage II VR
 - Applicable to 824 GDFs (based on sales >10,000 gals/mo)
 - Cost depends on the number of dispensers at a GDF
 - Most GDFs in metro area have between 2-6 dispensers (4-12 nozzles)
 - If we assume 4 dispensers (8 nozzles) the average Stage II VR installation cost is about \$60,000/GDF
 - Annual maintenance costs are assumed to be about \$3,000
- Enhanced Vapor Recovery (EVR) Stage II
 - EVR would be applicable to 702 GDFs (based on sales >600,000 gals/yr)
 - EVR supplements Basic Stage II VR by using In-Station Diagnostics (ISD)
 - ISD identifies failures automatically
 - Reduces VOC emissions by early detection and prompt repair
 - In California, all GDFs \geq 600,000 gallons per year are subject to ISD
 - Following EVR costs are based on 2006 CARB survey of GDFs (including equipment, installation, start-up testing & permitting):
 - \$11,000 (based on 2 dispensers & 0.6-1.2 million gallons/yr throughput)
 - \$19,100 (based on 4 dispensers and 1.2-2.4 million gals/yr throughput)
 - \$14,400 (based on 6 dispensers and 2.4 million gallons/yr throughput)
 - The additional cost for EVR is assumed to be about \$15,000/GDF



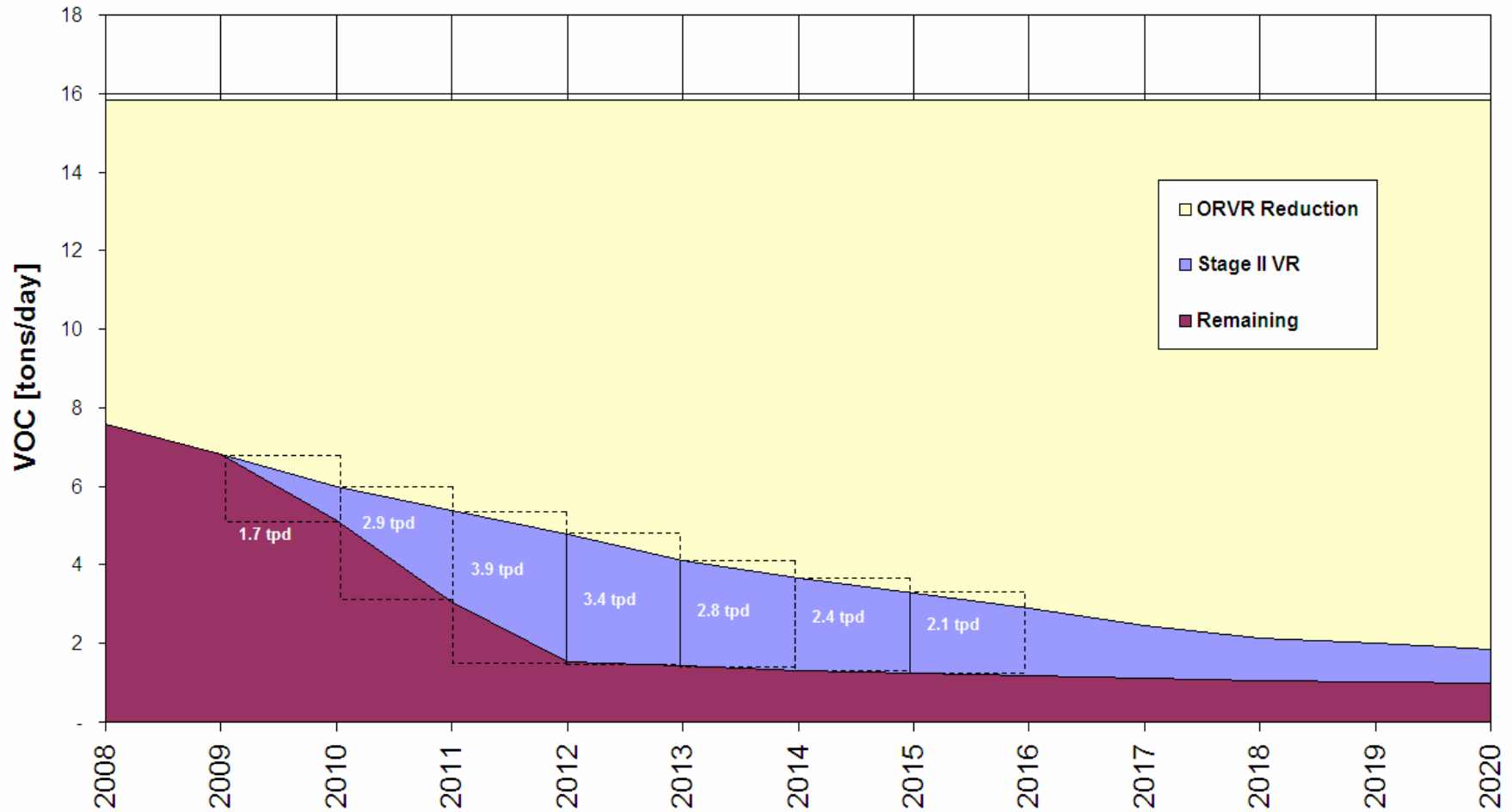
Stage II Other Costs

- At least 1 FTE (State or Local ?) would be required to inspect 1/3 of the GDFs annually
- Additional FTE required for enforcement
- Program inspection & enforcement is necessary to gain SIP credit for the VOC reductions

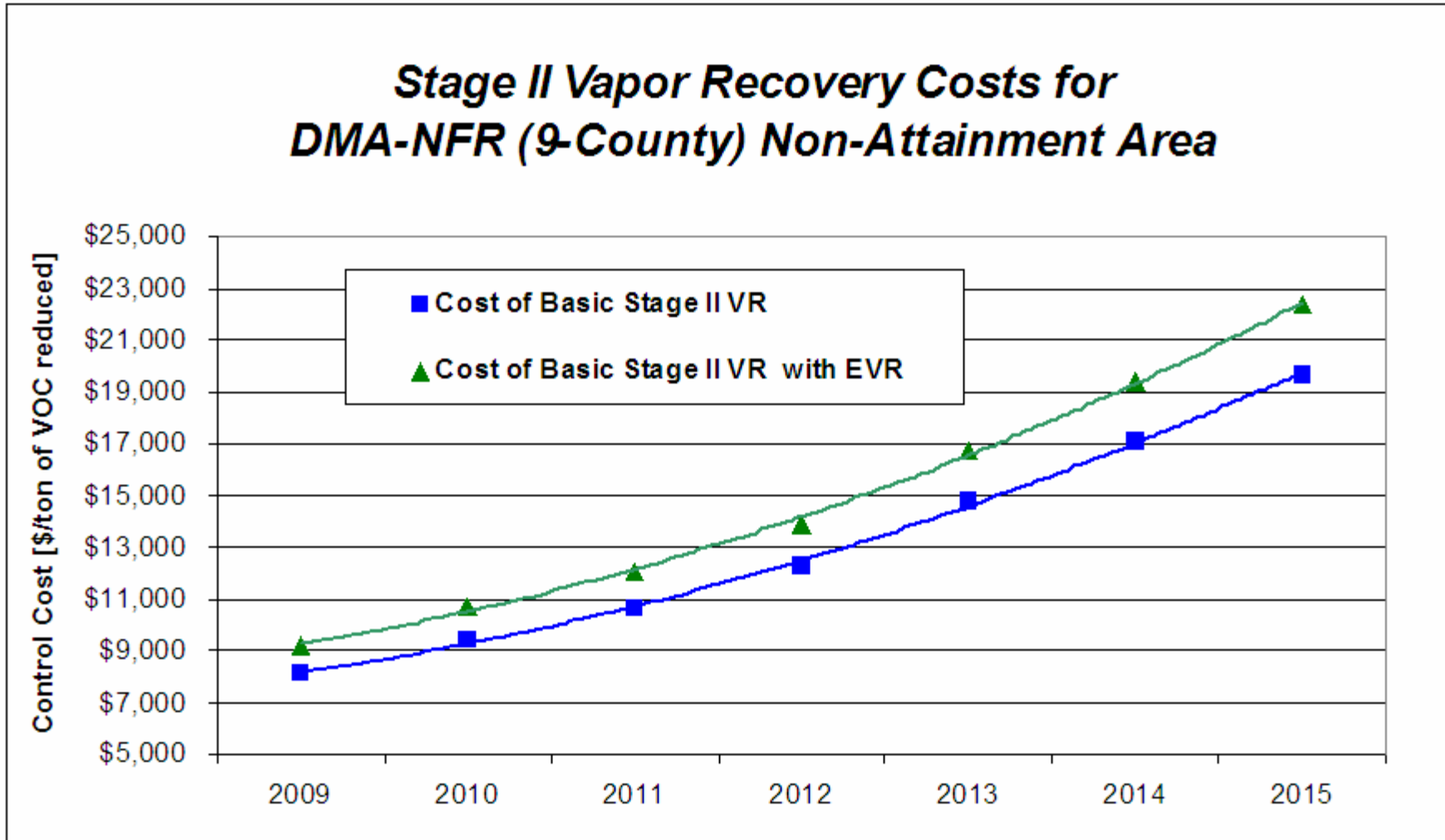


Estimated Stage II VR Benefits

VOC Emissions from Gasoline Refueling
DMA-NFR (9-county) Non-Attainment Area



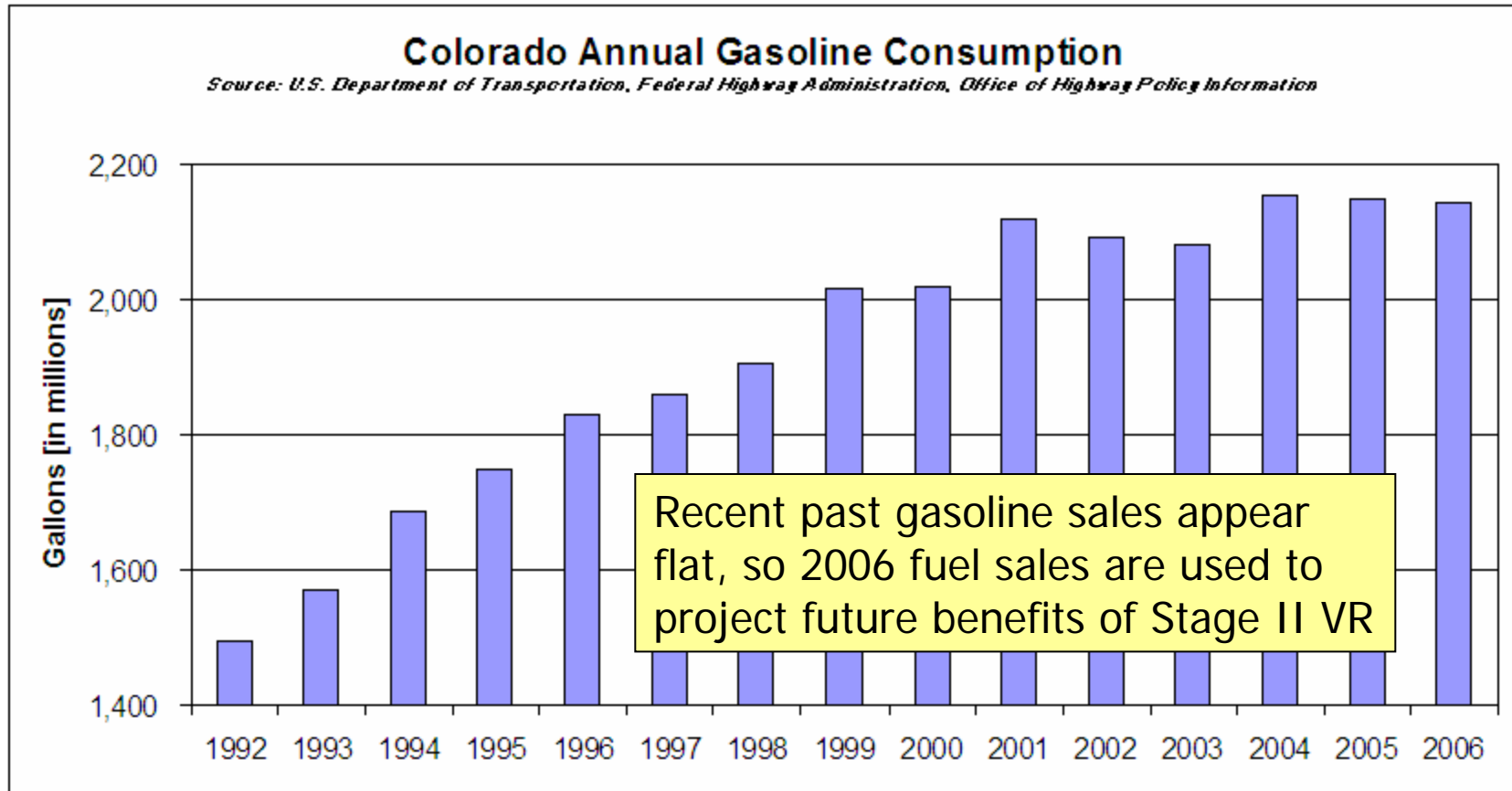
Stage II VR Cost Projections



Extra Slides



Statewide Fuel Consumption Data



VMT Trends in 9-County Area

Weekday Vehicle Miles Traveled (VMT)
in Denver Metro Area and North Front Range

