



November Air Quality Health Monitoring Task Force Meeting

North Central Texas Council of Governments

November 6, 2020

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UPDATE ON PARTICULATE MATTER (PM) EXCEEDANCE DAYS

**Vivek Thimmavajjala
NCTCOG**

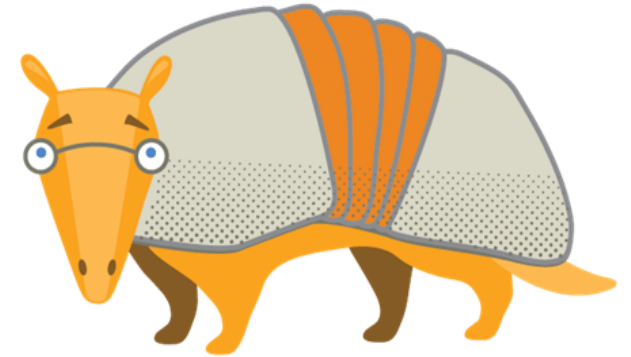
**Air Quality Health Monitoring Task Force Meeting
November 6, 2020**

REGIONAL PARTICULATE MATTER (PM) EPISODES

- **October 19, 2017** (Source: Unknown)
- **January 22, 2018** (Source: Grass Fires)
- **June 27 and June 28, 2020** (Source: Saharan Dust)

NCTCOG'S ACTIONS - OCTOBER 19TH, 2017 (RECAP)

- Issued a PM alert through the “Air North Texas”
- Responded to various enquires throughout the region
- Coordinated with the cities and local governments in an effort to determine source of the haze
- Discussed with the EPA and the TCEQ regarding the source of the haze and further actions
- The event could not be classified as an exceptional event in accordance with EPA’s definition

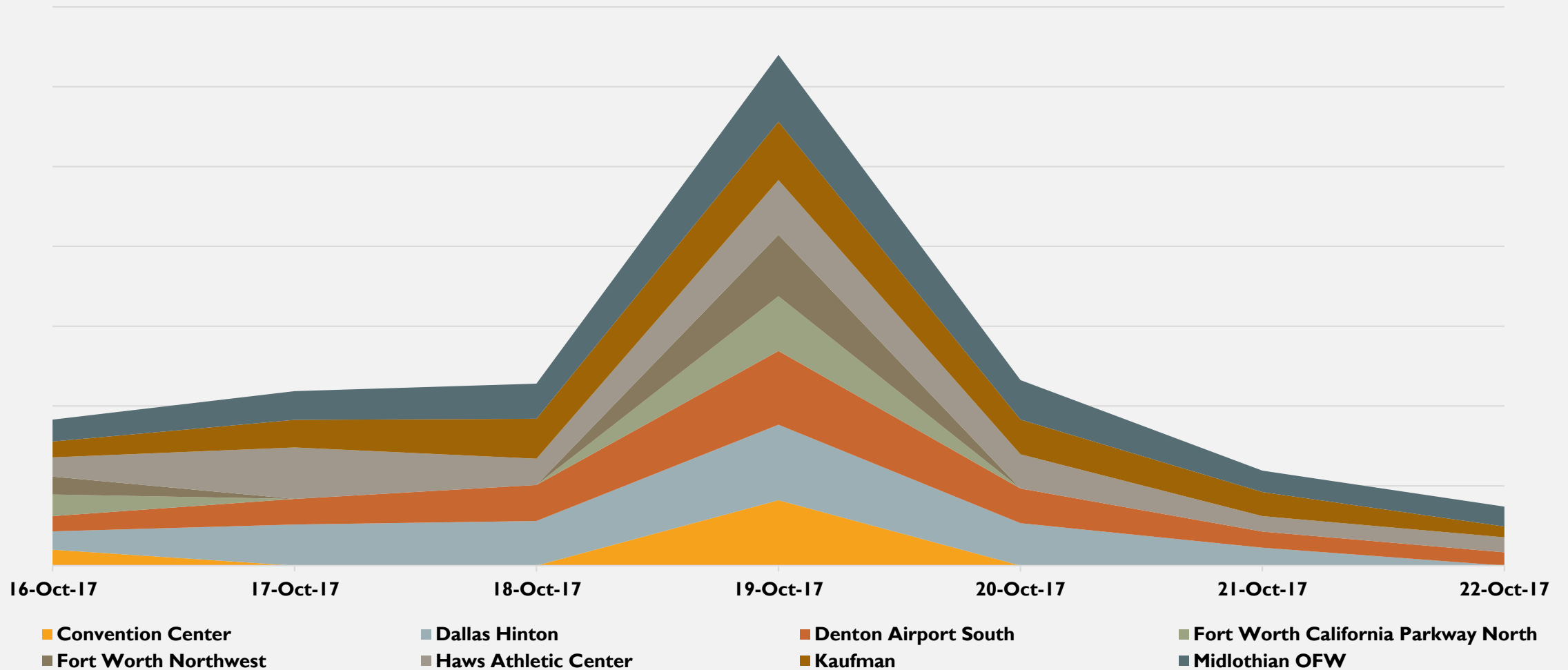


Orange Particulate Matter Alert Level Orange

Particulate matter (PM) is currently at Level Orange in the Dallas-Fort Worth area. Children, older adults and people with lung disease, such as asthma, emphysema, or chronic bronchitis, should limit outdoor activity. If PM reaches Level Red, Children, older adults and people with lung disease, such as asthma, emphysema, or chronic bronchitis, should avoid outdoor activity. All other people should limit prolonged outdoor exertion if PM reaches Level Red.

For more information, visit AirNorthTexas.org.

HOW WERE THE MONITOR READINGS? PARTICULATE MATTER (PM) 2.5



TEXAS DEPARTMENT OF STATE HEALTH SERVICES

2017 ANNUAL DATA

| County | Population | COPD Hospital Discharges | Asthma Outpatient Visits |
|---|------------|--------------------------|--------------------------|
| Collin | 1,025,618 | 1,071 | 2,655 |
| Dallas | 2,552,920 | 3,542 | 15,890 |
| Denton | 846,738 | 1,125 | 2,882 |
| Ellis | 183,618 | 468 | 985 |
| Erath | 40,353 | 77 | 174 |
| Hood | 58,168 | 164 | 218 |
| Hunt | 96,586 | 360 | 347 |
| Johnson | 175,030 | 574 | 1,192 |
| Kaufman | 133,652 | 264 | 476 |
| Navarro | 53,020 | 135 | 301 |
| Palo Pinto | 30,638 | 131 | 173 |
| Parker | 145,104 | 301 | 437 |
| Rockwall | 103,544 | 165 | 306 |
| Somervell | 9,844 | 20 | * |
| Tarrant | 2,023,985 | 3,284 | 11,771 |
| Wise | 202 | 121 | 69,449 |
| Note: * Indicates fewer than 12 visits were reported, corresponding rates were not reported | | | |

DATA REQUIREMENTS AND NEXT STEPS

- Looking for **daily** health data (COPD Hospital Discharges, Asthma Outpatient Visits) at the county-level a week prior to and after October 19th, 2017 to analyze the trends
- Continue similar analysis for other identified regional PM episodes
- Channel discussion towards local/neighborhood-level hotspots
- Combine/consolidate regional interests/analysis with various cities, local governments, and communities
- Discussion

EFFECTS OF COVID-19 ON TRANSPORTATION and AIR QUALITY

Air Quality Health Monitoring Taskforce Meeting

November 6, 2020

Nick Van Haasen

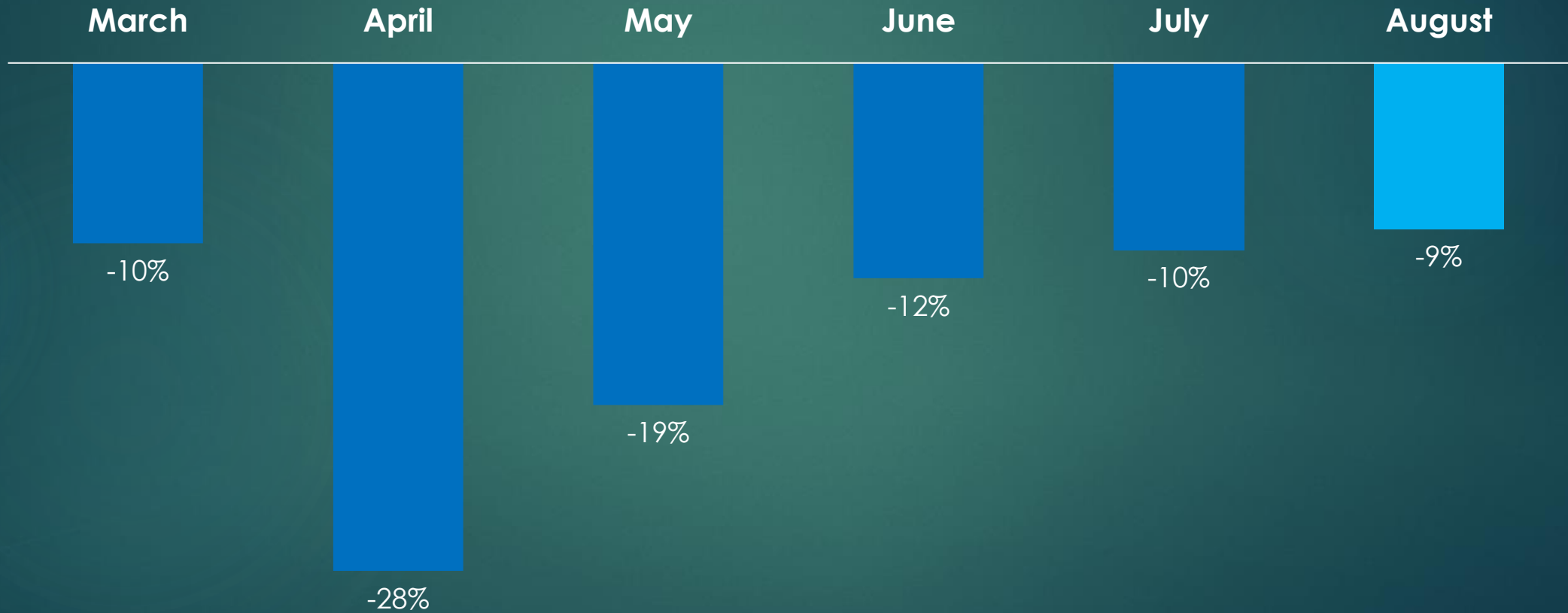


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1. TRANSPORTATION

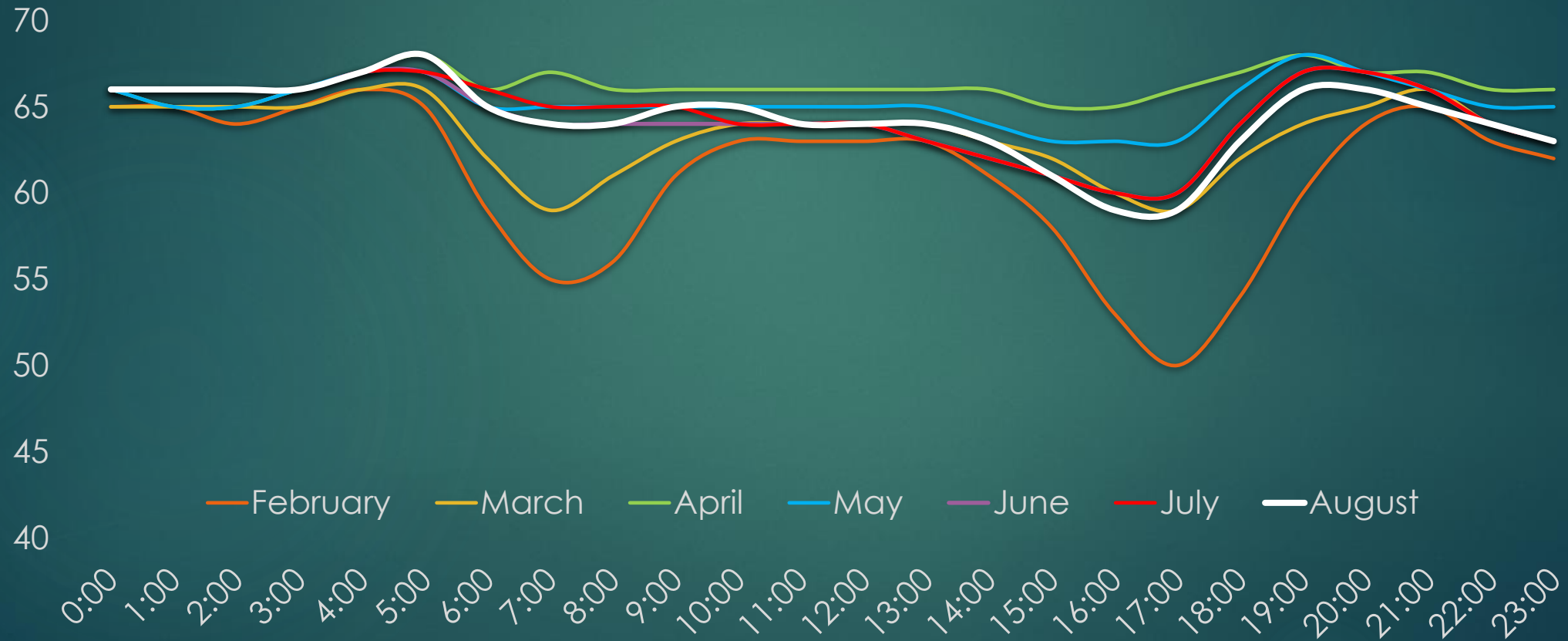
Average Weekday Freeway Volumes: Respective 2019 to 2020

Traffic Decrease vs 2019



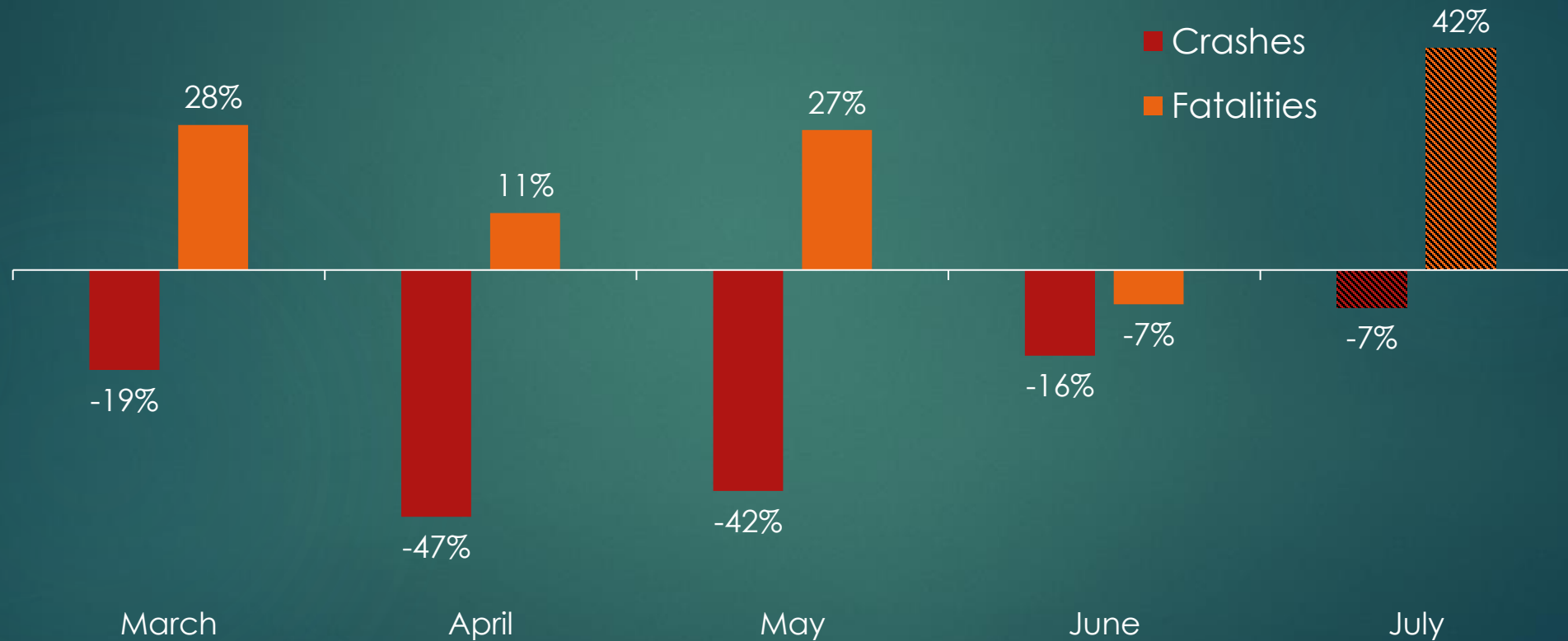
Regional Average Freeway Speed By Time of Day

Average Weekday Speeds, Weighted by Traffic Volumes



Percentage of Crashes: March and April 2019 vs March and April 2020

Crashes and Fatalities: 2019 vs 2020



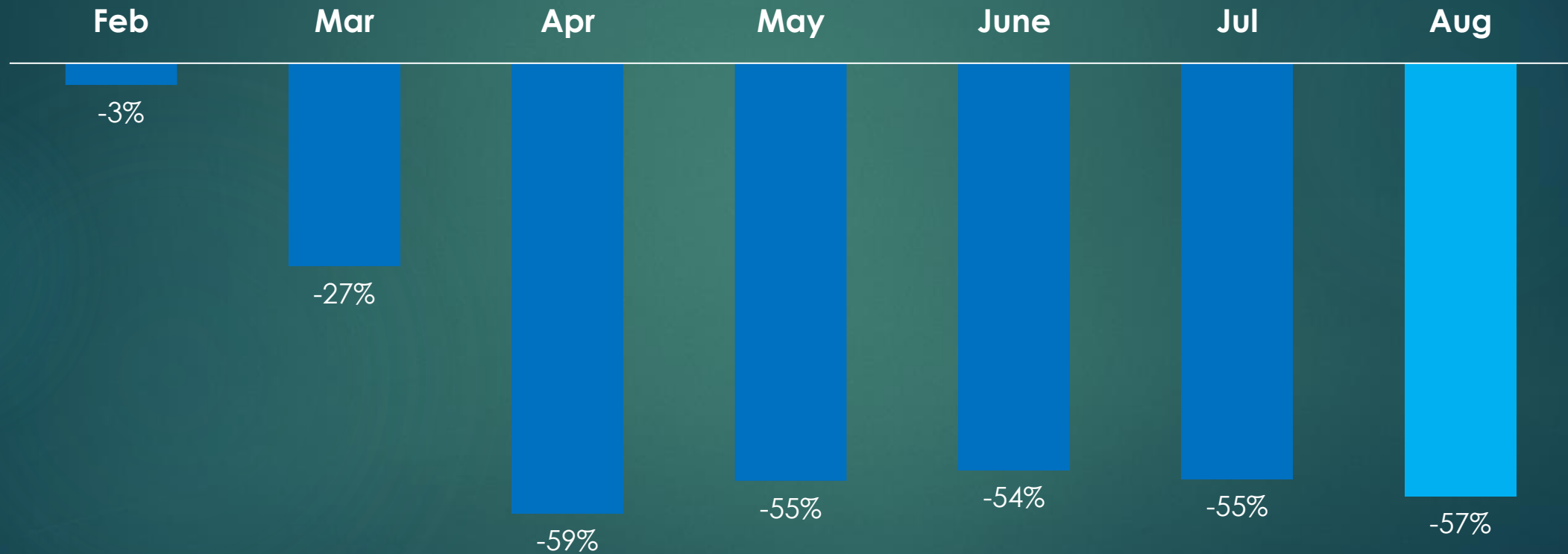
Source: TxDOT Crash Records Information System

Crash data is accurate as of August 12, 2020.

Traffic enforcement was significantly reduced during the COVID-19 shelter-in-place orders.

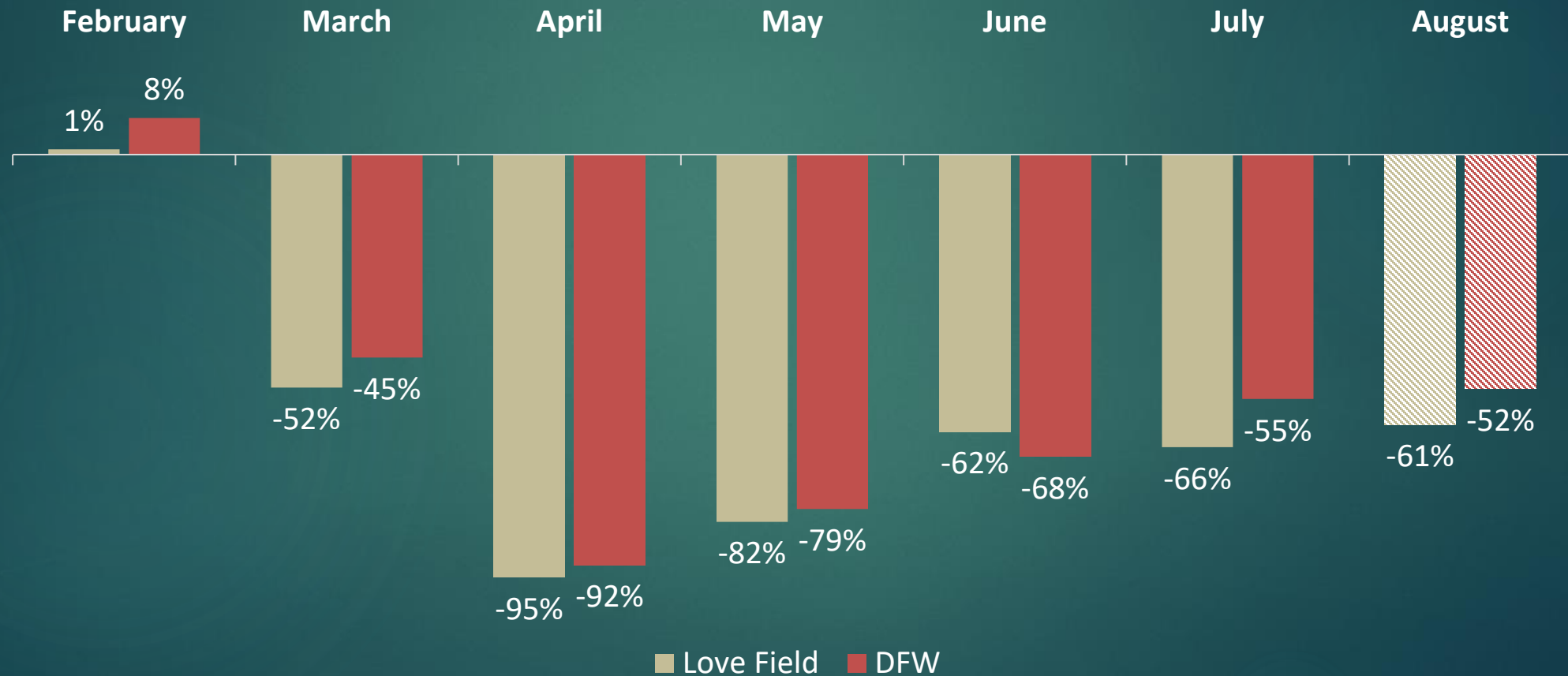
Transit Impacts: Weekday Ridership

Passenger Decrease : 2019 vs 2020



Airport Impacts: Passenger Trends

Change in Airport Passengers - 2019 vs 2020



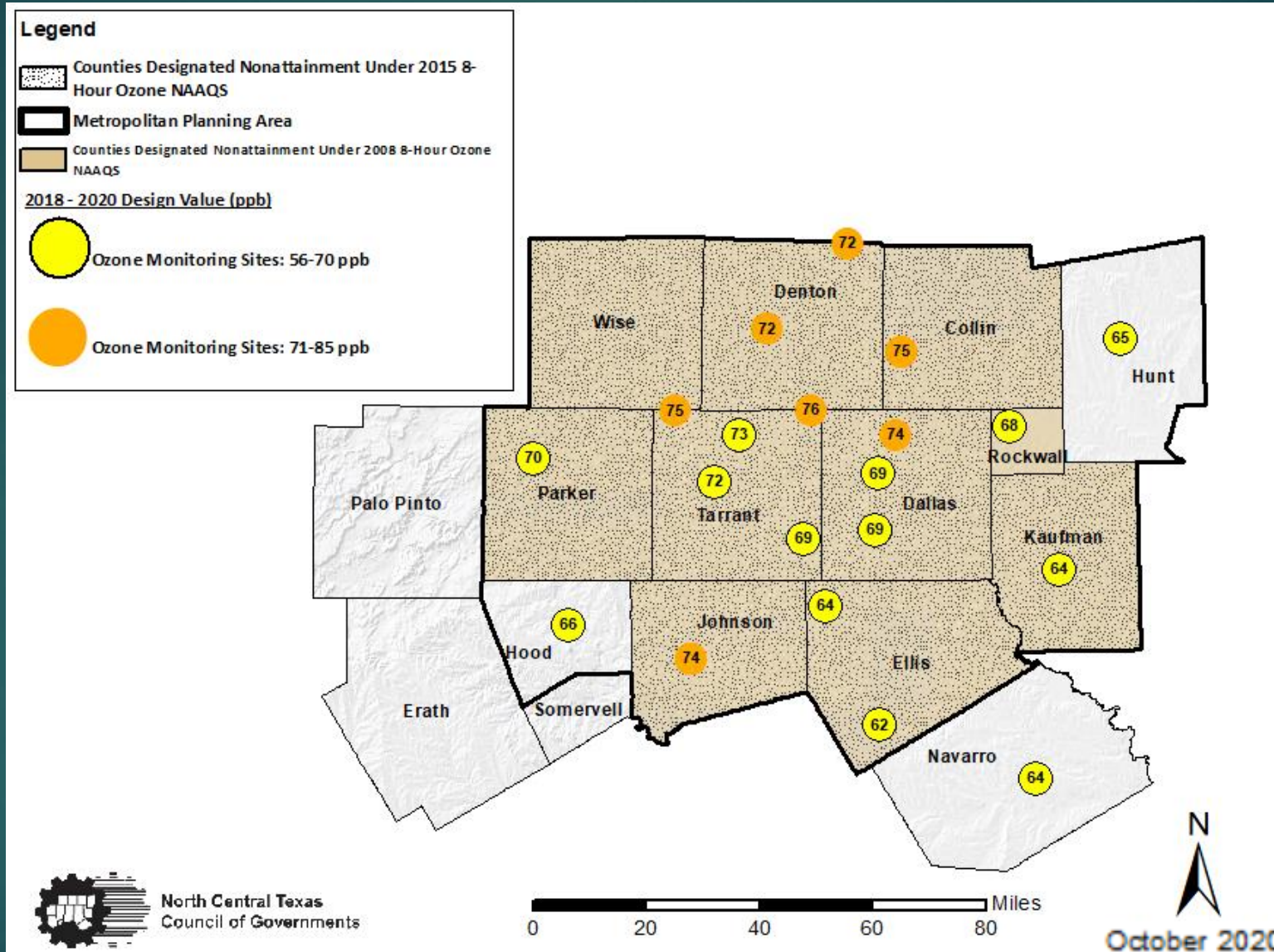
2. AIR QUALITY

Regional Air Quality Impacts During COVID-19

- ▶ Emissions from vehicles reduced
- ▶ Lowest frequency of high-level, unhealthy, exposure days to ozone (prior to exceedances on August 3, 2020)
 - ▶ Ozone levels influenced by meteorological conditions: high temperatures, low winds, high UV index, limited rain, and little cloud coverage
- ▶ Cleaner air = blue(r) skies
- ▶ Leading to a healthier populous (under review)
- ▶ Real world analysis on local contributions suggest multi-state SIP's to reduce background
- ▶ How Can We Sustain Impacts? (To be determined)
 - Electric and Fuel Cell Vehicles
 - Travel Demand Management (Telecommuting)

Real world analysis on local contributions suggest multi-state SIPs to reduce background

DFW OZONE NONATTAINMENT AREA



Colors represent Air Quality Index breakpoints

Attainment Goal - According to the US EPA National Ambient Air Quality Standards, attainment is reached when, at each monitor, the three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentration is less than or equal to 70 parts per billion (ppb).

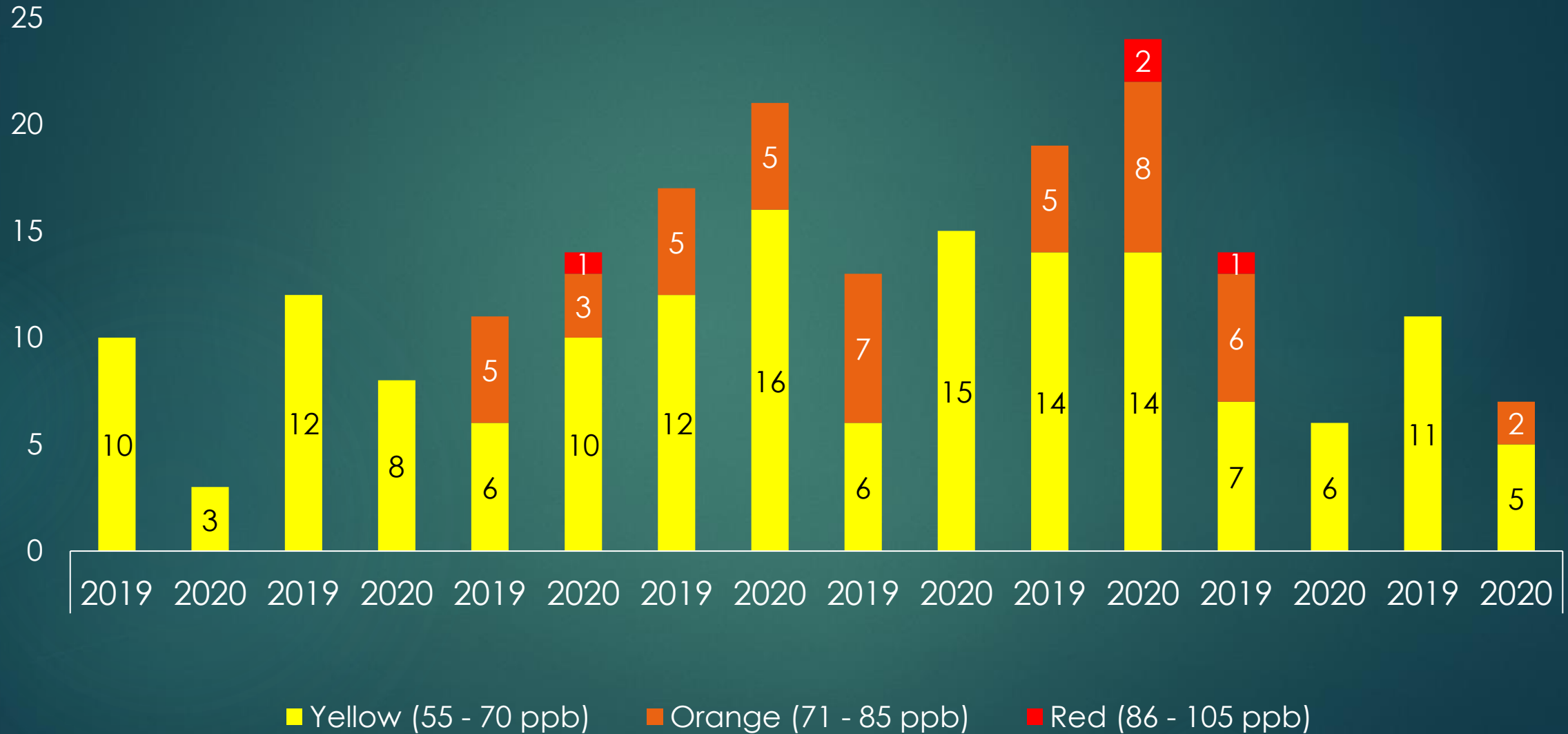
North Central Texas Ozone Comparison

| | 2017 | 3 Year Design Value | | |
|-----------|--|--|--|--|
| | | 2018 | 2019 | 2020* |
| March | 2 yellow days High: 62 at Eagle Mtn Lake | 8 yellow days High: 63 at Denton | 10 yellow days High: 66 at Cleburne | 3 yellow days High: 64 at Pilot Point |
| April | 10 yellow days High: 68 at Dallas Hinton | 16 yellow days 2 orange days High: 81 at Dallas North High: 81 at Dallas Hinton | 12 yellow days High: 69 at Greenville | 8 yellow days High: 69 at Rockwall High: 69 at Grapevine |
| May | 15 yellow days 5 orange days High: 80 at Dallas North High: 80 at Dallas Hinton | 9 yellow days 6 orange days 2 red days High: 92 at Eagle Mtn Lake | 6 yellow days 5 orange days High: 80 at Pilot Point | 10 yellow days 3 orange day 1 red day High: 86 at Grapevine Fairway |
| June | 6 yellow days 4 orange days High: 84 at Cleburne Airport | 7 yellow days 2 orange days High: 85 at Dallas North | 12 yellow days 5 orange days High: 76 at Frisco High: 76 at Arlington Municipal High: 76 at Cleburne Airport | 16 yellow days 5 orange days High: 77 at Eagle Mountain Lake |
| July | 14 yellow days 3 orange days High: 81 at Cleburne Airport High: 81 at Granbury | 14 yellow days 8 orange days 3 red days High: 92 at Grapevine Fairway | 6 yellow days 7 orange days High: 83 at Cleburne Airport | 15 yellow days High: 69 at Dallas North |
| August | 11 yellow days 3 orange days High: 83 at Grapevine Fairway | 12 yellow days 6 orange days 2 red days High: 91 at Parker County | 14 yellow days 5 orange days High: 84 at Keller | 14 yellow days 8 orange days 2 red days High: 89 at FT. Worth Northwest |
| September | 11 yellow days 8 orange days High: 82 at Dallas Hinton | 6 yellow days High: 69 at Pilot Point | 7 yellow days 6 orange days 1 red day High: 88 at Frisco | 6 yellow days High: 69 at Frisco |

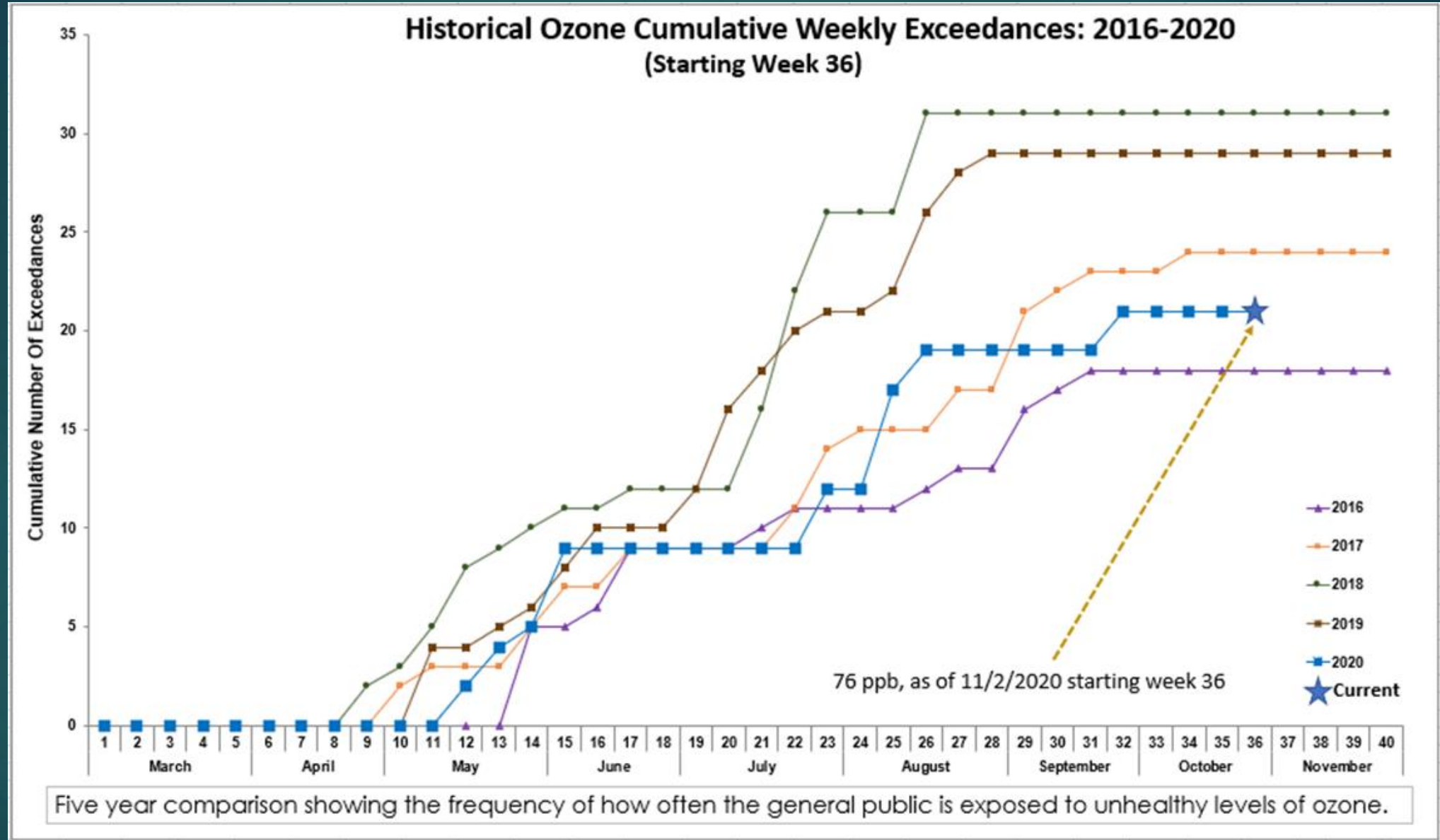
Data Source: TCEQ
Data Analysis: NCTCOG

* as of October 5, 2020. At this time last year (October 5, 2019), there were three Yellow days, whereas 2020 has 1 Yellow day.

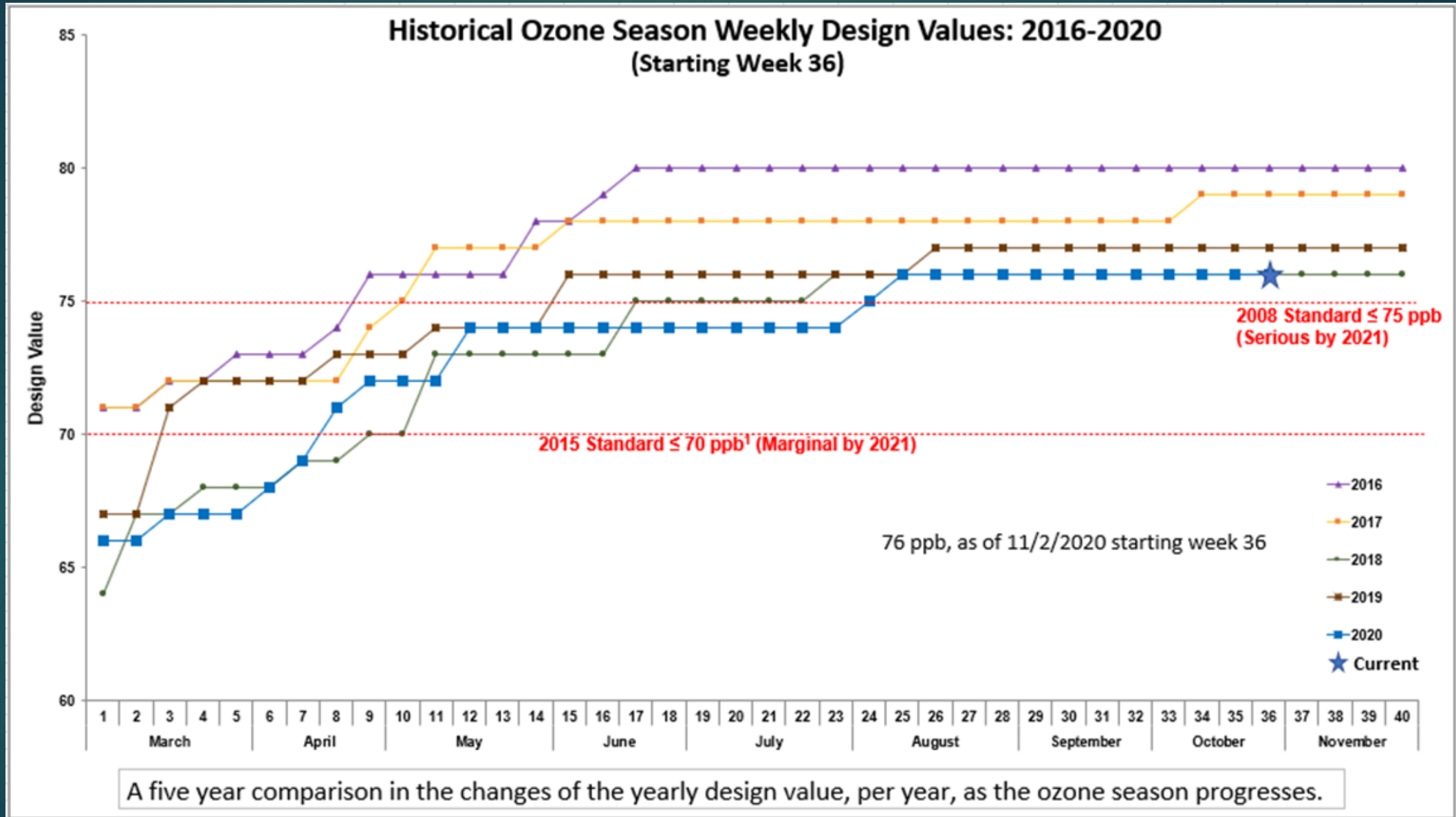
North Central Texas Ozone Exceedance Comparison: 2019-2020



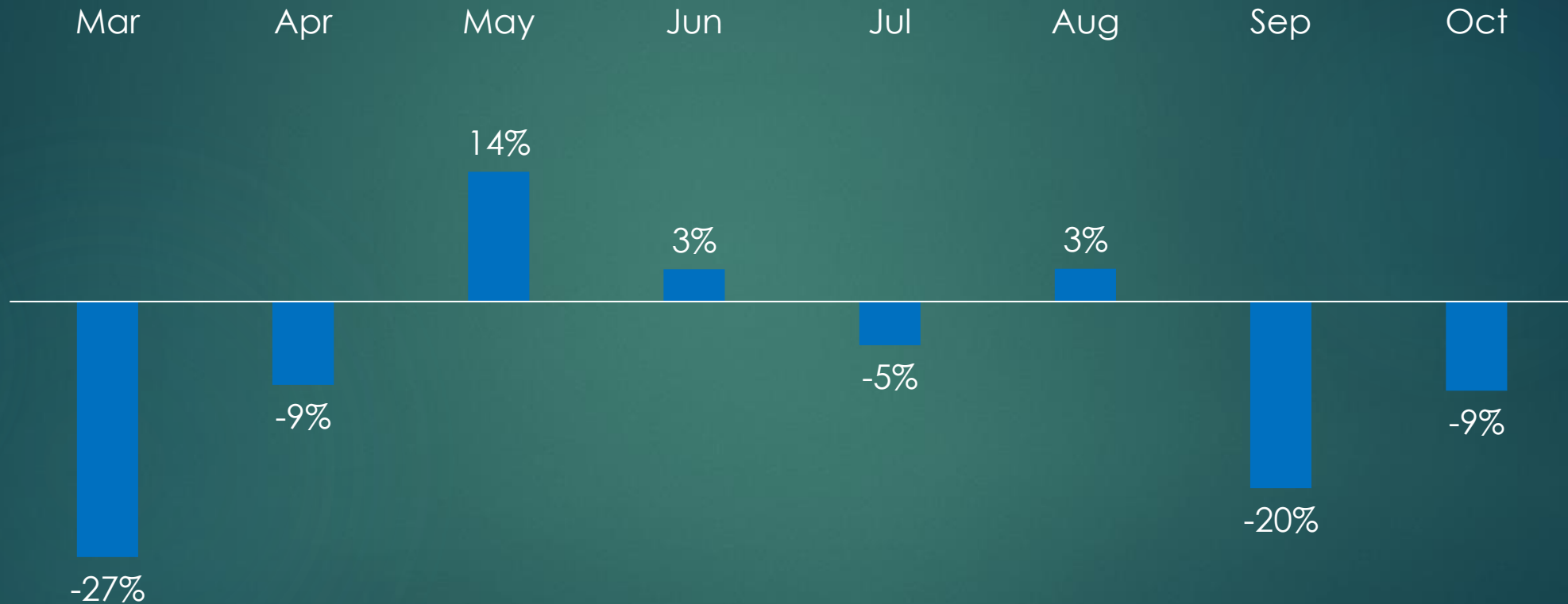
Cumulative Ozone Exceedances, 2016-2020



Weekly Ozone Design Values, 2016-2020



Percent Change in Average Regional Ozone Emissions: 2019 vs 2020



*ozone levels are influenced by meteorological conditions: high temperatures, low winds, high UV index, limited rain, and little cloud coverage.

FOR MORE INFORMATION, PLEASE CONTACT:

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Air Quality Planner
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NVanhaasen@nctcog.org

Nondiscrimination Analysis for Long-Range Planning

Potential Air Quality Metric

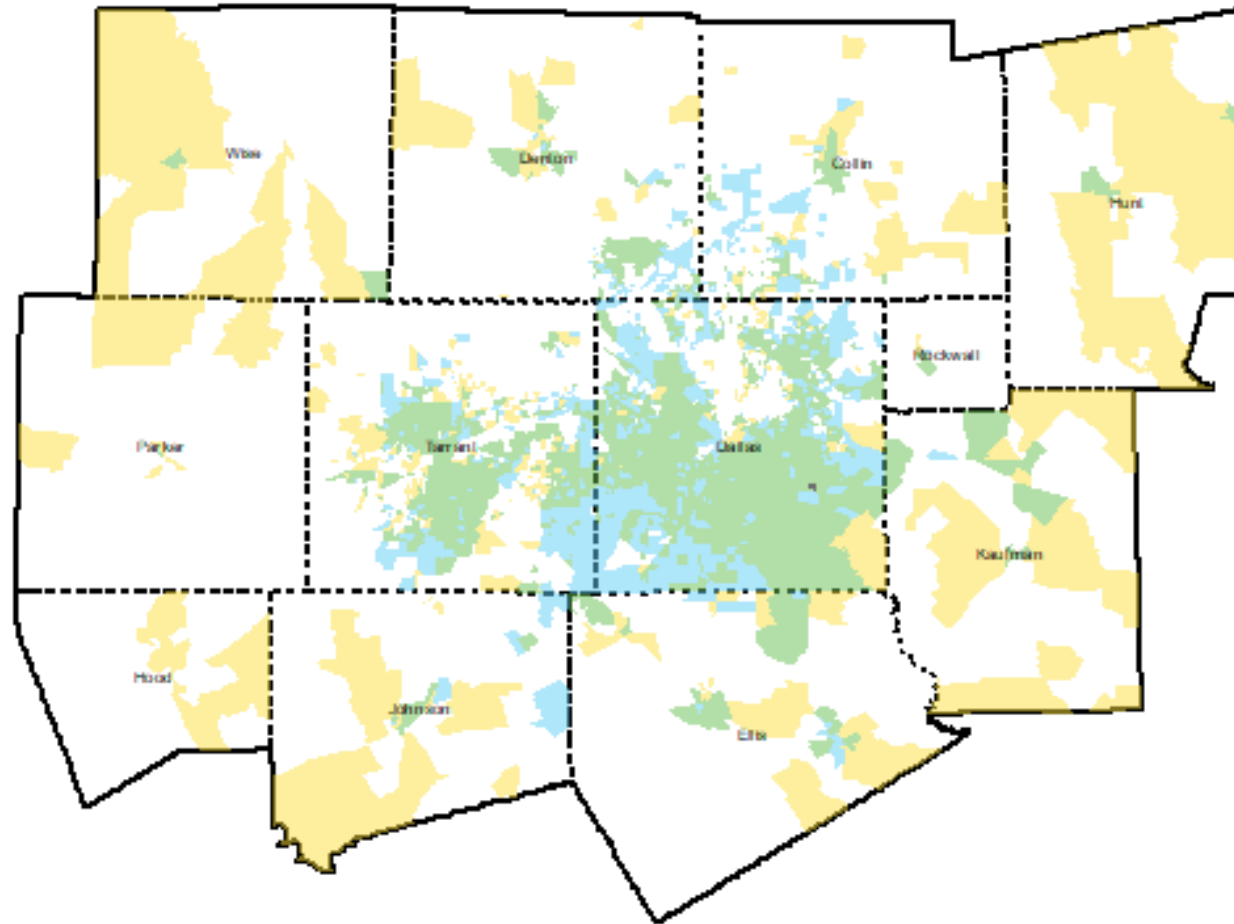


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Long-range planning and nondiscrimination requirements at NCTCOG

- 20+ year planning horizon with updates every 4 years (because of nonattainment)
- Compliance with EO 12898 and EO 13166; environmental justice and limited English proficiency, respectively
- Compliance with Title VI of Civil Rights Act of 1964; race, color, national origin

Environmental Justice Index

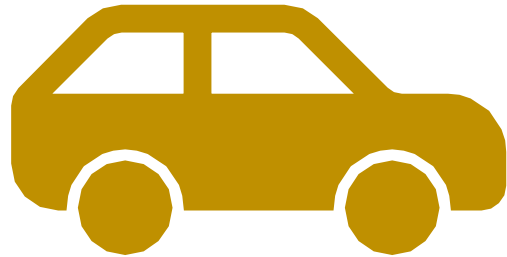


Goals for revising non-discrimination analysis

- Expand to include Title VI of Civil Rights Act of 1964 (limited English-proficient communities)
- Diversify metrics beyond roadway and transit accessibility, such as grade-separated vs. at-grade rail crossings; access to on-street bike facilities
- Include benefits *and* burdens
- Continue comparing current conditions to future conditions (post construction of long-range plan projects)
- Conduct a needs assessment that will help inform:
 - Future project selection and prioritization for the long-range plan, 10-year plan, and calls for projects (funding opportunities)
 - Programmatic tasks that are not roadway/transit alignments in the long-range plan

Potential air quality metric

Equity of communities neighboring roadways with >125,000 vehicles per day (VPD)

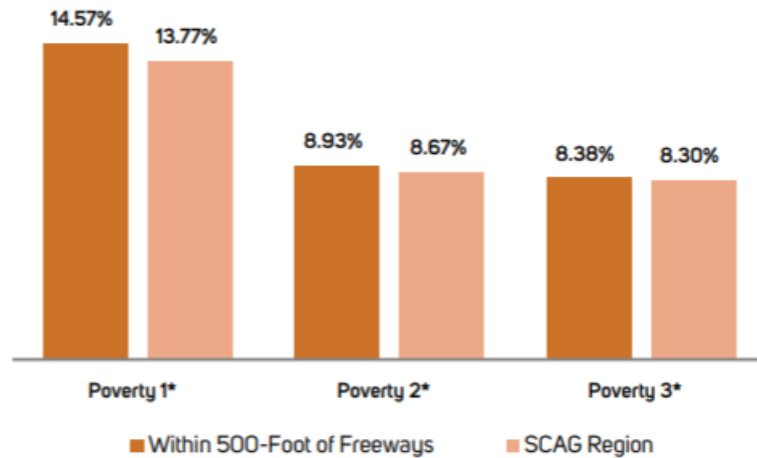


Reference for selecting 125,000 VPD metric

Population neighboring roadways with >125,000 VPD – focus on PM, CO

2012

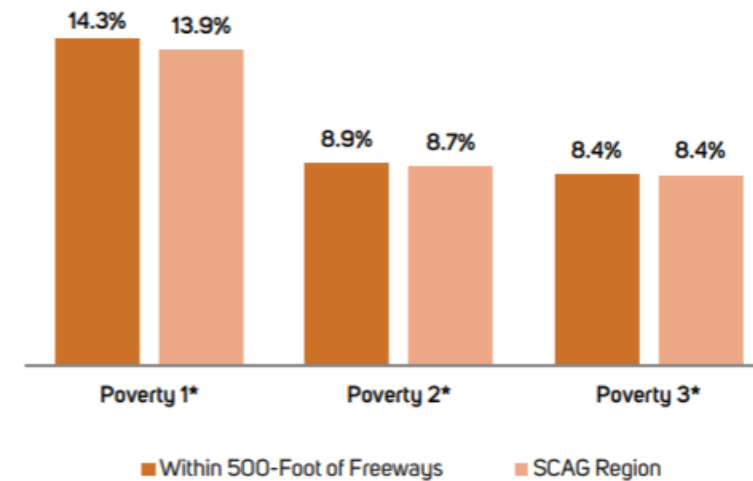
FIGURE 72 Breakdown of Poverty Households along Freeways and Highly Traveled Corridors (Base Year 2012)



Source: SCAG

2040

FIGURE 73 Breakdown of Poverty Households along Freeways and Highly Traveled Corridors (2040 Plan)



Source: SCAG

Poverty 1 is households < poverty; Poverty 2 is households 100%-149% poverty; Poverty 3 is households 150%-199% poverty

http://scagrtpscscs.net/Documents/2016/final/f2016RTPSCS_EnvironmentalJustice.pdf

Three challenges

1

Burden generated by individual roadway impact, or burden generated by cumulative roadway impact?

2

Relevance of 125,000 vehicles per day?

- Why 125,000?
- Volume, congestion, or diesel truck use?
- LA is out of attainment for PM 2.5?

3

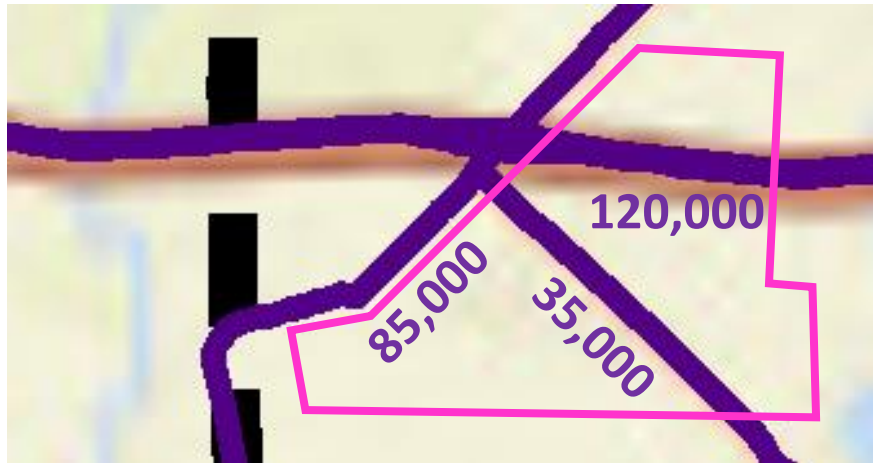
Distance of greatest exposure

- 500-600 feet typically accepted
- Are other distances worth considering?
- Roadway segment lengths, Census geographies, and traffic survey zones (TSZs) exceed these distances

1

Individual roadway burden

- ID roadways >125,000 VPD
- ID neighboring communities

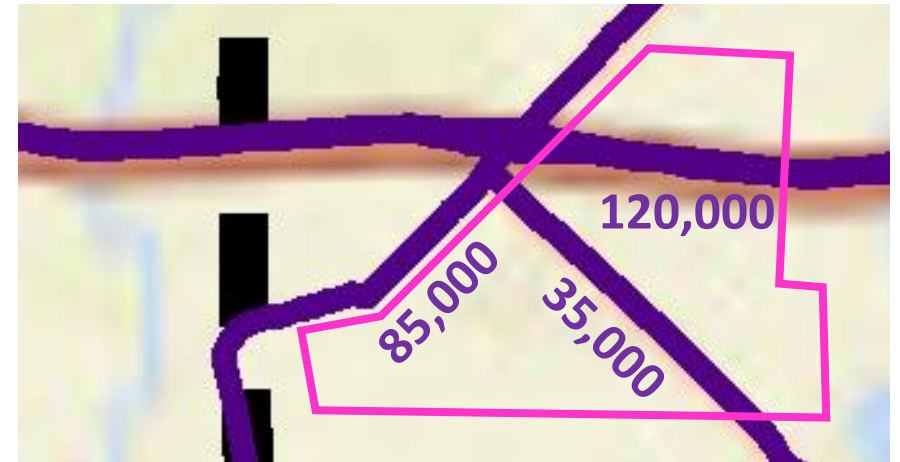
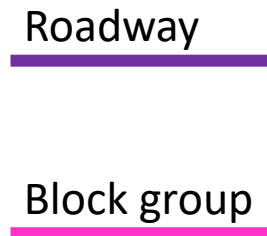


No impact

vs.

Cumulative burden

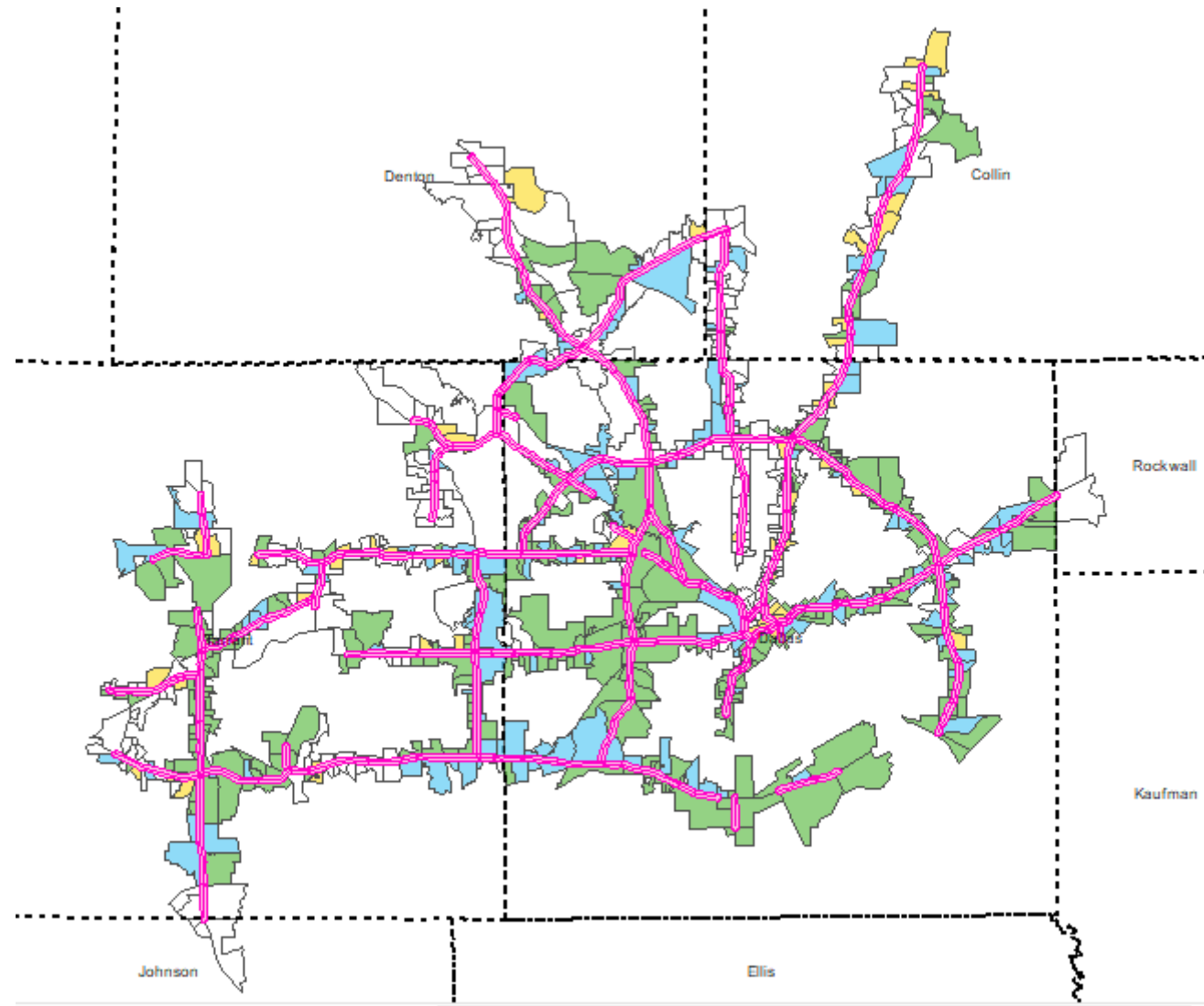
- ID communities within 500 feet of cumulative burden of >125,000 VPD



Impact

1

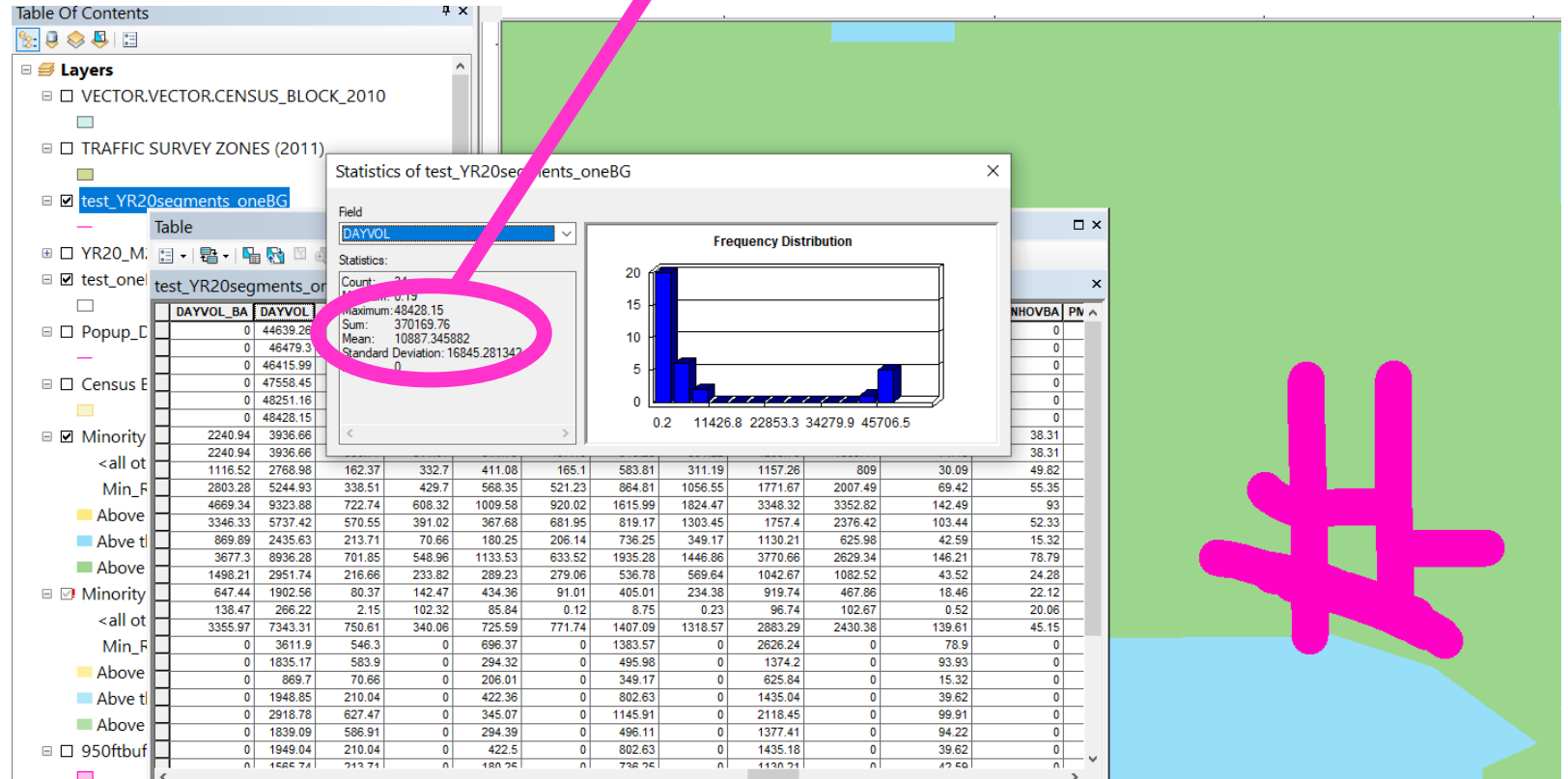
Environmental justice (and other) block groups intersecting roadways with >125,000 VPD



1

Cumulative vehicles per day >125,000 within 500 feet of one block group (in this case with high environmental justice population)

Sum=370,169.76





5.2 NEPA Triggers

- A CO TAQA is required if the project is NOT exempt in accordance with Section 6.2 of this handbook.
- MSAT consultation is required if the project is NOT exempt from an MSAT analysis in accordance with Section 6.2 of this handbook and any of the following apply:
 - The project is adding capacity and has an Annual Average Daily Traffic (AADT) greater than the 140,000 vehicles per day, or
 - The project affects or is affected by an intermodal facility or another facility which may be a large generator of diesel traffic, or
 - The public has expressed air quality concerns specifically about this project (the consultation process would assess if the public concerns would be addressed by conducting a quantitative MSAT analysis).

meters, or approximately 650
ocation of roads and traffic

levels come from the 2011 National Transportation Atlas Database; data on population come from the 2010 Census.

Related Links

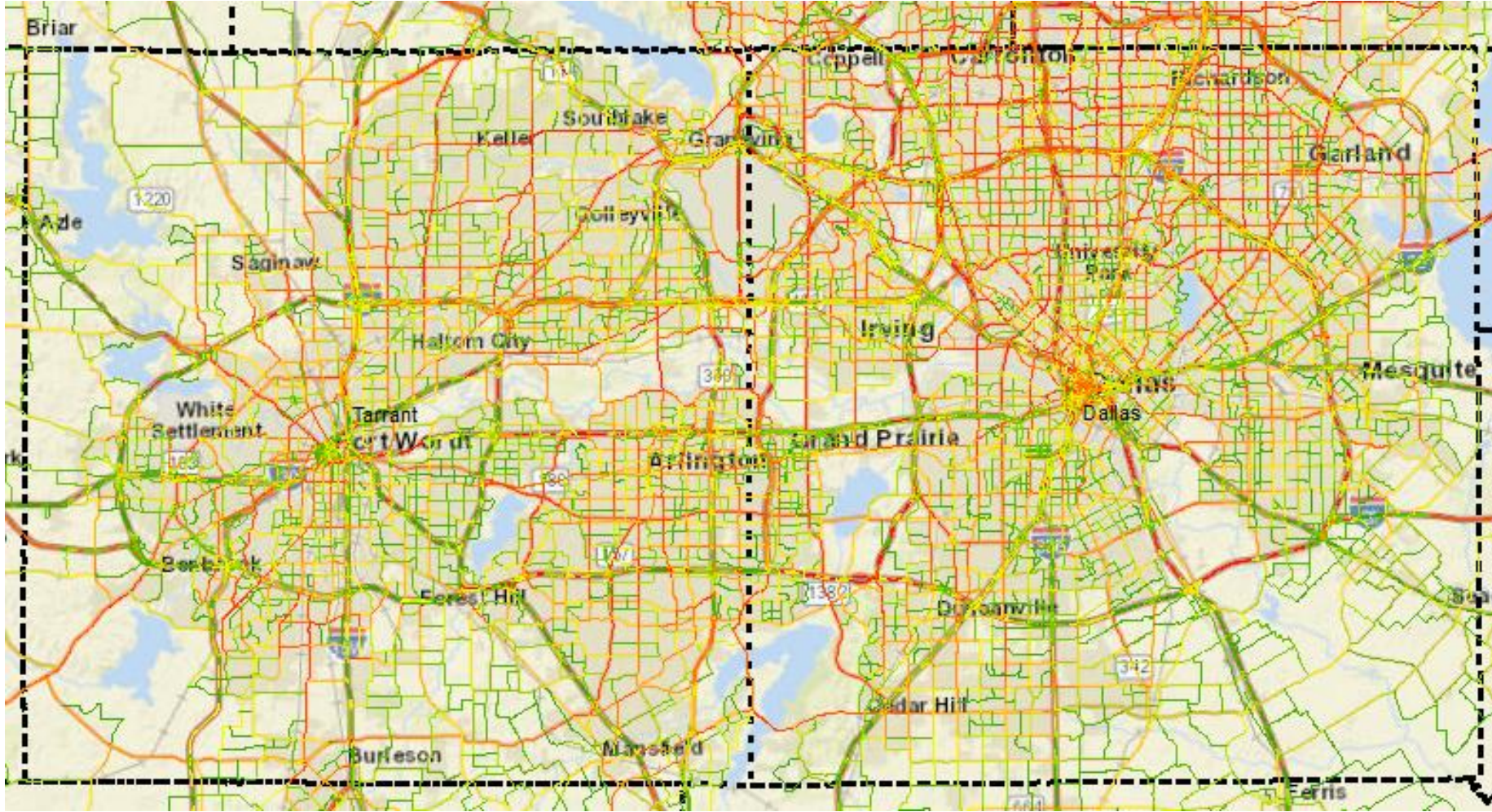
From TxDOT’s Environmental Handbook: Air Quality, <https://ftp.txdot.gov/pub/txdot-info/env/toolkit/210-01-gui.pdf>

2

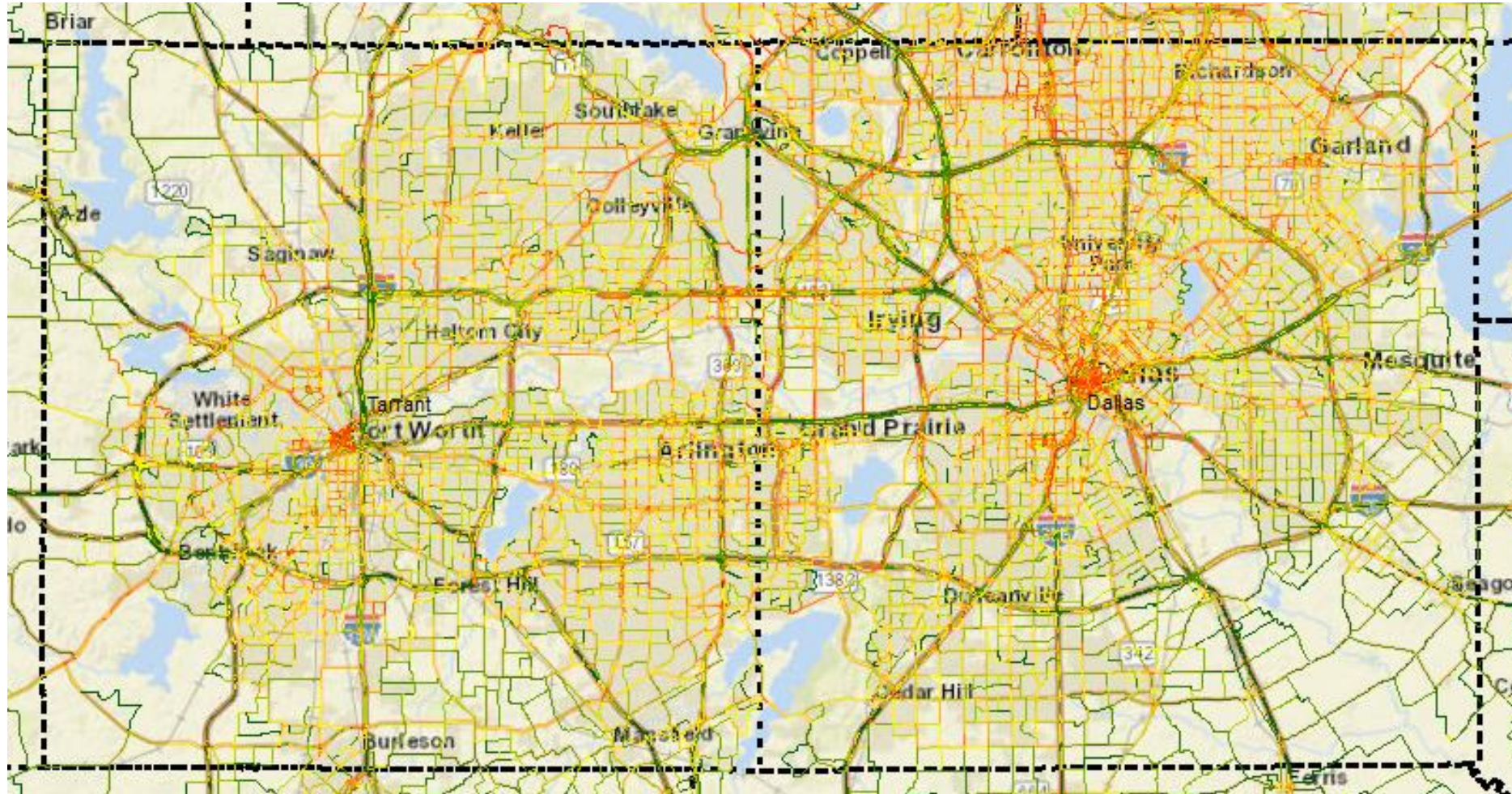
Reasons for 125,000 (or other) VPD threshold:

- a) Volume?
- b) Congestion?
- c) Presence of trucks?
- d) LA (reference metric) is in nonattainment for PM 2.5?

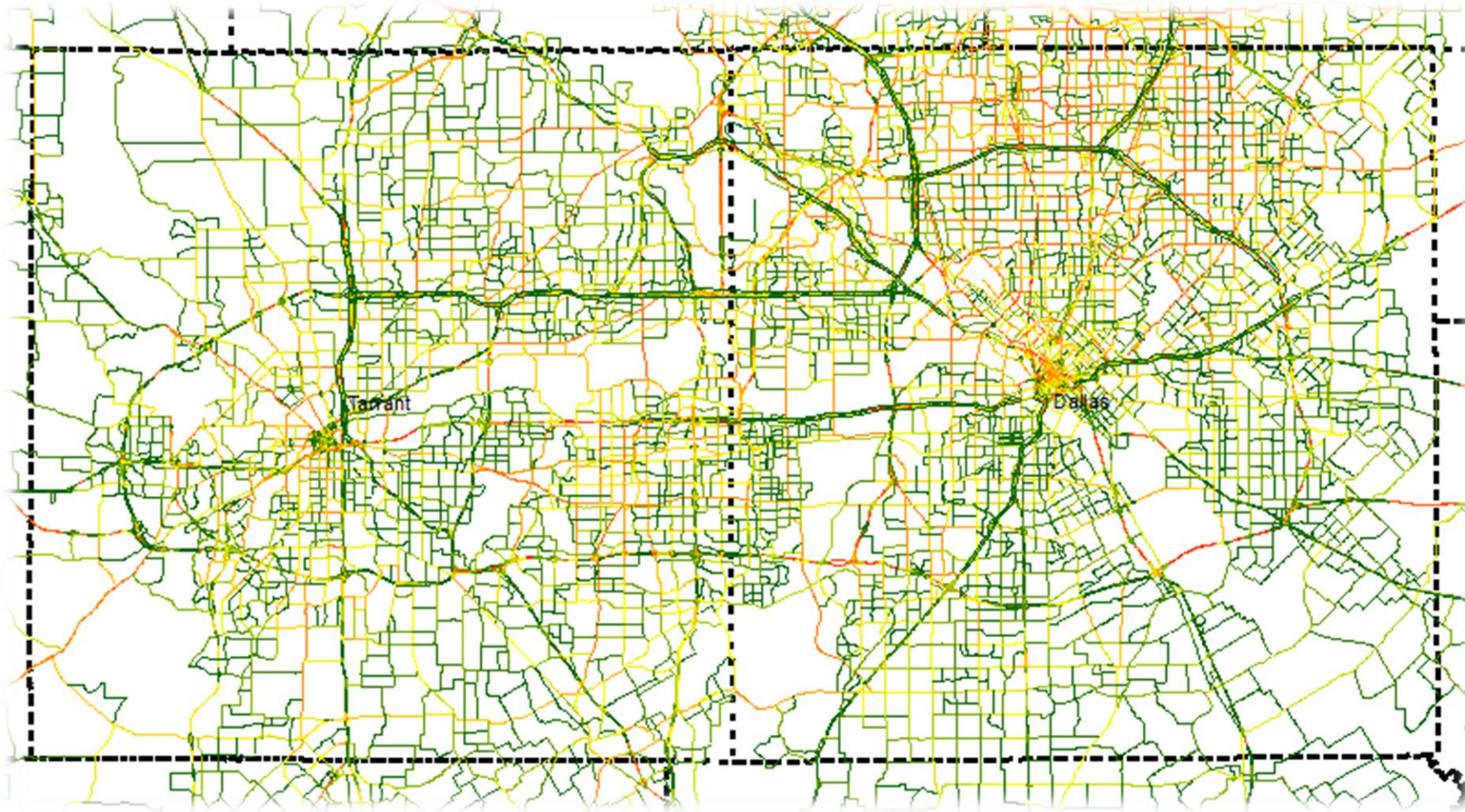
a) Volume



b) Congestion



c) Presence of trucks*



* NCTCOG truck data is not calibrated for individual locations, so it is less accurate on a local scale than on an aggregated, regional scale

d) LA is in nonattainment for PM 2.5...

Making 125,000 relevant in LA. Is it also relevant for DFW?

Los Angeles County

- Lead (2008)* * Los Angeles County-South Coast Air Basin, CA
- PM-2.5 (1997)* * Los Angeles-South Coast Air Basin, CA - (Moderate)
- PM-2.5 (2006)* * Los Angeles-South Coast Air Basin, CA - (Serious)
- PM-2.5 (2012)* * Los Angeles-South Coast Air Basin, CA - (Moderate)
- 8-Hour Ozone (2008)* * Los Angeles-San Bernardino Counties (West Mojave Desert), CA - (Severe 15)
- 8-Hour Ozone (2008)* * Los Angeles-South Coast Air Basin, CA - (Extreme)
- 8-Hour Ozone (2015)* * Los Angeles-San Bernardino Counties (West Mojave Desert), CA - (Severe 15)
- 8-Hour Ozone (2015)* * Los Angeles-South Coast Air Basin, CA - (Extreme)

<https://www3.epa.gov/airquality/greenbook/ancl.html>

3

Living within 500-600 feet from roadway documented as creating increased health risk
www.transportation.gov/mission/health/proximity-major-roadways

But...

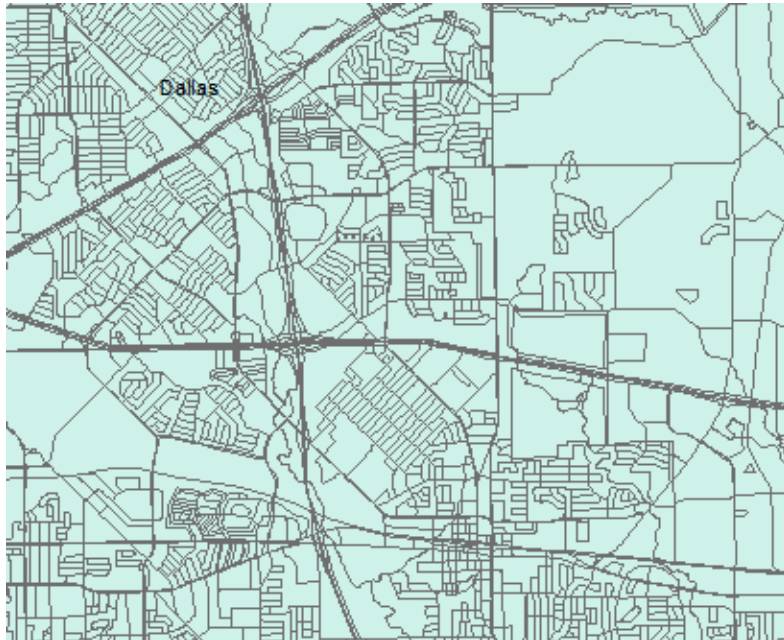
a) Geography presents challenges

- Census block (finest-scale) data not always available and can exceed 500-foot distance
- Census block group data can exceed 500-foot distance by greater amount than blocks
- Traffic survey zones can exceed 500-foot distance

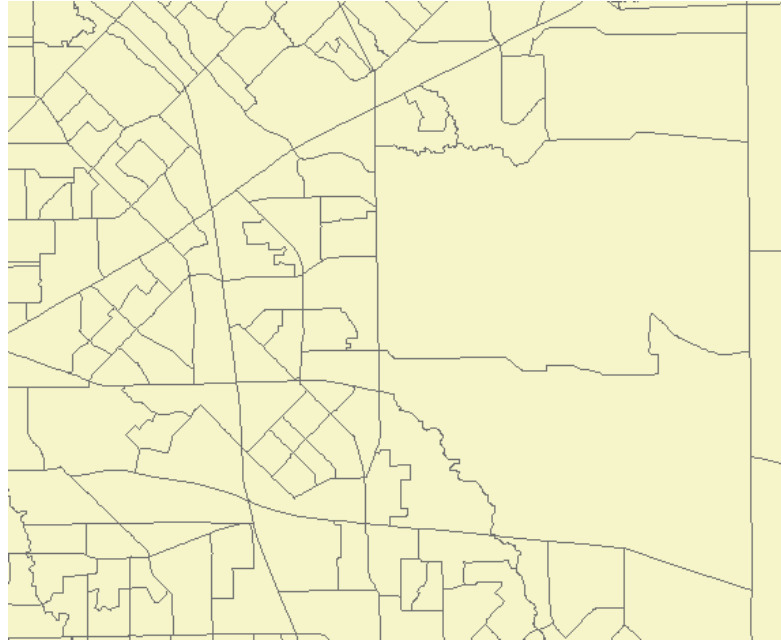
b) Roadway segment lengths present challenge

- Segment may exceed 500-foot distance

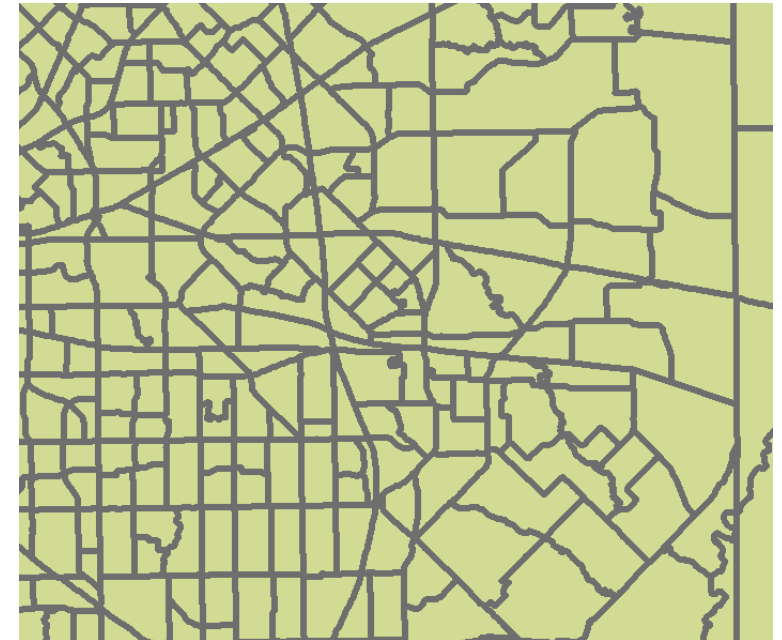
a) Census geography and TSZ sizes



Blocks



Block groups



TSZs – used when projecting demographics into future

b) Roadway segment lengths

AQ Metrics test mapx.mxd - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

1:500,000 Drawing Arial

523% NCTCOGDATA

Table Of Contents

- Layers
 - VECTOR.VECTOR.CENSUS_BLOCK_2010
 - test_YR20segments_oneBG
 - YR20_M2045_NOV2018_RDWY
 - test_oneBG
 - Popup_Dayvol_2018_125000
 - Census Block Groups (Current)
 - Minority and/or Population Below Poverty
 - <all other values>

Measure

Line measurement (Planar)
Segment: 8,144.674177 Feet
Length: 8,144.674177 Feet

Your thoughts?

Contact

Kate Zielke

Principal Transportation Planner

kzielke@nctcog.org



CO-Benefits Risk Assessment (COBRA) Health Impact Screening and Mapping Tool

Emma Zinsmeister, MPH

Presentation to the North Central Texas Council of Governments
Webinar | November 6, 2020



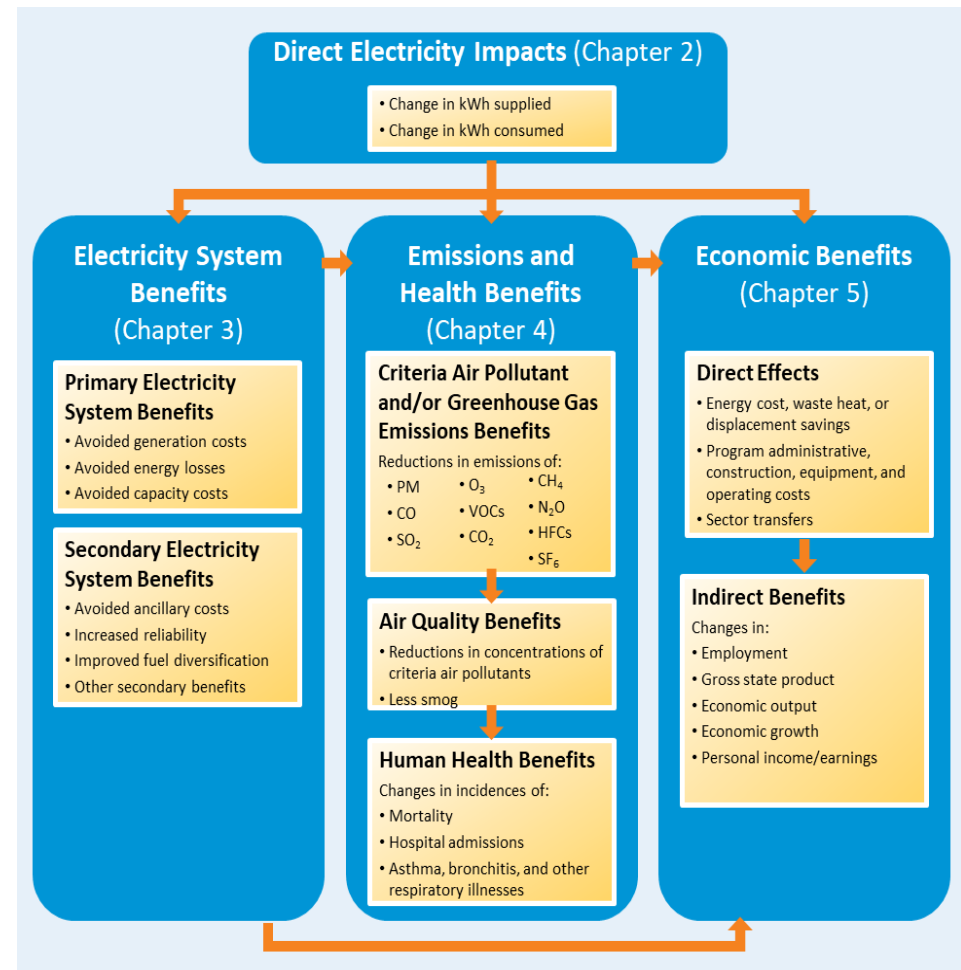
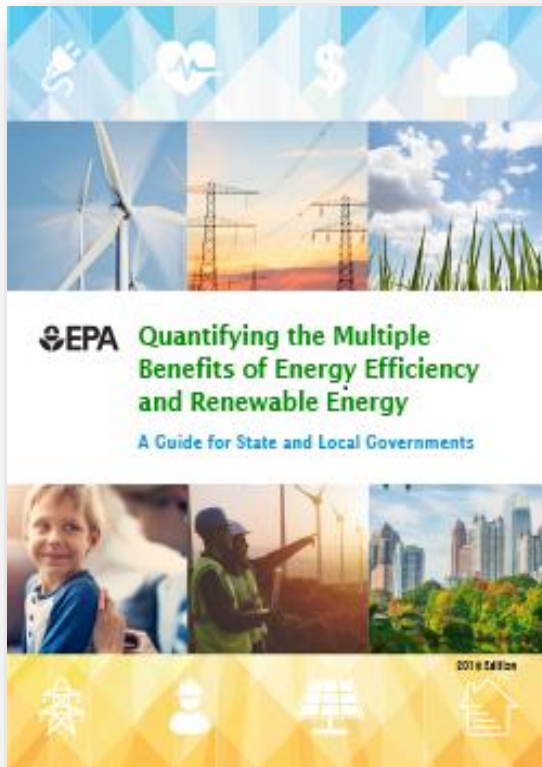
Today

- Provide an overview of EPA's CO-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool
- Offer an example of how COBRA can be used
- Invite you to share ideas for how COBRA can support your work within local governments

EPA's State and Local Energy and Environment Program



Emissions, air quality (AQ), and health benefits are a key component of EPA's multiple benefits framework

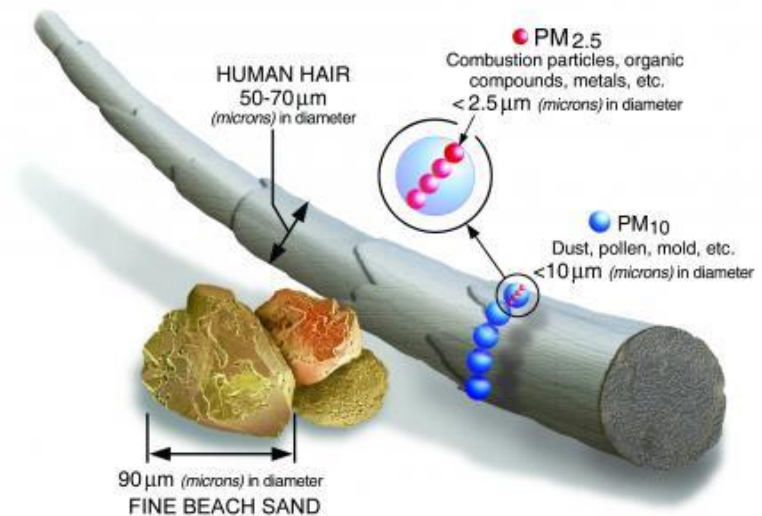




Fine particulate matter (PM_{2.5}) and public health

Numerous scientific studies have linked PM_{2.5} exposure to a variety of health problems, including:

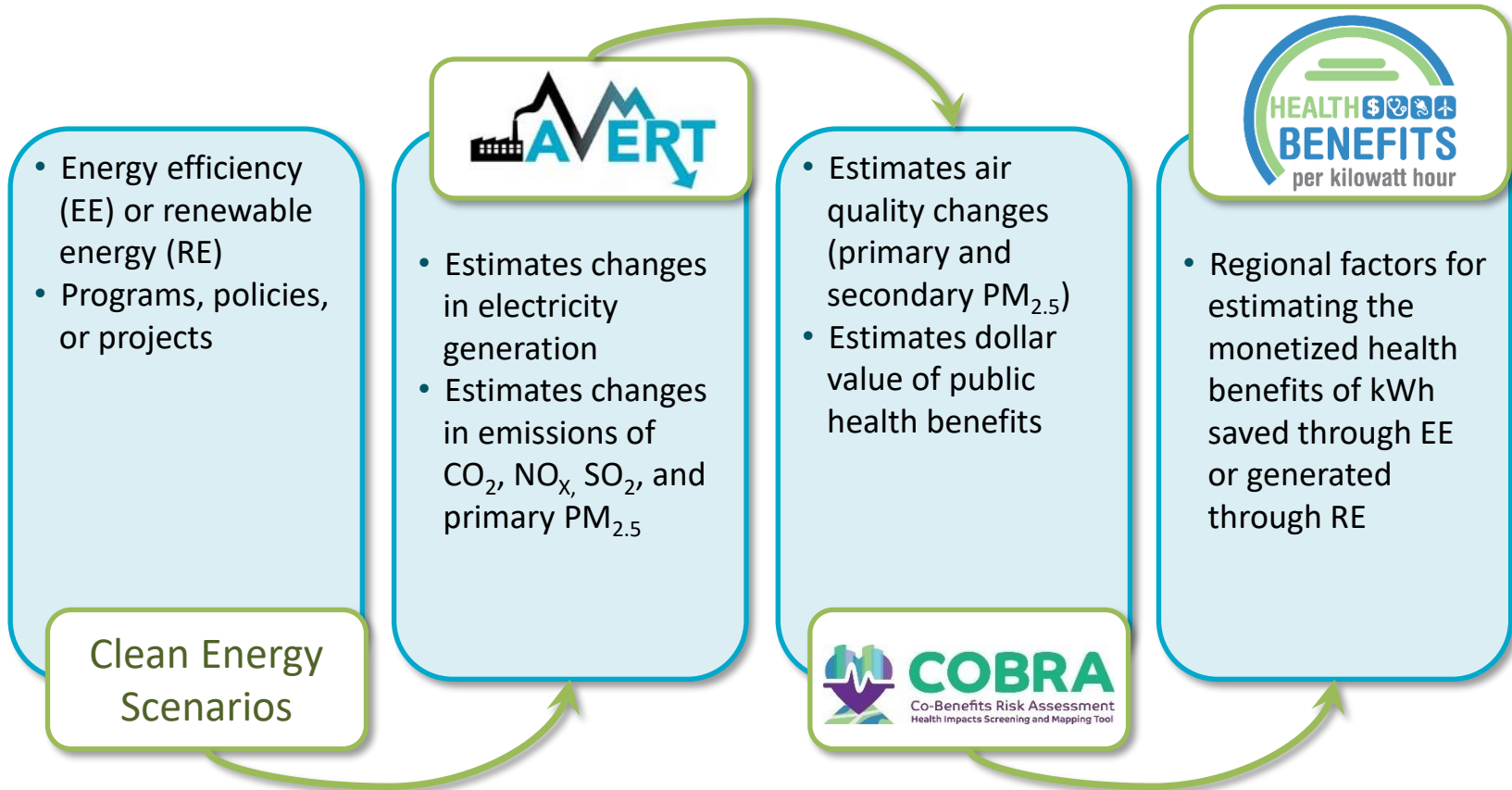
- premature death in people with lung or heart disease
- nonfatal heart attacks
- irregular heartbeat
- aggravated asthma
- decreased lung function
- increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.



PM_{2.5} Sources

- Some PM_{2.5} emitted directly
 - construction sites, unpaved roads, fields, smokestacks or fires.
- Most forms in the atmosphere
 - a result of complex reactions of chemicals such as sulfur dioxide (SO₂) and nitrogen oxides (NO_x),
 - pollutants emitted from power plants, industries and automobiles.

EPA offers a suite of tools for quantifying emissions, AQ, and health impacts of clean energy



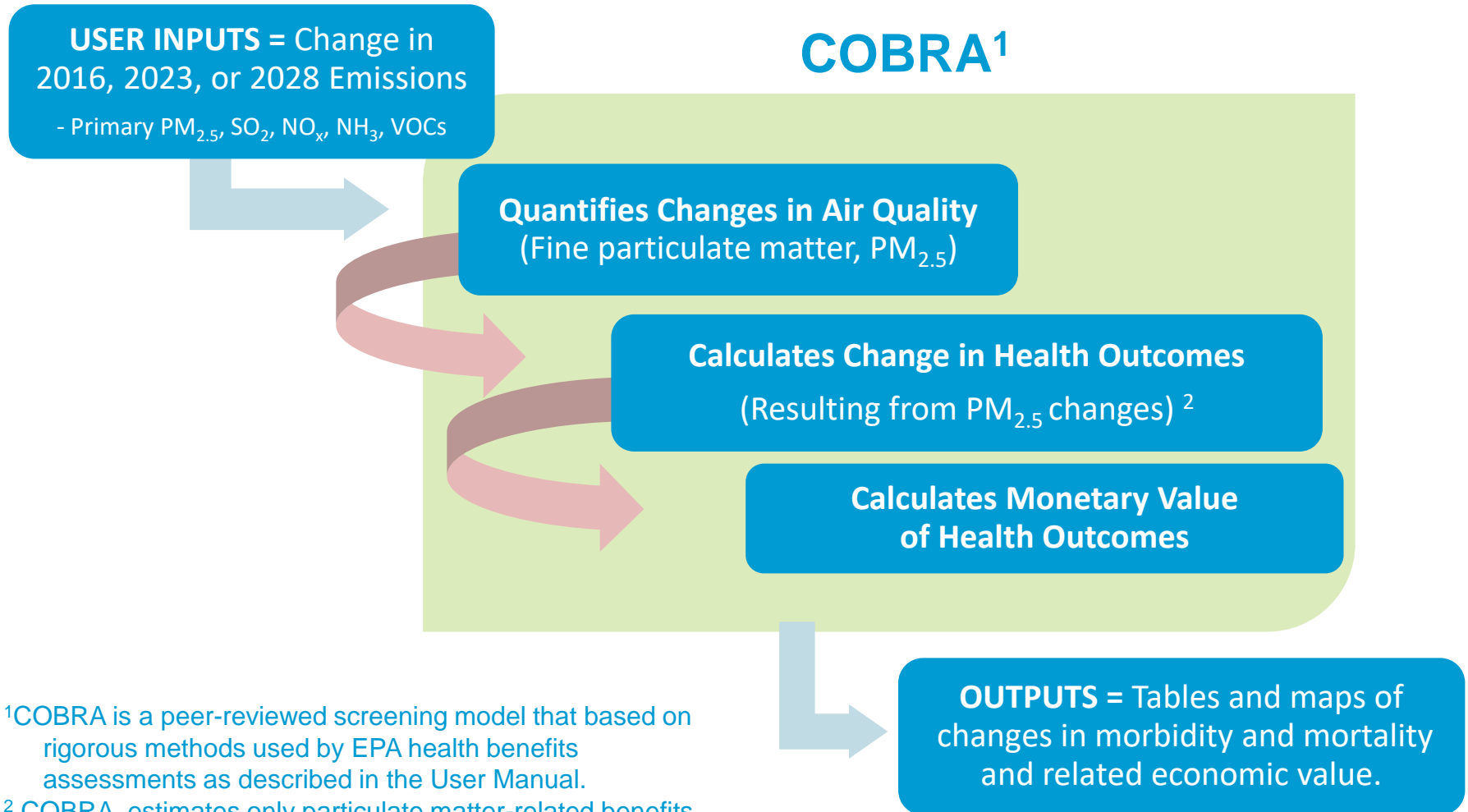


What is COBRA?

- COBRA is a free, easy-to-use, peer reviewed screening model that quickly:
 - *Estimates county-level health impacts* from changes in criteria air pollutants,
 - *Monetizes the economic value* of those benefits, and
 - *Presents results via tables and maps* that facilitate visualization of the results.
- COBRA uses approaches and assumptions consistent with EPA's standard practices
- Intended to support inclusion of health benefits in cost-benefits analyses and policy making



How does COBRA work?



¹COBRA is a peer-reviewed screening model that based on rigorous methods used by EPA health benefits assessments as described in the User Manual.

² COBRA estimates only particulate matter-related benefits and may be conservative in that respect.



What health effects does COBRA estimate and what are their economic values?

| Health Incidence Avoided | Economic Value (\$2017) | |
|---|-------------------------|-----------------------|
| | 3% discount rate | 7% discount rate |
| Adult Mortality* | \$10,040,738 | \$8,943,125 |
| Infant Mortality | \$11,191,541 | \$11,191,541 |
| Non-Fatal Heart Attacks* | \$39,174 - \$309,825 | \$37,2038 - \$297,494 |
| Hospital Admissions | \$17,707 - \$47,652 | \$17,707 - \$47,652 |
| Asthma ER Visits | \$457 - \$547 | \$457 - \$547 |
| Acute Bronchitis | \$556 | \$556 |
| Respiratory Symptoms (upper + lower) | \$24 - \$39 | \$24 - \$39 |
| Asthma Exacerbations | \$67 | \$67 |
| Minor Restricted Activity Days | \$77 | \$77 |
| Work Loss Days | \$178 | \$178 |

*Discounted due to time lag between PM_{2.5} exposure and health outcome.



Who can use COBRA and why?

- Analysts, planners, and officials from environmental, health, energy, transportation, and economic development agencies can use COBRA to:



Quickly and inexpensively compare different clean energy policies and identify those that:

- Are likely to result in the greatest health benefits
- Are expected to reduce health risks in the most cost-effective manner



Estimate and promote improvements in air quality and economic value of associated human health benefits of:

- Clean and/or renewable energy projects
- Other types of projects, such as transportation or municipal waste



Visually convey - using COBRA's mapping capabilities - how clean energy benefits can go beyond a single county and impact people at the state, regional, and national levels



Strengths & limitations of COBRA

STRENGTHS

- Consistent with EPA's standard practices
- Enriches discussion of co-benefits
- Easy-to-Use screening tool
- Flexible for User
- Inexpensive (free!) compared to rigorous air quality models
- Quick to generate results
- Mapping of results facilitates visualization of impacts

LIMITATIONS

- COBRA is a free, screening tool not a highly sophisticated model
- Requires inputs generated elsewhere
- While there are limitations that users should understand, technical peer reviewers found COBRA to be “a valuable model that produces a screening tool that can contribute to policy analysis and public dialogue”

EXAMPLE:

**WHAT ARE THE HEALTH BENEFITS OF
UTILITY INVESTMENTS IN EE PROGRAMS
IN TEXAS IN 2019?**

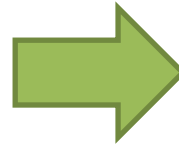


Step 0. Develop inputs



Form 861

<https://www.eia.gov/electricity/data/eia861/>



| State | Total Annual Energy Savings (2019) |
|-------|------------------------------------|
| Texas | 960.51 GWh |

| State | PM2.5 (tons) | SO2 (tons) | NOx (tons) |
|--------------|--------------|------------|------------|
| Texas | -23.657 | -208.51 | -213.634 |
| Oklahoma | -1.056 | -3.373 | -12.516 |
| Nebraska | -0.183 | -17.848 | -8.507 |
| Kansas | -0.475 | -2.475 | -6.719 |
| Missouri | -0.815 | -9.219 | -6.135 |
| Louisiana | -0.252 | -3.026 | -4.614 |
| Indiana | -1.947 | -3.649 | -3.951 |
| Arkansas | -0.206 | -6.942 | -3.462 |
| Arizona | -0.316 | -1.003 | -3.447 |
| Iowa | -0.29 | -4.751 | -3.268 |
| Michigan | -0.093 | -4.214 | -2.833 |
| Kentucky | -0.305 | -3.517 | -2.342 |
| Illinois | -0.136 | -4.72 | -2.129 |
| Minnesota | -0.135 | -1.097 | -1.784 |
| Wisconsin | -0.238 | -0.578 | -1.517 |
| New Mexico | -0.069 | -0.374 | -1.433 |
| North Dakota | -0.113 | -1.307 | -1.085 |
| Mississippi | -0.036 | -0.02 | -0.53 |
| South Dakota | -0.044 | -0.1 | -0.371 |
| Montana | -0.008 | -0.005 | -0.072 |
| California | -0.001 | 0 | -0.004 |



Step 1. Apply analysis year

COBRA

File Help

Introduction 1. Select Analysis Year 2. Create Emissions Scenario 3. Execute Run 4. View Health Effects and Valuation Results

Basic Options Advanced Options

Choose an Analysis Year:

Select the year for which you would like to estimate health impacts of emissions changes. COBRA will automatically use the baseline emissions, population, health incidence, and health impact valuation datasets corresponding to that year. After clicking "apply analysis year data" you can proceed to step 2 to enter your emissions changes.

2016
2016
2023
2028

Apply Analysis Year Data

Select baseline year and cick "Apply Analysis Year"



Step 2. Create emissions scenario

Introduction | 1. Select Analysis Year | 2. Create Emissions Scenario | 3. Execute Run | 4. View Health Effects and Valuation Results

Emissions Scenario | View Emissions Map | View Detailed Emissions Changes

Select Location

- US
 - Alabama
 - Arizona
 - Arkansas
 - California
 - Colorado
 - Connecticut
 - DC
 - Delaware
 - Florida
 - Georgia
 - Idaho
 - Illinois
 - Indiana
 - Iowa
 - Kansas
 - Kentucky
 - Louisiana
 - Maine
 - Maryland
 - Massachusetts
 - Michigan
 - Minnesota
 - Mississippi
 - Missouri
 - Montana
 - Nebraska
 - Nevada
 - New Hampshire
 - New Jersey
 - New Mexico
 - New York
 - North Carolina
 - North Dakota

1. Select Location

Select Emissions Tier

- FUEL COMB. ELEC. UTIL.
- FUEL COMB. INDUSTRIAL
- FUEL COMB. OTHER
- CHEMICAL & ALLIED PRODUCT MFG
- METALS PROCESSING
- PETROLEUM & RELATED INDUSTRIES
- OTHER INDUSTRIAL PROCESSES
- SOLVENT UTILIZATION
- STORAGE & TRANSPORT
- WASTE DISPOSAL & RECYCLING
- HIGHWAY VEHICLES
- OFF-HIGHWAY
- NATURAL SOURCES
- MISCELLANEOUS

2. Select the emissions tier

Modify Emissions

- | | | | |
|--------|--|-----------------------------------|---------------------------------------|
| PM 2.5 | <input type="radio"/> reduce by | <input type="text" value="0.00"/> | <input type="radio"/> pct |
| | <input checked="" type="radio"/> increase by | | <input checked="" type="radio"/> tons |
| SO2 | <input type="radio"/> reduce by | <input type="text" value="0.00"/> | <input type="radio"/> pct |
| | <input checked="" type="radio"/> increase by | | <input checked="" type="radio"/> tons |
| NOx | <input type="radio"/> reduce by | <input type="text" value="0.00"/> | <input type="radio"/> pct |
| | <input checked="" type="radio"/> increase by | | <input checked="" type="radio"/> tons |
| NH3 | <input type="radio"/> reduce by | <input type="text" value="0.00"/> | <input type="radio"/> pct |
| | <input checked="" type="radio"/> increase by | | <input checked="" type="radio"/> tons |
| VOC | <input type="radio"/> reduce by | <input type="text" value="0.00"/> | <input type="radio"/> pct |
| | <input checked="" type="radio"/> increase by | | <input checked="" type="radio"/> tons |

3. Enter your emissions reductions

Apply Changes

Other Options

- Save Scenario
- Reset to baseline
- Load AVERT output file

4. Click Apply changes

Use this page to create an emissions scenario by applying emissions changes to a selected location and tier level. After entering emission changes, click "Apply Changes." If you are entering different emission changes for different states or counties, you must click "Apply Changes" after entering each set of emission changes. After making your emissions changes, you can review the scenario in the "View Detailed Emissions Changes" tab. For more information on creating an emissions scenario, see chapter 4 of the COBRA user manual.

Clear Selected States and Counties

Clear

5. To enter additional emissions reductions for another location or tier, use the "Clear" buttons and repeat steps 1-4.



Step 3. Execute run

COBRA

File Help

Introduction 1. Select Analysis Year 2. Create Emissions Scenario 3. Execute Run 4. View Health Effects and Valuation Results

Select Discount Rate

In order to run the COBRA model, please select a discount rate to use in this COBRA session.

3% 7%

COBRA estimates the economic value of current and future avoided deaths and illnesses expected based on emissions reductions in the year 2025. Emission reductions require investments and, like all investments, there are trade-offs, or opportunity costs, of picking one investment over another, each with their own set and schedule of expected benefits. To reflect the opportunity costs of the investments foregone by investing in emission reductions and to figure out how much future benefits are worth today, COBRA users must select a discount rate.

Rather than using just a single rate, EPA's Guidelines for Preparing Economic Analyses (available at <https://www.epa.gov/environmental-economics/guidelines-preparing-economic-analyses>) recommend that analysts use a bounding approach to discounting, developing an upper and lower bound for their estimates. They advise use of both:

- a 3% rate, reflecting the interest rate consumers might earn on Government backed securities, and
- a 7% rate, reflecting the opportunity cost of private capital, based on estimates from the Office of Management and Budget.

NOTE: A higher discount rate favors those investments with immediate benefits and reduces the value of future benefits more than a lower discount rate, which places a greater value on future benefits to society.

For more information on discount rates and how EPA uses them in monetizing health benefits, see the User Manual.

Run using above option

Select Discount Rate and click "Run using above option"



Step 4. View health effects and valuation results

COBRA

File Help

Introduction 1. Select Analysis Year 2. Create Emissions Scenario 3. Execute Run 4. View Health Effects and Valuation Results

Table Maps

Export to CSV

Export to Excel

| FIPS | State | County | Base PM 2.5 | Control PM 2.5 | Delta PM 2.5 | \$ Total Health Benefits (low estimate) | \$ Total Health Benefits (high estimate) | Mortality (low estimate) | \$ |
|-----------------|-------|-----------|-------------|----------------|--------------|---|--|--------------------------|---------|
| Contains: Texas | | | Equals: | Equals: | Equals: | Equals: | Equals: | Equals: | Equals: |
| 48001 | Texas | Anderson | 7.968 | 7.968 | 0.0002 | 7,137.07 | 16,199.05 | 0.0007 | |
| 48003 | Texas | Andrews | 5.95 | 5.95 | 0.0002 | 1,897.68 | 4,320.99 | 0.0002 | |
| 48005 | Texas | Angelina | 8.222 | 8.222 | 0.0001 | 5,731.59 | 12,982.31 | 0.0005 | |
| 48007 | Texas | Aransas | 8.398 | 8.398 | 0.0002 | 5,250.63 | 11,848.21 | 0.0005 | |
| 48009 | Texas | Archer | 6.509 | 6.508 | 0.0002 | 1,131.23 | 2,555.26 | 0.0001 | |
| 48011 | Texas | Armstrong | 5.25 | 5.25 | 0.0002 | 220.38 | 496.14 | 0 | |
| 48013 | Texas | Atascosa | 8.227 | 8.227 | 0.0002 | 11,691.98 | 26,525.07 | 0.0011 | |
| 48015 | Texas | Austin | 7.996 | 7.996 | 0.0002 | 2,934.43 | 6,531.01 | 0.0003 | |
| 48017 | Texas | Bailey | 4.88 | 4.88 | 0.0002 | 438.3 | 987.5 | 0 | |
| 48019 | Texas | Bandera | 7.715 | 7.715 | 0.0002 | 3,212.17 | 7,251.01 | 0.0003 | |
| 48021 | Texas | Bastrop | 7.898 | 7.898 | 0.0002 | 15,047.67 | 34,111.01 | 0.0014 | |
| 48023 | Texas | Baylor | 6.301 | 6.301 | 0.0002 | 624.09 | 1,411.01 | 0.0001 | |
| 48025 | Texas | Brewster | 8.413 | 8.412 | 0.0002 | 4,701.72 | 10,577.01 | 0.0004 | |
| 48027 | Texas | Brewster | 7.465 | 7.464 | 0.0004 | 44,969.75 | 101,450.44 | 0.0041 | |
| 48029 | Texas | Brewster | 8.159 | 8.158 | 0.0003 | 242,233.19 | 547,053.92 | 0.0225 | |
| 48031 | Texas | Brewster | 7.668 | 7.668 | 0.0003 | 2,401 | 5,414.77 | 0.0002 | |
| 48033 | Texas | Brewster | 6.038 | 6.038 | 0.0002 | 58.99 | 133 | 0 | |
| 48035 | Texas | Brewster | 7.374 | 7.374 | 0.0003 | 4,609.25 | 10,391.87 | 0.0004 | |
| 48037 | Texas | Bowie | 8.186 | 8.186 | 0.0002 | 11,785.66 | 26,625.95 | 0.0011 | |
| 48039 | Texas | Brazoria | 7.877 | 7.877 | 0.0002 | 23,863.39 | 53,870.28 | 0.0022 | |
| 48041 | Texas | Brazos | 7.92 | 7.92 | 0.0002 | 10,741.63 | 24,160.5 | 0.001 | |
| 48043 | Texas | Brewster | 5.727 | 5.727 | 0.0001 | 613.46 | 1,390.75 | 0.0001 | |
| 48045 | Texas | Brewster | 5.386 | 5.385 | 0.0001 | 131.26 | 295.75 | 0 | |

Total: 2,972,201.9

Total: 6,703,253.21

Total Health Benefits (low): \$2,972,201.90

Total Health Benefits (high): \$6,703,253.21

Narrow Results to Texas



Step 4. View health effects and valuation results *(cont'd)*

COBRA

File Help

Introduction 1. Select Analysis Year 2. Create Emissions Scenario 3. Execute Run 4. View Health Effects and Valuation Results

Table Maps

Use this page to explore the changes in air quality and health effects between the baseline and control scenarios in map form. For more information on viewing and interpreting health impacts and valuation results, see Chapter 5 (Viewing Results) of the COBRA user manual. For more information on using COBRA's mapping functionality, including how to change the ranges or highlight specific values or incidences on the map, see Chapter 6 (Using Mapping Functionality) of the COBRA user manual. Users can view the user manual by clicking "Help" then "Show Manual."

To copy the map for use in other publications or presentations, click the 'Print' button in the toolbar. For more information on saving maps created in COBRA, see Chapter 6 (Using Mapping Functionality) of the COBRA user manual.

Select the field that is to be mapped:

- \$ Total Health Benefits (low estimate)
- \$ Total Health Benefits (low estimate)
- \$ Total Health Benefits (high estimate)
- Mortality (low estimate)
- \$ Mortality (low estimate)
- Mortality (high estimate)
- \$ Mortality (high estimate)
- Infant Mortality
- \$ Infant Mortality
- Nonfatal Heart Attacks (low estimate)
- \$ Nonfatal Heart Attacks (low estimate)
- Nonfatal Heart Attacks (high estimate)
- \$ Nonfatal Heart Attacks (high estimate)
- Hospital Admits, All Respiratory
- Hospital Admits All Respiratory Direct
- Hospital Admits, Asthma
- Hospital Admits, Chronic Lung Disease
- \$ Hospital Admits, All Respiratory
- Hospital Admits, Cardiovascular (except heart attacks)
- \$ Hospital Admits, Cardiovascular (except heart attacks)
- Acute Bronchitis
- \$ Acute Bronchitis
- Upper Respiratory Symptoms
- \$ Upper Respiratory Symptoms
- Lower Respiratory Symptoms
- \$ Lower Respiratory Symptoms
- Emergency Room Visits, Asthma
- \$ Emergency Room Visits, Asthma
- Minor Restricted Activity Days
- \$ Minor Restricted Activity Days
- Work Loss Days

Legend

Map Layers

- US Counties - \$ Total Health Benefits

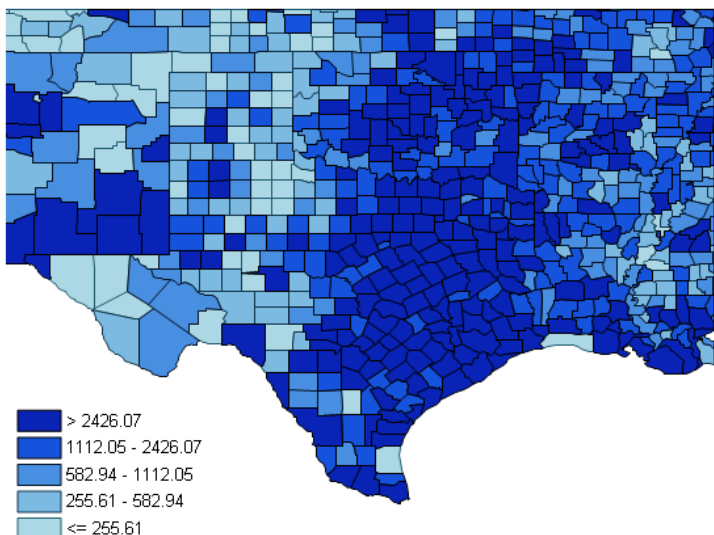
Value

- <= 255.61
- 255.61 - 582.94
- 582.94 - 1112.05
- 1112.05 - 2426.07
- > 2426.07

Use these tools to zoom, pan, and export the map

Select the result to be mapped

Step 5. Export Results



Total Health Benefits, \$2017 (3%, Low Estimate)

| Health Incidence Avoided | Economic Value (\$2017) | |
|---|-------------------------|------------------------|
| | 3%, Low Estimate | 3%, High estimate |
| Adult Mortality* | \$ 2,903,048.35 | \$ 6,603,554.88 |
| Infant Mortality | \$ 29,188.15 | \$ 29,188.15 |
| Non-Fatal Heart Attacks (NFHAs)* | \$ 3,683.67 | \$ 34,228.45 |
| Hospital Admissions, All Respiratory | \$ 2,101.20 | \$ 2,101.20 |
| Hospital Admissions, Cardiovascular (excl. NFHAs) | \$ 3,282.94 | \$ 3,282.94 |
| Asthma ER Visits | \$ 127.26 | \$ 127.26 |
| Acute Bronchitis | \$ 313.97 | \$ 313.97 |
| Upper Respiratory Symptoms | \$ 394.67 | \$ 394.67 |
| Lower Respiratory Symptoms | \$ 174.95 | \$ 174.95 |
| Asthma Exacerbation | \$ 704.58 | \$ 704.58 |
| Minor Restricted Activity Days | \$ 20,998.73 | \$ 20,998.73 |
| Work Loss Days | \$ 8,183.43 | \$ 8,183.43 |
| Total Health Benefits | \$ 2,972,201.90 | \$ 6,703,253.21 |

*Discounted due to time lag between PM_{2.5} exposure and health outcome.

We welcome your feedback!

- EPA wants to understand how we can make the COBRA tool work for you
- Please reach out with questions and ideas
- Download the software and learn more at: epa.gov/COBRA
- Access all our resources and sign up for our newsletters at: epa.gov/statelocalenergy



Thank you!

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State and Local
Energy and Environment Program