

Unconventional Oil and Gas and Sustainable Development

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To be sustainable, shale gas development:

- ▶ requires a sophisticated and comprehensive regulatory system to protect the environment and public health;
- ▶ Requires a legal and policy framework capable of ensuring both significant social and economic benefits and ensuring that no one is made socially or economically worse off in absolute terms;
- ▶ must be nested in ambitious national and international energy and climate change laws to ensure that it is a bridge fuel to a sustainable future, and does not delay or divert from that objective; and
- ▶ must occur within a political and legal system that is committed to accelerating the transition to sustainability

--John Dernbach

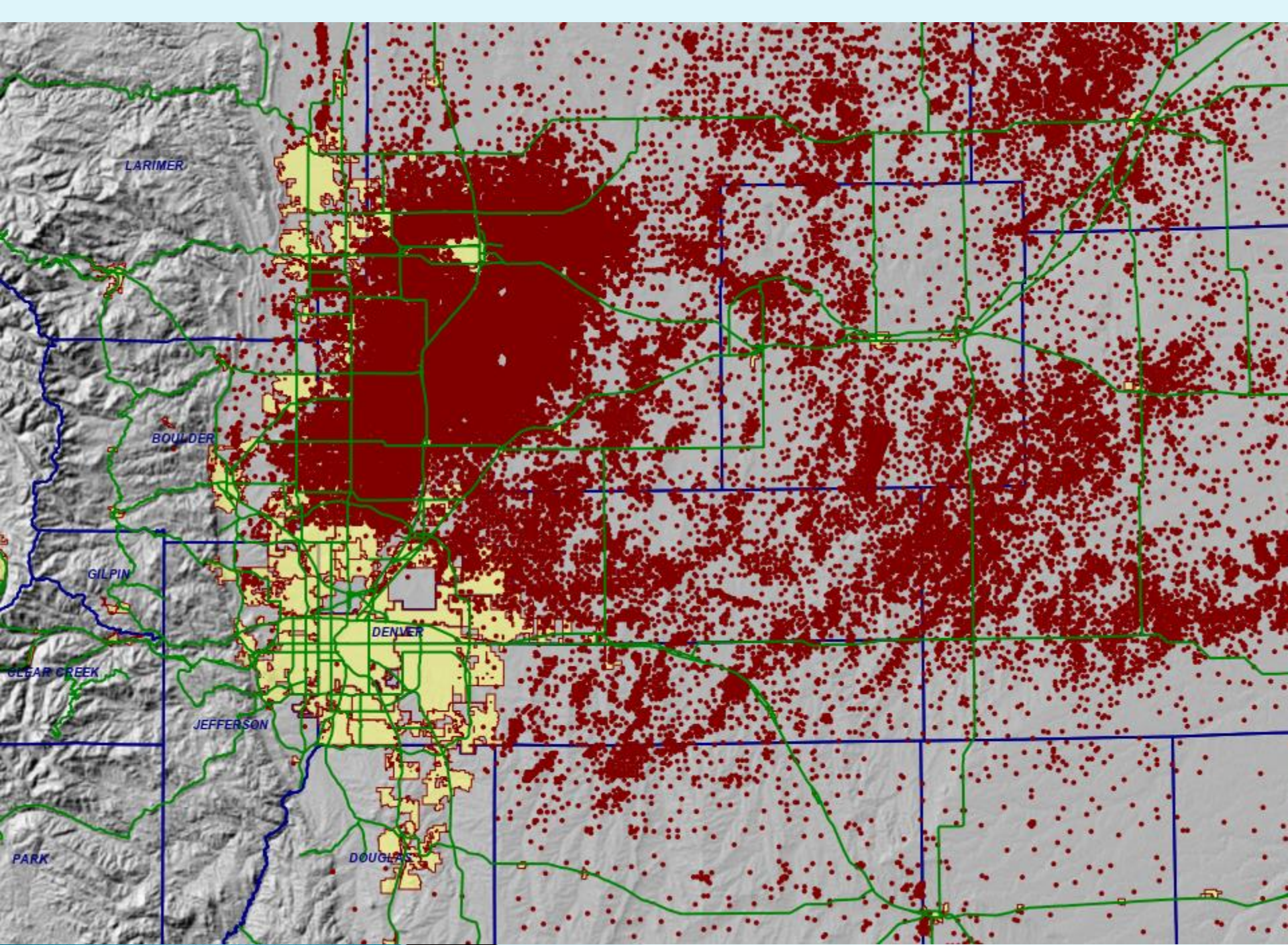
Shale Gas and the Future of Energy: Law and Policy for Sustainability

Severance Tax

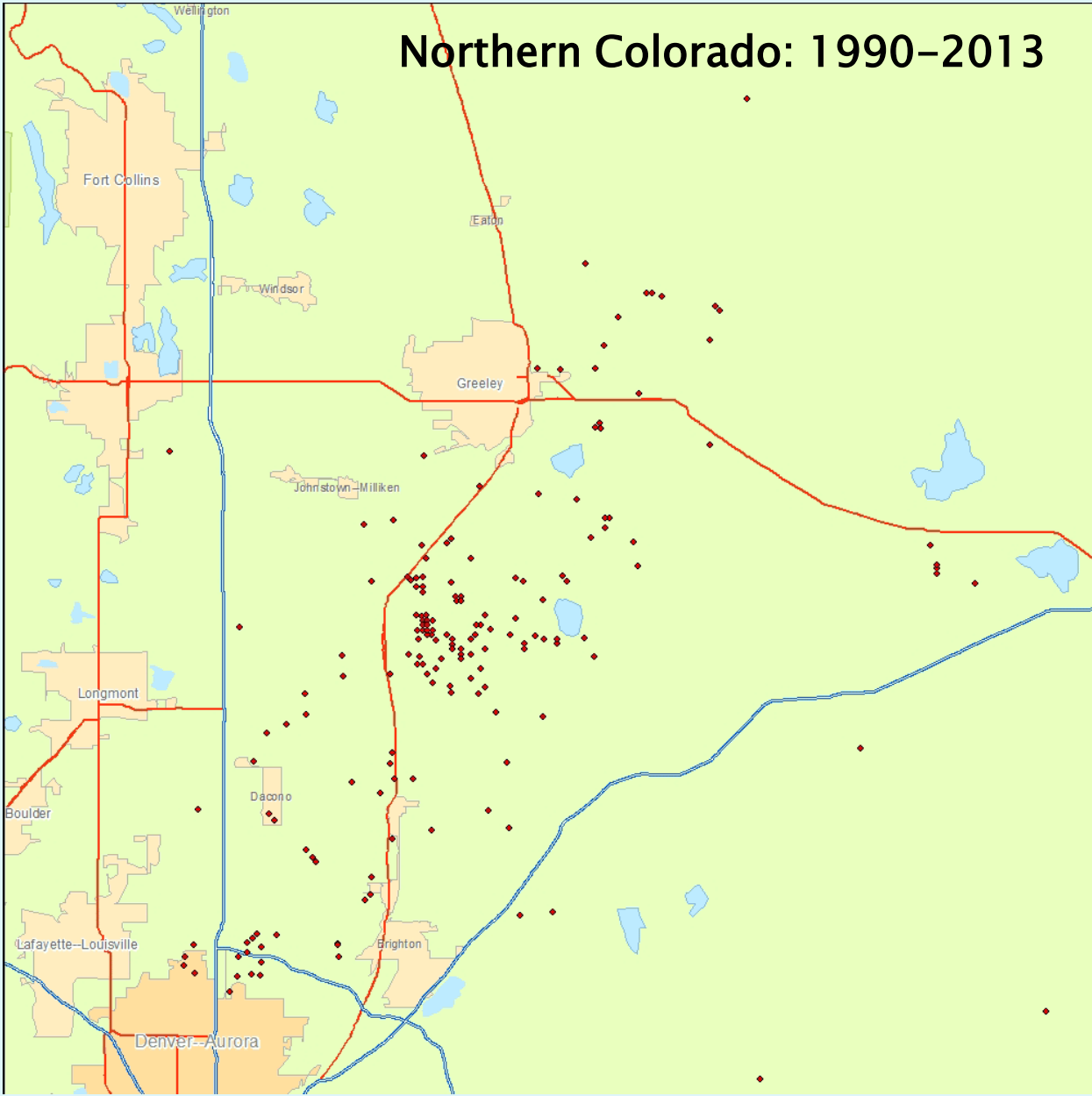
- ▶ Wyoming gets 6% severance tax from oil and gas, allowing, among other benefits, for every state resident to get free instate college tuition.
- ▶ **Colorado has an effective severance tax rate of ½ %.**

The Colorado Example

- ▶ Is Colorado's regulatory system protective of the environment and public health?
- ▶ Does Colorado's regulatory system allow for *effective* participation from the impacted public?
- ▶ Is Colorado's shale regulatory system nested in **climate change laws** and policies to ensure that it is a bridge fuel to a sustainable future, and does not delay or divert from that objective?



Northern Colorado: 1990-2013



Is Colorado's regulatory system
protective of the environment
and public health?

Air quality

Public health and safety



IMPACTS TO AIR QUALITY

Local

- Dust
- Toxic emissions
- Carcinogenic (Benzene)

Regional

- Front Range in Non-Attainment for Ozone
- NW Colorado in Non-Attainment for Ozone.

Global

- Methane is 20 X more potent greenhouse gas than CO₂



Dust and emissions from
heavy truck traffic

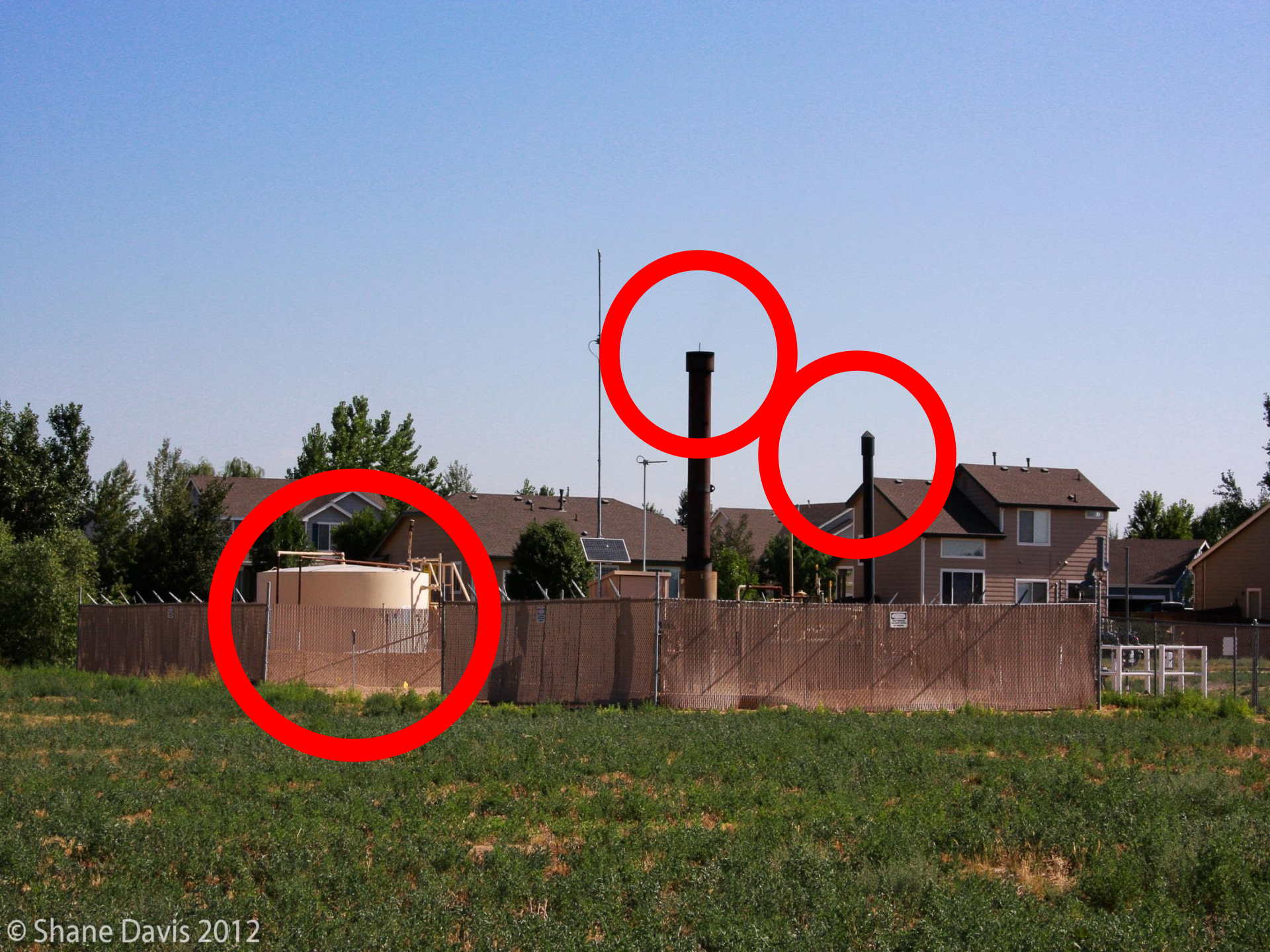


Compressor Engines



Storage Tanks







Elevated levels of surface ozone can cause:

- Shortness of breath
- Chest pain when inhaling deeply
- Wheezing and coughing
- Increased susceptibility to respiratory infections
- Inflammation of the lungs and airways
- Increased risk of asthma attacks

(American Lung Association)



→ Increased risk of death



Ground-Level Ozone

HOW GROUND-LEVEL OZONE IS CREATED



STORAGE TANKS & WELLS

VOCs

+



TRANSPORTATION

NO_x

+



HEAT

SUN

=



GROUND LEVEL OZONE

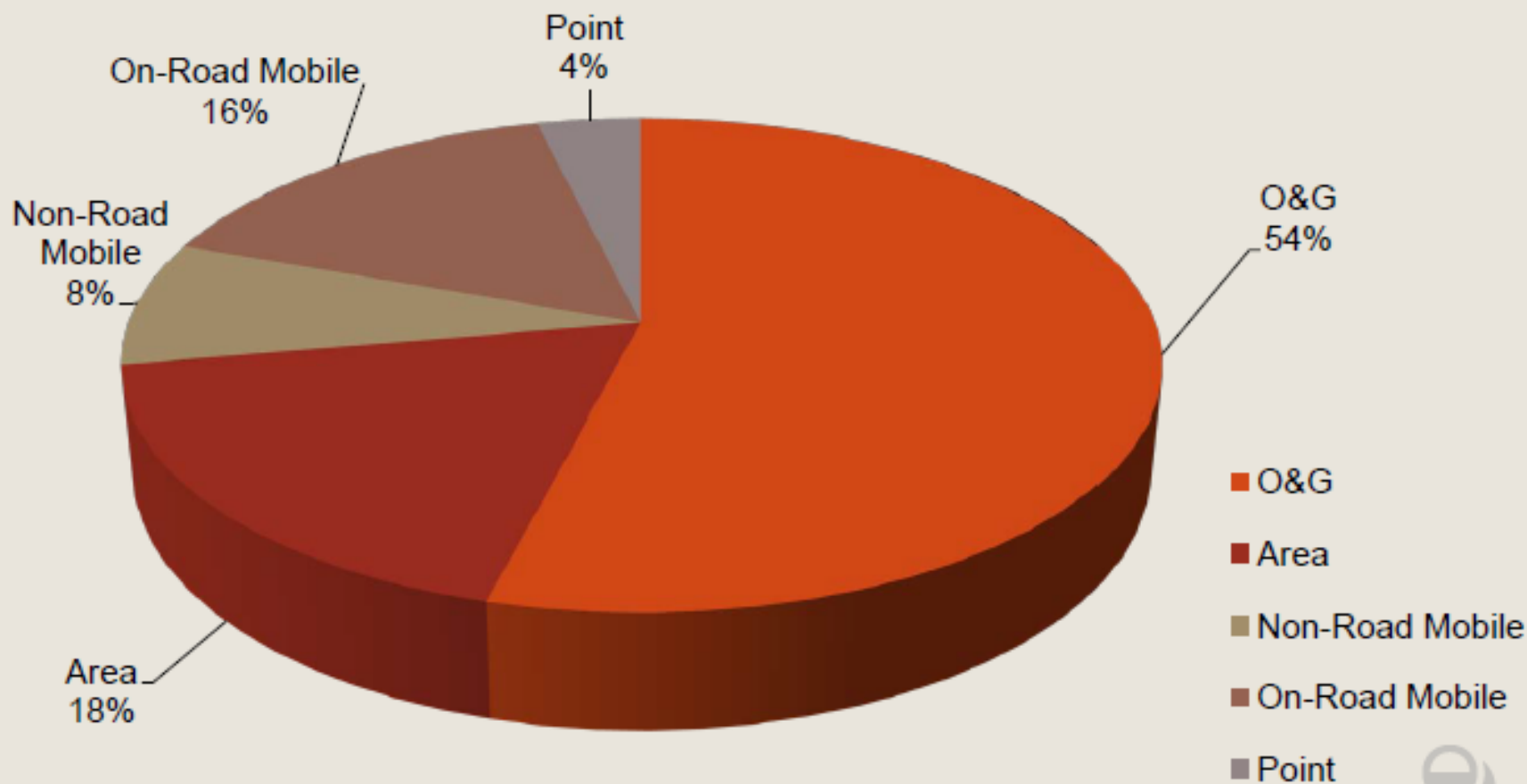
Source: EPA, ALA

Colorado Anthropogenic VOC Inventory

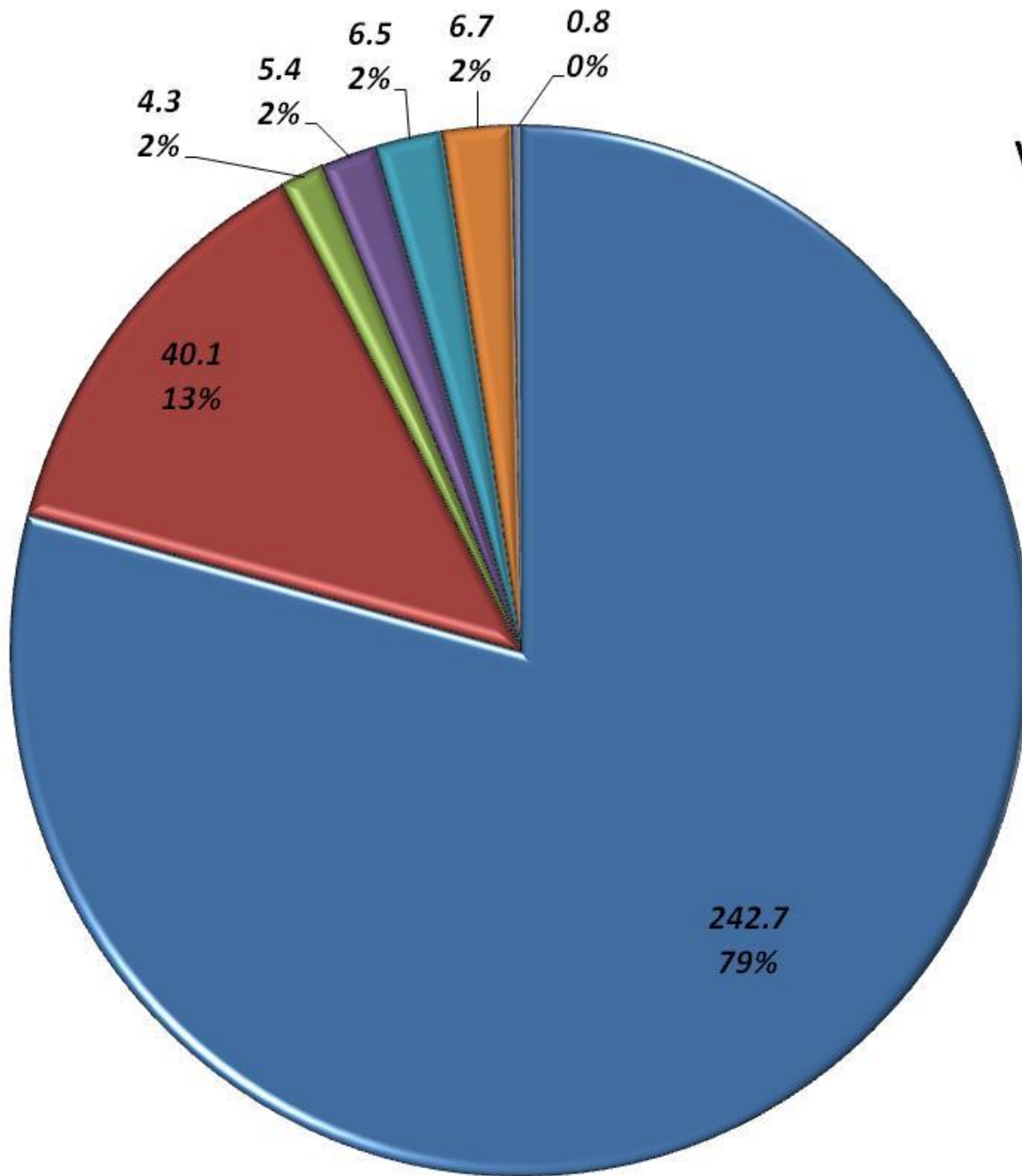


CDPHE 2011 VOC Inventory

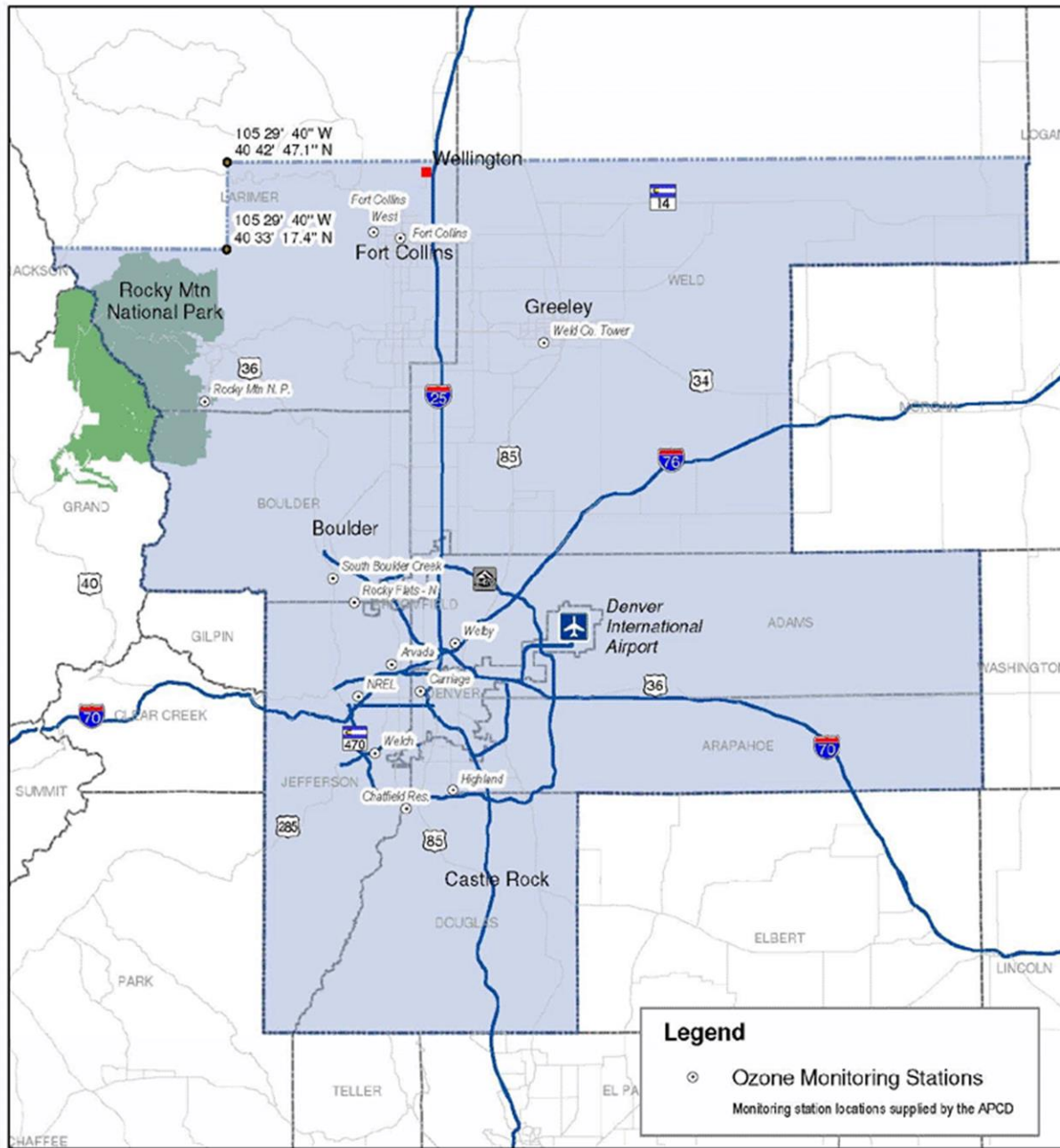
Total: 389,000 tons/year



**Colorado (9-County NAA)
2011 O&G Sources
VOC Emissions - 306.6 tons/day**



- O&G - Tanks
- O&G Area - Venting/Fugitives
- O&G Area - Pneumatics/Pumps
- O&G Point - Industrial Processes
- O&G Point - Evaporation
- O&G Point - Engines
- O&G Area - Engines/Rigs



Denver-Boulder-Greeley-Fort Collins, Colorado
Eight-Hour Ozone Control Area

Increased Risk to Public Health

People living within a half mile from oil and gas operations are at increased risk for health impacts

Colorado School of Public Health & University of Colorado, Anschutz Medical Campus McKenzie LM, et al, —Human health risk assessment of air emissions from development of unconventional natural gas resources,|| Sci Total Environ (2012)

**Increased risk to
public safety?**



Well blow-out near Windsor, CO in
February, 2013

DANGER

**HIGH PRESSURE
EXPLOSIVE VAPORS
NO SMOKING**

Six tank explosions and fires in two months in 2014

school told to “shelter in place”



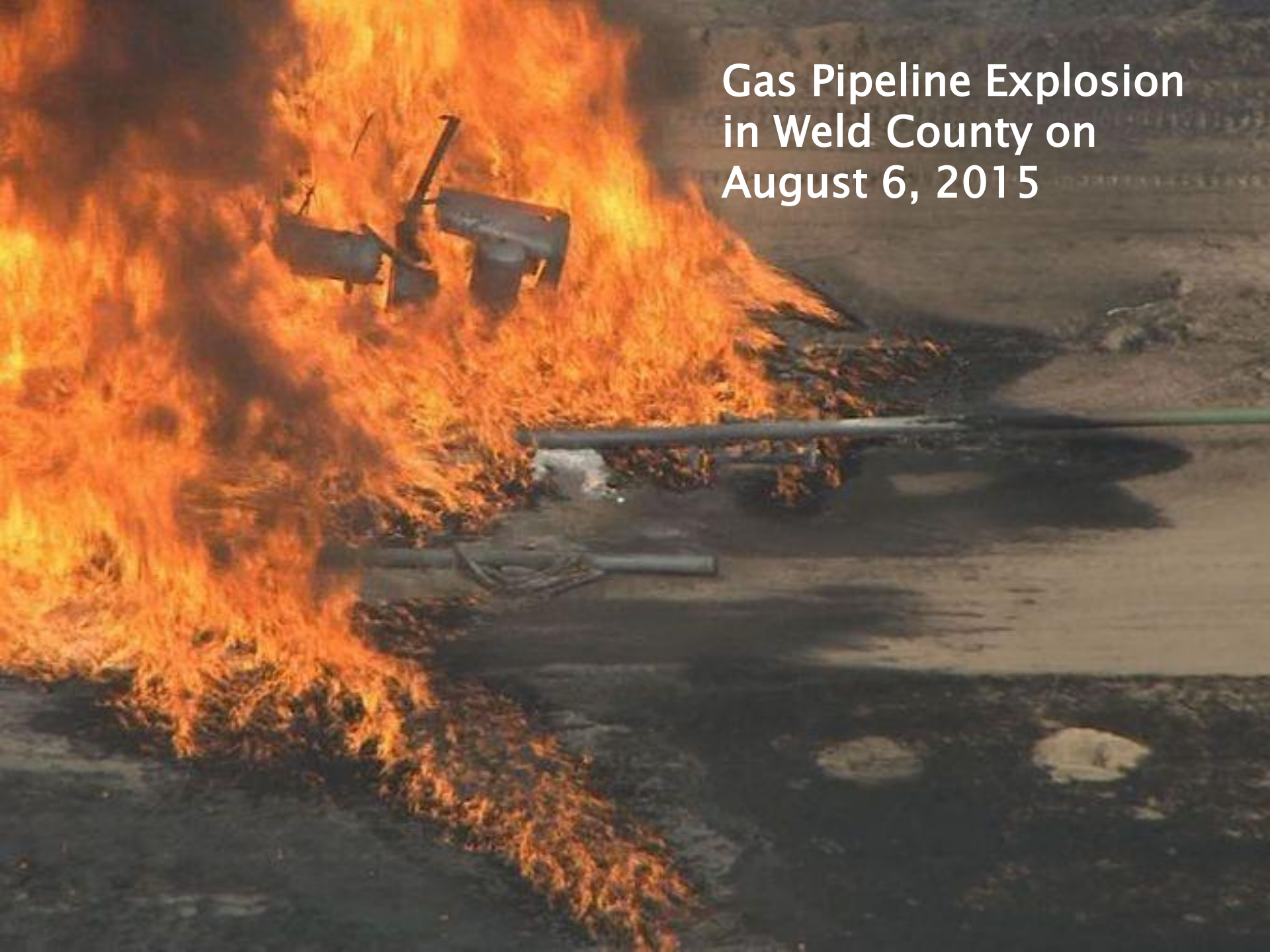




Result of a lightning strike of waste water facility near Greeley on April 17, 2015



**Gas Pipeline Explosion
in Weld County on
August 6, 2015**



**Oil and gas development is a
heavy industrial activity**

**NOT compatible with
residential areas**

Does Colorado's regulatory system allow for *effective* participation from the impacted public?

1. Mechanisms for participation in permitting decisions
2. Due process

Setbacks– *600 series Rules*

- ▶ Schools and hospitals: 1,000-foot setback
- ▶ Urban Setbacks: 500-foot setback
Affects less than 4% of wells
- ▶ Rural Setback: 500-foot setback
Allows an “exception” if the industry asks for it
The only requirement is that impacts are mitigated to the greatest extent economically practicable

Sound wall near residential area

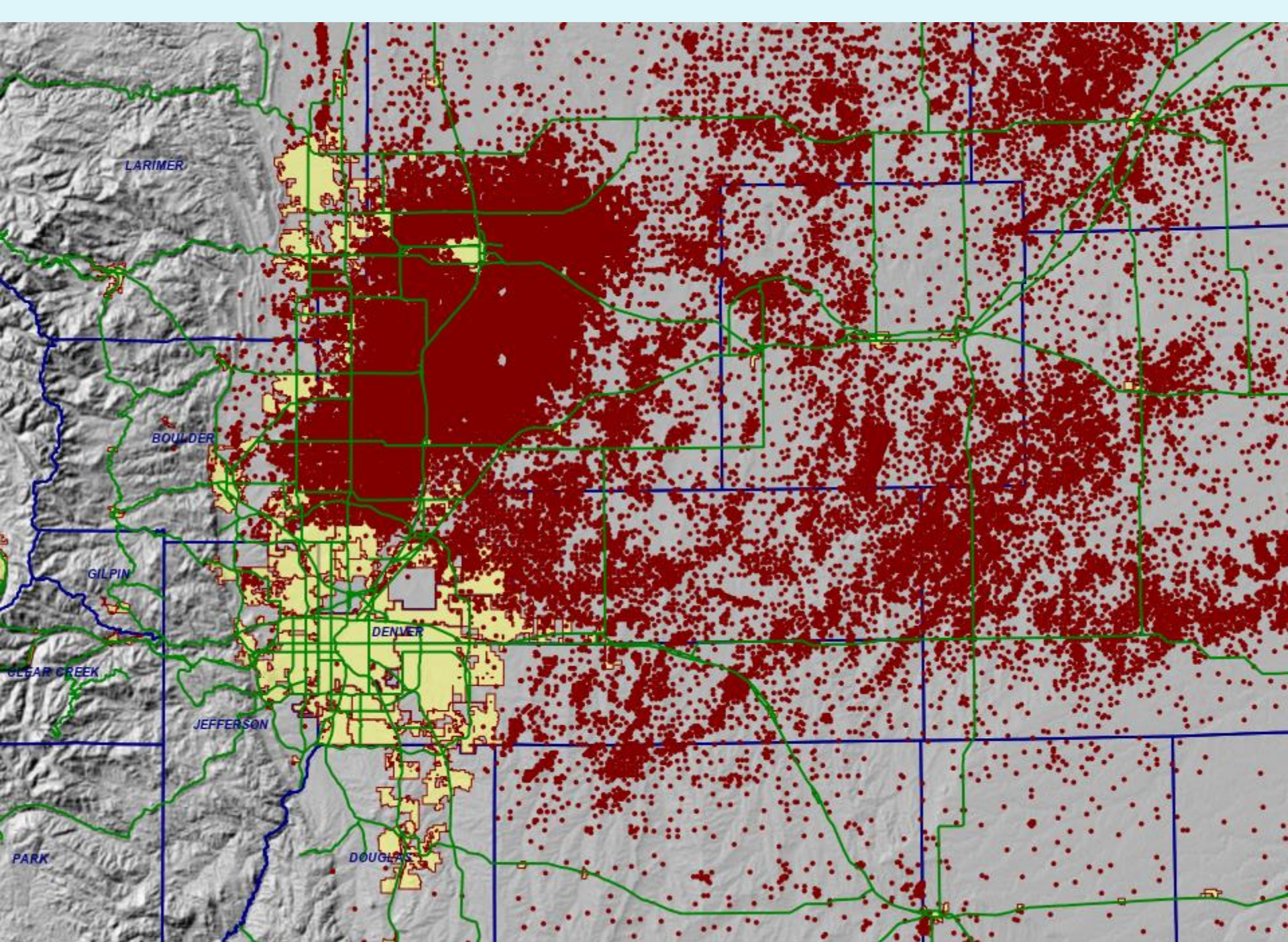


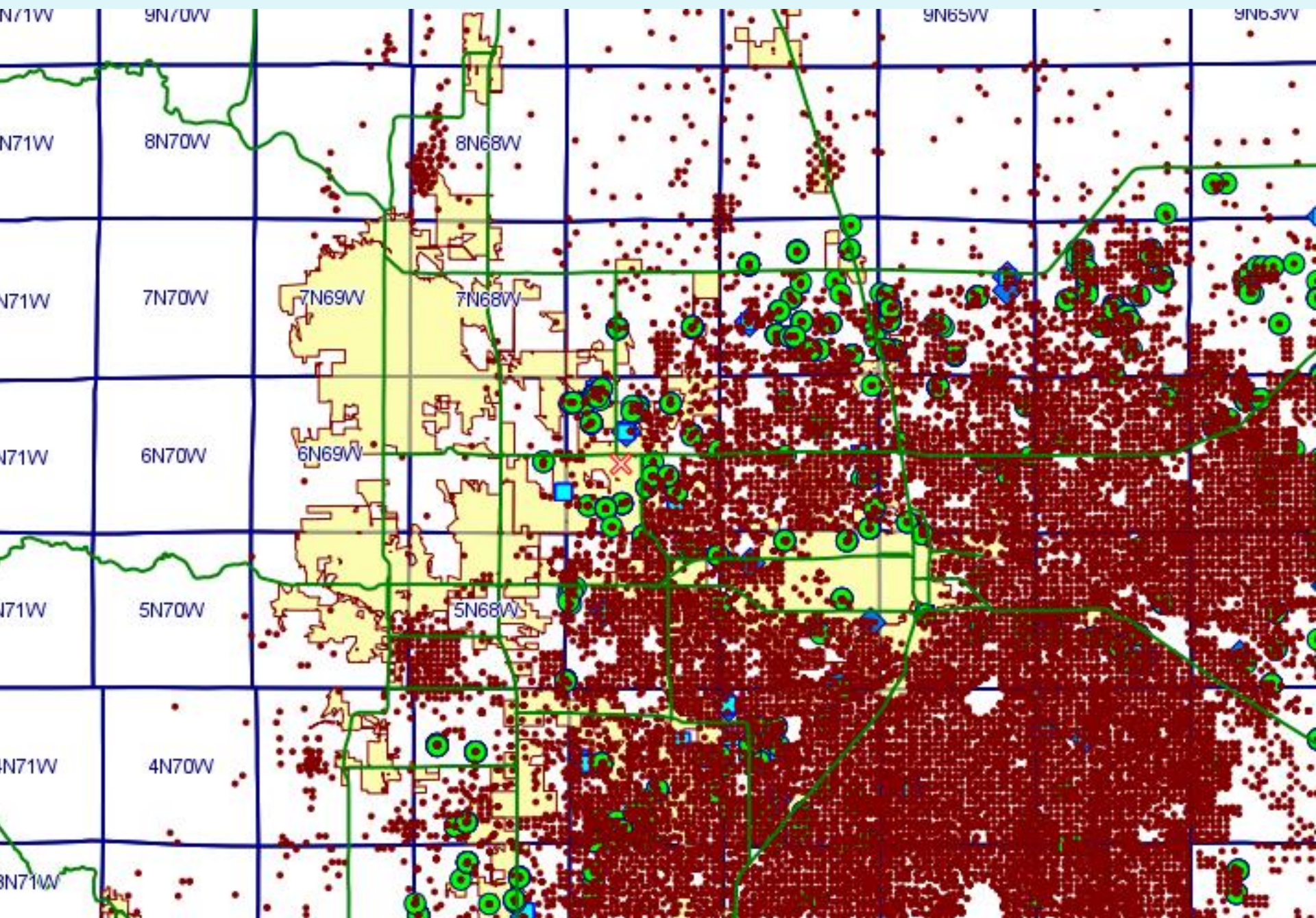


Hydraulic Fracturing













202 NEW WELLS

Synergy
Kelly Farms

C Street
Directional

Downtown
Directional

Sheep
Draw
Directional

MidTown
Directional

Synergy
Gilbert
Location

South
Greeley
Directional

Sheep Draw
(Fox Run)
16 wells

Mid Town
Directional
37 wells

Downtown
Directional
22 wells

South Greeley
Directional
67 wells

Gilbert
Location
16 wells

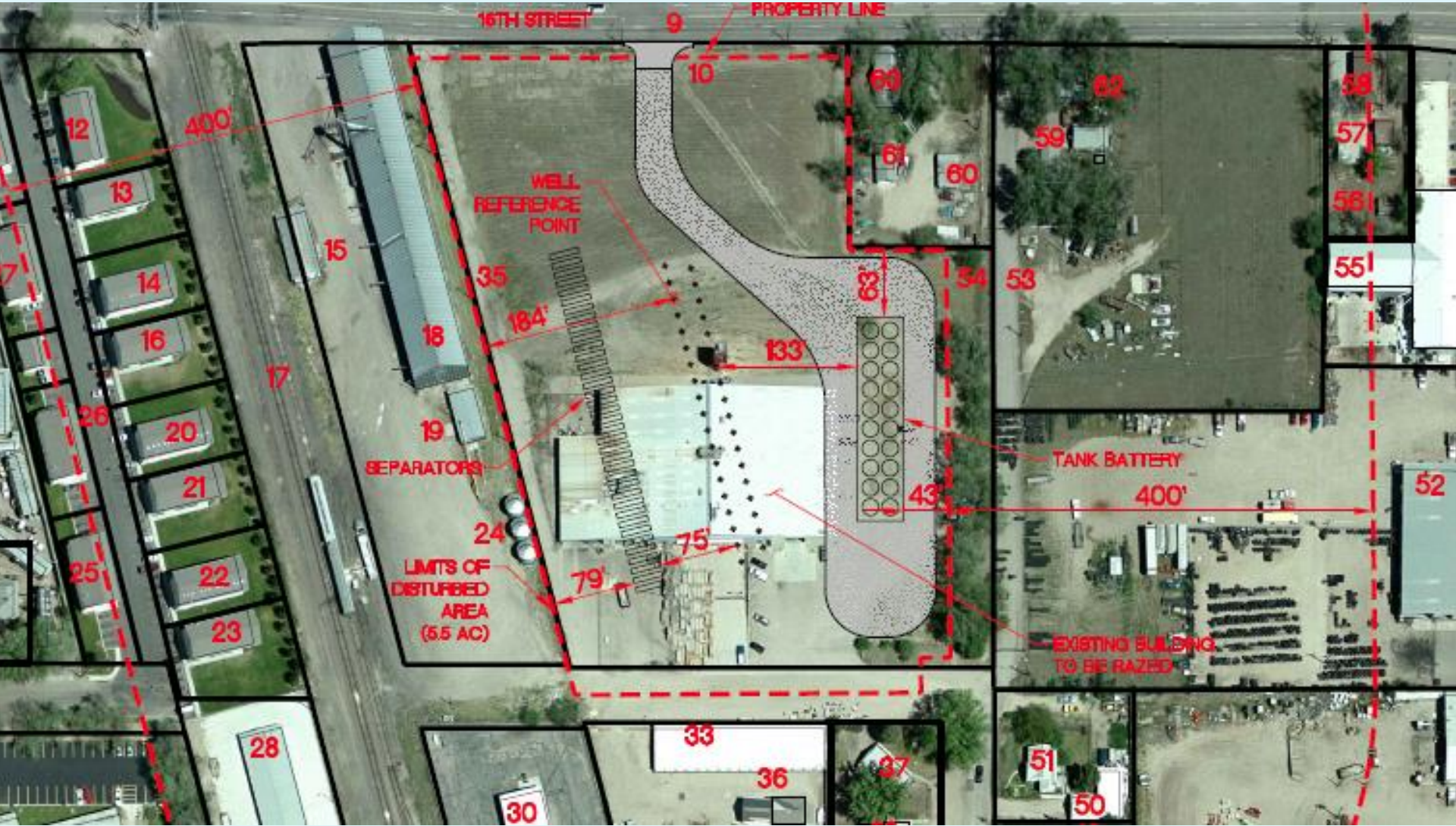
C Street
Directional
32 wells

Kelly
Farms
12 wells

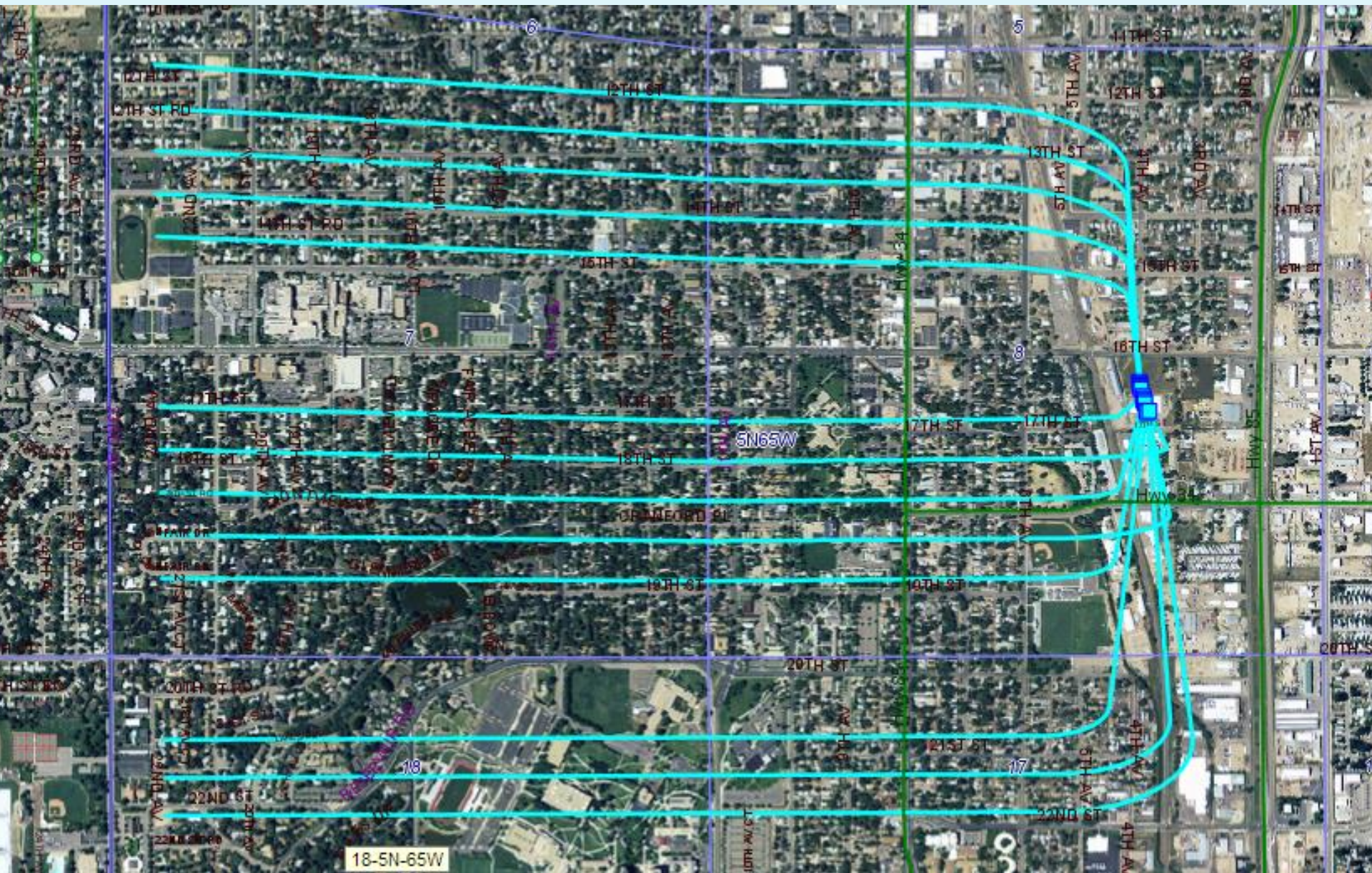
Mineral Resources

Midtown Directional Location 5/31/13





Midtown Directional – 37 wells and associated equipment have been approved less than 400 feet from an apartment complex



18-5N-65W

5N65W

18

17

8

5

6

12TH ST, 13TH ST, 14TH ST, 15TH ST, 16TH ST, 17TH ST, 18TH ST, 19TH ST, 20TH ST, 21ST ST, 22ND ST, 23RD ST

1ST AV, 2ND AV, 3RD AV, 4TH AV, 5TH AV

Hwy 34, Hwy 35

18-5N-65W

5N65W

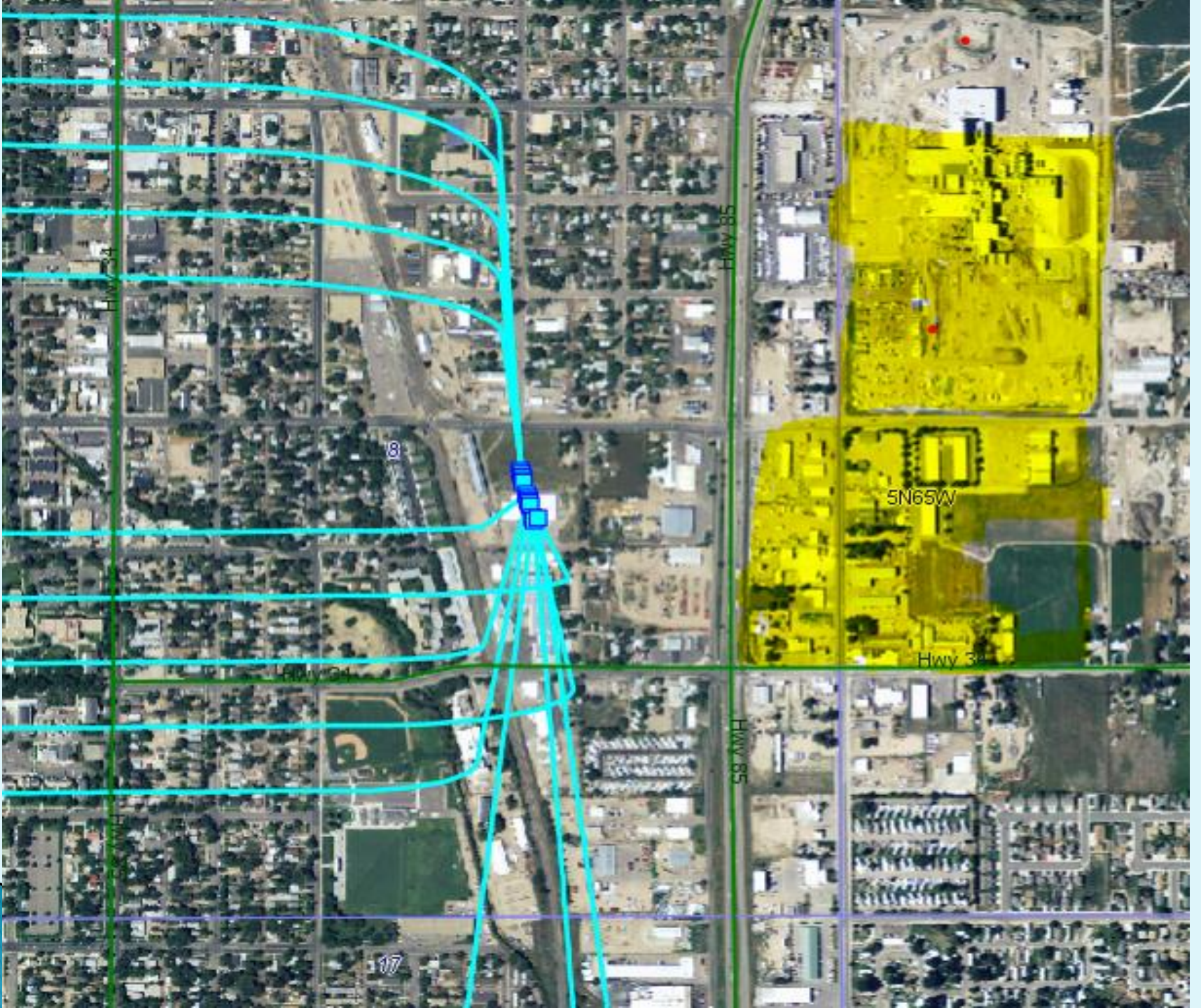
18

17

8

5

6



Hwy 34

Hwy 85

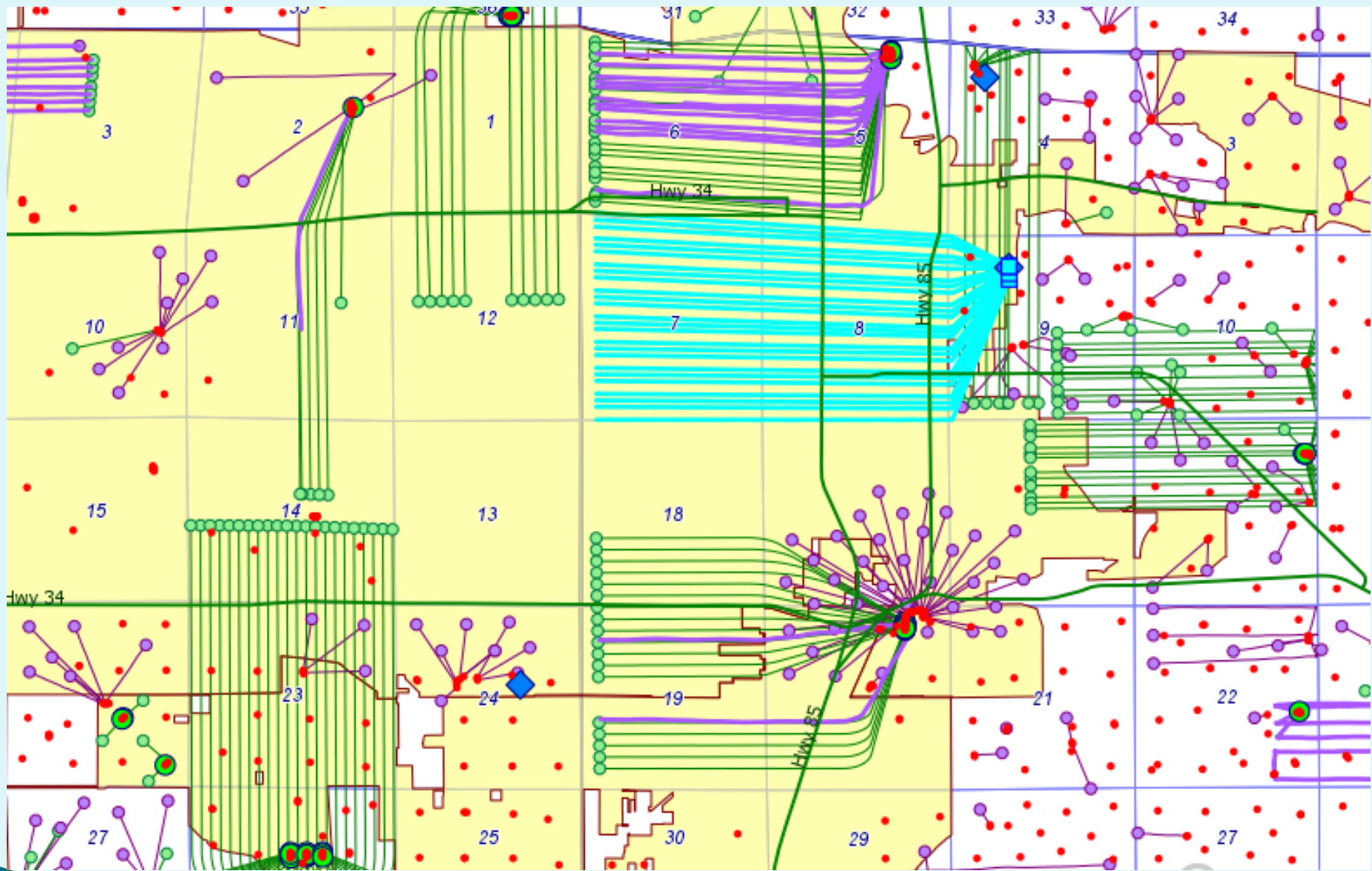
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5N65W

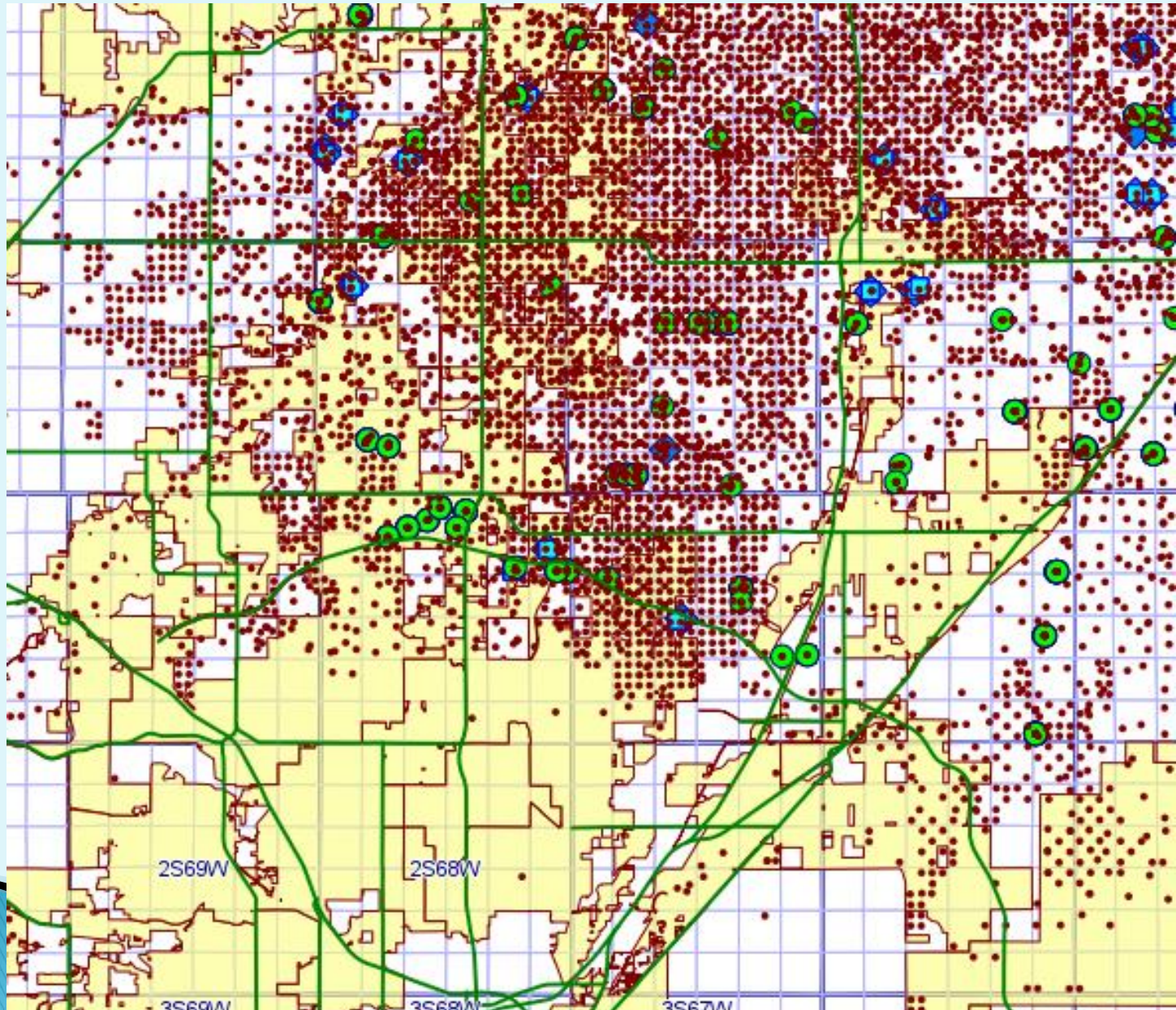
Hwy 30

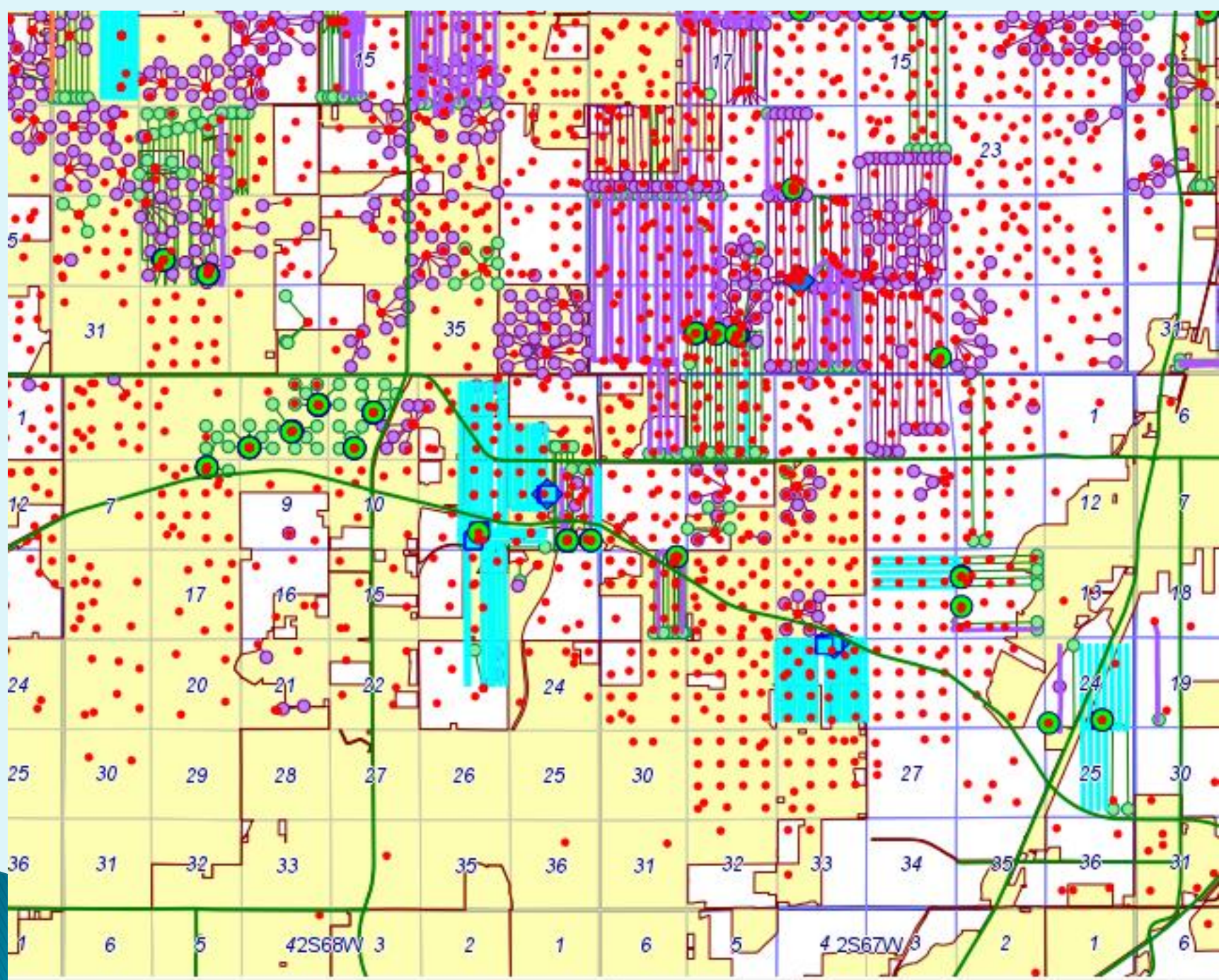
Hwy 85

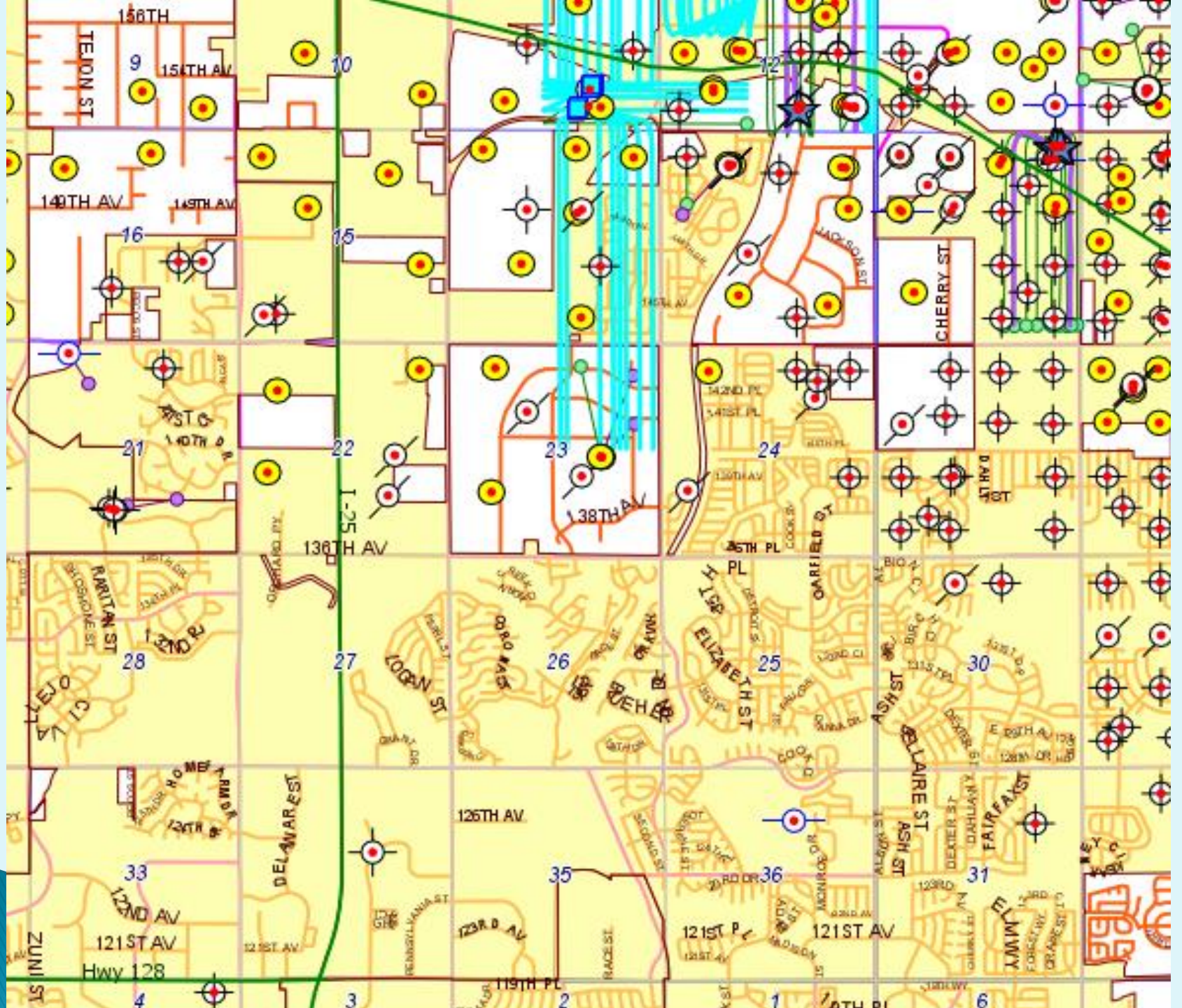
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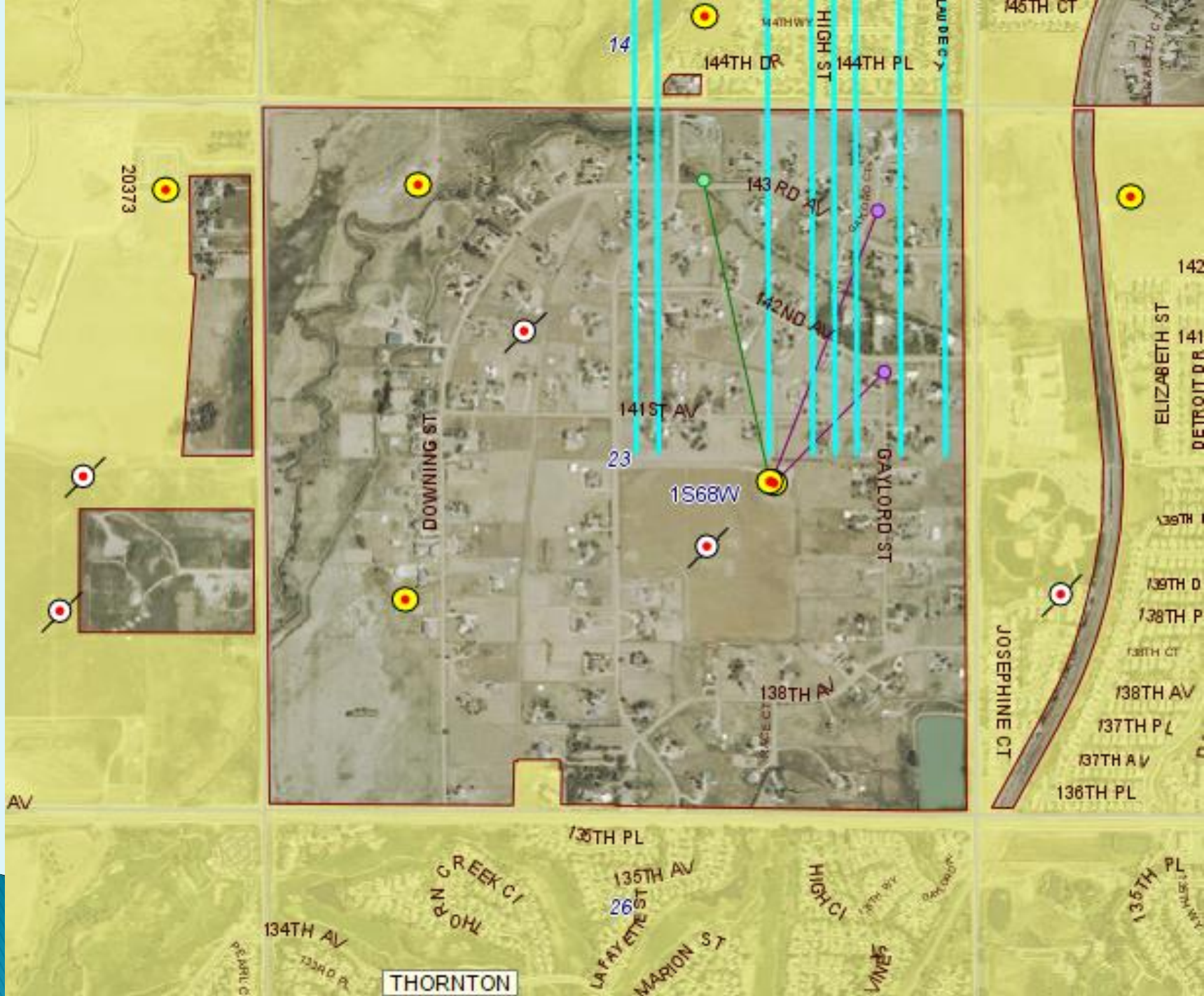


City of Thornton - Unincorporated Adams County









14

144TH DR

HIGH ST

144TH PL

145TH CT

20373

143 RD AV

142ND AV

141ST AV

23

1568W

GAYLORD ST

ELIZABETH ST

142

141

140

139

138

137

136

135

134

133

JOSEPHINE CT

138TH AV

137TH PL

137TH AV

136TH PL

135TH PL

THORNTON CREEK CT

135TH AV

134TH AV

133RD DR

THORNTON

LAFAYETTE ST

MARION ST

HIGH CT

VINES

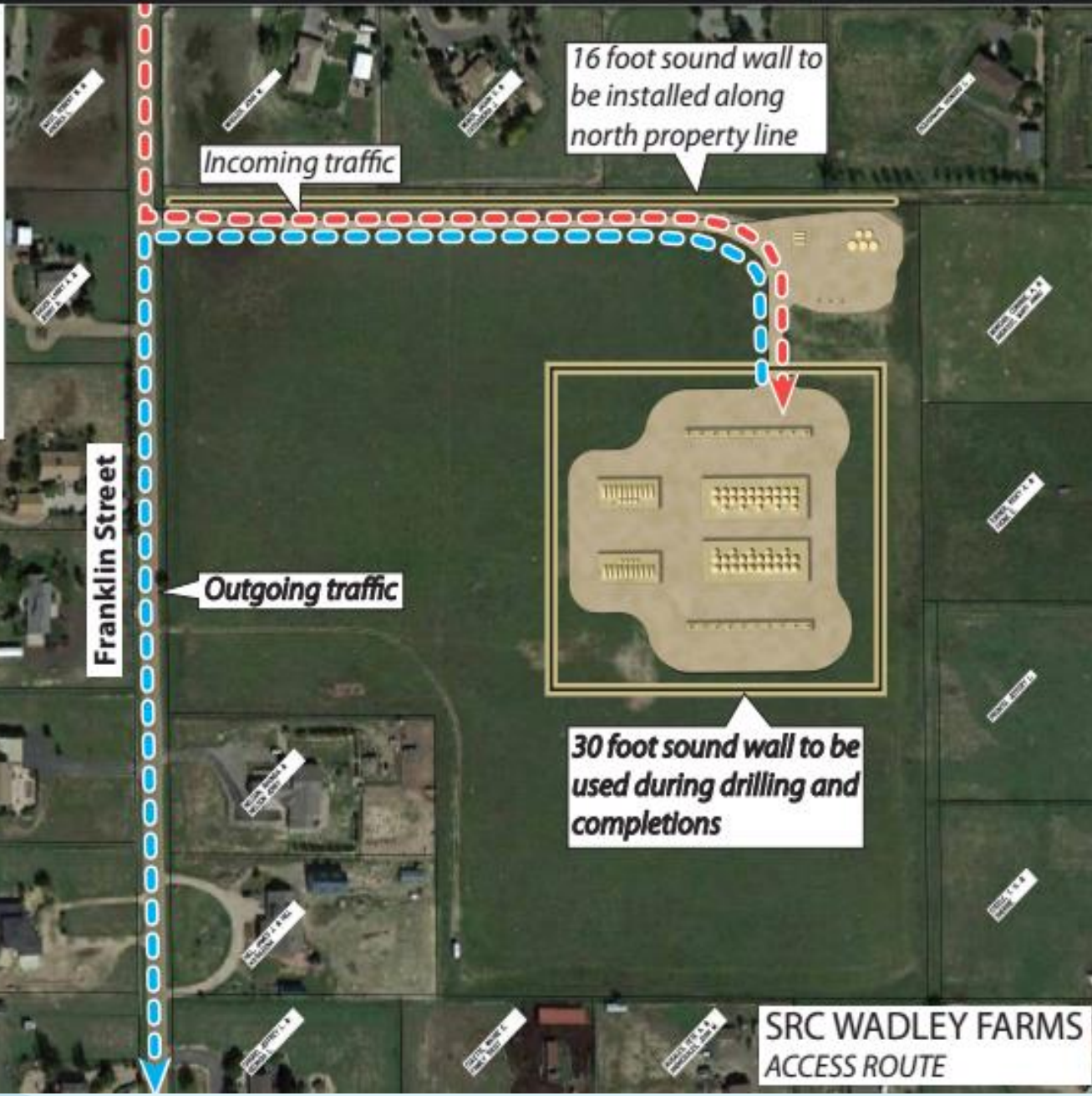
135TH PL

26

PARL C

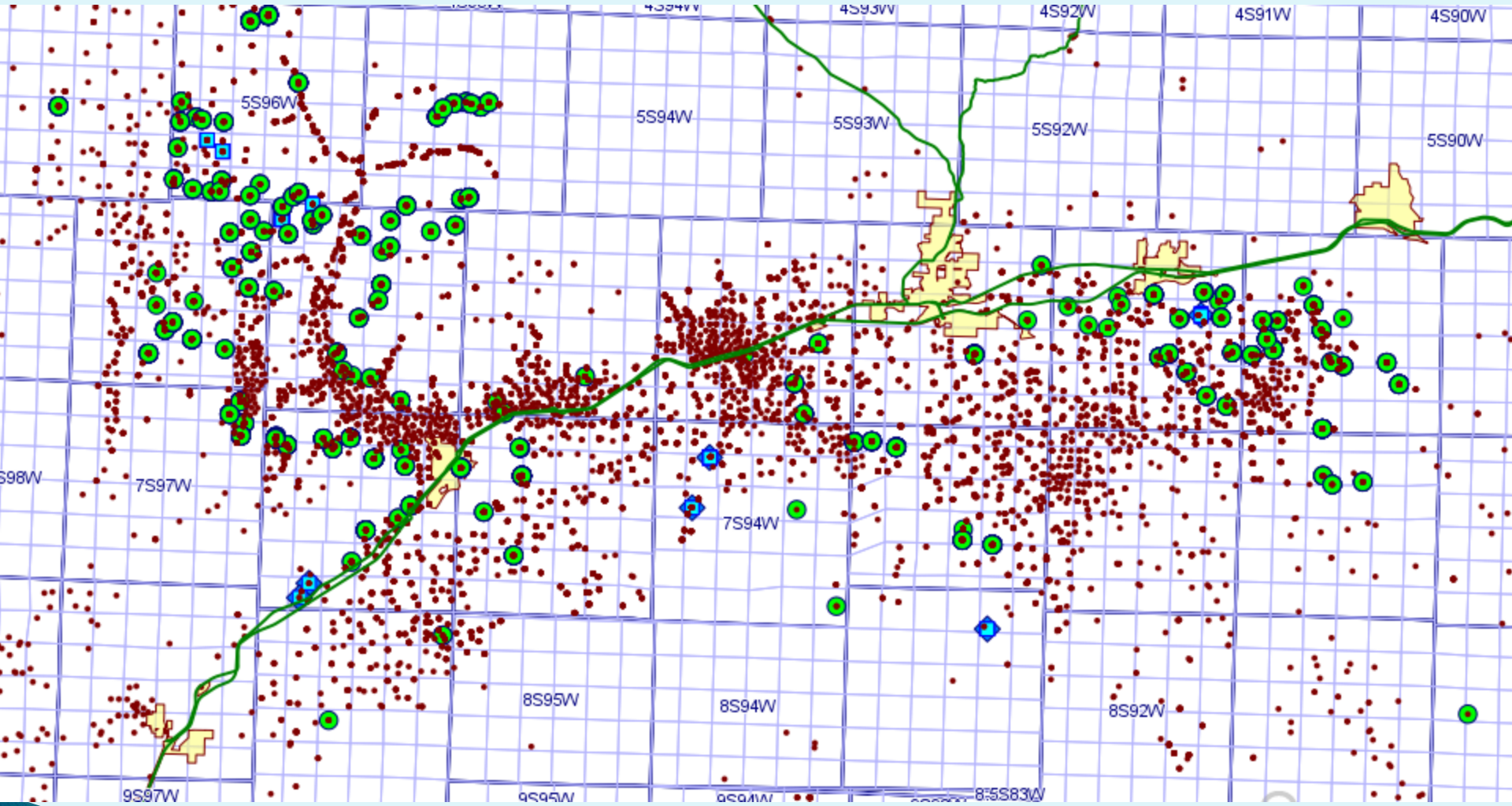
135TH PL

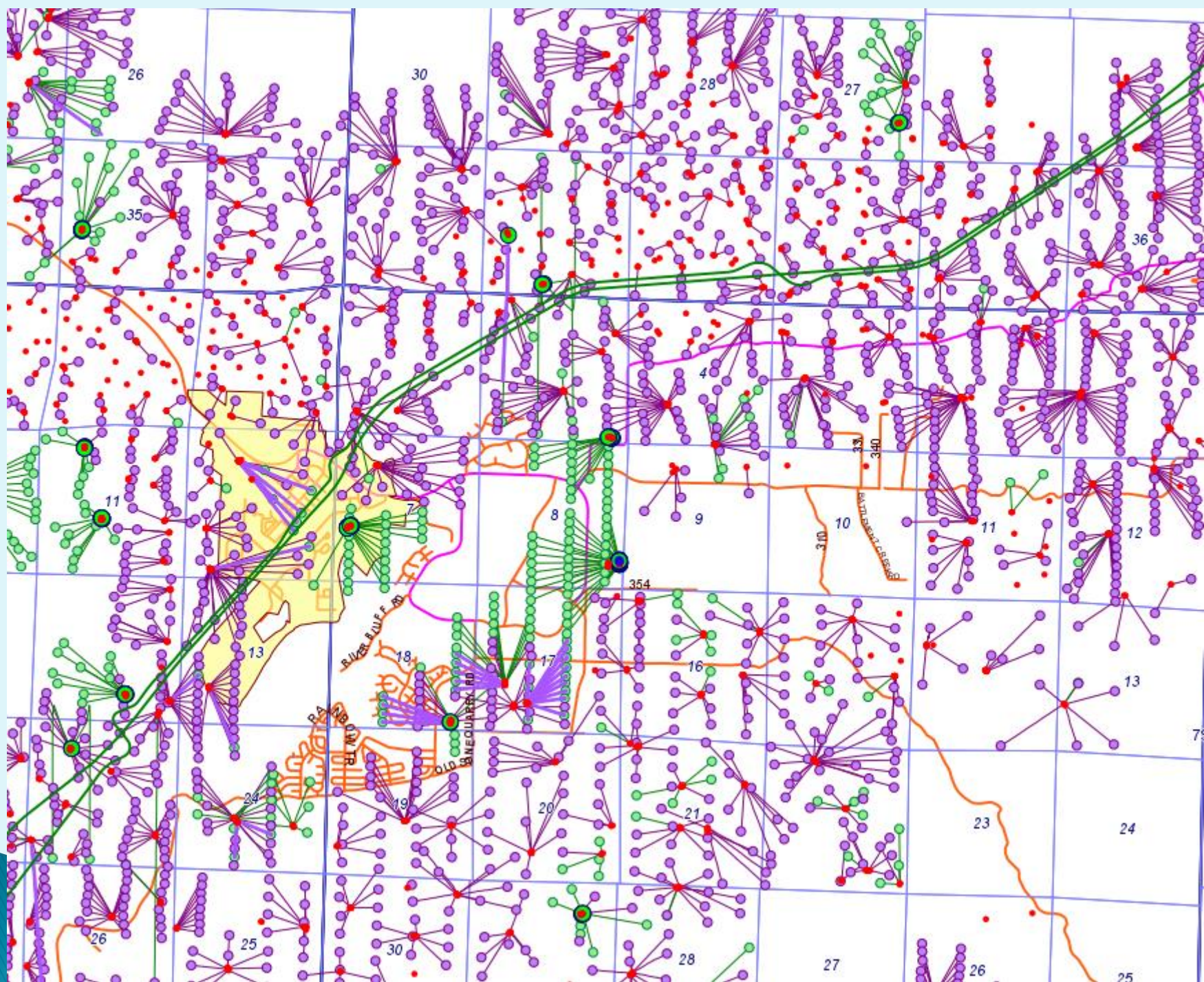
135TH HWY

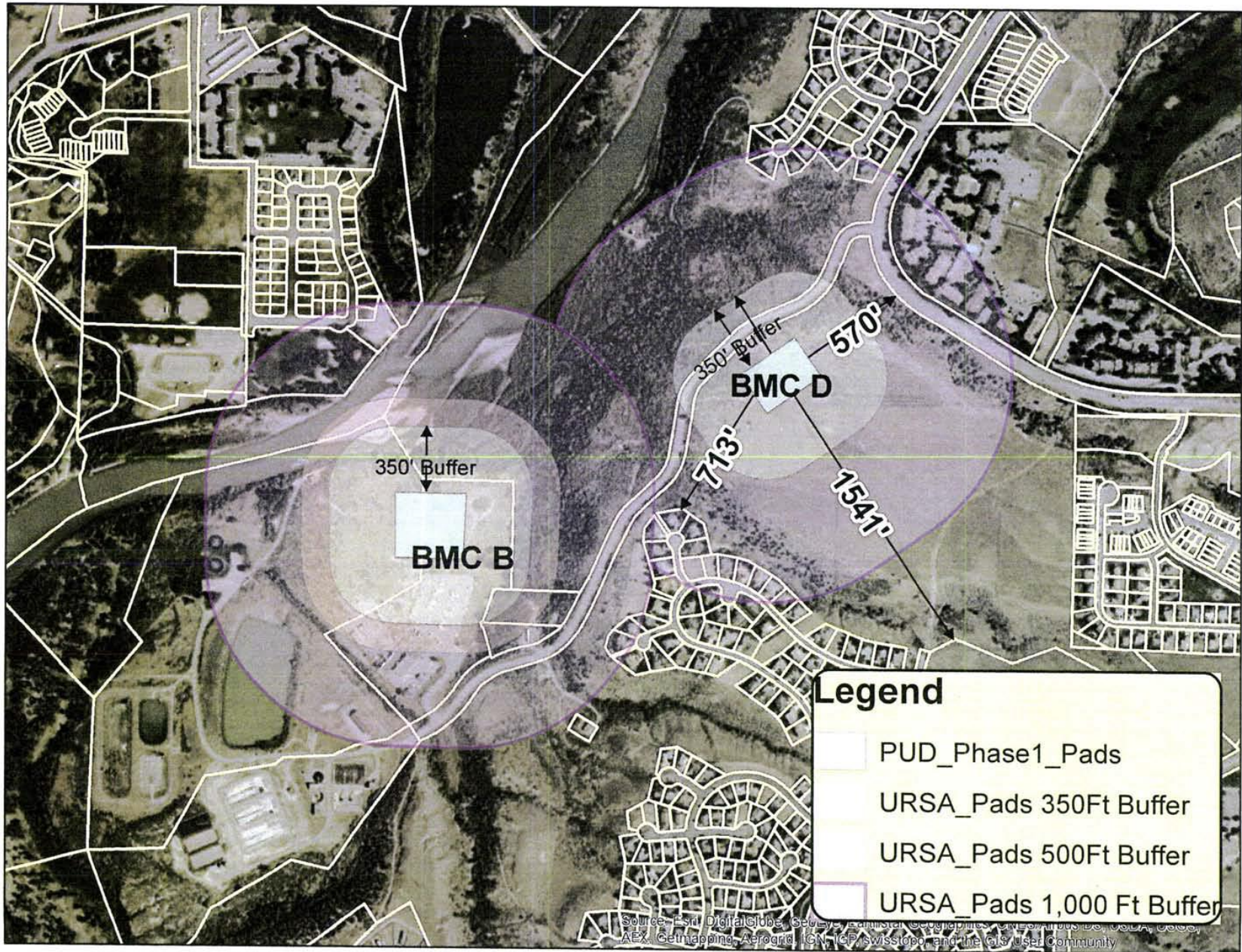


Synergy proposal









Legend

- PUD_Phase1_Pads
- URSA_Pads 350Ft Buffer
- URSA_Pads 500Ft Buffer
- URSA_Pads 1,000 Ft Buffer

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, AeroGRID, IGN, GEBCO, Swisstopo, and the GIS User Community



Community organizations making a difference...

BATTLEMENT CONCERNED CITIZENS

Battlement Mesa, Colorado



Weld Air and Water

weldairandwater@gmail.com



ACCDAN

A Community Voice

**Windsor Neighbors
for Responsible Drilling**



FPG
A Parent Group
Working to Keep
Frontier
Academy
Children
Safe

<https://www.facebook.com/FPG.parentgroup>
fpg.parentgroup@gmail.com

Due Process – a guarantee that all legal proceedings will be fair and that one will be given notice of the proceedings and an opportunity to be heard before the government acts to take away one's life, liberty, or property.

- ▶ Only allows 20 days in which to comment on proposed
- ▶ Does not allow a hearing to those impacted by the development

Is Colorado's shale regulatory system nested in climate change laws and policies to ensure that it is a bridge fuel to a sustainable future, and does not delay or divert from that objective?

2015 Colorado Climate Plan



COLORADO **CLIMATE PLAN**

State Level Policies and Strategies to Mitigate and Adapt

*State Level Policies
and Strategies to
Mitigate and Adapt*

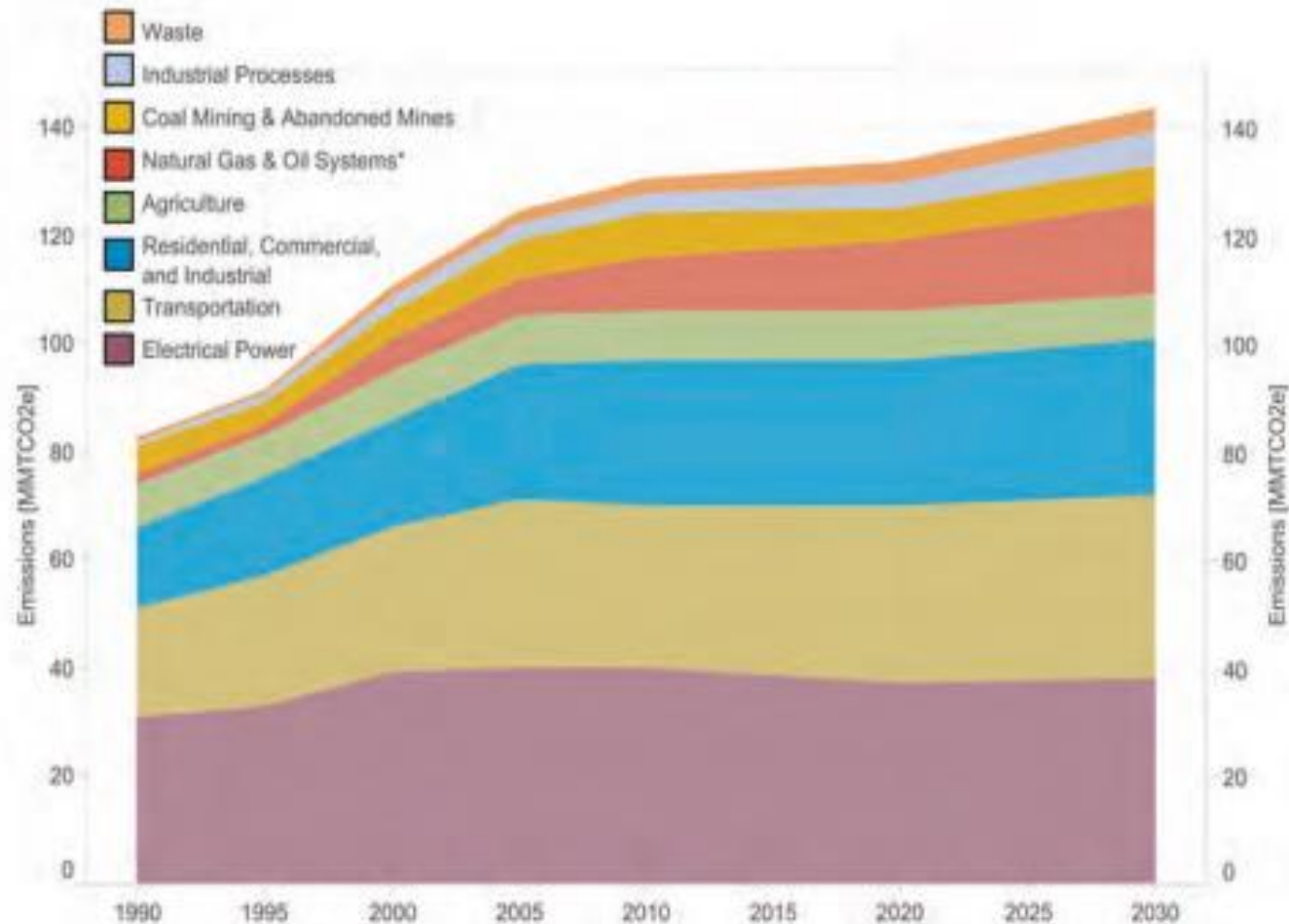


Projected increase in GHGs

Figure 3-1

**Summary of Colorado GHG Emissions
by Sector (MMTCO₂e).²⁴**

*Modified to account for Colorado Oil and Gas
Conservation Commission well counts.



Health Policy Recommendations

- ❖ By 2016, adopt an ozone State Implementation Plan with sufficient control measures to demonstrate attainment of the current ozone standard by 2017.
- ❖ Fully implement Colorado's 2014 oil and gas emission regulations, evaluate the resulting reductions of methane and other pollutants, and evaluate potential refinements to those regulations.

Energy Policy Recommendations

- ❖ Engage with energy companies to encourage and promote the most water-efficient technologies for energy extraction.
- ❖ Aid in the commercialization of clean technologies in the oil and gas development sector, such as methane capture, waste heat recovery, and related technologies that increase efficiency and reduce adverse environmental impacts.

Colorado's approach to climate change

- ▶ “Addressing climate change will take a concerted effort by all Coloradans and involve a two-pronged approach. We must reduce our own emissions, where possible, while still preparing for and **adapting** to future effects beyond our control.”
- ▶ “Colorado is on the right track, and **federal regulations** may quicken this pace.”

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