

Managing Oil and Gas Production Site and Midstream Facility Emissions Inventories in Wyoming

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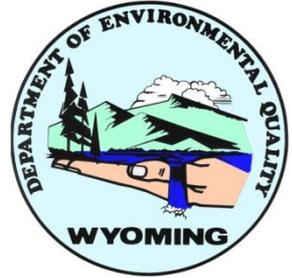
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WY Department of Environmental Quality
Air Quality Division

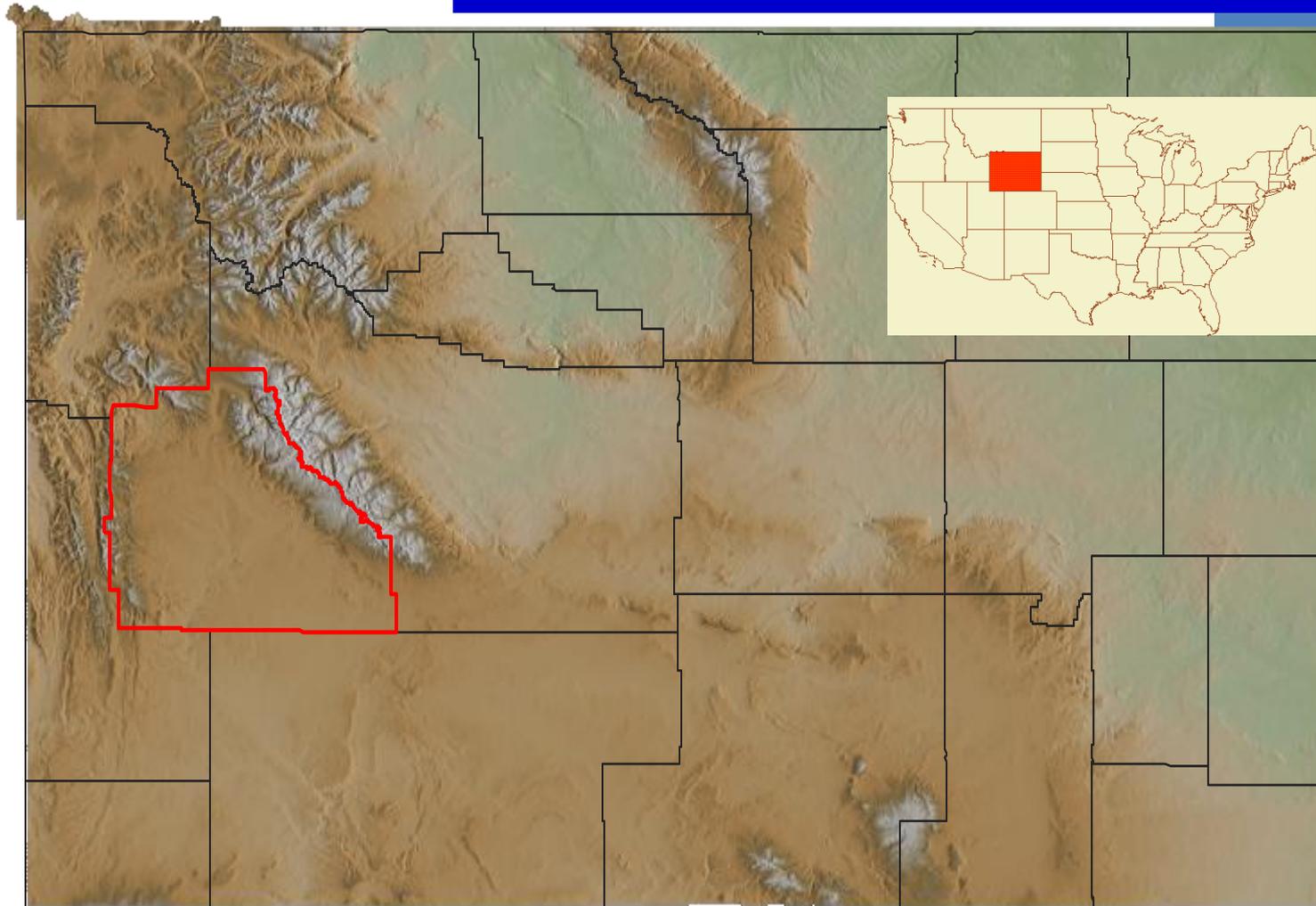
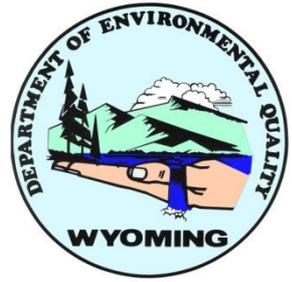
November 20, 2013

Topics

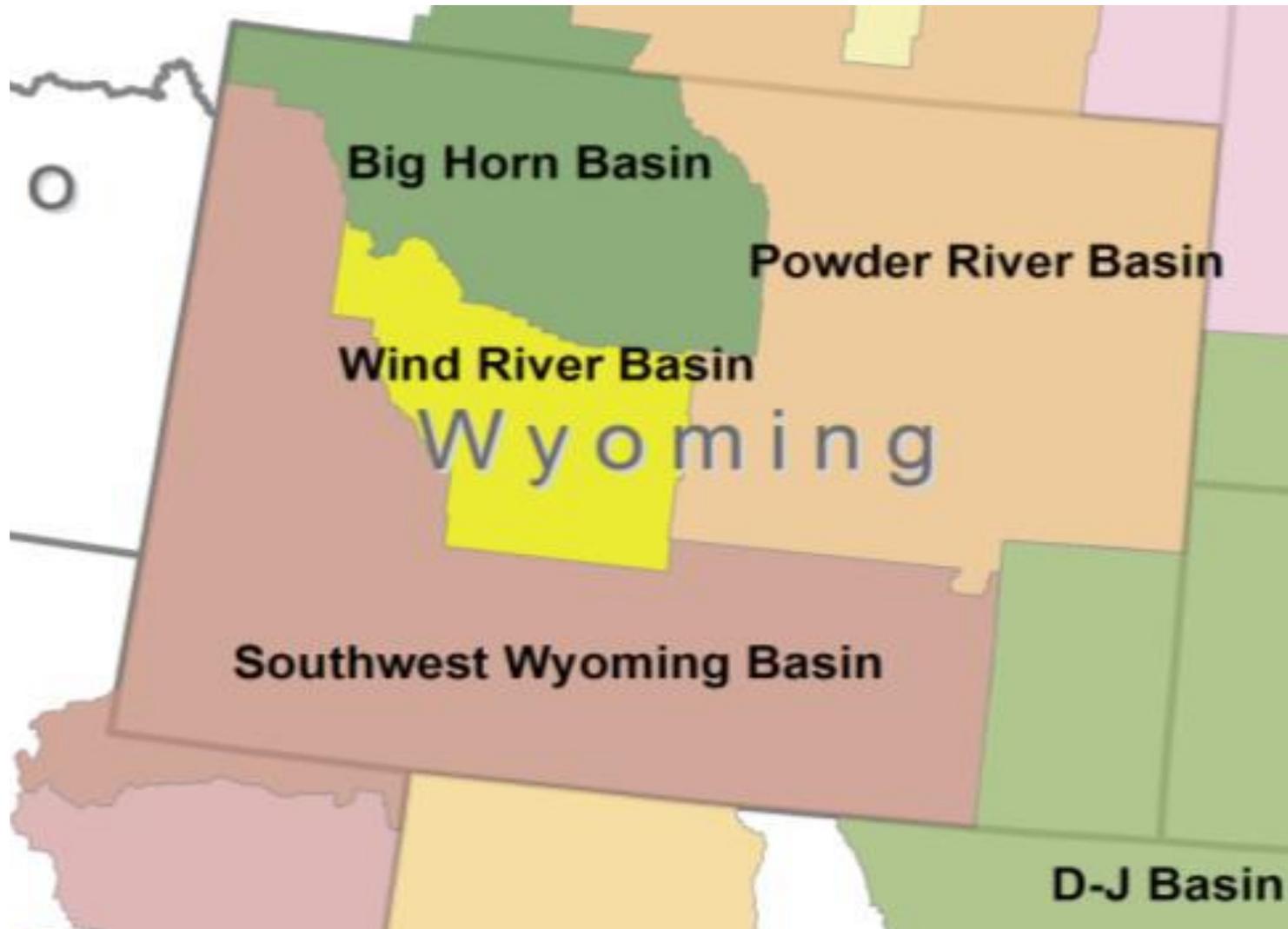
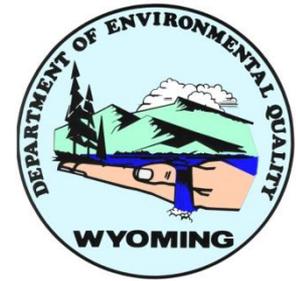


- ◆ Oil and Gas Development in Sublette County, Wyoming
- ◆ Emissions Inventory Development for the Oil and Gas Sector
- ◆ Management of Emissions Data

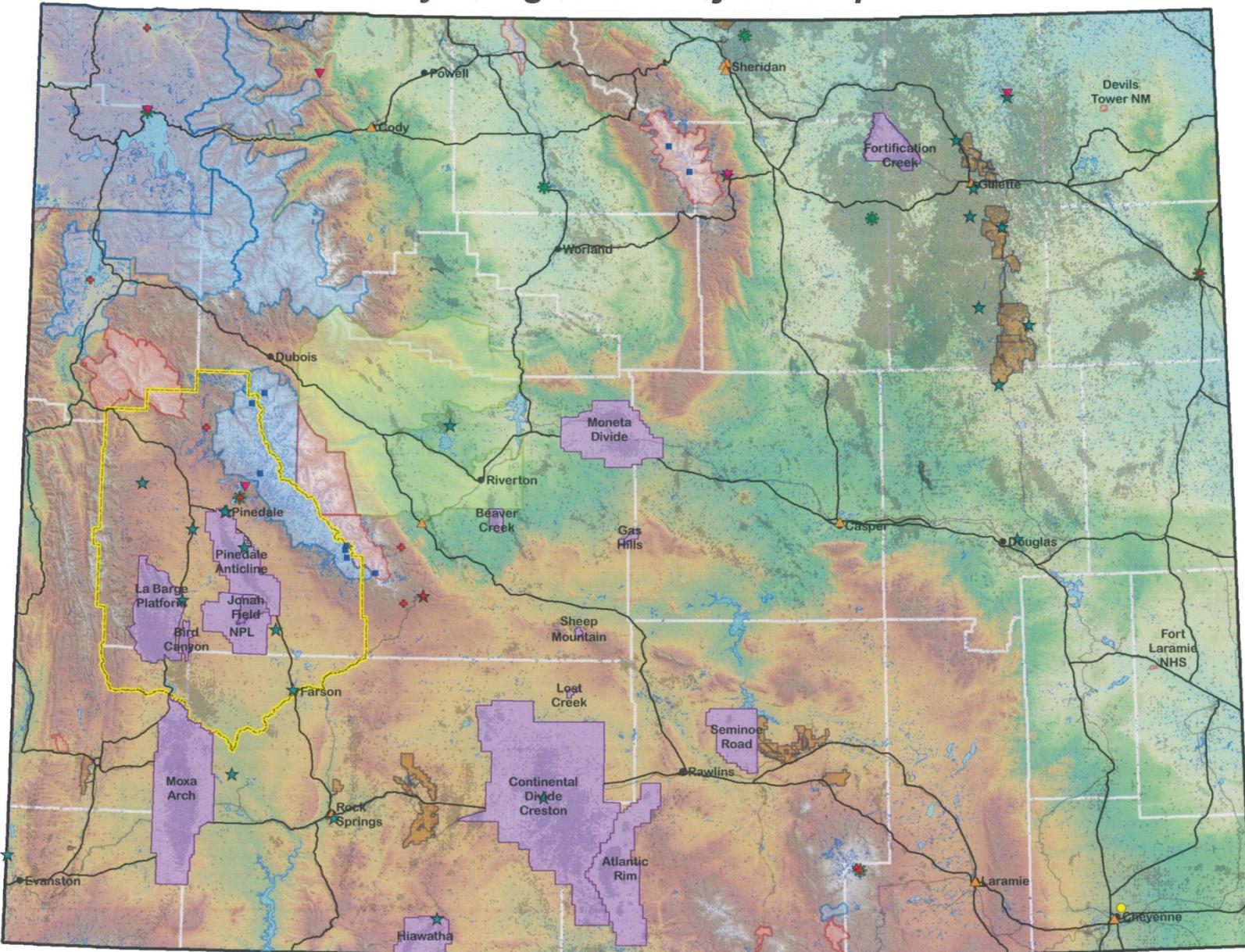
Oil and Gas Development



WRAP Phase III – Wyoming Basins



Wyoming NEPA Projects Map

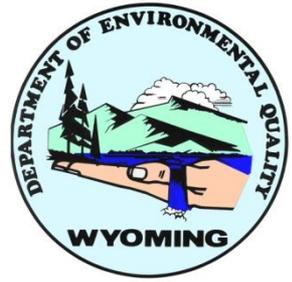


Legend

Monitor_Ty

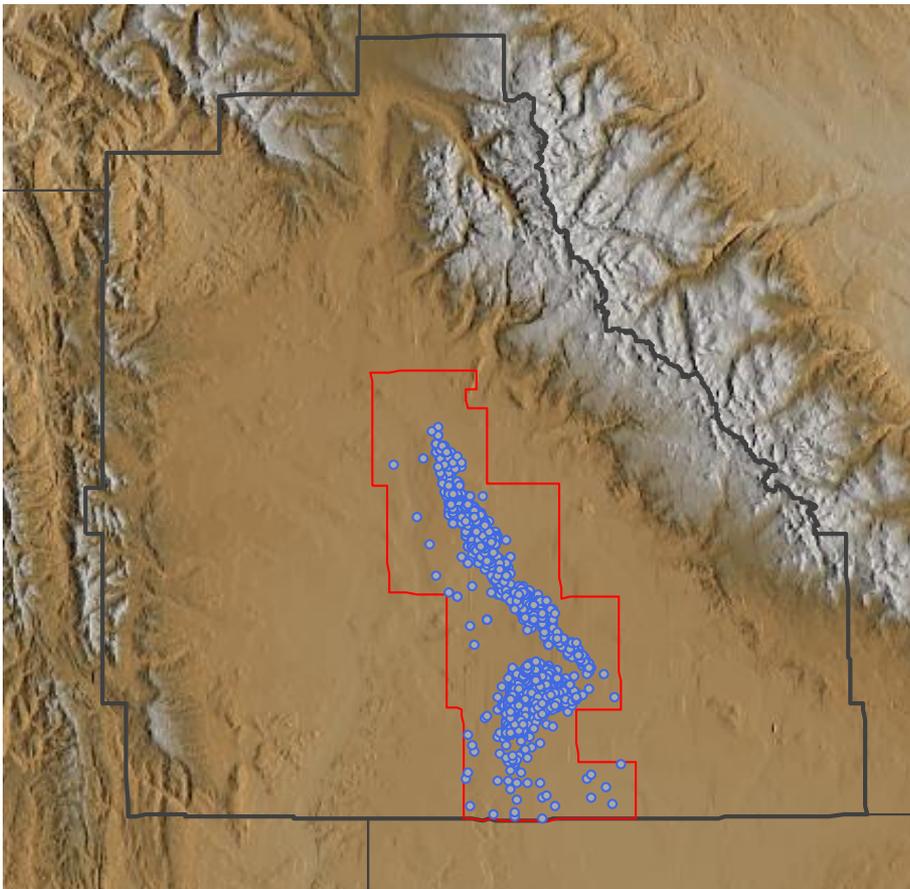
- CASNET
- IMPROVE
- Longterm Lake
- NADP
- NCore
- SLAMS
- SPM
- Cities
- WOGCC_WELLS
- NEPA Project Areas
- Railroad
- Major Roads
- UGRB_Ozone_NAA
- Class II Sensitive Areas
- Wind River IR
- Class I Areas
- Water Bodies
- Coal Mines
- COUNTYS

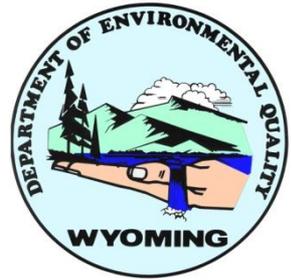




Oil and Gas Development

- ◆ Jonah Field and Pinedale Anticline Development (JPAD)

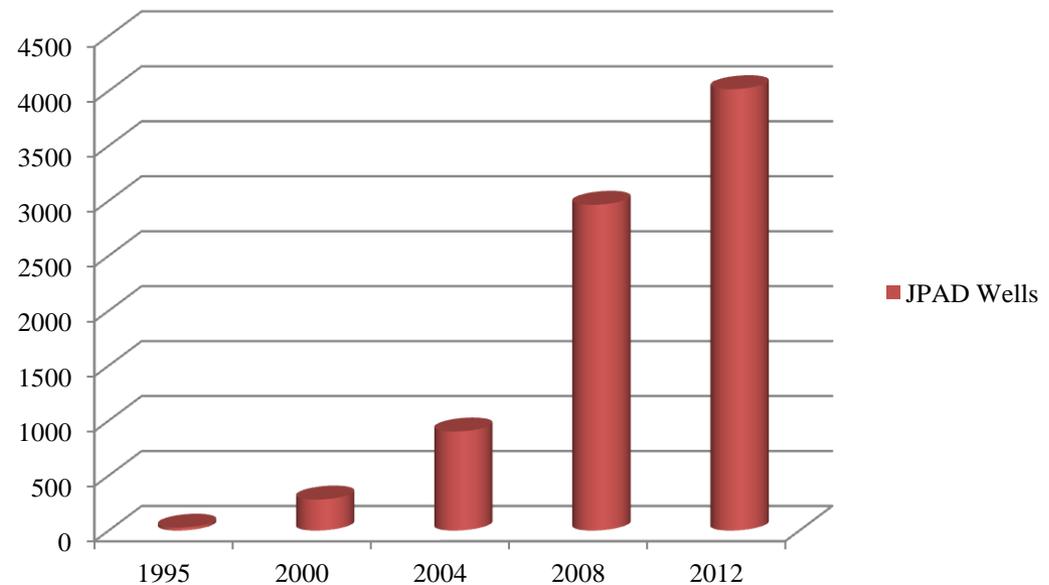


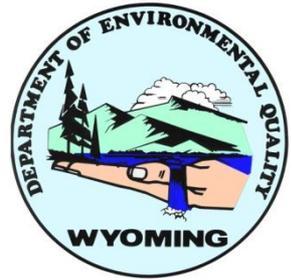


Oil and Gas Development

◆ Producing JPAD Wells

- 26 in 1995
- 282 in 2000
- 901 in 2004
- 2964 in 2008
- 4016 in 2012

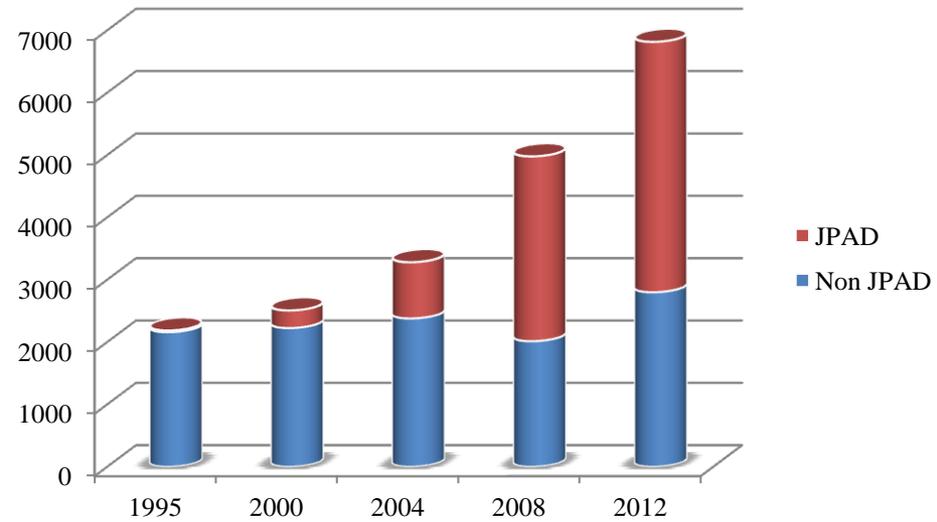
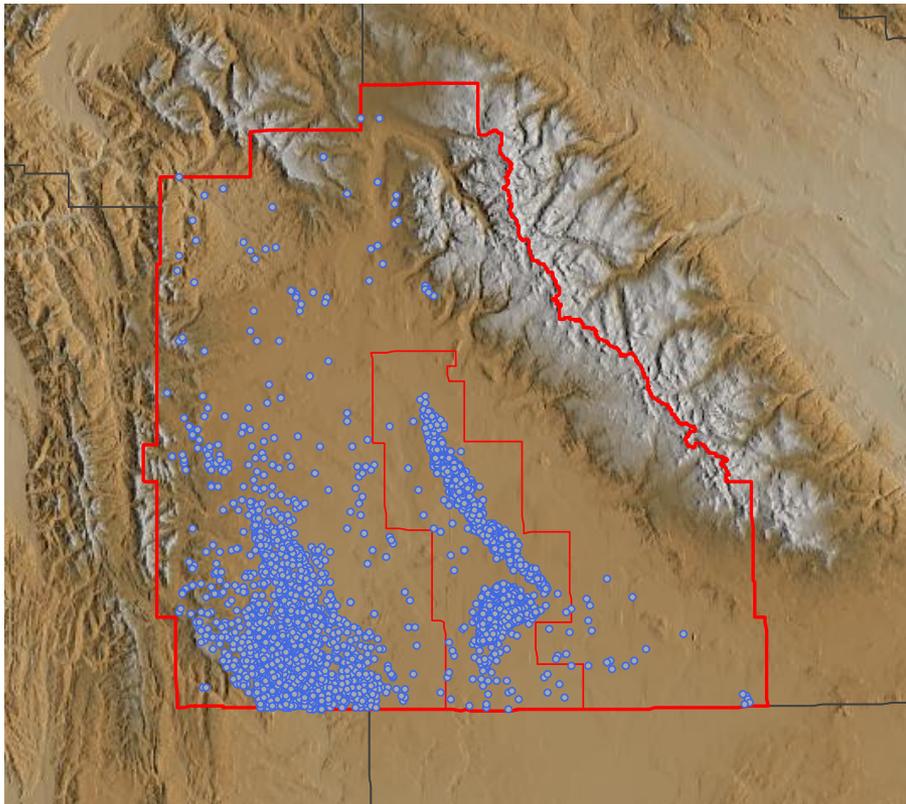
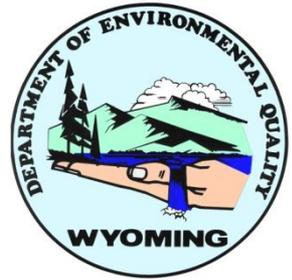


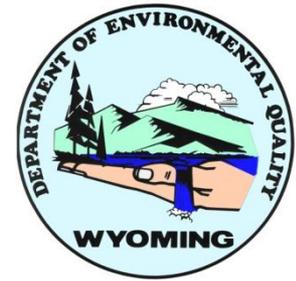


Inventory Development

- ◆ Emission Inventories began in 2004
- ◆ Annual Inventories
- ◆ 2004 JPAD inventory included:
 - 8 Emission Sources
 - drill rigs, wellhead engines, process burners, tanks, dehydration units, pneumatic pumps, well venting, and well completions
 - 7 Pollutants
 - NO_x, SO₂, Total VOCs, and speciated BTEX compounds
 - BTEX : Benzene, Toluene, Ethyl-Benzene, Xylene

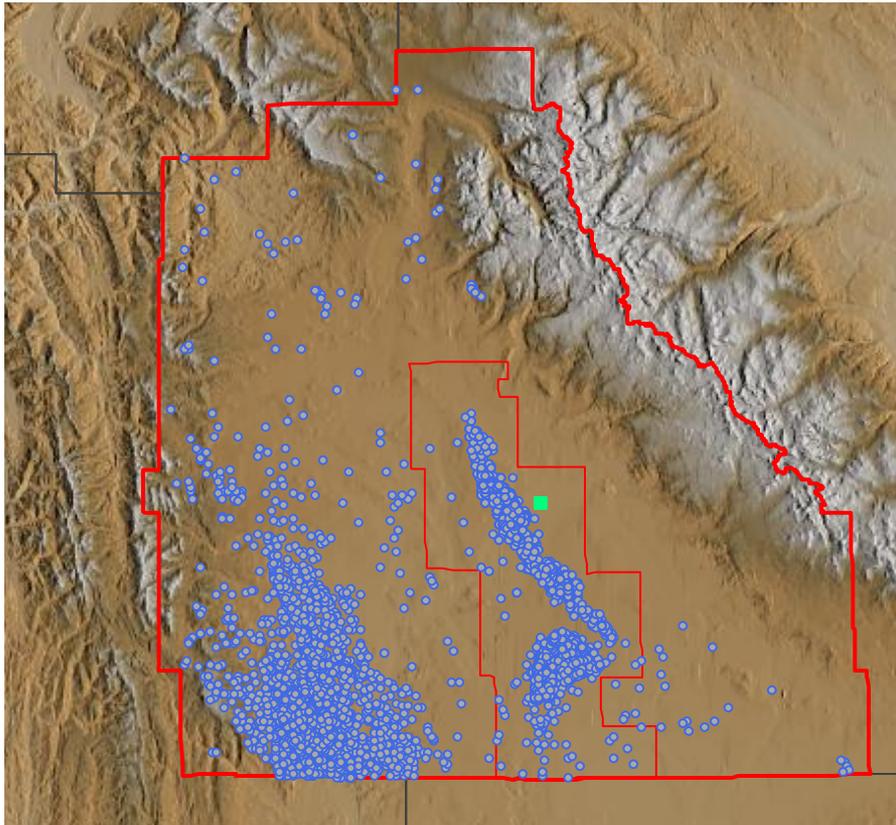
Oil and Gas Development



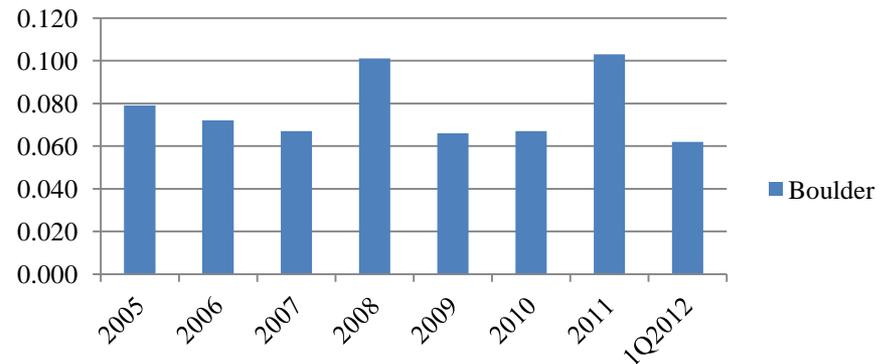


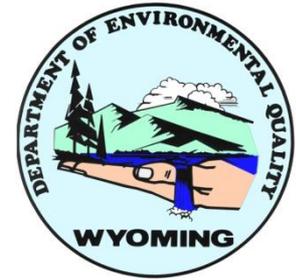
Oil and Gas Development

◆ Ambient ozone concentrations

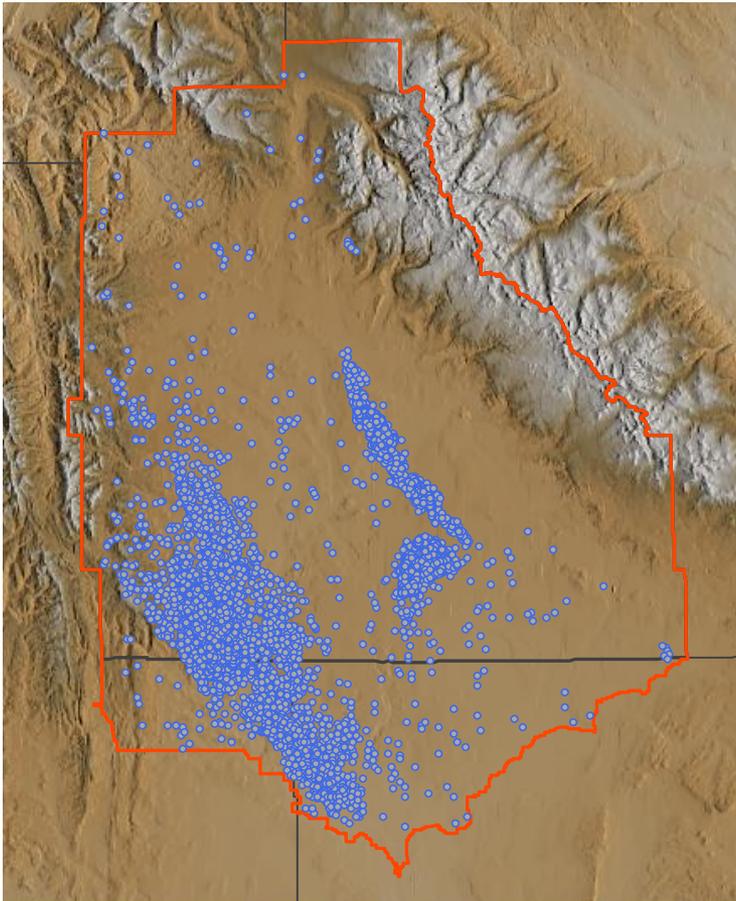


Boulder 4th highest 8-hour daily maximum (ppm)



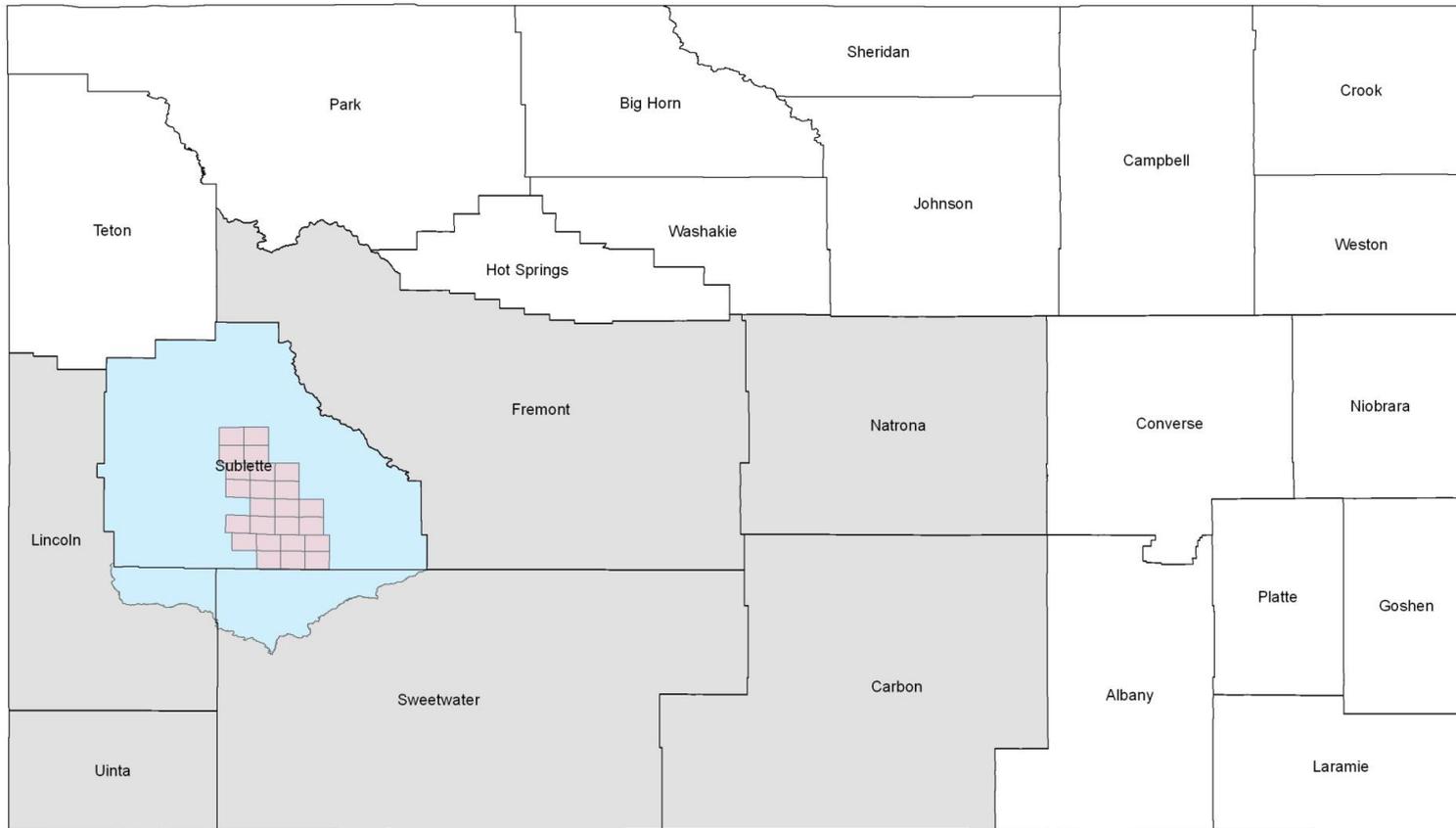
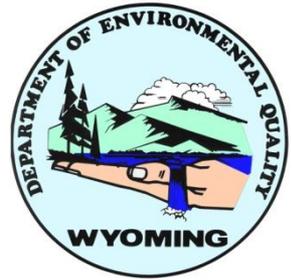


Oil and Gas Development



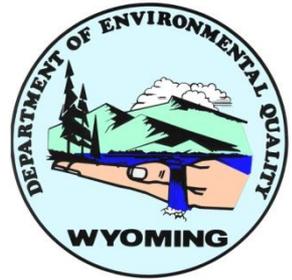
- ◆ Creation of non-attainment area for ozone
- ◆ Proposed by WDEQ in 2009
- ◆ Official Designation was July 20, 2012
- ◆ Upper Green River Basin (UGRB)

September, 2013 Permitting Guidance Update



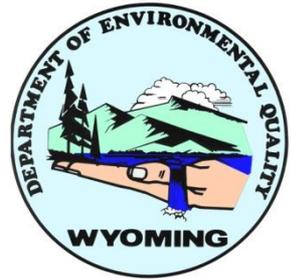
Legend

 JPAD/NPL  UGRB  CDA  Statewide



Inventory Development

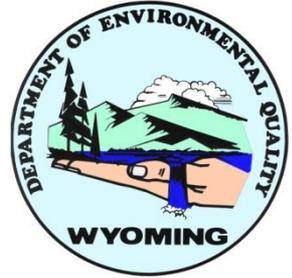
- ◆ Winter Inventories Requested
 - Began in 2007
 - February 1 – March 31
 - 2007-2008 used original JPAD format but expanded geographically to Sublette County
 - Included midstream facilities in addition to production facilities
- ◆ Inventory forms evolve to include midstream facilities



Inventory Development

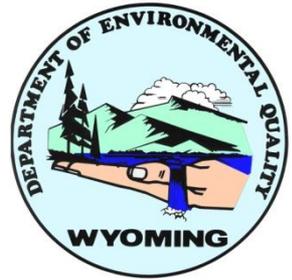
- ◆ 2004 JPAD inventory included:
 - 8 Emission Sources
 - drill rigs, wellhead engines, process burners, tanks, dehydration units, pneumatic pumps, well venting, and well completions
 - 7 Pollutants
 - NO_x, SO₂, Total VOCs, and BTEX (benzene, toluene, ethyl benzene xylenes)
- ◆ 2008 Forms evolve to included Midstream Facilities:
 - 14 Emission Sources
 - 8 sources above plus fugitives, truck loading, non-road mobile, on-road mobile on both paved and unpaved roads, flares and compressor engines
 - 25 Pollutants
 - 7 pollutants above plus C1 through C10+ speciated hydrocarbons, CO, H₂S, and formaldehyde

Field & Formation Specific Emissions Equations

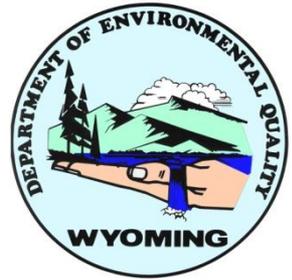


- ◆ Using ProMax developed by Bryon Research & Engineering (BR&E), multiple field & formation specific equations have been developed. The first three were for the production fields in the UGRB:
 - Pinedale Anticline
 - Jonah Field
 - Big Piney & La Barge Fields

Field & Formation Specific Emissions Equations



- ◆ Extended hydrocarbon analyses for both liquids (condensate) and gas:
 - Required when submitting NSR permit application for a new or modified well pad
 - Information request by the AQD
 - Contains C1 through C10+ including H₂S & HAPs (n-Hexane, BTEX, & 2,2,4-trimethylpentane)

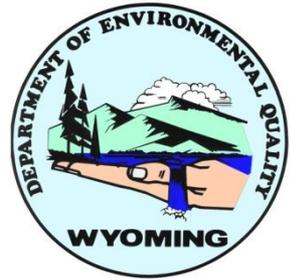


Inventory Development

- ◆ Annual Inventories use new format in 2008
 - Expand geographically to UGRB

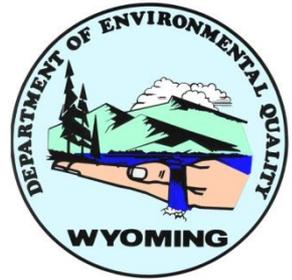
- ◆ Winter Inventories use new format in 2009
 - Expanded Geographically to UGRB

- ◆ Statewide Minor Source Inventory
 - 2008 and 2011 use new format



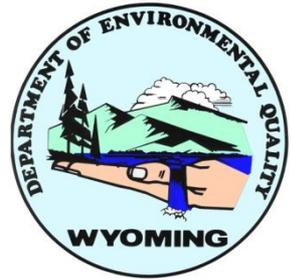
What does this mean?

- ◆ Winter Inventories Collected
 - 445 operator submitted inventories from 2007-2012
- ◆ Annual Inventories Collected
 - 1073 from 2004 to 2011
 - Includes 2008 and 2011 Statewide effort
- ◆ Only Oil and Gas production and midstream operations
- ◆ Each inventory can contain information from 1 to several thousand individual production sites.



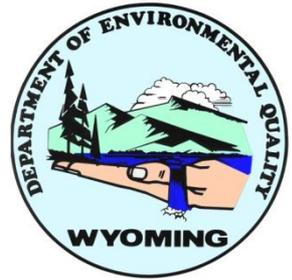
Data Management

- ◆ We've got a Data Management Challenge
- ◆ We also need to submit 2008 data to EIS
- ◆ We also need faster access to data from Wyoming Oil and Gas Conservation Commission (WOGCC)



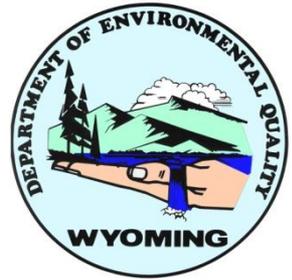
OGER Data System

- ◆ Received EPA Exchange Network Grant
- ◆ AQD Partners with Windsor Solutions
 - Upgrade Node v 1.1 to 2.0
 - Submit facility and point data to EIS
- ◆ Exchange data with WOGCC
- ◆ Build a web application for AQD Staff



OGER Data System

- ◆ Production data as far back as 1978
- ◆ Logical place to store emissions data
 - Expanded database to store emissions
- ◆ Batch Upload of spreadsheets
- ◆ Integrated Spatial Viewer
- ◆ Nonpoint data flow to EIS

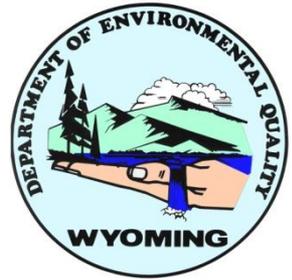


Inventory Form Demonstration

- ◆ DEQ Website to download EI forms -
<http://deq.state.wy.us/aqd/ei.asp>
 - Triennial - [Oil and Gas Production Site Emission Inventory Forms](#)
 - UGRB - [Annual and Winter Upper Green River Basin Emission Inventories:](#)
 - Upload - <https://deq.state.wy.us/AQDFileUploads/LoginUser.aspx>
 - UserName: (case sensitive)
 - Password: (case sensitive)
 - Permitting Guidance -
http://deq.state.wy.us/aqd/Oil%20and%20Gas/September%202013%20FINAL_Oil%20and%20Gas%20Revision_UGRB.pdf

Inventory Form Demonstration

(continued)

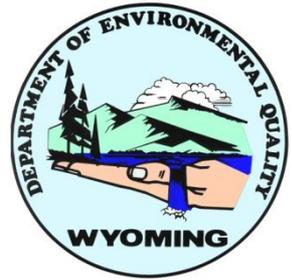


- ◆ Two Types of Inventory Forms
 1. Production Site (Must have API #)
 2. Compressor & Pipeline (Includes compressor stations, gas plants, water disposal wells, etc.)

- ◆ Both forms have a similar structure
 - Emissions are calculated on a facility basis
 - Emissions for each source are calculated on separate tabs
 - Emissions are added together on summary tabs

Inventory Form Demonstration

(Form Structure)



◆ Facility Specific Emissions Calculation Tabs

■ Production Site Form

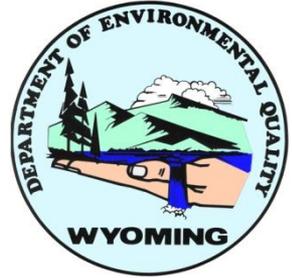
- Facility Summary
- Stationary Engines
- Heaters
- Tanks
- Dehys
- Pneumatic Pumps
- Pneumatic Controllers
- Fugitives
- Venting & Blowdowns
- Drill Rigs
- Completions & Workovers
- Truck Loading

■ Compressor & Pipeline Form

- Facility Summary
- Stationary Engines
- Heaters
- Tanks
- Dehys
- Pneumatic Pumps
- Pneumatic Controllers
- Fugitives
- Venting & Blowdowns
- Other Emission Sources (i.e. amine units, water disposal pits, etc.)

Inventory Form Demonstration

(Form Structure continued)

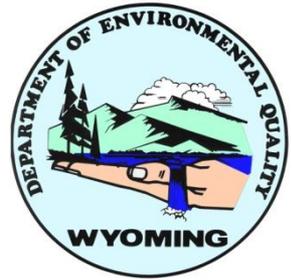


- Operator Specific Emissions Calculation Tabs:
 - On-Road Mobile
 - Non-Road Mobile

- Summary Tabs
 - Facility Summary
 - Operator Summary

Inventory Form Demonstration

(Calculation Basis)

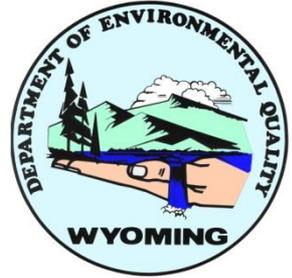


◆ Basis of Calculations

- Operator Supplied
 - Stationary Engines
 - Dehys
 - Drill Rigs
 - Completions & Workovers
 - Non-Road Mobile
 - Other Emissions Sources
- EPA AP-42
 - Heaters
 - Pneumatics
 - Fugitives
 - Truck Loading
 - On-Road Mobile
- Engineering Calculations
 - Tanks (ProMax)
 - Venting & Blowdowns
 - Wet Gas Analyses (ProMax)
 - Condensate (Oil) Analyses (ProMax)
 - Water Analyses (ProMax)

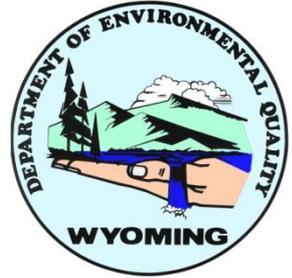
Inventory Form Demonstration

(QA)



- ◆ QA Process
 - QA_Check_List
 - Facility Summary (adj)

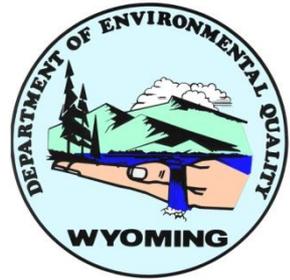
Oil & Gas Emissions Reporting OGER Demonstration



- ◆ Emission Upload
 - Facility Summary sheet
 - OGER Upload Process

Oil & Gas Emissions Reporting

OGER Demonstration (continued)



◆ Queries

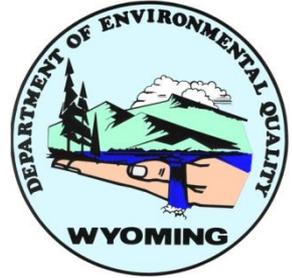
■ Production

- Spatial (Map, County, Basin, PLSS)
- Company
- Well Type and Status
- Field
- Reservoir
- Date (Feb-Mar (Winter))

■ Emissions

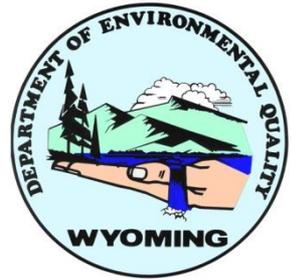
- Spatial (Map, County, Basin, PLSS)
- Company
- Well Type and Status
- Field
- Reservoir
- Annual / Winter
- Source (i.e. Tanks, Pneumatics, etc)
- Controlled (i.e. Yes or No)

DEMO



- ◆ Inventory Sheets
- ◆ OGER

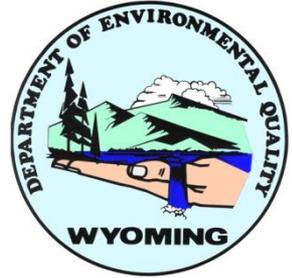
Production Site Inventory Form Overview (Facility Summary)



◆ Facility Summary Tab

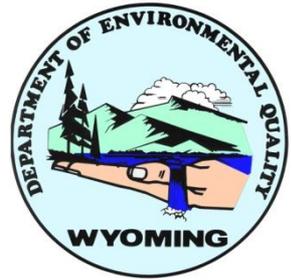
- General information (Company name, inventory year, API #, Coordinates, Production values, Pressure)
- “Drives” the Rest of the facility Specific tabs (i.e. engines, heaters, tanks, etc)
- Gray section to right is compilation of emissions from all sources for that facility

Production Site Inventory Form Overview (Operator Summary)



- ◆ Operator Summary Tab
 - Sum of all emissions reported by the operator on this form
 - Includes mobile emissions

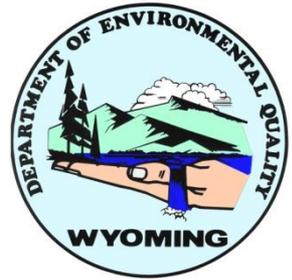
Production Site Inventory Form Overview (Stationary Engines)



◆ Stationary Engines Tab

- User Inputs:
 - Model
 - Fuel
 - Horsepower
 - Operating hours
 - Emission factors
- Emission calculations in Gray Section to Right

Production Site Inventory Form Overview (Heaters)



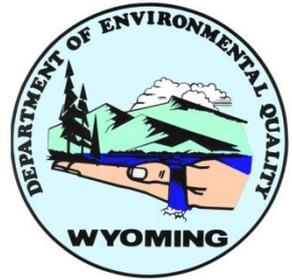
◆ Heaters Tab

■ User Inputs:

- Operating hours
- “Size” (MMBTU/hr)

■ Emission calculations in Gray Section to Right

Production Site Inventory Form Overview (Tanks)

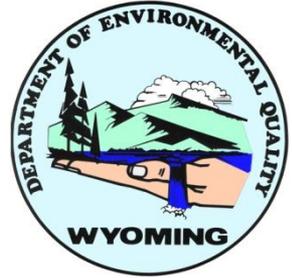


◆ Tanks Tab

■ User Inputs:

- # of Tanks
 - Type of Tanks
 - Operating hours,
 - H₂S Content
 - Standing-Working-Breathing Losses (Calculated from EPA Tanks or other software)
 - Controls
- ### ■ Uses field and formation specific Promax generated tank flashing emission factors
- ### ■ Emission calculations in Gray Section to Right

Production Site Inventory Form Overview (Dehys)

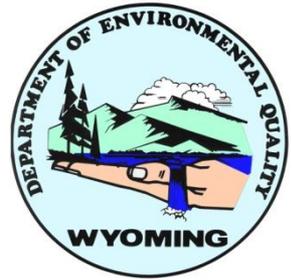


◆ Dehys Tab

■ User Inputs:

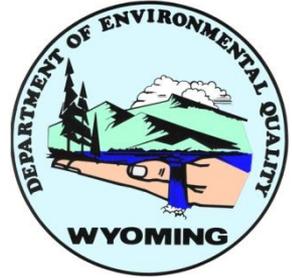
- Design Rating (MMSCFD)
 - Operating hours,
 - Emissions (Calculated from GRI-Glycalc or other software)
 - Controls
- ### ■ Emission calculations in Gray Section to Right

Production Site Inventory Form Overview (Pneumatics)



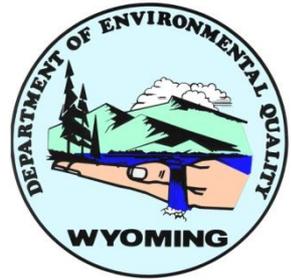
- ◆ Pneumatic Pumps / Pneumatic Controllers Tab
 - User Inputs:
 - # of Pumps
 - Vent Rate
 - Heat Content
 - Operating hours,
 - Controls
 - Emissions are calculated using the standardized gas analysis, “Wet Gas Analysis”
 - Emission calculations in Gray Section to Right

Production Site Inventory Form Overview (Analyses)



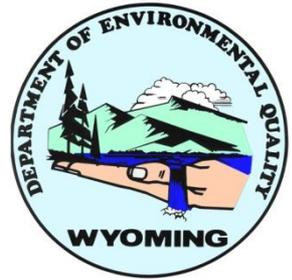
- ◆ Analysis Tabs
 - Types
 - Wet Gas
 - Condensate
 - Black Oil
 - Water
 - Generated from operator supplied oil and gas analyses
 - Analyses collected for emission factor generation
 - Used in
 - Pneumatics Tabs
 - Venting & Blowdown Tab
 - Fugitives Tabs

Production Site Inventory Form Overview (Fugitives)



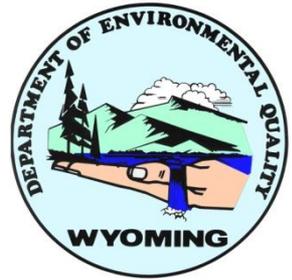
- ◆ Fugitives & Fugitive Emission Factors Tab
 - User Inputs:
 - # of Components
 - # of Facilities generated from Facility Summary Tab
 - Emissions are calculated using the standardized gas analyses
 - Fugitive emissions are calculated for each facility with production.

Production Site Inventory Form Overview (Venting & Blowdowns)



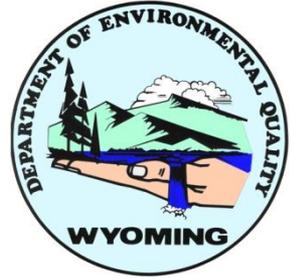
- ◆ Venting & Blowdowns Tab
 - User Inputs:
 - # of blowdowns
 - Vent Rate
 - Heat Content
 - Operating hours,
 - Controls
 - Emissions are calculated using the standardized gas analysis, “Wet Gas Analysis”
 - Emission calculations in Gray Section to Right

Production Site Inventory Form Overview (Drill Rigs)



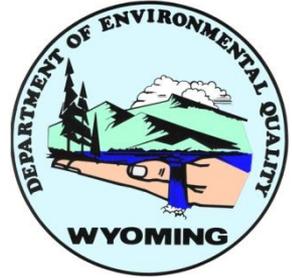
- ◆ Drill Rigs Tab
 - User Inputs:
 - Start & End Dates
 - Hours Drilling
 - Fuel Type / Quantity
 - Emissions
 - Emission calculations in Gray Section to Right

Production Site Inventory Form Overview (Completions)



- ◆ Completions & Workovers Tab
 - User Inputs:
 - Start & End Dates
 - Hours completing / Working over
 - Emissions from engines
 - Emissions from flaring / venting
 - Emission calculations in Gray Section to Right
 - AQD Completion Form can be used to assist with completion emissions calculations

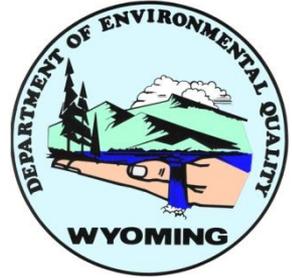
Production Site Inventory Form Overview (Truck Loading)



◆ Truck Loading Tab

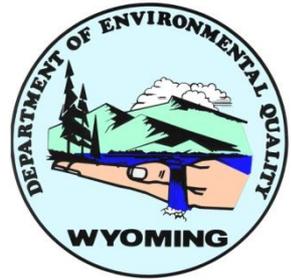
- User Inputs:
 - Saturation Factor
 - Vapor Pressure
 - Molecular weight
 - Temperature
 - Controls
- Emission calculations in Gray Section to Right
- Truck Loading Example can be used to assist with completion emissions calculations

Production Site Inventory Form Overview (Mobile)



- ◆ On-Road Mobile Tab
 - User Inputs:
 - Total Miles
 - Average Miles
 - Average speed

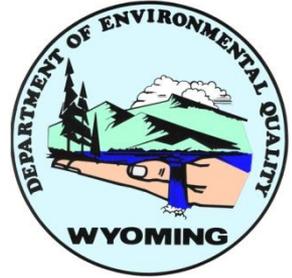
- ◆ Non-Road Mobile Tab
 - User Inputs:
 - Date
 - Location
 - Hours
 - Emissions



Production Site Inventory Form Overview (QA)

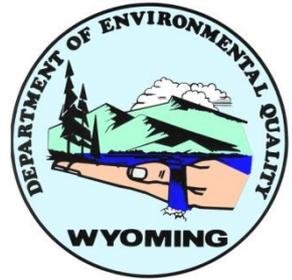
- ◆ QA Process
 - QA_Check_List
 - Macros
 - List of items to check
 - ◆ Reasonable Operating hours
 - ◆ Reasonable drilling time
 - ◆ Reasonable component counts
- ◆ Facility Summary (adj)
 - Copy of the Facility Summary tab with any adjustments that need to be made prior to upload to OGER
 - API # format
 - Equipment on well pads

OGER Demonstration (Upload)



- ◆ Upload
 - Copy & paste Facility Summary
 - QA checks
 - Preview of inputs
 - Upload successful!

OGER Demonstration (Queries continued)



◆ Queries (USE DEQ-UAT!!!)

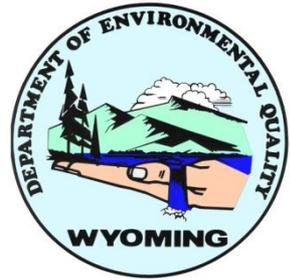
■ Production

- Spatial (Map, County, Basin, PLSS)
- Company
- Well Type and Status
- Field
- Reservoir
 - ◆ Currently Formation Name but could be formation type (i.e Shale oil) in the future with ease
- Date (Feb-Mar (Winter))

■ Emissions

- Spatial (Map, County, Basin, PLSS)
- Company
- Well Type and Status
- Field
- Reservoir
- Annual / Winter
- Source (i.e. Tanks, Pneumatics, etc)
- Controlled (i.e. Yes or No)

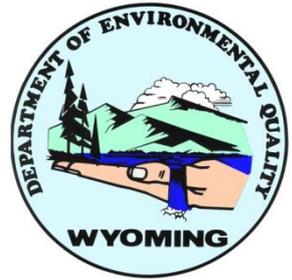
OGER Demonstration (Production Query)



◆ Production Query

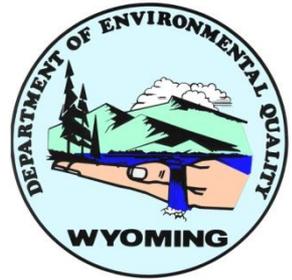
- Spatial – Proposed O3 Designation Area
- Zoom-To-Feature
- 10,000+ wells selected includes
 - Plugged & abandoned wells
 - Wells that were never drilled by have an API number
 - Not all of these wells are producing
- Jan 2011 to Dec 2011 for entire year
- This production search feature can be useful to the division in determining how production relates to emissions from
- 7.5 million bbl of Oil
- Over 1 billion MCF of gas
- 32 million bbl of water
- Expand a well site

OGER Demonstration (Emissions Query)



◆ Emission Query

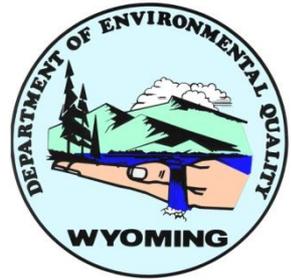
- Spatial – Proposed O3 Designation Area
- Annual 2011
- Source = Stationary Engines & Dehys
- Controlled = Yes
- Can assist permitting with internal requests for emissions from various combinations of source types and controls
- Use OGER to submit emissions to EPA
- Over 300 tons of VOCs from controlled dehys and engines in UGRB
- Over 150 tons of NOx from controlled dehys and engines in UGRB
- Expand a well site



Compressor Station & Pipeline Inventory Form Overview

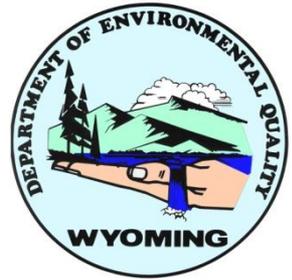
- ◆ Other Emissions Sources Tab (Pipeline & Compressor Form only)
 - User Inputs:
 - Source
 - Emission Basis
 - Gas Rate
 - H₂S Content
 - Operating Hours
 - Emissions
 - Controls
 - Emission calculations in Gray Section to Right
 - Emissions Stored in WISEView (no demonstration at this time.)

OGER Updates



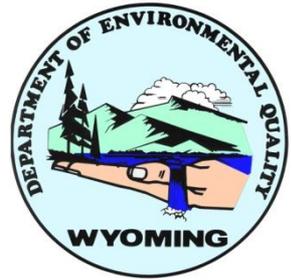
- ◆ SCCs included for each source
 - Current UAT version using SCCs in the O&G Inventory Tool developed for EPA

- ◆ More querying capabilities
 - Emissions by source or well



Next Steps

- ◆ Inventories on the web
 - AQD Query Wizard under development
 - Will Allow users to query all actual emissions data in the OGER and WISE View systems.
- ◆ E-reporting
 - Blowdowns and Workovers
 - Improved emission factors (field studies needed)
 - Fugitives (Do these need to be revised?)
 - Produced Water Disposal Pits & Ponds
- ◆ Integration with other AQD Data Systems



Websites/Links

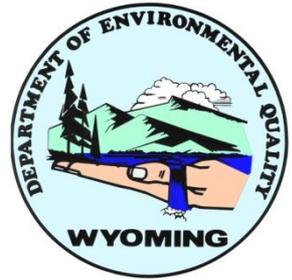
- ◆ Inventory Web Page:

<http://deq.state.wy.us/aqd/ei.asp>

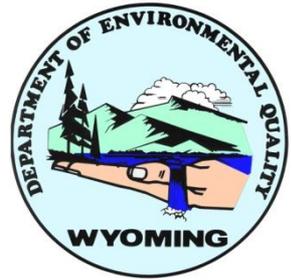
- ◆ UGRB Ozone Non-Attainment Area Inventory Forms Web page:

<http://deq.state.wy.us/aqd/Annual%20and%20Winter%20Upper%20Green%20River%20Basin%20Emission%20Inventories.asp>

Websites/Links



- ◆ Actual Emissions Web Page:
<http://deq.state.wy.us/aqd/Actual%20Emissions.asp>
- ◆ Oil & Gas forms & Guidance Documents Web page: <http://deq.state.wy.us/aqd/oilgas.asp>
- ◆ Oil & Gas Production Facilities Guidance Document (September, 2013 update):
http://deq.state.wy.us/aqd/Oil%20and%20Gas/September%202013%20FINAL_Oil%20and%20Gas%20Revision_UGRB.pdf



Questions?

- ◆ Questions?
- ◆ Inventory forms are available for download:
 - <http://deq.state.wy.us/aqd/ei.asp>
- ◆ Brian R. Bohlmann, P.E.
 - brian.bohlmann@wyo.gov
- ◆ Brett Davis
 - brett.davis@wyo.gov