Air Emissions Inventory

Development of Air Emissions Inventory of Criteria and Hazardous Air Pollutants on the Southern Ute Indian Reservation
Southern Ute Reservation
Getting Started: PLAN, PLAN, PLAN!

• Define what areas contractors will inventory.
• Define what areas your program will inventory.
• Establish QA/QC process.
• Establish priority areas.
• Keep records!
  – Notebook of conversations, notes, calculations.
  – Binder for copies of documents
What to Include

• **Definition** of source category.
• Procedures of data collection including difficulties.
• All assumptions.
• All calculation.
• Any improvements / Recommendations
• QA /QC Procedures
Site Visits

• Visit some local Point, Area, and Biogenic sources.
• This gets you out of the office!

Potential PM 10 source
The SUIT E1 Purpose

- Obtain and update baseline air pollutant emissions data.
- The data will be used to track total emissions of numerous pollutants including:
  - Nitric Oxides (NOx),
  - Carbon Monoxide (CO),
  - Particulate Matter (PM 10/2.5),
  - Sulfur Oxides (SOx)
  - Volatile Organic Compounds (VOC’s), and
  - Hazardous Air Pollutants (HAPs).
Data collection

• The SUIT Air Quality Program collected data for:
  all major point sources:
  – landfills, airports,
  – biogenic emissions, and
  – additional area sources utilizing the Tribal Emissions Inventory Software Solution (TEISS).

• ARS collected data for:
  – some area sources (excluding landfills),
  – all on-road sources and all non-road sources (excluding airports).
Source Categories

• Point Sources
• Area Sources
• Mobile Sources
• Biogenic Sources
Point Sources (Title V Sources)

- Potential to emit ≥ 100 tons per year of any criteria pollutant.

- Potential to emit ≥ 10 tons per year of any single HAP or ≥ 25 tons per year of more than one HAP.

  (as defined by EPA)
Data Collection for Point Source Emissions

- Contact EPA and or local State officials
- Emissions taken directly from Title V Permits.
- TEISS Projections
- QA/QC
  - Numerous Reviewers
  - Internal Checks
- Assumptions
  - When actual emission for Title V were not available the Potential To Emits (PTE) data was used.
Point Source Emissions

• What should you include?
  – Table of results including all pollutants

<table>
<thead>
<tr>
<th></th>
<th>CO</th>
<th>NO\textsubscript{x}</th>
<th>PM\textsubscript{10}-Pri</th>
<th>SO\textsubscript{2}</th>
<th>VOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title V Source</td>
<td>5063.64</td>
<td>5535.97</td>
<td>39.58</td>
<td>11.93</td>
<td>2005.35</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Acetaldehyde</th>
<th>Benzene</th>
<th>Formaldehyde</th>
<th>Toluene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title V Source</td>
<td>11.67</td>
<td>10.85</td>
<td>266.55</td>
<td>18.42</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2002 Point Source (Title V) Emissions on the SUIT Reservation (tons per year)
Helpful Tips

• Gather emissions data from the Title V permits.
  – Contact EPA for permit info on Reservations.
• Have a clear definition of what a Title V point source is.
Area Sources

- Actual emissions from a stationary source between 2 and 100 tons per year of any criteria pollutant.
- All other HAP emitting stationary sources that emit between 2 and 10 tons per year of any specific HAP.
  – (as defined by EPA)
Data Collection for Area Source Emissions

• Contact State and Local Agencies.
  – Obtain list of Sources.
  – Emissions factors.
    • Northern San Juan Basin DEIS.
    • From Current State and County E.I.’s.
    • Search the web.
  – TEISS Projections
Data Collection for Oil and Gas Specifics

• Obtained list of wells from regional commission website: “Colorado Oil and Gas Conservation Commissions”.

• Contacted companies directly

• Be professional and persistent!
Oil and Gas Specifics

- Include emissions from:
  - Well engines,
  - Condensate Tanks,
  - Dehydrators,
  - Heaters,
  - Flares
  - Minor sources compressors
Area Source Emissions Factors

(Example)

- Condensate Tanks: Taken from State of Wyoming Dept. of Environmental Quality.
  - Condensate Tanks output greater than 18.3 barrels per day (BPD) = 3,271 lbs. VOC per year / BPD
  - Condensate Tanks output below 18.3 BPD = 65.74 lbs. VOC per year / BPD
### Area Source Emissions ~ Break it down!

<table>
<thead>
<tr>
<th>Source Type</th>
<th>Emissions Source</th>
<th>CO</th>
<th>NO&lt;sub&gt;x&lt;/sub&gt;</th>
<th>VOC</th>
<th>PM&lt;sub&gt;10&lt;/sub&gt;</th>
<th>SO&lt;sub&gt;x&lt;/sub&gt;</th>
<th>HAP*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area Sources</td>
<td>Oil &amp; Gas wells</td>
<td>8,548.00</td>
<td>3,820.90</td>
<td>33,785.10</td>
<td>-</td>
<td>-</td>
<td>213.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Well-head compressors</td>
<td>2,766.10</td>
<td>3,099.90</td>
<td>1,204.10</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fireplace &amp; Wood Burning Stoves</td>
<td>26.84</td>
<td>0.33</td>
<td>-</td>
<td>3.56</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Propane use</td>
<td>11.23</td>
<td>66.67</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Airports</td>
<td>118.33</td>
<td>17.56</td>
<td>4.83</td>
<td>0.23</td>
<td>2.35</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Landfills</td>
<td>-</td>
<td>-</td>
<td>13.07</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>11,470.50</td>
<td>7,005.36</td>
<td>35,007.10</td>
<td>3.79</td>
<td>2.35</td>
<td>213.7</td>
<td></td>
</tr>
</tbody>
</table>

- **2002 Area Source Emissions on SUIT Reservation (tons per year)**
Helpful Tips

• Check current area resources.
  – Read current reports and compare emissions factors.
• Double check emissions factors for relevancy to your cause.
• Persistence helps when contacting Oil and Gas Companies.
• Clearly define Area sources and emissions thresholds before starting
Mobile Sources

• On-road (paved) and On-road (unpaved)
  – On-road sources consist of mobile sources licensed for use on highways or roadways.
• Non-road mobile sources.
  – Non-road sources consist of other mobile sources such as construction, lawn/garden, boats, airplanes, etc.
Mobile Source Emissions Calculations

- Total mileage of all roads.
  - Calculated from SUIT GIS files.
- Average Daily Vehicle Traveled
  - Obtained from CO Dept. of Transportation
- Emissions Modeling:
  - Lakes Environmental’s MOBILE View
  - EPA’s MOBILE6
## Mobile Source Emissions ~ break down!

<table>
<thead>
<tr>
<th>Source Types</th>
<th>Emissions Source</th>
<th>CO</th>
<th>NO\textsubscript{x}</th>
<th>VOC</th>
<th>PM\textsubscript{10}</th>
<th>SO\textsubscript{x}</th>
<th>HAP*</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Road Mobile Sources</td>
<td>On-road Mobile (paved)</td>
<td>3,862.95</td>
<td>394.06</td>
<td>253.21</td>
<td>10.14</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>On-road Mobile (unpaved)</td>
<td>184</td>
<td>18.52</td>
<td>12.51</td>
<td>8,589.00</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Non-Road Mobile Sources</td>
<td>Non-road Mobile</td>
<td>1,996.56</td>
<td>167.38</td>
<td>302.78</td>
<td>19.4</td>
<td>17.4</td>
<td>-</td>
</tr>
<tr>
<td>Total Reservation Emissions</td>
<td></td>
<td>6,043.51</td>
<td>579.96</td>
<td>568.50</td>
<td>8,618.54</td>
<td>17.4</td>
<td>-</td>
</tr>
</tbody>
</table>

**2002 Mobile Source Emissions on the SUIT Reservation (tons per year)**
Helpful Tips

- Include Dust Emissions in Area Sources Section.
- Take car counts manually (if necessary).
- Compare to State and County Data.
Biogenic

- Result from some sort of biological activity.
- Represent a significant portion of the natural source emissions acting as ozone precursors.
- Calculated using Biogenic Emissions Inventory Software (BEIS)
Types of Biogenic Emissions (acting as ozone precursors)

Isoprene: (2-methyl-1,3-butadiene)
   Emitted primarily from vegetation foliage, oak (mostly) but also citrus and eucalyptus. (Chinkin et al., 1996a, 1996b)

Monoterpene (Piperitol):
   Primarily emitted by pine, citrus, and eucalyptus. (Chinkin et al., 1996a, 1996b).

Biogenic VOC:
   Vegetation is the predominant biogenic source of VOC’s – emitting non-methane hydrocarbons (NMHC).

NOx:
   Microbial activity is the predominant biogenic source for the emission of NOx. Soil microbial activity responsible for NOx emissions and comes primarily from agricultural lands and grasslands.
# Biogenic Emissions

<table>
<thead>
<tr>
<th></th>
<th>Isoprene</th>
<th>Monoterpene</th>
<th>Organic VOC</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LaPlata Totals (kg)</strong></td>
<td>11,404,429.11</td>
<td>5,318,488.48</td>
<td>6,133,366.10</td>
<td>118,362.35</td>
</tr>
<tr>
<td>% of County covered by Res.</td>
<td>39.60%</td>
<td>39.60%</td>
<td>39.60%</td>
<td>39.60%</td>
</tr>
<tr>
<td><strong>Archuleta Totals (kg)</strong></td>
<td>11,722,611.29</td>
<td>5,208,588.18</td>
<td>5,935,871.95</td>
<td>45,902.41</td>
</tr>
<tr>
<td>% of County covered by Res.</td>
<td>29.00%</td>
<td>29.00%</td>
<td>29.00%</td>
<td>29.00%</td>
</tr>
<tr>
<td><strong>LaPlata Emissions on Res. (kg)</strong></td>
<td>4,516,153.93</td>
<td>2,106,121.44</td>
<td>2,428,812.98</td>
<td>46,871.49</td>
</tr>
<tr>
<td><strong>Archuleta Emissions on Res. (kg)</strong></td>
<td>3,399,557.27</td>
<td>1,510,490.57</td>
<td>1,721,402.87</td>
<td>13,311.70</td>
</tr>
<tr>
<td><strong>Reservation Totals (kg)</strong></td>
<td>7,915,711.20</td>
<td>3,616,612.01</td>
<td>4,150,215.84</td>
<td>60,183.19</td>
</tr>
<tr>
<td><strong>Reservation Totals (tons)</strong></td>
<td>8,725.58</td>
<td>3,986.63</td>
<td>4,574.83</td>
<td>66.34</td>
</tr>
</tbody>
</table>

**Biogenic Emissions on the SUIT Reservation**
Helpful Tips

• Make use of helpful Software.
  – BEIS (Biogenic Emissions Inventory Solution)
  – Other data resources.

• Visit some biogenic sites!
2005 SUIT EI

- The revised and update 2005 EI will include:
  - Point,
  - Area,
  - Mobile,
  - Biogenic Sources and
  - Some areas of further research looks to be completed in Fall 2006.
Areas of Further Research

• Include:
  – A more detailed biogenic emissions section breaking the sources down into land type/vegetation.
  – A more precise airport emissions inventory including an accurate count of small (private) airplane takeoff and landings.
  – Fire and prescribed burn data.
Closing Thoughts:

• Reproducibility:
  – Know where all the emissions factors, equations, and statistics come from.
  – Ensure that they are applicable to your project.
• Realize that an EI is a best estimate!
• Relax! It can be fun!?
Contact Info:

- Southern Ute Indian Tribe
  Air Quality Program
  P.O. Box 737
  Ignacio CO 81137
  Tele: 970.563.4705
  Email: jitemte@southern-ute.nsn.us