



# Estimating Nonpoint Emissions

February 16, 2021

**Tribal Air Monitoring**



**Support Center**



**NORTHERN  
ARIZONA  
UNIVERSITY**

# Webinar Logistics



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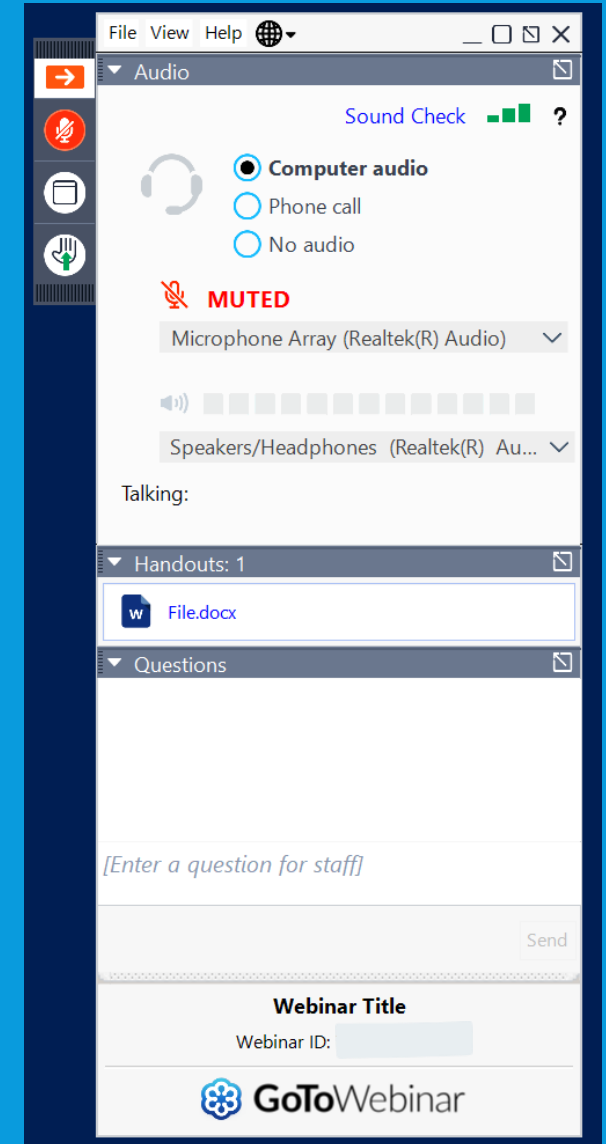
Thank you for joining! We will begin the webinar shortly.  
Tuesday, February 16, 2021; 10:00am-11:30am Pacific Time

 Submit questions in the "Questions" pane

 Raise your hand if you would like to be unmuted

 Download files from the "Handouts" pane

Presented by the Institute for Tribal Environmental Professionals  
American Indian Air Quality Training Program  
Questions? Contact [Christal.Black@nau.edu](mailto:Christal.Black@nau.edu)



The screenshot displays the GoToWebinar interface. At the top, there is a menu with 'File', 'View', and 'Help'. Below this is the 'Audio' pane, which includes a 'Sound Check' indicator, radio buttons for 'Computer audio' (selected), 'Phone call', and 'No audio', a 'MUTED' status with a red microphone icon, and dropdown menus for 'Microphone Array (Realtek(R) Audio)' and 'Speakers/Headphones (Realtek(R) Au...'. A 'Talking:' indicator is also present. Below the audio pane is the 'Handouts: 1' pane, showing a document icon and the file name 'File.docx'. The 'Questions' pane is at the bottom, featuring a text input field with the placeholder text '[Enter a question for staff]', a 'Send' button, and a 'Webinar Title' field. At the very bottom, the 'Webinar ID:' field is visible, followed by the GoToWebinar logo and name.

# Poll Question



- Which of the following best describes your role?
  - Environmental Staff
  - Community or Tribal Leader
  - Federal or State Partner
  - Other

# Poll Question

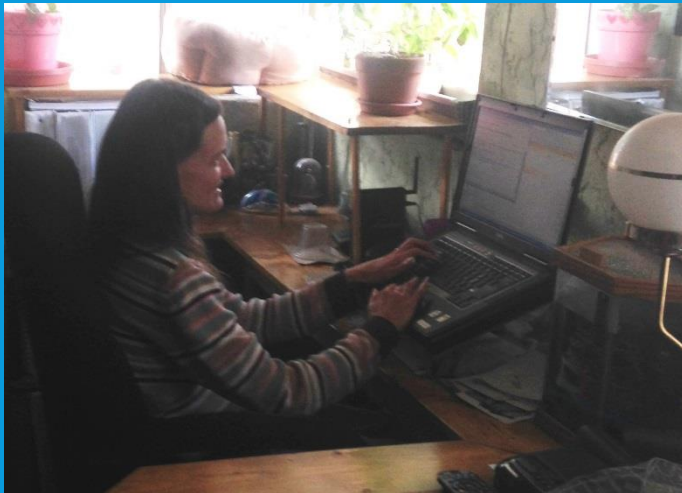


- How many years have you worked in Air Quality?
  - Less than a year
  - 1-3 years
  - 3-5 years
  - 5-10 years
  - Over 10 years

# Presenter



## Angelique Luedeker, Technology Specialist II, Tribal Air Monitoring Support Center



Angelique started working for ITEP in 2002, and since her first day, she has been working with emissions inventories. She has 18 years of experience of providing tribes assistance with emission inventories. Before working for ITEP, Angelique was part of the Los Alamos National Lab air quality team. She has a BS in Chemistry from Northern Arizona University.

Contact:

[Angelique.Luedeker@nau.edu](mailto:Angelique.Luedeker@nau.edu)



# Webinar Agenda



- Introduction to Nonpoint Sources Included in an Emissions Inventory
- Emissions Estimation Methods
- Activity Data Collection and Entry

# Poll Question 1



- Has your Tribe completed an EI?
  - Yes
  - No
  - Not Sure



# Nonpoint (Area) Sources



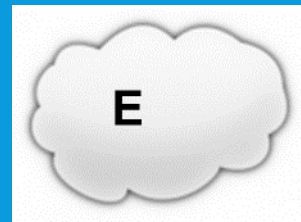
- Stationary sources that individually emit less than point source threshold
  - Often have fugitive (uncontrollable) emissions
  - Grouped together and reported collectively in an EI
  - Can be spread across a large area
- At a minimum, most tribal EIs include these nonpoint sources
  - ✓ Residential Heating
  - ✓ Paved Road Dust
  - ✓ Unpaved Road Dust
  - ✓ Gas Stations (if not inventoried as point source)

# Quantifying Emissions

- **Emission Factor**
  - Conversion factor provided by EPA or other source to quantify emissions
  - E.g., lbs mercury emitted per ton of coal burned
- **Activity**
  - Collected by the person that estimates the emissions
  - Process data (tons of coal burned, hours of operation)
- **Emission Factor and Activity used to estimate Emissions for a single pollutant**
  - E.g., 10 pounds/year mercury from small power plant

# Basic Emissions Estimation Equation

$$E = EF \times A$$



$$= EF \times \text{Activity (throughput)}$$

- **Where**

- **E** = Emissions
- **EF** = Emission Factor (built into TEISS calculator or spreadsheet)
- **A** = Activity (aka throughput, that you collect and enter into TEISS calculators or spreadsheets)

# Example Emissions Calculation

## • Residential Natural Gas Heating

- **Activity Data (Data You Collect):** 30 million cubic feet (ft<sup>3</sup>) of natural gas consumed annually by Reservation households
- **Emission Factor:** 40 lbs of CO are emitted per million cubic foot of natural gas consumed
- **Emissions:** 1200 lbs of CO  
 $30 \text{ million ft}^3 \times 40 \text{ lbs/million ft}^3 = 1200 \text{ lbs}$

# Emission Calculation Options

- **Option 1: TEISS Calculators**
  - TEISS has emission calculators for many nonpoint sources
- **Option 2: Spreadsheets**
  - I have generated some spreadsheets for sources where TEISS calculator is outdated, difficult to use, or not available
  - Since most of these spreadsheets include default values from the EPA 2017 NEI Wagon Wheel Tool specific to your area, please contact me for spreadsheets
- For each of these options, emission factors are built in, you just enter activity data, then Presto! ... Emissions Estimated

# Where Can I Get the Necessary Activity Data to Calculate Emissions?

- Directly from source
- Questionnaires/Surveys
- Online

Check out Module 12 of EI Advanced for tips on where to collect data for nonpoint sources

# Poll Question 2



- Have you enrolled in EI Fundamentals or EI Advanced (online, self-paced trainings on emissions inventory development)?
  - Yes
  - No
  - Not Sure



# How Do I Know What Activity Data to

## Collect?

- For common nonpoint sources, I have put together a table that lists the suggested method and data to collect

Recommended Method Column gives suggested estimation method of Spreadsheet or TEISS Calculator

Source	Recommended Method	Mandatory Data To Collect	Optional Data To Collect (Collecting These Data Improve Accuracy of Emissions)
Residential Wood Heating	Spreadsheet	A. Number of Occupied Households in Each County the Reservation Transsects	A. Burn Rate for Each Appliance Type (tons or cords burned on average in each appliance, for example, in my area, the average amount of wood burned annually in each fireplace is 1.5 cords) B. Wood Density (tons/cord)
Residential Propane Heating	TEISS Calculator 1.5	A. Amount of Propane Consumed Annually by All Homes on the Reservation	
Residential Natural Gas Heating	TEISS Calculator 1.4	A. Amount of Natural Gas Consumed Annually by All Homes on the Reservation	
Residential Distillate Oil Heating	TEISS Calculator 1.3	A. Amount of Distillate Oil (Fuel Oil) Consumed Annually by All Homes on the Reservation	

At a minimum, need data listed in Mandatory Data To Collect Column to estimate emissions using recommended method

# What If Source Is Not In Table?

- Look at TEISS calculators to determine what data you need to collect
  - From TEISS menu bar, click on the Calc icon to bring up the list of calculators



- Use the Print Blank option
- If you cannot find a relevant calculator, contact me for assistance

# Residential Wood Heating: Spreadsheet, Mandatory Data

- Number of Occupied Households in Each County Reservation Transects
  - Modify default data in GeneralData worksheet of spreadsheet
    - Default data is from US Census Bureau

1	Reservation Occupied Households in County 1				512	County 1 Wood Density (tons/cord) <sup>a</sup>	1.1705
2	Reservation Occupied Households in County 2				1752	County 2 Wood Density (tons/cord) <sup>a</sup>	1.0969
4	Distribution Profile for Midwest from EPA 2017 NEI Wagon Wheel Tool <sup>a</sup>						
5	SCC	Description	Appliance Type	Region	Ratio		
6	2104008210	Woodstov	Fireplace	MW	0.12		
7	2104008220	Woodstov	Fireplace	MW	0.53		
8	2104008230	Woodstov	Fireplace	MW	0.35		
9	2104008310	Woodstov	Woodstove	MW	0.12		
10	2104008320	Woodstov	Woodstove	MW	0.53		
11	2104008330	Woodstov	Woodstove	MW	0.35		
12	2104008510	Furnace: Ir	Central He	US	0.37		

# Residential Wood Heating: Spreadsheet, Optional Data

- Wood Density (tons/cord)
  - Modify default data in GeneralData worksheet of spreadsheet
    - Default data is from EPA 2017 NEI Wagon Wheel Tool

The screenshot shows an Excel spreadsheet with the following data:

1	Reservation Occupied Households in County 1				512	County 1 Wood Density (tons/cord) <sup>a</sup>	1.1705
2	Reservation Occupied Households in County 2				1752	County 2 Wood Density (tons/cord) <sup>a</sup>	1.0969
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9	2104008310	Woodstov	Woodstov	MW	0.12		
10	2104008320	Woodstov	Woodstov	MW	0.53		
11	2104008330	Woodstov	Woodstov	MW	0.35		
12	2104008510	Furnace: Ir	Central He	US	0.37		

The spreadsheet interface includes a status bar at the bottom showing 'READY', a worksheet tab labeled 'GeneralData', and a zoom level of 100%.

# Residential Wood Heating: Spreadsheet, Optional Data

- Burn Rate for Each Appliance Type (cords or tons, depending on appliance type)
  - Modify default data in each relevant worksheet of spreadsheet (worksheets include FireplacesAndInserts, Woodstoves, Furnaces, HydronicAndOthers)
    - Default data is county-specific data from EPA 2017 NEI Wagon Wheel Tool
  - Example: In my area, based on local knowledge, each household that has a fireplace burns 1.5 cords annually...next slide shows where to modify that data

# Residential Wood Heating: Optional Data Adjustment Example

- I click on FireplacesAndInserts tab
- In Burn Rate columns, default data shows about a quarter cord of wood burned in each fireplace...I need to change that to 1.5 cords

1 Throughput Calculation				County 1 Portion				County 2 Portion				
2	scd	SCC_L4	ApplFrac	BurnRate (Cords)	Number of Appliances	Throughput_Cords	Throughput_Tons	ApplFrac	BurnRate (Cords)	Number of Appliances	Throughput_Cords	Throughput_Tons
3	2104008100	Fireplace: general	0.1007939	0.26865	51.60646963	13.8644915	16.228	0.1008763	0.246695595	176.7356578	43.599908	47.825
4	2104008210	Woodstove: fireplace inserts; non-EPA certified	0.0678415	0.467287	4.168184463	1.94773846	2.280	0.0537972	0.447886102	11.3103248	5.0657373	5.557
5	2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	0.0678415	0.467287	18.40948138	8.60251155	10.069	0.0537972	0.447886102	49.95393453	22.373673	24.542
6	2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	0.0678415	0.467287	12.15720468	5.68090385	6.649	0.0537972	0.447886102	32.98844733	14.775067	16.207
7												
8												
9	Emission Factors (lb/ton)											
10	scd	SCC_L4	CO	NH3	NOX	PM10-PRI	PM25-PRI	SO2	VOC			
11	2104008100	Fireplace: general	149	1.8	7.6	23.6	23.6	0.4	18.9			
12	2104008210	Woodstove: fireplace inserts; non-EPA certified	230.8	1.7	2.8	30.6	30.6	0.4	53			
13	2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	127.6	0.665816	1.686735	8.76	8.76	0.295918	8.877551			
14	2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	92.3	0.670588	1.490196	9.72	9.72	0.298039	11.17647			
15												
16	Emissions (tons)											
17	scd	SCC_L4	CO	NH3	NOX	PM10-PRI	PM25-PRI	SO2	VOC			
18	2104008100	Fireplace: general	4.772	0.058	0.083	0.756	0.756	0.013	0.605			
19	2104008210	Woodstove: fireplace inserts; non-EPA certified	0.904	0.007	0.011	0.120	0.120	0.002	0.208			
20	2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	2.122	0.012	0.029	0.152	0.152	0.005	0.154			
21	2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1.055	0.008	0.017	0.111	0.111	0.003	0.128			
22												
23	Source of Appliance Fractions, Burn Rates, and Emission Factors: EPA 2017 NEI Wagon Wheel Tool											

GeneralData **FireplacesAndInserts** Woodstoves Furnaces HydronicAndOthers



# Residential Wood Heating: Optional Data Adjustment Example

- After making changes, fireplace emissions adjusted automatically
  - Emissions are about 6 times what they originally were since burn rate was increased by a factor of 6

1 Throughput Calculation		County 1 Portion					County 2 Portion					
2 sec	SCC_L4	ApplFrac	BurnRate (Cords)	Number of Appliances	Throughput Cords	Throughput Tons	ApplFrac	BurnRate (Cords)	Number of Appliances	Throughput Cords	Throughput Tons	
3	2104008100	Fireplace: general	0.1007939	1.5	51.60646963	77.4097044	90.608	0.1008765	1.5	176.7356578	265.10349	290.792
4	2104008210	Woodstove: fireplace inserts; non-EPA certified	0.0678415	0.467287	4.168184463	1.94773846	2.280	0.0537972	0.447886102	11.3103248	5.0657373	5.557
5	2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	0.0678415	0.467287	18.40948138	8.60251155	10.069	0.0537972	0.447886102	49.95393453	22.373673	24.542
6	2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	0.0678415	0.467287	12.15720468	5.68090385	6.649	0.0537972	0.447886102	32.98844733	14.775067	16.207
7												
8												
9	Emission Factors (lb/ton)											
10 sec	SCC_L4	CO	NIH3	NOX	PM10-PRI	PM25-PRI	SO2	VOC				
11	2104008100	Fireplace: general	149	1.8	2.6	23.6	23.6	0.4	18.9			
12	2104008210	Woodstove: fireplace inserts; non-EPA certified	230.8	1.7	2.8	30.6	30.6	0.4	53			
13	2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	122.6	0.665816	1.686735	8.76	8.76	0.295918	8.877551			
14	2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	92.3	0.670588	1.490196	9.72	9.72	0.298039	11.17647			
15												
16	Emissions (tons)											
17 sec	SCC_L4	CO	NIH3	NOX	PM10-PRI	PM25-PRI	SO2	VOC				
18	2104008100	Fireplace: general	28.414	0.343	0.496	4.501	4.501	0.076	3.604			
19	2104008210	Woodstove: fireplace inserts; non-EPA certified	0.204	0.007	0.012	0.120	0.120	0.002	0.200			
20	2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	2.122	0.012	0.029	0.152	0.152	0.005	0.154			
21	2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1.055	0.008	0.017	0.111	0.111	0.003	0.128			
22												
23	Source of Appliance Fractions, Burn Rates, and Emission Factors: EPA 2017 NFI Wagon Wheel Tool											



# Residential Wood Heating: Additional Information

- Spreadsheet has built in data on appliance distribution profiles, appliance fractions, burn rates, and wood densities
  - These are default values from EPA 2017 NEI Wagon Wheel Tool
- Emissions are calculated for many appliance types, if you know of appliance types that are not used on the Reservation, you can exclude those sources from your EI

# Residential Propane Heating: TEISS Calculator 1.5

- A. Change LPG Type to “propane”.
- B. Change Process Description to “residential use”.
- C. Enter Amount of LPG Fired value. Note value entered needs to be in units of thousand gallons/year.
- D. Then click on Calculate to estimate emissions.

The screenshot shows the 'External Combustion Sources: Liquefied Petroleum Gas Combustion' window. The 'Nonpoint Reporting Period' is set to 'Annual (Jan/1/18 - Dec/31/18)'. The 'Process Information' tab is active. The 'Units' dropdown is set to 'US standard (lb emissions)'. The 'LPG Type' dropdown is set to 'propane'. The 'Process Description' dropdown is set to 'residential use'. The 'Applicable SCCs' field contains '2104007000'. The 'Amount of LPG Fired' text box contains '0.0' with the unit '10<sup>3</sup> gallons'. The 'Sulfur Content' section has 'Sulfur Content Unknown' selected, and the 'Sulfur Content' text box contains '0.54' with the unit 'grains/100 ft<sup>3</sup>'. The 'Calculate' button is highlighted with a green circle labeled 'D.'. Other green circles labeled 'A.', 'B.', and 'C.' point to the 'Units', 'LPG Type', and 'Amount of LPG Fired' fields respectively.

# Residential Natural Gas Heating: TEISS Calculator 1.4

- A. Change Combustor Type to “residential furnaces, < 0.3 MMBtu/hr”.
- B. Enter Amount of Gas Fired value. Note that value entered needs to be in units of million cubic feet/year.
- C. Then click on Calculate to estimate emissions.

External Combustion Sources: Natural Gas Combustion

File Unit Converter Help

Nonpoint Reporting Period: Annual (Jan/1/02 - Dec/31/02)

Process Information Emission Results

Units: US standard (lb emissions)

Combustor Type: residential furnaces, < 0.3 MMBtu/hr

Applicable SCCs: none provided

Amount of Gas Fired: 0.0 MM ft<sup>3</sup>

Heating Value of Gas: 1020.0 Btu/ft<sup>3</sup>

Emission Controls (check all that apply):

- Low NO<sub>x</sub> Burners
- Flue Gas Recirculation
- Selective Non-Catalytic Reduction

Sulfur Content:

- Sulfur Content Unknown
- Sulfur Content Known

2000.0 grains/MM ft<sup>3</sup>

Calculate Reset

Previous Next Close

# Residential Distillate Oil Heating: TEISS Calculator 1.3

- Change Boiler Type to “commercial/institutional/residential”.
- Change Firing Configuration to “<100 MMBtu/hr, residential furnace”.
- Enter Amount of Oil Fired. Note that value entered needs to be in units of thousand gallons/year.
- Then click on Calculate to estimate emissions.

External Combustion Sources: Fuel Oil Combustion

File Unit Converter Help

Nonpoint Reporting Period: Annual (Jan/1/02 - Dec/31/02)

Process Information Emission Results

Units: US standard (lb emissions)

Boiler Type: commercial/institutional/residential

Firing Configuration: <100 MMBtu/hr, residential furnace

Oil Grade: no.1 (distillate)

Amount of Oil Fired: 0.0 10<sup>3</sup> gallons

Heat Input of Oil: 0.0 MMBtu/10<sup>3</sup> gallons

Applicable SCCs: 1-01-005-01

Sulfur Content:  % Wt of Sulfur Unknown,  % Wt of Sulfur Known, 0.3 %

Nitrogen Content:  % Wt of Nitrogen Unknown,  % Wt of Nitrogen Known, 0.0 %

Oil no. 6 Sulfur Content:  Low Sulfur,  High Sulfur

Control Equipment

PM Controls (check all that apply):  Multiple Cyclones,  Fabric Filter,  Electro-Static Precipitator (older model),  Electro-Static Precipitator (new/rebuilt)

SO<sub>2</sub> Controls (check all that apply):  Wet Scrubber: lime/limestone,  Wet Scrubber: sodium carbonate,  Wet Scrubber: magnesium oxide/hydroxide,  Wet Scrubber: dual alkali,  Spray Dryer Absorber,  Furnace Injection,  Duct Injection

NO<sub>x</sub> Controls (check all that apply):  Load Reduction,  Low Excess Air,  Staged Combustion,  Burners Out of Service,  Flue Gas Recirculation,  Low NO<sub>x</sub> Burners,  Reduced Air Preheat,  Selective Non-Catalytic Reduction,  Normal Selective Catalytic Reduction (SCR),  Air Heater SCR,  Duct SCR,  Activated Carbon SCR,  Oil/Water Emulsified Fuel

Calculate Reset

Previous Next Close

# Poll Question 3

- What is the predominant fuel used to heat homes in your area?
  - Wood
  - Propane
  - Natural Gas
  - Distillate Oil
  - Electricity

# Residential Open Burning: Spreadsheet, Mandatory Data

- Reservation Population
  - Modify default data in spreadsheet
    - Default data is from US Census Bureau

	A	B	C	D	E	F	G
1	US Population:	325,719,178	Source: US Census Bureau 2017 American Community Survey 1-Year Estimates, Total Po				
2							
3	<b>Material</b>	<b>Annual Weight Generated (million tons)*</b>	<b>Annual Total Residential Household Waste (tons/person)</b>	<b>Annual Combustible Residential Household Waste (tons/person)</b>			
4	Paper	67.01	0.12343762	0.12343762			
5	Glass	11.38	0.020962843	0			
6	Steel	18.89	0.034796846	0			
7	Aluminum	3.83	0.007055157	0			
8	Other Nonferrous Metals	2.33	0.004292041	0			
9	Plastics	35.37	0.065154285	0.065154285			
10	Rubber/Leather	9.11	0.016781327	0.016781327			
11	Textiles	16.89	0.031112691	0.031112691			
12	Wood	17.99	0.033138976	0.033138976			
13	Other Materials	5.1	0.009394596	0.009394596			
14	Food	40.67	0.074917296	0.074917296			
15	Yard	35.18	0	0			
16	Miscellaneous Inorganic	4.04	0.007441993	0.007441993			
17	<b>Total</b>	<b>267.79</b>	<b>0.428485669</b>	<b>0.361378783</b>			
18	*Source: EPA Advancing Sustainable Materials Management: 2017 Fact Sheet, November 2019 ( <a href="https://www.epa.gov/sites/p">https://www.epa.gov/sites/p</a> )						
20	Reservation Population:			22921	Source: US Census Bureau 2018 A		
21	Reservation Population Estimated to Burn Residential Waste:			5501	Assumption: 24% of the rural pop		
22	Annual Combustible Residential Household Waste Burned (tons):			1987.96	Assumption: 60% of waste is resic		
23	Annual Yard Waste Burned, Leaves (tons):			44.56	Assumptions: 60% of yard waste i		
24	Annual Yard Waste Burned, Brush (tons):			44.56	Assumptions: 60% of yard waste i		
25							
26	Open Burning Emission Factors (lb/tons)						
27	Waste Type	CO	NOX	PM10-PRI	PM25-PRI	SO2	VOC
28	Household Waste	100.7842288	7.114180854	38	34.8	1.185697	7.409
29	Leaves	112	6.2	38	29.3	0.76	28
30	Brush	140	5	17	13.1	1.66	19
31	Source: EPA 2017 AFEM... (https://www.epa.gov/sites/p)						

# Residential Open Burning: Spreadsheet, Optional Data

- Reservation Population That Burns Residential Waste
- OR
- Tons of Waste Burned
  - Household
  - Yard, Leaves
  - Yard, Brush

	A	B	C	D	E	F	G
1	US Population:	325,719,178	Source: US Census Bureau 2017 American Community Survey 1-Year Estimates, Total Po				
2							
3	<b>Material</b>	<b>Annual Weight Generated (million tons)*</b>	<b>Annual Total Residential Household Waste (tons/person)</b>	<b>Annual Combustible Residential Household Waste (tons/person)</b>			
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12	Wood	17.99	0.033138976	0.033138976			
13	Other Materials	5.1	0.009394596	0.009394596			
14	Food	40.67	0.074917296	0.074917296			
15	Yard	35.18	0	0			
16	Miscellaneous Inorganic	4.04	0.007441993	0.007441993			
17	<b>Total</b>	<b>267.79</b>	<b>0.428485669</b>	<b>0.361378783</b>			
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29	Leaves	112	6.2	38	29.3	0.76	28
30	Brush	140	5	17	13.1	1.66	19
31	Source: EPA 2017 NEI Waste Management Unit (https://www.epa.gov/air-quality/2017/dec/superfund-data/superfund/ManagementUnit)						



# Residential Open Burning: Additional Information

- Defaults from EPA 2017 NEI Methodology
  - 24% of rural population burns waste
  - 60% of total waste generated is residential
  - Annual per capita combustible household waste generation estimated as 0.361 tons/person using data from EPA Advancing Sustainable Materials Management 2017 Fact Sheet and US Census Bureau
  - 25% of yard waste is leaves, 25% of yard waste is brush
  - For yard waste, there is a county-specific adjustment factor for the amount of forested acreage

# Gas Station Storage Tank Filling: Spreadsheet, Mandatory Data

- Storage Tank Filling Method for Each Gas Station
  - Splash
  - Submerged
  - Balanced Submerged

# Gas Station Storage Tank Filling: Spreadsheet, Mandatory Data

- Volume of Gasoline Sold Annually, categorized by storage tank filling methods

- If you have monthly values, enter into Monthly Values worksheet

The screenshot shows a spreadsheet with several worksheets. Two worksheets, 'Gas Stations with Submerged Filling' and 'Gas Stations with Balanced Submerged Filling', are highlighted with yellow boxes. These worksheets have columns for 'Month' and 'Thousand Gallons of Gasoline Sold'. A third worksheet, 'Ratios of Gasoline Subtypes in Fuel Region 6\*', is also visible, showing ratios for 'Conventional Gas' (0.45) and 'Gasohol (E10), 10% Ethanol' (0.55). A green callout box points to a table titled 'Total VOC Emissions By Filling Method' with the following data:

Filling Method	VOC Emissions
Submerged Filling	0.000
Balanced Submerged Filling	0.000

A green callout bubble points to this table with the text: "VOC Emissions to Enter Into TEISS Project".

- If you only have annual values, enter into Annual Values worksheet

The screenshot shows a different view of the spreadsheet. A table titled 'Gas Stations with Submerged Filling, Conventional Gasoline' is highlighted with a yellow box. This table has columns for 'Month', 'Thousand Gallons of Gasoline Sold', 'VOC EFs (lb/thousand gallons)\*', and 'VOC Emissions (tons)'. A green callout box points to a summary table with the following data:

Filling Method	Thousand Gallons of Gasoline Sold	Conventional Gas VOC EFs (lb/thousand gallons)*	Gasohol (E10) VOC EFs (lb/thousand gallons)*	VOC Emissions (tons)
Submerged Filling		5.825	6.274	0.000
Balanced Submerged Filling		0.971	1.046	0.000

A green callout bubble points to this table with the text: "VOC Emissions to Enter Into TEISS Project".

# Gas Station Storage Tank Filling: Additional Information

- When requesting data from gas stations, make sure to specify that the volume of gasoline sold value only includes gasoline, NOT gasoline plus diesel
- Volume of Gasoline Sold value entered into spreadsheet needs to be in units of thousand gallons
  - If data supplied by gas station is in units of gallons, divide by 1000 to convert to thousand gallons

# Gas Station Storage Tank Breathing/Emptying: TEISS Calculator 5.2.1

- A. Change Station Operation to “underground tank breathing and emptying”.
- B. Enter Fuel Throughput value (volume of gasoline sold). Note that value entered needs to be in units of thousand gallons/year.
- C. Then click on Calculate to estimate emissions.

Petroleum Industry: Gasoline Service Station Operations

File Unit Converter Help

Process Information Emission Results

Units: US standard (lb emissions)

Station Operation: underground tank breathing and emptying

Applicable SCCs: none provided

Fuel Throughput: 0.0 10<sup>3</sup> gallons

Calculate Reset

Previous Next Close

# Paved Road Dust: Spreadsheet, Mandatory Data

- Road Length and Average Daily Traffic (ADT) Count for Each Paved Road Segment on Reservation
  - Data should be compiled in a spreadsheet
    - Example spreadsheet (TrafficData.xlsx) included within Mock Level 2 or 3 Emissions Inventory folder in Resources folder of EI Advanced training site
    - Spreadsheet needs to calculate **Vehicle Miles Travelled (VMT)** by multiplying road length by ADT by 365 days/year
    - Then VMT needs to be summed by ADT Categories

	A	B	C	D	E	F
1	Road	Length (miles)	Surface	Functional Classification	Daily Traffic Count	VMT
2	Sheridan	1.5	Unpaved	Rural Local	75	41,062.5
3	Meadow	10.1	Unpaved	Rural Local	100	368,650.0
4	Insight	7.9	Unpaved	Rural Local	50	144,175.0
5	Beauty	1.7	Unpaved	Rural Local	28	17,374.0
6	Regal	1.1	Paved	Rural Local	125	50,187.5
7	Champion	3.8	Paved	Rural Local	160	221,920.0
8	Lipstick	0.6	Paved	Rural Local	15	3,285.0
9	Neat	4	Paved	Rural Local	250	365,000.0
10	Award	4.4	Paved	Rural Local	220	353,320.0
11	Wonderful	2.4	Paved	Rural Minor Collector	985	862,860.0
12	Valley	1.2	Paved	Rural Local	60	26,280.0
13	10	9	Paved	Rural Major Collector	1,200	3,942,000.0
14	20	7.9	Paved	Rural Local	395	1,138,982.5
15	30	3.6	Paved	Rural Local	15	19,710.0
16	40	9.1	Paved	Rural Local	455	1,511,282.5
17	50	3.8	Paved	Rural Local	190	263,530.0
18	60	3.9	Paved	Rural Local	196	279,006.0
19						
20		Miles				Annual VMT
21	Paved Total	54.8				9,037,364
22	Unpaved Total	21.2				571,262
23						
24	Paved Road By ADT Category					
25	ADT Category	Miles				Annual VMT
26	< 500	43.4				4,232,504
27	500 - 5,000	11.4				4,804,860
28						

# Paved Road Dust: Spreadsheet, Mandatory Data

- If you email me your spreadsheet with road lengths and ADT values, I can assist with writing formulas to calculate VMT
- I can also add a worksheet that calculates the paved road dust emissions



# Paved Road Dust: Spreadsheet, Optional Data

- Number of Days Annually With Precipitation
  - Default value is from EPA AP-42 Section 13.2.1, Paved Roads, January 2011

	A	B	C	D	E	F	G	H	I	J
1	<b>Emission Factor Calculation Values</b>									
2	sL Silt Loading (g/m <sup>2</sup> ) <sup>a</sup>									
3	ADT Category									
4	< 500	500 - 5,000	5,000 - 10,000							
5	0.6	0.2	0.06							
6										
7	W Average Vehicle Weight (tons): <sup>b</sup> 3.68755063									
8	P Number of Days with Precipitation: <sup>a</sup> 60									
9										
10	Equation Constants <sup>a</sup>									
		k (Particle Size Multiplier)								
11										
12	PM10	0.0022								
13	PM2.5	0.00054								
14										
15	<b>Emission Factors (lb/VMT)<sup>a</sup></b>									
16	ADT Category									
17	< 500	500 - 5,000	5,000 - 10,000							
18	PM10-PRI	0.0050164	0.001845899	0.000617146						
19	PM2.5-PRI	0.0012313	0.000453084	0.000151481						
20										
21	<b>Emissions (tons)</b>									
22	ADT Category									
23	< 500	500 - 5,000	5,000 - 10,000	<b>TOTAL</b>						
24	PM10-PRI	10.61587	4.434642869	0	<b>15.051</b>					
25	PM2.5-PRI	2.6057135	1.08850325	0	<b>3.694</b>					
26										
27	Sources:									
28	<sup>a</sup> AP-42 Section 13.2.1, Paved Roads, January 2011 ( <a href="https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf">https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf</a> )									
29	Emission Factor Equation: $[k(sL)^{0.91}(W)^{1.02}(1-P/(4*365))]$									
30	Sample Calculation: PM10 EF for ADT <500 = $[(0.0022) \times (0.6)^{0.91} \times (3.69)^{1.02}] \times (1-(60/(4 \times 365))) = 0.005 \text{ lb/VMT}$									
31										
32	<sup>b</sup> Coconino County average vehicle weight for travel on rural local roads from EPA 2017 NEI Wagon Wheel Tool ( <a href="http://ne">http://ne</a> )									

# Unpaved Road Dust: TEISS Calculator 13.2.2

- A. Change Roadway Type to “public roads”.
- B. Change Silt Content from Known to Unknown, then select state.
- C. Contact me for default county-specific Surface Moisture from EPA 2017 NEI Wagon Wheel Tool.
- D. Enter an Average Vehicle Speed in units of mph.
- E. Check Include Rainfall/Precipitation Mitigation option and enter number of days annually with precipitation.
- F. Enter Total Annual Vehicle Miles Travelled value.
- G. Then click on Calculate to estimate emissions.

The screenshot shows the 'Miscellaneous Source: Unpaved Roads' window in the TEISS Calculator 13.2.2. The window has a menu bar with 'File', 'Unit Converter', and 'Help'. Below the menu bar are tabs for 'Process Information' and 'Emission Results'. The main area contains several input fields and checkboxes:

- Units:** US standard (lb emissions/VMT)
- Roadway Type:** public roads
- Source SCCs:** none provided
- Silt Content:**  Known (0.0 %) and  Unknown. The **State** is set to ARIZONA.
- Surface Moisture:**  Known (0.3 %) and  Unknown.
- Average Vehicle Weight:**  Known (0.0 tons) and  Unknown.
- Average Vehicle Speed:**  Known (35.0 mph) and  Unknown.
- Include Rainfall/Precipitation Mitigation:** . The **No. of Days with Minimum 0.01 in. Precipitation/Year** is 60.
- Emission Controls:** no controls exercised
- Water Treatment:** **Moisture Content of Watered Road** is 0.0 %.
- Petroleum Treatment:** **Resin Concentrate** is 0.0 gal/yd<sup>2</sup>. **Application Period** is  per month and  per two weeks.
- Total Annual Vehicle Miles Travelled:** 0.0 mi/year

At the bottom, there are 'Calculate' and 'Reset' buttons, and a 'Close' button. Navigation buttons for 'Previous' and 'Next' are also present. Green callout bubbles labeled A through G point to the following elements:

- A:** Roadway Type dropdown
- B:** Silt Content radio buttons and State dropdown
- C:** Surface Moisture radio buttons
- D:** Average Vehicle Speed radio buttons
- E:** Include Rainfall/Precipitation Mitigation checkbox and No. of Days with Minimum 0.01 in. Precipitation/Year field
- F:** Total Annual Vehicle Miles Travelled field
- G:** Calculate button

# Poll Question 4



- Has there been a traffic count study conducted for roads on your Tribal Lands in the past 5 years?
  - Yes
  - No
  - Not Sure

# Commercial and Consumer Solvent Use: Spreadsheet, Mandatory Data

- Enter Reservation Population value
- Select State that the Reservation is located in

5	SCC	Description	VOC Emission Factors (lb/person)*	VOC Emissions (tons)
6	2460100000	Personal Care Products	1.958896191	22.450
7	2460200000	Household Products	1.994744477	22.861
8	2460400000	Automotive Aftermarket Products	0.188963001	2.166
9	2460600000	Adhesives and Sealants	1.824009418	20.904
10	2460800000	FIFRA Related Products	1.78	20.400
11	2460500000	Coatings and Related Products	0.95	10.887
12	2460900000	Miscellaneous Products	0.07	0.802
13	2401001000	Architectural Coatings	1.88	21.546
14	*Source: EPA 2017 NEI Wagon Wheel Tool			
15				

Reservation Population: 22921  
State Reservation is Located In: Arizona

SolventUse

# Construction, Non-Residential Buildings: Spreadsheet, Mandatory Data

- Click on NonResidential tab
- Enter Size of Area Disturbed by Construction
  - Value needs to be in units of acres

The screenshot shows a spreadsheet with the following data:

	A	B	C	D	E
1	<b>Non-Residential Buildings Construction Activity Data</b>				
2	Size of area disturbed from construction of non-residential buildings (acres)				
3					
4	Duration of non-residential construction activity (months)	11	11 months is default value for non-residential		
5					
6	<b>Non-Residential Buildings Construction Emissions Data</b>				
7		<b>Pollutant</b>	<b>EF (tons/acre-month)</b>	<b>Emissions (tons)</b>	
8		PM10-PRI	0.238296156	0.0000	
9		PM25-PRI	0.023829616	0.0000	
10					
11	Sources of default values and emission factors:				
12	EPA 2017 NEI Wagon Wheel Tool ( <a href="ftp://newftp.epa.gov/Air/nei/2017/doc/supporting_data/nonpoint/WagonWheel_4.27.20.zip">ftp://newftp.epa.gov/Air/nei/2017/doc/supporting_data/nonpoint/WagonWheel_4.27.20.zip</a> ), r				
13	EPA 2017 National Emissions Inventory Complete Release Technical Support Document, April 2020 ( <a href="https://www.epa.gov/sites/pr">https://www.epa.gov/sites/pr</a>				
14					
15					

At the bottom of the spreadsheet, the 'NonResidential' tab is selected and circled in green. Other tabs visible include 'Residential', 'NewRoads', and 'OpenBurnLandClearing ...'.

# Construction, Non-Residential Buildings: Spreadsheet, Optional Data

- Number of Months Construction Occurred
  - Modify default data in NonResidential worksheet of spreadsheet
    - Default value of 11 months is from EPA 2017 NEI methodology

	A	B	C	D	E
1	<b>Non-Residential Buildings Construction Activity Data</b>				
2	Size of area disturbed from construction of non-residential buildings (acres)				
3					
4	Duration of non-residential construction activity (months)	11	11 months is default value for non-residential		
5					
6	<b>Non-Residential Buildings Construction Emissions Data</b>				
7		<b>Pollutant</b>	<b>EF (tons/acre-month)</b>	<b>Emissions (tons)</b>	
8		PM10-PRI	0.238296156	0.0000	
9		PM25-PRI	0.023829616	0.0000	
10					
11	Sources of default values and emission factors:				
12	EPA 2017 NEI Wagon Wheel Tool ( <a href="ftp://newftp.epa.gov/Air/nei/2017/doc/supporting_data/nonpoint/WagonWheel_4.27.20.zip">ftp://newftp.epa.gov/Air/nei/2017/doc/supporting_data/nonpoint/WagonWheel_4.27.20.zip</a> ), r				
13	EPA 2017 National Emissions Inventory Complete Release Technical Support Document, April 2020 ( <a href="https://www.epa.gov/sites/pr">https://www.epa.gov/sites/pr</a>				
14					
15					



# Construction, Residential Buildings: Spreadsheet, Mandatory Data

- Click on Residential tab
- Enter Acreage Disturbed by Construction for Each Structure Type  
OR
- Number of Each Structure Type Constructed

	A	B	C	D	E
1	<b>Apartment Construction Activity Data</b>				
2	Size of area disturbed from construction of apartments (acres)		OR	Number of apartment complexes built	
3					
4	Duration of apartment construction activity (months)	12	12 months is default value for apartment construction from EPA 2017 NEI r		
5	<b>Apartment Construction Emissions Data</b>				
6		<b>Pollutant</b>	<b>EF (tons/acre-month)</b>	<b>Emissions (tons)</b>	
7		PM10-PRI	0.137960932	0.0000	
8		PM25-PRI	0.013796093	0.0000	
9					
10	<b>2-Unit Homes Construction Activity Data</b>				
11	Size of area disturbed from construction of 2-unit homes (acres)		OR	Number of 2-unit homes built	
12					
13	Duration of 2-unit homes construction activity (months)	6	6 months is default value for home construction from EPA 2017 NEI method		
14	<b>2-Unit Homes Construction Emissions Data</b>				
15		<b>Pollutant</b>	<b>EF (tons/acre-month)</b>	<b>Emissions (tons)</b>	
16		PM10-PRI	0.040134089	0.0000	
17		PM25-PRI	0.004013409	0.0000	
18					
19	<b>1-Unit Homes with Basements Construction Activity Data</b>				
20	Size of area disturbed from construction of 1-unit homes with basements (acres)		OR	Number of 1-unit homes with basements built	
21					
22	Duration of 1-unit homes with basements construction activity (months)	6	6 months is default value for home construction from EPA 2017 NEI method		
23	<b>1-Unit Homes with Basements Construction Emissions Data</b>				
24		<b>Pollutant</b>	<b>EF (tons/acre-month)</b>	<b>Basement EF (tons/1000 yd<sup>3</sup>)</b>	<b>Emissions (tons)*</b>
25		PM10-PRI	0.013796093	0.073997227	0.0000
26		PM25-PRI	0.001379609	0.007399723	0.0000
27					
28	*Note: Per EPA 2017 NEI methodology, emissions cal				
29	<b>1-Unit Homes Without Basements Construction Activity Data</b>				
30	Size of area disturbed from construction of 1-unit homes without basements (acres)		OR	Number of 1-unit homes without basements built	
31					
32					
33					
34					



# Construction, Residential Buildings: Spreadsheet, Optional Data

- Number of Months Construction Occurred
  - Modify default data in Residential worksheet of spreadsheet
    - Default values from EPA 2017 NEI methodology
      - Apartments: 12 months
      - 2-Unit Homes: 6 months
      - 1-Unit Homes with Basements: 6 months
      - 1-Unit Homes without Basements: 6 months

# Construction, Residential Buildings: Additional Information

- Total residential buildings construction emissions are summed in SummaryTable worksheet
- If you enter number of buildings constructed instead of acreage, the following default acreages for each structure from EPA 2017 NEI methodology are used
  - Apartments: 1/2 acre
  - 2-Unit Homes: 1/3 acre
  - 1-Unit Homes with Basements: 1/4 acre
  - 1-Unit Homes without Basements: 1/4 acre
- For 1-Unit Homes with Basements, emissions calculations assume 651.85 cubic yards disturbed per basement from EPA 2017 NEI methodology

# Construction, New Roads: Spreadsheet, Mandatory Data

- Click on NewRoads tab
- Enter Acreage of Area Disturbed by Construction **OR** Miles of New Roads Constructed
  - If you enter Miles of New Roads Constructed, default value of 6.6 acres per mile of road for rural collector roads from EPA 2017 NEI methodology used

The screenshot shows a spreadsheet with the following data:

New Roads Construction Activity Data			
Acres of area disturbed from construction of new roads		OR	Miles of new roads constructed
Duration of new roads construction activity (months)	12	12 months is default value for new roads construction from EPA 2017 NEI	

New Roads Construction Emissions Data			
Pollutant	EF (tons/acre-month)*	Emissions (tons)	
PM10-PRI	0.263379962	0.0000	
PM25-PRI	0.026337996	0.0000	

\*Note: Emission Factors include a 50% control efficiency from watering the construction site, as recommended in EPA 2017 NEI Wagon Wheel Tool (ftp://newftp.epa.gov/Air/nei/2017/doc/supporting\_data/nonpoint/WagonWheel\_4.27.20.zip), note that emission factors are based on EPA 2017 National Emissions Inventory Complete Release Technical Support Document, April 2020 (https://www.epa.gov/sites/production/files/2020-04/doc/2017-NEI-Complete-Release-Technical-Support-Documents.pdf)

Sources of default values and emission factors:  
EPA 2017 NEI Wagon Wheel Tool (ftp://newftp.epa.gov/Air/nei/2017/doc/supporting\_data/nonpoint/WagonWheel\_4.27.20.zip), note that emission factors are based on EPA 2017 National Emissions Inventory Complete Release Technical Support Document, April 2020 (https://www.epa.gov/sites/production/files/2020-04/doc/2017-NEI-Complete-Release-Technical-Support-Documents.pdf)

The spreadsheet tabs at the bottom are: NonResidential, Residential, **NewRoads**, OpenBurnLandClearingDebris ...

# Construction, New Roads: Spreadsheet, Optional Data

- Number of Months Construction Occurred
  - Modify default data in NewRoads worksheet of spreadsheet
    - Default value of 12 months is from EPA 2017 NEI methodology

	A	B	C	D	E
1	<b>New Roads Construction Activity Data</b>				
2	Acres of area disturbed from construction of new roads		OR	Miles of new roads constructed	
3					
4	Duration of new roads construction activity (months)	12	12 months is default value for new roads construction from EPA 2017 NEI methodology		
5					
6	<b>New Roads Construction Emissions Data</b>				
7		<b>Pollutant</b>	<b>EF (tons/acre-month)*</b>	<b>Emissions (tons)</b>	
8		PM10-PRI	0.263379962	0.0000	
9		PM25-PRI	0.026337996	0.0000	
10		*Note: Emission Factors include a 50% control efficiency from watering the construction site, as recommended in EPA 2017 NEI methodology.			
11					
12	Sources of default values and emission factors:				
13	EPA 2017 NEI Wagon Wheel Tool ( <a href="ftp://newftp.epa.gov/Air/nei/2017/doc/supporting_data/nonpoint/WagonWheel_4.27.20.zip">ftp://newftp.epa.gov/Air/nei/2017/doc/supporting_data/nonpoint/WagonWheel_4.27.20.zip</a> ), note that emission factors				
14	EPA 2017 National Emissions Inventory Complete Release Technical Support Document, April 2020 ( <a href="https://www.epa.gov/sites/production/files/2020-04/doc/2017_nepri_complete_release_tsd.pdf">https://www.epa.gov/sites/production/files/2020-04/doc/2017_nepri_complete_release_tsd.pdf</a> )				
15					

# Construction, Land Clearing Debris Open Burning

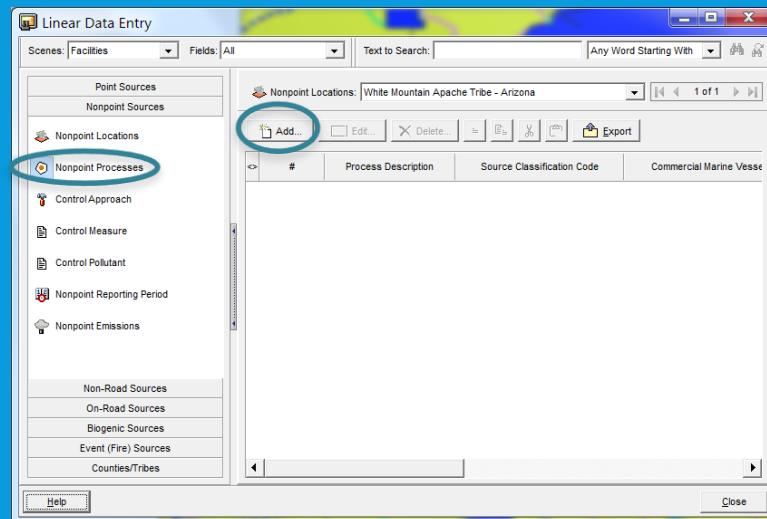
- The OpenBurnLandClearingDebris worksheet calculates emissions from the open burning of land clearing debris from construction based on data entered in other worksheets
- Assumes that all land clearing debris is burned
  - If land clearing debris are not burned on the Reservation, exclude these emissions from your EI

# Poll Question 5

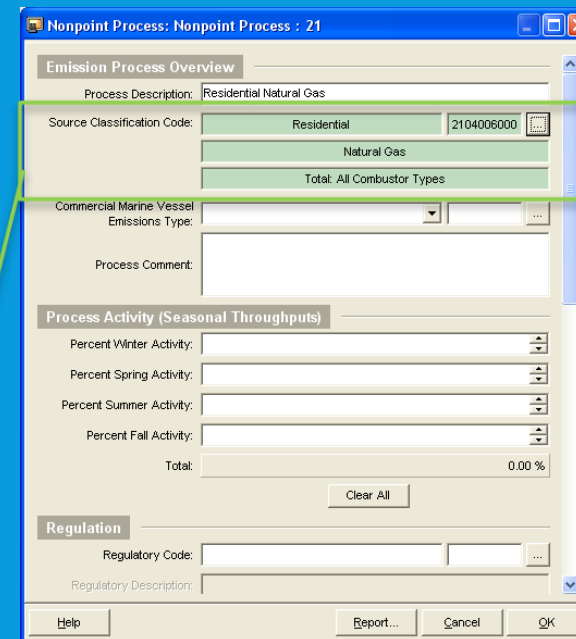
- Of the following nonpoint sources, what source are you most concerned about as a contributor of air pollution in your area?
  - Residential Heating
  - Open Burning
  - Gas Stations
  - Road Dust
  - Construction

# TEISS Calculator Basics

- Add a Nonpoint Process



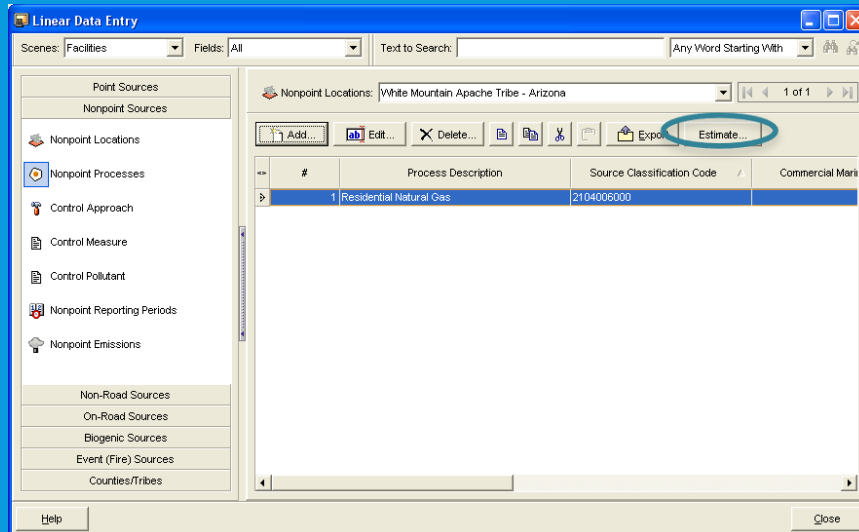
- Find and select a Source Classification Code



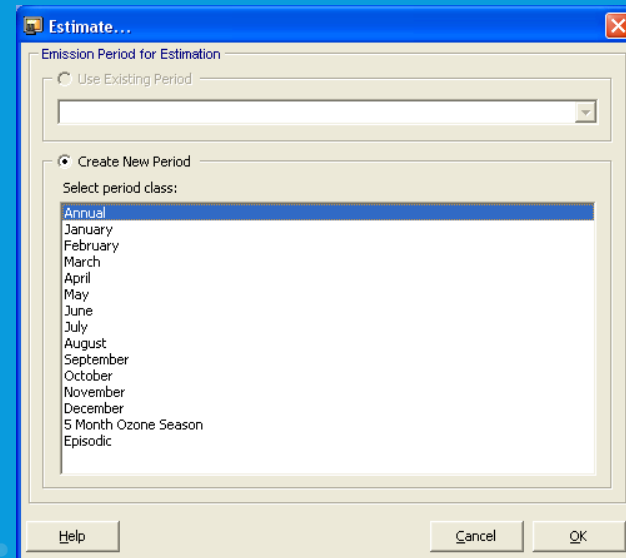


# TEISS Calculator Basics

- Click on Estimate button

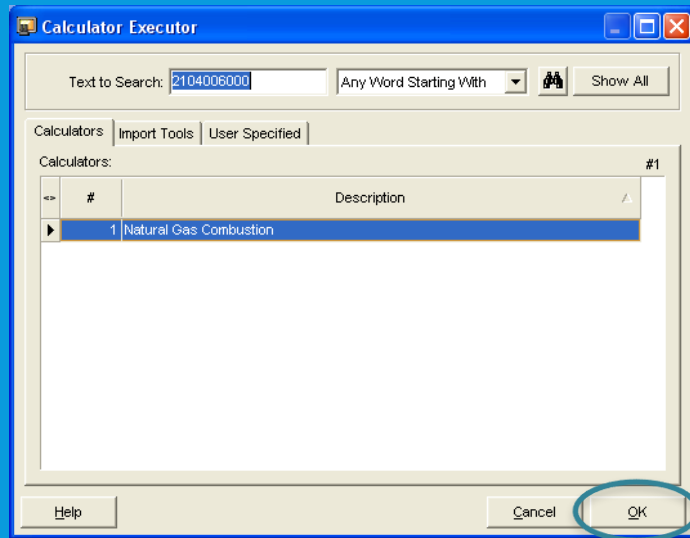


- Select Period of Annual



# TEISS Calculator Basics

- Click OK button to bring up calculator



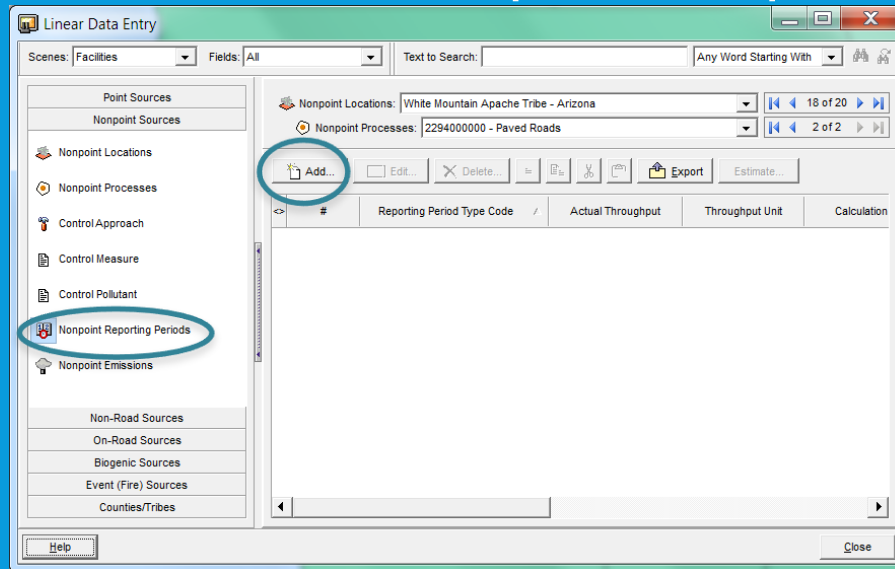
The entire process of using TEISS calculators to estimate emissions is demonstrated in Video 12C of EI Advanced

# Spreadsheet Basics

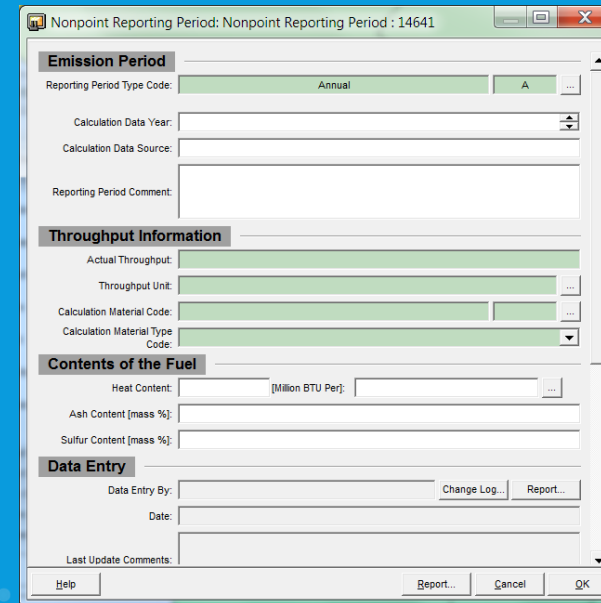
- You do not necessarily need to use TEISS if emissions are calculated with spreadsheets
  - You could simply calculate emissions in spreadsheets and copy into your EI
  - But, if you wanted to add emissions estimated by spreadsheets into TEISS, you can do that
    - To begin, follow the first two steps of adding a Nonpoint Process and selecting a Source Classification Code

# Spreadsheet Basics

- Next, add a Nonpoint Reporting Period

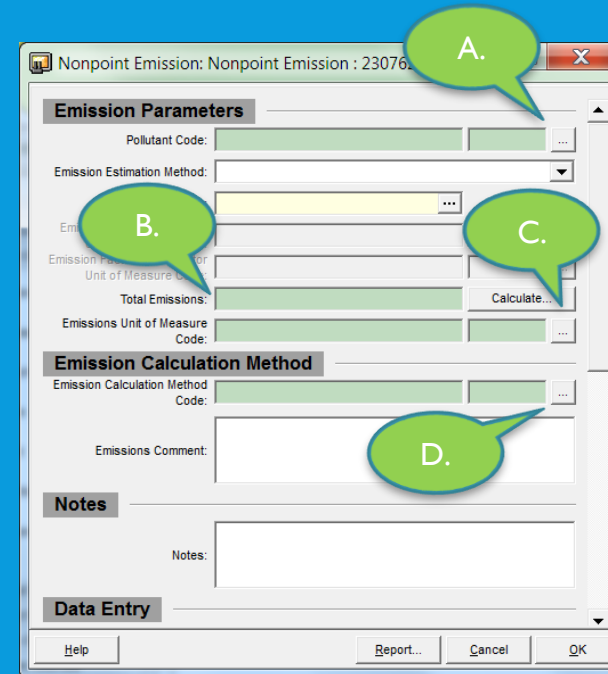
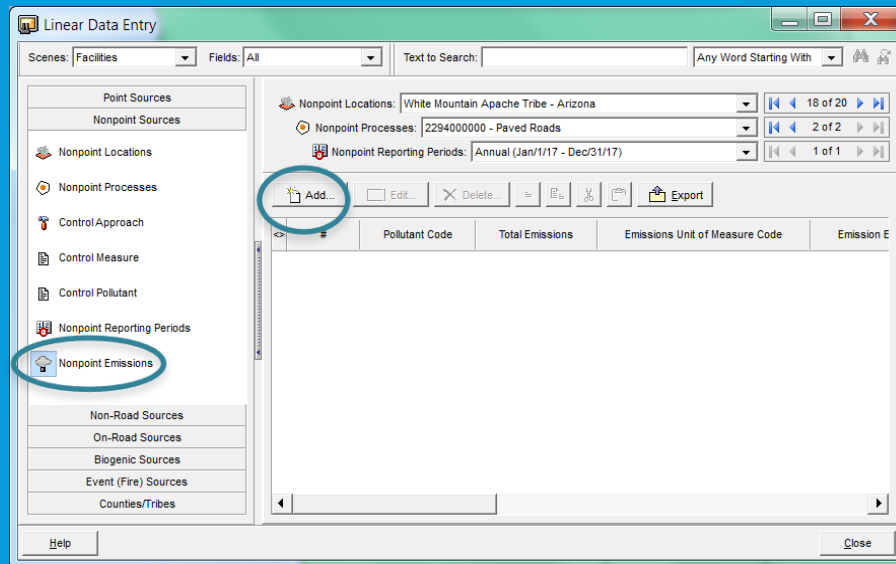


- Default Reporting Period Type Code of Annual is what you want, click OK button



# Spreadsheet Basics

- For each pollutant, add Nonpoint Emissions



- A. Find and select pollutant
- B. Enter emissions value
- C. Select emissions unit (lbs or tons)
- D. Select Emission Calculation Method Code of 8

# Poll Question 6

- What do you see as the biggest challenge in completing an EI?
  - Finding the time to work on the EI
  - Collecting data
  - Learning software
  - Working with numbers
  - No challenges, EIs are super fun



# Questions?

- [Angelique.Luedeker@nau.edu](mailto:Angelique.Luedeker@nau.edu)





# Resources

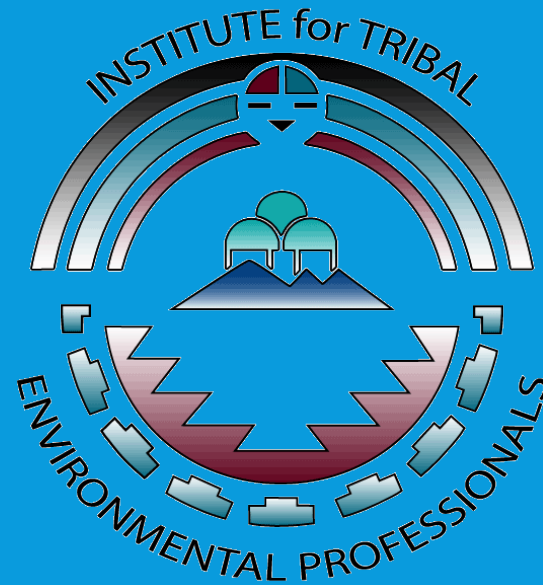


## Online Courses:

- [Emission Inventory Fundamentals](#)
- [Emission Inventory Advance](#)
- [Air Pollution Training Institute](#)

## Tribal Air Monitoring Support Center Resources:

- [TAMS Guidance on Developing Tribal Air Quality Programs](#)
- [Professional Assistance](#)



Thank you for joining today's webinar!