

# Module 3

## Generating Inventories at the County Scale



# Module Overview

- Developing a county-scale RunSpec
  - Exercise: Building a county-scale MOVES RunSpec to produce an emissions inventory, including guidance for each panel
- Entering data using the County Data Manager (CDM)
  - What is the CDM and how does it work?
  - Entering local data
  - Description/guidance for each table in the MOVES input database
- Running MOVES (Executing the RunSpec)
  - Class exercise: Run MOVES for the county inventory scenario

# Key References

- The MOVES Technical Guidance provides guidance on use of local inputs and defaults

[nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P100V7EY.pdf](https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P100V7EY.pdf)

- Consult the MOVES User Guide for a basic reference for use of the County Data Manager

[nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P100NNCY.pdf](https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P100NNCY.pdf)

- Some input guidance is presented in this course, but refer to Technical Guidance for more detail

**MOVES2014, MOVES2014a, and  
MOVES2014b Technical Guidance:**

Using MOVES to Prepare Emission  
Inventories for State Implementation  
Plans and Transportation Conformity

 United States  
Environmental Protection  
Agency

# Summary: MOVES Three Scales

	National	County	Project
Geographic area covered	<ul style="list-style-type: none"><li>• Entire nation</li><li>• One or more states</li><li>• One or more counties</li></ul>	<ul style="list-style-type: none"><li>• One county</li><li>• A multi-county area</li></ul>	An individual transportation project (e.g., a highway, intersection, or transit project)
Purpose	Non-regulatory only	Required for SIP and regional conformity analyses	Required for project-level conformity analyses
Input database	User does not need to create, use of Data Importer is optional*	User creates with local data, through the County Data Manager	User creates with local data, through the Project Data Manager
Default data	Used unless overridden	Access to default data is limited	Access to default data is limited

\* User cannot provide information for certain inputs at the National scale

# Developing a County-Scale RunSpec

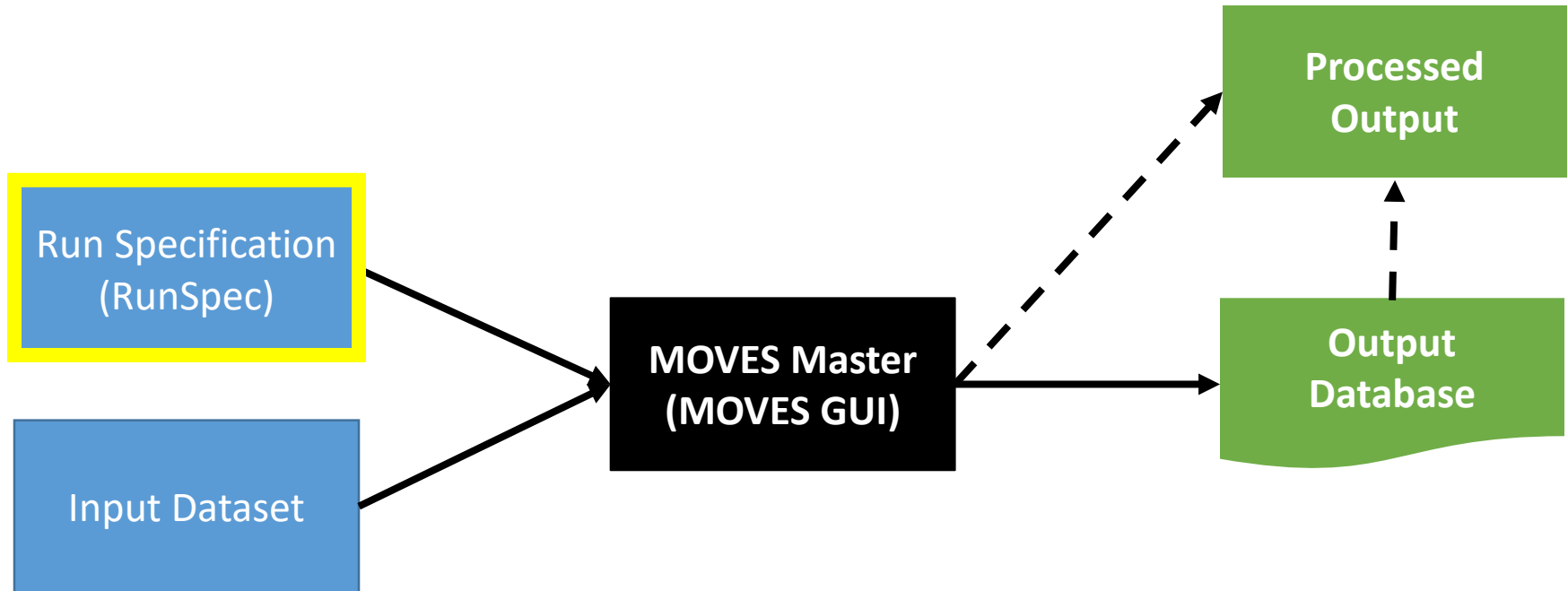


# MOVES Process Overview

Input

MOVES Functions

Output



# Developing a County-scale RunSpec

- Set up the entire RunSpec file first before the county inputs are added
  - This enables the County Data Manager (CDM) to filter the default database for relevant information
  - CDM also conducts error-checks on imported data based on selections made in the RunSpec
  - Output database must be identified to store the results
- The RunSpec can only have
  - A single county selected
  - A single calendar year selected
- A County input database with local inputs must be provided (can be created/populated with CDM – more later)

# Developing a County-scale RunSpec

- Purpose:
  - Provide hands-on practice building a RunSpec and entering data for a county-scale emissions inventory run
  - Give the user knowledge of guidance related to using MOVES at the county-scale for official purposes
- NOTE: This exercise scenario is intentionally simplified to facilitate learning, limit complexity, and reduce MOVES run time. Therefore, it should **NOT** be used as an example of an official County scale run using MOVES
  - A RunSpec being constructed to calculate an inventory for a SIP or conformity analysis would have to completely address all variables as described in EPA guidance



# Exercise Overview

- The county scale exercise scenario is identical to the national scale scenario from Module 2
- The next section of slides details how to set up this RunSpec from scratch before entering the County Data Manager
- Since building the RunSpec is very similar between national scale and county scale, we will save time today by simply loading a preconfigured county scale RunSpec
- We will then quickly review the choices made on each panel, since that will influence what data the County Data Manager will require

# Exercise Overview: Scenario Details

- Modeling one county: Lake County, Indiana
  - This is a portion of Chicago-Gary ozone nonattainment area
  - **NOTE: The “local” input files used in this exercise are not based on actual Lake County data and the results do not reflect expected vehicle emissions in Lake County**
- Typical summer day in 2015
  - Will select month of July and model only “weekday” days, all hours to represent this typical day
- Subset of vehicle types (same as in our National scale run in Module 2):
  - Diesel, gasoline, and ethanol (E-85) passenger cars and trucks
  - Compressed Natural Gas, Diesel, and Gasoline transit buses
  - Normally, all vehicle types would be selected

# Exercise Overview: Scenario Details

- All road types
  - Urban restricted and unrestricted
  - Rural restricted and unrestricted
  - Off-network
- Total gaseous hydrocarbons, all processes
  - All processes = starts, running, evaporative, crankcase, etc.
  - One pollutant (THC) selected for training purposes; normally, more pollutants would need to be modeled for a SIP or conformity run

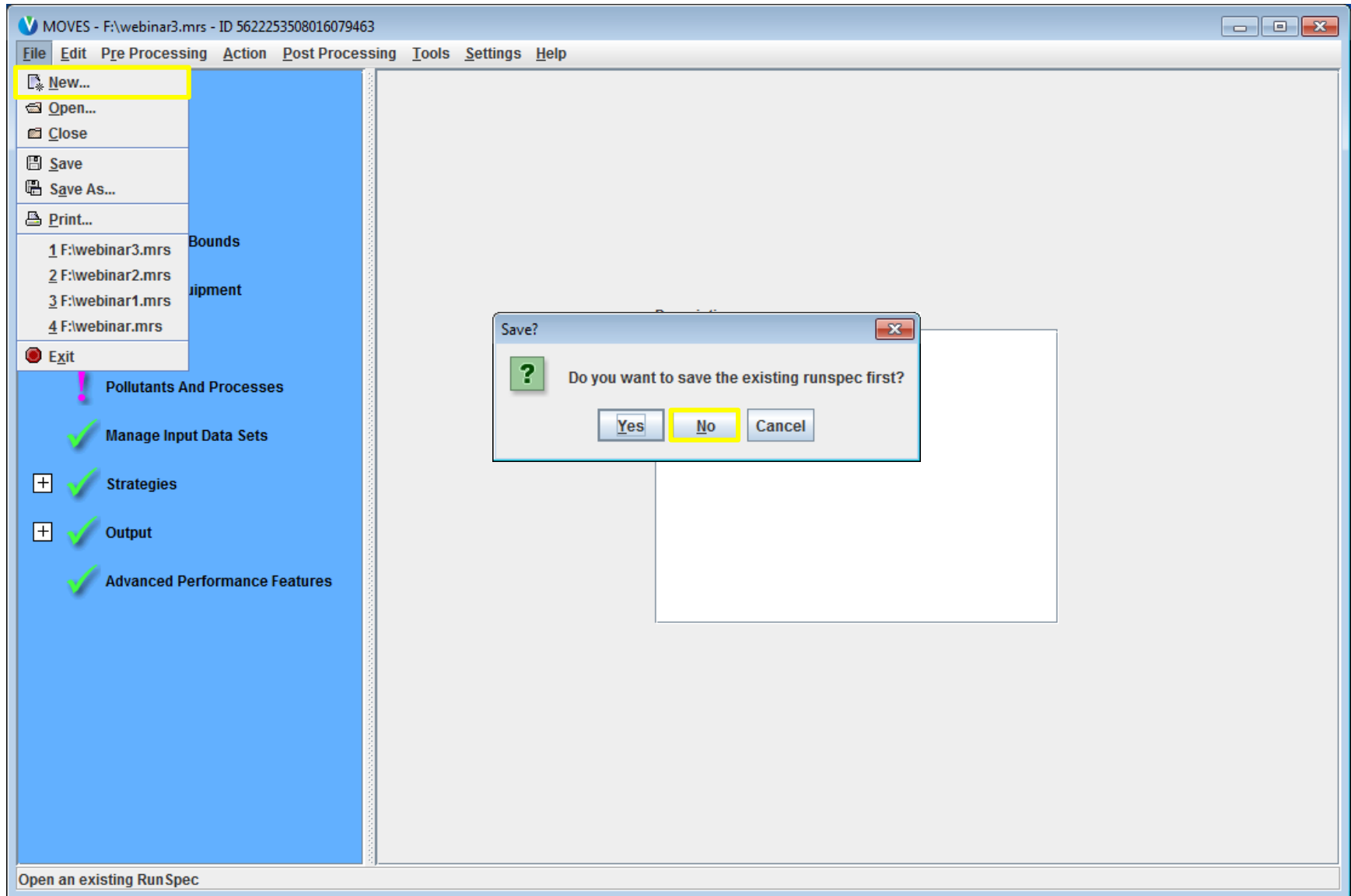
# Developing a County-scale Runspec

- Instructions for Developing a County-scale RunSpec:

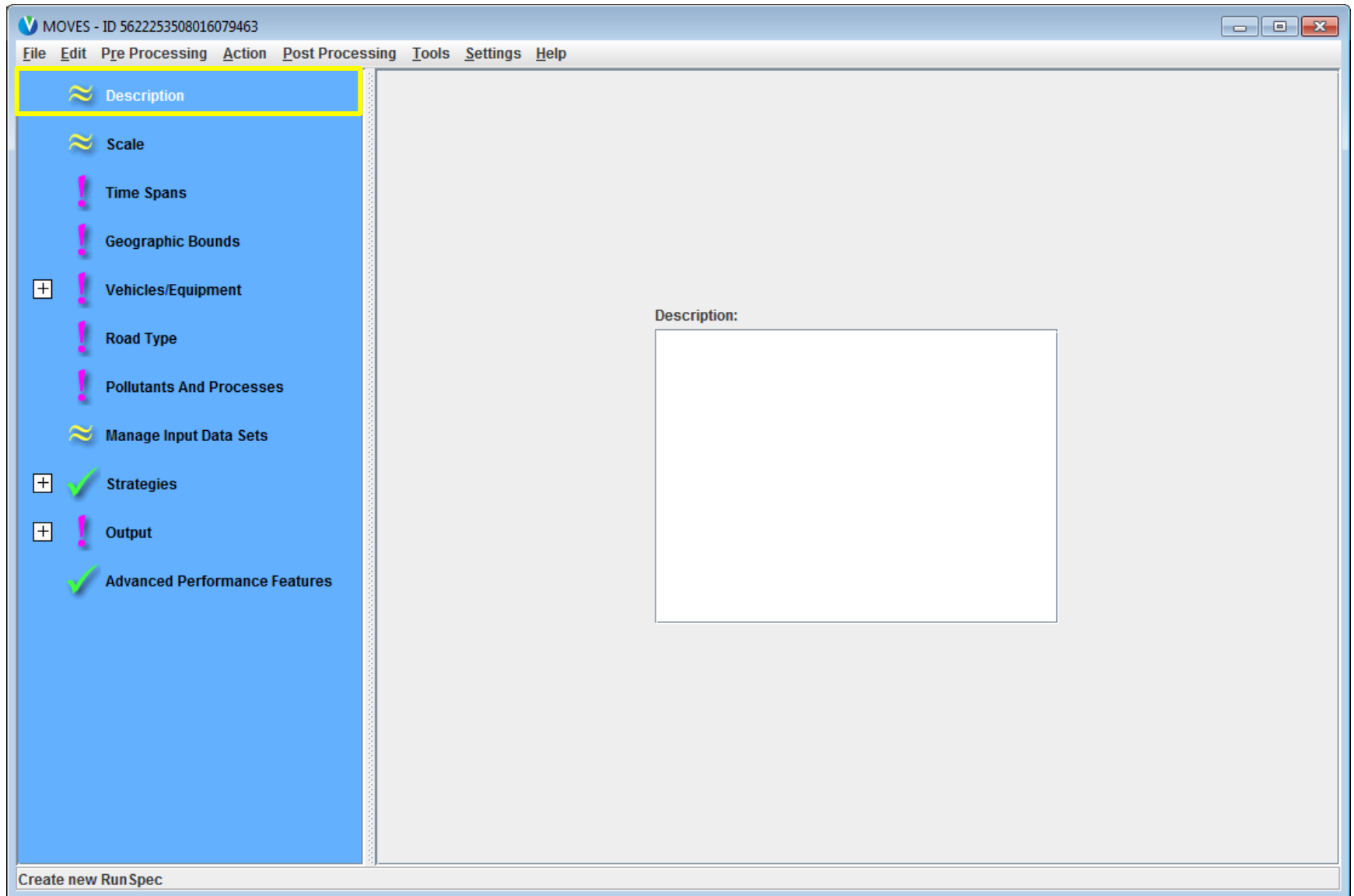
- If you've closed MOVES, open MOVES2014b by double-clicking the "MOVES2014b" icon
- If MOVES is open, click *File* on the menu bar and click *New...* in the dropdown menu to start building a new RunSpec (and close any current RunSpec)
- Click *No* when prompted to save the existing RunSpec



# File, New... to start a new RunSpec



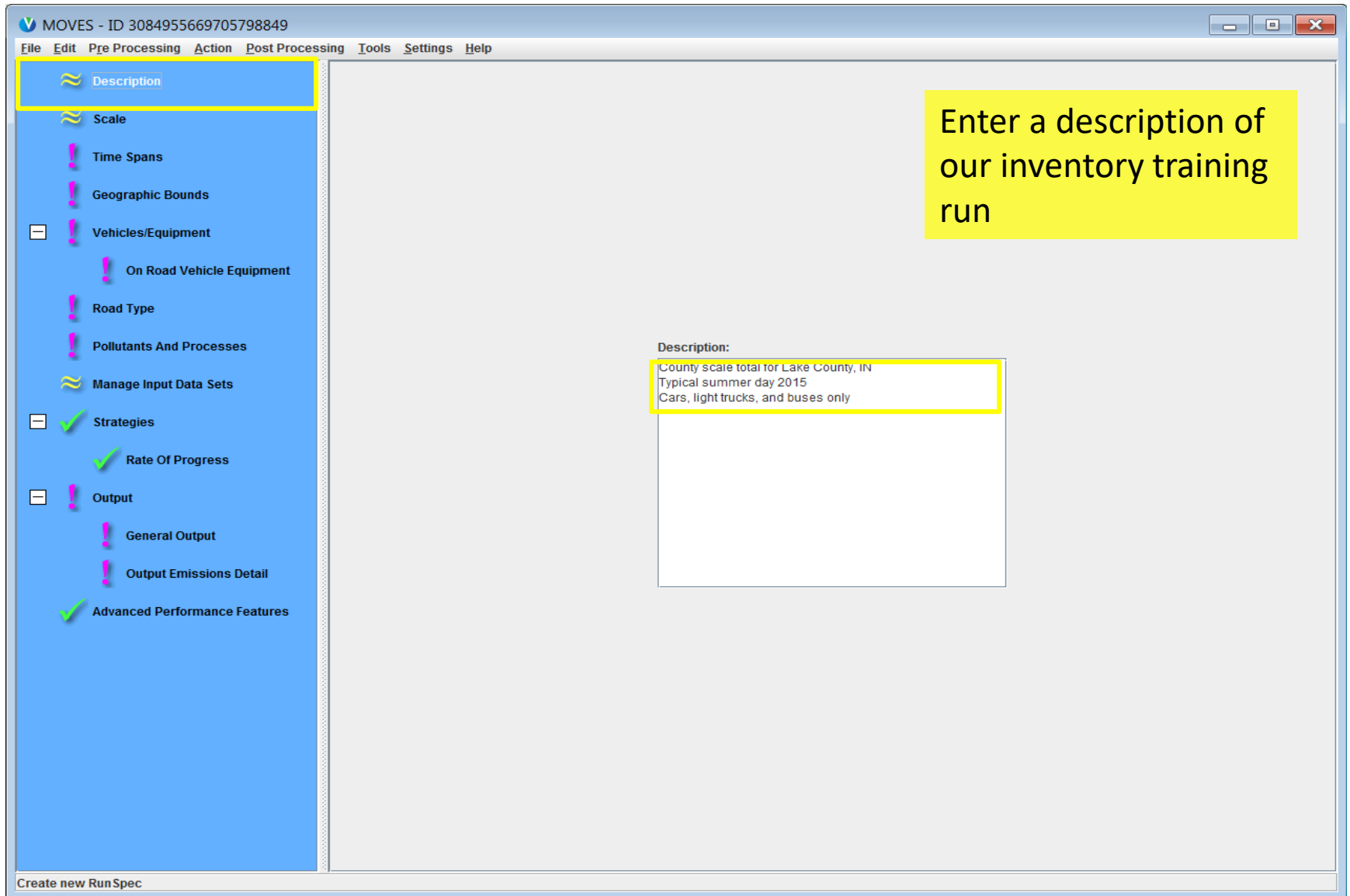
# Description Panel



# Description Panel

- Allows the user to describe the RunSpec
  - Include details like location, time period, pollutant type, or whatever else is unique about the run
  - Up to 5,000 characters of text, but no quotation marks, ampersand or backslash characters allowed
  - Description appears in the MOVESRun table of the output database
  - Description is optional but useful to keep track of runs
- Instructions for Developing a County-scale RunSpec:
  - *Type:*  
County scale total HC for Lake County, IN  
Typical summer day 2015  
Cars, light trucks, and buses only

# Description Panel





# Scale Panel

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help


- ✓ Description
- ✓ **Scale**
- ! Time Spans
- ! Geographic Bounds
- + ! Vehicles/Equipment
- ! Road Type
- ! Pollutants And Processes
- ≈ Manage Input Data Sets
- + ✓ Strategies
- + ! Output
- ✓ Advanced Performance Features

**Model**

☒ Onroad  
☐ Nonroad

**Domain/Scale**

☒ National Use the default national database with default state and local allocation factors.

 Caution: Do not use this scale setting for SIP or conformity analyses. The allocation factors and other defaults applied at the state or county level have not been verified against specific state or county data and do not meet regulatory requirements for SIPs and conformity determinations.

☐ County Select or define a single county that is the entire domain.

Note: Use this scale setting for SIP and regional conformity analysis. Use of this scale setting requires user-supplied local data for most activity and fleet inputs.

☐ Project Use project domain inputs.


Note: Use this scale setting for project-level analysis for conformity, NEPA, or any other regulatory purpose. Use of this scale setting requires user-supplied data at the link level for activity and fleet inputs that describe a particular transportation project.

**Calculation Type**

☒ Inventory Mass and/or Energy within a region and time span.

☐ Emission Rates Mass and/or Energy per unit of activity.

MOVESScenarioID:

 Caution: Changing these selections changes the contents of other input panels. These changes may include losing previous data contents.

Create new RunSpec

# Scale Panel: Inventory Guidance

- Domain/Scale
  - County scale must be used for SIPs or transportation conformity analyses
  - **NOTE: National scale relies on national defaults and allocation factors that are not appropriate for regulatory purposes**
- Calculation Type
  - Either *Inventory* or *Emission Rates* options may be used for SIPs or transportation conformity analyses
  - Both methods can give the equivalent results, but post-processing errors are more common when using emission rates
  - It is best to use the same approach to compare two or more cases
    - Base year and attainment year
    - Budget and regional conformity analysis
  - Use interagency consultation process to agree upon a common approach or to minimize differences in results if different approaches are used

# Scale Panel

- Instructions for Developing a County-scale RunSpec:
  - Model: Select *Onroad*
  - Domain/Scale: Select *County*
  - Calculation Type: Select *Inventory*

# Scale Panel

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

! Time Spans

! Geographic Bounds

+ ! Vehicles/Equipment

! Road Type

! Pollutants And Processes

≈ Manage Input Data Sets

+ ✓ Strategies

+ ! Output

✓ Advanced Performance Features

Model

☒ Onroad

☐ Nonroad

Domain/Scale

☐ National Use the default national database with default state and local allocation factors.

Caution: Do not use this scale setting for SIP or conformity analyses. The allocation factors and other defaults applied at the state or county level have not been verified against specific state or county data and do not meet regulatory requirements for SIPs and conformity determinations.

☒ County Select or define a single county that is the entire domain.

Note: Use this scale setting for SIP and regional conformity analysis. Use of this scale setting requires user-supplied local data for most activity and fleet inputs.

☐ Project Use project domain inputs.

Note: Use this scale setting for project-level analysis for conformity, NEPA, or any other regulatory purpose. Use of this scale setting requires user-supplied data at the link level for activity and fleet inputs that describe a particular transportation project.

Calculation Type

☒ Inventory Mass and/or Energy within a region and time span.

☐ Emission Rates Mass and/or Energy per unit of activity.

MOVESScenarioID:

Caution: Changing these selections changes the contents of other input panels. These changes may include losing previous data contents.

Create new RunSpec

Make the following selections for our exercise

# Time Spans Panel

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description  
✓ Scale  
**! Time Spans**  
! Geographic Bounds  
+ ! Vehicles/Equipment  
! Road Type  
! Pollutants And Processes  
≈ Manage Input Data Sets  
+ ✓ Strategies  
+ ! Output  
✓ Advanced Performance Features

Time Aggregation Level  
☐ Year ☐ Month ☐ Day ☒ Hour

Years  
Select Year:    
Years:

Months  
☐ January ☐ July  
☐ February ☐ August  
☐ March ☐ September  
☐ April ☐ October  
☐ May ☐ November  
☐ June ☐ December

Days  
☐ Weekend  
☐ Weekdays

Hours  
Start Hour:   
End Hour:

Create new RunSpec

# Time Spans Panel

- For all regulatory purposes
  - Time Aggregation Level should be set to Hour
  - All hours should be selected
  - Only one calendar year can be selected
- Consult with EPA and the MOVES Technical Guidance to determine the appropriate year, month(s), and type of day(s)

# Time Spans Panel

- Instructions for Developing a County-scale RunSpec:

Make the following selections for our exercise

- Time Aggregation Level: Hour
- Years: 2015
- Days: Weekdays
- Months: July
- Hours: Select All

# Time Spans Panel

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description  
✓ Scale  
✓ Time Spans  
! Geographic Bounds  
+ ! Vehicles/Equipment  
! Road Type  
! Pollutants And Processes  
≈ Manage Input Data Sets  
+ ✓ Strategies  
+ ! Output  
✓ Advanced Performance Features

Time Aggregation Level  
☐ Year ☐ Month ☐ Day ☒ Hour

Years  
Select Year: 2015 Add  
Years:  
2015  
Remove

Months  
☐ January ☒ July  
☐ February ☐ August  
☐ March ☐ September  
☐ April ☐ October  
☐ May ☐ November  
☐ June ☐ December  
Select All Clear All

Days  
☐ Weekend  
☒ Weekdays  
Select All Clear All

Hours  
Start Hour: 00:00 - 00:59  
End Hour: 23:00 - 23:59  
Select All Clear All

Create new RunSpec

Make the following selections for our exercise



# Geographic Bounds Panel

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

! Geographic Bounds

+ ! Vehicles/Equipment

! Road Type

! Pollutants And Processes

≈ Manage Input Data Sets

+ ✓ Strategies

+ ! Output

✓ Advanced Performance Features

Region:

☐ Nation

☐ State

☒ County

☐ Zone & Link

☐ Custom Domain

States:

ALABAMA  
ALASKA  
ARIZONA  
ARKANSAS  
CALIFORNIA  
COLORADO  
CONNECTICUT  
DELAWARE  
DISTRICT OF COLUMBIA

Counties:

Selections:

Select All

Add

Delete

Domain Input Database

The County domain scale requires a database of detailed data.

Server:

Database:

Refresh

Enter/Edit Data

Geographic Bounds Requirements

Please select a state and county.

Please select a domain database.

# Geographic Bounds Panel

- Once you have selected the County scale, you may
  - Choose a single county from the list or
  - Create a Custom Domain (will cover later in course)
- Choosing a county accesses the available default data stored for that county
- The Enter/Edit Data button in the Domain Input Database portion of the panel opens the County Data Manager
  - A County database must be created or selected to store the county specific data (done later)
- Will show ✓ after County database has been provided

# Geographic Bounds Panel

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

! Geographic Bounds

+ ! Vehicles/Equipment

! Road Type

! Pollutants And Processes

≈ Manage Input Data Sets

+ ✓ Strategies

+ ! Output

✓ Advanced Performance Features

Region:

☐ Nation

☐ State

☒ County

☐ Zone & Link

☐ Custom Domain

States:

CONNECTICUT

DELAWARE

DISTRICT OF COLUMBIA

FLORIDA

GEORGIA

HAWAII

IDAHO

ILLINOIS

INDIANA

Counties:

INDIANA - Knox County

INDIANA - Kosciusko County

INDIANA - La Porte County

INDIANA - Laarange County

INDIANA - Lake County

INDIANA - Lawrence County

INDIANA - Madison County

INDIANA - Marion County

Selections:

INDIANA - Lake County

Select All

Add

Delete

Domain Input Database

The County domain scale requires a database of detailed data.

Server:

Database:

Refresh

Enter/Edit Data

Geographic Bounds Requirements

Please select a domain database.

Make the following selections for our exercise

Create new RunSpec

# On Road Vehicle Equipment Panel

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

! Geographic Bounds

[-] Vehicles/Equipment

**! On Road Vehicle Equipment**

! Road Type

! Pollutants And Processes

≈ Manage Input Data Sets

[+] ✓ Strategies

[+] ! Output

✓ Advanced Performance Features

Fuels:

Compressed Natural Gas (CNG)  
Diesel Fuel  
Electricity  
Ethanol (E-85)  
Gasoline  
Liquefied Petroleum Gas (LPG)

Source Use Types:

Combination Long-haul Truck  
Combination Short-haul Truck  
Intercity Bus  
Light Commercial Truck  
Motor Home  
Motorcycle  
Passenger Car  
Passenger Truck  
Refuse Truck  
School Bus  
Single Unit Long-haul Truck  
Single Unit Short-haul Truck  
Transit Bus

Selections:

Select All

Select All

Delete

Add Fuel/Type Combinations

On Road Vehicle Equipment Requirements

Please select a Fuel and Source Use Type combination.

Create new RunSpec

# On Road Vehicle Equipment Panel

- For **most** analyses, select all valid **gasoline, ethanol, diesel, and CNG** vehicle combinations
- Always select Ethanol (E-85) plus gasoline and diesel for passenger cars, passenger trucks, and light commercial trucks
  - In this panel, Ethanol (E-85) refers to flex-fuel vehicles, which exist in every county in the U.S.
  - MOVES default fleet includes some E-85 vehicles; not selecting ethanol will result in lost VMT from these vehicles
  - Use the Fuel Usage table (covered later) to specify what fraction of ethanol usage occurs in your area
- Always select gasoline, diesel, and CNG for transit buses
  - By default, MOVES allocates some transit bus VMT to Compressed Natural Gas (CNG)
  - Use AVFT table (covered later) to specify what fuel types exist in your local fleet
  - In MOVES, transit buses are the only vehicles with CNG emission factors

# On Road Vehicle Equipment Panel

## Instructions for Developing a County-scale RunSpec:

- Select
  - Fuels: Diesel Fuel, Ethanol (E-85), and Gasoline
  - Source Use Types: Select Light Commercial Truck, Passenger Car, Passenger Truck
- Click Add Fuel/Type Combinations
  
- Also select
  - Fuels: Compressed Natural Gas, Diesel, Gasoline
  - Source Use Type: Transit Bus
- Click Add Fuel/Type Combinations

# On Road Vehicles Equipment Panel

MOVES - ID 9058820624419857438

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

✓ Geographic Bounds

[-] ✓ Vehicles/Equipment

✓ On Road Vehicle Equipment

! Road Type

! Pollutants And Processes

≈ Manage Input Data Sets

[+] ✓ Strategies

[+] ! Output

✓ Advanced Performance Features

Fuels:

Compressed Natural Gas (CNG)

Diesel Fuel

Electricity

Ethanol (E-85)

Gasoline

Source Use Types:

Combination Long-haul Truck

Combination Short-haul Truck

Intercity Bus

Light Commercial Truck

Motor Home

Motorcycle

Passenger Car

Passenger Truck

Refuse Truck

School Bus

Single Unit Long-haul Truck

Single Unit Short-haul Truck

Transit Bus

Selections:

Diesel Fuel - Light Commercial Truck

Diesel Fuel - Passenger Car

Diesel Fuel - Passenger Truck

Ethanol (E-85) - Light Commercial Truck

Ethanol (E-85) - Passenger Car

Ethanol (E-85) - Passenger Truck

Gasoline - Light Commercial Truck

Gasoline - Passenger Car

Gasoline - Passenger Truck

Select All

Select All

Delete

Add Fuel/Type Combinations

Select and Import Data

# On Road Vehicles Equipment Panel

MOVES - ID 9058820624419857438

File Edit Pre Processing Action Post Processing Tools Settings Help

<ul style="list-style-type: none"><li>✓ Description</li><li>✓ Scale</li><li>✓ Time Spans</li><li>✓ Geographic Bounds</li><li>[-] ✓ Vehicles/Equipment<ul style="list-style-type: none"><li>✓ On Road Vehicle Equipment</li></ul></li><li>! Road Type</li><li>! Pollutants And Processes</li><li>≈ Manage Input Data Sets</li><li>[+] ✓ Strategies</li><li>[+] ! Output</li><li>✓ Advanced Performance Features</li></ul>	<p>Fuels:</p> <ul style="list-style-type: none"><li>Compressed Natural Gas (CNG)</li><li>Diesel Fuel</li><li>Electricity</li><li>Ethanol (E-85)</li><li>Gasoline</li></ul>	<p>Source Use Types:</p> <ul style="list-style-type: none"><li>Combination Long-haul Truck</li><li>Combination Short-haul Truck</li><li>Intercity Bus</li><li>Light Commercial Truck</li><li>Motor Home</li><li>Motorcycle</li><li>Passenger Car</li><li>Passenger Truck</li><li>Refuse Truck</li><li>School Bus</li><li>Single Unit Long-haul Truck</li><li>Single Unit Short-haul Truck</li><li>Transit Bus</li></ul>	<p>Selections:</p> <ul style="list-style-type: none"><li>Diesel Fuel - Light Commercial Truck</li><li>Diesel Fuel - Passenger Car</li><li>Diesel Fuel - Passenger Truck</li><li>Ethanol (E-85) - Light Commercial Truck</li><li>Ethanol (E-85) - Passenger Car</li><li>Ethanol (E-85) - Passenger Truck</li><li>Gasoline - Light Commercial Truck</li><li>Gasoline - Passenger Car</li><li>Gasoline - Passenger Truck</li><li>Compressed Natural Gas (CNG) - Transit Bus</li><li>Diesel Fuel - Transit Bus</li><li>Gasoline - Transit Bus</li></ul>
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Select All Select All Delete

Add Fuel/Type Combinations

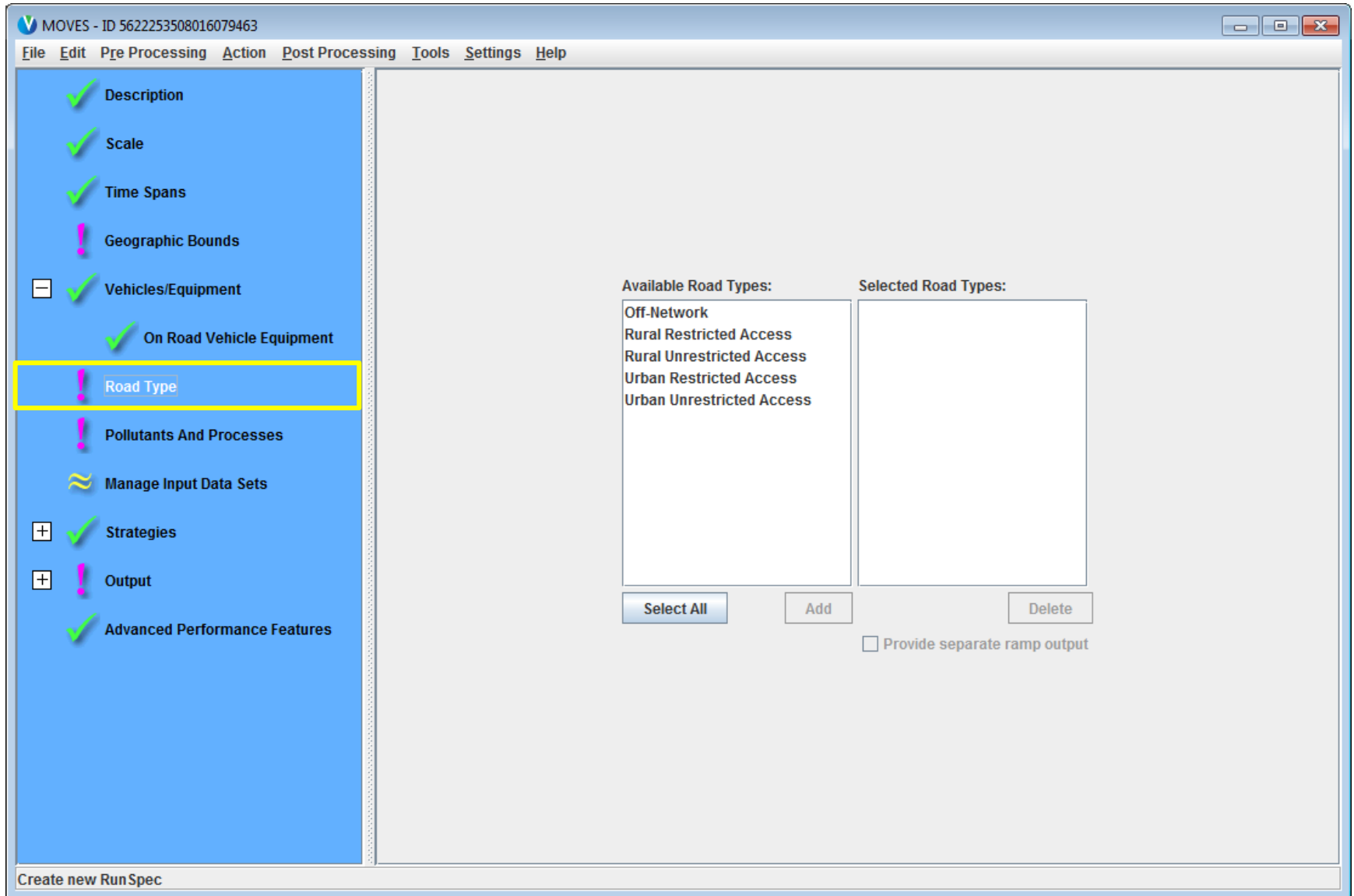
Select and Import Data



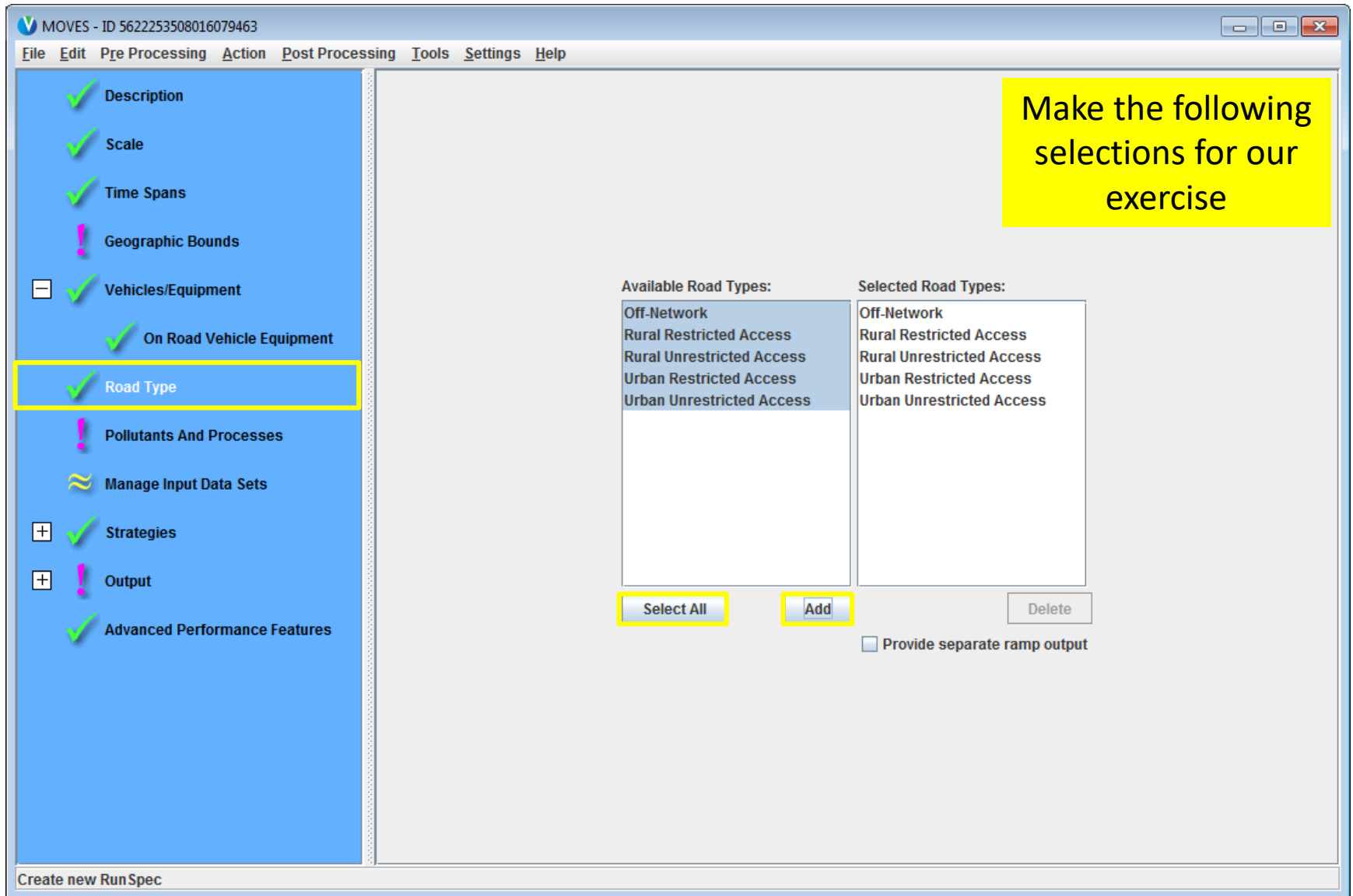
# Road Type Panel

- Generally recommended to select all road types in RunSpec
  - RoadTypeDistribution table in CDM can be used to allocate VMT to the various road types
- Off-network road type captures start, hotelling, and resting evaporative emissions
  - Running evaporative emissions occur on the normal road types
- Some pollutant-process selections automatically select certain road types
- A restricted road type must be selected for the Ramp Fraction tab to appear in the CDM

# Road Type Panel



# Road Type Panel



# Pollutants and Processes Panel

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

! Geographic Bounds

[-] ✓ Vehicles/Equipment

✓ On Road Vehicle Equipment

✓ Road Type

**! Pollutants And Processes**

≈ Manage Input Data Sets

[+] ✓ Strategies

[+] ! Output

✓ Advanced Performance Features

	Running Exhaust	Start Exhaust	Brakewear	Tirewear	Evap Permeation	Evap Fuel Vapo
<input type="checkbox"/> Total Gaseous Hydrocarbons	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Non-Methane Hydrocarbons	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Non-Methane Organic Gases	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Total Organic Gases	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Volatile Organic Compounds	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Methane (CH4)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Carbon Monoxide (CO)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Oxides of Nitrogen (NOx)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrogen Oxide (NO)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrogen Dioxide (NO2)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrous Acid (HONO)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Ammonia (NH3)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrous Oxide (N2O)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Primary Exhaust PM2.5 - Total	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> [+] Primary Exhaust PM2.5 - Species	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Primary PM2.5 - Brakewear Particulate			<input type="checkbox"/>			
<input type="checkbox"/> Primary PM2.5 - Tirewear Particulate				<input type="checkbox"/>		
<input type="checkbox"/> Primary Exhaust PM10 - Total	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Primary PM10 - Brakewear Particulate			<input type="checkbox"/>			
<input type="checkbox"/> Primary PM10 - Tirewear Particulate				<input type="checkbox"/>		
<input type="checkbox"/> Sulfur Dioxide (SO2)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Total Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Petroleum Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Fossil Fuel Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Atmospheric CO2	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> CO2 Equivalent	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Benzene	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Ethanol	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> MTDC	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>

Select Prerequisites

Clear All

Create new RunSpec

# Pollutants and Processes Panel

- Consult the MOVES Technical Guidance to determine the pollutants and processes that should be modeled
  - Varies based on purpose of modeling (e.g., What public health standard has been violated? What demonstration is being made?)
  - For SIP/conformity analyses, select all processes associated with a given pollutant
  - Extra pollutants/processes will increase run-time
- Box to the left of the pollutant name has two uses
  - Selects all processes for a pollutant if no processes have been selected for that pollutant; or
  - Unselects all processes for a pollutant if any processes have been selected for that pollutant.
- Some pollutants and processes are “chained”

# Pollutants and Processes Panel

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

! Geographic Bounds

[-] ✓ Vehicles/Equipment

✓ On Road Vehicle Equipment

✓ Road Type

✓ Pollutants And Processes

≈ Manage Input Data Sets

[+] ✓ Strategies

[+] ! Output

✓ Advanced Performance Features

	Running Exhaust	Start Exhaust	Brakewear	Tirewear	Evap Permeation	Evap Fuel Vapo
<input checked="" type="checkbox"/> Total Gaseous Hydrocarbons	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Non-Methane Hydrocarbons	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Non-Methane Organic Gases	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Total Organic Gases	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Volatile Organic Compounds	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Methane (CH4)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Carbon Monoxide (CO)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Oxides of Nitrogen (NOx)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrogen Oxide (NO)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrogen Dioxide (NO2)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrous Acid (HONO)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Ammonia (NH3)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrous Oxide (N2O)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Primary Exhaust PM2.5 - Total	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> [+] Primary Exhaust PM2.5 - Species	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Primary PM2.5 - Brakewear Particulate			<input type="checkbox"/>			
<input type="checkbox"/> Primary PM2.5 - Tirewear Particulate				<input type="checkbox"/>		
<input type="checkbox"/> Primary Exhaust PM10 - Total	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Primary PM10 - Brakewear Particulate			<input type="checkbox"/>			
<input type="checkbox"/> Primary PM10 - Tirewear Particulate				<input type="checkbox"/>		
<input type="checkbox"/> Sulfur Dioxide (SO2)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Total Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Petroleum Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Fossil Fuel Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Atmospheric CO2	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> CO2 Equivalent	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Benzene	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Ethanol	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> MTDC	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>

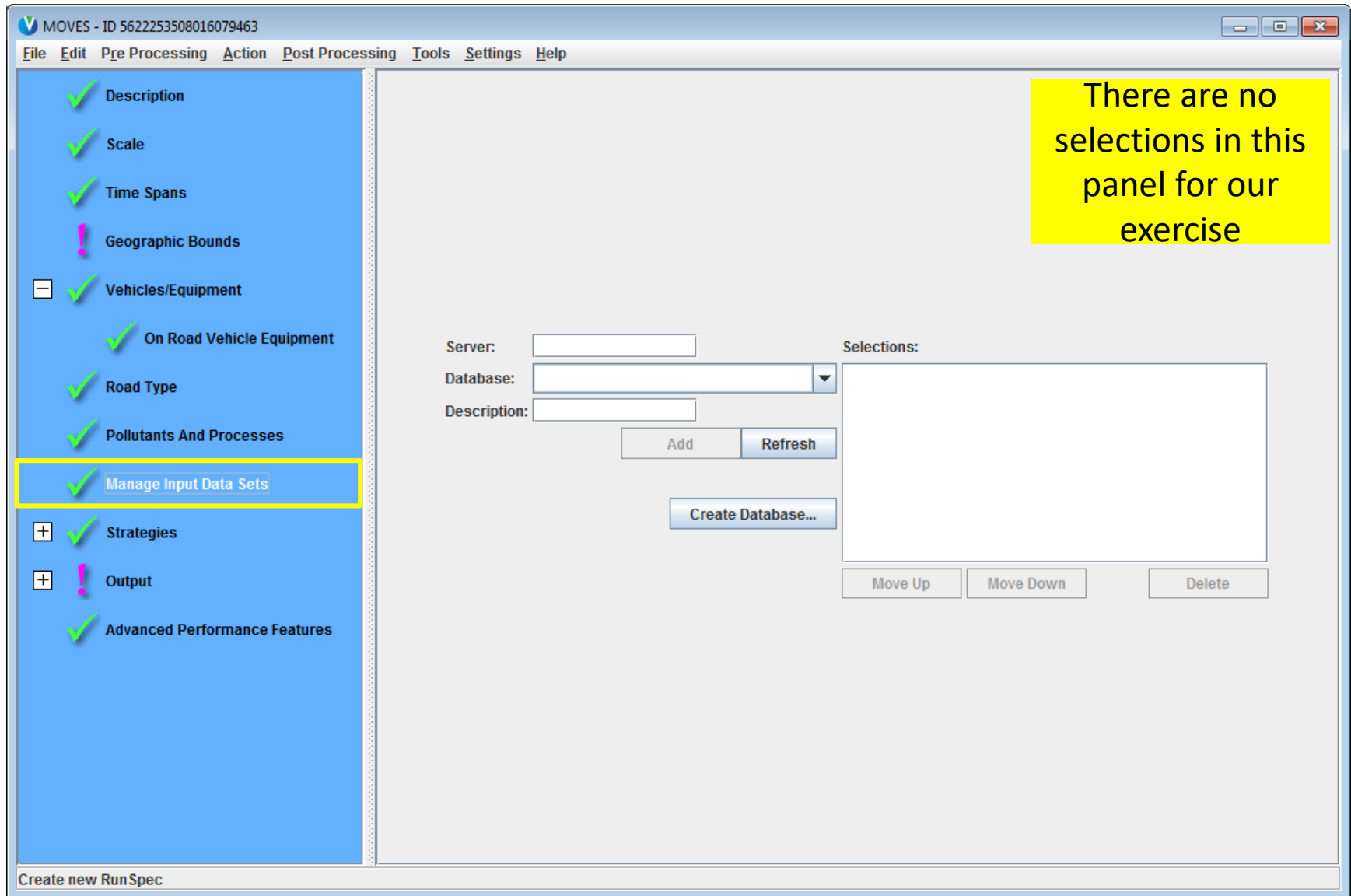
Select Prerequisites

Clear All

Create new RunSpec

Check the box to the left of *Total Gaseous Hydrocarbons* to select all processes for our exercise (scroll to see all processes)

# Manage Input Data Sets Panel

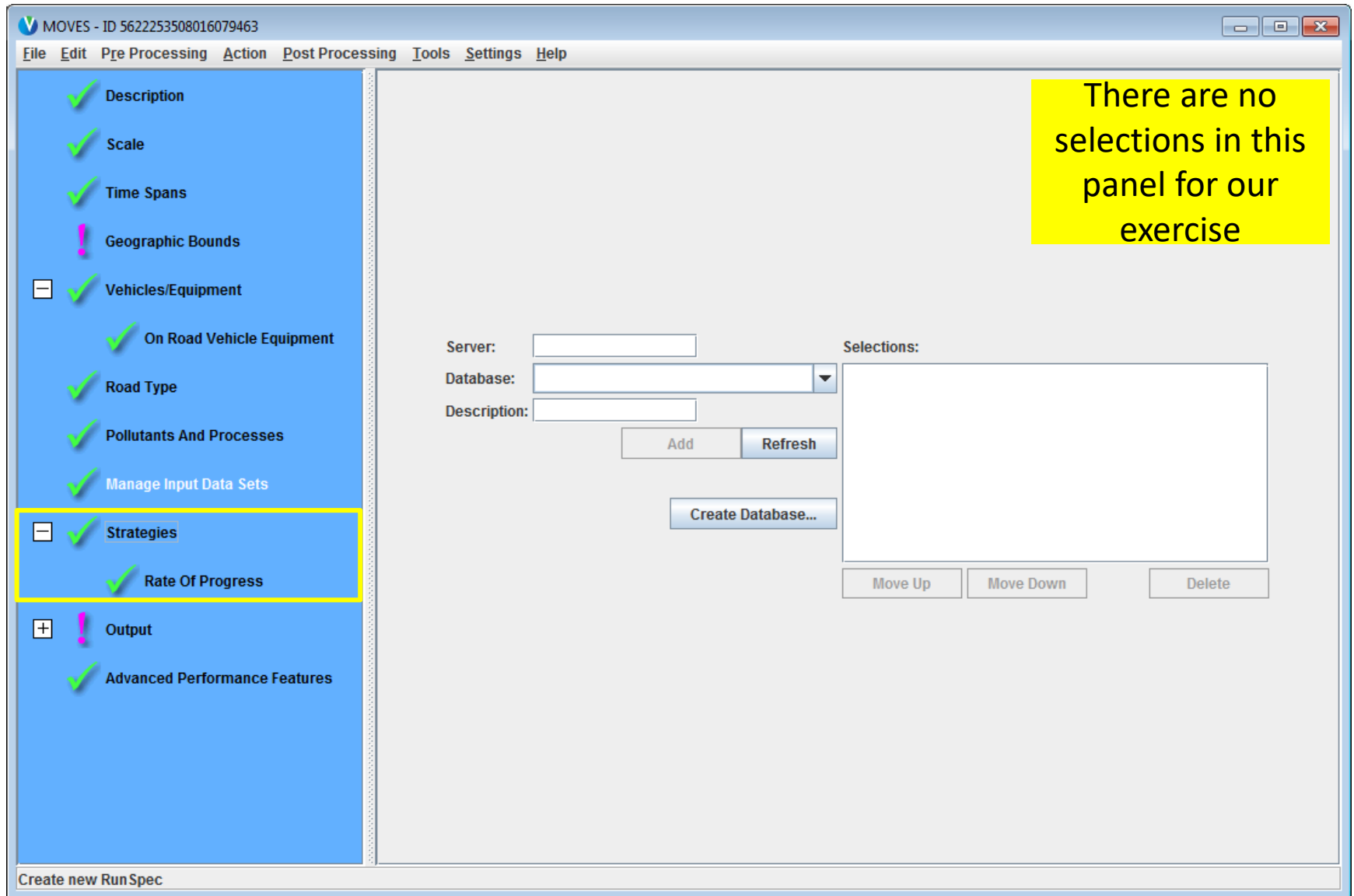


# Strategies Panel (Rate Of Progress)

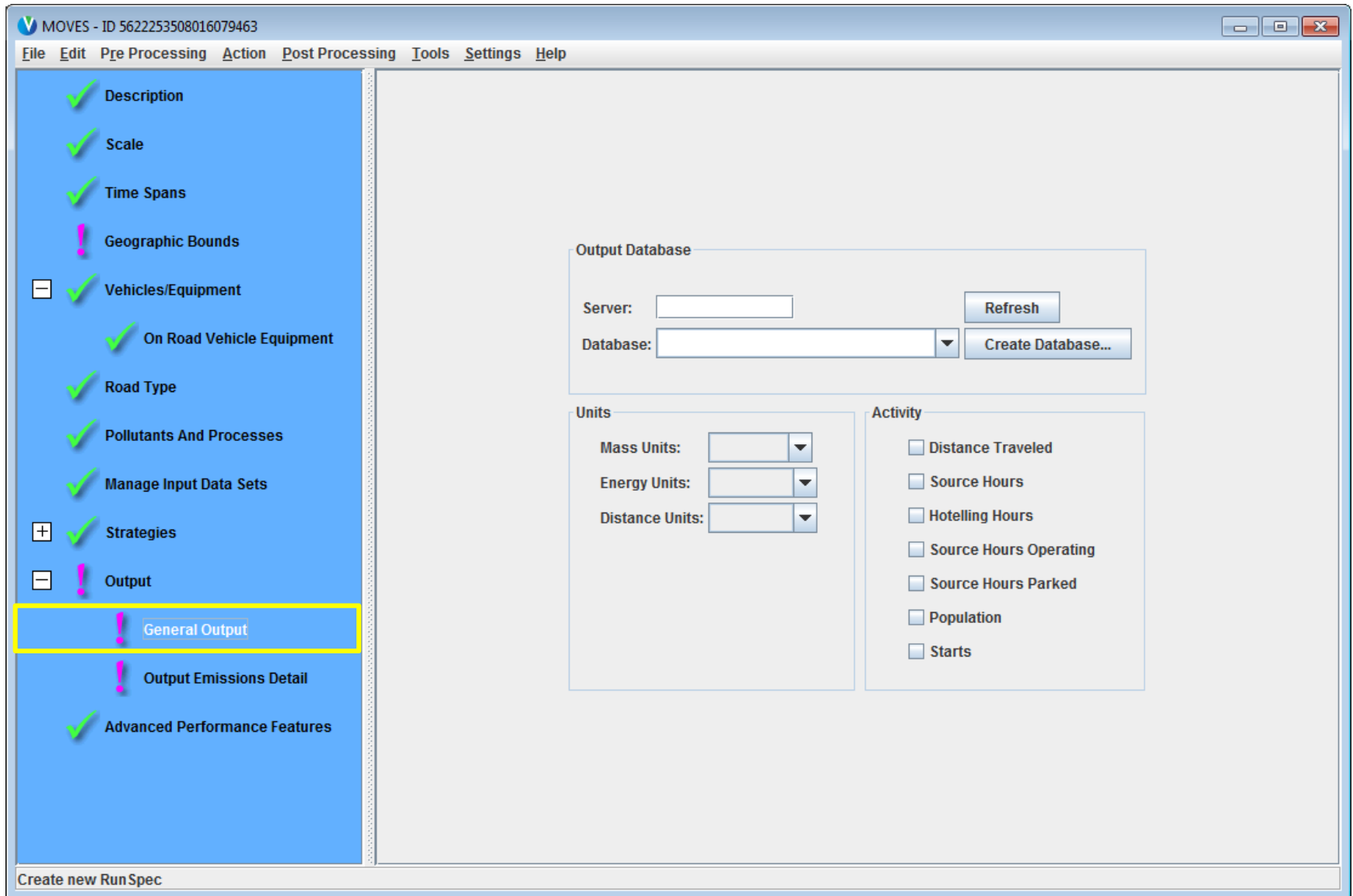
- The Rate of Progress panel (ROP) allows users to identify the RunSpec as a “rate of progress run,” which will estimate emissions using the assumption that the 1990 Clean Air Act Amendments had not been implemented
- Note: Earlier versions of MOVES included panels here called Alternative Vehicle and Fuels Technology (AVFT) and Retrofit Data. These inputs have been moves into the CDM.



# Strategies Panel (Rate Of Progress)



# Output Panel (General Output)



# Output Panel (General Output)

- User must identify the output database
  - Best practice is to name output databases ending with “\_out”
  - Manually create the database if it doesn’t already exist
  - Multiple RunSpecs can be stored in the same database
    - Different RunSpecs will be identified by different MOVESrunID’s
    - Generally, there should be a reason to have multiple RunSpecs in the same output database (e.g., each run is a county in a nonattainment area and the results will later be summed)
- Units must be selected
- Activity output selections are optional
  - Selecting “Distance Traveled” and “Population” is recommended
  - Selecting any of the other options is entirely up to the user

# Output Panel (General Output)

The screenshot shows the MOVES software interface with the title bar "MOVES - ID 5622253508016079463". The menu bar includes File, Edit, Pre Processing, Action, Post Processing, Tools, Settings, and Help. The left sidebar contains a list of output categories, each with a green checkmark icon: Description, Scale, Time Spans, Geographic Bounds, Vehicles/Equipment (with a minus icon), On Road Vehicle Equipment, Road Type, Pollutants And Processes, Manage Input Data Sets, Strategies (with a plus icon), Output (with a minus icon), General Output (highlighted with a yellow box), Output Emissions Detail (with a pink exclamation mark icon), and Advanced Performance Features. The main panel displays the "Output Database" section with a "Server:" field, a "Database:" dropdown menu set to "lake\_2015\_training\_out", and a "Create Database..." button. A yellow box highlights the "Database:" field and the "Create Database..." button. Below this, the "Units" section has three dropdown menus: "Mass Units:" set to "Grams", "Energy Units:" set to "Joules", and "Distance Units:" set to "Miles". The "Activity" section has several checkboxes: "Distance Traveled" (checked and highlighted with a yellow box), "Source Hours", "Hotelling Hours", "Source Hours Operating", "Source Hours Parked", "Population" (checked and highlighted with a yellow box), and "Starts". A yellow text box in the top right corner of the main panel contains the text: "Input the database name and make the following selections for our exercise". The bottom status bar says "Create new RunSpec".

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description  
✓ Scale  
✓ Time Spans  
! Geographic Bounds  
- ✓ Vehicles/Equipment  
✓ On Road Vehicle Equipment  
✓ Road Type  
✓ Pollutants And Processes  
✓ Manage Input Data Sets  
+ ✓ Strategies  
- ! Output  
**✓ General Output**  
! Output Emissions Detail  
✓ Advanced Performance Features

Output Database

Server:

Database: lake\_2015\_training\_out

Units

Mass Units: Grams   
Energy Units: Joules   
Distance Units: Miles

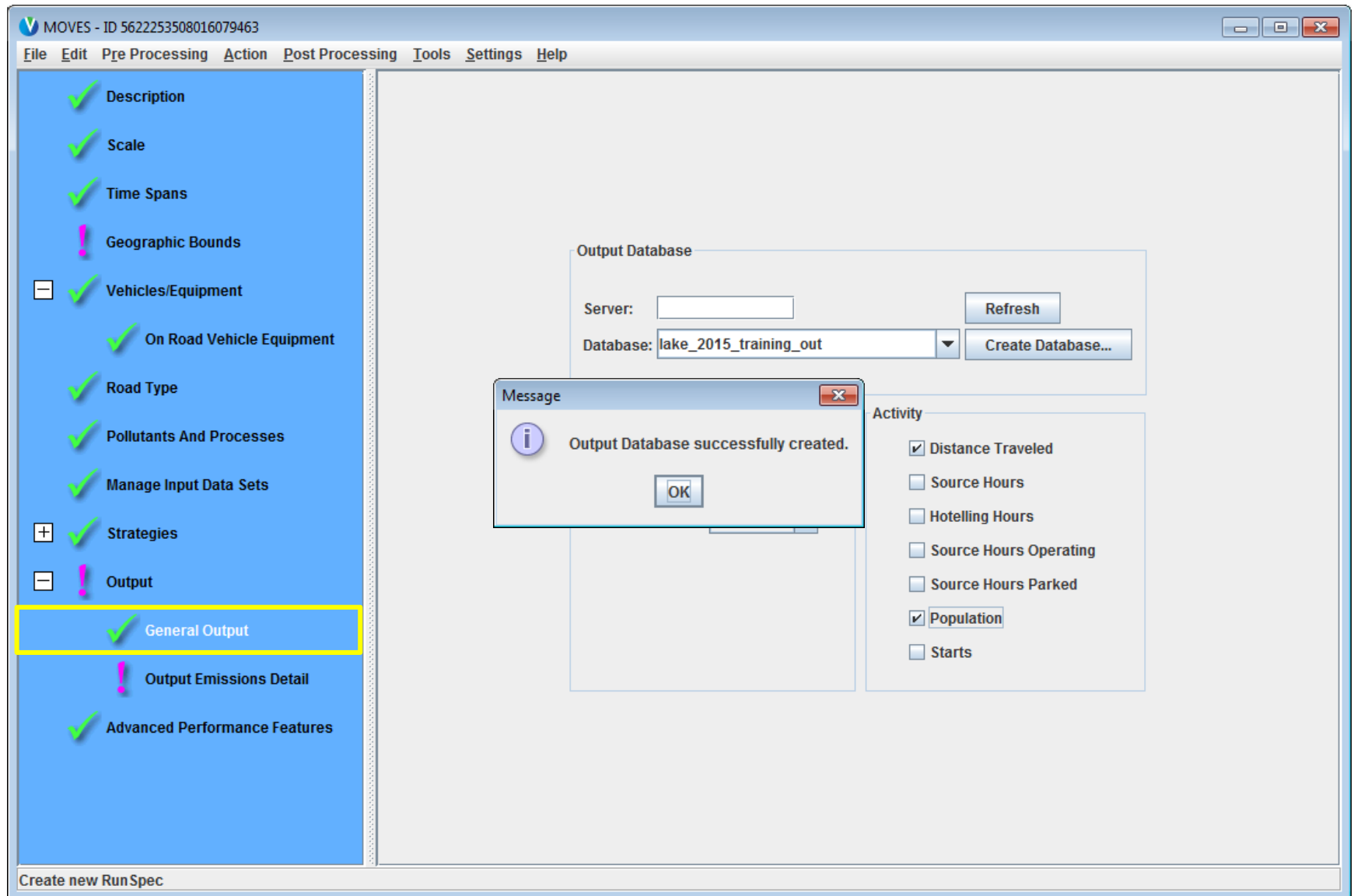
Activity

☒ Distance Traveled  
☐ Source Hours  
☐ Hotelling Hours  
☐ Source Hours Operating  
☐ Source Hours Parked  
☒ Population  
☐ Starts

Create new RunSpec

Input the database name and make the following selections for our exercise

# Output Panel (General Output)



# Output Panel (Output Emission Detail)

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help

- ✓ Description
- ✓ Scale
- ✓ Time Spans
- ! Geographic Bounds
- [-] ✓ Vehicles/Equipment
  - ✓ On Road Vehicle Equipment
  - ✓ Road Type
  - ✓ Pollutants And Processes
  - ✓ Manage Input Data Sets
- [+] ✓ Strategies
- [-] ✓ Output
  - ✓ General Output
  - ✓ **Output Emissions Detail**
  - ✓ Advanced Performance Features

**Always**

☒ Time

☒ Location

☒ Pollutant

**for All Vehicle/Equipment Categories**

☐ Model Year

☐ Fuel Type

☐ Emission Process

☐ Estimate Uncertainty

**On Road/Off Road**

☒ On Road/Off Road

**On and Off Road**

☐ Road Type

☐ Source Use Type

☐ SCC

☐ Regulatory Class

**Off Road**

☐ Sector

☐ Engine Tech.

☐ HP Class

Number of iterations:

☐ Keep pseudo-randomly sampled input

☐ Keep output from each iteration

Create new RunSpec

# Output Panel (Output Emission Detail)

- The aggregation of the Time level is up to the user
  - Generally *Hour* or *24-Hour Day* are recommended, but if *24-Hour Day* is selected detail at the Hour level will be lost
  - If *Hour* or *24-Hour Day* are selected, results must be properly weighted if emissions for longer timeframes are estimated
- At County Scale, selecting Location of *County* is recommended
- The 'for All Vehicle/Equipment Categories' and 'On Road' selections depend on the detail desired by the user
  - More selections means more detail
  - Differentiation by Source (vehicle) Type is likely most useful

# Output Panel (Output Emission Detail)

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

! Geographic Bounds

[-] ✓ Vehicles/Equipment

✓ On Road Vehicle Equipment

✓ Road Type

✓ Pollutants And Processes

✓ Manage Input Data Sets

[+] ✓ Strategies

[-] ✓ Output

✓ General Output

✓ Output Emissions Detail

✓ Advanced Performance Features

Always

☒ Time Hour

☒ Location COUNTY

☒ Pollutant

for All Vehicle/Equipment Categories

☐ Model Year

☒ Fuel Type

☒ Emission Process

☐ Estimate Uncertainty

Number of iterations: 2

☐ Keep pseudo-randomly sampled input

☐ Keep output from each iteration

On Road/Off Road

☒ On Road/Off Road

On and Off Road

☒ Road Type

☒ Source Use Type

☐ SCC

☐ Regulatory Class

Off Road

☐ Sector

☐ Engine Tech.

☐ HP Class

Create new RunSpec

Make the following selections for our exercise



# Advanced Performance Features Panel

MOVES - ID 5622253508016079463

File Edit Pre Processing Action Post Processing Tools Settings Help

- ✓ Description
- ✓ Scale
- ✓ Time Spans
- ! Geographic Bounds
- [-] ✓ Vehicles/Equipment
  - ✓ On Road Vehicle Equipment
- ✓ Road Type
- ✓ Pollutants And Processes
- ✓ Manage Input Data Sets
- [+] ✓ Strategies
- [-] ✓ Output
  - ✓ General Output
  - ✓ Output Emissions Detail
  - ✓ **Advanced Performance Features**

**Masterloopable Components**

Component			
Total Activity Generator (TAG)			
Operating Mode Distribution Generator (running OMDG)			
Start Operating Mode Distribution Generator			
Evaporative Operating Mode Distribution Generator			
Tirewear Operating Mode Distribution Generator			
Source Bin Distribution Generator (SBDG)			
Meteorology Generator			
Tank Temperature Generator			
Tank Fuel Generator			
Fuel Effects Generator			
Lookup Operating Mode Distribution Generator			
Emission Calculators			
On-Road Retrofit			
Project-Domain Total Activity Generator			
Project-Domain Operating Mode Distribution Generator (running exhaust)			
Rate Of Progress Strategy			

**Destination User Dataset**

☐ Copy Saved Generator Data

Server:  Refresh

Database:  Create Database

**Aggregation and Data Handling**

☐ Do Not Perform Final Aggregation

☐ Clear MOVEOutput after rate calculations

☐ Clear MOVEActivityOutput after rate calculations

☐ Clear BaseRateOutput after rate calculations

**Custom Input Database**

Server:  Refresh

Database:  Create Database

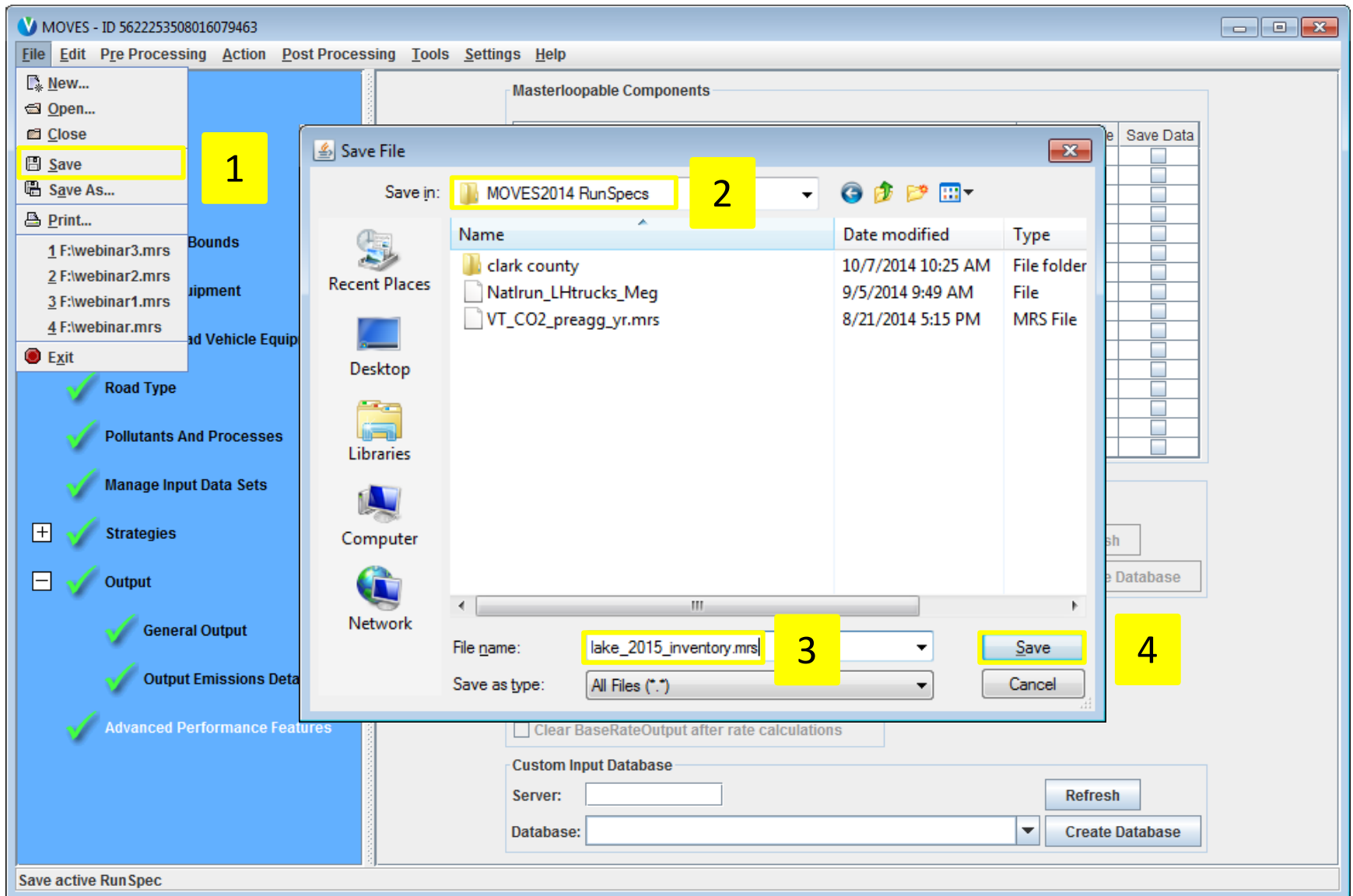
Create new RunSpec

There are no selections in this panel for our exercise

# Saving the RunSpec

- We've completed our RunSpec selections for this run. We want to save this before proceeding with the CDM
- Instructions for Developing a County-scale RunSpec:
  - Save as "lake\_2015\_inventory.mrs" in the "MOVES2014b RunSpecs" folder you created earlier

# Saving the RunSpec



# Entering Data Using the County Data Manager

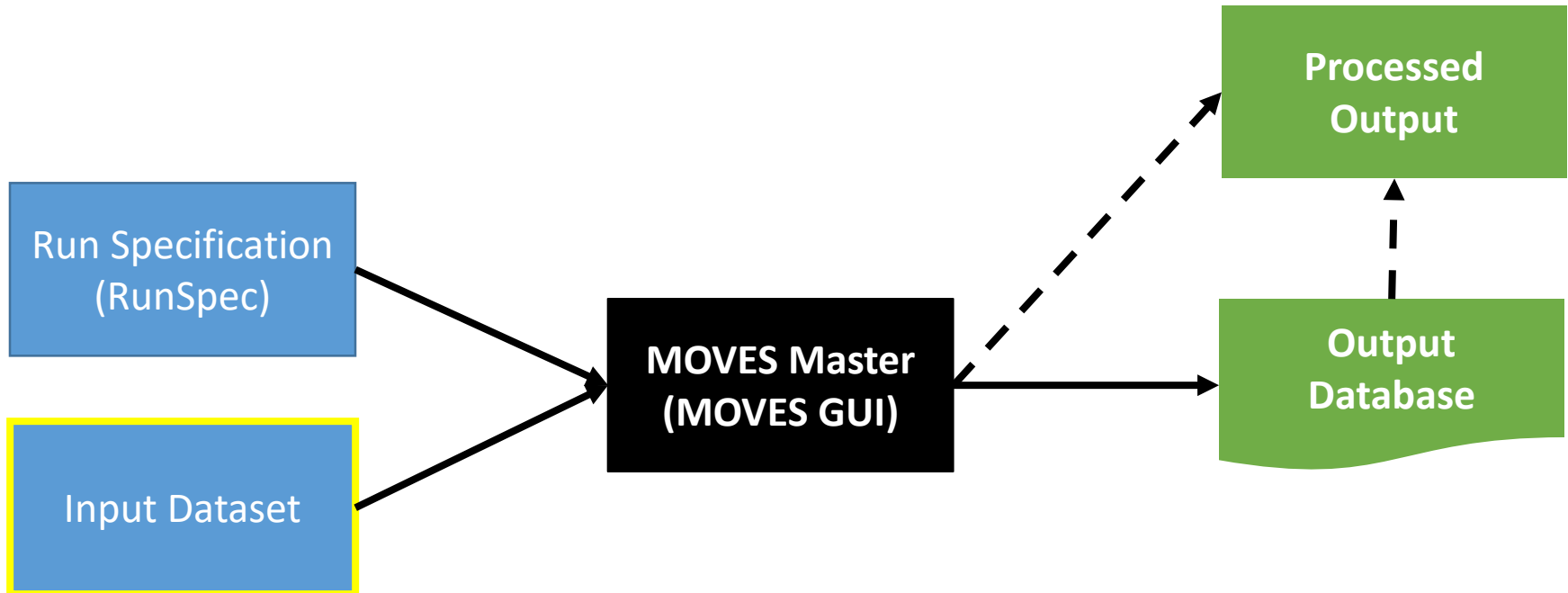


# Using MOVES: Where Are We?

Input

MOVES Functions

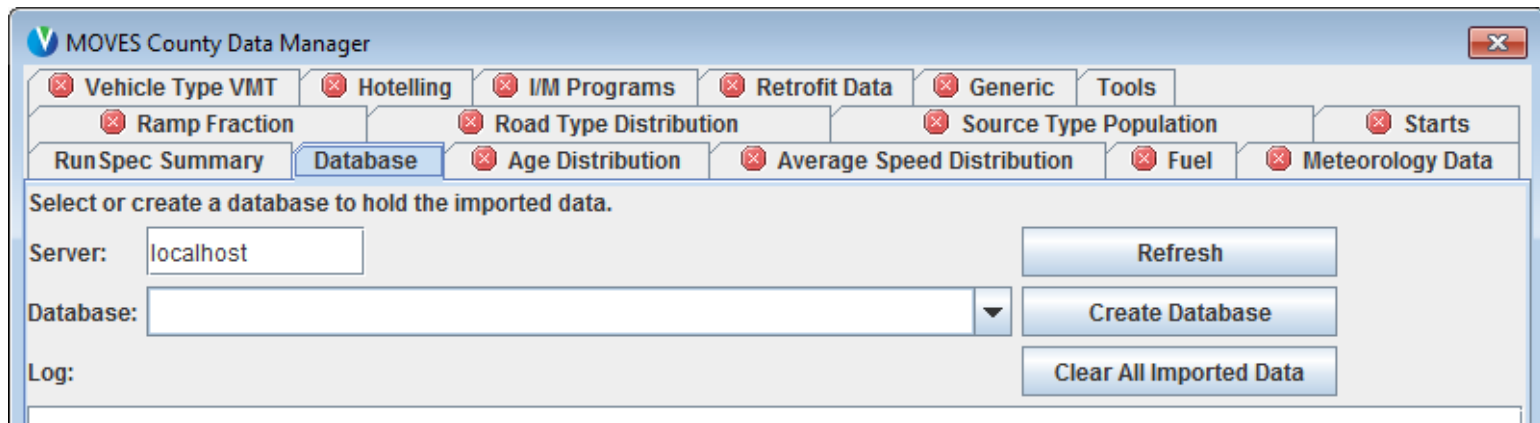
Output



We will now populate  
the input database  
using the County Data  
Manager

# What is the County Data Manager?

- The County Data Manager (CDM) is a tool that facilitates the process of entering data into a county input database
  - The data in the input database is used by MOVES when executing the run
- CDM takes the form of a separate Graphical User Interface (GUI) that is used in conjunction with the MOVES Master GUI
  - When the CDM is open, the MOVES Master GUI is frozen and no changes can be made to the RunSpec
  - Nothing done in the CDM will affect the selections in the RunSpec



# County Data Manager Functions

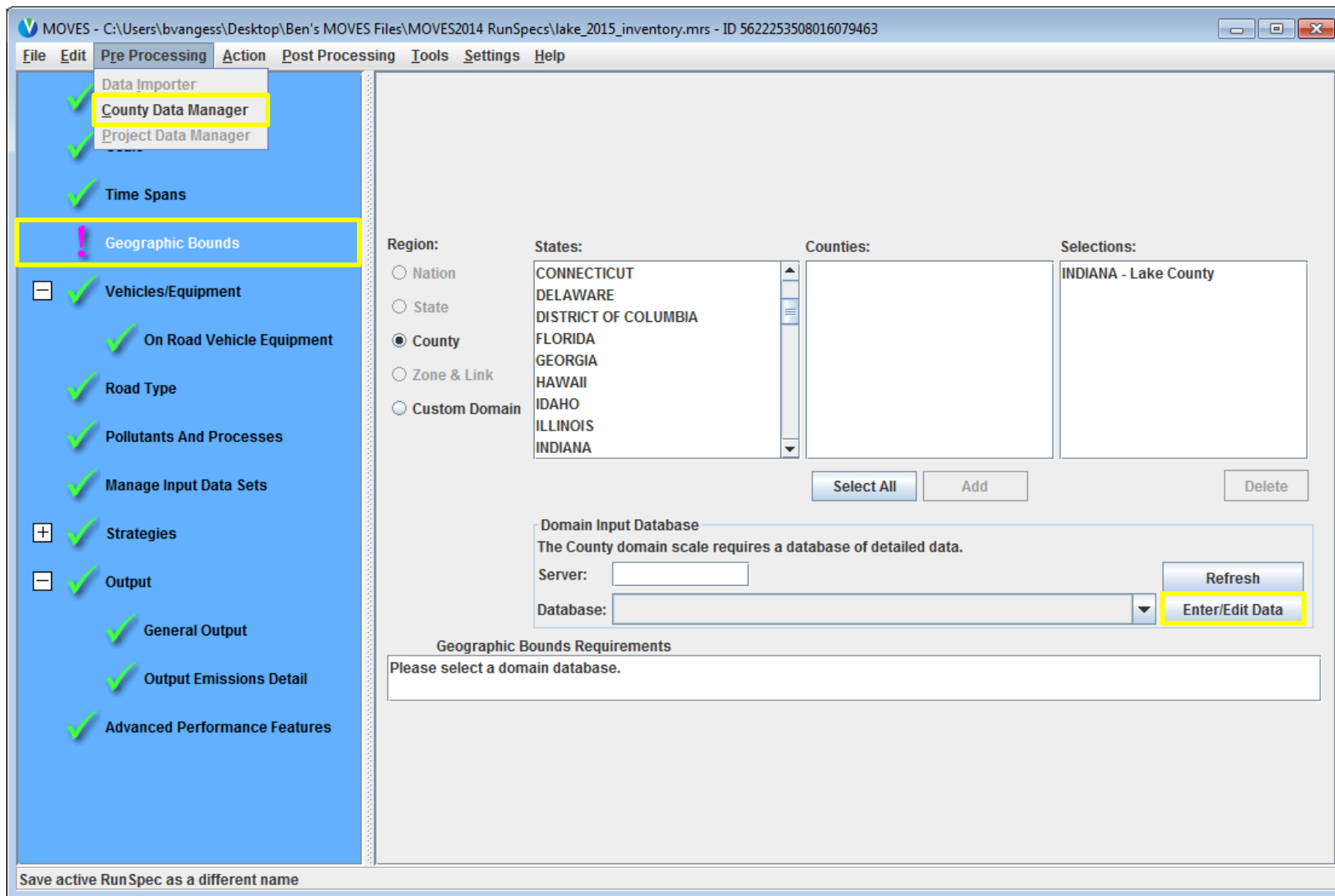
- Use the CDM to create an input database, an input at a time, by either:
  1. Creating a template of a table, in which you will enter local data, or
  2. Exporting default data (when available) to a table, in order to review and/or modify with local data
- Users manipulate data in Excel, then “Import” worksheets into the CDM
  - Data are not entered directly in the CDM
  - You can add descriptions in the CDM of data being imported to document data sources
- Using the CDM ensures the input tables are properly formatted, necessary for MOVES to run properly
- Imported data can be cleared for each tab or the entire database can be emptied
  - You should always clear previously-imported data before importing new data for the same input to prevent execution errors

# Opening the County Data Manager

- Two ways to open the CDM:
  - “Enter/Edit Data” button on the Geographic Bounds panel; or
  - Use the “Pre Processing” pull-down menu
- If the input database you want to use already exists, it can be selected in the Domain Input Database drop-down list; otherwise, new input database can be created in CDM
- **Advanced Tip: If the user plans on utilizing the batch import process, the user should not exit the CDM until all data have been imported**
  - The XML script written using the CDM Tools tab will only contain the names of the files that were imported during the active CDM session



# Opening the County Data Manager



# A Newly Opened CDM

**MOVES County Data Manager**

Vehicle Type VMT | Hotelling | I/M Programs | Retrofit Data | Generic | Tools

Ramp Fraction | Road Type Distribution | Source Type Population | Starts

RunSpec Summary | **Database** | Age Distribution | Average Speed Distribution | Fuel | Meteorology Data

Select or create a database to hold the imported data.

Server:  Refresh

Database:  Create Database

Log: Clear All Imported Data

Always start at the Database tab

Database

Done

# Using the CDM: Database Tab

- County input database is selected or created here
- Existing county input databases can be selected from the drop-down menu
- Once a county input database has been created or selected, the tables within it can be edited with the other CDM tabs
  - All the tables in the database can be cleared of data with the “Clear All Imported Data” button
- The tab also displays a log of changes

# Creating a New Input Database

MOVES County Data Manager

Vehicle Type VMT Hotelling I/M Programs Retrofit Data Generic Tools

Ramp Fraction Road Type Distribution Source Type Population Starts

RunSpec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Select or create a database to hold the imported data.

Server: localhost Refresh

Database: lake\_2015\_training\_in 1 Create Database 2

Log: Clear All Imported Data

Message

Database successfully created.

OK

Best practice: End input database names with “\_in” to help identify them as input databases

Database

Done

# Using the CDM: RunSpec Summary Tab





The screenshot shows the 'MOVES County Data Manager' application window. The 'RunSpec Summary' tab is selected and highlighted with a yellow border. The window contains several sections of configuration data:

- Output Database Server Name:** [using default]
- Output Database Name:** lake\_2015\_training\_out
- Time Spans:**
  - Aggregate By: Hour
  - Years: 2015
  - Months: July
  - Days: Weekdays
  - Hours: Begin Hour: 00:00 - 00:59, End Hour: 23:00 - 23:59
- Geographic Bounds:**
  - COUNTY geography
  - Selection: INDIANA - Lake County
- On Road Vehicle Equipment:**
  - Diesel Fuel - Light Commercial Truck
  - Diesel Fuel - Passenger Car
  - Diesel Fuel - Passenger Truck
  - Diesel Fuel - Transit Bus
  - Ethanol (E-85) - Light Commercial Truck
  - Ethanol (E-85) - Passenger Car

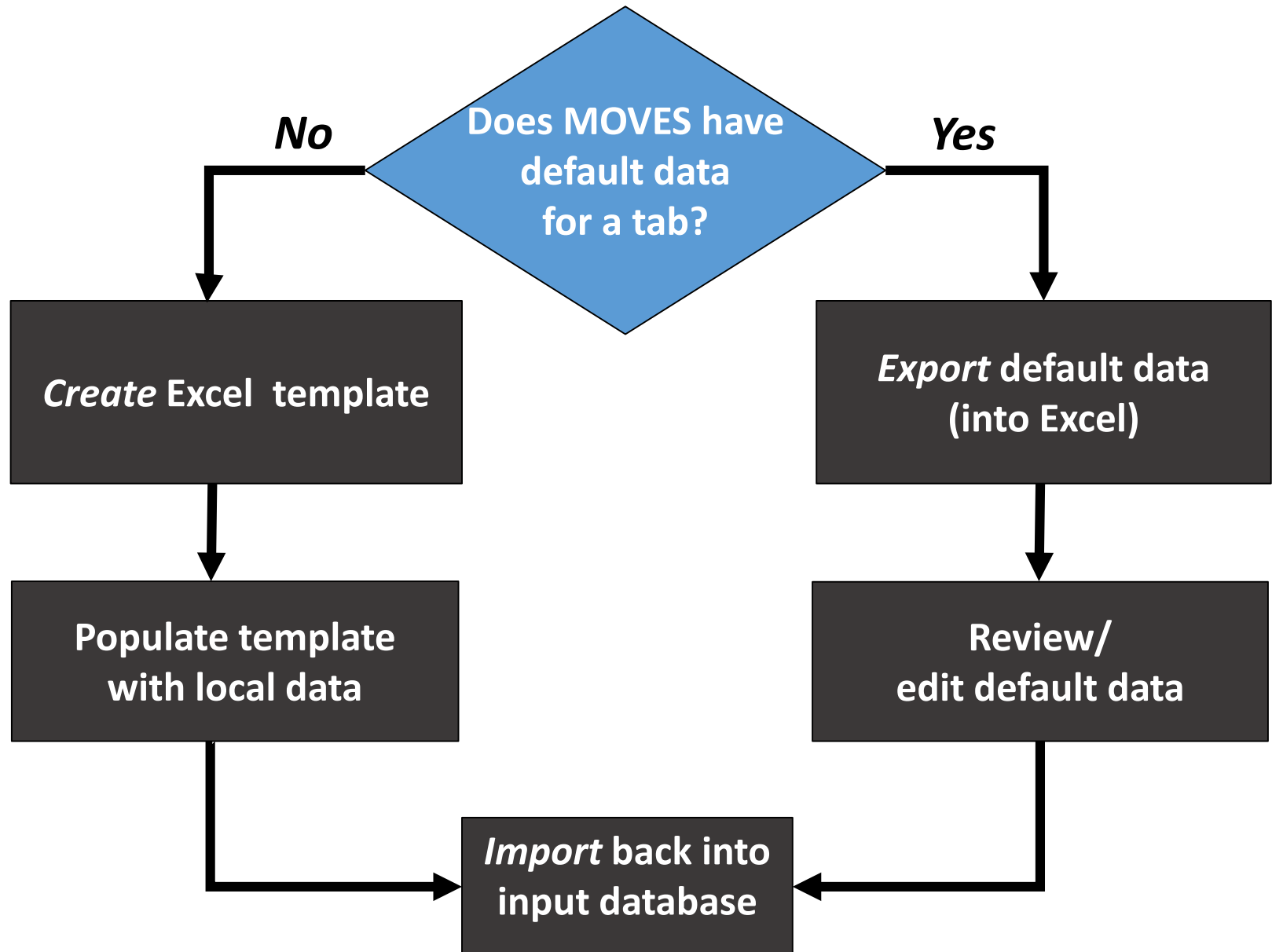
A yellow text box is overlaid on the right side of the window, stating: 'This tab restates selections made in the RunSpec – a helpful reference while using the CDM'.

The bottom of the window features an orange bar with the text 'RunSpec Summary' and a 'Done' button.

# Using the CDM: Tabs for Inputs

-  and  symbols for each tab are determined by the relationship between the selections made in the RunSpec and the data provided by the user
-  appears when the user has provided data that is sufficient and passes error checks for all parameters in the RunSpec
  - note that several tabs begin with a green check (optional inputs)
-  appears if the user has not provided enough information or if there is an error with the data provided

Enter Data One of Two Ways for Tabs with a  :

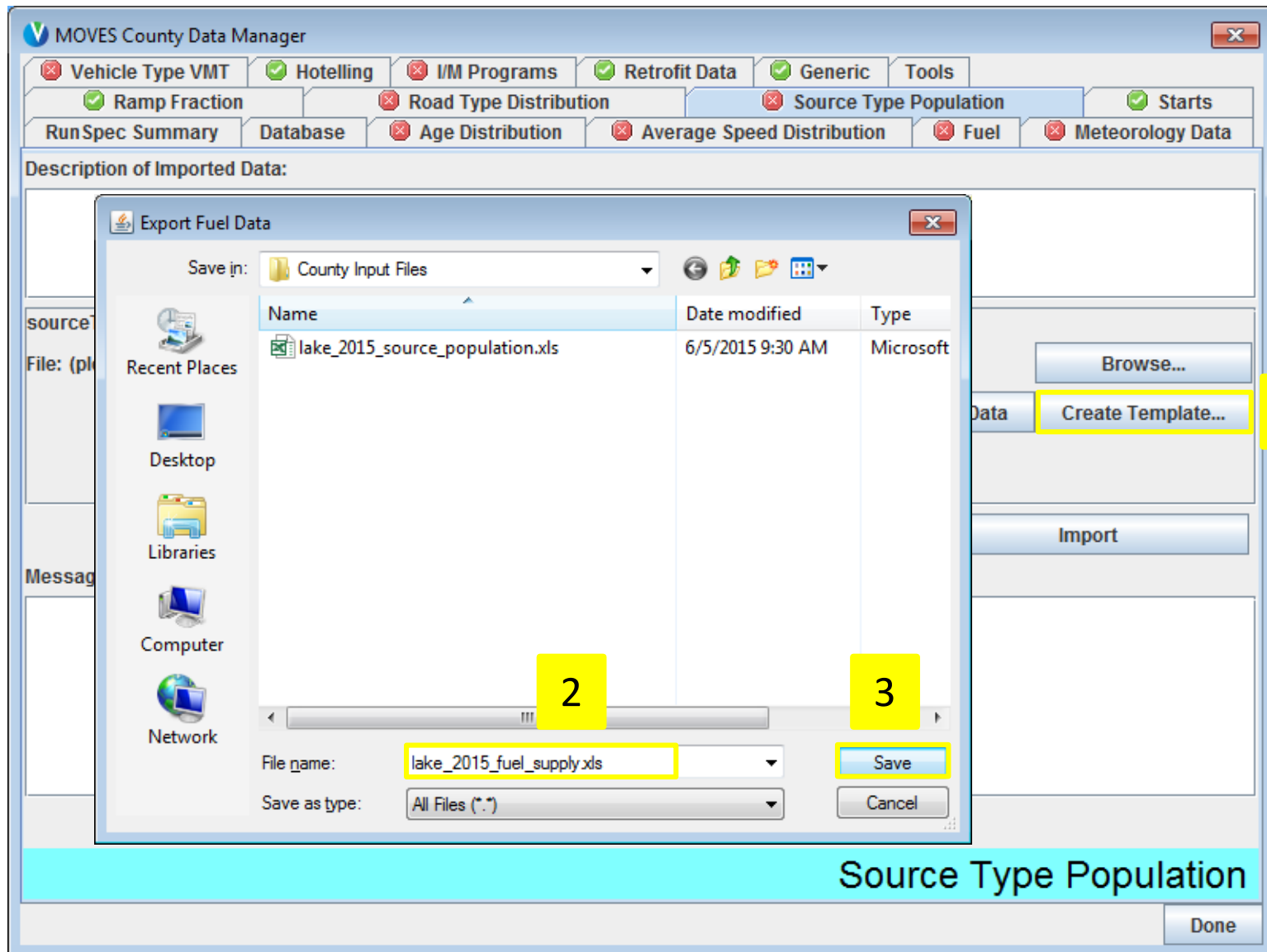


# Using the CDM: Creating a Template

- *A//* tabs provide the option of creating an Excel template spreadsheet of the appropriate MOVES table
  - Save as .xls extension to get a spreadsheet format
- Templates contain the proper fields/column headings, but have blank cells for user-specified data
- The template will be pre-populated with some data based on entries made in the RunSpec
  - This is why you should always complete all RunSpec panels first!
- Templates contain extra worksheets that will help you decipher MOVES codes



# Example: Creating a Template



# Example: Creating a Template

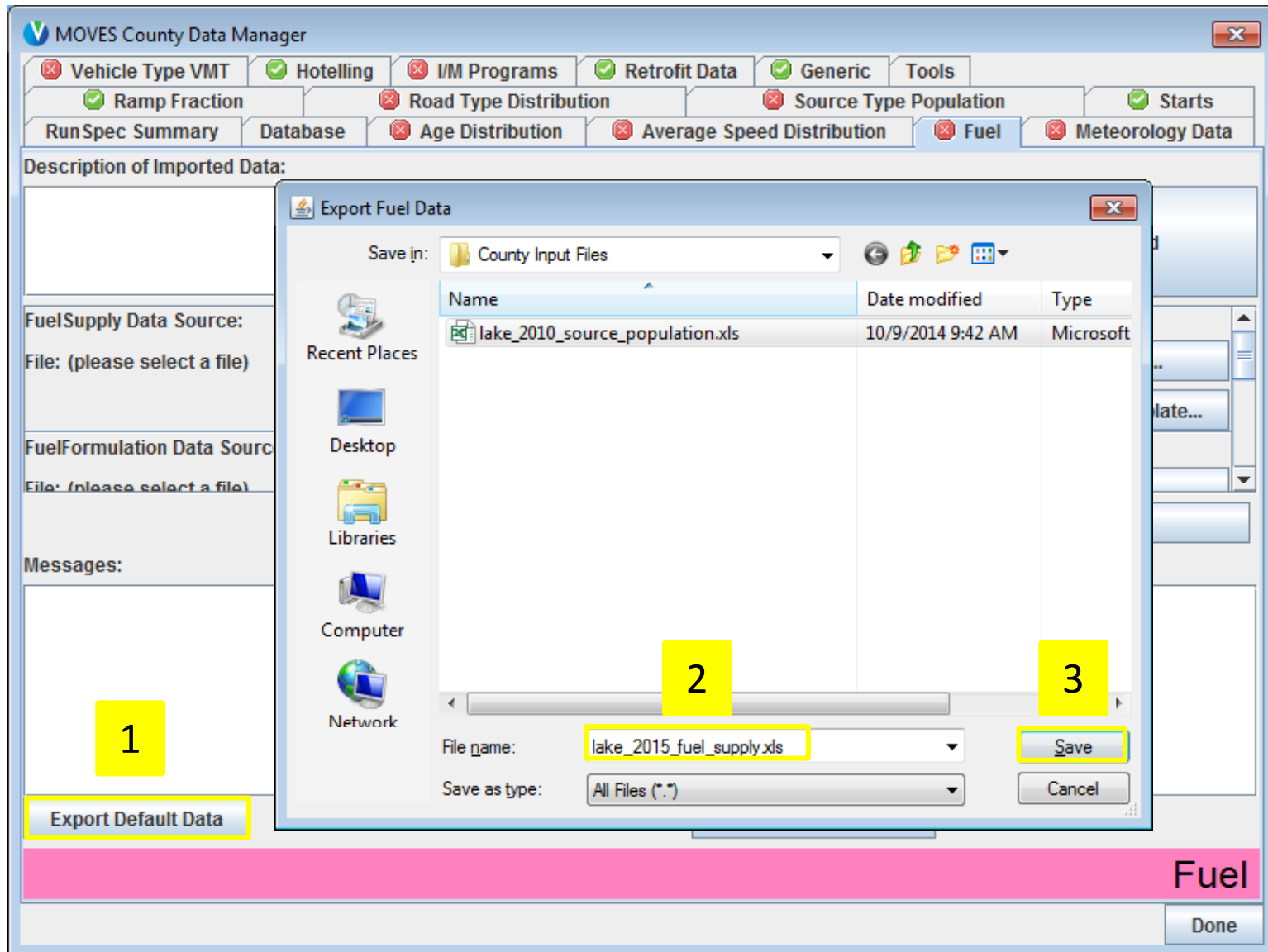
	A	B	C	D	E	F	G	H
1	yearID	sourceTypeID	sourceTypePopulation					
2	2015	21						
3	2015	31						
4	2015	32						
5	2015	42						
6								

- Example template of SourceTypeYear table created from the “Source Type Population” tab of the CDM
- Note that “YearID” and “SourceTypeID” have been pre-populated based on RunSpec selections; “SourceTypePopulation” fields will need to be filled in by the user

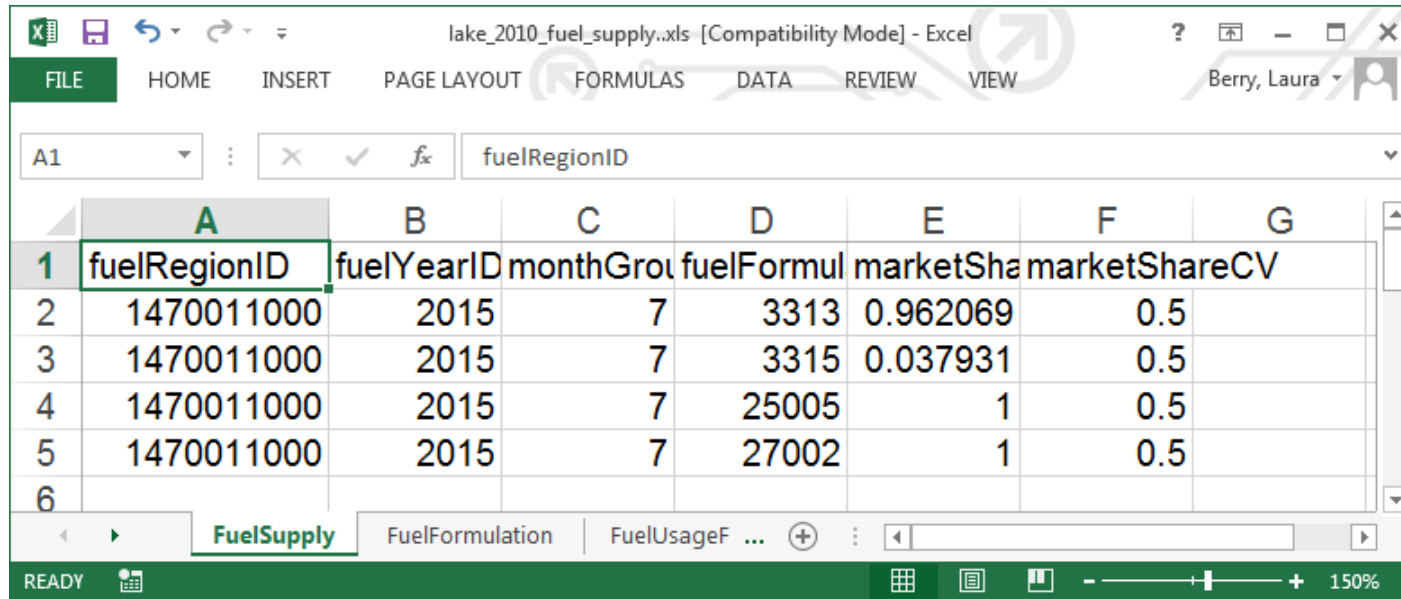
# Using the CDM: Exporting Default Data

- *Some* tabs have default data available:
  - Average Speed Distribution
  - Ramp Fraction
  - Fuel (Fuel Supply, Fuel Formulation, Fuel Usage, AVFT)
  - Meteorology Data
  - Vehicle Type VMT (only Month, Day, and Hour VMT Fractions)
  - I/M Programs
  - Hotelling (only Hotelling Activity Distribution)
- Tabs with default data will have “Export Default Data” option

# Example: Exporting Default Data



# Example: Exporting Default Data



lake\_2010\_fuel\_supply.xls [Compatibility Mode] - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW Berry, Laura

A1 : fuelRegionID

	A	B	C	D	E	F	G
1	fuelRegionID	fuelYearID	monthGroup	fuelFormul	marketShare	marketShareCV	
2	1470011000	2015	7	3313	0.962069	0.5	
3	1470011000	2015	7	3315	0.037931	0.5	
4	1470011000	2015	7	25005	1	0.5	
5	1470011000	2015	7	27002	1	0.5	
6							

FuelSupply FuelFormulation FuelUsageF ...




READY 150%

- Example of exported default data for FuelSupply table created from the “Fuel” tab of the CDM
- Per MOVES Technical Guidance, you should check default data to ensure applicability and make any changes
- Default data spreadsheets contain extra worksheets that will help you decipher MOVES codes

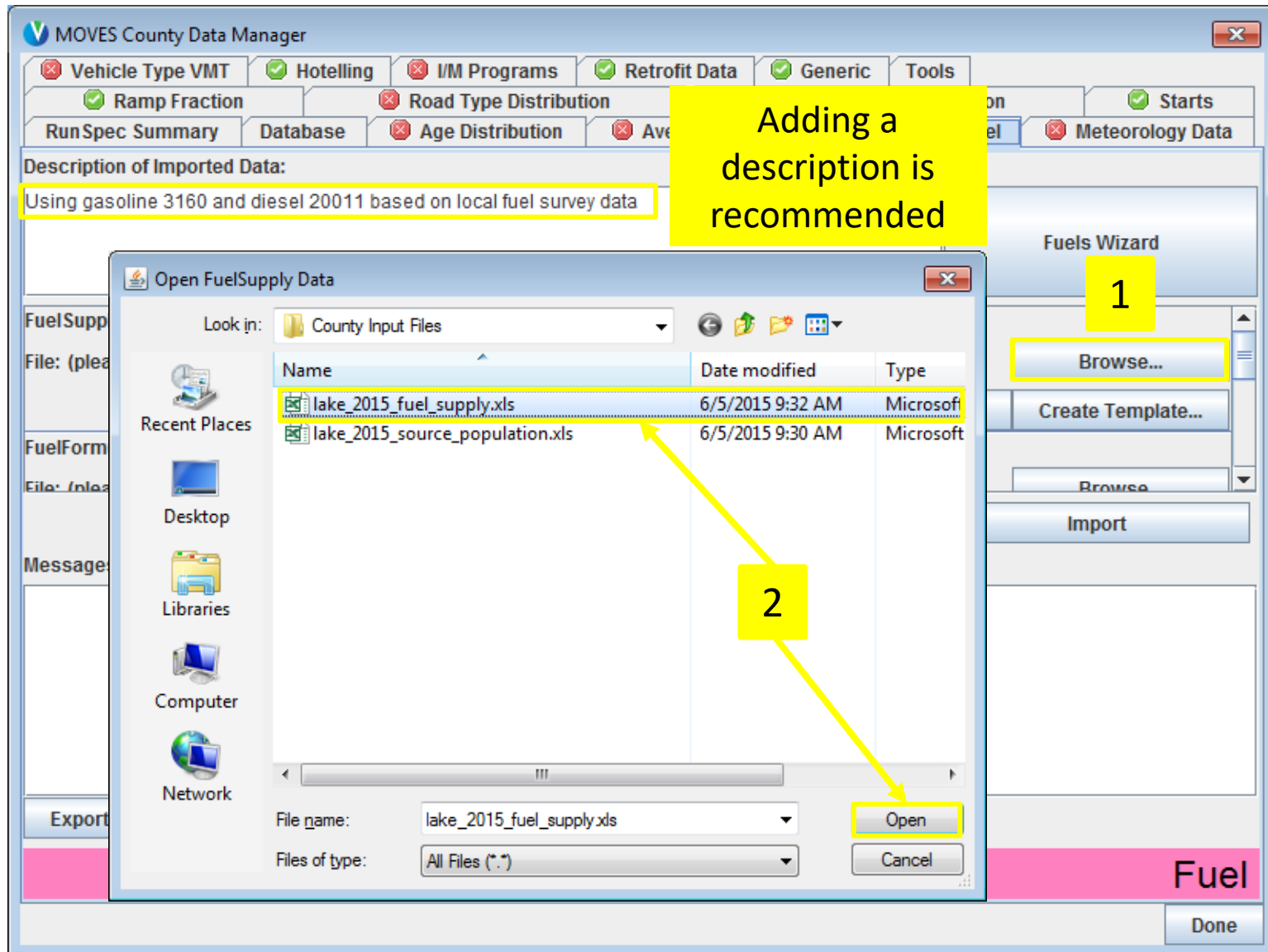
# Using the CDM: Importing Data

- Data must be imported back into the CDM from Excel for each tab (even when using default data for a tab)
- Imported data are read from a Excel worksheet that has been properly formatted with the correct columns
- General steps:
  - 1) Recommended: Add a description of the data you are about to import (e.g., the file location or data source)
  - 2) Browse to find the correct Excel file
  - 3) Select the Excel file
  - 4) Select the appropriate worksheet (name should match Data Source in the CDM tab)
  - 5) Click the “Import” button
- Tip – Some tabs require you to enter multiple worksheets. You will have to repeat steps 2-4 for each worksheet, but you only have to do step 5 once.

# Using the CDM: Importing Data

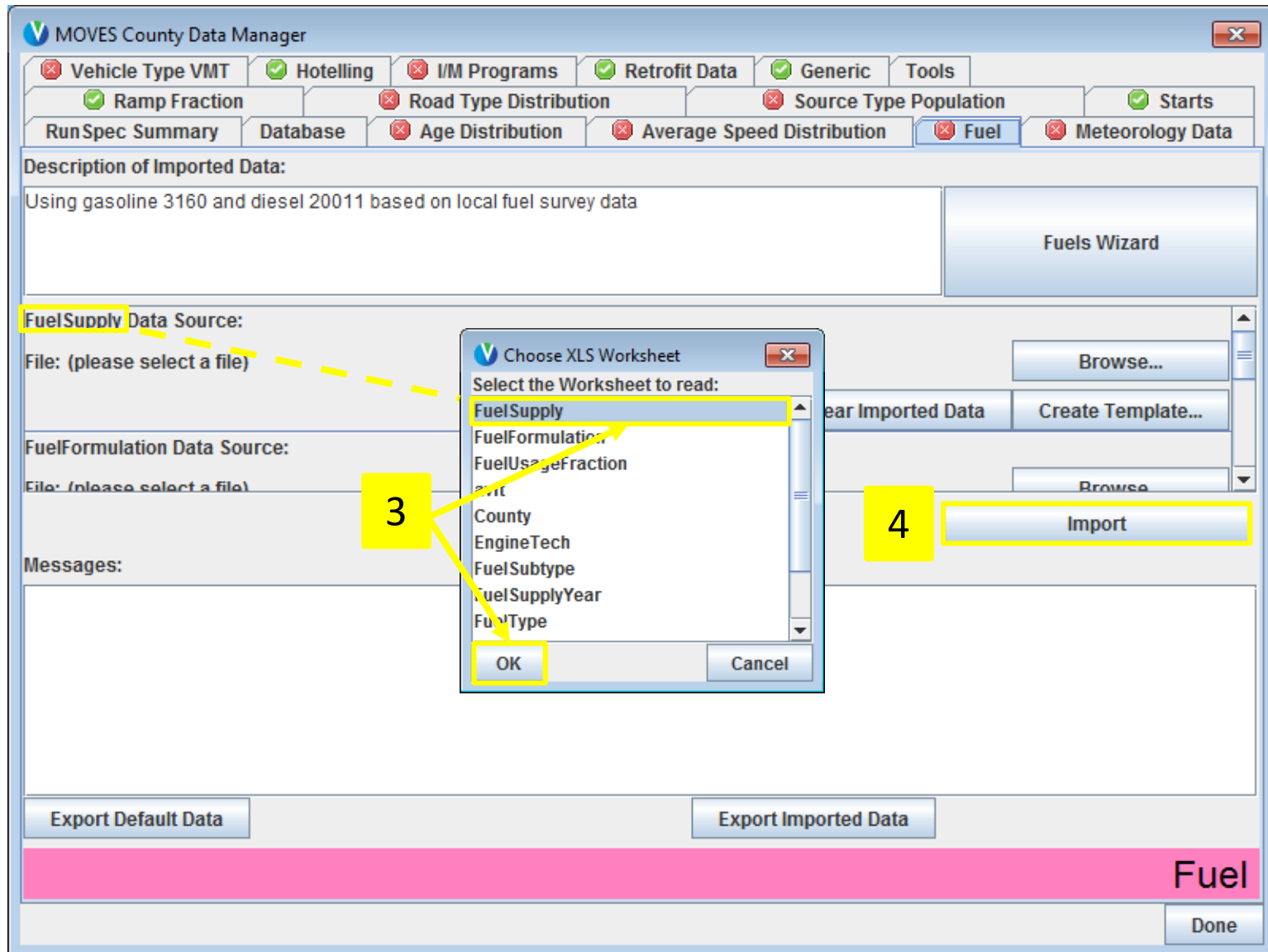
- Check to see if you get an “Import Complete” message
- When the import is successfully completed the  will change to a  on the County Data Manager tab
  - If message says, “Import Complete” but  remains, that means more data are required (e.g., data was not provided for all source types selected in the RunSpec)
  - For many tables, unused data can be imported (e.g., extra months, hours, source types, etc.) with no adverse impacts; however, data for additional counties and years should NOT be imported as this can cause errors when attempting to execute the RunSpec
- The description you entered will appear in the log, which can be viewed on the Database tab

# Example: Importing Data





# Example: Importing Data



# Example: Importing Data (Con't)

The screenshot shows the MOVES County Data Manager application window. The 'Database' tab is selected and highlighted with a yellow box. The interface includes a toolbar with various data sources, some of which are checked (e.g., Hotelling, Retrofit Data, Generic, Starts) and others are not (e.g., Vehicle Type VMT, I/M Programs, Road Type Distribution, Source Type Population, Age Distribution, Average Speed Distribution, Fuel, Meteorology Data). Below the toolbar, there is a section for selecting or creating a database to hold imported data. This section includes input fields for 'Server' (localhost) and 'Database' (lake\_2015\_training\_in), along with buttons for 'Refresh', 'Create Database', and 'Clear All Imported Data'. A log entry is displayed in a text area, which is also highlighted with a yellow box. The log entry reads: '2016-09-24 10:45:45.0 Fuel Filled FuelSupply table Using gasoline 3160 and diesel 20011 based on local fuel survey data'. At the bottom of the window, there is a green bar with the text 'Database' and a 'Done' button.

MOVES County Data Manager

Vehicle Type VMT Hotelling I/M Programs Retrofit Data Generic Tools

Ramp Fraction Road Type Distribution Source Type Population Starts

RunSpec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Select or create a database to hold the imported data.

Server: localhost Refresh

Database: lake\_2015\_training\_in Create Database

Log: Clear All Imported Data

2016-09-24 10:45:45.0 Fuel Filled FuelSupply table  
Using gasoline 3160 and diesel 20011 based on local fuel survey data

Database

Done

Database tab log shows FuelSupply has been imported (with date/time stamp, and any text included in the "Description of Imported Data")

# CDM: Entering Local Data



# Entering Data Using the CDM: Overview

- We will go through each data input (MOVES table) that can be accessed through each CDM tab
- We will look at the fields in each input table and go over EPA's MOVES Technical Guidance for that input
- After discussing each input, we will enter the appropriate data for our county-level inventory exercise for Lake County
  - Exercise files can be found in the "County Level Inventory" folder

# Summary of Data Inputs

- Meteorology Data tab
  - Temperature and humidity inputs
  - County level defaults available in CDM
  - MOVES table: ZoneMonthHour
- Vehicle Type VMT
  - Total annual or daily VMT, by HPMS vehicle type or MOVES source type
  - Also month, day, and hour VMT fractions
  - No defaults available for VMT in CDM
  - National defaults available for month, day, and hour VMT fractions in CDM
  - MOVES table: HPMSVTypeYear (and others)
- Source Type Population
  - Number (i.e., population) of local vehicles operating in the area
  - No defaults available in CDM
  - MOVES table: SourceTypeYear

# Summary of Data Inputs

- Age Distribution
  - Age fractions of fleet by age and source type
  - No defaults available in CDM
  - National defaults and projection tool available on MOVES Tools web page
  - MOVES table: SourceTypeAgeDistribution
- Average Speed Distribution
  - Speed distribution by road type, hour and source (vehicle) type
  - National defaults available in CDM
  - MOVES table: AvgSpeedDistribution
- Road Type Distribution
  - Fraction of source type VMT on different road types
  - No defaults available in CDM
  - MOVES table: RoadTypeDistribution

# Summary of Data Inputs

- Fuel
  - Market share and composition of fuel blends
  - County level defaults available in CDM
  - MOVES tables: FuelSupply, FuelFormulation, FuelUsage, and AVFT
- I/M Programs
  - Data on I/M program(s), if any
  - County level defaults available in CDM
  - MOVES table: IMCoverage
- Starts
  - Provides information on vehicle starts
  - Optional input, default start activity determined by vehicle population
  - MOVES table: Starts (and others)

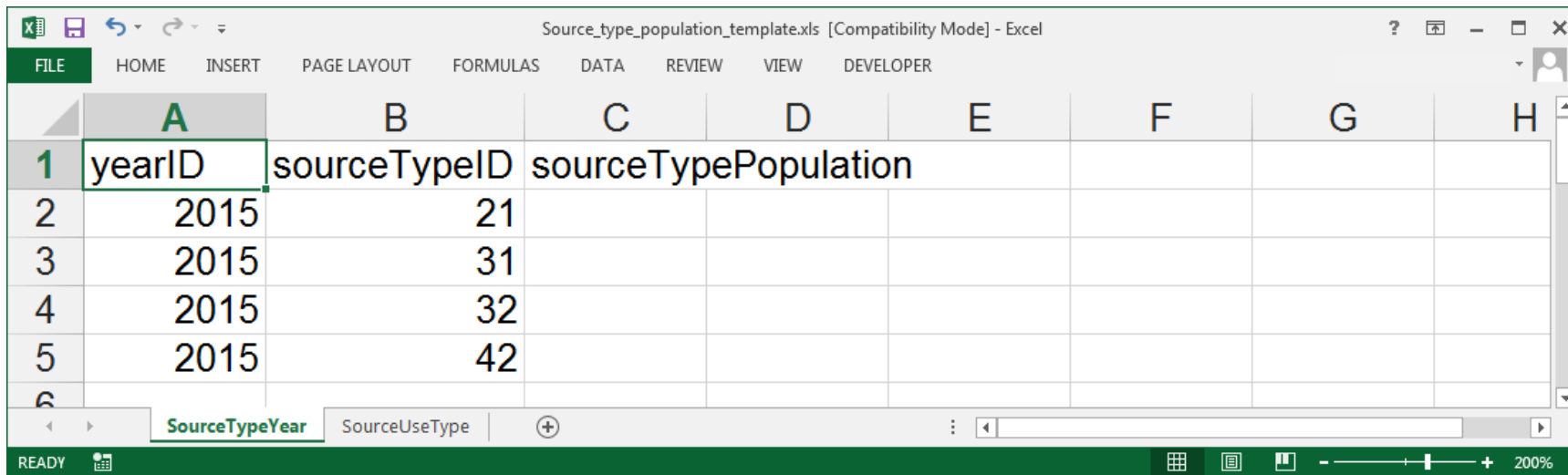
# Summary of Data Inputs

- Hotelling
  - Information on hours and type of hotelling activity
  - Optional input, default hotelling hours determined by local road type distribution
  - Default national distribution of type of hoteling activity available in CDM
  - MOVES tables: HotellingActivityDistribution and HotellingHours
- Ramp Fraction
  - Fraction of freeway VHT occurring on ramps
  - Optional input, national default available in CDM
  - MOVES table: RoadType
- Retrofit Data
  - Defines retrofit programs
  - Optional input, no defaults available in CDM
  - MOVES table: onRoadRetrofit



# Source Type Population

- This input is an example of creating and filling out a template
- Source Type Population is the actual number of vehicles of each “source type” (vehicle type) in the county being modeled



	A	B	C	D	E	F	G	H
1	yearID	sourceTypeID	sourceTypePopulation					
2	2015	21						
3	2015	31						
4	2015	32						
5	2015	42						
6								

# Source Type Population: Guidance

- Section 4.3 of MOVES Technical Guidance
- MOVES uses vehicle population to estimate start and evaporative emissions
- Local population data are again recommended
  - Based on registration or I/M data, for instance
- Vehicle population growth must be handled outside the model since MOVES at the county scale only runs one year
  - Vehicle population for future years can be scaled in proportion to VMT or human population growth

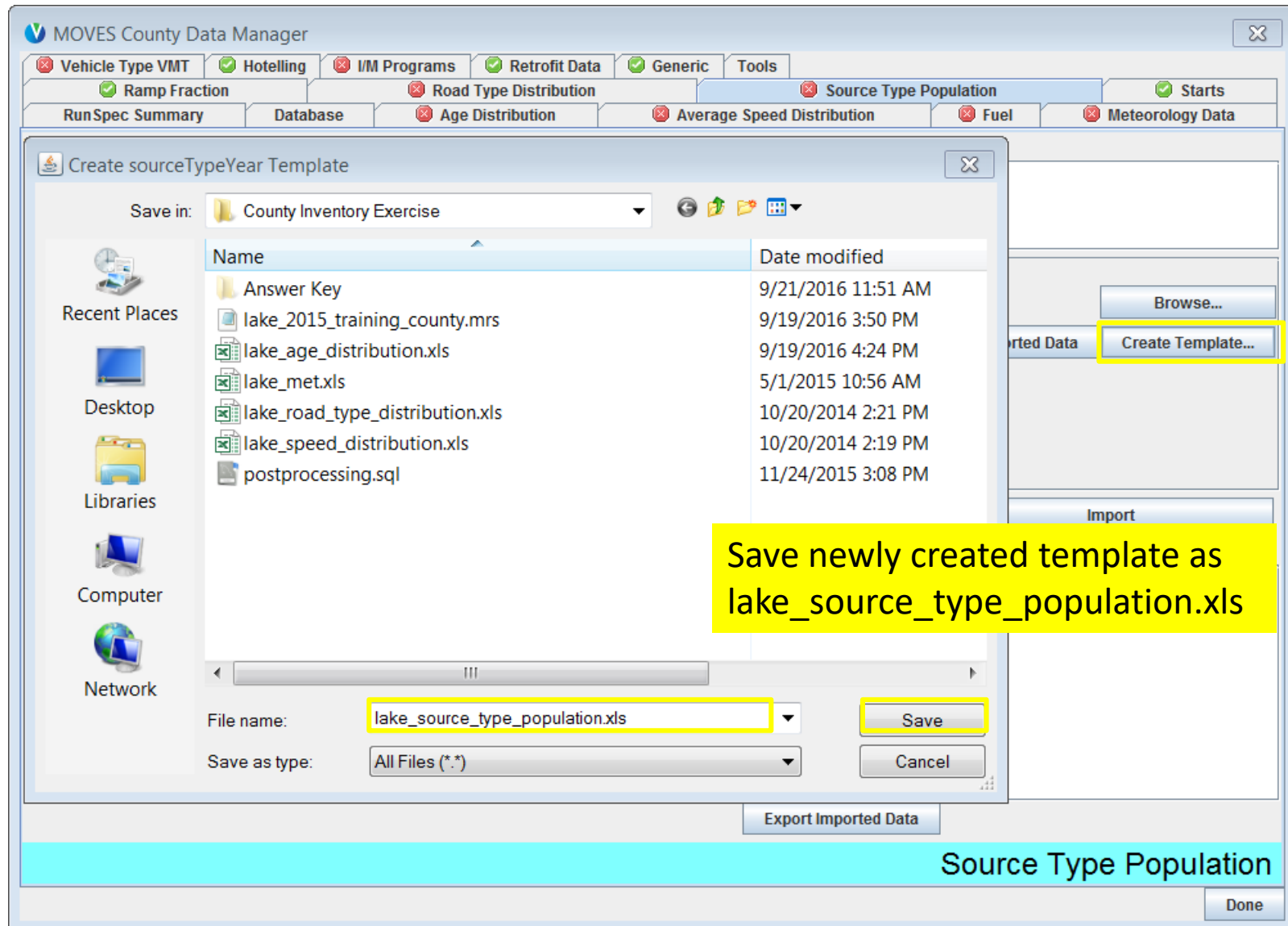
# Source Type Population: Guidance

- Only local vehicles need to be included in population
  - Local vehicles are those that have a significant portion of their starts and parked hours in the county
  - Pass-through vehicles do not have to be included in population, but their VMT must be included in the Vehicle Type VMT tab
- Sources of population data
  - Use local registration data for motorcycles, passenger cars and light trucks
  - Use data from transit agencies, school districts, refuse haulers for buses and refuse trucks
  - If information is not available for other vehicle classes, their local population can be estimated by using the ratio of MOVES default population to MOVES default VMT and then applying that same ratio to local VMT.

# Source Type Population: Exercise

- Let's enter source type population data into the CDM for our county-level exercise
- We have passenger car and truck populations from local registration data
  - 50,000 passenger cars
  - 25,000 passenger trucks
  - 25,000 light commercial trucks
- The number of transit buses is known by the fleet operator
  - 200 buses
- Next, we will create a template, enter and save our local population data in Excel, open the data file in the CDM, select the correct worksheet, import the worksheet into the CDM, and check for errors

# Creating the Source Type Population Data Template



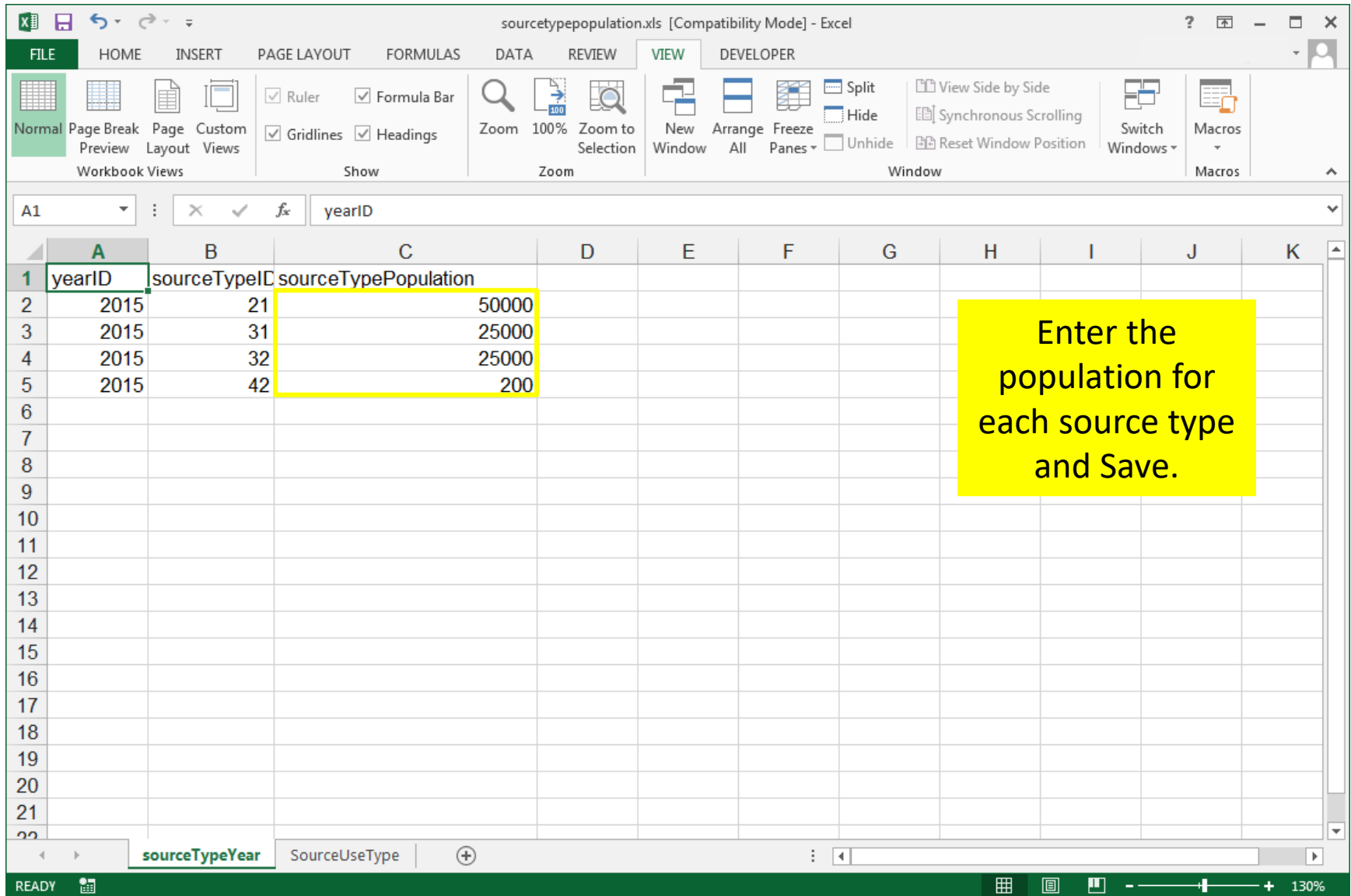
# Entering Source Type Population Data into the Template

The screenshot shows the Microsoft Excel interface with the file 'sourcetypepopulation.xls' open in Compatibility Mode. The ribbon is set to the 'VIEW' tab. The spreadsheet contains the following data:

	A	B	C	D	E	F	G	H	I	J	K
1	yearID	sourceTypeID	sourceTypePopulation								
2	2015	21									
3	2015	31									
4	2015	32									
5	2015	42									
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											

A yellow callout box on the right side of the spreadsheet contains the text: 'Source type population template, as exported'.

# Entering Source Type Population Data into the Template

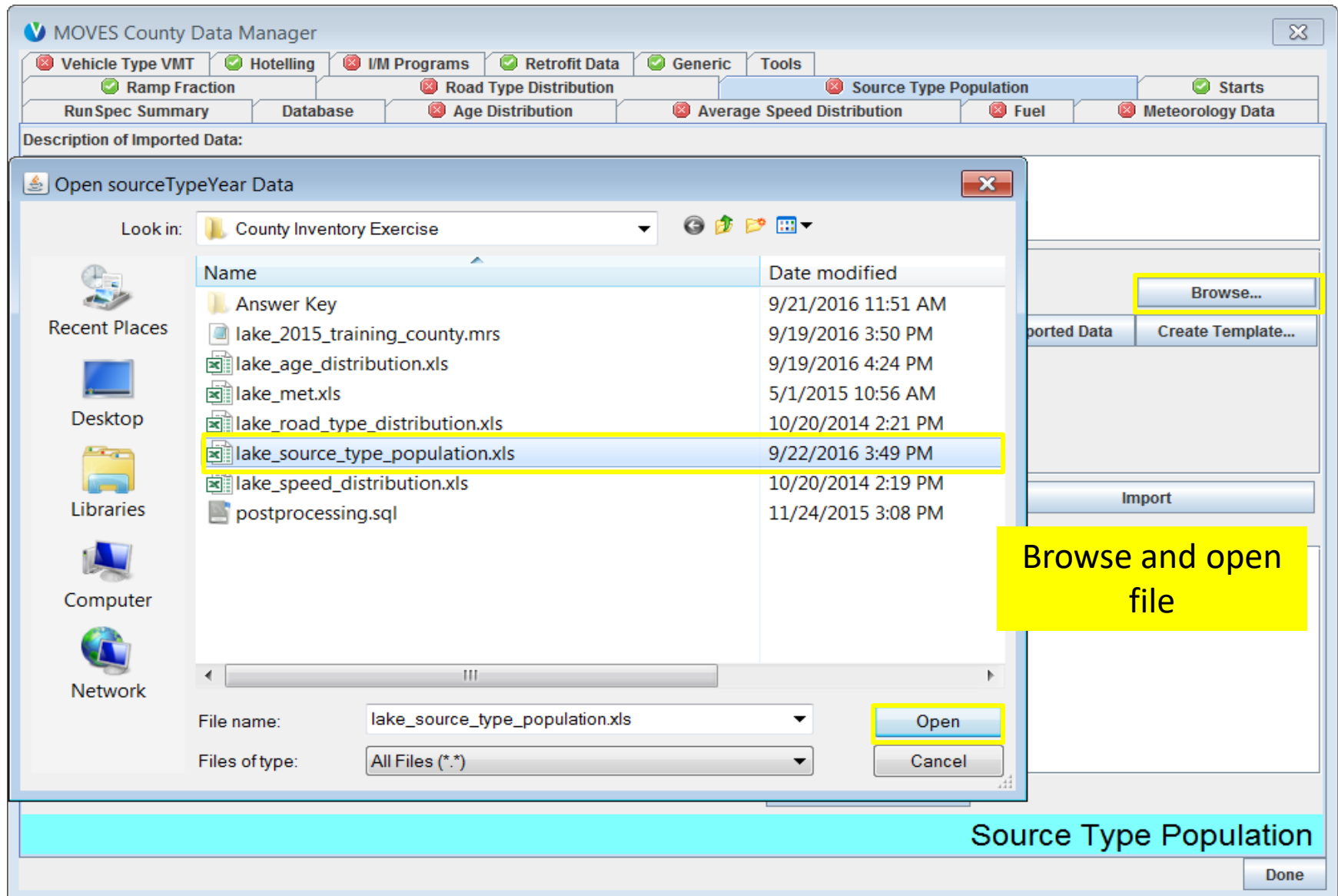


The screenshot shows the Microsoft Excel interface with the file "sourcetypepopulation.xls" open in Compatibility Mode. The ribbon is set to the "VIEW" tab. The spreadsheet contains the following data:

	A	B	C	D	E	F	G	H	I	J	K
1	yearID	sourceTypeID	sourceTypePopulation								
2	2015	21	50000								
3	2015	31	25000								
4	2015	32	25000								
5	2015	42	200								
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											

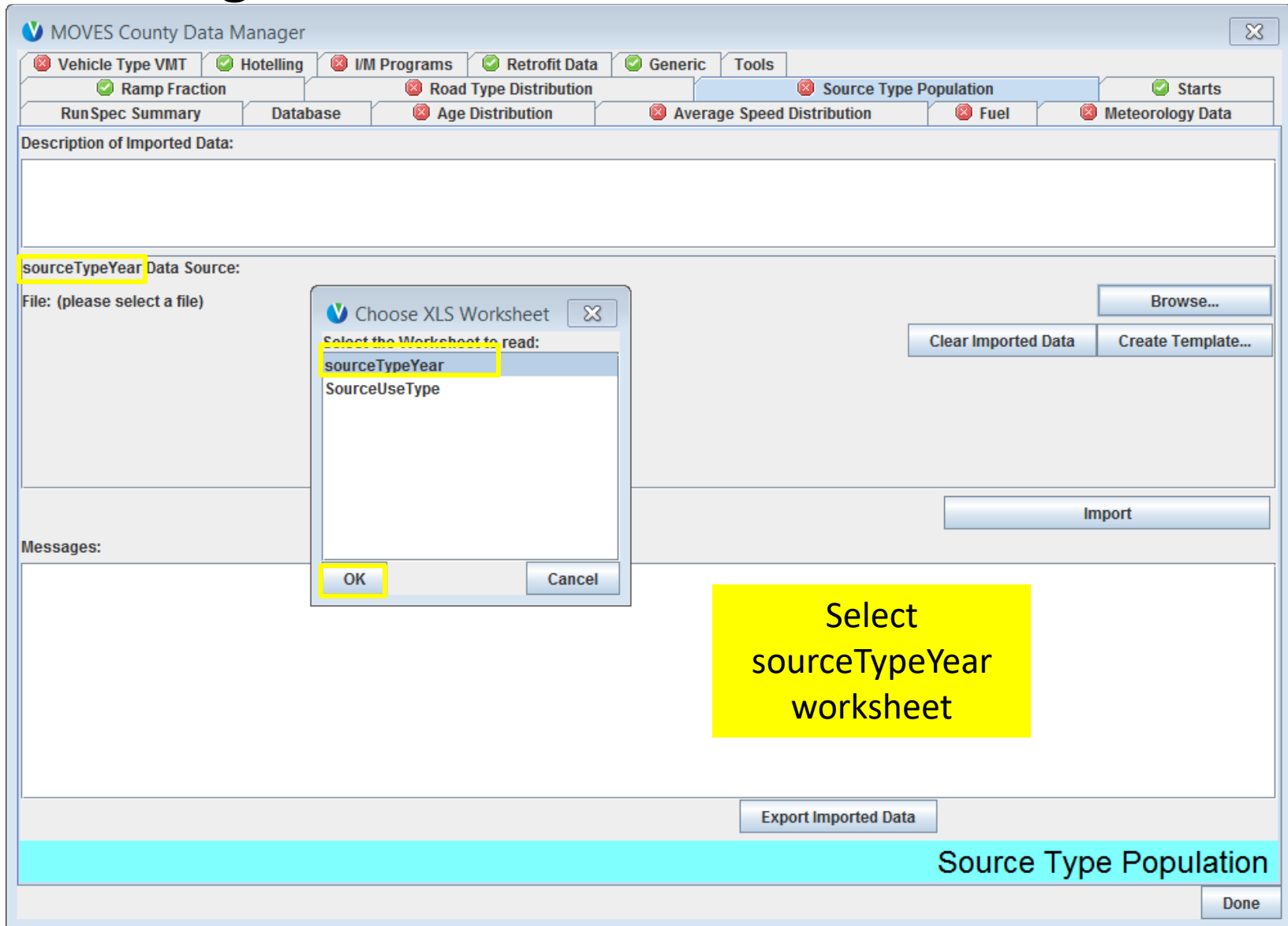
A yellow box highlights the cells in columns B and C for rows 2 through 5. A yellow callout box with the text "Enter the population for each source type and Save." is positioned to the right of the data entry area.

# Adding Source Type Population to the CDM: Opening the Data File





# Adding Source Type Population to the CDM: Selecting the Worksheet



# Adding Source Type Population to the CDM: Importing the Worksheet

MOVES County Data Manager

Vehicle Type VMT ☒ Hotelling ☒ I/M Programs ☒ Retrofit Data ☒ Generic ☒ Tools

Ramp Fraction ☒ Road Type Distribution ☒ Source Type Population ☒ Starts ☒

RunSpec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Description of Imported Data:

sourceTypeYear Data Source:

File: lake\_source\_type\_population.xls

XLS, sourceTypeYear

Browse...

Clear Imported Data Create Template...

Import

Messages:

Import worksheet

Export Imported Data

Source Type Population

Done

# Adding Source Type Population Data to the CDM: Checking for Errors

The screenshot displays the MOVES County Data Manager application window. The title bar reads "MOVES County Data Manager". The interface features a series of tabs at the top, each with a status icon (red X or green checkmark). The tabs are: Vehicle Type VMT (red X), Hotelling (green checkmark), I/M Programs (red X), Retrofit Data (green checkmark), Generic (green checkmark), Tools, Ramp Fraction (green checkmark), Road Type Distribution (red X), Source Type Population (green checkmark, highlighted with a yellow box), Starts (green checkmark), RunSpec Summary, Database, Age Distribution (red X), Average Speed Distribution (red X), Fuel (red X), and Meteorology Data (red X).

Below the tabs is a section titled "Description of Imported Data:" which is currently empty.

The "sourceTypeYear Data Source:" section contains the text "File: lake\_source\_type\_population.xls" (highlighted with a yellow box) and "XLS, sourceTypeYear" (also highlighted with a yellow box). To the right of this text are three buttons: "Browse...", "Clear Imported Data", and "Create Template...". A large yellow box is overlaid on this section with the text: "Check for correct filename, worksheet name, no error messages, green check mark".

Below the "sourceTypeYear Data Source:" section is a section titled "Messages:". It contains a message box with the text "SourceTypeYear imported. Import complete." (highlighted with a yellow box). To the right of the messages is an "Import" button.

At the bottom of the window is an "Export Imported Data" button. A light blue bar at the very bottom of the window contains the text "Source Type Population" and a "Done" button.

# Inspection & Maintenance (I/M) Programs

- This input is an example of exporting default information, reviewing, and modifying it
- Only one I/M program can be applied to each pollutant-process, source type, fuel type, model year combination
- IMProgramID is arbitrary number but must be unique for each fuel type, inspection frequency, test standard combination

im.xls [Compatibility Mode] - Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
	polProcess	stateID	countyID	yearID	sourceType	fuelTypeID	IMProgram	inspectFreq	testStandard	begModelYr	endModelYr	useIMyn	complianceFactor				
1																	
2	101	18	18089	2015	21	1	1	2	11	1976	1980	Y	95				
3	101	18	18089	2015	21	1	6	2	33	1981	1995	Y	95				
4	101	18	18089	2015	21	1	10	2	51	1996	2013	Y	95				
5	101	18	18089	2015	21	5	1	2	11	1976	1980	Y	95				
6	101	18	18089	2015	21	5	6	2	33	1981	1995	Y	95				
7	101	18	18089	2015	21	5	10	2	51	1996	2013	Y	95				
8	101	18	18089	2015	31	1	1	2	11	1976	1980	Y	95				
9	101	18	18089	2015	31	1	6	2	33	1981	1995	Y	95				
10	101	18	18089	2015	31	1	10	2	51	1996	2013	Y	95				
11	101	18	18089	2015	31	5	1	2	11	1976	1980	Y	95				
12	101	18	18089	2015	31	5	6	2	33	1981	1995	Y	95				

IMCoverage CountyState FuelType IMInspectFreq IMPollutantProc ...

# I/M Programs: Guidance

- Section 4.10 of MOVES Technical Guidance
- MOVES uses a single “compliance factor” to account for the program compliance rate, waiver rate, and an adjustment to account for I/M programs which may not cover an entire source type because the program only applies to certain weight classes
- The general equation for finding compliance factor is:

$$\text{Compliance Factor} = \frac{\% \text{ Compliance Rate}}{100} \times (100\% - \text{waiver rate}) \times \text{Regulatory class coverage adjustment}$$

# I/M Programs: Guidance

- If separate I/M programs apply to different weight classes within the same source type, the two programs cannot be accounted for in a single RunSpec
  - If such a situation exists, assume the I/M program that covers a larger amount of the VMT within the source type applies to all weight classes for which there is an I/M program
- Consult MOVES Technical Guidance (Section 4.11) and User Guide for detailed instructions on how to construct I/M inputs
- Note: I/M inputs do not affect direct PM or GHG emissions, but do affect some precursors

# I/M Programs: Exercise

- Let's enter our I/M data into the CDM for our county-level exercise
- MOVES will have default data for our county I/M program. However, we need to update the compliance factor to 95%
- Next, we will export the default Lake County, change the compliance factors and save in Excel, open the data file in the CDM, select the correct worksheet, import the worksheet into the CDM, and check for errors.
- Note: The I/M Programs importer includes a checkbox labeled “No I/M Program”. Check this box to get a green check for an area without an I/M program or to compare emissions with and without I/M
  - Checking box removes I/M coverage table from county database
  - When unchecking box, you will need to re-import I/M coverage table

# Exporting Default I/M Programs Data

MOVES County Data Manager

Vehicle Type VMT Hotelling I/M Programs Retrofit Data Generic Tools

Ramp Fraction Road Type Distribution Source Type Population Starts

Run Spec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Export I/M Programs Data

Save in: County Inventory Exercise

Name	Date modified
Answer Key	9/21/2016 11:51 AM
lake_2015_training_county.mrs	9/19/2016 3:50 PM
lake_age_distribution.xls	9/19/2016 4:24 PM
lake_met.xls	5/1/2015 10:56 AM
lake_road_type_distribution.xls	10/20/2014 2:21 PM
lake_source_type_population.xls	9/22/2016 3:49 PM
lake_speed_distribution.xls	10/20/2014 2:19 PM
postprocessing.sql	11/24/2015 3:08 PM

Recent Places Desktop Libraries Computer Network

File name: lake\_im.xls Save

Save as type: All Files (\*.\*) Cancel

Export Default Data Export Imported Data

I/M Programs Done

Export default data, save as lake\_im.xls



# Reviewing Default I/M Programs Data

im.xls [Compatibility Mode] - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW DEVELOPER

Paste Clipboard Font Alignment Number Styles Cells Editing

A1 : polProcessID

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	polProcessID	stateID	countyID	yearID	sourceType	fuelTypeID	IMProgram	inspectFreq	testStandard	begModelYear	endModelYear	useIMyn	complianceFactor				
2	101	18	18089	2015	21	1	1	2	11	1976	1980	Y	93.12				
3	101	18	18089	2015	21	1	6	2	33	1981	1995	Y	93.12				
4	101	18	18089	2015	21	1	10	2	51	1996	2013	Y	93.12				
5	101	18	18089	2015	21	5	201	2	11	1976	1980	Y	93.12				
6	101	18	18089	2015	21	5	206	2	33	1981	1995	Y	93.12				
7	101	18	18089	2015	21	5	210	2	51	1996	2013	Y	93.12				
8	101	18	18089	2015	31	1	1	2	11	1976	1980	Y	93.12				
9	101	18	18089	2015	31	1	6	2	33	1981	1995	Y	93.12				
10	101	18	18089	2015	31	1	10	2	51	1996	2013	Y	93.12				
11	101	18	18089	2015	31	5	201	2	11	1976	1980	Y	93.12				
12	101	18	18089	2015	31	5	206	2	33	1981	1995	Y	93.12				
13	101	18	18089	2015	31	5	210	2	51	1996	2013	Y	93.12				
14	101	18	18089	2015	32	1	1	2	11	1976	1980	Y	93.12				
15	101	18	18089	2015	32	1	6	2	33	1981	1995	Y	93.12				
16	101	18	18089	2015	32	1	10	2	51	1996							
17	101	18	18089	2015	32	5	201	2	11	1976							
18	101	18	18089	2015	32	5	206	2	33	1981							
19	101	18	18089	2015	32	5	210	2	51	1996							
20	102	18	18089	2015	21	1	1	2	11	1976							
21	102	18	18089	2015	21	1	6	2	33	1981							
22	102	18	18089	2015	21	1	10	2	51	1996							
23	102	18	18089	2015	21	5	201	2	11	1976							
24	102	18	18089	2015	21	5	206	2	33	1981							
25	102	18	18089	2015	21	5	210	2	51	1996							
26	102	18	18089	2015	31	1	1	2	11	1976							
27	102	18	18089	2015	31	1	6	2	33	1981							
28	102	18	18089	2015	31	1	10	2	51	1996	2013	Y	93.12				

IMCoverage CountyState FuelType IMInspectFreq IMPollutantProc ...

READY 100%

lake\_im.xls as exported with default data

Default compliance factor = 93.12%

# Changing I/M Programs Data

im.xls [Compatibility Mode] - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW DEVELOPER

Paste Clipboard Font Alignment Number Styles Cells Editing

M1 : X ✓ fx complianceFactor

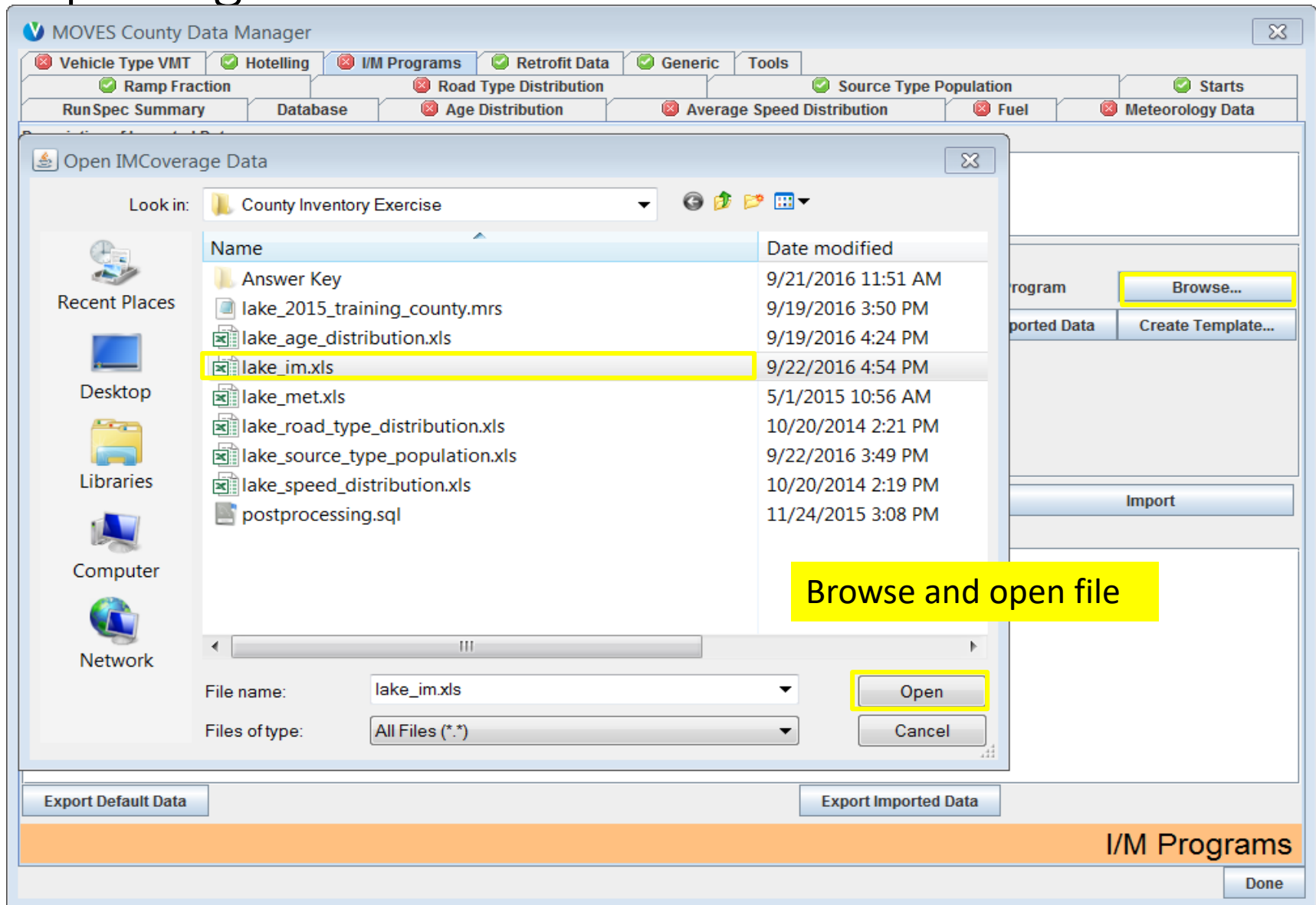
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	polProcess	stateID	countyID	yearID	sourceType	fuelTypeID	IMProgram	inspectFre	testStand	begModelY	endModelY	uselMyn	complianceFactor				
2	101	18	18089	2015	21	1	1	2	11	1976	1980	Y	95				
3	101	18	18089	2015	21	1	6	2	33	1981	1995	Y	95				
4	101	18	18089	2015	21	1	10	2	51	1996	2013	Y	95				
5	101	18	18089	2015	21	5	1	2	11	1976	1980	Y	95				
6	101	18	18089	2015	21	5	6	2	33	1981	1995	Y	95				
7	101	18	18089	2015	21	5	10	2	51	1996	2013	Y	95				
8	101	18	18089	2015	31	1	1	2	11	1976	1980	Y	95				
9	101	18	18089	2015	31	1	6	2	33	1981	1995	Y	95				
10	101	18	18089	2015	31	1	10	2	51	1996	2013	Y	95				
11	101	18	18089	2015	31	5	1	2	11	1976	1980	Y	95				
12	101	18	18089	2015	31	5	6	2	33	1981	1995	Y	95				
13	101	18	18089	2015	31	5	10	2	51	1996	2013	Y	95				
14	101	18	18089	2015	32	1	1	2	11	1976	1980	Y	95				
15	101	18	18089	2015	32	1	6	2	33	1981	1995	Y	95				
16	101	18	18089	2015	32	1	10	2	51	1996	2013	Y	95				
17	101	18	18089	2015	32	5	1	2	11	1976	1980	Y	95				
18	101	18	18089	2015	32	5	6	2	33	1981	1995	Y	95				
19							10	2	51	1996	2013	Y	95				
20							1	2	11	1976	1980	Y	95				
21							6	2	33	1981	1995	Y	95				
22							10	2	51	1996	2013	Y	95				
23							1	2	11	1976	1980	Y	95				
24							6	2	33	1981	1995	Y	95				
25							10	2	51	1996	2013	Y	95				
26	102	18	18089	2015	31	1	1	2	11	1976	1980	Y	95				
27	102	18	18089	2015	31	1	6	2	33	1981	1995	Y	95				
28	102	18	18089	2015	31	1	10	2	51	1996	2013	Y	95				

IMCoverage CountyState FuelType IMInspectFreq IMPollutantProc ...

READY 100%

Change the compliance rate to 95% for all source types and Save

# Adding I/M Programs to the CDM: Opening the Data File



# Adding I/M Programs Data to the CDM: Selecting the Worksheet

The screenshot shows the MOVES County Data Manager application window. The 'I/M Programs' tab is selected in the top navigation bar. Below the tabs, there is a 'Description of Imported Data' section. In the 'Data Source:' section, the text 'IMCoverage' is highlighted in yellow. Below this, there is a 'File: (please select a file)' label. A dialog box titled 'Choose XLS Worksheet' is open, showing a list of worksheets: 'IMCoverage', 'County State', 'FuelType', 'IMInspectFreq', 'IMPollutantProcessAssoc', 'IMTestStandards', and 'SourceUseType'. The 'IMCoverage' worksheet is highlighted in yellow. To the right of the dialog box, there are buttons for 'No I/M Program', 'Browse...', 'Clear Imported Data', and 'Create Template...'. Below these buttons is an 'Import' button. At the bottom of the window, there are buttons for 'Export Default Data' and 'Export Imported Data'. A yellow box with the text 'Select IMCoverage worksheet' is overlaid on the dialog box. The bottom status bar shows 'I/M Programs' and a 'Done' button.

MOVES County Data Manager

Vehicle Type VMT Hotelling I/M Programs Retrofit Data Generic Tools

Ramp Fraction Road Type Distribution Source Type Population Starts

Run Spec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Description of Imported Data:

IMCoverage Data Source:

File: (please select a file)

Choose XLS Worksheet

Select the Worksheet to read:

- IMCoverage
- County State
- FuelType
- IMInspectFreq
- IMPollutantProcessAssoc
- IMTestStandards
- SourceUseType

OK Cancel

No I/M Program Browse...

Clear Imported Data Create Template...

Import

Messages:

Export Default Data Export Imported Data

I/M Programs

Done

Select IMCoverage worksheet

# Adding I/M Programs Data to the CDM: Importing the Worksheet

The screenshot shows the MOVES County Data Manager application window. The 'I/M Programs' tab is selected in the top navigation bar. Below the tabs, there is a 'Description of Imported Data' section, an 'IMCoverage Data Source' section, and a 'Messages' section. The 'IMCoverage Data Source' section shows the file 'lake\_im.xls' and the format 'XLS, IMCoverage'. The 'Import' button is highlighted with a yellow rectangle. A yellow text box with the text 'Import IMCoverage worksheet' is overlaid on the 'Messages' section. The bottom of the window has buttons for 'Export Default Data', 'Export Imported Data', and 'Done'.

MOVES County Data Manager

Vehicle Type VMT Hotelling I/M Programs Retrofit Data Generic Tools

Ramp Fraction Road Type Distribution Source Type Population Starts

RunSpec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Description of Imported Data:

IMCoverage Data Source:

File: lake\_im.xls

XLS, IMCoverage

☐ No I/M Program Browse...

Clear Imported Data Create Template...

Import

Messages:

Import IMCoverage worksheet

Export Default Data Export Imported Data

I/M Programs

Done

# Adding I/M Programs Data to the CDM: Checking for Errors

The screenshot shows the MOVES County Data Manager application window. The 'I/M Programs' tab is selected and highlighted with a yellow box. The 'Description of Imported Data' section is empty. The 'IMCoverage Data Source' section shows 'File: lake\_im.xls' and 'XLS, IMCoverage' both highlighted with yellow boxes. A yellow text box in the center of the window contains the instruction: 'Check for correct filename, worksheet name, no error messages, green check mark'. The 'Messages' section at the bottom left shows a green checkmark and the text 'IMCoverage imported. Import complete.', which is also highlighted with a yellow box. The bottom right of the window has an orange bar with the text 'I/M Programs' and a 'Done' button.

MOVES County Data Manager

Vehicle Type VMT Hotelling **I/M Programs** Retrofit Data Generic Tools

Ramp Fraction Road Type Distribution Source Type Population Starts

RunSpec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Description of Imported Data:

IMCoverage Data Source:

File: lake\_im.xls

XLS, IMCoverage

☐ No I/M Program Browse...

Clear Imported Data Create Template...

Check for correct filename,  
worksheet name, no error  
messages, green check mark

Import

Messages:

IMCoverage imported.  
Import complete.

Export Default Data Export Imported Data

I/M Programs

Done

# Meteorology Data

- Meteorology data should be entered for every month and hour selected in the RunSpec
- Temperatures are in degrees Fahrenheit
- Relative humidity must be between 0 and 100
- ZoneID is simply the countyID + a zero

	A	B	C	D	E	F	G
1	monthID	zoneID	hourID	temperatu	relHumidity		
2	7	180890	1	67.8	78.9		
3	7	180890	2	66.6	80.3		
4	7	180890	3	65.8	81.4		
5	7	180890	4	65	82.6		
6	7	180890	5	64.4	83.6		

# Meteorology Data: Guidance

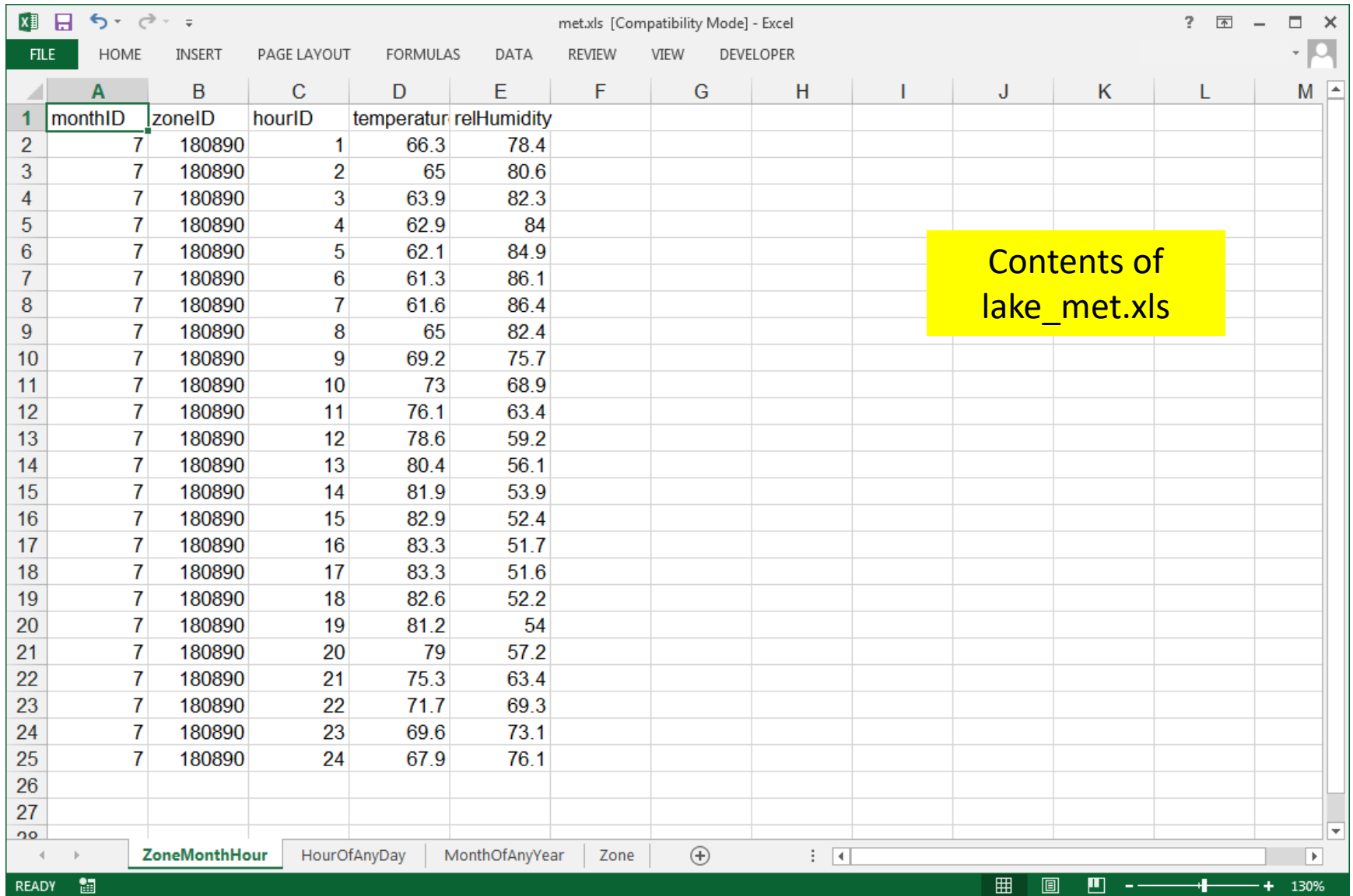
- Section 4.2 of MOVES Technical Guidance
- Local temperature and humidity data are required inputs for SIP and regional conformity analysis with MOVES
- Default data based on 10 year averages – these may not be appropriate for all types of analysis
- Temperatures for conformity analysis must be consistent with temperatures used to develop SIP emissions budgets



# Meteorology Data: Exercise

- Let's enter meteorology data into the CDM for our county-level exercise
- The template with specific local meteorology for Lake County has already been filled out and saved in the *County Inventory Exercise* folder
- You can open the file *lake\_met.xls* in Excel to review the data
- Always review your input files before entering in MOVES to ensure accuracy and avoid run errors

# Meteorology Data: Exercise



met.xls [Compatibility Mode] - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW DEVELOPER

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	monthID	zoneID	hourID	temperature	relHumidity								
2	7	180890	1	66.3	78.4								
3	7	180890	2	65	80.6								
4	7	180890	3	63.9	82.3								
5	7	180890	4	62.9	84								
6	7	180890	5	62.1	84.9								
7	7	180890	6	61.3	86.1								
8	7	180890	7	61.6	86.4								
9	7	180890	8	65	82.4								
10	7	180890	9	69.2	75.7								
11	7	180890	10	73	68.9								
12	7	180890	11	76.1	63.4								
13	7	180890	12	78.6	59.2								
14	7	180890	13	80.4	56.1								
15	7	180890	14	81.9	53.9								
16	7	180890	15	82.9	52.4								
17	7	180890	16	83.3	51.7								
18	7	180890	17	83.3	51.6								
19	7	180890	18	82.6	52.2								
20	7	180890	19	81.2	54								
21	7	180890	20	79	57.2								
22	7	180890	21	75.3	63.4								
23	7	180890	22	71.7	69.3								
24	7	180890	23	69.6	73.1								
25	7	180890	24	67.9	76.1								
26													
27													
28													

ZoneMonthHour HourOfAnyDay MonthOfAnyYear Zone

READY 130%

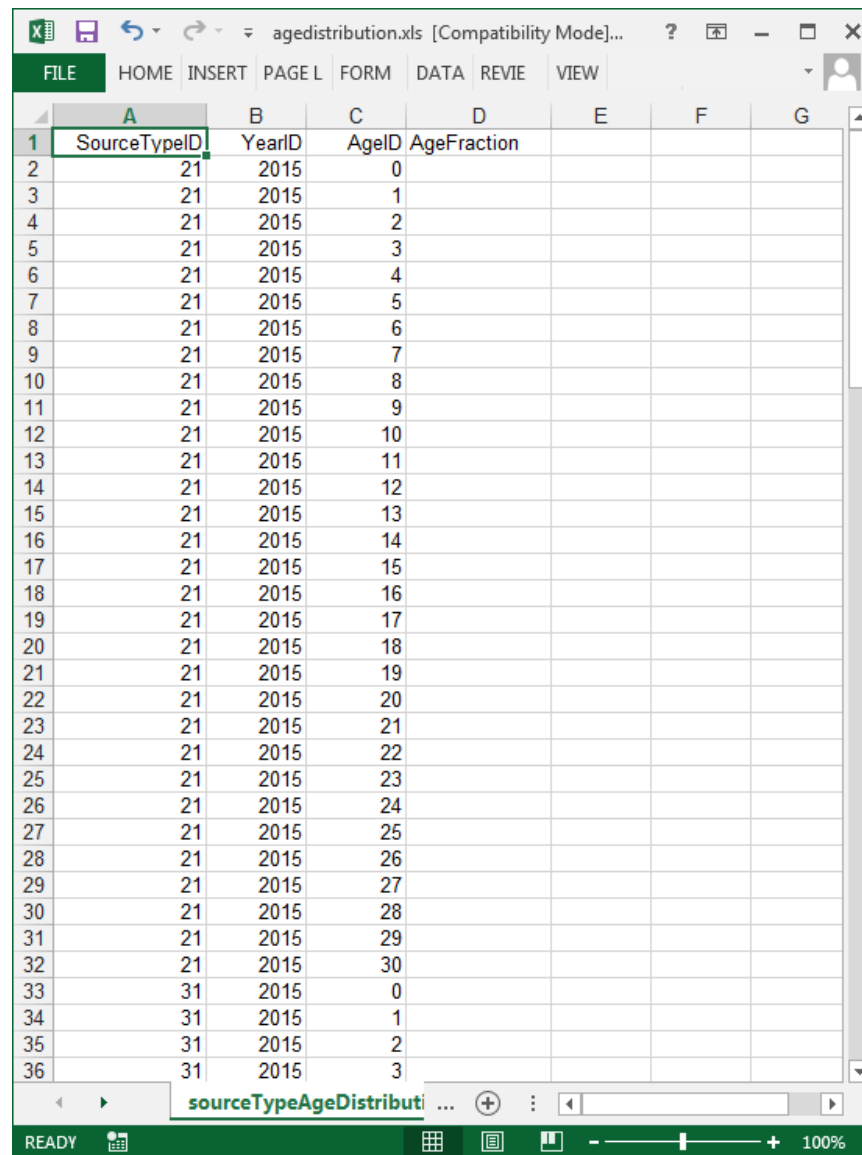
Contents of lake\_met.xls

# Meteorology Data: Exercise

- Instructions for importing met data into the CDM:
  - Go to Meteorology tab
  - Click Browse, select *lake\_met.xls*, and click Open
  - Select the worksheet called “ZoneMonthHour” and click OK
  - Click Import
  - Check:
    - Proper file name and worksheet are listed
    - No error messages
    - Green check on Meteorology tab
- See slides 88-91 to review these steps

# Age Distribution

- Age Distribution is entered according to MOVES source types and calendar year
  - AgeFraction must sum to “1” within these fields
- Age Distribution covers new (0) to 30+ year old vehicles
- MOVES does not vary age distribution by month with one run
- EPA has age distribution converters on web, if needed.



	A	B	C	D	E	F	G
	SourceTypeID	YearID	AgeID	AgeFraction			
1	21	2015	0				
2	21	2015	1				
3	21	2015	2				
4	21	2015	3				
5	21	2015	4				
6	21	2015	5				
7	21	2015	6				
8	21	2015	7				
9	21	2015	8				
10	21	2015	9				
11	21	2015	10				
12	21	2015	11				
13	21	2015	12				
14	21	2015	13				
15	21	2015	14				
16	21	2015	15				
17	21	2015	16				
18	21	2015	17				
19	21	2015	18				
20	21	2015	19				
21	21	2015	20				
22	21	2015	21				
23	21	2015	22				
24	21	2015	23				
25	21	2015	24				
26	21	2015	25				
27	21	2015	26				
28	21	2015	27				
29	21	2015	28				
30	21	2015	29				
31	21	2015	30				
32	31	2015	0				
33	31	2015	1				
34	31	2015	2				
35	31	2015	3				
36	31	2015					

# Age Distribution: Guidance

- Section 4.4 of MOVES Technical Guidance
- Critical input: emissions are sensitive to age and age distributions vary considerably by locality
- Using local age distribution data is therefore recommended
  - Can be based on registration or I/M data, for instance
- Needed for 31 age groups (0-29 years, 30 years and older), and each of 13 MOVES source types (vehicle types)
  - Age is based on model year relative to calendar year

# Age Distribution: Guidance

- If data not available for individual source types, can use data for similar HPMS classes
- Default distributions can be used in some cases
  - If local data not representative of operating fleet (e.g., combination long-haul truck, intercity bus)
  - Default age distributions also on EPA MOVES tools website:  
[www.epa.gov/moves/tools-develop-or-convert-moves-inputs#fleet](http://www.epa.gov/moves/tools-develop-or-convert-moves-inputs#fleet)
- When modeling a future year, the EPA Age Distribution Projection Tool can be used to adjust base year age distributions
  - The tool accounts for the recession's impact on vehicle sales for a future year
  - The Age Distribution Projection Tool is available on EPA MOVES tools website: [www.epa.gov/moves/tools-develop-or-convert-moves-inputs#fleet](http://www.epa.gov/moves/tools-develop-or-convert-moves-inputs#fleet)

# Age Distribution: Exercise

- Let's enter age distribution data into the CDM for our county-level exercise
- We have obtained age distribution data for the passenger cars and trucks from local registration data
- For this example, the age of buses is known by the fleet operator
  - 50% are new (<1 year old)
  - 50% are one year old
- The template has already been filled out with our local age distribution reflecting the age of the bus fleet and saved in the *County Inventory Exercise* folder
- You can open the file *lake\_age\_distribution.xls* in Excel to review the data
- Always review your input files before entering in MOVES to ensure accuracy and avoid run errors

# Age Distribution: Exercise

agedistribution.xls [Compatibility Mode] - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW DEVELOPER

Paste Font Alignment Number Styles Cells Editing

A1 SourceTypeID

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	SourceTypeID	YearID	AgeID	AgeFraction												
2	21	2015	0	0.076270												
3	21	2015	1	0.093200												
4	21	2015	2	0.092650												
5	21	2015	3	0.080160												
6	21	2015	4	0.074950												
7	21	2015	5	0.070560												
8	21	2015	6	0.064050												
9	21	2015	7	0.069240												
10	21	2015	8	0.055980												
11	21	2015	9	0.052930												
12	21	2015	10	0.046190												
13	21	2015	11	0.042860												
14	21	2015	12	0.037610												
15	21	2015	13	0.031160												
16	21	2015	14	0.024680												
17	21	2015	15	0.018220												
18	21	2015	16	0.014790												
19	21	2015	17	0.012830												
20	21	2015	18	0.009620												
21	21	2015	19	0.005570												
22	21	2015	20	0.004140												
23	21	2015	21	0.003010												
24	21	2015	22	0.002240												
25	21	2015	23	0.002830												
26	21	2015	24	0.003575												
27	21	2015	25	0.004517												
28	21	2015	26	0.005707												

sourceTypeAgeDistribution AgeCategory SourceUseType

READY 100%

Contents of lake\_age\_distribution.xls



# Age Distribution: Exercise

- Instructions for importing age distribution data into the CDM:
  - Go to Age Distribution tab
  - Click Browse, select *lake\_age\_distribution.xls*, and click Open
  - Select the worksheet called “sourceTypeAgeDistribution” and click OK
  - Click Import
  - Check:
    - Proper file name and worksheet are listed
    - No error messages
    - Green check on Age Distribution tab
- See slides 88-91 to review these steps

# Average Speed Distribution

- Avg. Speed Distribution entered according to source type, road type, and hour-day
  - AvgSpeedFraction should sum to 1 within these fields
- MOVES has 16 speed bins ranging from 2.5 to 75+ mph

	A	B	C	D	E	F	G	H
	sourceType	roadType	hourDayID	avgSpeed	avgSpeedFraction			
2	21	2	15	1	0.002842			
3	21	2	15	2	0.00378			
4	21	2	15	3	0.00158			
5	21	2	15	4	0.0012			
6	21	2	15	5	0.001278			
7	21	2	15	6	0.001794			
8	21	2	15	7	0.002793			
9	21	2	15	8	0.004359			
10	21	2	15	9	0.007152			
11	21	2	15	10	0.012269			
12	21	2	15	11	0.024125			
13	21	2	15	12	0.057194			
14	21	2	15	13	0.130021			
15	21	2	15	14	0.229695			
16	21	2	15	15	0.259183			
17	21	2	15	16	0.260735			
18	21	2	25	1	0.002187			
19	21	2	25	2	0.002574			
20	21	2	25	3	0.001202			
21	21	2	25	4	0.001027			
22	21	2	25	5	0.001167			
23	21	2	25	6	0.001733			
24	21	2	25	7	0.002792			
25	21	2	25	8	0.004444			
26	21	2	25	9	0.007411			
27	21	2	25	10	0.012717			
28	21	2	25	11	0.025026			
29	21	2	25	12	0.060454			
30	21	2	25	13	0.141023			
31	21	2	25	14	0.243122			
32	21	2	25	15	0.252269			
33	21	2	25	16	0.240851			
34	21	2	35	1	0.001602			
35	21	2	35	2	0.001729			
36	21	2	35	3	0.000885			

# Average Speed Distribution: Speed Bins

avgSpeedBinID	avgSpeedBinDesc
1	Speed < 2.5mph
2	2.5mph <= speed < 7.5mph
3	7.5mph <= speed < 12.5mph
4	12.5mph <= speed < 17.5mph
5	17.5mph <= speed < 22.5mph
6	22.5mph <= speed < 27.5mph
7	27.5mph <= speed < 32.5mph
8	32.5mph <= speed < 37.5mph
9	37.5mph <= speed < 42.5mph
10	42.5mph <= speed < 47.5mph
11	47.5mph <= speed < 52.5mph
12	52.5mph <= speed < 57.5mph
13	57.5mph <= speed < 62.5mph
14	62.5mph <= speed < 67.5mph
15	67.5mph <= speed < 72.5mph
16	72.5 <= speed

# Average Speed Distribution

- Avg. Speed Distribution is in terms of time, not distance (i.e. fraction of VHT, not VMT, in each speed bin)
- AvgSpeedDistribution table can be very long (~50,000+ rows) if RunSpec covers all source types, road types, day types, and hours
  - Consult MOVES User Guide for info about “wildcards” to provide identical speed inputs for multiple fields (e.g., HPMS classes, both types of day, etc.)

# Average Speed Distribution: Guidance

- Section 4.6 of MOVES Technical Guidance
- Local speed distribution data are recommended
  - The more detail that can be obtained, the better
  - Speed distribution data can be applied to all source types within an HPMS class (e.g., same distribution for 31 and 32) or for more general categories (e.g., same distribution for all light-duty vehicles) if more detailed information is not available
  - For temporal aspects, speed distribution data can be entered at the hourly level, but varying the speed distribution for peak and off-peak hours is also acceptable
  - Freeway speeds should reflect mainline freeway speeds (not ramps)

# Average Speed Distribution: Guidance

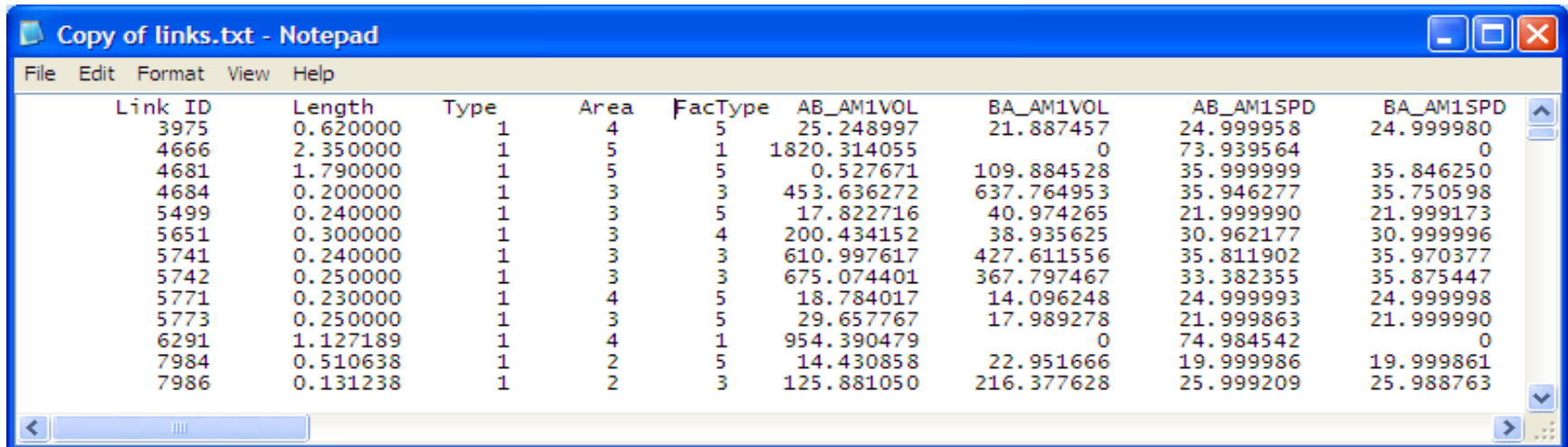
- MOVES has four road types which are affected by the speed distribution
  - Urban restricted and rural restricted road types are generally interstates and highways
  - Urban unrestricted and rural unrestricted road types are generally arterials, collectors, and local roads
- If separate speed distributions are known for arterials, collectors, and local roads, either:
  - Calculate a weighted speed distribution that applies to all urban or rural unrestricted roads, or
  - Do multiple MOVES runs using the appropriate speed and VMT information for arterials, collectors, and local roads separately and combine the results

# Average Speed Distribution: Working with Travel Model Data

- MPO travel demand forecasting (TDF) models typically produce link-level output that can be used to develop speed distributions, road type distributions and ramp fractions
- Depending on model capabilities, speeds may need to be post-processed
- Output will need to be “mapped” to MOVES format
  - Map TDF model road types to MOVES road types
  - Map TDF model time periods to MOVES hours
  - If different vehicle types are modeled, map vehicle types to MOVES source types
  - If different geographic areas modeled (e.g., CBD, urban, suburban, etc.), map to MOVES urban and rural groups

# Average Speed Distribution: Example Travel Model Output

- Type = link type (highway, transit, etc.)
- Area = area type (CBD, urban, suburban, etc.)
- Factype = roadway type (freeway, major arterial, etc.)
- AB\_AM1VOL = traffic volume in the A to B direction during the first a.m. time period (BA\_AM1VOL = volume in the B to A direction)
- AB\_AM1SPD = speed in the A to B direction during the first a.m. time period (BA\_AM1SPD = speed in the B to A direction)
- This example continues for 9 more time periods and ~ 19,000 more links



Copy of links.txt - Notepad

Link ID	Length	Type	Area	Factype	AB_AM1VOL	BA_AM1VOL	AB_AM1SPD	BA_AM1SPD
3975	0.620000	1	4	5	25.248997	21.887457	24.999958	24.999980
4666	2.350000	1	5	1	1820.314055	0	73.939564	0
4681	1.790000	1	5	5	0.527671	109.884528	35.999999	35.846250
4684	0.200000	1	3	3	453.636272	637.764953	35.946277	35.750598
5499	0.240000	1	3	5	17.822716	40.974265	21.999990	21.999173
5651	0.300000	1	3	4	200.434152	38.935625	30.962177	30.999996
5741	0.240000	1	3	3	610.997617	427.611556	35.811902	35.970377
5742	0.250000	1	3	3	675.074401	367.797467	33.382355	35.875447
5771	0.230000	1	4	5	18.784017	14.096248	24.999993	24.999998
5773	0.250000	1	3	5	29.657767	17.989278	21.999863	21.999990
6291	1.127189	1	4	1	954.390479	0	74.984542	0
7984	0.510638	1	2	5	14.430858	22.951666	19.999986	19.999861
7986	0.131238	1	2	3	125.881050	216.377628	25.999209	25.988763



# Average Speed Distribution: Steps in Developing Speed Inputs

- Map to the four relevant MOVES road types
  - No VMT or VHT on roadtypeid = 1 (“off-network”)
  - Use only roadway links, not rail, bike, walk links
- Sort by speed bin
- Calculate VHT by speed bin and road type (link length times volume divided by speed = VHT)
  - If ramps coded separately, use only freeway mainline segments in VHT calculations, but still need to reflect ramp VMT in VMT inputs
- Sum total VHT by road type and then calculate bin fractions

# Average Speed Distribution: Steps in Developing Speed Inputs

- Repeat for each time period; map to MOVES hours
- If multiple vehicle types modeled, repeat for each vehicle group and map to MOVES source type
  - Some areas do separate traffic assignment for cars, trucks, and other classes
  - If bus transit links modeled separately, calculate speeds separately and use these speeds for the transit bus source type)
- If multiple area types, then map to rural and urban
  - Can also handle as individual “zones”

# Average Speed Distribution: Exercise

- Let's enter average speed distribution data into the CDM for our county-level exercise
- In this case, we have the same speed distribution for all vehicle types
- The template has already been filled out and saved in the *County Inventory Exercise* folder
- You can open the file *lake\_speed\_distribution.xls* in Excel to review the data
- Always review your input files before entering in MOVES to ensure accuracy and avoid run errors

# Average Speed Distribution: Exercise

speeddistribution.xls [Compatibility Mode] - Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	sourceType	roadType	hourDayID	avgSpeed	avgSpeedFraction								
2	21	2	15	1	0.002842								
3	21	2	15	2	0.00378								
4	21	2	15	3	0.00158								
5	21	2	15	4	0.0012								
6	21	2	15	5	0.001278								
7	21	2	15	6	0.001794								
8	21	2	15	7	0.002793								
9	21	2	15	8	0.004359								
10	21	2	15	9	0.007152								
11	21	2	15	10	0.012269								
12	21	2	15	11	0.024125								
13	21	2	15	12	0.057194								
14	21	2	15	13	0.130021								
15	21	2	15	14	0.229695								
16	21	2	15	15	0.259183								
17	21	2	15	16	0.260735								
18	21	2	25	1	0.002187								
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20	21	2	25	3	0.001202								
21	21	2	25	4	0.001027								
22	21	2	25	5	0.001167								
23	21	2	25	6	0.001733								
24	21	2	25	7	0.002792								
25	21	2	25	8	0.004444								
26	21	2	25	9	0.007411								
27	21	2	25	10	0.012717								
28	21	2	25	11	0.025028								

Contents of lake\_speed\_distribution.xls

AvgSpeedDistribution | AvgSpeedBin | HourDay | RoadType | SourceUs ...

READY 130%

# Average Speed Distribution: Exercise

- Instructions for importing average speed distribution into the CDM:
  - Go to Average Speed Distribution tab
  - Click Browse, select *lake\_speed\_distribution.xls*, and click Open
  - Select the worksheet called “AvgSpeedDistribution” and click OK
  - Click Import
  - Check:
    - Proper file name and worksheet are listed
    - No error messages
    - Green check on Age Distribution tab
- See slides 88-91 to review these steps

# Vehicle Type VMT IN MOVES2014b

- MOVES uses VMT to calculate emission for running processes
- VMT input is also used to allocate emissions by month, day type (weekday or weekend), and hour
- MOVES2014a/b allows VMT to be entered in different forms:
  - VMT by HPMS class or VMT by MOVES source type
  - Annual VMT or daily VMT

The screenshot shows the 'MOVES County Data Manager' window. The 'Vehicle Type VMT' tab is selected. Below the tabs, there are several input fields and buttons. The 'Input VMT by:' section has two radio buttons: 'HPMS' and 'Source Type', with 'Source Type' selected. The 'VMT values are:' section has two radio buttons: 'Annual' and 'Daily', with 'Annual' selected. There is a 'Clear All' button next to these. Below these sections is a large text area for 'Description of Imported Data:'. At the bottom, there are buttons for 'Export Default Data', 'Export Imported Data', and 'Import'. A pink bar at the bottom of the window contains the text 'Vehicle Type VMT' and a 'Done' button.

# Vehicle Type VMT: HPMS Class vs. Source Type

- HPMS class
  - Enter VMT by 5 HPMS classes
    - The more likely form for local data
    - Relies on default data in MOVES to allocate VMT from HPMS class to source type
- MOVES Source Type
  - Enter VMT by 13 MOVES source types
    - Allows more control over how VMT is allocated, e.g., between passenger cars and light trucks
    - Requires more pre-processing if raw data are by HPMS class

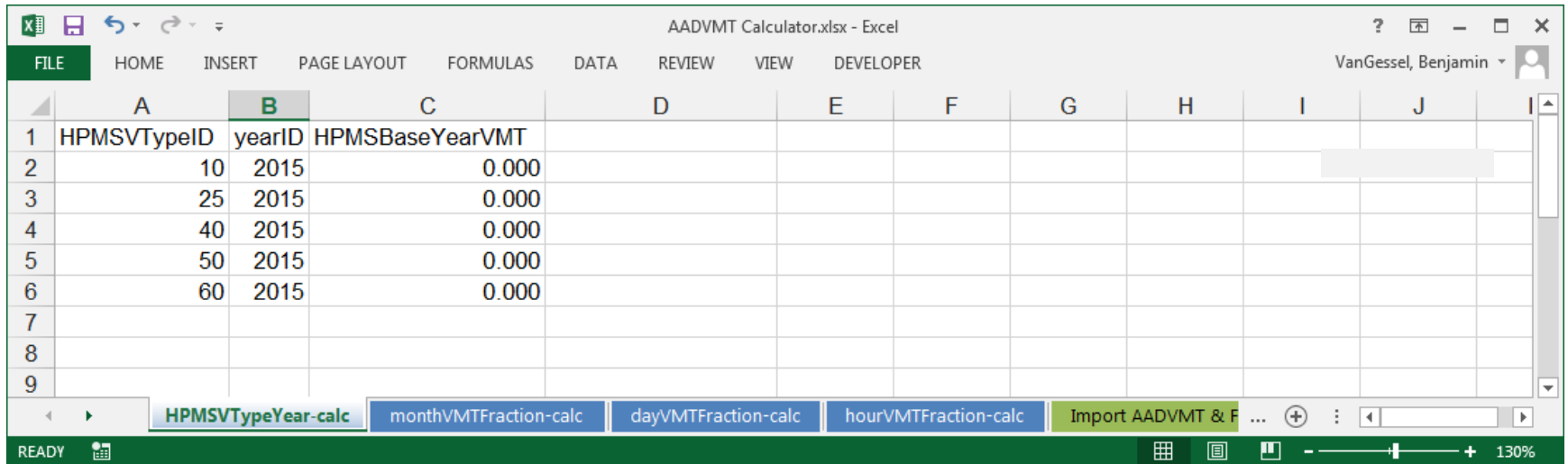
# Vehicle Type VMT: HPMS Class vs. Source Types

Source Type ID	Source Types	HPMS Class ID	HPMS Vehicle Class
11	Motorcycle	10	Motorcycles
21	Passenger Car	25	Light Duty Vehicles – Short and Long Wheelbase
31	Passenger Truck		
32	Light Commercial Truck		
41	Intercity Bus	40	Buses
42	Transit Bus		
43	School Bus		
51	Refuse Truck	50	Single Unit Trucks
52	Single Unit Short-haul Truck		
53	Single Unit Long-haul Truck		
54	Motor Home		
61	Combination Short-haul Truck	60	Combination Trucks
62	Combination Long-haul Truck		



# Vehicle Type VMT: HPMS Class

- VMT is entered for each HPMS vehicle class
- Could be annual VMT or daily VMT



The screenshot shows the AADVMT Calculator Excel spreadsheet. The worksheet is titled "AADVMT Calculator.xlsx - Excel". The ribbon includes FILE, HOME, INSERT, PAGE LAYOUT, FORMULAS, DATA, REVIEW, VIEW, and DEVELOPER. The user is logged in as "VanGessel, Benjamin". The spreadsheet has columns A through J. The data is organized as follows:

	A	B	C	D	E	F	G	H	I	J
1	HPMSVTypeID	yearID	HPMSBaseYearVMT							
2	10	2015	0.000							
3	25	2015	0.000							
4	40	2015	0.000							
5	50	2015	0.000							
6	60	2015	0.000							
7										
8										
9										

The bottom of the spreadsheet shows several tabs: "HPMSVTypeYear-calc", "monthVMTFraction-calc", "dayVMTFraction-calc", "hourVMTFraction-calc", and "Import AADVMT & F ...". The status bar at the bottom indicates "READY" and "130%".

# Vehicle Type VMT: Source Type

- VMT is entered for each Source Type specified in the Run Spec
- Could be annual VMT or daily VMT

	A	B	C	D	E	F	G	H	I	J	K	L
1	sourceTypeID	yearID	VMT									
2	21	2015										
3	31	2015										
4	32	2015										
5	42	2015										
6												
7												

# Vehicle Type VMT: Annual vs. Daily

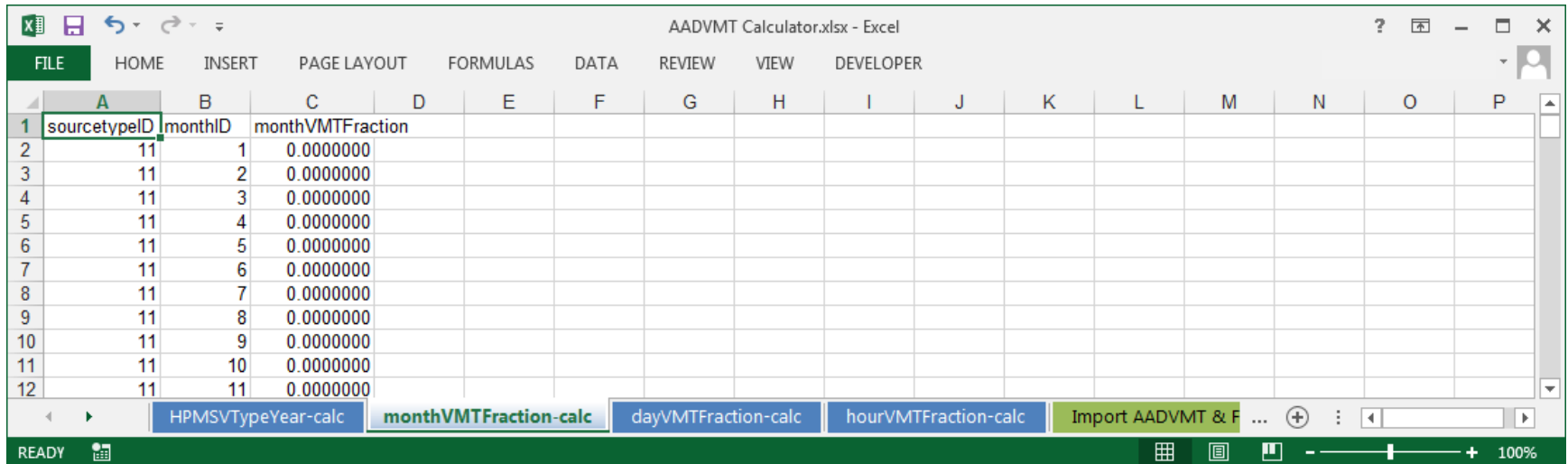
- Annual VMT
  - MOVES accepts annual VMT, along with VMT fractions by month, day type, and hour
  - Entering annual VMT and the correct month and daily VMT fractions for the entire year allows the same files to be used to model any month or day
- Daily VMT
  - MOVES accepts daily VMT along with VMT fractions by hour
  - MOVES applies same VMT to each month if running multiple months
  - MOVES applies same VMT to weekdays and weekend days if running both day types, however, you can enter different hourly fractions for weekdays and weekend days
- If you want to model multiple months and day types in a single run, annual VMT may be a better choice
  - Can use AADVMT Converter tool to convert daily VMT to annual VMT, but VMT must be by HPMS class

# Vehicle Type VMT – Allocation Fractions by Time Period

- Month VMT fractions - Fraction of annual VMT (per source type) occurring per month.
  - Required input for Annual VMT input only
- Day VMT fractions - Fraction of annual VMT (per source type) occurring on one of two day types (weekday or weekend)
  - Required input for Annual VMT input only
- Hour VMT fractions - Fraction of daily VMT (per source type) occurring per hour
  - Required input for both Annual and Daily VMT inputs
- Note: Even when VMT is entered based on HPMS vehicle class, temporal allocation factors are based on MOVES source type

# Vehicle Type VMT: Month VMT Fraction

- MonthVMTFraction must sum to 1 within each source type over a 12-month period
- Users will either use the default Month VMT Fraction or generate the Month VMT Fraction using the AADVMT Calculator (introduced in later slides)

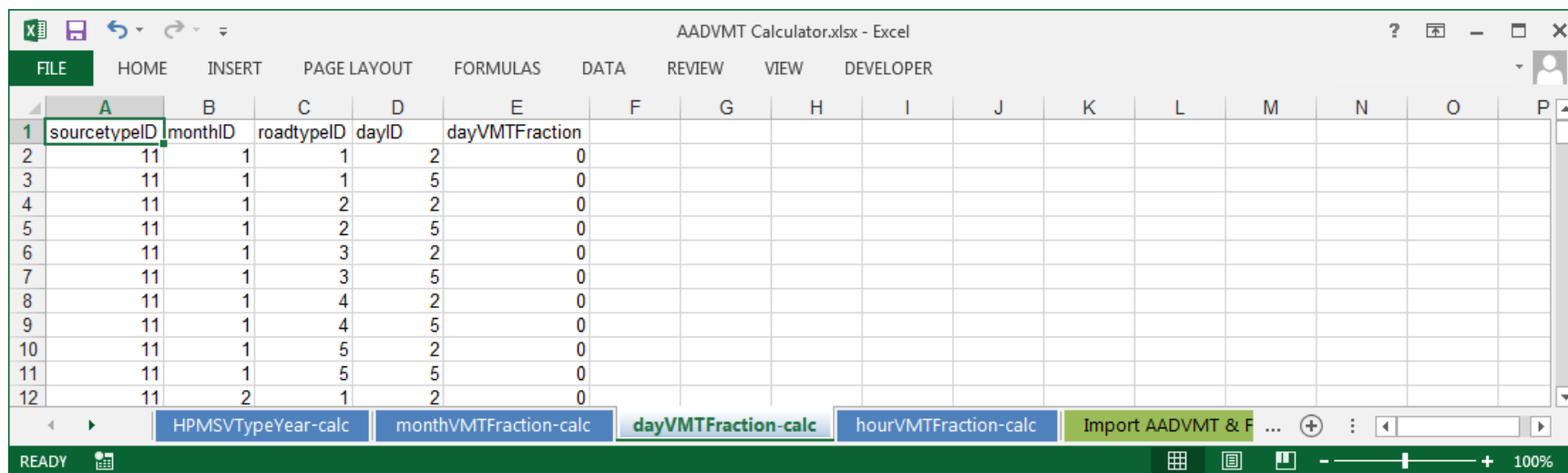


The screenshot shows the AADVMT Calculator Excel spreadsheet. The active worksheet is 'monthVMTFraction-calc'. The spreadsheet has columns A through P. Column A is labeled 'sourcetypeID', column B is 'monthID', and column C is 'monthVMTFraction'. The data rows (rows 2 through 12) show a constant 'sourcetypeID' of 11 and 'monthID' values from 1 to 11, with 'monthVMTFraction' values of 0.0000000. The bottom of the spreadsheet shows a ribbon with tabs for 'HPMSVTypeYear-calc', 'monthVMTFraction-calc' (active), 'dayVMTFraction-calc', 'hourVMTFraction-calc', and 'Import AADVMT & F ...'. The status bar at the bottom indicates 'READY' and '100%' zoom.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	sourcetypeID	monthID	monthVMTFraction													
2		11	1	0.0000000												
3		11	2	0.0000000												
4		11	3	0.0000000												
5		11	4	0.0000000												
6		11	5	0.0000000												
7		11	6	0.0000000												
8		11	7	0.0000000												
9		11	8	0.0000000												
10		11	9	0.0000000												
11		11	10	0.0000000												
12		11	11	0.0000000												

# Vehicle Type VMT: Day VMT Fraction

- DayVMTFraction must sum to 1 within each source type, month, road type combination
- DayVMTFraction is the fraction of VMT occurring on each day, by type, throughout a month (i.e.,  $\approx 22$  weekdays +  $\approx 9$  weekend days in a 31 day month;  $22/31 = 0.71$ , similar to default values)



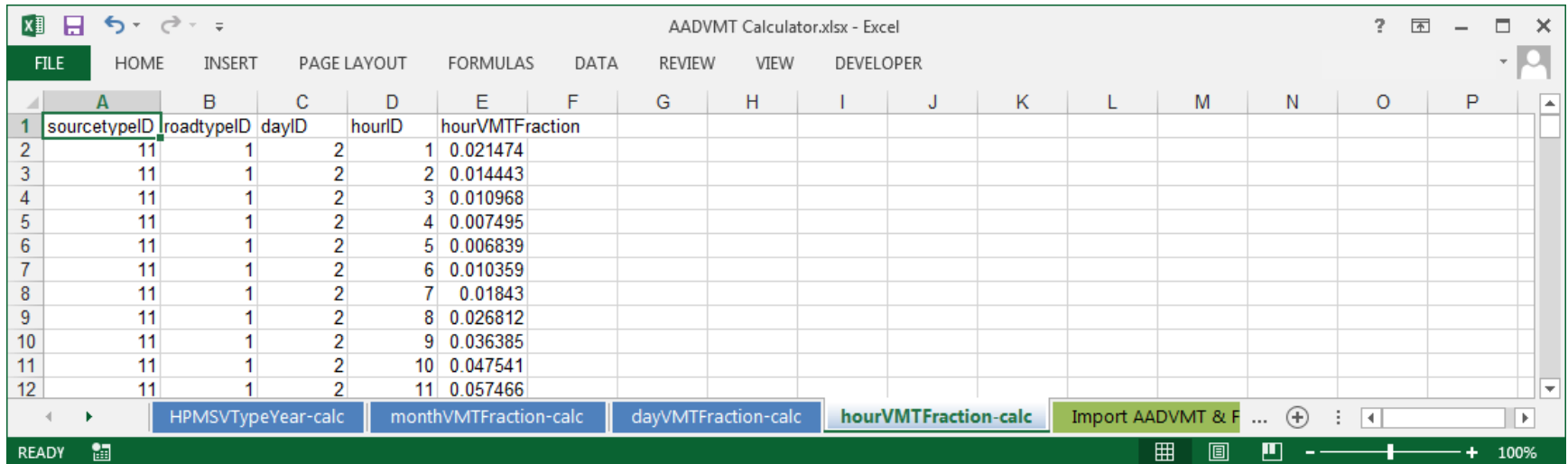
AADVMT Calculator.xlsx - Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	sourceTypeID	monthID	roadTypeID	dayID	dayVMTFraction											
1																
2	11	1	1	2	0											
3	11	1	1	5	0											
4	11	1	2	2	0											
5	11	1	2	5	0											
6	11	1	3	2	0											
7	11	1	3	5	0											
8	11	1	4	2	0											
9	11	1	4	5	0											
10	11	1	5	2	0											
11	11	1	5	5	0											
12	11	2	1	2	0											

HPMSVTypeYear-calc monthVMTFraction-calc dayVMTFraction-calc hourVMTFraction-calc Import AADVMT & F ...

# Vehicle Type VMT: Hour VMT Fraction

- HourVMTFraction must sum to 1 within each source type, road type, type of day combination
- HourVMTFraction is applied to all months
  - If data varies for different months, you must run different RunSpecs for each



The screenshot shows the 'AADVMT Calculator.xlsx' spreadsheet in Excel. The 'hourVMTFraction-calc' worksheet is active, displaying a table with columns for source type, road type, day of the week, hour of the day, and the calculated hour VMT fraction. The data is organized into rows for each hour of the day (1-12) for a specific source type (11) and road type (1).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	sourceTypeID	roadTypeID	dayID	hourID	hourVMTFraction											
1	11	1	2	1	0.021474											
2	11	1	2	2	0.014443											
3	11	1	2	3	0.010968											
4	11	1	2	4	0.007495											
5	11	1	2	5	0.006839											
6	11	1	2	6	0.010359											
7	11	1	2	7	0.01843											
8	11	1	2	8	0.026812											
9	11	1	2	9	0.036385											
10	11	1	2	10	0.047541											
11	11	1	2	11	0.057466											
12	11	1	2	12												

# Entering Vehicle Type VMT Data – Input Tables

		Input VMT by:	
		HPMS	Source Type
VMT Values are:	Annual	HPMSVtypeYear monthVMTFraction dayVMTFraction hourVMTFraction	SourceTypeYearVMT monthVMTFraction dayVMTFraction hourVMTFraction
	Daily	HPMSVtypeDay hourVMTFraction	SourceTypeDayVMT hourVMTFraction



# Entering Vehicle Type VMT Data

The screenshot shows the MOVES County Data Manager application window. The 'Vehicle Type VMT' tab is selected. The interface includes a menu bar with options like 'Vehicle Type VMT', 'Hotelling', 'I/M Programs', 'Retrofit Data', 'Generic', and 'Tools'. Below the menu bar, there are several sub-tabs: 'Ramp Fraction', 'Road Type Distribution', 'Source Type Population', 'Starts', 'RunSpec Summary', 'Database', 'Age Distribution', 'Average Speed Distribution', 'Fuel', and 'Meteorology Data'. The main area is titled 'Description of Imported Data:'. It contains a section for 'Input VMT by:' with radio buttons for 'HPMS' (selected) and 'Source Type'. Next to it is a section for 'VMT values are:' with radio buttons for 'Annual' (selected) and 'Daily'. A 'Clear All' button is also present. Below this, there are four sections for different data sources: 'HPMSVtypeYear Data Source:', 'monthVMTFraction Data Source:', 'dayVMTFraction Data Source:', and 'hourVMTFraction Data Source:'. Each section has a 'File: (please select a file)' label, a 'Browse...' button, and 'Clear Imported Data' and 'Create Template...' buttons. At the bottom, there is an 'Import' button, a 'Messages:' section, and 'Export Default Data' and 'Export Imported Data' buttons. A pink bar at the bottom of the window is labeled 'Vehicle Type VMT' and has a 'Done' button.

MOVES County Data Manager

Vehicle Type VMT Hotelling I/M Programs Retrofit Data Generic Tools

Ramp Fraction Road Type Distribution Source Type Population Starts

RunSpec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Description of Imported Data:

Input VMT by: ☒ HPMS ☐ Source Type VMT values are: ☒ Annual ☐ Daily Clear All

HPMSVtypeYear Data Source: File: (please select a file) Browse... Clear Imported Data Create Template...

monthVMTFraction Data Source: File: (please select a file) Browse... Clear Imported Data Create Template...

dayVMTFraction Data Source: File: (please select a file) Browse... Clear Imported Data Create Template...

hourVMTFraction Data Source: File: (please select a file) Browse... Clear Imported Data Create Template...

Import

Messages:

Export Default Data Export Imported Data

Vehicle Type VMT Done

VMT and temporal fractions are all imported in this tab

You will have to browse/import 4 separate worksheets to complete this tab with Annual VMT selected.

# Entering Vehicle Type VMT Data

The screenshot shows the 'MOVES County Data Manager' application window. The 'Vehicle Type VMT' tab is active, indicated by a green checkmark. Other tabs include 'Hotelling', 'I/M Programs', 'Retrofit Data', 'Generic', and 'Tools'. Below the tabs, there are several sub-tabs: 'Run Spec Summary', 'Database', 'Age Distribution', 'Average Speed Distribution', 'Fuel', and 'Meteorology Data'. The 'Description of Imported Data:' section is empty. The 'Input VMT by:' section has two radio buttons: 'HPMS' and 'Source Type', with 'Source Type' selected. The 'VMT values are:' section has two radio buttons: 'Annual' and 'Daily', with 'Daily' selected. A 'Clear All' button is next to these. The 'SourceTypeDayVMT Data Source:' section is highlighted with a red box. It contains a 'File: (please select a file)' label, a 'Browse...' button, and 'Clear Imported Data' and 'Create Template...' buttons. The 'hourVMTFraction Data Source:' section is similar, with a 'File: (please select a file)' label, a 'Browse...' button, and 'Clear Imported Data' and 'Create Template...' buttons. An 'Import' button is located below these sections. The 'Messages:' section is empty. At the bottom, there are 'Export Default Data' and 'Export Imported Data' buttons. A pink bar at the bottom of the window contains the text 'Vehicle Type VMT' and a 'Done' button.

MOVES County Data Manager

Vehicle Type VMT Hotelling I/M Programs Retrofit Data Generic Tools

Run Spec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Description of Imported Data:

Input VMT by: HPMS ☒ Source Type VMT values are: Annual ☐ Daily ☒ Clear All

SourceTypeDayVMT Data Source:

File: (please select a file) Browse... Clear Imported Data Create Template...

hourVMTFraction Data Source:

File: (please select a file) Browse... Clear Imported Data Create Template...

Import

Messages:

Export Default Data Export Imported Data

Vehicle Type VMT Done

VMT and temporal fractions are all imported in this tab

You will have to browse/import 2 separate worksheets to complete this tab with Daily VMT selected.

# Vehicle Type VMT: Guidance

- Section 4.5 of MOVES Technical Guidance
- Local VMT data are necessary
- Can enter by HPMS Class or by Source Type
  - Use HPMS Class if you don't have enough detail to disaggregate to Source Type
  - Use Source Type if you have that data and want more control over how MOVES allocates VMT

# Vehicle Type VMT: Guidance

- Can enter as Annual or Daily VMT
  - Use Annual if you want to model multiple months and day types with different VMT fractions in a single run
    - Local VMT, month, day, and hour fractions should be used if available; otherwise, defaults are acceptable
    - Entering annual VMT and the correct month and daily VMT fractions for the entire year allows the same files to be used to model any month or day
  - Use EPA's AADVMT Converter tool to convert local Daily VMT to Annual VMT if necessary
    - Available at EPA's MOVES Tools website:  
[www.epa.gov/otaq/models/moves/tools.htm](http://www.epa.gov/otaq/models/moves/tools.htm)
    - Currently, can only use the tool if VMT is by HPMS class
- Use Daily if that is the form your VMT is in and the VMT is appropriate for the month and day type you are modeling

# Vehicle Type VMT: Guidance

- Recommend using the same approach (HPMS or source type, annual or daily VMT) for any analysis that compares two or more cases
  - Avoid causing differences in results due to differences in the way VMT is allocated
  - Use interagency consultation process to agree on a common approach or to minimize differences caused by different approaches

# Vehicle Type VMT: Exercise

- We know daily VMT for an average July weekday and will enter VMT as Daily HPMS
  - Light duty vehicles = 3,000,000, Transit buses = 10,000
- We will use the default hourly VMT distribution for this example
- Instructions for importing average speed distribution into the CDM:
  - Check “HPMS” and “Daily” buttons in the Vehicle Type VMT tab
  - In the HPMSVtypeDay section, click Create Template and save as lake\_vmt.xls
    - Open lake\_vmt.xls and enter VMT for HPMSVtype ID 25 and 40
  - Click Export Default Data and save as lake\_hour\_vmt.xls
    - You will use this file to get the default hourly VMT fractions
    - Note that month, day, and hour fraction tabs are populated with default data, but we will only use the hour fraction tab because we selected daily VMT input
  - In the HPMSVtypeDay section, browse, select lake\_vmt.xls, and select the HPMSVtype day worksheet
  - In the hourVMTFraction section, browse, select lake\_hour\_vmt.xls and select the hourVMTFraction worksheet
  - Import both tables by clicking Import

# Vehicle Type VMT: Exercise

- Completed Daily HPMS VMT table for exercise
- Average July weekday VMT by HPMS category
  - Passenger vehicles = 3,000,000
  - Transit buses = 10,000

The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J
1	HPMSVtype	yearID	monthID	dayID	VMT					
2	25	2015	7	5	3000000					
3	40	2015	7	5	10000					
4										
5										
6										
7										
8										

# Entering Vehicle Type VMT Data

The screenshot shows the MOVES County Data Manager application window. The title bar reads "MOVES County Data Manager". The interface has a tabbed menu at the top with the following tabs: "Vehicle Type VMT" (selected, marked with a red X), "Hotelling" (checked), "I/M Programs" (checked), "Retrofit Data" (checked), "Generic" (checked), and "Tools". Below this is a secondary row of tabs: "Ramp Fraction" (checked), "Road Type Distribution" (marked with a red X), "Source Type Population" (checked), and "Starts" (checked). A third row includes "RunSpec Summary", "Database", "Age Distribution" (checked), "Average Speed Distribution" (checked), "Fuel" (marked with a red X), and "Meteorology Data" (checked).

The main content area is titled "Description of Imported Data:". Below this title is a large empty text box. Further down, there are two sections for data source selection:

- HPMSVtypeDay Data Source:** Includes a "File: (please select a file)" label and a "Browse..." button. Below the file selection are "Clear Imported Data" and "Create Template..." buttons.
- hourVMTfraction Data Source:** Includes a "File: (please select a file)" label and a "Browse..." button. Below the file selection are "Clear Imported Data" and "Create Template..." buttons.

At the bottom of the main area is a "Messages:" label and an empty text box. Below the messages box is an "Export Default Data" button.

At the very bottom of the window is a pink bar with the text "Vehicle Type VMT" and a "Done" button on the right.

Overlaid on the center of the screenshot is a yellow text box with the following text:

Total VMT and hour fractions are both imported in this tab

You will have to browse/import 2 separate worksheets (HPMSVtypeDay and hourVMTfraction) from 2 separate files to complete this tab

You can save a little time by clicking Browse and Select Worksheet twice, then clicking Import once



# Entering Vehicle Type VMT Data

**MOVES County Data Manager** [X]

Vehicle Type VMT [X] Hotelling [X] I/M Programs [X] Retrofit Data [X] Generic [X] Tools [X]

Ramp Fraction [X] Road Type Distribution [X] Source Type Population [X] Starts [X]

Run Spec Summary Database Age Distribution Average Speed Distribution Fuel [X] Meteorology Data [X]

Description of Imported Data:

Input VMT by: ☒ HPMS ☐ Source Type VMT values are: ☐ Annual ☒ Daily [Clear All]

HPMSVtypeDay Data Source:

File: lake\_vmt.xls [Browse...]

XLS, HPMSVtypeDay [Clear Imported Data] [Create Template...]

hourVMTFraction Data Source:

File: lake\_hour\_vmt.xls [Browse...]

XLS, HourVMTFraction [Clear Imported Data] [Create Template...]

[Import]

Messages:

HPMSVtypeDay imported.  
HourVMTFraction imported.  
Import complete.

Export Default Data Export Imported Data

Vehicle Type VMT

[Done]

Importing  
complete

# Road Type Distribution

- RoadTypeVMTFraction is the fraction of VMT (distance, not time) on each road type by a source type

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	sourceType	roadType	roadTypeVMTFraction														
2	21	2															
3	21	3															
4	21	4															
5	21	5															
6	31	2															
7	31	3															
8	31	4															
9	31	5															
10	32	2															
11	32	3															
12	32	4															

# Road Type Distribution

- Fractions should sum to 1 within each source type
- All road types appear in the template even if they were not selected in the RunSpec
  - Any VMT assigned to a road type not selected in the RunSpec will not be accounted for in MOVES output
  - This could lead to misleading or incorrect results
  - Safest approach is to always include all road types in RunSpec

# Road Type Distribution: Guidance

- Section 4.7 of MOVES Technical Guidance
- Users should develop road type distribution data based on local information
- If data are not available, the same road type distribution can be used for all source types in the same HPMS class
  - However, in many cases, road type distributions vary for source types in the same HPMS class (e.g., transit bus vs. intercity bus), so source type specific information is encouraged

# Road Type Distribution: Using Travel Model Outputs

- Travel model link volumes can be used to develop road type distribution fractions
- Map links to MOVES road types
  - If ramps are coded separately, ramps are included as part of restricted access road
- Calculate VMT by link (length x volume)
- Sum by link and road type across all time periods (MOVES inputs do not vary by hour)
- Calculate fractions that sum to one
- Repeat for each vehicle group, as needed

# Road Type Distribution: Exercise

- Let's enter our road type distribution data into the CDM for our county-level exercise
- The template has been filled out with our local road type distribution and saved in the *County Inventory Exercise* folder
- You can open the file *lake\_road\_type\_distribution.xls* in Excel to review the data
- Always review your input files before entering in MOVES to ensure accuracy and avoid run errors

# Entering Road Type Distribution Data

roadtypedistribution.xls [Compatibility Mode] - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW DEVELOPER

Normal Page Break Preview Page Layout Custom Views

Workbook Views

☒ Ruler ☒ Formula Bar

☒ Gridlines ☒ Headings

Show

Zoom 100% Zoom to Selection

Zoom

New Window Arrange All Freeze Panes

Split Hide Unhide

Window

View Side by Side Synchronous Scrolling Reset Window Position

Switch Windows

Macros

E8

	A	B	C	D	E	F	G	H	I	J	K
1	sourceTypeID	roadTypeID	roadTypeVMTfraction								
2	21	2	0								
3	21	3	0.000320702								
4	21	4	0.311675146								
5	21	5	0.688004152								
6	31	2	0								
7	31	3	0.000320702								
8	31	4	0.311675146								
9	31	5	0.688004152								
10	32	2	0								
11	32	3	0.000320702								
12	32	4	0.311675146								
13	32	5	0.688004152								
14	42	2	0								
15	42	3	0.000320702								
16	42	4	0.311675146								
17	42	5	0.688004152								
18											
19											
20											
21											
22											

Contents of lake\_road\_type\_distribution.xls

roadTypeDistribution RoadType SourceUseType

READY 130%

# Road Type Distribution: Exercise

- Instructions for importing road type distribution into the CDM:
  - Go to Road Type Distribution tab
  - Click Browse, select *lake\_road\_type\_distribution.xls*, and click Open
  - Select the worksheet called “roadTypeDistribution” and click OK
  - Select Import
  - Check:
    - Proper file name and worksheet are listed
    - No error messages
    - Green check on Road Type Distribution tab
- See slides 88-91 to review these steps



# Fuel

- The Fuel tab contains four data tables
  - Fuel Supply
  - Fuel Formulation
  - Fuel Usage Fraction
  - AVFT
- Data must be selected/entered for each table
- It also includes the “Fuels Wizard,” which allows the user to modify fuel formulation parameters for gasoline and gasoline-ethanol blends
- In MOVES2010, these tables were separate tabs; they have been combined under one “Fuel” tab since MOVES2010b

# Fuel: Fuel Supply Data

- Fuel Supply entered by county, year, month, fuel type
  - marketShare (column E) must sum to 1 within these fields
  - marketShare CV (column F) is inactive; ignore any values
- If defaults are exported, they will contain gasoline, diesel, ethanol (E-85), and CNG formulations
  - Users should add entries for alt. fuels if selected in RunSpec

	A	B	C	D	E	F	G	H	I	J	K	L
1	fuelRegionID	fuelYearID	monthGroup	fuelFormulation	marketShare	marketShareCV						
2	1470011000	2015	7	3313	0.962069	0.5						
3	1470011000	2015	7	3315	0.037931	0.5						
4	1470011000	2015	7	25005	1	0.5						
5	1470011000	2015	7	27002	1	0.5						
6												
7												
8												
9												

# Fuel: Fuel Formulation Data

- Use only existing FuelFormulationID's with the appropriate FuelSubTypeID for the fuel properties being entered
  - However, properties can be changed for existing formulations
- Consult MOVES Technical Guidance for information about the requirements for populating each field
  - Use the Fuels Wizard in the CDM if changes are needed to gasoline fuels

fuels.xls [Compatibility Mode] - Excel

VanGessel, Benjamin

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	fuelFormul	fuelSubtyp	RVP	sulfurLevel	ETOHVolu	MTBEVolu	ETBEVolu	TAMEVolu	aromaticC	olefinCont	benzeneC	e200	e300	BioDieselE	CetaneIndi	PAHConte	T50
2	10	10	6.9	30	0	0	0	0	26.1	5.6	1	41.09	83.09	0	0	0	
3	20	20	0	11	0	0	0	0	0	0	0	0	0	0	0	0	
4	50	51	7.7	11	85	0	0	0	0	0	0	49.9	89.5	0	0	0	
5	96	10	8.7	338	0	0	0	0	26.4	11.9	1.64	50	83	0	0	0	199
6	97	10	6.6	150	0	11.7581	0	0	24	11	0.8	52	84	0	0	0	195
7	98	10	6.9	30	0	0	0	0	26.1	5.6	1	41.09	83.09	0	0	0	
8	99	10	6.9	90	0	0	0	0	26.1	5.6	1	41.09	83.09	0	0	0	
9	3313	12	7.06	30	10	0	0	0	17.13	7.85	0.77	50.98	85.24	0	0	0	1
10	3315	15	6.06	30	15	0	0	0	15.79	6.67	0.77	57.11	85.76	0	0	0	18
11	25005	21	0	15	0	0	0	0	0	0	0	0	0	5	0	0	
12	27002	51	7.7	8	74	0	0	0	0	0	0	49.9	89.5	0	0	0	

FuelSupply FuelFormulation FuelUsageFraction avft County Et ...

READY 100%

# Fuel: Fuel Usage Fraction

- Fuelusagefraction is a new required input that specifies the fraction of E-85 capable (flex-fuel) vehicles that use E-85 (sourcebinfueltypeid 5) vs. conventional gasoline
- The table below shows that 98.7% of E-85 capable vehicles use conventional gasoline and 1.3% use E-85 for Lake County, IN
- Fractions of 1 are required for sourcebinfueltypeid 1, 2, and 3 (gas, diesel, and CNG fuel types)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	countyID	fuelYearID	modelYear	sourceBinF	fuelSupply	usageFraction							
2	18089	2015	0	1	1	1							
3	18089	2015	0	2	2	1							
4	18089	2015	0	5	1	0.986574							
5	18089	2015	0	5	5	0.013426							
6													
7													

# Fuel: AVFT

- The Alternate Vehicle and Fuel Technology (AVFT) input allows users to define the split between diesel, gasoline, CNG, and electricity, for each vehicle source type and model year.
- Combinations of sourceTypeID and modelyearID must sum to 1.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	sourceTypeID	modelYear	fuelTypeID	engTechID	fuelEngFraction								
2	21	1960	1	1	0.993123								
3	21	1960	2	1	0.006877								
4	21	1960	5	1	0								
5	21	1960	9	30	0								
6	21	1961	1	1	0.993123								
7	21	1961	2	1	0.006877								

# Fuels Wizard

- Once fuel formulation is imported, the Fuels Wizard can be used to adjust unknown fuel formulation properties based on known fuel properties, such as RVP
  - For gasoline and gasoline-ethanol blends
  - Not used for E-85, diesel, or CNG fuels
- Fuels Wizard calculates the appropriate values consistent with EPA's refinery modeling

Select	Region	Fuel ...	Mo...	Fu...	RVP	Sul...	Eth...	T50	T90	Aroma...	Olefi...	Benz...	E200	E300	Bio...	Cet...	PAH	MTBE	ETBE	TAME
<input type="checkbox"/>	1470011000	2015	7	17.1	30	10	193.20	326.70	17.13	7.85	0.77	50.98	85.24	0	0	0	0.00	0.00	0.00	
<input type="checkbox"/>	1470011000	2015	7	17.1	30	15	180.77	324.33	15.79	6.67	0.77	57.11	85.76	0	0	0	0.00	0.00	0.00	
<input type="checkbox"/>	1470011000	2015	7	20.0	15	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5	0	0	0.00	0.00	0.00	
<input type="checkbox"/>	1470011000	2015	7	57.7	8	74	200.00	300.00	0.00	0.00	0.00	49.90	89.50	0	0	0	0.00	0.00	0.00	
<input type="checkbox"/>	1470011000	2015	7	30.0	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0.00	0.00	0.00	

Change  to

# Example: Change RVP of Gasoline to 7.5

Fuels Wizard

Select fuels to modify

Select	Region	Fuel ...	Mo...	Fu...	RVP	Sul...	Eth...	T50	T90	Aroma...	Olefi...	Benz...	E200	E300	Bio...	Cet...	PAH	MTBE	ETBE	TAME
<input checked="" type="checkbox"/>	1000	2015	7	1	17.1	30	10	193.20	326.70	17.13	7.85	0.77	50.98	85.24	0	0	0	0.00	0.00	0.00
<input checked="" type="checkbox"/>	1000	2015	7	1	17.1	30	15	180.77	324.33	15.79	6.67	0.77	57.11	85.76	0	0	0	0.00	0.00	0.00
<input type="checkbox"/>	1000	2015	7	2	20.0	15	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5	0	0	0.00	0.00	0.00
<input type="checkbox"/>	1470011000	2015	7	5	7.7	8	74	200.00	300.00	0.00	0.00	0.00	49.90	89.50	0	0	0	0.00	0.00	0.00
<input type="checkbox"/>	1470011000	2015	7	3	0.0	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0.00	0.00	0.00

Change RVP to 7.5 psi

Done Calculate >

Both Gasoline fuels (Fuel type id 1) are selected

Fuels Wizard

Changes

Select	Region	Fuel ...	Mo...	Fu...	RVP	Sul...	Eth...	T50	T90	Aroma...	Olefi...	Benz...	E200	E300	Bio...	Cet...	PAH	MTBE	ETBE	TAME
Old	1470011000	2015	7	1	17.1	30	10	193.20	326.70	17.13	7.85	0.77	50.98	85.24	0	0	0	0.00	0.00	0.00
New	1470011000	2015	7	1	17.5	30	10	192.07	325.70	17.13	7.85	0.77	53.80	83.82	0	0	0	0.00	0.00	0.00
Old	1470011000	2015	7	1	17.1	30	15	180.77	324.33	15.79	6.67	0.77	57.11	85.76	0	0	0	0.00	0.00	0.00
New	1470011000	2015	7	1	17.5	30	15	179.64	323.33	15.79	6.67	0.77	59.89	84.34	0	0	0	0.00	0.00	0.00

Messages

Calculations complete.

< Reject Accept >

# Fuel: Guidance

- Section 4.9 of MOVES Technical Guidance
- Review default data and only make changes when local volumetric fuel property information is available
  - Recommended approach is to modify existing fuel formulations and assign each the appropriate market share
  - Another acceptable approach is to calculate a weighted average of the fuel properties, but this will result in differences from the first approach where non-linear relationships exist
  - Straight averages should NEVER be used
- If only certain properties are known (e.g., RVP, sulfur, ethanol), but others are not (e.g., olefins), then
  - Defaults can be used for the other parameters or
  - Fuels in the same fuel PADD can be used if they have the desired composition for the known properties



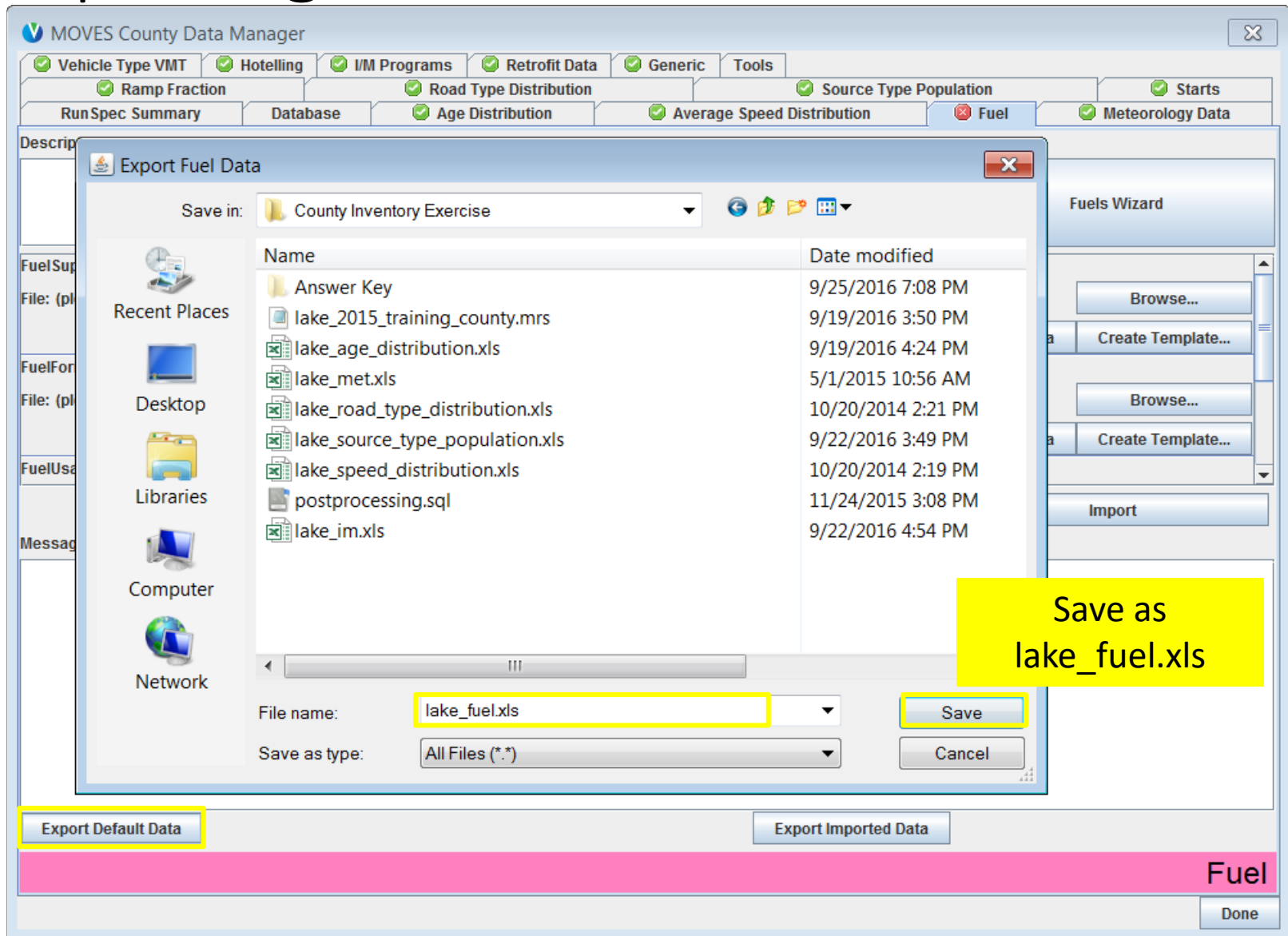
# Fuel: Guidance

- RVP should always be reviewed by the user
  - In some cases, the 1 psi ethanol waiver was not taken into account; in other years, the RVP was interpolated in default database
  - Therefore, assumptions were made to populate the database that should be corrected by the user
  - The RVP should be set to the regulatory limit applicable in the area, making sure RVP reflects whether the 1 psi ethanol waiver is present for 10% ethanol blends
- More details on Federal gasoline regulations are available at:  
<https://www.epa.gov/gasoline-standards/federal-gasoline-regulations>
- When adjusting individual fuel properties, the Fuels Wizard should be used (accessed in the Fuels tab of the CDM)
  - Appropriately adjusts other fuel properties based on known fuel properties (e.g., RVP)

# Fuel: Exercise

- Let's enter fuel data into the CDM for our county-level exercise
- We will use default fuel supply, fuel formulation, and fuel usage data
- We will adjust the AVFT table to reflect a 100% diesel transit bus fleet that consist only of buses one year old or less (see age distribution portion of exercise for this assumption)
- Note that there are 4 boxes for entering data, one for each of the types of fuel information we have to enter
  - Use the scroll bar to see all of the boxes

# Exporting Default Fuel Data



# Checking Default Fuel Supply Data

lake\_fuel.xls [Compatibility Mode] - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ESRI MAPS ACROBAT ! Dolce,...

A1 : X ✓ fx fuelRegionID

	A	B	C	D	E	F	G	H	I	J
1	fuelRegionID	fuelYearID	monthGroup	fuelFormulation	marketShare	marketShareCV				
2	1470011000	2015	7	3313	0.977235	0.5				
3	1470011000	2015	7	3315	0.022765	0.5				
4	1470011000	2015	7	25005	1	0.5				
5	1470011000	2015	7	27002	1	0.5				
6	1470011000	2015	7	28001	1	0.5				
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

Check fuel supply default values for Lake County

FuelSupply FuelFormulation FuelUsage ...

READY 100%

# Checking Default Fuel Formulation Data

lake\_fuel.xls [Compatibility Mode] - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ESRI MAPS ACROBAT

A1 : fuelFormulationID

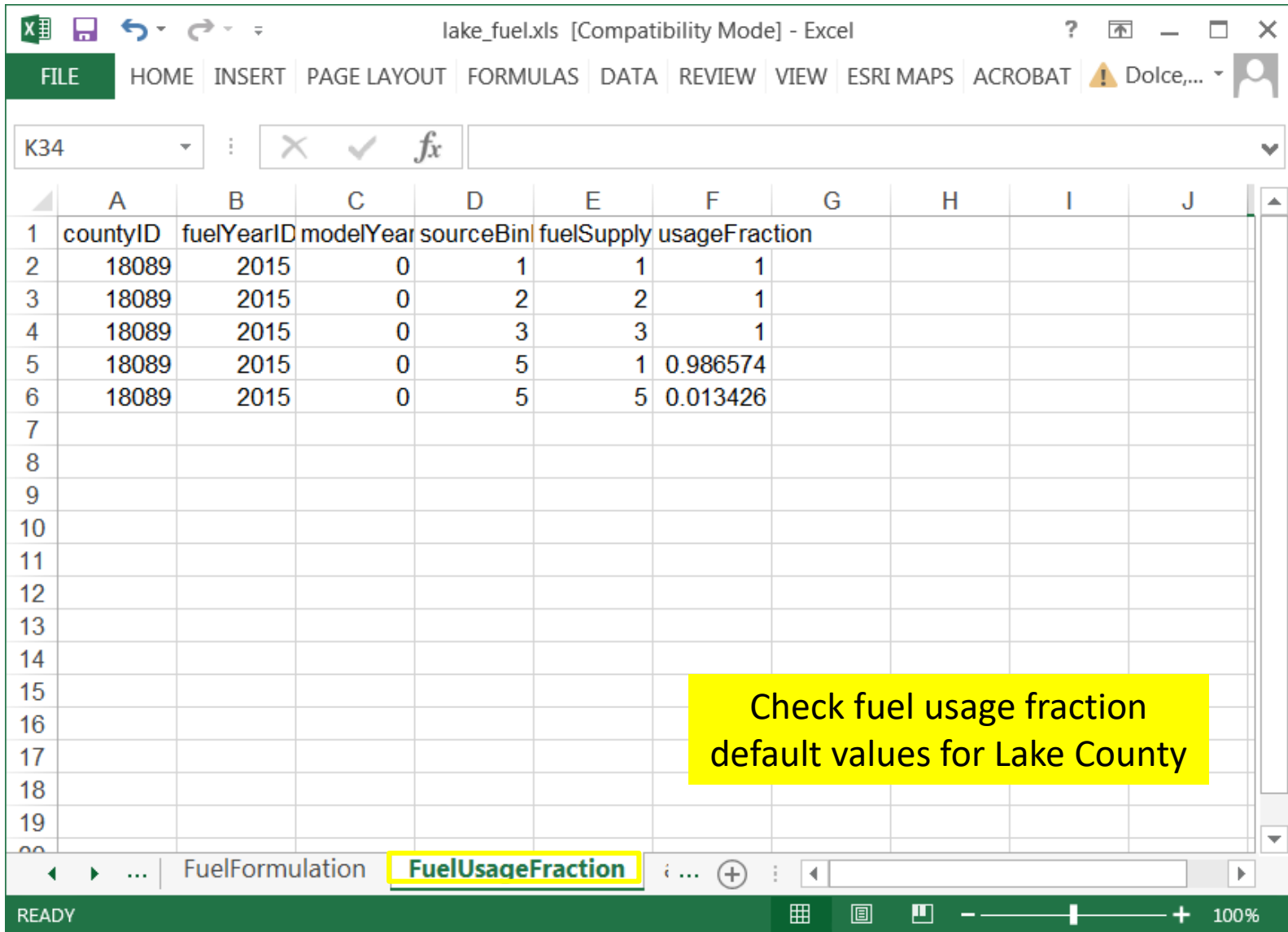
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	fuelFormul	fuelSubtyp	RVP	sulfurLevel	ETOHVolu	MTBEVolu	ETBEVolu	TAMEVolu	aromaticC	olefinCont	benzeneC	e200	e300
2	10	10	6.9	30	0	0	0	0	26.1	5.6	1	41.09	83.09
3	20	20	0	11	0	0	0	0	0	0	0	0	0
4	30	30	0	7.6	0	0	0	0	0	0	0	0	0
5	50	51	7.7	11	85	0	0	0	0	0	0	49.9	89.5
6	96	10	8.7	338	0	0	0	0	26.4	11.9	1.64	50	83
7	97	10	6.6	150	0	11.7581	0	0	24	11	0.8	52	84
8	98	10	6.9	30	0	0	0	0	26.1	5.6	1	41.09	83.09
9	99	10	6.9	90	0	0	0	0	26.1	5.6	1	41.09	83.09
10	3313	12	7.06	30	10	0	0	0	17.13	7.85	0.77	50.98	85.24
11	3315	15	7.06	30	15	0	0	0	15.79	6.67	0.77	57.11	85.76
12	25005	21	0	15	0	0	0	0	0	0	0	0	0
13	27002	51	7.7	8	74	0	0	0	0	0	0	49.9	89.5
14	28001	30	0	7.6	0	0	0	0	0	0	0	0	0
15													
16													
17													
18													
19													
20													

FuelSupply **FuelFormulation** FuelUsageFraction avft ...

READY 100%

Check fuel formulation default values for Lake County

# Checking Default Fuel Usage Fraction Data



lake\_fuel.xls [Compatibility Mode] - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ESRI MAPS ACROBAT ! Dolce,...

K34

	A	B	C	D	E	F	G	H	I	J
1	countyID	fuelYearID	modelYear	sourceBin	fuelSupply	usageFraction				
2	18089	2015	0	1	1	1				
3	18089	2015	0	2	2	1				
4	18089	2015	0	3	3	1				
5	18089	2015	0	5	1	0.986574				
6	18089	2015	0	5	5	0.013426				
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

Check fuel usage fraction default values for Lake County

FuelFormulation FuelUsageFraction

READY 100%

# Checking Default AVFT Data

lake\_fuel.xls [Compatibility Mode] - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ESRI MAPS ACROBAT ! Dolce,...

A1 : X ✓ fx sourceTypeID

	A	B	C	D	E	F	G	H	I	J
1	sourceTypeID	modelYear	fuelTypeID	engTechID	fuelEngFraction					
2	21	1960	1	1	0.993123					
3	21	1960	2	1	0.006877					
4	21	1960	5	1	0					
5	21	1960	9	30	0					
6	21	1961	1	1	0.993123					
7	21	1961	2	1	0.006877					
8	21	1961	5	1	0					
9	21	1961	9	30	0					
10	21	1962	1	1	0.993123					
11	21	1962	2	1	0.006877					
12	21	1962	5	1	0					
13	21	1962	9	30	0					
14	21	1963	1	1	0.993123					
15	21	1963	2	1	0.006877					
16	21	1963	5	1	0					
17	21	1963	9	30	0					
18	21	1964	1	1	0.993123					
19	21	1964	2	1	0.006877					
20	21	1964	5	1	0					
21	21	1964	9	30	0					

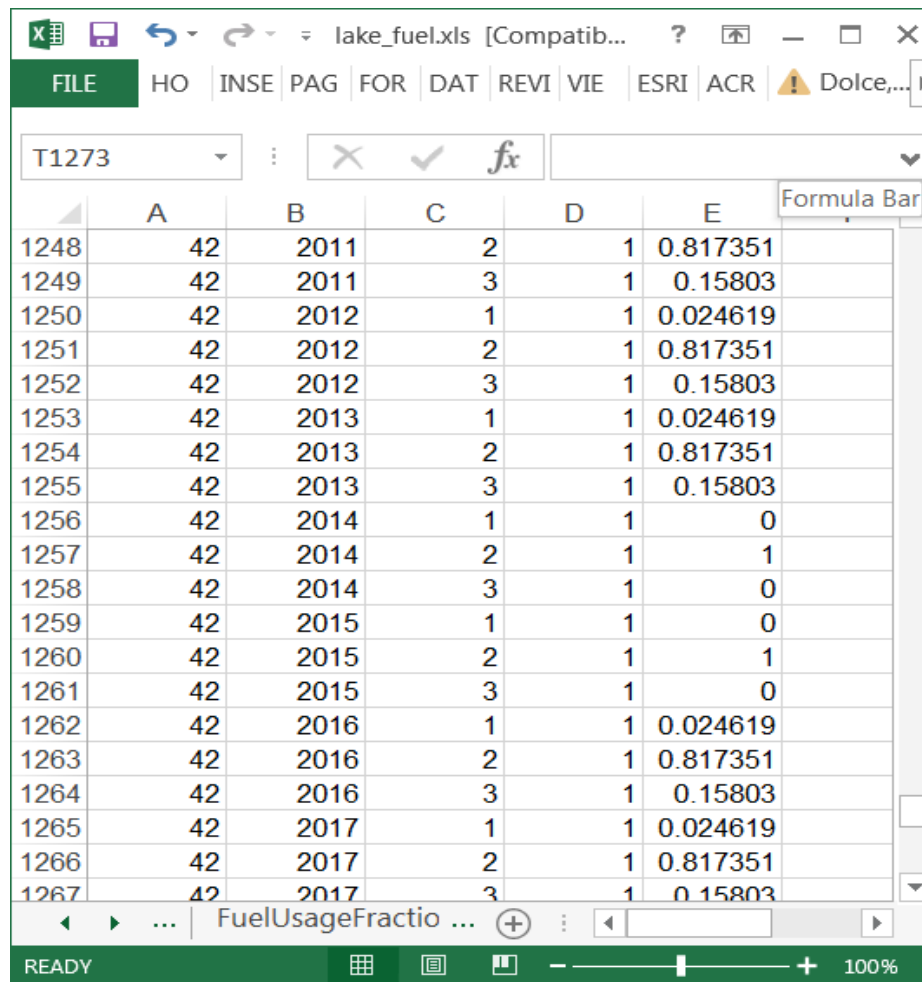
Check fuel AVFT default values for Lake County

FuelUsageFraction avft County Eng ...

READY 100%

# Changing AVFT fractions

- Input fractions of 1.0 for FuelTypeID 2 and SourceTypeID 42
  - Model years 2014 and 2015 only
  - Indicates a 100% diesel fueled transit bus fleet



The screenshot shows a Microsoft Excel spreadsheet titled 'lake\_fuel.xls'. The spreadsheet contains a table with columns A through E. Column A contains model years from 1248 to 1267. Column B contains fuel types (42). Column C contains source types (2, 3, 1). Column D contains fuel usage fractions (0, 1). Column E contains fuel usage fractions (0.817351, 0.15803, 0.024619, 0). The formula bar shows the formula for cell E1248: =0.817351. The status bar at the bottom indicates 'READY' and '100%' zoom.

	A	B	C	D	E
1248	42	2011	2	1	0.817351
1249	42	2011	3	1	0.15803
1250	42	2012	1	1	0.024619
1251	42	2012	2	1	0.817351
1252	42	2012	3	1	0.15803
1253	42	2013	1	1	0.024619
1254	42	2013	2	1	0.817351
1255	42	2013	3	1	0.15803
1256	42	2014	1	1	0
1257	42	2014	2	1	1
1258	42	2014	3	1	0
1259	42	2015	1	1	0
1260	42	2015	2	1	1
1261	42	2015	3	1	0
1262	42	2016	1	1	0.024619
1263	42	2016	2	1	0.817351
1264	42	2016	3	1	0.15803
1265	42	2017	1	1	0.024619
1266	42	2017	2	1	0.817351
1267	42	2017	3	1	0.15803

Change fuel fractions for transit buses and save as lake\_fuel.xls



# Fuel: Exercise

- Instructions for importing fuel into the CDM:
  - Go to fuel tab
  - Click Browse in the Fuel Supply Data Source box, select *lake\_fuel.xls*, and click Open
  - Select the worksheet called “FuelSupply” and click OK
  - Scroll down and repeat this step for each of the remaining three boxes
    - Fuel Formulation
    - Fuel Usage Fraction
    - AVFT
  - Select Import
  - Check:
    - Proper file name and worksheet are listed
    - No error messages
    - Green check on Fuel tab
- See slides 88-91 to review these steps

# Run Lake County Exercise

- We will finish the CDM portion of the exercise here, and then, while MOVES is running, we will review some of the optional inputs in the CDM.
- First, we will go to the database tab to check that all data tables were properly imported.
- Then, we will tell MOVES to execute the run.
- We will review the results of this exercise in Module 4.

# County Inventory Exercise: All Data Imported

The screenshot shows the 'MOVES County Data Manager' application window. The 'Database' tab is selected, displaying a list of imported data tables. The interface includes a top menu bar with various data categories, a central area for selecting or creating a database, and a bottom status bar with a 'Done' button.

**MOVES County Data Manager**

Vehicle Type VMT ✓ Hotelling ✓ I/M Programs ✓ Retrofit Data ✓ Generic ✓ Tools ✓

Ramp Fraction ✓ Road Type Distribution ✓ Source Type Population ✓ Starts ✓

RunSpec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Select or create a database to hold the imported data.

Server: localhost Refresh

Database: lake\_2015\_training\_in Create Database

Log: Clear All Imported Data

2016-09-26 19:04:52.0 Fuel Filled FuelSupply table  
2016-09-26 19:04:52.0 Fuel Filled FuelFormulation table  
2016-09-26 19:04:52.0 Fuel Filled FuelUsageFraction table  
2016-09-26 19:04:52.0 Fuel Filled avft table  
2016-09-26 19:01:55.0 Road Type Distribution Filled RoadTypeDistribution table  
2016-09-26 19:01:11.0 Vehicle Type VMT Filled HourVMTFraction table  
2016-09-26 19:01:10.0 Vehicle Type VMT Filled DayVMTFraction table  
2016-09-26 19:01:10.0 Vehicle Type VMT Filled MonthVMTFraction table  
2016-09-26 19:01:09.0 Vehicle Type VMT Filled HPMSVTypeYear table  
2016-09-26 18:52:49.0 Average Speed Distribution Filled AvgSpeedDistribution table  
2016-09-26 18:52:14.0 Age Distribution Filled SourceTypeAgeDistribution table  
2016-09-26 18:52:12.0 Age Distribution Filled SourceTypeAgeDistribution table  
2016-09-26 18:50:42.0 Meteorology Data Filled ZoneMonthHour table  
2016-09-26 18:49:49.0 I/M Programs Filled IMCoverage table  
2016-09-26 18:47:36.0 Source Type Population Filled SourceTypeYear table

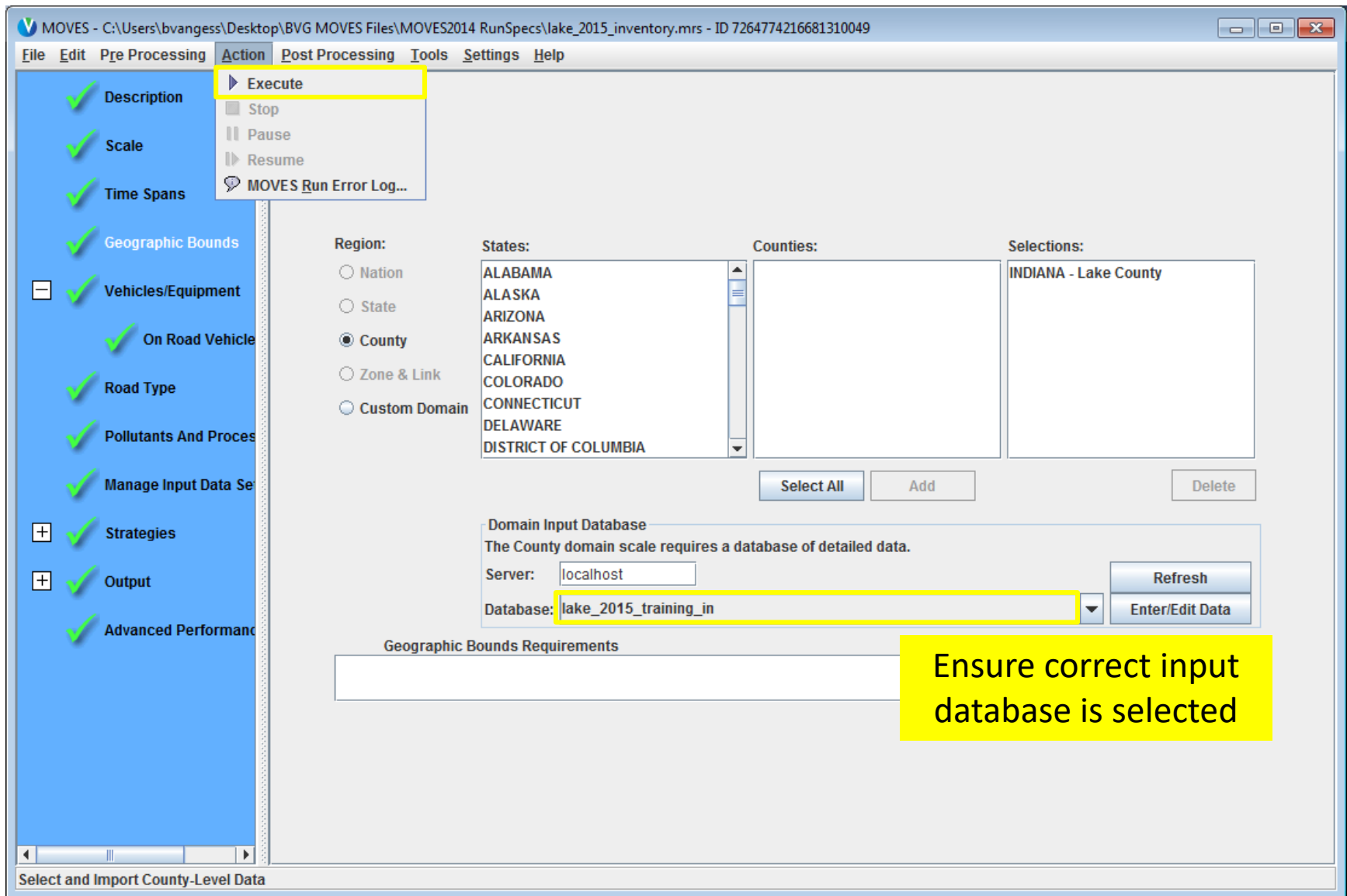
**Database**

Done

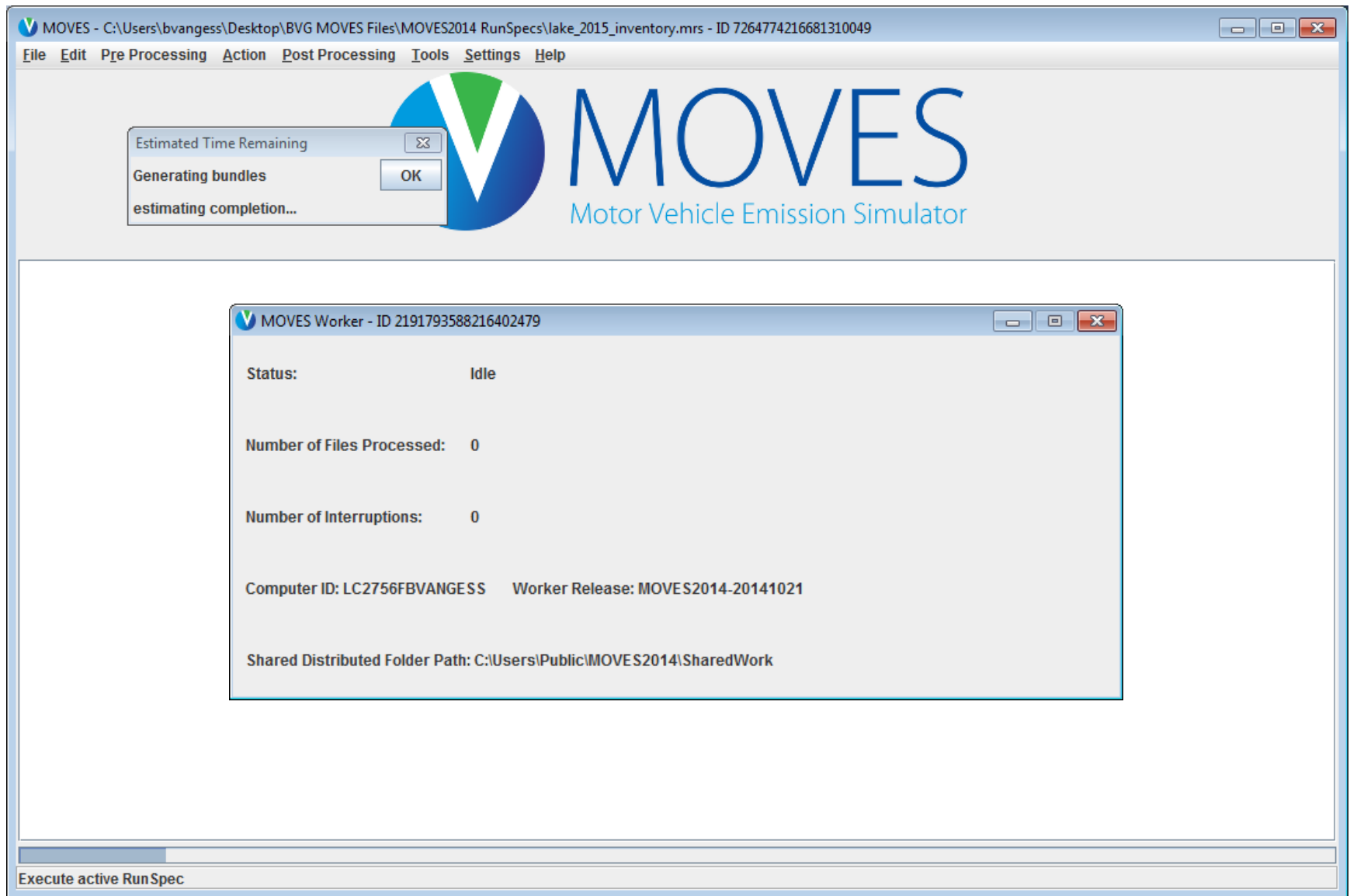
Run can be started:

- Click "Done" bottom right
- See next slide

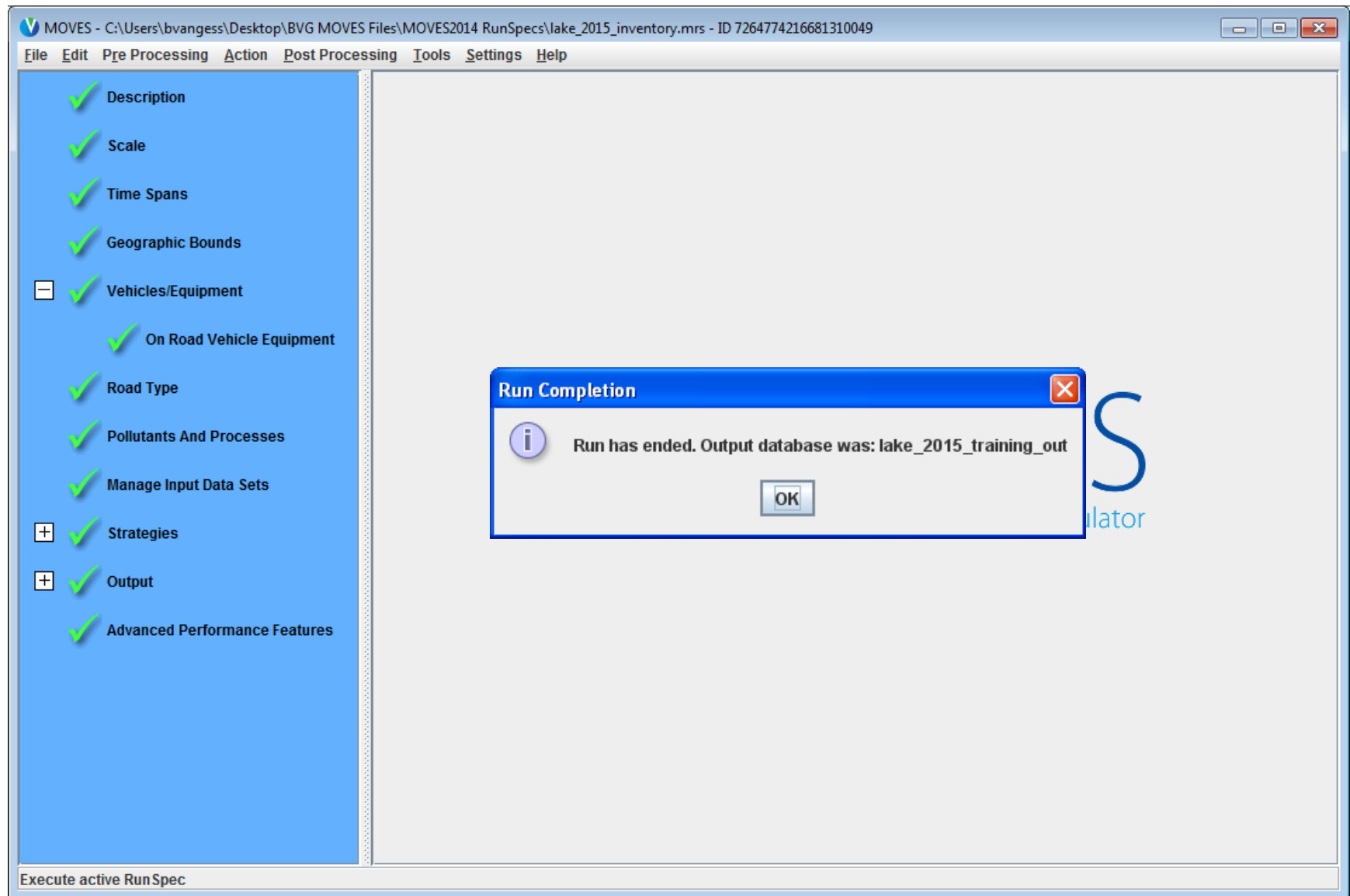
# Executing the RunSpec



# MOVES Running

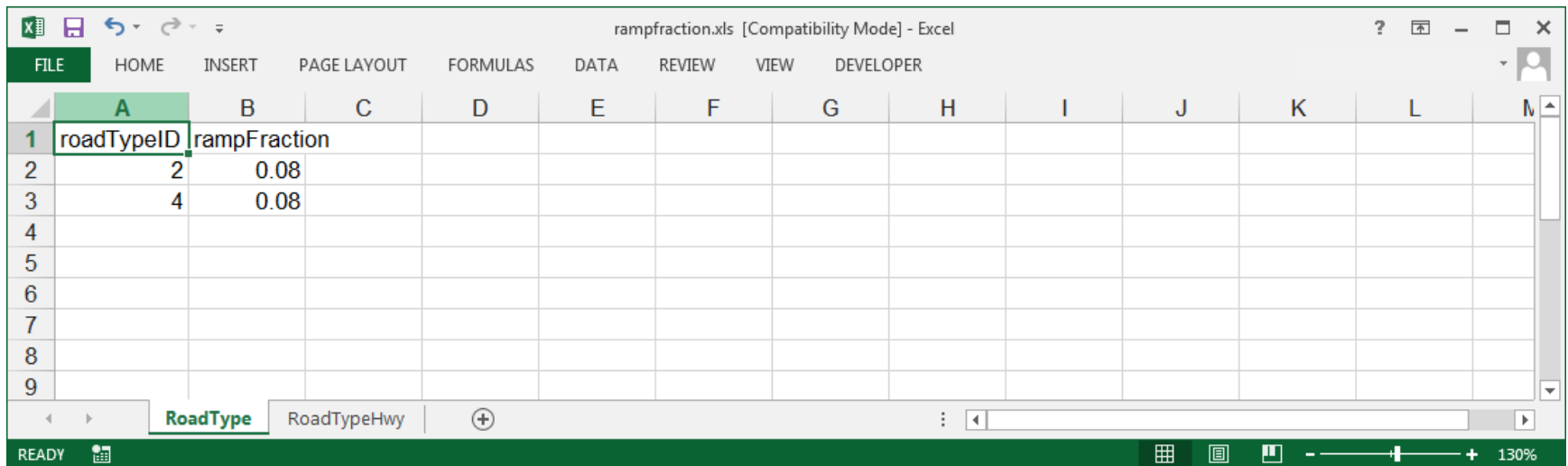


# Run Complete



# Optional CDM Tabs: Ramp Fraction

- RampFraction is the fraction of *time* (daily VHT) – *not* distance – spent on ramps as compared to the total time on restricted roadways and ramps
  - A restricted road type must have been selected in the Road Type panel to be able to import Ramp Fraction data
- This tab starts with a green check. Default ramp fraction of 0.08 (8%) is applied if this fraction is not changed



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	roadTypeID	rampFraction											
2	2	0.08											
3	4	0.08											
4													
5													
6													
7													
8													
9													

# Optional CDM Tabs: Ramp Fraction

- Current guidance in Section 4.8 of MOVES Technical Guidance indicates that local data should be used here.
- EPA is currently reviewing data on ramp activity and how it affects emissions.
- During this review, we recommend the use of default ramp activity.



# Optional CDM Tabs: Retrofit

The screenshot shows the 'MOVES County Data Manager' window. The 'Retrofit Data' tab is selected in the top menu. Below the menu, there are several sub-tabs: 'Vehicle Type VMT', 'Hotelling', 'I/M Programs', 'Retrofit Data' (selected), 'Generic', 'Tools', 'Meteorology Data', 'Ramp Fraction', 'Road Type Distribution', 'Source Type Population', 'Starts', 'RunSpec Summary', 'Database', 'Age Distribution', 'Average Speed Distribution', and 'Fuel'. The main area is divided into sections: 'Description of Imported Data' (a large empty text box), 'onRoadRetrofit Data Source:' (containing a 'File: (please select a file)' label, a 'Browse...' button, and 'Clear Imported Data' and 'Create Template...' buttons), 'Messages:' (a large empty text box), and 'Export Imported Data' (a button). At the bottom, there is a green bar labeled 'Retrofit Data' and a 'Done' button.

- The retrofit importer (formerly in the RunSpec of MOVES2010b) is now located in the CDM/PDM
- Use to model diesel retrofit programs
- This is an optional input

# Optional CDM Tabs: Retrofit

pollutantID	processID	fuelTypeID	sourceTypeID	retrofitYearID	beginModelYearID	endModelYearID	cumFractionRetrofit	retrofitEffectiveFraction
3	1	2	62	2024	2020	2024	0.5	0.3

The example above describes a retrofit program:

- Applying to diesel combination long-haul trucks (sourceTypeID 62)
- Affecting running emissions (process ID 1) of NOx (pollutantID 3)
- For model years 2020 through 2024 (beginModelYearID/endModelYearID)
- Where 50% of all vehicles in that MY range are retrofitted (cumFractionRetrofit 0.5)
- And the retrofit technology reduces emissions 30% (retrofitEffectiveFraction 0.3)
- The retrofitYearID should always be the analysis year
- Consult EPA guidance material for more information on when to use the Retrofit input (Section 4.14 of the MOVES Technical Guidance)

# Optional CDM Tabs: Hotelling

The screenshot shows the MOVES County Data Manager application window. The 'Hotelling' tab is selected, indicated by a green checkmark and a blue highlight. The interface includes a top menu bar with various data sources like Vehicle Type VMT, Meteorology Data, and Age Distribution. Below this, there's a 'Description of Imported Data' section. The main area is divided into two panels: 'hotellingActivityDistribution Data Source' and 'hotellingHours Data Source'. Each panel has a 'File: (please select a file)' label, a 'Browse...' button, and 'Clear Imported Data' and 'Create Template...' buttons. At the bottom, there's a 'Messages' section, 'Export Default Data' and 'Export Imported Data' buttons, and a red bar with the word 'Hotelling' in white. A 'Done' button is in the bottom right corner.

- Section 4.13 of MOVES Technical Guidance
- The Hotelling input allows users to describe long-haul combination truck hotelling behavior
- The two panels are:
  - **hotellingactivitydistribution** and
  - **hotellinghours**
- Both are optional inputs
- Output in Rates mode is provided in the **ratepervehicle** table, but also in a new **rateperhour** table. *Only one should be used* depending on if activity is available in terms of vehicle population or hotelling hours

# Optional CDM Tabs: Hotelling

- The **hotellingactivitydistribution** table is used to define the fraction of trucks in each of four modes of hotelling activity:
- 200 – Extended Idling
- 201 – Auxiliary Power Units (APUs)
- 203 – Battery Power
- 204 – Engine Off
- The example shows the national default fractions

beginModelYearID	endModelYearID	opModelID	opModeFraction
1960	2009	200	1
1960	2009	201	0
1960	2009	203	0
1960	2009	204	0
2010	2050	200	0.7
2010	2050	201	0.3
2010	2050	203	0
2010	2050	204	0

# Optional CDM Tabs: Hotelling

hourDayID	monthID	yearID	ageID	zoneID	sourceTyp	hotellingHo
15	1	2024	30	131210	62	0
15	1	2024	29	131210	62	0
15	1	2024	28	131210	62	0
15	1	2024	27	131210	62	0
15	1	2024	26	131210	62	0
15	1	2024	25	131210	62	0.033932
15	1	2024	24	131210	62	0.146956
15	1	2024	23	131210	62	0.141804
15	1	2024	22	131210	62	0.113281
15	1	2024	21	131210	62	0.129963
15	1	2024	20	131210	62	0.23111
15	1	2024	19	131210	62	0.102025
15	1	2024	18	131210	62	0.409672
15	1	2024	17	131210	62	0.397336
15	1	2024	16	131210	62	0.402312
15	1	2024	15	131210	62	0.737026
15	1	2024	14	131210	62	0.82595
15	1	2024	13	131210	62	1.388
15	1	2024	12	131210	62	1.41376
15	1	2024	11	131210	62	1.52765
15	1	2024	10	131210	62	1.05556
15	1	2024	9	131210	62	2.35206
15	1	2024	8	131210	62	1.73303
15	1	2024	7	131210	62	3.48606
15	1	2024	6	131210	62	1.39675
15	1	2024	5	131210	62	2.19772
15	1	2024	4	131210	62	2.56074
15	1	2024	3	131210	62	5.66776
15	1	2024	2	131210	62	4.5037
15	1	2024	1	131210	62	3.1559
15	1	2024	0	131210	62	3.07248

- The **hotellinghours** table is used to define the total number of hotelling hours in your modeling domain
- In MOVES2014, hotelling hours are allocated to counties based on rural combination truck VMT – in MOVES2010b it was based on long-haul combination truck population
- This input can be used to override the defaults and provide local hotelling hours (if available)
- Note that hotelling hours are by “day-type”
  - day 5 = 5 weekdays
  - day 2 = 2 weekend days

# Optional CDM Tabs: Starts

- Section 4.12 of the MOVES Technical Guidance
- MOVES2014 offers the option to import local vehicle start information
  - Input is optional: if no data are provided, MOVES calculates starts from the user defined source type population input
- Depending on the data available, users can use one or more of the following panels:
- **starts** – use when you have all information: starts by source type, hourdayid, modelyear, monthid. If **starts** table used, no other tables below should be used
  - **startsPerDay** – use when you have the number of starts per day
  - **startsHourFraction** – use when you know the distribution of starts throughout the day
  - **startsSourceTypeFraction** – use when you know how to allocate starts among the different source types
  - **startsMonthAdjust** – use to adjust start activity by month

An importer is also available to provide information on vehicle soak time

- **importStartsOpModeDistribution** – defines vehicles soak times

# Optional CDM Tabs: Starts

- An entire “**starts**” table can be imported. This will completely replace the MOVES generated default starts profile.
- Note that this input requires all information on starts for all hours, dayIDs, age (model year), and source type selected in the runspec

hourDayID	monthID	yearID	ageID	zoneID	sourceTypeID	starts	startsCV
15	1	2024	0	131210	11		
15	1	2024	0	131210	21		
15	1	2024	0	131210	31		
15	1	2024	0	131210	32		
15	1	2024	0	131210	41		
15	1	2024	0	131210	42		
15	1	2024	0	131210	43		
15	1	2024	0	131210	51		
15	1	2024	0	131210	52		
15	1	2024	0	131210	53		
15	1	2024	0	131210	54		
15	1	2024	0	131210	61		
15	1	2024	0	131210	62		
15	1	2024	1	131210	11		
15	1	2024	1	131210	21		
15	1	2024	1	131210	31		
15	1	2024	1	131210	32		

# Optional CDM Tabs: Starts

- The startspersday importer is used to provide total starts by day type
- Starts should be entered for all vehicles and all days within the day type (day 5 represents five weekdays, and day 2 represents two weekends)
- This input can be used independently, or in combination with **startsHourFraction**, **startsSourceTypeFraction**, and **startsMonthAdjust**

zoneID	dayID	yearID	startsPerDay	
131210	5	2024		



# Optional CDM Tabs: Starts

zoneID	dayID	hourID	allocationFraction
131210	5	1	
131210	5	2	
131210	5	3	
131210	5	4	
131210	5	5	
131210	5	6	
131210	5	7	
131210	5	8	
131210	5	9	
131210	5	10	
131210	5	11	
131210	5	12	
131210	5	13	
131210	5	14	
131210	5	15	
131210	5	16	
131210	5	17	
131210	5	18	
131210	5	19	
131210	5	20	

- The **startshourfraction** importer is used to define the distribution of total starts across the day
- Different distributions can be provided for each day type
- This input can be used independently, or in combination with **startspersday**, **startsSourceTypeFraction**, and **startsMonthAdjust**

# Optional CDM Tabs: Starts

sourceTypeID	allocationFraction
11	
21	
31	
32	
41	
42	
43	
51	
52	
53	
54	
61	
62	

- The **startssourcetypefraction** importer is used to define the distribution of total starts by source type
- This input can be used independently, or in combination with **startspersday**, **startshourfraction**, and **startsMonthAdjust**

# Optional CDM Tabs: Starts

monthID	monthAdjustment
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

- The **startsmothadjust** importer is used to define the distribution of total starts by month
- A fraction of 1 for all months indicates every month has an equal number of starts
- These can be varied to adjust for a scenario where there is greater start activity in the summer months vs. winter months
- This input can be used independently, or in combination with **startspersday**, **startshourfraction**, and **startssourcetypefraction**

# Optional CDM Tabs: Starts

sourceType	hourDayID	linkID	polProcess	opModelID	opModeFraction
11	15	1312101	302	101	
11	15	1312101	302	102	
11	15	1312101	302	103	
11	15	1312101	302	104	
11	15	1312101	302	105	
11	15	1312101	302	106	
11	15	1312101	302	107	
11	15	1312101	302	108	
11	25	1312101	302	101	
11	25	1312101	302	102	
11	25	1312101	302	103	
11	25	1312101	302	104	
11	25	1312101	302	105	
11	25	1312101	302	106	
11	25	1312101	302	107	
11	25	1312101	302	108	
11	35	1312101	302	101	
11	35	1312101	302	102	
11	35	1312101	302	103	
11	35	1312101	302	104	
11	35	1312101	302	105	
11	35	1312101	302	106	
11	35	1312101	302	107	
11	35	1312101	302	108	

- The **startsopmodedistribution** importer is used to define the distribution of soak times by sourcetype, hour, and dayID
- For each combination of sourcetype, hourDayid, and polprocessID, opmodefractions should sum to 1
- The table below shows the available soak times

opModelID	opModeName
101	Soak Time < 6 minutes
102	6 minutes <= Soak Time < 30 minutes
103	30 minutes <= Soak Time < 60 minutes
104	60 minutes <= Soak Time < 90 minutes
105	90 minutes <= Soak Time < 120 minutes
106	120 minutes <= Soak Time < 360 minutes
107	360 minutes <= Soak Time < 720 minutes
108	720 minutes <= Soak Time

# Optional CDM Tabs: Starts

- In the General Output panel of the RunSpec, checking output by “Starts” allows you to confirm that MOVES used the correct number of starts
- For Rates runs, two new tables are created called “**startpervehicle**” and “**rateperstart**”
  - The **startpervehicle** table is primarily informational and can be used for diagnostic purposes

*Only one of these tables should be used for developing a starts emissions inventory:*
  - The **rateperstart** table can be used as an alternative for the **ratepervehicle** table if start information is available
  - If you have start info: Multiply **rateperstart** rates x [# of vehicle starts]
  - If you don't: Multiply **ratepervehicle** rate x [vehicle population]

# Optional CDM Tabs: Generic

- The Generic tab allows advanced users to enter data into the many tables used by MOVES to complete its calculations
- In general, most users will not have a reason to enter data through this tab
- Section 4.16 of the MOVES Technical Guidance

# Helpful MOVES Tools

- Three new tools available for MOVES2014:
  - AADVMT Converter
  - Age Distribution Projection Tool
  - Default Age Distribution Tool
  - These and other tools can be found at:  
[www.epa.gov/moves/tools-develop-or-convert-moves-inputs](http://www.epa.gov/moves/tools-develop-or-convert-moves-inputs)
- All of these tools are compatible with MOVES2014a/b
- Note, the tools website also contains several MOBILE6 to MOVES converters. Generally, these should not be used with MOVES2014.

# Questions?

