California Air Resources Board

and the California Air Pollution Control Officers Association

Diesel Internal Combustion Engine Risk Tool User Guide

July 2024

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1. Introduction

The development of the *Non-Vehicular Diesel Engine Risk Assessment Guidance* (Guidance) included a tool created to assist local Air Pollution Control Districts and Air Quality Management Districts (Districts) in performing screening health risk assessments (HRAs) of toxic emissions from diesel internal combustion engines (DICE). The Hotspots Analysis and Reporting Program 2 (HARP2) Diesel Internal Combustion Engine Risk Assessment Tool (DICE Risk Tool) follows this Guidance and allows users to perform customized screening health risk assessments (HRAs). Users of the DICE Risk Tool should refer to the Guidance for a complete technical understanding of the inputs to the tool, as well as its limitations.

2. Downloading the DICE Risk Tool

This section provides information for installing the program.

2.1 System Requirements

Before installing the DICE Risk Tool on your computer, please review the system requirements. The current version of the DICE Risk Tool is a Microsoft Windows based program and can be installed on any Windows operating system that supports the Microsoft .NET Framework 4.0 or later. Additional system requirements include:

- 2 GB of RAM
- 20 MB of free hard drive space for the DICE Risk Tool program files
- At least 1 GB of storage space for project files

2.2 Installing the DICE Risk Tool

The DICE Risk Tool installation files are available on the Internet at:

https://ww2.arb.ca.gov/resources/documents/non-vehicular-diesel-engine-risk-assessment-guidance

Click the **Download Software and User Guide** link. Follow the online instructions for complete details on how to download the installation software. Once the installation setup file has been downloaded and saved to your hard drive, double-click on it to begin the program setup. Follow the on-screen instructions to complete the setup.

The default destination folder is C:\DICE. It is recommended that you install to the default destination folder. In addition, the installer will create a DICE Risk Tool folder on your desktop. This folder will contain shortcuts to the program's executable file and the user guide.

2.3 Opening the Program

To launch the DICE Risk Tool, open the DICE folder found on your desktop. Double-click on the **DICE** icon.

2.4 Getting Familiar with the Program

The DICE Risk Tool is designed as a wizard to guide the user through the emissions calculation, air dispersion modeling and risk assessment process. It has been streamlined to require minimal user input, while still providing a robust assessment. The DICE Risk Tool is composed of the following main user screens:

- Title
- Project Information
- Engine Information
- Building Information
- Receptor Information
- Run and View Results

The sections that follow provide a step by step description of the use of the DICE Risk Tool.

3. Calculating Risk

3.1 Required Information for Performing an Assessment

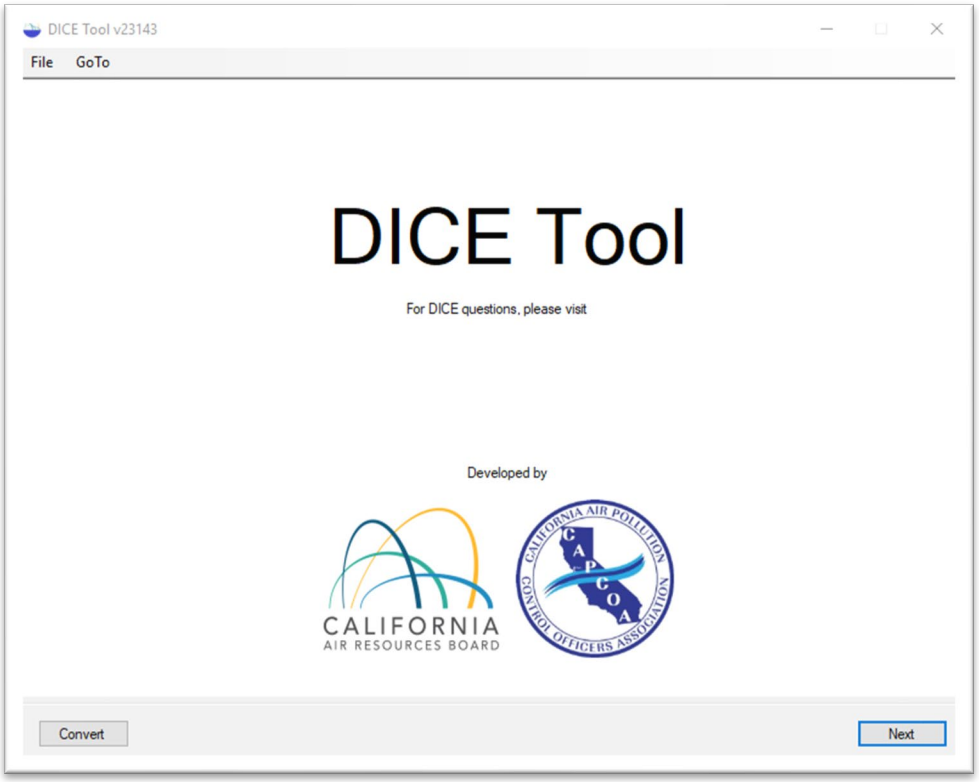
The DICE Risk Tool uses the following information to perform a health risk assessment:

- Engine exhaust stack parameters: stack height, stack diameter, exhaust temperature and exhaust exit velocity or flow rate. If not known, the DICE Risk Tool provides defaults based on engine horsepower.
- Engine exhaust release type: vertical, horizontal or capped.
- Annual diesel PM_{10} emissions (lbs/year). If not known, the DICE Risk Tool will calculate emissions given engine horsepower, engine load, diesel PM_{10} emission factor (g/bhp-hr or g/kw-hr), and engine annual activity in hours or gallons.
- Building information (if applicable).
- Nearest resident and worker receptor distance (m).
- AERMOD ready meteorological data. A link is provided to data for California.
- Name of Agency with jurisdiction over the project (in order to select the appropriate pre-set default risk settings) or user-entered risk settings.

3.2 Opening the DICE Risk Tool

Launching the DICE Risk Tool will open the title screen as shown in Figure 1. On this screen, the user can start a new project by selecting the **Next** button on the bottom right, or open a previously saved project by selecting the **Open Project** option in the **File** drop-down menu. The **GoTo** drop-down menu allows the user to navigate to a specific screen in the DICE Risk Tool.

Figure 1 - DICE Risk Tool on Startup



A conversion tool, shown in Figure 2, is available to the user from most screens by selecting the **Convert** button located in the bottom left corner of the DICE Risk Tool.

The conversion tool allows the user to convert common units for the following measurements:

- Length – Feet, inches, and miles to meters.
- Temperature – Fahrenheit and Celsius to Kelvin.
- Velocity – Feet per second and kilometers per hour to meters per second.
- Flow Rate – Cubic Feet per second, minute, and hour to cubic meters per second.

To use the conversion tool, enter the desired numerical value in the white boxes under **Convert From**. The conversion tool will then automatically generate the converted value into the corresponding grey boxes located under **Convert To** as shown in Figure 3.

Figure 2 - Conversion Tool Page

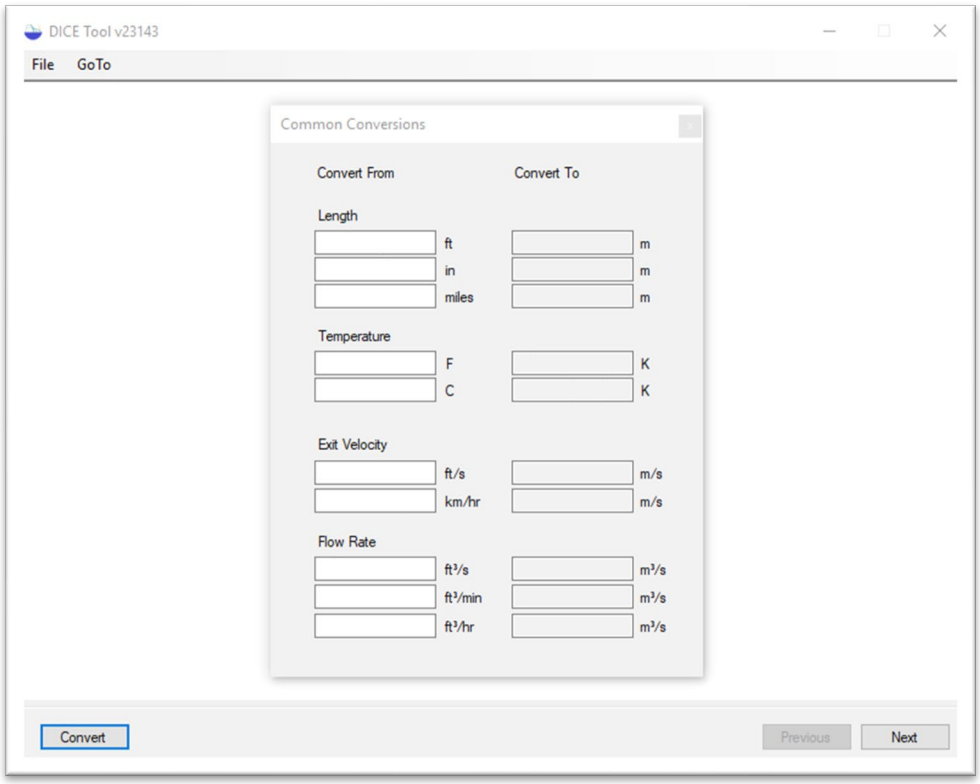
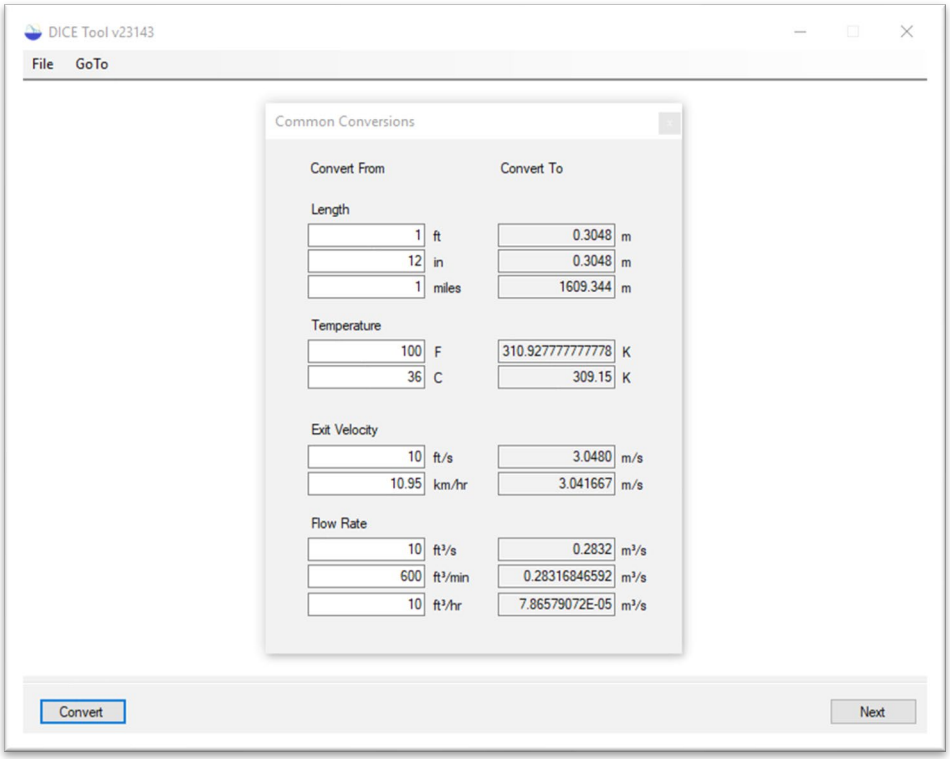


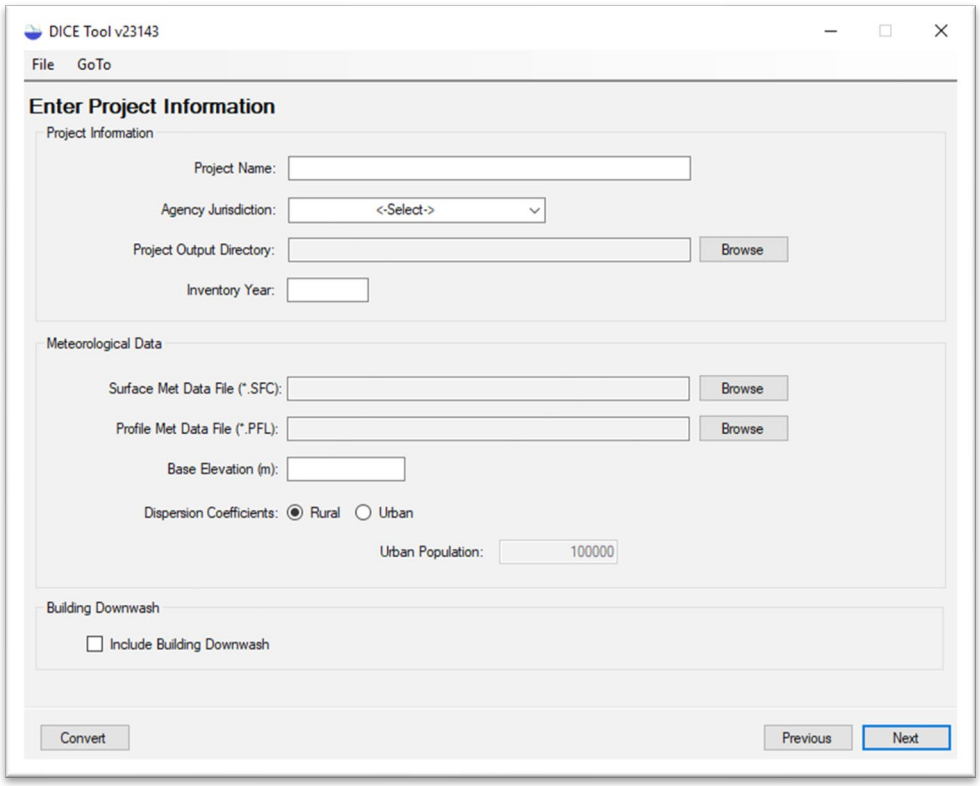
Figure 3 – Conversion Tool Page with Entered Values



3.3 Enter Project Information Screen

To start the risk assessment, enter the project information as shown in Figure 4.

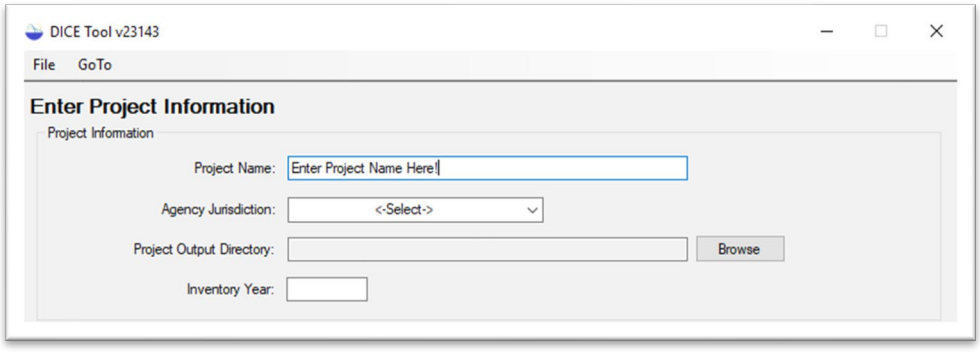
Figure 4 – Project Information Page



3.3.1 Project Information

In the project information box, input a **Project Name** as shown in Figure 5. The **Project Name** will be displayed on the project's summary reports.

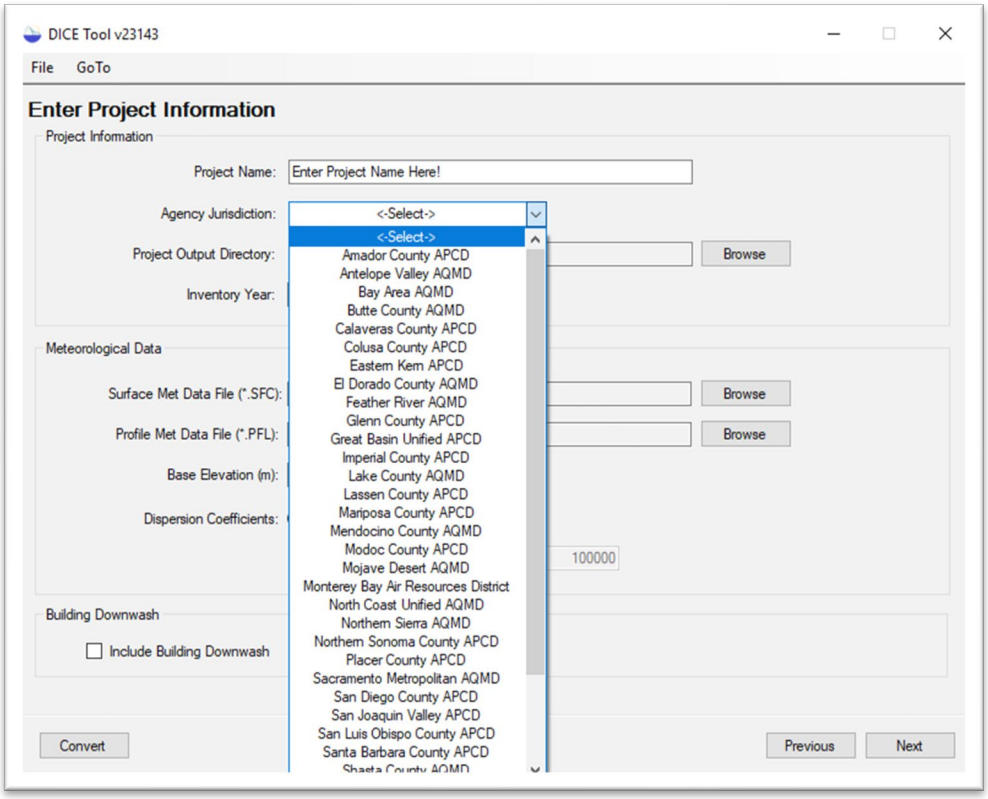
Figure 5 – Entering the Project Name



Select the project's reviewing agency by using the **Agency Jurisdiction** drop down box as shown in Figure 6. This will load that agency's recommended HARP2 risk settings, which are

then used to perform the HRA. Risk settings are described in more detail in Section 3.6.3 of this user guide, including a discussion of how to change from the default pre-set risk settings.

Figure 6 – Selecting Agency Jurisdiction from Dropdown Box



To enter a project folder name in the **Project Output Directory** box, first select the **Browse** button indicated by the red arrow in Figure 7. A **Browse for Folder** window will appear as shown in Figure 8.

Figure 7 – Selecting the Browse Button

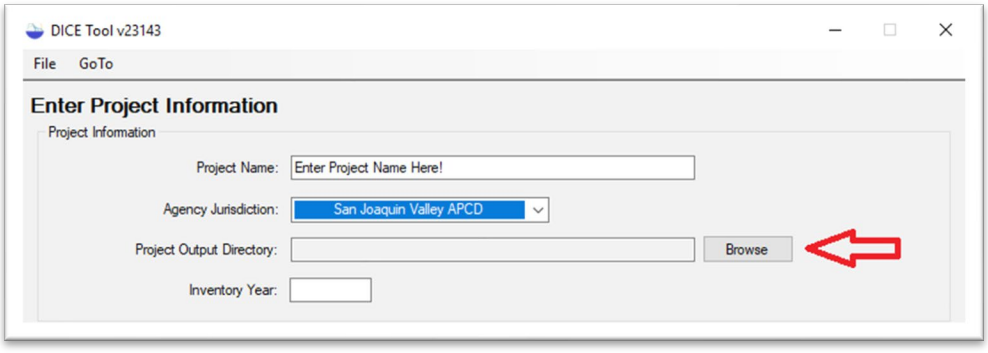
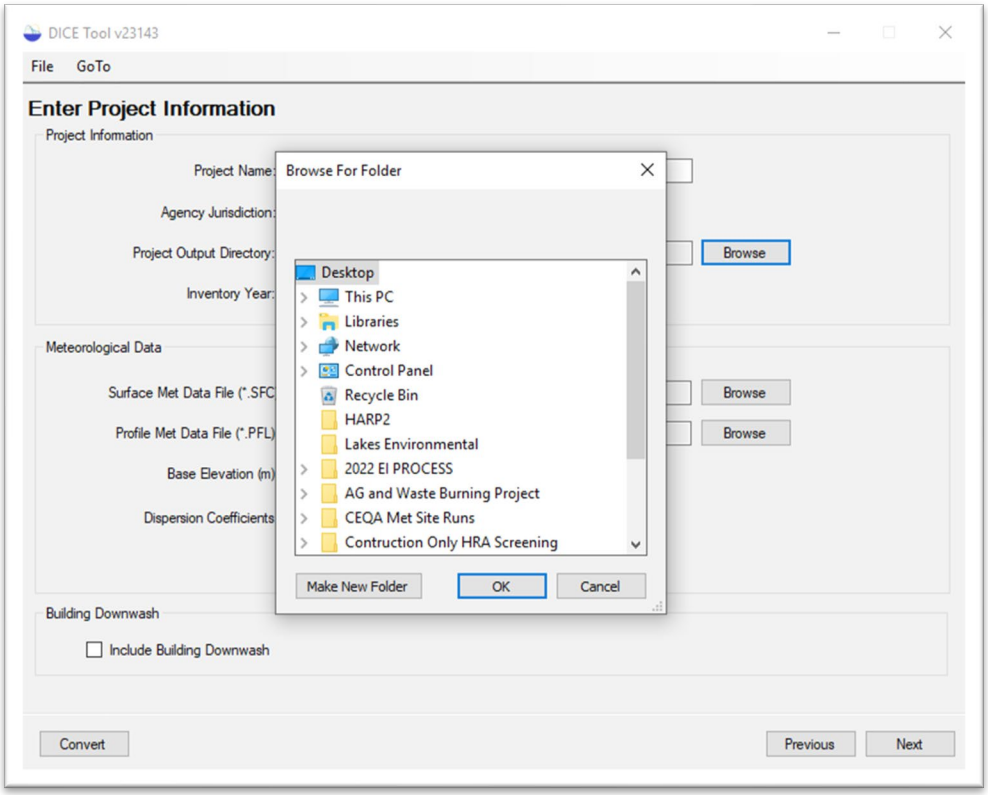
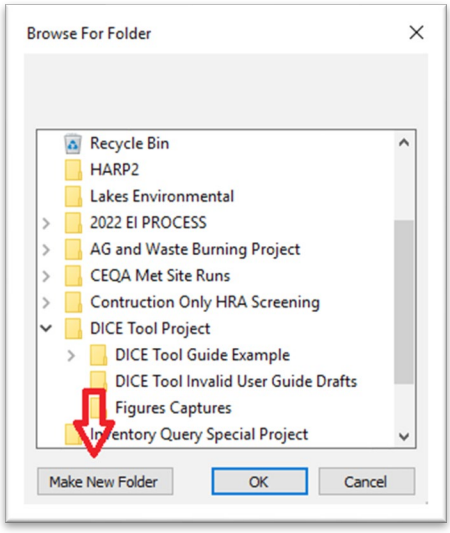


Figure 8 – Browse for Folder Window



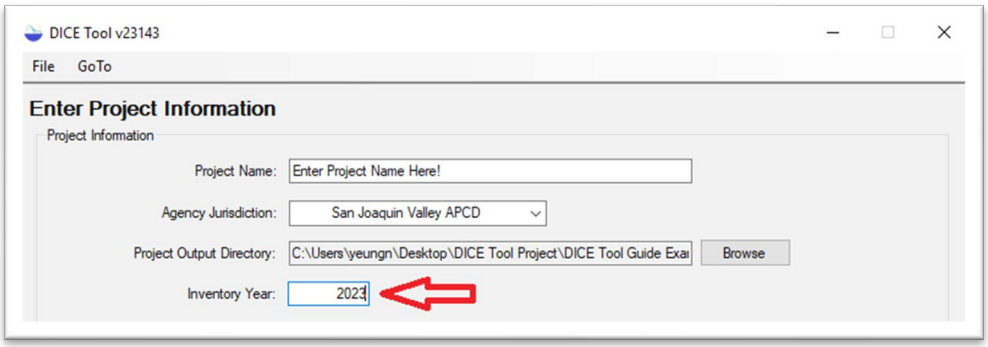
Navigate through your computer's files and select the desired location of your output files. To make a new folder, select the **Make New Folder** button as indicated by the red arrow in Figure 9. After selecting the output folder location, click **OK** to finish.

Figure 9 – Making New Folder Location



Enter the year in which the engine's emissions occurred into the **Inventory Year** box as indicated by the red arrow in Figure 10. Otherwise, leave this box blank.

Figure 10 – Entering Project's Inventory Year



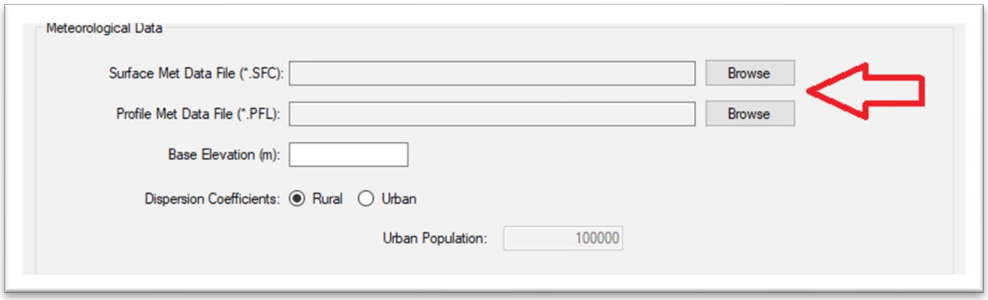
3.3.2 Meteorological Data

Next, the meteorological data needed to run the air dispersion model must be loaded into the tool. These data can be obtained from the local air district or from the California Air Resources Board (CARB) website at:

https://ww2.arb.ca.gov/resources/documents/harp-aermod-meteorological-files

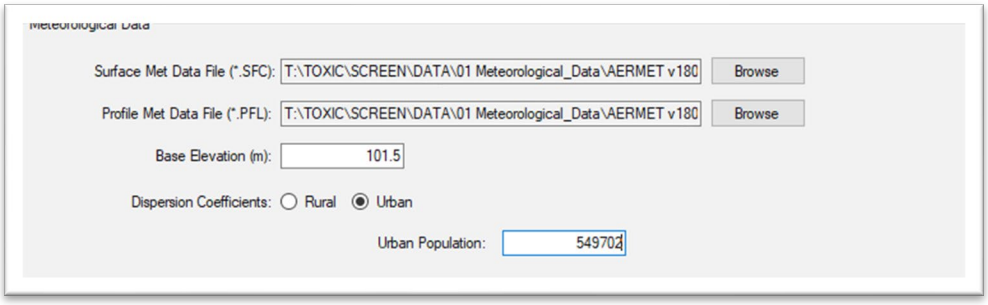
To enter the meteorological data, click the **Browse** buttons next to the Surface and Profile Met Data File boxes as shown in Figure 11 and select the .SFC and .PFL files of the selected meteorological site.

Figure 11 - Importing the Meteorological Data



Next, enter the chosen site's **Base Elevation** and select the **Dispersion Coefficient** type. If the urban dispersion coefficient is selected, enter the **Urban Population** of the project's location. As an example, in Figure 12, the Fresno Met site was selected and its base elevation of 101.5 meters was entered. The urban dispersion coefficient was selected and the project location's population of 549,702 was entered.

Figure 12 – Entered Meteorological Data



3.3.3 Building Downwash

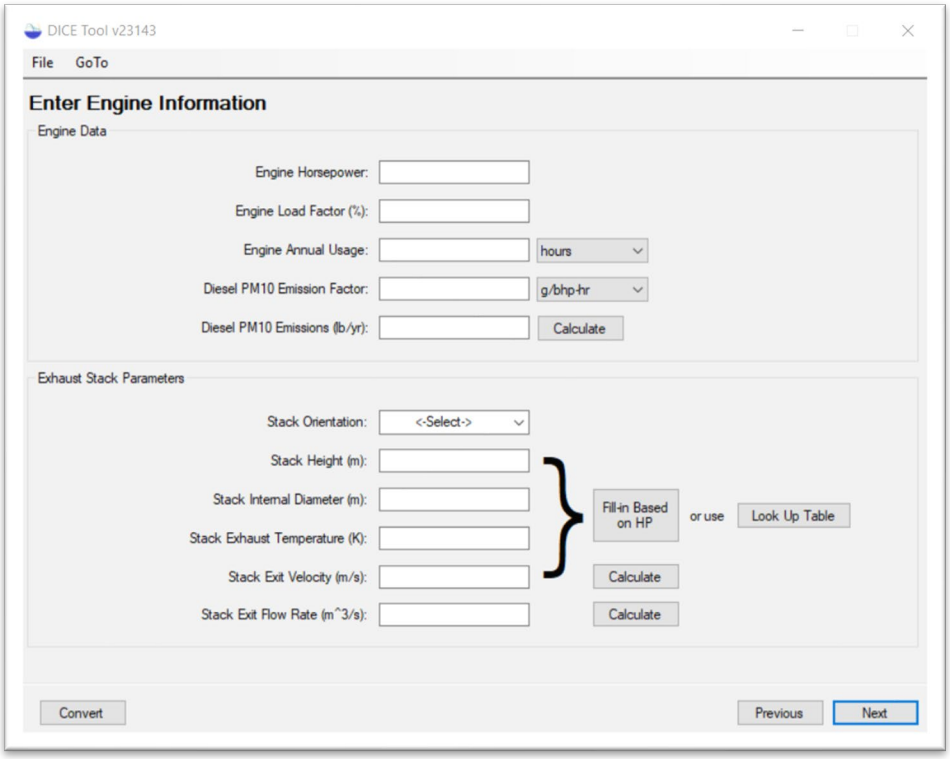
If the DICE is located near a building and the exhaust stack is subjected to building downwash, the user can include building downwash in the air dispersion model by clicking the **Include Building Downwash** check box as shown in Figure 13. If the building downwash option is selected, the user will be prompted later to enter the building information. Click the **Next** button to continue to the next step.

Figure 13 - Specifying Building Downwash

3.4 Enter Engine Information Screen

The Enter Engine Information Screen collects engine emissions and exhaust information as shown in Figure 14.

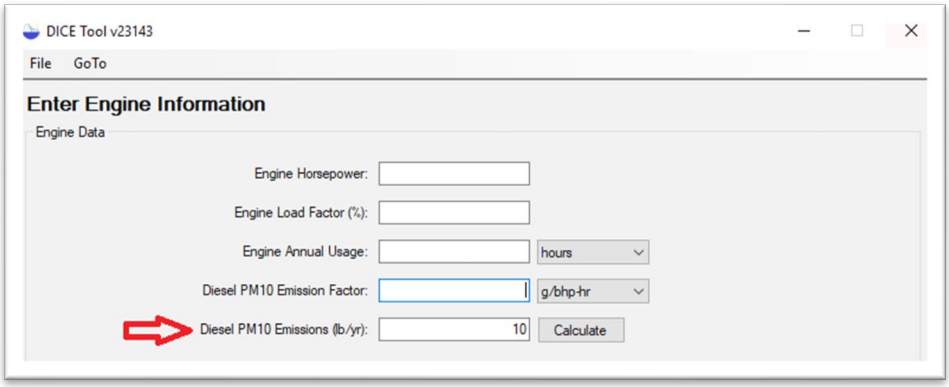
Figure 14 – Enter Engine Emissions Data



3.4.1 Engine Data

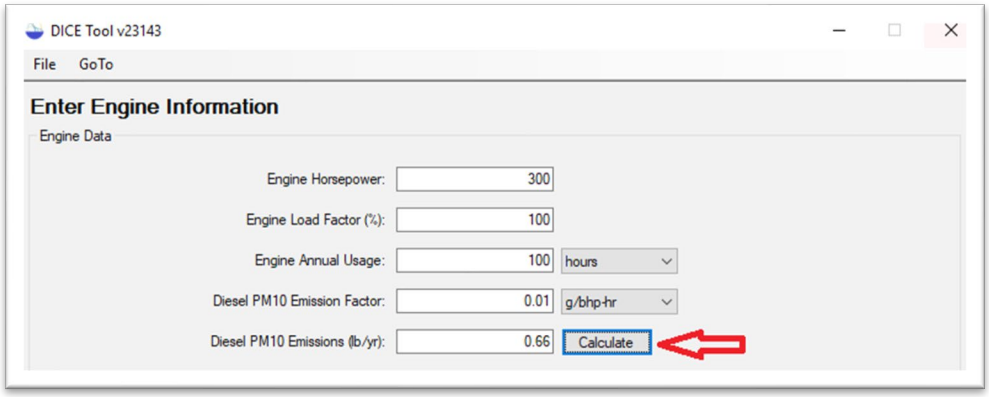
In the Engine Data Section, the user must enter or calculate the **Diesel PM10 Emissions**. The user is only required to enter the annual diesel PM10 emissions indicated by the red arrow in Figure 15.

Figure 15 - Entering Engine Specification Data



However, if the user would like the tool to calculate the annual diesel PM10 emission rate, the user may instead enter the **Engine Horsepower**, **Engine Load Factor**, **Engine Annual Usage**, and **Diesel PM10 Emission Factor** and then press the **Calculate** button to generate the annual diesel PM10 emission rate as shown in Figure 16.

Figure 16 – Generating Diesel PM10 Emissions from Engine Information



The **Engine Annual Usage** can be entered as hours operated or gallons of diesel fuel consumed. The **Diesel PM10 Emission Factor** can be entered as g/bhp-hr or g/kw-hr. To select which unit to use, click the drop down boxes shown in Figures 17 and 18.

Figure 17 – Selecting Units for Engine Annual Usage

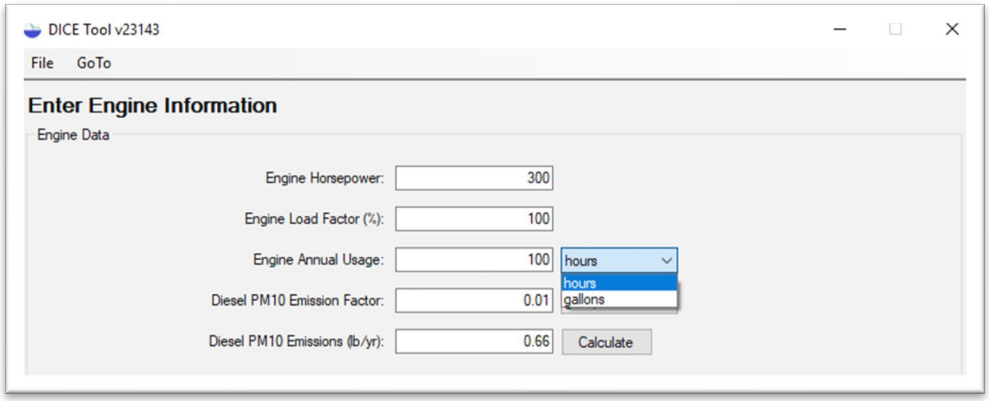
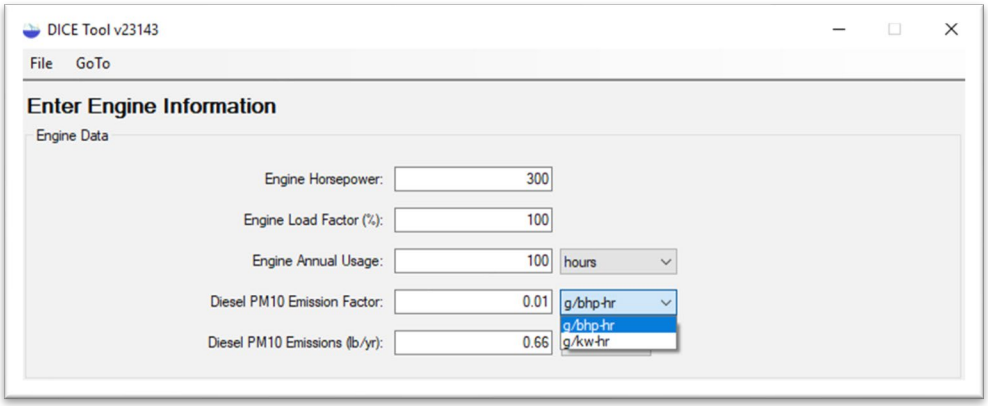
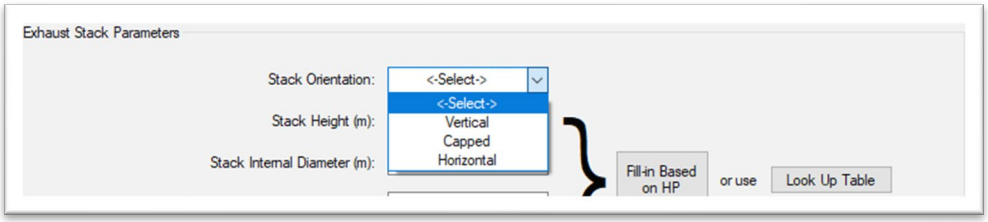


Figure 18 – Selecting Units for Diesel PM10 Emission Factor



The next step is to enter the exhaust stack parameters. First, select the stack orientation of the DICE by using the **Stack Orientation** drop down box as shown in Figure 19. The **Stack Orientation** drop down box gives the user three options to select from: vertical, capped, and horizontal. Vertical and horizontal refer to the direction of exhaust and capped is used when the exhaust has a fixed rain cap that obstructs the vertical momentum of the exhaust. Flappers are considered vertical.

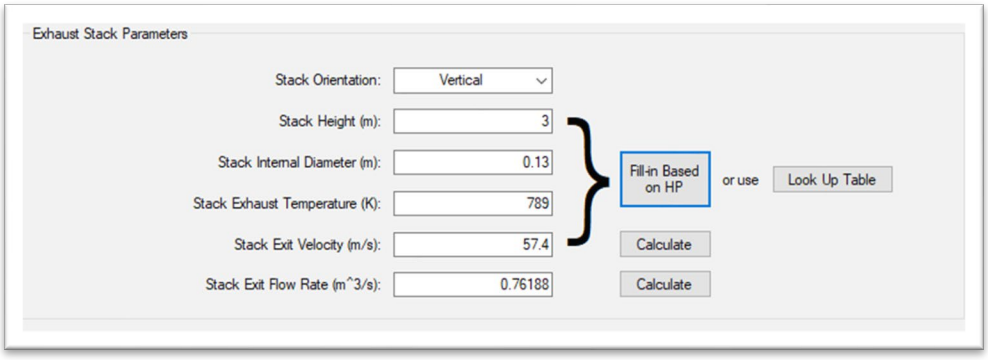
Figure 19 – Selecting Stack Orientation



Next, enter the Stack Height (meters), Stack Internal Diameter (meters), Stack Exhaust Temperature (Kelvin), and Stack Exit Velocity (meters/second) in the boxes shown in Figure 20. The user also has the option to calculate the Stack Exit Velocity if the Stack Exit Flow Rate is known by clicking the **Calculate** button.

Note: In order to use the **Stack Exit Velocity (m/s) Calculate** button, values must be entered for the Stack Internal Diameter (m) and the Stack Exit Flow Rate (m^3/s). In order to use the **Stack Exit Flow Rate (m^3/s) calculate button**, values must be entered for the Stack Internal Diameter (m) and the Stack Exit Velocity (m/s).

Figure 20 – Entered Stack Parameter Data



If the information for stack parameters is not available to the user, default parameters may be used instead. In order to use the default parameters, the engine's horsepower must be known. Once the engine horsepower has been entered, the user may click the **Fill-in Based on HP** button to autofill the exhaust stack parameters, or manually select parameters from the **Select Engine Stack Parameters** table. To access this table, shown in Figure 21, click the **Look Up Table** button. From the table, the user may select the brake-horsepower (BHP) range representing the engine, and then either click **Select** or double-click the row to copy the default values to the input form's exhaust stack parameter fields. When all of the fields are complete, click the **Next** button to go to the next screen in the DICE Risk Tool.

Figure 21 - Engine Stack Parameters Look-Up Table

Select Engine Stack Parameters

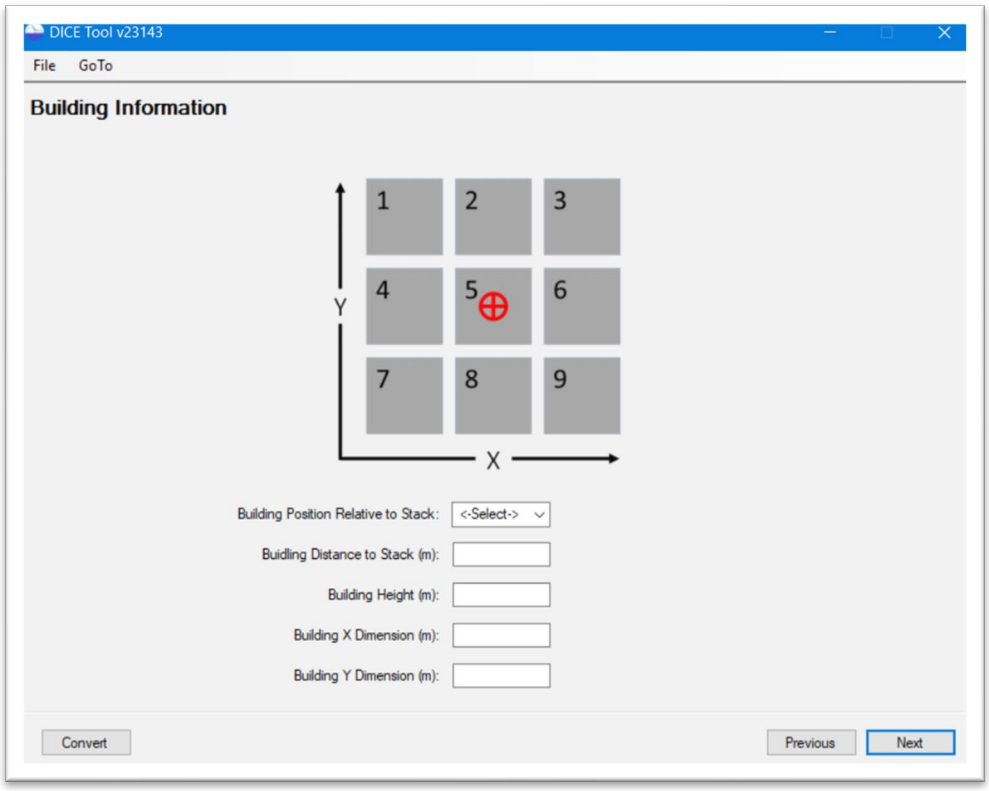
BHP Range	Count	BHP	Stack Height (m)	Stack Diameter (m)	Exhaust Temperature (K)	Exit Velocity (m/s)
0-50	59	48	2.1	0.06	813	47.1
51-100	616	86	2.4	0.07	797	56.9
101-150	406	131	2.4	0.09	755	53
151-175	301	166	2.4	0.1	795	46.9
176-200	107	197	2.9	0.1	761	55.5
201-275	413	237	3	0.11	780	56.4
276-300	121	279	3	0.13	789	57.4
301-400	582	355	3	0.13	780	63.9
401-500	275	464	3.1	0.15	770	59.4
501-600	187	539	3.4	0.15	786	69.8
601-750	195	680	3.7	0.2	764	57.8
751-825	313	755	3.7	0.2	755	55.8
826-1150	310	954	3.8	0.25	775	53.5
1151-1500	292	1474	4.3	0.25	750	52.2
1501-1850	128	1800	4.9	0.3	751	57.4
1851-2500	259	2220	5.3	0.36	750	51.8
2501-3500	429	2923	6.1	0.46	747	45.1
3501-4500	175	3705	7.6	0.51	753	45.6
>4500	22	4680	7.6	0.58	786	40

Select

3.5 Building Information Screen

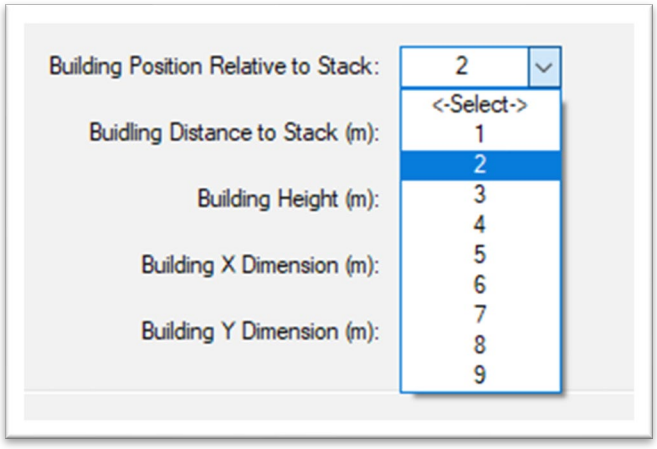
If the **Include Building Downwash** option was checked on the Enter Project Information screen, the user will be prompted to provide information required for the program to calculate downwash. In Figure 22, the red circled cross represents the stack, and the numbered grey boxes represents the different potential building locations relative to the stack. Only one building may be included in the screening model.

Figure 22 – Building Information Page



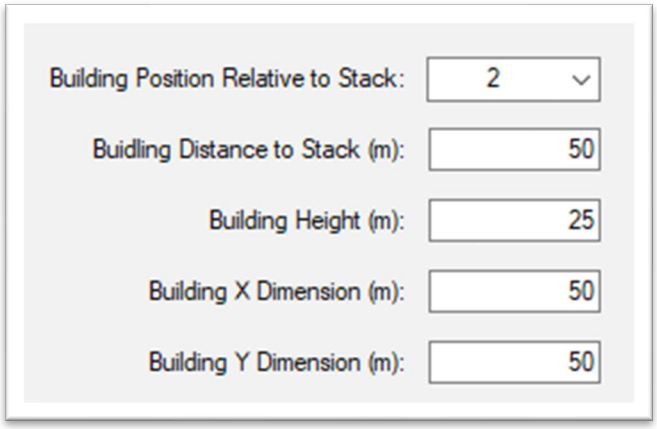
To select the building's relative position, click the **Building Position Relative to Stack** dropdown box. From the dropdown box shown in Figure 23, choose a number from 1 to 9 to match the building's relative position to the stack. For example, if the building is north of the stack, the user should select the number 2. Stack position 5 should be used if the stack is exhausting through the roof of a building.

Figure 23 – Selecting Building Relative Position



The next step is to enter the desired **Building Distance to Stack (m)**, the **Building Height (m)**, the **Building X Dimension (m)** (east-west) and **Building Y Dimension (m)** (north-south), as shown in Figure 24. The **Building Distance to Stack** should be measured from the stack to the nearest edge of the building. Click **Next** when finished.

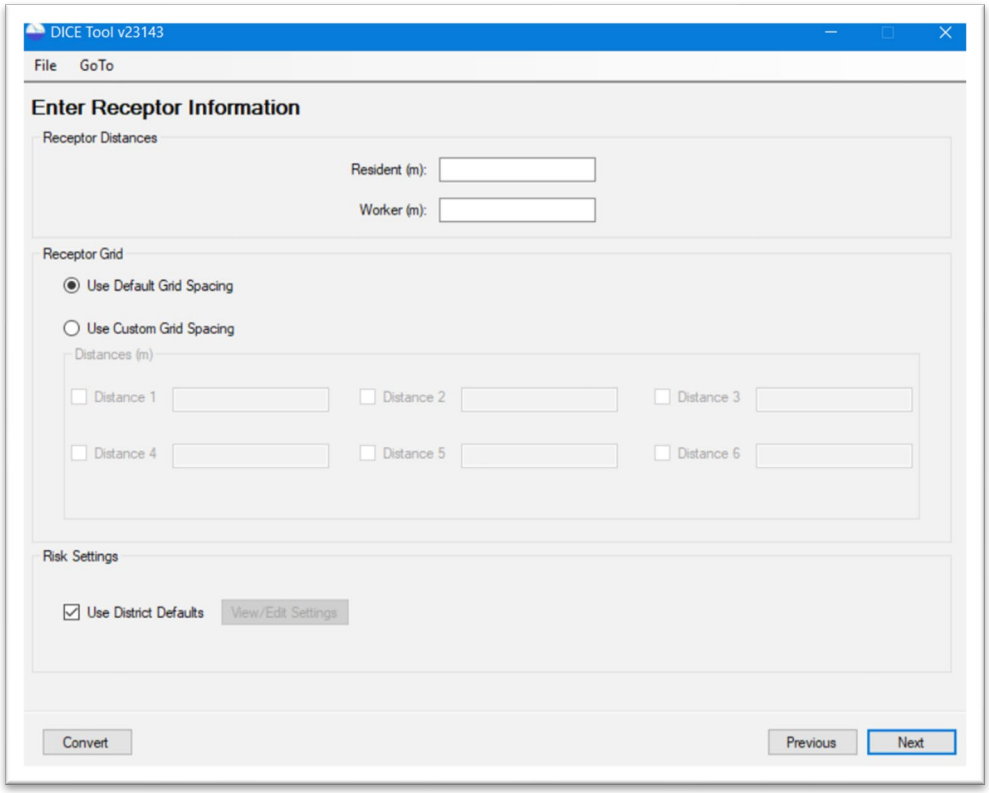
Figure 24 – Entering Building Dimensions



3.6 Enter Receptor Information Screen

The Enter Receptor Information screen requires the user to input receptor distances, select either the default air dispersion modeling grid or custom grid spacing, and customize the risk settings, as shown in Figure 25.

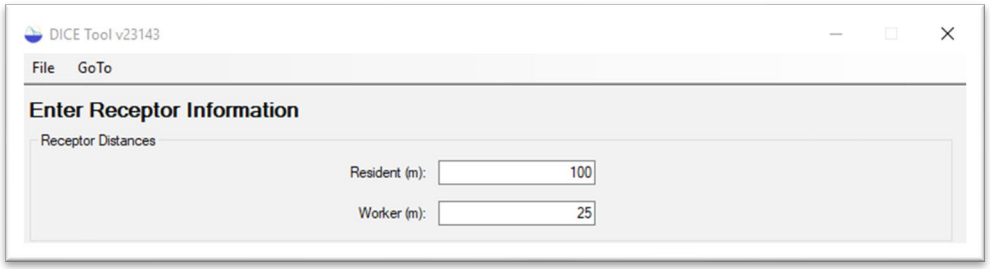
Figure 25 – Enter Receptor Information Screen



3.6.1 Receptor Distances

The distance to the nearest **Resident (m)** and **Worker (m)** must be entered, as shown in Figure 26. Risk will be calculated at these distances using the exposure assumptions selected in the next screen in the DICE Risk Tool.

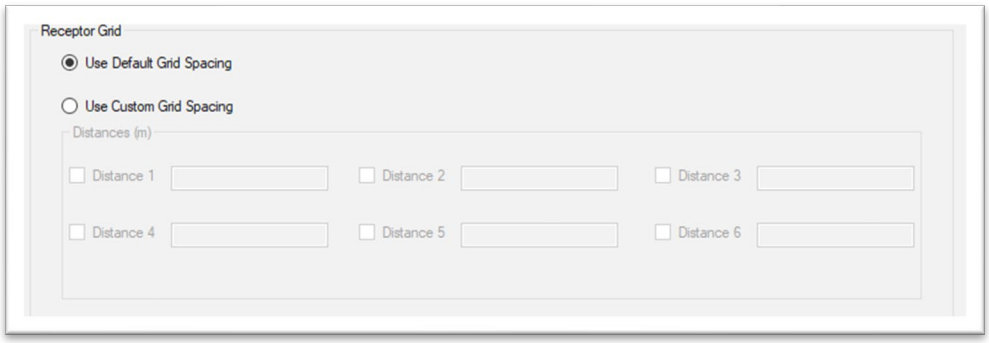
Figure 26 – Entering Receptor Information



3.6.2 Receptor Grid

Selecting the **Use Default Grid Spacing** setting will calculate the risk results using a telescoping polar grid with varying receptor spacing from 10 meters out to 4,850 meters from the diesel engine (located at the grid's origin point).

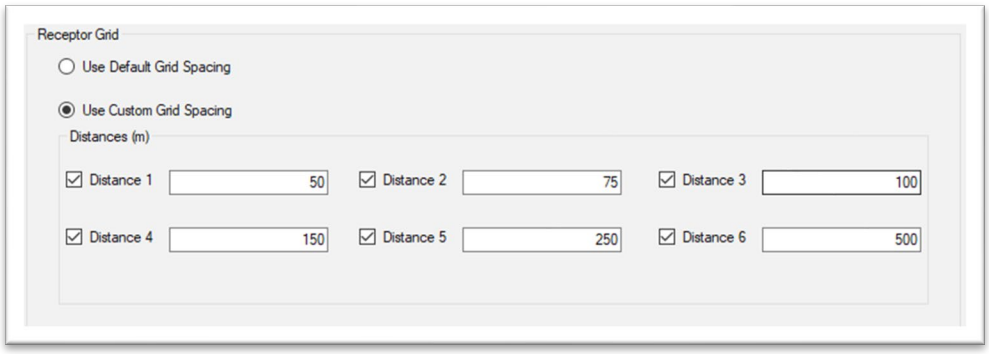
Figure 27 – Use Default Grid Spacing



Selecting the **Use Custom Grid Spacing** setting will calculate the risk results using a polar grid with up to six receptor rings at the distances specified. These are in addition to the worker and resident receptor distances previously identified.

In Figure 28, the **Use Custom Grid Spacing** setting was selected and values were entered into the boxes **Distance 1** through **Distance 6**. The user has the option to use up to six receptor ring distances by checking or unchecking the **Distance** number boxes. Compared to the **Use Default Grid Spacing** setting, a custom grid allows the user to decrease the number of receptors used in the risk assessment.

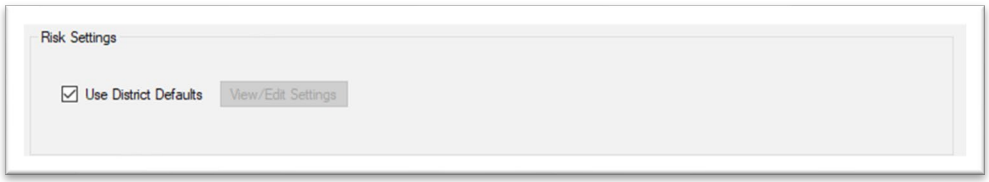
Figure 28 – Use Custom Grid Spacing Selected and Distances Entered



3.6.3 Risk Settings

As shown in Figure 29, the **Use District Defaults** risk settings box is automatically checked. The default risk settings are determined the agency selected in Section 3.3.1 of this user guide.

Figure 29 - Using District Defaults Risk Setting

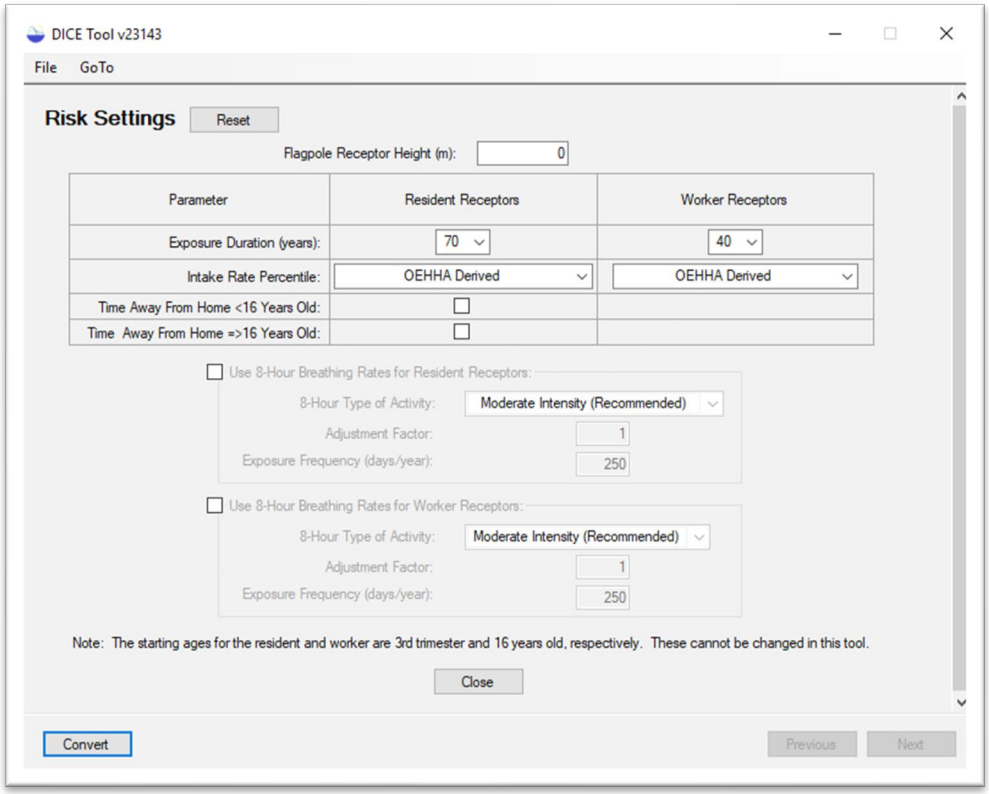


In order to edit the risk settings, the user must uncheck the **Use District Defaults** box and click the **View/Edit Settings** button to open the **Risk Settings** window, shown in Figure 29.

Note: It is recommended that the user consult with the project's reviewing agency before making any changes to the default risk settings.

The risk settings shown in Figure 30 are the default options used by the San Joaquin Valley Air Pollution Control District (SJVAPCD); however, the risk settings will change depending on the agency that was selected.

Figure 30 – Risk Setting Page with San Joaquin Valley Air Pollution Control District Risk Settings



If the user wants to perform a refined analysis, they may edit the values in the **Risk Settings** window. The user may assign a **Flagpole Receptor Height (m)**, change the **Exposure Duration (years)** for the resident and worker receptors, apply **Time Away from Home <16 Years Old** or **Time Away from Home =>16 Years Old** factors to the resident receptors, or **Use 8-hour Breathing Rates** for Resident and/or Worker Receptors.

The user should consult with the reviewing agency before changing these values. For a technical understanding of these inputs, please refer to the HARP2 User Guide[1] and the OEHHA Health Risk Assessment Guidelines[2].

To restore the risk settings to the selected agency's district defaults, click the **Reset** button on the top of the **Risk Settings** page shown in Figure 30.

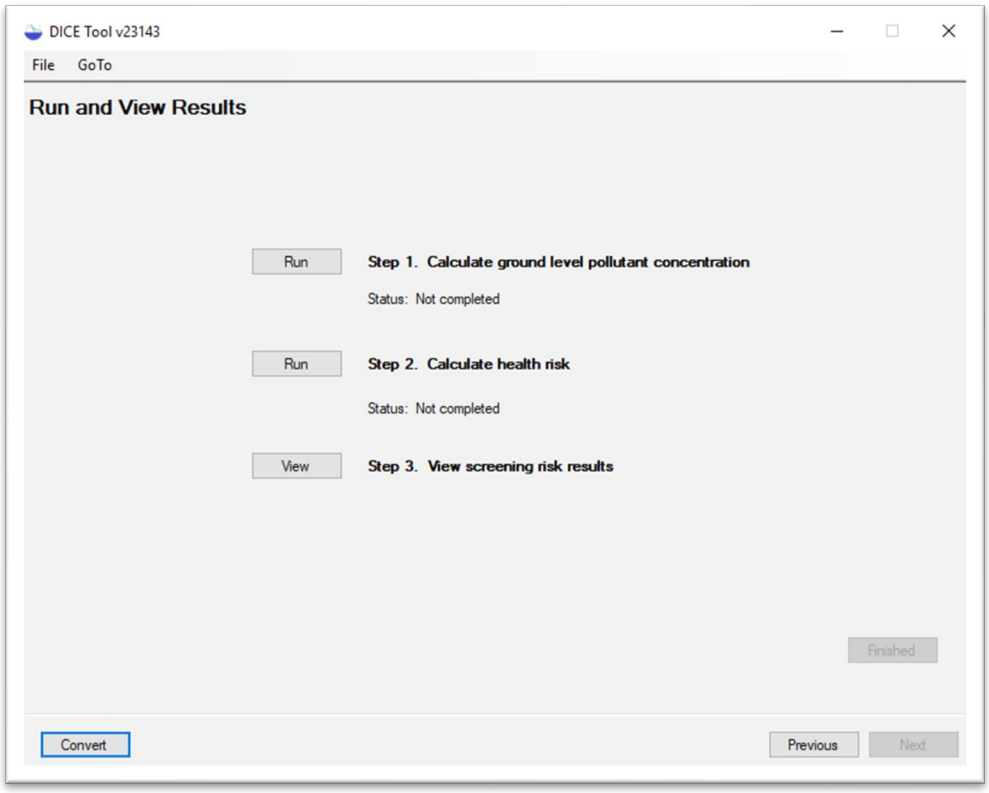
3.7 Run and View Results Screen

After all user inputs are entered, the final step of the DICE Risk Tool generates the risk screening results. Figure 31 shows the **Run and View Results** screen where the air dispersion modeling is performed and the health risk is calculated.

[1] California Air Resources Board. 2015. User Manual for the Hotspots Analysis and Reporting Program Air Dispersion Modeling and Risk Assessment Tool Version 2. Available online at: https://ww2.arb.ca.gov/resources/documents/harp-air-dispersion-modeling-and-risk-tool.

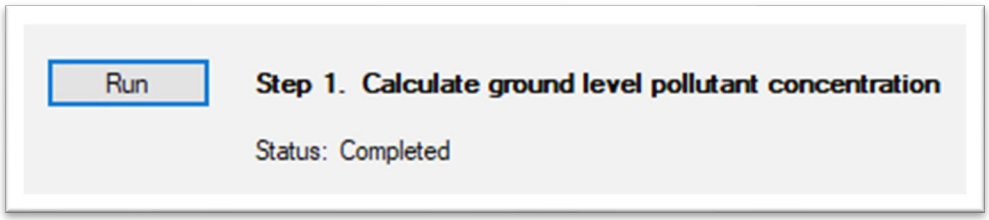
[2] Office of Environmental Health Hazard Assessment. 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines: Guidance Manual for Preparation of Health Risk Assessments. Available online at: https://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0.

Figure 31 - Run and View Results Page



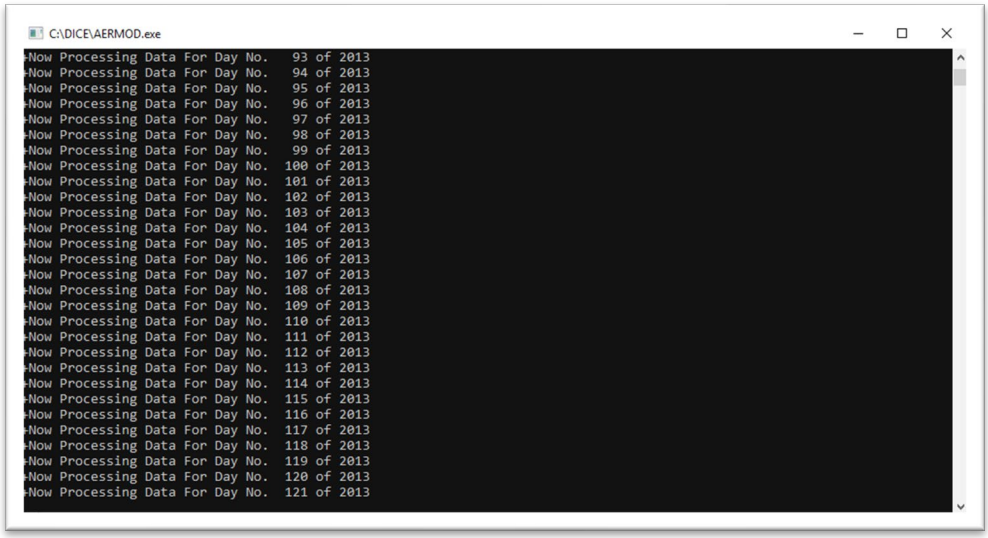
Click the **Run** button next to **Step 1. Calculate ground level pollutant concentration** as shown in Figure 32.

Figure 32 - Calculating Ground Level Pollutant Concentration



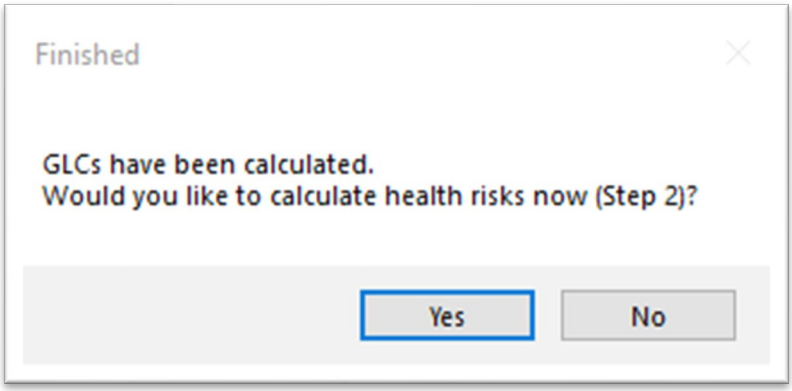
A new window will appear, as shown in Figure 33, tracking the progress of the air dispersion model's calculation of the ground level pollutant concentrations. Once the model is finished, the status under Step 1 will change to Completed.

Figure 33 - Ground Level Pollutant Concentration Being Calculated



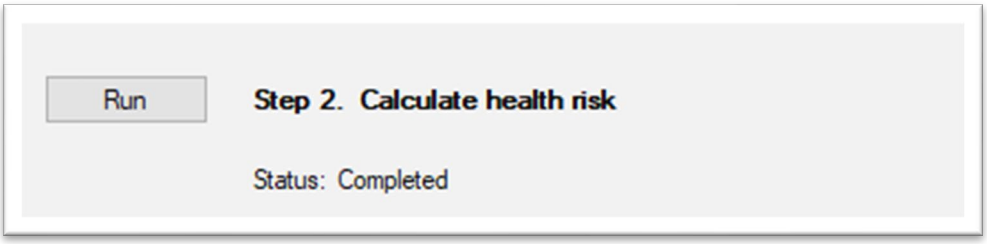
After the ground level pollutant concentrations have been calculated, a message box asking the user if they would like to calculate the health risks will appear, as shown in Figure 34. Select **Yes** to continue with the health risk calculations and another progress window will appear similar to that shown in Figure 33.

Figure 34 - Calculating Health Risk Scores



The user may also initiate the health risk calculations by clicking the **Run** button next to **Step 2. Calculate health risk** as shown in Figure 35. Once the health risk calculation is finished, the status under Step 2 will change to Completed.

Figure 35 - Calculating Health Risk Scores



Once the health risk calculations are finished, a report will open in the user's web browser. An example report is shown in Figure 36.

In order to view the most recent HRA report created by the DICE Risk Tool after closing out the report, click the **View** button next to **Step 3. View screening risk results** as shown in Figure 37.

Note: The HRA report is saved as a HTML file in the project folder. This type of file may be viewed in a web browser or word processing program. Word processing programs can convert the HTML HRA report to other types of files.

Figure 36 – DICE Risk Tool Results Report

Non-Vehicular Diesel Engine Risk Screening Tool Results

Table 1. Results Summary						
Receptor	Cancer		Chronic		Acute	
	Risk (in a million)	Receptor Distance (m)	Hazard Index (HI)	Receptor Distance (m)	Hazard Index (HI)	Receptor Distance (m)
Resident (MEIR)	0.5	100	0	100	-	-
Worker (MEIW)	0.1	25	0	25	-	-
Maximum (PMI)	0.8	50	0	50	-	-

Table 2. Inputs		
Project Information		
Project Name:	Enter Project Name Here!	
Agency Jurisdiction:	San Joaquin Valley APCD	
Project Output Directory:	C:\Users\yeungn\Desktop\DICE Tool Project\DICE Tool Guide Example\DICE Tool Example Project	
Date Assessment Conducted:	9/7/2023 8:50:01 AM	
Inventory Year:	2023	
Tool Version:	23143	
Meteorological Data		
Surface Met Data File (*.SFC):	T:\TOXIC\SCREEN\DATA\01 Meteorological_Data\AERMET v18081_UStar\Fresno_93193\Fresno_2013-2017.SFC	
Profile Met Data File (*.PFL):	T:\TOXIC\SCREEN\DATA\01 Meteorological_Data\AERMET v18081_UStar\Fresno_93193\Fresno_2013-2017.PFL	
Base Elevation (m):	101.5	
Dispersion Coefficients:	Urban	
Building Downwash:	Yes | **Building Information** | Rel. Position from Stack: 2 | Distance from Stack (m): 50 | Bldg Hgt (m): 25 | Bldg X Dim (m): 50 | Bldg Y Dim (m): 50	
Engine Information		
Engine Horsepower:	300	
Engine Load Factor (%):	100	
Engine Annual Usage:	100	hours
Diesel PM10 Emission Factor:	0.01	g/bhp-hr
Diesel PM10 Emissions (lb/yr):	0.66	
Stack Height (m):	3	
Stack Diameter (m):	0.13	
Stack Temperature (K):	789	
Stack Exit Velocity (m/s):	57.4	
Risk Settings		
Use District Defaults:	Yes	
Flagpole Receptor Height (m):	0	
Deposition Rate (g/s):	NA	
Receptor Type:	Resident	Worker
Exposure Duration (yrs):	70	40
Intake Rate Percentile:	OEHHA Derived	OEHHA Derived
Time Away from Home <16:	No	-
Time Away from Home =>16:	No	-
Use 8-Hour Breathing Rate:	No	No
Enabled Pathways:	Inhalation Only	Inhalation Only

Table 3. DPM Concentration and Risk by Receptor Distance							
Receptor Distance (m)	DPM Concentration ($\mu g/m^3$)	Resident			Worker		
		Cancer Risk (in a million)	Chronic HI	Acute HI	Cancer Risk (in a million)	Chronic HI	Acute HI
50	0.0007826806	0.8	0	-	0.1	0	-
75	0.0006100829	0.6	0	-	0.1	0	-
100	0.0004612601	0.5	0	-	0.1	0	-
150	0.0002897588	0.3	0	-	0	0	-
250	0.0001513462	0.2	0	-	0	0	-
500	5.861246E-05	0.1	0	-	0	0	-

Figure 37 - Viewing the Screening Risk Results

3.8 DICE Risk Tool Results Report

The DICE Risk Tool's results report is divided into three tables: *Results Summary*, *Inputs*, and *DPM Concentration and Risk by Receptor Distance*. The information provided in each table is presented below.

3.8.1 Table 1. Results Summary

Figure 38 presents a summary of the results for the project. This table contains the maximally exposed individual resident and worker (MEIR and MEIW) cancer risk and chronic hazard index (HI) at the distances specified by the user. The Maximum (PMI) is the point of maximum impact, and the cancer risk presented uses residential exposure assumptions. The Maximum (PMI) provides the project's maximum calculated cancer risk and chronic HI and is dependent on the receptor grid spacing. In the example below, the Maximally Exposed Individual Resident cancer risk is 0.5 in a million (5×10^{-7}) at a distance of 100 meters. The acute hazard index values are not populated, as the state has not published acute non-cancer risk factors for diesel particulate matter.

Figure 38 – Results Summary Table

Table 1. Results Summary						
Receptor	Cancer		Chronic		Acute	
	Risk (in a million)	Receptor Distance (m)	Hazard Index (HI)	Receptor Distance (m)	Hazard Index (HI)	Receptor Distance (m)
Resident (MEIR)	0.5	100	0	100	-	-
Worker (MEIW)	0.1	25	0	25	-	-
Maximum (PMI)	0.8	50	0	50	-	-

3.8.2 Table 2. Inputs

Figure 39 summarizes all user inputs to the DICE Risk Tool. This table allows reviewing agencies to view the meteorological data, dispersion coefficient, building information, engine information, and risk settings used in the project without having to open the DICE Risk Tool.

Figure 39 – Project Input Information Table

Table 2. Inputs		
Project Information		
Project Name:	Enter Project Name Here!	
Agency Jurisdiction:	San Joaquin Valley APCD	
Project Output Directory:	C:\Users\yeungn\Desktop\DICE Tool Project\DICE Tool Guide Example\DICE Tool Example Project	
Date Assessment Conducted:	9/7/2023 8:50:01 AM	
Inventory Year:	2023	
Tool Version:	23143	
Meteorological Data		
Surface Met Data File (*.SFC):	T:\TOXIC\SCREEN\DATA\01 Meteorological_Data\AERMET v18081_UStar\Fresno_93193\Fresno_2013-2017.SFC	
Profile Met Data File (*.PFL):	T:\TOXIC\SCREEN\DATA\01 Meteorological_Data\AERMET v18081_UStar\Fresno_93193\Fresno_2013-2017.PFL	
Base Elevation (m):	101.5	
Dispersion Coefficients:	Urban	
Building Downwash:	Yes | **Building Information** | Rel. Position from Stack: 2 | Distance from Stack (m): 50 | Bldg Hgt (m): 25 | Bldg X Dim (m): 50 | Bldg Y Dim (m): 50	
Engine Information		
Engine Horsepower:	300	
Engine Load Factor (%):	100	
Engine Annual Usage:	100	hours
Diesel PM10 Emission Factor:	0.01	g/bhp-hr
Diesel PM10 Emissions (lb/yr):	0.66	
Stack Height (m):	3	
Stack Diameter (m):	0.13	
Stack Temperature (K):	789	
Stack Exit Velocity (m/s):	57.4	
Risk Settings		
Use District Defaults:	Yes	
Flagpole Receptor Height (m):	0	
Deposition Rate (g/s):	NA	
Receptor Type:	Resident	Worker
Exposure Duration (yrs):	70	40
Intake Rate Percentile:	OEHHA Derived	OEHHA Derived
Time Away from Home <16:	No	-
Time Away from Home =>16:	No	-
Use 8-Hour Breathing Rate:	No	No
Enabled Pathways:	Inhalation Only	Inhalation Only

3.8.3 Table 3. DPM Concentration and Risk by Receptor Distance

Figure 40 presents the diesel particulate matter (DPM) concentration as well as the cancer risk and chronic HI results for residents and workers at each ring distance in the receptor grid. In the example below, the results were calculated for six user specified distances using the **Use Custom Grid Spacing** option (see Section 3.6.2 of this user guide). If the **Use Default Grid Spacing** option were selected, Table 3 would have generated results at 60 discrete distances from 10 meters to 4,850 meters.

Figure 40 – Receptor Grid DPM Concentration and Risk Score Table

Table 3. DPM Concentration and Risk by Receptor Distance

Receptor Distance (m)	DPM Concentration ($\mu g/m^3$)	Resident			Worker		
		Cancer Risk (in a million)	Chronic HI	Acute HI	Cancer Risk (in a million)	Chronic HI	Acute HI
50	0.0007826806	0.8	0	-	0.1	0	-
75	0.0006100829	0.6	0	-	0.1	0	-
100	0.0004612601	0.5	0	-	0.1	0	-
150	0.0002897588	0.3	0	-	0	0	-
250	0.0001513462	0.2	0	-	0	0	-
500	5.861246E-05	0.1	0	-	0	0	-

4. Output Files

4.1 DICE Risk Tool Output File Summary

After the user calculates the ground level pollution concentrations and health risk results, the DICE Risk Tool will generate AERMOD and HARP files into the **Project Output Directory** folder location. Table 1 summarizes these output files.

Table 1. DICE Risk Tool Output File Summary

File Name	File Description
DICE Tool Files	
ProjectName.dice	DICE Risk Tool project file containing all project inputs. Replace 'ProjectName' with the Project Name entry from Enter Project Information page.
Air Dispersion Modeling Files	
AERMOD.inp	AERMOD input file
AERMOD.out	AERMOD output file
BPIP.inp	Building Profile Input Program (BPIP) input file (only created when building downwash option is used)
BPIP.out	Building Profile Input Program (BPIP) output file (only created when building downwash option is used)
BPIP.sum	Building Profile Input Program (BPIP) summary file (only created when building downwash option is used)
STK01.PLT	AERMOD period plot file for the project engine
Risk Assessment Files	
9901AnnualConc.txt	Diesel Particulate Matter (DPM) ground level concentration (GLC) file for use with HARP2
Res1CancerRisk.csv	HARP2 residential cancer risk output file. Contains detailed cancer risk results by receptor and pollutant.
Res1CancerRiskSumByRec.csv	HARP2 residential cancer risk output file. Contains summed cancer risk results by receptor for all sources and pollutants.
Res1Output.txt	HARP2 residential cancer risk output file. Contains a summary of settings used in HARP2 analysis.
Res2NCChronicRisk.csv	HARP2 residential chronic non-cancer risk output file. Contains detailed chronic HI results by receptor, pollutant, and affected pathways.
Res2NCChronicRiskSumByRec.csv	HARP2 residential chronic non-cancer risk output file. Contains summed chronic HI results by receptor for all sources, pollutants, and affected pathways.
Res2Output.txt	HARP2 residential chronic non-cancer risk output file. Contains a summary of settings used in HARP2 analysis.

File Name	File Description
ResCancerHRAInput.hra	HARP2 input file. Contains all inputs for use in performing residential cancer risk analysis using HARP2.
ResChronicHRAInput.hra	HARP2 input file. Contains all inputs for use in performing residential chronic non-cancer risk analysis using HARP2.
Worker1CancerRisk.csv	HARP2 worker cancer risk output file. Contains detailed cancer risk results by receptor and pollutant.
Worker1CancerRiskSumByRec.csv	HARP2 worker cancer risk output file. Contains summed cancer risk results by receptor for all sources and pollutants.
Worker1Output.txt	HARP2 worker cancer risk output file. Contains a summary of settings used in HARP2 analysis.
Worker2NCChronicRisk.csv	HARP2 worker chronic non-cancer risk output file. Contains detailed chronic HI results by receptor, pollutant, and affected pathways.
Worker2NCChronicRiskSumByRec.csv	HARP2 worker chronic non-cancer risk output file. Contains summed chronic HI results by receptor for all sources, pollutants, and affected pathways.
Worker2Output.txt	HARP2 worker chronic non-cancer risk output file. Contains a summary of settings used in HARP2 analysis.
WorkerCancerHRAInput.hra	HARP2 input file. Contains all inputs for use in performing worker cancer risk analysis using HARP2.
WorkerChronicHRAInput.hra	HARP2 input file. Contains all inputs for use in performing worker chronic non-cancer risk analysis using HARP2.
Risk Results Report	
DICESummaryReport.htm	Summarizes results from DICE Risk Tool. Provides detailed information of inputs used in the tool as well as cancer risk and chronic HI for maximally exposed resident (MEIR), maximally exposed worker (MEIW), and point of maximum impact (PMI).