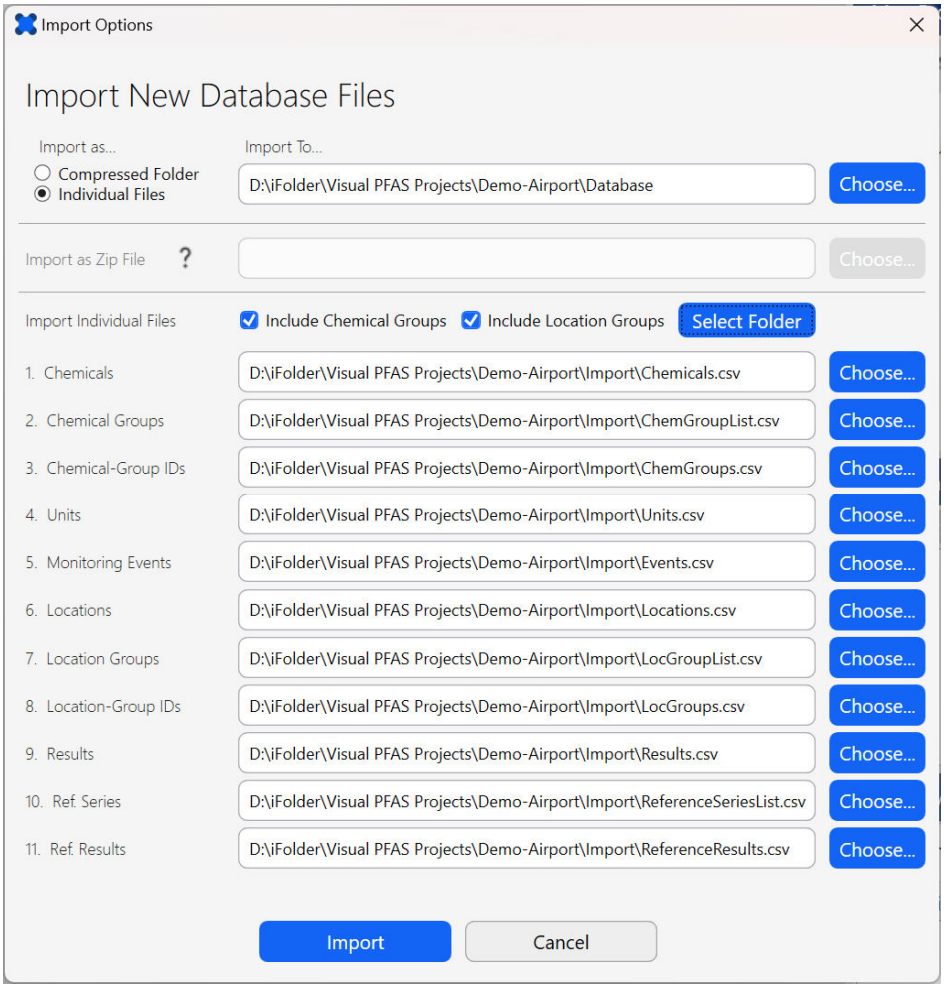
Visual PFAS™
Users Guide:

Creating A Project and Importing the Dataset

Chapter 2



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2.1 Introduction to Visual PFAS Projects

Visual PFAS™ input and output files are stored within a project-specific folder. Each new project that you work on with Visual PFAS™ will have its own folder, with six sub-folders that are created automatically by Visual PFAS™ when each new project folder is created. The names of these six project sub-folders created by Visual PFAS™ are:

- **Basemaps** – stores basemaps created users (*.vpmap) using Visual PFAS™. Projects may include one site-wide basemap, and possibly maps with smaller areas of focus at larger sites. The basemaps are used as underlays for radial diagram or stacked bar maps.
- **Map Layers** – contain polyline and/or polygon files that may be added as individual layers to the basemap, including GIS shapefiles (*.shp), CAD dxf files (*.dxf), and Surfer boundary line files (*.bln).
- **Import** – contains the dataset tables in comma-delimited (*.csv) files which are to be imported into the Visual PFAS™ project database. These dataset import files have strict format requirements which are discussed further in Section 2.3.
- **Database** – this is a read-only folder that contains the project database files that are created by Visual PFAS™ after users import the *.csv dataset table files. It is important that users do not change or move/delete files in this **Database** folder.
- **RD Properties** – contains radial diagram property files (*.rd) which are used to construct radial diagram maps. These property files contain all the look-and-feel properties for radial diagrams, as well as lists of applicable site locations, reference and monitoring event series, and chemicals associated with each axis.
- **Bar Charts** – contains stacked bar property files (*.bar) which are used to construct stacked bar maps. These property files contain all properties associated with a stacked bar map, including lists of applicable site locations, monitoring events, and chemicals. Reports created by Visual PFAS™ with stacked bar statistics for each location are produced automatically and stored in this folder as well.

Users can create additional sub-folders in these project folders, such as an Export sub-folder to store images and other files exported from Visual PFAS™.

Notes:

1. It is strongly recommended that users do not create a new project within an existing project folder. This may result in deletion of prior work.
2. It may be beneficial to create multiple instances of a project with different project folders e.g., one for working with groundwater data, the other for working with soil data (see Section 2.5).

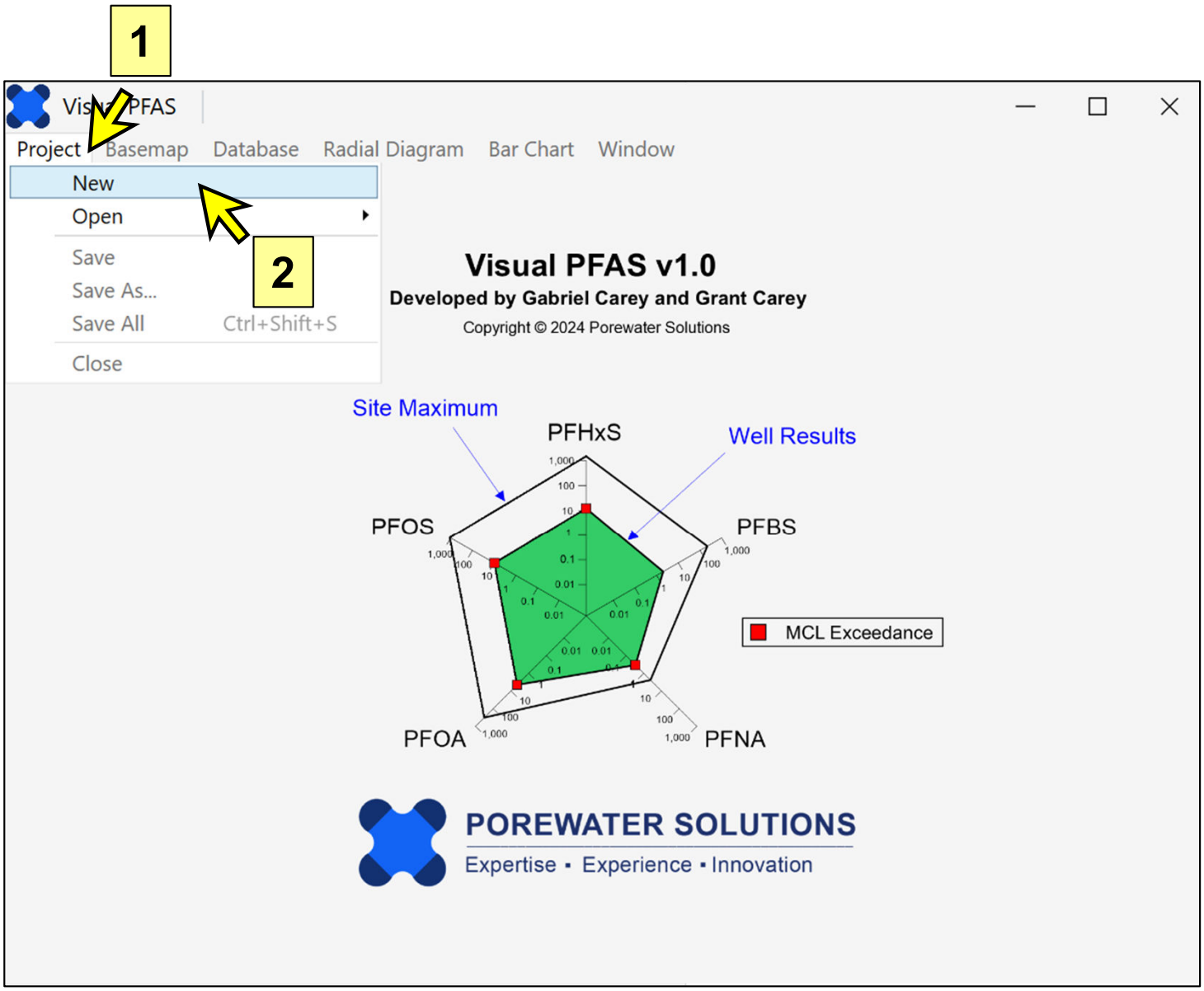
2.2 Creating or Opening a Project

When opening Visual PFAS™ for the first time, the software splash screen will be displayed (see example below) because there have been no projects created yet.

To create a new project, click the **Project** menu (see "1" below) and select **New** (see "2" below).

Notes:

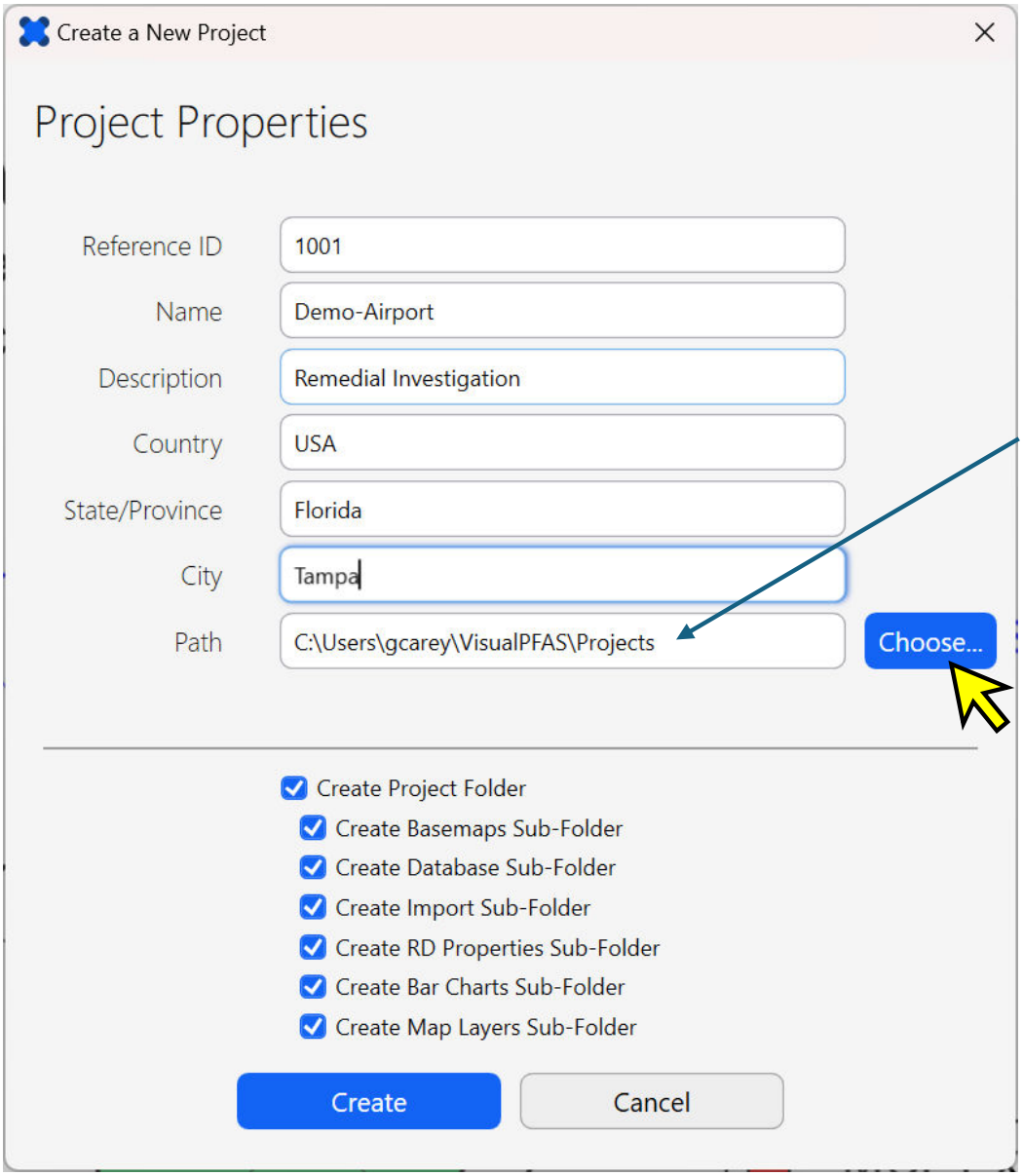
1. Visual PFAS™ will automatically maintain a log of projects that have recently been opened, and the program will provide you with a short-cut to recently opened projects if you decide to open a different project.
2. When starting Visual PFAS™ after a previous session, the most recently used project will be opened automatically. You can close this project and open a different project.



For this tutorial, fill out the information below. When creating a new project, Visual PFAS™ will automatically create a project-specific folder with the same name as the project name, at a location specified by the user.

In the example below, the project name is *Demo-Airport*. A project folder with this same name will be created at the **Path** specified below, along with the project sub-folders shown at the bottom of the dialog box.

To change the path where the project folder is to be located, click the **Choose** button as shown by the yellow arrow below, and select the folder under which the new project main folder will be created.



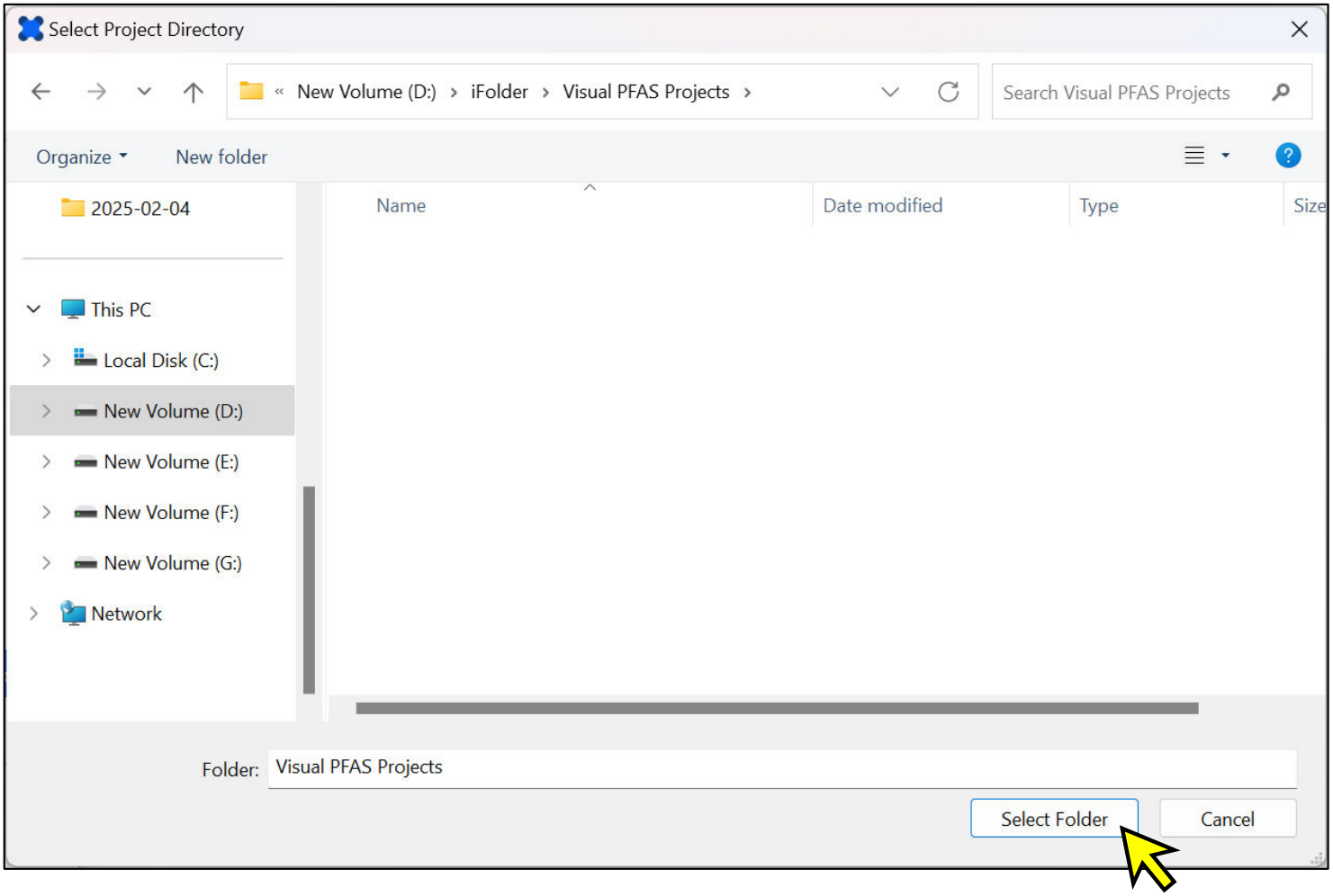
Default user path

For this example, we prepared a new folder called “Visual PFAS Projects” on a local hard drive. You can identify a different location where the *Demo-Airport* project folder is to be created.

Once you have identified the folder location under which the new project folder will be created, click **Select Folder** at the bottom of the window as shown below.

Notes:

1. In this step, you are selecting an existing folder. Visual PFAS™ will create the new project folder under the folder you select. In this example, we have created an overall folder to house all Visual PFAS™ Projects. You can take a different approach and store the project files under an already-existing project-specific folder.
2. You are not specifying the name of the project folder here, only the existing folder under which the new project folder will be created. The name of the new project folder will automatically be specified to be the same as the project name: *Demo-Airport*.

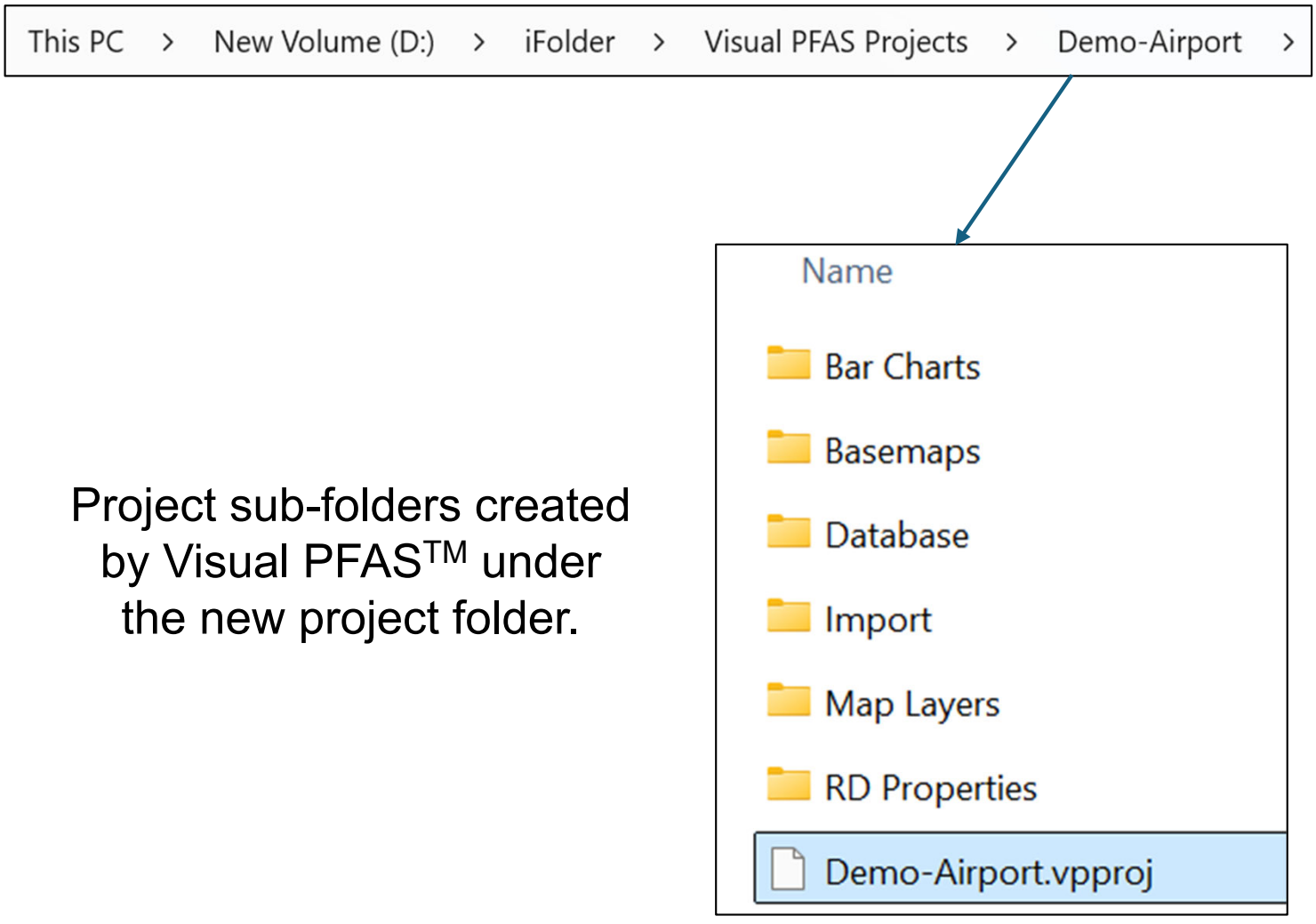


Once you have selected the path for where to create the new project folder, you will return to the Project Properties dialog box (see image on p. 2.4). Click the blue **Create** button to create the new project folder.

Visual PFAS™ will create a new project file with a *.vpproj extension under the new project folder, where the name of the file is the same as the project name: **Demo-Airport.vpproj**. This project file is stored directly under the main project folder, and it stores the basic project information entered on p. 2.4. This project file will also store the path and name of the most recent basemap, radial diagram, and stacked bar input files created or opened with this project.

The project sub-folders shown below are created automatically by Visual PFAS™ when a new project is first created. Users may add additional sub-folders and files at any time, but the names of these default sub-folders should not be modified.

Note: Users do not have to do anything with the project file after a project is opened. Visual PFAS™ saves the names of recently opened files automatically to this project file. Do not try to open or edit this file outside of Visual PFAS™.

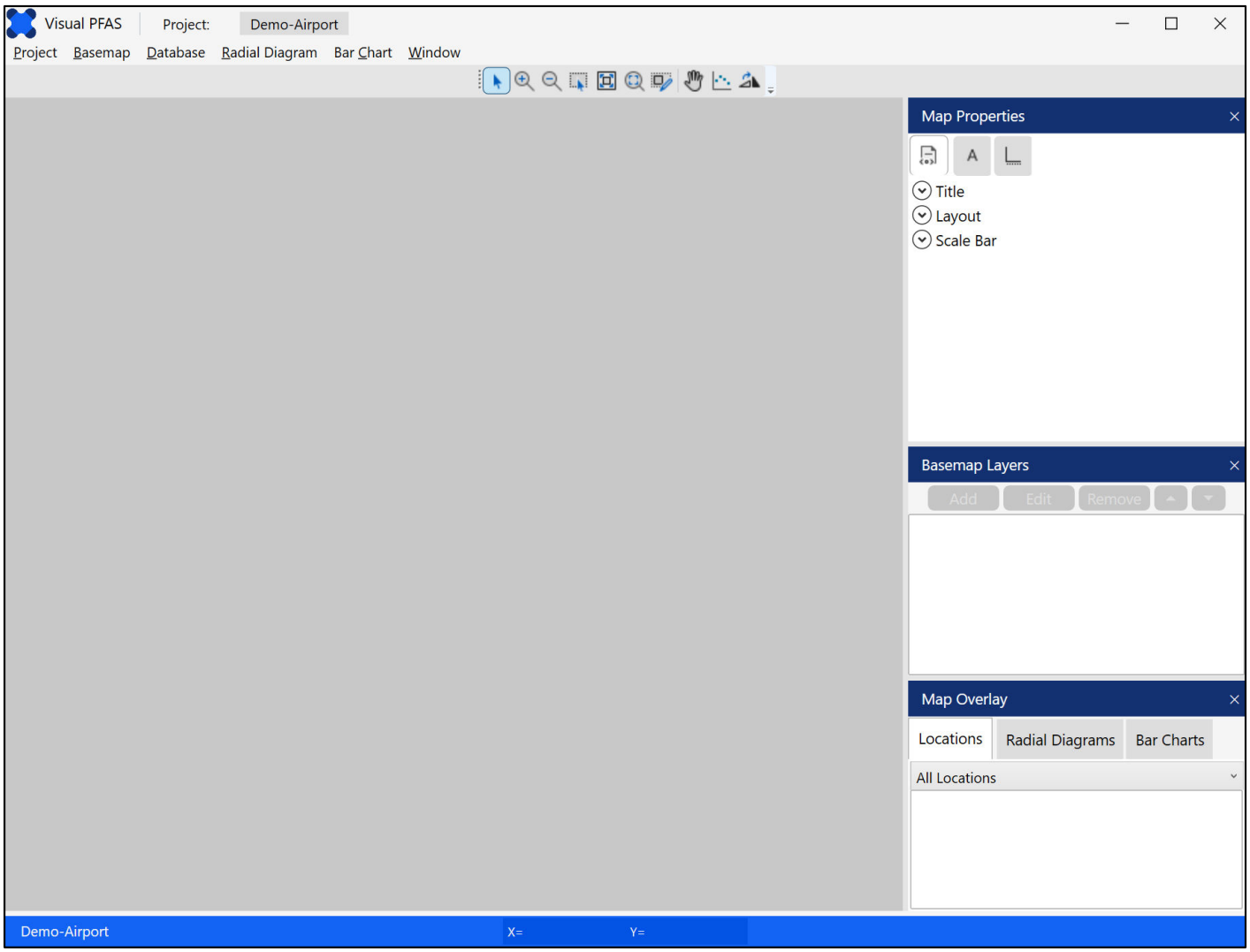


Project sub-folders created by Visual PFAS™ under the new project folder.

After the new project has been created, the project basemap window will be displayed. No basemaps have been created yet so the basemap screen is blank. (see gray are in the image below)

The project database has not been imported yet, so no locations are shown in the list at the bottom-right in the Map Overlay section.

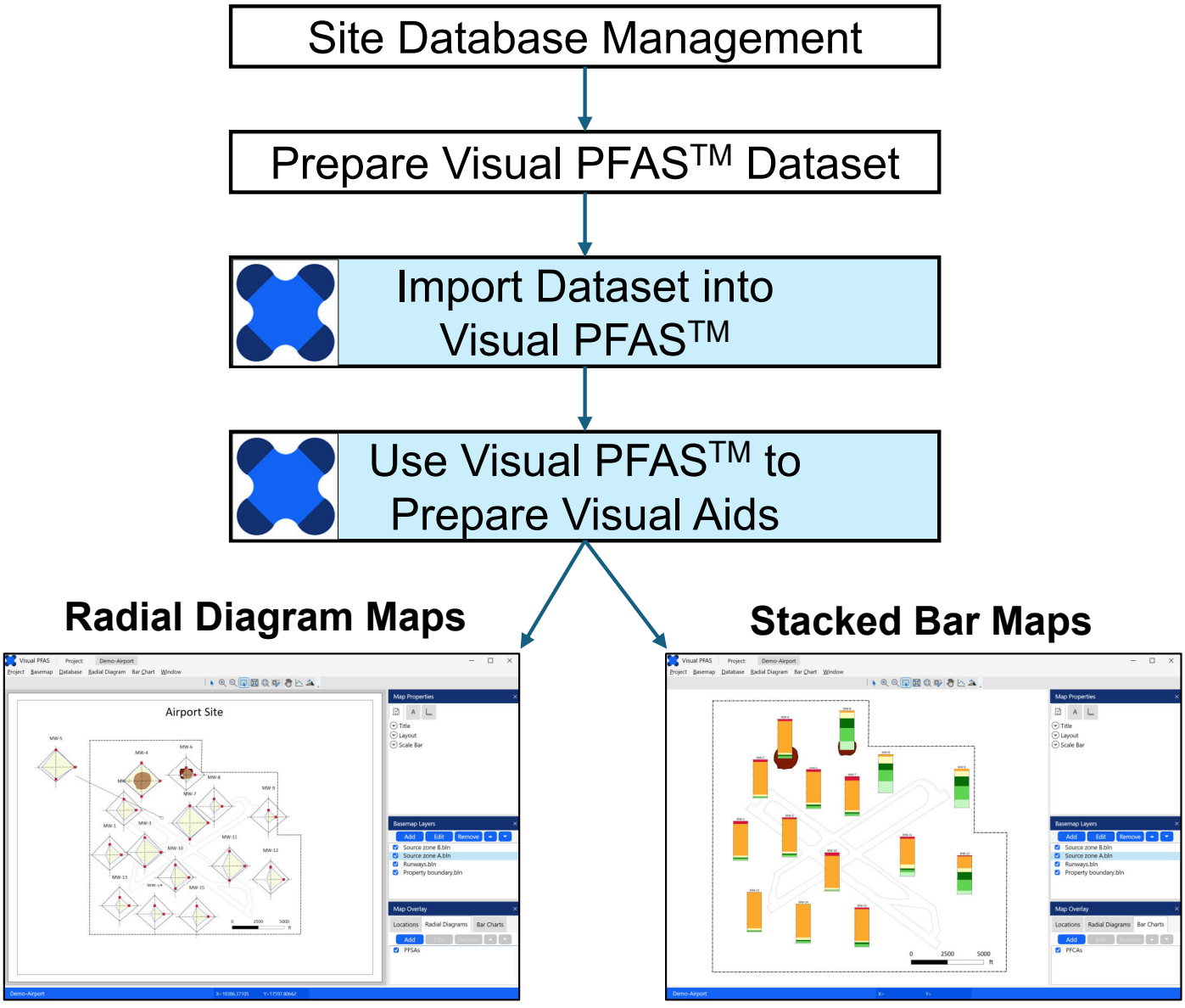
The next two sections will describe the project database format and how to import a dataset. Chapter 3 provides a tutorial for creating the project basemap.



2.3 Imported Dataset Format

Visual PFAS™ provides users with an easy-to-use interface for constructing visual aids that support site characterization, forensic analyses, and remediation performance monitoring assessments. An overall environmental database for a contaminated site typically includes a large array of information that are more extensive than what Visual PFAS™ needs. It is recognized that organizations use a wide range of specialized methods and software tools for managing the overall site database.

For that reason, Visual PFAS™ is intentionally not a data management tool; it is expected that users will conduct data management activities outside of Visual PFAS™, and then import a prepared dataset into Visual PFAS™. The dataset to be imported into Visual PFAS™ is focused on chemical analytical data, and will typically constitute only a subset of the overall site database. The figure below illustrates the general processes involved with using Visual PFAS™.



The current version of Visual PFAS™ is focused on plotting radial diagrams and stacked bar maps that convey chemical analytical results for water-based media including groundwater, surface water, and porewater. Refer to Section 2.5 for a simple workaround for preparing radial diagram and stacked bar map visual aids based on a soil and/or sediment analytical dataset.

The dataset to be imported into Visual PFAS™ consists of a series of 11 comma-delimited (*.csv) tables that are summarized below.

Visual PFAS™ Comma-Delimited Import Tables

Table No.	Filename	Description
Chemical Lists and Properties		
1	Chemicals.csv	Chemical names and default concentration units
2	ChemGroupList.csv	List of chemical groups
3	ChemGroups.csv	List of chemicals associated with each chemical group
Concentration Units List and Conversion Factors		
4	Units.csv	List of concentration units and conversion factors
Location Lists and Coordinates		
5	Locations.csv	Location names and coordinates
6	LocGroupList.csv	List of location groups
7	LocGroups.csv	List of locations associated with each location group
Monitoring Events List and Analytical Results		
8	Events.csv	List of monitoring event series
9	Results.csv	Chemical sample results
Reference Series List and Results		
10	ReferenceSeriesList.csv	List of reference series
11	ReferenceResults.csv	Reference Series chemical results

The list of fields and required formats for each of these 11 comma-delimited table are described in Sections 2.3.1 through 2.3.11. These tables can easily be edited using Microsoft Excel which opens and saves comma delimited (*.csv) files.

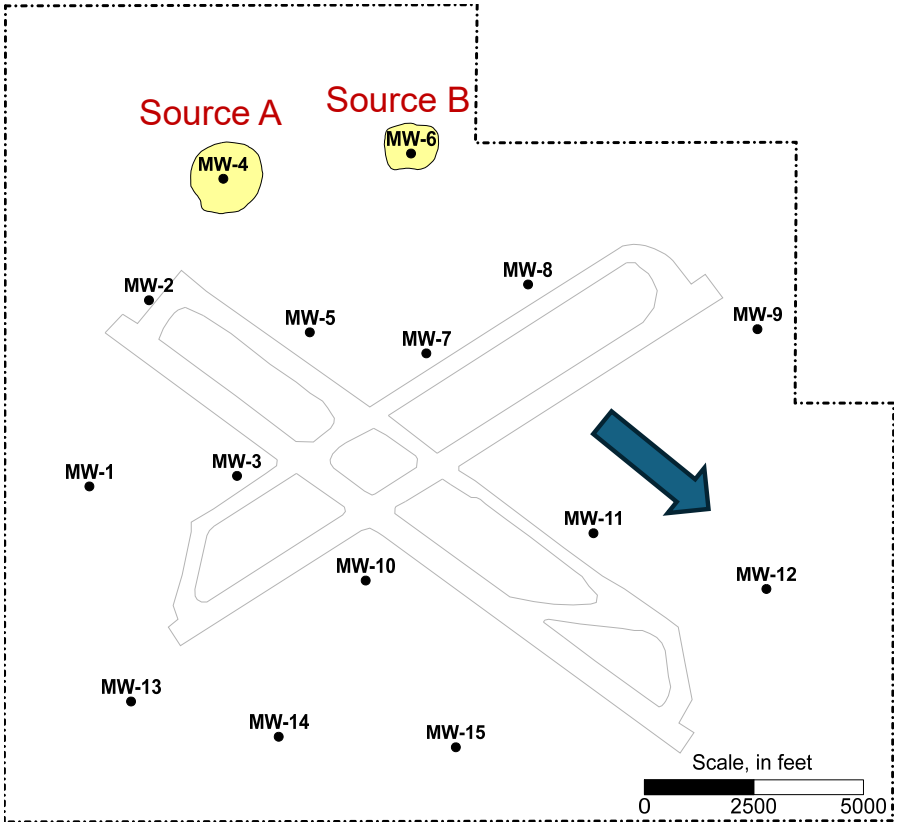
Note: The following are strict rules required for the import dataset table formats:

1. Include the same number of fields in the tables as shown in Sections 2.3.1 to 2.3.11;
2. First row is always a header row;
3. All eleven *.csv tables, with the exact filenames shown here, need to be in one folder or one zip file, and contain at least one row after the header row;
4. Follow the specifications in Sections 2.3.1 to 2.3.11 about fields requiring integer or real numbers, or character strings.
5. Do not leave table cells blank, values are required in every cell in the populated rows.
6. Do not use character strings with “,” since these are comma-delimited files, even if the strings are in quotes. E.g., use 111-TCA instead of 1,1,1-TCA as a chemical name.

The tutorial presented in this Users Guide based on the *Demo-Airport* example includes a complete dataset which has been set-up to import into Visual PFAS™. (The process used to import this dataset is discussed in Section 2.4.) The *Demo-Airport* hypothetical site example has the following characteristics:

- Two AFFF-impacted source areas:
    - Source A represents the former fire training area (former FTA) where legacy AFFF products based on long-chain constituents including a mix of sulfonates (PFSAs) and carboxylates (PFCAs) were used in an unlined pit; and
    - Source B is the location of the current FTA where modern AFFF products are used, resulting in predominantly short-chain PFCAs impacts to groundwater with smaller releases than the former FTA.
- Fifteen monitoring wells (MW-1 through MW-15, inclusive) with eleven wells screened in the shallow zone and four wells screened in the deeper zone of the main aquifer at the site.
- Two recent PFAS groundwater monitoring events where samples were collected at the 15 monitoring wells in February and August, 2023.
- Groundwater flow direction is from the northwest to the southeast.

The site basemap showing the source area and monitoring well locations is presented below, including the direction of groundwater flow downgradient from the source areas.



2.3.1 Chemicals.csv Table Format

The 7 fields required for this import table are described in the table below, and the *Demo-Airport* example table is presented on the next page.

Notes on this table format:

- Project chemical lists should be kept relatively small, since this list is used to populate various dropdown lists for chemical selection. i.e., it's easier to select from a list of 30 chemicals than from a list of 300 chemicals.
- Chemical type and molecular weight are not currently used in Visual PFAS™, but these fields do require values to be populated prior to the import process.
- As shown in the example on the next page, you can create a chemical name for various total concentrations if these are to be represented in radial diagrams or stacked bars. You would need to calculate these total concentrations and enter these values in the Results.csv table prior to importing the dataset into Visual PFAS™.
- For TOP assays, you may want to create a second monitoring event to represent the total concentrations measured during the assay for various PFCAs, using the original chemical IDs for PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, etc. (see Section 2.3.9 for a more detailed description of how to include TOP assay results.)
- Do not use "," in chemical names because these are comma-delimited files
- ID numbers and sort IDs to not have to be in order, and do not have to contiguous series of numbers
- Default units are used to set the initial units for radial diagram axes, but are not required to be used in the imported **Results.csv** or **ReferenceResults.csv** files
- Enter "-1" in the Criterion field for chemicals that do not have cleanup criteria. This flag tells Visual PFASTM that there are no applicable criterion for these chemicals. Users may still enter a criterion manually when preparing radial diagrams (see Chapter 4).

Table 1 - Chemicals.csv: Chemical names and default concentration units

Field No.	Field	Description	Variable Type	Comments
1.1	ChemID	Chemical ID No.	Integer	
1.2	ChemSName	Chemical short name	Character (25 max)	
1.3	DefUnitID	Chemical default concentration unit ID No.	Integer	ID number of default units (e.g., 1=ug/L)
1.4	ChemType	Chemical type	Integer	Not currently used, set to 1
1.5	ChemSortID	Chemical sorting order	Integer	Order for populating drop-down lists
1.6	ChemMW	Molecular weight (g/mol)	Real	Not currently used (-1 if not available)
1.7	Criterion	Default cleanup criterion in default concentration units	Real	Default cleanup criterion (-1 if not applicable)

Demo-Airport Example Table

ChemID	ChemSname	DefUnitID	ChemType	ChemSortID	ChemMW	Criterion
3	PFBA	1	1	1	214.04	-1
4	PFPeA	1	1	2	264.05	-1
5	PFHxA	1	1	3	314.05	-1
6	PFHpA	1	1	4	364.06	-1
7	PFOA	1	1	5	414.07	0.004
8	PFNA	1	1	6	464.08	0.01
9	PFDA	1	1	7	514.08	-1
10	PFBS	1	1	8	300.1	2
23	PFPeS	1	1	9	350.11	-1
11	PFHxS	1	1	10	400.11	0.01
24	PFHpS	1	1	11	450.12	-1
12	PFOS	1	1	12	500.13	0.004
25	4:2 FtS	1	1	13	350.13	-1
21	6:2 FtS	1	1	14	428.16	-1
22	8:2 FtS	1	1	15	545.22	-1
15	FHxSA	1	1	16	400.12	-1
27	FOSA	1	1	17	499.15	-1
1	Total PFCAs	1	1	18	-1	-1
2	Total PFSAs	1	1	19	-1	-1
14	Total_FtS	1	1	20	-1	-1
13	Total Precursors	1	1	21	-1	-1
16	Top-PFBA	1	1	22	214.04	-1
17	Top-PFPeA	1	1	23	264.05	-1
18	Top-PFHxA	1	1	24	314.05	-1
19	Top-PFHpA	1	1	25	364.06	-1
20	Top-PFOA	1	1	26	414.07	-1
26	Top-PFNA	1	1	27	464.08	-1

2.3.2 ChemGroupList.csv Table Format

The 3 fields required for this import table are described in the table below, and the *Demo-Airport* example table is presented at the bottom of the page.

Notes on this table format:

- Chemical groups are used to create smaller lists of chemicals to select from

Table 2 - ChemGroupList.csv: List of chemical groups				
Field No.	**Field**	**Description**	**Variable Type**	**Comments**
2.1	ChemGrpID	Chemical group ID No.	Integer	
2.2	ChemGrpName	Chemical group name	Character (25 max)	
2.3	ChemGrpSortID	Chemical group sorting order	Integer	Order for populating drop-down lists

Demo-Airport Example Table

ChemGrpID	ChemGrpName	ChemGrpSortID
1	PFCAs	1
2	PFSAs	2
3	Precursors	3
4	Top Assay	5
5	Regulated	4

2.3.3 ChemGroups.csv Table Format

The 2 fields required for this import table are described in the table below, and the *Demo-Airport* example table is presented at the bottom of the page.

Notes on this table format:

- This table lists the chemical ID numbers associated with each chemical group listed in **ChemGroupList.csv**
- All chemical groups listed in **ChemGroupList.csv** must be listed in this table with at least one chemical associated with each group.

Table 3 - ChemGroups.csv: List of chemicals associated with each chemical group

Field No.	Field	Description	Variable Type	Comments
3.1	ChemGrpID	Chemical group ID No.	Integer	
3.2	ChemID	Chemical ID No. associated with chemical group	Integer	

Demo-Airport Example Table

ChemGrpID	ChemID
1	3
1	4
1	5
1	6
1	7
1	8
1	9
2	10
2	23
2	11
2	24
2	12
3	15
3	27
3	25
3	21
3	22
4	12
4	11
4	10
4	7
4	8
5	16
5	17
5	18
5	19
5	20
5	26

2.3.4 Units.csv Table Format

The 6 fields required for this import table are described in the table below, and the *Demo-Airport* example table is presented at the bottom of the page.

Notes on this table format:

- The units table lists the names and conversion factors for water sample concentrations. A simple workaround for representing soil and/or sediment sample results in radial diagrams or stacked bar maps is discussed in Section 2.5.
- All units associated with a single matrix (e.g., water) must have the same reference unit ID. In the example shown at the bottom of the page, the reference units are mg/L (i.e., UnitID=2) for all rows in the **Units.csv** table.
- The unit conversion factor represents the multiplier to be used to convert from the current units to the reference units. For example, the unit conversion factor for ug/L is 0.001 to convert from ug/L to mg/L.
- The monitoring event **Results.csv** and **ReferenceResults.csv** tables include specification of the units ID number for each result i.e., each row in these tables. Visual PFAS™ will automatically convert units from the imported dataset to represent the user-specified units for each radial diagram axis.

Table 4 - Units.csv: List of concentration units and conversion factors

Field No.	Field	Description	Variable Type	Comments
4.1	UnitID	Unit ID No.	Integer	
4.2	UnitName	Unit name	Character (20 max)	
4.3	UnitConv	Multiplier to confirm from current units to reference units	Real	e.g., UnitConv = 0.001 when current units are ug/L, and the reference units are mg/L
4.4	RefUnitID	Reference unit ID No.	Integer	
4.5	UnitType	Unit type	Integer	Not current used, set to 1
4.6	UnitSortID	Unit sorting order	Integer	Order for populating drop-down lists

Demo-Airport Example Table

UnitID	UnitName	UnitConv	RefUnitID	UnitType	UnitSortID
1	ug/L	0.001	2	1	2
2	mg/L	1	2	1	3
3	ng/L	1.00E-06	2	1	1
4	g/L	1000	2	1	4
5	Kg/L	1.00E+06	2	1	5

2.3.5 Locations.csv Table Format

The 5 fields required for this import table are described in the table below, and the *Demo-Airport* example table is presented at the bottom of the page.

Notes on this table format:

- This table lists all locations which may be used to plot radial diagrams or stacked bars on a map.
- It is possible to show other locations on the site basemap even if they are not used for plotting radial diagrams; in this case, these locations should be listed in locations.csv even if no analytical results are included for these locations in the monitoring event **Results.csv** table.

Table 5 - Locations.csv: Location names and coordinates

Field No.	Field	Description	Variable Type	Comments
5.1	LocID	Location ID No.	Integer	
5.2	LocName	Location name	Character (20 max)	
5.3	Easting	Location easting coordinate in map units	Real	Map units (e.g., feet or meters) must be consistent for
5.4	Northing	Location northing coordinate in map units	Real	all locations and basemap layer files
5.5	LocSortID	Location list sorting order	Integer	Order for populating drop-down lists

Demo-Airport Example Table

LocID	LocName	Easting	Northing	LocSortID
1	MW-1	-5172.7	6397.6	1
2	MW-2	-3812.8	10657.6	2
3	MW-3	-1803.2	6638.3	3
4	MW-4	-2116	13437.4	4
5	MW-5	-142.5	9923.5	5
6	MW-6	2167.9	14015.1	6
7	MW-7	2516.9	9442.2	7
8	MW-8	4839.5	11018.6	8
9	MW-9	10074.2	9995.8	9
10	MW-10	1133	4243.5	10
11	MW-11	6331.7	5326.6	11
12	MW-12	10278.8	4051	12
13	MW-13	-4222	1475.7	13
14	MW-14	-852.5	669.5	14
15	MW-15	3190.8	428.8	15

2.3.6 LocGroupList.csv Table Format

The 3 fields required for this import table are described in the table below, and the *Demo-Airport* example table is presented at the bottom of the page.

Notes on this table format:

- This table lists the names of location groups which may be used to filter down the list of available locations to select from. i.e., it's easier to select from a group of 30 wells than from a list of 300 available wells at a site.
- The sort ID reflects the order at which the locations are shown in selection boxes. This allows you to sort the location names alphanumerically. For example, if you were to sort the list alphabetically based on well names, then MW-10 will appear before MW-2, MW-3, etc. in a well list. Using the sort IDs, you can arrange to have the wells sorted based on their alphanumeric ID values e.g., so MW-2, MW-3, etc. appear in the displayed selection list before MW-10.

Table 6 - LocGroupList.csv: List of location groups

Field No.	Field	Description	Variable Type	Comments
6.1	LocGrpID	Location group ID No.	Integer	Examples of well groups could be shallow and deep, and/ or monitoring and extraction wells
6.2	LocGrpName	Location group name	Character (25 max)	
6.3	LocGrpSortID	Location group sorting ID	Integer	Order for populating drop-down list

Demo-Airport Example Table

LocGrpID	LocGrpName	LocGrpSortID
1	Shallow	1
2	Deep	2

2.3.7 LocGroups.csv Table Format

The 2 fields required for this import table are described in the table below, and the *Demo-Airport* example table is presented at the bottom of the page.

Notes on this table format:

- This table lists the location ID numbers associated with each location group specified in **LocGroupList.csv**
- All groups listed in LocGroupList.csv must be listed with at least one location in this table.

Table 7 -LocGroups.csv: List of locations associated with each location group

Field No.	Field	Description	Variable Type	Comments
7.1	LocGrpID	Location group ID No.	Integer	
7.2	LocID	Location ID No. associated with location group	Integer	

Demo-Airport Example Table

LocGrpID	LocID
1	1
1	2
1	4
1	5
1	6
1	7
1	8
1	10
1	12
1	13
1	15
2	3
2	9
2	11
2	14

2.3.8 Events.csv Table Format

The 4 fields required for this import table are described in the table below, and the *Demo-Airport* example table is presented at the bottom of the page.

Notes on this table format:

- This table lists the monitoring events which may be used as separate data series on a radial diagram map or used to prepare stacked bar maps.
- Do not enter dates or event names that contain a comma, this will cause an error because these are comma-delimited files (even if the dates or names are in quotes in the csv table)
- This table is also used to represent depth or elevation intervals for plotting soil and/or sediment results – refer to Section 2.5 for more details.
- The sort ID field governs the order at which monitoring events are listed in selection boxes. Events are not sorted chronologically based on the date.

Table 8 - Events.csv: List of monitoring event series

Field No.	Field	Description	Variable Type	Comments
8.1	EventID	Monitoring event ID No.	Integer	
8.2	EventDate	Monitoring event date	Character (15 max)	Example format: YYYY-MM-DD (format not required; date is not currently used)
8.3	EventName	Monitoring event name	Character (25 max)	Event name presented in event lists
8.4	EventSortID	Monitoring event sorting order	Integer	Order for populating drop-down list (by date)

Demo-Airport Example Table

EventID	EventDate	EventName	EventSortID
1	2023-02-15	2023-02-15	1
2	2023-08-21	2023-08-21	2

2.3.9 Results.csv Table Format

The 7 fields required for this import table are described in the table on the next page, as well as an excerpt from the *Demo-Airport* example table.

Notes on this table format:

- This table represents monitoring event chemical analytical results to be used as well-specific data series in radial diagrams and stacked bar maps
- The location, monitoring event, and chemical ID numbers listed in the first three fields must correspond to entries in **Locations.csv, Events.csv, and Chemicals.csv**
- Enter one row in the table for each available analytical result
- If results are not available for a specific chemical in a monitoring event, do not include a row entry in the **Results.csv** file for this chemical/event.
- A result of zero for a concentration is invalid and will cause an error. You must enter a non-zero value for chemical analytical results.
- Non-detect results are represented as negative values, where the negative means it's a non-detect, and the absolute value of the result is the method detection limit (MDL) or more generally, the detection limit to be represented on radial diagrams. (see the example table on the next page.) Reporting limits can be entered as the detection limit as an alternative to the MDL.
- If you are entering data into the table from a historic report which only lists ND without a detection limit, you cannot enter zero. You can enter an arbitrarily low value if you are confident that the detection limit was relatively low (e.g., -0.001 or -0.01 ug/L).
- Top Assay results may be entered as follows:
    - For the monitoring event, enter the results for the non-TOP sample analyses for PFCAs such as PFBA, PFPeA, PFHxA, PFHpA, PFOA, and PFNA. These values represent the groundwater concentrations prior to the performance of the TOP assay and are assigned to the specific monitoring event.
    - To represent the total TOP assay results (i.e., total PFCA species measured in the assay), create a new monitoring event so that these total measured assay results can be represented as a second data series on radial diagrams, or on stacked bar maps. The chemicals are the same (PFBA, PFPeA, etc.) as the pre-assay chemicals.
    - For a stacked bar map representing the *increase* in PFCAs measured in the TOP assay, create new rows in the Chemicals.csv list to account for the measured increases (e.g., chemical name Top-PFBA to represent ΔPFBA which is the observed increase in PFBA after the TOP assay, and similarly for other relevant PFCAs). These results should be saved in the original monitoring event – there is no need to create a second event to represent TOP assay results if you are plotting the *increase* or change in PFCAs instead of the *total*. You must assign a non-detect value if the increase is zero or negative in the TOP assay relative to the non-assay sample results.

Table 9 - Results.csv: Chemical sample results				
Field No.	**Field**	**Description**	**Variable Type**	**Comments**
9.1	LocID	Result Location ID No.	Integer	
9.2	EventID	Result Event ID No.	Integer	
9.3	ChemID	Result Chemical ID No.	Integer	
9.4	ResultVal	Result value	Real	Result is detected if value is positive; a negative result represents a non-detect, where the absolute value is the detection limit
9.5	UnitID	Concentration units ID No.	Integer	
9.6	ResultType	Result type	Integer	Not currently used, set to 1
9.7	ResultMatrix	Result matrix ID No.	Integer	Not currently used, set to 1

Handling Duplicate Sample Results: It is recommended that you have only one row for results unique to each location, monitoring event, and chemical analyte. This could be the average or maximum result, for example. If multiple results are presented as multiple rows in the Results.csv table, then the last result read during the import process (i.e., lowest applicable row in the table) will be used. As shown below and on the next page, you can sort these on Location-Event-Chemical-Result fields so that the lowest applicable row is the maximum result.

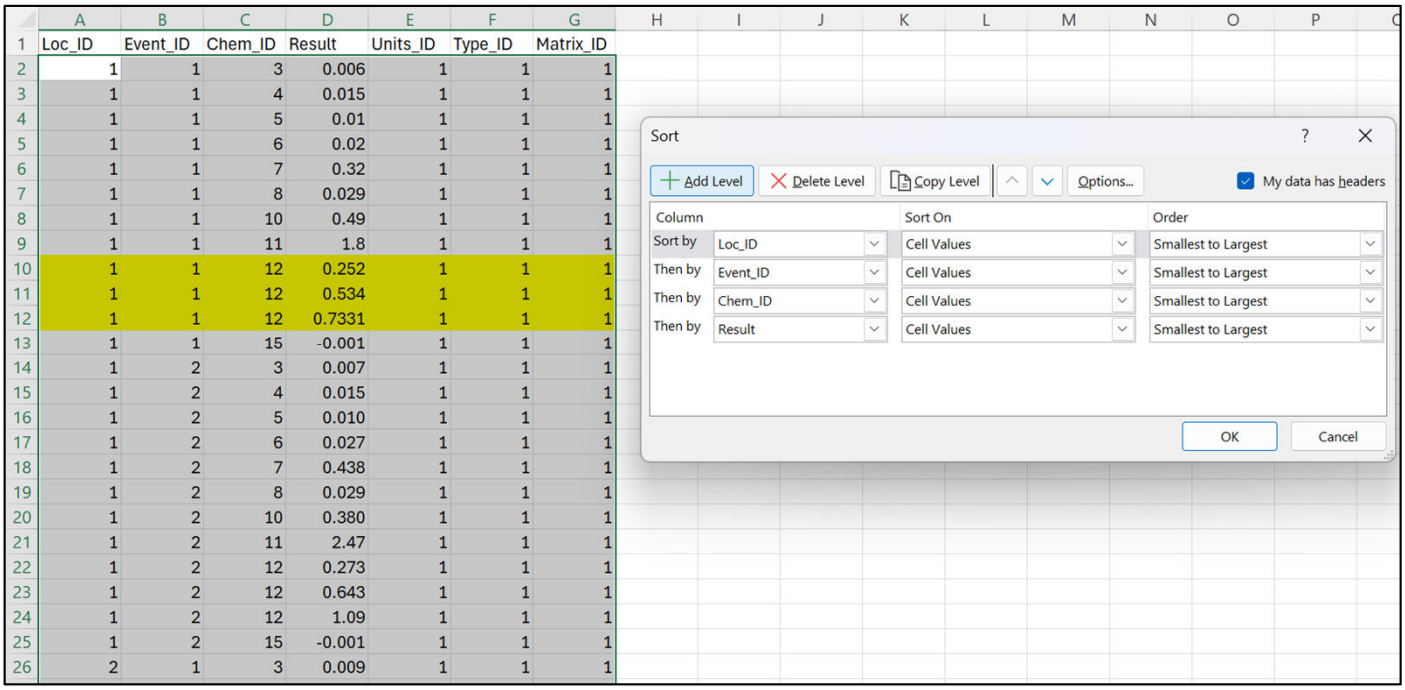
Demo-Airport Example Table

LocID	EventID	ChemID	ResultVal	UnitID	ResultType	ResultMatrix
1	1	3	0.006	1	1	1
1	1	4	0.015	1	1	1
1	1	5	0.01	1	1	1
1	1	6	0.02	1	1	1
1	1	7	0.32	1	1	1
1	1	8	0.029	1	1	1
1	1	10	0.49	1	1	1
1	1	11	1.8	1	1	1
1	1	12	0.252	1	1	1
1	1	12	0.534	1	1	1
1	1	12	0.7331	1	1	1
1	1	15	-0.001	1	1	1
1	2	3	0.007	1	1	1
1	2	4	0.015	1	1	1
1	2	5	0.01	1	1	1
1	2	6	0.027	1	1	1
1	2	7	0.438	1	1	1
1	2	8	0.029	1	1	1
1	2	10	0.38	1	1	1
1	2	11	2.47	1	1	1
1	2	12	0.273	1	1	1
1	2	12	0.643	1	1	1
1	2	12	1.09	1	1	1
1	2	15	-0.001	1	1	1
2	1	3	0.009	1	1	1

In this example with multiple results, the lowest row with a result of 0.7331 ug/L will be used in Visual PFAS™.

The example below shows how the **Results.csv** table can be sorted so that the maximum result with duplicate or triplicate samples is the lowest applicable row in the table for each unique combination of location-event-chemical analyte.

If it is desired to use the average concentration, then that calculation must be done outside of Visual PFAS™. In this case, only a single row with the average analyte concentration would be included for each location-event-chemical in the **Results.csv** table. Averaging concentrations will need to take into account how to handle a mix of non-detect and detected results for duplicate samples.



	A	B	C	D	E	F	G
1	Loc_ID	Event_ID	Chem_ID	Result	Units_ID	Type_ID	Matrix_ID
2	1	1	3	0.006	1	1	1
3	1	1	4	0.015	1	1	1
4	1	1	5	0.01	1	1	1
5	1	1	6	0.02	1	1	1
6	1	1	7	0.32	1	1	1
7	1	1	8	0.029	1	1	1
8	1	1	10	0.49	1	1	1
9	1	1	11	1.8	1	1	1
10	1	1	12	0.252	1	1	1
11	1	1	12	0.534	1	1	1
12	1	1	12	0.7331	1	1	1
13	1	1	15	-0.001	1	1	1
14	1	2	3	0.007	1	1	1
15	1	2	4	0.015	1	1	1
16	1	2	5	0.010	1	1	1
17	1	2	6	0.027	1	1	1
18	1	2	7	0.438	1	1	1
19	1	2	8	0.029	1	1	1
20	1	2	10	0.380	1	1	1
21	1	2	11	2.47	1	1	1
22	1	2	12	0.273	1	1	1
23	1	2	12	0.643	1	1	1
24	1	2	12	1.09	1	1	1
25	1	2	15	-0.001	1	1	1
26	2	1	3	0.009	1	1	1

2.3.10 ReferenceSeriesList.csv Table Format

The 3 fields required for this import table are described in the table below, and the *Demo-Airport* example table is presented at the bottom of the page.

Notes on this table format:

- This table includes a list of reference series which are to be available for plotting with radial diagrams.
- Reference series are plotted using uniform results across all locations at a site. Examples of reference series include background or maximum source concentrations.
- In the *Demo-Airport* example dataset, the reference series represents the Source A concentrations because this source (former FTA where an unlined burn pit was used) has higher PFAS concentrations than Source B (current FTA with a lined burn pit).
- At least one reference series needs to be entered into this table, even if it's not used on radial diagrams.

Note: Large sites may have more than one set of PFAS background concentrations. It is possible to have more than one background reference series listed as reference series (e.g., north and south background reference series). One radial diagram properties file would be created specific to one of these two background reference series. Both sets of radial diagrams (i.e., one with a north background reference series, the other with locations using the south background series) can be overlaid on the site basemap simultaneously simply by adding each radial diagram map as a separate layer to the basemap. (See Section 4.8 in Chapter 4 for more information on how to add radial diagrams to the site basemap.)

Table 10 - ReferenceSeriesList.csv: List of reference series

Field No.	Field	Description	Variable Type	Comments
10.1	RefSeriesID	Reference series ID No.	Integer	
10.2	RefSeriesName	Reference series name	Character (25 max)	
10.3	RefSeriesSortID	Reference series sorting order	Integer	Order for populating drop-down list

Demo-Airport Example Table

RefSeriesID	RefSeriesName	RefSeriesSortID
1	Source A	1

2.3.11 ReferenceResults.csv Table Format

The 6 fields required for this import table are described in the table below, and the *Demo-Airport* example table is presented at the bottom of the page.

Notes on this table format:

- This table lists the chemical analytical results for each reference series listed in the **ReferenceSeriesList.csv** table discussed in Section 2.3.10.
- The fields in this table are generally similar to those in the **Results.csv** table. Refer to the corresponding notes in Section 2.3.9, particularly with respect to entering negative values to represent non-detects (where the absolute value of the result is the detection limit).
- Only one row in the table should be used to represent each chemical analyte in the reference series.

Table 11 - ReferenceResults.csv: Reference Series chemical results

Field No.	Field	Description	Variable Type	Comments
11.1	RefSeriesID	Reference series ID No.	Integer	
11.2	ChemID	Chemical ID No.	Integer	
11.3	ResultVal	Reference series result value	Real	If negative value for UnitType()=1 --> not detected, value=detection limit
11.4	UnitID	Unit ID No.	Integer	
11.5	ResultType	Result type	Integer	Not currently used, set to 1
11.6	ResultMatrix	Result matrix	Integer	Not currently used, set to 1

Demo-Airport Example Table

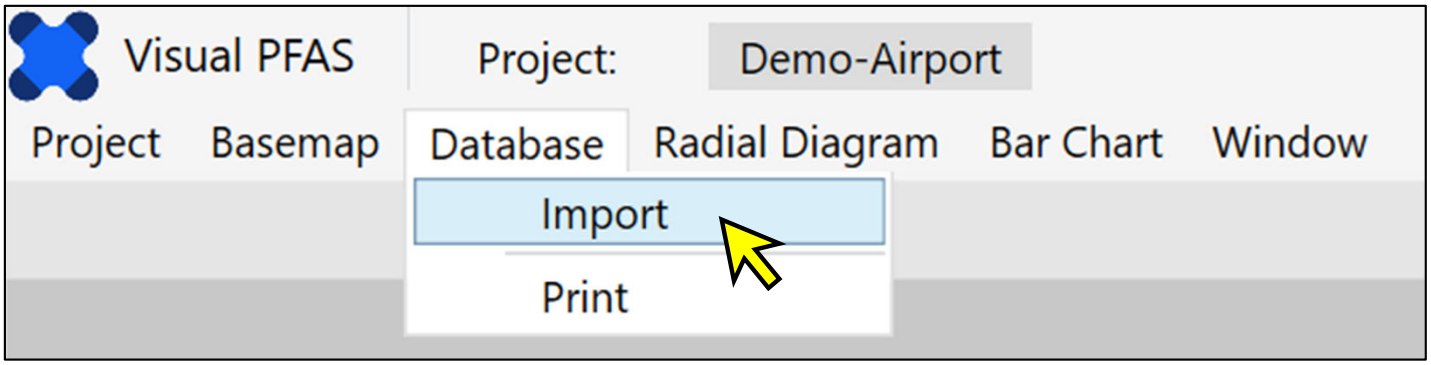
RefSeriesID	ChemID	ResultVal	UnitID	ResultType	ResultMatrix
1	3	1.44	1	1	1
1	4	4.4	1	1	1
1	5	2.94	1	1	1
1	6	4.8	1	1	1
1	7	77.8	1	1	1
1	8	4.7	1	1	1
1	10	25	1	1	1
1	11	200	1	1	1
1	12	250	1	1	1
1	15	150	1	1	1

2.4 Importing the Dataset

After creating a new project, the next step is to import the 11 project dataset tables described in Section 2.3. Click on the **Database** option in the top menu bar and then click **Import** to start this process (see arrow below).

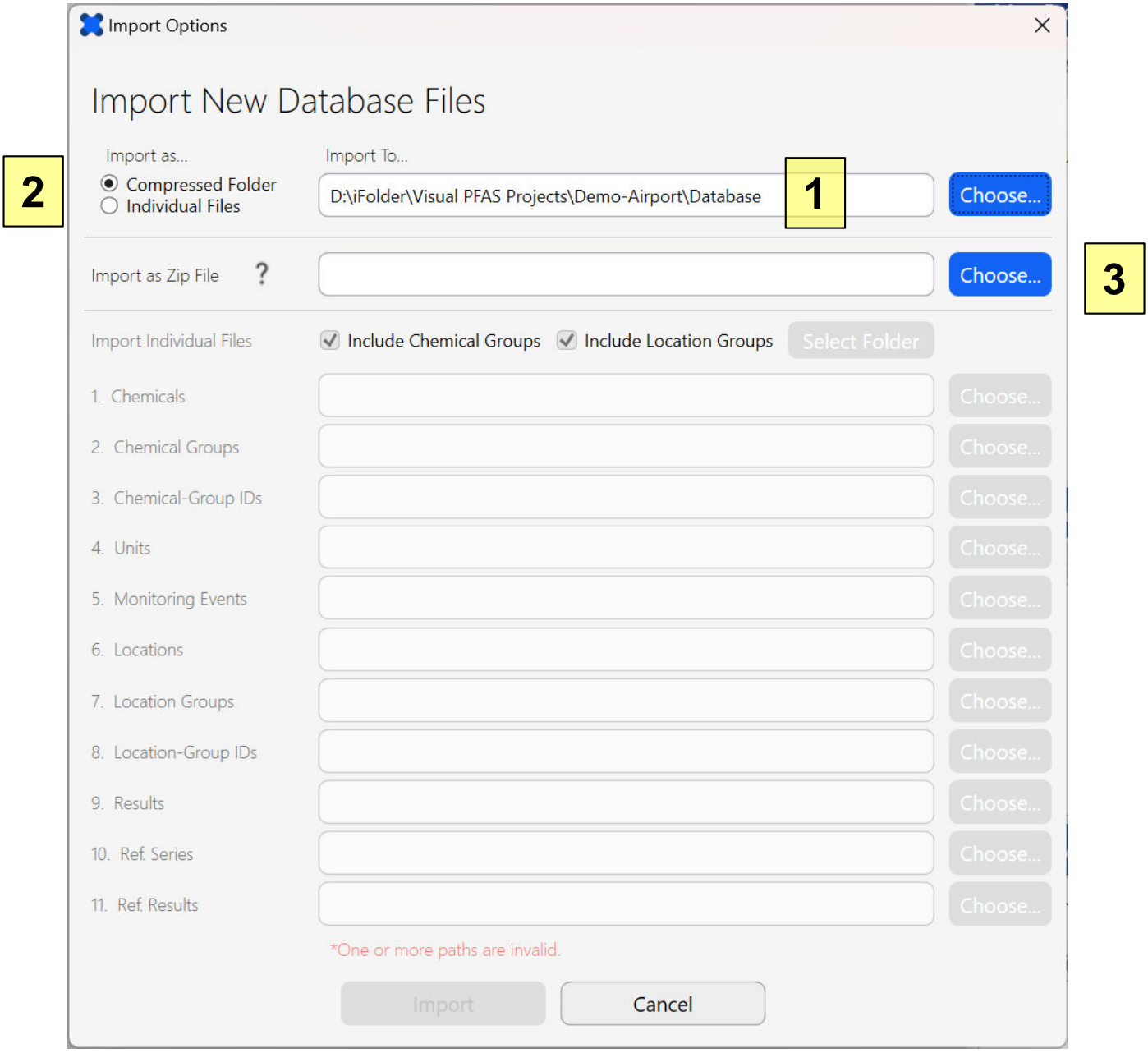
Notes:

1. This import process only needs to be done once. During the import process, Visual PFAS™ will conduct a QA/QC to verify that the import data tables are properly formatted. Error messages will be displayed if there is a problem with the formatting of any of these tables. Import errors should be corrected before proceeding.
2. After the import process has been completed, the imported dataset tables will be copied to the **Database** folder as read-only, with the same names as the eleven csv files previously imported. Do not change or move/delete the files in the **Database** folder.
3. It is possible to print the contents of all tables in the **Database** folder to a single csv report file, to verify the content of the database after the import process. To print a database "report", select the Print option in the **Database** menu (see image below).
4. Visual PFAS™ will automatically read the dataset files in the **Database** folder each time it is re-opened.
5. If any of the eleven dataset files (*.csv) are changed in the **Import** folder, then these changes will only be adopted after re-importing the dataset.
6. Visual PFAS™ tracks the path of the project folder and the corresponding sub-folders (e.g., Basemap, Database, Import, etc.). It is possible to copy a **Project** folder to another location, in which case you will need to re-import the dataset again.



The pop-up menu below shows two options for importing the dataset files to the default **Database** folder (see "1" below) for the project :

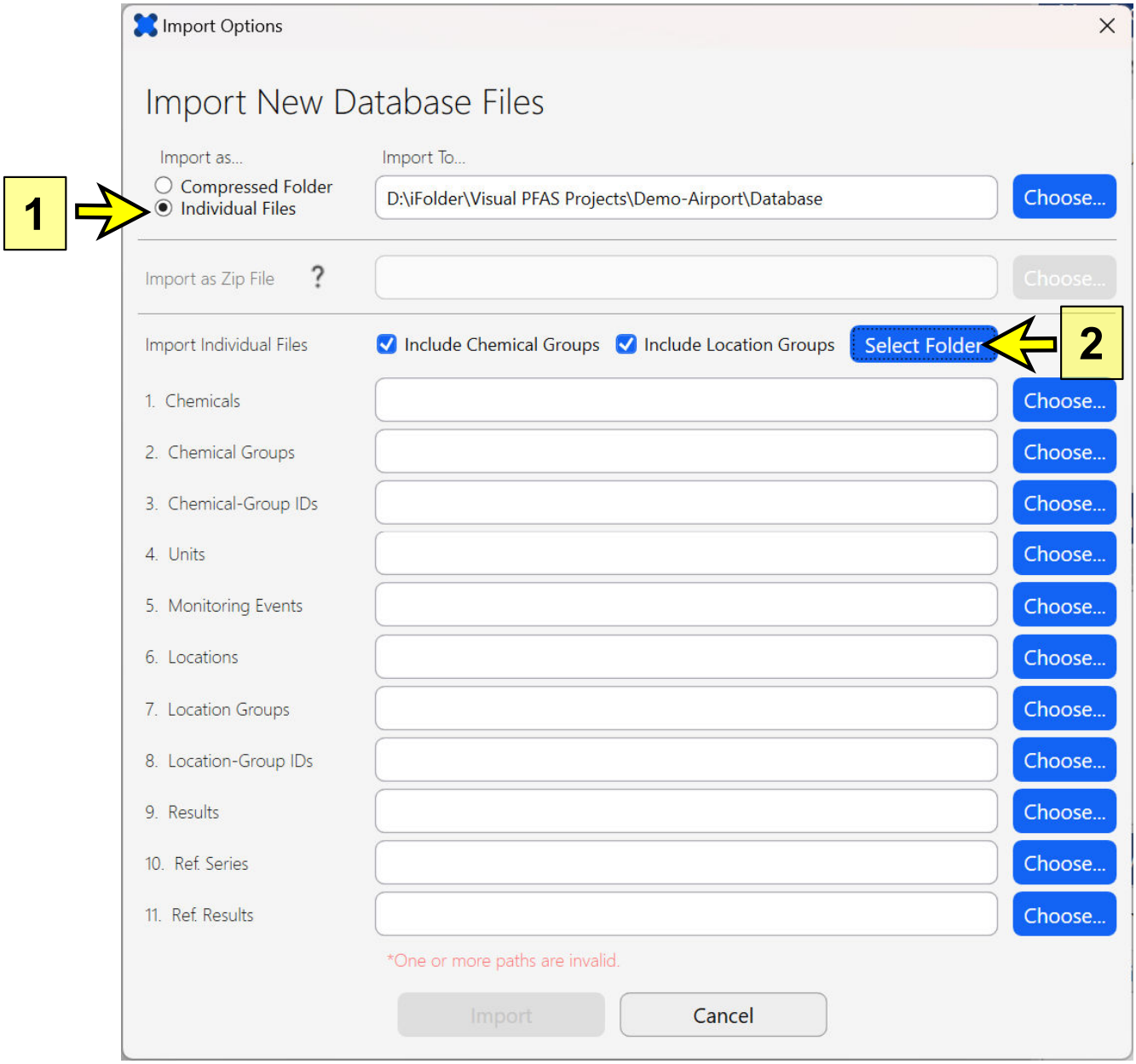
1. Import the tables contained in a compressed folder (i.e., zip file) – see selection at "2" below. If this option is selected, then Visual PFAS™ will automatically read the 11 csv files from the specified zip file. The zip filename and path are specified by clicking the Choose button (see "3" below); OR
2. Import the 11 csv files directly from a sub-folder (see next page).



Selecting Import from Individual (csv) Files

To specify that the 11 csv files will be read from a sub-folder instead of a zipped file:

1. Click the “Individual Files” button (see “1” below); and
2. Click the Select Folder button (see “2” below).

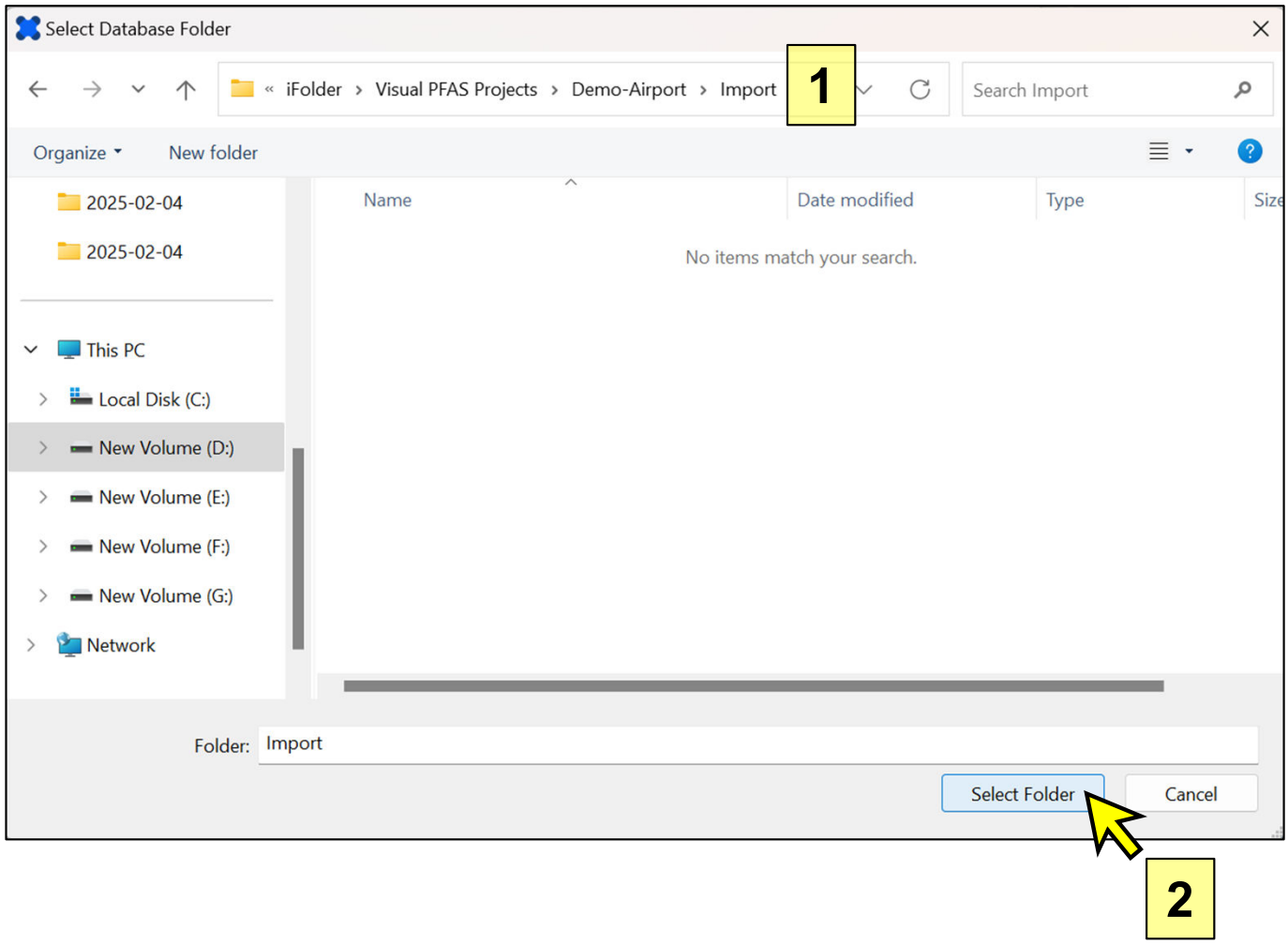


After pressing the **Select Folder** button, the dialog box below will appear.

Using the path bar at the top of the dialog box (see "1" below), navigate to the location of the Import folder containing the project dataset. The default sub-folder will be the **Import** folder under the Visual PFAS™ main **Project** folder that was created when the new project was started (see Section 2.1).

You won't see the csv files in this dialog box because you are only selecting the folder, not an actual file.

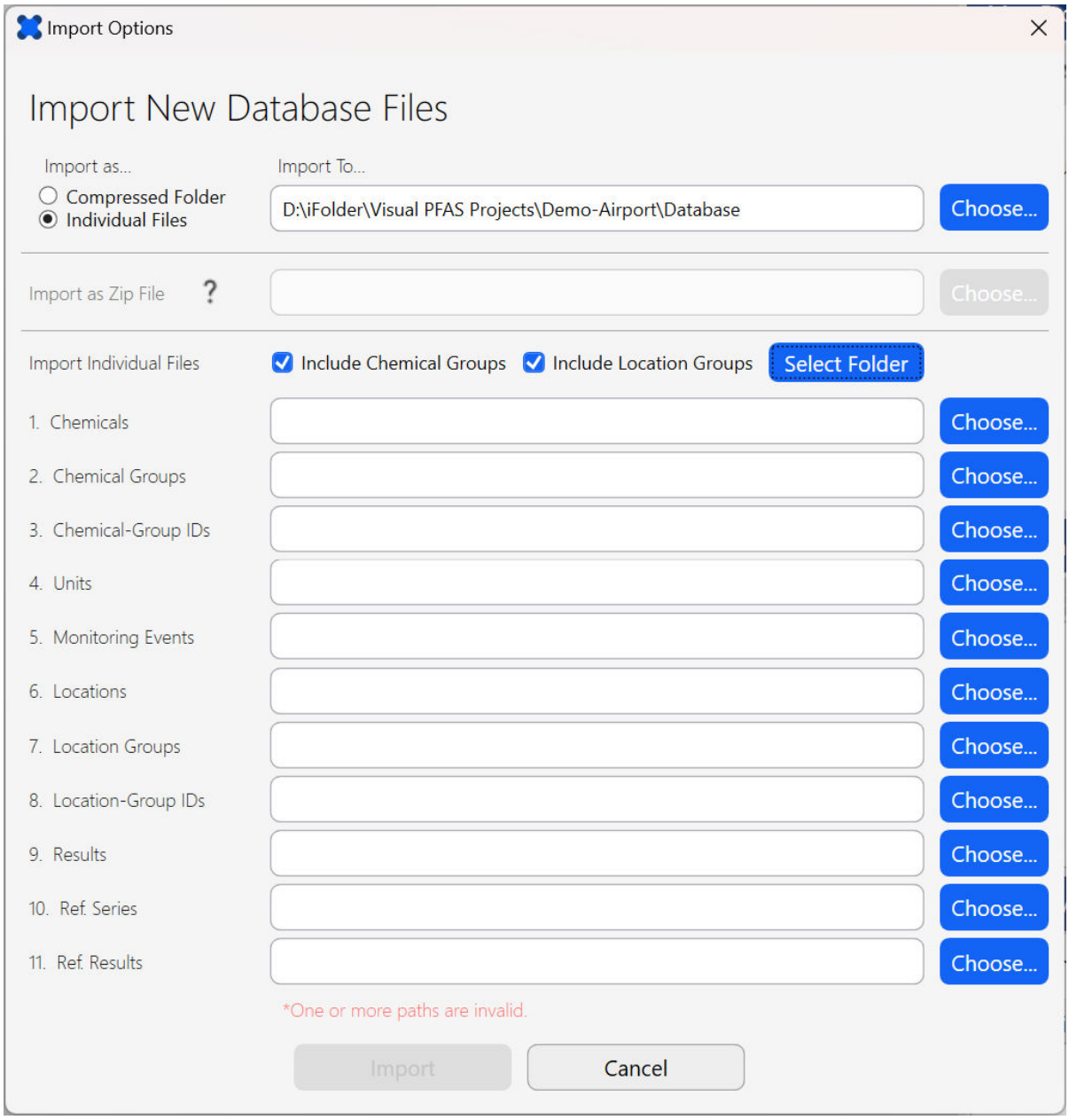
Once the **Import** folder path has been specified, click the **Select Folder** button to save this change (see "2" below).



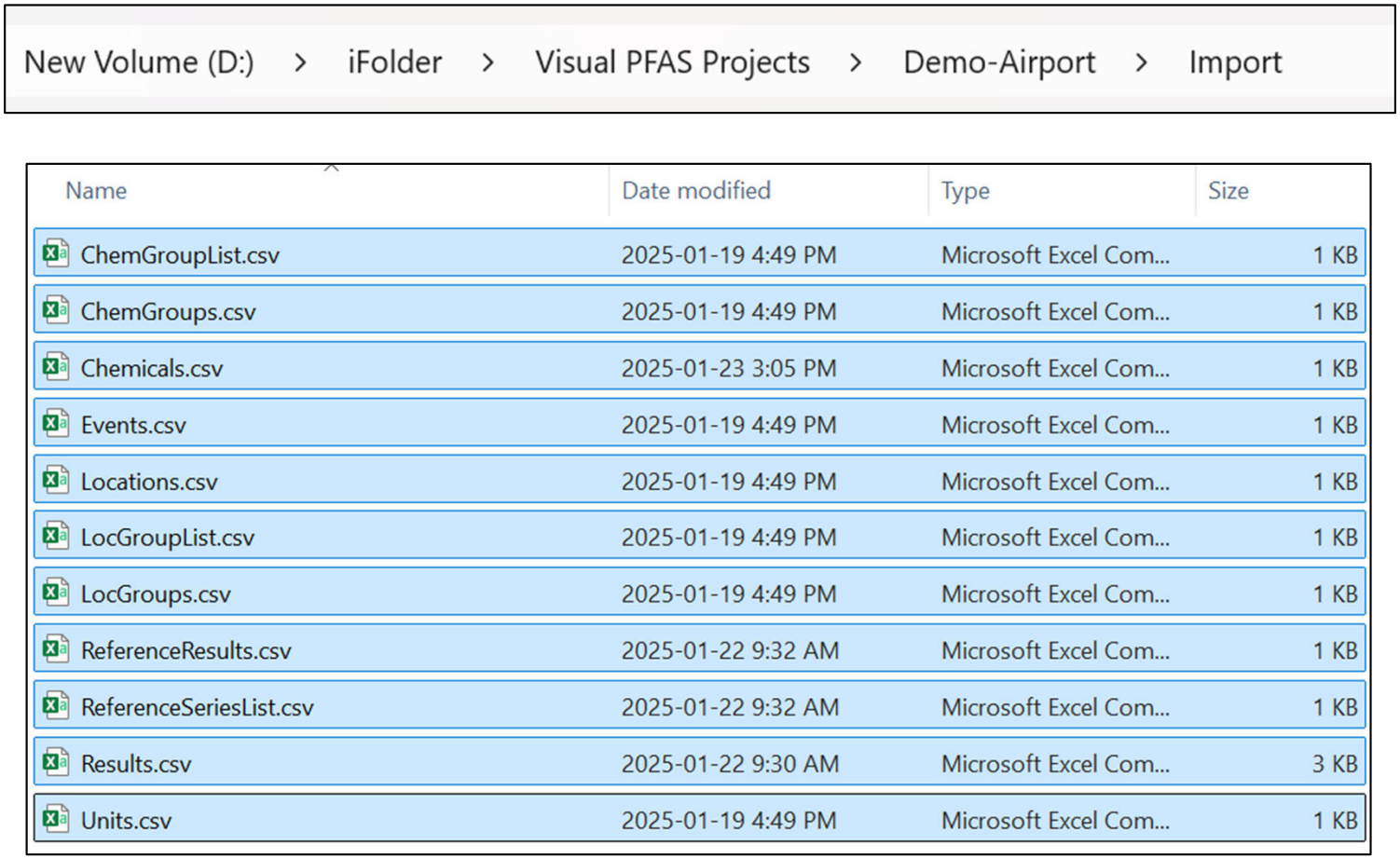
Once you've specified the **Import** folder path, you should see the path and names of all 11 csv files for the import dataset listed in the window below.

If you are not seeing the names of these files listed, as shown below, it means that the csv files were not found in the selected Import folder. This is also noted with the "One or more paths are invalid" error message shown in red font at the both of the image below.

In our case, the project **Import** files have not yet been copied into the Import folder as part of this tutorial. The *Demo-Airport* dataset csv files are provided with the Visual PFAS™ install files in a separate folder. (see the Visual PFAS™ Quick Install Guide for the location of this tutorial folder)

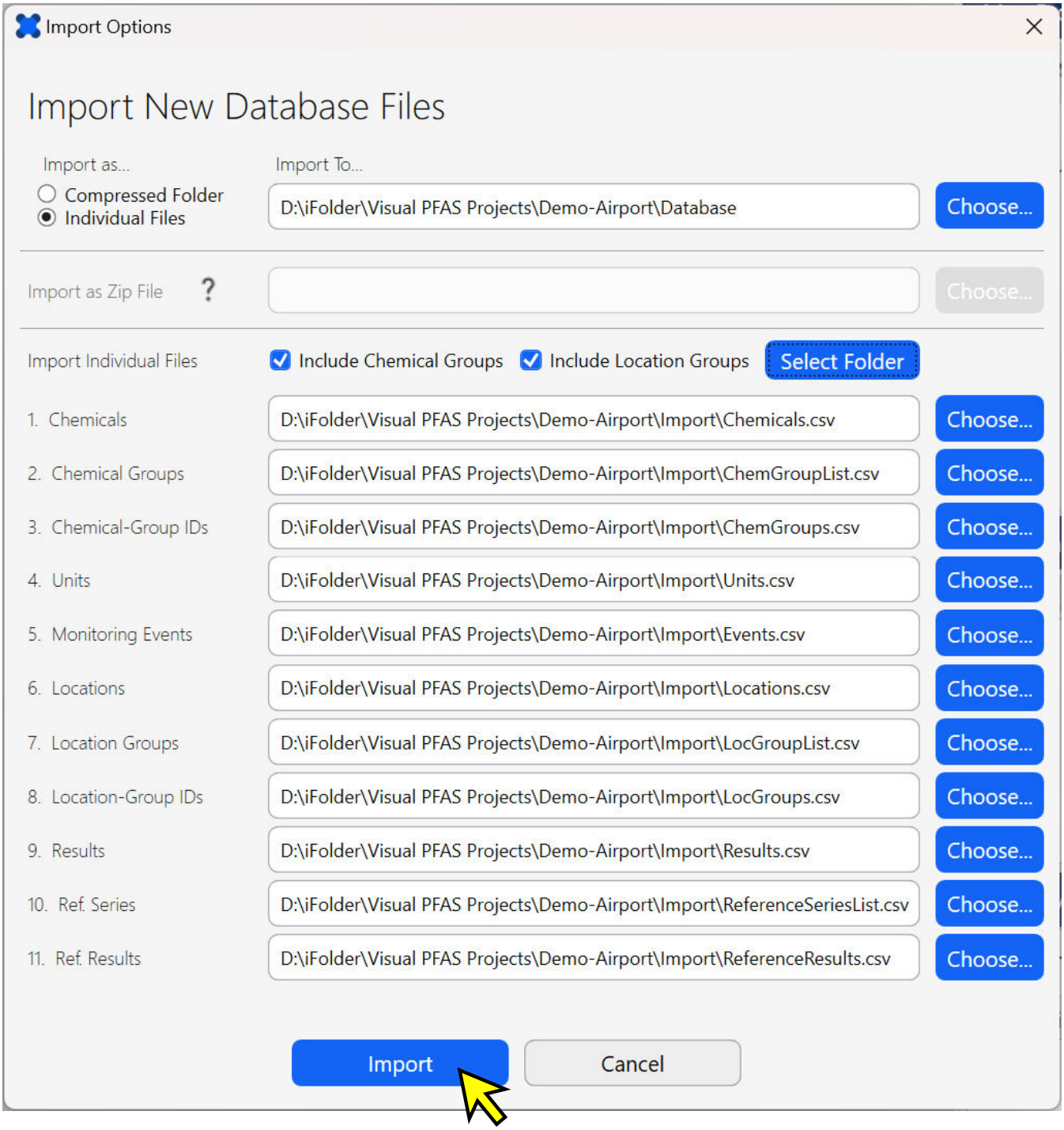


The next step in the tutorial is to copy the *Demo-Airport* dataset csv files to the project Import folder. An example path is shown below, along with the list of import csv table files that should be copied from the Visual PFAS™ install folder to the project **Import** sub-folder. (This step is conducted using Windows Explorer, outside of Visual PFAS™.)



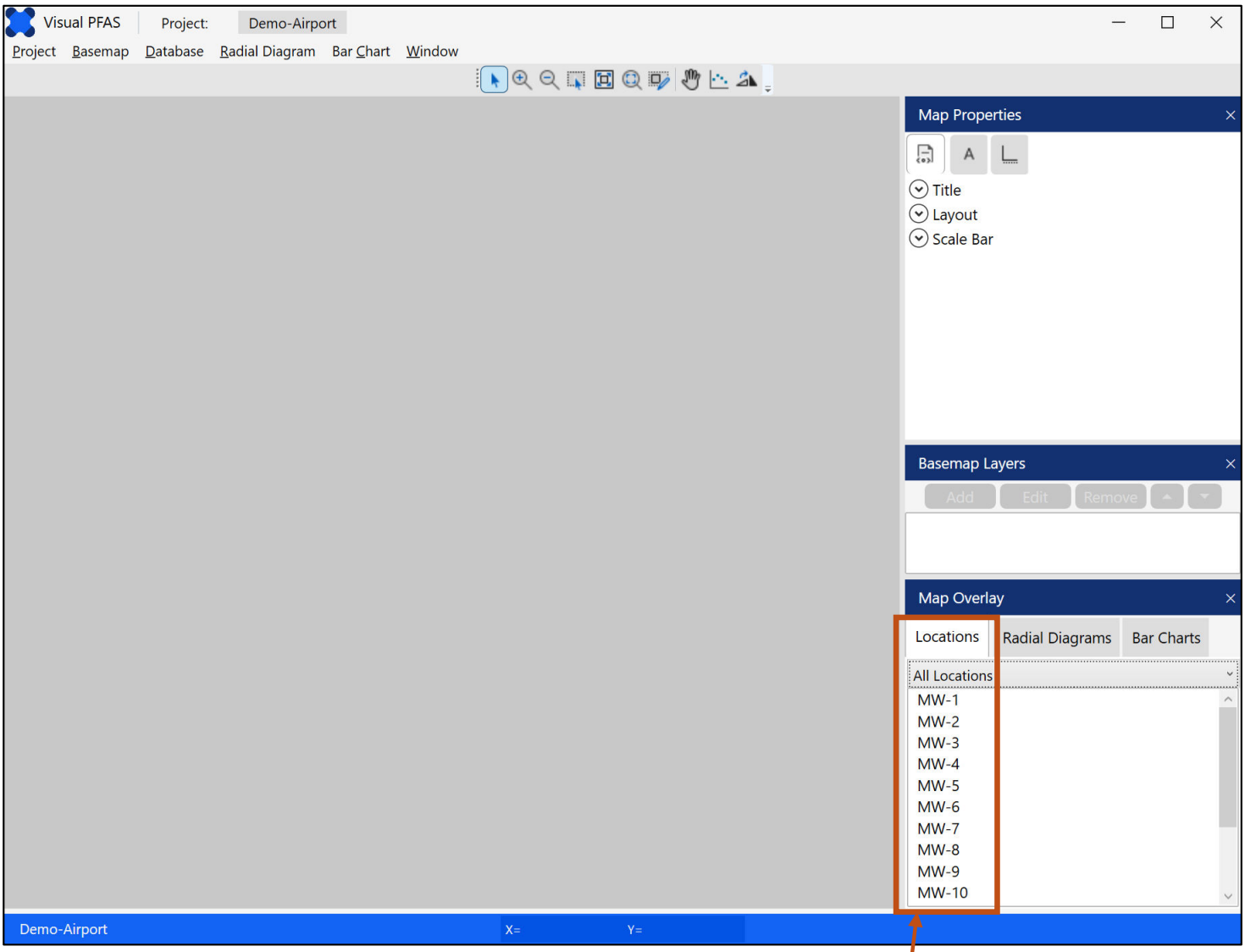
After copying the csv files into the target Import sub-folder, re-select the **Import** sub-folder using the steps shown previously on p. 2.27 to 2.28.

Now when you return to the dialog box below, you will see the paths and filenames for all 11 comma-delimited csv files shown as depicted below. Click the Import button (see arrow below) to import the dataset into Visual PFAS™. If any errors are displayed during the automatic QA/QC process that Visual PFAS™ conducts during this import step, these errors should be corrected and the dataset re-imported before proceeding.



Once you've successfully imported the dataset, the monitoring well locations will be listed in the Map Overlay section of the basemap as shown below.

The well locations are not shown yet on the basemap because a basemap hasn't been created yet as part of this tutorial. See Chapter 3 for the tutorial steps to create a basemap and display selected well locations.



Locations are listed after database imported

2.5 Importing A Soil/Sediment Dataset for Visualization

The current version of Visual PFAS™ is generally focused on preparing visual aids based on groundwater monitoring results. However, it is possible to plot soil and/or sediment sample results using the same visualization tools.

The main difference between groundwater and soil samples is that groundwater samples are associated with a single monitoring location (i.e., single screened horizon); whereas soil borings will typically have multiple sampling intervals associated with each location. It is true that nested wells have multiple screens, although in this case each well screen would be assigned to a different location in the dataset (e.g., MW-1S and MW-1D would be listed as separate locations in the **Locations.csv** table).

When using radial diagrams or stacked bar maps to visualize soil or sediment data on a plan view map of a site, the monitoring events list (**Events.csv**) can be re-purposed to become a list of sampling horizons based on user-specified depth or elevation target intervals. For example, let's say that you wanted to plot one or multiple maps to represent soil concentration trends for the following depth intervals: a) 0-2 feet below ground surface (ft bgs); b) 2-10 ft bgs; 10-20 ft bgs; and d) 20 to 40 ft bgs. (In this example, the site water table is at a depth of 40 ft bgs.)

A simple workaround with Visual PFAS™ is to create a new project folder and a new dataset (separate from your groundwater sample folder and dataset), to represent soil and/or sediment sample results. In this new dataset, the monitoring events list would list the four depth intervals as Event Names instead of four monitoring events. (It is assumed that you would plot soil sample results from all available site characterization events, or you could use a subset of investigations – this dataset compilation is done outside of Visual PFAS™, so you have flexibility about which data to include in the import dataset.)

The Events.csv file would have four rows below the header with the following EventNames:

- 0 to 2 ft bgs
- 2 to 10 ft bgs
- 10 to 20 ft bgs
- 20 to 40 ft bgs

Each of these depth intervals becomes a separate data series that can be represented on a radial diagram or in a stacked bar map. For example, you can plot all four data series (i.e., depth intervals) on a single radial diagram at each soil boring location, to visually assess how PFAS concentrations change with depth on a single map. The main difference between soil and groundwater visualization using radial diagrams is that with soil, each event or data series represents a distinct depth (or elevation) horizon; and with groundwater each series represents a different monitoring event.

Visual PFAS™ currently has hardwired concentration units for a water matrix (e.g., ng/L, ug/L, mg/L, etc.). When using Visual PFAS™ to represent soil or sediment sample results, you can use the same water units as if they were solid concentrations. For example, use ng/L to represent solid concentrations in ng/kg; use ug/L units to represent sample results in ug/kg; etc.

So the **Units.csv** file will still have the same water concentration units; and your **Results.csv** and **ReferenceResults.csv** will have the same Unit IDs that correspond to ng, ug, mg, etc. in the solid units. For example, if a soil sample result was 1.2 ug/kg, the UnitID assigned to that sample result would be 1 in the **Results.csv** table, which is consistent with units of ug/L in the **Units.csv** table. The unit conversion factors are the same for soil and water concentrations in this case.

A future version of Visual PFAS™ will include solid concentration units (e.g., ng/kg, ug/kg, mg/kg, etc.) as another option in the **Units.csv** table.