# WinSLAMM v 9.4
# User's Guide

Control Devices

# Start-Up Hints

**Press F1 on any screen within the program to see the corresponding Help File Topic**

**Throughout this User's Guide, the text in red walks you through the program**

**The User may need to press Enter in various input screens to activate the next data input**

# Control Devices Summary

- **Biofiltration**
- **Catch Basins**
- **Grass Swales**
- **Hydrodynamic Devices**
- **Other Control Device**
- **Porous Pavement**
- **Street Cleaning**
- **Wet Detention**

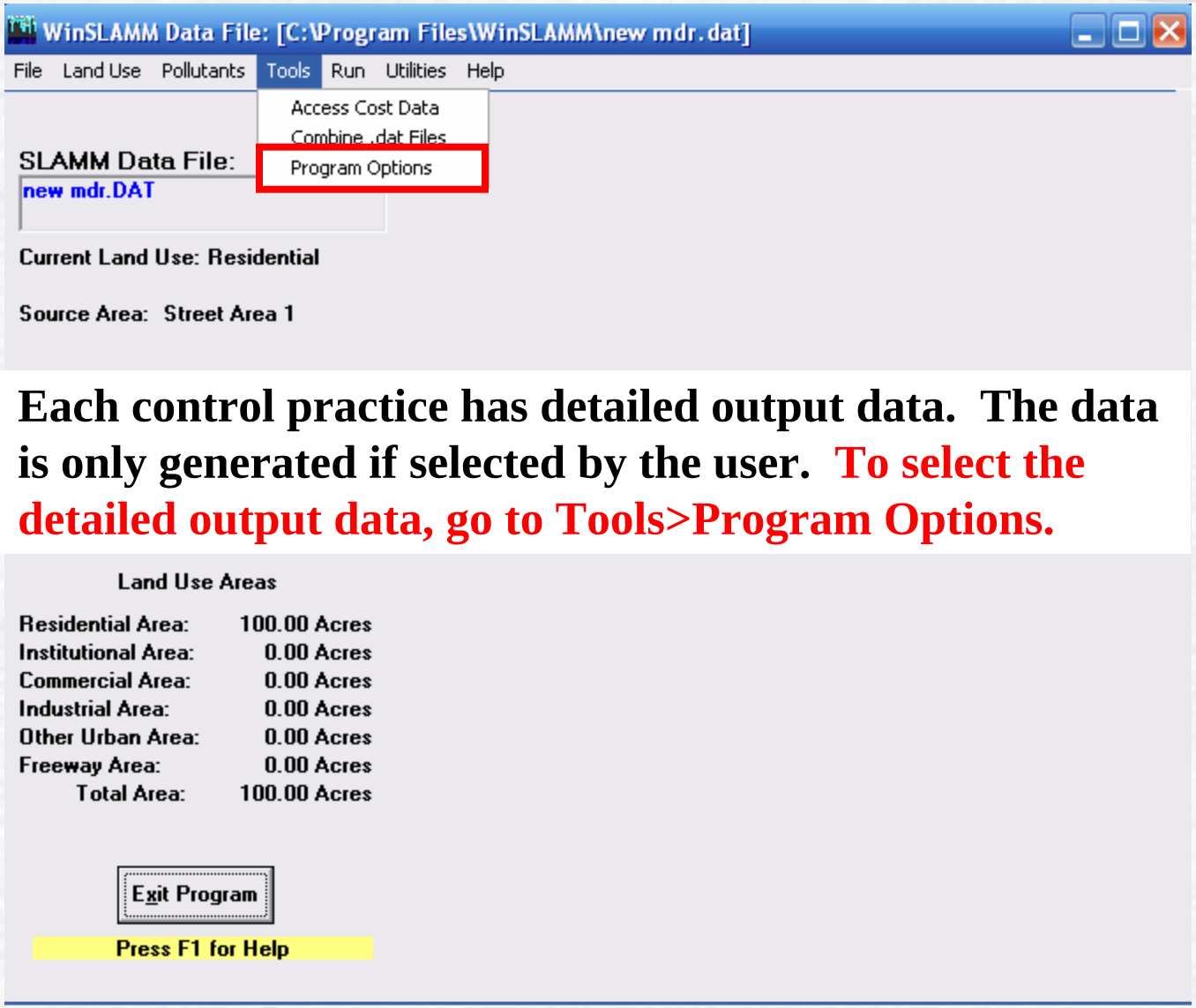
# Control Devices

**After the Basic Parameter Files and Source Area data is entered, Control Devices can be added to analyze affect their effect on pollution generation.**

**There are two ‘classes’ of control devices –**

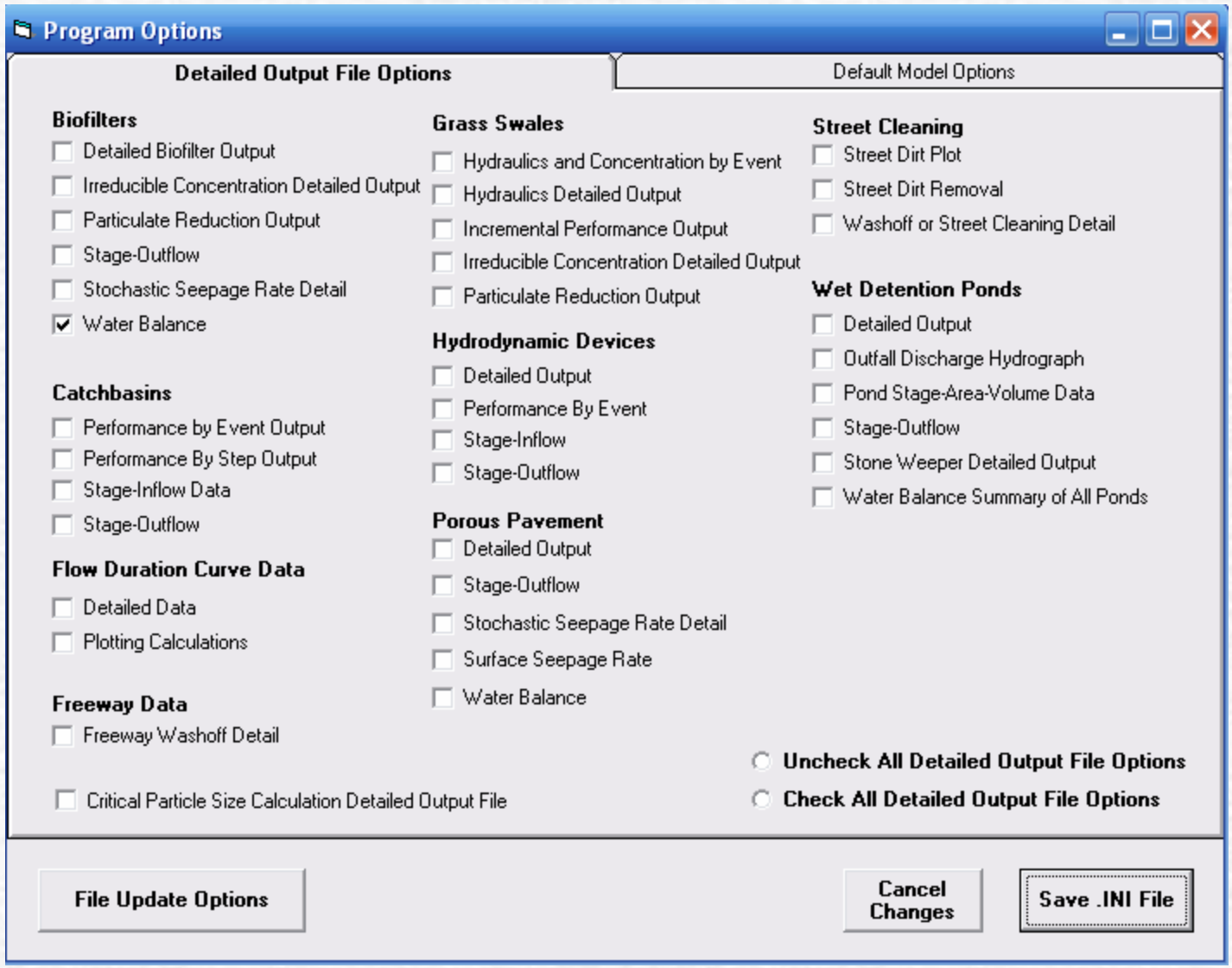
1. **Source Area Specific Control Devices (Source Area(s))**
2. **System Control Devices (Land Use(s), Drainage System, or Outfall)**

# Detailed Output Options



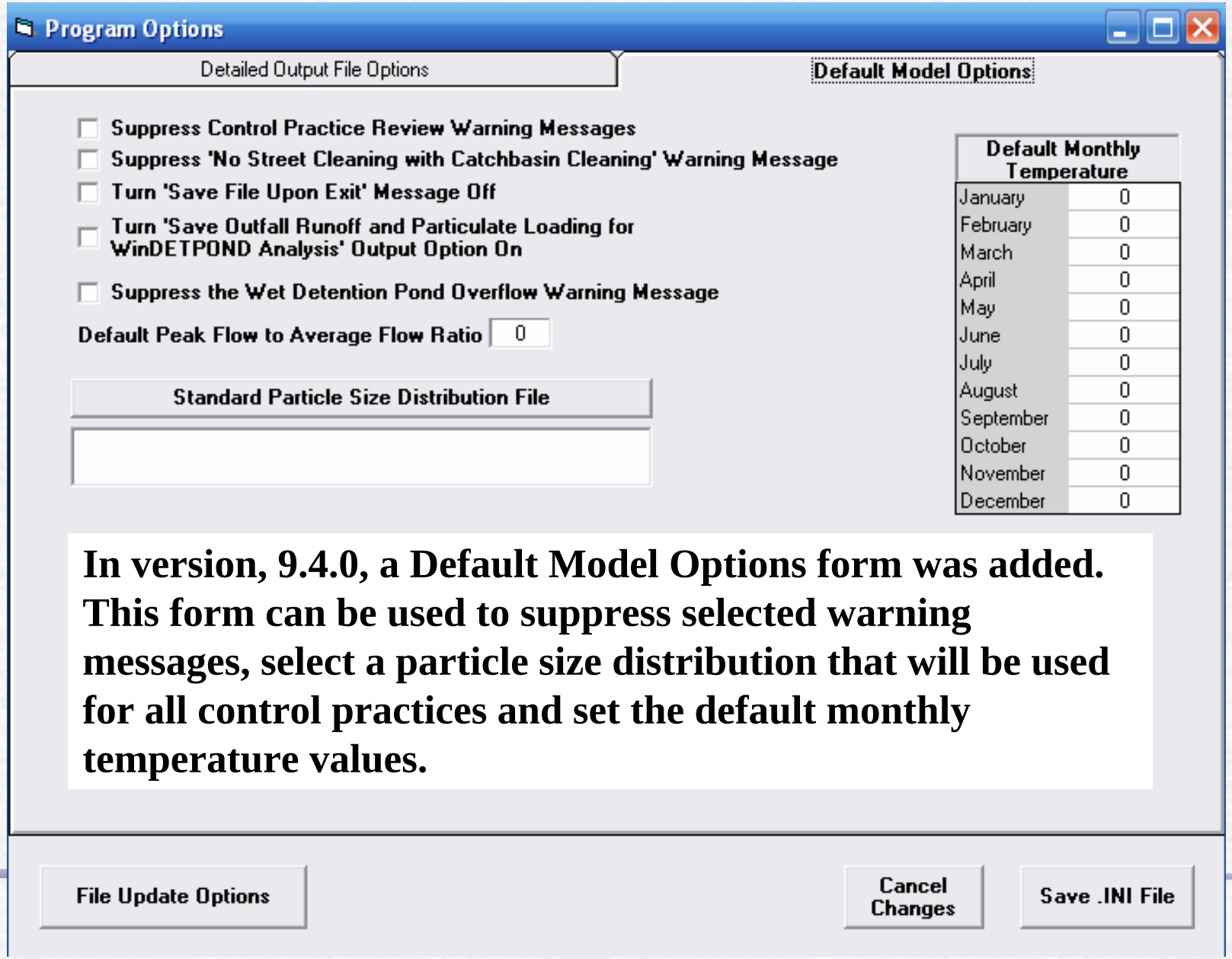

**Each control practice has detailed output data. The data is only generated if selected by the user. To select the detailed output data, go to Tools>Program Options.**

# Detailed Output Options




**Based on the control device being modeled, select the desired output by checking the box next to the file name. Then select 'Save .INI File'. A Comma-Separated Value file (*.csv file) will be created in the file the *.dat file is saved in after the file is run.**

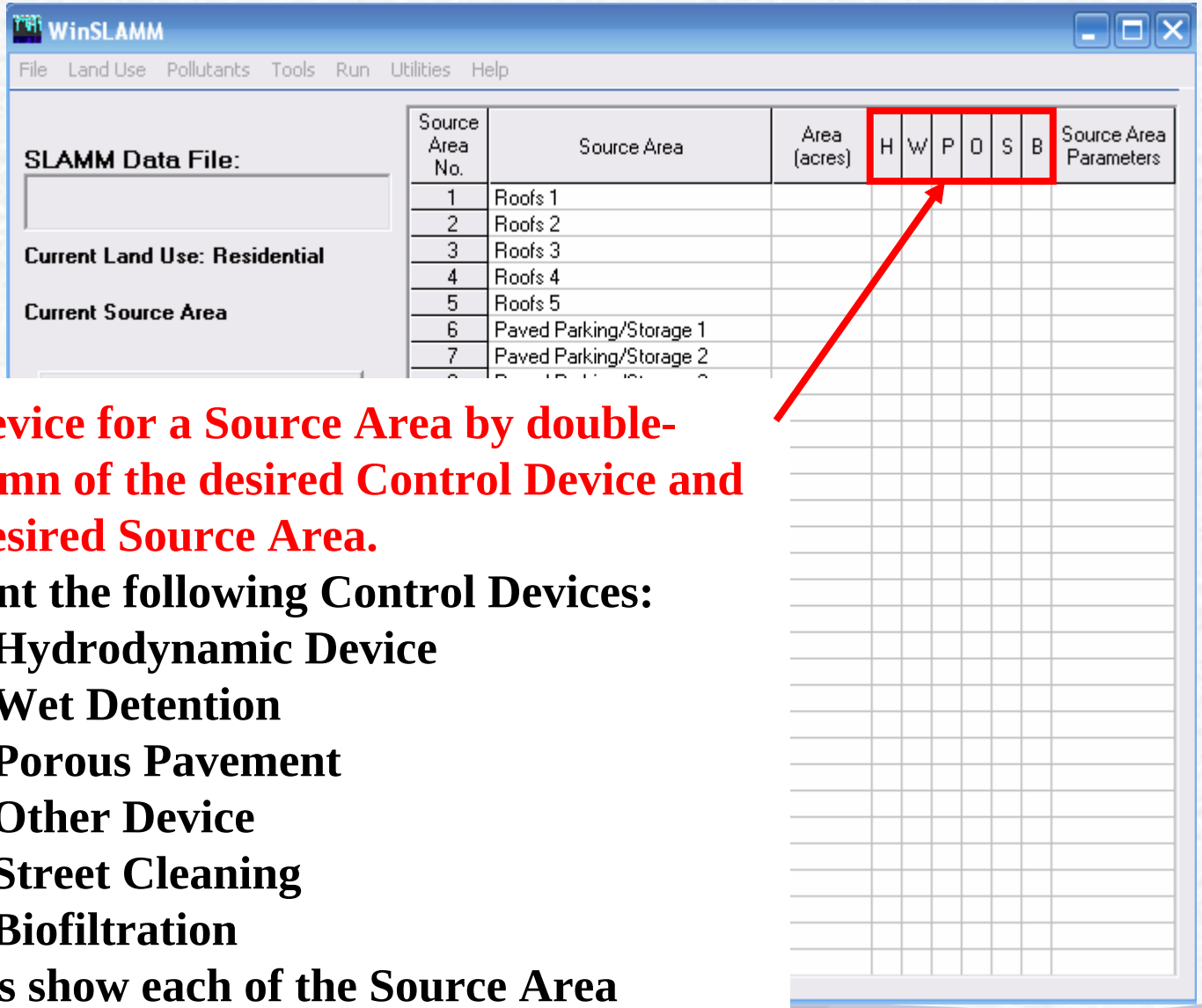
# Default Model Options




**In version, 9.4.0, a Default Model Options form was added. This form can be used to suppress selected warning messages, select a particle size distribution that will be used for all control practices and set the default monthly temperature values.**

# Control Devices – Source Area Specific

# Source Area Specific Control Device




**Select a Control Device for a Source Area by double-clicking in the column of the desired Control Device and in the row of the desired Source Area.**

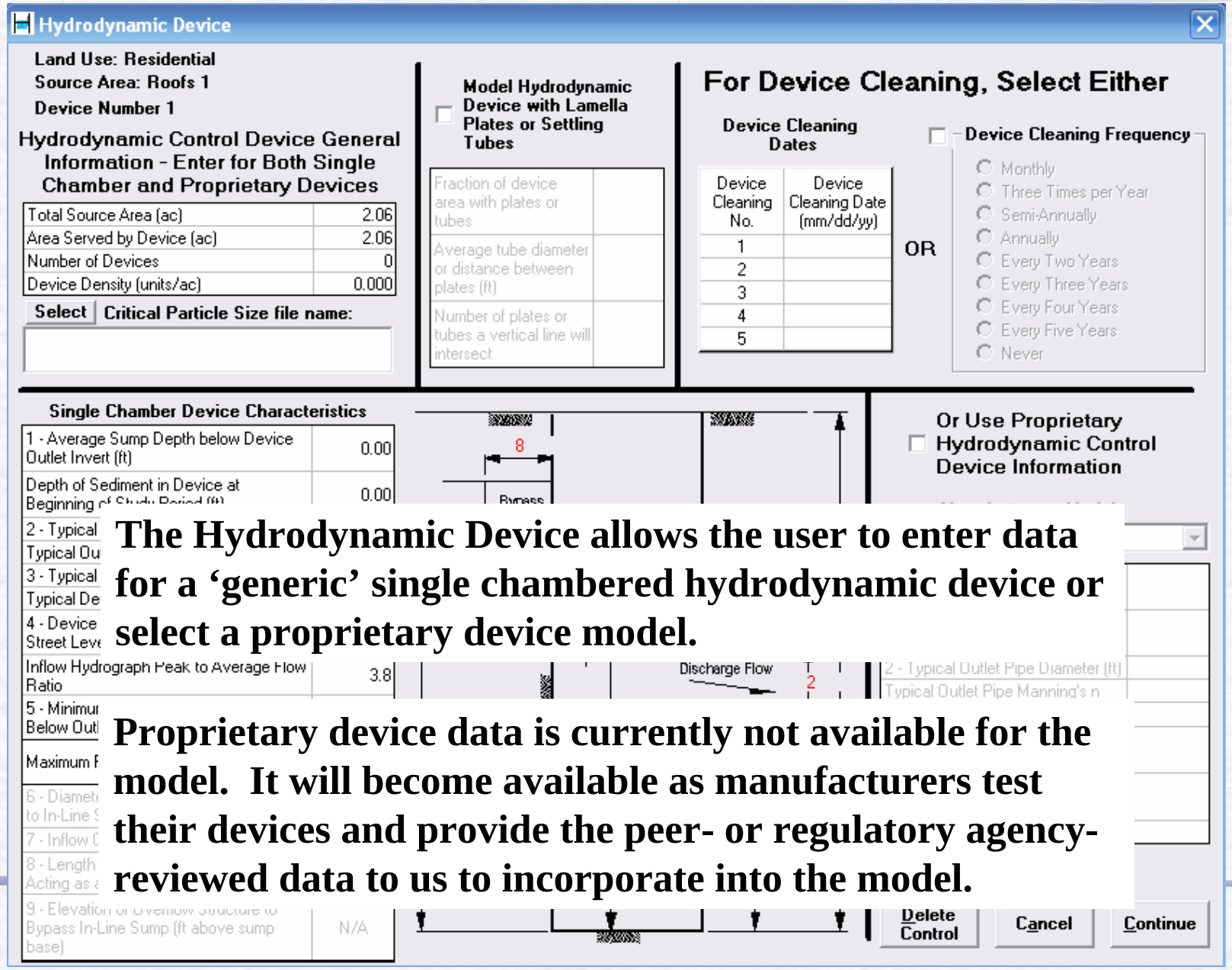
**The letters represent the following Control Devices:**

- **H – Hydrodynamic Device**
- **W – Wet Detention**
- **P – Porous Pavement**
- **O – Other Device**
- **S – Street Cleaning**
- **B – Biofiltration**

**The following slides show each of the Source Area Specific Control Devices**

# Control Devices – Hydrodynamic Device

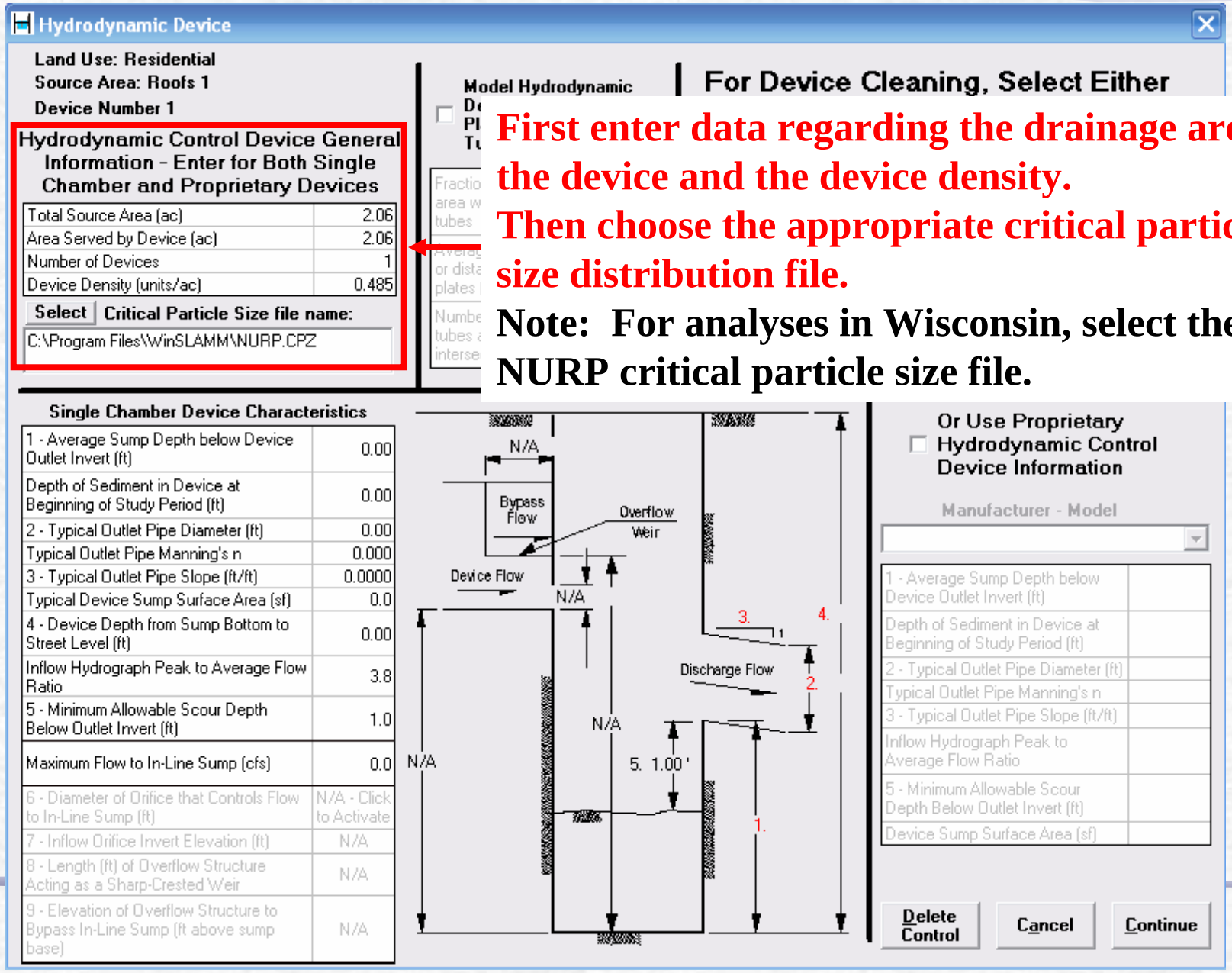
# Hydrodynamic Device



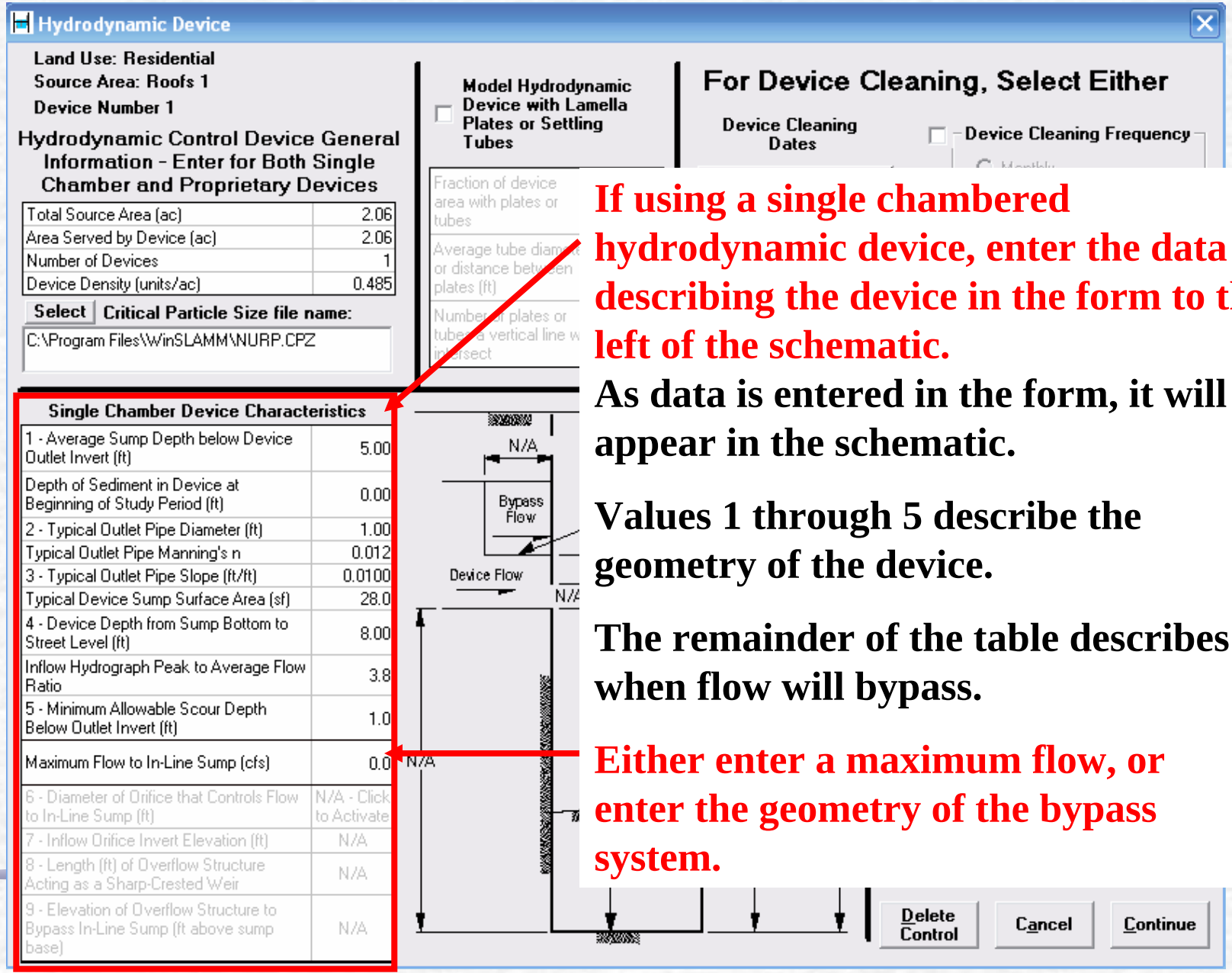

**The Hydrodynamic Device allows the user to enter data for a 'generic' single chambered hydrodynamic device or select a proprietary device model.**

**Proprietary device data is currently not available for the model. It will become available as manufacturers test their devices and provide the peer- or regulatory agency-reviewed data to us to incorporate into the model.**

# Hydrodynamic Device



# Hydrodynamic Device




**If using a single chambered hydrodynamic device, enter the data describing the device in the form to the left of the schematic.**

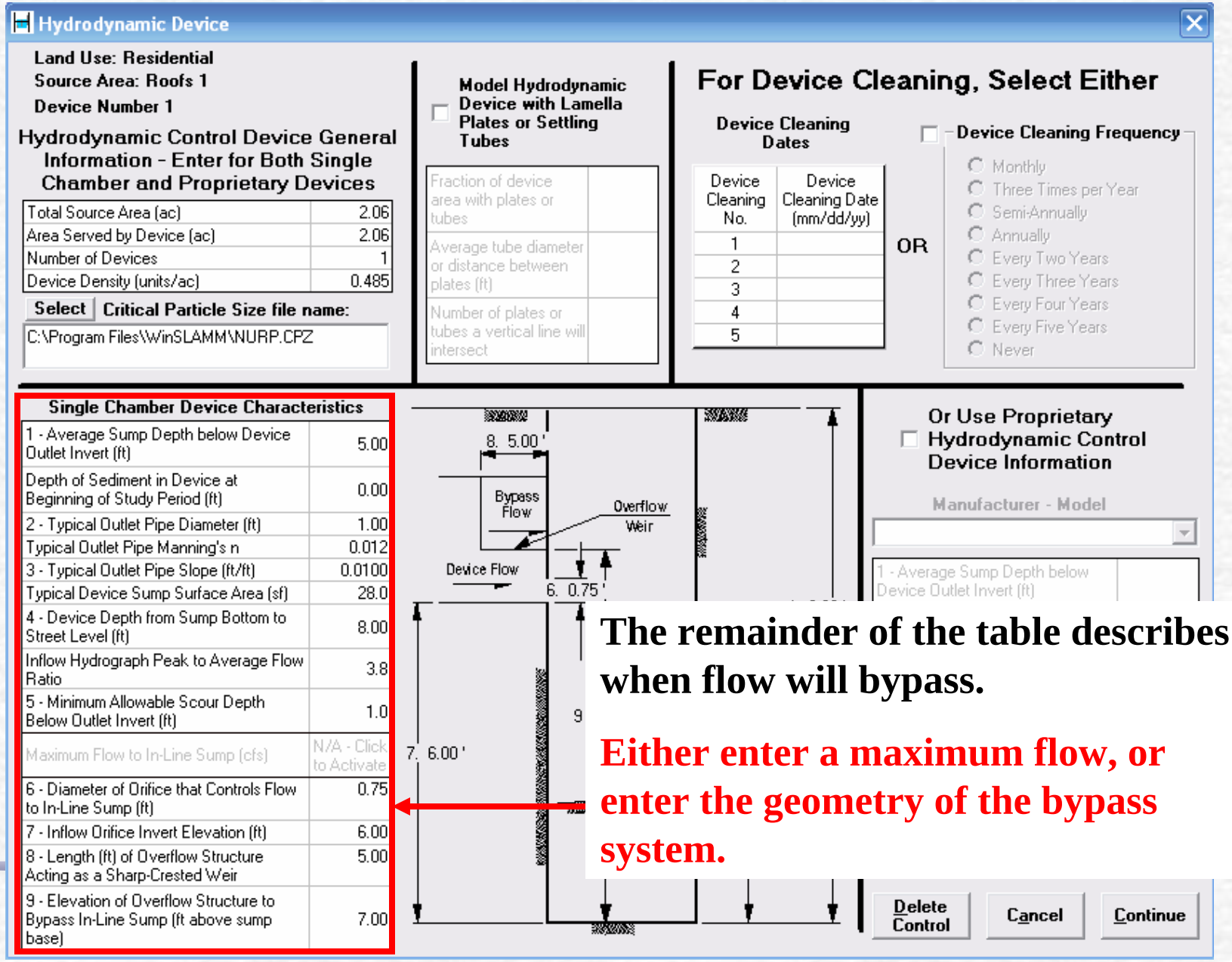
**As data is entered in the form, it will appear in the schematic.**

**Values 1 through 5 describe the geometry of the device.**

**The remainder of the table describes when flow will bypass.**

**Either enter a maximum flow, or enter the geometry of the bypass system.**

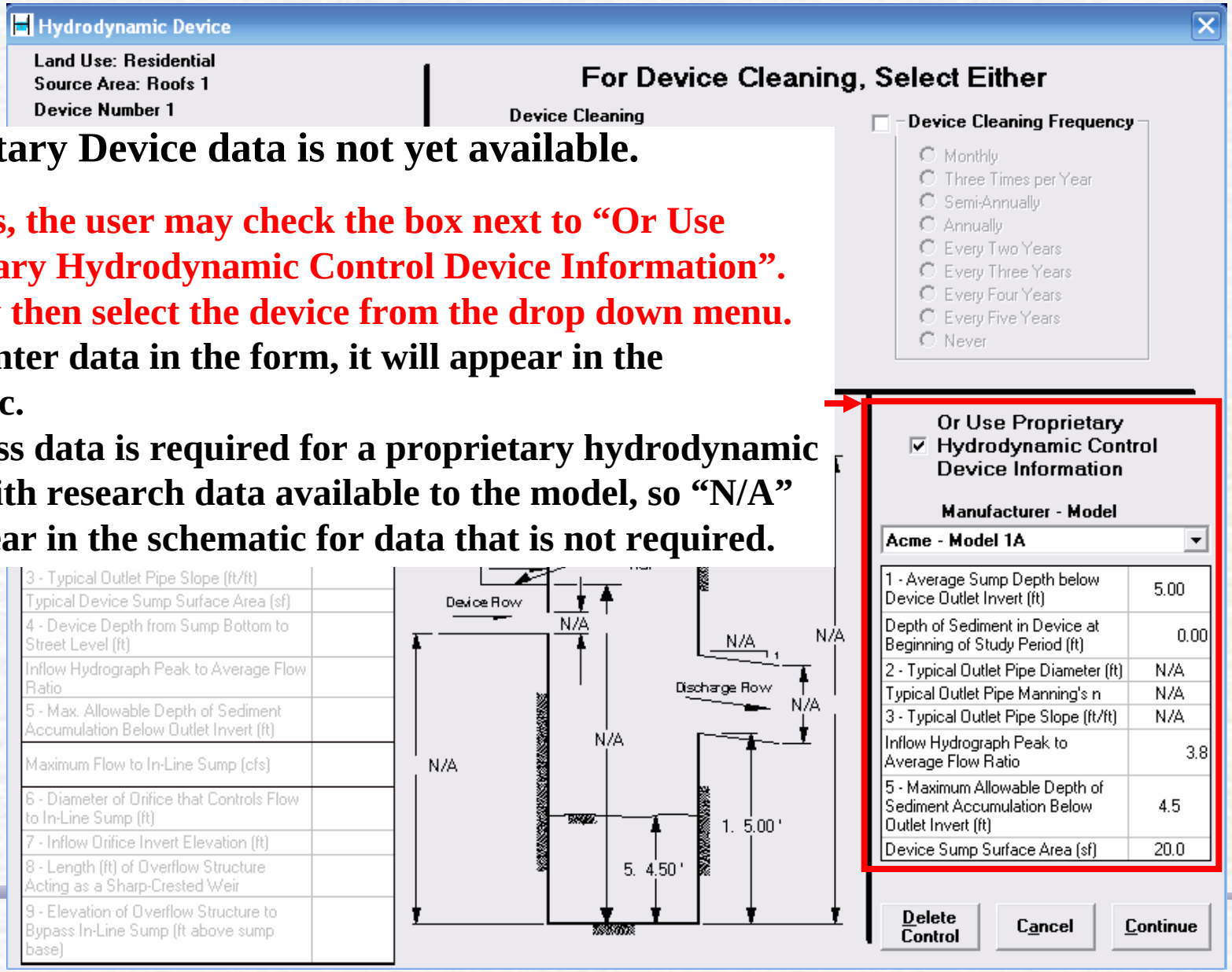
# Hydrodynamic Device




**The remainder of the table describes when flow will bypass.**

**Either enter a maximum flow, or enter the geometry of the bypass system.**

# Hydrodynamic Device



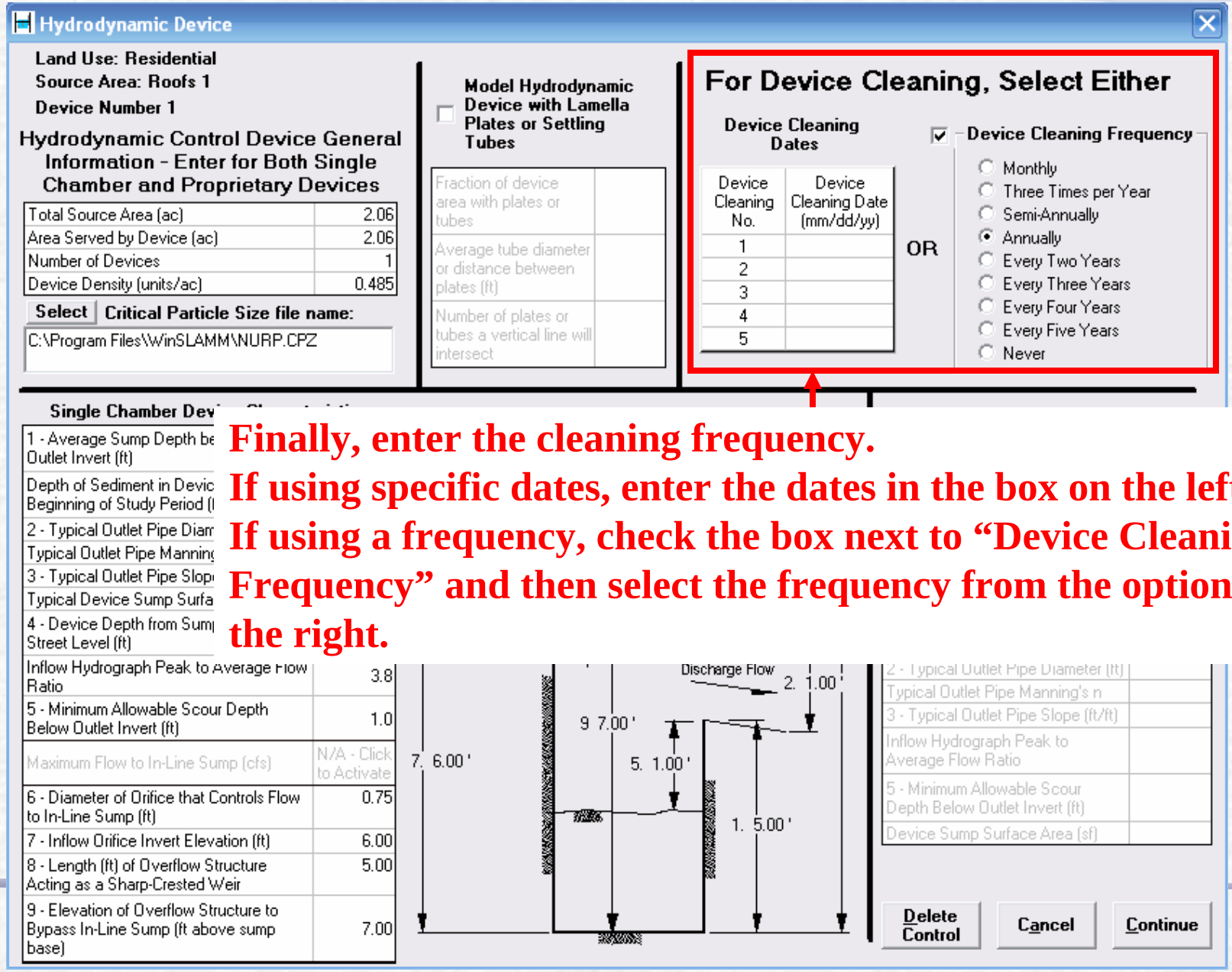

**Proprietary Device data is not yet available.**

**Once it is, the user may check the box next to "Or Use Proprietary Hydrodynamic Control Device Information". You may then select the device from the drop down menu.**

**As you enter data in the form, it will appear in the schematic.**

**Note: Less data is required for a proprietary hydrodynamic device with research data available to the model, so "N/A" will appear in the schematic for data that is not required.**

# Hydrodynamic Device




**Finally, enter the cleaning frequency.**
**If using specific dates, enter the dates in the box on the left.**
**If using a frequency, check the box next to "Device Cleaning Frequency" and then select the frequency from the options on the right.**

# New Hydrodynamic Device New

Hydrodynamic Device

Land Use: Residential
Source Area: Roofs 1
Device Number 1

**Hydrodynamic Control Device General Information - Enter for Both Single Chamber and Proprietary Devices**

| | |
|---|---|
| Total Source Area (ac) | 2.06 |
| Area Served by Device (ac) | 2.06 |
| Number of Devices | 1 |
| Device Density (units/ac) | 0.500 |

Select Critical Particle Size file name:
C:\Program Files\WinSLAMM\NURP.CPZ

**Model Hydrodynamic Device with Lamella Plates or Settling Tubes**

| | |
|---|---|
| Fraction of device area with plates or tubes | 0.80 |
| Average tube diameter or distance between plates (ft) | 1.00 |
| Number of plates or tubes a vertical line will intersect | 3 |

**For Device Cleaning, Select Either**

Device Cleaning Dates

| Device Cleaning No. | Device Cleaning Date (mm/dd/yy) |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

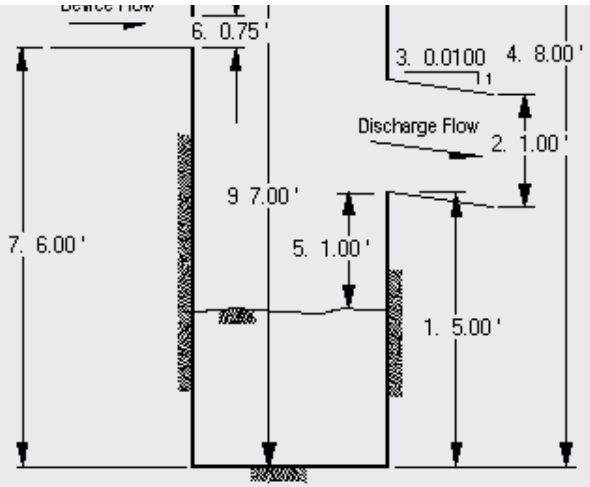
OR

Device Cleaning Frequency
- Monthly
- Three Times per Year
- Semi-Annually
- Annually
- Every Two Years
- Every Three Years
- Every Four Years
- Every Five Years
- Never

**Lamella plates can now be modeled using version 9.4.0.**
**Enter the data describing the plates.**
**A schematic is available in the Help File to illustrate each data value.**

Single Chamber Device Characteristics

| | |
|---|---|
| Typical Device Sump Surface Area (sf) | 28.0 |
| 4 - Device Depth from Sump Bottom to Street Level (ft) | 8.00 |
| Inflow Hydrograph Peak to Average Flow Ratio | 3.8 |
| 5 - Minimum Allowable Scour Depth Below Outlet Invert (ft) | 1.0 |
| Maximum Flow to In-Line Sump (cfs) | N/A - Click to Activate |
| 6 - Diameter of Orifice that Controls Flow to In-Line Sump (ft) | 0.75 |
| 7 - Inflow Orifice Invert Elevation (ft) | 6.00 |
| 8 - Length (ft) of Overflow Structure Acting as a Sharp-Crested Weir | 5.00 |
| 9 - Elevation of Overflow Structure to Bypass In-Line Sump (ft above sump base) | 7.00 |




Or Use Proprietary

| | |
|---|---|
| Device Outlet Invert (ft) | |
| Depth of Sediment in Device at Beginning of Study Period (ft) | |
| 2 - Typical Outlet Pipe Diameter (ft) | |
| Typical Outlet Pipe Manning's n | |
| 3 - Typical Outlet Pipe Slope (ft/ft) | |
| Inflow Hydrograph Peak to Average Flow Ratio | |
| 5 - Minimum Allowable Scour Depth Below Outlet Invert (ft) | |
| Device Sump Surface Area (sf) | |

Delete Control | Cancel | Continue

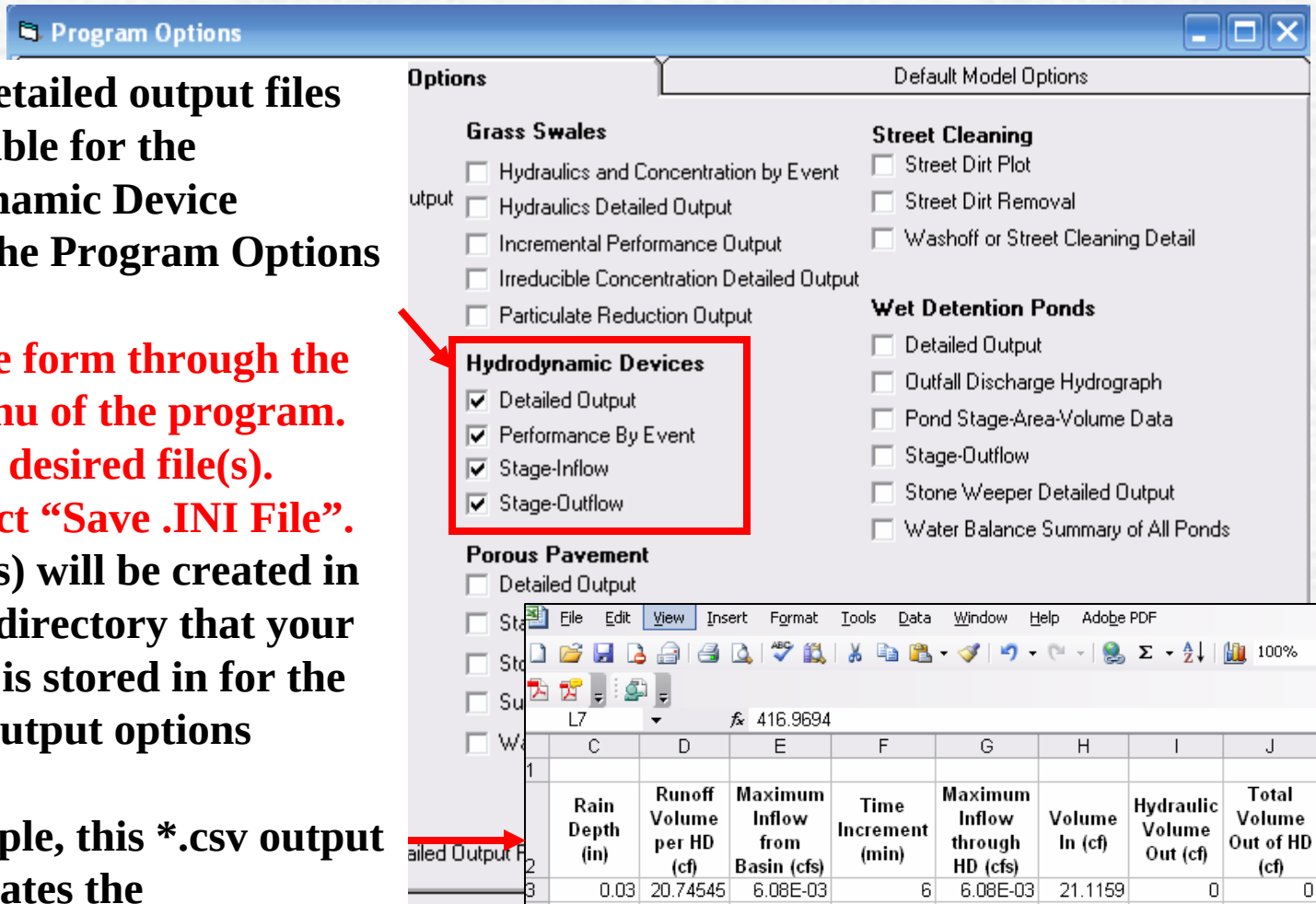
# Hydrodynamic Device

**Several detailed output files are available for the Hydrodynamic Device through the Program Options form.**

**Access the form through the Main Menu of the program. Select the desired file(s). Then select "Save .INI File".**

***.csv file(s) will be created in the same directory that your .DAT file is stored in for the detailed output options selected.**

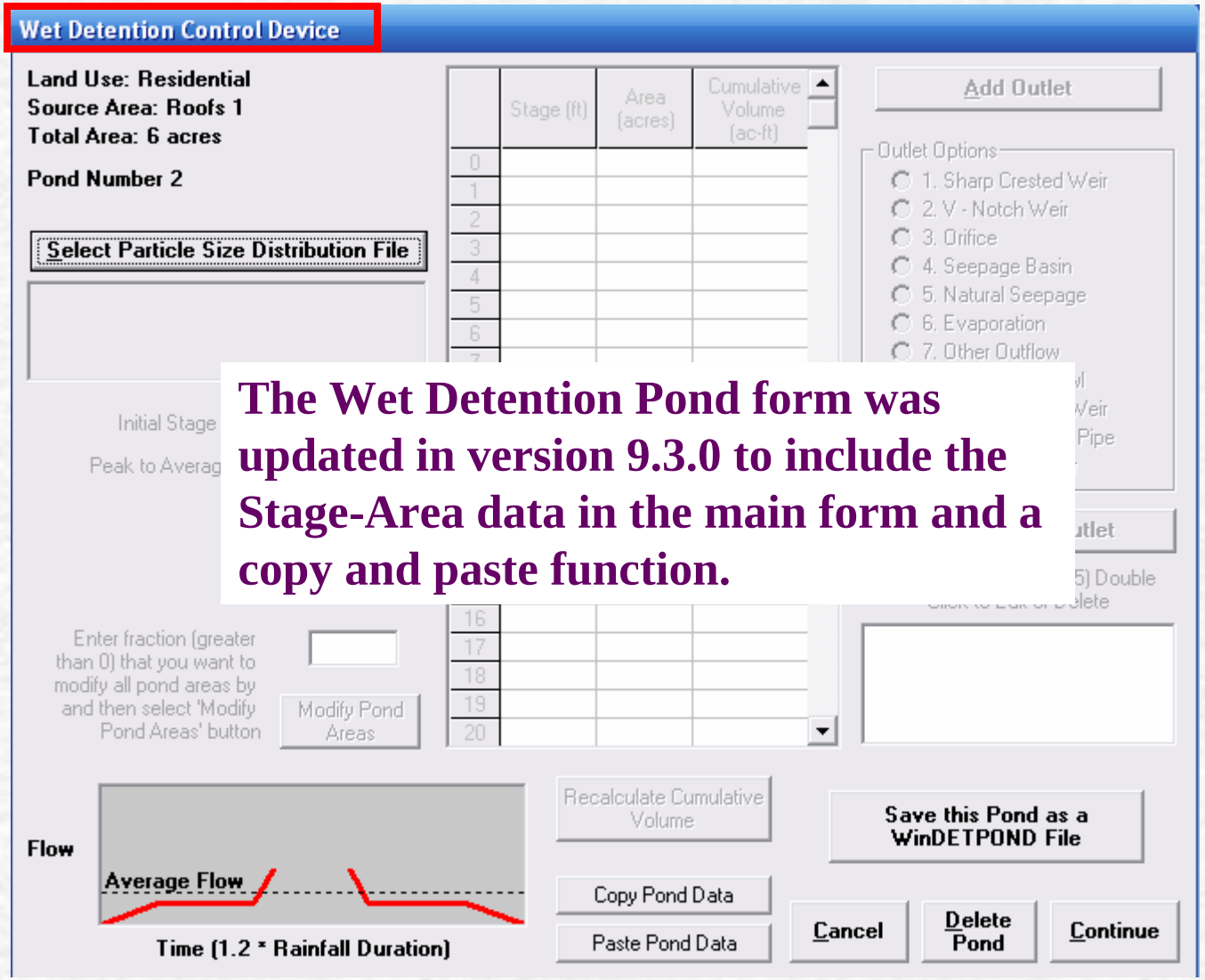
**For example, this *.csv output file illustrates the Hydrodynamic Device Performance By Event. The file was opened in Microsoft Excel.**




| | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | |
| 2 | Rain Depth (in) | Runoff Volume per HD (cf) | Maximum Inflow from Basin (cfs) | Time Increment (min) | Maximum Inflow through HD (cfs) | Volume In (cf) | Hydraulic Volume Out (cf) | Total Volume Out of HD (cf) | Bypass Volume (cf) | Cumulative Volume Out of HD (cf) |
| 3 | 0.03 | 20.74545 | 6.08E-03 | 6 | 6.08E-03 | 21.1159 | 0 | 0 | 0 | 21.1159 |
| 4 | 0.06 | 97.81833 | 1.07E-02 | 15 | 1.07E-02 | 96.38525 | 0 | 0 | 0 | 117.5011 |
| 5 | 0.01 | 2.30505 | 2.03E-03 | 2 | 2.03E-03 | 2.346212 | 0 | 0 | 0 | 119.8474 |
| 6 | 0.01 | 2.30505 | 2.03E-03 | 2 | 2.03E-03 | 2.346212 | 0 | 0 | 0 | 122.1936 |
| 7 | 0.11 | 289.6043 | 4.25E-02 | 12 | 4.25E-02 | 294.7758 | 0 | 0 | 0 | 416.9694 |
| 8 | 0.05 | 63.9969 | 9.38E-03 | 12 | 9.38E-03 | 65.1397 | 0 | 0 | 0 | 482.1091 |
| 9 | 0.06 | 97.81833 | 1.72E-02 | 10 | 1.72E-02 | 99.56506 | 0 | 0 | 0 | 581.6741 |
| 10 | 0.01 | 2.30505 | 2.03E-03 | 2 | 2.03E-03 | 2.346212 | 0 | 0 | 0 | 584.0203 |
| 11 | 0.01 | 2.30505 | 2.03E-03 | 2 | 2.03E-03 | 2.346212 | 0 | 0 | 0 | 586.3665 |
| 12 | 0.38 | 1275.161 | 5.61E-02 | 15 | 5.61E-02 | 1287.116 | 0 | 0 | 0 | 1873.483 |
| 13 | 1.58 | 5621.45 | 0.2602523 | 15 | 0.2602523 | 5613.082 | 0 | 0 | 0 | 7486.564 |

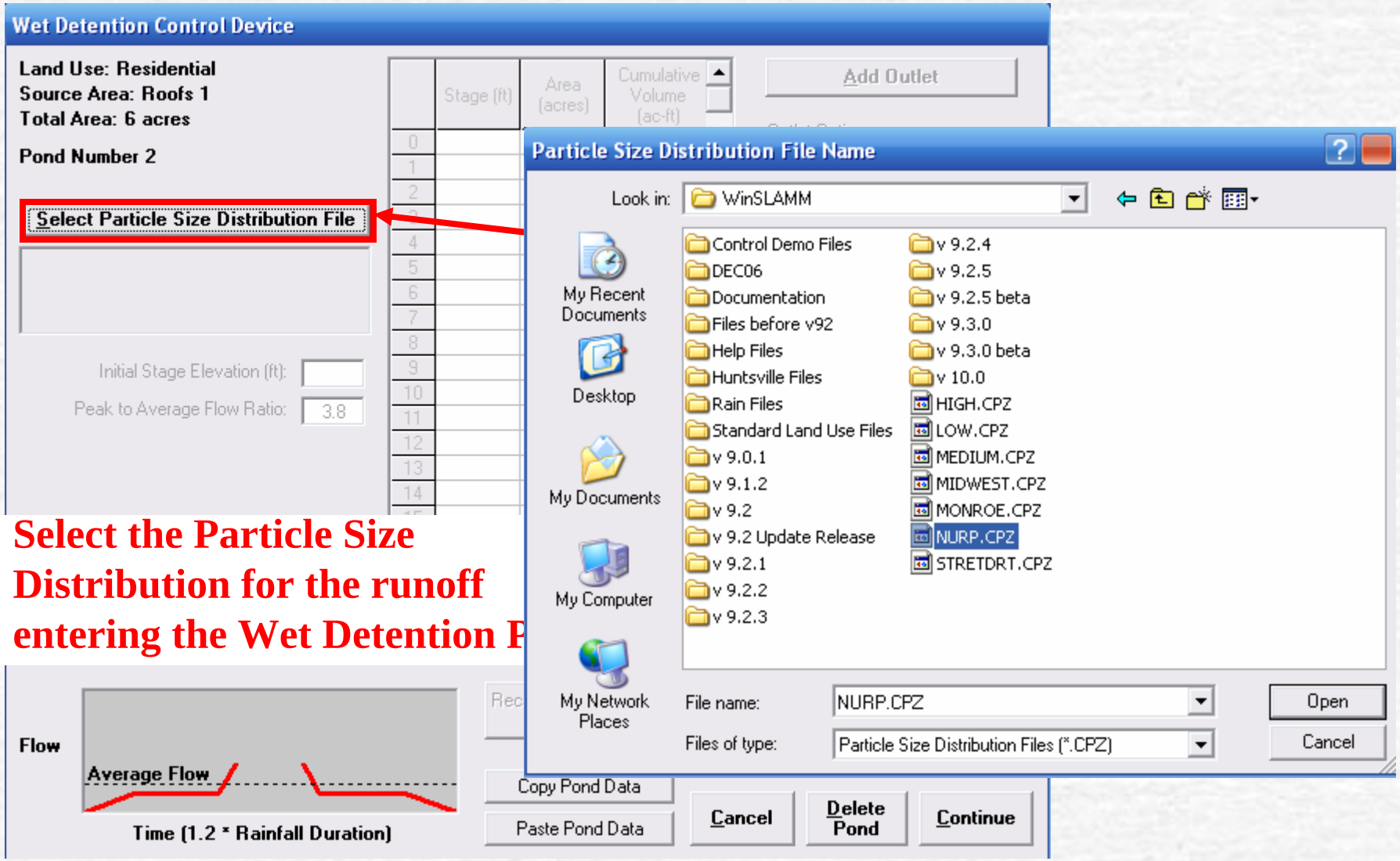
# Control Devices – Wet Detention

# Wet Detention Control Device



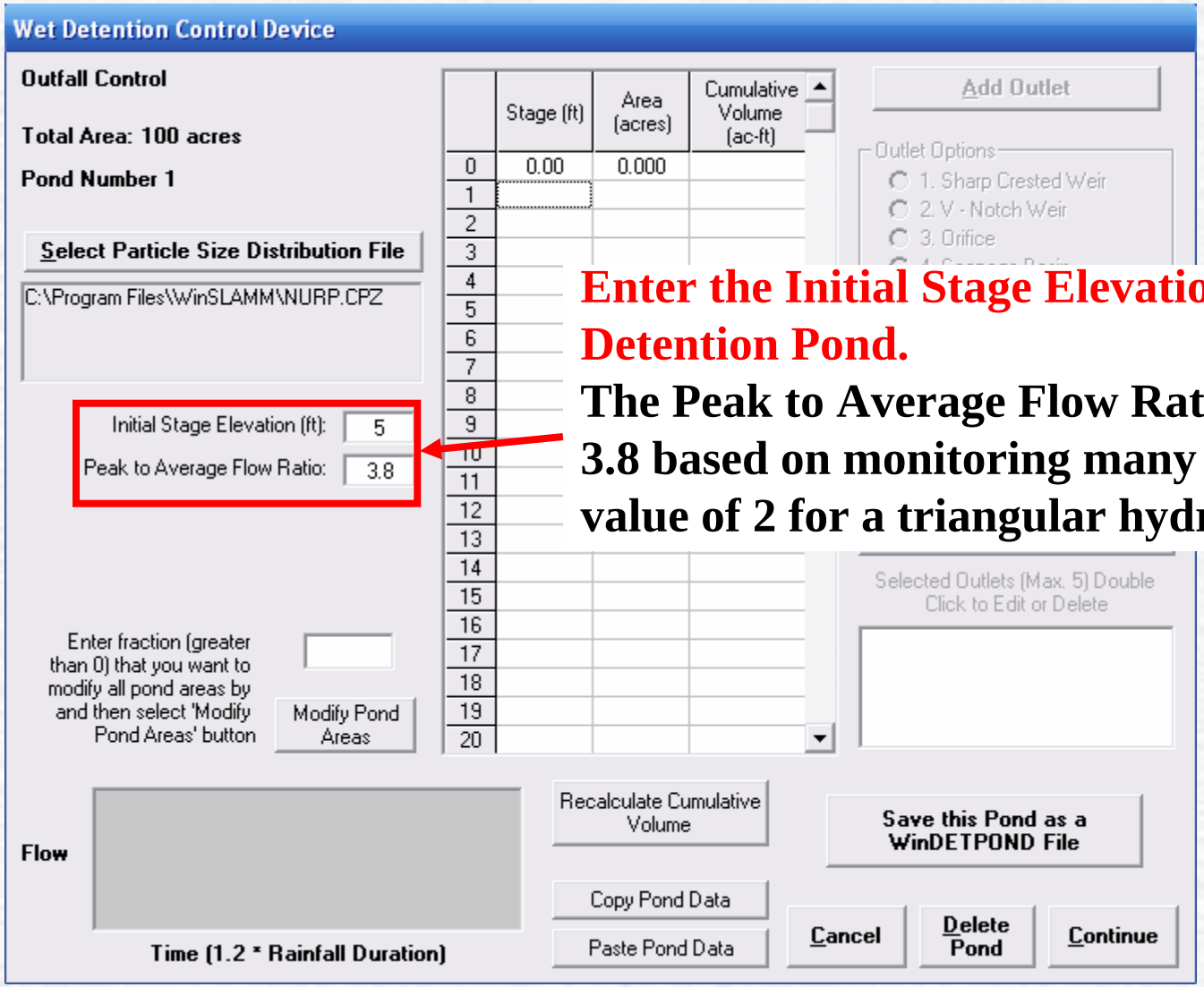

**The Wet Detention Pond form was updated in version 9.3.0 to include the Stage-Area data in the main form and a copy and paste function.**

# Wet Detention Control Device




**Select the Particle Size Distribution for the runoff entering the Wet Detention P**

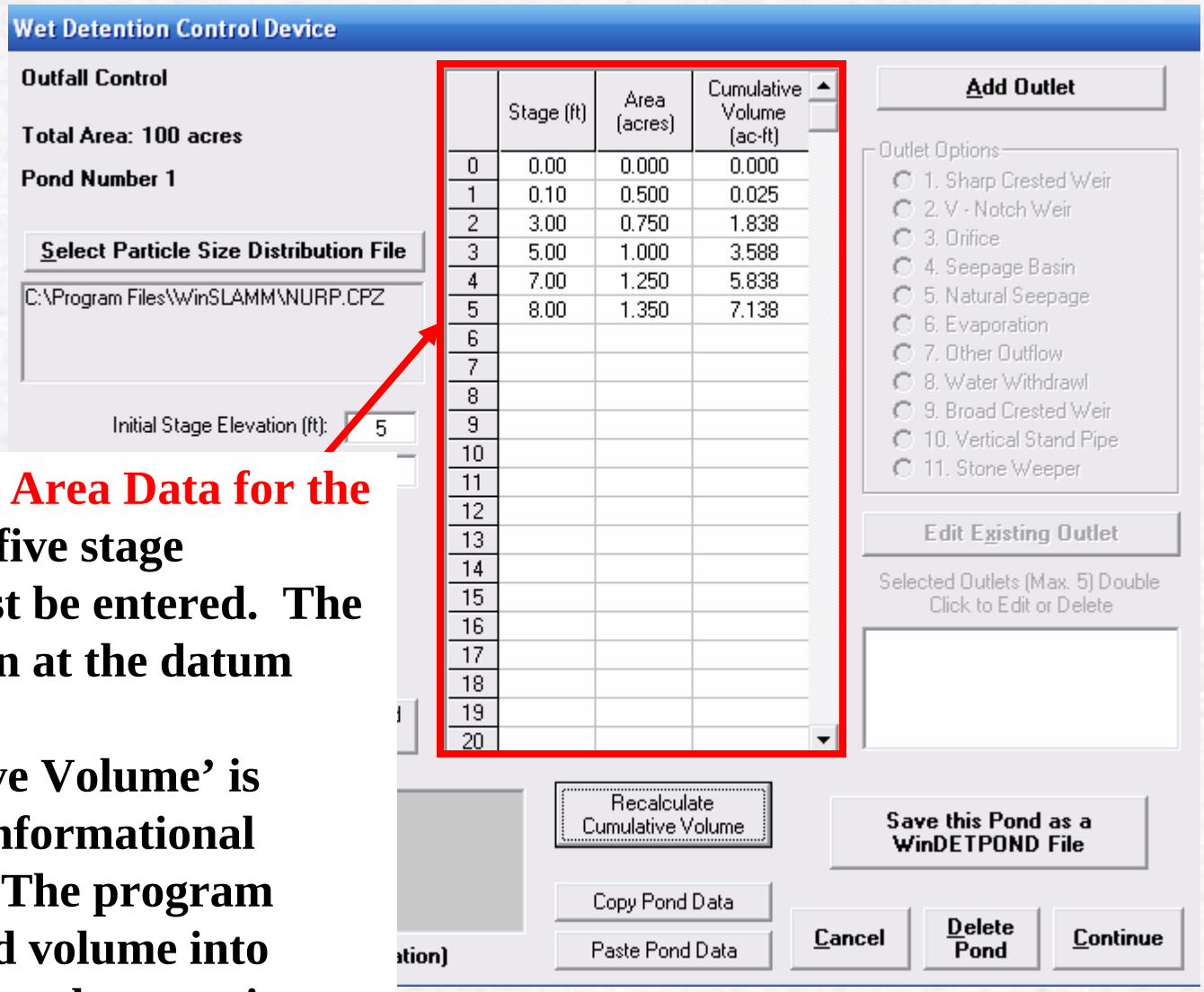
# Wet Detention Control Device




**Enter the Initial Stage Elevation of the Wet Detention Pond.**

**The Peak to Average Flow Ratio default value is 3.8 based on monitoring many urban areas. Use a value of 2 for a triangular hydrograph.**

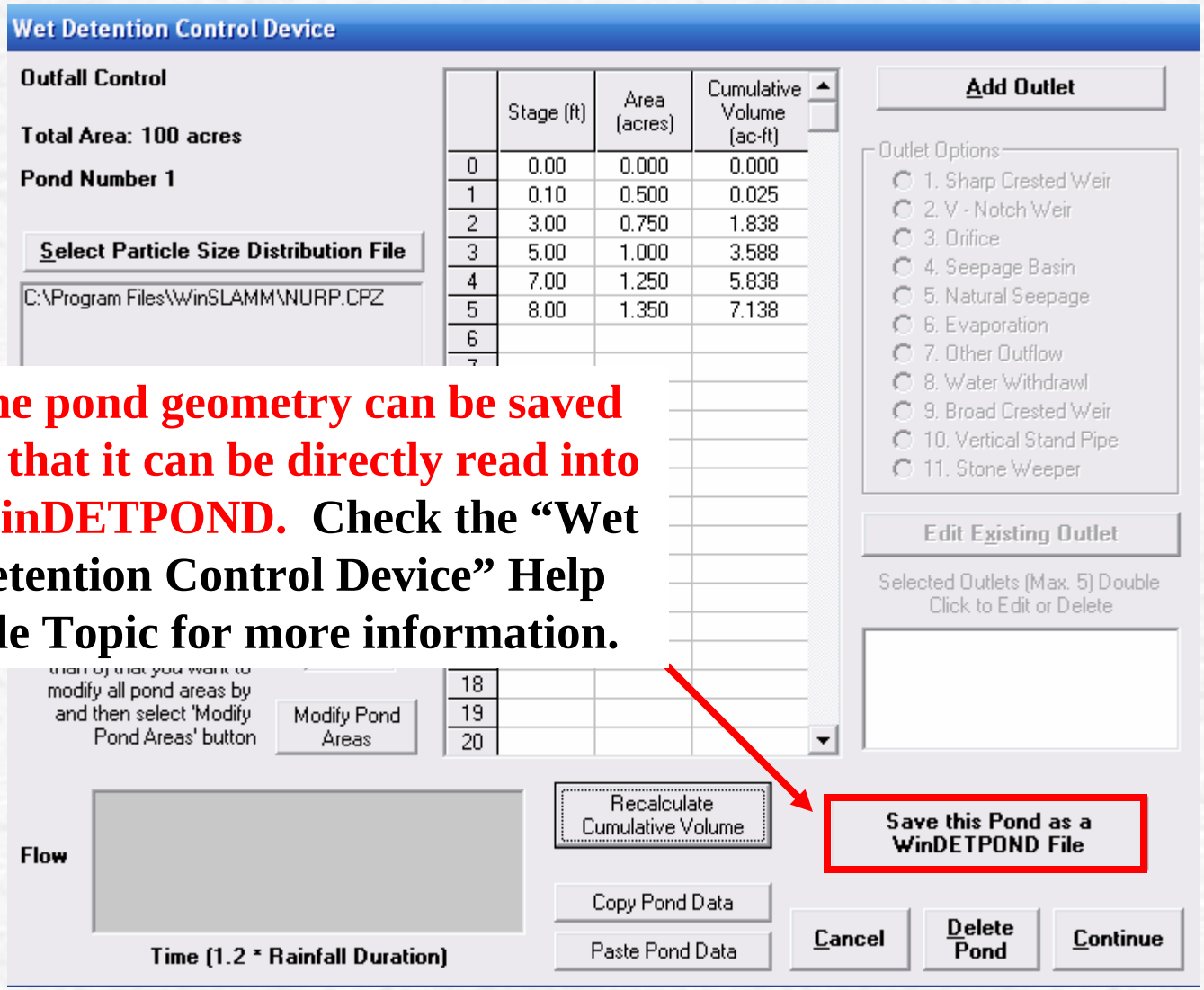
# Wet Detention Control Device




**Enter the Stage Area Data for the basin.** **At least five stage increments must be entered. The area of the basin at the datum must be zero.**

**The 'Cumulative Volume' is calculated for informational purposes only. The program divides the pond volume into much finer slices when routing runoff through the pond.**

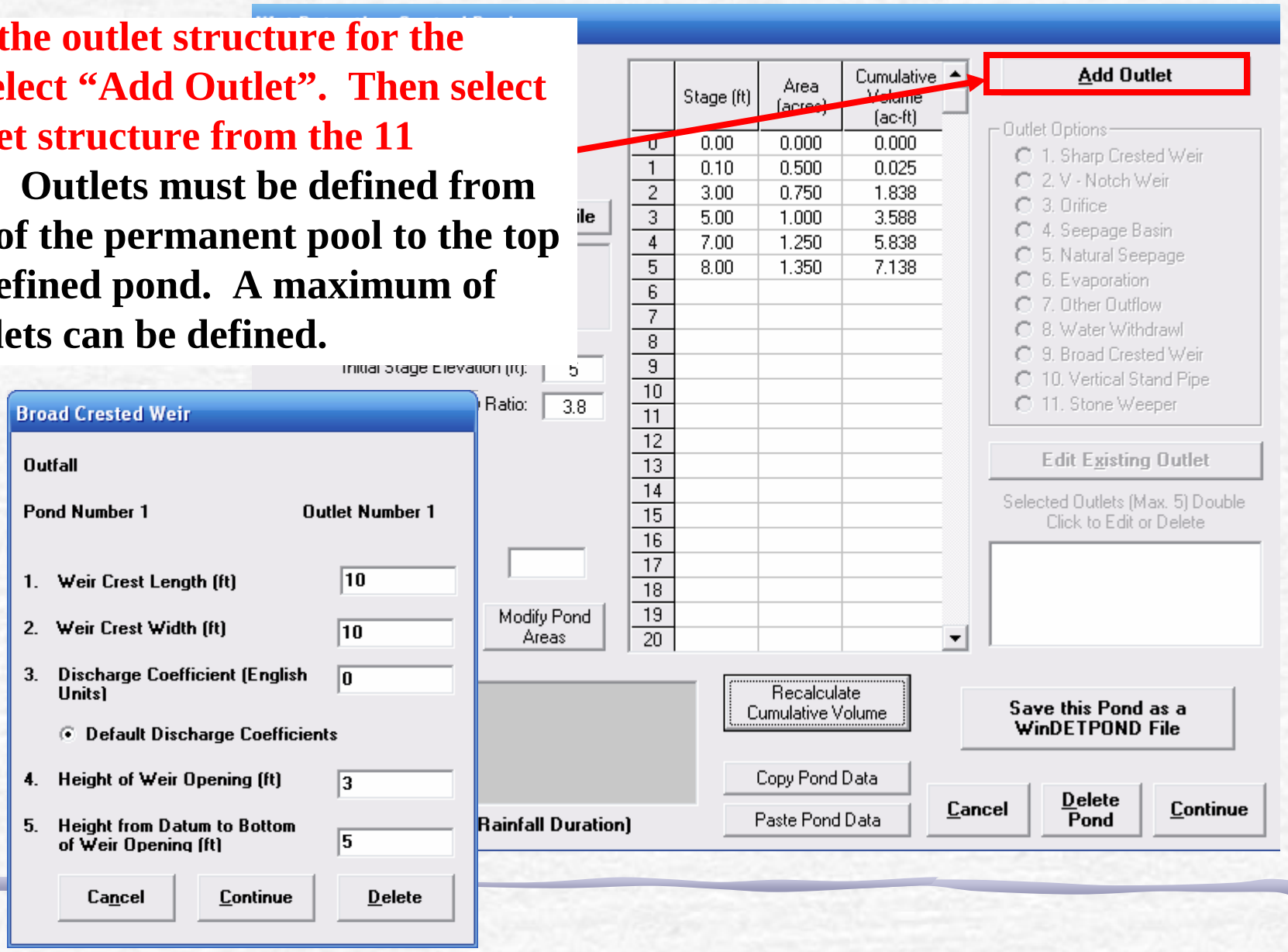
# Wet Detention Control Device



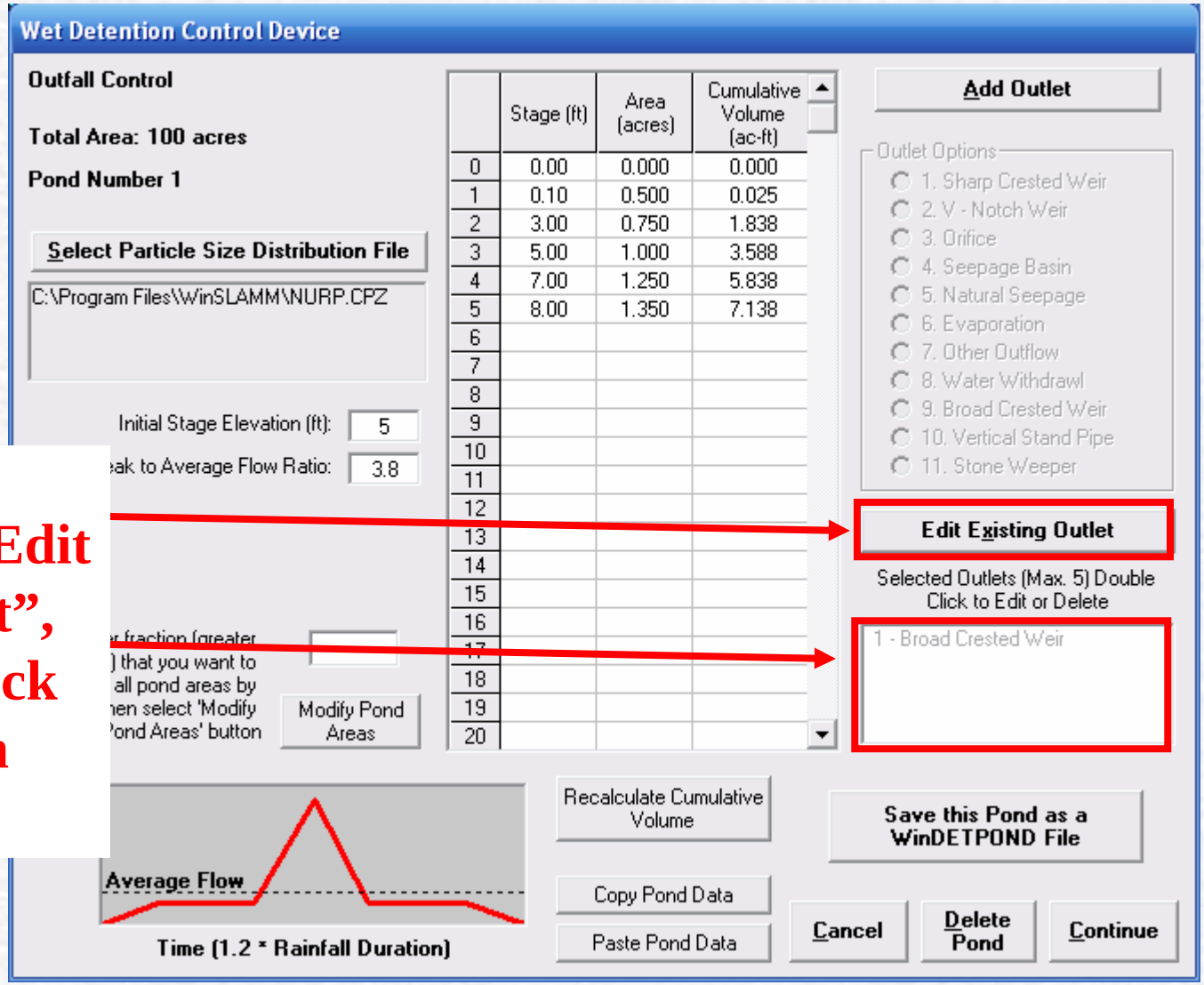

**The pond geometry can be saved so that it can be directly read into WinDETPOND. Check the "Wet Detention Control Device" Help File Topic for more information.**

# Wet Detention Control Device

**To add the outlet structure for the pond, select "Add Outlet". Then select the outlet structure from the 11 options. Outlets must be defined from the top of the permanent pool to the top of the defined pond. A maximum of five outlets can be defined.**

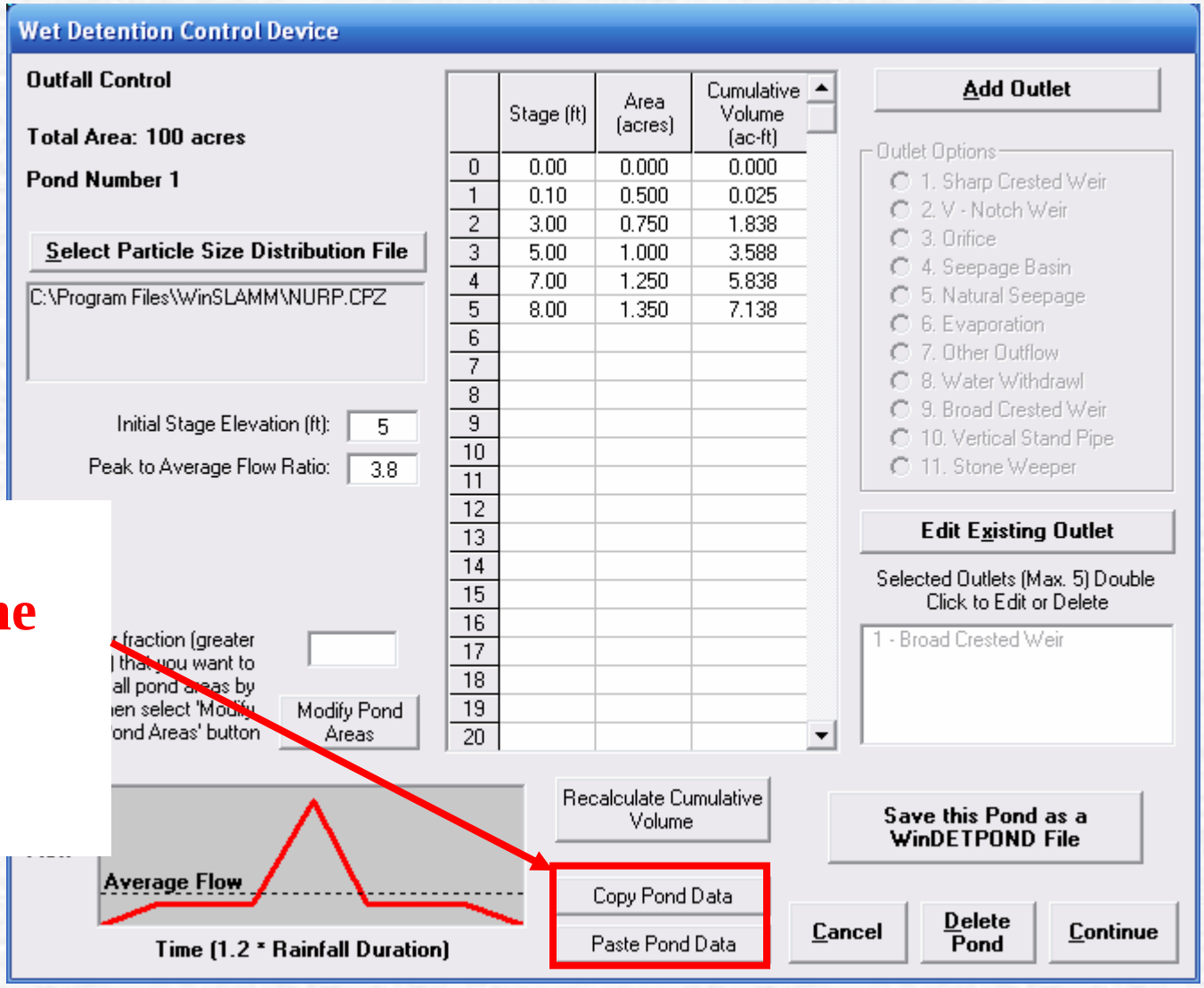


# Wet Detention Control Device




**To change an outlet, select "Edit Existing Outlet", then double click on the outlet in the box below.**

# Wet Detention Control Device




**Data can be copied from one *.dat file and pasted into another one.**

# Control Devices – Porous Pavement

# Porous Pavement Control Device

**Porous Pavement Control Device**

**Land Use: Residential**

**Source Area: Driveways 1**

**Total Area: 5.14** **Porous Pavement Number 1**

| | |
|---|---|
| **Porous pavement area (acres):** | 5.14 |
| **Inflow Hydrograph Peak to Average Flow Ratio** | 3.8 |

**Pavement Geometry and Properties**

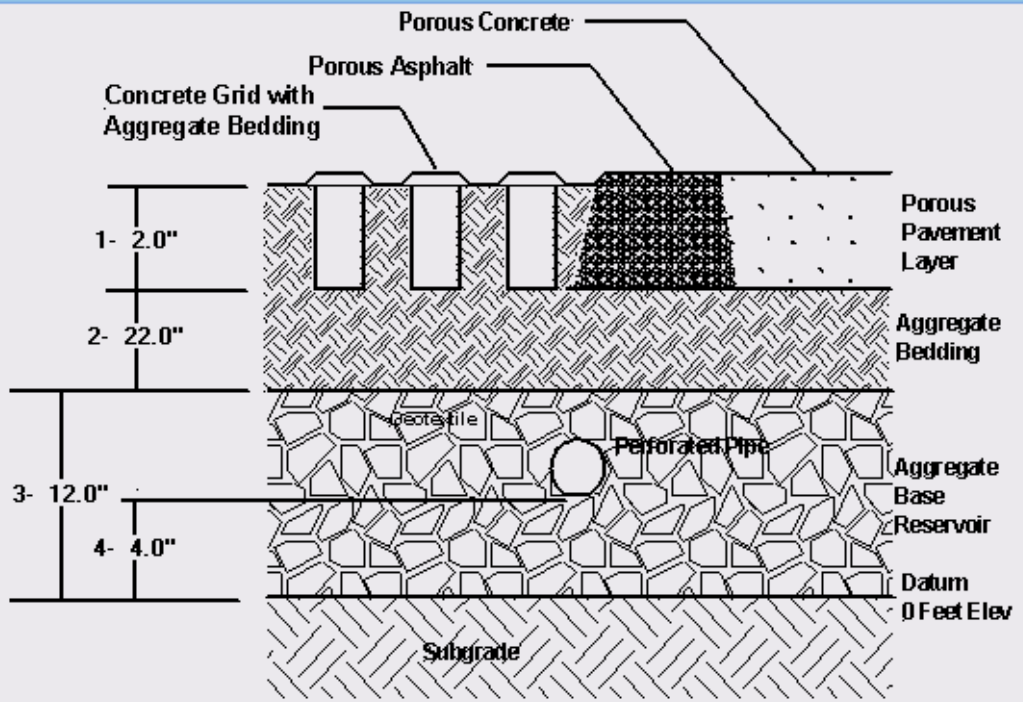
| | |
|---|---|
| 1 - Pavement Thickness (in) | 2.0 |
| Pavement Void Ratio (0-1) | 0.20 |
| 2 - Aggregate Bedding Thickness (in) | 22.0 |
| Aggregate Bedding Void Ratio (0-1) | 0.25 |
| 3 - Aggregate Base Reservoir Thickness (in) | 12.0 |
| Aggregate Base Reservoir Void Ratio (0-1) | 0.80 |

**Outlet/Discharge Options**

| | |
|---|---|
| Perforated Pipe Underdrain Diameter, if used (inches) | 8.00 |
| 4 - Perforated Pipe Underdrain Outlet Invert Elevation (inches above Datum) | 4.0 |
| Number of Perforated Pipe Underdrains | 2 |
| Subgrade Seepage Rate (in/hr) - select below or enter | 0.05 |
| Use Random Number Generation to Account for Uncertainty in Seepage Rate | ☐ |
| Subgrade Seepage Rate COV | 1.60 |

**Select Subgrade Seepage Rate**

- ○ Sand - 8 in/hr
- ○ Loamy sand - 2.5 in/hr
- ○ Sandy loam - 1.0 in/hr
- ○ Loam - 0.5 in/hr
- ○ Silt loam - 0.3 in/hr
- ○ Sandy silt loam - 0.2 in/hr
- ○ Clay loam - 0.1 in/hr
- ○ Silty clay loam - 0.05 in/hr
- ○ Sandy clay - 0.05 in/hr
- ○ Silty clay - 0.04 in/hr
- ○ Clay - 0.02 in/hr




**Surface Pavement Layer Infiltration Rate Data**

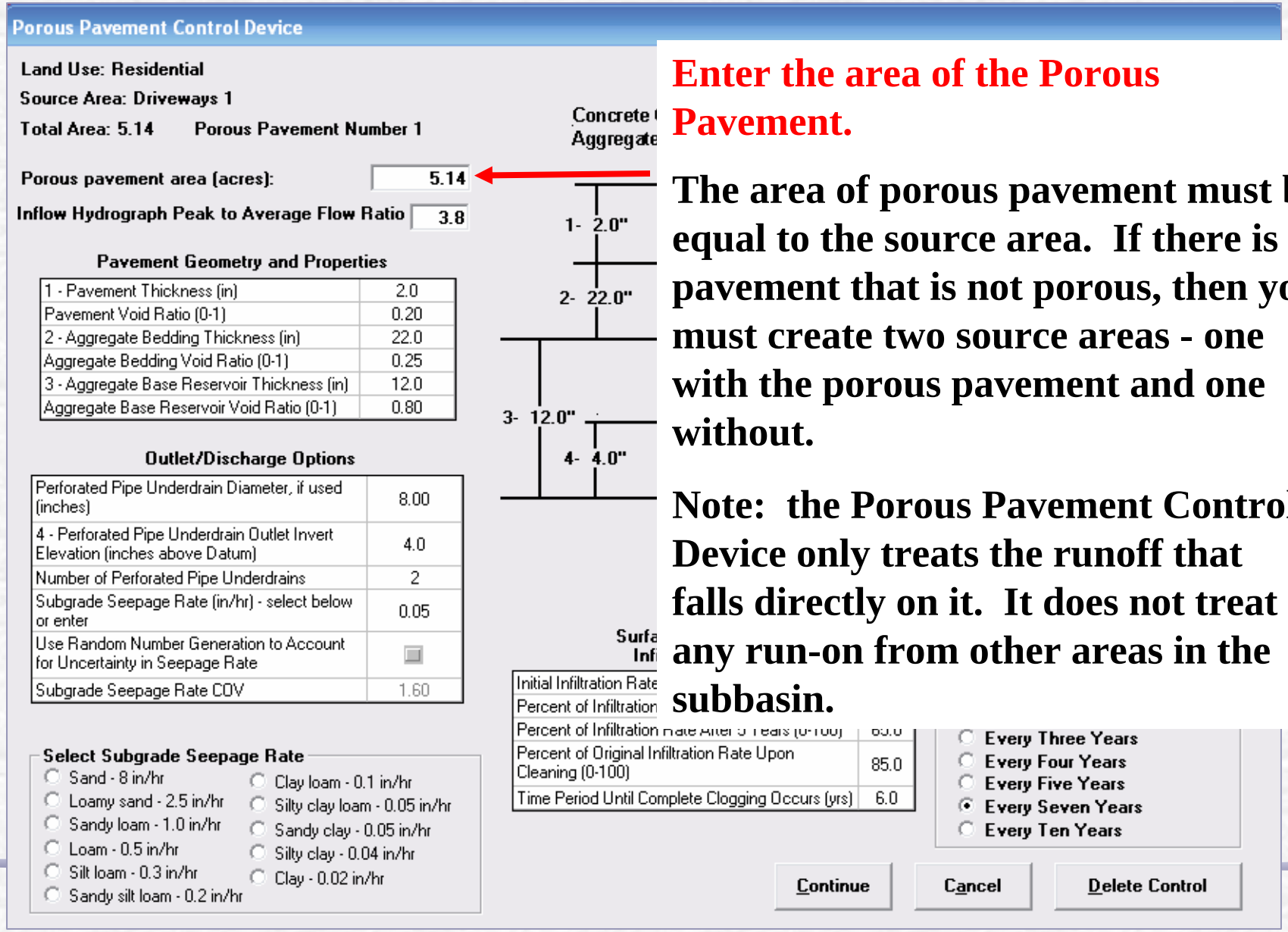
| | |
|---|---|
| Initial Infiltration Rate (in/hr) | 0.05 |
| Percent of Infiltration Rate After 3 Years (0-100) | 75.0 |
| Percent of Infiltration Rate After 5 Years (0-100) | 65.0 |
| Percent of Original Infiltration Rate Upon Cleaning (0-100) | 85.0 |
| Time Period Until Complete Clogging Occurs (yrs) | 6.0 |

**Restorative Cleaning Frequency**

- ○ Never Cleaned
- ○ Three Times per Year
- ○ Semi-Annually
- ○ Annually
- ○ Every Two Years
- ○ Every Three Years
- ○ Every Four Years
- ○ Every Five Years
- ◉ Every Seven Years
- ○ Every Ten Years

[Continue] [Cancel] [Delete Control]

# Porous Pavement Control Device




**Enter the area of the Porous Pavement.**

**The area of porous pavement must be equal to the source area. If there is pavement that is not porous, then you must create two source areas - one with the porous pavement and one without.**

**Note: the Porous Pavement Control Device only treats the runoff that falls directly on it. It does not treat any run-on from other areas in the subbasin.**

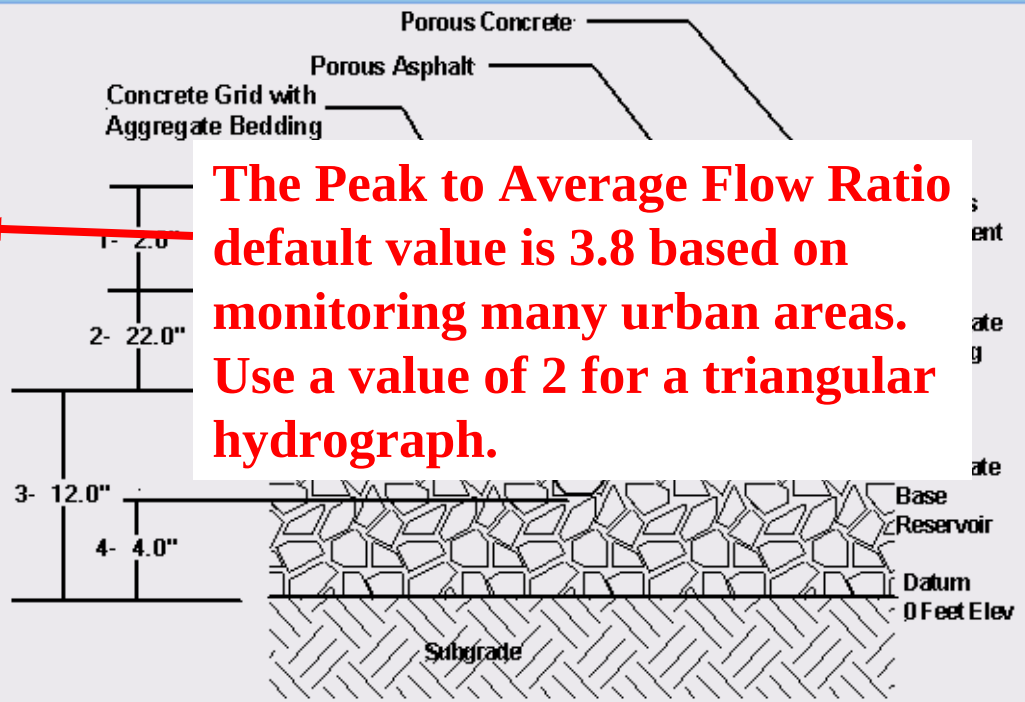
# Porous Pavement Control Device

**Porous Pavement Control Device**

Land Use: Residential
Source Area: Driveways 1
Total Area: 5.14 Porous Pavement Number 1

| | |
|---|---|
| Porous pavement area (acres): | 5.14 |
| Inflow Hydrograph Peak to Average Flow Ratio | 3.8 |

**The Peak to Average Flow Ratio default value is 3.8 based on monitoring many urban areas. Use a value of 2 for a triangular hydrograph.**




**Pavement Geometry and Properties**

| | |
|---|---|
| 1 - Pavement Thickness (in) | 2.0 |
| Pavement Void Ratio (0-1) | 0.20 |
| 2 - Aggregate Bedding Thickness (in) | 22.0 |
| Aggregate Bedding Void Ratio (0-1) | 0.25 |
| 3 - Aggregate Base Reservoir Thickness (in) | 12.0 |
| Aggregate Base Reservoir Void Ratio (0-1) | 0.80 |

**Outlet/Discharge Options**

| | |
|---|---|
| Perforated Pipe Underdrain Diameter, if used (inches) | 8.00 |
| 4 - Perforated Pipe Underdrain Outlet Invert Elevation (inches above Datum) | 4.0 |
| Number of Perforated Pipe Underdrains | 2 |
| Subgrade Seepage Rate (in/hr) - select below or enter | 0.05 |
| Use Random Number Generation to Account for Uncertainty in Seepage Rate | ☐ |
| Subgrade Seepage Rate COV | 1.60 |

**Select Subgrade Seepage Rate**

- ○ Sand - 8 in/hr
- ○ Loamy sand - 2.5 in/hr
- ○ Sandy loam - 1.0 in/hr
- ○ Loam - 0.5 in/hr
- ○ Silt loam - 0.3 in/hr
- ○ Sandy silt loam - 0.2 in/hr
- ○ Clay loam - 0.1 in/hr
- ○ Silty clay loam - 0.05 in/hr
- ○ Sandy clay - 0.05 in/hr
- ○ Silty clay - 0.04 in/hr
- ○ Clay - 0.02 in/hr

**Surface Pavement Layer Infiltration Rate Data**

| | |
|---|---|
| Initial Infiltration Rate (in/hr) | 0.05 |
| Percent of Infiltration Rate After 3 Years (0-100) | 75.0 |
| Percent of Infiltration Rate After 5 Years (0-100) | 65.0 |
| Percent of Original Infiltration Rate Upon Cleaning (0-100) | 85.0 |
| Time Period Until Complete Clogging Occurs (yrs) | 6.0 |

**Restorative Cleaning Frequency**

- ○ Never Cleaned
- ○ Three Times per Year
- ○ Semi-Annually
- ○ Annually
- ○ Every Two Years
- ○ Every Three Years
- ○ Every Four Years
- ○ Every Five Years
- ◉ Every Seven Years
- ○ Every Ten Years

Continue | Cancel | Delete Control

# Porous Pavement Control Device

**Porous Pavement Control Device**

**Land Use: Residential**

**Source Area: Driveways 1**

**Total Area: 5.14** **Porous Pavement Number 1**

| | |
|---|---|
| **Porous pavement area (acres):** | 5.14 |
| **Inflow Hydrograph Peak to Average Flow Ratio** | 3.8 |

**Pavement Geometry and Properties**

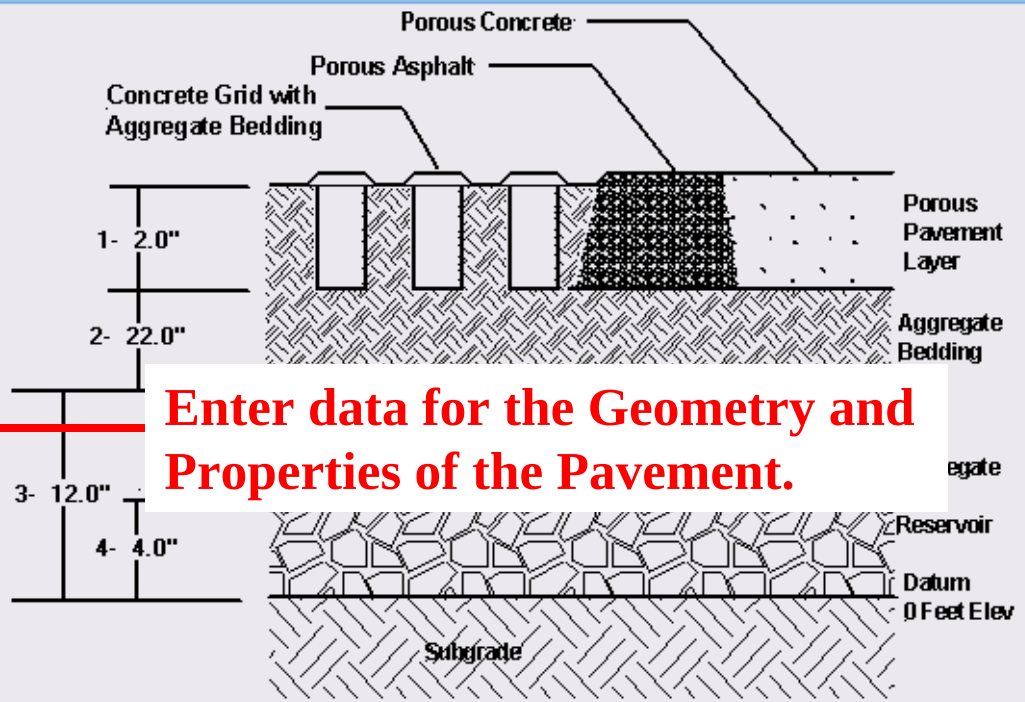
| | |
|---|---|
| 1 - Pavement Thickness (in) | 2.0 |
| Pavement Void Ratio (0-1) | 0.20 |
| 2 - Aggregate Bedding Thickness (in) | 22.0 |
| Aggregate Bedding Void Ratio (0-1) | 0.25 |
| 3 - Aggregate Base Reservoir Thickness (in) | 12.0 |
| Aggregate Base Reservoir Void Ratio (0-1) | 0.80 |

**Outlet/Discharge Options**

| | |
|---|---|
| Perforated Pipe Underdrain Diameter, if used (inches) | 8.00 |
| 4 - Perforated Pipe Underdrain Outlet Invert Elevation (inches above Datum) | 4.0 |
| Number of Perforated Pipe Underdrains | 2 |
| Subgrade Seepage Rate (in/hr) - select below or enter | 0.05 |
| Use Random Number Generation to Account for Uncertainty in Seepage Rate | ☐ |
| Subgrade Seepage Rate COV | 1.60 |

**Select Subgrade Seepage Rate**

- ○ Sand - 8 in/hr
- ○ Loamy sand - 2.5 in/hr
- ○ Sandy loam - 1.0 in/hr
- ○ Loam - 0.5 in/hr
- ○ Silt loam - 0.3 in/hr
- ○ Sandy silt loam - 0.2 in/hr
- ○ Clay loam - 0.1 in/hr
- ○ Silty clay loam - 0.05 in/hr
- ○ Sandy clay - 0.05 in/hr
- ○ Silty clay - 0.04 in/hr
- ○ Clay - 0.02 in/hr




**Enter data for the Geometry and Properties of the Pavement.**

**Surface Pavement Layer Infiltration Rate Data**

| | |
|---|---|
| Initial Infiltration Rate (in/hr) | 0.05 |
| Percent of Infiltration Rate After 3 Years (0-100) | 75.0 |
| Percent of Infiltration Rate After 5 Years (0-100) | 65.0 |
| Percent of Original Infiltration Rate Upon Cleaning (0-100) | 85.0 |
| Time Period Until Complete Clogging Occurs (yrs) | 6.0 |

**Restorative Cleaning Frequency**

- ○ Never Cleaned
- ○ Three Times per Year
- ○ Semi-Annually
- ○ Annually
- ○ Every Two Years
- ○ Every Three Years
- ○ Every Four Years
- ○ Every Five Years
- ◉ Every Seven Years
- ○ Every Ten Years

Continue Cancel Delete Control

# Porous Pavement Control Device

**Porous Pavement Control Device**

**Land Use: Residential**

**Source Area: Driveways 1**

**Total Area: 5.14** **Porous Pavement Number 1**

| | |
|---|---|
| **Porous pavement area (acres):** | 5.14 |
| **Inflow Hydrograph Peak to Average Flow Ratio** | 3.8 |

**Pavement Geometry and Properties**

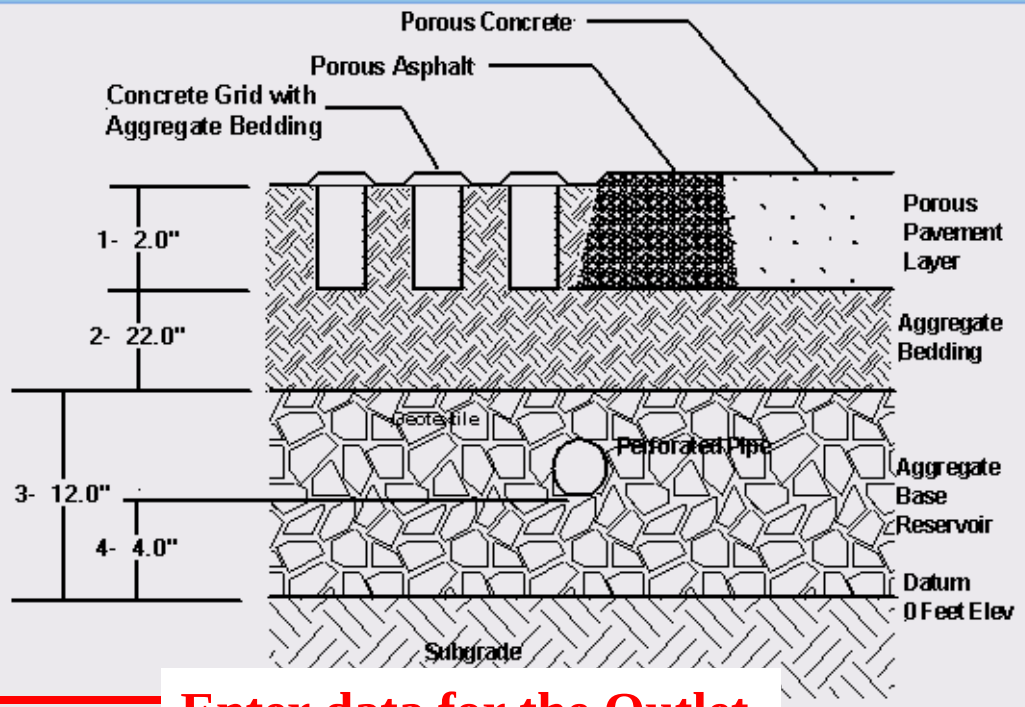
| | |
|---|---|
| 1 - Pavement Thickness (in) | 2.0 |
| Pavement Void Ratio (0-1) | 0.20 |
| 2 - Aggregate Bedding Thickness (in) | 22.0 |
| Aggregate Bedding Void Ratio (0-1) | 0.25 |
| 3 - Aggregate Base Reservoir Thickness (in) | 12.0 |
| Aggregate Base Reservoir Void Ratio (0-1) | 0.80 |

**Outlet/Discharge Options**

| | |
|---|---|
| Perforated Pipe Underdrain Diameter, if used (inches) | 8.00 |
| 4 - Perforated Pipe Underdrain Outlet Invert Elevation (inches above Datum) | 4.0 |
| Number of Perforated Pipe Underdrains | 2 |
| Subgrade Seepage Rate (in/hr) - select below or enter | 0.05 |
| Use Random Number Generation to Account for Uncertainty in Seepage Rate | ☐ |
| Subgrade Seepage Rate COV | 1.60 |

**Select Subgrade Seepage Rate**

- ○ Sand - 8 in/hr
- ○ Loamy sand - 2.5 in/hr
- ○ Sandy loam - 1.0 in/hr
- ○ Loam - 0.5 in/hr
- ○ Silt loam - 0.3 in/hr
- ○ Sandy silt loam - 0.2 in/hr
- ○ Clay loam - 0.1 in/hr
- ○ Silty clay loam - 0.05 in/hr
- ○ Sandy clay - 0.05 in/hr
- ○ Silty clay - 0.04 in/hr
- ○ Clay - 0.02 in/hr




**Enter data for the Outlet.**

**Surface Pavement Layer Infiltration Rate Data**

| | |
|---|---|
| Initial Infiltration Rate (in/hr) | 0.05 |
| Percent of Infiltration Rate After 3 Years (0-100) | 75.0 |
| Percent of Infiltration Rate After 5 Years (0-100) | 65.0 |
| Percent of Original Infiltration Rate Upon Cleaning (0-100) | 85.0 |
| Time Period Until Complete Clogging Occurs (yrs) | 6.0 |

**ning Frequency**

- ○ Never Cleaned
- ○ Three Times per Year
- ○ Semi-Annually
- ○ Annually
- ○ Every Two Years
- ○ Every Three Years
- ○ Every Four Years
- ○ Every Five Years
- ◉ Every Seven Years
- ○ Every Ten Years

Continue Cancel Delete Control

# Porous Pavement Control Device

**Porous Pavement Control Device**

**Land Use: Residential**

**Source Area: Driveways 1**

**Total Area: 5.14** **Porous Pavement Number 1**

| | |
|---|---|
| **Porous pavement area (acres):** | 5.14 |
| **Inflow Hydrograph Peak to Average Flow Ratio** | 3.8 |

**Pavement Geometry and Properties**

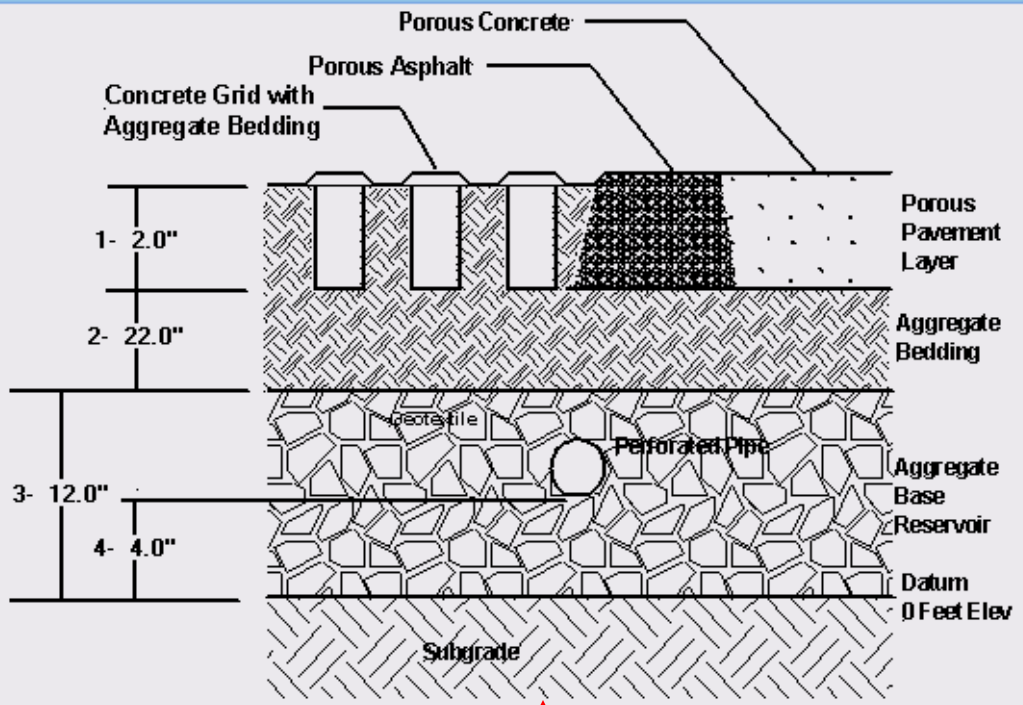
| | |
|---|---|
| 1 - Pavement Thickness (in) | 2.0 |
| Pavement Void Ratio (0-1) | 0.20 |
| 2 - Aggregate Bedding Thickness (in) | 22.0 |
| Aggregate Bedding Void Ratio (0-1) | 0.25 |
| 3 - Aggregate Base Reservoir Thickness (in) | 12.0 |
| Aggregate Base Reservoir Void Ratio (0-1) | 0.80 |

**Outlet/Discharge Options**

| | |
|---|---|
| Perforated Pipe Underdrain Diameter, if used (inches) | 8.00 |
| 4 - Perforated Pipe Underdrain Outlet Invert Elevation (inches above Datum) | 4.0 |
| Number of Perforated Pipe Underdrains | 2 |
| Subgrade Seepage Rate (in/hr) - select below or enter | 0.05 |
| Use Random Number Generation to Account for Uncertainty in Seepage Rate | ☐ |
| Subgrade Seepage Rate COV | 1.60 |

**Select Subgrade Seepage Rate**

- ○ Sand - 8 in/hr
- ○ Loamy sand - 2.5 in/hr
- ○ Sandy loam - 1.0 in/hr
- ○ Loam - 0.5 in/hr
- ○ Silt loam - 0.3 in/hr
- ○ Sandy silt loam - 0.2 in/hr
- ○ Clay loam - 0.1 in/hr
- ○ Silty clay loam - 0.05 in/hr
- ○ Sandy clay - 0.05 in/hr
- ○ Silty clay - 0.04 in/hr
- ○ Clay - 0.02 in/hr




**Surface Pavement Layer Infiltration Rate Data**

| | |
|---|---|
| Initial Infiltration Rate (in/hr) | 0.05 |
| Percent of Infiltration Rate After 3 Years (0-100) | 75.0 |
| Percent of Infi | |
| Percent of Ori Cleaning (0-10 | |
| Time Period U | |

**Restorative Cleaning Frequency**

- ○ Never Cleaned
- ○ Three Times per Year
- ○ Semi-Annually
- ○ Annually
- ○ Every Two Years

**Values are filled in in the schematic above as values are entered.**

Continue Cancel Delete Control

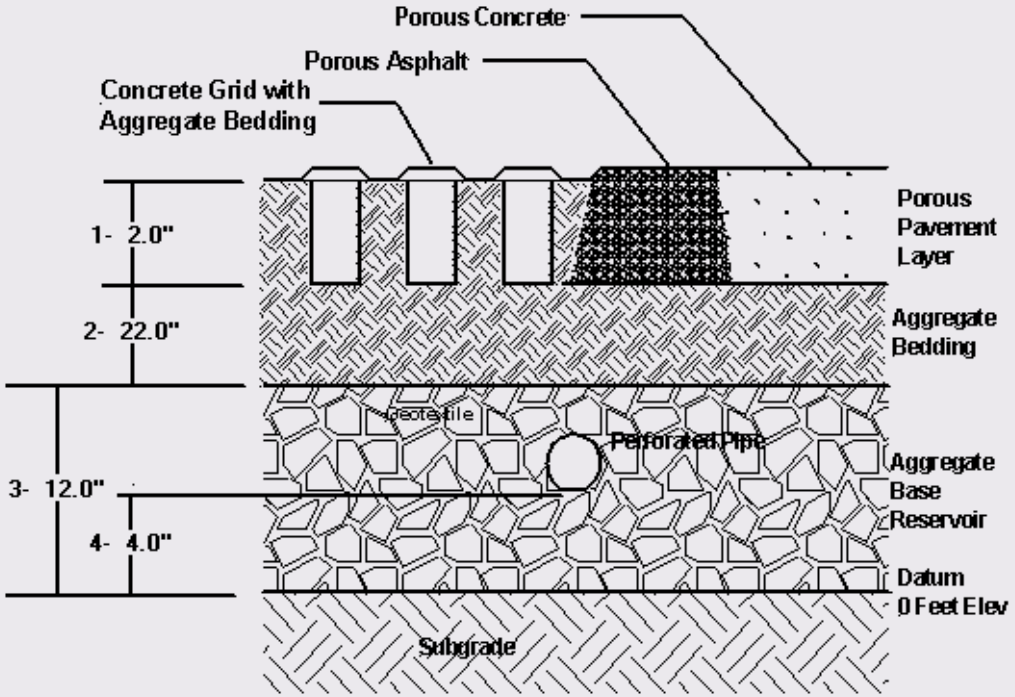
# Porous Pavement Control Device

**Porous Pavement Control Device**

Land Use: Residential
Source Area: Driveways 1
Total Area: 5.14 Porous Pavement Number 1

| | |
|---|---|
| Porous pavement area (acres): | 5.14 |
| Inflow Hydrograph Peak to Average Flow Ratio | 3.8 |

**Select the Seepage Rate of the Subgrade from the list of default values or enter the value if known.**




| | |
|---|---|
| 4 - Perforated Pipe Underdrain Outlet Invert Elevation (inches above Datum) | 4.0 |
| Number of Perforated Pipe Underdrains | 2 |
| Subgrade Seepage Rate (in/hr) - select below or enter | 0.05 |
| Use Random Number Generation to Account for Uncertainty in Seepage Rate | ☐ |
| Subgrade Seepage Rate COV | 1.60 |

**Select Subgrade Seepage Rate**

- ○ Sand - 8 in/hr
- ○ Loamy sand - 2.5 in/hr
- ○ Sandy loam - 1.0 in/hr
- ○ Loam - 0.5 in/hr
- ○ Silt loam - 0.3 in/hr
- ○ Sandy silt loam - 0.2 in/hr
- ○ Clay loam - 0.1 in/hr
- ○ Silty clay loam - 0.05 in/hr
- ○ Sandy clay - 0.05 in/hr
- ○ Silty clay - 0.04 in/hr
- ○ Clay - 0.02 in/hr

**Surface Pavement Layer Infiltration Rate Data**

| | |
|---|---|
| Initial Infiltration Rate (in/hr) | 0.05 |
| Percent of Infiltration Rate After 3 Years (0-100) | 75.0 |
| Percent of Infiltration Rate After 5 Years (0-100) | 65.0 |
| Percent of Original Infiltration Rate Upon Cleaning (0-100) | 85.0 |
| Time Period Until Complete Clogging Occurs (yrs) | 6.0 |

**Restorative Cleaning Frequency**

- ○ Never Cleaned
- ○ Three Times per Year
- ○ Semi-Annually
- ○ Annually
- ○ Every Two Years
- ○ Every Three Years
- ○ Every Four Years
- ○ Every Five Years
- ◉ Every Seven Years
- ○ Every Ten Years

Continue | Cancel | Delete Control

# Porous Pavement Control Device

**Porous Pavement Control Device**

Land Use: Residential

Source Area: Driveways 1

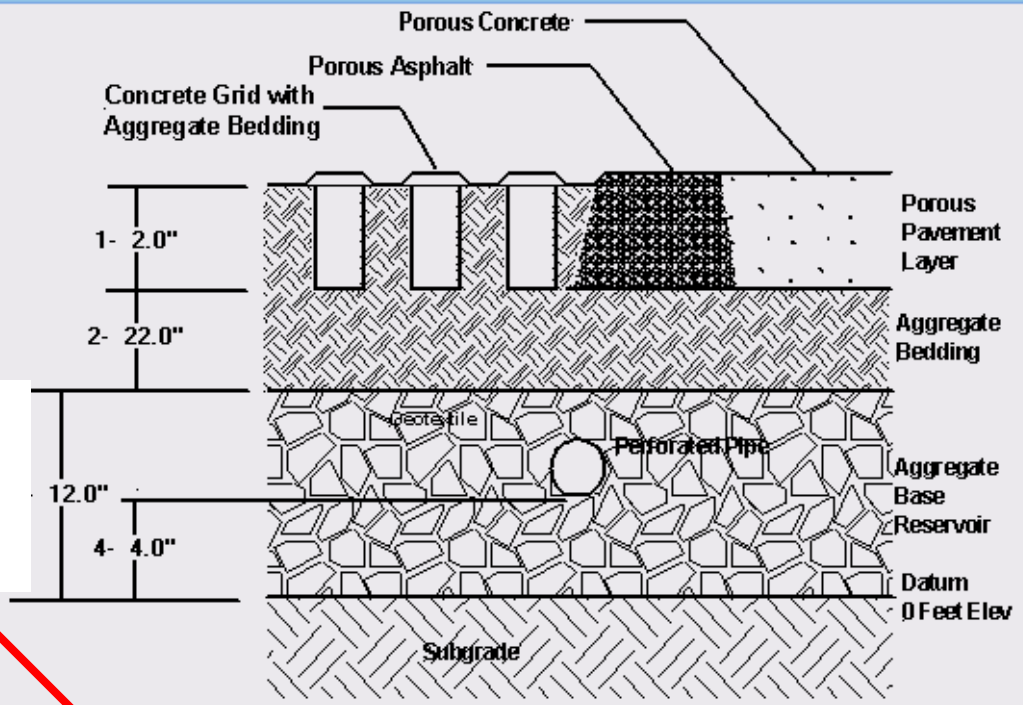
Total Area: 5.14 Porous Pavement Number 1

| | |
|---|---|
| Porous pavement area (acres): | 5.14 |
| Inflow Hydrograph Peak to Average Flow Ratio | 3.8 |

**Pavement Geometry and Properties**

| | |
|---|---|
| 1 - Pavement Thickness (in) | 2.0 |
| Pavement Void Ratio (0-1) | 0.20 |
| (inches) | 8.00 |
| 4 - Perforated Pipe Underdrain Outlet Invert Elevation (inches above Datum) | 4.0 |
| Number of Perforated Pipe Underdrains | 2 |
| Subgrade Seepage Rate (in/hr) - select below or enter | 0.05 |
| Use Random Number Generation to Account for Uncertainty in Seepage Rate | ☐ |
| Subgrade Seepage Rate COV | 1.60 |

**Enter the remaining data for the Surface Pavement Layer.**




**Surface Pavement Layer Infiltration Rate Data**

| | |
|---|---|
| Initial Infiltration Rate (in/hr) | 0.05 |
| Percent of Infiltration Rate After 3 Years (0-100) | 75.0 |
| Percent of Infiltration Rate After 5 Years (0-100) | 65.0 |
| Percent of Original Infiltration Rate Upon Cleaning (0-100) | 85.0 |
| Time Period Until Complete Clogging Occurs (yrs) | 6.0 |

**Restorative Cleaning Frequency**

- ○ Never Cleaned
- ○ Three Times per Year
- ○ Semi-Annually
- ○ Annually
- ○ Every Two Years
- ○ Every Three Years
- ○ Every Four Years
- ○ Every Five Years
- ◉ Every Seven Years
- ○ Every Ten Years

**Select Subgrade Seepage Rate**

- ○ Sand - 8 in/hr
- ○ Loamy sand - 2.5 in/hr
- ○ Sandy loam - 1.0 in/hr
- ○ Loam - 0.5 in/hr
- ○ Silt loam - 0.3 in/hr
- ○ Sandy silt loam - 0.2 in/hr
- ○ Clay loam - 0.1 in/hr
- ○ Silty clay loam - 0.05 in/hr
- ○ Sandy clay - 0.05 in/hr
- ○ Silty clay - 0.04 in/hr
- ○ Clay - 0.02 in/hr

Continue Cancel Delete Control

# Porous Pavement Control Device

**Porous Pavement Control Device**

**Land Use: Residential**

**Source Area: Driveways 1**

**Total Area: 5.14** **Porous Pavement Number 1**

| | |
|---|---|
| **Porous pavement area (acres):** | 5.14 |
| **Inflow Hydrograph Peak to Average Flow Ratio** | 3.8 |

**Pavement Geometry and Properties**

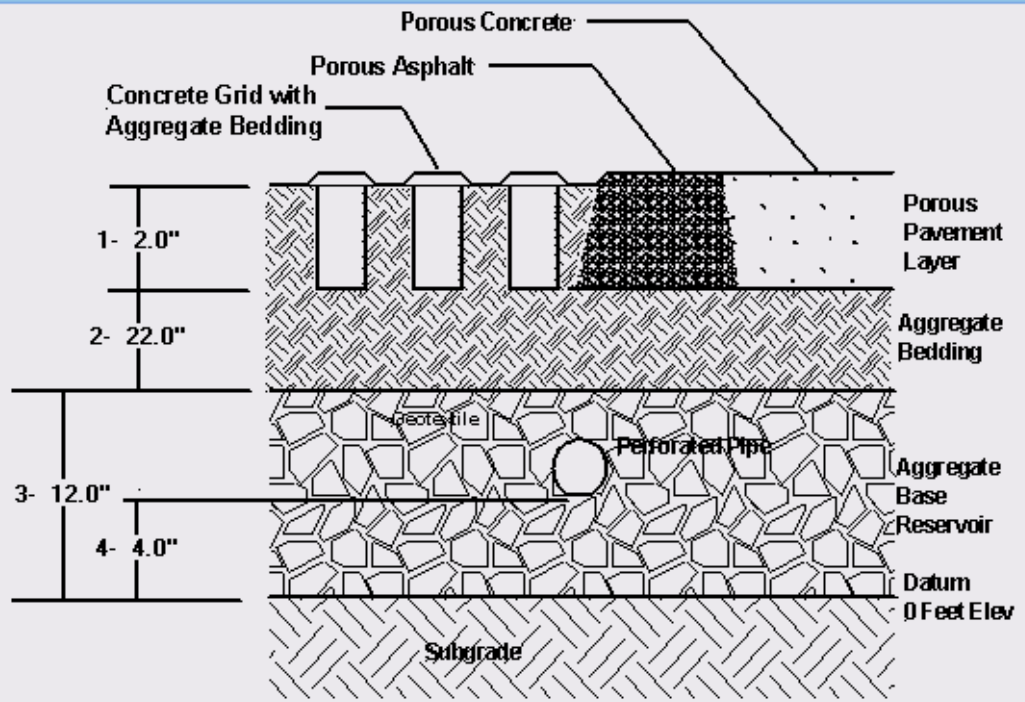
| | |
|---|---|
| 1 - Pavement Thickness (in) | 2.0 |
| Pavement Void Ratio (0-1) | 0.20 |
| 2 - Aggregate Bedding Thickness (in) | 22.0 |
| Aggregate Bedding Void Ratio (0-1) | 0.25 |
| 3 - Aggregate Base Reservoir Thickness (in) | 12.0 |
| Aggregate Base Reservoir Void Ratio (0-1) | 0.80 |

**Outlet/Discharge Options**

| | |
|---|---|
| Perforated Pipe Underdrain Diameter, if used (inches) | 8.00 |
| 4 - Perforated Pipe Underdrain Outlet Invert Elevation (inches above Datum) | 4.0 |
| Number of Perforated Pipe Underdrains | 2 |
| Subgrade Seepage Rate (in/hr) - select below or enter | 0.05 |
| Use Random Number Generation to Account for Uncertainty in Seepage Rate | ☐ |
| Subgrade Seepage Rate COV | 1.60 |

**Select Subgrade Seepage Rate**

- ○ Sand - 8 in/hr
- ○ Loamy sand - 2.5 in/hr
- ○ Sandy loam - 1.0 in/hr
- ○ Loam - 0.5 in/hr
- ○ Silt loam - 0.3 in/hr
- ○ Sandy silt loam - 0.2 in/hr
- ○ Clay loam - 0.1 in/hr
- ○ Silty clay loam - 0.05 in/hr
- ○ Sandy clay - 0.05 in/hr
- ○ Silty clay - 0.04 in/hr
- ○ Clay - 0.02 in/hr




**Surface Pavement Layer Infiltration Rate Data**

| | |
|---|---|
| Initial Infiltration Rate (in/hr) | 0.05 |
| Percent of Infiltration Rate After 3 Years (0-100) | 75.0 |
| Percent of Infiltration Rate After 5 Years (0-100) | 65.0 |
| Percent of Original Infiltration Rate Upon Cleaning (0-100) | 85.0 |
| Time Period Until Complete Clogging Occurs (yrs) | 6.0 |

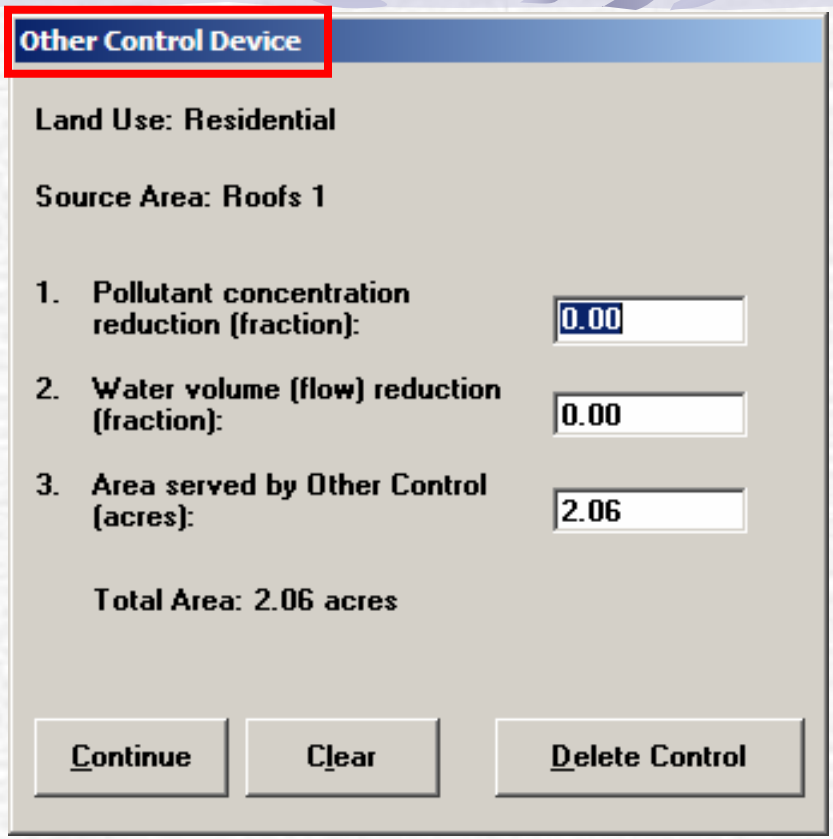
**Restorative Cleaning Frequency**

- ○ Never Cleaned
- ○ Three Times per Year
- ○ Semi-Annually
- ○ Annually
- ○ Every Two Years
- ○ Every Three Years
- ○ Every Four Years
- ○ Every Five Years
- ◉ Every Seven Years
- ○ Every Ten Years

**Finally, enter the Restorative Cleaning Frequency.**

# Control Devices - Other

# Other Control Device

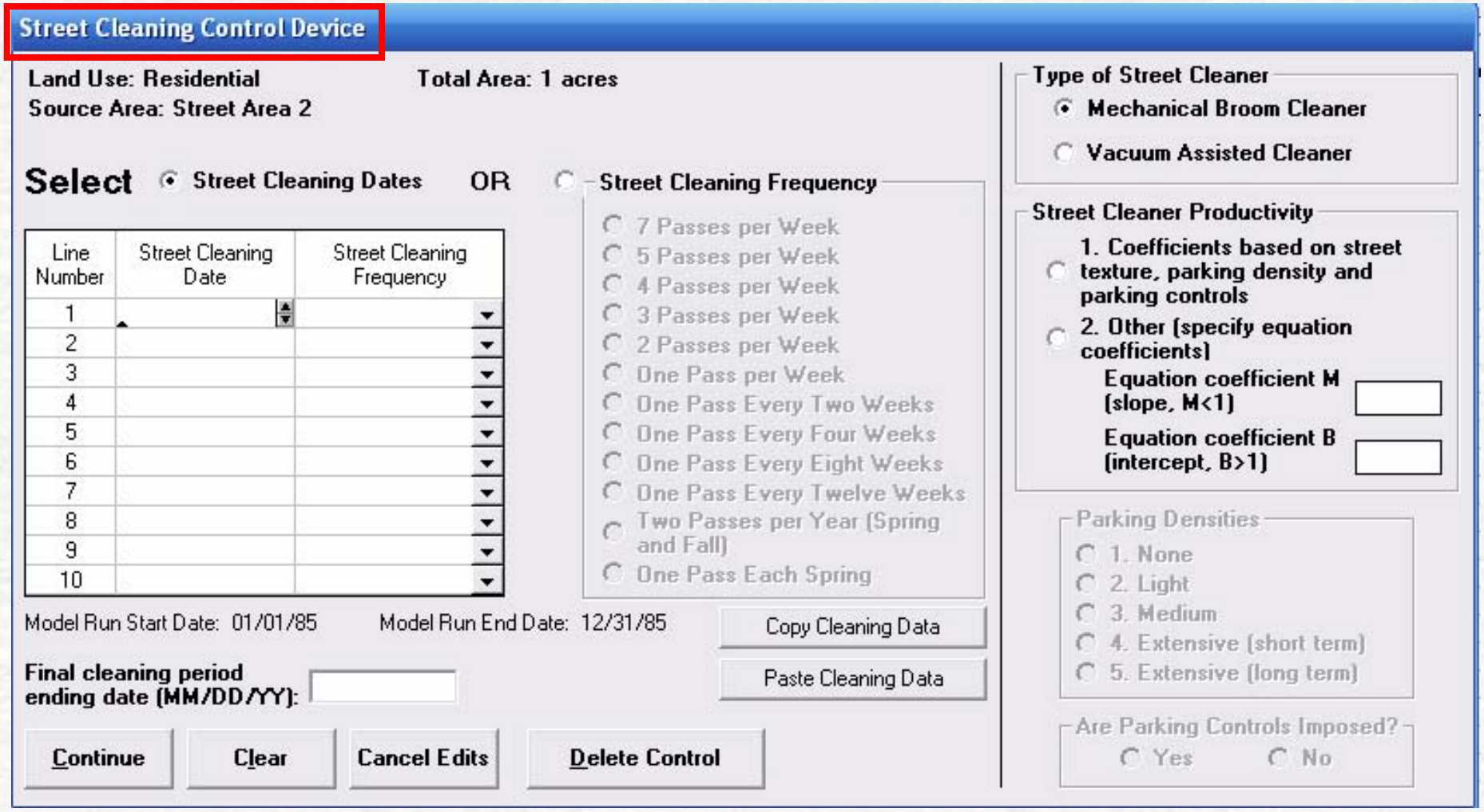



**Enter the Percent Reduction in Pollutant Concentration and Runoff, and the Area served by the Control Practice. The percent reduction will be applied uniformly to the Source Area's Pollutant Load and Runoff Volume generated.**

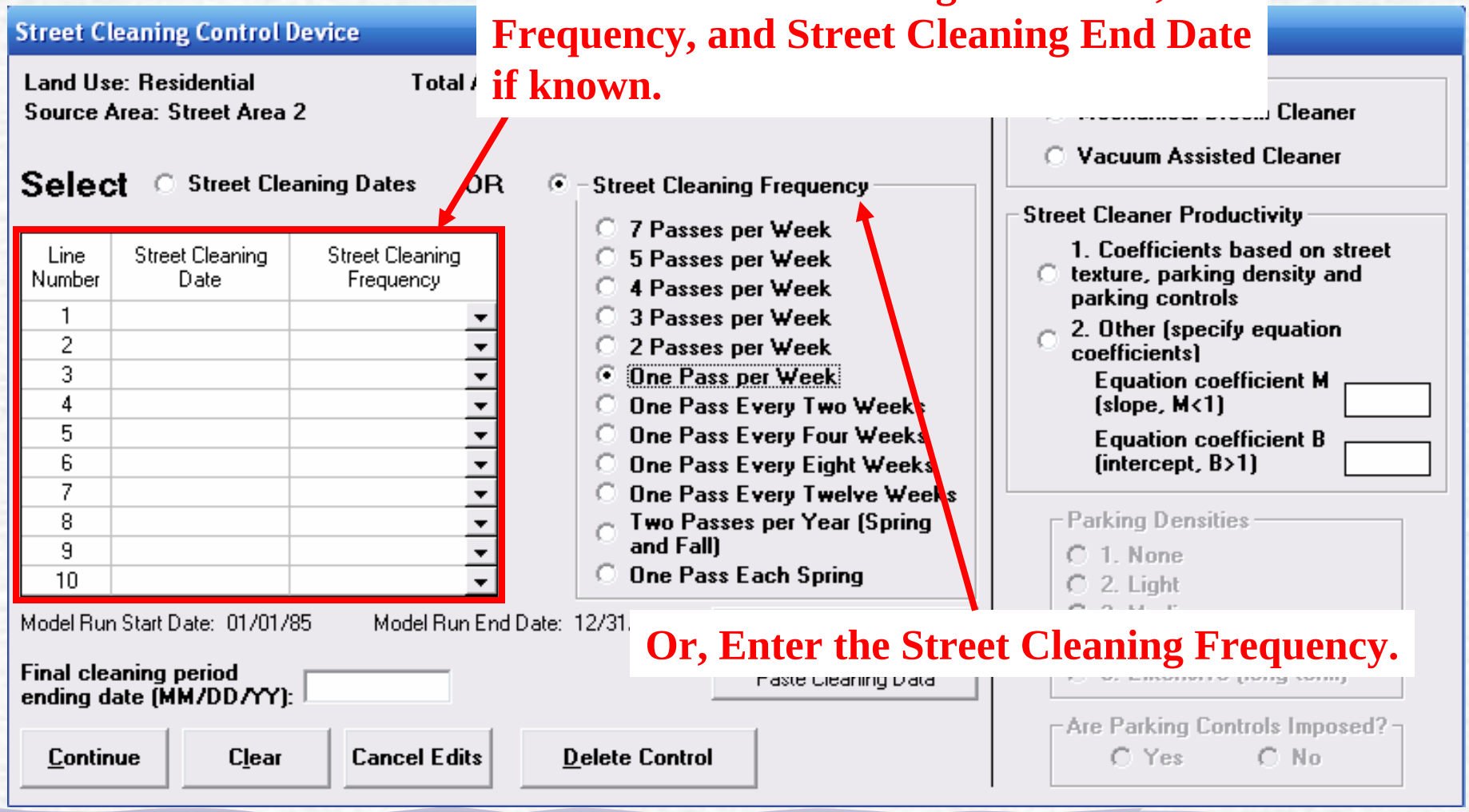
**Note: The Other Control Device should only be used if monitored data is available and applicable.**

# Control Devices – Street Cleaning

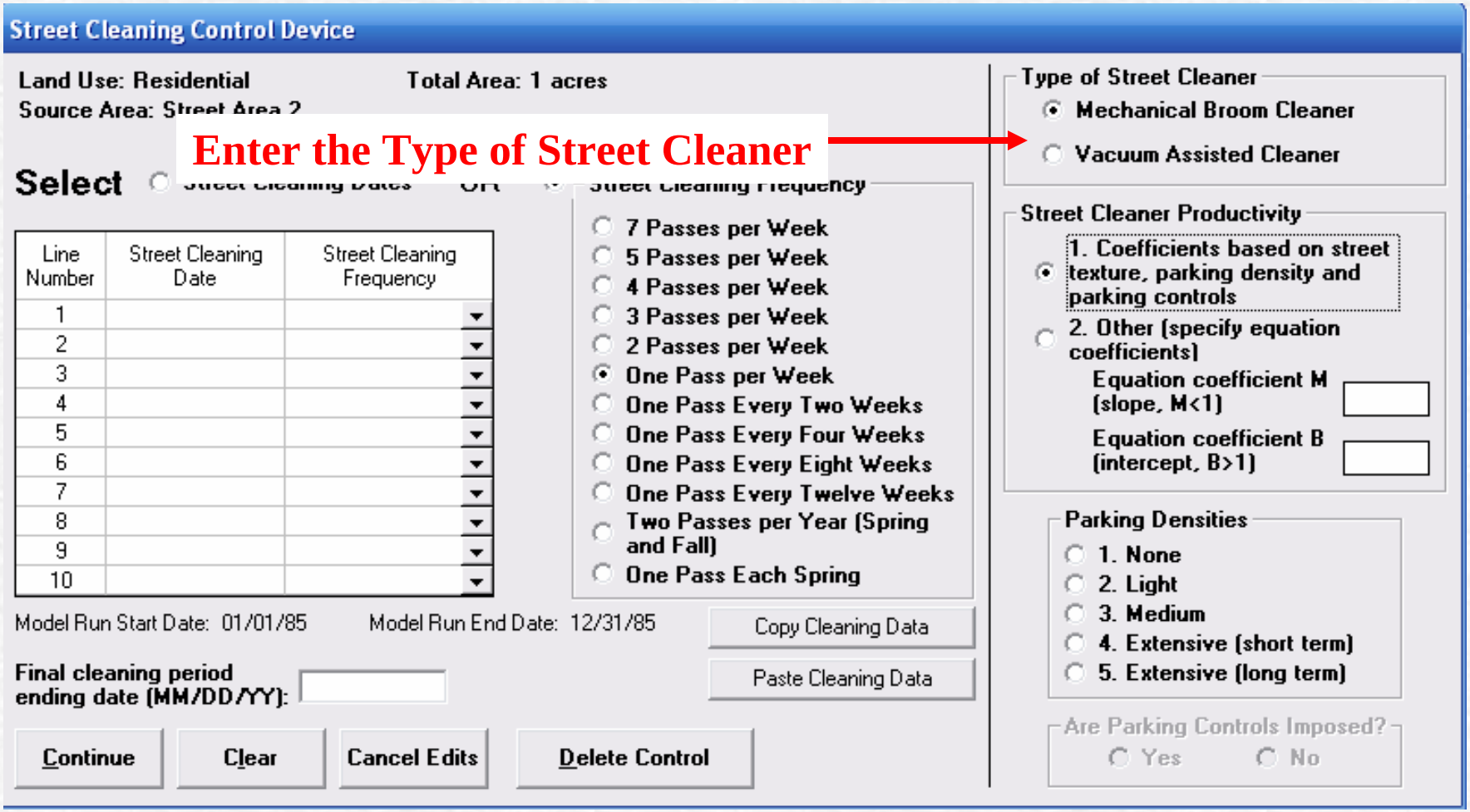
# Street Cleaning Control Device



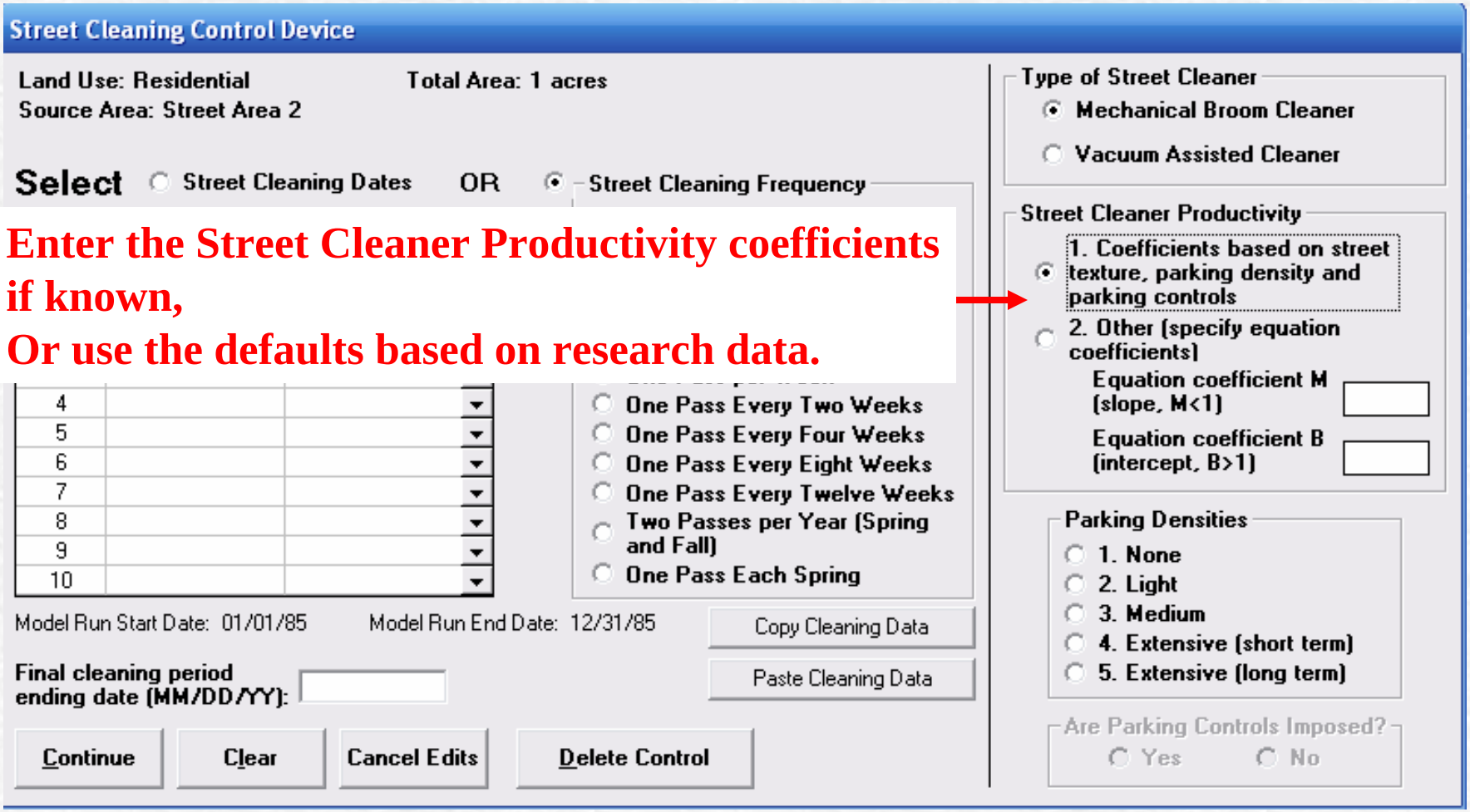
# Street Cleaning Control Device



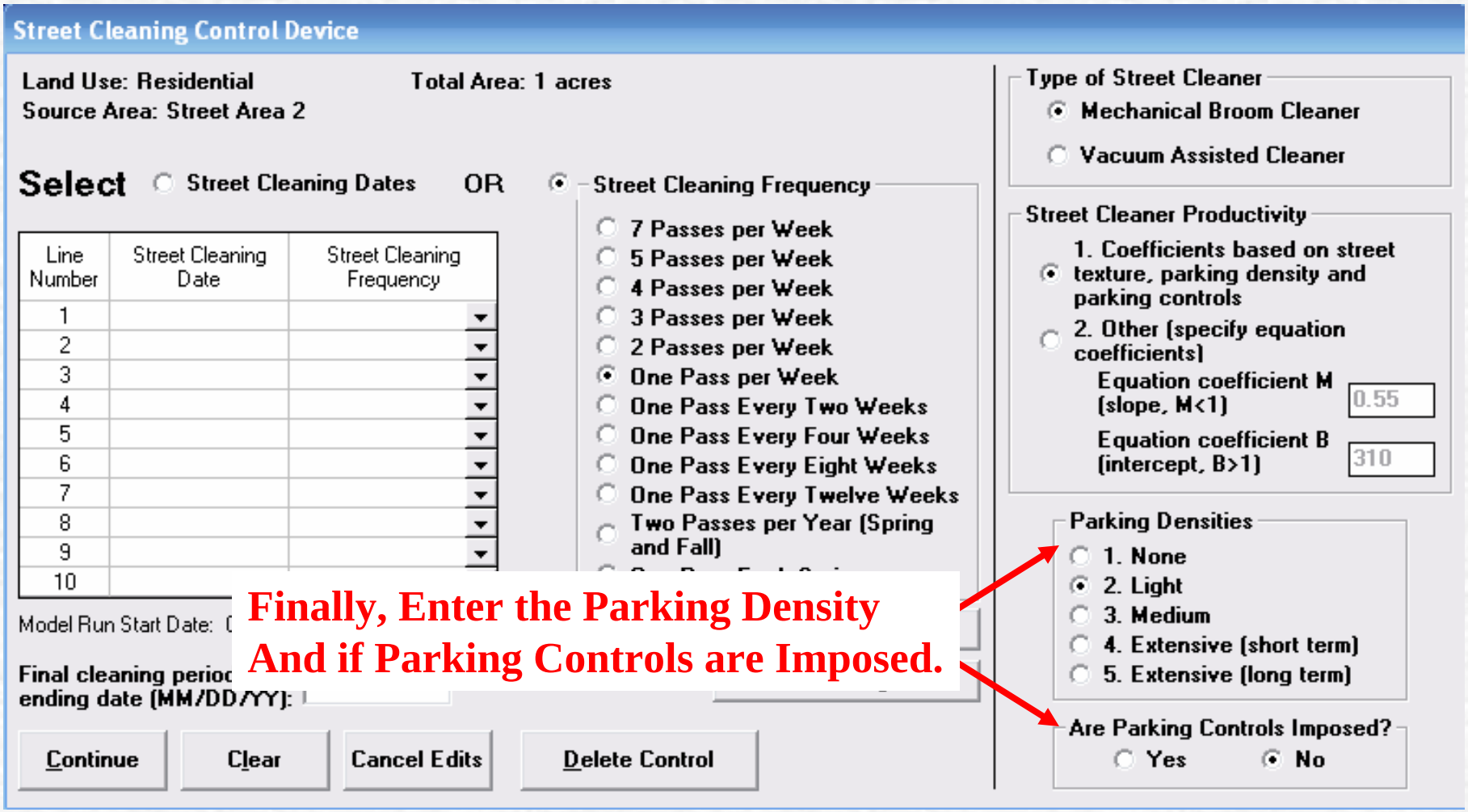
# Street Cleaning Control Device



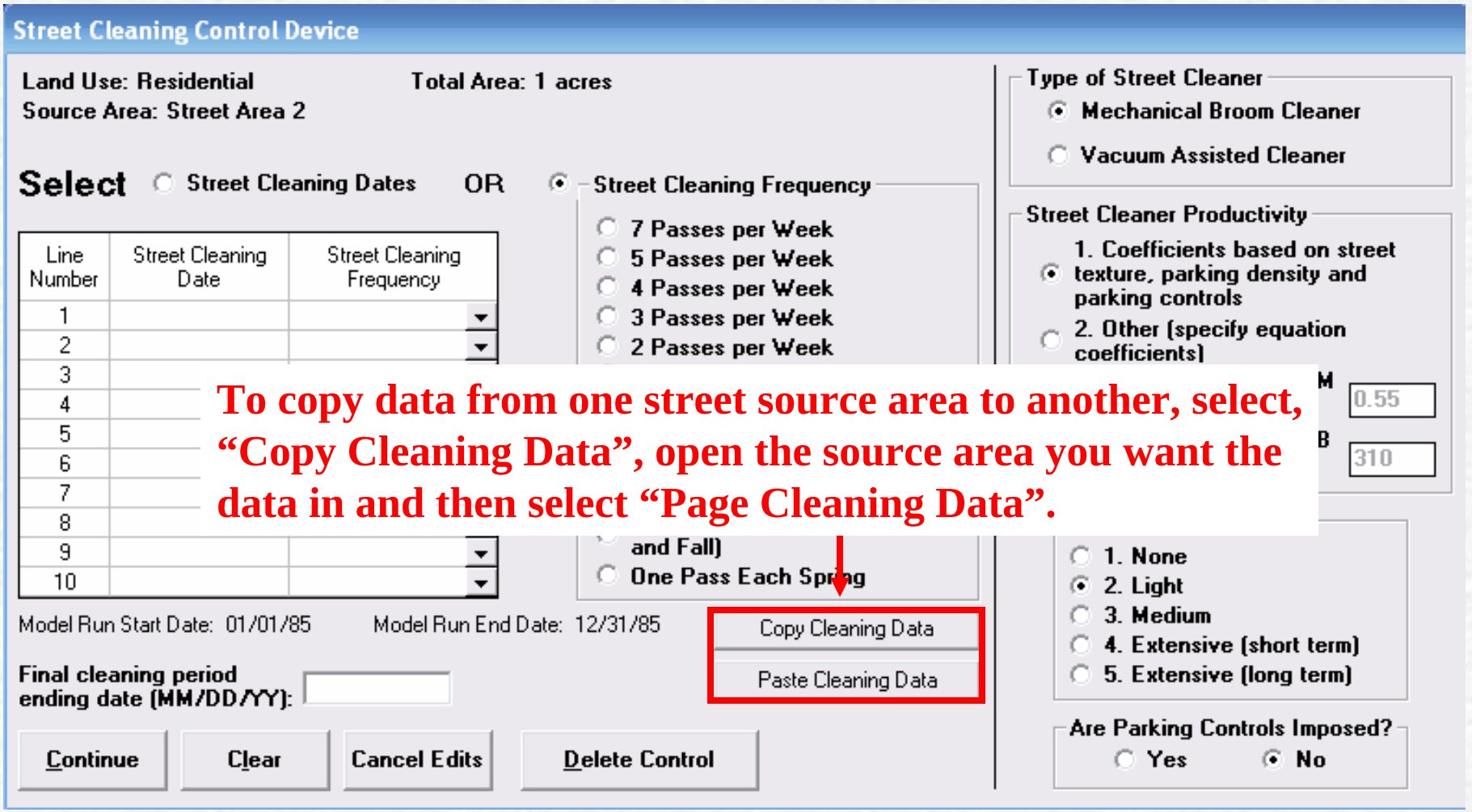
# Street Cleaning Control Device



# Street Cleaning Control Device



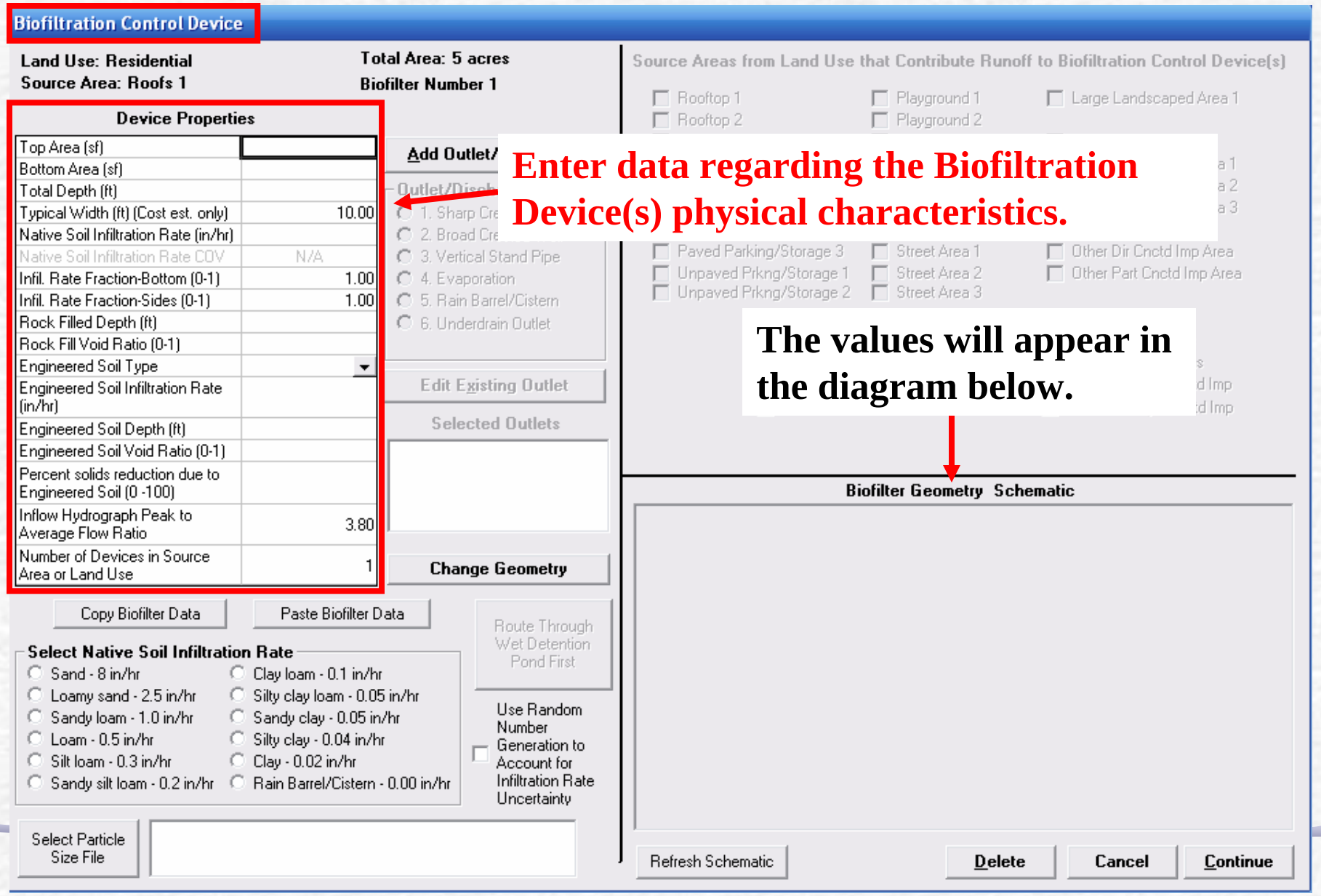
# Street Cleaning Control Device




**To copy data from one street source area to another, select, "Copy Cleaning Data", open the source area you want the data in and then select "Page Cleaning Data".**

# Control Devices – Biofiltration

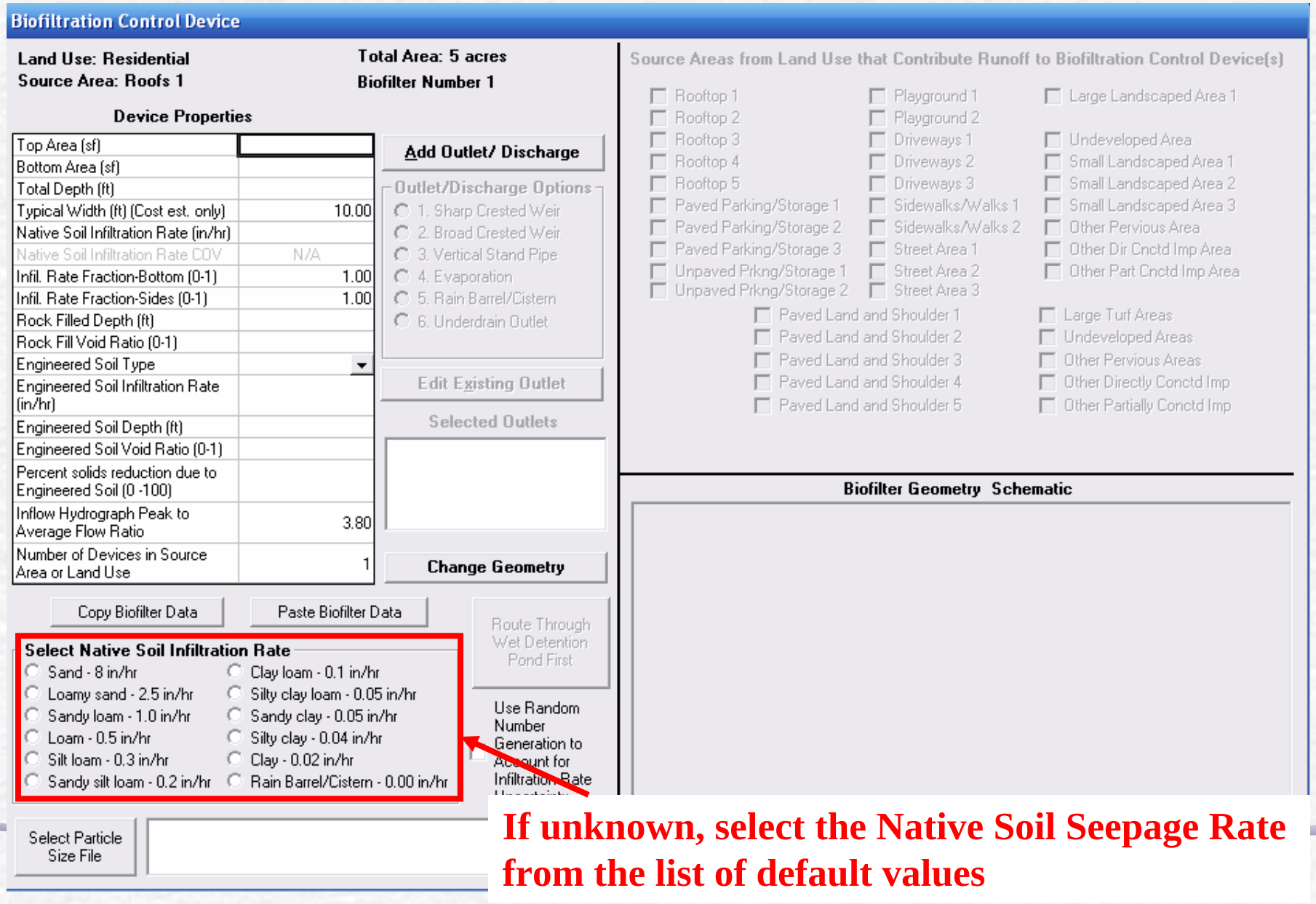
# Biofiltration Control Device




**Enter data regarding the Biofiltration Device(s) physical characteristics.**

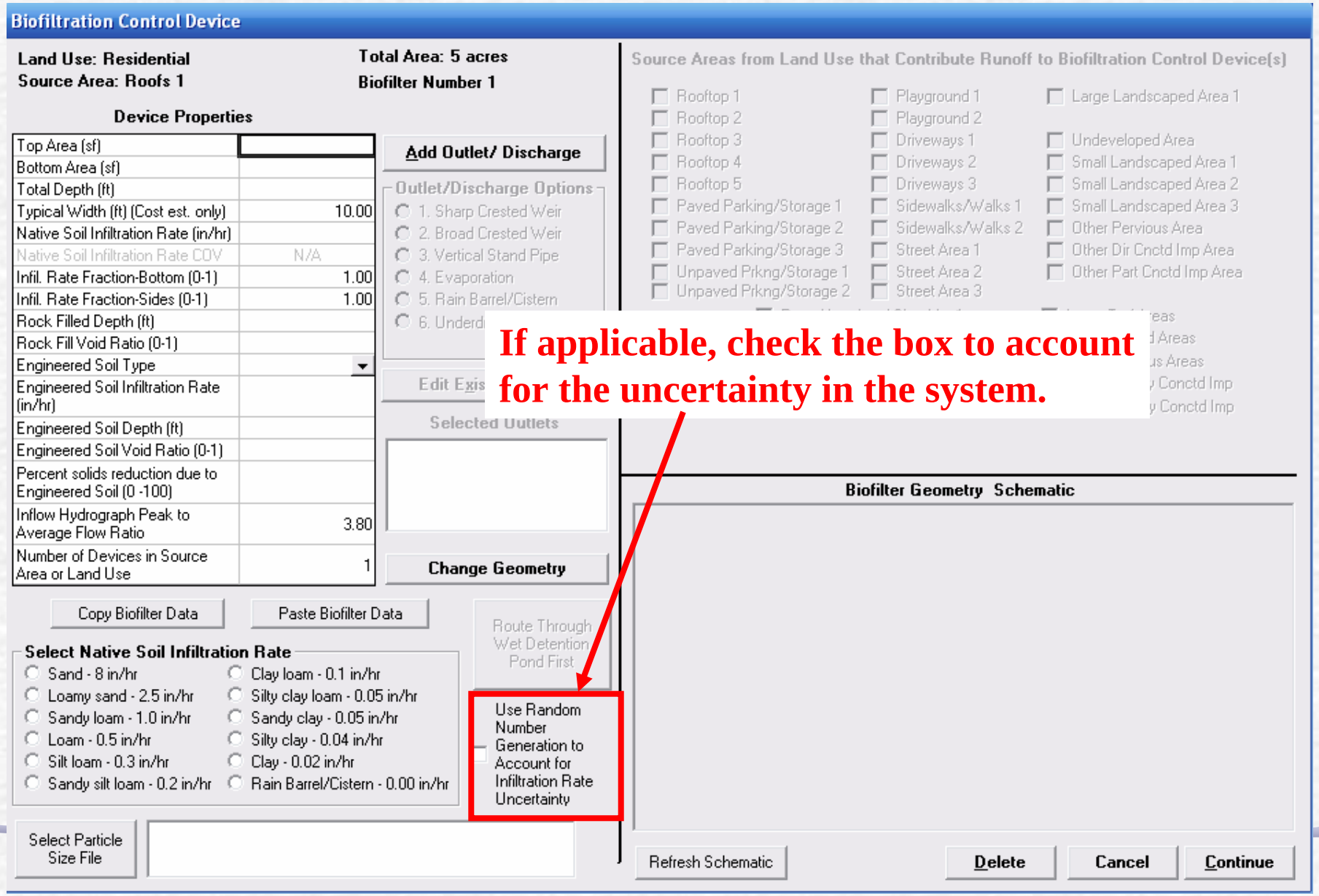
**The values will appear in the diagram below.**

# Biofiltration Control Device



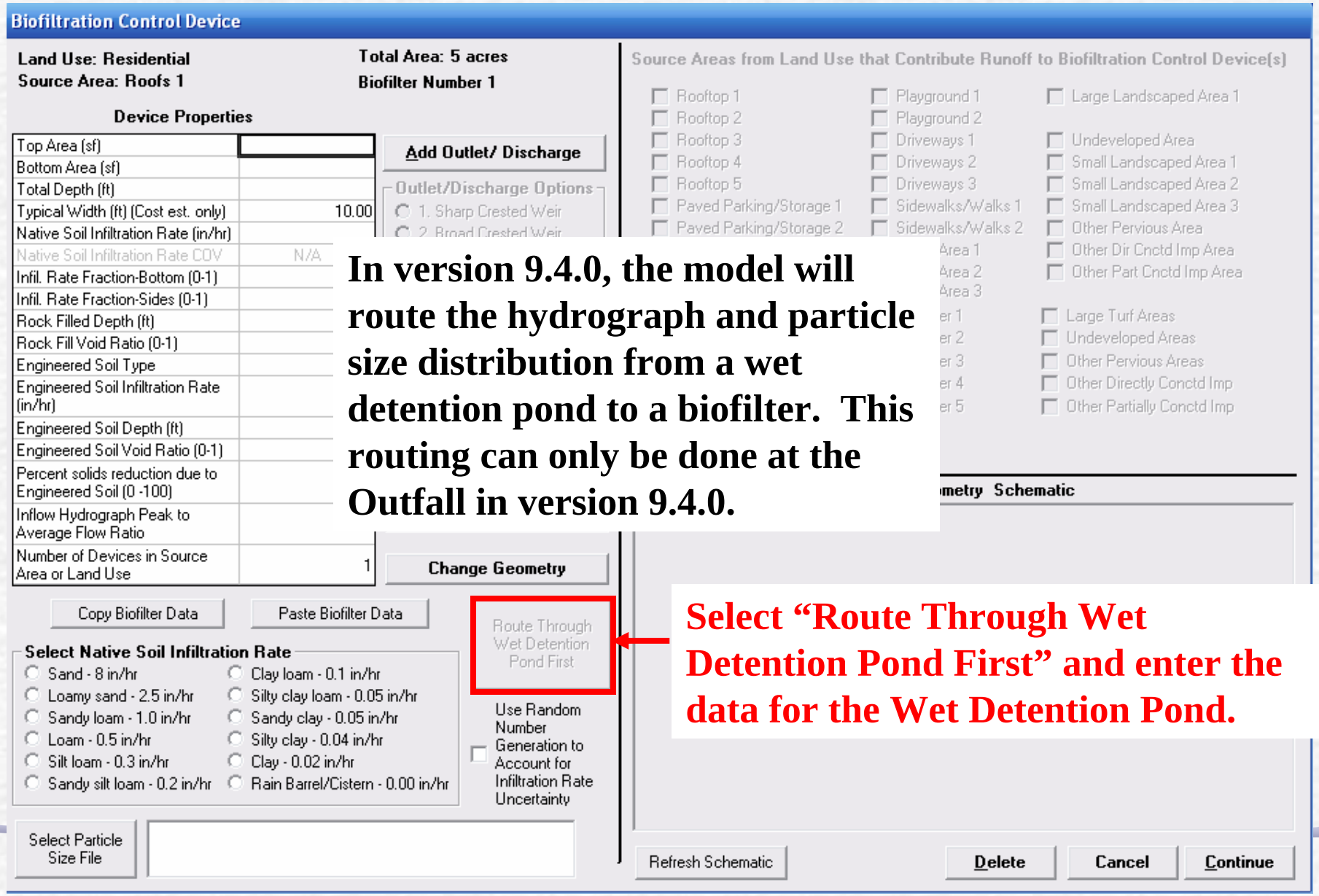

**If unknown, select the Native Soil Seepage Rate from the list of default values**

# Biofiltration Control Device




**If applicable, check the box to account for the uncertainty in the system.**

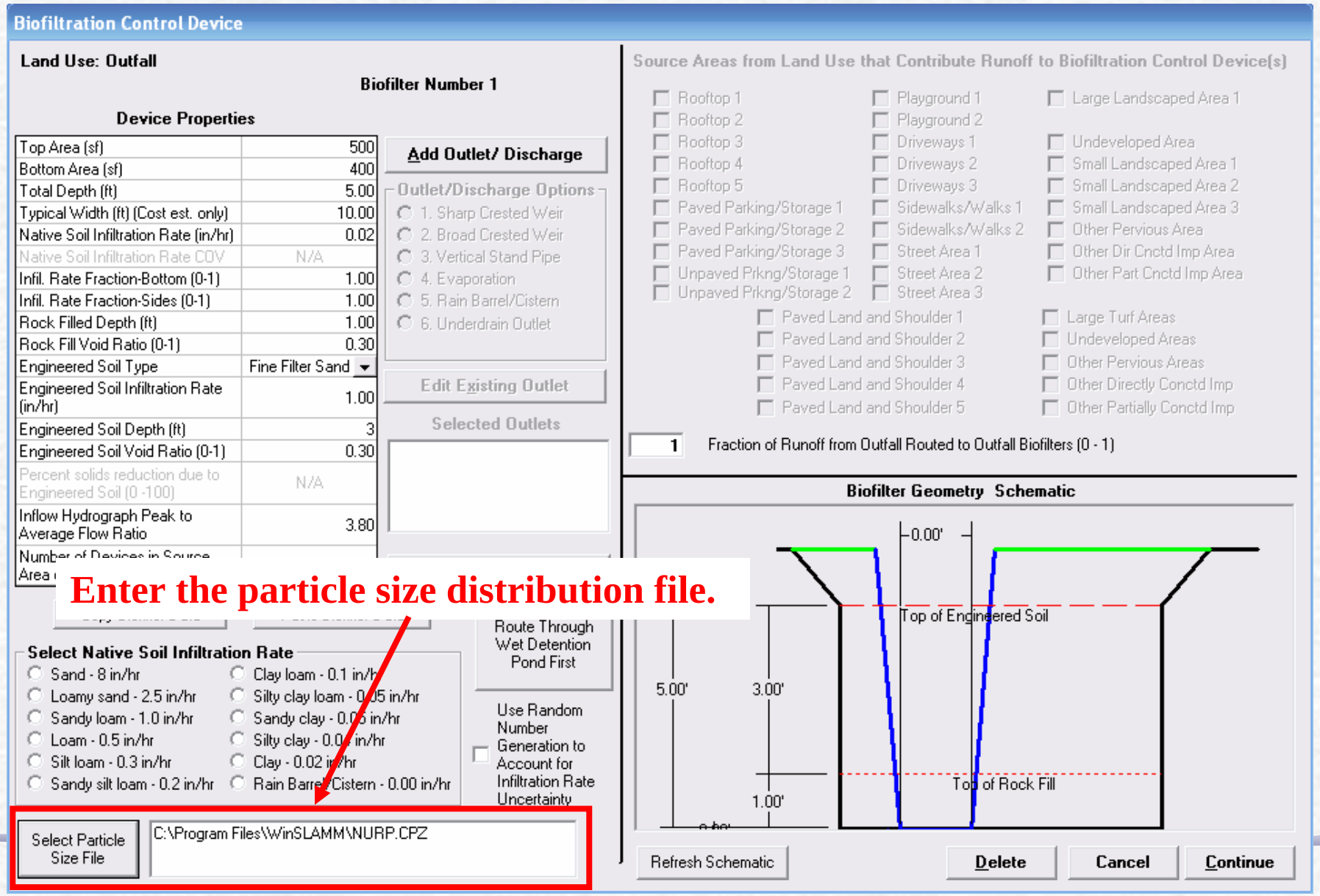
# Biofiltration Control Device



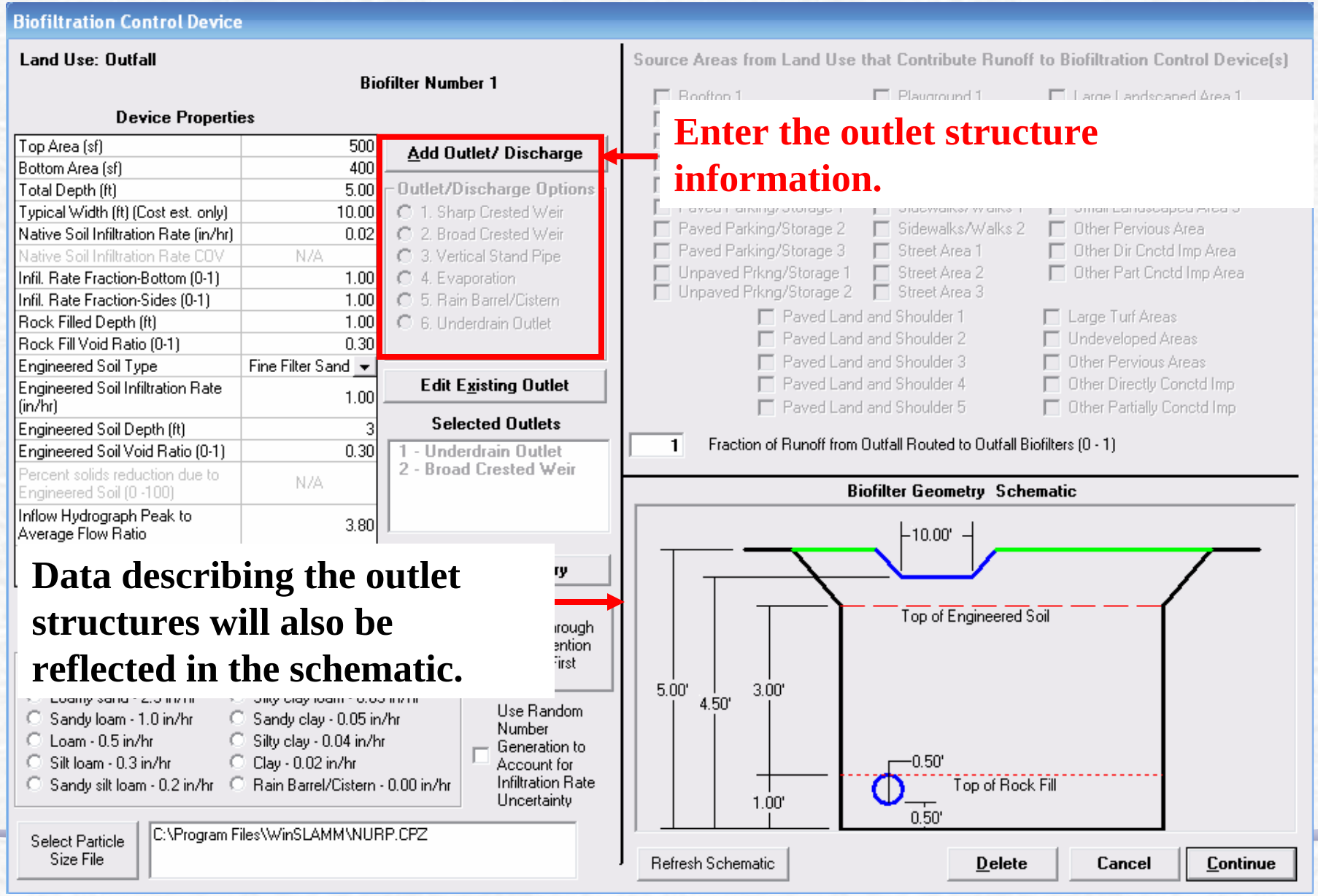

**In version 9.4.0, the model will route the hydrograph and particle size distribution from a wet detention pond to a biofilter. This routing can only be done at the Outfall in version 9.4.0.**

**Select "Route Through Wet Detention Pond First" and enter the data for the Wet Detention Pond.**

# Biofiltration Control Device



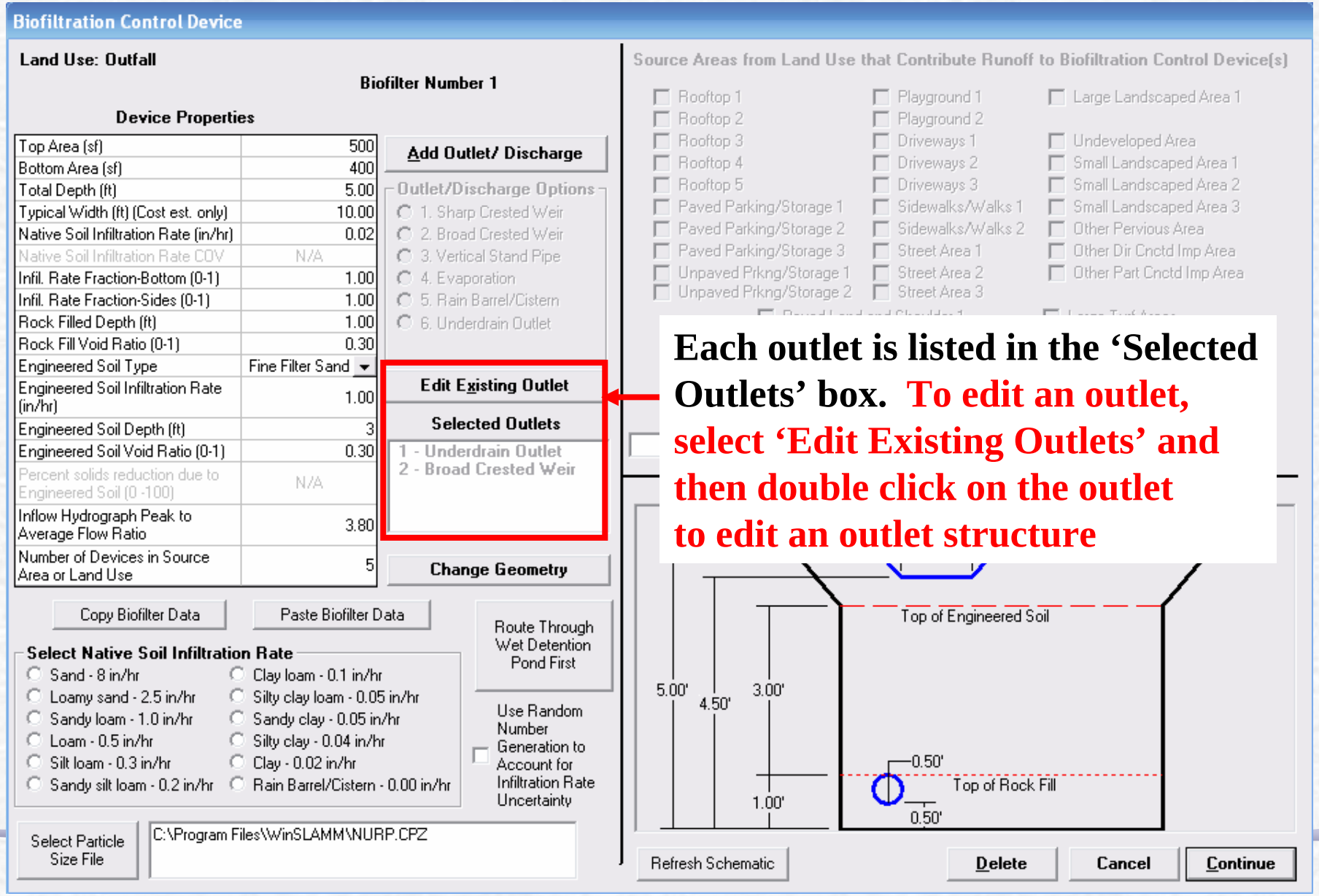
# Biofiltration Control Device




**Enter the outlet structure information.**

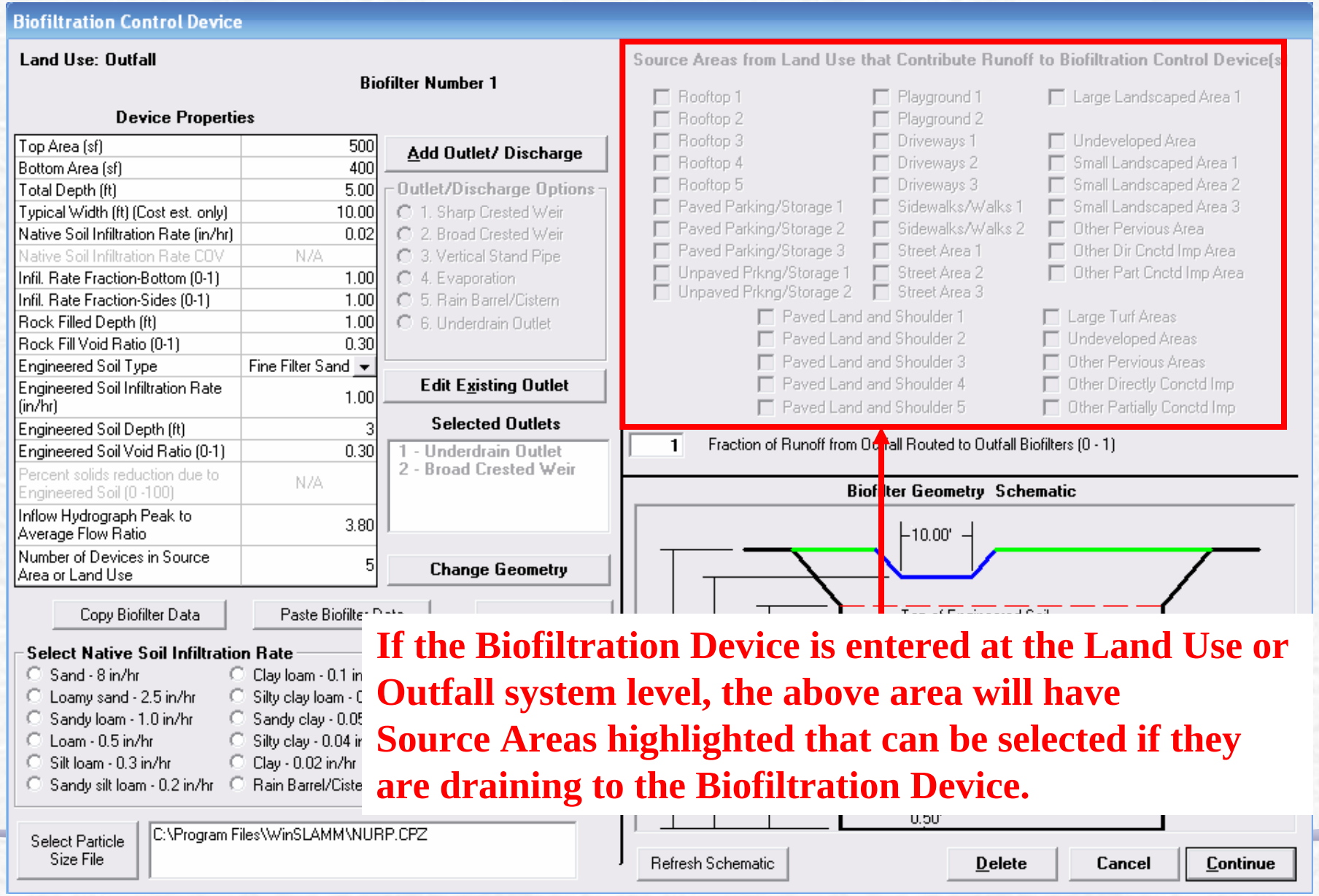
**Data describing the outlet structures will also be reflected in the schematic.**

# Biofiltration Control Device



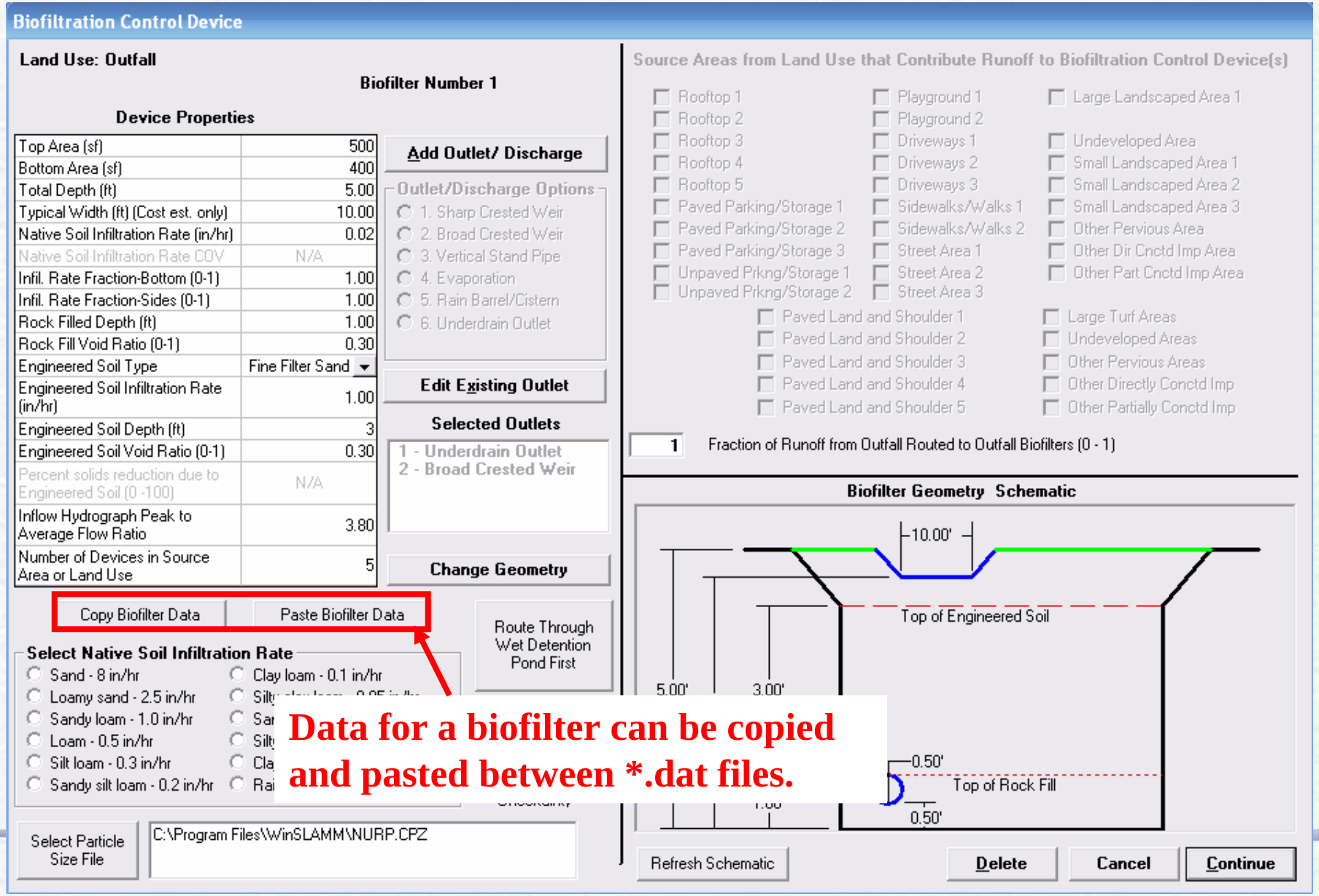

**Each outlet is listed in the 'Selected Outlets' box. To edit an outlet, select 'Edit Existing Outlets' and then double click on the outlet to edit an outlet structure**

# Biofiltration Control Device



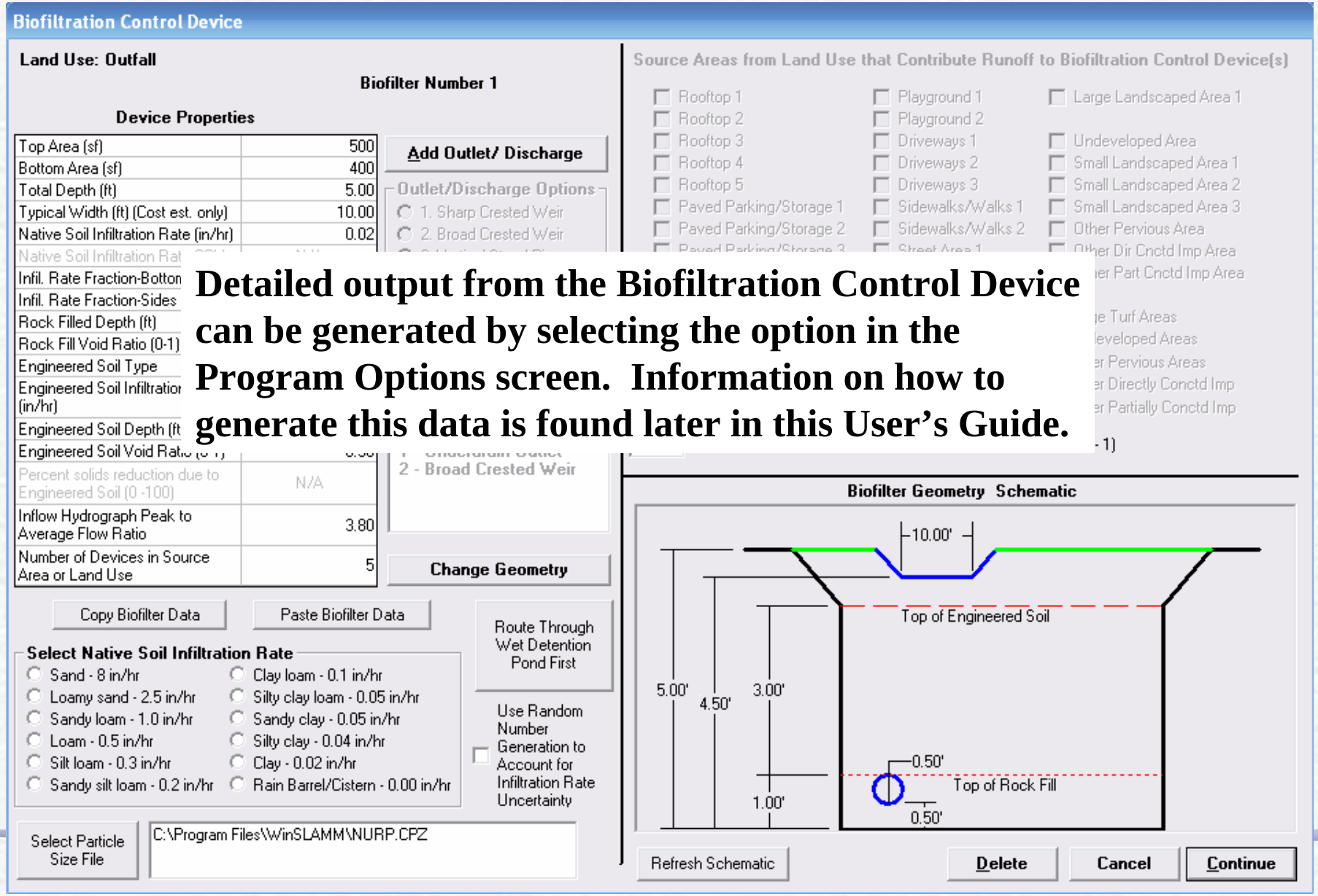

**If the Biofiltration Device is entered at the Land Use or Outfall system level, the above area will have Source Areas highlighted that can be selected if they are draining to the Biofiltration Device.**

# Biofiltration Control Device



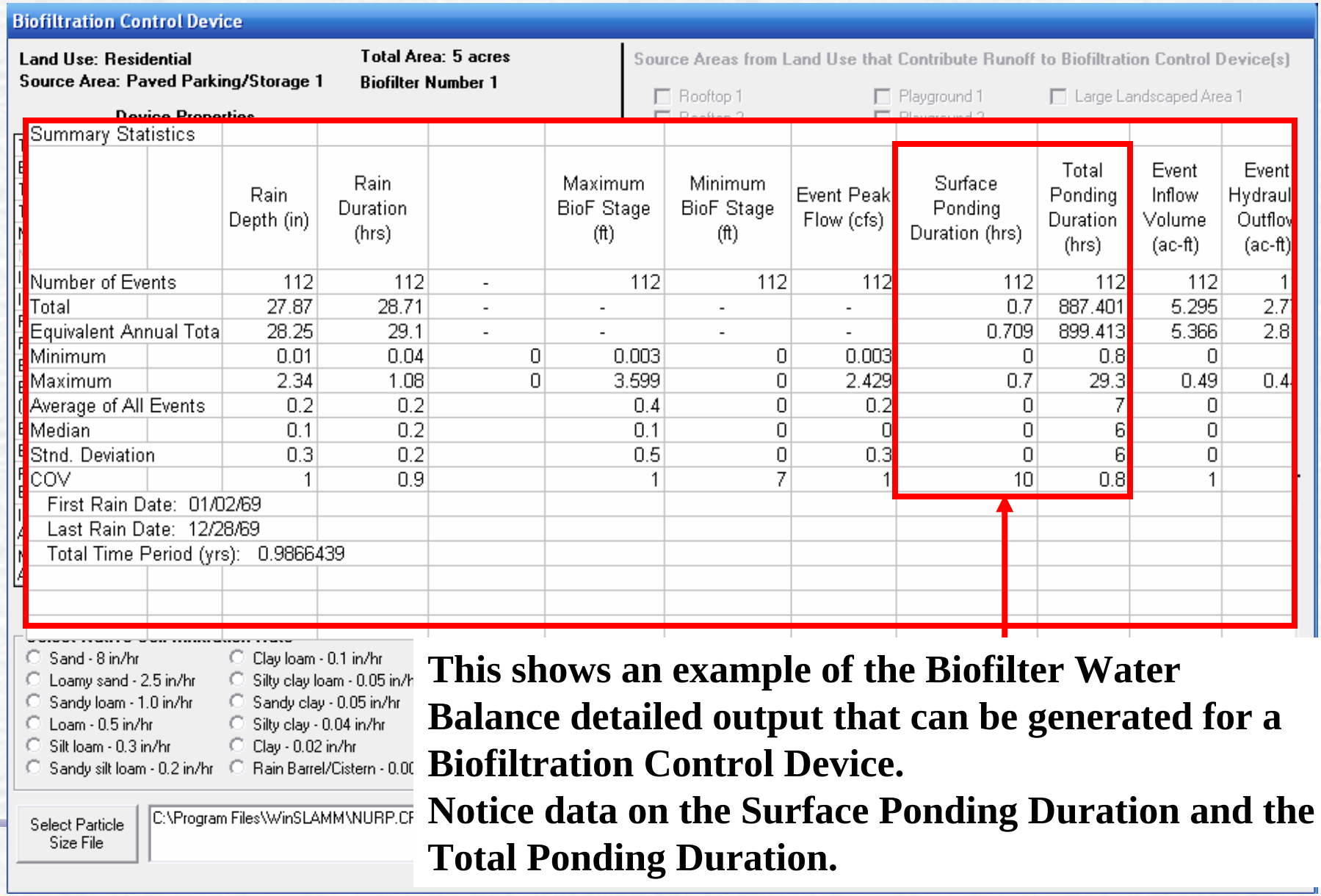

**Data for a biofilter can be copied and pasted between *.dat files.**

# Biofiltration Control Device




**Detailed output from the Biofiltration Control Device can be generated by selecting the option in the Program Options screen. Information on how to generate this data is found later in this User's Guide.**

# Biofiltration Control Device

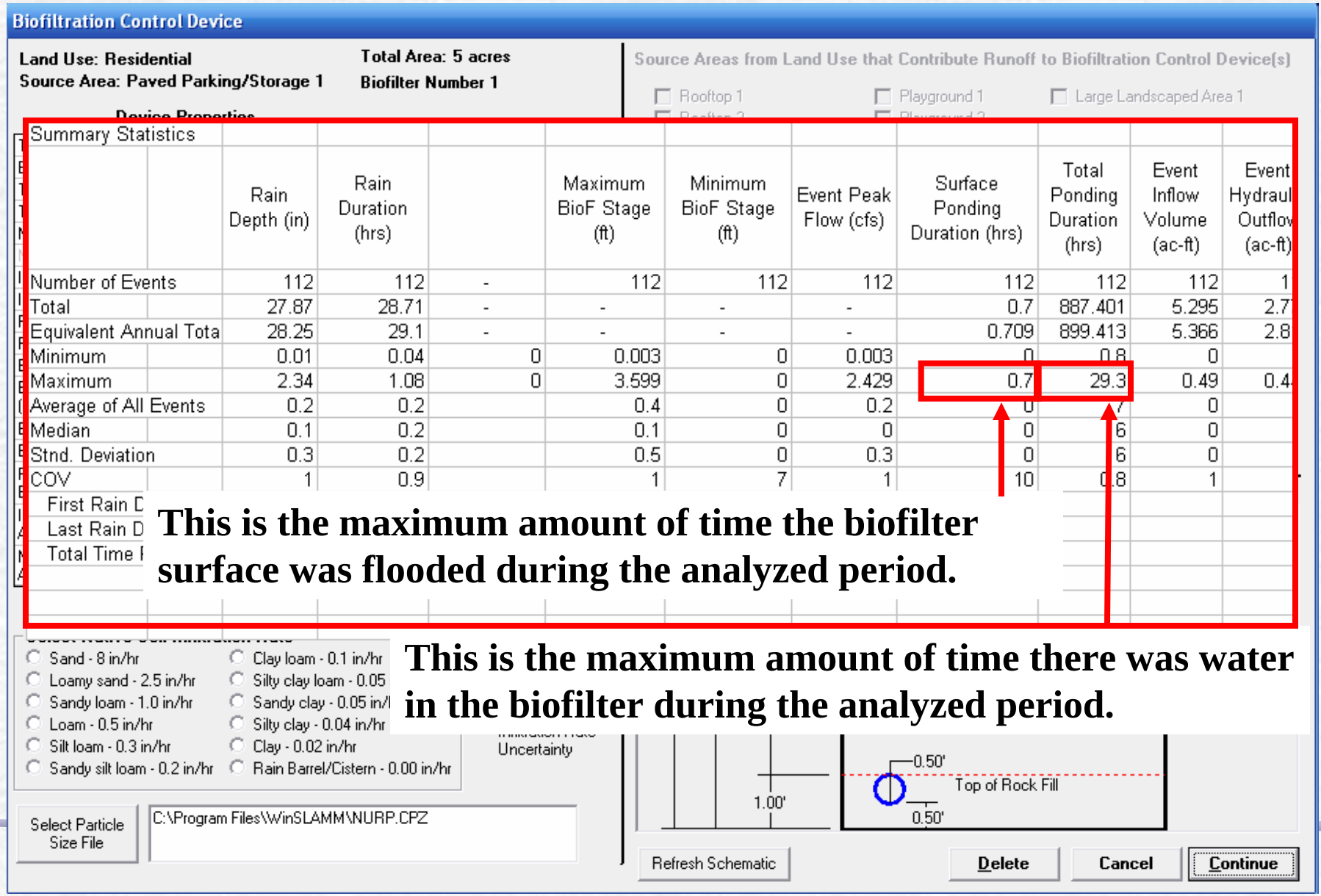



| | Rain Depth (in) | Rain Duration (hrs) | | Maximum BioF Stage (ft) | Minimum BioF Stage (ft) | Event Peak Flow (cfs) | Surface Ponding Duration (hrs) | Total Ponding Duration (hrs) | Event Inflow Volume (ac-ft) | Event Hydraul Outflov (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| Number of Events | 112 | 112 | - | 112 | 112 | 112 | 112 | 112 | 112 | 1 |
| Total | 27.87 | 28.71 | - | - | - | - | 0.7 | 887.401 | 5.295 | 2.7 |
| Equivalent Annual Tota | 28.25 | 29.1 | - | - | - | - | 0.709 | 899.413 | 5.366 | 2.8 |
| Minimum | 0.01 | 0.04 | 0 | 0.003 | 0 | 0.003 | 0 | 0.8 | 0 | |
| Maximum | 2.34 | 1.08 | 0 | 3.599 | 0 | 2.429 | 0.7 | 29.3 | 0.49 | 0.4 |
| Average of All Events | 0.2 | 0.2 | | 0.4 | 0 | 0.2 | 0 | 7 | 0 | |
| Median | 0.1 | 0.2 | | 0.1 | 0 | 0 | 0 | 6 | 0 | |
| Stnd. Deviation | 0.3 | 0.2 | | 0.5 | 0 | 0.3 | 0 | 6 | 0 | |
| COV | 1 | 0.9 | | 1 | 7 | 1 | 10 | 0.8 | 1 | |

First Rain Date: 01/02/69
Last Rain Date: 12/28/69
Total Time Period (yrs): 0.9866439

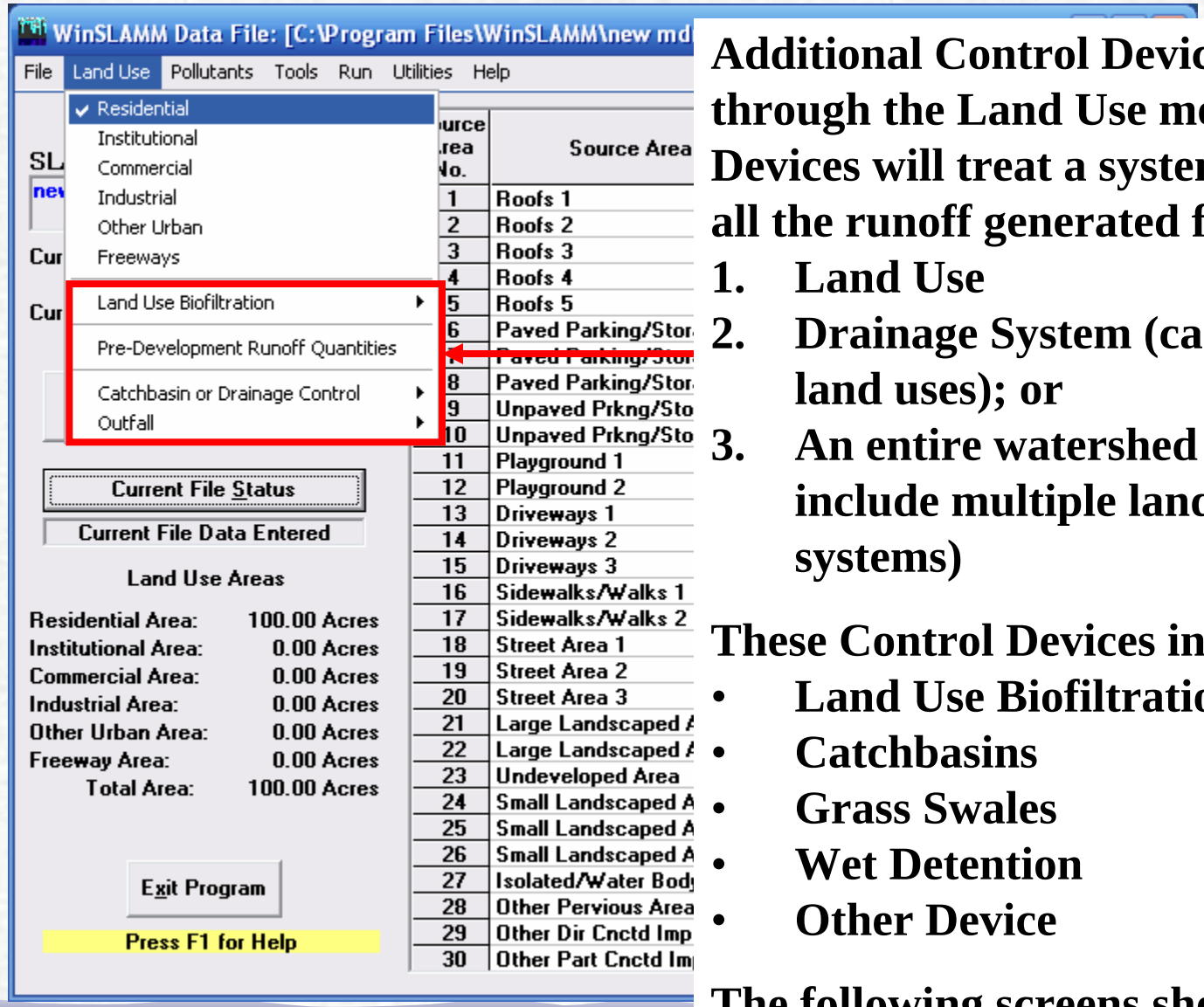
**This shows an example of the Biofilter Water Balance detailed output that can be generated for a Biofiltration Control Device.**
**Notice data on the Surface Ponding Duration and the Total Ponding Duration.**

# Biofiltration Control Device



# Control Devices – System

# System Control Devices




**Additional Control Devices are available through the Land Use menu. These Control Devices will treat a system. A system may be all the runoff generated from a**

1. **Land Use**
2. **Drainage System (can include multiple land uses); or**
3. **An entire watershed (Outfall – can include multiple land uses and drainage systems)**

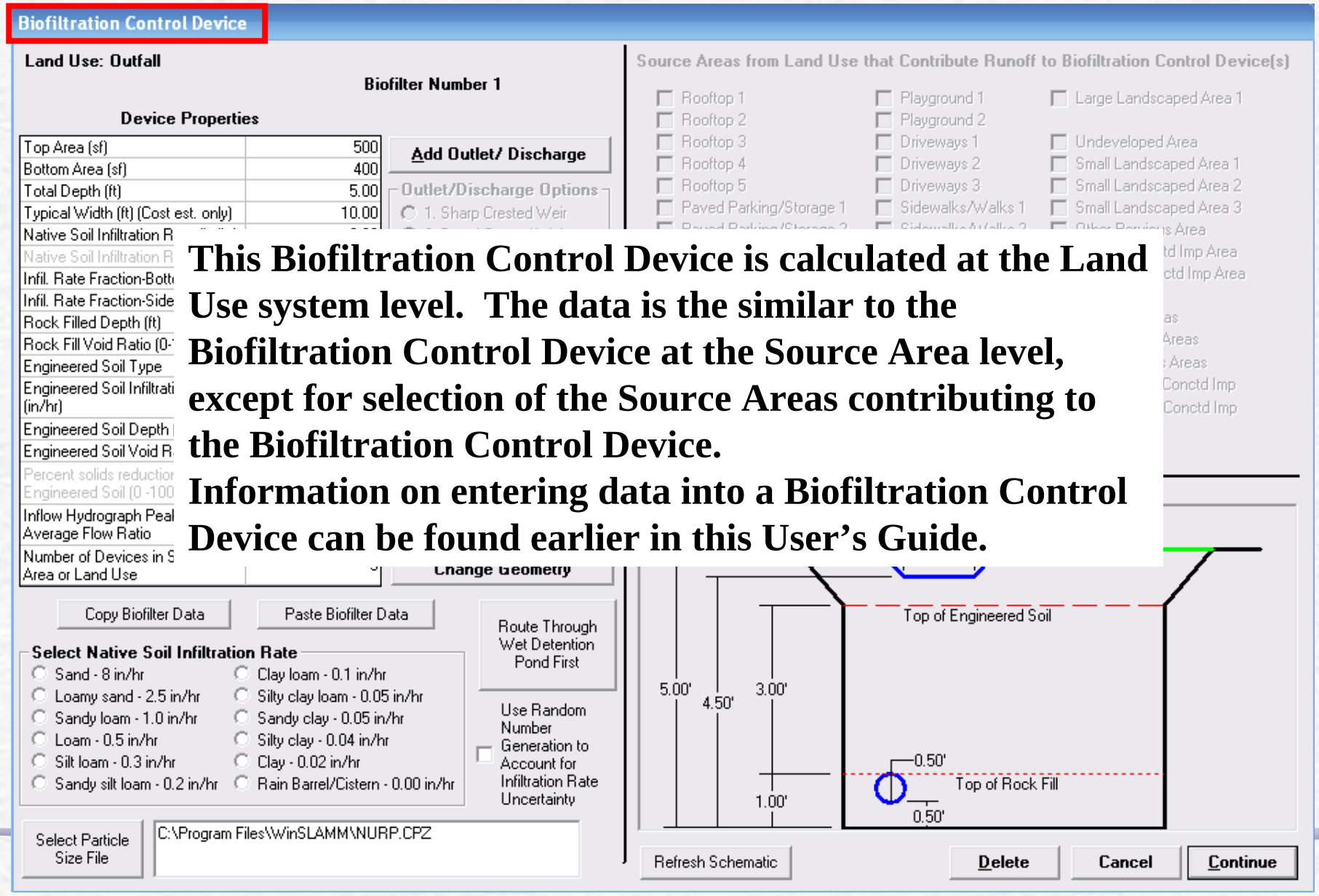
**These Control Devices include:**

- **Land Use Biofiltration**
- **Catchbasins**
- **Grass Swales**
- **Wet Detention**
- **Other Device**

**The following screens show the System Control Devices**

# Control Devices – Land Use Biofiltration

# Land Use Biofiltration

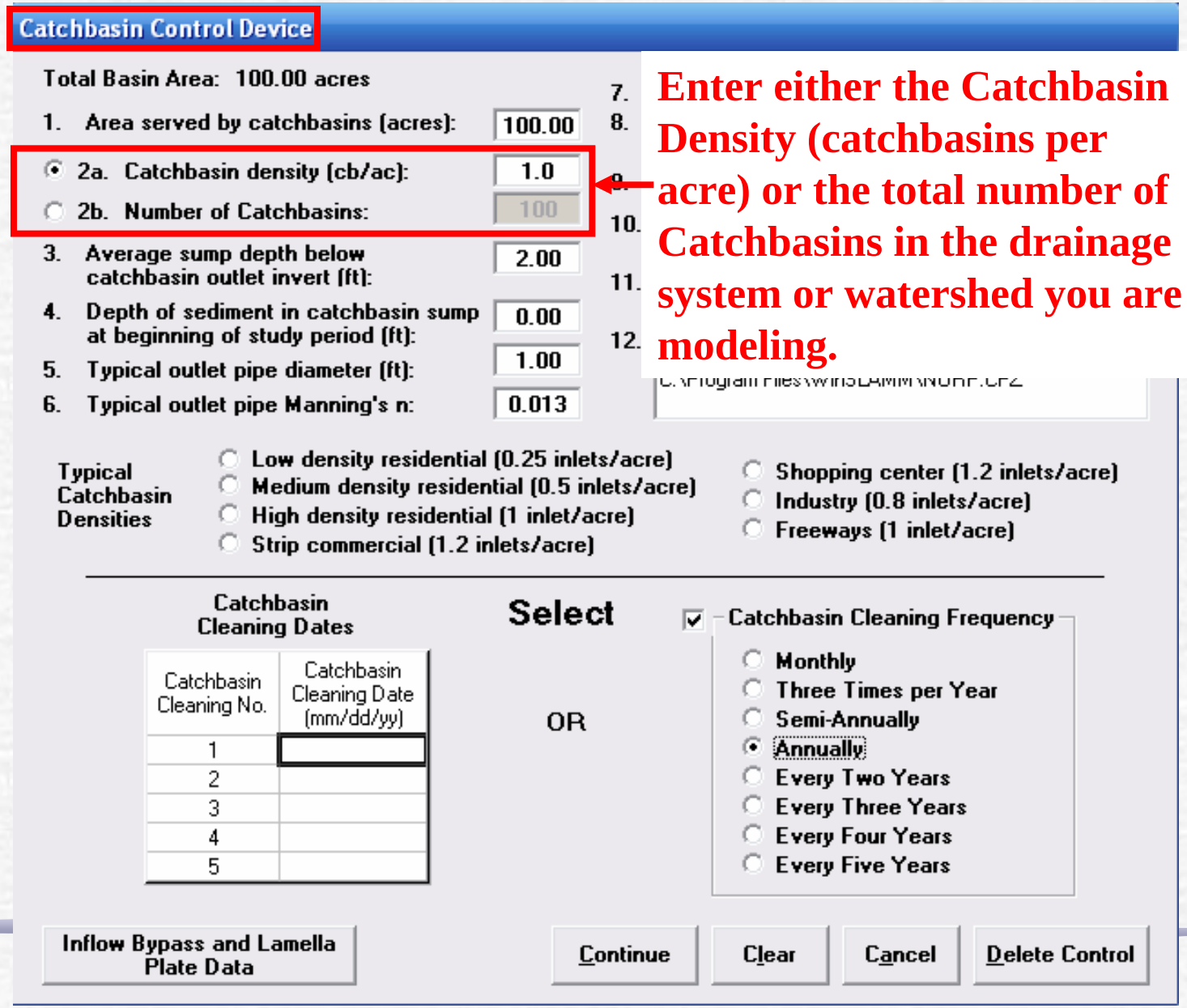



**This Biofiltration Control Device is calculated at the Land Use system level. The data is the similar to the Biofiltration Control Device at the Source Area level, except for selection of the Source Areas contributing to the Biofiltration Control Device.**

**Information on entering data into a Biofiltration Control Device can be found earlier in this User's Guide.**

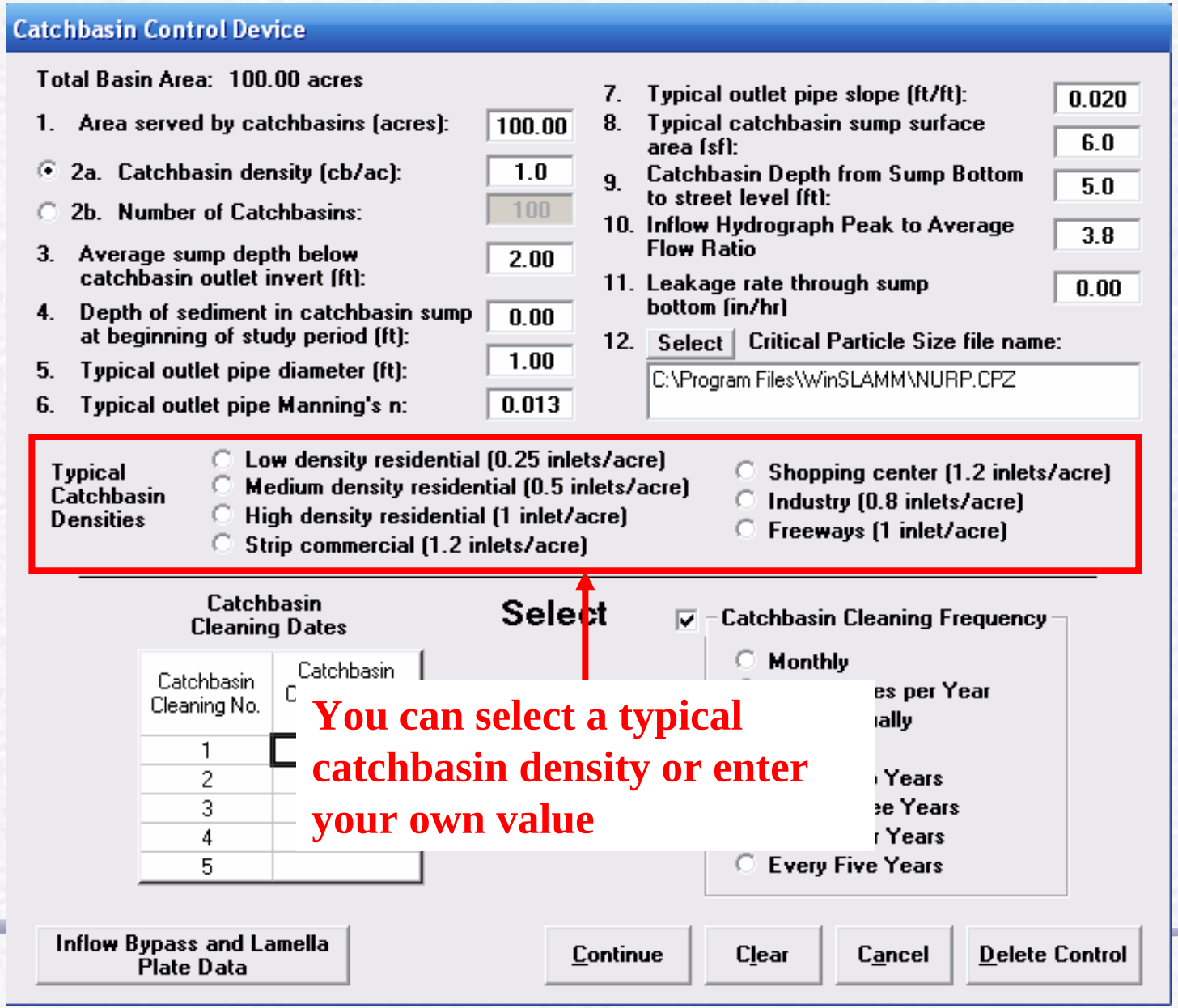
# Control Devices – Catchbasins

# Catchbasin Control Device

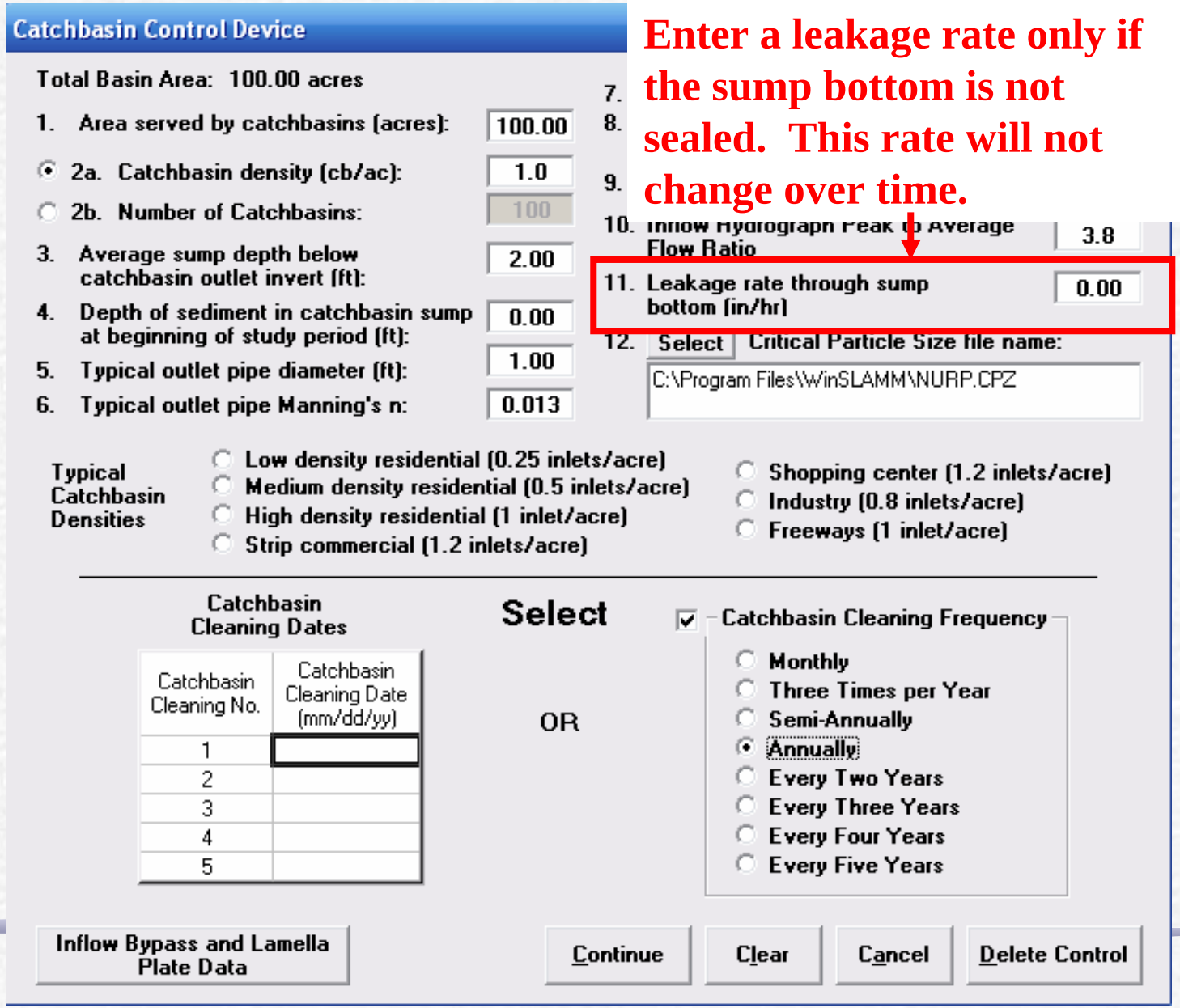



**Enter either the Catchbasin Density (catchbasins per acre) or the total number of Catchbasins in the drainage system or watershed you are modeling.**

# Catchbasin Control Device

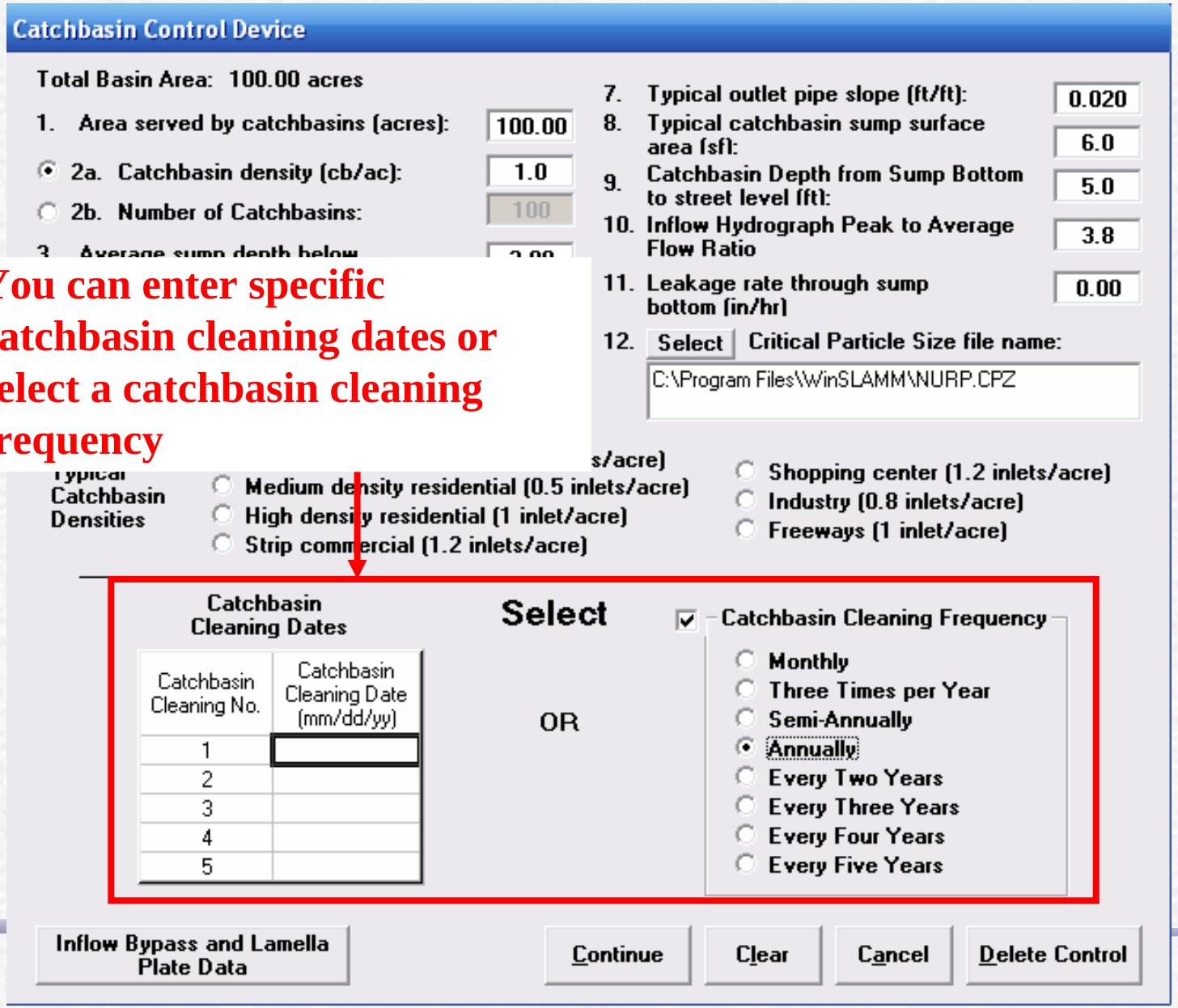


# Catchbasin Control Device

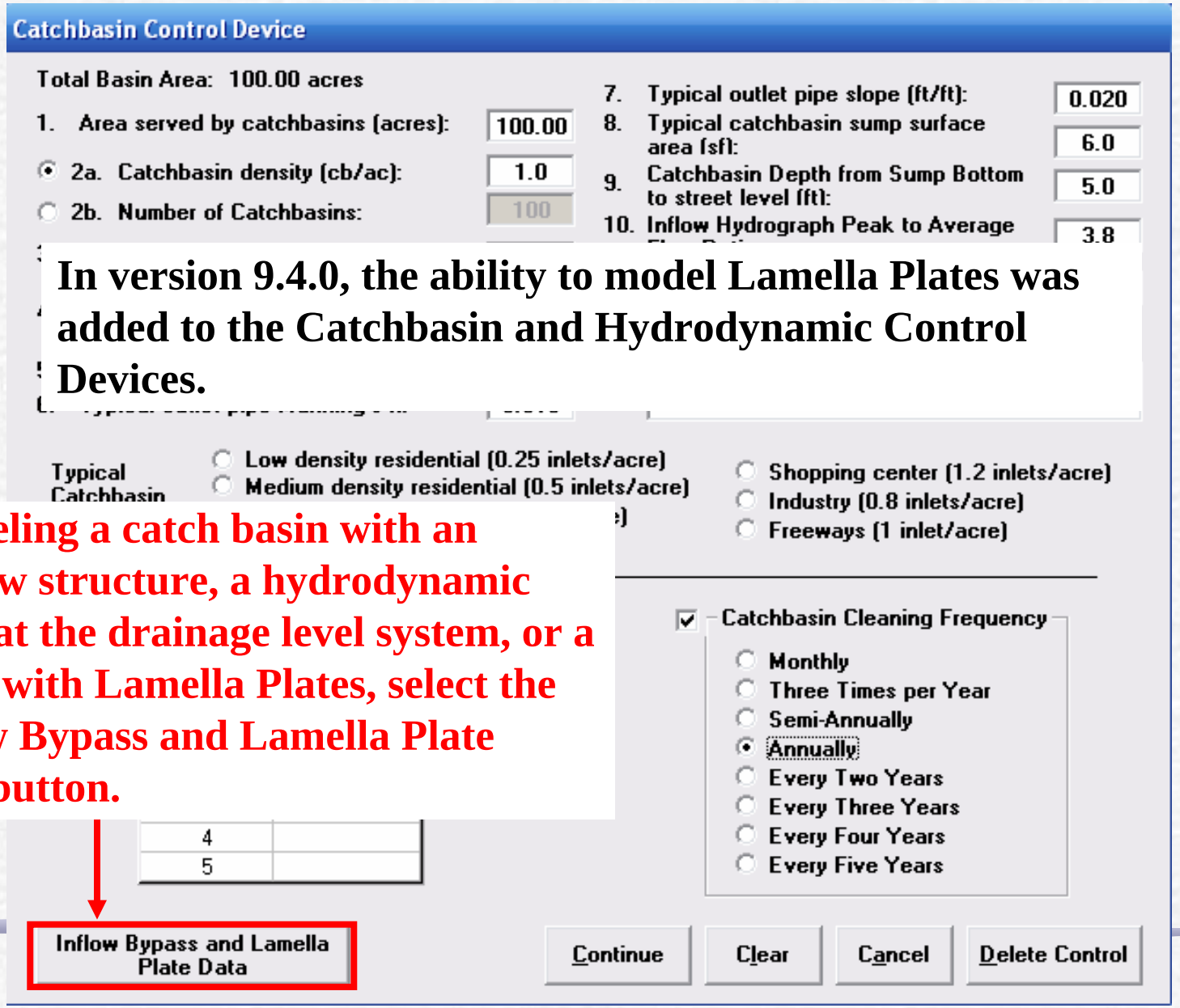



**Enter a leakage rate only if the sump bottom is not sealed. This rate will not change over time.**

# Catchbasin Control Device



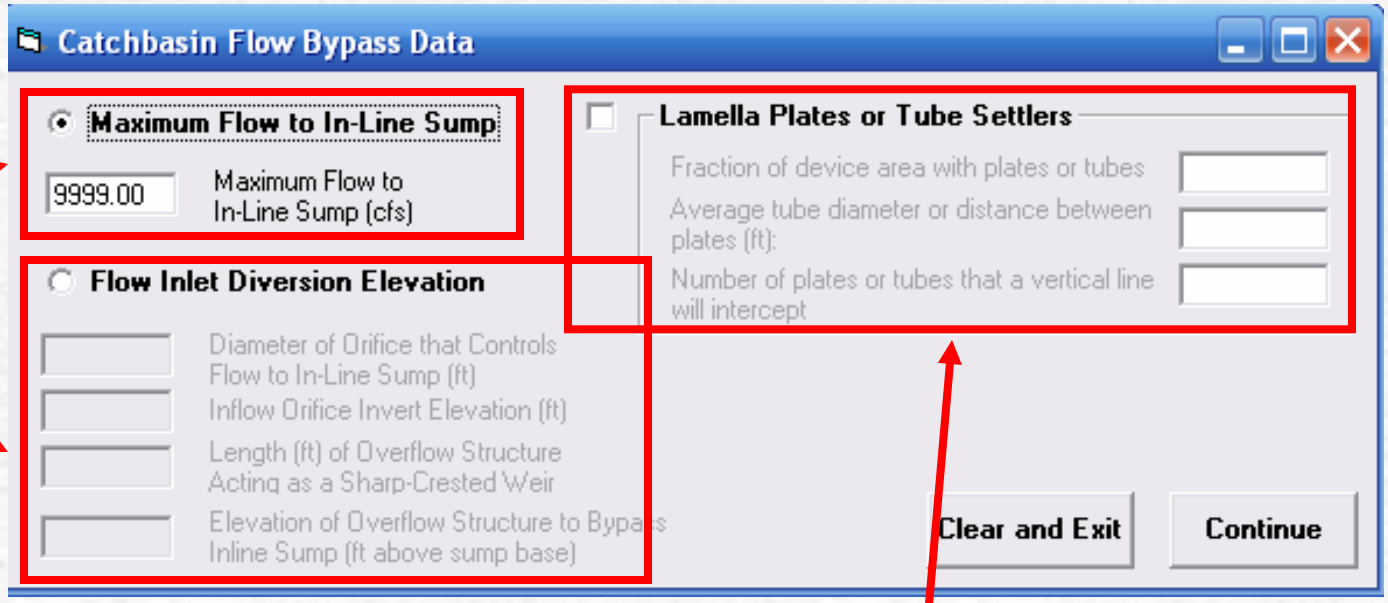
# Catchbasin Control Device



# Catchbasin Control Device

**The data required for this control device when using the bypass is the same data required for the hydrodynamic device.**

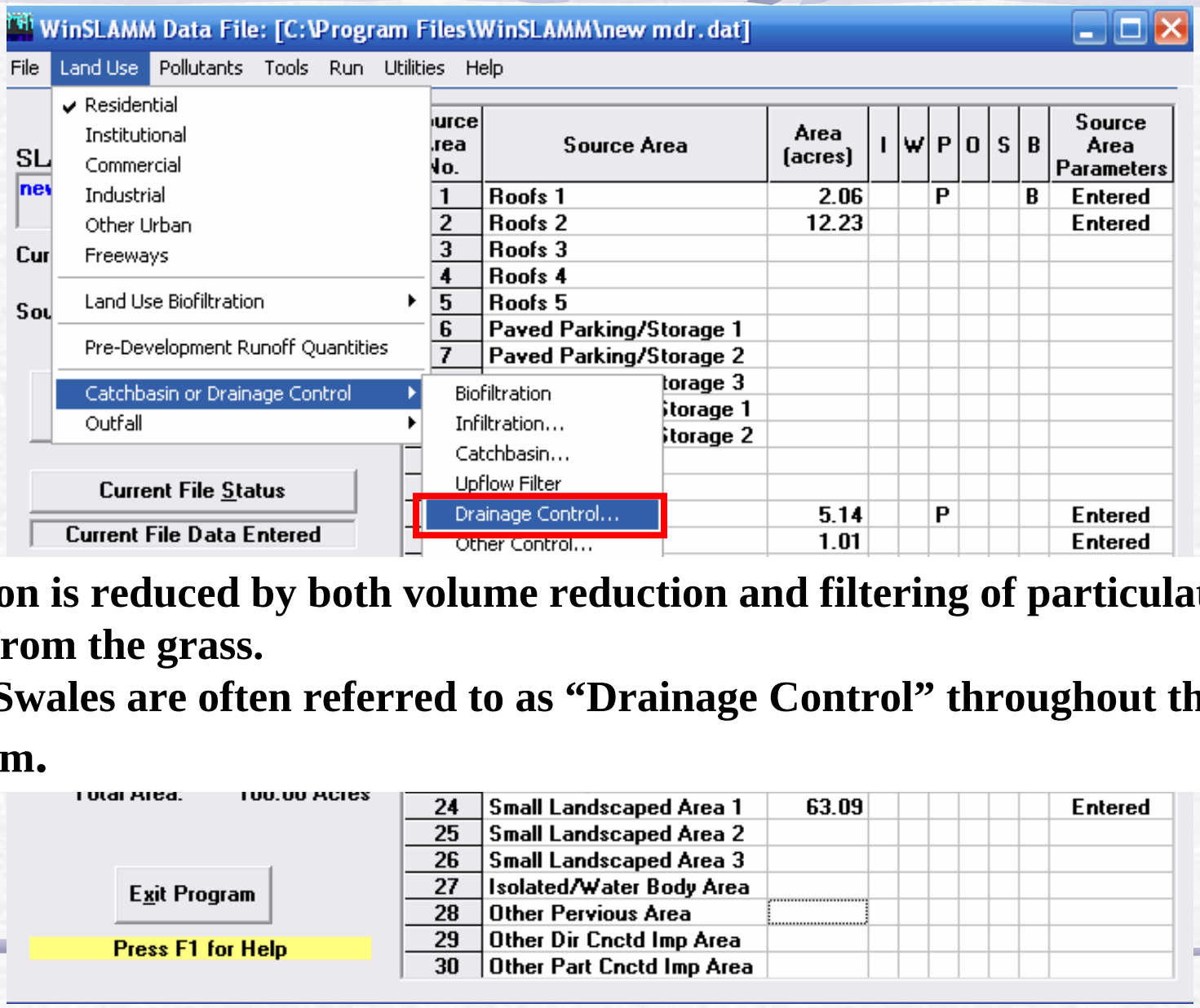
**Enter the Maximum Flow to the In-Line Sump if known.**
**Or enter the characteristics of the diversion and the program will calculate the maximum flow.**




**Enter the data for the Lamella Plates if relevant.**

# Control Devices – Grass Swales

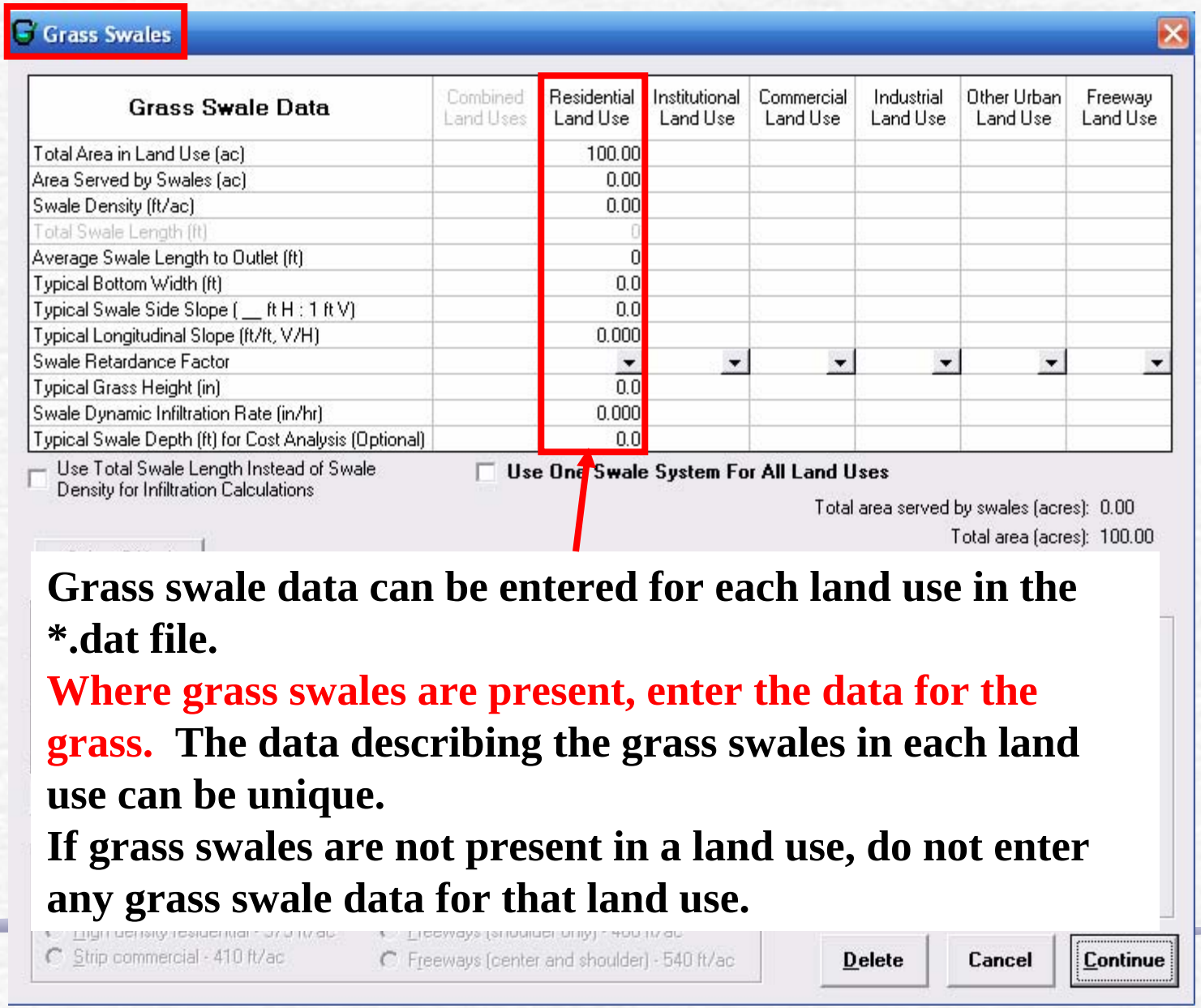
# Grass Swales




**Pollution is reduced by both volume reduction and filtering of particulate solids from the grass.**

**Grass Swales are often referred to as "Drainage Control" throughout the program.**

# Grass Swales

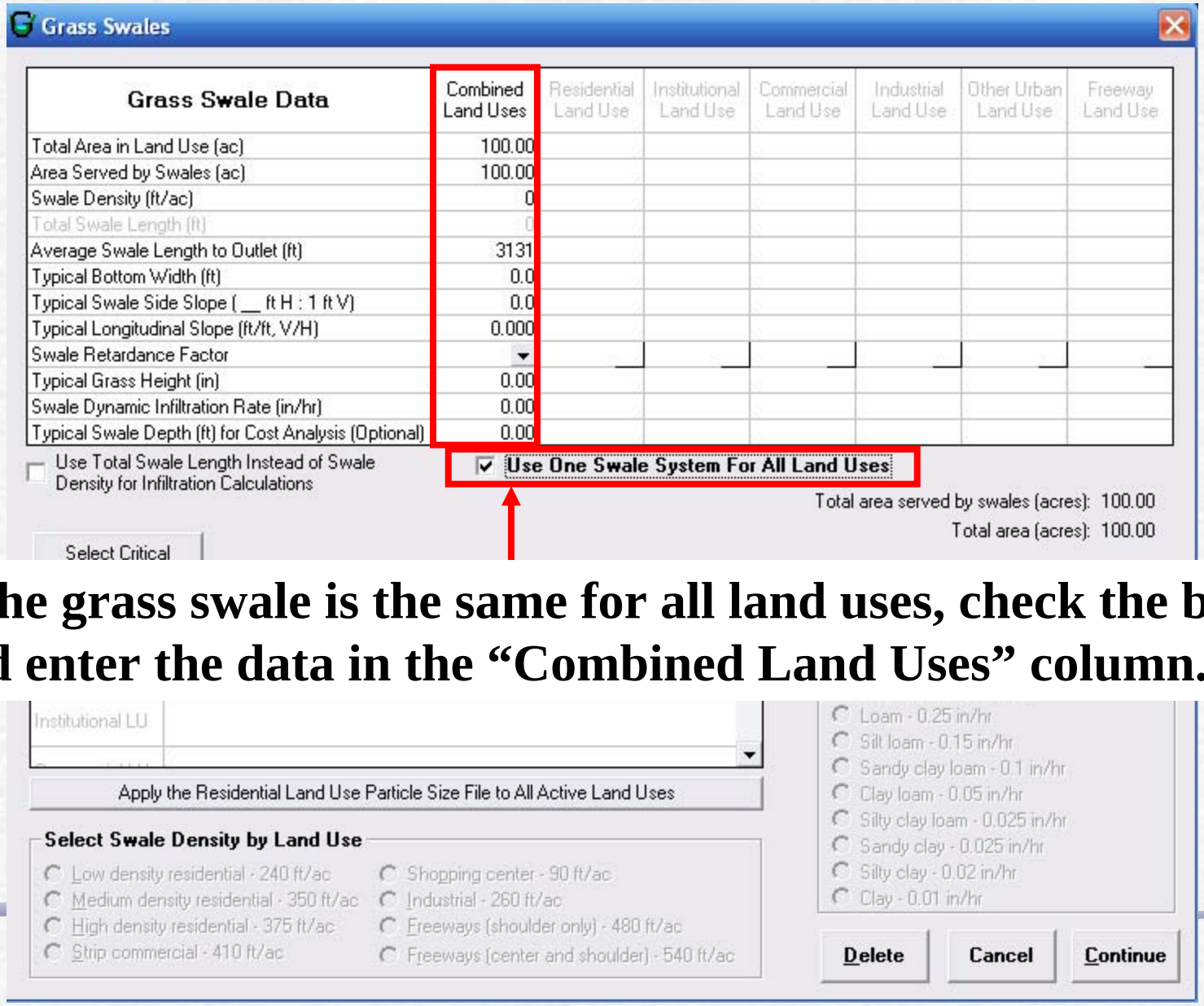



**Grass swale data can be entered for each land use in the *.dat file.**

**Where grass swales are present, enter the data for the grass. The data describing the grass swales in each land use can be unique.**

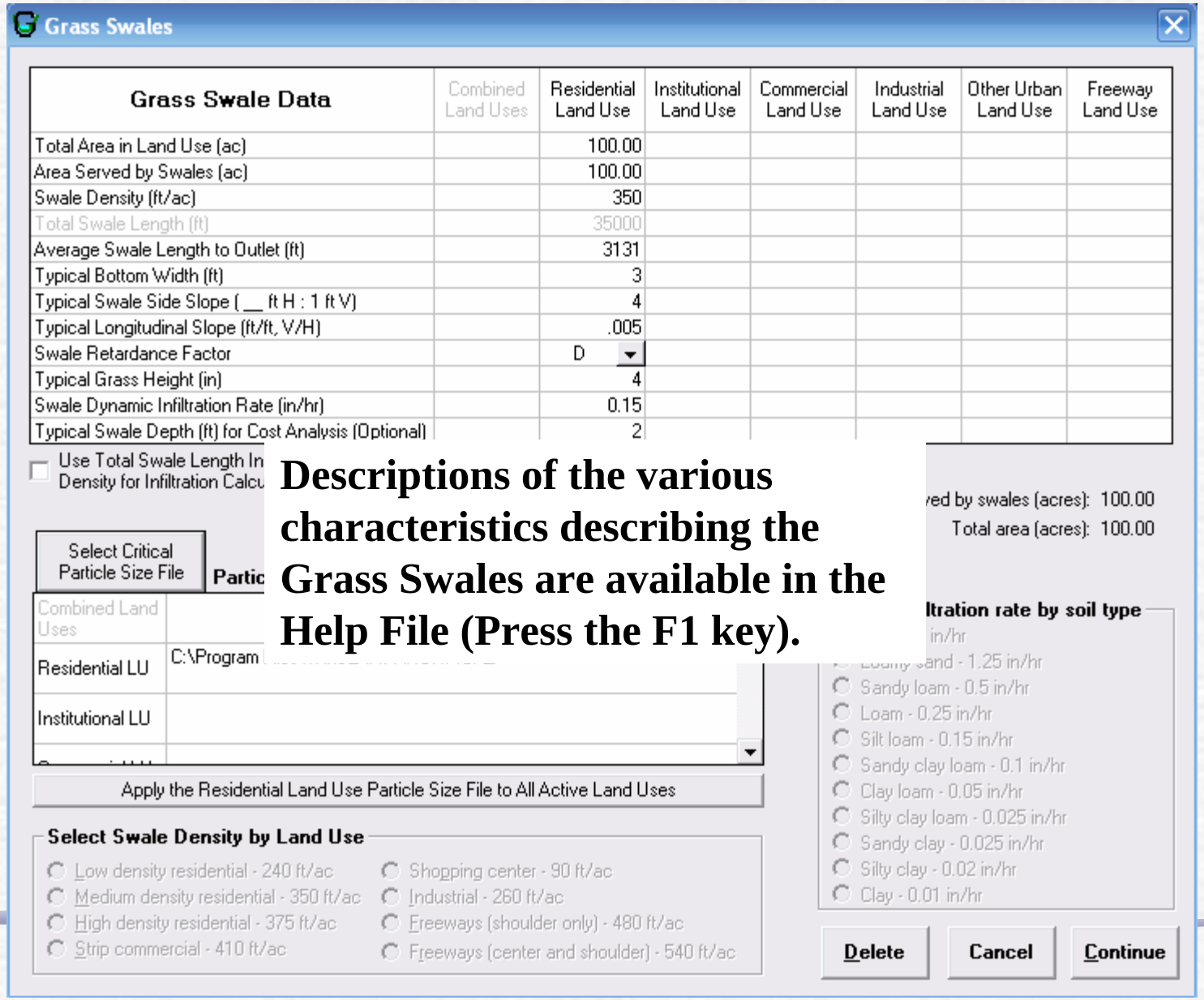
**If grass swales are not present in a land use, do not enter any grass swale data for that land use.**

# Grass Swales




**If the grass swale is the same for all land uses, check the box and enter the data in the "Combined Land Uses" column.**

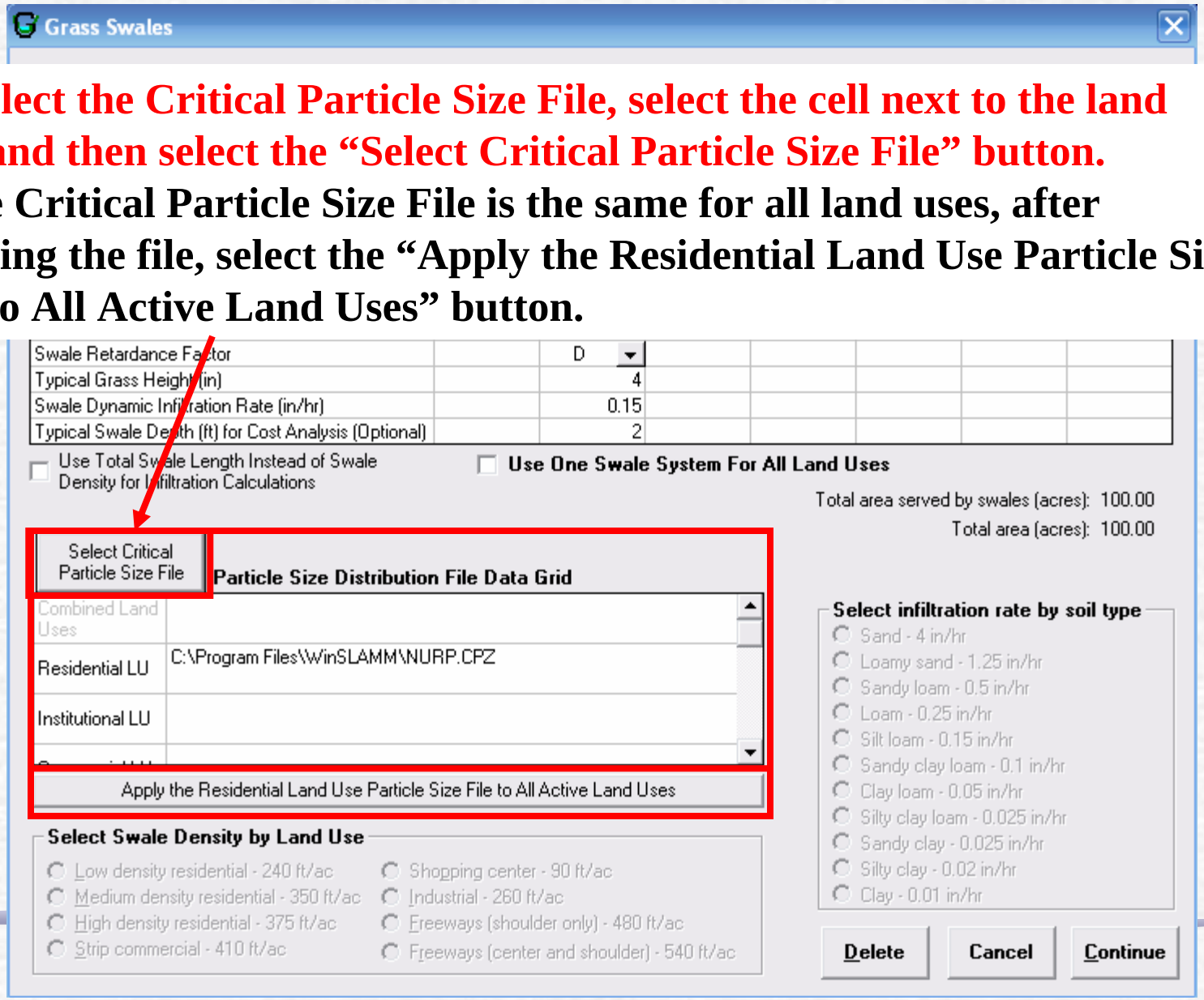
# Grass Swales



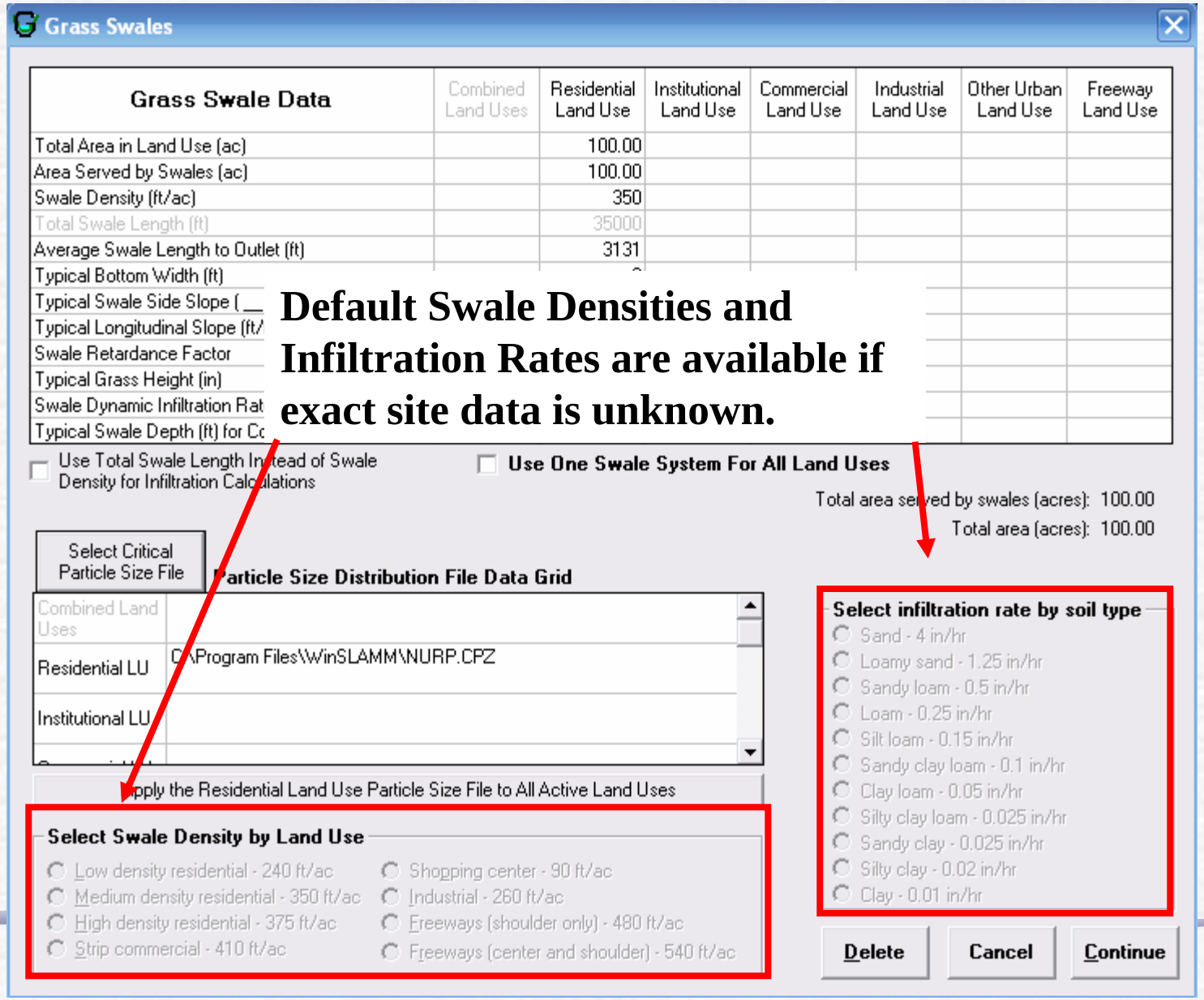
# Grass Swales

**To select the Critical Particle Size File, select the cell next to the land use, and then select the "Select Critical Particle Size File" button.**

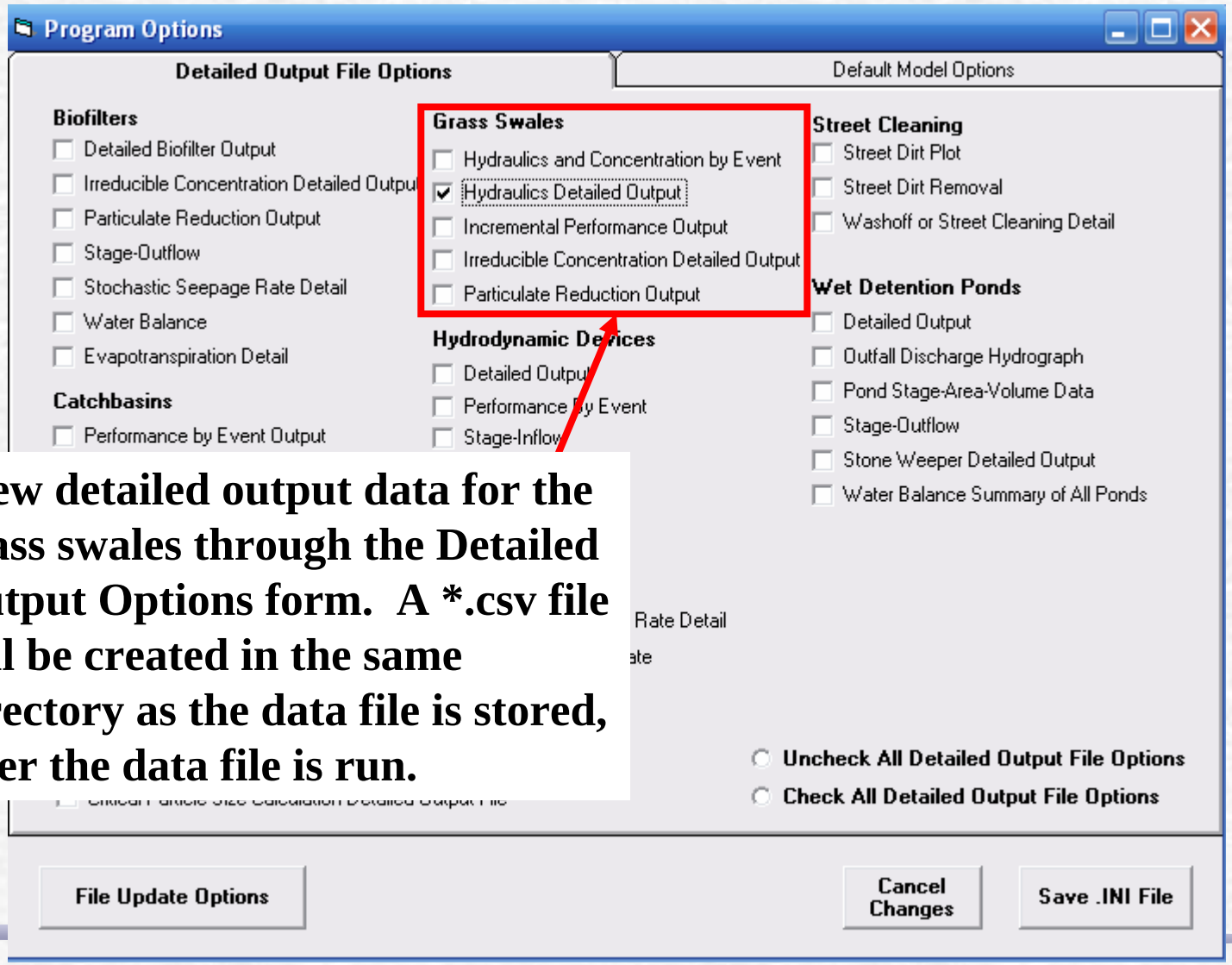
**If the Critical Particle Size File is the same for all land uses, after entering the file, select the "Apply the Residential Land Use Particle Size File to All Active Land Uses" button.**



# Grass Swales



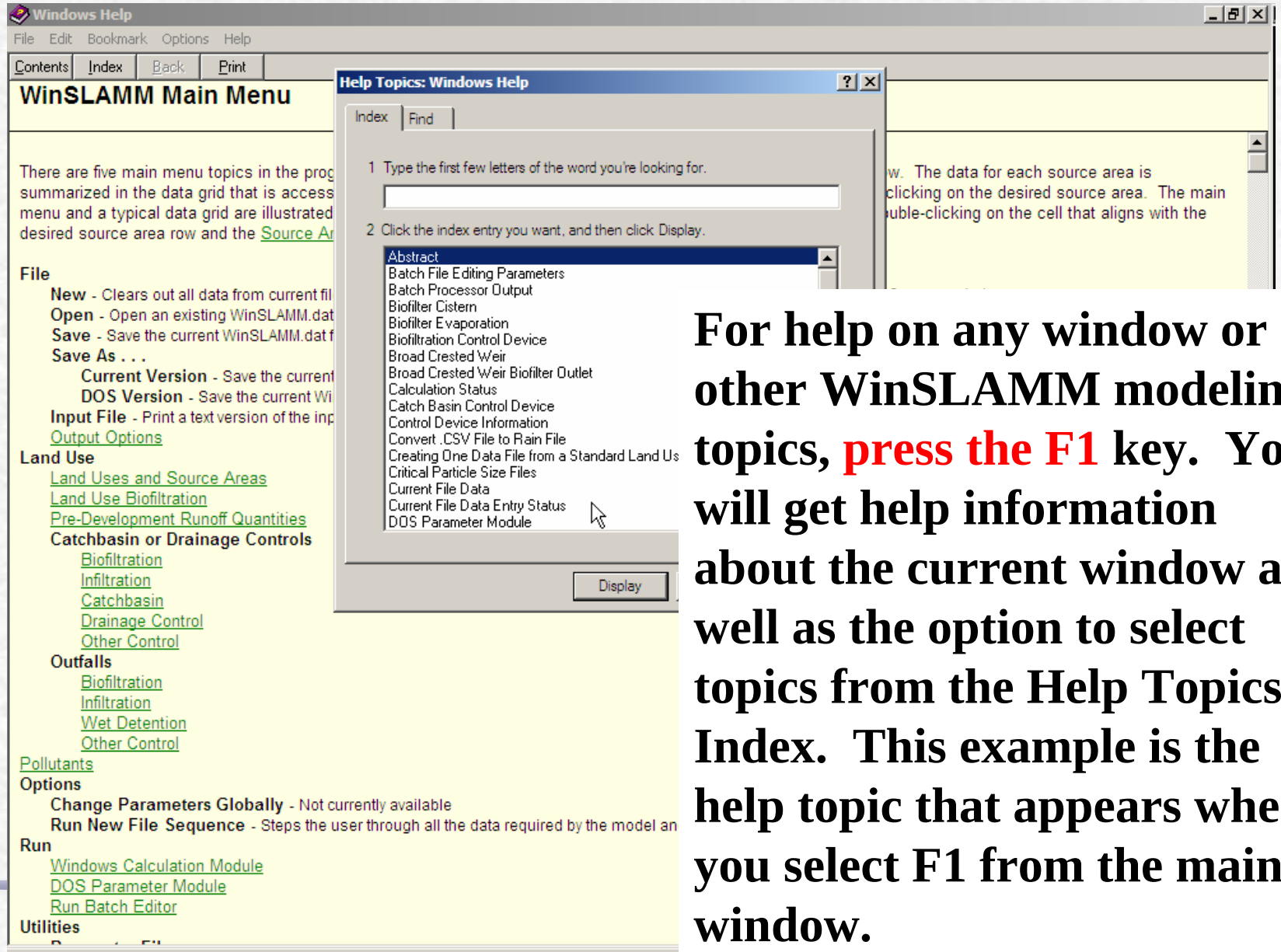
# Grass Swales




**View detailed output data for the grass swales through the Detailed Output Options form. A *.csv file will be created in the same directory as the data file is stored, after the data file is run.**

# For Additional Information See . . .

# The Context-Sensitive Help in the Program




**For help on any window or on other WinSLAMM modeling topics, press the F1 key. You will get help information about the current window as well as the option to select topics from the Help Topics Index. This example is the help topic that appears when you select F1 from the main window.**

# Model Documentation Included on the CD

- WinSLAMM Introduction and Basics
- Integration of Water Quality and Design Objectives
- Sources of Stormwater Pollutants
- Stormwater Quality Controls in WinSLAMM
- Using SLAMM
- Biofiltration Example
- Detention Pond Design
- National Stormwater Quality Database (NSQD, version 1.1)