Steady State Peaking Flow Analysis

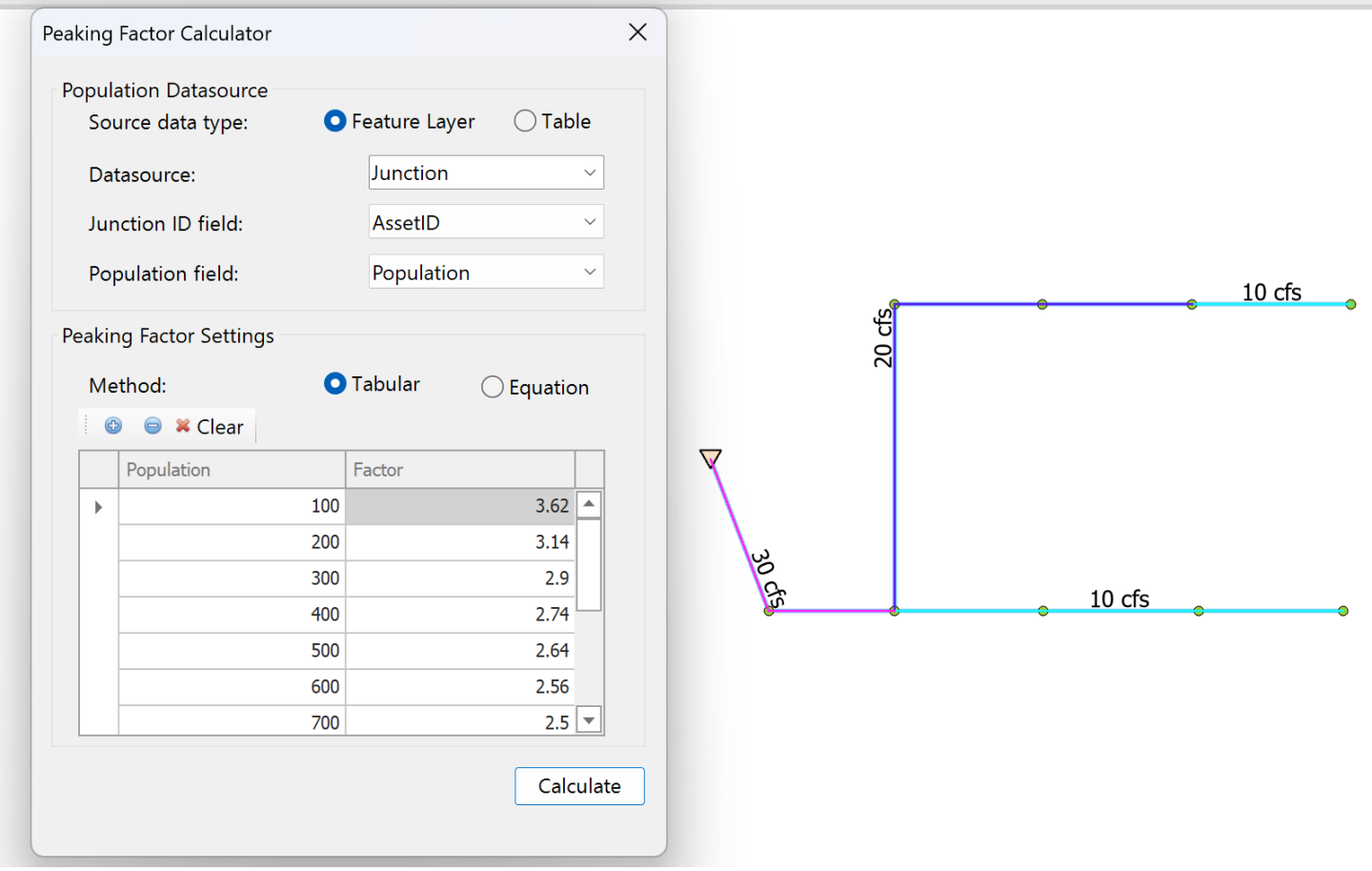


Figure 1: Example of adding the peaking factors in AquaTwin Sewer.

Contents

Adding Peaking Factors

Adding Population Based Peaking Factors

1. The *Peaking Factor Calculator* tool under *Data Explorer* > *Tools* (**Figure 2**) can be used to add population based peaking factors into the sewer model.

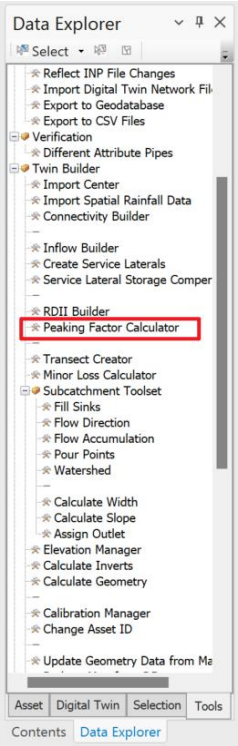


Figure 2: The *Peaking Factor Calculator* tool location.

2. The *Peaking Factor Calculator* requires a population dataset associated with junctions or nodes to calculate the subsequent peaking factors. This population dataset can be a feature class or external table with matching junction asset IDs. **Figure 3** shows how to import the population data from a feature layer based on matching junction asset IDs.

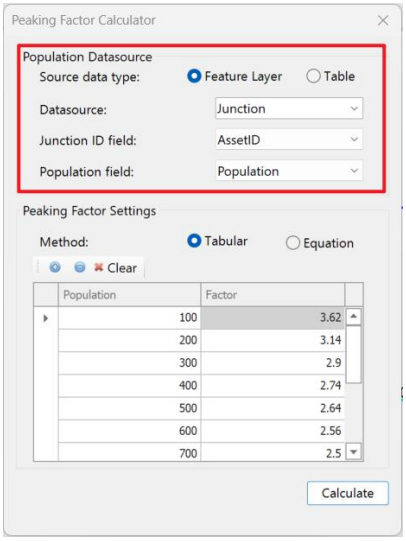


Figure 3: Population data source in the *Peaking Factor Calculator*.

3. AquaTwin Sewer allows the user to import their population based peaking factor in two separate ways:
    - Tabular Method: The tabular method allows the user to create a table of population vs peaking factors.

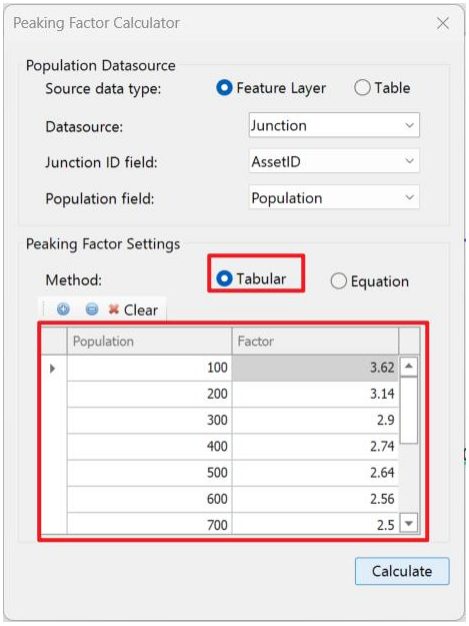


Figure 4: An example of tabular peaking factors.

- Equation Method: The equation method allows the user to add peaking factors based on a general exponential equation as shown in **Figure 5**. This generic equation is,

$$\text{Peaking Factor} = c_1 + \frac{c_2 + (m_1 P)^{e_1}}{c_3 + (m_2 P)^{e_2}}$$

Where, $c_1, c_2, c_3, m_1, m_2, e_1$, and e_2 are all constants.

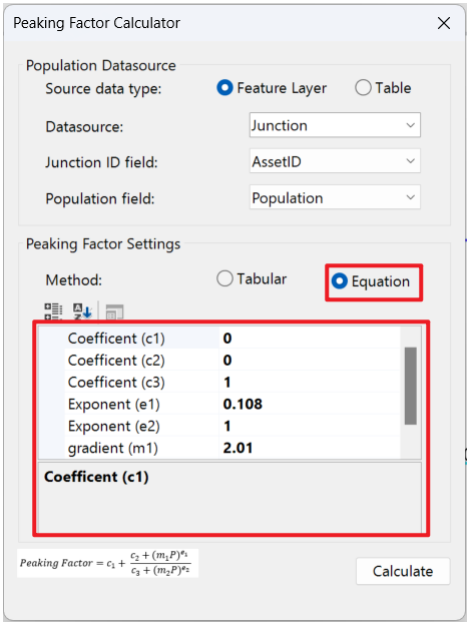
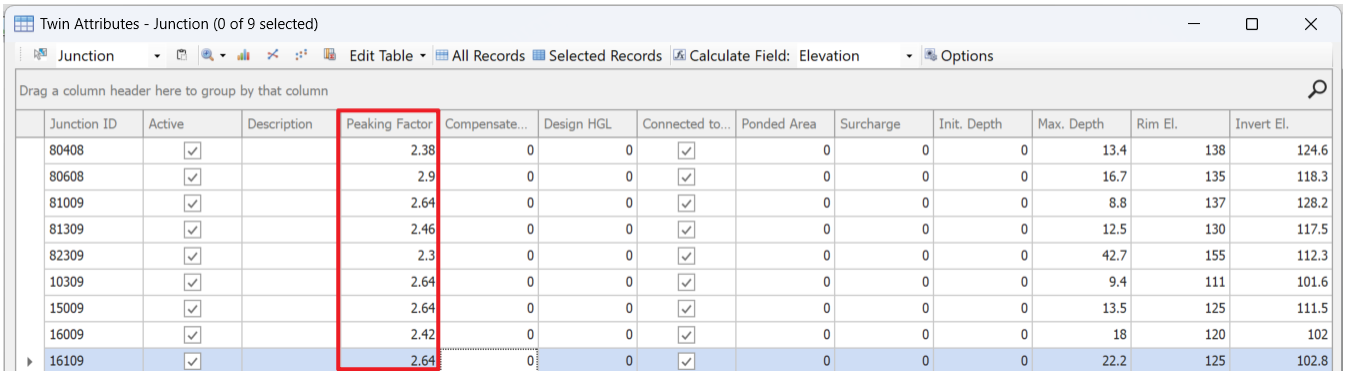


Figure 5: An example of peaking factors based on generic equation.

Finally, the *Calculate* button will calculate and add the population based peaking factors in the *Junction Twin Attribute Tables*.

Adding/Modifying Peaking Factors from Junction Twin Attribute Tables

1. The calculated peaking factors are populated as a model parameter in the *Junction Twin Attribute Table* **(Figure 6)**. The user can add new or modify the already calculated peaking factors here.



Junction ID	Active	Description	Peaking Factor	Compensate...	Design HGL	Connected to...	Ponded Area	Surcharge	Init. Depth	Max. Depth	Rim El.	Invert El.
80408	☑		2.38	0	0	☑	0	0	0	13.4	138	124.6
80608	☑		2.9	0	0	☑	0	0	0	16.7	135	118.3
81009	☑		2.64	0	0	☑	0	0	0	8.8	137	128.2
81309	☑		2.46	0	0	☑	0	0	0	12.5	130	117.5
82309	☑		2.3	0	0	☑	0	0	0	42.7	155	112.3
10309	☑		2.64	0	0	☑	0	0	0	9.4	111	101.6
15009	☑		2.64	0	0	☑	0	0	0	13.5	125	111.5
16009	☑		2.42	0	0	☑	0	0	0	18	120	102
16109	☑		2.64	0	0	☑	0	0	0	22.2	125	102.8

Figure 6: Adding/modifying the peaking factors from *Junction Twin Attribute Tables*.

Steady State Analysis

Starting a Steady State Analysis

1. To run a steady state simulation in AquaTwin Sewer, the user will need to go to *Digital Twin* > *Run Options* > *General* > *Routing model* and select *Steady_Flow* from the dropdown menu **(Figure 7)**.

   The *Steady_Flow* routing method cannot model adverse sloped pipes and backwater effect. Moreover, Divider node may be required to properly partition flows when 3 or more conduits are connected to a single junction. More on the limitations of *Steady_Flow* routing method can be found in the EPA SWMM Hydraulic Manual.

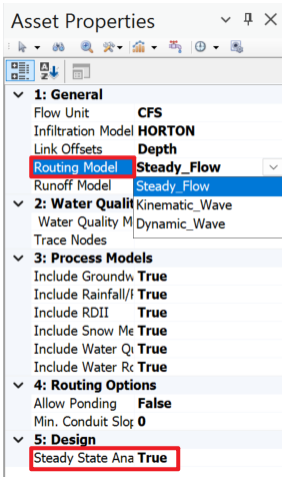
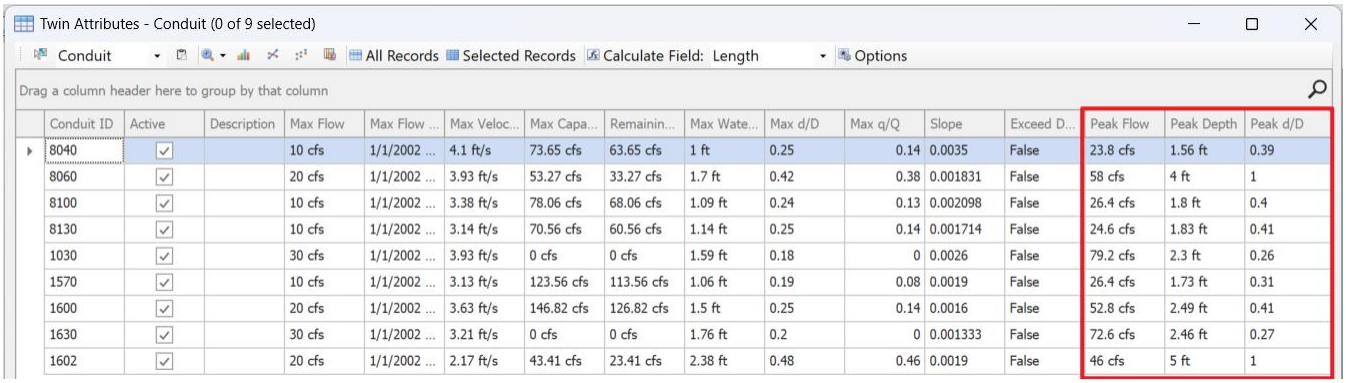


Figure 7: Selecting the Steady_Flow routing model

2. The user will also need to set the *Steady State Analysis* to True (**Figure 7**), which ignores the patterns and the inflow hydrographs at junctions. Only the constant direct inflow at the junction nodes is turned on for the steady state analysis. The peaking factors are **applied only** if this *Steady State Analysis* option is turned on.

Viewing Peaked Flow Results

1. After running the simulation, the peaked flow at all the conduits can be viewed from the *Conduit Twin Attribute* > *Options* > *Summary results* (**Figure 8**).



Conduit ID	Active	Description	Max Flow	Max Flow ...	Max Veloc...	Max Capa...	Remainin...	Max Wate...	Max d/D	Max q/Q	Slope	Exceed D...	Peak Flow	Peak Depth	Peak d/D
8040	☑		10 cfs	1/1/2002 ...	4.1 ft/s	73.65 cfs	63.65 cfs	1 ft	0.25	0.14	0.0035	False	23.8 cfs	1.56 ft	0.39
8060	☑		20 cfs	1/1/2002 ...	3.93 ft/s	53.27 cfs	33.27 cfs	1.7 ft	0.42	0.38	0.001831	False	58 cfs	4 ft	1
8100	☑		10 cfs	1/1/2002 ...	3.38 ft/s	78.06 cfs	68.06 cfs	1.09 ft	0.24	0.13	0.002098	False	26.4 cfs	1.8 ft	0.4
8130	☑		10 cfs	1/1/2002 ...	3.14 ft/s	70.56 cfs	60.56 cfs	1.14 ft	0.25	0.14	0.001714	False	24.6 cfs	1.83 ft	0.41
1030	☑		30 cfs	1/1/2002 ...	3.93 ft/s	0 cfs	0 cfs	1.59 ft	0.18	0	0.0026	False	79.2 cfs	2.3 ft	0.26
1570	☑		10 cfs	1/1/2002 ...	3.13 ft/s	123.56 cfs	113.56 cfs	1.06 ft	0.19	0.08	0.0019	False	26.4 cfs	1.73 ft	0.31
1600	☑		20 cfs	1/1/2002 ...	3.63 ft/s	146.82 cfs	126.82 cfs	1.5 ft	0.25	0.14	0.0016	False	52.8 cfs	2.49 ft	0.41
1630	☑		30 cfs	1/1/2002 ...	3.21 ft/s	0 cfs	0 cfs	1.76 ft	0.2	0	0.001333	False	72.6 cfs	2.46 ft	0.27
1602	☑		20 cfs	1/1/2002 ...	2.17 ft/s	43.41 cfs	23.41 cfs	2.38 ft	0.48	0.46	0.0019	False	46 cfs	5 ft	1

Figure 8: Viewing peaked flow results from the conduit twin attribute table.

2. Individual peaked flows can be viewed from the Asset Properties window (**Figure 9**).

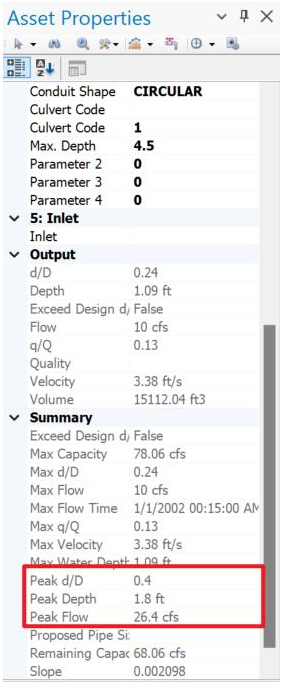


Figure 8: Individual peaked flow in the asset properties window.

Moreover, map display option if also available for peaked flow results.