Mapping The Results of MiDUSS to MiTS Software

MSMA · https://mes100.com/docs/mapping-the-results-of-miduss-to-mits-software/

MiDUSS was (is?) a popular stormwater management design tool that was used by local consultants. This is a guide written for the users who want to transit from MiDUSS to MiTS, and to understand how MiDUSS results map to MiTS results.

MiDUSS and MSMA 2

MiDUSS contains the data for MSMA 1, which makes it suitable for local (Malaysia) use ten years ago when MSMA 2 had not yet been introduced.

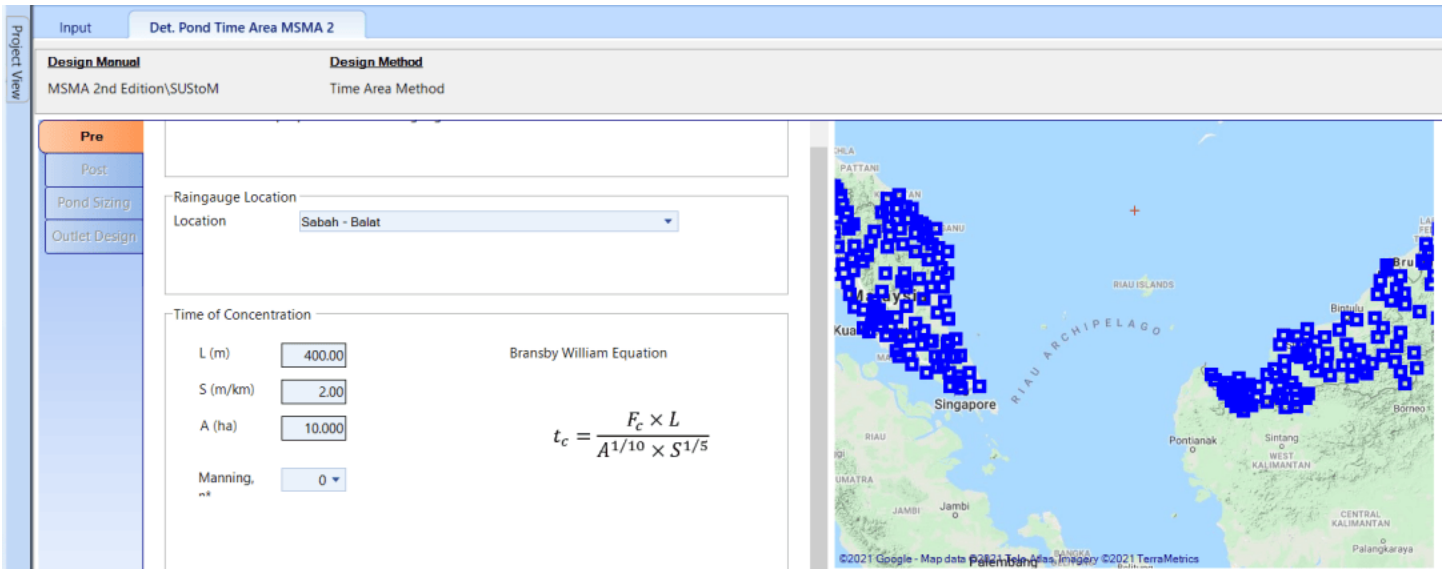
However, it doesn't contain data for MSMA 2 (West Malaysia). Likewise, the new IDF coefficients for Sabah and Sarawak, that are incorporated in the "Estimation of Design Rainstorm in Sabah and Sarawak" handbook (2018) are also not available in MiDUSS. Due to global warming and climate change, the rainfall patterns *do* change significantly. All these entails the latest rainfall data in order to facilitate an adequate stormwater management design to minimize flooding. This handicaps the use of MiDUSS for stormwater design (drainage and pond) in Malaysia.

Not only that MiDUSS provides only Time Area Method, but MSMA 2 also allows for (and some authority insists on) Rational Method. This is yet another shortcoming of MiDUSS.

MiTS contains both MSMA 1 and MSMA 2 data, Time Area and Rational method, and thus makes it suitable for all the local stormwater design use.

Transiting from MiDUSS to MiTS

The MiTS module that maps perfectly to MiDUSS is the **detention pond** module, even for small sites that are normally covered by the OSD method, more on this later. We shall go through them one by one:



Rainfall Input

As far as we can tell, the MiDUSS method is based essentially on the Time Area Method (MSMA suggests it to be used when your development area is more than 80 hectare), and the IDF curve is similar to that used in MSMA 1.

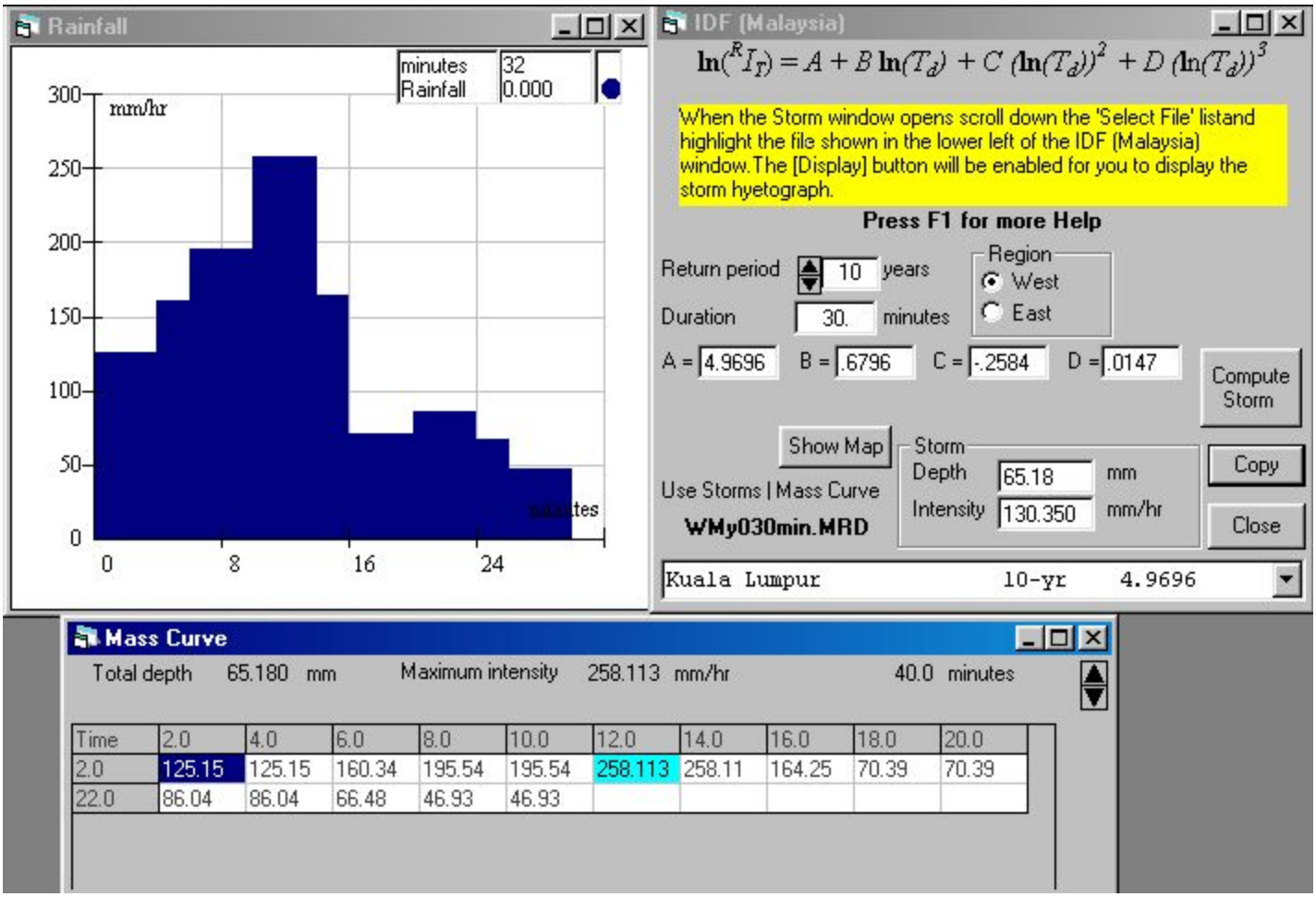
$$ln({}^{R}I_t) = a + b\,ln(t) + c(ln(t))^2 + d(ln(t))^3$$

Polynomial IDF Curve Equation (MSMA1 Equation 13.2)

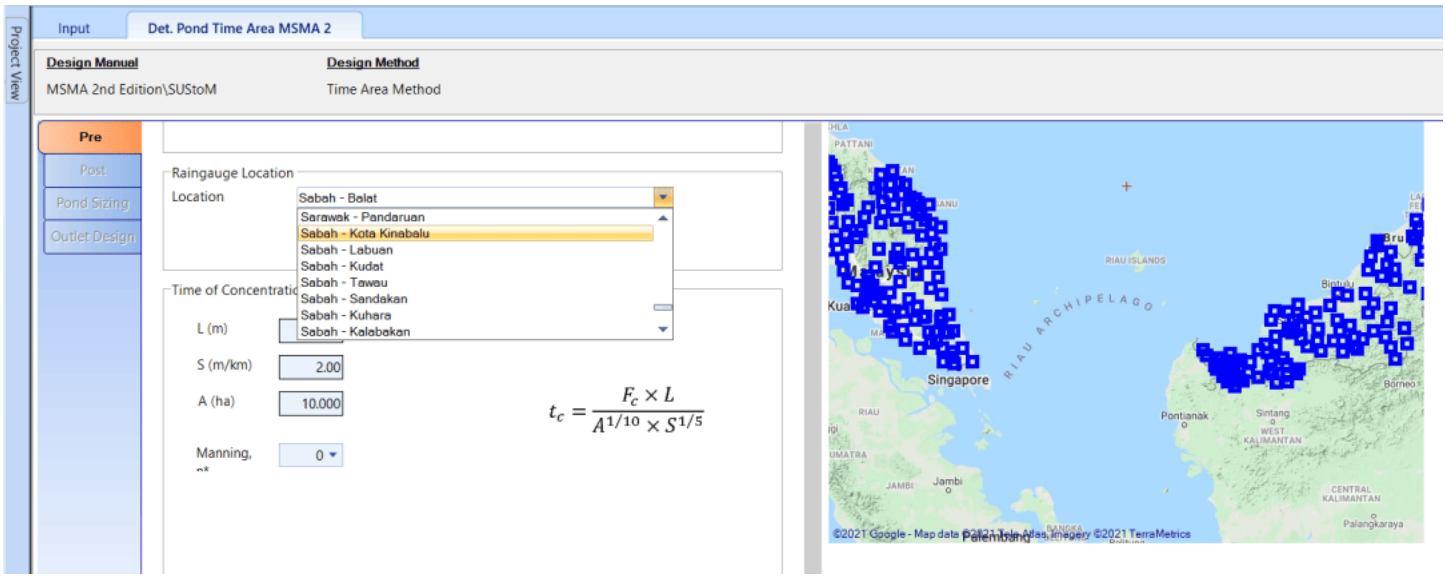
And it's different from the IDF curve formula that we use in MSMA 2.

$$i = \frac{\lambda T^{\kappa}}{(d+\theta)^{\eta}}$$

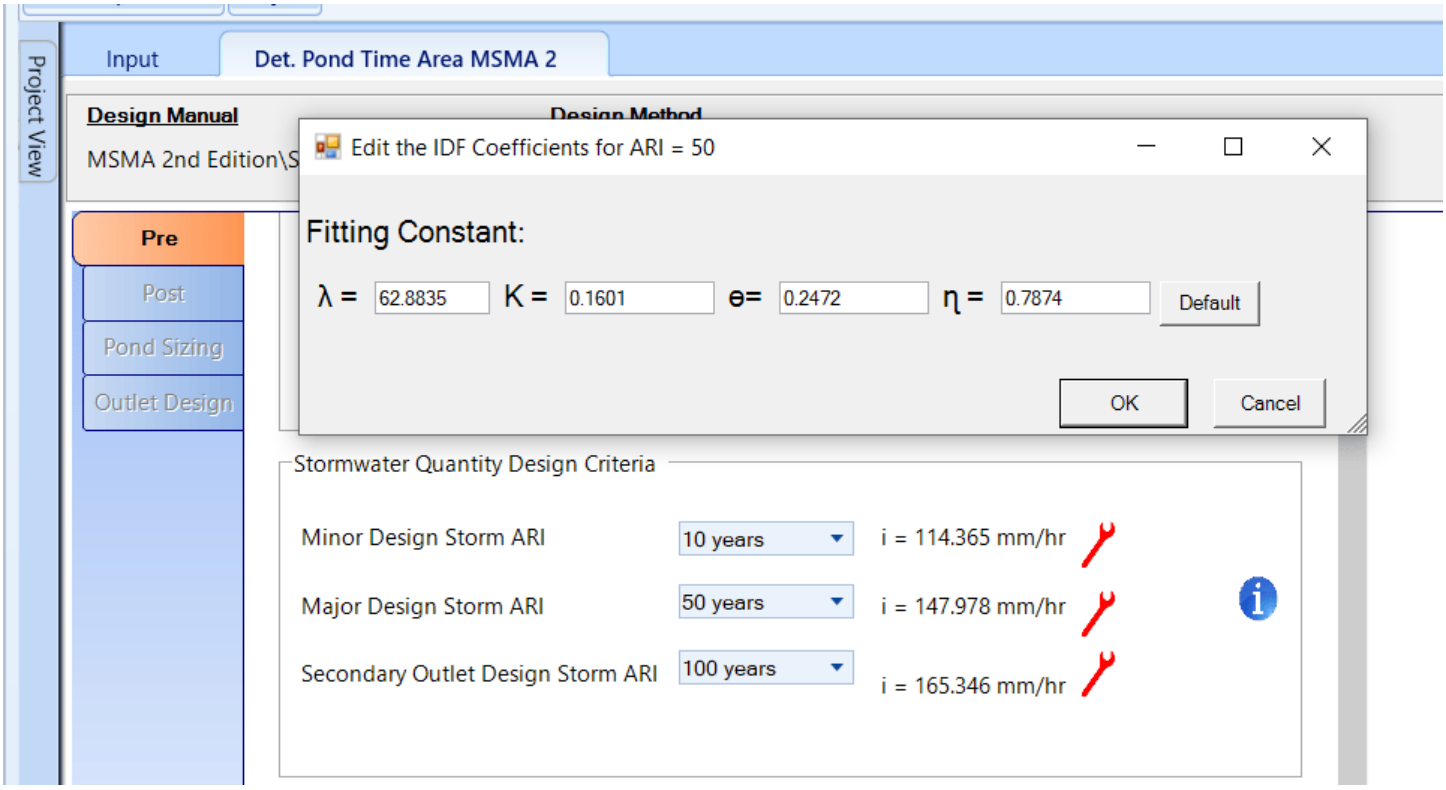
MSMA 2 Equation 2.2



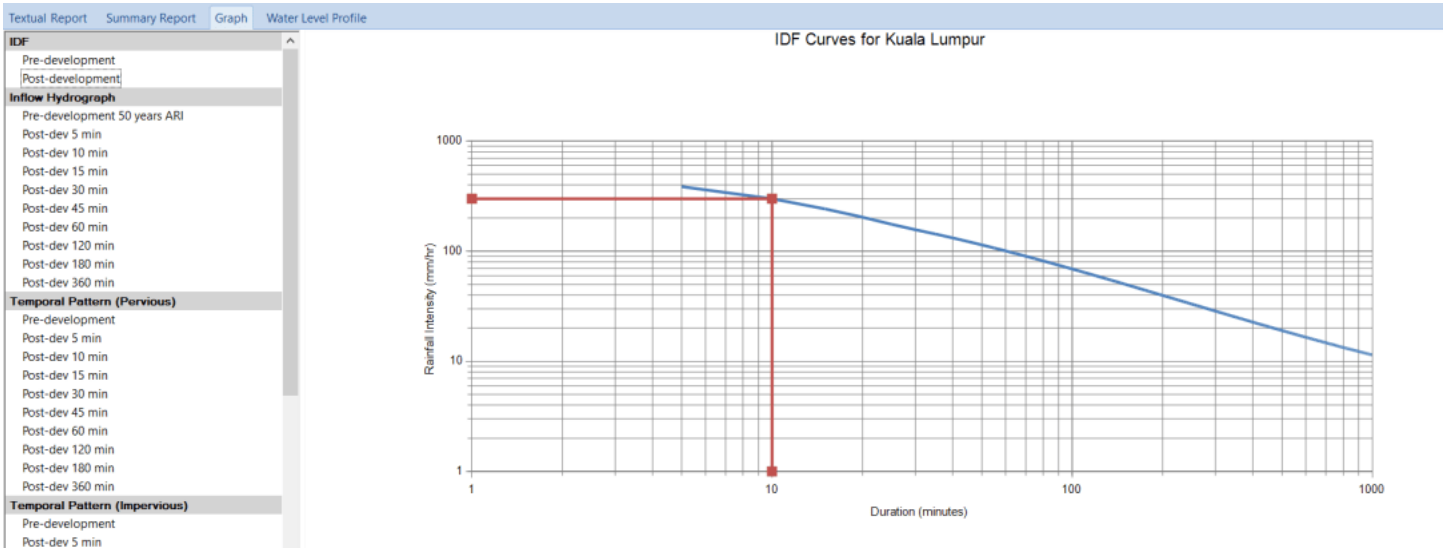
The mapping between MiDUSS and MiTS for Rainfall Intensity curve should be straightforward; In MiTS, one can also specify the IDF curve parameter and rainfall pattern as per below:



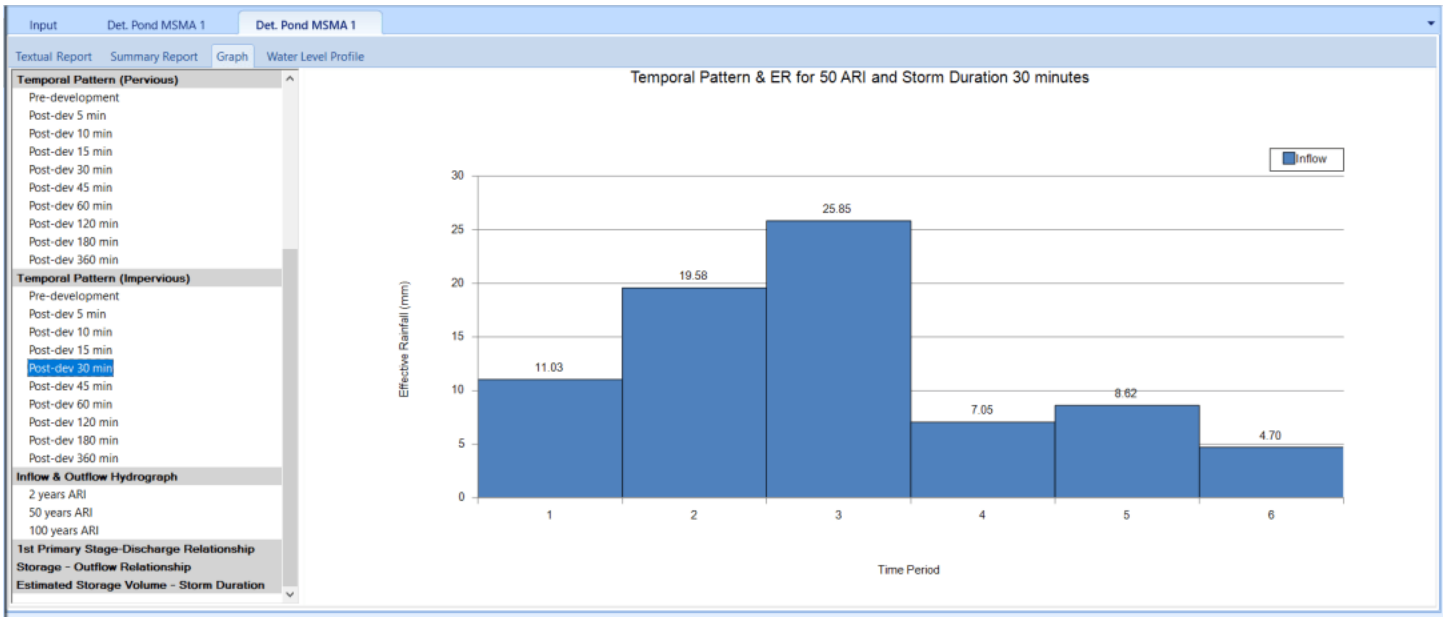
Raingauge location



Rainfall intensity with fitting constants respective to its raingauge location



IDF Curve



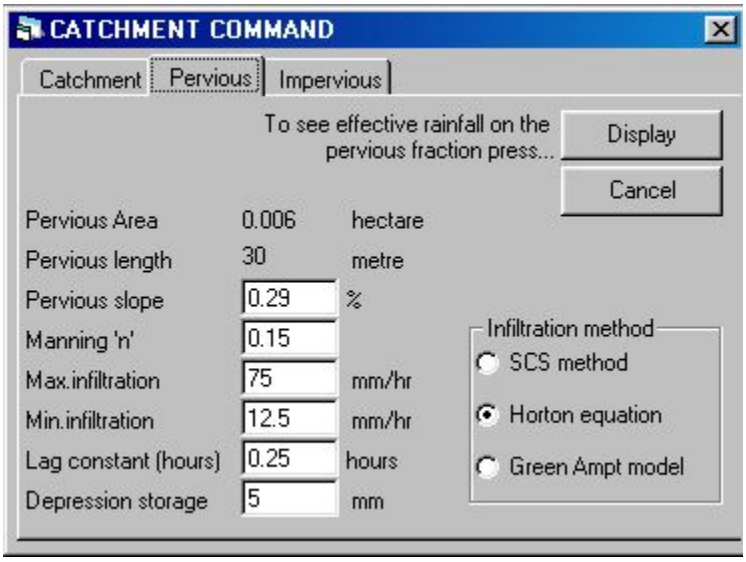
Temporal Pattern & Excessive Rainfall Graph

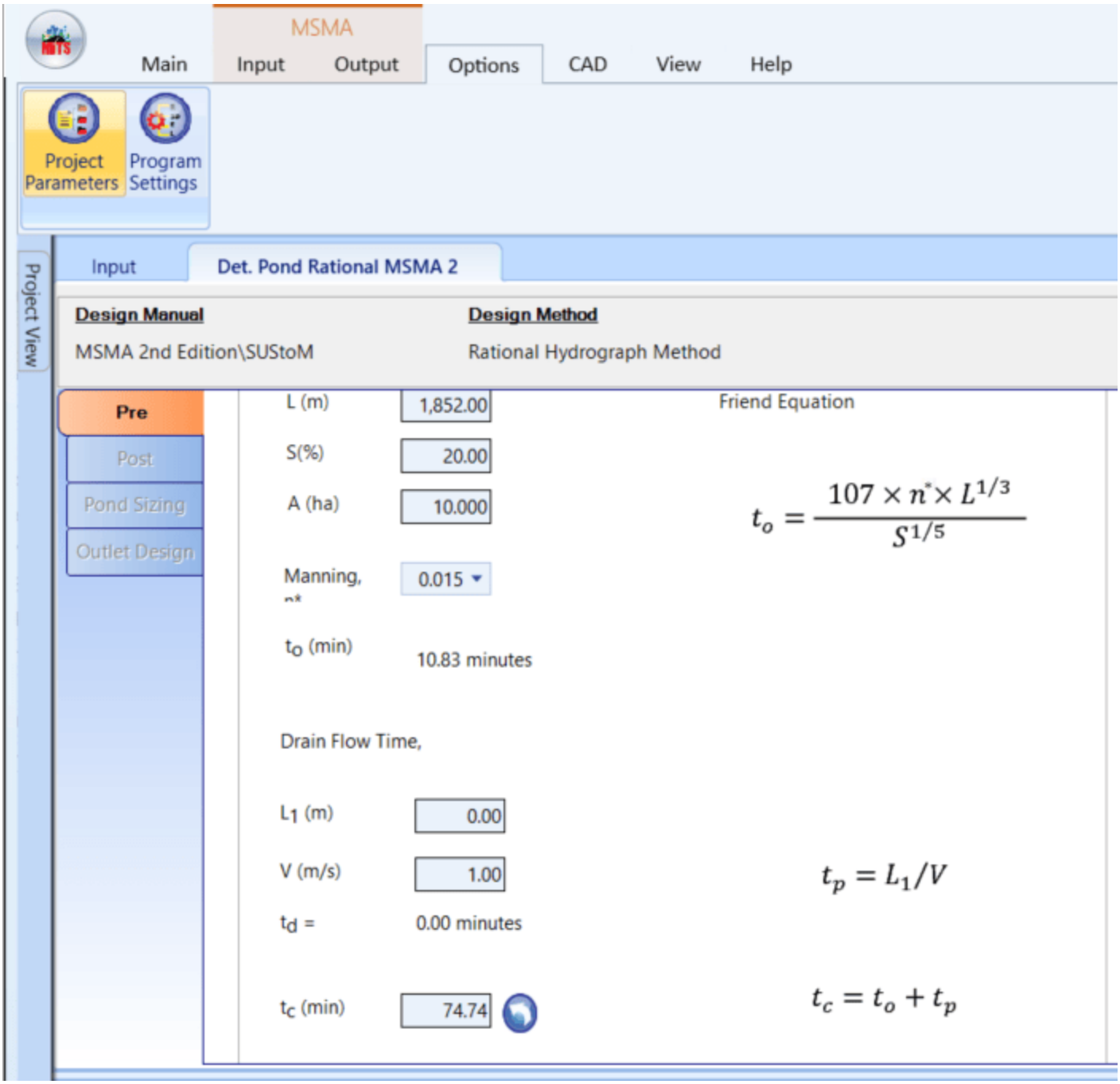
Also do note that MiDUSS is using the Time Area method in the above screenshot (which is why it has a rainfall excess pattern), the same rainfall excess pattern is also available for Time Area Method in MiTS.

In MiTS we also have a rational method (whereby you only need to specify the IDF curve coefficient but not the rainfall excess pattern) which is more suitable for smaller development sites. It has no direct mapping to MiDUSS, but it should be easier and more straightforward to use.

Catchment Information

The mapping of catchment information is also straightforward between MiDUSS and MiTS

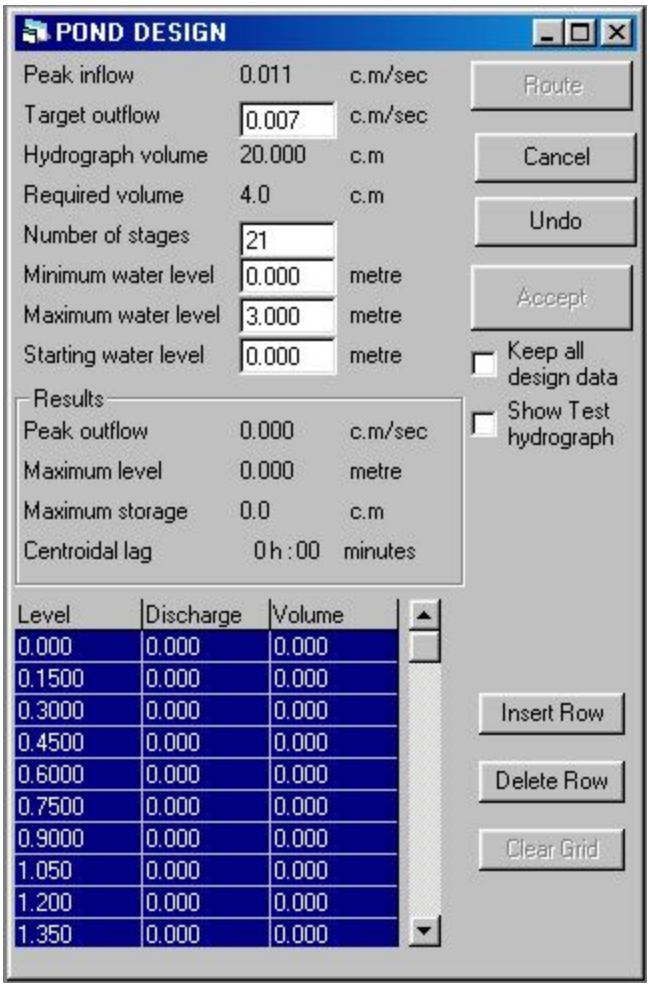




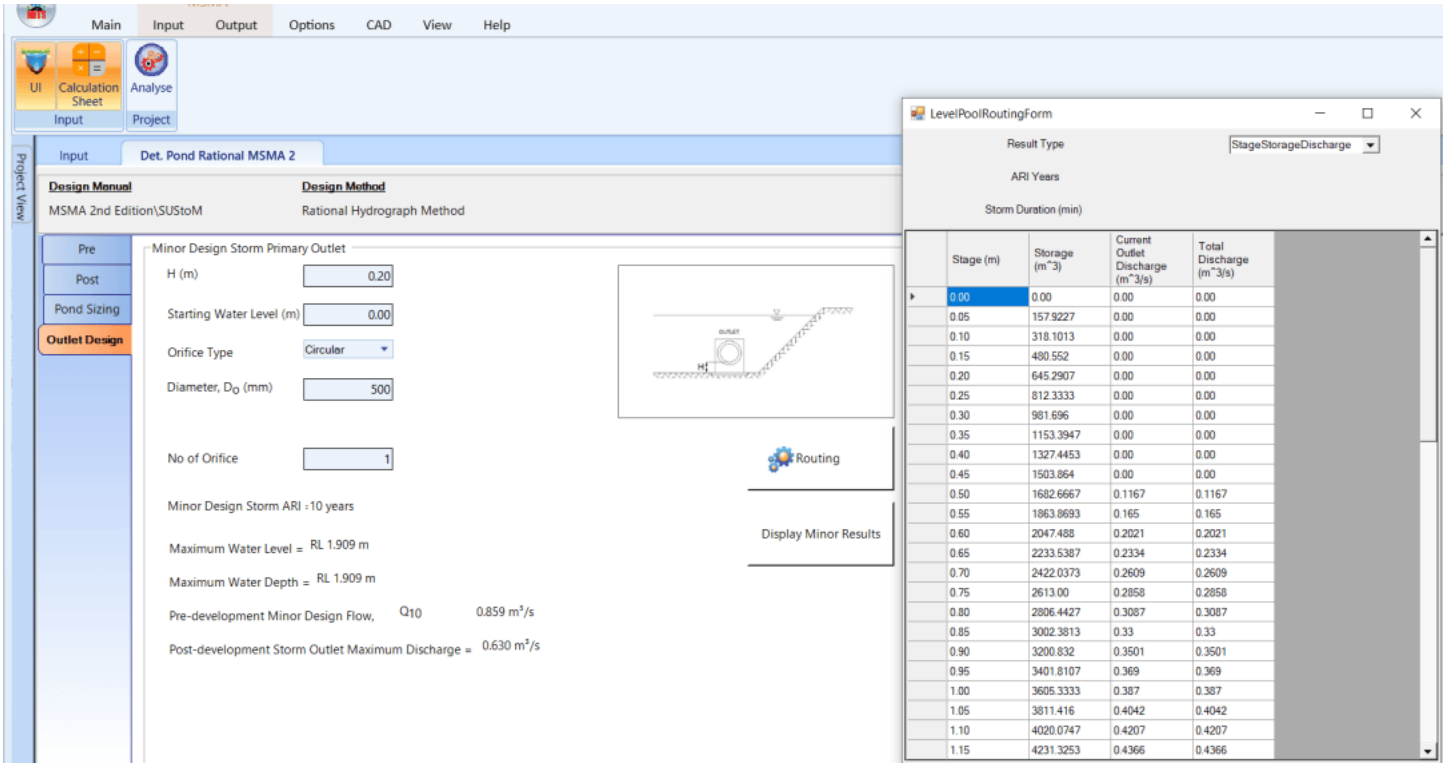
Note that for some parameters like **Lag constant, Depression storage** and **Infiltration method** are missing in MiTS, that's because in MSMA such parameters are already either built-in or not being used, that's why we are not exposing it.

Pond Sizing Design

The mapping for Pond Sizing Design is also quite straightforward between the two software. Here's a screenshot of the MiDUSS.



One can specify the above parameters such as (max. And min. Water level, starting water level) at the below Orifice Design tab:



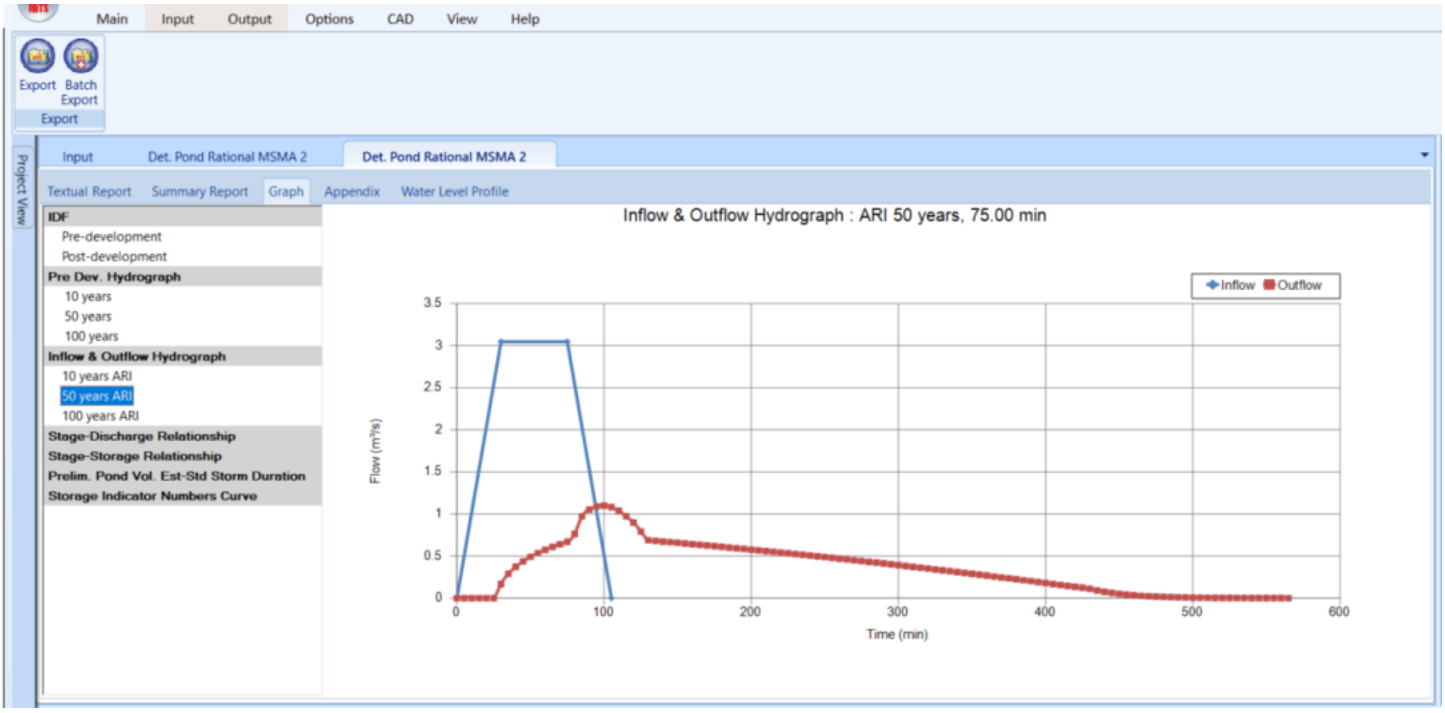
Hydrographs for pre and post, with and without control

The authority with the background in MiDUSS would usually be interested in the **inflow hydrographs for pre and post (with/without control)**. This is essential to make sure that the development has the flow rate under control (at least lower than the pre-development) so that it won’t introduce problems downstream.

MiTS contains the inflow and outflow hydrograph in the **Results** section



Pre Development Hydrograph



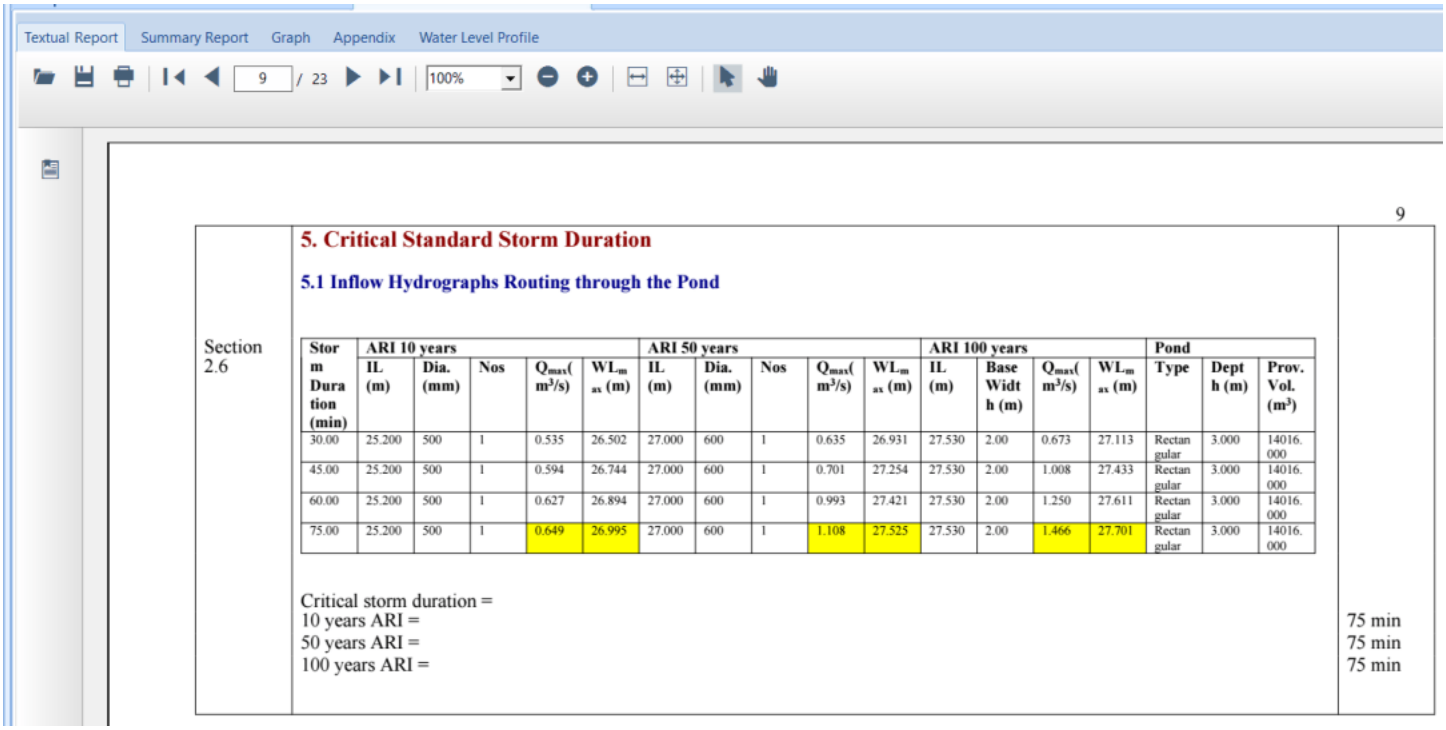
Post Development Hydrograph With Control and Without Control

Here we need to clarify a bit on the terminology:

- **Hydrograph for pre development** refers to **Pre Development Inflow hydrograph graph in MiTS**.
- **Hydrograph for post development without control** refers to **Post Development Inflow hydrograph graph in MiTS**, as this would be the hydrograph (flow rate vs time) if there is no detention facility (ie: without control)
- Hydrograph for post development with control refers to **Post Development Outflow hydrograph graph in MiTS**, as this would be the hydrograph if there is a detention facility presented (ie: with control)

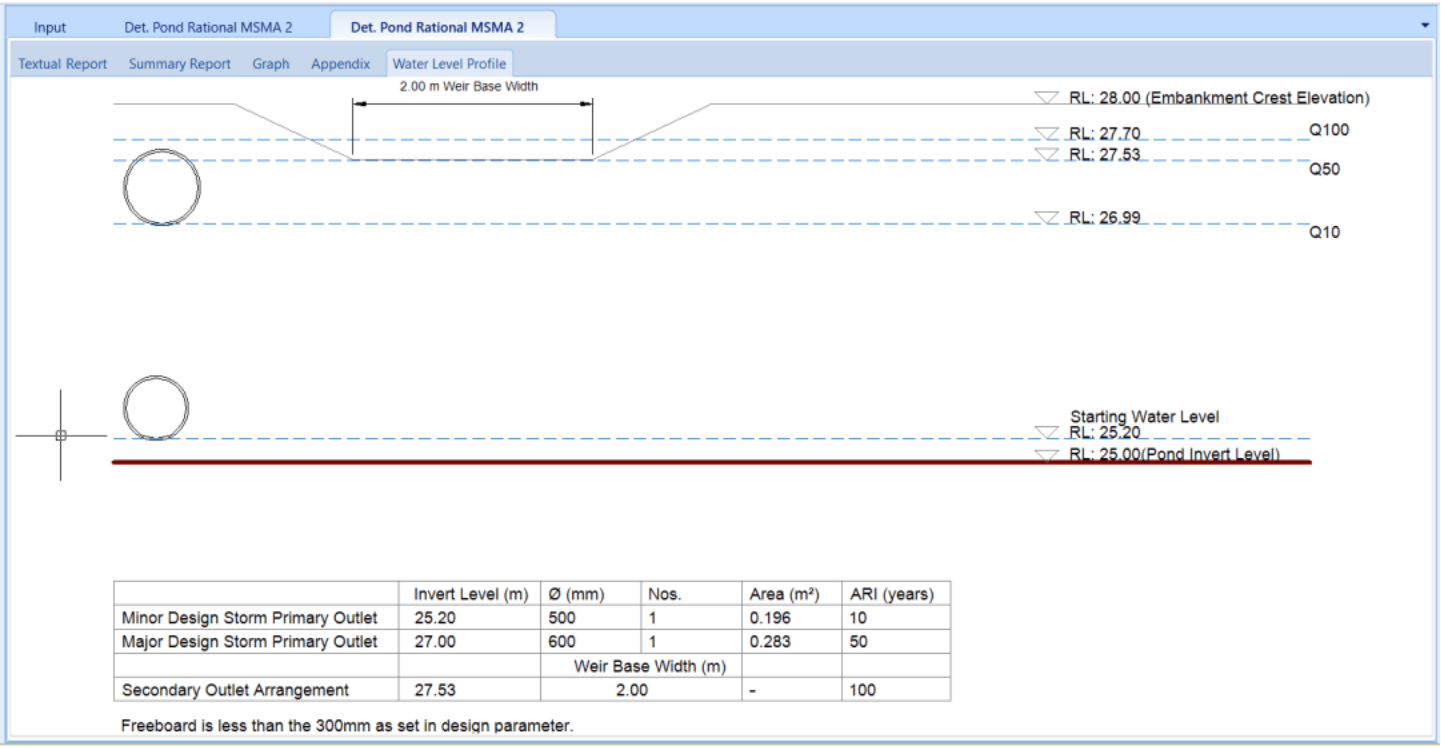
M****ax. Water Level

The Max. Water Level for minor, major and secondary orifice/weir design can be found at MiTS, at the below places:



Storm Duration (min)	ARI 10 years IL (m)	Dia. (mm)	Nos	Q_{max} (m^3/s)	WL_{max} (m)	ARI 50 years IL (m)	Dia. (mm)	Nos	Q_{max} (m^3/s)	WL_{max} (m)	ARI 100 years IL (m)	Base Width (m)	Q_{max} (m^3/s)	WL_{max} (m)	Pond Type	Depth (m)	Prov. Vol. (m^3)
30.00	25.200	500	1	0.535	26.502	27.000	600	1	0.635	26.931	27.530	2.00	0.673	27.113	Rectangular	3.000	14016.000
45.00	25.200	500	1	0.594	26.744	27.000	600	1	0.701	27.254	27.530	2.00	1.008	27.433	Rectangular	3.000	14016.000
60.00	25.200	500	1	0.627	26.894	27.000	600	1	0.993	27.421	27.530	2.00	1.250	27.611	Rectangular	3.000	14016.000
75.00	25.200	500	1	0.649	26.995	27.000	600	1	1.108	27.525	27.530	2.00	1.466	27.701	Rectangular	3.000	14016.000

Discharge, water level and critical storm duration routing through pond for minor, major and secondary design storm



	Invert Level (m)	Ø (mm)	Nos.	Area (m²)	ARI (years)
Minor Design Storm Primary Outlet	25.20	500	1	0.196	10
Major Design Storm Primary Outlet	27.00	600	1	0.283	50
		Weir Base Width (m)			
Secondary Outlet Arrangement	27.53	2.00		-	100

Water level profile with outlet control detailing

But what if I want to use the OSD method?

For OSD, **MiTS utilizes the Swinburne method and Simplified table method**, which has no direct equivalent in MiDUSS.

Swinburne method design utilizes the concept of SSR, which is based on the solution to the PSD formula, instead of the Pond Routing method (that is utilized by Time Area and Rational Method) for the design of pond sizing and orifice. The two design methods can’t be more different than each other.

As such, you are **not able** to calculate the Max. water level if you are using the OSD method.

What about the hydrograph for pre and post development? The Swinburne method assumes a certain shape for inflow and outflow hydrograph (**see more here**). Thus, you can still draw the hydrograph for OSD method, but keep in mind of the following limitations:

1. The hydrograph is just an assumption used to derive the PSD and/or SSR, it’s not the result of the actual routing process.

2. Swinburne method is a “catchment” based method, in the sense that you need out-of-the-site information in order to properly estimate the tcs and tc, and these two parameters are critical to compute the hydrograph.

Conclusion

If you want to get results from MiTS that closely resemble that of MiDUSS, Detention Pond Module is the way to go. With the above mapping information in mind, one can thus directly translate the input/result of MiDUSS to MiTS.

Related



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I’m the Benevolent Dictator for Life for MiTS Software cum Editor of this website. Read more here.

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