Gridded HP1 and HP26 IDF Coefficients

MSMA 2nd Edition · https://mes100.com/docs/gridded-hp1-hp26-idf/

Most design sites are not next to a rain gauge. Before HP1 (2021) and HP26 (2018), the engineer picked the nearest MSMA2 station and used its fitted λ, κ, θ and η, even when that station was 30 km away and on the other side of a ridge. HP1 and HP26 now publish the same four coefficients on 10 km and 20 km grids covering Peninsular Malaysia (HP1) and Sabah and Sarawak (HP26). In this article we set up a Storm Sync project to read its IDF coefficients from the grid cell that contains the design site, and we show how to check which cell and which numbers a run used.

How the grid gives the IDF

Each published grid cell carries a centre coordinate and the four coefficients of the generalized IDF equation:

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

where:

- i is the rainfall intensity in mm/hr
- T the ARI in years
- d the storm duration in hours.

This is the same equation the MSMA2 rain gauges use, so only the source of λ, κ, θ and η changes; the drain and Time Area calculations downstream are unchanged.

MiTS looks up the cell whose published centre is nearest to the design site. The site must lie within half a cell diagonal of that centre (about 7 km on the 10 km grid, 14 km on the 20 km grid); a site further out, for example offshore or across the national border, is rejected rather than snapped to a distant cell. The tables publish centre coordinates, not cell polygons, so the cell outlines drawn on the map are nominal.

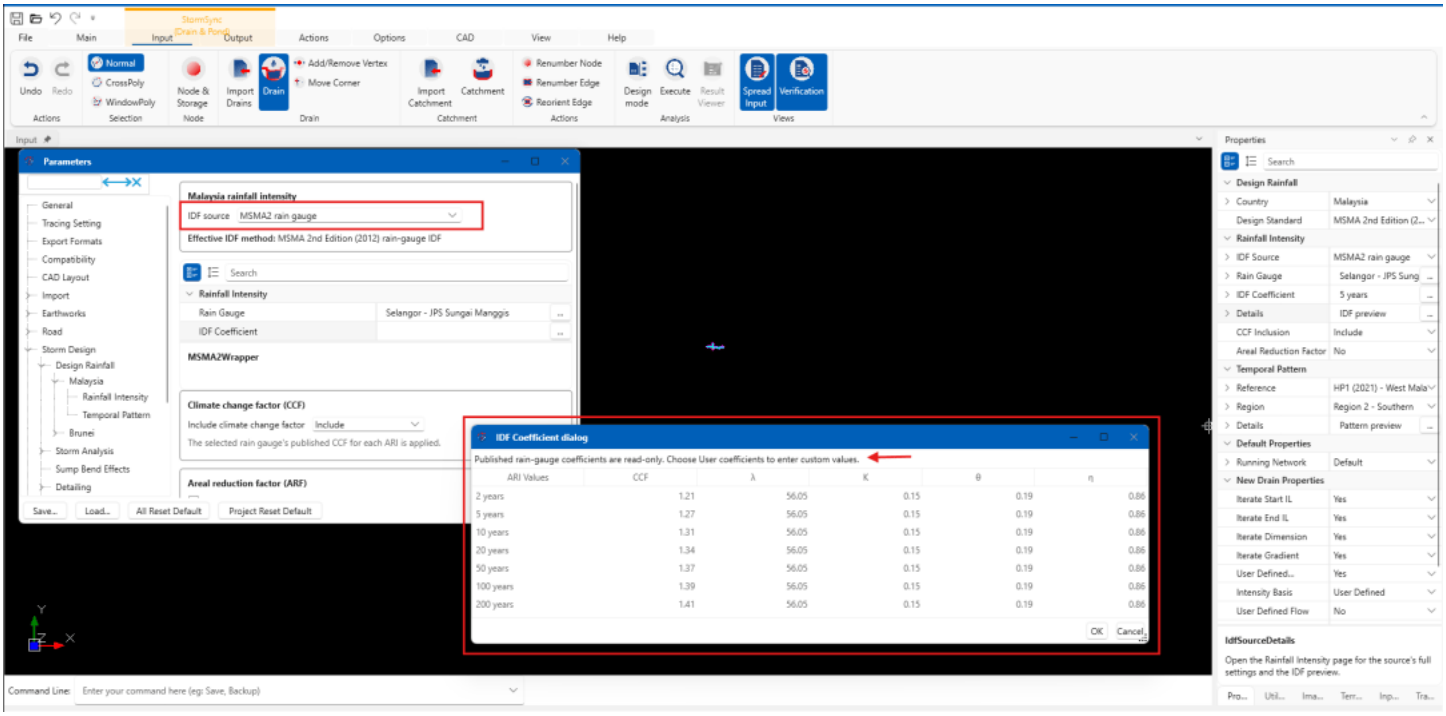
HP1 recommends the 10 km grid for small catchments and the 20 km grid for medium and large ones, subject to the local authority's requirement. MiTS does not pick the resolution from the catchment size, and it does not average coefficients over a basin as the HP1 and HP26 basin examples do. It uses the point cell.

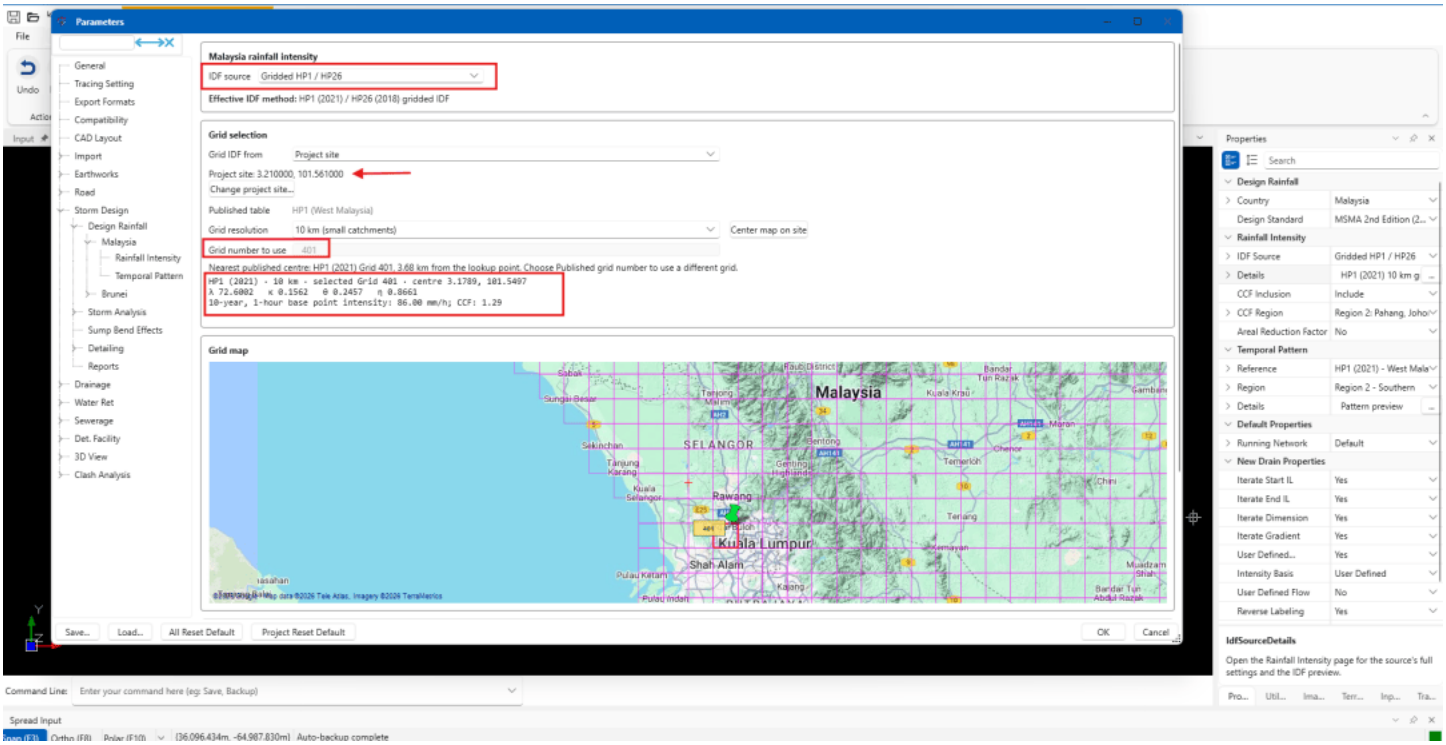
Selecting the grid

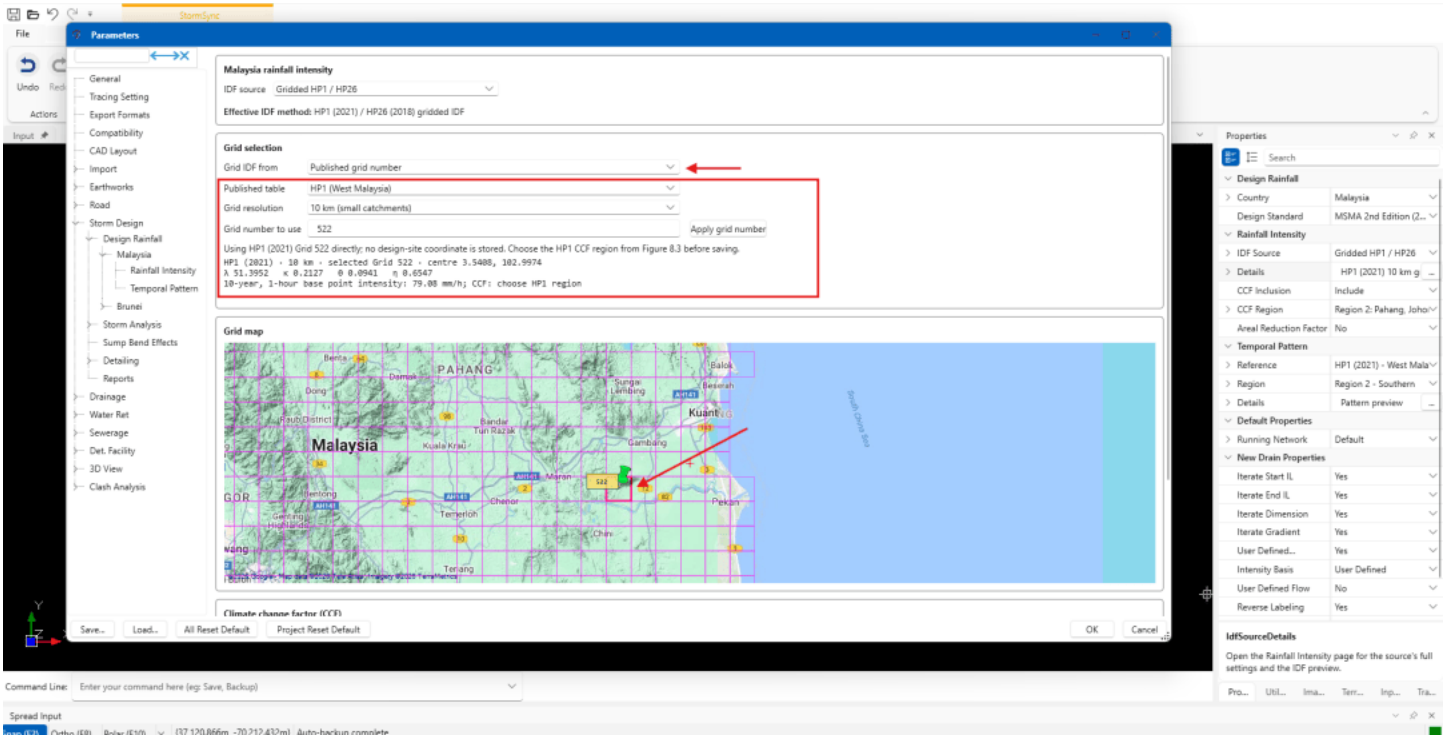
Steps:

1. Go to **Options > Project Settings > Storm Design > Design Rainfall > Malaysia > Rainfall Intensity**, OR step 2 of Project Setup. The design standard must be **MSMA 2nd or 3rd Edition**.
2. Set **IDF source** to **Gridded HP1 / HP26**.
3. Under **Grid selection**, choose where the cell comes from with **Grid IDF from**:
   - **Project site:** the cell at the project site set in Project Setup. **Change project site…** takes you there.
   - **Another point:** the cell at a different latitude and longitude (WGS84), for example a catchment some distance from the site pin. Type the coordinates or click the map; they start at the project site.
   - **Published grid number:** choose the **Published table** (HP1 or HP26) and type the grid number, for example when the authority has already specified the cell. MiTS starts from the cell nearest the project site, so often you only change the number. No design-site coordinate is assumed.
4. Choose the **Grid resolution**: 10 km (small catchments) or 20 km (medium / large catchments). The labels repeat HP1's recommendation; the choice is still yours.
5. Check the cell. For the two point choices, MiTS picks HP1 or HP26 from the nearest published centre and shows that publication and the cell's number in **Grid number to use**, greyed out, with its distance from the point and its four coefficients. To use a different cell, switch to **Published grid number**; only then can the number be typed.

If the cell moves between HP1 and HP26, for example when the point moves from Peninsular Malaysia to Sarawak, the temporal-pattern reference follows it and the region is cleared for you to choose again.


Parameters
Malaysia rainfall intensity
IDF source MSMA2 rain gauge
Effective IDF method: MSMA 2nd Edition (2012) rain-gauge IDF
Rainfall Intensity
Rain Gauge Selangor - JPS Sungai Manggis
IDF Coefficient
MSMA2Wrapper
Climate change factor (CCF)
Include climate change factor Include
The selected rain gauge's published CCF for each ARI is applied.
Areal reduction factor (ARF)
Save... Load... All Reset Default Project Reset Default
IDF Coefficient dialog
Published rain-gauge coefficients are read-only. Choose User coefficients to enter custom values.
ARI Values CCF λ K θ η
2 years 1.21 56.05 0.15 0.19 0.86
5 years 1.27 56.05 0.15 0.19 0.86
10 years 1.31 56.05 0.15 0.19 0.86
20 years 1.34 56.05 0.15 0.19 0.86
50 years 1.37 56.05 0.15 0.19 0.86
100 years 1.39 56.05 0.15 0.19 0.86
200 years 1.41 56.05 0.15 0.19 0.86
OK Cancel
Properties
Design Rainfall
Country Malaysia
Design Standard MSMA 2nd Edition (2...
Rainfall Intensity
IDF Source MSMA2 rain gauge
Rain Gauge Selangor - JPS Sung...
IDF Coefficient 5 years
Details IDF preview
CCF Inclusion Include
Areal Reduction Factor No
Temporal Pattern
Reference HP1 (2021) - West Mala...
Region Region 2 - Southern
Details Pattern preview
Default Properties
Running Network Default
New Drain Properties
Iterate Start IL Yes
Iterate End IL Yes
Iterate Dimension Yes
Iterate Gradient Yes
User Defined... Yes
Intensity Basis User Defined
User Defined Flow No
IdfSourceDetails
Open the Rainfall Intensity page for the source's full settings and the IDF preview.
Command Line: Enter your command here (eg: Save, Backup)

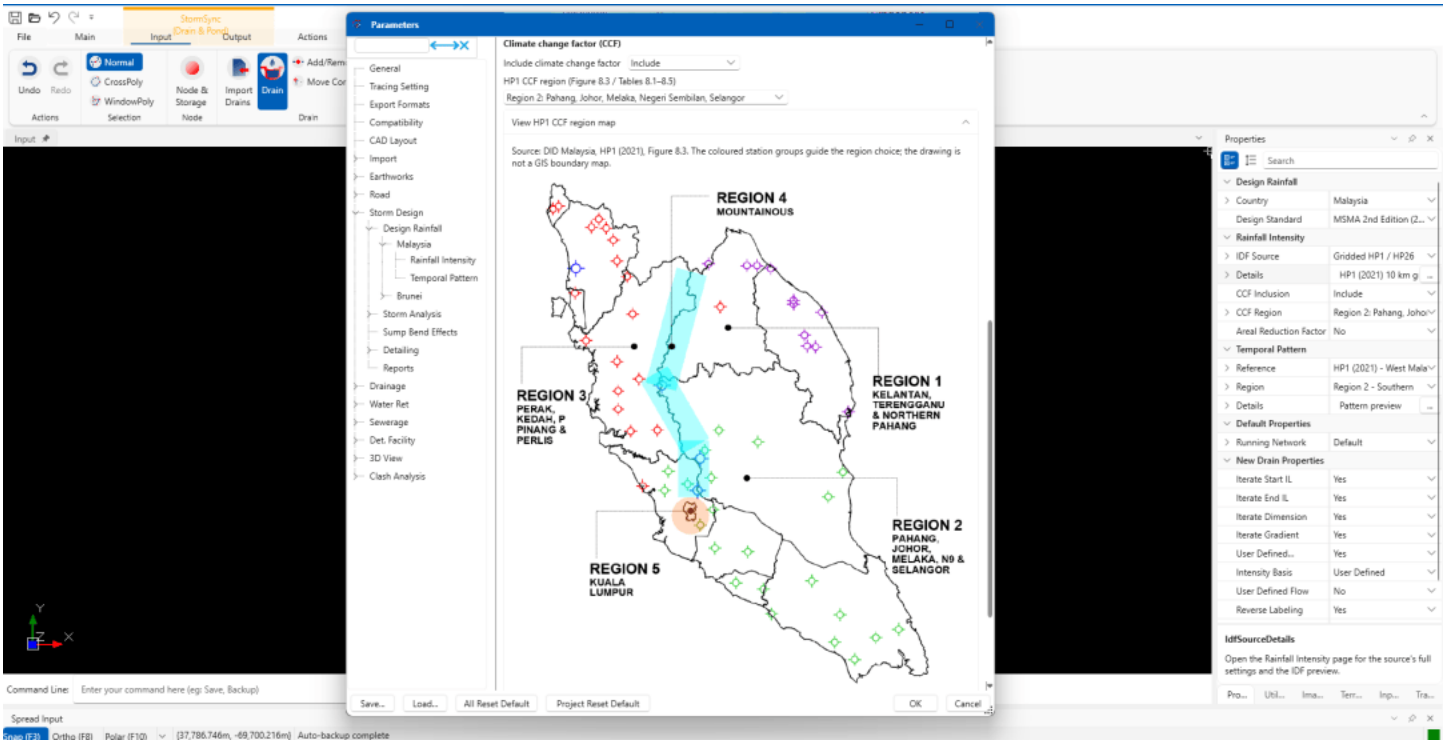

Parameters
Malaysia rainfall intensity
IDF source Gridded HP1 / HP26
Effective IDF method: HP1 (2021) / HP26 (2018) gridded IDF
Grid selection
Grid IDF from Project site
Project site: 3.210000, 101.561000
Change project site...
Published table HP1 (West Malaysia)
Grid resolution 10 km (small catchments)
Center map on site
Grid number to use 401
Nearest published centre: HP1 (2021) Grid 401, 3.68 km from the lookup point. Choose Published grid number to use a different grid.
HP1 (2021) - 10 km - selected Grid 401 - centre 3.1789, 101.5497
λ 72.6802 κ 0.1562 θ 0.2457 η 0.8661
10-year, 1-hour base point intensity: 86.00 mm/h; CCF: 1.29
Grid map
Malaysia
SELANGOR
Kuala Lumpur
Rawang
Shah Alam
Save... Load... All Reset Default Project Reset Default
OK Cancel
Properties
Design Rainfall
Country Malaysia
Design Standard MSMA 2nd Edition (2...
Rainfall Intensity
IDF Source Gridded HP1 / HP26
Details HP1 (2021) 10 km g...
CCF Inclusion Include
CCF Region Region 2: Pahang, Johor
Areal Reduction Factor No
Temporal Pattern
Reference HP1 (2021) - West Mala...
Region Region 2 - Southern
Details Pattern preview
Default Properties
Running Network Default
New Drain Properties
Iterate Start IL Yes
Iterate End IL Yes
Iterate Dimension Yes
Iterate Gradient Yes
User Defined... Yes
Intensity Basis User Defined
User Defined Flow No
Reverse Labeling Yes
IdfSourceDetails
Open the Rainfall Intensity page for the source's full settings and the IDF preview.
Command Line: Enter your command here (eg: Save, Backup)
Spread Input



Climate change factor

CCF inclusion sits beside the IDF source at the top of the page and is on by default.

- **HP1 (Peninsular Malaysia):** the CCF depends on the region in HP1 Figure 8.3 (Tables 8.1–8.5), which a grid number alone does not determine. Choose the **HP1 CCF region**. MiTS suggests one from the state of the listed town nearest the site or point, but check it against the map near mountains, Kuala Lumpur and regional edges. Click **View HP1 CCF region map** to see Figure 8.3. These CCF regions are separate from the temporal-pattern regions.
- **HP26 (Sabah and Sarawak):** the CCF is read from the selected grid cell and ARI; there is nothing to choose.

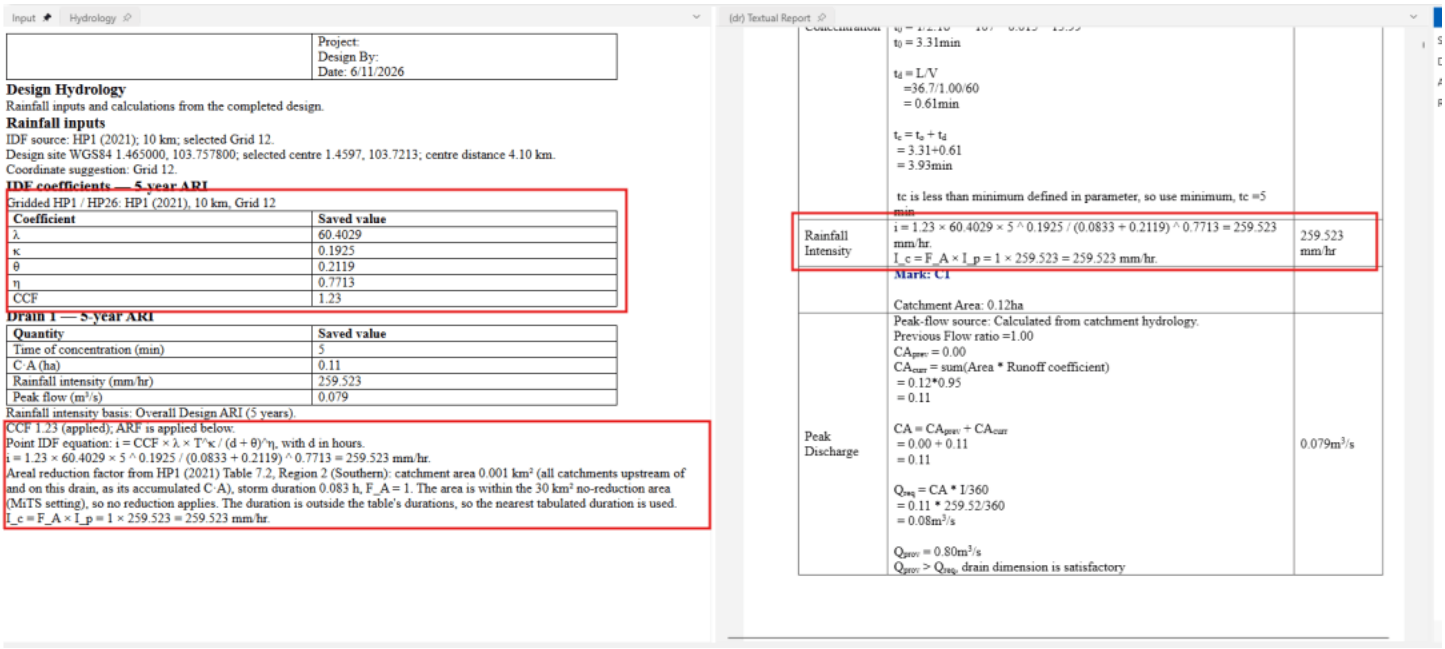


The areal reduction factor is not applied to gridded coefficients.

Check what a run used

The project saves the site, resolution and grid selection, not the coefficients. If you change the grid afterwards, the existing report still shows values from previous run, that is until you rerun the analysis.

The detailed drainage textual report and the Storm Sync run summary name the source as **Gridded HP1 / HP26** and give the publication, resolution and grid number used, the λ, κ, θ, η and CCF used, and the data hash. The Hydrology Excel report’s Rainfall sheet lists the source, the four coefficients and the CCF for each analysed ARI.



Input | Hydrology

	Project: Design By: Date: 6/11/2026

Design Hydrology

Rainfall inputs and calculations from the completed design.

Rainfall inputs

IDF source: HP1 (2021); 10 km; selected Grid 12.
Design site WGS84 1.465000, 103.757800; selected centre 1.4597, 103.7213; centre distance 4.10 km.
Coordinate suggestion: Grid 12.

IDF coefficients — 5-year ARI

Gridded HP1 / HP26: HP1 (2021), 10 km, Grid 12

Coefficient	Saved value
λ	60.4029
κ	0.1925
θ	0.2119
η	0.7713
CCF	1.23

Drain 1 — 5-year ARI

Quantity	Saved value
Time of concentration (min)	5
C·A (ha)	0.11
Rainfall intensity (mm/hr)	259.523
Peak flow (m³/s)	0.079

Rainfall intensity basis: Overall Design ARI (5 years).
CCF 1.23 (applied); ARF is applied below.
Point IDF equation: i = CCF × λ × T^κ / (d + θ)^η, with d in hours.
i = 1.23 × 60.4029 × 5 ^ 0.1925 / (0.0833 + 0.2119) ^ 0.7713 = 259.523 mm/hr.
Areal reduction factor from HP1 (2021) Table 7.2, Region 2 (Southern): catchment area 0.001 km² (all catchments upstream of and on this drain, as its accumulated C·A), storm duration 0.083 h, F_A = 1. The area is within the 30 km² no-reduction area (MiTS setting), so no reduction applies. The duration is outside the table's durations, so the nearest tabulated duration is used.
I_c = F_A × I_p = 1 × 259.523 = 259.523 mm/hr.

(dr) Textual Report

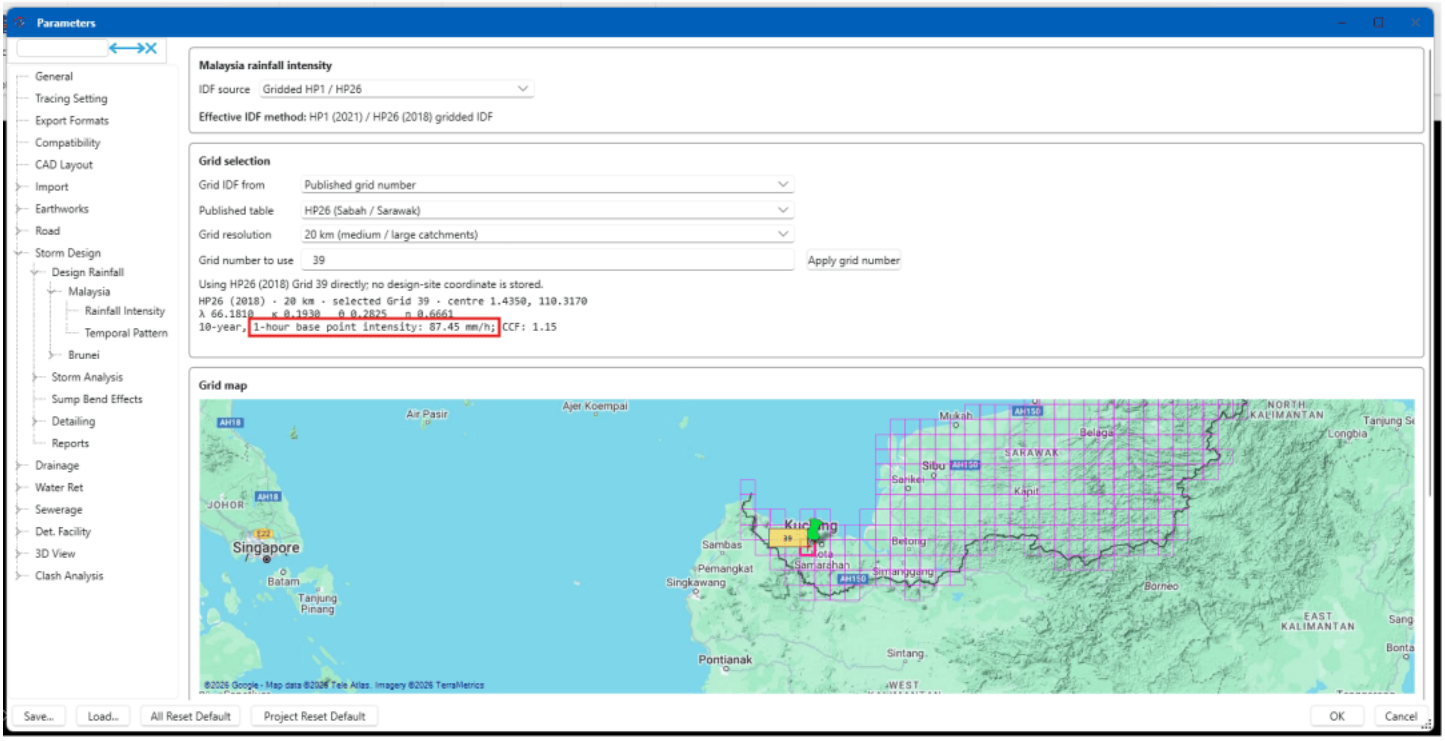
	t_0 = 3.31min t_d = L/V =36.7/1.00/60 = 0.61min $t_c = t_o + t_d$ = 3.31+0.61 = 3.93min tc is less than minimum defined in parameter, so use minimum, tc =5 min	
Rainfall Intensity	i = 1.23 × 60.4029 × 5 ^ 0.1925 / (0.0833 + 0.2119) ^ 0.7713 = 259.523 mm/hr. I_c = F_A × I_p = 1 × 259.523 = 259.523 mm/hr. **Mark: C1** Catchment Area: 0.12ha	259.523 mm/hr
Peak Discharge	Peak-flow source: Calculated from catchment hydrology. Previous Flow ratio =1.00 CA_{prev} = 0.00 CA_{curr} = sum(Area * Runoff coefficient) = 0.12*0.95 = 0.11 $CA = CA_{prev} + CA_{curr}$ = 0.00 + 0.11 = 0.11 $Q_{req} = CA * I/360$ = 0.11 * 259.52/360 = 0.08m³/s Q_{prov} = 0.80m³/s $Q_{prov} > Q_{req}$, drain dimension is satisfactory	0.079m³/s

Worked check

HP26 Table 5.1 gives the 10-year, 1-hour rainfall intensity at 20 km Grid 39 as 87.45 mm/hr. With that cell's λ = 66.1810 and its κ, θ and η, MiTS calculates 87.4493 mm/hr, which rounds to the published value. HP26's prose on the same page quotes λ = 66.1870, which would round to 87.46; we keep the table and map value.

Table 5.1: Derived Design Rainfall Intensity (mm/hr) for Grid ID 39.

Intensity (mm/hr)	Return Period, *T* (yr)						
Duration (hr)	2	5	10	20	25	50	100
0.25	115.11	137.38	157.05	179.53	187.43	214.26	244.92
0.5	89.08	106.31	121.53	138.93	145.04	165.80	189.53
1	64.10	76.50	87.45	99.97	104.37	119.30	136.38
3	34.28	40.91	46.76	53.45	55.81	63.80	72.93
6	22.24	26.55	30.35	34.69	36.22	41.40	47.33
12	14.23	16.98	19.42	22.20	23.17	26.49	30.28
24	9.04	10.79	12.33	14.10	14.72	16.82	19.23
48	5.72	6.82	7.80	8.92	9.31	10.64	12.17
72	4.37	5.22	5.96	6.82	7.12	8.13	9.30



Conclusion

For an ungauged site, the gridded source replaces “nearest station” with “the published cell the site lies in”. Do confirm the resolution the authority expects, review the cell on the map, choose the HP1 CCF region yourself, and check the grid number and data hash in the report before submission is done.

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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