

Sample Metocean & Berth Operability Note

Merak / Sunda Strait

Wind climate 2020–2025 · Surface currents 2023–2025 · Observational desk-study

SAMPLE ONLY – illustrative criteria, not a design basis

Purpose. This short note shows how a berth / ferry weather-window desk-study can be assembled from BMKG observations: automatic weather station wind and HF-radar surface currents near Merak. Ferry wind thresholds (15 kt amber / 21 kt red) follow BMKG operational thresholds and are used here only as a **sample** downtime proxy. Multi-year observational waves for 2020–2024 are **not** available for the full period and are omitted rather than invented.

1. Site and data

Berth reference: Merak ferry terminal vicinity, 5.9189° S, 105.9853° E.

Sources:

- **Wind:** BMKG automatic weather station, Merak (hourly means, 2020–2025). Period 2020-01-01 to 2025-12-31 UTC; 50322 hourly records (95.7% of the 2020–2025 calendar-hour span).
- **Currents:** BMKG HF-radar surface currents near Merak (hourly means, 2023–2025), cells within 0.006° of the berth. Period 2023-01-03 to 2025-12-30; 20718 hours (78.8% of 2023–2025 calendar hours). Coverage begins ~Nov 2022; earlier years are not fabricated.
- **Waves:** not included; multi-year observational waves are not available for the full 2020–2024 period. Wave roses are therefore omitted.

2. Wind climate

Mean hourly wind speed over the sample is 2.66 m/s (median 2.01, P95 6.86, P99 8.44, max 12.04 m/s). Figure 1 shows the directional climate; Figure 2 shows the exceedance curve against the sample ferry thresholds (7.72 m/s = 15 kt; 10.80 m/s = 21 kt; conversion $1 \text{ m s}^{-1} = 1.94384 \text{ kt}$).

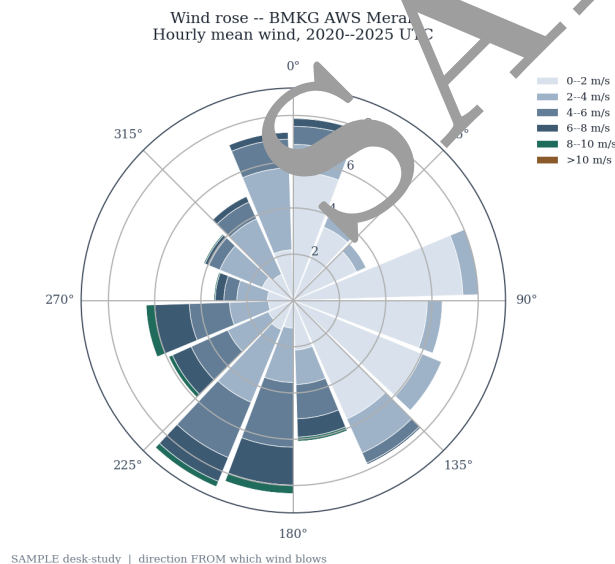


Figure 1: Wind rose from Merak AWS hourly means, 2020–2025.

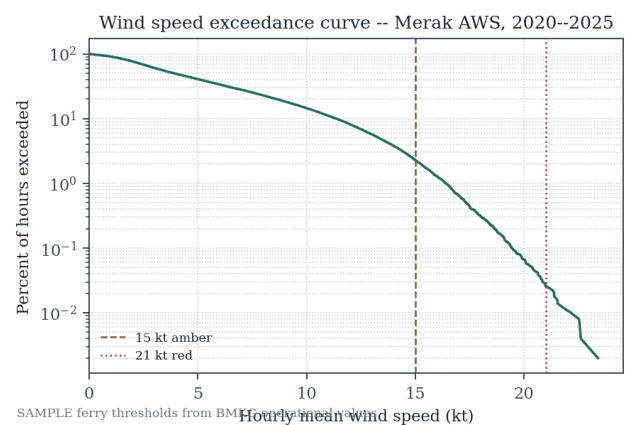


Figure 2: Exceedance of hourly mean wind speed (kt).

3. Extreme wind sketch

Annual maxima of hourly mean wind (Table 1) are fitted with a **Gumbel (Type I) distribution by method of moments** ($n = 6$ years). Location $\xi = 10.375$ m/s, scale $\beta = 0.953$ m/s. Illustrative return levels: 10-yr 12.52 m/s, 20-yr 13.20 m/s, 50-yr 14.09 m/s (Figure 3). With only six annual maxima this fit is **exploratory**, not a certification extremal analysis.

Table 1: Annual maxima of hourly mean wind speed, Merak AWS.

Year	Max (m/s)	Max (kt)
2020	8.63	16.8
2021	10.69	20.8
2022	12.04	23.4
2023	11.61	22.6
2024	11.59	22.5
2025	11.00	21.4

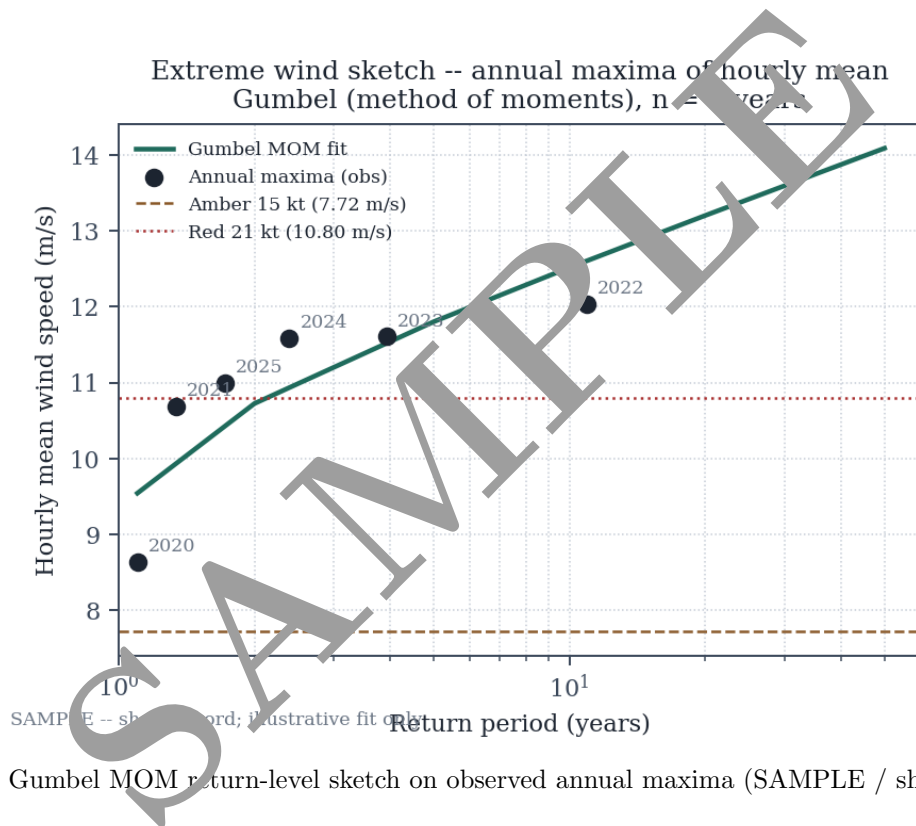


Figure 3: Gumbel MOM return-level sketch on observed annual maxima (SAMPLE / short record).

4. Sample berth / ferry wind-window proxy

Using BMKG operational ferry wind thresholds solely as a SAMPLE criterion:

- Hours with mean wind ≥ 15 kt (amber): 1144 (2.27% of observed hours).
- Hours with mean wind ≥ 21 kt (red): 12 (0.024%).
- Hours below amber (proxy “available”): 97.73%.

Figure 4 shows the calendar-month breakdown. Real berth decisions also need wave, current shear, visibility, and operator SOPs; this table is wind-only.

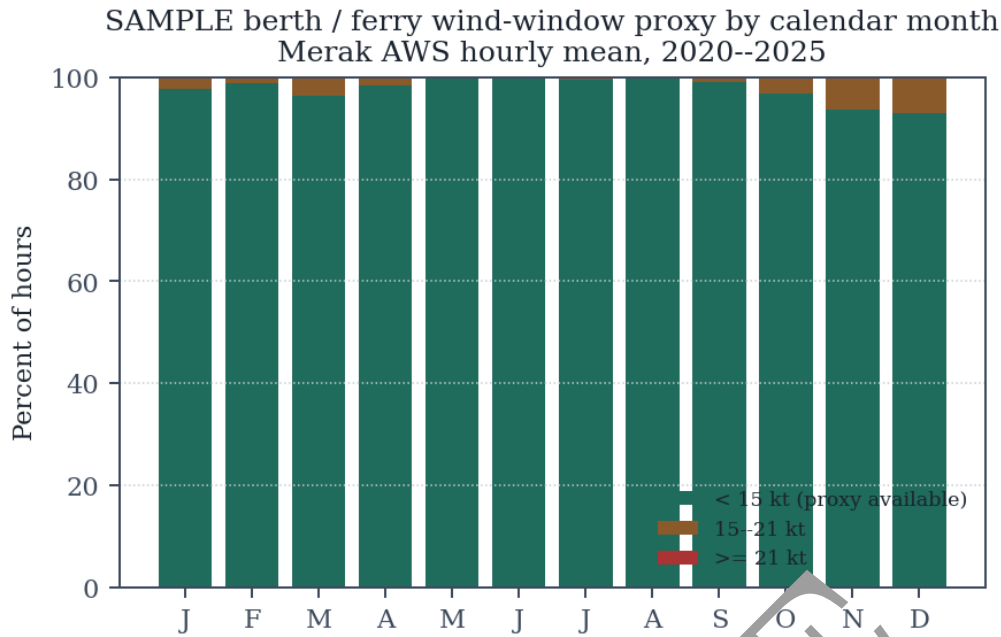


Figure 4: Monthly wind-window proxy using SAMPLE 15 / 21 kt thresholds.

Table 2: Summary operability proxies (wind only, SAMPLE criteria).

Criterion	Hours	Share of record
Below 15 kt (proxy available)		97.73%
≥ 15 kt amber	1141	2.27%
≥ 21 kt red	12	0.024%

5. Surface currents near the berth

Hourly means from BMKG HF-radar cells within 0.006° of Merak (mean cell ~ 0.66 m/s, P95 1.24 m/s, max 2.03 m/s) are shown in Figure 5. Coverage is 2023–2025 only; 2020–2021 currents are not available.

Related research on short-range HF-radar current forecasting in the Sunda Strait is documented in Gautama et al. (2026), *Advances in Statistical Climatology, Meteorology and Oceanography*, DOI [10.5194/ascmo-12-221-2026](https://doi.org/10.5194/ascmo-12-221-2026). That paper addresses forecast skill for surface currents; it is cited here for context only and is **not** claimed as the method used to produce the observational roses above.

6. Limitations

1. Wind is a single AWS point; spatial gust structure across the ferry lane is unresolved.
2. Current mosaic begins late 2022; seasonal climatology is shorter than the wind record.
3. Waves not included: observational wave climate is not available for the full 2020–2024 period.
4. Operability thresholds are SAMPLE BMKG operational values, not a client design basis.
5. Extreme-value fit uses $n = 6$ annual maxima and is illustrative only.

Prepared as a portfolio SAMPLE from BMKG observations. Contact: dhava.gautama@proton.me · <https://dhava.my.id>

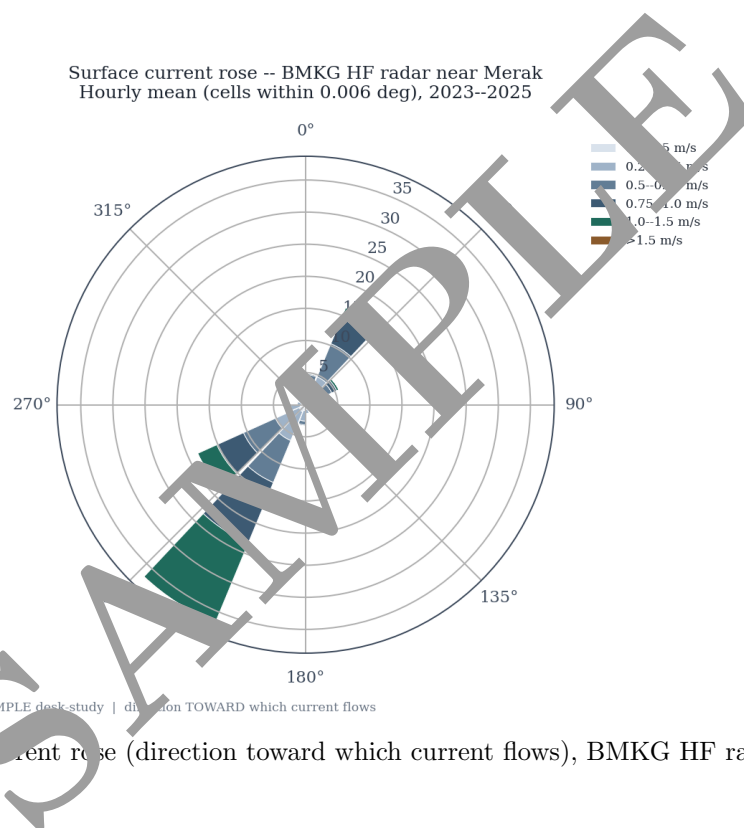


Figure 5: Surface current rose (direction toward which current flows), BMKG HF radar near Merak.