JUMBO BLOCK ENGINEERING SUITE

JUMBO BLOCK Hydro

User Manual · Version 9.3.1

https://jumboblock.org

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1. Overview

JUMBO BLOCK Hydro is the hydrological estimation tool of the JUMBO BLOCK Engineering Suite. It provides an initial technical assessment of urban rainwater retention: surface effect, design rainfall, storage verification under DWA-A 117, heavy-rain scenarios, and a standalone urban street model — each tied directly to the real JUMBO BLOCK modular system.

The program runs entirely locally in the browser as a single HTML file. There is no cloud connection, no server, no user account, and no automatic mapping of a site to rainfall data. All technical inputs — in particular the KOSTRA-DWD-2020 rainfall depth — are deliberately entered manually, keeping them traceable and verifiable.

HYDRO is one of several standalone tools in the suite (including PLAN, STATIC, BUDGET, TEMP, Project). All tools can share a common project file (project.dbm) when needed and can also be used independently of one another.

2. Getting Started

When hydro.html is opened for the first time, all fields are pre-filled with technical default values (see chapter 18). No prior import is required to use the tool — every input automatically triggers a recalculation.

There is no persistent storage in the browser (no LocalStorage, no cookie-based saving). The current working state exists only in the memory of the open page until it is deliberately saved as a project.dbm file via “Export” (chapter 16). Reloading the page discards unsaved input.

The hash status notice above the project data reads “no project.dbm checked yet” on first open, since no file has been imported yet.

3. Project Data

Section “1. Project Data” captures the project name, postal code, location and date. These entries are used purely for documentation in the print report and export — they do not enter into any calculation.

4. Surface Analysis

Section “2. Surface Analysis” automatically calculates the effective area from the total area (m²) and the sealing rate (%):

```
Effective area = total area × (sealing rate / 100)
```

Choosing a surface type (asphalt, concrete, paving, green area, custom) automatically sets a typical runoff coefficient in the “Design Rainfall” section. The effective area is a read-only result field and feeds into both the simple method (chapter 8) and the DWA-A 117 verification (chapter 6).

5. Design Rainfall

Section “3. Design Rainfall” captures the return period (T), duration stage, KOSTRA rainfall depth, site factor and runoff coefficient. The tool deliberately does not perform an automatic mapping of a site to KOSTRA grid values — the rainfall depth is entered manually as a site-specific technical value, e.g. from the German Weather Service's KOSTRA viewer or from local technical planning.

Return period and duration stage are purely documentary in this section: they record which design event the entered rainfall value applies to, without themselves affecting the calculation. The actual rainfall depth is scaled by the site factor and, together with the runoff coefficient, feeds directly into the simple method (chapter 8).

The “Active basis of the rainfall depth” field automatically compiles the selections made into a short summary text (return period, duration, factor, source) for traceability in the report.

6. DWA-A 117 – Storage Verification (Governing Duration Stage)

This section performs a comparative calculation of the required retention volume across five duration stages (15, 30, 60, 120, 360 minutes) using the simplified method of DWA-A 117. The governing stage is the one with the greatest storage demand, taking the throttled outflow into account.

Common orientation-value lists are available for the throttled outflow Q_dr and the infiltration rate Q_sick (e.g. 5 l/(s·ha) as a widely used orientation value, or 0 l/(s·ha) as a conservative approach with no infiltration verification). Selecting an orientation value automatically calculates the corresponding l/s figure as effective area × orientation value; “Custom” makes the field freely editable, e.g. for an actual infiltration-test result.

A clearly highlighted warning states: these values are common orientation values for preliminary planning, not a binding design. The permissible throttled outflow must be confirmed with the responsible lower water authority or the municipal drainage statute; for permit design, infiltration requires a site-specific infiltration test or geotechnical report under DWA-A 138. When in doubt, calculate conservatively with “no infiltration”.

A separate KOSTRA-DWD-2020 rainfall depth is entered for each of the five duration stages. From this, the tool automatically calculates for each duration stage:

```
Rainfall intensity r_D,T = (1000 × h_D,T) / (6 × D)
Rainfall volume = (effective area × runoff coefficient × h_D,T) / 1000
Outflow volume = Q_ab × D × 0.06
Required storage volume = max(0, rainfall volume − outflow volume)
```

Q_ab is the sum of throttled outflow and infiltration rate (Q_dr + Q_sick). The duration stage with the greatest required storage volume is highlighted as the governing stage (row shown in bold, shaded) and determines storage reserve and coverage against the planned storage volume from chapter 7.

The assessment is automatic and has three levels: sufficient (adequate reserve), tight (storage reserve below 10% of planned capacity), and not met (reserve negative — module count must be increased).

7. JUMBO BLOCK System Dimensioning

This section translates the calculated storage demand into a real modular system. The volume per module is fixed at 13.9 m³ (net volume of the standard module, 2.50 × 2.50 × 2.50 m) and read-only.

Required modules are calculated from the rainfall volume of the simple method (chapter 8): required modules = rounded up (rainfall volume / module volume). The “Apply required modules” button sets this value directly as the planned module count.

The “Calculate” button triggers a full recalculation of all sections; “Default values” resets every input to the factory setting (chapter 18).

8. Results

This section compares rainfall volume, module demand and planned storage capacity from the simple method (not the DWA-A 117 verification of chapter 6):

```
Rainfall volume = (effective area × rainfall depth × site factor × runoff coefficient) / 1000
Required modules = rounded up (rainfall volume / module volume)
Planned storage volume = planned modules × module volume
Storage reserve = planned storage volume − rainfall volume
```

A fill bar shows the percentage utilisation of the planned system (capped at 0–100%). The text assessment below distinguishes the same three levels as the DWA-A 117 verification: sufficient, tight, and exceeded. At “tight” or “exceeded”, the emergency planning section (chapter 13) automatically displays a correspondingly stronger notice.

9. Project Summary

A condensed summary of retained rainwater volume, installed modules, total storage capacity and coverage (planned storage volume relative to rainfall volume, in %). These figures summarise the state of the simple method at a glance and appear unchanged in the print report.

10. Heavy Rain Scenario Simulation

This section automatically compares three fixed rainfall scenarios (100 mm “heavy rain”, 200 mm “heavy rain”, 300 mm “extreme rain”) against the effective area, runoff coefficient and planned storage volume from chapter 7. For each scenario, retention volume, required block count, capacity check and an automatic assessment (sufficient/tight/exceeded) are listed in a table.

These scenarios are independent of the KOSTRA rainfall depth entered in “Design Rainfall” and are intended to make the effect of exceptional rainfall events on the planned system visible.

11. Urban Street Model

A standalone model, independent of the rest of the project: from road length, road width, sealing rate and a selected rainfall event (100/200/300 mm), a potential retention volume for a typical road surface is calculated directly.

Road area = length × width
Rainfall volume = (road area × sealing rate/100 × rainfall event) / 1000
Required modules = rounded up (rainfall volume / 13.9)

This model uses a fixed module volume of 13.9 m³ and is independent of the module volume field entered in chapter 7 (which in any case only displays the same value for documentation).

12. Project Planning

An informational section with no inputs of its own: it clarifies that the results generated by the tool are an initial technical indication, and that detailed planning — system layout, hydraulic design, integration into existing infrastructure, permit preparation — can be requested project-specifically from the JUMBO BLOCK team (mail@jumboblock.de).

13. Emergency Planning

This section automatically displays a notice on emergency overflow planning matched to the current assessment status of the simple method (chapter 8): with sufficient reserve, a general recommendation for an emergency overflow path is given; with tight reserve, explicitly including an emergency overflow path in planning is recommended; when storage volume is exceeded, an emergency overflow path or overflow concept is stated as required.

14. Infrastructure Readiness

Three informational cards describe the general suitability of JUMBO BLOCK for resilient infrastructure, urban rainwater retention, and optional digital monitoring with traceable event logging via the JUMBO BLOCK Dashboard.

A clearly highlighted wording note states: these statements describe suitability, architectural intent and design orientation — they do not constitute formal certification or a legal guarantee.

15. Dashboard Integration

Describes the optional extension via the JUMBO BLOCK Dashboard (jumboblock.net): transparent capture of fill levels, sensor values and status data. The dashboard aligns with current European requirements for digital infrastructure and cybersecurity; logged system events can be evaluated for audit and security purposes.

This section is purely informational and only links to the demo at jumboblock.net — HYDRO itself has no technical connection to the dashboard.

16. Saving, Export and Import (project.dbm)

At the top of the tool is the “Data Exchange” section: HYDRO reads and writes the shared project.dbm file, which is also used by other suite tools (e.g. PLAN, STATIC).

“Export” calculates an updated SHA-256 hash over the entire stored dataset, saves it together with the data, and downloads the file named YYYYMMDD_HHMMSS_project.dbm (timestamp of the export). Only the fields defined in the shared data model are written.

“Import” reads an existing project.dbm file, checks its hash (chapter 20), and takes over all HYDRO-relevant fields from it: project data, surface analysis, design rainfall, urban street model, and all DWA-A 117 inputs including the selected orientation values. The planned module count is preferentially taken from a shared value set by PLAN; if none is present, a value previously saved by HYDRO itself is used. If a file is invalid or unreadable, a corresponding error message is shown and no fields are changed.

After every import or export, the tool immediately recalculates, so that results, summary and assessment always match the loaded data.

17. Print / PDF / Inquiry

The “Print / PDF” button opens a standalone, cleanly formatted Hydrological Report in a new window/tab (bilingual, according to the current interface language). The report includes project information, design rainfall, surface analysis, the complete DWA-A 117 storage verification, the JUMBO BLOCK system dimensioning, the heavy rain simulation, the urban street model, a summary with assessment, and document information with hash values.

Before the report is generated, a full recalculation is performed automatically, so the report always reflects the current input state. Optionally, a contact person, email address and a project inquiry/notes can be entered — these are intended for an informal inquiry to mail@jumboblock.de and do not enter into any calculation.

“Reset planning” resets all inputs to the default values (identical to chapter 18) and then scrolls to the top of the page.

18. Default Values and Reset

The “Default values” button (section 5) and “Reset planning” (section 14) both reset all inputs to the same technical factory settings:

A reset affects only the values currently displayed in the browser. An already exported project.dbm file is unaffected by it; no further step is required to permanently discard the previous state — however, exporting beforehand is recommended if needed.

- Project name/postal code/location: “Please enter”, date: current day's date
- Total area: 0 m², sealing rate: 90%, surface: asphalt
- Return period T = 10, duration: 60 min, KOSTRA rainfall depth: 35.0 mm, site factor: 1.00, runoff coefficient: 0.90, source: KOSTRA-DWD-2020
- Planned modules: 0, urban street model: 0 m / 0 m / 90% / 100 mm
- DWA-A 117: Q_dr orientation value 5 l/(s·ha), Q_sick orientation value 0 l/(s·ha) (no infiltration); rainfall depths per duration stage: 18.0 / 25.0 / 35.0 / 45.0 / 60.0 mm for 15/30/60/120/360 minutes
- Contact person, email and project inquiry fields are cleared

19. Language (German/English)

Language switching is handled via the suite's global menu (menue.js) above the tool. HYDRO fully switches all labels, notices, info content and the print report between German and English without altering any input values. German is selected by default on first open.

20. Data Integrity (SHA-256)

Every exported project.dbm file contains a SHA-256 hash over the entire sorted dataset (excluding the hash fields themselves). On import, this hash is automatically recalculated and compared against the stored value.

The hash status notice above the project data shows one of four states: “no project.dbm checked yet” (before the first import/export), “project.dbm exported · shared project hash recalculated” (after export), “project.dbm clean · shared project hash valid” (import with matching hash), or “project.dbm modified or not reproducible · hash mismatch detected” (import with a differing hash). If the hash is entirely missing from the imported file, a separate warning is shown.

The hash serves purely for traceability (has the file been altered since the last export?) — it does not block import or calculation.

21. Info Buttons (Contextual Help)

Nearly every input field has a small **i** button next to it. Clicking it opens an overlay window with a precise technical explanation of that specific field — including what it means, whether and how it is calculated automatically, and which other calculations it is used in.

The overlay can be closed by clicking outside the window, via the close button, or with the Escape key. The info content follows the same language switch as the rest of the tool.

22. Limitations, Notes and Best Practices

- HYDRO does not replace permit-stage planning: all results are an initial technical indication, not water-law-relevant design planning.
- There is no automatic mapping to KOSTRA grid values — every rainfall depth (in both the simple method and the DWA-A 117 verification) must be entered manually as a verified, site-specific technical value.
- The orientation values for throttled outflow and infiltration in the DWA-A 117 section do not replace consultation with the responsible lower water authority or the municipal drainage statute, nor a required infiltration test or geotechnical report under DWA-A 138.
- The simple method (chapter 8) and the DWA-A 117 verification (chapter 6) are two independent calculation paths with different results (different treatment of throttled outflow and infiltration) — both should be considered together in the report.
- Without persistent browser storage, unsaved input is lost when the page is closed or reloaded — regular export is recommended.
- The infrastructure readiness statements (chapter 14) describe suitability and architectural orientation, not formal certification.

23. Quick Reference of Icons and Buttons

Icon / Button	Meaning
ℹ Info	Opens the technical explanation for the respective field
Import	Reads in a project.dbm file and checks its hash
Export	Saves the current state as a project.dbm file and recalculates the hash
Calculate	Triggers a full recalculation of all sections
Apply required modules	Sets the planned module count to the calculated demand
Default values	Resets all inputs to the technical factory settings
Print / PDF	Opens the Hydrological Report in a new window
Reset planning	Resets all inputs and scrolls to the top of the page
✓ sufficient	Storage reserve positive and adequately large
⚠ tight	Storage reserve below 10% of planned capacity
⚠ exceeded / not met	Storage reserve negative — increase module count
🔒 Hash status	Current SHA-256 verification status of the project.dbm