Data as the Foundation of Intelligent Water Systems

How Waternet is building a sovereign,
AI-ready water knowledge graph for Amsterdam

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Who is Waternet?

Amsterdam's integrated water utility — one organisation, three critical missions

Drinking Water

Produces & delivers clean drinking water to 1.4 million people in Amsterdam and surrounding area

Wastewater

Manages 5119 km of sewers and 7 treatment plants — the full urban water cycle

Water Management

Controls water levels, dike safety, and surface water quality across 1,000 km² of waterways

1.4M
people served

2030
fully digital AIM target

3
organisations after split

5119km
sewers managed

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The Dragon: Why Data is Broken

The challenge every water organisation knows — but few have fixed

Fragmented Systems

GIS, EAM (Maximo), BIM, DMS — each holds a piece of the truth. No single source of truth exists.

Inconsistent Quality

Missing & Duplicate attributes, duplicate objects, contradicting records across systems degrade every decision.

Locked-in Data

Data captured in applications, not in standards.
Switching vendors means losing history.

No structured Data Governance
& Organizational Split

unclear governance and impending separation

Waternet splitting into 3 entities
— who owns which data? Without governance: data chaos.

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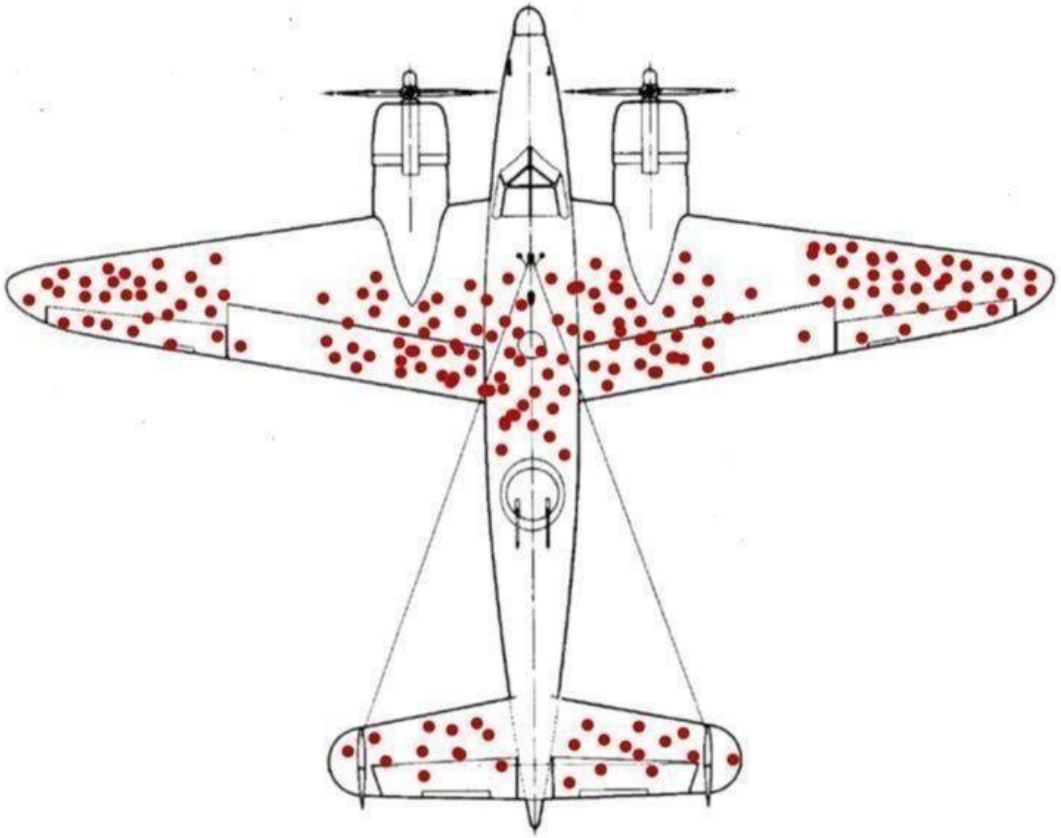
How do you view the data?
Or the information displayed?



The story behind the data is perhaps more important than the data itself.

Or

The reason why we miss certain data is perhaps more important than the data itself.

It is important to know what data and composition you are looking at!

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“Data Behaves Like Water”

> *“Give data structure — and it gains value”*
>
> Alexander Worp · Waternet

Water without structure

→ Floods and causes damage

→ Cannot be directed

→ Evaporates — lost forever

→ Inconsistent, uncontrolled

Water with structure

→ Flows where needed, reliably

→ Supports life and industry

→ Stored and reused efficiently

→ Measured, monitored, trusted

Data with structure (W-OTL)

→ Flows between systems reliably

→ Knowledge Graph Powers decisions making and AI

→ Reusable across the full lifecycle, vendor lock free

→ FAIR: Findable, Accessible, Interoperable, Reusable

The Treasure: One Platform, One Truth

Governance first. Technology second.

By 2030, all 3 new water organizations share one integral open digital asset information platform
— enabling real-time steering on performance, risk and cost, with reliable, sustainable and affordable water services.

Integral Asset Information

All asset data linked across systems — one complete, trusted picture

Data Availability

Centralised, automated deliveries. Dashboards always current.

Data Quality

Semantic validation via W-OTL. Quality is a process, not an accident

Facilitate Organisational Split

Three clean data domains.
Each organisation starts with reliable data

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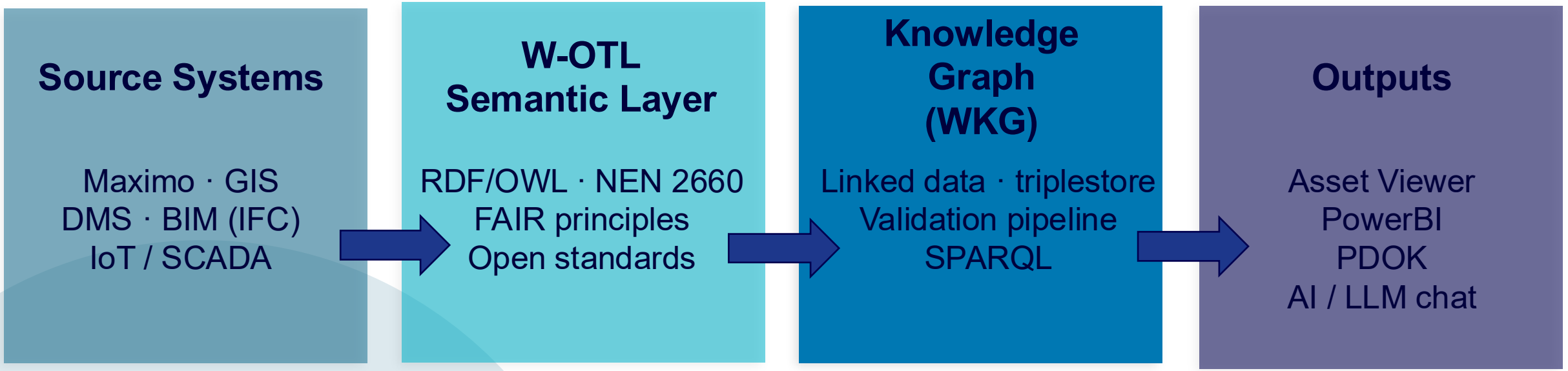
The Architecture: Waternet Knowledge Graph

Semantic ontology · Open standards · Graph database · Asset Viewer



Tooling: Laces Suite · GraphDB · Github · Autodesk Construction Cloud (ACC)

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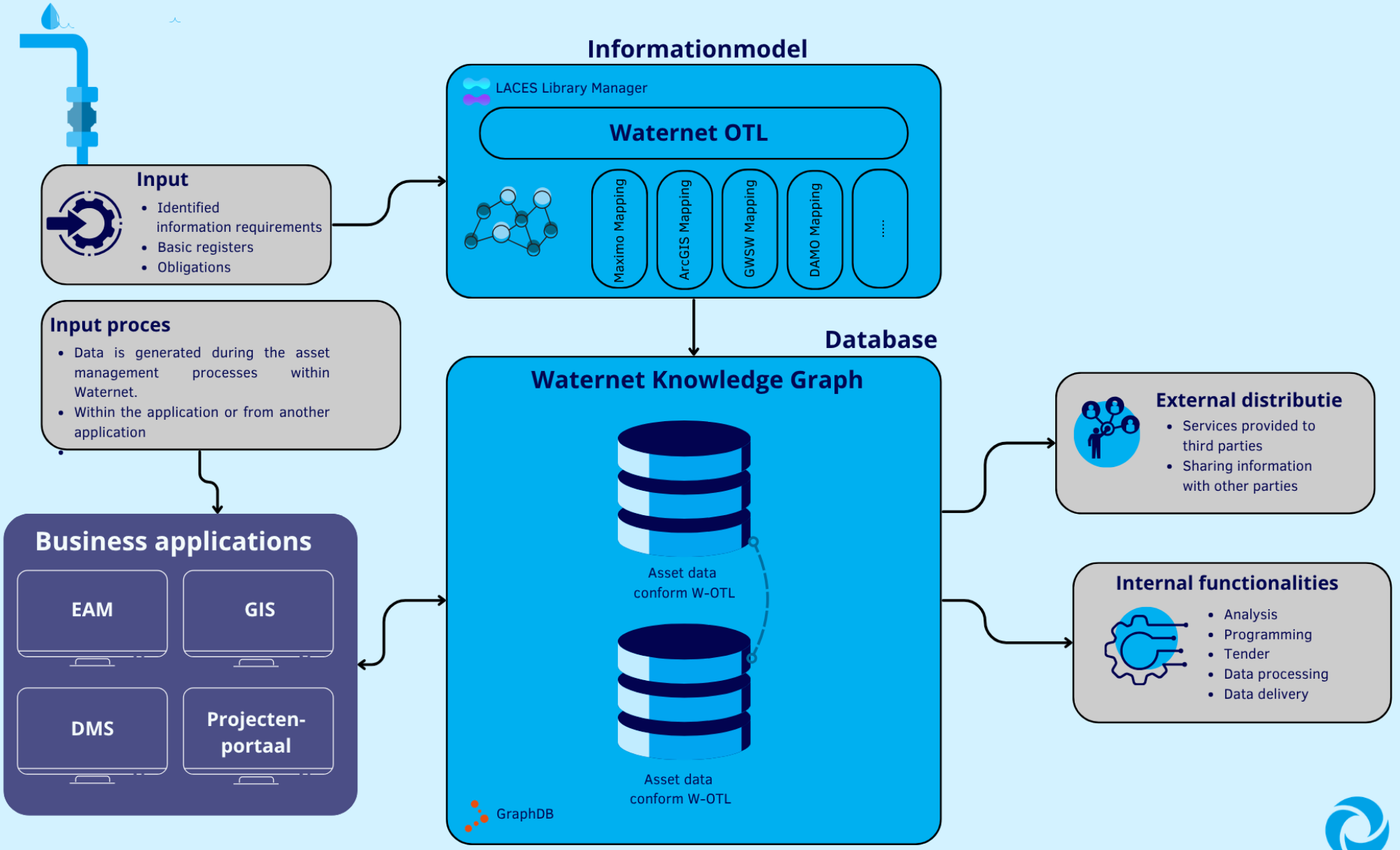
The Architecture: Waternet Knowledge Graph

Data Hub

to provide uniform access to data from various sources, improve its quality and make it available independently.



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W-OTL: A Common Language for Water Assets

The Waternet Object Type Library — where governance becomes machine-readable

What the W-OTL is

- ✓ RDF/OWL ontology — machine & human readable
- ✓ Taxonomies, meronymies (part-whole relations)
- ✓ Defines objects, attributes, functions, locations
- ✓ Versioned — URI per object, per requirement
- ✓ Governs Maximo, GIS, BIM, IoT data uniformly
- ✓ Mapped to GWSW, IFC, DAMO, IMWA, IMBOR

Why it matters for geospatial

Spatial + semantic:

Links GIS geometry to W-OTL object — location becomes meaningful

Interoperability:

GWSW, IFC, CityGML, OGC — one asset, multiple spatial standards

Underground utility:

Data Rotonde Amsterdam: unified subsurface network coordination

Open for AI:

Structured graph = queryable by LLMs. No structure → hallucinations

From Strategy to Delivery: Live Use Cases

Real results from the Waternet Knowledge Graph — already in production

GWSW → PDOK

LIVE

Full wastewater network delivered to national open data platform via linked data.
First WKG production case.

DAMO Deliveries

Testing

Bridge & Diks asset data delivered to Waterschapshuis in DAMO format — directly from the knowledge graph.

Requirement washmachine (AI)

IN PRODUCTION

AI-powered pipeline: auto-ingests requirements from project documents, validates against W-OTL, loads to Laces library.

buildingSMART Water utility Domain

2026

Leading international IFC for Water working group. Porto 2026 hackathon results: IFC4.3 + bSDD + IDS pilots.

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The Next Frontier: Digital Twin & AI

The the Waternet Data Hub roadmap — AI only works with structured data

What makes AI work for water

- Structured knowledge graph
  → LLM can query it reliably
- W-OTL as 'guardrails'
  — AI stays within defined semantics
- Machine-readable requirements (WSL)
  → automated validation
- SPARQL queries replace manual data hunting
- Predictive maintenance on top of sensor + asset history data

Chat with the Database

Natural language queries on the full asset graph — maintenance teams get instant answers

Leak & Risk Detection

AI + IoT + geospatial: real-time stress prediction and demand forecasting

Automated Classification

Incoming IFC/CityGML(GIS) data auto-classified against W-OTL

Digital Water Twin

Virtual replica for climate scenario modelling and long-term infrastructure planning

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The Geospatial Dimension

Spatial intelligence is not a layer on top — it is embedded in the data model

GIS as Core Infrastructure

· W-OTL links every object to its spatial representation

· IFC & OGC (Citygml) standards: underground utilities mapped in 3D

· Data Rotonde: unified subsurface utility coordination, Amsterdam

· Real-time IoT sensor feeds true the knowledge graph (Q4 2026)

Climate Resilience

· Spatial scenario modelling for flood risk on sewer capacity

· Digital twin for long-term infrastructure planning

· Smart meter data + GIS in WKG = non-revenue water hotspot detection

· Real-time water stress monitoring via integrated WKG dashboarding

National & International

· PDOK: national open data delivery via linked data standard

· GWSW (Rioned) mapping — national wastewater standard

· buildingSMART IFC4.3 for water infrastructure globally (BuildingSMART International WG)

· DSO (Enviromentallaw) legal reporting via structured data (CityGML&Geo-sparql 2027)

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Open Standards = Data Sovereignty

GWF 2026 theme: Sovereignty, Economy & Society — here is what that means for water utilities

"Data is **not** captured in our systems — data is captured by **open standards.** **Because systems come and go."

ISO 55001	Asset management framework — governance foundation
ISO 19650	BIM information management across the project lifecycle
NEN 2660	Dutch national ontology standard — backbone of W-OTL
RDF / OWL	W3C linked data — machine-readable, vendor-independent
GWSW	National wastewater data standard for PDOK delivery
IFC 4.3 - CityGML	buildingSMART — Water Utility WG OGC -- CityGML & GEO-sparql

Vendor independence: best-of-breed tooling, zero lock-in — because our URIs outlive any software.

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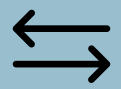
Join the Water Data Community

The water sector's digital future is built on shared standards and open collaboration

buildingSMART Water Utilities WG

Help define IFC for water infrastructure globally.
Contact us if your organisation works with water assets and openBIM.



Data Rotonde Amsterdam

Open-source underground utility coordination tool for cities. Linked data.
Soon it is free to use. Already tested in Amsterdam.

Waternet Knowledge Sharing

We share our AIM playbook openly. HH Delfland & HH Rijnland were the first.
Who's next? Connect with Alexander after this session.

"Give data structure — and it gains value." · Alexander Worp · Waternet · GWF 2026

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Thank You

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