UPF – Gestió de projectes

GP2526 Project Work Plan

AIGÜES DE BARCELONA - INCIDÈNCIES EN COMPTADORS INTEL·LIGENTS

Document Control Information

Settings	Value
Document Title:	Project Work Plan
Project Title:	Incidències en comptadors intel·ligents
Team Number:	102F
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Revision	Date	Created by	Short Description of Changes
v.0.1	13/10/2025	PCT	Definition of product scope, requirements, and work breakdown structure
v.1.0	18/10/2025	PCT	First version of the Project Work Plan Completed.
v.1.1	25/10/2025	PCT	Modification of Success Criteria and Work Breakdown Structure due to delayed delivery of the full dataset. Adjusted analysis and modeling schedule accordingly.
v.2.0	31/10/2025	PCT	Clarifies roles and governance, makes success criteria SMART, refines requirements and WBS for clarity and accountability, adds communication cadence and traceability, and updates the footer date.
v.3.0	12/11/2025	PCT	Updates Project Work Plan to clarify and refine unclear steps. Deletes some unnecessary tasks that are performed together.
v.3.1	22/11/2025	PCT	Aligns WBS and project-management artefacts with the Follow-up Register and Status Reports, assigns a single responsible to each work package, clarifies stakeholder roles (no Business Manager; PO conceptual), and explicitly marks the main v3.1 updates in the document.

The latest version of this controlled document is stored in Google Drive\GP2025-26\Subject global documents\Project methodology and templates\

1. INTRODUCTION

This project aims to analyze smart water meter data from Aigües de Barcelona to detect and predict potential malfunctions or anomalies. By combining statistical and machine learning approaches, the project seeks to enhance predictive maintenance and improve the reliability of urban water systems. The outcomes will contribute to smarter and more sustainable water management, directly supporting Aigües de Barcelona's objectives and the Gestió de Projectes course.

1.1. Project summary

This plan guides a ten-week, three-iteration effort to detect anomalies in smart water meters for Aigües de Barcelona. We will deliver a clean, unified dataset; a validated statistical analysis; and baseline ML models (e.g., LightGBM, LSTM) evaluated on business-relevant metrics.

Governance is led by the **Project Owner (Sheila Piñol)** via the **Project Steering Committee (PSC)**; the **Project Manager** coordinates scope, schedule, quality, and communication across the academic and client sides. The summary aligns with the Success Criteria and the WBS, which is organized by iteration for traceability.

1.2. Success Criteria and Critical Success Factors

Success criteria (SMART)

1. **Data readiness:** a single, validated dataset and reproducible data-prep pipeline, signed off by PO, by **Week 6**.
2. **Model quality:** anomaly detector achieving **≤ X% false-positive rate** and **≥ Y% recall** on pilot meters by **Week 8**, with a clear error analysis.
3. **Explainability:** stakeholder-readable model explanation (top features, example cases) and a one-page "how to interpret" guide by **Week 9**.
4. **Value narrative:** a short memo quantifying potential operational impact (e.g., avoided truck rolls/leak losses) by **Week 10**.
5. **Governance cadence kept:** all weekly PO↔PM syncs and monthly PSC review held, with minutes and decisions logged.

Three critical success factors

- **Timely data & data quality** (stable schemas, consistent join keys, labeled anomalies where possible).
- **Stakeholder engagement** (PO present in PSC reviews; decisions and assumptions logged).
- **Technical readiness** (automated scripts; environment/version control so work is reproducible).

1.3. Project Stakeholders [UPDATED v3.1]

The key stakeholders are:

- ***Sponsor / Client:** Aigües de Barcelona — original challenge provider; would evaluate outcomes if the project were selected.*

- ***Project Owner (conceptual):*** *Sheila Piñol (Aigües de Barcelona) — referenced as the client-side owner of scope and acceptance in the methodology, but not actively involved because the GP2526 project was not selected by Aigües de Barcelona. In practice, PSC members emulate PO decisions.*
- ***Solution Providers / PSC members:*** *Elisabet Duocastella, Rebeca Calderón, Alejandro Oller — provide methodology, quality assurance, and phase-exit approvals.*
- ***[UPDATED v3.1] Business Manager:*** *not assigned, as the project has not been selected by Aigües de Barcelona. Business-context questions are handled by the Solution Providers and the Project Manager based on the original challenge description.*
- ***Project Manager:*** *Arnau Rodon Comas — coordinates delivery, schedule, risks, and communication; not a PSC member, attends PSC by invitation to report status and request decisions.*
- ***Project Core Team:*** *Arnau Rodon, Asul Garcia, Jordi Esteve, Albert Jané, Nahia Anaut — implement all technical and documentation work packages.*
- ***End Users (conceptual):*** *Operations & Maintenance teams at Aigües de Barcelona — target users of the anomaly-detection insights; no direct participation during the academic project.*
- ***Challenge Jury (GP2526):*** *evaluates the final presentation, innovation, and impact of the solution at the end of the course.*

1.4. Project Constraints / Assumptions

Constraints: *academic calendar (fixed 10-week window); limited compute; intermittent client availability; potential lag in full dataset delivery; no production deployment scope.*

Assumptions: *datasets provided are representative; anomaly labels or proxy events can be derived for evaluation; methods (stats/ML) are adequate; PSC decisions unblock data or scope issues within* ***24h*** *escalation.*

Out of scope: *live system integration, customer-facing dashboards, production MLOps, and real-time alerting.*

2. PRODUCT SCOPE

This section outlines the product scope of the project "Incidències en Comptadors Intel·ligents," defining all required deliverables and their relationship with the overall project objectives. The product will consist of a predictive system for anomaly detection in smart water meters, including data integration, statistical analysis, model design, and visualization deliverables, all aligned with the objectives and success criteria described in the Project Charter.

2.1. Requirements [UPDATED v3.1]

This section presents the product/service requirements that must be related with the product deliverables.

- ***ID:** The unique requirement identifier. It should be numbered sequentially.*
- ***Name:** Short name of the requirement.*
- ***Category**: Business need, Feature, Functional Requirements, Technical Requirements, Training Requirements, Quality Requirements, Performance Requirements, Security requirement, Support Requirements, Maintenance Requirements, System quality requirement, Business rule, Legal, etc.*
- ***Requested by**: The source of the requirement. The stakeholder(s) to whom the requirement is important.*
- ***Deliverable ID**: the deliverable that includes the requirement.*

Requirement	Primary WBS Deliverable	Supporting WBS Deliverables	Verification Method & Acceptance	Due
Rq1 – Data consistency & integrity	*1.1.1 Unified dataset v1*	*1.1.1.a Data cleaning scripts; 1.1.1.b Validation report*	*Review of validation report; no schema/key errors; join key consistency checks pass; issues log cleared*	*W6*
[UPDATED v3.1] Rq2 – Anomaly labeling / evaluation protocol	*1.2.3 Evaluation pack*	*1.1.2 EDA pack v1 (hypotheses to guide labels)*	*Protocol document approved by PSC (PO if available); sample labels or proxy events defined; evaluation steps reproducible*	*W7*
Rq3 – Model performance (≤ X% FPR, ≥ Y% Recall)	*1.2.2 Model baselines*	*1.2.3 Evaluation pack (metrics, error analysis)*	*Metric report with CI; thresholds met on pilot set; PSC minutes show acceptance*	*W8*

[UPDATED v3.1] Rq4 – Explainability (stakeholder-readable)	*1.3.2 Visualization pack*	*1.2.2 Model baselines (feature importance), 1.2.3 Evaluation pack (case studies)*	*PSC review of 1-pager "How to interpret" (PO if available); examples of true/false alarms; clarity test with a non-technical reviewer*	*W9*
[UPDATED v3.1] Rq5 – Reproducibility (env, versioning, runbook)	*1.4.2 Schedule / Monitoring pack (with environment & runbook annex)*	*1.1.1.a Scripts; 1.2.2.b Training & tuning*	*Fresh clone runs E2E; versions pinned; runbook present; commit hashes referenced in document footers*	*W9*
[UPDATED v3.1] Rq6 – Documentation (final report + exec summary)	*1.3.1 Final report*	*1.3.3 Final presentation*	*PSC sign-off on report (PO if available); 1-page exec summary exists and is consistent with presentation*	*W10*
Rq7 – Visualization of anomalies & performance	*1.3.2 Visualization pack*	*1.2.3 Evaluation pack*	*Plots explain anomalies, thresholds, and trade-offs; matches reported metrics*	*W9*

2.2. Work Breakdown Structure [UPDATED v3.1]

Note: The original Work Breakdown Structure can be consulted in Team102F.ProjectWorkPlan.v1.0. This updated version (v1.1) modifies the timeline and sequence of activities to reflect the late availability of the full dataset.

This section presents the scope of the product using a Work Breakdown Structure a breakdown of the project into smaller and more manageable components such as deliverables, work packages and/or activities. Each lower level of the representation offers a finer level of detail of the deliverables and work that all together defines the project output(s) and the work involved to produce them.

*The Work Breakdown Structure has been revised to account for the **partial dataset** received during the first five weeks of the project. From **Weeks 2 to 4**, the team performed a **preliminary exploratory data analysis (EDA)** and built **automated statistical scripts** designed to be re-executed once the full dataset was obtained. **Model design and preparation** began in **Week 5**, using insights from the sample data. The **final data analysis** and **model training** are now scheduled for **Weeks 6–7**, ensuring all analytical tasks and modeling activities are completed before the final documentation and presentation stages.*

The WBS is deliverable-based and organized by iterations. Activities only appear at the lowest level; everything above is a deliverable. Project-management artefacts are included to ensure governance and traceability. IDs match the Requirements mapping.

[UPDATED v3.1] *Project-management deliverables (1.4.x) have been adjusted so that their IDs, names and responsibilities are aligned with the Requirements, the Follow-up Register and the Status Reports.*

Work Breakdown					
ID	**Name**	**Type**	**Parent**	**Supports Rq**	**Due**
1.0	*Project Deliverables*	*Deliverable (container)*	*—*	*—*	*—*
1.1	*Iteration 1 — Data readiness & EDA*	*Deliverable (container)*	*1.0*	*Rq1, Rq2, Rq5*	*W6*
1.1.1	*Unified dataset v1*	*Deliverable*	*1.1*	*Rq1, Rq5*	*W6*
1.1.1.a	*Data cleaning scripts*	*Work package*	*1.1.1*	*Rq1, Rq5*	*W6*
1.1.1.b	*Validation report*	*Work package*	*1.1.1*	*Rq1, Rq5*	*W6*
1.1.2	*Exploratory Data Analysis pack v1*	*Deliverable*	*1.1*	*Rq2*	*W6*
1.1.2.a	*Exploratory visuals*	*Work package*	*1.1.2*	*Rq2*	*W6*
1.1.2.b	*Initial hypotheses*	*Work package*	*1.1.2*	*Rq2*	*W6*
1.2	***Iteration 2 — Modeling & evaluation***	***Deliverable (container)***	***1.0***	***Rq2, Rq3, Rq4, Rq5, Rq7***	***W7–W8***

1.2.1	*Statistical analysis v2*	*Deliverable*	*1.2*	*Rq3, Rq4*	*W7*
1.2.1.a	*Correlation/regression analyses*	*Work package*	*1.2.1*	*Rq3, Rq4*	*W7*
1.2.1.b	*Feature screening notes*	*Work package*	*1.2.1*	*Rq3, Rq4*	*W7*
1.2.2	*Model baselines*	*Deliverable*	*1.2*	*Rq3, Rq4, Rq7*	*W7–W8*
1.2.2.a	*Feature set & engineering notebook*	*Work package*	*1.2.2*	*Rq3, Rq4, Rq7*	*W7*
1.2.2.b	*Training & tuning runs*	*Work package*	*1.2.2*	*Rq3, Rq4, Rq5, Rq7*	*W7–W8*
1.2.3	*Evaluation pack*	*Deliverable*	*1.2*	*Rq2, Rq3, Rq4, Rq7*	*W8–W9*
[UPDATED v3.1] *1.2.3.a*	*Metrics report (with CIs)*	*Work package*	*1.2.3*	*Rq2, Rq3, Rq7*	*W8*
[UPDATED v3.1] *1.2.3.b*	*Error analysis & case studies*	*Work package*	*1.2.3*	*Rq2, Rq3, Rq4, Rq7*	*W8–W9*
1.3	***Iteration 3 — Synthesis & storytelling***	***Deliverable (container)***	***1.0***	***Rq4, Rq6, Rq7***	***W9–W10***
1.3.1	*Final report*	*Deliverable*	*1.3*	*Rq6*	*W10*

1.3.2	*Visualization pack*	*Deliverable*	*1.3*	*Rq4, Rq7*	*W9*
1.3.2.a	*Anomaly & performance plots*	*Work package*	*1.3.2*	*Rq4, Rq7*	*W9*
1.3.3	*Final presentation*	*Deliverable*	*1.3*	*Rq6*	*W10*
1.4	***Project management deliverables***	***Deliverable (container)***	***1.0***	***Rq5 (traceability)***	***Weekly/ Monthly***
1.4.1	*Decision & Assumptions Log*	*Deliverable*	*1.4*	*Rq5*	*Weekly*
[UPDATED v3.1] *1.4.2*	*Schedule / Monitoring pack (with env & runbook annex)*	*Deliverable*	*1.4*	*Rq5*	*W9*

2.3. Work Breakdown Component Descriptions [UPDATED v3.1]

Work Breakdown Component Descriptions

Project: Incidències en Comptadors Intel·ligents

****.* Deliverable***

WP 1.1.1.a — Data cleaning scripts

Purpose: *Implement cleaning, deduplication, type checks, and standardized keys (e.g., POLISSA_SUBM) to build a unified dataset.*

Inputs: *Raw meter data; data dictionary; prior notes.*

Output / Acceptance: *Reproducible scripts run end-to-end on sample and full data without errors; log of fixes produced.*

Responsible / Due: *Albert · W6*

Supports: *Rq1, Rq5*

Dependencies: *—*

WP 1.1.1.b — Validation report

Purpose: *Profile integrity (missingness, duplicates), join-key consistency, schema conformity, coverage.*

Inputs: *Cleaned dataset; profiling notebooks.*

Output / Acceptance: *Validation report approved by PSC (PO if available); no schema/key errors; issues log cleared.*

Responsible / Due: *Nahia · W6*

Supports: *Rq1, Rq5*

Dependencies: *1.1.1.a*

WP 1.1.2.a — Exploratory visuals

Purpose: *Visualize distributions, trends, and anomaly candidates to inform evaluation design.*

Inputs: *Unified dataset v1.*

Output / Acceptance: *Visuals bundle with concise commentary; reviewers can identify candidate labelling strategies.*

Responsible / Due: *Jordi · W6*

Supports: *Rq2*

Dependencies: *1.1.1*

WP 1.1.2.b — Initial hypotheses

Purpose: *Document plausible anomaly patterns and proxies for labelling/evaluation.*

Inputs: *EDA visuals; domain notes.*

Output / Acceptance: *Hypotheses note accepted by PM and referenced in evaluation protocol.*

Responsible / Due: *Arnau · W6*

Supports: *Rq2*

Dependencies: *1.1.2.a*

[UPDATED v3.1] WP 1.2.1.a — Correlation/regression analyses

Purpose: *Quantify relationships and guide feature selection/thresholds.*

Inputs: *Unified dataset; hypotheses note.*

Output / Acceptance: *Short analysis memo feeding feature screening; results are reproducible.*

Responsible / Due: *Jordi · W7*

Supports: *Rq3, Rq4*

Dependencies: *1.1.1, 1.1.2*

[UPDATED v3.1] WP 1.2.1.b — Feature screening notes

Purpose: *Record selected feature candidates and rationale based on analyses.*

Inputs: *1.2.1.a outputs.*

Output / Acceptance: *Screened feature list cross-referenced in 1.2.2.a.*

Responsible / Due: *Nahia · W7*

Supports: *Rq3, Rq4*

Dependencies: *1.2.1.a*

[UPDATED v3.1] WP 1.2.2.a — Feature set & engineering notebook

Purpose: *Implement chosen features and transformations with documentation.*

Inputs: *Screened features; unified dataset; environment specification.*

Output / Acceptance: *Reproducible notebook; feature definitions documented and versioned.*

Responsible / Due: *Nahia · W7*

Supports: *Rq3, Rq4, Rq7*

Dependencies: *1.2.1.b*

[UPDATED v3.1] WP 1.2.2.b — Training & tuning runs

Purpose: *Train baseline models (e.g., LightGBM, LSTM); record params, seeds, and artifacts.*

Inputs: *Feature set; environment spec.*

Output / Acceptance: *Training logs; saved models; performance snapshot stored with commit refs.*

Responsible / Due: *Jordi · W7–W8*

Supports: *Rq3, Rq4, Rq5, Rq7*

Dependencies: *1.2.2.a*

[UPDATED v3.1] WP 1.2.3.a — Metrics report (with CIs)

Purpose: *Report FPR/Recall and confidence intervals on the pilot set per evaluation protocol.*

Inputs: *Trained models; protocol; labeled/proxy events.*

Output / Acceptance: *Thresholds met (≤ X% FPR, ≥ Y% Recall) or gaps flagged; PSC acceptance minuted.*

Responsible / Due: *Arnau · W8*

Supports: *Rq2, Rq3, Rq7*

Dependencies: *1.2.2.b*

[UPDATED v3.1] WP 1.2.3.b — Error analysis & case studies

Purpose: *Analyze false positives/negatives; compile clear case studies.*

Inputs: *Predictions; metrics; labelled/proxy events.*

Output / Acceptance: *Case compendium feeding Visualization pack; actionable insights logged.*

Responsible / Due: *Albert · W8–W9*

Supports: *Rq2, Rq3, Rq4, Rq7*

Dependencies: *1.2.3.a*

[UPDATED v3.1] WP 1.3.2.a — Anomaly & performance plots

Purpose: *Produce plots that explain anomalies, thresholds, and trade-offs.*

Inputs: *Metrics report; case studies.*

Output / Acceptance: *Plots consistent with reported metrics; PSC review complete (PO if available).*

Responsible / Due: *Jordi · W9*

Supports: *Rq4, Rq7*

Dependencies: *1.2.3.b*

[UPDATED v3.1] WP 1.3.1 — Final report

Purpose: *Consolidate approach, results, and impact narrative.*

Inputs: *All prior packs and logs.*

Output / Acceptance: *Signed off by PSC (PO if available); consistent with presentation and exec summary.*

Responsible / Due: *Asul · W10*

Supports: *Rq6*

Dependencies: *1.3.2, 1.2.3*

[UPDATED v3.1] WP 1.3.3 — Final presentation

Purpose: *Concise narrative of findings and business value for jury/client.*

Inputs: *Report; visualization pack.*

Output / Acceptance: *Delivered and aligned to the exec summary; feedback captured.*

Responsible / Due: *Nahia · W10*

Supports: *Rq6*

Dependencies: *1.3.1, 1.3.2*

WP 1.4.2.a — Environment specification

Purpose: *Pin dependencies and versions to guarantee reproducibility.*

Inputs: *Current notebooks; package lists.*

Output / Acceptance: *Spec allows fresh clone to run end-to-end.*

Responsible / Due: *Jordi · W9*

Supports: *Rq5*

Dependencies: *—*

WP 1.4.2.b — Runbook

Purpose: *Step-by-step instructions to reproduce data prep, training, and evaluation.*

Inputs: *Env spec; scripts; notebooks.*

Output / Acceptance: *Another team member reproduces outputs without assistance; times noted.*

Responsible / Due: *Albert · W9*

Supports: *Rq5*

Dependencies: *1.4.2.a*

[UPDATED v3.1] WP 1.4.1 — Decision & Assumptions Log

Purpose: *Record decisions and assumptions; link to impacts/actions.*

Inputs: *Meeting minutes; PSC reviews.*

Output / Acceptance: *Up-to-date log with IDs; cross-referenced from deliverables.*

Responsible / Due: *Arnau · Weekly*

Supports: *Rq5*

Dependencies: *—*

3. Roles & responsibilities [UPDATED v3.1]

[UPDATED v3.1] *We adopt the Project Handbook RACI matrix and add the Project Manager role as a column. The Project Owner (Sheila Piñol) is treated as a conceptual role for this academic project: scope and acceptance decisions are emulated by the PSC, with the Solution Providers (led by Elisabet Duocastella) acting as Solution Provider (SP) in practice. The PM (Arnau Rodon) is not a PSC member and attends by invitation to report status and request decisions. This clarifies the separation between steering (PSC/SP) and day-to-day management (PM and PCT).*

4. Communications Management [UPDATED v3.1]

[UPDATED v3.1]

Cadence: *Weekly 15-minute sync between the Project Manager and the SP / PSC representative (PO if available), supported by a 1-page status (progress, risks, decisions needed); Monthly 45-minute PSC Review with SP/SP (and PO if available); Crisis path: call between PM and SP/PSC within 24h when a blocking risk or issue is identified.*

Channels: *Email (official record, pre-reads), WhatsApp or Teams (quick coordination), Google Drive (versioned documents), GitHub (code & notebooks).*

Records: *Decisions and assumptions are logged in the Decision & Assumptions Log (1.4.1); PSC and SP/PO receive meeting minutes within 24h.*

5. Configuration Management [UPDATED v3.1]

Configuration management ensures that all project materials remain consistent, organized, and traceable throughout the project lifecycle.

All project documentation and versions will be stored in a ***shared Google Drive folder*** *within the* ***GP2025-26 repository****, serving as the central location for collaboration and version tracking. File versions will follow the standardized naming convention* ***"ProjectWorkPlan_vX.X"****, ensuring clarity and traceability across updates.*

All documents will continue to comply with a ***standard naming structure*** *(e.g., Group102F.DocumentName.vX.X.docx/pdf), and the Drive repository will be organized by iteration and deliverable. Key documents such as the Project Charter, Work Plan, and Risk Plan will be* ***archived by version*** *to safeguard previous iterations.*

To maintain document integrity and team alignment, ***all changes will be reviewed collectively during the weekly meetings****.*

Additionally, ***GitHub*** *will manage version control for all development assets — including data processing scripts, analytical notebooks, and visualization code. Document versions in Drive must cite the corresponding Git commit for code-generated figures to preserve traceability*

The ***Project Manager*** *will oversee configuration management and version control, ensuring that the latest approved versions are consistently accessible to all team members.*

[UPDATED v3.1] *Changes introduced in version 3.1 (stakeholders, WBS 1.2.x and 1.4.x, and work package responsibilities) are recorded in the Revision table and tagged as "[UPDATED v3.1]" in this document so that they can be easily identified by reviewers.*