Ridgeline Mechanical Services — Sponsor Reporting & Close Acceleration Platform

Preliminary Requirements and System Specification

Document Type: Pre-Pipeline Functional Specification (M0 Deliverable) **Version:** 0.2 (Revision following independent specification review — see §13) **Date:** 2026-07-12 **Supersedes:** v0.1 (2026-07-06) **Prepared For:** AI-Native Software Delivery Pipeline (VH M0–M7) — Epic/Feature Decomposition **Classification:** Published Demonstration Artifact

> **Demonstration notice.** Ridgeline Mechanical Services is a fictional company and this scenario is a composite. The requirements, specification structure, provenance discipline, and all build artifacts generated from this document are real and independently verifiable. No fictional entity herein is intended to resemble any actual company.
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> **Revision notice.** Version 0.2 incorporates the findings of an independent specification review conducted against v0.1 (ten findings; one rated high, five medium, four low). Every finding and its disposition — adopted, adapted, or declined with rationale — is recorded in §13. Requirements added or materially modified in this revision carry the [RV] provenance tag in addition to their original evidentiary basis.

Provenance legend (per-requirement tags):

- **[E] Extracted** — derived from artifacts (GL export samples, credit-agreement covenant schedule, prior lender packs, job-system exports)
- **[S] SME-stated** — stated in stakeholder interviews (role attributed)
- **[I] Inferred** — synthesized by the audit from indirect evidence; flagged for confirmation before build
- **[RV] Review-derived** — added or modified in response to the independent specification review of v0.1 (2026-07-10); where a review item required a stakeholder decision, the resolving party is attributed

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1. System Overview

1.1 What Is the Ridgeline Reporting Platform?

Ridgeline Mechanical Services is a $30M-revenue commercial mechanical contractor (HVAC service, maintenance agreements, and mechanical projects), acquired ninety days ago by an independent sponsor in a debt-financed transaction. [E — closing set extract] The acquisition created, on day one, reporting obligations the company has never produced: a monthly KPI pack for the sponsor and board, covenant compliance reporting to the senior lender, and a disciplined monthly close. The finance function is one controller and one bookkeeper on QuickBooks; the current close takes ~15 business days and the first two post-close lender packs were assembled manually in Excel over multiple late nights. [S — Controller, Interview 1] This system replaces that manual assembly: a bounded reporting and close-orchestration platform that ingests the books as posted, computes the pack, tracks the covenants, and gives the sponsor a live window — without becoming the accounting system, which remains QuickBooks (§8).

1.2 Problem Statement

Three reporting clocks now run monthly: the close itself (target: business day 5, currently day 15), the board/sponsor pack (due BD+7 per the sponsor's portfolio policy [E — reporting policy memo]), and the lender compliance certificate (due within 30 days of month-end per the credit agreement [E — §6.02, covenant schedule extract]). Missing or restating any of them consumes the two scarcest resources at a newly acquired company: the controller's hours and the sponsor's confidence.

1.3 Operating Environment

- **Users:** Controller (1), bookkeeper (1), operations manager (1), CEO/owner-operator (1), sponsor deal team (3, read-only). [S — Controller; Sponsor Deal Partner]
- **Financial footprint:** QuickBooks chart of ~380 active accounts; 3 service lines (Service & Repair, Maintenance Agreements, Projects); ~600 active jobs/year in the legacy job-tracking system; single entity, single currency (USD). [E — GL export samples; job-system CSV]
- **Debt structure:** senior term loan + revolver; three financial covenants (senior net leverage, fixed-charge coverage, minimum liquidity) tested monthly, certified quarterly. [E — covenant schedule]
- **Budget:** annual budget exists in Excel at account and service-line grain, produced at close. [E — budget file]

1.4 Key Technical Approach

Five-system decomposition (§3): pure-software core (Close Orchestration, Financial Data Core, Covenant & Debt, Pack Generation, Platform) with all external dependencies isolated behind contracted seams (System X): QuickBooks GL exports, bank statements, the legacy job system's CSVs, and the debt schedule. The platform derives; it never posts — the books of record stay where they are, and every figure the platform shows traces to an ingested, posted source (Constraint C-3). Seam contracts are now formalized at field level in Appendix C [RV].

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2. Stakeholders and System Roles

Role	**Person (fictional)**	**Interest**	**Interview provenance**
Controller	J. Whitfield	Close speed, covenant accuracy, certification control, no restatements	Interviews 1–3 [S]
Sponsor Deal Partner	A. Rothman	BD+7 pack, covenant headroom visibility, portfolio-standard KPIs, live read-only access	Interview 2 [S]
Operations Manager	C. Delgado	Service-line performance, backlog visibility, job-margin flags	Interview 3 [S]
CEO (owner-operator, rolled equity)	S. Ridgeline	One page that tells him the month; minimal new process on the field side	Interview 4 [S]
Bookkeeper (staff)	—	Ingestion cadence, checklist tasks, no double entry	Interview 1 [S]

Role definitions above are the authoritative source for the RBAC matrix (P1, §9).

3. Architecture & Decomposition Model

System K — Close Orchestration: the monthly close checklist as a workflow — tasks, owners, dependencies, status, and variance commentary capture. **System F — Financial Data Core:** ingestion-derived trial balance, management chart mapping, KPI computation (revenue and gross margin by service line, backlog, DSO/DPO, working capital, TTM EBITDA per the credit-agreement definition). **System V — Covenant & Debt:** debt schedule, covenant definitions as configured formulas, monthly computation with headroom, threshold alerts, and draft compliance certificates. **System G — Pack Generation:** one-click board/sponsor pack and lender pack rendering (PDF), assembled from F/V/K outputs plus captured commentary. **System X — External Seams:** X1 QuickBooks GL export ingestion; X2 bank statement ingestion; X3 job-system CSV ingestion; X4 debt schedule maintenance. **System P — Platform:** RBAC including the sponsor read-only portal; authentication and data protection (P3 [RV]); append-only audit; operations views.

Constraint C-1 — Monetary representation (hard constraint, applies to every system)

All monetary amounts are represented, stored, transmitted, and computed as integer cents (`cents: i64`). Floating-point monetary types are prohibited in schemas, interfaces, and persistence. Rounding occurs only at defined points (ratio computation for display; allocation of mapped balances), using round-half-even. Every derived total must reconcile exactly to the sum of its ingested components (AT-1). *Pipeline note:* enforced by deterministic validation; generated artifacts carrying DECIMAL/float money types fail the build gate.

Constraint C-2 — Seam idempotency

All System X ingestions are idempotent under file replay; every ingested record carries source-batch identity and content hash. [I — inferred from the bookkeeper's description of occasional re-exports; confirmed at the v0.2 stakeholder review gate — Bookkeeper, Controller]

Constraint C-3 — Derived, never posted; no shadow figures

The platform holds no books of record and posts nothing back to QuickBooks. Every displayed or rendered figure derives from ingested posted data through versioned mappings; no figure may be manually keyed into a pack (commentary is text; numbers are derived). [S — Controller: "the pack must never disagree with the books"] (AT-3.)

Constraint C-4 — Mapping immutability

The management-chart mapping and covenant formula configurations are versioned with actor, timestamp, and effective period; historical packs re-render under their original mapping versions. (AT-7.)

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4. System K — Close Orchestration

K1 — Close Checklist Workflow

- **REQ-K1.1** [S — Controller] The system shall maintain a monthly close checklist instantiated from a template: tasks with owners, due business-days, dependencies, and evidence attachments (e.g., reconciliation exports).
- **REQ-K1.2** [S — Controller; Bookkeeper] The system shall track task status through PENDING → IN_PROGRESS → COMPLETE → REVIEWED, with dependency gating (a task cannot be COMPLETE before its dependencies) and business-day-aware due tracking.
- **REQ-K1.3** [S — Sponsor Deal Partner] The system shall present close progress (percent complete, tasks at risk, projected completion business day) on the sponsor portal in read-only form.
- **REQ-K1.4** The system shall log all task state changes with actor and timestamp (feeds P2 audit).
- **REQ-K1.5** [I — inferred from the two completed close cycles' Excel artifacts; flagged] The checklist template ships pre-populated from the observed close (34 tasks across bank recs, AR/AP cutoffs, job-cost review, accruals, mapping refresh); Controller confirms and owns the template thereafter.

K2 — Variance Commentary Capture

- **REQ-K2.1** [E — prior lender packs] The system shall compute budget-vs-actual and prior-period variances at the management-chart and service-line grain and shall require commentary on variances exceeding configurable thresholds before a pack may be finalized (thresholds resolved: OQ-4, ±10% and ±$25,000, per-line overridable [RV — Controller and Sponsor Deal Partner, review gate]).
- **REQ-K2.2** Commentary shall be captured against the specific variance line, carried into pack rendering verbatim, and attributed to its author.

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5. System F — Financial Data Core

F1 — Trial Balance & Management Mapping

- **REQ-F1.1** [E — GL export samples] The system shall construct the monthly trial balance from ingested QuickBooks exports and shall reconcile ingested totals to the export's own control totals before acceptance (`ERR_CONTROL_TOTAL_MISMATCH` quarantines the batch).
- **REQ-F1.2** [S — Controller; E — prior packs] The system shall map GL accounts to the management chart (the pack's line structure) via a versioned many-to-one mapping with allocation support for split accounts; unmapped active accounts block pack finalization (`ERR_UNMAPPED_ACCOUNT`) rather than falling into an "other" bucket silently.
- **REQ-F1.3** The system shall maintain service-line dimensionality from the job-system linkage (X3) for revenue and direct-cost accounts. [E — class/job fields in GL and job CSVs]
- **REQ-F1.4** [RV; E — field survey of GL and job-system samples] GL-to-job linkage shall use the QuickBooks `Customer:Job` field, exact-matched to the job system's `job_id` (normalization rules: trim, case-fold, strip the QuickBooks parent-customer prefix; the normalization function is part of the X3 seam contract, Appendix C). GL revenue and direct-cost transactions lacking a job assignment shall map to a service line via an account-level default configured in the management chart mapping (versioned under C-4). Where the QuickBooks class and the job system's `service_line` disagree for the same transaction, the job system prevails — it is the operational source of truth per §1.3 — and the disagreement is logged as a dimension variance for Controller review; unresolved dimension variances above the K2.1 thresholds block pack finalization.

F2 — KPI Computation

- **REQ-F2.1** [E — sponsor reporting policy; prior packs] The system shall compute the portfolio-standard KPI set monthly: revenue and gross margin by service line; TTM revenue and TTM EBITDA (per the credit-agreement EBITDA definition, F3); backlog (X3-derived); DSO and DPO; net working capital and its month-over-month bridge; maintenance-agreement renewal rate (inclusion in finalized packs gated on OQ-8 contract-record validation).
- **REQ-F2.2** (C-3) Every KPI shall be traceable to its ingested components via a drill path (KPI → mapped lines → GL accounts → source batch).
- **REQ-F2.3** [S — Ops Manager] The system shall flag jobs whose posted cost-to-date exceeds a configurable percentage of contract value without corresponding billings (job-margin watch list) — as a reporting flag only (no job accounting; §10.1).
- **REQ-F2.4** [RV; S — Ops Manager, review gate] Job-margin watch defaults and escalation: the default watch threshold shall be posted cost-to-date ≥ 80% of contract value with < 50% billed-to-date, configurable per service line (Projects and Service &

Repair are expected to diverge; Maintenance Agreements are excluded from the watch list by construction — no percent-complete economics). Each newly flagged job shall auto-generate a close checklist task (K1) assigned to the Operations Manager for investigation. If in any period the flagged-job count exceeds 5 or the aggregate flagged contract value exceeds $250,000, investigation commentary on the watch list becomes a pack-finalization blocker (G1.3 blocker class).

F3 — Defined-Term EBITDA

- **REQ-F3.1** [E — credit agreement §1.01 definition extract] The system shall compute "Consolidated EBITDA" per the credit agreement's defined term — including its enumerated add-backs (transaction expenses within the permitted window; sponsor management fees to the permitted cap; non-recurring items subject to the aggregate cap) — as a configured, versioned formula over mapped lines, with each add-back itemized and evidenced.
- **REQ-F3.2** The add-back schedule shall render as its own pack exhibit (lenders review it line by line [S — Controller]).

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6. System V — Covenant & Debt

V1 — Debt Schedule

- **REQ-V1.1** [E — loan statements; covenant schedule] The system shall maintain the debt schedule (term loan balance and amortization; revolver balance and availability; applicable rates) updated monthly from statements via X4, with balances in integer cents.

V2 — Covenant Computation & Headroom

- **REQ-V2.1** [E — covenant schedule] The system shall compute the three covenants monthly as configured formulas: Senior Net Leverage (Senior Net Debt / TTM Consolidated EBITDA); Fixed Charge Coverage; Minimum Liquidity — each against its scheduled threshold for the test period (thresholds step per the agreement's schedule).
- **REQ-V2.2** The system shall present headroom (absolute and percentage) per covenant, trend over trailing 12 months, and shall raise alerts at configurable early-warning margins (default 15% headroom, confirmed as the portfolio standard at the review gate [RV — Sponsor Deal Partner]).
- **REQ-V2.3** Covenant formulas and thresholds are versioned configuration (C-4); computation reproduces historically under period-correct versions.

V3 — Compliance Certificate Drafting

- **REQ-V3.1** [E — certificate template from credit agreement exhibit] The system shall generate a draft quarterly compliance certificate populating the computed covenant values, the EBITDA build-up, and the add-back schedule into the lender's required format.
- **REQ-V3.2** (governance fence) The draft shall carry a DRAFT watermark and shall require an explicit Controller review-and-certify action — recorded with actor and timestamp — before an unwatermarked final may be rendered. The system computes; the Controller certifies. No auto-submission path exists. [S — Controller]

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7. System G — Pack Generation

- **REQ-G1.1** [E — prior packs; sponsor policy] The system shall render the monthly board/sponsor pack on demand: cover KPI dashboard; service-line P&L vs budget and prior year with captured commentary; working-capital bridge; backlog and job-margin watch list; covenant summary with headroom; close-status appendix.
- **REQ-G1.2** The system shall render the lender pack variant (covenant detail, EBITDA build-up, add-back schedule, certificate status) from the same derived data (C-3 — one source, two renderings).
- **REQ-G1.3** Pack finalization shall be blocked by: incomplete blocking close tasks (K1), unmapped accounts (F1.2), missing required commentary (K2.1), unresolved dimension variances (F1.4), and watch-list investigation commentary when the F2.4 escalation condition holds — with a single readiness report enumerating blockers.
- **REQ-G1.4** Finalized packs are immutable, versioned, and retained; re-renders of historical periods use period-correct mappings and formulas (C-4).
- **REQ-G1.5** Rendering shall complete in ≤ 5 minutes from a ready state (§12.2).

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8. System X — External Seams

Each seam is a contracted stub: typed payloads, versioned formats, idempotent ingestion (C-2), and provenance on every assumption about the counterparty. The counterparty is outside build scope; the contract is inside it. **Field-level input schemas for X1–X3 are normative and defined in Appendix C [RV]; every seam payload carries a `format_version` field, and ingestion of an unrecognized version quarantines the batch with an escalation report rather than adapting silently.**

X1 — QuickBooks GL Export Ingestion

- **REQ-X1.1** [E — sample export set, 6 monthly files] The system shall ingest the QuickBooks general-ledger and trial-balance exports (observed format: QBO report export, CSV; schema per Appendix C.1), validating control totals (F1.1), batch identity, and hash; malformed rows quarantine with a report, never partial-apply.
- **REQ-X1.2** [S — Bookkeeper] Ingestion cadence: monthly at close start, plus on-demand re-ingestion after adjusting entries; each re-ingestion supersedes the period's prior batch atomically.
- **REQ-X1.3** [I — flagged; Controller confirmed at review gate: no QBO migration or chart restructure planned through the first four close cycles] Export format assumed stable per the Appendix C.1 contract; a QuickBooks version migration or chart restructure triggers a seam-contract revision under change control (OQ-2 disposition), not silent adaptation.
- **REQ-X1.4** [RV; S — Controller, review gate] Ingestion cadence enforcement: if no GL export batch has been ingested for the closing period by 10:00 AM local on business day 1, the system shall notify the Bookkeeper; if none by business day 2, it shall escalate to the Controller and mark the close checklist's ingestion task AT RISK (K1.3 surfaces this on the sponsor portal's close-progress view).

X2 — Bank Statement Ingestion

- **REQ-X2.1** The system shall ingest monthly bank statements (CSV; format per bank [E — 2 sample statements]; schema per Appendix C.2) for the liquidity covenant input and the close checklist's reconciliation evidence linkage; balances in integer cents.

X3 — Job-System Ingestion

- **REQ-X3.1** [E — legacy job-tracking CSV exports] The system shall ingest the job master and job-transaction CSVs weekly (schema per Appendix C.3) for service-line dimensionality (F1.3, F1.4), backlog computation (open contract value less billed-to-date), and the job-margin watch list (F2.3, F2.4); job accounting itself remains in the legacy system (§10.1 exclusion).
- **REQ-X3.2** [RV] Cadence enforcement mirrors X1.4: if no job-system batch has been ingested within 9 calendar days of the prior batch, the system shall notify the Operations Manager and mark backlog and watch-list KPIs STALE in all views until a fresh batch lands (stale KPIs are annotated, never suppressed — the annotation, like every figure, derives from ingested state per C-3).

X4 — Debt Schedule Maintenance

- **REQ-X4.1** The system shall support Controller-entered monthly debt-schedule updates from lender statements (statement attached as evidence), with full audit trail; no direct lender-system integration in v0.1 (OQ-5).

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9. System P — Platform

P1 — Access Control & Sponsor Portal

- **REQ-P1.1** The system shall enforce the role matrix derived from §2 (CONTROLLER, BOOKKEEPER, OPS, CEO, SPONSOR_READONLY, ADMIN); SPONSOR_READONLY holds no mutation path by construction (AT-12) and sees: close progress (K1.3), finalized packs, KPI dashboard, covenant headroom. [S — Sponsor Deal Partner; Controller — the Controller controls what the portal exposes before finalization]
- **REQ-P1.2** Draft-period figures are visible to sponsor roles only after pack finalization, except close progress and covenant early-warning alerts, which are live. [S — negotiated position, Interviews 2–3]

P2 — Audit Log

- **REQ-P2.1** The system shall record every mapping change, formula/threshold change, ingestion event, certification action, authentication event (P3.4), and pack finalization to an append-only audit log (actor, timestamp, before/after); no deletion or update paths exist.

P3 — Authentication & Data Protection [RV]

Rationale: v0.1 defined authorization (P1) but was silent on authentication and data protection — the review's sole high-severity finding. The platform holds bank balances, covenant computations, and defined-term EBITDA detail; the sponsor portal crosses an organizational boundary; and the credit agreement's confidentiality provisions plausibly reach live covenant data.

- **REQ-P3.1** [RV] Authentication shall use a managed identity provider (OIDC); no locally stored passwords. Multi-factor authentication is mandatory for CONTROLLER and ADMIN roles and default-on for all others. SPONSOR_READONLY users authenticate via federation with the sponsor's identity provider where available (SAML/OIDC), so that portfolio-side joiner/leaver governance controls portal access; where federation is unavailable at cutover, MFA-enforced managed accounts are the fallback, reviewed quarterly by the Controller.
- **REQ-P3.2** [RV] All data shall be encrypted in transit (TLS 1.3) and at rest (AES-256, including database, pack archive, and evidence attachments; see §10.3 for the mechanism). Session policy: idle timeout ≤ 30 minutes for financial-mutation roles (CONTROLLER, BOOKKEEPER, ADMIN), ≤ 8 hours absolute for all sessions.

- **REQ-P3.3** [RV] Automated seam ingestion endpoints (X1–X3, where automation is used) authenticate with per-seam scoped API credentials, rotated at least every 90 days, held in a secrets manager, and never embedded in exported artifacts; credential use is audit-logged (P2.1).
- **REQ-P3.4** [RV] Authentication events (login success/failure, MFA challenge outcomes, session expiry, credential rotation) feed the P2 append-only audit log.
- **REQ-P3.5** [RV — Controller action item, review gate] Before sponsor-portal cutover, the Controller shall confirm with counsel that live covenant-headroom exposure to sponsor users is consistent with the credit agreement's confidentiality obligations; the portal's covenant views ship behind a feature flag pending that confirmation. (Tracked as OQ-9.)

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10. Constraints and Exclusions

10.1 Scope Boundary (published coverage map)

In scope: the reporting, close-orchestration, covenant, and pack-generation slice defined in §§4–9, derived from posted data. Explicitly out of scope, v0.1/v0.2: the accounting system itself (QuickBooks remains the book of record; the platform never posts); revenue recognition computation — including percent-of-completion accounting for the Projects service line — the platform reports the GL as posted and flags job-margin anomalies, but rev-rec policy and entries remain the Controller's process in the books (OQ-3, now RESOLVED: GL-as-posted confirmed as the portfolio-acceptable v0.x posture); job costing and field-service operations (ingested via X3 only); AP automation and payroll; forecasting beyond budget-vs-actual (13-week cash flow: OQ-6, deferred); multi-entity consolidation (OQ-7); direct lender-system integration (OQ-5); automated QuickBooks API polling (OQ-10, deferred as a v0.2+ enhancement candidate).

10.2 Technical Constraints

C-1 integer-cents discipline (all systems); C-2 seam idempotency; C-3 derived-never-posted with full drill-path traceability; C-4 mapping/formula versioning with historical reproduction; the V3.2 certification fence (the system computes; the Controller certifies); gapless immutable pack versioning (G1.4); append-only audit (P2.1); P3 authentication and data-protection requirements [RV].

10.3 Technical Stack & Deployment [RV]

Placement note: stack selection is ordinarily a pipeline-phase (M2/M3) decision, not an M0 intake output — v0.1's silence was deliberate. Because this is a published demonstration artifact shipped alongside its generated build package, the stack is documented here so the specification and the artifact it produced can be checked against each other. Where the review suggested alternatives (e.g., PostgreSQL), the disposition and rationale are recorded in §13.

- **Runtime & language:** Node.js LTS, TypeScript (strict mode). Monetary types carried as `bigint` cents end-to-end per C-1.
- **Persistence:** SQLite in WAL mode, encrypted at rest via SQLCipher (satisfies P3.2). Rationale: the operating footprint (§1.3) is 7 named users, single entity, monthly batch ingestion, and a read-mostly portal — well inside SQLite's concurrency envelope, and WAL mode gives non-blocking reads during ingestion/recomputation (§12.4). ACID transaction guarantees required by C-1/C-3/C-4 hold. Append-only audit (P2.1) and immutable pack versioning (G1.4) are enforced at the application layer with no UPDATE/DELETE paths generated, verified by AT-3/AT-7 style property checks. A relational-server migration path (e.g., PostgreSQL) is preserved by confining all persistence behind a repository interface; triggers for migration: multi-entity consolidation (OQ-7) or sustained concurrent-write load beyond §12.4 targets.
- **Deployment:** single-container deployment to a managed cloud host; infrastructure as code; separate staging and production environments; secrets in the platform's secrets manager (P3.3).
- **PDF rendering (System G):** headless-Chromium HTML-to-PDF pipeline; pack templates are versioned artifacts so historical re-renders (G1.4/C-4) reproduce byte-comparable output under period-correct template versions.
- **Identity:** managed OIDC provider per P3.1.

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11. Open Questions and Assumptions

v0.2 change: a stakeholder review gate was held (2026-07-10, per the review's first finding) with the objective of closing all OPEN items before detailed design. Five of the original eight were resolved; dispositions below. Two new items (OQ-9, OQ-10) were opened by the review itself.

#	Status	Question / Ambiguity	Resolution / Path
OQ-1	**RESOLVED** [RV — Controller]	Historical depth: how many pre-acquisition months ingest for TTM continuity?	12 pre-close months confirmed available from the QuickBooks archive. Controller's data-quality assessment: months 1–9 clean; months 10–12 (pre-diligence) carry known class-field gaps —

#	Status	Question / Ambiguity	Resolution / Path
			ingested with a `pre_acquisition` provenance flag, and TTM figures spanning flagged months are annotated in packs until superseded by post-close months.
OQ-2	**RESOLVED** [RV — Controller]	QuickBooks export format stability; any planned QBO migration or chart restructure?	No migration or restructure planned through at least the first four close cycles. Format contract frozen as Appendix C.1 with `format_version` field; any change is a seam-contract revision under change control (REQ-X1.3).
OQ-3	**RESOLVED** [RV — Sponsor Deal Partner]	Projects rev-rec: POC-adjusted management figures in the pack, or GL-as-posted with the watch list?	GL-as-posted + job-margin watch list confirmed as the portfolio-acceptable posture for v0.x. POC-adjusted management reporting remains a named scope-change candidate, to be revisited alongside OQ-6 after two clean BD+7 cycles.
OQ-4	**RESOLVED** [RV — Controller; Sponsor Deal Partner]	Variance commentary thresholds (% and absolute)	Confirmed at ±10% and ±$25,000, evaluated per

#	Status	Question / Ambiguity	Resolution / Path
			management-chart line, per-line override supported (versioned under C-4). Job-margin watch defaults confirmed per REQ-F2.4.
OQ-5	OPEN	Direct lender-portal integration for certificate submission	Out of v0.1/v0.2; X4 manual with evidence; revisit post-cutover.
OQ-6	DEFERRED	13-week cash flow forecast. Sponsor Deal Partner requested a rolling 13-week cash forecast module during Interview 2; explicitly deferred to protect the close-acceleration critical path. [S — Sponsor Deal Partner]	Revisit as a scope-change candidate after two clean BD+7 cycles; the bank-ingestion seam (X2) and derived-data core (C-3) were designed to admit it without structural rework.
OQ-7	OPEN	Sister LLC (equipment holdco) consolidation in the pack	Out of v0.1/v0.2 (single entity [S — Controller]); flag for the sponsor's year-end audit conversation. Named as a migration trigger in §10.3.
OQ-8	**RESOLVED — CONDITIONAL** [RV — Ops Manager]	Maintenance-agreement renewal rate: source of truth is the job system's contract	Ops Manager's validation pass: 87% of active maintenance

#	Status	Question / Ambiguity	Resolution / Path
		records — completeness unverified	agreements carry complete term/renewal fields. Disposition: the renewal-rate KPI computes and displays internally with a data-coverage annotation, but is excluded from finalized packs (REQ-F2.1 gate) until coverage ≥ 98%; remediation of the remaining records is a K1 checklist task owned by the Ops Manager for the next two cycles.
OQ-9	**OPEN** [RV]	Credit-agreement confidentiality vs. live sponsor-portal covenant views	Controller to confirm with counsel before portal cutover (REQ-P3.5); covenant views feature-flagged pending confirmation.
OQ-10	**DEFERRED** [RV]	QuickBooks Online API polling to replace manual CSV export (X1), and equivalent automation for X3	Deferred as a v0.2+ enhancement candidate. v0.x posture: manual export with cadence enforcement and escalation (REQ-X1.4, REQ-X3.2). Prioritize if bookkeeper export discipline becomes a measured close-cycle

#	Status	Question / Ambiguity	Resolution / Path
			bottleneck during the first two cutover cycles. The X1/X3 seam contracts (Appendix C) are transport-agnostic by design: API-sourced payloads must satisfy the same schema, batch-identity, and idempotency obligations, so the swap is a seam-implementation change, not a core change.

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12. Acceptance & Performance

12.1 Business Acceptance Tests (selected)

- **AT-1** (property): every derived total reconciles exactly, in integer cents, to the sum of its ingested components, over the full test corpus.
- **AT-3:** no rendered pack figure exists without a complete drill path to ingested source (derived-never-posted enforcement; attempted manual figure entry has no path).
- **AT-5:** covenant computations reproduce the credit agreement's worked example [E — agreement exhibit] to the cent.
- **AT-7:** re-rendering a historical pack after subsequent mapping/formula changes reproduces the original figures under period-correct versions.
- **AT-9:** replay of any ingested batch produces zero duplicate records; superseding re-ingestion atomically replaces the period's data.
- **AT-11:** pack finalization is blocked by each blocker class (open blocking task, unmapped account, missing commentary, unresolved dimension variance, watch-list escalation) and the readiness report enumerates all blockers accurately.
- **AT-12:** SPONSOR_READONLY holds no mutation path (exhaustive endpoint check) and cannot access unfinalized figures except the negotiated live views (P1.2).

- **AT-13:** the certification fence: no unwatermarked certificate exists without a recorded Controller certify action.
- **AT-15** (the exhibit's headline claim) — *revised in v0.2 to dual-track validation* [RV]: a full close-to-pack cycle on the reference dataset — ingestion, checklist completion, mapping, KPI computation, covenant computation, commentary, finalization — completes within the close-in-5-business-days target, validated on two independent tracks:
    - **AT-15a (authoritative):** every pack figure reconciles to the source QuickBooks trial-balance exports through the documented account-to-line mapping with zero unexplained variance — the GL, not the prior manual pack, is the standard of correctness.
    - **AT-15b (directional):** figures are compared against the manually prepared control pack [E — prior pack, restated as control]; every discrepancy between the control pack and the GL-reconciled figures is investigated, documented, and dispositioned (control-pack error vs. mapping decision vs. system defect) before AT-15 may be declared passed. *Rationale: v0.1 used the manual pack — an artifact of unverified accuracy assembled under the very conditions this system replaces — as the sole baseline, a circular validation the review correctly flagged. Discrepancies where the manual pack is wrong are an expected and reportable outcome, not a failure.*
- **AT-16** [RV]: authentication controls hold: no unauthenticated path reaches any data endpoint; MFA is enforced for CONTROLLER/ADMIN; expired sessions cannot mutate; all P3.4 event classes appear in the audit log under test.

12.2 Performance Targets

Monthly GL export ingestion and reconciliation ≤ 10 minutes; KPI recomputation on re-ingestion ≤ 2 minutes; pack rendering ≤ 5 minutes from ready state; sponsor portal views ≤ 3 s. [I — sized from §1.3 footprint; confirmed adequate at review gate]

12.3 Availability & Recovery [RV]

- **Availability target:** 99% during business hours (6:00 AM – 8:00 PM ET, business days), measured monthly. The close window (BD 1–5) and pack deadlines (BD+7, 30-day certificate) are the criticality drivers; overnight/weekend maintenance windows are acceptable.
- **Degraded mode:** during any outage, read access to finalized packs (immutable artifacts, G1.4) shall remain available via the pack archive — sponsors and lenders can always retrieve what has been certified, even when computation is down.
- **Backup & retention:** daily encrypted backups of the database and pack archive; 90-day rolling retention, plus indefinite retention of finalized packs and the append-only audit log (P2.1) consistent with the credit agreement's record-keeping obligations.
- **Recovery objectives:** RPO ≤ 24 hours for derived data (all derived state is reproducible from re-ingestion per C-3, so the effective data-loss exposure is bounded by

re-ingestable sources); RPO ≤ 1 hour for non-reproducible state (certification actions, commentary, mapping versions, audit log) via continuous log shipping. RTO ≤ 4 hours to restore read access to finalized packs; ≤ 1 business day to full functionality. Restore drills: once before cutover, then semi-annually, evidenced as a K1-style checklist artifact.

12.4 Concurrency [RV]

- The system shall support ≥ 8 concurrent authenticated sessions (headroom above the 7 named users) with < 10% latency degradation against §12.2 targets.
- X1 re-ingestion requested while a KPI recomputation is in progress shall queue rather than fail, with notification to the requesting user on queue entry and on completion; supersession remains atomic (REQ-X1.2).
- Sponsor-portal reads shall never block ingestion, recomputation, or finalization workflows (WAL-mode non-blocking reads, §10.3), and shall serve the most recent consistent snapshot during recomputation.
- **Load-test scenario (acceptance):** 3 SPONSOR_READONLY users refreshing dashboards every 30 seconds while the Controller performs a full re-ingestion, recomputation, and finalization sequence and the Bookkeeper updates checklist tasks — all §12.2 targets hold and no operation fails or deadlocks.

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13. Revision History & Review Disposition [RV]

v0.1 (2026-07-06) — initial intake synthesis from stakeholder interviews and artifact extraction.
v0.2 (2026-07-12) — revision following independent specification review (2026-07-10; ten findings). Full disposition:

#	Finding (severity)	Disposition	Where
1	Eight open questions deferred to stakeholder confirmation (medium)	**Adopted.** Stakeholder review gate held; OQ-1, OQ-2, OQ-3, OQ-4 resolved; OQ-8 resolved conditionally with a KPI publication gate; OQ-5/6/7 remain deliberately open/deferred with named revisit triggers.	§11

#	Finding (severity)	Disposition	Where
2	Technology stack and deployment unspecified (low)	**Adapted.** §10.3 added. The review's PostgreSQL recommendation was declined in favor of SQLite/WAL + SQLCipher: at 7 users, single entity, and monthly batch cadence, an embedded ACID store meets every stated constraint (C-1/C-3/C-4, P3.2) with less operational surface; a repository-interface migration path to a relational server is preserved, with OQ-7 and §12.4 breach as named triggers. Stack documentation is also flagged as ordinarily a pipeline-phase decision, recorded here because the artifact is published beside its build package.	§10.3
3	External data format contracts incomplete (medium)	**Adopted.** Field-level normative schemas for X1–X3 added as Appendix C, including `format_version` on every payload, quarantine-on-unknown-version behavior,	Appendix C; §8

#	Finding (severity)	Disposition	Where
		and the multi-currency exclusion made explicit at the schema level.	
4	Availability, backup, DR undefined (medium)	**Adopted** at review-suggested scale, with one refinement: RPO differentiates reproducible derived data (bounded by re-ingestion, per C-3) from non-reproducible state (certifications, commentary, audit), which gets ≤ 1 hour.	§12.3
5	Authentication and sensitive-data protection unspecified (**high**)	**Adopted in full.** New P3 subsystem: managed OIDC, MFA for financial roles, sponsor-side federation, TLS 1.3 / AES-256, scoped rotating API credentials, authentication events into the append-only audit. Credit-agreement confidentiality check on live covenant exposure captured as REQ-P3.5 / OQ-9 with the portal's covenant views feature-flagged	§9 P3; OQ-9; AT-16

#	Finding (severity)	Disposition	Where
		pending counsel confirmation.	
6	AT-15 circular validation against unverified manual pack (low)	**Adopted.** AT-15 split into dual tracks: GL reconciliation authoritative (AT-15a), manual control pack directional with mandatory discrepancy disposition (AT-15b).	§12.1
7	QuickBooks API vs. manual export unaddressed (low)	**Adapted.** API automation deferred as OQ-10 per the review's own v0.2-enhancement framing; cadence-enforcement requirements added now (REQ-X1.4 for X1, REQ-X3.2 for X3). Seam contracts written transport-agnostic so the future swap is a seam-implementation change only.	§8; OQ-10
8	Concurrent load and close-window collision undefined (medium)	**Adopted** at review-suggested scale, including the queued-re-ingestion behavior and the specific close-window load-test scenario as an acceptance condition.	§12.4

#	Finding (severity)	Disposition	Where
9	Job-margin watch threshold and escalation incomplete (medium)	**Adopted.** REQ-F2.4: 80%/50% defaults, per-service-line configuration, auto-generated K1 investigation tasks, and the >5-jobs / >$250k commentary blocker wired into G1.3. Maintenance Agreements excluded from the watch list by construction.	§5 F2.4; §7 G1.3
10	GL↔job-system join key and precedence unspecified (medium)	**Adopted.** REQ-F1.4: `Customer:Job` exact match with normalization rules in the seam contract, account-default mapping for unassigned transactions, job-system-prevails precedence with logged dimension variances that can block finalization.	§5 F1.4; Appendix C.3

Appendix A — Provenance Source Register

QuickBooks GL/TB export sample set (6 monthly files + 2 statements); credit agreement extracts (§1.01 defined terms, §6.02 covenant schedule, certificate exhibit); prior lender packs (2, Excel); sponsor portfolio reporting policy memo; legacy job-system CSV exports; stakeholder interviews 1–4 as attributed; **independent specification review of v0.1 (2026-07-10) and stakeholder review-gate session (2026-07-10) [RV]**. Appendix B (acceptance traceability) and the M7-generated build package are published alongside this document on the case-study page.

Appendix C — Seam Input Schema Contracts (normative) [RV]

General provisions, all seams: payloads are CSV, UTF-8, header row required; every batch carries `format_version` (semver string; current versions below), a source-batch identity (filename + SHA-256 content hash, per C-2), and single-currency USD amounts as **integer cents** (C-1 — any decimal-formatted monetary field is converted at the seam boundary with exactness verification; a value that does not convert exactly to integer cents quarantines the row). Unknown `format_version` or missing required columns quarantine the batch whole (never partial-apply, REQ-X1.1). Multi-currency exports are out of contract (§1.3 single-currency) and quarantine with `ERR_UNSUPPORTED_CURRENCY`.

C.1 — X1: QuickBooks GL / Trial Balance Export (format_version 1.0.0)

Trial balance file: `account_id` (string, QuickBooks account list ID), `account_name` (string), `account_type` (string, QuickBooks type enum), `debit_cents` (integer ≥ 0), `credit_cents` (integer ≥ 0), `period_end_date` (ISO 8601 date). File-level control totals row (sum of debits = sum of credits) validated per REQ-F1.1.

GL detail file: `transaction_id` (string, unique within batch), `transaction_date` (ISO 8601 date), `transaction_type` (string), `account_id` (string, FK → trial balance `account_id`), `customer_job` (string, nullable — F1.4 join field), `class` (string, nullable), `amount_cents` (integer, signed), `memo` (string, nullable).

C.2 — X2: Bank Statement Export (format_version 1.0.0)

`statement_date` (ISO 8601 date), `account_ref` (string, masked account identifier), `transaction_date` (ISO 8601 date), `description` (string), `debit_cents` (integer ≥ 0, nullable), `credit_cents` (integer ≥ 0, nullable), `running_balance_cents` (integer, signed). Statement-level opening/closing balance rows required; closing balance validated as opening + Σcredits − Σdebits.

C.3 — X3: Job System Export (format_version 1.0.0)

Job master file: `job_id` (string, unique — F1.4 join target), `job_name` (string), `customer_name` (string), `service_line` (enum: `SERVICE_REPAIR` | `MAINTENANCE_AGREEMENT` | `PROJECTS` — authoritative dimension per F1.4), `status` (enum: `OPEN` | `CLOSED` | `ON_HOLD`), `contract_value_cents` (integer ≥ 0), `billed_to_date_cents` (integer ≥ 0), `cost_to_date_cents` (integer ≥ 0), `start_date` (ISO 8601 date), `renewal_date` (ISO 8601 date, nullable — OQ-8 field), `contract_term_months` (integer, nullable — OQ-8 field).

Join normalization (F1.4, normative): QuickBooks `customer_job` values match `job_id` after: trimming whitespace, case-folding, and stripping the QuickBooks parent-customer prefix

(the segment through the final `:`). Non-matching non-null values log a dimension variance; null values fall to account-default mapping.

End of document. Version 0.2 · 2026-07-12 · Published Demonstration Artifact.