**PRD-41 — Food & Agri — FSMA 204 Traceability**

**Intent**

Implement FSMA 204 Key Data Elements (KDE) and Critical Tracking Events (CTE) for covered foods, enabling lot-level traceability, dashboards, and exportable audit packs.

**Preconditions**

• Products flagged as FSMA 204-covered where applicable; category → KDE dictionary.

• Serial/lot tracking active (PRD-17); partner linkages and site addresses (Partner Store).

• Attachment vault for bills of lading, receiving records, transformation docs, temperature logs (PRD-11).

**Steps**

• Scope & KDE Map: enable FSMA 204 overlay; load KDEs per CTE (growing, receiving, transformation, creation, shipping).

• Lot Model: ensure lot IDs and date/time stamps at each CTE; bind lots to ProductVersion and supplier/customer sites.

• Data Capture Flows: ingest CTE events from ERP/WMS or UI/bulk; validate required KDEs (source lot, receiving conditions, transformation inputs/outputs, ship-to).

• AI Assist (advisory): detect missing KDEs and propose targeted fixes; suggest probable source lot matches with confidence.

• Temperature/Condition Logs: link sensor/inspection files to lots; store hash receipts; flag excursion events.

• Trace Query: build forward/backward trace in one click (lot in → all finished goods and customers; finished good → all source lots and growers).

• Audit Pack Export: compile CTE chain, KDE snapshots, attachments’ hashes, and a narrative; sign a Traceability Pack Receipt.

• Gate Hooks: for covered foods, require KDE completeness before shipment; otherwise HOLD with WHY and direct links to missing fields.

**Edge cases**

• Split/merge of lots during transformation → maintain input-output mapping; trace must include proportions where applicable.

• Third-party gaps → create exception with supplier request and deadline; allow temporary release only with executive approval.

**Done when**

• Any covered lot can be traced forward/backward with complete KDEs in <2s P95; audit pack exports verify against stored hashes; holds reliably trigger on incomplete KDEs.