Final Report

Freeze Drying Proof of Concept

and Prototype Products



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1.0 Abstract

Australian red meat processors generate organ meats and other by-products that may have limited existing markets or returns. This project examined whether small-batch freeze drying could produce materials suitable for future value-adding. A Weber demonstration unit was installed at Wodonga Abattoir's 15 Kane Road facility on 25 August 2026. Heuch assisted with setup and initial operator training, while Wodonga personnel conducted trials and recorded results. Five product categories—beef liver, bile, beef heart, beef blood and tendons—produced samples below 5% measured residual moisture; all eight analysed trays met that criterion. A bile run was affected by a cold-trap start-up issue, while dense kidney and testicle samples remained wet centrally. Samples were packaged and visually examined, without further laboratory testing or customer evaluation. The trial demonstrated initial technical and operational capability, but not commercial feasibility. The principal recommendation is a proposed follow-up AMPC co-funded feasibility project to validate markets and customer specifications, obtain commercial equipment and site capital-cost estimates, determine operating costs, and build a staged business case for bulk powders and selected offal products. This would guide Wodonga's investment decisions and generate transferable commercial evidence for the wider red meat industry.

2.0 Executive summary

The project explored the technical feasibility of converting low-value red meat co-products into freeze-dried material and building a pathway towards potential higher-value ingredients or offal products. The trial was conducted at Wodonga Abattoir's former cold-store facility at 15 Kane Road. This site has become substantially underutilised for cold storage following commissioning of a pallet store at the main site in 2025. Its potential reuse as a processing location is an opportunity, but suitability has not been established.

The Weber bench-scale equipment was installed on 25 August 2026 following procurement and subsequent upgrading of compressor capacity. Operations selected materials based primarily on immediate availability rather than a market-led product shortlist. Five runs involving seven product categories were recorded. Eight analysed trays from five categories—beef liver, bile, beef heart, beef blood and tendons—had residual moisture measurements between 0.18% and 4.37% (mean approximately 2.91%). The remaining products or batches highlighted the importance of cold-trap preconditioning and appropriate preparation of dense cuts. Samples were packaged and visually reviewed, but no further product testing or customer sampling was undertaken.

The project demonstrates small-scale process capability and useful operational learning, fulfilling the substantive purposes of the two milestones, subject to AMPC assessment and acceptance. It does not establish commercial-scale throughput, validated yields, product safety, customer demand or return on investment. Management supports continued investigation of fifth-quarter value-adding opportunities. The principal recommendation is that Wodonga Abattoir and AMPC scope a follow-up, co-funded commercial feasibility project. This separately costed study would first assess markets, customers, specifications, indicative demand and achievable prices; then obtain commercial-scale equipment, infrastructure and operating-cost inputs, evaluate Kane Road and alternative processing arrangements, and prepare an investment-grade business case. A decision gate after initial market validation would limit unnecessary expenditure if demand is insufficient. Any commercial plant investment would be considered only after the business case is evaluated.

3.0 Introduction

Organ meats and other co-products from cattle, sheep and goat processing represent a diverse resource whose present value varies significantly by species, age, market and end use. Freeze drying removes water from frozen product under vacuum. It can produce a light, low-moisture material suitable for subsequent milling or packaging, but the high-value positioning often associated with the technology must be tested against production economics and identifiable customers.

This investigation focused on practical learnings for Wodonga Abattoir and on information that can inform wider industry adoption. The trial was not a food-safety validation, a product-market launch or a commercial-scale demonstration.

4.0 Project objectives

The executed project schedule sets objectives to assess suitability, feasibility and effectiveness, identify setup and operating requirements, develop operational capability, explore product pathways and process control, and investigate global market opportunities for beef, lamb and goat products.

Item	Evidence and assessment
Milestone 1 – installation, capability and target products	Equipment installed 25 August 2026. Compressor was purchased and then upgraded. Operations team completed practical trial activity. Product slate: beef liver, bile, beef heart, beef blood, beef testicles, tendons and beef kidneys.
Milestone 2 – final results, learning and future likelihood	Five runs documented; tested moisture results and process outliers reported. Management wishes to investigate commercial opportunities further, without a capital commitment at this stage.
Wider objectives	Bench-scale suitability demonstrated for selected samples; commercial costs, scalable capacity, product safety, buyer specifications and market access remain to be established.

Contractual milestone dates were 31 August 2026 (Milestone 1) and 5 October 2026 (Milestone 2). This combined retrospective report documents completion evidence; formal milestone acceptance remains a decision for AMPC.

5.0 Methodology

5.1 Site and equipment

The trial commenced with successful installation of a Weber WeDry demonstration freeze dryer at 15 Kane Road on 25 August 2026. Site enabling works required procurement of a compressor and subsequent upgrade to greater capacity. Heuch assisted with equipment setup and initial training of Wodonga QA officer Blake Farmer. Wodonga personnel undertook the operational trial activities and Blake collected and maintained the trial data. Nick Hanley of Weber Vacuum Group subsequently organised the recorded data into the October HTML technical report. The equipment utilised vacuum freeze drying and temperature-controlled shelves; the hire documentation describes pre-freezing and optional grinding as elements of the process, but records do not establish how extensively auxiliary equipment was used in each run.

5.2 Product selection and trials

Although the July 2026 pre-trial assessment prioritised lamb liver and beef lung on initial market and technical criteria, actual trial material was chosen operationally from product readily available at the time. This provided a practical range of tissues but did not constitute a market-optimised product selection program.

An operator workbook recorded five runs with product descriptions, gross pre- and post-drying weights, calculated weight loss, residual moisture-analysis results where available, and process notes. Moisture results reported here are analyser measurements rather than finished-product safety certification. Product examples were packaged and visually examined; no microbiological, shelf-life, nutritional or contaminant tests were performed and no customer samples were distributed.

5.3 Trial dates and record treatment

The five recorded run dates are 25 August (Run 3), 31 August (Run 1), 3 September (Run 4), 8 September (Run 2; corrected from 9 August following operator/management confirmation) and 9 September 2026 (Run 5). Run numbering is preserved as entered in the workbook rather than converted to chronological order. The supporting copy of the workbook records the confirmed correction. All other dates remain as originally recorded.

6.0 Results

6.1 Product outcomes

Product	Measured residual moisture	Interpretation
Beef liver	3.26%, 3.46%	Two samples below 5%
Bile	2.44%, 3.21%, 3.69%	Three successful samples below 5%; separate failed start-up run
Beef heart	2.70%	One sample below 5%
Beef blood	4.37%	One sample below 5%
Tendons	0.18%	One sample below 5%
Beef testicles	Not measured	Remained wet at centre
Beef kidneys	Not measured	Remained wet at centre

Eight of eight analysed trays achieved the trial residual-moisture threshold of less than 5%, with an arithmetic mean of 2.91% and observed range of 0.18% to 4.37%. This is a within-sample observation and not proof of repeatable specification compliance across commercial production.

6.2 Process deviations

Run 4 (bile) was recorded as unsuccessful because the cold trap was not preconditioned before the cycle. The successful bile results in Run 2 indicate that this was a process set-up issue rather than evidence that bile cannot be dried. Run 5 testicles and kidneys were still wet at the centre. These dense cuts need controlled re-trials involving product thickness, load and cycle duration before suitability can be determined; no successful outcome can be assumed.

6.3 Yield and data reliability

The vendor's report indicates a measured bile yield equivalent to approximately 84 kg dried output per tonne wet input, and theoretical yields for other products derived from typical reference moisture. Those illustrative figures are not validated production yields. The operator workbook records gross tray weights and includes apparent inconsistencies in moisture-removal calculations, including percentages exceeding 100%. Consequently, neither its calculated water-removal field nor extrapolated per-tonne yields is suitable as a definitive commercial input without reconstruction from confirmed tray tare, net starting and finished mass, and measured initial moisture. Direct metering of electricity and complete labour-cycle observations were not provided.

7.0 Discussion

7.1 What was demonstrated

The trial established that the technology can produce low-moisture samples from several different red meat co-products and that site operators can undertake bench-scale cycles. It identified practical start-up and preparation controls that would form part of standard operating procedures. The diversity of successful samples is relevant to future ingredient development, but does not imply all products are equally attractive commercially.

7.2 What remains unproven

The trial did not validate food or pet-food safety, product shelf life, contaminant compliance, packaging performance, flavour or palatability, consistency, energy intensity, production-scale yield, capital costs, price realisation or demand. Freeze drying concentrates non-volatile constituents such as heavy metals in the remaining dry material: potentially high-cadmium older-animal organs require source controls, testing and customer-specific specifications, not an assumption that drying makes them acceptable.

7.3 Potential markets and value proposition

Two logical commercial directions are (a) bulk powders for pet-food and potentially human nutrition or nutraceutical supply chains, and (b) whole, diced or portioned offal items, particularly for specialist pet-food applications. These are hypotheses to test rather than confirmed opportunities. For each candidate, the relevant comparison is net value added over its existing disposition and credible alternatives such as conventional drying or external toll processing.

The AMPC Vitafoods Asia visit in September 2026 documented interest in fifth-quarter ingredients and potential supply-chain collaborators, but does not establish a customer for Wodonga product. Further work needs buyer-led specification development, sample testing, demand validation and regulatory/export review. Specific health claims, where relevant, would need appropriate substantiation.

7.4 Kane Road facility

The reduced cold-store utilisation at 15 Kane Road makes it a potential location for future value-added processing. Its suitability depends on a dedicated review of premises condition, food/pet-food licensing and zoning, hygienic segregation, services and refrigeration, electrical capacity, ventilation, waste, packaging, dispatch, staffing, refurbishment cost and logistical links with the main abattoir. Existing space alone is not a saving until required investment and opportunity costs are quantified.

8.0 Conclusions

The project achieved a meaningful initial proof of concept: five product categories yielded tested samples below a 5% residual-moisture benchmark, and Wodonga developed practical familiarity with bench-scale freeze-drying. Unsuccessful runs provided actionable process learning. Management is interested in investigating commercial opportunities in fifth-quarter products, but this trial has not established buyer demand, regulatory compliance, production-scale throughput, capital and operating costs, or financial viability. The appropriate next step is a separately funded commercial feasibility assessment and business case, rather than committing to commercial equipment at this stage. A co-funded follow-up project with AMPC could address these gaps while generating findings relevant to other Australian red meat processors.

9.0 Recommendations

Principal recommendation — follow-up AMPC co-funded project

Wodonga Abattoir recommends that it seek to scope and undertake a second project with AMPC, subject to AMPC approval and an agreed budget, to assess the commercial feasibility of freeze-dried fifth-quarter products. The work would be a discrete, costed investigation requiring market research, specialist engineering and technical advice, supplier quotations, site assessment and financial modelling. It would focus on (i) bulk powders for ingredient, pet-food and potentially nutraceutical markets and (ii) whole or portioned offal products for specialist buyers. The deliverable would be a decision-ready business case, not a commitment to capital expenditure.

Proposed staged work program

Stage 1 / Gate 1 — market validation: identify and prioritise credible customers and channels; establish products, target specifications, indicative volumes, competition and realistically achievable prices. Review raw material availability and current alternative value. Obtain initial evidence of demand before commissioning detailed engineering.

Stage 1 / Gate 2 — product and process requirements: select 2–3 market-led products; identify further sample, laboratory and process validation needed for buyers, including moisture, water activity, microbiology, shelf life, contaminants, yields, cycle times, power and labour. Undertake additional trials only where justified by market evidence.

Stage 2 / Gate 3 — CAPEX and OPEX: obtain comparable budget quotations for commercial dryers, pre-freezing, preparation, milling, packaging, utilities and installation. Estimate operating costs per kilogram of saleable output, including raw-product opportunity cost, electricity, labour, maintenance, packaging, QA, freight and working capital. Compare own-plant operation with toll processing and conventional drying.

Stage 2 / Gate 4 — processing-site feasibility: assess 15 Kane Road for building condition, zoning, food/pet-food approvals, hygiene, energy and refrigeration services, ventilation, waste, logistics, refurbishment requirements and incremental capital cost. Compare with main-site and outsourced alternatives.

Stage 2 / Gate 5 — business case and investment decision: develop conservative, base and upside models, including customer price sensitivity, plant utilisation, product yield, EBITDA, cash flow, investment payback, key risks and go/no-go criteria. The final deliverable should identify the most promising products and commercial pathway and recommend whether further piloting or investment is warranted.

The project should have a formal decision point following Stage 1 so detailed Stage 2 spending occurs only if a credible market opportunity is demonstrated. Scope, responsibilities, quotations and the proposed AMPC/processor funding split should be agreed before commencement. Findings suitable for publication should be shared with AMPC members, while commercially sensitive buyer prices and site costs can be handled through an agreed confidential annex if necessary.

10.0 Project outputs

•Installed and operated a Weber bench-scale freeze dryer at Wodonga on 25 August 2026, including site compressor-capacity modification.

•Five documented runs across seven product categories, with eight reported analyser readings from five successful categories.

•Packaged and visually examined proof-of-concept material; no samples distributed commercially.

•Operator trial workbook, Weber technical summary, photographs and preliminary market/product assessment.

•Practical operational learnings and a staged recommendation for a separately scoped AMPC co-funded market assessment, CAPEX/OPEX study, processing-site review and commercial business case of wider industry relevance.

10.1 Acknowledgements

This project was undertaken by Wodonga Rendering Pty Ltd as trustee for Wodonga Meat Processors Trust, in collaboration with the Australian Meat Processor Corporation (AMPC). Heuch Pty Ltd assisted with equipment setup and initial training of Wodonga QA officer Blake Farmer. Wodonga personnel conducted the trials, with Blake collecting and maintaining the trial records; Nick Hanley of Weber Vacuum Group prepared the subsequent HTML technical summary from those records. AMPC project funding includes contributions associated with the Australian Government and the participating red meat processing sector. The project schedule records total project funds of $6,300 (GST exclusive), including $3,150 from AMPC Commonwealth matching payments and $3,150 from the Wodonga participant.

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12.0 Appendices

12.1 Milestone evidence register

Milestone	Evidence	Limitation / next action
1	25 August installation photos; practical trial records; product list	Training attendance/competency documentation not separately supplied
2	Weber October report; operator workbook; product outcomes; lessons and roadmap	AMPC acceptance pending; no buyer or commercial validation

12.2 Photographic evidence



Figure B1. Interior of demonstration freeze dryer showing trays, shelves and refrigeration/vacuum chamber components, 25 August 2026.



Figure B2. Installation and demonstration at the Kane Road facility, 25 August 2026.

12.3 Data and interpretation notes

The separate Excel workbook is provided as a supporting raw-data file, with Run 2 corrected to 8 September 2026 per management instruction. No other raw measurements or formulas were changed. Original workbook and technical report should remain archived. Calculations in the workbook should be verified before use for external benchmarking or financial modelling. The residual-moisture values are reported as recorded; independent laboratory confirmation is not available.