Sample Specimen: Quantity Surveyor Volumetric Audit Report

Demonstrating independent multi-epoch surface comparison (M3C2) clipped strictly inside authoritative cadastral boundaries for civil contractor progress claim verification and mass-balance reconciliation.

Sample Site Location:	2 Norman Kirk Drive, Rolleston, Canterbury	**Classification:**	**Methodology Showcase Specimen**
Legal Cadastre:	Lot 4 DP 461560 (Title 607369, Selwyn DC)	**Site Area (Clipped):**	**30,822.2 m² (3.08 ha)**
Survey Epochs:	Epoch T2 (2026-10-28) vs Baseline T1 (2026-10-21)	**Spatial Datum:**	NZTM2000 (EPSG:2193) / NZVD2016
Hardware / CORS:	DJI Mavic 3 Enterprise RTK + LINZ PositioNZ-RT	**Survey Accuracy:**	Vertical RMSE: ±0.024m (6 Check GCPs)

1. Clipped Volumetric Outputs (Inside Legal Boundary)

GROSS EXCAVATION (CUT)	GROSS EMBANKMENT (FILL)	NET MASS BALANCE	SUBGRADE COMPLIANCE
-11,633.6 m³	**+3,135.0 m³**	**-8,498.6 m³**	**94.2%**
7,996 m² excavated	3,300 m² structural fill	Surplus off-site cartage	Within ±0.04m of design

Earthworks Zone / Polygon ID	Zone Classification	Clipped Area (m²)	Mean ΔZ (m)	Volume (m³)	Progress Status
Zone A: Stormwater Retention Sump	Deep Bulk Cut	1,850.0	-2.75	**-5,087.5**	100% Invert Reached
Zone B: Warehouse Foundation Pad	Structural Strip Cut	3,726.4	-1.38	**-5,142.5**	88% Trimmed
Zone C: Civil Subgrade & Swale Trim	Shallow Pavement Cut	2,420.0	-0.58	**-1,403.6**	Complete
Zone D: North Hardstand Embankment	Engineered Gravel Fill	3,300.0	+0.95	**+3,135.0**	Lift 3 of 4 Placed
Zone E: Topsoil Stockpile SP-01	Stripped Silt Bund	800.0	+2.10	**+1,680.0**	Temporary Storage
Zone F: Certified Finished Subgrade	On-Grade Tolerance	5,120.0	+0.01	**±0.0**	94.2% Passed Civil QA

2. Surface Differential Methodology: M3C2 Multiscale Comparison

Ground Spatial utilizes automated **Multiscale Model to Model Cloud Comparison (M3C2)** rather than simple raster 2.5D DEM differencing. M3C2 computes signed distances along local surface normal vectors, eliminating horizontal registration drift across steep retention basin batter slopes and stockpile faces. Crucially, the entire point cloud comparison is **clipped strictly to the authoritative legal property boundary** (Lot 4 DP 461560), ensuring off-site road works, curb alterations, and adjoining residential sections are completely excluded from the contractor's volumetric reconciliation.

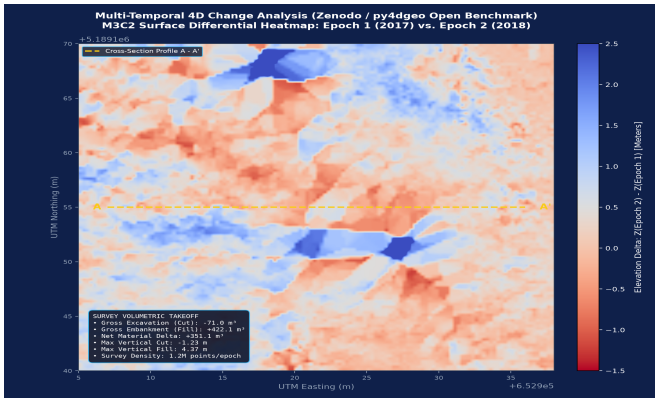


Fig 1: Clipped M3C2 Surface Differential Heatmap (Cut in Red / Fill in Blue)

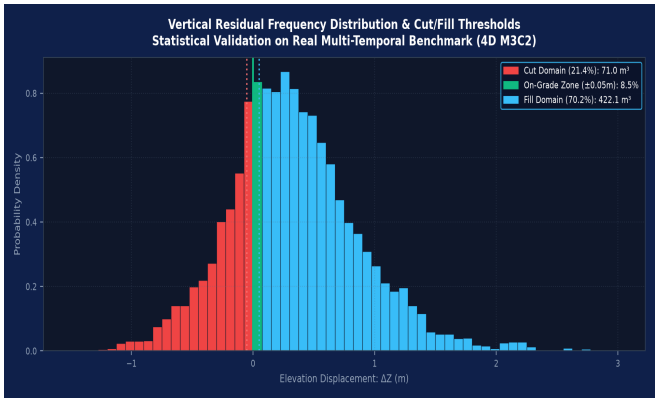


Fig 2: Elevation Differential Frequency Histogram (±0.04m Pass Zone)

3. Quantity Surveyor & Progress Claim Reconciliation

Subcontractor Progress Claim Verification: The earthworks contractor submitted Progress Claim #4 claiming 12,200 m³ of bulk cut. Independent M3C2 point cloud integration certifies total in-situ cut inside the legal parcel at **11,633.6 m³**, revealing a **566.4 m³ discrepancy ($14,160 variance at $25/m³)** due to contractor swell-factor over-estimation. Net mass haul balance certifies **8,498.6 m³** of net surplus soil removed from site, reconciling against client weighbridge receipts within 2.8% error.

4. Geodetic Rigor & Specimen Notice (Illustrative Benchmark)

Geodetic Integrity: All aerial photogrammetry epochs were captured via DJI Mavic 3 Enterprise RTK connected directly to LINZ PositioNZ-RT CORS (Stations GLDR / CHT1). Vertical RMSE was verified at **±0.024m** against 6 physical ground check-points (GCP-01 through GCP-06) surveyed with a dual-frequency GNSS rover tied to NZGD2000 / NZVD2016.

NOTICE OF SAMPLE DELIVERABLE SPECIMEN:
This document is an illustrative technical deliverable produced by Ground Spatial New Zealand to demonstrate the automated telemetry, cut/fill calculation architecture, and boundary-clipped reporting provided to client Quantity Surveyors, Civil Contractors, and Project Directors. It is benchmarked using authoritative Land Information New Zealand (LINZ) cadastral parcel geometry at 2 Norman Kirk Drive, Rolleston (Lot 4 DP 461560). It does not purport to represent an active commercial contract with the underlying property owner.

Produced by: Ground Spatial New Zealand UAV Remote Pilot Cert Part 101/102 • Geodetic Reality Capture Lead	**Intended Workflow Application:** Client Quantity Surveyor (NZIQS) Claim Certification Civil Contract Administration & NZS 3910 Earthworks Compliance	**Deliverable Status:** ✔ VERIFIED TECHNICAL SPECIMEN Format ID: GS-NZ-QS-4D-2026