

Supplementary File S4. Reference-Shoreline Uncertainty and Sensitivity Figures

This supplementary file presents the figures supporting the inter-analyst reference-shoreline assessment and the robustness analyses for sampling density and contiguous spatial-block size.

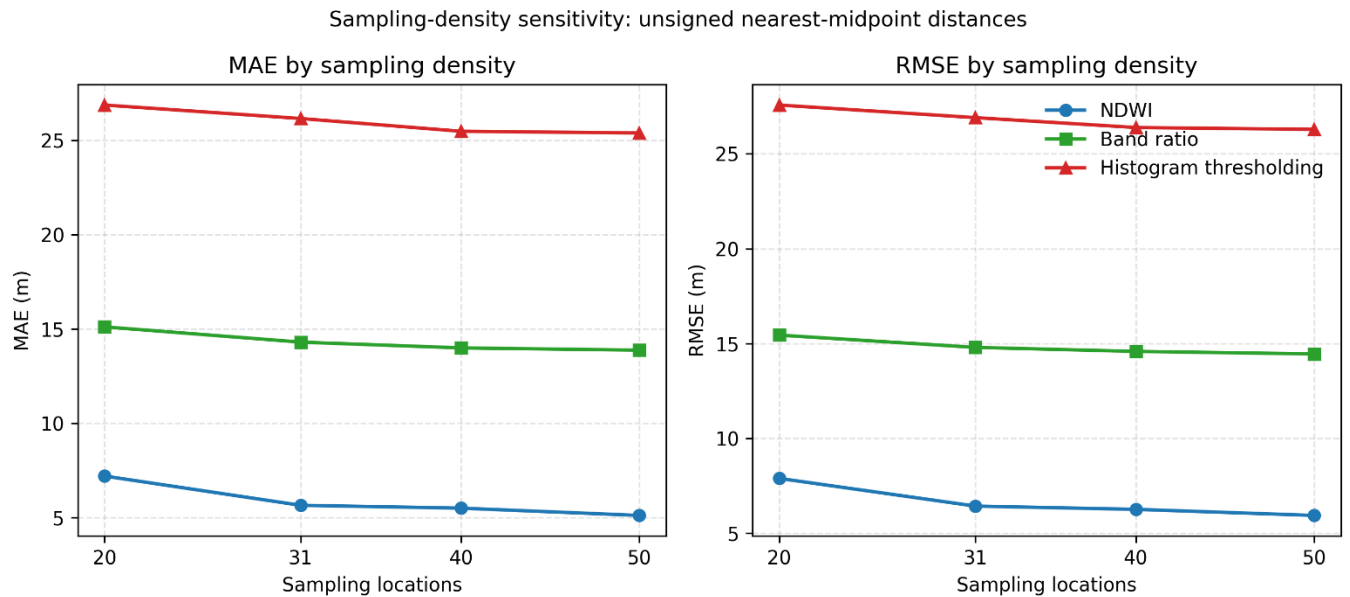
1- Figure S1. Inter-analyst digitisation of the UAV reference shoreline.

Three independently digitised shoreline positions are displayed over the RGB true orthomosaic: Analyst 1 in red, Analyst 2 in green and Analyst 3 in orange. The comparison illustrates the positional variability associated with manual interpretation across sandy–gravel, rocky, riprap and engineered shoreline sections.



2- Figure S2. Sampling-density sensitivity of the unsigned nearest-midpoint distance assessment.

MAE and RMSE were recalculated using 20, 31, 40 and 50 equally spaced shoreline locations. Absolute error values varied with sampling density, but the ranking remained NDWI first, band ratio second and histogram thresholding third at every tested density.



3- Figure S3. Sensitivity of the extraction-method comparison to contiguous spatial-block size.

The left panel presents empirical p-values for block sizes of two to eight adjacent shoreline locations, with the dashed line indicating $\alpha = 0.05$. The right panel compares the observed repeated-measures F -statistic with the 95th and 99th percentiles of the corresponding permutation null distributions. The method effect remained significant for all tested block sizes.

