

EXOSTRATA

Satellite Ground Movement Evidence Report

1 George Street, Luton, LU1 2AA

Report Reference: EXO-2026-74228

Report Date: 18 April 2026

Data Period: 2019-01-09 to 2023-12-26

This report is provided for informational purposes in support of insurance claim assessment. It does not constitute structural engineering advice. See Limitations section for full terms and conditions.

Executive Summary

Ground Movement Rating: **GREEN**

Satellite monitoring shows this property has experienced an average vertical upward movement of 0.3 mm/year between 2019 and 2023.

Key Measurements

Average Vertical Velocity	0.3 mm/year
Total Cumulative Vertical Displacement	10.0 mm
Seasonal Amplitude (peak-to-peak)	2.7 mm
Monitoring Period	2019-01-09 to 2023-12-26
Number of Satellite Acquisitions	230
Data Confidence	HIGH

Data Sources & Cross-Validation

EGMS Calibrated (2019–2023)	51 building-level measurement points within 30 m. EGMS-only velocity: -0.13 mm/yr.
LiCSAR + LiCSBAS (2015–2024)	No LiCSAR data at this location.
Unified Time Series	230 observations from 2019-01-09 to 2023-12-26. Vertical velocity 0.35 mm/yr combines both sources for a single continuous record.

Spatial Resolution Note: Satellite radar data measures average ground movement across a ~100m area centred on the subject property. For clay shrink-swell subsidence, which typically affects entire streets and neighbourhoods uniformly, this spatial resolution provides reliable evidence of ground movement trends at the property location.

Vertical Ground Velocity Map

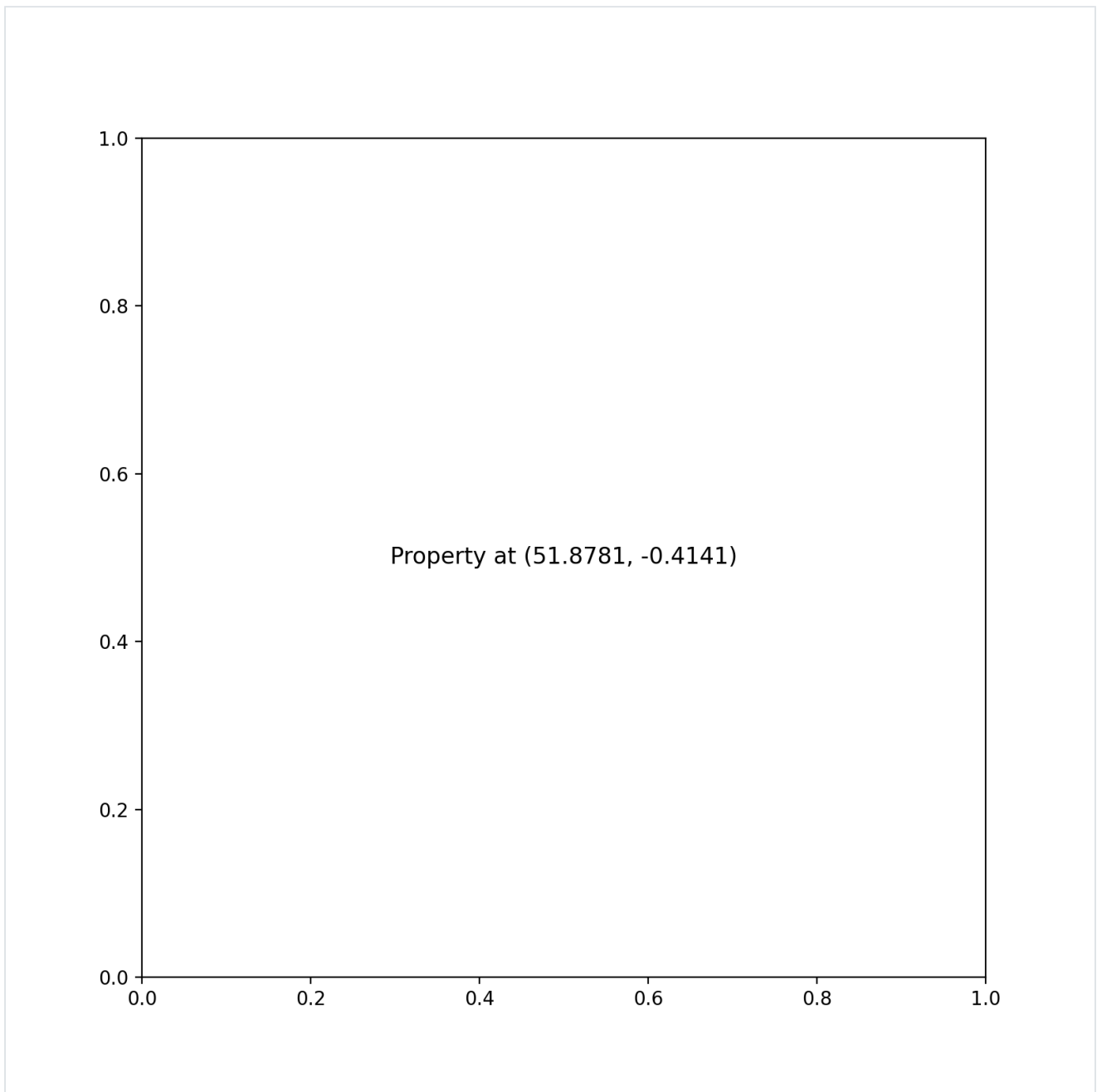


Figure 1: Vertical ground velocity (mm/year) within 500m of the subject property. Red indicates downward movement (subsidence); blue indicates stability or uplift. The subject property is marked with a star.

Ground Movement Time Series

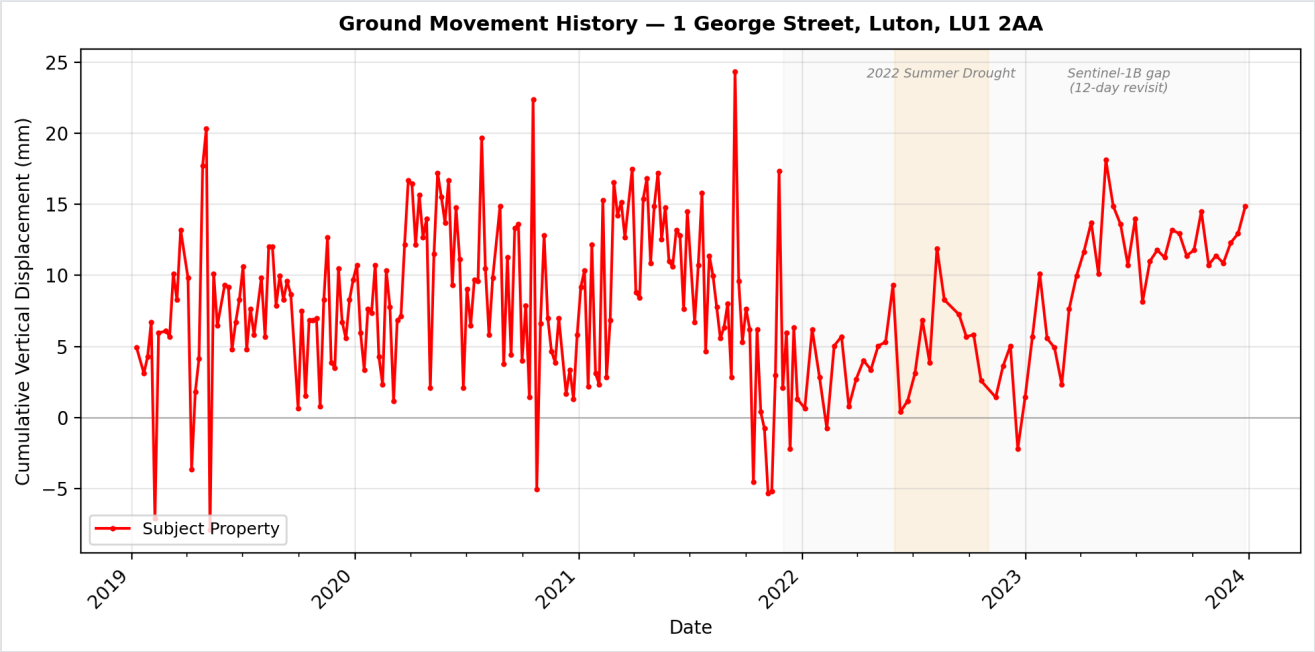


Figure 2: Cumulative vertical displacement (mm) at the subject property (red) compared to a nearby stable reference point (blue dashed). Negative values indicate downward movement. Note: Reduced data density between Dec 2021 and Dec 2024 due to Sentinel-1B failure.

Geological Context

Property Geology (BGS 1:50,000)

Bedrock Geology	New Pit Chalk Formation
Superficial Deposits	Glaciofluvial deposits, Anglian

Regional Shrink-Swell Susceptibility (BGS GeoSure)

GeoSure Classification	LOW
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Note: The bedrock and superficial geology are derived from BGS 1:50,000 scale mapping at the property location. The GeoSure classification is a regional 5km assessment and may not reflect local variations.

Interpretation

The property is founded on New Pit Chalk Formation (Chalk), dating from the Late Cretaceous.

Methodology

Satellite Platform: Sentinel-1 C-band Synthetic Aperture Radar (SAR), operated by the European Space Agency under the Copernicus programme. Free and open data.

Pre-processed Data: LiCSAR interferograms produced by COMET, University of Leeds. Frame IDs: 154D_03661_253146 (desc), 030A_03517_515153 (asc).

Time Series Analysis: COMET LiCSBAS software using the NSBAS (New Small Baseline Subset) inversion method. This combines hundreds of interferometric measurements into a consistent displacement time series.

Vertical Decomposition: Vertical displacement derived from decomposition of ascending and descending satellite tracks. See Methodology section for details.

Measurement Accuracy: Velocity accuracy is typically $\pm 1\text{--}2$ mm/year. Individual epoch displacement accuracy is < 10 mm.

Spatial Resolution: Ground sampling is approximately 100m. Each measurement represents the average ground movement across this area.

Data Period: 2019-01-09 to 2023-12-26 (230 satellite acquisitions across ascending and descending tracks).

Sentinel-1 Constellation: Reduced acquisition frequency from December 2021 to December 2024 due to Sentinel-1B failure. Sentinel-1C launched December 2024 restoring full 6-day revisit capability.

Limitations & Disclaimer

Measurement Limitations

Spatial Resolution: Measurements represent average ground movement across approximately 100m. The technique cannot distinguish movement of individual buildings within this area. For highly localised causes (e.g. a single leaking drain), ground-based monitoring remains necessary.

Decomposition Assumptions: Vertical/horizontal decomposition assumes motion is predominantly in the vertical and east–west planes. North–south motion cannot be resolved from polar-orbiting SAR satellites.

Cause of Movement: InSAR measures ground displacement only. It cannot determine the cause of movement (e.g. clay shrink-swell, mining, groundwater abstraction, or construction activity). Causation assessment requires additional investigation.

Coherence: Measurements may be unavailable in heavily vegetated areas or locations with significant surface change during the monitoring period.

Data Gap: Reduced satellite revisit frequency from December 2021 to December 2024 (Sentinel-1B failure) may result in lower temporal resolution during this period.

Disclaimer

This report is provided as supporting evidence for insurance claim assessment only. It does not constitute structural engineering advice, geotechnical assessment, or a building survey. The information should be used alongside other evidence and professional judgement, not as the sole basis for claim decisions.

Exostrata Ltd holds Professional Indemnity insurance. Details available on request.

Data Quality Statement

Confidence Classification	HIGH
Measurement Location	51 satellite measurement points within 6m of the property.
Valid Epochs	230 of 230 (100%)
Valid Pixels within 500m	51
Reference Point	26 ascending + 25 descending EGMS points. Nearest: 6m

Confidence Classification Criteria

HIGH	Direct pixel hit, ≥80% epoch completeness, ≥5 years data, ≥5 valid pixels within 500m, stable reference point (<1 mm/yr).
MEDIUM	Measurement within 200m, ≥50% epoch completeness, ≥3 years data, ≥2 valid pixels within 500m.
LOW	Conditions below MEDIUM thresholds. Results should be interpreted with caution.