DTM GENERATOR

User Guide

Survey points → TIN surface → contours, volumes, sections

Offset pegs, piling platforms, graded road formations

Downloads for Leica / Trimble / Topcon total stations

Single HTML file · runs in any browser · no install · works offline

Version: July 2026 · dtmgenerator.com · support@dtmgenerator.com

What this app does. You paste or load survey points (Easting, Northing, Level), and it builds a Digital Terrain Model — a TIN (Triangulated Irregular Network) of the ground. From that one model it gives you contours, interpolated levels anywhere on site, cut/fill volumes to flat or graded formations, piling platform quantities, long sections, kerb offset pegs, and files ready to upload to a total station.

What you need. A browser (Edge, Chrome, Firefox — laptop or tablet). The app is one HTML file: keep it somewhere deliberate (not Downloads), double-click to open, bookmark it. Everything runs on your machine — no account, no upload, your survey never leaves the computer.

Contents

1 · Quick start — two minutes with the demo

1. Open the HTML file in your browser.
2. In **1 · Survey points**, press **Demo site**. 42 ground shots load and the TIN, contours and stats appear.
3. Move the cursor over the plan — the readout bar shows live E, N and the interpolated **LEVEL** under the cursor.
4. Click anywhere on the surface to drop a green check point with its level.
5. In **5 · Volumes**, enter formation 99.50 and press **Calculate**, then toggle **Cut/Fill** in the plan toolbar — red is dig, blue is fill.
6. In **10 · Download for instrument**, press **LandXML (N E Z)** — that file goes straight onto a USB stick and into the instrument.

Everything else in this guide is a variation on that loop: points in, model on screen, numbers and files out.

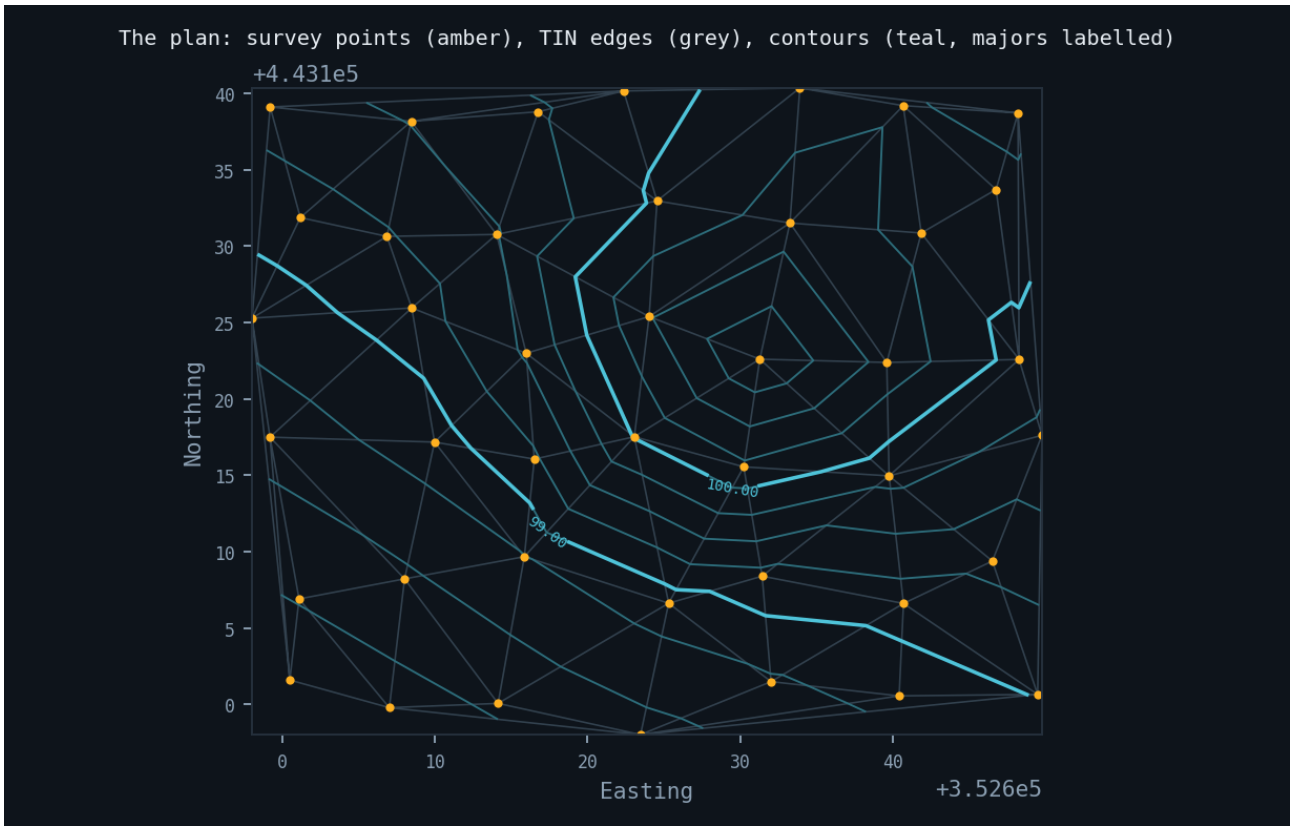

Figure 1 — the plan view: amber survey points, grey TIN edges, teal contours with majors labelled.

2 · Getting your points in

Paste or load a file

Use the **Load CSV / TXT file** button or paste rows straight into the box, one point per line. Values can be separated by commas, tabs, semicolons or spaces. Header rows are skipped automatically.

```
101,352614.250,443128.760,98.345,EP
102,352630.110,443140.220,98.910,EP
103,352645.870,443131.400,99.264,EP
```

Column order — get this right first

The **Column order** dropdown tells the app what your columns mean. Four layouts are supported:

Pt, E, N, Z, Code (the default, usual UK convention) · **Pt, N, E, Z, Code** · **E, N, Z** · **N, E, Z** (the last two for bare coordinates without point numbers).

After pressing **Add points**, check the point list below the box: columns run ID, E, N, Z. With UK national grid coordinates the Easting is the smaller number (e.g. 3526xx) and the Northing the larger (4431xx). If they look swapped, press **Clear all**, change the dropdown, paste again — the plan will also look obviously wrong (stretched or rotated) with the wrong order.

Loading raw GSI from a Leica instrument

The same Load button reads **.gsi** files directly — both GSI-8 and GSI-16, in mm or 0.1 mm precision. Point number, Easting (word 81), Northing (82) and level (83) come in automatically, so you can pull the day's topo straight off the TS16 memory stick with no reformatting.

Managing points

Every point appears in the scrollable list with a red ✕ to delete it (bad shots, duplicated pegs). **Clear all** wipes the lot including lines, pegs and results. The TIN rebuilds automatically after any change.

> **Note:** Duplicate positions (identical E and N) are ignored beyond the first — two shots on the same nail won't break the triangulation.

3 · The plan screen

Navigation: scroll to zoom (about the cursor), drag to pan, pinch on a touchscreen, and **Fit** to zoom back to the whole site.

Toolbar toggles: TIN (triangle edges), **Contours**, **Points**, **Labels** (point IDs and levels — handy zoomed in, cluttered zoomed out), and **Cut/Fill** (volume shading, section 7).

Readout bar (bottom): live Easting, Northing and interpolated level under the cursor. It reads *outside DTM* beyond the surveyed area, and adds ***ext** when the level is projected in the extension band (section 4).

When an overlay survey is loaded (section 7) it draws in violet over the main model, so you can see both surfaces at once.

Clicking the plan normally drops a green check point with its level. When one of the drawing tools is active (kerb line, breakline, section, platform, fall line, centreline) clicks feed that tool instead — the active button shows amber and says *Clicking… (finish)*; press it again to stop.

> **Note:** Only one drawing tool is active at a time. If clicks seem to be doing the wrong thing, look for an amber button and switch it off.

4 · Surface settings

Contours

Contour interval sets the step (0.25 m default); **Major every** makes every Nth contour bold and labelled. For a steep site try 0.5 m; for a snooker-table car park drop to 0.1 m.

Max triangle edge — important on odd-shaped sites

The TIN naturally fills the convex outline of your points, so an L-shaped or ring-shaped survey gets false triangles bridging across the gap — and fake levels there. Set **Max triangle edge** to strip any triangle with an edge longer than the limit. A value a little over your typical shot spacing (say 15 m for a 10 m grid) removes the bridges without eating real surface. 0 = off.

Extending the DTM edge

Levels stop at the last shot, but pegs and platforms often sit just beyond. **Extend DTM edge** (say 2 m) projects the slope of the nearest edge triangle outwards: a dashed green boundary and tinted band show the zone, and any level taken in it is flagged with ***** — projected, not surveyed.

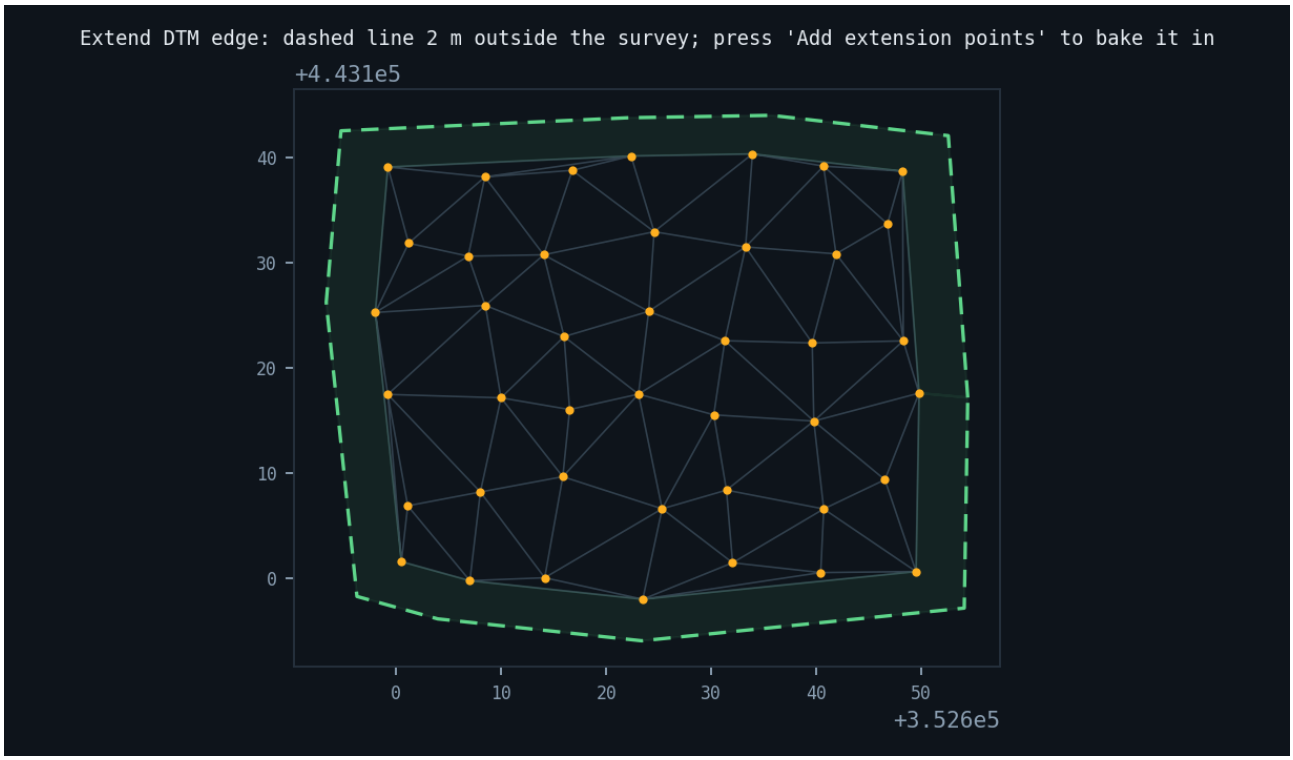

Figure 2 — the extension band. Inside the TIN = real interpolation; the green band = projected levels marked *.

Press **Add extension points** to make the band permanent: a ring of points (code **EXT**) is created around the survey with projected levels, the TIN grows to cover it, and — crucially — the extended surface then goes into every download, including the LandXML the instrument uses. Re-pressing after changing the distance replaces the old ring.

> **Site tip:** Projected is not surveyed. Over 1–2 m of steady ground it's fine; beyond a top of batter or edge of dig it's a guess. The EXT code follows the points onto the instrument so nobody mistakes one for a real shot.

5 · Breaklines

A TIN doesn't know where your banks are: triangles happily span from top of batter to the field beyond, smoothing the feature away. A breakline forces the model to honour it.

1. Press **Pick breakline**, then click the surveyed shots in order along the feature — top of bank, bottom of bank, channel line. Clicks must land on actual points (it snaps; clicks in space are refused).
2. Press **Finish line**. Repeat for the next string — top and bottom of a batter are two separate breaklines.
3. Press **Apply to TIN**. Points (code **BL**) are inserted along each line at the **Densify** spacing, with levels interpolated between your shots, and the TIN rebuilds tight to the feature.

Breaklines draw in pink on the plan. **Clear all** removes the lines and their BL points together.

> **Site tip:** Survey banks as strings when you're on site — TOB and BOB coded shots in order — and breaklines take thirty seconds back at the cabin.

6 · Level checks

Three ways to pull a level off the model: hover the cursor (live readout), click the plan (drops a labelled green check point), or type an Easting and Northing into **4 · Level check** and press **Interpolate level** — useful when someone radios a coordinate over. Extrapolated answers carry the * flag and a note.

7 · Volumes — cut and fill

Volumes are measured between the ground model and a **formation**. Four formation types cover most civils work:

Flat level

One level across the whole DTM — pads, tanks, crane mats. Enter the level, press **Calculate**. You get cut (dig out), fill (import), the net surplus/deficit, and the plan areas of each.

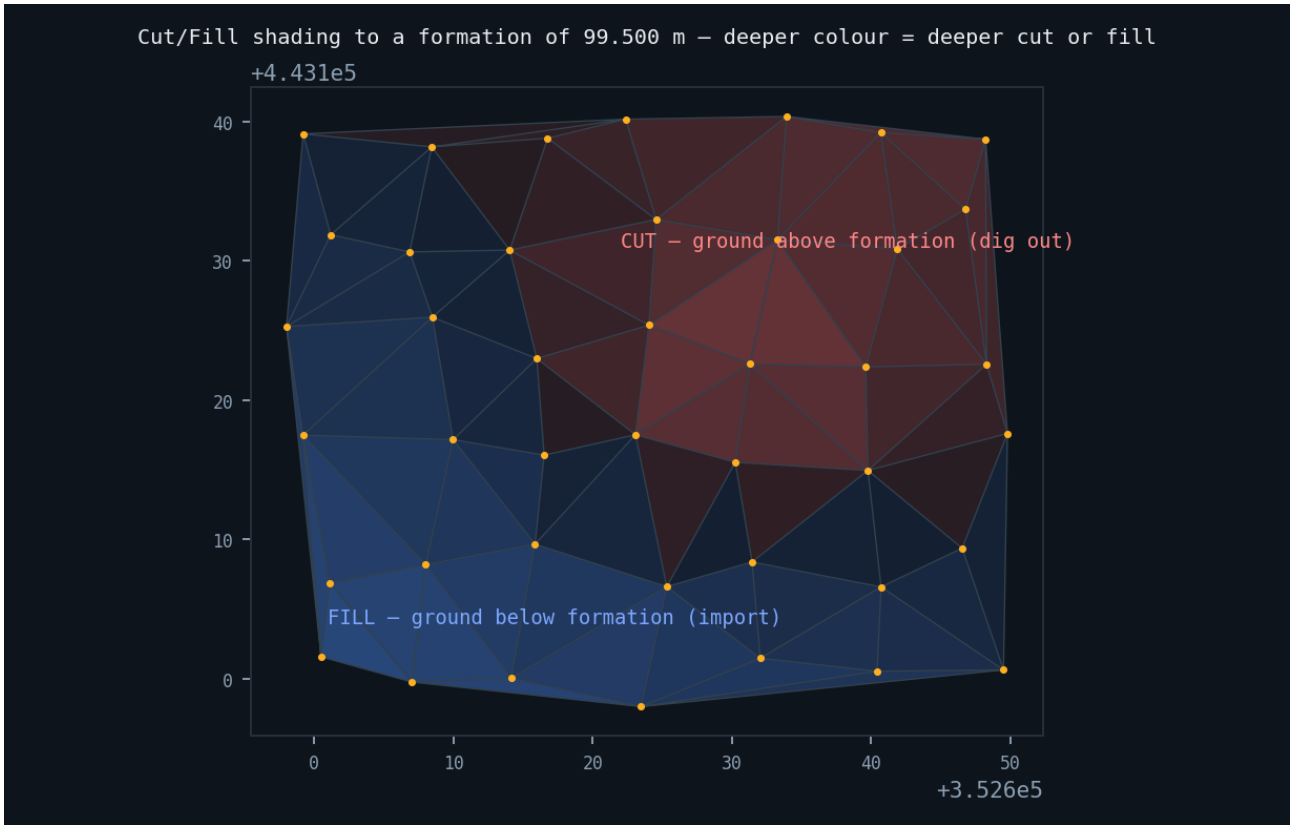

Figure 3 — Cut/Fill shading: red where ground is above formation (dig), blue below (fill). Deeper colour = deeper.

Graded — straight fall at 1 in X

For a formation that falls uniformly in one direction. Press **Set fall line** and click twice on the plan: the **start**, then a point in the **direction of fall** — a yellow arrow appears pointing downhill. Enter the formation level at the start and the gradient (1 in 40 = 2.5%).

Crossfall tilts the plane sideways at 1 in X, falling to the **left or right of your direction of travel** along the arrow. Set 0 for none. This is one-way crossfall: a cambered road falling both ways from the crown is two planes, so run it as two halves (fall line along the crown, crossfall left, then crossfall right) and add the volumes.

Graded along centreline — curved roads

Where the road has radius kerbs, the level falls along the **chainage of the curve**, not a straight projection. Choose this type and draw the centreline exactly like the kerb tool: click along the road from the start; for each radius click into the curve, click a point **on** it, click the end, and press **Make arc** — it reports the radius it fitted. Chain as many straights and arcs as the road has. The line shows dashed blue with **CH 0.0** at your start; the grade also continues along the end tangents beyond the drawn line.

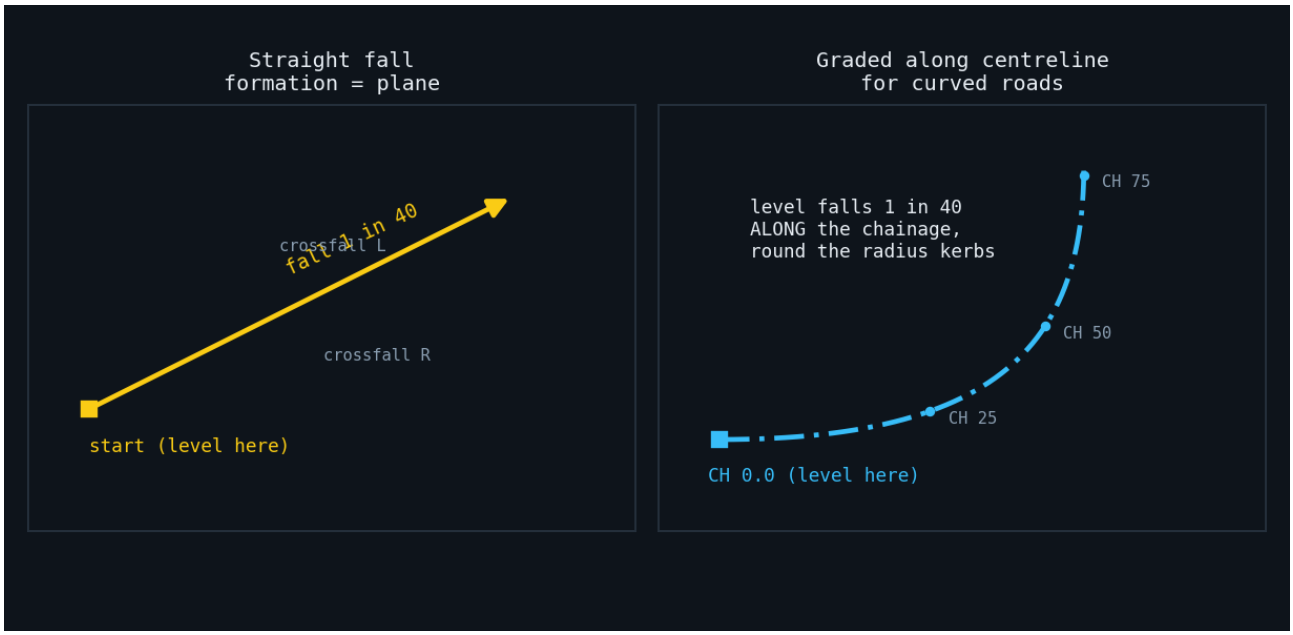

Figure 4 — straight fall (left) versus graded along a curved centreline (right), where 1 in 40 is measured round the bends.

Compare to overlay survey — the muckshift measure

The fourth type compares **two surveyed surfaces** — no formation assumptions at all. Load the original ground as the main survey (section 1), choose *Compare to overlay survey*, and load this month's re-survey with the Load overlay button (CSV or GSI, same column-order dropdown as section 1). The overlay draws in violet over the main TIN so you can see both surfaces sitting together.

Press Calculate and the volume between the surfaces is measured over the area where they **overlap only**: **cut** is where the main survey sits above the overlay (what's been dug since the original), **fill** where material has been placed. That number is the interim valuation — measured, not estimated — and it flows into the material summary and the PDF report like any other volume run. Balance level doesn't apply here (between two real surfaces the volume is what it is), and the app warns you if the surveys don't overlap, which usually means a column-order mistake on the overlay file.

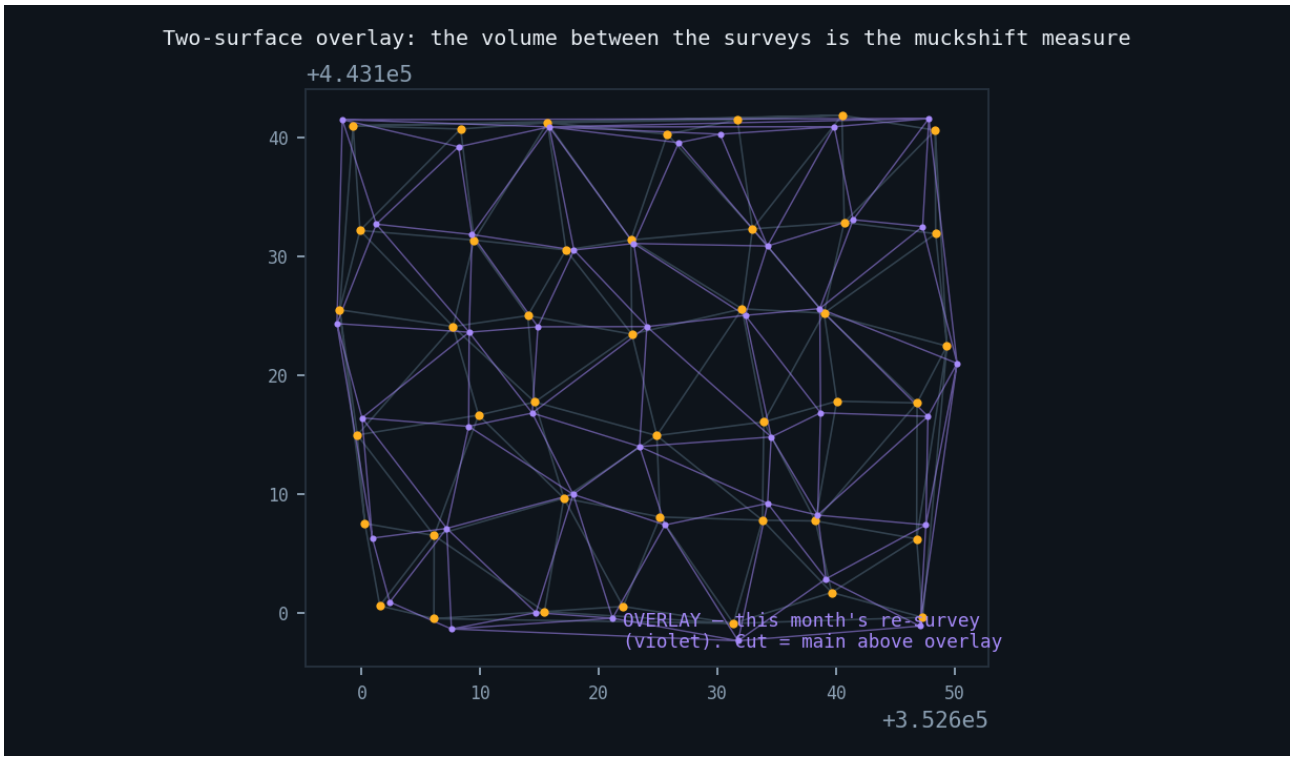

Figure 5 — overlay measurement: original ground in amber, the re-survey in violet; the difference is the muckshift.

Site tip: For a defensible monthly measure, re-survey the same extent each month and shoot the unexcavated edges too — the calculation only counts where both surveys exist, so a re-survey that stops short of the original's edge under-measures the dig.

Find balance level

One button answers “what level do I work to so no muck comes on or off site?” It slides the formation (flat level, or the whole graded plane, or the centreline start level) up and down until cut equals fill, fills the level box in for you and recalculates. The message reads e.g. *Muck balances at formation 99.427 m*.

Note: Accuracy: flat and straight-graded volumes are computed exactly (triangles crossing the formation are split, not averaged). Centreline-graded and overlay volumes are integrated on a fine sampling grid (~0.25 m) — comfortably within a wagon load on any real site. Sanity check on every job: cut area + fill area should equal the plan area in section 2 (for overlay runs, the overlap area).

8 · Material summary — what to order

Under the volume results, enter the **import material** (e.g. MOT Type 1) and its compacted **density**, then press **Material summary**. Two scenarios come back:

A — reusing suitable dug material: dig-and-place volume, plus the import needed to make up the shortfall — in m³ **and tonnes** — or the surplus to remove if you're cut-heavy.

B — all dug material off site: full muck-away plus the full import tonnage.

Typical compacted densities: **MOT Type 1** 2.1–2.2 t/m³ · **6F5 crushed concrete** 2.0–2.1 · **6F5 virgin limestone** ~2.2 · **sand** ~1.6. If the source isn't known yet, use the lower figure — slightly over-ordering capping beats coming up short.

Note: m³ orders material; m² orders surface treatments (membrane, geotextile). The volumes are compacted-in-place — buying by the tonne means loose bulking on the wagon mostly washes out.

9 · Piling platforms

A platform is a two-layer problem: prepare the subgrade to a **formation**, then place stone at constant **thickness** up to the **platform top level** the rig runs on. Section 6 of the app does the whole thing inside a boundary you draw.

1. Press **Draw boundary** and click the platform corners on the plan (3+ clicks, snaps to points, closes itself). It shows in orange.
2. Enter the **platform top level** and **thickness** from the temporary works design (600 mm default), and the stone type and density (6F5 at 2.0 default).
3. Press **Calculate platform**.

Results, measured **inside the boundary only**: formation level (top – thickness), **dig to formation**, **fill to formation** (suitable material to bring low spots up before stone), and the **stone** volume and tonnage (area × thickness).

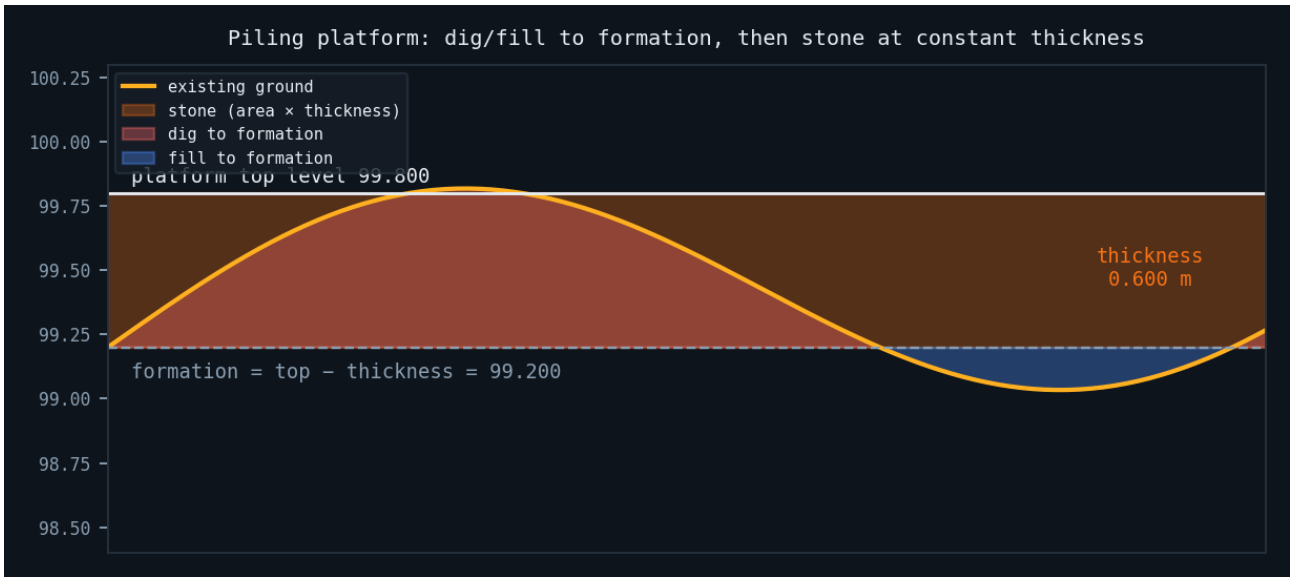

Figure 6 — platform build-up: red dig and blue fill to formation, then the orange stone layer at constant thickness.

Corners CSV / Corners GSI export the boundary as points PL1, PL2… coded **PLT**, carrying the platform **top** level — load them into the instrument and the mat corners are set out in minutes.

> **Note:** If part of your boundary hangs off the DTM the app warns you and the dig/fill is under-measured there — extend the DTM edge (section 4) or survey further. And remember: this quantifies the platform; the thickness itself comes from the working platform design (BRE 470 / rig bearing pressures), not from this tool.

10 · Long sections

1. Press **Draw section** and click 2 or more points across the plan (A → A'). The line shows dashed purple.

2. Set the **interval** (levels every 1 m by default) and press **Generate section**.

A profile panel opens over the plan: chainage along the bottom, levels against a datum, gridlines, and the ground line in teal. Green squares mark extrapolated levels. **Section CSV** exports chainage, E, N and level for every station — drop it into a drainage design or level book. The section also becomes page 2 of the PDF report.

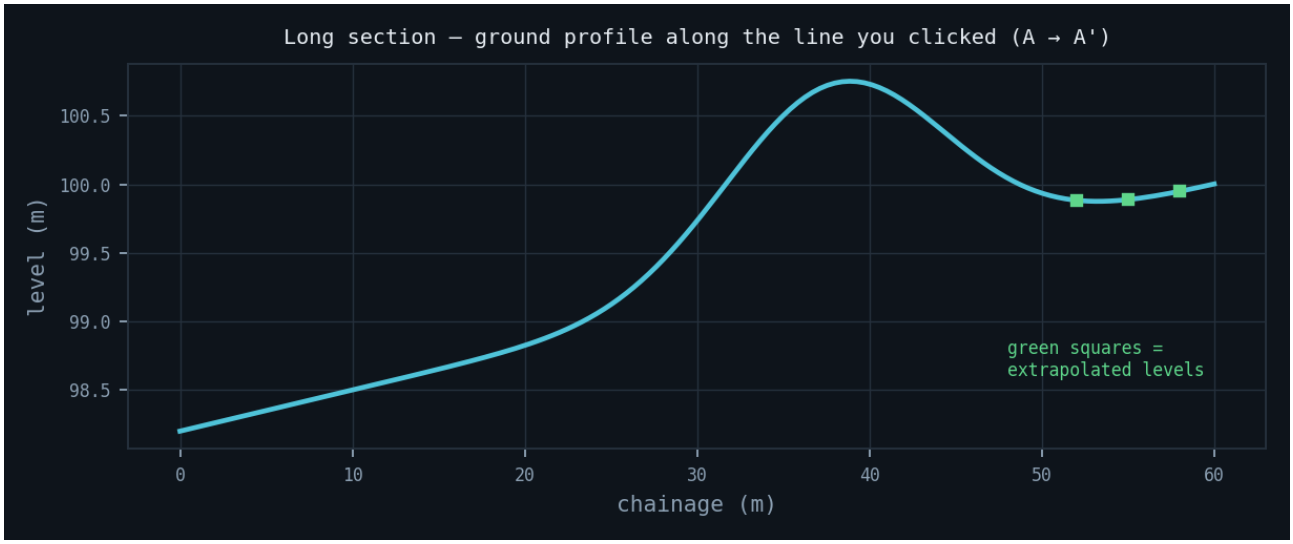

Figure 7 — a generated long section: ground profile, gridlines, datum, extrapolated stations flagged.

11 · Kerb lines and offset pegs

Setting out back of kerb, you can't peg the line itself — the dig's in the way — so you offset pegs a set distance and mark them with the kerb level for a traveller. Section 8 of the app generates the whole peg schedule.

Draw the kerb line

1. Press **Draw line**, click along the kerb (snaps to survey points).

2. For a radius: click the start, click a point **on** the curve, click the end, press **Make arc**. Mix straights and radii freely; **Undo pt** steps back. Or paste kerb line coordinates (E,N per line) from a drawing.

Generate the pegs

Offset (e.g. 3.000 m) and **side of travel** — left or right of the direction you drew the line; on a radius the offset curve's radius adjusts itself automatically. **Interval** is the peg spacing along the chainage. **Level adj** adds a constant to every peg level (e.g. +0.125 for kerb race). **Peg level from** is the key choice:

DTM @ kerb line — each peg carries the level of the kerb at that chainage (the usual traveller setup), or **DTM @ peg posn** — the ground level at the peg itself.

Press **Generate offset pegs**: green triangles appear with levels, and the table lists point number, chainage, E, N and level. Extrapolated levels carry the * flag. **Pegs CSV / Pegs GSI** export them coded e.g. **OS3.00L**.

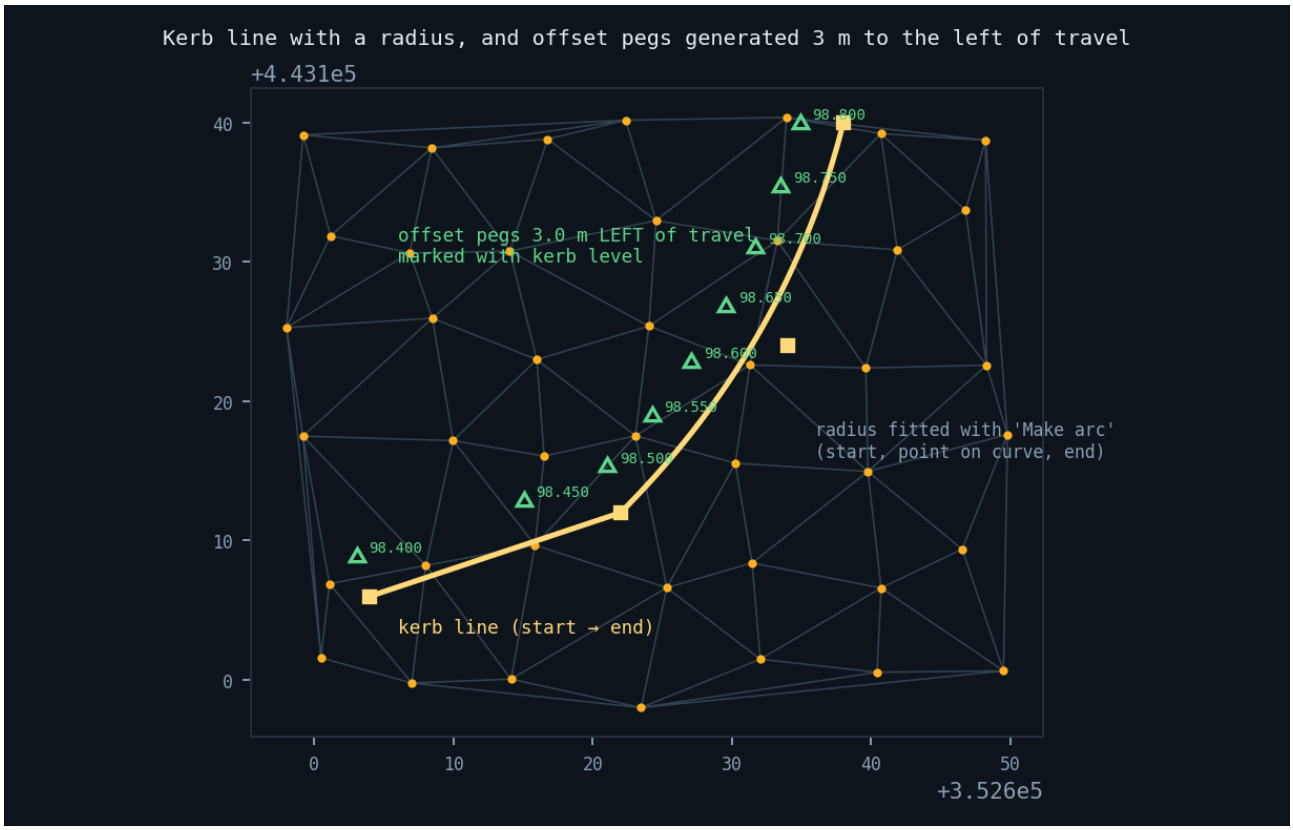

Figure 8 — a kerb line with a fitted radius and the offset pegs generated 3 m left of travel, each marked with its level.

12 · Saving jobs and the PDF report

Save / load job

Save job writes everything — points, breaklines, kerb lines, centreline, overlay survey, platform boundary, section line, pegs and all settings — into one .json file named after the job. **Load job** brings it all back exactly as you left it. Save at the end of every session; the browser keeps nothing itself.

PDF report (A3)

One button builds the deliverable: **page 1** is the plan sheet with a title block (job, date, point counts, levels, area, scale, north arrow) plus EARTHWORKS, MATERIALS, and PILING PLATFORM summaries when you've run those calculations; **page 2** is the long section if one is drawn; the remaining pages are the full point schedule including EXT and BL points, four columns per page.

> **Note:** The PDF button fetches its library from the internet the first time it's used on a machine. Everything else in the app works fully offline.

13 · Downloads for the total station

Section 10 of the app produces four file types. Copy them to a USB stick — don't open them; a LandXML opened in a browser just shows a wall of tags, which is normal.

Points CSV — the coordinate list in PENZD or PNEZD order (dropdown). Uploads to Leica, Trimble and Topcon as a standard coordinate file.

Leica GSI-16 — point ID with E (81), N (82) and Z (83) words in millimetres.

DXF — points with ID text, the TIN as 3DFACEs and joined contour polylines, on separate layers (DTM_POINTS, DTM_TIN, DTM_CONTOUR_MINOR/MAJOR). Opens in any CAD; many controllers import the faces as a surface.

LandXML surface — the full TIN (points + faces) plus the CgPoints list with codes. This is the one for DTM stakeout: live cut/fill against the surface on the instrument. **Two buttons: N E Z** is the official LandXML order and

what Leica Captivate and Trimble Access expect — **use this for the TS16**. The **E N Z** variant exists for software that reads Easting-first; if points import mirrored or kilometres away, you've used the wrong one — try the other file.

Importing on a Leica TS16 (Captivate)

1. Copy dtm-surface-NEZ.xml into the \Data folder on the USB stick.

2. Home → Jobs & Data → Import data → Import XML data; pick the file and the job.

3. The surface “DTM” and all points come in. Use Stake DTM / Measure to DTM for live cut/fill (a licensed app on Captivate — if absent, stake the points individually with their design levels).

4. Verify one known point before relying on it: with the demo data, point 101 should read E 352600-ish, N 443100-ish at its listed level, and the site shouldn't look mirrored.

Trimble Access: drop the .xml in the project folder; it appears as a surface under Stakeout → DTM. **Topcon Magnet:** Job → Import → From File → LandXML, choose Surfaces.

14 · Point codes, accuracy notes and quick reference

Codes the app writes

Code	Meaning	Where it appears
EXT	Extension point — level projected beyond the surveyed edge	Point list, all exports, PDF schedule
BL	Densified breakline point, interpolated between surveyed shots	Point list, all exports
PLT	Piling platform corner, Z = platform top level	Corners CSV / GSI
OS…L / OS…R	Kerb offset peg, distance and side encoded (e.g. OS3.00L)	Pegs CSV / GSI
*	Level flag: extrapolated (extension band)	Readout, check points, pegs, sections

Trust, but verify

The audits built into the workflow: cut area + fill area = plan area on every volume run · check one known coordinate after every instrument import · EXT and * levels are projections, indicative only · balance levels and tonnages are only as good as the density and the formation you fed in · the crossfall model is one-way (camber = two runs) · platform thickness comes from the temporary works design, not this tool.

Housekeeping

Keep **one** copy of the HTML file in a permanent folder and bookmark it — a Downloads folder full of dtm-generator (7).html is how last month's version ends up on site. Save the job .json at the end of every session. New downloads from the app land in the browser's normal download folder.

DTM Generator · single-file HTML · all computation local to your machine.