

The General Contractor's

# Guide to Smart Surveys

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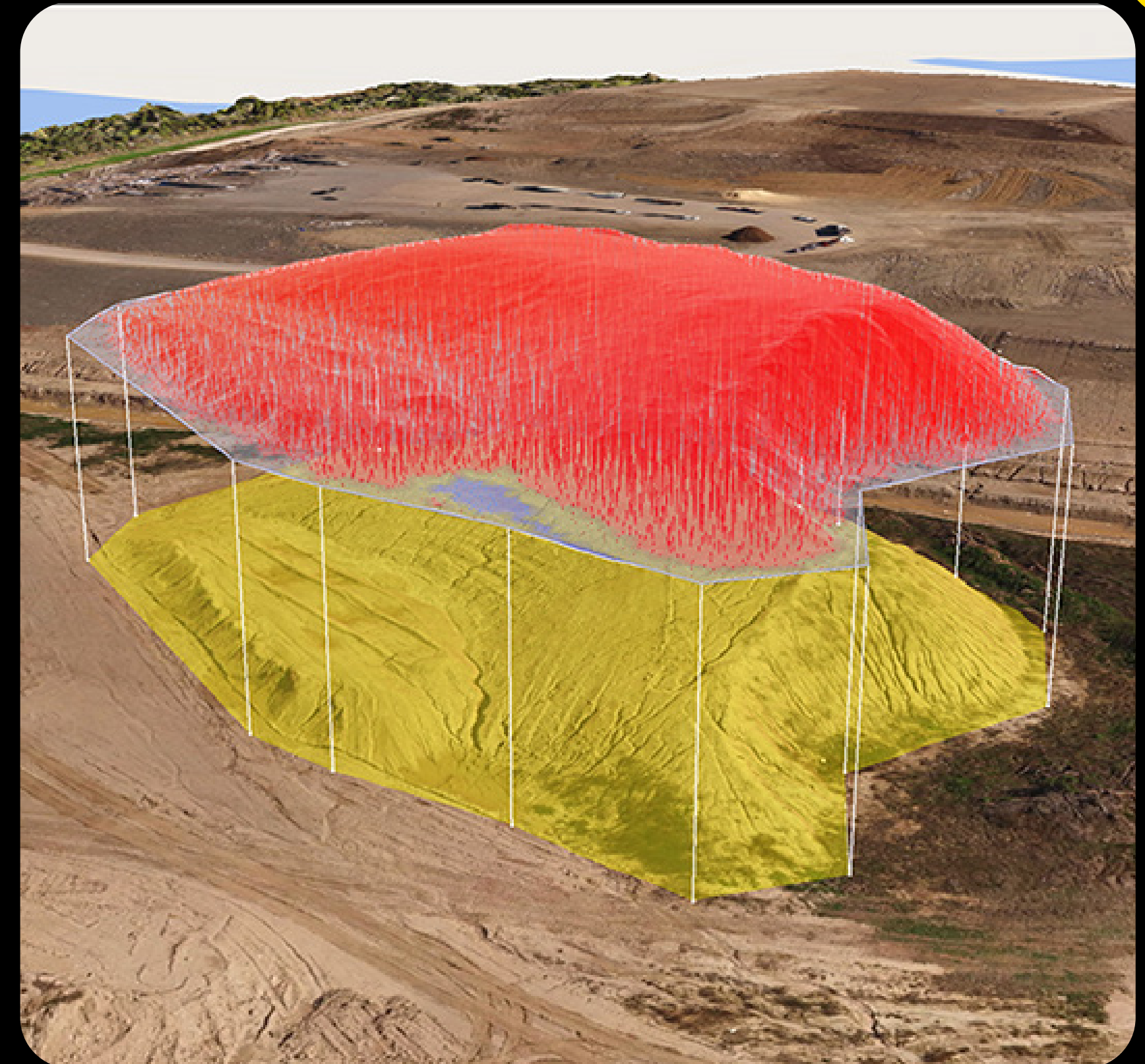


# How to use this guide

We've put together this guide to show how smart surveys can help you measure and manage your site yourself.

Whether you're new to drone surveying or are looking to scale up your map-based workflows, you want to know how it can help you manage progress, productivity, quality, and cost on your site. Here you can find a deep dive into how Propeller delivers on those values for general contractors.

By the end of this guide, you'll know how smart surveys empower you and your team to answer how much work is done, how fast it's progressing, whether or not you're matching the plan, and if you're going to make money on a job. Ultimately, leading to simpler, faster, and smarter workflows for everyone on site.



# Contents

In this guide, you'll learn about:

- What are smart surveys?
- Smart survey solutions + products
- Automated data capture
- Survey processing + QA
- Map-based data analytics
- Data management
- Collaboration + communication



# Intro to smart surveys

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Section 01



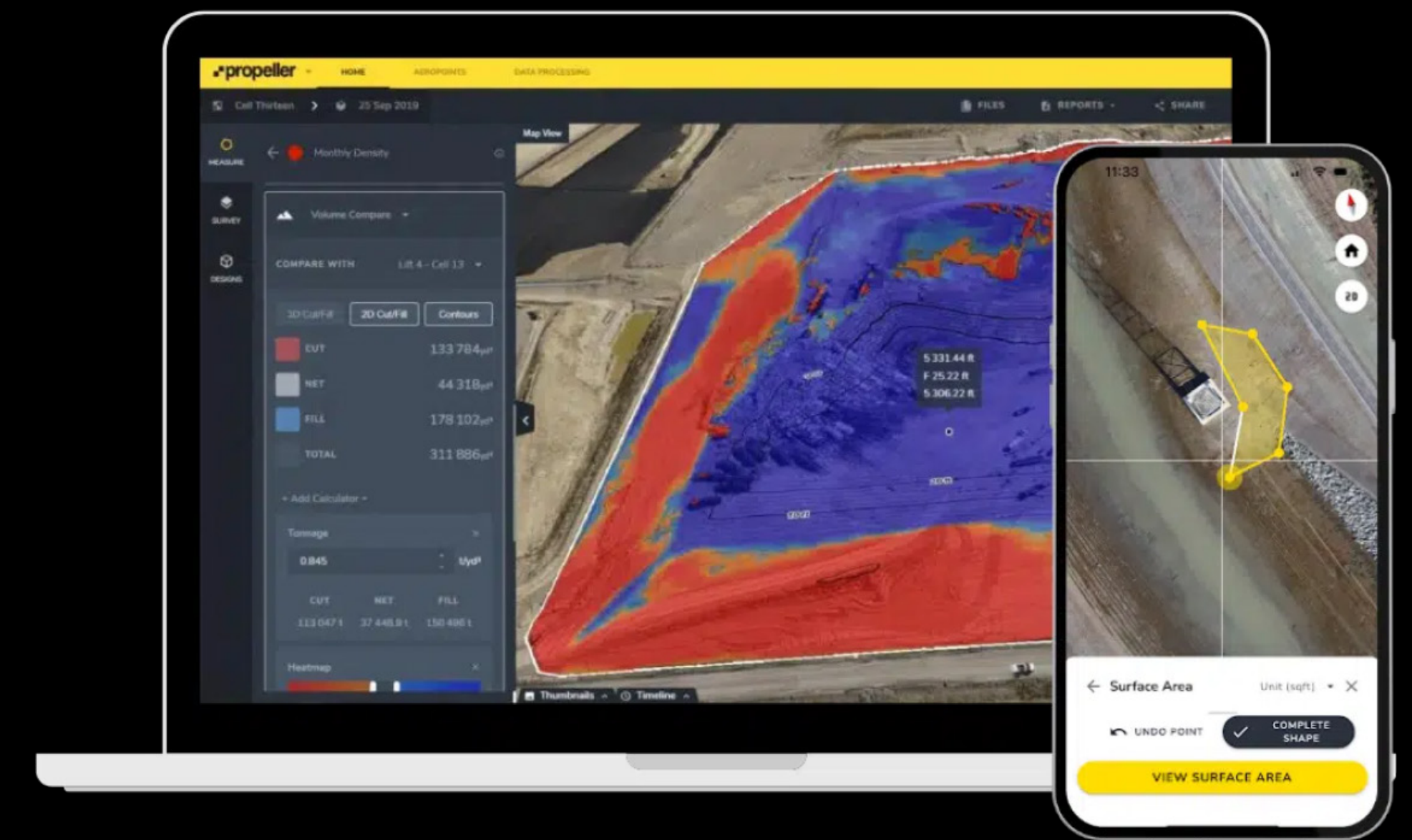
# So, what exactly are smart surveys?

The best of both worlds.

The construction and surveying landscape is evolving, and contractors are seeking new technologies that can enhance productivity, efficiency, and safety. Smart surveys represent a new category of solutions that address these needs.

In the past, surveying and GIS (Geographic Information Systems) were separate realms. However, with the advent of drones and visualization software, these two worlds have converged to create smart surveys—a powerful combination of technology solutions that merge the intuitive qualities of GIS and the accuracy of surveys to build an interactive reality that is universally understood.

Think surveys, but easy to understand. Think reality capture, but accurate. That's smart surveys.

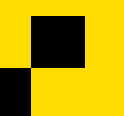


And that reality is powered by Propeller.

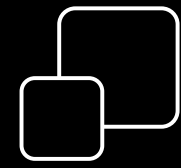
# Smart survey solutions

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Section 02

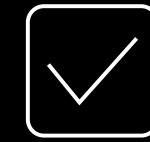


# Propeller's smart survey vision



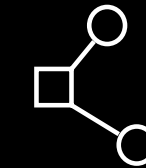
## Easy + scalable

No matter the size of your business, you can enjoy simple survey data workflows.



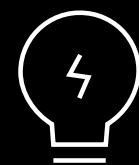
## Accurate

Simply upload your data. We'll process it to give you verified survey-grade results.



## Integrated

All systems are go with Propeller. It's an end-to-end solution that can integrate with your existing system.



## Insightful

Critical insights you can access from any device



## Supported

We're here to help you with processing, analysis, and advice, 24/7.



## One-Stop Shop

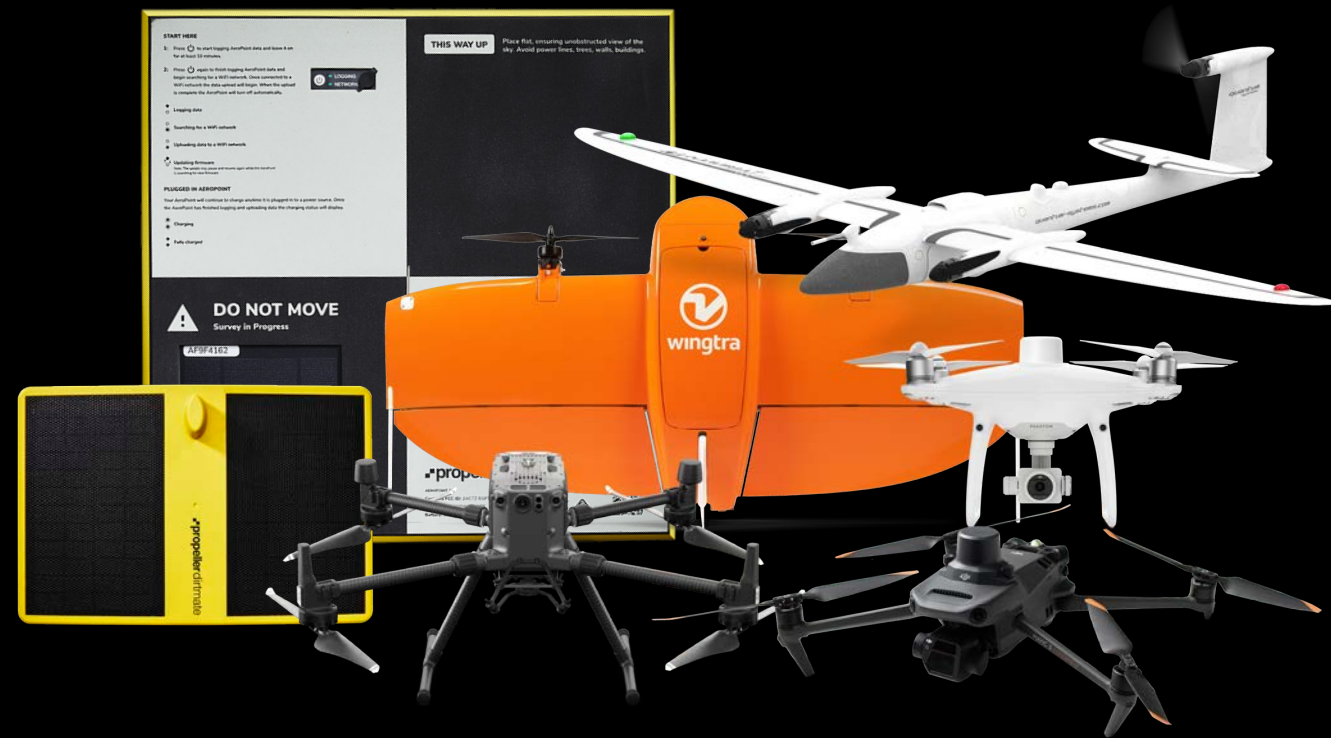
Map, measure, and manage from a single platform.



# How our smart survey solutions will work for you

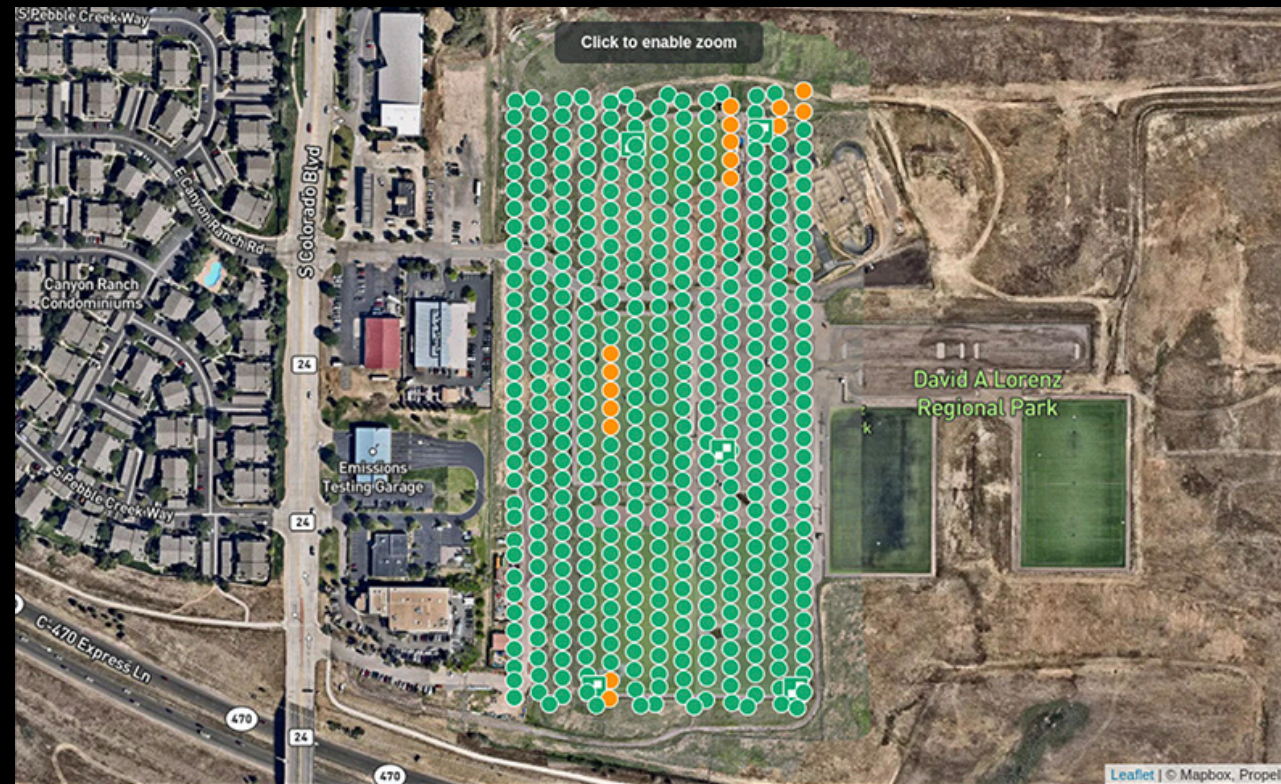
Meet the solutions powering simpler, faster, smarter survey data workflows for general contractors worldwide.

## Hardware



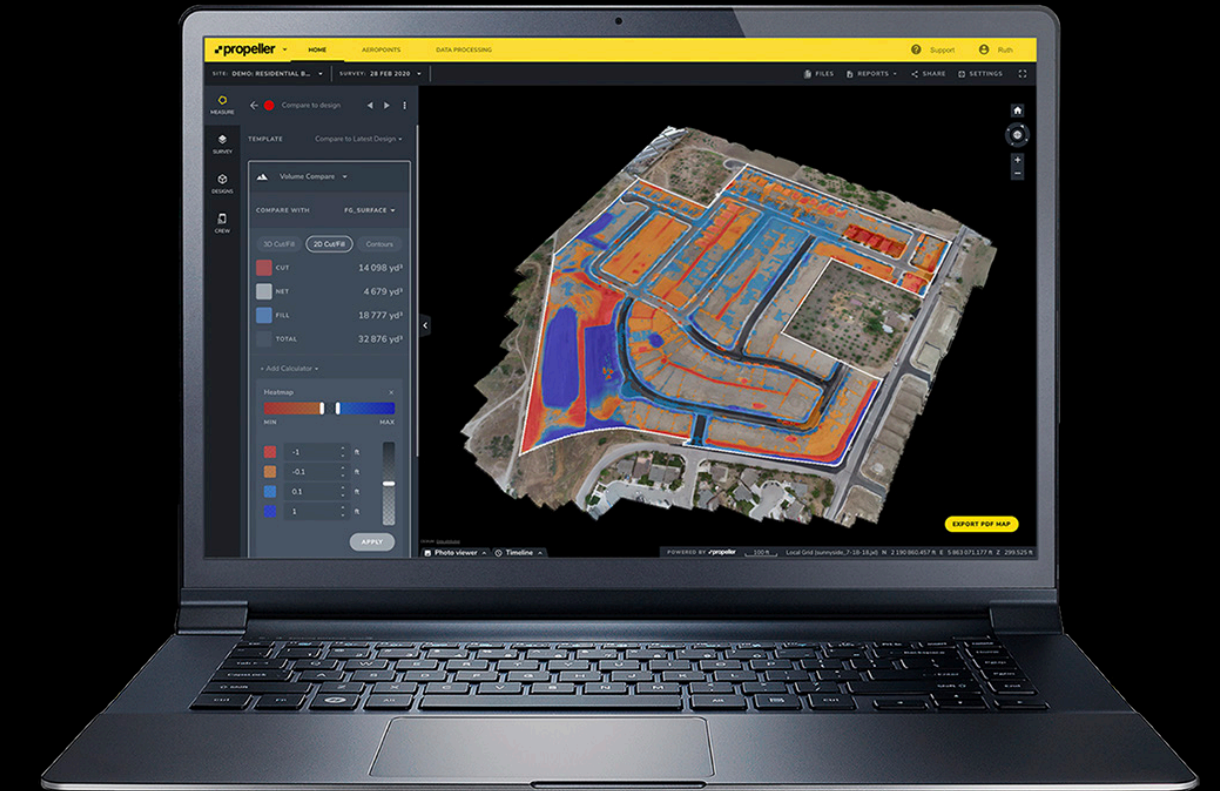
Make data capture easy.

## Data services



Get expert analysis and advice.

## Propeller platform



Gather insights and collaborate on a single map.

# Hardware



## Drones + sensors

Solve the speed-accuracy paradox with automated flight paths, and high-accuracy geotags.



## Smart ground control

Fast and simple methods for setting ground control for your drone flight.



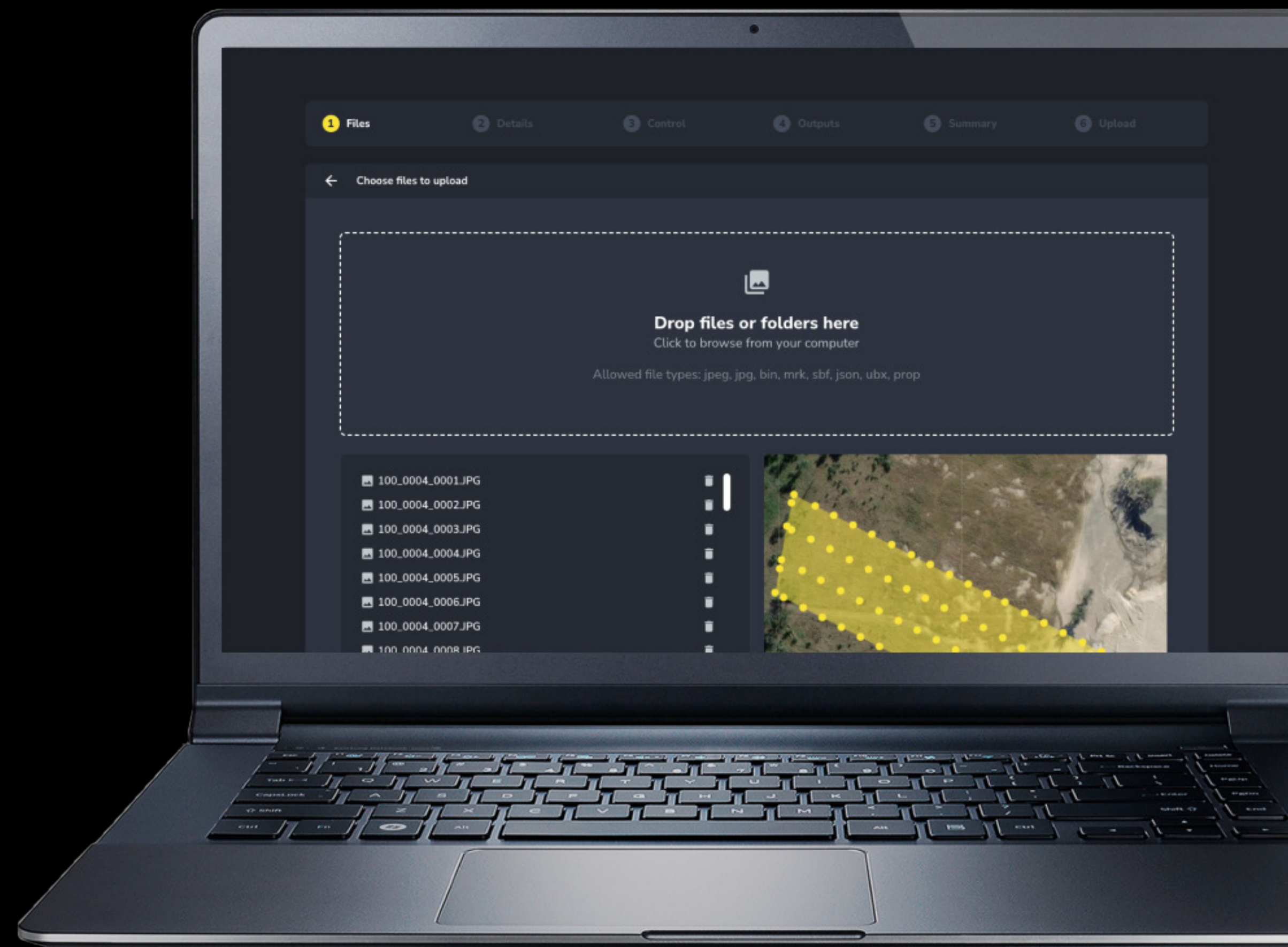
## Machine telematics

Real-time productivity insights that capture what's happening on the ground.

# Data services

## Expert survey processing

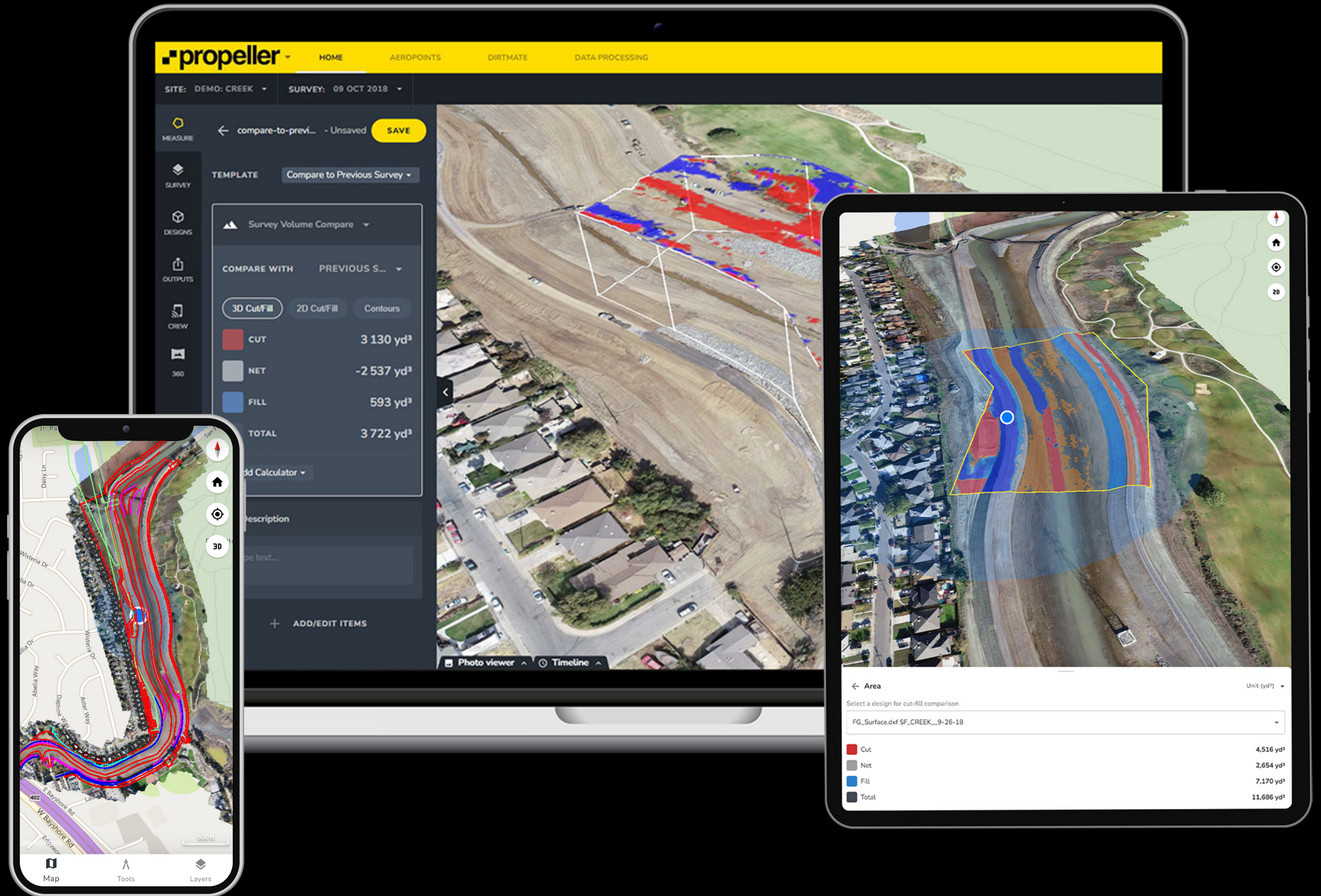
Scalable and reliable survey data, processed quickly.



# Software

A central hub to map, measure, and manage all your geospatial data.

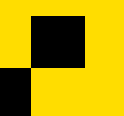
CHECK OUT PROPELLER'S PLATFORM →



# Workflows + use cases

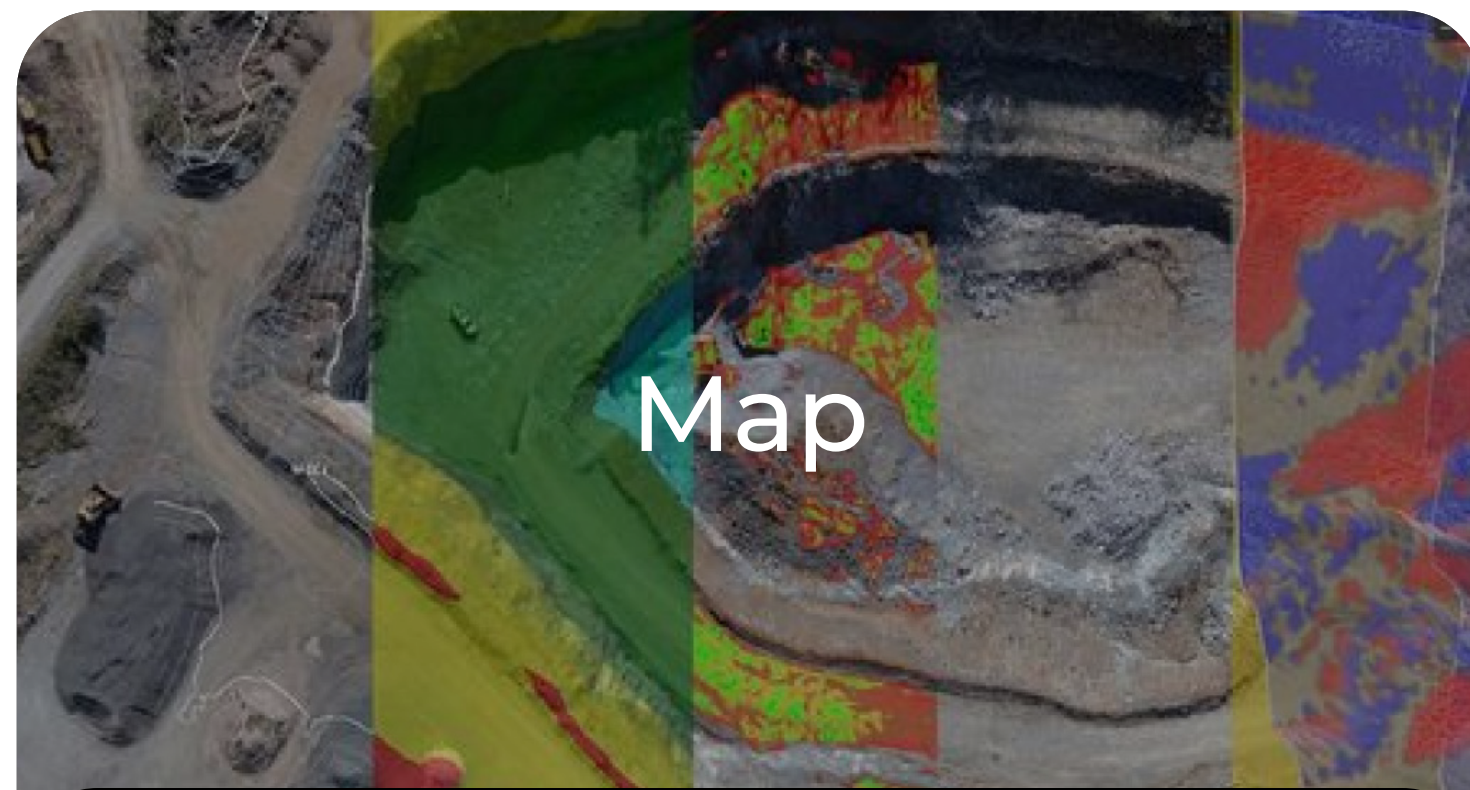
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Section 03



# Smart survey workflows

Let's talk through how it all works.



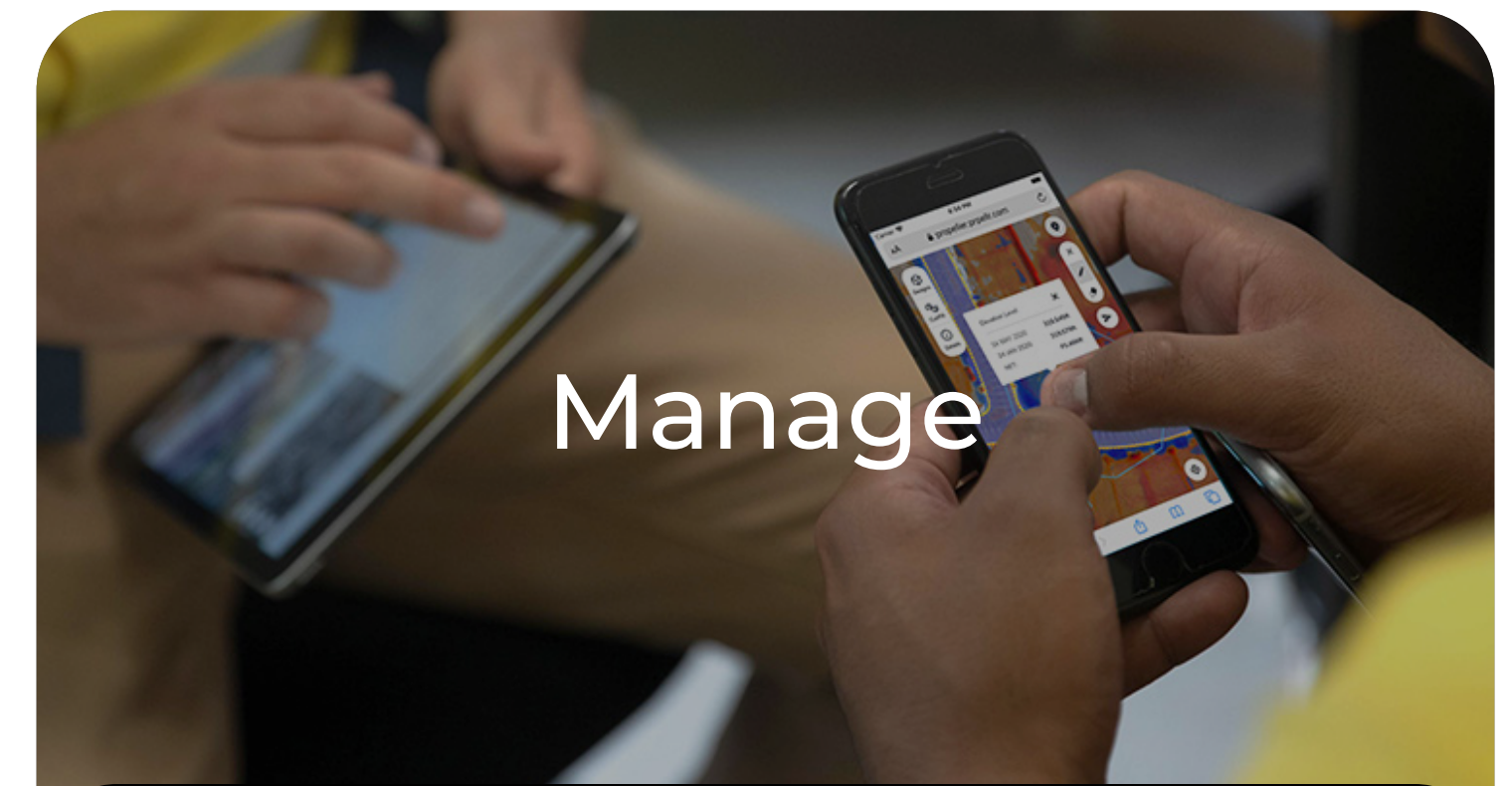
Capture survey-grade data and explore an interactive map of your worksite

- Data capture
- Processing + QA
- 3D model



Inform the best decisions with up-to-date measurements in just a few clicks

- Data analytics + reporting
- Design + linework
- Surface comparisons



Centralize your data and keep project teams on track

- Data management
- Communication + collaboration
- Production + project tracking
- Daily productivity
- Scheduling + cost control

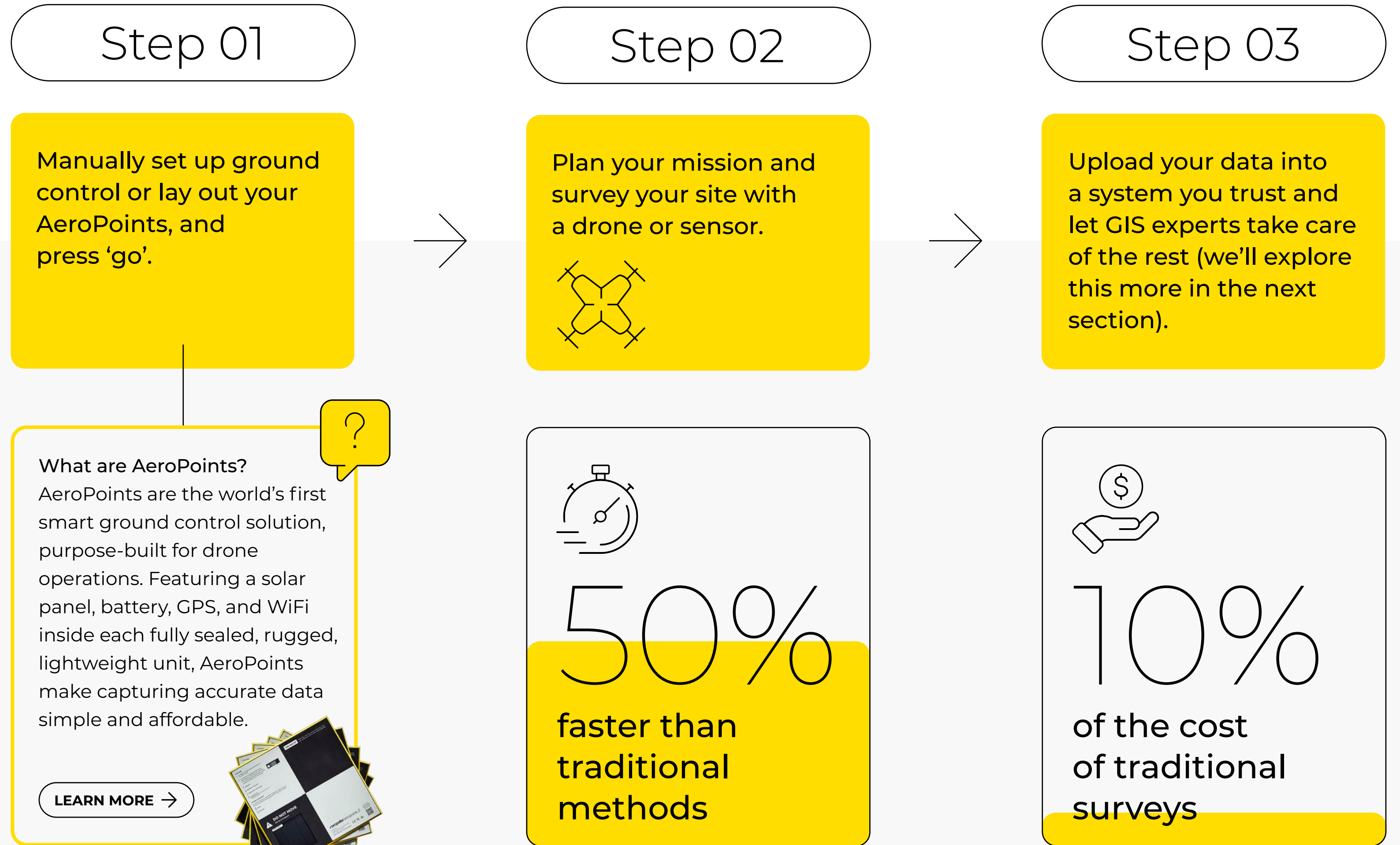
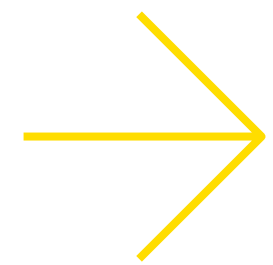
# Data capture

Let's face it: Sites run on survey data. But traditionally, it was a complex and slow slog. And, depending on your operations, infrequent.

Advances in technology have made the drone an affordable tool for worksites. Unlike traditional professional surveyor equipment, however, you don't need tons of special training and education to use it.

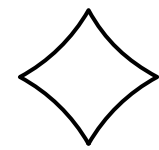
And when it comes to actually flying to capture your survey images? That can be totally automated.

## Here's how it works



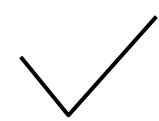
# Benefits of automated data capture

Collect data points, not pain points.



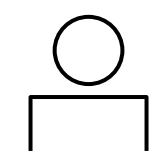
## Better results, faster

Solve the speed-accuracy paradox and hit “the easy button” on site surveys



## High accuracy

Get verified survey-grade results every time you fly



## Safer worksites

Reduce machine-to-human interaction for greater accuracy and safer conditions



“Before Propeller, we had our projects flown a couple of times a year for drone photography, but we did not utilize mapping. We used to gather all of our topographic information manually, which was very time-consuming and costly.

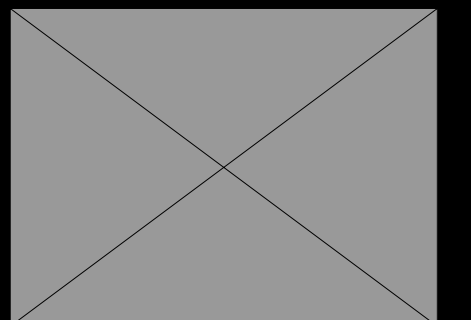
Now, the regular mapping of our commercial and residential infrastructure projects with Propeller provides us with valuable earthwork progress tracking data and stockpile volume management.”

**Marc Rickabaugh,**  
Principal at Rickabaugh Construction

[READ RICKABAUGH'S STORY →](#)

Saving  
22  
hours  
of labor in a week

Saving  
\$100k  
in a single day

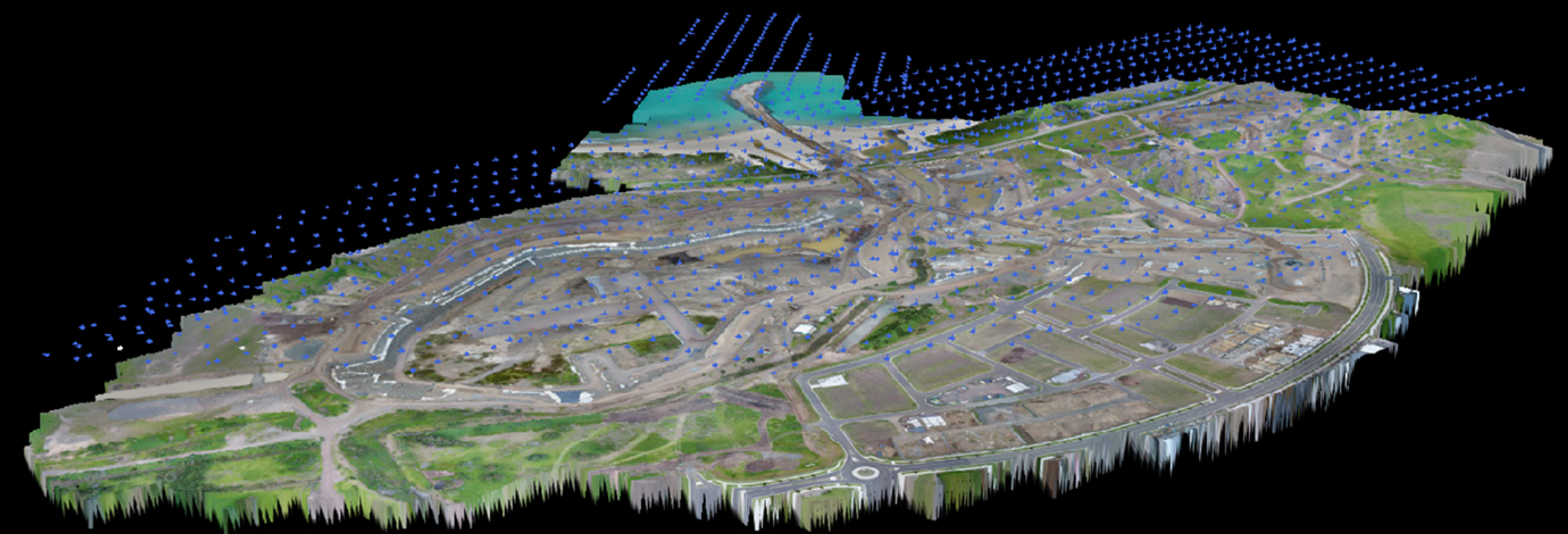
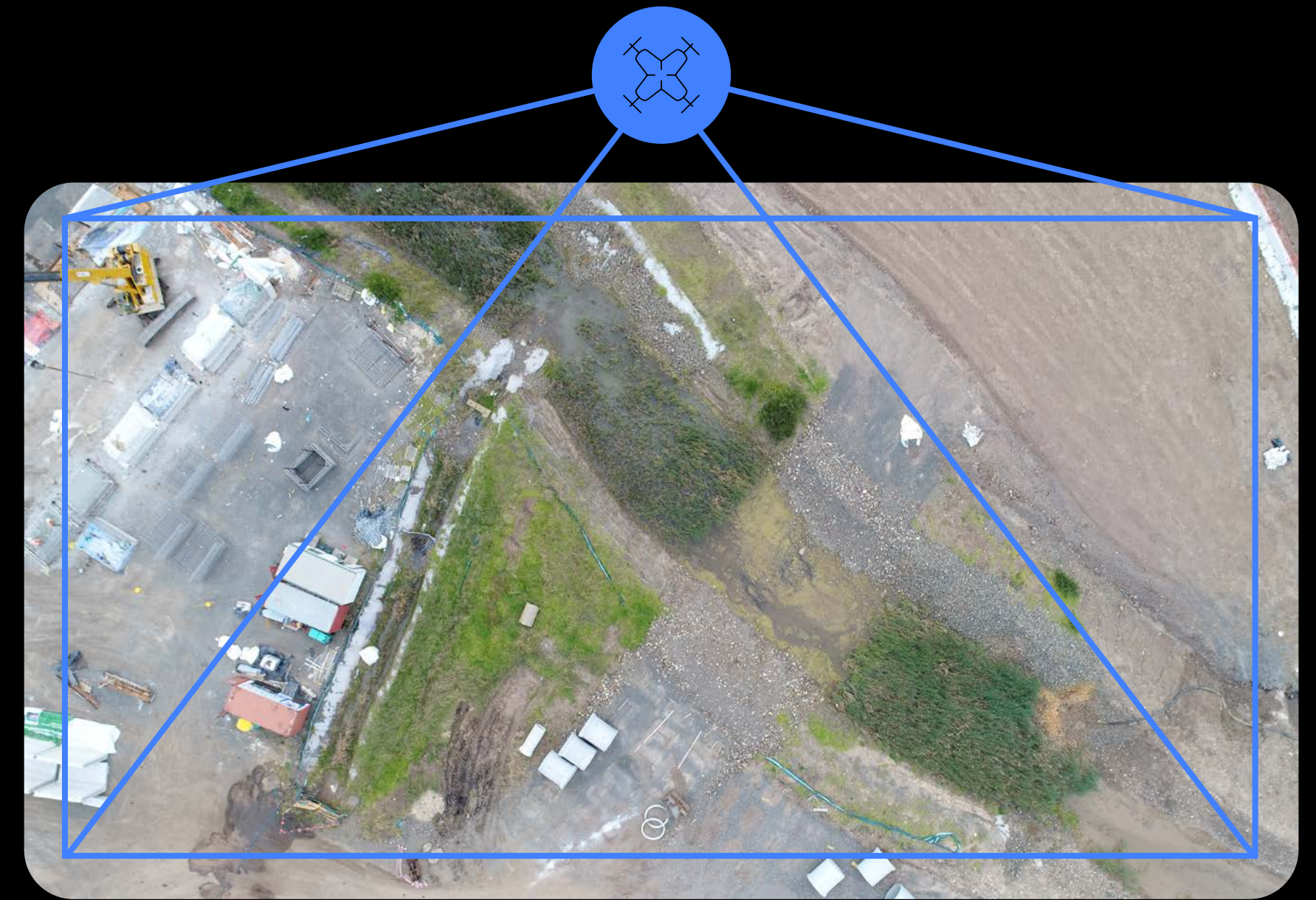


# Survey processing + QA

Survey data is only as useful as its final form. Once you survey your site, all those millions of datapoints need to be stitched together into a 3D model and validated.

It takes a lot of technical expertise to turn survey data into accurate and realistic 3D maps, and teams lose a lot of bandwidth trying to make it work internally. When it comes to processing, there are two schools of thought.

In-house processing vs.  
Outsourced processing



# Drawbacks of in-house processing



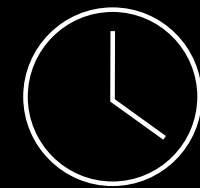
## High cost

Especially when you account for all man hours



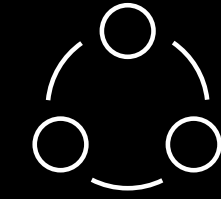
## Unsupported

Limited support makes adoption difficult for non-experts



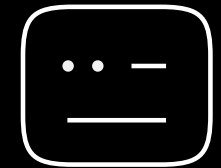
## Time sink

Only accurate when an expert spends hours on every dataset



## Difficult to share

Limited possibilities for sharing maps and measurements



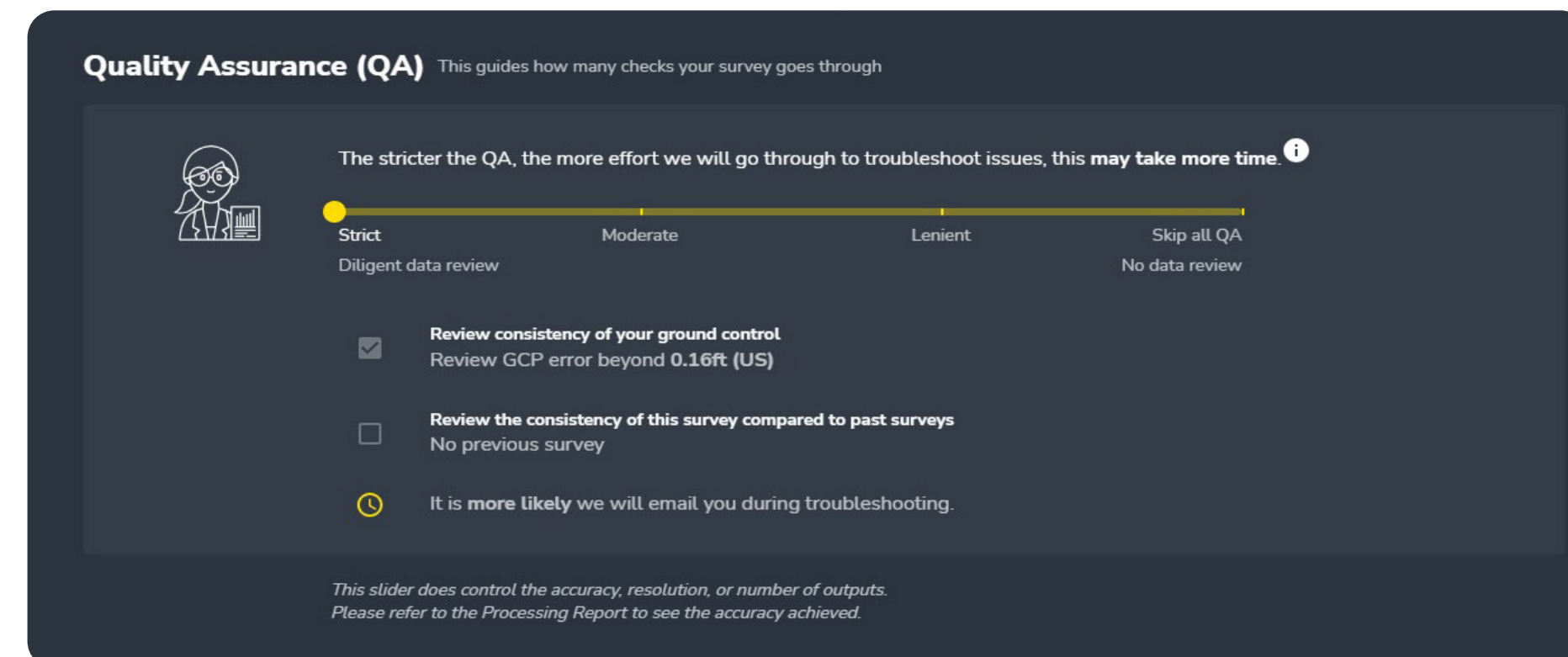
## Extra tools required

You need separate software to interpret and analyze the data



# Propeller's approach to survey processing

The best survey data is served on demand and processed thoughtfully by experts who care a great deal about the work they're doing. And good news, a processing engine like Propeller that's managed by GIS specialists can relieve the processing burden for general contractors and deliver third-party validation to every dataset.



- Simplify with an all-in-one solution:**  
 Using one consolidated solution rather than a collection of tools is the fastest and most reliable route to survey-grade results.
- Sit back and relax with on-demand processing:**  
 Simply upload your data, and we'll do the rest. We'll build a high-resolution terrain model and orthophoto within 24 hours.
- Accurate data vetted by GIS specialists:**  
 We work as an extension of your survey team to help assess the quality of your data and ensure consistency between datasets.
- Whatever you need, 24/7:**  
 No matter the time of day, you can talk to one of our GIS specialists. From troubleshooting to targeted advice, we're here to get you the answers you need.
- Data catered to your worksite, wherever you are:**  
 It doesn't matter if you're local, global, or somewhere in between. We'll make sure you get the data you need.
- Our innovations never stop:**  
 Our innovative spirit is the core of who we are, so we'll never stop working to find the best ways to move your work forward. We're constantly researching and adapting our tools to bring you even more value.

# How Propeller survey processing works

 You work smarter to

01

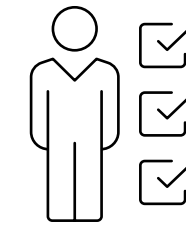
Upload your images, ground control, checkpoints, and GPS files into Propeller. Just drag and drop your survey data, and we'll do the rest.

02

Select terrain filters to filter out equipment, vegetation, structures, or everything outside of the "bare earth" model.

03

Decide how strict or lenient you want our QA process to be. (The stricter the QA, the more effort we go through to troubleshoot issues, which takes more processing time.)



We work harder to

## Create the 3D model

We'll align your images and digitally stitch them together to create a 3D point cloud model.

## Complete the georeferencing

We tie your 3D model down to your site's ground control points.

## Validate the data

After producing the 3D point cloud, we'll validate it to ensure ultimate accuracy.

## Create the site's orthophoto

We generate surface and elevation models to create the site's orthophoto, an aerial image that's been geometrically corrected.

## Check the model's accuracy

Our GIS specialists validate the site model and surface accuracy.



Less than 24 hours after data upload, we'll notify you that your dataset is ready to explore. You'll receive a realistic 3D map of your worksite without any headache.



“That’s when I discovered  
how a picture could speak  
a thousand words”

Alex Wong,  
Senior Digital Engineer, McConnel Dowell

# 3D model

They say a picture's worth 1000 words . . .

. . . And most of the time, they're only talking in two dimensions.

Smart surveys are 3D site maps that provide the most efficient and effective way to communicate and make decisions about your worksite.

These hyper-realistic 3D models of your site are the culmination of all the data you collect during a drone flight. They combine realistic visuals with accurate positional data to provide an immersive tool for mapping, measuring, and managing sitework.

- **Interactive reality:**

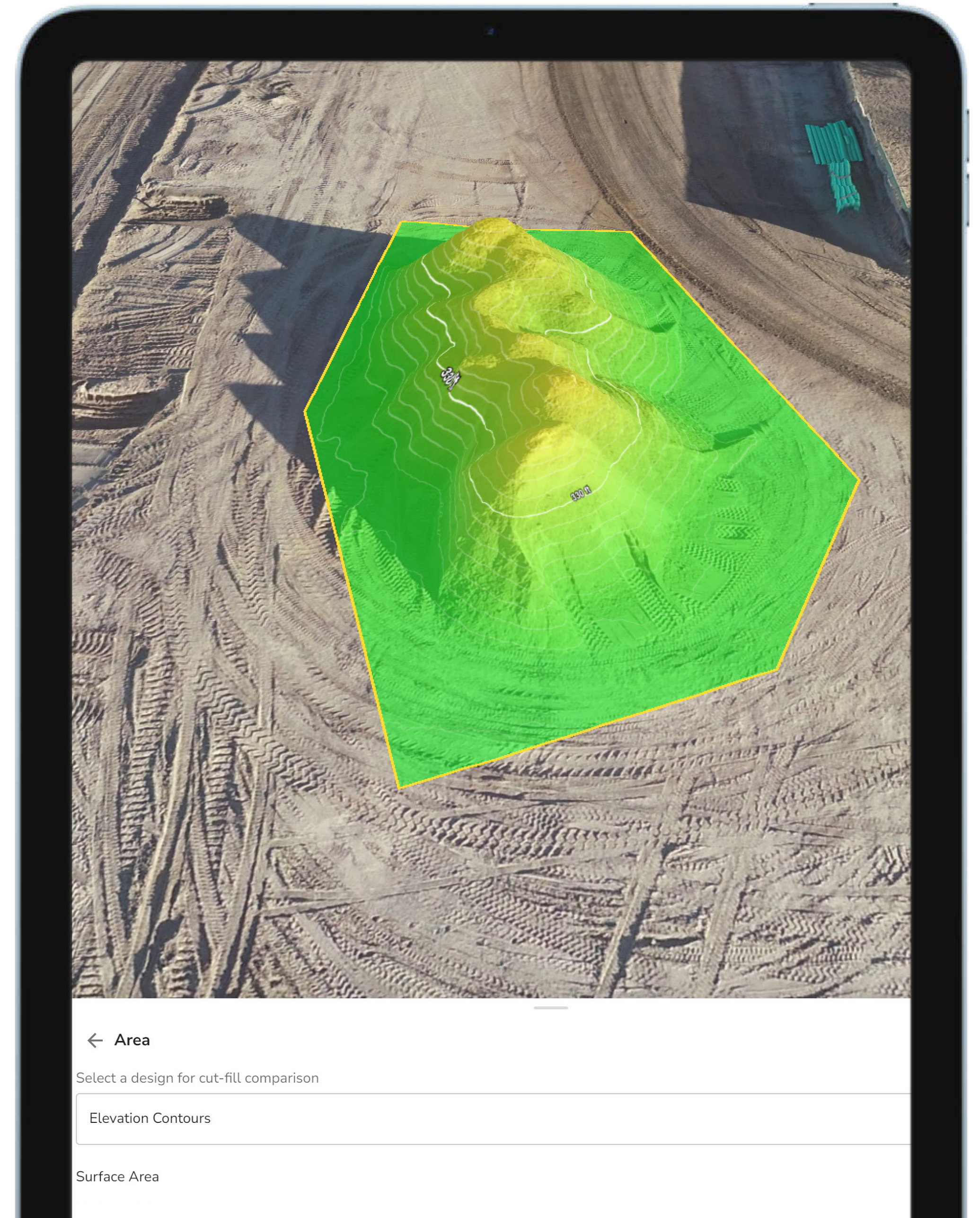
Point and click to take distance measurements, calculate cut/fill, and track site progress

- **Universal understanding:**

Propeller's realistic maps are easily understood by your whole team—no specialized training necessary

- **Easily shareable:**

Grant access to anyone who's collaborating on your project, wherever they are



# The many layers of the map

From the ground up.

## Orthophoto



An orthophoto is a two-dimensional aerial image of the surveyed area that contains horizontal geospatial data.

## Survey metadata



Ground control points, survey boundaries, and camera positions for an extra layer of validation.

## Point cloud



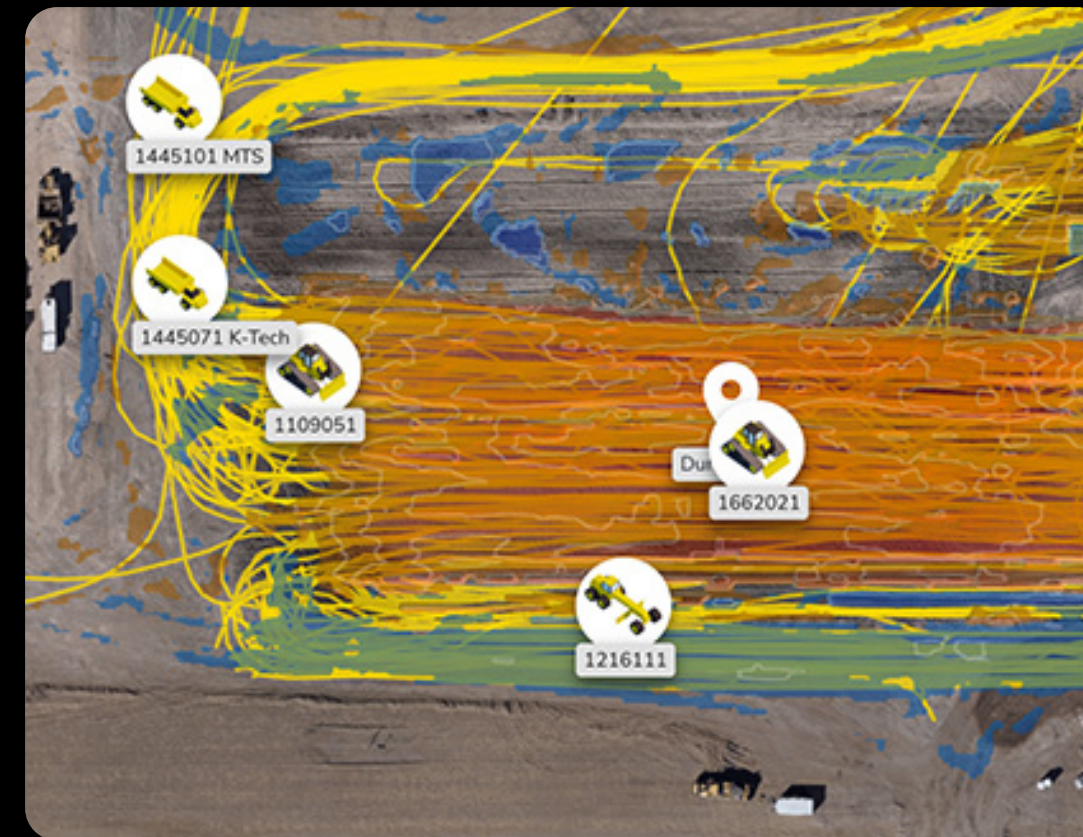
Think of point clouds as the georeferenced wireframes for 3D survey models.

## Terrain



Digital elevation models (DEM) are visual representations of elevation data for every point captured on your site.

## Machine data



We're talking idle times, load counts, and machine routes, all visible on the map for daily productivity and production tracking (but we'll get into that later on).

## Media

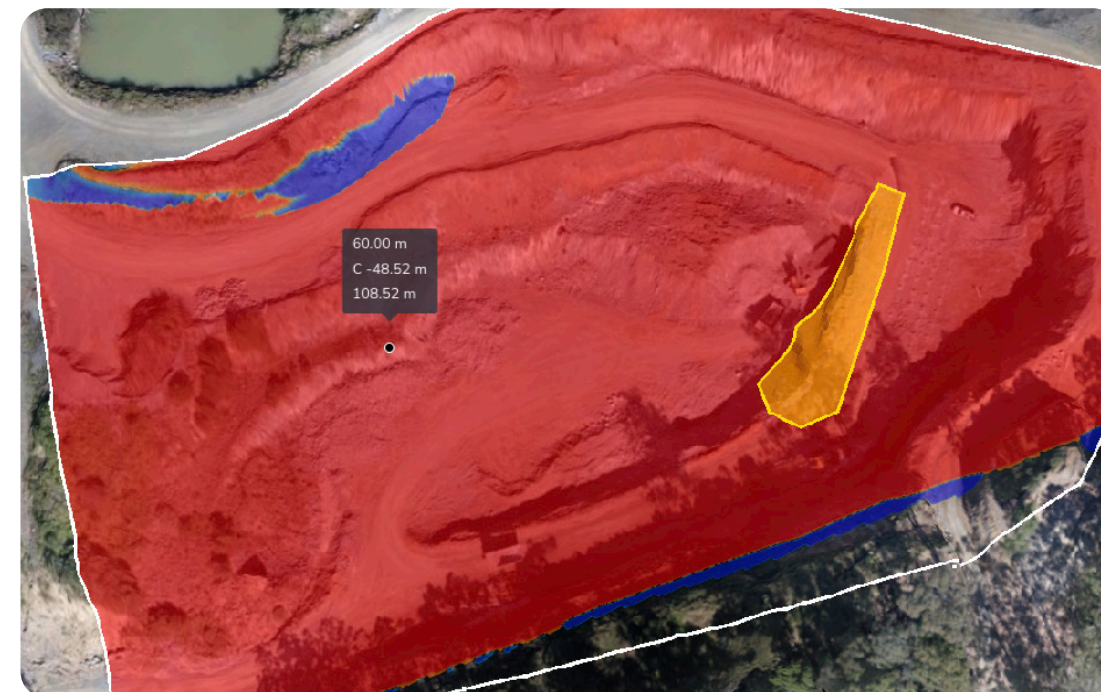
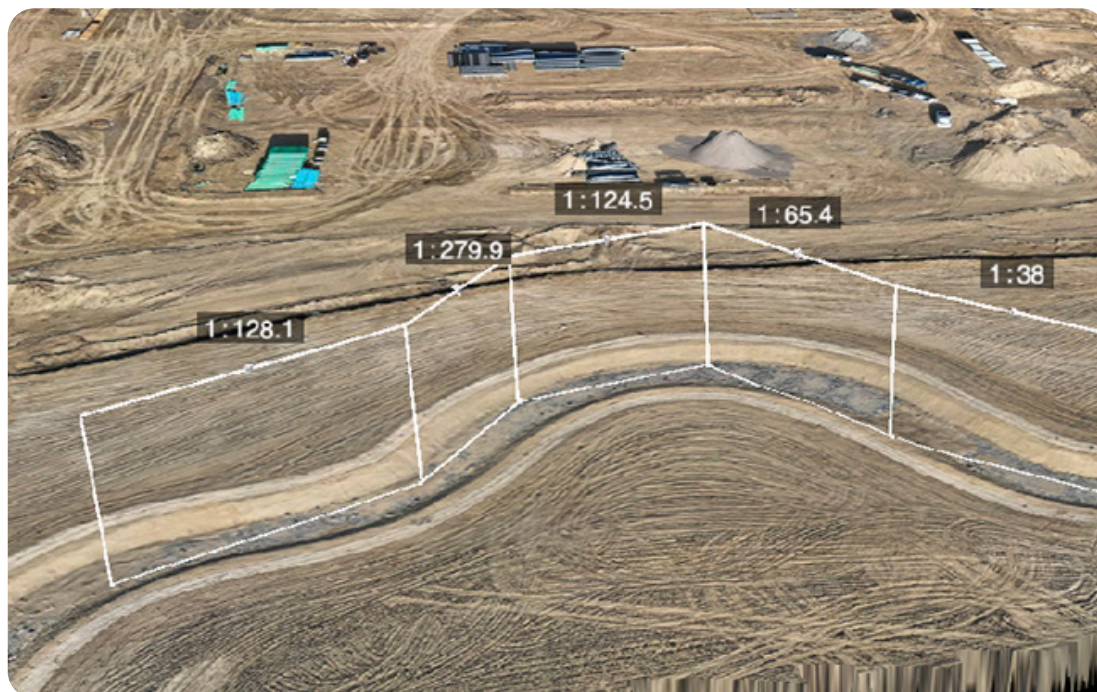
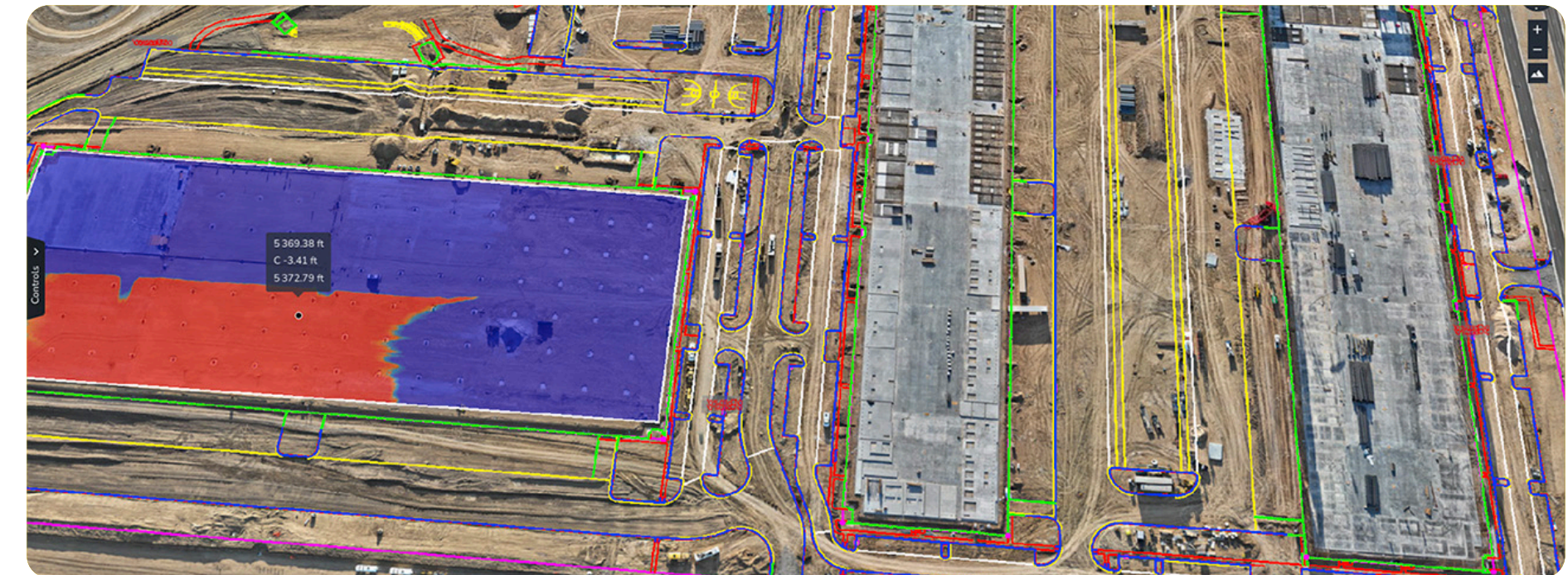
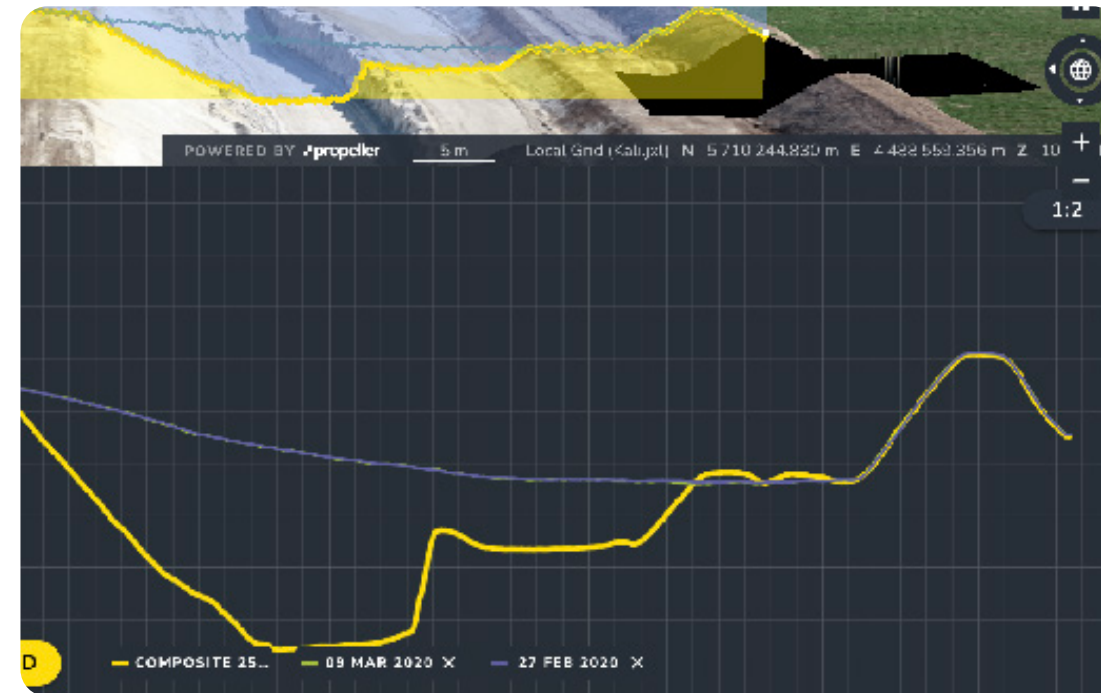
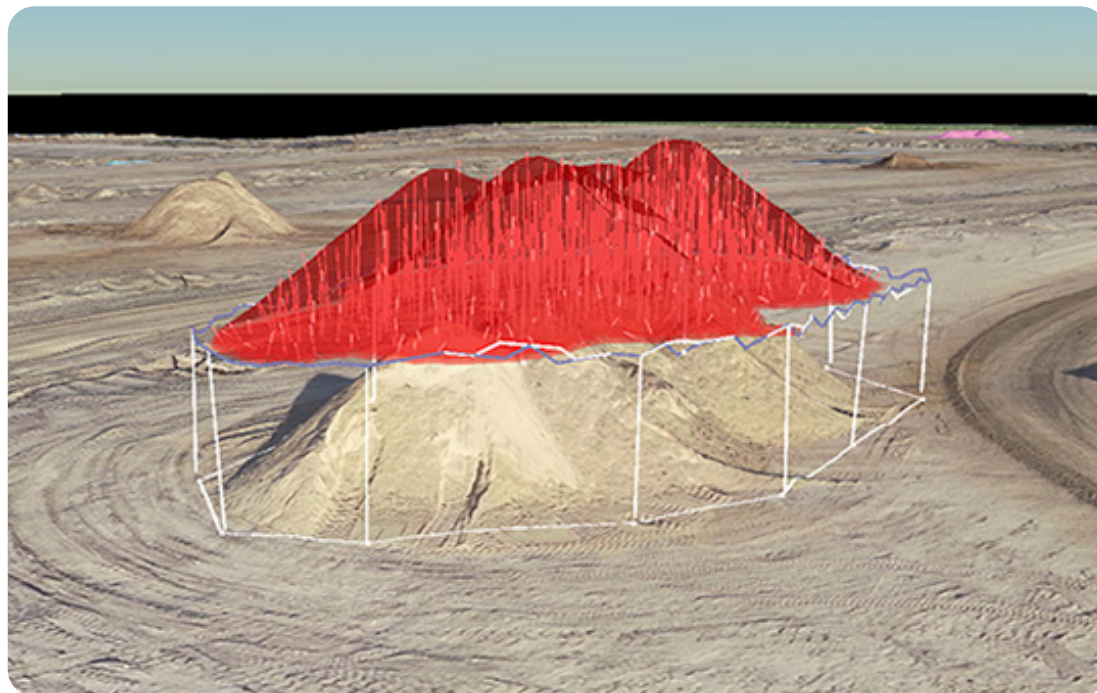


Progress photos and updates that have been pinned to various locations on the map, capturing reality in real-time.

# Data analytics

You've got your map. Now, you can measure and manage your site like never before. Get quick earthwork volumes for roads, stockpiles, and drainage channels, all in just a few clicks. For added analysis, compare two surveys against designs or final grade.

- You can make calculations and check quantities on the go.  
Volumes | Surface area | Elevation | Slope angles | Cross sections



- You can clamp designs and linework over your survey data.

- You can layer multiple surveys to visualize progress over time.
- And, you can even layer two designs.

# Your measurement toolbox

MEASUREMENT	DESCRIPTION	SURVEY	SURVEY-TO-SURVEY	SURVEY-TO-DESIGN	DESIGN-TO-DESIGN
<b>Volume + stockpiles</b>	Measure the volume of material in any given area on the map.	✓	✓	✓	✓
<b>Cross-section</b>	View a cross-section along a specified line.	✓	✓	✓	✓
<b>Elevation</b>	Calculate the height on a specific point on the map.	✓	✓	✓	✓
<b>Surface area</b>	Create a polygon on any area of the map to measure surface area.	✓			
<b>Cut-fill</b>	Generate excavation and backfill maps.		✓	✓	✓
<b>Slope angle</b>	Draw a line along any slope to calculate the slope angle in degrees, as a percentage, or a ratio.	✓			
<b>Distance</b>	Draw a line between two or more points and measure the total surface length, point-to-point distance, and horizontal distance.	✓			

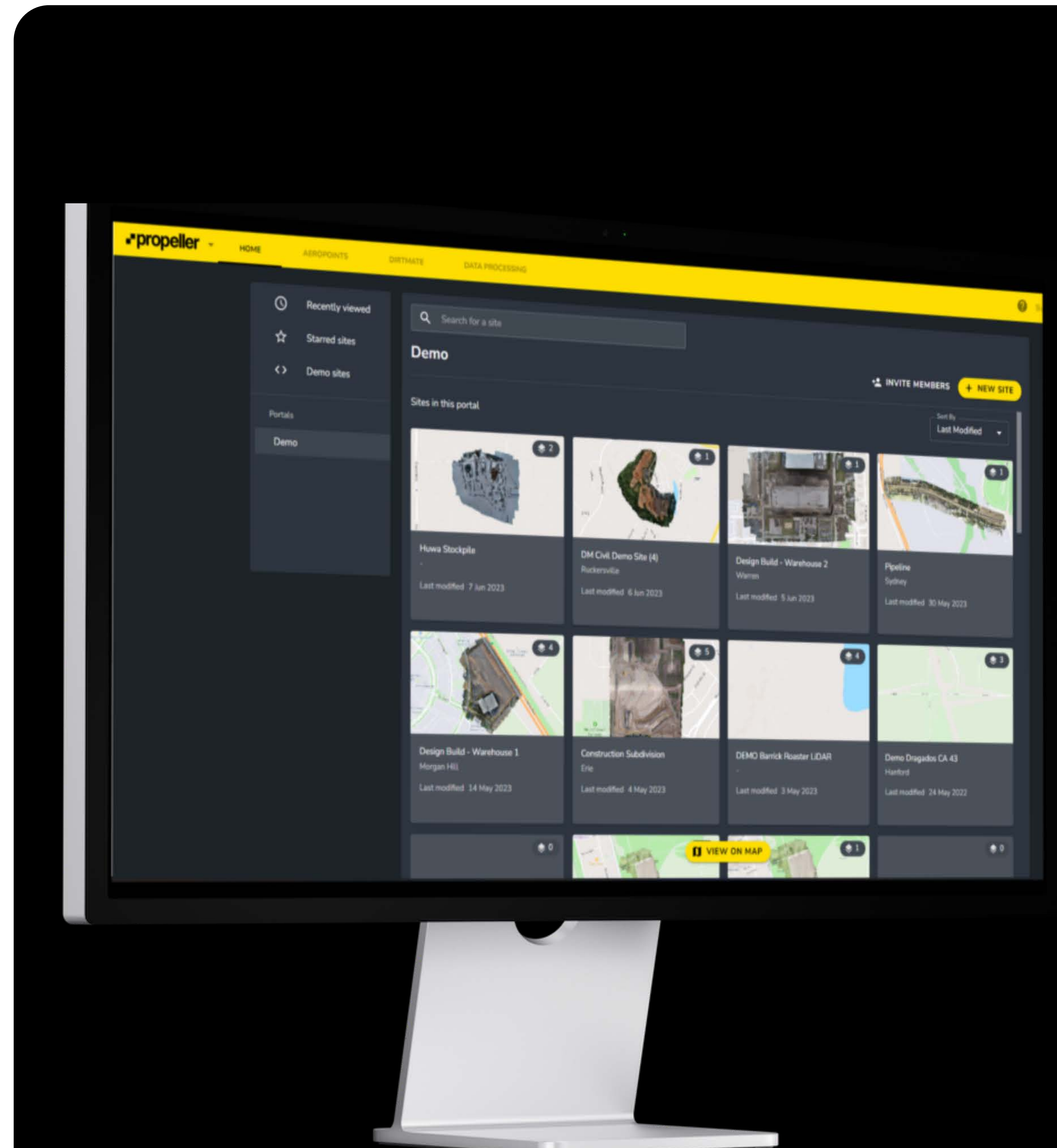
# Data management

Everything you need in one place.

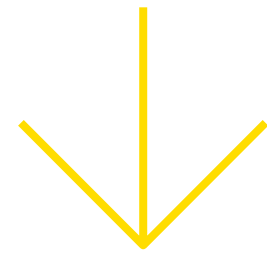
Smart surveys can also be used as a database for survey data, designs, communications, and media.

Users can exchange in-app messages and tag each other in photos to alert other team members to a particular site feature, point of interest, or safety hazard.

Managing data can be cumbersome and complex when you're exporting and importing between different systems. Smart survey solutions play nice with other tools to make sure you're working smarter, not harder when accessing the insights you need.



# Imports



## Survey

- Geotagged JPEGs
- AeroPoints
- GCPs

## Pre-processed

- GEOTIFF

## Point cloud

- LAS/LAZ

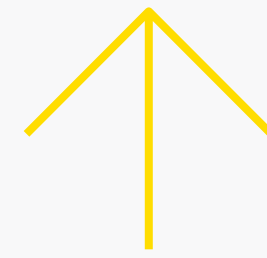
## Media

- 360 photos
- JPEG

## Designs

- GEOTIFF
- TTM
- DXF
- KML
- KMZ
- Land XML
- CZML
- IFC

# Exports



## 3D model

- DXF

## Orthophoto

- GEOTIFF
- JIFF
- JPEG

## Point cloud

- LAZ

## Shapefile

- CZML

## Survey boundary

- GEOJSON

## Terrain

- GEOTIFF
- DXF
- TTM

## Contours

- DXF

## Measurement outlines

- DXF
- KML

## Media

- 360 photos
- JPEG

# Communication + collaboration

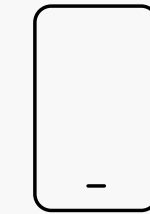
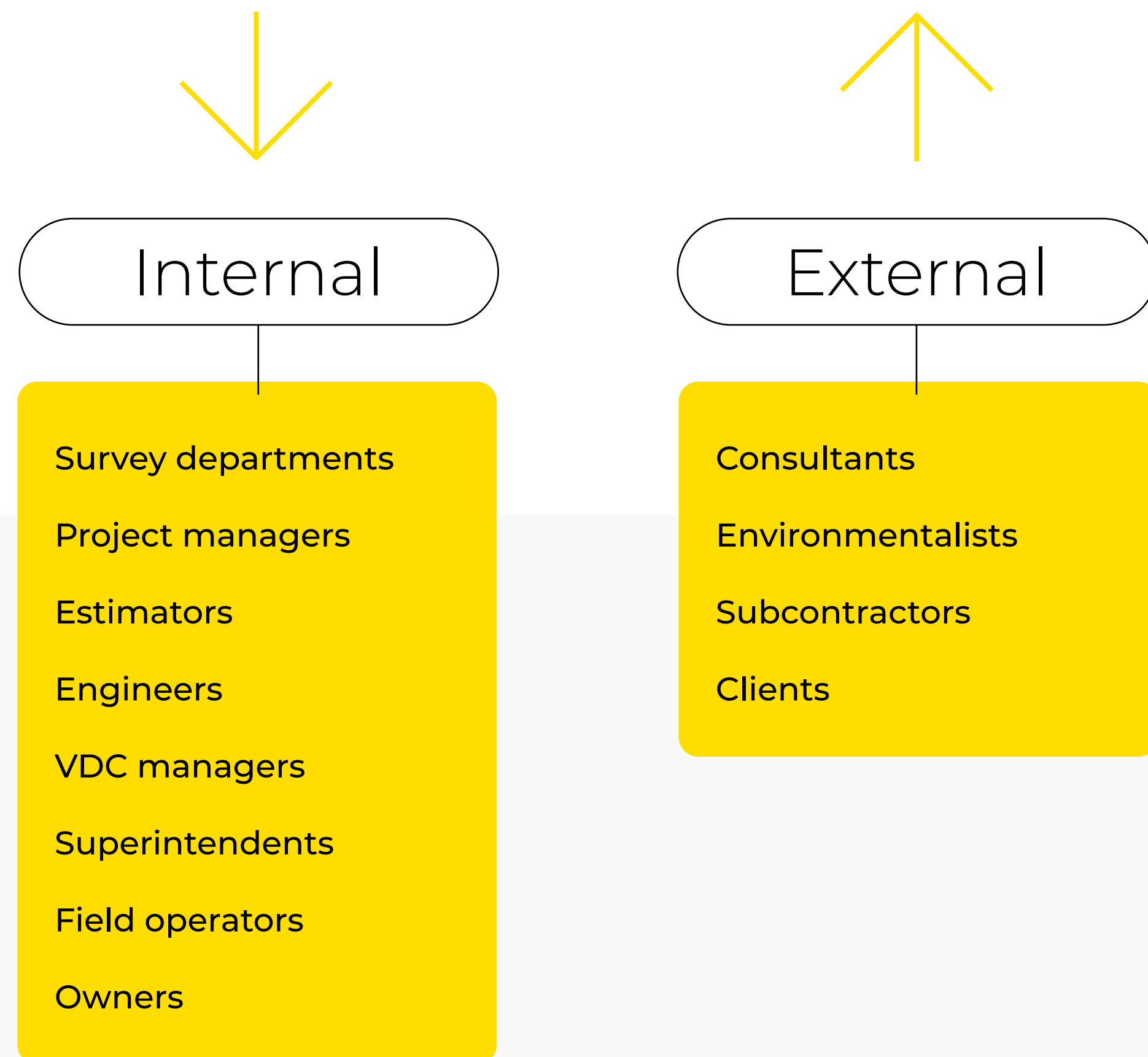
## High on energy but short on time?

With so much to do, you need technology that delivers the data you need to understand what's been done, what's left to do, and what to tackle next.

Smart surveys are the meeting ground where internal and external stakeholders can join forces to do just that.

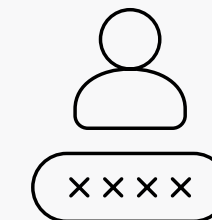


# Who benefits from smart survey data?



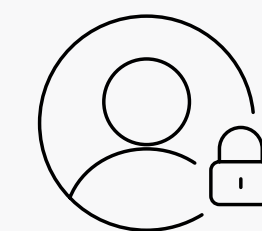
## Anywhere, any device

Access Propeller from any device and download the mobile app to take maps into the field. Smart surveys put your worksite in your pocket.



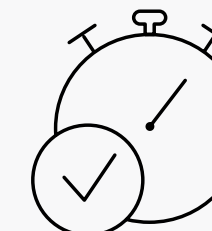
## Monitor usage

Keep tabs on changes, users, and log-ins.



## Control access

Share your data with whoever should see it. Administrators can [manage user permissions](#), both individually and through teams.



## Communicate in real-time

Share progress photos from the field and exchange messages on the map using any device.

# Production + project tracking

Replace finger-pointing with facts using a complete visual record of site activity, from takeoff to closeout.

With more regular progress and productivity and progress tracking, you can spot problems before they become expensive. Think of it as the difference between planning ahead and simply reacting.

## ■ Don't guess, know.

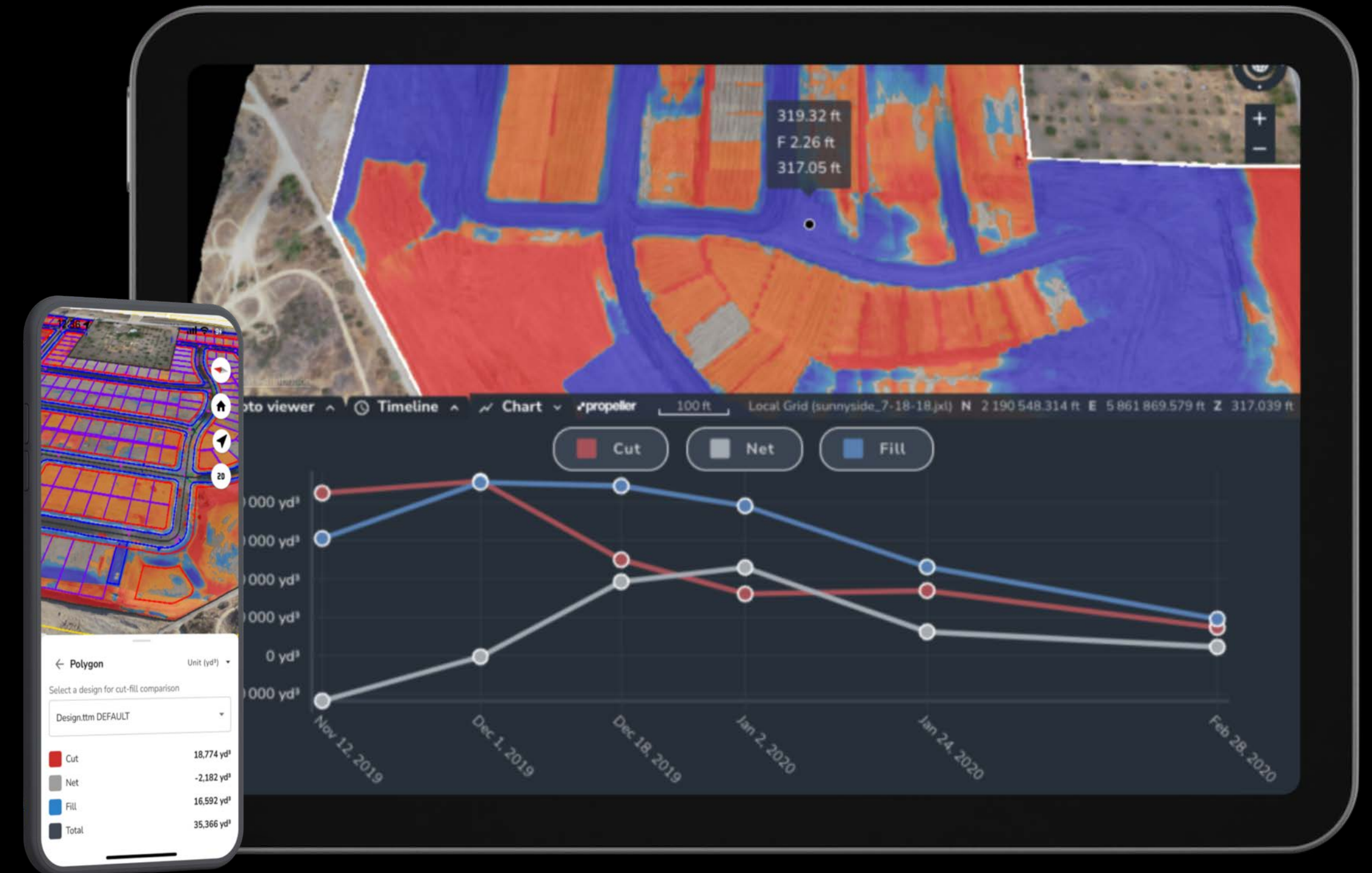
Use a combination of machine telematics, frequent site surveys, and surface comparisons to know exactly where your team's at day to day.

## ■ Resolve disputes

Disputes over what work was completed by which dates disappear with hard data to establish proof of work.

## ■ Safety is the best policy.

Use remote inspections to monitor site conditions, spot safety hazards proactively, and keep human-to-machine interactions low.



“Sometimes you find yourself in a finger-pointing match. “Hey, you’re behind!” “No, you’re behind!”. Propeller takes all of that away. We have a picture of the site from two days ago to prove we’re not behind.

Since that caught hold, we haven’t been thrown under the bus in a very long time.”

**Rory Hall, Operations Manager, Grade Tech**



[READ GRADE TECH'S STORY →](#)



**GRADE TECH**  
POWER SERVICES

# Daily productivity data

There's no disputing that drone surveys are bringing faster, accurate data to the masses, but odds are you aren't flying your site daily.

There are machine-mounted smart survey solutions that help fill in the blanks between drone flights with daily productivity and production data. Because they live on machines rather than in the sky, these sensors provide machine utilization data, as well.

## ■ Manage your production

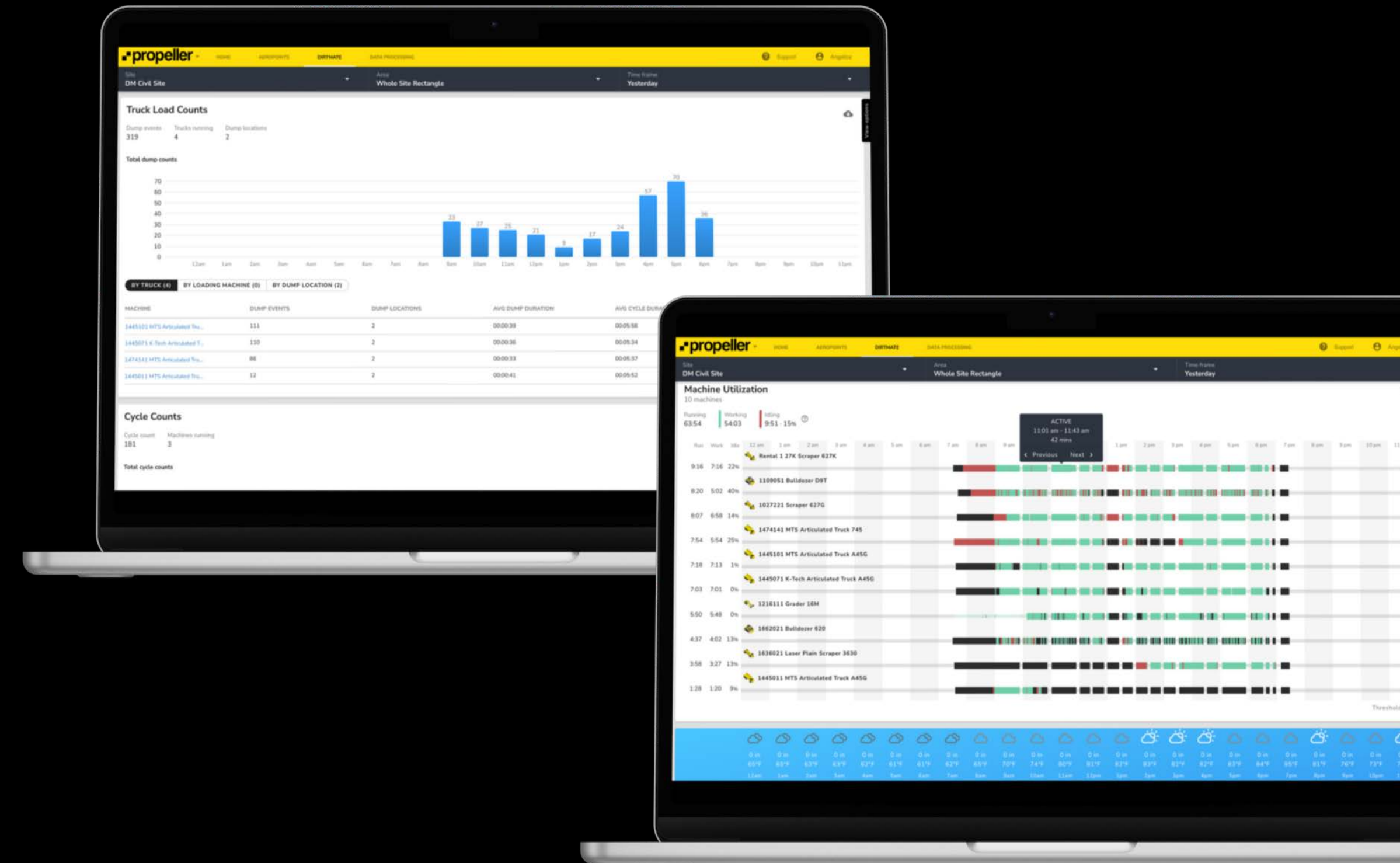
Track load counts, cycle times, and daily values from one centralized dashboard.

## ■ Map what you move

Record survey-grade elevations for daily progress tracking.

## ■ Keep on-track

See how your fleet's tracking with a holistic overview of the paths they took, how long they idled for, and what they accomplished.



## Meet, DirtMate

DirtMate is a telematics system for heavy machinery that filters GPS and IMU data to the map.

[LEARN MORE →](#)



“Since we started using Propeller for drone data and DirtMate for production tracking, we have improved our day-to-day decision-making based on accurate, real-time data. Our supervisors can take a deeper dive into workflows, haul paths, and cumulative quantities claimed on a daily basis.”

**Esco Construction**



# Scheduling + cost control

Use Propeller to keep your projects on track and on budget.

- **Manage your time and money.**

Keep close tabs on time, materials, your team's time management, and see what's billable.

- **Teamwork makes the site work.**

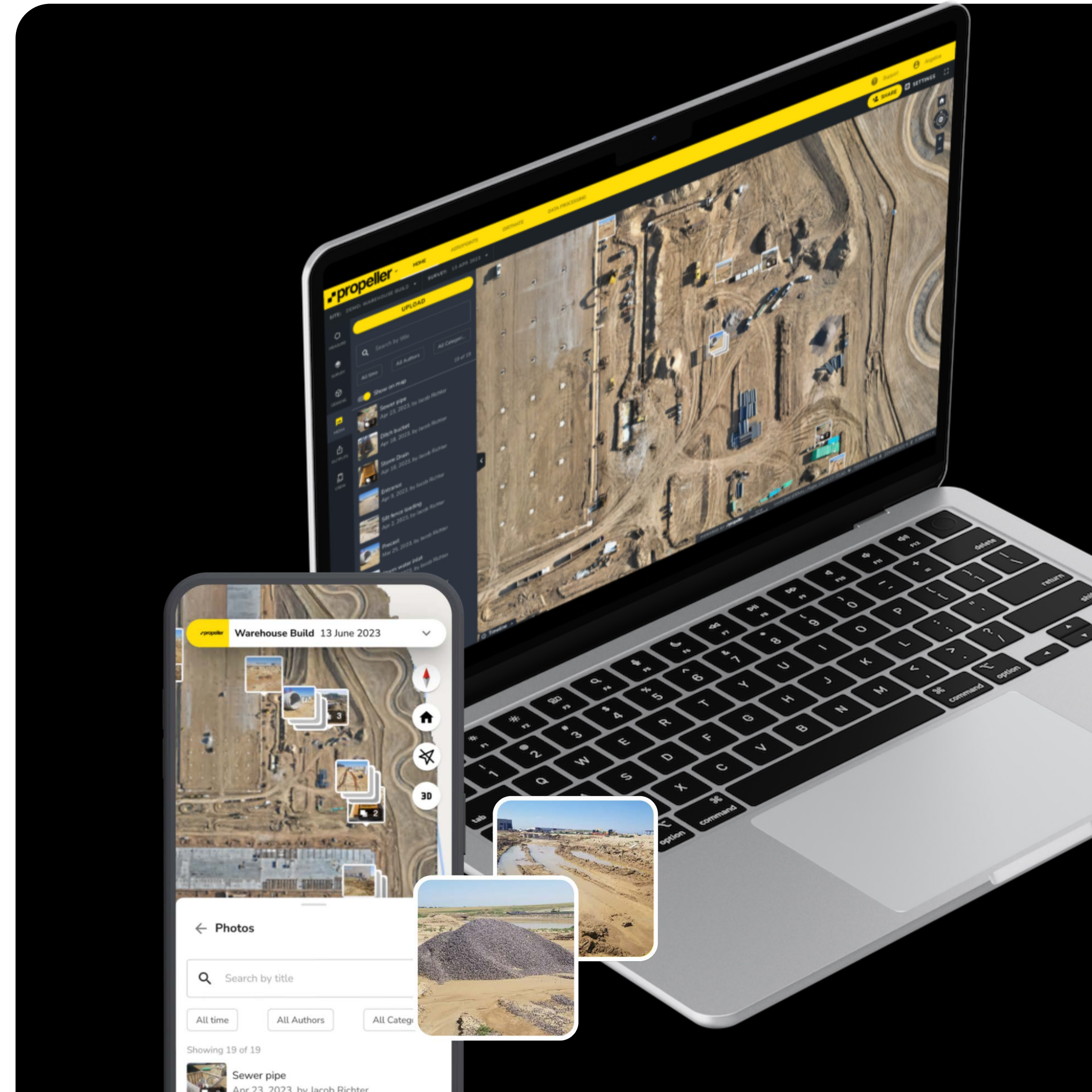
The map is universally understood, making it the ideal workspace for collaboration. Empower your field team and keep the office informed.

- **Coordinate with subcontractors**

Keep sites running efficiently with a complete picture of which teams are working where and when.

- **Avoid environmental fines**

Mark off protected areas on your site and share them with your team. This gets everyone on the same page easily and highlights exactly where they need to be cautious.



One map,  
one team

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Section 04



# Mind the map

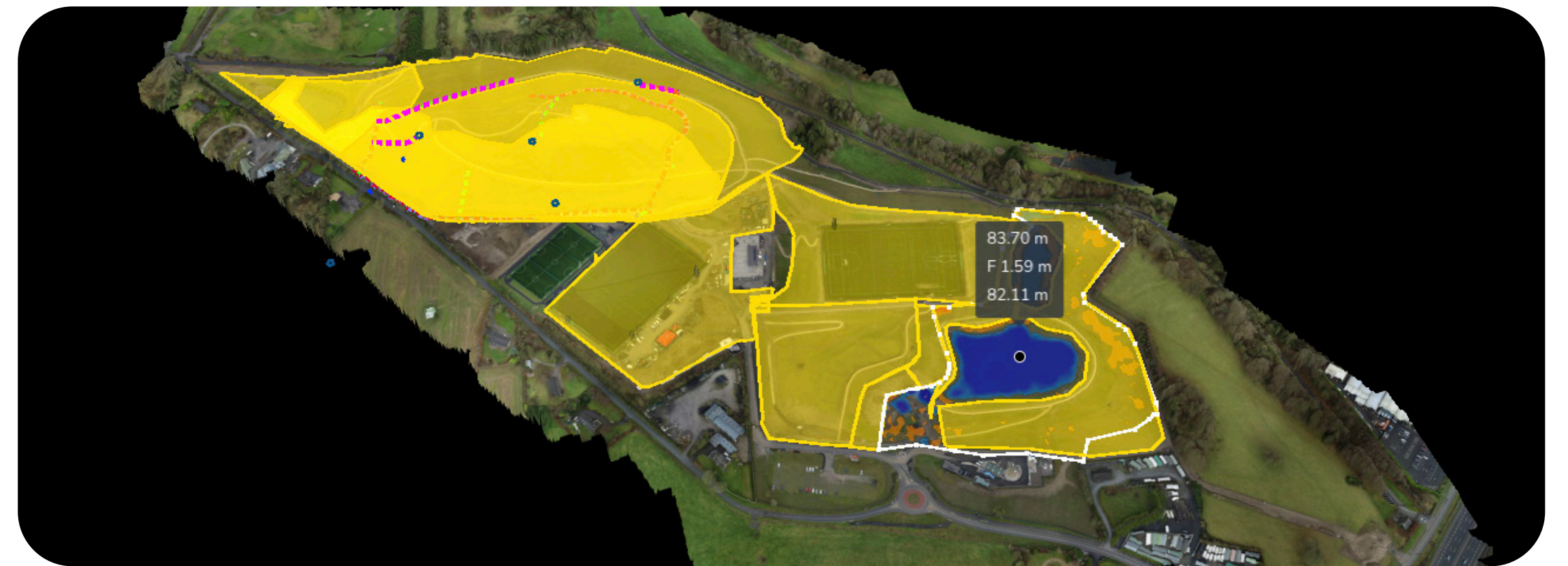
With smart surveys, all roads lead to the map—it's where collaboration happens.

By bringing survey-grade accuracy to site mapping, you can empower your team to use the map as a digital meeting ground where they can measure and manage site activity on their own.

When the people doing the job, the people managing the job, and the people paying for the job have a shared understanding of what needs to happen and when productivity and team synergy reach a natural peak.

Greater alignment means fewer mistakes, happier clients, higher margins, and a heightened competitive advantage.

**A win for you, your team, and your clients.**



# About Propeller


Since 2014, Propeller has revolutionized the way construction sites, quarries, mines, and landfills work, from the ground up.

We've grown from a Sydney-based start-up to a widely-respected global business. Today, we're proud to power more than 80,000 users across 40,000 worksites in over 120 countries.

We work single-mindedly toward one goal:  
**Empowering our users with survey solutions that are simpler, faster, and smarter.**

**James Donaldson**  
Property insights for smarter planning, building and effici...

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We have used [Propeller Aero](#) almost from the start of their company in Australia. Their products such as AeroPoints and the software itself are ...see more

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**Scale up Your Earthworks Business with Technology**  
propelleraero.com · 3 min read

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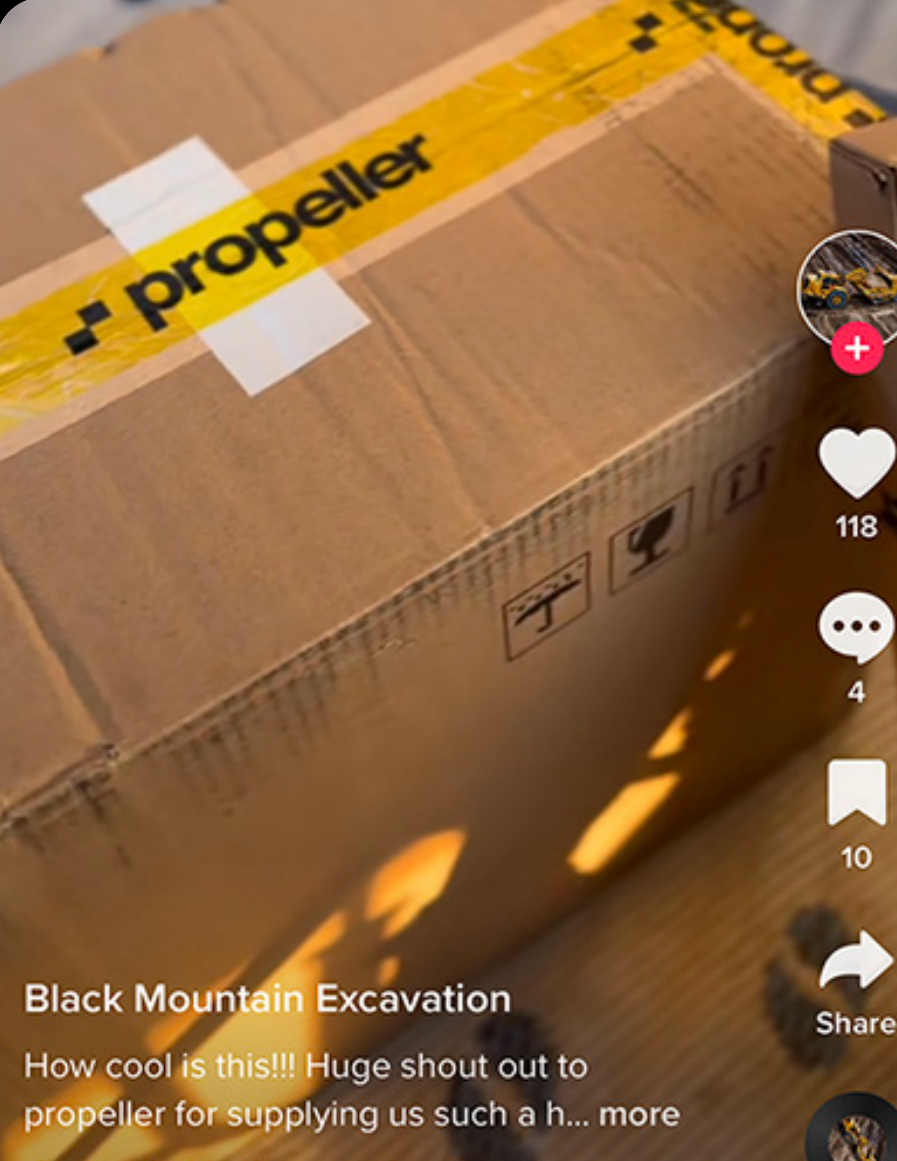
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How cool is this!!! Huge shout out to propeller for supplying us such a h... more

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**Terry Henry**  
Field Engineer Guru (FE5)

Doing great things here at the Austin [#thebeckgroup](#) office. Implementing Propeller Aero with the DJI Mavic 3E for site progression and design checks. This combo has been an amazing tool so far! [#propeller](#) [#DJI](#)



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7 MIN READ

We need you to come back to the site. There's been some flooding.

No general contractor wants to find a message like that in their inbox half a decade after wrapping up a construction project. But a representative from Magnolia Montessori was indeed coming back to [Rogers-O'Brien \(RO\)](#). They were concerned because water was ponding at the entrances to buildings, and in some cases, infiltrating inside.



**Drones have transformed from gee-whiz technology into an essential construction tool.**

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