

DroneDeploy

An Aerial View of Your Jobsite

Leveraging Drone Maps and 3D Models in the Construction Industry

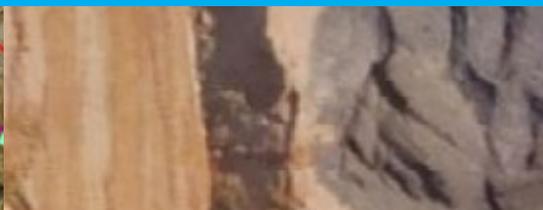


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01 Introduction: Build Instant ROI with Jobsite-Ready Maps and Models

By now, there's no denying it: drones have made their way into the construction industry, and they are here to stay. Today's drones pack a big punch, helping project managers, superintendents, field engineers, and VDC teams build instant ROI with jobsite-ready maps and models. Time and again, drones save money, reduce downtime, and improve safety on construction projects.

But if you are like many construction professionals, you probably have a few questions about implementing drones on your own jobsite. Sure, you've heard all the hype, but are they really worth the effort? Exactly what types of results will drones deliver? And most importantly, are they safe?

In this eBook, we explore how construction teams use drones to generate collaborative maps and 3D models, leverage data from high-resolution point clouds, and even create accurate contour maps. We also give examples of how industry leaders like Brasfield & Gorrie, Choate Construction, and McCarthy Building Companies handle safety, implementation, and scale in their drone programs.

Drones are quickly becoming a must-have tool on any jobsite. Whether your team already has a drone, or you're just beginning to consider the idea, we're confident you'll come away with a better understanding of how drones can help you streamline and improve your daily workflows, save time, and create more informed, collaborative teams.

Let's get started.



02 An Aerial View of Your Jobsite: Monitor, Measure, and Communicate with Drones

Keeping tabs on the complex, moving parts of a construction project is no small task. The good news is, by spending less than an hour each week mapping your jobsite, you'll gain an entire toolkit to help you and your team work more efficiently, make more informed decisions, and communicate with ease.

Drone maps and models not only provide an aerial view of your entire project, but each map includes a rich set of data that can be used to further measure and analyze just about anything on a site.

Monitor: Project Monitoring and Site Inspection

Gain a New Perspective

Many companies choose to conduct mapping flights of the jobsite each week. This regular, overhead view is invaluable when it comes to tracking progress and inspecting for safety issues.

As Matthew Forster, Project Engineer for Choate Construction, points out, an aerial view gives his team a different perspective, helping them catch issues they might not notice at ground level.

Pro Tip: Create Weekly Drone Maps

Choate Construction creates weekly drone maps on all large projects, including this 557,000 square-foot manufacturing plant.



"Drone maps give my team a bird's eye view of the site, which looks a lot different than being on the ground. It gives them a full picture."

Matthew Forster, Project Engineer for Choate Construction

[Read the Case Study](#)



Fig. Choate Construction made weekly maps to keep their project on track.

Monitor More Efficiently

Although nothing replaces boots on the ground, weekly drone maps can significantly reduce the amount of time you spend walking an entire site for the purposes of inspection and monitoring. If an issue stands out on the drone map, and warrants closer inspection, DroneDeploy's built-in annotation tools allow you to mark the exact location of the issue and make shareable notes for efficient follow up.

Regular mapping flights have the added bonus of creating a complete, visual record of a site's progress, which many project managers and site engineers find invaluable when it comes to exploring trends over time.

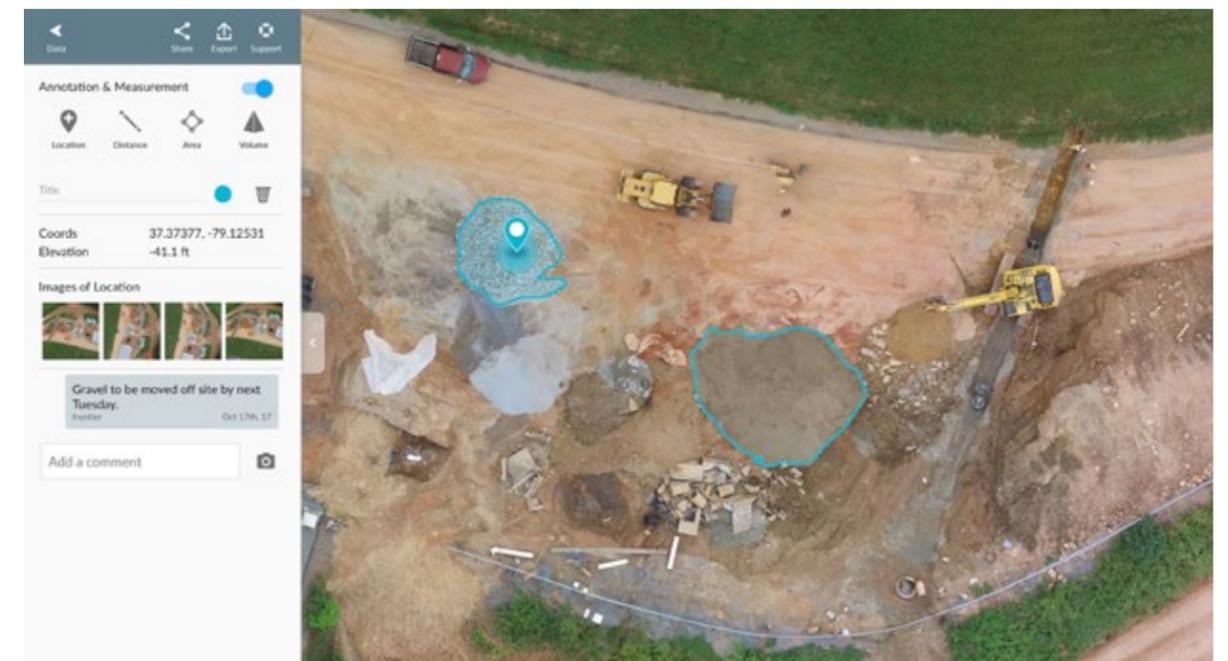


Fig. Use DroneDeploy's built-in annotation tools to mark locations and make shareable notes for efficient follow up.

Catch Conflicts Sooner

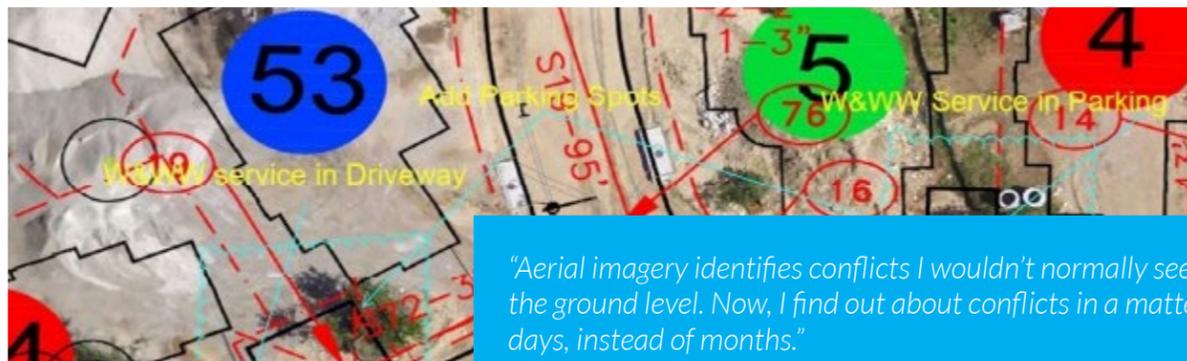
For more advanced oversight, you can import and overlay site plans right in the DroneDeploy interface, or export your maps into industry software like BIM, GIS and CAD. You can easily export your data in the format you need, including TIFF, KML, SHP, DXF, LAS, OBJ and XYZ, or use open APIs to sync your data with everyday tools.

Contract Project Manager Nick Johnson of Tilt Rock of Texas does this to help him manage large, custom home projects. Homeowners make frequent changes to house footprints, models, and orientation, so Nick overlays drone maps with utility, wastewater, and communications plans to help him catch conflicts with services before they actually happen and redirect them at minimal cost.



Fig. Export data in the format you need.

Pro Tip: Overlay Site Plans with Drone Maps



"Aerial imagery identifies conflicts I wouldn't normally see from the ground level. Now, I find out about conflicts in a matter of days, instead of months."

PM Nick Johnson, Tilt Rock of Texas

[Read the Case Study](#)

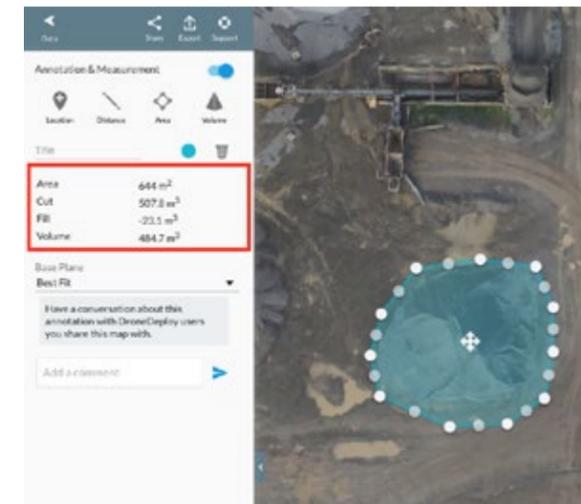
Every location on a drone map is geotagged, so you can take basic measurements almost instantly, from any device. Many teams use standard drone maps, combined with DroneDeploy's built-in tools, to take basic area and volume measurements and estimate stockpiles for on-the-go decision making.

For situations that require centimeter-level accuracy, ground control points can be added to a map. These marked targets help mapping software accurately position your map in relation to the real world and afford the accuracy needed to make precise volumetric and linear measurements.

Make On-the-Ground Decisions Quickly

Measurement tools can be used to help your team make more informed decisions about a whole host of everyday site issues. The staff at McCarthy Building Companies uses DroneDeploy to assess everything from the volume of a topsoil stockpile, to the width of a road for truck clearance. As Field Services Manager Ryan Moret puts it, "For what we're doing on a commercial site, the measurement tools are killer."

Pro Tip: Use DroneDeploy's Built-In Measurement Tools



"I can tell how many square feet of roof we've put down, how much square footage of concrete is left to pour. If we're trying to figure out truck access, we can measure the width of a road or gate or how much room we need to clear out for material to make the site clean and organized."

Ryan Moret, Field Solutions Manager, McCarthy Building Companies

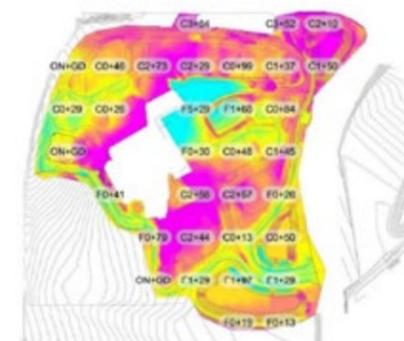
[Read the Case Study](#)



Reduce Downtime by Monitoring Contracted Work in Real Time

Many construction professionals also use drone-generated measurements to review the work of site contractors. With quick access to this type of information, a site manager can easily hold a contractor accountable, and save downtime by requesting changes to work before the contractor leaves the jobsite.

Pro Tip: Use Drone Data to Verify Earthwork Before a Contractor Leaves the Jobsite



During work on a 61-acre hospital construction site, the VDC team at Brasfield & Gorrie used drone-generated elevation data to monitor the site grade on contracted earthwork, saving days compared to on-the-ground data collection methods.

[Read the Case Study](#)



Communicate: Share Insights, Align Teams and Inform Stakeholders

Drones make collaboration and information sharing, both internally and externally, easier than ever before. DroneDeploy's platform is cloud based, so it's easy to share annotated and analyzed maps between team members, or keep external stakeholders up-to-speed on the progress of a project.

In contractor meetings, having a clear display of any current site issues is a powerful communication tool. Likewise, having an up-to-date drone map helps distribute information efficiently, even among large teams. Streamline the decision-making process by referencing a drone map any time changes need to be made to a project.

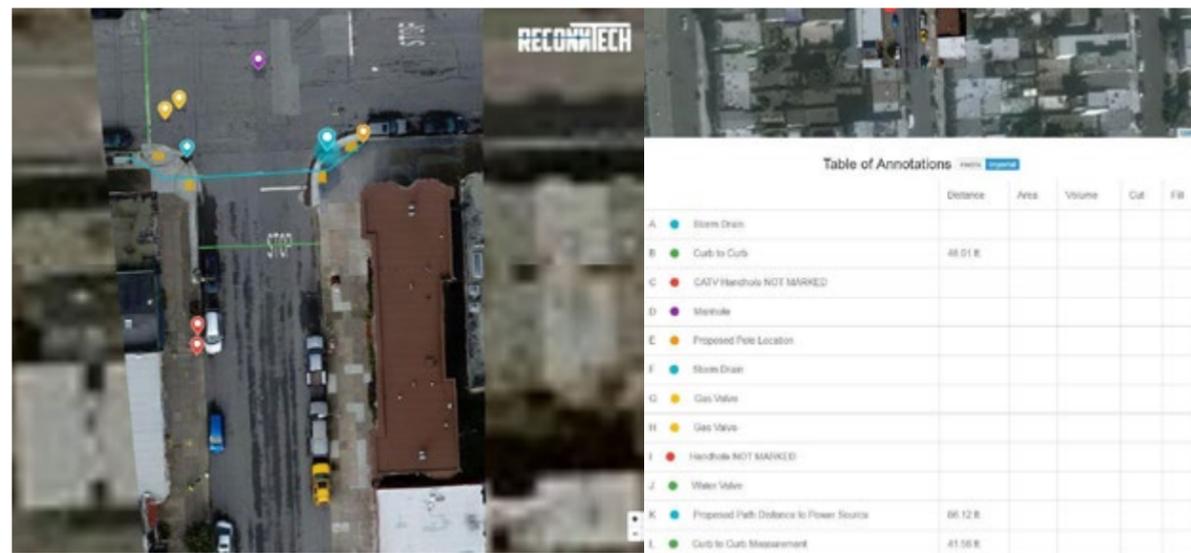
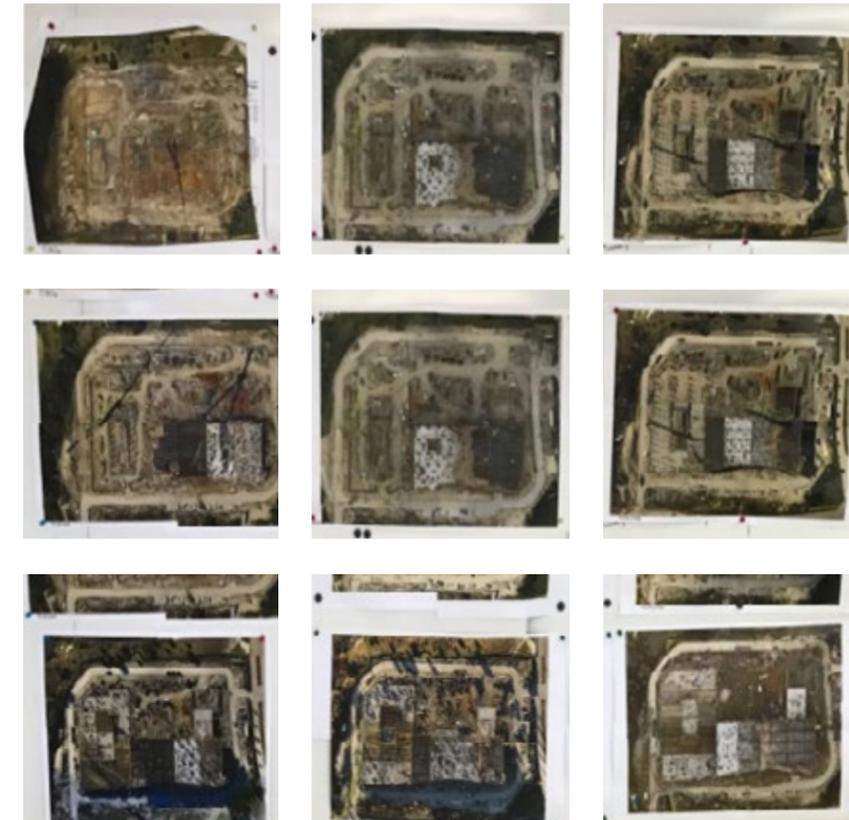


Fig. Orthomosaic drone map of site (right) and PDF annotation report (left) simplifies communication and reporting from the field.

"If I need a contractor to be aware of a design change before he lays pipe, I simply walk over to him with my tablet, blow up a particular section of overlaid plans and show him exactly what he needs to know. I have it all in a PDF, so I can pencil in the new route of the pipe right there in front of him and then send the information over to the engineers. This cuts out weeks of back and forth and boils it all down to less than an hour."

Nick Johnson, Contract Project Manager, Tilt Rock of Texas



The McCarthy Map Wall

McCarthy Building Companies uses drones in many high-tech ways, but at the end of the day, "paper is still the common denominator for jobsites," says Field Solutions Manager Ryan Moret.

On every McCarthy site, the wall of the job trailer is covered with weekly drone maps posted in sequence, giving anyone who walks into the room a clear picture of the project's progress over time, as well as a snapshot of any current issues on the site.

"The trades love it, being able to walk up to the wall and see nine weeks of construction photos. They pull these up in every sub meeting, every owner meeting. We have data from that week to show contractors, 'Hey, the site's a mess, you guys need to go clean it up.' You can see rebar spread out all over the place, so there's no arguing. They see it for what it's worth."

Ryan Moret, Field Solutions Manager, McCarthy Building Companies

03 The Safety Advantage: Aerial Mapping Workflows to Improve Site Safety

If you are new to the idea of drones on a construction site, your first thought might be: how can flying an unmanned aircraft around heavy machinery be safe? But in reality, when used correctly, they can actually improve the safety of everyday work by reducing the need to put boots on the ground in dangerous areas.

Enhance Safety Inspections and Identify Hazards Early

By using drone maps as part of the regular safety inspection process, site managers are able to identify hazards more efficiently. In many cases, the comprehensive overhead view helps managers spot potential hazards sooner, and take action before a problem becomes larger.

Pro Tip: Use Drone Maps to Inspect Sites More Often and More Thoroughly



Dale Parrish of Hover Visions created a high-resolution drone map each week during construction of an oil storage facility in Cushing, Oklahoma. PMs and site engineers used the maps to monitor earthwork on safety dykes meant to contain spillage in the event of a leak. By reducing the need for PMs to spend hours walking the site, these real-time overviews allowed them to monitor progress more often and more thoroughly.

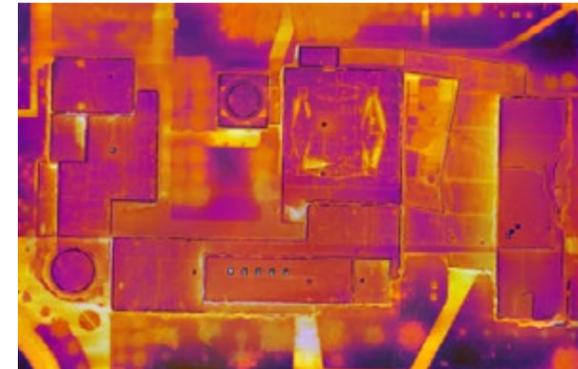
[Read the Case Study](#)



Improve Employee Safety

The Beck Group, a commercial architecture and construction company based in Dallas, collects drone-generated thermal imagery as part of their roof inspection process. By allowing inspectors to perform remote inspections with real-time information, drone mapping reduces the amount of time workers spend in dangerous areas. If an inspector can reduce the time spent on a roof by 3–4 hours, that's 3–4 hours he is on the ground and out of harm's way.

Pro Tip: Drone-Generated Thermal Imagery Reduces Risk During Roof Inspections



"The work input to value output with drone-based thermal imagery is game changing. It's unlike anything else in construction technology right now."

Grant Hagen, VDC Manager at The Beck Group



[Read the Case Study](#)

Improve Client Safety

Keeping external stakeholders informed with drone maps and models not only ensures everyone is on the same page, but it also reduces the frequency of walkthroughs—and the chance of a client being injured while on site.

In this respect, construction giant Brasfield & Gorrie is pushing the envelope by experimenting with the use of virtual reality, in conjunction with DroneDeploy's mapping software, to create immediate, virtual representations of construction sites.

Virtual Reality and Drone Models: The Future of Worksite Safety Inspections



"Our project and safety teams can now complete walkthroughs remotely — increasing safety and awareness without ever having to step on site."

Russell Byrd, Virtual Design + Construction Coordinator at Brasfield & Gorrie



04 A Design Tool for the Future: Use Drone Data to Create Point Clouds and Generate Accurate Contour Maps

Undoubtedly, drones improve daily workflows on any jobsite. But beyond the day-to-day, drone maps and models can be used during all stages of a project, including initial site survey and design. Each DroneDeploy map generates a high-resolution 3D point cloud that is compatible with Building Information Modeling software, making drones a favorite tool for Virtual Design and Construction teams.

Generate Site Surveys in Days, Not Weeks

In a fraction of the time it takes to conduct a ground-based survey, a drone can automatically fly and capture imagery of a project site. Using traditional ground methods, it can 1-2 weeks to collect survey data on a 60-acre jobsite. For most construction sites of this size, it takes less than an hour to fly and capture the same information using a drone.

As we mentioned earlier, by using ground control points, you can achieve centimeter-level accuracy with your drone map. Export the map into AutoCAD software to create accurate contour maps in days, instead of weeks.

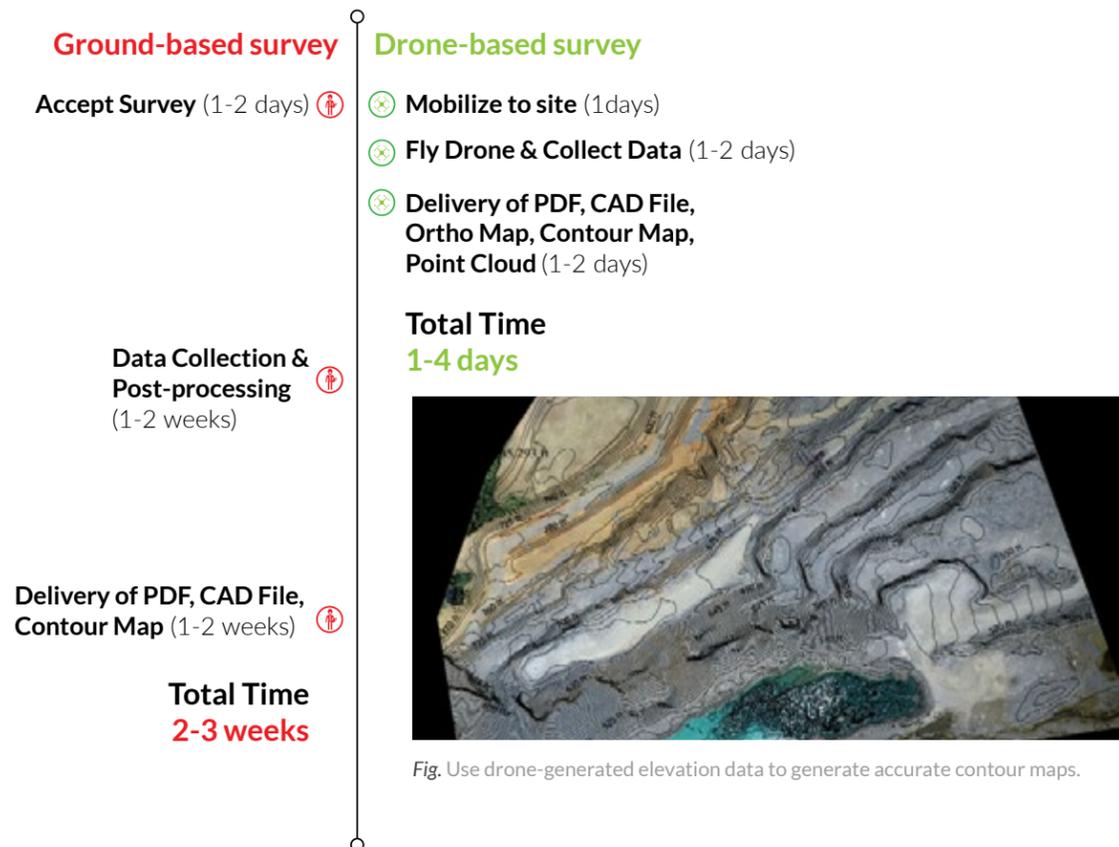


Fig. Use drone-generated elevation data to generate accurate contour maps.



Fig. A point cloud of a hospital construction site by Brasfield & Gorrie.

Create Point Clouds Compatible with BIM Software

Not only are drone-based surveys faster to perform than ground-based surveys, but they also deliver much more detailed data. Where a ground survey yields only a few hundred points of resolution, a drone-generated point cloud contains millions of points. These high-resolution point clouds seamlessly integrated into BIM software, enhancing the work of VDC teams.



The Autodesk App in the DroneDeploy App Market makes it easy to send point clouds directly to your Autodesk Forge account.

The VDC team at Brasfield & Gorrie imports their drone-generated point clouds into Autodesk Revit, where they overlay the data with 3D site plan models to enhance a whole host of processes.

- Enhance initial site survey and design
- Verify earthwork
- Comparing actual construction against plans
- Check on the placement of concrete footings and pipes
- Measure and compare changes over time

"I can overlay a point cloud over that 3D model, line it up exactly and see, for the first time, what's been built versus the design intent."

Hunter Cole, VDC Coordinator at Brasfield & Gorrie



05 Taking it to the Skies: How to Deploy Drones on Your Jobsite

Thorough preparation is key to creating a safe, effective drone program. Now that you have a better idea of what drones can help you achieve on your jobsite, you'll need to think through your plans for implementation.

Get Buy-in From Executives

Of course, the first step to building a drone program is getting the green light from upper management. Depending on the culture of your company, this might be an easy task, or it might require some extra legwork.

Before you present your idea, it's important to outline a clear plan for adoption that details how you'll handle liability and insurance issues, maintain safety, train employees, and scale the program over time. Come prepared with specific examples of how drones can provide immediate value to the company, as well as how they can expand value further down the line.

The [DroneDeploy blog](#) is a great place to gather examples of how other construction companies have found value in drones.



"Putting any new technology into place can be a lot of work, especially when it's something like drones that often have safety concerns, privacy concerns...It was something we had to come at very tactfully."

Ryan Moret, Field Solutions Manager at McCarthy Building Companies



Prove Value with a Proof-of-Concept Program

When it comes to creating buy in at all levels of the company, it's often best to start with an initial proof-of-concept program. At Brasfield & Gorrie, Russ Gibbs and his team took this approach.

"The initial cost of drones is very low. You can get a DJI Phantom 4 at your local Apple store, work with DroneDeploy to test, and you're up and running at a very low entry cost," says Russ. "Because of that, we quickly had enough data to set up a presentation with management and as soon as they saw it, they understood it."

If you want to show proof of concept, but aren't ready to invest in a drone or deal with certifications and training, you can contract a drone service provider to fly your site and generate maps and models.

Our blog post about [contracting out versus building an in-house team](#) gives more insight on this approach.



Meet Federal Compliance to Ensure Your Enterprise is Drone Ready

Part 107 Certification

Anyone who flies a drone commercially must obtain their Part 107 Certification through the FAA. This applies to individual drone operators, not businesses, so any employee who plans to operate a drone on your jobsite must go through their own certification. It's a straightforward process:

1. Take the knowledge test at an [approved center](#).
2. Register as a commercial UAV pilot through the [FAA IACRA system](#)
3. All drones flown commercially must be [registered through the FAA](#). This is done at the company level, not by individual employees.



Your Waiver Application

* What regulation(s) do you want waived?
 Select only the regulation(s) that you need waived to conduct your operation.

- 107.25 Operations from a moving vehicle or aircraft
- 107.29 Daylight operation
- 107.31 Visual line of sight aircraft operation
- 107.33 Visual observer
- 107.35 Operation of multiple small unmanned aircraft
- 107.37(a) Operation near aircraft
- 107.39 Operation over people
- 107.51(a) Operating limitations: ground speed
- 107.51(b) Operating limitations: altitude
- 107.51(c) Operating limitations: minimum visibility
- 107.51(d) Operating limitations: minimum distance from clouds

For each regulation subject to waiver that you checked above, please provide details about how you will meet the waiver safety explanation guidelines.

* Waiver safety explanation:

Fig. Submit FAA waiver applications online.

Educate Yourself about Regulations and Compliance

The FAA prohibits flying drones under certain circumstances, including at night, directly over people, from a moving vehicle, and in controlled airspace. The good news is that it's possible to apply for an airspace waiver to operate drones under special conditions.

Apply for an airspace waiver through the [FAA's website](#).

Spend some time reviewing all of the FAA's regulations on flying commercial drones, which can be found [here](#). Likewise, make sure to research any local and state regulations that apply to your area.

Train Employees and Maintain Safe Flight Practices

Well-trained drone operators are less likely to make mistakes that compromise the safety of a jobsite. It's important to develop a standardized training for all employees that plan to operate drones on site.

[Learn about the innovative employee training and support program McCarthy Building Companies implemented when it introduced drones on its jobsites nationwide.](#)

Many companies bring in outside resources, such as [DARTDrones](#) to help train employees, especially in the early stages of a drone program.



Keep Accurate Logbooks

If you plan to maintain a fleet of drones across multiple jobsites, it's especially important to keep accurate records of all flights, airspace waivers, pilot assignments, and aircraft maintenance. Most companies keep records in a digital logbook.

Several logbook options are available on the [DroneDeploy App Market](#) and can be accessed by all pilots and management staff directly from the DroneDeploy dashboard.



[Airdata UAV Sync](#) - Discover 'under the hood' information and review early signs of problems before you take off again.



[DroneLogbook Mission Uploader](#) - Automatically upload DroneDeploy missions to your DroneLogbook. A flight record is created with location, drone, and battery—based on settings from your inventory.



[NVdrones Sync](#) - Organize your flight data within your respective DroneDeploy projects as well as display detailed telemetry and battery data for each flight.



[Skyward Sync](#) - An innovative drone management platform that helps connect pilot networks, track equipment and manage processes.

Use Pre-Flight Checklists

A few extra minutes of planning will prepare your employees for a safe, successful flight. A jobsite-specific, pre-flight checklist is the best way to achieve this. There are also apps available to aid operations, including:



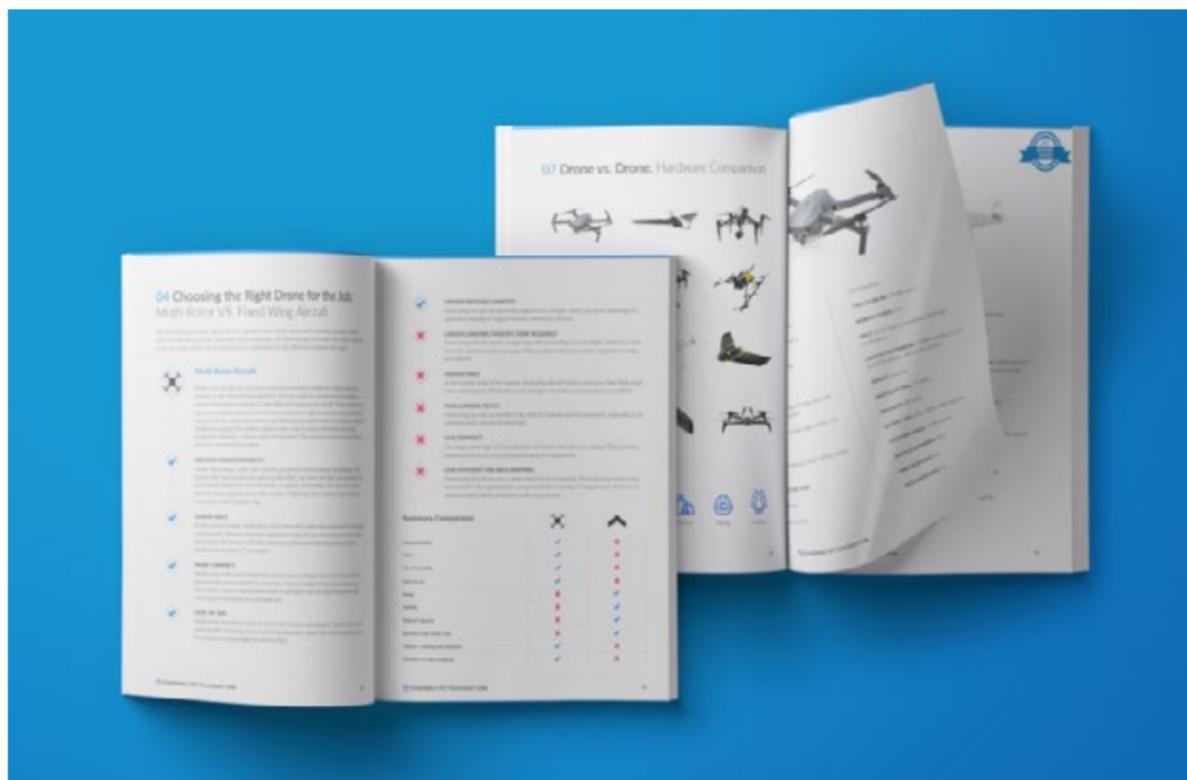
Apps like [Flyte Lite](#) help you create preflight checklists and identify ground or airspace issues before takeoff.



[FAAWaiverWallet](#) is the easiest way to complete, track, and store your FAA Waiver Requests. Stay organized and make sure you have your FAA waiver before each flight.



The [AirMap app](#) brings realtime airspace awareness to DroneDeploy, allowing operators to check for nearby advisories before a flight and get a 'safe-to-fly' indicator.



Choose the Right Hardware and Software for Success on Your Site

Drone Buyer's Guide

Multi-rotor or fixed wing aircraft? Mavic or Phantom 4 Pro? Standard or thermal camera?

Businesses just getting started with drone mapping often ask us what drone they should buy. While there is no simple answer, we can help you better understand what you should consider before making a purchase. This guide will help you navigate the different options available in the market and decide which drone model is the right choice for your business.

Download this guide to:

- Learn about the benefits drone mapping can offer your business
- Understand the various types of drone models and applications
- Explore aerial imaging and cameras options available for drone mapping
- Review side-by-side comparisons of some of the most popular drones for mapping

[Download the Guide](#)

DroneDeploy App Market

The DroneDeploy App Market enables your business to unleash the full power of aerial data with enterprise software integrations and specialized tools built right within the DroneDeploy user interface.

There are over 50 great apps available on the market. Here are a few that you'll find especially helpful in the construction industry:



[MapGage](#) - Digitize your work and inspection forms, and combine these with drone maps, blueprints, and sensor data to collect field observations while inspecting construction and industrial sites.



[Procore Export](#) - Easily export DroneDeploy orthomosaic and elevation maps into your Procore project album.



[Autodesk App](#) - Securely sync your drone data and maps directly from DroneDeploy to your Autodesk Forge account storage.



[ArcGIS Online Web Tile Layer](#) - Generate template links for your maps that you can use as web tile layers in ArcGIS Online.



[RTC Pre-Plan Site Cleanup](#) - Save time pre-planning construction site cleanup. Calculate the volume of materials and run the app to see how many trucks it will take to clean up the site.



[EZ3D](#) generates actionable information from DroneDeploy photos for building inspection and repair. EZRoof provides precise condition and 98% accurate measurement detail for job estimates.



[Fulcrum](#) turns your map annotations into tasks for field service follow up using the Fulcrum field data collection platform.

[Explore App Market](#)

06 Conclusion: Next Steps and Where to Go from Here

Now that you've tackled the fundamentals of using drones in construction, we hope you feel more prepared to integrate drones on your jobsite, or into your next project. Of course, there is so much more to learn about drones in the construction industry. If you still have questions, or want to learn more from your peers who have successfully adopted drones at their companies, we suggest you look into some of our other resources.

Construction Webinar Series

Our [construction webinar series](#), in conjunction with leading drone manufacturer DJI, gives great tips and tools to help your company get started with drones.

Watch our webinar, [Improving Commercial Inspections and Jobsite Safety with UAVs](#) to hear how panelists from Beck Group and The Sequel Group use drones to streamline inspection workflows on their jobsites.

Tune into our webinar, [Mapping for Project Communication and Coordination](#) to learn how McCarthy Building Companies have been using shared maps for communication and project management across the organization.

Construction Onboarding Guide

Our [Construction Onboarding](#) support documents are a one-stop shop to guide you through the steps to becoming a successful construction user of DroneDeploy.

Get Started with DroneDeploy

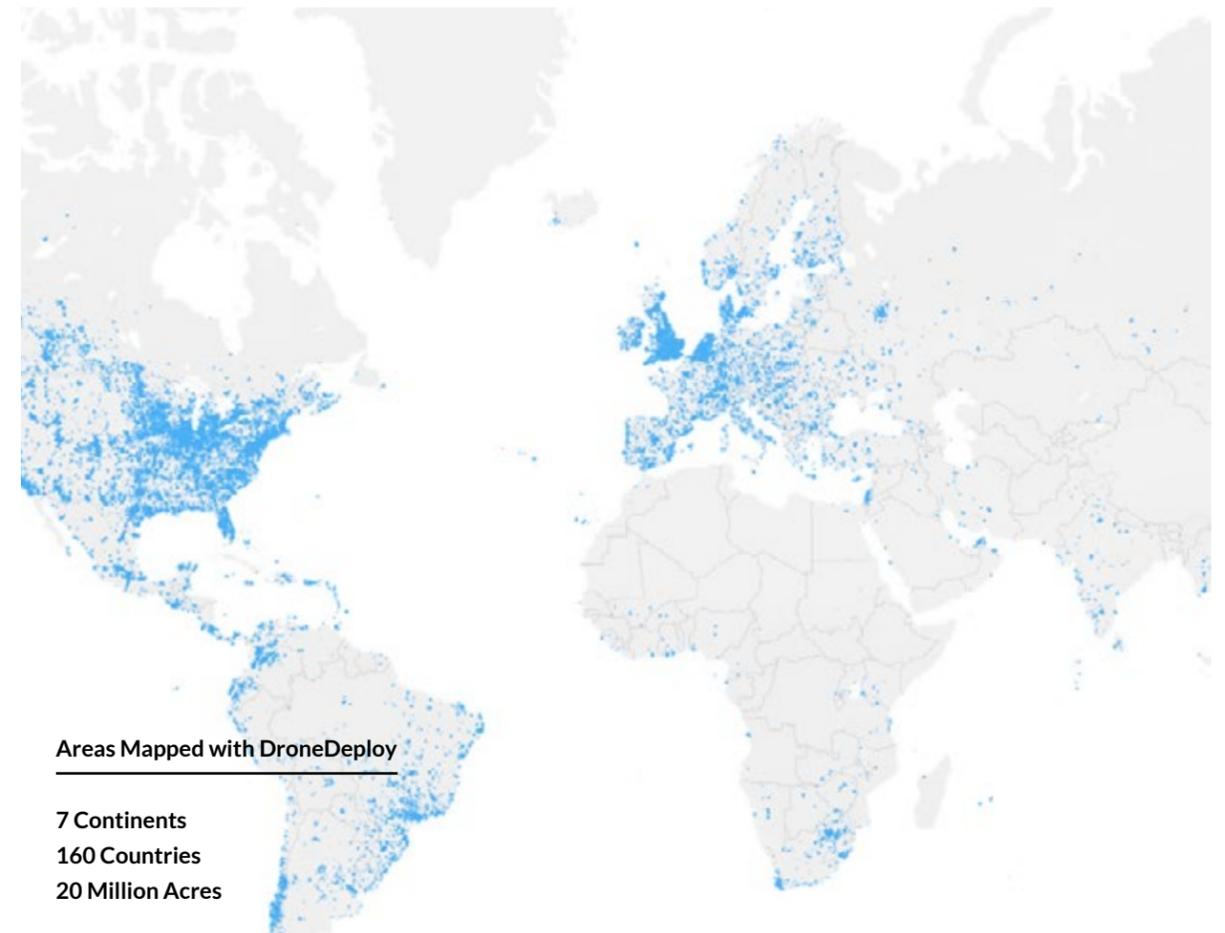
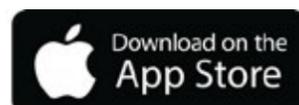
Ready to give DroneDeploy a try? [Sign up to start a 30-day free trial](#) of our software and begin putting drone maps to work in your company.

Talk with a Drone Mapping Expert

Still have questions? We are happy to hear from you. Please don't hesitate in reaching out to us with any questions. We'll connect you with one of our drone mapping experts.

Contact Us

Download the DroneDeploy app on iOS and Android



About DroneDeploy

DroneDeploy is the leading cloud software platform for commercial drones, and is making the power of aerial data accessible and productive for everyone.

Trusted by leading brands globally, DroneDeploy is transforming the way businesses leverage drones and aerial data across industries, including agriculture, construction, mining, inspection and surveying. Simple by design, DroneDeploy enables professional-grade imagery and analysis, 3D modeling and more from any drone on any device.

DroneDeploy is located in the heart of San Francisco. To learn more visit us online and join the conversation on Twitter.

[www.dronedeploy.com](#) [@DroneDeploy](#)





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