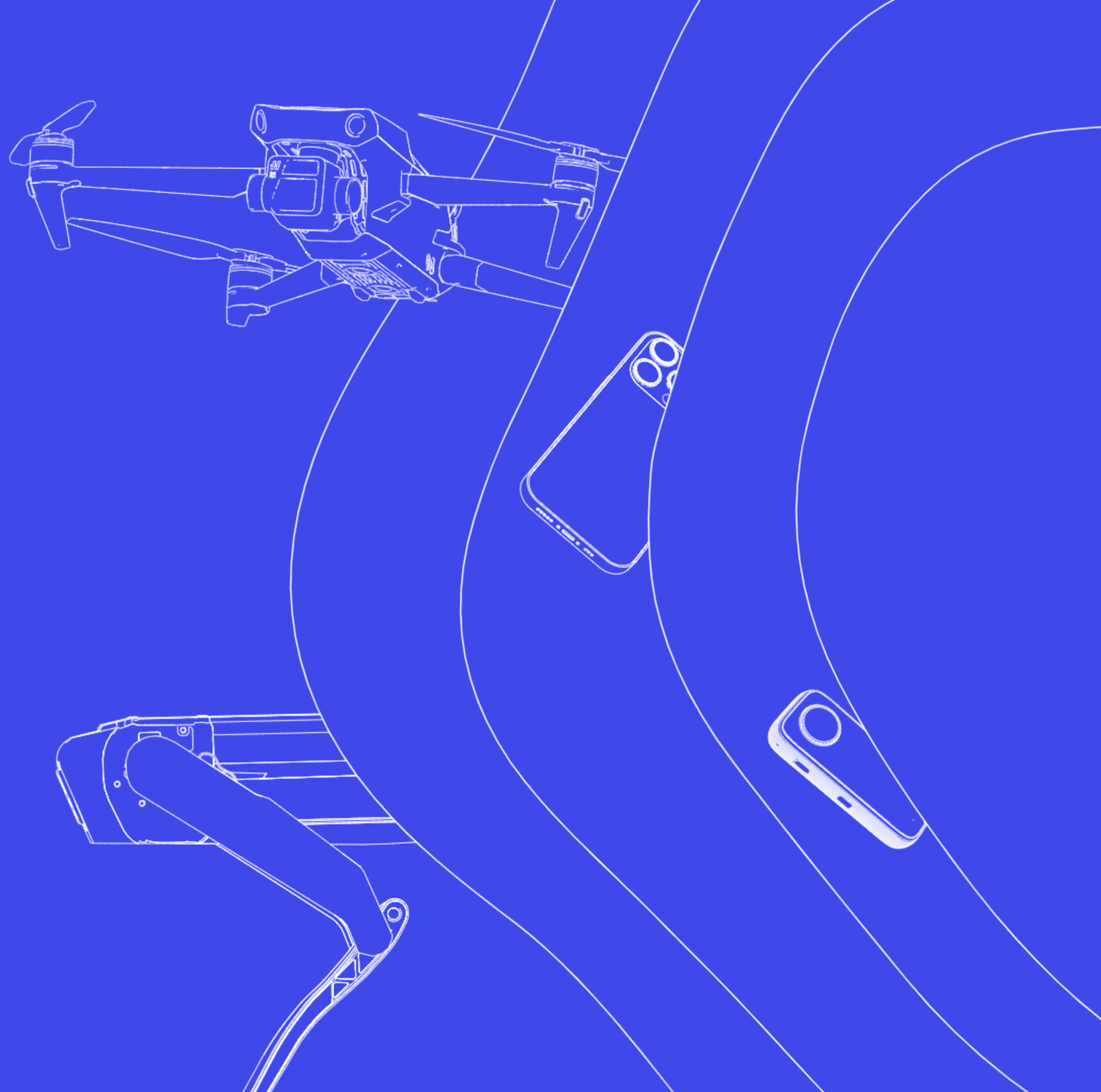
DroneDeploy

The Reality Capture Playbook

Construction Edition



Contents

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How to use this playbook

Overview

DroneDeploy is an easy-to-use reality capture tool that allows you to capture the jobsite from every angle with a drone, 360 camera, robot or smartphone, and then share the virtual jobsite with your team.

This Playbook will walk you through critical milestones to capture throughout the project lifecycle, and how to make the most of the photos with unique workflows and use cases that have been used by our customers – including some big wins.

Phases to document

In this section you'll learn how DroneDeploy can be used to capture critical milestones during each phase of construction, from pre-con to close-out. By documenting consistently throughout the course of a project, your team can create a virtual time machine.

Unique DroneDeploy workflows

In this section you'll learn how teams have used DroneDeploy for unique workflows on their projects involving scheduling, change management, QA/QC and more. Let these examples inspire your team to maximize the value you get from your reality capture!

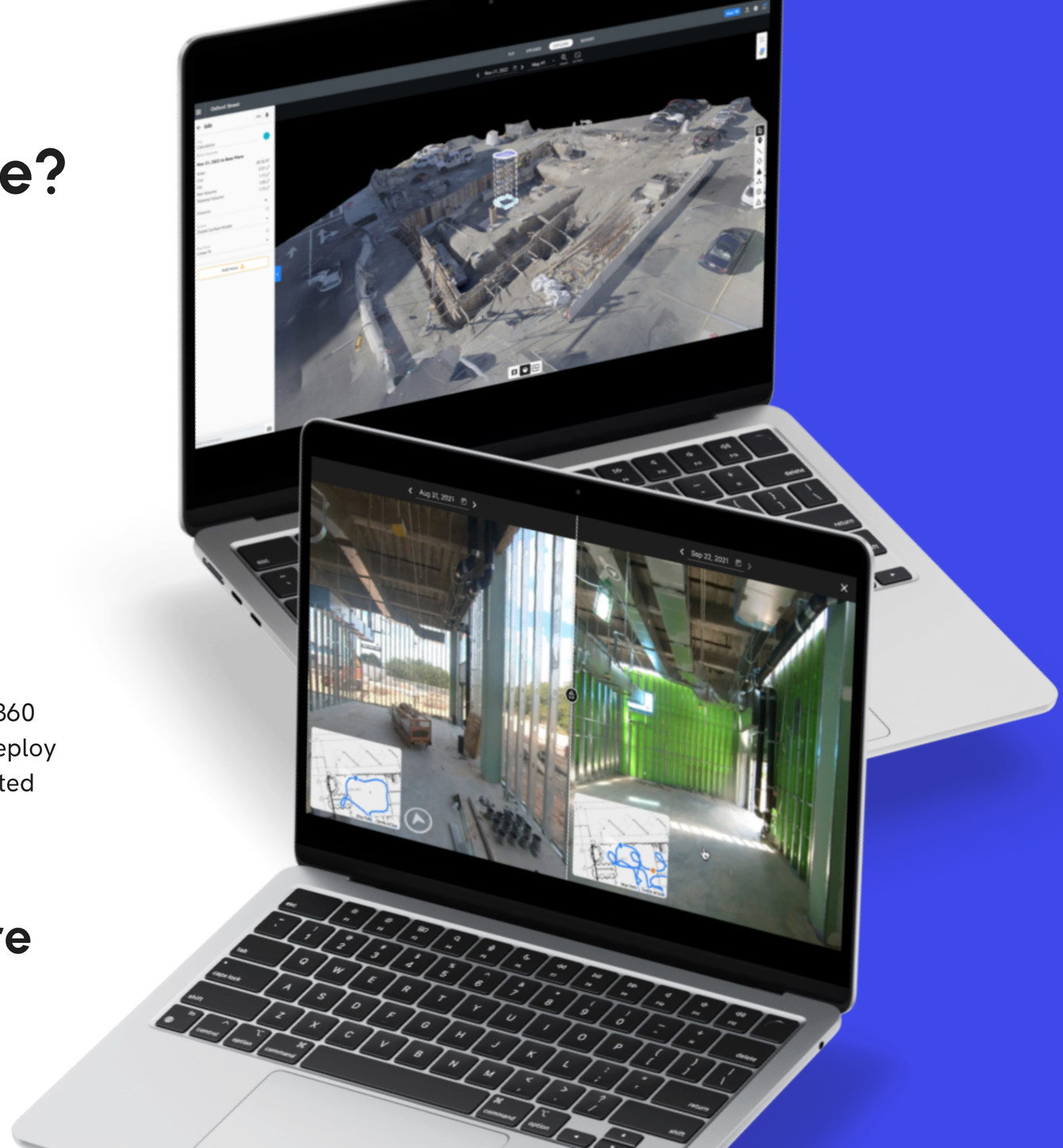
What is reality capture?

Reality capture is the process of creating digital representations of your construction sites.

This allows you to:

- Improve site documentation and communication
- Clearly and accurately track changes over time
- Make comparisons between designs and as-built
- Reduce the risk of expensive rework
- Save time spent on in-person inspections
- Virtually visit the jobsite from anywhere
- Easily share this data with stakeholders

Reality capture can be achieved using mobile devices, 360 cameras, drones and even ground robots. The DroneDeploy platform is designed to make this process fast, automated and seamless.

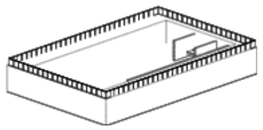


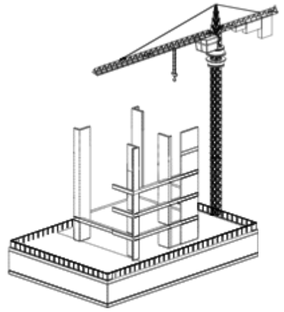
Our Vision of Reality Capture

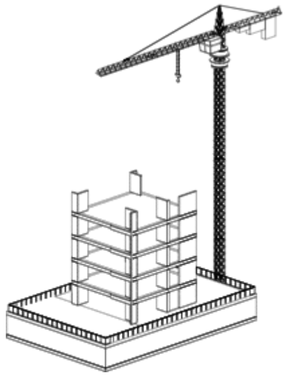
Unified • Automated • Intelligent

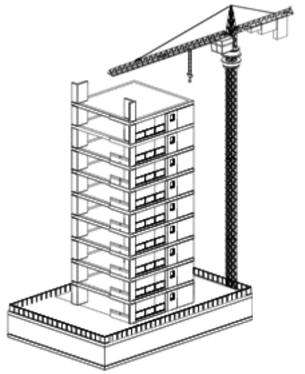
Reality capture lifecycle

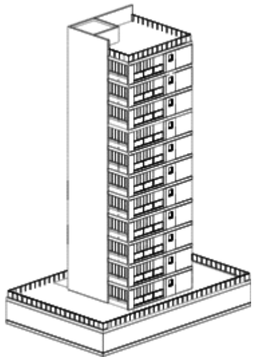
Important phases to document throughout your project.











Pre-construction

Pre-bid
Mobilization

Substructure

Earthworks
Underground utilities
Foundations

Structure

Concrete
Steel

Exterior

Exterior framing
Exterior systems
Punchlist

Interior

Interior framing
Mechanical, electrical, plumbing
Interior finishes
Punchlist

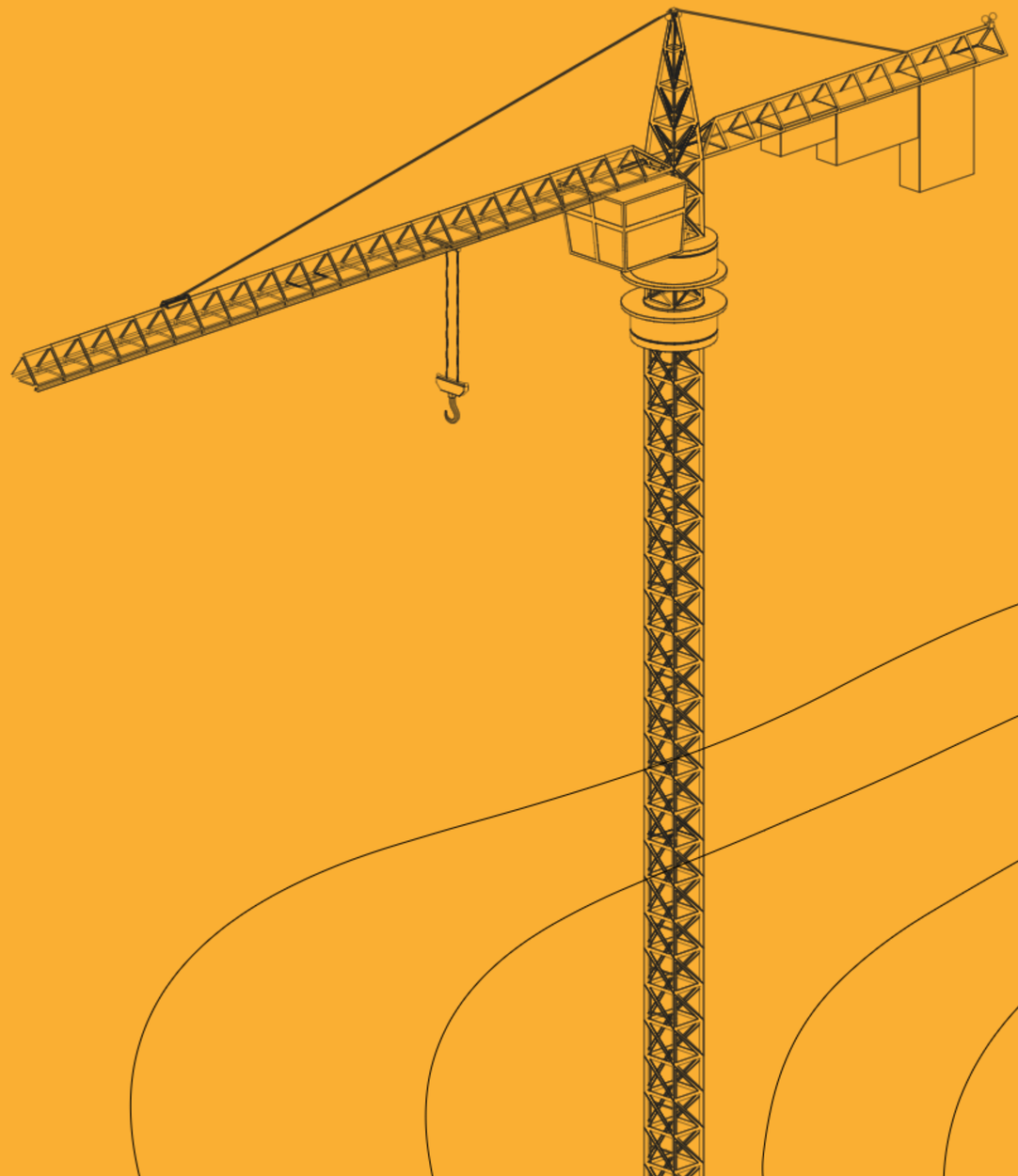
Close-Out

Offline deliverable
Facilities management

Color Code: Aerial Ground

DroneDeploy

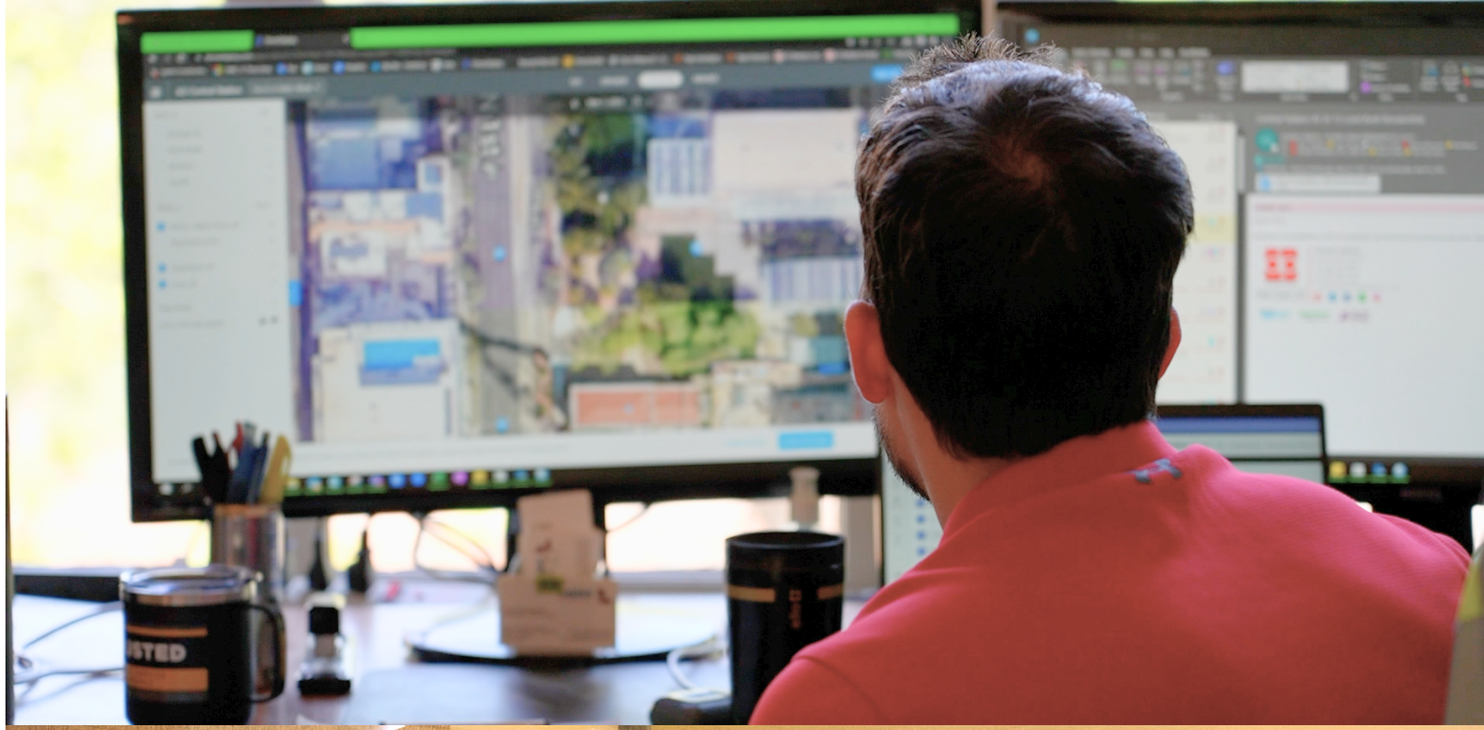
Phases to document



Pre-construction

Reality capture in this phase has benefits for the estimating team and beyond.

- Communicate existing conditions to bidding trade partners
- Give stakeholders higher confidence in their proposal
- Help the trades to coordinate prior to mobilization
- Communicate important site logistics (e.g. laydown areas, parking, storage, offices, connex, dumpster locations)
- All images are mapped by date and location for future reference



Pre-site survey

Use reality capture to document existing site conditions prior to mobilization. Survey data can be shared with the project team, trade partners and other consultants to ensure everyone is familiar with the site.

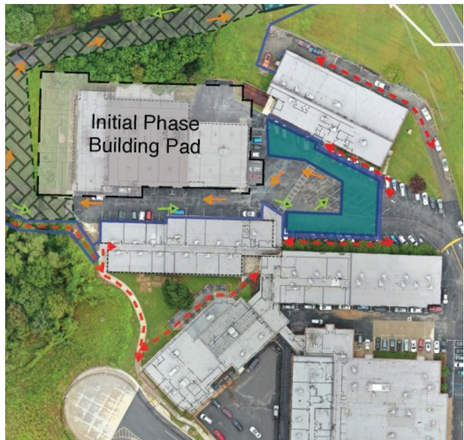
Additionally, include a PDF of survey data in the contract for a comprehensive overview of the site.

Above ceiling investigation

Use reality capture to ensure that exploratory conditions, tie-in locations and equipment locations are all documented in an organized manner. This will provide a comprehensive site overview and aid in planning.

Enhanced site logistics

Capture access points, parking, loading zones and laydown areas for coordination prior to mobilizing. This information can be shared with the team and partners to ensure a smooth and efficient construction process.

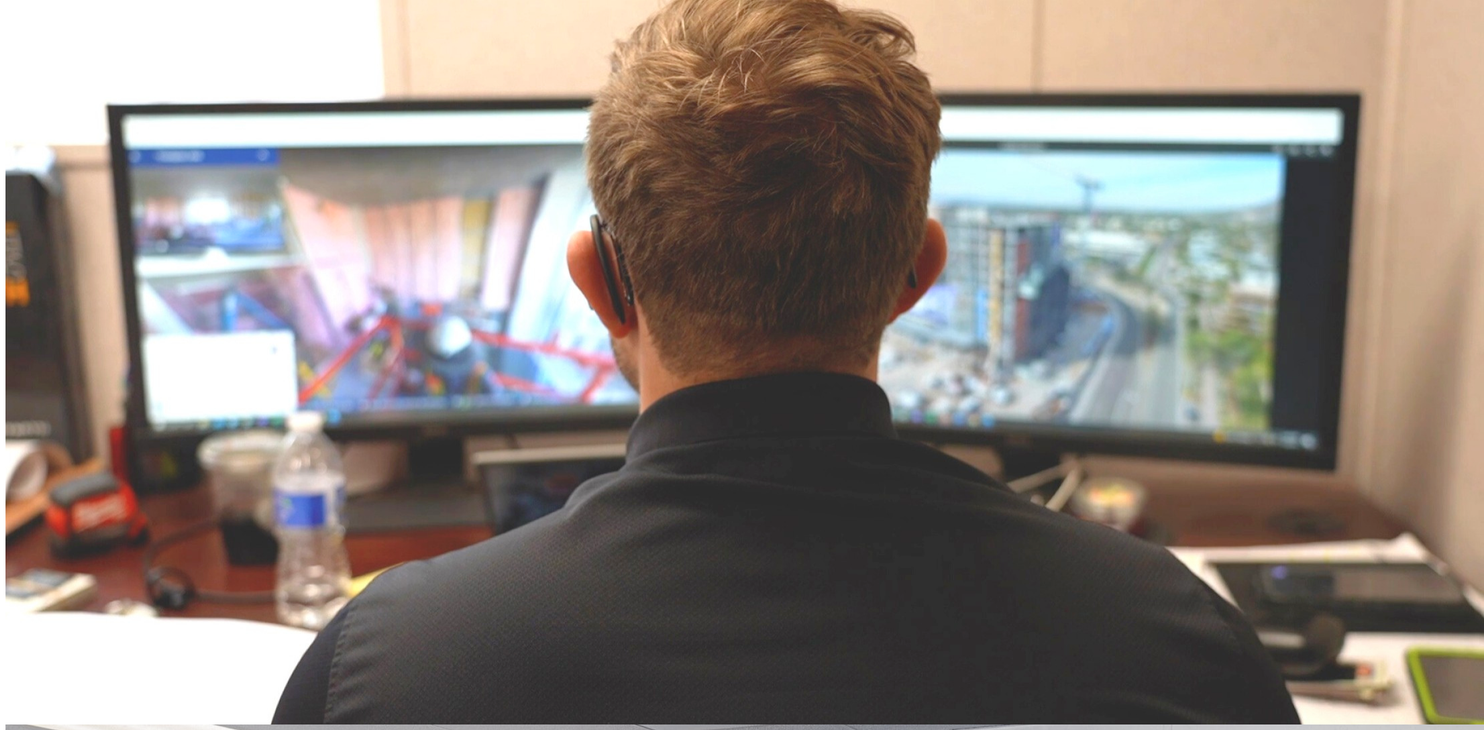


Construction

Value to project teams

The benefits of frequent reality capture throughout construction:

- Virtual access to the jobsite for internal team and stakeholders (architects, owners, etc)
- Reference images for use during OAC meetings, trade partner meetings and daily huddles
- Resolve trade damage claims
- Mitigate risk and minimize rework
- Stay on budget and on schedule



DroneDeploy provides the most comprehensive and holistic view of our project sites throughout the whole lifecycle. We finally have a single tool for all site documentation in one place.

Austin Lay, Reality Capture Manager | STO Group - Layton Construction

Earthwork

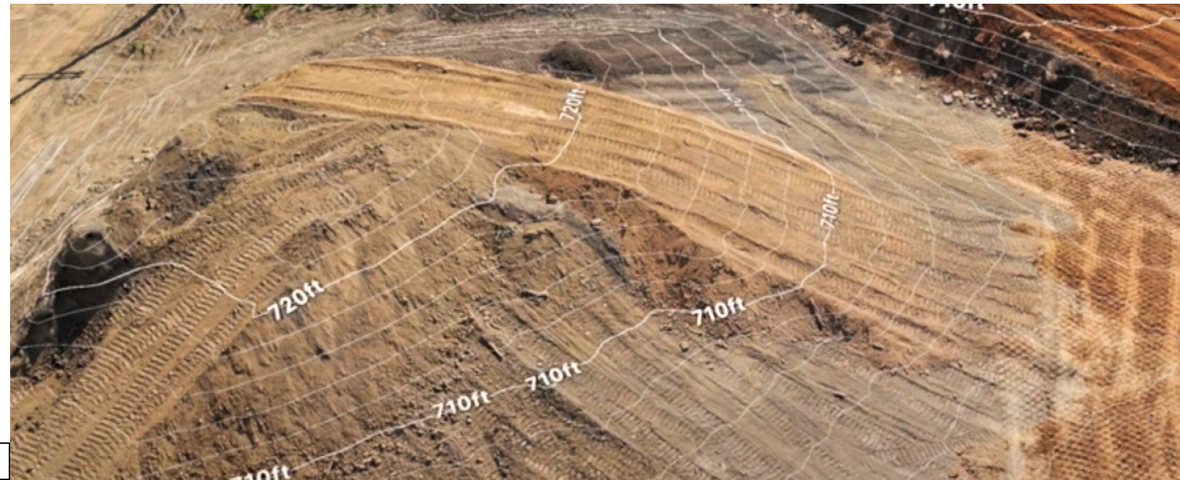
Critical capture milestones

- Quantity reports
- Cut/fill analysis
- Overall site progress

Why it's important

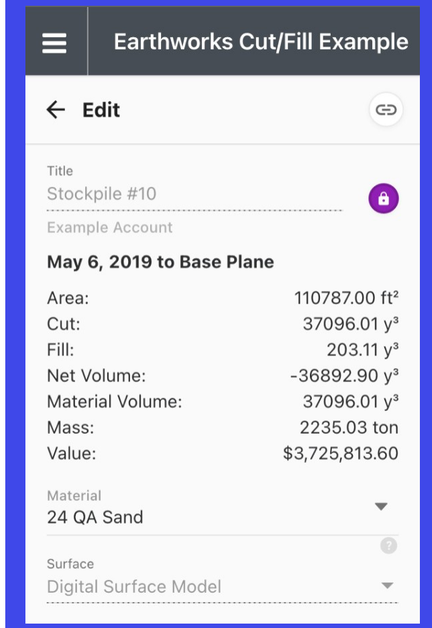
Reality capture provides accurate snapshots of how much earthwork is on site at any given date. Compare progress over time. Contractors gain insights about the area's topography and receive a survey that's accurate down to the centimeter.

Use DroneDeploy to produce an exact high-resolution map and 3D model of a job site – all processed in a matter of hours.



More than Visual

View quantities of earth moved over time.



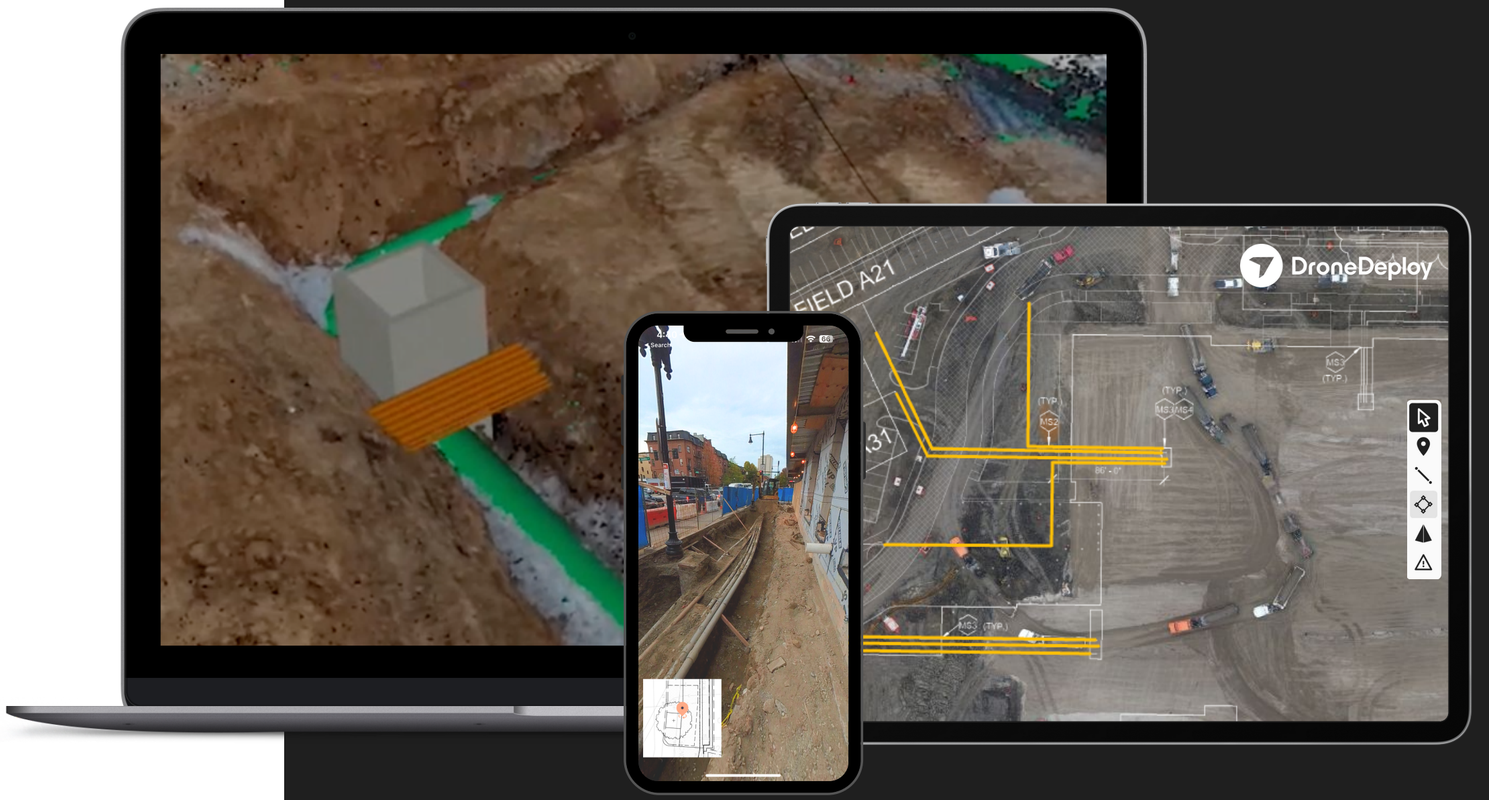
Underground utilities

Critical capture milestones

- Existing conditions
- Utility installation
- Backfilling
- Final grade

Why it's important

Reality capture of underground utilities means you'll be able to view components that have been covered later. This makes it easier to coordinate logistics with trade partners, including turnover of the site to the concrete vendor.



Use Case

Finding the root cause of water intrusion

Reality capture at this phase can be useful for determining the root cause of efflorescence, spalling or water intrusion. For example, water intrusion in the site work section such as tears, holes, and improper installation of vapor barriers can be documented with DroneDeploy.

Foundation

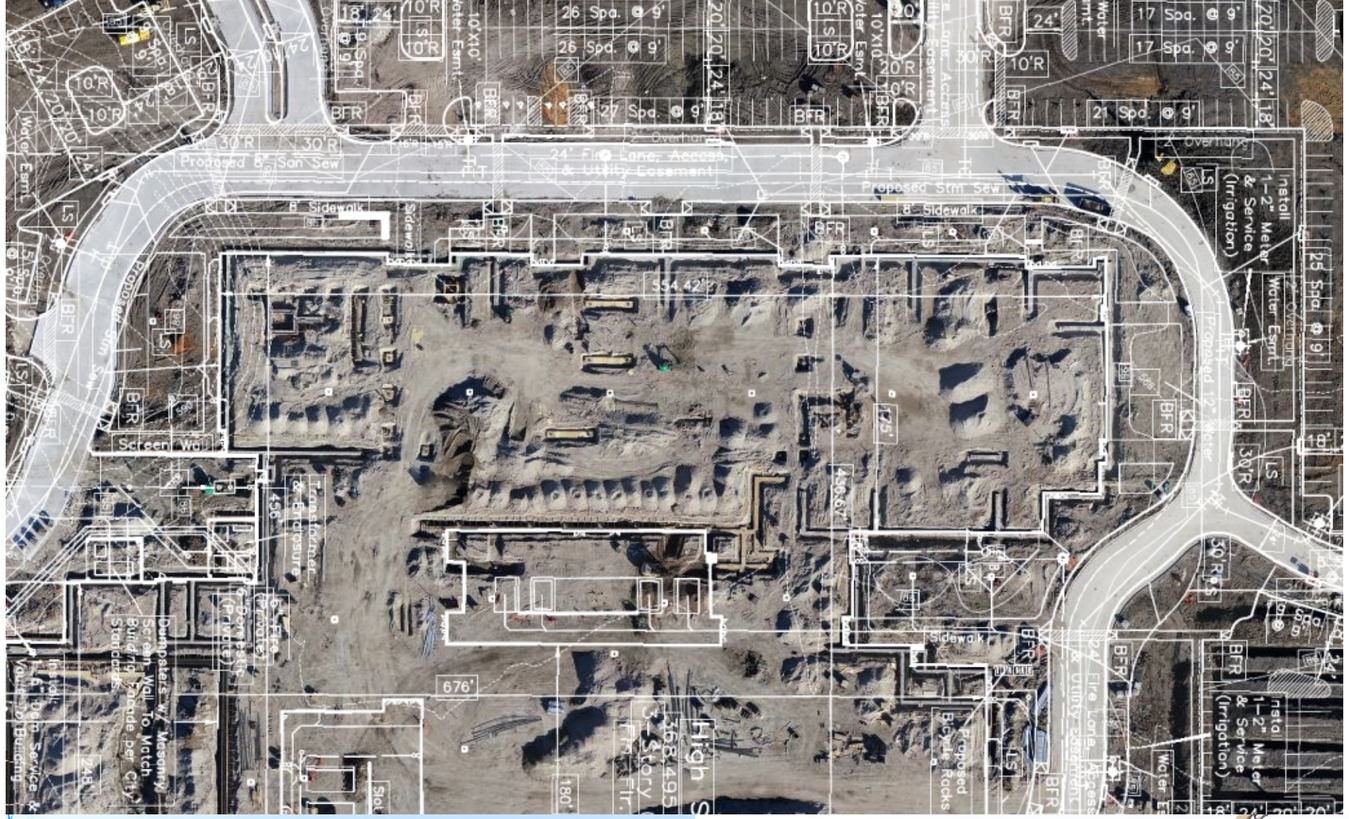
Critical capture milestones

- Drilled piers
- Foundation walls
- Grade beams

Why it's important

Capturing the location of structural elements means you can ensure everything is in the right location before concrete is permanently placed.

View aerial imagery to get a holistic view of progress as foundations are being installed. Or use ground robots to inspect work installed and validate installation of key structural elements.



Concrete structure

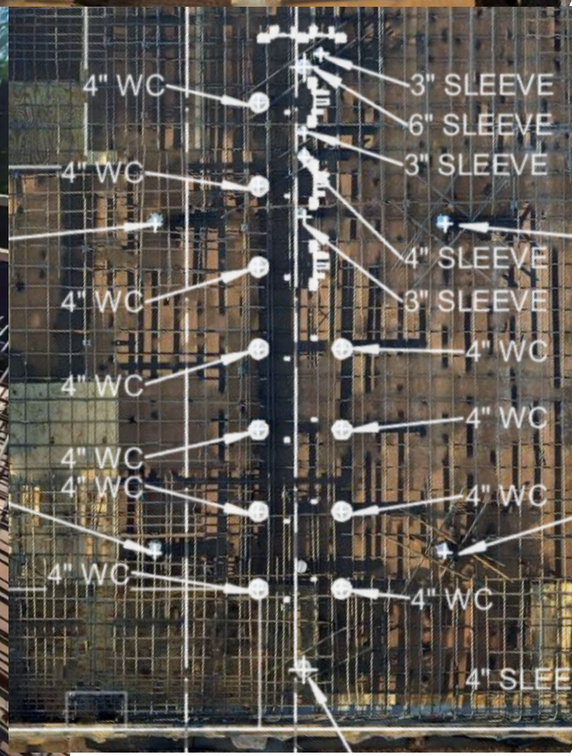
Critical capture milestones

- Rebar/post tension cables
- Slab edges
- Slab depressions
- Mechanical sleeves
- Steel embeds
- Blockouts

Why it's important

After concrete has been placed, you can find missing sleeves or spacers, check forms for cleanliness and know where rebar and post-tension cables are in the slab – especially in the event core drilling is necessary.

This also allows VDC engineers to QC penetrations remotely, and it reduces the need for costly slab scanning.



With DroneDeploy's automated flights, I can capture a map, pano, video and progress photos in one flight, spending 40% less time than flying manually. I can now fly one extra site a day, in the same amount of time, using the same battery life.

Matt Czuzak, Sr. Virtual Construction Manager | CORE Construction

Steel structure

Critical capture milestones

- Steel beam and column installation progress
- Detailed miscellaneous steel connections
- Metal decking
- Structural deck pours

Why it's important

Visually documenting progress of structural steel and decking on a weekly or monthly basis can help with quantity and schedule comparison.

Reality capture also aids with the verification of work completed, since the majority of the connections/members will be covered up by other elements in future phases.

Facade

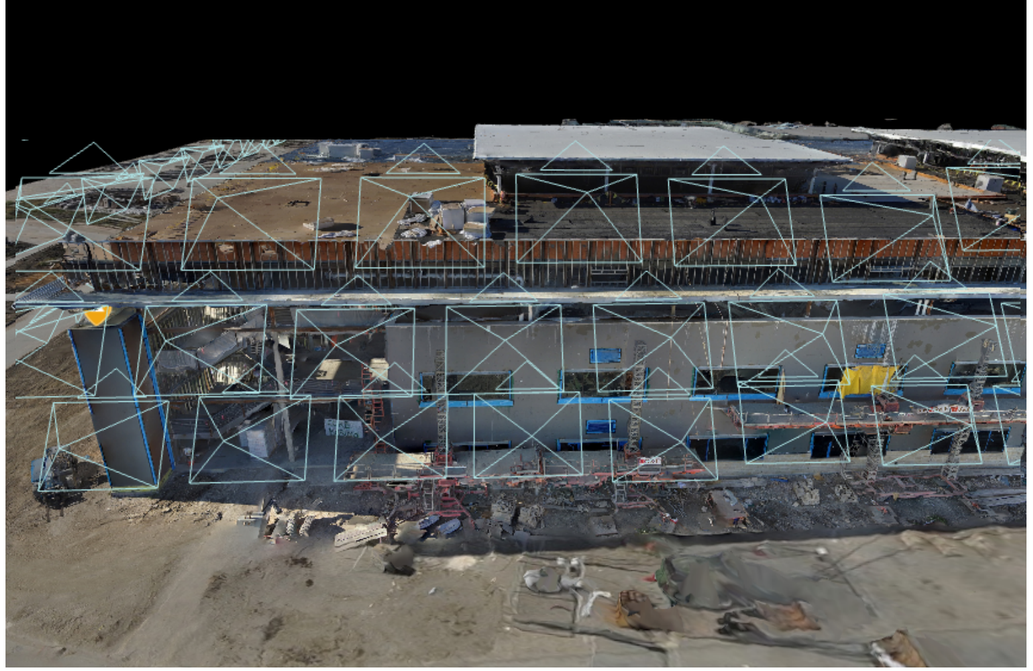
Critical capture milestones

- Progress of exterior framing
- Waterproofing details
- Wall System installation
- Exterior penetrations
- Exterior punchlist

Why it's important

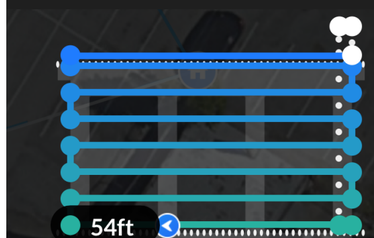
Reality capture allows you to efficiently check the installation and quality of work at key exterior milestones.

With DroneDeploy, you can send drones on autonomous inspection missions to capture building exteriors – keeping team members out of dangerous conditions.



Using DroneDeploy:

Automated Facade Flights



Manually flying a façade can be challenging and cumbersome.

DroneDeploy makes this process easy, efficient, automated – and most importantly, safe.

Roofing

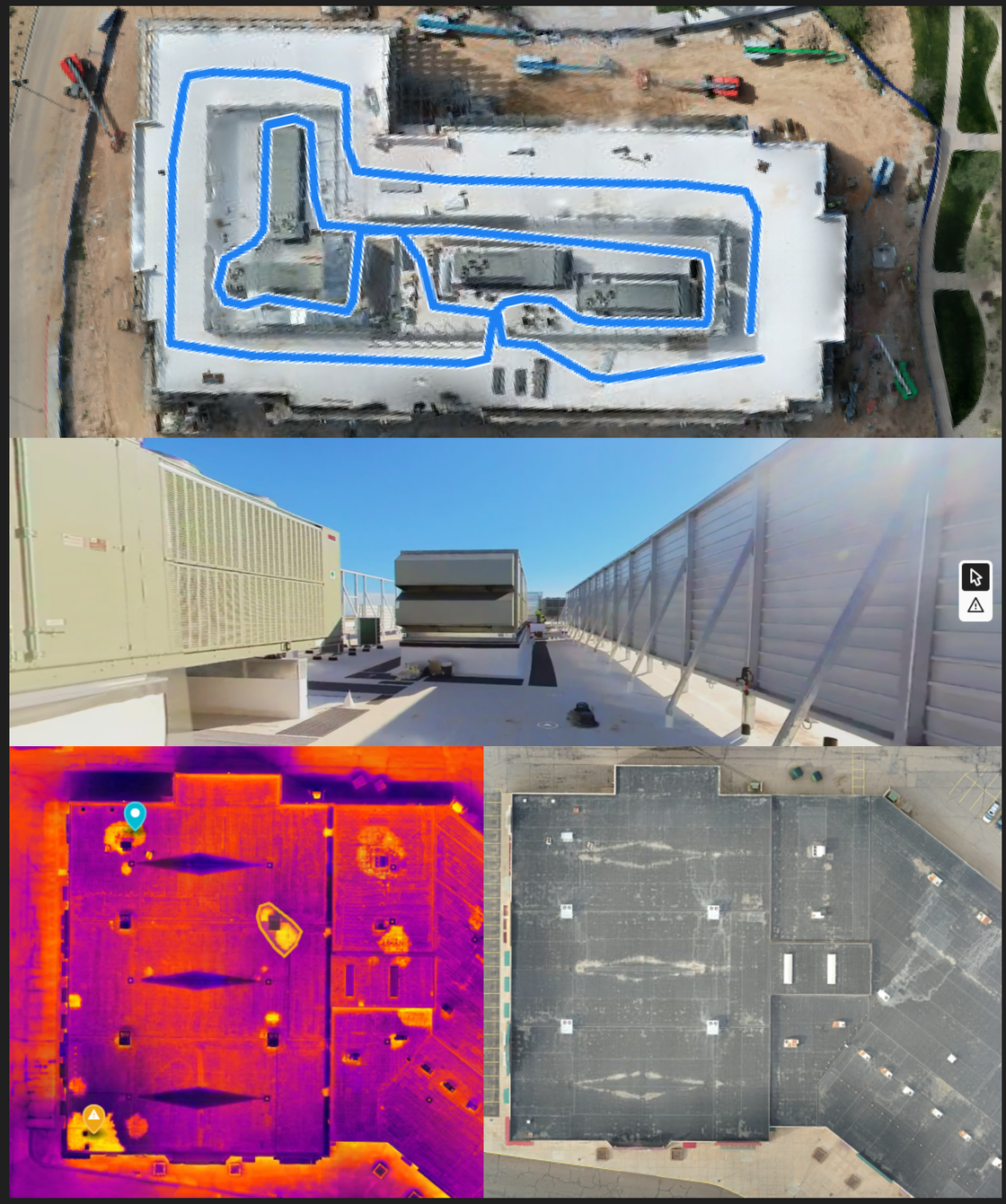
Critical capture milestones

- Quantity measurements of roofing progress
- Insulation lay down areas and installation
- Roofing membrane installation
- Penetrations and roof drain install
- Complex waterproofing transitions
- Final condition of roof at hand off

Why it's important

Water intrusion is a common problem in construction. It can lead to serious issues such as mold growth, deterioration of building materials and structural damage.

Reality capture can help to resolve water issues, as the quality of work in place can be verified without having to open up the roofing system.



Framing & in-wall MEP

Critical capture milestones

- Wall framing
- In-wall rough "in"
- Backing locations
- Insulation
- Fire/smoke/sound caulking and insulation
- Pre-rock
- Drywall finish progress

Why it's important

Reality capture at this stage means that once drywall has been hung, you can look back at past dates to see what's behind closed walls. This helps you to avoid unnecessary rework and protect your business from future damage related claims.

DroneDeploy's timeline of images helped us identify wall penetration firestop issues. It also helped us verify if we inserted backing for our equipment. This saved us about $70-100k in time and resources.

Dhakshan Potuhera, Innovation Analyst | McCarthy

Finishes

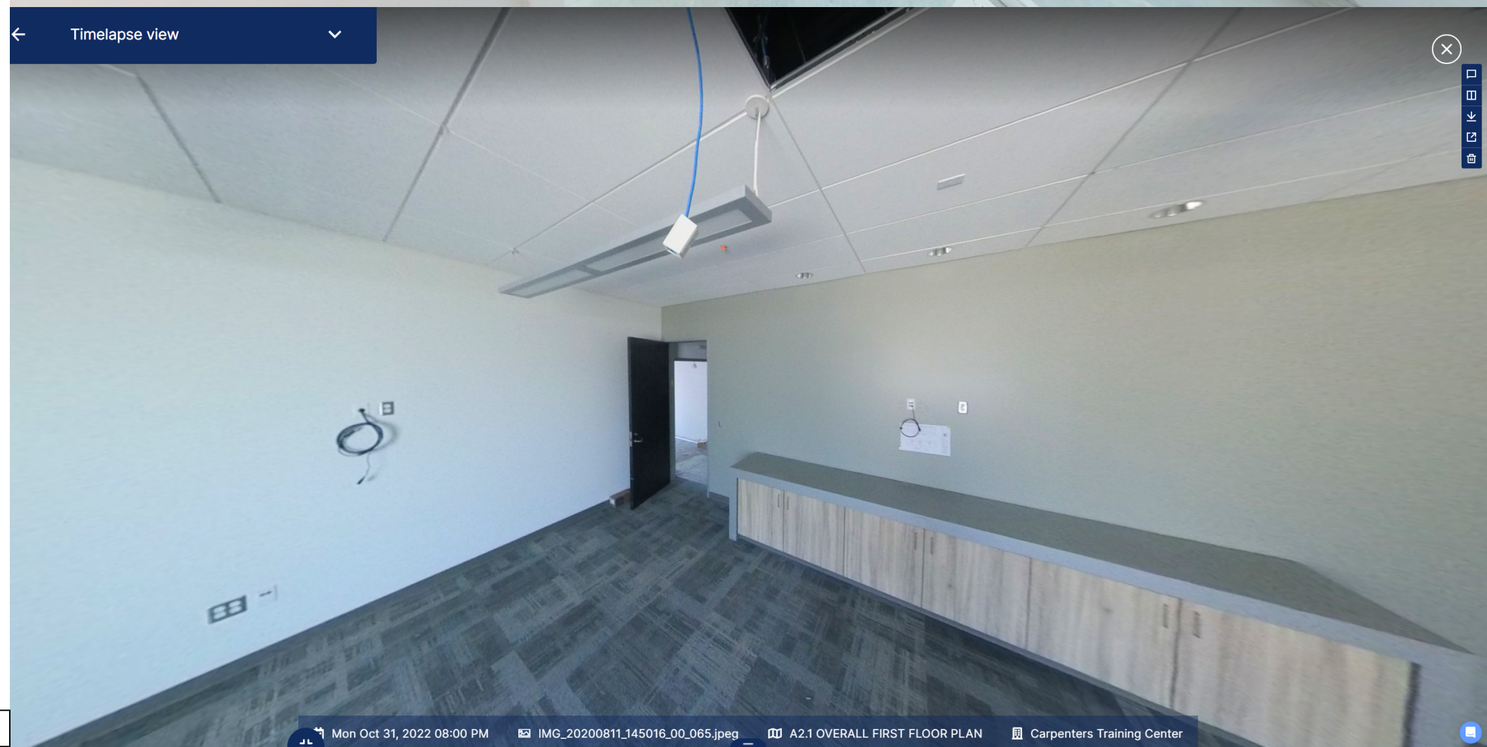
Critical capture milestones

- Interior finishes
- Paint, tiling, flooring, etc
- Punchlist items
- Floor turnover to owner
- Turnover to external vendors

Why it's important

Reality capture at this stage records the condition and quality of final finishes; including paint, flooring, tiling and other decorative elements.

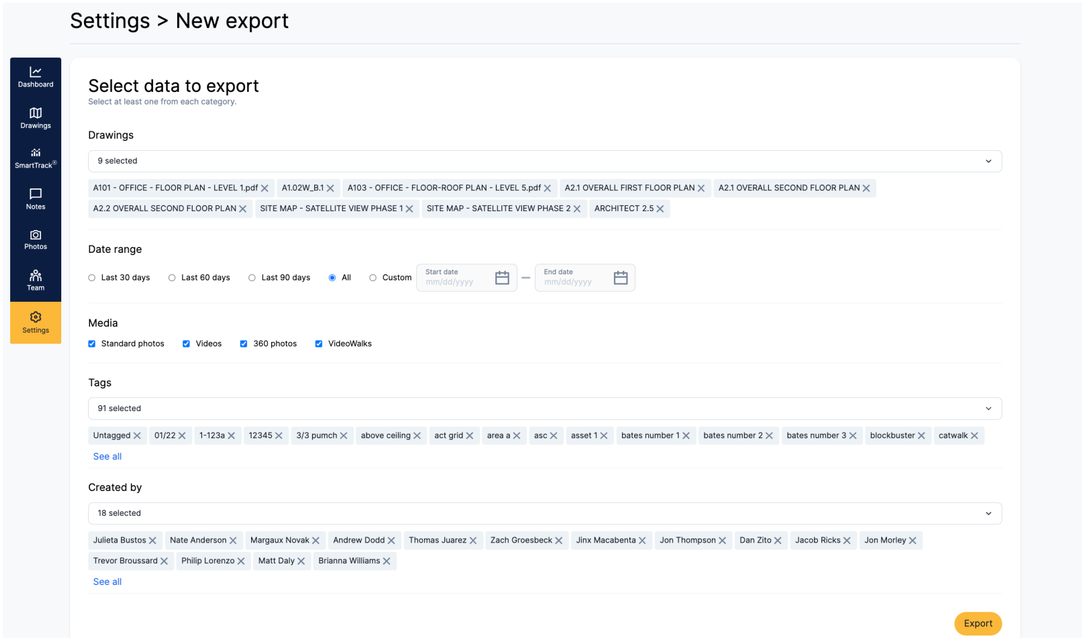
Prior to other people moving into the space, documenting conditions helps to combat a potential punchlist of issues created by external vendors.

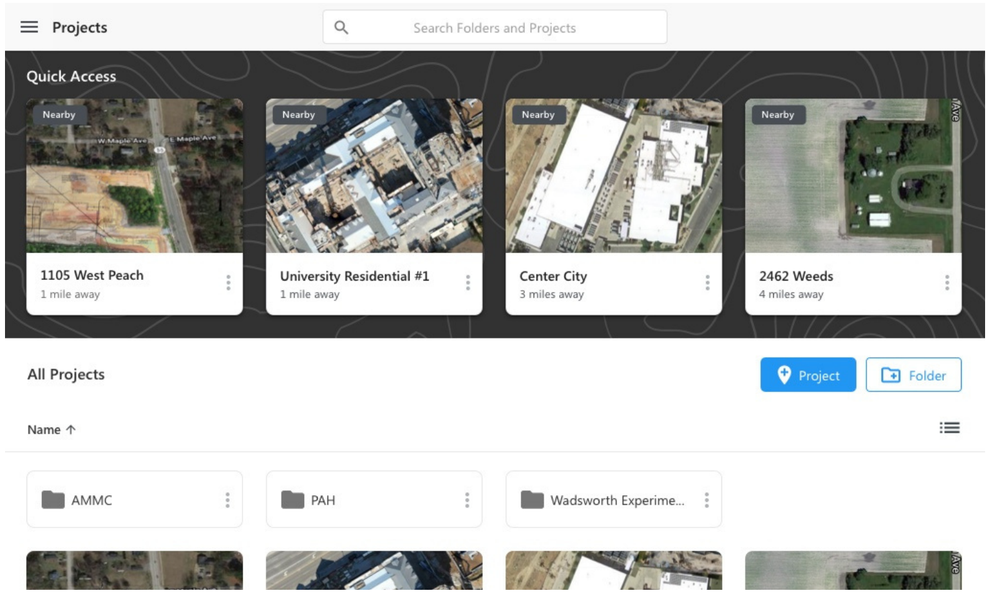


Close-out

Close with confidence

DroneDeploy makes it easy to filter through photos you want to share, or export the entire document as an offline record for the owner at the end of the project.





Project Dashboard

With DroneDeploy, you have an internal company archive of all projects that can be used to reference with lessons learned and best practices when building similar projects.

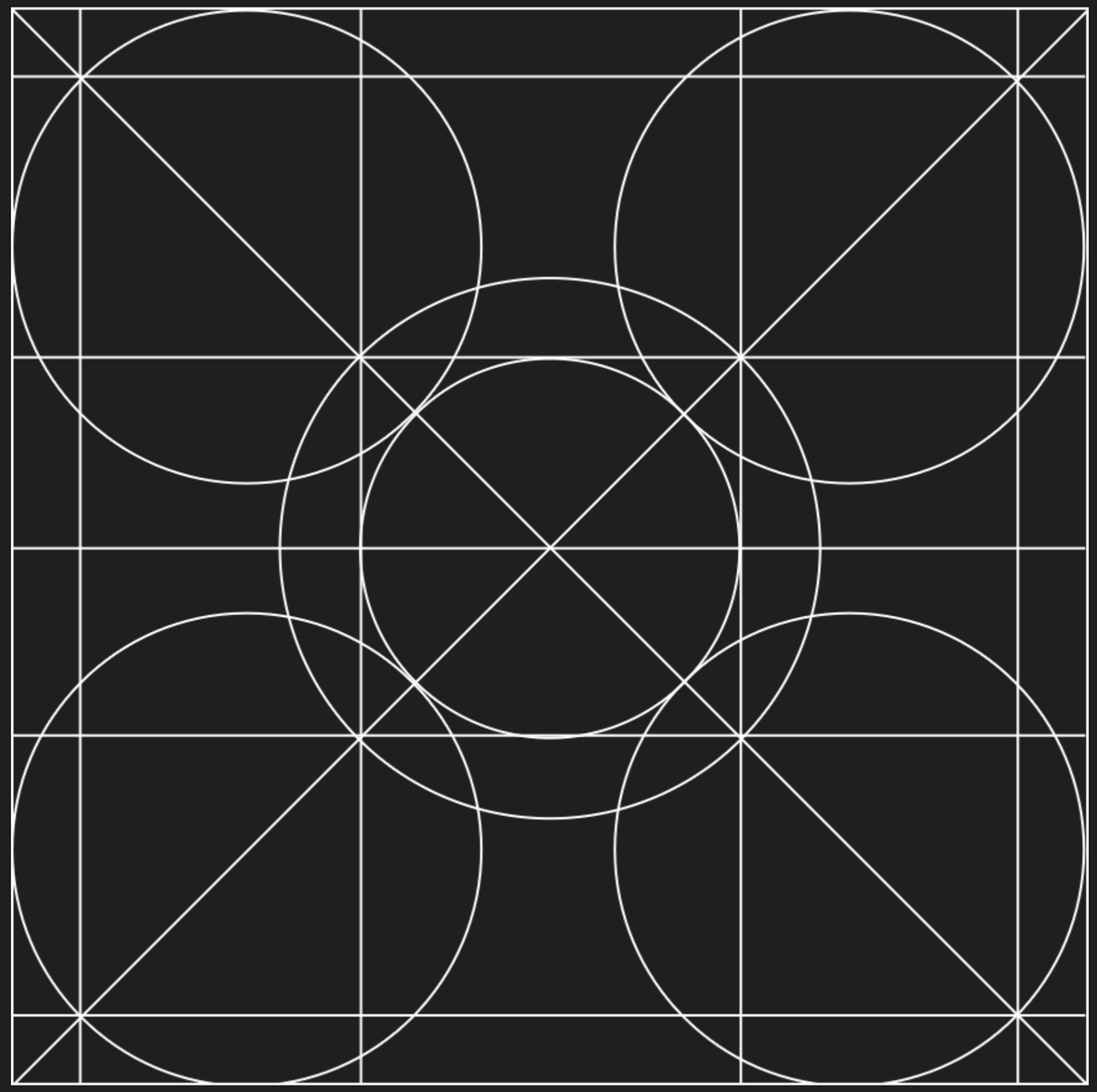
A client was working remotely from Australia on a project that was based in Singapore. Visual verification of quality and completed work was easily carried out using DroneDeploy. Comparison between the design BIM and photos was also a good visual context for technical discussions.

The time savings estimated +500 man hours for a 6 month project.

David Pau, Project Manager | Obayashi Singapore

DroneDeploy

Unique Workflows Using DroneDeploy



Progress documentation

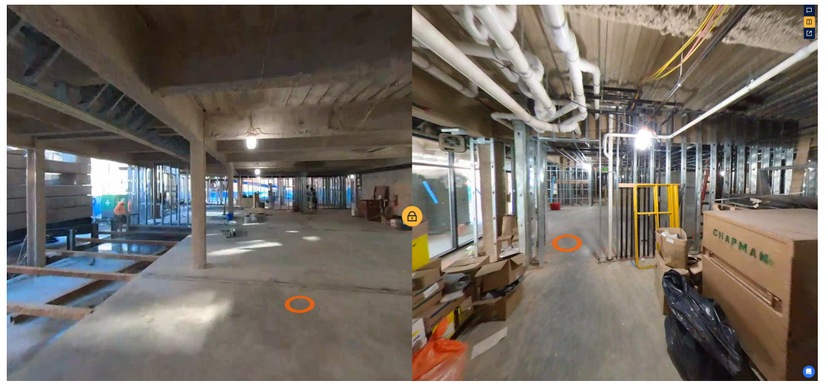
Best practices

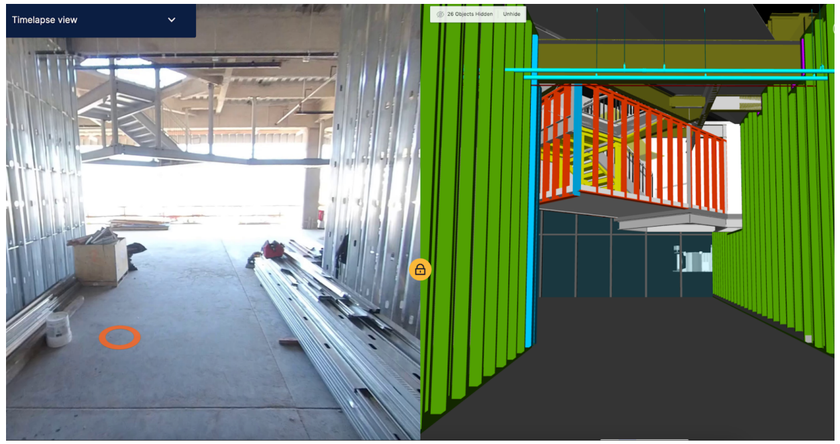
Capture your job site weekly or bi-weekly. This will allow you to cover the most trafficked areas and reference back at any time stamp.

DroneDeploy's SOP Guidelines can also help you establish your own best practices.

When to use the images:

- Progress reports
- Pay applications
- Trade partner / OAC meetings
- LEAN meetings





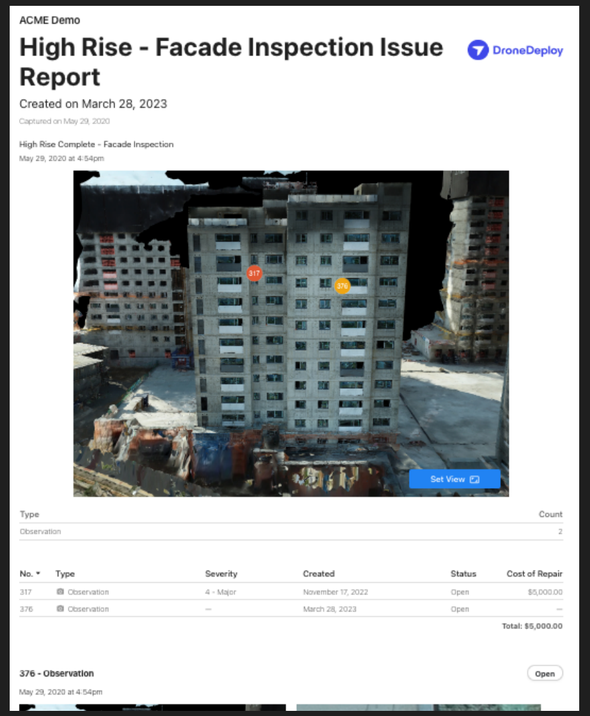
QA/QC

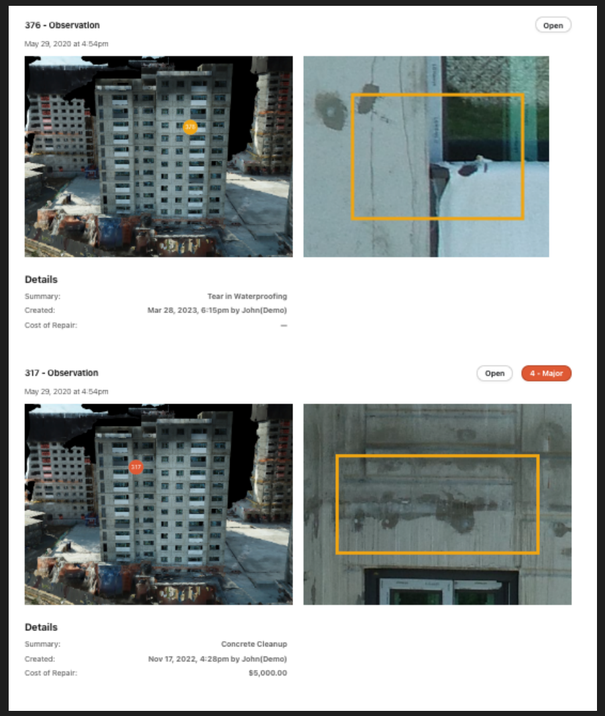
Best practices

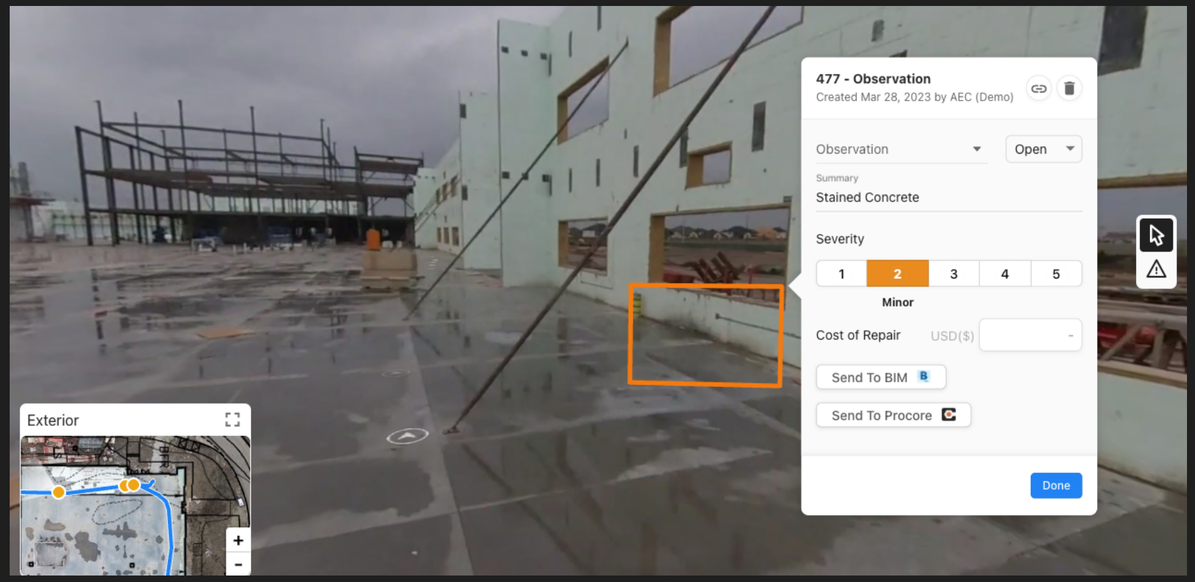
Reality capture data can be used for monitoring work quality throughout the construction process, identifying and addressing issues and implementing quality control measures to prevent future problems.

When to use the images:

- Inspection check lists
- Preventing rework
- Punchlist







Trade coordination

Best practices

Throughout the day, the hundreds of activities that take place are difficult to manage without having photos to use as a reference.

Use reality capture photos to talk through areas of the building as a helpful way of keeping everyone on the same page.

When to use the images:

- Preconstruction bid reviews
- Daily standup / huddles
- Reviewing change orders / RFI's
- Site logistics and lay down area

For our coordination meeting, we used photos almost the whole time. Now that the trades can see field conditions, it opens up entirely new coordination dialogue.

Mike Jakes, Manager - Construction Technology | XL Construction

Integrations

Procore

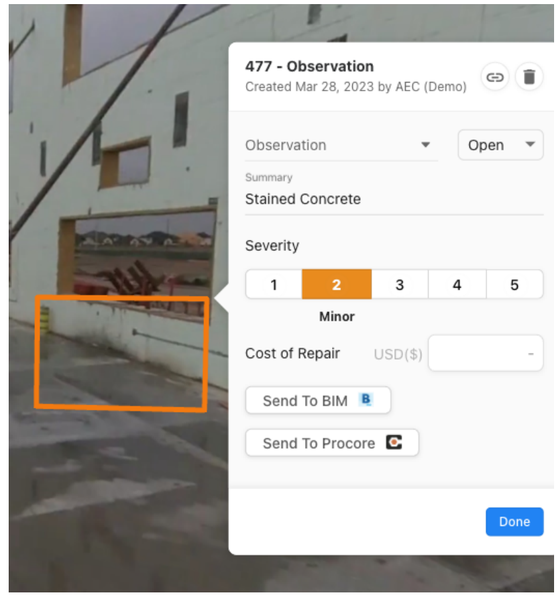
- Create/add existing RFIs or observations
- Embedded app experience
- Ability to sync drawings
- Single Sign On with existing accounts
- Procore BIM comparison

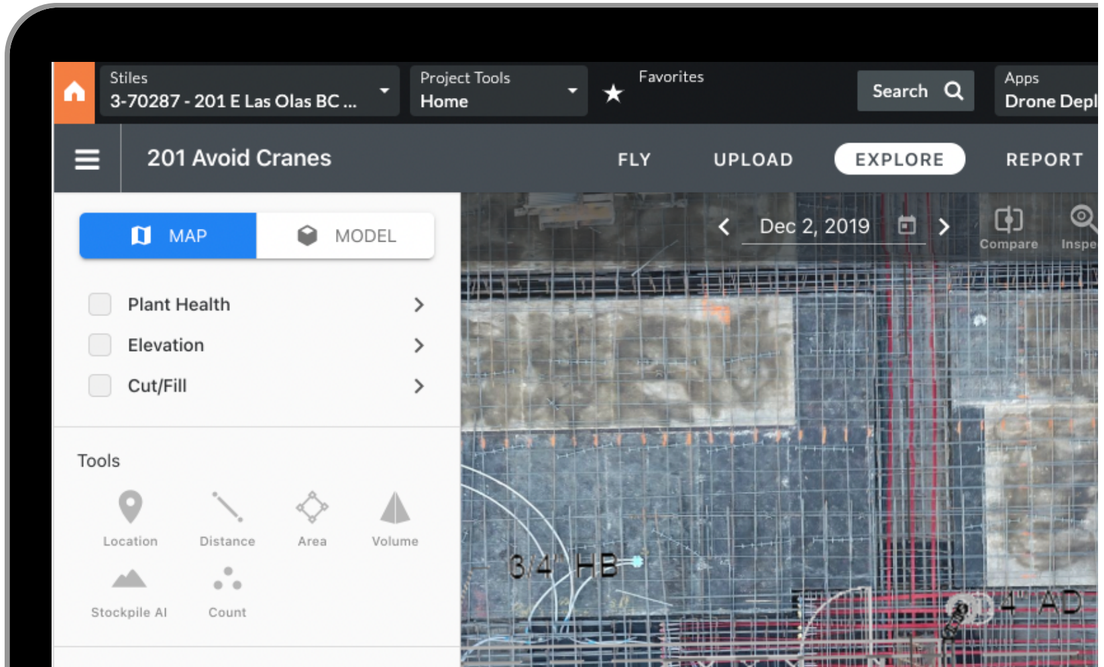
Autodesk

- Create/add existing RFIs
- Ability to sync issues
- Embedded app experience
- Ability to sync drawings
- Single Sign On with existing accounts
- BIM comparison

> *Today, we've got everything linked with Procore - from a project's floor plans, to its foundation, to its civil site utility drawings. And every time we have a revision, it's auto-synced from Procore into DroneDeploy.*

Michael Gekas,
VDC Director |
McCownGordon
Construction





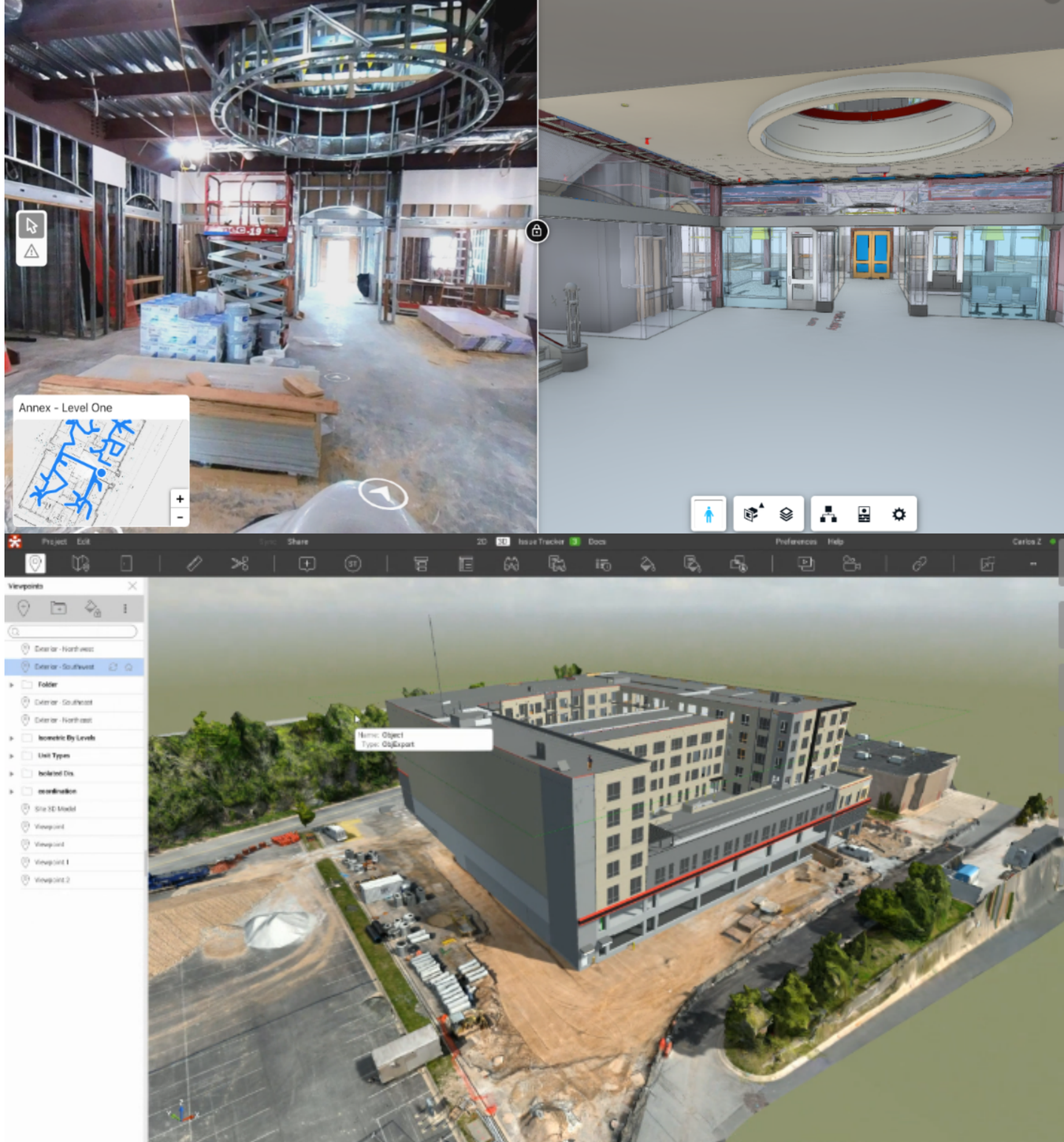
BIM comparison

Critical capture milestones

- Major equipment installation
- Material storage (e.g. ensure duct is protected for certifications)

Why it's important

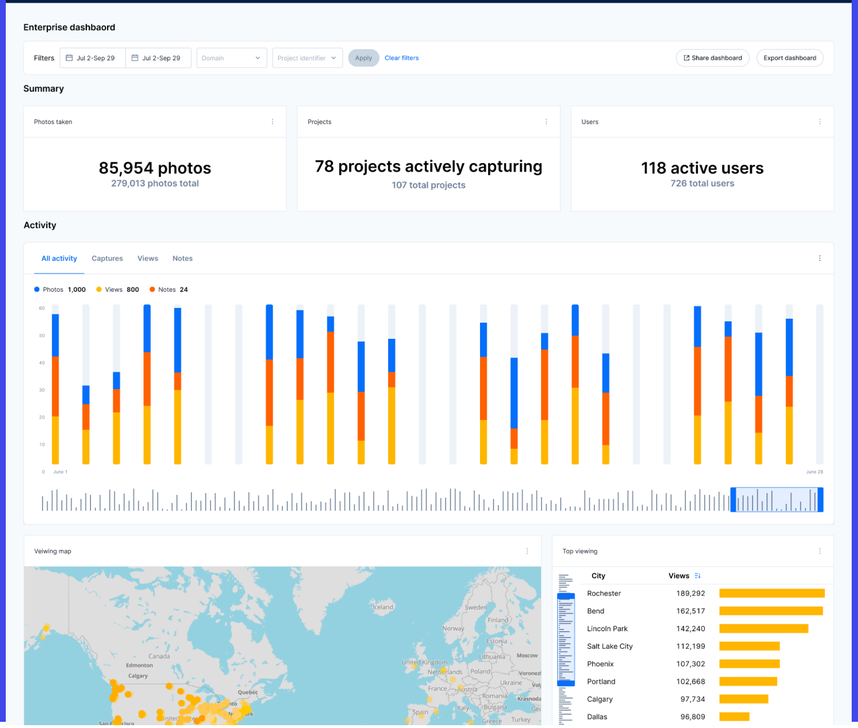
- Address quality control by integrating BIM coordination model
- Logistics planning in tight areas
- Use for coordination in weekly meetings
- Export drone data into other platforms

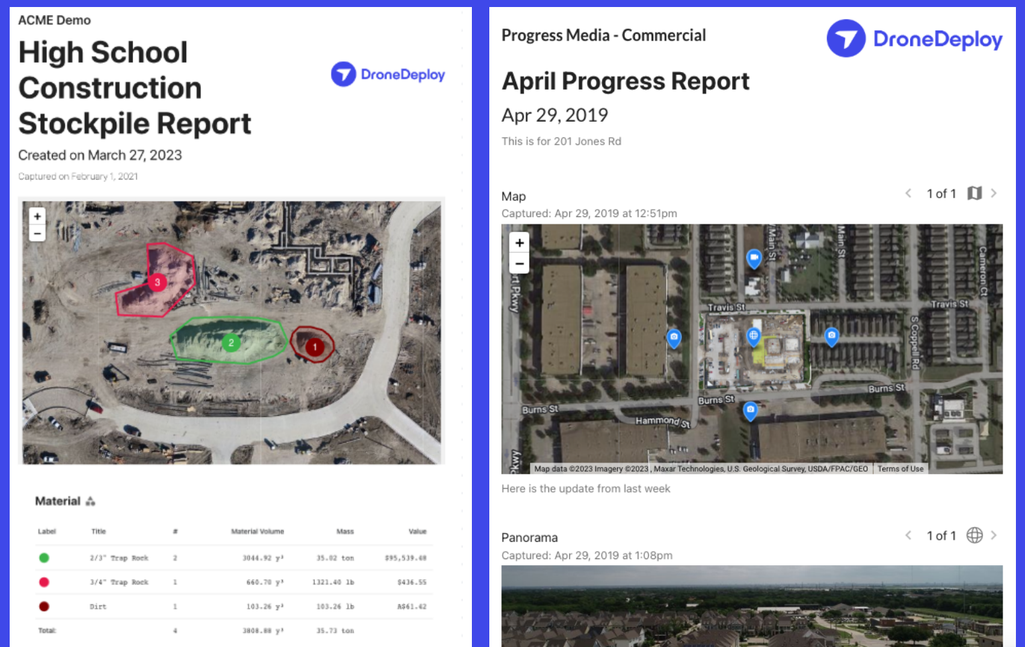


Company analytics

Enterprise & project dashboards

Use DroneDeploy's Enterprise Dashboard to see how frequently, and where, your interior images are being captured and viewed on projects across the company.





Automated reports

Progress Photo & stockpile reporting

Automate reporting from DroneDeploy to send to external stakeholders. You can adjust both the interval of reporting and the people the data gets sent to.

Robotics

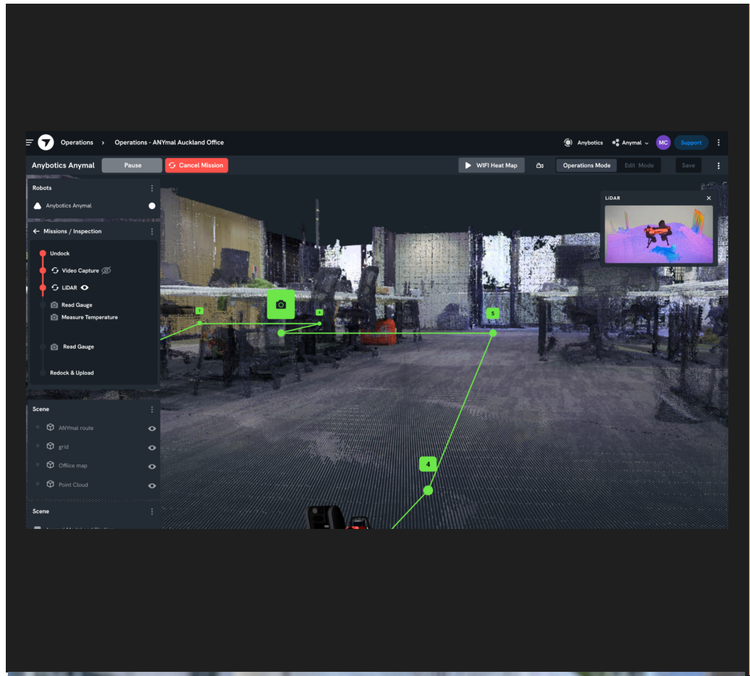
Ground robots are an increasingly popular tool for reality capture on construction sites.

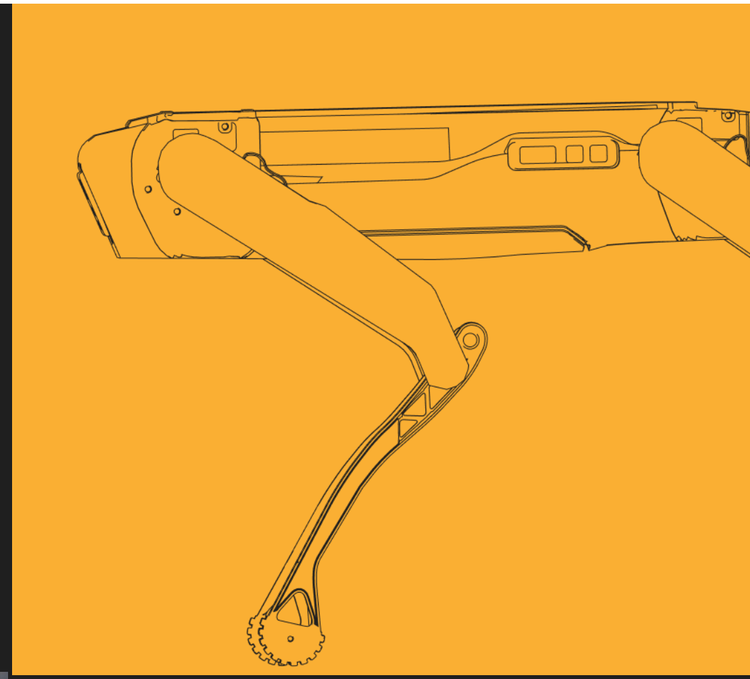
With DroneDeploy Robotics, you can:

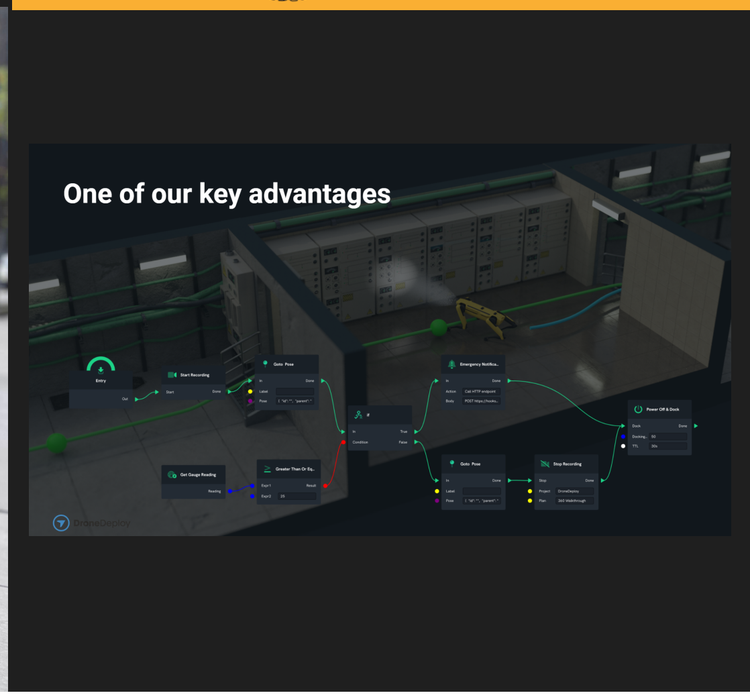
- Capture high-res images of building interiors
- Carry multiple sensors (LiDAR, 360, PTZ)
- Automate data capture missions 24/7
- Upload data to the cloud for analysis
- Track changes in buildings over time
- Compare point cloud data with BIMs

Robots can capture LiDAR approximately **16x faster than terrestrial scanning.** This can have a major impact on inspection times.

For example, Turner Construction is using DroneDeploy and Boston Dynamics' Spot to **cut site inspection times by 95%.**







DroneDeploy

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