Briar Chapel has nearly 1,500 homeowners, with approximately 10 new homes being occupied every week, according to Newland Senior Project Manager Lee Bowman.
Photo courtesy of Newland Communities

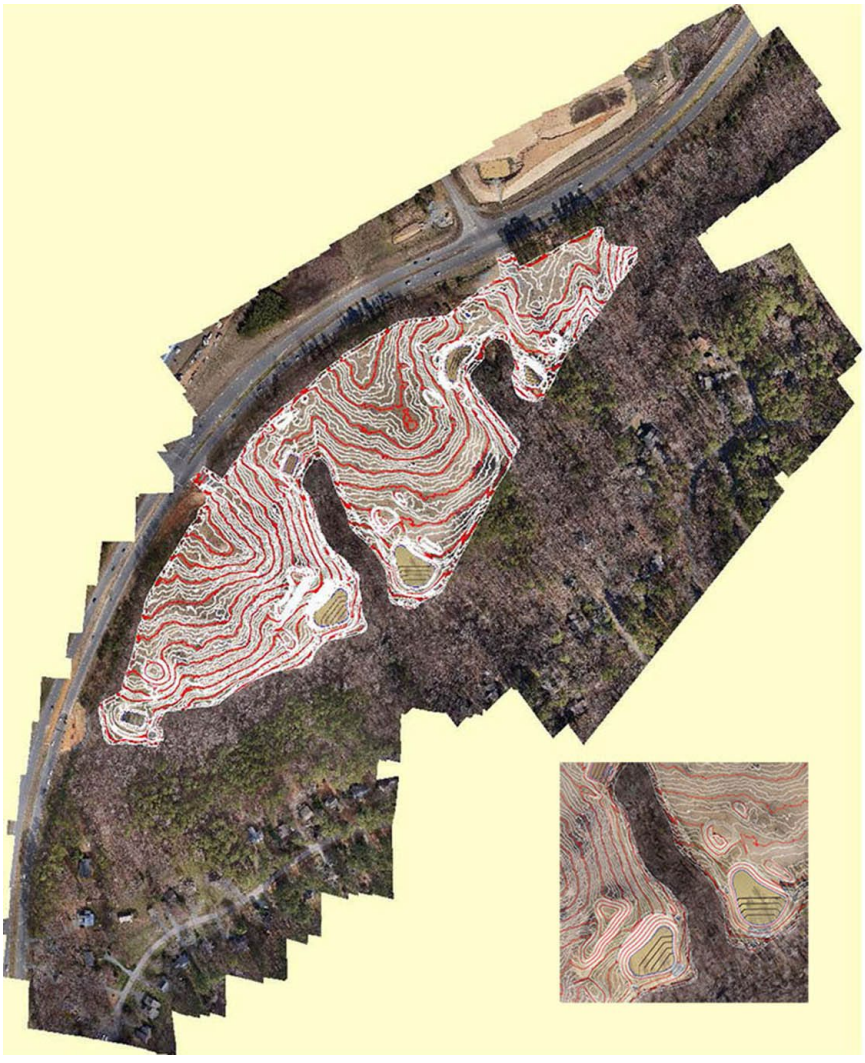
Rapid-Response UAS Keeps Construction on Schedule and Prevents Earthwork Overages

On a large development site, slight discrepancies in elevation can throw off earthwork volume estimates by tens of thousands of cubic yards. What looks small on paper becomes massive in the field.

McKim & Creed, Inc.—an ENR Top 500 engineering, surveying and planning firm— faced this situation when verifying elevations in Briar Chapel, a 1,600-acre master planned community in Chapel Hill, North Carolina. Developed by Newland Communities, Briar Chapel is one of the largest green residential communities in the Triangle (Raleigh/Durham/Chapel Hill) area. McKim & Creed is providing civil / site engineering and surveying services for the community.

Last spring, when the initial clearing was completed on a 25-acre commercial site within Briar Chapel, McKim & Creed surveyors were called in to verify elevations. An aerial photogrammetry survey of the entire community site had been conducted by another company several years earlier, and McKim & Creed needed to verify the

BY CHRISTIAN **STALLINGS**



This image was created so that Newland could visualize both the contours as well as the high-resolution ortho. (Inset) At 5 cm, the ortho showed exquisite detail. Capturing the data using conventional surveying methods would have taken approximately two days in the field with a two-person crew. UAS captured this same data in a few hours with the help of a one-person crew to provide ground control points.

accuracies. "As we prepare engineering design on each individual phase of the project, we have our survey crews do field checks of spot elevations to make sure the current grades still match the old survey," explained Chris Seamster, RLA, McKim & Creed's project manager for Briar Chapel.

In their field checks, the surveyors discovered some variances, ranging from a few inches to over a foot, between their data and the existing aerial survey. "The discrepancies were not consistently low or high; they were just varied," Mr. Seamster commented. "The original aerial survey was done with full tree cover, which can sometimes skew survey data. In the other company's defense, it was probably within their contracted tolerance."

Even so, once construction began the slight differences on paper could quickly turn into mountains of wasted dirt. For Newland—a leader in sustainability, green building and open space—waste is not an option.

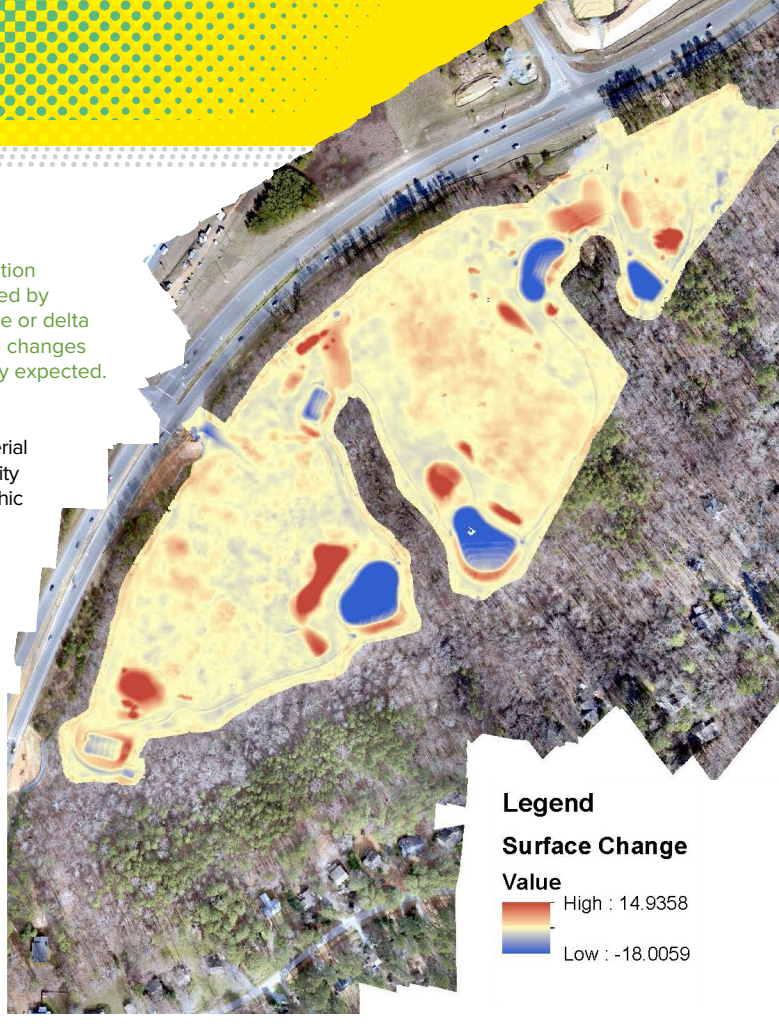
Because construction was imminent, the team needed a quick, reliable and cost-effective way to verify the elevations. Flying the site again would take too long and be too expensive. "The main things were time and the ability to provide quick results," said Mr. Seamster.

That's when the idea to use unmanned aerial systems (UAS), also known as drones, took off. UAS achieves the 5-cm data accuracy of aerial photogrammetry, but data can be collected much faster and more cost-effectively on sites that are less than one square mile. "We saw an opportunity to try out drone capabilities in our type of industry. In our partnership with McKim & Creed, we were trying to find another way to be more efficient, manage the whole design-build process, and be integrative. Hopefully it would be quicker," said Lee Bowman, senior project manager with Newland.

McKim & Creed's UAS team quickly deployed to the site, and a full survey of the site was performed within a few hours. The next day, Newland was presented with an updated survey CAD file of the topo, a high-resolution ortho photo, a classified point cloud of the bare earth, and a change detection analysis to compare the two surveys. The earthwork estimates were adjusted as needed and construction commenced on schedule, with no wasted time, money or fill.

"UAS is increasingly becoming a very attractive tool for land development. The conditions are ideal because there are no features to obstruct the surface, and we can easily conduct repeat visits to monitor progress," explained Mr. Seamster.

This image depicts the difference between the existing surface information and the surface information created from the drone. This is accomplished by subtracting one surface from the other and then reporting the difference or delta of the two surfaces. Newland was able to use this to determine that the changes from the previous surface to the new surface were in line with what they expected.



Concluded Mr. Bowman, "Getting the information that fast saved us money in the end."

Christian Stallings, CP, is responsible for overseeing LiDAR production operations at McKim & Creed, Inc. He holds a master's in geographic information technology and a graduate certificate in remote sensing from Northwestern, and extensive instruction in advanced LiDAR data processing and advanced production workflow from Penn State.

McKim & Creed is an employee-owned engineering, surveying and planning firm with more than 400 staff members in offices throughout the U.S., including North Carolina, Florida, Virginia, Georgia, Texas, and Pennsylvania. McKim & Creed specializes in airborne and mobile LiDAR/scanning; unmanned aerial systems; subsurface utility engineering; hydrographic and conventional surveying services; civil, environmental, mechanical, electrical, plumbing, and structural engineering; and industrial design-build services for the energy, transportation, federal, land development, water and building markets. For more information about McKim & Creed, visit www.mckimcreed.com.