



Project Summary

Organization

CEDARVILLE Engineering Group, LLC

Solution

Government

Location

Coatesville, PA, United States

Project Objectives

- Deliver an accurate 3D terrain model to support the redevelopment of Coatesville's largest brownfield site.
- Challenge traditional survey methods to generate a 3D reality model that allows users to visualize and measure topography and ground conditions for planning and design.

Products Used

ContextCapture

Fast Facts

- The comprehensive 3D model of the brownfield area is a valuable resource that the city can use for related economic planning and development projects.
- Reality modeling drove the success of this project to the extent that CEDARVILLE has embraced the use of ContextCapture for future infrastructure projects.

ROI

- Using ContextCapture, CEDARVILLE generated a high-resolution 3D reality model from more than 750 aerial photos, site photographs, and old survey data in mere hours.
- The flexibility and interoperability of Bentley software enabled CEDARVILLE to overcome traditional survey restraints and produce an accurate 3D reality mesh of the constrained footprint, eliminating the need for costly and risky on-site visits.
- The 3D terrain model provided the necessary details to help city planners and engineers accurately calculate 22,400 cubic yards of stockpile fill, saving significant costs on otherwise purchased clean fill.

ContextCapture Underpins the City of Coatesville's Largest Brownfield Redevelopment

CEDARVILLE Engineering Group Produces Accurate 3D Terrain Model Eliminating the Need for Costly On-site Surveys of the Constrained Footprint

Planning Redevelopment of a Former Industrial Site

Coatesville, the poorest community in Chester County, Pennsylvania's wealthiest, has suffered from the exportation of manufacturing and industrial jobs that have left a once thriving steel-producing city struggling to prosper amid a degrading infrastructure. To facilitate economic development, the Coatesville Redevelopment Authority (RDA) is working to rehabilitate commercial, residential, and industrial facilities that are now brownfield sites. As part of its interest in promoting the community redevelopment and sustainable growth, CEDARVILLE Engineering Group (CEDARVILLE) provided at no cost to the city or RDA conceptual design and planning services for a large brownfield redevelopment project known as "The Flats."

To deliver 3D conceptual design plans, CEDARVILLE needed to survey existing site conditions of the former steel-mill location. Spanning 30 acres, "The Flats" encompasses abandoned foundations from demolished industrial structures, hazardous materials, and soil contamination, and is subject to railroad intrusions and floodplain vulnerability. These conditions made it expensive and potentially dangerous to perform a traditional on-site survey and required the project team to consider alternative solutions to address the survey restraints. With special procedures and permits needed to enter the site, "it could be a USD 40,000 effort to get a traditional survey," commented April Barkasi, founder and president of CEDARVILLE. Given the restricted site access and detailed analysis necessary amid a modest budget, CEDARVILLE needed accurate, scalable software to safely and cost-efficiently capture a 3D model of the existing terrain conditions for effective redevelopment planning of "The Flats."

Reality Modeling Provides Optimal Solution

Challenging cost-prohibitive and risky conventional survey methods, CEDARVILLE explored numerous options to safely survey the existing terrain and accurately model the site. The team compiled various disparate data forms already available, determined additional data needs, and ultimately decided that photogrammetric reality modeling provided an optimal,



CEDARVILLE captured more than 750 aerial photos via a drone in a matter of 20 minutes, and using ContextCapture, incorporated base imagery to build a precise reality model.

cost-effective solution. This new technology allowed CEDARVILLE to survey the site using unmanned aerial vehicles (UAVs) to capture simple photographs, eliminating the need for an on-site surveys, and create an accurate model as a textured mesh.

Numerous reality modeling applications are available, but CEDARVILLE required an interoperable technology that could handle the capacity of the 30-acre brownfield site, the high-resolution images, and the existing data and metadata, which could then generate an accurate 3D mesh needed to work with design cross sections and analysis profiles. Based on these requirements, CEDARVILLE determined that Bentley's ContextCapture met the scalability, engineering precision, interoperability, and modeling criteria for the project.

"We wanted to generate topographic data as efficiently as we could," explained Barkasi. Using ContextCapture for reality modeling provided the flexibility and precision necessary for the team to timely and cost-efficiently deliver to the RDA its conceptual planning assessment and designs for the redevelopment of the former steel-mill site.

“Using the most innovative tools in technology, we have developed a process that efficiently creates 3D scalable models with precision and accuracy. Reality modeling is where infrastructure of the future begins.”

– April Barkasi, Founder and President, CEDARVILLE

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ContextCapture was instrumental in allowing local municipalities to visualize the state of “The Flats,” and the conceptual design plans for the brownfield redevelopment.

Automated Technology

Using a drone, CEDARVILLE captured more than 750 aerial photos in a mere 20 minutes, and with ContextCapture, the team incorporated base imagery from four perimeter ground-control points (GCP). The interoperability and photogrammetric reconstruction capabilities of ContextCapture allowed CEDARVILLE to leverage information and images from the drone, a handheld camera, the ground control points, existing survey data, and old photos to build a precise reality model, eliminating the need for an on-site inspection altogether. “There are parts of the property that were difficult to access. [Bentley] technology makes it almost like having boots on the ground – without having boots on the ground,” stated Coatesville’s City Manager Michael Trio.

Furthermore, the flexibility and interoperability of ContextCapture made it much faster for CEDARVILLE to collect the data, and to accurately illustrate that data to the city of Coatesville. The software automated the reconstruction of the site model in just hours. No manual modeling of the structures or the terrain of the project site was necessary. Using Bentley’s reality modeling application to automatically produce a geo-referenced 3D model reduced risk, ensured safety, enhanced decision making, and accelerated buy-in from local municipalities. The project team was able to quickly and accurately document the current conditions of “The Flats” and then present conceptual plans to demonstrate the type of reuse envisioned for the brownfield, resulting in a significant time savings for the city.

Accurate 3D Reality Mesh Facilitates Engineering and Optioneering

With ContextCapture, CEDARVILLE produced a multi-resolution 3D reality model in a file size nearly 30 percent smaller than a point cloud, which enhanced the overall processing power and responsiveness of the data when manipulating the model. Project designers could interactively move within the model to achieve desired grading for drainage and permit compliance for optimal planning and redevelopment. CEDARVILLE leveraged the visual value of the accurate

surface model to articulate its recommendations and findings for design options, grading, and infrastructure planning. The texturized mesh provided a complete visual rendition of the project, easily recognized and usable by the team, the client, and the stakeholders.

More specifically, the 3D terrain model generated by ContextCapture enabled easy volumetric calculations to determine the amount of fill to complete a two-foot overflow cap for the mitigation of the brownfield area. Using the model, city planners and project engineers accurately calculated the presence of 22,400 cubic yards of stockpiled clean fill, demonstrating that enough stockpiled material existed on-site to cap over seven acres of the 26 acres within the city boundary, an amount that exceeds required zoning provisions for the parcel. Barkasi commented, “Bulk clean fill ranges from USD 8 to USD 20 per cubic yard, which represents a huge cost benefit.”

Finally, the reality model provided CEDARVILLE designers with excellent information to establish the stream alignment and profile necessary prior to extracting and exporting cross sections to HEC-RAS to perform the required floodway analysis. Structural details from the abandoned mill foundations and bridge structures were clearly illustrated in the extracted cross sections, enabling CEDARVILLE engineers to optimize analysis, minimizing the impact of the new grading over the floodway, and overall determine viable options for redevelopment.

Driving the Future of Reality Modeling

Initiating the use of ContextCapture reality modeling technology on “The Flats” brownfield redevelopment project proved successful for CEDARVILLE and Coatesville. Not only did this approach save significant time and money, the visually realistic, dimensionally accurate, highly detailed 3D model facilitated engineering, enhanced decision making, and accelerated stakeholder buy-in critical for effective economic redevelopment of the land. The reality model presents a comprehensive birds-eye view of the property, with reliable field data, providing a strategic advantage in developing a prospectus for potential investors, and will continue to provide value to the city throughout planning and design on related economic development projects. Using the model has already secured additional grants and funding from various agencies for the intersection and roadways aligned with the “The Flats” redevelopment.

Based on its successful launch of reality modeling in Coatesville, CEDARVILLE already has expanded the role of the new technology, using it to address townhome community drainage problems and plan sidewalks along rural roadways. With several upcoming projects, CEDARVILLE plans on using ContextCapture with the hopes to achieve similar results. “Using the most innovative tools in technology, we have developed a process that efficiently creates 3D scalable models with precision and accuracy. Reality modeling is where infrastructure of the future begins,” stated Barkasi.