Reality Modeling Drives Efficient Design,
Management of Anderson Road Quarry

Bentley’s Integrated Solution Enables 4D Construction Process

Accommodating a Soaring Population Growth
To support the surge in economic development and population, Hong Kong has invested in numerous large-scale infrastructure works and new building structures. For more than 50 years, Anderson Road Quarry supplied aggregate, asphalt, stone, and concrete for construction programs in Hong Kong. Now a vacated site, Hong Kong’s Civil Engineering and Development Department (CEDD) has initiated a USD 1 billion project to develop the quarry in response to the acute housing shortage, the result of rapid population growth. The quarry site offers 40 hectares of land to construct approximately 9,400 private and subsidized housing flats to accommodate a planned population of 25,000 people.

AECOM was retained as the engineering consultant for sustainable infrastructure design, including site formation, road improvement works, pedestrian connectivity facilities, underground utilities, and housing estates. AECOM needed integrated BIM advancements and reality modeling technology to optimize planning and construction efficiency, streamline workflows, facilitate stakeholder communication, and meet client reporting requirements. “Based on the complex nature of the project, its variety of infrastructure, and large-scale site formation, we have selected a comprehensive and appropriate package of Bentley solutions to help manage the project more efficiently,” explained Ivan H.K. Tsang, vice president at AECOM Asia.

Extending the Scope of Reality Modeling
Beyond creating visualizations, AECOM understood that reality modeling provides a comprehensive record of a site’s current conditions that can be utilized in the future. Leveraging Bentley BIM methodology and reality modeling capabilities, AECOM partnered with Earth Solutions to implement a Site Data Management Solution (SDMS), using ContextCapture as the foundation. This innovative construction management solution extended the function of reality meshes from visualizations to more informative uses to achieve a full 4D BIM methodology approach. The ability to add information, such as key construction dates, images, and BIM renderings, to specific points in the reality meshes optimized
planning and construction. By automatically overlaying models, the SDMS highlights locations or changes in height to visualize works in progress and cut and fill volumes for easy interface of earthworks balance, all in the same platform.

The use of reality modeling for topographic surveys and photo recordings saved a total of 55 resource-days per month and using the SDMS for automating and processing data saved over 200 resource-days. The combined solution streamlined workflows and improved communication among the team and with stakeholders, minimizing rework and significantly reducing project costs.

**Integrated Solution Facilitates Synergy**

With different disciplines required for the site and infrastructure development, it was necessary to have accurate collaboration and information sharing among the team and with stakeholders. The mass quantity of project data was managed and analyzed in ProjectWise; that information was attached to reality meshes in SDMS and on-site building contractors and team members accessed the data through their mobile devices. This set-up enabled any conflicts regarding site boundary and foundation works to be identified and resolved prior to construction for more careful planning. The enhanced information mobility enabled fast, temporary traffic diversion arrangements and minimized impact to traveling citizens. Integrating LumenRT to simulate construction progress and produce animated visualizations helped communicate progress to the public adjacent to the site.

Having an effective, integrated construction management solution optimized collaboration among AECOM, the contractor, the client, and the public for a holistic project approach. The technology enabled AECOM to work closer with the contractors for more efficient supervision and allowed the building contractors to anticipate and solve problems in advance. The use of reality meshes provided more precise and accurate site monitoring through detailed visualizations, enhancing client decision making and facilitating citizen understanding of the construction progress.

“By creating synergy between our expertise in project management and the further utilization of reality modeling and BIM, we successfully increased productivity and safety,” Tsang said.

**Smart Community Model to Yield Future Smart City**

Anderson Road Quarry will serve as the fundamental model to develop other communities in Hong Kong that, when combined, will gradually form the smart city of Hong Kong. Although the model was populated with facility data for this specific project, it can be integrated with other data sources for uses in other cases, ranging from energy efficiency and environmental sustainability analyses to generating master plans for future facility, transportation, utilities, and security plans. An innovative milestone in Hong Kong’s civil projects, Anderson Road Quarry was the first project to apply Bentley’s BIM advancements and reality modeling capabilities to traditional construction work, revolutionizing the construction industry in Hong Kong.

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