



Project Summary

Organization:

Lebuhraya Borneo Utara Sdn. Bhd.

Solution:

Road Asset Performance

Location:

Sarawak, Malaysia

Project Objectives:

- To leverage data captured during design and construction and develop a sustainable asset management solution in accordance with government objectives.
- To set a benchmark for government road projects, optimizing efficiency and performance of the state highway by establishing digital processes.

Project Playbook:

AssetWise®, ContextCapture, ProjectWise®

Fast Facts

- LBU integrated ProjectWise and AssetWise to deliver an efficient asset performance and management system.
- ContextCapture helped establish reality context for the 1,060-kilometer highway.
- The team established a digital twin to achieve a sustainable asset maintenance and management solution.

ROI

- LBU's connected data environment facilitated data integration and streamlined access to reliable information.
- Using AssetWise as the foundation for an integrated highway management system enabled LBU to mitigate risk, increase operational efficiency, and ensure regulatory compliance.
- LBU's digital twin provides immersive visualization and analytics to support decision-making and optimize cost, operations, and maintenance.

LBU Integrates BIM, Reality Modeling, and GIS Data to Deliver Digital Twins for Highway in Malaysia

Leveraging AssetWise in Bentley's Connected Data Environment Optimizes Asset Performance and Management

A Benchmark Highway Initiative

In 2014, the government of Malaysia announced a plan to fully develop and upgrade the two-lane trunk road across Malaysia's largest state, Sarawak, to accelerate socioeconomic growth in East Malaysia. Located on the island of Borneo, the new toll-free expressway is to be named the Pan Borneo Highway. The highway stretches 1,060 kilometers through undulating, rainforest terrain and protected reserves between Telok Melano and Merapok. Construction began in 2015 and when fully completed in 2021 the Pan Borneo Highway will be the state's transportation backbone, playing a major role in opening economic corridors and opportunities for residents and local businesses.

Development of phase one of the MYR 16.15 billion government-funded roadway initiative involved constructing a four-lane dual carriageway over a length of 786 kilometers. Lebuhraya Borneo Utara (LBU) is the project delivery partner on this project, facilitating lifecycle digitalization to meet strictly imposed government requirements. LBU selected Reveron Consulting, a Bentley Channel Partner, to implement Bentley solutions for design, construction, and operations of the Pan Borneo Highway.

Throughout design, planning, and construction, LBU initiated BIM workflows for the first time on a Malaysian road and highway project. The team used ProjectWise to create an open, connected data environment to support the implementation and integration of BIM, GIS, and reality modeling processes. Now, LBU is responsible for expanding the application of BIM and big data, leveraging design models and construction information to establish a digital platform to manage operations and maintenance. As the largest infrastructure project in Sarawak, its pioneering digital methodologies means that the Pan Borneo Highway serves as a benchmark, capitalizing on BIM and advanced technology strategies for more efficient delivery and optimal asset performance.

Developing a Sustainable Technology Solution

LBU digitalized planning, design, and construction of the Pan Borneo Highway, accommodating government standards to

deliver best value while retaining and training local contractors and resources to build expertise using advanced technology for construction. Having leveraged Bentley applications throughout construction, including for construction monitoring, the next phase focused on operations, maintenance, and asset management to ensure the highway meets its current and future functional requirements. "We had to look at a sustainable solution 30 to 40 years down the line to ensure a reliable backbone for transportation infrastructure within the state, for the people, and needed a system that best fit within our digital architecture. AssetWise did [that]," said Ravi Koka, chief executive officer, Reveron Consulting.

Effective asset management starts with knowing where all the assets are located along the infrastructure. Using AssetWise, LBU integrated BIM information within GIS applications to produce highway information modeling for the entire 786 kilometers of phase one. With the first work package spanning 32.8 kilometers from Telok Melano to Sematan already complete, the team used the Bentley-based integrated highway management system to provide the government with verification of each roadway asset, including inventory, location, condition, and defect management along its length. Bentley's asset performance and management technology serves as a reliable platform to help LBU better plan for the operation and maintenance of the Pan Borneo Highway. With real-time visibility into asset status, easily accessible to the entire project team and government stakeholders, AssetWise provides a single source of truth for all asset data, facilitating an efficient and sustainable solution to optimize highway operations.

Leveraging Bentley's Connected Data Environment for Asset Management

During the phase-one delivery stage, LBU used ProjectWise to establish a connected data environment, which was used to manage the design and construction data generated on the project, enabling teams to simultaneously access and work on information from various sources. It also facilitated early clash detection and resolution that helped avoid unnecessary rework and simplified construction management. Having already established the connected data environment with ProjectWise,

“AssetWise provides industry-leading tools for network management and asset inventory, coupled with unparalleled capabilities in the field of road asset maintenance. AssetWise helps to optimize operations and maintenance through more informed decisions based on the data in its connected data environment”

– Ir. Safuani Abdul Hamid, Chief Executive Officer, Lebuhraya Borneo Utara, Malaysia

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LBU introduced Bentley's AssetWise enabling the team to link the valuable design and construction information with asset tags to track and manage change throughout project delivery.

Starting with the completed 32-kilometer span in January 2019, LBU began integrating construction data from ProjectWise into AssetWise for its ongoing operations and maintenance. Providing seamless integration with a connected data environment that spans project delivery and operations unlocks the full potential of the organization's digital data. “We integrated ProjectWise and AssetWise seamlessly so that the asset management system can leverage on every detail that has been captured [in the connected data environment] during design and construction,” said Koka.

The connected data environment is central to LBU's project information management system and highway information modeling, key components for the delivery and management of assets during operations and maintenance of the highway. AssetWise leverages a connected data environment to facilitate interoperability of multiple data sources, providing a common view of accurate and reliable data and delivering insight when needed during operations, maintenance, and for future upgrades. Bentley's asset performance and management software enables LBU to mitigate risks, increase operational efficiency, and ensure regulatory compliance in the highway's asset management.

The improved information flow and seamless integration allows the collection, analysis, and control of relevant asset information. There is no need to transfer data from one system to another, which might introduce unnecessary risk. The data remains accurate and reliable, and accessible in real-time for senior management to make strategic decisions and policies, which can be more efficiently translated into operational programs during the implementation stage. The result is efficient and economic management of the Pan Borneo Highway network that is expected to optimize best practices.

Digital Twins Key to Efficiency

In addition to seamlessly integrating design and construction information for asset management on the highway, LBU is also using ContextCapture to incorporate the reality context for lengths of existing roads on a highway network built over the last 10 to 15 years. Leveraging images captured using unmanned aerial vehicles, LBU has built an accurate record of asset information for the entire 1,060-kilometer Pan Borneo Highway. “The key to efficient management and operating [of] this highway is the insight I have to what's happening on the ground,” said Koka. Capitalizing on reality modeling, as well as digital processes and workflows that are already implemented within the connected data environment, LBU is using contextual information and a digital twin approach as the basis for operational decisions. Bentley's integrated applications along with its connected data environment provide a complete technology solution that enables the creation of a digital twin.

With AssetWise at its core, a digital twin provides a single reliable source of asset information necessary to support ongoing asset performance and management.

LBU's digital twin uses Bentley technology to combine BIM, reality modeling, and GIS data to provide immersive visibility and analytics for timely decision-making and improved infrastructure asset performance. The digital twin integrates a road information system, a bridge management system, and a maintenance management system that are specifically developed and designed to include development of nonconformance reports. The road information system also includes a cyclical work program and customized interim payment certificate for managing work orders. It also includes a web-based GIS, mobile-based field data collection for inventory of assets and their conditions, a pavement management system in conjunction with HDM-4, together with real-time dashboards and reporting.

LBU engineers, maintenance and management teams, and government stakeholders have access to reports, dashboards, and performance data via a dynamic digital twin to ensure safety, reliability, and efficiency. Leveraging Bentley's connected data environment, including ProjectWise and AssetWise, to create and maintain its digital twin is key to driving LBU's entire digital framework for managing data, building the asset, integrating visualizing all information in a dashboard for the government to monitor and ensure LBU meets its commitments.

Digitalization Promotes Industry Success

The Pan Borneo Highway is not just another infrastructure initiative; it is a technology advancement that is promoting digitalization efforts to expand opportunities within the roadway industry beyond Malaysia. LBU is encouraging and training future local engineers and designers to use BIM and digital technology for infrastructure. The organization is playing a significant role driving economic opportunities in East Malaysia using digitalization, leveraging Bentley's asset performance and management technology within a connected data environment, to benefit the public and promote industry success.

“Using BIM across the asset lifecycle of the Pan Borneo Highway Sarawak readies this transportation backbone for more digital applications to be used, such as Internet of Things (IoT) and big data, to better manage future traffic flows, and contribute to a balanced economic development for Sarawak,” stated Nor Zalida Ahmad, head of communications at LBU. With such potential, a digital twin can be used to determine traffic patterns and where people are moving to help balance economic and social developments, ensuring that the state's continued good progress. As the benchmark for government road projects in Malaysia, providing increased efficiency and cost-effective processes using digital workflows, the Pan Borneo Highway is setting the stage for future highway operations, maintenance, and asset management.