Bentley
Advancing Infrastructure

The Wave

Empowering digital delivery and lifecycle excellence

Start

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Revisiting digital delivery for project success

The Wave is a legacy-defining rail investment for Queensland, forming a crucial part of the 2032 Olympics infrastructure legacy. The business case specifies rigorous planning, design, construction, commissioning, and operational asset management milestones, including comprehensive environmental and stakeholder engagement. These are supported by a commitment to progressively integrate digital workflows and information handover at each phase, in alignment with local and international best practices.

Progressive, standards-compliant digital delivery and asset data handover are a central part of delivering the project's community and operational objectives.

For any organisation tendering on The Wave, Bentley's comprehensive and proven technology suite ensures interoperability across the project's planning, design and engineering, construction, handover, and operations. This will help to deliver risk-controlled, transparent, compliant, and truly future-ready rail infrastructure for Queensland.

Solving digital delivery across the lifecycle

Bentley’s market-leading rail engineering solutions are specifically designed to address the demands of modern rail infrastructure. Our open, federated, and standards-compliant technology stack supports every phase of The Wave’s lifecycle: from confident planning and collaborative design to safe, transparent construction, and information-rich asset operations.

Founded more than 40 years ago as the infrastructure software company, we are the principal technology partner for many state agencies and departments of transport worldwide. We understand the unique challenges faced by rail projects and how Bentley technology can help to solve them.

Planning phase challenges

Alignment and corridor planning

Updating and refining preserved transport corridors, responding to changes in land use, engineering, technical standards, and environmental and cultural heritage constraints, as well as community feedback across a rapidly growing region. The long, terrain-crossing nature of The Wave, combined with the large number of parties involved, creates a range of subsurface and geotechnical risks.

Community and stakeholder engagement

Designing for future urban growth, active transport options, and ensuring broad public trust, with requirements for transparent information sharing and integration of diverse feedback into the planning process.

Scope and standards management

Accommodating a dual-track, high-speed design with future-proofed stations for both Olympic-scale demand and legacy community benefit – while embedding evolving government digital and sustainability standards from the outset.

Economic and cost certainty

Addressing rising construction and digital enablement costs, and demonstrating value for money and cost control to both local and national stakeholders.

Design phase integration challenges

Managing subsurface complexity

The long terrain-crossing nature of The Wave poses geotechnical design issues for project delivery teams, combined with the need to connect geotechnical data, interpretative modelling, and numerical analysis.

Federated, multidiscipline modelling

Managing a complex design ecosystem, with multiple designers, specialists, and stakeholders needing to produce, coordinate, and validate discipline-specific models (subsurface, geospatial, civil, structural, mechanical, electrical, signalling, etc.) within a common standards-compliant data environment.

Open data standards compliance

Aligning with ISO 19650, Queensland, and national BIM standards and ensuring interoperability for downstream asset management and operational use.

Stakeholder collaboration

Providing real-time, transparent data access and coordination tools to internal and external project partners, breaking down legacy silos.

Construction phase digital delivery challenges

4D planning and scheduling

Coordinating staged construction activities, interface management, sequencing, and logistics across a live rail corridor and complex urban environments, where the impacts of deviations or late interventions are costly.

Site progress, transparency, and safety

Managing and communicating construction progress, site productivity, deviations, site records, and field data in real time to minimise risk, rework, and incidents.

Data capture and as-built validation

Ensuring that as-constructed asset data, models, and documents are returned to the shared CDE for assurance, commissioning, and eventual handover.

Contractual compliance

Demonstrating ongoing compliance with risk, quality, and safety requirements throughout construction. Ensuring that requirements and compliance evidence are embedded and traceable throughout the project delivery process so that assurance activities are not delayed until end-of-phase reviews.

Commissioning and handover challenges

Integrated asset data transfer

Preparing for seamless handover of federated, verified information that complies with operator-specific requirements, and minimising costly conversion, or data loss.

Progressive verification

Meeting assurance, safety, and regulatory requirements which mandate that data, models, and documentation are up-to-date, accurate, and sufficient at each handover stage, as opposed to incomplete “dumped” information at the project’s end.

Operational readiness

Ensuring that all operating agencies and maintainers can readily ingest and use the data for commissioning, operations, and long-term asset management.

Operational and asset management challenges

Digital enablement for ongoing asset operations

Providing maintainable, accessible, and accurate asset data, supporting predictive and condition-based maintenance, and integrating with enterprise asset management systems.

Information updating and renewal

Supporting ongoing updates and continuous improvement of asset data over the lifecycle, aligned to operational insight, new capital works, and user feedback. Configuration management to maintain system performance and functionality.

Stakeholder and community transparency

Maintaining open channels for operational performance, supporting ongoing community benefit realisation, and demonstrating the legacy value promised at the front end.

Cybersecurity and asset information protection

Managing the digital asset and information security risks that come with a fully digital-enabled and connected rail infrastructure.

The Bentley technology advantage

Our market-leading rail technology solutions, as well as those from Seequent®, The Bentley Subsurface Company, are designed to address the full spectrum of The Wave's challenges—empowering every phase of the lifecycle from confident planning and collaborative design to safe, transparent construction, and information-rich asset operations.

Bentley technology across The Wave lifecycle

Reset

Select a topic to read more ↘

Planning and design | Construction | Commissioning and handover | Operations and asset management

Image courtesy of WSP Australia

Excellence in design

Improve design efficiency and enable contractors to benefit from a more complete representation of the design.

Integrated multidiscipline design

Bentley's design portfolio offers dedicated applications for every infrastructure asset and discipline including civil, geotechnical, structural, mechanical, electrical, and rail engineering. These tools integrate seamlessly across Bentley's iTwin® platform—leveraging open standards and standard exchange formats (DWG, DGN, IFC, LandXML)—to ensure frictionless interoperability within Bentley's ecosystem and with third-party solutions. Our Rail Engineering Solution delivers automated, data-centric workflows, from 2D drawings to 3D models, for light, heavy, and high-speed rail networks, supporting track geometry, alignments, yard and station layouts, electrification, and earthworks. The open, common data environment links people, processes, and standards across disciplines, optimising design, reducing rework, and simplifying handover to construction teams for faster, more reliable project delivery.

Parametric design capability across our suite of design tools—powered by GenerativeComponents®—captures design intent through rules and relationships, enabling designers to quickly explore alternatives without rebuilding models. Geometry can be linked to logic so that changes ripple automatically—accelerating iteration, encouraging creativity, and ensuring consistency across complex projects. Constructors receive better designs that can be built better.

Python integration in MicroStation® lets users automate repetitive tasks, customise workflows and tap into thousands of open-source libraries. It boosts productivity, reduces errors, and makes advanced capabilities such as data analysis and AI accessible directly in the desktop design environment.

Subsurface and geotechnical design

The long, terrain-crossing nature of The Wave, combined with the large number of parties involved and the intense scrutiny associated with public funding, create a range of geotechnical, logistical, and collaborative issues for project delivery teams.

Investing in ground condition investigation reduces uncertainty, which reduces rework and disputes. Embedding digital geotechnical models early in the procurement process enables constraints to be identified, improves the pricing of risk, and promotes adaptive design.

Bentley subsurface solutions connect geotechnical data, interpretative modelling and numerical analysis, giving you an understanding of the underground that leads to better decisions, faster.

Project transparency across stakeholders

Transparent coordination and decision-making are foundational to project success, risk control, and community trust. Bentley's integrated environment addresses traditional silos by creating a single, trusted data ecosystem. Every participant in The Wave has continuous, role-appropriate access to the right information—ensuring clarity, accountability, and project momentum.

ProjectWise®

ProjectWise establishes a collaborative common data environment (CDE), providing a central, secure hub, and single source of truth for all design, engineering, construction, and asset information. Models, documents, and data from all disciplines and contractual partners are federated within ISO 19650-compliant workflows, which means that information is timely, traceable, and securely accessible by all authorised stakeholders, no matter their company or discipline—which also reduces project risk significantly. Dashboards and digital workflows enable relevant project stakeholders to maintain insights into status, changes and compliance throughout delivery, ensuring an efficient and effective transition into operations.

iTwin platform

iTwin technology extends ProjectWise by enabling real-time federation of multidiscipline 3D/4D models including input from BIM, GIS, and legacy systems. This allows for the instant visualisation, change-tracking, and analytics of every decision and update, providing clear transparency on status, issues, and accountability throughout the lifecycle.

Key features of ProjectWise CDE

Feature	Benefit
Federated discipline models	Retains design integrity and allows parallel, real-time collaboration
ISO 19650 BIM compliance	Fulfils Queensland Government contract and regulatory needs
Version control and audit trails	Enables progressive assurance and data accountability
Visual dashboards and change logs	Improves communication across owners/operators, designers and contractors
Secure and scalable cloud access	Supports geographically dispersed delivery ecosystems
Integration with asset management	Smooths eventual handover to operator enterprise systems

Better risk management

Risk management in rail projects is multidimensional and lifecycle-wide. Key to success is the early identification, visualisation, and mitigation of potential issues, ranging from schedule and cost overruns to safety, design conflicts, or regulatory non-compliance.

SYNCHRO™ digital construction

SYNCHRO brings 4D/5D planning and simulation to construction management, enabling the linkage of digital models to work schedules, resource plans, and site records. Project teams can visualise, simulate, and analyse work sequencing, site logistics, and access—identifying conflicts, optimising schedules, and planning appropriate mitigation.

Advanced model-based validation

SYNCHRO enables real-time validation, clash detection, and performance tracking. The integration with field data apps ensures that site events, deviations, and issues are captured and shared immediately with relevant teams, lowering the risk of compounded rework or safety incidents.

ComplyPro™ assurance platform

ComplyPro embeds risk assessment, issue tracking, and automated compliance dashboards into the model progression, enabling project-wide visibility of risk hot spots, requirements fulfilment, and change impacts as they develop, not after the fact. For example, London's Crossrail used ComplyPro to realise a 60% reduction in safety management costs and slashed hazard management time.

Better margin certainty

Margin certainty means removing or reducing key causes of cost and schedule overruns, including rework, programme slippage, inefficient coordination, and data loss at handover. Digital engineering, as enabled by Bentley's technology, directly supports this at all project phases.

Integrated, data-centric workflows

Digital models, federated in ProjectWise, are always current and accessible—supporting reliable quantity take-off, change order analysis, and programme forecasting.

Daily field progress and productivity tracking

SYNCHRO Perform allows real-time field-to-office tracking of daily productivity, site records, and earned value analysis, supporting data-driven progress measurement and intervention.

Automated reporting and change forecasting

Synchronisation of cost, schedule, and design changes allows rapid impact analysis. Programme leaders can understand consequences immediately, ensuring that potential margin erosion is noticed early and can be addressed quickly.

Bid differentiation with 4D visuals and data

Teams competing for contracts on The Wave can use SYNCHRO's 4D visualisations in tenders, bringing construction strategies to life, building greater procurement and sponsor confidence, and enabling realistic price and programme commitments supported by credible digital-execution plans. Quantity data can be extracted from design information quickly and easily, enabling accurate estimates to be produced in days, rather than weeks.

Ensuring trust, assurance, and data readiness for asset operations

Progressive assurance

The traditional approach of focusing compliance and handover efforts at the end of a project is incompatible with The Wave's complexity and digital requirements. Bentley enables progressive assurance—the continuous activity-level certification, validation, and documentation of compliance and readiness. This approach reduces project-completion risk, improves readiness for regulatory reviews, and enables a smoother, less adversarial handover to operations.

- **Structured process and data framework:** Assurance requirements are documented, their fulfilment is tracked throughout design and construction, and compliance evidence is dynamically linked to project activities and model elements.
- **Early issue resolution and change management:** All stakeholders can see assurance hot spots, risk areas, and outstanding compliance items in real time, enabling them to make informed collaborative decisions to resolve issues ahead of critical milestones.
- **Traceability and compliance evidence:** Each change or nonconformance is logged and tracked within the CDE. Evidence, such as inspection records, test results, and certifications, is linked to specific asset and model elements, supporting regulatory fulfilment and ISO 19650 data traceability.

Progressive handover

Progressive handover is a systematic, phased approach to transferring asset information from project teams to owner operators. By sharing and validating documents, models, and asset data throughout each project stage it ensures accuracy, completeness, and readiness for seamless integration into asset management systems. This continual flow of validated information builds trust, reduces operational risk, and prepares assets for efficient, compliant operation from day one.

- **Incremental information transfer:** Asset data covering documents, drawings, 3D models, asset registers, geospatial datasets, and more is created, updated, and submitted by project phase. Each data type is associated with physical entities such as facilities, systems, or components to provide context and enable traceability.
- **Progressive validation:** Information is continually validated and curated to maintain accuracy, completeness, relevance, and compatibility with evolving project requirements and asset management needs.
- **Project CDE:** The common data environment (CDE) is the project's dynamic digital backbone, supporting collaboration and secure sharing of information among contractors, consultants, and owner-operator teams.
- **Operational readiness and system integration:** By the time of final handover, all information is complete and ready for seamless integration into an enterprise asset management (EAM) system. Asset hierarchies and as-built records are already established, minimising operational compliance risks.
- **Risk reduction:** Progressive handover offers owner-operators transparency and continuous assurance, reducing the risk that missing or inaccurate information could negatively impact operations or compliance of the asset.

Better asset information to Queensland Rail

A central objective for The Wave is that information delivered at handover is immediately useable, accurate, and complete—enabling seamless transition to operations and whole-of-life asset management.

AssetWise® for asset information and management

Bentley's AssetWise platform is designed for the management of rail and transit asset information across all operational phases. It supports asset registry, tag and change management, spatially enabled asset and linear network analytics, and an integrated connected data environment, ensuring that all as-built and as-maintained data are accessible, visualised, and actionable in context. This is foundational for a digitally-enabled approach to reliability, inspection, and maintenance strategies.

Standards-compliant data for operations

AssetWise ensures that the handed-over data is not "dumped" or inoperable but structured, compliant to operator requirements, and ready for ingestion into enterprise asset management and maintenance systems, reducing the traditional "handover gap."

iTwin digital twin integration

Once models are federated, as-constructed and combined with sensor or operational data, The Wave's stakeholders will have a true digital twin of the infrastructure. This will support:

- Predictive maintenance and data-driven capital planning.
- More efficient, accurate inspections, and regulatory reporting.
- Real-time operational optimisation and asset performance tracking.

Outcomes from Bentley-enabled asset data delivery

Feature	Benefit
Fully populated asset information models	Supports digital maintenance and renewal planning
Accurate, dynamic, and updateable records	Improves operational efficiency and data-driven decisions
Integration with operator systems	Streamlines operational readiness and reliability
Platform for long-term predictive analytics	Lowers lifecycle cost and boosts community benefit

Artificial intelligence—we've got your back

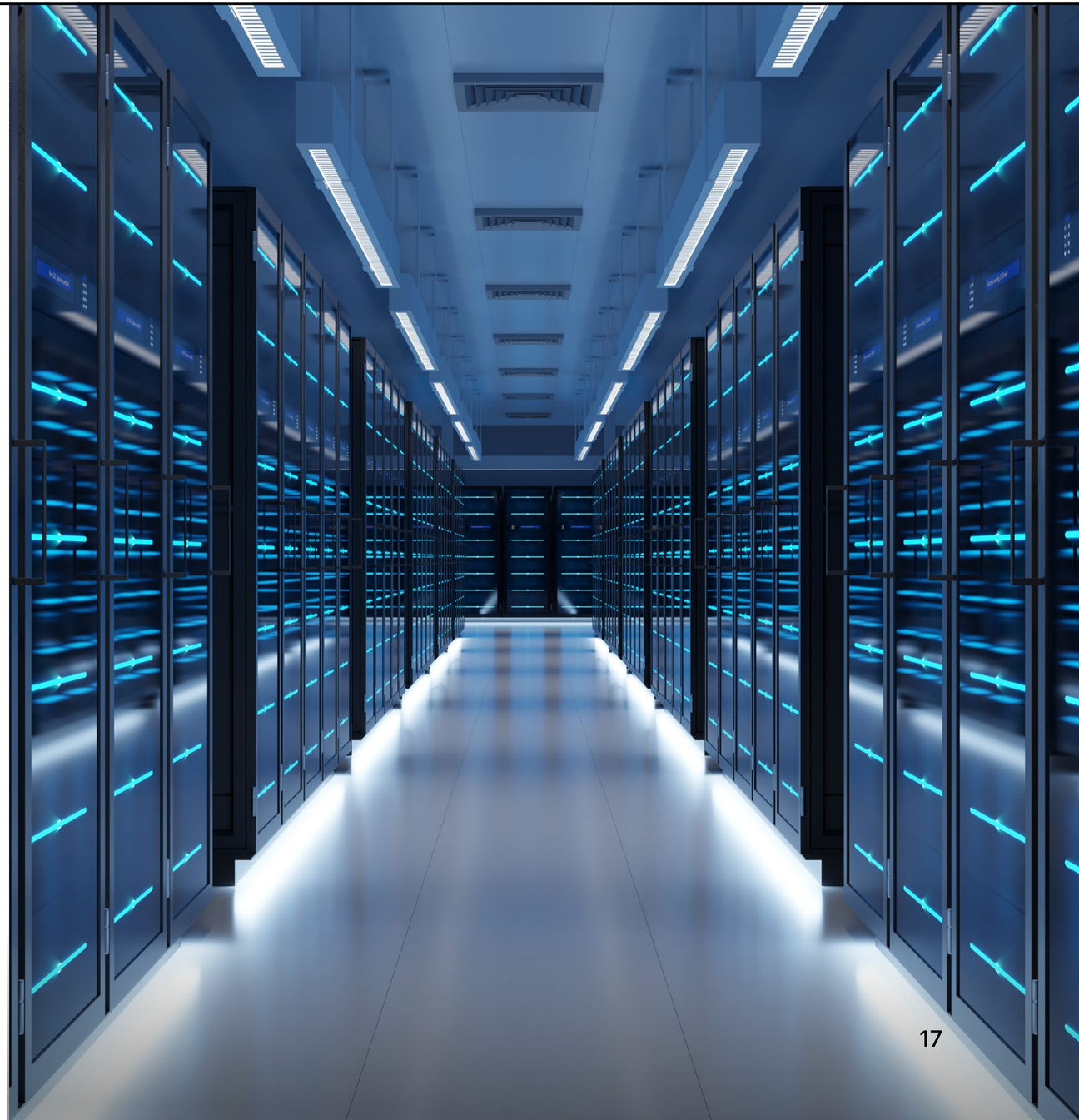
Bentley uses AI in software for automated design, predictive maintenance, and site-specific analytics. Our generative AI tools automate repetitive design tasks, optimise site layouts, and produce drawings to boost productivity; analytical AI identifies asset conditions from data, such as crowd-sourced imagery, to automate maintenance and predict failures before they occur. AI tools and services are being progressively added to and integrated across our software portfolio, which saves our customers from having to find their own way of doing so and helps them to maximise the value of AI in their work.

Across sectors such as transport, energy, water, and cities, Bentley combines deep in-house expertise with close collaboration alongside domain experts. This helps ensure that the AI being developed is not only technically capable but also contextually relevant and aligned with the needs of real-world projects.

However, as AI becomes more embedded in infrastructure workflows, it's critical to understand how vendors handle customer data and train their AI models. Bentley's core data principles are fundamental to the responsible use of AI. We consider it to be the foundation for the responsible development of AI and key to further strengthening relationships with our users based on trust and transparency.

We made a commitment to our users that their data will always be their data:

- You will always retain control of your data and will decide if and how it is used for AI.
- You will always have the final decision on contributing, or not contributing, your data to train models that benefit others.
- We will always share with you how we create AI models and the data that we used to develop them.



Demonstrated results in major rail projects

Theory is one thing, but what really matters is the practice. What happens when Bentley is asked to meet the challenges faced by major transportation projects in Australia and overseas? Here are some customer success stories in which we are proud to have played a part.

Demonstrated results in major rail projects

ACCIONA removes dangerous rail level crossings

The government of Victoria is removing more than 100 level crossings in Melbourne and rebuilding more than 50 stations to improve safety, reduce congestion, and allow trains to run more often. ACCIONA used SYNCHRO to create a 4D construction model of the project, enabling them to conduct virtual planning ahead of construction, minimise disruptions to the community, and align the team and stakeholders around a single plan.

Outcomes

- Easier data collection, issue tracking, and better team alignment.
- Reduced staging time by 67% and drafting requests by nearly 90%.
- Workers were always a safe distance from live rail lines.

Laing O'Rourke creates a digital twin of rail redevelopment

Laing O'Rourke and the Southern Program Alliance (SEPA) used SYNCHRO to create a 4D model to visualise the project and simulate construction activities on Melbourne's level crossing removal programme, enabling site teams to anticipate any issues.

Outcomes

- Developed construction staging plans more than 70% faster than using 2D diagrams.
- Compared with traditional methods of interface checking, the construction simulation improved visibility of the project by 50% and lowered the risk of clashes by 75%.

WSP drives Victoria's transport initiatives with level crossing removal

During Melbourne's level crossing removal programme, WSP developed a federated digital twin for design coordination and clash detection, as well as used gaming controllers to give stakeholders drive-through experiences of new stations, accessibility, safety, and precinct connectivity.

Outcomes

- Saved approximately 300 resource hours by working in a connected data environment.
- Reduced modelling time by 60%.
- Reduced bridge material use by 7% and lowered the overall carbon footprint by 30%.

Demonstrated results in major rail projects

North Western Program Alliance (NWPA) improves construction efficiency

NWPA is delivering three projects on Melbourne's level crossing removal project – docketing more than AUD 2.5 million of works each week. They use SYNCHRO to collect, document, and value a huge number of hours worked and materials used, ensuring that projects are meeting cost and productivity targets.

Outcomes

- Accelerated the collection and availability of daily costs by 80%.
- Reduced site engineers' time spent handling dockets and data by up to 20%.
- Produced industry-leading reductions in construction emissions through rigorous management of sustainability data.

SMEC uses collaborative design on the North East Link in Melbourne

SMEC was awarded design and construction services for the entire project – with safety, functionality, and sustainability at the forefront. Working with global teams, they used MicroStation and ProjectWise to create designs in a collaborative shared information environment.

Outcomes

- 6,450 fewer hours worked, saving AUD 300,000.
- Integrated work between design and construction teams.
- Fewer design errors and better risk management.

Why Bentley is essential for achieving The Wave's digital ambitions

The Wave rail project is Australia's new benchmark for digitally-enabled transport infrastructure. The Queensland Government has set the direction emphasising open, federated, and standards-compliant digital delivery across all stages, from initial planning through decades of safe, reliable operation.

To realise these ambitious goals, project tenderers and delivery partners must embrace best-in-class technology and digital workflows that deliver:

- Unmatched transparency and collaboration across disciplines, contractors, and lifecycle stages.
- Robust, continuous risk management and compliance – moving from reactive to progressive assurance.
- Certainty of pricing, programme, and quality through digital-first delivery and real-time analytics.
- Complete, standards-aligned and operationally ready asset information at handover, powering ongoing digital enablement and community benefit.

Bentley's rail design, construction, information management, and asset performance platforms are uniquely designed, proven, and ready to deliver across these critical pillars for The Wave. Their open, federated, and standards-driven approach enables tenderers and delivery teams to meet and exceed Queensland's objectives—unlocking long-term value, resilience, and benefit for all stakeholders and the communities The Wave will serve.

For any organisation tendering or proposing on The Wave, Bentley's integrated technology suite will help to deliver risk-controlled, transparent, compliant and truly future-ready rail infrastructure for Queensland.

Your next steps

We believe there are numerous opportunities for us to realise more value together and we'd love to explore them with you. We hope you agree and book a meeting.

Let's start the conversation

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About Bentley

Who we are

Around the world, infrastructure professionals rely on Bentley software to help them design, build, and operate better and more resilient infrastructure for transportation, water, energy, cities, and more. Founded in 1984 by engineers for engineers, Bentley is the partner of choice for engineering firms and owner-operators worldwide, with software that spans engineering disciplines, industry sectors, and all phases of the infrastructure lifecycle. Through our digital twin solutions, we help infrastructure professionals unlock the value of their data to transform project delivery and asset performance.

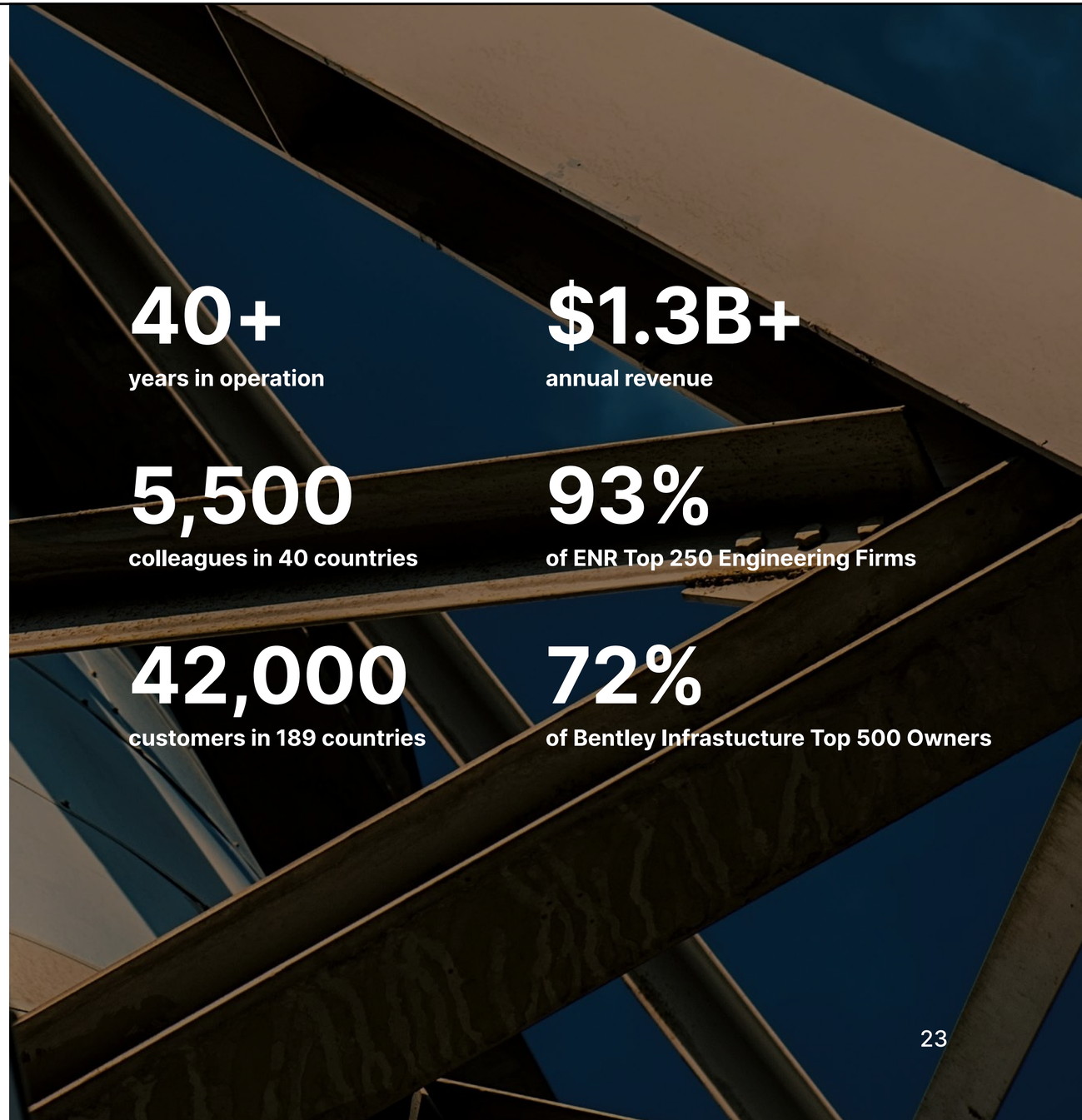
What we offer

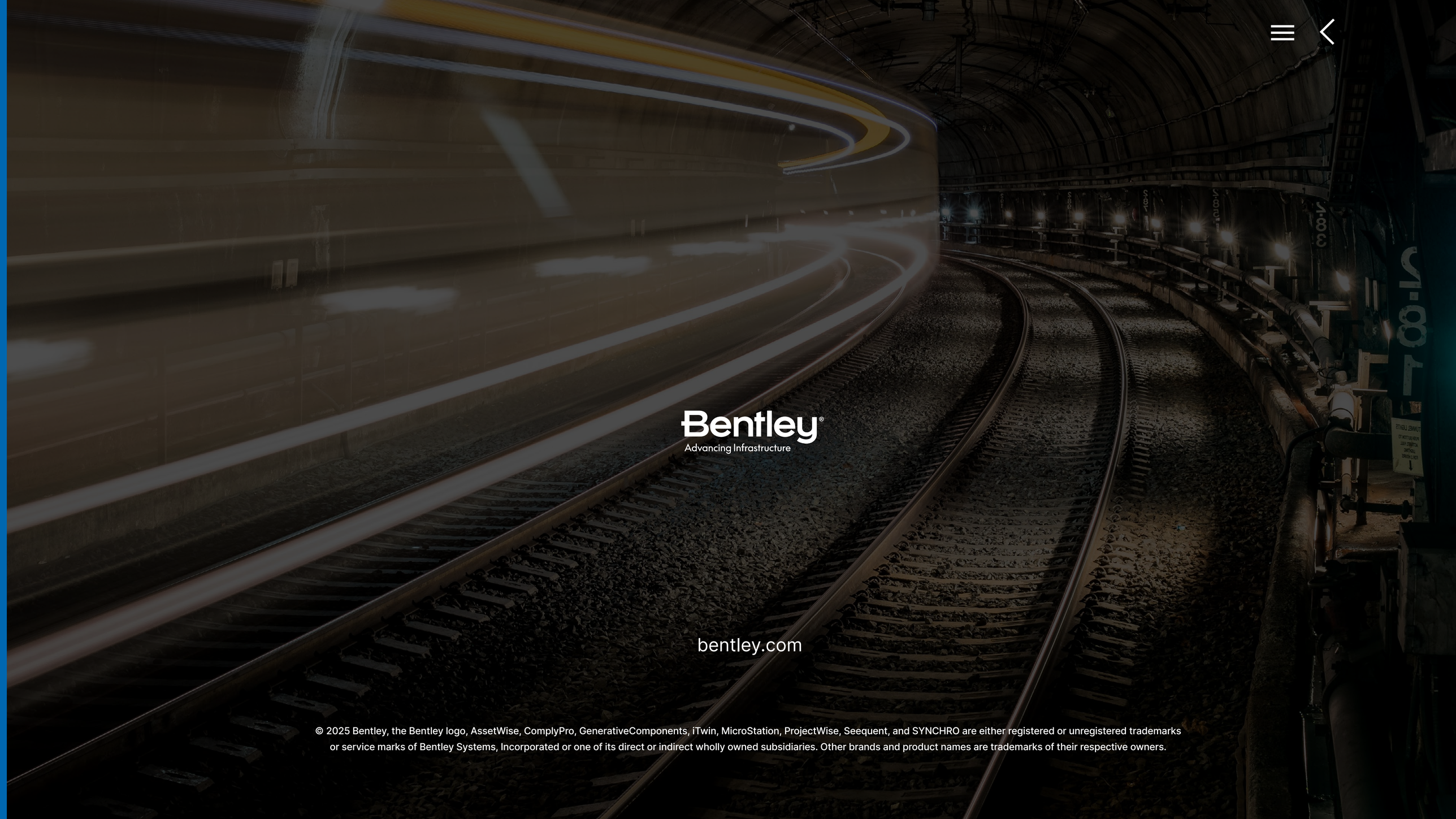
Product value
Making infrastructures more productive.

Technology innovation
Helping users leverage data across the infrastructure lifecycle.

Industry leadership
Advancing digital delivery and asset analytics.

Our commitment to sustainability
Bentley's impact strategy is rooted in our passion for advancing infrastructure for better quality of life. The pillars of this strategy are environmental, social, and governance, and empowering our users to achieve UN Sustainable Development Goals.





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