

## Project Summary

**Organization:**  
Grontmij

**Solution:**  
Roads

**Location:**  
Stockport, Manchester, and  
Cheshire, United Kingdom

### Project Objective:

- Deliver detailed design, construction, and defects liability maintenance for a 10-kilometer dual carriageway.
- Establish a common data environment that supports collaboration among 200 multi-discipline team members across six offices, and the realization of scheme goals.
- Provide early contractor access to over 160 models, allowing stakeholders to develop a virtual construction sequence.

### Products used:

Bentley Navigator, MXROAD, OpenRoads, i-model Composition Server, MicroStation®, and ProjectWise

## Fast Facts

- ProjectWise served as the common data environment, giving team members and stakeholders controlled access to project information and data models.
- Integrating i-models with Bentley Navigator provided a process to analyze more than 200 clash detection rules during the design phase.

## ROI

- The project will contribute up to GBP 2,492 million in economic growth throughout the Greater Manchester and Cheshire East economies.
- Reduced travel times, lower vehicle operating costs, and fewer accidents will save motorists an estimated GBP 880 million.

# Grontmij Uses Bentley Technology to Facilitate Information Mobility on Dual Carriageway Design

Federated BIM Strategy Streamlines Collaboration with Three Different Clients, and among 200 Multi-discipline Team Members

## A Pioneer BIM Initiative

Grontmij, a design partner in the Carillion Morgan Sindall joint venture, pioneered a federated BIM methodology in the detailed design, construction, and defects liability maintenance of a 10-kilometer dual carriageway in Manchester, England. The GBP 100 million project runs from A6 at Hazel Grove to Ringway Road/Ringway Road West Junction, and includes a section of the A555, the geometric layout and signal controls on the A6 junction, four railway structures requiring a major interface with Network Rail, bridgework, utility diversions, and flight path constraints of the Manchester Airport. Grontmij initiated this project under an early contractor involvement (ECI) arrangement, and is expecting the completion of design and construction works by May 2017.

Using a collaborative process powered by Bentley technology Bentley Navigator, MXROAD®, i-model Composition Server (formerly i-model Composer), OpenRoads, and ProjectWise®, Grontmij established an integrated modeling environment across its six offices—comprised of 200 staff supporting 15 disciplines—helping break down interdepartmental barriers and enhancing the model review process. The information mobility and integrated modeling capabilities of Bentley applications enabled cost-effective design with improved accuracy, fewer errors, minimal clashes, and fewer construction site queries, thereby reducing project time and costs.

## Supporting Three Clients

The primary challenge involved working with three municipal authorities—Stockport Metropolitan Borough Council, Manchester City Council, and Cheshire East Council—each with different information requirements and regulatory compliance issues. All three municipalities were individually seeking planning permission for the proposed scheme.

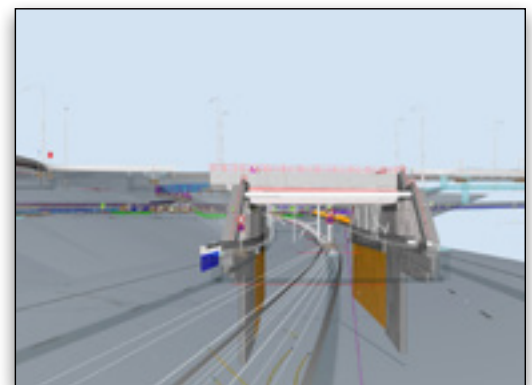
Together with the main carriageway, the scheme required construction of railway, roadway, bicycle, and pedestrian

bridges; traffic signal installations; road lighting and culverts; utility diversions; and landscaping works. Four railway structures also required extensive interface with Network Rail to address land constraints, and at the west end of the project the Manchester Airport flight path constrained the project's vertical geometry.

To ensure success for all parties, the multi-office project team established a common set of overarching scheme goals: define value and common objectives, establish a collaborative working environment, recognize and resolve disputes, take an open and transparent approach, ensure equal consideration for suppliers, and promote a culture of innovation and value management. The project delivery team determined that only a federated BIM methodology would enable project stakeholders to work in a truly collaborative manner.

## Unified Design Environment

Harnessing Bentley's BIM advancement solutions allowed the Grontmij team to be innovative in an enhanced, collaborative environment, and seamlessly manage the risk associated with the disparate delivery team. Fully implementing a unified



*The GBP 100 million project included the geometric layout and signal controls on the A6 junction, four railway structures, bridgework, utility diversions, and flight path constraints of the Manchester Airport.*

*“Working in a common data environment while encompassing the federation and clash detection process has been a significant change for us... Without the innovative use of Bentley products in a digital design-based BIM environment, delivering this project would have been infinitely more difficult and certainly much riskier.”*

*— Alistair Webb,  
Head of Engineering,  
Grontmij*

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digital design environment involved cultural changes and required collaboration earlier in the design phase, and enabled a deeper level of detail and information and workflows that support digital design practices.

Using ProjectWise as the common data environment simplified access to the latest information and saved considerable time in tracking changes. This allowed Grontmij to develop downstream workflows that supported the use of i-model Composition Server, Bentley Navigator, MXROAD, OpenRoads, and MicroStation. The federated design process utilized Bentley technology (i-models in conjunction with Bentley Navigator) to create a fully integrated 3D federated information model accessible through ProjectWise.

### **Virtual Model**

The use of a virtual, federated model allowed project team members to quickly assimilate the latest information and assess the impact of their design elements. Multi-discipline consultation design reviews were more productive, as all parties had a clear understanding of the developing design and were better able to resolve issues, control changes, and minimize costly re-work.

Using i-model technology in conjunction with Bentley Navigator, Grontmij instituted a process in which more than 200 clash detection rules were tested during the design program. The rules allow team members to check and validate their proposed design solutions, and eliminate clashes between drains, fencing, road restraint systems, and other elements. This reduced the issuance of technical queries and designer instructions during construction.

Sharing 3D models was an integral part of achieving value engineering and risk management objectives. For example, value-engineered solutions for certain elements were adopted based on review and acceptance of the illustrative 3D models. In another instance, a point-cloud survey of the overhead lines for the railway structures allowed structural engineers to virtually analyze and validate their 3D models against critical headroom constraints. The highly accurate model was distributed to the project team via ProjectWise, helping to reduce risk of interferences.

### **Cost-effective Design**

Bentley technology allowed the project team to produce more detailed, accurate, and error-free designs. The virtual environment provided an opportunity for stakeholders



*Grontmij used MXRoad and OpenRoads to deliver template-based designs allowing all parties to virtually review full pavement layers and construction depths.*

to test design concepts, assumptions, and interactions during the design phase. Under the early contractor involvement arrangement, ProjectWise gave contractors controlled access to models so they could develop virtual construction sequences including the movement of plant and temporary works. As a result, the general contractor received a more coordinated, efficient, cost-effective, and buildable design. This collaborative effort produced the best outcome for all parties.

As a critical project deliverable, the federated information model will ultimately be available for asset management, allowing the project owners to run virtual simulations of maintenance and operations and assess the impacts of future construction proposals.

### **Economic Growth**

The A6 to Manchester Relief Road project will deliver substantial benefits to motorists, including reduced travel times, lower vehicle operating costs, and fewer accidents. This represents as much as GBP 880 million in savings, delivering a cost-benefit ratio of 5.06. By improving connectivity between labor and business, the project will also help generate up to 5,450 new jobs in the region. The resulting increase in productivity will contribute up to GBP 2,492 million to the area economy. This is in alignment with government policies aimed at delivering jobs and economic growth while increasing social mobility and cohesion.