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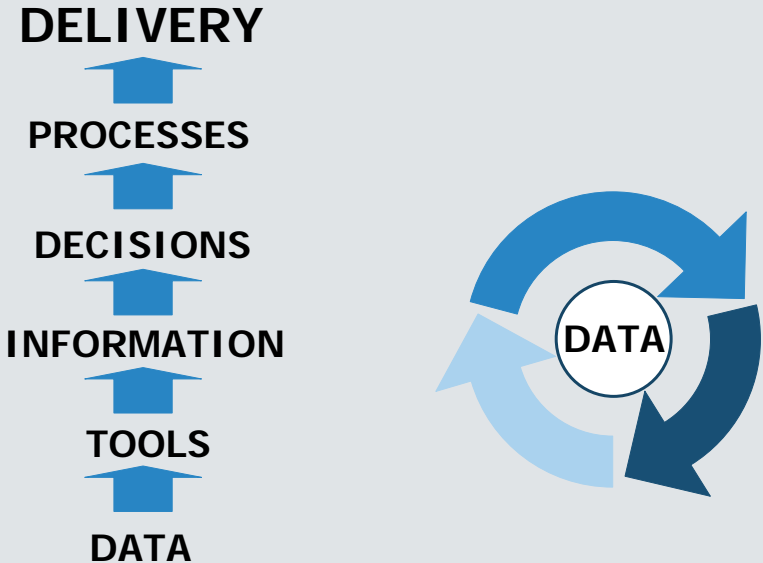


Bentley Rail Solutions Showcase

Chris Angus
Business Development Director
Bentley Professional Services



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DELIVERY

↑

PROCESSES

↑

DECISIONS

↑

INFORMATION


↑

TOOLS

↑

DATA

DATA



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Decision Support Information

- Appropriate form
- Understandable
- Timely
- Known currency
- Known quality
- Comprehensive

The Problem

- Scattered data
- Different data types
- Many ways of describing position



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Scattered Data

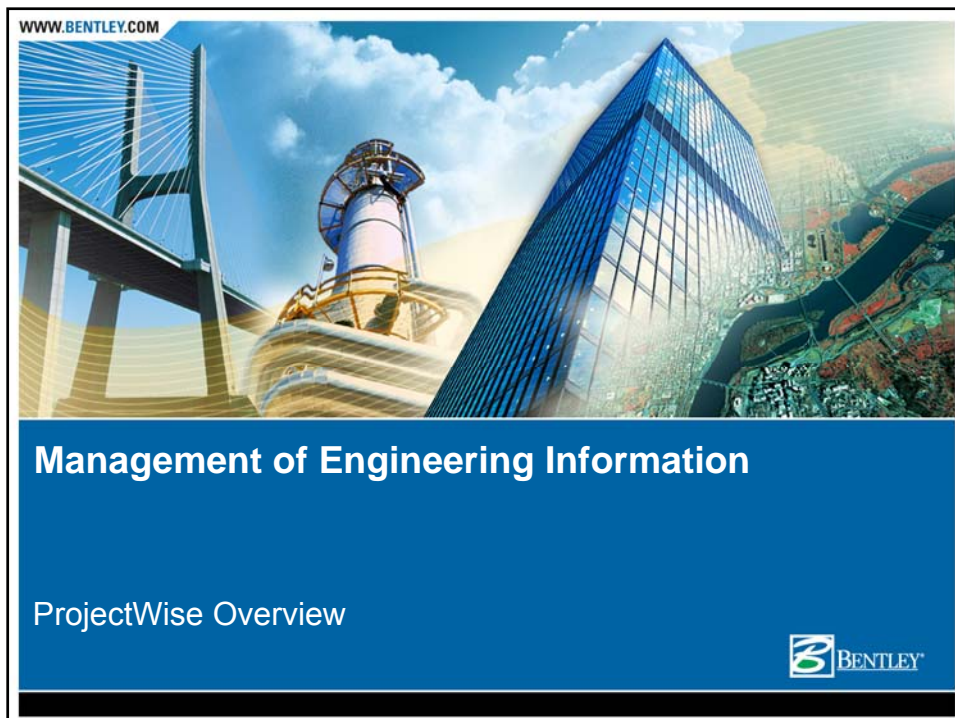
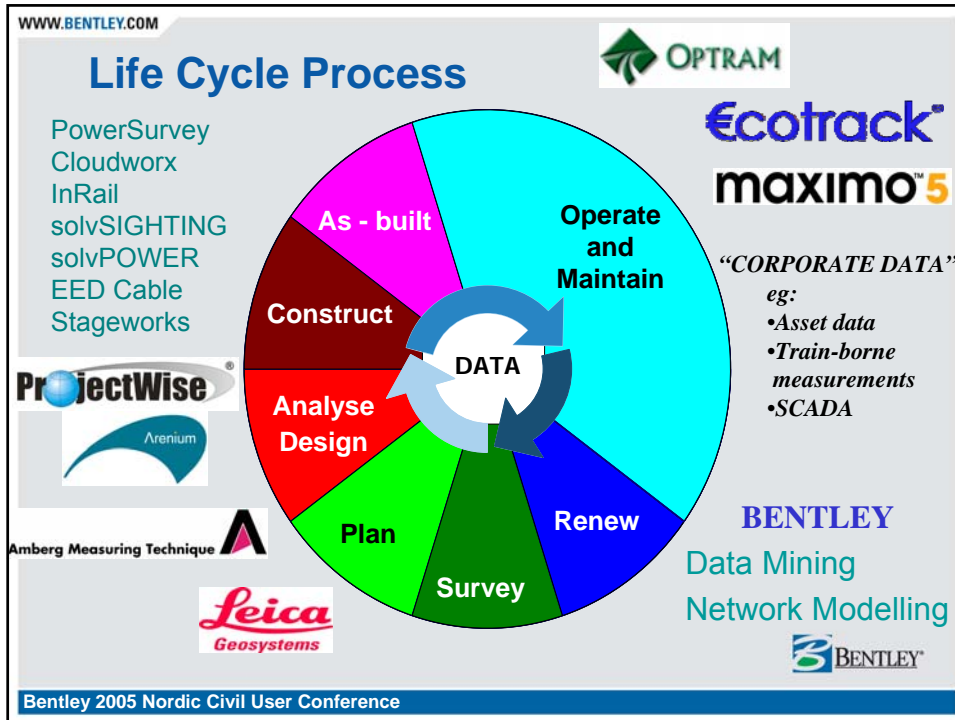
- Variety of data stores
- Distributed on multiple sites
- Variety of managers and users

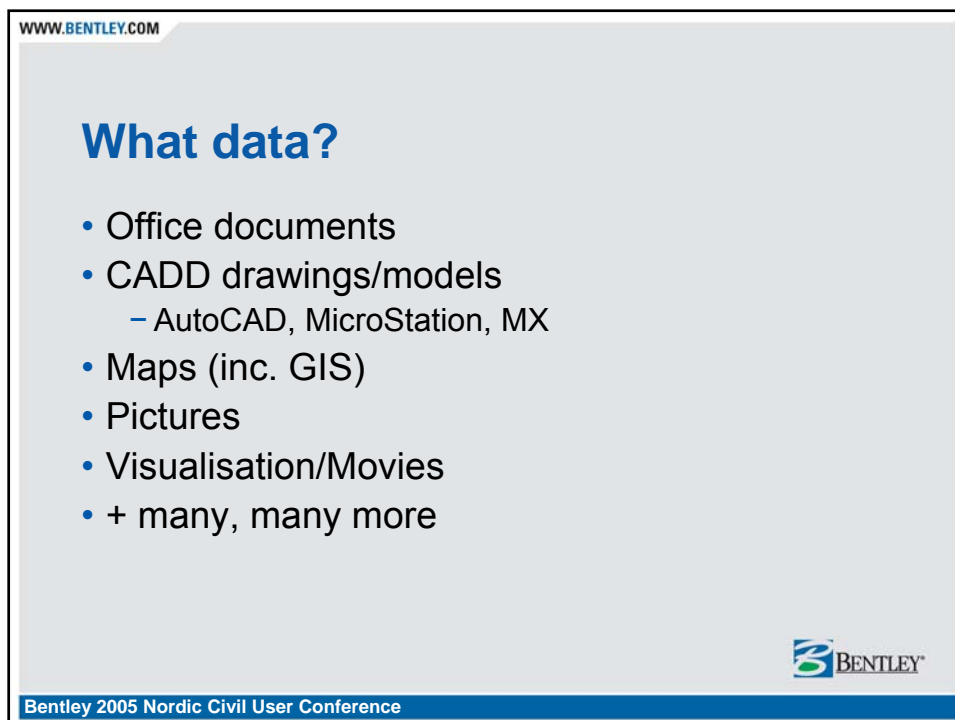
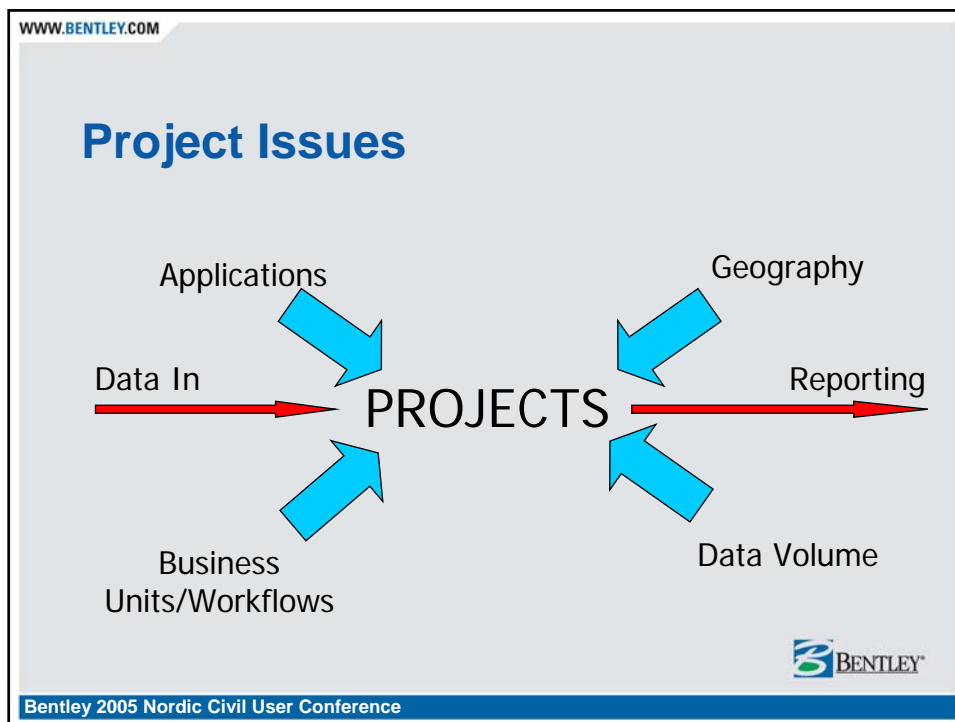
Data Types

- Point - Signals, Bridges, Features, Attributes
- Linear - Ballast, Rail, Line Speed, Timetables, Routes
- Area - Leases, Freehold, Contamination
- Stream - Video, Track Geometry, Ultrasonic



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Distribution System

Limited Engineering Audience

ProjectWise System

RENDITION + META-DATA

Expanded Enterprise
Reviewers
Viewers
Redlining of Drawings
e.g. eB, Documentum

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BANVERKET

“Besides its seamless integration with MicroStation, **ProjectWise** provided the tools we need to share our engineering information in a secure, efficient way between departments within Banverket and with outside consultants and contractors,”

Bjorn Paulsson, head of the Track and Civil Engineering Department

Luleå

Borlänge

Gävle

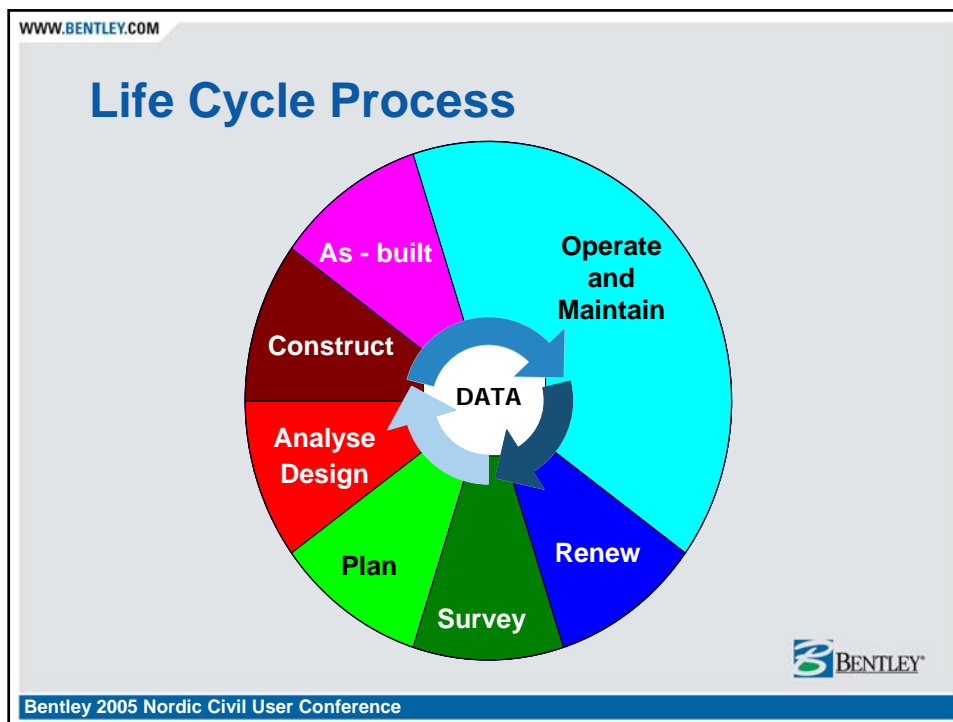
Stockholm

Göteborg

Malmö

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Survey

- Traditional
- Cloud scanning
- Wriggle
- Gauging






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Traditional Survey

- EDM
- Aerial
- Trolley
- GPS


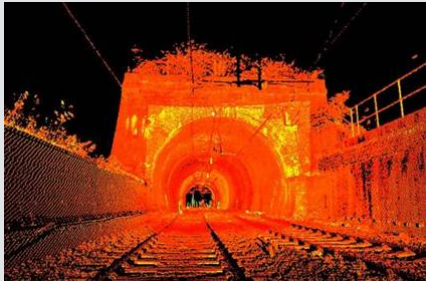



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Cloud Scanning


- Cloudworx
- InRail analysis




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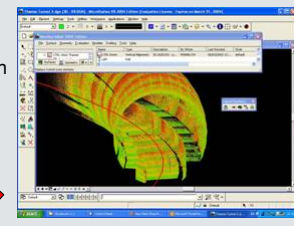
Tunnel Profile Survey



CYRAX Scanner



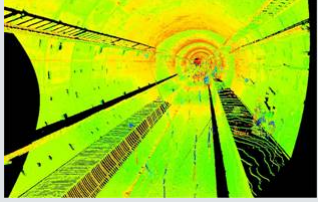
InRail

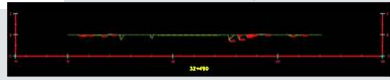


View Data using Cloudworx in
MicroStation and InRail

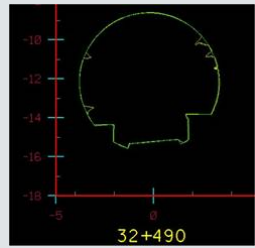
Flatten Surface of Point Cloud Data using new InRail commands

ASCII File from Cyclone Software imported into Surfaces within InRail






Create Cross Sections using InRail



32+490



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Tunnel Design.dgn, Tunnel Design (3D - V8 DGN) - MicroStation V8 2004 Edition

File Edit Element Settings Tools Utilities Workspace BentleyCivils Window Help

Ditch Back-slope 37 0 0

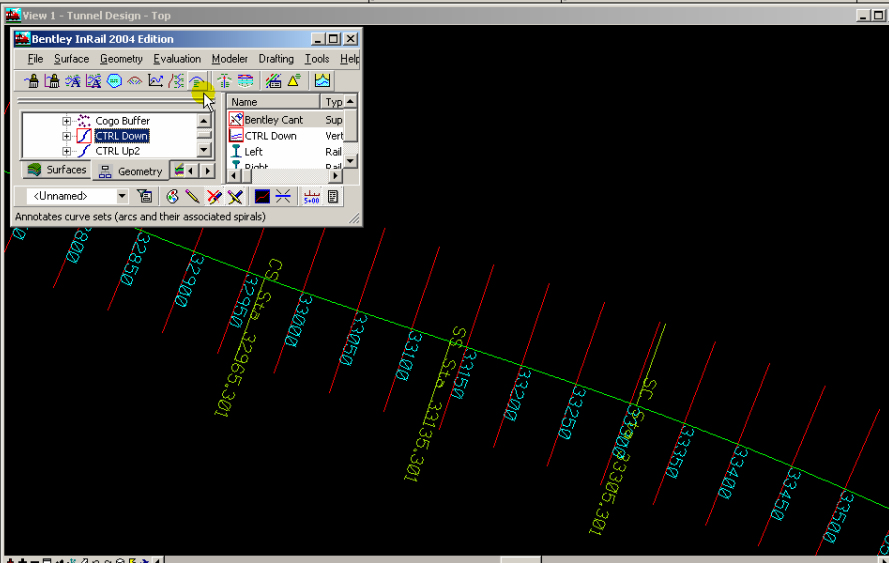
View 1 - Tunnel Design - Top

Bentley InRail 2004 Edition

File Surface Geometry Evaluation Modeler Drafting Tools Help

Name	Typ
Cogo Buffer	Surf
Bentley Cant	Surf
CTRL Down	Vert
CTRL Up2	Rail
Left	o.d
o.d++	

<Unnamed> Annotates curve sets (arcs and their associated spirals)



Tunnel Design Vie 39188.712 56499.761 -9.121

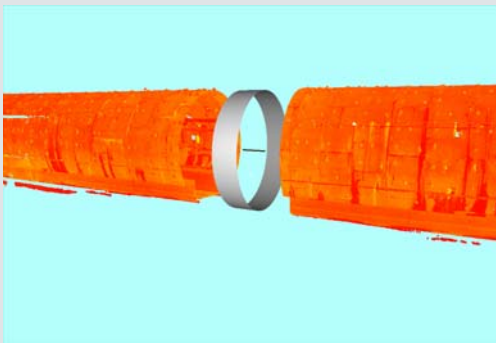
Ditch Back-slope

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CTRL OLE Bracket Placement Project

The requirement:

- To survey the tunnel lining for tunnel supporting brackets for the OLE components



ABA Surveying

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28.01.2005 12:37

ABA Surveying

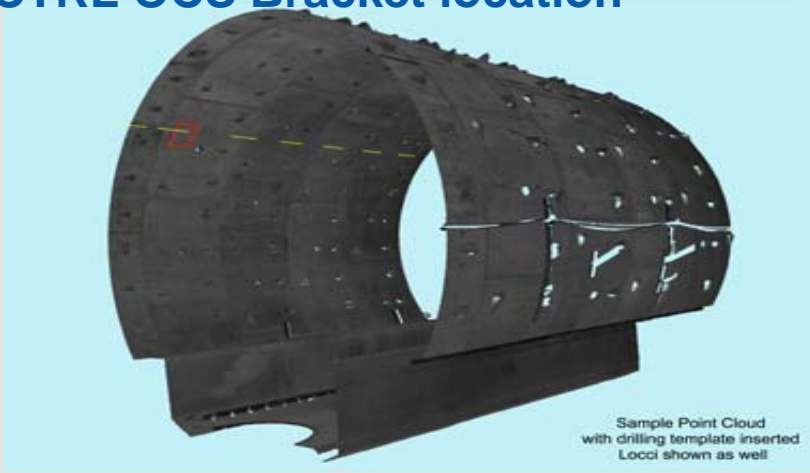
360 Scan using HDS 4500

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CTRL OCS Bracket location



Sample Point Cloud
with drilling template inserted
Locci shown as well



Drilling Template



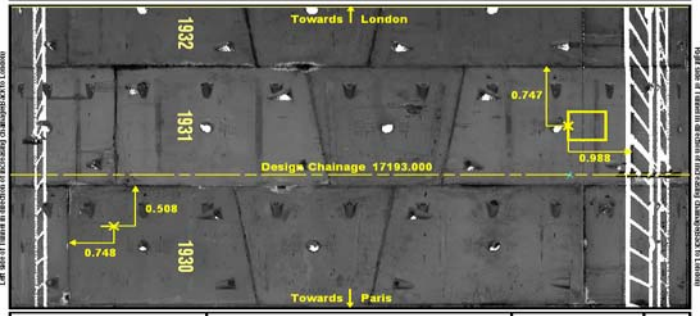
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CTRL OCS Bracket location


Tunnel Drilling Information

Left side of Tunnel in direction of increasing chainage (back to London)




Right side of Tunnel in direction of increasing chainage (back to Paris)

SECTION 4.2 CTRL DN		DESIGN CHAINAGE: 17193.000	Location Y-17-10 rev 0
Left Hand Side	Right Hand Side	General Notes	
Equipment: Earth Support	Equipment: STD Cartridge	1. This drawing shows tunnel lining derived from track bed and concrete.	
Set Out Dimension: 2.255	Set Out Dimension: 2.51	2. Left/Right is defined in direction of increasing chainage (back to London).	
Modified Chainage: 17193.630	Modified Chainage: 17192.377	3. All dimensions in meters.	
E: 29354.836 N: 63681.412 HT: -21.530	E: 29351.582 N: 63677.713 HT: -21.347	4. Sheet will be linked to a City Survey.	



Final Deliverable

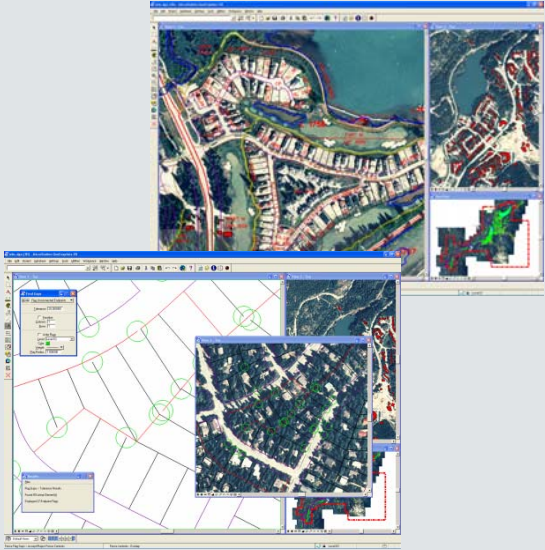


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Planning

- Route selection
- Environmental impact assessment
- Land ownership
- Project Development
- Bentley Geographics



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Geospatial ProjectWise



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What is it ?

- ProjectWise Geospatial is a geographical extension to ProjectWise
- Its adds spatial indexing to Document Management System
- Spatial indexing is a traditional GIS feature, but is not a GIS exclusive feature.




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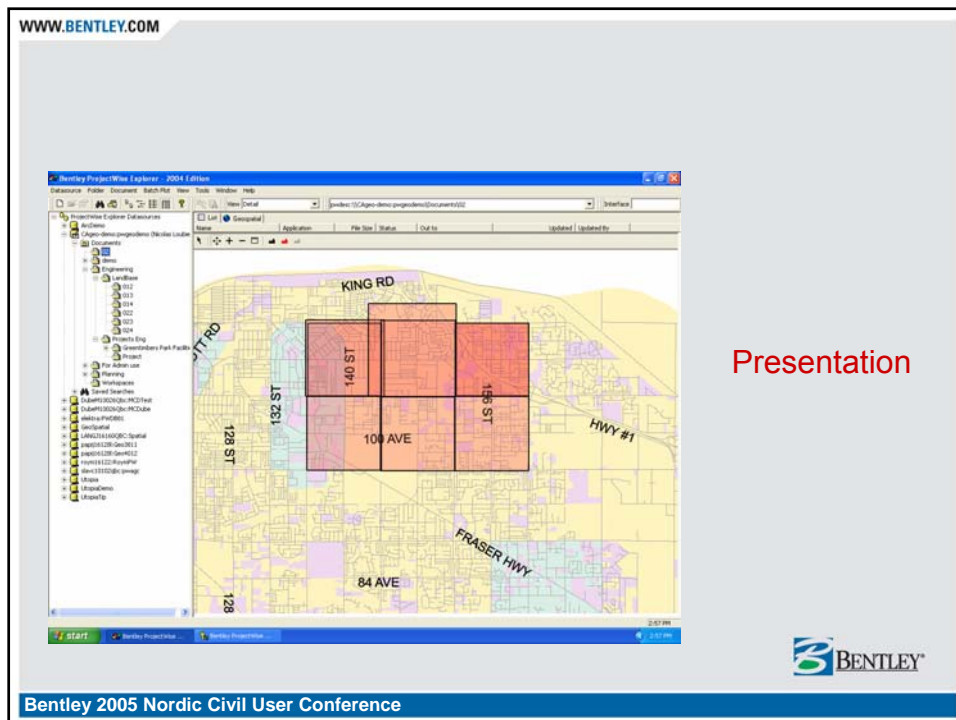
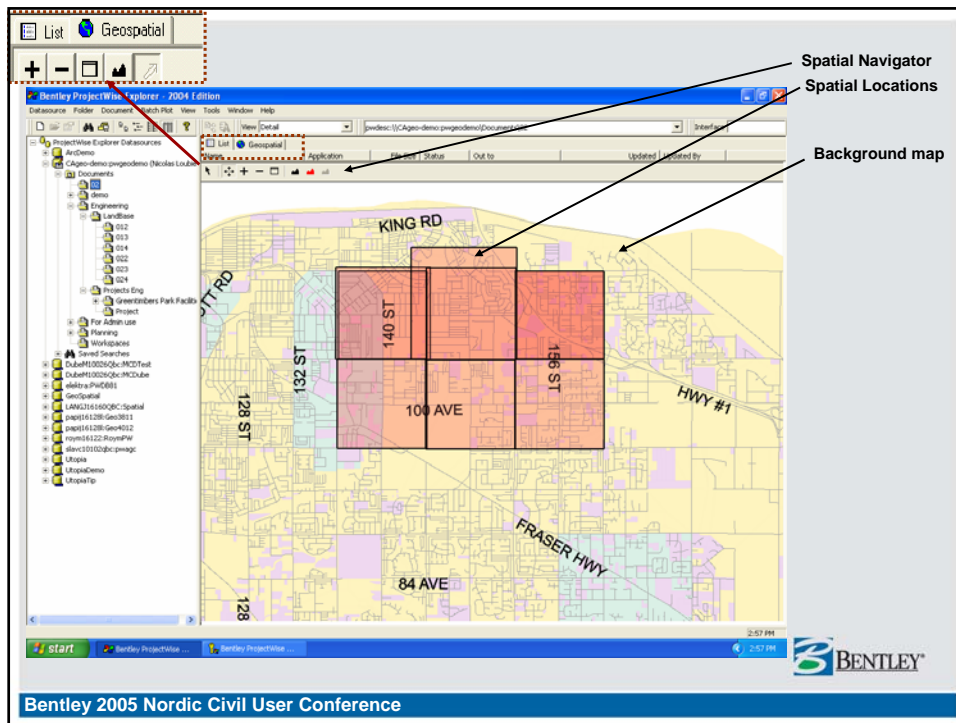
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Geospatially enabled ProjectWise ?

- Any document can be associated with a spatial location, even a pdf or word document.
- ProjectWise folders can also be associated with Spatial Locations
- Any ProjectWise datasource can be spatially enabled



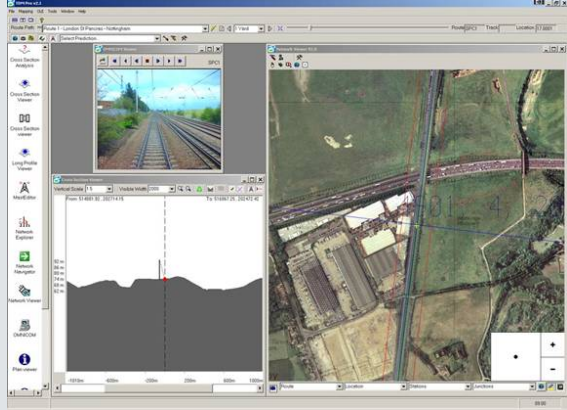
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Route Selection

- Digital images
- Terrain models
- Options
- Virtual Survey Tool
- **Presentation**

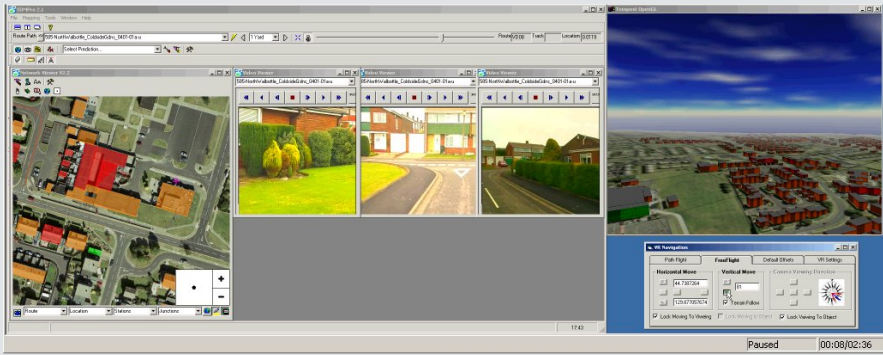





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Additional Work on Virtual Survey Tool (VST)




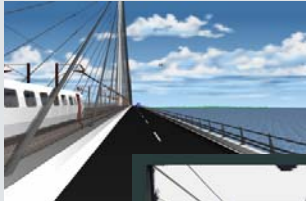




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Project Development

- Early view of construction quantities
- Operating costs
- Fuel costs, Save Project
- Whole life cost
- Stakeholder involvement

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Design and Analyse

- Track
 - track design and optimisation
 - turnout design
 - construction detailing for light rail
 - earthworks and ballast
- Signals
 - signal configuration design
 - signal placement in 3D
 - sighting analysis
 - in-situ signal visualisation
 - signal relay layout
- Energy and Power
 - overhead line
 - conductor rail design
 - elementary electrical diagrams
- Communications
 - mast positioning
 - cable management



Valuable data defining the asset


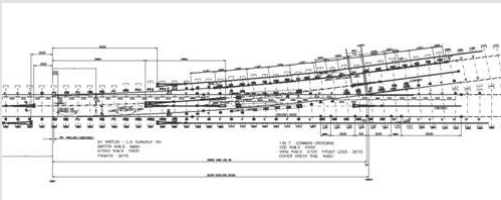

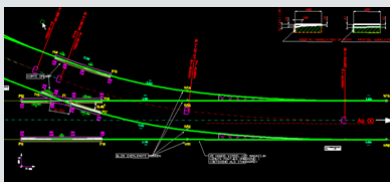


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Track Design

- InRail
 - Heavy and Light Rail
 - Automated design
 - Integrated with Civils Design
 - Design standards






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Signal Design

- Plans based on MicroStation
- Elementary Electrical Diagrams – EED
- EED – Signal Relay
- Signal Sighting



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EED Signal Relay

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Signal Sighting

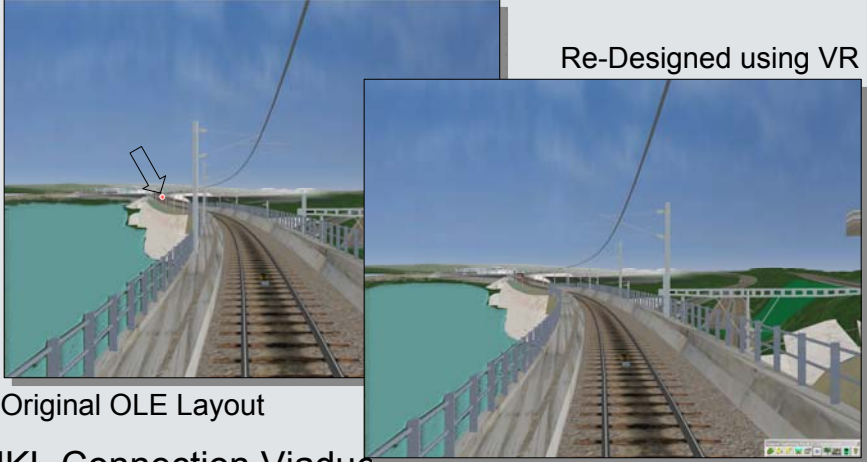
- Integrates
 - Track
 - OLE
 - Signals
 - Terrain
 - Architectural
- Virtual Reality
- **Presentation**

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Case Study - Ebbsfleet




Original OLE Layout

Re-Designed using VR

- NKL Connection Viaduct

Images courtesy of CTRL




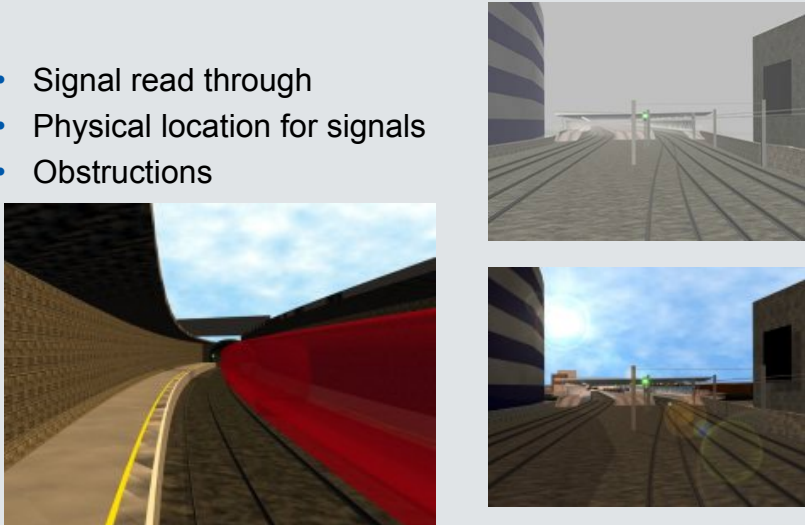
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Detailed description: This slide compares two versions of the Overhead Line Equipment (OLE) layout for the NKL Connection Viaduct. The left image, titled 'Original OLE Layout', shows a perspective view of the viaduct tracks with a white arrow pointing to a specific area of the overhead wires. The right image, titled 'Re-Designed using VR', shows the same viaduct but with a significantly improved and more organized OLE layout. The Bentley logo and the text 'Images courtesy of CTRL' are located at the bottom right of the slide. A blue footer bar at the very bottom contains the text 'Bentley 2005 Nordic Civil User Conference'.

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Thameslink 2000

- Signal read through
- Physical location for signals
- Obstructions



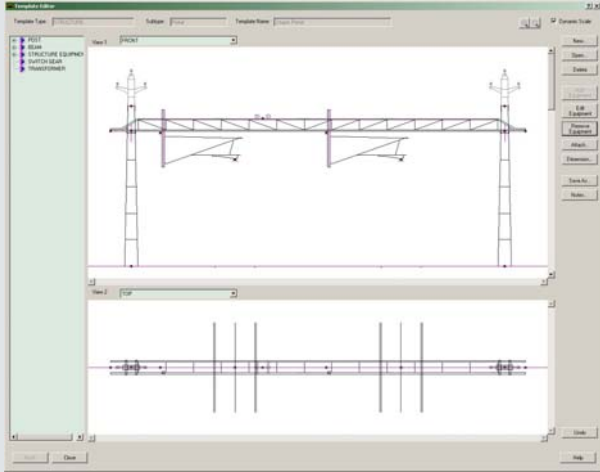
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Detailed description: This slide illustrates three key VR simulation scenarios for the Thameslink 2000 project. The first image shows a perspective view of a tunnel with a red train, highlighting 'Signal read through'. The second image shows a perspective view of tracks with a signal post, highlighting the 'Physical location for signals'. The third image shows a perspective view of tracks with a signal post and a building, highlighting 'Obstructions'. The Bentley logo and the text 'Bentley 2005 Nordic Civil User Conference' are located at the bottom right of the slide. A blue footer bar at the very bottom contains the text 'Bentley 2005 Nordic Civil User Conference'.

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Traction Power

- **Bentley Rail - Overhead Line Design**
 - New solution in development
 - Lead customer Banverket Projektering
- Conductor Rail



The screenshot shows a software interface with a top view of an overhead line structure supported by two towers, and a bottom view showing the conductor rail layout. A left-hand pane contains a tree view with categories like 'RAIL', 'TRACK', 'STRUCTURE EQUIPMENT', 'SWITCHGEAR', and 'INFRASTRUCTURE'. A right-hand pane contains various tool icons.

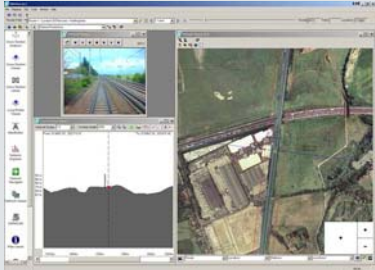

BANVERKET | PROJEKTERING | BENTLEY

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Communications

- GSM-R Mast location
- Telecommunications Records

The top screenshot shows a network diagram with nodes and connections, and a data table. The bottom screenshot shows a 3D perspective view of a railway track with a cross-section view of the ground and underground conduits. The cross-section view shows fiber optic cables in color-coded conduits.

Edit optical systems and assign bandwidth to individual fibers.

Fiber in underground conduit is displayed in color-coded cross-section views.


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Clash Detection

- Early resolution of issues
- Give client confidence
- Integrate disciplines




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Human Factors

- Confirms design
- Reduces risk
- Early acceptance



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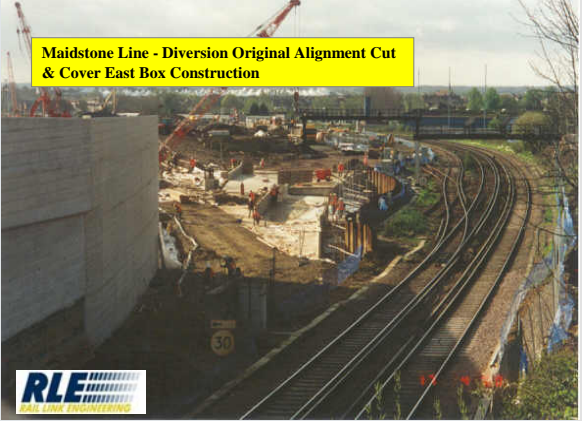
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Construct

- Construction sequencing
- Possession planning
- Digital data for construction
- As built records
- **Presentation of Project Documents in PDF (Bid Set)**



RLE

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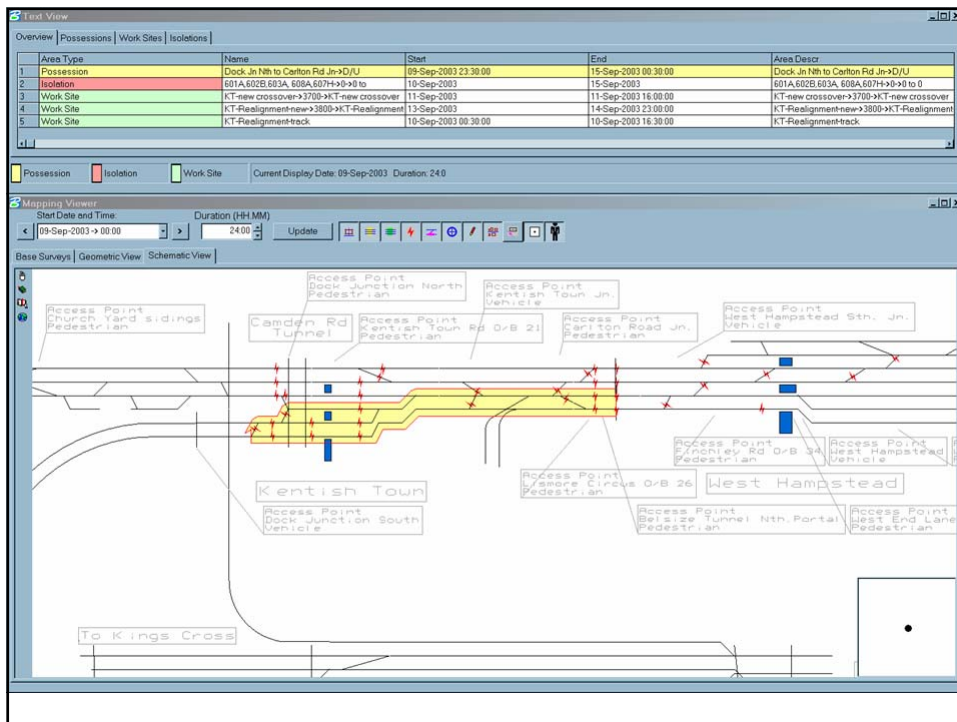
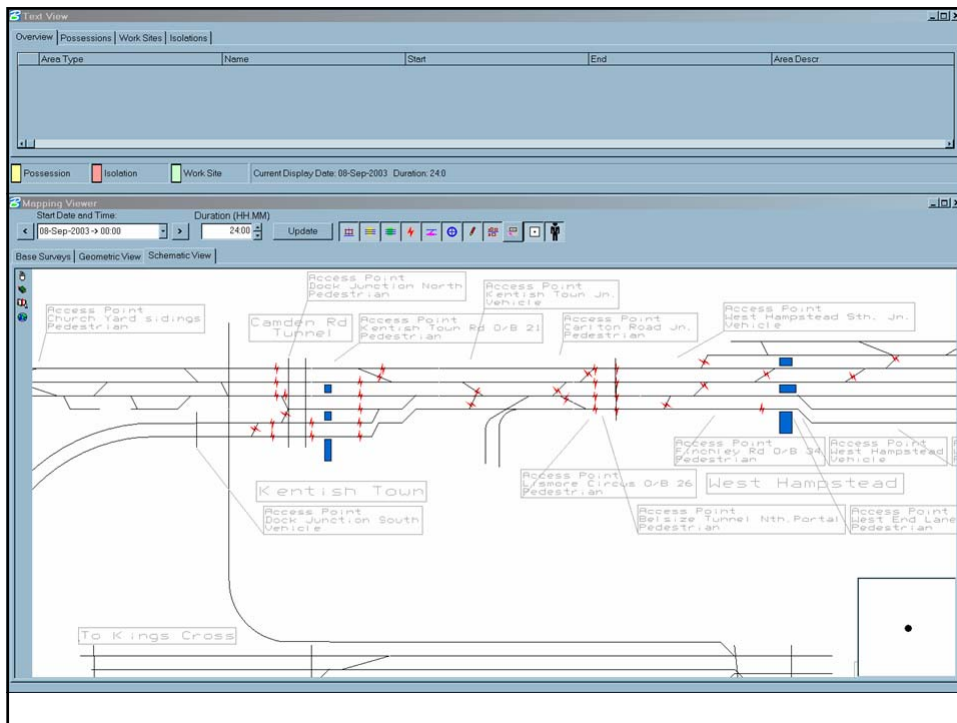
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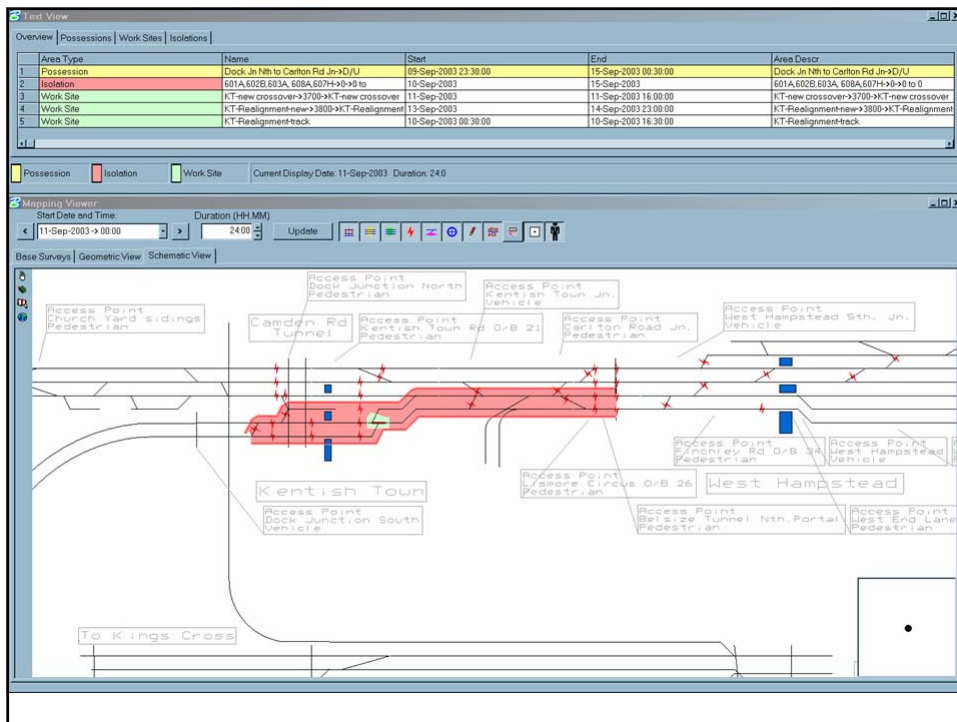
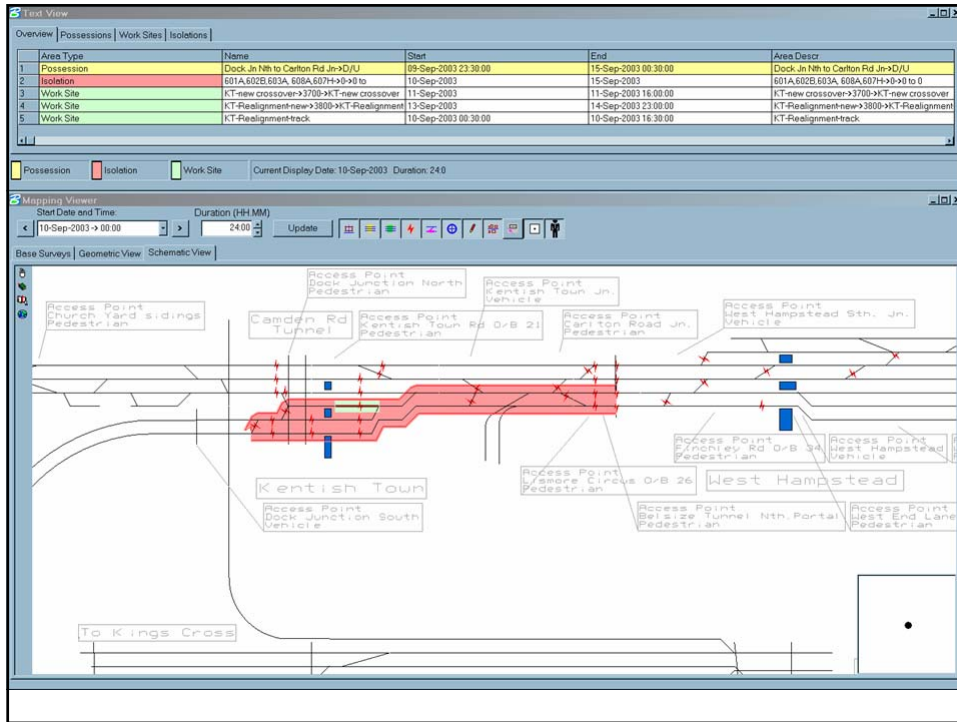
Construction Sequencing

- Technology to enhance Stageworks Planning
- Geometric track view and Schematic are fully linked
- Tasks located in space and time
- Project changes update drawings and analyses
- Publish through XML, CAD, MS Excel or PDF

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Right-of-Way Asset Management

- Optram is an Information System for Managing Right-of-Way
 - Safety
 - Reliability
 - Profitability
 - Risk




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Managing Linear Assets




Linear asset

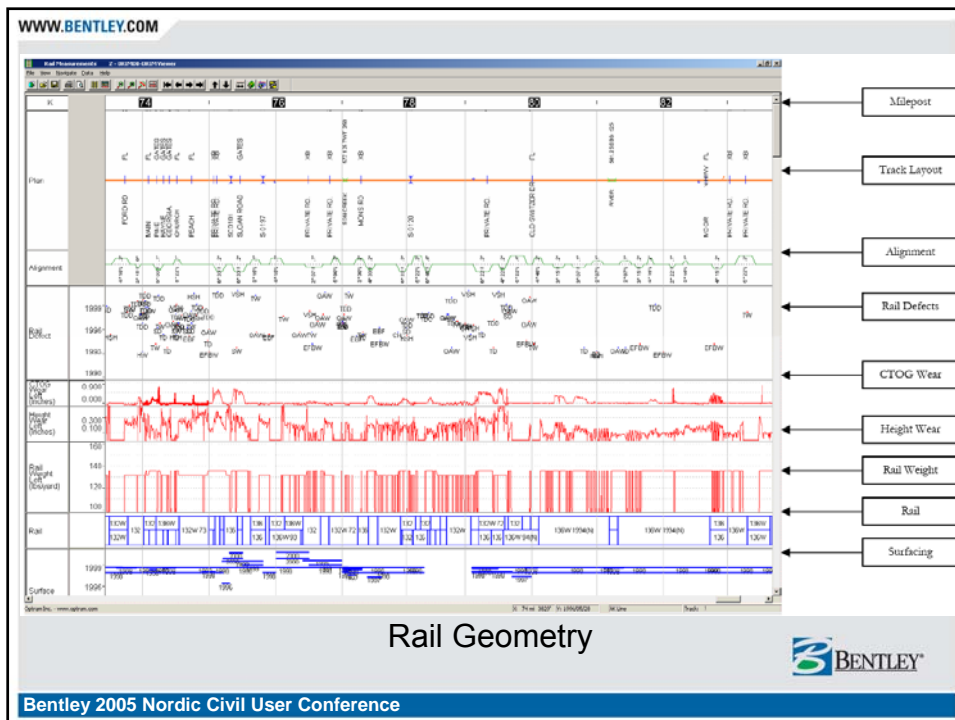
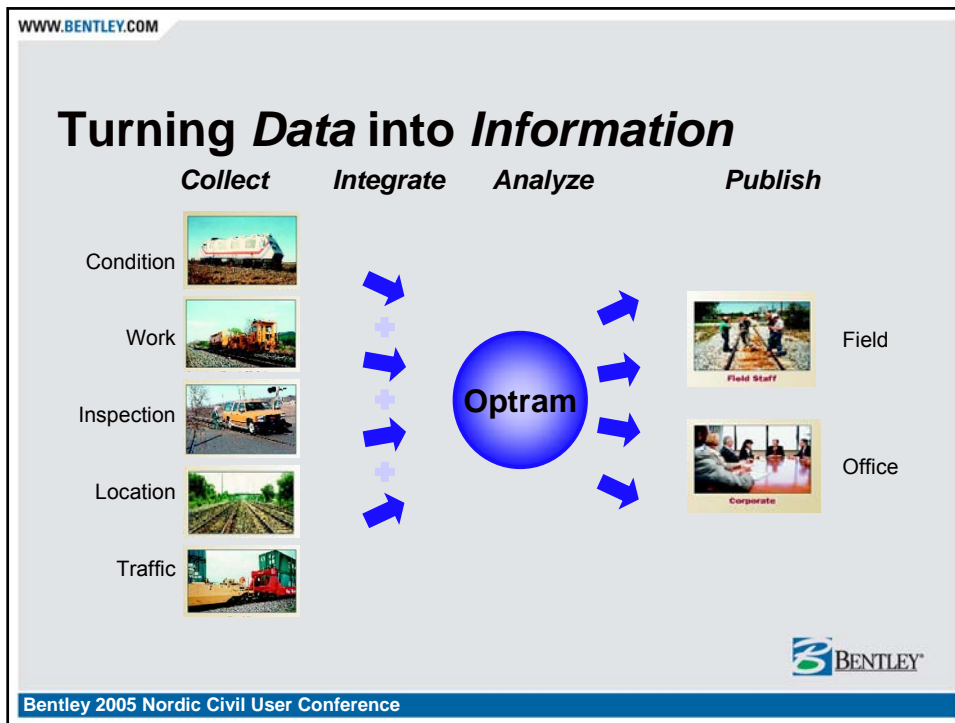
Liner Asset OBJECTIVES

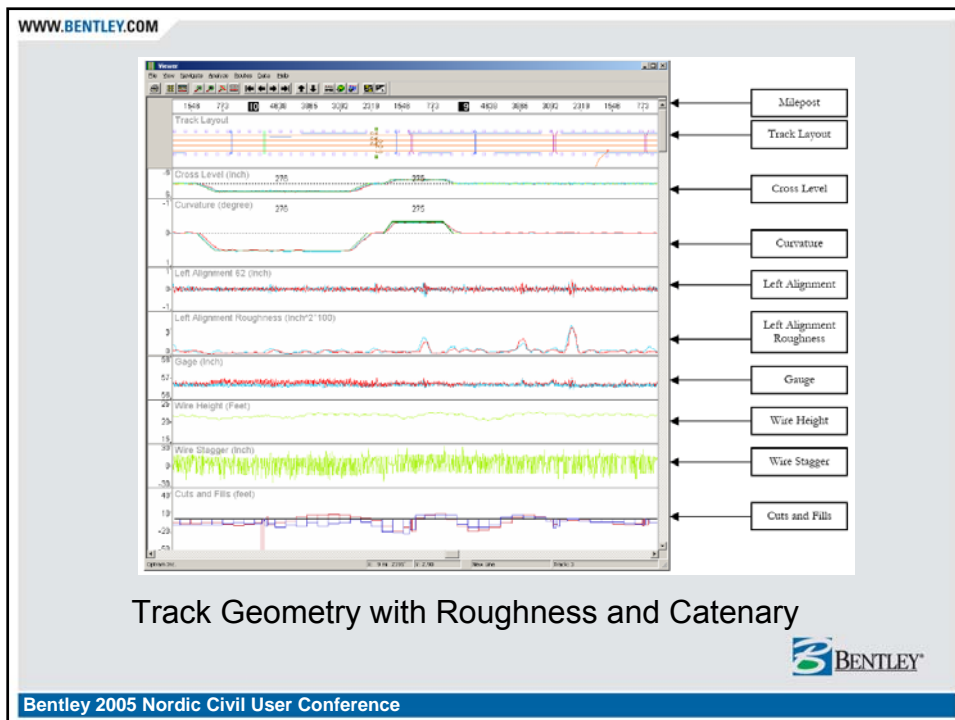
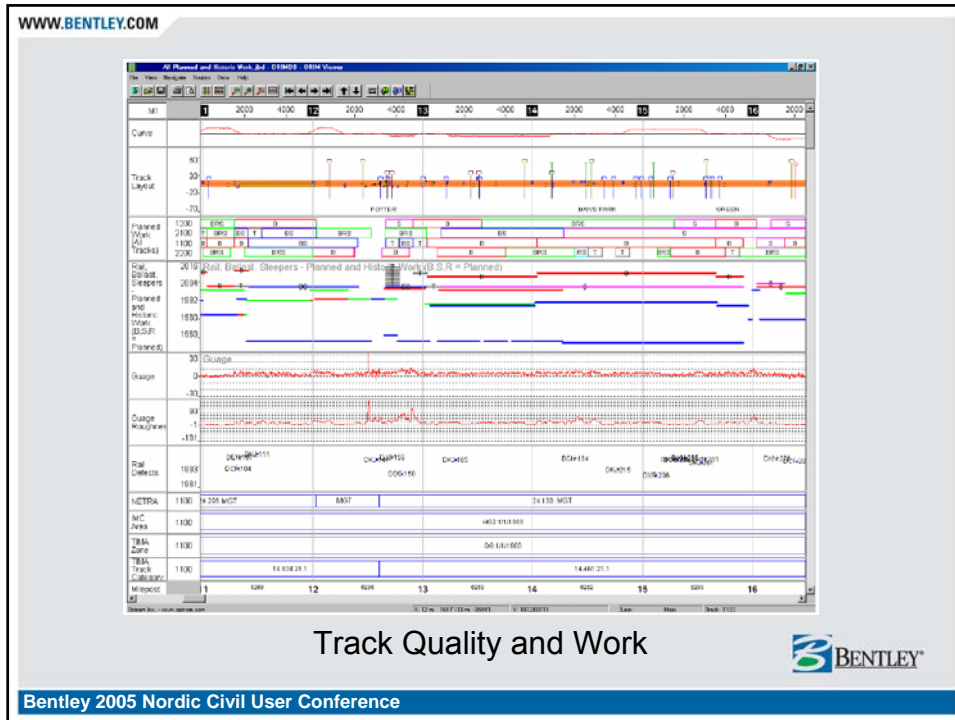
- Target resources to a specific need
- Reduce maintenance occupancy and costs
- Apply cost reducing long-term solutions to areas of high costs
- Enhance track capacity and on-time reliability
- Improve margins with increased asset life without spending additional capital

Effective linear asset management provides a unified system view and tools for collecting, viewing and analyzing any dimension of a corridor asset's condition and performance over time...




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Some Optram Customers


WMATA – Passenger



BART – Bay Area Rapid Transit



LA Metrolink – Commuter



Amtrak – Passenger



First Engineering – Maintenance Contractor



Network Rail – Passenger


CSX – Freight


BNSF – Freight


NJT – Passenger


MBTA – Boston's Subway Transit





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Where Optram Can Help You...

- 19 cars from Montana Rail Link (MRL) freight train derailed near Alberton, Montana.
 - Six of the derailed cars contained hazardous materials. One containing chlorine (a poison gas) ruptured, releasing 130,000 pounds of chlorine into the atmosphere; another tank car containing potassium hydroxide solution ...
- The MRL train was traveling 40 mph just before the derailment when both train crew members reported rough track ...
 - Rail sections located on the outside of the curve at the point of derailment exhibited gage and head wear. Additionally, a portion of rail recovered from the accident site displayed evidence of a vertical split head ...



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Where Optram Cannot Help You...

Man gets arm stuck in train toilet, causes commuting delays

- A man riding a Metro-North train dropped his cell phone in a toilet and got his arm stuck trying to retrieve it Thursday, forcing the train to stop and delaying the evening commute for thousands of people.

Edwin Gallart, 41, of the Bronx, was stuck with his arm in the toilet for 90 minutes

Crew members were alerted to the incident

- "When this moron's arm went down the crapper, so did our evening commute," Metro-North spokesman said.

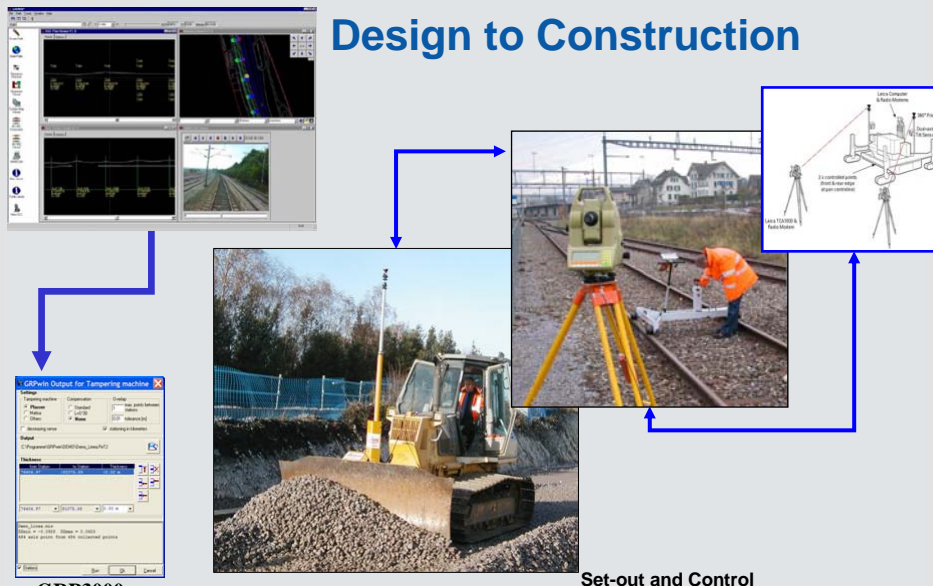
The phone has not yet been recovered !



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Design to Construction



GRP3000

LandXML

Set-out and Control

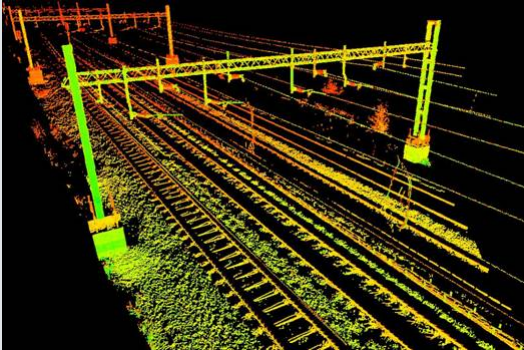


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As Built Records

- Marked up drawings
- Drawing management
- Scan survey



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Roll Out

- Driver briefing
- Signaller briefing
- Route knowledge




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Operations

- Driver training and assessment
- Signaller training




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Continuity of Information

- Data that is connected
 - Planning to Design
 - Design to construction
 - Construction to operate
 - Operate to manage
- Tools that make information flow
 - MicroStation, GeoGraphics
 - InRail, OLE, EED
 - Adobe PDF
 - Projectwise for a Managed Environment
 - Network modeling




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Benefits

- Design time savings
- Resolve design issues quickly
- Avoidance of errors
- Communication to stakeholders
- Human factors work reduces risk
- Savings on signal sighting
- Reduced site visits
- Provides route learning and signaller training



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Conclusion

- Use of synthetic engineering with VR does give real tangible benefits
- Reasons for use
 - Lower project costs
 - Better design
- Careful analysis required for deployment
 - Process
 - Decisions
 - Information
 - Tools
 - Data

DELIVERY

↑

PROCESSES

↑

DECISIONS

↑


INFORMATION

↑

TOOLS

↑

DATA



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So talk to us, if you are involved in ...

PLEASE Contact:
Chris Angus
Business Development Director
Mobile: +44 7748 643775
Email: chris.angus@bentley.com

- Survey
- Land property terriers
- Earthworks
- Track design
- Signal placement
- Electrification
- Architecture
- Structures and bridges
- Reinforcement design
- Cable layouts
- Electrical diagrams
- Drainage
- Gas
- Water supply
- Mining subsidence/geological
- Environmental – noise – visibility
- Telecomms

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GSM – R