

RILA Train Mounted Survey System



Trevor Burton – Fugro Raildata

- **RILA is a suite of train mounted sensors for rapid acquisition of survey data that negates the requirement for surveyors to be on or near the track during the collection of the data.**
- **RILA data supports a range of topographical survey, gauging and infrastructure monitoring applications for asset management and engineering design.**





2007
RILA Track



2013/14
RILA 360



2017
RILA v3.0



UK Development

2013 – Initial RILA Track trials – Wigan to Southport /Manchester Airport

2014 – Project based trials – Settle to Carlisle/ Carnforth

2015 – Gt Western IEP (RILA Track), Norwich in 90, Midland Mainline Elec, High Output Scotland,

2016 –Great Western Route Modernisation/Electrification, Northern Hub, High Output Scotland, LNW, Western & Wales, Anglia & South East, Crossrail Anglia

2017 – Wessex DMU, Basingstoke to Reading, Crossrail West, Transpennine Route Upgrade, Midland Mainline, High Output Scotland, LNW, Western & Wales, Anglia & South East



RILA – UK Operations, Product Acceptance



Network Rail

Certificate of Acceptance

PA05/06174

Manufacturer:
Fugro RailData B.V.

Issue : 1
Valid From : 07-03-2016
Monitoring Period Review : 07-03-2017

Rail Infrastructure Alignment Acquisition System (RILA) and associated RILA360

Product Description

RILA is a measuring device to capture accurate 3D absolute track measurement and if used in conjunction with the RILA360 system will collect 3D measurements of objects within the rail corridor. The system consists of RILA survey with integrated video, RILA 360, 360 degree twin laser scanners with panoramic camera, GPS and IMU equipment.

RILA can be mounted to a dedicated train with buffers or to a scheduled passenger train by use of a coupler adaptor. Due to the size and power demands of the RAIL-MAP system, if the RILA360 system is used in conjunction with RILA it must be mounted on a non-passenger train with buffers.

Network Rail is not purchasing RILA or RILA360, therefore no details are provided for **Product Configuration**. This certificate allows the use of RILA or RILA360 over Network Rail infrastructure to facilitate Fugro RailData B.V. to provide a survey service.

Product Image



Scope of Acceptance

The operation of RILA or RILA360 equipment over Network Rail infrastructure.

This certificate allows operation of the aforementioned equipment in conjunction with the necessary approval by the relevant Railway Undertaking that operates the rolling stock that the equipment will be fitted to in accordance with the Specific Conditions detailed.

The operation is dependent upon the continued compliance with the Safety Related Application Conditions (SRACs) and actions identified by SRP and the equipment Limitations. The following tables detail the SRAC, Limitations and all other SRP conditions.

Network Rail Acceptance Panel (NRAP) hereby authorises the manner of operation detailed above for use and trial use on railway infrastructure for which Network Rail is the Infrastructure Manager.

Reviewed by:

Steve Penfold
Product Acceptance Specialist

Authorised by:

Peter Gibbons
SRP Chairman

Please contact technology@raildata.co.uk

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SRAC-RILA009	RAIL-MAP	Assessment of data to be completed. Carry out the same process that was applied to RILA as described by section 7.5. NoBo certification for RAIL-MAP, Ref[26].	Controlled by the PA05 certificate
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Limitations

The full details of limitations are detailed by the NoBo Technical files for RILA and RAIL-MAP. The following table is for general information.

RILA with Adaptor type	Max Speed at front	Max Speed at rear	Max Load on vehicle	Installation time
Universal Buffer	160 km/h (100 mph)	200 km/h (125 mph)	130 kg	< 16min
Deliner Adaptor	160 km/h (100 mph)	200 km/h (125 mph)	85 kg	<2 min
Scharfenberg Adaptor	140 km/h (90 mph)	140 km/h (90 mph)	84 kg	<2 min
BSI adaptor	40 km/h (25 mph)	160 km/h (100 mph)	88 kg	<2 min
RILA at front			RILA at rear	
Maximum Speed	100 mph		125 mph	
Type of loads	Measuring Loads	Failure Loads	Measuring Loads	Failure Loads
Maximum operating Wind Load	8 Beaufort = 20.7 m/s	12 Beaufort=32.7	8 Beaufort = 20.7 m/s	12 Beaufort = 32.7 m/s
Inertial Loads(X-direction)	5 m/s ²	20 m/s ²	5 m/s ²	20 m/s ²
Inertial Loads(Y-direction)	5 m/s ²	25 m/s ²	5 m/s ²	25 m/s ²
Inertial Loads(Z-direction)	5 m/s ²	20 m/s ²	5 m/s ²	20 m/s ²

SRP Conditions



Survey Standards

	Absolute accuracy of points mm (68% probab.)		Relative accuracy between points (see notes) mm (68% probab.)				
			Correlated		Uncorrelated		
Band	Horizontal	Vertical	H	V	H	V	Survey technique
Band 0	N/A	N/A			±3	±3	Direct measurement of steelwork with disto/steel tape
Band 1	±5	±5	±4	±4	±7	±7	1" Total station topo survey. Terrestrial laser scanning (see NOTE 4)
Band 1A	±8	±12	±5	±5			RILA-Track+RILA360 see NOTE 3
Band 2	±10	±10	±7	±7	±14	±14	
Band 2A	±10	±15	±7	±11			RILA-Track only
Band 2B	±10	±20	±7	±14	±14	±28	GNSS Survey accuracy receivers (tripod mounted)
Band 2C	±15	±25	±11	±18	±21	±35	GNSS Survey accuracy receivers (pole mounted).
Band 2D	±25	±20	±18	±14	±35	±28	LiDAR augmented with RILA
Band 3	±25	±25	±18	±18	±35	±35	Aerial imagery and mapping - at low flying height
Band 3A	±50	±30	±36	±28	±71	±57	Aerial imagery mapping & LiDAR Vehicle mounted LiDAR
Band 4	±100	±50	±71	±36	±141	±71	GNSS hand held receivers –GIS data collection
Band 5	±500	±1000	±354	±707	±707	±1414	DCS Vehicles - NMT

Note 3 RILA Track+RILA 360 measurements are always correlated thereby improving the relative accuracy. When modelling objects (using multiple points from the point cloud) the relative accuracy between objects is +/-3mm in X,Y&Z.

RILA – Proven & Operational



RILA Opportunities

- Clearly defined health and safety benefit
- Survey entire routes in days
- No possessions or track access required in the collection of data
- Can be mounted to a range of locos and passenger services
- Assigned NR Band 1A accuracy
- Survey once and use for many different projects / applications



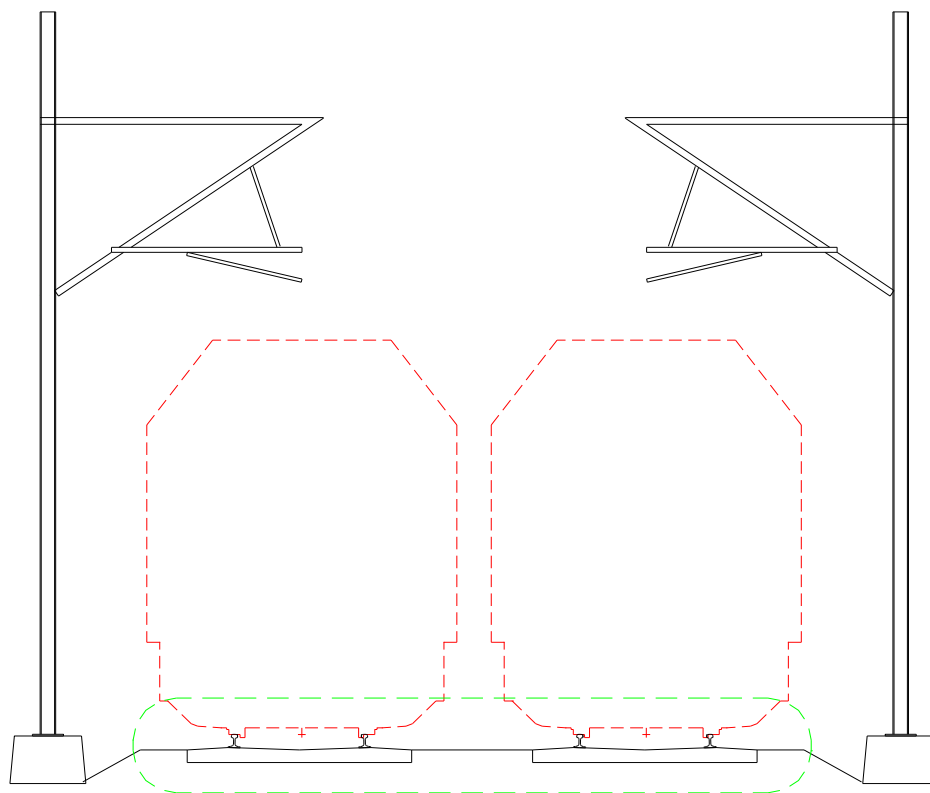
Health & Safety Case

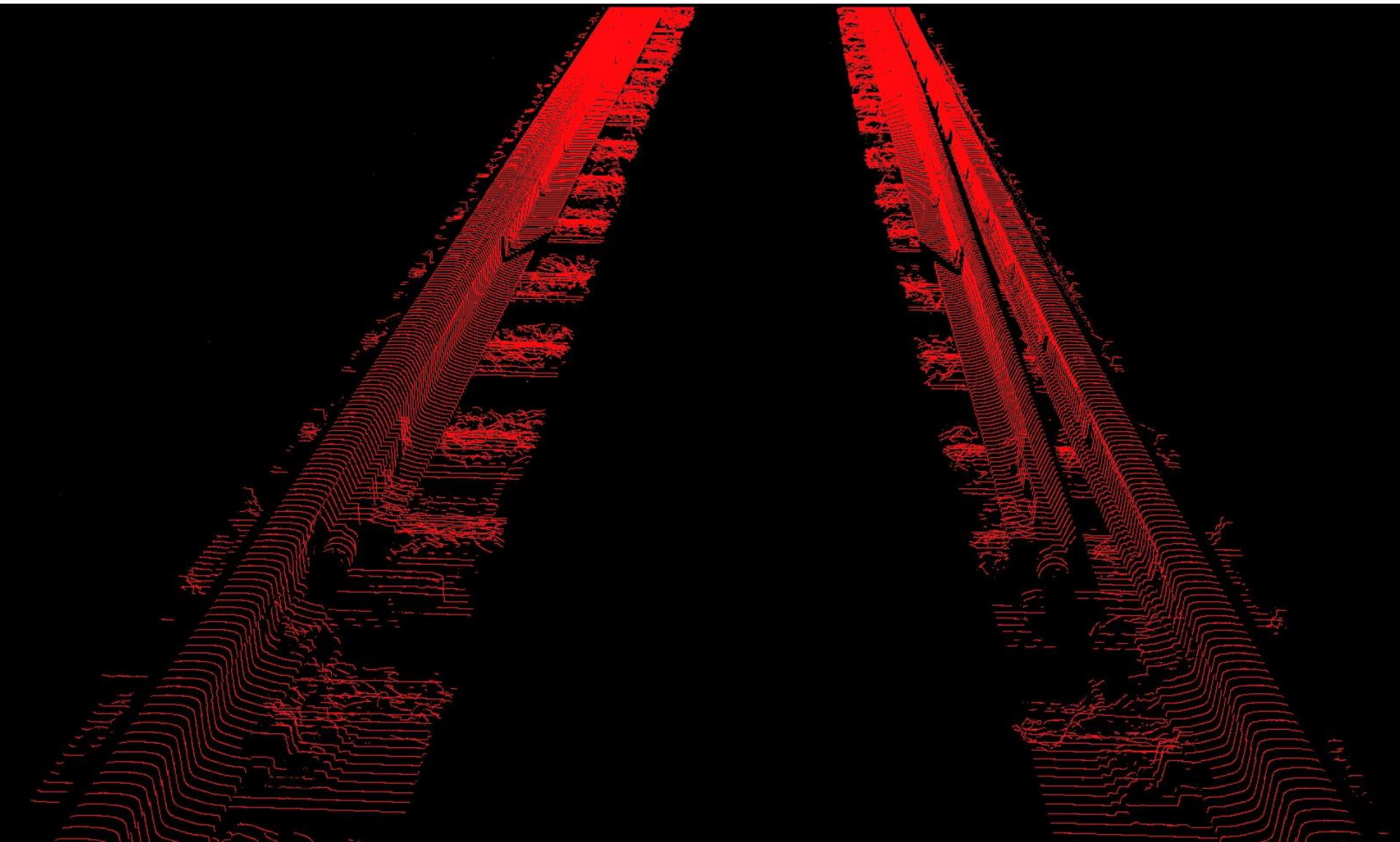
- **High Output Track Renewals** for whom RILA is used to survey Scotland, LNW, Anglia & SE have estimated that the use of RILA saved:-
- **6,590 track man hours** for the current year's survey (2017/18)
- **215 site visits.**

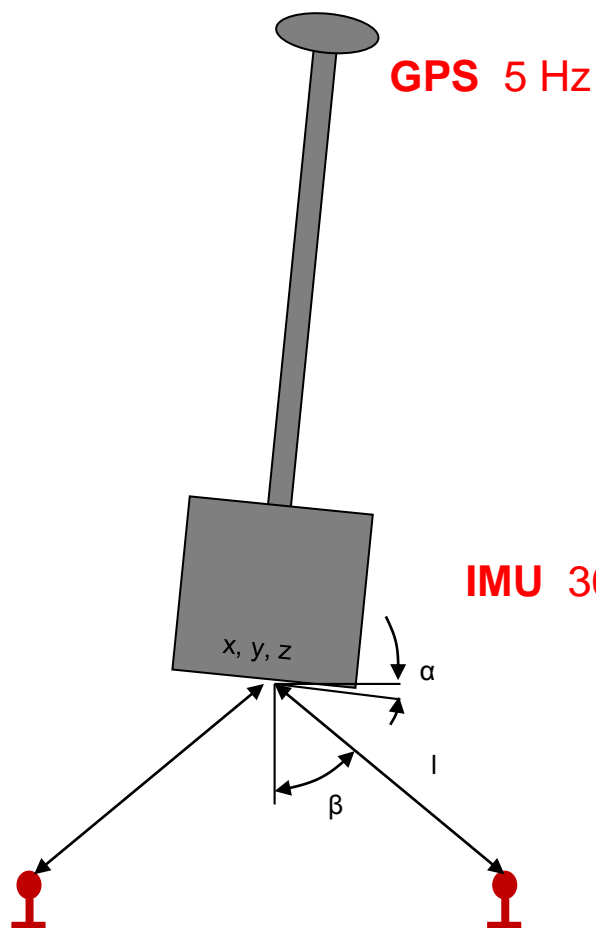


RILA Technology – RILA Track & RILA 360





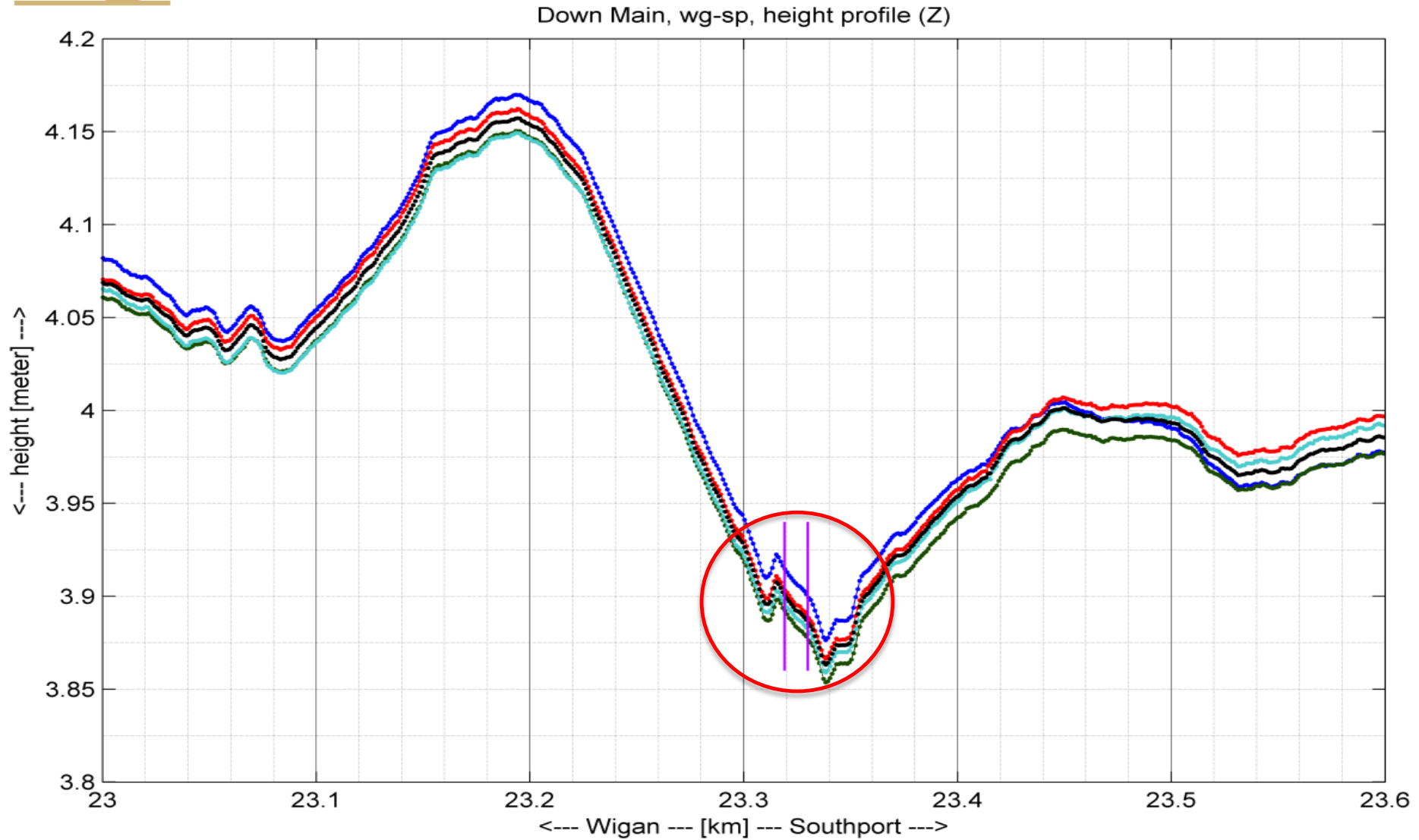




IMU 300 Hz

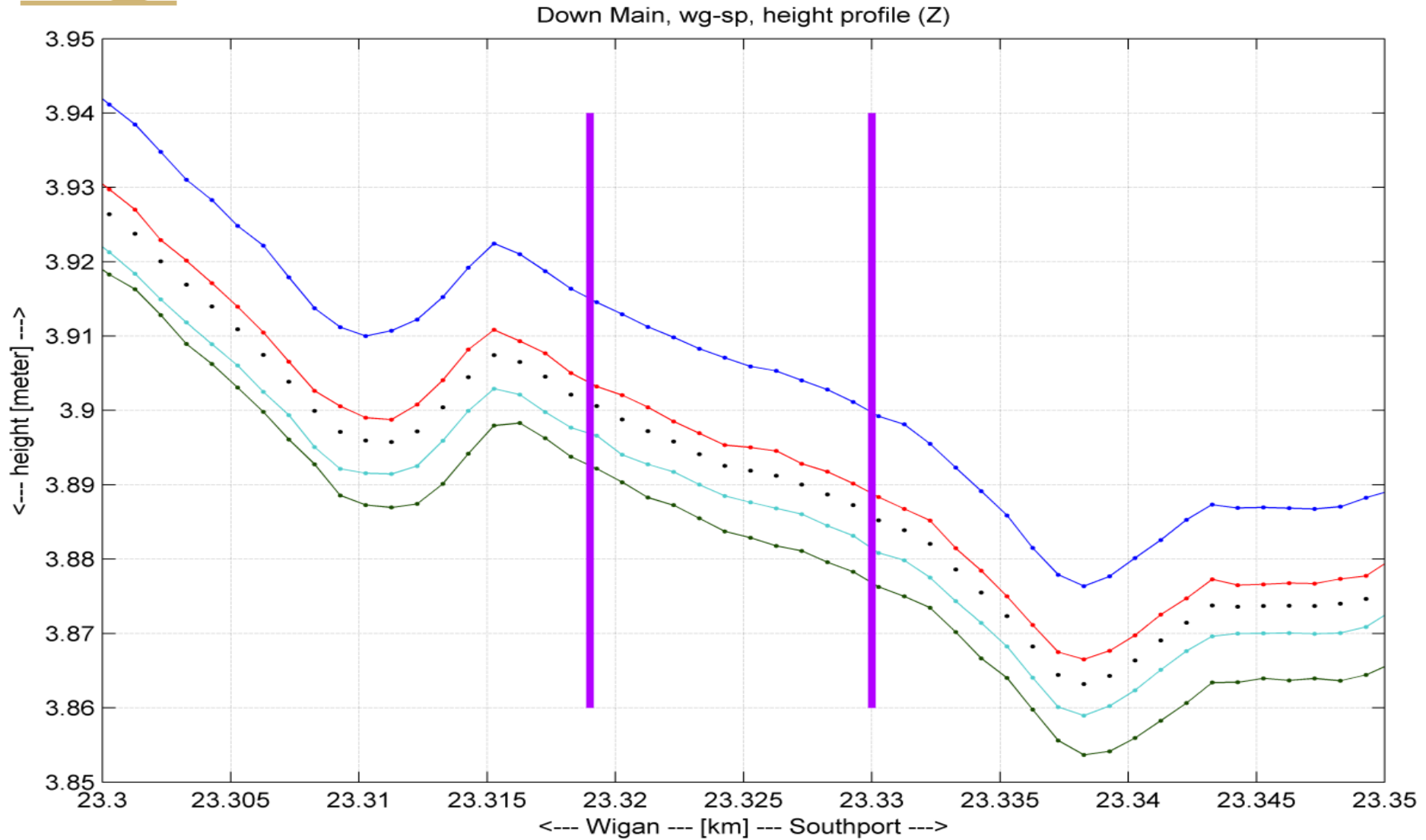


Laser Vision 500 Hz





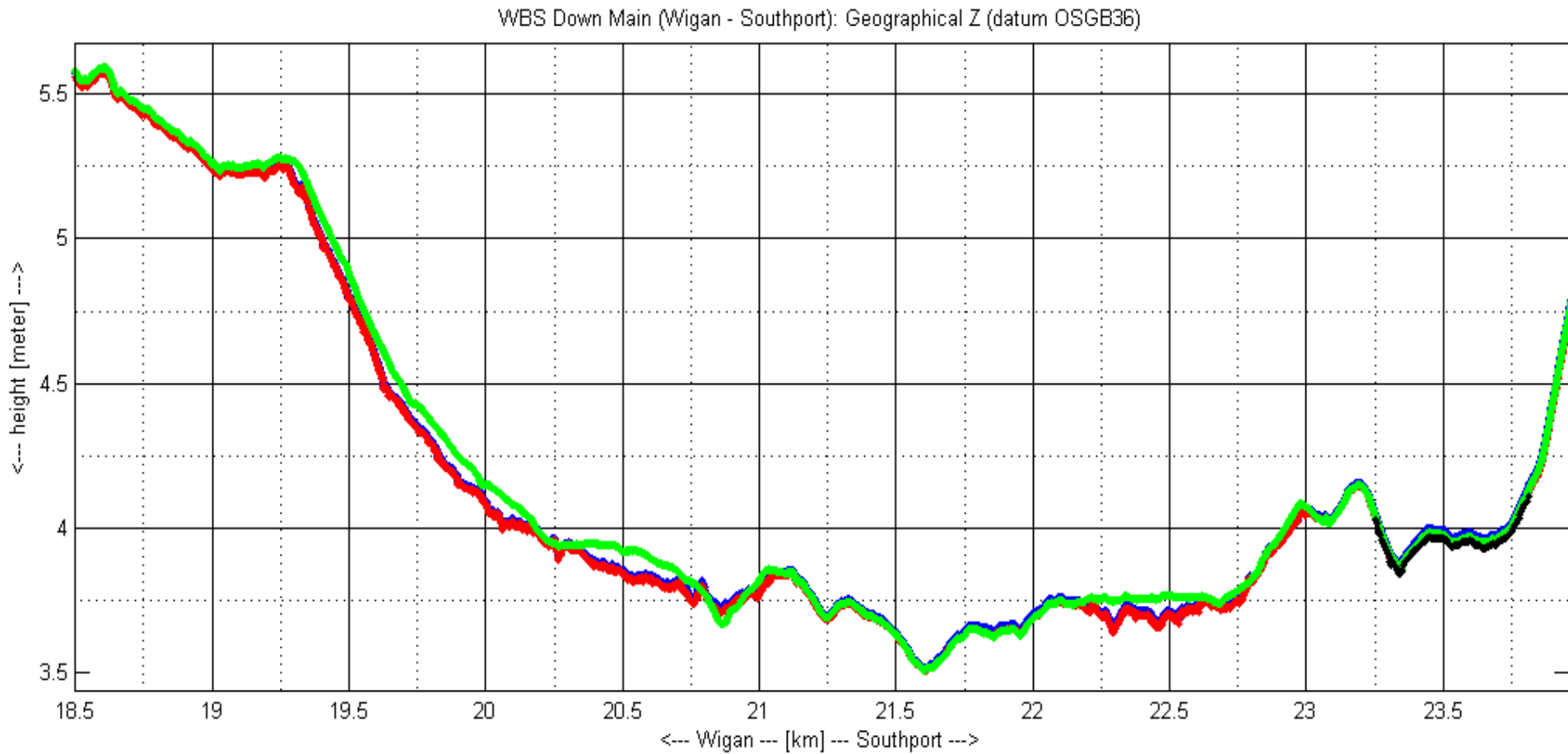
Case study Manchester - Southport





Case study Manchester - Southport

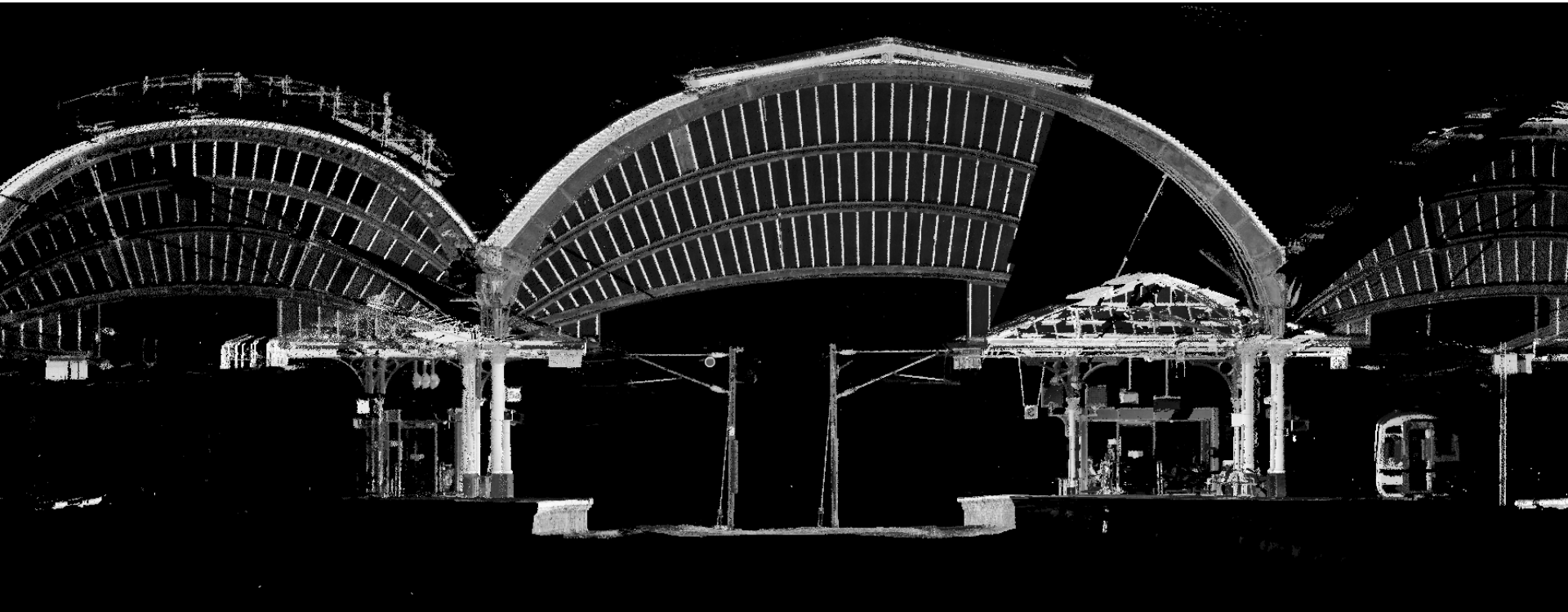
- RILA July
- RILA September
- RILA October

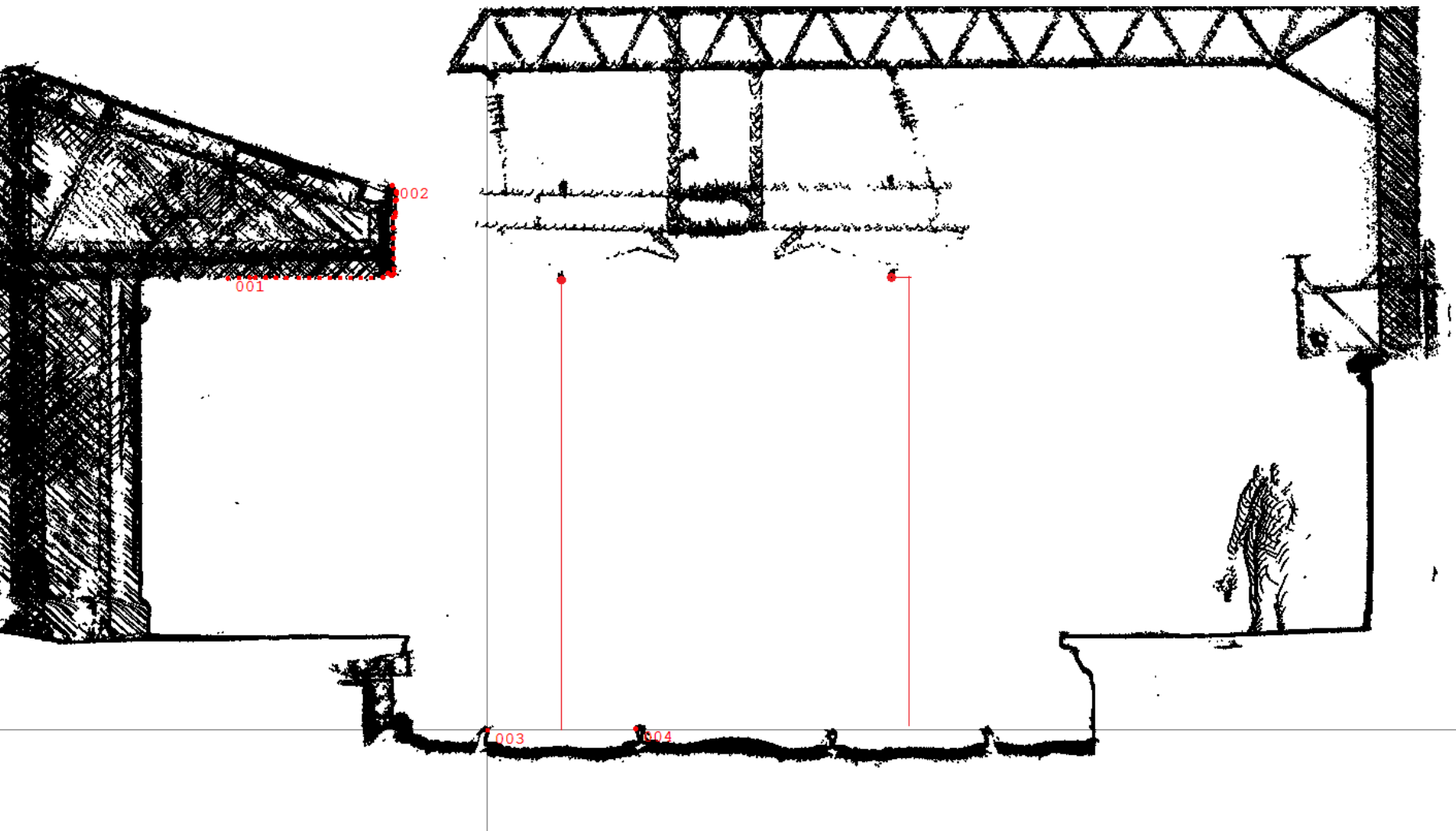


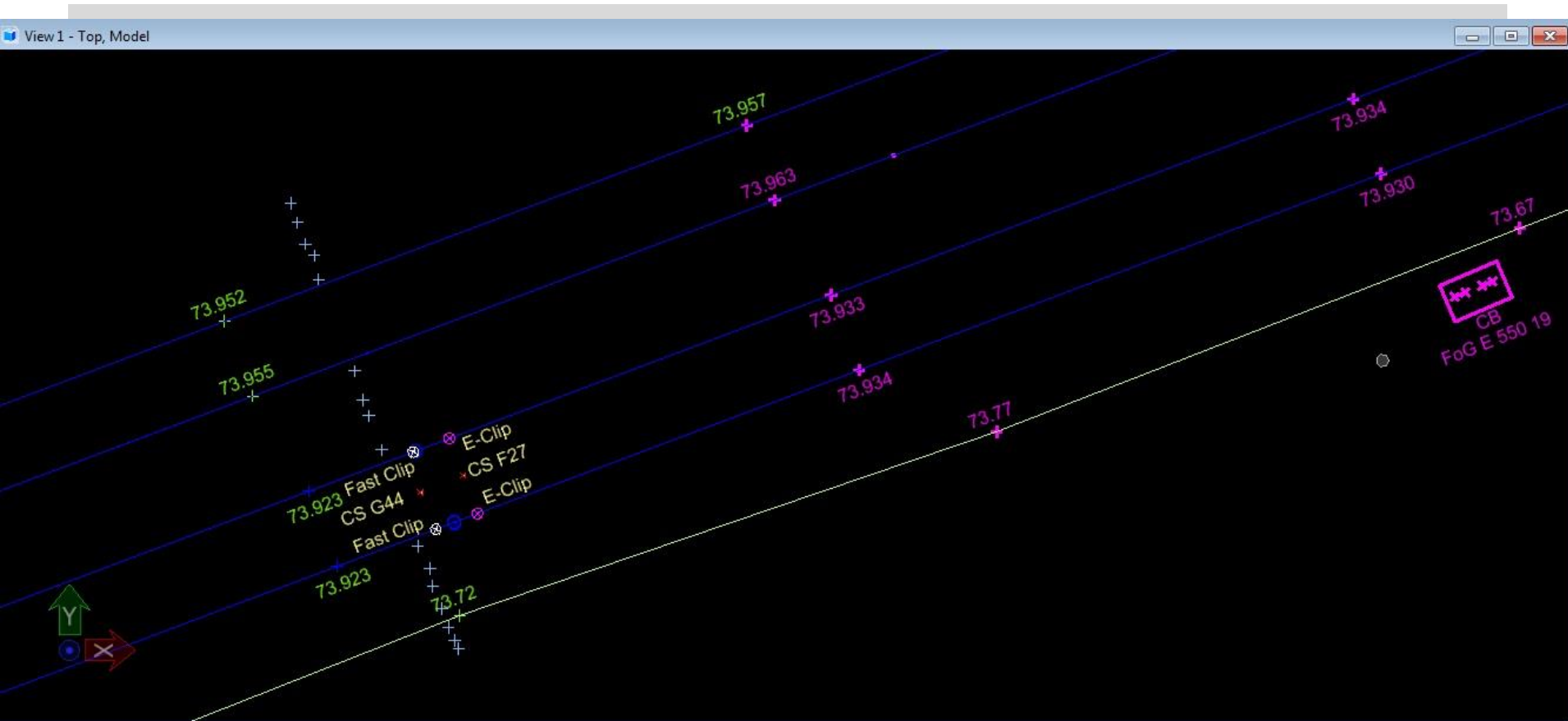


RILA Case Study – TransPennine Route Upgrade

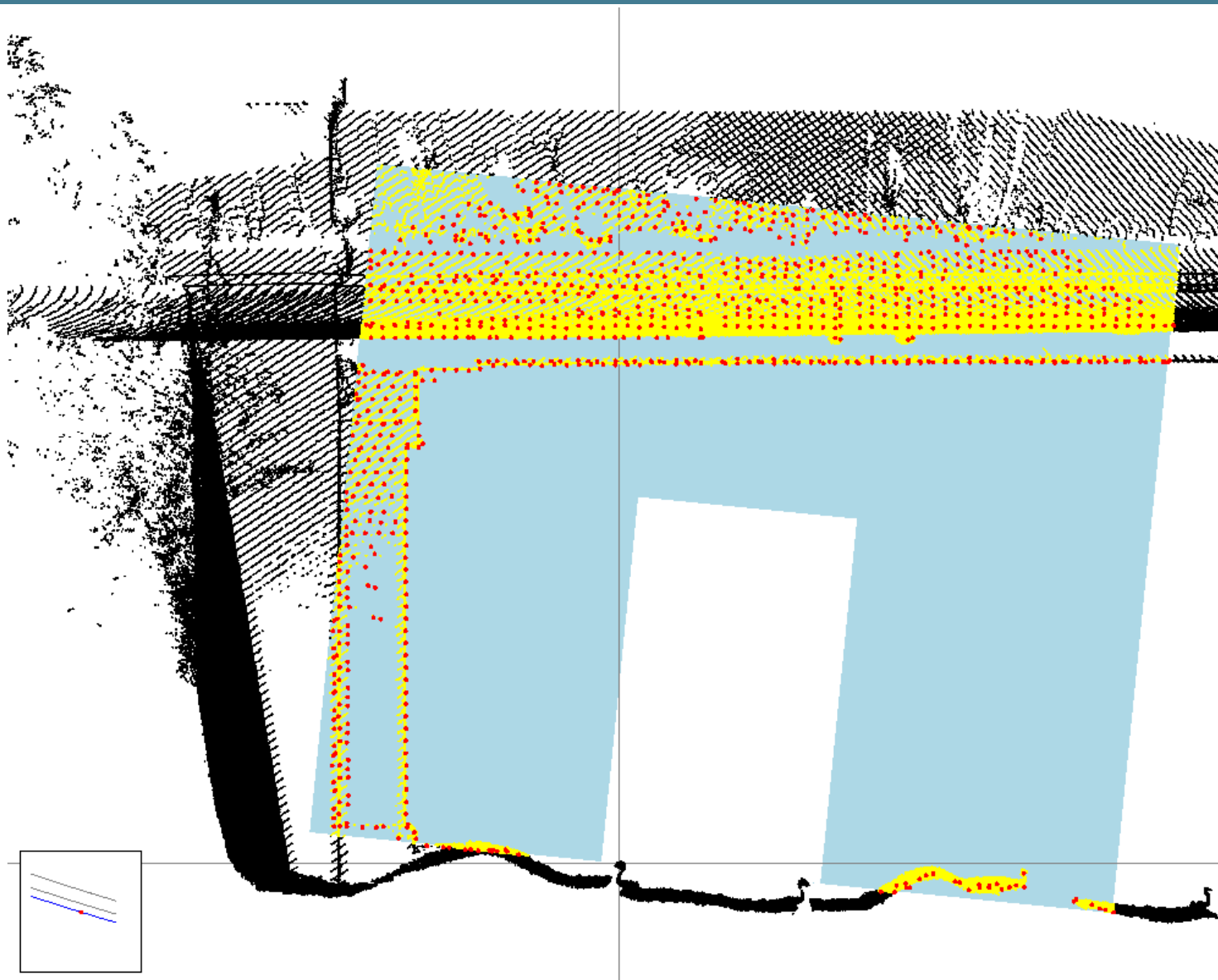


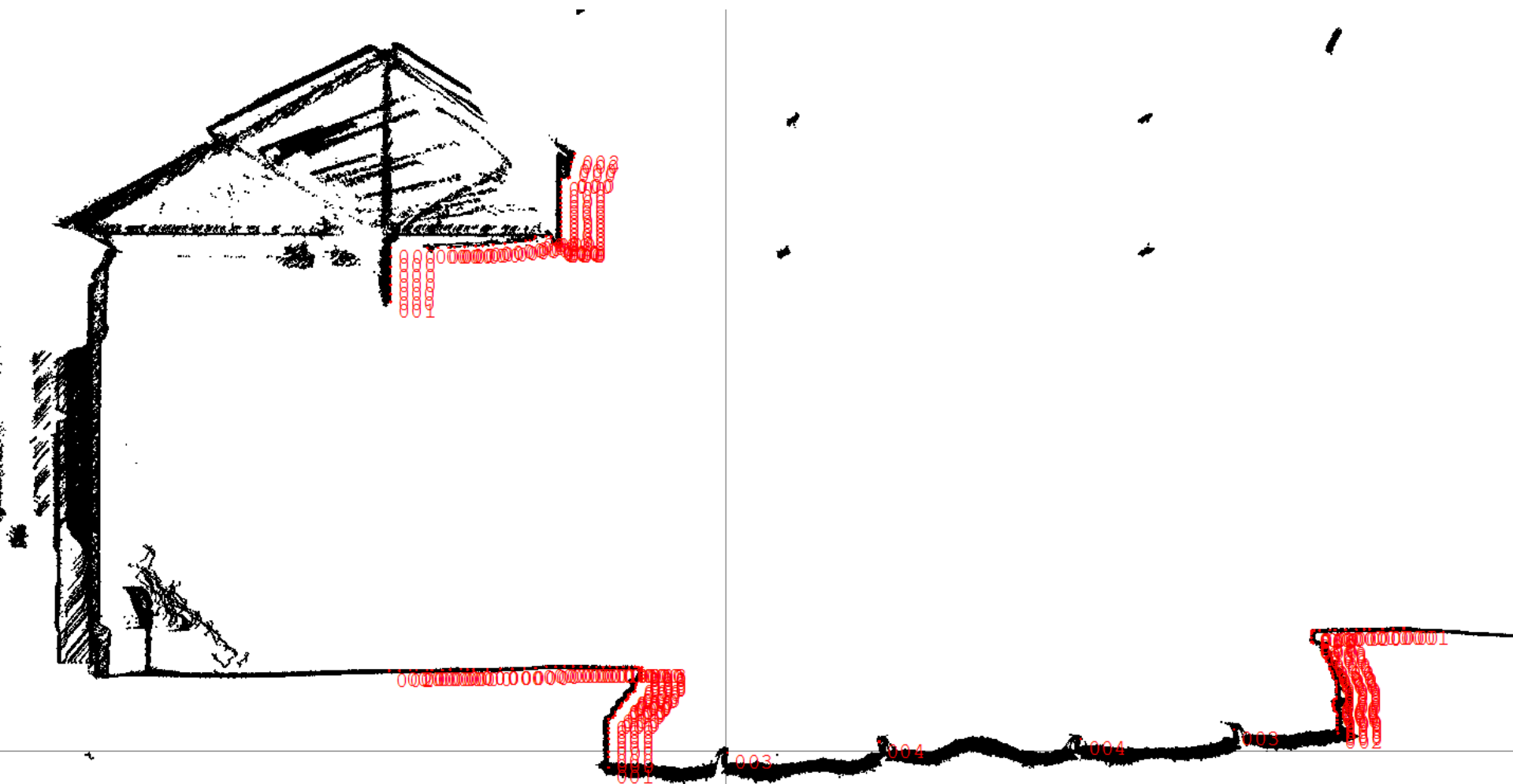






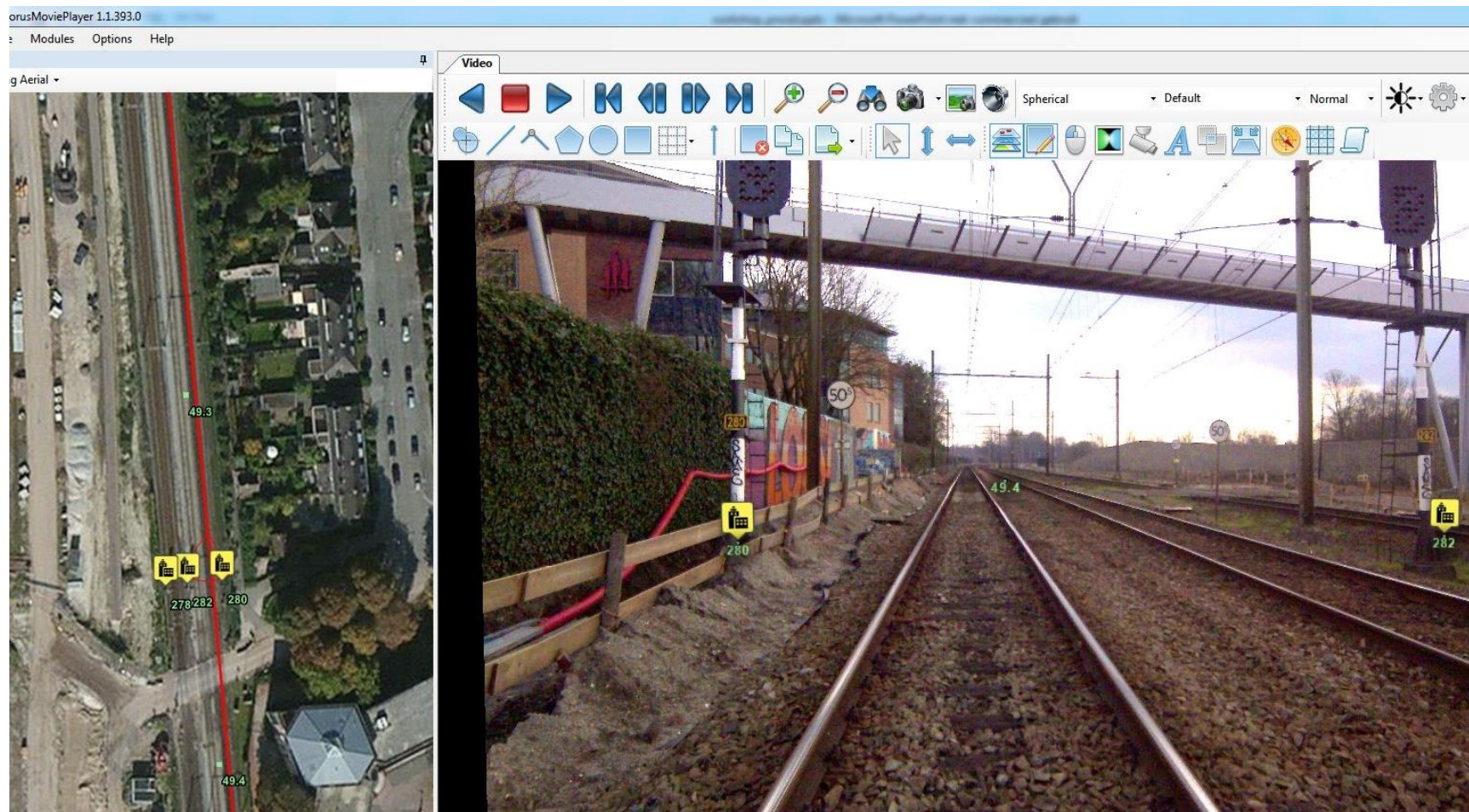
Structure Gauging Data





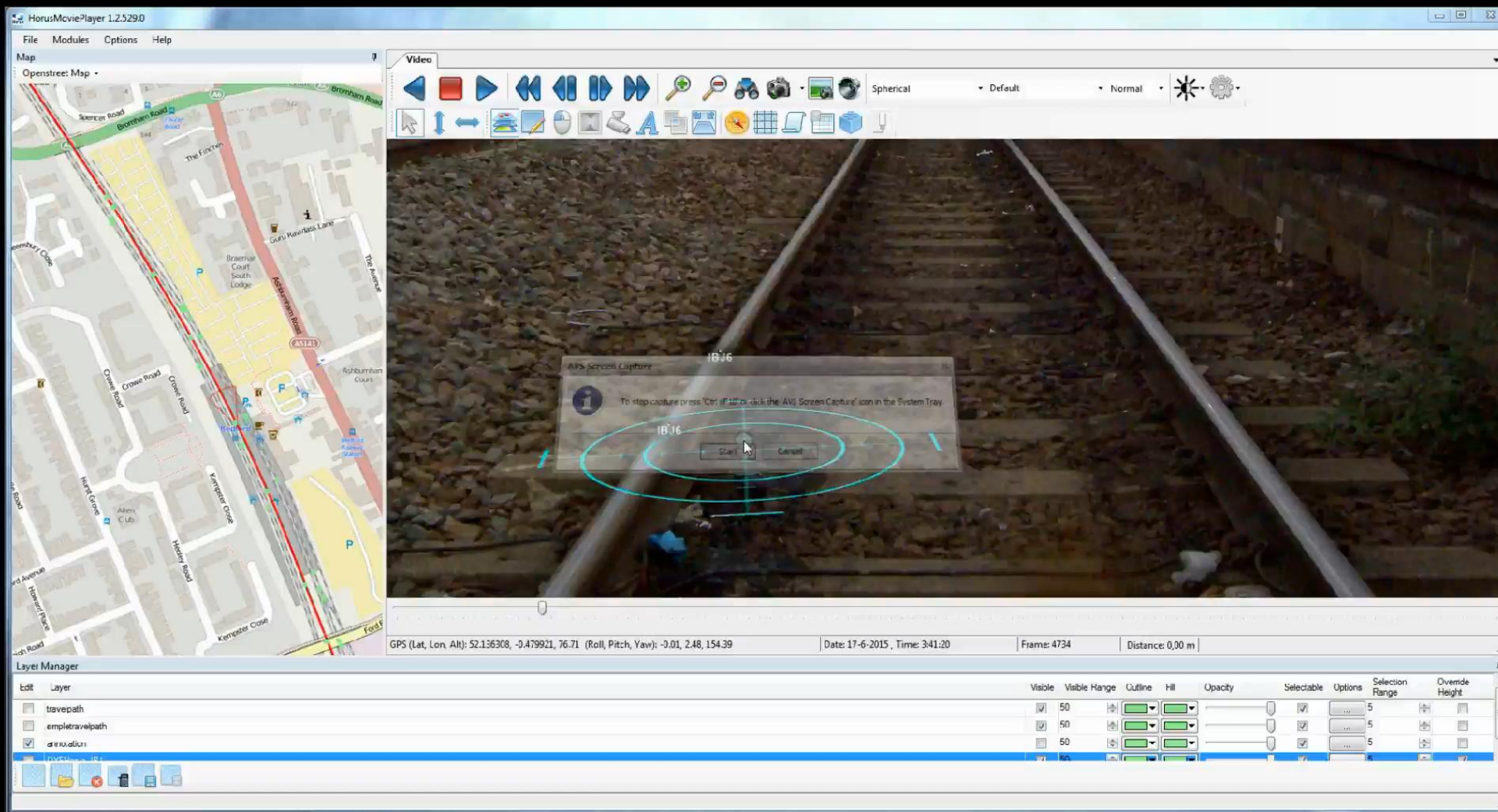
Currently awaiting formal approval for Platform Gauging

RILA – Georeferenced video mapping



This allows you to extract a list of notes for e.g. for a reconstruction behind your desk instead of going into the track.

RILA – Georeferenced video mapping



RILA Track V3.0 (Launched June 2017)

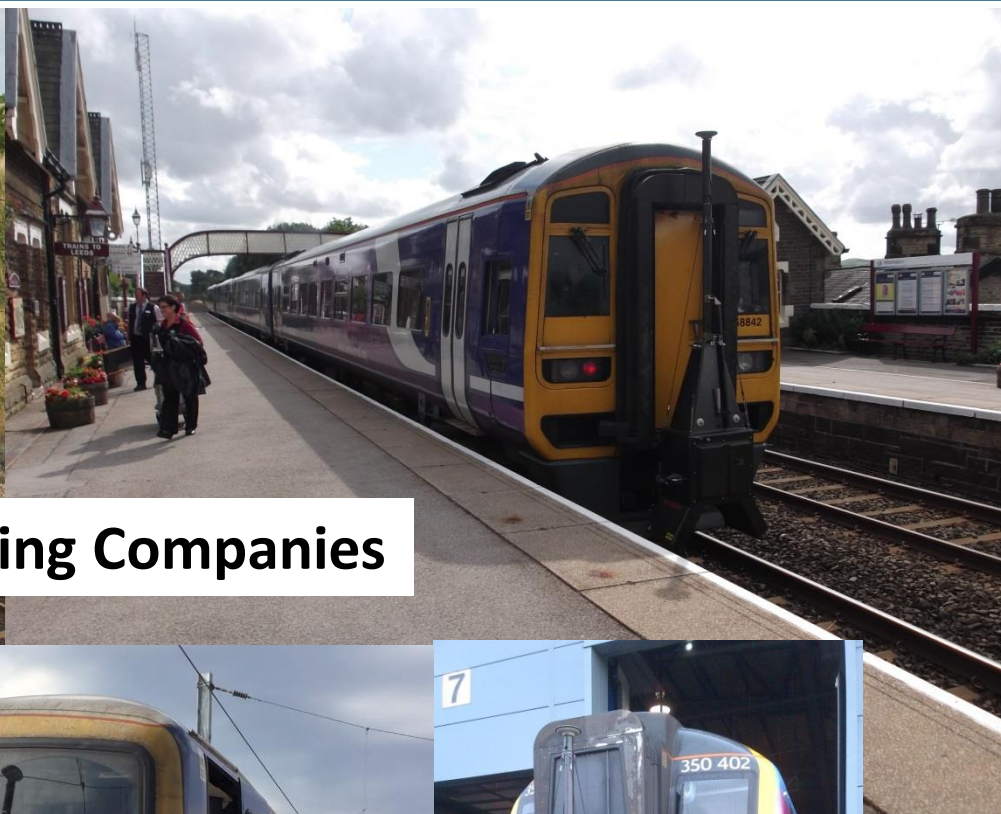


RILA Track – installation in less than 2 minutes



RILA Track – installation in less than 2 minutes





Train Operating Companies



RILA 360 corridor mapping



RILA 360 corridor mapping





Freight Operating Companies





Locomotive Types



RILA Constraints

- **RILA is not a panacea for railway survey.**
 - Definitely not cost-effective for small isolated track sections / locations
 - Train planning is extremely complex
 - Survey data can be compromised in deep cuttings or urban corridors
 - Survey data can be missing on approaches to major stations
 - Challenging procurement and operational deployment
 - Volume of post processing involved



RILA Conclusions

- **RILA is just one of a number of technologies used by NR**
 - Clearly defined health and safety benefit
 - Rapid survey acquisition
 - Survey data suitable for most applications in most situations
 - Can be very cost effective for route size projects
 - Current procurement model does not maximise cost benefits
 - Challenging volumes of processing and delivery programmes





Thank you.

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RAILDATA