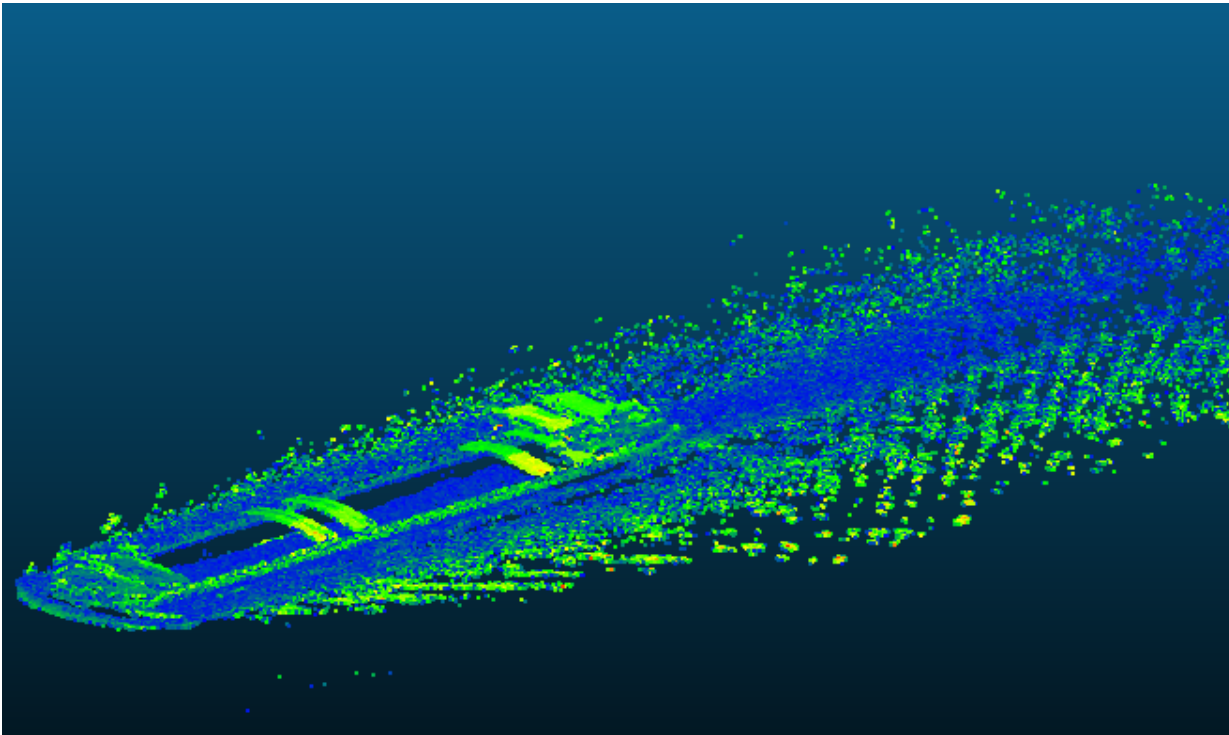




Rijkswaterstaat  
*Ministry of Infrastructure  
and Water Management*



AHN4 – MOERDIJKBRUG ZONE

# Guest lecture: Rijkswaterstaat & IHN

CIV-IGA-Advies en Toetsing  
Geodata & TU Delft

Daan van der Heide  
15 February 2023



**Rijkswaterstaat**  
*Ministry of Infrastructure  
and Water Management*



# Rijkswaterstaat and geo-data acquisitions





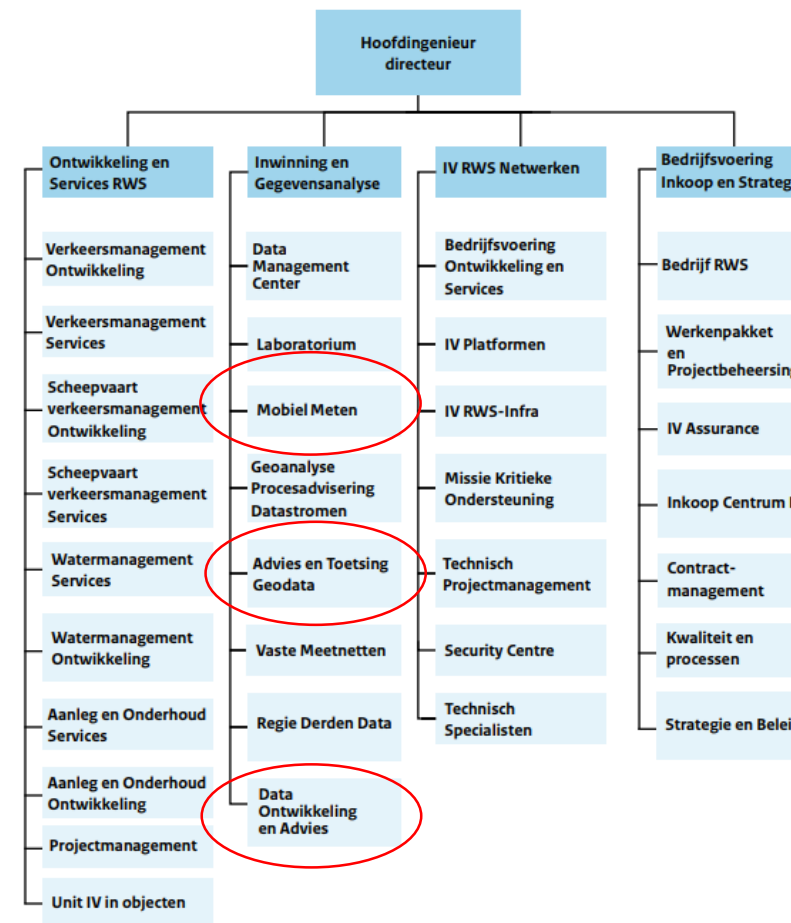
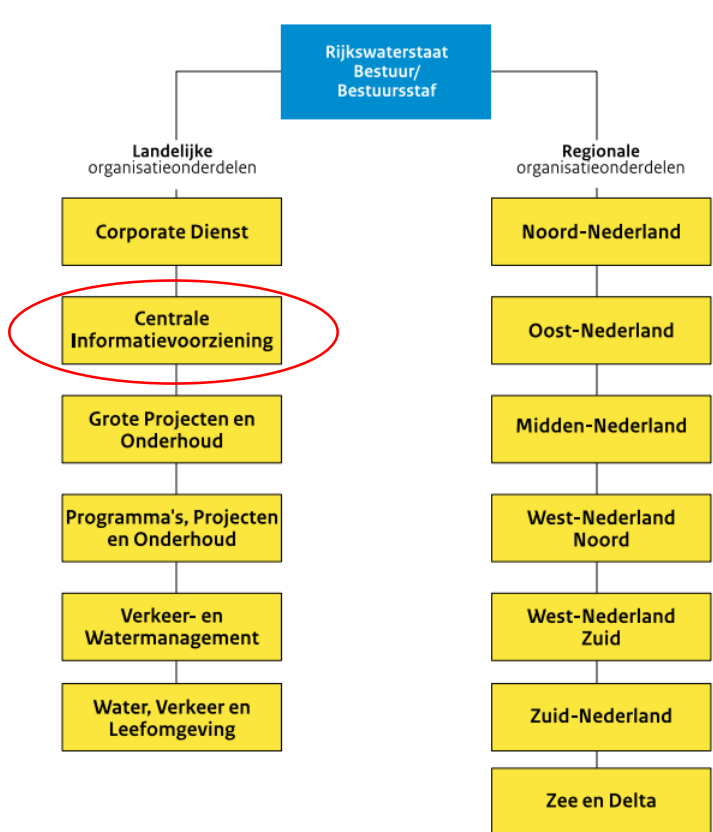
# Rijkswaterstaat

- Rijkswaterstaat is an executive organization of the Ministry of Infrastructure and Water Management.
- Maintaining and innovating the national roads, waterways, and open waters.
- Responsible for important assets in the Netherlands:
  - Stormvloed keringen
  - Afsluitdijk
  - Prins Claus plein → Highway flyover near the Hague





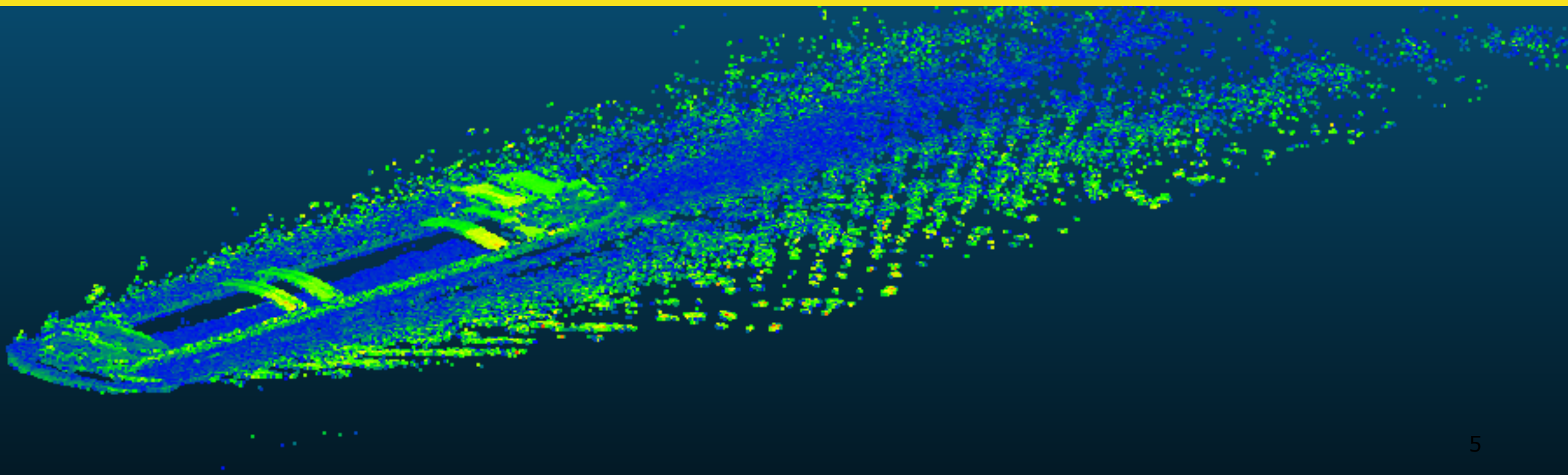
# Central Information and departments





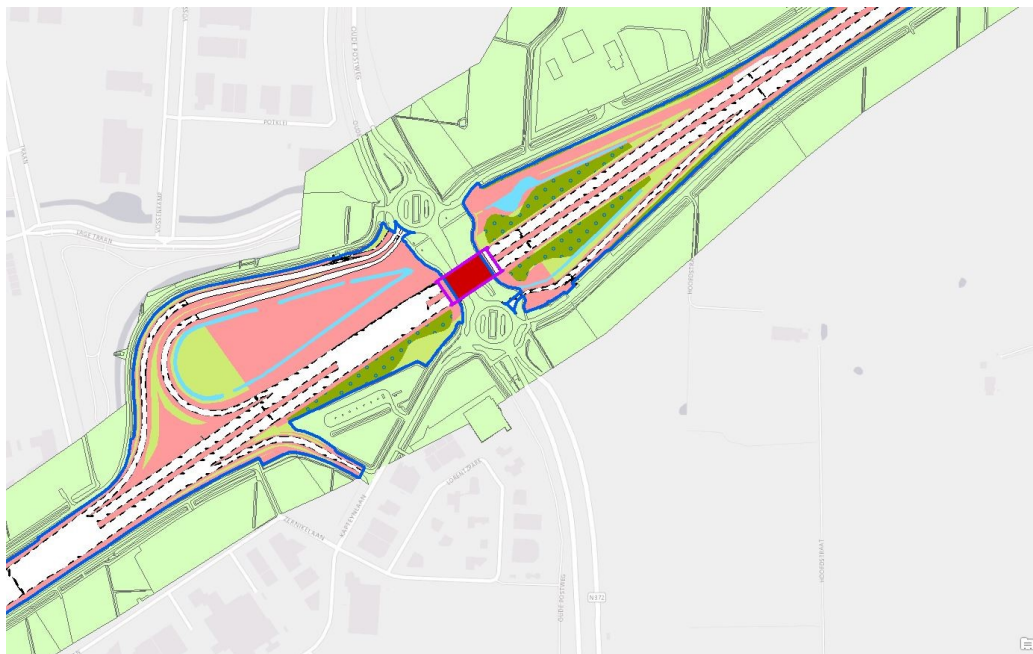


# Use of geo-data at Rijkswaterstaat

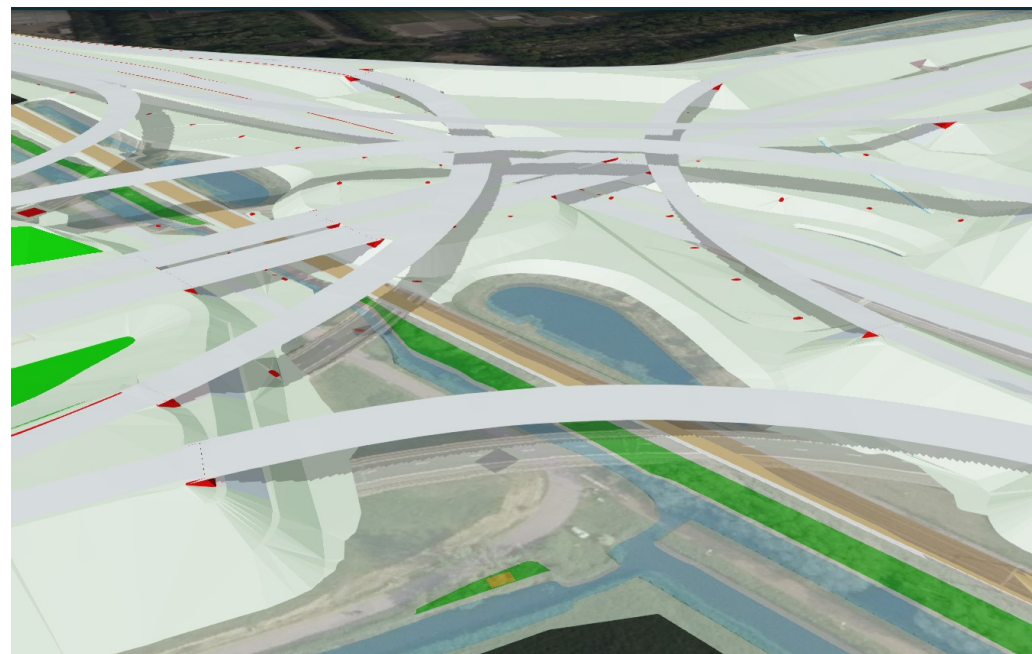




# BGT (Basisregistratie grootschalige topografie) & DTB (digitaal topografisch bestand)



BGT (2D)



DTB (2.5D)



Use Case:  
Pointclouds for the  
determination of  
clearance heights





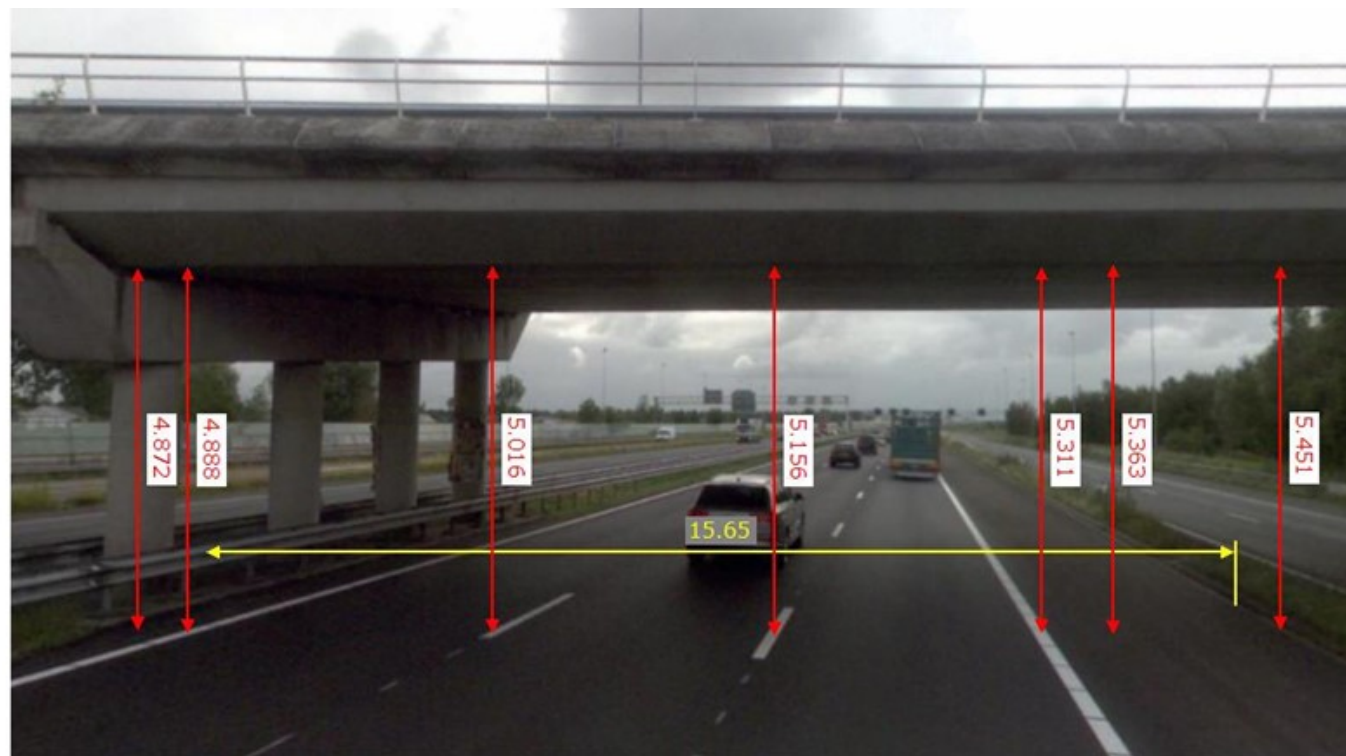


# Clearance heights (current method)

- Required for the movement of special objects (tanks, wind turbines, satellites, ships, etc.)
- Free space between a structure/gantry and the road surface
- Determined per lane with centimeter relative accuracy.



# Clearance heights (current method)

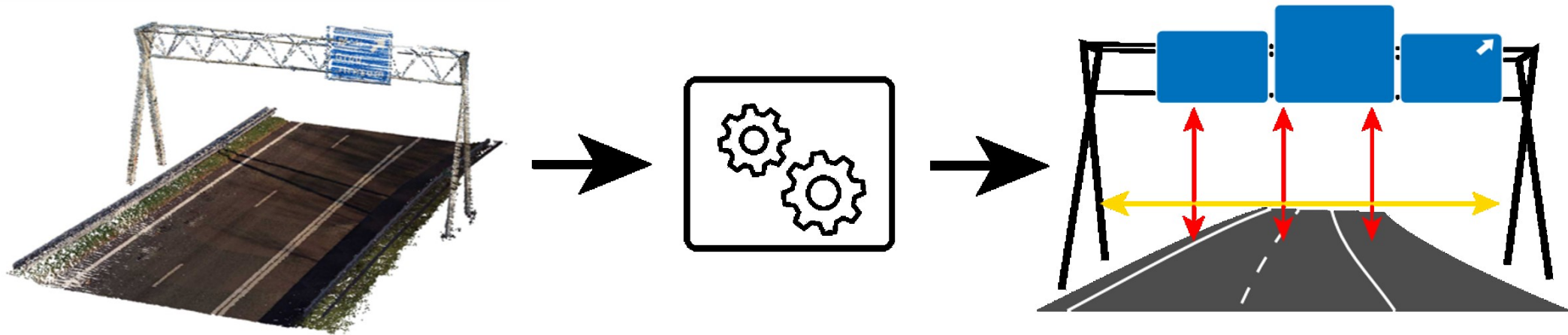


Rijksweg: A009  
Rijbaan: HRL  
Kilometer: 038.620  
Bijzonderheden: geen

Meetdatum: 01-09-2021  
Dwarsprofiel: 2  
Viaduct: Raasdorp  
Minimale doorrijhoogte: **4.872**



# Workflow automatic inspection







# Classifications of the objects

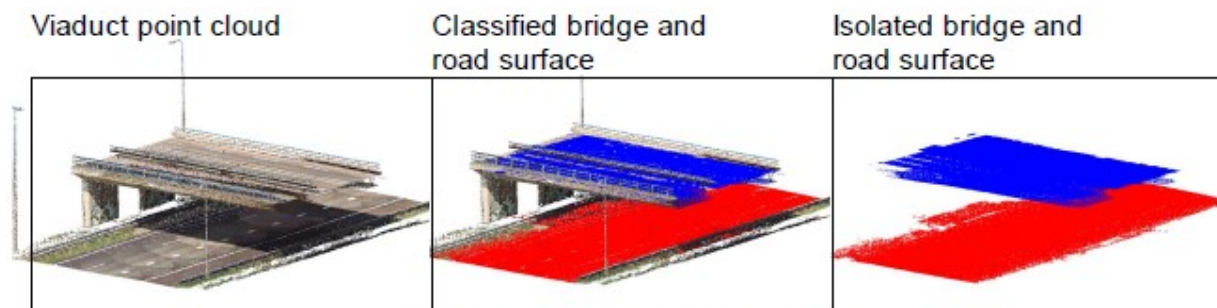


Figure 4.19: Classified road and viaduct surfaces.

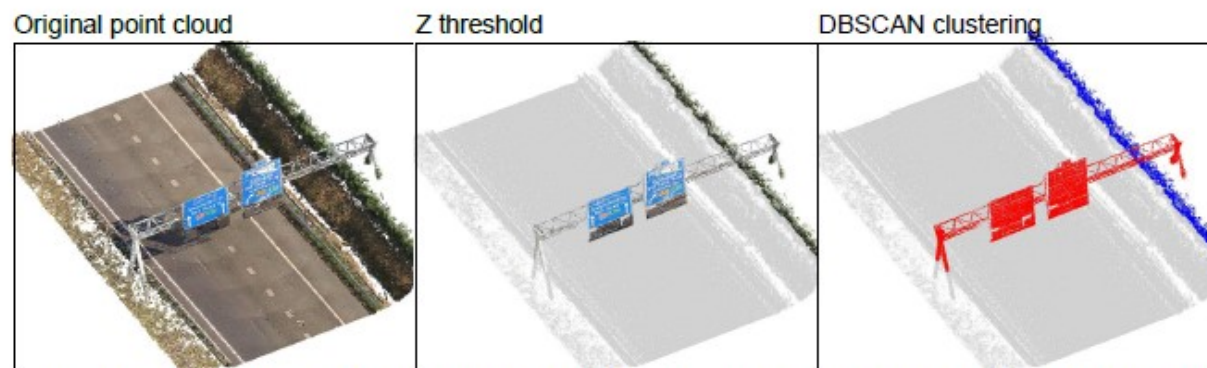
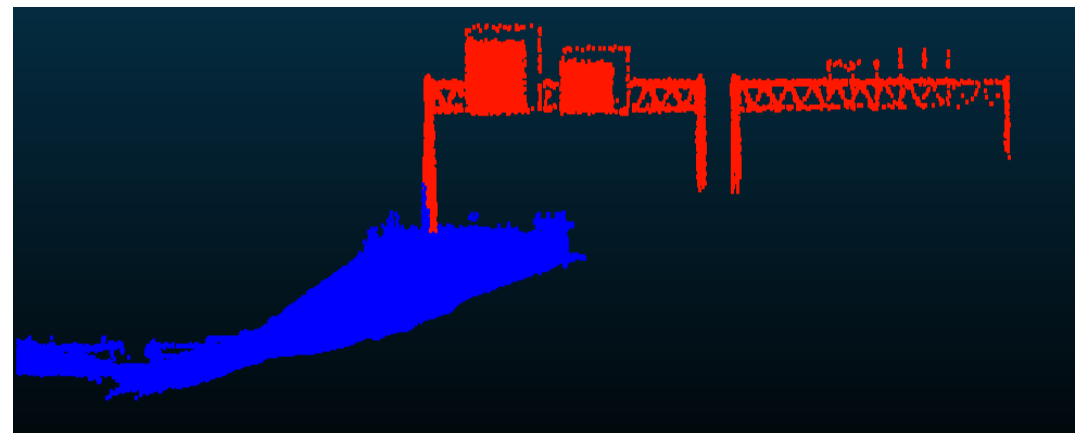
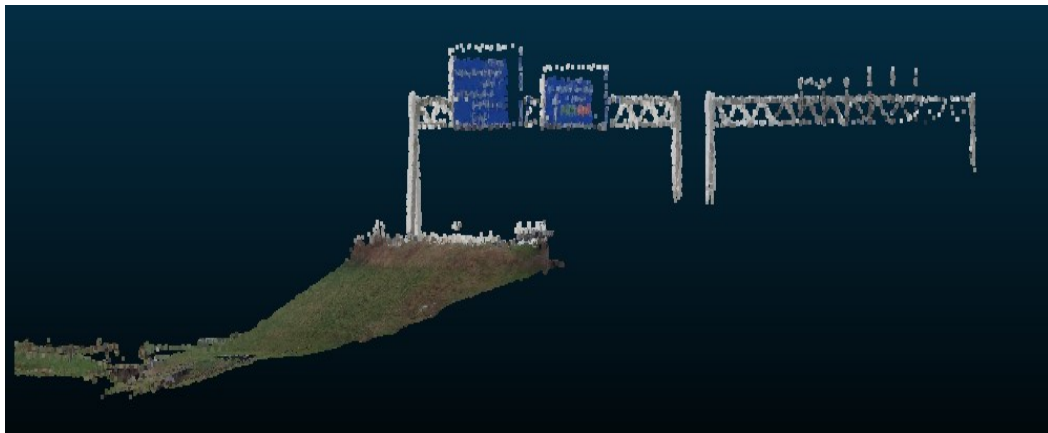


Figure 4.27: Initial clustering of the point cloud to obtain the gantry superstructure after a height threshold is applied.



# Inspection of gantry



*Using for instance the DTB or  
Deep/Machine learning*



# Classification of the underside of the gantry

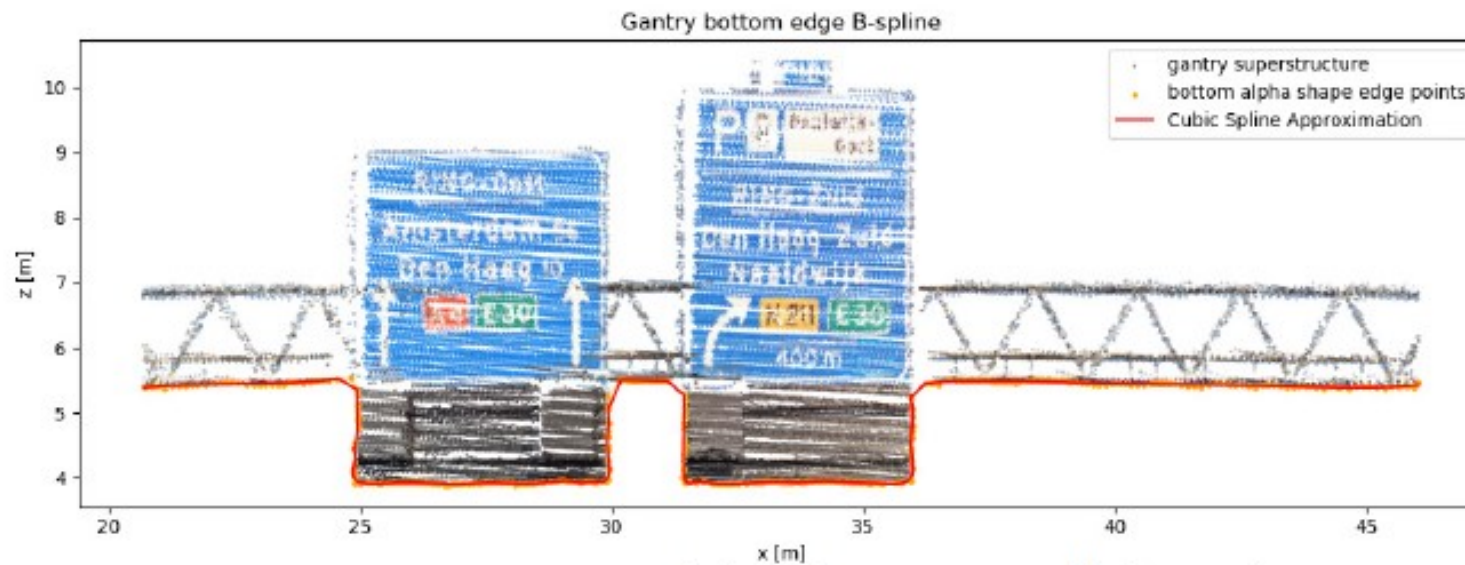


Figure 4.33: Gantry superstructure with the B-spline approximation of the bottom edge.





# Classification of road markings

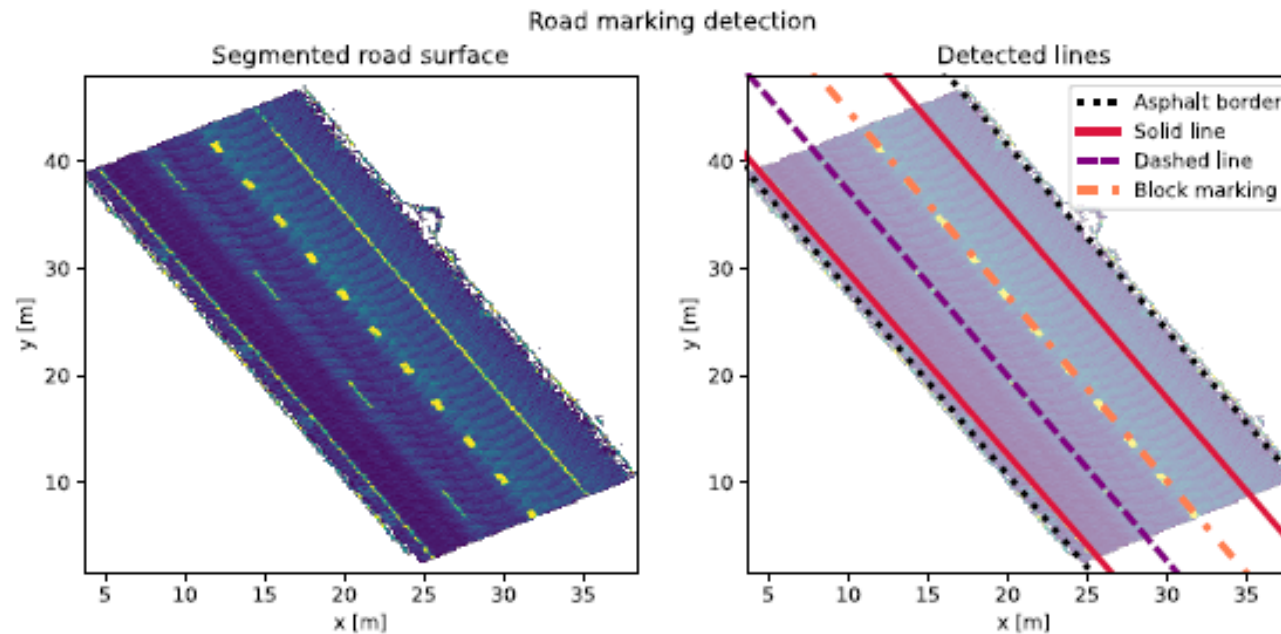
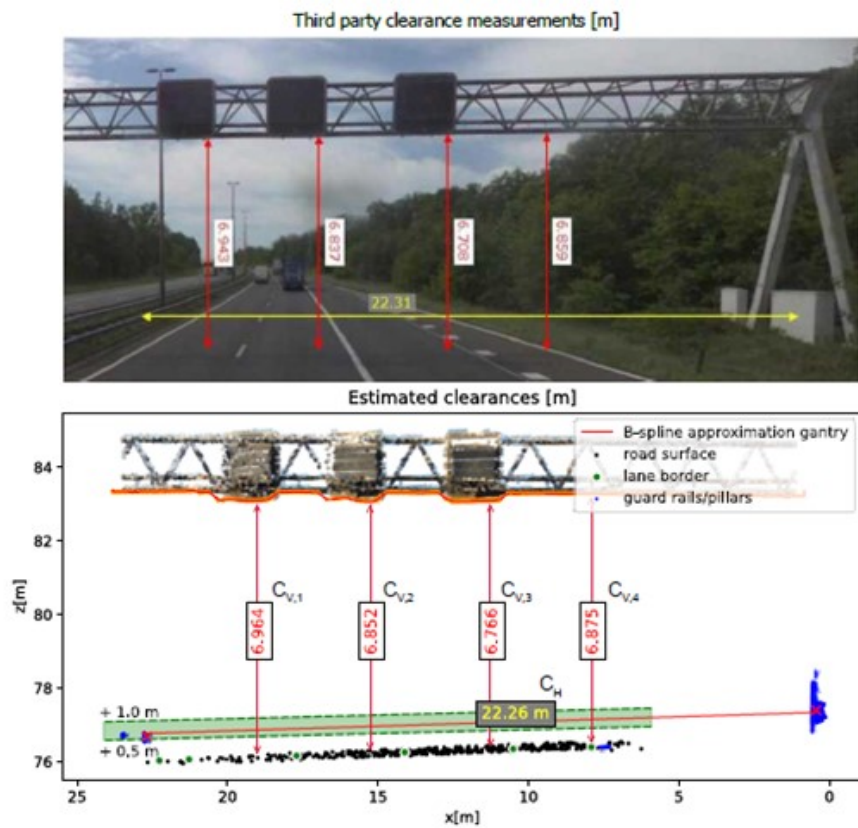


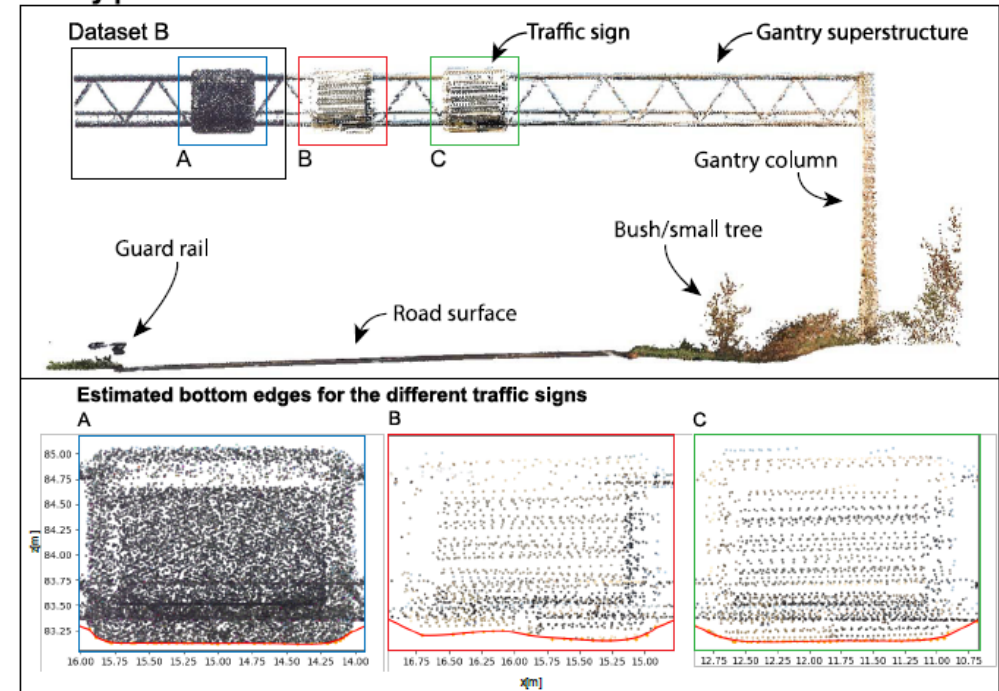
Figure 4.26: Example of a road section with different classes of detected lines.



# Resulting data



Gantry point cloud from dataset A





# Use Case 3 : Tunnels of South Holland







# Locations of the current projects





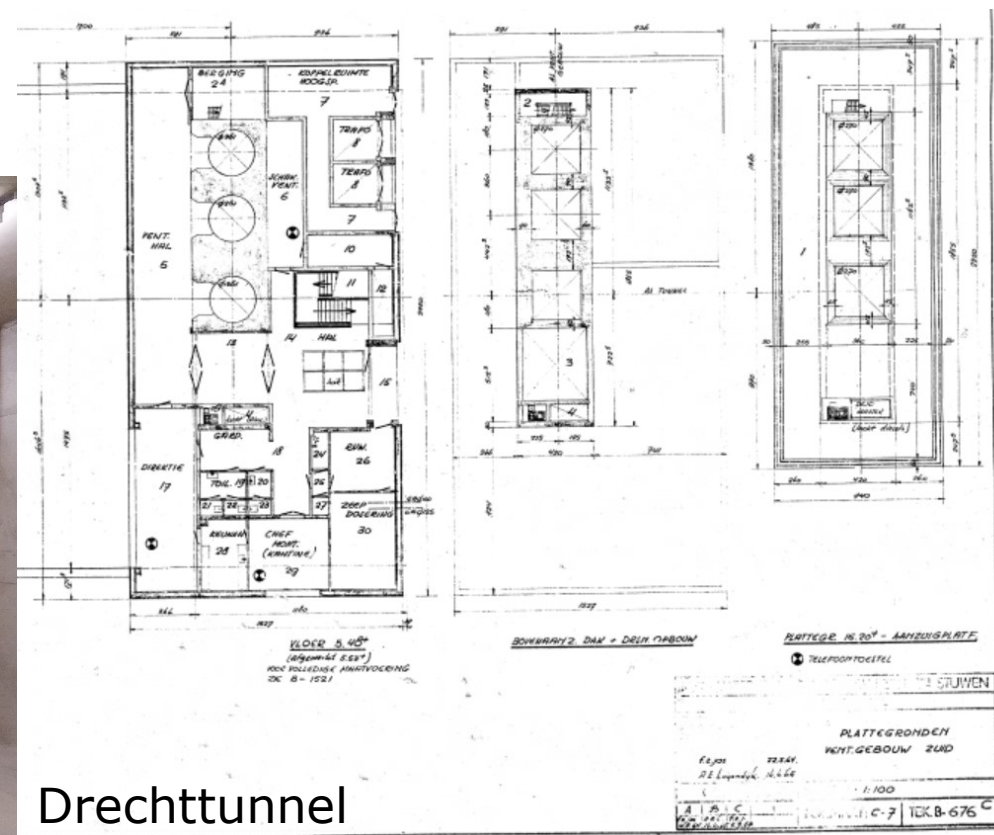
# Initial status of the tunnel data



Drechtunnel



Noordtunnel

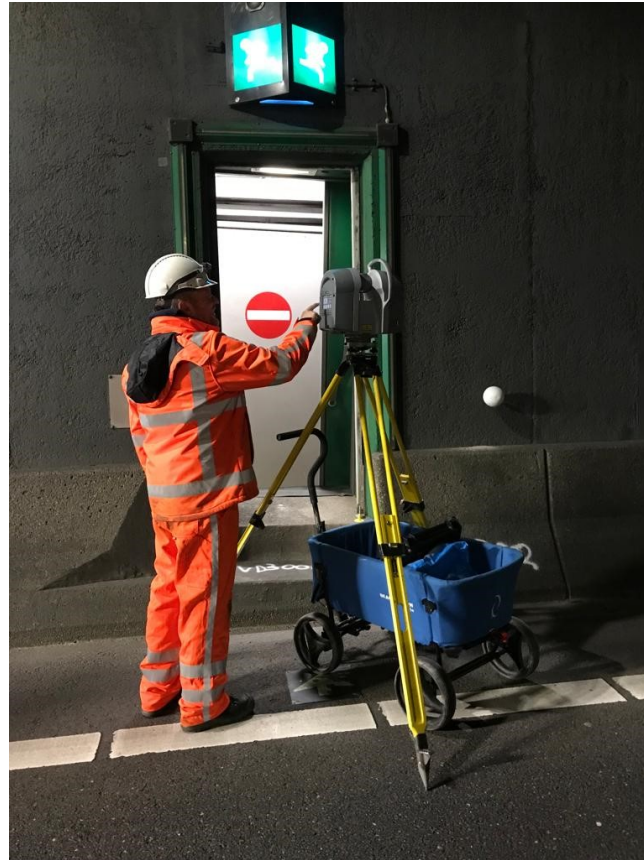


Drechtunnel

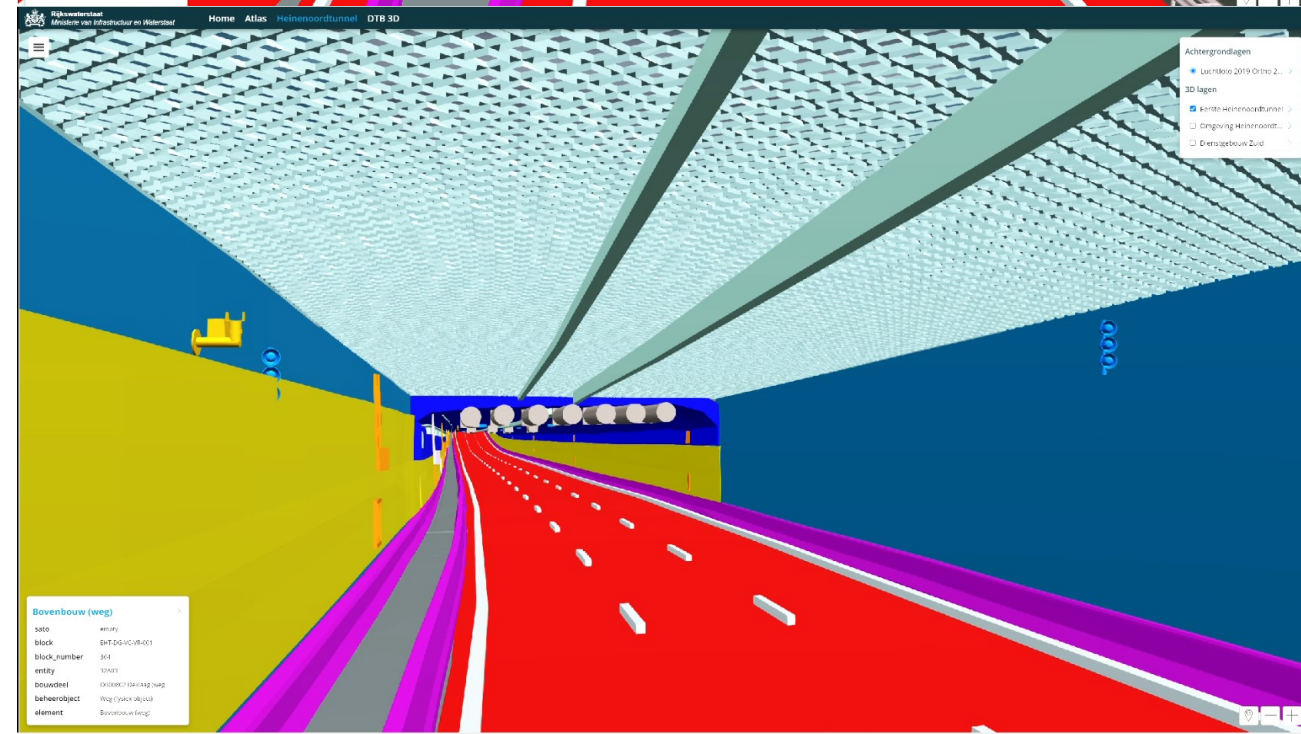
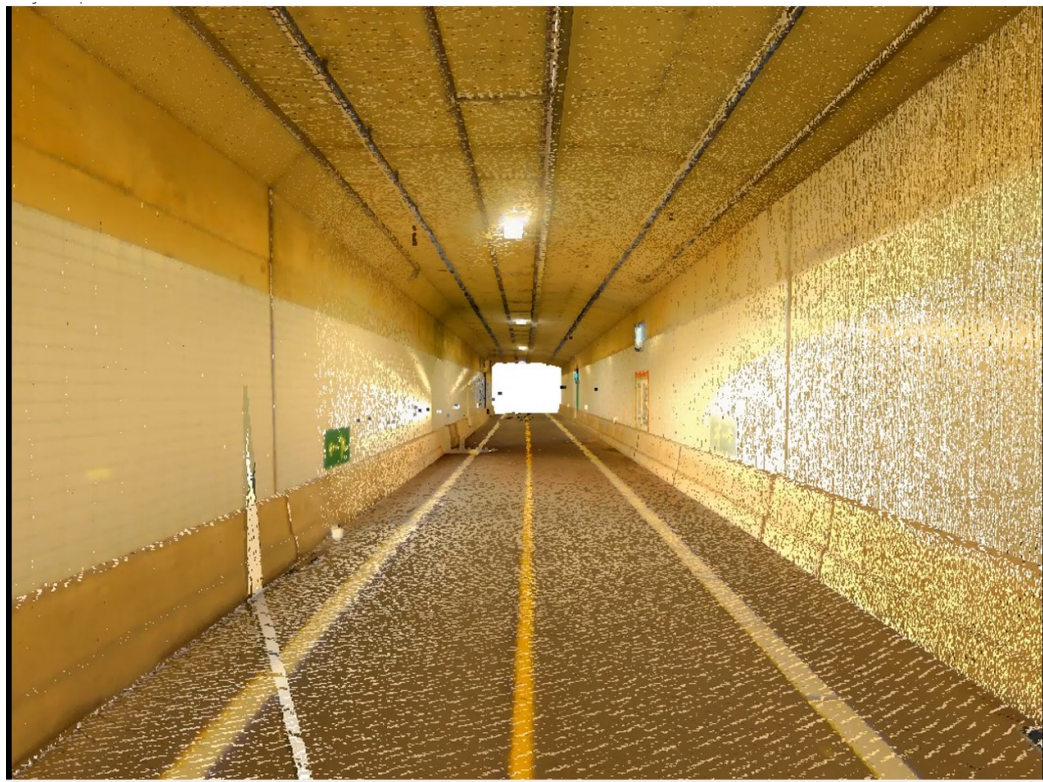




# Measurements of the tunnels



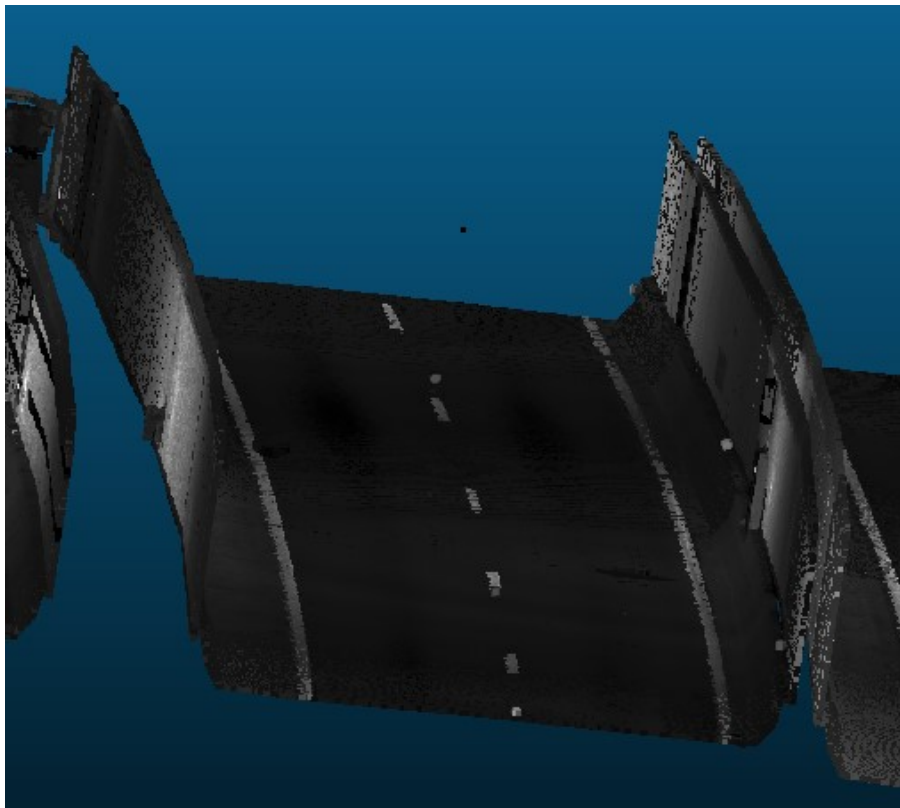








# Receiving data at Rijkswaterstaat





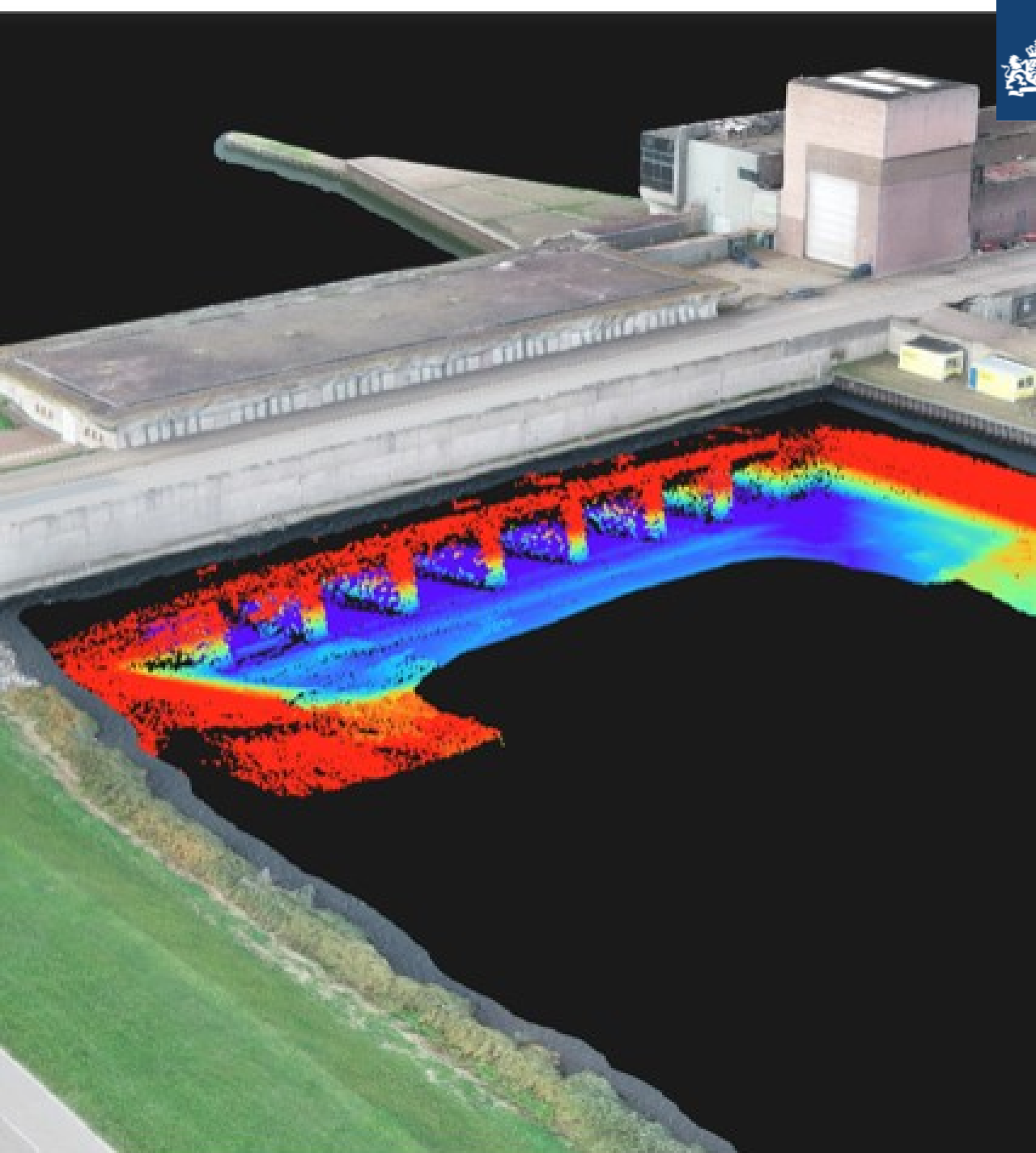
# Location of open Rijkswaterstaat data

- Large database of open datasets
- 20 themes available
- [Free to download](#)
- Available in different platforms
- Published with quality specifications

The screenshot shows the Rijkswaterstaat website interface. At the top, there is a navigation bar with 'Home', 'Zoeken', 'Kaart', and 'Contact' on the left, and 'Inloggen' on the right. Below this is a search bar with the text 'Terug naar zoeken' and buttons for 'Metadata' and 'Weergave'. The main heading is 'Basisregistratie Grootchalige Topografie - omhullende'. Underneath, it says 'Brontype: Dataset' and 'Deze omhullende van het BGT geeft aan binnen welk gebied de Basisregistratie Grootchalige Topografie is ingewonnen.' There are three tabs: 'Beschrijving', 'Contact gegevens', and 'Downloads, views en links', with the last one being active. The 'Downloads, views en links' section lists three items:

- bgt\_hull**: [https://geo.rijkswaterstaat.nl/arcgis/rest/services/GDR/bgt\\_hull/MapServer](https://geo.rijkswaterstaat.nl/arcgis/rest/services/GDR/bgt_hull/MapServer) (Open link)
- bgt\_hull**: [https://geo.rijkswaterstaat.nl/arcgis/rest/services/GDR/bgt\\_hull/FeatureServer](https://geo.rijkswaterstaat.nl/arcgis/rest/services/GDR/bgt_hull/FeatureServer) (Open link)
- bgt\_omhullende**: De laag 'bgt\_omhullende' is/zijn gepubliceerd in de Web Map Service [https://geo.rijkswaterstaat.nl/services/ogc/gdr/bgt\\_hull/ows?service=WMS&request=getcapabilities&version=1.3.0](https://geo.rijkswaterstaat.nl/services/ogc/gdr/bgt_hull/ows?service=WMS&request=getcapabilities&version=1.3.0). Lees meer over het WMS protocol. (Voeg aan kaart toe)
- bgt\_hull:bgt\_omhullende**: Het featuretype 'bgt\_hull:bgt\_omhullende' is gepubliceerd in de Web Feature Service [https://geo.rijkswaterstaat.nl/services/ogc/gdr/bgt\\_hull/ows?service=WFS&request=getcapabilities&version=2.0.0](https://geo.rijkswaterstaat.nl/services/ogc/gdr/bgt_hull/ows?service=WFS&request=getcapabilities&version=2.0.0). Lees meer over

On the right side, there is a 'Overzicht' section with a thumbnail map of the Netherlands and a 'Ruimtelijke dekking' section with a map showing the spatial coverage of the dataset in the Netherlands, with labels for 'Netherlands', 'Amsterdam', 'Utrecht', 'Rotterdam', and 'Gelsen'.



## Digital Twin at RWS

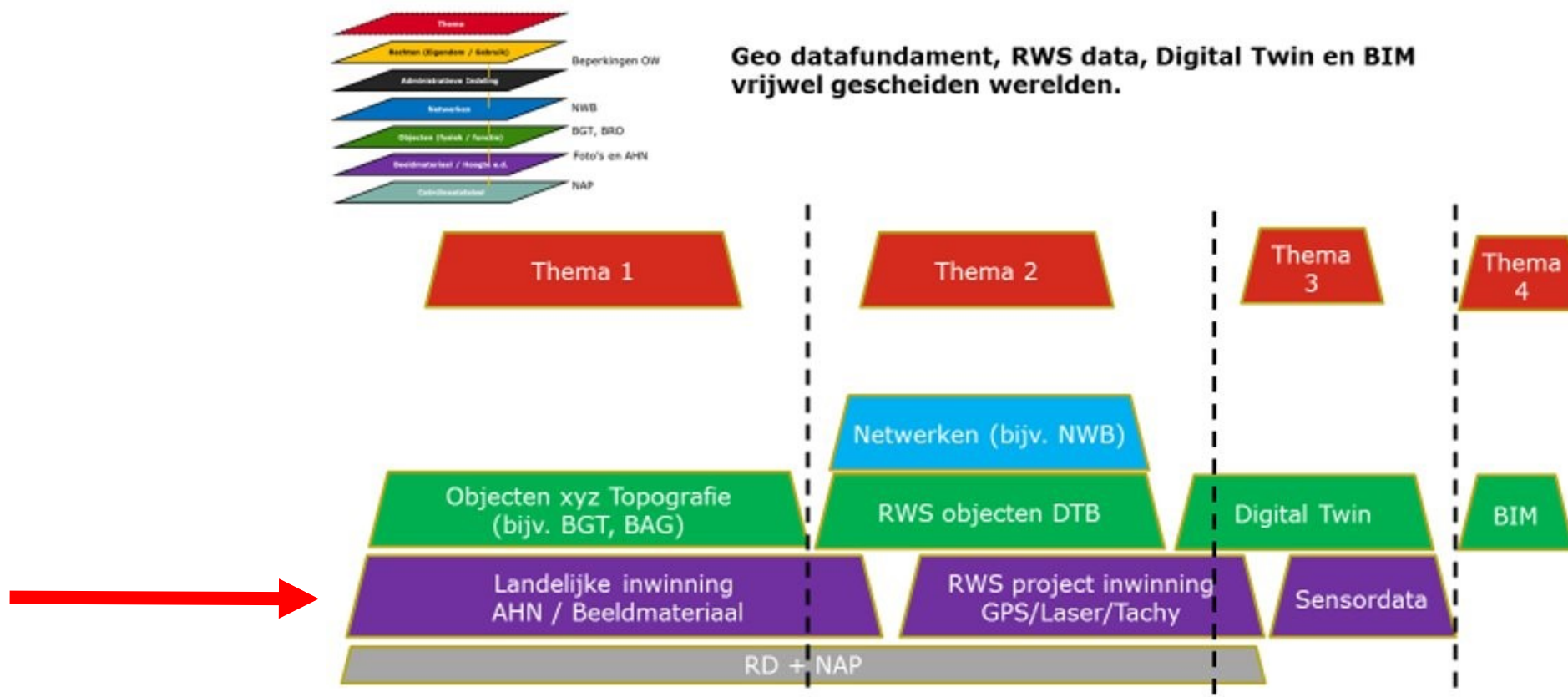
**Objective:** a complete and up-to-date view of the entire object

3D scans of the underwater combined with a laser scan of what is above water

- Support for Asset Management



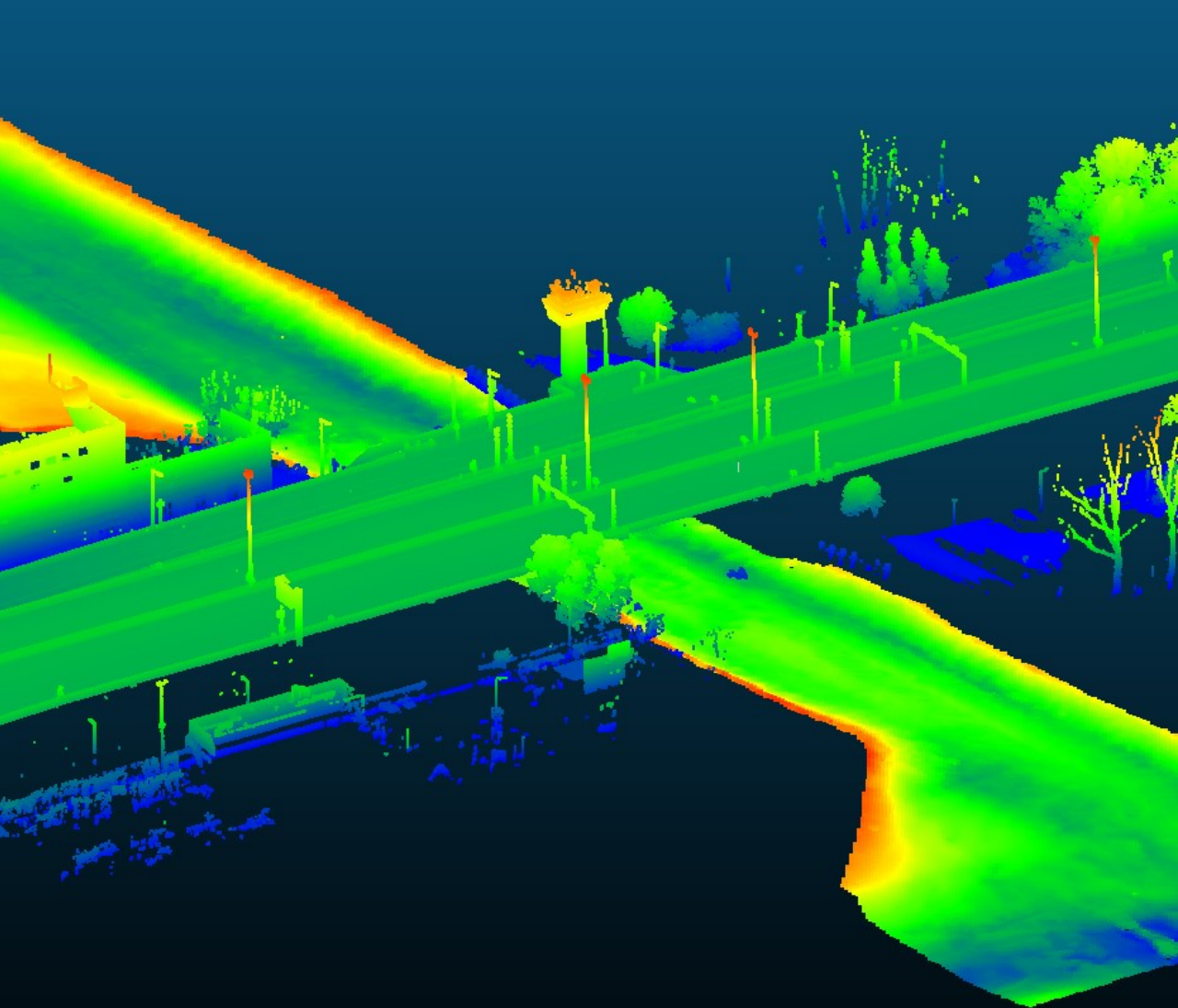
# New Geodatafundament of Rijkswaterstaat







Rijkswaterstaat  
*Ministry of Infrastructure  
and Water Management*



# Integrale Hoogtebestand Nederland

*TU Delft & Rijkswaterstaat*

# Potential stakeholders of the data governance

- Different government agencies
- Varying specifications regarding the point clouds
- Varying locations of the open data
  - *Land*
  - *Urban*
  - *Rivers*
  - *Sea*

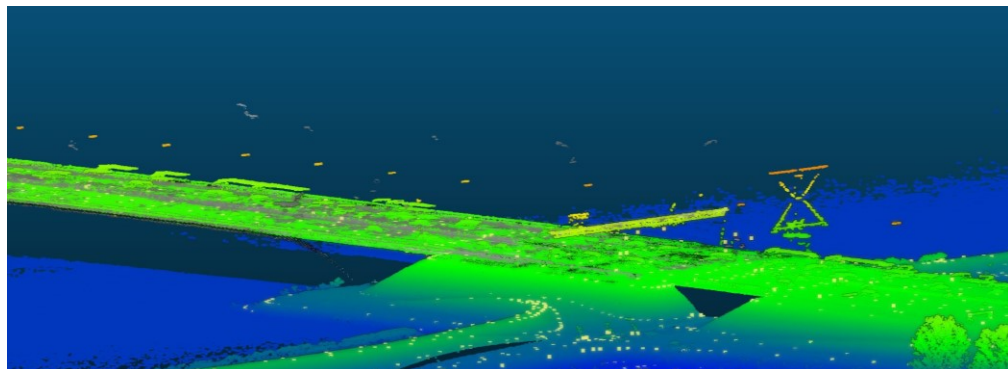


# The integration of heterogeneous pointclouds

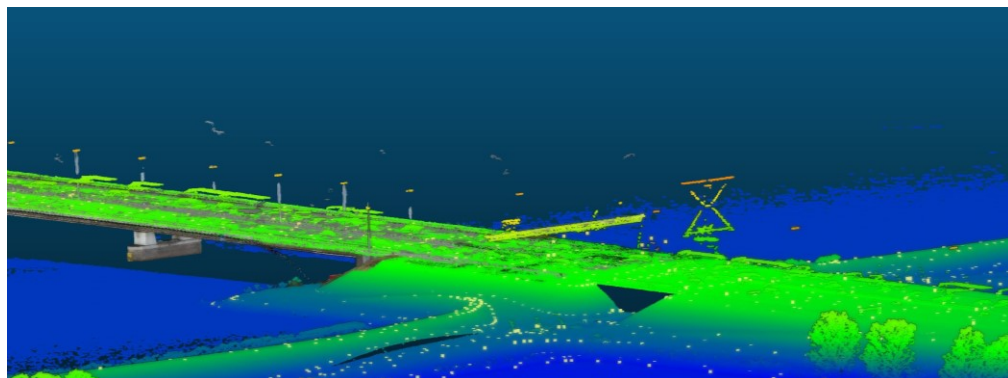
- PhD research: *integrating point clouds in the Netherlands*
- Collaboration between Rijkswaterstaat and TU Delft
- The merging of point clouds on a national scale
  - 4 research fields



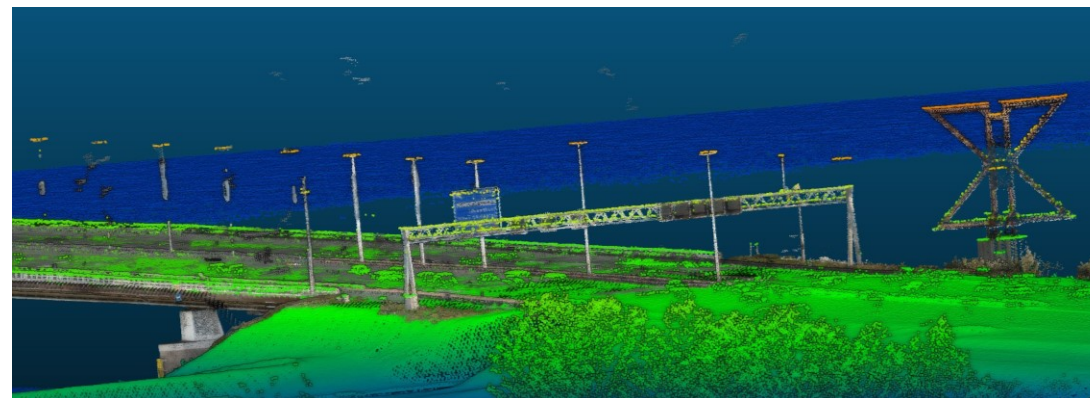
# Potential of the Integrated Height dataset of the Netherlands



**AHN4 (hWH)+Dense Matching (KD)+DTB (RWS)**

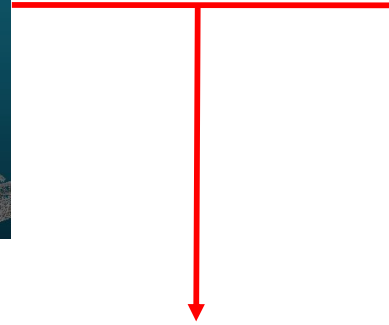
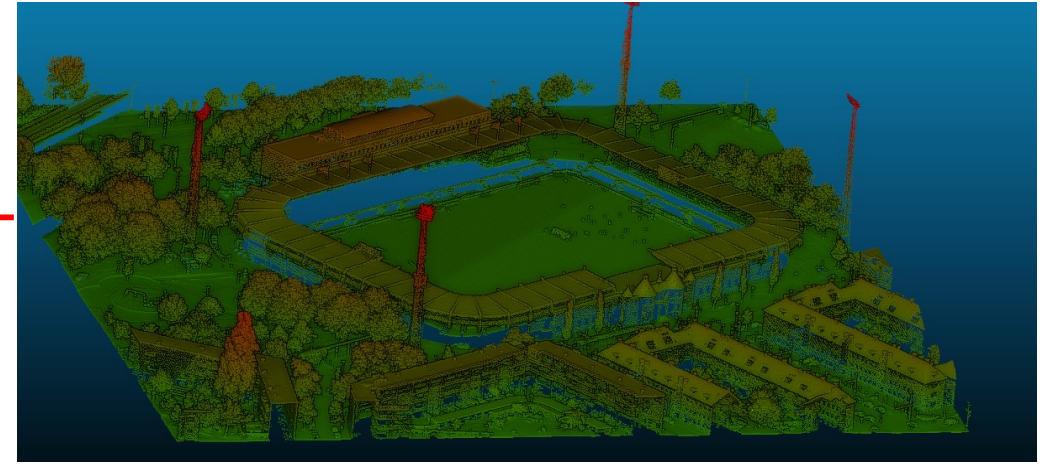
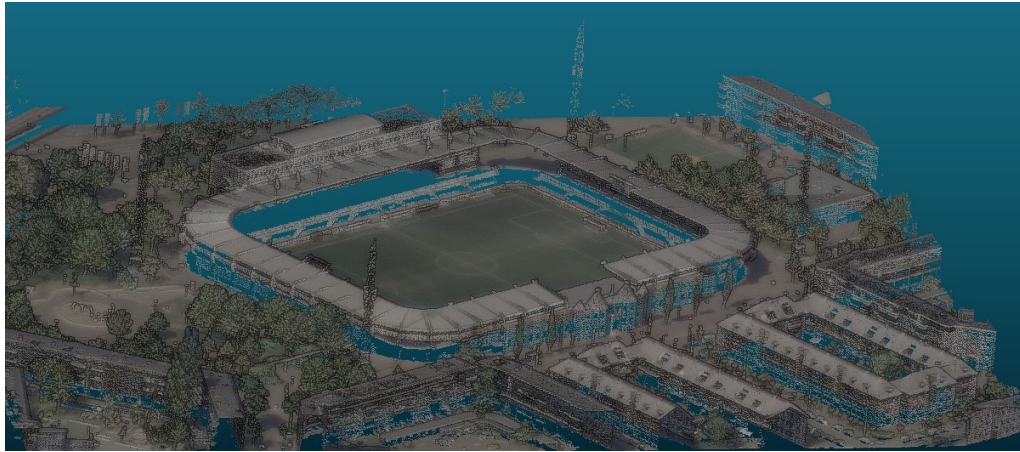


**AHN4 (hWH)+Dense Matching (KD)+DTB (RWS) + drone (RWS)**

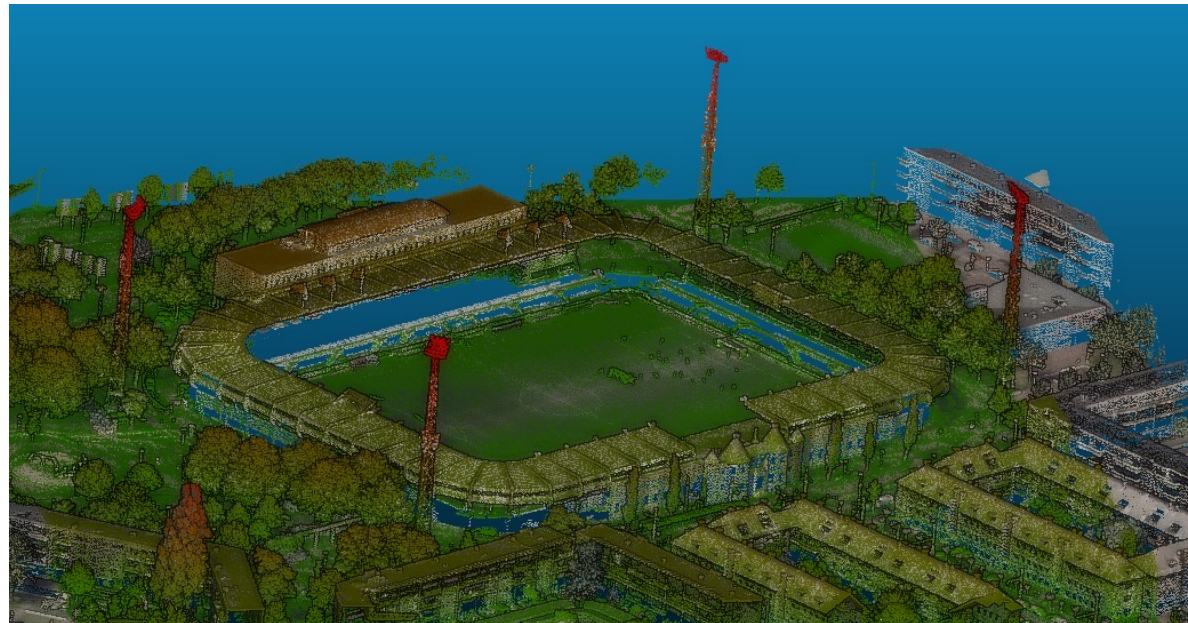


**AHN4+DM+DTB+drone+car = IHN**





**Een IHN  
visualisatie van  
het Kasteel,  
Rotterdam**



# Complexity of data governance



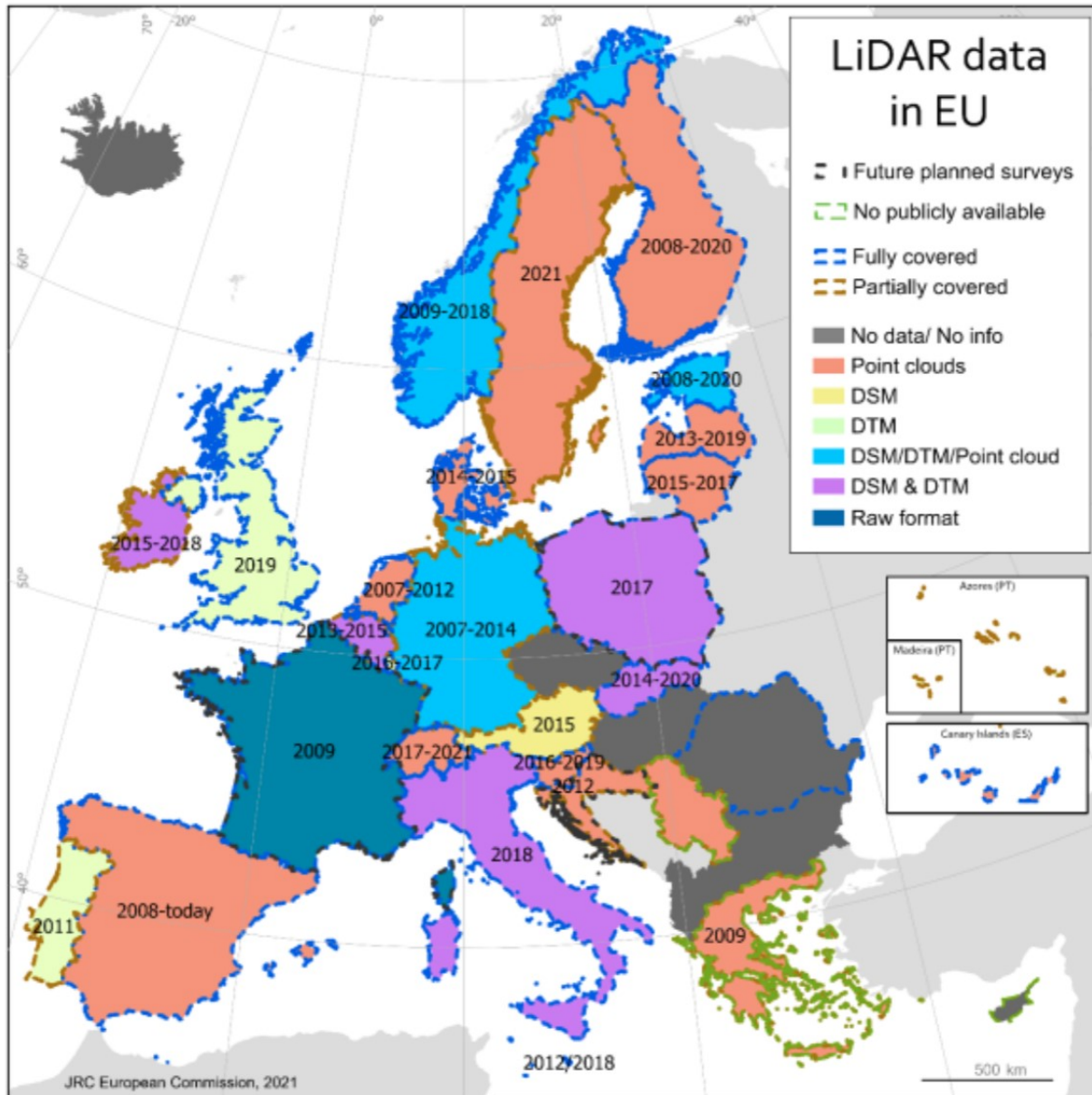




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## ***Research subject 1***

### ***Uniform specifications of pointcloud datasets***



## Specifications of point clouds in the EU

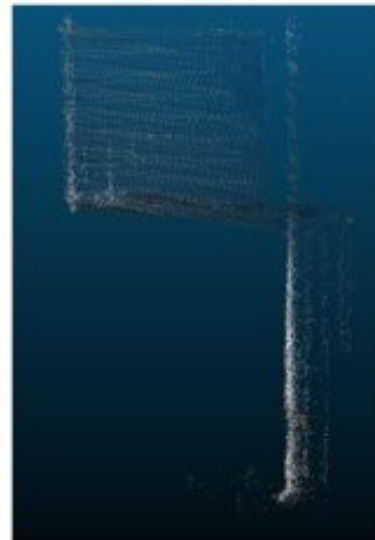
- Research from 2020 of the Joint Research Centre
- Significant difference between open and closed datasets
- Subjective consensus for the quality
  - Questionnaire at the EuroSDR



# Effects of different specifications and goals



VS



Gantry point cloud from dataset A

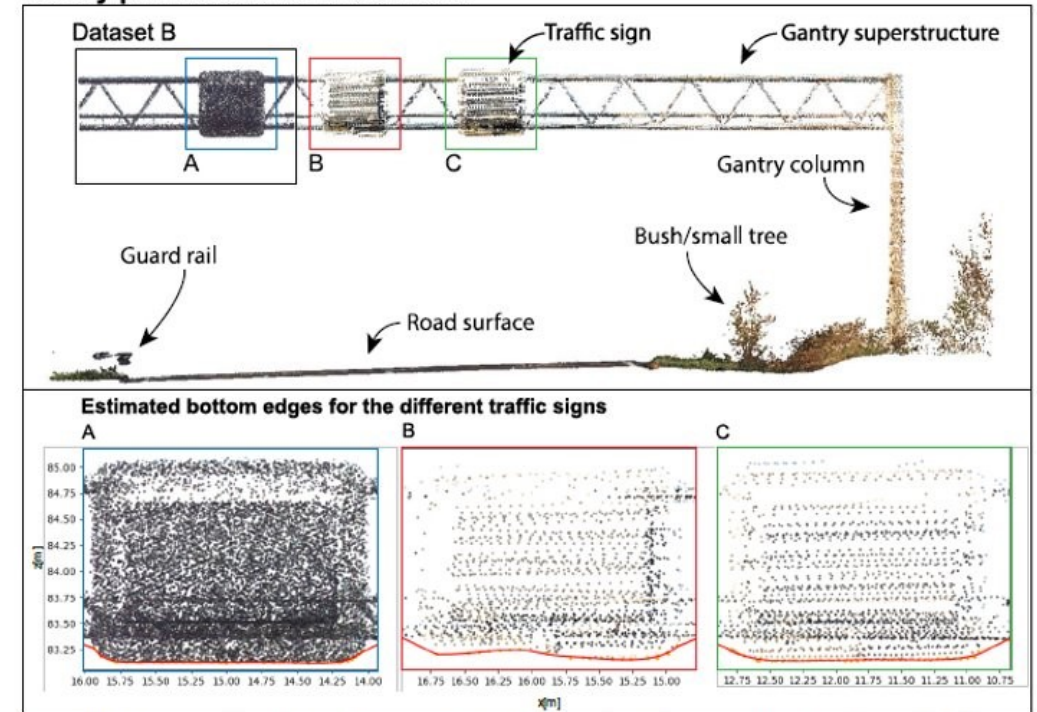
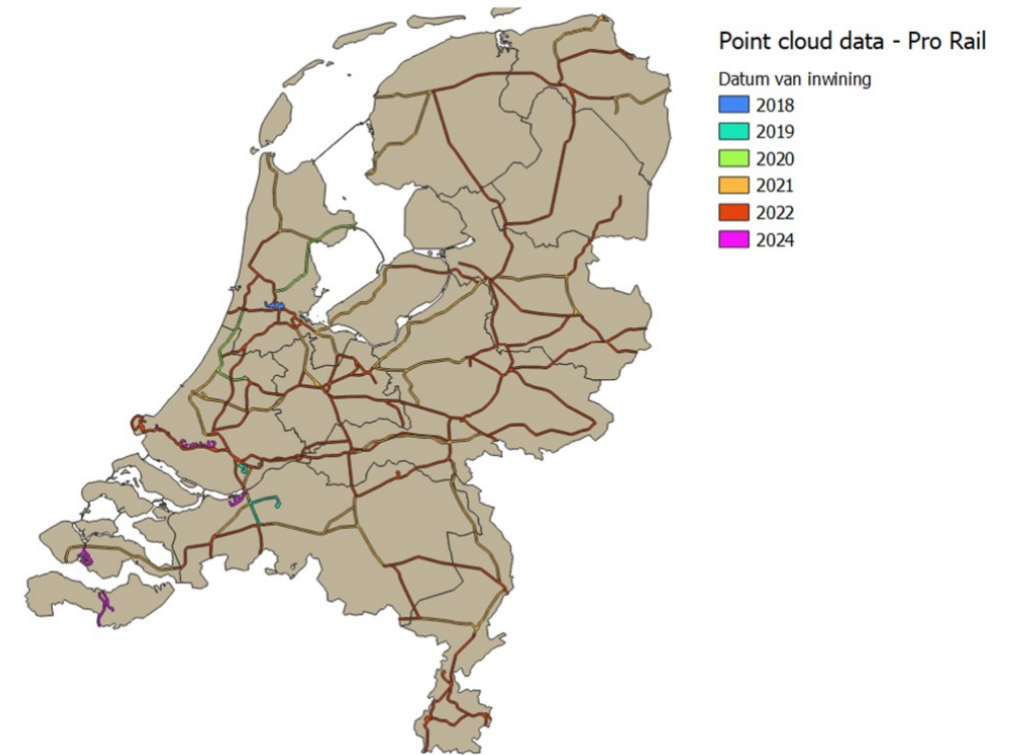
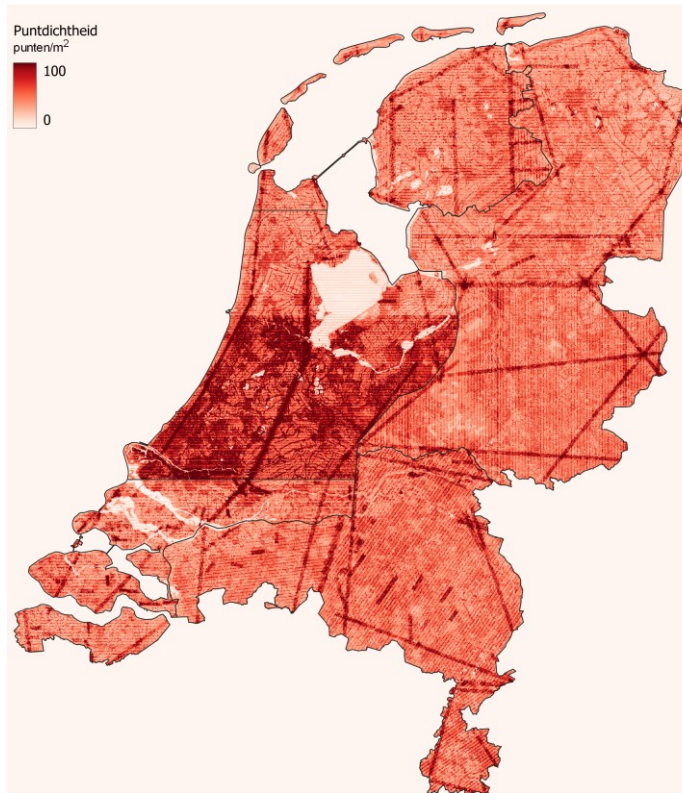


Figure 5.48: Example input point cloud of a gantry. The bottom panel shows the estimated bottom edges of the traffic signs attached to the gantry superstructure.

# Effects of different specifications and goals







Rijkswaterstaat  
Ministry of Infrastructure  
and Water Management



# Looking forward: Co- registration of pointclouds

*Research subject 2*

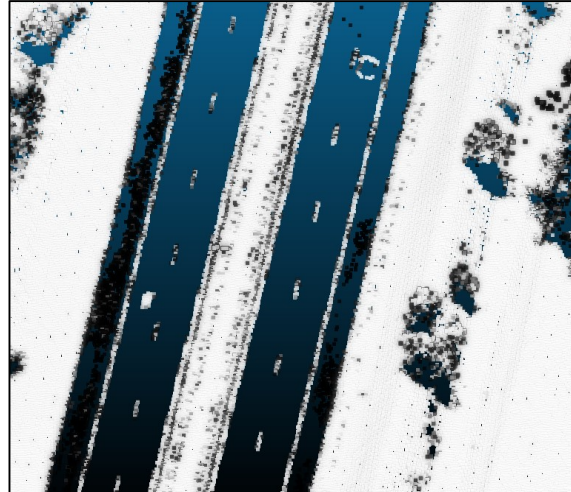


# Research Subject 2

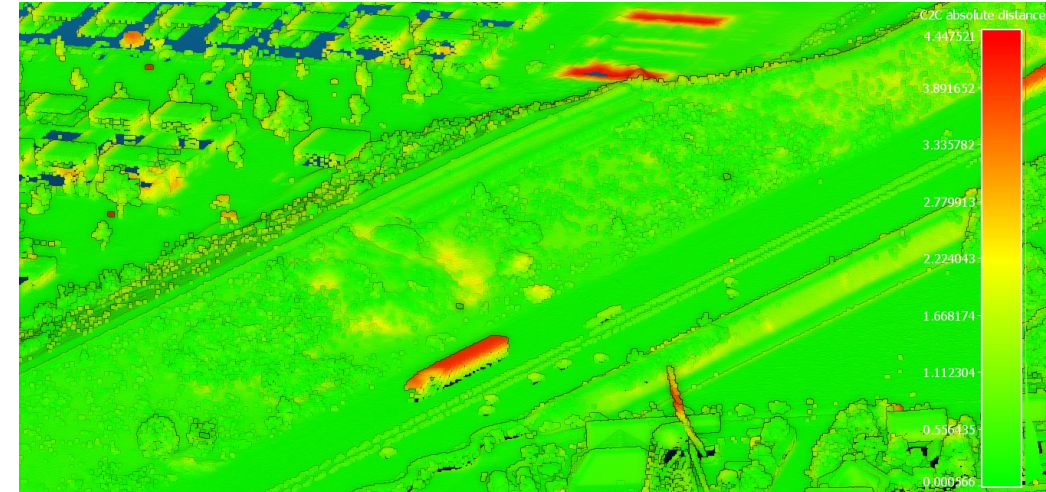
**AHN4**



**Road marking**



**Difference between AHN4 and AHN3**



**Co-registration for comparison analysis**



# Contact



**Daan van der Heide**

*Mail:* [d.h.vanderheide-1@tudelft.nl](mailto:d.h.vanderheide-1@tudelft.nl) /  
[daan.vander.heide@rws.nl](mailto:daan.vander.heide@rws.nl)



**Prof. dr. Jantien Stoter**

*Mail:* [j.e.stoter@tudelft.nl](mailto:j.e.stoter@tudelft.nl)  
*Website:* <https://3d.bk.tudelft.nl/jstoter/>



**Dr. Tessa Eikelboom**

*Mail:* [tessa.eikelboom@rws.nl](mailto:tessa.eikelboom@rws.nl)