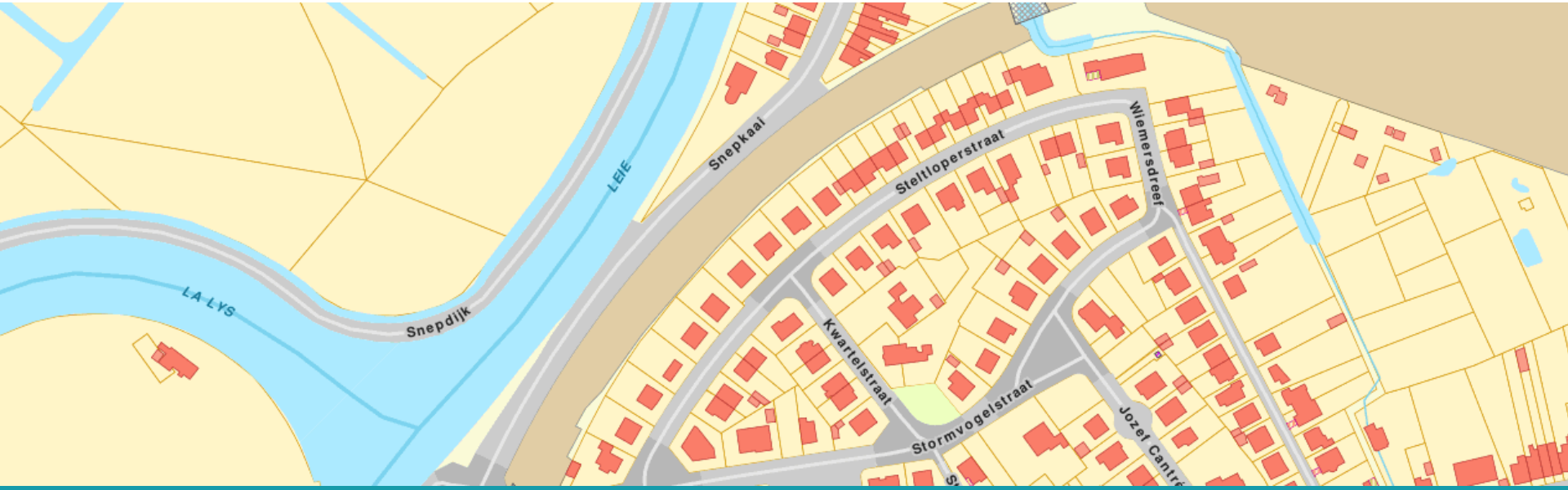
Quality control of Large-scale Reference Data at the Flemish Geographical Information Agency

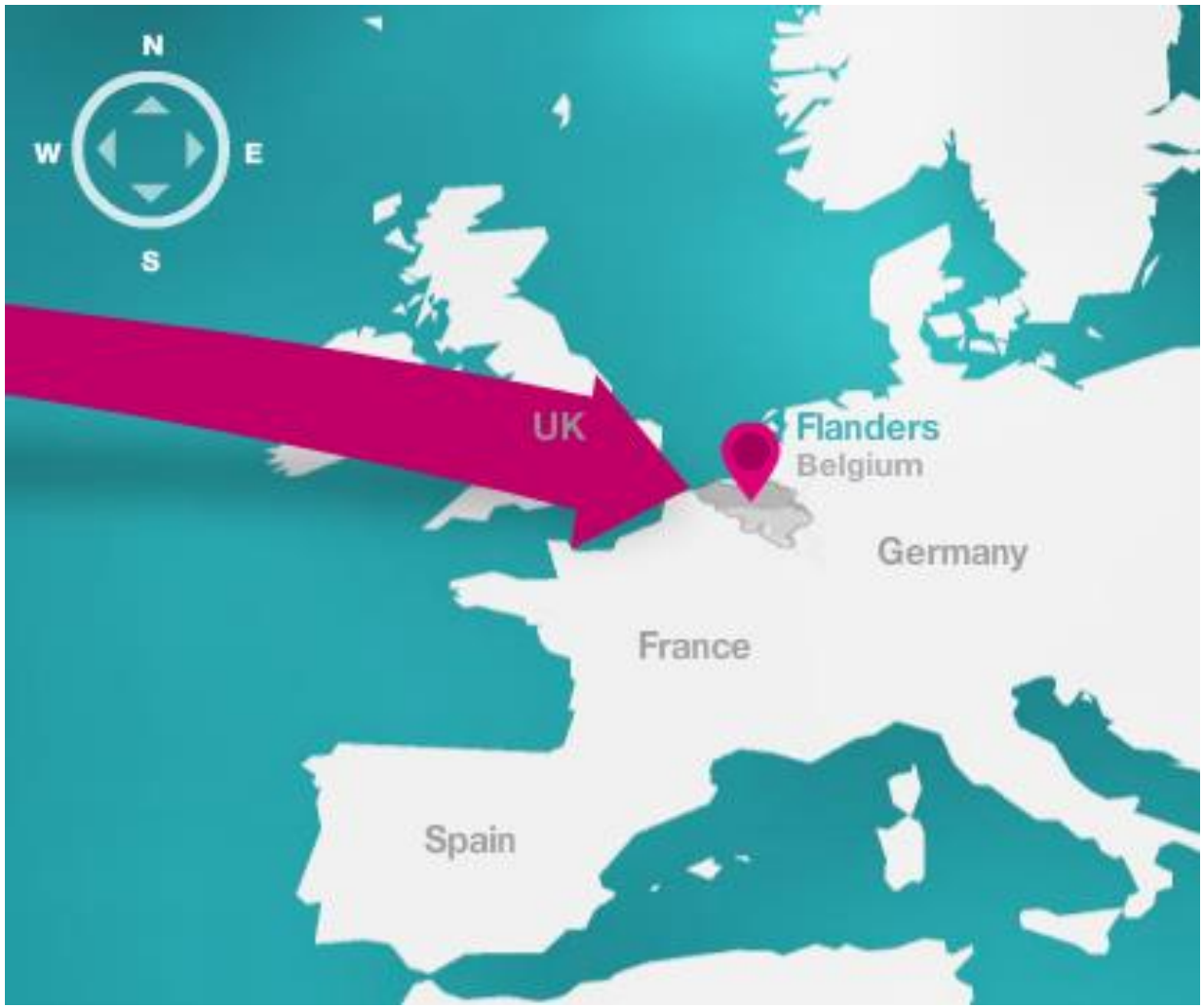
Lies De Meulenaer – Barbara Bulkens

Agenda

- FGIA (AGIV)
- LRD
- Quality control of LRD data
- MIRO
- Future



Flanders? Belgium?



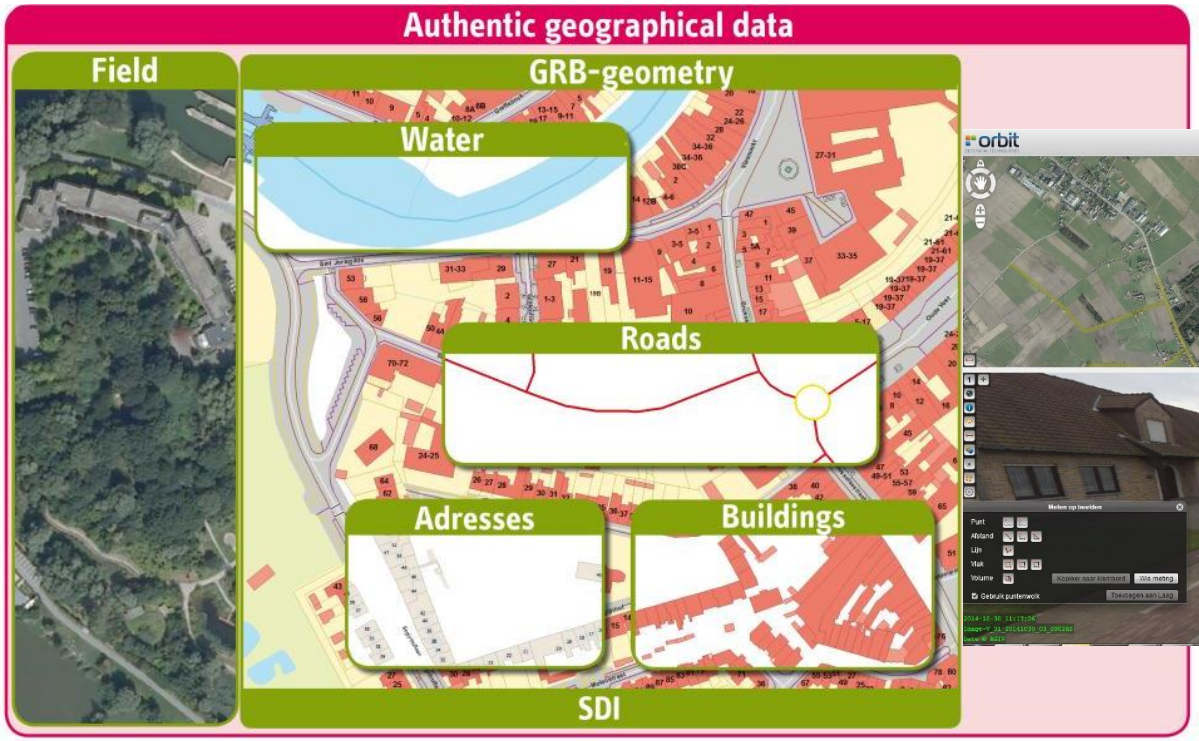
Flanders? Belgium?

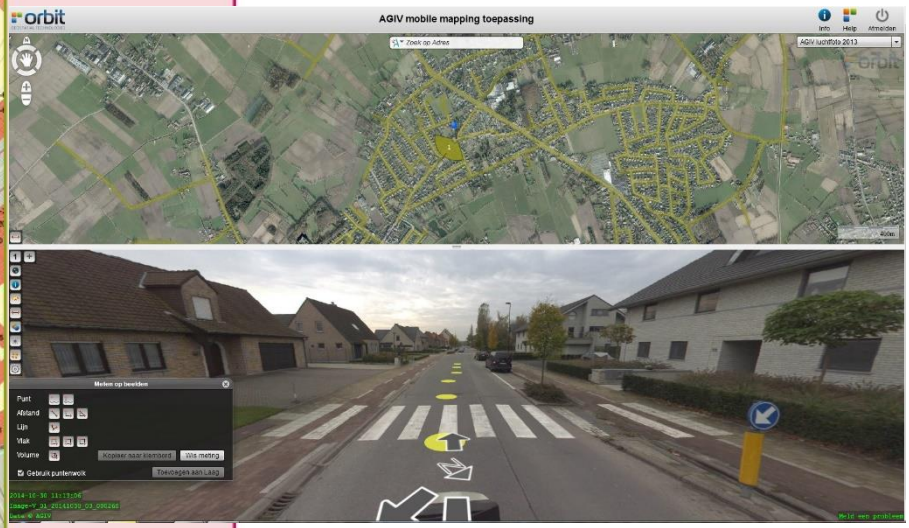
Who is FGIA?

- Flemish Geographical Information Agency
- Public organisation, founded in 1995
- Flemish Government
- Fast growing
  - 1998: 15 employees
  - 2014: 140 employees (geography, engineering, ICT, …)
- 2015-2016: Transition
  - Flemish Information Agency

Mission FGIA

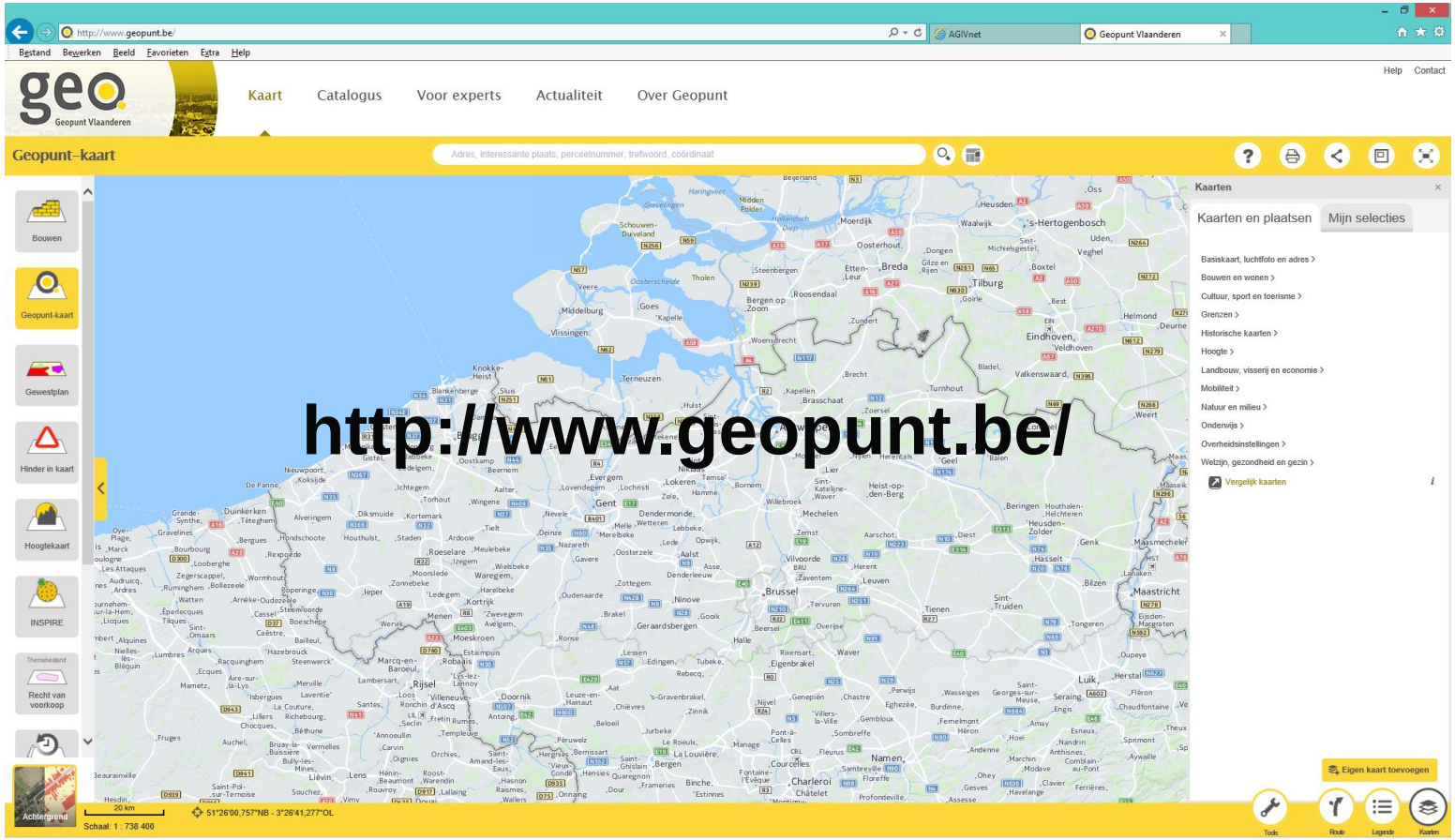
- “Enabling an optimal application of geographical information in Flanders”
  - Leading provider of geodata
    - All data = open data (exception: Mobile mapping)





Mission FGIA

- IT service provider
  - Geopunt, FLEPOS, KLIP, GIPOD, …



FGIA assignments

- Legal basis
  - Several decrees (Flemish Parliament)
  - INSPIRE (European Commission)

- Co-financed
  - Public private partnerships

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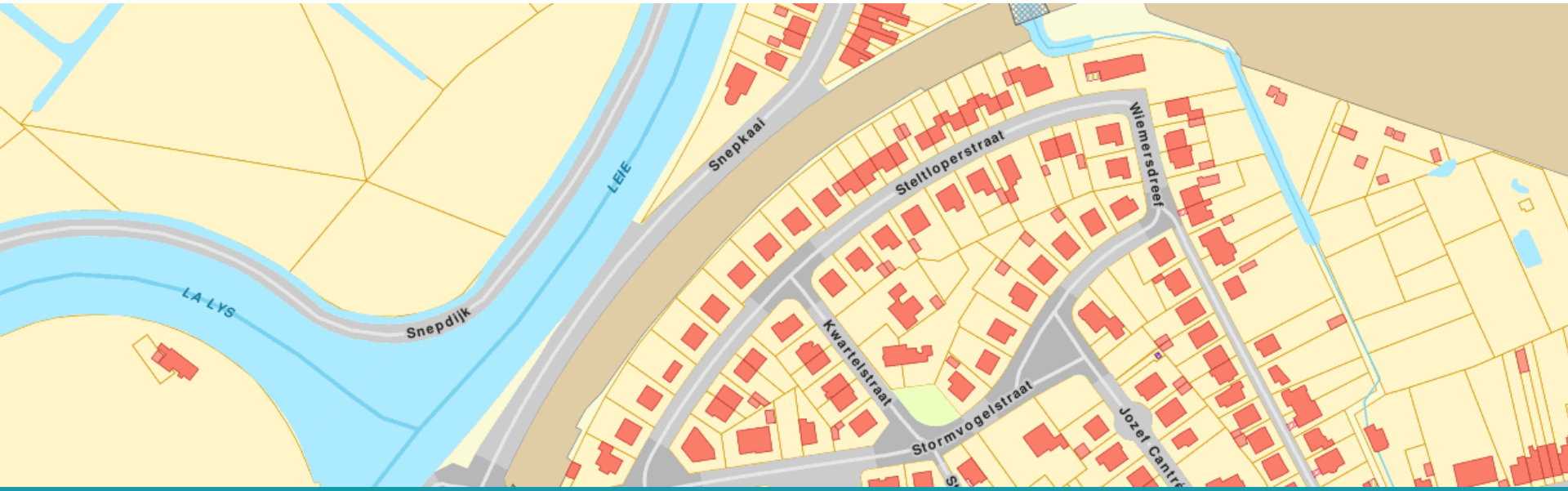


LRD concept

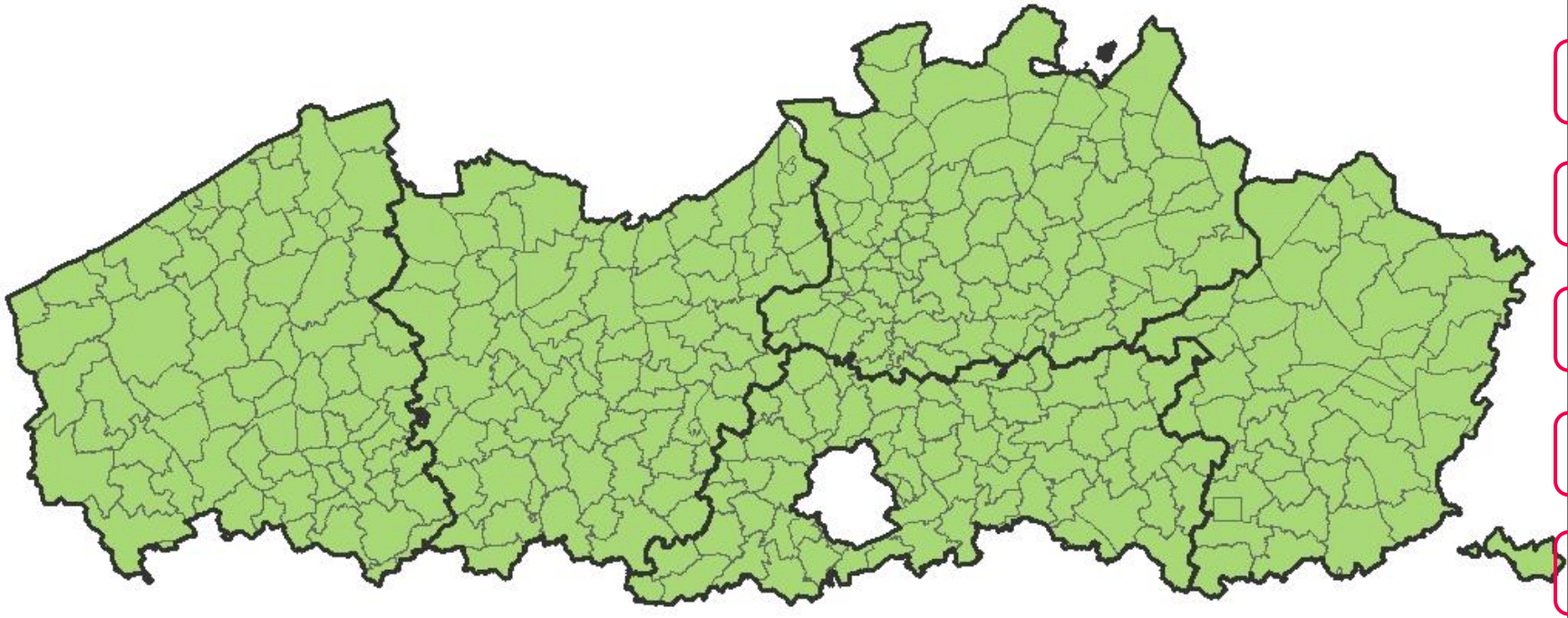
- **L**arge
  - Scale 1/250 – 1/5000
- **R**eference
  - Uniform data for Flanders
  - Area-wide (since 2013)
  - Basis for link with external data
- **D**ata
  - Central database
  - Object oriented

Mandatory use

- LRD is an official Flemish **authentic** data source
- LRD decree sets **mandatory use** and **notification obligation** for public bodies
- **Guarantee** for utility sector

Timeline – production phase

- 2013: LRD area-wide



2013

2012

2011

2010

2009

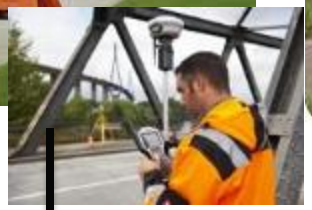
2008

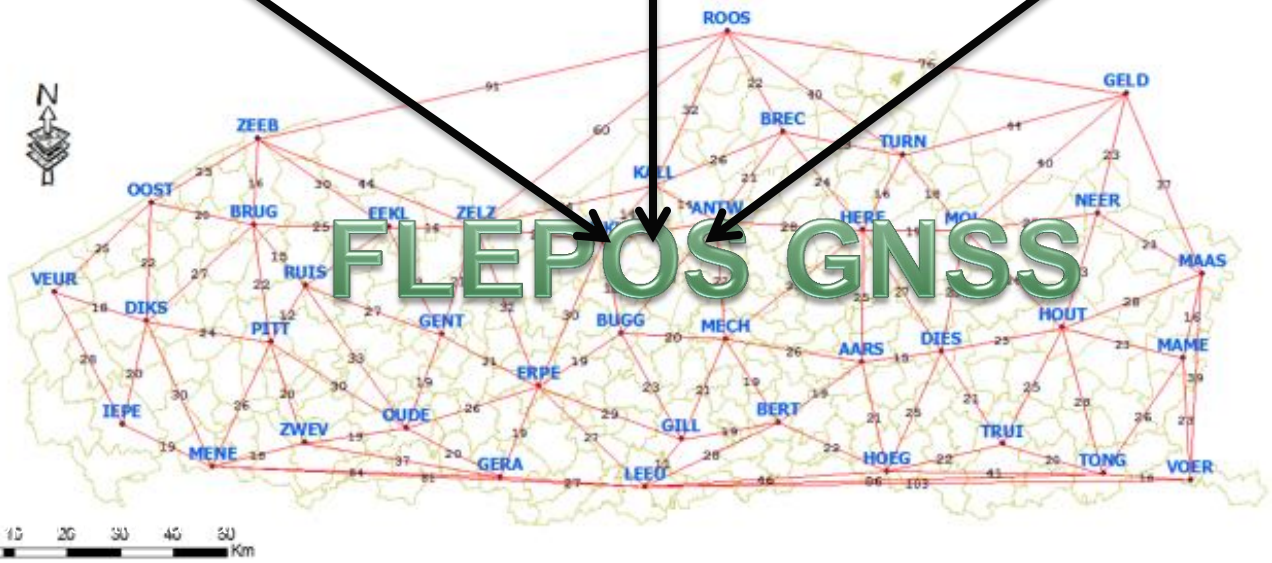
2007

2006

2005

Multi platform data collection





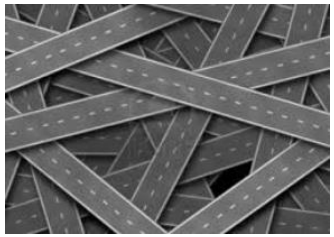
LRD objects

4.300.000

buildings

4.700.000

parcels



64.000

km transport network

1.000.000

sewer lids

1.300.000

poles

40.000

km curbstone

20.000

km canals

11.000

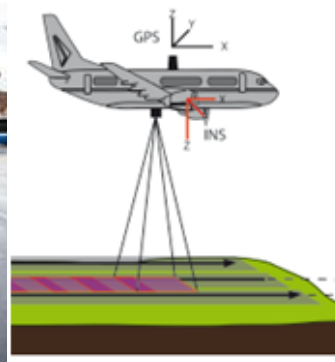
bus shelters

Updating LRD

- Since 2006
- Different update processes
  - Road + 20m: every 6-9 months update for each city/village
    - Terrain survey
  - Backsides: every 3 years
    - Photogrammetry
  - Parcels: yearly
    - CADMAP (Cadastre)
  - As built maps: continuous
- Based on abnormalities
  - Notifications from users
  - Notifications collected by FGIA

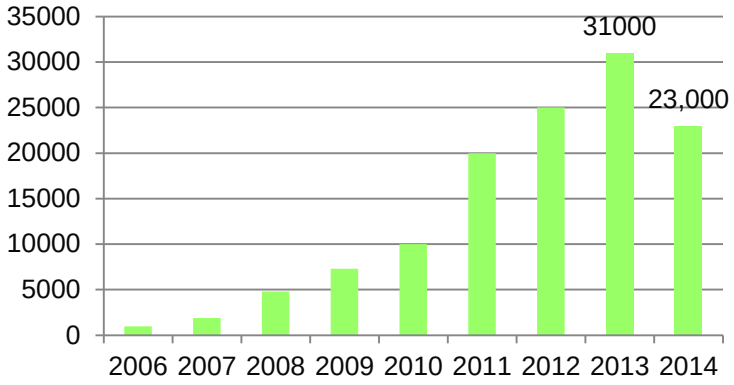




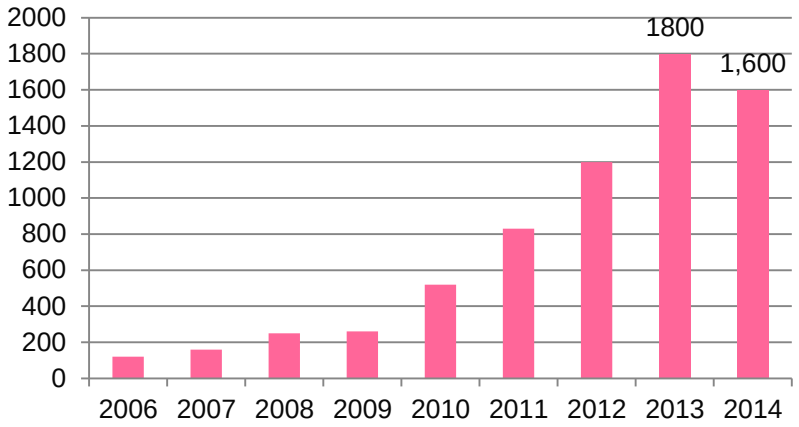


LRD updates - statistics

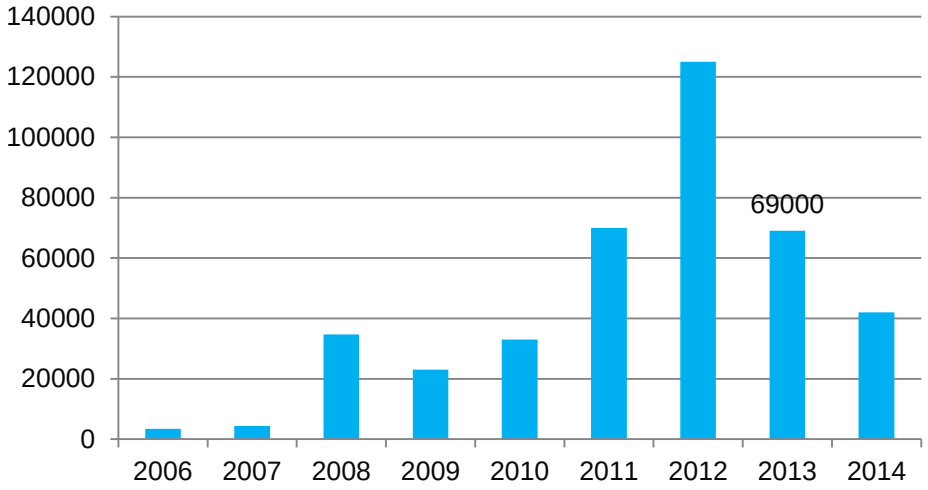
Amount of new buildings, demolitions and rebuildings



km renewed roads, new roads



Adaptation parcels



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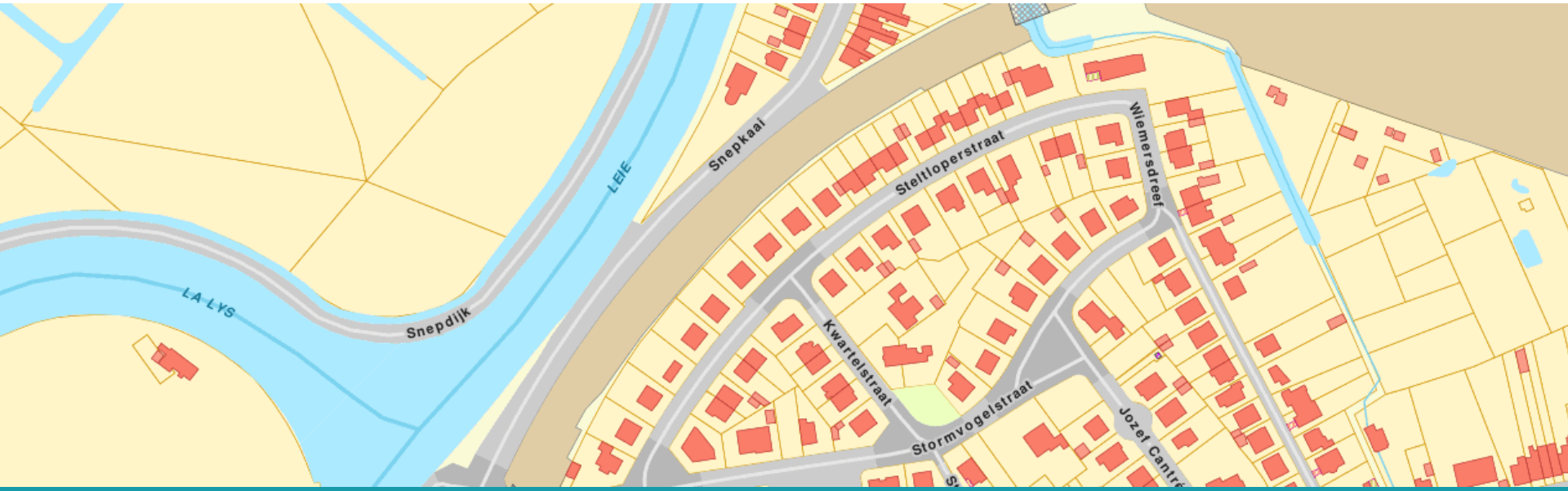
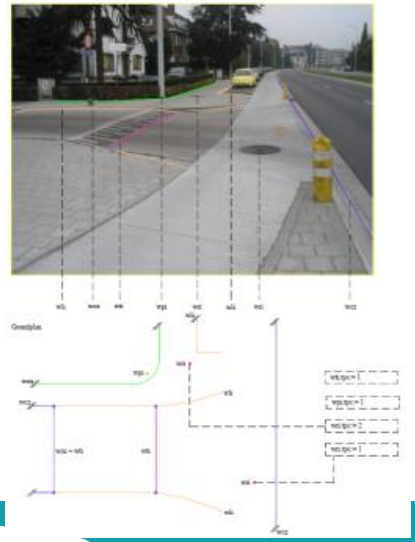
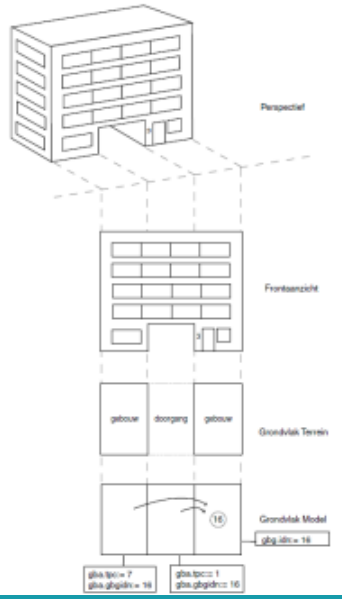
- LRD
- Quality control of LRD data
- MIRO
- Future



Quality control? What?

- Production of LRD data is outsourced to private data providers
- Extensive documentation set
  - Specifications
  - Quality control specifications
  - Examples
  - …
- Deliveries are subject to quality control by FGIA

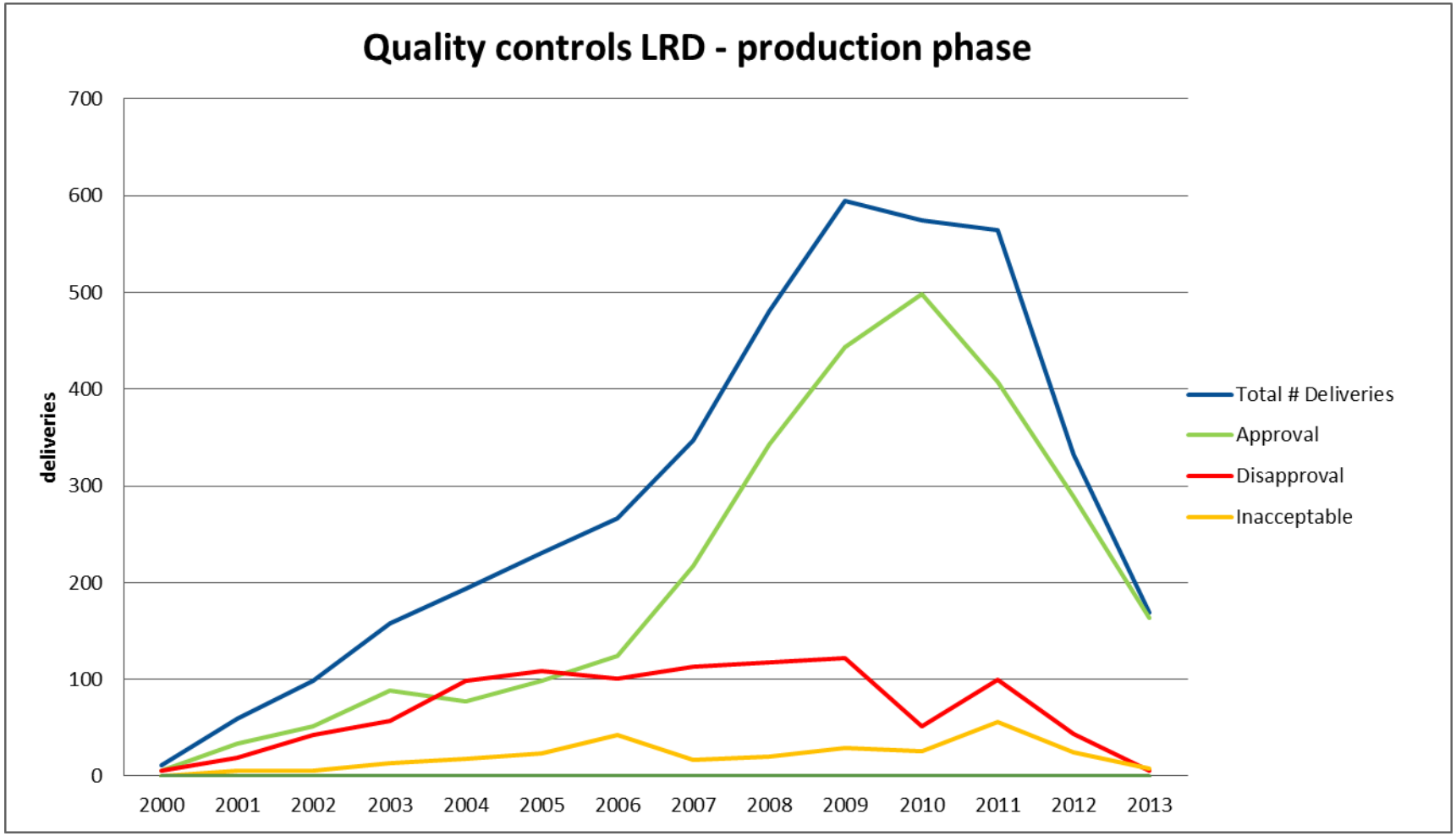




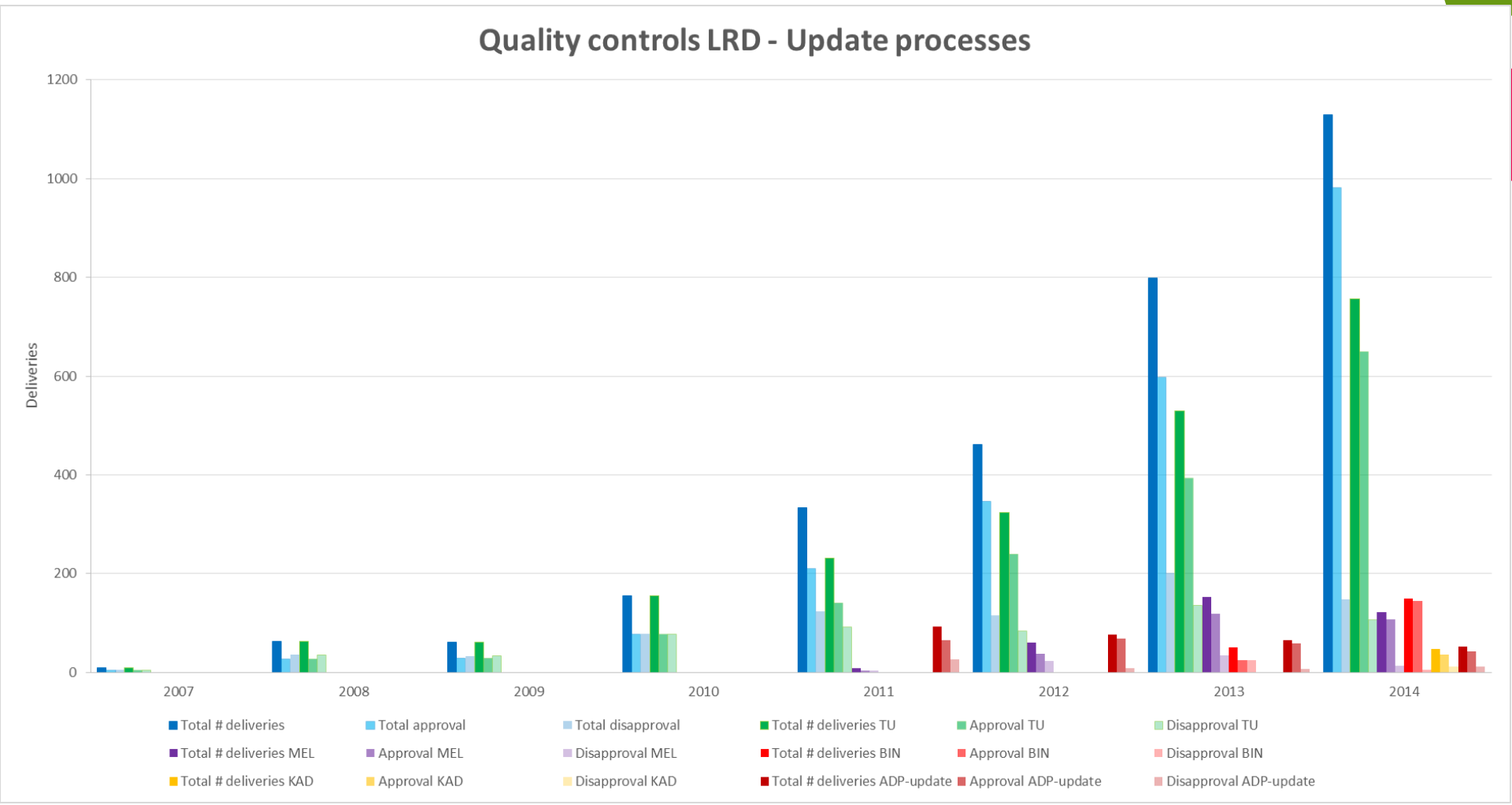
Quality control? What?

- Check if data delivered by contractors is conform data specifications
- Control time:
  - Receipt control: 24h
  - Full control: 4 weeks
- Result = Quality report with quality results and decision for contractor
  - Delivery approved
  - Delivery disapproved

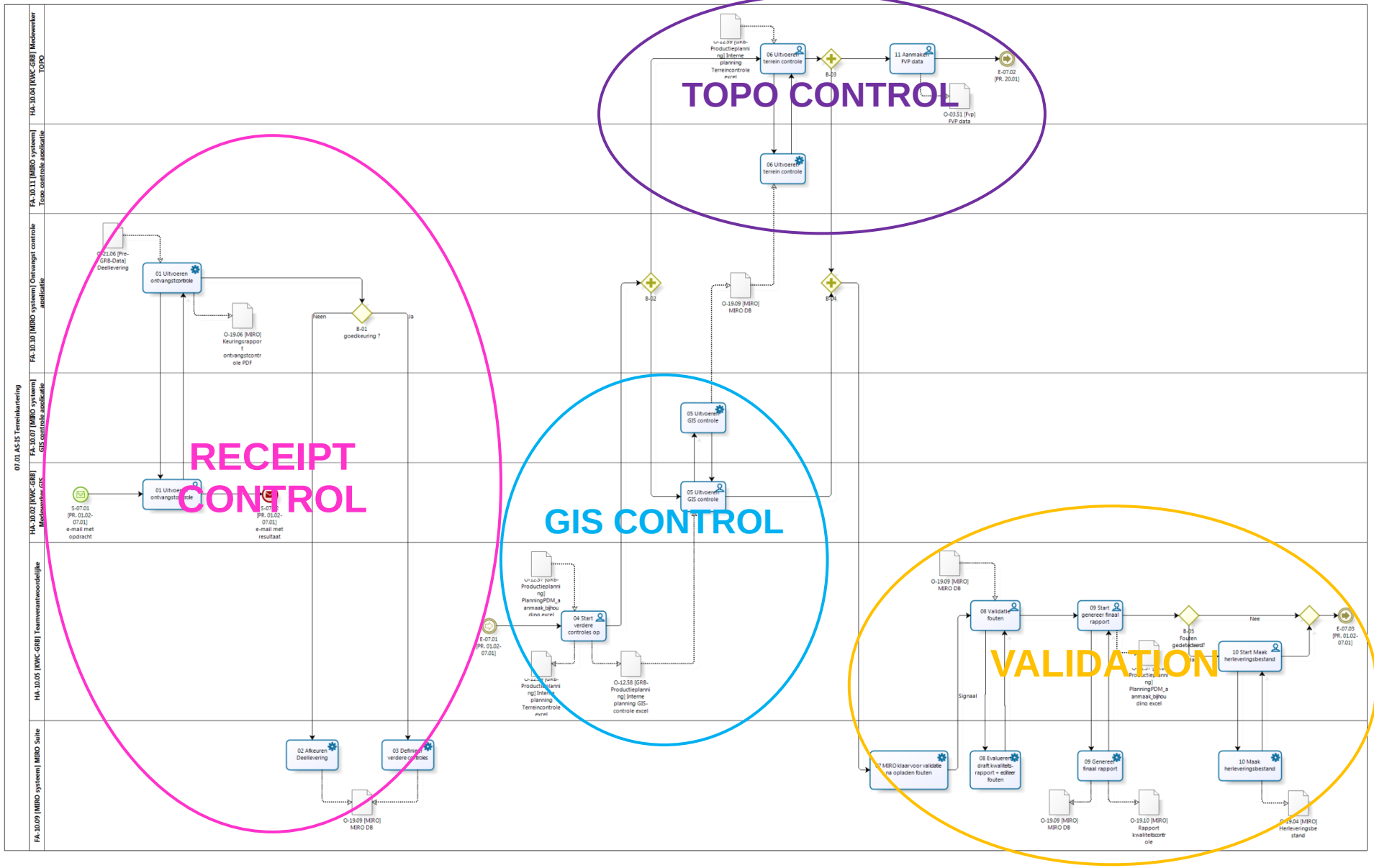
Quality control - statistics



Quality control - statistics



Quality control - process

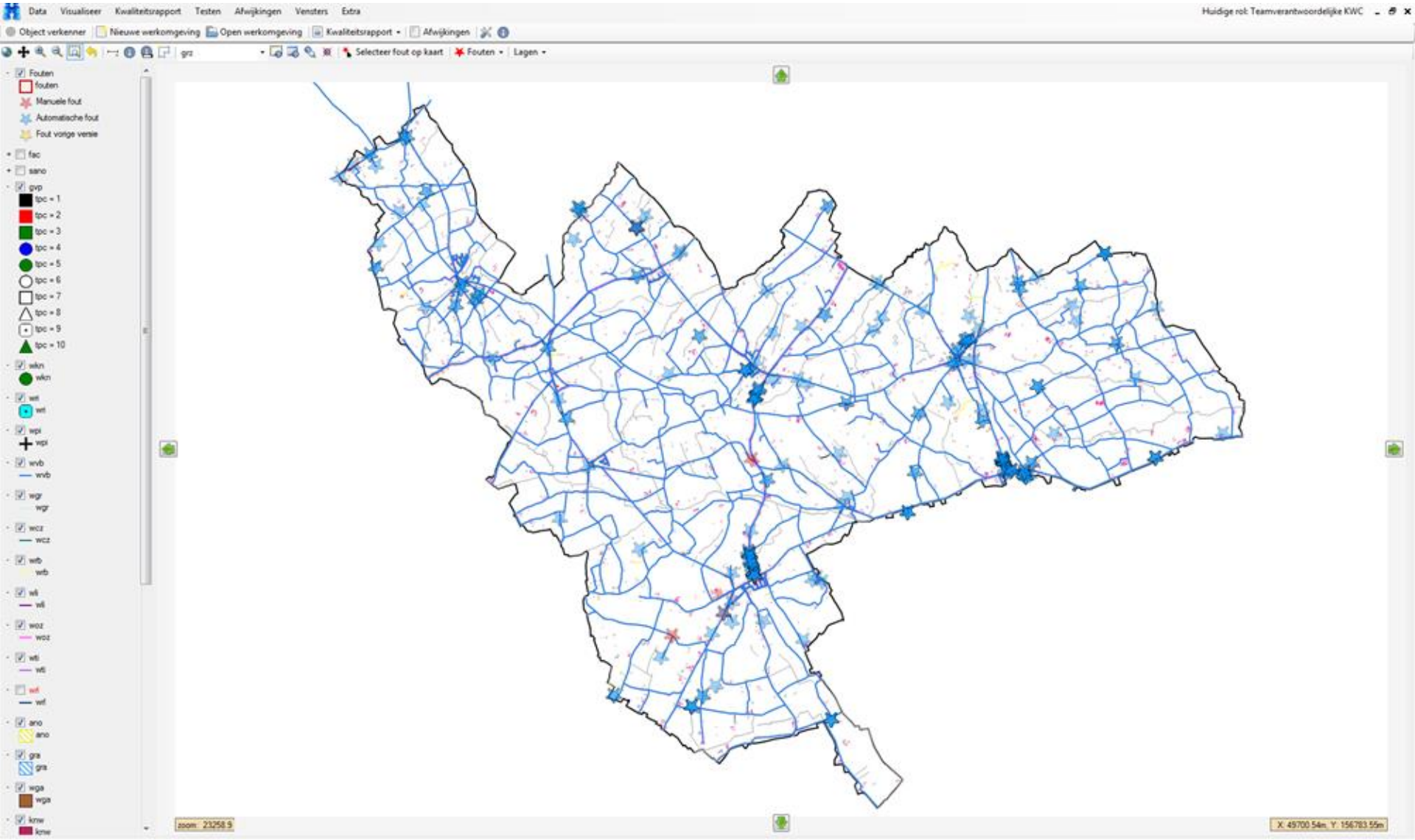


Quality control - process

- Receipt control
  - Checks the incoming data on the required file structure
  - If a delivery is not receptive, it will be rejected
    - Examples:
      - Format is not correct
      - File is not readable
      - Name of the file is not correct
      - …
    - There will be no further quality controls
    - Contractor has to deliver a new file

Quality control - process

- GIS control
  - 100% digital controls
    - Unacceptable errors
      - Example: Double vertices, intersects, …
      - QC can be done
    - Integration
      - Control integration of the data with the surrounding data
    - Topology tests
  - Sample controls (based on ISO 2859-1)
    - Visual screen controls


Data
Visualiseer
Kwaliteitsrapport
Testen
Afwijkingen
Vensters
Extra
Huidige rol: Teamverantwoordelijke KWC
Object verkenner
Nieuwe werkomgeving
Open werkomgeving
Kwaliteitsrapport
Afwijkingen
Selecteer fout op kaart
Fouten
Lagen
Fouten
fouten
Manuele fout
Automatische fout
Fout vorige versie
fac
sano
gvp
tpc = 1
tpc = 2
tpc = 3
tpc = 4
tpc = 5
tpc = 6
tpc = 7
tpc = 8
tpc = 9
tpc = 10
wkn
wkn
wri
wri
wpi
wpi
wvb
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wgr
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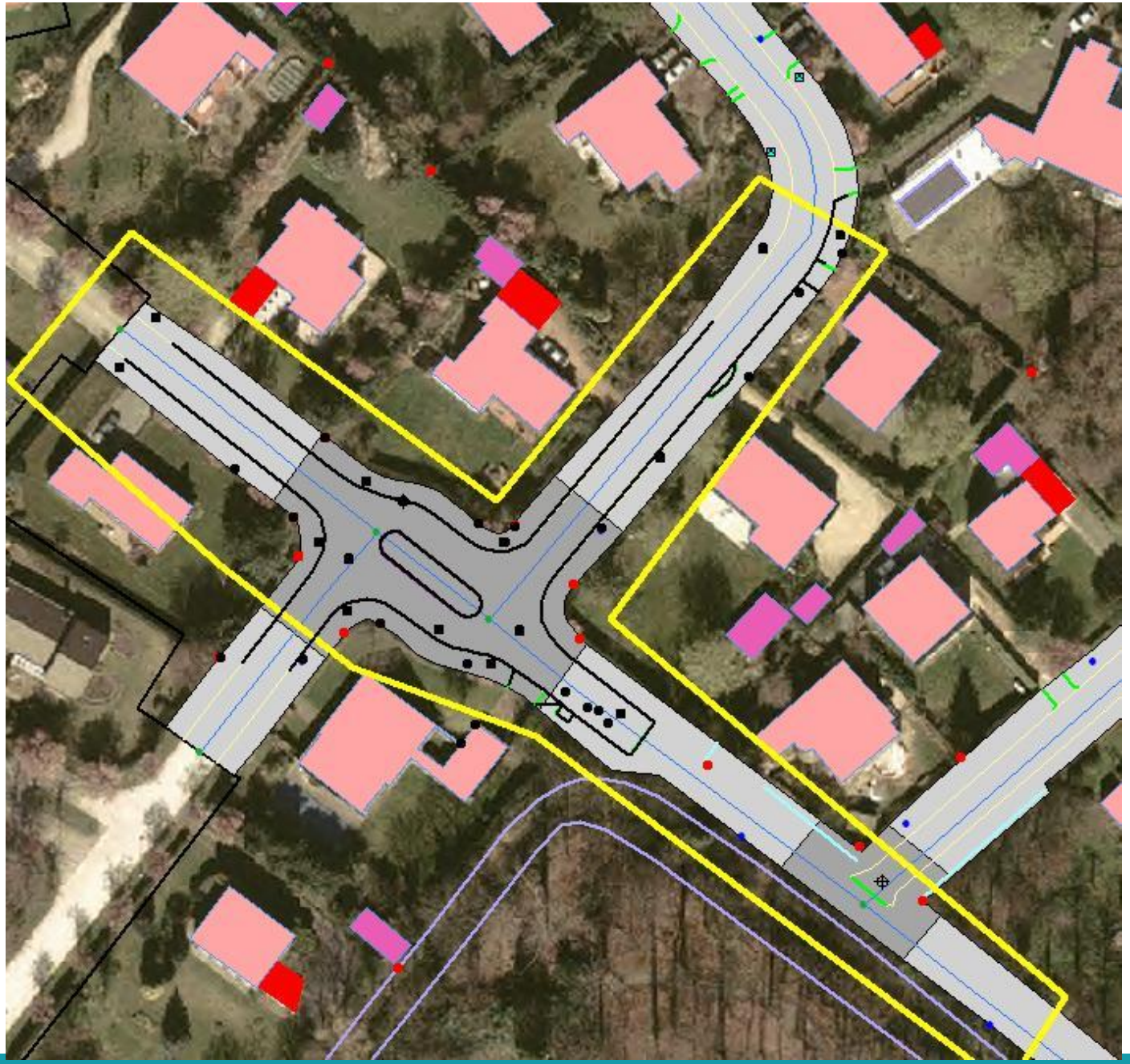
gra
wga
wga
knw
knw
zoom: 23258.9
X: 49700.54m, Y: 156783.55m

Quality control - process

Delivery → Receipt control → GIS control → TOPO control → QC validation → Reporting

- TOPO control
  - Terrain controls important for:
    - Positional accuracy
    - Completeness
    - Attribute correctness

→ Sampling based on ISO 2859-1



Quality control - process

- QC Validation
  - Bringing together errors from GIS and TOPO control
  - Evaluate results
    - Approval: All the quality results are conform the predefined AQL values
    - Disapproval:
      - To many “unacceptable errors”
      - Systematic errors
      - At least one test exceeds the acceptance level
  - Making a quality report + error shape

Rapport GRB22_24_01_01

1 Ontvangstnazicht

OK

2 Niet toegelaten fouten

OK

3 Kwaliteitstypes

3.1 POS

3.1.1 Positionele nauwkeurigheid

Totaal aantal gecontroleerde items: 16
Aantal foutieve items: 0
Aanvaardingsgetal: 0

3.2 VT

3.2.1 Volledigheid/Typologie

Totaal aantal gecontroleerde items: 32
Aantal foutieve items: 1
Aanvaardingsgetal: 2

Fouten

ID	Entiteit1	IDN1	TPC	Entiteit2	IDN2	Omschrijving test	Verduidelijking
1661715	woz	30029052				Foutieve geometrie: geometrie van het exemplaar is niet correct	

Bemerkingen

ID	Entiteit1	IDN1	TPC	Entiteit2	IDN2	Omschrijving test	Verduidelijking
1661716	gra	30029016				Foutieve geometrie: geometrie van het exemplaar is niet correct	Gra ligt niet op de plaats van de nieuwbouw (en is veel te groot). Plaats de gra zo correct mogelijk.

Illustratie voor #1661715

3.4 GRB

3.4.1 Ligging

Totaal aantal gecontroleerde items: 1139
Aantal foutieve items: 0
Aanvaardingsgetal: 114

3.4.2 Codering

Totaal aantal gecontroleerde items: 1139
Aantal foutieve items: 0
Aanvaardingsgetal: 57

3.4.3 Juistheid

Totaal aantal gecontroleerde items: 1139
Aantal foutieve items: 2
Aanvaardingsgetal: 57

Fouten

ID	Entiteit1	IDN1	TPC	Entiteit2	IDN2	Omschrijving test	Verduidelijking
1651000	wvb	456981	103			attribuutwaarde is niet correct: tpc (wvb)	tpc dient = 114 te zijn
1651001	wbn	30029039	2			attribuutwaarde is niet correct: tpc (wbn)	ontbrekende kruispuntzone

3.4.4 Grafische consistentie 100%

Totaal aantal gecontroleerde items: 1139
Aantal foutieve items: 0
Aanvaardingsgetal: 1

3.4.5 Grafische consistentie steekproef

Totaal aantal gecontroleerde items: 13
Aantal foutieve items: 0
Aanvaardingsgetal: 0

3.4.6 Integratiecontrole

Totaal aantal gecontroleerde items: 6
Aantal foutieve items: 0
Aanvaardingsgetal: 0

4 Bemerkingen

geen

5 Beoordeling

Goedgekeurd

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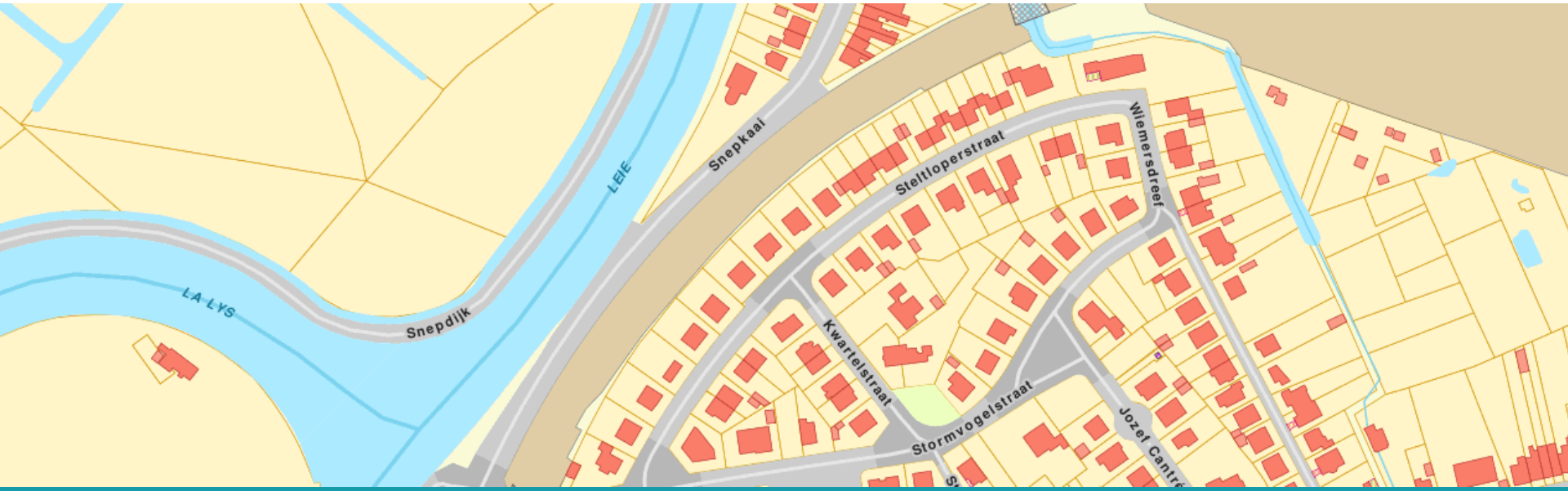
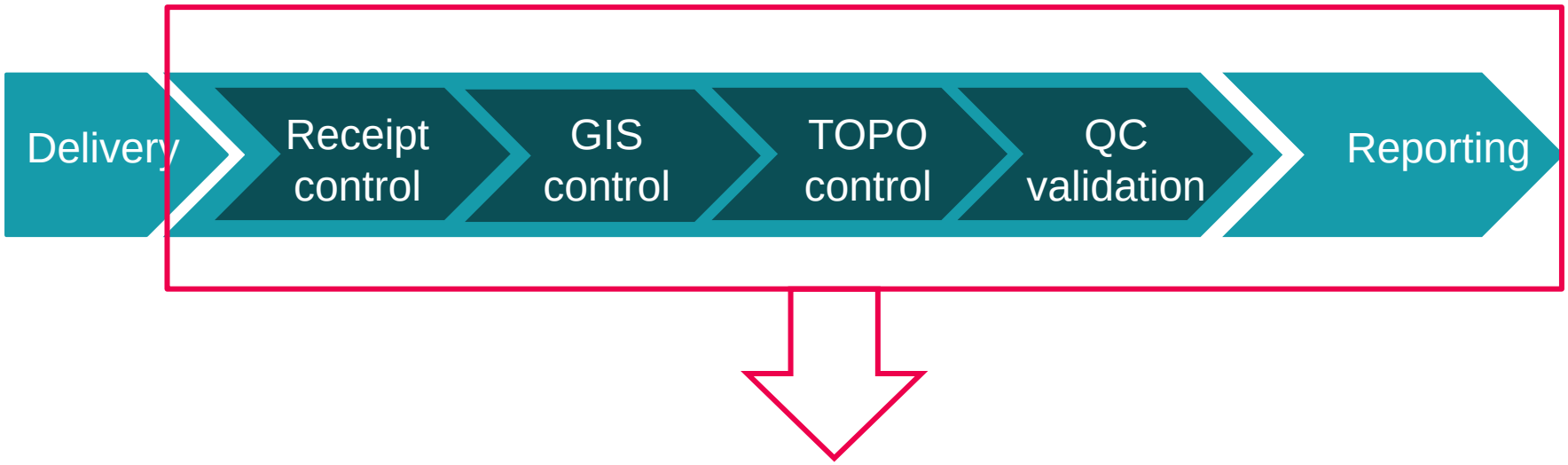


QC system: MIRO

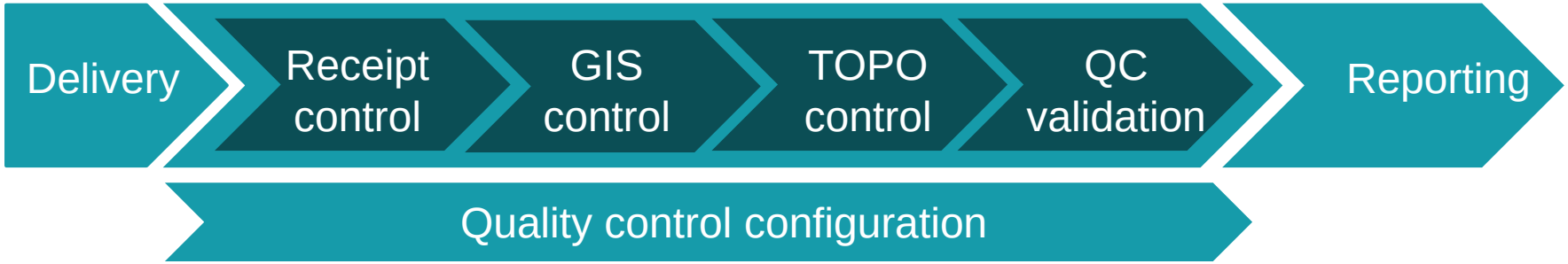


Quality control system MIRO

Design principles:

- Reduce manual work
- Support controllers during the complete quality process
- Central database where all specifications and tests are defined

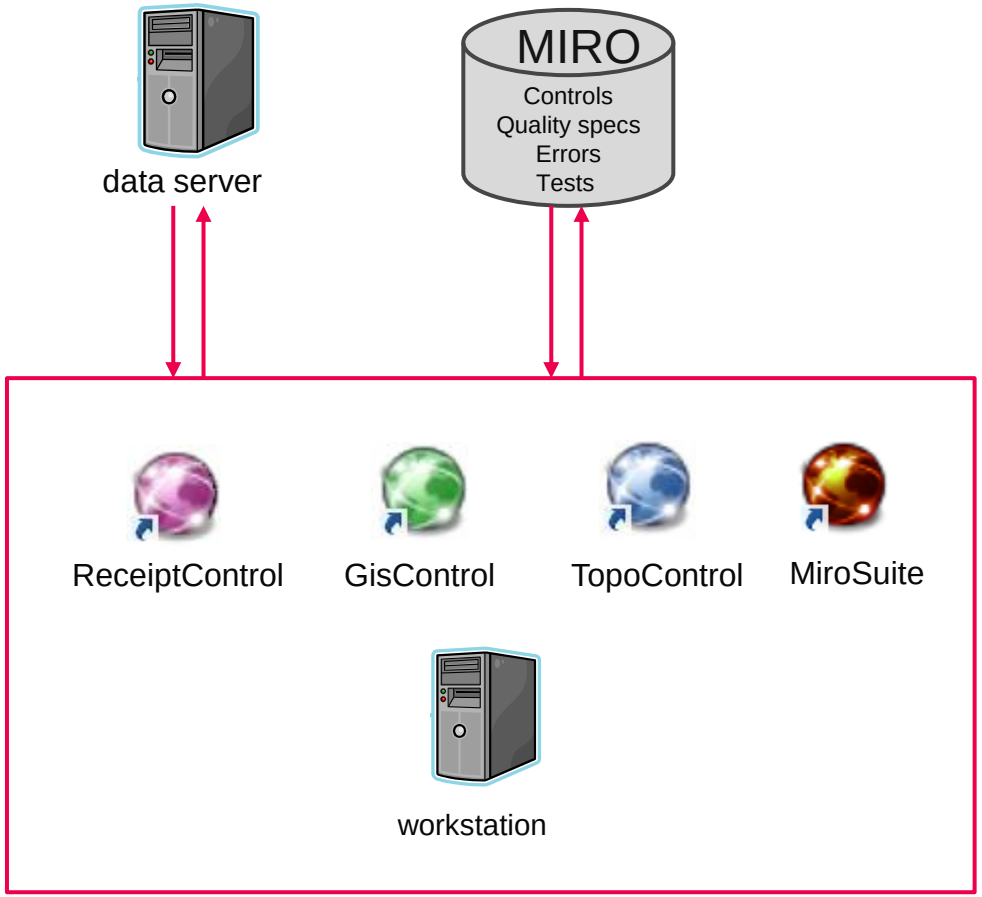
QC system: MIRO



Additional process

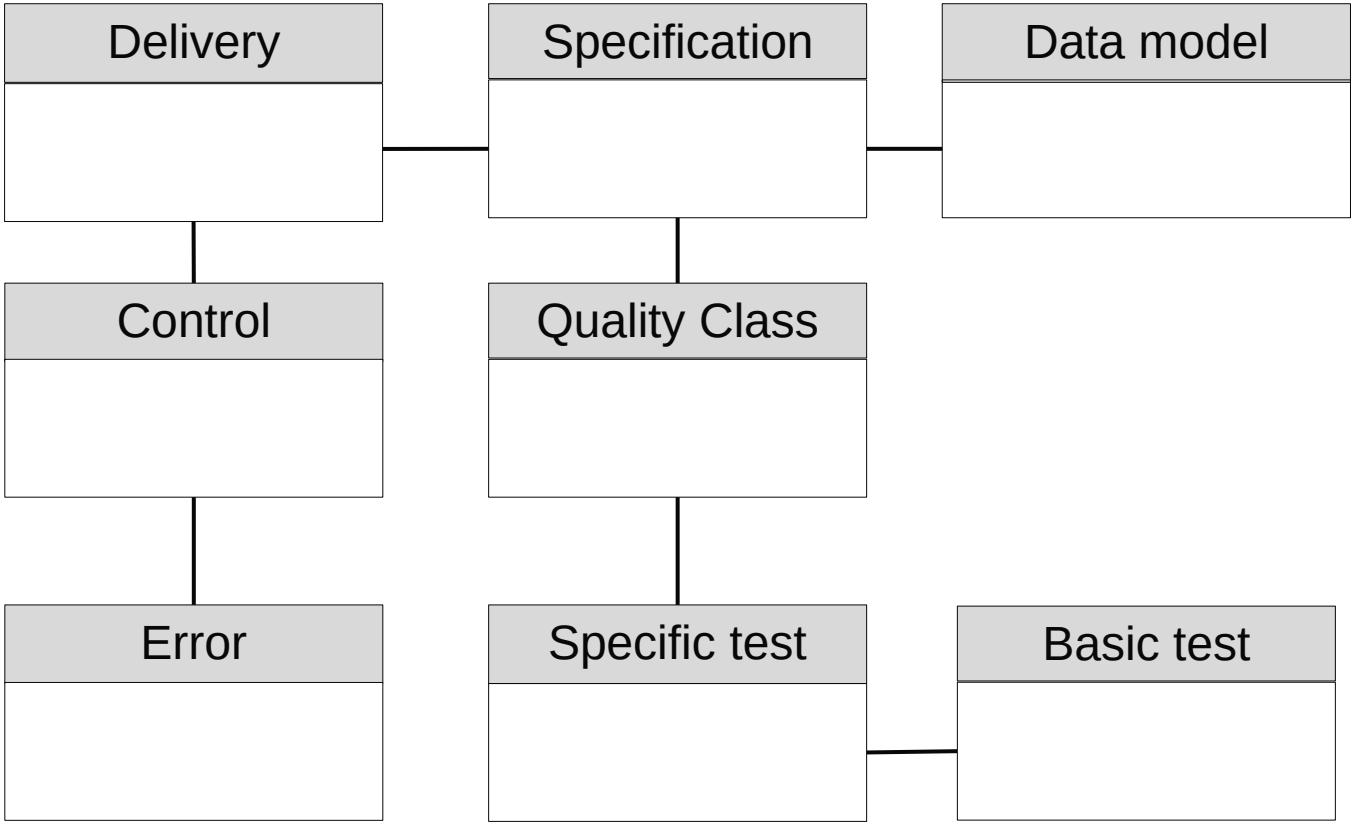
- QC configuration
  - Definition of tests
  - Definition of quality criteria

MIRO architecture and technology



- Technology
  - .NET
  - Net Topology Suite
  - SharpMap

MIRO database: simplified data model



MiroSuite

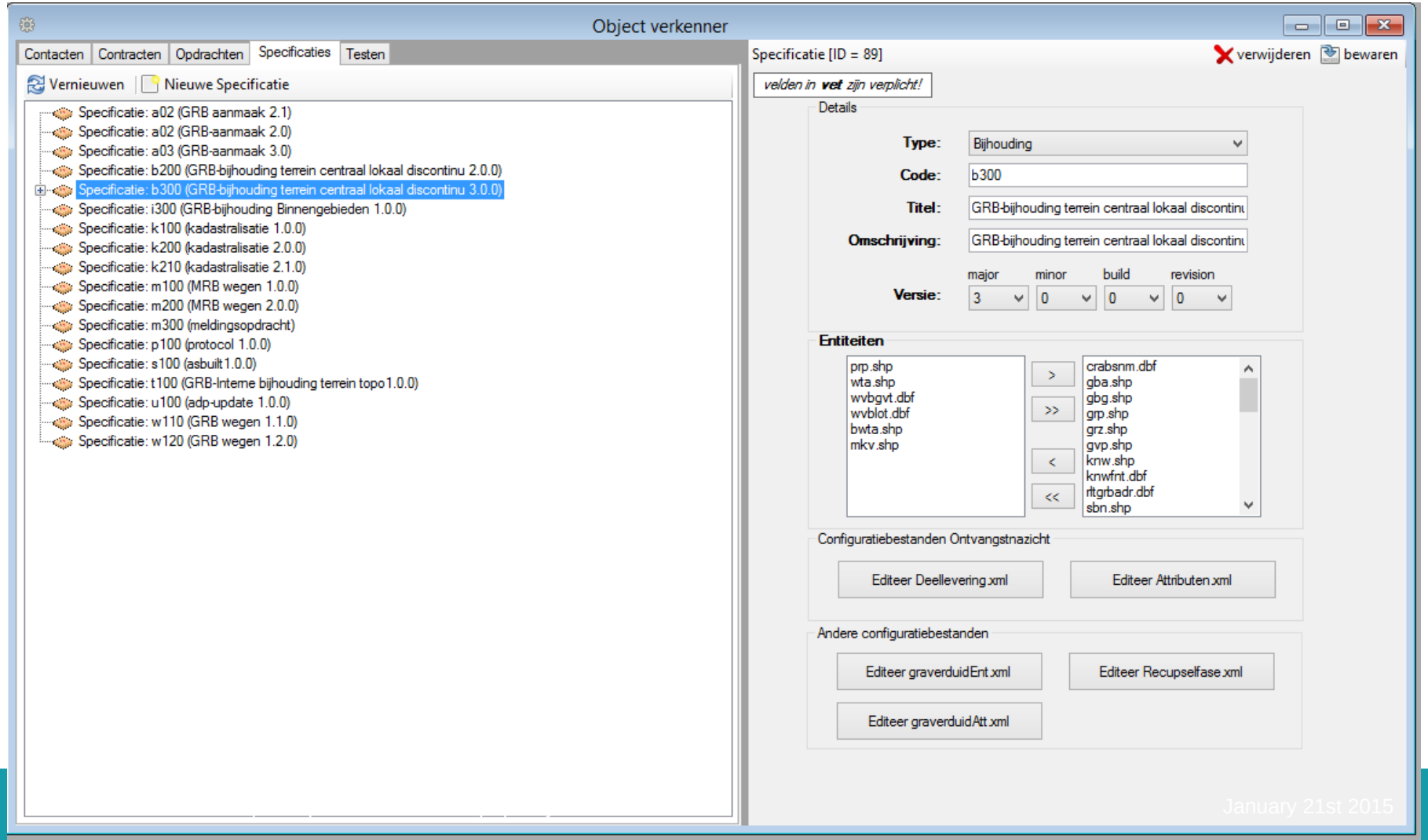
MIRO suite

- Interface for MIRO database
- Quality control configuration
  - Configuration of specification
    - Data model
    - List tests
    - Definition of quality criteria
  - Registration of delivery

Specification

- Type
- Code
- Description

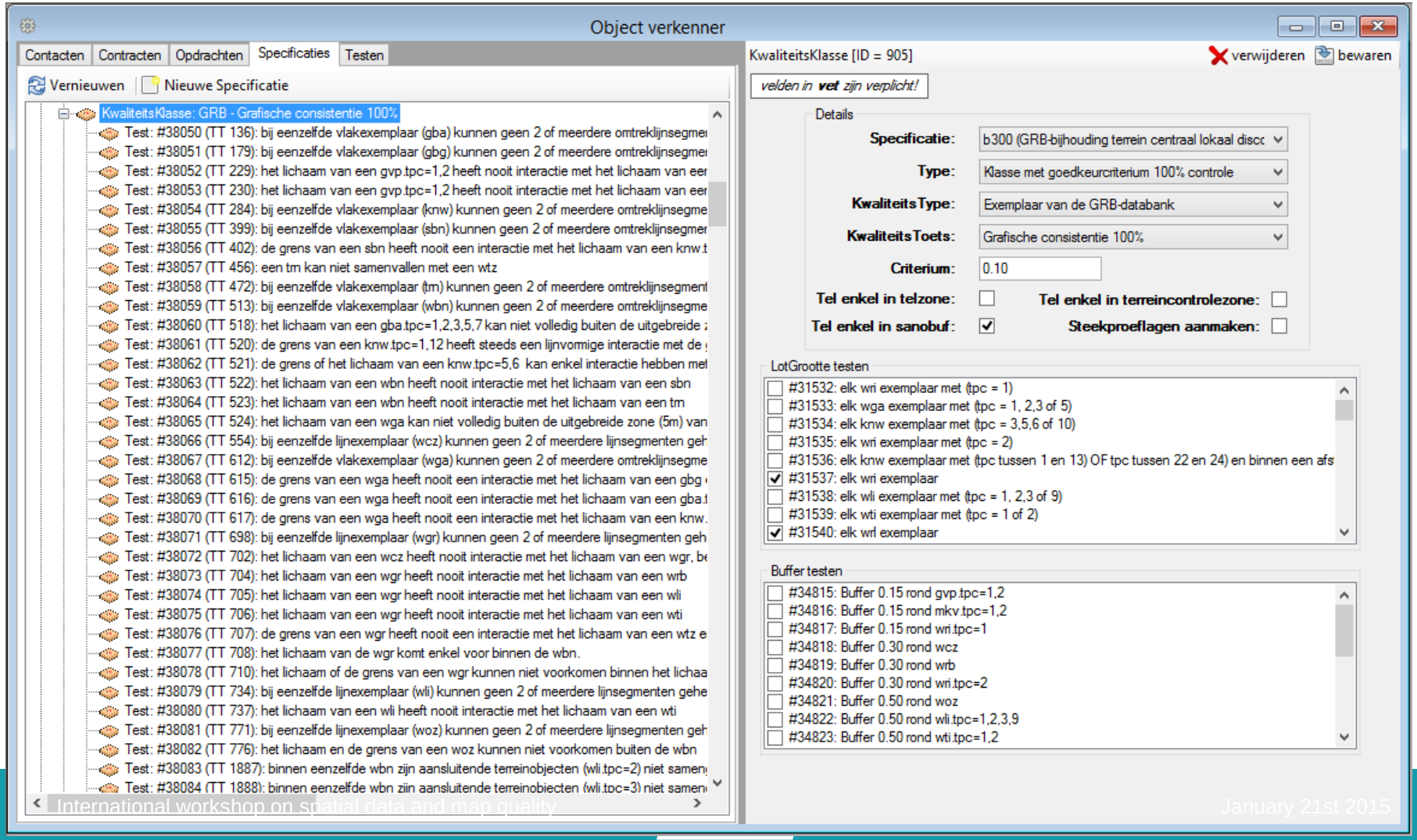
MiroSuite



Quality Class

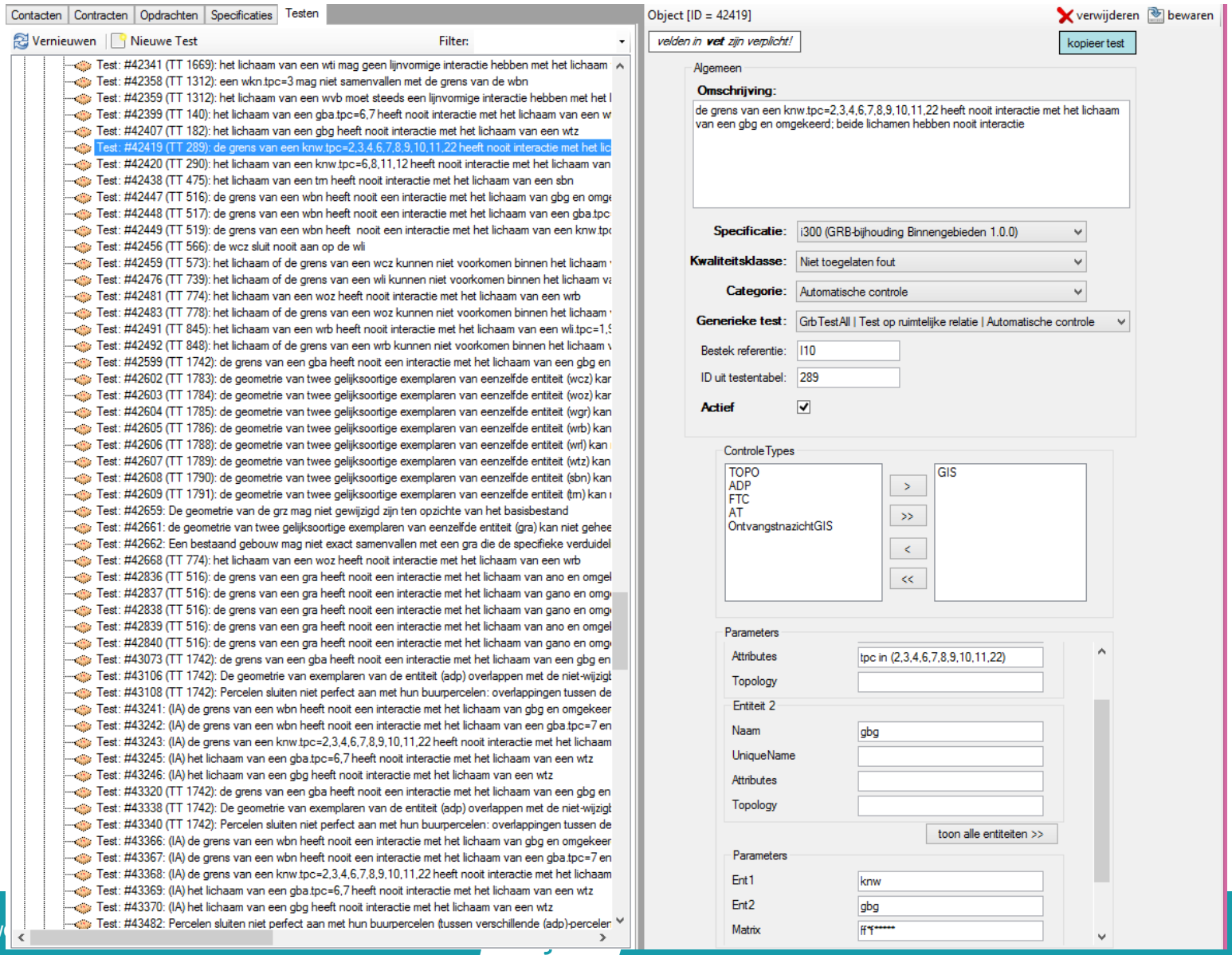
- 100% or sampling
- AQL
- Composition of lot

MiroSuite



Basic test – specific test

MiroSuite

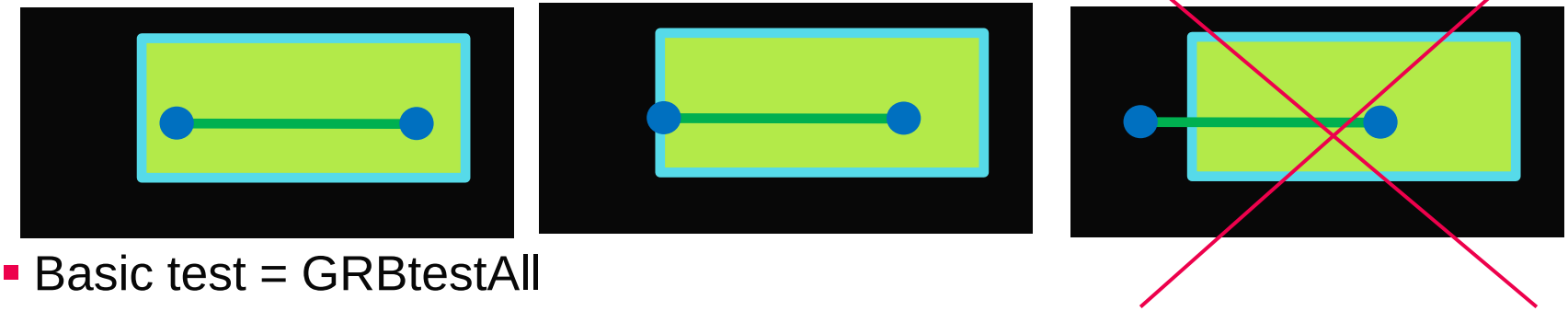


Basic test – specific test

- 70 basic tests → define specific tests with parameters
- Parameters
  - Features
  - Attribute restrictions
  - Topological restrictions
  - Intersection matrix (DE-9IM)

Basic test – specific test: example

- Example “Each road segment must coincide the road area”

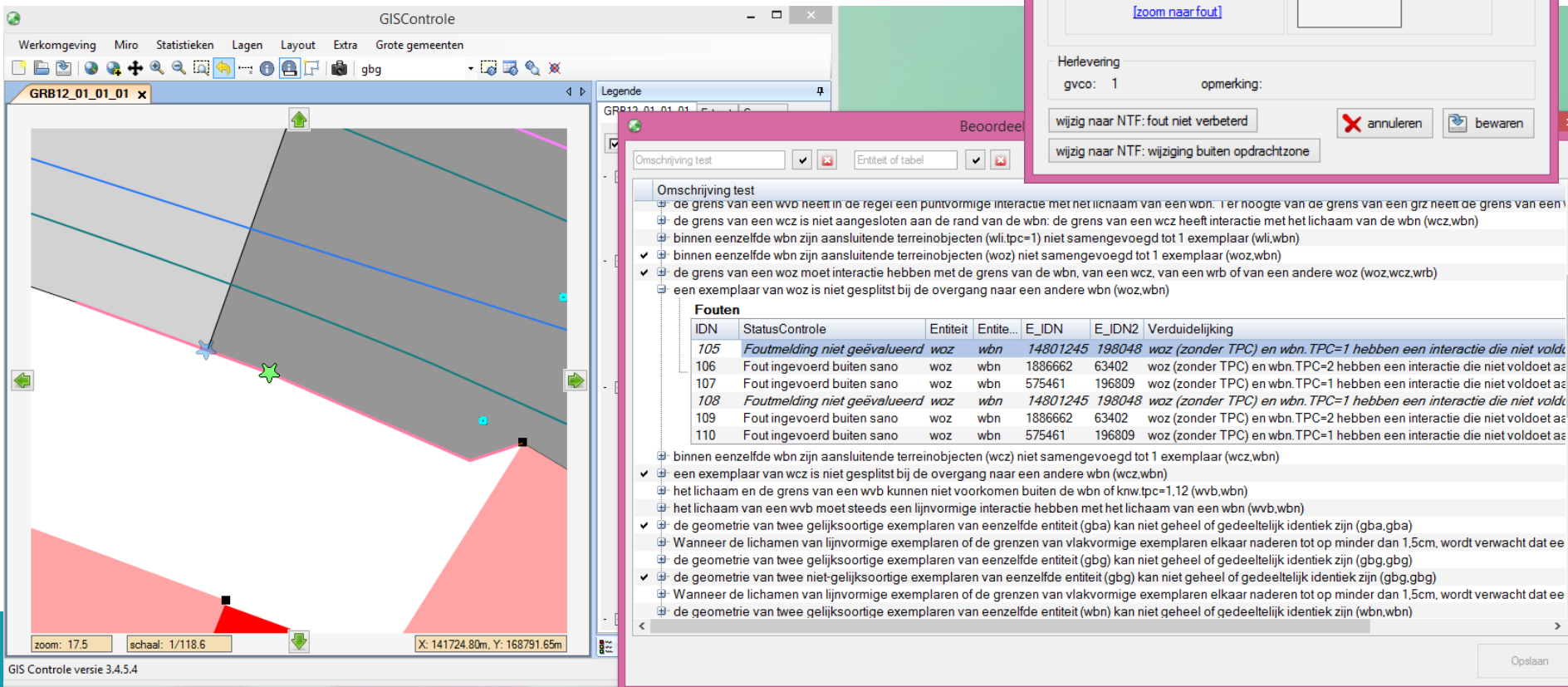


  - Basic test = GRBtestAll
    - Calculate intersecton matric for each pair of features
    - If Calculated IM <> Defined IM
      - Add error
  - Parameters
    - Entity 1 = road segment
    - Entity 2 = road area
    - Intersection matrix= **F**F***

		Road area		
		Interior	Boundary	Exterior
Road segment	Interior	*	*	F
	Boundary	*	*	F
	Exterior	*	*	*

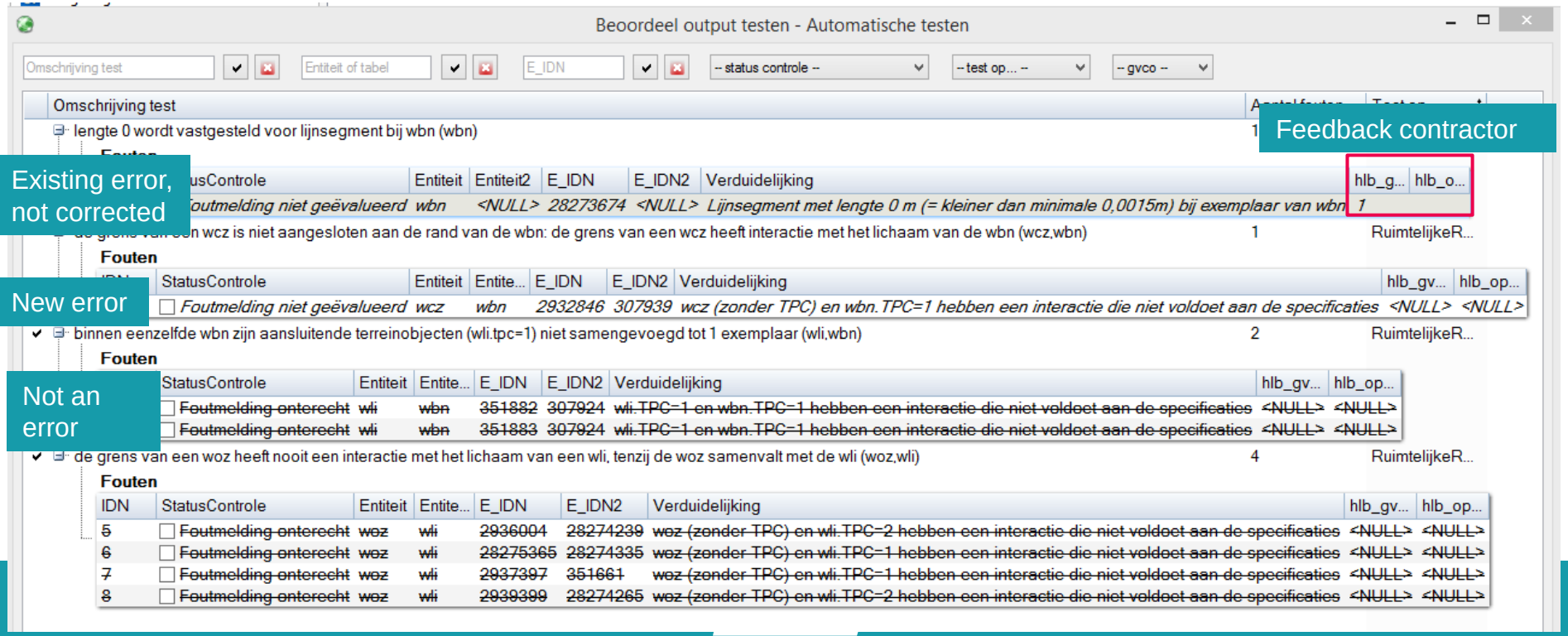
Error

- Geometry
- Status
  - Evaluated
  - No error
  - …
- Description
- Explanation
- Feature ID



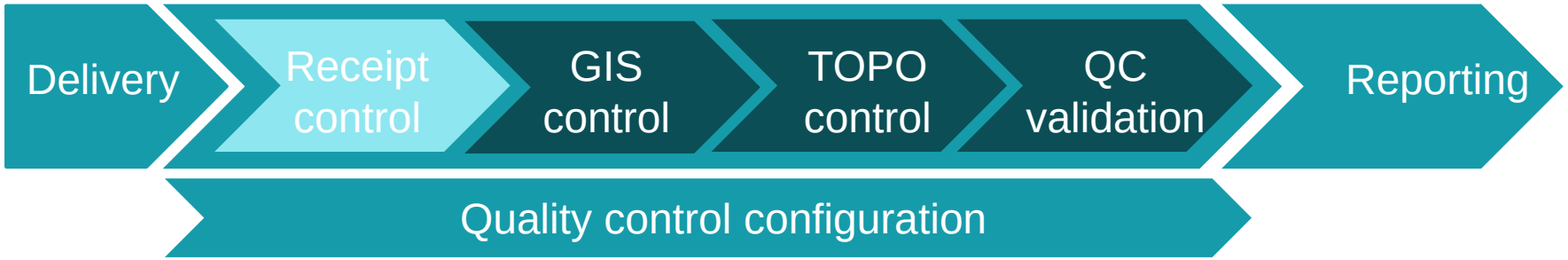
Error: processes

- Evaluate error only once
  - Inheritance of status
- Error shape in case of redelivery
  - Contractor reports which errors were solved and why errors were not solved
  - Automatic join with remaining errors
- Communication between GIS and TOPO



Receipt control

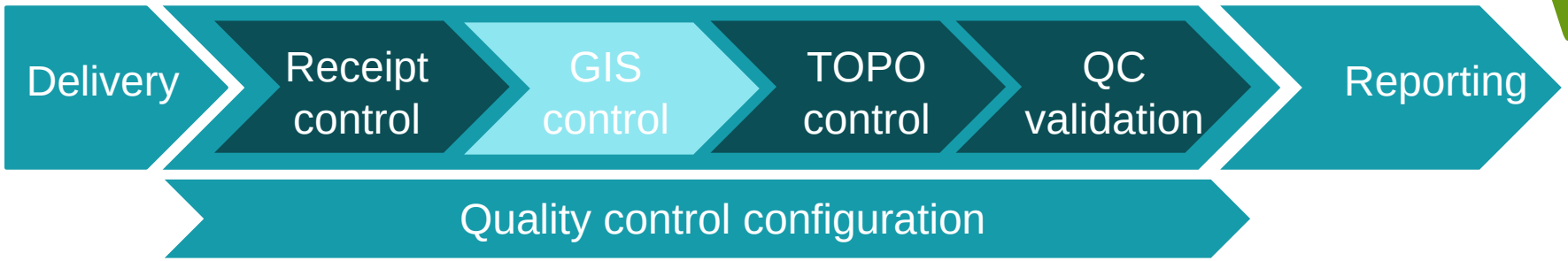
ReceiptControl



- Preparation
  - Unzip delivery
  - Create folders
  - Load tests from MIRO database
- Format consistency evaluation
  - Run tests
  - Evaluate tests
- Load results to MIRO database

GIS control

GisControl

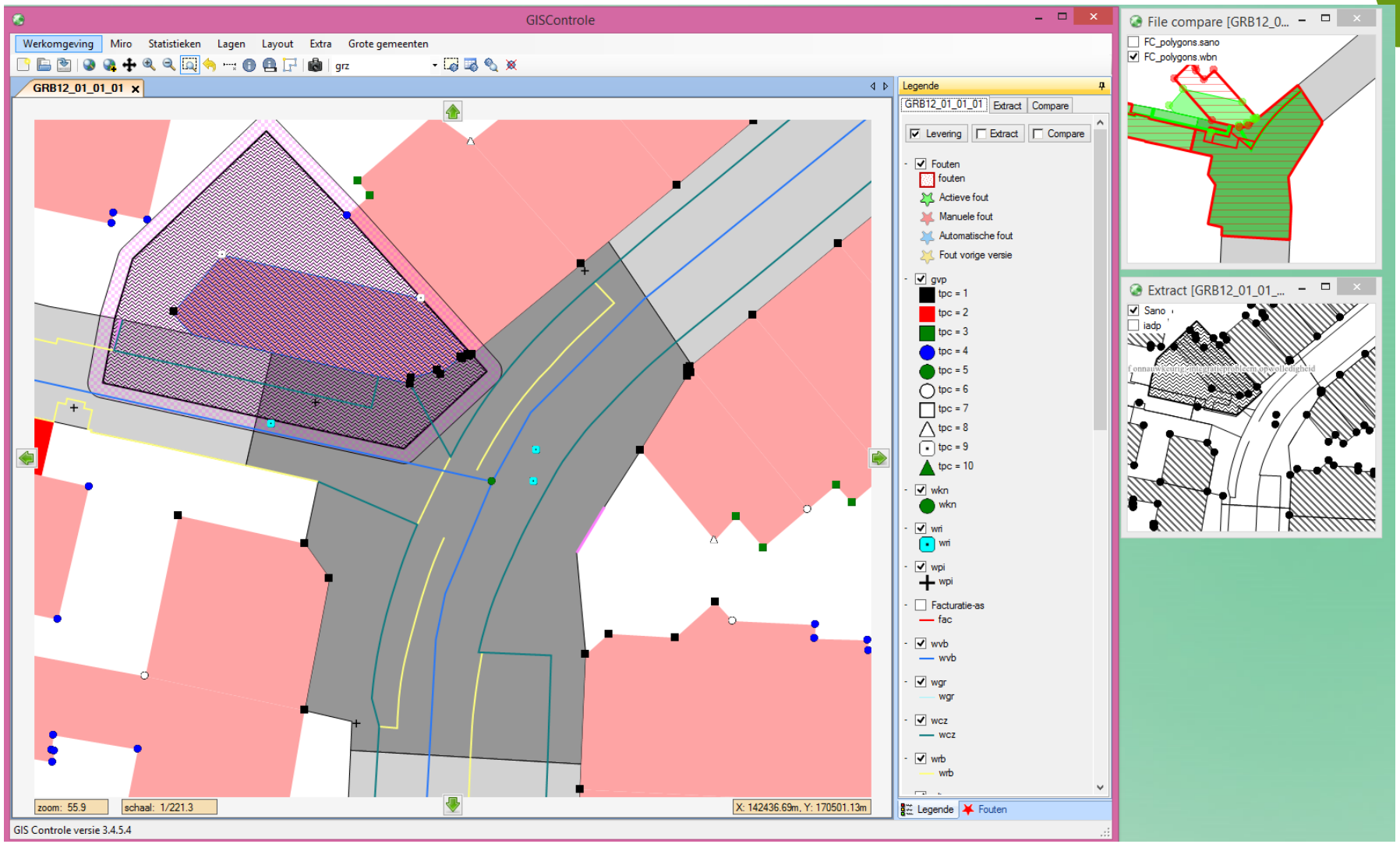


- Functionality
  - Map interface
  - Calculate statistics (lot size, sample size, acceptance number)
  - File compare
  - Evaluation of logical consistency
    - Automatic topological tests + evaluation output
      - Aim: evaluate error only once (in case of redelivery, update,…)
    - Manual tests
      - Facilitates sampling of the data (ISO 2859-1)
      - Enables the registration of errors

- Process
  - Load control information from MIRO database
  - Load delivery from file server
  - Perform control
  - Load results to MIRO database

GIS control: interface

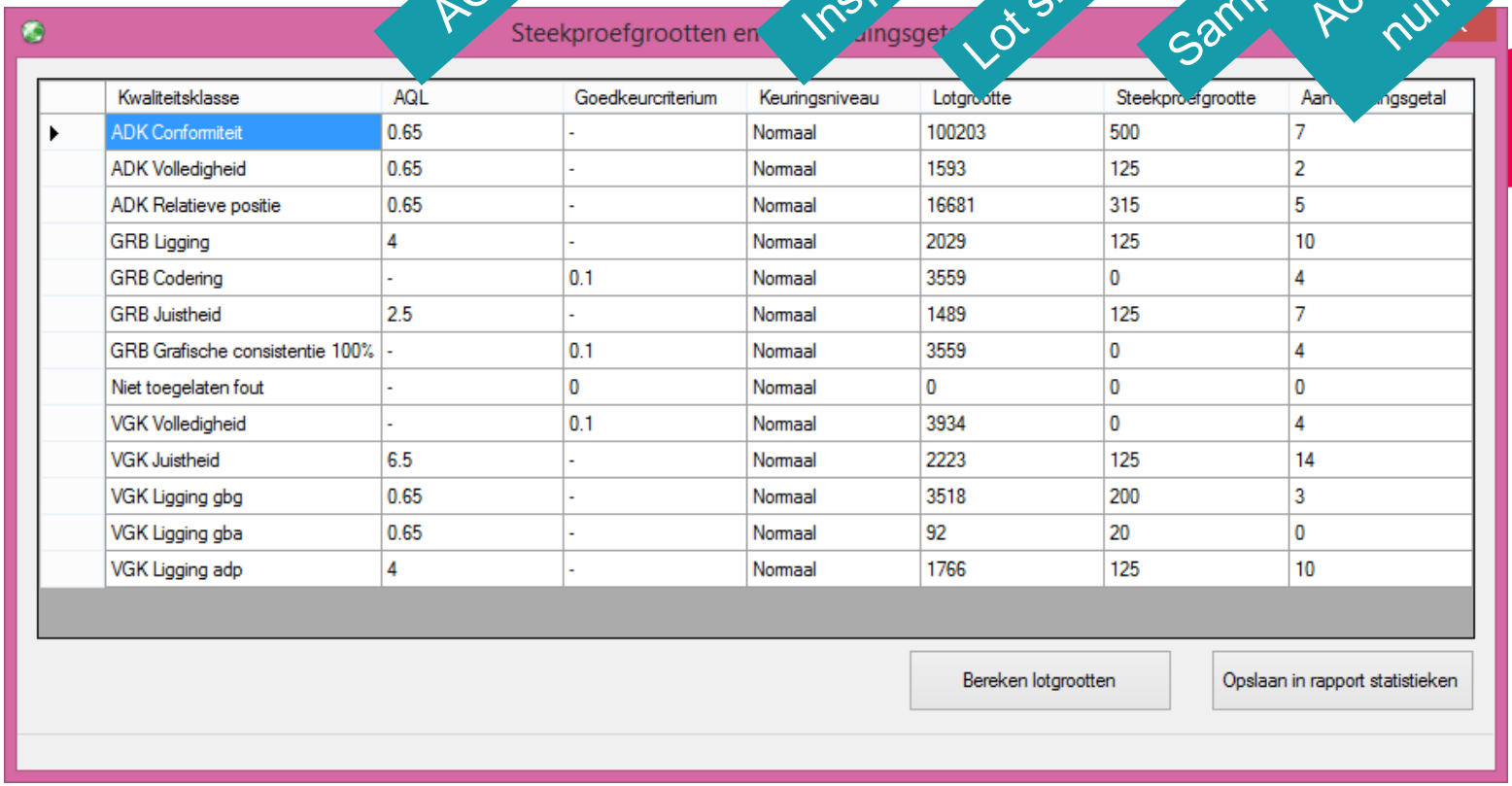
GisControl



GIS control: sampling

GisControl

- Statistics



Kwaliteitsklasse	AQL	Goedkeurcriterium	Keuringsniveau	Lotgrootte	Steekproefgrootte	Aan…ingsgetal
ADK Conformiteit	0.65	-	Normaal	100203	500	7
ADK Volledigheid	0.65	-	Normaal	1593	125	2
ADK Relatieve positie	0.65	-	Normaal	16681	315	5
GRB Ligging	4	-	Normaal	2029	125	10
GRB Codering	-	0.1	Normaal	3559	0	4
GRB Juistheid	2.5	-	Normaal	1489	125	7
GRB Grafische consistentie 100%	-	0.1	Normaal	3559	0	4
Niet toegelaten fout	-	0	Normaal	0	0	0
VGK Volledigheid	-	0.1	Normaal	3934	0	4
VGK Juistheid	6.5	-	Normaal	2223	125	14
VGK Ligging gbg	0.65	-	Normaal	3518	200	3
VGK Ligging gba	0.65	-	Normaal	92	20	0
VGK Ligging adp	4	-	Normaal	1766	125	10

- Composition of sample
  - Drawing area
  - Random selection

TOPO control

TopoControl

Preparation

- Calculating sample size
- Defining measurement areas

Field measurements

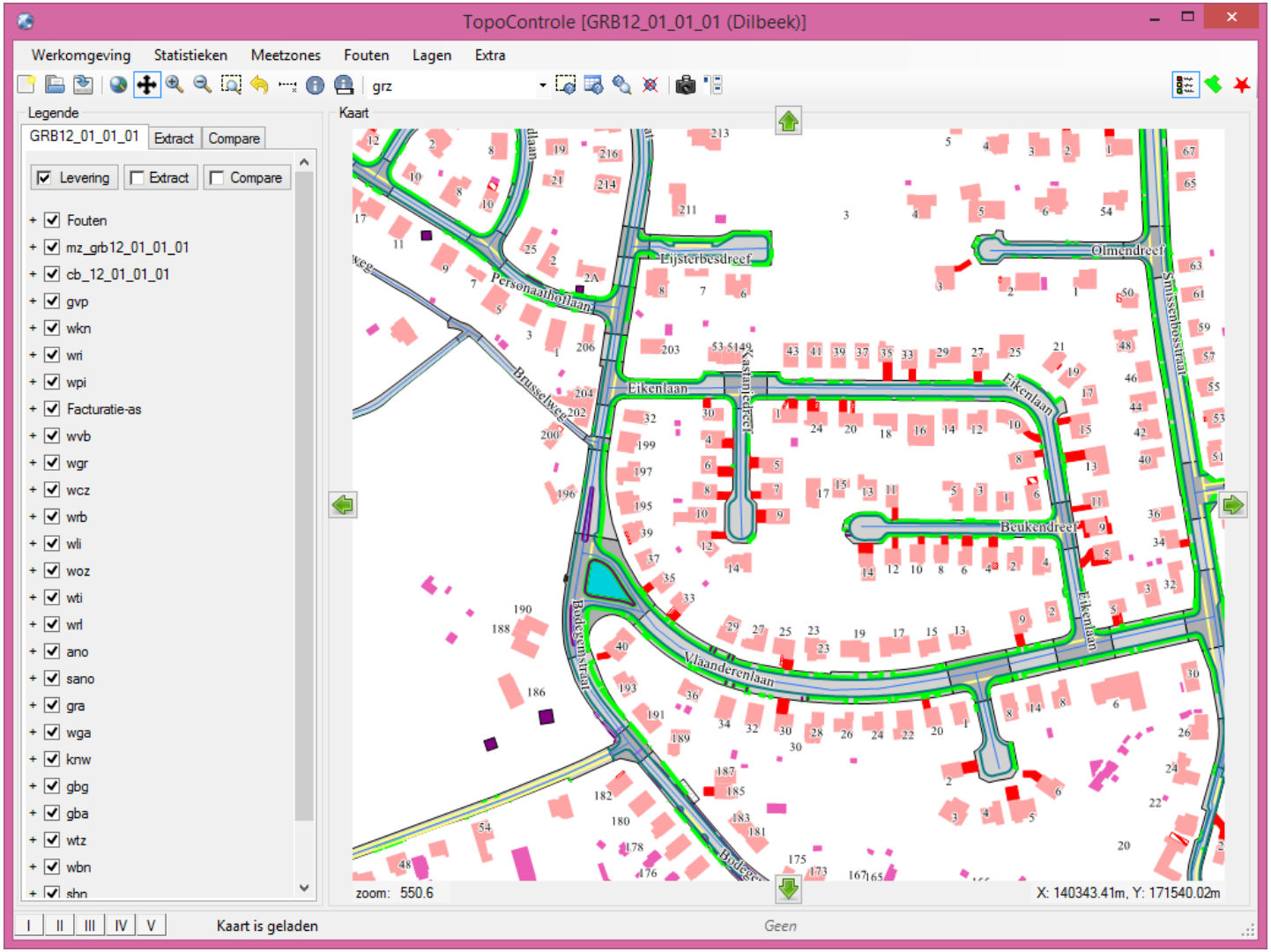
TopoControl

Processing

- Compare datasets
- Locate errors
- Load results

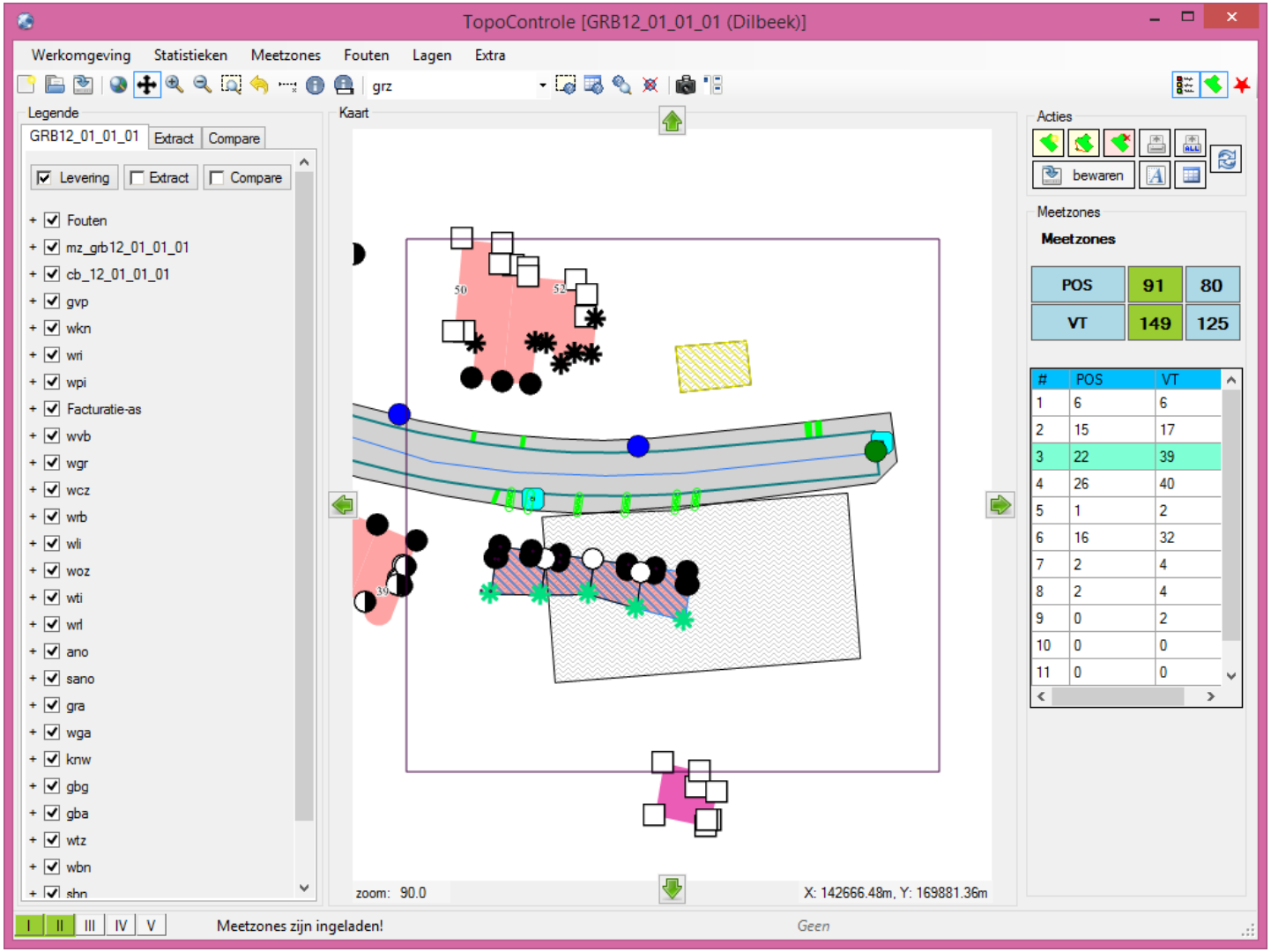
TOPO control: interface

TopoControl



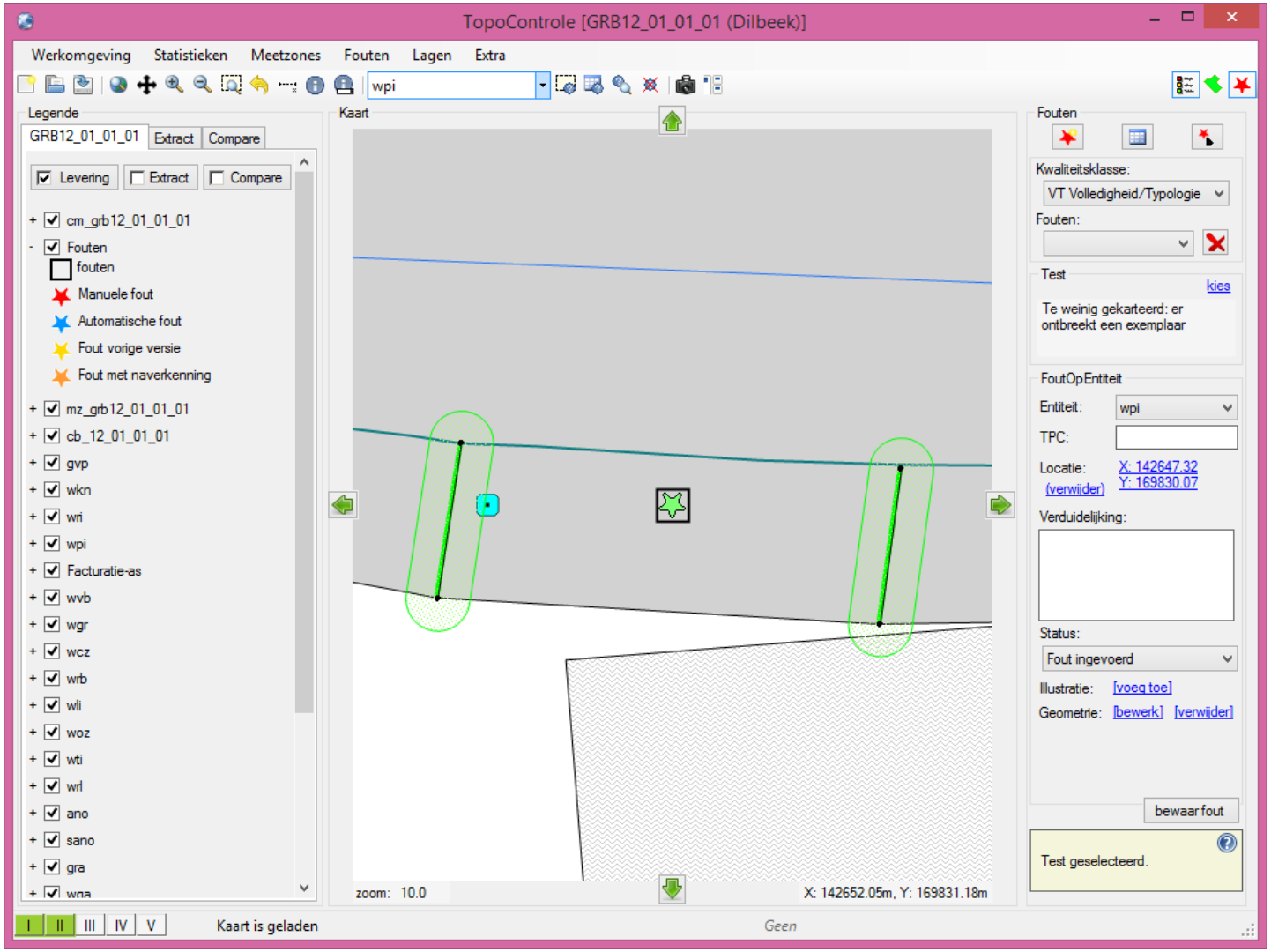
TOPO control: preparation

TopoControl



TOPO control: processing

TopoControl



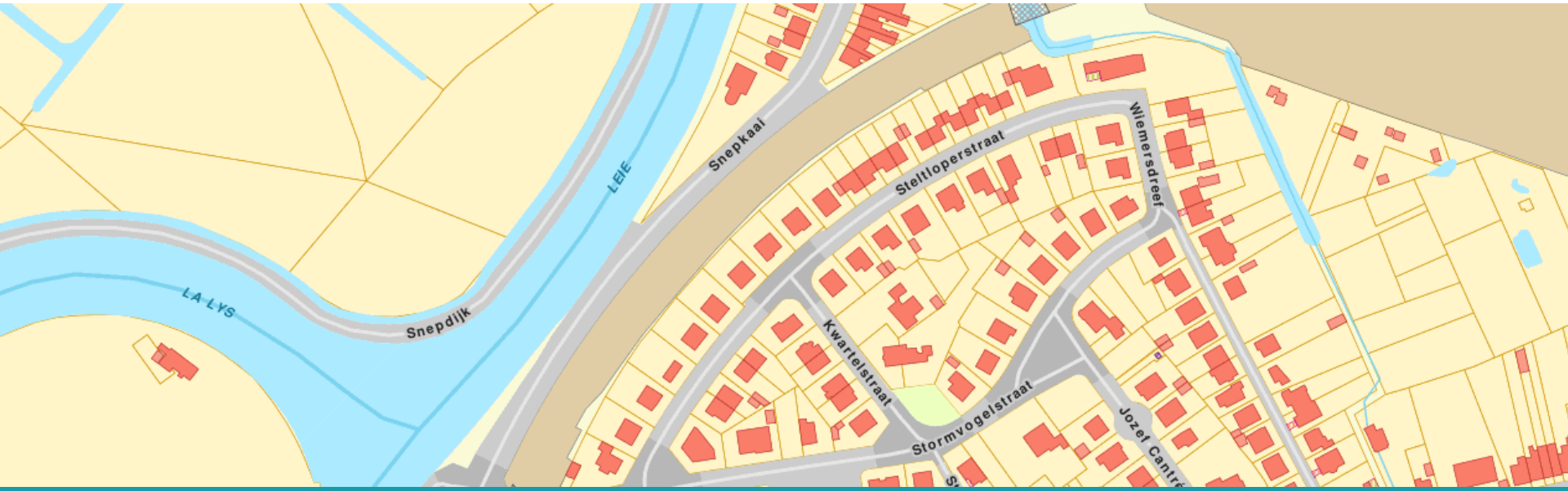
MIRO suite

MiroSuite

- Management environment
- QC validation
  - Bringing together errors GIS and TOPO
  - Decision approval or not
- Reporting
  - Quality report
  - In case of disapproval: error shape
  - In case of approval: shape with remaining errors
    - Solve at FGIA
    - Upload to database and solve in next update
- QC configuration

Agenda

- FGIA
- LRD
- Quality control of LRD data
- MIRO
- Future



AS IS <> TO BE

- FGIA has different quality control systems for different vector datasets
  - MIRO → LRD
  - Other datasets have their own systems
- No longer feasible for FGIA to maintain all these different environments
  - High cost for maintenance
  - Centralize knowledge quality control
  - More efficient controls

→ 2014: start project “Quality control system for all FGIA vector data”

Main goal project

Guarantee the quality of FGIA vector data in a cost efficient way

LOWER COSTS FOR QUALITY CONTROL

+

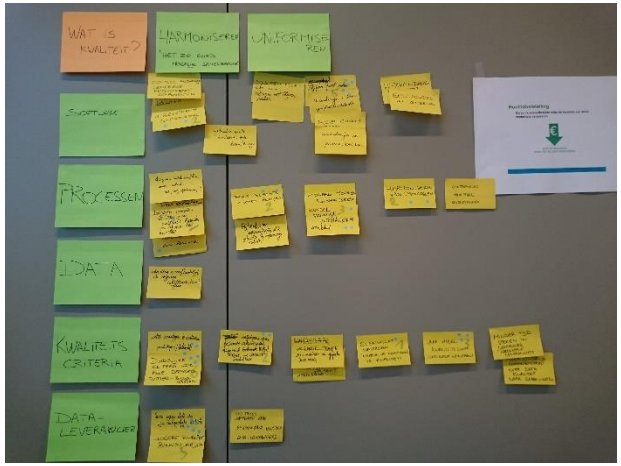
GUARANTEE QUALITY DATA

Roadmap

- Project with AGILE approach
- 2014: Inventory AS IS situation
  - Interviews with product owners
  - Collecting documentation

→ Result = Report

- December 2014
  - Workshop with product owners
  - Collecting needs
- Begin 2015
  - Making product backlog
  - Prioritise
- 2015 - …
  - Starting development



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