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This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

Visualisation

References

Ref.	Title/Version/Publication Date/Author
[1]	ELF D2.3 http://www.elfproject.eu/documentation/specification/data-maintenance-and-processing
[2]	D2.5 E.L.F. GeoLocator http://www.elfproject.eu/sites/default/files/D2.5%20Service%20specification%20for%20Geolocator.pdf
[3]	D3.4 GeoLocator Service
[4]	ELF Glossary http://www.elfproject.eu/documentation/glossary
[5]	ELF Specifications http://www.elfproject.eu/documentation/specification
[6]	ELF Schema Repository http://www.locationframework.eu/schemas/
[7]	Peter van Oosterom, Theo Tijssen, Ingrid Alkemade and Marian de Vries Multi-source Cartography in Internet GIS In: Milan Konecny (ed.); Proceedings 4th AGILE Conference, Brno, April 2001, pp. 562-573
[8]	Mark Luijten, NVBR BVIM (Brandweer Vraagorganisatie Informatiemanagement) Standaardisatie Kaartsymbolen - Operationele Informatievoorziening Veiligheidsregio's Inclusief voorstel voor uitbreiding van de NEN1414 norm (Dutch fire fighters document)
[9]	Robinson et.al.(1995). Elements of Cartography.
[10]	D2.8 E.L.F. Cadastre http://www.elfproject.eu/documentation/specification/elf-cadastre

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I Introduction

I.1 Purpose

The primary purpose of this document is to describe the visualisation concept

This document does not specify the implementation of the visualisation described in the document.

I.2 Scope

ELF visualisation describes the content, organisation and graphic presentation for each theme and LoD defining:

- Layers to present a theme
- Organisation by groups of layers and hierarchy for a specific use case (if any)
- Which spatial object types are portrayed in which layer

There will be several phases for setting up ELF visualisation:

- Preparation phase
 - o Clarification of requirements and identification of communalities and differences between Basemap and visualisation
 - o Analysis of INSPIRE portrayal
 - o Description of use cases
- Design phase
 - o Draft portrayal specification for themes with high priority in the cluster areas
 - o Test implementation in cooperation with WP4 using the SLD editor
 - o Visualisation concept
- Specification phase
 - o Portrayal specification by theme and LoD

I.3 Terminology

The ELF Glossary [4] defines basic terms relevant for the ELF project. Beside this generic glossary, the following terms are used in this document:

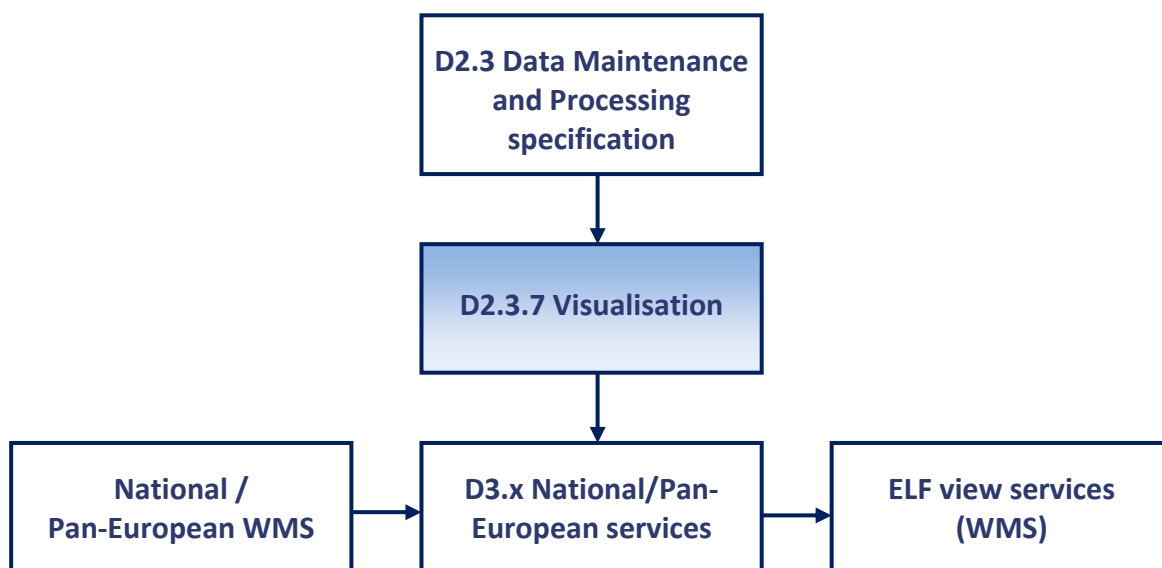
Acronym	Term	Definition
EG	EuroGeographics	http://www.eurogeographics.org
ERM	EuroRegionalMap	http://www.eurogeographics.org/products-and-services/euroregionalmap
S&S	Safety & Security	
CM	Cadastral Map	
LoD	Level of Detail	
AD	Addresses	ELF/INSPIRE theme
BU	Buildings	ELF/INSPIRE theme
CP	Cadastral Parcels	ELF/INSPIRE theme
GN	Geographical Names	ELF/INSPIRE theme
HY	Hydrography	ELF/INSPIRE theme
TN	Transport Network	ELF/INSPIRE theme
PS	Protected Sites	ELF/INSPIRE theme

2 Visualisation in the ELF framework

2.1 ELF organisational framework

The overall data supply chain, from national data to the ELF platform, is described in the deliverable D2.3 Data Maintenance and Processing specification [1].

Visualisation is the process applied when publishing ELF data available for viewing (view services, applications). The following picture portrays the link between visualisation and the other deliverables in the ELF framework.



2.2 ELF level of detail

ELF has defined different levels of detail (LoD), from Master LoD (LoD0, LoD1 and LoD2) via Regional LoD to Global LoD. Visualisation has to be considered for these LoDs in the following way:

- ELF Master LoD0: This LoD contains only very specific themes which are not included in other LoDs. The visualisation of themes Addresses (AD), Buildings (BU), Cadastral Parcels (CP) is described in D2.8 ELF Cadastre.
- ELF Master LoD1: The theme Geographical Names is an important component of several services and applications. It is considered in a specific way (see chapter 5.1).

The analysis shows the necessity of visualisation for different LoDs.

The implementation of this concept requires the style files to be defined. Specific parameters have to be defined for the different LoDs.

3 Visualisation concept

3.1 Objectives

ELF Visualisation aims at providing a portrayal specification to enable viewing the ELF data in accordance with the INSPIRE technical guidance for the view service.

The INSPIRE Generic Conceptual Model requires (Requirement 64):

Layers for each application schema shall be specified in accordance with the technical guidance for the view service so that each spatial object which is geo-referenced is rendered in at least one layer of a view service. For each layer, one default style to be used for portrayal shall be specified.

The ELF portrayal specification as part of the ELF data specifications (Chapter “Portrayal”) will be based on the INSPIRE rules for layers and styles of the INSPIRE themes referenced in ELF. The INSPIRE rules are extended with layers and styles for any ELF extensions.

Further, ELF visualisation is looking into the definition of layers and well-defined styles allowing combinations of cross-theme layers to achieve good cartographic results.

3.2 Data content

The INSPIRE portrayal model is understood as a capability to view the data. Thus, all ELF data is subject for consideration in this task.

3.3 Users

NMCAs and data providers will set up view services for their ELF data using the ELF visualisation.

In the GeoProductFinder viewing data is offered to users before download. This helps users to assess whether the data meets the requirements and intended use.

Besides, that ELF visualisation is targeting at application developers and professional GI users who want to create combinations of different layers from different ELF themes and over data.

3.4 Scale

ELF visualisation will address all levels of detail: Global, Regional and Master (levels 0, 1, 2).

4 INSPIRE portrayal

4.1 Analysis of INSPIRE portrayal

In a first step the INSPIRE portrayal for the themes in the ELF scope has been analysed to indicate whether a certain layer and style is considered relevant for ELF and if there is a need for extensions.

The analysis of INSPIRE portrayal D2.3.7_Visualisation_AnnexA.xlsx

4.2 INSPIRE style files

The project assumed that the INSPIRE style files are available through the INSPIRE repository or the INSPIRE geoportal. As this is not the case, the style files have been created from the data specifications for INSPIRE Annex I themes AD, AU, CP, GN, HY, PS, TN.

For use in ELF the INSPIRE style files are made available for use in the ELF platform under www.locationsframework.eu/...

5 ELF Use Cases

INSPIRE defines default portrayal per theme (map layers with features) and partly related to scale. Applications often combine different themes into one map and have often defined this portrayal. Using the default portrayal of each individual theme / layer in a combined map environment could result in visualization conflicts: e.g. different themes use same portrayal. These problems could be detected by automated reasoning [7] and in theory also be automatically solved (by giving layers different priorities and in case of style conflict assign 2nd or 3rd default style instead of first default portrayal style for the layer with lower priority). More pragmatic for the time being is manual inspection of the layers and their styles involved.

Default INSPIRE/ELF portrayal is compared to the portrayal as specified in the domain of the use case. It is most likely that in several cases styles different then default need to be used. Then there are two options for specifying this:

- 1) Extend the data product specification with more styles for the theme/ layer and label these as by use case
- 2) Make separate register of use cases, with per use case: name of use case (e.g. S&S, CM, ...), the involved themes/ layers and per layer the use case specific portrayal.

The order in which the different themes are displayed is also relevant is. This is easier in option b) and could be included in the portrayal use case register.

5.1 ELF GeoLocator

Geographical names (GN) are a key component of a map. As Robinson points out “only a person familiar with an area would not need names to identify the mapped features” ([9], p.404). But the selection, design and placement of names have a great influence on the quality and readability of a map.

Two demonstration applications show the theme GN in combination with ERM (1) as background and another uses Bing aerial images (2) as background.

Demonstration application (1)

http://osm2.fgi.fi/elf_gn_sld/elf_gn_erm_background.html

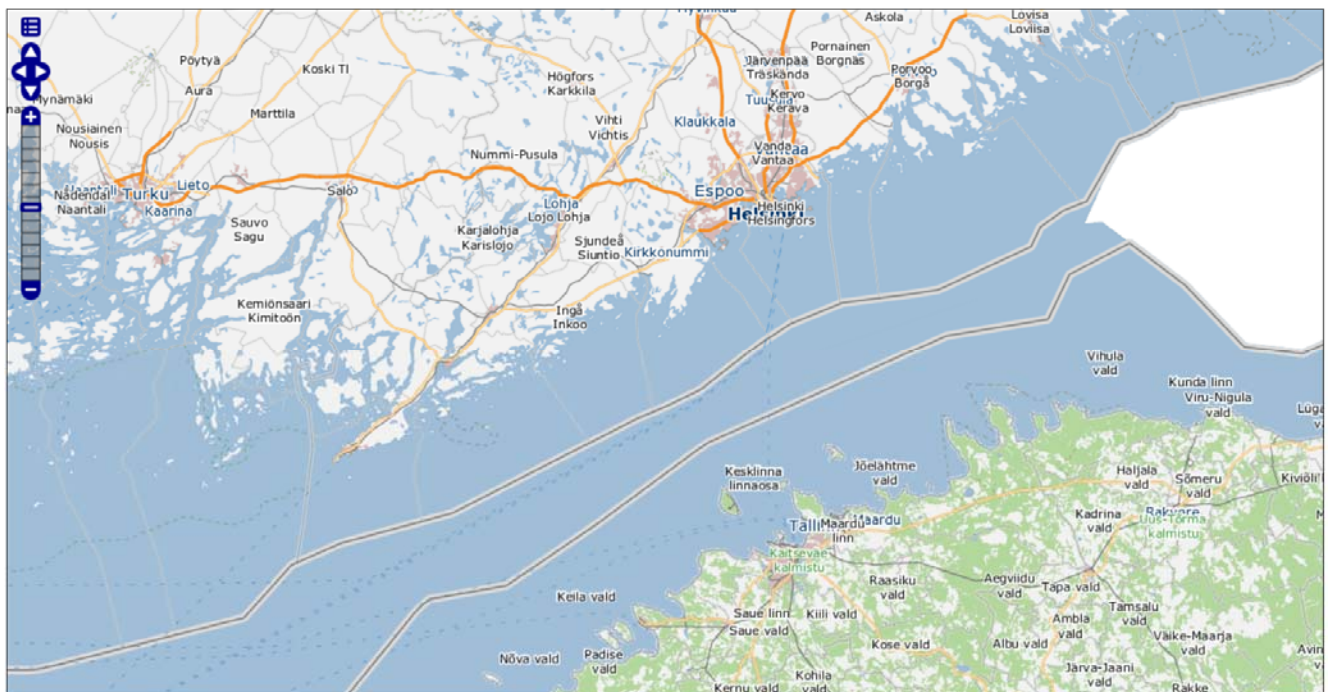


Figure 1 - Geographical names with ERM as background

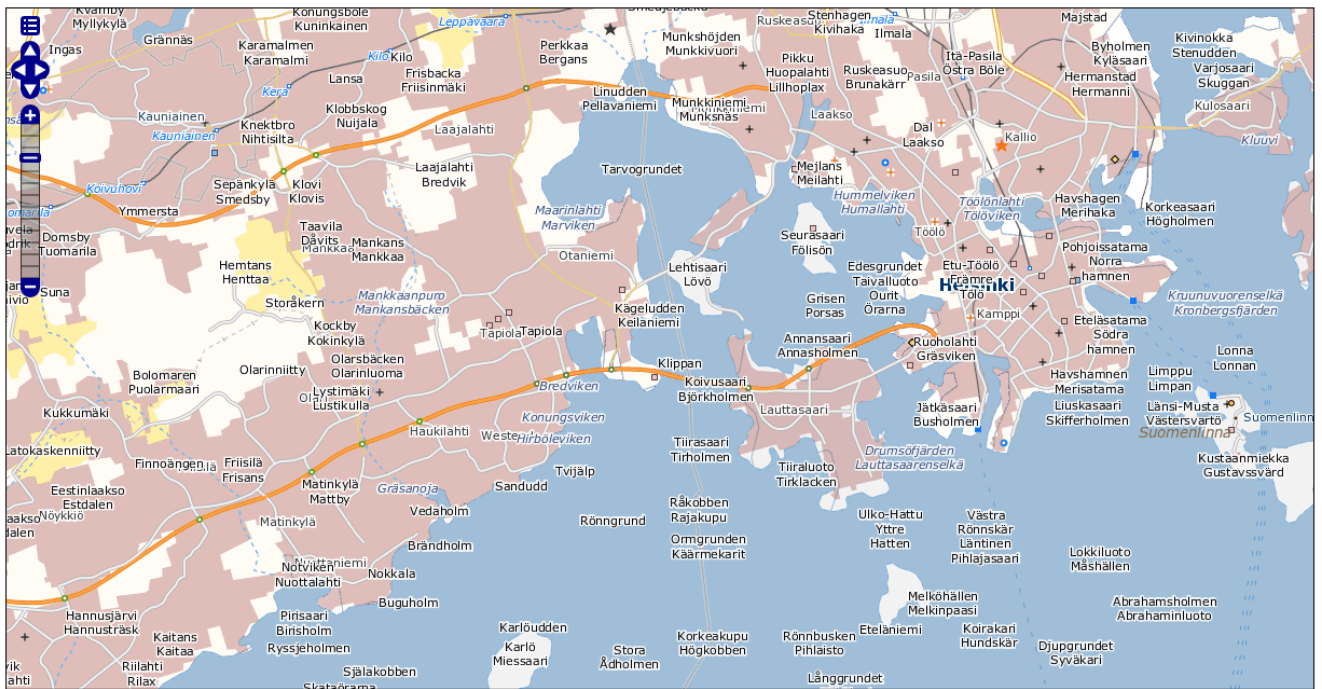


Figure 2 – Geographical names with ERM as background (more detail)

Demonstration application (2)

http://osm2.fgi.fi/elf_gn_sld/elf_gn_bing_background.html

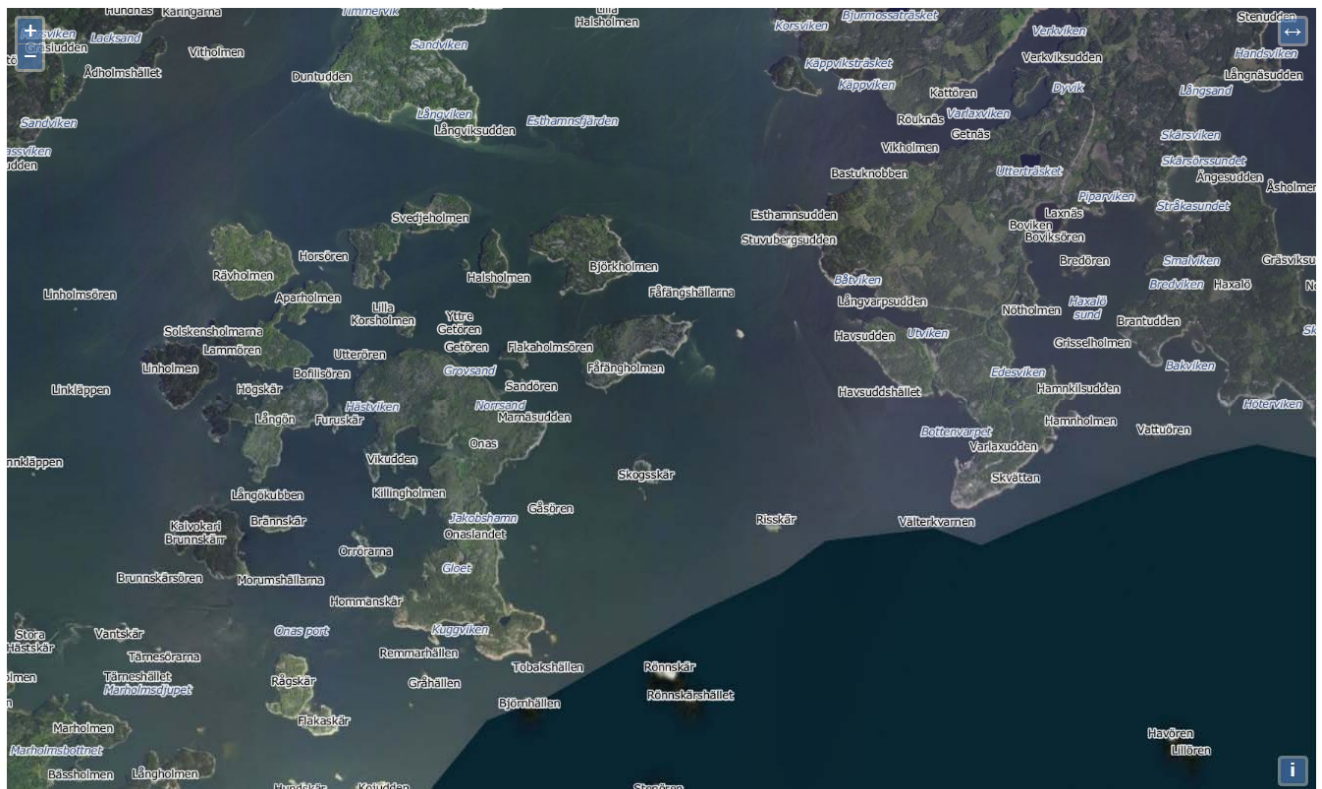


Figure 3 – Geographical names with Bing aerial images as background

5.1.1 Layers

Layer Name	Layer Title	Spatial object type(s)	Keywords
elf_gn	ELF Geographical Names	Point geometry	geographical names
ERM	-	WMS layer (raster)	-
Bing	-	WMS layer (raster)	-

5.1.2 Styles

Style Name	GN.GeographicalNames.Default	
Style Title	Geographical Names	
Style Abstract	ELF GN default style	
Symbology		
Minimum & maximum scales	Depends on the feature class 1 COUNTRIES, ADMINISTRATIVE UNITS AND OTHER AREAS 1:150000 – 1:250000 2 Country 1:4000000 – 1:50000000 3 Administrative units 1:200000 – 1:2500000 4 Other non-administrative units > 1:250000 5 POPULATED PLACES > 1:150000 6 Administrative capitals 1:700000 – 1:1500000 7 Other populated places > 1:150000 8 Houses > 1:10000 9 NON-RESIDENTIAL STRUCTURES AND BUILDINGS > 1: 30000 10 Economic activity facilities > 1: 30000 11 Social facilities, administrative buildings and monuments > 1: 30000 12 Other non-residential structures > 1: 30000 13 TRANSPORT AND TELECOMMUNICATION FEATURES > 1: 70000 14 Air transport > 1: 150000 15 Waterborne transport > 1: 150000 16 Land transport > 1: 30000 17 Telecommunication > 1: 30000 18 TERRAIN FEATURES > 1: 250000 19 Island > 1: 150000	

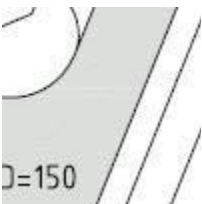
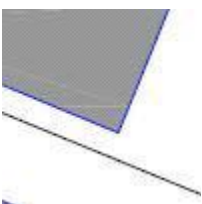
	20 Coastal and shore relieves > 1: 200000 21 Elevation > 1: 30000 22 Natural terrain areas or regions > 1: 30000 23 Point terrain features > 1: 30000 24 HYDROGRAPHIC FEATURES > 1: 500000 25 Seas or part of them > 1: 500000 26 Standing water features > 1: 150000 27 Flowing water features > 1: 120000 28 Hydrographic point features > 1: 30000 29 Diverse hydrographic structures > 1: 30000 30 Other hydrographic and underwater features > 1: 30000 31 CONSERVATION AREAS > 1: 3000000 32 World Heritage Sites > 1: 250000 33 Conservation areas of natural environment > 1: 250000 34 MISCELLANEOUS > 1: 30000	
Example	<pre> <!-- 2 Country --> <se:Rule> <ogc:Filter> <ogc:PropertyIsEqualTo> <ogc:PropertyName>location_type</ogc:PropertyName> <ogc:Literal>2</ogc:Literal> </ogc:PropertyIsEqualTo> </ogc:Filter> <se:MinScaleDenominator>4000000</se:MinScaleDenominator> <se:MaxScaleDenominator>50000000</se:MaxScaleDenominator> <se:TextSymbolizer> <se:Label> <ogc:PropertyName>name</ogc:PropertyName> </se:Label> <se:LabelPlacement> <se:PointPlacement> <AnchorPoint> <AnchorPointX>0.5</AnchorPointX> <AnchorPointY>0.7</AnchorPointY> </AnchorPoint> </se:PointPlacement> </se:LabelPlacement> </se:TextSymbolizer> </se:Rule> </pre>	

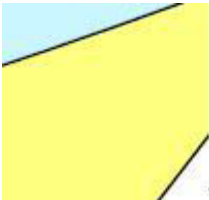
	<pre> </AnchorPoint> <Displacement> <DisplacementX>0</DisplacementX> <DisplacementY>0</DisplacementY> </Displacement> </se:PointPlacement> </se:LabelPlacement> <se:Fill> <se:SvgParameter name="fill">#000000</se:SvgParameter> </se:Fill> <se:Font> <se:SvgParameter name="font-family">Verdana</se:SvgParameter> <se:SvgParameter name="font-size">12</se:SvgParameter> <se:SvgParameter name="font-style">normal</se:SvgParameter> <se:SvgParameter name="font-weight">normal</se:SvgParameter> </se:Font> <se:Halo> <se:Radius> <ogc:Literal>1.5</ogc:Literal> </se:Radius> <se:Fill> <se:SvgParameter name="fill">#FFFFFF</se:SvgParameter> <se:SvgParameter name="fill-opacity">0.85</se:SvgParameter> </se:Fill> </se:Halo> <VendorOption name="autoWrap">60</VendorOption> </se:TextSymbolizer> </se:Rule> </pre>	
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5.2 Safety and Security

In the Netherlands the map use in Safety and Security (S&S) is based on a standard as defined by Dutch fire fighters association [8]. It includes the representation of roads, buildings, water, terrain etc.

The table below shows the relevant geographic features used for the background map in the Netherlands S&S. In this table the first column gives a graphic impression of the feature, the second column specifies which INSPIRE / ELF theme is involved, while the next column expresses the portrayal as specified in INSPIRE / ELF. In the last column the comments are stated after our analysis.

NL safety and security	INSPIRE / ELF theme	INSPIRE / ELF portrayal	Comment
	RoadArea (TN)	“ The geometry is rendered using a grey (#A9A9A9) fill and a solid black (#000000) outline with a stroke width of 1 pixel.”	No conflict
	access route for fire trucks = RoadServiceArea (TN)	“ The geometry is rendered using a grey (#A9A9A9) fill and a solid black (#000000) outline with a stroke width of 1 pixel.”	Style for RoadServiceArea should be specified in ELF (depending on use case)
	Building (surface and contour)	No style defined yet ELF: “ The INSPIRE DS are not homogenous we suggest that the width be defined in pixels and RGB. Outline width: 2 pixels. And 1:1 to 1:5,000”	Defined in D2.8 ELF Cadastre [10]

NL safety and security	INSPIRE / ELF theme	INSPIRE / ELF portrayal	Comment
	Waterbody (HY)	ELF: “ Physical waters as watercourses or standing water can be portrayed with different geometries depending on its dimensions and the level of detail or resolution. Lineal watercourses are depicted by solid blue (#33CCFF) lines with stroke width of 1 pixel and the superficial ones are depicted by filled blue light polygons (#CCFFFF) without border. Punctual standing waters are depicted by dark blue (#0066FF) circles with size of 6 pixel and the superficial ones are depicted by filled blue light polygons (#CCFFFF) without border.”	Check RGB values
	LandCoverSurface (LC) (classification = 'Sand')	ELF:” This Style defined the default INSPIRE style for Land Cover data supported by a set of non overlapping of polygons. As there is no required nomenclature, only the geometry is represented, ie only polygons with a white (FFFFFF) fill and a black outline (000000) of 3 pixels width. ”	No style yet per (relevant) LandCover class

5.3 Cadastral Map

In the Netherlands the cadastral map typically contains a number of feature types, each with their own standard portrayal: parcels (boundaries and numbers), buildings, street names and house numbers. Note that the buildings, street names and house numbers are included on the cadastral map for reference purpose only. The table below contains the analysis of comparing the portrayal of the involved themes in the Netherlands cadastral map and their default portrayal according the INSPIRE/ ELF specification. The illustration below the table in Figure 4, shows an example cadastral map from the Netherlands.

Note that this concerns a cadastral map at a specific moment in time (usually the most up-to-date map). Instead of the portrayal of map at a specific moment, sometimes also the portrayal of changes during a specified interval needs to be specified. For example in cadastral update maps not only the current situation is depicted, also the changes are displayed with their own portrayal rules: deleted boundaries, new boundaries have their own styling: instead of black lines use blue and red lines. This may also be the case for other use cases.

NL 'cadastral map'	Feature type INSPIRE	INSPIRE / ELF	Comment
Parcel boundary / outline: black line	CadastralBoundary (CP) Or CadastralParcel (CP)	When CadastralBoundary: black (#000000) line, width 1 pixel When CadastralParcel: no fill, only black outline, width 1 pixel	No conflict
Parcel number (positioned when possible inside the parcel): black font	CadastralParcel. LabelOnReferencePoint	Labels: in Arial 10 black (#000000)	No conflict, but more hints needed for scale dependent rendering of text
Building contour: red line, no fill	Building (BU)	ELF: " The INSPIRE DS are not homogenous we suggest that the width be defined in pixels and RGB. Outline width: 2 pixels. And 1:1 to 1:5,000 "	Not default style for buildings yet, must be defined in ELF. Order on the map: Red outline for building will not be visible if black parcel outline is printed on top.

Address is displayed on two label points - Street name(s): positioned inside the contours of street-parcels - House numbers: positioned inside buildings that have an address	Address (AD)	INSPIRE: “6 pixel square with black (#000000) border and – white (#FFFFFF) fill, if the position of the address represents the postal delivery point, a point of utility service, the access point from the thoroughfare, or the entrance door or gate, – 75% grey (#C0C0C0) fill, if the position of the address represents the building or parcel, – 50% grey (#808080), if the position of the address represents the related segment of a thoroughfare, and – 25% grey (#404040), otherwise.”	INSPIRE default style has a black border around the (complete?) address. This conflicts with the style of the current NL ‘cadastral map’
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Some additional notes:

- Sometimes the parcel number is rotated if space is not enough for normal display (and if we can still not position the text with rotation, then parcel number is placed elsewhere with a connecting ‘stick’ to intended parcel; ‘bijpijling’ in Dutch).
- Street names should always run in the longitudinal direction of the street (which is may be inconvenient as seen from theme address, as the road geometry itself may be in other INSPIRE theme: transportation networks).
- In some cases a cadastral boundaries plays a double role; e.g. also municipal boundary, and in this case, it should be visualized differently.

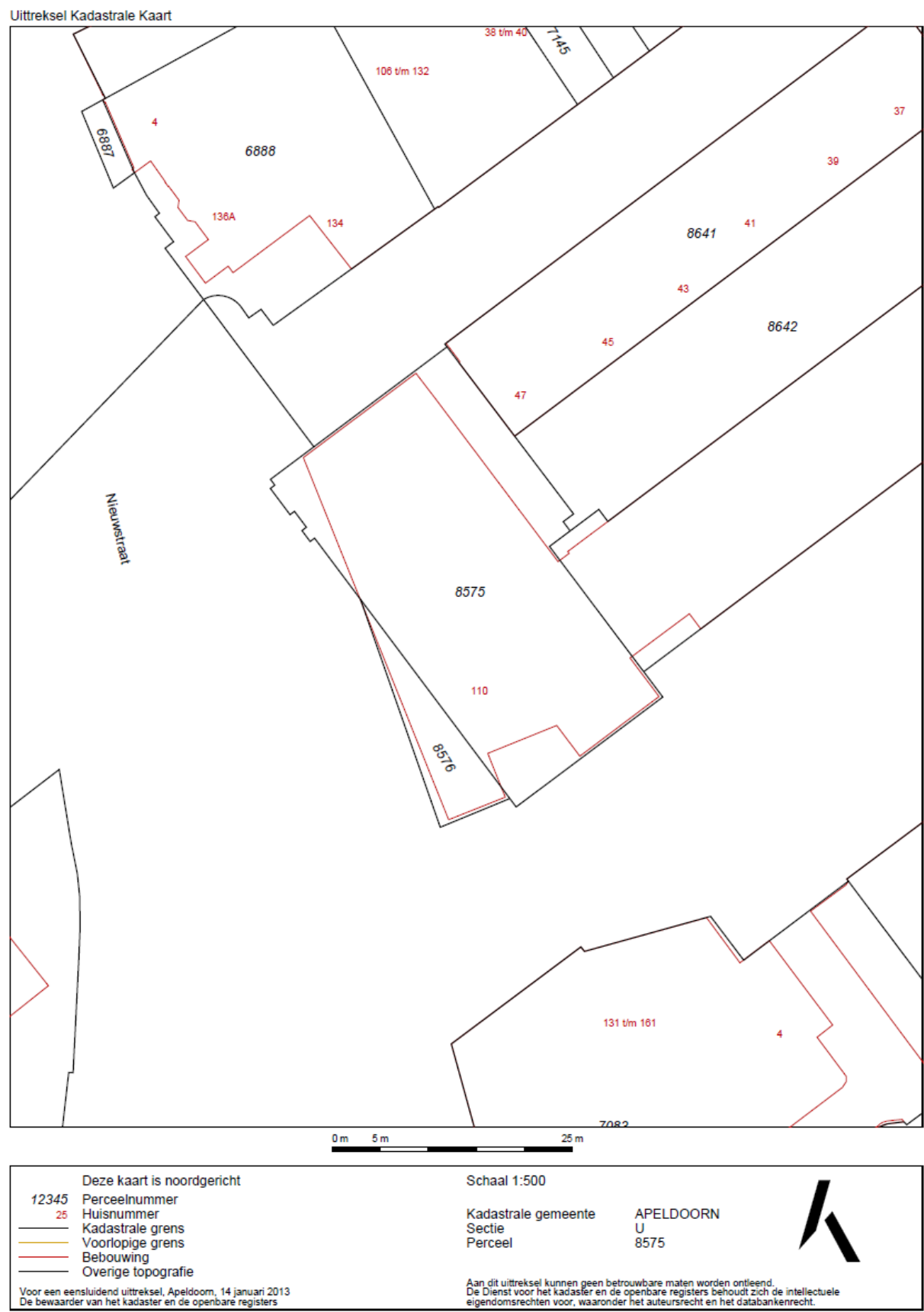


Figure 4 – Example of Dutch cadastral map

6 Summary and conclusions

The work on visualisation is progressing slower than expected. One reason is the delay in the work on the ELF data model. Besides the project assumed that the INSPIRE portrayal is available and just needs to be referenced. This was not the case and the INSPIRE portrayal needed to be implemented as SLD files based on the INSPIRE data specifications by WP2. There seems to be a lack of knowledge in WP2 regarding the set up and use of SLD for the portrayal which slows down the process in the design phase, especially as the WP4 SLD editor is not providing support in creation of SLDs but only allows to change/update existing SLDs.

It is recommended to continue the work on the use cases and to start the design phase for themes with high priority in the cluster areas and regarding D2.8 ELF Cadastre [10].

The document will be updated accordingly.