

INSURE

Innovative Sustainable Remediation



EUROPEAN UNION
European Regional Development Fund



LÄNSSTYRELSEN
ÖSTERGÖTLAND



GIS methods for contaminated areas in 2D and 3D

2019-04-10

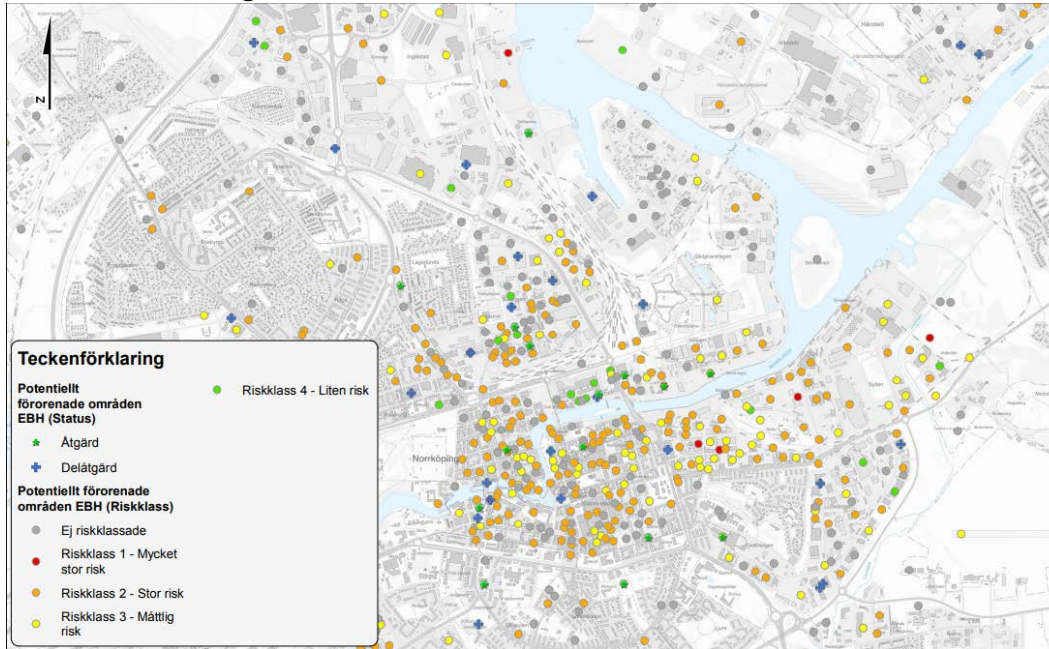
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GIS-layers for contaminated areas



Before this INSURE-project we only had points that visualized the location of contaminated areas.

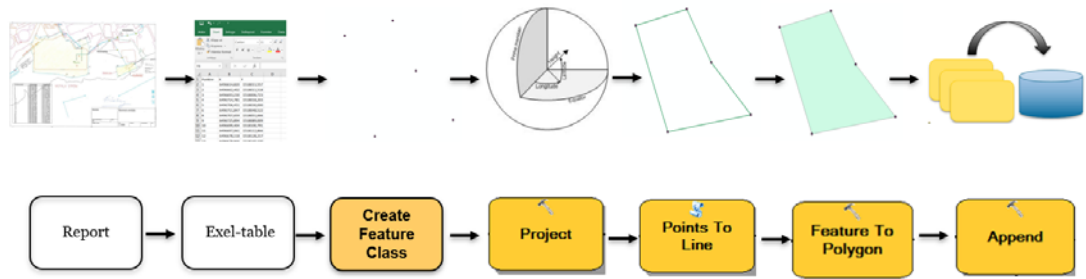
We wanted to create GIS-layers of investigated and remediated areas for a better visualization and follow up on contaminated areas.

We will present the GIS-methods that we have used in creating this GIS-layers in 2D and 3D.



GIS-layers 2D

The main GIS-process



Depending on what format the existing information are in, the method to create GIS-layers vary some.

If the existing information of remediated or investigated areas are as coordinates in a report or table we step thre the hole chain of the GIS-process.

Most of the existing information are in a local coordinate system and we than have to project to Sweref99TM.

Some of the existing information are as polygon shapefiles and we than go the other way and create points from the vertices.



GIS-layers 2D

Remediated Contaminated Areas	
ObjektID	Unique ID for the contaminated area
Id	ID for the remediated area within the contaminated area
NyckelID	Unique combined ID for the remediated area within the contaminated area

Measured points that define remediated areas

ObjektID	Unique ID for the contaminated area
Id	ID for the remediated area within the contaminated area
NyckelID	Unique combined ID for the remediated area within the contaminated area



Investigated Contaminated Areas	
ObjektID	Unique ID for the contaminated area
Id	ID for the investigated area
NyckelID	Unique combined ID for the investigated area within the contaminated area

Investigated points in Contaminated Areas	
ObjektID	Unique ID for the contaminated area
Id	ID for the investigated area
NyckelID	Unique combined ID for the investigated area within the contaminated area



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We created four layers:

- Polygon layer for remediated contaminated areas
- Point layer for measured points that define the remediated areas
- Polygon layer for investigated contaminated areas
- Point layer for investigated points

They all have the ObjectID which is a national ID for contaminated areas.

They all also have a key-ID which is unique for every remediated or investigated area in a contaminated area. It is also a link between polygons and points for every area.

GIS-layers 2D

The screenshot displays a WebGIS interface with a search bar containing 'Åtgärdade'. Below the search bar, there are options for 'Geografisk sökning' (Geographic search) with radio buttons for 'Välj områden i lista', 'Rita område i karta', and 'Importerera område från fil'. A map of Sweden is visible, showing the location of Östergötland. The search results are displayed in a table with columns for 'Länkar' and 'Typ'. The results include 'LstE Förorenade områden, Åtgärdade områden' and 'LstE Potentiellt förorenade och åtgärdade områden - webbkarta'.

	T	M	Länkar	Typ
				LstE Förorenade områden, Åtgärdade områden
				LstE Potentiellt förorenade och åtgärdade områden - webbkarta

We show the remediated contaminated areas for external users in a WebGIS, along with national point-data over contaminated areas.

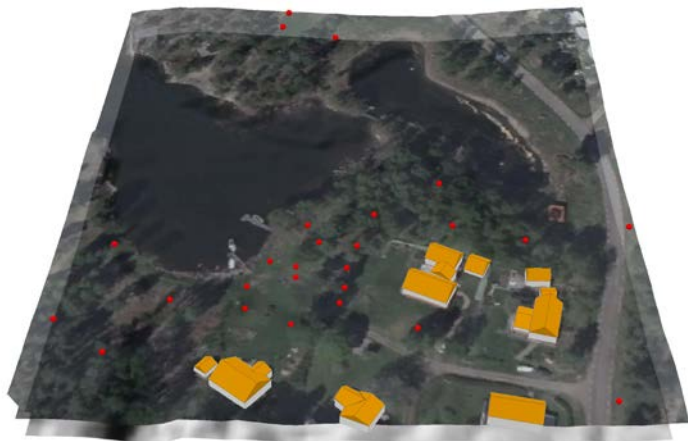
Remediated contaminated areas can be downloaded by external users from our catalog of geodata,

[Geodatakatalogen.se](https://geodatakatalogen.se).



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3D model



Input data

Points representing sample locations from 2D work.
Additional information about sample depth intervals, dioxin and peat/bed rock depth was joined to this layer.

Creation of a scene in ArcGIS PRO

A 3D map is called a scene in ArcGIS Pro. Elevation data is needed to represent a ground surface height. A raster DEM (grid 2+) from Lantmäteriet was used for this. All other data gets a vertical position in relation to this height.

To visualize sample points in 3D the *Extrude*-tool was used. Points can be extruded based on an attribute value, in this case the depth interval at which the sample was taken.

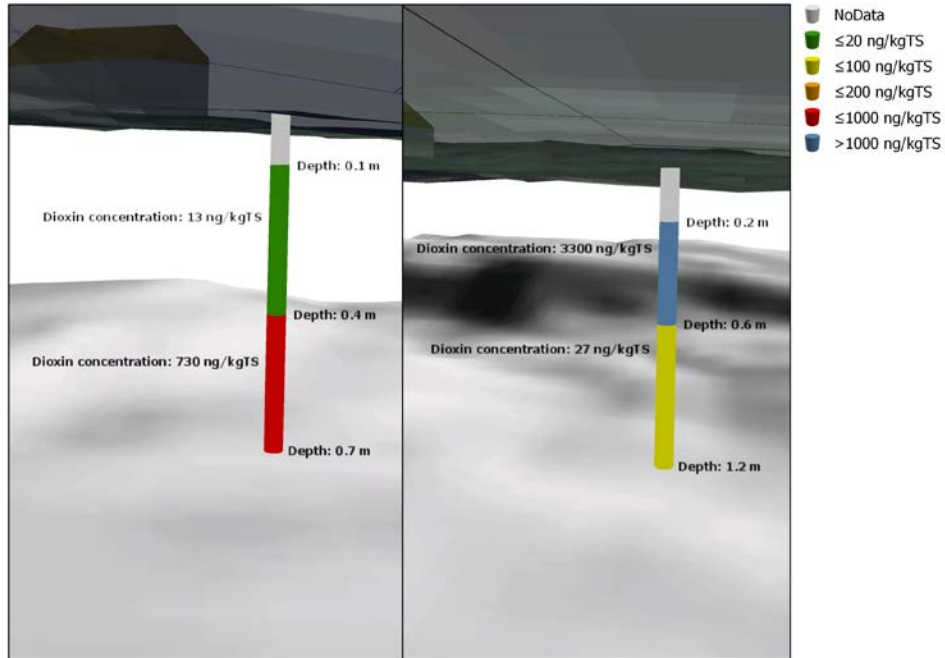
Created layers

Some points contain data for bedrock depth. Based on this a bedrock surface was created with *Inverse Distance Weighted* interpolation.

The same method was used to create a surface representing distribution of peat in the area.



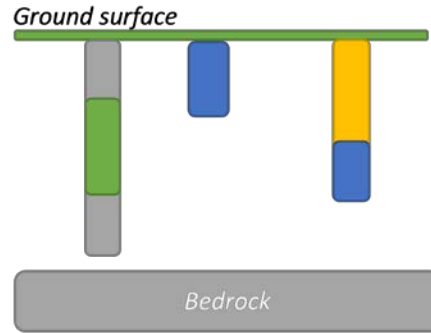
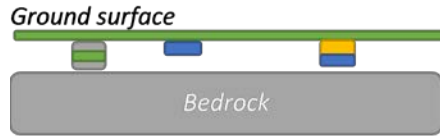
Dioxin concentration displayed in 3D



Dioxin classes and depth intervals



Challenges of displaying data in 3D



- Reality vs visualization
- Exaggeration of vertical distances
- Maintaining relative distance

3D animation of the Brandsnäs test site



Animation showing the created scene of Brandsnäs.

Red underground surface represents mean depth and distribution of peat based on interpolation of point data.

Multi-colored vertical bars represents depth intervals and different concentration of dioxin.

Link:

<https://www.youtube.com/watch?v=fkMKyi-1LKw&feature=youtu.be>



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