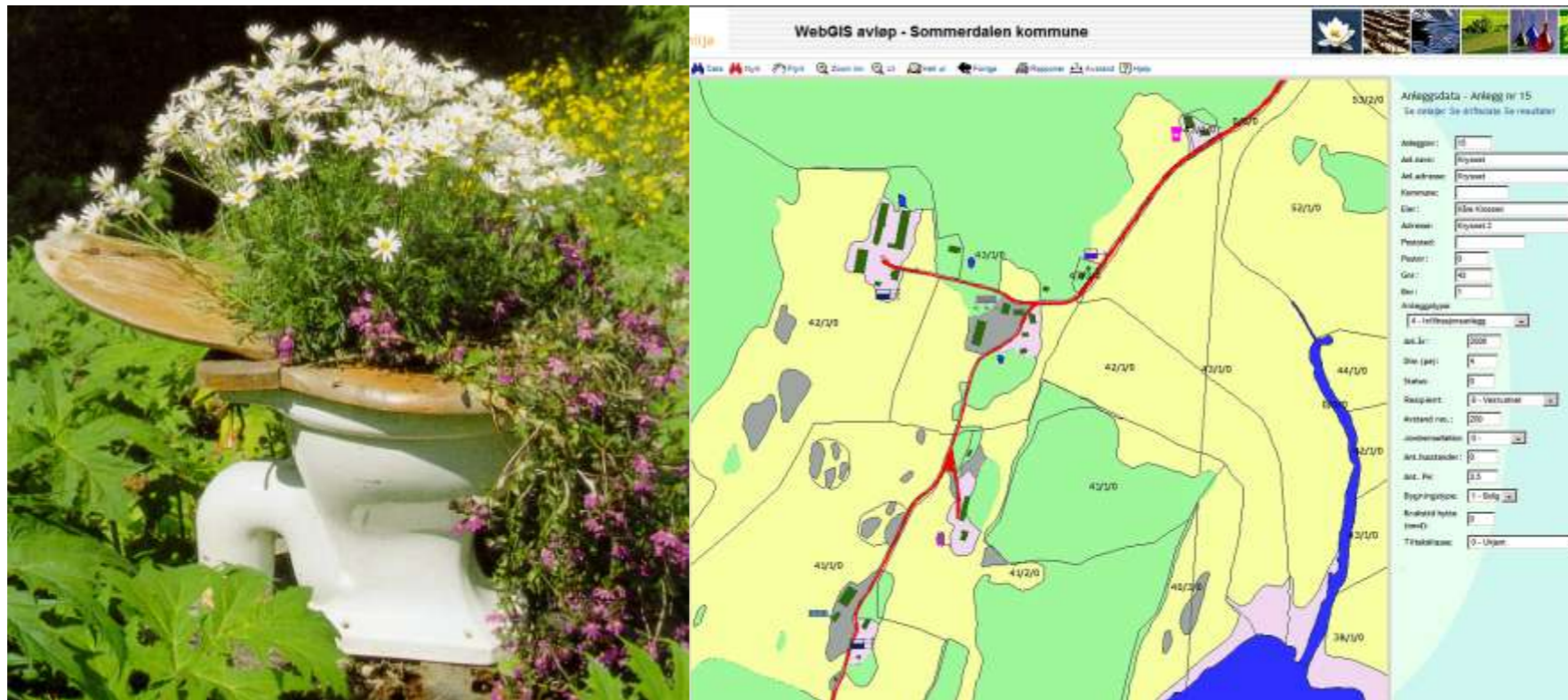


Use of a web-based GIS tool for local wastewater planning in Norway

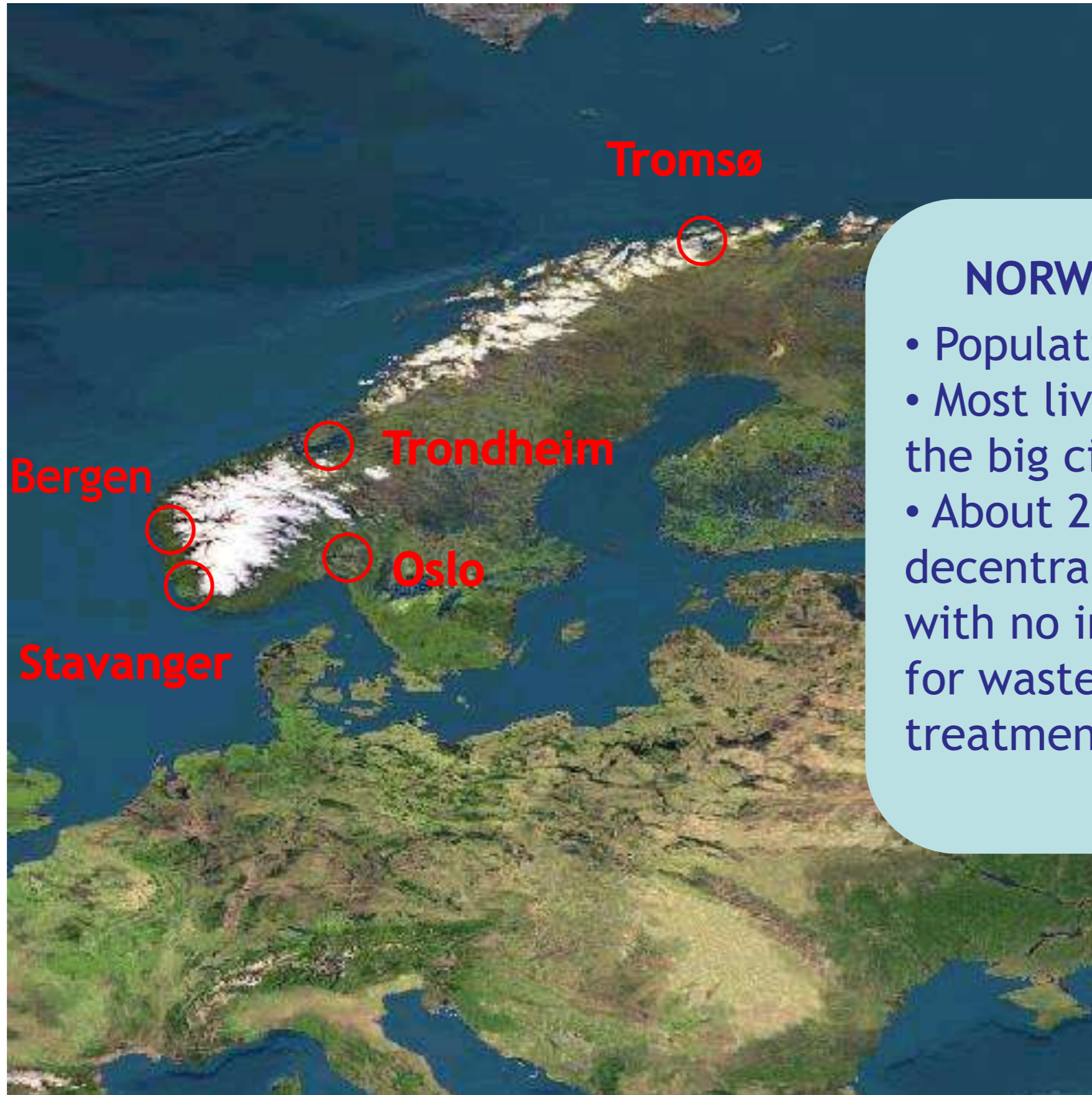
G. Eggen¹, O. S. Hanserud¹, S. Turtumøygard¹, P. D. Jenssen²



Sevilla, 27th April.

¹) Bioforsk Soil and Environment, Norwegian Institute for Agricultural and Environmental Research, Ås

²) The Norwegian University of Environmental Studies and Life Sciences, UMB, Ås



NORWAY:

- Population: 4.9 M
- Most live in or near the big cities
- About 20 % live in decentralized areas with no infrastructure for wastewater treatment

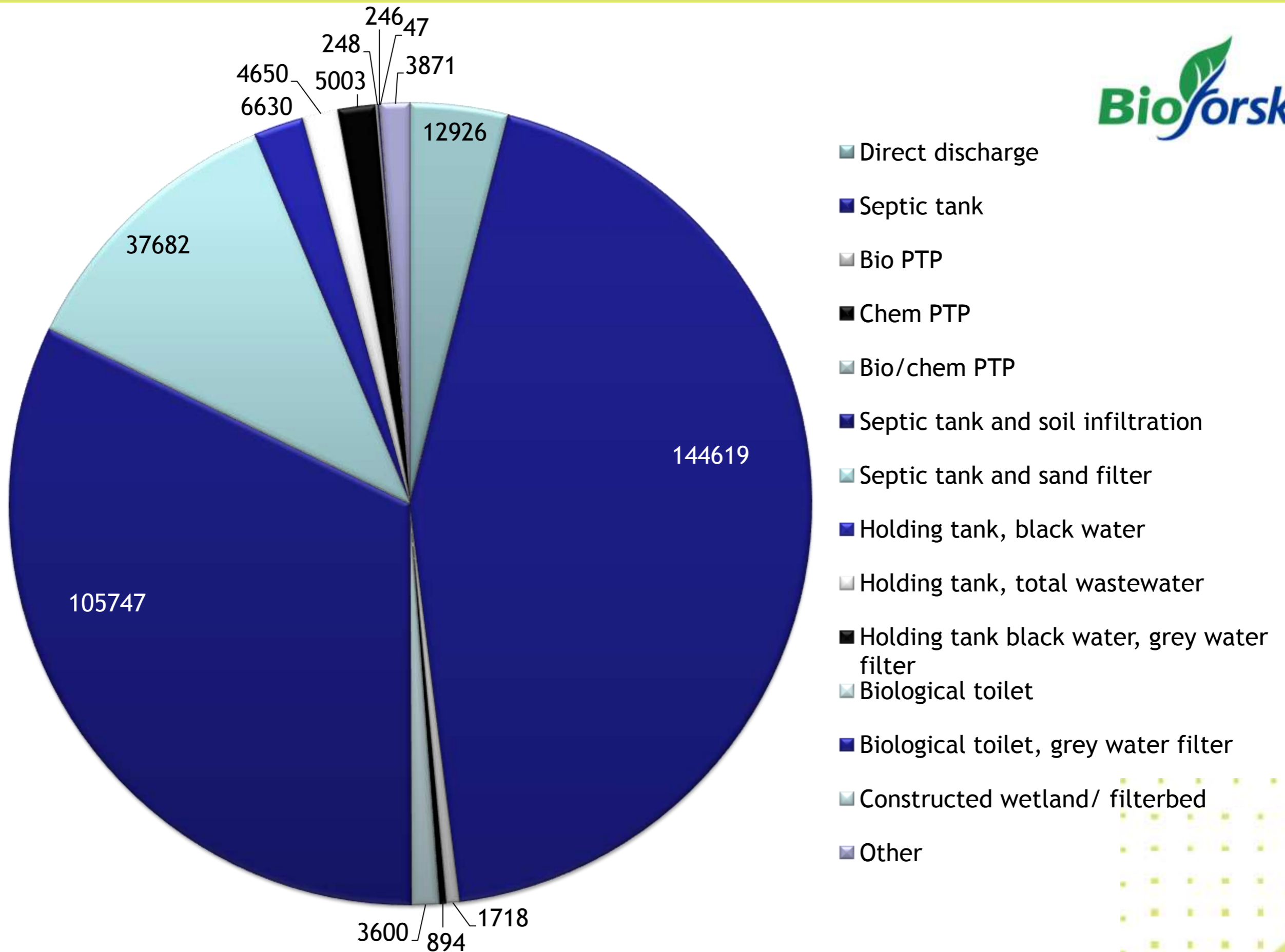




Small wastewater systems in Norway for houses (<50 PE) 2005

Direct discharge	12 962
Septic tanks	144 619
Bio PTP	1 718
Chem PTP	894
Bio/Chem PTP	3 600
Septic tank and soil infiltration	105 747
Septic tank and sand filter	37 682
Holding tank black water	6 630
Biological toilet	248
Holding tank waste water	4 650
Constructed wetland/filter bed	47
Holding tank black water and grey water fil	5 003
Biological toilet and grey water filter	246
Other systems	3 871
<hr/> Total	<hr/> 327 916





Background



Wastewater from imperfect or missing private wastewater treatment plants can cause serious pollution of streams and lakes

Many communities are facing the challenge of restoring and implementing old wastewater plants

Implementation of the water framework directive

What is the contribution to pollution from small systems in a catchment?

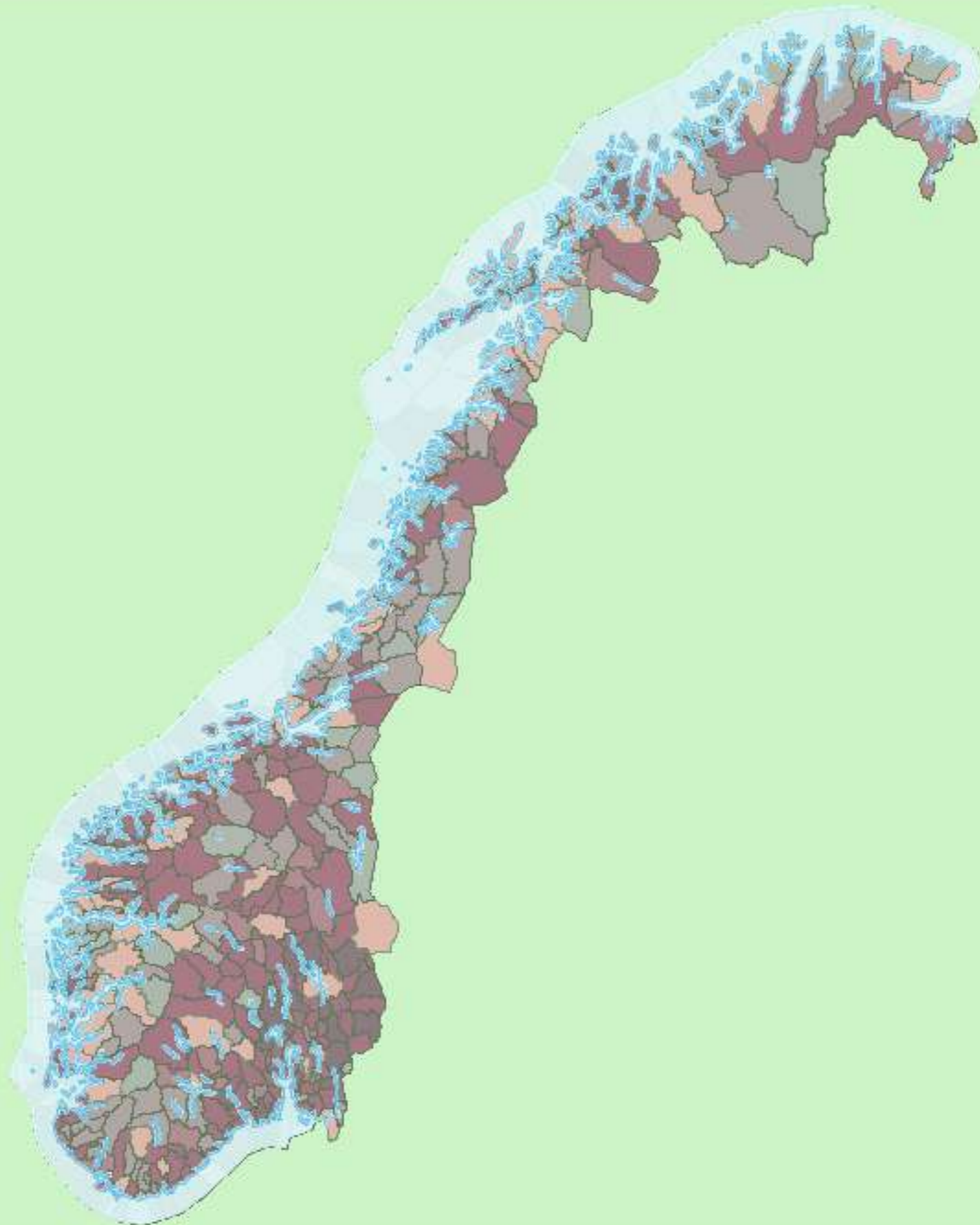
Which measures shall be given priority and where?

Bioforsk has therefore developed the wastewater model **'WebGIS wastewater'** as a helpful tool for this work

WebGIS wastewater is an application for recording, management and monitoring of small wastewater treatment plants in rural areas with geographic location on map

1. Register data on load, type, recipient
2. Calculate treatment effect in each wastewater plant, and pollution load to the recipients
3. Calculate environmental influence
4. Register administrative data
5. Generate reports, tables, statistics, graphic presentations

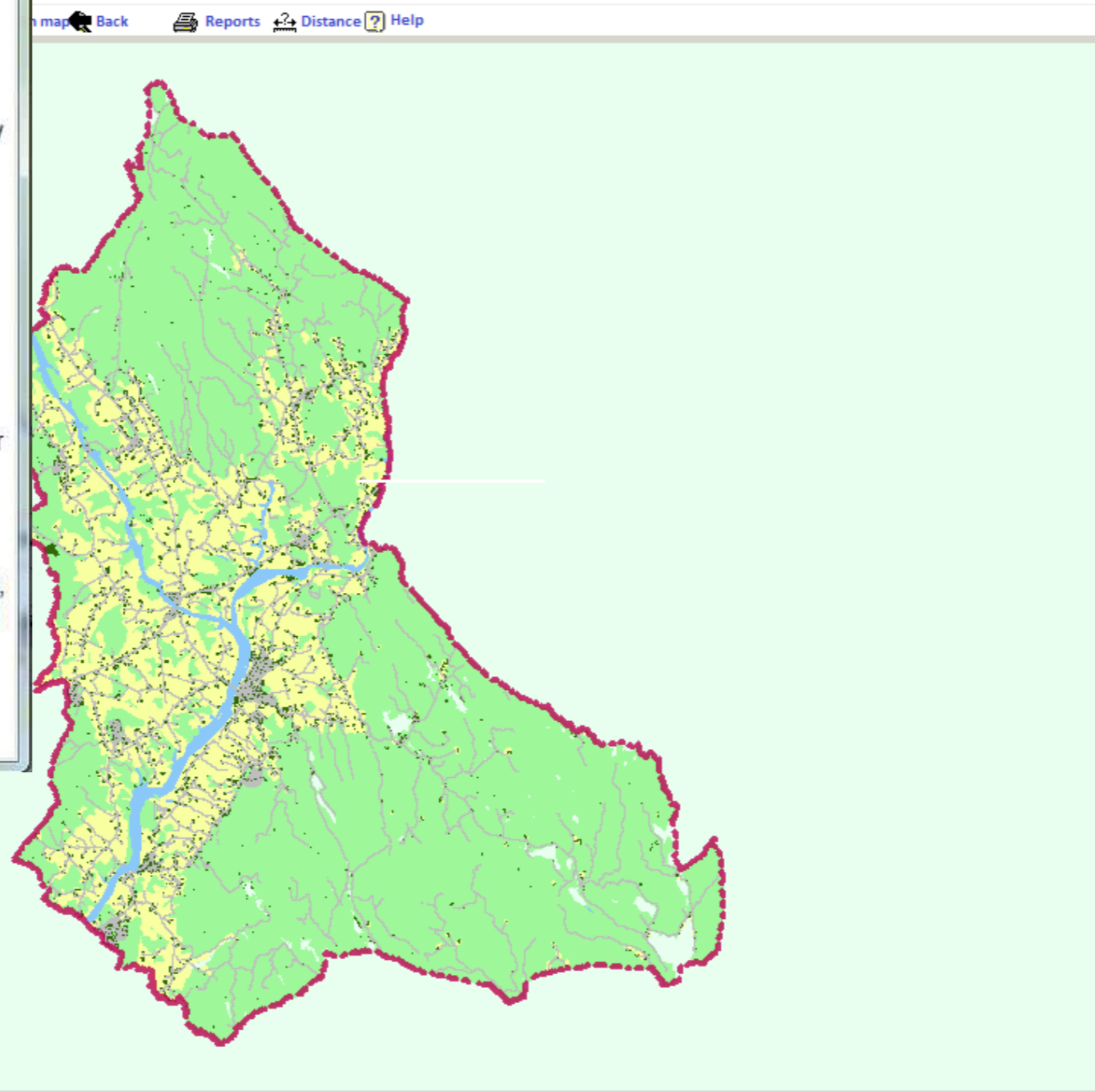






- Properties
- Sewage systems
- Environ index *i*
- Status
- Vegetation cover
- Soil type
- Surface water
- Buildings
- Resipients
- Roads
- Road names
- Catchment area
- Working zones
- Sludge route
- Sludge zones
- Detailed background map

- http://128.39.191.10/w... municipality
- 1 Direct discharge
 - 2 Septic tank, terrain
 - 3 Septic tank, to water body
 - 4 Soil Infiltration system
 - 5 Sandfilter
 - 6 Bio/Chem PTP
 - 7 Bio PTP
 - 8 Chem PTP
 - 9 Holding tank waste water
 - 10 Holding tank, black water
 - 11 Biological toilet
 - 12 Constructed wetland
 - 13 Holding tank black water, greywater to filtration
 - 14 Biological toilet, greywater to filtration
 - 20 Shared system



Bioforsk
Senter for jord og miljø

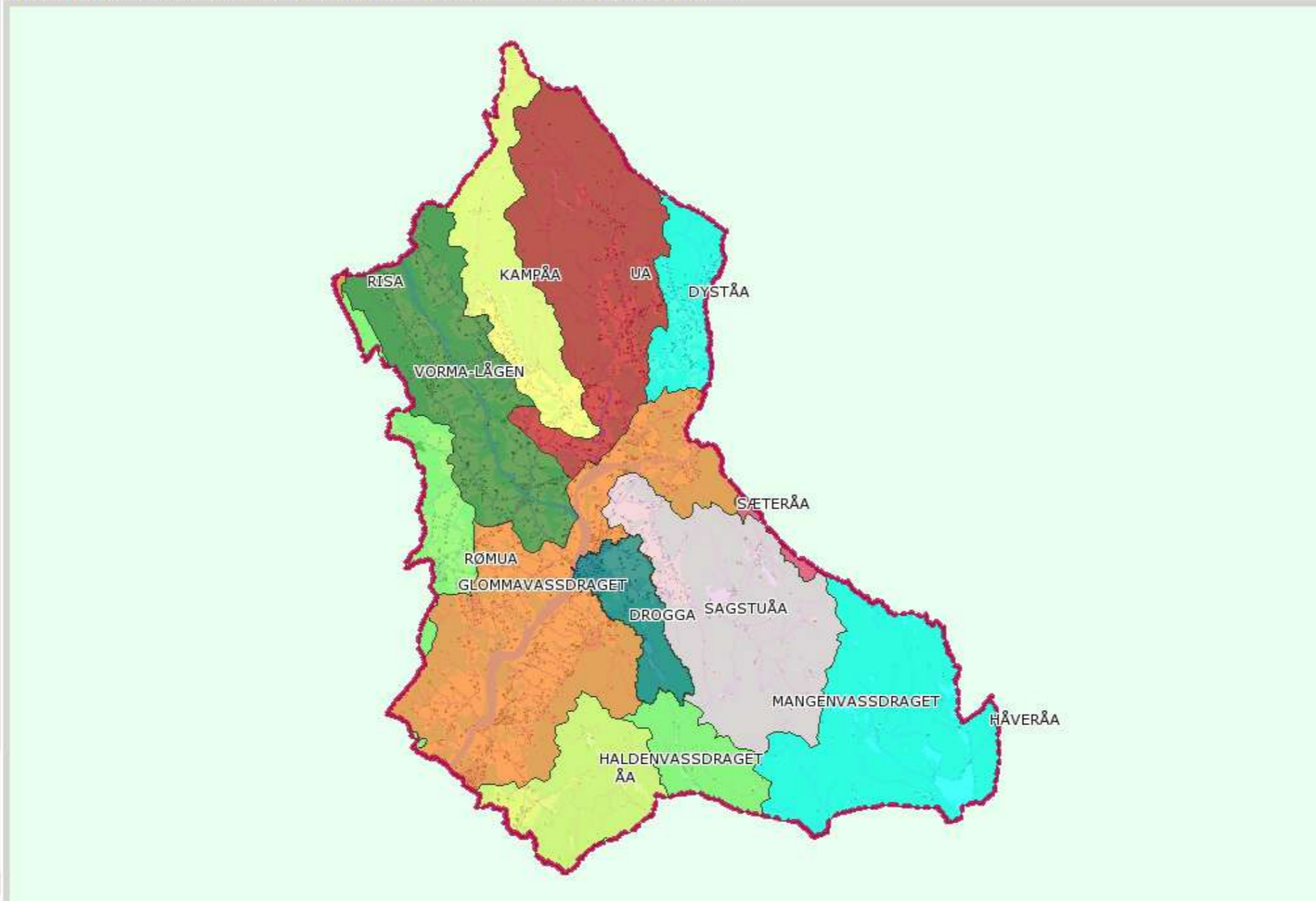
Search system:
Owner
Choose
System number
Gnr
Adress
Search property:
Gnr

WebGIS sewage - Nes municipality

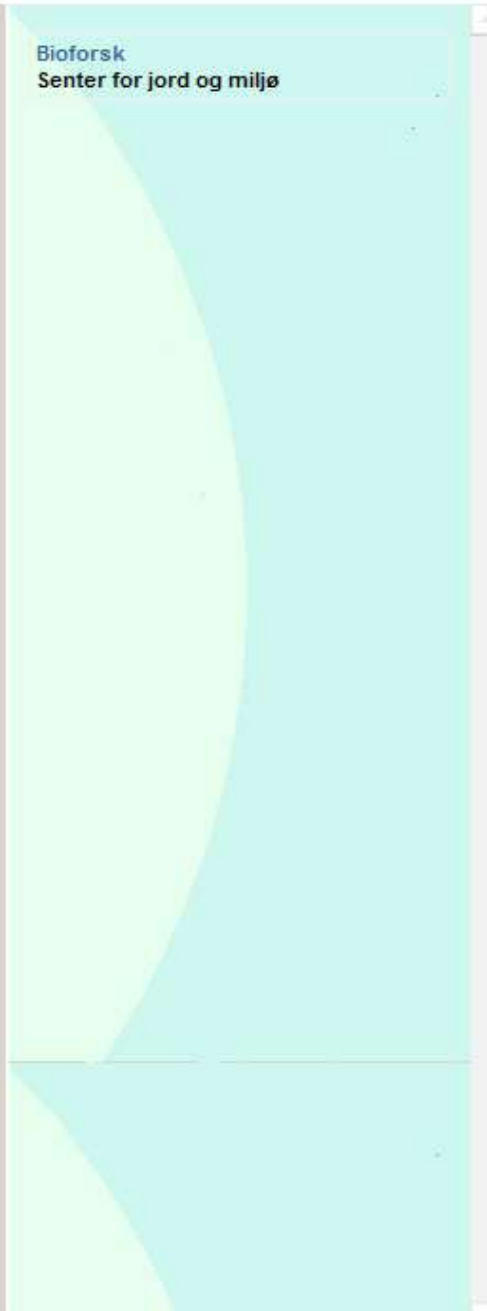


Data New Move Zoom in Zoom Out Main map Back Reports Distance Help

- Properties
 - Sewage systems *i*
 - Environ index *i*
 - Status
 - Vegetation cover
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 - Surface water
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- Search system:
Owner
Choose
System number
Gnr
Adress
Search property:
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Bioforsk
Senter for jord og miljø

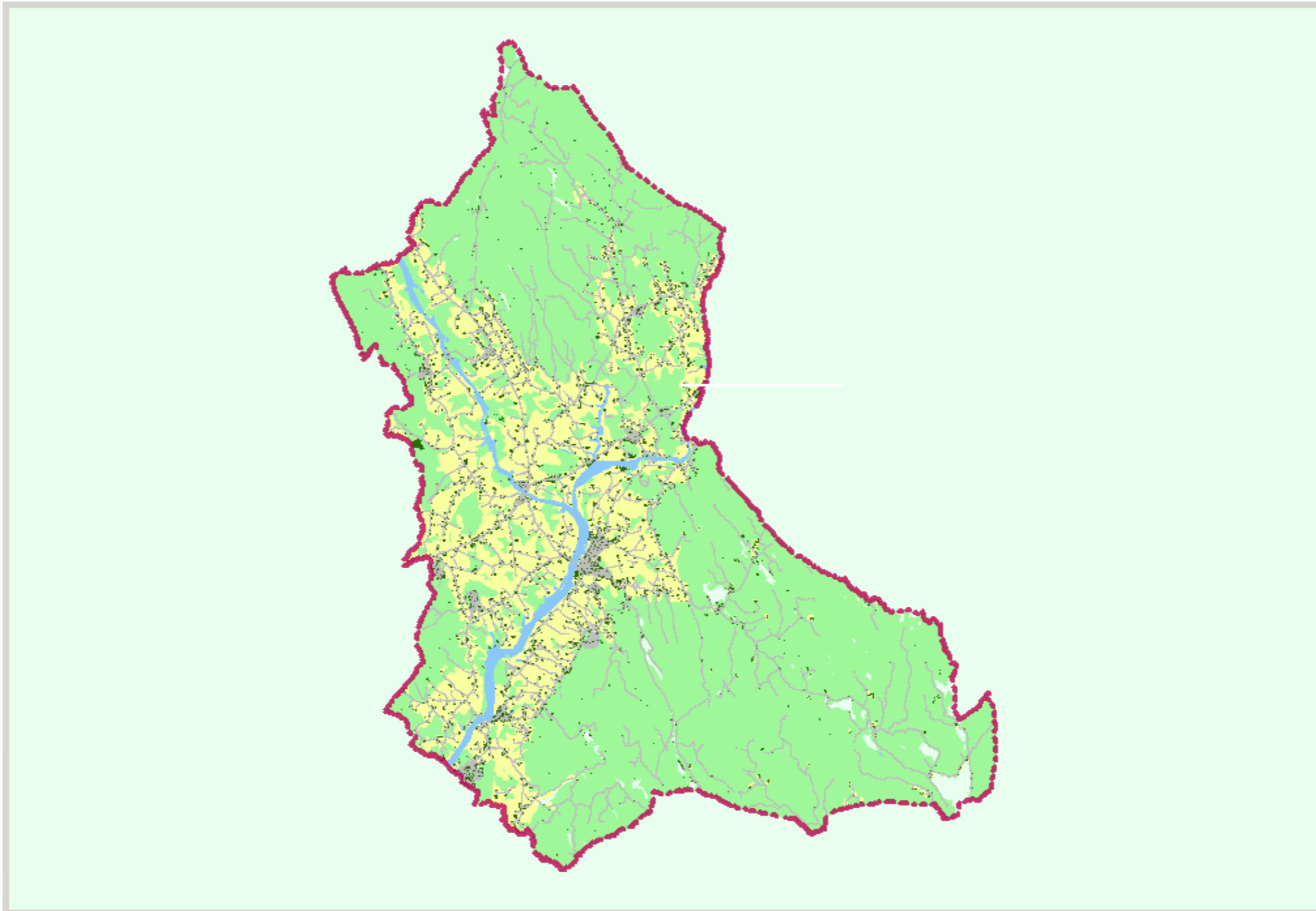


1) Register data

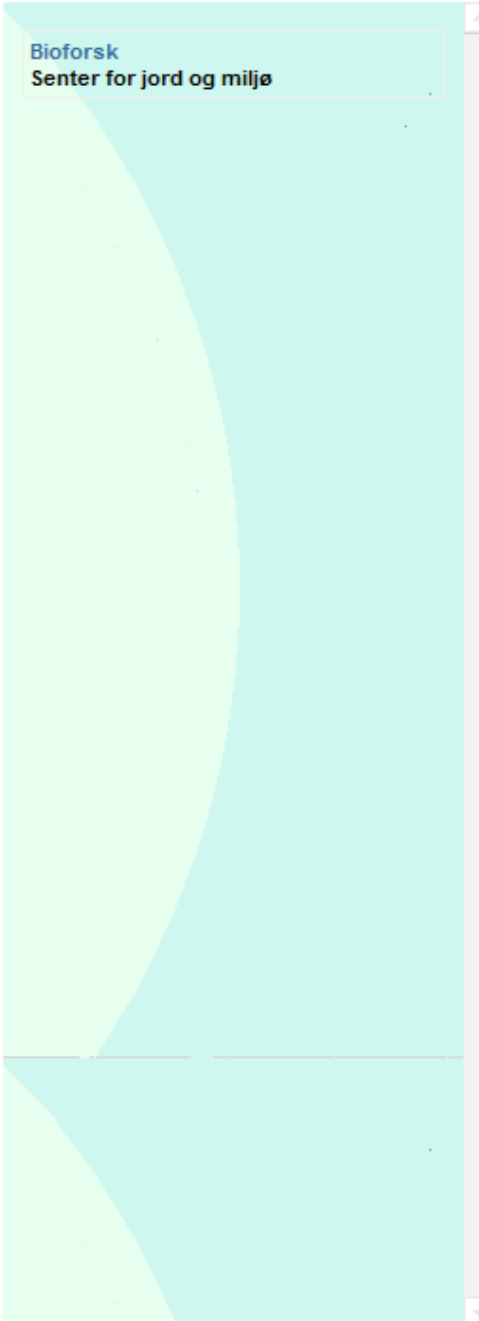


Data New Move Zoom in Zoom Out Main map Back Reports Distance Help

- Properties
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 - Environ index *i*
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 - Vegetation cover
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- Search system:
Owner
Choose
- System number
- Gnr
- Adress
- Search property:
Gnr



Bioforsk
Senter for jord og miljø

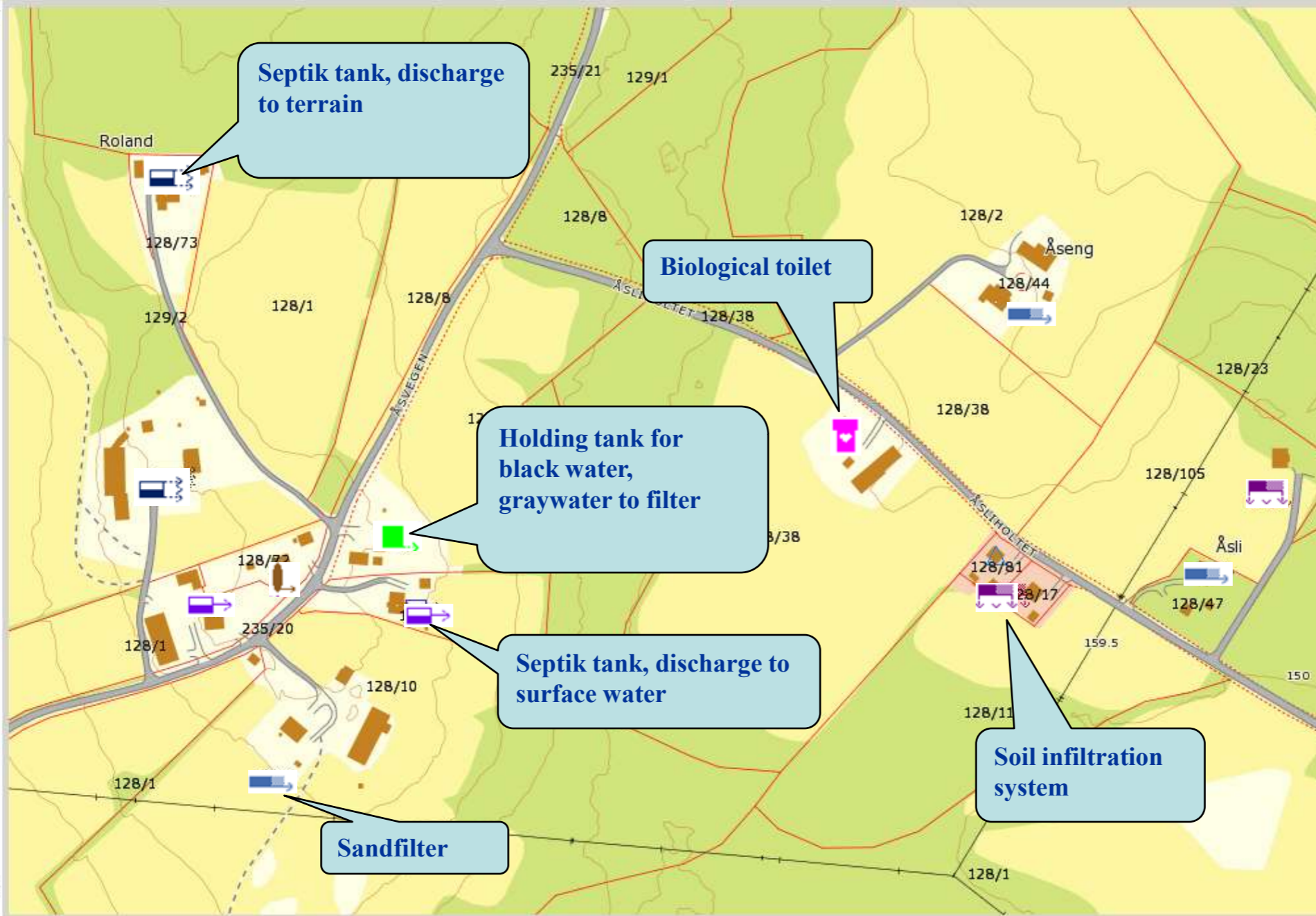


1) Register data



- Properties
- Sewage systems *i*
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- Status
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System number
Gnr
Adress
Search property:
Gnr



Bioforsk
Senter for jord og miljø

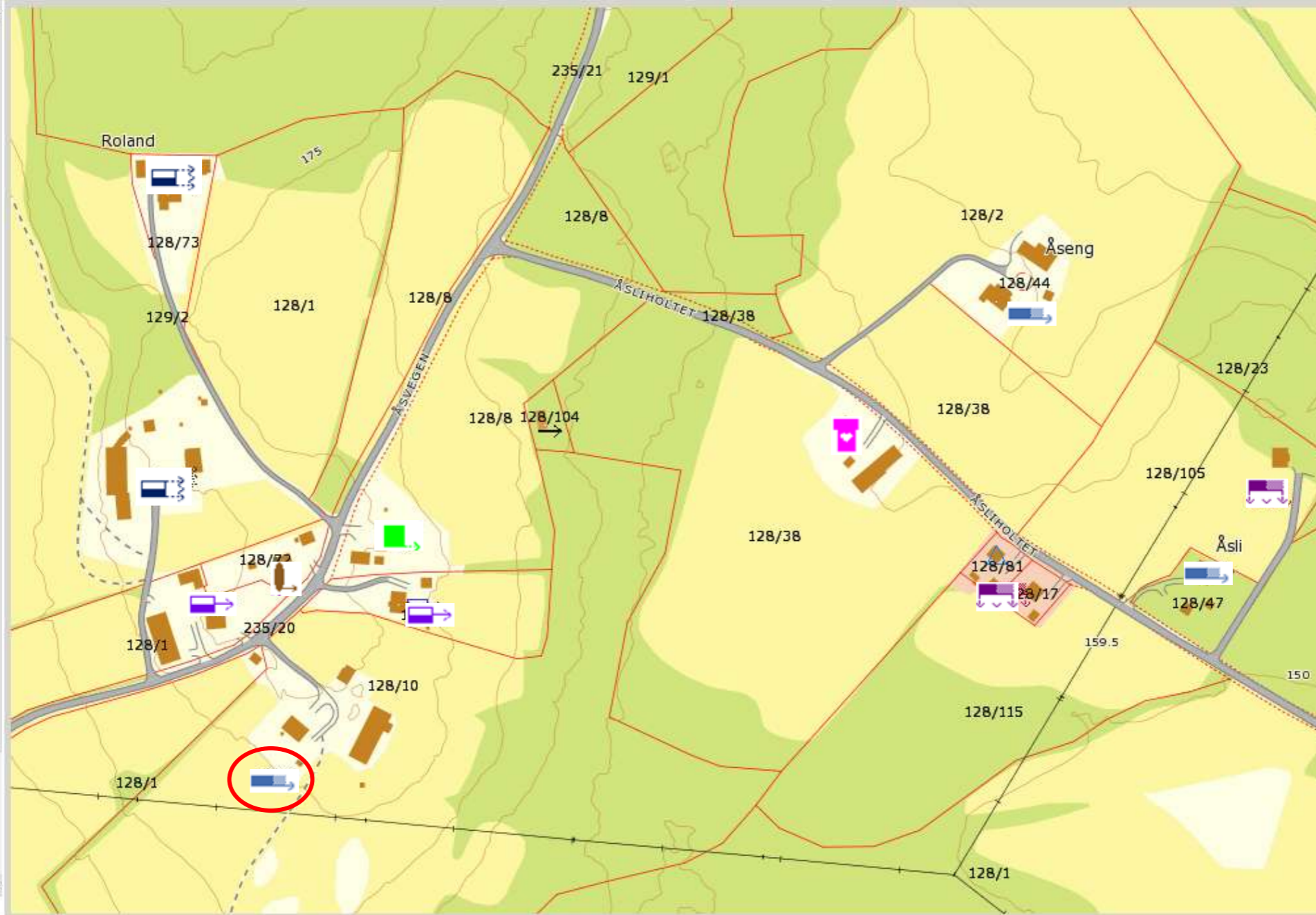
1) Register data



Data New Move Zoom in Out Main map Back Reports Distance Help

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Search system:
Owner
Choose
System number
Gnr
Adress
Search property:
Gnr



Data - Sewage system no 3238

Main info Details Results

Anleggsnr: 3238
Anl.navn: 128.10.0.0
Anl.adresse:
Eier:
Adresse:
Poststed: SKOGBYGDA
Postnr: 2164
Komm.nr: 238
Gnr:
Bnr:
Fnr: 0
Anleggstype:
5 - Sandfilteranlegg
Anl.år: 1985
Dim (pe): 5
Status: 1
Resipient: 1 - DYSTAA
Avstand res.: 298
Jordrensefaktor: 3 - Middels
Ant.husstander: 1
Ant. Pe: 2
Bygningstype: 1 - Bolig
Brukstil hytte (mnd): 12
Tiltaksklasse: 0 - Ukjent

1) Register data

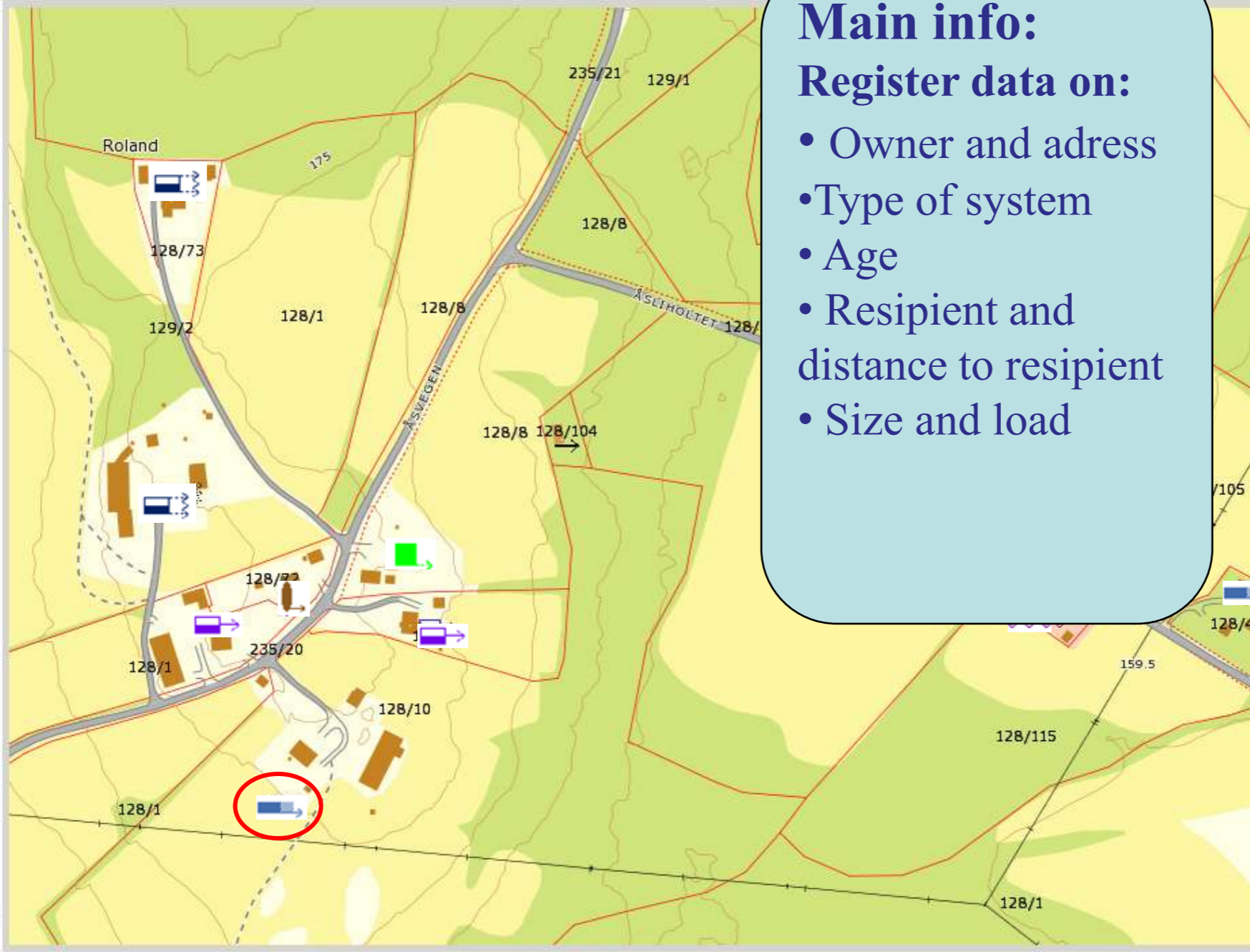
WebGIS sewage - Nes municipality

Data New Move Zoom in Out Main map Back Reports Distance Help

Properties
 Sewage systems *i*
 Environ index *i*
 Status
 Vegetation cover
 Soil type
 Surface water
 Buildings
 Resipients
 Roads
 Road names
 Catchment area
 Working zones
 Sludge route
 Sludge zones
 Detailed background map

Search system:
Owner
Choose
System number
Gnr
Adress

Search property:
Gnr



- Main info:**
Register data on:
- Owner and adress
 - Type of system
 - Age
 - Resipient and distance to resipient
 - Size and load

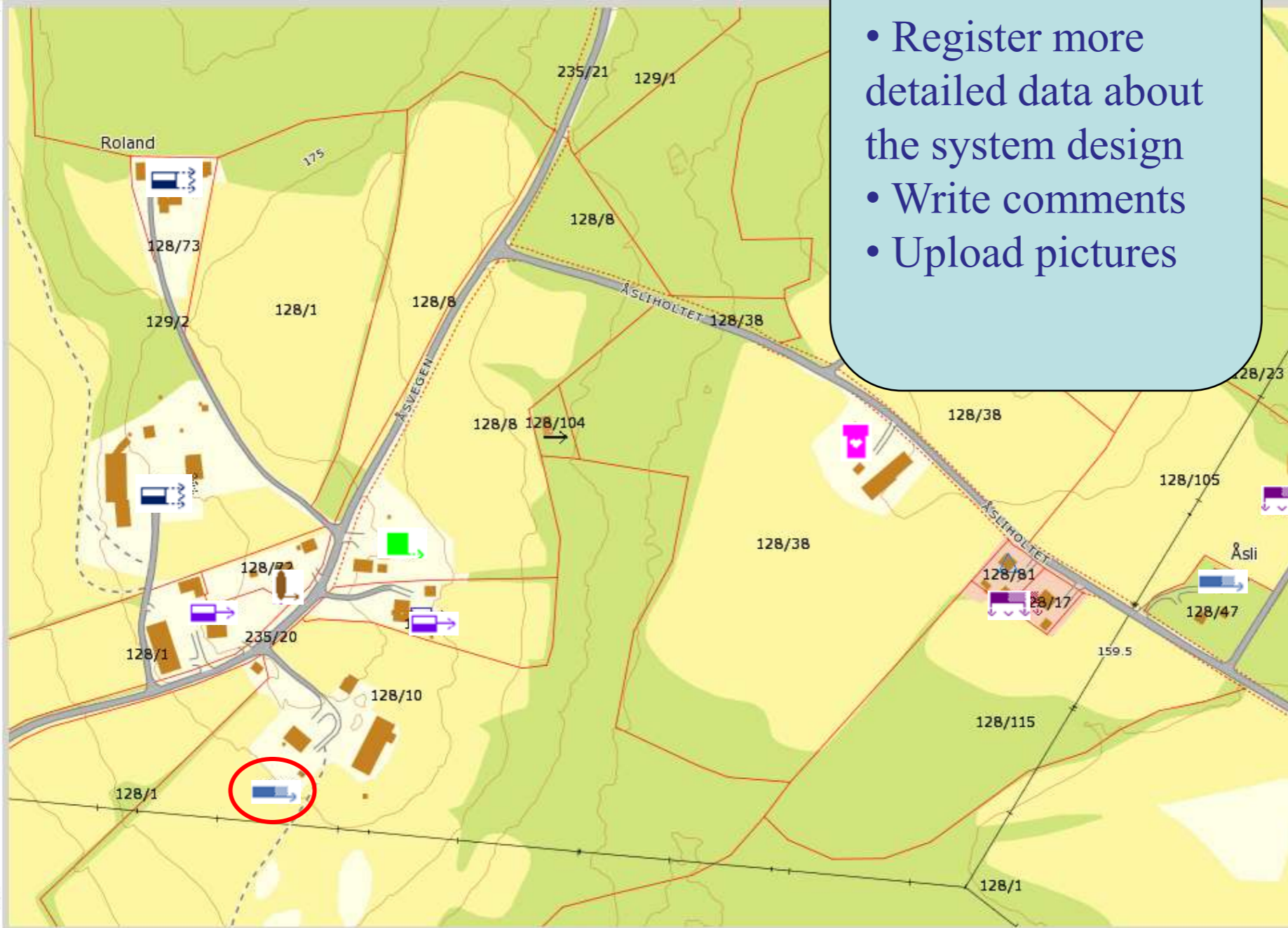
Data - Sewage system no 3238
Main info Details Results

Anleggsnr:	3238
Anl.navn:	128.10.0.0
Anl.adresse:	
Eier:	
Adresse:	
Poststed:	SKOGBYGDA
Postnr:	2164
Komm.nr:	236
Gnr:	
Bnr:	
Fnr:	0
Anleggstype:	5 - Sandfilteranlegg
Anl.år:	1985
Dim (pe):	5
Status:	1
Resipient:	1 - DYSTAA
Avstand res.:	298
Jordresefaktor:	3 - Middels
Ant.husstander:	1
Ant. Pe:	2
Bygningstype:	1 - Bolig
Brukstid hytte (mnd):	12
Tiltaksklasse:	0 - Ukjent

1) Register data

- Properties
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- Environ index *i*
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- Soil type
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Search system:
Owner
Choose
System number
Gnr
Adress
Search property:
Gnr



Details:

- Register more detailed data about the system design
- Write comments
- Upload pictures

Ant. kamre:	<input type="text" value="3"/>
Volum:	<input type="text" value="4"/>
Volum oppsamlingstank:	<input type="text" value="0"/>
Etterpoleringsenhet:	<input type="text"/>
Tømmerute:	<input type="text" value="10-SK"/>
Avstand veg:	<input type="text" value="35"/>
Kvalitet::	<input type="text" value="0"/>
Bakteriefunn:	<input type="text"/>
Antall grøfter:	<input type="text" value="2"/>
Grøftelengde (m):	<input type="text" value="24"/>
Støtbelastar (J/N):	<input type="text" value="N"/>
Vannoppstuving (J/N):	<input type="text" value="N"/>
Vannutslag (J/N):	<input type="text" value="N"/>
Type registrering:	<input type="text" value="F"/>
Registrert av:	<input type="text" value="GE"/>
Registreringsdato:	<input type="text" value="07.07.09"/>
Tiltakssone:	<input type="text" value="2"/>
Merknader:	<input type="text"/>

Skjema: Saksbehandling utslippstillatelse
Skjema: Tømmerapporrt fra slamkjører
Skjema: Inspeksjonsrapport
Last opp bilder
Vis bilder fra anlegget

Flytt anlegg (klikk på ny plassering)

2) Calculate treatment effect in each wastewater plant, and pollution load to the resipients



Based on information about:

- Type of system
- Age
- Size
- Load
- Distance to resipient

The treatment effect of each wastewater plant is calculated based on empirical formulas

Treatment effect is estimated as removal of:

- Phosphorus (P)
 - Nitrogen (N)
 - Organic matter (TOC)
- } - Treatment in each wastewater plant
- Load to resipients



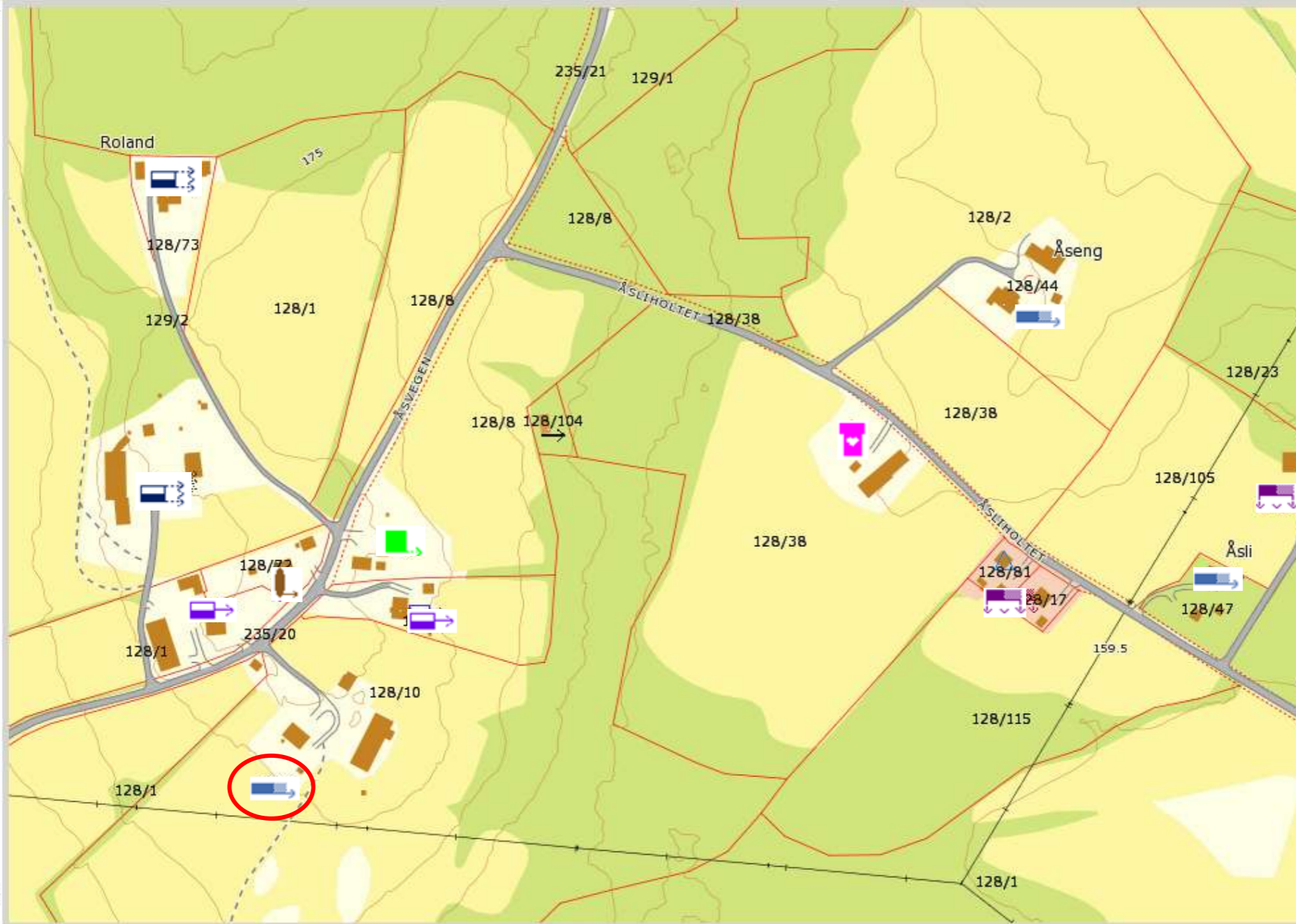
2) Calculate treatment effect in each wastewater plant, and pollution load to the recipients



Data New Move Zoom in Out Main map Back Reports Distance Help

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Search system:
Owner
Choose
System number
Gnr
Adress
Search property:
Gnr



Data - Sewage system no 3238

Main info Details **Results**

Rensegrad TOC (%):	70
Rensegrad P (%):	5
Rensegrad N (%):	20
Vannmengde:	360
Miljøindeks:	62
Inn P (kg/år):	1.2
Inn N (kg/år):	8.8
Inn TOC (kg/år):	19.7
Ut P (kg/år):	1.2
Ut N (kg/år):	7
Ut TOC (kg/år):	5.9
P til resipient (kg/år):	1.2
N til resipient (kg/år):	7
TOC til resipient (kg/år):	5.9
Total rensegrad P (%):	5
Total rensegrad N (%):	20
Total rensegrad TOC (%):	70

2) Calculate treatment effect in each wastewater plant, and pollution load to the recipients



Type name and nr.	Functions for cleaning performance in % for P
1 Direct outlet	0
2 Mud pit with outlet to terrain	$5 - 1 \times (\text{no. PE.} - \text{dimension})$
3 - Mud pit with outlet to water body	$5 - 1 \times (\text{no. PE.} - \text{dimension})$
4 Infiltration	$75 - 5 \times (\text{no. PE.} - \text{dimension}) - 10 \times (\text{year} - (\text{building year} + 10))$
5 Sand filter plant	$75 - 5 \times (\text{no. PE.} - \text{dimension}) - 10 \times (\text{year} - (\text{building year} + 5))$
6 Mini purification plant class 1 (bio/chem)	$75 - 10 \times (\text{no. PE.} - \text{dimension})$
7 Mini purification plant class 2 (biol.)	$60 - 10 \times (\text{no. PE.} - \text{dimension})$
8 - Mini purification plant class 3 (chem.)	$70 - 10 \times (\text{no. PE.} - \text{dimension})$
9 Water tight tank	100
10 Water tight tank for black water, grey water to terrain	75
11 - Biological toilet grey water to terrain	75

Examples of formulas in WEBGIS model

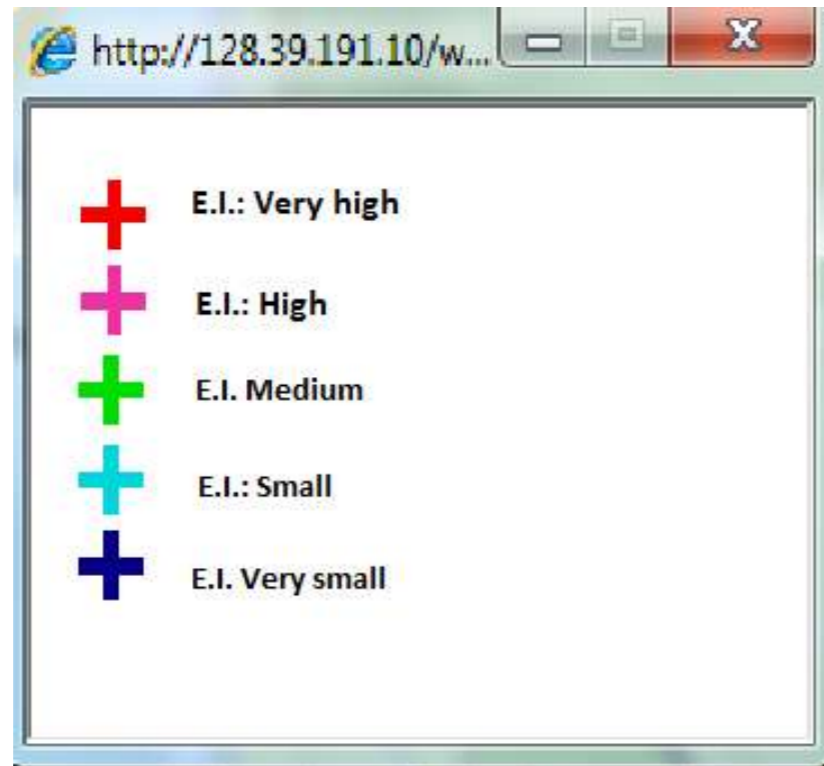
Purification performance is calculated for different types of wastewater plants.



3) Calculate environmental influence



Environmental impact index (E.I.)



3) Calculate environmental influence



Calculating environmental impact index

- Environmental impact index is a combined evaluation of different effects of the outlet from the plant to the recipient. This is calculated as:
 - $(\text{Out-P} * 16 + \text{Out-N} * 3 + \text{out-TOC}) * \text{Person equivalents}$



4) Register administrative data



Sjekkliste saksbehandling utslippstillatelse

Om søknadsskjema: →

Om avløpsforskriften: →

Lokale forskrifter: →

Om avlop.no: →

Om bygging: →

Eiendom og ansvarlig søker

Eiendom:

Eier:

Ansvarlig søker:

Eiendommer tilknyttet:

Eiendommens adresse:

Eiers adresse:

Søkers adresse:

Planstatus:

Postnr:

Anl nr:

Arkivnr:

Anleggets status:

Status for saksbehandlingen:

Søknaden gjelder

Omfang (husstander):

Antall personekvivalenter:

Bygningstype:

Utslippsted

Type utslippssted:

Utslippsdyp under laveste vannstand:

Dokumentasjon

Godkjent fagkyndig:

Dok minirensanlegg:

Dok rensegrad minirensanlegg:

Dok rensegrad andre renseløsninger:

Godkjent kart:

Nabovarsel:

Navn fagkyndig:

Avstand vei:

Anleggstype og rensegrad

Anleggstype:

Anleggsbeskrivelse:

Rensegrad:

Interesser som kan bli berørt:

Andre vilkår for utslipp:

Drift og oppfølging

Serviceavtale:

Dato utslippstillatelse:

Dato ferdigattest:

Tømmerute:

Gebyr saksbehandling meldt inn:

Navn på servicefirma:

Dato byggemelding:

Dato frist ferdigstillelse:

Gebyrkode_slam:

5) Generate reports, tables, statistics, graphic presentations



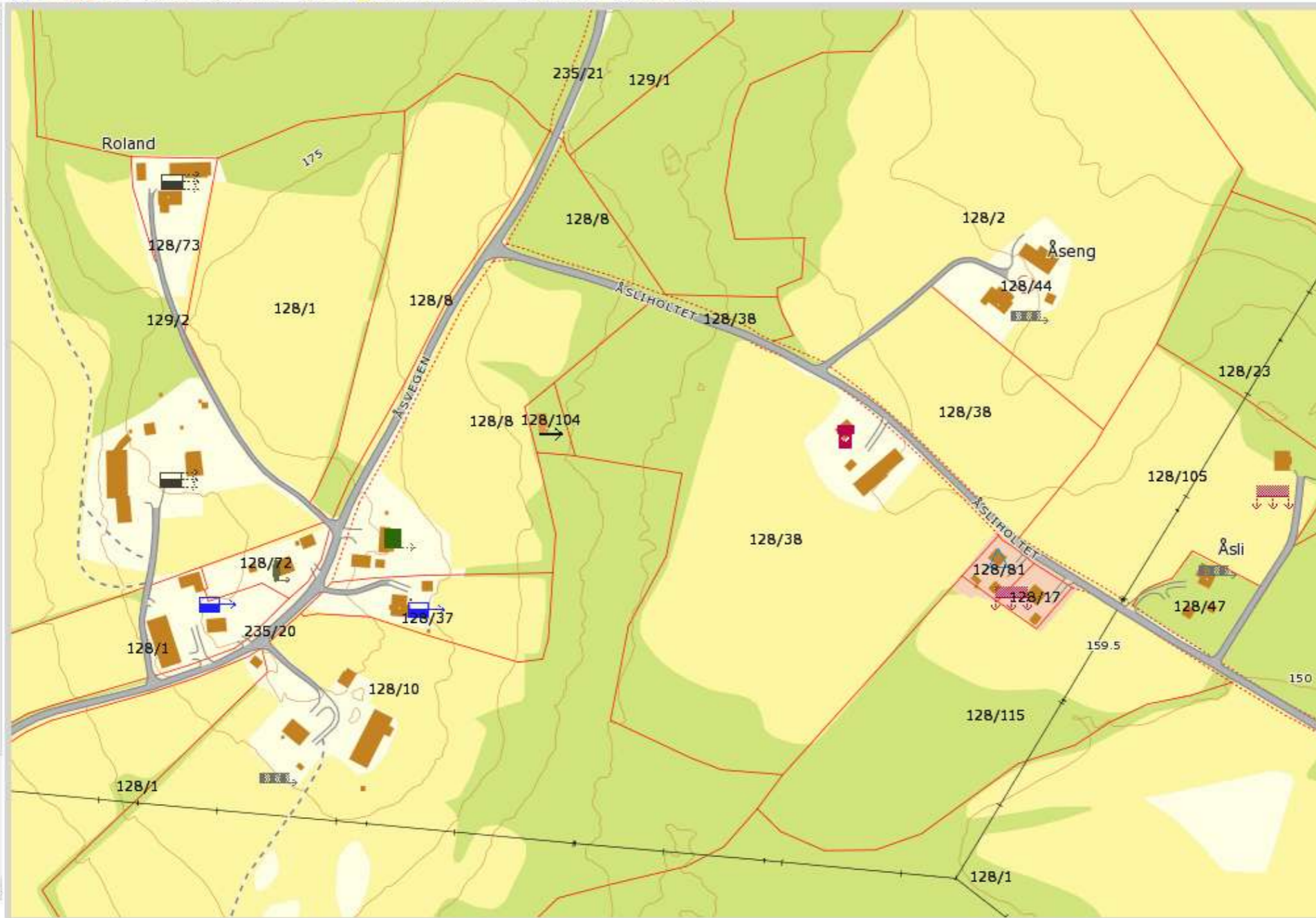
WebGIS sewage - Nes municipality



Data New Move Zoom in Out Main map Back Reports Distance Help

- Properties
- Sewage systems *i*
- Environ index *i*
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- Detailed background map

Search system:
Owner
Choose
System number
Gnr
Adress
Search property:
Gnr



Rapporter

- Rapport 1. Sum utslipp pr resipient
- Rapport 2. Diagram sum utslipp pr resipient
- Rapport 3. Diagram sum utslipp av P pr resipient
- Rapport 4. Anlegg pr resipient
- Rapport 5. Renseanlegg i kommunen
- Rapport 6. Anlegg pr type
- Rapport 7. Hytteanlegg
- Rapport 8. Boliganlegg
- Rapport 9. Andel godkjente anlegg pr. nedbørfelt
- Rapport 10. Egendefinert rapport
- Rapport 11. Antall anlegg pr miljøindeksklasse
- Rapport 12. Anleggstyper pr miljøindeksklasse
- Rapport 13. Grafisk miljøindeks
- Rapport 14. Fellesanlegg

Rapporter saksbehandling

- Rapport 100. Tiltaksklasser pr. nedbørfelt
- Rapport 101. Anlegg pr tiltaksklasse
- Rapport 102. Tømmeliste for slamkjører
- Rapport 103. Slamtømming, statusoversikt
- Rapport 104. Kontrolliste pr anleggstype
- Rapport 105. Anlegg pr saksbehandlings-status
- Rapport 106. Inspiserte anlegg

Innrapportering til sentrale myndigheter

- Rapport 200. KOSTRA-rapport Skjema 26A
- Rapport 201. Årsrapportering til Fylkesmannen

Kommunens spesialrapporter

- Rapport 500. Sum utslipp pr resipient, nivå 1
- Rapport 501. Anlegg pr resipient, nivå 1
- Rapport 502. Slettede anlegg pr tiltaksklasse
- Rapport 504. Brev pr resipient
- Rapport 505. Utskrift av slamtømmekart 1:5000
- Rapport 506. Merknader fra kartlegging
- Rapport 507. Neste tilsynsår

5) Generate reports, tables, statistics, graphic presentations

Spredd avløp fra fast bosetting, Nes

Anleggstype	Antall anlegg	Antall personer
Annen løsning	59	36
Urenset(1)	7	24
Slamavskiller	1613	3962
Infiltrasjonsanlegg	124	312
Sandfilteranlegg	352	955
Kjemisk/biologisk renseanlegg	224	675
Biologisk renseanlegg	13	38
Kjemisk renseanlegg		
Tett tank (for alt avløpsvann)		
Tett tank for svartvann		
Biologisk toalett		
Konstruert våtmark		
Tett tank for svartvann, grå		
Biologisk toalett, gråvannsf		
Sum		

Spredd avløp fra fritidsboliger, Nes

Anleggstype	Antall anlegg	Antall personer
Annen løsning	27	135
Urenset(1)	6	14

E.I. Category	Count
Very high	280
High	93
Medium	84
Small	30
Very small	17

- + E.I.: Very high
- + E.I.: High
- + E.I. Medium
- + E.I.: Small
- + E.I. Very small

Report 507. Neste tilsynsår

Conclusion

- **WebGIS Wastewater:**

- Tool for the authorities to register and manage on site wastewater treatment plants
- Estimation of treatment effect of each plant and discharge to recipient
- Evaluate the environmental impact, tool for prioritizing measures
- Watershed approach, comparison between different municipalities
- For authorities “WebGIS waste water” is a tool for making priority plans

50 Norwegian municipalities use this tool so far



Start WEBGIS



http://webgis.no/webgisavlop_sommerdalen/avloplogin.htm

Username (Brukernavn): "jbv"

Password (Passord): "avlop"

Or english version:

http://bioweb04.bioforsk.no/Wastewater_GIS



WEBGIS sewage - technical details



Based on map system Map Server (open source Univ. of Minnesota)

Models developed at Bioforsk

The application is developed for MS Internet Explorer, but can also be run by other browsers

The system is running at the Bioforsk web server

There is no need for installation of software on the users computers

Broadband Internet connection is recommended

php programming language

MS Access database

ESRI shape map files

JP Graph (open source)

GD generate Diagram on the fly





Thank you for your attention!!!

gro.eggen@bioforsk.no