



# Release notes Groundwater Atlas v4.3.2

Wageningen Environmental Research, December 19, 2023

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## 1. Introduction

A new Groundwater Atlas version 4.3.2 (GUI date December 14, 2023) is available at [www.pesticidemodels.eu/groundwateratlas](http://www.pesticidemodels.eu/groundwateratlas). In this release, known bugs in the Groundwater Atlas User Interface (release date January 26, 2023) were repaired, and known issues regarding the Groundwater Atlas output options were solved.

## 2. Bugs and issues solved

### 2.1 90 percentile (P90)

The algorithm for calculating percentile values from the selection of measurement values (concentrations) in the Groundwater Atlas is similar to the algorithm implemented in



GeoPEARL 3.3.3. In these notes, an example is included for a selection with only a few measurement values. See Annex A for more details.

In the Groundwater Atlas option Descriptive statistics (Statistics per category of measurements), at the bottom row the P50 instead of P90 was printed. The P90 concentration is shown if the selection contains more than one measurement value, and the P90 concentration is less than the maximum value. If one of these conditions is not met, a note is printed beneath the table: 'Not enough data' ([User Manual](#); Sections 3.8.1 and 3.10.4). These criteria were implemented correctly in the Groundwater Atlas option 'Statistics of measurement results per year'. However, these criteria were not implemented correctly in the Groundwater Atlas option 'Descriptive statistics (Statistics per category of measurements)' and in the Groundwater Atlas 'Report for registration'. These bugs are solved.

## 2.2 Sampling site type

The Groundwater Atlas makes a distinction between the sampling site types Physical well and Spring. Switching between both types caused unstable performance of the User Interface and the Groundwater Atlas Export function. This bug is solved. The sampling site type is now added explicitly to the selection criteria in the left hand part of the Groundwater Atlas start screen. The scope of a session in the Groundwater Atlas can be either physical wells or springs. The default is physical wells. Note that the #MeasurementResults column in the Select a substance dialogue shows the total number of measurement results obtained at samples from both sampling site types. In addition, some issues regarding consistency in the source data that can be printed to the Groundwater Atlas Export options were solved.

## 2.3 Report for registration

The Groundwater Atlas Report for registration contains sections with: 1) substance attributes and user settings; 2) descriptive statistics for the measurement results from the target layer (the selection) and from the layers above and below this layer (the context); and 3) average land-use statistics for the sampling points from the regional authorities; with measurement values, and those with measurement results. The descriptive statistics section in the Report for registration were not based on the full selection. This bug is solved. See Annex B for the update Figure 27 in WOt Technical Report 231; and Annex C for the update Figure 13 in WEnR Report 3217.

## 2.4 Substance list

According to Ctgb registration databases, substance N,N-dimethylsulfamide is a metabolite rather than an active ingredient. The metabolite has a relationship with two parent substances with measurement results available (dichlofluanid and tolylfluanid). The attributes for these substances in the Groundwater Atlas substance list version 2 were modified accordingly.



## 2.5 #MeasurementResults column at the Substance dialogue

When GrondwaterAtlas\_3.3.2.fdb is used, the #MeasurementResults column at the Select a substance dialogue shows the number of measurement results according to the previous database GrondwaterAtlas\_3.2.2.fdb. This bug does not affect any output. It is solved in the current installation which includes GrondwaterAtlas\_4.3.2.fdb (this database version has similar content compared to GrondwaterAtlas\_3.3.2.fdb).

## 3. Other notes

### 3.1 Period selection

The proposed selection of the start and end of the registration period is based on the date values in the Groundwater Atlas substance table, whereas the period selection for other Groundwater Atlas output options is based on the start year and end year. The selection delimited by the start year and end year may contain some additional measurement results when compared to the selection delimited by the start date and end date for the Report for registration. Such a difference may occur when the selection includes measurement results from samples taken between January 1<sup>st</sup> and the start date of the registration period, and/or from samples between the expiration date and December 31<sup>st</sup>.

### 3.2 Groundwater Atlas version numbering

Separate version numbers are used for the user interface, database, and substance list. The database has a single number that is increased with each modification in the monitoring data. The substance list has a single version number that is increased with each substance list update (e.g. added substances, modified substance attributes). Note that the substance list is part of the Groundwater Atlas database.

At the About screen the user can see the GUI version number (x.y.z) which includes the interface version number (x), database monitoring data version number (y) and substance list version number (z). The internal database version number is the rank number.

### 3.3 Compatibility

Old Groundwater Atlas database versions with similar structure are compatible with the Groundwater Atlas version 4.3.2. This applies to the database versions GrondwaterAtlas\_3.3.2.fdb and GrondwaterAtlas\_3.2.2.fdb. However, note that when opening GrondwaterAtlas\_3.2.2.fdb, you will **not** have the Brabant Water data that were included from version GrondwaterAtlas\_3.3.2.fdb onwards.



## Annex A: Details P90 calculation

The example in this Annex illustrates the algorithm implemented in the Groundwater Atlas for calculating the 90-percentile concentration.

User selections: Substance glyphosate, Period 1980-2021, Sampling site type Physical wells, Screen depths 10-15 m below soil surface, all Monitoring networks/Owners.

In the Groundwater Atlas option Descriptive Statistics (Statistics per category of measurements), it can be seen that the selection includes 7 measurement values  $\leq$  Norm and 5 measurement values  $>$  Norm.

Descriptive statistics

File

# Descriptive statistics

glyphosate

Norm: 0.1 µg/L

	< LOD	< LOQ	< LOR	≤ Norm	> Norm
Number of measurement results per	445	70	0	7	5
Minimum value per category (µg/L)	0.01	0.03		0.03	0.14
Maximum value per category (µg/L)	0.5	0.13		0.09	5.48
P50/median per category (µg/L)				0.07	0.32
P90 per category (µg/L)				*	*

\* = Not enough data

**Selection criteria:**

Period:

1980 t/m 2021

Screen depth (m below soil surface):


10.00 t/m 15.00

Monitoring networks:

ALL (All)

Sampling site type:

Physical wells



Groundwater Atlas for pesticides in The Netherlands, Version 4.3.2 (GUI date 11-12-2023)

The measurement values and the result of the algorithm for calculating the percentile values are shown in the figures below. For the category  $\leq$  Norm, the calculated P90 equals the maximum measurement value (Figure A-1). There is not enough data and so the P90 is not shown. Also for the category  $>$  Norm, the calculated P90 equals the maximum measurement value (Figure A-2). There is not enough data and the P90 is not shown.



nr	wf	conc_ug/L
1	1	0.03
2	1	0.05
3	1	0.06
4	1	0.07
5	1	0.08
6	1	0.09
7	1	0.09

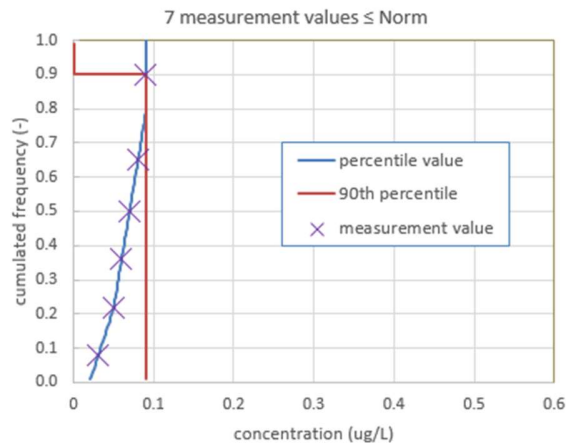


Figure A-1: Input (observation nr., fixed weighting factor 1.0, measurement value in  $\mu\text{g/L}$ ) and calculated percentile values (blue line) for 7 measurement values in the category  $\leq$  Norm.

nr	wf	conc_ug/L
1	1	0.14
2	1	0.32
3	1	0.32
4	1	1.73
5	1	5.48

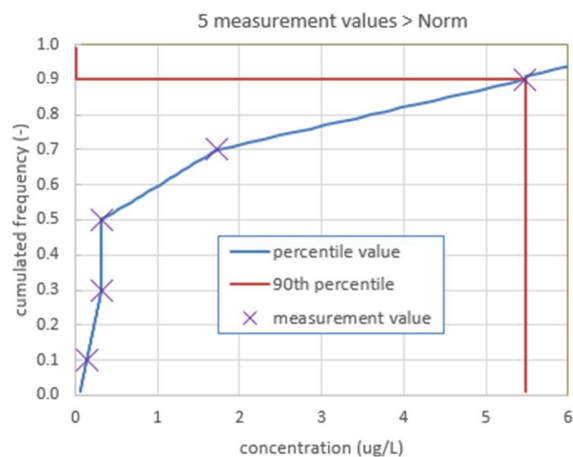
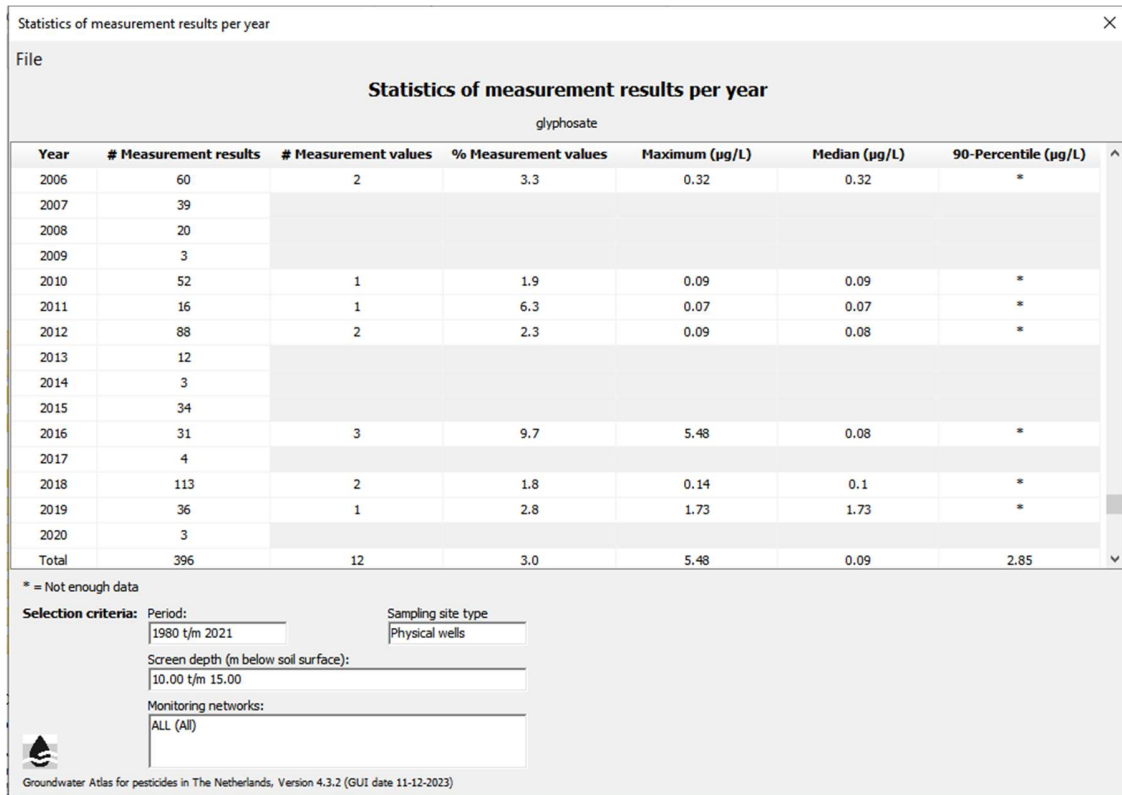


Figure A-2: Input (observation nr., fixed weighting factor 1.0, measurement value in  $\mu\text{g/L}$ ) and calculated percentile values (blue line) for 5 measurement values in the category  $>$  Norm.

In the Groundwater Atlas option Temporal Distribution (Statistics of measurement results per year), the calculated 90-percentile (P90) for all 12 measurement values in the selection is shown at the bottom row.



The measurement values and the result of the algorithm for calculating the percentile values are shown in Figure A-3. The P90 (2.85 µg/L) is less than the maximum value.

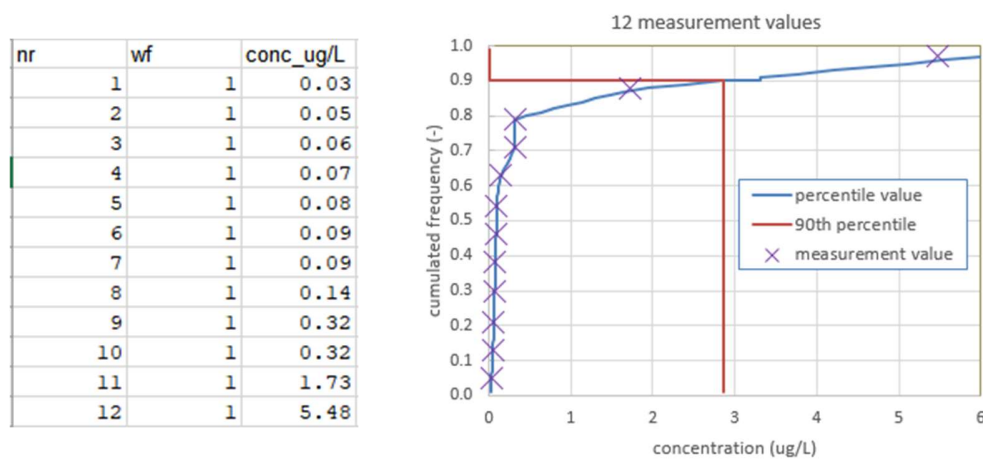


Figure A-3: Input (observation nr., fixed weighting factor 1.0, measurement value in µg/L) and calculated percentile values (blue line) for the measurement values in the selection ( $n = 12$ ).



The Groundwater Atlas Report for registration contains the P90 of the measurement values per owner group and for both groups together (Figure A-4). For the regional authorities, P90 = 3.23 µg/L (n = 11). For the water companies there is not enough data (n = 1). For both owner groups together, P90 = 2.85 µg/L (n = 12).

Report for registration				
Substance	glyphosate (CASNr 1071-83-6)			
This substance has 1 metabolite				
Metabolite 1	AMPA (CASNr 1066-51-9)			
This substance has no parents				
Date of first authorization	27-6-1980			
Expiration date	1-2-2023			
Productgroup	Herbicide			
Selection of period (as proposed for registration)				
Begin date	27-6-1980			
End date	1-2-2023			
Depth of target layer (m-ss., as proposed for registration)				
Top	10			
Bottom	15			
Descriptive statistics				
Target layer	regional authorities	water companies	both groups	
Number of measurement values	11	1	12	
Number of measurement results	456	71	527	
Number of measurement values / results (%)	2.4	1.4	2.3	
Maximum measurement value (ug/L)	5.48	0.07	5.48	
P90 of measurement values (ug/L)	3.23	*	2.85	
Layer above the target layer				
Number of measurement values/number of measurement results	114/2750 (4.1%)			
Layer below the target layer				
Number of measurement values/number of measurement results	76/2133 (3.6%)			
Land-use in sampling points from the regional authorities				
Sampling points with land-use data	AGRI	URBA	NATU	SWAT
Land-use for the sampling points with measurement values (% n=7)	74	5	19	1
Land-use for the sampling points with measurement results (% n=125)	68	14	14	3
Agricultural land-use (AGRI) break down	PAST	MAIZ	ARCR	GRHO
Land-use for the sampling points with measurement values (% n=7)	22	1	44	0
Land-use for the sampling points with measurement results (% n=125)	37	7	21	1
Land-use explanation:				
n=number of sampling points				
AGRI=agriculture				
URBA=non-agricultural land-use in urban area				
NATU=non-agricultural land-use and fallow in rural area				
SWAT=surface water				
PAST=pasture				
MAIZ=maize				
ARCR=arable crops				
GRHO=greenhouses				
ORCH=fruit orchard				
FBLB=flower bulbs				
Groundwater Atlas for pesticides in The Netherlands, Version 4.3.2 (GUI date 11-12-2023)				

Figure A-4: Report for registration with a summary of measurement results in the period and the target layer as proposed for registration (period Jun 27, 1980 to Feb 1, 2023; target layer between 10 and 15 m below soil surface; Groundwater Atlas version 4.3.2 (GUI date Dec 11, 2023)).





## Annex B: Figure 27, WOt Technical Report 231

Figure 27 in WOt Technical Report 231 is updated. The statistics in the Report for registration are changed; with the bugs solved and the update from Groundwater Atlas version 3.2.2 to 4.3.2.

<b>Report for registration</b>							
Substance	MCPA (CASNr 94-74-6)						
This substance has 1 metabolite							
Metabolite 1	4-chloro-2-methylphenol (CASNr 1570-64-5)						
This substance has no parents							
Date of first authorization	1-12-1969						
Expiration date	1-6-2025						
Productgroup	Herbicide						
Selection of period (as proposed for registration)							
Begin date	1-12-1969						
End date	13-12-2023						
Depth of target layer (m-ss., as proposed for registration)							
Top	10						
Bottom	15						
<b>Descriptive statistics</b>							
Target layer	regional authorities	water companies	both groups				
Number of measurement values	5	2	7				
Number of measurement results	478	348	826				
Number of measurement values / results (%)	1	0.6	0.8				
Maximum measurement value (ug/L)	1.52	0.15	1.52				
P90 of measurement values (ug/L)	*	*	1.25				
Layer above the target layer							
Number of measurement values/number of measurement results	16/3596 (0.4%)						
Layer below the target layer							
Number of measurement values/number of measurement results	16/4249 (0.4%)						
<b>Land-use in sampling points from the regional authorities</b>							
Sampling points with land-use data	AGRI	URBA	NATU	SWAT			
Land-use for the sampling points with measurement values (% , n=2)	95	1	3	0			
Land-use for the sampling points with measurement results (% , n=126)	69	14	14	3			
Agricultural land-use (AGRI) break down							
Land-use for the sampling points with measurement values (% , n=2)	PAST	MAIZ	ARCR	GRHO	ORCH	FBLB	
Land-use for the sampling points with measurement results (% , n=126)	48	2	46	0	0	0	
	37	7	21	1	2	2	
Land-use explanation:							
n=number of sampling points							
AGRI=agriculture							
URBA=non-agricultural land-use in urban area							
NATU=non-agricultural land-use and fallow in rural area							
SWAT=surface water							
PAST=pasture							
MAIZ=maize							
ARCR=arable crops							
GRHO=greenhouses							
ORCH=fruit orchard							
FBLB=flower bulbs							
Groundwater Atlas for pesticides in The Netherlands, Version 4.3.2 (GUI date 11-12-2023)							

*Erratum and update Figure 27 in WOt Technical Report 231: Report for registration with a summary of measurement results in the period and the target layer as proposed for registration (period Dec 1, 1969 to Nov 22, 2023; target layer between 10 and 15 m below soil surface; Groundwater Atlas version 3.3.2 (GUI date Dec 11, 2023)).*

The selection includes 478 instead of 366 measurement results from the regional authorities, and 348 instead of 249 measurement results from the drinking water companies (update Groundwater Atlas version 4.3.2). The P90 measurement values for the regional authorities (n = 5) and for the water companies (n = 2) are not shown (not enough data). The P90 for both owner groups together = 1.25 µg/L (n = 7).





## Annex C: Figure 13, WEnR Report 3217

Figure 13 in WEnR Report 3217 is updated. The parent substance is mentioned in the Report for registration, and the statistics are changed; with the bugs solved and the update from Groundwater Atlas version 3.2.2 to 4.3.2.

Report for registration							
Substance	BAM (CASNr 2008-58-4)						
This substance has no metabolites							
This substance has 1 parent							
Parent 1	dichlobenil (CASNr 1194-65-6)						
Date of first authorization	27-6-1980						
Expiration date	1-10-2008						
Productgroup	None specified						
Selection of period (as proposed for registration)							
Begin date	27-6-1980						
End date	1-10-2008						
Depth of target layer (m-ss., as proposed for registration)							
Top	10						
Bottom	15						
Descriptive statistics							
Target layer	regional authorities	water companies	both groups				
Number of measurement values	16	133	149				
Number of measurement results	124	295	419				
Number of measurement values / results (%)	12.9	45.1	35.6				
Maximum measurement value (ug/L)	3	8.8	8.8				
P90 of measurement values (ug/L)	2.25	0.61	0.82				
Layer above the target layer							
Number of measurement values/number of measurement results	262/1178 (22.2%)						
Layer below the target layer							
Number of measurement values/number of measurement results	665/2621 (25.4%)						
Land-use in sampling points from the regional authorities							
Sampling points with land-use data	AGRI	URBA	NATU	SWAT			
Land-use for the sampling points with measurement values (% , n=6)	72	22	3	3			
Land-use for the sampling points with measurement results (% , n=59)	74	12	12	2			
Agricultural land-use (AGRI) break down							
Land-use for the sampling points with measurement values (% , n=6)	PAST	MAIZ	ARCR	GRHO	ORCH	FBLB	
Land-use for the sampling points with measurement results (% , n=59)	16	6	48	0	0	1	
	38	4	28	1	3		
Land-use explanation:							
n=number of sampling points							
AGRI=agriculture							
URBA=non-agricultural land-use in urban area							
NATU=non-agricultural land-use and fallow in rural area							
SWAT=surface water							
PAST=pasture							
MAIZ=maize							
ARCR=arable crops							
GRHO=greenhouses							
ORCH=fruit orchard							
FBLB=flower bulbs							
Groundwater Atlas for pesticides in The Netherlands, Version 4.3.2 (GUI date 11-12-2023)							

*Erratum and update Figure 13 in WEnR Report 3217: Example Groundwater Atlas Report for registration for metabolite BAM (update Groundwater Atlas version 3.2.2 to 4.3.2 (GUI date Dec 11, 2023)).*

The parent substance of the metabolite is printed. The selection includes 124 instead of 97 measurement results from the regional authorities, and 295 instead of 183 measurement results from the water companies. The P90 measurement value for the regional authorities = 2.25 µg/L (n = 16) and for the water companies 0.61 µg/L (n = 133). The P90 for both owner groups together = 0.82 µg/L (n = 149).