Supplementary Information (SI)

Arsenic in groundwater in south west Ireland: occurrence, controls and hydrochemistry

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Text 1 – Removal of locality due to anomalous arsenic

One locality from the DWS dataset was removed from any statistical analysis. In the northwest of Kerry, one borehole had a maximum arsenic value of 21,020 µg L^{-1} (in addition to iron, 52,340 µg L^{-1}) in 2008 and it results from a potential sampling artefact from the presence of high amount of suspended solids (McGrory et al., 2017). These suspended solids may have overestimated the arsenic concentration which as a result may not be reflective of arsenic concentrations within the groundwater within this locality. Leaching of arsenic from the sediment due to acid preserving may have elevated the arsenic in the sample which can give an unrealistic result. While subsequent measurements at this borehole contain lower levels of arsenic (<1-958.4 µg L^{-1}) no suspended solids were present. As a result of the possible sampling irregularities, this locality was removed from any statistical analysis (total of eleven analyses) for all hydrochemical parameters.

Table S1

Site (KY_335; Lenamore, north Kerry) which was removed from both statistical and spatial analysis with coordinates (E: 103410.4; N: 144245.6).

Date	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH
	µg L^{-1}	pH units	µS cm^{-1}	µg L^{-1}	µg L^{-1}	µg L^{-1}	mg L^{-1}	mg L^{-1}	mg L^{-1}	mg L^{-1}
08/10/2008	958.9	7	916	246	504	35.4	1.67	135.1	14.84	395
20/10/2008	34.5	7	897	< 20	< 10	ND*	0.58	3.7	0.68	140
20/10/2008	21020	7.2	1010	52340	237	67.8	< 0.5	22.6	2.43	182
20/10/2008	4.6	7	840	24	298	29.6	1.26	127.9	7.95	422
20/10/2008	356.4	7.3	1011	< 20	60	158.6	1.46	44.6	4.5	159
20/10/2008	663.7	ND	ND	134	44	145.4	1.2	30.2	3.22	ND
30/10/2008	481.4	7.2	884	1636	914	31.2	1.98	152.4	16.81	480
10/11/2008	<1	7.1	ND	580	1151	31.8	1.55	137.1	8.54	18
09/12/2008	<1	7.2	661	1541	141	61.1	2.1	52.1	22	240
09/12/2008	<1	7.3	674	1219	254	38.3	2.09	89.7	20.78	324
09/12/2008	7.4	6.8	655	409	4629	25.7	3.09	105.9	7.67	15

* ND = not determined

Table S2

Grouping of data from 'National Draft Generalised Bedrock Map (Groundwater rockunits)' into 11 new reclassifications ['Rock type']) from 27 original classifications ['Rockunit']

Rock type	Rockunit	Abbreviation
Pure Limestone	Dinantian Pure Unbedded Limestones (DPUL)	PL
	Dinantian Pure Bedded Limestones (DPBL)	
	Dinantian Dolomitised Limestones (DDL)	
	Precambrian Marbles (PM)	
Impure Limestone	Dinantian Upper Impure Limestones (DUIL)	IL
	Dinantian Mixed Sandstones, Shales and Limestones (DMSSL)	
	Dinantian Lower Impure Limestones (DLIL)	
Sandstone (ORS/NRS)	Devonian Old Red Sandstones (DORS)	SS(O/N)
	Permo-Triassic Sandstones (PTS)	
Sandstone	Dinantian Sandstones (DS)	S
	Devonian Kiltorcan-type Sandstones (DKS)	
	Namurian Sandstones (NSA)	
	Westphalian Sandstones (WSA)	
Schist/Gneiss	Precambrian Quartzites, Gneisses & Schists (PQGS)	SG
Sandstone/Shale (Greywackes)	Cambrian Metasediments (CM)	SSh(G)
	Ordovician Metasediments (OM)	
	Silurian Metasediments and Volcanics (SMV)	
Sandstone/Shale	Dinantian (early) Sandstones, Shales and Limestones (DESSL)	SSh
	Namurian Undifferentiated (NU)	
	Dinantian Mudstones and Sandstones (Cork Group) (DMSC)	
	Permo-Triassic Mudstones and Gypsum (PTMG)	
Shale	Namurian Shales (NSH)	Sh
	Dinantian Shales and Limestones (DSL)	
	Westphalian Shales (WSH)	
Basalt	Basalts and other Volcanic rocks (BV)	B
Granite	Granites & other Igneous Intrusive rocks (GII)	G
Rhyolite	Ordovician Volcanics (OV)	

Table S3

Data description from 'Groundwater Aquifers' dataset

Group	ID	Description
Karstic aquifers	Rk	Regionally Important Aquifer – Karstified
	Rkd	Regionally Important Aquifer - Karstified (diffuse)
	Rkc	Regionally Important Aquifer - Karstified (conduit)
	Lk	Locally Important Aquifer – Karstified
Productive fractured aquifers	Rf	Regionally Important Aquifer - Fissured bedrock
	Lm	Locally Important Aquifer - Bedrock which is Generally Moderately Productive
Poorly productive aquifers	Ll	Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
	Pu	Poor Aquifer – Bedrock Aquifer which are Generally Unproductive
	Pl	Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

Table S4

Data description from 'Groundwater Vulnerability' dataset

ID	Description
X	Rock at or near surface or karst
E	Extreme
H	High
M	Moderate
L	Low
W	Water

Table S5

Data descriptions from '1:100,000 (Bedrock Geology)' dataset

Abbreviation	Name	Geological description	Rock type
CL	Cloonagh Limestone Formation	Bedded bioclastic limestone	PL
CLcr	Cracoean Reef Member	Unbedded calcilutite limestone	PL
DIN	Dinantian Limestones (undifferentiated)	Limestone	PL
VIS	Visean Limestones (undifferentiated)	Undifferentiated limestone	PL
WA	Waulsortian Limestones	Massive unbedded lime-mudstone	PL
BA	Ballysteen Formation	Dark muddy limestone, shale	IL
DI	Dirtoge Limestone Formation	Bioclastic cherty grey limestone	IL
RF	Rockfield Limestone Formation	Well-bedded argillaceous limestone	IL
BD	Ballydavid Formation	Sandstone with conglomerate	SS(O/N)
BH	Bird Hill Formation	Purple siltstone & fine sandstone	SS(O/N)
BJ	Ballinskelligs Sandstone Formation	Purple sandstone & siltstone	SS(O/N)
BM	Ballymore Sandstone Formation	Rhythmically bedded sandstone	SS(O/N)
CA	Cappagh Sandstone Formation	Purple cross-bedded sandstone	SS(O/N)
CH	Caha Mountain Formation	Purple & green sandstone & siltstone	SS(O/N)
EK	Eask Sandstone Formation	Purple sandstone & siltstone	SS(O/N)
GB	Glashabeg Conglomerate Formation	Conglomerate & sandstone	SS(O/N)
GC	Glenflesk Chloritic Sandstone Formation	Green sandstone & purple siltstone	SS(O/N)
GCdl	Doo Lough Pebbly Sandstone Member	Pebbly sandstone & conglomerate	SS(O/N)
GH	Glandahalin Formation	Red cross bedded siltstone & sandstone	SS(O/N)
GP	Gun Point Formation	Green-grey sandstone & purple siltstone	SS(O/N)
IY	Inshaboy Formation	Sandstone, siltstone & mudstone	SS(O/N)
KM	Kilmore Formation	Yellow - olive mudstone to sandstone	SS(O/N)
LA	Lough Acoose Sandstone Formation	Well-bedded grey sandstone	SS(O/N)
LK	Lack Sandstone Formation	Micaceous sandstone and siltstone	SS(O/N)
SF	St. Finans Sandstone Formation	Green sandstone & siltstone	SS(O/N)
SH	Slea Head Formation	Pebbly sandstone & conglomerate	SS(O/N)
SL	Slaheny Sandstone Formation	Cross-bedded sandstone & siltstone	SS(O/N)
TH	Toe Head Formation	Cross-bedded sandstone & minor mudstone	SS(O/N)
VS	Valentia Slate Formation	Purple mudstone & siltstone	SS(O/N)
CF	Cloone Flagstone Formation	Greywacke, siltstone & silty shale	S
FS	Feale Sandstone Formation	Sandstone, siltstone & shale	S
BW	Ballynahown Sandstone Formation	Sandstone & shale	S

Table S5. *(continued).*

AL	Annascaul Formation	Mudstone, siltstone & breccia	SSh(G)
CM	Croaghmarhin Formation	Fossiliferous green to grey siltstone	SSh(G)
DP	Drom Point Formation	Grey siltstone with trace fossils	SSh(G)
CCG	Central Clare Group	Sandstone, siltstone & mudstone	SSh
KNrg	Reenagough Member	Massive & flaser-bedded sandstone	SSh
LLS	Lower Limestone Shale	Sandstone, mudstone & thin limestone	SSh
NAM	Namurian (undifferentiated)	Shale & sandstone	SSh
OH	Old Head Sandstone Formation	Flaser-bedded sandstone & minor mudstone	SSh
SHG	Shannon Group	Mudstone, siltstone & sandstone	SSh
GN	Glenoween Shale Formation	Grey silty mudstone	Sh
SFr	Lough Guitane rhyolites	Rhyolitic lavas	B
SFv	Lough Guitane Volcaniclastics	Massive & bedded volcaniclastic deposits	B

Table S6

Data descriptions from 'Quaternary (Sediments)' dataset

Abbreviation	Description
A	Alluvium
BktPt	Blanket Peat
Cut	Cut over raised peat
GDSs	Gravels derived from Devonian sandstones
KaRck	Kartsified bedrock outcrop or subcrop
Rck	Bedrock outcrop or subcrop
TDSs	Till derived from Devonian sandstones
TLPSsS	Till derived from Lower Palaeozoic sandstones and shales
TLs	Till derived from limestones
TNSSs	Till derived from Namurian sandstones and shales
Urban	Urban
Wsd	Windblown sands and dunes

Table S7

Data descriptions from 'CORINE' land use dataset

First level Code (L1)	First level name	Second level code (L2)	Second level name	Third level code (L3)	Third level name
1	Artificial Surfaces	11	Urban Fabric	112	Discontinuous urban Fabric
		14	Artificial, Non-Agricultural Vegetated Areas	142	Sport and Leisure Facilites
2	Agricultural Areas	23	Pastures	231	Pastures
		24	Heterogeneous Agricultural Areas	242	Complex Cultivation Patterns
				243	Land Principally Occupied by Agriculture
3	Forest and Seminatural Areas	31	Forests	311	Broad-Leaved Forest
				312	Coniferous Forest
				313	Mixed Forest
		32	Shrub and/or Herbaceous Vegetation Associations	322	Moors and Heathland
				324	Transitional Woodland Shrub
		33	Open Spaces with little or no Vegetation	331	Beaches, Dunes, and Sand Plains
				333	Sparsely Vegetated Areas
4	Wetlands	41	Inland Wetlands	411	Island Marshes
				412	Peat Bogs

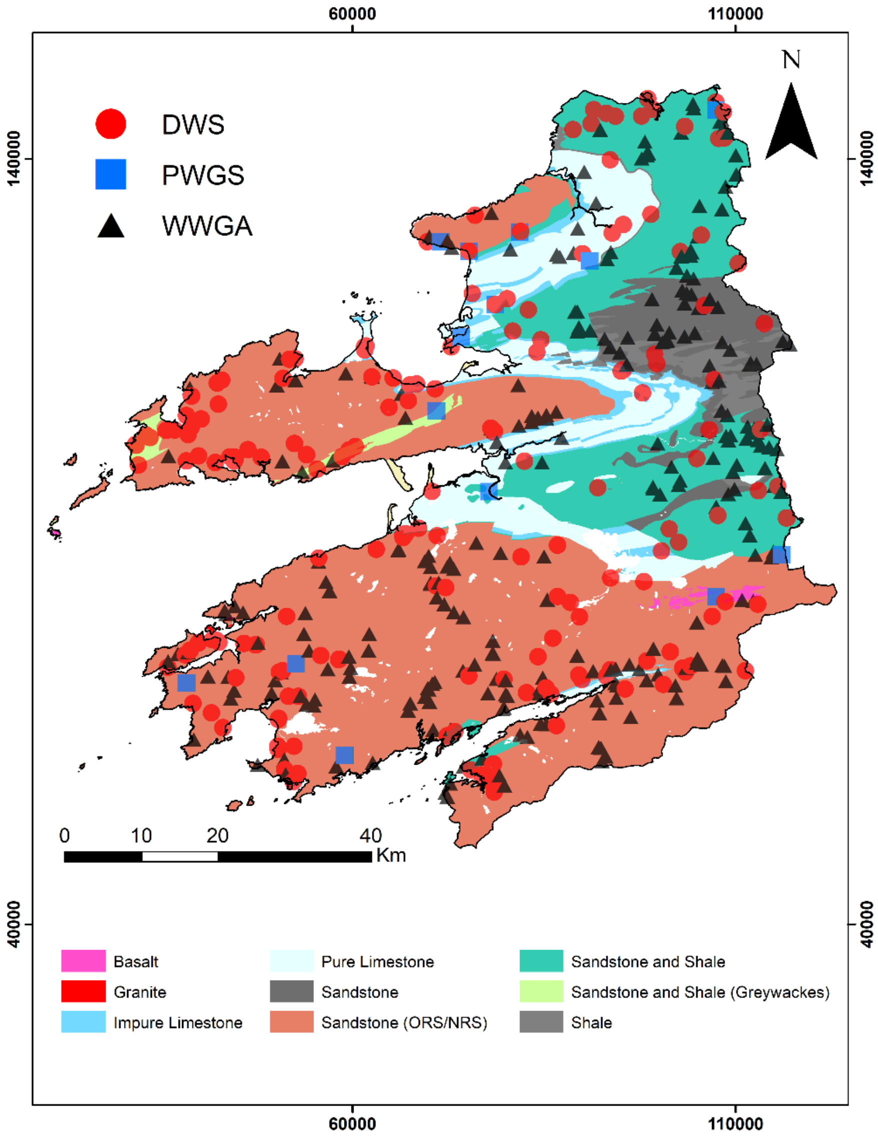

Fig. S1. Spatial distribution of the rock types in Kerry in relation to the three datasets used in this study (where DWS = drinking water supplies, WWGAs = well water grant applications, and PWGS = public water groundwater sources).

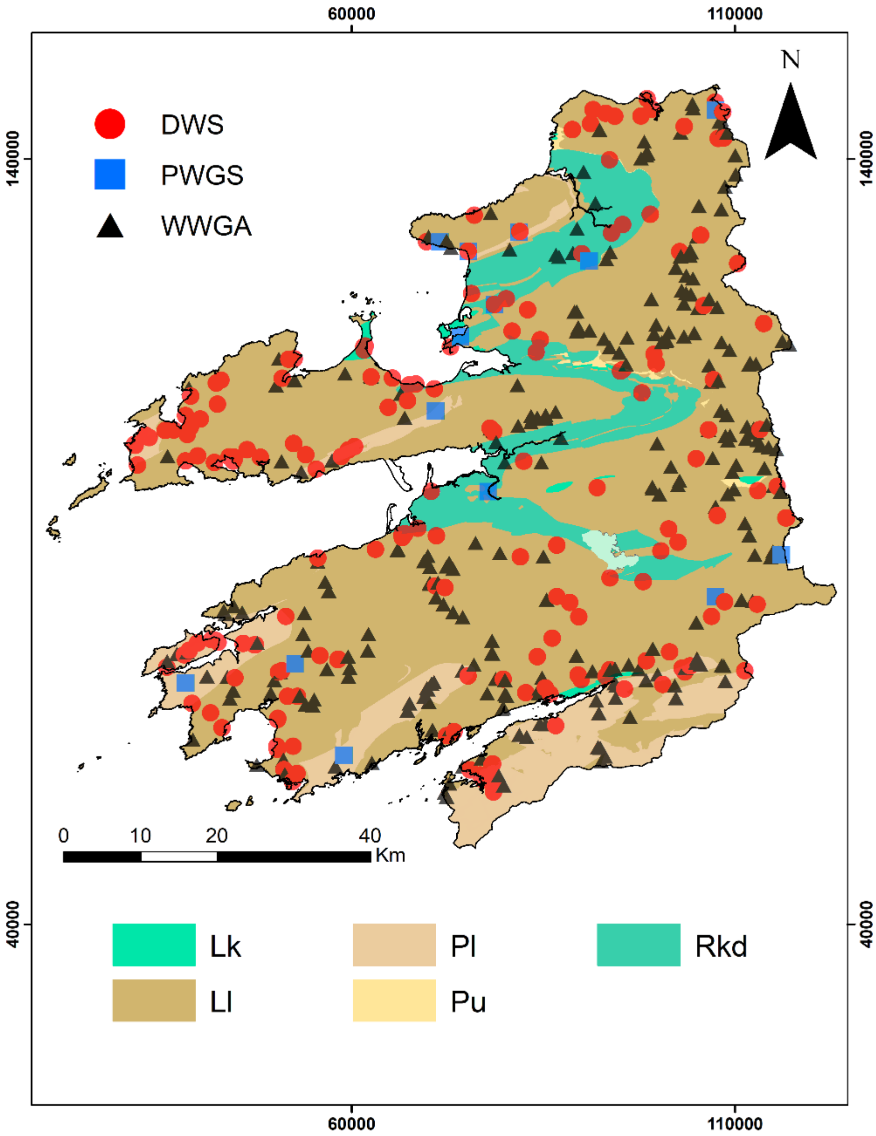

Fig. S2. Spatial distribution of the aquifer classification in Kerry in relation to the three datasets used in this study (where DWS = drinking water supplies, WWGAs = well water grant applications, and PWGS = public water groundwater sources). Where LK = Locally Important Aquifer – Karstified, Ll = Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones, Pl = Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones, Pu = Poor Aquifer – Bedrock Aquifer which are Generally Unproductive, and Rkd = Regionally Important Aquifer - Karstified (diffuse).

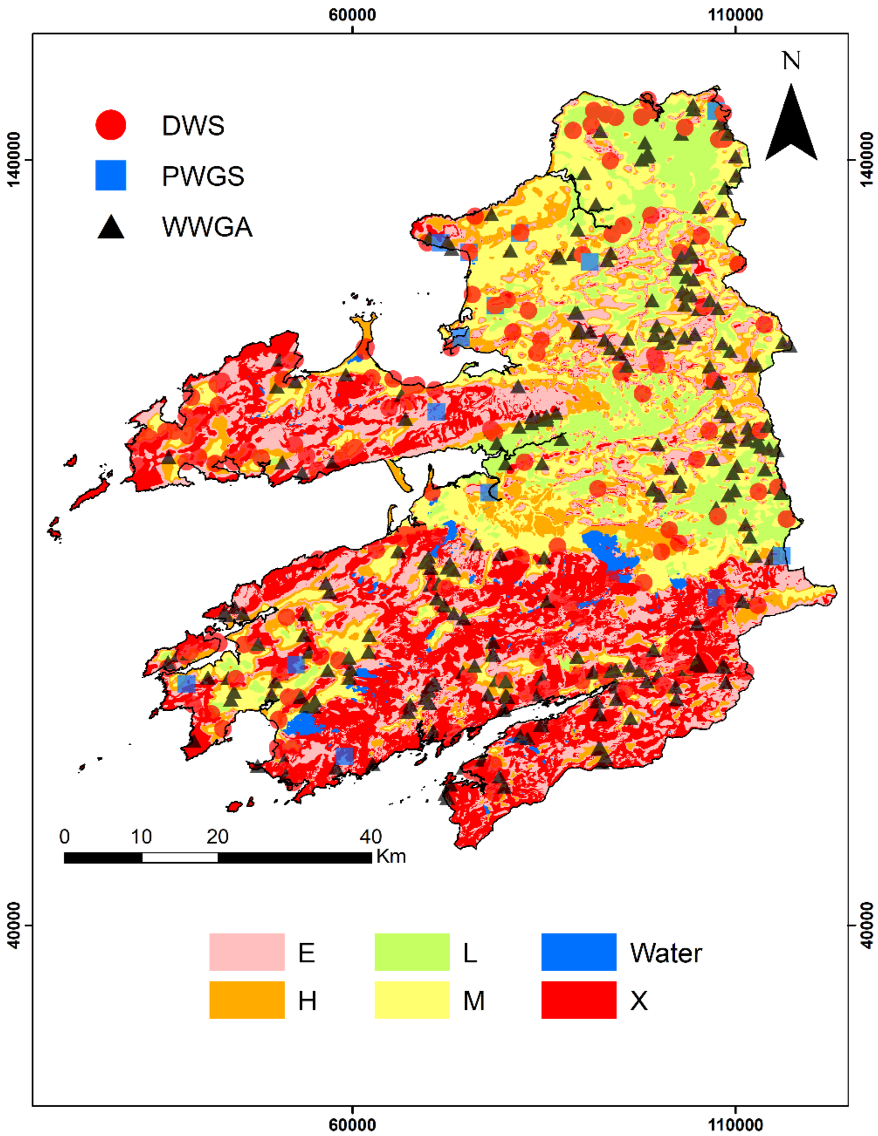

Fig. S3. Spatial distribution of the groundwater vulnerability in Kerry in relation to the three datasets used in this study (where DWS = drinking water supplies, WWGAs = well water grant applications, and PWGS = public water groundwater sources). Where E = Extreme, H = High, L = Low, M = Moderate, W = Water, and X = Rock at or near surface or karst.

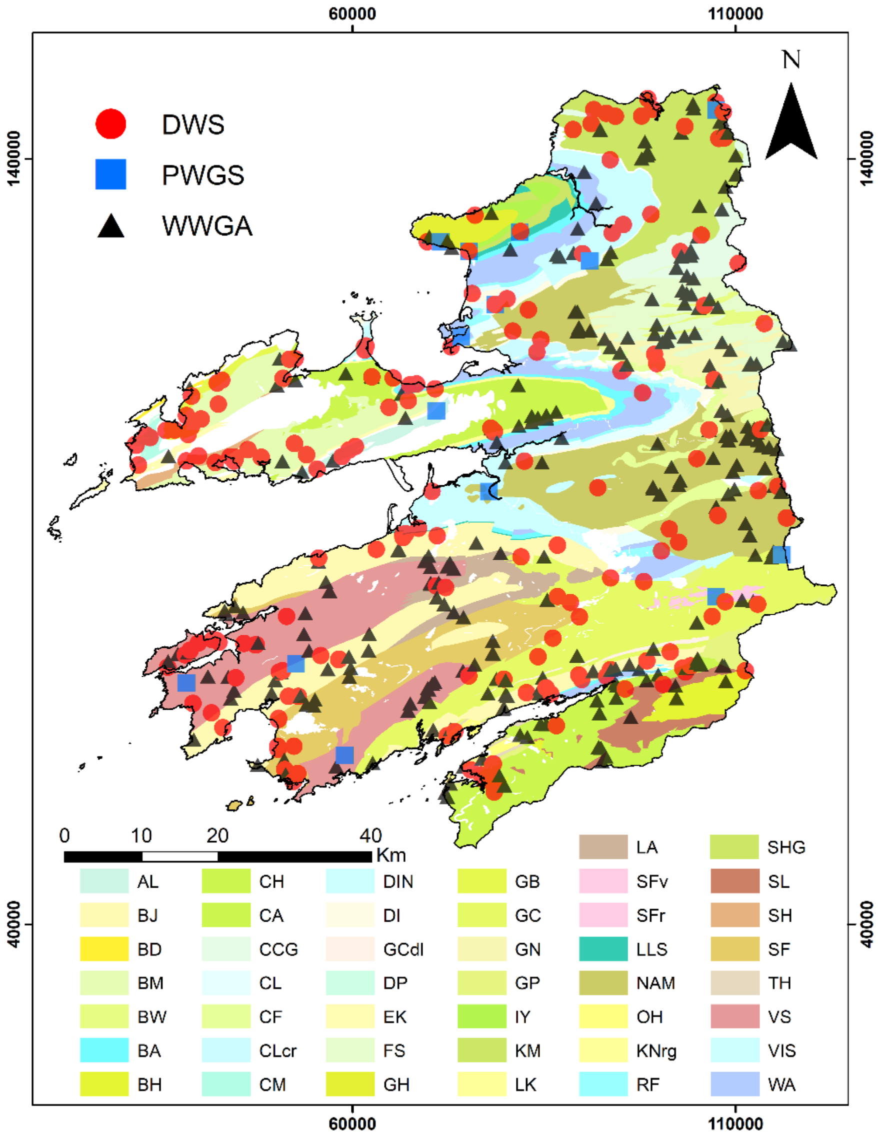

Fig. S4. Spatial distribution of the rock geology (1:100,000) in Kerry in relation to the three datasets used in this study (where DWS = drinking water supplies, WWGAs = well water grant applications, and PWGS = public water groundwater sources). Where AL = Annascaul Formation, BJ = Ballinskelligs Sandstone Formation, BD = Ballydavid Formation, BM = Ballymore Sandstone Formation, BW = Ballynahown Sandstone Formation, BA = Ballysteen Formation, BH = Bird Hill Formation, CH = Caha Mountain Formation, CA = Cappagh Sandstone Formation, CCG = Clare Central Group, CL = Cloonagh Limestone Formation, CLcr = Cracoean Reef Member, CM = Croaghmarhin Formation, DIN = Dinantian Limestones (undifferentiated), DI = Dirtoge Limestone Formation, GCdl = Doo Lough Pebbly Sandstone Member, DP = Drom Point Formation, EK = Eask Sandstone Formation, FS = Feale Sandstone Formation, GH =Glandahalin Formation, GB = Glashabeg Conglomerate Formation, GC = Glenflesk Chloritic Sandstone Formation, GN = Glenoween Shale Formation, GP = Gun Point Formation, IY = Inshaboy Formation, KM = Kilmore Formation, LK = Lack Sandstone Formation, LA = Lough Acoose Sandstone Formation, SFv = Lough Guitane Volcaniclastics, SFr = Lough Guitane Rhyolites, LLS = Lower Limestone Shale, NAM = Namurian (undifferentiated), OH = Old Head Sandstone Formation, KNrg = Reenagough Member, RF =

Rockfield Limestone Formation, SHG = Shannon Group, SL = Slaheny Sandstone Formation, SH = Slea Head Formation, SF = St. Finans Sandstone Formation, TH = Toe Head Formation, VS = Valentia Slate Formation, VIS = Visean Limestones (undifferentiated), and WA = Waulsortian Limestones. Inclusion of all the unit formations were not included for map clarity with only those having geochemical data points within them present. However other relevant formations not presented in the map, but in the region of Kerry included BF = Ballyferriter Formation, BJag = Ardnagluggen Sandstone Member, BJdh = Doulus Head Conglomerate Member, BL = Ballydeenlea Formation, BN = Ballynane Formation, BT = Ballymartin Formation, Bp = Basalt, CC = Caherconree Formation, CF = Cloone Flagstone Formation, CG = Coosglass Slate Formation, CN = Camillan Sandstone Formation, CO = Coumeenoole Sandstone Formation, CS = Clare Shale Formation, D = Dolerite and Grabbro, DG = Derrymore Glen Formation, FC = Ferriters Cove Formation , FM = Foilnamahagh Formation, FN = Farran Sandstone Formation, GBcm = Coosmore Conglomerate Member, GBco = Coosgorrib Conglomerate Member, GBcs = GBcs Coosglass Conglomerate Member, IC = Inch Conglomerate Formation, IO = Inishnabro Formation, IV = Inishvickillane Formation, KNat = Ardaturrish Member, KNam = Ardamanagh Member, LP = Landing Place Formation, LS = Lough Slat Conglomerate Formation, MC = Mill Cove Formation, ORS = Old Red Sandstone (undifferentiated), PA = Parsonage & Corgrig Lodge Formation, PGG = Pointagare Group, SC = Sauce Creek Formation, SMG = Slieve Mish Group, SWG = Smerwick Group, TC = Trabeg Conglomerate Formation, VhBg = Bealtra Volcaniclastic Rocks, and VhBg = Beginish Island Intrusion.

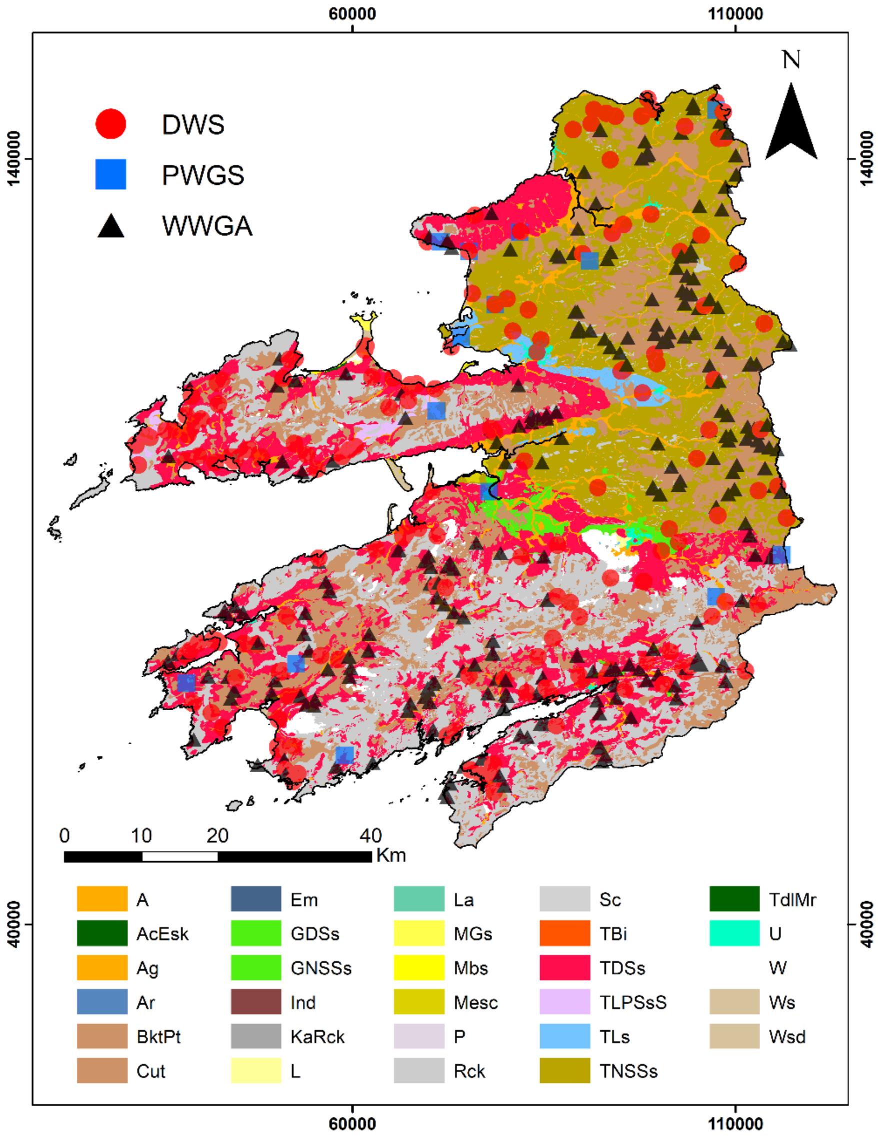

Fig. S5. Spatial distribution of the quaternary categories in Kerry in relation to the three datasets used in this study (where DWS = drinking water supplies, WWGAs = well water grant applications, and PWGS = public water groundwater sources). Where A = Alluvium, AcEsk = Eskers comprised of gravels of acidic reaction, Ag = Alluvium (gravelly), Ar = Airfield/Airport, BktPt = Blanket Peat, Cut = Cut over raised peat, Em = Embankment, GDSs = gravels derived from Devonian sandstones, GNSSs = gravels derived from Namurian sandstones and shales, Ind = industrial, KaRck = Karstified bedrock outcrop or subcrop, L = Lacustrine sediments, La = Landfill, MGs = Marine gravel and sands (often raised), Mbs = Marine beach sands, Mesc = Estuarine silts and clays, P = Pier, Rck = Bedrock outcrop or subcrop, Sc = Scree, TBi = Till derived from basic igneous rocks, TDSs = Till derived from Devonian sandstones, TLPSsS = Till derived from Lower Palaeozoic sandstones and shales, TLs = Till derived from limestones, TNSSs = Till derived from Namurian sandstones and shales, TdlMr = Tidal marsh, U = Urban, W = Water, Ws = Windblown sands, and Wsd = Windblown sands and dunes.

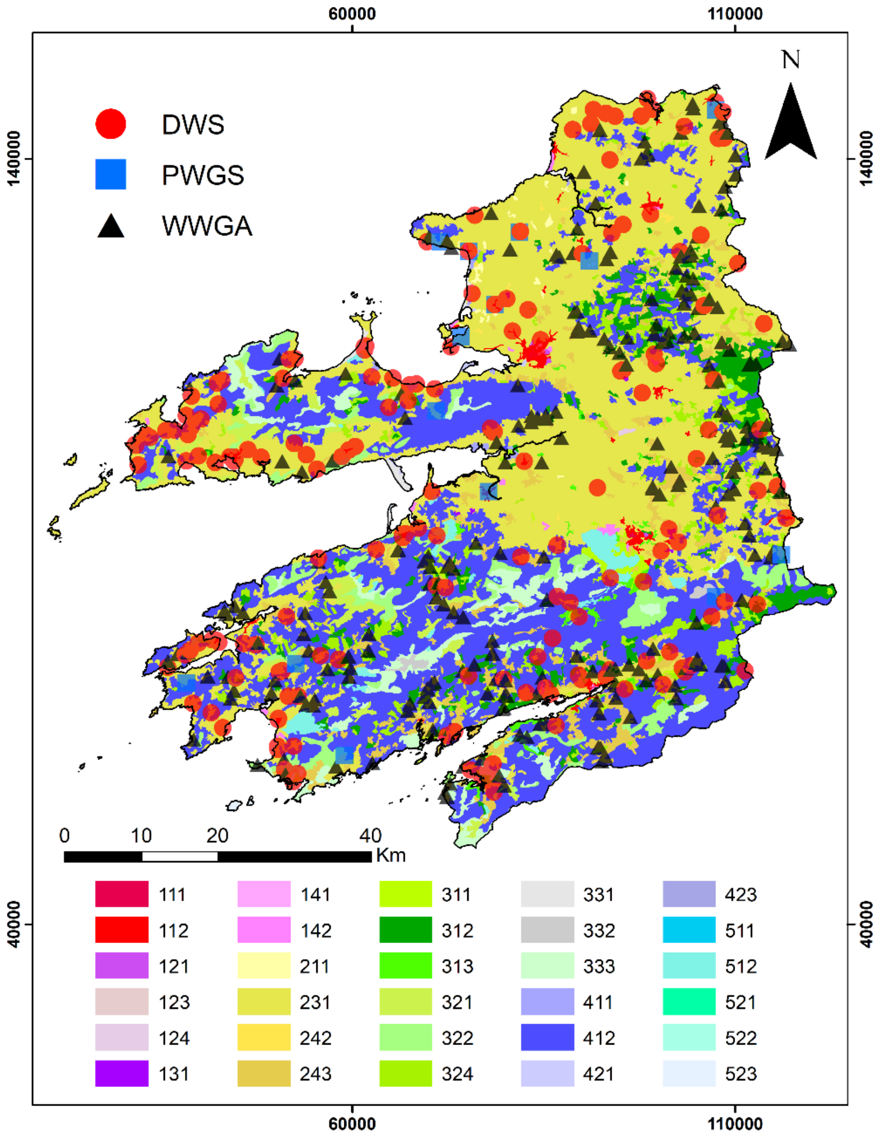

Fig. S6. Spatial distribution of the CORINE categories in Kerry in relation to the three datasets used in this study (where DWS = drinking water supplies, WWGAs = well water grant applications, and PWGS = public water groundwater sources). Where 111 = **A**rtificial Surfaces, **U**rban Fabric, **C**ontinuous Urban Fabric, 112 = **A**rtificial Surfaces, **U**rban Fabric, **D**iscontinuous Urban Fabric, 121 = **A**rtificial Surfaces, **I**ndustrial, Commercial and Transport Units, **I**ndustrial or Commercial Units, 123 = **A**rtificial Surfaces, **I**ndustrial, Commercial and Transport Units, **P**ort Areas, 124 = **A**rtificial Surfaces, **I**ndustrial, Commercial and Transport Units, **A**irports, 131 = **A**rtificial Surfaces, **M**ine, Dump and Construction Sites, **M**ineral Extraction Sites, 141 = **A**rtificial Surfaces, **A**rtificial, Non-Agricultural Vegetated Areas, **G**reen Urban Areas, 142 = **A**rtificial Surfaces, **A**rtificial, Non-Agricultural Vegetated Areas, **S**port and Leisure Facilites, 211 = **A**gricultural Areas, **A**rable Land, **N**on-irrigated Arable Land, 231 = **A**gricultural Areas, **P**astures, **P**astures, 242 = **A**griculture Areas, **H**eterogeneous Agricultural Areas, **C**omplex Cultivation Patterns, 243 = **A**griculture Areas, **H**eterogeneous Agricultural Areas, **L**and Principally Occupied by Agriculture, 311 = **F**orest and Seminatural Areas, **F**orests, **B**road-Leaved Forest, 312 = **F**orest and Seminatural Areas, **F**orests, **C**oniferous Forest, 313 = **F**orest and Seminatural Areas, **F**orests, **M**ixed Forest, 321 = **F**orest and

Seminatural Areas, **S**hrub and/or Herbaceous Vegetation Associations, **N**atural Grassland, 322 = **F**orest and Seminatural Areas, **S**hrub and/or Herbaceous Vegetation Associations, **M**oors and Heathland, 324 = **F**orest and Seminatural Areas, **S**hrub and/or Herbaceous Vegetation Associations, **T**ransitional Woodland Shrub, 331 = **F**orest and Seminatural Areas, **O**pen Spaces with little or no Vegetation, **B**eaches, Dunes, and Sand Plains, 332 = **F**orest and Seminatural Areas, **O**pen Spaces with little or no Vegetation, **B**are Rock, 333 = **F**orest and Seminatural Areas, **O**pen Spaces with little or no Vegetation, Beaches, **S**parsely Vegetated Areas, 411 = **W**etlands, **I**nland Wetlands, **I**nland Marshes, 412 = **W**etlands, **I**nland Wetlands, **P**eat Bogs, 421 = **W**etlands, **C**oastal Wetlands, **S**alt Marshes, 423 = **W**etlands, **C**oastal Wetlands, **I**ntertidal Flats, 511 = **W**ater Bodies, **I**nland Waters, **W**ater Courses, 512 = **W**ater Bodies, **I**nland Waters, **W**ater Bodies, 521 = **W**ater Bodies, **M**arine Waters, **C**oastal Lagoons, 522 = **W**ater Bodies, **M**arine Waters, **E**stuaries, and 523 = **W**ater Bodies, **M**arine Waters, **S**ea and Ocean. (For each CLC (2012) classification the three classes are denoted with a bold first letter.)

Table S8

Number of sites per parameter for each rock type classification. Rock type classes Schist/Gneiss, Rhyolite and Granite had no locations in the Kerry region) (Groupings in bold to be removed from prior to statistical analysis, i.e. Basalt).

Rock type	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH
Pure Limestone	31	28	28	31	31	27	27	27	26	19
Impure Limestone	6	6	6	6	6	6	6	6	6	5
Sandstone (ORS/NRS)	275	266	258	275	275	269	267	268	257	198
Sandstone	35	36	34	36	36	35	35	34	31	31
Schist/Gneiss	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sandstone and Shale (Greywackes)	11	10	10	11	11	11	11	11	10	7
Sandstone and Shale	100	100	95	101	100	100	96	98	92	81
Shale	7	7	7	7	7	7	7	7	6	6
Basalt	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Granite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rhyolite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table S9

Number of sites per parameter for each aquifer classification. Aquifer classes Rk, Rkc, Rf, Lm and Pu had no locations in the Kerry region. (Groupings in bold to be removed from prior to statistical analysis, i.e. Lk).

Aquifer	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH
Rk	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rkd	27	24	24	27	27	24	23	24	23	19
Rkc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lk	**4**	**4**	**4**	**4**	**4**	**3**	**4**	**3**	**3**	**0**
Rf	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ll	355	348	334	357	356	352	344	347	328	270
Pu	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pl	81	79	78	81	81	78	80	79	76	60

Table S10

Number of sites per parameter for each vulnerability classification. Vulnerability class W had no locations in the Kerry region.

Vulnerability	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH
X	65	63	60	65	65	64	65	64	59	50
E	162	157	150	162	162	158	157	158	153	117
H	115	112	110	116	115	113	110	112	107	90
M	92	90	87	92	92	88	88	86	84	67
L	33	33	33	34	34	34	31	33	27	25
W	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table S11

Number of sites per parameter for each rock classification. Rock class Cm, GCdl KM, LLS had no locations in the Kerry region. (Groupings in bold to be removed from prior to statistical analysis, i.e. BA, BD, BH, BW, CL, CLcr, CM, DI, DP, EK, GCdl, GP, IY, KM, KNrg, LA, LK, LLS, OH, RF, SFr, SFv, SH and TH).

Rock	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH
AL	7	6	6	7	7	7	7	7	7	5
BA	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
BD	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
BH	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**2**
BJ	59	56	55	59	59	59	56	57	54	42
BM	21	20	20	21	21	21	21	21	20	7
BW	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
CA	20	19	20	20	20	19	20	19	18	18
CCG	9	10	10	10	10	10	10	10	9	9
CF	8	9	9	9	9	9	9	9	9	7
CH	33	33	33	33	33	32	33	33	31	27
CL	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
CLcr	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**
CM	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**
DI	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
DIN	7	7	7	7	7	6	6	6	5	**2**
DP	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**
EK	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
FS	23	23	21	23	23	22	22	21	18	20
GB	6	6	6	6	6	6	6	6	6	2
GC	25	25	23	25	25	25	25	25	23	17
GCdl	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
GH	7	6	6	7	7	6	6	6	6	4
GN	7	7	7	7	7	7	7	7	6	6
GP	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**3**	**3**
IY	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
KM	**2**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**0**
KNrg	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
LA	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
LK	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**
LLS	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**0**
NAM	50	49	44	50	49	50	46	48	45	42
OH	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
RF	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
SF	24	24	22	24	24	24	23	24	24	18
SFr	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
SFv	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
SH	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
SHG	34	34	34	34	34	33	33	33	31	26
SL	5	5	4	5	5	5	5	5	4	5
TH	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
VIS	9	8	8	9	9	8	8	8	8	7
VS	48	46	44	48	48	46	46	46	46	39
WA	10	8	8	10	10	9	8	9	9	7

Table S12

Number of sites per parameter for each quaternary classification. Quaternary class Wsd had no locations in the Kerry region for certain parameters. (Groupings in bold to be removed from prior to statistical analysis, i.e. Cut, GDSs, KaRck, TLs and Wsd).

ID	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH
A	6	6	6	6	6	5	5	5	5	**2**
BktPt	28	29	28	29	29	27	28	27	21	20
Cut	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
GDSs	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2**
KaRck	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Rck	59	55	54	59	59	58	59	59	57	42
TDSs	214	208	200	214	214	210	206	208	201	157
TLPSsS	9	9	9	9	9	9	9	9	8	6
TLs	**3**	**2**	**2**	**3**	**3**	**2**	**2**	**2**	**2**	**2**
TNSSs	133	131	126	134	134	131	127	128	121	111
Urban	5	5	5	5	5	5	5	5	5	**3**
Wsd	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**0**

Table S13

Number of sites per parameter for each CORINE (L1) classification.

First level Code	First level name	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH
1	Artificial surfaces	21	21	21	21	21	20	20	20	20	8
2	Agricultural areas	348	337	328	349	348	339	332	335	321	269
3	Forest and Seminatural Areas	37	37	36	38	38	37	38	37	34	27
4	Wetlands	61	60	55	61	61	61	61	61	55	45

Table S14

Number of sites per parameter for each CORINE (L2) classification. Land use class Artificial, Non-Agricultural Vegetated Areas had no locations in the Kerry region for certain parameters. (Groupings in bold to be removed from prior to statistical analysis, i.e. Artificial, Non-Agricultural Vegetated Areas and Open Spaces with little or no Vegetation).

Second level Code	Second level name	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH
11	Urban Fabric	20	20	20	20	20	19	19	19	19	8
14	**Artificial, Non-Agricultural Vegetated Areas**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**
23	Pastures	262	252	246	263	263	256	249	253	241	200
24	Heterogeneous Agricultural Areas	86	85	82	86	85	83	83	82	80	69
31	Forests	21	21	21	22	22	21	22	21	19	14
32	Shrub and/or Herbaceous Vegetation Associations	13	13	12	13	13	13	13	13	12	12
33	**Open Spaces with little or no Vegetation**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**1**
41	Inland Wetlands	61	60	55	61	61	61	61	61	55	45

Table S15

Number of sites per parameter for each CORINE (L3) classification. Land use class Sport and Leisure Facilities had no locations in the Kerry region for certain parameters. (Groupings in bold to be removed from prior to statistical analysis, i.e. Sport and Leisure Facilities, Complex Cultivation Patterns, Broad-Leaved Forest, Mixed Forest, Moors and Heathland, Beaches, Dunes, and Sand Plains, Sparsely Vegetated Areas and Inland Marshes).

Third level code	Third level name	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH
112	Discontinuous urban Fabric	20	20	20	20	20	19	19	19	19	8
142	**Sport and Leisure Facilities**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**
231	Pastures	262	252	246	263	263	256	249	253	241	200
242	**Complex Cultivation Patterns**	**2**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**0**
243	Land Principally Occupied by Agriculture	84	84	81	84	83	82	82	81	79	69
311	**Broad-Leaved Forest**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**3**
312	Coniferous Forest	11	12	12	12	12	11	12	11	9	9
313	**Mixed Forest**	**5**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**2**
322	**Moors and Heathland**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
324	Transitional Woodland Shrub	12	12	11	12	12	12	12	12	11	11
331	**Beaches, Dunes, and Sand Plains**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**0**
333	**Sparsely Vegetated Areas**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
411	**Inland Marshes**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**0**
412	Peat Bogs	59	58	53	59	59	59	59	59	53	45

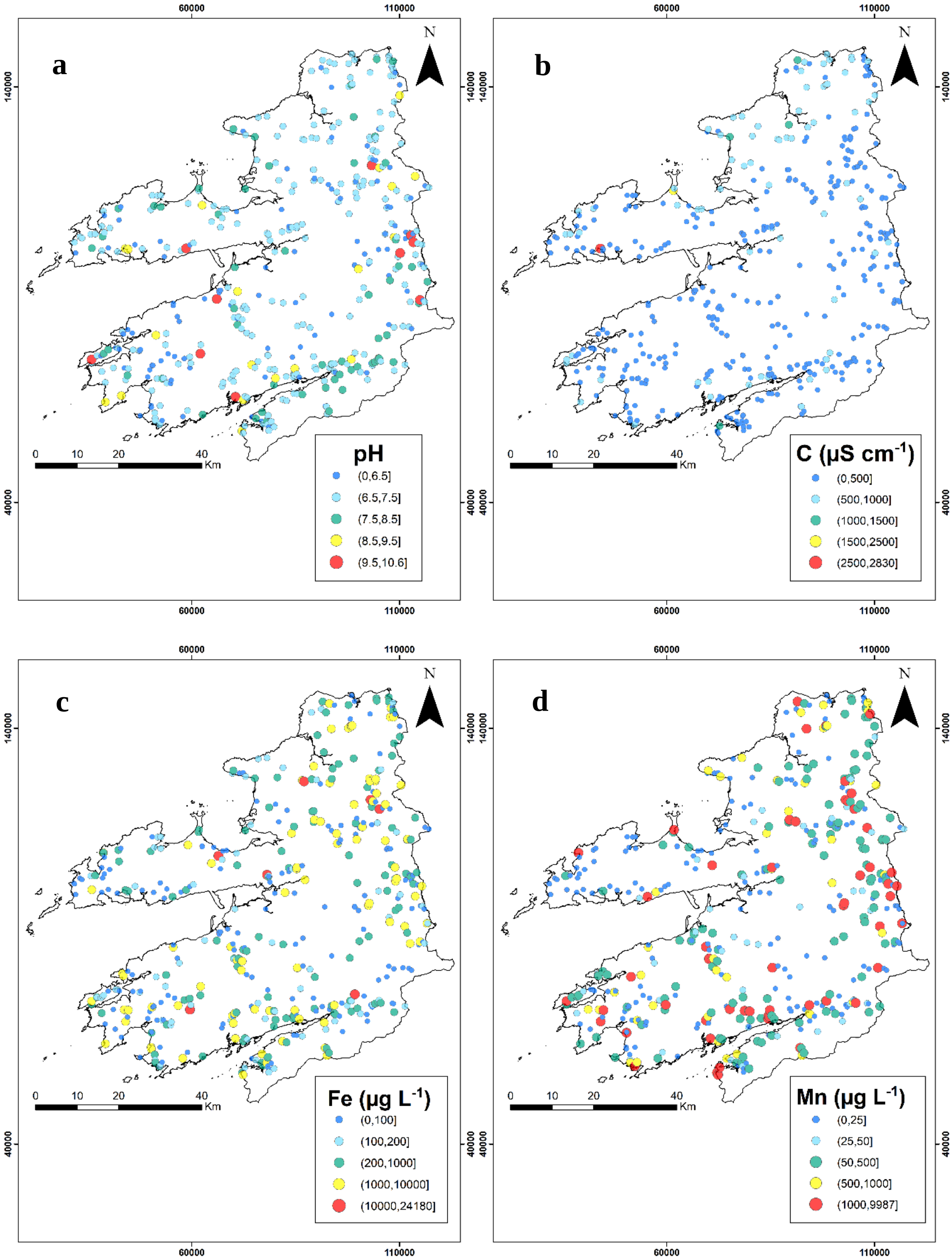

Fig. S7. Spatial distribution of groundwater quality parameters divided into five intervals: (**a**) pH, (**b**) conductivity, (**c**) Fe, (**d**) Mn, (**e**) Na, (**f**) K, (**g**) Ca, (**h**) Mg, and (**i**) total hardness.

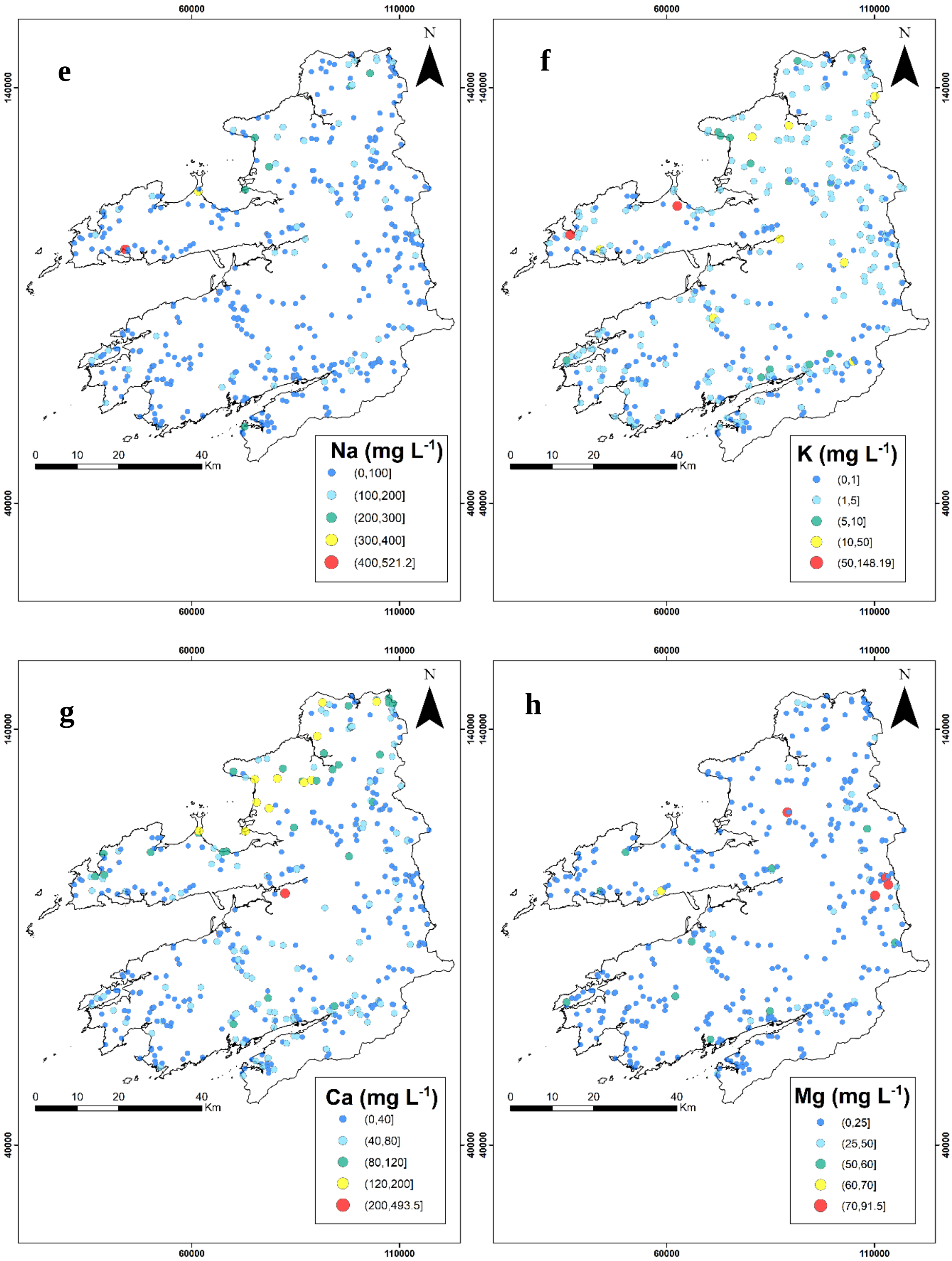

Fig. S7. *(continued).*

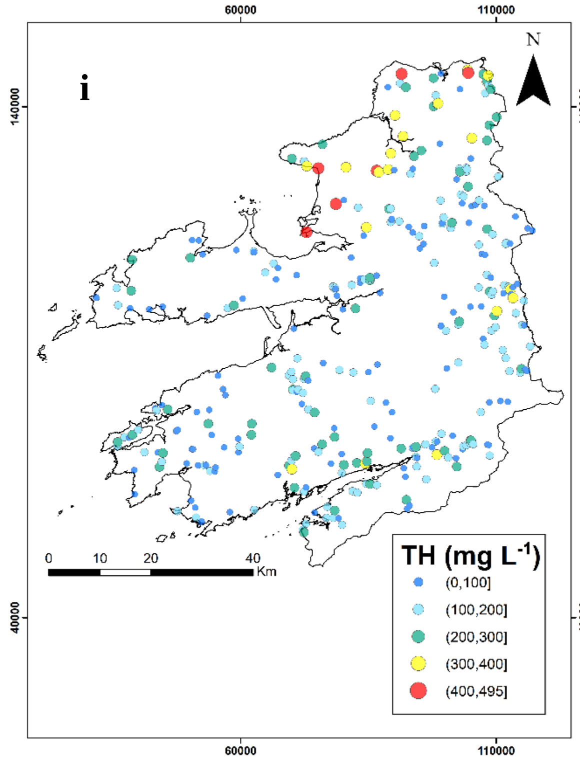

Fig. S7. *(continued).*

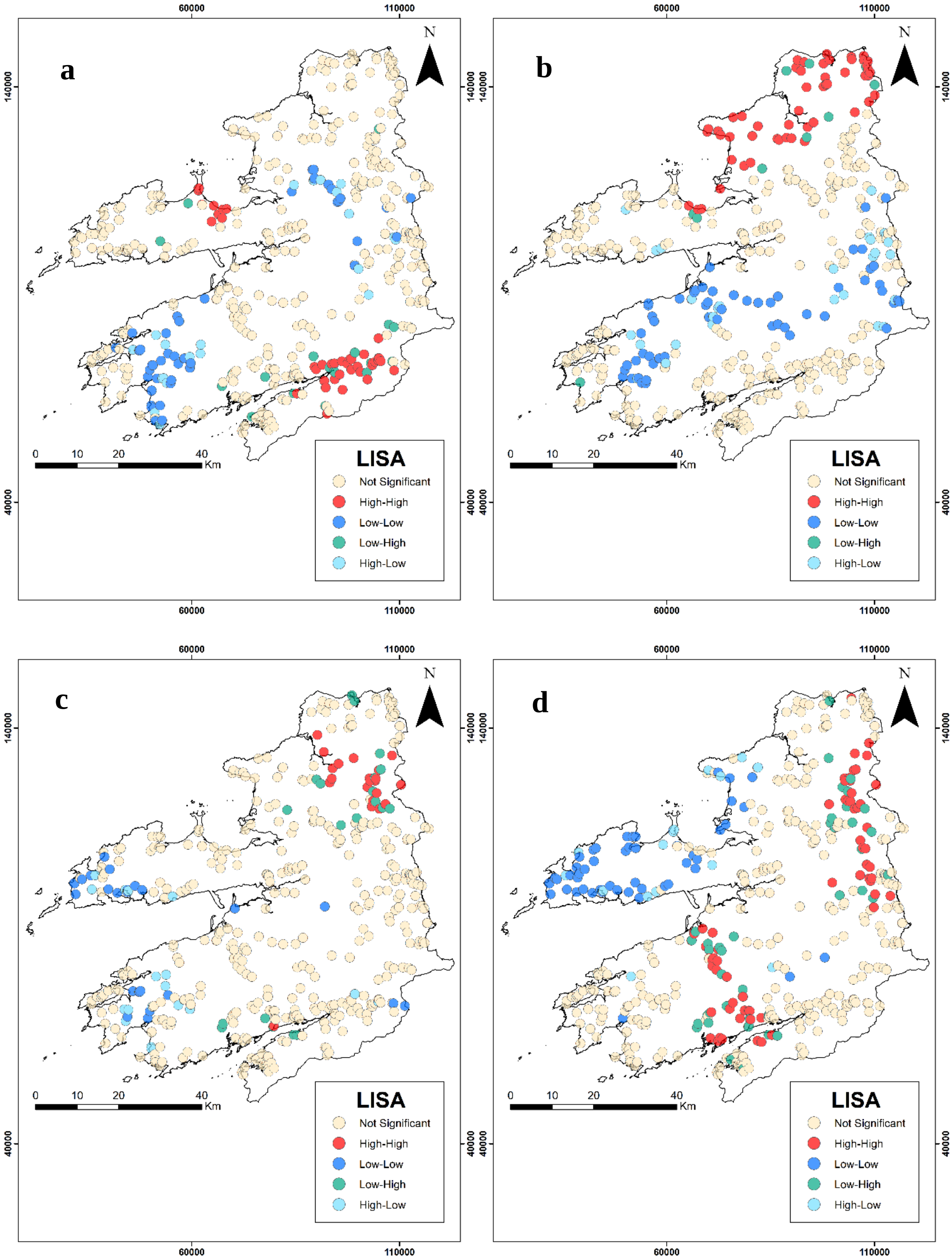

Fig. S8. Hot-spot distribution of groundwater quality parameters: (**a**) pH, (**b**) conductivity, (**c**) Fe, (**d**) Mn, (**e**) Na, (**f**) K, (**g**) Ca, (**h**) Mg, and (**i**) total hardness.

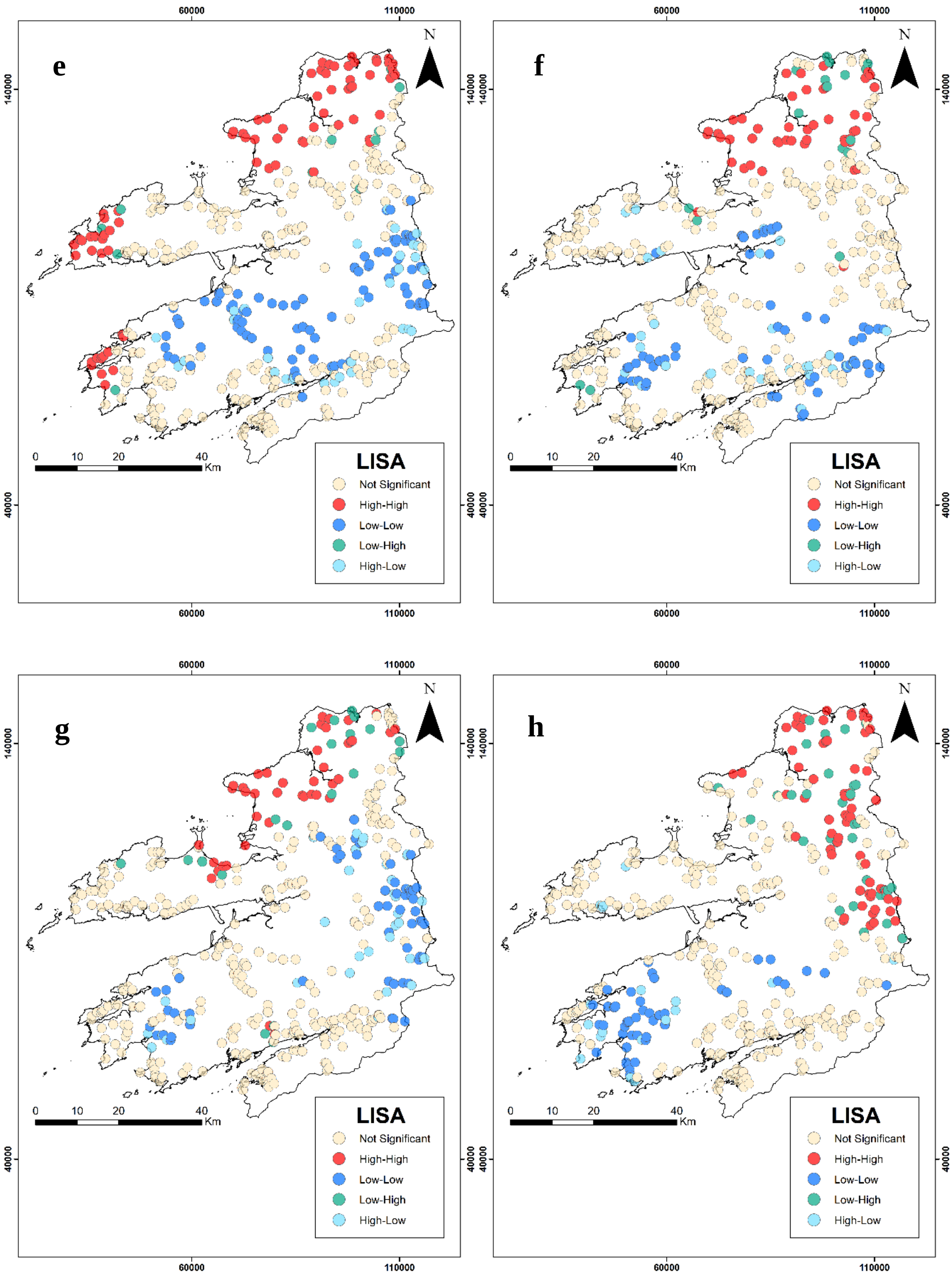

Fig. S8. *(continued).*

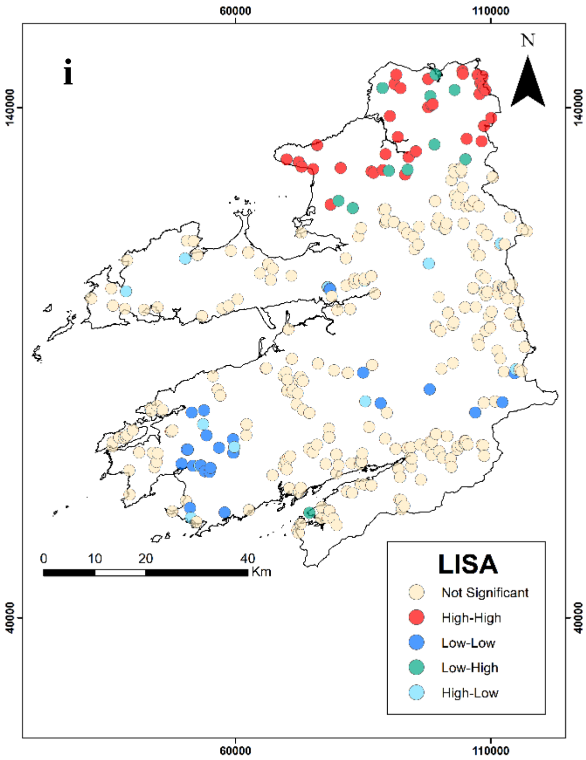

Fig. S8. *(continued).*

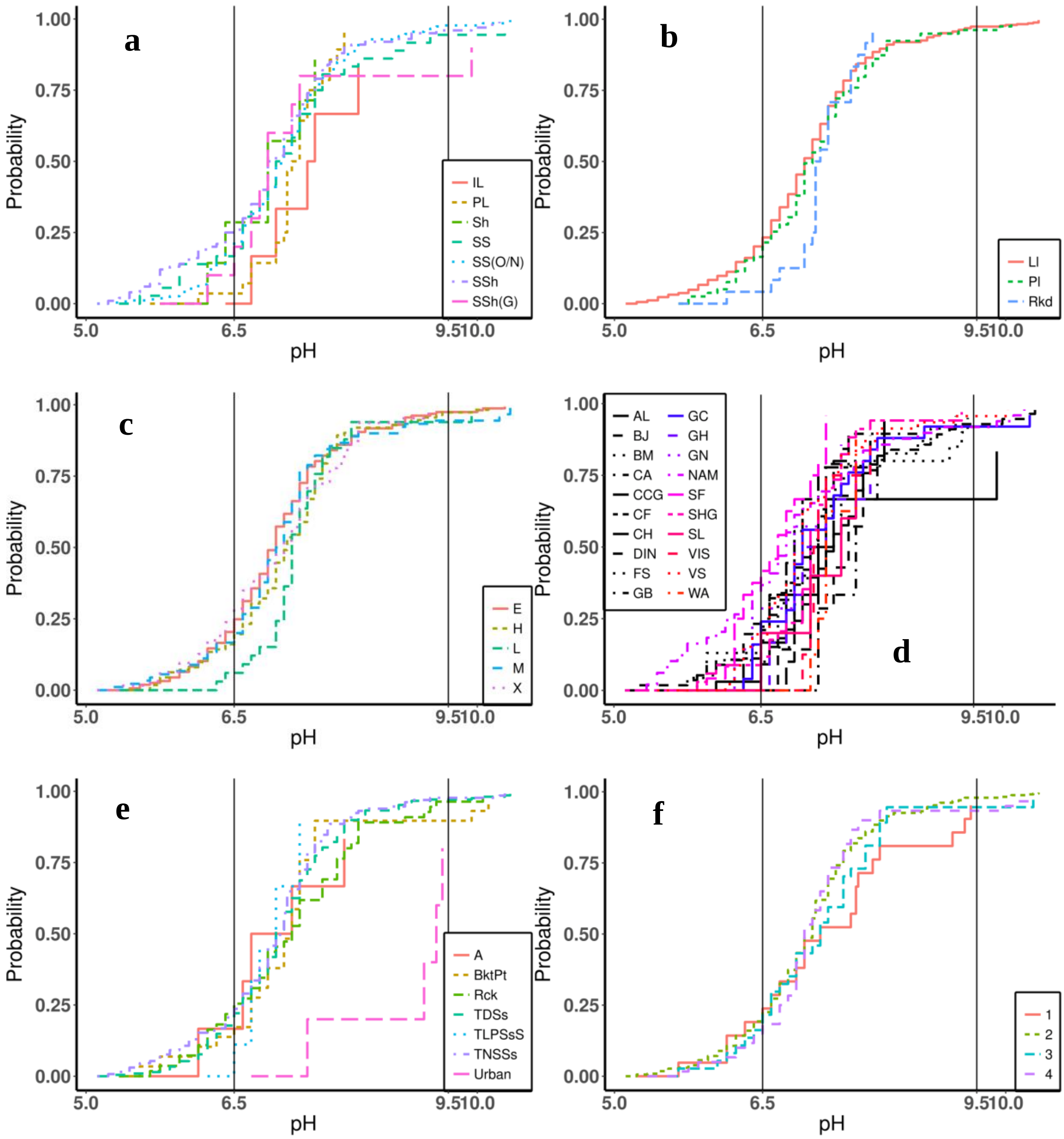

Fig. S9. ECDF plot displaying the empirical distribution function of pH in relation to (**a**) rock type, (**b**) aquifer, (**c**) groundwater vulnerability, (**d**) rock, (**e**) quaternary, (**f**) CORINE(L1), (**g**) CORINE(L2), and (**h**) CORINE(L3). The indicator parameter guide value of pH of 6.5 and 9.5 is represented as two black vertical lines.

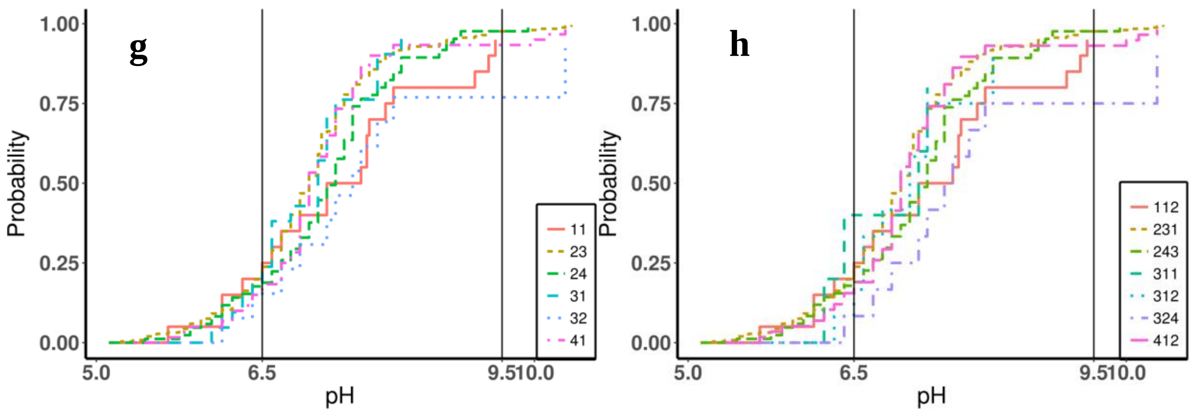

Fig. S9. *(continued).*

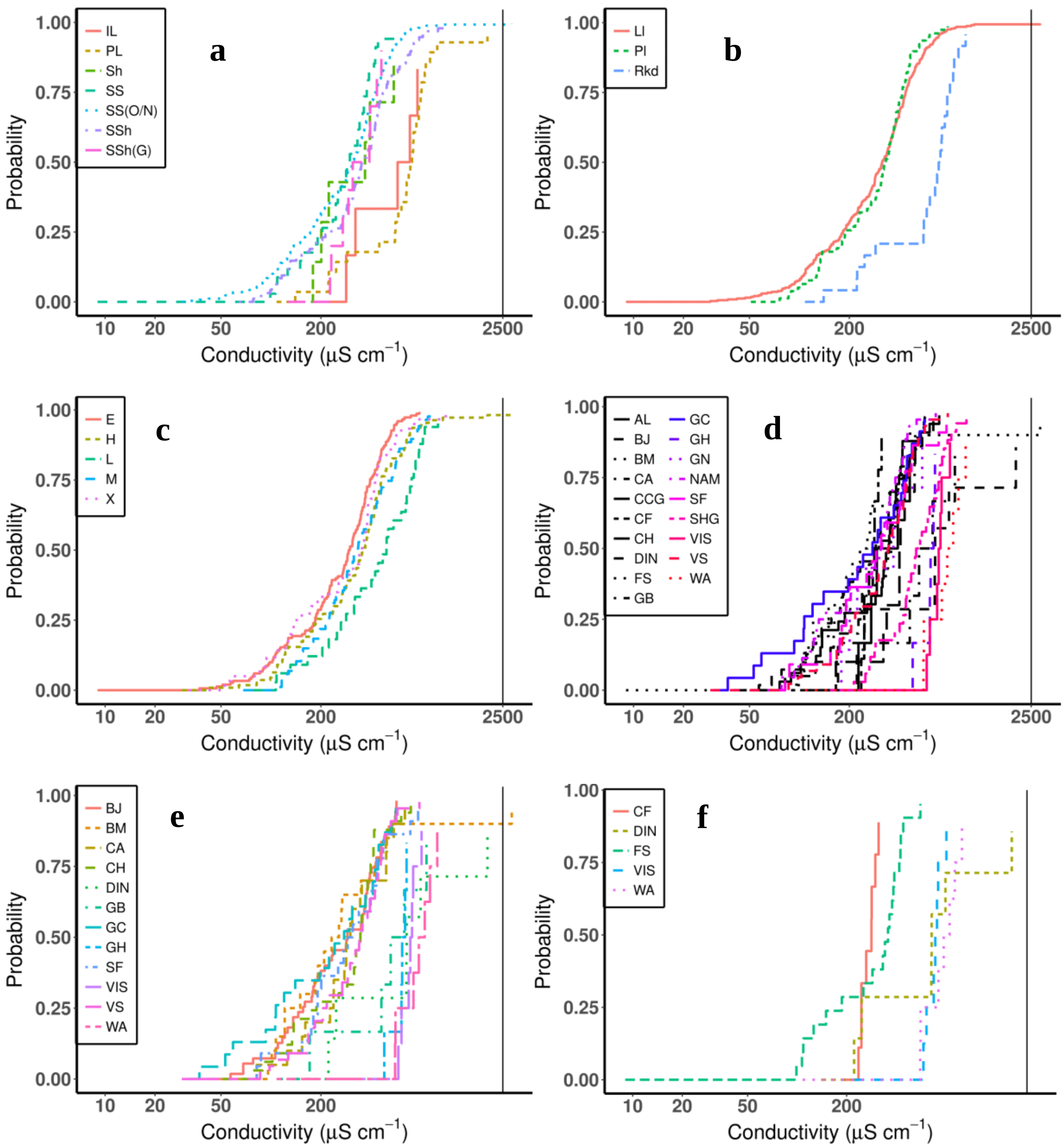

Fig. S10. ECDF plot displaying the empirical distribution function of conductivity in relation to (**a**) rock type, (**b**) aquifer, (**c**) groundwater vulnerability, (**d**) rock, (**e**) rock (Pure Limestone and Sandstone (ORS/NRS)), (**f**) rock (Pure Limestone and Sandstone), (**g**) rock (Pure Limestone and Sandstone and Shale), (**h**) quaternary, (**i**) CORINE(L1), (**j**) CORINE(L2), and (**k**) CORINE(L3). The indicator parameter guide value of conductivity of 2500 µS cm^{-1} is represented as a black vertical line.

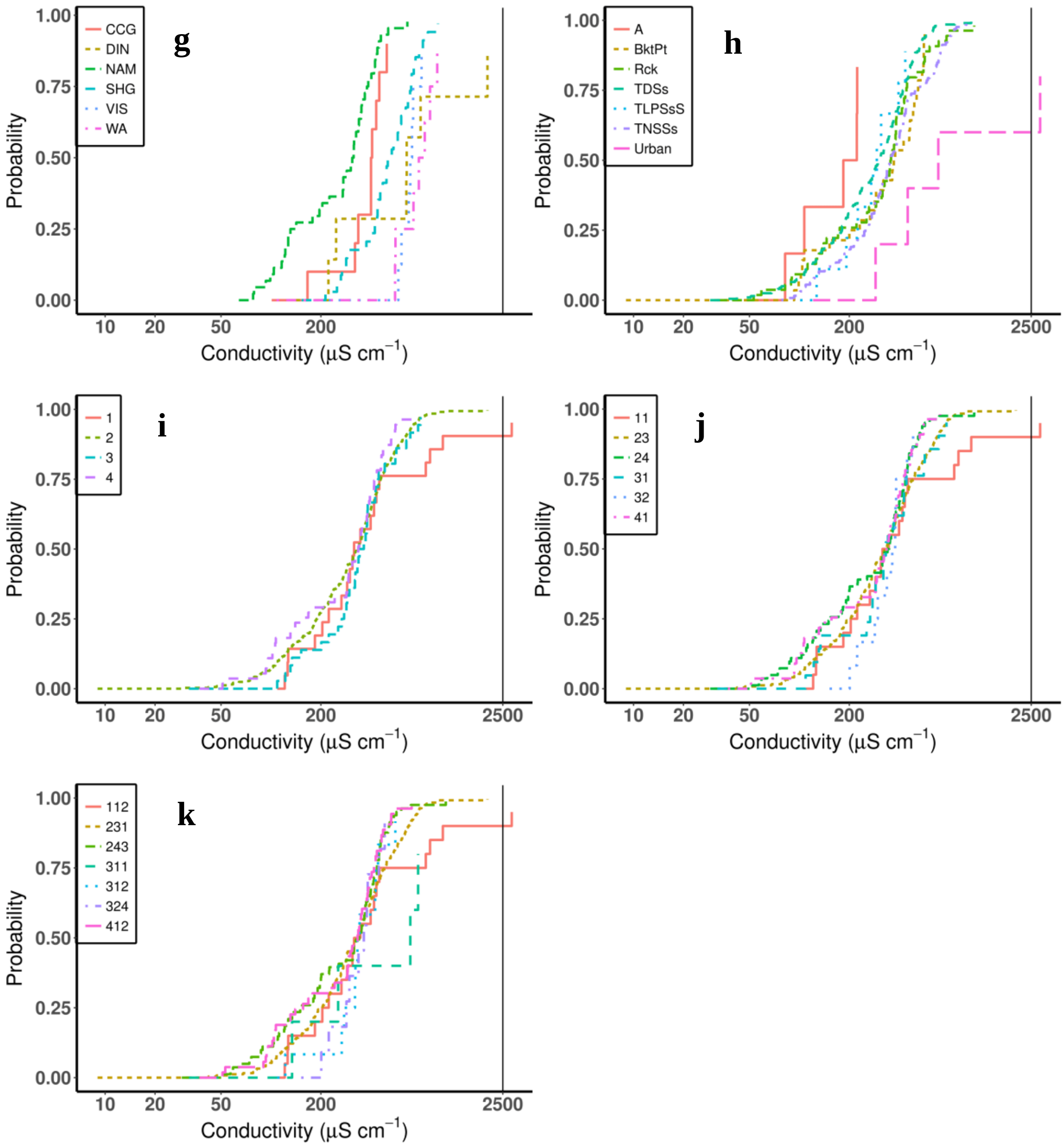

Fig. S10. *(continued).*

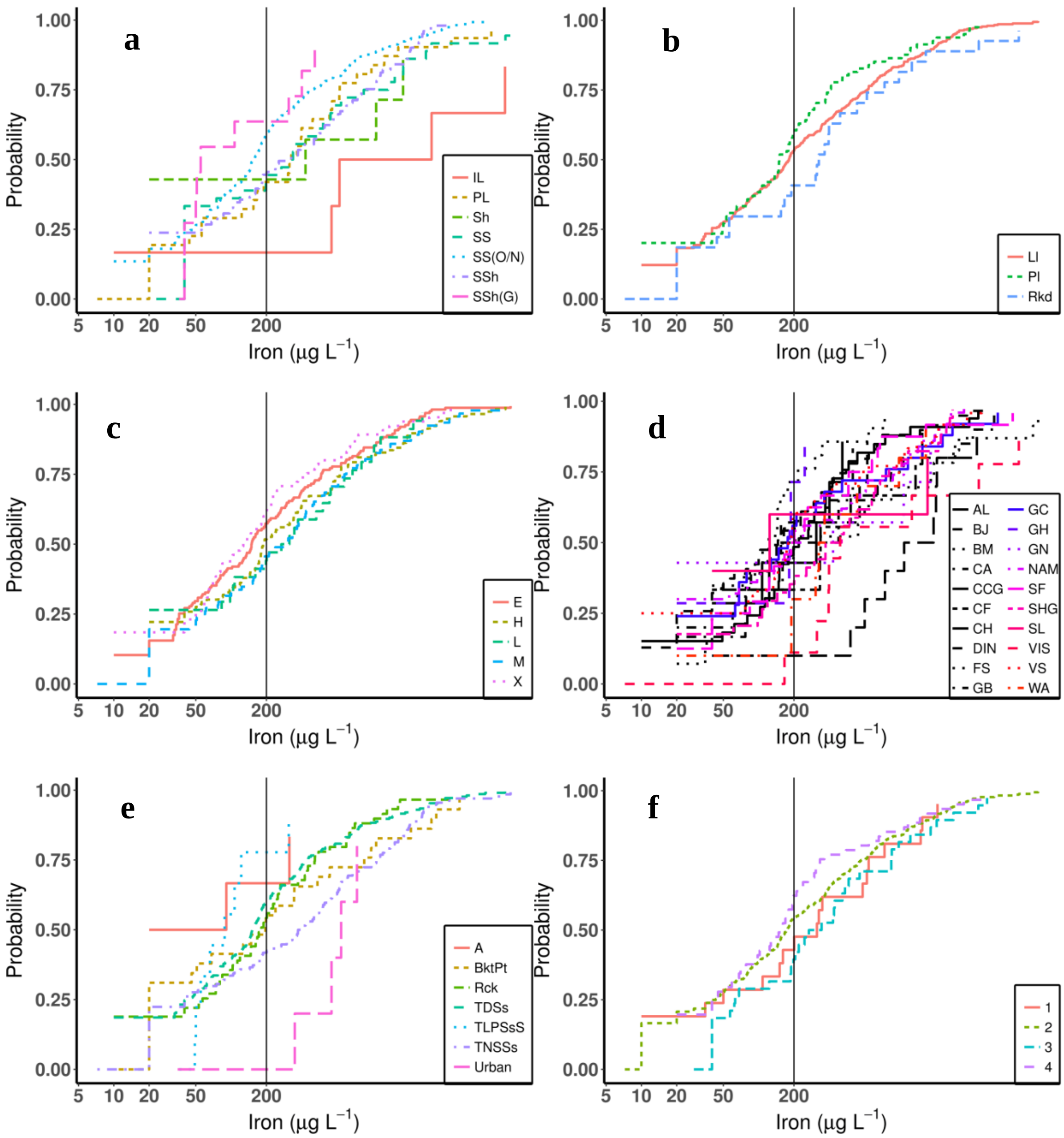

Fig. S11. ECDF plot displaying the empirical distribution function of iron in relation to (**a**) rock type, (**b**) aquifer, (**c**) groundwater vulnerability, (**d**) rock, (**e**) quaternary, (**f**) CORINE(L1), (**g**) CORINE(L2), and (**h**) CORINE(L3). The indicator parameter guide value of iron of 200 µg L^{-1} is represented as a black vertical line.

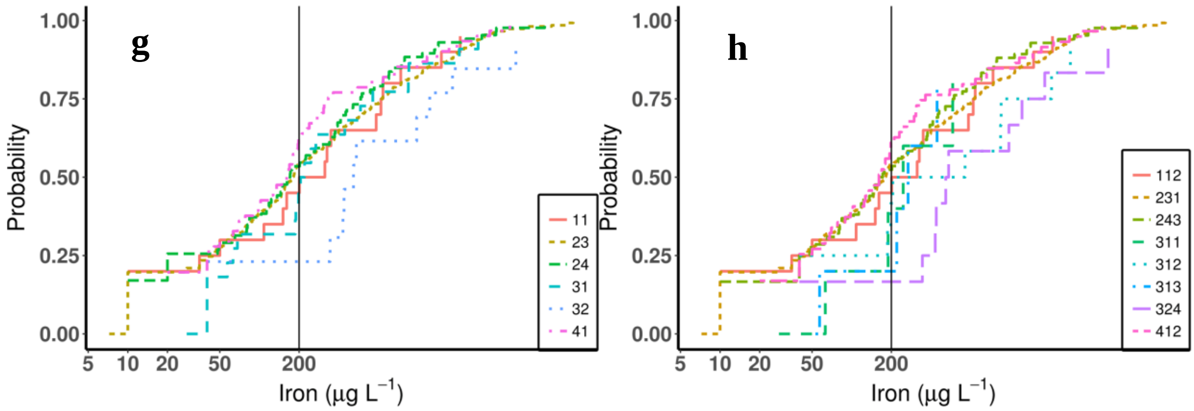

Fig. S11. *(continued).*

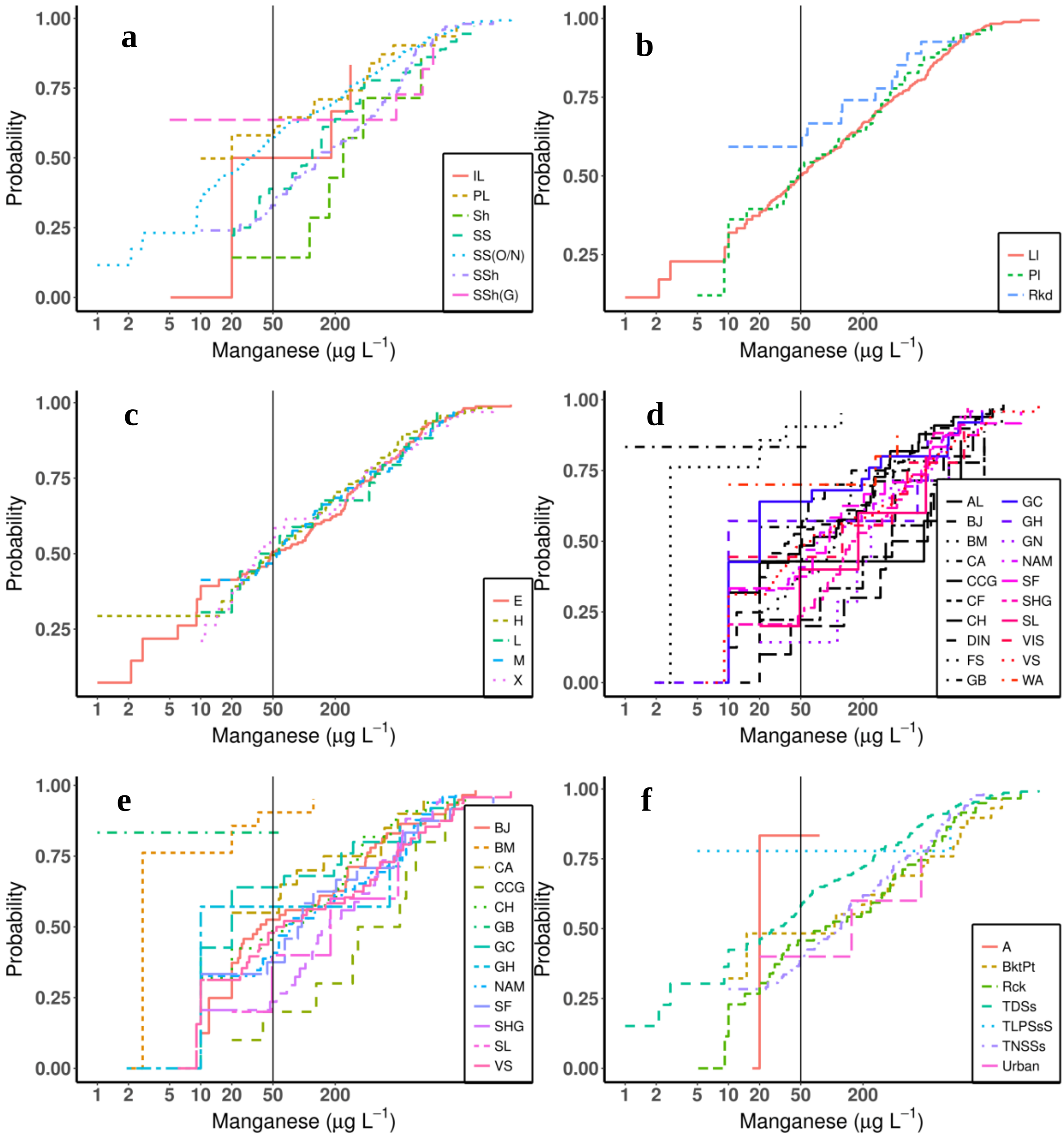

Fig. S12. ECDF plot displaying the empirical distribution function of manganese in relation to (**a**) rock type, (**b**) aquifer, (**c**) groundwater vulnerability, (**d**) rock, (e) rock (Sandstone (ORS/NRS) and Sandstone and Shale), (**f**) quaternary, (**g**) CORINE(L1), (**h**) CORINE(L2), and (**i**) CORINE(L3). The indicator parameter guide value of manganese of 50 μg L^{-1} is represented as a black vertical line.

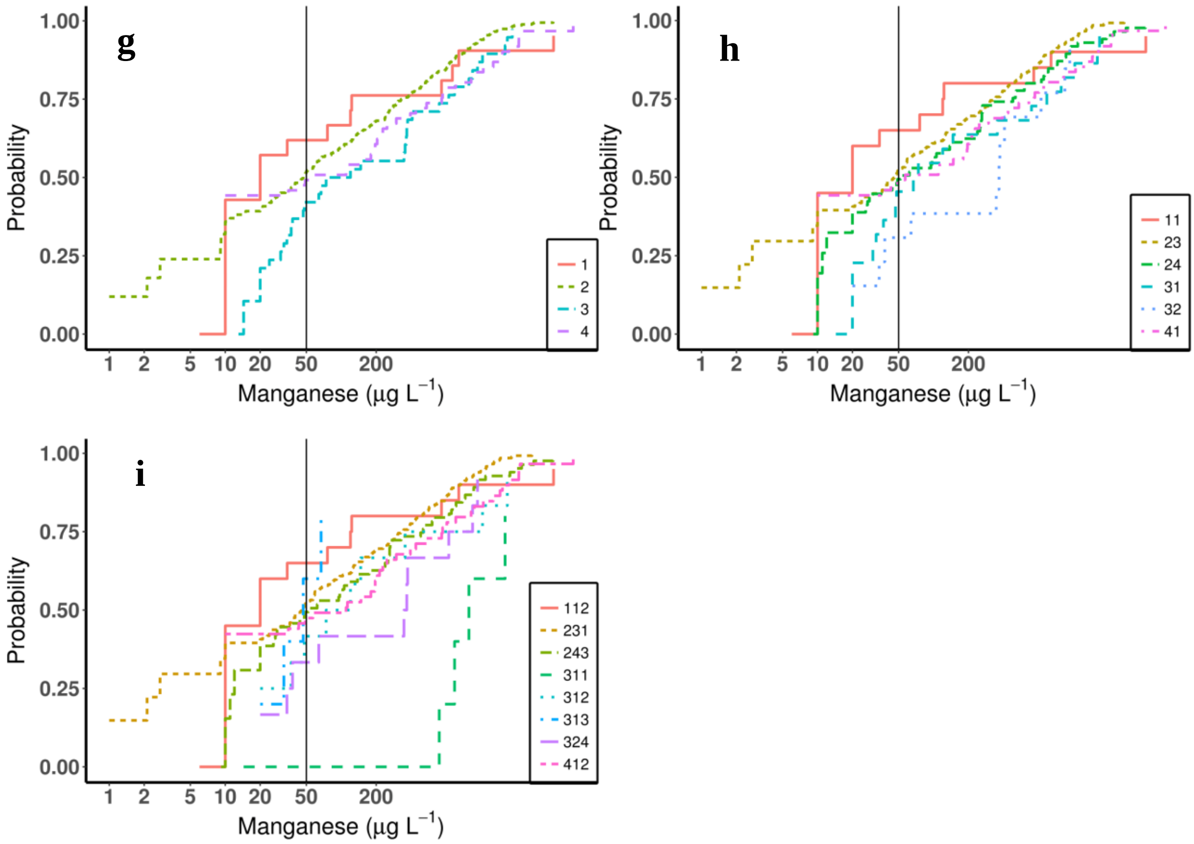

Fig. S12. *(continued).*

Text 2 – Sodium

Sodium ECDF plots for rock type, aquifer, vulnerability, rock, quaternary, CORINE (L1), CORINE (L2), and CORINE (L3) are illustrated in Fig. S13a-k (SI). The distributions of sodium concentrations differ across rock type ($p \approx 0.000$) with pairwise comparisons revealing differences between Pure Limestone and Sandstone ($p = 0.020$), between Pure Limestone and Sandstone (ORS/NRS) ($p \approx 0.000$), and between Pure Limestone and Sandstone/Shale ($p = 0.017$). Looking at rock groupings, there are differences in sodium ($p \approx 0.000$) with pairwise comparisons showing significant differences between BJ and GH ($p \approx 0.000$), BJ and SHG ($p \approx 0.000$), BJ and VIS ($p \approx 0.000$), BJ and WA ($p = 0.003$), GC and SHG ($p = 0.006$), GC and VIS ($p = 0.020$), GH and NAM ($p = 0.020$), NAM and SHG ($p \approx 0.000$), NAM and VIS ($p = 0.011$), and between NAM and WA ($p = 0.040$). The data also suggests differences across quaternary groupings ($p = 0.020$) with pairwise comparisons highlighting the comparison of TNSSs and TDSs in particular ($p = 0.011$).

Aquifer groupings display significant differences in sodium ($p \approx 0.000$) with pairwise comparisons showing differences between Rkd and Ll ($p \approx 0.000$) and between Rkd and Pl ($p = 0.001$). Regarding groundwater vulnerability groupings there is evidence that the distributions of sodium concentration differ ($p \approx 0.000$), pairwise comparisons show differences between L and E ($p = 0.000$), L and H ($p = 0.007$), L and M ($p = 0.002$), and between L and X ($p = 0.008$).

The distribution of sodium concentrations differ across the CORINE (L1) groupings ($p = 0.017$), with pairwise comparisons showing one pair having significant difference, Artificial Surfaces and Wetlands ($p = 0.048$). CORINE (L2) groupings display differences in the global test ($p = 0.006$) however no differences existed between the groups applying pairwise testing. CORINE (L3) groupings also show statistical significance in the global test ($p = 0.011$) but no statistical significance between any pair when applying pairwise comparisons with correction for multiple testing.

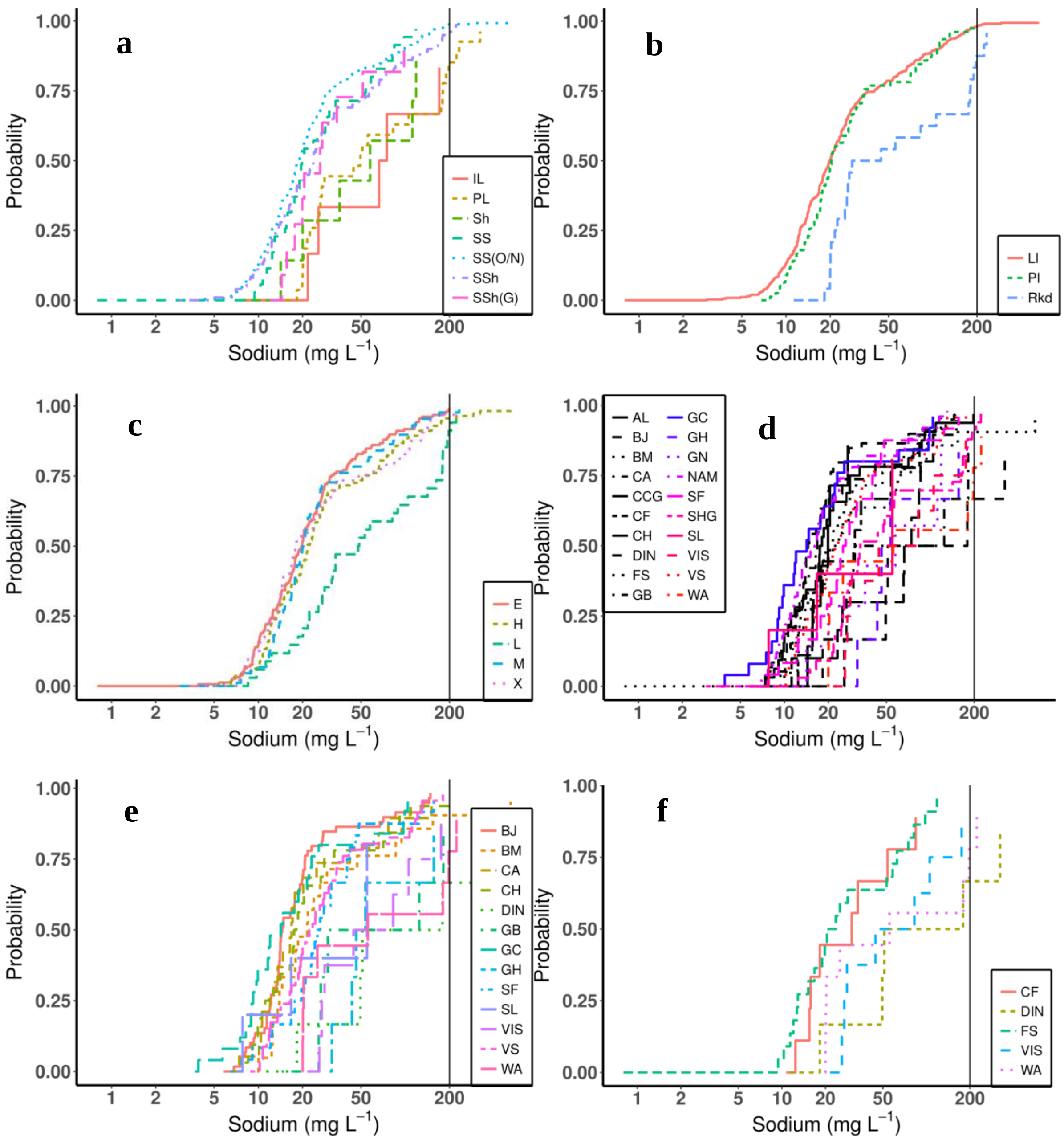

Fig. S13. ECDF plot displaying the empirical distribution function of sodium in relation to (**a**) rock type, (**b**) aquifer, (**c**) groundwater vulnerability, (**d**) rock, (**e**) rock (Pure Limestone and Sandstone (ORS/NRS)), (**f**) rock (Pure Limestone and Sandstone), (**g**) rock (Pure Limestone and Sandstone and Shale), (**h**) quaternary, (**i**) CORINE(L1), (**j**) CORINE(L2), and (**k**) CORINE(L3). The indicator parameter value of sodium of 200 mg L^{-1} is represented as a black vertical line.

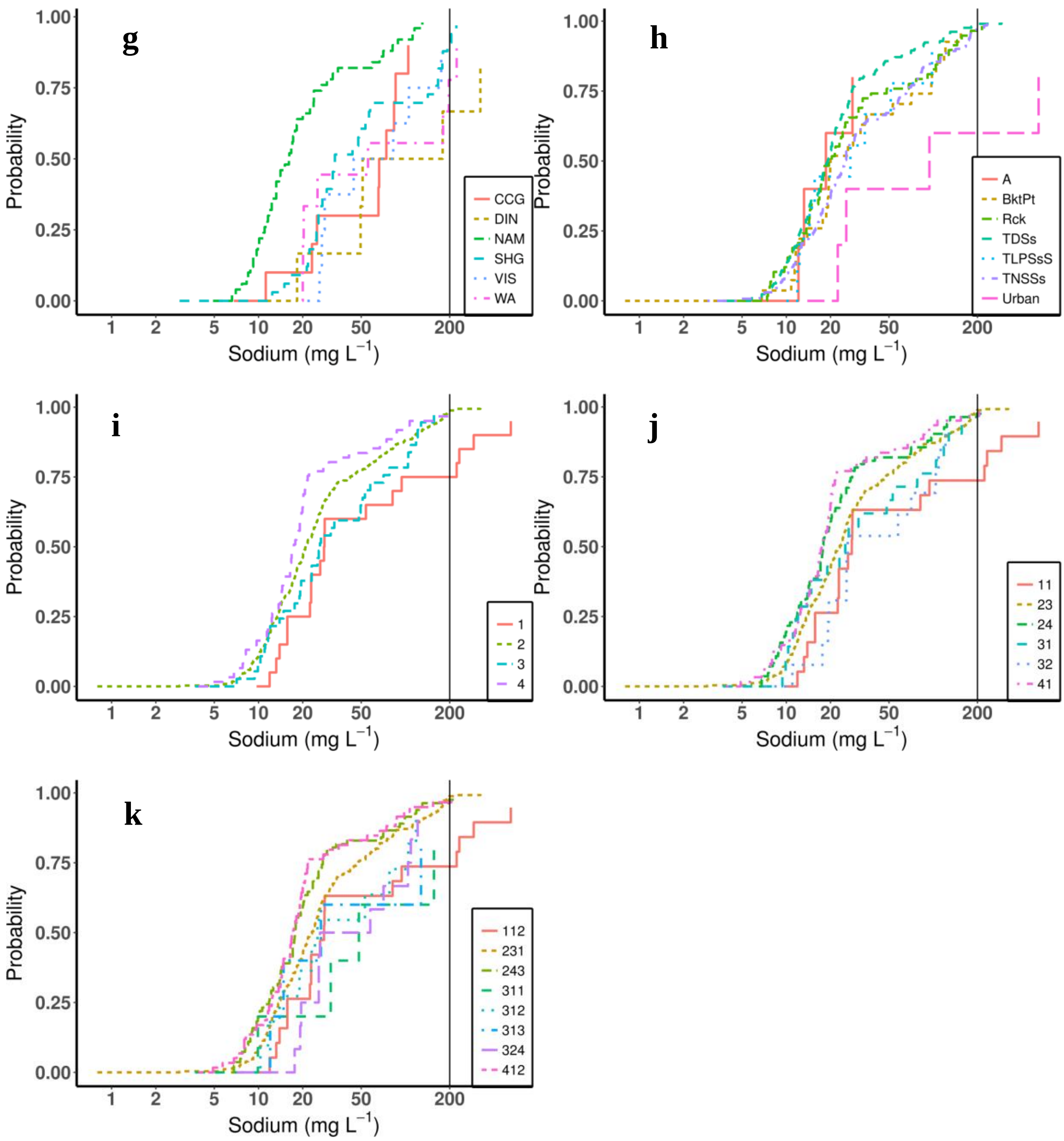

Fig. S13. *(continued).*

Text 3 – Potassium

Potassium ECDF plots for rock type, aquifer, vulnerability, rock, quaternary, CORINE (L1), CORINE (L2), and CORINE (L3) are illustrated in Fig. S14a-l (SI). Potassium concentrations display significant differences across rock types ($p \approx 0.000$) with pairwise comparisons indicating differences between Pure Limestone and Sandstone ($p = 0.013$), Pure Limestone and Sandstone (ORS/NRS) ($p \approx 0.000$), Pure Limestone and Sandstone/Shale ($p = 0.008$), and between Sandstone/Shale and Sandstone (ORS/NRS) ($p \approx 0.000$). The distributions of potassium differs across the rock groupings ($p \approx 0.000$) with pairwise comparisons specifying differences between the groups of BJ and GH ($p \approx 0.000$), BJ and SHG ($p = 0.001$), BJ and VIS ($p \approx 0.000$), BJ and WA ($p \approx 0.000$), BM and GH ($p = 0.012$), BM and VIS ($p = 0.004$), BM and WA ($p = 0.020$), CA and GH ($p = 0.002$), CA and VIS ($p \approx 0.000$), CA and WA ($p = 0.002$), CH and GN ($p \approx 0.000$), CH and VIS ($p \approx 0.000$), CH and WA ($p \approx 0.000$), FS and GH ($p = 0.004$), FS and VIS ($p = 0.030$), GC and GH ($p = 0.001$), GC and SHG ($p = 0.022$), GC and VIS ($p = 0.003$), GC and WA ($p = 0.002$), GH and NAM ($p = 0.036$), GH and SF ($p = 0.004$), GH and VS ($p = 0.003$), NAM and VIS ($p = 0.018$), SF and VIS ($p = 0.002$), SF and WA ($p = 0.024$), VIS and VS ($p = 0.002$), and VS and WA ($p = 0.040$). For quaternary groupings the distributions of potassium concentrations differ ($p \approx 0.000$) with pairwise comparisons indicating differences between the groups of TNSSs and Rck ($p = 0.040$) and between TNSSs and TDSs ($p \approx 0.000$).

The observations provide evidence that the distribution of potassium concentrations differ across aquifer groupings ($p \approx 0.000$) with pairwise comparisons showing differences between Rkd and Ll ($p \approx 0.000$) and between Rkd and Pl ($p \approx 0.000$). The distributions of potassium differs across groundwater vulnerability groupings ($p = 0.005$) with pairwise comparisons revealing differences between E and X ($p = 0.040$), between L and X ($p = 0.008$), and between M and X ($p = 0.008$).

Each of three CORINE groupings show statistical significant differences in potassium concentrations. Pairwise comparisons within CORINE (L1) categorisation show differences between the groups Artificial Surfaces and Wetlands ($p \approx 0.000$) and between Agricultural Areas and Wetlands ($p = 0.020$). Pairwise comparisons within CORINE (L2) groupings also show differences between the groups Urban Fabric and Heterogeneous Agricultural Areas ($p = 0.0030$), Urban Fabric and Inland Wetlands ($p \approx 0.000$), Pastures and Heterogeneous Agricultural Areas ($p = 0.002$), and between Pastures and Inland Wetlands ($p = 0.002$). For CORINE (L3) categorisation pairwise comparisons specified differences between the groups Discontinuous Urban Fabric and Land Principally Occupied by Agriculture ($p = 0.004$), Discontinuous Urban Fabric and Peat Bogs ($p \approx 0.000$), Pastures and Land Principally Occupied by Agriculture ($p = 0.003$), and between Pastures and Peat Bogs ($p = 0.002$).

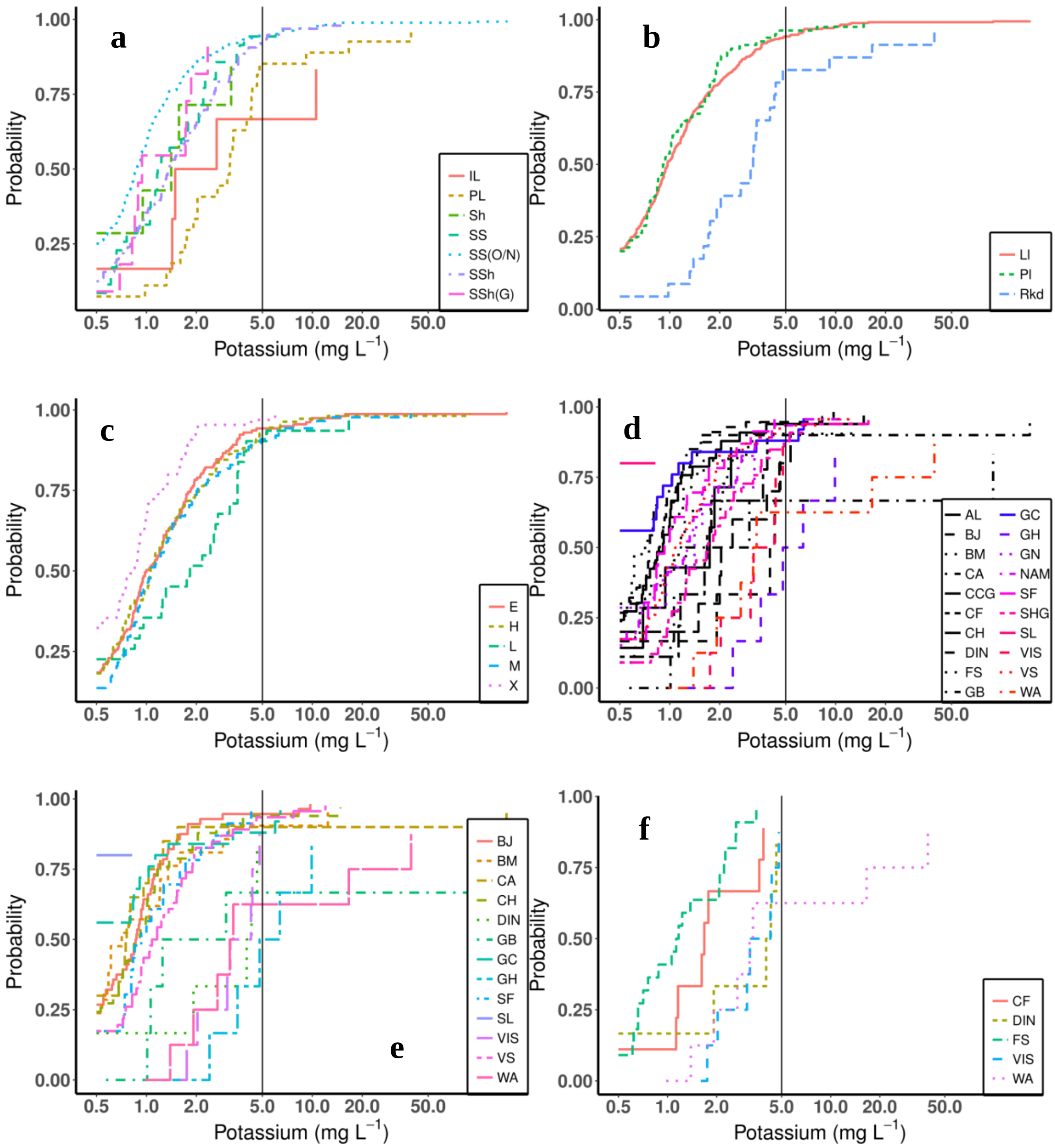

Fig. S14. ECDF plot displaying the empirical distribution function of potassium in relation to (**a**) rock type, (**b**) aquifer, (**c**) groundwater vulnerability, (**d**) rock, (**e**) rock (Pure Limestone and Sandstone (ORS/NRS)), (**f**) rock (Pure Limestone and Sandstone), (**g**) rock (Pure Limestone and Sandstone and Shale), (**h**) rock (Sandstone (ORS/NRS) and Sandstone), (**i**) quaternary, (**j**) CORINE(L1), (**k**) CORINE(L2), and (**l**) CORINE(L3). The interim guideline value of potassium of 5 mg L^{-1} is represented as a black vertical line.

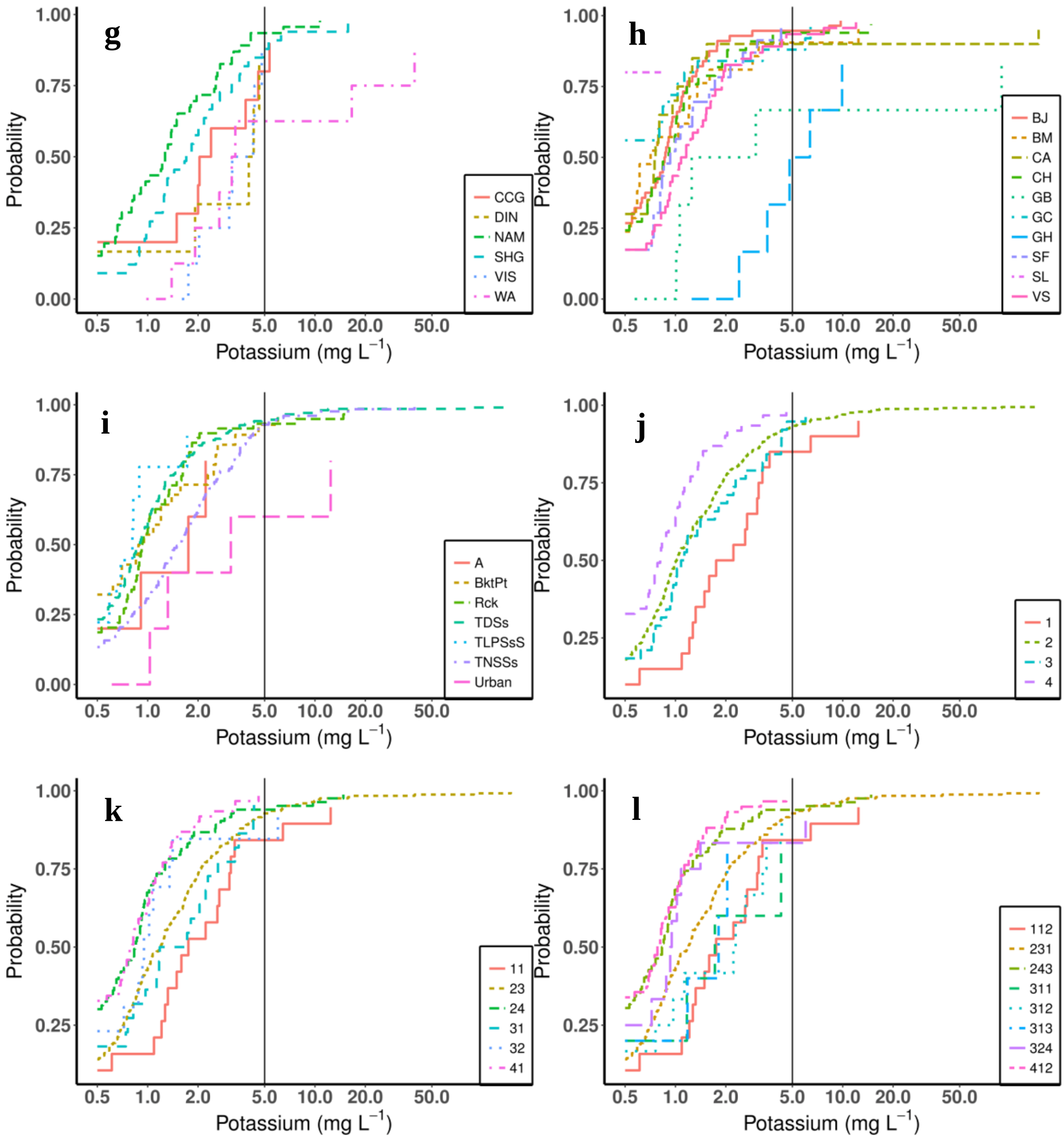

Fig. S14. *(continued).*

Text 4 – Calcium

Calcium ECDF plots for rock type, aquifer, vulnerability, rock, quaternary, CORINE (L1), CORINE (L2), and CORINE (L3) are presented in Fig. S15a-k (SI). The distributions of calcium concentration differ across rock type ($p \approx 0.000$) with pairwise comparisons indicating differences between Pure Limestone and Sandstone ($p \approx 0.000$), Pure Limestone and Sandstone (ORS/NRS) ($p \approx 0.000$), and between Pure Limestone and Sandstone/Shale ($p \approx 0.000$). For rock type grouping the calcium concentration distributions differ ($p \approx 0.000$) with pairwise comparisons showing differences between groups BJ and VIS ($p \approx 0.000$), BJ and WA ($p \approx 0.000$), CH and VIS ($p = 0.041$), CH and WA ($p = 0.044$), GC and VIS ($p = 0.006$), GC and WA ($p = 0.023$), GH and NAM ($p \approx 0.000$), NAM and SHG ($p = 0.005$), NAM and VIS ($p = 0.002$), NAM and WA ($p = 0.003$), SF and VIS ($p = 0.015$), VIS and VS ($p = 0.007$), and between VS and WA ($p = 0.006$). The observations provide no evidence that the distributions of calcium concentration differ across quaternary groupings.

The distributions of calcium concentration differ across aquifer groupings ($p \approx 0.000$) with pairwise comparisons showing differences between Rkd and Ll ($p \approx 0.000$) and between Rkd and Pl ($p \approx 0.000$). Groundwater vulnerability groupings also display differences in calcium concentrations ($p = 0.006$) with pairwise comparisons showing a difference exists between E and M ($p = 0.034$).

No differences in the distribution of calcium concentration across CORINE (L1), CORINE (L2), and CORINE (L3) groupings were observed.

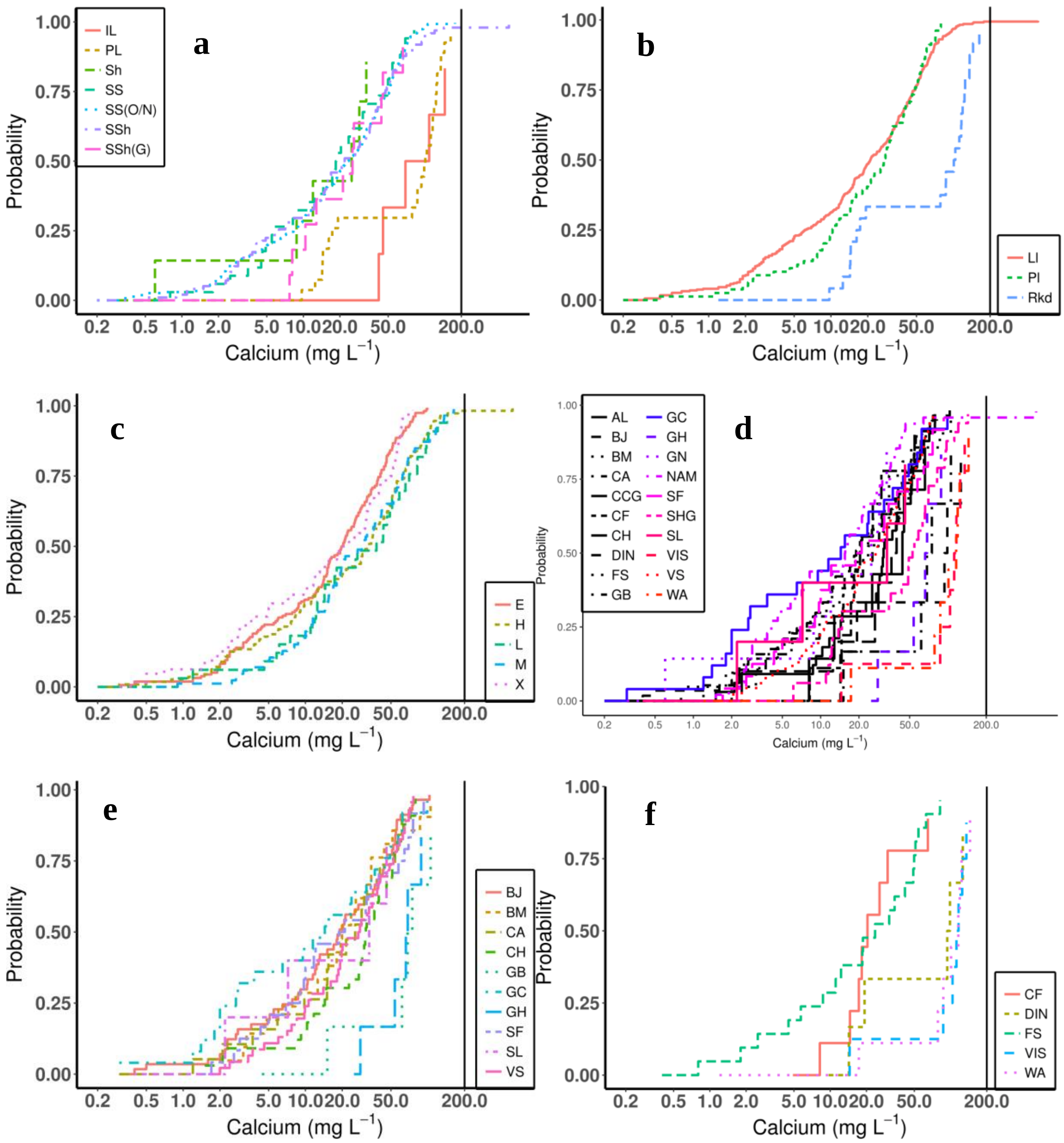

Fig. S15. ECDF plot displaying the empirical distribution function of calcium in relation to (**a**) rock type, (**b**) aquifer, (**c**) groundwater vulnerability, (**d**) rock, (**e**) rock (Pure Limestone and Sandstone (ORS/NRS)), (**f**) rock (Pure Limestone and Sandstone), (**g**) rock (Pure Limestone and Sandstone and Shale), (**h**) quaternary, (**i**) CORINE(L1), (**j**) CORINE(L2), and (**k**) CORINE(L3). The interim guideline value of calcium of 200 mg L^{-1} is represented as a black vertical line.

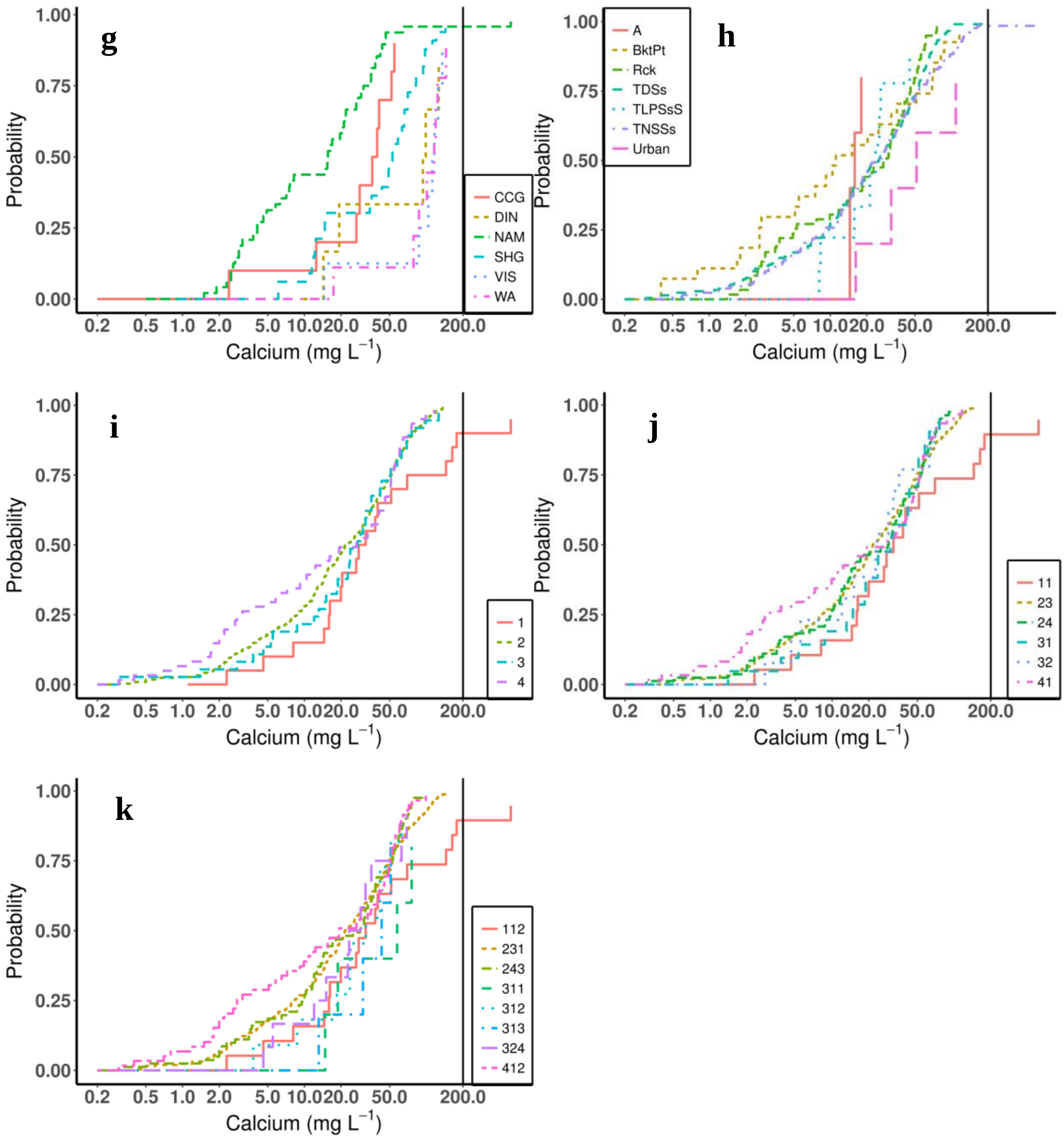

Fig. S15. *(continued).*

Text 5 – Magnesium

Magnesium ECDF plots for rock type, aquifer, vulnerability, rock, quaternary, CORINE (L1), CORINE (L2), and CORINE (L3) are illustrated in Fig. S16a-i (SI). The distribution of magnesium concentrations differ across rock type ($p \approx 0.000$) with pairwise comparisons indicating differences between Sandstone (ORS/NRS) and Sandstone/Shale ($p \approx 0.000$). Considering rock groupings, there is evidence of differences ($p \approx 0.000$) with pairwise comparisons showing differences between the groups CCG and SF ($p = 0.011$), CCG and VS ($p = 0.038$), CF and SF ($p \approx 0.000$), CF and VS (p 0.002), SF and SHG ($p = 0.010$), and between SHG and VS ($p = 0.002$). Quaternary groupings display significant differences ($p \approx 0.000$) with pairwise comparisons showing differences between TNSSs and Rck ($p = 0.041$) and between TNSSs and TDSs ($p \approx 0.000$).

The observations provide no evidence of a difference in the distribution of magnesium concentrations in relation to aquifer groupings, but suggest a difference across groundwater vulnerability groupings ($p = 0.009$). Pairwise comparisons found differences between X and H ($p = 0.032$), and between X and M ($p = 0.044$).

The distribution of magnesium concentrations did not differ across the CORINE groupings.

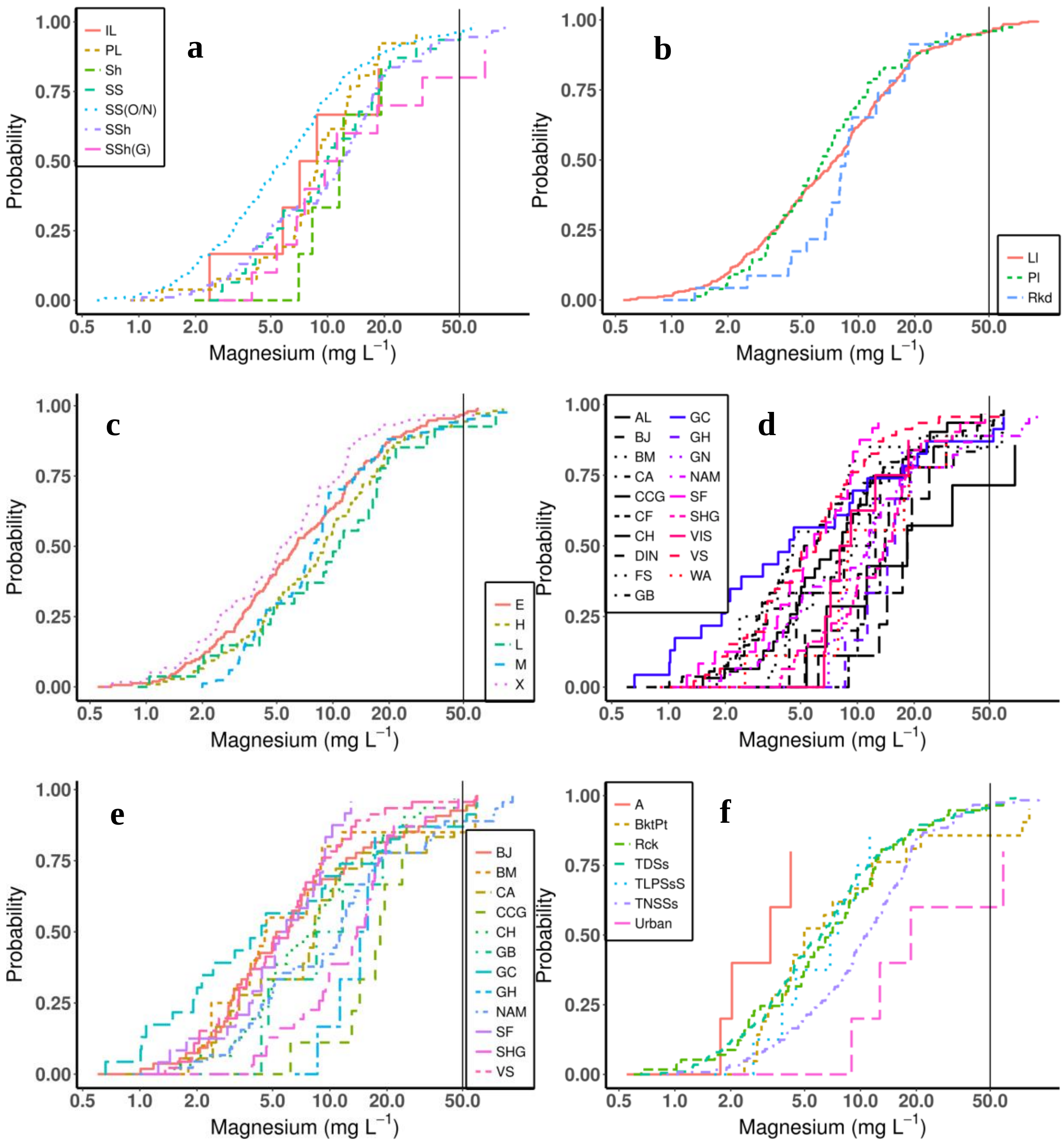

Fig. S16. ECDF plot displaying the empirical distribution function of magnesium in relation to (**a**) rock type, (**b**) aquifer, (**c**) groundwater vulnerability, (**d**) rock, (**e**) rock (Sandstone (ORS/NRS) and Sandstone and Shale), (**f**) quaternary, (**g**) CORINE(L1), (**h**) CORINE(L2), and (**i**) CORINE(L3). The interim guideline value of magnesium of 50 mg L^{-1} is represented as a black vertical line.

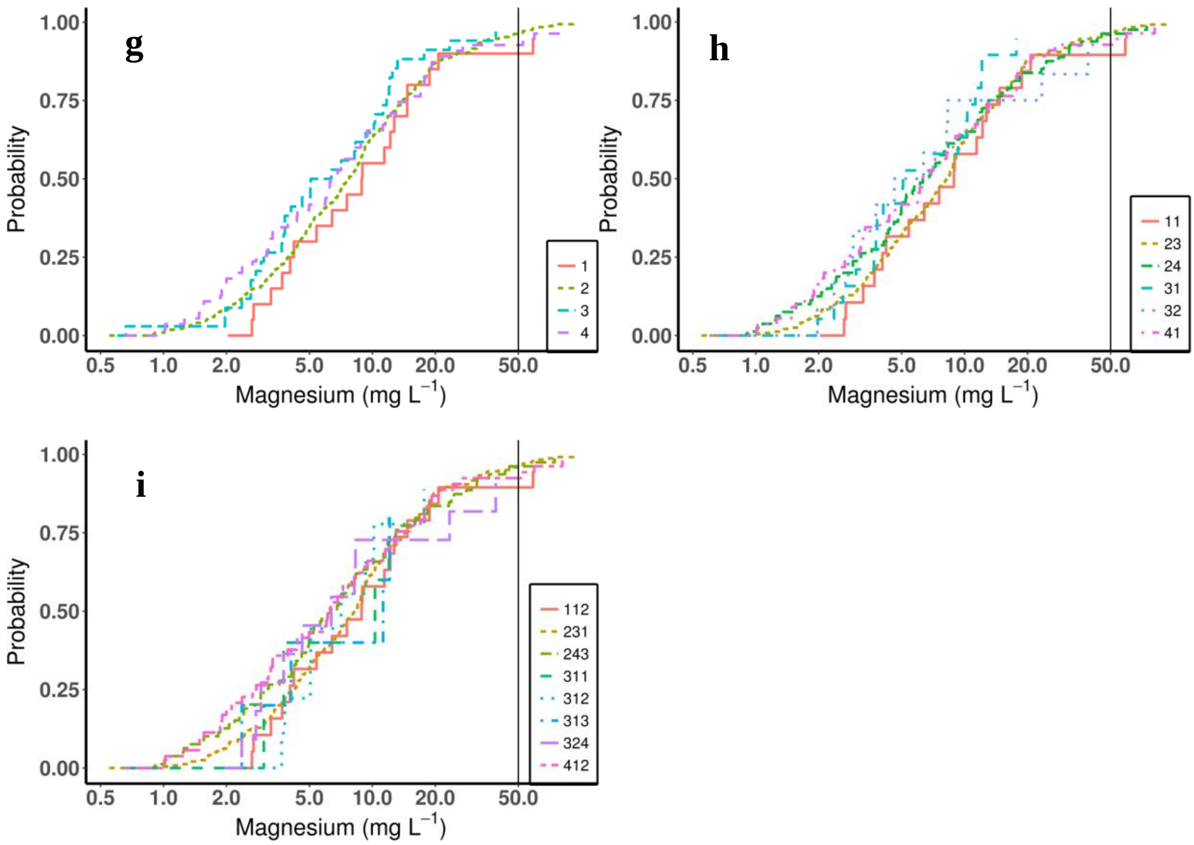

Fig. S16. *(continued).*

Text 6 – Total Hardness

Total hardness ECDF plots for rock type, aquifer, vulnerability, rock, quaternary, CORINE (L1), CORINE (L2), and CORINE (L3) are given in Fig. S17a-j (SI). Distributions of hardness concentration across rock type were significantly different ($p = 0.003$) and pairwise comparisons indicated differences in particular between Sandstone (ORS/NRS) and Sandstone/Shale ($p = 0.049$). Looking across the categories of there is evidence of a difference in hardness concentration ($p \approx 0.000$) with pairwise comparisons showing differences between the groups BJ and SHG ($p = 0.025$), FS and SHG ($p = 0.041$), and between SHG and VS (p 0.049). The observations give no evidence to suggest the distribution of hardness concentrations differ in quaternary groupings.

For aquifer groupings the distributions of hardness concentrations differ ($p = 0.040$) with pairwise comparisons showing differences between groups Rkd and Ll ($p = 0.046$). The observations provided no evidence of differences in the distribution of hardness concentration across groundwater vulnerability groupings.

The distribution of hardness concentrations did not differ across the CORINE groupings, however pairwise comparisons indicated differences between CORINE (L1) groups Artificial Surfaces and Agricultural Areas ($p = 0.013$), Artificial Surfaces and Forests and Seminatural Areas ($p = 0.006$), and between Artificial Surfaces and Wetlands ($p = 0.042$).

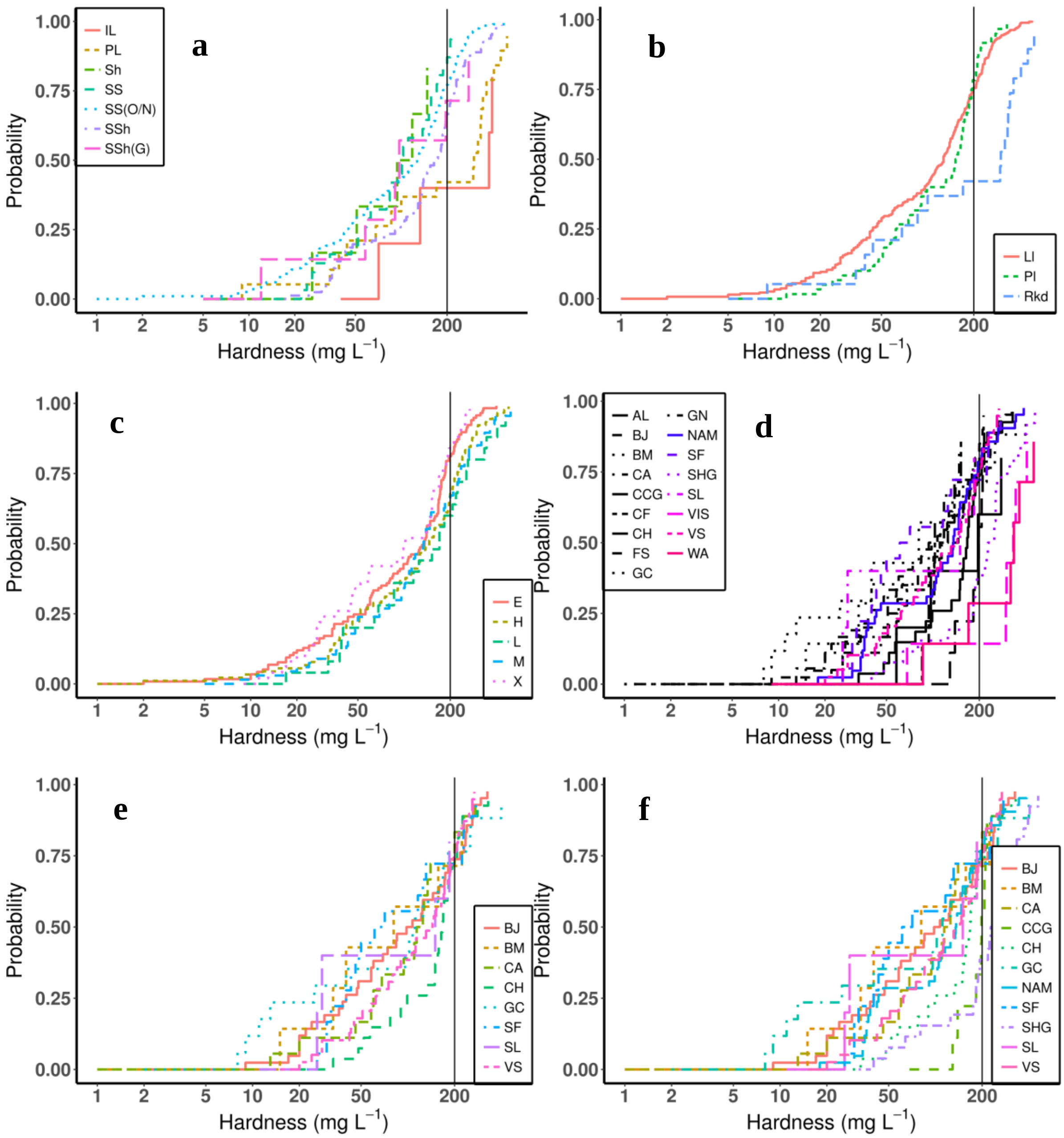

Fig. S17. ECDF plot displaying the empirical distribution function of total hardness in relation to (**a**) rock type, (**b**) aquifer, (**c**) groundwater vulnerability, (**d**) rock, (**e**) rock (Sandstone (ORS/NRS) and Sandstone), (**f**) rock (Sandstone (ORS/NRS) and Sandstone and Shale), (**g**) quaternary, (**h**) CORINE(L1), (**i**) CORINE(L2), and (**j**) CORINE(L3). The interim guideline value of total hardness 200 mg L^{-1} is represented as a black vertical line.

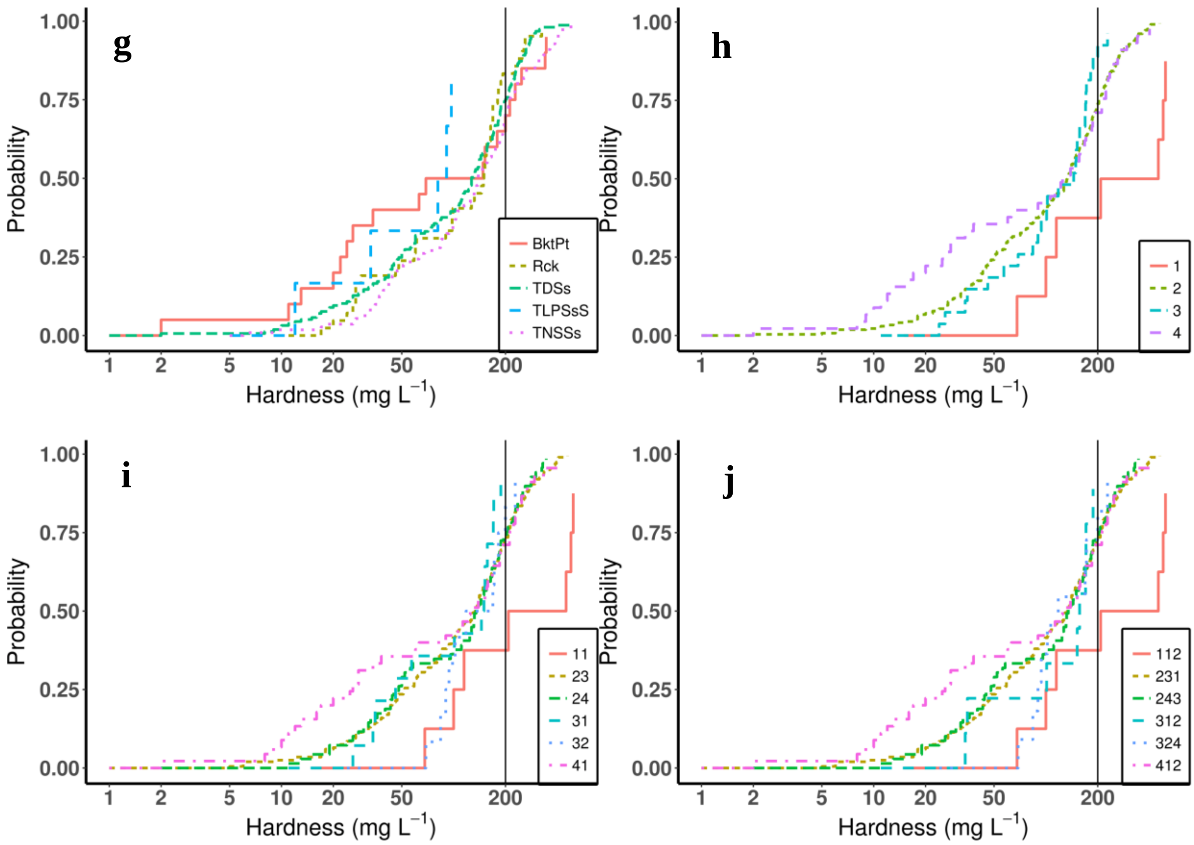

Fig. S17. *(continued).*

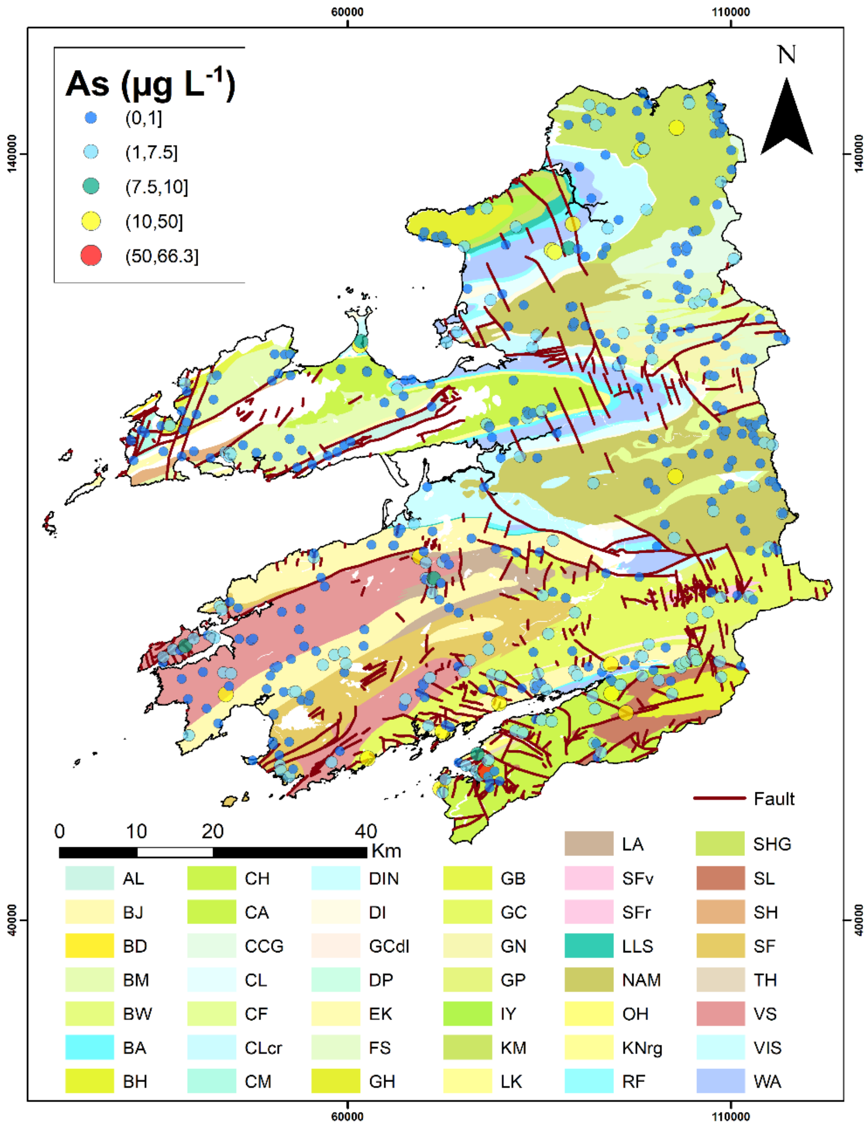

Fig. S18. Spatial distribution of arsenic in groundwater divided into five intervals overlain on the rock geology (1:100,000) map. Please refer to Fig. S4 for legend descriptions.

Table S16

Site (KY_410; Rosdohan, south Kerry) with elevated copper (E:72385.8; N: 64639.7).

Date	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH	Cu	Zn
	µg L^{-1}	pH units	µS cm^{-1}	µg L^{-1}	µg L^{-1}	µg L^{-1}	mg L^{-1}	mg L^{-1}	mg L^{-1}	mg L^{-1}	µg L^{-1}	µg L^{-1}
01/11/2006	2.8	8.6	418	< 10	< 5	ND	3.16	25.5	ND	ND	136	ND
03/04/2008	9.47	ND	ND	166	< 20	21.2	0.71	43.2	10.57	ND	<25	< 20
28/05/2008	12.9	7.7	405	112	< 10	22.5	0.64	41.6	10.88	173	143	32
16/07/2008	9.8	ND	ND	65	20	22.3	1.42	41.6	10.34	ND	<25	106
16/07/2008	10.7	ND	ND	94	< 10	21.9	0.63	44	10.32	ND	1904	44
16/07/2008	19.1	ND	ND	132	< 10	19.8	0.55	40	9.39	ND	57	18
16/07/2008	12.3	ND	ND	24	40	21.4	0.61	43.1	10.22	ND	<25	23
16/07/2008	14.5	ND	ND	27	26	20.8	0.59	43.4	9.89	ND	<25	26
16/07/2008	11.2	ND	ND	89	< 10	21	0.64	45.9	9.87	ND	<25	< 15
16/07/2008	10.8	ND	ND	82	< 10	21.7	0.61	44.1	10.34	ND	25	< 15
21/04/2009	2.3	7.4	383	258	203	22.2	0.72	44.6	12.53	165	<25	38
08/05/2009	1.6	ND	359	225	15	22.7	0.83	44.2	13.02	ND	<25	44
08/05/2009	< 1	ND	354	194	< 10	21.8	0.74	42.1	12.26	ND	<25	55
14/10/2009	6.62	7	415	254	516	17.8	0.79	43.8	15.04	176	<25	< 20
21/10/2009	5.23	7.2	345	392	142	17.5	0.76	43	13.74	187	<25	< 20
26/01/2010	14.7	7.3	376	< 20	10	22	ND	47.5	13.92	158	<25	< 15
10/05/2010	3.044	7.3	355	91	< 10	23.7	0.86	47.1	12.92	ND	33	16
21/02/2012	1.19	7.4	338	< 20	< 20	23.3	0.82	44.5	11.09	ND	<25	< 20

* ND = not determined

Table S17

Site (KY_434; Slaheny, east Kerry) with elevated copper (E: 100598.9; N: 71364.4).

Date	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH	Cu	Zn
	µg L^{-1}	pH units	µS cm^{-1}	µg L^{-1}	µg L^{-1}	µg L^{-1}	mg L^{-1}	mg L^{-1}	mg L^{-1}	mg L^{-1}	µg L^{-1}	µg L^{-1}
18/12/2008	5.8	7.5	378	124	180	5.4	0.82	14.4	18.39	183	2827	1810
22/02/2012	<1	7.4	369	< 40	< 20	16.7	0.62	46	17.47	185	<25	< 20

Table S18

Site (KY_410; Killorglin 048A, west Kerry) with elevated copper (E: 70355.5; N: 96568.6).

Date	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH	Cu	Zn
	µg L^{-1}	pH units	µS cm^{-1}	µg L^{-1}	µg L^{-1}	µg L^{-1}	mg L^{-1}	mg L^{-1}	mg L^{-1}	mg L^{-1}	µg L^{-1}	µg L^{-1}
14-Sep-04	< 0.3	6.3	216	< 20	27	18.3	ND	ND	ND	ND	90	ND
05-Jul-05	0.23	6.2	210	71	16	17	ND	ND	ND	ND	63	ND
29-Nov-05	0.48	6.4	ND	< 20	31	15.3	ND	ND	ND	ND	36	ND
20-Mar-06	< 0.3	6	219	< 20	25	16.5	ND	ND	ND	ND	<25	ND
09-Oct-06	0.13	5.9	155	< 20	11	12.7	ND	11.8	ND	ND	155	ND
14-Dec-06	< 0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
29-Jan-07	< 1	6.1	159	56	< 20	12	1.4	10.4	2.87	ND	31	21
29-Jan-07	< 1	ND	ND	44	< 20	4.2	< 0.5	3.4	0.95	ND	2421	138
17-Apr-07	< 1	5.8	228	155	18	15	1.7	17.7	4.34	ND	6104	1990
17-Apr-07	< 1	6.2	232	129	50	14.7	4.02	18.2	4.36	ND	5466	110
17-Apr-07	< 1	5.9	208	69	< 10	14	1.45	16.4	4.06	ND	72	24
17-Apr-07	< 1	5.9	247	74	< 10	14.9	2.96	17.4	4.37	ND	15580	212
30-Apr-07	0.688	ND	213	69	< 10	15.1	1.48	19.3	ND	ND	1393	1615
23-Jul-07	< 1	7.1	54	< 40	< 20	6.9	< 0.5	1.7	1.32	ND	<12	< 20
17-Sep-07	< 0.5	6.8	46	39	5.92	5.7	0.52	1.3	1.05	ND	24	9.26
25-Oct-07	< 0.5	6.2	121	38	12	16	ND	7.8	3.91	34	21	< 15
03-Dec-07	< 0.12	6.4	66	32	< 10	6.4	< 0.5	3.3	1.41	ND	<25	< 15
26-May-08	0.121	7.8	66	< 20	< 10	6.5	< 0.5	2.6	1.16	ND	<25	< 15
10-Jun-08	< 1	6.5	86	55	< 20	8.1	1.02	6.5	1.6	ND	<12	< 20
18-Aug-08	< 1	6.3	197	130	< 20	15.2	1.41	17.2	4.06	ND	277	20
02-Dec-08	< 0.12	7	54	< 20	< 10	6.4	< 0.5	2.7	1.13	ND	<25	< 15

* ND = not determined

Table S19

Site (KY_273; Inchicorrigane West, east Kerry) with elevated copper (E: 102760.9; N: 97937.8).

Date	As	pH	Cond	Fe	Mn	Na	K	Ca	Mg	TH	Cu	Zn
	μg L^{-1}	pH units	μS cm^{-1}	μg L^{-1}	μg L^{-1}	μg L^{-1}	mg L^{-1}	mg L^{-1}	mg L^{-1}	mg L^{-1}	μg L^{-1}	μg L^{-1}
10-May-07	7.5	6.5	364	1013	1439	12.1	1.23	32.1	15.85	185	<25	< 20
14-Apr-08	14.7	6.6	387	1738	1684	14.5	1.21	36.1	17.66	208	142	21
13-May-08	5.3	6.6	383	666	1585	14.7	1.27	36.6	18.6	8	218	27
21-Oct-08	41.7	6.4	403	473	388	12.6	1.14	38.6	15.27	263	<25	23
07-Apr-09	2.4	6.4	426	200	< 20	18.2	10.71	41.9	18.79	171	<25	< 20

References

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