



Sewage-related contaminants in Isles of Scilly groundwater: concentrations, spatial distribution, sources and risk

Project ENVRESW001361

September 2016

Part 4 of 4

Figure 35: Unsaturated zone thicknesses (m)
measured Nov 2015 - Jan 2016

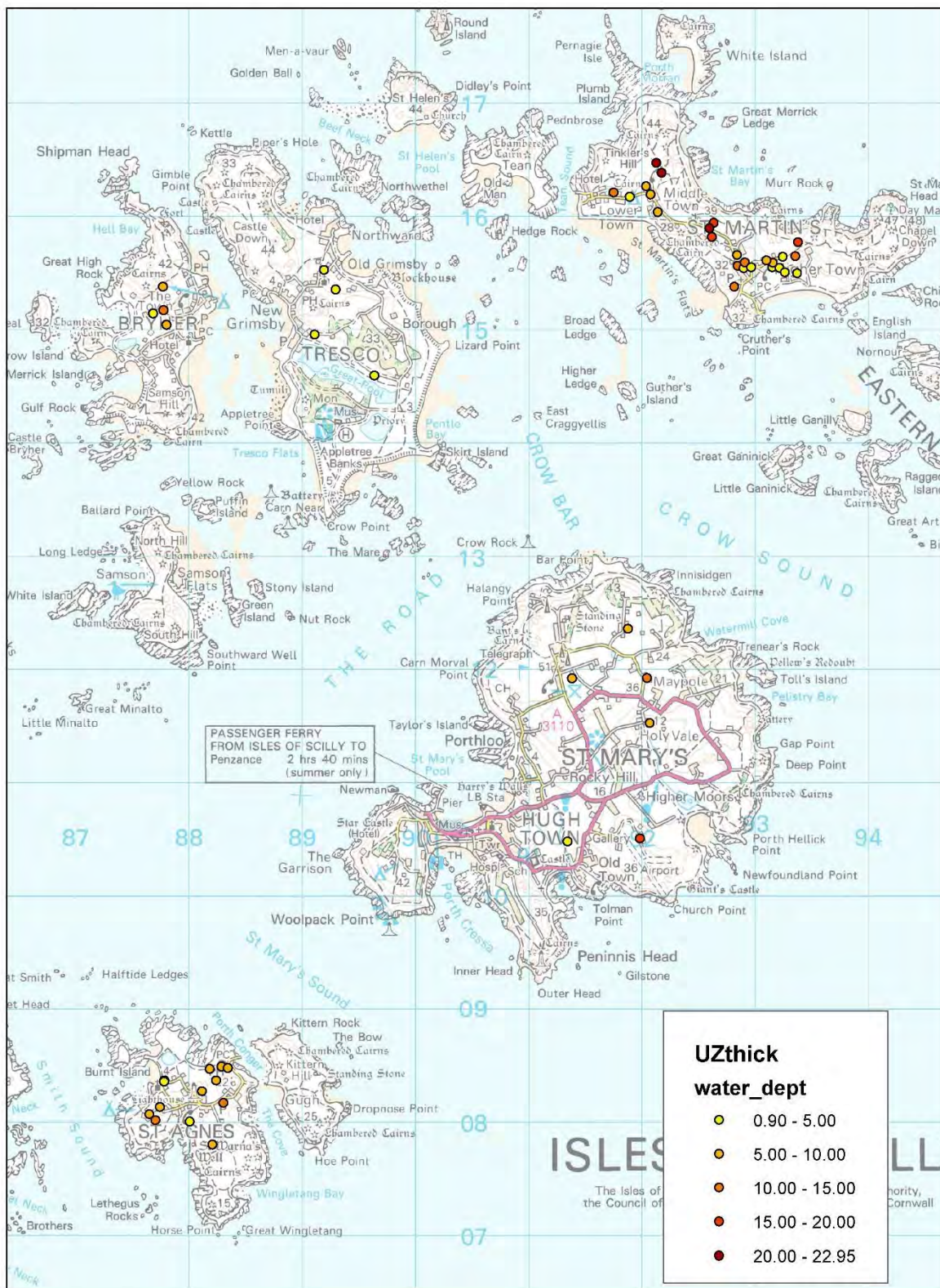


Figure 36: Isles of Scilly borehole depths (m)



Figure 37: Major ions water types recorded Nov 2015 - Jan 2016

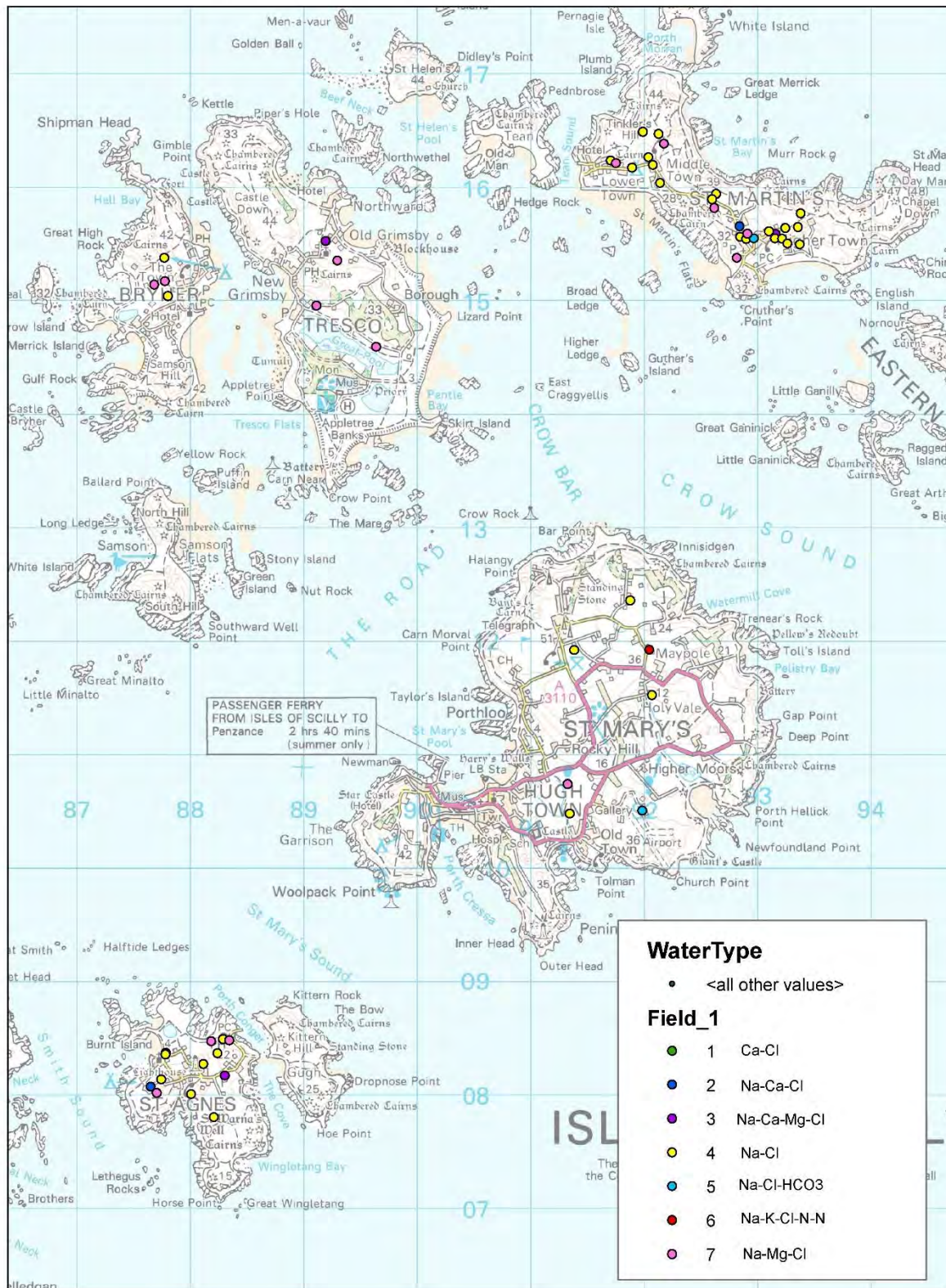


Figure 38: Piper Plot – Isles of Scilly groundwater data Nov 2015
– Jan 2016

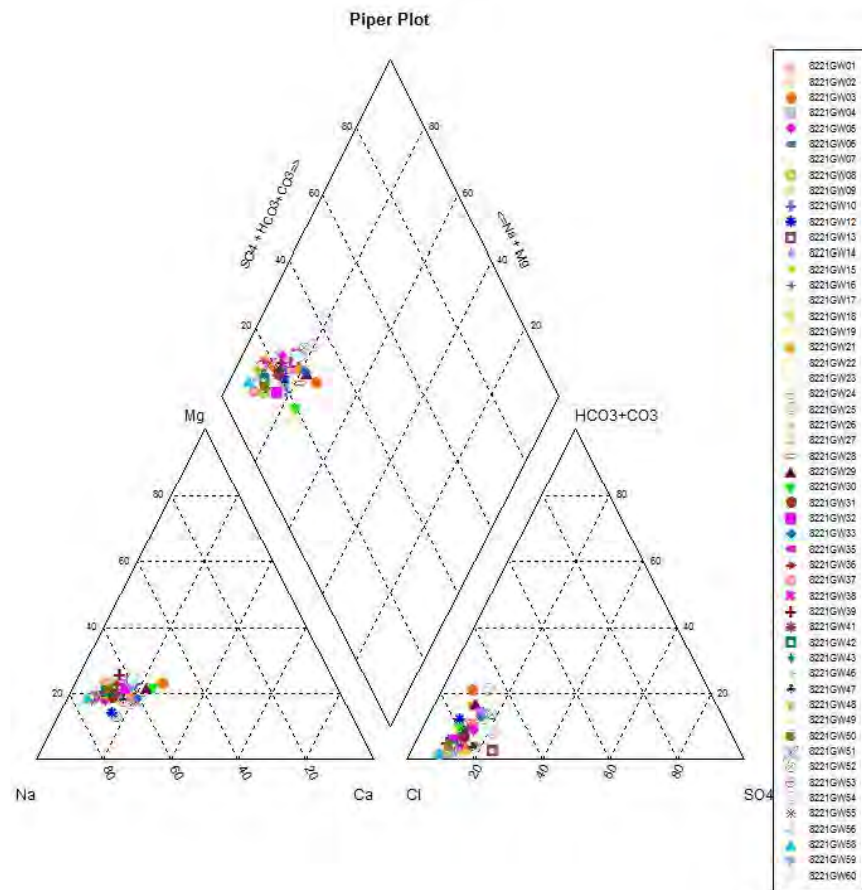


Figure 39: Isles of Scilly land use and nitrate concentrations (nitrate data from EA, IOS council and Duchy)

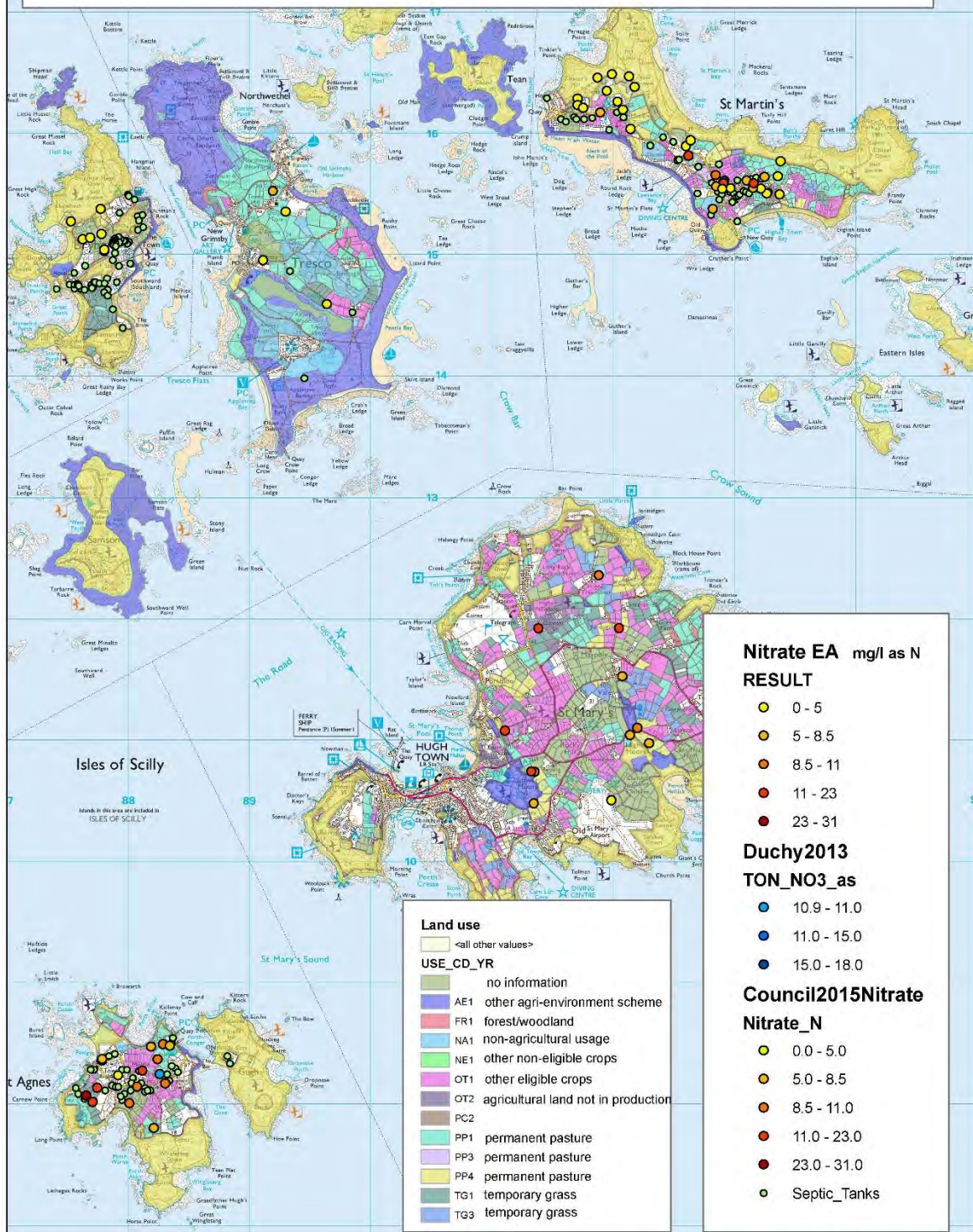
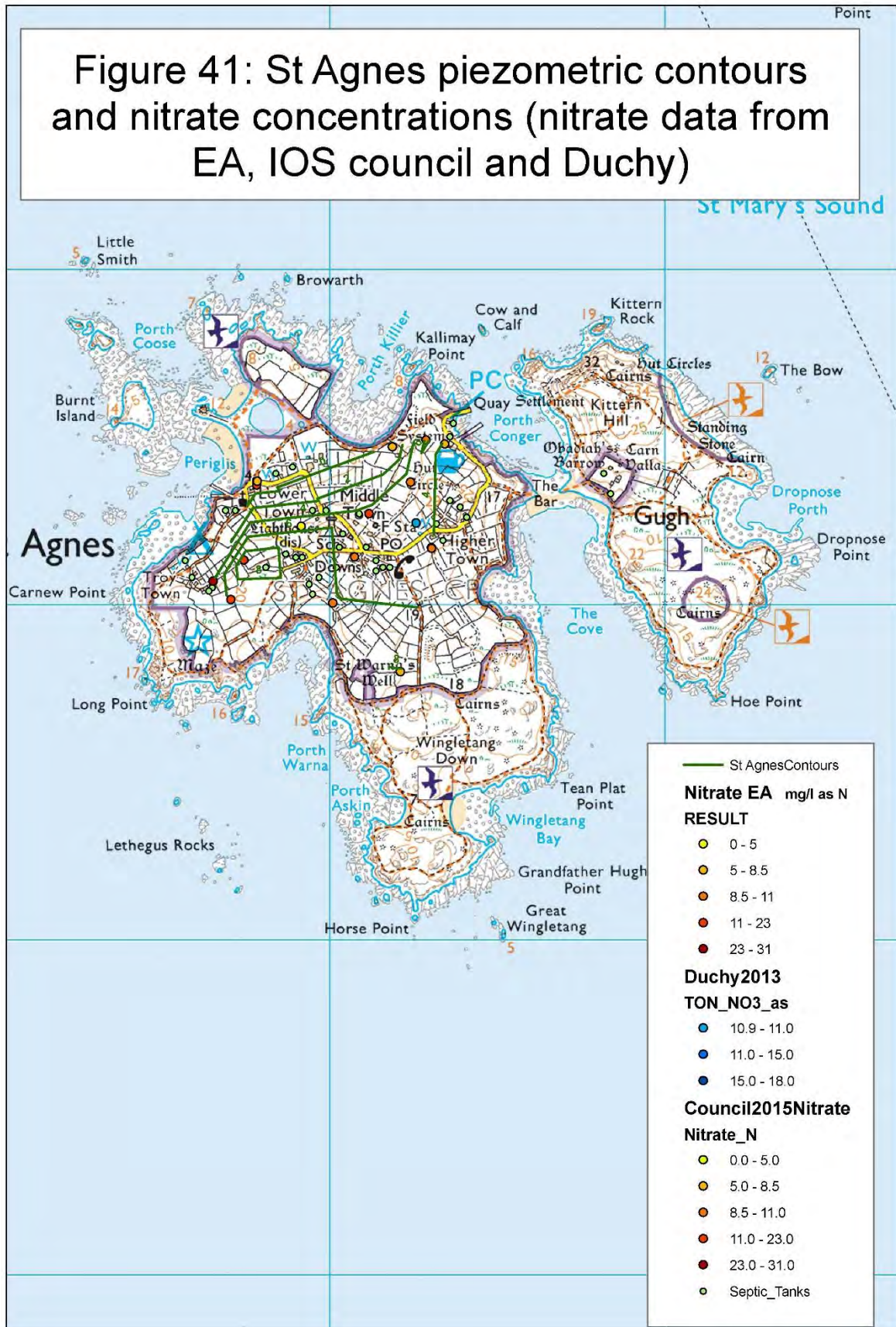


Figure 40: St Martin's piezometric contours and nitrate concentrations (nitrate data from EA, IOS council and Duchy)



Figure 41: St Agnes piezometric contours and nitrate concentrations (nitrate data from EA, IOS council and Duchy)



11. References

- BANKS, D, REIMANN, C, SKARPHAGEN, H., 1997. The comparative hydrochemistry of two granitic island aquifers: The Isles of Scilly, UK and the Hvaler Islands, Norway. *The Science of the total environment*, 209 (1998) 169-183
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12. Appendices

Table 1: sample points data, November 2015 – January 2016

St Mary's

borehole/well code	water level (m below ground level)	depth (m)	date	other info
8221GW45	17.33	36.55	25/11/2015	This borehole is not used (it is about to be capped). Did not purge BH before taking water quality samples
8221GW36	8.28m	60m	03/12/2015	BH drilled in 2010 land used for bulb growing
8221GW38	9.9m	20.5m	03/12/2015	BH drilled over 20 years ago has not been pumped for at least 2years
8221GW59	0.9m	2.4m	13/01/2016	in use since 1950's surrounding land Marshland, Biobubble approx 200m away (1 field). well serving 2 cottages, has probably been there since the 1950s.
8221GW60	11.5m	18m	13/01/2016	Bulb fields and cattle land use
8221GW13	9.30m	39.6m	13/01/2016	Bulb fields and cattle land use
8221GW01			12/01/2016	wetland with some cattle grazing

St Martin's

borehole/well code	water level (m below ground level)	depth (m)	date	other info
8221GW49	21.2	38.5	09/12/2015	surrounding land use = unused - grass, gorse and bracken.
8221GW50	20.45	39.95	09/12/2015	surrounding land use = unused - grass, gorse and bracken
8221GW35	21.3	39.6	09/12/2015	surrounding land use = unused - grass, gorse and bracken. Datum = top of pipe, around 0.4m above ground level.
8221GW37	14	22	09/12/2015	This property is going on the Duchy supply in March 2016. Borehole was drilled by Saxtons around 20 years ago, at the same time as the hotel boreholes. Construction: 6 inch pipe to 3m, then a 4 inch pipe inside to the bottom of the borehole. The pump is around 2m above the bottom of the borehole. Probes are installed to measure water levels and control pumping rates. If overpumped, water can be heard cascading out of fissures. The water is cloudy with pink sediment if overpumped. .
8221GW43	2.5	18.81	09/12/2015	The yield has always been sufficient so far. Borehole thought to have been drilled in 1980s. Land use - grass field at time of visit.
8221GW51	8.3	23.5	09/12/2015	part of Duchy supply. In bulb field.
8221GW52	7.9	9.1	10/11/2015	Domestic supply - used by one family.
8221GW46	17.08	43	10/11/2015	Part of network. Sample taken from pipe. Field used for grazing one horse.
8221GW14	16.6		10/11/2015	field used for grazing one horse.
8221GW15	22.95	41.8	10/11/2015	field used for grazing one horse.
8221GW23	9.6	28.4	10/11/2015	Located in flower field, polytunnels nearby.
8221GW24	10.9	24.8	10/11/2015	supplies 3 properties. Pump cuts out more than it used to.
8221GW25	4.15	27.8	10/11/2015	Borehole not used as became impossible to obtain an adequate yield in the summer.

8221GW54	4.2	35	10/11/2015	
8221GW53	10.7	39.7	11/11/2015	Drilled in last few years.
8221GW48	17	39.9	11/11/2015	Land use is cattle grazing.
8221GW26	14.9	15.7	11/11/2015	Land in which borehole is located is unused.
8221GW55	7.3	24.4	11/11/2015	Supplies several properties. Iron colour came and went when pumping to collect samples.
8221GW28	1.95	17.85	13/01/2016	Water used for washing tanks/equipment. Surrounding land use: vineyard
8221GW18	4.65	7.85	13/01/2016	Old wide diameter well. Part of network.
8221GW17	5	33.5	13/01/2016	Part of network. Land use: holiday let. Surrounding land use: grass. Horse field up-gradient.
8221GW16	4.5	35	13/01/2016	Surrounding land use: cattle grazing.
8221GW19	14.5	35	13/01/2016	Land use: cattle grazing
8221GW47	4.35	23.85	13/01/2016	Borehole is in garden. Cattle grazing and bulb growing land surrounds property.
8221GW22	6.93	25.65	14/01/2016	Borehole was being pumped during sampling and water level measurement.
8221GW12	8.05	9.95	14/01/2016	Borehole not used. Located in unused field which is covered in bracken.
8221GW56	3.4		14/01/2016	Water used for toilet flushing only. Could not plumb well for depth as dipper may get stuck in venturi pump arrangement.

St Agnes

borehole/well code	water level (m below ground level)	depth (m)	date	other info
8221GW31	6.64	28.7	25/11/2015	Land use: grass.
8221GW32	6.45	16.95	25/11/2015	Land use: grassed field.
8221GW10	8.84	19.51	25/11/2015	Yield: 250 gallons per hour - never dries. Drilled in last few decades. Clay encountered above granite during drilling, water emerged under pressure as a 'fountain'. Water quality has been good. Borehole is in narcissus field.
8221GW21	9.82	27.4	25/11/2015	Good yield - unlimited in winter. Summer 100 gallons then pump cuts off. Cattle nearby, and in field occasionally. Field used for hay. Drilled around 30 years ago by Don Wilkins. Water samples taken from pipe flowing into cattle trough.
8221GW07	6.9	20.7	26/11/2015	30 gallons per hour when pumping. Borehole is 6 inches to 20 ft depth, then 4.5 inches to base, lined to 20 ft with brown soil pipe, pea grit around pipe. Recently used compressor to blow out silt from base of borehole - increased depth from 60 ft to 104 ft. borehole used all year - for home and for cattle tanks. drilled late 1970s by Don Wilkins. cows are in field 0.5m away. owner gave DWI Dave Watkins' groundwater quality data in Sept 2015.
8221GW30	9.8	37.5	26/11/2015	Site has 3 boreholes drilled 1982/83. abstracted 800 m3 April 2015 - Oct 2015 from the 3 BHs combined. They keep abstraction records. They could pump more if they needed to. The most easterly borehole yields the least and the most southerly the most. Cattle in fields around 3 wells. since April 2014, 1800 m3 of water has been used.
8221GW09	8.22	22.8	26/11/2015	Field used for cattle grazing.
8221GW08	11.4	42.8	26/11/2015	Fields used for cattle grazing.

8221GW05	3.5	4.25	26/11/2015	This is an old wide diameter well in a hedge (the other groundwater abstractions on St Agnes are boreholes). Very close to sea.
8221GW29	11.93	29	26/11/2015	Duchy supply. Supplies half the island. Duchy sample this borehole and have records. In field with cattle.
8221GW06	3.66	5	26/11/2015	Borehole in cottage garden. Very close to sea.
8221GW27	3.83	21.3	26/11/2015	300 gallons per hour. Borehole in field used for cattle grazing. Liner to 60ft below ground level. Pump at 45 ft below ground level.
8221GW33	7.9	30.48	11/01/2016	Borehole in owner,s garden. Drilled about 12 years ago

Tresco

borehole/well code	water level (m below ground level)	depth (m)	date	other info
8221GW39	4.65	25.25	23/11/2015	This is the only borehole on Tresco, the other 3 groundwater abstractions are wells. This source is only used in summer, and yields around 30 m ³ /d. Tresco Estate dips the borehole and wells and keep records. Estate had a Hydrology study carried out on the water supply. They analyse the water quality of the groundwater supplies and keep records (they do own microbiology analysis). land use: grass surrounding tennis court.
8221GW04	3.1	4.9	23/11/2015	Very wide diameter well. Tresco Estate excavated it 20 years ago and put in concrete rings. Land use: grassed field.
8221GW03	2.7	5.44	23/11/2015	always yields water.
8221GW02	4.6	5.6	23/11/2015	Well was constructed by the Navy in World War One. In summer, water level reaches pump cut out.

Bryher

borehole/well code	water level (m below ground level)	depth (m)	date	other info
8221GW57	3	6	02/12/2015	Well constructed 1980 used for public drinking supply.
8221GW41	8.3	32	02/12/2015	Borehole sunk in 2011 Sample taken from Tap, Land use agricultural.
8221GW42	11.5	32	02/12/2015	Borehole sunk in 1992 Sample taken from tap, land use agricultural.
8221GW58	9.3	40	02/12/2015	Borehole sunk June 2011, sample taken from overflowing pipe, land use agricultural.

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