



## Nitrate vulnerable zone designation 2012 (Groundwater)

Mae fersiwn Cymraeg o'r ddogfen hon ar gael

A Welsh version of this document is also available

Version 1.1, revised 27 June 2012

# Evidence of Groundwater Water Nitrate Pollution 2012

## **INTRODUCTION**

This document is intended to provide a summary of the evidence used in assessing the need for nitrate vulnerable zone (NVZ) designation under the Nitrates Directive reference(91/676/EEC of 12th Decmeber 1991). A full description of the methods used is given in the detailed methodologies for Surface Water, Groundwater and Eutrophic Water reports which are available from the Defra and Welsh Government websites. These methods were developed under the guidance of a Review Group convened by the Defra and the Welsh Government which included representatives from the farming and water industries as well as independent academic experts.

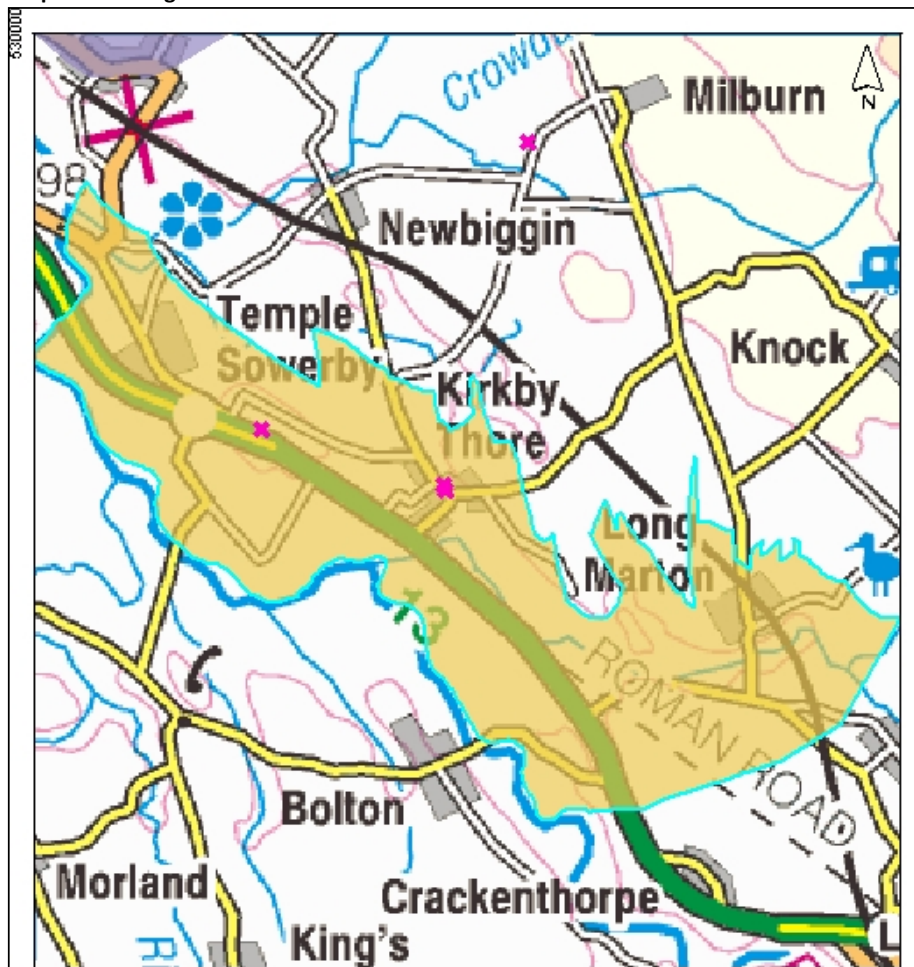
NVZ areas are designated based on a combination of both monitored water quality data and modelled nitrogen loadings that are based on the agricultural census and other data.

The concentration data is presented as milligrams of Nitrogen per litre. Please note 50 mg per litre of Nitrate is equivalent to 11.3 mg per litre as Nitrogen (N). Monitoring sites which exceed the concentration of 11.3 mg N/l set by the Nitrates Directive may lead to designation of all land draining to this point.

Note that for land already designated as a groundwater NVZ prior to this assessment, the land will remain designated even if the 95%ile concentration is now below 11.3 mg N/l. At least two cycles of low Nitrate concentrations are needed to show a sustained decrease that would then be considered for removal from NVZ designation.

For each NVZ area, monitoring data in combination with information on land-use indicate that concentrations of nitrates in one or more groundwaters are likely to exceed the level set out in the EU Nitrates Directive. Agricultural sources are likely to make a significant contribution to the observed or expected concentration of nitrate. Hence the land area draining to these groundwaters has been identified for designation as a Nitrate Vulnerable Zone.

Map of the designated area.



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**Legend**

-  Groundwater NVZ newly designated in 2012
-  Groundwater NVZ designated before 2012 and continuing as designated in 2012
-  Groundwater Monitoring sites

## Description of the boundary

Surface Water Zone designations are applied at a waterbody scale, for groundwater zones, other factors such as geology need to be taken into account. Physical boundaries influencing groundwater NVZs delineation have been defined based on expert discussion at local level. The following represents a selection of the types of boundaries that have been used to delineate the NVZs and determine the land draining to a polluted groundwater.

- Geological boundaries such as faults and geological contacts.
- Surface water catchment boundaries.
- Groundwater level contours.
- High permeability drift outcrops.
- Low permeability drift outcrops.
- Rivers, acting as groundwater catchment divides.
- Coastlines.
- Solution features.

For NVZ area 53 the boundary is based on;

*Kirby Thore NVZ (ID 53) The NVZ is delineated by the Eden River to the West, the contact between the Penrith Sandstone and the Eden Shales to the East, and a flow line taken from sandstone groundwater contours (2000).*

ID of monitoring site(s):

*88010246, 88010247*

Previously designated area, new area or new area adjacent to previously designated area: *Previously designated area*

Total new area designated (Km2): *15.98*

## Monitored Nitrate data for sites in zone ID: 53

For the 2012 designations monitoring data was analysed where available for the years 1980 - 2009. Where sufficient data was available results were projected to give a predicted concentration in 2027. For the earlier 2008 designation, monitoring data was analysed to 2006 and trend predicted to 2021. The results of the analysis were then compared to the standard of a 95%ile value of 11.3 mg N /l. See section 3 of the Groundwater Methodology report for more details.

The following tables summarise the nitrate concentrations for monitoring sites that either exceed the threshold or show increasing trend for nitrate. Data for these and other nearby sites are presented in Appendix A

**This area was designated in 2008.**

**Results for 2008 monitoring data.**

<i>Monitoring Site ID</i>	88010246
<i>Easting</i>	363850
<i>Northing</i>	525828
<i>Total Inorganic Nitrogen concentration 95%ile (mg/l)</i>	17.65
<i>Future predicted 95%ile Total Inorganic Nitrogen estimate (mg/l)</i>	19.62
<i>Trend (upward, downward, stagnation):</i>	Upward

<i>Monitoring Site ID</i>	88010247
<i>Easting</i>	362170
<i>Northing</i>	526340
<i>Total Inorganic Nitrogen concentration 95%ile (mg/l)</i>	7.71
<i>Future predicted 95%ile Total Inorganic Nitrogen estimate (mg/l)</i>	8.16
<i>Trend (upward, downward, stagnation):</i>	Upward

**Results for 2012 monitoring data.**

<i>Monitoring Site ID</i>	88010246
<i>Easting</i>	363860
<i>Northing</i>	525780
<i>Total Inorganic Nitrogen concentration 95%ile (mg/l)</i>	16.37
<i>Future predicted 95%ile Total Inorganic Nitrogen estimate (mg/l)</i>	13.61
<i>Trend (upward, downward, stagnation):</i>	Downward

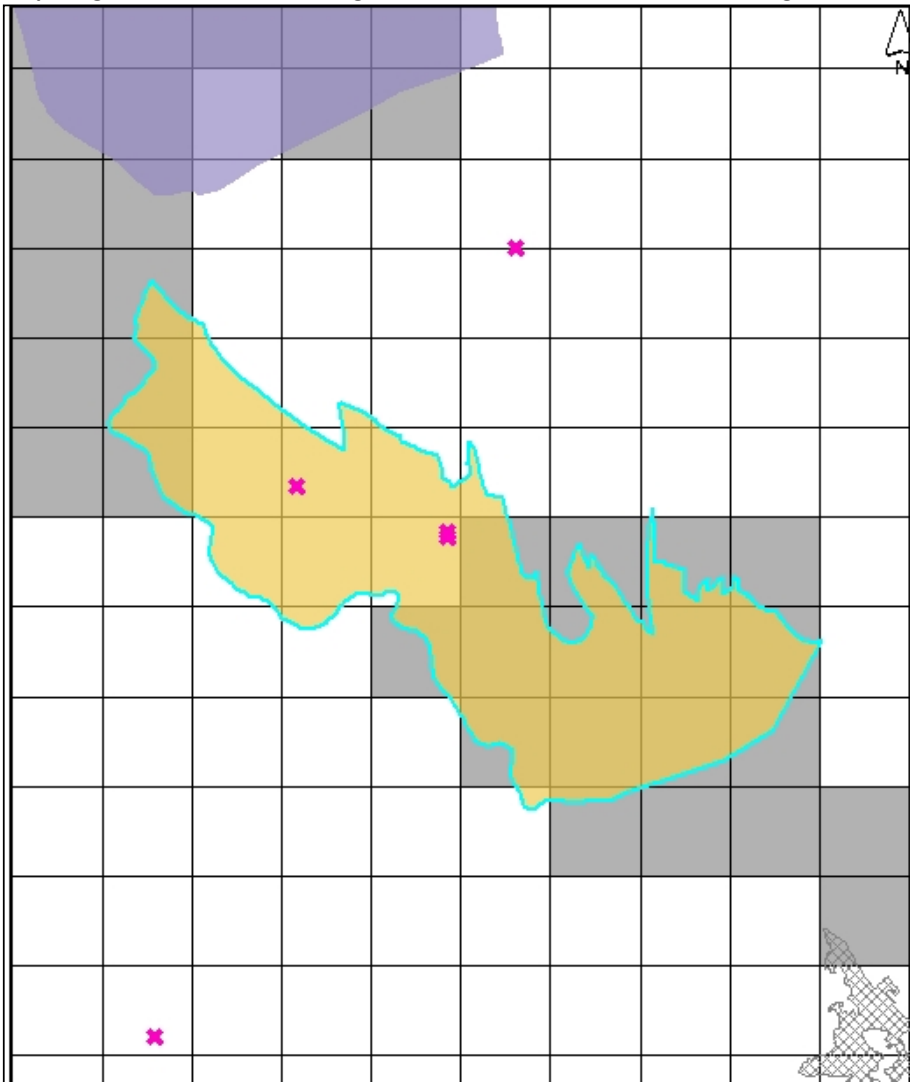
<i>Monitoring Site ID</i>	88010247
<i>Easting</i>	362170
<i>Northing</i>	526340
<i>Total Inorganic Nitrogen concentration 95%ile (mg/l)</i>	9.04
<i>Future predicted 95%ile Total Inorganic Nitrogen estimate (mg/l)</i>	9.86
<i>Trend (upward, downward, stagnation):</i>	Upward

## Land Use Model results

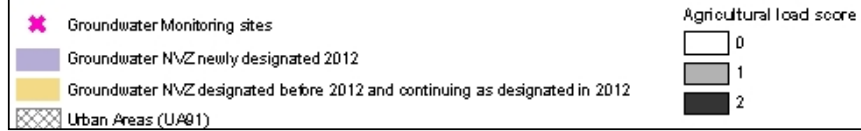
Urban and agricultural load were included in the assessment to identify if agriculture provides a main contribution of nitrate to the groundwater.

The following maps and associated figures indicate the annual average concentration of nitrate from agriculture contained in soil water. The figures are derived from farm scale research undertaken for Defra and are extrapolated based on farming land-use data for the land area covered by this report obtained in 2010 and long-term average rainfall based, using a model called NEAP-N developed by ADAS. The maps indicate those areas within the catchment with higher or lower levels of potential agricultural nitrate leaching to the groundwater.

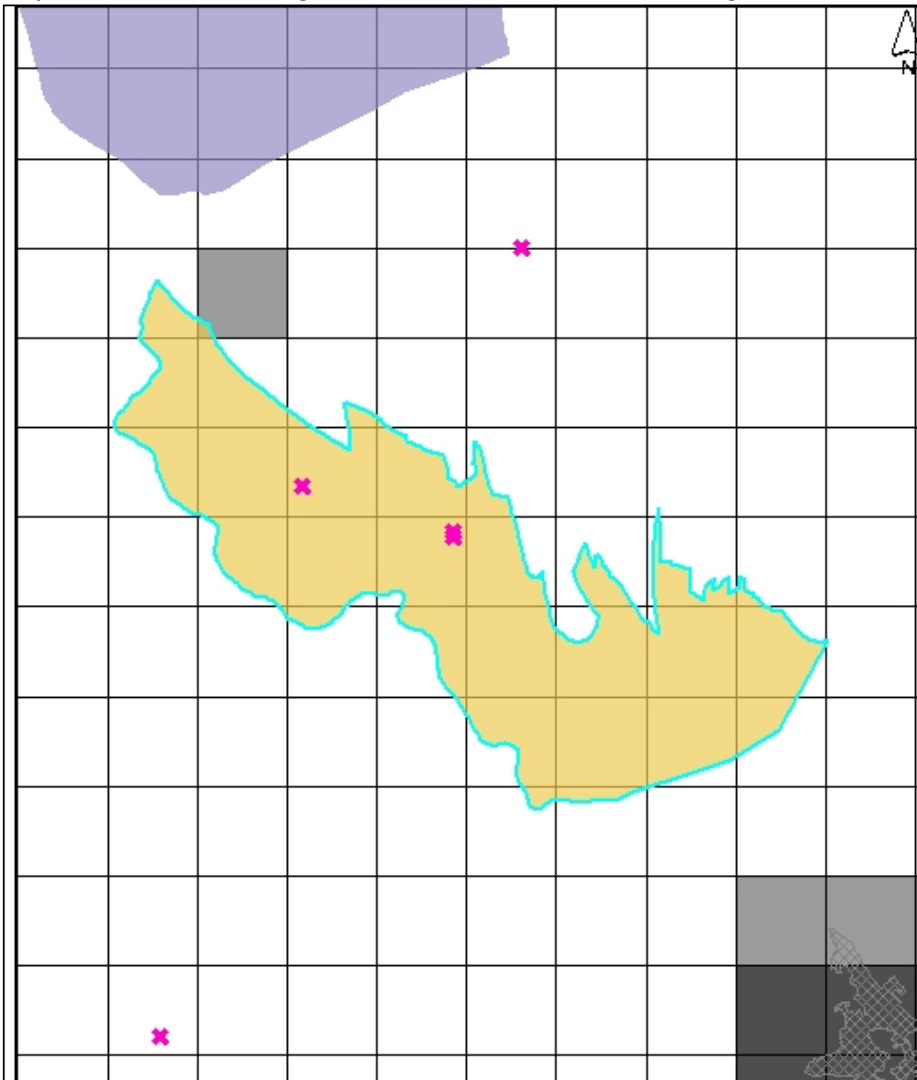
Map of agricultural load in the designated area. Load score is shown on 1km2 grid.



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Map of urban load in the designated area. Load score is shown on 1km<sup>2</sup> grid.



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## **Additional Lines of evidence**

Advice was sought from local Environment Agency staff to identify any additional data that could be used in the risk model to improve the robustness of the decision making process. Examples include the location of point sources (e.g. industrial or septic discharges), monitoring data from different groundwater bodies and monitoring data from related surface waters. See section 6 of the Groundwater Methodology report for more details.

For this area, no lines of evidence have been modified from local Environment Agency staff.

## Appendix A: Environment Agency monitoring data

This appendix presents historical concentration data at every monitoring site. For the 2012 designation, samples collected before 1980 were excluded because they may not be indicative of present day groundwater quality.

Monitoring point ID	Easting	Northing	Date	Nitrate (mg N / l)
88010246	363860	525780	14/02/1997	17.2
88010246	363860	525780	15/10/1997	17.3
88010246	363860	525780	19/03/1998	17.1
88010246	363860	525780	01/06/1999	15.7
88010246	363860	525780	05/11/1999	15.3
88010246	363860	525780	26/05/2000	16.2
88010246	363860	525780	17/11/2000	15.9
88010246	363860	525780	08/02/2002	16.9
88010246	363850	525828	08/02/2002	17.1
88010246	363860	525780	06/09/2002	13.6
88010246	363850	525828	06/09/2002	13.8
88010246	363860	525780	12/12/2002	15.3
88010246	363850	525828	12/12/2002	15.6
88010246	363850	525828	04/06/2003	16.4
88010246	363860	525780	04/06/2003	16.2
88010246	363860	525780	13/01/2004	16.3
88010246	363850	525828	13/01/2004	16.3
88010246	363850	525828	25/06/2004	15.6
88010246	363860	525780	25/06/2004	15.6
88010246	363850	525828	04/03/2005	17.8
88010246	363860	525780	04/03/2005	17.7
88010246	363860	525780	11/07/2005	15.4
88010246	363850	525828	11/07/2005	15.7
88010246	363860	525780	14/12/2005	16.1
88010246	363850	525828	14/12/2005	16.1
88010246	363850	525828	09/06/2006	15.2
88010246	363860	525780	09/06/2006	15.2
88010246	363860	525780	01/12/2006	15.3
88010246	363850	525828	01/12/2006	15.3
88010246	363850	525828	14/06/2007	14.8
88010246	363850	525828	17/06/2008	15.3
88010246	363850	525828	02/12/2008	15.1
88010246	363850	525828	02/07/2009	15.2
88010247	362170	526340	14/02/1997	6.6
88010247	362170	526340	15/10/1997	6.9
88010247	362170	526340	19/03/1998	6.7
88010247	362170	526340	01/06/1999	6.9
88010247	362170	526340	05/11/1999	7.3
88010247	362170	526340	26/05/2000	7
88010247	362170	526340	17/11/2000	6.9
88010247	362170	526340	08/02/2002	8
88010247	362170	526340	08/02/2002	7.7
88010247	362170	526340	06/09/2002	6
88010247	362170	526340	06/09/2002	5.8
88010247	362170	526340	12/12/2002	7.6
88010247	362170	526340	12/12/2002	7.8
88010247	362170	526340	04/06/2003	7.8
88010247	362170	526340	04/06/2003	7.6
88010247	362170	526340	13/01/2004	7.1
88010247	362170	526340	13/01/2004	7.2
88010247	362170	526340	25/06/2004	7.1

88010247	362170	526340	04/03/2005	7.2
88010247	362170	526340	04/03/2005	7.3
88010247	362170	526340	11/07/2005	7.1
88010247	362170	526340	11/07/2005	7
88010247	362170	526340	14/12/2005	7.4
88010247	362170	526340	14/12/2005	7.5
88010247	362170	526340	09/06/2006	6.9
88010247	362170	526340	01/12/2006	7.3
88010247	362170	526340	26/11/2007	7.3
88010247	362170	526340	17/06/2008	7.7
88010247	362170	526340	02/12/2008	8.3
88010247	362170	526340	02/07/2009	8

## **References**

<http://www.defra.gov.uk/food-farm/land-manage/nitrates-watercourses/nitrates/>

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