Nitrate Vulnerable Zone (NVZ) designation, 2017 Eutrophication (lakes)

Publication Date: June 2016

NVZ Name: Barton Broad
NVZ ID: EL105
This document provides a summary of the evidence used in proposing an area of land as one which should be, or should continue to be, designated as a Nitrate Vulnerable Zone (NVZ) for the purposes of the Nitrate Pollution Prevention Regulations 2015.

A full description of the methods used in developing the NVZ proposals is set out in the detailed methodology for eutrophication-related NVZs, available via [http://apps.environment-agency.gov.uk/wiyby/141443.aspx](http://apps.environment-agency.gov.uk/wiyby/141443.aspx). These methods were developed under the guidance of a review group convened by the Defra for the last NVZ review (2011-2013), which included representatives from the farming and water industries as well as independent academic experts. Minor refinements to the methods have been made for the current review.

NVZs are areas of land that drain to polluted waters and which contribute to the pollution of those waters. Polluted waters include those which are eutrophic or may in the near future become so if the Regulations were not to apply there.

Eutrophication is defined as "the enrichment of water by nitrogen compounds, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned".

For both freshwaters and saline waters, a weight-of-evidence based approach to assessing the risks and impacts of eutrophication was employed. The evidence for individual water bodies was assessed against a national suite of criteria for eutrophication in the different categories/types of water for review. The criteria are both quantitative and qualitative and reflect scientific understanding of the process and effects of eutrophication. They are broken down in the same way for each water category as follows:-

- Nutrients
- Plants/algae
- Secondary and other effects

For each designated or candidate water body which might meet the criteria for eutrophication, a datasheet such as this one was completed, bringing together information about the water body, its catchment, its uses, evidence of eutrophication and the sources of nitrogen input.

This document is a record of the evidence used in the designation process, including results from national monitoring and assessment programmes, and further information supplied by Area staff. The proposals for NVZ designation are made as a result of close working between Area and national Environment Agency teams, with further quality assurance for the eutrophication designations through the use of a national expert panel.

An accompanying guide to these datasheets is available, which provides an explanation of the contents, acronyms and technical terms.

Some features of the maps within this report are based on digital spatial data licensed from the Centre for Ecology and Hydrology, ©. Please note that any maps shown here have not used detailed field boundaries and therefore represent the indicative 'soft' boundary only. The definitive NVZ area can be seen on the "What's in Your Backyard" (WIYBY) website ([http://apps.environment-agency.gov.uk/wiyby/141443.aspx](http://apps.environment-agency.gov.uk/wiyby/141443.aspx)).
Section 1. Lake and catchment characteristics

WB ID: 35655  2013 NVZ status: Designate

Lake attributes

<table>
<thead>
<tr>
<th>EA Area</th>
<th>Essex Norfolk and Suffolk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake grid co-ordinates (Easting/Northing)</td>
<td>635998 / 321408</td>
</tr>
<tr>
<td>Lake waterbody area (ha)</td>
<td>57.6</td>
</tr>
<tr>
<td>WFD Lake Typology</td>
<td>High alkalinity, very shallow, large, lowland</td>
</tr>
<tr>
<td>Lake Alkalinity (ueq/L)</td>
<td>3747</td>
</tr>
<tr>
<td>Mean lake depth (m)</td>
<td>1.5</td>
</tr>
<tr>
<td>Is the lake heavily modified according to WFD?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does stratification occur?</td>
<td>Well mixed</td>
</tr>
<tr>
<td>Is this waterbody a reservoir?</td>
<td>No</td>
</tr>
</tbody>
</table>

Natural or artificial lake:

Type of artificial lake:
--- Man made by historical peat diggings.

Lake perimeter (% artificial)

Significant changes in lake level due to seasonal drawdown:

Pumped storage or other reservoir:
0

Information on abstraction (if available)
Lake catchment attributes

<table>
<thead>
<tr>
<th>Lake catchment area (ha)</th>
<th>13114</th>
</tr>
</thead>
<tbody>
<tr>
<td>If pumped, pumped catchment area (ha)</td>
<td></td>
</tr>
</tbody>
</table>

**Hydrological character**

--- May be a very small groundwater component. The main inflow into Barton Broad is from the River Ant. Smaller tributaries from Neatishead, Stalham and Sutton and Cat’s Common also contribute to flow.

---

**Comments on accuracy of lake catchment:**

**Is the map representative of the natural catchment?**

--- Yes, catchment of the River Ant plus a few small tributaries.

**Is the map representative of the artificial catchment?**

---

**NVZ Name:** Barton Broad  
**NVZ ID:** EL105
Section II - Waterbody uses

**Water Supply:**
Controlled water (Section 104 of Water Resources Act):
Yes

**Public Water Supply:**
No

**Drinking Water Protected Area:**
No

**UWWTD designation**
--- River Ant.

**Used for hydropower or flow regulation:**

---

**Recreational use:**

**Accessibility to public:**

**Recreational fishing:**

**Contact watersports**
--- Used for sailing and regattas.

**Nature of watersports (if applicable):**
---

**Other public benefit visits:**

- Many small settlements nearby.

**Conservation status:**

**Conservation value of lake:**
--- National and Local nature reserves.

**Habitats Directive site:**
--- SAC, SPA, Ramsar, SSSI

**SPA or SAC for aquatic interest features**
---

**SSSI or local conservation designation:**
--- Lake is part of Ant Broads and Marshes SSSI.

**Description of Aquatic interest features:**
--- SSSI is for: 1. Assemblages of breeding birds – lowland open waters and their margins, 2. Eutrophic lakes, 3. Invertebrate assemblage – mineral marsh and open water: open water on disturbed sediments, 4. Otter. Part of Broadland Broads SAC/SPA and includes wetland, and water supported features
Section III - Causes - Nutrients

Total oxidised nitrogen (TON) data

<table>
<thead>
<tr>
<th>Mean summer TON (mg/l)</th>
<th>0.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of summer TON samples</td>
<td>28</td>
</tr>
<tr>
<td>75th percentile annual TON (mg/l)</td>
<td>1.8</td>
</tr>
<tr>
<td>Total number of TON samples</td>
<td>57</td>
</tr>
<tr>
<td>Confidence of annual 75th %ile TON exceeding 1 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Confidence of annual 75th %ile TON exceeding 2 mg/l</td>
<td>Not confident</td>
</tr>
<tr>
<td>Date range of TON samples</td>
<td>2010 - 2014</td>
</tr>
</tbody>
</table>

TON monitoring data

NVZ Name: Barton Broad
NVZ ID: EL105
**Total nitrogen (TN) data**

<table>
<thead>
<tr>
<th>Mean annual TN (mg/l)</th>
<th>1.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of TN samples</td>
<td>53</td>
</tr>
<tr>
<td>Confidence of annual mean TN exceeding 1 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Confidence of annual mean TN exceeding 2 mg/l</td>
<td>Not confident</td>
</tr>
<tr>
<td>Date range of TN samples</td>
<td>2010 - 2014</td>
</tr>
</tbody>
</table>

**TN monitoring data**

Does any other (e.g. EA non-WFD, or third party) monitoring data for the lake provide improved evidence of significantly elevated nutrient nitrogen?
Total phosphorus (TP) data

<table>
<thead>
<tr>
<th>Annual geometric mean TP (ug/l)</th>
<th>66</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFD face value TP class</td>
<td>Moderate</td>
</tr>
<tr>
<td>Confidence of moderate or worse TP status</td>
<td>94%</td>
</tr>
<tr>
<td>Date range of TP samples</td>
<td>2010 - 2014</td>
</tr>
</tbody>
</table>

TP monitoring data

Does any other (e.g. EA non-WFD, or third party) monitoring data for the lake provide improved evidence of significantly elevated nutrient phosphorus?
**Nutrient sources**

**Nitrogen loading estimates based on catchment map area**

<table>
<thead>
<tr>
<th>Source</th>
<th>Leached N (kgN/yr)</th>
<th>Conc. (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From all agricultural sources</td>
<td>390414</td>
<td>15.6</td>
</tr>
<tr>
<td>From agricultural sources minus atmospheric deposition</td>
<td>357822</td>
<td>14.3</td>
</tr>
<tr>
<td>From urban sources</td>
<td>12407</td>
<td>0.5</td>
</tr>
<tr>
<td>From all sources</td>
<td>402821</td>
<td>16.1</td>
</tr>
<tr>
<td>From all sources (minus atmospheric deposition)</td>
<td>370229</td>
<td>14.8</td>
</tr>
<tr>
<td>Ranking based on nitrogen loading from agricultural sources</td>
<td></td>
<td>13</td>
</tr>
</tbody>
</table>

**Local assessment 2015**

**Significance of loading from agricultural sources to the catchment of the lake**

--- Barton is in an agricultural area, work is ongoing to provide advice and guidance to the farming community to reduce inputs from agriculture - believed a significant source of nutrients.

**Significance of loading from human habitation to the catchment of the lake**

**Significance of any other sources of nutrient loading to the lake or its catchment**
Section IV - Response - Plants/Algae

Chlorophyll data

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual mean Chlorophyll (ug/l)</td>
<td>29</td>
</tr>
<tr>
<td>total number of Chlorophyll samples</td>
<td>59</td>
</tr>
<tr>
<td>WFD face value Chlorophyll class</td>
<td>Moderate</td>
</tr>
<tr>
<td>Confidence of moderate or worse status</td>
<td>100%</td>
</tr>
<tr>
<td>Chlorophyll Good/Moderate boundary value</td>
<td>20</td>
</tr>
<tr>
<td>Date range of Chlorophyll samples</td>
<td>2010-2014</td>
</tr>
</tbody>
</table>

Chlorophyll monitoring data

NVZ Name: Barton Broad
NVZ ID: EL105
<table>
<thead>
<tr>
<th>Phytoplankton (Pluto EQR)</th>
<th>Macrophytes (EQR)</th>
<th>Diatoms (EQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.19</td>
<td>0.4</td>
<td>No data</td>
</tr>
<tr>
<td><strong>Total number of samples/surveys</strong></td>
<td>34</td>
<td>2</td>
</tr>
<tr>
<td><strong>WFD face value class</strong></td>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td><strong>Confidence of moderate or worse status</strong></td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Date range of samples</strong></td>
<td>2011 - 2013</td>
<td>2009 - 2012</td>
</tr>
</tbody>
</table>

Number of years when algal blooms were observed based on reactive monitoring 2010-2015: 0

Does any other (e.g. EA non - WFD, or third party monitoring data for the lake provide improved evidence of eutrophication? (local judgement)

No change --- The Broads Authority's macrophyte surveys have shown that there is a low abundance of aquatic plants but there is high species diversity. The community is typical of a high nutrient system. There is a restoration project at Barton Broad and some improvements have been seen.

To which biological element(s) does it relate?

Macrophytes ---

**Palaeolimnology**

<table>
<thead>
<tr>
<th>Change as Square Chord Distance</th>
<th>0.65</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Change in Diatom community</strong></td>
<td>Significant Change</td>
</tr>
</tbody>
</table>

Evidence that designated aquatic interest features associated with the lake show evidence of eutrophic disturbance? (local judgement)

- The Broads Authority's macrophyte surveys have shown that there is a low abundance of aquatic plants but there is high species diversity. The community is typical of a high nutrient system. There is a restoration project at Barton Broad and some improvements have been seen.

Strength of evidence (local judgement)

---

Local judgement on the evidence of eutrophic disturbance

Y, definitely
Comments and decisions

WFD Weight of evidence for eutrophication:

Certainty of eutrophication problem based on core WFD tools: Very certain eutrophication problem

Certainty of eutrophication problem based on overall weight of evidence: Very certain eutrophication problem

WFD overall ecological status: Poor

Confidence in WFD status: Very Certain

Current assessment of weight of evidence supporting designation in 2017

First national panel

Recommended action: Existing designation - check needed

Comments from first panel:
Existing designation still has elevated N (>1 mg/l) and evidence of eutrophic impact. Recommend continued designation.

Second national panel

Comments from second national panel:
Agreed with provisional decision to continue designation

Recommendation: Continued designation

Local summary and recommendation:

This lake is currently designated. Additional evidence has been received from the Broads Authority - their macrophyte surveys have shown that there is a low abundance of aquatic plants but there is high species diversity. The community is typical of a high nutrient system. Other evidence still stands, and continued designation is appropriate. Designation is supported by the Broads Authority.
Lake Description:
Barton Broad is high alkalinity, shallow, Norfolk Broad created by peat digging. The lake is part of Ant Broads and Marshes SSSI. It is also a SPA/SAC and NNR.

Why the lake should be designated as a Polluted Water (eutrophic):
Barton Broad is an existing NVZ eutrophic designation, and within a groundwater NVZ. There has been a small reduction in mean TON values since the previous review but both TN and TON remain above 1 mg/l, and there is continued evidence of eutrophic impact.

Nitrogen:
75th percentile TON and annual mean TN are both within the 1-2 mg/l threshold range.

Phosphorus:
The WFD total phosphorus classification is Moderate status.

Ecological response:
Both the phytoplankton and macrophyte status for WFD are Poor, indicating a eutrophication impact on the ecology.

Supplementary evidence:
Broads Authority macrophyte surveys show low abundance of aquatic plants and a plant community typical of a high nutrient system.

NVZ Name: Barton Broad
NVZ ID: EL105
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