






CALDERDALE LOCAL PLAN

# Environmental Thresholds Study - Core Strategy

## 1st Edition - March 2014

ONE DIFFERENT EVERYONE MATTERS EVERYONE

Calderdale Council

# Contents

# 1 Executive Summary

## Introduction

1.1 The Environmental Thresholds Study (ETS) will support the process of identifying potential areas of growth, and in turn inform the overall distribution of development through the Local Plan. The study will assist the council in meeting the requirements of the National Planning Policy Framework (NPPF) which requires Local Planning Authorities (LPA) to meet their objectively assessed needs, unless any 'adverse impacts' of development proposed through the Local Plan will 'significantly and demonstrably outweigh the benefits'. [i]

1.2 The ETS aims to provide as clear a picture as possible of the current state of various environmental aspects of the district, to ensure that they can be appropriately considered prior to the Publication version of the Core Strategy. It presents an 'environmental thresholds' style of assessment and uses it to give an indication of where certain environmental criteria are in a relatively positive or negative state in the local area. This can then be another tool and input into decision making in terms of future growth areas.

## Methodology

1.3 The first stage was to establish a list of individual environmental criteria and to consult on these with various consultees both internally and externally. The consultation responses enabled a final list of criteria to be developed. In order to score the criteria, each was accompanied by an 'acceptable' and 'unacceptable' threshold. Some criteria were considered to have met the unacceptable threshold by their presence in a grid square (for instance flood risk zone 2, contaminated land etc.); scoring of other criteria was more complex, for example, the Sites of Special Scientific Interest (SSSI) criteria was considered to be acceptable if it was recorded as being in a 'favourable condition'; the unacceptable threshold was awarded to those SSSI areas considered to be in anything other than a 'favourable' condition.

1.4 The next stage was to map each criteria and score accordingly. A series of 500m grid squares covered the district, and each criteria was queried to establish the extent of those areas considered to meet the unacceptable threshold. In order to score each criteria, the extent of coverage was split into ranges and scored according to these;

0ha of Grid Square = 0
Up to 0.5ha of Grid Square = -0.25
>0.5ha and <=1ha of Grid Square = -0.50
>1ha and <= 5ha of Grid Square = -0.75
>5ha of Grid Square = -1.00

1.5 The scores were based on the principle that '0' is the point at which the threshold is considered acceptable, and anything that fell within the unacceptable threshold would be awarded a minus score, dependent on the extent of the coverage.

1.6 In order to avoid skewing results, each criteria was weighted according to its degree of constraint and relative unacceptable threshold. For example national and international nature designations (SPA, SAC, and SSSI) meeting unacceptable thresholds were scored '1', whilst others (Contaminated Land for example) were scored '0.5'.

i National Planning Policy Framework, Communities and Local Government, 2012, paragraph 14

**Outputs**

1.7 Once all grid squares had been scored, the final stage was to create a series of maps showing the results of the individual criteria, along with a composite map to spatially represent the combined scores of all the environmental criteria applied in the ETS.

1.8 It is important to note the role of the ETS is to indicate where environmental thresholds have been crossed; therefore some of the environmental criteria that are considered to be within the 'acceptable' threshold will score relatively well; this does not mean they should then be considered as areas that could accommodate future development, since the environmental constraint remains. The main application of the data will be to review the existing urban areas and urban fringes to inform the location of future development through the Local Plan.

## 2 Introduction

**2.1** The National Planning Policy Framework (NPPF) places sustainable development at its heart, including a 'presumption in favour of sustainable development, which should be seen as a golden thread running through both plan-making and decision-taking' (paragraph 14). Within the context of plan-making specifically, paragraph 14 states that Local Planning Authorities should meet any 'objectively assessed needs' for development identified in their area, unless 'any adverse impacts of doing so would significantly and demonstrably outweigh the benefits'.

**2.2** The reasoning for the study emerged as a result of a number of other councils attempting to support their Local Plans in relation to meeting the requirements of NPPF paragraph 14. It must be noted however, that the majority of Environmental Capacity or Thresholds studies have been prepared to inform the site allocations part of the Local Plan. The strategic nature of the Core Strategy means that at this stage the Calderdale Environmental Thresholds Study (ETS) does not go down to a specific site level.

**2.3** There are three dimensions to sustainable development: economic, social and environmental. Calderdale Council has already published evidence relating to the current state of economic and social aspects of the district, and its settlements, in the Settlement Hierarchy study. The ETS aims to provide as clear a picture as possible of the current state of various environmental aspects of the district, to ensure that they can be appropriately considered prior to the Publication version of the Core Strategy.

**2.4** The ETS will help in assessing whether any 'adverse impacts' of development proposed through the Local Plan will 'significantly and demonstrably outweigh the benefits', based on the current picture of environmental quality around the district. The ETS establishes 'acceptable' and 'unacceptable' thresholds of various environmental criteria, and presents the results via a composite map. The map consists of different layers of environmental criteria, which have been scored according to the extent to which they are considered to meet either the 'acceptable' or 'unacceptable' thresholds.

**2.5** It must be noted that the ETS is purely concerned with the question as to whether or not an environmental threshold has been crossed; where they have not does not automatically mean that development can or should take place. For instance, there are some areas within some of the criteria, such as Sites of Special Scientific Interest (SSSI) that are not considered to have crossed into an unacceptable threshold and therefore score relatively well; obviously that does not mean this area would be proposed for development.

**2.6** The ETS is intended to inform the development of policies not only in the Core Strategy but also in the Land Allocations; however this initial report is focused on the Core Strategy, the Land Allocations will have some form of additional work carried out as part of the evidence base for sites.

**2.7** The Core Strategy will set the strategic policy framework for the Local Plan; it includes a vision, a set of strategic objectives, a spatial strategy, and a number of strategic topic based policies. The Core Strategy will identify broad locations as opposed to specific sites; however future site allocations in the Land Allocations will be required to be within these broad locations.

**Environmental Capacity**

**2.8** The concept of 'environmental capacity', i.e. the maximum level of use (or development) that an environment can accept without undergoing significant change, is an established one - as is the idea that there are environmental 'limits', 'triggers' or 'thresholds' beyond which an environment may exhibit a rapid decline or collapse. Sustainable development embeds the concept of living within our environmental limits as key to planning an area.

2.9 The consideration of environmental capacity within the preparation of local plans can be taken at a number of different levels:

Environmental Constraints assessment – at the simplest level, an analysis of local environmental constraints will highlight the key environmental issues at the local scale. At the Core Strategy Refined Issues and Options stage, the Council presented environmental constraints mapping, layering each identified constraint on top of each other to produce composite maps of constraints across the district.

Environmental Limits assessment – this takes the constraints mapping a stage further to identify 'limits' for each environmental topic or theme, and can then assess which areas have currently exceeded these limits to give an assessment of the current state of play, and where particular environmental pressures exist at present.

Development capacity assessment – the most advanced form of assessment, and one that truly reflects a comprehensive 'environmental capacity assessment' would identify the maximum amount of development and/or type in an area, beyond which no further development could be taken without breaching the identified limits, triggers or thresholds.

2.10 Clearly the most desirable assessment would be the third option, a fully comprehensive development capacity assessment. However, there are no identified surveys of this kind evident. Theoretical and scoping studies that have been carried out in recent years have investigated concepts and methodologies for environmental capacity studies in great detail[ii]. A key issue with achieving this final stage of assessment however is that there are both 'direct' and 'indirect' pressures from new development being placed on specific local environments. 'Indirect' pressures range from pollution, the over-exploitation of natural resources, and climate change impact and would be very difficult, if not impossible to measure as different kinds of environments will respond to these pressures in different ways.

2.11 The best compromise for a study of this kind therefore appears to be to take an 'environmental limits' style of assessment and use it to give an indication of where the environment is in a relatively good or bad state in the local area. This can then be another tool and input into decision making in terms of future growth areas.

2.12 There will be two different versions of the ETS. This first publication reviews the thresholds on the Core Strategy, and will be updated as and when new data becomes available. The second version will analyse the thresholds in relation to the subsequent Land Allocations part of the Local Plan.

**Definition of Environmental Thresholds**

2.13 An important starting point is to define what the study means by 'Environmental Thresholds'. There has been little in the way of similar studies or a common methodology applied in those few studies that have been carried out as part of a Local Plan evidence base. Nationally, Defra considered that *" if the goals of sustainable development are to be achieved then we need to understand environmental limits and thresholds".* The same report then described environmental limits as being *"the point or range of conditions beyond which there is a significant risk of abrupt irreversible, or difficult to reverse, changes to the benefits derived from natural resource systems with impacts on human well being.*[iii].

2.14 Other Local Planning Authorities have carried out a similar studies including Huntingdonshire and Craven, whilst the former regional plan for the East of England was supported by a similar study[iv]

ii e.g. NWRA – North West Environmental Capacity Scoping Study (2007, Entec), and EMRA – Environmental Capacity in the East Midlands: an evidence base fit for purpose (2008, Hallam Environmental Consultants)

iii Haines-Young, R, Potschin, M, Cheshire, D, 2006 Defining and Identifying Environmental Limits for Sustainable Development. Final Report. Defra project Code NR0102"

iv Environmental Capacity in the East of England: Applying an Environmental Limits Approach to the Haven Gateway Final Report , Land Use Consultants, January 2008

This study considered the term environmental thresholds as being the "point at which the functioning of an environmental asset or the services it provides, experiences a rapid decline or sudden collapse".

**2.15** As discussed, the purpose of the Calderdale ETS is to consider what are acceptable and unacceptable thresholds, and apply these to inform the future distribution of development in Calderdale. Taking account of previous studies, for the purposes of the Calderdale ETS, an environmental threshold **describes when a certain impact means that the natural system is unable to deliver that systems benefits**. In other words, the point at which an environmental effect will result in the environmental asset being unable to deliver its benefits.

**2.16** It is suggested that absolute thresholds may be difficult to apply in practise[(v)]. In terms of the ETS, there are two approaches to be considered. One, adopt an approach that considers an unacceptable threshold as being a certain point from which the environment cannot recover, or two, adopt a precautionary approach from which the environmental criteria can recover. Some consultees felt the latter would be the most realistic approach, given the uncertainties and variability that exist within natural systems.

**2.17** Because it is often the case that abrupt changes in the natural state result from a combination of impacts, such as land use change over a gradual period, the environmental criteria proposed are considered to represent the widest range that a Local Plan could have some form of influence over, and where there is sufficient available data to enable the objectives of the report to be met.

**2.18** As an example of how the term could be applied in the ETS, it is useful to use one of the environmental criteria, Contaminated Land. The 'acceptable' threshold is defined as land with no confirmed contamination, whilst the 'unacceptable' threshold is defined as land where confirmed contaminated land exists. This is also an example of the precautionary approach, as although land may be considered to be contaminated (and therefore within the unacceptable threshold) this does not prevent the land being remediated and being made available for future use.

### Spatial Scale

**2.19** Environmental issues can occur at both the local and global scale. For instance, greenhouse gas emissions alongside the consumption of the earths resources are considered to have a global impact, and require a national and international response, whereas contaminated land, air quality, and the condition of local nature sites are environmental issues that occur on a local scale. As other studies [(vi)] have noted, some broader scale issues such as greenhouse gas emissions cannot *inform* a spatial distribution of development, instead they are more relevant to the quantity and type of development, for instance policies relating to energy efficient development or density of development.

### Alignment with Strategic Environmental Assessment (SEA)

**2.20** In order to integrate the ETS with other evidence base documents such as the Sustainability Appraisal (incorporating the Strategic Environmental Assessment), it is useful to ensure that every effort is made to ensure consistency where possible. Therefore, one of the starting points when drafting the list of environmental criteria for the ETS was to look at the categories in the Strategic Environmental Assessment (SEA) and apply these in the ETS. Those environmental criteria that are considered within the context of the ETS to have a local impact and accord with the Strategic Environmental Assessment (SEA) are as follows:

v Environmental Capacity in the East Midlands: an Evidence Base Fit for Purpose. Final Report December 2008 Hallam Environmental Consultants Ltd , East Midlands Regional Assembly)

vi Environmental Capacity in the East of England: Applying an Environmental Limits Approach to the Haven Gateway Final Report , Land Use Consultants, January 2008

Air;
Climate Factors;
Water;
Biodiversity, Fauna and Flora;
Geology;
Human Health (Linked to Open Space).

**Climate Change**

**2.21** Any threshold in relation to climate change is difficult to establish (see paragraph 2.10) through such a study as the ETS, as the methodology relies on establishing the current state of the environment, and not the future state (as this is something that the Local Plan monitoring and Sustainability Appraisal monitoring will measure). However, there is a criteria included that focuses on the potential impact on priority habits as a result of climate change. A Natural England report [vii] provided data that measures the vulnerability of priority habitats to climate change, and provides an indication of whether they are at a low, medium, or high risk; in essence therefore, the data does provide an indication of their current state of vulnerability and is of relevance to the ETS.

**Output Maps**

**2.22** The report will present a series of maps showing the results of each of the individual environmental criteria, as well as a composite map indicating where there are is a greater degree of 'unacceptable' environmental thresholds. Because of the nature of the Core Strategy, as mentioned, the maps will not go down to individual site level, both as a result of the purpose of the Core Strategy, and the scale of the individual grid squares (500m$^2$).

vii National Biodiversity Climate Change Vulnerability Model, Natural England, Research Report NERR054, 2014

## 3 Local Plan

**3.1** The Local Plan will consist of two planning documents; the 'Core Strategy' and the 'Land Allocations and Designations'. The Core Strategy is the first document to be prepared, and this will identify the strategic policy framework for the Local Plan. The Core Strategy will identify the scale and distribution of development in Calderdale until 2029. The Core Strategy will not identify specific sites for development; rather it will identify broad locations for future development.

**3.2** The second document, the Land Allocations and Designations will allocate specific sites for development and protection in line with the broad locations identified in the Core Strategy. Sites will be allocated for housing, employment, mixed use, and protection such as open space and green belt.

**3.3** The preparation of both Local Plan documents will be assessed and informed by a number of Evidence Base documents. The Sustainability Appraisal (incorporating Strategic Environmental Assessment) assesses and informs the Local Plan's objectives and policies, against a number of social, economic, and environmental sustainability objectives.

**3.4** The Settlement Hierarchy reports identify and analyse a wealth of evidence on the provision of services and facilities across Calderdale, along with the accessibility of local communities to them. The reports set out the existing Settlement Hierarchy in the district, and the relative sustainability of different settlements and areas across Calderdale.

**3.5** Both the Settlement Hierarchy and the ETS will be key documents to help inform the SA process. However, the ETS is different from the SA as it looks at the limits of development, whereas the SA is reporting on the potential impact of the policies and proposals of the Local Plan on a set of environmental, social, and economic objectives.

# 4 Methodology

4.1 The following section discusses both the development of the ETS environmental criteria as a result of the consultation with stakeholders and how they were applied in more detail.

4.2 The Calderdale ETS will go beyond previous exercises of simply mapping and layering environmental constraints across the district. The ETS study will give an indication of where the environment is currently in a relatively positive or negative condition across the district in accordance with agreed 'environmental thresholds'.

4.3 The ETS employs a similar method as applied in the Settlement Hierarchy in terms of a 500m grid covering the district. A set of defined environmental criteria are assessed against the grid squares, and scored accordingly dependent on the extent to how much of the grid square is covered by the criteria falling within the 'unacceptable' threshold. A series of individual maps present the results of the individual environmental criteria, whilst a composite map will present the combined results of all the environmental criteria, indicating overall as to where there are greater or fewer negative environmental impacts.

4.4 Although this method remains focused on displaying the current situation to highlight where negative impacts on the environment are already taking place, it does go further than simply displaying constraints as was the case at the Core Strategy Refined Issues and Options stage. As this approach closely models the approach used in the settlement hierarchy which considered the social and economic aspects of our settlements, in combination the ETS and the Settlement Hierarchy should therefore give a full picture of social, economic and environmental opportunities and constraints to inform the spatial distribution of the Core Strategy.

4.5 An assessment of a wide range of environmental criteria, against thresholds, will highlight those areas of the district currently under the most environmental stress, and experiencing the greatest negative impacts.

4.6 The ETS therefore involved the following steps:

The identification of suitable environmental criteria, with associated spatial data available, against which the current state of the environment may be assessed;
The selection of appropriate 'environmental limits', or thresholds, against which each environmental criterion may be assessed; and
Illustrating the current state relative to environmental thresholds via a composite map.

4.7 The following sections discuss these steps in more detail.

## 4.1 Step 1 - Identifying Environmental Criteria

**Step 1 The identification of suitable environmental criteria, with associated spatial data available, against which the current state of the environment may be assessed.**

4.8 Environmental criteria were established through an initial scoping exercise with input from various parties, both internal and external. At the start of the process the initial list of environmental criteria was influenced by the Strategic Environmental Assessment (SEA), which addresses different elements of the environment. This also maintained a link to the Sustainability Appraisal of the Local Plan which is required to meet aspects of the SEA requirements. The environmental categories of the SEA which informed the development of the ETS criteria are listed below:

Air;
Climate Factors;
Water;

Biodiversity, Fauna and Flora;
Geology;
Human Health (Open Space).

4.9 Other criteria were added based on a literature review of other studies of this kind alongside a review of data that could be mapped. The initial list of criteria suggested to both internal and external consultees was as follows:

**Table 4.1 Initial List of Environmental Criteria consulted on**

| Environmental Criteria | Indicator / Measure | Environmental Threshold Acceptable? | Environmental Threshold Unacceptable? | Data Source |
|---|---|---|---|---|
| Air Quality | Air Quality Objectives (AQO) monitoring | AQO met/expected to be met in area – pollution levels predicted to fall in future years | AQO not met/not expected to be met in area – pollution levels predicted to rise in future years | CMBC assessment reports for AQMA areas – Environmental Health service |
| Water Quality | River water quality | River water satisfying quality objectives | River water not satisfying quality objectives | Environment Agency |
| | Permissions granted contrary to EA advice | No permissions granted contrary to EA advice | Permissions granted contrary to EA advice | CMBC AMR<br><br>Environment Agency |
| Water Quantity (resources) | Water availability status – ground water and/or surface water? | No identified issues of water availability | Issues identified with water availability | Yorkshire Water |
| Flood risk | Permissions granted contrary to EA advice | No permissions granted contrary to EA advice | Permissions granted contrary to EA advice | CMBC AMR<br><br>Environment Agency |
| | Flood vulnerability | Flood zone 2 or no designation | Flood zone 3 and functional flood plain | Environment Agency |
| Land use, minerals and Soils | Efficient use of land | Developments completed on brown field sites over past 5 years | Developments completed on green field sites over past 5 years | CMBC Planning service |
| | Contaminated land | No contamination | Confirmed contamination of land – include 'potential' but unconfirmed? | CMBC Environmental Health service |

| Environmental Criteria | Indicator / Measure | Environmental Threshold Acceptable? | Environmental Threshold Unacceptable? | Data Source |
|---|---|---|---|---|
| Geology | SSSI unit condition | 'Favourable' status | Any other status | Natural England |
| | Local sites of geological interest (SEGIs) | Positive conservation management is being or has been implemented in the previous 5 years | No positive conservation management in the previous 5 years | CMBC Conservation service |
| | Unstable land | Area not identified as potentially unstable | Area identified as potentially unstable land | British Geological Survey |
| Biodiversity | SSSI unit condition | 'Favourable' status | Any other status including 'unfavourable recovering'? | Natural England |
| | Local wildlife sites | Positive conservation management is being or has been implemented in the previous 5 years | No positive conservation management in the previous 5 years | CMBC Conservation service |
| Recreation / Open Space | Access to green space / green infrastructure (ANGST) | Area within catchment of any category of ANGSt | Area not within catchment of any category of ANGSt | CMBC Communities Service |
| Noise pollution / tranquillity | Intrusion mapping | Area unaffected by noise or visual disturbance – or low limits acceptable? | Area affected by noise or visual disturbance – what is a suitable limit? | CPRE tranquillity / intrusion mapping and West Yorkshire Noise Action Plan (Defra) |

**4.10** The list of consultees invited to comment was as follows:

CMBC Environmental Management Team
CMBC – Conservation
CMBC – Environmental Health
Natural England
Yorkshire Water
Environment Agency
English Heritage
CPRE
Friends of the Earth
West Yorkshire Ecology Service
West Yorkshire Geology Trust
Yorkshire Wildlife Trust

4.11 Each stakeholder was contacted to provide feedback on the proposed environmental criteria and associated thresholds for which known datasets were available. Once comments had been received and analysed, it was then possible to establish a list of environmental criteria and associated thresholds.

**Consultation Feedback**

4.12 Following the initial consultation, a number of consultees responded with comments that resulted in the criteria and indicators being amended.

4.13 Natural England responded by proposing the South Pennine Moors Special Protection Area (SPA) and Special Area of Conservation (SAC) be added to the criteria. Although Sites of Special Scientific Interest (SSSI) were already included and there is a degree of crossover between SSSI and the SPA/SAC, it was important to be aware of the condition and conservation objectives of the SPA/SAC, since developments or policies that threaten the achievement of these objectives (alone or in combination) and result in unfavourable conditions would be considered unacceptable as well as being non compliant with the Habitats Directive.

4.14 Natural England also provided mapping data in relation to a study [viii] focused on priority habitats and their potential vulnerability to Climate Change. The study's methodology is similar to the ETS in that it scored an areas performance against a set number of criteria on a grid square basis. The data was based on five 'metrics' (or criteria), these being Habitat Sensitivity, Fragmentation, Topography, Management and Conservation Value. Two versions of the mapping data were provided; one with the first four of the metrics scored, and a second version where Conservation Value was included as an additional metric, the rationale being that sites that are currently good for wildlife are likely to continue to be good in the future. The technical note that accompanies the data commented that although in reality the conservation value of an area does not affect its vulnerability, it is an important consideration in prioritisation and targeting of action to build resilience to climate change and therefore it was the chosen data set for the ETS.

4.15 In terms of the thresholds for Sites of Special Scientific Interest (SSSI), it was also recommended that the status of 'unfavourable recovering' was placed in the 'unacceptable' thresholds category, since any SSSI that this status applied to had not yet achieved 'favourable' status. Following discussion with the council's conservation officer, it emerged that the initial priority habitats criteria (not the one relating to Natural England and vulnerability to climate change) proposal would be difficult to measure, since it would be inappropriate to use incomplete data which would result in prioritising some species where data was available over others where data was not. The relevant indicator in the Annual Monitoring Report had reported no change in the previous 7 years therefore there would be nothing to measure against.

4.16 Water quantity was no longer a suitable criteria, as there would be nothing to measure following the implementation of a grid system following the mid 1990s shortage. The feedback from Yorkshire Water also suggested to move away from the traditional assessment of river flooding; instead the ETS should take into account 'Pluvial' or surface water flooding.

4.17 The Environment Agency's response was concerned mainly with the water related criteria. In relation to water quality, the EA recommended that consideration should be given to the Water Framework Directive (WFD), specifically the waterbody status and measures information in Annex B of the Humber River Basin Management Plan.[ix] The EA suggested that an indicator based on the WFD status of each waterbody in the district would distill a number of environmental criteria, such as the status of surface and ground waters into a single measurable indicator. The 'acceptable'

viii National Biodiversity Climate Change Vulnerability Model, Natural England, Research Report NERR054, 2014

ix Water For Life and Livelihoods; River Basin Management Plan, Humber River Basin District, Defra, Environment Agency, 2009

threshold was suggested to be set as 'good', whilst 'unacceptable' would apply to areas where permissions had been granted that would deteriorate the status of a waterbody. In terms of Flood Risk, the EA suggested that although the initial list of criteria suggested that development in Flood zone 2 was acceptable, the NPPF considers this only acceptable if there are no other areas considered reasonably available within flood zone 1. The EA also pointed out that the consultation criteria suggested that development in flood zone 3 and the functional floodplain would be within the 'unacceptable' threshold, yet the EA pointed out that there are some uses which are considered acceptable in both of these, such as water compatible uses and essential infrastructure. Other comments related to biodiversity, and support for the use of SSSIs, but concern there were no proposed indicators relating to priority habitats, species, or in connection with this, Green Infrastructure generally.

**4.18** Some elements of the EA feedback were not considered to fit with the objectives and the role of the ETS. For instance, the issues relating to the addition of an indicator relating to priority habitats and species had already been discussed with the councils conservation officer.In relation to the flood risk thresholds, although it is the case that some development is compatible in zone 3 or the functional floodplain, it was still the case that for the purposes of the ETS this would represent an unacceptable environmental threshold, and therefore this was retained as such. In terms of flood zone 2, it was decided that this too would be brought into the 'unacceptable' threshold, given the EA comments, the NPPF, and the direction of the policy in the Core Strategy Preferred Options.

**4.19** Concerning the EA's comments on water quality, the EA's suggested 'unacceptable' threshold was not considered to fit with the ETS methodology and the need to measure the current state of the environment. The unacceptable threshold was therefore amended to apply to those water bodies measuring anything other than 'good' status in the context of the WFD. In relation to Green Infrastructure (GI), reviewing the methodology there were various elements of the GI mapping which were already covered elsewhere in the list of criteria (biodiversity, flood risk, air quality), and therefore it was decided not to include this data set in the ETS to avoid double counting. It must be noted that the ETS is one part of the overall evidence base for the Core Strategy, and although some criteria did not form part of the study, these would be addressed through other parts of the evidence base.

**4.20** The Campaign to Protect Rural England (CPRE) suggested that the tranquillity mapping be included, which applied a 500m$^2$ grid and awarded a score based on 44 different factors which add or detract from people's feeling of tranquillity. Positive factors included seeing a 'natural' landscape, hearing birdsong, and seeing the stars at night; detracting factors included hearing constant traffic noise, seeing lots of people and urban development.

**4.21** Internal discussions also took place with the conservation, environmental health, environmental management, highways and engineering (flooding) teams. Various amendments were suggested, such as the surface water flood risk maps, which would be updated in late 2013 or early 2014.[(x)] Criteria relating to the biodiversity element of the initial list of criteria were discussed with the conservation officer. In addition to the issues surrounding the measuring of priority habitats, it was not felt that any indicators relating to woodland would add value to the ETS. The Environmental Management team felt that climate change should be reflected in the ETS, but recognised the difficulty in measuring carbon at a local scale, and within the context of the ETS.

x The ETS uses the 2nd generation surface water flooding maps, the ETS will be updated with the 3rd generation maps once these are available for use

## 4.2 Step 2 - Selecting Environmental Thresholds

**Step 2: The selection of appropriate 'environmental limits', or thresholds, against which each environmental criterion may be assessed.**

4.22 Following the consultation and feedback, this section describes those criteria and thresholds applied in the first version of the Core Strategy ETS:

### Climate Change

4.23 Initially, this criteria was considered difficult to apply in the ETS, given that discussions with the council's Environmental Management team highlighted the difficulty with measuring carbon at a local scale. However, Natural England (NE) made the council aware of a report that was in preparation that would map the vulnerability of priority habitat areas to the impacts of climate change. Once the data was finalised, NE supplied a copy of the data and associated reports [xi] to the council, for inclusion in the ETS.

4.24 The NE study is based on a software model that "provides an assessment of the vulnerability of priority habitats to climate change based on the principles of adaptation for biodiversity". The model assesses the areas based on 200m$^2$ grid squares, and each grid square is placed in a category, dependent on whether it is considered as having a high, medium, or low vulnerability to climate change. For the purposes of the ETS, the results were split into five categories, low, low/ medium, medium, medium/high, and high. The vulnerability scoring ranges for the data were as follows: Low (0 to 0.6), Low Medium (0.9) Medium (1.2 to 1.5), Medium High (1.8) High (2.1 to 2.7).

### Air Quality

4.25 The air quality criteria is based around the presence of an Air Quality Management Area (AQMA) within a grid square. Initially the measure was proposed to be around the air quality objectives, and the 'unacceptable' threshold would be awarded to those AQMAs where it was considered the air quality objectives would not be met. The council's Updating and Screening Assessment (2012) commented that *"within the six AQMAs declared by the council the new monitoring data supports the continuation of the areas"* . Therefore the presence of an AQMA resulted in an unacceptable score.

### Water Quality

4.26 This criteria was developed as a result of the Environment Agency's comments during the consultation stage. The Water Framework Directive (WFD) criteria combines a number of water quality (river, groundwater, water resources, and species diversity) related indicators into one, making the monitoring and reporting easier. Where the water quality status is recorded as being in any other category than 'good', this would qualify for an unacceptable threshold.

### Flood Risk

4.27 Two criteria were developed as a result of the consultation and scoping stage. The flood vulnerability criteria considers only those areas outside of flood zones 2 & 3 as being 'acceptable' in terms of the ETS.

4.28 In terms of Pluvial Flooding, which relates to areas at risk from surface water flooding, map data was provided by the Environment Agency via the Council's Highways and Engineers section. This data was split into four separate categories, which are as follows:

xi National Biodiversity Climate Change Vulnerability Model, Natural England, Research Report NERR054, 2014

1 in 30 year SHALLOW - a 1 in 30 year rainfall event falling across Calderdale at the same time. Surface water building up to 300mm (property threshold level)
1 in 30 year DEEP - a 1 in 30 year rainfall event falling across Calderdale at the same time. Surface water building between 300-1000mm (above property threshold level)
1 in 200 year SHALLOW - a 1 in 200 year rainfall event falling across Calderdale at the same time. Surface water building up to 300mm (property threshold level)
1 in 200 year DEEP - a 1 in 200 year rainfall event falling across Calderdale at the same time. Surface water building between 300-1000mm (above property threshold level)

4.29 The 200 year rainfall event is the more extreme flood event. The 1 in 30 year rainfall event has also been chosen as this is the design capacity of the sewer system. All areas that fell within the pluvial flooding data were placed in the unacceptable threshold. This criteria was included to highlight the issue of flood risk is wider than simply that associated with areas surrounded by the main watercourses.

**Land Use, Minerals and Soils**

4.30 As land is a finite resource, with many competing uses, it was considered necessary to include an indicator which presented some form of spatial data that related to the use of brownfield and greenfield land for residential development. The criteria of 'efficient use of land' therefore represents pressures on land use, specifically in relation to development on greenfield and brownfield sites. As with all the other indicators, the ETS will only give a 'strategic assessment', as although greenfield development is 'unacceptable' and brownfield development is considered 'acceptable', it can be the case in some instances where a brownfield site may have a high environmental value, whereas a greenfield site may offer a more sustainable location than a brownfield site, as a result of flood risk, noise and air quality concerns.

4.31 The council's data set of contaminated land was also used in this category. Before the data was used however, it was considered necessary to review the list to only include those records where the contamination was confirmed; this was due to the original lists including many records where no confirmation of contamination existed. This was further refined by excluding those records where the land had since undergone remediation, or had since been developed for residential. The presence of any contaminated land based on the refined data set resulted in an unacceptable threshold.

**Geology and Biodiversity**

4.32 There are four criteria relating to the geology and biodiversity category. The Replacement Calderdale Unitary Development Plan (RCUDP) data for Potentially Unstable Land was prepared by the British Geological Survey (BGS), which shows both modern (active or potentially active unstable land) and historical landslides where no evidence of current or potential movement is visible or known. Therefore for the ETS, any area falling within this designation was considered to meet the unacceptable threshold.

4.33 In relation to both biodiversity and geology, the criteria included an assessment of Local Wildlife Sites (LWS), formerly referred to as Local Nature Reserves and Sites of Ecological or Geological Importance (SEGI). The acceptable threshold for this indicator referred to those LWS where positive conservation management is being or has been implemented in the previous 5 years, whereas the unacceptable threshold applied to those LWS where this had not been the case. If it was considered unknown as to whether any positive conservation management had been carried out, the site was placed within the 'unacceptable' threshold.

4.34 There are 5 Sites of Special Scientific Interest (SSSI) within Calderdale. Some of these sites are particularly important because of their habitats, whilst others are designated on account of their geological value. Such sites not only require special protection but also positive management to

ensure that they are managed to conserve or enhance their nature conservation value, taking into account factors such as access, recreation and land use. Natural England assess the condition of the SSSI land in England and report their findings using six reportable condition categories: favourable; unfavourable recovering; unfavourable no change; unfavourable declining; part destroyed and destroyed. Any status other than 'favourable' was considered as meeting the 'unacceptable' threshold.

4.35 The final category in this criteria were the South Pennine Moors Special Protection Area (SPA) and Special Area of Conservation (SAC). Similar to SSSIs, Natural England carry out assessments on the condition of these sites and award a status in relation to each site's condition, and like the SSSI scoring, all sites awarded a status other than 'favourable' were scored as being in the unacceptable threshold.

**Open Space**

4.36 This category was proposed to allow an indicator that related to open space (which is considered an environmental asset, but also links to another SEA category, human health). Other studies are focusing on a review of open spaces in the district, therefore it was considered the ETS would include an 'Access to Natural Greenspace Standards' (ANGSt) indicator; data was supplied by Natural England via the Council's communities section, and mapped accordingly.

4.37 The 'unacceptable' threshold for the ANGSt criteria was based on identifying areas that did not meet any of the following categories:

Of at least 2 hectares in size, no more than 300 metres (5 minutes walk) from home;
At least one accessible 20 hectare site within two kilometre of home;
One accessible 100 hectare site within five kilometres of home; and
One accessible 500 hectare site within ten kilometres of home; plus
A minimum of one hectare of statutory Local Nature Reserves per thousand population.

**Noise and Tranquillity**

4.38 The final environmental criteria was tranquillity. The Campaign to Protect Rural England (CPRE) supplied mapping data which took into account a range of factors. The CPRE report was based (as is the ETS) on scoring 500m$^2$ grid squares, awarding an overall tranquillity score based on a sum of 44 individual criteria for each grid square. Dependent on the score of each grid square, it was placed into one of the following categories: Very Low, Low, Moderate, High or Very High tranquillity. Those grid squares considered as being Very Low or Low tranquillity were placed in the 'unacceptable' threshold, with areas considered as Moderate, High, or Very High tranquillity placed in the 'acceptable' threshold. Because of the nature of the original CPRE data (scored by 500m$^2$ grid squares) this criteria will only return a minimum ('-0.50') or maximum ('0') score.

4.39 The following table therefore sets out the final proposed environmental criteria and related indicators and thresholds, along with the data source.

**Table 4.2 Table of Environmental Criteria, Indicators, Thresholds and Data Sources**

| Environmental Criteria | Indicator / Measure | Environmental Threshold Acceptable? | Environmental Threshold Unacceptable? | Data Source |
|---|---|---|---|---|
| Air Quality | Air Quality Objectives Monitoring | Air Quality Objectives met | Air Quality Objectives not met | CMBC assessment reports for AQMA areas - |

| Environmental Criteria | Indicator / Measure | Environmental Threshold Acceptable? | Environmental Threshold Unacceptable? | Data Source |
|---|---|---|---|---|
| | | | | Environmental Health service |
| Water Quality | Water Framework Directive - Water Quality Status | Water Quality classed as 'Good' | Water Quality classed as 'Moderate' or 'Poor' | Environment Agency |
| Flood risk | Flood vulnerability | Outside Flood Risk Zones 2,3 & Functional Flood Plain | Within Flood Risk Zone 2, 3 & Functional Flood Plain | Environment Agency & CMBC |
| | Pluvial Flooding | Areas outside the following:<br>1 in 30 year Shallow<br>1 in 30 year Deep<br>1 in 200 year Shallow<br>1 in 200 year Deep | Areas within the following:<br>1 in 30 year Shallow<br>1 in 30 year Deep<br>1 in 200 year Shallow<br>1 in 200 year Deep | Environment Agency & CMBC |
| Land use, minerals and Soils | Efficient Use of Land | Developments completed on brownfield sites over past 5 years | Developments completed on greenfield sites over past 5 years | CMBC Spatial Planning |
| | Contaminated land | No Contamination | Confirmed contamination of land | CMBC Environmental Health |
| Geology & Biodiversity | Potentially Unstable Land | Area not identified as Potentially Unstable Land | Area identified as Potentially Unstable Land | British Geological Survey<br>CMBC |
| | Vulnerability to Climate Change | Priority Habitat Area identified as Low to Medium Low vulnerability | Priority Habitat Area identified as Medium, Medium/ High to High vulnerability | Natural England |
| | Local Wildlife Sites (Including Local Nature Reserves and Sites of Ecological and Geological Interest) | Positive conservation management is being or has been implemented in the previous 5 years | No positive conservation management in the previous 5 years. | CMBC |

| Environmental Criteria | Indicator / Measure | Environmental Threshold Acceptable? | Environmental Threshold Unacceptable? | Data Source |
|---|---|---|---|---|
| | Sites of Special Scientific Interest (SSSI) unit condition | SSSI Unit in a 'favourable' status | SSSI unit in any other status | Natural England |
| | Natura 2000 sites condition - South Pennine Moors Special Protection Area (SPA) & Special Area of Conservation (SAC) | SPA & SAC in 'favourable' status | SPA & SAC in any other status | Natural England |
| Recreation / Open space | Access to Natural Green Space Standards (ANGSt) | Area within catchment of any category of ANGSt | Area not within any catchment of any category of ANGSt | CMBC Communities |
| Noise pollution / tranquillity | Tranquillity | Moderate, High or Very High Tranquillity | Low or Very Low Tranquillity | CPRE Tranquillity Mapping data |

## 4.3 Step 3 Mapping the Environmental Thresholds Results

**Step 3: Illustrate the current state relative to environmental thresholds via a composite map.**

4.40 The final output of the ETS is a composite map made up of 500m$^2$ grid squares which allows the reader to view where there may be areas of environmental concern in the district. To arrive at this stage, it was necessary to carry out the following steps:

Create a map of the district made up of a series of 500m$^2$ grid squares; each of the squares was given a cell reference to enable scoring to take place.
Run a query to establish which squares met the acceptable threshold, and which squares met the unacceptable threshold for each individual environmental criteria.
After running the query against all environmental criteria, the total scores for each grid square were calculated.
This results in a composite map which will inform the future distribution of development in Calderdale.

4.41 The first stage in developing a composite map was to create a map of the district covered by a series of 500m$^2$ grid squares. Each of the grid squares was given a reference number, which at the end of the process would allow combined scoring to take place. Once the grid square map was created, the next stage was to query the extent of each criteria's 'unacceptable ' threshold coverage in each grid square.

4.42 For some of the criteria, its mere presence within a grid square would return a score; for others, it would be dependent on whether or not it met certain conditions that represented an unacceptable threshold. For example, if a contaminated land polygon occurred in a grid square, that was considered to meet the unacceptable threshold, however, the presence of a SSSI did not automatically qualify as unacceptable, instead, it was scored only if it met the unacceptable criteria as outlined in table 4.2, that is if it was recorded as being in any other status than 'favourable'.

4.43 For each individual criteria, prior to running the query, it was necessary to assign a scoring range, dependent on the extent to which it did (or did not) meet the unacceptable threshold. Applying a method that would score the same for any extent of an unacceptable threshold within a grid square would lead to a skewing of the results, since a grid square that had a very small coverage of an unacceptable threshold would then score the same as a grid square which was entirely taken up by an unacceptable threshold.

4.44 In order to avoid this, the ETS applied a scoring range to reflect the extent of coverage of unacceptable thresholds. The ranges were as follows, ('0' representing an acceptable threshold):

0ha of Grid Square = 0
Up to 0.5ha of Grid Square = -0.25
>0.5ha and <=1ha of Grid Square = -0.50
>1ha and <= 5ha of Grid Square = -0.75
>5ha of Grid Square = -1.00

**Weighting scores**

4.45 As well as ensuring an appropriate scoring range was applied to avoid skewing the results, a further refinement was made and each criteria was awarded a weighted score. This was to ensure as much as possible the ETS reflected the importance of each criteria. Therefore, Internationally designated nature sites, such as the SPA and SAC, were awarded a weighting of '1', whilst others, such as developments on greenfield sites in the past 5 years were weighted '0.5'. Where there may be more than one data set for a criteria, the weighting scores were applied in line with their severity, for instance in terms of flood risk, areas within flood risk zone 2 were given a weighted score of 0.5, whilst those in flood risk zone 3 and the functional floodplain were scored '1'.

**Table 4.3 Table showing Scoring Ranges and weighting criteria**

| Environmental Criteria | Ranges | Score | Weighting |
|---|---|---|---|
| Air Quality Management Areas - Air Quality Objectives not met | 0ha of Grid Square | 0 | 0.5 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| Water Quality - Overall quality considered 'Moderate' or 'Poor' | 0ha of Grid Square | 0 | 0.5 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |

| Environmental Criteria | Ranges | Score | Weighting |
|---|---|---|---|
| | | | |
| Within Flood Risk Zone 2 | 0 ha of Grid Square | 0 | 0.5 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| Within Flood Risk Zone 3 | 0 ha of Grid Square | 0 | 1 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| Within SFRA Functional Flood Plain | 0 ha of Grid Square | 0 | 1 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| Pluvial Flooding - Shallow | 0 ha of Grid Square | 0 | 0.5 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| Pluvial Flooding - Deep | 0 ha of Grid Square | 0 | 1 |

| Environmental Criteria | Ranges | Score | Weighting |
|---|---|---|---|
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| Developments completed on greenfield sites over past 5 years | 0 ha of Grid Square | 0 | 0.5 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| Confirmed contamination of land | 0 ha of Grid Square | 0 | 0.5 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| Area identified as Potentially Unstable Land | 0 ha of Grid Square | 0 | 0.5 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| Priority Habitat Area identified as Medium , Medium/ High, or High vulnerability to climate Change | 0 ha of Grid Square | 0 | 0.5 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |

| Environmental Criteria | Ranges | Score | Weighting |
|---|---|---|---|
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| Local Wildlife Sites (LWS, SEGI, LGS) - No positive conservation management in the previous 5 years. | 0 ha of Grid Square | 0 | 0.5 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| SSSI unit in any other status than 'Favourable' | 0 ha of Grid Square | 0 | 1.0 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| SPA & SAC in any other status than 'Favourable' | 0 ha of Grid Square | 0 | 1.0 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |
| | | | |
| Area not within any catchment of any category of ANGSt | 0 ha of Grid Square | 0 | 0.5 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |

| Environmental Criteria | Ranges | Score | Weighting |
|---|---|---|---|
| | | | |
| Low or Very Low Tranquillity(1) | 0 ha of Grid Square | 0 | 0.5 |
| | Up to 0.5ha of Grid Square | -0.25 | |
| | >0.5ha and <=1ha of Grid Square | -0.50 | |
| | >1 and <= 5ha of Grid Square | -0.75 | |
| | >5ha of Grid Square | -1 | |

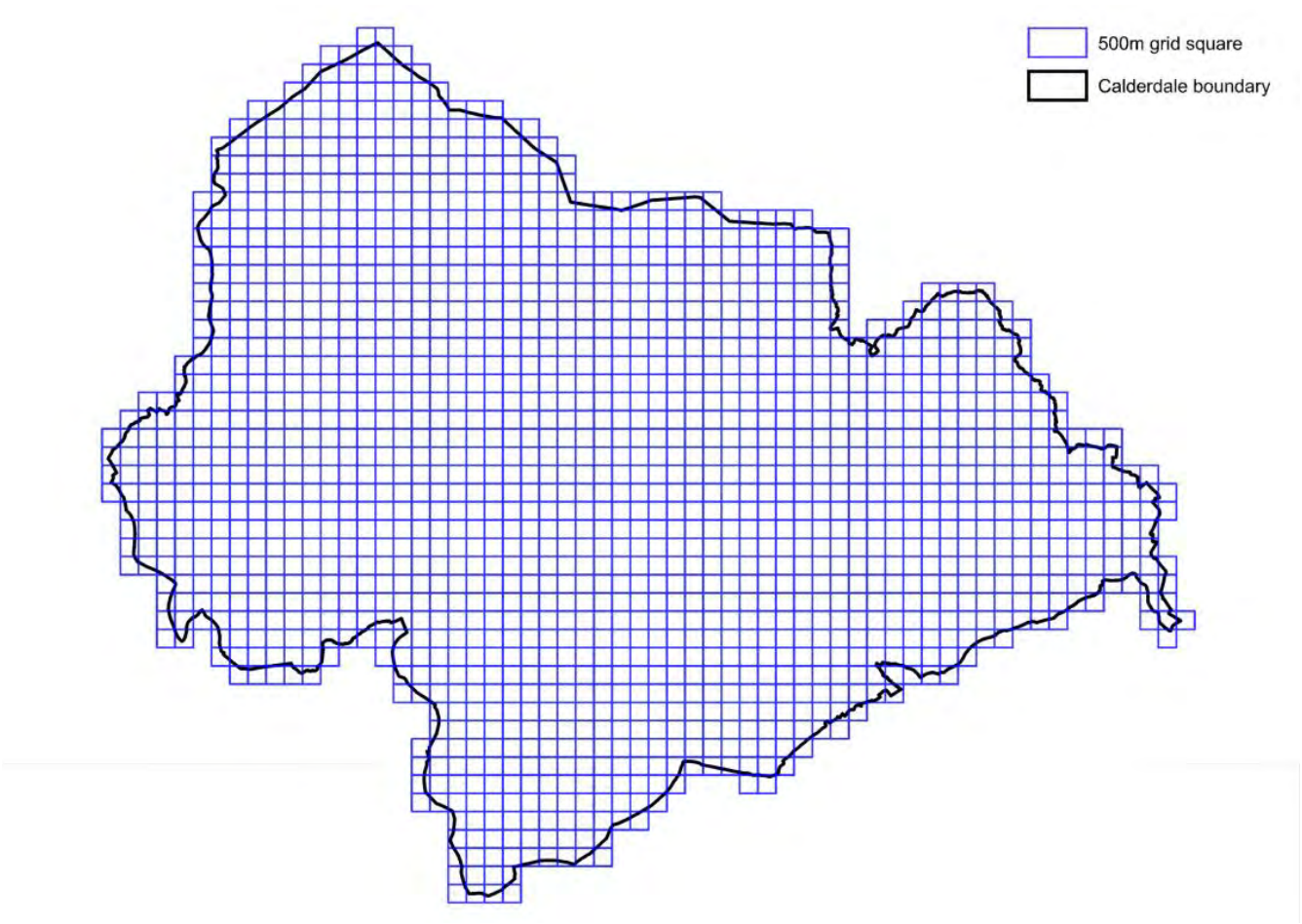
1. Because of the CPRE data scoring entire grid squares, this criteria will only return a minimum or maximum score

**4.46** The following section presents the results via a composite map which combines all the individual criteria scores.

## 5 Results

5.1 The following section reports on the results of the ETS. The results for each individual environmental criteria are presented with a brief summary, with a concluding section showing the composite map. The scoring ranges for the individual maps are based on an equal range of each individual criteria's weighting and results; therefore some criteria have a minimum score of '-1', whilst others have a minimum score of '-0.5'.

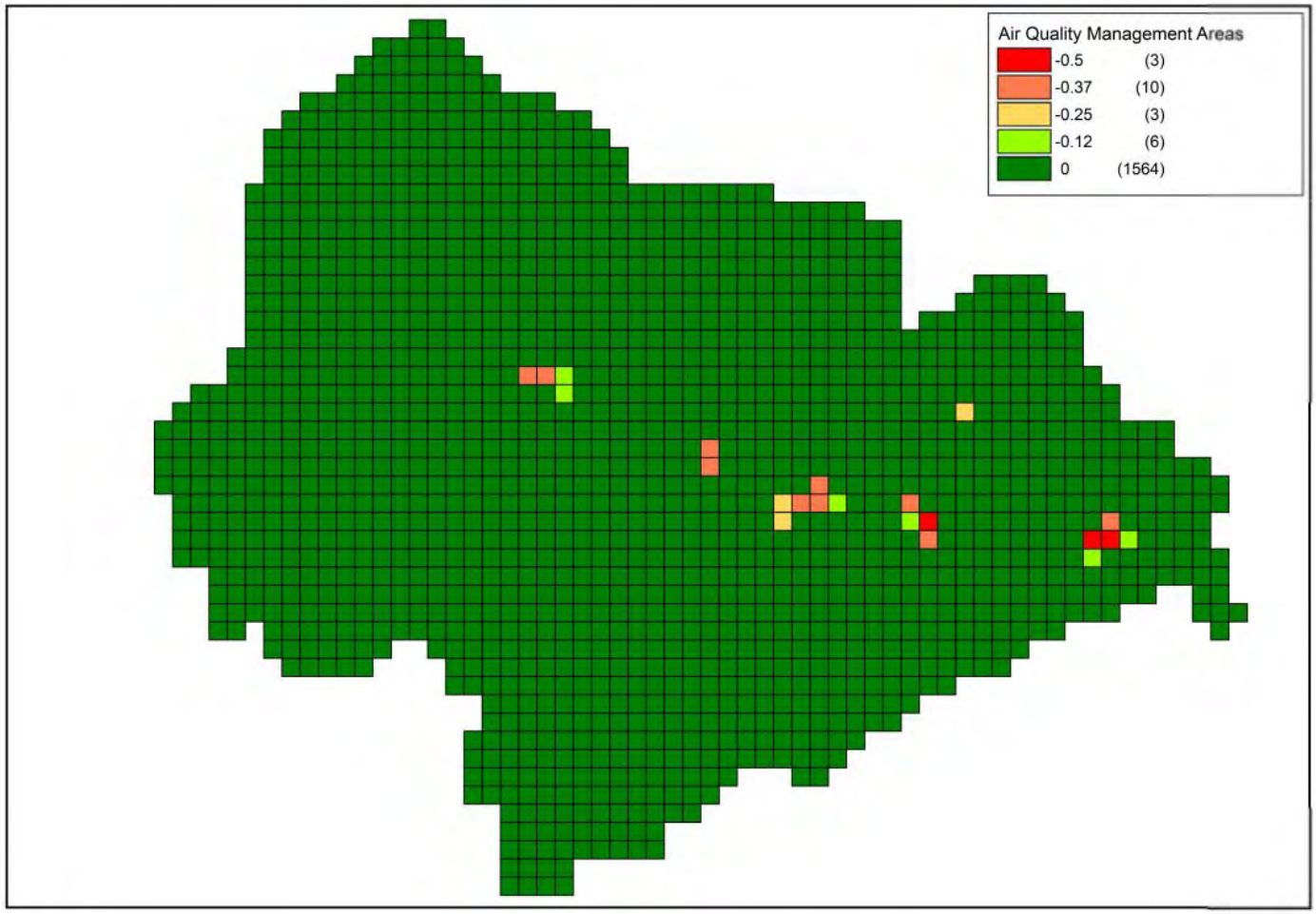
**Map 5.1 Map of Calderdale with 500m2 grid**



## Air Quality

5.2 The following map presents the results for the Air Quality criteria. As the map illustrates the vast majority of grid squares are within an acceptable threshold; however, the impact on Air Quality Management Areas (AQMA) can arise from these areas since new and existing development creates car journeys which will pass through the AQMA, which can have a negative impact on the Air Quality objectives.

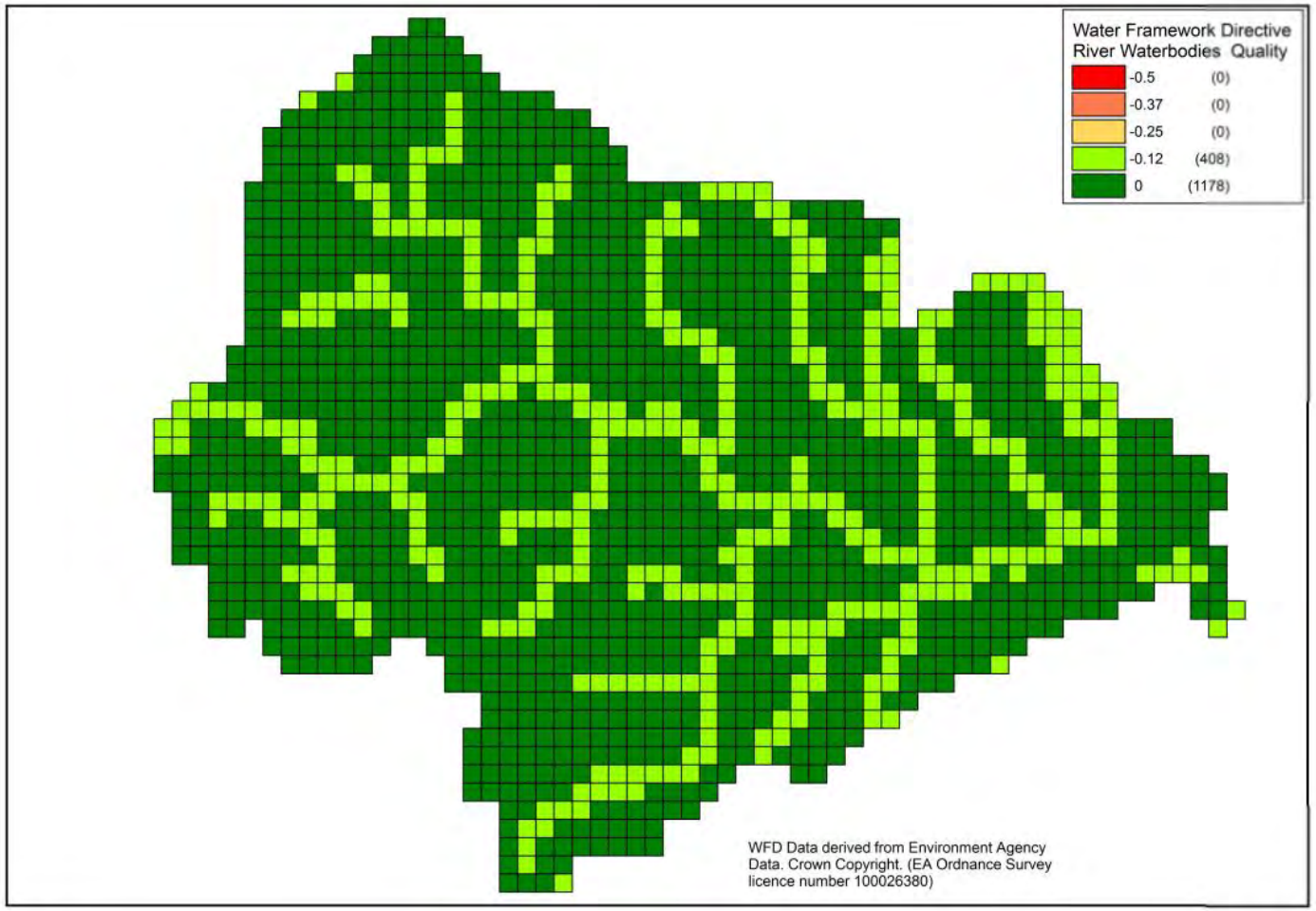
**Map 5.2 Air Quality Management Area scores**



## Water Quality

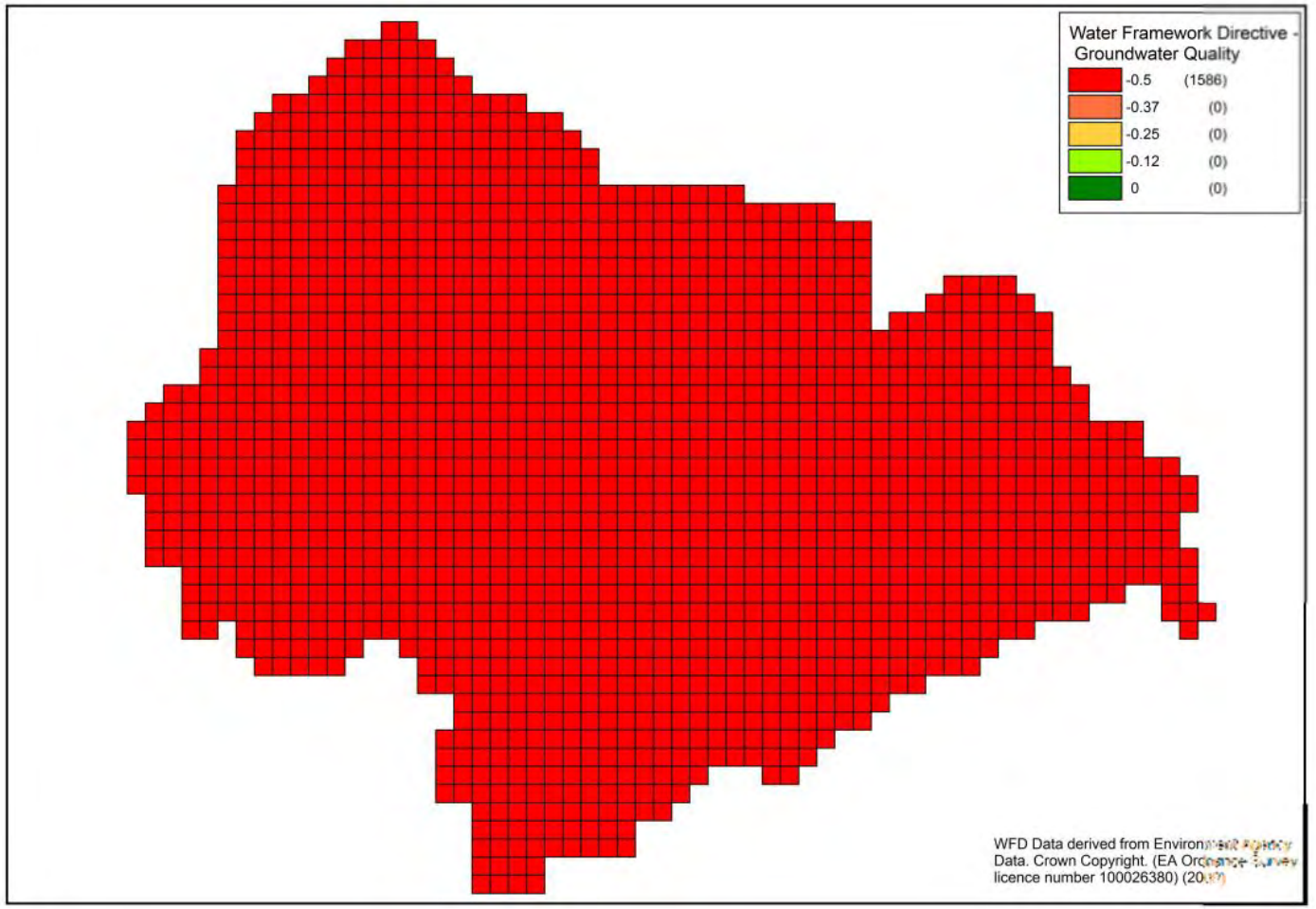
5.3 The following set of maps show the results for the water quality indicator, against four categories of water bodies; Rivers, Canals, Lakes and Groundwater. The first map presents the results of the extent of the unacceptable thresholds in relation to River water quality. Out of 25 river water bodies that were assessed, 5 were considered 'poor', 19 were considered 'moderate', with 1 that was considered to be 'good'.

**Map 5.3 Water Framework Directive River Water Quality Scores**



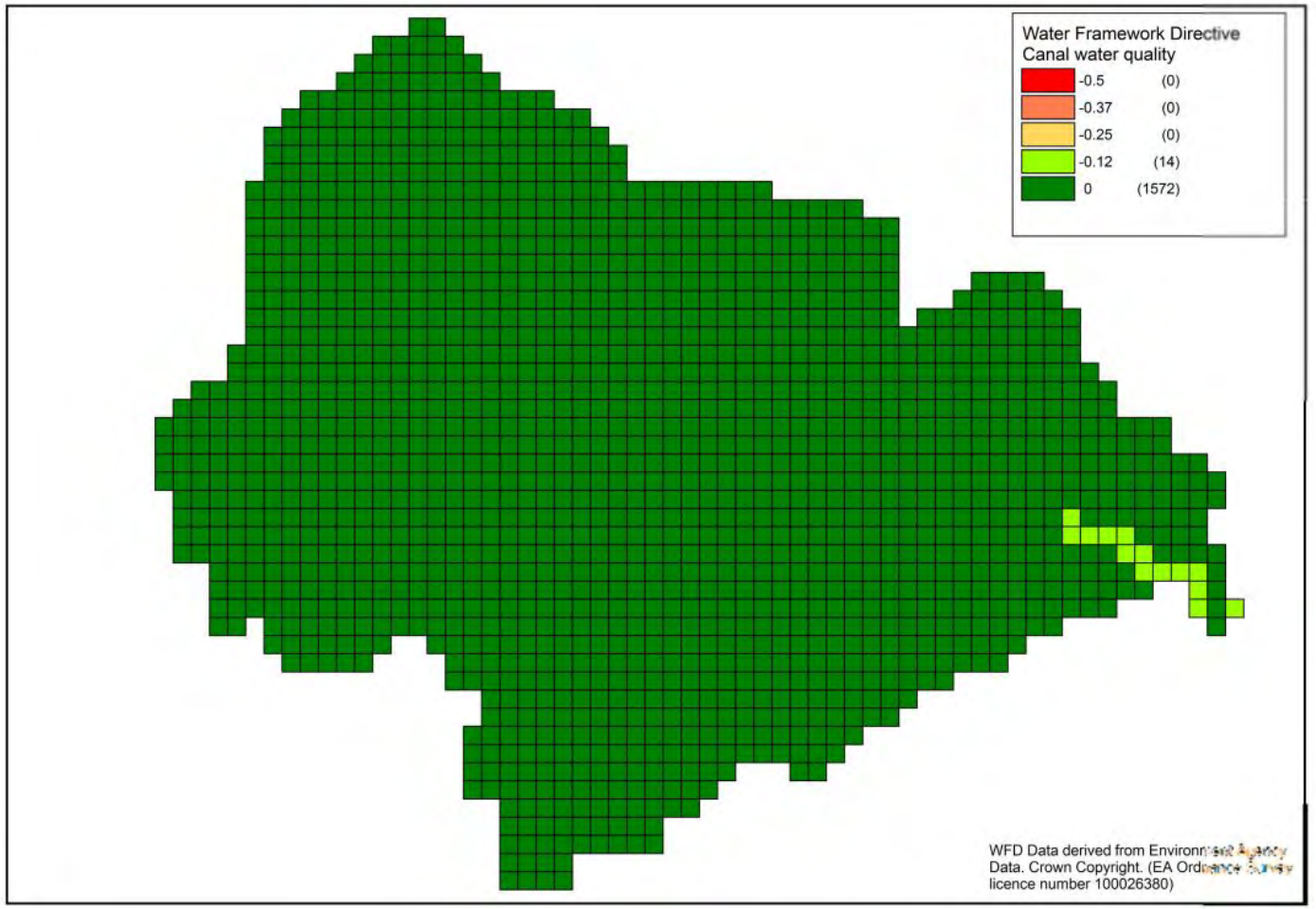
5.4 The results map for water quality concerning groundwaters is shown below. This indicates that the entire districts groundwaters are considered as being within the water quality unacceptable threshold. There are four aquifers underlying Calderdale and all were recorded as being of a 'poor' quality.

**Map 5.4 Water Framework Directive Groundwater Scores**



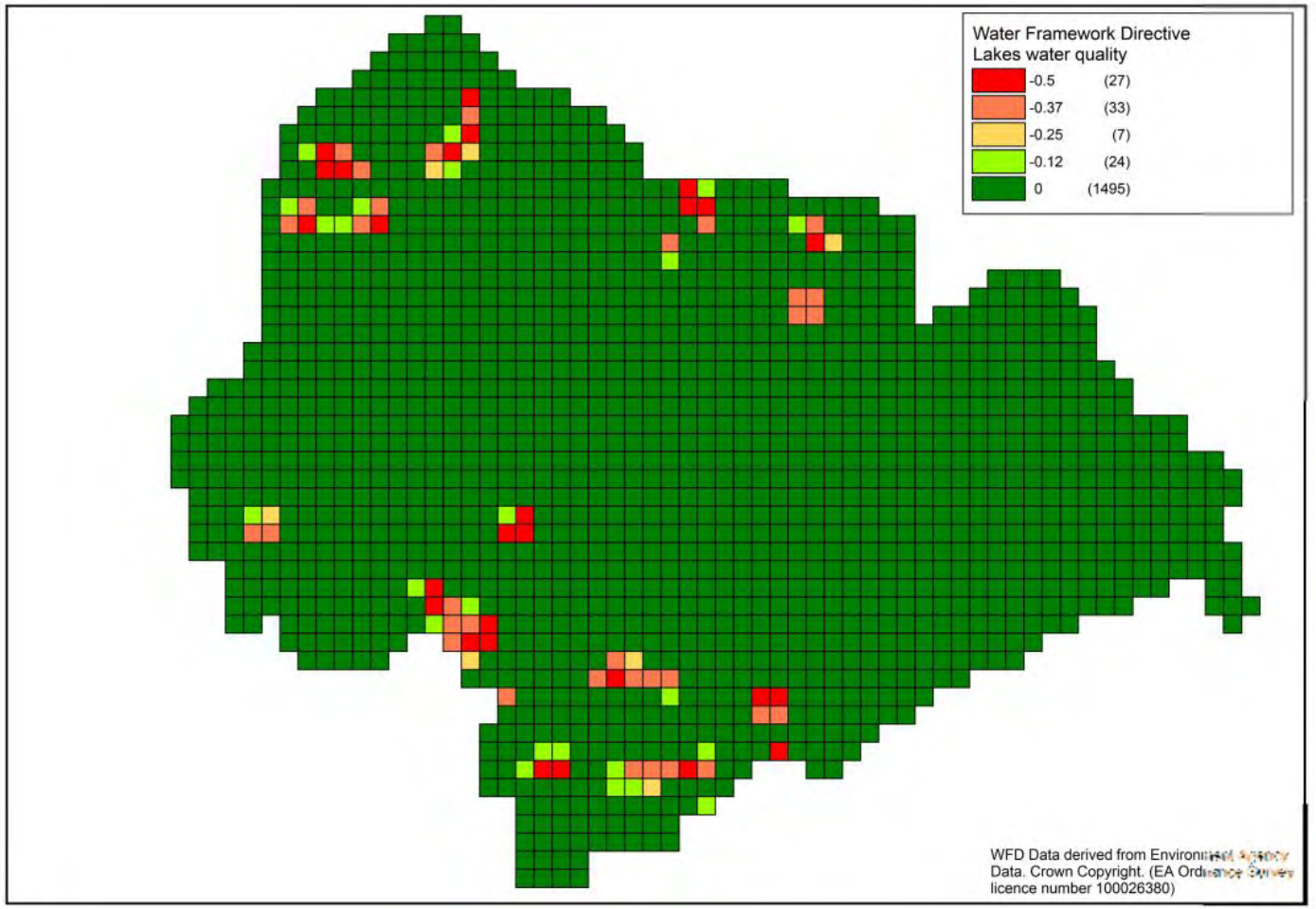
**5.5** The third map relating to water quality is concerned with the water quality within canals. Of the five water bodies that were assessed as part of the WFD, four were considered to be of a 'good' overall quality, with the other one being recorded as being within the 'moderate' classification.

**Map 5.5 Water Framework Directive Canal Water Quality Scores**



5.6 The final map in relation to the water quality indicator is concerned with water quality in lakes. The Environment Agency's assessment was that out of the 25 bodies of water classed as lakes, 22 were recorded as being of 'moderate' quality, 2 were 'poor' and 1 was classed as 'good' .

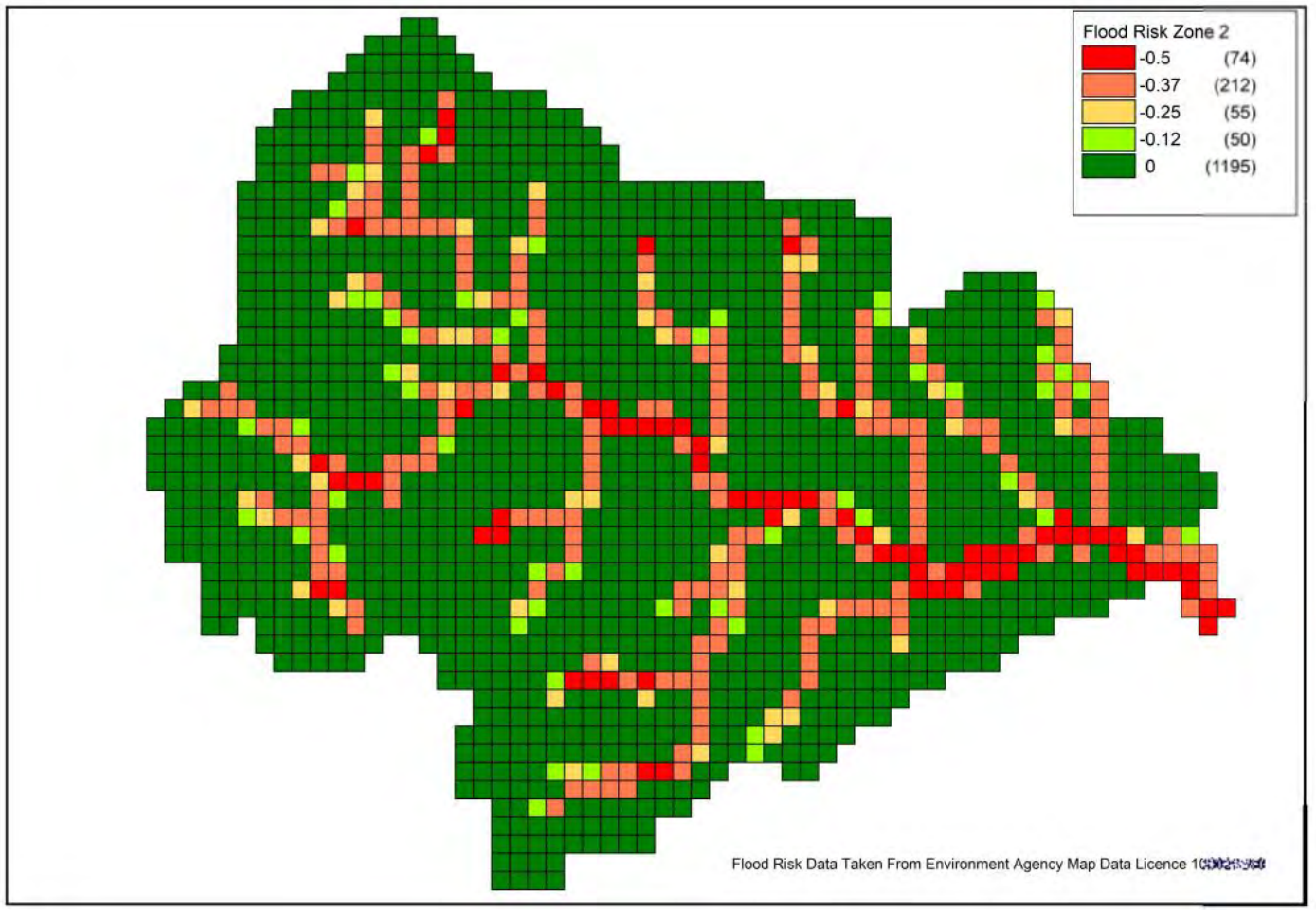
**Map 5.6 Water Framework Directive Lakes Water Quality Scores**



## Flood Risk

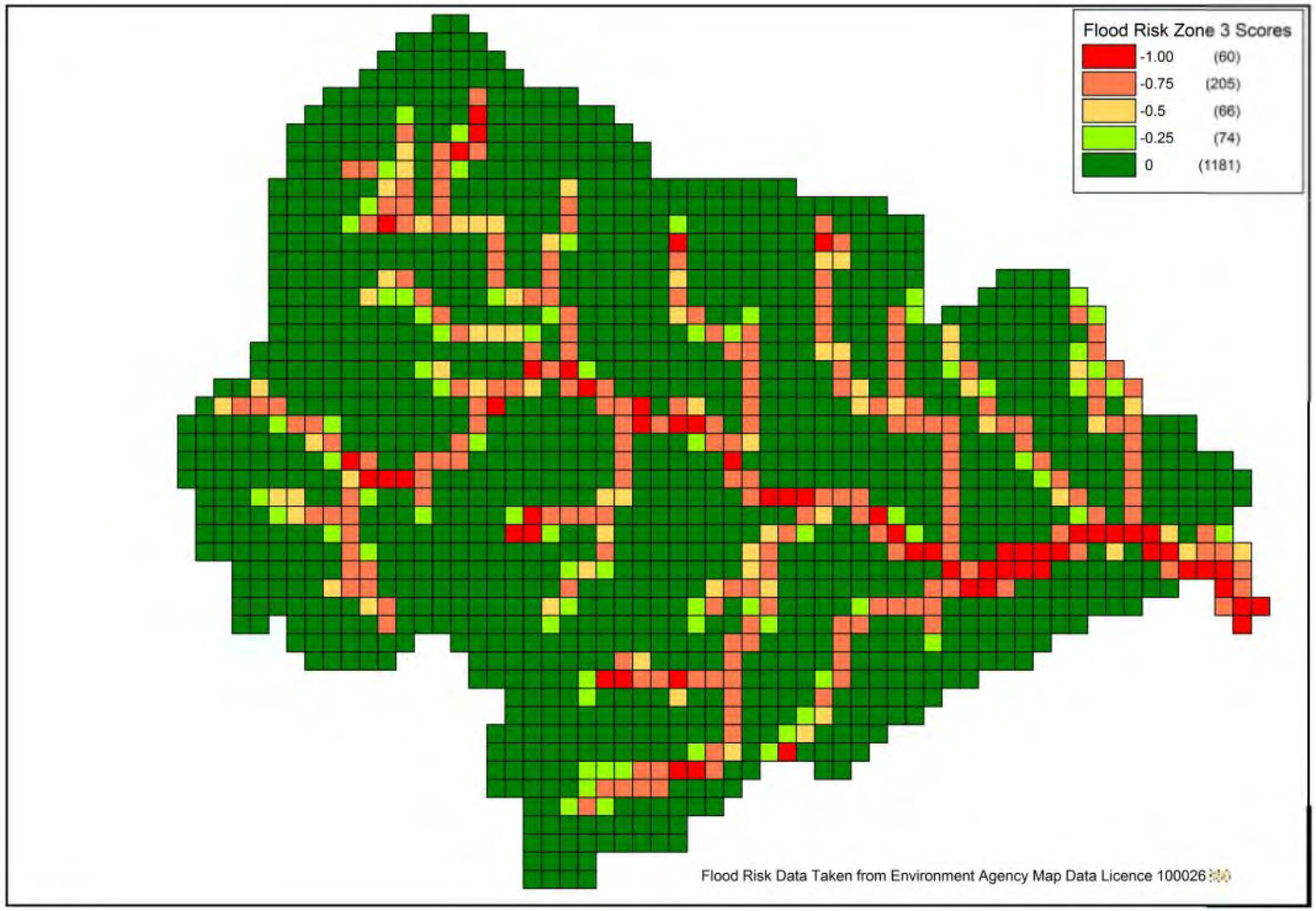
5.7 The following map illustrates the results of the flood risk zone 2 criteria. As expected, the grid squares most affected are those in the valley bottoms around the main watercourses, and the areas around the smaller watercourses that run down off the moors and valley sides.

**Map 5.7 Flood Risk Zone 2 Scores**



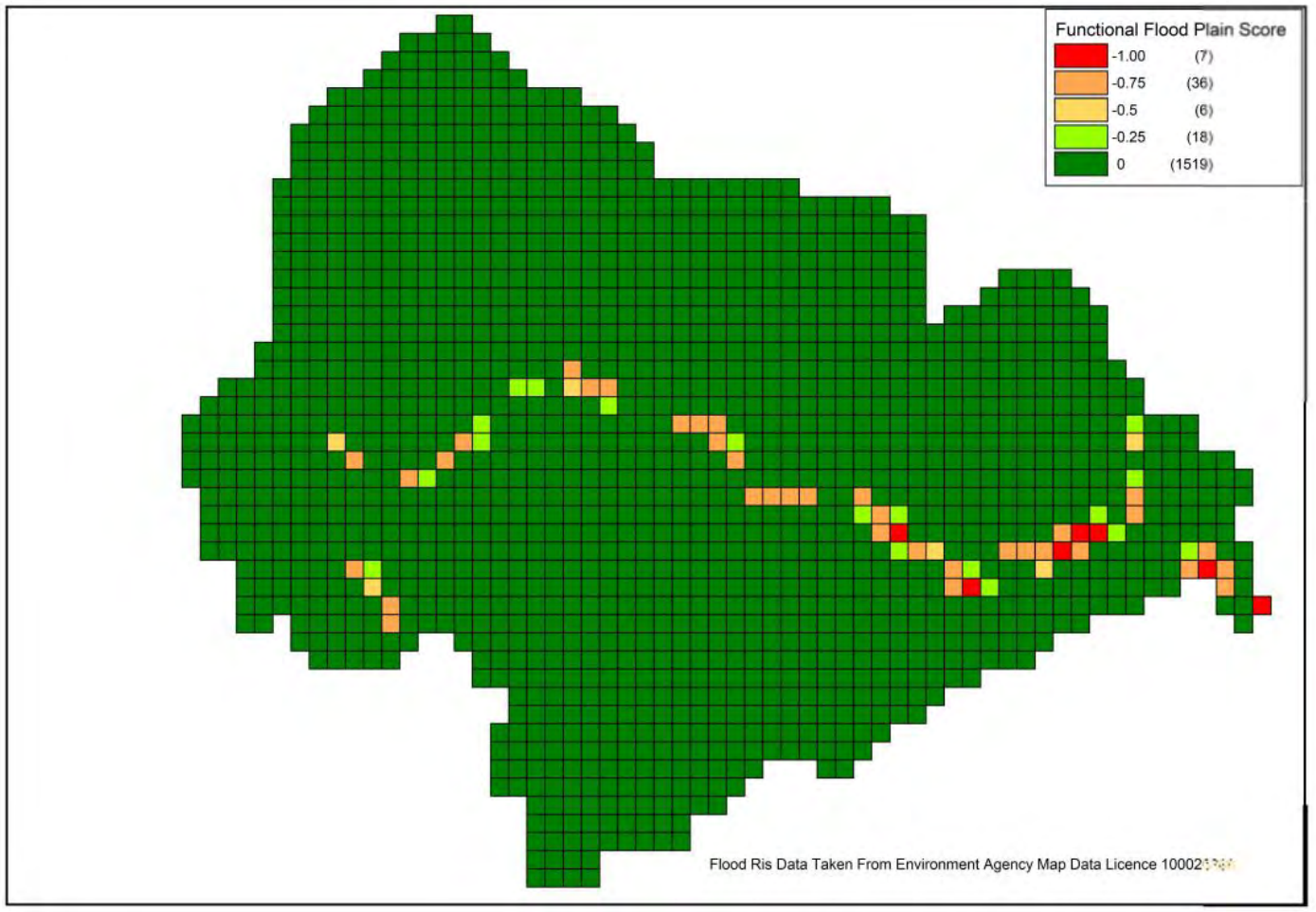
5.8 The next map shows the grid squares results in relation to flood risk zone 3. As expected the same grid squares that are affected by flood risk zone 2 are also affected by the higher risk zone, although there are some minor changes in the scoring of some grid squares, since there may be instances where zone 3 covers a smaller extent than zone 2.

**Map 5.8 Flood Risk Zone 3 Scores**



5.9 The next flood risk criteria map is the functional floodplain. The results against this criteria show that there are significantly fewer grid squares that show a significant risk; this is primarily due to the extent of the functional floodplain which represents areas where water has to flow or be stored in times of flooding and does not cover as an extensive area as either zone 2 or 3. The worst performing grid squares are exclusively along the valley floor of the district.

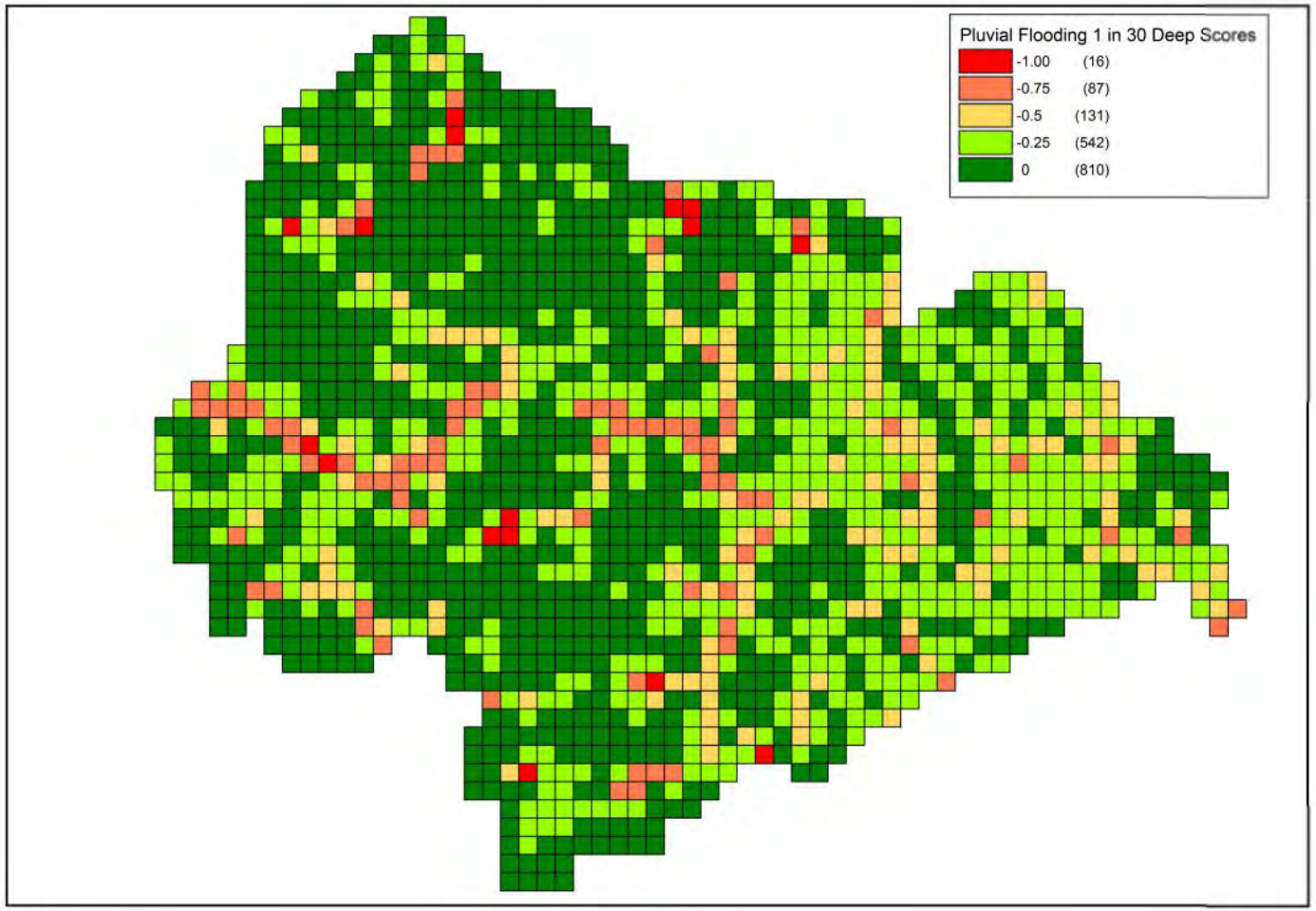
**Map 5.9 Functional Flood Plain Scores**

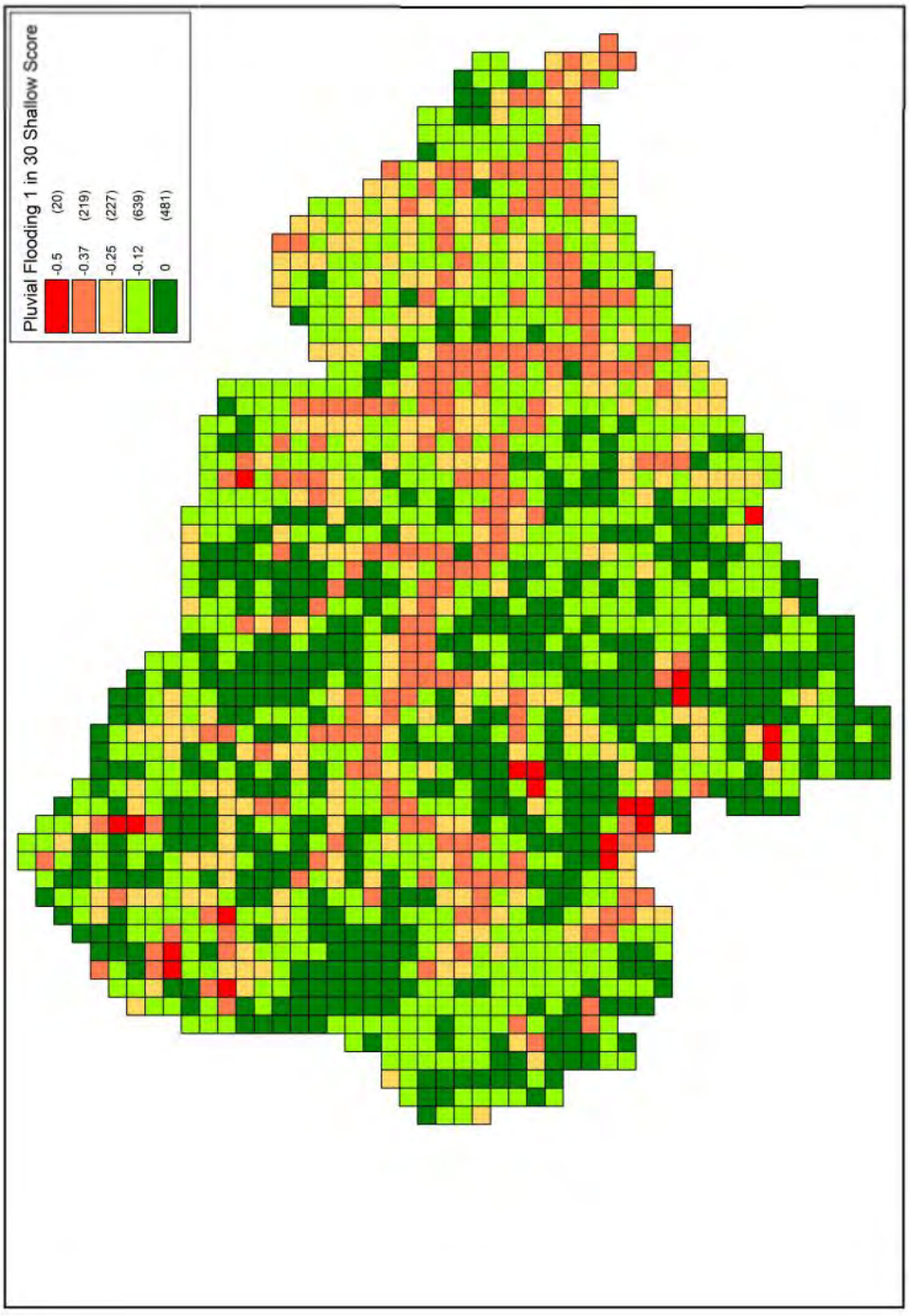


## Pluvial (Surface Water) Flooding

**5.10** The Pluvial Flooding criteria resulted in a large number of grid squares being affected, especially so for the 1 in 30 and 1 in 200 year 'shallow' events, which identify where surface water could rise up to the property threshold (300mm). The more extreme events are the 1 in 30 year and 1 in 200 year 'deep' events, as in these circumstances surface waters could rise to between 300mm and 1000mm. Of the four individual data sets mapped, by far the most extreme event is the 1 in 200 year deep event.

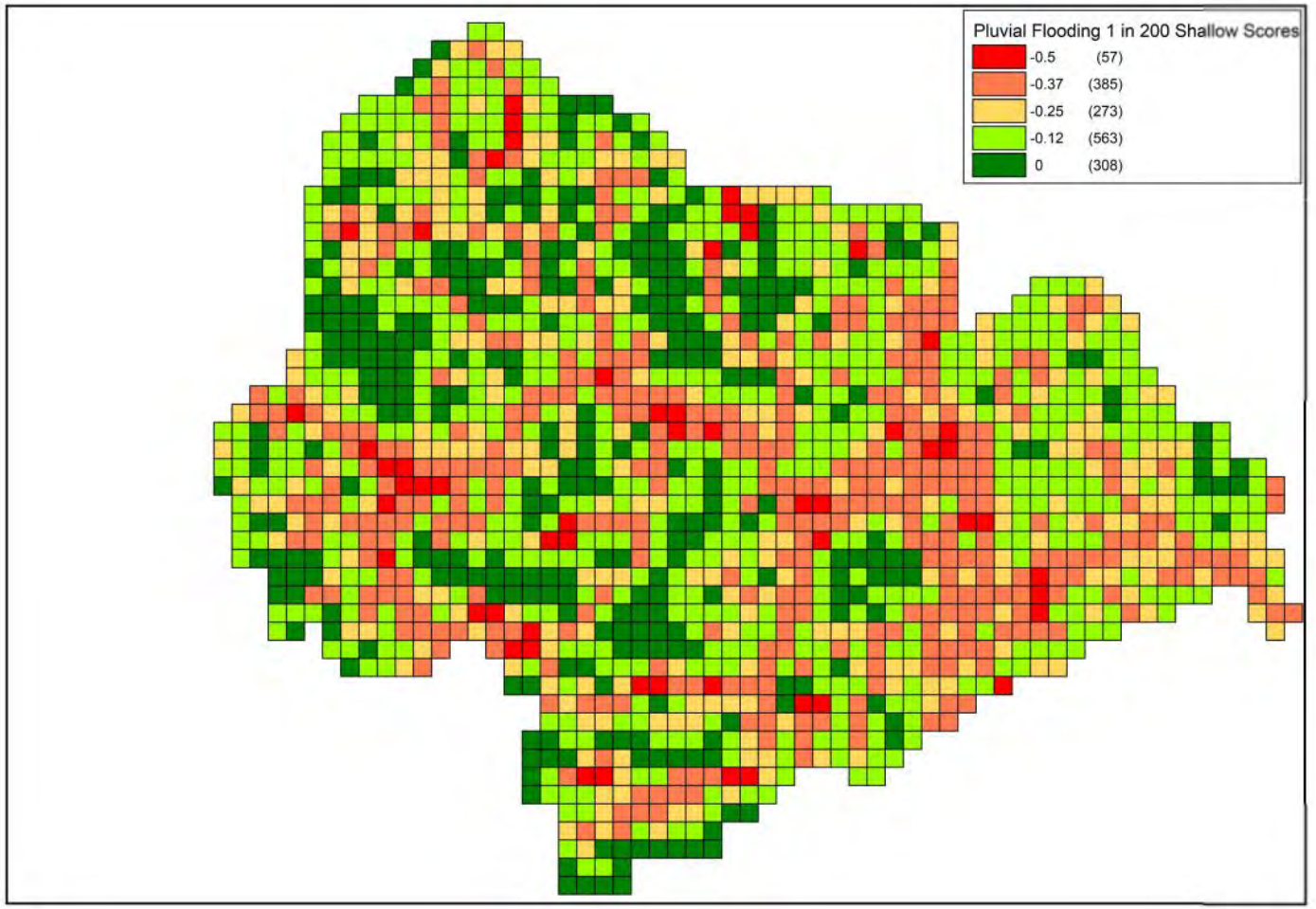
**Map 5.10 Pluvial Flooding - 1 in 30 Deep Scores**

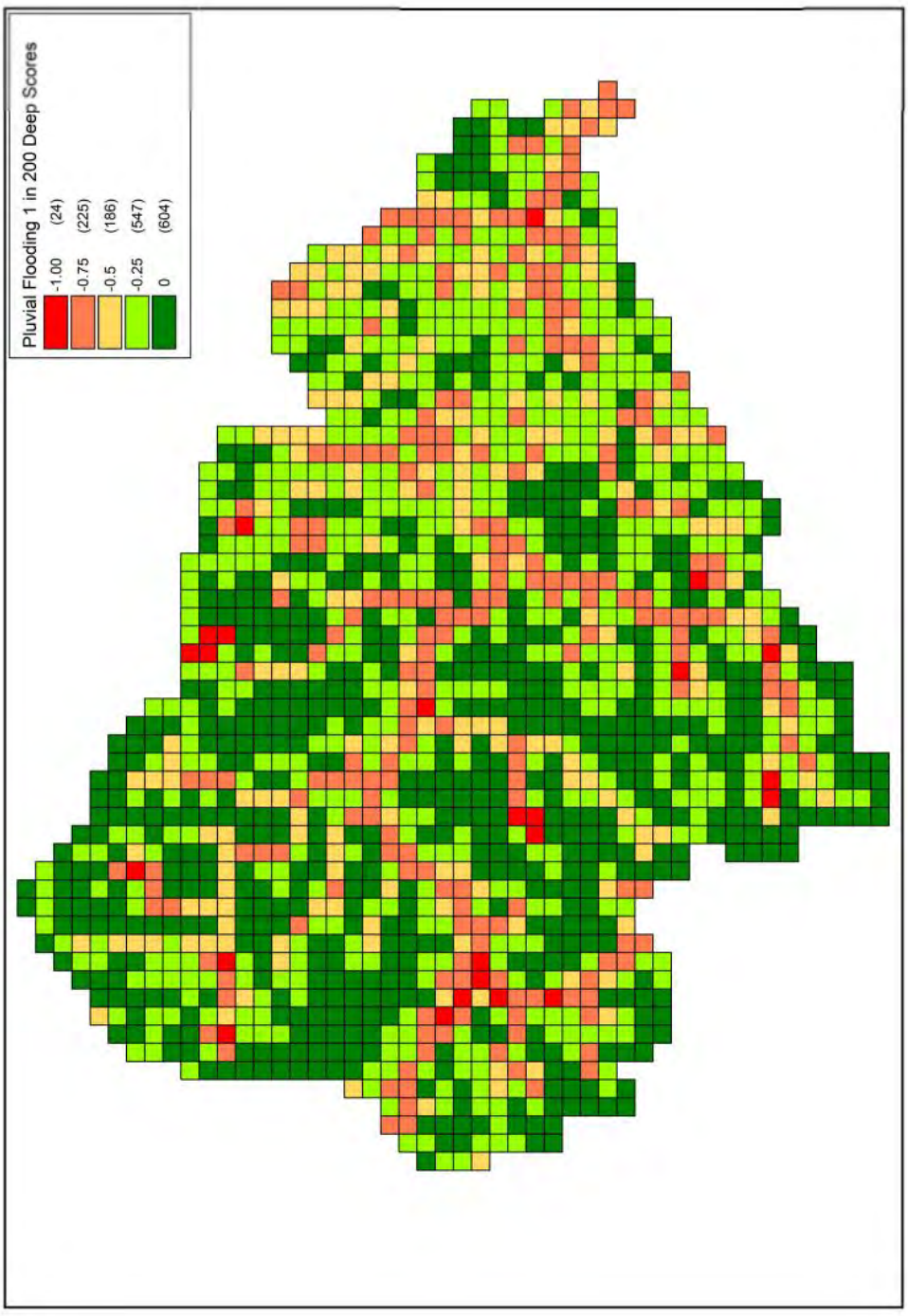





**Map 5.11 Pluvial Flooding 1 in 30 Shallow Scores**

**Map 5.12 Pluvial Flooding 1 in 200 Shallow Scores**



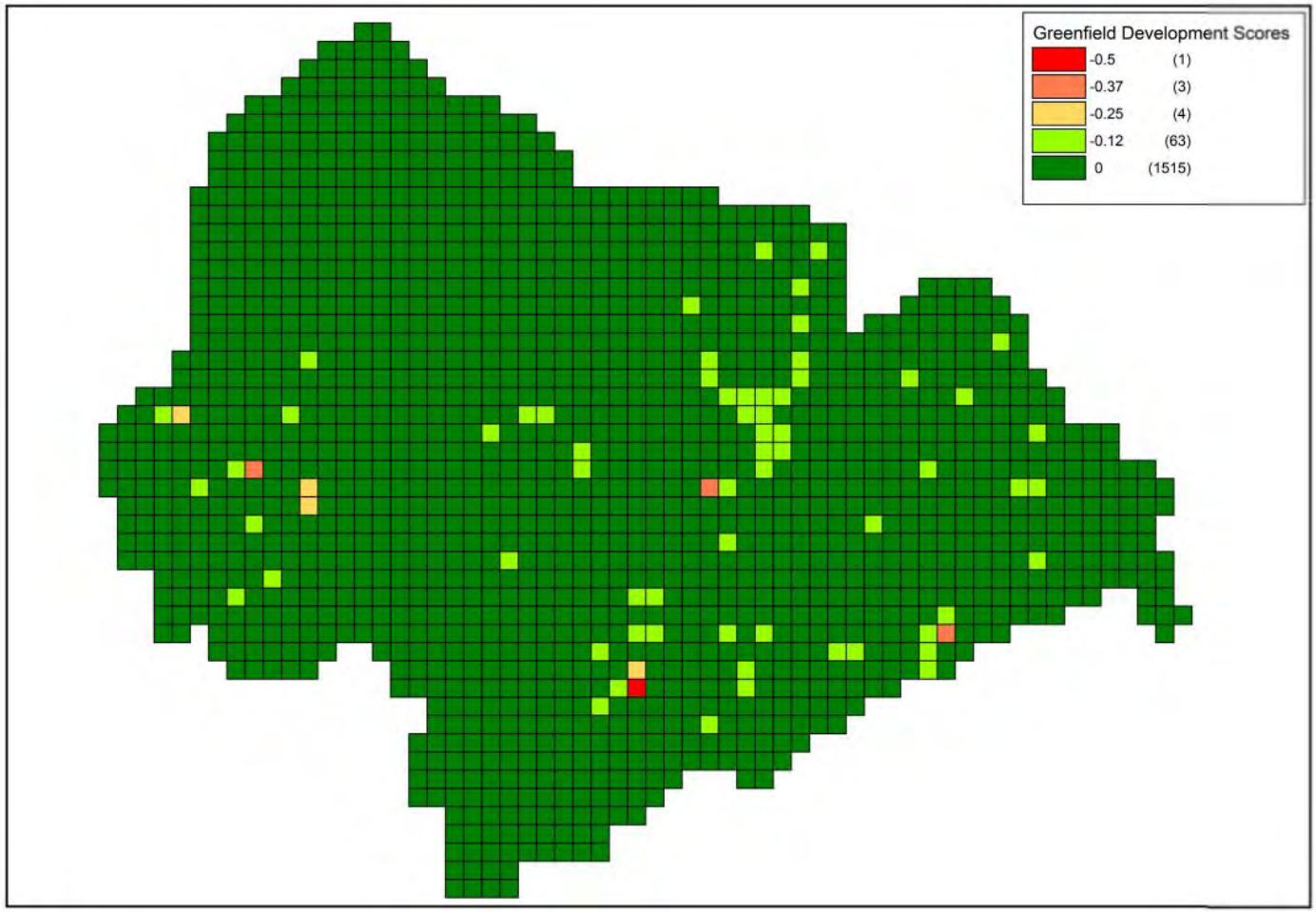



**Map 5.13 Pluvial Flooding 1 in 200 Deep Scores**

## Land Use Minerals and Soils - Greenfield Development

**5.11** As land is a finite resource, with many competing uses, it was considered necessary to include an indicator which presented some form of spatial data that related to the use of brownfield and greenfield land for residential development. The following map therefore shows those grid squares where planning permission has been granted for residential development on greenfield sites over the past 5 years. It highlights the fact that there has been little in the way of greenfield development during the period, with only one grid square including an area of more than 5 hectares.

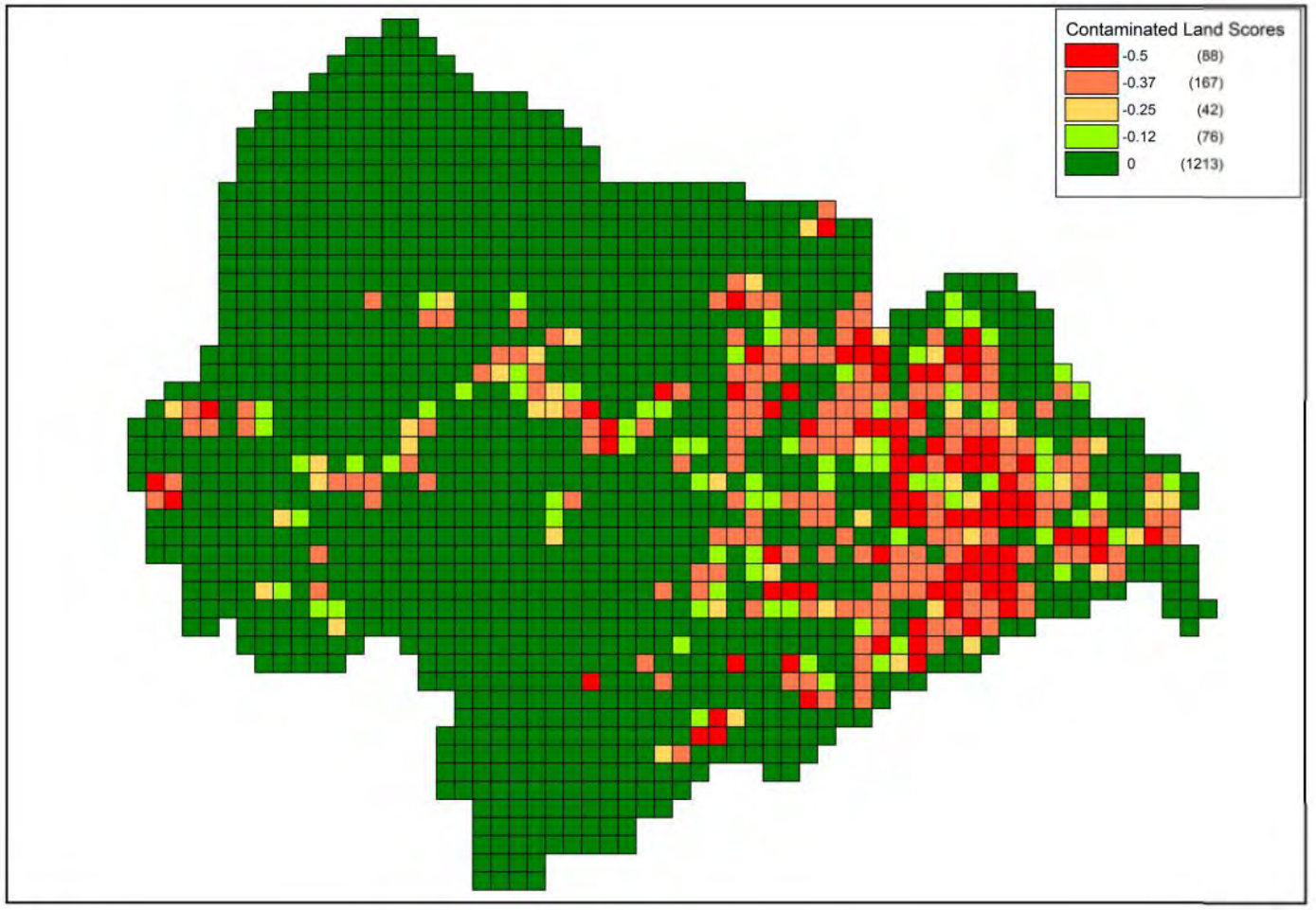
**Map 5.14 Greenfield Development Scores**



## Land Use Minerals and Soils - Contaminated Land

5.12 As explained in section 4, this data set was reviewed prior to mapping, due to the extent of the records without any information against them, alongside removing those sites where remediation had taken place. The results map shows that the majority of contaminated land occurs in the east of the district, likely to be as a result of this being the location of the main industrial areas of the district.

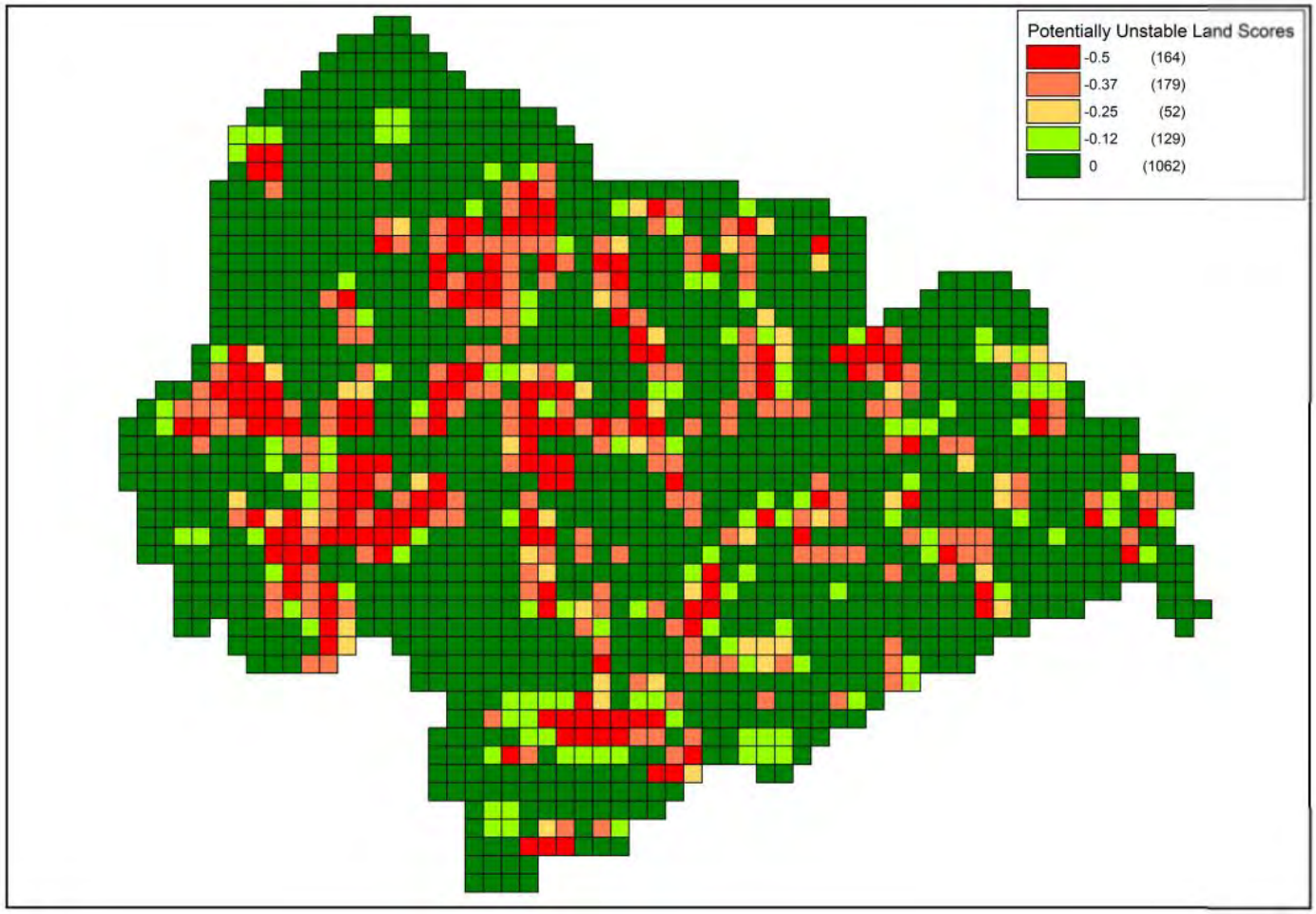
**Map 5.15 Contaminated Land Scores**



## Geology and Biodiversity - Potentially Unstable Land

5.13 The current Local Plan, the Replacement Calderdale Unitary Development Plan (RCUDP) includes a designation of Potentially Unstable Land. This data was provided by the British Geological Survey, and the following map highlights those grid squares that contain areas identified as such in the RCUDP.

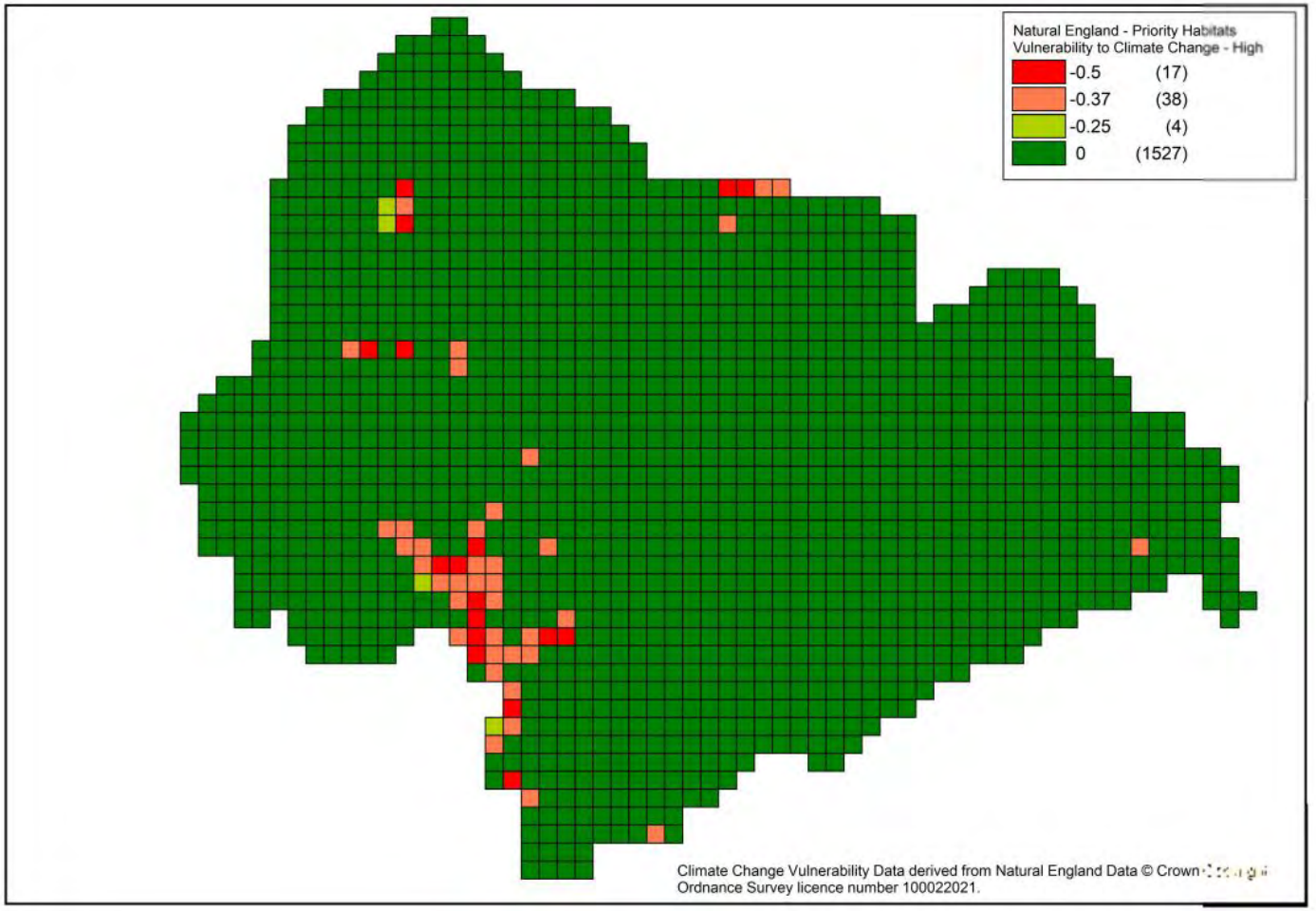
**Map 5.16 Potentially Unstable Land Scores**



## Climate Change

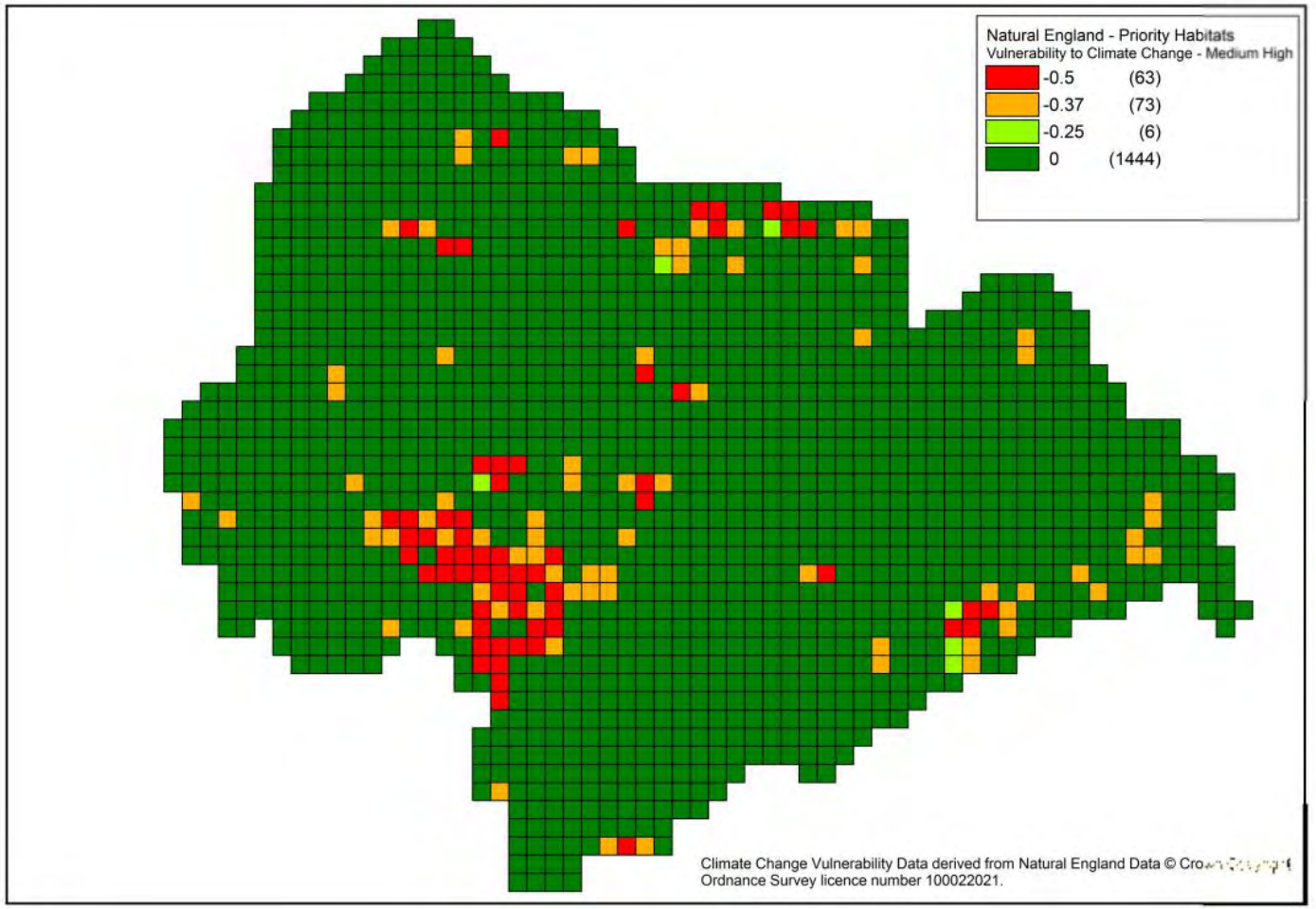
5.14 The climate change data was supplied by Natural England (NE) and focused on the vulnerability of priority habitats to climate change. The following maps present the results in relation to the Medium, Medium-High, and High risk to climate change in relation to this criteria. This indicates that apart from a small number of isolated grid squares, the main concentration of those priority considered to be at a high vulnerability to climate change occur in the south west of the district.

**Map 5.17 Priority Habitats at a High Vulnerability to Climate Change - Scores**



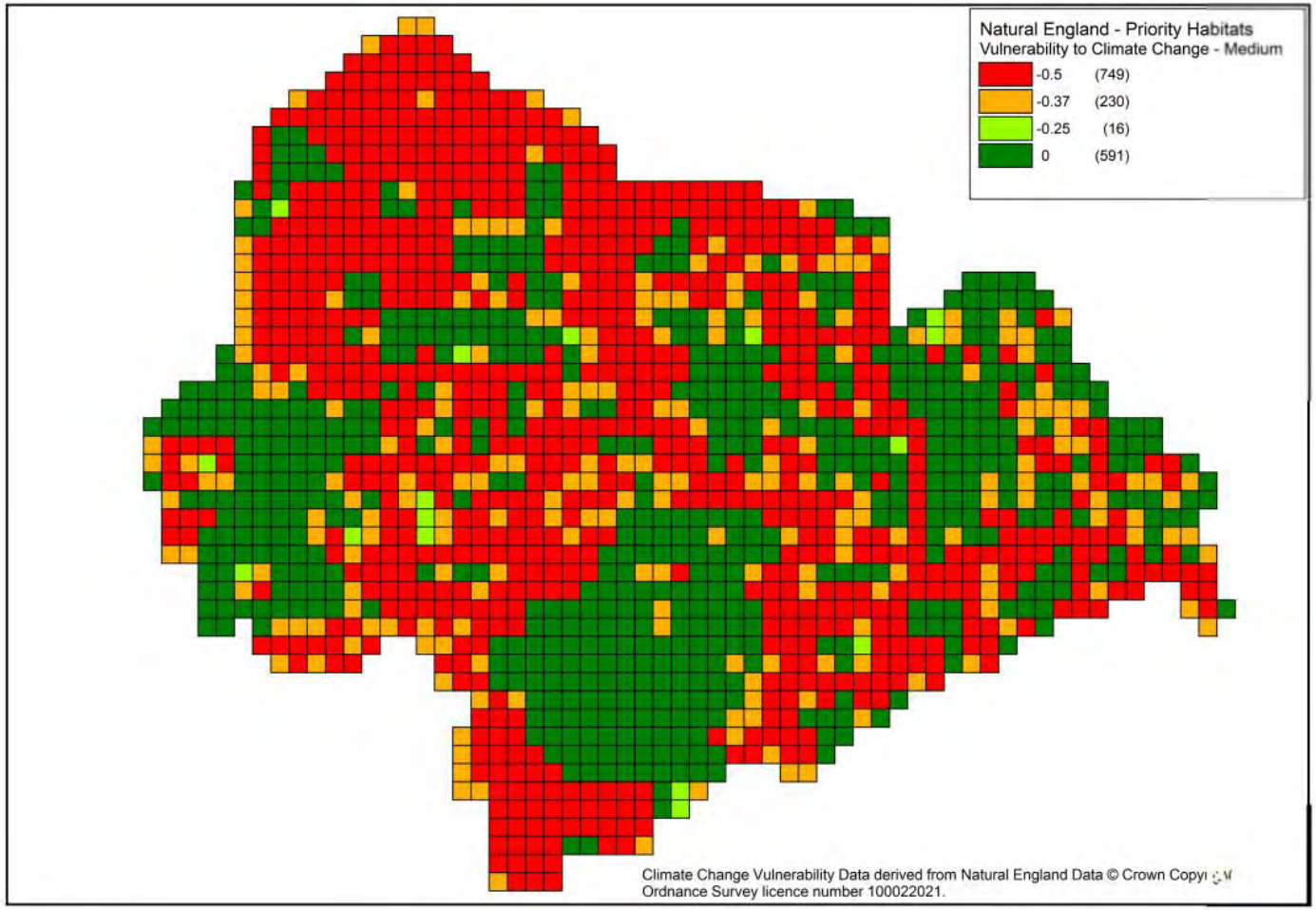
**5.15** The Medium-High results show again that a concentration of priority habitats at risk of vulnerability exist in the south west of the district, however there are an increased number of other pockets of vulnerability dotted around the district.

**Map 5.18 Priority Habitats at a Medium-High Vulnerability to Climate Change - Scores**



**5.16** The final map concerning vulnerability to climate change is presented below. This shows a much larger distribution of those areas considered to be at a medium vulnerability level to climate change, especially around the SPA and SAC areas in the west of the district.

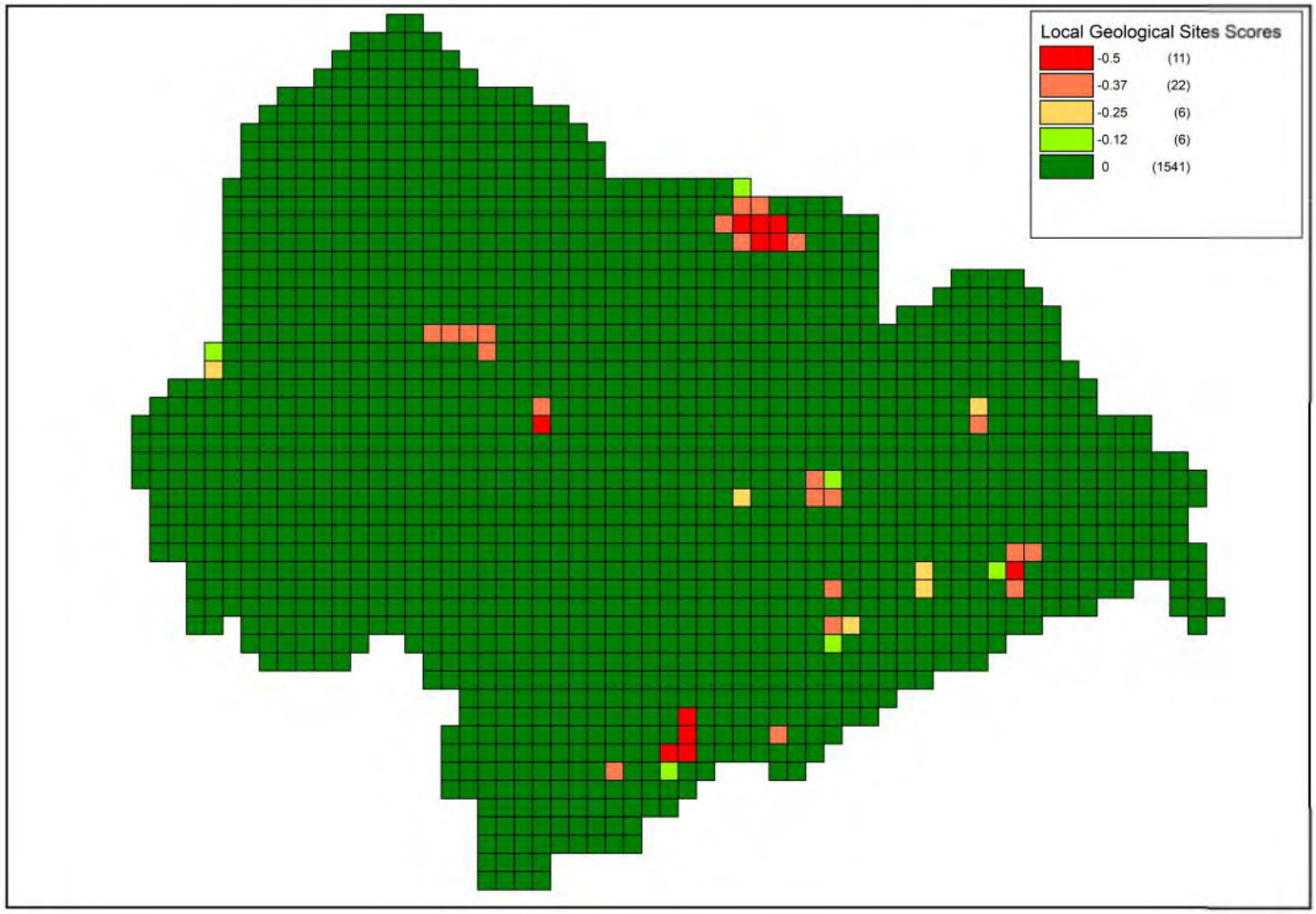
**Map 5.19 Priority Habitats at a Medium Vulnerability to Climate Change - Scores**



## Geology and Biodiversity - Local Geological Sites

**5.17** The next map presents the results of querying the Local Geological Sites (LGS, also including those sites formerly referred to as Sites of Ecological and Geological Interest (SEGI)) criteria. The LGS map shows that there are a small number of grid squares which contain areas of 5 hectares or more of LGS sites where no recorded positive management has taken place in the previous 5 years.

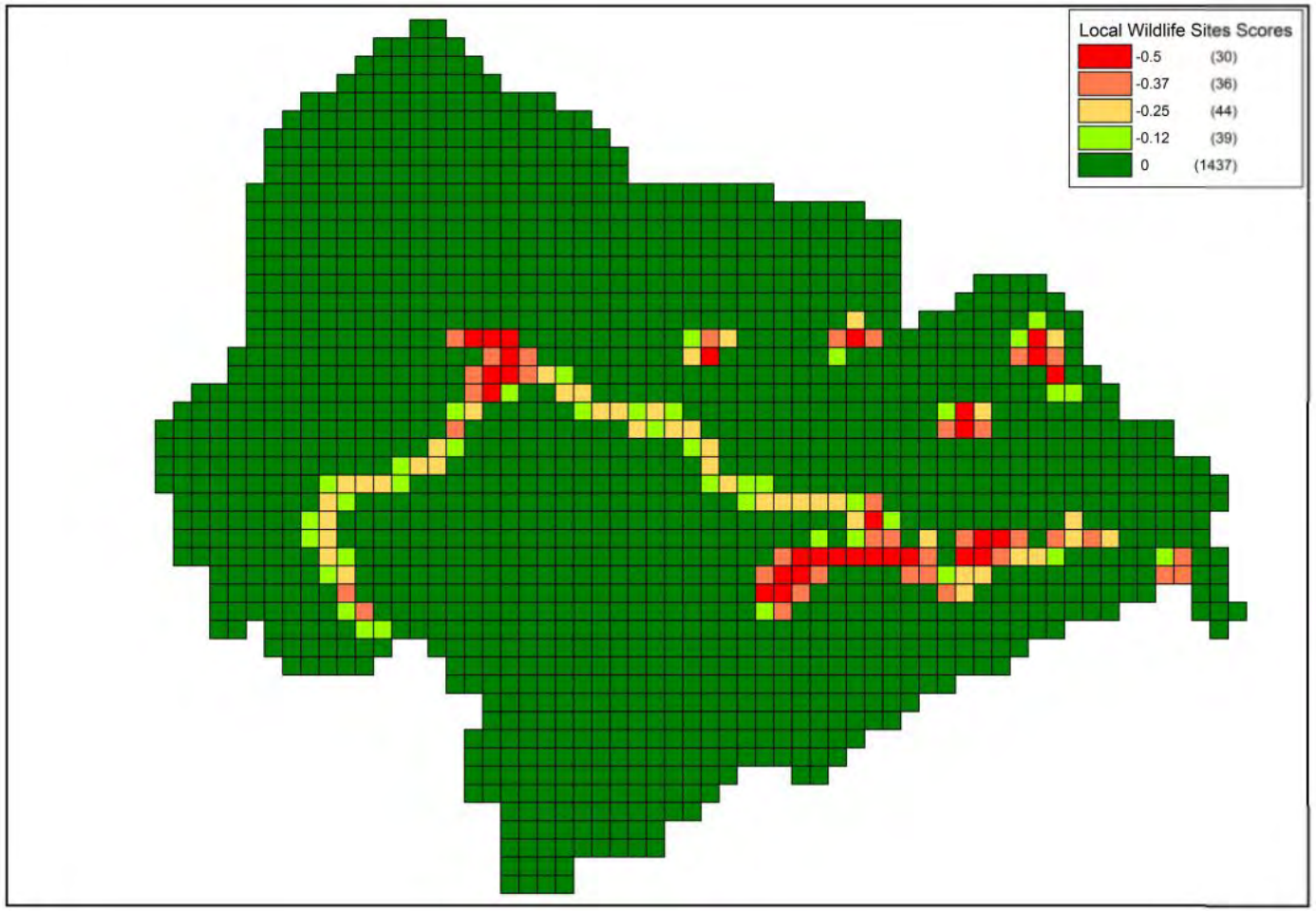
**Map 5.20 Local Geological Sites Scores**



## Geology and Biodiversity - Local Wildlife Sites

5.18 There are a slightly higher number of grid squares that return the highest negative score where there are Local Wildlife Sites that cover more than 5 hectares where no positive conservation management has taken place. The pattern of negative scoring grid squares running along the valley floor follow the paths of both the Rochdale Canal, and the Calder and Hebble Canal.

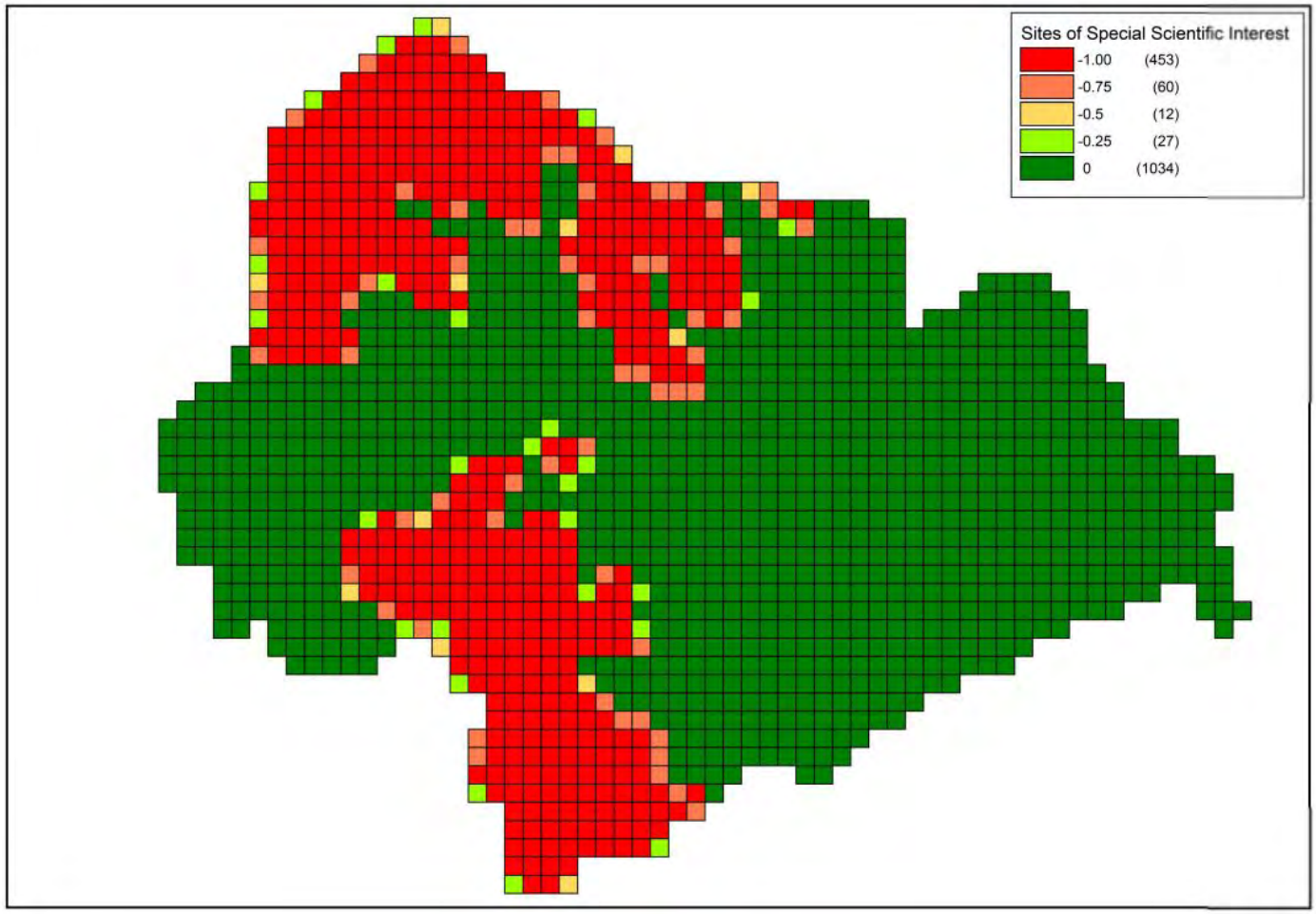
**Map 5.21 Local Wildlife Sites Scores**



## Geology and Biodiversity - Sites of Special Scientific Interest (SSSI)

**5.19** The district has a number of Sites of Special Scientific Interest (SSSI), and the results show where these are considered to have met the unacceptable threshold (recording anything other than a 'favourable' status by Natural England). The map shows that the South Pennines Moors SSSI dominates the negative scoring.

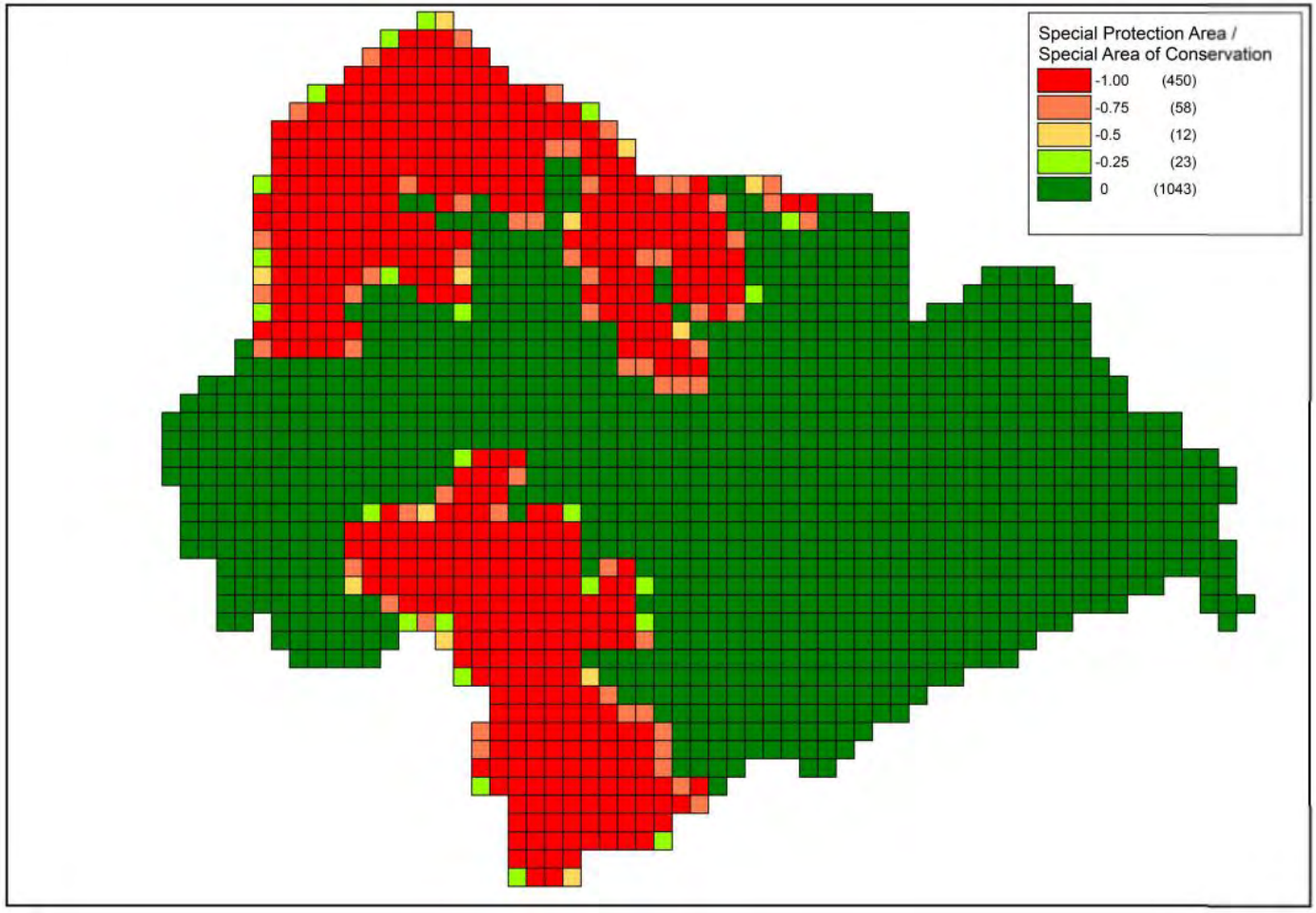
**Map 5.22 Sites of Special Scientific Interest scores**



## Geology and Biodiversity - Special Protection Area (SPA) and Special Area of Conservation (SAC)

5.20 The South Pennines (in addition to it's SSSI status) is also designated as a Special Protection Area (SPA) and a Special Area of Conservation (SAC), which are international designations reflecting the area's nature conservation value. Similar to SSSI, Natural England also carry out assessments on the condition of this designation. The assessment recorded all the SPA / SAC areas within Calderdale as being of either an 'Unfavourable Recovering' or an 'Unfavourable No Change' status, and therefore the results reflect an unacceptable threshold score.

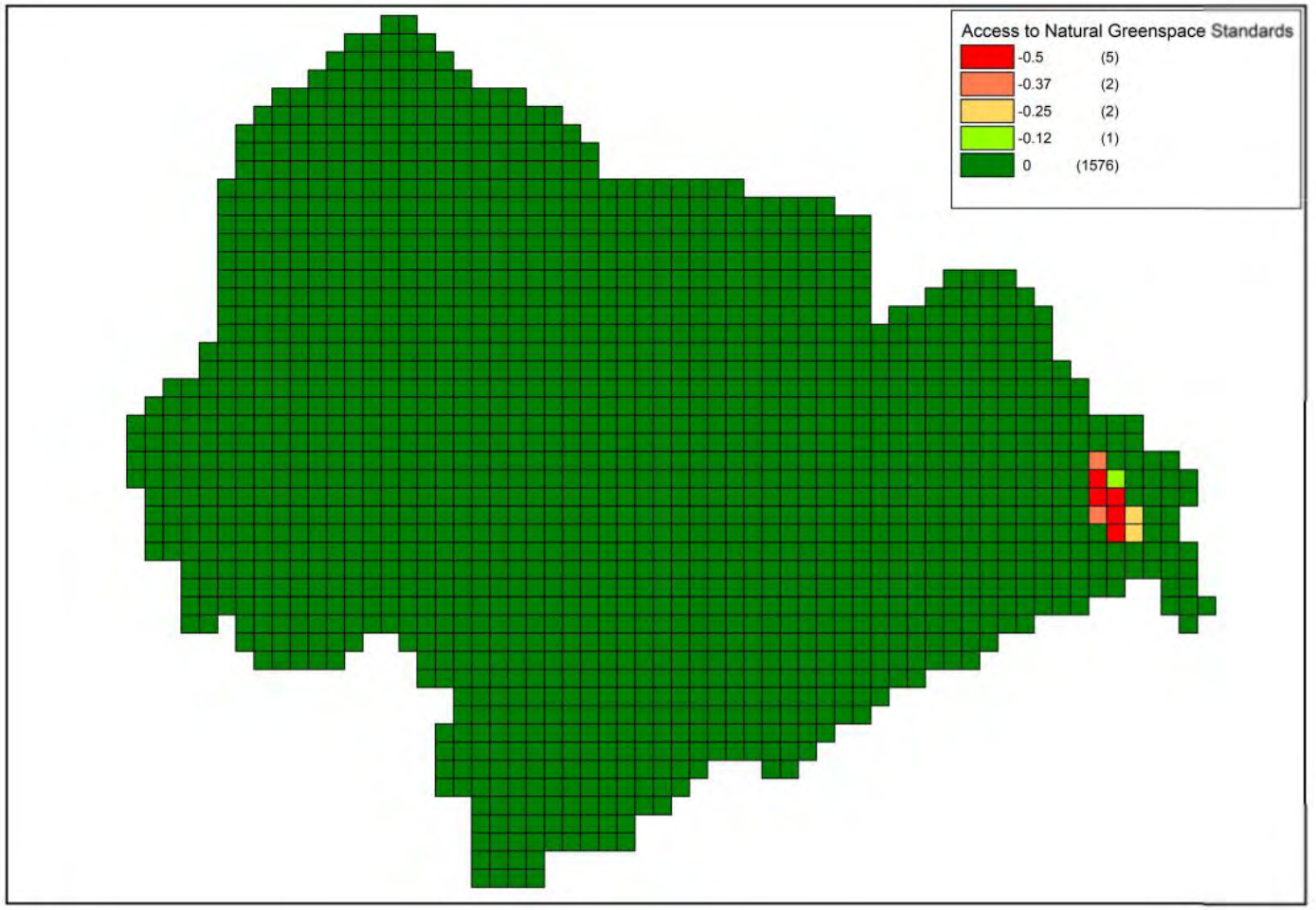
**Map 5.23 Special Protection Area / Special Area of Conservation Scores**



## Open Space & Recreation

**5.21** The map below shows the results of the Access to Natural Green Space Standards (ANGSt) criteria. This indicates there is only one area in the east of the district that does not meet the requirements of the standards.

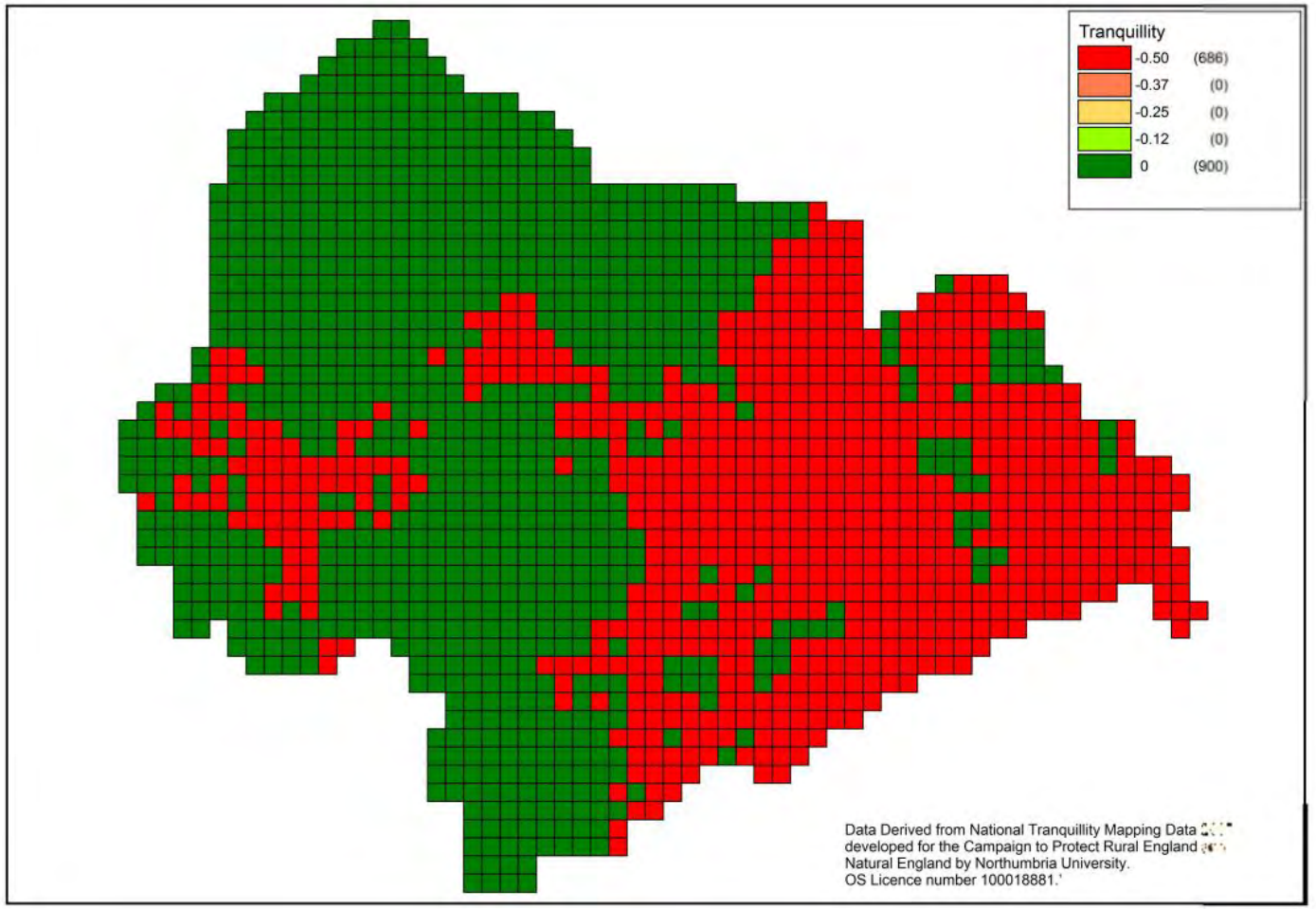
**Map 5.24 Access to Natural Greenspace Standards Scores**



## Tranquillity

5.22 The final individual map presents the results of the data derived from the CPRE tranquillity mapping. This shows that as expected, the urbanised areas score poorly, whilst the moorlands and hillside areas score well. Because of the nature of the original data (scored by 500m$^2$ grid squares and the ETS scoring ranges) this criteria will only return a minimum ('-0.50') or maximum ('0') score.

**Map 5.25 Tranquillity Map Scores**



**Overall Environmental Thresholds Results Composite Map**

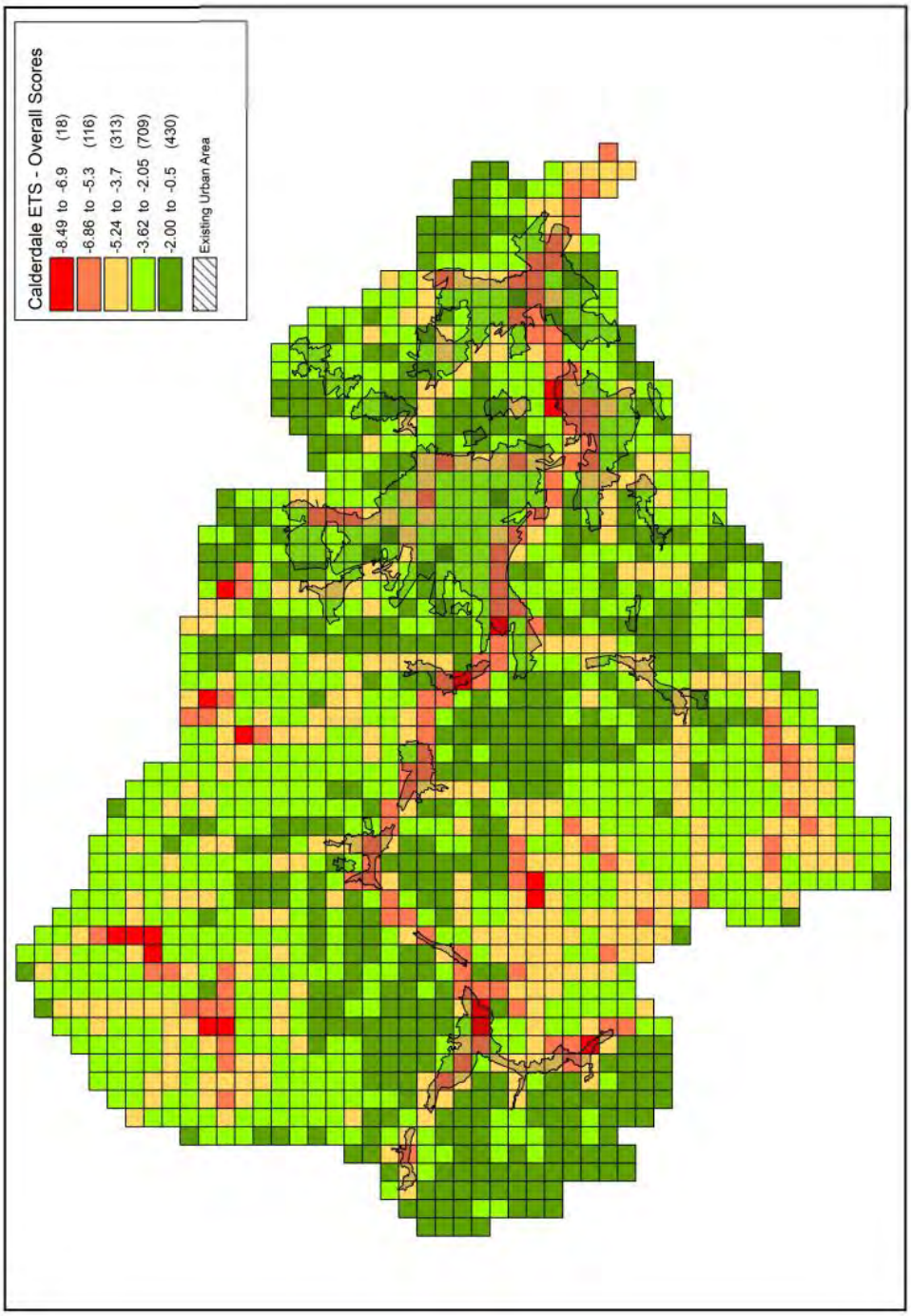
**5.23** The final map is the composite map which sums up all the individual scores and presents the overall environmental thresholds map. The overall results show that there are a greater concentration of 'unacceptable' environmental thresholds along the valley bottoms and the associated urban areas, with other concentrated pockets of negative scores running along the urban areas at the eastern edge of Halifax, the northern half of Elland, central and eastern Brighouse.

**5.24** It is once again important to emphasise that the role of the ETS is to *present an assessment of the condition of certain environmental criteria*. Although the rural areas show a lesser concentration of 'unacceptable' environmental thresholds, this does not mean they are suitable sites for development; rather it is because they do not have as greater concentration of environmental criteria within 'unacceptable' thresholds; the environmental constraint or constraints still exist. Similarly, where there are a greater concentration of unacceptable thresholds in the urban areas this does not rule out such areas from accommodating future development, the ETS instead raises awareness of their presence. The main application of the data will be to review the existing urban areas and urban fringes to inform the location of future development through the Local Plan.

**5.25** In terms of their location, there was an even split of the worst performing grid squares consisting of those within or at least partially overlapping an urban area, and those completely outside an urban area. In terms of those grid squares within or overlapping an urban area they were relatively evenly distributed across the district's towns, although they were exclusively along the valley floor. Of those grid squares in the rural area, all were either within or overlapped by the South Pennines Special Protection Area (SPA) and Special Area of Conservation (SAC)(and therefore also within or overlapped by the Sites of Special Scientific Interest).

**5.26** The second worst performing range of grid squares were again mainly located along the valley bottoms with other concentrated pockets of negative scores running along the urban areas at the eastern edge of Halifax, the northern half of Elland, central and eastern Brighouse.

**Map 5.26 Calderdale Environmental Thresholds Study - Overall Results Map**



# 6 Conclusion

**6.1** The overall conclusion established through the ETS is that there are a greater concentration of 'unacceptable' environmental thresholds along the valley bottoms and the associated urban areas. A review of those grid squares scoring the lowest negative values presents a consistent picture. The criteria with the highest concentration of negative scores was the Flood Risk Zone 3, with the second and third most frequent criteria being the 1 in 200 year and 1 in 30 year deep surface water flooding criteria. Other criteria of note were the Special Protection Area (SPA), the Special Area of Conservation (SAC) and the Sites of Special Scientific Interest (SSSI).

**6.2** The Calderdale ETS has raised some positive and negative issues in relation to the mapping of environmental thresholds. In terms of the positive outcomes, the following are considered to represent the positive outcomes from the first edition of the ETS:

Supports the Local Plan by informing the distribution of development;
Highlights the current environmental condition of a number of criteria;
Presents an environmental assessment that can be combined with the Settlement Hierarchy's social and economic assessments;
Establishes a baseline position from which further revisions can be made;
Supports the Local Plan Sustainability Appraisal.

**6.3** It is also useful to consider the limitations of the ETS. Having carried out a scoping exercise to establish the most appropriate range of data, it remains the case that the ETS has to reflect a 'point in time', and that it will require updating as and when new data becomes available. As this and other studies [(xii)] have noted, it remains the case that:

Quantifying environmental thresholds is difficult;
Any absolute values are difficult to determine;
Different environmental criteria do not have the same 'threshold';
Some criteria are subjective and will remain difficult to define;



xii Environmental Capacity in the East Midlands: an evidence base fit for purpose. Final Report East Midlands Regional Assembly, Hallam Environmental Consultants Ltd, December 2008

# 7 Next Steps



**Next Steps**

**7.1** This first edition of the ETS is intended to help aid the discussion concerning the current state of the environment within Calderdale and inform the distribution of development in the Core Strategy. It is acknowledged there are limitations with the extent of the available data at present; however as future data becomes available, such as Pluvial Flooding and the forthcoming update to the Strategic Flood Risk Assessment (SFRA), the ETS will be updated accordingly.

**7.2** The next revision of the ETS is likely to take place alongside the Core Strategy Publication, and will support work on the Sustainability Appraisal Final report. Because of the nature of the outputs, in the interests of efficiency it is proposed that updated versions of the ETS relating to the Core Strategy will consist of a map and a briefing note informing the viewer what has changed from the previous version(s). It is not envisaged that the methodology of the Core Strategy ETS will alter significantly.

**7.3** It is necessary to emphasise that the ETS is one of a number of evidence base documents for the new Local Plan, and will assist in supporting the future distribution of development in the Core Strategy and the allocating and protection of sites in the Land Allocations and Designations plan. The ETS is not intended to be used as the final assessment as to whether or not a certain level of development would exceed an environmental threshold, but it does provide an indication of where there are currently greater concentrations of environmental criteria that are considered to lie within 'unacceptable' thresholds. Further use of the ETS data will occur in respect of merging the results with the Settlement Hierarchy. This will then give as complete a picture as possible in relation to the social , economic, and environmental conditions in the district.

**7.4** The ETS relating to the Land Allocations and Designations plan will be prepared with a slightly different methodology, and will use a 'vector' style mapping as opposed to the 500$m^2$ grid squares that have been applied in the Core Strategy ETS. A separate report and methodology will accompany any future ETS that relate to the Land Allocations and Designations part of the Local Plan.